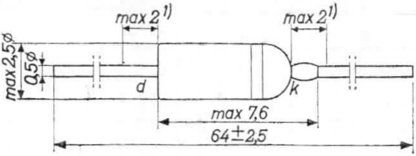
PHILIPS AA119

POINT-CONTACT GERMANIUM DIODE in miniature all-glass construction for use in A.M. detector and ratio detector circuits

Dimensions in mm The white band indicates the cathode side



LIMITING VALUES (Absolute max. values)

		T_{amb} =	25 °C	60 °C
Inverse voltage				
Average value (averaging time max. 50 msec)	$-V_D$	= max.	30 V	30 V
	(t_{av}	= max.	50 msec	50 msec)
Peak value	$-V_{DM}$	= max.	45 V	45 V
Forward current				
Average value (averaging time max. 50 msec) (See page D)	I_D	= max.	35 mA	15 mA
	(t_{av}	= max.	50 msec	50 msec)
Peak value	I_{DM}	= max.	100 mA	100 mA
Surge current (max. duration 1 sec)	I_{Dsurge}	= max.	200 mA	200 mA
	(t	= max.	1 sec	1 sec)

Temperatures

Storage temperature	T_s	=	-55 °C to +75 °C
Operating ambient temperature	T_{amb}	=	-55 °C to +60 °C

THERMAL DATA

Thermal resistance from junction to ambience in free air K = max. 0.45 °C/mW

1) Not tinned

CHARACTERISTICS at T_{amb} = 25 °C

Forward current (I_D)	Forward voltage (V_D) =	Forward voltage (V_D) max.
0.1 mA	= 0.23 V	< 0.30 V
1 mA	= 0.56 V	< 0.88 V
30 mA	= 2.8 V	< 4.0 V 1)

Inverse voltage ($-V_D$)	Reverse current ($-I_D$) =	Reverse current ($-I_D$) max.
1.5 V	= 0.8 µA	< 2.8 µA
10 V	= 4.5 µA	< 18 µA
30 V	= 35 µA	< 150 µA
45 V	= 90 µA	< 350 µA

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Forward current (I_D)	Forward voltage (V_D)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
0.1 mA			= 0.16 V	< 0.25 V
1 mA			= 0.50 V	< 0.80 V
10 mA	= 1.5 V	< 2.2 V	= 1.4 V	< 2.1 V
30 mA 1)			= 2.6 V	< 3.8 V

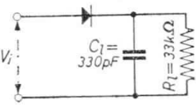
Inverse voltage ($-V_D$)	Reverse current ($-I_D$)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
0.1 V	= 0.35 µA	< 1.0 µA	= 4.5 µA	< 12 µA
1.5 V			= 6 µA	< 25 µA
10 V			= 16 µA	< 60 µA
30 V			= 60 µA	< 300 µA
45 V			= 170 µA	< 500 µA

Input voltage V_i = 3 Vrms

Frequency f = 10.7 Mc/s

Efficiency η = 85 %

Damping resistance r_d = 15 kΩ (> 13.5 kΩ, < 19 kΩ)



1) Measured with current pulses to prevent excessive dissipation

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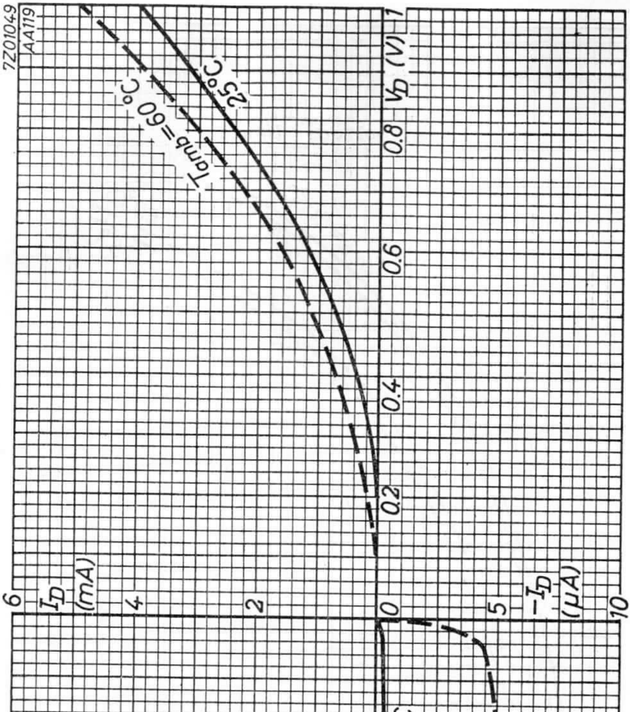
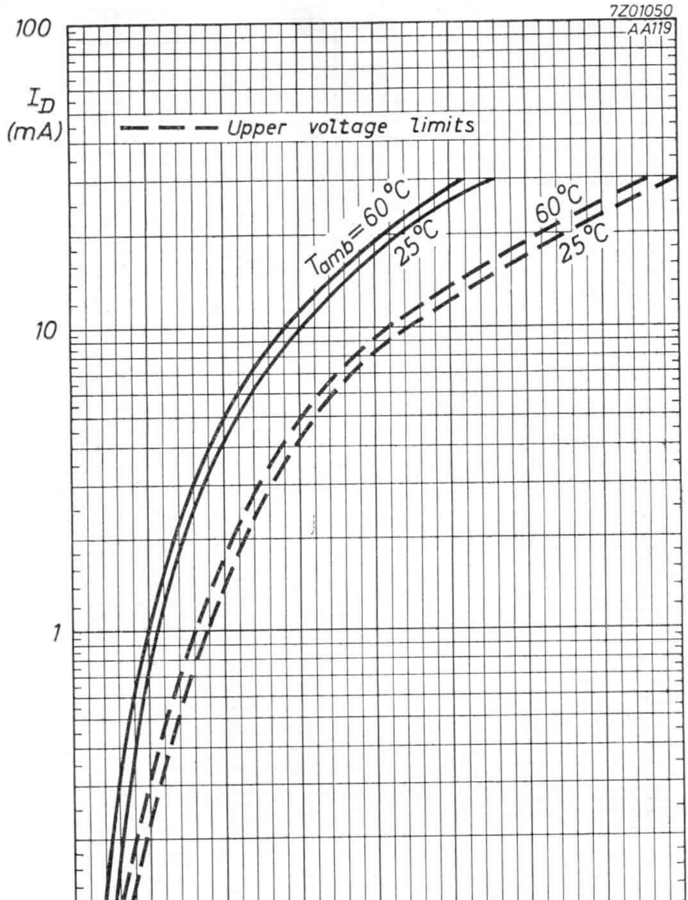
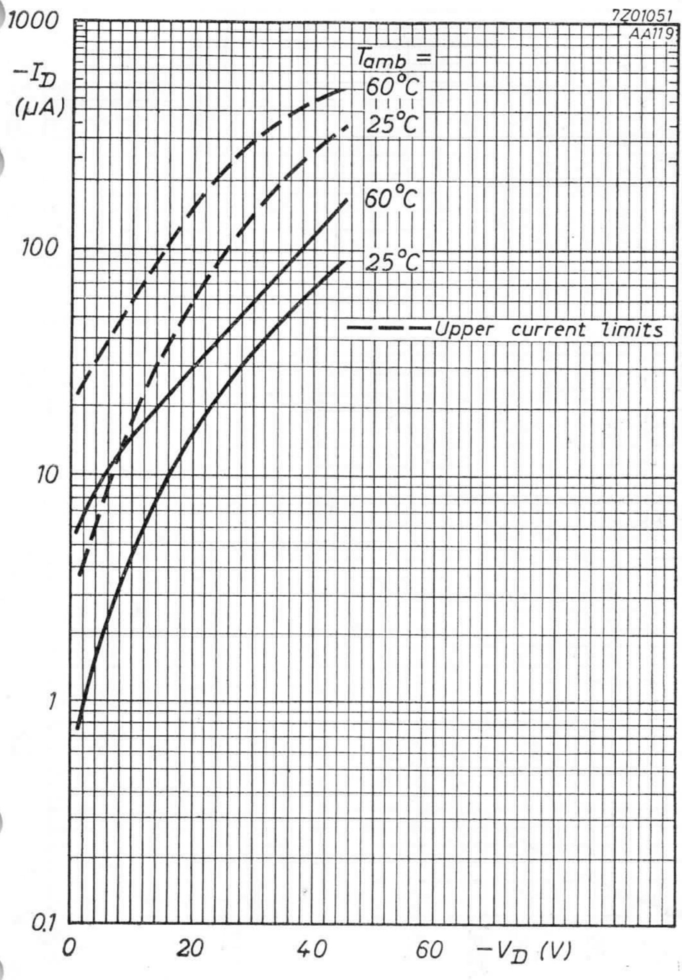
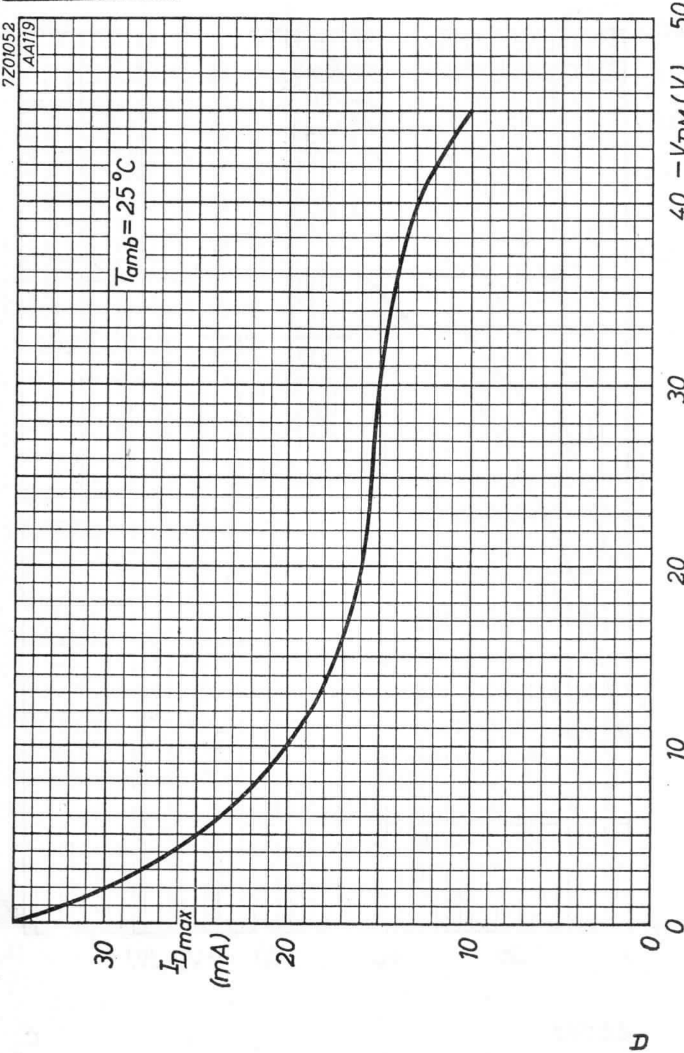



7Z01050
AA119
100
10
1
0.1
I_D (mA)
Upper voltage limits
T_{amb} = 60 °C
25 °C
60 °C
25 °C
0
1
2
3
4
V_D (V)


7Z01051
AA119
1000
$-I_D$ (μA)
100
10
1
0.1
0
20
40
60
$-V_D$ (V)
T_{amb} =
60°C
25°C
60°C
25°C
Upper current limits

AA119 **PHILIPS**



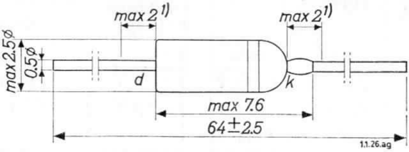
D

PHILIPS

AAY21

POINT CONTACT GERMANIUM DIODE in miniature all-glass construction for high speed computer logic applications

Dimensions in mm   The white band indicates the cathode side



LIMITING VALUES (Absolute max. values)

Inverse voltage	$-V_D$	= max.	15 V
Forward current			
Continuous	I_D	= max.	20 mA
Peak value	I_{DM}	= max.	50 mA
Temperatures			
Junction temperature	T_j	= max.	75 °C
Operating ambient temperature	T_{amb}	=	-65°C to +60 °C
Storage temperature	T_s	=	-65°C to +75 °C

THERMAL DATA

Thermal resistance from junction to ambience in free air   K = max. 0.75 °C/mW

CHARACTERISTICS

T_j = 25 °C		
Forward current (I_D)	Forward voltage (V_D) min.	Forward voltage (V_D) max.
2 mA	0.25 V	0.45 V
10 mA	0.40 V	0.80 V
50 mA	0.60 V	1.5 V

T_{amb} = 60 °C	
Inverse voltage ($-V_D$)	Reverse current ($-I_D$) max.
5 V	30 µA
15 V	100 µA

[1]) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_j = 60 °C		
Forward current (I_D)	Forward voltage (V_D) min.	Forward voltage (V_D) max.
2 mA	0.19 V	0.39 V
10 mA	0.34 V	0.74 V
50 mA	0.54 V	1.44 V

T_{amb} = 25 °C	
Inverse voltage ($-V_D$)	Reverse current ($-I_D$) max.
5 V	10 µA
15 V	60 µA

Diode capacitance

Inverse voltage	$-V_D$	=	1 V
Frequency	f	=	0.5 Mc/s
Ambient temperature	T_{amb}	=	25 °C
Diode capacitance	C_{dk}	<	1.2 pF

Reverse recovery time (see figs. 1, 3 and 4)

Initial forward current	I_D	=	3 mA
Inverse voltage	$-V_D$	=	1 V
Loop resistance	R_{loop}	=	100 Ω
Ambient temperature	T_{amb}	=	25 °C
Reverse recovery time for $-I_D$ = 1 mA	t_{rec}	= <	5 nsec 12 nsec

Reverse recovery current (see figs. 2, 3 and 5)

Initial forward current	I_D	=	3 mA
Inverse voltage	$-V_D$	=	5 V
Loop resistance	R_{loop}	=	500 Ω
Ambient temperature	T_{amb}	=	25 °C
Reverse recovery current after t = 50 nsec	$-I_D$	<	0.5 mA

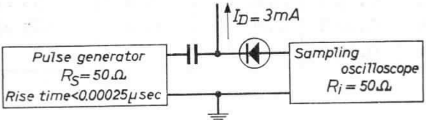


Fig. 1

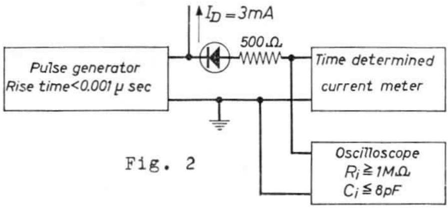


Fig. 2

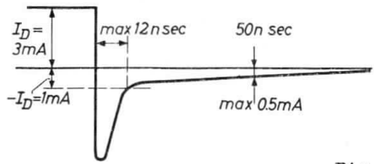


Fig. 3

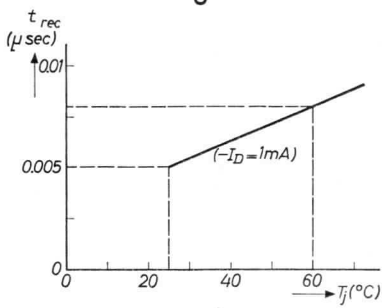


Fig. 4

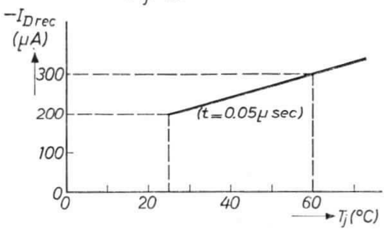
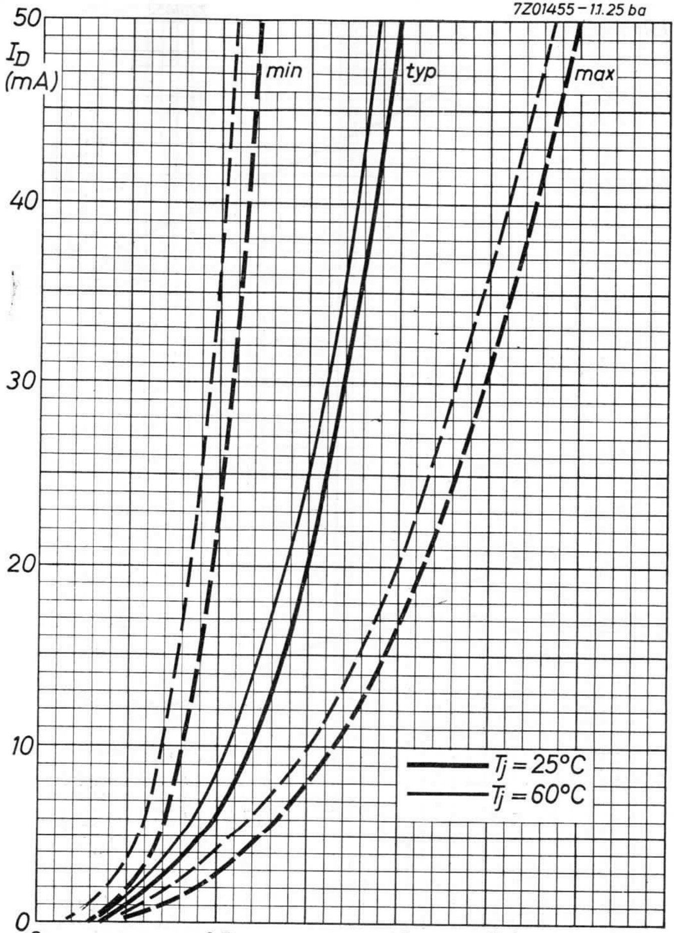
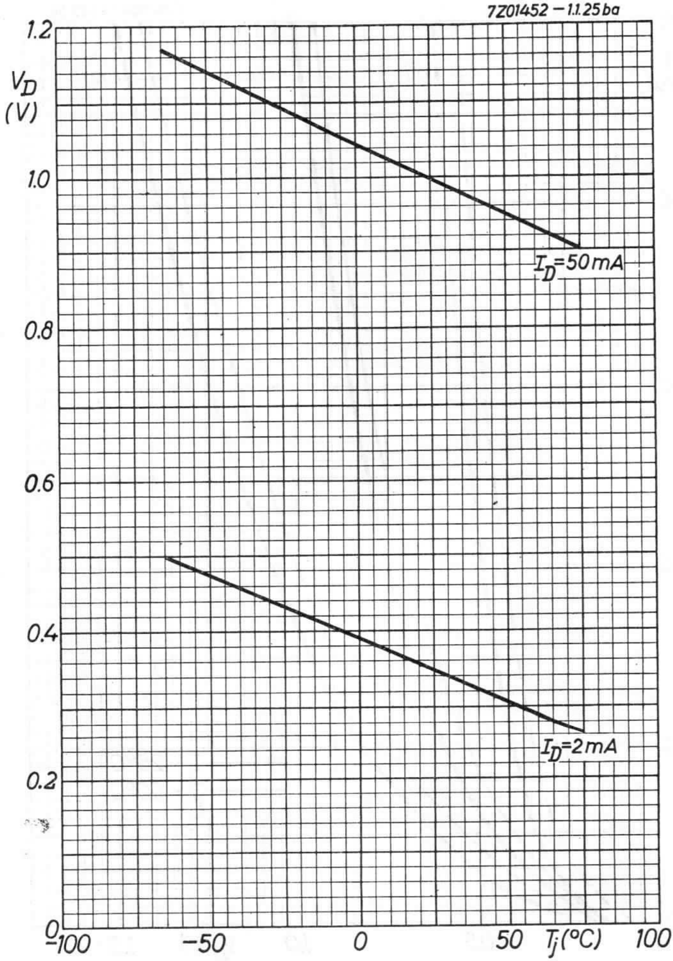
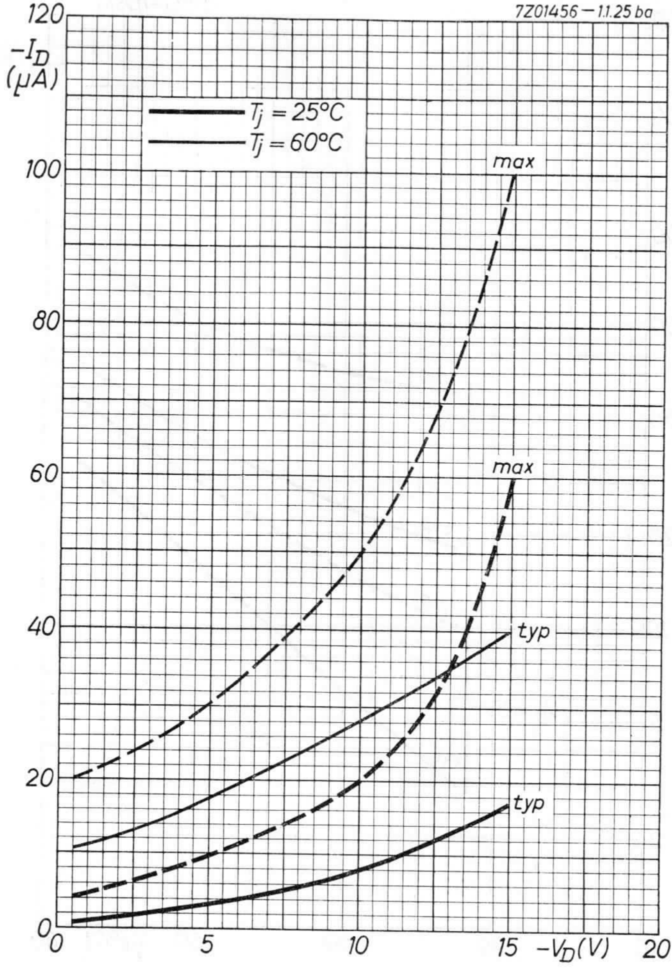
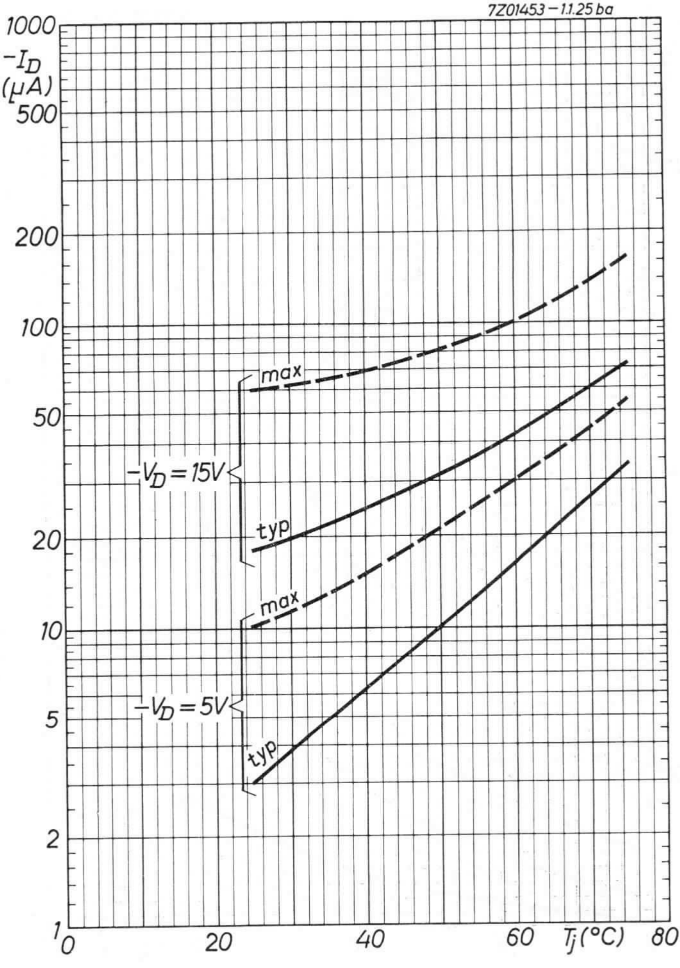


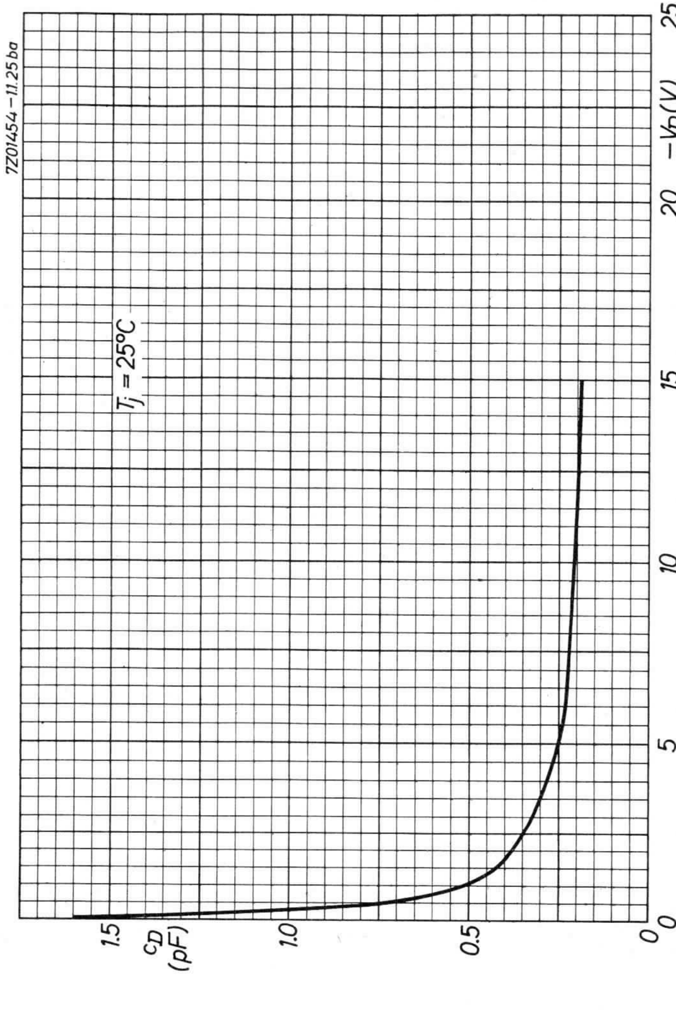
Fig. 5


7Z01455 – 1.1.25 ba
50
I_D
(mA)
40
30
20
10
0
0
0.5
1.0
V_D(V)
1.5
min
typ
max
T_j = 25°C
T_j = 60°C


7Z01452 — 1.1.25ba
1.2
V_D
(V)
1.0
0.8
0.6
0.4
0.2
0
−100
−50
0
50
T_j (°C)
100
I_D=50mA
I_D=2mA


7Z01456 — 1.1.25 ba
120
$-I_D$
(μA)
100
80
60
40
20
0
T_j = 25°C
T_j = 60°C
max
max
typ
typ
0
5
10
15
$-V_D$(V)
20


7Z01453 – 1.1.25 ba
1000
$-I_D$
(μA)
500
200
100
50
20
10
5
2
1
0
20
40
60
80
T_j (°C)
max
typ
$-V_D = 15V$
max
typ
$-V_D = 5V$


7Z01454-1.1.25 ba
Tj = 25°C
-VD (V)
0
5
10
15
20
25
cD
(pF)
1.5
1.0
0.5
0

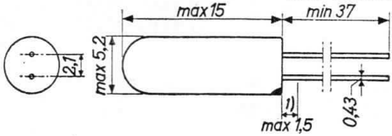
GERMANIUM JUNCTION DIODE in single-ended all-glass construction for high current low hole-storage applications

DIODE AU GERMANIUM A JONCTION en construction tout-verre à sorties unilatérales destinée aux applications de courant élevé et de faible accumulation de lacunes

GERMANIUM-FLÄCHENDIODE in Allglastechnik mit einseitig ausgeführten Anschlüssen für Anwendungen mit hohen Strömen und geringer Löcheraufspeicherung

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The red dot indicates the cathode connection
Le point rouge indique la connexion de la cathode
Der rote Punkt bezeichnet den Katodenanschluss



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

T_{amb}	=	25	60	°C
$-V_D$	= max.	30	30	V
I_D (t_{av} = max. 50 msec)	= max.	100	100	mA
I_{DM}	= max.	1,0	0,5	A
I_D surge (t = max. 100 µsec)	= max.	4,0		A
T_j	=	max. 75 °C		
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	-55 °C/+75 °C		

1) Not tinned; non étamé; nicht verzinnt

Tentative data. Vorläufige Daten
Caractéristiques provisoires

Thermal data. Thermal resistance from junction to ambience in free air	K	$\leq$	0.4 °C/mW
Données thermiques. Résistance thermique entre la jonction et l'ambiance à l'air libre	K	$\leq$	0,4 °C/mW
Thermische Daten. Wärmewiderstand zwischen Kristall und Umgebung in freier Luft	K	$\leq$	0,4 °C/mW

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

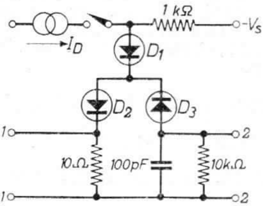
T_{amb} = 25 °C { unless otherwise specified / sauf indication différente / wenn nicht anders angegeben

I_D	=	0,3		mA	$-V_D$	=	1,5		V
V_D	=	135	< 190	mV	$-I_D$	=	1,5	< 5,0	µA
I_D	=	30		mA	$-V_D$	=	10		V
V_D	=	250	< 330	mV	$-I_D$	=	2,0	< 10	µA
I_D	=	100		mA	$-V_D$	=	20		V
V_D	=	320	< 420	mV	$-I_D$	=	3,2		µA
I_D	=	1000		mA[1]	$-V_D$	=	30		V
V_D	=	700		mV	$-I_D$	=	6,0		µA
$-V_D$	=	3		V	T_{amb}	=	60		°C
c_{dk}	=	9,0	< 12	pF[2]	$-V_D$	=	30		V
					$-I_D$	=	80	< 300	µA

[1]) Measured with current pulses to prevent excessive dissipation
Mesuré avec des impulsions de courant pour prévenir une dissipation excessive
Zur Vermeidung einer übermässigen Verlustleistung mit Stromimpulsen gemessen.

[2]) Capacitance with small signals
Capacité à faible signal
Kapazität bei kleiner Signalstärke

Recovered charge
Récupération de charge
Freikommende Ladung



D_1 = diode under test
D_1 = diode à l'essai
D_1 = geprüfte Diode

D_2 = low hole storage diode
D_2 = diode à faible accumulation de lacunes
D_2 = Diode mit geringer Löcheraufspeicherung

D_3 = diode with low forward voltage drop
D_3 = diode à faible chute de tension en sens conducteur
D_3 = Diode mit niedrigem Spannungsabfall im Durchlasszustand

Terminals 1: forward current wave form
Bornes 1 : forme d'onde du courant en sens conducteur
Anschlussklemmen 1: Wellenform des Stromes in Durchlassrichtung

Terminals 2: measuring of recovered charge
Bornes 2 : mesure de la charge de récupération
Anschlussklemmen 2: Messung der freigekommenen Ladung

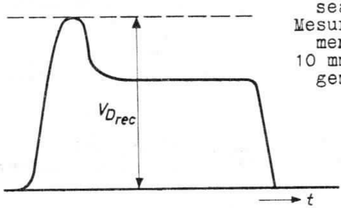
I_D	=	10		mA
Fall time of I_D Temps de descente de I_D Abfallzeit von I_D	<	0,01		µsec
$-V_S$	=	10		V
Q	=	150	< 200	pC

Recombination time (time taken by recovered charge in excess of that due to capacitance to fall to 10% of its peak value)
Temps de recombinaison (durée du temps prise par la charge de récupération, au-dessus de celle par suite de la capacité, pour descendre jusqu'à 10% de sa valeur de crête)
Rekombinationszeit (Zeit die die freikommende Ladung, ausser der infolge der Kapazität, braucht um bis 10% ihres Höchstwertes abzufallen).

Measured in the circuit page 3 with delayed application of $-V_S$
Mesuré avec le circuit page 3, mais avec application retardée de $-V_S$
Gemessen in der Schaltung Seite 3 aber mit verzögerter Anlegung von $-V_S$

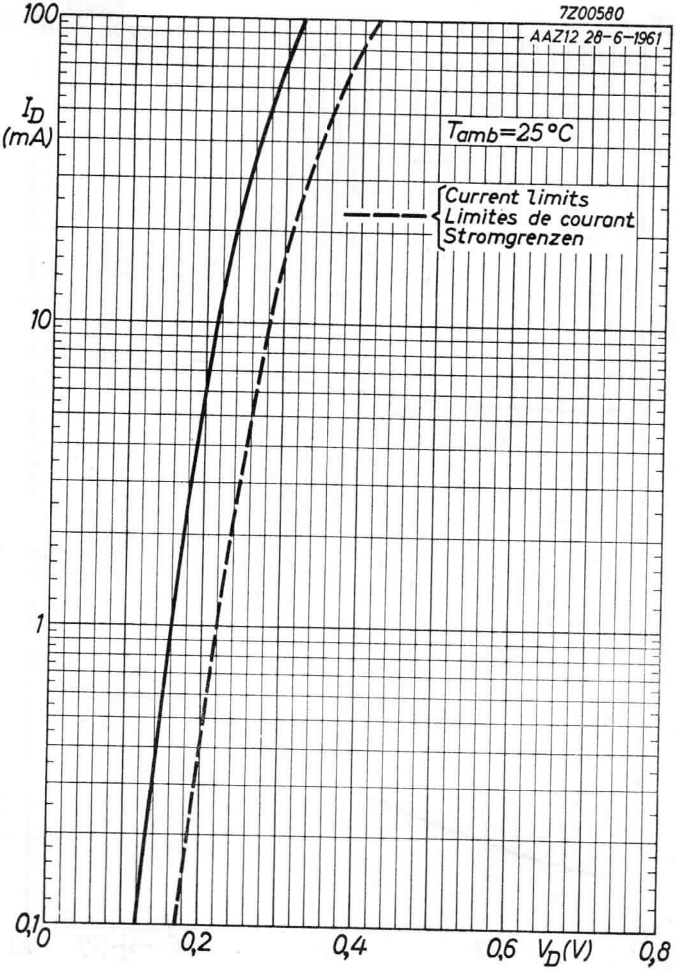
I_D	=	10		mA
τ_{rec}	=	0,05	< 0,12	μsec

Forward recovery voltage
Tension de recouvrement en sens conducteur
Übergangsspannung in Durchlassrichtung



Measured at 10 mm from the seal
Mesuré à 10 mm du scellement
10 mm von der Einschmelzung gemessen

I_D	=	400		mA
Rise time of I_D Temps de montée de I_D Anstiegszeit von I_D	=	0,04		μsec
$V_{D\ rec}$	=	0,8	< 2,0	V


7Z00580
AAZ12 28-6-1961
100
I_D
(mA)
10
1
0,1
0
0,2
0,4
0,6
V_D(V)
0,8
T_{amb}=25 °C
Current limits
Limites de courant
Stromgrenzen

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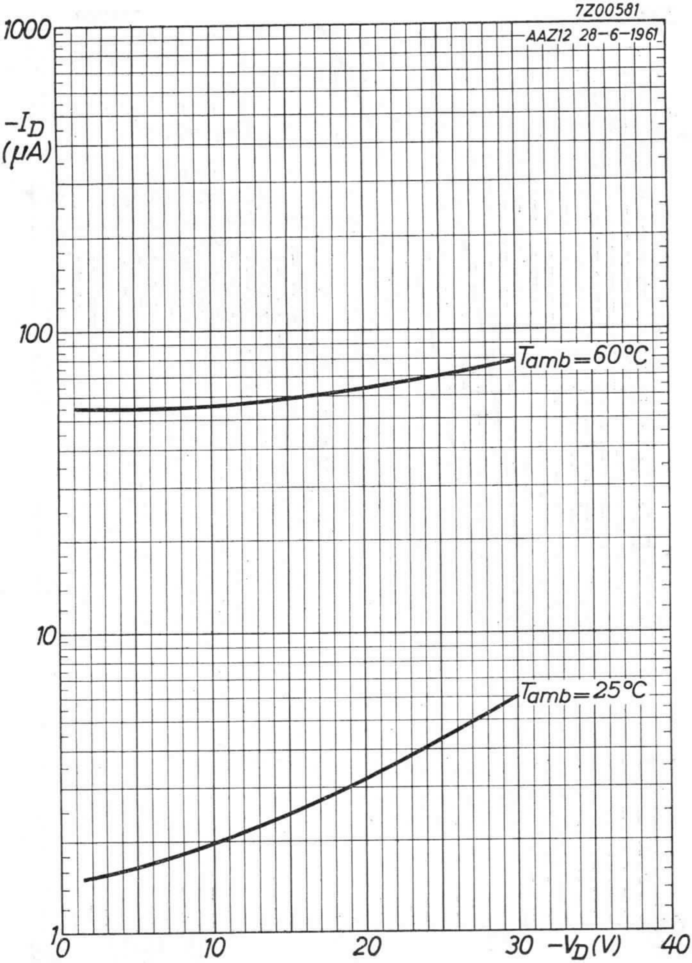

7Z00581
AAZ12 28-6-1961
1000
$-I_D$
(μA)
100
10
1
0
10
20
30
$-V_D$(V)
40
T_{amb}=60°C
T_{amb}=25°C

PHILIPS

AAZ13

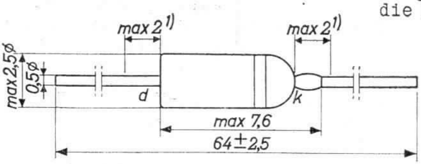
GOLD-BONDED GERMANIUM DIODE in miniature double-ended all-glass construction for use in high-speed switching applications

DIODE AU GERMANIUM À POINTE D'OR en construction miniature tout-verre à sorties bilatérales destinée aux applications de commutation à grande vitesse

GERMANIUM-GOLDDRAHTDIODE in Miniatur-Allglastechnik mit zweiseitig ausgeführten Anschlüssen zur Verwendung als Schalter grosser Geschwindigkeit

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The white band indicates the position of the cathode
L'anneau blanc indique la position de la cathode
Der weisse Ring bezeichnet die Katodenseite



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

	T_{amb} =		25	60 °C
$-V_D$		= max.	8	8 V
I_D	(t_{av} = max. 50 msec)	= max.	30	20 mA
I_{DM}	(t = max. 5 msec)	= max.	100	50 mA
T_j		=	max.	75 °C

Storage temperature
Température d'emmagasinage = -55 °C/+75 °C
Lagerungstemperatur

[1]) Not tinned; non étamé; nicht verzinnt

Thermal data. Thermal resistance from junction to ambience in free air	K	≦	0.5 °C/mW
Données thermiques. Résistance thermique entre la jonction et l'ambiance à l'air libre	K	≦	0,5 °C/mW
Thermische Daten. Wärmewiderstand zwischen Kristall und Umgebung in freier Luft	K	≦	0,5 °C/mW

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements.
Kenndatenbereiche für Gerätentwurf

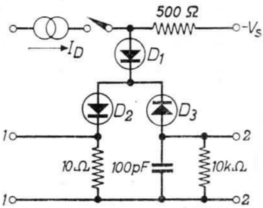
$T_{amb} = 25\ ^\circ C$ { unless otherwise specified / sauf indication différente / wenn nicht anders angegeben

I_D	= 1			mA
V_D	= 270	<	320	mV
I_D	= 10			mA
V_D	= 500	<	600	mV
I_D	= 30			mA
V_D	= 600	<	1000	mV
$-V_D$	= 1			V
c_{dk}	= 3,3			pF[1]
$-V_D$	= 3			V
c_{dk}	= 1,3	<	2,0	pF[1]

$-V_D$	= 3			V
$-I_D$	= 5	<	25	μA
T_{amb}	= 60			°C
$-V_D$	= 3			V
$-I_D$	= 30	<	85	μA
$-V_D$	= 8			V
$-I_D$	= 30	<	150	μA
T_{amb}	= 60			°C
$-V_D$	= 8			V
$-I_D$	= 190			μA

[1]) Capacitance with small signals
Capacité à faible signal
Kapazität bei kleiner Signalstärke

Recovered charge
Récupération de charge
Freikommende Ladung



D_1 = diode under test
D_1 = diode à l'essai
D_1 = geprüfte Diode

D_2 = low hole storage diode
D_2 = diode à faible accumulation de lacunes
D_2 = Diode mit geringer Löcheraufspeicherung

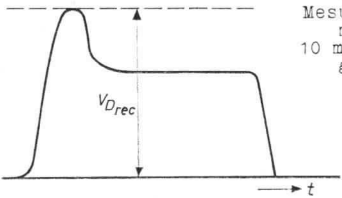
D_3 = diode with low forward voltage drop
D_3 = diode à faible chute de tension en sens conducteur
D_3 = Diode mit niedrigem Spannungsabfall im Durchlasszustand

Terminals 1: forward current wave form
Bornes 1 : forme d'onde du courant en sens conducteur
Anschlussklemmen 1: Wellenform des Stromes in Durchlassrichtung

Terminals 2: measuring of recovered charge
Bornes 2 : mesure de la charge de récupération
Anschlussklemmen 2: Messung der freigekommenen Ladung

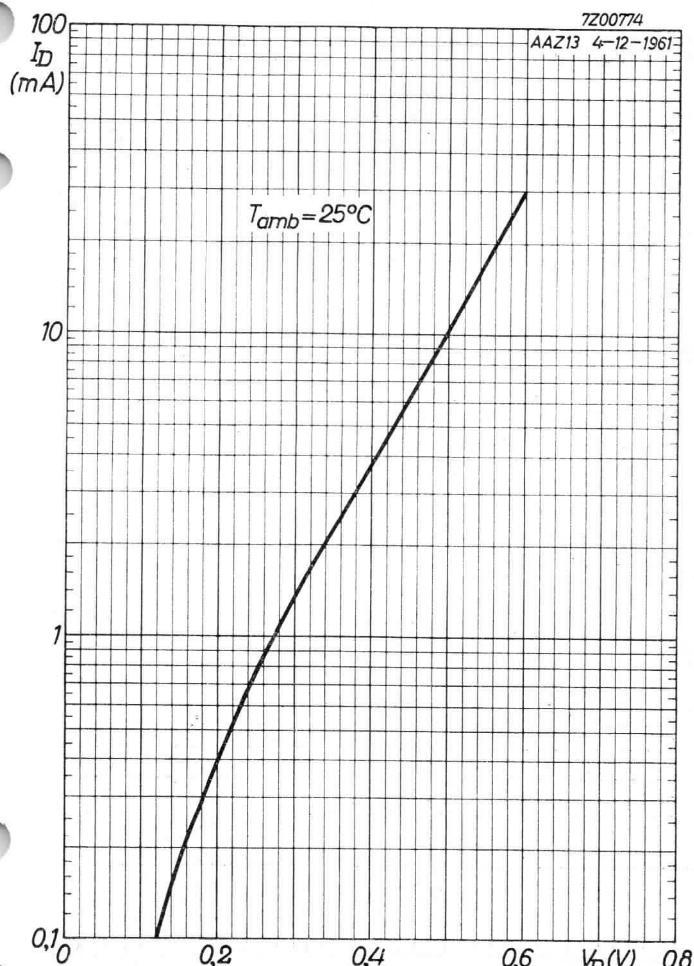
I_D	=	10	mA
Fall time of I_D Temps de descente de I_D Abfallzeit von I_D	<	0,005	µsec
$-V_S$	=	5	V
Q	=	20	< 30 pC

Forward recovery voltage
Tension de recouvrement en sens conducteur
Übergangsspannung in Durchlassrichtung



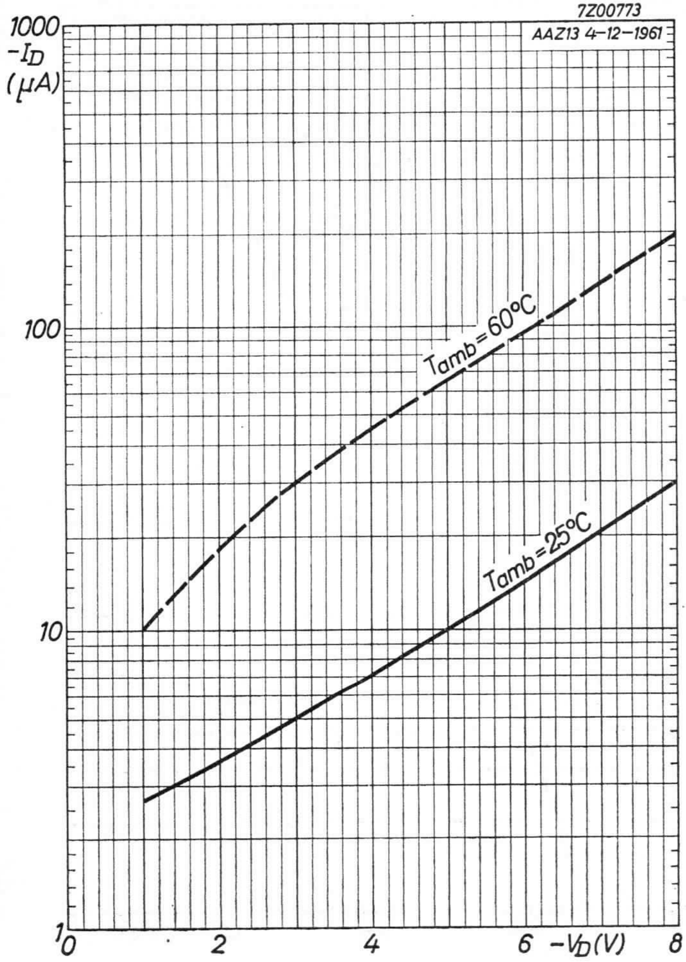
Measured at 10 mm from the seal
Mesuré à 10 mm du scellement
10 mm von der Einschmelzung gemessen

I_D	=	20	mA
Rise time of I_D Temps de montée de I_D Anstiegszeit von I_D	=	0,005	µsec
$V_{D\ rec}$	=	0,7 <1,5	V



7Z00774
AAZ13 4-12-1961
100
I_D (mA)
10
1
0,1
0
0,2
0,4
0,6
V_D(V)
0,8
T_{amb}=25°C

PHILIPS

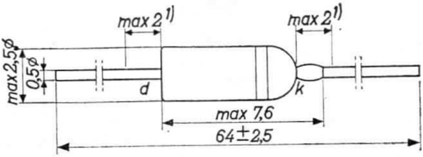

7Z00773
AAZ13 4-12-1961
1000
$-I_D$
(μA)
100
10
1
0
2
4
6
$-V_D$(V)
8
T_{amb} = 60°C
T_{amb} = 25°C

B

GOLD-BONDED GERMANIUM DIODE in all-glass construction for general purpose applications
DIODE À CRISTAL DE GERMANIUM À POINTE D'OR en construction tout-verre miniature pour usages généraux
GERMANIUM-GOLDDRAHTDIODE in Miniatur-Allglastechnik für allgemeine Verwendungszwecke

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The white band indicates the position of the cathode
L'anneau blanc indique la position de la cathode
Der weisse Ring bezeichnet die Katodenseite



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

	T_{amb} =	25 °C	60 °C
$-V_D$	= max.	75	75 V
$-V_{DM}$	= max.	75	75 V
$-V_{Dsurge}$ (t = max. 1 sec)	= max.	115	115 V
I_D {direct current / courant continu / Gleichstrom}	= max.	140	55 mA[2)]
I_D (t_{av} = max. 50 msec)	See pages E,F / Voir pages E,F / Siehe Seiten E,F		
I_{DM}	= max.	250	250 mA
I_{Dsurge} (t = max. 1 sec)	= max.	300	300 mA
T_{amb}	=	-55 °C/+60 °C	

Storage temperature
Température d'emmagasinage = -55 °C/+75 °C
Lagerungstemperatur

1) Not tinned
Non étamé
Nicht verzinnt

2) See also page D
Voir aussi page D
Siehe auch Seite D

PHILIPS

Thermal data. Thermal resistance from junction to ambience in free air	$K \leq 0.45\ ^{o}C/mW$
Données thermiques. Résistance thermique entre la jonction et l'ambiance à l'air libre	$K \leq 0{,}45\ ^{o}C/mW$
Thermische Daten. Wärmewiderstand zwischen Kristall und Umgebung in freier Luft	$K \leq 0{,}45\ ^{o}C/mW$

Characteristics
Caractéristiques
Kenndaten

I_D (mA)	V_D(V)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
0,1	= 0,15	< 0,23	= 0,08	< 0,18
10	= 0,35	< 0,45	= 0,30	< 0,40
250[1])	= 0,70	< 1,10	= 0,65	< 1,05

$-V_D$ (V)	$-I_D$(μA)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
1,5	= 0,6	< 2,5	= 12	< 30
10	= 1,0	< 4	= 16	< 60
75	= 10	< 25	= 35	<120

[1]) Measured under pulsed conditions to prevent excessive dissipation
Mesuré avec des impulsions pour prévenir une dissipation excessive
Zur Vermeidung einer übermässigen Verlustleistung mit Impulsen gemessen

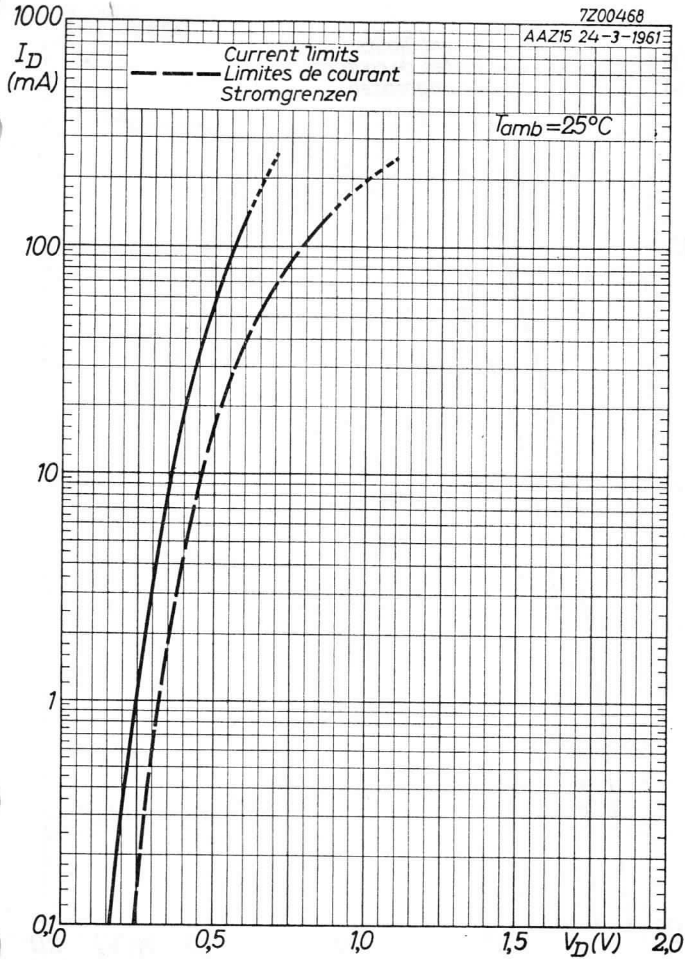
Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

Capacitance Capacité Kapazität	$-V_D$	=	0,75 V
	f	=	0,5 Mc/s
	C_{dk}	=	1,2 pF
		<	4,0 pF [1])

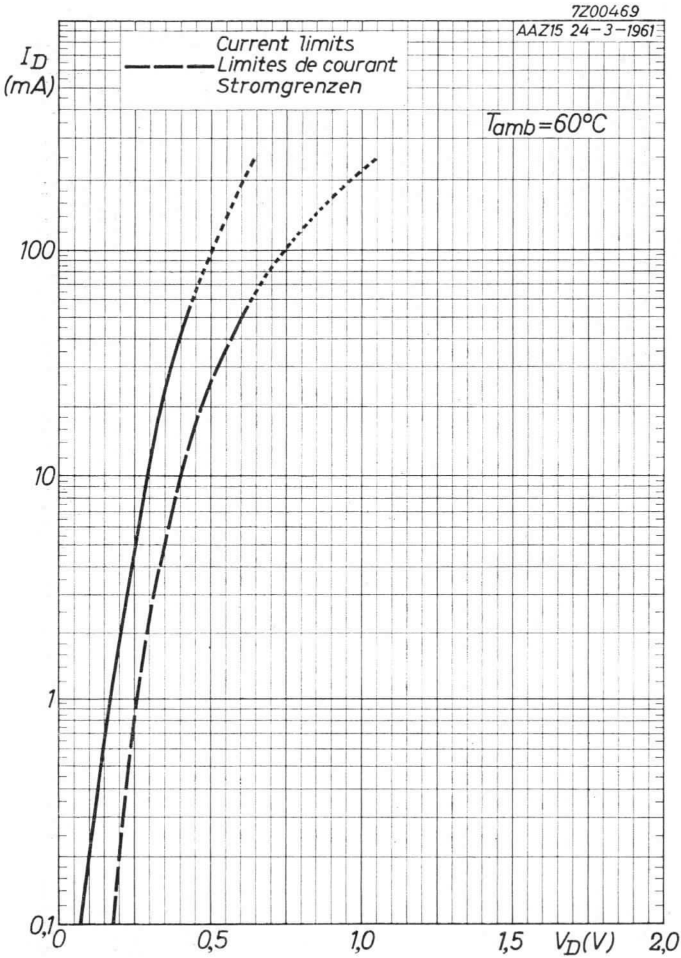
[1]) Characteristic range value for equipment design. For other characteristics range values for equipment design see curves pages A,B and C except for the points mentionned at page 2
Gamme de valeur caractéristique pour l'étude d'équipements. Pour les autres gammes de valeurs caractéristiques pour l'étude d'équipements voir les courbes pages A,B et C sauf les points mentionnés page 2
Charakteristischer Kenndatenbereich für Gerätentwurf. Für die übrigen charakteristischen Kenndatenbereiche für Gerätentwurf siehe die Kurven auf Seite A,B und C, mit Ausnahme der auf Seite 2 erwähnten Punkte

PHILIPS

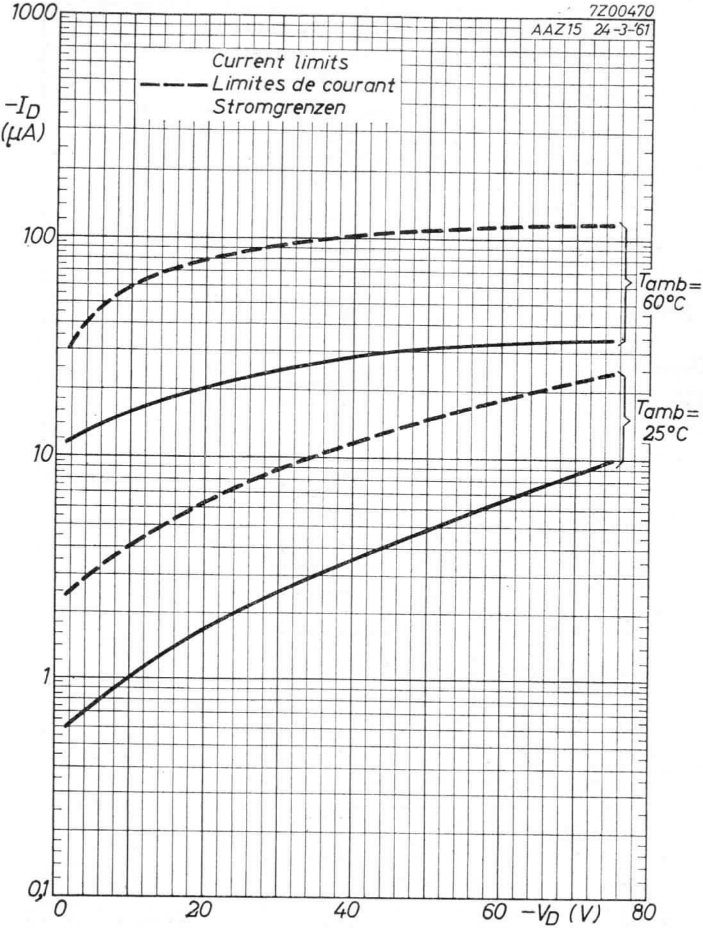
AAZ 15



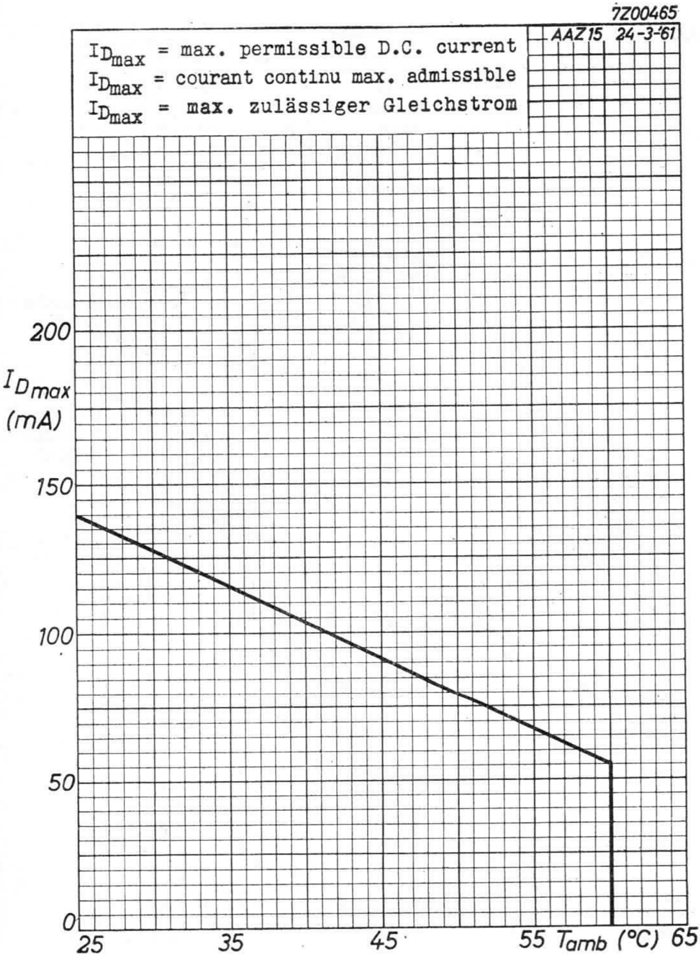
PHILIPS


7Z00469
AAZ15 24-3-1961
I_D (mA)
Current limits
Limites de courant
Stromgrenzen
T_{amb}=60°C
100
10
1
0,1
0
0,5
1,0
1,5
V_D(V)
2,0

B


7Z00470
AAZ15 24-3-'61
Current limits
Limites de courant
Stromgrenzen
$-I_D$
(μA)
1000
100
10
1
0,1
T_{amb}=
60°C
T_{amb}=
25°C
0
20
40
60
$-V_D$ (V)
80

PHILIPS

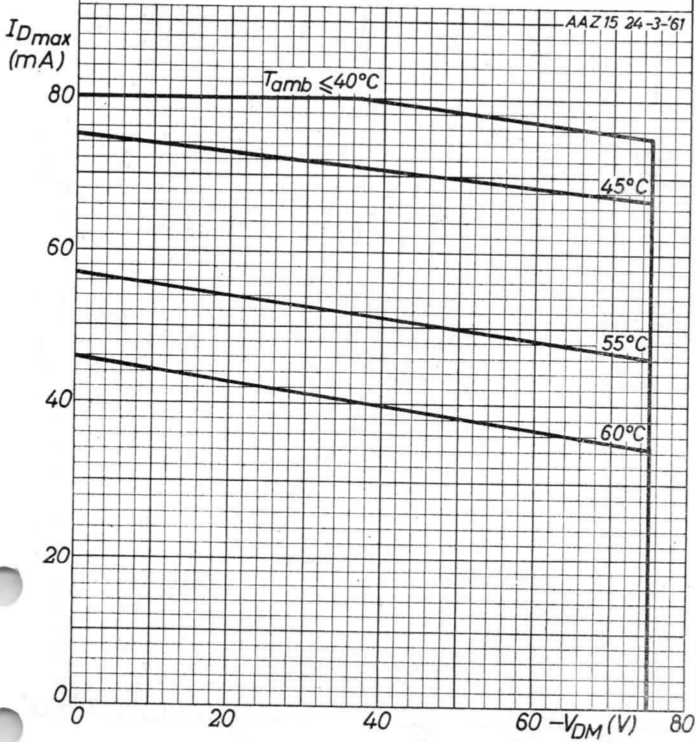

7Z00465
AAZ15 24-3-'61
I_{Dmax} = max. permissible D.C. current
I_{Dmax} = courant continu max. admissible
I_{Dmax} = max. zulässiger Gleichstrom
200
I_{Dmax} (mA)
150
100
50
0
25
35
45
55
T_{amb} (°C)
65

7Z00466

I_{Dmax} = max. permissible value of I_D for sinusoidal input voltages and resistive load. ($I_{DM} = \pi x I_D$; t_{av} = max. 50 msec)

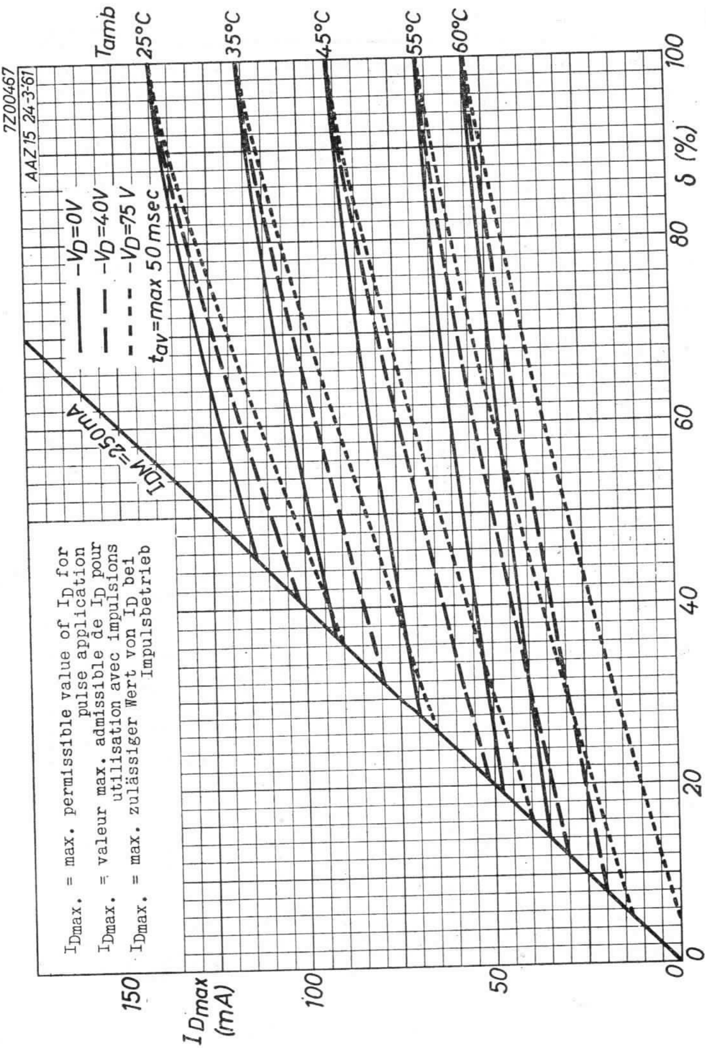
I_{Dmax} = valeur max. admissible de I_D pour des tensions d'entrée sinusoïdales avec charge résistive. ($I_{DM} = \pi . I_D$; t_{av} = 50 msec au max.)

I_{Dmax} = max. zulässiger Wert von I_D bei sinusförmigen Eingangsspannungen mit Widerstandsbelastung. ($I_{DM} = \pi . I_D$; t_{av} = max. 50 mSek)



AAZ 15

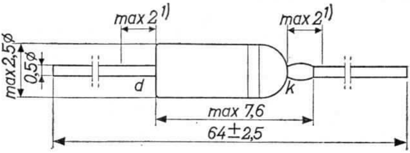
PHILIPS



GOLD-BONDED GERMANIUM DIODE in miniature all-glass construction for high back resistance switching applications
DIODE À CRISTAL DE GERMANIUM À POINTE D'OR en construction tout-verre miniature pour applications de commutation à résistance inverse élevée
GERMANIUM-GOLDDRAHTDIODE in Miniatur-Allglastechnik zur Verwendung als Schalterdiode mit hohem Widerstand im Sperrzustand

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The white band indicates the position of the cathode
L'anneau blanc marque la position de la cathode
Der weisse Ring bezeichnet die Katodenseite



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

		T_{amb} = 25 °C	60 °C
$-V_D$	= max.	50	50 V
$-V_{DM}$	= max.	50	50 V
$-V_{Dsurge}$ (t = max. 1 sec)	= max.	75	75 V
I_D { direct current / courant continu / Gleichstrom	= max.	110	40 mA [2]
I_D (t_{av} = max. 50 msec)	{ See pages D,E / Voir pages D,E / Siehe Seiten D,E		
I_{DM}	= max.	150	150 mA
I_{Dsurge} (t = max. 1 sec)	= max.	200	200 mA
T_{amb}	= - 55 °C/+ 60 °C		
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	= - 55 °C/+ 75 °C		

[1]) Not tinned; non étamé; nicht verzinnt

[2]) See also page C; voir aussi page C; siehe auch Seite C

Thermal data. Junction temperature rise to ambient temperature in free air — $K \leq 0.45\ ^oC/mW$

Données thermiques. Augmentation de la température de la jonction au regard de la température de l'ambiance à l'air libre — $K \leq 0,45\ ^oC/mW$

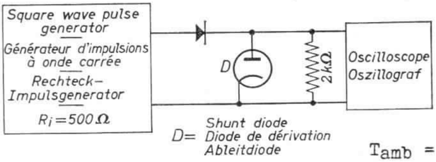
Thermische Daten. Temperaturerhöhung des Kristalls in bezug auf die Umgebungstemperatur in freier Luft — $K \leq 0,45\ ^oC/mW$

Characteristics
Caractéristiques
Kenndaten

I_D (mA)	V_D (V)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
1	=0,15	<0,25	=0,09	
10	=0,35	<0,65	=0,30	
150[1])	=0,74	<1,10	=0,68	

$-V_D$ (V)	$-I_D$ (µA)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
1,5	= 1,5	< 3,5	= 14	
10	= 4,0	< 20	= 22	
50	= 30	< 150	= 100	

Reverse recovery, measured at $-V_D$ = 35 V after forward current pulse of 30 mA
Recouvrement inverse, mesuré à $-V_D$ = 35 V après une impulsion de courant en sens conducteur de 30 mA
Übergangszeit für Sperrichtung, gemessen bei $-V_D$ = 35 V nach einem Stromimpuls von 30 mA in der Durchlassrichtung



T_{amb} = 25 °C

Measuring circuit; circuit de mesure; Messchaltung

1) See page 3; voir page 3; siehe Seite 3

Reverse recovery (continued)
Recouvrement inverse (suite)
Übergangszeit für Sperrichtung (Fortsetzung)

Pulse data
Données de l'impulsion
Impulsdaten

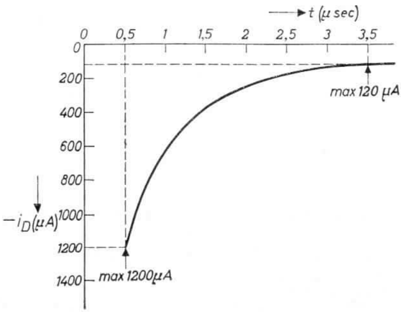
	f	=	50 kc/s
	δ	=	0,5
Rise time Temps de montée Anstiegszeit		<	0,1 µsec
	I_{DM}	=	30 mA
	$-V_{DM}$	=	35 V

Oscilloscope data
Données de l'oscilloscope
Daten des Oszillographen

	C C_{inp}	=	40 pF
Rise time Temps de montée Anstiegszeit		=	0,025 µsec

$-i_D$ { 0.5 µsec after the current impuls / 0,5 µsec après l'impulsion de courant / 0,5 µSek nach dem Stromimpuls } = 850 µA, <1200 µA

$-i_D$ { 3.5 µsec after the current impuls / 3,5 µsec après l'impulsion de courant / 3,5 µSek nach dem Stromimpuls } = 60 µA, < 120 µA



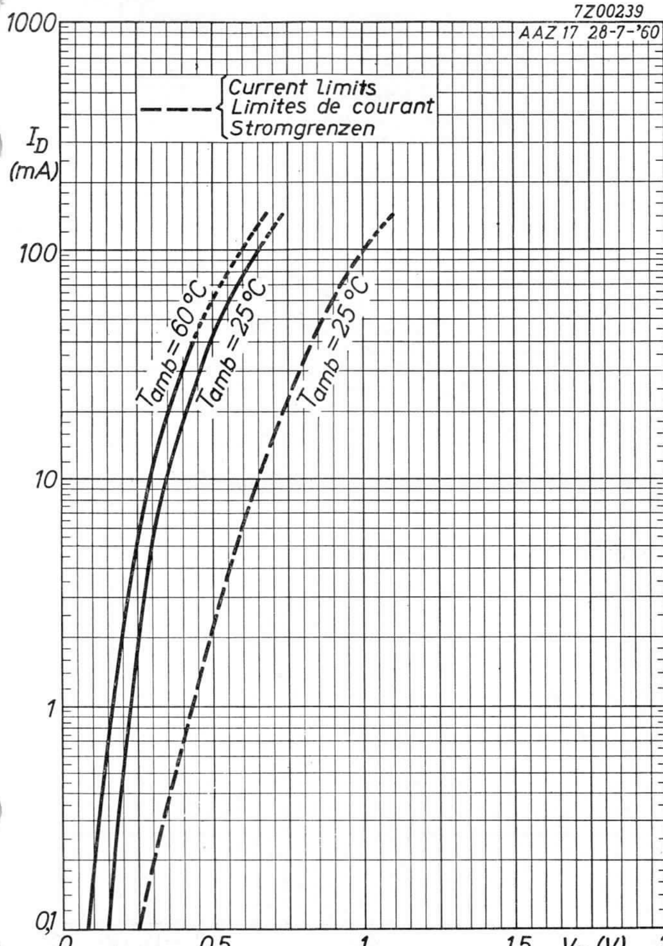
[1]) Measured under pulsed conditions to prevent excessive dissipation
Mesuré avec des impulsions pour prévenir une dissipation excessive
Zur Vermeidung einer übermässigen Verlustleistung mit Impulsen gemessen

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

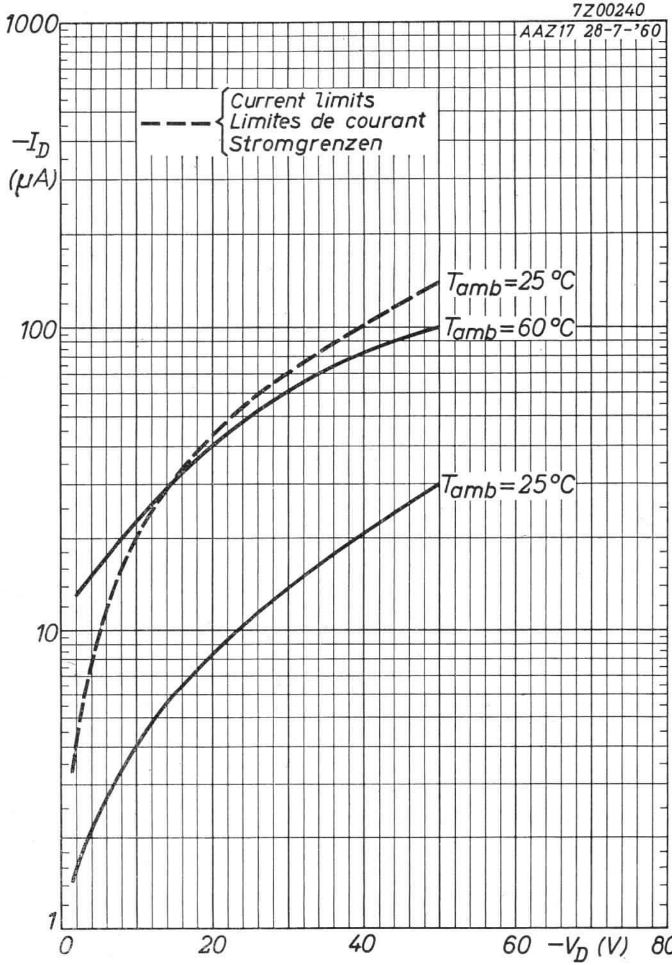
Capacitance
Capacité
Kapazität

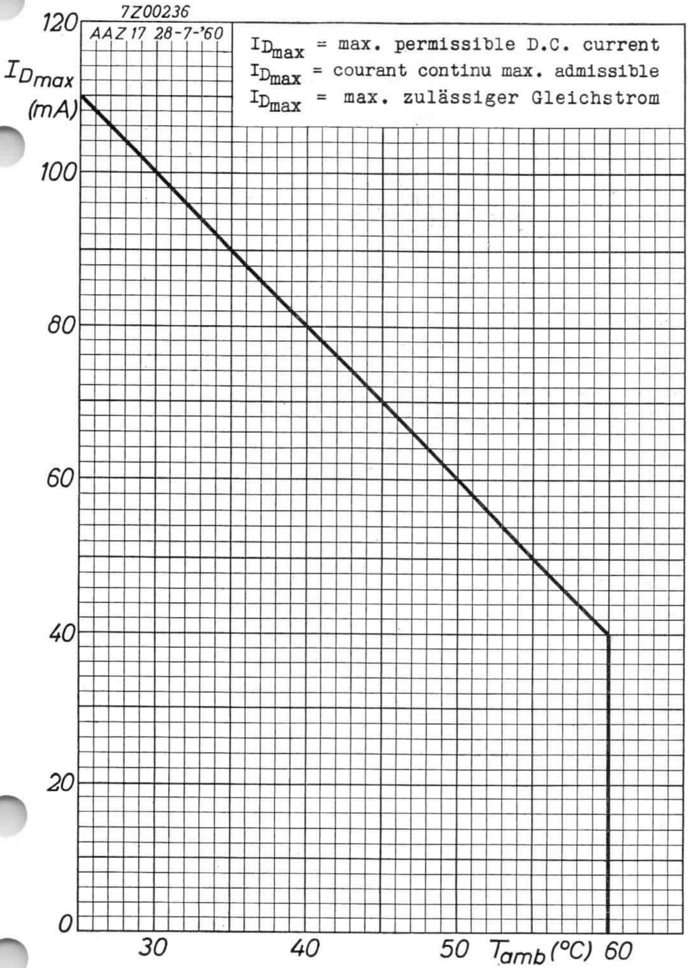
$-V_D$ = 0,75 V
f = 0,5 Mc/s
c_{dk} = 1,5 pF
c_{dk} < 4,0 pF [1]

[1]) Characteristic range values for equipment design. For other characteristic range values for equipment design see curves pages A and B except the points mentionned at page 2
Gamme de valeurs caractéristiques pour l'étude d'équipements. Pour les autres gammes de valeurs caractéristiques pour l'étude d'équipements voir les courbes pages A et B sauf les points mentionnés page 2
Charakteristischer Wertbereich für Gerätentwurf. Für die übrigen charakteristischen Wertbereiche für Gerätentwurf siehe die Kurven Seiten A und B, mit Ausnahme der auf Seite 2 erwähnten Punkte.


7Z00239
AAZ 17 28-7-'60
Current limits
Limites de courant
Stromgrenzen
1000
100
10
1
0,1
I_D (mA)
Tamb = 60 °C
Tamb = 25 °C
Tamb = 25 °C
0
0,5
1
1,5
2
V_D (V)

PHILIPS


7Z00240
AAZ17 28-7-'60
Current limits
Limites de courant
Stromgrenzen
$-I_D$ (μA)
1000
100
10
1
T_{amb}=25 °C
T_{amb}=60 °C
T_{amb}=25 °C
0
20
40
60
80
$-V_D$ (V)


7Z00236
AAZ 17 28-7-'60
I_{Dmax} = max. permissible D.C. current
I_{Dmax} = courant continu max. admissible
I_{Dmax} = max. zulässiger Gleichstrom
I_{Dmax} (mA)
120
100
80
60
40
20
0
30
40
50
T_{amb} (°C)
60

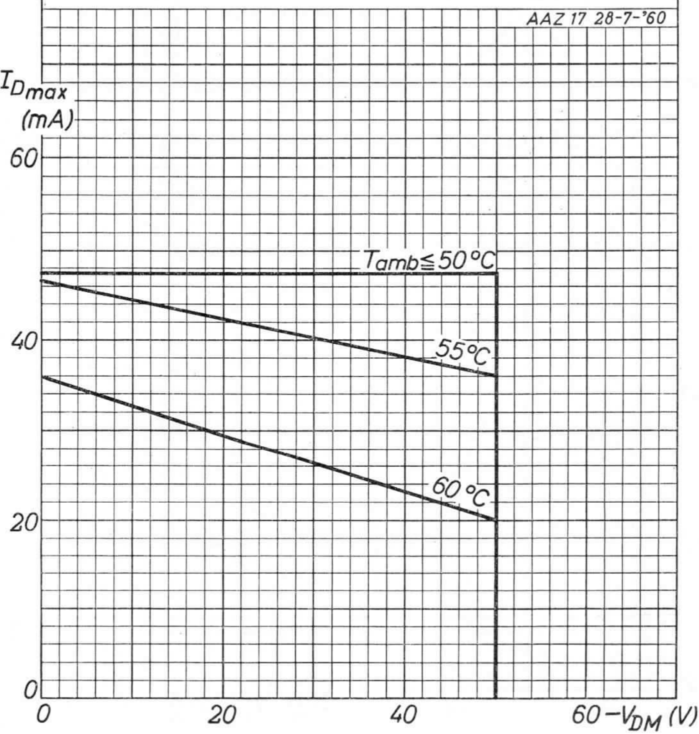
PHILIPS

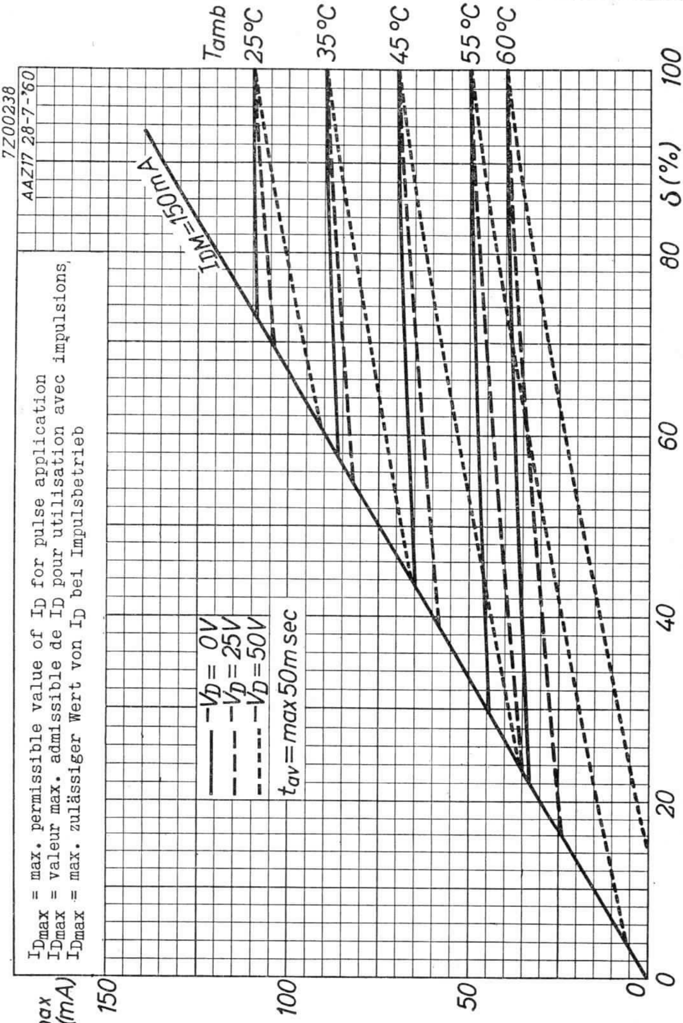
7Z00237

I_{Dmax} = max. permissible value of I_D for sinusoidal input voltages and resistive load. ($I_{DM} = \pi x I_D$; t_{av} = max. 50 msec)

I_{Dmax} = valeur max. admissible de I_D pour des tensions d'entrée sinusoïdales avec charge résistive. ($I_{DM} = \pi . I_D$; t_{av} = 50 msec au max.)

I_{Dmax} = max. zulässiger Wert von I_D bei sinusförmigen Eingangsspannungen mit Widerstandsbelastung. ($I_{DM} = \pi . I_D$; t_{av} = max. 50 mSek)

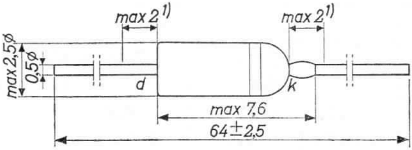



Tamb =
25°C
35°C
45°C
55°C
60°C
7Z00238
AAZ17 28-7-'60
IDM=150mA
I_Dmax = max. permissible value of I_D for pulse application
I_Dmax = valeur max. admissible de I_D pour utilisation avec impulsions
I_Dmax = max. zulässiger Wert von I_D bei Impulsbetrieb
—V_D = 0V
—V_D = 25V
—V_D = 50V
t_av = max 50 msec
I_Dmax (mA)
150
100
50
0
0
20
40
60
80
100
δ (%)

GOLD-BONDED GERMANIUM DIODE in miniature all-glass construction for high current switching applications
DIODE À CRISTAL DE GERMANIUM À POINTE D'OR en construction tout-verre miniature pour applications de commutation à courant élevé
GERMANIUM-GOLDDRAHTDIODE in Miniatur-Allglastechnik zur Verwendung als Schalterdiode für hohe Ströme

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The white band indicates the position of the cathode
L'anneau blanc marque la position de la cathode
Der weisse Ring bezeichnet die Katodenseite



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

		Tamb = 25 °C	60 °C
$-V_D$	= max.	20	20 V
$-V_{DM}$	= max.	20	20 V
$-V_{Dsurge}$ (t = max. 1 sec)	= max.	30	30 V
$-I_D$ { direct current / courant continu / Gleichstrom	= max.	180	65 mA 2)
I_D (t_{av} = max. 50 msec)	{ See pages D,E / Voir pages D,E / Siehe Seite D,E		
I_{DM}	= max.	300	300 mA
I_{Dsurge} (t = max. 1 sec)	= max.	400	400 mA
T_{amb}	= - 55 °C/+ 60 °C		
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	= - 55 °C/+ 75 °C		

1) Not tinned; non étamé; nicht verzinnt

2) See also page C; voir aussi page C; siehe auch Seite C

Thermal data. Junction temperature rise to ambient temperature in free air — $K \leq 0.45\ ^{o}C/mW$

Données thermiques. Augmentation de la température de la jonction au regard de la température de l'ambiance à l'air libre — $K \leq 0{,}45\ ^{o}C/mW$

Thermische Daten. Temperaturerhöhung des Kristalls in bezug auf die Umgebungstemperatur in freier Luft — $K \leq 0{,}45\ ^{o}C/mW$

Characteristics
Caractéristiques
Kenndaten

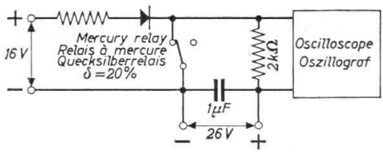
I_D (mA)	V_D (V)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
0,1	= 0,15	< 0,21	= 0,09	
10	= 0,34	< 0,41	= 0,29	
300[1])		< 0,78		

$-V_D$ (V)	$-I_D$ (μA)			
	T_{amb} = 25 °C		T_{amb} = 60 °C	
	=	max.	=	max.
1,5	= 0,6	< 3,5	= 5	
10	= 3	< 15	= 8	
20	= 6	< 50	= 15	

<u>Reverse recovery time</u>, measured at $-V_D$ = 10 V after forward current pulse of 300 mA

→ <u>Temps de recouvrement inverse</u>, mesuré à $-V_D$ = 10 V après une impulsion de courant de 300 mA dans le sens conducteur

<u>Übergangszeit für Sperrichtung,</u> gemessen bei $-V_D$ = 10 V nach einem Stromimpuls von 300 mA in Durchlassrichtung



Measuring circuit; circuit de mesure; Messchaltung

[1]) See page 3; voir page 3; siehe Seite 3

Reverse recovery time (continued)
Temps de recouvrement inverse (suite)
Übergangszeit für Sperrichtung (Fortsetzung)

Pulse data
Données de l'impulsion
Impulsdaten

I_{DM}	=	300 mA
$-V_{DM}$	=	20 V
δ	=	20 %
f	=	50 c/s

Oscilloscope data
Données de l'oscilloscope
Daten des Oszillographen

C_{inp}	=	15 pF
R_{inp}	=	4 MΩ

Rise time
Temps de montée = 0,016 µsec
Anstiegszeit

$-i_D$ { 3.5 µsec after the current impuls / 3,5 µsec après l'impulsion de courant / 3,5 µSek nach dem Stromimpuls } = 40 µA, < 150 µA

Column I: Setting of the diode and typical (average) measuring results of new diodes
II: Characteristic range values for equipment design [2])

Colonne I: Valeurs pour le réglage de la diode et les résultats moyens de mesures de diodes neuves.
II: Gamme de valeurs caractéristiques pour l'étude d'équipements [2])

Spalte I: Einstelldaten der Diode und mittlere Messergebnisse neuer Dioden
II: Charakteristischer Wertbereich für Gerätentwurf [2])

Page 2, Seite 2

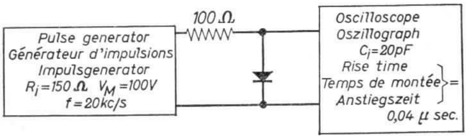
[1]) Measured under pulsed conditions to prevent excessive dissipation
Mesuré en service d'impulsions pour prévenir une dissipation excessive
Gemessen mit Impulsen zur Verhütung einer übermässigen Verlustleistung

[2]) For other characteristic range values for equipment design see curves at T_{amb} = 25 °C pages A and B
Pour les autres gammes de valeurs caractéristiques pour l'étude d'équipements voir les courbes à Tamb = 25 °C pages A et B
Für die übrigen charakteristischen Wertbereiche für Gerätentwurf siehe die Kurven bei T_{amb} = 25 °C Seiten A und B

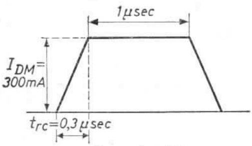
Capacitance
Capacité
Kapazität

		I	II	
$-V_D$	=	0,75		V
f	=	0,5		Mc/s
c_{dk}	=	1,8	< 4	pF

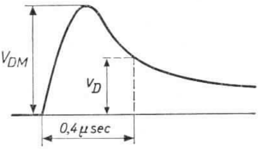
Forward recovery
Temps de recouvrement direct
Übergangszeit für Durchlassrichtung



Measuring circuit; circuit de mesure; Messanordnung

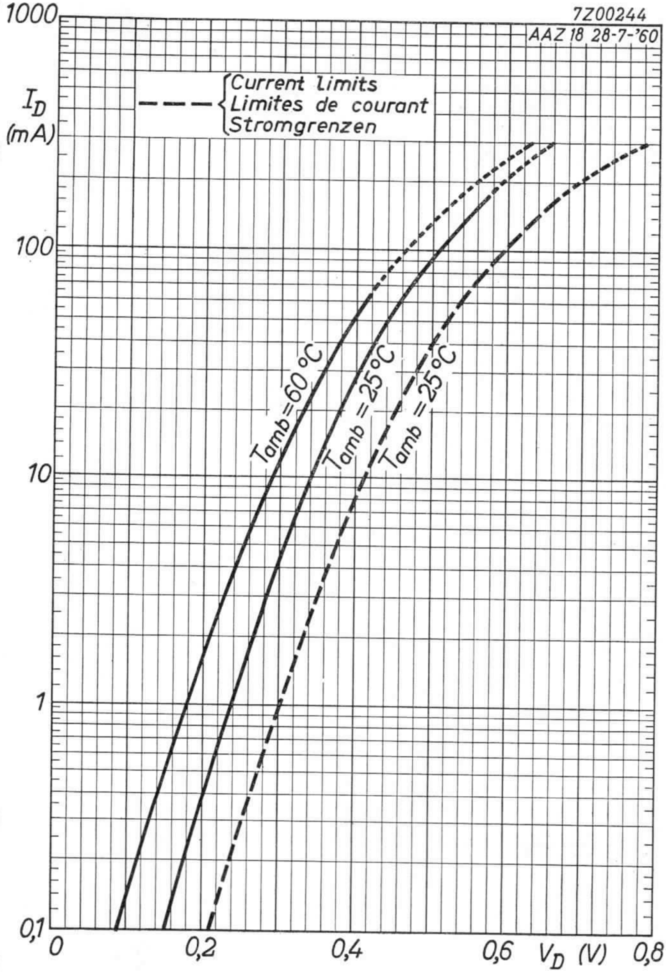


Current pulse
Impulsion de courant
Stromimpuls



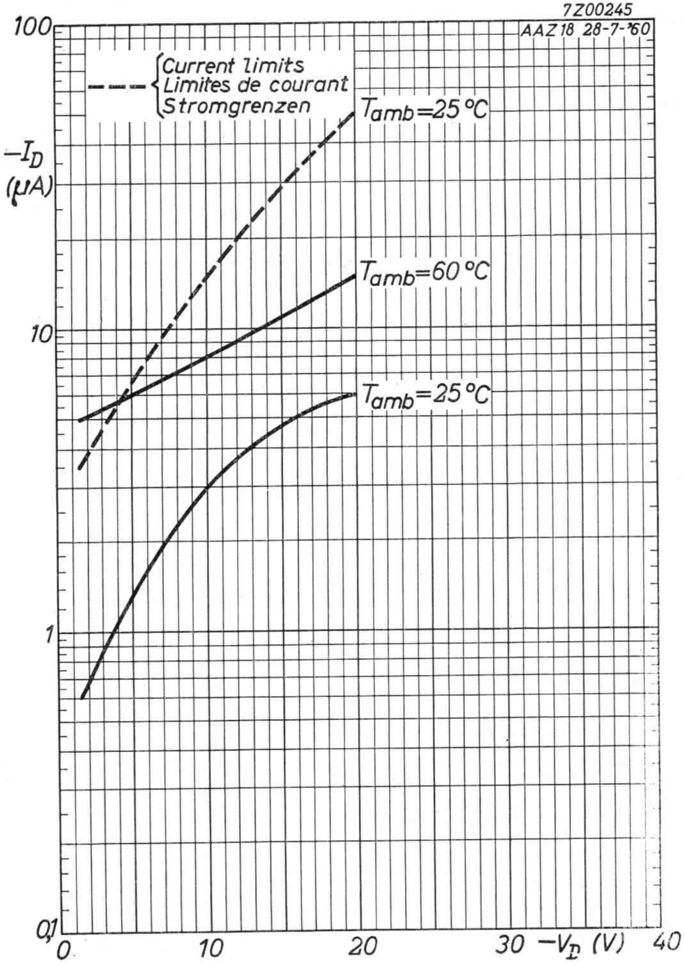
Voltage pulse
Impulsion de tension
Spannungsimpuls

		I	II	
I_{DM}	=	300		mA
t_{imp}	=	1		μsec
V_{DM}	=	0,65		V
v_D after 0.4 μsec / après 0,4 μsec / nach 0,4 μSek	=	0,62		V

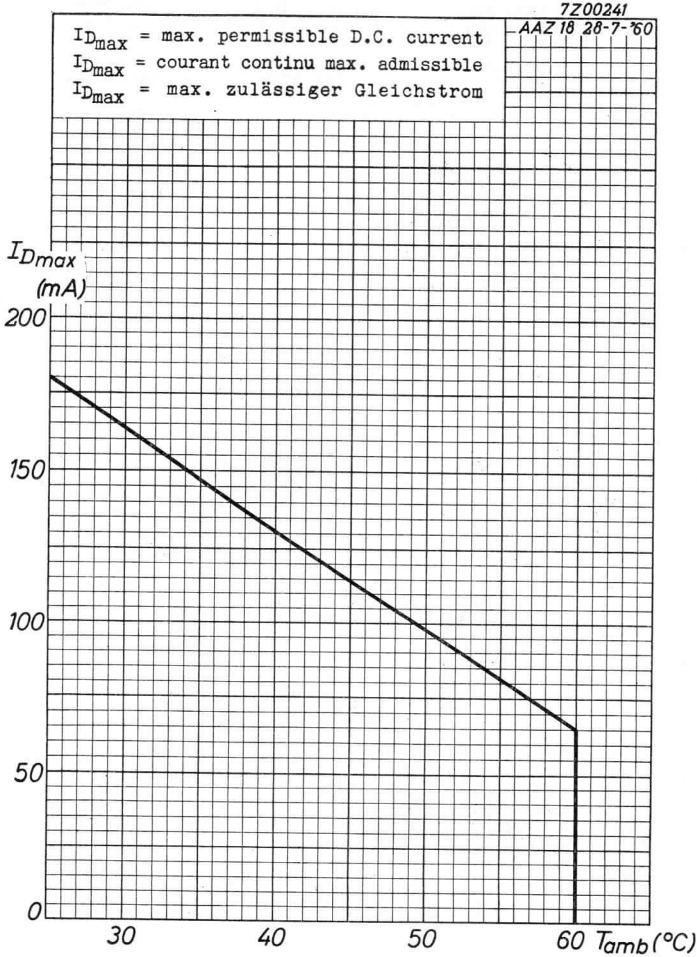

7Z00244
AAZ 18 28-7-'60
Current limits
Limites de courant
Stromgrenzen
I_D (mA)
1000
100
10
1
0,1
0
0,2
0,4
0,6
0,8
V_D (V)
Tamb=60 °C
Tamb = 25°C
Tamb = 25°C

AAZ 18

PHILIPS



B

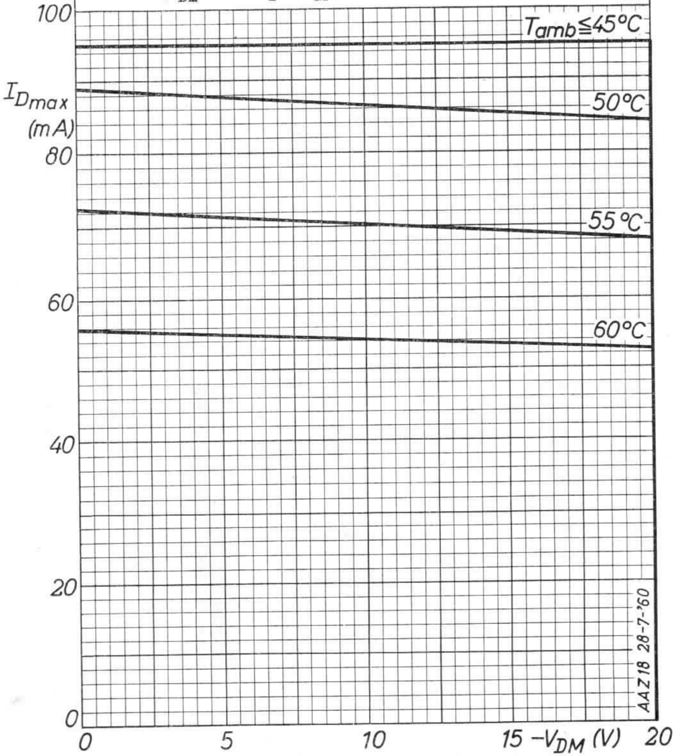

7Z00241
AAZ 18 28-7-'60
I_{Dmax} = max. permissible D.C. current
I_{Dmax} = courant continu max. admissible
I_{Dmax} = max. zulässiger Gleichstrom
I_{Dmax} (mA)
200
150
100
50
0
30
40
50
60
T_{amb} (°C)

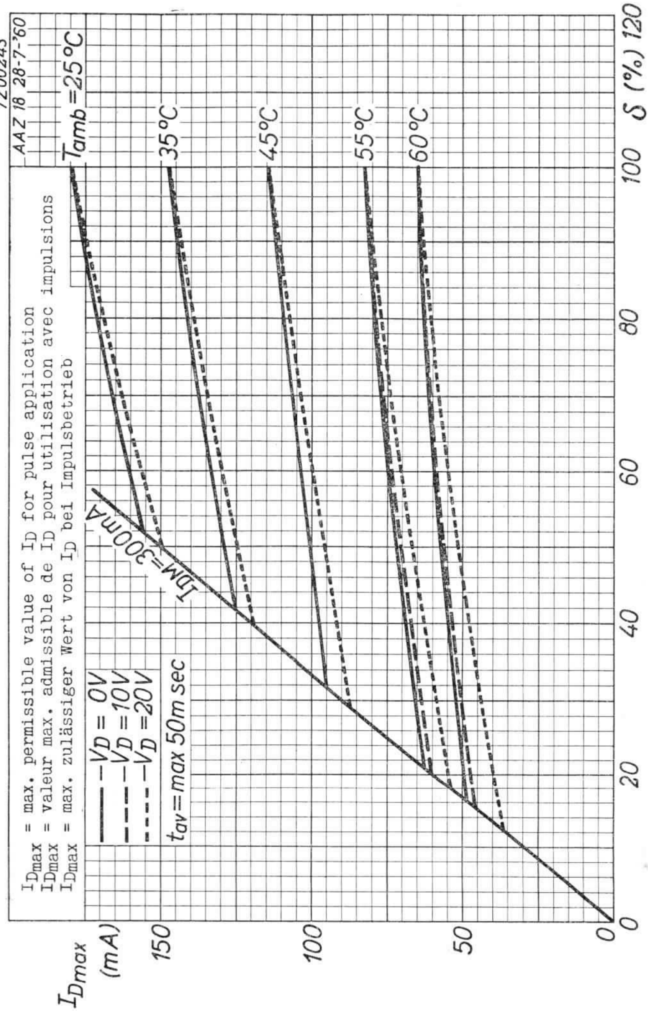
7Z00242

I_{Dmax} = max. permissible value of I_D for sinusoidal input voltages and resistive load. ($I_{DM} = \pi x I_D$; t_{av} = max. 50 msec)

I_{Dmax} = valeur max. admissible de I_D pour des tensions d'entrée sinusoïdales avec charge résistive. ($I_{DM} = \pi . I_D$; t_{av} = 50 msec au max.)

I_{Dmax} = max. zulässiger Wert von I_D bei sinusförmigen Eingangsspannungen mit Widerstandsbelastung. ($I_{DM} = \pi . I_D$; t_{av} = max. 50 mSek)



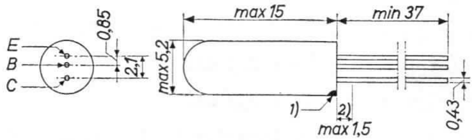

7Z00243
AAZ 18 28-7-'60
I_{Dmax} = max. permissible value of I_D for pulse application
I_{Dmax} = valeur max. admissible de I_D pour utilisation avec impulsions
I_{Dmax} = max. zulässiger Wert von I_D bei Impulsbetrieb
V_D = 0V
V_D = 10V
V_D = 20V
t_{av} = max 50m sec
T_{amb} = 25 °C
35°C
45°C
55°C
60°C
I_{DM} = 300mA
I_{Dmax} (mA)
0
50
100
150
δ (%)
0
20
40
60
80
100
120

PHILIPS AC 107

Low noise GERMANIUM TRANSISTOR of the p-n-p type in all-glass construction suitable as input stage of hybrid tape recorders with a speed up to 19 cm/sec.
TRANSISTOR À CRISTAL DE GERMANIUM du type p-n-p à faible bruit et en construction tout-verre conçu pour l'utilisation dans l'étage d'entrée de magnétophones hybrides avec une vitesse jusqu'à 19 cm/sec
p-n-p GERMANIUMTRANSISTOR in Allglastechnik mit schwachem Rauschen zur Verwendung in der Eingangsstufe von hybridischen Tonbandgeräten mit einer Geschwindigkeit bis zu 19 cm/Sek.

Dimensions in mm
Dimensions en mm
Abmessungen in mm

The red dot indicates the collector
Le point rouge indique le collecteur
Der rote Punkt bezeichnet den Kollektor



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$ = max. 15 V

$-V_{CE}$ { See page D / Voir page D / Siehe Seite D

$-V_{EB}$ = max. 5 V $\qquad P_{tot}$ = max. $\frac{T_j\ max - T_{amb}}{K}$

$-I_{CM}$ = max. 10 mA $\qquad -I_C$ = max. 5 mA

I_{EM} = max. 10 mA $\qquad I_E$ = max. 5 mA

T_j { continuous operation / service continu / Dauerbetrieb = max. 75 °C

T_j { intermittent operation / service intermittent / aussetzender Betrieb = max. 90 °C [2])

Storage temperature
Température d'emmagasinage
Lagerungstemperatur = -55 °C/+75 °C

[1]) Not tinned; non-étamé; nicht verzinnt

[2]) Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

Thermal data
Données thermiques
Thermische Daten

Thermal resistance from junction to ambience in free air	K	≦ 0.6 °C/mW
Résistance thermique entre la jonction et l'ambiance à l'air libre	K	≦ 0,6 °C/mW
Thermischer Widerstand zwischen Kristall und Umgebung in freier Luft	K	≦ 0,6 °C/mW

Characteristics
Caractéristiques
Kenndaten

T_{amb} = 25 °C

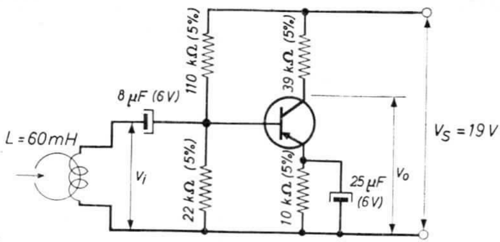
$-I_{CBO}$ ($-V_{CB}$ = 5 V)	= 2,0 µA	< 3,0 µA
h_{fe} ($-V_{CB}$ = 5 V; I_E = 0,3 mA)	= 60	> 35 < 160
F [1]) ($-V_{CB}$ = 5 V; I_E = 0,3 mA)	= 3 dB	< 5 dB

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

$-V_{CB}$	= 5 V	
I_E	= 0,3 mA	
T_{amb}	= 25 °C	
$-I_B$	= 5 µA	< 10 µA
$-V_{BE}$	= 120 mV	> 90 mV < 150 mV
$f_{\alpha b}$	=	> 2 Mc/s
$r_{bb'}$	=	< 200 Ω
$c_{b'c}$	=	< 14 pF
g_{oe} (f = 1 Mc/s)	=	< 35 µA/V

1) Noise factor, measured with a source impedance of 1500 Ω; band width 30-15000 c/s.
Facteur de bruit, mesure avec une impédance de la source d'entrée de 1500 Ω; largeur de bande 30-15000 Hz.
Rauschfaktor, gemessen mit einer Impedanz der Eingangsspannungsquelle von 1500 Ω; Bandbreite 30-15000 Hz.

Operating characteristics in an input stage of a hybrid tape recorder
Caractéristiques d'utilisation dans un étage d'entrée d'un magnétophon hybride
Betriebsdaten in einer Eingangsstufe eines hybridischen Tonbandgerätes



The circuit has been designed for operation with good performance up to an ambient temperature of 55 °C
Le circuit a été conçu pour un fonctionnement de meilleure qualité jusqu'à une température de l'ambiance de 55 °C
Die Schaltung ist hergestellt für Betrieb guter Qualität bis zu einer Umgebungstemperatur von 55 °C

V_S = 19 V
$-I_C$ = 0,3 mA
v_o/v_i = 330

Signal to noise ratio
Rapport signal/bruit
Signal/Rausch-Verhältnis ≥ 60 dB [1])

Frequency response
Réponse de fréquence
Frequenzwiedergabe = 40-14000 c/s [2])

1) See page 4; voir page 4; siehe Seite 4

2) Between the frequencies where the output is 3 dB down (see page E)
Entre les fréquences où la sortie est de 3 dB en bas (voir page E)
Zwischen den Frequenzen wo der Ausgang 3 dB gesunken ist (siehe Seite E)

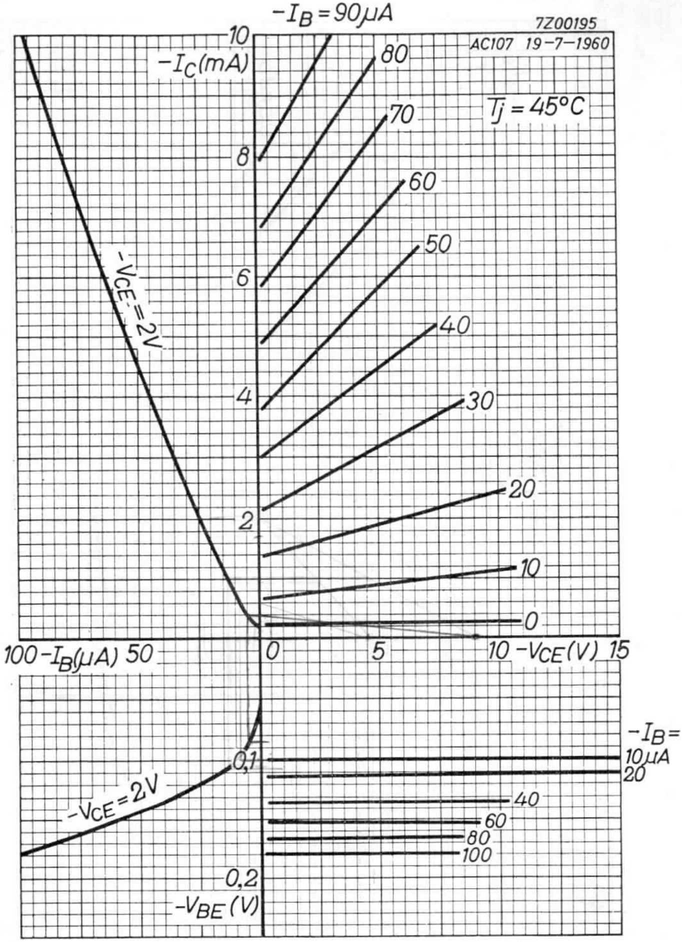
[1]) This signal to noise ratio is based upon an output voltage of 0.5 mV at f = 1 kc/s of a playback head with L = 60 mH. With a four track system and a tape speed of 9.5 cm/sec, the minimum induced voltage in the playback head is about 0.5 mV at maximum modulation of the tape

Ce rapport signal/bruit est fondé sur une tension de sortie d'une tête de lecture avec L = 60 mH de 0,5 mV à f = 1 kHz. Avec un système à quatre pistes et une vitesse de la bande de 9,5 cm/sec la tension induite dans la tête de lecture est d'environ 0,5 mV au minimum à la modulation max. de la bande

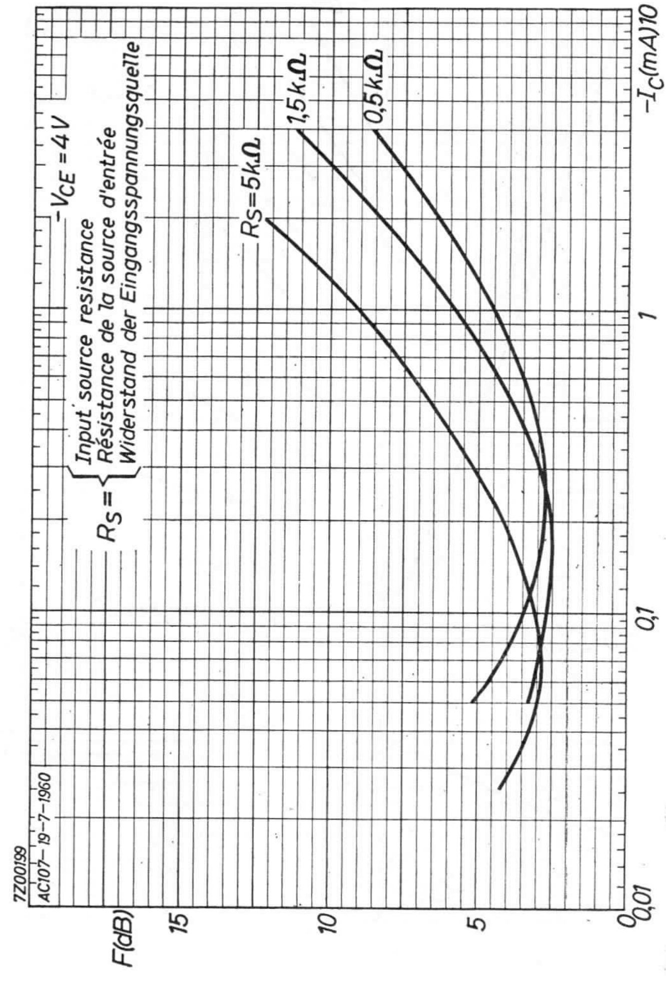
Dieses Signal/Rausch-Verhältnis ist gegründet auf eine Ausgangsspannung eines Wiedergabekopfes mit L = 60 mH von 0,5 mV bei f = 1 kHz. Bei einem System mit vier Tonspuren und einer Bandgeschwindigkeit von 9,5 cm/Sek ist die im Wiedergabekopf induzierte Spannung mindestens etwa 0,5 mV bei max. Modulation des Bandes

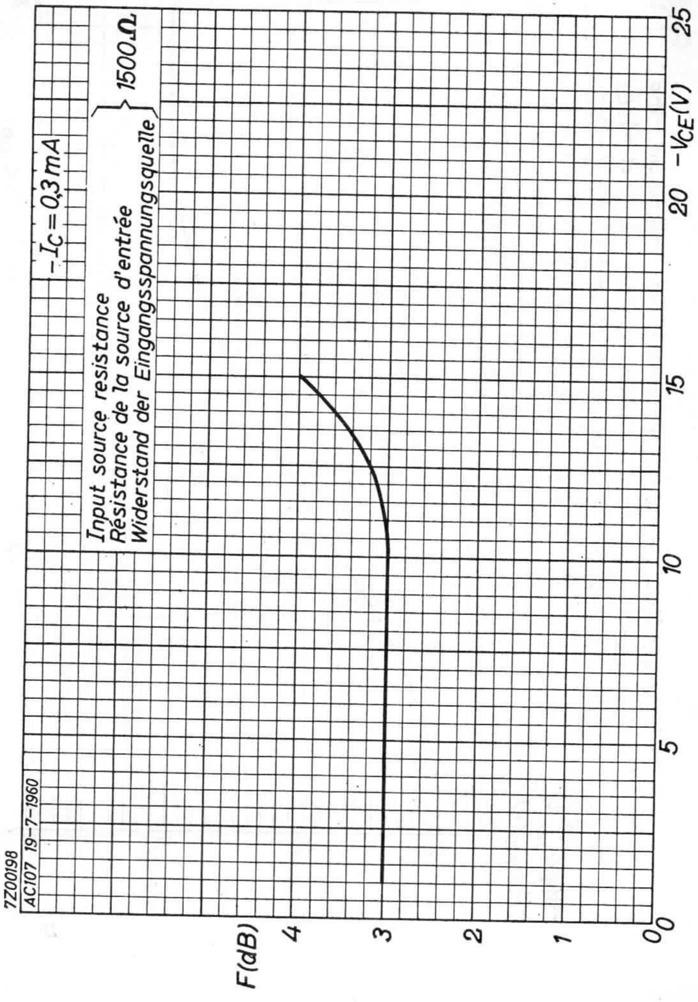
PHILIPS

AC 107

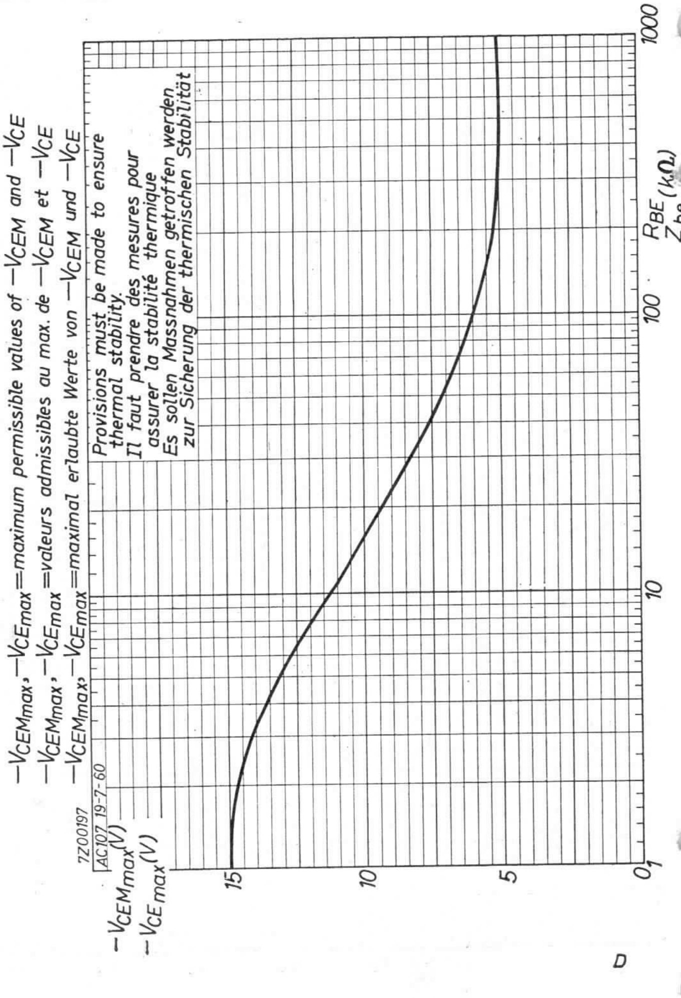


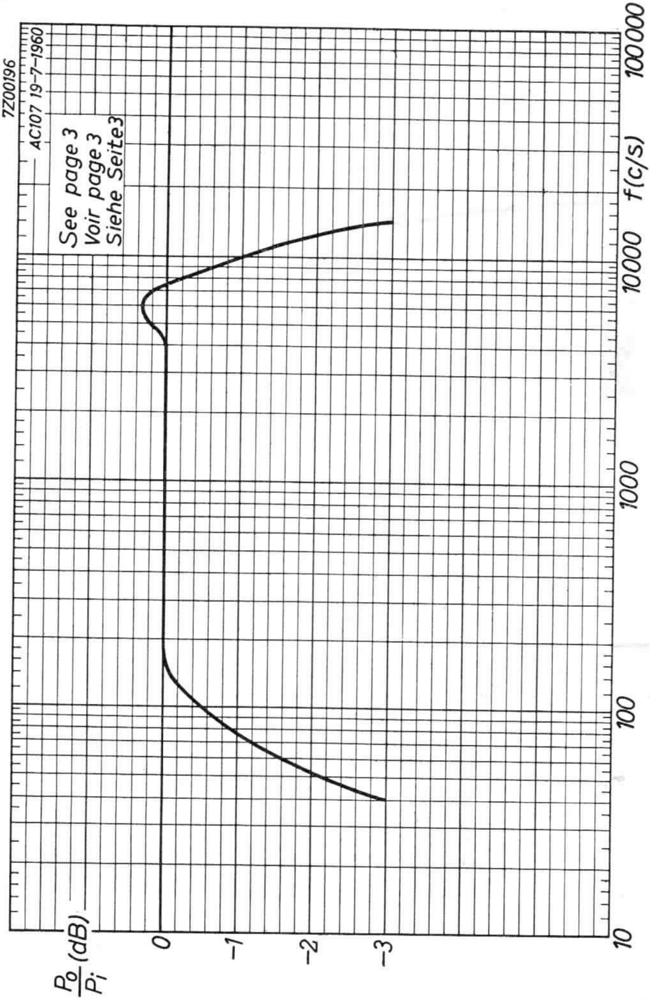
PHILIPS


7Z00199
AC107–19–7–1960
F(dB)
15
10
5
0
0,01
0,1
1
10
−I_C(mA)
−V_CE = 4 V
R_S = Input source resistance
Résistance de la source d'entrée
Widerstand der Eingangsspannungsquelle
R_S=5kΩ
1,5kΩ
0,5kΩ


-I_C = 0,3 mA
Input source resistance
Résistance de la source d'entrée
Widerstand der Eingangsspannungsquelle
1500 Ω
7Z00198
AC107 19-7-1960
F(dB)
0
1
2
3
4
-V_{CE}(V)
0
5
10
15
20
25

PHILIPS


$-V_{CEMmax}$, $-V_{CEmax}$ = maximum permissible values of $-V_{CEM}$ and $-V_{CE}$
$-V_{CEMmax}$, $-V_{CEmax}$ = valeurs admissibles au max. de $-V_{CEM}$ et $-V_{CE}$
$-V_{CEMmax}$, $-V_{CEmax}$ = maximal erlaubte Werte von $-V_{CEM}$ und $-V_{CE}$
7Z00197
AC107 19-7-60
Provisions must be made to ensure thermal stability.
Il faut prendre des mesures pour assurer la stabilité thermique
Es sollen Massnahmen getroffen werden zur Sicherung der thermischen Stabilität
$-V_{CEMmax}$ (V)
$-V_{CEmax}$ (V)
15
10
5
0
1
10
100
1000
R_{BE}
Z_{be} (kΩ)


7Z00196
AC107 19-7-1960
See page 3
Voir page 3
Siehe Seite3
f(c/s)
100000
10000
1000
100
10
$\frac{P_o}{P_i}$ (dB)
0
−1
−2
−3

GERMANIUM ALLOY JUNCTION TRANSISTOR of the p-n-p type in metal envelope for use in pre-amplifier and driver stages with battery voltages up to 14 V.

LIMITING VALUES (Absolute max. values)

Collector			
Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference)	$-V_{CE}$	= max.	32 V [1]
Current	$-I_C$	= max.	100 mA
Emitter			
Voltage (base reference)	$-V_{EB}$	= max.	10 V
Base			
Current	$-I_B$	= max.	5 mA
Dissipation			
Total dissipation	P_{tot}	= max.	500 mW
Temperatures			
Storage temperature	T_s	=	-55 °C to +75 °C
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hours)	T_j	= max.	90 °C
	(t	= max.	200 hrs)

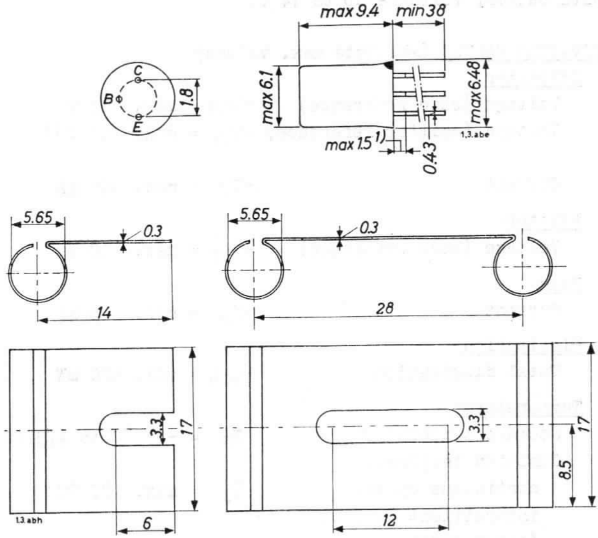
THERMAL DATA

Thermal resistance from junction to ambience in free air	K	= max.	0.3 °C/mW
Thermal resistance from junction to ambience with cooling fin mounted on heat sink of at least 12.5 cm²	K	= max.	0.09 °C/mW

[1]) For recommended practical limits of $-V_{CE}$ see page F

Dimensions in mm

The red dot indicates the collector side



Cooling fin 56227 Cooling fin 56226

CHARACTERISTICS at Tamb = 25 °C

Collector current at I_E = 0 mA

$-I_{CBO}$ ($-V_{CB}$ = 10 V; I_E = 0 mA) < 10 µA

Collector voltage at V_{BE} = 0 V

$-V_{CB}$ ($-I_C$ = 500 µA; V_{BE} = 0 V) > 32 V

Emitter voltage at I_C = 0 mA

$-V_{EB}$ ($-I_E$ = 200 µA; I_C = 0 mA) > 10 V

1) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

Collector current at I_E = 0 mA

$-I_{CBO}$ See page D

Emitter current at I_C = 0 mA

$-I_{EBO}$	$-V_{EB}$ = 5 V; I_C = 0 mA; T_j = 75 °C		< 550 µA

Current amplification factor $\frac{I_C - I_{CBO}}{I_B + I_{CBO}}$

h_{FE}	(I_E = 2 mA; $-V_{CB}$ = 5 V)	= 100	> 50
h_{FE}	(I_E = 50 mA; V_{CB} = 0 V)	= 95	
h_{FE}	(I_E = 100 mA; V_{CB} = 0 V)	= 80	

Base voltage

$-V_{BE}$	(I_E = 2 mA; $-V_{CB}$ = 5 V)	= 105 mV	
$-V_{BE}$	(I_E = 100 mA; V_{CB} = 0 V)		< 400 mV

Frequency at which $|h_{fe}|$ = 1

f_1	($-V_{CB}$ = 2 V; I_E = 10 mA)	= 1.7 Mc/s	> 1.3 Mc/s

Cut-off frequency

$f_{\alpha e}$	($-V_{CB}$ = 2 V; I_E = 10 mA)	= 17 kc/s	> 10 kc/s

Base resistance

$\lvert z_{rb} \rvert$	$-V_{CB}$ = 5 V; I_E = 1 mA; f = 0.45 Mc/s	= 90 Ω	

Collector capacitance

c_c	$-V_{CB}$ = 5 V; I_E = 0 mA; f = 0.45 Mc/s	= 40 pF	< 50 pF

Noise figure

F	$-V_{CB}$ = 5 V; I_E = 0.5 mA; f = 1 kc/s; B = 200 c/s; Input source resistance = 500 Ω	= 4 dB	< 10 dB

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

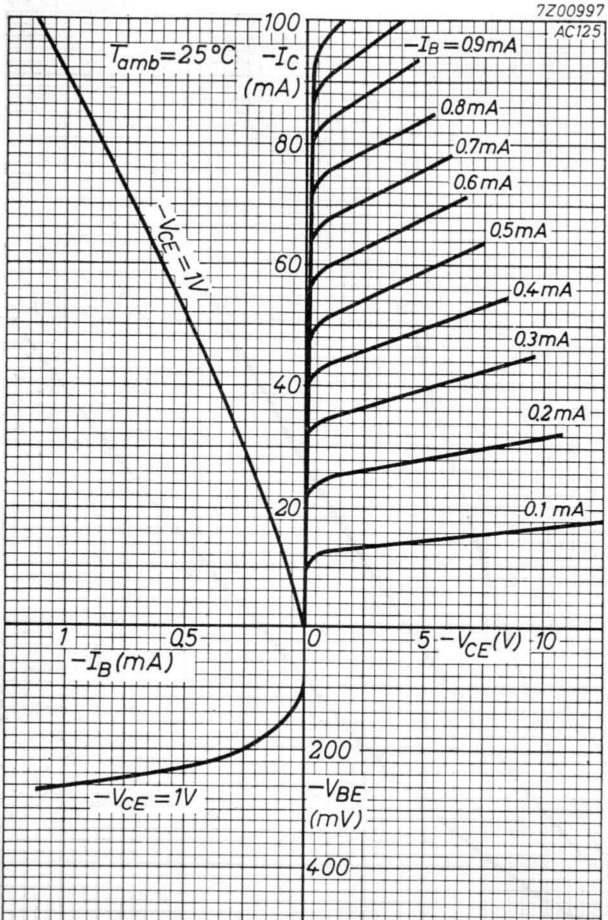
T_{amb} = 25 °C

Small signal parameters

Measured at

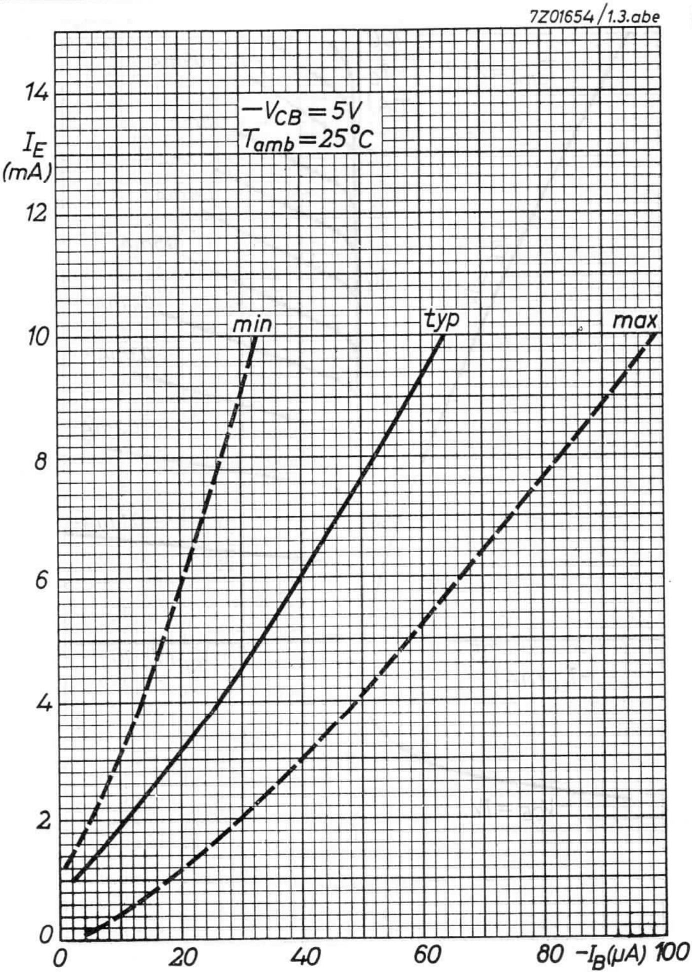
Collector voltage	$-V_{CB}$	= 5 V
Emitter current	I_E	= 2 mA
Frequency	f	= 1 kc/s

Input impedance	h_{ie}	= 1.7 kΩ	> 1.1 kΩ < 2.5 kΩ
Voltage feedback ratio	h_{re}	= 6.5×10^{-4}	< 8.5×10^{-4}
Current amplification factor	h_{fe}	= 125	> 80 < 170
Output admittance	h_{oe}	= 80 µA/V	< 110 µA/V

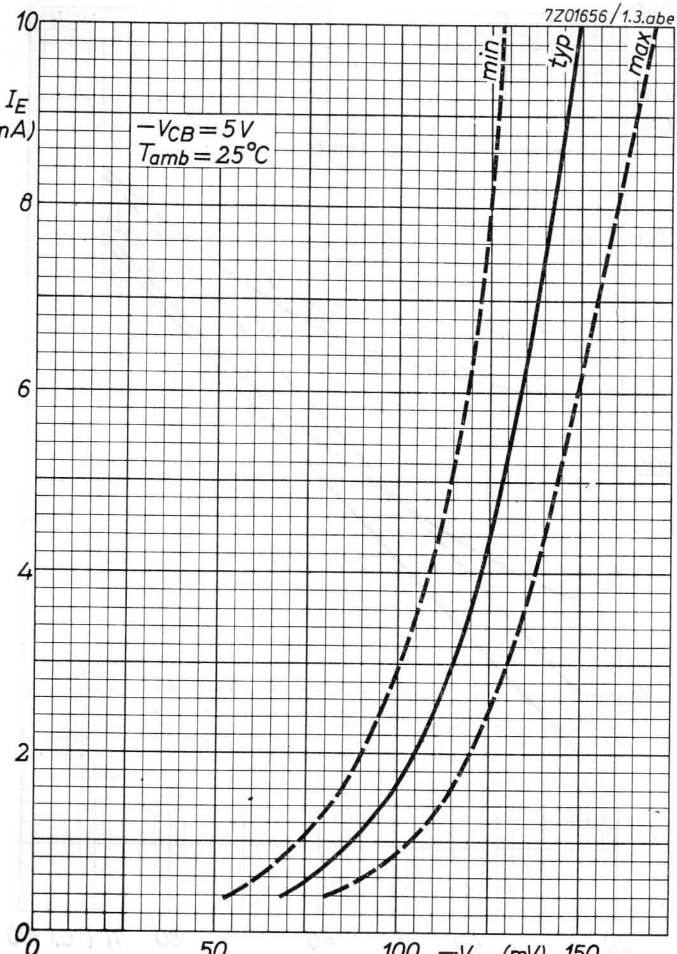

7Z00997
AC125
T_{amb}=25°C
$-I_C$ (mA)
100
80
60
40
20
$-I_B$=0.9mA
0.8mA
0.7mA
0.6mA
0.5mA
0.4mA
0.3mA
0.2mA
0.1 mA
$-V_{CE}$=1V
1
0.5
0
5
$-V_{CE}$(V)
10
$-I_B$(mA)
200
$-V_{BE}$ (mV)
400
$-V_{CE}$=1V

AC125

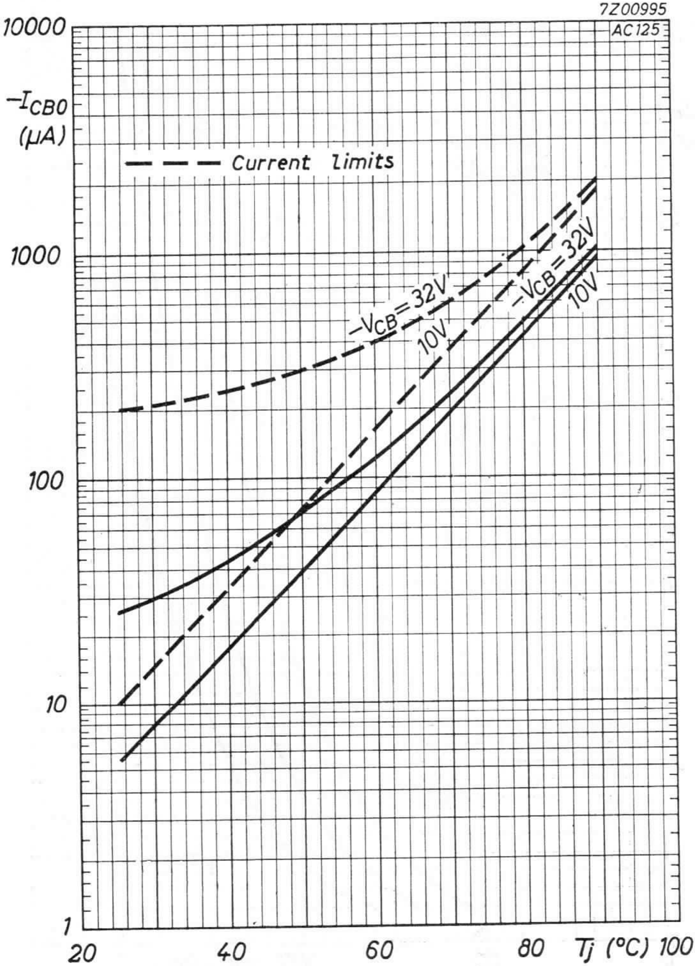
PHILIPS

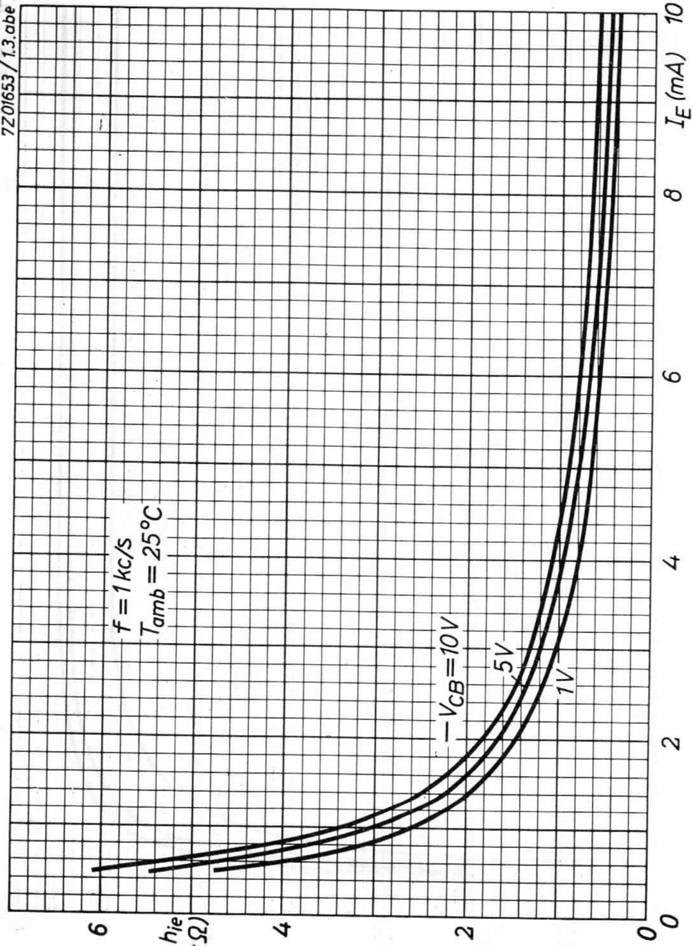


B

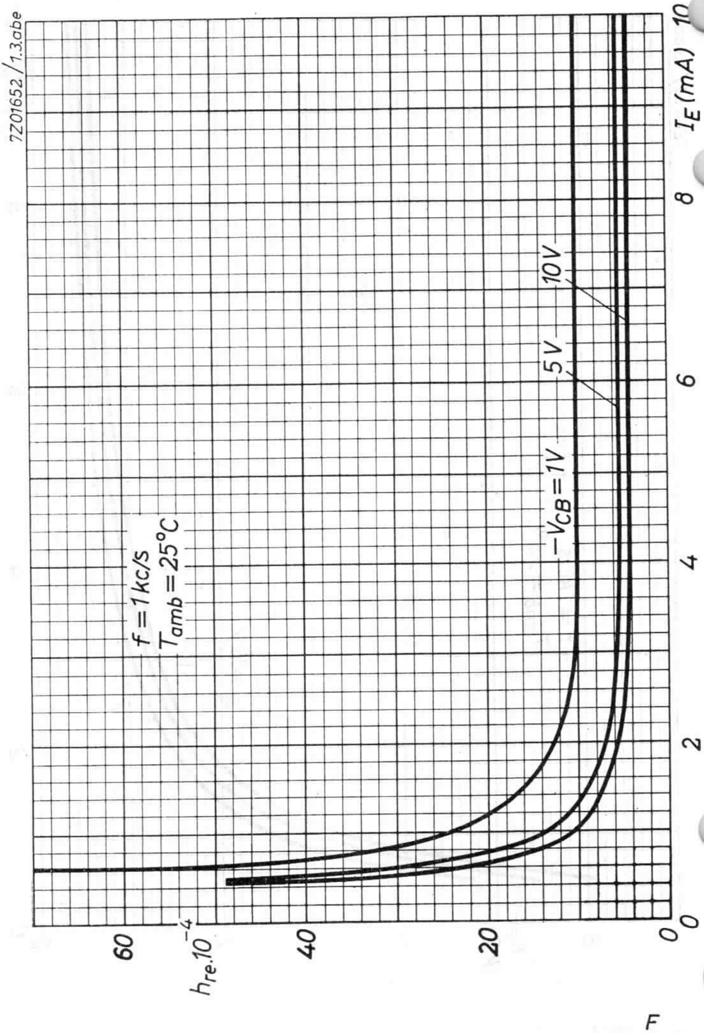

7Z01656/1.3.abe
I_E (mA)
10
8
6
4
2
0
$-V_{CB} = 5\,V$
$T_{amb} = 25\,°C$
min
typ
max
0
50
100
$-V_{BE}$ (mV)
150

PHILIPS

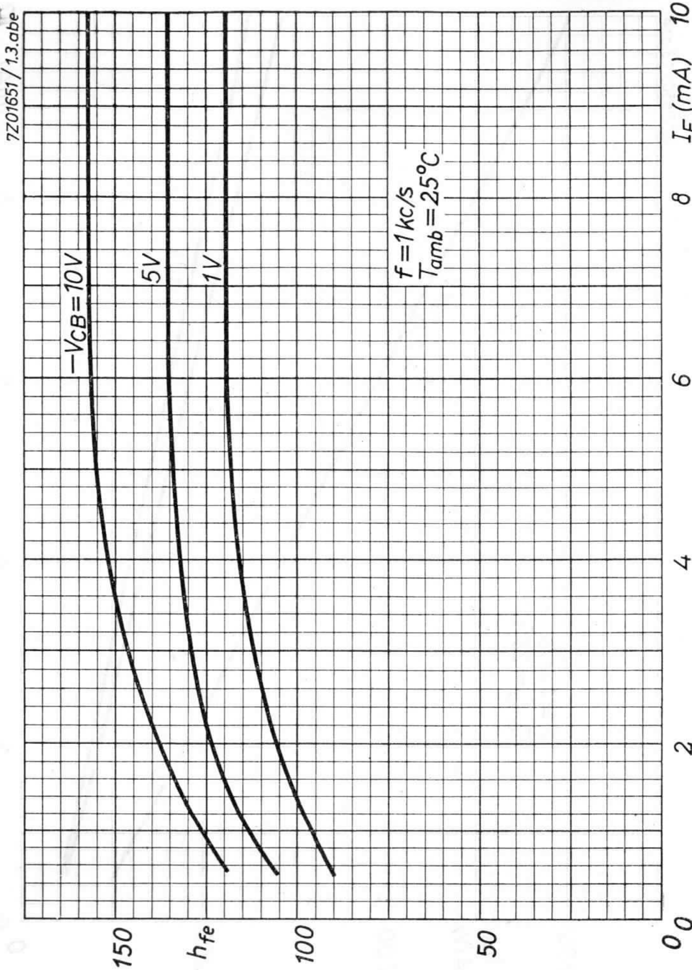

7Z00995
AC125
10000
1000
100
10
1
$-I_{CBO}$ (μA)
Current limits
$-V_{CB}$=32V
10V
$-V_{CB}$=32V
10V
20
40
60
80
T_j (°C)
100


7Z01653/1.3.abe
f = 1 kc/s
T_{amb} = 25°C
$-V_{CB}$=10V
5V
1V
I_E (mA)
h_{ie} (kΩ)
0
2
4
6
8
10
0
2
4
6

AC125 **PHILIPS**

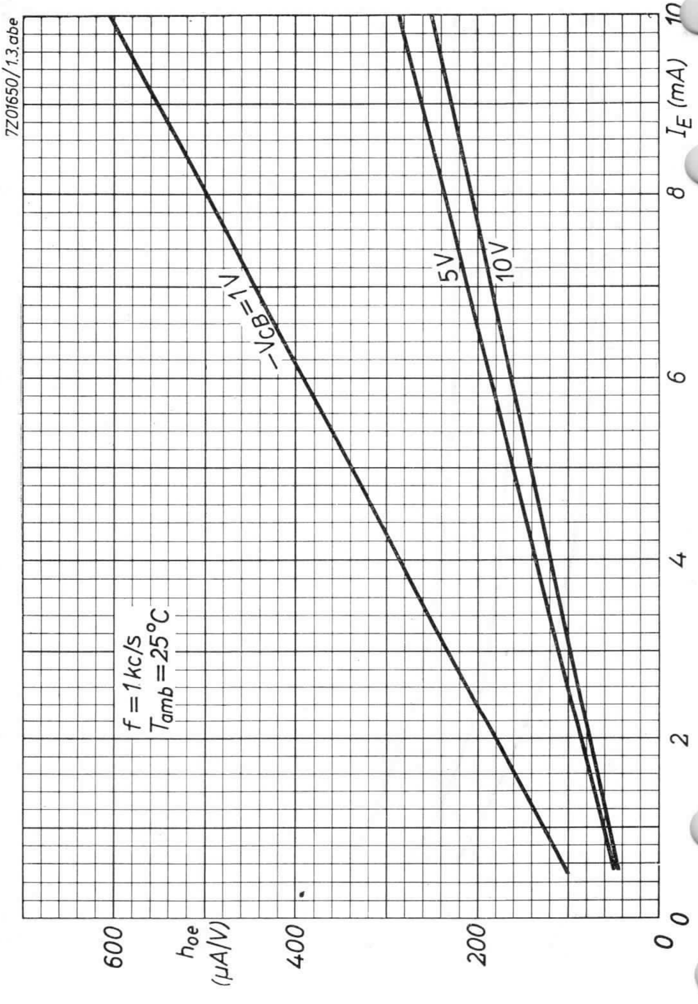


F

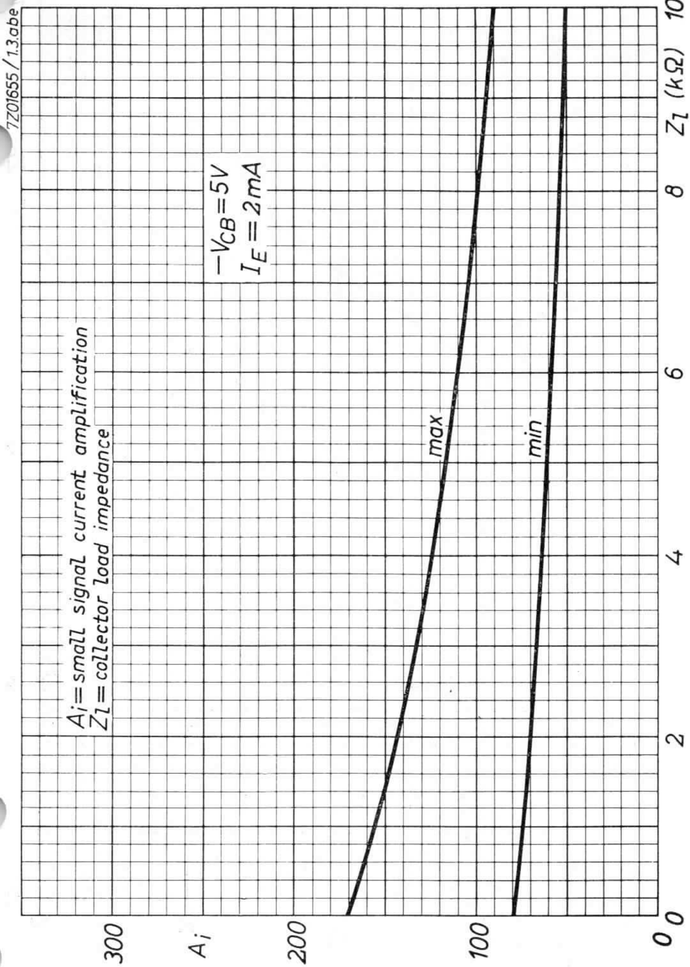

7Z01651/1.3.abe
$-V_{CB}=10V$
5V
1V
f = 1 kc/s
T_{amb} = 25°C
I_E (mA)
10
8
6
4
2
0
h_{fe}
150
100
50
0

AC125

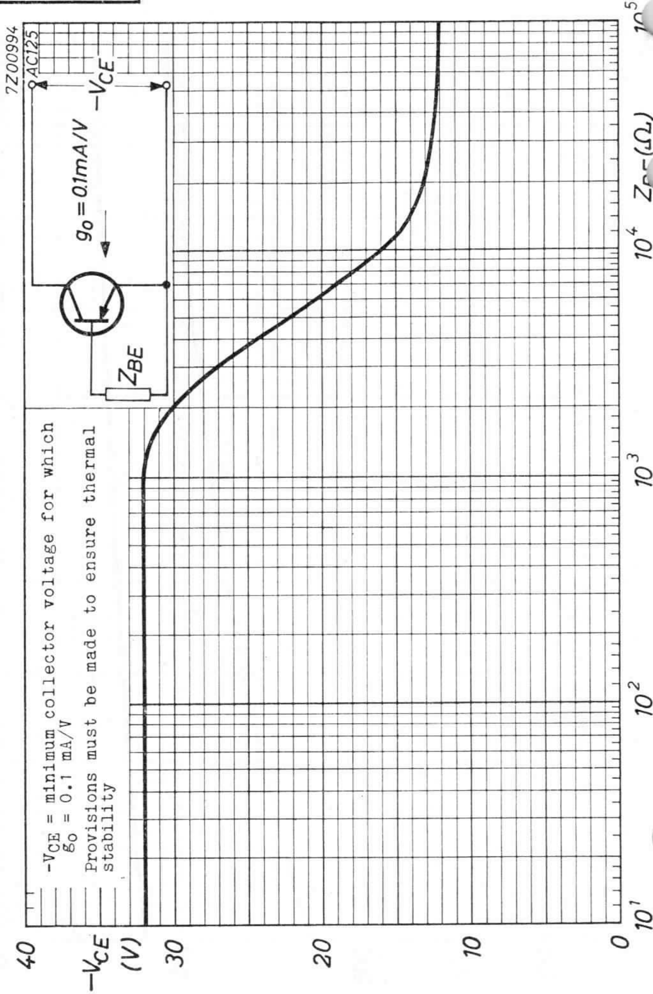
PHILIPS



H


7Z01655 / 1.3.abe
$-V_{CB} = 5V$
$I_E = 2mA$
A_i = small signal current amplification
Z_l = collector load impedance
max
min
Z_l (kΩ)
0
2
4
6
8
10
A_i
0
100
200
300

PHILIPS


7Z00994
AC125
$-V_{CE}$
$g_o = 0.1mA/V$
Z_{BE}
$-V_{CE}$ = minimum collector voltage for which g_o = 0.1 mA/V
Provisions must be made to ensure thermal stability
40
30
20
10
0
$-V_{CE}$ (V)
10^1
10^2
10^3
10^4
10^5
Z_{BE} (Ω)

PHILIPS AC126

GERMANIUM ALLOY JUNCTION TRANSISTOR of the p-n-p type in metal envelope for use in pre-amplifier and driver stages with battery voltages up to 14 V.

LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$ = max.	32 V
Voltage (emitter reference)	$-V_{CE}$ = max.	32 V [1]
Current	$-I_C$ = max.	100 mA

Emitter

Voltage (base reference)	$-V_{EB}$ = max.	10 V

Base

Current	$-I_B$ = max.	5 mA

Dissipation

Total dissipation	P_{tot} = max.	500 mW

Temperatures

Storage temperature	T_S =	−55 °C to +75 °C
Junction temperature		
continuous operation	T_j = max.	75 °C
intermittent operation (total duration max. 200 hours)	T_j = max.	90 °C
	(t = max.	200 hrs)

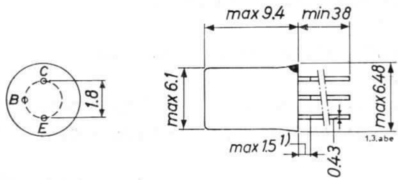
THERMAL DATA

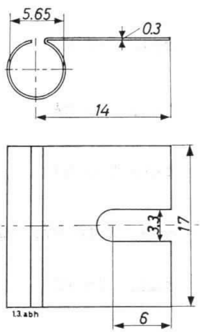
Thermal resistance from junction to ambience in free air	K = max.	0.3 °C/mW
Thermal resistance from junction to ambience with cooling fin mounted on heat sink of at least 12.5 cm²	K = max.	0.09 °C/mW

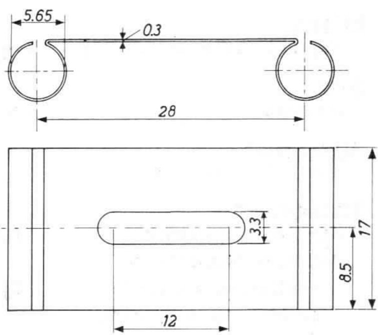
[1]) For recommended practical limits of $-V_{CE}$ see page F

Dimensions in mm

The red dot indicates the collector side







Cooling fin 56227

Cooling fin 56226

CHARACTERISTICS at T_{amb} = 25 °C

Collector current at I_E = 0 mA

$-I_{CBO}$ ($-V_{CB}$ = 10 V; I_E = 0 mA)	<	10 µA

Collector voltage at V_{BE} = 0 V

$-V_{CB}$ ($-I_C$ = 500 µA; V_{BE} = 0 V)	>	32 V

Emitter voltage at I_C = 0 mA

$-V_{EB}$ ($-I_E$ = 200 µA; I_C = 0 mA)	>	10 V

[1]) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

Collector current at I_E = 0 mA			
$-I_{CBO}$		See page D	
Emitter current at I_C = 0 mA			
$-I_{EBO}$	$-V_{EB}$ = 5 V; I_C = 0 mA; T_j = 75 °C		< 550 µA
Current amplification factor $\frac{I_C - I_{CBO}}{I_B + I_{CBO}}$			
h_{FE}	(I_E = 2 mA; $-V_{CB}$ = 5 V)	= 140	> 65
h_{FE}	(I_E = 50 mA; V_{CB} = 0 V)	= 135	
h_{FE}	(I_E = 100 mA; V_{CB} = 0 V)	= 105	
Base voltage			
$-V_{BE}$	(I_E = 2 mA; $-V_{CB}$ = 5 V)	= 105 mV	
$-V_{BE}$	(I_E = 100 mA; V_{CB} = 0 V)		< 400 mV
Frequency at which $\lvert h_{fe} \rvert$ = 1			
f_1	($-V_{CB}$ = 2 V; I_E = 10 mA)	= 2.3 Mc/s	> 1.7 Mc/s
Cut-off frequency			
$f_{\alpha e}$	($-V_{CB}$ = 2 V; I_E = 10 mA)	= 17 kc/s	> 10 kc/s
Base resistance			
$\lvert z_{rb} \rvert$	$-V_{CB}$ = 5 V; I_E = 1 mA; f = 0.45 Mc/s	= 90 Ω	
Collector capacitance			
c_c	$-V_{CB}$ = 5 V; I_E = 0 mA; f = 0.45 Mc/s	= 40 pF	< 50 pF
Noise figure			
F	$-V_{CB}$ = 5 V; I_E = 0.5 mA; f = 1 kc/s; B = 200 c/s; Input source resistance = 500 Ω	= 4 dB	< 10 dB

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

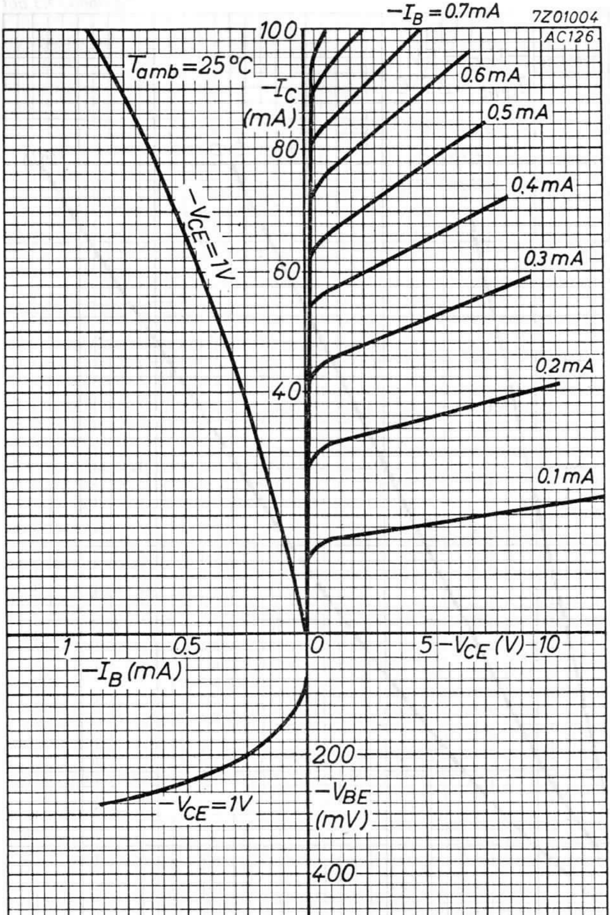
T_{amb} = 25 °C

Small signal parameters

Measured at

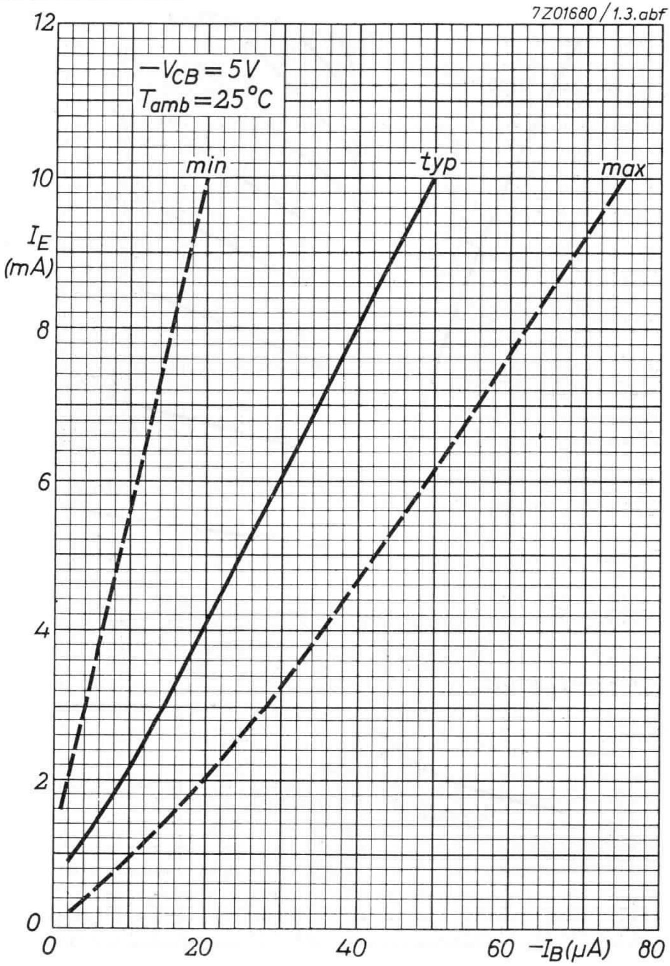
Collector voltage	$-V_{CB}$	= 5 V
Emitter current	I_E	= 2 mA
Frequency	f	= 1 kc/s

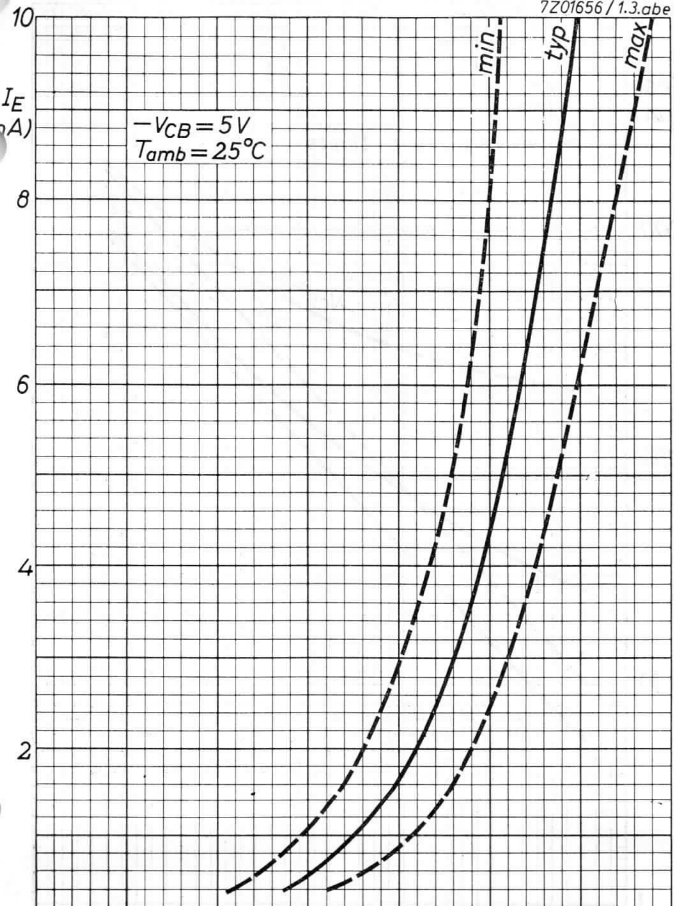
Input impedance	h_{ie} = 2.4 kΩ	> 1.7 kΩ < 3.8 kΩ
Voltage feedback ratio	h_{re} = 8×10^{-4}	< 13×10^{-4}
Current amplification factor	h_{fe} = 180	> 130 < 300
Output admittance	h_{oe} = 100 µA/V	< 170 µA/V



$-I_B = 0.7mA$
7Z01004
AC126
100
$T_{amb} = 25\,°C$
$-I_C$ (mA)
0.6 mA
0.5 mA
80
0.4 mA
$-V_{CE} = 1V$
60
0.3 mA
40
0.2 mA
0.1 mA
1
0.5
0
5
$-V_{CE}$ (V)
10
$-I_B$ (mA)
200
$-V_{CE} = 1V$
$-V_{BE}$ (mV)
400

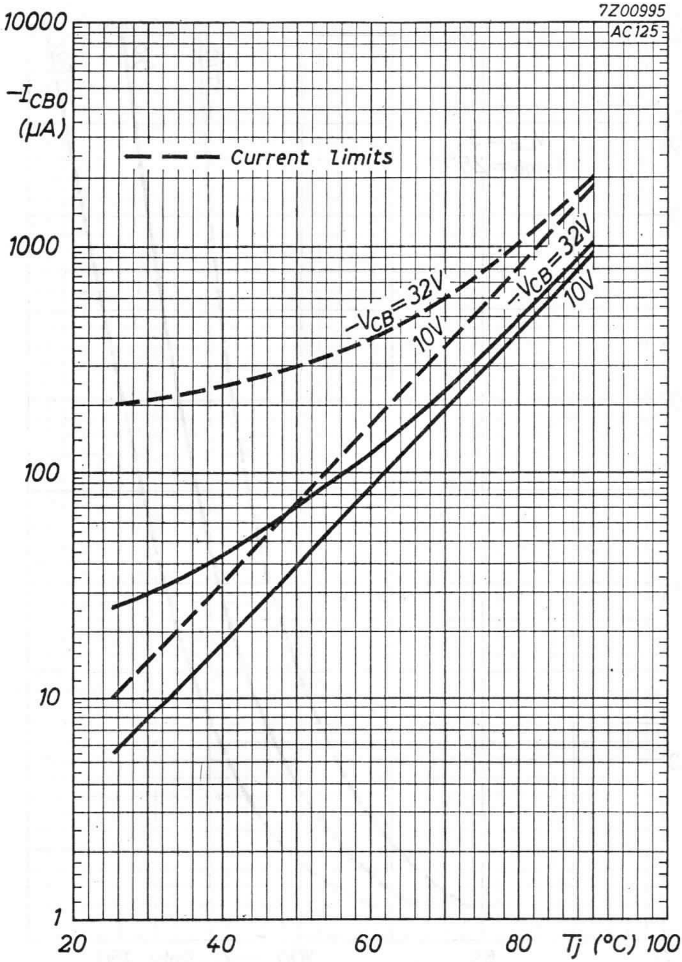
PHILIPS

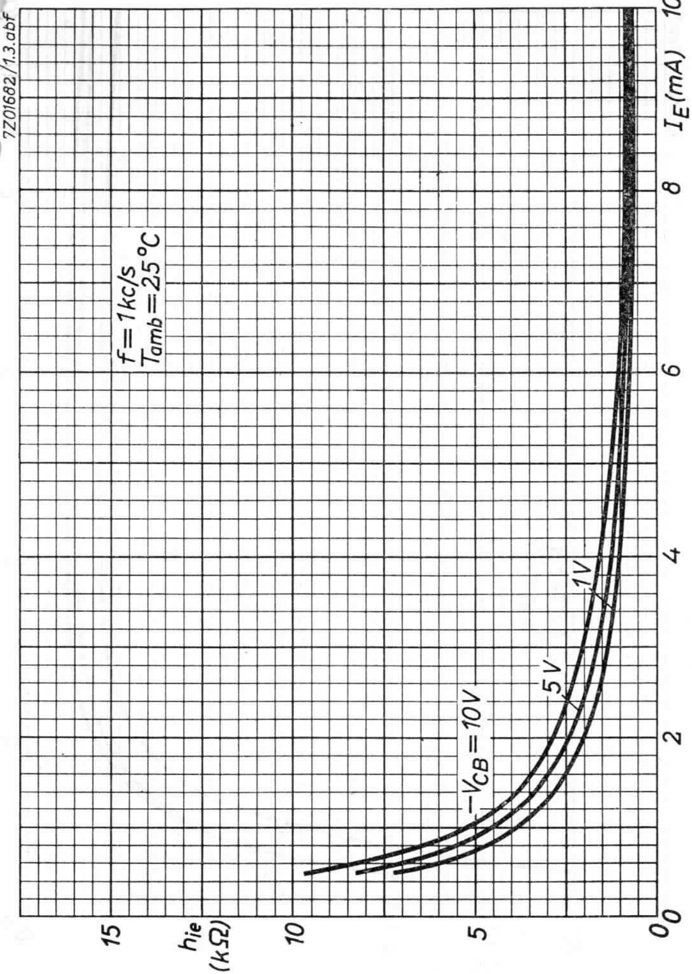

7Z01680 / 1.3.abf
$-V_{CB} = 5V$
$T_{amb} = 25°C$
min
typ
max
I_E (mA)
$-I_B$ (μA)
0
2
4
6
8
10
12
0
20
40
60
80

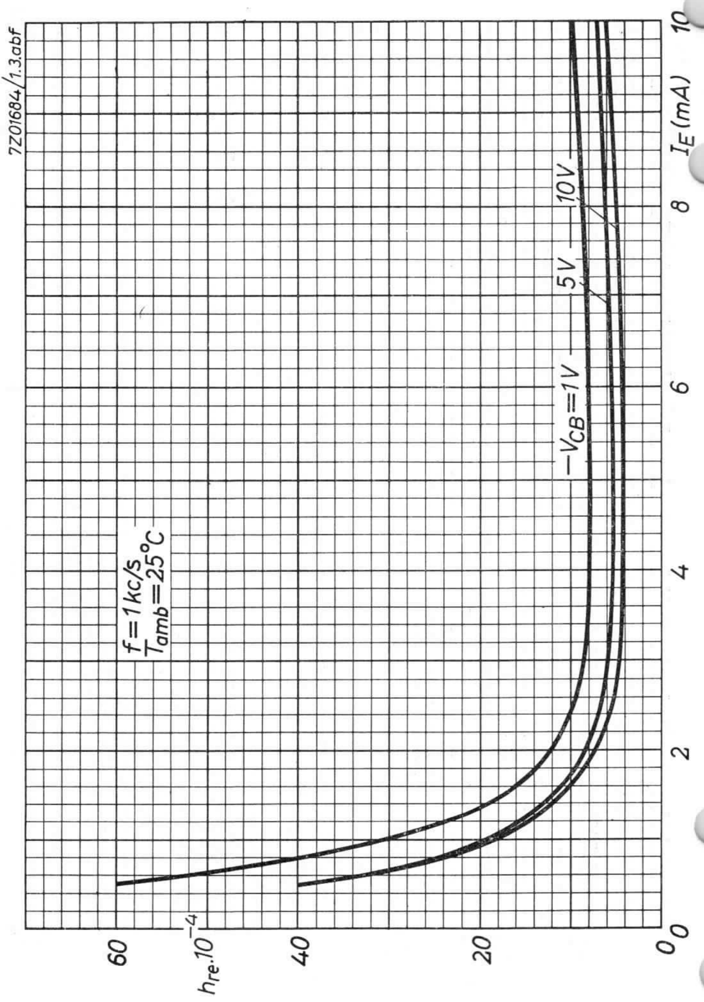

7Z01656/1.3.abe
10
I_E (mA)
8
6
4
2
0
$-V_{CB} = 5\,V$
$T_{amb} = 25°C$
min
typ
max
0
50
100
$-V_{BE}$ (mV)
150

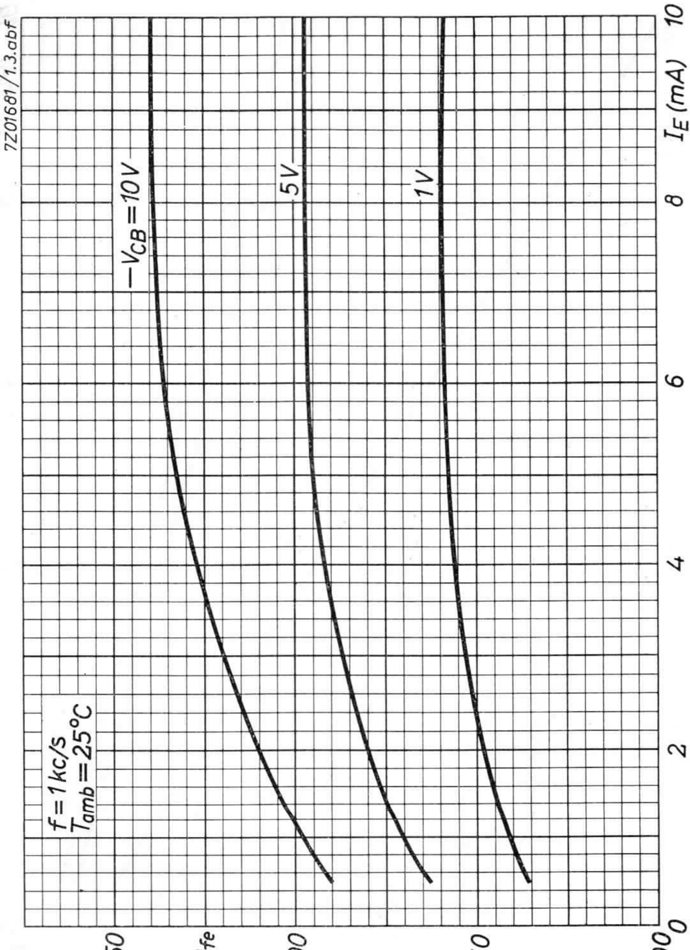
AC126

PHILIPS

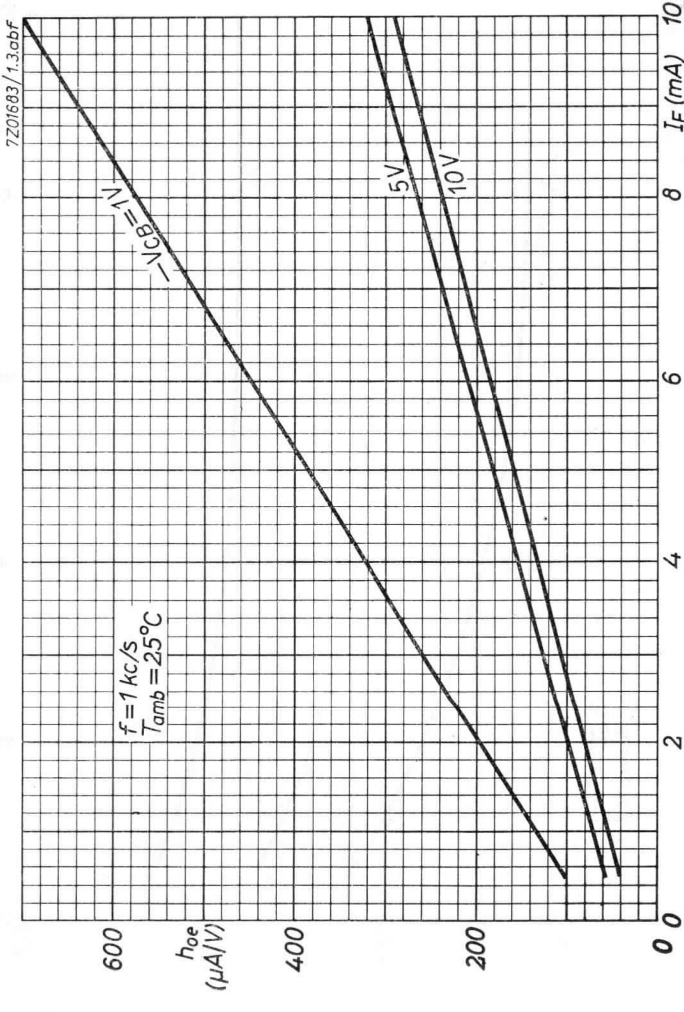



7Z01682/1.3.abf
f = 1kc/s
Tamb = 25 °C
−VCB = 10V
5 V
1V
IE(mA)
hie
(kΩ)
0
2
4
6
8
10
5
10
15

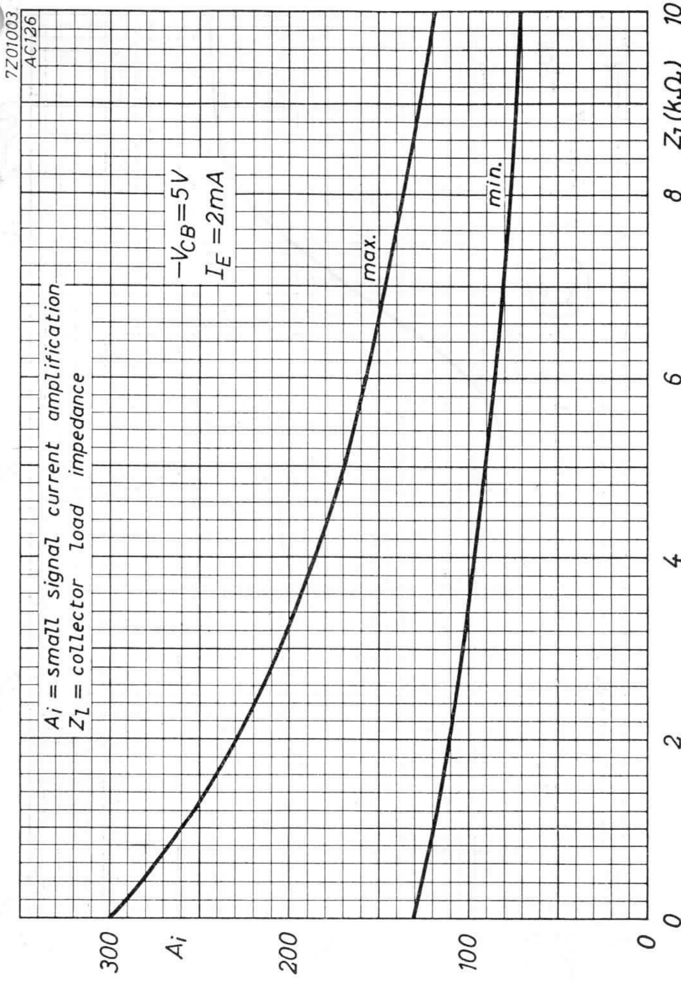

7Z01684/1.3.abf
f = 1 kc/s
T_amb = 25°C
−V_CB = 1V
5V
10V
I_E (mA)
h_re.10^-4
0
2
4
6
8
10
20
40
60


7Z01681/1.3.abf
−V_CB = 10 V
5 V
1 V
I_E (mA)
10
8
6
4
2
0
250
h_fe
200
150
100
f = 1 kc/s
T_amb = 25°C

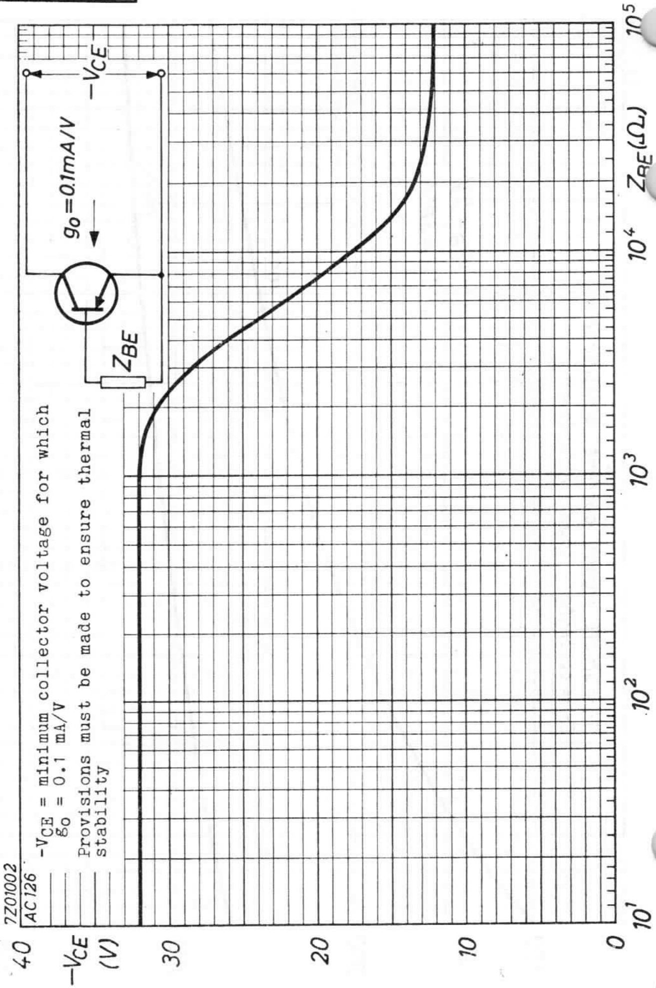
AC126 **PHILIPS**



H


7Z01003
AC126
Ai = small signal current amplification
ZL = collector load impedance
−VCB=5V
IE =2mA
max.
min.
Ai
300
200
100
0
ZL (kΩ)
0
2
4
6
8
10

PHILIPS


7Z01002
AC126
−VCE = minimum collector voltage for which
go = 0.1 mA/V
Provisions must be made to ensure thermal stability
−VCE
(V)
40
30
20
10
0
10¹
10²
10³
10⁴
10⁵
ZBE (Ω)
go=0.1mA/V
−VCE
ZBE

PHILIPS AC127

High gain n-p-n GERMANIUM ALLOY JUNCTION TRANSISTOR, especially intended for operation in complementary symmetrical class B output stages in combination with type AC132

LIMITING VALUES (Absolute max. values)

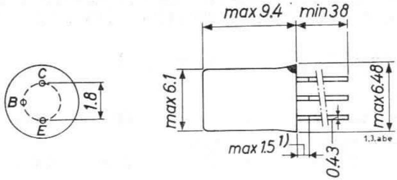
Collector		
Voltage (base reference)	V_{CB}	= max. 32 V
Voltage (emitter reference) (See also page G)	V_{CE}	= max. 32 V
Current	I_C	= max. 300 mA
Emitter		
Voltage (base reference)	V_{EB}	= max. 10 V
Base		
Current	I_B	= max. 15 mA
Dissipation		
Total dissipation	P_{tot}	= max. 280 mW
Temperatures		
Storage temperature	T_S	= -55^oC to $+75^oC$
Junction temperature		
Continuous operation	T_j	= max. 90 ^oC

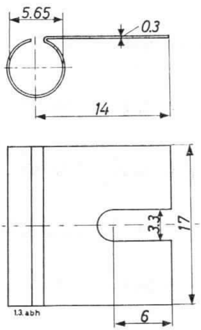
THERMAL DATA

Thermal resistance from junction to ambience in free air	K_{j-amb}	= max. 0.37 $^oC/mW$
Thermal resistance from junction to ambience with cooling fin mounted on a heat sink of at least 12.5 cm^2	K_{j-amb}	= max. 0.16 $^oC/mW$
Thermal resistance from junction to case	K_{j-c}	= max. 0.11 $^oC/mW$

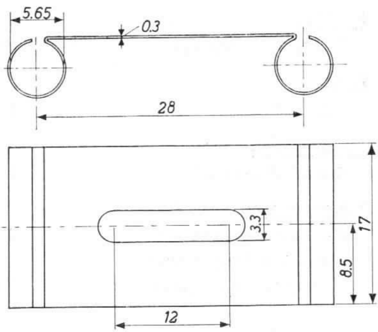
Dimensions in mm

The blue dot indicates the collector side





Cooling fin 56227



Cooling fin 56226

CHARACTERISTICS at T_{amb} = 25 °C

Collector-base leakage current

I_{CBO} (V_{CB} = 0.5 V; I_E = 0 mA) < 10 µA

Collector base voltage

V_{CB} (I_C = 500 µA; V_{BE} = 0 V) > 32 V

Emitter-base voltage

V_{EB} (I_E = 200 µA; I_C = 0 mA) > 10 V

[1]) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

Collector-base leakage current

I_{CBO} — See page F

Emitter-base leakage current

I_{EBO} (V_{EB} = 5 V; I_C = 0 mA; T_j = 75 °C) < 550 μA

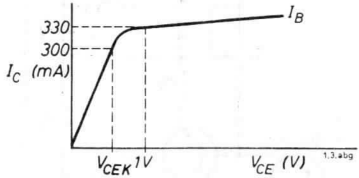
Large signal current amplification factor $\frac{I_C - I_{CBO}}{I_B + I_{CBO}}$
(See also page D)

h_{FE} (V_{CB} = 0 V; $-I_E$ = 20 mA) = 120
h_{FE} (V_{CB} = 0 V; $-I_E$ = 50 mA) = 115
h_{FE} (V_{CB} = 0 V; $-I_E$ = 200 mA) = 90
h_{FE} (V_{CB} = 0 V; $-I_E$ = 300 mA) = 75

Base voltage (See also page E)

V_{BE} (V_{CB} = 5 V; $-I_E$ = 2 mA) = 120 mV
V_{BE} (V_{CB} = 0 V; $-I_E$ = 300 mA) < 800 mV

Collector knee voltage



V_{CEK} (I_C = 300 mA; I_B = value at which I_C = 330 mA when V_{CE} = 1 V) < 500 mV

Frequency at which $|h_{fe}|$ = 1

f_1 (V_{CB} = 2 V; $-I_E$ = 10 mA) = 2.5 Mc/s > 1.5 Mc/s

Common emitter cut-off frequency

$f_{\alpha e}$ (V_{CB} = 2 V; $-I_E$ = 10 mA) = 20 kc/s > 10 kc/s

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

T_{amb} = 25 °C

Intrinsic base impedance

$|z_{rb}|$ (V_{CB} = 5 V; $-I_E$ = 1 mA; f = 0.45 Mc/s) = 70 Ω

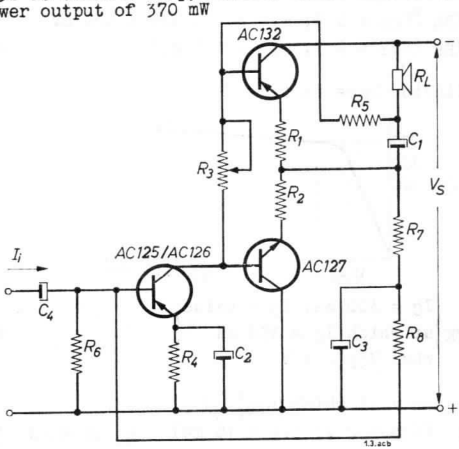
Collector depletion capacitance

c_c (V_{CB} = 5 V; $-I_E$ = 0 mA; f = 0.45 Mc/s) = 70 pF

Noise figure

F (V_{CB} = 5 V; $-I_E$ = 0.5 mA; f = 1 kc/s; B = 200 c/s; Input source resistance = 500 Ω) = 4 dB < 10 dB

OPERATING CHARACTERISTICS at T_{amb} = 25 °C of a matched pair AC127/AC132 as class B complementary symmetrical amplifier with a power output of 370 mW



Stable continuous operation is ensured up to T_{amb} = 45 °C

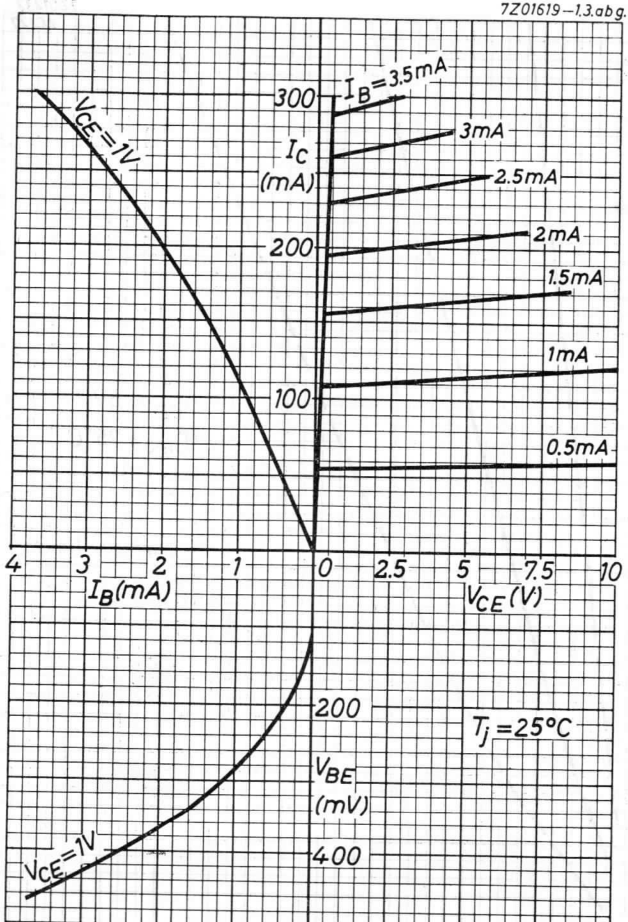
For the 370 mW circuit each transistor should be mounted with a cooling fin

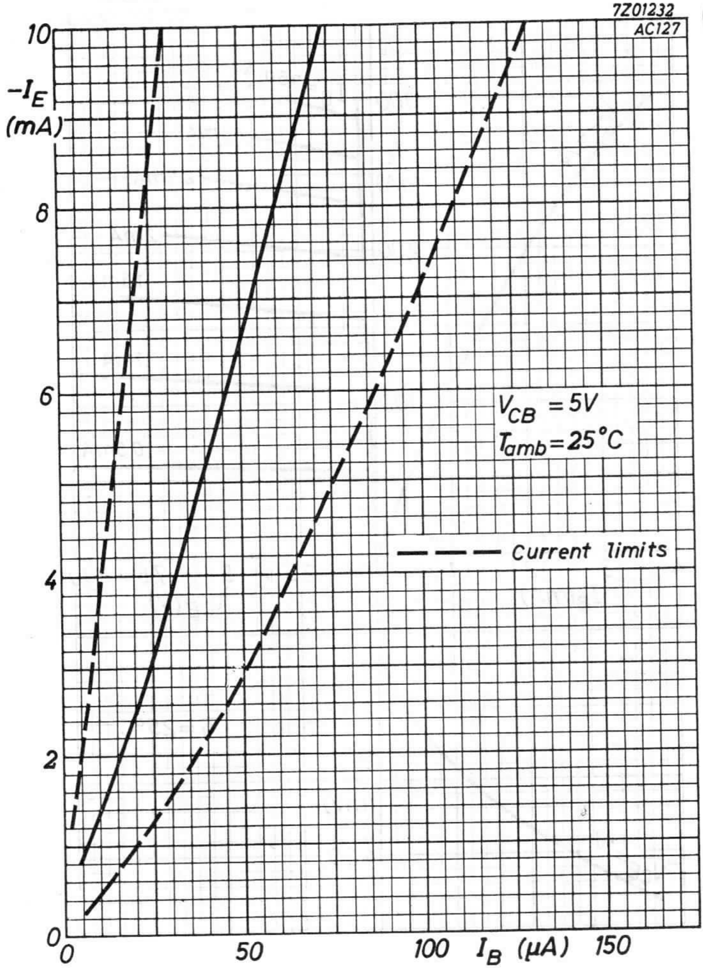
(See further page 5)

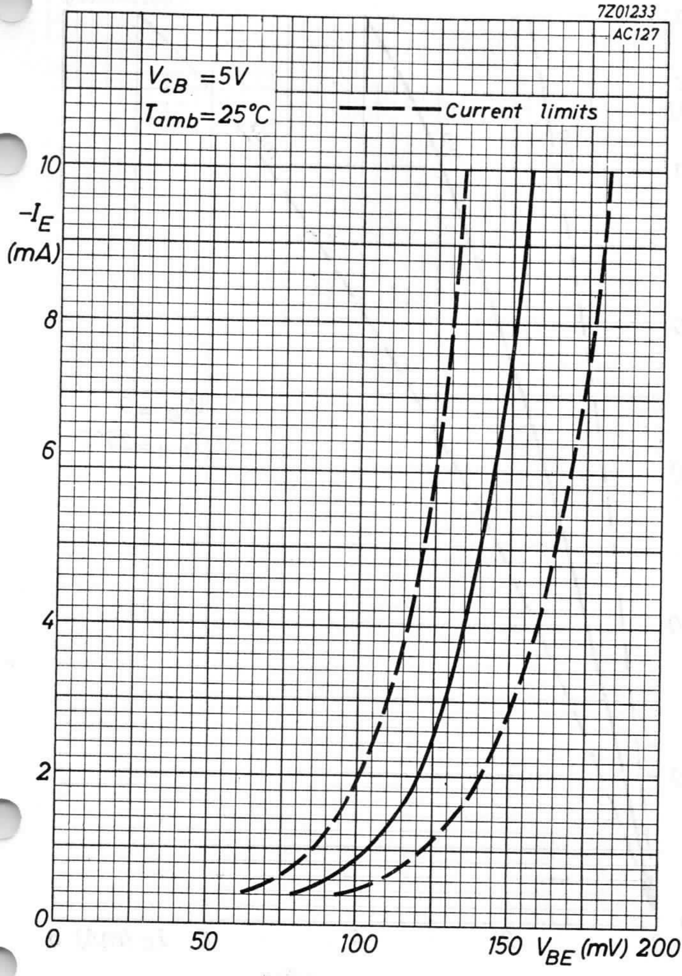
OPERATING CHARACTERISTICS (continued)

The ratio of the large current amplification factors of a matched pair AC127/AC132 at $|I_E|$ = 50 mA and V_{CB} = 0 V is typical 1.1 and maximum 1.25

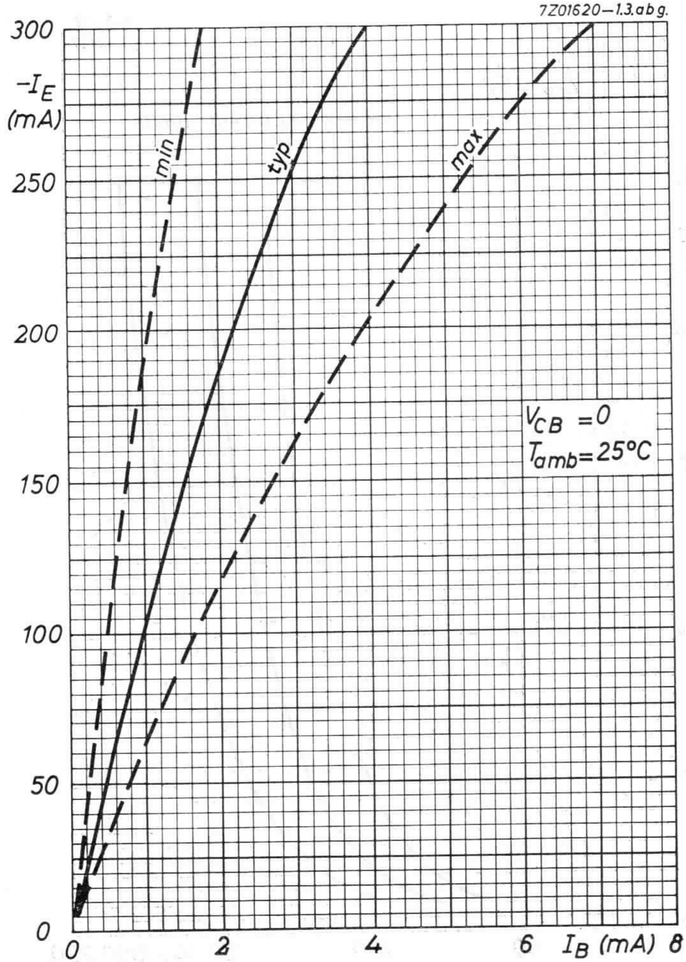
			I	II	III	
Supply voltage	V_S	=	6	9	9	V
Power output (at d = 10%)	P_o	=	115	110	370	mW
	P_o	= min.	105	100	300	mW
Distortion	d	=	see page H			
Output stage						
Zero signal emitter current	I_{E1}	=	2	2	2	mA
	$-I_{E2}$	=	2	2	2	mA
Emitter resistors	R_1	=	3.3	4.7	3.9	Ω
	R_2	=	3.3	4.7	3.9	Ω
Bias resistor	R_3	= max.	100	250	50	Ω
Coupling capacitor	C_1	=	200	64	320	µF
Peak collector current at P_o = max.	$\|I_{CM}\|$	=	90	50	200	mA
Driver stage (Tolerances of resistors 5%)						
Collector current	$-I_C$	=	2.7	1.2	7.6	mA
Emitter resistor	R_4	=	180	680	82	Ω
Collector resistor	R_5	=	910	3300	510	Ω
Bias resistors	R_6	=	4.7	6.8	1.8	kΩ
	R_7	=	3.9	4.7	2.2	kΩ
	R_8	=	15	24	6.8	kΩ
Decoupling capacitors	C_2	=	40	25	120	µF
	C_3	=	25	25	25	µF
Coupling capacitor	C_4	=	6.4	6.4	6.4	µF
Input current at P_o = max. (RMS value)						
with AC125	I_i	=	20	10	55	µA
with AC126	I_i	=	15	8	40	µA
Input current at P_o = 50 mW (RMS value)						
with AC125	I_i	=	11.5	6	17	µA
with AC126	I_i	=	9	4.5	12.5	µA
Total harmonic distortion at P_o = 50 mW	d_{tot}	=	2.5	3.8	2.0	%

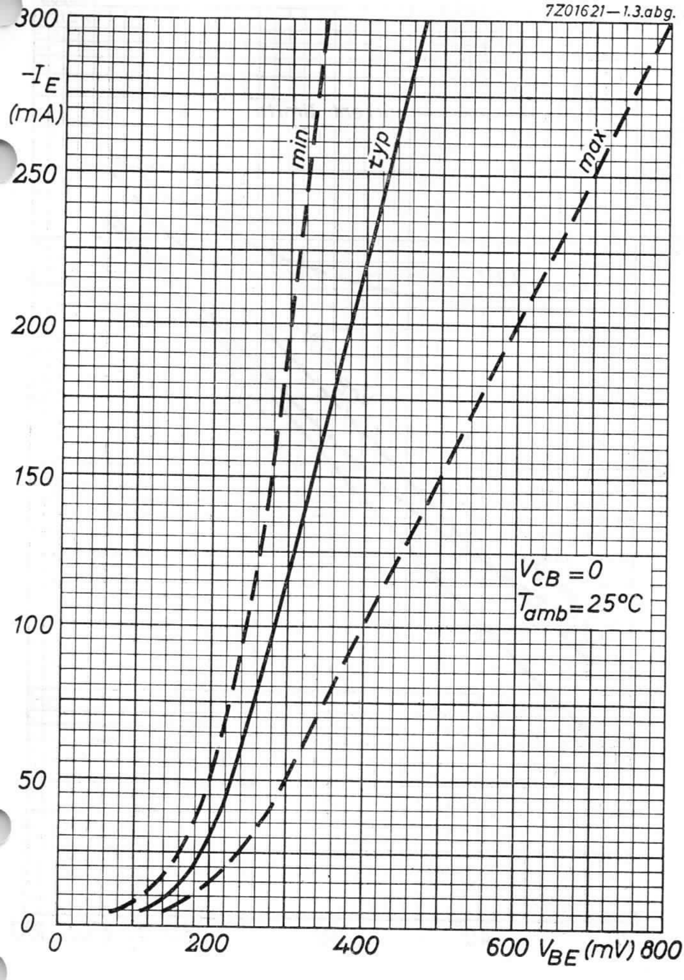

7Z01619—1.3.abg.
I_B=3.5mA
3mA
2.5mA
2mA
1.5mA
1mA
0.5mA
300
200
100
I_C (mA)
V_{CE}=1V
4
3
2
1
0
2.5
5
7.5
10
I_B(mA)
V_{CE}(V)
200
400
V_{BE} (mV)
T_j=25°C
V_{CE}=1V


7Z01232
AC127
10
$-I_E$
(mA)
8
6
4
2
0
0
50
100
I_B (μA)
150
V_{CB} = 5V
T_{amb} = 25°C
Current limits

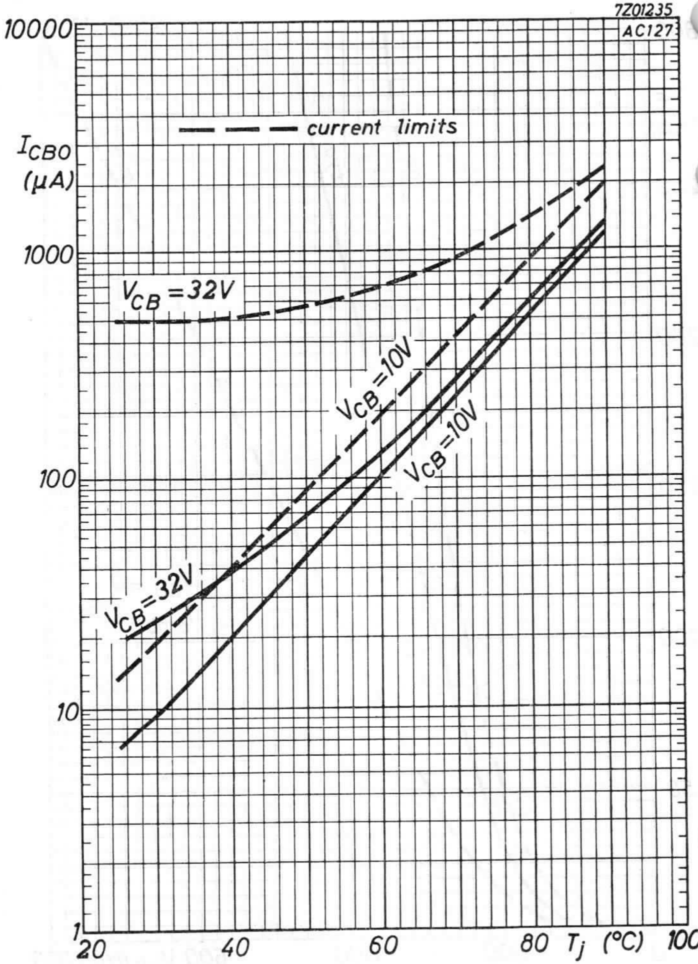

7Z01233
AC127
V_{CB} = 5V
T_{amb} = 25°C
Current limits
10
$-I_E$
(mA)
8
6
4
2
0
0
50
100
150
V_{BE} (mV)
200

PHILIPS


7Z01620—1.3.abg.
300
$-I_E$
(mA)
250
200
150
100
50
0
0
2
4
6
I_B (mA)
8
min
typ
max
V_{CB} =0
T_{amb}=25°C

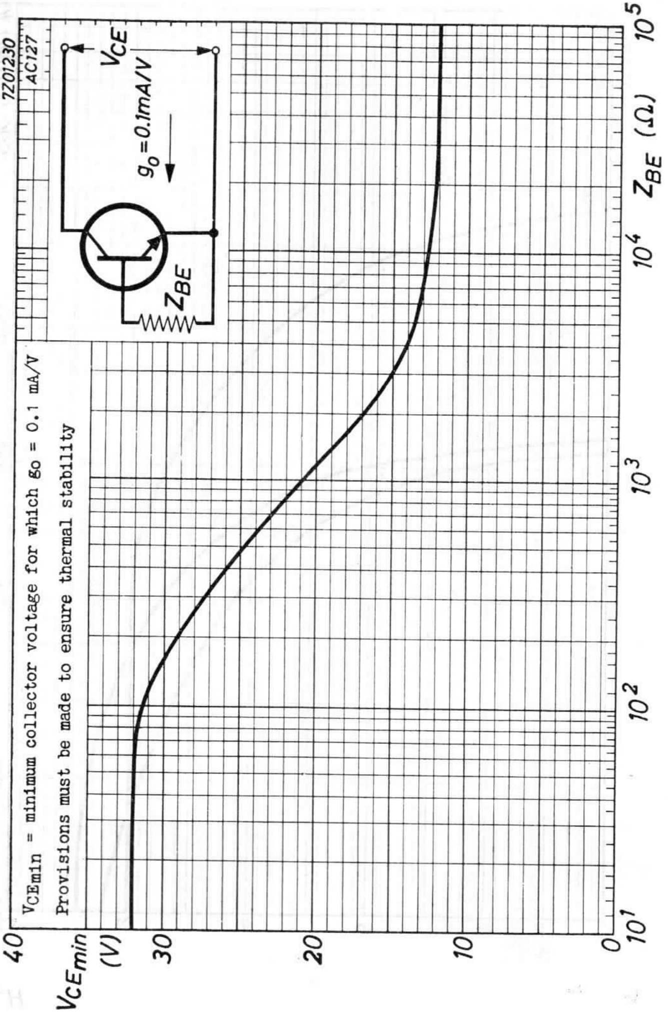

7Z01621—1.3.abg.
300
$-I_E$
(mA)
250
200
150
100
50
0
0
200
400
600 V_{BE} (mV) 800
min
typ
max
$V_{CB} = 0$
$T_{amb} = 25°C$

PHILIPS

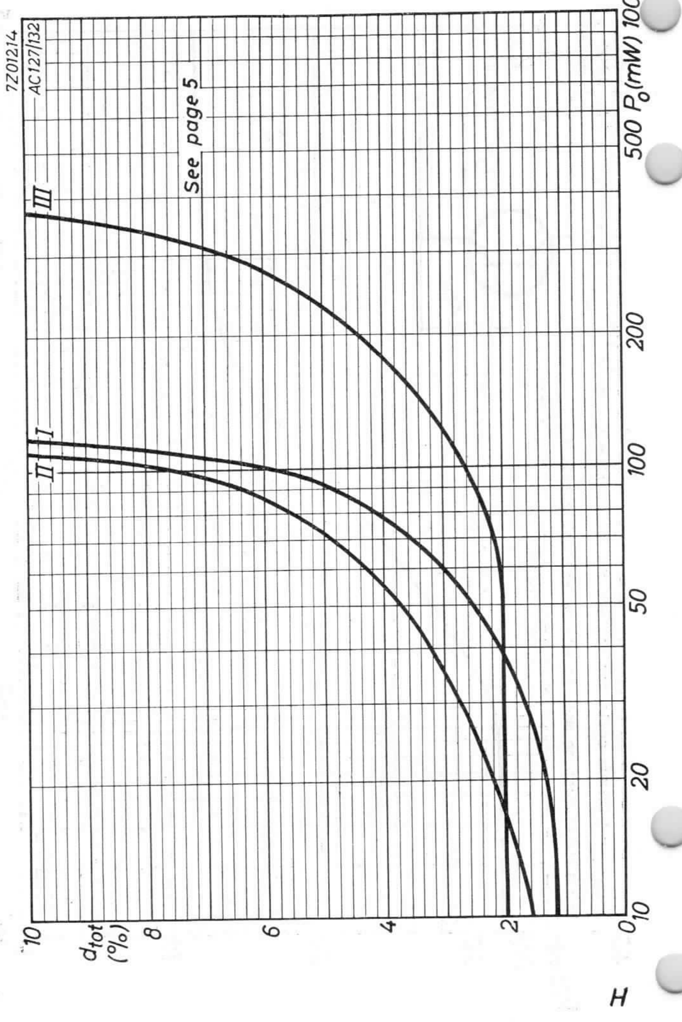

7Z01235
AC127
10000
1000
100
10
1
I_{CBO} (μA)
current limits
$V_{CB}=32V$
$V_{CB}=10V$
$V_{CB}=32V$
$V_{CB}=10V$
20
40
60
80
100
T_j (°C)

PHILIPS

AC127



PHILIPS


7Z01214
AC127/132
See page 5
III
I
II
d_{tot} (%)
10
8
6
4
2
0
10
20
50
100
200
500 P_o (mW) 1000
H

PHILIPS AC128 2-AC128

GERMANIUM ALLOY JUNCTION TRANSISTOR of the p-n-p type with high gain in metal envelope for use in class A and class B output stages with battery voltages up to 14 volts and a power output up to 2 watts
Type 2-AC128 consists of 2 transistors AC128 which are matched to operate in a low distortion class B circuit.

LIMITING VALUES (Absolute max. values)

Collector		
Voltage (base reference)	$-V_{CB}$	= max. 32 V
Voltage (emitter reference) (see also page H)	$-V_{CE}$	= max. 32 V
Current	$-I_C$	= max. 1 A
Emitter		
Voltage (base reference)	$-V_{EB}$	= max. 10 V
Base		
Current	$-I_B$	= max. 40 mA
Dissipation		
Total dissipation	P_{tot}	= max. 550 mW
Temperatures		
Storage temperature	T_S	= -55 °C to +75 °C
Junction temperature	T_j	= max. 90 °C

THERMAL DATA

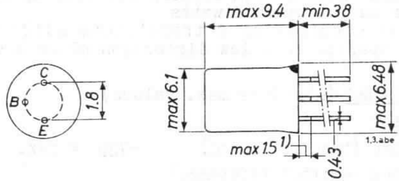
Thermal resistance from junction to ambience in free air	K = max. 0.3 °C/mW
Thermal resistance from junction to ambience with cooling fin in free air	K = max. 0.15 °C/mW
Thermal resistance from junction to ambience with cooling fin mounted on heat sink of at least 12.5 cm^2	K = max. 0.09 °C/mW
Thermal resistance from junction to case	K = max. 0.05 °C/mW

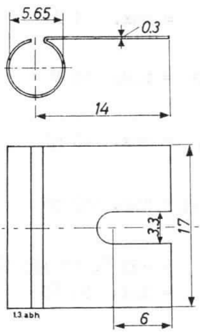
AC128
2-AC128

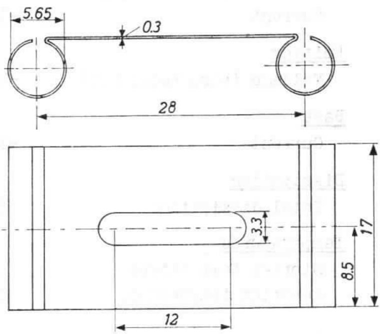
PHILIPS

Dimensions in mm

The red dot indicates the collector side







Cooling fin 56227

Cooling fin 56226

<u>CHARACTERISTICS</u> at T_{amb} = 25 °C

Collector current at I_E = 0 mA

$-I_{CBO}$ ($-V_{CB}$ = 10 V; I_E = 0 mA)	< 10 µA

Collector voltage at I_E = 0 mA

$-V_{CB}$ ($-I_C$ = 200 µA; I_E = 0 mA)	> 32 V

Emitter voltage at I_C = 0 mA

$-V_{EB}$ ($-I_E$ = 200 µA; I_C = 0 mA)	> 10 V

Base voltage at V_{CB} = 0 V

$-V_{BE}$ (I_E = 50 mA; V_{CB} = 0 V)	< 300 mV
$-V_{BE}$ (I_E = 300 mA; V_{CB} = 0 V)	< 450 mV

[1]) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

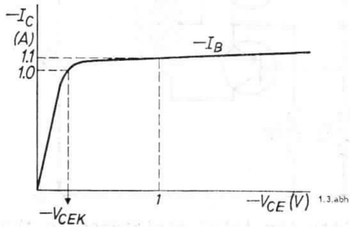
Emitter current at $I_C = 0$

$-I_{EBO}$	$-V_{EB} = 5$ V; $I_C = 0$ mA; $T_j = 75$ °C		< 500 μA

D.C. current amplification factor

h_{FE} ($I_E = 50$ mA; $-V_{CB} = 0$ V)	= 90	> 55 < 175	
h_{FE} ($I_E = 300$ mA; $-V_{CB} = 0$ V)	= 90	> 60 < 175	
h_{FE} ($I_E = 1$ A; $-V_{CB} = 0$ V)	= 80	> 45 < 165	←

Collector knee voltage



$-V_{CEK}$ ($-I_C = 1$ A; $-I_B$ = value at which $-I_C = 1.1$ A, when $-V_{CE} = 1$ V) < 0.6 V ←

Frequency at which $|h_{fe}| = 1$

f_1 ($-V_{CB} = 2$ V; $I_E = 10$ mA) = 1.5 Mc/s > 1.0 Mc/s

Cut-off frequency

$f_{\alpha e}$ ($-V_{CB} = 2$ V; $I_E = 10$ mA) = 15 kc/s > 10 kc/s

Base resistance

$r_{bb'}$ ($-V_{CB} = 5$ V; $I_E = 1$ mA) = 25 Ω

Collector capacitance

c_c ($-V_{CB} = 5$ V; $I_E = 0$ mA) = 100 pF

Current gain linearity

λ_{500} (see curve B page G) = 0.60 > 0.50

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

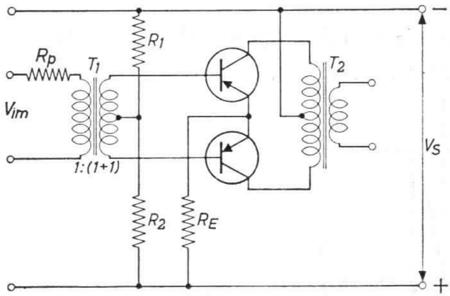
T_{amb} = 25 °C

Characteristics of 2-AC128

Ratio of D.C. current amplification factors

h_{FE_1}/h_{FE_2}	$(-V_{CB} = 0\ V;\ I_E = 50\ mA)$	= 1.1	< 1.25
h_{FE_1}/h_{FE_2}	$(-V_{CB} = 0\ V;\ I_E = 300\ mA)$	= 1.1	< 1.25

OPERATING CHARACTERISTICS OF A MATCHED PAIR 2-AC128 as class B output amplifier



For providing stability the total resistance in the base circuit of each transistor is less than 100 Ω

The data below (page 5) have been designed for continuous operation up to the ambient temperature specified in the tables. The junction temperature may then be up to 90 °C (K = 0.09 °C/mW)

R_p = input source resistance

For tables see next page

OPERATING CHARACTERISTICS OF A MATCHED PAIR 2-AC128 as class B output amplifier (continued)

V_S	=	6	9	9	V
T_{amb}	=	max. 55	max. 55	max. 45	°C
I_E (V_i = 0)	=	2x3	2x3	2x3	mA
R_1 [1]	=	2.0	2.2	3.5 [2]	kΩ
R_2 [1]	=	47	39	[3]	Ω
R_E	=	2.2	3.9	1.5	Ω
R_p	=	1.5	1.5	1.0	kΩ
R_{cc}	=	65	98	62	Ω
$P_{C\,max.}$ [4]	=	2x0.425	2x0.65	2x1.05	W
$P_{o\,max.}$ [5]	=	0.75	1.1	1.9	W
$-I_{CM}$(P_o = max.)	=	300	300	500	mA
$-I_C$ (P_o = max.)	=	2x95	2x95	2x150	mA
V_{im}(P_o = max.)	=	5.5	6.0	6.5	V [6]
d_{tot}(P_o= max.)	=	3.5	4.0	5.5	%
V_{im}(P_o = 50 mW)	=	1.6	1.4	1.1	V [6]
d_{tot}(P_o = 50 mW)	=	2.0	2.0	2.5	%

[1]) Tolerance of the bias resistors 5%

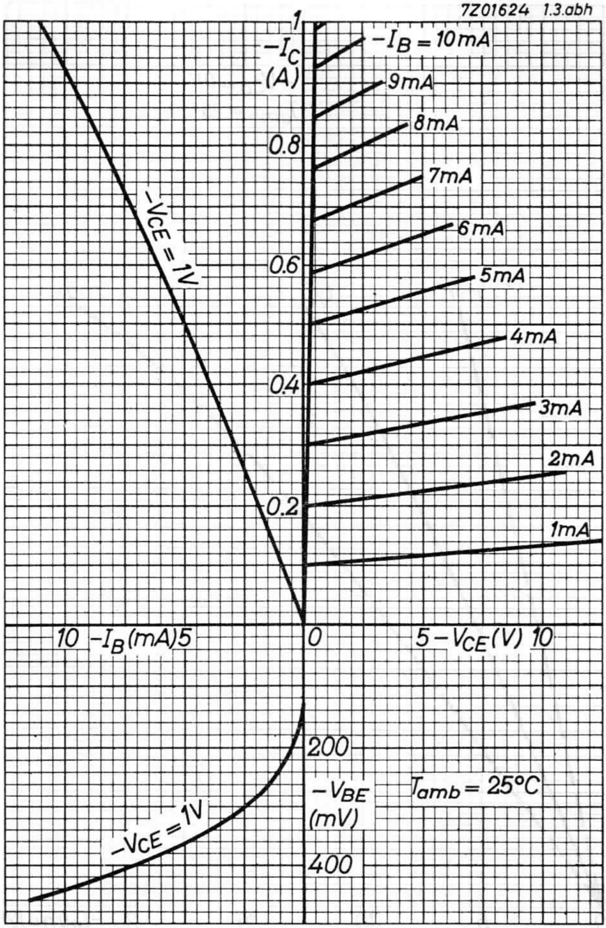
[2]) Variable resistor

[3]) This resistance is composed of a 68 Ω resistor in parallel with a 130 Ω NTC resistor (code no. E201 BC/A 130 E)

[4]) Output power of two transistors

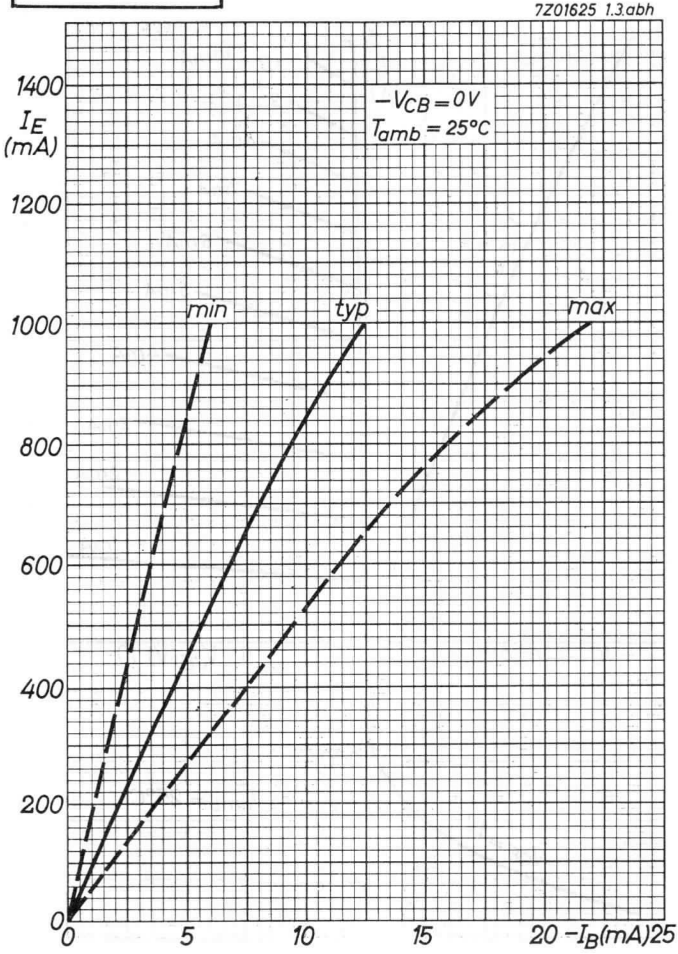
[5]) Power delivered to the primary of the output transformer

[6]) Losses in the driver transformer are not taken into acount

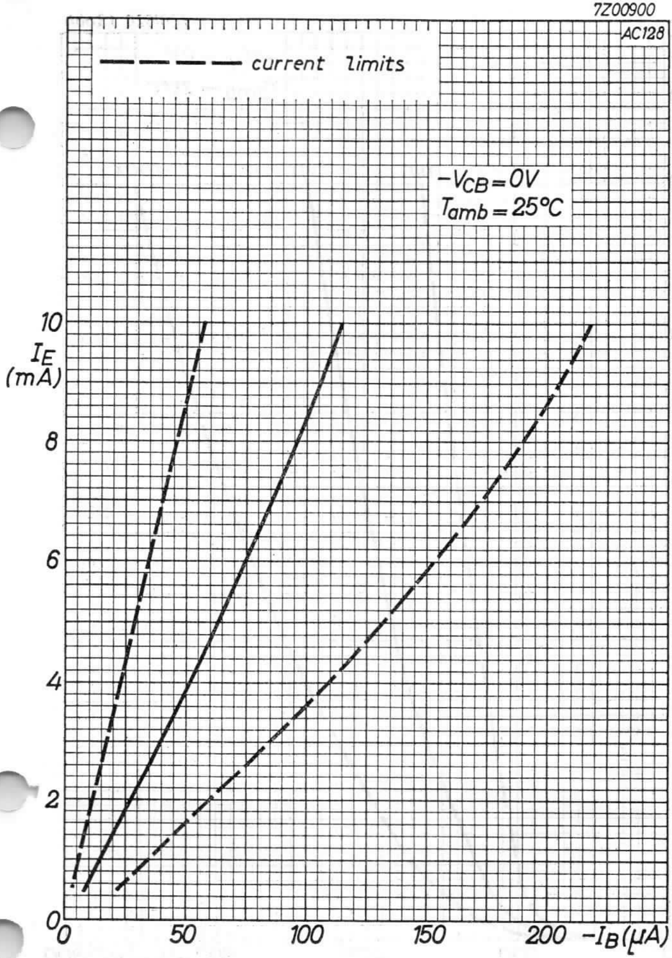

7Z01624 1.3.abh
1
$-I_C$
(A)
0.8
0.6
0.4
0.2
$-I_B = 10mA$
9mA
8mA
7mA
6mA
5mA
4mA
3mA
2mA
1mA
$-V_{CE} = 1V$
10 $-I_B$(mA) 5
0
5 $-V_{CE}$(V) 10
200
$-V_{BE}$
(mV)
400
$T_{amb} = 25°C$
$-V_{CE} = 1V$

AC128
2-AC128

PHILIPS

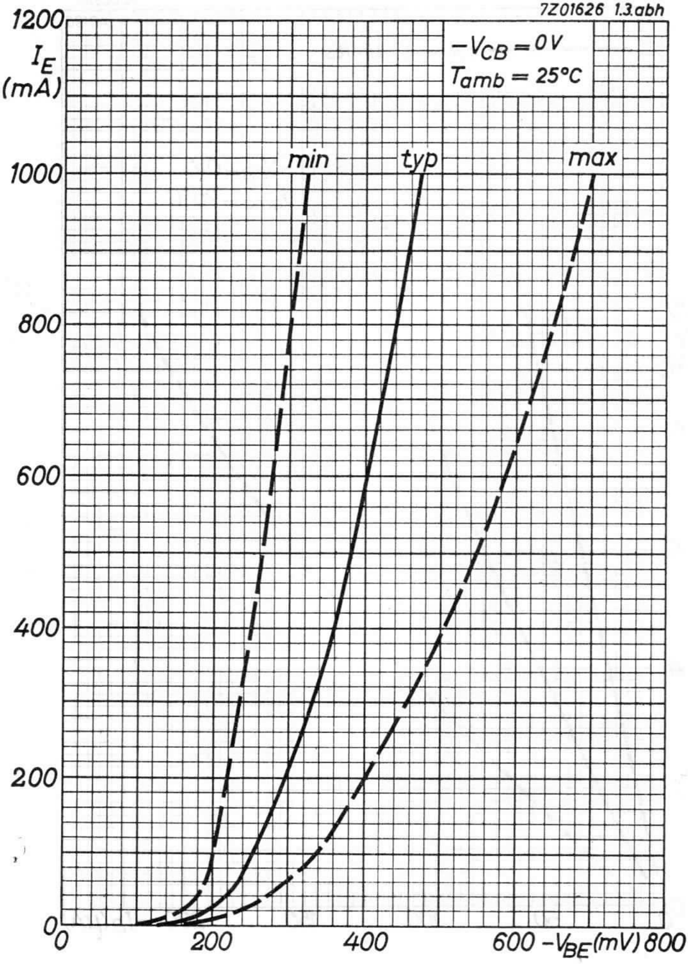


B


7Z00900
AC128
current limits
$-V_{CB} = 0V$
$T_{amb} = 25°C$
10
I_E (mA)
8
6
4
2
0
0
50
100
150
200
$-I_B$ (μA)

AC128
2-AC128

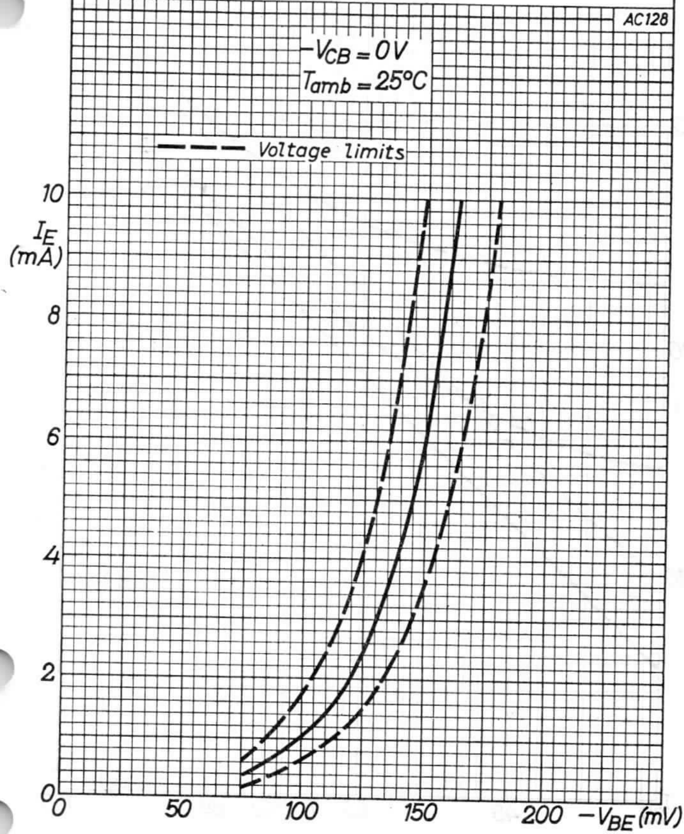
PHILIPS



7Z00901

$-V_{BE}$ decreases with about 2.3 mV/°C with increasing temperature

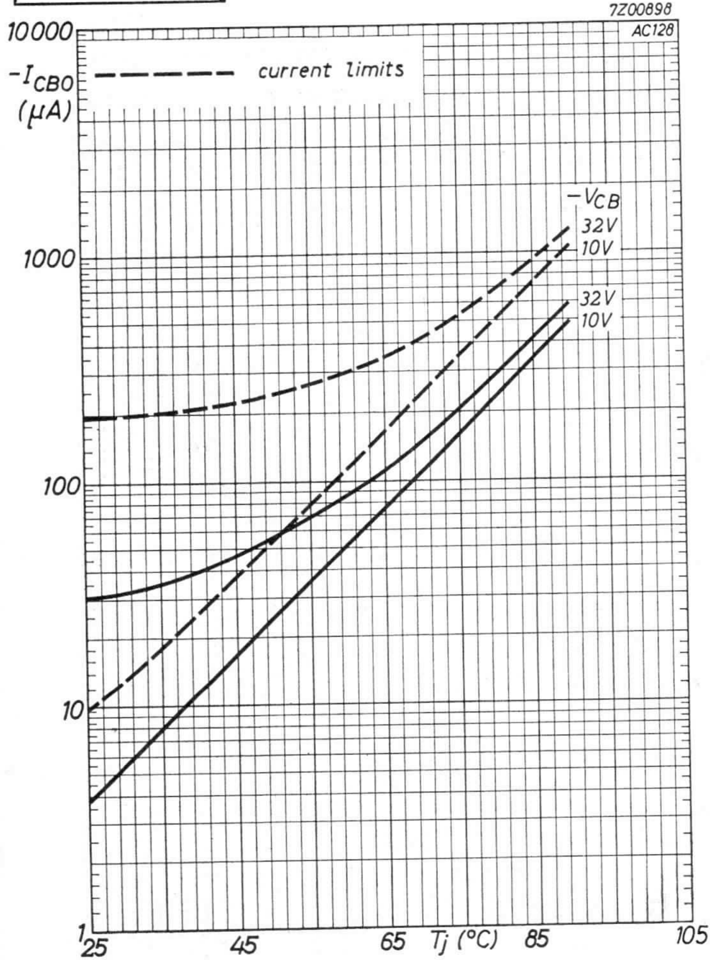
$-V_{BE}$ decreases with about 0.4 mV/V with increasing collector to emitter voltage

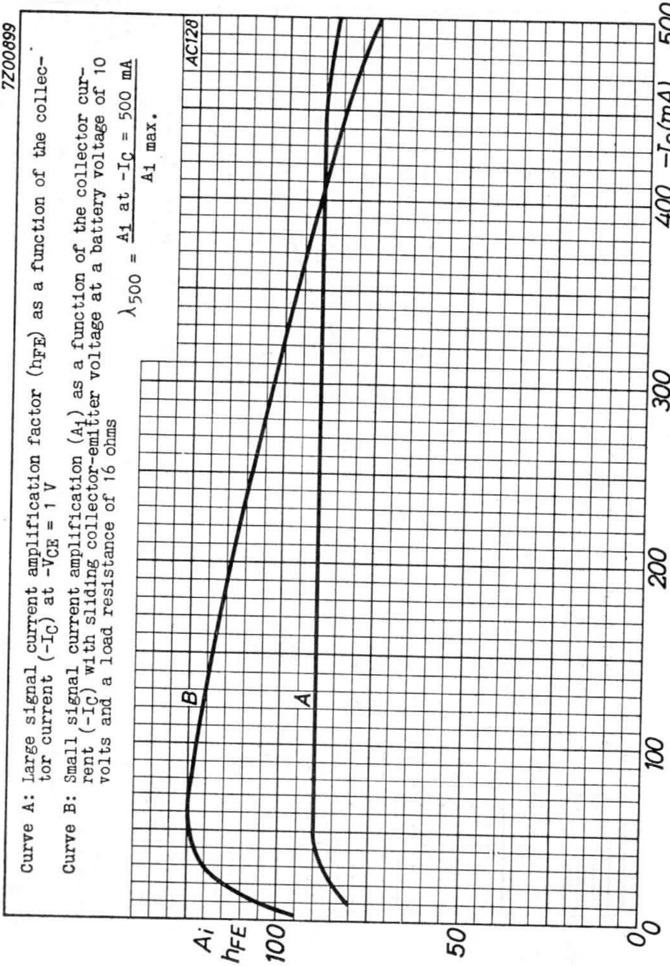


5.5.1962

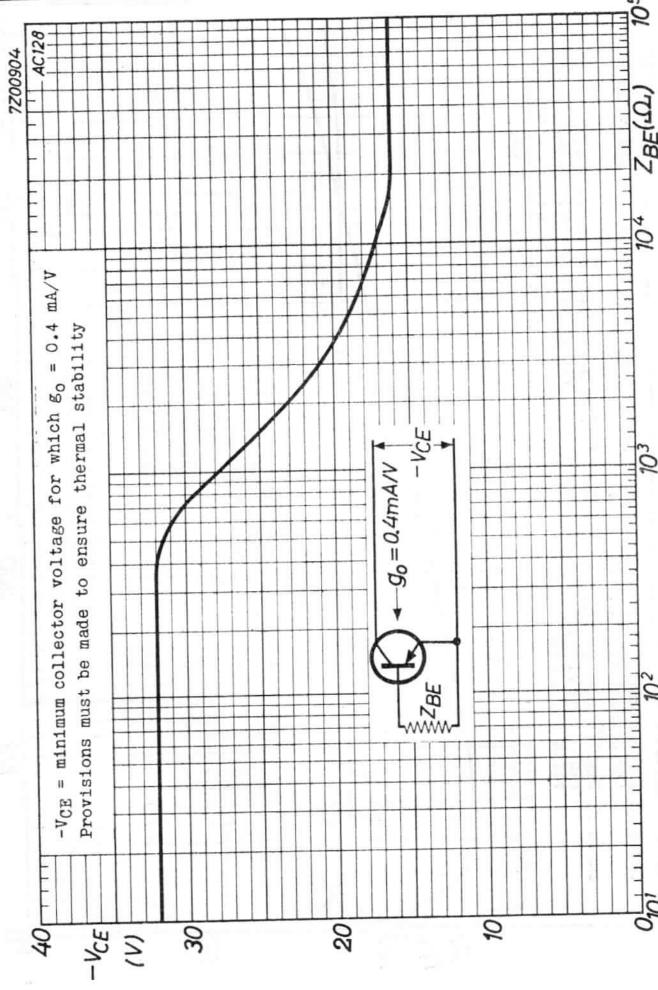
AC128
2-AC128

PHILIPS




7Z00899
Curve A: Large signal current amplification factor (h_{FE}) as a function of the collector current ($-I_C$) at $-V_{CE}$ = 1 V
Curve B: Small signal current amplification (A_i) as a function of the collector current ($-I_C$) with sliding collector-emitter voltage at a battery voltage of 10 volts and a load resistance of 16 ohms
$\lambda_{500} = \frac{A_i \text{ at } -I_C = 500 \text{ mA}}{A_i \text{ max.}}$
AC128
B
A
A_i
h_{FE}
100
50
0
0
100
200
300
400
500
$-I_C$(mA)

PHILIPS


7Z00904
AC128
$-V_{CE}$ = minimum collector voltage for which g_o = 0.4 mA/V
Provisions must be made to ensure thermal stability
g_o=0.4mA/V
$-V_{CE}$
Z_{BE}
$-V_{CE}$ (V)
40
30
20
10
0
Z_{BE}(Ω)
10^1
10^2
10^3
10^4
10^5

PHILIPS AC132

High gain p-n-p GERMANIUM ALLOY JUNCTION TRANSISTOR, especially intended for operation in complementary symmetrical class B output stages in combination with type AC127

LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference) (See also page G)	$-V_{CE}$	= max.	32 V
Current	$-I_C$	= max.	200 mA

Emitter

Voltage (base reference)	$-V_{EB}$	= max.	10 V

Base

Current	$-I_B$	= max.	10 mA

Dissipation

Total dissipation	P_{tot}	= max.	500 mW

Temperatures

Storage temperature	T_s	= -55 °C to +75	°C
Junction temperature			
Continuous operation	T_j	= max.	75 °C
Intermittent operation	T_j	= max.	90 °C
Total duration	t	= max.	200 hours

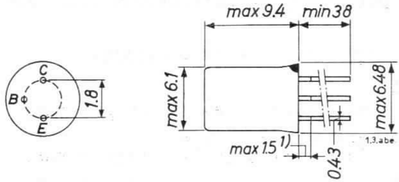
THERMAL DATA

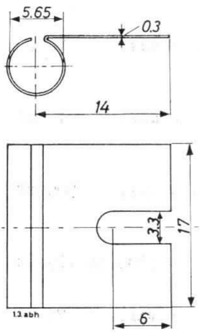
Thermal resistance from junction to ambience in free air	K_{j-amb}	= max.	0.3 °C/mW
Thermal resistance from junction to ambience with cooling fin mounted on a heat sink of at least 12.5 cm^2	K_{j-amb}	= max.	0.09 °C/mW
Thermal resistance from junction to case	K_{j-c}	= max.	0.05 °C/mW

AC132 PHILIPS

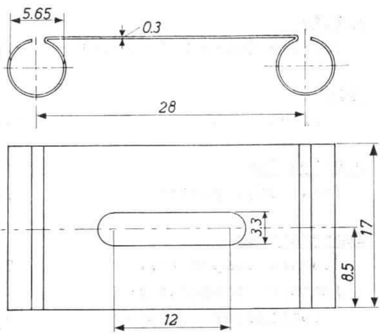
Dimensions in mm

The red dot indicates the collector side





Cooling fin 56227



Cooling fin 56226

<u>CHARACTERISTICS</u> at T_{amb} = 25 °C

Collector-base leakage current

$-I_{CBO}$ ($-V_{CB}$ = 0.5 V; I_E = 0 mA) < 10 µA

Collector-base voltage

$-V_{CB}$ ($-I_C$ = 500 µA; V_{BE} = 0 V) > 32 V

Emitter-base voltage

$-V_{EB}$ ($-I_E$ = 200 µA; I_C = 0 mA) > 10 V

[1]) Not tinned

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Tamb = 25 °C unless otherwise specified

Collector-base leakage current

$-I_{CBO}$ See page F

Emitter-base leakage current

$-I_{EBO}$ $(-V_{EB} = 5\ V;\ I_C = 0\ mA;\ T_j = 75\ °C)$ < 550 µA

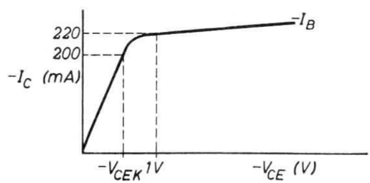
Large signal current amplification factor $\frac{I_C - I_{CBO}}{I_B + I_{CBO}}$

h_{FE} $(V_{CB} = 0\ V;\ I_E = 20\ mA)$ = 135
h_{FE} $(V_{CB} = 0\ V;\ I_E = 50\ mA)$ = 115
h_{FE} $(V_{CB} = 0\ V;\ I_E = 200\ mA)$ = 70

Base voltage

$-V_{BE}$ $(-V_{CB} = 5\ V;\ I_E = 2\ mA)$ = 105 mV
$-V_{BE}$ $(V_{CB} = 0\ V;\ I_E = 200\ mA)$ < 550 mV

Collector knee voltage



$-V_{CEK}$ $(-I_C = 200\ mA;\ -I_B = $ value at which $-I_C = 220\ mA$ when $-V_{CE} = 1\ V)$ < 350 mV

Frequency at which $|h_{fe}| = 1$
f_1 $(-V_{CB} = 2\ V;\ I_E = 10\ mA)$ = 2.0 Mc/s > 1.3 Mc/s

Common emitter cut-off frequency
$f_{\alpha e}$ $(-V_{CB} = 2\ V;\ I_E = 10\ mA)$ = 17 kc/s > 10 kc/s

Intrinsic base impedance
$|z_{rb}|$ $(-V_{CB} = 5\ V;\ I_E = 1\ mA;\ f = 0.45\ Mc/s)$ = 90 Ω

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

$T_{amb} = 25\ ^{o}C$

Collector depletion capacitance

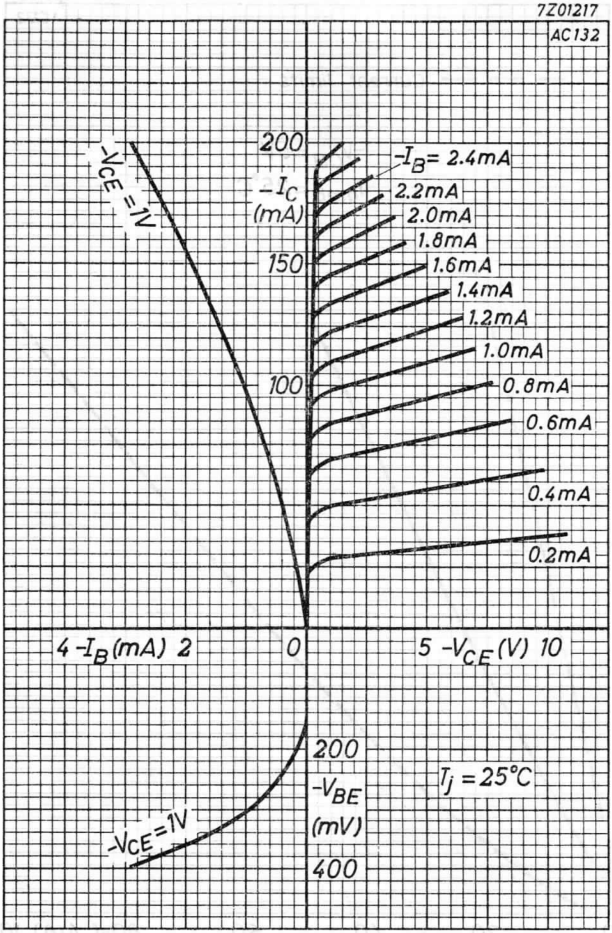
$$c_c \left\{ \begin{array}{l} -V_{CB} = 5\ V;\ I_E = 0\ mA \\ f = 0.45\ Mc/s \end{array} \right\} = 40\ pF$$

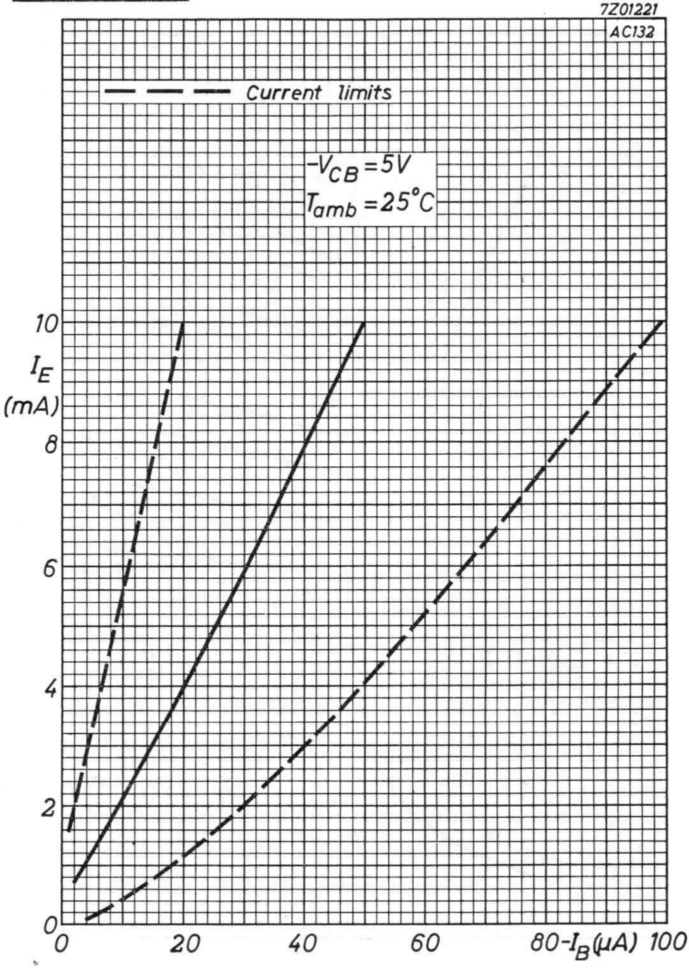
Noise figure

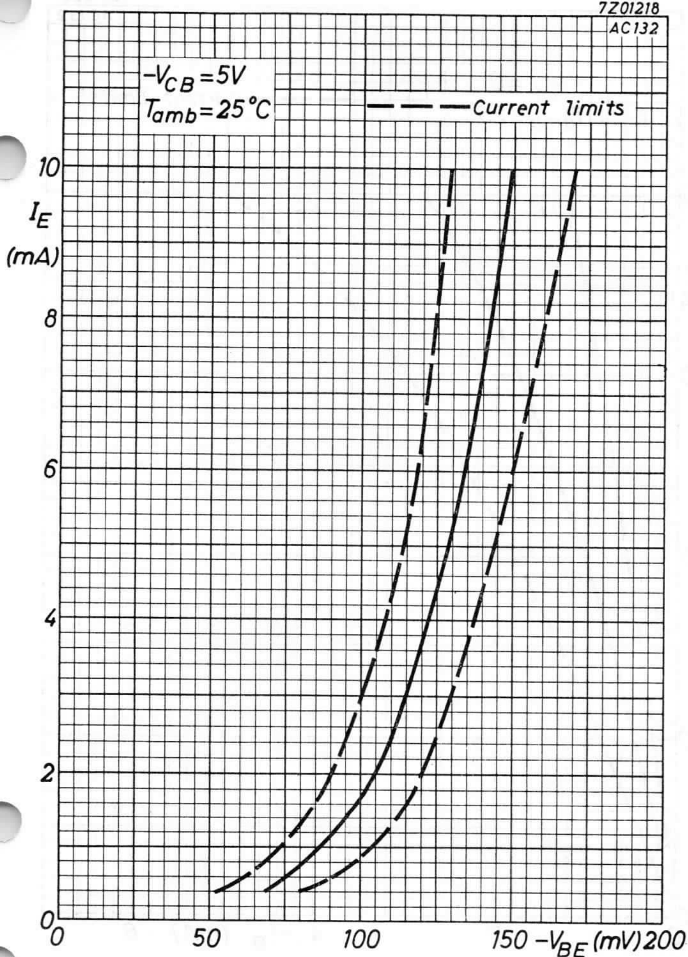
$$F \left(\begin{array}{l} -V_{CB} = 5\ V;\ I_E = 0.5\ mA \\ f = 1\ kc/s;\ B = 200\ c/s \\ \text{Input source resistance} = 500\ \Omega \end{array} \right) = 4\ dB \quad < 10\ dB$$

OPERATING CHARACTERISTICS at $T_{amb} = 25\ ^{o}C$ of a matched pair AC127/AC132 as class B complementary symmetrical amplifier with a power output of 370 mW

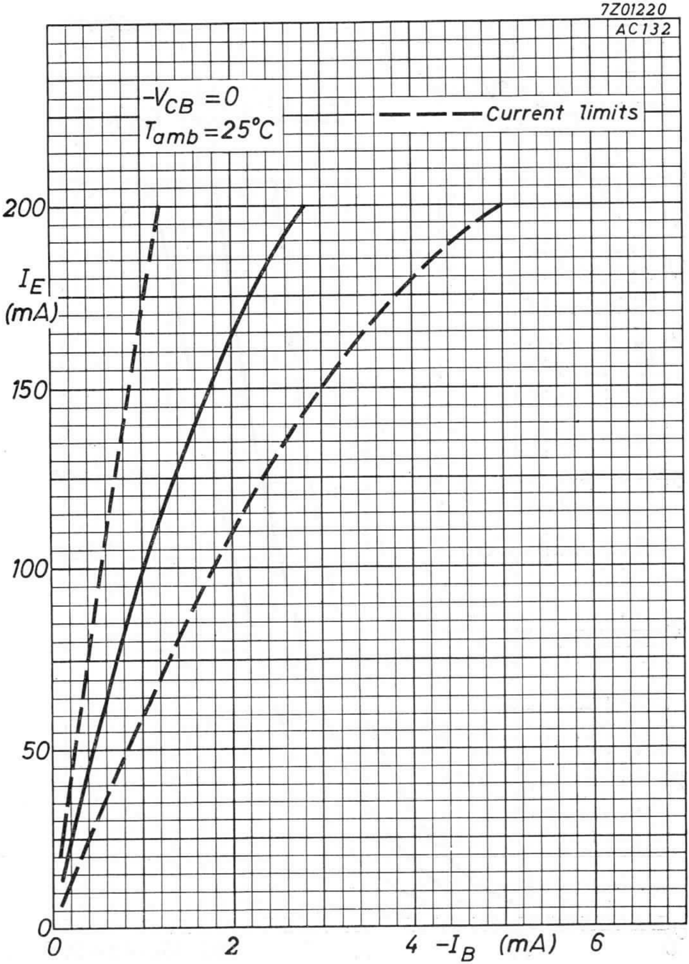
For circuit diagram and data please refer to data sheets of AC127

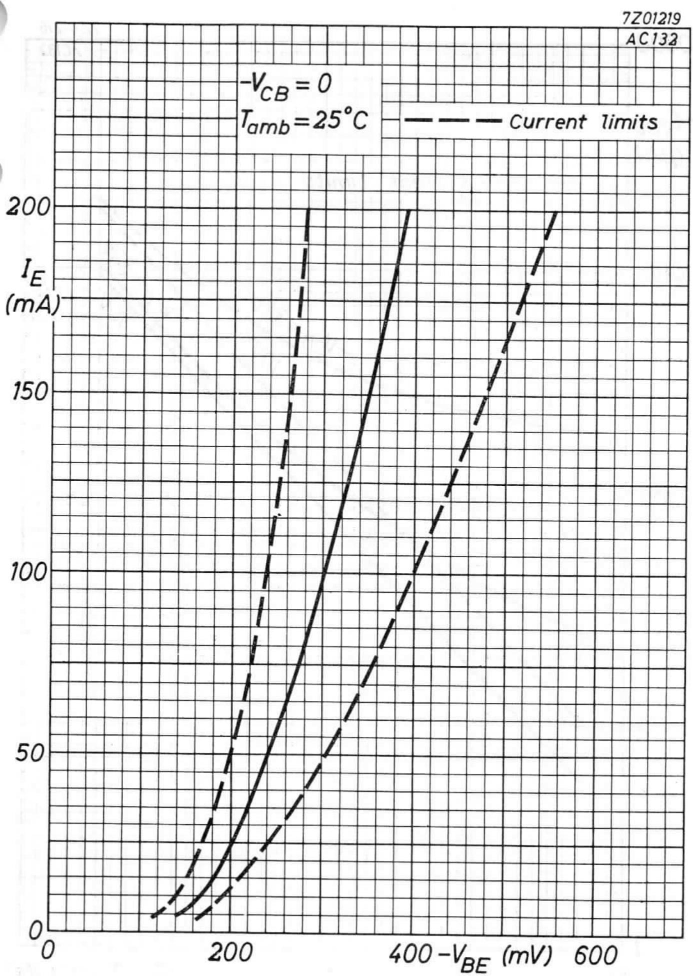

7Z01217
AC132
200
$-I_C$
(mA)
150
100
$-I_B$= 2.4mA
2.2mA
2.0mA
1.8mA
1.6mA
1.4mA
1.2mA
1.0mA
0.8mA
0.6mA
0.4mA
0.2mA
$-V_{CE}$ = 1V
4 $-I_B$ (mA) 2
0
5 $-V_{CE}$ (V) 10
200
$-V_{BE}$
(mV)
400
T_j = 25°C
$-V_{CE}$ = 1V


7Z01221
AC132
Current limits
$-V_{CB} = 5V$
$T_{amb} = 25°C$
I_E (mA)
10
8
6
4
2
0
0
20
40
60
80
$-I_B$ (μA)
100


7Z01218
AC132
$-V_{CB} = 5V$
$T_{amb} = 25°C$
Current limits
10
I_E
(mA)
8
6
4
2
0
0
50
100
150
$-V_{BE}$ (mV)
200

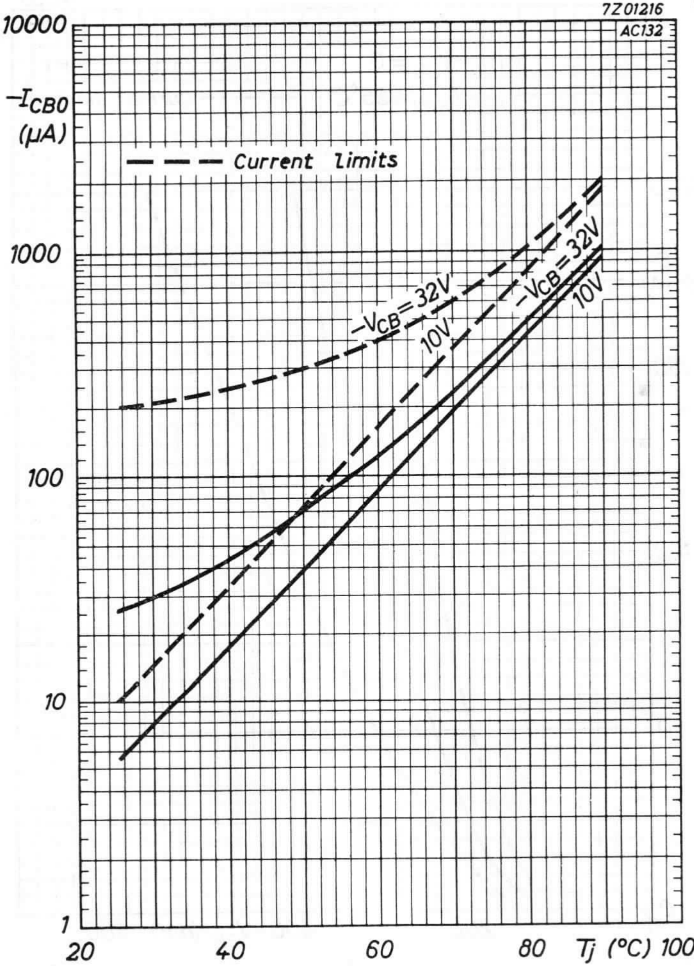
PHILIPS

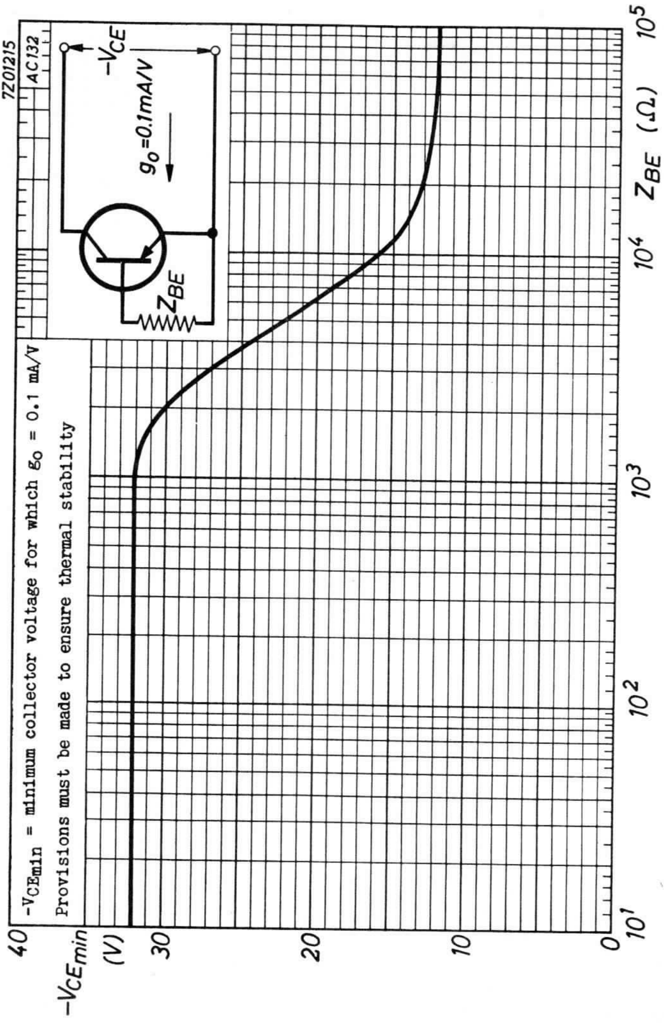

7Z01220
AC132
$-V_{CB} = 0$
$T_{amb} = 25°C$
Current limits
200
150
100
50
0
I_E
(mA)
0
2
4
6
$-I_B$ (mA)


7Z01219
AC132
$-V_{CB} = 0$
$T_{amb} = 25°C$
Current limits
200
I_E
(mA)
150
100
50
0
0
200
400
$-V_{BE}$ (mV)
600

AC132

PHILIPS




7Z01215
AC132
$-V_{CE}$
g_o=0.1mA/V
Z_{BE}
$-V_{CEmin}$ = minimum collector voltage for which g_o = 0.1 mA/V
Provisions must be made to ensure thermal stability
$-V_{CEmin}$ (V)
40
30
20
10
0
10^1
10^2
10^3
10^4
10^5
Z_{BE} (Ω)

PHILIPS **ADZ11**

GERMANIUM JUNCTION POWER TRANSISTOR of the p-n-p type for A.F. applications

LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$	= max.	50 V
Voltage (emitter reference)	$-V_{CE}$	= max.	40 V
Current			
Peak value	$-I_{CM}$	= max.	20 A
D.C. value	$-I_C$	= max.	15 A
Dissipation (transistor bottom temperature lower than 55°C)	P_C	= max.	45 W ←
	(T_m	≦	55 °C)

Emitter

Voltage (base reference)	$-V_{EB}$	= max.	30 V
Current			
Peak value	I_{EM}	= max.	22 A
D.C. value	I_E	= max.	17 A

Base

Current			
Peak value	$-I_{BM}$	= max.	4 A
D.C. value	$-I_B$	= max.	2 A

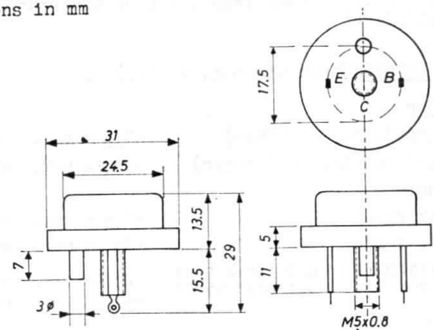
Temperatures

Storage temperature	T_S	=	-55 °C to +75 °C
Junction temperature	T_j	= max.	90 °C

THERMAL DATA

Thermal resistance between junction and transistor bottom	K	= max.	0.8 °C/W

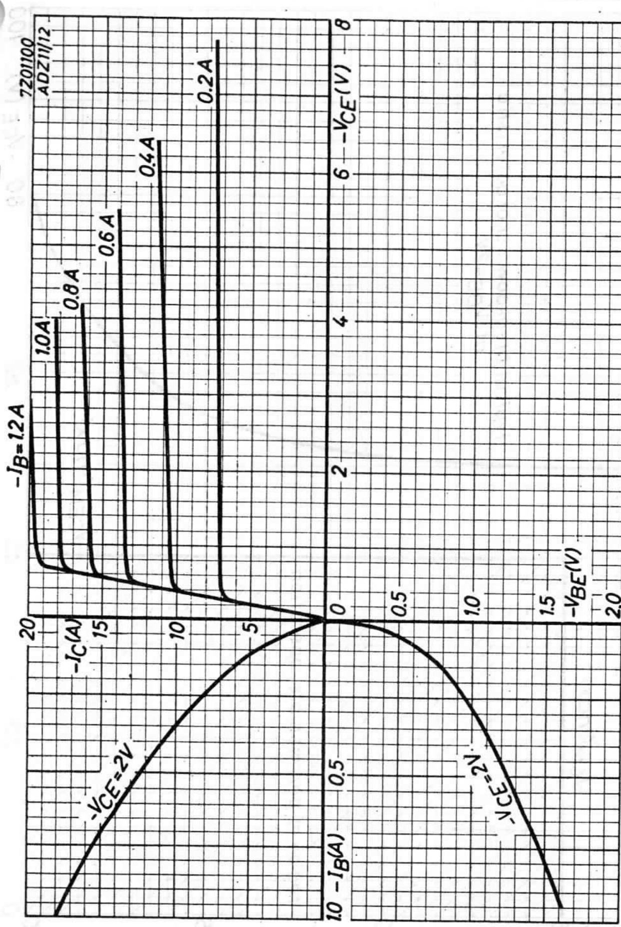
Dimensions in mm

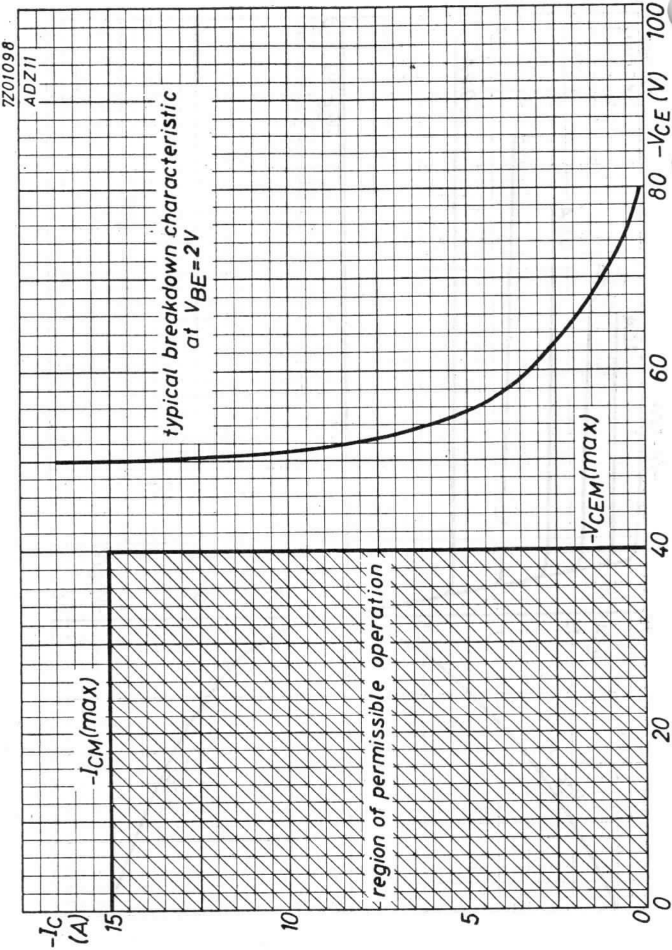


CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Transistor bottom temperature = 25 °C

Collector current at I_E = 0 mA		
$-I_{CBO}$	($-V_{CB}$ = 2 V; I_E = 0 mA)	< 0.2 mA
$-I_{CBO}$	($-V_{CB}$ = 50 V; I_E = 0 mA)	< 8 mA
Emitter current at I_C = 0 mA		
$-I_{EBO}$	($-V_{EB}$ = 2 V; I_C = 0 mA)	< 0.2 mA
$-I_{EBO}$	($-V_{EB}$ = 30 V; I_C = 0 mA)	< 8 mA
Emitter voltage at I_E = 0 mA		
$-V_{EB}$	($-V_{CB}$ = 50 V; I_E = 0 mA)	< 1 V
Collector knee voltage		
$-V_{CEK}$	($-I_C$ = 15 A; $-I_B$ = 2 A)	< 1 V
Base voltage		
$-V_{BE}$	($-V_{CE}$ = 2 V; $-I_C$ = 1.2 A)	< 0.7 V
$-V_{BE}$	($-V_{CE}$ = 2 V; $-I_C$ = 5 A)	< 1.2 V
$-V_{BE}$	($-V_{CE}$ = 2 V; $-I_C$ = 15 A)	< 2.0 V
Cut-off frequency		
$f_{\alpha b}$	($-V_{CB}$ = 12 V; I_E = 1 A)	> 80 kc/s
D.C. current amplification factor		
h_{FE}	($-V_{CE}$ = 2 V; $-I_C$ = 1.2 A)	> 40 < 120
h_{FE}	($-V_{CE}$ = 2 V; $-I_C$ = 5 A)	> 25
h_{FE}	($-V_{CE}$ = 2 V; $-I_C$ = 15 A)	> 15


7201100
ADZ11/12
$-I_B$=1.2A
1.0A
0.8A
0.6A
0.4A
0.2A
$-V_{CE}(V)$
8
6
4
2
0
0.5
1.0
1.5
$-V_{BE}(V)$
2.0
20
$-I_C(A)$
15
10
5
$-V_{CE}$=2V
$-V_{CE}$=2V
0.5
1.0
$-I_B(A)$


7Z01098
ADZ11
typical breakdown characteristic
at $V_{BE}=2V$
$-V_{CEM}(max)$
$-I_{CM}(max)$
region of permissible operation
$-I_C$ (A)
15
10
5
0
0
20
40
60
80
100
$-V_{CE}$ (V)

GERMANIUM JUNCTION POWER TRANSISTOR of the p-n-p type for industrial applications

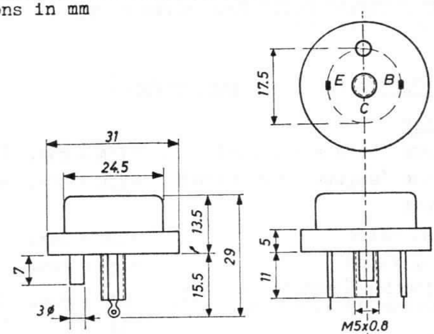
LIMITING VALUES (Absolute max. values)

Collector		
Voltage (base reference)	$-V_{CB}$ = max.	80 V
Voltage (emitter reference)	$-V_{CE}$ = max.	60 V
Current		
Peak value	$-I_{CM}$ = max.	20 A
D.C. value	$-I_C$ = max.	15 A
Dissipation (transistor bottom temperature lower than 55°C)	P_C = max.	45 W
	(T_m ≦	55 °C)
Emitter		
Voltage (base reference)	$-V_{EB}$ = max.	50 V
Current		
Peak value	I_{EM} = max.	22 A
D.C. value	I_E = max.	17 A
Base		
Current		
Peak value	$-I_{BM}$ = max.	4 A
D.C. value	$-I_B$ = max.	2 A
Temperatures		
Storage temperature	T_s =	-55 °C to +75 °C
Junction temperature	T_j = max.	90 °C

THERMAL DATA

Thermal resistance between junction and transistor bottom	K = max.	0.8 °C/W

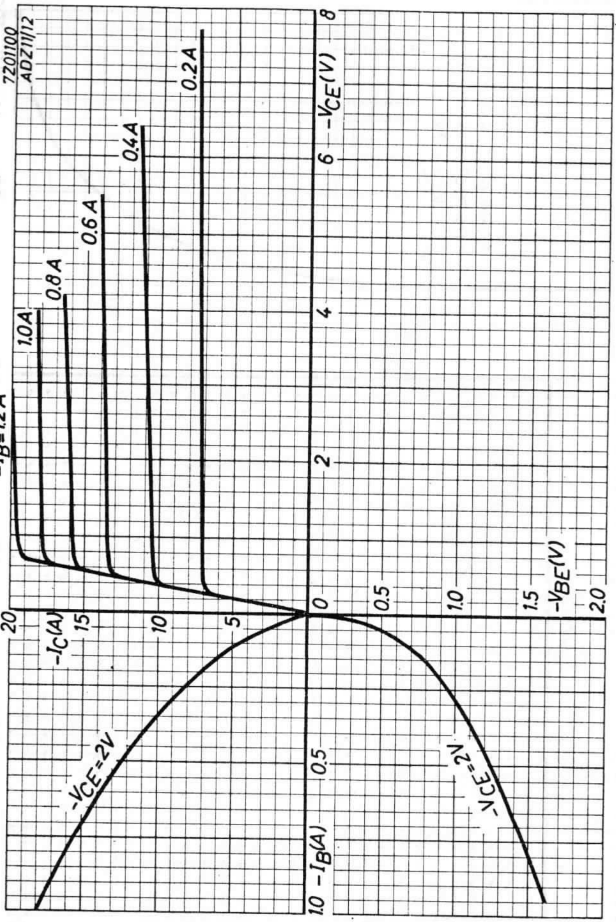
Dimensions in mm



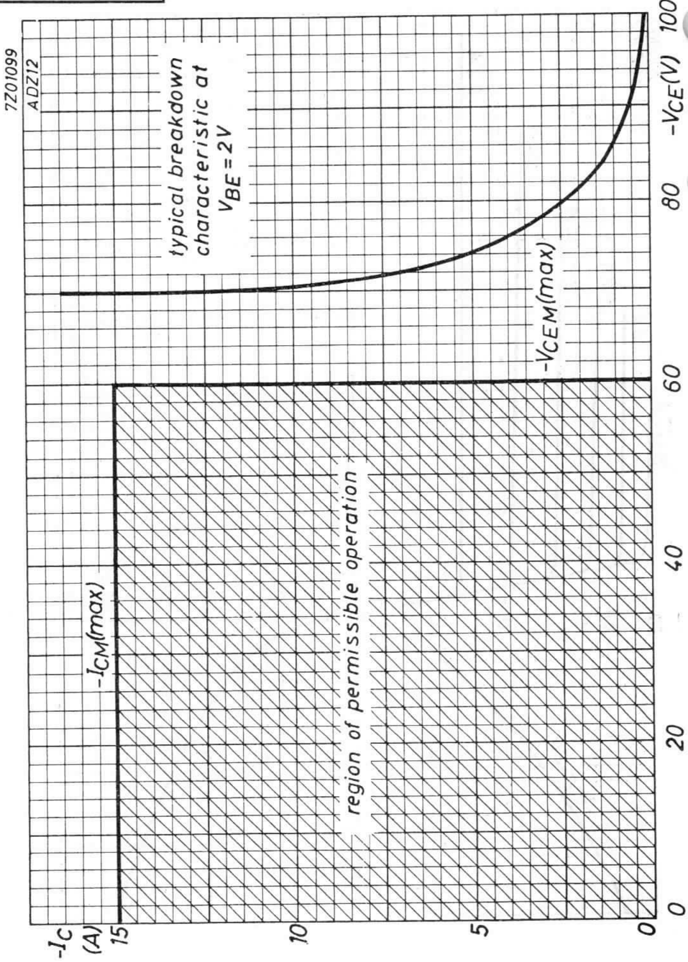
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Transistor bottom temperature = 25 °C

Collector current at I_E = 0 mA	
$-I_{CBO}$ ($-V_{CB}$ = 2 V; I_E = 0 mA)	< 0.2 mA
$-I_{CBO}$ ($-V_{CB}$ = 80 V; I_E = 0 mA)	< 8 mA
Emitter current at I_C = 0 mA	
$-I_{EBO}$ ($-V_{EB}$ = 2 V; I_C = 0 mA)	< 0.2 mA
$-I_{EBO}$ ($-V_{EB}$ = 50 V; I_C = 0 mA)	< 8 mA
Emitter voltage at I_E = 0 mA	
$-V_{EB}$ ($-V_{CB}$ = 80 V; I_E = 0 mA)	< 1 V
Collector knee voltage	
$-V_{CEK}$ ($-I_C$ = 15 A; $-I_B$ = 2 A)	< 1 V
Base voltage	
$-V_{BE}$ ($-V_{CE}$ = 2 V; $-I_C$ = 1.2 A)	< 0.7 V
$-V_{BE}$ ($-V_{CE}$ = 2 V; $-I_C$ = 5 A)	< 1.2 V
$-V_{BE}$ ($-V_{CE}$ = 2 V; $-I_C$ = 15 A)	< 2.0 V
Cut-off frequency	
$f_{\alpha b}$ ($-V_{CB}$ = 12 V; I_E = 1 A)	> 100 kc/s
D.C. current amplification factor	
h_{FE} ($-V_{CE}$ = 2 V; $-I_C$ = 1.2 A)	> 40 < 120
h_{FE} ($-V_{CE}$ = 2 V; $-I_C$ = 5 A)	> 25
h_{FE} ($-V_{CE}$ = 2 V; $-I_C$ = 15 A)	> 15


7201100
ADZ11/12
$-V_{CE}(V)$
8
6
4
2
0
0.2A
0.4A
0.6A
0.8A
1.0A
$-I_B=1.2A$
$-V_{BE}(V)$
0.5
1.0
1.5
2.0
20
15
10
5
$-I_C(A)$
$-V_{CE}=2V$
$-V_{CE}=2V$
0.5
1.0
$-I_B(A)$

ADZ12 PHILIPS



R.F. ALLOY-DIFFUSED GERMANIUM TRANSISTOR of the p-n-p type with low noise and high gain at V.H.F. for amplifier, oscillator and convertor circuits up to 260 Mc/s. The transistor is hermetically sealed in a metal can and absolutely moisture proof.

TRANSISTOR H.F. À CRISTAL DE GERMANIUM du type p-n-p en technique alliage-diffusion à faible bruit et amplification élevée aux fréquences V.H.F. pour les circuits amplificateurs, oscillateurs et convertisseurs jusqu'à 260 MHz. Le transistor est scellé hermétiquement dans un boîtier métallique et protégé contre l'humidité.

HF p-n-p GERMANIUMTRANSISTOR nach dem Legierungs-Diffusionsverfahren mit schwachem Rauschen und hoher Verstärkung bei VHF-Frequenzen zur Verwendung in Verstärker-, Oszillator und Mischschaltungen bis zu 260 MHz. Der Transistor ist hermetisch abgeschlossen in einem Metallgehäuse und absolut sicher für Feuchtigkeit.

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max.	25	V
$-I_C$	= max.	10	mA
I_E	= max.	10	mA
$-I_E$	= max.	1	mA
P_C ($T_{amb} \leq 45$ °C)	= max.	50	mW
T_j {continuous operation / service continu / Dauerbetrieb}	= max.	75	°C
T_j {intermittent operation / service intermittent / aussetzender Betrieb}	= max.	90	°C [1]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	-55 °C/+75	°C

Thermal data; Données thermiques; Thermische Daten

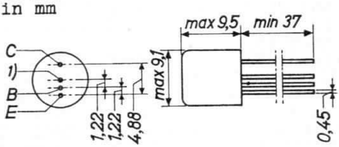
Thermal resistance from junction to ambience in free air	K	$\leq$ 0.6 °C/mW
Résistance thermique entre la jonction et l'ambiance à l'air libre	K	$\leq$ 0,6 °C/mW
Thermischer Widerstand zwischen dem Kristall und der Umgebung in freier Luft	K	$\leq$ 0,6 °C/mW

[1] Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

AF102

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Characteristics
Caractéristiques T_{amb} = 25 °C
Kenndaten

$-I_{CBO}$	($-V_{CB}$ = 12 V)		< 10 µA
$-V_{CB}$	($-I_C$ = 50 µA; I_E = 0 mA)		> 25 V
$-V_{EB}$	($-I_E$ = 50 µA; I_C = 0 mA)		> 0,5 V
$-I_B$	($-V_{CB}$ = 12 V; $-I_C$ = 1 mA)		< 50 µA
$-V_{BE}$	($-V_{CB}$ = 12 V; $-I_C$ = 1 mA)	> 220 mV	< 360 mV

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf T_{amb} = 25 °C

$-V_{CB}$ = 12 V; I_E = 1 mA — f_1 = 180 Mc/s [2])

$-V_{CE}$ = 12 V; $-I_C$ = 1 mA
f = 1 kc/s — h_{fe} > 20

$-V_{CB}$ = 12 V; I_E = 1 mA
f = 2 Mc/s — $|z_{rb}|$ = 10 Ω [3])

$-V_{CE}$ = 12 V; $-I_C$ = 1 mA
f = 200 Mc/s; R_S = 30 Ω [4]) — F = 6 dB < 7,5 dB

Circuit page 4
Schaltung Seite 4 — G = 13 dB > 10 dB [5])

[1]) Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

[2])[3])[4])[5]) See page 3; voir page 3; siehe Seite 3

Characteristics range values for equipment design (continued)
Gammes de valeurs des caractéristiques pour l'étude d'équipements (suite)
Kenndatenbereiche für Gerätentwurf (Fortsetzung)

T_{amb} = 25 °C

Small signal characteristics
Caractéristiques pour les signaux faibles
Kenndaten für kleine Signale

$-V_{CE}$ = 12 V; $-I_C$ = 1 mA; f = 0,45 Mc/s	$-c_{re}$	=	0,8 pF
$-V_{CE}$ = 12 V; $-I_C$ = 1 mA; f = 35 Mc/s	g_{oe}	=	10 μA/V
	c_{oe}	=	2 pF
$-V_{CB}$ = 12 V; I_E = 1 mA; f = 200 Mc/s	g_{ib}	=	30 mA/V
	$-c_{ib}$	=	12 pF
	$\lvert y_{rb}\rvert$	=	0,4 mA/V
	$-\varphi_{rb}$	=	90 °
	$\lvert y_{fb}\rvert$	=	25 mA/V
	φ_{fb}	=	90 °
	g_{ob}	=	0,3 mA/V
	c_{ob}	=	1,8 pF

2) f_1 = Frequency at which $|h_{fe}|$ = 1
f_1 = la fréquence à laquelle $|h_{fe}|$ = 1
f_1 = Frequenz bei der $|h_{fe}|$ = 1

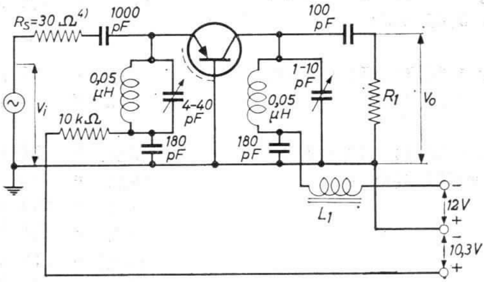
3) Intrinsic base impedance
Impédance intrinsèque de la base
Innere Impedanz der Basis

4) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

5) Available power gain
Amplification de puissance disponible
Verfügbare Leistungsverstärkung

R_1 is chosen so that the total impedance R_L of the tuned circuit is 2.0 kΩ
R_1 est choisie tellement que l'impédance totale R_L du circuit accordé est de 2,0 kΩ
R_1 wird derartig gewählt, dass die Gesamtimpedanz R_L des abgestimmten Kreises 2,0 kΩ ist.

L_1 = ferrite bead
L_1 = perle magnétique
L_1 = Ferritperle



4) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

PHILIPS

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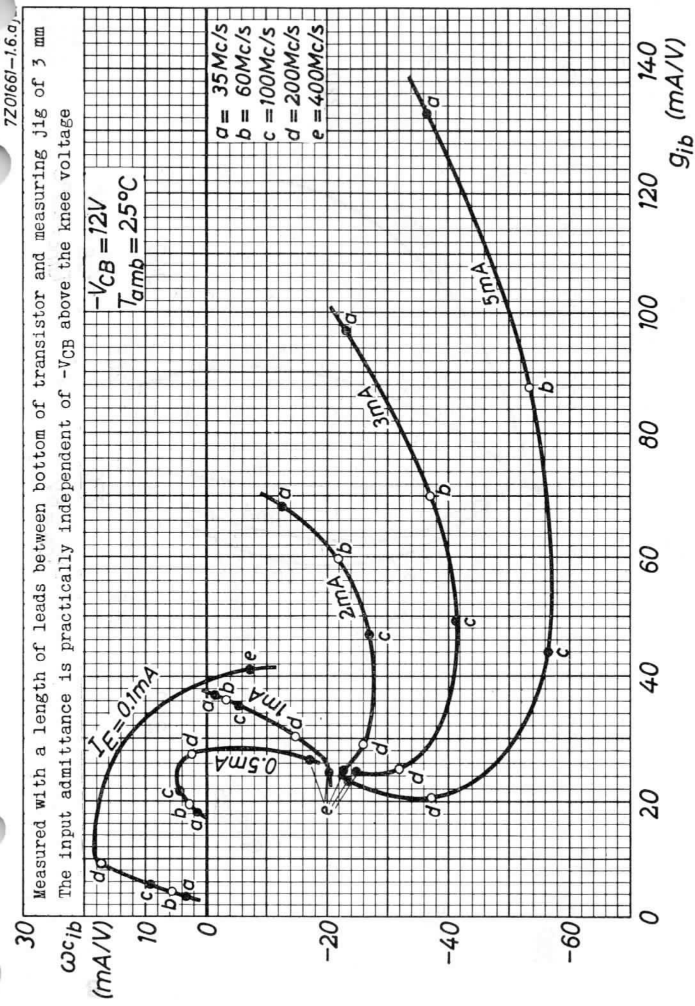

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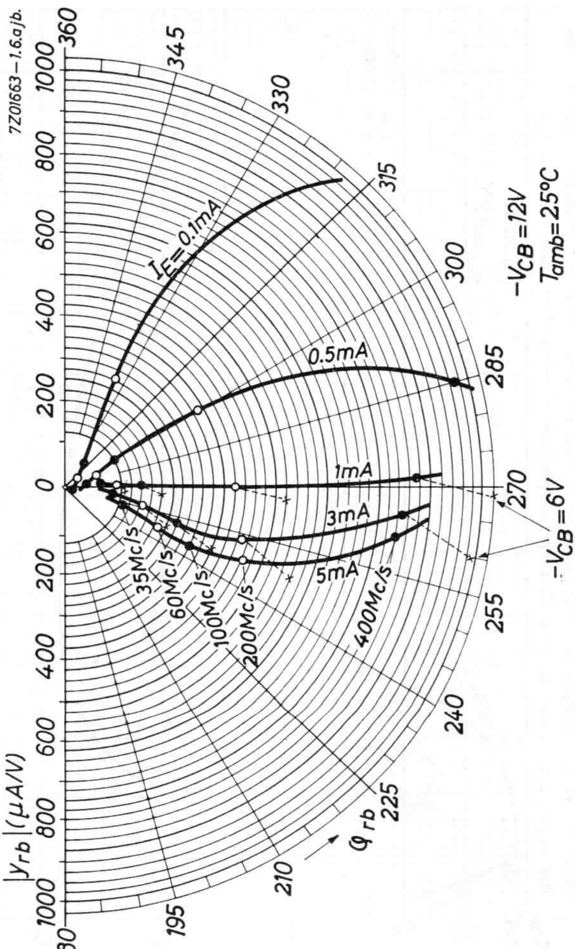
A

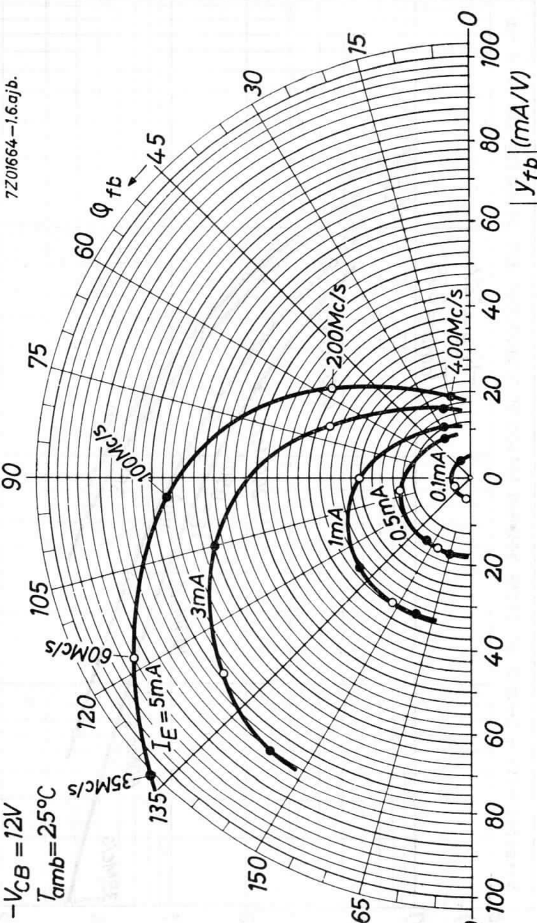
AF102 **PHILIPS**

Measured with a length of leads between bottom of transistor and measuring jig of 3 mm



B

Measured with a length of leads between bottom of transistor and measuring jig of 3 mm
The forward transfer admittance is practically independent of $-V_{CB}$ above the knee voltage



AF102

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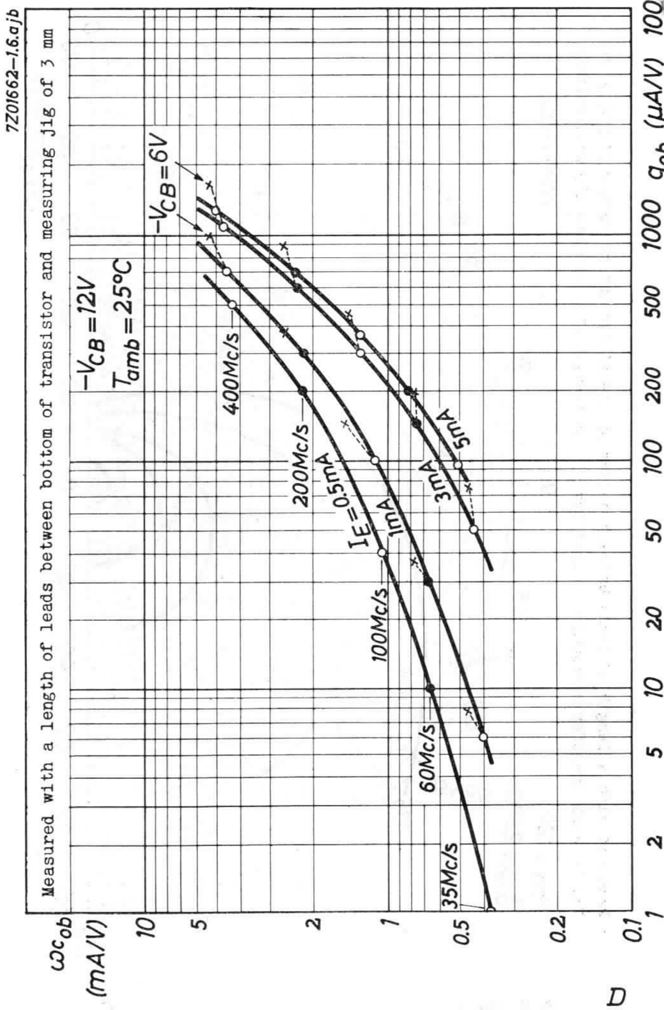


PHILIPS AF114

R.F. GERMANIUM TRANSISTOR of the p-n-p type, made in the alloy-diffusion technique with low noise and high power gain at 100 Mc/s, for use as R.F. amplifier in F.M. receivers. The transistor is hermetically sealed in a metal can and absolutely moisture proof

TRANSISTOR H.F. À CRISTAL DE GERMANIUM du type p-n-p, en technique alliage-diffusion avec bruit faible et amplification de puissance élevée à 100 MHz, pour utilisation en amplificateur H.F. dans les récepteurs F.M. Le transistor est scellé hermétiquement dans un boîtier métallique et protégé contre l'humidité

HF p-n-p GERMANIUMTRANSISTOR nach dem Legierungs-Diffusionsverfahren mit schwachem Rauschen und hoher Leistungsverstärkung bei 100 MHz, zur Verwendung als HF-Verstärker in FM-Empfängern. Der Transistor ist hermetisch abgeschlossen in einem Metallgehäuse und absolut sicher vor Feuchtigkeit

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

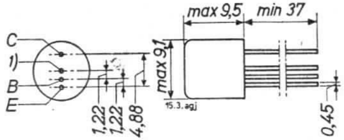
$-V_{CB}$	= max.	32 V
$-V_{CE}$	= max.	32 V [1]
$-I_C$	= max.	10 mA
I_E	= max.	11 mA
$-I_E$	= max.	1 mA
$\lvert I_B \rvert$	= max.	1 mA
P_C ($T_{amb} \leq 45\ ^\circ C$)	= max.	50 mW
T_j continuous operation / service continu / Dauerbetrieb	= max.	75 °C
T_j intermittent operation / service intermittent / aussetzender Betrieb	= max.	90 °C [2]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	-55 °C/+75 °C

[1] See also page F
Voir aussi page F
Siehe auch Seite F

[2] Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

AF114 **PHILIPS**

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Thermal data
Données thermiques
Thermische Daten

Thermal resistance from junction to ambience in free air	K ≦ 0.6 °C/mW
Résistance thermique entre la jonction et l'ambiance à l'air libre	K ≦ 0,6 °C/mW
Thermischer Widerstand zwischen dem Kristall und der Umgebung in freier Luft	K ≦ 0,6 °C/mW

Characteristics
Caractéristiques T_{amb} = 25 °C
Kenndaten

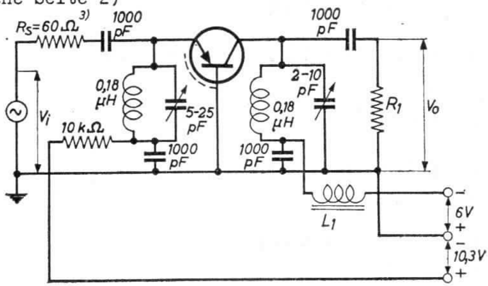
$-I_{CBO}$	($-V_{CB}$ = 6 V)	= 1,2 µA	< 8 µA
$-V_{CB}$	($-I_C$ = 50 µA; I_E = 0 mA)		> 32 V
$-I_B$	($-V_{CB}$ = 6 V; I_E = 1 mA)	= 7 µA	< 25 µA
$-V_{BE}$	($-V_{CB}$ = 6 V; I_E = 1 mA)	= 270 mV	> 210 mV < 330 mV
G	(f = 100 Mc/s)	= 14 dB	>12,5dB[2])

1) Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

2) Available power gain in the circuit page 3, defined by:
Amplification de puissance disponible dans le circuit page 3, définie par:
Verfügbare Leistungsverstärkung der auf Seite 3 angegebenen Schaltung, definiert durch:

$$G = \frac{4R_S}{R_L}\frac{V_o^2}{V_i^2} = 0{,}073\,\frac{V_o^2}{V_i^2}$$

Test circuit for power gain at 100 Mc/s (See page 2)
Circuit pour la mesure de l'amplification à 100 MHz (voir page 2)
Schaltung zum Messen der Leistungsverstärkung bei 100 MHz (siehe Seite 2)



R_1 is choses so that the total impedance R_L of the tuned circuit is 3.3 kΩ
R_1 est choisie tellement que l'impédance totale R_L du circuit accordé est de 3,3 kΩ
R_1 wird derartig gewählt dass die Gesamtimpedanz R_L des abgestimmten Kreises 3,3 kΩ ist

L_1 = ferrite bead; L_1 = perle magnétique; L_1 = Ferritperle

[3]) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

AF 114 PHILIPS

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf T_{amb} = 25 °C

$-I_E$ = 50 µA; $-I_C$ = 0 mA	$-V_{EB}$ = 1,5 V	> 1,0 V
$-V_{CB}$ = 6 V; I_E = 1 mA	f_1 = 75 Mc/s[1])	
$-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s	$\|z_{rb}\|$ = 20 Ω [2])	
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 0,45 Mc/s	$-c_{re}$ = 1,5 pF	
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s	h_{fe} = 150	
$-V_{CB}$ = 6 V; I_E = 1 mA; f = 100 Mc/s; R_S = 60 Ω[3])	F = 8 dB	< 9,5 dB

Small signal characteristics (measured with a length of leads between transistor and measuring jig of 5 mm)
Caractéristiques pour les signaux faibles (mesurées avec une longueur des fils de connexion entre le transistor et l'appareil de mesure de 5 mm)
Kenndaten für kleine Signale (gemessen mit einer Länge der Anschlussdrähte zwischen Transistor und Messvorrichtung von 5 mm)

$-V_{CB}$ = 6 V; I_E = 1 mA
f = 100 Mc/s

g_{ib} =	15 mA/V
$-c_{ib}$ =	5 pF
$\|y_{rb}\|$ =	0,45 mA/V
φ_{rb} =	250 °
$\|y_{fb}\|$ =	16 mA/V
φ_{fb} =	95 °
g_{ob} =	0,3 mA/V
c_{ob} =	2,5 pF

[1]) Frequency at which $|h_{fe}|$ = 1
Fréquence à laquelle $|h_{fe}|$ = 1
Frequenz bei der $|h_{fe}|$ = 1

[2]) Intrinsic base impedance
Impédance intrinsèque de la base
Innere Impedanz der Basis

[3]) See page 3; voir page 3; siehe Seite 3

Operating characteristics as R.F. amplifier in front-end unit of F.M. tuner (see page 6)
Caractéristiques d'utilisation comme amplificateur H.F. dans un amplificateur d'entrée d'un récepteur F.M. (voir page 6)
Betriebsdaten als HF-Verstarker in der Eingangsstufe eines FM-Empfängers (siehe Seite 6)

	f = 87 - 101 Mc/s	
Total available power gain Amplification de puissance totale disponible Verfügbare Leistungsverstärkung	= 28 dB	> 24 dB
Total noise factor Facteur de bruit total Gesamter Rauschfaktor	= 8 dB	< 9,5 dB
Oscillator voltage at aerial terminals Tension d'oscillation aux bornes de l'antenne Oszillatorspannung an den Antennenklemmen		= 1,5 mV
Image rejection Elimination de la fréquence image Spiegelfrequenzunterdrückung		= 27 dB
	$-I_C$	= 1,4 mA

COIL DATA

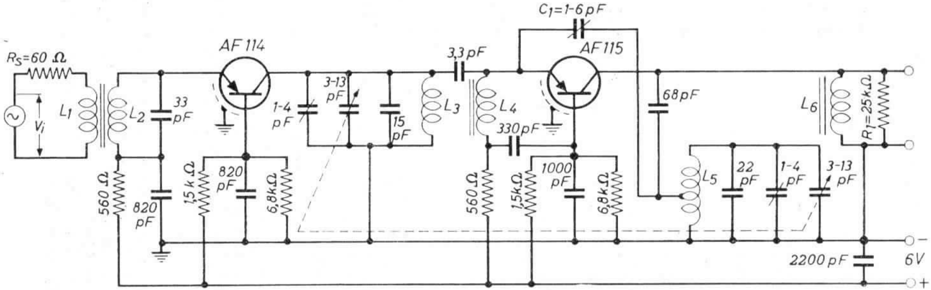
L_1: 4 1/2 turns of 0.3 mm enamelled copper wire, wound between L_2.
L_2: 4 turns of 1 mm enamelled copper wire, winding pitch 2 mm; L = 0.18 μH; Q_o = 60-80
L_3: 3 1/4 turns of 1 mm silvered copper wire, winding pitch 2 mm; L = 0.086 μH; Q_o = 200

DONNÉES DES BOBINES

L_1: 4 1/2 tours de fil de cuivre émaillé de 0,3 mm, enroulés entre L_2.
L_2: 4 tours de fil de cuivre émaillé de 1 mm, pas des spires 2 mm, L = 0,18 μH; Q_o = 60-80
L_3: 3 1/4 tours de fil de cuivre argenté de 1 mm, pas des spires 2 mm; L = 0,086 μH; Q_o = 200

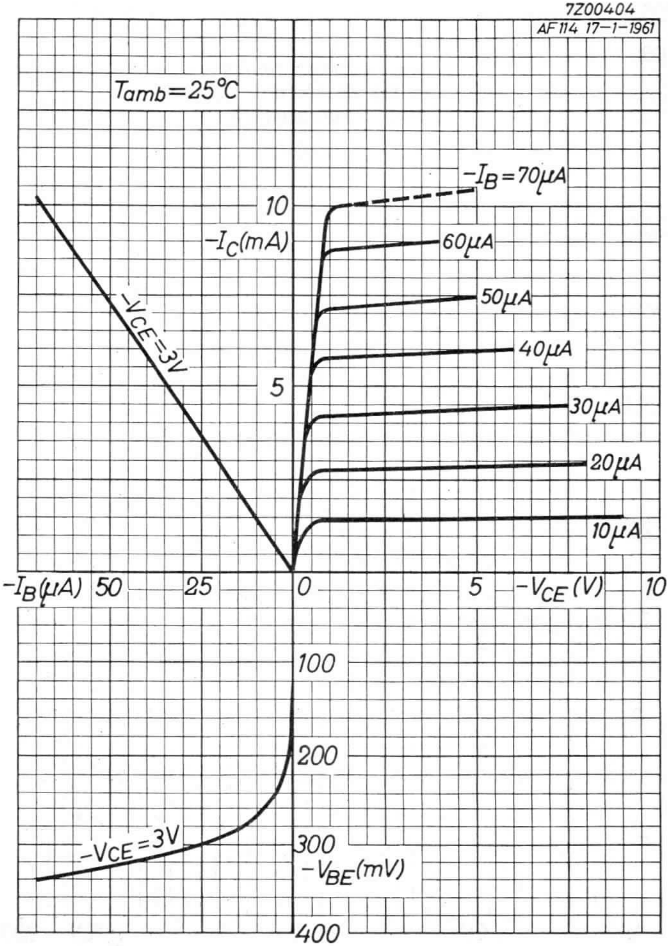
SPULENDATEN

L_1: 4 1/2 Windungen 0,3 mm Kupfer lackiert, zwischen die Windungen von L_2 gewickelt
L_2: 4 Windungen 1 mm Kupfer lackiert, Ganghöhe 2 mm; L = 0,18 μH; Q_o = 60-80
L_3: 3 1/4 Windungen 1 mm versilbertes Kupfer, Ganghöhe 2 mm; L = 0,086 μH; Q_o = 200



Front-end unit of F.M. tuner (see page 5)
Amplificateur d'entrée d'un récepteur F.M. (voir page 5)
Eingangsverstärker eines FM-Empfängers (siehe Seite 5)

For data of the oscillator-mixer stage please refer to the data sheets of the AF 115
Pour les données de l'étage oscillateur-mélangeur voir les feuilles de données du AF 115
Für die Daten der Oszillator-Mischstufe siehe die Datenblätter AF 115


7Z00404
AF 114 17-1-1961
Tamb=25°C
−IB=70μA
60μA
50μA
40μA
30μA
20μA
10μA
10
−IC(mA)
5
−VCE=3V
−IB(μA) 50
25
0
5
−VCE (V)
10
100
200
300
−VBE(mV)
400
−VCE=3V

AF 114

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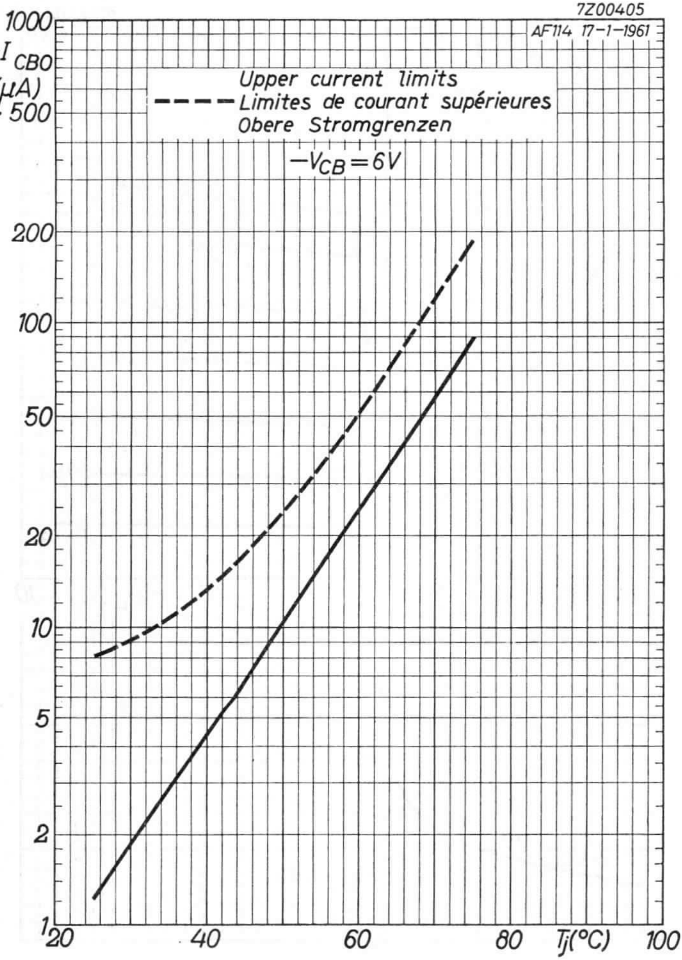
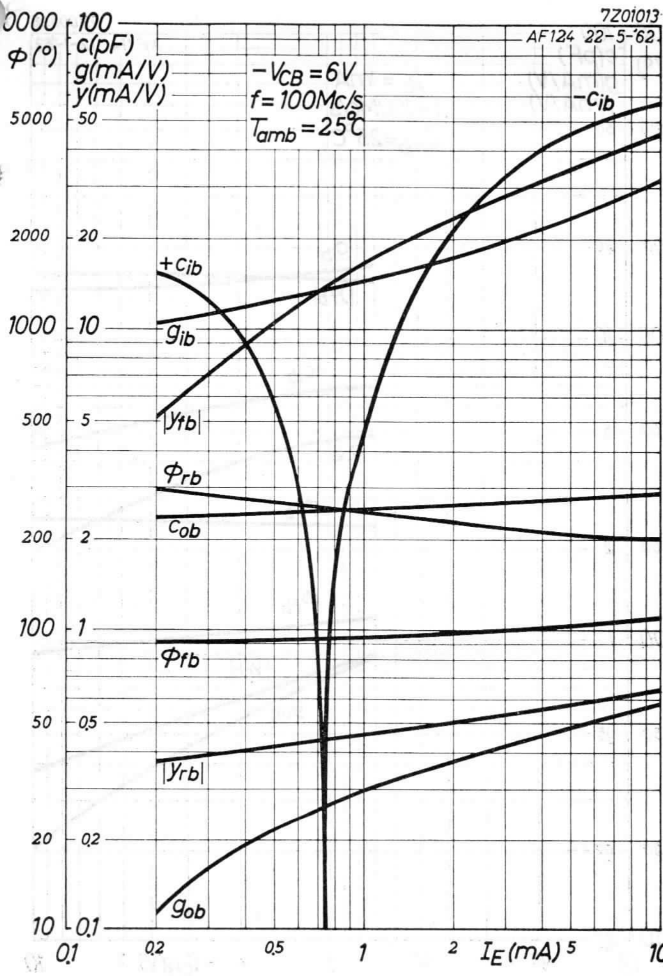
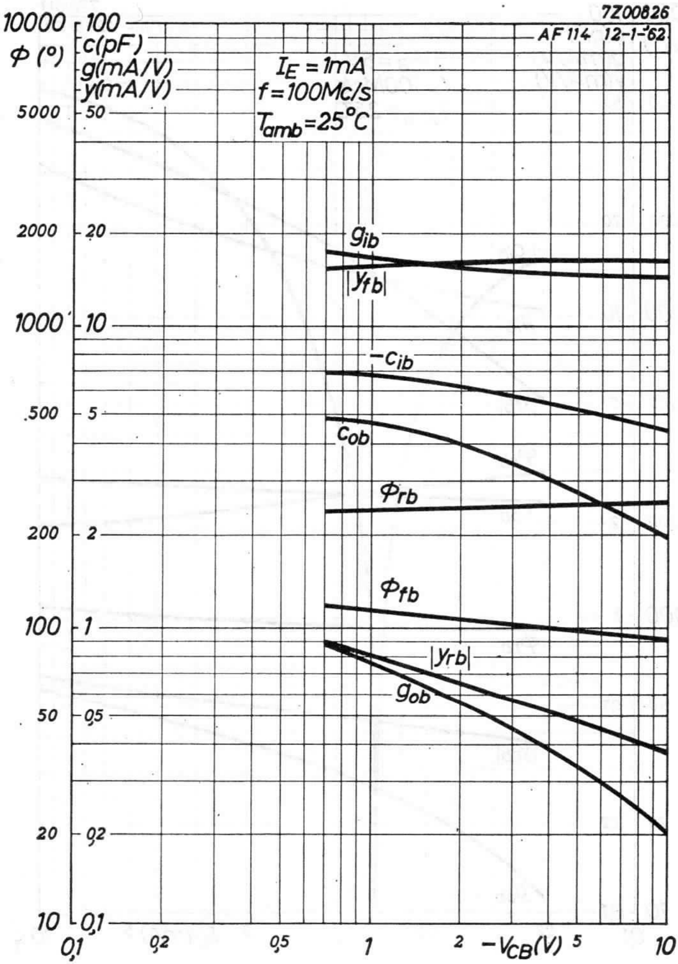



7Z01013
AF124 22-5-'62
0000
Φ (°)
100
c(pF)
g(mA/V)
y(mA/V)
−V_CB = 6V
f = 100Mc/s
T_amb = 25°C
−c_ib
5000
50
2000
20
+c_ib
1000
10
g_ib
500
5
|y_fb|
Φ_rb
c_ob
200
2
100
1
Φ_fb
50
0.5
|y_rb|
20
0.2
g_ob
10
0.1
0.1
0.2
0.5
1
2
I_E (mA)
5
10

AF114

PHILIPS



D

PHILIPS

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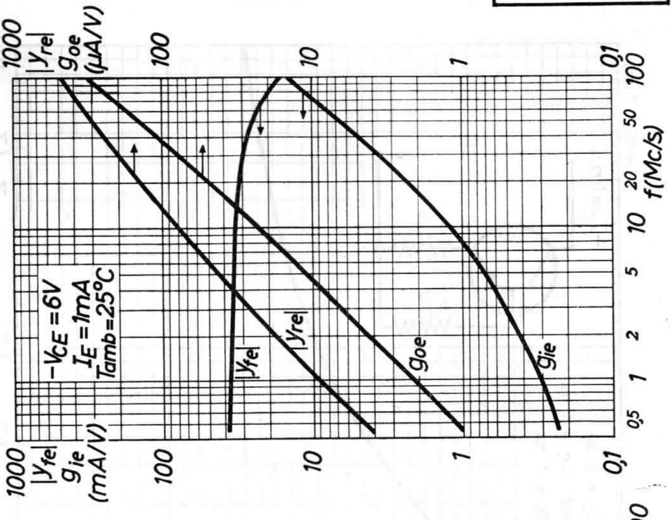

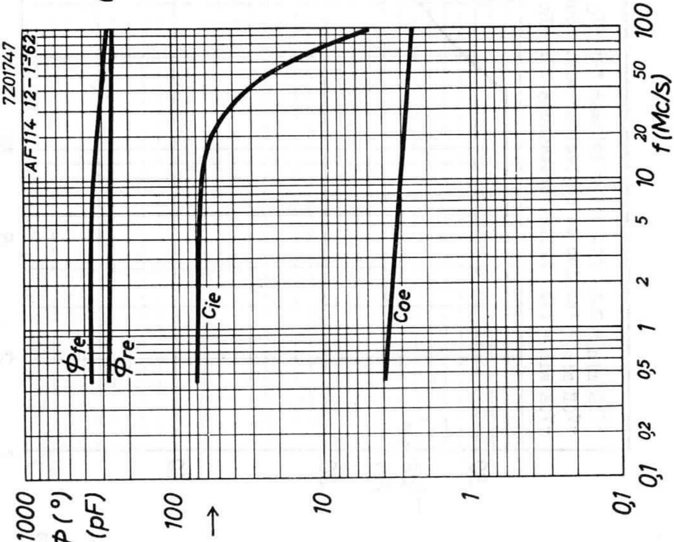

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E

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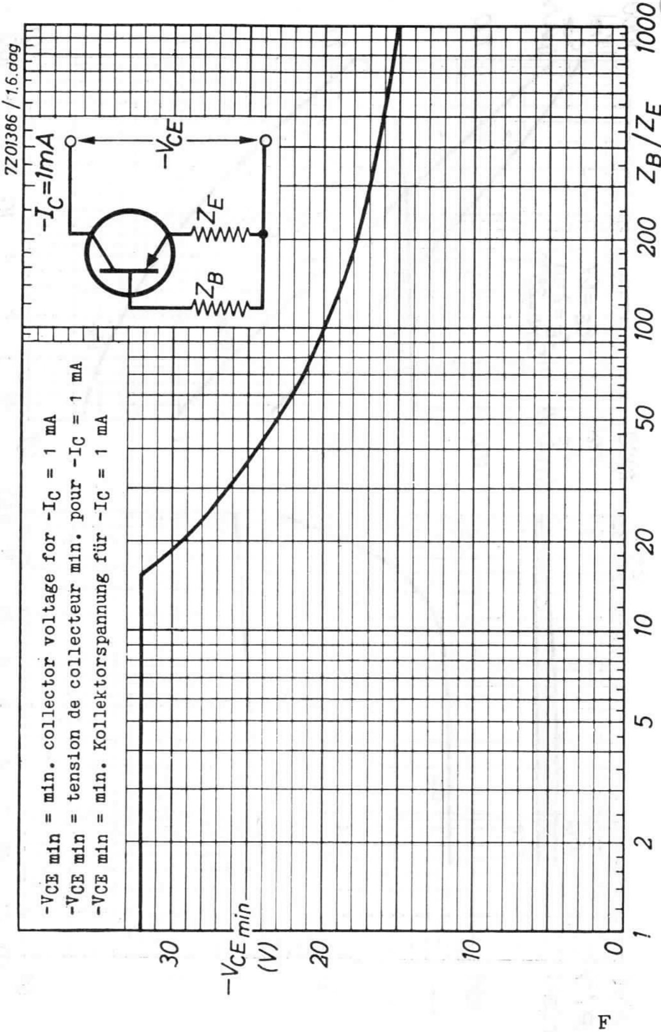


F

PHILIPS AF115

R.F. GERMANIUM TRANSISTOR of the p-n-p type, made in the alloy-diffusion technique with high conversion gain up to 100 Mc/s, for use as mixer-oscillator in F.M. receivers and as R.F. amplifier or mixer-oscillator in short wave receivers up to 27 Mc/s.
The transistor is hermetically sealed in a metal can and absolutely moisture proof

TRANSISTOR H.F. À CRISTAL DE GERMANIUM du type p-n-p, en technique alliage-diffusion avec amplification de conversion élevée jusqu'à 100 MHz, pour utilisation comme mélangeur-oscillateur dans les récepteurs F.M. et comme amplificateur H.F. ou mélangeur-oscillateur dans les récepteurs ondes courtes jusqu'à 27 MHz. Le transistor est scellé hermétiquement dans un boîtier métallique et protégé contre l'humidité

HF p-n-p GERMANIUMTRANSISTOR nach dem Legierungs-Diffusionsverfahren mit hoher Überlagerungsverstärkung bis zu 100 MHz, zur Verwendung als Mischer-Oszillator in FM-Empfängern und als HF-Verstärker oder Mischer-Oszillator in Kurzwellenempfängern bis zu 27 MHz. Der Transistor ist hermetisch abgeschlossen in einem Metallgehäuse und absolut sicher vor Feuchtigkeit

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

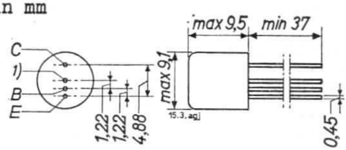
$-V_{CB}$	= max. 32 V ←
$-V_{CE}$	= max. 32 V [1]
$-I_C$	= max. 10 mA
I_E	= max. 11 mA
$-I_E$	= max. 1 mA
$\lvert I_B \rvert$	= max. 1 mA
P_C ($T_{amb} \leq 45$ °C)	= max. 50 mW
T_j continuous operation / service continu / Dauerbetrieb	= max. 75 °C
T_j intermittent operation / service intermittent / aussetzender Betrieb	= max. 90 °C [2]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	= -55 °C/+75 °C

→ [1]) See also page J
Voir aussi page J
Siehe auch Seite J

[2]) Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

AF115 **PHILIPS**

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Thermal data
Données thermiques
Thermische Daten

Thermal resistance from junction to ambience in free air	$K \leq 0.6$ °C/mW
Résistance thermique entre la jonction et l'ambiance à l'air libre	$K \leq 0,6$ °C/mW
Thermischer Widerstand zwischen dem Kristall und der Umgebung in freier Luft	$K \leq 0,6$ °C/mW

Characteristics
Caractéristiques $T_{amb} = 25$ °C
Kenndaten

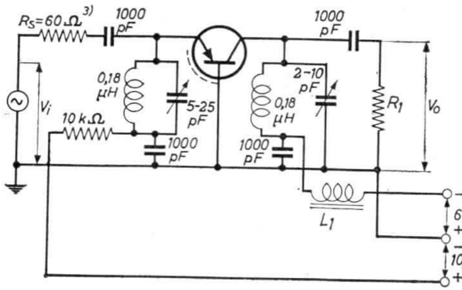
$-I_{CBO}$	$(-V_{CB} = 6$ V)	= 1,2 μA	< 8 μA
$-V_{CB}$	$(-I_C = 50$ μA; $I_E = 0$ mA)		> 32 V ←
$-I_B$	$(-V_{CB} = 6$ V; $I_E = 1$ mA)	= 7 μA	< 25 μA
$-V_{BE}$	$(-V_{CB} = 6$ V; $I_E = 1$ mA)	= 270 mV	> 210 mV < 330 mV
G	(f = 100 Mc/s)	= 13 dB	> 10 dB [2]

[1]) Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

[2]) Available power gain in the circuit page 3, defined by:
Amplification de puissance disponible dans le circuit page 3, définie par:
Verfügbare Leistungsverstärkung der auf Seite 3 angegebenen Schaltung, definiert durch:

$$G = \frac{4R_S}{R_L} \frac{V_o^2}{V_i^2} = 0,073 \frac{V_o^2}{V_i^2}$$

Test circuit for power gain at 100 Mc/s (See page 2)
Circuit pour la mesure de l'amplification à 100 MHz (voir page 2)
Schaltung zum Messen der Leistungsverstärkung bei 100 MHz (siehe Seite 2)



R_1 is chosen so that the total impedance R_L of the tuned circuit is 3.3 kΩ
R_1 est choisie tellement que l'impédance totale R_L du circuit accordé est de 3,3 kΩ
R_1 wird derartig gewählt dass die Gesamtimpedanz R_L des abgestimmten Kreises 3,3 kΩ ist

L_1 = ferrite bead; L_1 = perle magnétique; L_1 = Ferritperle

3) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

AF 115 PHILIPS

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

T_{amb} = 25 °C

$-I_E$ = 50 µA; $-I_C$ = 0 mA	$-V_{EB}$ = 1,5 V	> 1,0 V
$-V_{CB}$ = 6 V ; I_E = 1 mA	f_1 = 75 Mc/s 1)	
$-V_{CB}$ = 6 V ; I_E = 1 mA f = 2 Mc/s	$\|z_{rb}\|$ = 25 Ω 2)	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 0,45 Mc/s	$-c_{re}$ = 1,5 pF	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 kc/s	h_{fe} = 150	
$-V_{CB}$ = 6 V ; I_E = 1 mA f = 100 Mc/s; R_S = 60 Ω 3)	F = 9,5 dB	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 10,7 Mc/s; R_S = 200 Ω 3)	F = 3 dB	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 Mc/s; R_S = 500 Ω 3)	F = 1,5 dB	< 3 dB
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 Mc/s; R_S = 500 Ω 3)	F_{conv} = 3 dB	< 5 dB 4)
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 200 kc/s; R_S = 2 kΩ 3)	F_{conv} = 4 dB	< 7 dB 4)

1) Frequency at which $|h_{fe}|$ = 1
Fréquence à laquelle $|h_{fe}|$ = 1
Frequenz bei der $|h_{fe}|$ = 1

2) Intrinsic base impedance
Impédance intrinsèque de la base
Innere Impedanz der Basis

3) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

4) Conversion noise
Bruit de conversion
Überlagerungsrauschen

Characteristics range values for equipment design (continued)
Gammes de valeurs des caractéristiques pour l'étude d'équipements (suite)
Kenndatenbereiche für Gerätentwurf (Fortsetzung)

Small signal characteristics (measured with a length of leads between transistor and measuring jig of 5 mm)
Caractéristiques pour les signaux faibles (mesurées avec une longueur des fils de connexion entre le transistor et l'appareil de mesure de 5 mm)
Kenndaten für kleine Signale (gemessen mit einer Länge der Anschlussdrähte zwischen Transistor und Messvorrichtung von 5 mm)

$-V_{CB}$ = 6 V; I_E = 1 mA
f = 100 Mc/s; T_{amb} = 25 °C

g_{ib}	=	15 mA/V
$-c_{ib}$	=	5 pF ←
$\lvert y_{rb}\rvert$	=	0,45 mA/V
φ_{rb}	=	250 °
$\lvert y_{fb}\rvert$	=	15 mA/V
φ_{fb}	=	95 °
g_{ob}	=	0,35 mA/V
c_{ob}	=	2,5 pF

$-V_{CE}$ = 6 V; I_E = 1 mA
f = 10,7 Mc/s; T_{amb} = 25 °C

g_{ie}	=	1,3 mA/V
c_{ie}	=	65 pF
$\lvert y_{re}\rvert$	=	80 µA/V
φ_{re}	=	260 °
$\lvert y_{fe}\rvert$	=	34 mA/V
φ_{fe}	=	335 °
g_{oe}	=	25 µA/V
c_{oe}	=	3,0 pF

$-V_{CE}$ = 6 V; I_E = 1 mA
f = 0,45 Mc/s; T_{amb} = 25 °C

g_{ie}	=	0,25 mA/V
c_{ie}	=	70 pF
$\lvert y_{re}\rvert$	=	4 µA/V
φ_{re}	=	270 °
$\lvert y_{fe}\rvert$	=	37 mA/V
φ_{fe}	=	0 °
g_{oe}	=	1,0 µA/V
c_{oe}	=	4 pF

Operating characteristics as self-oscillating mixer in front-end unit of F.M. tuner (see page 7)
Caractéristiques d'utilisation comme mélangeur auto-oscillateur dans un amplificateur d'entrée d'un récepteur F.M. (voir page 7)
Betriebsdaten als selbstschwingender Mischer in der Eingangsstufe eines FM-Empfängers (siehe Seite 7)

Shift of oscillator frequency as a function of V_S is about 50 kc/s from 6 to 5 V and about 100 kc/s from 5 to 4 V.
Le glissement de la fréquence d'oscillation en fonction de V_S est d'environ 50 kHz à une variation de 6 à 5 V et d'environ 100 kHz de 5 à 4 V.
Die Frequenzverschiebung des Oszillators als Funktion von V_S ist etwa 50 kHz bei einer Änderung von 6 bis 5 V und etwa 100 kHz von 5 bis 4 V.

The oscillator voltage at the aerial terminals is about 1.5 mV
La tension d'oscillation aux bornes de l'antenne est d'environ 1,5 mV
Die Oszillatorspannung an den Antennenklemmen ist etwa 1,5 mV

$-I_C$ = 1,5 mA.

COIL DATA

L_4 : 6 turns of 0.5 mm enamelled copper wire, closely wound; L = 0.65 µH
L_5 : 2½ turns of 1 mm silvered copper wire, winding pitch 2 mm; L = 0.062 µH, Q_o > 200. Tap at 1⅛ turn from earth side
L_6 : 18 turns of 36x0.03 copper wire, enamelled, soldering graded, stranded, open covered, closely wound; L = 2.9 µH, Q_o = 120, Q (loaded with 25 kΩ) = 60. Screening can A3 304 20

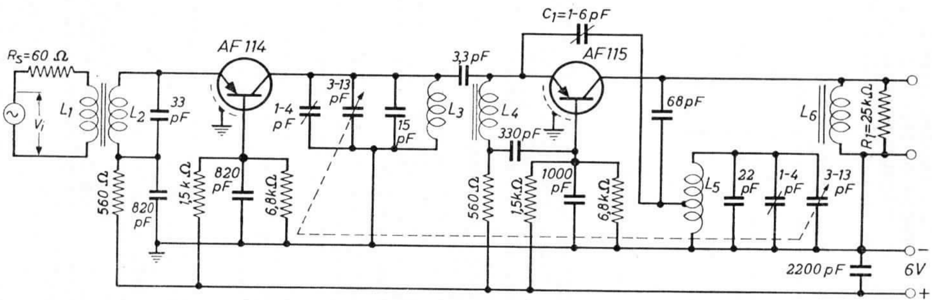
DONNEES DES BOBINES

L4 : 6 tours de fil de cuivre émaillé de 0,5 mm, enroulés jointifs; L = 0,65 µH
L_5 : 2½ tours de fil de cuivre argenté de 1 mm, pas des spires 2 mm; L = 0,062 µH, Q_o > 200. Prise à 1⅛ tour de l'extrémité mise a la terre
L_6 : 18 tours de fil de cuivre 36x0,03, émaillé, torsadé, enroulés jointifs; L = 2,9 µH, Q_o = 120, Q (chargé de 25 kΩ) = 60. Boîte de blindage A3 304 20

SPULENDATEN

L_4 : 6 Windungen, 0,5 mm lackiertes Kupferdraht, anschliessend gewickelt; L = 0,65 µH
L_5 : 2½ Windungen, 1 mm versilbertes Kupfer, Ganghöhe 2 mm; L = 0,062 µH, Q_o > 200. Anzapfung bei 1⅛ Windungen von dem geerdeten Ende.
L_6 : 18 Windungen, lackiertes Litzedraht 36x0,03, anschliessend gewickelt; L = 2,9 µH, Q_o = 120, Q (belastet mit 25 kΩ) = 60. Abschirmbuchse A3 304 20.

The oscillator voltage at the emitter should be adjusted to 80 mV means of C_1 at V_S = 4 V.
La tension d'oscillation à l'émetteur doit être réglée à 80 mV au moyen de C_1, à V_S = 4 V.
Die Oszillatorspannung am Emitter soll mittels C_1 auf 80 mV eingestellt werden, mit V_S = 4 V.



Front-end unit of F.M. tuner (see page 6)
Amplificateur d'entrée d'un récepteur F.M. (voir page 6)
Eingangsverstärker eines FM-Empfängers (siehe Seite 6)

For data of the R.F. stage please refer to the data sheets of the AF 114
Pour les données de l'étage H.F. voir les feuilles de données du AF 114
Für die Daten der HF-Stufe siehe die Datenblätter AF 114

Operating characteristics as self-oscillating mixer for the frequency range 15.1 to 26.1 Mc/s (see page 9)
Caractéristiques d'utilisation comme mélangeur auto-oscillateur pour la bande de 15,1 - 26,1 MHz (voir page 9)
Betriebsdaten als selbstschwingender Mischer für den Frequenzbereich von 15,1 - 26,1 MHz (siehe Seite 9)

$V_S = 9$ V $-V_{CE} = 6$ V $I_E = 1$ mA

f	V_{osc} [1]	Δf_{osc} [2]	P_o/P_i [3]
(Mc/s)	(V)	(kc/s)	(dB)
15	0,11	3	26
20	0,14	2	23
26	0,15	10	20

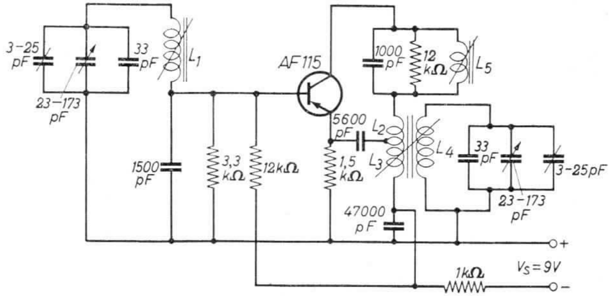
COIL DATA

L_1 : 5 1/2 turns of 0.25 mm enamelled copper wire, closely wound on coil former with diameter of 7 mm; L = 0.59 µH Q_o (f = 15 Mc/s) = 100, Q_o (f = 26 Mc/s) = 115.
L_2 : 1 1/4 turns of 0.25 mm enamelled copper wire, wound in L_4 at earth side
L_3 : 1 turn of 0.25 mm enamelled copper wire, wound in L_4 at earth side
L_4 : 6 1/2 turns of 0.9 mm enamelled copper wire, closely wound on coil former with diameter of 7 mm; L = 0.46 µH, Q_o (f= 15 Mc/s) = 110, Q_o (f = 26 Mc/s) = 110.
L_5 : L = 125 µH; Q_o = 140

[1]) Oscillator voltage, measured between emitter and earth
Tension d'oscillation, mesurée entre émetteur et masse
Oszillatorspannung, gemessen zwischen Emitter und Erde

[2]) Frequency shift by a variation of V_S from 9 to 6 V
Glissement de fréquence par une variation de V_S de 9-6 V
Frequenzverschiebung durch eine Änderung von V_S von 9 bis 6 V

[3]) Conversion gain, defined as the ratio between the I.F. power in a 10 kΩ load (the total I.F. impedance in the collector lead) and the available R.F. power in the aerial circuit.
Amplification de conversion de puissance, définie par le rapport entre la puissance M.F. dans une charge de 10 kΩ (l'impédance M.F. totale dans le conducteur du collecteur) et la puissance H.F. disponible dans le circuit d'antenne.
Überlagerungsverstärkung der Leistung, definiert durch das Verhältnis zwischen der ZF-Leistung in einer Belastung von 10 kΩ (die Gesamt-ZF-Impedanz in der Kollektorleitung) und der HF-Leistung verfügbar in dem Antennenkreis



Self-oscillating mixer for the frequency range from 15.1 to 26.1 Mc/s
Mélangeur auto-oscillateur pour la bande de 15,1-26,1 MHz
Selbstschwingender Mischer für den Frequenzbereich von 15,1 bis 26,1 MHz

Coil data See page 8

Données des bobines

L_1 : 5 1/2 tours de fil de cuivre émaillé de 0,25 mm; enroulés jointifs sur un mandrin de 7 mm de diamètre; L = 0,59 µH, Q_o (à f = 15 MHz) = 100, Q_o (à f = 26 MHz) = 115

L_2 : 1 1/4 tours de fil de cuivre émaillé de 0,25 mm; enroulés entre les spires de L_4 à l'extrémité mise à la terre

L_3 : 1 tour de fil de cuivre émaillé de 0,25 mm; enroulé entre les spires de L_4 à l'extrémité mise à la terre

L_4 : 6 1/2 tours de fil de cuivre émaillé de 0,9 mm; enroulés jointifs sur un mandrin de 7 mm de diamètre; L = 0,46 µH, Q_o (à f = 15 MHz) = 110, Q_o (à f = 26 MHz) = 110

L_5 : L = 125 µH; Q_o = 140

Spulendaten

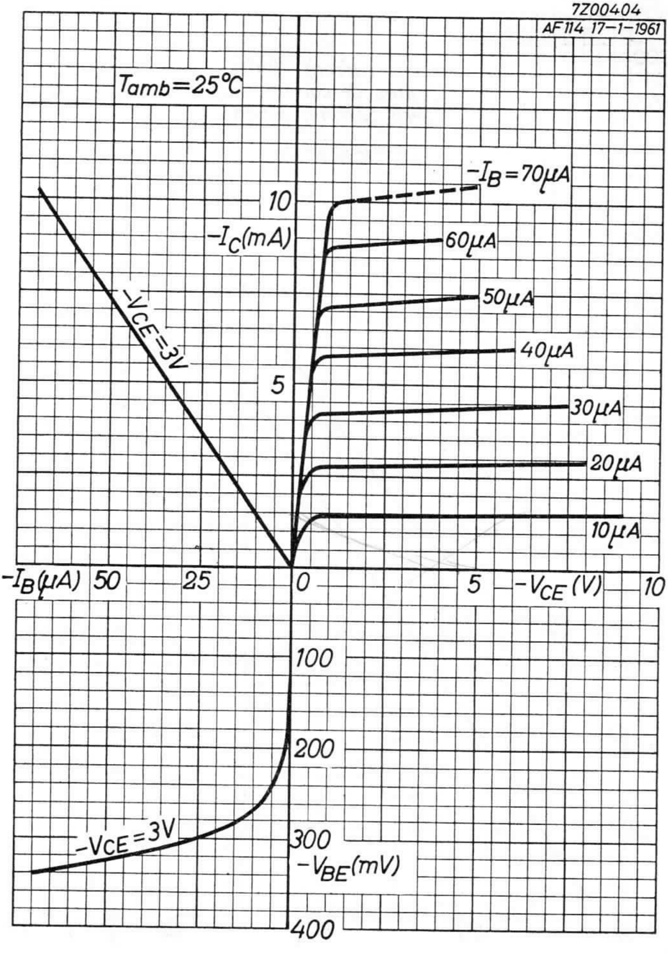
L_1 : 5 1/2 Windungen, 0,25 mm lackiertes Kupferdraht; anschliessend auf einen Spulenkörper von 7 mm gewickelt; L = 0,59 µH, Q_o (bei f = 15 MHz) = 100, Q_o (bei f = 26 MHz) = 115

L_2 : 1 1/4 Windungen, 0,25 mm lackiertes Kupferdraht; zwischen die Windungen am geerdeten Ende von L_4 gewickelt

L_3 : 1 Windung, 0,25 mm lackiertes Kupferdraht; zwischen die Windungen am geerdeten Ende von L_4 gewickelt

L_4 : 6 1/2 Windungen, 0,9 mm lackiertes Kupferdraht; anschliessend auf einen Spulenkörper von 7 mm gewickelt; L = 0,46 µH, Q_o (bei f = 15 MHz) = 110, Q_o (bei f = 26 MHz) = 110

L_5 : L = 125 µH; Q_o = 140



7Z00404
AF114 17-1-1961
Tamb=25°C
-IB=70µA
60µA
50µA
40µA
30µA
20µA
10µA
10
-IC(mA)
5
-VCE=3V
-IB(µA) 50
25
0
5
-VCE (V)
10
100
200
300
-VBE(mV)
400
-VCE=3V

AF 115

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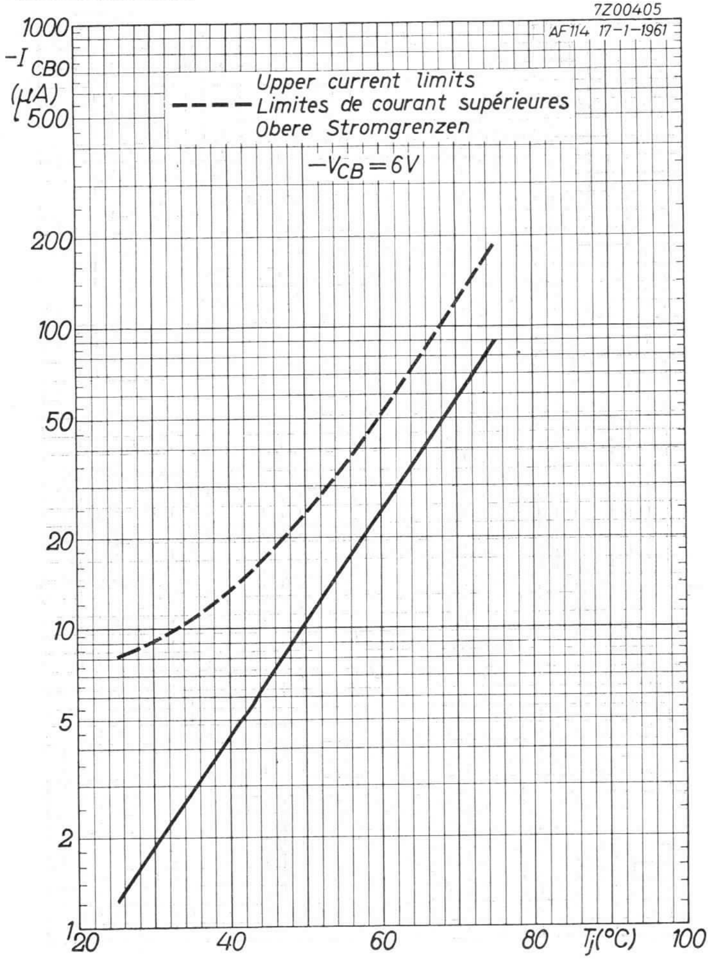

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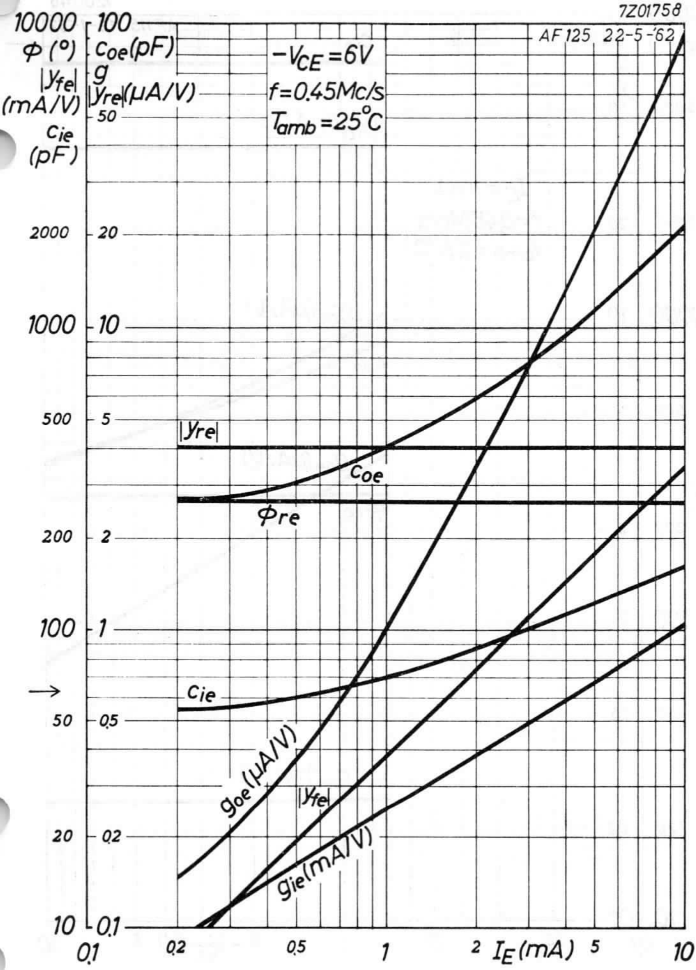

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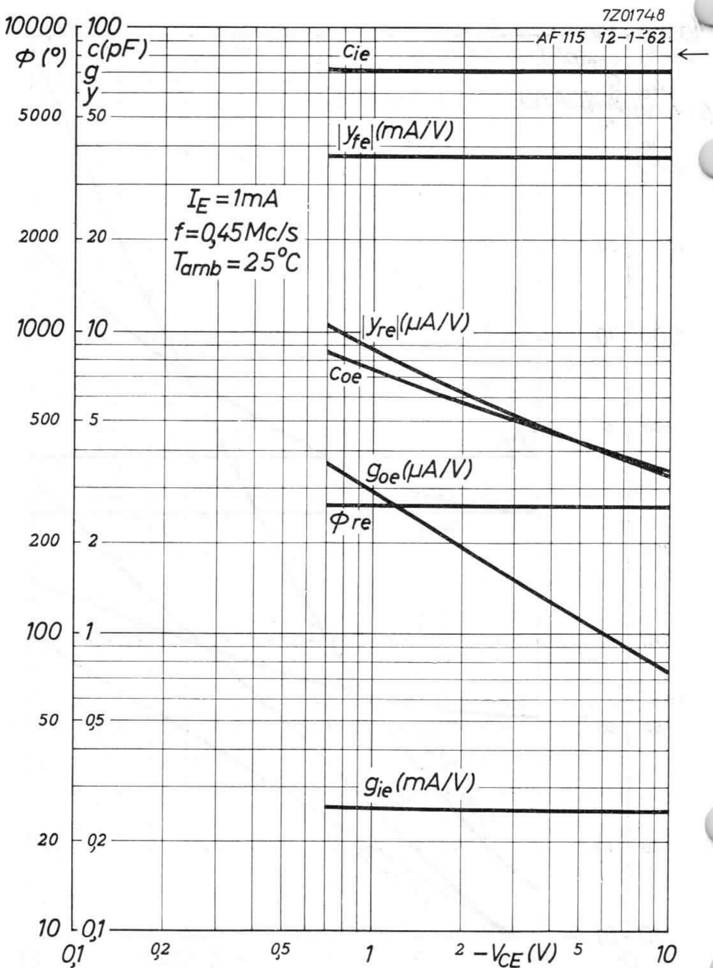
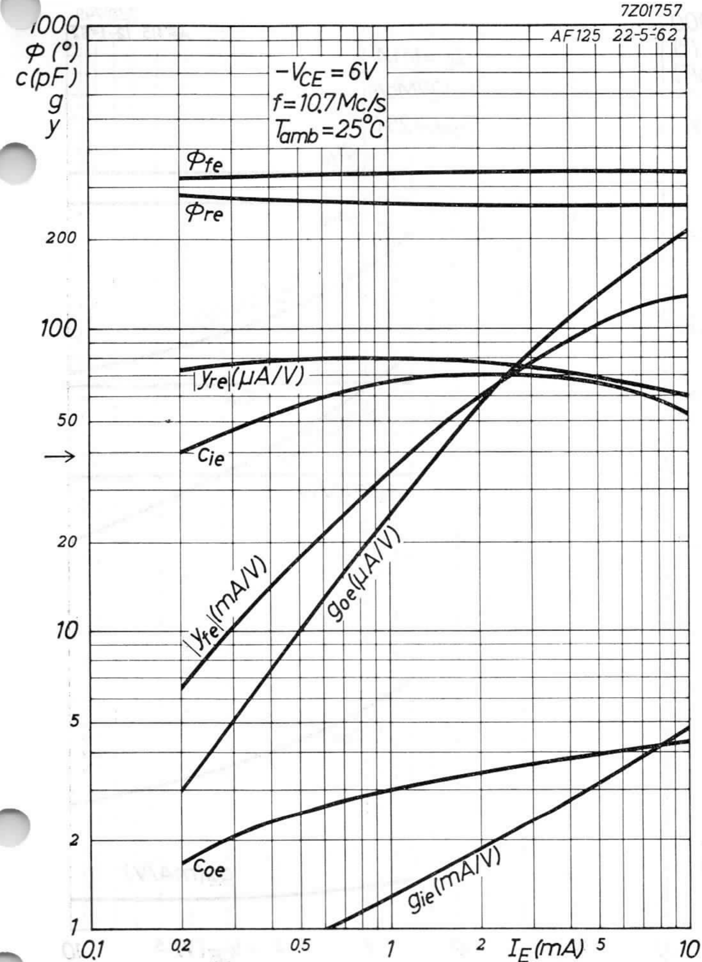


D


7Z01757
AF125 22-5-62
1000
φ (°)
c (pF)
g
y
−V_CE = 6V
f = 10.7 Mc/s
T_amb = 25°C
φfe
φre
200
100
|yre| (μA/V)
50
Cie
20
|yfe| (mA/V)
goe (μA/V)
10
5
2
Coe
gie (mA/V)
1
0.1
0.2
0.5
1
2
I_E (mA)
5
10

AF115

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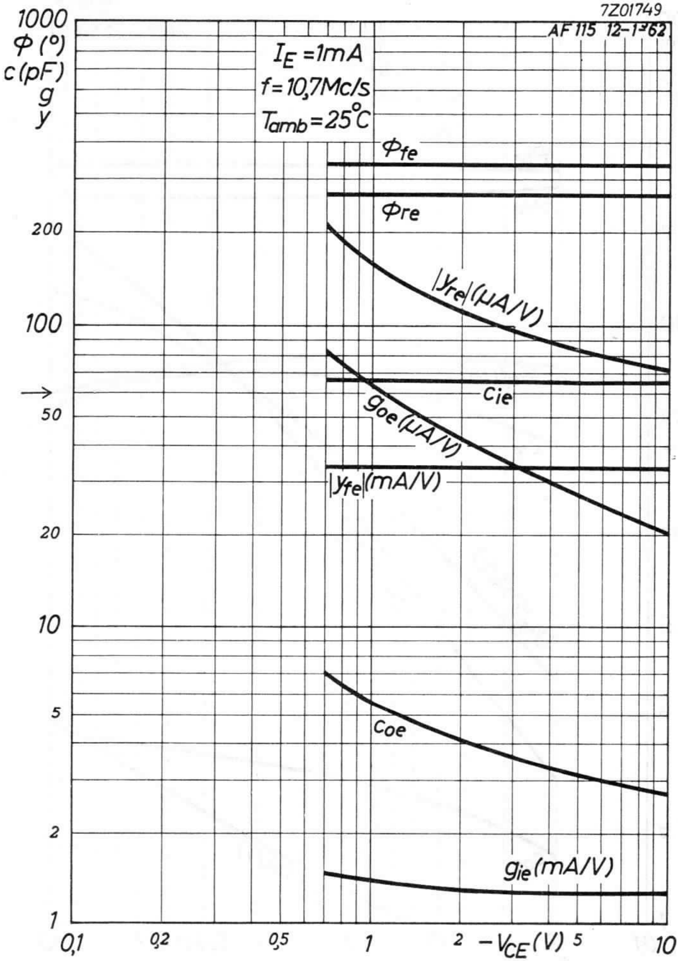
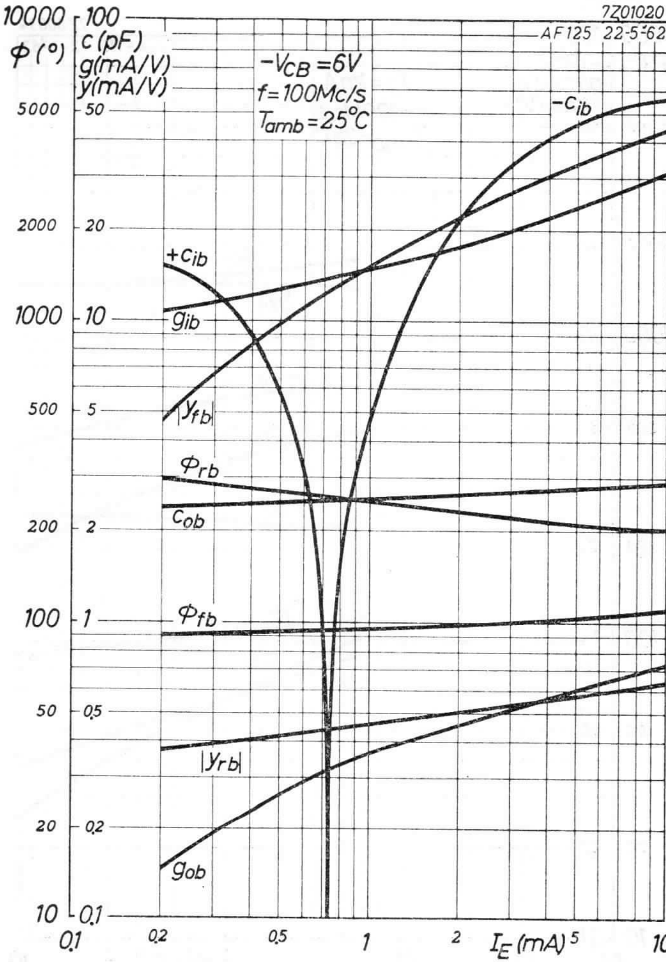


F

PHILIPS

AF115



AF115

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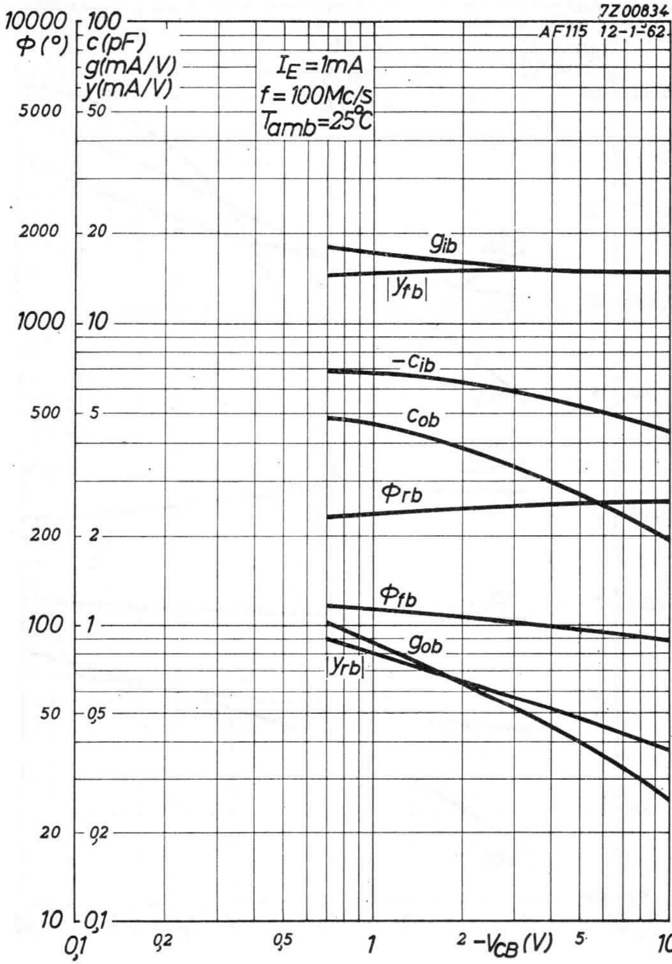
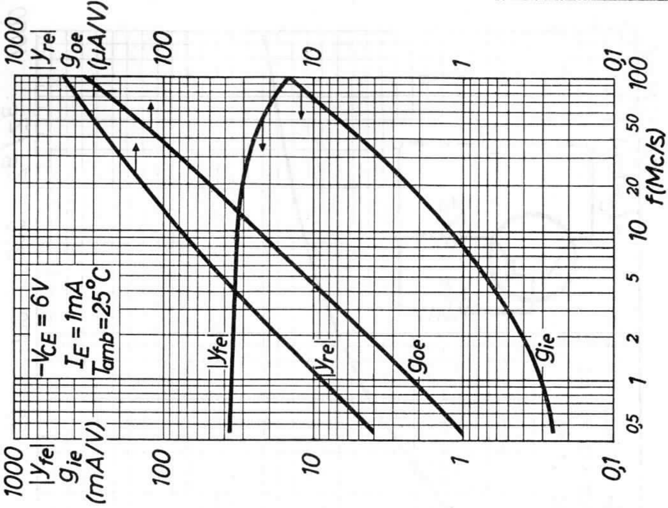
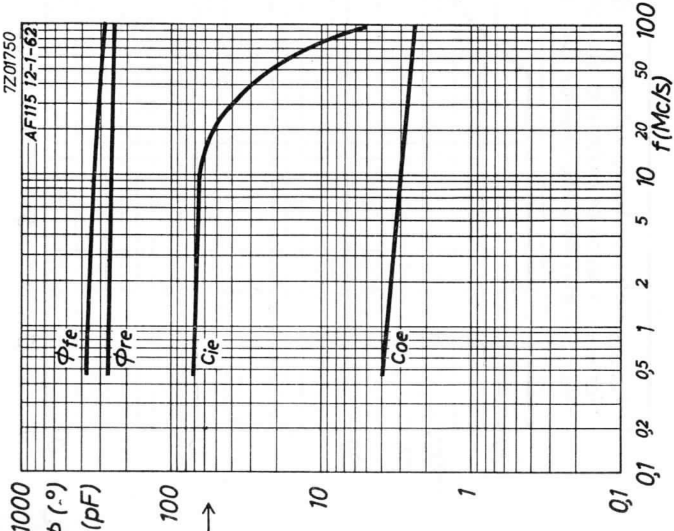
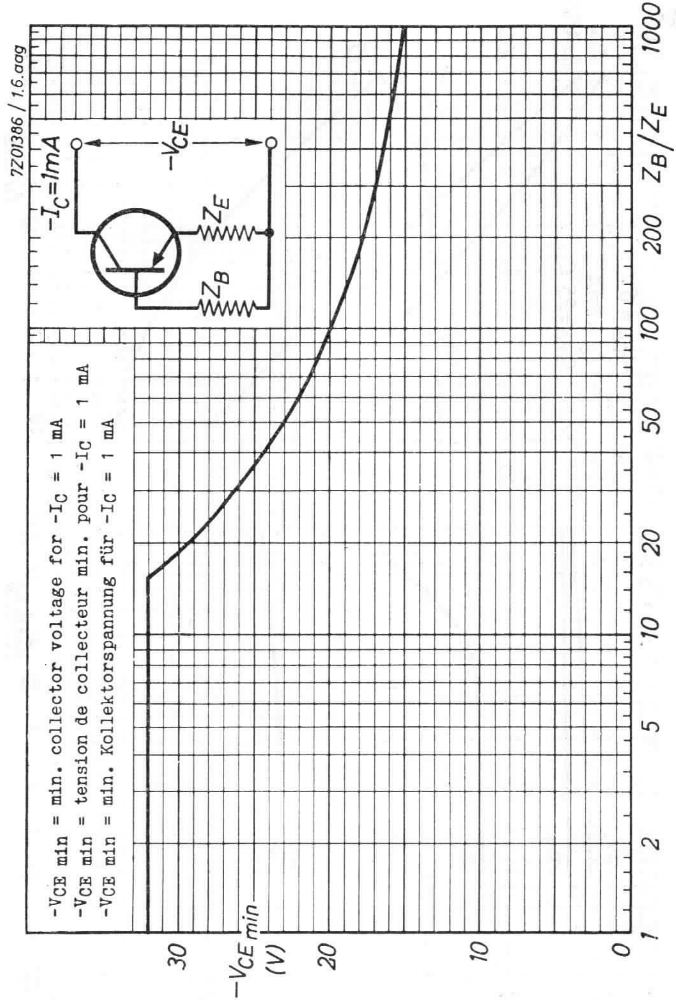



1000
100
10
1
0,1
|y_re|
g_oe
(µA/V)
|y_fe|
g_ie
(mA/V)
-V_CE = 6V
I_E = 1mA
T_amb = 25°C
|y_fe|
|y_re|
g_oe
g_ie
0,5
1
2
5
10
20
50
100
f(Mc/s)


7Z01750
AF115 12-1-62
1000
φ (°)
c(pF)
100
10
1
0,1
φ_fe
φ_re
C_ie
C_oe
0,1
0,2
0,5
1
2
5
10
20
50
100
f(Mc/s)


7Z01386 / 1.6.aag
$-I_C$=1mA
$-V_{CE}$
Z_E
Z_B
$-V_{CE}$ min = min. collector voltage for $-I_C$ = 1 mA
$-V_{CE}$ min = tension de collecteur min. pour $-I_C$ = 1 mA
$-V_{CE}$ min = min. Kollektorspannung für $-I_C$ = 1 mA
$-V_{CE}$ min (V)
30
20
10
0
1
2
5
10
20
50
100
200
1000
Z_B/Z_E

PHILIPS

AF116

R.F. GERMANIUM TRANSISTOR of the p-n-p type, made in the alloy-diffusion technique with low output conductance and low collector capacitance at 10.7 Mc/s, low noise and good A.G.C. performance at high ambient temperatures, for use as I.F. amplifier in A.M. and F.M. receivers and as R.F. amplifier or mixer-oscillator in short wave receivers up to 16 Mc/s. The transistor is hermetically sealed in a metal can and absolutely moisture proof

TRANSISTOR H.F. À CRISTAL DE GERMANIUM du type p-n-p, en technique alliage-diffusion, avec petite conductance de sortie et petite capacité de collecteur à 10,7 MHz, bruit faible et comportement favorable par rapport au réglage automatique de l'amplification aux températures élevées, pour l'utilisation comme amplificateur M.F. dans les récepteurs A.M. et F.M. et comme amplificateur H.F. ou mélangeur-oscillateur dans les récepteurs ondes courtes jusqu'à une fréquence de 16 MHz. Le transistor est scellé hermétiquement dans un boîtier métallique et protégé contre l'humidité

HF p-n-p GERMANIUMTRANSISTOR nach dem Legierungs-Diffusionsverfahren, mit niedriger Ausgangskonduktanz und kleiner Kollektorkapazität bei 10,7 MHz, schwachem Rauschen und guten Eigenschaften in bezug auf automatische Stärkeregelung bei hohen Temperaturen, zur Verwendung als ZF-Verstärker in AM- und FM-Empfängern und als HF-Verstärker oder Mischer-Oszillator in Kurzwellenempfängern bis zu 16 MHz. Der Transistor ist hermetisch abgeschlossen in einem Metallgehäuse und absolut sicher vor Feuchtigkeit

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max. 32 V
$-V_{CE}$	= max. 32 V [1]
$-I_C$	= max. 10 mA
I_E	= max. 11 mA
$-I_E$	= max. 1 mA
$\lvert I_B \rvert$	= max. 1 mA
P_C ($T_{amb} \leq 45\ ^{\circ}C$)	= max. 50 mW
T_j continuous operation / service continu / Dauerbetrieb	= max. 75 °C
T_j intermittent operation / service intermittent / aussetzender Betrieb	= max. 90 °C [2]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	= -55°C/+75 °C

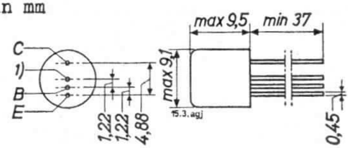
[1]) See page H; voir page H; siehe Seite H

[2]) See page 3; voir page 3; siehe Seite 3

AF116

PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Thermal data
Données thermiques
Thermische Daten

Thermal resistance from junction to ambience in free air	$K \leq 0.6\ ^{o}C/mW$
Résistance thermique entre la jonction et l'ambiance à l'air libre	$K \leq 0,6\ ^{o}C/mW$
Thermischer Widerstand zwischen dem Kristall und der Umgebung in freier Luft	$K \leq 0,6\ ^{o}C/mW$

Characteristics
Caractéristiques $T_{amb} = 25\ ^{o}C$
Kenndaten

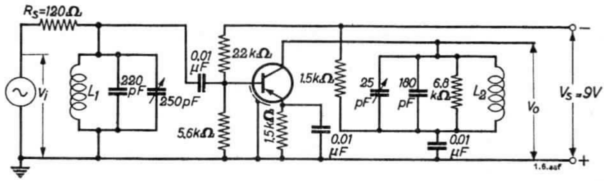
$-I_{CBO}$	$(-V_{CB} = 6\ V)$	$= 1,2\ \mu A$	$< 8\ \mu A$
$-V_{CB}$	$(-I_C = 50\ \mu A;\ I_E = 0\ mA)$		$> 32\ V$ ←
$-I_B$	$(-V_{CB} = 6\ V;\ I_E = 1\ mA)$	$= 7\ \mu A$	$< 25\ \mu A$
$-V_{BE}$	$(-V_{CB} = 6\ V;\ I_E = 1\ mA)$	$= 270\ mV$	$> 210\ mV$ $< 330\ mV$
G	(f = 10,7 Mc/s)	= 25 dB	> 19 dB[2])

1) Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

2) Available power gain in the circuit page 3, defined by:
Amplification de puissance disponible dans le circuit page 3, définie par:
Verfügbare Leistungsverstärkung der auf Seite 3 angegebenen Schaltung, definiert durch:

$$G = \frac{4R_S}{R_L}\frac{V_o^2}{V_i^2} = 0,1\frac{V_o^2}{V_i^2}$$

Test circuit for power gain at 10.7 Mc/s (see page 2)
Circuit pour la mesure de l'amplification de puissance à 10,7 MHz (voir page 2)
Schaltung zur Messung der Leistungsverstärkung bei 10,7 MHz (siehe Seite 2)



L_1 = 0,5 μH; Q_o = 100

L_2 = 2,47 μH; Q_o = 100

R_S = input source impedance
R_S = impédance de la source d'entrée
R_S = Impedanz der Eingangsspannungsquelle

R_L = total collector impedance = 4.8 kΩ
R_L = impédance de collecteur totale = 4,8 kΩ
R_L = Gesamtwiderstand in der Kollektorleitung = 4,8 kΩ

Page 1, Seite 1

2) Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf T_{amb} = 25 °C

$-I_E$ = 50 µA; $-I_C$ = 0 mA	$-V_{EB}$ = 1,5 V	> 1,0 V
$-V_{CB}$ = 6 V ; I_E = 1 mA	f_1 = 75 Mc/s [1]	
$-V_{CB}$ = 6 V ; I_E = 1 mA f = 2 Mc/s	$\|z_{rb}\|$ = 27 Ω [2]	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 0,45 Mc/s	$-c_{re}$ = 1,5 pF	
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 kc/s	h_{fe} = 150	
$-V_{CE}$ = 6 V; I_E = 1 mA f = 10,7 Mc/s; R_S = 200 Ω [3]	F = 3 dB	< 4,5 dB
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 Mc/s; R_S = 500 Ω [3]	F = 1,5 dB	< 3 dB
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 1 Mc/s; R_S = 500 Ω [3]	F_{conv} = 3 dB	< 5 dB [4]
$-V_{CE}$ = 6 V ; I_E = 1 mA f = 200 kc/s; R_S = 2 kΩ [3]	F_{conv} = 4 dB	< 7 dB [4]

[1]) Frequency at which $|h_{fe}|$ = 1
Fréquence à laquelle $|h_{fe}|$ = 1
Frequenz bei der $|h_{fe}|$ = 1

[2]) Intrinsic base impedance
Impédance intrinsèque de la base
Innere Impedanz der Basis

[3]) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

[4]) Conversion noise
Bruit de conversion
Überlagerungsrauschen

Tentative data. Vorläufige Daten
Caractéristiques provisoires

Characteristics range values for equipment design (continued)
Gammes de valeurs des caractéristiques pour l'étude d'équipements (suite)
Kenndatenbereiche für Gerätentwurf (Fortsetzung)

Small signal characteristics (measured with a length of leads between transistor and measuring jig of 5 mm)
Caractéristiques pour les signaux faibles (mesurées avec une longueur des fils de connexion entre le transistor et l'appareil de mesure de 5 mm)
Kenndaten für kleine Signale (gemessen mit einer Länge der Anschlussdrähte zwischen Transistor und Messvorrichtung von 5 mm)

$-V_{CE}$ = 6 V; I_E = 1 mA
f = 10,7 Mc/s; T_{amb} = 25 °C

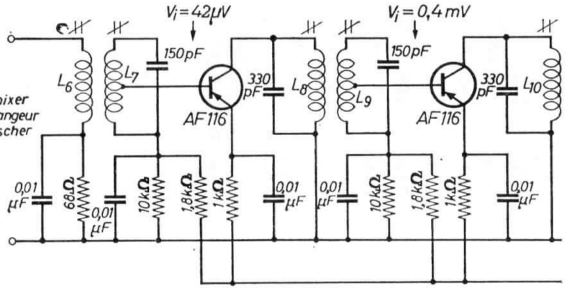
g_{ie}	=	1,7 mA/V
c_{ie}	=	60 pF
$\lvert y_{re}\rvert$	=	100 µA/V
φ_{re}	=	260 °
$\lvert y_{fe}\rvert$	=	32 mA/V
φ_{fe}	=	335 °
g_{oe}	=	40 µA/V
c_{oe}	=	3,5 pF

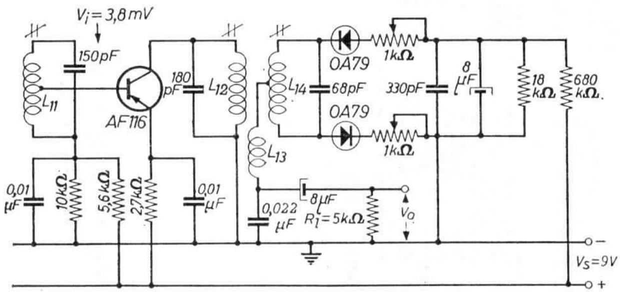
$-V_{CE}$ = 6 V; I_E = 1 mA
f = 0,45 Mc/s; T_{amb} = 25 °C

g_{ie}	=	0,25 mA/V
c_{ie}	=	70 pF
$\lvert y_{re}\rvert$	=	4 µA/V
φ_{re}	=	270 °
$\lvert y_{fe}\rvert$	=	37 mA/V
φ_{fe}	=	0 °
g_{oe}	=	1,0 µA/V
c_{oe}	=	4 pF

I.F. amplifier for 10.7 Mc/s
Amplificateur M.F. pour 10,7 MHz
ZF-Verstärker für 10,7 MHz

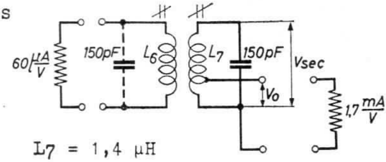
I_E of each transistor = 1.0 mA
I_E de chaque transistor = 1,0 mA
I_E jedes Transistors = 1,0 mA





For coil data please refer to page 7
Pour les données des bobines voir page 7
Für die Spulendaten siehe Seite 7

Coil data
Données des bobines
Spulendaten



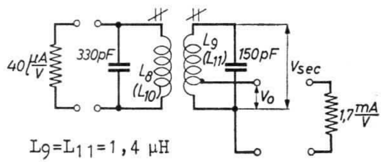
$L_6 = 1,4\ \mu H$ $L_7 = 1,4\ \mu H$

$Q_o \geq 120$ $Q_o \geq 110$

$Q_L = 70$ $Q_L = 92$

$KQ_L = 1,25$

$\frac{V_o}{V_{sec}} = 0,1$



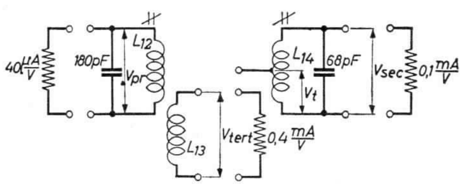
$L_8 = L_{10} = 0,67\ \mu H$ $L_9 = L_{11} = 1,4\ \mu H$

$Q_o \geq 110$ $Q_o \geq 110$

$Q_L = 92$ $Q_L = 92$

$KQ_L = 1,25$

$\frac{V_o}{V_{sec}} = 0,1$



$L_{12} = 1,2\ \mu H$ $L_{14} = 3,05\ \mu H$

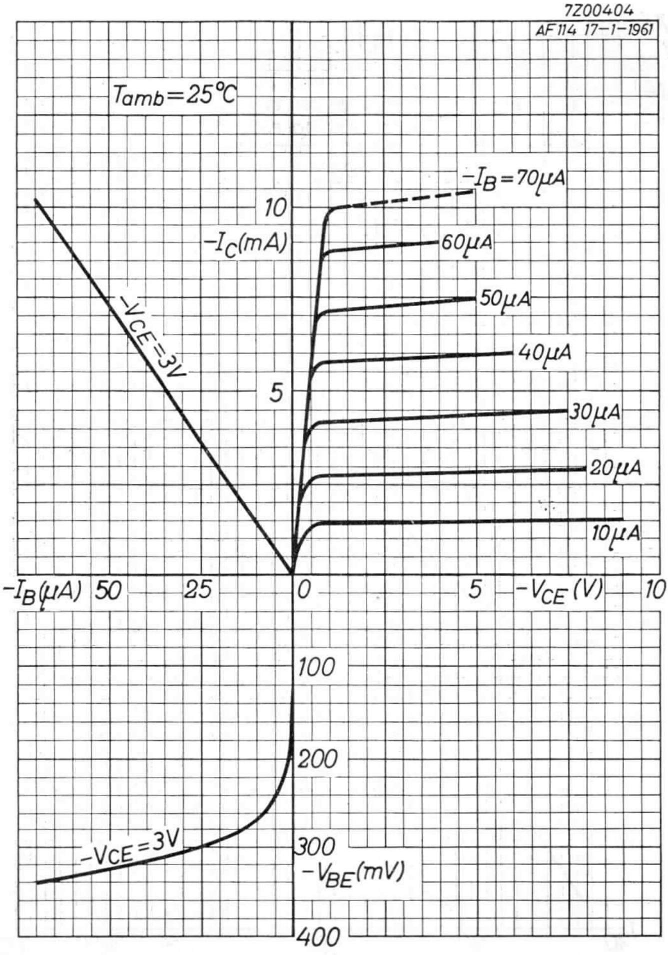
$Q_o \geq 90$ $Q_o \geq 90$

$KQ_L = 0,7$

$\frac{V_{tert}}{V_{pr}} = 0,45$ $\frac{V_t}{V_{sec}} = 0,5$

L_{14} is bifilarly wound
L_{14} est enroulée bifilairement
L_{14} ist bifilar gewickelt

Tentative data. Vorläufige Daten
Caractéristiques provisoires


7Z00404
AF114 17-1-1961
Tamb=25°C
-IB=70µA
60µA
50µA
40µA
30µA
20µA
10µA
10
-IC(mA)
5
-VCE=3V
-IB(µA) 50
25
0
5
-VCE (V)
10
100
200
300
-VBE(mV)
400
-VCE=3V

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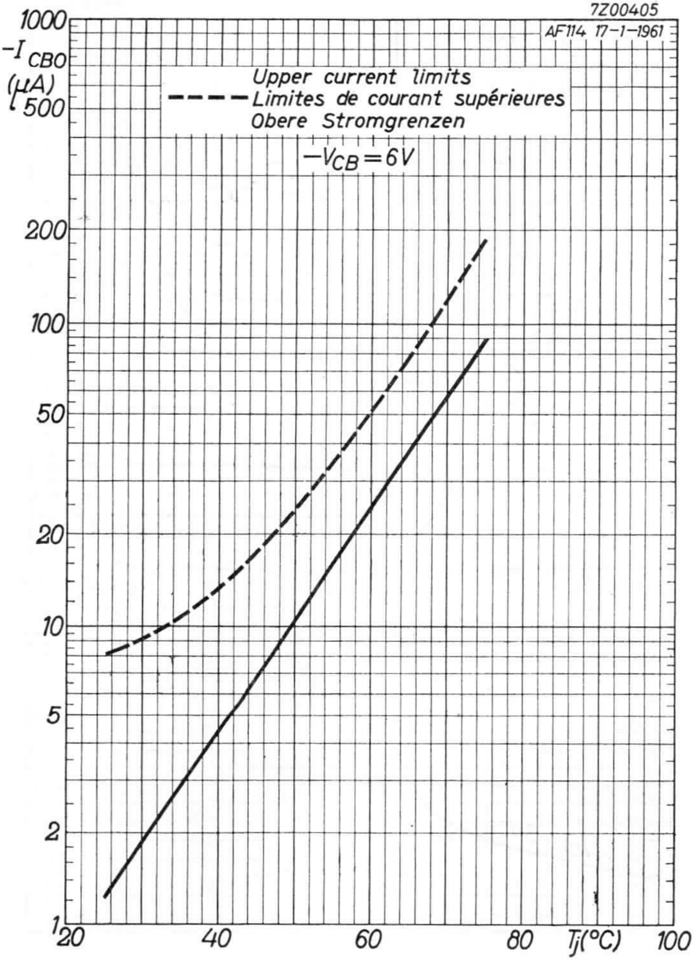
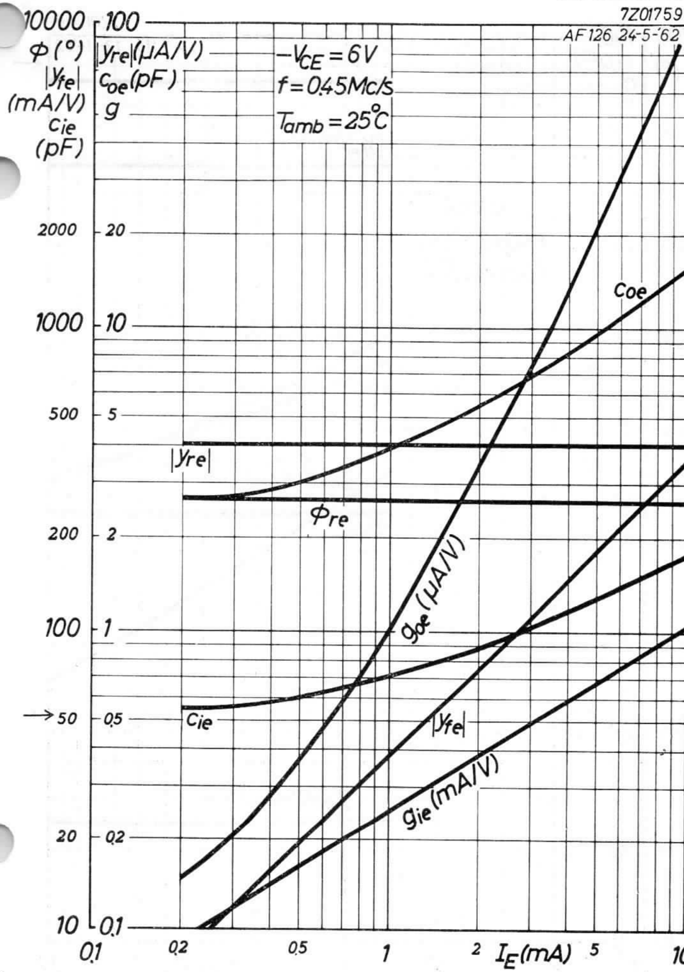

7Z00405
AF114 17-1-1961
$-I_{CBO}$ (μA)
1000
500
200
100
50
20
10
5
2
1
Upper current limits
Limites de courant supérieures
Obere Stromgrenzen
$-V_{CB} = 6V$
20
40
60
80
T_j(°C)
100


7Z01759
AF 126 24-5-'62
10000
Φ (°)
|yfe|
(mA/V)
cie
(pF)
100
|yre| (μA/V)
Coe (pF)
g
−VCE = 6V
f = 0.45Mc/s
Tamb = 25°C
2000
20
1000
10
500
5
200
2
100
1
50
0.5
20
0.2
10
0.1
Coe
|yre|
Φre
goe (μA/V)
Cie
|yfe|
gie (mA/V)
0.1
0.2
0.5
1
2
IE (mA)
5
10

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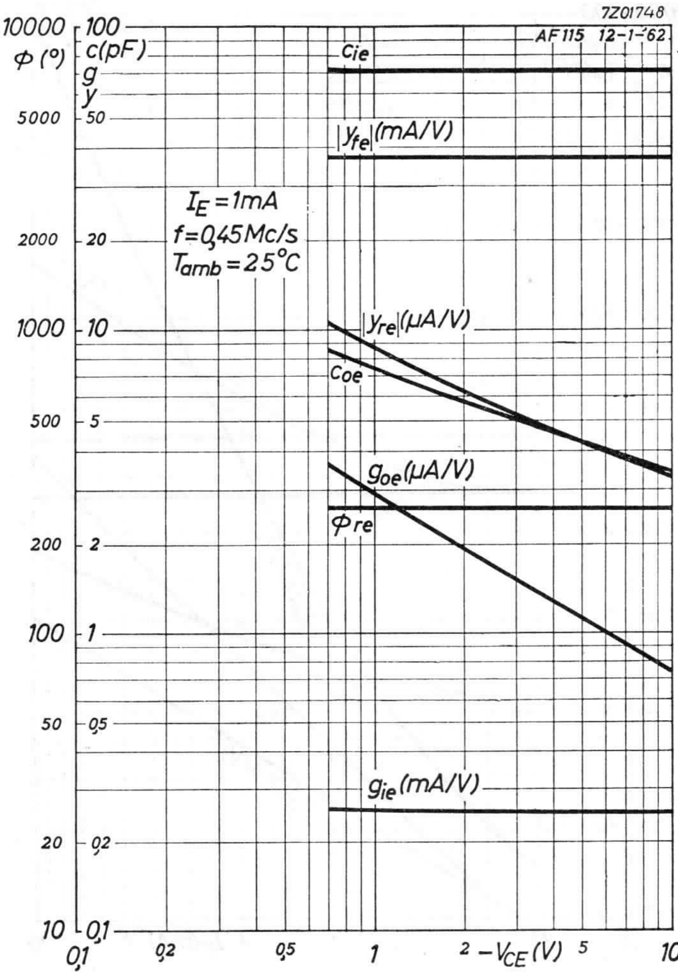
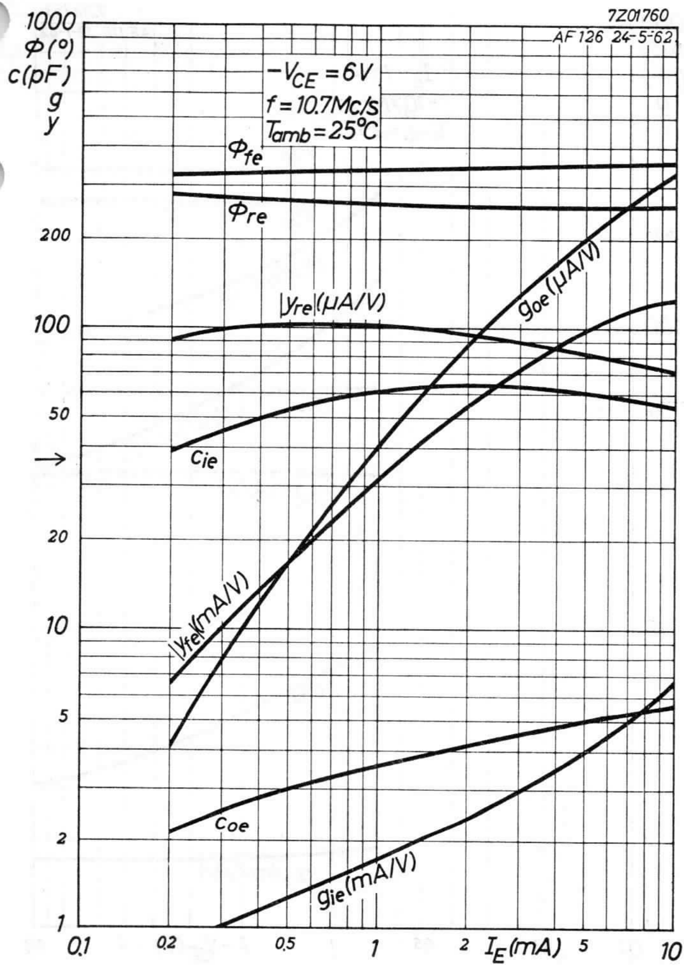

7Z01748
AF115 12-1-'62
10000
φ (°)
5000
2000
1000
500
200
100
50
20
10
100
c(pF)
g
y
50
20
10
5
2
1
0,5
0,2
0,1
Cie
|yfe|(mA/V)
IE = 1mA
f=0,45Mc/s
Tamb = 25°C
|yre|(μA/V)
Coe
goe(μA/V)
φre
gie(mA/V)
0,1
0,2
0,5
1
2
−VCE (V)
5
10


7Z01760
AF 126 24-5-62
1000
Φ(°)
c(pF)
g
y
$-V_{CE} = 6V$
$f = 10.7Mc/s$
$T_{amb} = 25°C$
$φ_{fe}$
$φ_{re}$
200
$|y_{re}|(μA/V)$
$g_{oe}(μA/V)$
100
50
c_{ie}
20
$|y_{fe}|(mA/V)$
10
5
c_{oe}
2
$g_{ie}(mA/V)$
1
0.1
0.2
0.5
1
2
$I_E(mA)$
5
10

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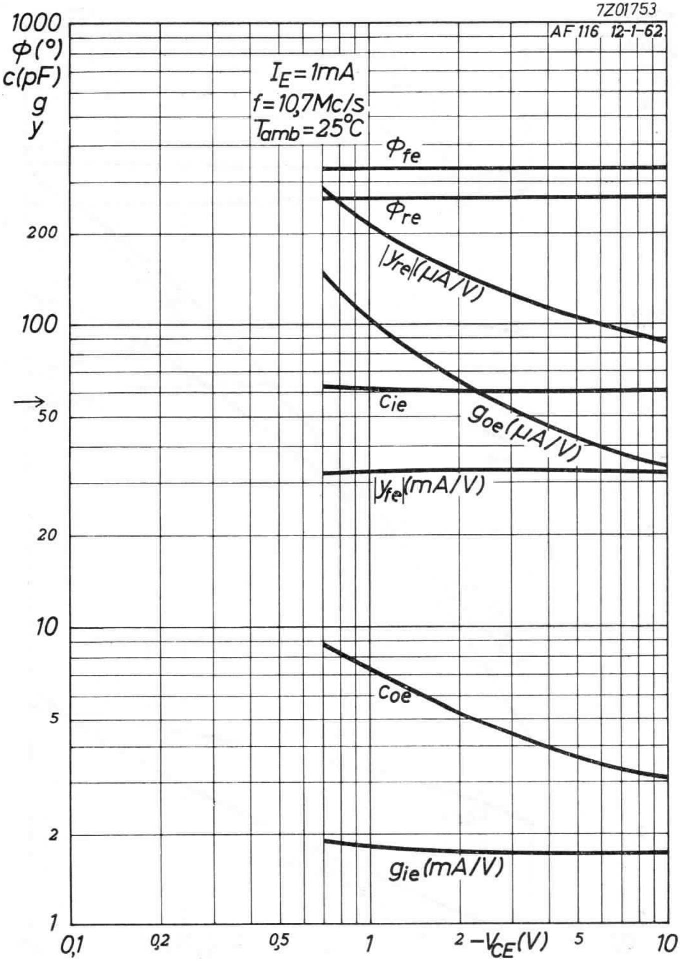
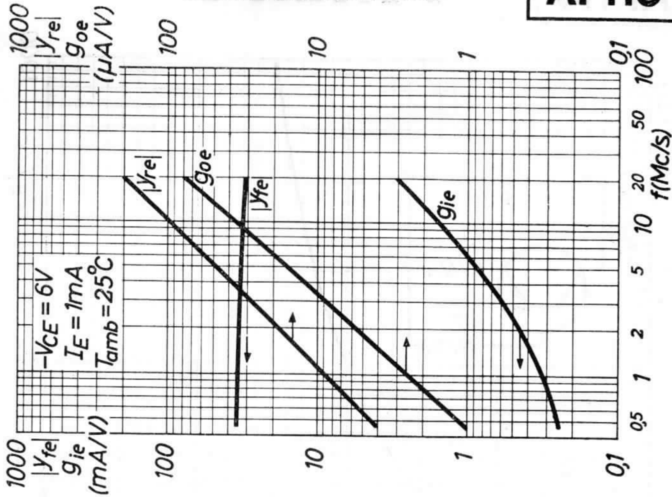
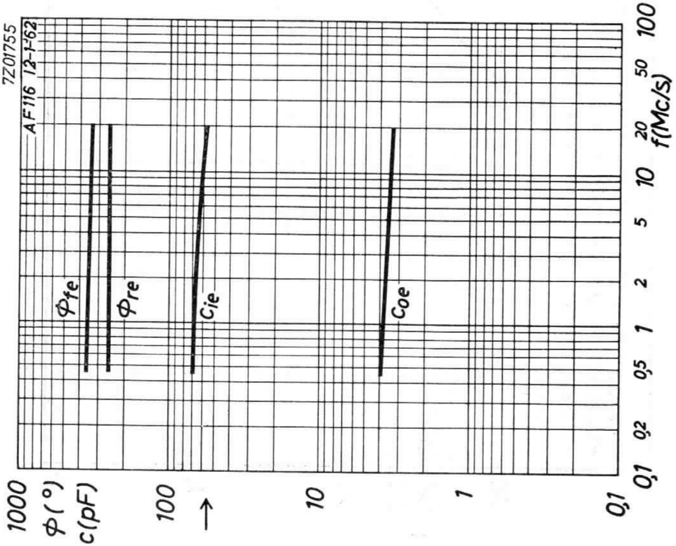

7Z01753
AF 116 12-1-62
1000
φ(°)
c(pF)
g
y
I_E = 1mA
f = 10,7Mc/s
T_{amb} = 25°C
φ_{fe}
φ_{re}
$|y_{re}|$(μA/V)
200
100
C_{ie}
50
g_{oe}(μA/V)
$|y_{fe}|$(mA/V)
20
10
C_{oe}
5
2
g_{ie}(mA/V)
1
0,1
0,2
0,5
1
2
$-V_{CE}$(V)
5
10

PHILIPS

AF116





AF116

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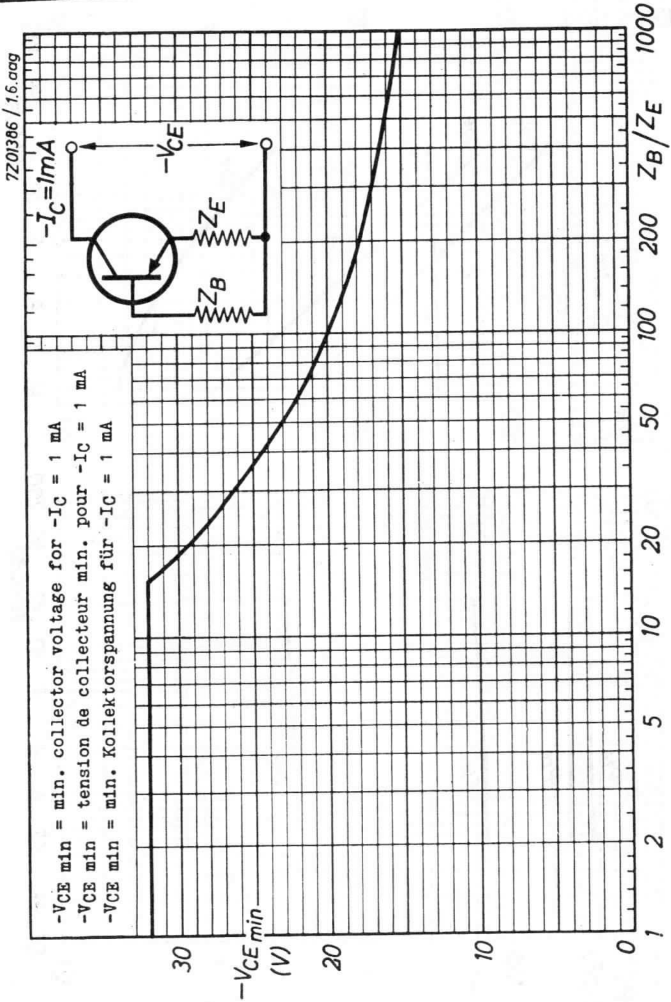


PHILIPS

AF117

R.F. GERMANIUM TRANSISTOR of the p-n-p type, made in the alloy-diffusion technique with low collector capacitance, low noise and good A.G.C. performance at high ambient temperatures, for use as I.F. amplifier in A.M. receivers and as R.F. amplifier or oscillator-mixer in A.M. receivers up to 6 Mc/s. The transistor is hermetically sealed in a metal can and absolutely moisture proof.

TRANSISTOR H.F. A CRISTAL DE GERMANIUM du type p-n-p, en technique alliage-diffusion, avec petite capacité de collecteur, bruit faible et comportement favorable par rapport au réglage automatique de l'amplification aux températures élevées, pour l'utilisation comme amplificateur M.F. dans les récepteurs A.M. et comme amplificateur H.F. ou mélangeur-oscillateur dans les récepteurs A.M. jusqu'à une fréquence de 6 MHz. Le transistor est scellé hermétiquement dans un boîtier métallique et protégé contre l'humidité.

HF p-n-p GERMANIUMTRANSISTOR nach dem Legierungs-Diffusionsverfahren, mit kleiner Kollektorkapazität, schwachem Rauschen und guten Eigenschaften in bezug auf automatische Stärkeregelung bei hohen Temperaturen, zur Verwendung als ZF-Verstärker in AM-Empfängern und als HF-Verstärker oder Mischer-Oszillator in AM-Empfängern bis zu 6 MHz. Der Transistor ist hermetisch abgeschlossen in einem Metallgehäuse und absolut sicher vor Feuchtigkeit.

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max. 32 V	$-I_E$	= max. 1 mA
$-V_{CE}$	= max. 32 V [1]	$\lvert I_B \rvert$	= max. 1 mA
$-I_C$	= max. 10 mA	P_C ($T_{amb} \leq 45\ ^oC$)	= max. 50 mW
I_E	= max. 11 mA		

T_j { continuous operation / service continu / Dauerbetrieb } = max. 75 °C

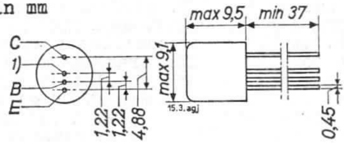
T_j { intermittent operation / service intermittent / aussetzender Betrieb } = max. 90 °C [2]

Storage temperature
Température d'emmagasinage = -55 °C/+75 °C
Lagerungstemperatur

[1] See also page E
Voir aussi page E
Siehe auch Seite E

[2] Total duration max. 200 hours
Durée totale 200 heures au max.
Gesamtdauer max. 200 Stunden

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Thermal data
Données thermiques
Thermische Daten

Thermal resistance from junction to ambience in free air	K	≦ 0.6 °C/mW
Résistance thermique entre la jonction et l'ambiance à l'air libre	K	≦ 0,6 °C/mW
Thermischer Widerstand zwischen dem Kristall und der Umgebung in freier Luft	K	≦ 0,6 °C/mW

Characteristics
Caractéristiques
Kenndaten $T_{amb} = 25\ ^{\circ}C$

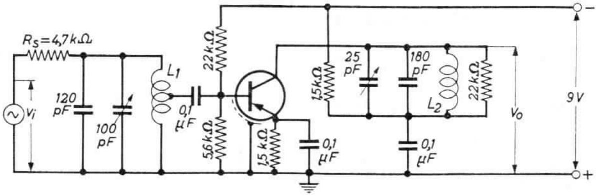
$-I_{CBO}$	$(-V_{CB} = 6\ V)$	= 1,2 μA	< 8 μA
$-V_{CB}$	$(-I_C = 50\ \mu A;\ I_E = 0\ mA)$		> 32 V ←
$-I_B$	$(-V_{CB} = 6\ V;\ I_E = 1\ mA)$	= 7 μA	< 25 μA
$-V_{BE}$	$(-V_{CB} = 6\ V;\ I_E = 1\ mA)$	= 270 mV	> 210 mV < 330 mV
G [2]	(f = 0,45 Mc/s)	= 42 dB	> 40 dB

[1]) Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

[2]) Available power gain in the circuit page 3, defined by:
Amplification de puissance disponible dans le circuit page 3, définie par:
Verfügbare Leistungsverstärkung der auf Seite 3 angegebenen Schaltung, definiert durch:

$$G = \frac{4R_S}{R_L}\frac{V_o^2}{V_i^2} = 0{,}94\,\frac{V_o^2}{V_i^2}$$

Test circuit for power gain at 0.45 Mc/s (See page 2)
Circuit pour la mesure de l'amplification de puissance à 0,45 MHz (voir page 2)
Schaltung zur Messung der Leistungsverstärkung bei 0,45 MHz (siehe Seite 2)



L_1 = 625 µH; Q_o = 140;
L_2 = 625 µH; Q_o = 140

tap at t = 0.2
prise à t = 0,2
Anzapfung bei t = 0,2

R_S = input source impedance
R_S = impédance de la source d'entrée
R_S = Impedanz der Eingangsspannungsquelle

R_L = total collector impedance = 20 kΩ
R_L = impédance de collecteur totale = 20 kΩ
R_L = Gesamtwiderstand in der Kollektorleitung = 20 kΩ

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

T_{amb} = 25 °C

$-I_E$ = 50 μA; $-I_C$ = 0 mA	$-V_{EB}$ = 1,5 V	> 1,0 V
$-V_{CB}$ = 6 V; I_E = 1 mA	f_1 = 75 Mc/s 1)	
$-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s	$\|z_{rb}\|$ = 35 Ω 2)	
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 0,45 Mc/s	$-c_{re}$ = 1,5 pF	
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s	h_{fe} = 150	
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; R_S = 500 Ω 3)	F = 1,5 dB	< 3 dB
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; R_S = 500 Ω 3)	F_{conv} = 3 dB	< 5 dB 4)
$-V_{CE}$ = 6 V; I_E = 1 mA; f = 200 kc/s; R_S = 2 kΩ 3)	F_{conv} = 4 dB	< 7 dB 4)

1) Frequency at which $|h_{fe}|$ = 1
Fréquence à laquelle $|h_{fe}|$ = 1
Frequenz bei der $|h_{fe}|$ = 1

2) Intrinsic base impedance
Impédance intrinsèque de la base
Innere Impedanz der Basis

3) Input source impedance
Impédance de la source d'entrée
Impedanz der Eingangsspannungsquelle

4) Conversion noise
Bruit de conversion
Überlagerungsrauschen

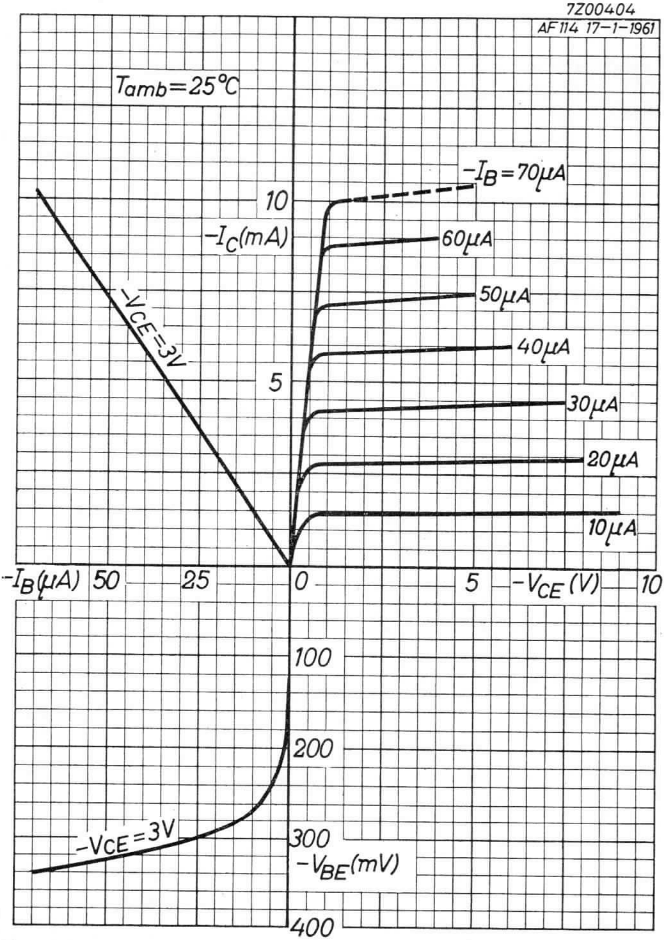
Characteristics range values for equipment design (continued)
Gammes de valeurs des caractéristiques pour l'étude d'équipements (suite)
Kenndatenbereiche für Gerätentwurf (Fortsetzung)

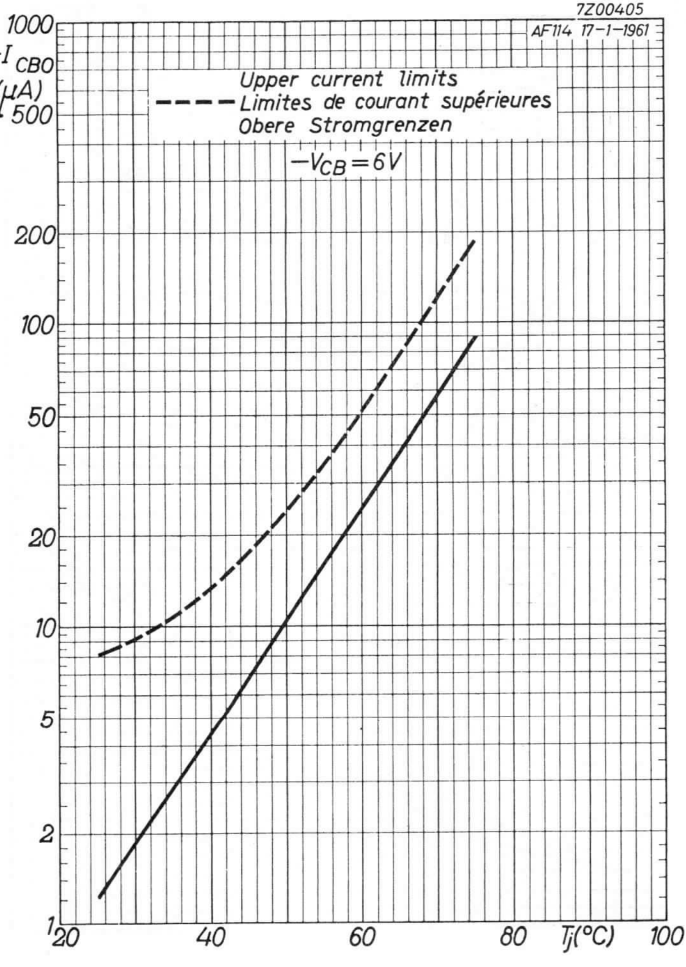
Small signal characteristics
Caractéristiques pour les signaux faibles
Kenndaten für kleine Signale

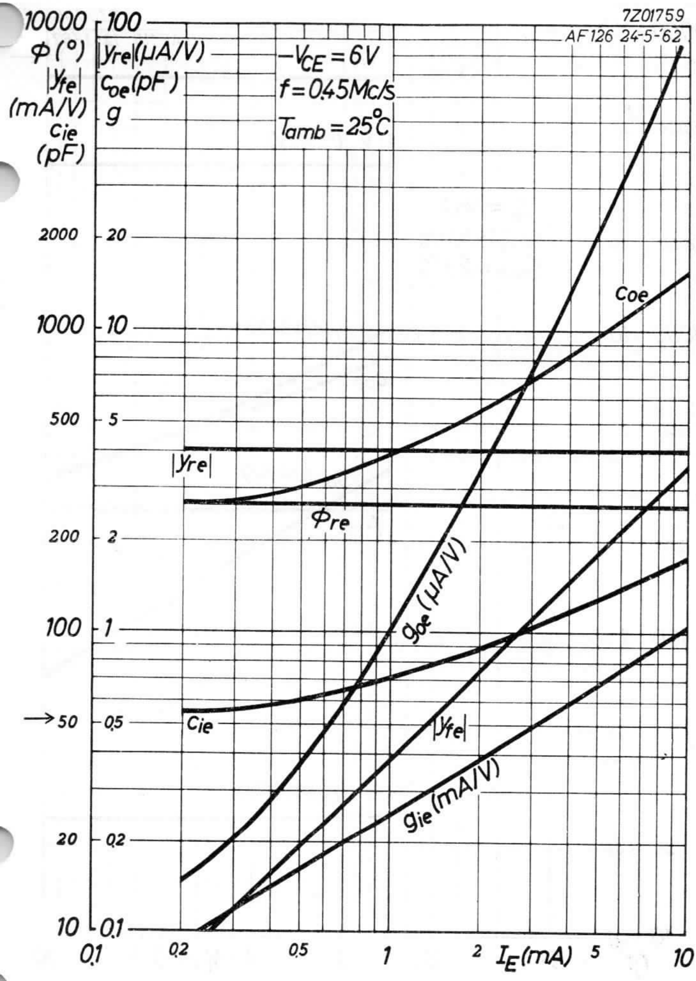
T_{amb} = 25 °C

$-V_{CE}$ = 6 V; I_E = 1 mA
f = 0,45 Mc/s

g_{ie}	=	0,25 mA/V
c_{ie}	=	70 pF
$\lvert y_{re}\rvert$	=	4 µA/V
φ_{re}	=	270 °
$\lvert y_{fe}\rvert$	=	37 mA/V
φ_{fe}	=	0 °
g_{oe}	=	1,0 µA/V
c_{oe}	=	4 pF

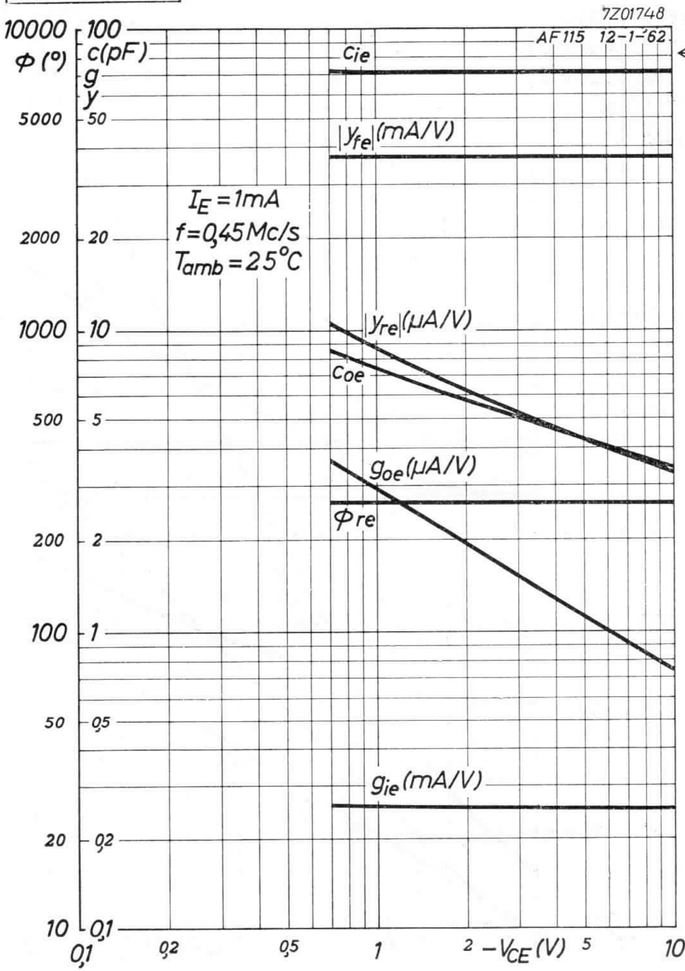

7Z00404
AF114 17-1-1961
Tamb=25°C
−IB=70μA
60μA
50μA
40μA
30μA
20μA
10μA
10
5
−IC(mA)
−VCE=3V
−IB(μA) 50
25
0
5
−VCE (V)
10
100
200
300
400
−VBE(mV)
−VCE=3V


7Z00405
AF114 17-1-1961
Upper current limits
Limites de courant supérieures
Obere Stromgrenzen
$-V_{CB} = 6V$
$-I_{CBO}$ (μA)
1000
500
200
100
50
20
10
5
2
1
20
40
60
80
T_j(°C)
100


7Z01759
AF126 24-5-'62
10000
φ (°)
|yfe|
(mA/V)
cie
(pF)
100
|yre|(μA/V)
Coe(pF)
g
−VCE = 6V
f = 0.45Mc/s
Tamb = 25°C
2000
20
1000
10
500
5
200
2
100
1
50
0.5
20
0.2
10
0.1
Coe
|yre|
φre
goe (μA/V)
Cie
|yfe|
gie (mA/V)
0.1
0.2
0.5
1
2
IE(mA)
5
10

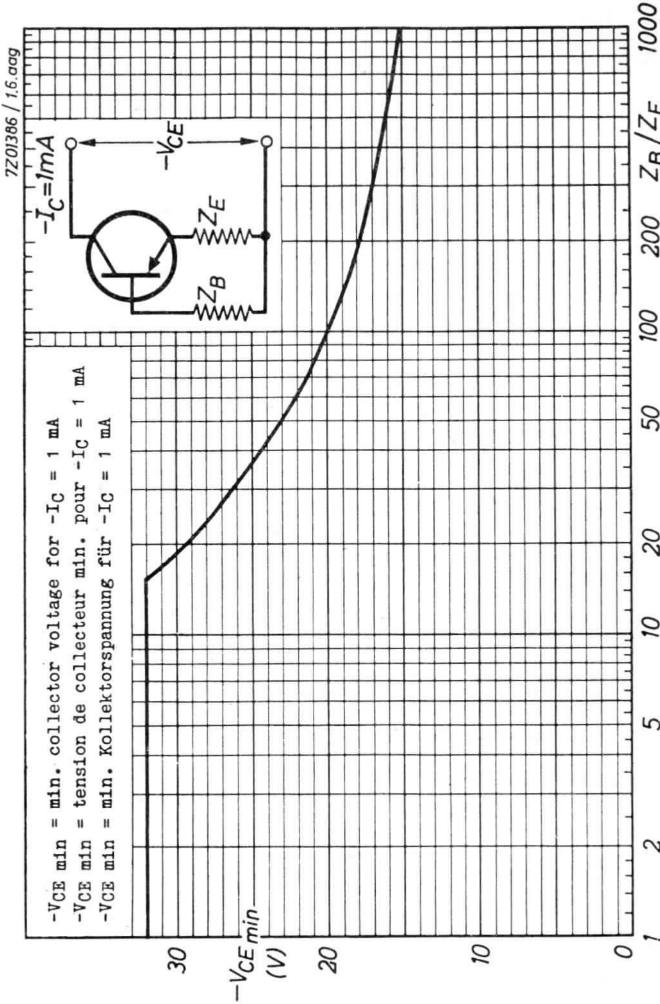
AF117

PHILIPS



D

PHILIPS AF117



PHILIPS

AF118

R.F. GERMANIUM ALLOY-DIFFUSED TRANSISTOR of the p-n-p type for medium power, high voltage, high frequency applications, e.g. in the video output stage of television receivers

LIMITING VALUES (Absolute max. values)

Collector

Voltage (emitter reference) (See also page G)	$-V_{CE}$	= max.	70 V
Current	$-I_C$	= max.	30 mA
Dissipation	P_C	= max.	375 mW

Emitter

Current	I_E	= max.	33 mA
Reverse current	$-I_E$	= max.	1 mA

Base

Current	$-I_B$	= max.	3 mA
Reverse current	I_B	= max.	1 mA

Temperatures

Storage temperature	T_s	=	-55 to +75 °C
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hours)	T_j (t	= max. = max.	90 °C 200 hrs)

THERMAL DATA

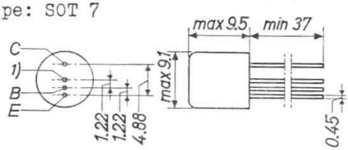
Thermal resistance from junction

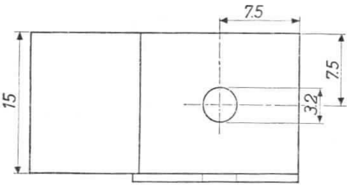
to ambience in free air	K	= max.	0.25 °C/mW
with cooling fin	K	= max.	0.12 °C/mW

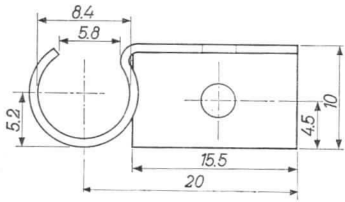
AF118 PHILIPS

Dimensions in mm

Envelope: SOT 7







Cooling fin
No. R1 338 29.0
Painted black

<u>CHARACTERISTICS</u> at T_{amb} = 25 °C

Collector voltage			
$-V_{CB}$ ($-I_C$ = 1 mA; I_E = 0 mA)	=	95 V	> 70 V
Emitter voltage			
$-V_{EB}$ ($-I_E$ = 50 μA; I_C = 0 mA)	=	1.5 V	> 0.5 V
Base current			
$-I_B$ (I_E = 10 mA; $-V_{CB}$ = 2 V)	=	55 μA	< 275 μA

<u>REMARK</u>

Driving the transistor into the bottoming knee region results in an excessively high turn-off delay

[1]) Interlead shield and metal case

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN at T_{amb} = 25 °C

Collector current See page B

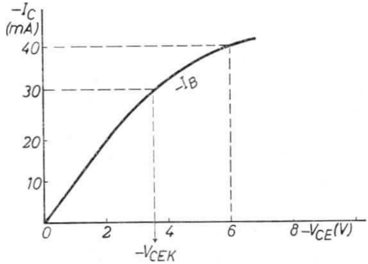
Base voltage

$-V_{BE}$ (I_E = 10 mA; $-V_{CB}$ = 2 V) = < 375 mV

Knee voltage

Measured at $-I_C$ = 30 mA

$-I_B$ = value at which $-I_C$ = 40 mA when $-V_{CE}$ = 6 V



$-V_{CEK}$ = 3.5 V < 5 V

Intrinsic base impedance

$|z_{rb}|$ { I_E = 10 mA; $-V_{CB}$ = 6 V; f = 2 Mc/s } = 30 Ω

Frequency at which $|h_{fe}|$ = 1

f_1 (I_E = 10 mA; $-V_{CB}$ = 6 V) = 175 Mc/s > 125 Mc/s

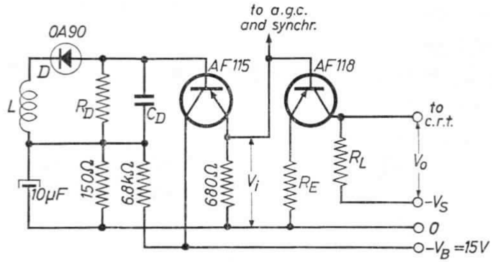
Forward transfer admittance

$|y_{fe}|$ { I_E = 10 mA; $-V_{CB}$ = 6 V; f = 10.7 Mc/s } = 130 mA/V > 100 mA/V

Feedback capacitance

$-c_{re}$ { I_E = 10 mA; $-V_{CB}$ = 6 V; f = 10.7 Mc/s } = 1.8 pF < 2.3 pF

→ OPERATING CHARACTERISTICS in a video output stage for a supply voltage up to 70 V



L = secondary winding of the coupling transformer between last I.F. stage and video detector

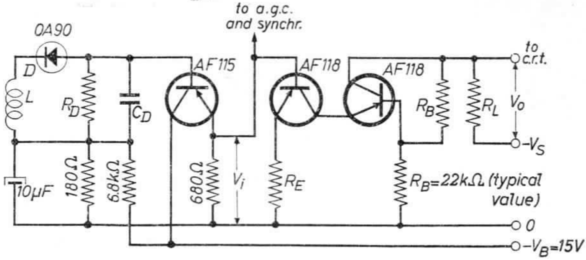
D, R_D, C_D = detection circuit

R_E should be chosen according to $A_v = \frac{V_o}{V_i} \approx \frac{R_L}{R_E}$, in which A_v is the voltage amplication of the output stage

Supply voltage	$-V_S$ =	50	60	70 V
Load resistance	R_L =	2.7	3.9	4.7 kΩ
Output voltage (black to white)	V_o =	32	39	45 V
Bandwidth at -3 dB	B =	6.0	4.1	3.4 Mc/s

If necessary enhancing of the bandwidth by a peaking coil in series with R_L (shunt compensation) or by a peaking coil in series with the lead to the cathode ray tube (series compensation) is possible

OPERATING CHARACTERISTICS in a video output stage for a supply voltage up to 110 V



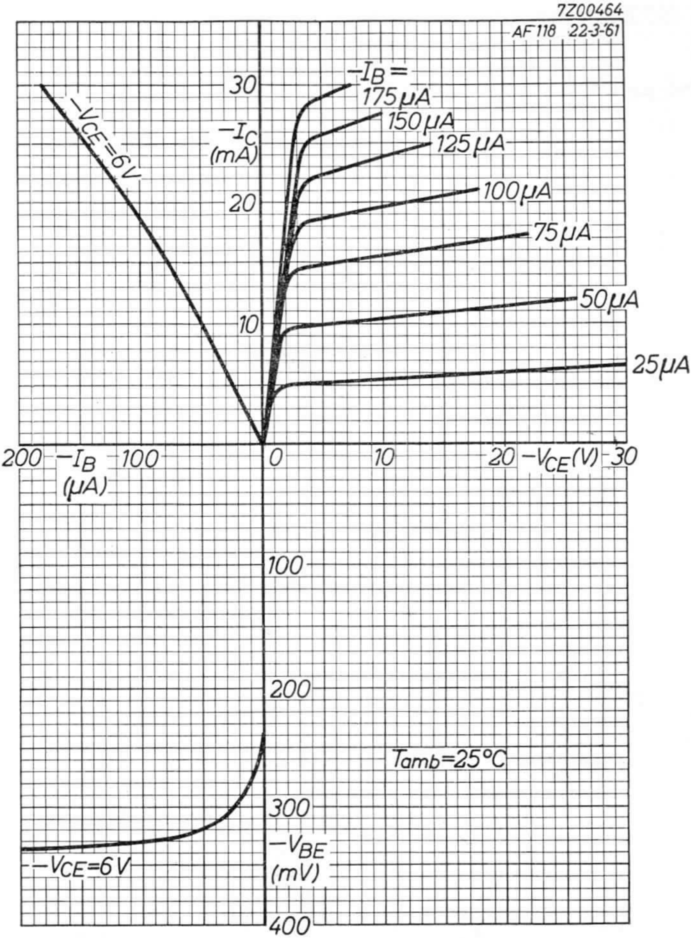
L = secondary winding of the coupling transformer between last I.F. stage and video detector

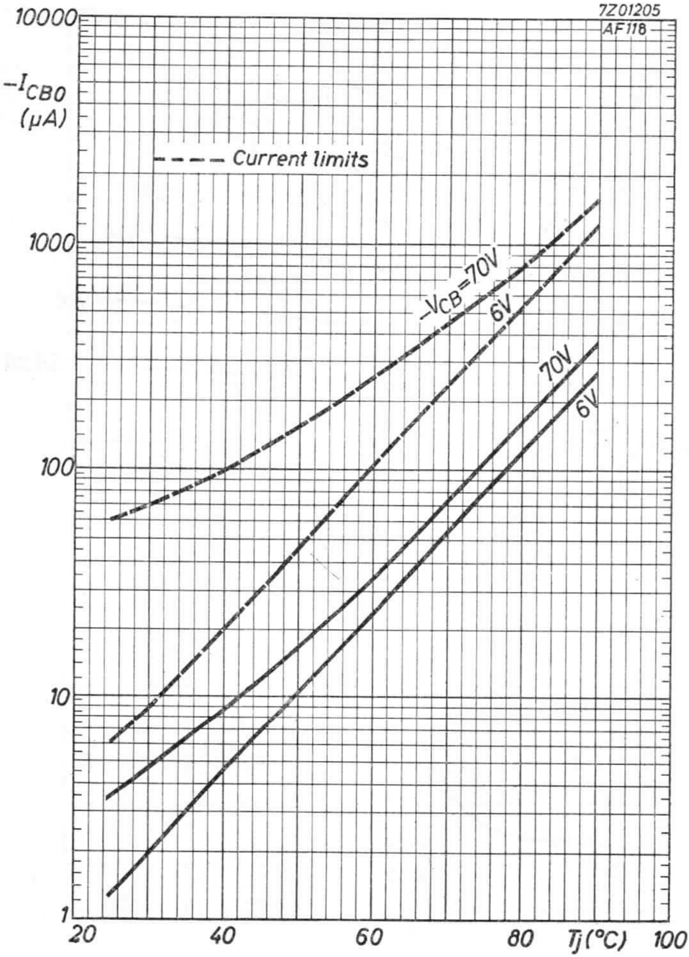
D, R_D, C_D = detection circuit

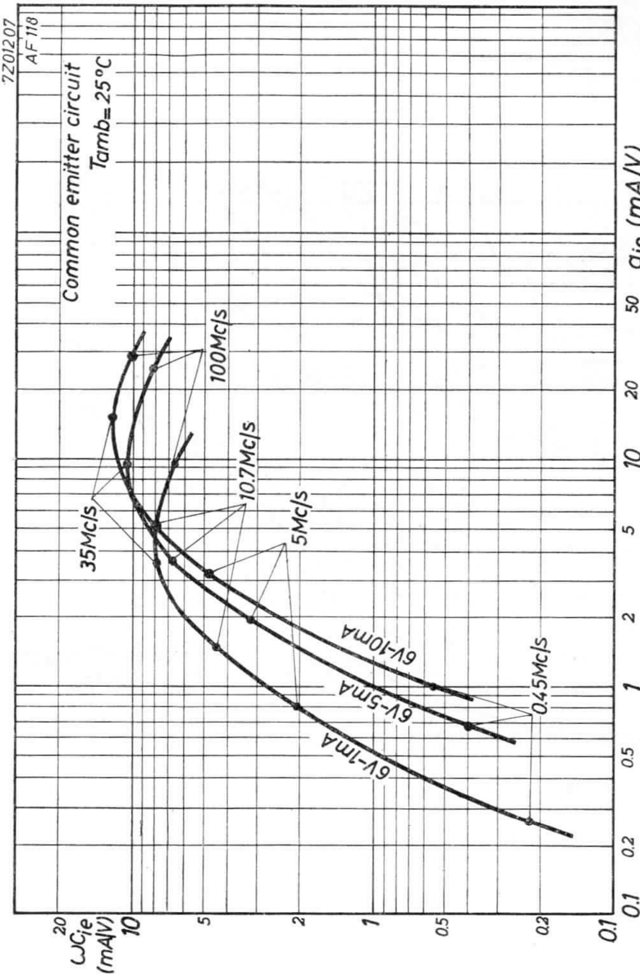
R_E should be chosen according to $A_V = \frac{V_o}{V_i} \approx \frac{1}{R_E} \cdot \frac{2R_B \cdot R_L}{2R_B + R_L}$, in which A_V is the voltage amplification of the output stage

Supply voltage	$-V_S$ =	90	110 V
Load resistance	R_L =	4.7	6.8 kΩ
Output voltage (black to white)	V_o =	57	65 V
Bandwidth at -3 dB	B =	3.5	2.4 Mc/s

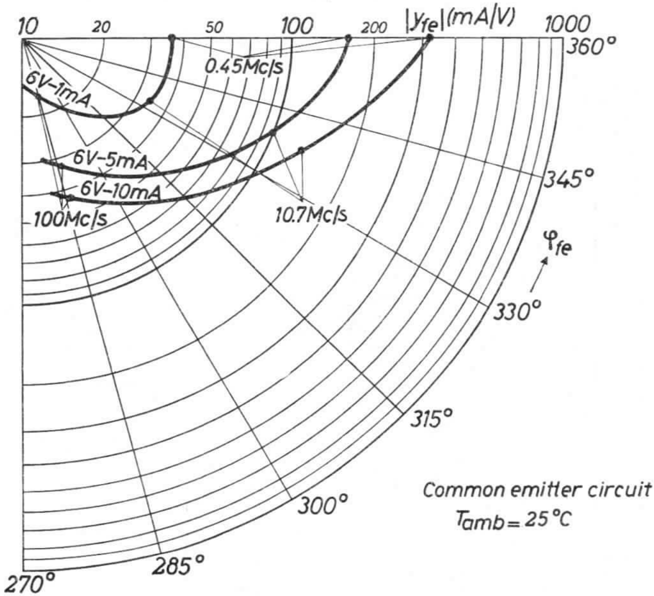
If necessary enhancing of the bandwidth by a peaking coil in series with R_L (shunt compensation) or by a peaking coil in series with the lead to the cathode ray tube (series compensation) is possible


7Z00464
AF 118 22-3-'61
$-I_B =$
175 μA
150 μA
125 μA
100 μA
75 μA
50 μA
25 μA
$-I_C$ (mA)
30
20
10
$-V_{CE}$=6V
200
$-I_B$ (μA)
100
0
10
20
$-V_{CE}$(V)
30
100
200
300
400
$-V_{BE}$ (mV)
T_{amb}=25°C
$-V_{CE}$=6V

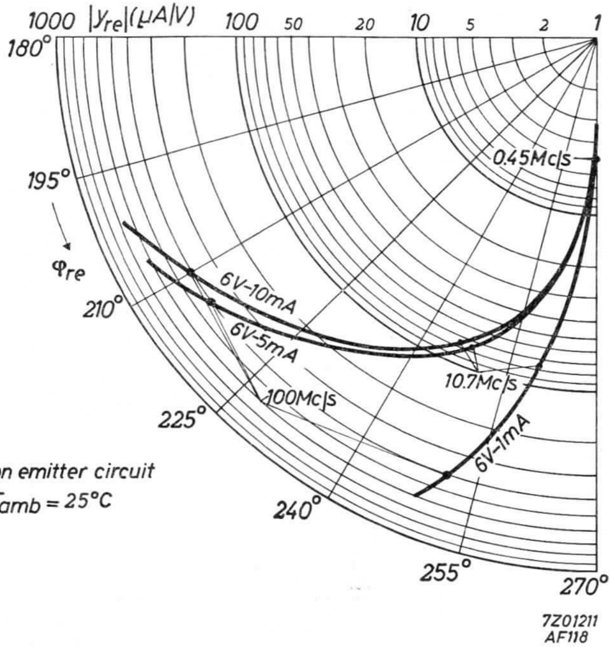

7Z01205
AF118
10000
1000
100
10
1
$-I_{CBO}$ (μA)
- - - - Current limits
$-V_{CB}$=70V
6V
70V
6V
20
40
60
80
100
T_j (°C)


7Z01207
AF118
Common emitter circuit
Tamb = 25°C
g_ie (mA/V)
ωC_ie (mA/V)
100Mc/s
35Mc/s
10.7Mc/s
5Mc/s
0.45Mc/s
6V-10mA
6V-5mA
6V-1mA
0.1
0.2
0.5
1
2
5
10
20
50

PHILIPS

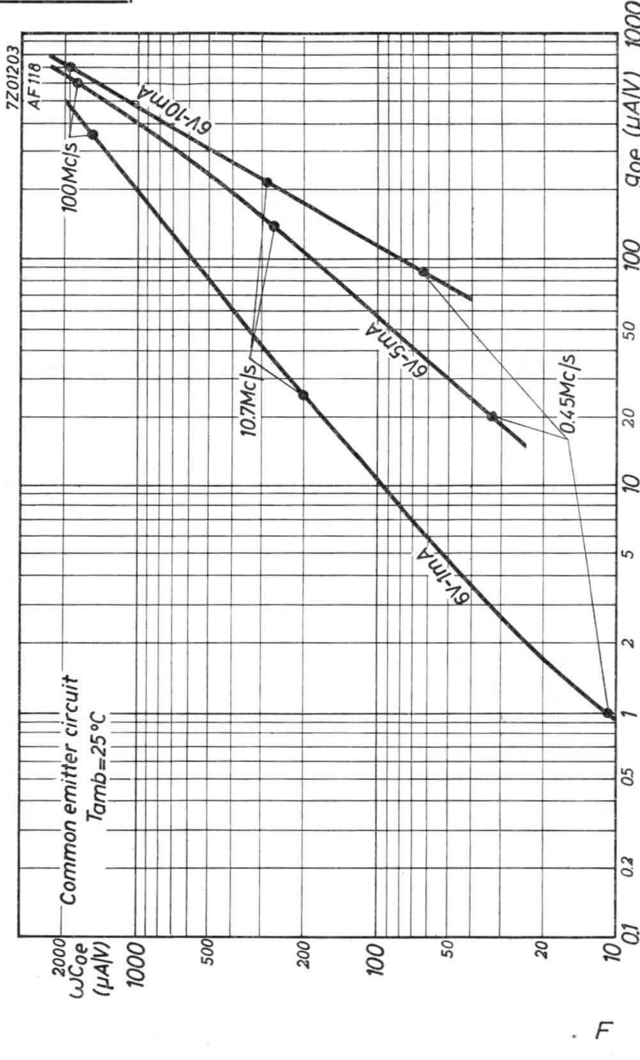


7Z01210
AF118

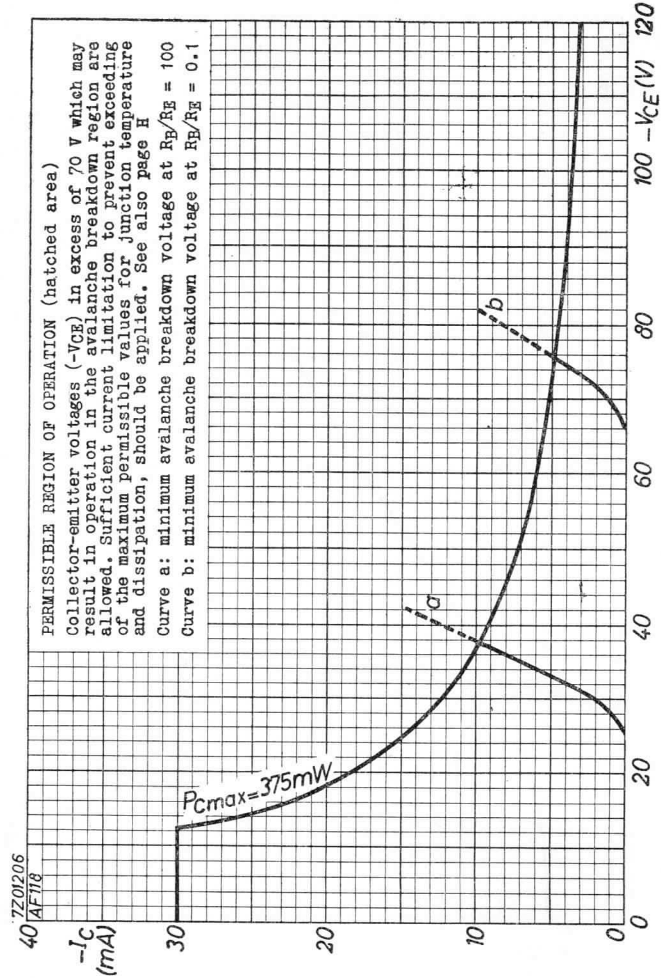


Common emitter circuit
$T_{amb} = 25°C$

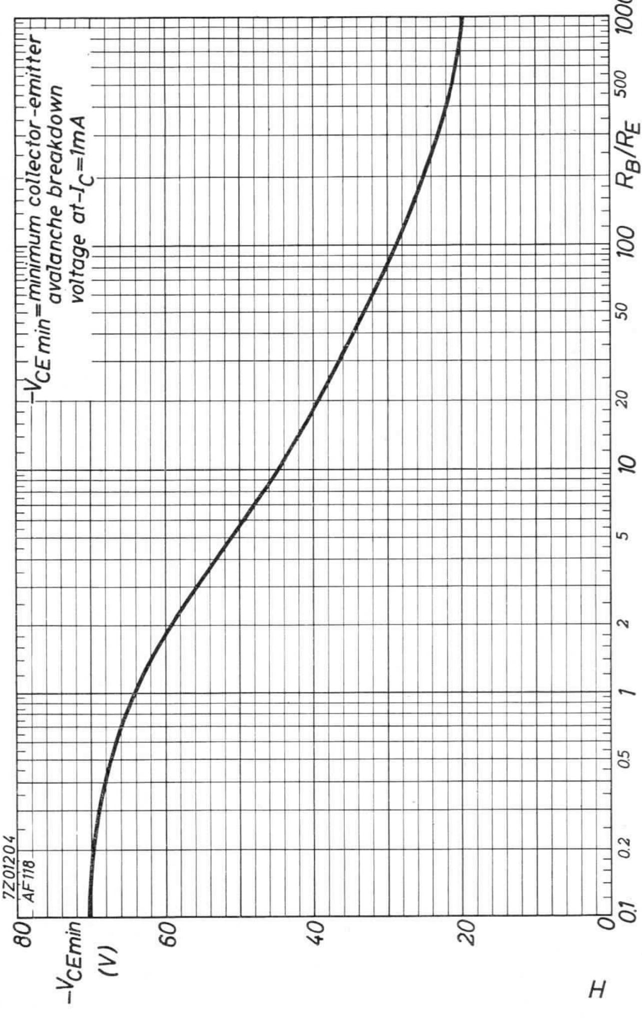
PHILIPS


7Z01203
AF118
Common emitter circuit
Tamb=25°C
100Mc/s
10.7Mc/s
0.45Mc/s
6V-10mA
6V-5mA
6V-1mA
goe (μA/V)
1000
100
50
20
10
5
2
1
0.5
0.2
0.1
ωCoe (μA/V)
2000
1000
500
200
100
50
20
10

F

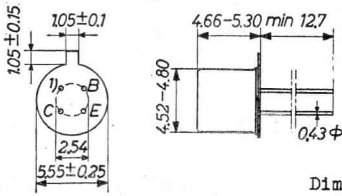

7Z01206
AF118
PERMISSIBLE REGION OF OPERATION (hatched area)
Collector-emitter voltages (-V_{CE}) in excess of 70 V which may result in operation in the avalanche breakdown region are allowed. Sufficient current limitation to prevent exceeding of the maximum permissible values for junction temperature and dissipation, should be applied. See also page H
Curve a: minimum avalanche breakdown voltage at R_B/R_E = 100
Curve b: minimum avalanche breakdown voltage at R_B/R_E = 0.1
P_{Cmax}=375mW
a
b
$-I_C$ (mA)
$-V_{CE}$ (V)
0
10
20
30
40
0
20
40
60
80
100
120

PHILIPS


−V_CE min = minimum collector-emitter avalanche breakdown voltage at −I_C = 1mA
7Z01204
AF118
−V_CEmin (V)
80
60
40
20
0
R_B/R_E
0.1
0.2
0.5
1
2
5
10
20
50
100
500
1000

PHILIPS AF124

GERMANIUM ALLOY-DIFFUSED TRANSISTOR of the p-n-p type in metal envelope with low noise and high power gain at 100 Mc/s, for use as R.F. amplifier in F.M. receivers



Dimensions in mm

LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference)	$-V_{CE}$	= max.	32 V [2]
Current	$-I_C$	= max.	10 mA
Dissipation	P_C	= max.	60 mW

Emitter

Reverse current	$-I_E$	= max.	1 mA

Base

Current	$\|I_B\|$	= max.	1 mA

Temperatures

Storage temperature	T_S	= -55 °C to +75 °C	
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hrs)	T_j	= max.	90 °C
	(t	= max.	200 hrs)

THERMAL DATA

Thermal resistance from junction to ambience in free air   K = max. 0.75 °C/mW

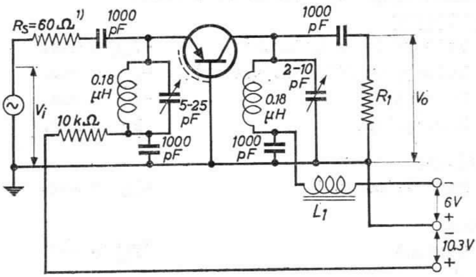
[1]) Interlead shield and metal case

[2]) See also page F.

CHARACTERISTICS at T_{amb} = 25 °C

Collector current at I_E = 0 mA		
$-I_{CBO}$ ($-V_{CB}$ = 6 V; I_E = 0 mA)	= 1.2 µA	< 8 µA
Collector voltage at I_E = 0 mA		
$-V_{CB}$ ($-I_C$ = 50 µA; I_E = 0 mA)		> 32 V
Base current		
$-I_B$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 7 µA	< 25 µA
Base voltage		
$-V_{BE}$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 270 mV	> 210 mV < 330 mV

Test circuit for power gain at 100 Mc/s



R_1 is chosen so that the total impedance R_L of the tuned circuit is 3.3 kΩ

L_1 = ferrite bead

Available power gain at 100 Mc/s in the circuit above

G (f = 100 Mc/s) = 14 dB > 12.5 dB

The available power gain is defined as

$$G = \frac{V_o^2}{V_i^2} \cdot \frac{4R_S}{R_L} = 0.073 \frac{V_o^2}{V_i^2} .$$

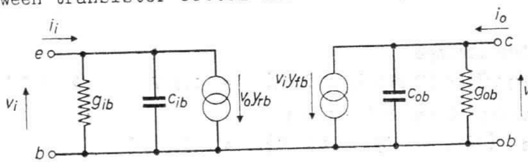
[1]) Input source impedance

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

$T_{amb} = 25\ ^\circ C$

Emitter voltage			
$-V_{EB}$ ($-I_E$ = 50 µA; I_C = 0 mA)	=	1.5 V	> 1.0 V
Frequency at which $\lvert h_{fe} \rvert = 1$			
f_1 ($-V_{CB}$ = 6 V; I_E = 1 mA)	=	75 Mc/s	
Intrinsic base impedance			
$\lvert z_{rb} \rvert$ ($-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s)	=	20 Ω	
Feedback capacitance			
$-c_{re}$ ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 0.45 Mc/s)	=	1.5 pF	
Current amplification factor			
h_{fe} ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s)	=	150	
Noise figure			
F ($-V_{CB}$ = 6 V; I_E = 1 mA; f = 100 Mc/s; Input source resistance = 60 Ω)	=	8 dB	< 9.5 dB

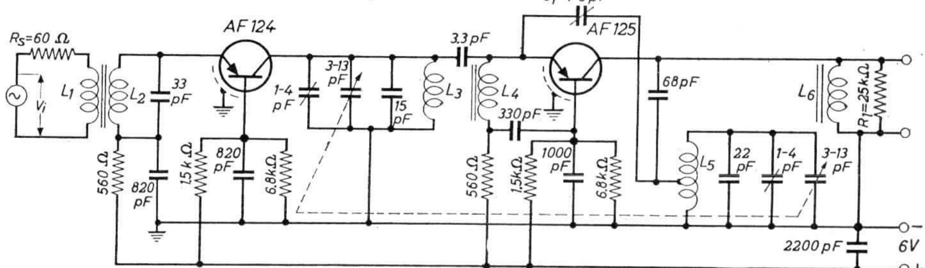
SMALL SIGNAL PARAMETERS measured with a length of lead between transistor bottom and measuring jig of 5 mm



Measured at

Collector voltage	$-V_{CB}$ =	6 V
Emitter current	I_E =	1 mA
Frequency	f =	100 Mc/s
Input conductance	g_{ib} =	15 mA/V
Input capacitance	$-c_{ib}$ =	5 pF
Feedback admittance	$\lvert y_{rb}\rvert$ =	0.45 mA/V
Phase angle of feedback admittance	φ_{rb} =	250 °
Transfer admittance	$\lvert y_{fb}\rvert$ =	16 mA/V
Phase angle of transfer admittance	φ_{fb} =	95 °
Output conductance	g_{ob} =	0.3 mA/V
Output capacitance	c_{ob} =	2.5 pF

FRONT-END UNIT OF F.M. TUNER



For data of the oscillator-mixer stage please refer to the data sheets of type AF125

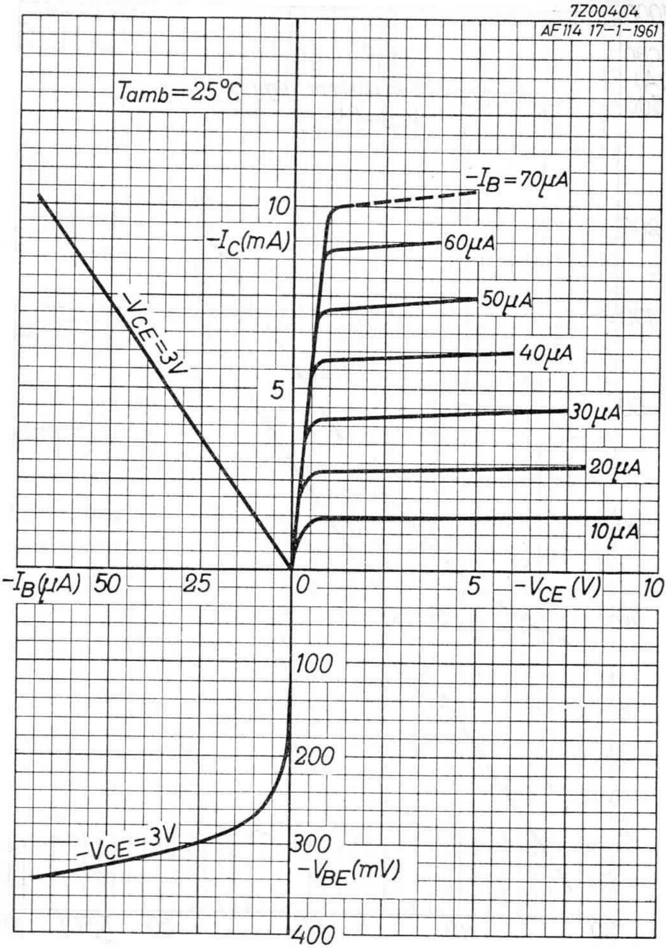
Coil data. L_1: $4\frac{1}{2}$ turns of 0.3 mm enamelled copper wire, wound between L_2

L_2: 4 turns of 1 mm enamelled copper wire, winding pitch 2 mm; inductance L = 0.18 µH; unloaded Q-factor Q_o = 60 to 80

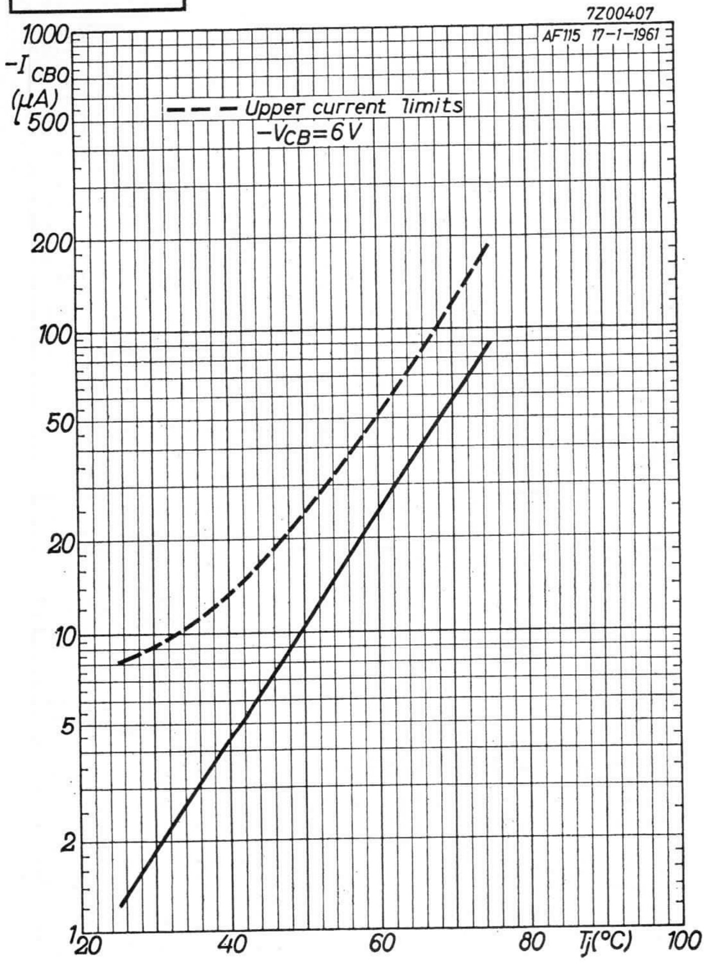
L_3: $3\frac{1}{4}$ turns of 1 mm silvered copper wire, winding pitch 2 mm; inductance L = 0.086 µH; unloaded Q-factor Q_o = 200

Operating characteristics

Frequency range	f	=	87 to 101 Mc/s	
Collector current AF124	$-I_C$	=	1.4 mA	
Total available power gain	G	=	28 dB	> 24 dB
Total noise factor	F	=	8 dB	< 9.5 dB
Oscillator voltage at aerial terminals		=	1.5 mV	
Image rejection		=	27 dB	


7Z00404
AF 114 17-1-1961
Tamb=25°C
-IB=70µA
60µA
50µA
40µA
30µA
20µA
10µA
10
5
-IC(mA)
-VCE=3V
-IB(µA) 50
25
0
5
-VCE (V)
10
100
200
300
-VBE(mV)
400
-VCE=3V

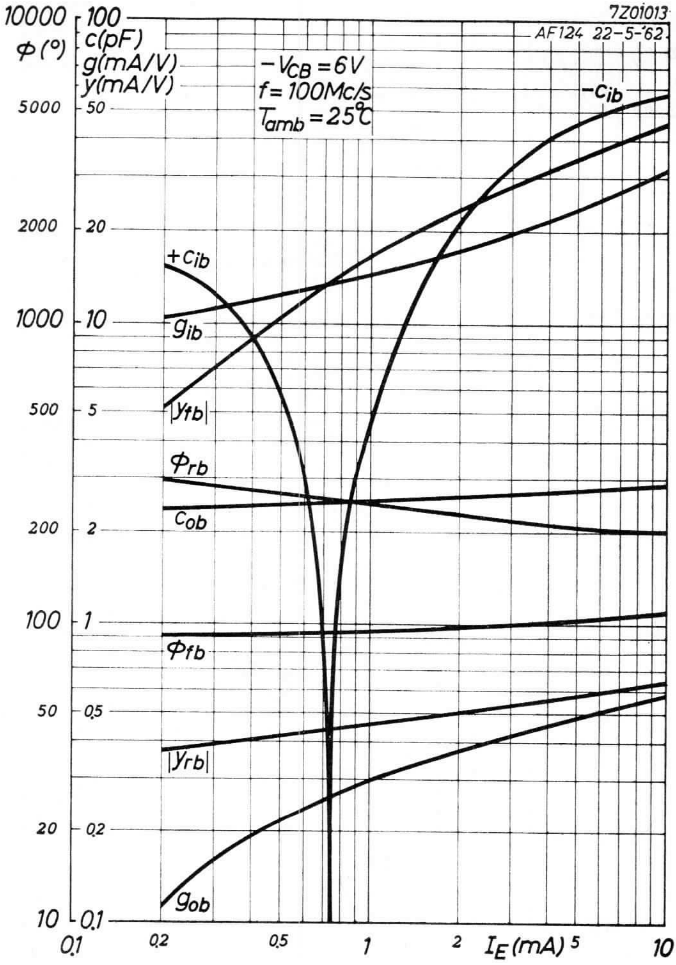
PHILIPS


7Z00407
AF115 17-1-1961
1000
$-I_{CBO}$
(μA)
500
200
100
50
20
10
5
2
1
20
40
60
80
T_j(°C)
100
Upper current limits
$-V_{CB}$=6 V

B

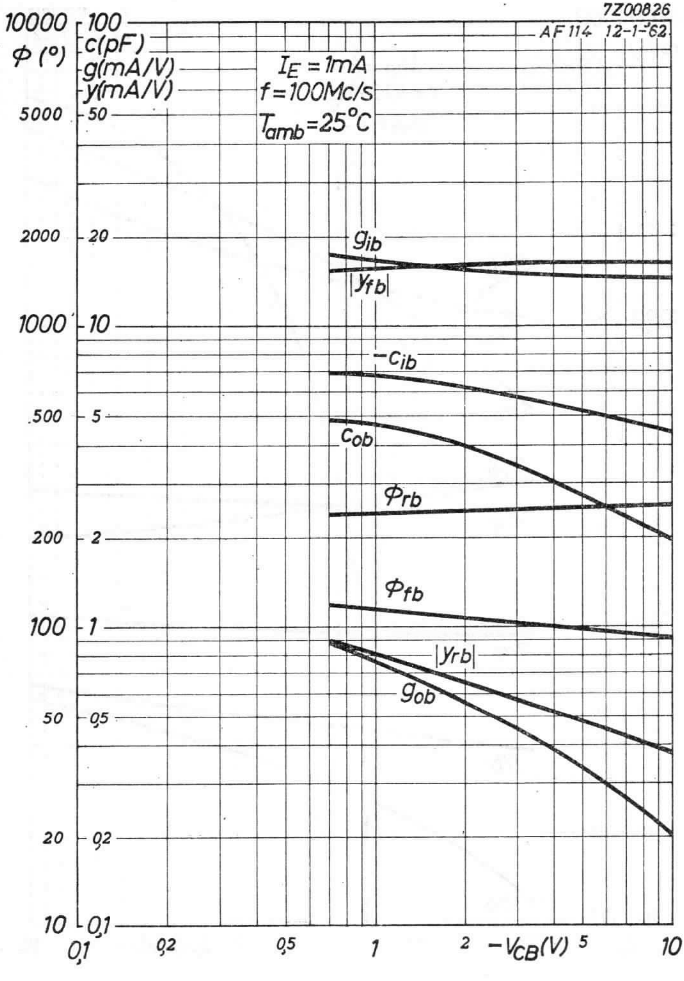
PHILIPS

AF124

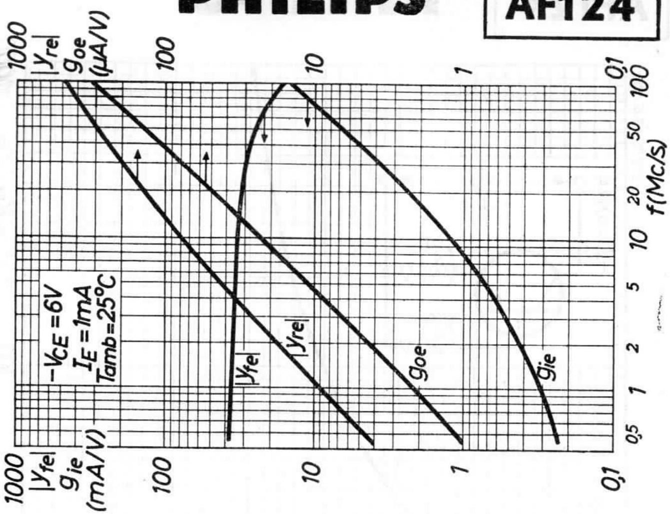


AF124

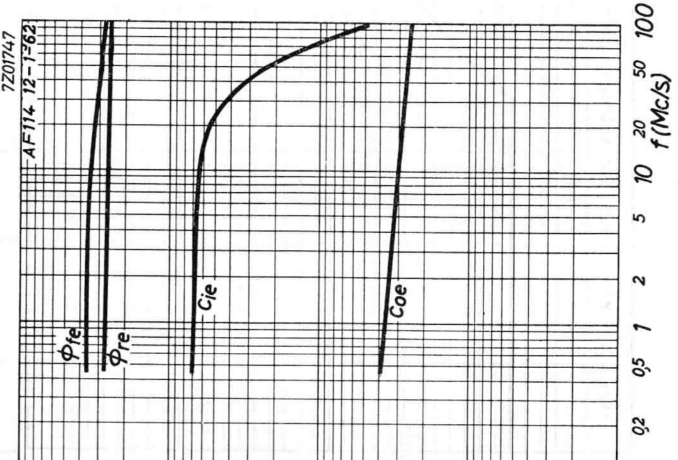
PHILIPS



D

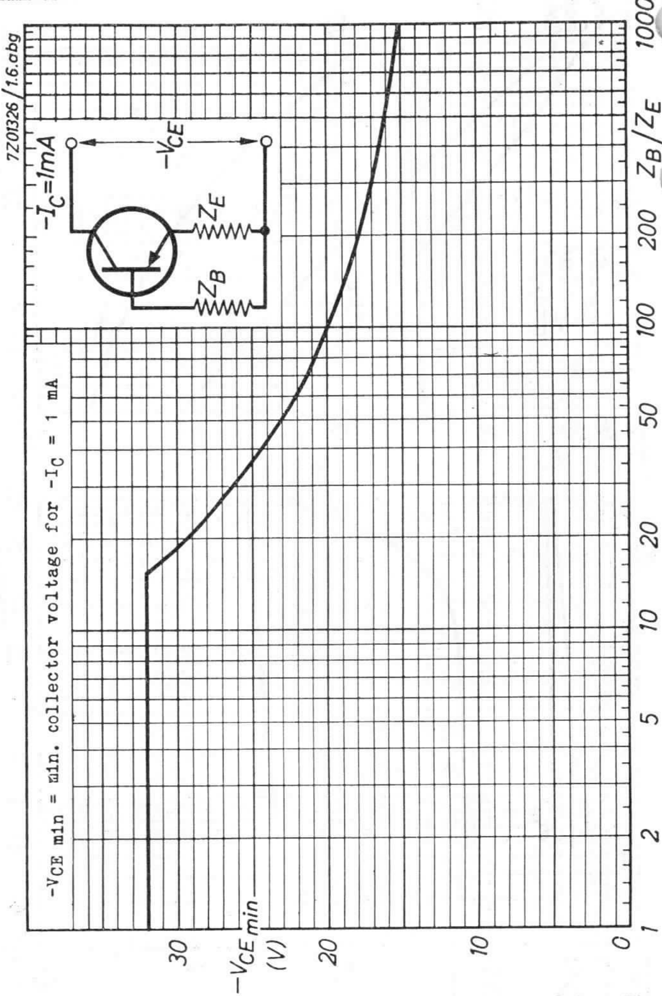


$|y_{re}|$ g_{oe} (μA/V)
$|y_{fe}|$ g_{ie} (mA/V)
$-V_{CE}$ = 6V
I_E = 1mA
T_{amb} = 25°C
$|y_{fe}|$
$|y_{re}|$
g_{oe}
g_{ie}
f (Mc/s)



φ (°)
c (pF)
7Z01747
AF114 12-1-'62
φ_{fe}
φ_{re}
C_{ie}
C_{oe}
f (Mc/s)

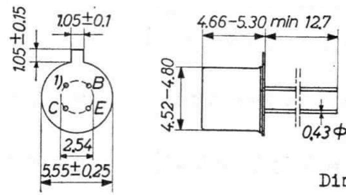
AF124 PHILIPS



PHILIPS

AF125

GERMANIUM ALLOY-DIFFUSED TRANSISTOR of the p-n-p type in metal envelope with high conversion gain up to 100 Mc/s, for use as mixer-oscillator in F.M. receivers and as R.F. amplifier and mixer-oscillator in short-wave receivers up to 27 Mc/s



Dimensions in mm

LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference)	$-V_{CE}$	= max.	32 V 2)
Current	$-I_C$	= max.	10 mA
Dissipation	P_C	= max.	60 mW

Emitter

Reverse current	$-I_E$	= max.	1 mA

Base

Current	$\|I_B\|$	= max.	1 mA

Temperatures

Storage temperature	T_s	= -55 °C to +75 °C	
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hrs)	T_j	= max.	90 °C
	(t	= max.	200 hrs)

THERMAL DATA

Thermal resistance from junction to ambience in free air K = max. 0.75 °C/mW

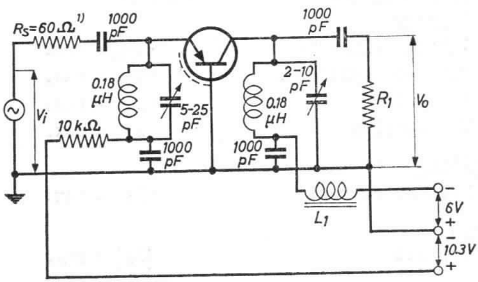
1) Interlead shield and metal case

2) See also page J.

CHARACTERISTICS at Tamb = 25 °C

Collector current at I_E = 0 mA		
$-I_{CBO}$ ($-V_{CB}$ = 6 V; I_E = 0 mA)	= 1.2 µA	< 8 µA
Collector voltage at I_E = 0 mA		
$-V_{CB}$ ($-I_C$ = 50 µA; I_E = 0 mA)		> 32 V
Base current		
$-I_B$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 7 µA	< 25 µA
Base voltage		
$-V_{BE}$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 270 mV	> 210 mV < 330 mV

Test circuit for power gain at 100 Mc/s



R_1 is chosen so that the total impedance R_L of the tuned circuit is 3.3 kΩ

L_1 = ferrite bead

Available power gain at 100 Mc/s in the circuit above

G (f = 100 Mc/s)	= 13 dB	> 10 dB

The available power is defined as

$$G = \frac{V_o^2}{V_i^2} \cdot \frac{4R_S}{R_L} = 0.073\ \frac{V_o^2}{V_i^2} \cdot$$

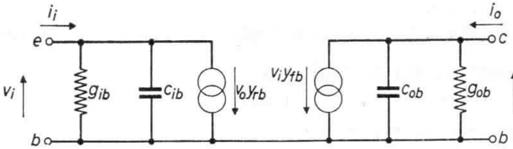
1) Input source impedance

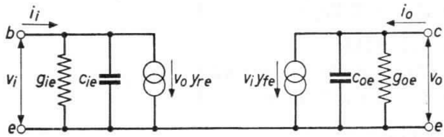
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C

Parameter	Conditions	Typical	Limit
Emitter voltage $-V_{EB}$	($-I_E$ = 50 μA; I_C = 0 mA)	= 1.5 V	> 1.0 V
Frequency at which $\|h_{fe}\|$ = 1, f_1	($-V_{CB}$ = 6 V; I_E = 1 mA)	= 75 Mc/s	
Intrinsic base impedance $\|z_{rb}\|$	$-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s	= 25 Ω	
Feedback capacitance $-c_{re}$	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 0.45 Mc/s	= 1.5 pF	
Current amplification factor h_{fe}	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s	= 150	
Noise figure F	$-V_{CB}$ = 6 V; I_E = 1 mA; f = 100 Mc/s; Input source resistance = 60 Ω	= 9.5 dB	
Noise figure F	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 10.7 Mc/s; Input source resistance = 200 Ω	= 3.0 dB	
Noise figure F	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω	= 1.5 dB	< 3 dB
Conversion noise figure F	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω	= 3 dB	< 5 dB
Conversion noise figure F	$-V_{CE}$ = 6 V; I_E = 1 mA; f = 200 kc/s; Input source resistance = 2 kΩ	= 4 dB	< 7 dB

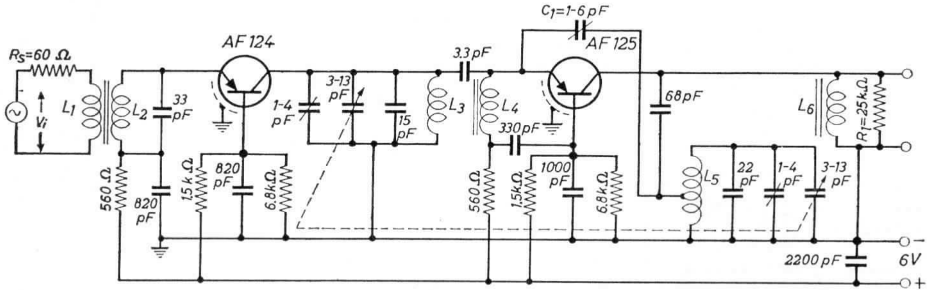
Small signal parameters measured with a length of lead between transistor bottom and measuring jig of 5 mm





Common base		Common emitter		Common emitter	
$-V_{CB}$ =	6 V	$-V_{CE}$ =	6 V	$-V_{CE}$ =	6 V
I_E =	1 mA	I_E =	1 mA	I_E =	1 mA
f =	100 Mc/s	f =	10.7 Mc/s	f =	0.45 Mc/s
g_{ib} =	15 mA/V	g_{ie} =	1.3 mA/V	g_{ie} =	0.25 mA/V
→ $-c_{ib}$ =	5 pF	c_{ie} =	65 pF	c_{ie} =	70 pF
$\lvert y_{rb}\rvert$ =	0.45 mA/V	$\lvert y_{re}\rvert$ =	80 µA/V	$\lvert y_{re}\rvert$ =	4 µA/V
φ_{rb} =	250 °	φ_{re} =	260 °	φ_{re} =	270 °
$\lvert y_{fb}\rvert$ =	15 mA/V	$\lvert y_{fe}\rvert$ =	34 mA/V	$\lvert y_{fe}\rvert$ =	37 mA/V
φ_{rb} =	95 °	φ_{fe} =	335 °	φ_{fe} =	0 °
g_{ob} =	0.35 mA/V	g_{oe} =	25 µA/V	g_{oe} =	1.0 µA/V
c_{ob} =	2.5 pF	c_{oe} =	3.0 pF	c_{oe} =	4 pF

FRONT-END UNIT OF F.M. TUNER



For data of the R.F. stage please refer to the data sheets of type AF124

The oscillator voltage at the emitter of the AF125 should be adjusted to 80 mV by means of C_1 at a battery voltage V_S = 4 V

Coil data. L_4: 6 turns of 0.5 mm enamelled copper wire, closely wound; inductance L = 0.65 µH

L_5: $2\frac{1}{2}$ turns of 1 mm silvered copper wire, winding pitch 2 mm; inductance L = 0.062 µH unloaded Q-factor Q_o > 200. Tap at $1\frac{1}{8}$ turn from the earth side

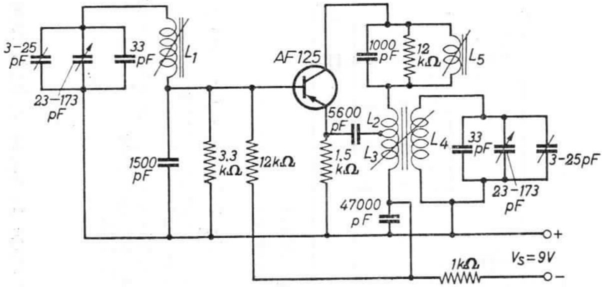
L_6: 18 turns of 36 x 0.03 copper wire, enamelled, soldering graded, stranded, open covered, closely wound; inductance L = 2.9 µH; unloaded Q-factor Q_o = 120; Q-factor loaded with 25 kΩ = 60. Screening can A3 304 20

Operating characteristics

Collector current AF125	$-I_C$ =	1.5 mA
Oscillator voltage at the aerial terminals	=	1.5 mV

Shift of the oscillator frequency as a function of the battery voltage is about 50 kc/s from 6 to 5 V and about 100 kc/s from 5 to 4 V

SELF-OSCILLATING MIXER STAGE for the frequency range from 15.1 to 26.1 Mc/s



OPERATING CHARACTERISTICS measured at

Battery voltage	V_S	= 9 V
Collector voltage	$-V_{CE}$	= 6 V
Emitter current	I_E	= 1 mA

f	V_{osc} 1)	Δf_{osc} 2)	P_o/P_i 3)
(Mc/s)	(V)	(kc/s)	(dB)
15	0.11	3	26
20	0.14	2	23
26	0.15	10	20

For coil data see page 7

1) Oscillator voltage, measured between emitter and earth

2) Frequency shift by a battery voltage variation from 9 to 6 V

3) Conversion gain, defined as the ratio between the I.F. power in a 10 kΩ load (the total I.F. impedance in the collector lead) and the available R.F. power in the aerial circuit

SELF-OSCILLATING MIXER STAGE (continued)

Coil data.

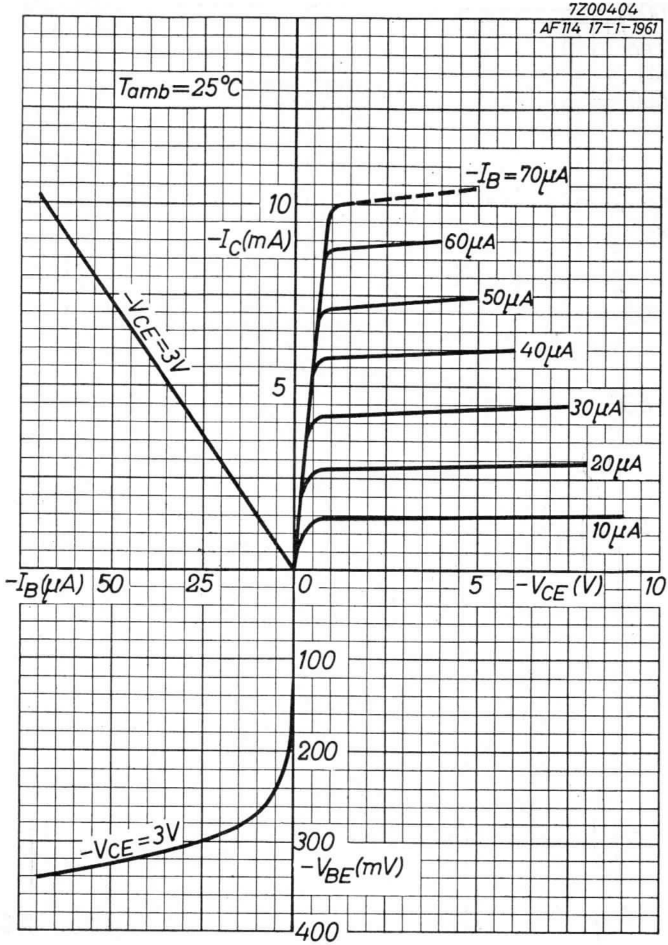
L_1: $5\frac{1}{2}$ turns of 0.25 mm enamelled copper wire, closely wound on coil former with diameter of 7 mm; inductance L = 0.59 µH; unloaded Q-factor Q_o = 100 at f = 15 Mc/s, Q_o = 115 at f = 26 Mc/s

L_2: $1\frac{1}{4}$ turns of 0.25 mm enamelled copper wire, wound in L_4 at earth side

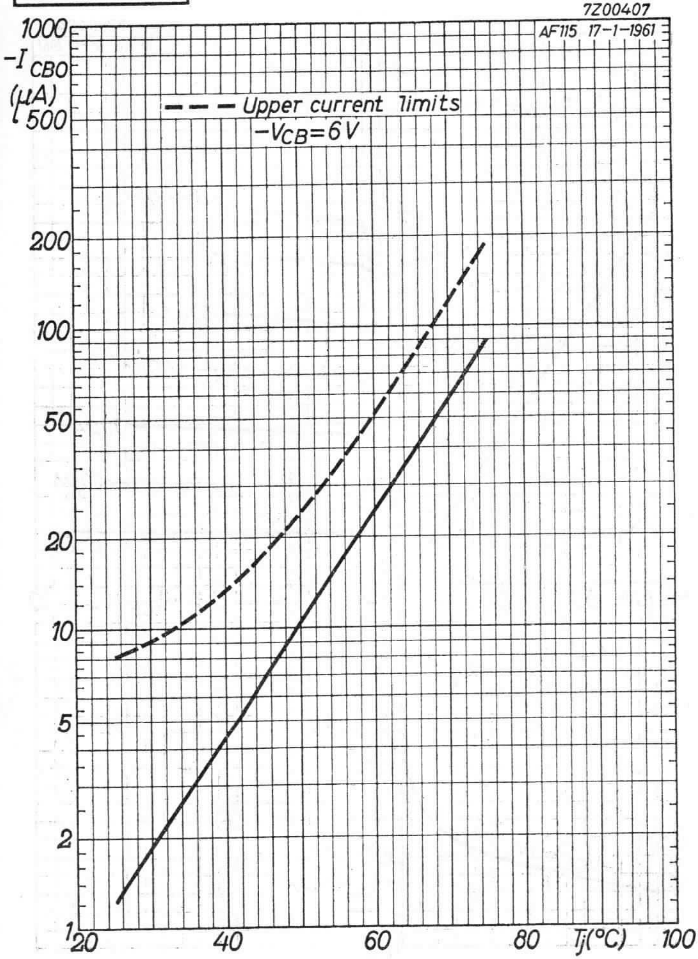
L_3: 1 turn of 0.25 mm enamelled copper wire, wound in L_4 at earth side

L_4: $6\frac{1}{2}$ turns of 0.9 mm enamelled copper wire, closely wound on coil former with diameter of 7 mm; inductance L = 0.46 µH; unloaded Q-factor Q_o = 110 at f = 15 Mc/s and at f = 26 Mc/s

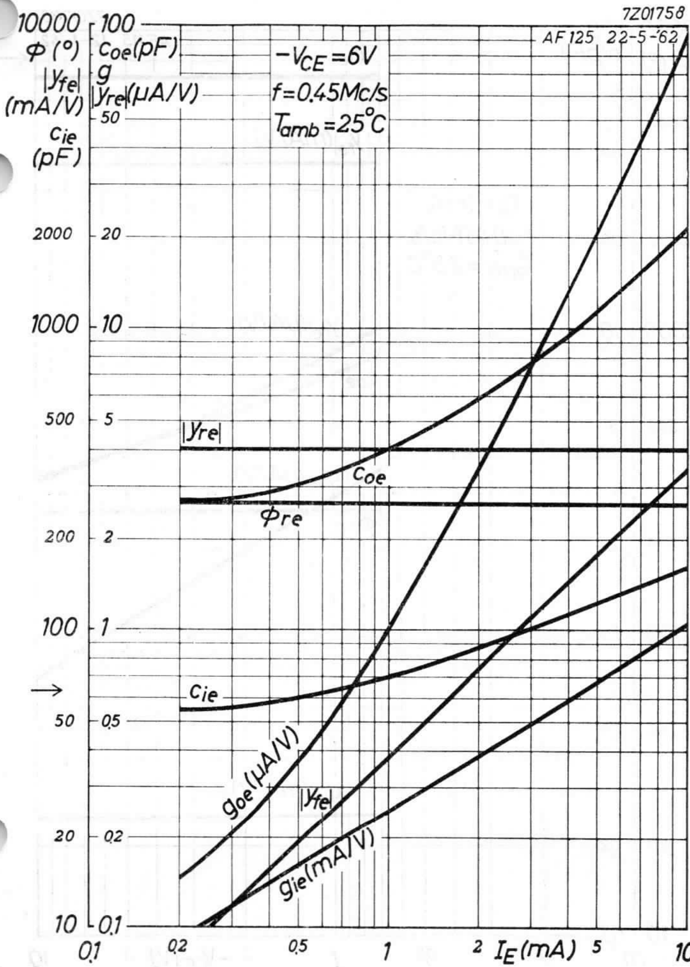
L_5: Inductance L = 125 µH; unloaded Q-factor Q_o = 140


7Z00404
AF114 17-1-1961
T_{amb}=25°C
$-I_B$=70μA
60μA
50μA
40μA
30μA
20μA
10μA
10
5
$-I_C$(mA)
$-V_{CE}$=3V
$-I_B$(μA) 50
25
0
5
$-V_{CE}$ (V)
10
100
200
300
400
$-V_{BE}$(mV)
$-V_{CE}$=3V

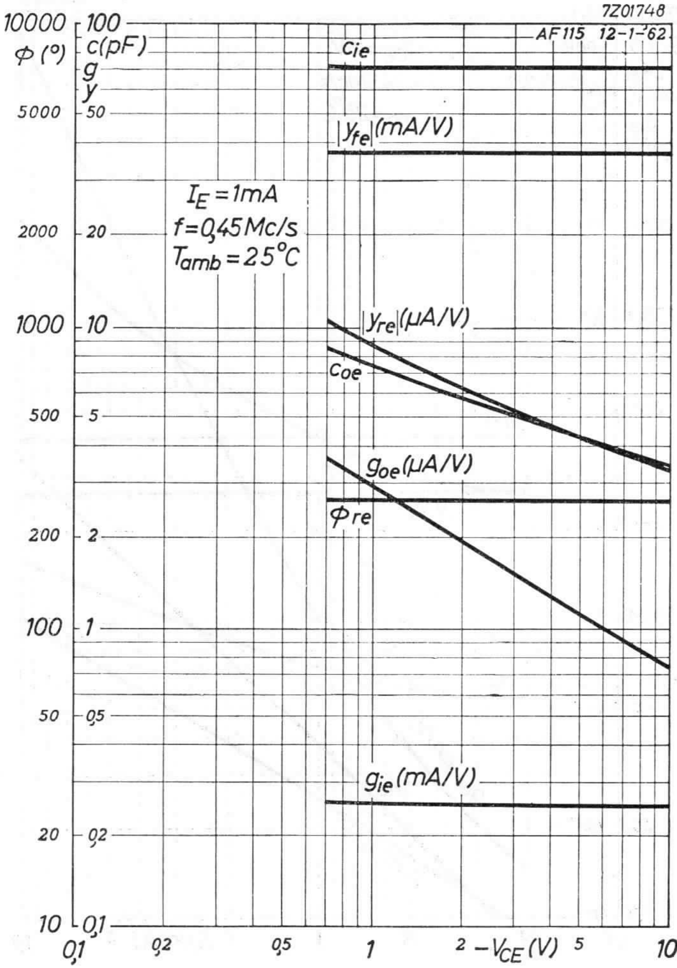
AF125 PHILIPS



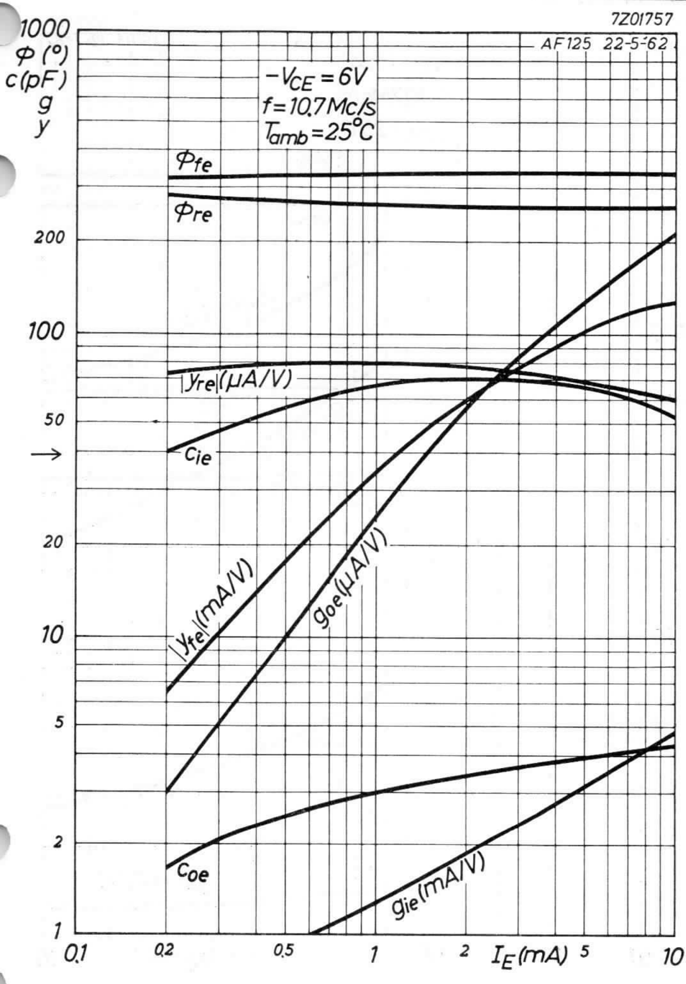
B


7Z01758
AF 125 22-5-'62
$-V_{CE}$ = 6V
f = 0.45Mc/s
T_{amb} = 25°C
10000
Φ (°)
$|y_{fe}|$
(mA/V)
c_{ie}
(pF)
100
C_{oe}(pF)
g
$|y_{re}|$(μA/V)
50
2000
20
1000
10
500
5
200
2
100
1
50
0.5
20
0.2
10
0.1
0.1
0.2
0.5
1
2
I_E(mA)
5
10
$|y_{re}|$
C_{oe}
Φ_{re}
c_{ie}
g_{oe}(μA/V)
$|y_{fe}|$
g_{ie}(mA/V)

AF125 PHILIPS

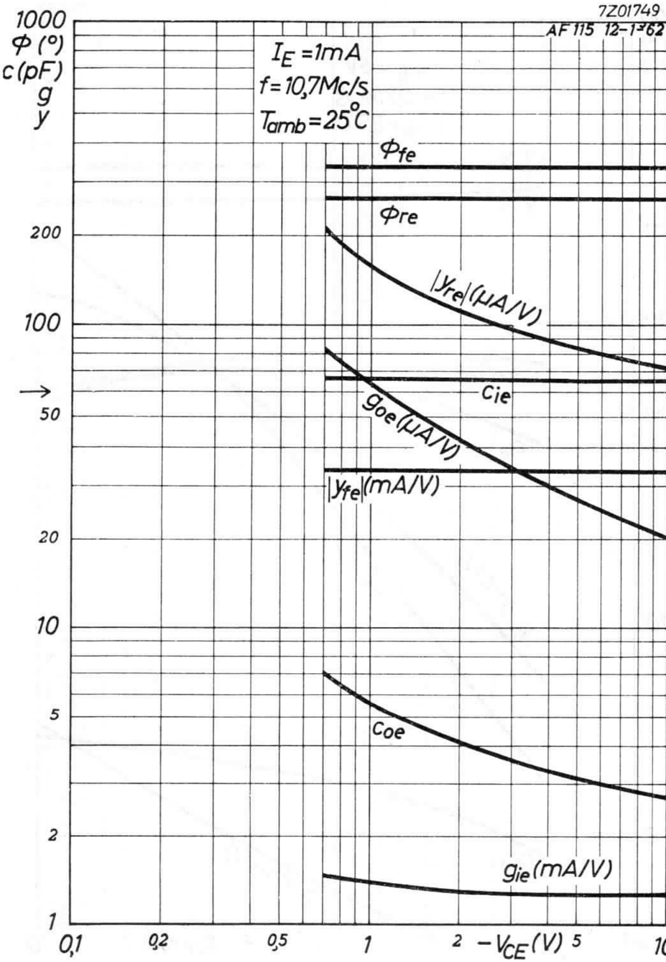


D

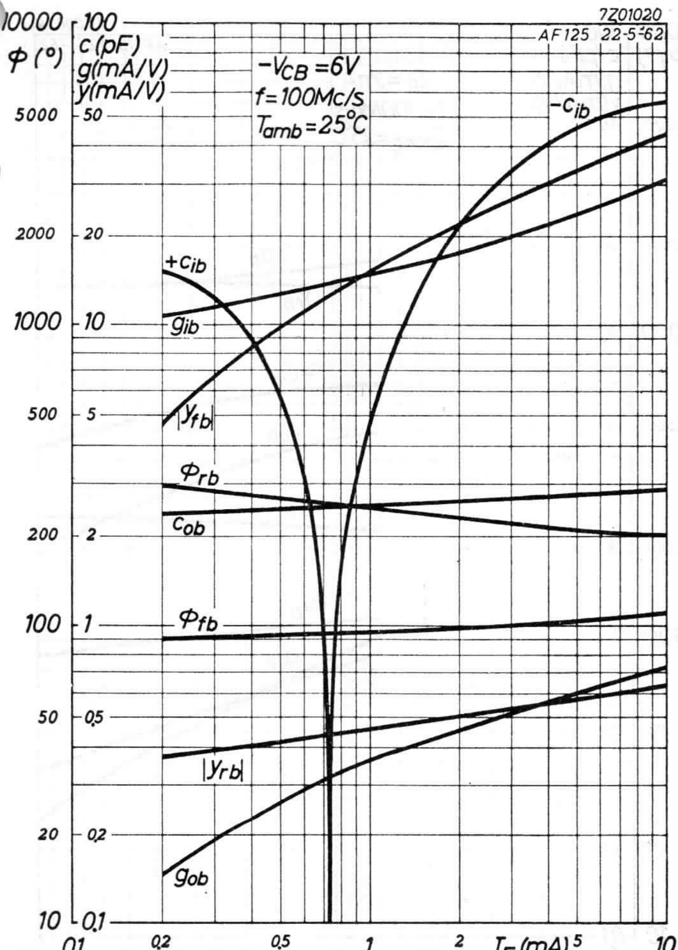

7Z01757
AF125 22-5-62
1000
φ (°)
c (pF)
g
y
200
100
50
20
10
5
2
1
0.1
0.2
0.5
1
2
5
10
I_E (mA)
$-V_{CE} = 6V$
f = 10.7 Mc/s
$T_{amb} = 25°C$
φ_{fe}
φ_{re}
$|y_{re}|$ (μA/V)
c_{ie}
$|y_{fe}|$ (mA/V)
g_{oe} (μA/V)
c_{oe}
g_{ie} (mA/V)

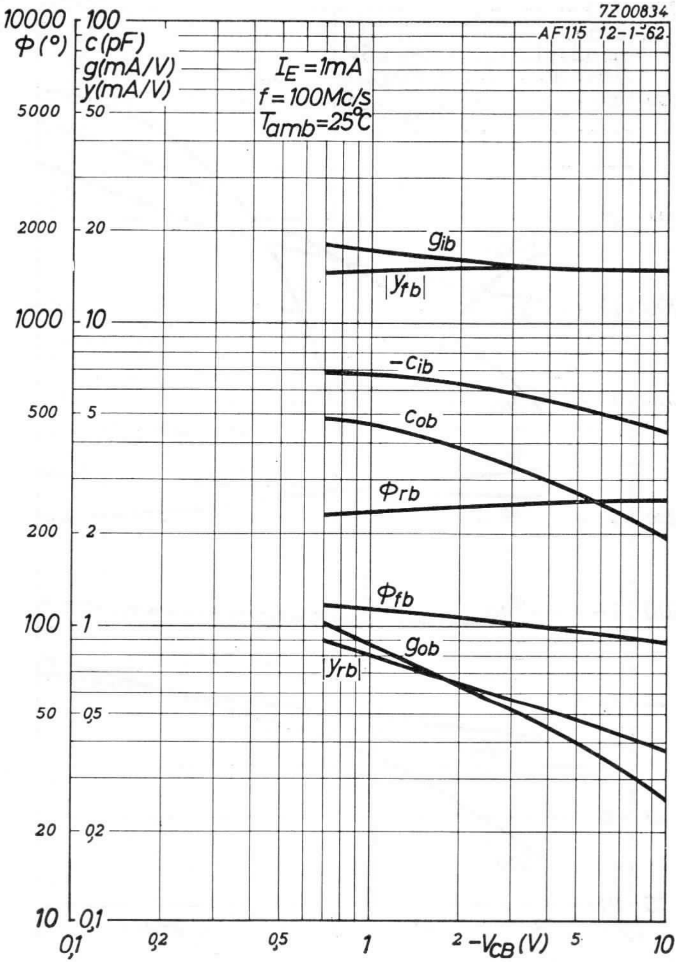
AF125

PHILIPS



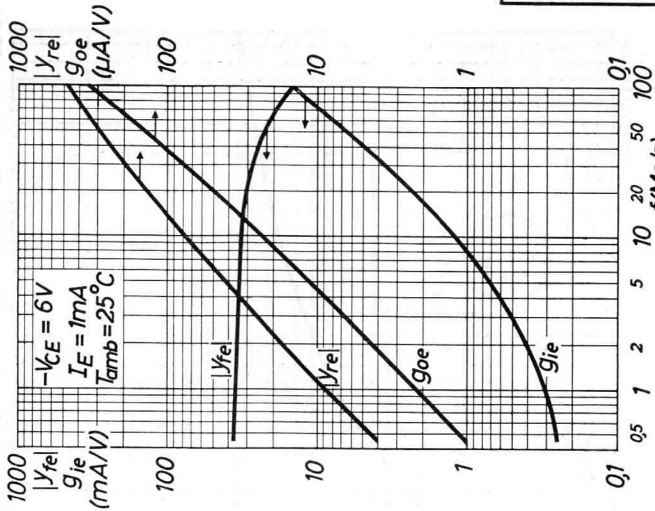
F

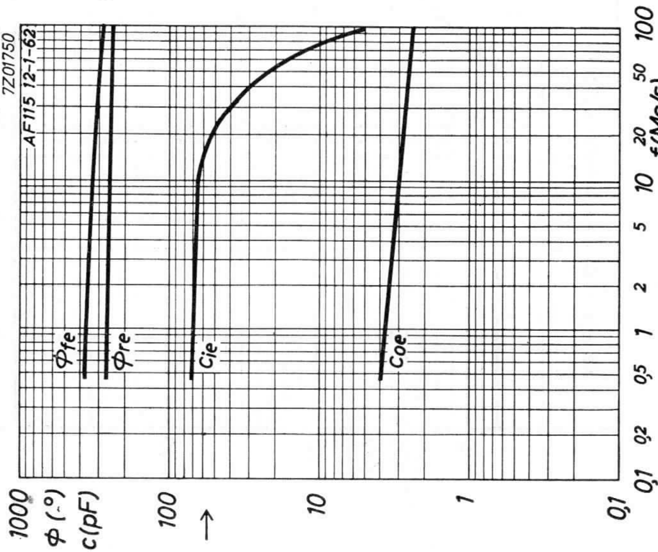

7Z01020
AF125 22-5-62
10000
φ (°)
5000
2000
1000
500
200
100
50
20
10
100
c (pF)
g(mA/V)
y(mA/V)
50
20
10
5
2
1
0,5
0,2
0,1
−V_CB = 6V
f = 100Mc/s
T_amb = 25°C
−c_ib
+c_ib
g_ib
|y_fb|
φ_rb
c_ob
φ_fb
|y_rb|
g_ob
0,1
0,2
0,5
1
2
I_E (mA) 5
10


7Z00834
AF115 12-1-'62
10000
Φ (°)
100
c (pF)
g(mA/V)
y(mA/V)
5000
50
2000
20
1000
10
500
5
200
2
100
1
50
0,5
20
0,2
10
0,1
I_E = 1mA
f = 100Mc/s
T_{amb} = 25°C
g_{ib}
$|y_{fb}|$
$-c_{ib}$
c_{ob}
φ_{rb}
φ_{fb}
g_{ob}
$|y_{rb}|$
0,1
0,2
0,5
1
2
$-V_{CB}$ (V)
5
10

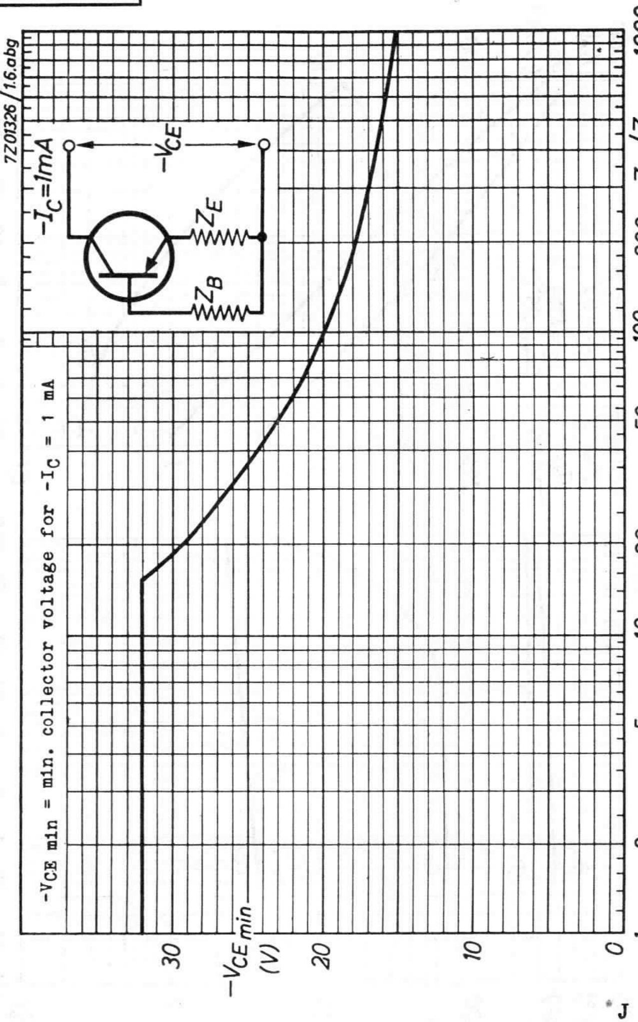
PHILIPS

AF125





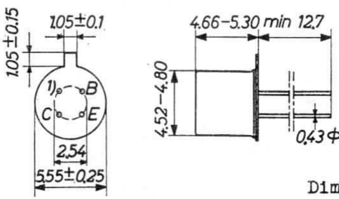
AF125 PHILIPS



J

PHILIPS AF126

GERMANIUM ALLOY-DIFFUSED TRANSISTOR of the p-n-p type in metal envelope with low output conductance and low collector capacitance at 10.7 Mc/s and with low noise and good A.G.C. performance at high ambient temperatures, for use as I.F. amplifier in A.M. and F.M. receivers and as R.F. amplifier and mixer-oscillator in short-wave receivers up to 16 Mc/s



Dimensions in mm

LIMITING VALUES (Absolute max. values)

Collector			
Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference)	$-V_{CE}$	= max.	32 V [2]
Current	$-I_C$	= max.	10 mA
Dissipation	P_C	= max.	60 mW
Emitter			
Reverse current	$-I_E$	= max.	1 mA
Base			
Current	$\lvert I_B \rvert$	= max.	1 mA
Temperatures			
Storage temperature	T_s	=	-55 °C to +75 °C
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hrs)	T_j	= max.	90 °C
	(t	= max.	200 hrs)

THERMAL DATA

Thermal resistance from junction to ambience in free air	K	= max.	0.75 °C/mW

[1]) Interlead shield and metal case

[2]) See also page H

7Z2 1524
12.12.1962

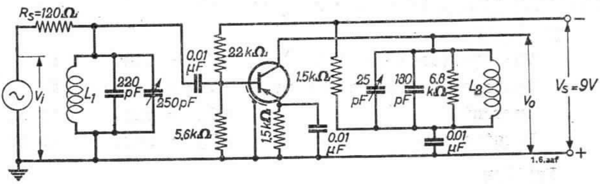
Tentative data.

AF126 PHILIPS

CHARACTERISTICS at T_{amb} = 25 °C

Collector current at I_E = 0 mA			
$-I_{CBO}$ ($-V_{CB}$ = 6 V; I_E = 0 mA)	= 1.2 µA	<	8 µA
Collector voltage at I_E = 0 mA			
$-V_{CB}$ ($-I_C$ = 50 µA; I_E = 0 mA)		>	32 V
Base current			
$-I_B$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 7 µA	<	25 µA
Base voltage			
$-V_{BE}$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 270 mV	> 210 mV < 330 mV	

Test circuit for power gain at 10.7 Mc/s



L_1: inductance L = 0.5 µH; unloaded Q-factor Q_o = 100

L_2: inductance L = 2.47 µH; unloaded Q-factor Q_o = 100

R_S: input source resistance

R_L: total collector resistance = 4.8 kΩ

Available power gain at 10.7 Mc/s in the circuit above

G (f = 10.7 Mc/s)	= 25 dB	>	19 dB

The available power gain is defined as

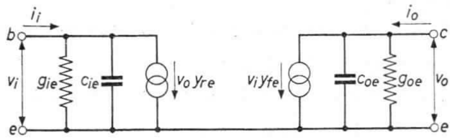
$$G = \frac{4R_S}{R_L}\frac{V_o^2}{V_i^2} = 0.1\frac{V_o^2}{V_i^2}$$

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C

Emitter voltage			
$-V_{EB}$ ($-I_E$ = 50 µA; I_C = 0 mA)	=	1.5 V	> 1.0 V
Frequency at which $\vert h_{fe}\vert$ = 1			
f_1 ($-V_{CB}$ = 6 V; I_E = 1 mA)	=	75 Mc/s	
Intrinsic base impedance			
$\vert z_{rb}\vert$ ($-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s)	=	27 Ω	
Feedback capacitance			
$-c_{re}$ ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 0.45 Mc/s)	=	1.5 pF	
Current amplification factor			
h_{fe} ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s)	=	150	
Noise figure			
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 10.7 Mc/s; Input source resistance = 200 Ω)	=	3.0 dB	< 4.5 dB
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω)	=	1.5 dB	< 3 dB
Conversion noise figure			
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω)	=	3 dB	< 5 dB
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 200 kc/s; Input source resistance = 2 kΩ)	=	4 dB	< 7 dB

Small signal parameters measured with a length of lead between transistor bottom and measuring jig of 5 mm



Measured in common emitter circuit at

Collector voltage $-V_{CE}$ = 6 V

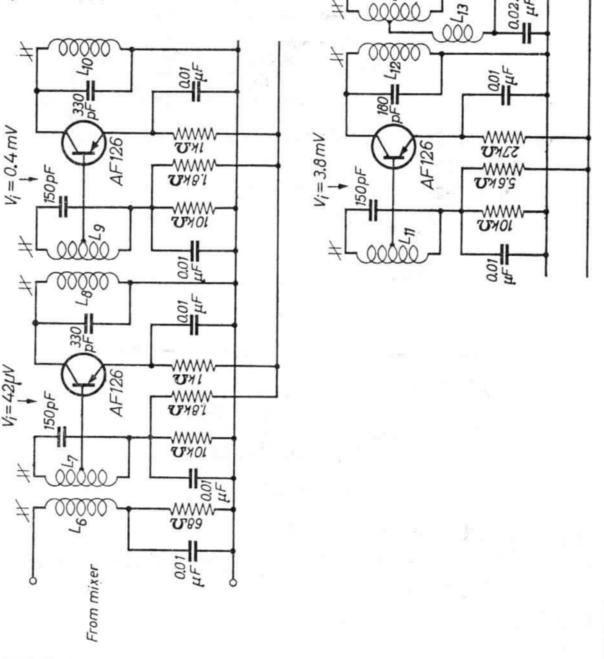
Emitter current I_E = 1 mA

Frequency	f = 10.7 Mc/s	f = 0.45 Mc/s
Input conductance	g_{ie} = 1.7 mA/V	g_{ie} = 0.25 mA/V
Input capacitance	c_{ie} = 60 pF	c_{ie} = 70 pF
Feedback admittance	$\|y_{re}\|$ = 0.1 mA/V	$\|y_{re}\|$ = 4.0 µA/V
Phase angle of feedback admittance	φ_{re} = 260 °	φ_{re} = 270°
Transfer admittance	$\|y_{fe}\|$ = 32 mA/V	$\|y_{fe}\|$ = 37 mA/V
Phase angle of transfer admittance	φ_{fe} = 335 °	φ_{fe} = 0 °
Output conductance	g_{oe} = 40 µA/V	g_{oe} = 1.0 µA/V
Output capacitance	c_{oe} = 3.5 pF	c_{oe} = 4.0 pF

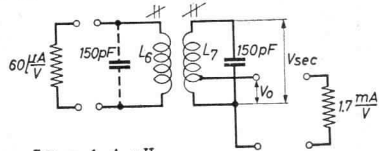
I.F. AMPLIFIER FOR 10.7 Mc/s

I_E of each transistor = 1.0 mA

For coil data please refer to page 6



COIL DATA (See page 5)



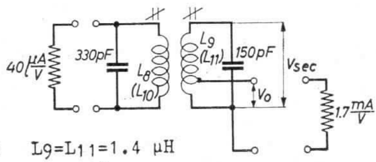
$L_6 = 1.4\ \mu H$ $L_7 = 1.4\ \mu H$

$Q_o \geqq 120$ $Q_o \geqq 110$

$Q_L = 70$ $Q_L = 92$

$KQ_L = 1.25$

$$\frac{V_o}{V_{sec}} = 0.1$$



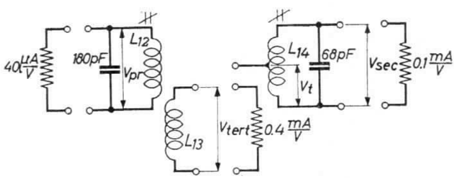
$L_8 = L_{10} = 0.67\ \mu H$ $L_9 = L_{11} = 1.4\ \mu H$

$Q_o \geqq 110$ $Q_o \geqq 110$

$Q_L = 92$ $Q_L = 92$

$KQ_L = 1.25$

$$\frac{V_o}{V_{sec}} = 0.1$$

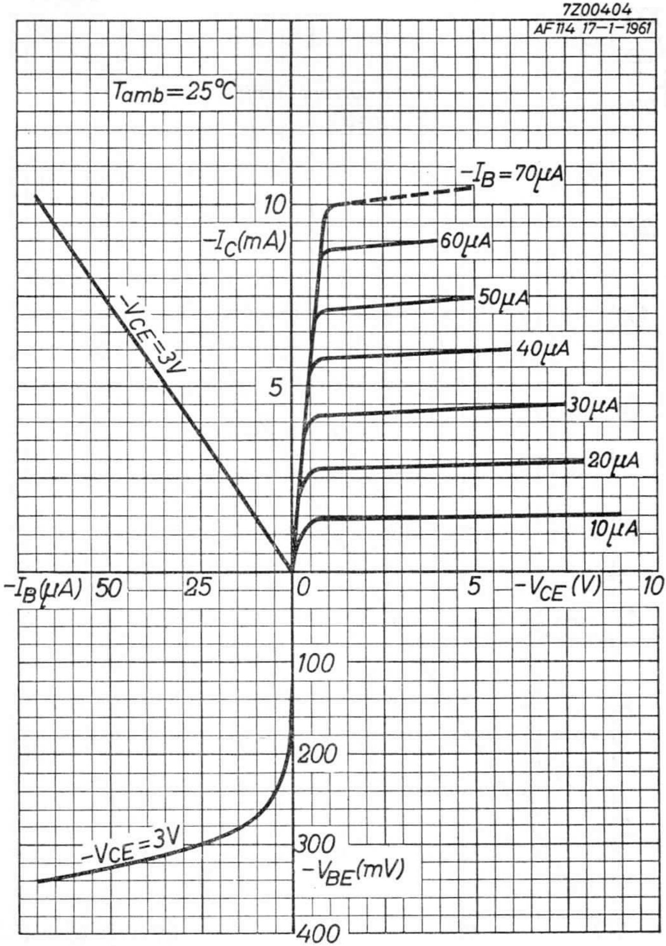


$L_{12} = 1.2\ \mu H$ $L_{14} = 3.05\ \mu H$

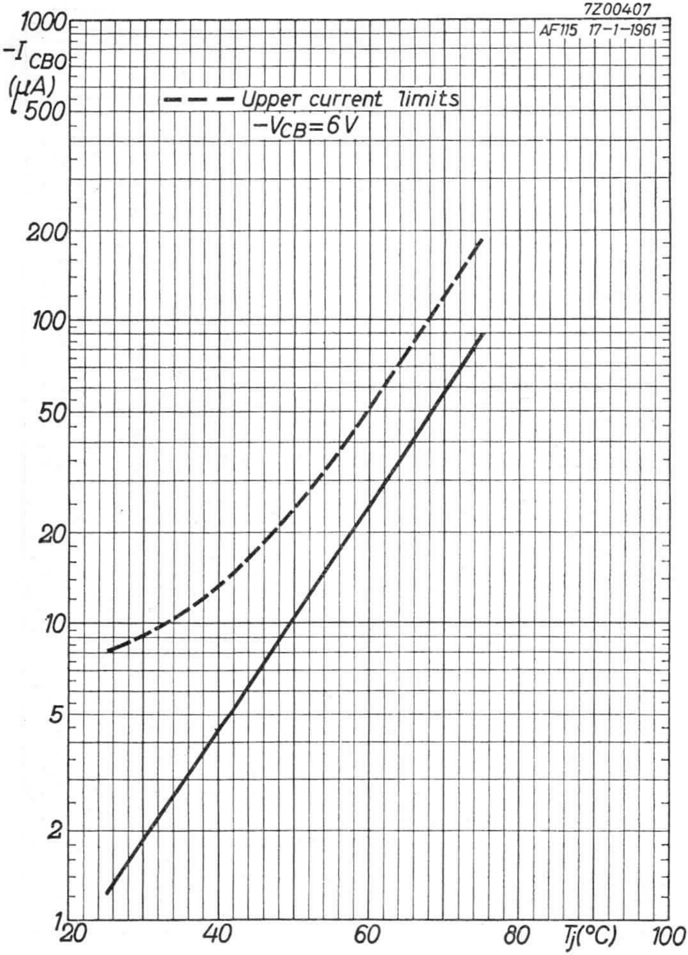
$Q_o \geqq 90$ $Q_o \geqq 90$ L_{14} is bifilarly wound

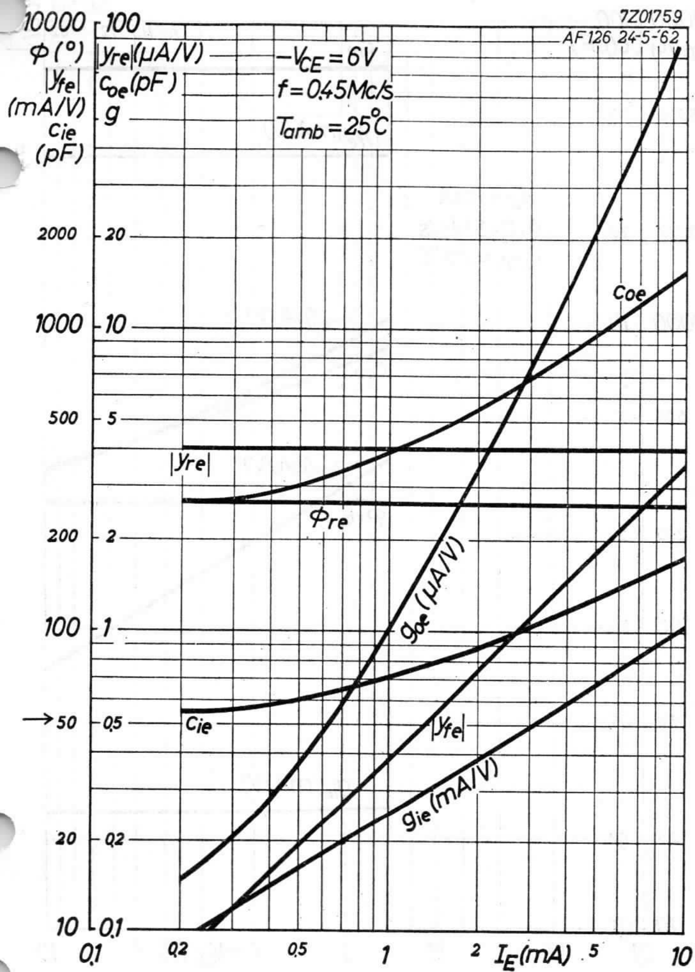
$KQ_L = 0.7$

$$\frac{V_{tert}}{V_{pr}} = 0.45 \qquad \frac{V_t}{V_{sec}} = 0.5$$

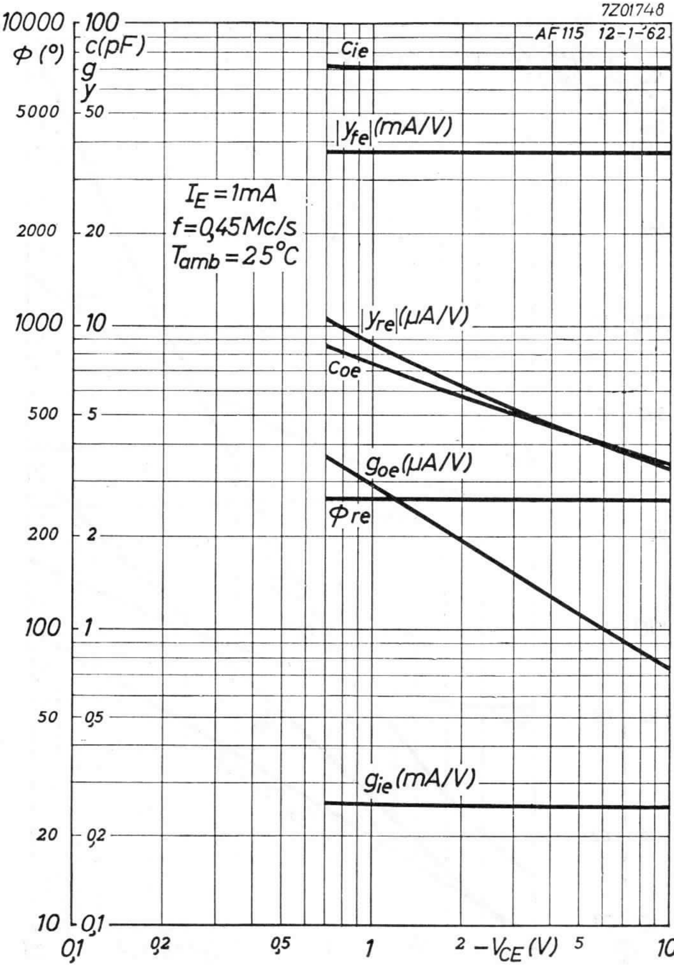

7Z00404
AF114 17-1-1961
Tamb=25°C
$-I_B$=70μA
60μA
50μA
40μA
30μA
20μA
10μA
10
5
$-I_C$(mA)
$-V_{CE}$=3V
$-I_B$(μA) 50
25
0
5
$-V_{CE}$ (V)
10
100
200
300
400
$-V_{BE}$(mV)
-VCE=3V

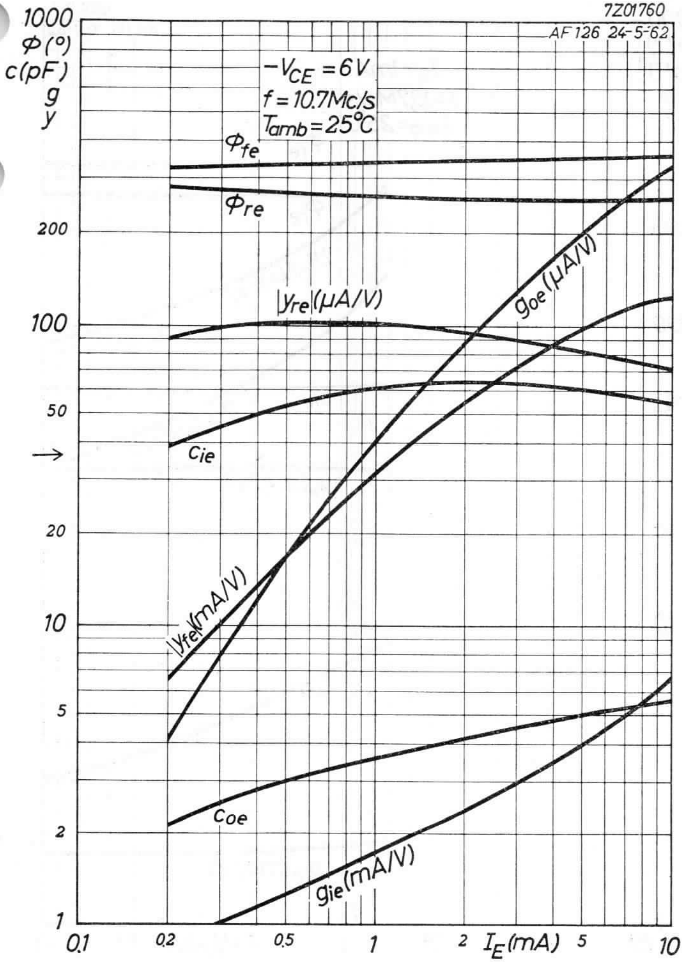
PHILIPS


7Z00407
AF115 17-1-1961
1000
$-I_{CBO}$
(μA)
500
200
100
50
20
10
5
2
1
- - - Upper current limits
$-V_{CB}=6V$
20
40
60
80
T_j(°C)
100

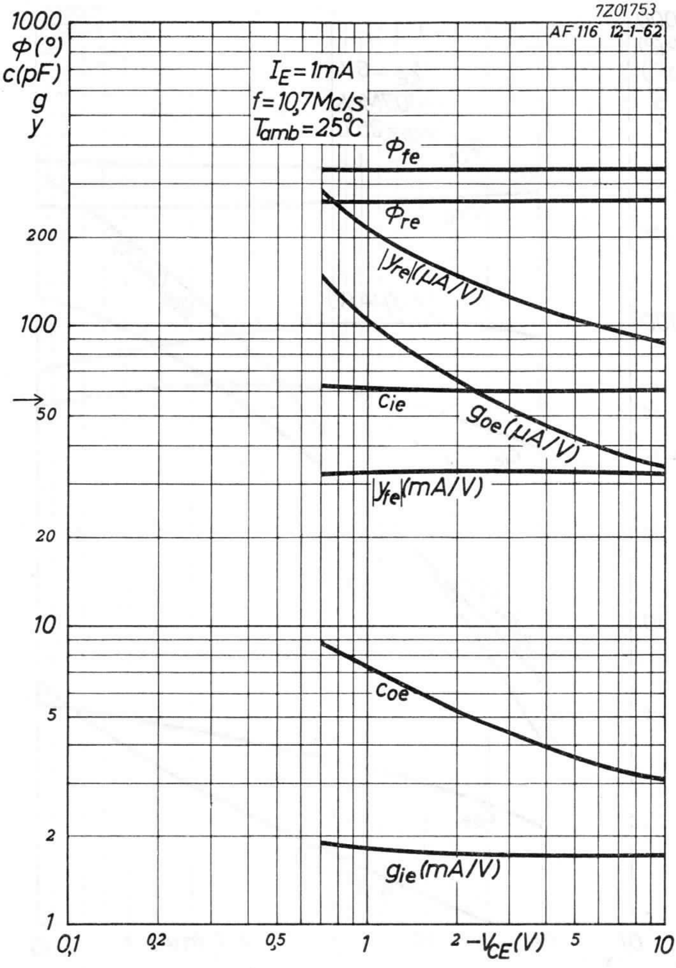

7Z01759
AF126 24-5-'62
10000
φ (°)
|yfe|
(mA/V)
cie
(pF)
100
|yre| (μA/V)
coe (pF)
g
−VCE = 6V
f = 0.45Mc/s
Tamb = 25°C
2000
20
1000
10
500
5
200
2
100
1
50
0.5
20
0.2
10
0.1
coe
|yre|
φre
goe (μA/V)
cie
|yfe|
gie (mA/V)
0.1
0.2
0.5
1
2
IE (mA)
5
10

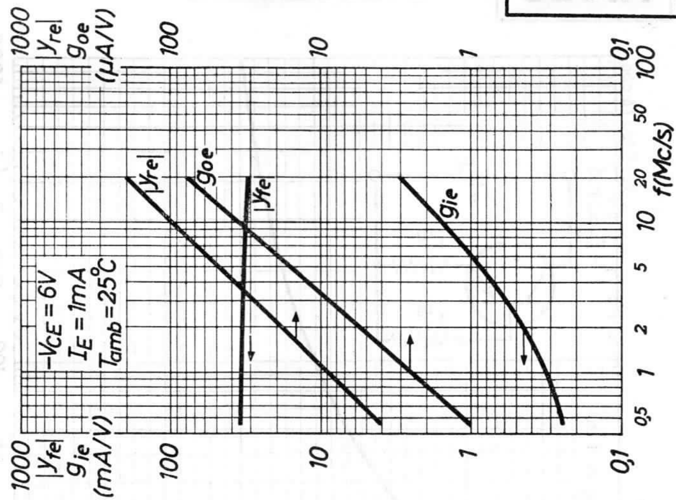
PHILIPS

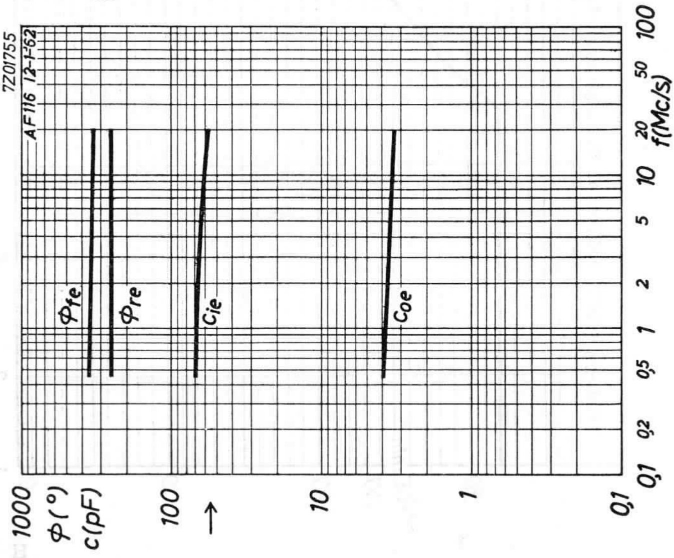

7Z01748
AF115 12-1-'62
10000
Φ (°)
5000
2000
1000
500
200
100
50
20
10
100
c(pF)
g
y
50
20
10
5
2
1
0,5
0,2
0,1
Cie
|yfe|(mA/V)
IE = 1mA
f = 0,45 Mc/s
Tamb = 25°C
|yre|(μA/V)
Coe
goe(μA/V)
Φre
gie(mA/V)
0,1
0,2
0,5
1
2
−VCE (V)
5
10


7Z01760
AF 126 24-5-62
1000
φ(°)
c(pF)
g
y
$-V_{CE} = 6V$
f = 10.7Mc/s
$T_{amb} = 25°C$
φ_{fe}
φ_{re}
200
$|y_{re}|$(μA/V)
100
g_{oe}(μA/V)
50
→
c_{ie}
20
$|y_{fe}|$(mA/V)
10
5
c_{oe}
2
g_{ie}(mA/V)
1
0.1
0.2
0.5
1
2
I_E(mA)
5
10

PHILIPS

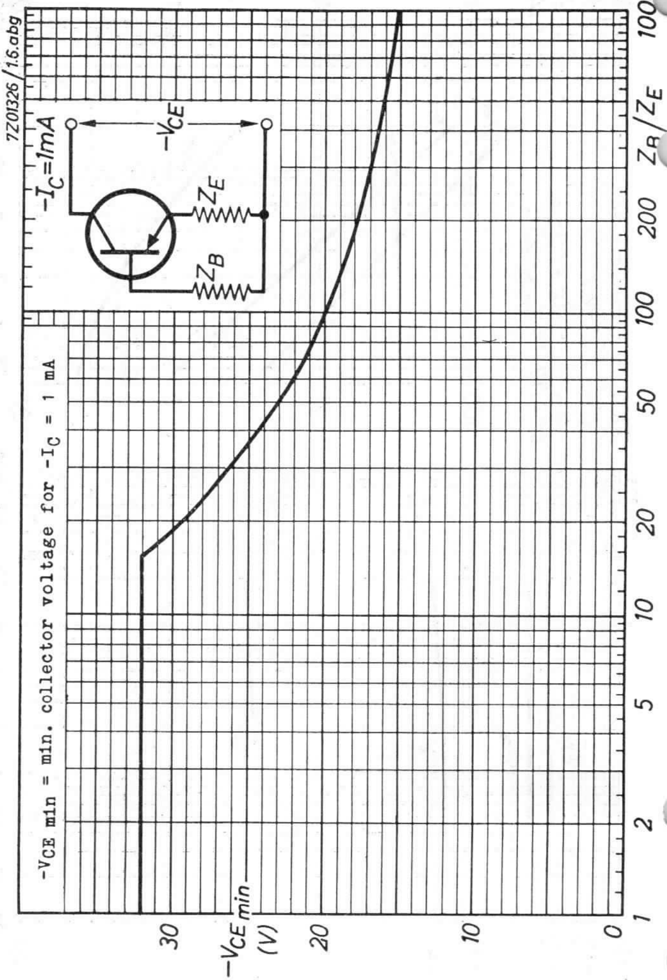

7Z01753
AF 116 12-1-62
1000
φ(°)
c(pF)
g
y
I_E=1mA
f=10,7Mc/s
T_{amb}=25°C
φ_{fe}
φ_{re}
$|y_{re}|$(μA/V)
200
100
C_{ie}
g_{oe}(μA/V)
50
$|y_{fe}|$(mA/V)
20
10
C_{oe}
5
2
g_{ie}(mA/V)
1
0,1
0,2
0,5
1
2
$-V_{CE}$(V)
5
10


1000
|yre|
goe
(μA/V)
100
10
1
0,1
100
50
20
10
5
2
1
0,5
f(Mc/s)
|yre|
goe
|yfe|
gie
-VCE = 6V
IE = 1mA
Tamb = 25°C
1000
|yfe|
gie
(mA/V)
100
10
1
0,1


7Z01755
AF116 12-1-62
100
50
20
10
5
2
1
0,5
0,2
0,1
f(Mc/s)
φfe
φre
Cie
Coe
1000
φ(°)
c(pF)
100
10
1
0,1

AF126

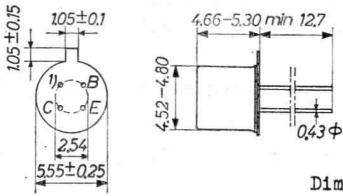
PHILIPS



H

PHILIPS AF127

GERMANIUM ALLOY-DIFFUSED TRANSISTOR of the p-n-p type in metal envelope with low collector capacitance, low noise and good A.G.C. performance at high ambient temperatures, for use as I.F. amplifier, R.F. amplifier and oscillator-mixer in A.M. receivers up to 6 Mc/s



Dimensions in mm

LIMITING VALUES (Absolute max. values)

Collector			
Voltage (base reference)	$-V_{CB}$	= max.	32 V
Voltage (emitter reference)	$-V_{CE}$	= max.	32 V [2]
Current	$-I_C$	= max.	10 mA
Dissipation	P_C	= max.	60 mW
Emitter			
Reverse current	$-I_E$	= max.	1 mA
Base			
Current	$\|I_B\|$	= max.	1 mA
Temperatures			
Storage temperature	T_s	= −55 °C to +75 °C	
Junction temperature			
continuous operation	T_j	= max.	75 °C
intermittent operation (total duration max. 200 hrs)	T_j (t	= max.	90 °C 200 hrs)

THERMAL DATA

Thermal resistance from junction to ambience in free air K = max. 0.75 °C/mW

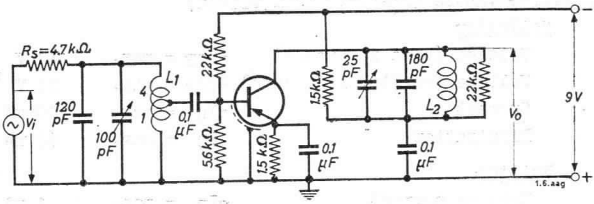
[1]) Interlead shield and metal case

[2]) See also page E

CHARACTERISTICS at Tamb = 25 °C

Collector current at I_E = 0 mA		
$-I_{CBO}$ ($-V_{CB}$ = 6 V; I_E = 0 mA)	= 1.2 µA	< 8 µA
Collector voltage at I_E = 0 mA		
$-V_{CB}$ ($-I_C$ = 50 µA; I_E = 0 mA)		> 32 V
Base current		
$-I_B$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 7 µA	< 25 µA
Base voltage		
$-V_{BE}$ ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 270 mV	> 210 mV < 330 mV

Test circuit for power gain at f = 0.45 Mc/s



L_1: inductance L = 625 µH; unloaded Q-factor Q_o = 140; tap at t = 0.2

L_2: inductance L = 625 µH; unloaded Q-factor Q_o = 140

R_S: input source resistance

R_L: total collector resistance = 20 kΩ

Available power gain at 0.45 Mc/s in the circuit above

G (f = 0.45 Mc/s)	= 42 dB	> 40 dB

The available power gain is defined by

$$G = \frac{4R_S}{R_L} \cdot \frac{V_o^2}{V_i^2} = 0.94 \frac{V_o^2}{V_i^2}$$

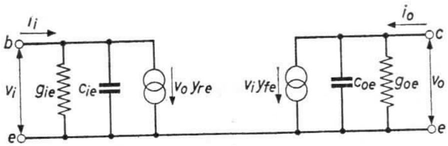
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C

Emitter voltage			
$-V_{EB}$ ($-I_E$ = 50 µA; I_C = 0 mA)	= 1.5 V	>	1.0 V
Frequency at which $\|h_{fe}\|$ = 1			
f_1 ($-V_{CB}$ = 6 V; I_E = 1 mA)	= 75 Mc/s		
Intrinsic base impedance			
$\|z_{rb}\|$ ($-V_{CB}$ = 6 V; I_E = 1 mA; f = 2 Mc/s)	= 35 Ω		
Feedback capacitance			
$-c_{re}$ ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 0.45 Mc/s)	= 1.5 pF		
Current amplification factor			
h_{fe} ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 kc/s)	= 150		
Noise figure			
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω)	= 1.5 dB	<	3 dB
Conversion noise figure			
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 1 Mc/s; Input source resistance = 500 Ω)	= 3 dB	<	5 dB
F ($-V_{CE}$ = 6 V; I_E = 1 mA; f = 200 kc/s; Input source resistance = 2 kΩ)	= 4 dB	<	7 dB

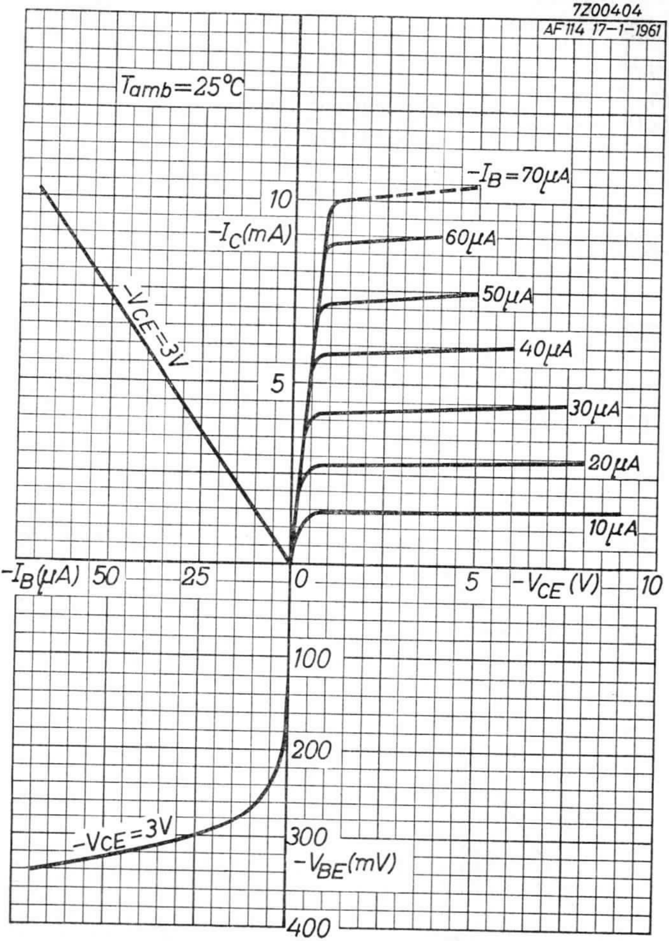
PHILIPS

Small signal parameters

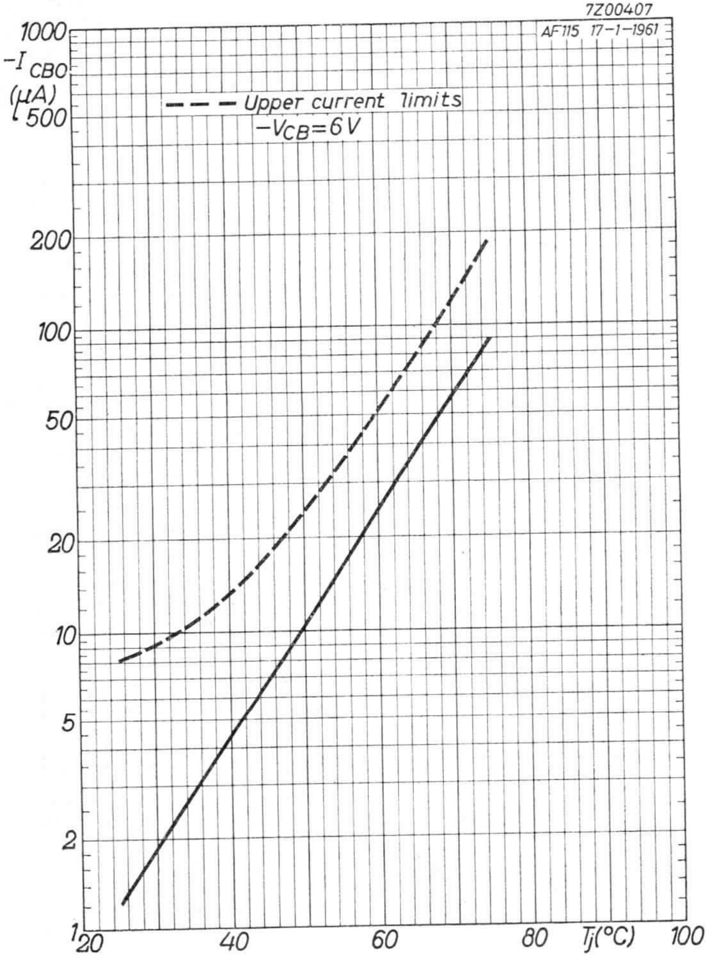


Measured in common emitter circuit at

Collector voltage	$-V_{CE}$	= 6 V
Emitter current	I_E	= 1 mA
Frequency	f	= 0.45 Mc/s
Input conductance	g_{ie}	= 0.25 mA/V
Input capacitance	c_{ie}	= 70 pF
Feedback admittance	$\|y_{re}\|$	= 4.0 µA/V
Phase angle of feedback admittance	φ_{re}	= 270 °
Transfer admittance	$\|y_{fe}\|$	= 37 mA/V
Phase angle of transfer admittance	φ_{fe}	= 0 °
Output conductance	g_{oe}	= 1.0 µA/V
Output capacitance	c_{oe}	= 4.0 pF

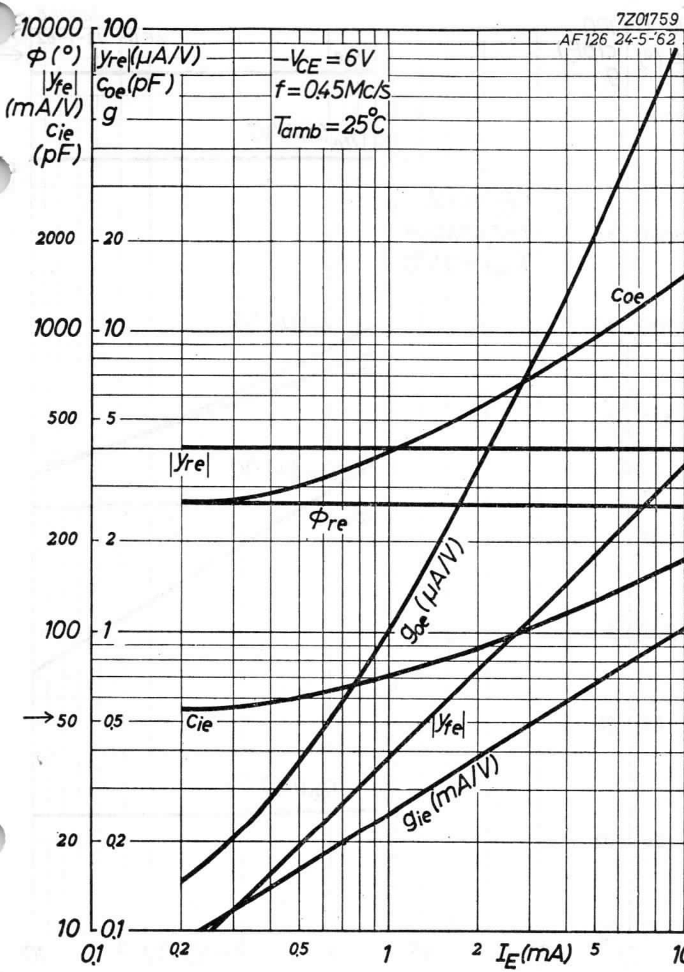

7Z00404
AF114 17-1-1961
Tamb=25°C
−IB=70µA
60µA
50µA
40µA
30µA
20µA
10µA
10
−IC(mA)
5
−VCE=3V
−IB(µA) 50
25
0
5
−VCE (V)
10
100
200
300
−VBE(mV)
400
−VCE=3V

PHILIPS


7Z00407
AF115 17-1-1961
1000
$-I_{CBO}$ (μA)
500
200
100
50
20
10
5
2
1
Upper current limits
$-V_{CB}$=6 V
20
40
60
80
T_j(°C)
100

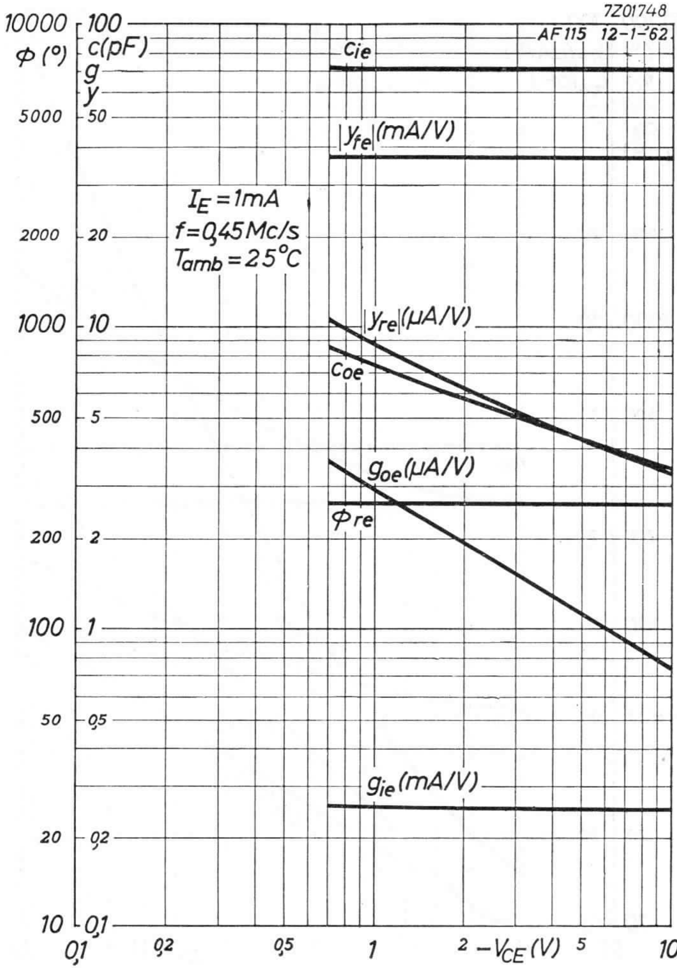
B

PHILIPS AF127

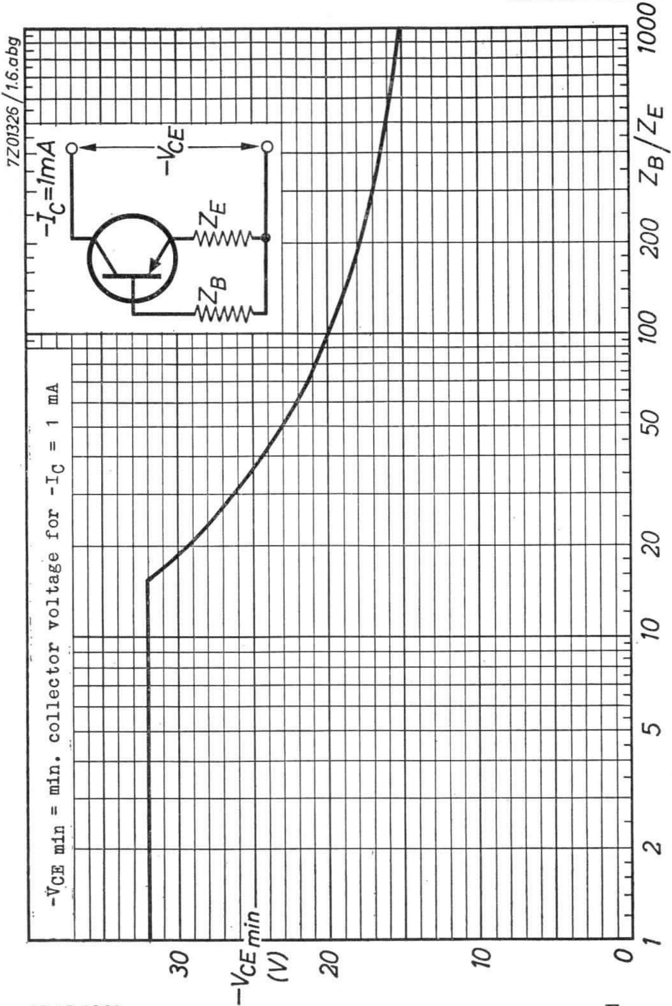


AF127

PHILIPS



D


7Z01326/1.6.abg
$-I_C = 1mA$
$-V_{CE}$
Z_E
Z_B
$-V_{CE\,min}$ = min. collector voltage for $-I_C$ = 1 mA
Z_B/Z_E
1000
200
100
50
20
10
5
2
1
$-V_{CE\,min}$ (V)
30
20
10
0

PHILIPS

AFY19

V.H.F. alloy-diffused germanium transistor of the p-n-p type in TO-5 metal case for use as a power amplifier in transmitters with frequencies up to 180 Mc/s

LIMITING VALUES (Absolute max. limits)

Collector

Voltage (base reference)	$-V_{CB}$ = max.	32 V
Voltage (emitter reference)	$-V_{CE}$ = max.	32 V [1]
Peak current	$-I_{CM}$ = max.	300 mA
Continuous current	$-I_C$ = max.	150 mA

Emitter

Peak current	I_{EM} = max.	350 mA
Continuous current	I_E = max.	200 mA
Peak reverse current	$-I_{EM}$ = max.	30 mA
Continuous reverse current	$-I_E$ = max.	10 mA

Dissipation

Total dissipation	P_{tot} = max.	800 mW [2]

Temperatures

Storage temperature	T_S =	-55 °C to +75 °C
Junction temperature		
continuous operation	T_j = max.	90 °C
incidentally, up to a total of 200 hrs	T_j = max.	100 °C

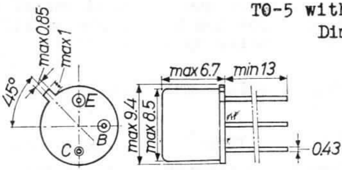
THERMAL DATA

Thermal resistance from junction to ambience			
in free air	K	<	0.25 °C/mW
mounted on heat sink of at least 12.5 cm^2	K	<	0.08 °C/mW
Thermal resistance from junction to case	K	<	0.035 °C/mW

[1] At $-I_C$ = 1 mA and V_{BE} = 0 V

[2] The max. incidental junction temperature of 100 °C may also be reached by a peak dissipation of 1000 mW.

TO-5 with short leads
Dimensions in mm



The collector is electrically connected to the case.

Accessories for insulated mounting can be delivered separately (type number 56218).

CHARACTERISTICS at T_{amb} = 25 °C

Collector leakage current at			
$-V_{CB}$ = 10 V; I_E = 0 mA	$-I_{CBO}$	<	10 µA
$-V_{CB}$ = 32 V; I_E = 0 mA	$-I_{CBO}$	<	1 mA
Emitter leakage current at			
$-V_{EB}$ = 0.5 V; I_C = 0 mA	$-I_{EBO}$	<	1 mA
Base current at			
I_E = 100 mA; V_{CB} = 2 V	$-I_B$	<	3 mA

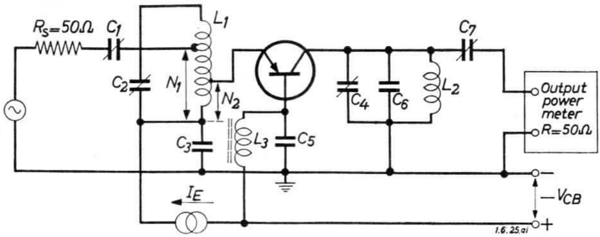
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C

Collector leakage current	$-I_{CBO}$	See page E		
Base current at				
I_E = 80 mA; $-V_{CB}$ = 12 V	$-I_B$	= 1	< 2	mA
Collector saturation voltage at				
$-I_C$ = 300 mA; $-I_B$ = 20 mA	$-V_{CE}$		< 1	V
Frequency at which $\lvert h_{fe} \rvert$ = 1 at				
I_E = 100 mA; $-V_{CB}$ = 5 V	f_1	= 350	> 225	Mc/s
Base-emitter input resistance, output short-circuited for H.F. at				
(I_E = 100 mA; $-V_{CB}$ = 5 V; f = 100 Mc/s)	r_{ie}	= 18		Ω
Collector capacitance at				
($-V_{CB}$ = 10 V; I_E = 0 mA; f = 0.5 Mc/s)	c_c	= 12		pF

OPERATING CHARACTERISTICS as V.H.F. power amplifier at $T_{amb} = 25^{\circ}C$

Circuit



f	=	80	180 Mc/s
C_1	=	50	15 pF
C_2	=	50	15 pF
C_3	=	10	1 nF
C_4	=	50	15 pF
C_5 1)	=	10	0.12 nF
C_6	=	82	0 pF
C_7	=	100	15 pF

f	=	80	180 Mc/s
L_1	=	0.1	0.08 µH
L_2	=	0.03	0.02 µH
L_3	=	H.F.choke	
N_1/N_{tot}	=	1	0.5
N_2/N_{tot}	=	0.5	0.22
Q_1	>	150	>200
Q_2	>	150	>200

Characteristics

Output power and available power gain at

I_E = 80 mA; $-V_{CB}$ = 12 V;

f = 80 Mc/s: P_o > 500 mW; G > 10 dB 2)

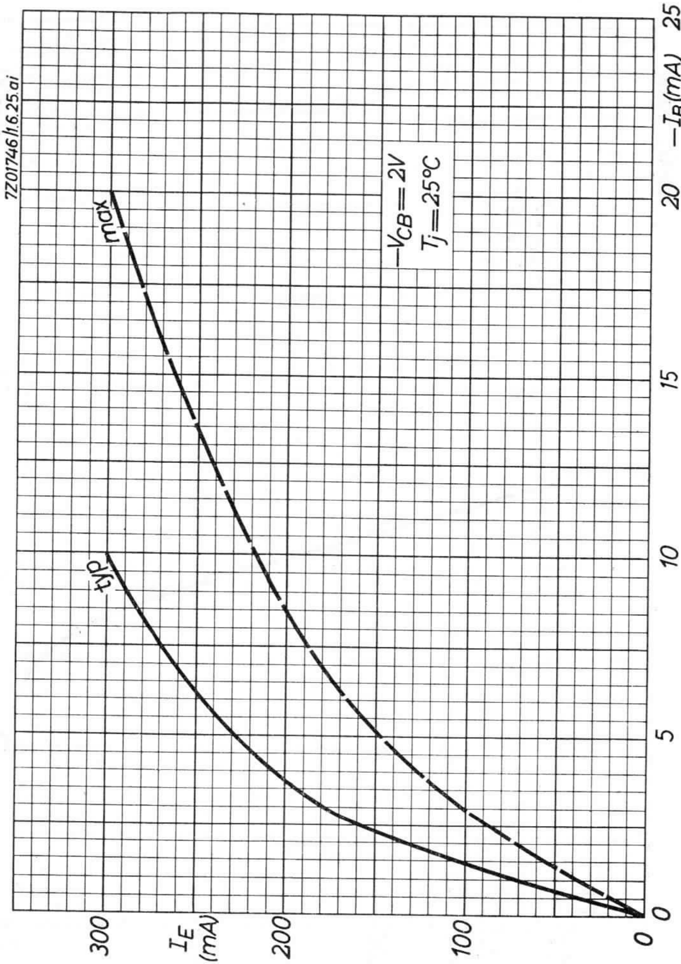
f = 180 Mc/s: P_o > 400 mW; G > 9 dB 2)

Design considerations

If the transistor is mounted on a heat sink with the aid of accessories for insulated mounting (e.g. accessories 56218), case and heat sink constitute a capacitor with the insulation as dielectricum. As the collector is connected to the case the total collector capacitance will be higher. Measures should be taken to prevent too high a capacitance, especially at 180 Mc/s.

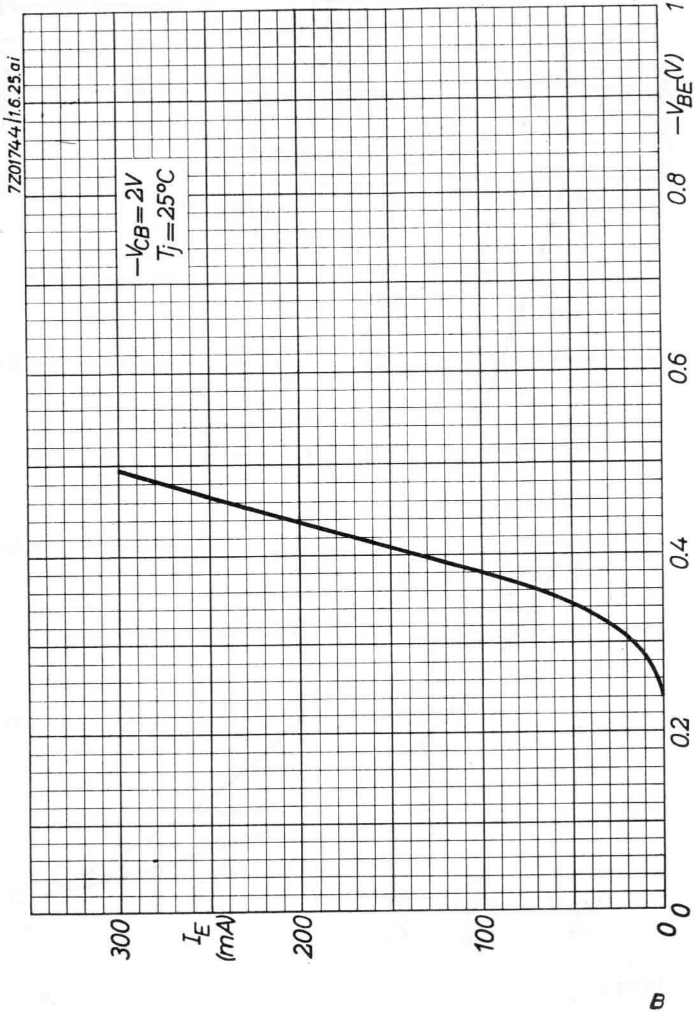
1) The capacitor C_5 should be chosen so that its series inductance can be neglected (e.g. a tubular ceramic capacitor mounted in a copper block).

2) Without insertion losses and at stated min. P_o

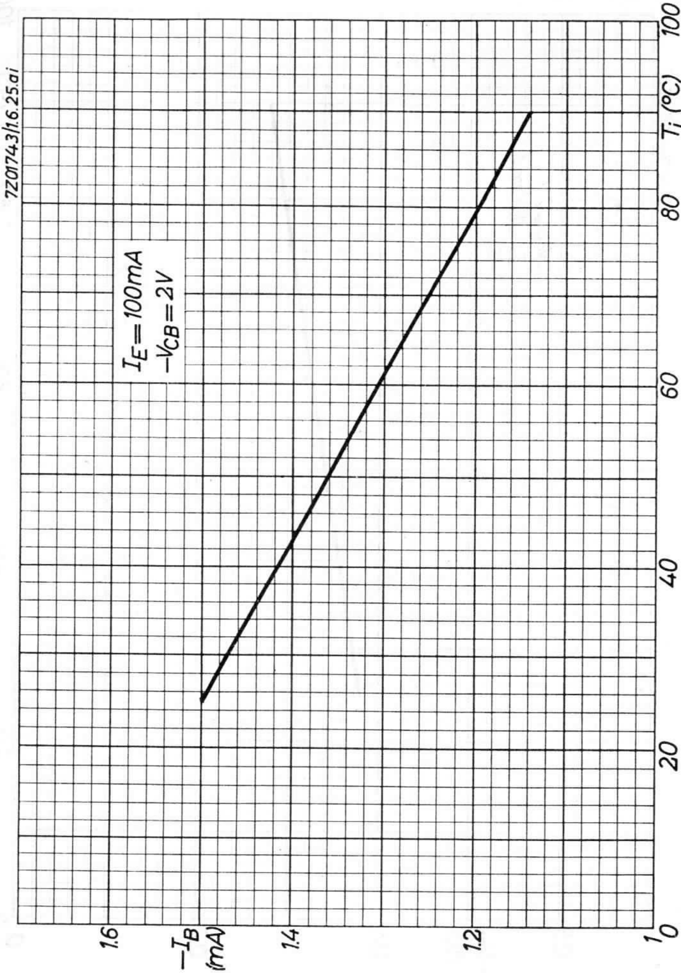

7Z01746/1.6.25.ai
max
typ
−V_CB = 2V
T_j = 25°C
−I_B (mA)
0
5
10
15
20
25
I_E (mA)
0
100
200
300

AFY19

PHILIPS

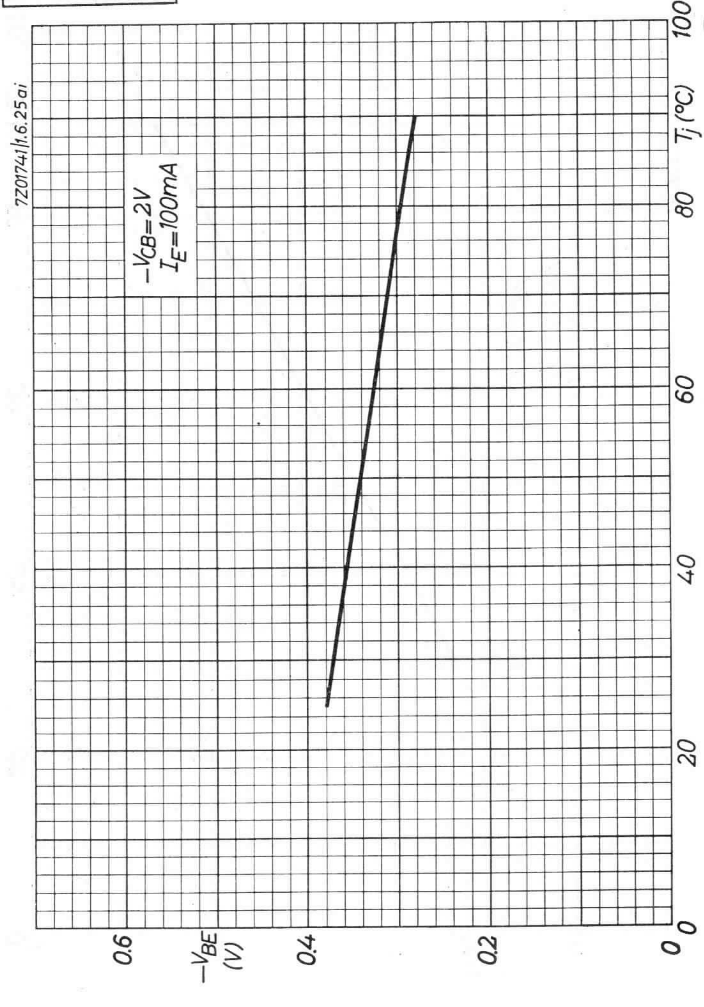


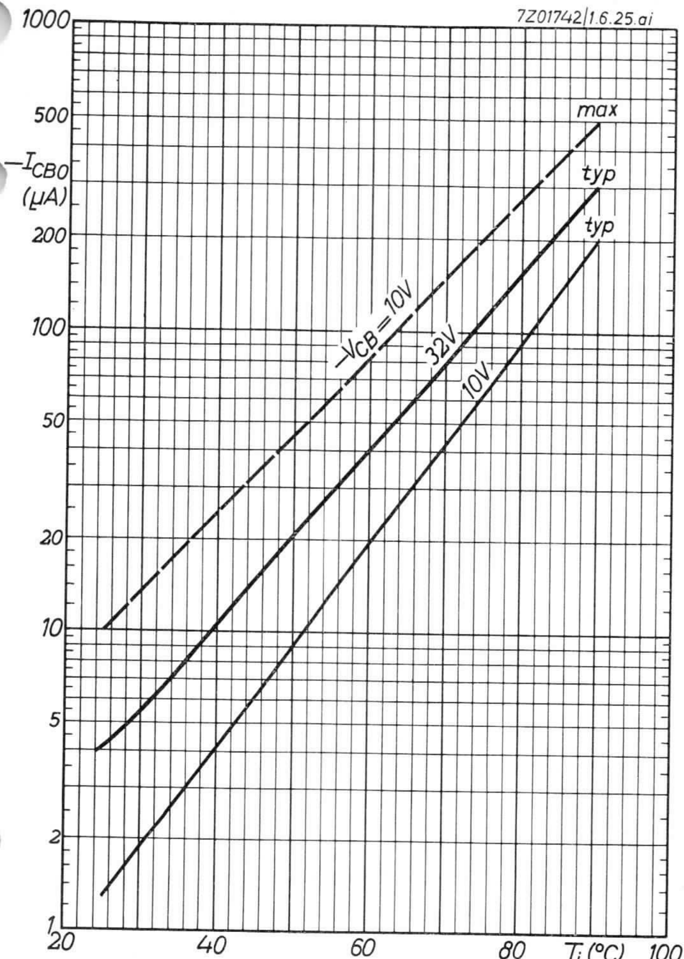
B


7Z01743/1.6.25.ai
$I_E = 100mA$
$-V_{CB} = 2V$
T_j (°C)
100
80
60
40
20
0
$-I_B$ (mA)
1.6
1.4
1.2
1.0

AFY19

PHILIPS



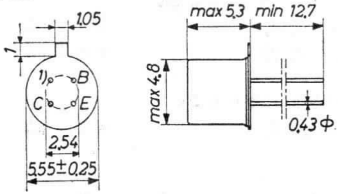

7Z01742|1.6.25.ai
1000
500
200
100
50
20
10
5
2
1
$-I_{CBO}$ (μA)
max
typ
typ
$-V_{CB}$=10V
32V
10V
20
40
60
80
100
T_j (°C)

PHILIPS

AFZ12

GERMANIUM JUNCTION TRANSISTOR of the p-n-p alloy diffused type in metal envelope for V.H.F. operation up to 200 Mc/s

Dimensions in mm



LIMITING VALUES (Absolute max. values)

Collector

Voltage (emitter reference)	$-V_{CE}$	= max.	20 V [2]
Voltage (base reference)	$-V_{CB}$	= max.	20 V
Current	$-I_C$	= max.	10 mA

Emitter

Reverse voltage (base reference)	$-V_{EB}$	= max.	500 mV
Current	I_E	= max.	10 mA
Reverse current	$-I_E$	= max.	1.0 mA

Base

Current	$-I_B$	= max.	1.0 mA

Dissipation

Total dissipation $P_{tot} = \max. \frac{T_{j\,max} - T_{amb}}{K}$ [3]

Temperatures

Storage	T_S	=	-55°C/+75 °C
Junction, continuous operation	T_j	= max.	75 °C
Junction, intermittent operation (total duration max. 200 hours)	T_j (t	= max. = max.	90 °C 200 hrs)

THERMAL DATA

Thermal resistance from junction to ambience in free air	K	= max.	0.6 °C/mW

[1]) Interlead shield

[2]) At $V_{BE} \geq 500$ mV. At $-I_C$ = 10 mA, $-V_{CE}$ = max. 10 V

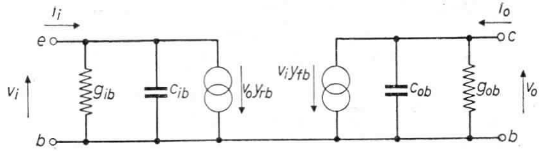
[3]) See also page H

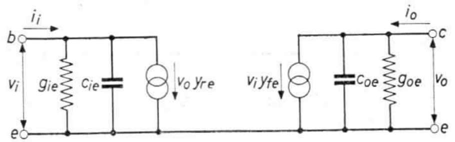
CHARACTERISTICS RANGE VALUES for equipment design

T_{amb} = 25 °C

Collector current at I_E = 0 mA		
$-I_{CBO}$ ($-V_{CB}$ = 6 V)	= 1.0 μA	< 6.0 μA
$-I_{CBO}$ ($-V_{CB}$ = 20 V)	= 2.6 μA	< 50 μA
Emitter current at I_C = 0 mA		
$-I_{EBO}$ ($-V_{EB}$ = 0.5 V)	= 2.0 μA	< 27 μA
Base voltage		
$-V_{BE}$ ($-V_{CE}$ = 6 V; $-I_C$ = 1 mA)	= 310 mV	> 220 mV < 380 mV
$-V_{BE}$ ($-V_{CE}$ = 2 V; $-I_C$ = 10 mA)	= 380 mV	
D.C. current amplification factor		
h_{FE} ($-V_{CE}$ = 6 V; $-I_C$ = 1 mA)	= 60	> 20
h_{FE} ($-V_{CE}$ = 2 V; $-I_C$ = 10 mA)	= 60	> 25
Frequency at which $\lvert h_{fe} \rvert$ = 1		
f_1 ($-V_{CE}$ = 6 V; $-I_C$ = 1 mA)	= 180 Mc/s	> 135 Mc/s
Current amplification factor		
h_{fe} { $-V_{CE}$ = 6 V; $-I_C$ = 1 mA; f = 1 kc/s }	= 70	> 20
Intrinsic base impedance		
z_{rb} { $-V_{CE}$ = 6 V; $-I_C$ = 1 mA; f = 2 Mc/s }	= 10 Ω	
Feedback capacitance		
c_{re} { $-V_{CE}$ = 6 V; $-I_C$ = 1 mA; f = 450 kc/s }	= 1.0 pF	< 1.5 pF
Noise		
F { $-V_{CE}$ = 12 V; $-I_C$ = 1 mA; f = 200 Mc/s; Input source resistance = 30Ω }	= 6.0 dB	< 7.5 dB
Available power gain in the circuit of page 4		
	G_a = 13 dB	> 10 dB

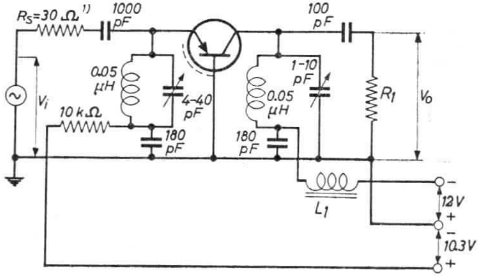
Small signal parameters. Measured with a length of lead between transistor bottom and measuring jig of 5 mm





Measured at:	Common base	Common emitter
Collector voltage	V_{CB} = 12 V	$-V_{CE}$ = 12 V
Collector current		$-I_C$ = 1 mA
Emitter current	I_E = 1 mA	
Frequency	f = 200 Mc/s	f = 200 Mc/s
Input conductance	g_{ib} = 32.5 mA/V	g_{ie} = 28 mA/V
Input capacitance	$-c_{ib}$ = 10 pF	c_{ie} = 13 pF
Feedback admittance	$\|y_{rb}\|$ = 0.41 mA/V	$\|y_{re}\|$ = 0.50 mA/V
Phase angle of feed-back admittance	$-\varphi_{rb}$ = 80 °	$-\varphi_{re}$ = 110 °
Transfer admittance	$\|y_{fb}\|$ = 30 mA/V	$\|y_{fe}\|$ = 34 mA/V
Phase angle of trans-fer admittance	φ_{fb} = 115 °	$-\varphi_{fe}$ = 68 °
Output conductance	g_{ob} = 0.22 mA/V	g_{oe} = 0.22 mA/V
Output capacitance	c_{ob} = 2.0 pF	c_{oe} = 2.0 pF

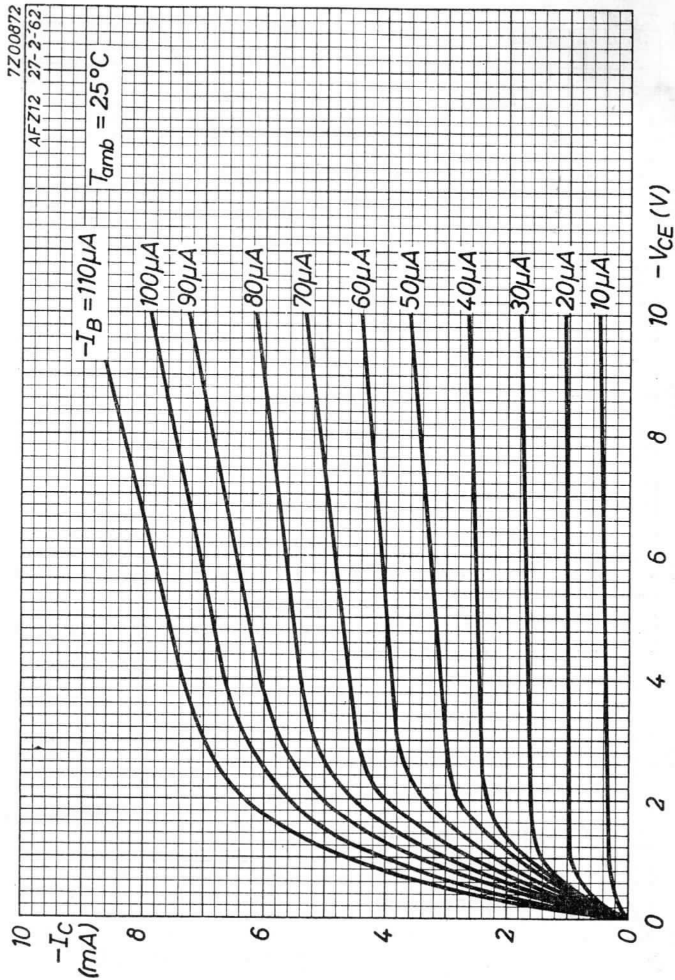
Test circuit for power gain at 200 Mc/s



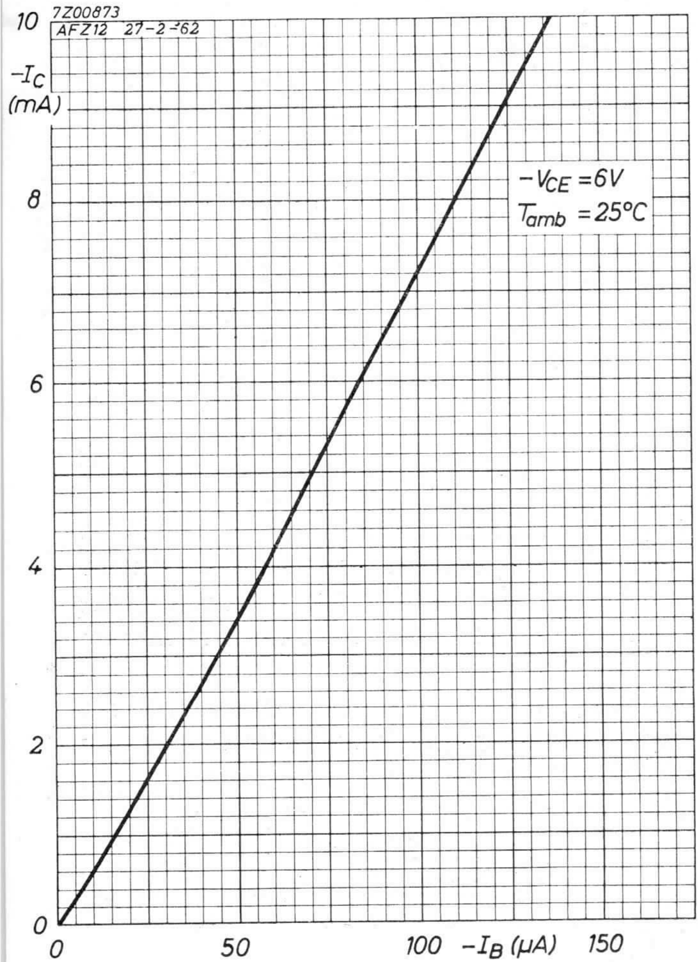
R_1 is chosen so that the total impedance R_L of the tuned circuit is 2 kΩ

L_1 = ferrite bead

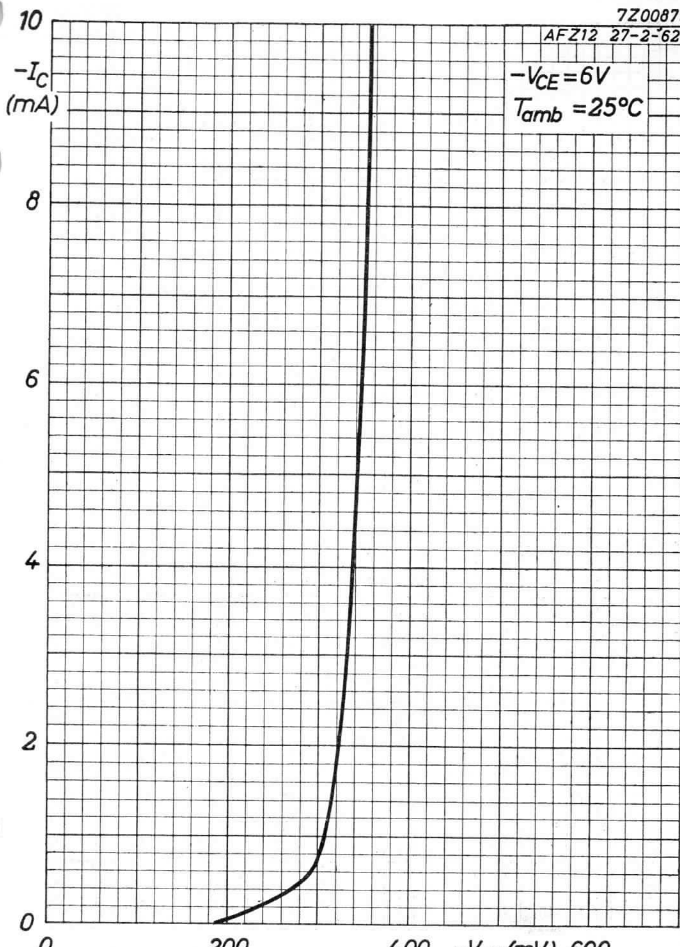
[1]) Input source impedance


7Z00872
AFZ12 27-2-'62
Tamb = 25°C
−IB = 110µA
100µA
90µA
80µA
70µA
60µA
50µA
40µA
30µA
20µA
10µA
10
−IC
(mA)
8
6
4
2
0
0
2
4
6
8
10
−VCE (V)

PHILIPS

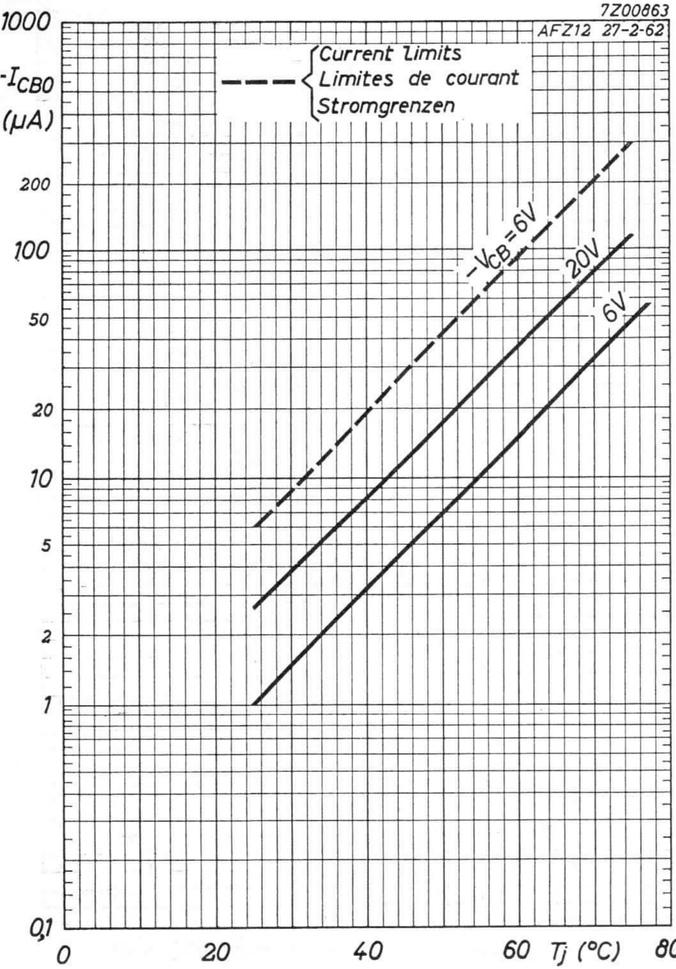


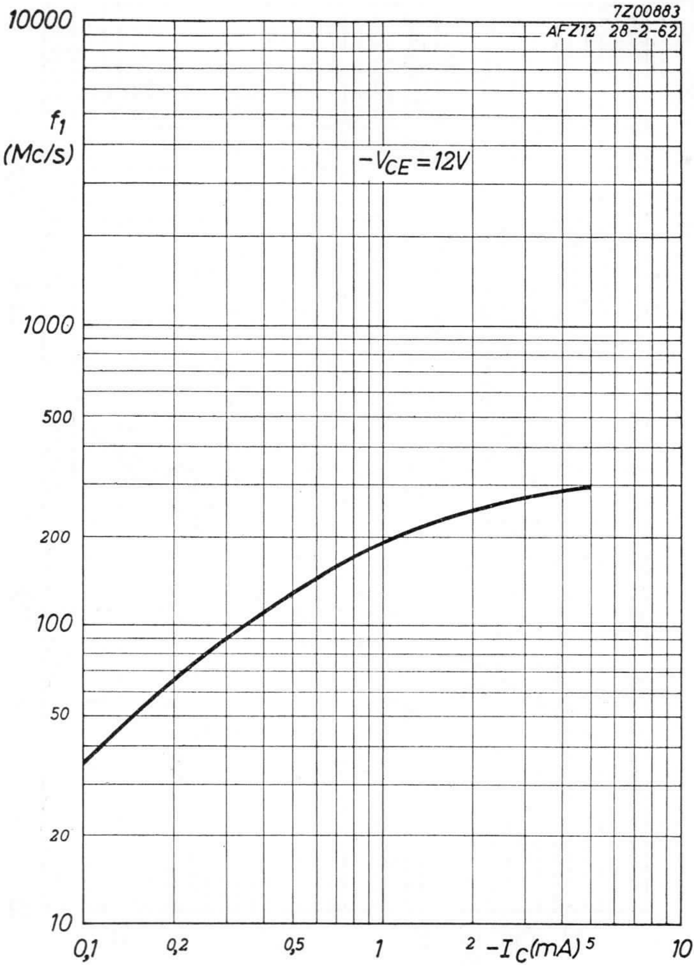
7Z00873
AFZ12 27-2-62
10
$-I_C$
(mA)
8
6
4
2
0
0
50
100
$-I_B$ (μA)
150
$-V_{CE}$ = 6V
T_{amb} = 25°C


7Z00871
AFZ12 27-2-62
$-V_{CE}=6V$
$T_{amb}=25°C$
10
$-I_C$
(mA)
8
6
4
2
0
0
200
400
$-V_{BE}$ (mV)
600

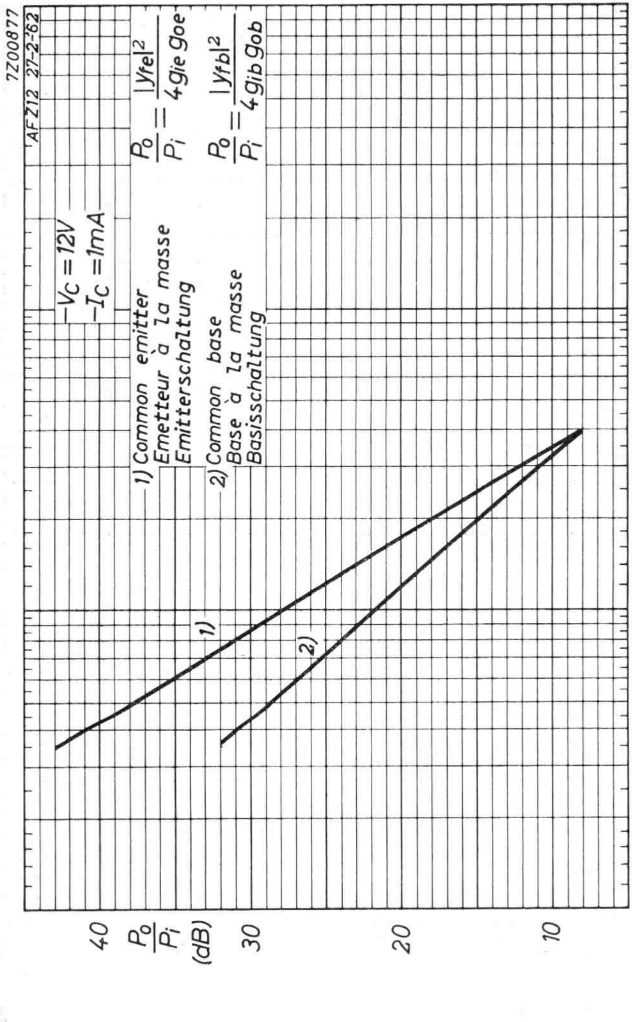
AFZ12

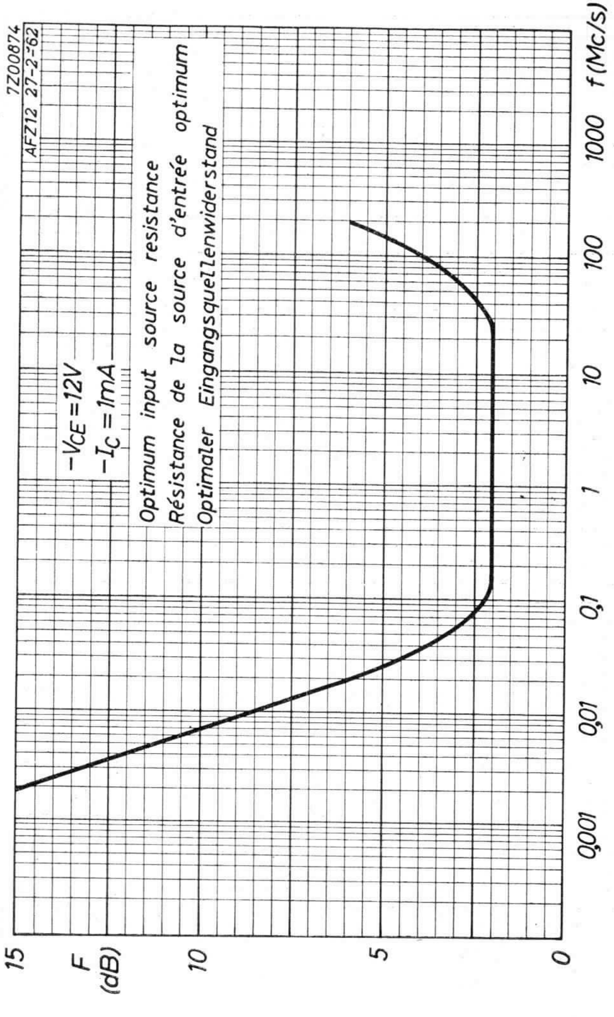
PHILIPS



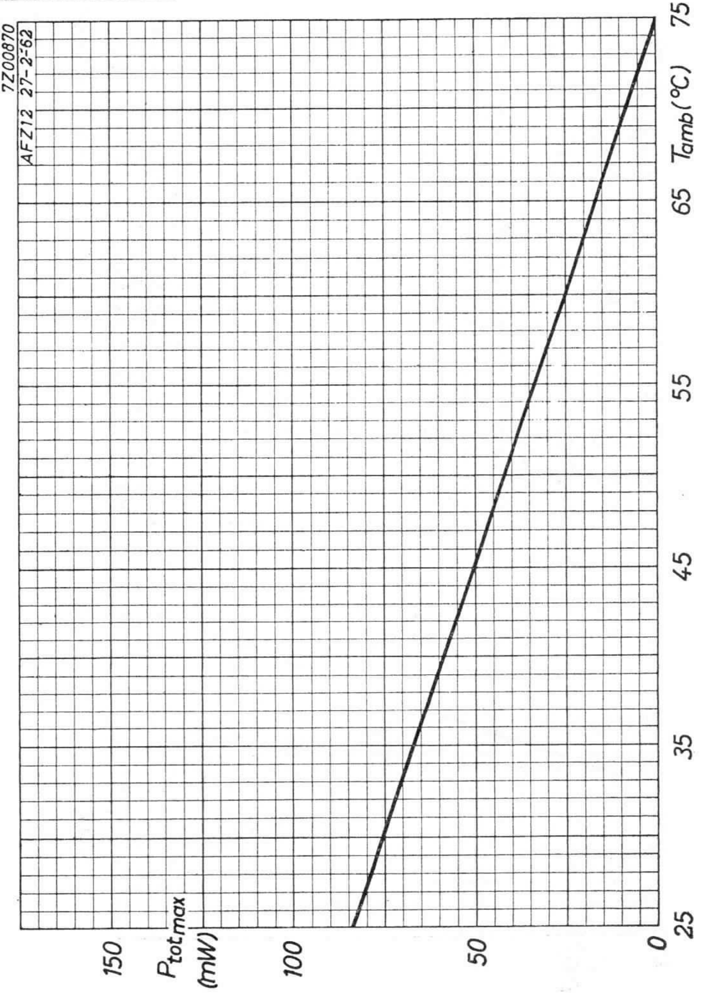

7Z00883
AFZ12 28-2-62.
10000
f_1
(Mc/s)
$-V_{CE} = 12V$
1000
500
200
100
50
20
10
0,1
0,2
0,5
1
2
$-I_C$(mA)
5
10

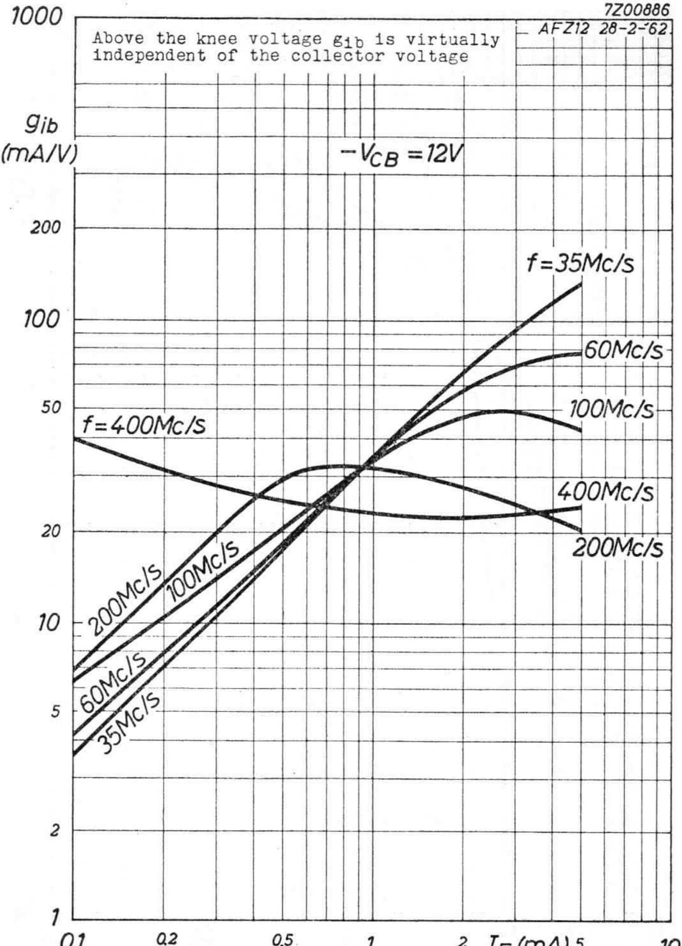
PHILIPS


7Z00877
AFZ12 27-2-'62
$-V_C = 12V$
$-I_C = 1mA$
1) Common emitter
Emetteur à la masse
Emitterschaltung
$\frac{P_o}{P_i} = \frac{|y_{fe}|^2}{4 g_{ie} g_{oe}}$
2) Common base
Base à la masse
Basisschaltung
$\frac{P_o}{P_i} = \frac{|y_{fb}|^2}{4 g_{ib} g_{ob}}$
1)
2)
40
$\frac{P_o}{P_i}$ (dB)
30
20
10
10
20
50
100
200
500
1000
f (Mc/s)

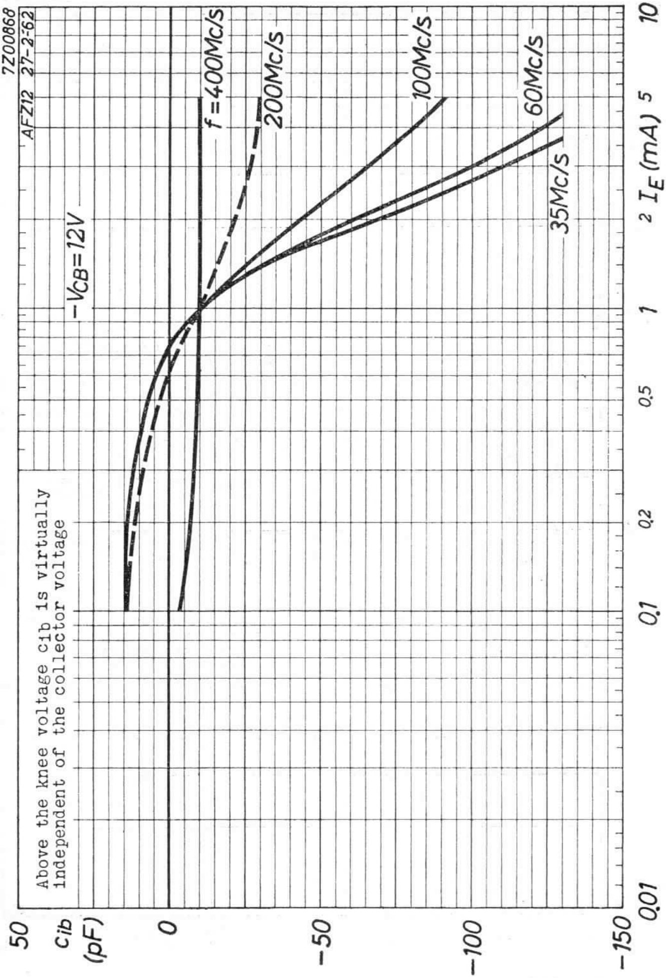

7Z00874
AFZ12 27-2-'62
$-V_{CE} = 12V$
$-I_C = 1mA$
Optimum input source resistance
Résistance de la source d'entrée optimum
Optimaler Eingangsquellenwiderstand
F
(dB)
15
10
5
0
0,001
0,01
0,1
1
10
100
1000
f (Mc/s)

PHILIPS

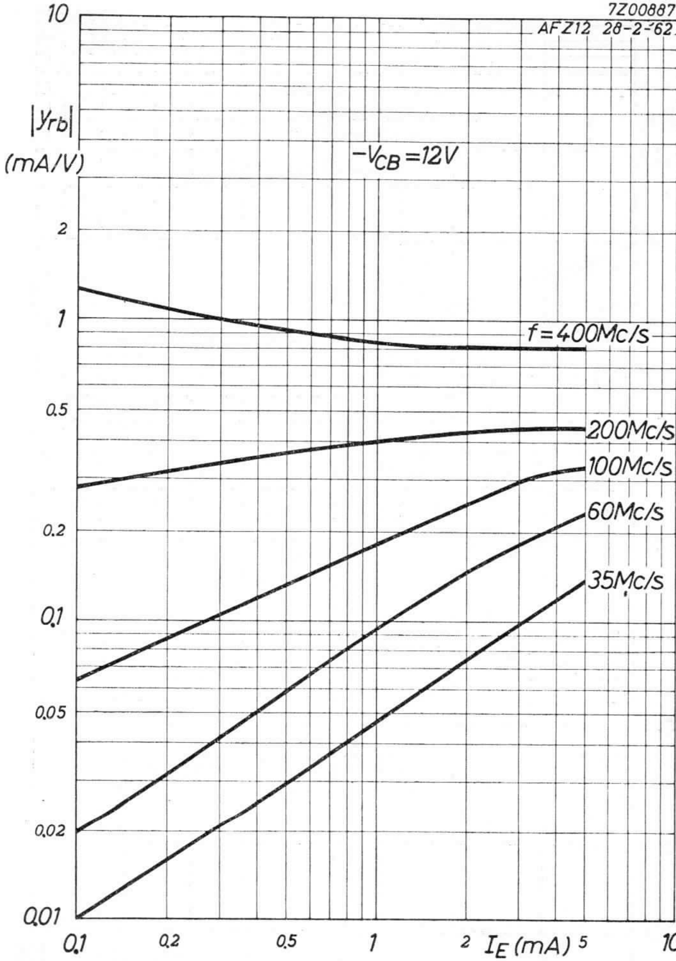

7Z00870
AFZ12 27-2-'62
$P_{tot\,max}$ (mW)
150
100
50
0
T_{amb} (°C)
25
35
45
55
65
75

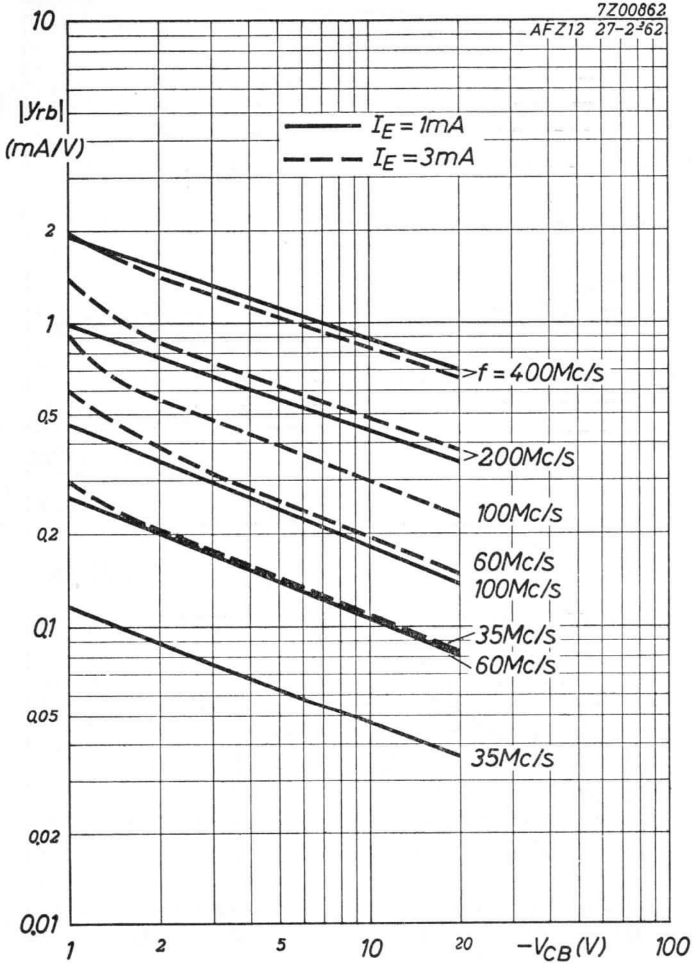

7Z00886
AFZ12 28-2-'62
Above the knee voltage g_{ib} is virtually independent of the collector voltage
g_{ib} (mA/V)
$-V_{CB}$ = 12V
f = 35Mc/s
60Mc/s
100Mc/s
400Mc/s
200Mc/s
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
1000
200
100
50
20
10
5
2
1
0.1
0.2
0.5
1
2
I_E (mA)
5
10

PHILIPS

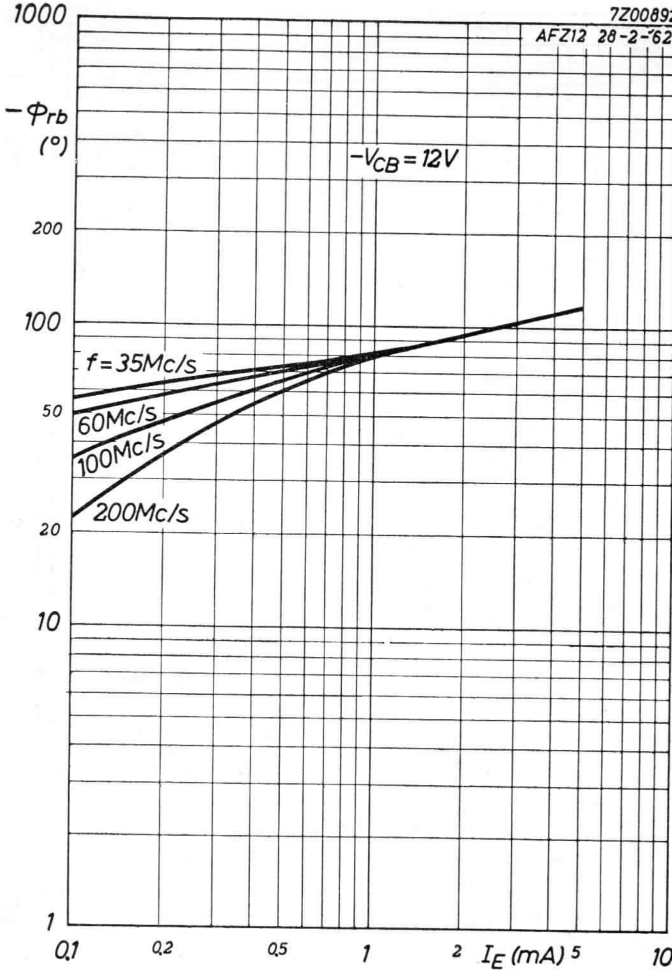


7Z00868
AFZ12 27-2-62
f=400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
−VCB=12V
Above the knee voltage cib is virtually independent of the collector voltage
Cib (pF)
50
0
−50
−100
−150
0.01
0.1
0.2
0.5
1
2
5
10
IE (mA)


7Z00887
AFZ12 28-2-'62
10
|yrb|
(mA/V)
2
1
0.5
0.2
0.1
0.05
0.02
0.01
−VCB = 12V
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
0.1
0.2
0.5
1
2
IE (mA)
5
10

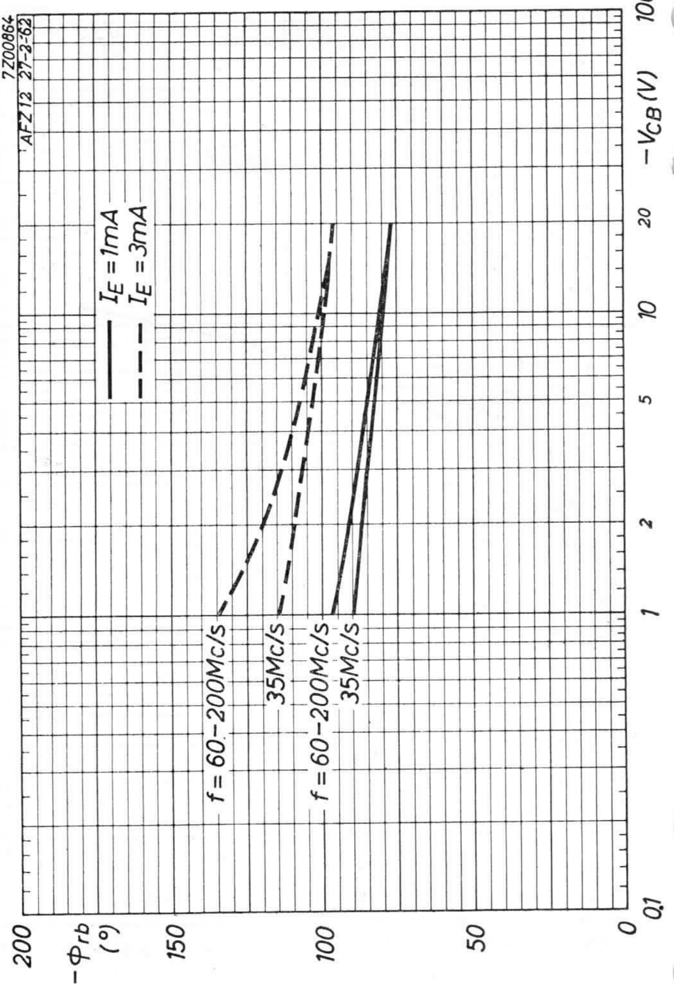

7Z00862
AFZ12 27-2-62
10
|yrb| (mA/V)
IE = 1mA
IE = 3mA
2
1
0,5
0,2
0,1
0,05
0,02
0,01
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
100Mc/s
35Mc/s
60Mc/s
35Mc/s
1
2
5
10
20
100
−VCB (V)

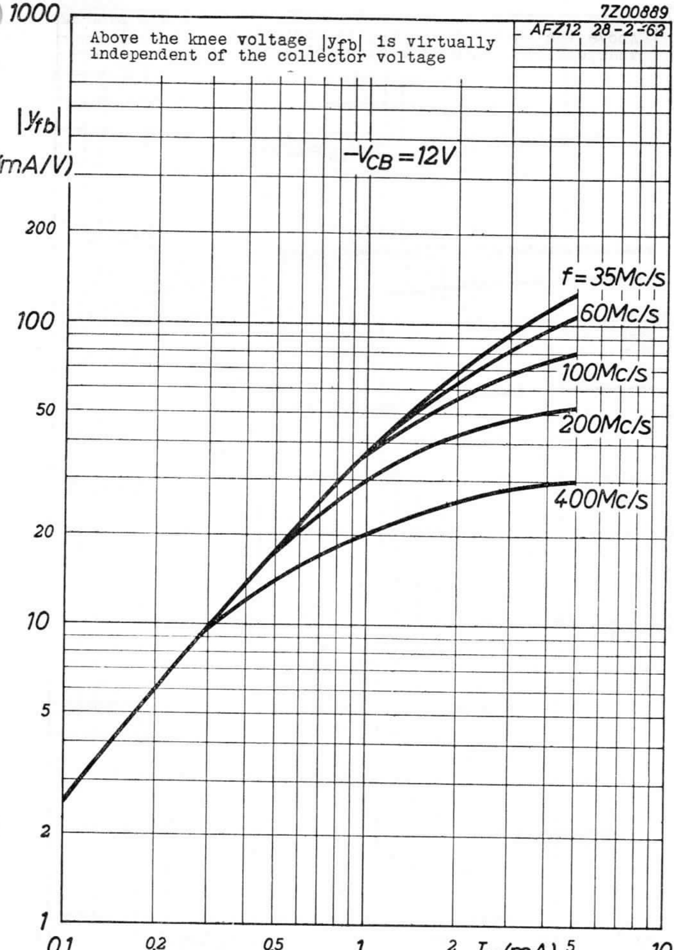
L

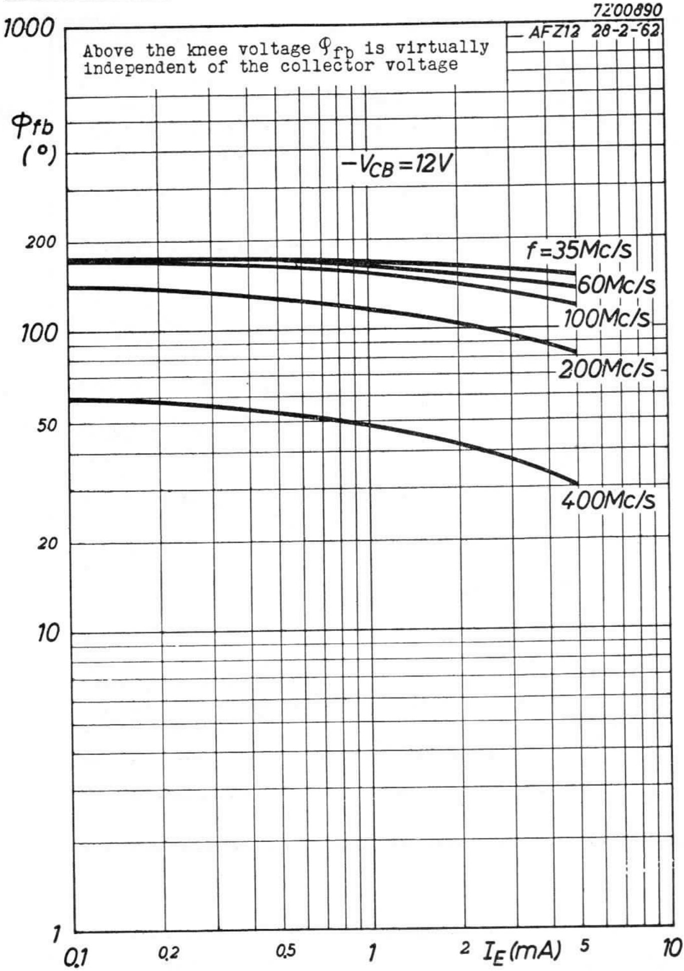

7Z00892
AFZ12 28-2-'62
1000
$-\varphi_{rb}$
(°)
200
100
50
20
10
1
$-V_{CB} = 12V$
f = 35Mc/s
60Mc/s
100Mc/s
200Mc/s
0,1
0,2
0,5
1
2
I_E (mA)
5
10

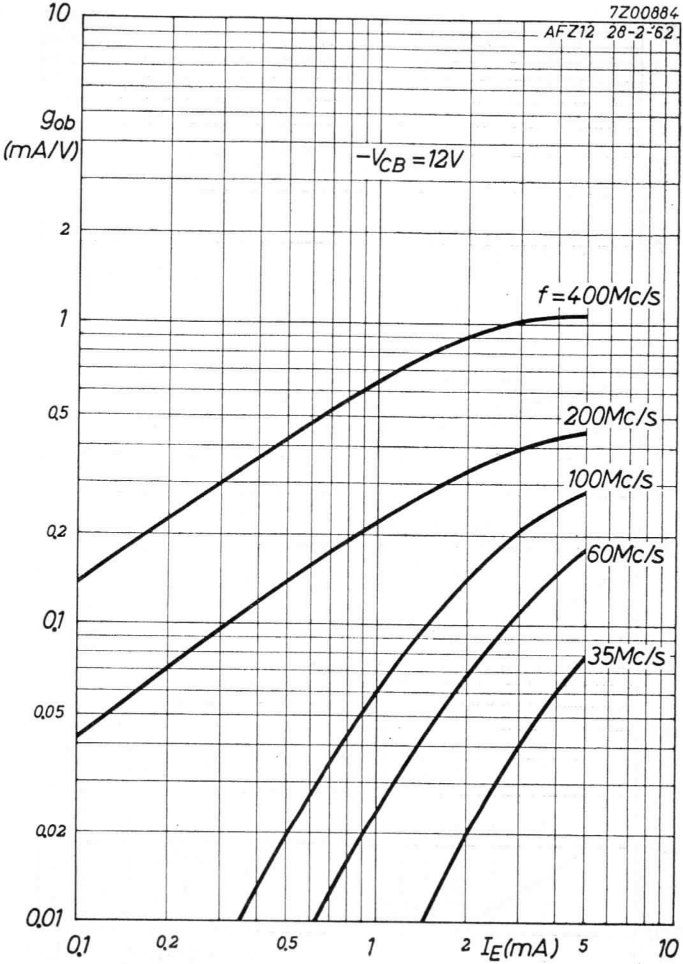
AFZ12

PHILIPS

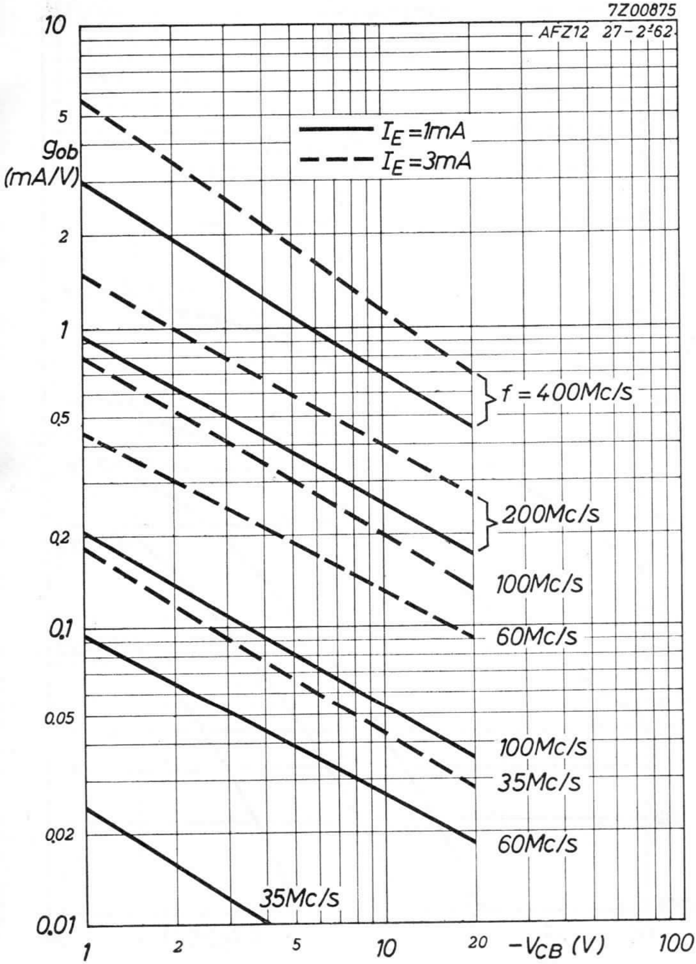



7Z00889
AFZ12 28-2-62
Above the knee voltage |yfb| is virtually independent of the collector voltage
|yfb|
(mA/V)
1000
200
100
50
20
10
5
2
1
$-V_{CB} = 12V$
f = 35Mc/s
60Mc/s
100Mc/s
200Mc/s
400Mc/s
0.1
0.2
0.5
1
2
I_E(mA)
5
10


7Z00890
AFZ12 28-2-'62
Above the knee voltage φ_{fb} is virtually independent of the collector voltage
φ_{fb} (°)
1000
200
100
50
20
10
1
$-V_{CB}=12V$
f=35Mc/s
60Mc/s
100Mc/s
200Mc/s
400Mc/s
0.1
0.2
0.5
1
2
I_E (mA)
5
10

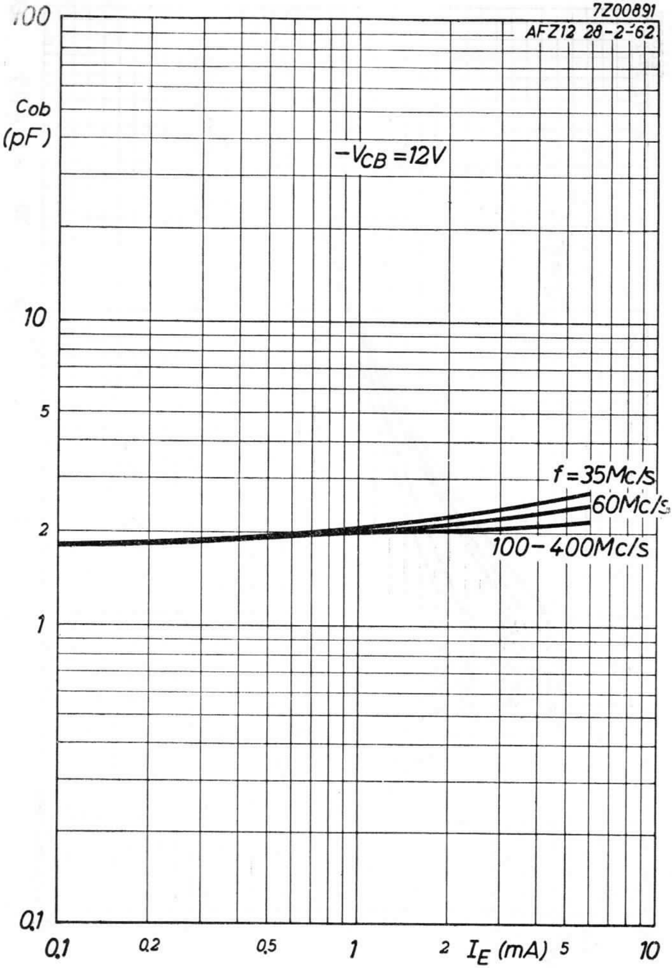

7Z00884
AFZ12 28-2-'62
g_{ob} (mA/V)
$-V_{CB}$ = 12V
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
10
2
1
0,5
0,2
0,1
0,05
0,02
0,01
0,1
0,2
0,5
1
2
I_E (mA)
5
10

PHILIPS


7Z00875
AFZ12 27-2-62
10
5
g_{ob} (mA/V)
2
1
0.5
0.2
0.1
0.05
0.02
0.01
I_E = 1mA
I_E = 3mA
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
100Mc/s
35Mc/s
60Mc/s
35Mc/s
1
2
5
10
20
$-V_{CB}$ (V)
100

PHILIPS

AFZ12



AFZ12

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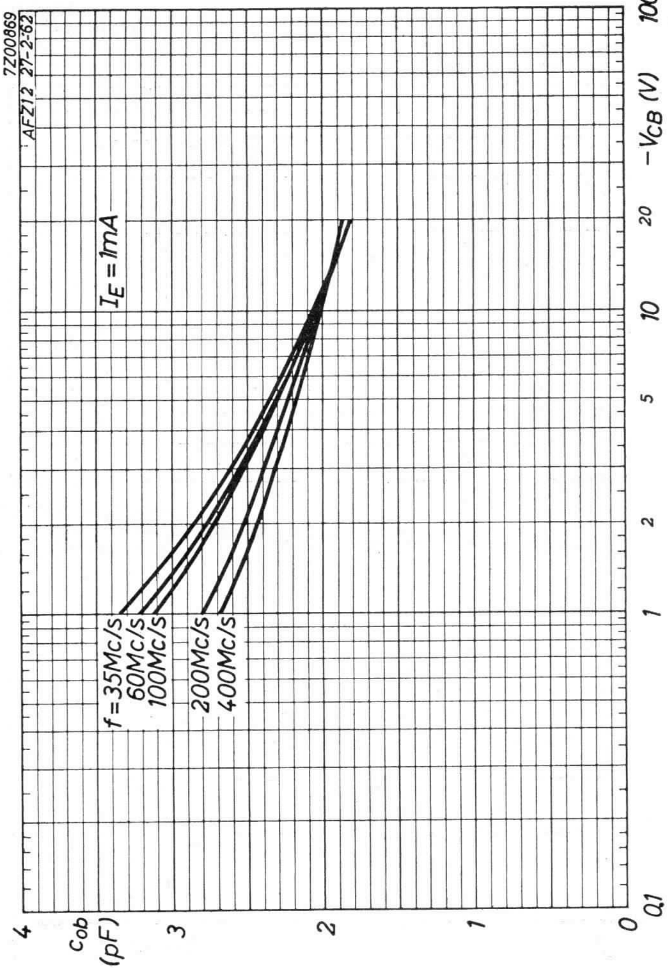
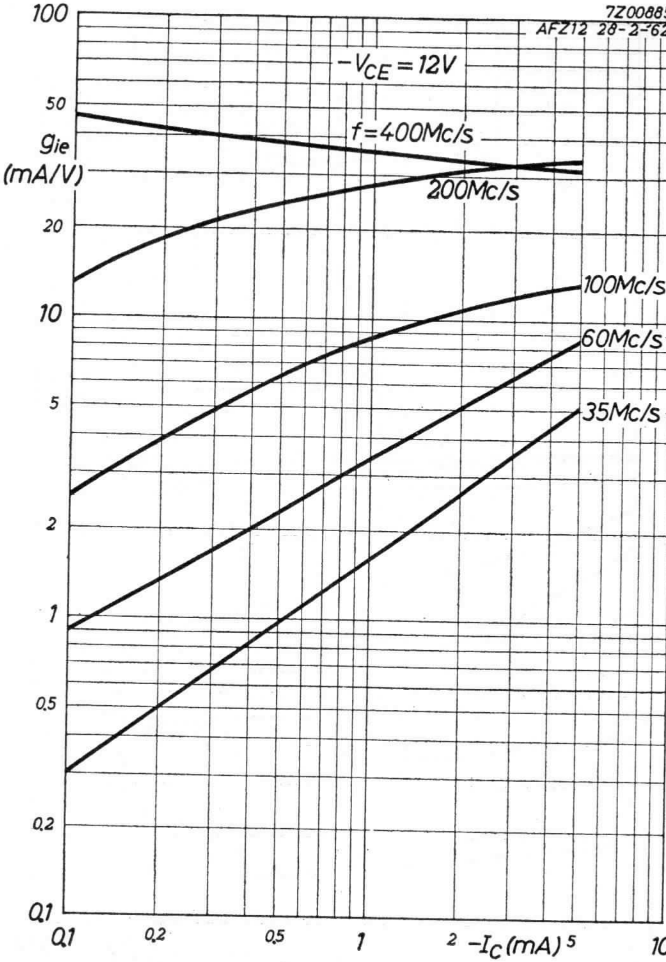


T


7Z00885
AFZ12 28-2-'62
$-V_{CE} = 12V$
g_{ie} (mA/V)
f=400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
100
50
20
10
5
2
1
0.5
0.2
0.1
0.1
0.2
0.5
1
2
5
10
$-I_C$ (mA)

AFZ12

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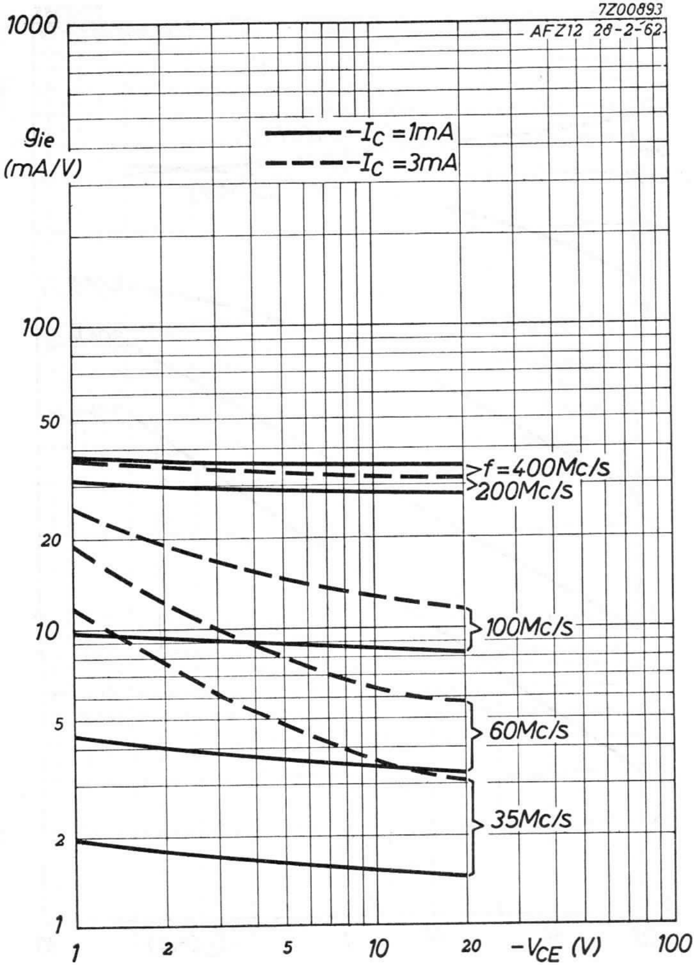
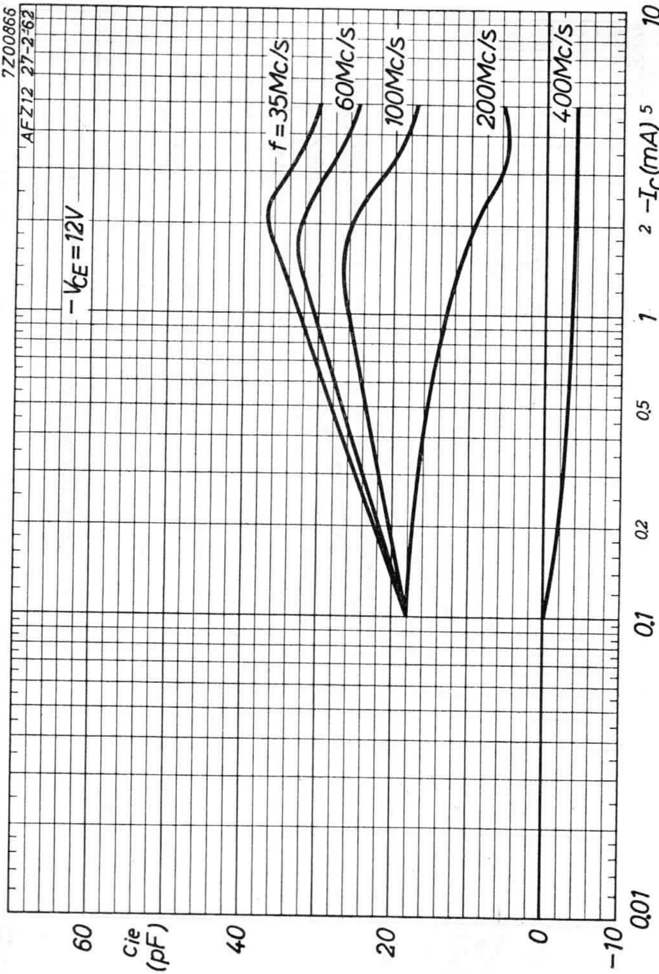


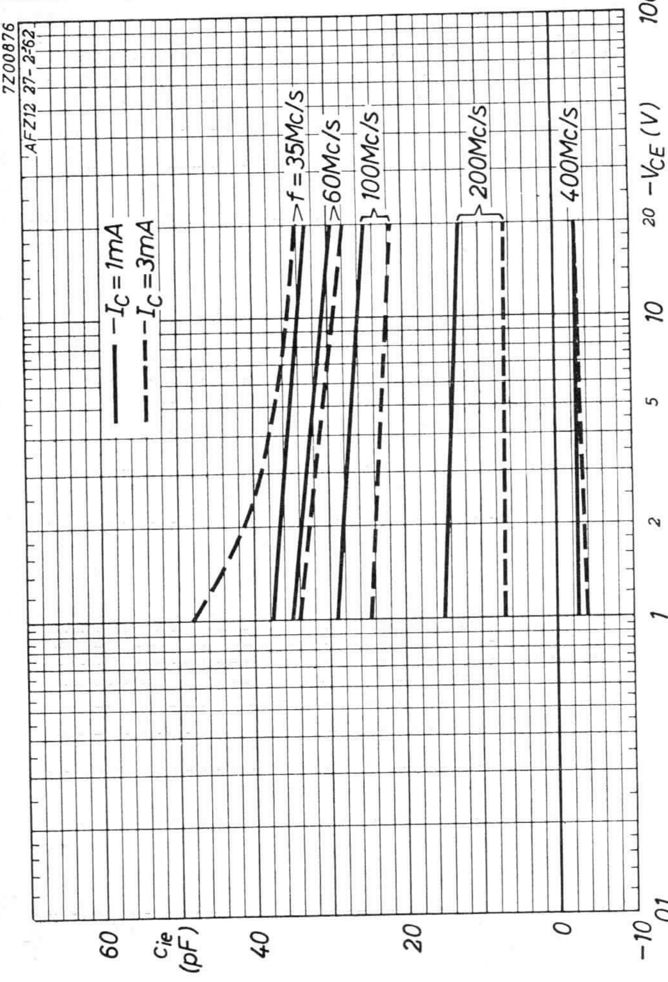
V

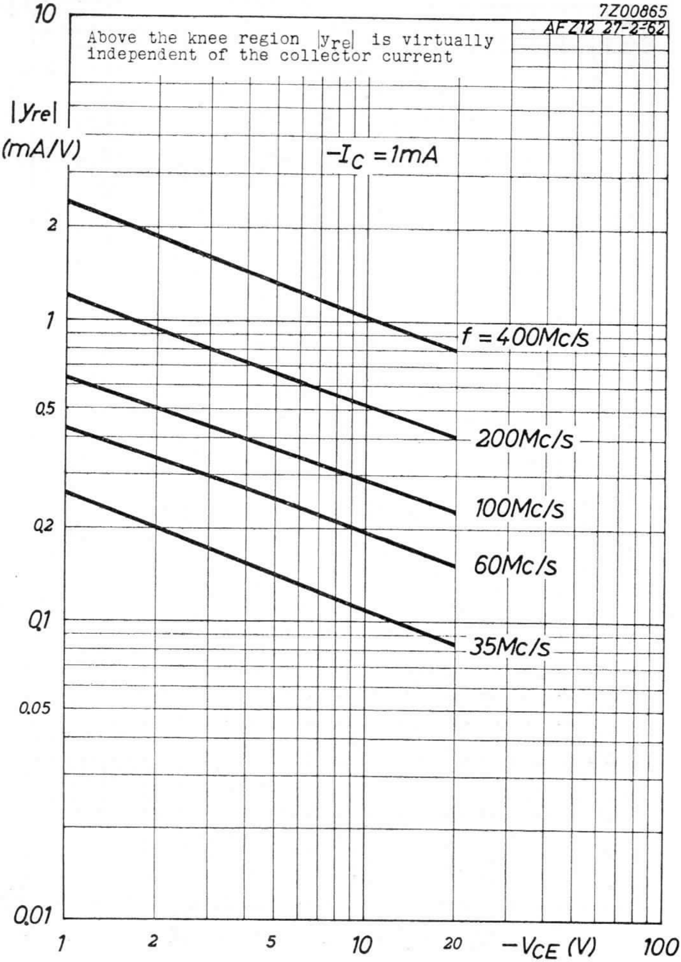
PHILIPS

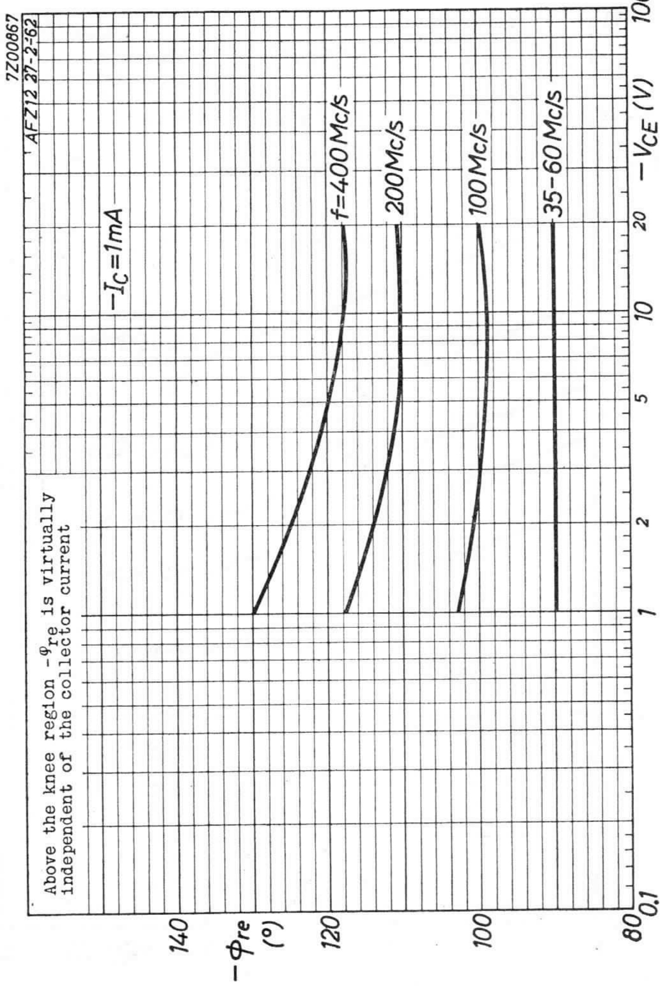
AFZ12

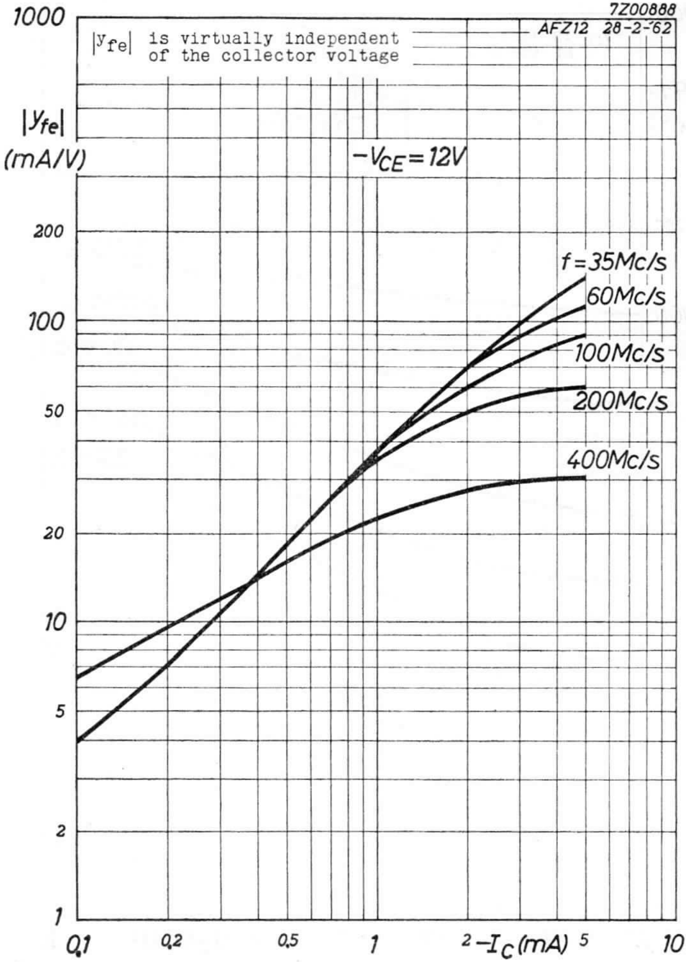


PHILIPS

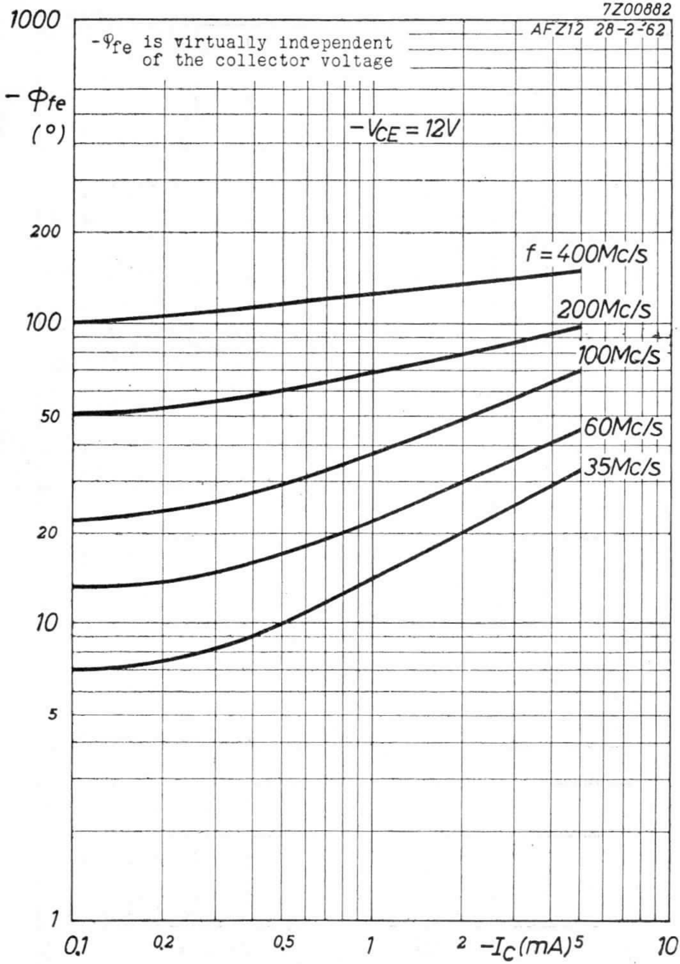

7Z00876
AFZ12 27-2-'62
$-I_C = 1mA$
$-I_C = 3mA$
f = 35Mc/s
60Mc/s
100Mc/s
200Mc/s
400Mc/s
C_{ie} (pF)
60
40
20
0
-10
0.1
1
2
5
10
20
100
$-V_{CE}$ (V)


7Z00865
AFZ12 27-2-62
Above the knee region $|y_{re}|$ is virtually independent of the collector current
$|y_{re}|$ (mA/V)
$-I_C = 1mA$
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
10
2
1
0.5
0.2
0.1
0.05
0.01
1
2
5
10
20
$-V_{CE}$ (V)
100


7Z00867
AFZ12 27-2-62
$-I_C=1mA$
f=400Mc/s
200Mc/s
100Mc/s
35-60Mc/s
Above the knee region $-\varphi_{re}$ is virtually independent of the collector current
$-V_{CE}$ (V)
0.1
1
2
5
10
20
100
$-\varphi_{re}$ (°)
80
100
120
140

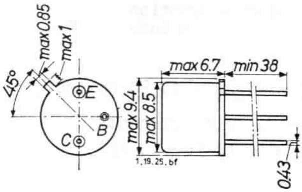

7Z00888
AFZ12 28-2-'62
|yfe| is virtually independent
of the collector voltage
|yfe|
(mA/V)
−VCE = 12V
f = 35Mc/s
60Mc/s
100Mc/s
200Mc/s
400Mc/s
1000
200
100
50
20
10
5
2
1
0,1
0,2
0,5
1
2
5
10
−IC (mA)

PHILIPS


7Z00882
AFZ12 28-2-'62
$-\varphi_{fe}$ is virtually independent of the collector voltage
$-\varphi_{fe}$ (°)
$-V_{CE} = 12V$
f = 400Mc/s
200Mc/s
100Mc/s
60Mc/s
35Mc/s
1000
200
100
50
20
10
5
1
0.1
0.2
0.5
1
2
$-I_C$ (mA)
5
10

GERMANIUM p-n-p ALLOY TRANSISTOR for medium current medium speed computer logic applications and for general purposes

Dimensions in mm



The base is electrically connected to the case

→ LIMITING VALUES (Absolute max. values)

Collector

Voltage (base reference)	$-V_{CB}$	= max.	30 V
Voltage (emitter reference) (See also page M)	$-V_{CE}$	= max.	25 V
Current (averaging time = max. 20 msec)	$-I_C$	= max.	200 mA
	(t_{av}	= max.	20 msec)
Peak current	$-I_{CM}$	= max.	300 mA

Emitter

Voltage (base reference)	$-V_{EB}$	= max.	20 V
Current (averaging time = max. 20 msec)	I_E	= max.	230 mA
	(t_{av}	= max.	20 msec)
Peak current	I_{EM}	= max.	300 mA

Base

Current (averaging time = max. 20 msec)	$-I_B$	= max.	30 mA
	(t_{av}	= max.	20 msec)
Peak current	$-I_{BM}$	= max.	300 mA

Dissipation

Total dissipation	P_{tot}	= max.	150 mW [1]

Temperatures

Junction temperature	T_j	= max.	85 °C
Storage temperature	T_s	=	-65 °C to +100 °C

[1]) The maximum permissible dissipation for a certain application can be calculated from the formula:

$$P_{tot} = \max. \frac{T_{j\,max.} - T_{amb}}{K_{j-amb}}$$

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THERMAL DATA

Thermal resistance from junction to ambience in free air	K_{j-amb}	= max. 0.4 °C/mW
Thermal resistance from junction to case	K_{j-c}	= max. 0.2 °C/mW

CHARACTERISTICS at T_{amb} = 25 °C unless otherwise specified

Collector-base leakage current		
$-I_{CBO}$ ($-V_{CB}$ = 5 V; I_E = 0 mA)	<	3 μA
Emitter-base leakage current		
$-I_{EBO}$ ($-V_{EB}$ = 5 V; I_C = 0 mA)	<	3 μA
Base current		
$-I_B$ (I_E = 10 mA; V_{CB} = 0 V)	<	325 μA
$-I_B$ (I_E = 100 mA; V_{CB} = 0 V)	<	4.75 mA
Collector-base voltage		
$-V_{CB}$ ($-I_C$ = 100 μA; I_E = 0 mA; T_{amb} = 60 °C)	>	30 V
Emitter-base voltage		
$-V_{EB}$ ($-I_E$ = 100 μA; I_C = 0 mA; T_{amb} = 60 °C)	>	20 V
V_{EB} (I_E = 100 mA; V_{CB} = 0 V)	<	0.65 V
$-V_{BE}$ ($-I_C$ = 50 mA; $-I_B$ = 2.4 mA)	<	0.55 V
Punch through voltage		
V_{PT}	>	25 V

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

Collector current

→ $-I_C$ ($-V_{CE}$ = 25 V; V_{BE} = 0.2 V; T_{amb} = 60 °C) < 35 μA

Base current

I_B ($-V_{CE}$ = 20 V; V_{BE} = 5 V; T_{amb} = 60 °C) < 35 μA

Collector voltage

$-V_{CE}$ ($-I_C$ = 5 mA; I_B = 0 mA) > 15 V

→ Direct current amplification factor

h_{FE} (I_E = 20 mA; V_{CB} = 0 V) > 30, < 80

h_{FE} (I_E = 200 mA; V_{CB} = 0 V) > 15

→ Base emitter voltage

$-V_{BE}$ (I_E = 200 mA; V_{CB} = 0 V) < 1.3 V

Collector voltage during bottoming

$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.33 mA) < 0.20 V

$-\hat{V}_{CE}$ ($-I_C$ = 50 mA; $-I_B$ = 2 mA) < 0.25 V

Base voltage

$-V_{BE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.4 mA) > 0.20 V, < 0.37 V

Frequency at which $|h_{fe}|$ = 1

f_1 ($-V_{CE}$ = 5 V; $-I_C$ = 3 mA > 4 Mc/s

Collector capacitance

c_c ($-V_{CB}$ = 5 V; I_E = 0 mA) < 16 pF

Emitter capacitance

c_e ($-V_{EB}$ = 5 V; I_C = 0 mA) < 13 pF

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

T_{amb} = 25 °C

Transient behaviour

Time constant with current feed

τ_c ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 50 mA) < 2.2 µsec

Time constant with voltage feed

τ_v ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 1 mA) < 0.2 µsec

Desaturation time constant

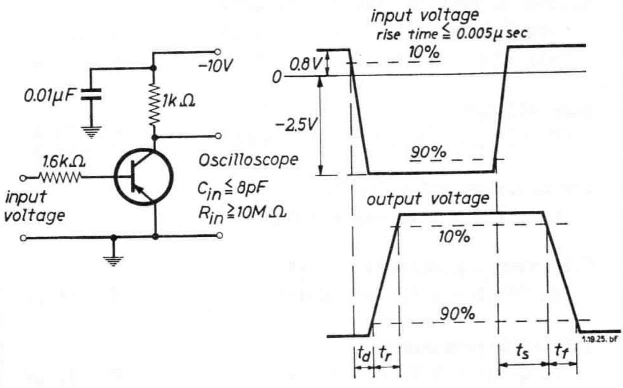
τ_s ($-I_C$ = 0 mA; $-I_B$ = 1 mA) < 1.4 µsec

On demand current gain

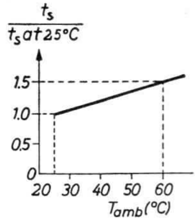
β_T (ΔI_C = 50 mA; t = 0.1 µsec; $-V_{CE} \leq 0.3$ V) = 15

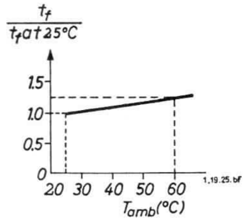
SWITCHING CHARACTERISTICS at T_{amb} = 25 °C

Delay time	t_d	<	0.09 µsec
Rise time	t_r	<	0.49 µsec
Storage time	t_s	<	1.35 µsec
Fall time	t_f	<	0.73 µsec



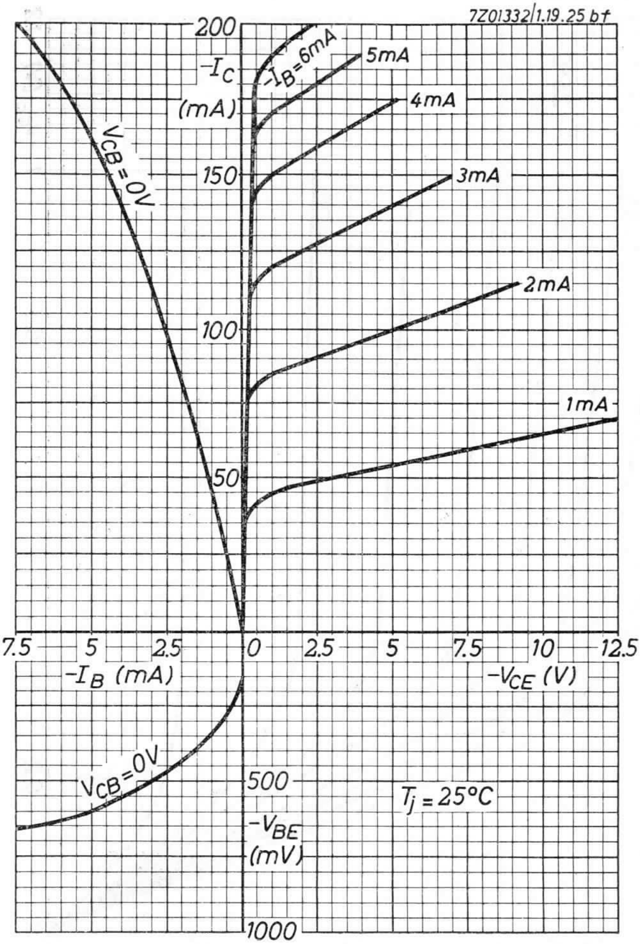
See also page 5

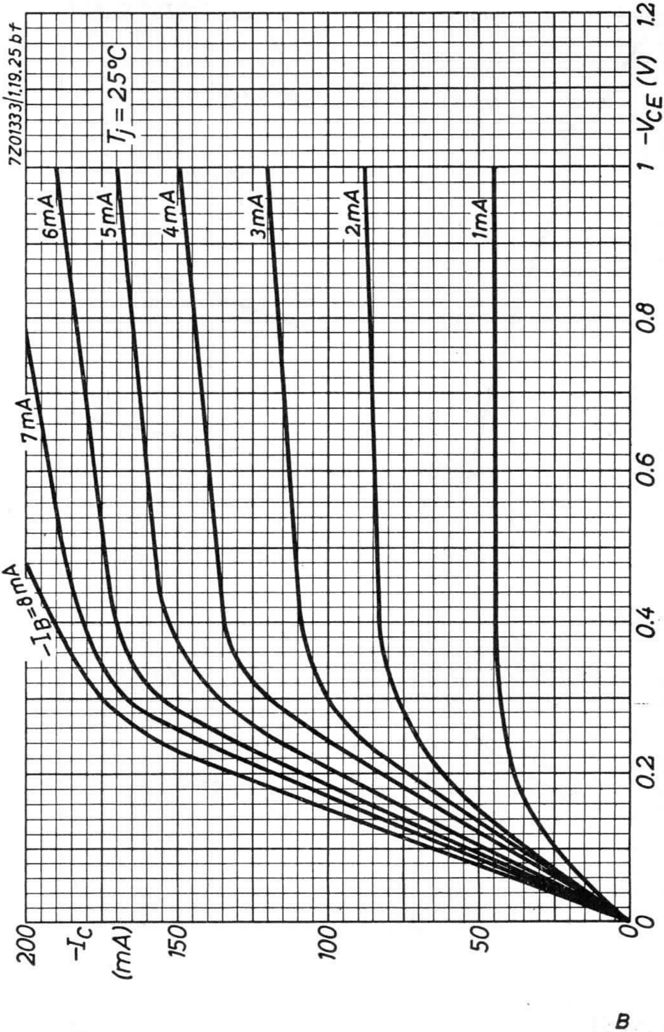

$\frac{t_s}{t_s \, at \, 25°C}$
1.5
1.0
0.5
0
20 30 40 50 60
T_{amb} (°C)


$\frac{t_f}{t_f \, at \, 25°C}$
1.5
1.0
0.5
0
20 30 40 50 60
T_{amb} (°C)
1.19.25.bf

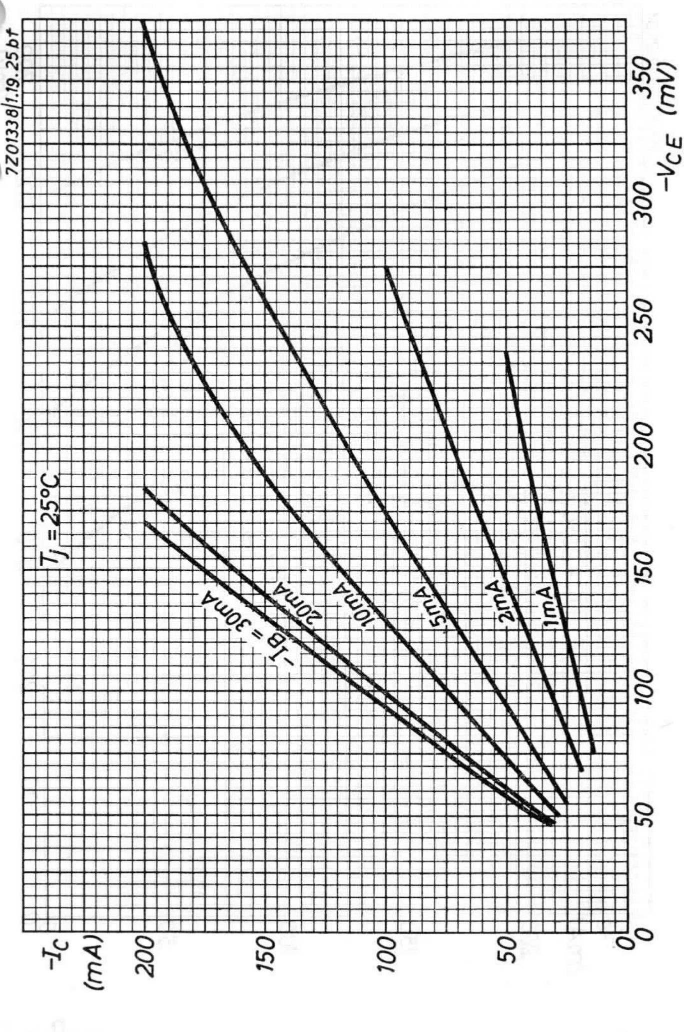
PHILIPS

ASY26

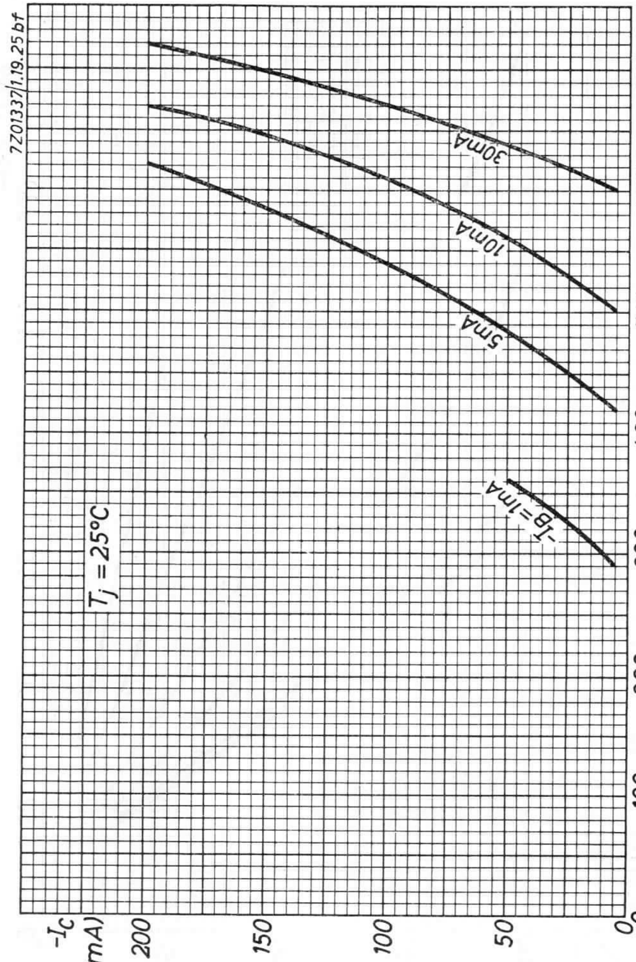




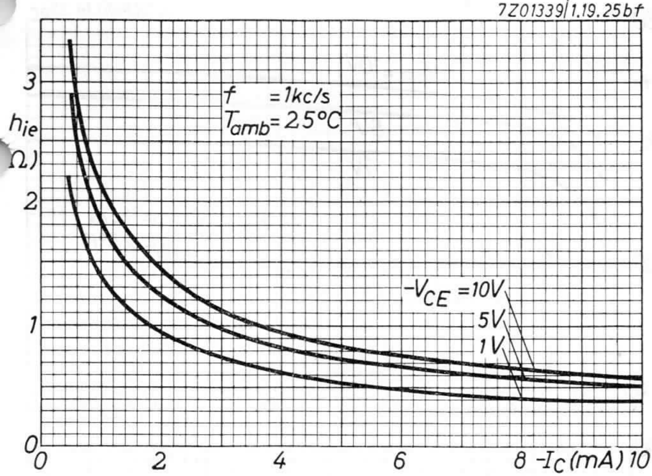
7Z01333/1.19.25 bf
$T_j = 25°C$
$-I_B$=8mA
7mA
6mA
5mA
4mA
3mA
2mA
1mA
$-I_C$ (mA)
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
$-V_{CE}$ (V)

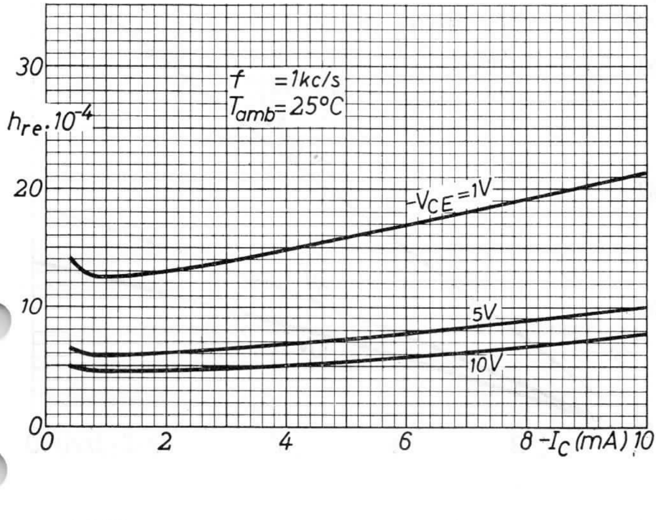

7Z01338/1.19.25bf
T_j = 25°C
-I_B = 30mA
20mA
10mA
5mA
2mA
1mA
-V_CE (mV)
-I_C (mA)
0
50
100
150
200
250
300
350

ASY26 **PHILIPS**



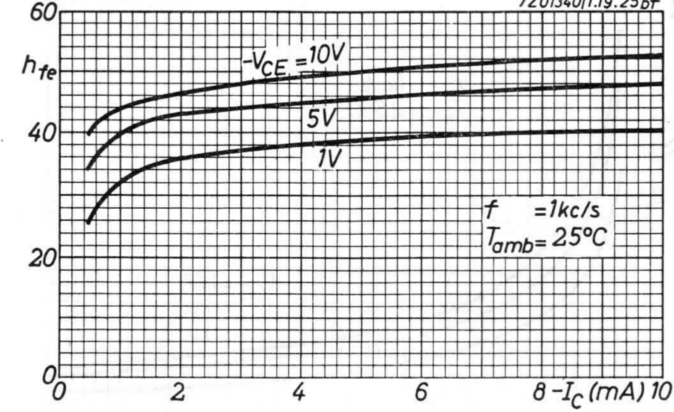
D

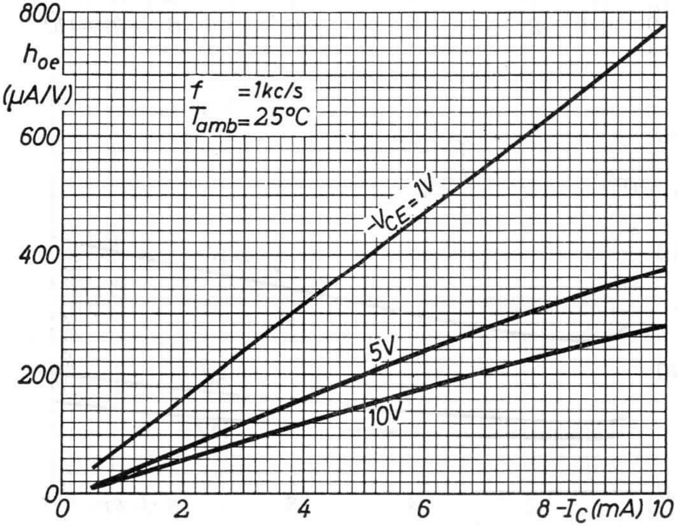

7Z01339/1.19.25bf
f = 1kc/s
Tamb = 25°C
hie
(kΩ)
3
2
1
0
-VCE = 10V
5V
1V
0
2
4
6
8 -IC (mA) 10

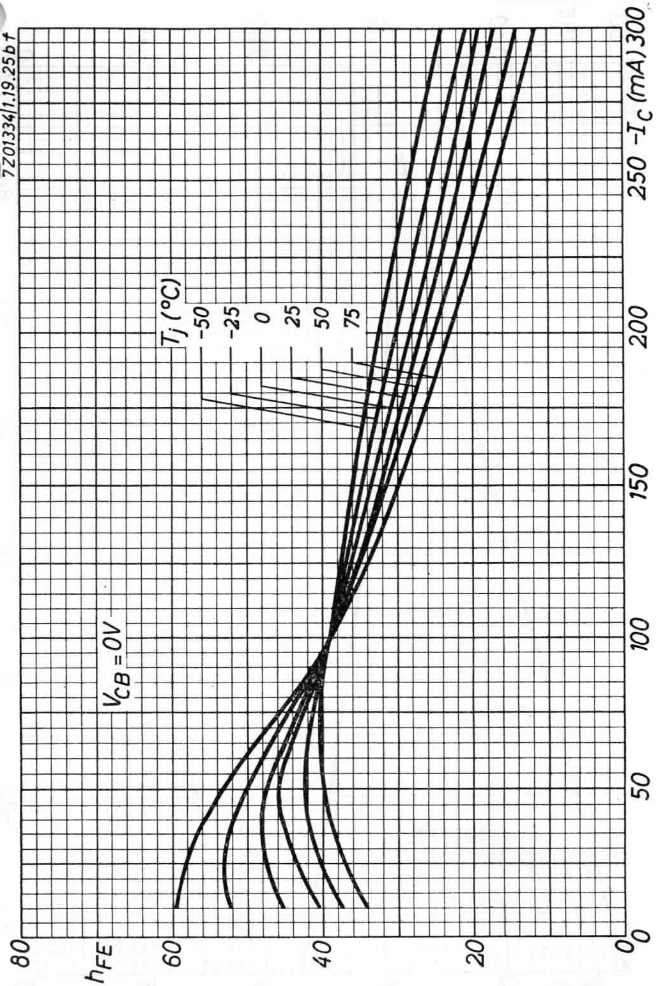

f = 1kc/s
Tamb = 25°C
hre.10-4
30
20
10
0
-VCE = 1V
5V
10V
0
2
4
6
8 -IC (mA) 10

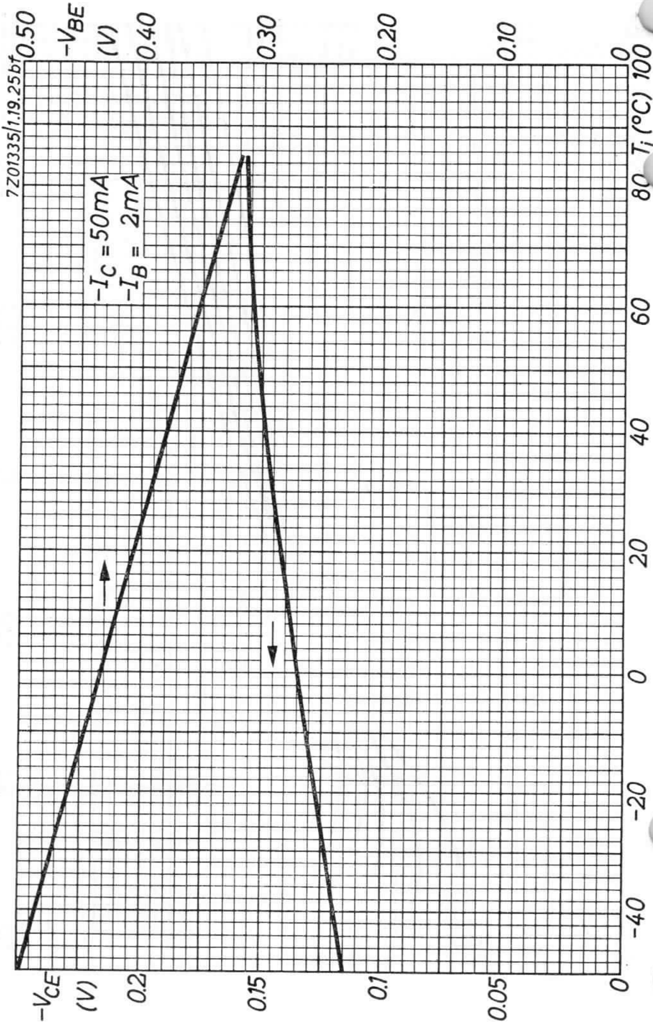
ASY26

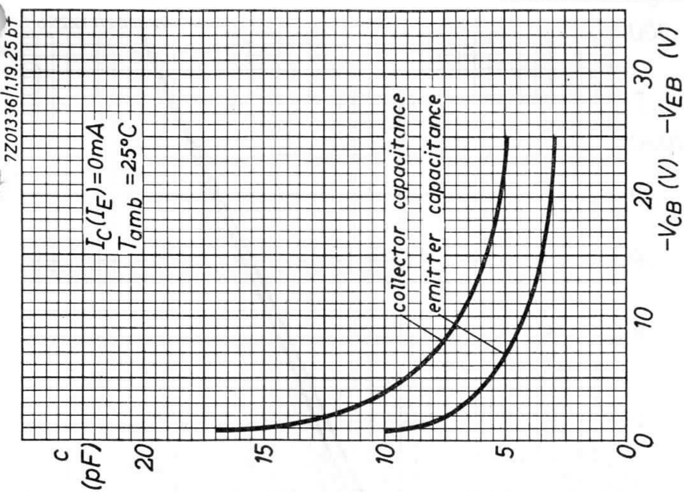
PHILIPS

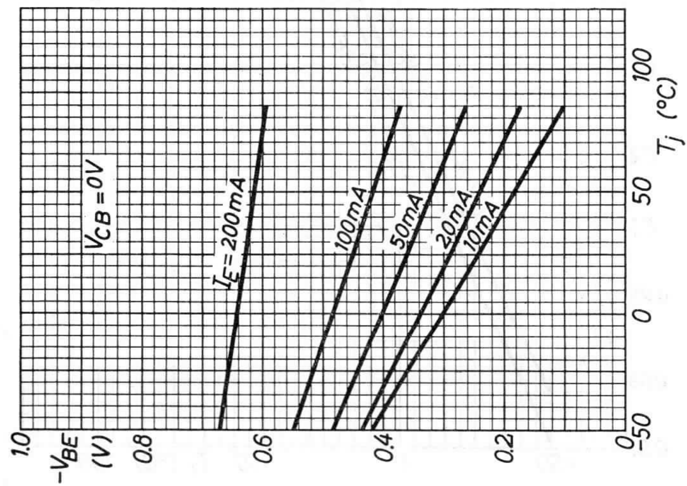




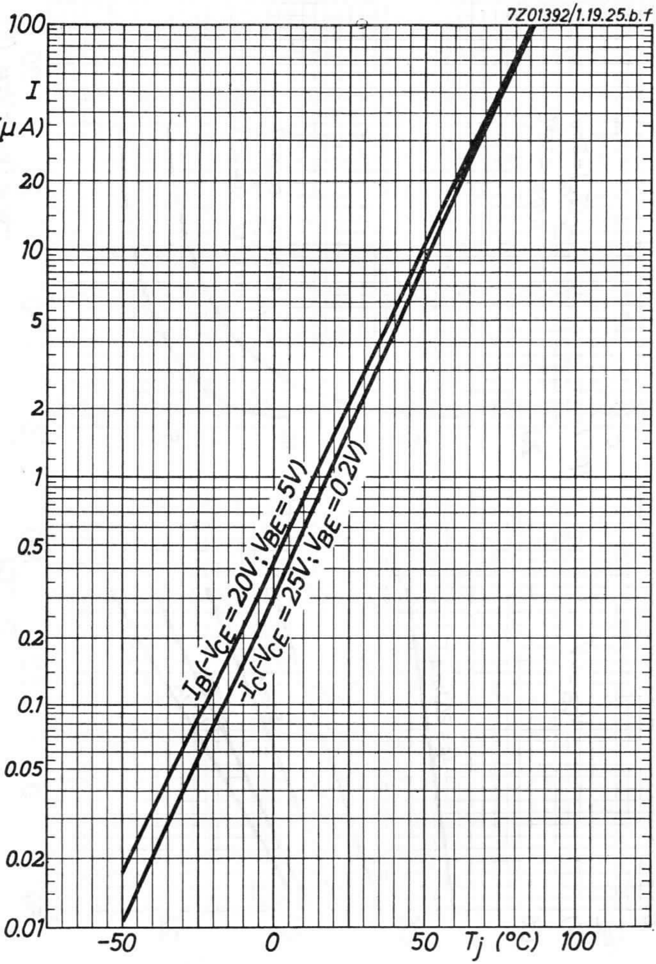

7Z01334/1.19.25b†
h_{FE}
80
60
40
20
0
$-I_C$ (mA)
0
50
100
150
200
250
300
$V_{CB} = 0V$
T_j (°C)
-50
-25
0
25
50
75


7Z01335/1.19.25bf
$-V_{BE}$ (V)
0.50
0.40
0.30
0.20
0.10
0
$-I_C$ = 50mA
$-I_B$ = 2mA
$-V_{CE}$ (V)
0.2
0.15
0.1
0.05
0
T_j (°C)
100
80
60
40
20
0
-20
-40


7Z01336/1.19.25bt
$I_C(I_E) = 0mA$
$T_{amb} = 25°C$
collector capacitance
emitter capacitance
c
(pF)
20
15
10
5
0
0
10
20
30
$-V_{CB}$ (V) $-V_{EB}$ (V)


$V_{CB} = 0V$
$I_E = 200mA$
100mA
50mA
20mA
10mA
$-V_{BE}$
(V)
1.0
0.8
0.6
0.4
0.2
0
−50
0
50
100
T_j (°C)

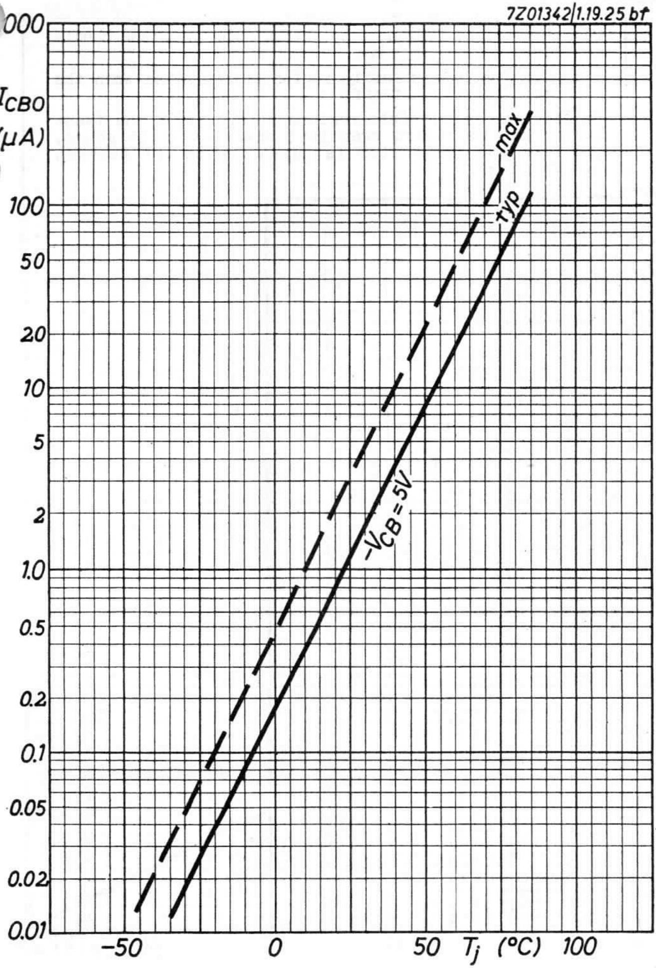
PHILIPS


7Z01392/1.19.25.b.f
I
(μA)
100
20
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
$I_B(-V_{CE}=20V; V_{BE}=5V)$
$-I_C(-V_{CE}=25V; V_{BE}=0.2V)$
−50
0
50
T_j (°C)
100

J

PHILIPS

ASY26



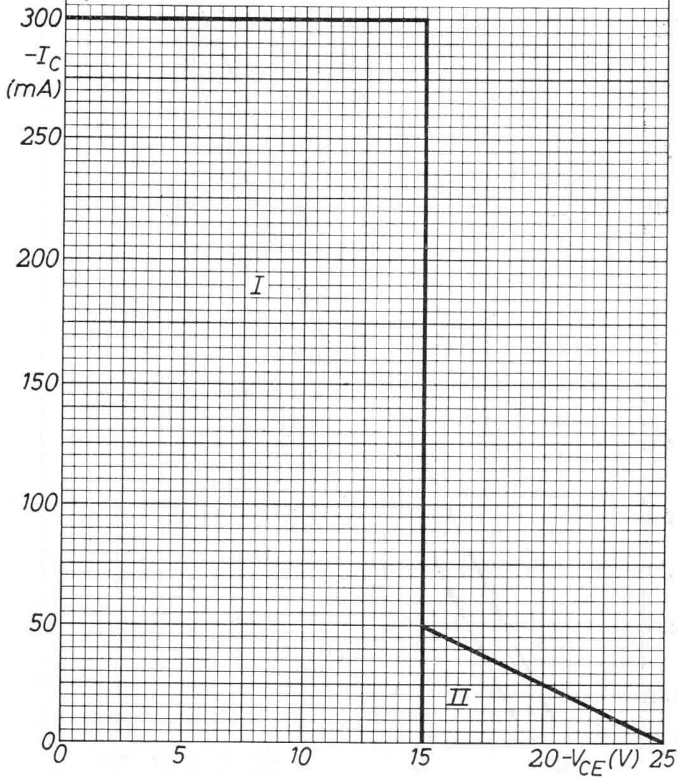
PHILIPS

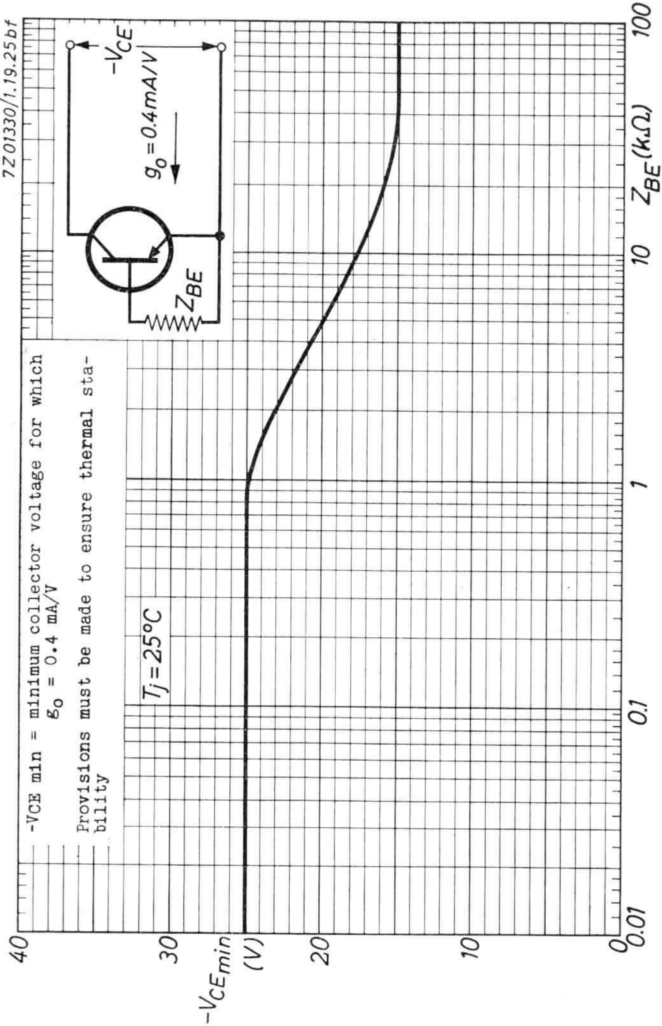
7Z01331/1.19.25 bf

I: Permissible region of operation under all base conditions

II: Additional permissible region of operation when the transistor is cut-off

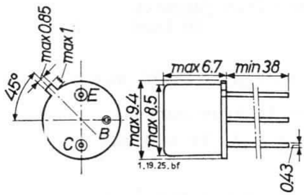
Outside the permissible regions of operation the transistor can withstand transient energies of 15 μWsec, provided the transistor is cut-off with V_{BE} between 0.2 V and 2 V




7Z01330/1.19.25bf
$-V_{CE}$
$g_o = 0.4mA/V$
Z_{BE}
-VCE min = minimum collector voltage for which g_o = 0.4 mA/V
Provisions must be made to ensure thermal stability
$T_j = 25°C$
40
30
20
10
0
$-V_{CEmin}$ (V)
0.01
0.1
1
10
100
Z_{BE} (kΩ)

GERMANIUM p-n-p ALLOY TRANSISTOR for medium current medium speed computer logic applications and for general purposes

Dimensions in mm



The base is electrically connected to the case

LIMITING VALUES (Absolute max. values)

Collector			
Voltage (base reference)	$-V_{CB}$	= max.	25 V
Voltage (emitter reference) (See also page M)	$-V_{CE}$	= max.	20 V
Current (averaging time = max. 20 msec)	$-I_C$ (t_{av}	= max. = max.	200 mA 20 msec)
Peak current	$-I_{CM}$	= max.	300 mA
Emitter			
Voltage (base reference)	$-V_{EB}$	= max.	20 V
Current (averaging time = max. 20 msec)	I_E (t_{av}	= max. = max.	230 mA 20 msec)
Peak current	I_{EM}	= max.	300 mA
Base			
Current (averaging time = max. 20 msec)	$-I_B$ (t_{av}	= max. = max.	30 mA 20 msec)
Peak current	$-I_{BM}$	= max.	300 mA
Dissipation			
Total dissipation	P_{tot}	= max.	150 mW [1]
Temperatures			
Junction temperature	T_j	= max.	85 °C
Storage temperature	T_S	= -65 °C to +100 °C	

[1]) The maximum permissible dissipation for a certain application can be calculated from the formula:

$$P_{tot} = \text{max.}\ \frac{T_{j\,max} - T_{amb}}{K_{j-amb}}$$

THERMAL DATA

Thermal resistance from junction to ambience in free air	K_{j-amb} = max. 0.4 °C/mW
Thermal resistance from junction to case	K_{j-c} = max. 0.2 °C/mW

CHARACTERISTICS at T_{amb} = 25 °C unless otherwise specified

Collector-base leakage current	
$-I_{CBO}$ ($-V_{CB}$ = 5 V; I_E = 0 mA)	< 3 µA
Emitter-base leakage current	
$-I_{EBO}$ ($-V_{EB}$ = 5 V; I_C = 0 mA)	< 3 µA
Base current	
$-I_B$ (I_E = 10 mA; V_{CB} = 0 V)	< 195 µA
$-I_B$ (I_E = 100 mA; V_{CB} = 0 V)	< 3.25 mA
Collector-base voltage	
$-V_{CB}$ ($-I_C$ = 100 µA; I_E = 0 mA; T_{amb} = 60 °C)	> 25 V
Emitter-base voltage	
$-V_{EB}$ ($-I_E$ = 100 µA; I_C = 0 mA; T_{amb} = 60 °C)	> 20 V
V_{EB} (I_E = 100 mA; V_{CB} = 0 V)	< 0.55 V
$-V_{BE}$ ($-I_C$ = 50 mA; $-I_B$ = 1.55 mA)	< 0.45 V
Punch through voltage	
V_{PT}	> 20 V

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

Collector current		
$-I_C$ ($-V_{CE}$ = 20 V; V_{BE} = 0.2 V; T_{amb} = 60 °C)	<	35 μA
Base current		
I_B ($-V_{CE}$ = 20 V; V_{BE} = 5 V; T_{amb} = 60 °C)	<	35 μA
Collector voltage		
$-V_{CE}$ ($-I_C$ = 5 mA; I_B = 0 mA)	>	15 V
→ Direct current amplification factor		
h_{FE} (I_E = 20 mA; V_{CB} = 0 V)	> <	50 150
h_{FE} (I_E = 200 mA; V_{CB} = 0 V)	>	20
→ Base-emitter voltage		
$-V_{BE}$ (I_E = 200 mA; V_{CB} = 0 V)	<	1.4 V
Collector voltage during bottoming		
$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.2 mA)	<	0.20 V
$-V_{CE}$ ($-I_C$ = 50 mA; $-I_B$ = 1.25 mA)	<	0.25 V
Base voltage		
$-V_{BE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.25 mA)	> <	0.15 V 0.32 V
Frequency at which $\|h_{fe}\|$ = 1		
f_1 ($-V_{CE}$ = 5 V; $-I_C$ = 3 mA)	>	6 Mc/s
Collector capacitance		
c_c ($-V_{CB}$ = 5 V; I_E = 0 mA)	<	16 pF
Emitter capacitance		
c_e ($-V_{EB}$ = 5 V; I_C = 0 mA)	<	13 pF

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued) T_{amb} = 25 °C

Transient behaviour

Time constant with current feed

τ_c ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 50 mA) < 2.2 µsec

Time constant with voltage feed

τ_v ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 1 mA) < 0.2 µsec

Desaturation time constant

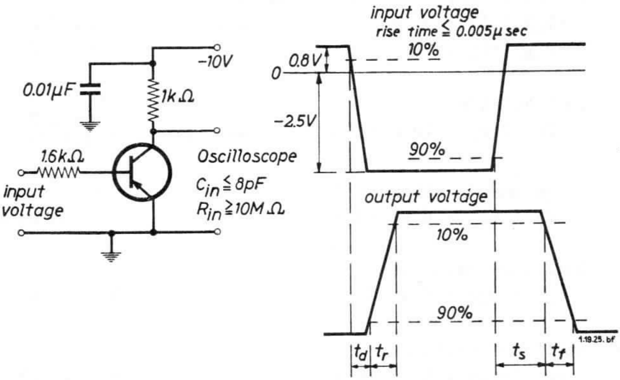
τ_s ($-I_C$ = 0 mA; $-I_B$ = 1 mA) < 1.4 µsec

On demand current gain

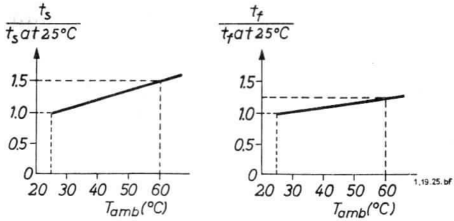
β_T (ΔI_C = 50 mA; t = 0.1 µsec; $-V_{CE} \leqq$ 0.3 V) = 25

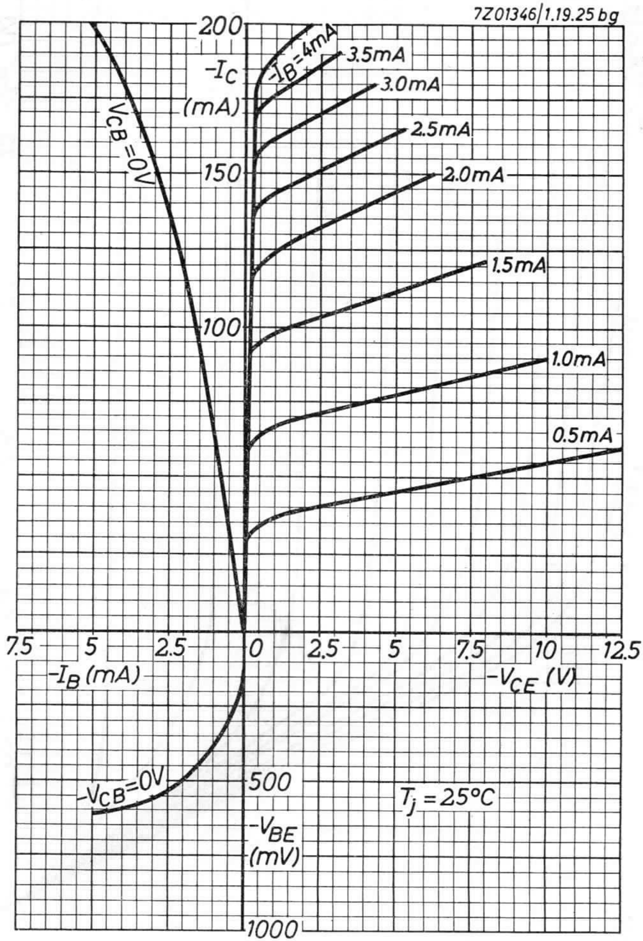
SWITCHING CHARACTERISTICS at T_{amb} = 25 °C

Delay time	t_d	<	0.075 µsec
Rise time	t_r	<	0.35 µsec
Storage time	t_s	<	1.55 µsec
Fall time	t_f	<	0.62 µsec



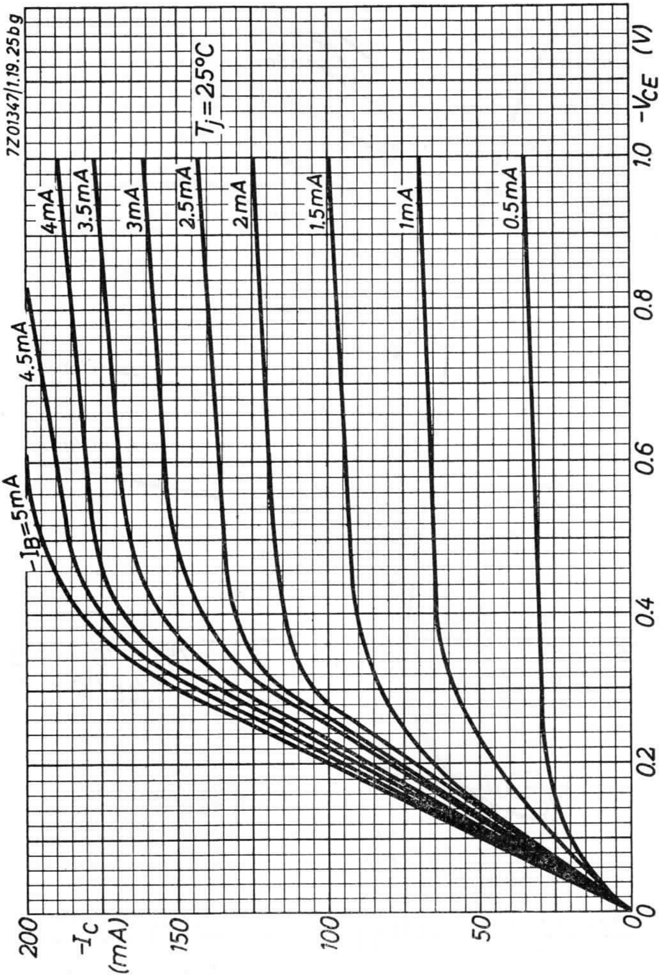
See also page 5

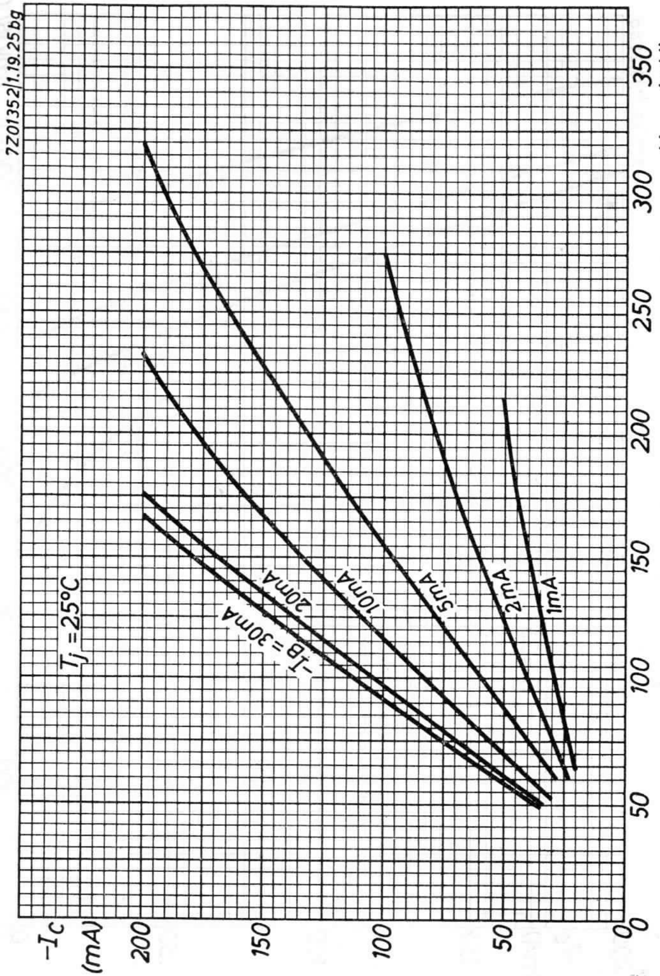

ts
ts at 25°C
1.5
1.0
0.5
0
20 30 40 50 60
Tamb(°C)
tf
tf at 25°C
1.5
1.0
0.5
0
20 30 40 50 60
Tamb(°C)
1.19.25.bf

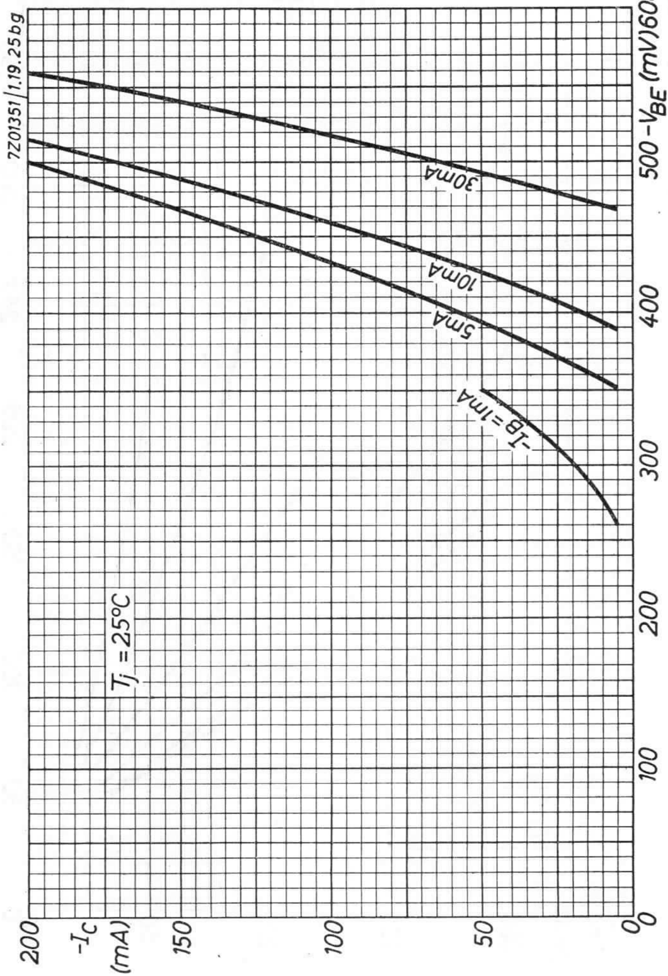

7Z01346/1.19.25 bg
200
$-I_C$
(mA)
150
100
$-I_B=4mA$
3.5mA
3.0mA
2.5mA
2.0mA
1.5mA
1.0mA
0.5mA
$V_{CB}=0V$
7.5
5
2.5
0
2.5
5
7.5
10
12.5
$-I_B$ (mA)
$-V_{CE}$ (V)
$-V_{CB}=0V$
500
$-V_{BE}$
(mV)
1000
$T_j = 25°C$

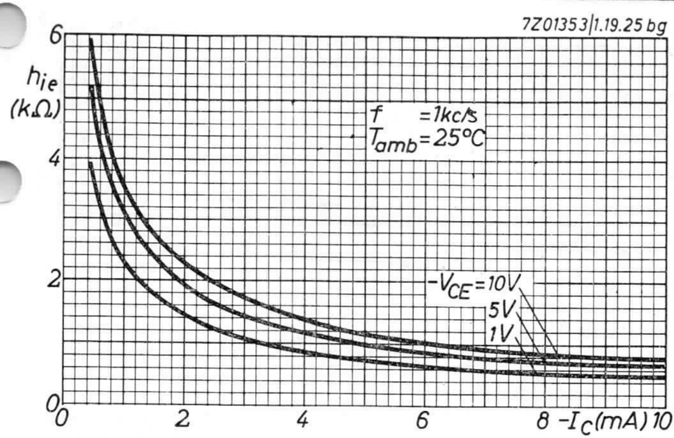
ASY27

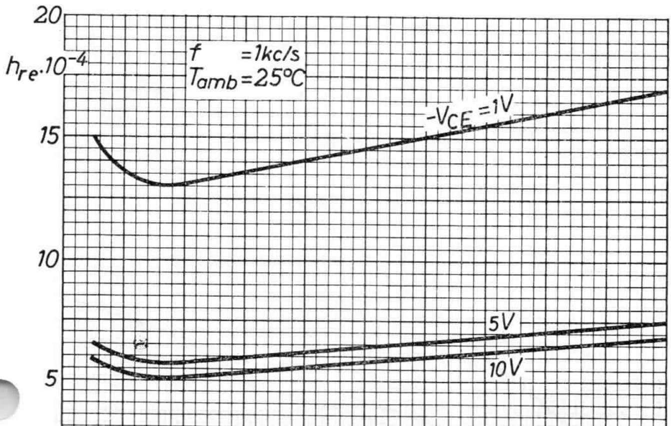
PHILIPS




7Z01352/1.19.25bg
$-V_{CE}$ (mV)
350
300
250
200
150
100
50
0
$-I_C$ (mA)
200
150
100
50
0
$T_j = 25°C$
$-I_B = 30mA$
20mA
10mA
5mA
2mA
1mA

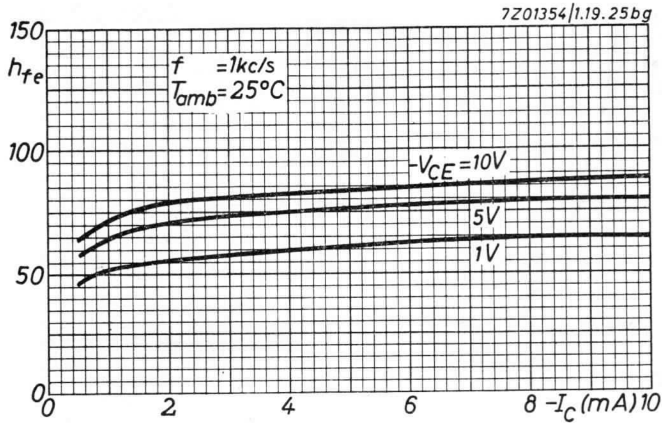

7Z01351/1.19.25bg
500 -V_{BE} (mV) 600
400
300
200
100
0
200
$-I_C$ (mA)
150
100
50
0
30mA
10mA
5mA
$-I_B$=1mA
T_j = 25°C

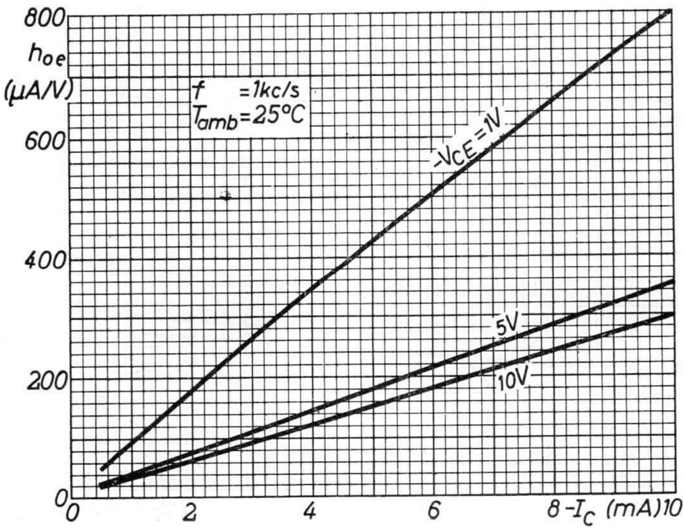

7Z01353|1.19.25 bg
h_{ie} (kΩ)
f = 1kc/s
T_{amb} = 25°C
$-V_{CE}$ = 10V
5V
1V
0
2
4
6
6
8 $-I_C$(mA) 10


$h_{re}.10^{-4}$
f = 1kc/s
T_{amb} = 25°C
$-V_{CE}$ = 1V
5V
10V
0
5
10
15
20
2
4
6
8 $-I_C$ (mA) 10

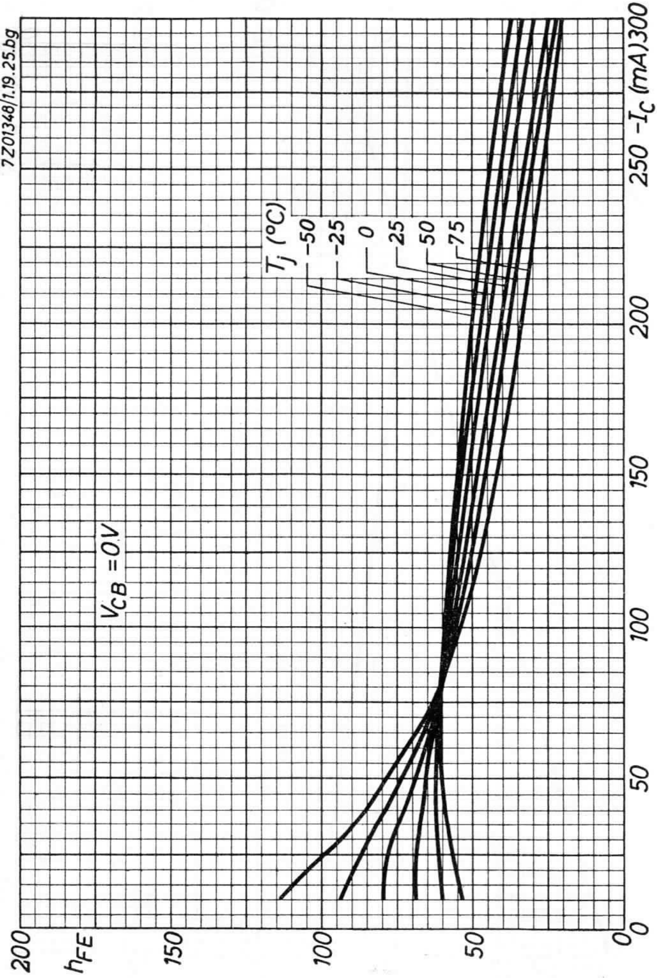
ASY27

PHILIPS



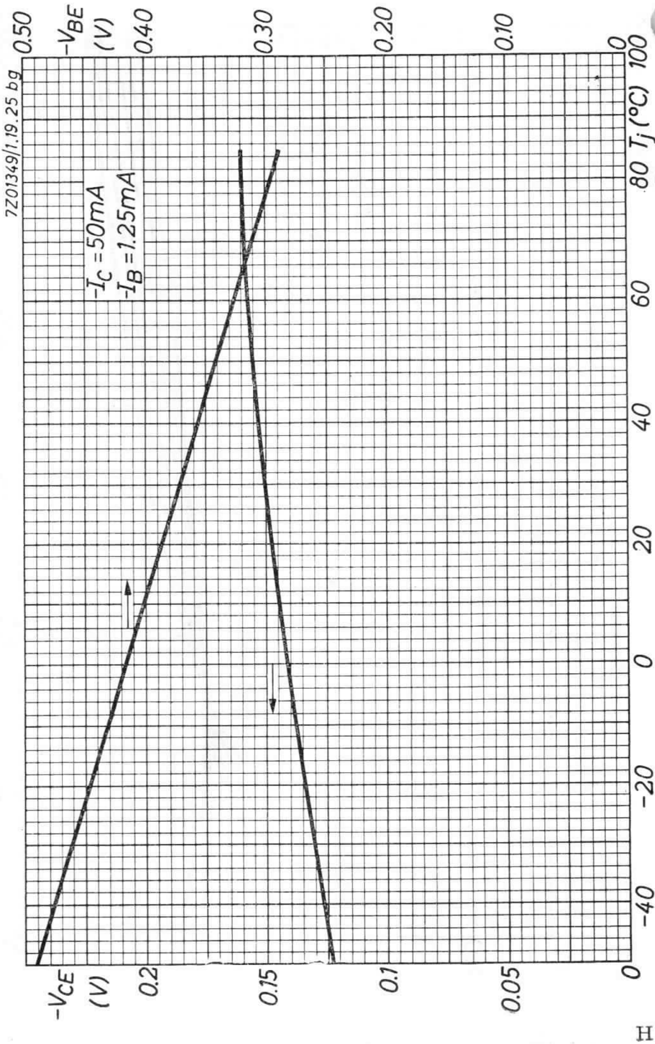


F

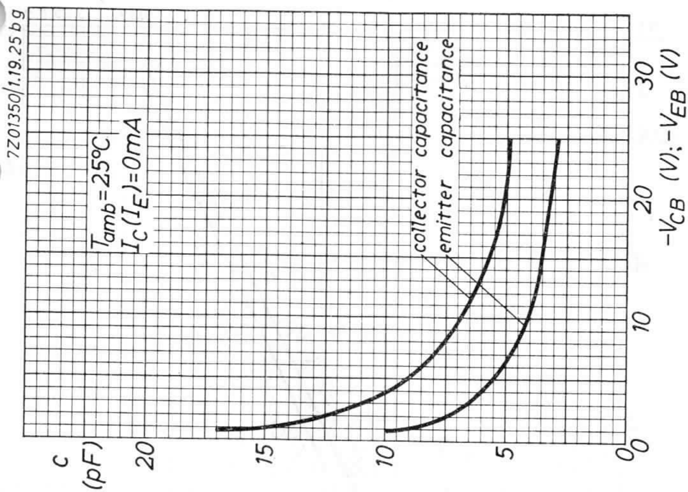

7Z01348/1.19.25.bg
h_{FE}
200
150
100
50
0
$-I_C$ (mA)
300
250
200
150
100
50
0
V_{CB} = 0V
T_j (°C)
−50
−25
0
25
50
75

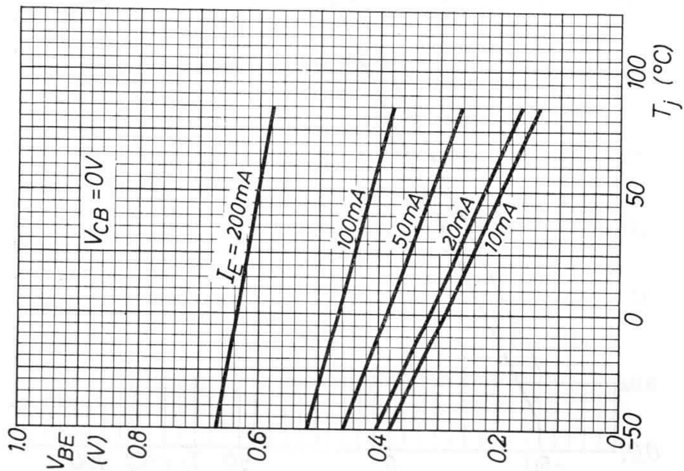
ASY27

PHILIPS

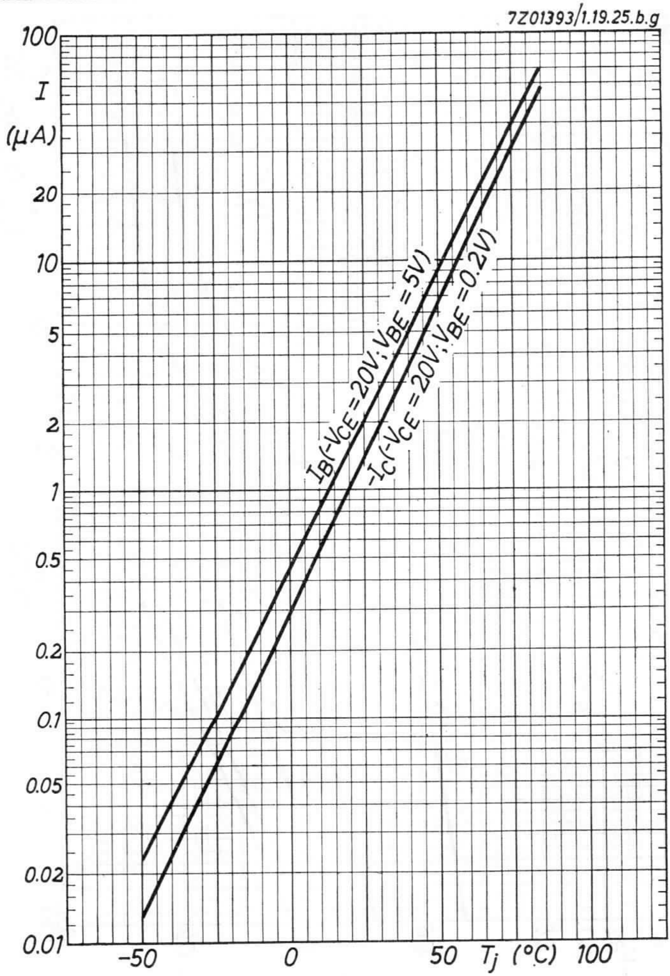


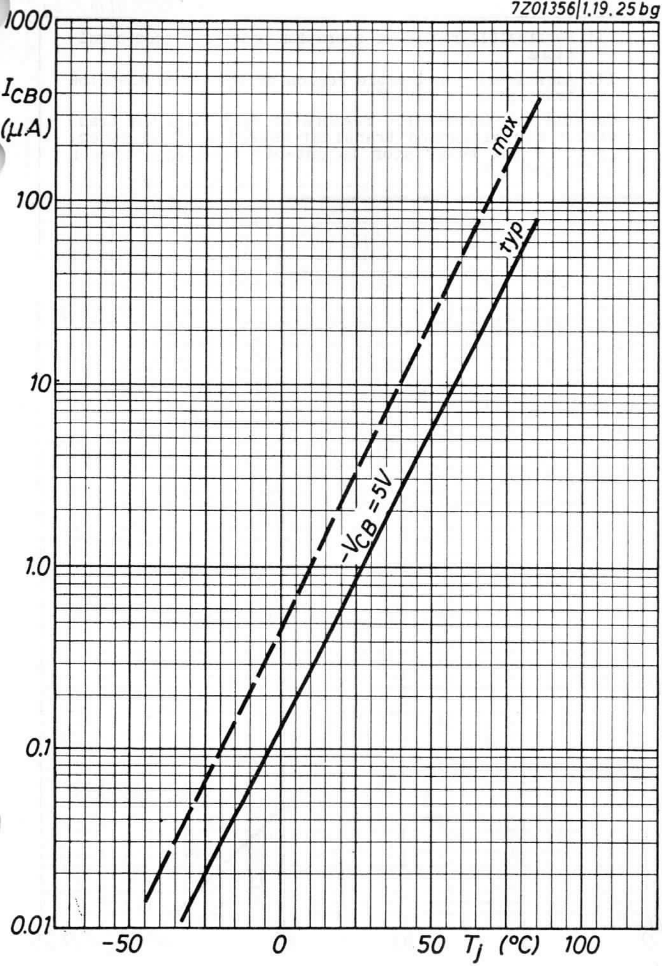
H


7Z01350/1.19.25 b g
T_{amb}=25°C
I_C (I_E)=0mA
collector capacitance
emitter capacitance
C (pF)
0
5
10
15
20
0
10
20
30
$-V_{CB}$ (V); $-V_{EB}$ (V)


V_{CB} =0V
I_E = 200mA
100mA
50mA
20mA
10mA
$-V_{BE}$ (V)
0
0.2
0.4
0.6
0.8
1.0
-50
0
50
100
T_j (°C)

PHILIPS


7Z01393/1.19.25.b.g
100
I
(μA)
20
10
5
2
1
0.5
0.2
0.1
0.05
0.02
0.01
−50
0
50
100
Tj (°C)
IB(−VCE=20V; VBE=5V)
−IC(−VCE=20V; VBE=0.2V)


7Z01356|1.19.25 bg
1000
I_{CBO}
(μA)
100
10
1.0
0.1
0.01
max
typ
$-V_{CB}=5V$
−50
0
50
T_j (°C)
100

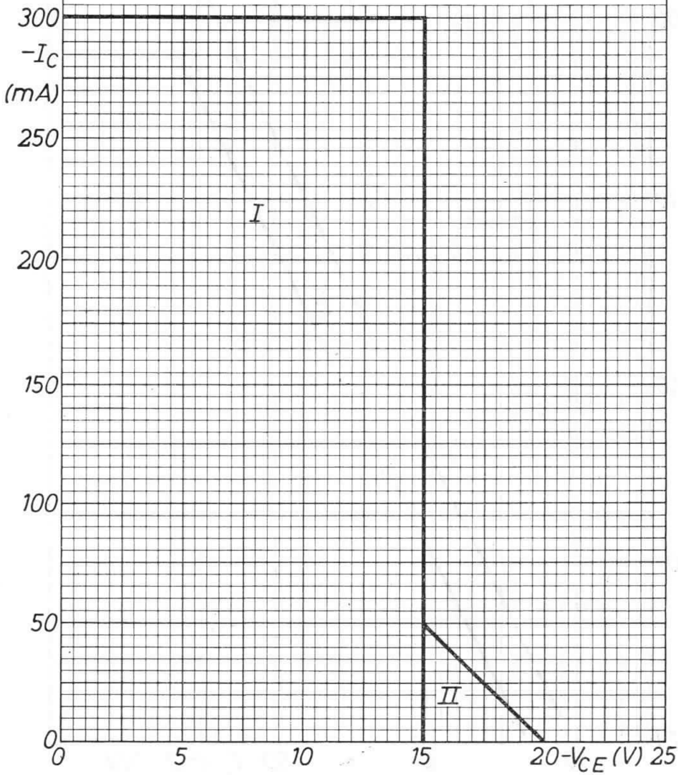
PHILIPS

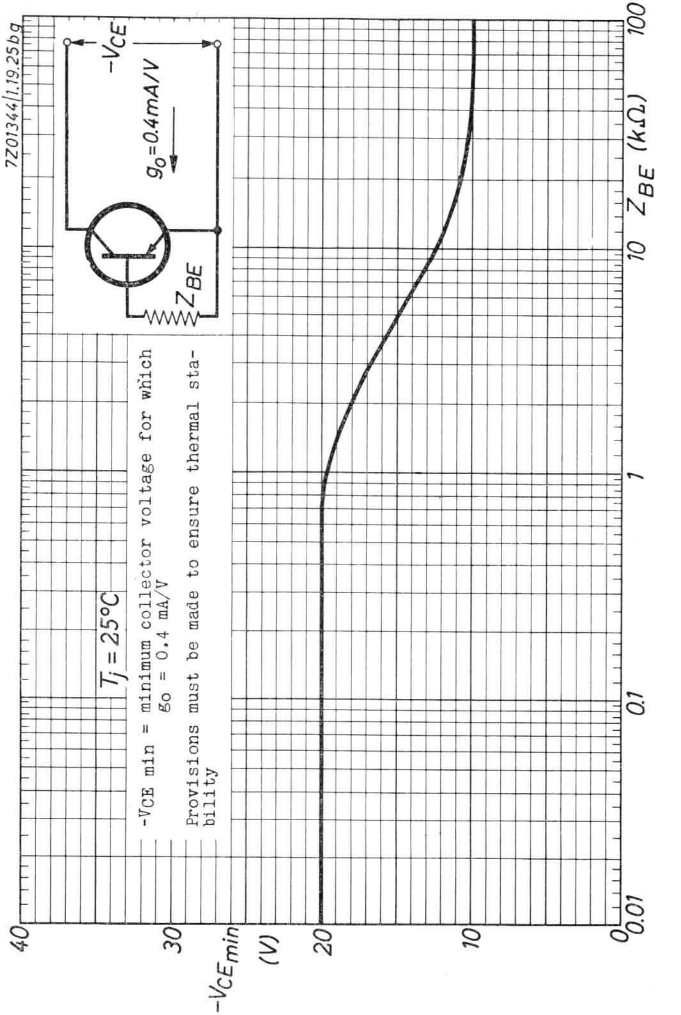
7Z01345/1.19.25bg

I: Permissible region of operation under all base conditions

II: Additional permissible region of operation when the transistor is cut-off

Outside the permissible regions of operation the transistor can withstand transient energies of 15 µWsec, provided the transistor is cut-off with V_{BE} between 0.2 V and 2 V





7Z01344/1.19.25bg
$-V_{CE}$
g_o=0.4mA/V
Z_{BE}
T_j = 25°C
-VCE min = minimum collector voltage for which
go = 0.4 mA/V
Provisions must be made to ensure thermal stability
$-V_{CE min}$ (V)
Z_{BE} (kΩ)
40
30
20
10
0
0.01
0.1
1
10
100

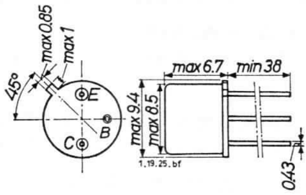
PHILIPS

ASY28
ASY29

GERMANIUM n-p-n ALLOY TRANSISTORS for medium current medium speed computer logic applications

SOT 5 metal envelope

Dimensions in mm



The base is electrically connected to the case

LIMITING VALUES (Absolute max. values)

		ASY28	ASY29	
Collector				
Voltage (base reference)	V_{CB} = max.	30 V	25 V	
Voltage (emitter reference)	V_{CE} = max.	25 V	20 V	
Current (averaging time = max. 20 msec)	I_C = max. (t_{av} = max.	100 20		mA msec)
Peak current	I_{CM} = max.	200		mA
Emitter				
Voltage (base reference)	V_{EB} = max.	20		V
Current (averaging time = max. 20 msec)	$-I_E$ = max. (t_{av} = max.	125 20		mA msec)
Peak current	$-I_{EM}$ = max.	200		mA
Base				
Current (averaging time = max. 20 msec)	I_B = max. (t_{av} = max.	25 20		mA msec)
Peak current	I_{BM} = max.	200		mA
Dissipation				
Total dissipation	P_{tot} = max.	125		mW
Temperatures				
Junction temperature	T_j = max.	75		°C
Storage temperature	T_s = -65°C to +75			°C

THERMAL DATA

Thermal resistance from junction to ambience in free air $K_{j\text{-}amb}$ = max. 0.4 °C/mW

Thermal resistance from junction to case $K_{j\text{-}c}$ = max. 0.2 °C/mW

CHARACTERISTICS at T_{amb} = 25 °C

	ASY28	ASY29
Collector-base leakage current		
I_{CBO} (V_{CB} = 5 V; I_E = 0 mA)	< 3 µA	< 3 µA
Emitter-base leakage current		
I_{EBO} (V_{EB} = 5 V; I_C = 0 mA)	< 3 µA	< 3 µA
Base current		
I_B ($-I_E$ = 10 mA; V_{CB} = 0 V)	< 325 µA	< 195 µA
I_B ($-I_E$ = 100 mA; V_{CB} = 0 V)	< 4.75 mA	< 3.25 mA
Collector-emitter saturation voltage		
V_{CE} (I_C = 50 mA; I_B = 2 mA)	< 0.25 V	
V_{CE} (I_C = 50 mA; I_B = 1.25 mA)		< 0.25 V
Punch through voltage		
V_{PT}	> 25 V	> 20 V

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

	ASY28	ASY29
Collector reverse current		
I_C (V_{CE} = 25 V; $-V_{BE}$ = 0.2 V; T_{amb} = 60 °C)	< 35 µA	
I_C (V_{CE} = 20 V; $-V_{BE}$ = 0.2 V; T_{amb} = 60 °C)		< 35 µA
Base current		
I_B (V_{CE} = 20 V; $-V_{BE}$ = 5 V; T_{amb} = 60 °C)	< 35 µA	< 35 µA
Direct current amplification factor		
h_{FE} ($-I_E$ = 20 mA; V_{CB} = 0 V)	> 30 < 80	> 50 < 150
Base-emitter voltage		
V_{BE} ($-I_E$ = 100 mA; V_{CB} = 0 V)	< 0.65 V	< 0.55 V
Collector-emitter saturation voltage		
V_{CE} (I_C = 10 mA; I_B = 0.33 mA)	< 0.20 V	
V_{CE} (I_C = 10 mA; I_B = 0.2 mA)		< 0.20 V

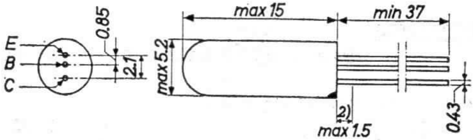
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN (continued)

$T_{amb} = 25\ ^{o}C$

	ASY28	ASY29
Base voltage		
V_{BE} (I_C = 10 mA; I_B = 0.4 mA)	> 0.20 V < 0.37 V	
V_{BE} (I_C = 10 mA; I_B = 0.25 mA)		> 0.15 V < 0.32 V
V_{BE} (I_C = 50 mA; I_B = 2.4 mA)	< 0.55 V	
V_{BE} (I_C = 50 mA; I_B = 1.55 mA)		< 0.45 V
Frequency at which $\lvert h_{fe} \rvert = 1$		
f_1 (V_{CE} = 5 V; I_C = 3 mA)	> 4 Mc/s	> 6 Mc/s
Collector capacitance		
c_c (V_{CB} = 5 V; I_E = 0 mA)	< 16 pF	< 16 pF
Emitter capacitance		
c_e (V_{EB} = 5 V; I_C = 0 mA)	< 13 pF	< 13 pF
Transient behaviour		
Time constant with current feed		
τ_c (V_{CE} = 0.75 V; I_{CM}= 50 mA)	< 2.2 µsec	< 2.2 µsec
Time constant with voltage feed		
τ_v (V_{CE} = 0.75 V; I_{CM} = 1mA)	< 0.2 µsec	< 0.2 µsec
Desaturation time constant		
τ_s (I_C = 0 mA; I_B = 1 mA)	< 1.4 µsec	< 1.4 µsec

GERMANIUM ALLOY TRANSISTOR of the p-n-p type in all-glass construction for medium-current medium-speed computer logic applications

Dimensions in mm The red dot indicates the collector



LIMITING VALUES (Absolute maximum values)

Collector

Voltage (base reference)	$-V_{CB}$ = max. 25 V
Voltage (emitter reference)	$-V_{CE}$ = max. 20 V
Current	
Peak	$-I_{CM}$ = max. 200 mA
D.C. and average (averaging time = max. 20 msec)	$-I_C$ = max. 100 mA
	(t_{av} = max. 20 msec)

Emitter

Voltage (base reference)	$-V_{EB}$ = max. 20 V
Current	
Peak	I_{EM} = max. 200 mA
D.C. and average (averaging time = max. 20 msec)	I_E = max. 125 mA
	(t_{av} = max. 20 msec)

Base

Current	
Peak	$-I_{BM}$ = max. 200 mA
D.C. and average (averaging time = max. 20 msec)	$-I_B$ = max. 25 mA
	(t_{av} = max. 20 msec)

Dissipation

Total dissipation	P_{tot} = max. 125 mW [1]

Temperatures

Storage	T_s = -55 °C to +75 °C
Junction	T_j = max. 75 °C

[1] The maximum admissible dissipation for a certain application can be calculated from the formula: $P_{tot} = \text{max.}\ \frac{T_j\ \text{max} - T_{amb}}{K}$

[2] Not tinned

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Tentative data

THERMAL DATA

Thermal resistance from junction to ambience in free air	K = max. 0.4 °C/mW
Thermal resistance from junction to case	K = max. 0.2 °C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector current at I_E = 0 mA	
$-I_{CBO}$ ($-V_{CB}$ = 5 V)	< 3 μA
Emitter current at I_C = 0 mA	
$-I_{EBO}$ ($-V_{EB}$ = 5 V)	< 3 μA
Base current at V_{CB} = 0 V	
$-I_B$ (I_E = 10 mA; V_{CB} = 0 V)	< 325 μA
$-I_B$ (I_E = 20 mA; V_{CB} = 0 V)	> 250 μA < 645 μA
$-I_B$ (I_E = 100 mA; V_{CB} = 0 V)	< 4.75 mA
Collector voltage	
$-V_{CB}$ ($-I_C$ = 100 μA; I_E = 0 mA; T_{amb} = 60 °C)	> 25 V
Emitter voltage	
$-V_{EB}$ ($-I_E$ = 100 μA; I_C = 0 mA; T_{amb} = 60 °C)	> 20 V
V_{EB} (I_E = 100 mA; V_{CB} = 0 V)	< 0.65 V
$-V_{BE}$ ($-I_C$ = 50 mA; $-I_B$ = 2.4 mA)	< 0.55 V
Punch through voltage	
V_{PT}	> 20 V

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

$T_{amb} = 25^{o}C$ unless otherwise specified

Collector current

$-I_C$ { $-V_{CE}$ = 20 V; V_{BE} = 0.2 V; T_{amb} = 60 °C } < 35 µA

Base current

I_B { $-V_{CE}$ = 20 V; V_{BE} = 5 V; T_{amb} = 60 °C } < 35 µA

Collector voltage

$-V_{CE}$ ($-I_C$ = 5 mA; I_B = 0 mA) > 15 V

Collector voltage in bottoming

$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.33 mA) < 0.20 V

$-V_{CE}$ ($-I_C$ = 50 mA; $-I_B$ = 2.0 mA) < 0.25 V

Base voltage

$-V_{BE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.4 mA) > 0.20 V; < 0.37 V

Frequency at which $|h_{fe}|$ = 1

f_1 ($-V_{CE}$ = 5 V; $-I_C$ = 3 mA) > 4 Mc/s

Collector capacitance

c_c ($-V_{CB}$ = 5 V; I_E = 0 mA) < 16 pF

Emitter capacitance

c_e ($-V_{EB}$ = 5 V; I_C = 0 mA) < 13 pF

Transient behaviour

Time constant with current feed

τ_c ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 50 mA) < 2.2 µsec

Time constant with voltage feed

τ_v ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 1 mA) < 0.2 µsec

Desaturation time constant

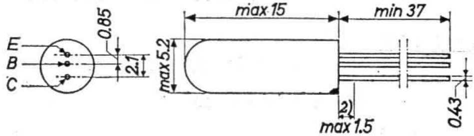
τ_s ($-I_C$ = 0 mA; $-I_B$ = 1 mA) < 1.4 µsec

PHILIPS

ASY32

GERMANIUM ALLOY TRANSISTOR of the p-n-p type in all-glass construction for medium-current medium-speed computer logic applications

Dimensions in mm   The red dot indicates the collector



LIMITING VALUES (Absolute maximum values)

Collector

Voltage (base reference)	$-V_{CB}$ = max.	25 V
Voltage (emitter reference)	$-V_{CE}$ = max.	20 V
Current		
Peak	$-I_{CM}$ = max.	200 mA
D.C. and average (averaging time = max. 20 msec)	$-I_C$ = max.	100 mA
	(t_{av} = max.	20 msec)

Emitter

Voltage (base reference)	$-V_{EB}$ = max.	20 V
Current		
Peak	I_{EM} = max.	200 mA
D.C. and average (averaging time = max. 20 msec)	I_E = max.	125 mA
	(t_{av} = max.	20 msec)

Base

Current		
Peak	$-I_{BM}$ = max.	200 mA
D.C. and average (averaging time = max. 20 msec)	$-I_B$ = max.	25 mA
	(t_{av} = max.	20 msec)

Dissipation

Total dissipation	P_{tot} = max.	125 mW [1]

Temperatures

Storage	T_s	= -55 °C to +75 °C
Junction	T_j	= max. 75 °C

[1]) The maximum admissible dissipation for a certain application can be calculated from the formula: $P_{tot} = \text{max.}\ \frac{T_j\ \text{max} - T_{amb}}{K}$

[2]) Not tinned

THERMAL DATA

Thermal resistance from junction to ambience in free air	K = max. 0.4 °C/mW
Thermal resistance from junction to case	K = max. 0.2 °C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector current at I_E = 0 mA

$-I_{CBO}$ ($-V_{CB}$ = 5 V)	< 3 μA

Emitter current at I_C = 0 mA

$-I_{EBO}$ ($-V_{EB}$ = 5 V)	< 3 μA

Base current at V_{CB} = 0 V

$-I_B$ (I_E = 10 mA; V_{CB} = 0 V)	< 195 μA
$-I_B$ (I_E = 20 mA; V_{CB} = 0 V)	> 130 μA < 390 μA
$-I_B$ (I_E = 100 mA; V_{CB} = 0 V)	< 3.25 mA

Collector voltage

$-V_{CB}$ ($-I_C$ = 100 μA; I_E = 0 mA; T_{amb} = 60 °C)	> 25 V

Emitter voltage

$-V_{EB}$ ($-I_E$ = 100 μA; I_C = 0 mA; T_{amb} = 60 °C)	> 20 V
V_{EB} (I_E = 100 mA; V_{CB} = 0 V)	< 0.55 V
$-V_{BE}$ ($-I_C$ = 50 mA; $-I_B$ = 1.55 mA)	< 0.45 V

Punch through voltage

V_{PT}	> 20 V

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

Tamb = 25 °C unless otherwise specified

Collector current	
$-I_C$ ($-V_{CE}$ = 20 V; V_{BE} = 0.2 V; T_{amb} = 60 °C)	< 35 µA
Base current	
I_B ($-V_{CE}$ = 20 V; V_{BE} = 5 V; T_{amb} = 60 °C)	< 35 µA
Collector voltage	
$-V_{CE}$ ($-I_C$ = 5 mA; I_B = 0 mA)	> 15 V
Collector voltage in bottoming	
$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.2 mA)	< 0.20 V
$-V_{CE}$ ($-I_C$ = 50 mA; $-I_B$ = 1.25 mA)	< 0.25 V
Base voltage	
$-V_{BE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.25 mA)	> 0.15 V < 0.32 V
Frequency at which $\|h_{fe}\|$ = 1	
f_1 ($-V_{CE}$ = 5 V; $-I_C$ = 3 mA)	> 6 Mc/s
Collector capacitance	
c_c ($-V_{CB}$ = 5 V; I_E = 0 mA)	< 16 pF
Emitter capacitance	
c_e ($-V_{EB}$ = 5 V; I_C = 0 mA)	< 13 pF
Transient behaviour	
Time constant with current feed	
τ_c ($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 50 mA)	< 2.2 µsec
Time constant with voltage feed	
τ_v =($-V_{CE}$ = 0.75 V; $-I_{CM}$ = 1 mA)	< 0.2 µsec
Desaturation time constant	
τ_s ($-I_C$ = 0 mA; $-I_B$ = 1 mA)	< 1.4 µsec

PHILIPS ASZ 15

Low spread medium gain GERMANIUM POWER TRANSISTOR of the p-n-p type for use in switching circuits at high voltages and currents

TRANSISTOR DE PUISSANCE À CRISTAL DE GERMANIUM du type p-n-p avec dispersion faible et amplification moyenne pour utilisation dans des circuits de commutation de tensions et courants élevés

p-n-p-GERMANIUM-LEISTUNGSTRANSISTOR mit geringer Streuung und mittlerer Verstärkung für Schalteranwendungen mit hohen Spannungen und Strömen

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max.	80 V [1]
$-V_{CE}$	= max.	60 V [2]
$-V_{EB}$	= max.	40 V
$-I_C$	= max.	6 A
I_E	= max.	7,2 A
$-I_B$ (t_{av} = max. 20 msec)	= max.	1 A
$-I_{BM}$	= max.	2 A
P_C ($T_m \leqq 45$ °C)	= max.	30 W [3]
T_j continuous operation / service continu / Dauerbetrieb	= max.	90 °C
T_j intermittent operation / service intermittent / aussetzender Betrieb	= max.	100 °C [4]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	−55 °C/+75 °C

[1]) When switched from a thermally stable on-state with maximum junction temperature to an unstabilised cut-off, the max. voltage rating is always permissible as long as $T_{amb} \leqq 55$ °C and $K_{tot} \leqq 9$ °C/W

Dans le cas de commutation à la température max. de la jonction d'une condition "en circuit" thermiquement stable à une condition de coupure non stabilisée la valeur max. de cette tension est permise, tant que $T_{amb} \leqq 55$ °C et $K_{tot} \leqq 9$ °C/W

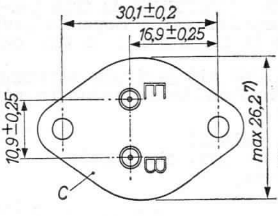
Wenn bei der max. Kristalltemperatur von einem thermisch stabilen "Ein"-Zustand in einen nicht stabilisierten gesperrten Zustand umgeschaltet wird, ist der max. Wert dieser Spannung immer zulässig wenn $T_{amb} \leqq 55$ °C und $K_{tot} \leqq 9$ °C/W

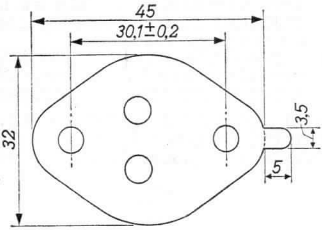
[2])[3])[4]) See pages 3, 4; voir pages 3, 4; siehe Seite 3, 4.

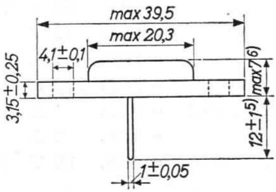
ASZ 15 **PHILIPS**

Dimensions in mm
Dimensions en mm
Abmessungen in mm

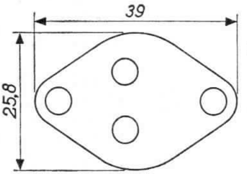
Mica insulation, 0.05 mm
Isolement de mica, 0,05 mm
Glimmerisolierung, 0,05 mm



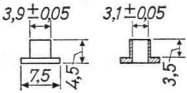




Lead washer, 1 mm
Plaque de plomb, 1 mm
Bleischeibe, 1 mm



Insulation tubes
Isolateurs de traversée
Durchführungsisolatoren



5) 6) 7)
The following dimensions of a former execution differ from those stated above:
Les dimensions suivantes d'une exécution antérieure diffèrent des dimensions mentionnées ci-dessus:
Die folgenden Abmessungen einer älteren Ausführung unterscheiden sich von den obengenannten Abmessungen:

5) 9,5 ± 1,2 mm
6) max. 10,4 mm
7) max. 26,6 mm

Thermal data
Données thermiques
Thermische Daten

Junction temperature rise to transistor bottom	$K_m \leqq 1{,}5\ ^oC/W$
Temperature rise of transistor bottom to heat sink when mounted with lead washer of 1 mm and with mica washer	$K \leqq 0.5\ ^oC/W$
Augmentation de la température de la jonction par rapport au fond du transistor	$K_m \leqq 1{,}5\ ^oC/W$
Augmentation de la température du fond du transistor par rapport à la plaque de refroidissement, lorsqu'il est monté avec une plaque de plomb de 1 mm et avec une plaque de mica	$K \leqq 0{,}5\ ^oC/W$
Temperaturerhöhung des Kristalls in Bezuf auf den Transistorboden	$K_m \leqq 1{,}5\ ^oC/W$
Temperaturerhöhung des Transistorbodens in Bezug auf die Kühlplatte wenn der Transistor mit einer 1 mm-Bleischeibe und einer Glimmerscheibe montiert ist	$K \leqq 0{,}5\ ^oC/W$

Page 1; Seite 1

[2]) During switch-off transients higher voltages are allowed as long as an energy dissipation of 8 mWsec is not exceeded. See also page C.
Pendant le régime transitoire après une mise hors circuit des tensions plus élevées sont admissibles tant qu'une dissipation d'énergie de 8 mWsec n'est pas surpassée. Voir aussi page C.
Während der Ausgleichsvorgänge nach einer Ausschaltung sind höhere Spannungen erlaubt, wenn nur ein Energieverbrauch von 8 mWsek nicht überschritten wird. Siehe auch Seite C.

[3]) T_m = temperature of transistor bottom. At $T_m > 45\ ^oC$, $P_{C_{max}} = \frac{T_{j\,max} - T_m}{K_m}$, where K_m is the thermal resistance from junction to transistor bottom
T_m = température du fond du transistor. Lorsque $T_m > 45\ ^oC$, $P_{C_{max}} = \frac{T_{j\,max} - T_m}{K_m}$; K_m est la résistance thermique de la jonction jusqu'au fond du transistor
T_m = Temperatur des Transistorbodens. Wenn $T_m > 45\ ^oC$, ist $P_{C_{max}} = \frac{T_{j\,max} - T_m}{K_m}$, wo K_m der thermische Widerstand zwischen Kristall und Transistorboden ist

Characteristics
Caractéristiques
Kenndaten

Transistor bottom temperature
Température du fond du transistor = 25 °C
Temperatur des Transistorbodens

$-I_{CBO}(-V_{CB} = 0{,}5\ V)$		< 0,1 mA
$-V_{CE}\ (V_{BE} = 2\ V;\ -I_C = 6\ A)$	> 60	V[8]
$-I_B\ (-V_{CB} = 0\ V;\ I_E = 1\ A)$	> 17,5	< 50 mA
$-I_B\ (-V_{CB} = 0\ V;\ I_E = 6\ A)$	> 190	< 375 mA
$-V_{BE}\ (-V_{CB} = 0\ V;\ I_E = 1\ A)$		< 0,8 V
$-V_{BE}\ (-V_{CB} = 0\ V;\ I_E = 6\ A)$	> 0,6	< 1,6 V

Page 1; Seite 1

[4]) Total duration max. 200 hours. Likelihood of full performance of a circuit at this temperature is also dependent upon the type of application
Durée totale 200 heures au max. La probabilité de fonctionnement optimum d'un circuit à cette température est aussi dépendante du genre d'application
Gesamtdauer max. 200 Stunden. Die Wahrscheinlichkeit optimaler Wirkung einer Schaltung bei dieser Temperatur wird auch von der Verwendungsart bestimmt

[8]) Measured under pulsed conditions to prevent excessive dissipation. Care should also be taken not to exceed the maximum energy dissipation of 8 mWsec.
Mesuré avec des impulsions pour prévenir une dissipation excessive. En outre il faut veiller à ne pas surpasser la dissipation d'énergie max. de 8 mWsec.
Zur Vermeidung einer übermässigen Verlustleistung gemessen mit Impulsen. Es soll darauf geachtet werden dass der maximale Energieverbrauch von 8 mWsek nicht überschritten wird

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

T_m = transistor bottom temperature = 25 °C, unless otherwise specified
T_m = température du fond du transistor = 25 °C, sauf indication différente
T_m = Temperatur des Transistorbodens = 25 °C, wenn nicht anders angegeben

Column I: Setting of the transistor and typical (average) measuring results of new transistors
II: Characteristic range values for equipment design
Colonne I: Valeurs pour le réglage du transistor et les résultats moyens de mesures de transistors neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
Spalte I: Einstelldaten des Transistors und mittlere Messergebnisse neuer Transistoren.
II: Charakteristischer Wertbereich für Gerätentwurf

		I	II	
$-V_{CB}$	=	14		V
T_m	=	100		°C
$-I_{CBO}$	=		< 20	mA
$-V_{CB}$	=	80		V
T_m	=	100		°C
$-I_{CBO}$	=		< 30	mA
$-V_{CB}$	=	60		V
I_E	=	0		mA
T_m	=	100		°C
$-V_{EB}$	=		< 0,5	V
V_{PT}	=	9)	> 80	V

		I	II	
$-V_{CB}$	=	6		V
I_E	=	1		A
$f_{\alpha b}$	=	250		kc/s
$-V_{CB}$	=	12		V
I_E	=	0		mA
c_c	=	160		pF
$-V_{EB}$	=	6		V
I_C	=	0		mA
c_e	=	165		pF
$-I_C$	=	6		A
$-I_B$	=	10)		
$-V_{CEK}$	=	0,5	< 1,0	V

9) Punch through voltage
Tension de perforation
Durchschlagsspannung

10) $-I_B$ = {the value at which $-I_C$ = 6.6 A when $-V_{CE}$ = 2 V
la valeur à laquelle $-I_C$ = 6,6 A lorsque $-V_{CE}$ = 2 V
der Wert bei dem $-I_C$ = 6,6 A wenn $-V_{CE}$ = 2 V

Characteristics (continued)
Caractéristiques (suite) T_m = 25 °C
Kenndaten (Fortsetzung)

Large signal characteristics
Caractéristiques pour grands signaux
Kenndaten für grosse Signale

	I	II	
$-V_{CE}$ =	14		V
$-I_C$ =	30		mA
h_{FE} =		> 20	
$-V_{CE}$ =	1		V
$-I_C$ =	1		A
h_{FE} =		20- 55	
$-V_{CE}$ =	1		V
$-I_C$ =	6		A
h_{FE} =		15- 30	

Operating characteristics in "on-off" switching circuits
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit"
Betriebsdaten für "Ein-Aus"-Schalteranwendung

Fundamental switching parameters
Paramètres fondamentaux de commutation
Grundlegende Parameter für Schalteranwendung

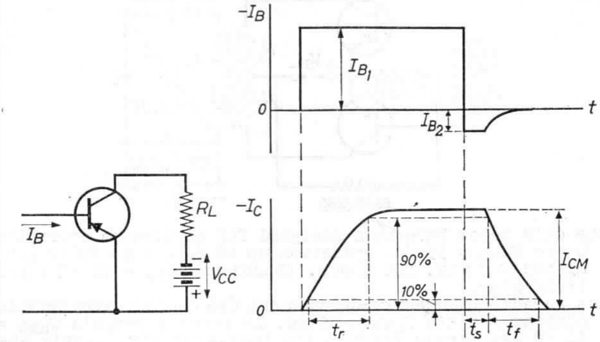
τ_c = time constant with current feed / constante de temps avec alimentation par courant / Zeitkonstante mit Stromspeisung

τ_v = time constant with voltage feed / constante de temps avec alimentation par tension / Zeitkonstante mit Spannungsspeisung

τ_s = desaturation time constant / constante de temps de désaturation / Entsättigungszeitkonstante

τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) =	45	< 70	μsec
τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) =	30	< 50	μsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) =	45	< 70	μsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) =	40	< 55	μsec
τ_s ($-V_{CE}$ = 0 V; $-I_{BM}$ = 50 mA) =	30	< 50	μsec

Operating characteristics in "on-off" switching circuits (continued)
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit" (suite)
Betriebsdaten für "Ein-Aus"-Schalteranwendung (Fortsetzung)



Formulae for the calculation of switching times
Formules pour la calculation de temps de commutation
Formeln zur Berechnung der Schaltdauer

Rise time
Temps de montée
Anstiegszeit

$$t_r = \tau_c \ln \frac{h_{FE}\,|I_{B1}|}{h_{FE}\,|I_{B1}| - |I_{CM}|}$$

Fall time
Temps de retombée
Abfallzeit

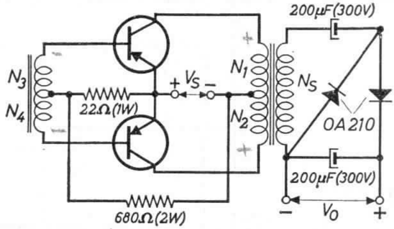
$$t_f = \tau_c \ln \left\{ 1 + \frac{|I_{CM}|}{h_{FE}\,|I_{B2}|} \right\}$$

Storage time
Temps d'accumulation
Speicherzeit

$$t_s = \tau_s \ln \frac{|I_{B1}| + |I_{B2}|}{\frac{|I_{CM}|}{h_{FE}} + |I_{B2}|}$$

V_{CC}	=	28	28	V
R_L	=	28	4,7	Ω
$-I_{CM}$	=	1	6	A
$-I_{B_1}$	=	70	480	mA
I_{B_2}	=	17,5	120	mA
t_r	=	20	20	µsec
t_s	=	15	15	µsec
t_f	=	40	35	µsec

Operating characteristics for a D.C. converter
Caractéristiques d'utilisation comme convertisseur à tension continue
Betriebsdaten als Gleichspannungswandler



The data below have been designed for continuous operation up to T_{amb} = 55 °C. Operation up to T_{amb} = 60 °C is permitted for max. 200 hours. (Based on K_{tot} = 15 °C/W per transistor.)
Les caractéristiques ci-dessous ont été conçues pour service continu jusqu'à T_{amb} = 55 °C. Le service jusqu'à T_{amb} = 60 °C est permis pendant 200 heures au max. (Admis que K_{tot} = 15 °C/W pour chaque transistor.)
Die untenstehenden Daten gelten für Dauerbetrieb bis zu T_{amb} = 55 °C. Betrieb bis zu T_{amb} = 60 °C während max. 200 Stunden ist gestattet. (Die Daten gründen sich auf K_{tot} = 15 °C/W für jeden Transistor.)

See also page D
Voir aussi page D
Siehe also Seite D

V_S	=	28 V
I_S	=	2,5 A
P_S	=	70 W
V_O	=	220 V
I_O	=	0,27 A
P_O	=	60 W
η	=	86 %
f	=	450 c/s

Losses; pertes; Verluste

In the transistors Dans les transistors In den Transistoren	2 x 2 W
In the diodes Dans les diodes In den Dioden	2 x 0,3 W
In the biasing resistors Dans les résistances de polarisation In den Widerständen für die Vorspannung	1,7 W
In the transformer Dans le transformateur Im Transformator	3,7 W

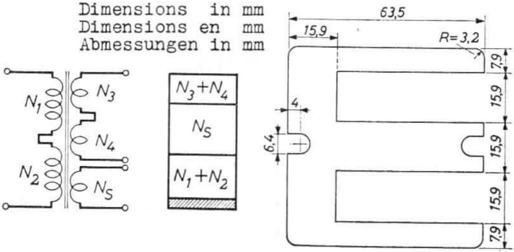
Operating characteristics for a D.C. converter (continued)
Caractéristiques d'utilisation comme convertisseur à tension continue (suite)
Betriebsdaten als Gleichspannungswandler (Fortsetzung)

Transformer data
Données du transformateur
Transformatordaten

Core dimensions
Dimensions du noyau 63,5 x 63,5 x 15 mm
Kernabmessungen

Transformer lamination: NiFe magnetic alloy with rectangular hysteresis loop (Ni-50%, Fe-50%)
Laminage du transformateur: Alliage NiFe magnétique avec courbe d'hystérésis rectangulaire (Ni-50 %, Fe-50 %)
Lamellierung des Transformators: magnetische NiFe-Legierung mit rechteckiger Hystereseschleife (50% Ni, 50% Fe).

Dimensions in mm
Dimensions en mm
Abmessungen in mm



N_1+N_2, N_3+N_4: are bifilarly wound / sont bobinés bifilairement / sind bifilar gewickelt

$N_1=N_2$ = 46 turns of enamelled copper wire, 1 mm / 46 spires de fil de cuivre émaillé, 1 mm / 46 Windungen Kupfer-Lackdraht, 1 mm

$N_3=N_4$ = 5 turns of enamelled copper wire, 0.5 mm / 5 spires de fil de cuivre émaillé, 0,5 mm / 5 Windungen Kupfer-Lackdraht, 0,5 mm

N_S = 190 turns of enamelled copper wire, 0.5 mm / 190 spires de fil de cuivre émaillé, 0,5 mm / 190 Windungen Kupfer-Lackdraht, 0,5 mm

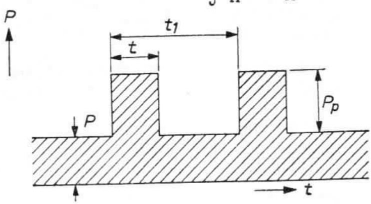
Determination of the peak power ratings

For a pulse duration, shorter than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

For a pulse duration, longer than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = pulse duration

t_1 = pulse period

δ = t/t_1 = duty factor

P = constant power dissipation

P_p = permissible pulse power dissipation over P

K_h = heat-sink thermal resistance (see page E)

K_t = function of t and δ (see page F)

K_{j-h}[1]) = value of K_t for durations longer than the temperature stabilisation time

$T_{j\,max}$ = maximum permissible junction temperature

T_{amb} = ambient temperature

Temperature stabilisation time = 1 sec (see page F)

Example: to determine the peak power rating for P = 5 W, t = 1msec, δ = 0.1, K_h = 4.25 ^{o}C/W and T_{amb} = 25^{o}C

From t = 1 msec and δ = 0.1 it follows that K_t = 0.28 ^{o}C/W (see page F)

$$P_p = \frac{90 - 25 - (2.0 + 4.25) \times 5}{0.28 + 0.1 \times 4.25} \approx 47.5\ \text{W}$$

1) K_{j-h} is the thermal resistance between junction and heat sink (K_{j-h} = 1.5 + 0.5 ^{o}C/W, see page 3)

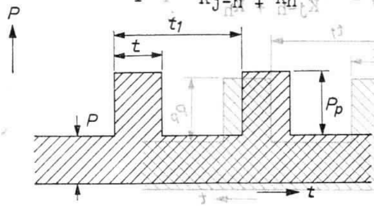
Détermination des valeurs limites des puissances de crête

Pour une durée d'impulsion, plus courte que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Pour une durée d'impulsion, plus longue que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = durée de l'impulsion

t_1 = période de l'impulsion

δ = t/t_1 = facteur de marche

P = dissipation de puissance continue

P_p = dissipation de puissance d'impulsion admissible au-dessus de P

K_h = résistance thermique de la plaque de refroidissement (voir page E)

K_t = fonction de t et δ (voir page F)

K_{j-h}[1] = valeur de K_t pour une durée plus longue que la durée pour la stabilisation de la température

$T_{j\,max}$ = température des jonctions maximum admissible

T_{amb} = température ambiante

Durée pour la stabilisation de la température = 1 sec (voir page F)

Exemple: Déterminer la valeur limite de la puissance de crête pour P = 5 W, t = 1 msec, δ = 0,1, K_h = 4,25 °C/W et T_{amb} = 25 °C

Pour t = 1 msec et δ = 0,1 on peut lire de la page F que K_t = 0,28 °C/W

Il en résulte: $P_p = \frac{90 - 25 - (2,0 + 4,25).5}{0,28 + 0,1.4,25} \approx 47,5$ W

[1]) K_{j-h} est la résistance thermique entre les jonctions et la plaque de refroidissement (K_{j-h} = 1,5 + 0,5 °C/W, voir page 3)

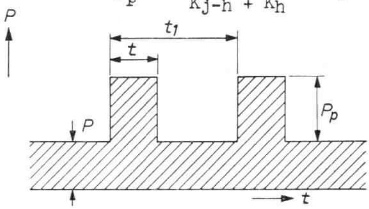
Bestimmung der Grenzwerte von Impulsleistungen

Für eine Impulsdauer, kürzer als die Zeit zur Temperaturstabilisierung ist

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Für eine Impulsdauer, länger als die Zeit zur Ausgleichung der Temperatur ist

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = Impulsdauer

t_1 = Impulsperiode

δ = t/t_1 = Arbeitsfaktor

P = konstante Verlustleistung

P_p = die über P hinaus erlaubte Impuls-Verlustleistung

K_h = Wärmewiderstand der Kühlplatte (siehe Seite E)

K_t = eine Funktion von t und δ (siehe Seite F)

K_{j-h}[1] = Wert von K_t für eine längere Dauer als die Zeit zur Ausgleichung der Temperatur

T_j = max. erlaubte Kristalltemperatur

T_{amb} = Umgebungstemperatur

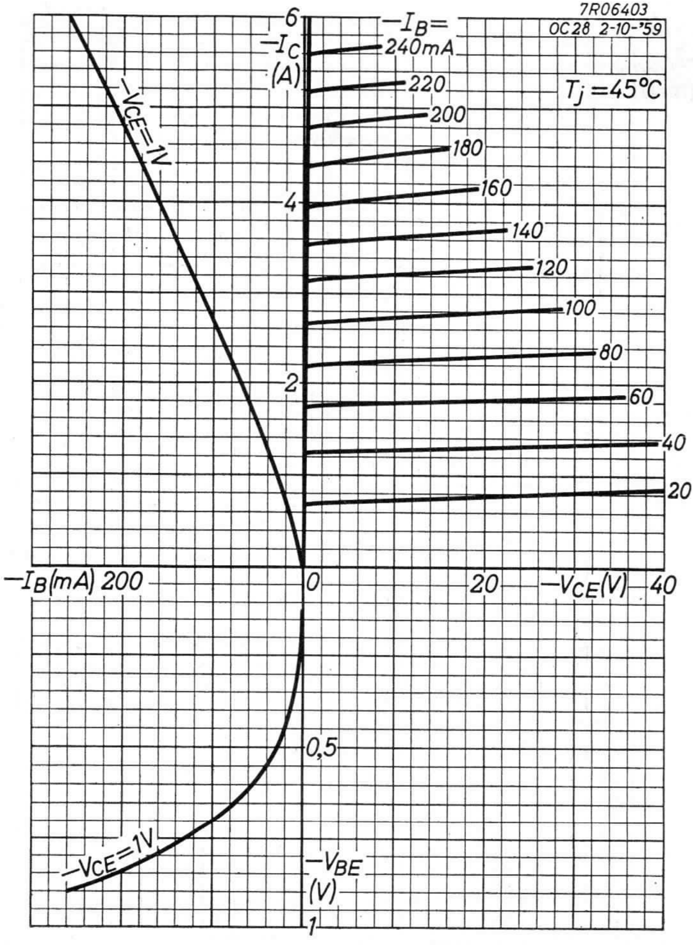
Zeit zur Ausgleichung der Temperatur = 1 Sek (siehe Seite F)

Beispiel: Der Grenzwert der Impuls-Verlustleistung zu bestimmen, wenn P = 5 W, t = 1 msec, δ = 0,1, K_h = 4,25 °C/W und T_{amb} = 25 °C

Für t = 1 msec und δ = 0,1 ist nach Seite F K_t = 0,28 °C/W

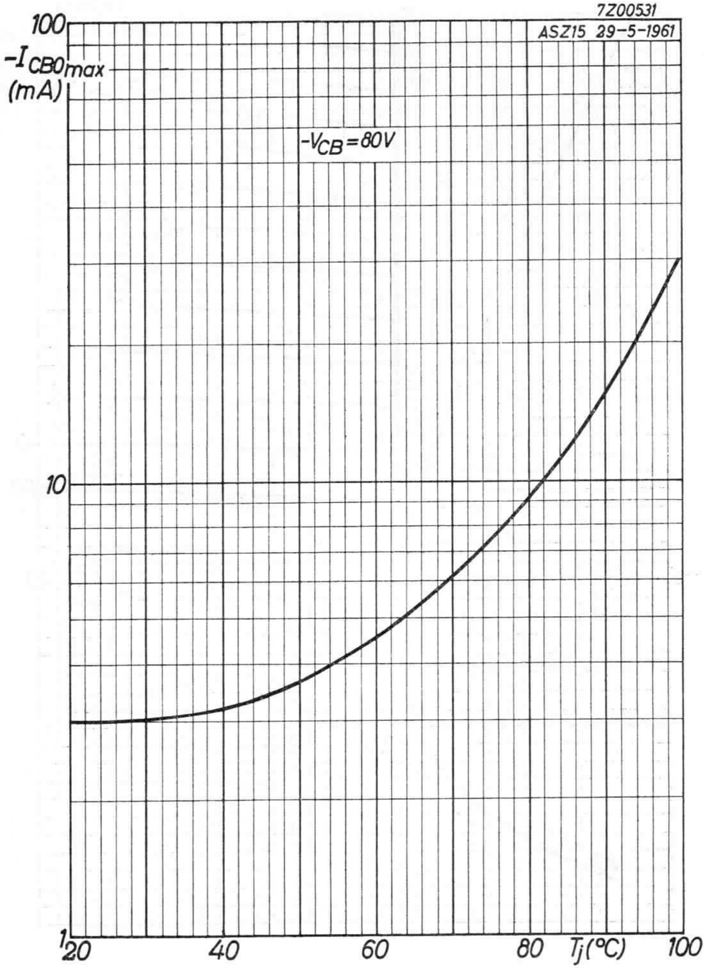
Damit wird $P_p = \frac{90 - 25 - (2,0 + 4,25).5}{0,28 + 0,1.4,25} \approx 47,5$ W

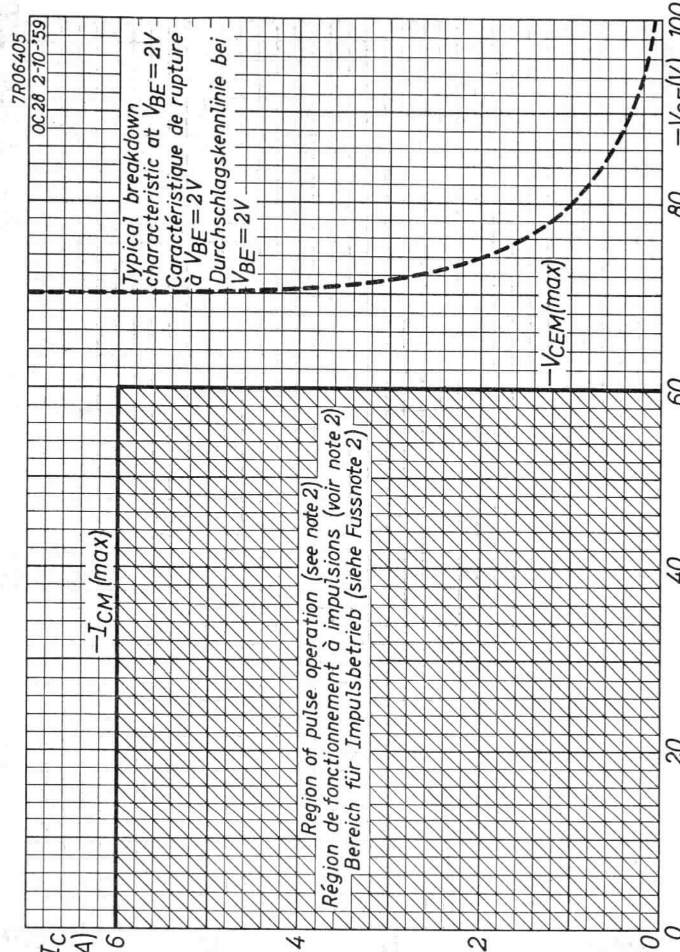
[1]) K_{j-h} ist der thermische Widerstand zwischen Kristall und Kühlplatte (K_{j-h} = 1,5 + 0,5 °C/W, siehe Seite 3)


7R06403
OC28 2-10-'59
$T_j = 45°C$
$-I_B =$
240mA
220
200
180
160
140
120
100
80
60
40
20
6
4
2
$-I_C$ (A)
$-V_{CE} = 1V$
$-I_B$(mA) 200
0
20
$-V_{CE}$(V)
40
0,5
$-V_{BE}$ (V)
1
$-V_{CE} = 1V$

ASZ 15

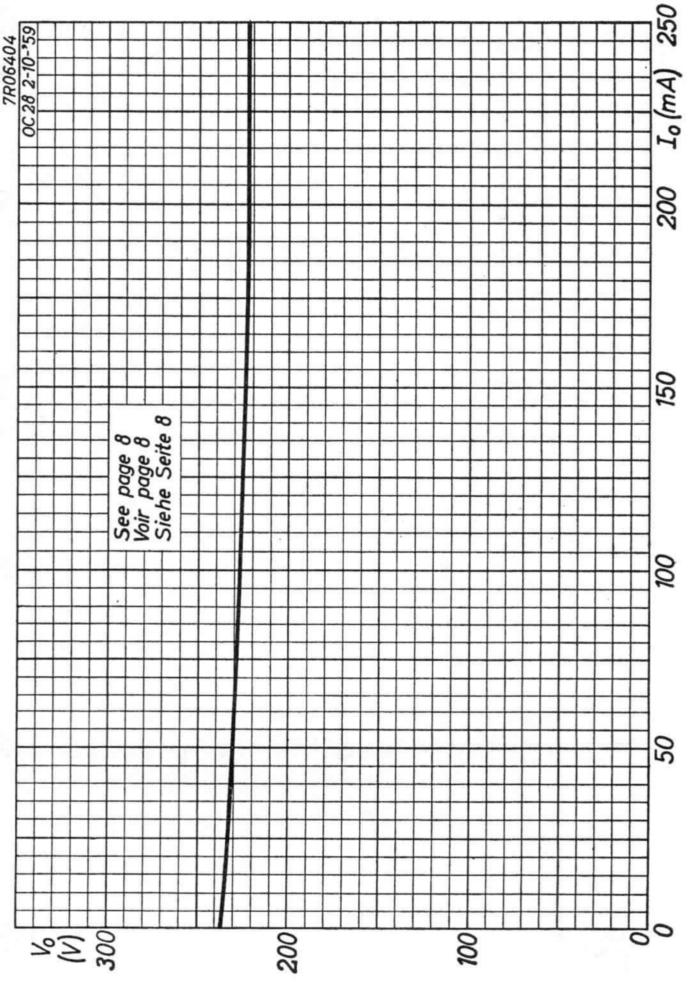
PHILIPS




7R06405
OC28 2-10-'59
Typical breakdown characteristic at $V_{BE}=2V$
Caractéristique de rupture à $V_{BE}=2V$
Durchschlagskennlinie bei $V_{BE}=2V$
$-V_{CEM}(max)$
$-I_{CM}(max)$
Region of pulse operation (see note 2)
Région de fonctionnement à impulsions (voir note 2)
Bereich für Impulsbetrieb (siehe Fussnote 2)
$-I_C$ (A)
6
4
2
0
0
20
40
60
80
100
$-V_{CE}$(V)

ASZ 15

PHILIPS



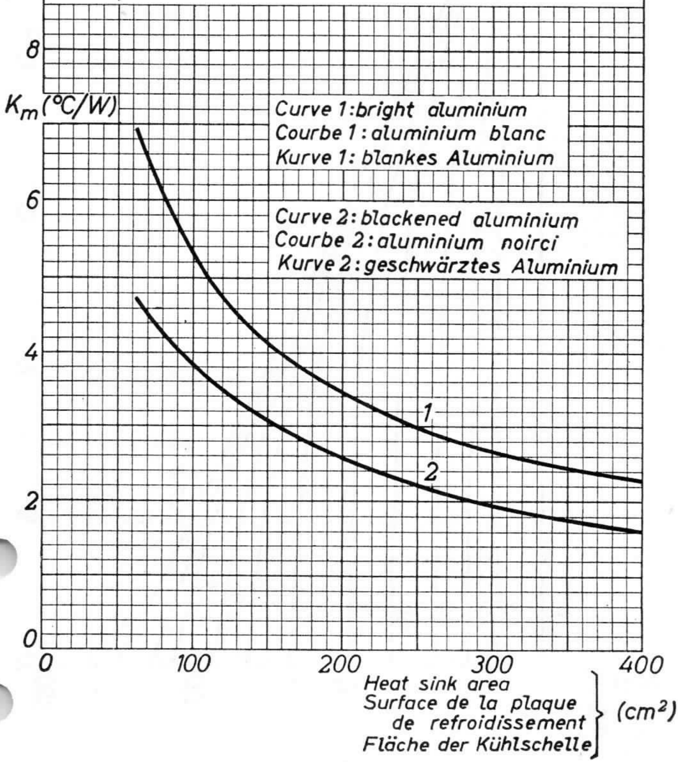
D

7Z00209

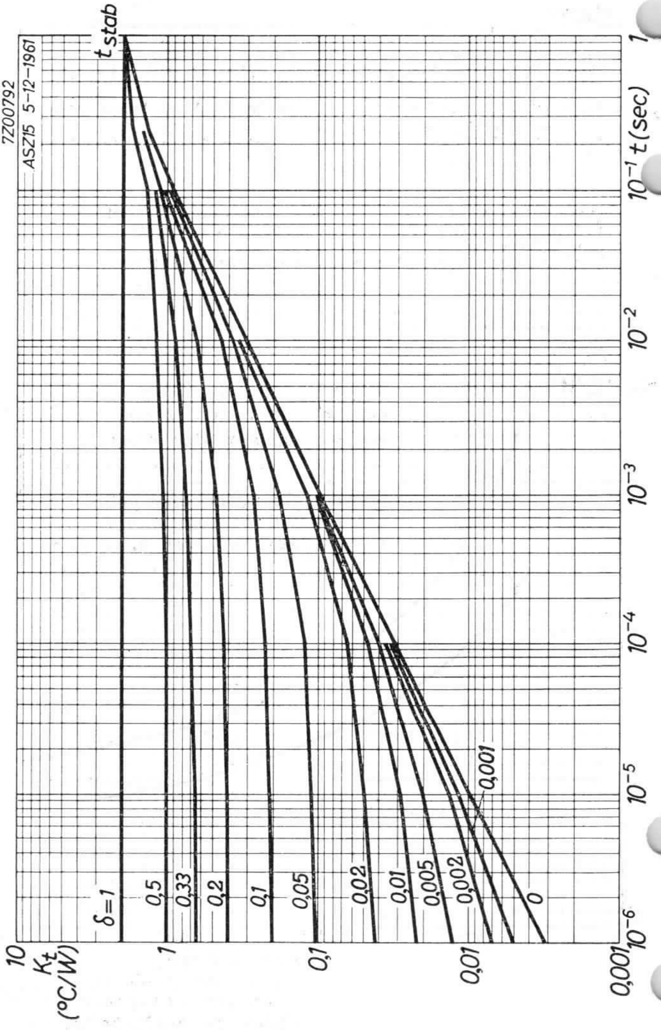
22-7-'60

K_m = thermal resistance between transistor bottom and ambience
K_m = résistance thermique entre le fond du transistor et l'ambiance
K_m = thermischer Widerstand zwischen Transistorboden und Umgebung

Heat sink material: 3 mm aluminium, mounted vertically
Plaque de refroidissement: aluminium de 3 mm, montée verticalement
Kühlschelle: 3 mm-Aluminium, senkrecht montiert



PHILIPS


7Z00792
ASZ15 5-12-1961
t_{stab}
t (sec)
1
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
K_t (°C/W)
10
1
0,1
0,01
0,001
δ=1
0,5
0,33
0,2
0,1
0,05
0,02
0,01
0,005
0,002
0,001
0

PHILIPS ASZ 16

High gain GERMANIUM POWER TRANSISTOR of the p-n-p type for use in switching circuits at medium voltages and high currents

TRANSISTOR DE PUISSANCE À CRISTAL DE GERMANIUM du type p-n-p avec amplification élevée pour utilisation dans des circuits de commutation de tensions moyennes et courants élevés

p-n-p-GERMANIUM-LEISTUNGSTRANSISTOR mit grosser Verstärkung für Schalteranwendungen mit mittleren Spannungen und hohen Strömen

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max.	60 V [1])
$-V_{CE}$	= max.	48 V [2])
$-V_{EB}$	= max.	20 V
$-I_C$	= max.	6 A
I_E	= max.	7,2 A
$-I_B$ (t_{av} = max. 20 msec)	= max.	1 A
$-I_{BM}$	= max.	2 A
P_C ($T_m \leqq 45\ ^oC$)	= max.	30 W [3])
T_j {continuous operation / service continu / Dauerbetrieb}	= max.	90 °C
T_j {intermittent operation / service intermittent / aussetzender Betrieb}	= max.	100 °C [4])
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	-55°C/+75 °C

---

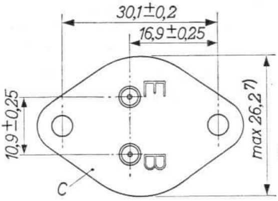
[1]) When switched from a thermally stable on-state with maximum junction temperature to an unstabilised cut-off, the max. voltage rating is always permissible as long as $T_{amb} \leqq 55\ ^oC$ and $K_{tot} \leqq 9\ ^oC/W$

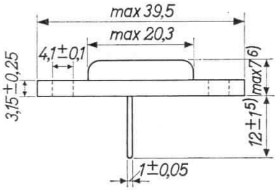
Dans le cas de commutation à la température max. de la jonction d'une condition "en circuit" thermiquement stable à une condition de coupure non stabilisée la valeur max. de cette tension est permise, tant que $T_{amb} \leqq 55\ ^oC$ et $K_{tot} \leqq 9\ ^oC/W$

Wenn bei der max. Kristalltemperatur von einem thermisch stabilen "Ein"-Zustand in einen nicht stabilisierten gesperrten Zustand umgeschaltet wird, ist der max. Wert dieser Spannung immer zulässig wenn $T_{amb} \leqq 55\ ^oC$ und $K_{tot} \leqq 9\ ^oC/W$

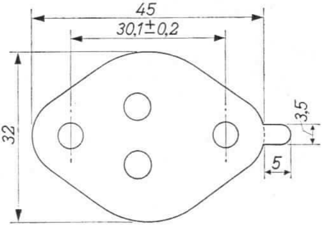
2)3)4) See pages 3,4; voir pages 3, 4; siehe Seite 3, 4.

Dimensions in mm
Dimensions en mm
Abmessungen in mm

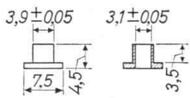




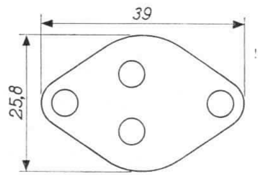
Mica insulation, 0.05 mm
Isolement de mica,0,05 mm
Glimmerisolierung,0,05 mm



Insulation tubes
Isolateurs de traversée
Durchführungsisolatoren



Lead washer, 1 mm
Plaque de plomb, 1 mm
Bleischeibe, 1 mm



5) 6) 7)
The following dimensions of a former execution differ from those stated above:
Les dimensions suivantes d'une exécution antérieure diffèrent des dimensions mentionnées ci-dessus:
Die folgenden Abmessungen einer älteren Ausführung unterscheiden sich von den obengenannten Abmessungen:

5) 9,5 ± 1,2 mm

6) max. 10,4 mm

7) max. 26,6 mm

Thermal data
Données thermiques
Thermische Daten

Junction temperature rise to transistor bottom	$K_m \leq 1.5$ °C/W
Temperature rise of transistor bottom to heat sink when mounted with lead washer of 1 mm and with mica washer	$K \leq 0.5$ °C/W
Augmentation de la température de la jonction par rapport au fond du transistor	$K_m \leq 1,5$ °C/W
Augmentation de la température du fond du transistor par rapport à la plaque de refroidissement, lorsqu'il est monté avec une plaque de plomb de 1 mm et avec une plaque de mica	$K \leq 0,5$ °C/W
Temperaturerhöhung des Kristalls in Bezug auf den Transistorboden	$K_m \leq 1,5$ °C/W
Temperaturerhöhung des Transistorbodens in Bezug auf die Kühlplatte wenn der Transistor mit einer 1 mm-Bleischeibe und einer Glimmerscheibe montiert ist	$K \leq 0,5$ °C/W

Page 1; Seite 1

[2]) For-I_C > 0.5 A please refer to page C. During switch-off transients higher voltages are allowed as long as an energy dissipation of 8 mWsec is not exceeded
Pour-I_C > 0,5 A voir page C. Pendant le régime transitoire après une mise hors circuit des tensions plus élevées sont admissibles tant qu'une dissipation d'énergie de 8 mWsec n'est pas surpassée
Für-I_C > 0,5 A siehe Seite C. Während der Ausgleichsvorgänge nach einer Ausschaltung sind höhere Spannungen erlaubt, wenn nur ein Energieverbrauch von 8 mWsek nicht überschritten wird

[3]) T_m = temperature of transistor bottom. At $T_m > 45$ °C, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, where K_m is the thermal resistance from junction to transistor bottom.

T_m = température du fond du transistor. Lorsque $T_m >$ 45 °C, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, K_m est la résistance thermique de la jonction jusqu'au fond du transistor

T_m = Temperatur des Transistorbodens. Wenn $T_m > 45$ °C, ist $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, wo K_m der thermische Widerstand zwischen Kristall und Transistorboden ist

ASZ 16 PHILIPS

Characteristics
Caractéristiques
Kenndaten

Transistor bottom temperature
Température du fond du transistor = 25 °C
Temperatur des Transistorbodens

$-I_{CBO}(-V_{CB} = 0{,}5$ V)		< 0,1 mA	
$-V_{CE}$ ($V_{BE} = 2$ V, $-I_C = 0{,}5$ A)	> 48		V [8]
$-V_{CE}$ ($V_{BE} = 2$ V, $-I_C = 6$ A)	> 32		V [8]
$-I_B$ ($-V_{CB} = 0$ V, $I_E = 1$ A)	> 7,2	< 21,5 mA	
$-I_B$ ($-V_{CB} = 0$ V, $I_E = 6$ A)	> 73	< 165 mA	
$-V_{BE}$ ($-V_{CB} = 0$ V, $I_E = 1$ A)		< 0,8 V	
$-V_{BE}$ ($-V_{CB} = 0$ V, $I_E = 6$ A)		< 1,6 V	

Page 1; Seite 1

4) Total duration max. 200 hours. Likelihood of full performance of a circuit at this temperature is also dependent upon the type of application
Durée totale 200 heures au max. La probabilité de fonctionnement optimum d'un circuit à cette température est aussi dépendante du genre d'application
Gesamtdauer max. 200 Stunden. Die Wahrscheinlichkeit optimaler Wirkung einer Schaltung bei dieser Temperatur wird auch von der Verwendungsart bestimmt

8) Measured under pulsed conditions to prevent excessive dissipation. Care should also be taken not to exceed the maximum energy dissipation of 8 mWsec.
Mesuré avec des impulsions pour prévenir une dissipation excessive. En outre il faut veiller à ne pas surpasser la dissipation d'énergie max. de 8 mWsec.
Zur Vermeidung einer übermässigen Verlustleistung gemessen mit Impulsen. Es soll darauf geachtet werden dass der maximale Energieverbrauch von 8 mWsek nicht überschritten wird.

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

T_m = transistor bottom temperature = 25 °C, unless otherwise specified
T_m = température du fond du transistor = 25 °C, sauf indication différente
T_m = Temperatur des Transistorbodens = 25 °C, wenn nicht anders angegeben

Column I: Setting of the transistor and typical (average) measuring results of new transistors
II: Characteristic range values for equipment design
Colonne I: Valeurs pour le réglage du transistor et les résultats moyens de mesures de transistors neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
Spalte I: Einstelldaten des Transistors und mittlere Messergebnisse neuer Transistoren
II: Charakteristischer Wertbereich für Gerätentwurf

	I	II			I	II	
$-V_{CB}$ =	14		V	$-V_{CB}$ =	6		V
T_m =	100		°C	I_E =	1		A
$-I_{CBO}$ =		< 20	mA	$f_{\alpha b}$ =	250		kc/s
$-V_{CB}$ =	60		V	$-V_{CB}$ =	12		V
T_m =	100		°C	I_E =	0		mA
$-I_{CBO}$ =		< 30	mA	c_c =	160		pF
$-V_{CB}$ =	48		V	$-V_{EB}$ =	6		V
I_E =	0		mA	I_C =	0		mA
T_m =	100		°C	c_e =	165		pF
$-V_{EB}$ =		< 0,5	V	$-I_C$ =	6		A
V_{PT} =	9)	> 60	V	$-I_B$ =	10)		
				$-V_{CEK}$ =	0,5	< 1,0	V

9) Punch through voltage
Tension de perforation
Durchschlagsspannung

10) $-I_B$ = the value at which $-I_C$ = 6.6 A when $-V_{CE}$ = 2 V
la valeur à laquelle $-I_C$ = 6,6 A lorsque $-V_{CE}$ = 2 V
der Wert bei dem $-I_C$ = 6,6 A wenn $-V_{CE}$ = 2 V

Characteristics (continued)
Caractéristiques (suite) $T_m = 25\ ^oC$
Kenndaten (Fortsetzung)

Large signal characteristics
Caractéristiques pour grands signaux
Kenndaten für grosse Signale

	I	II	
$-V_{CE}$ =	1		V
$-I_C$ =	1		A
h_{FE} =		45-130	
$-V_{CE}$ =	1		V
$-I_C$ =	6		A
h_{FE} =		35- 80	

Operating characteristics in "on-off" switching circuits
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit"
Betriebsdaten für "Ein-Aus"-Schalteranwendung

Fundamental switching parameters
Paramètres fondamentaux de commutation
Grundlegende Parameter für Schalteranwendung

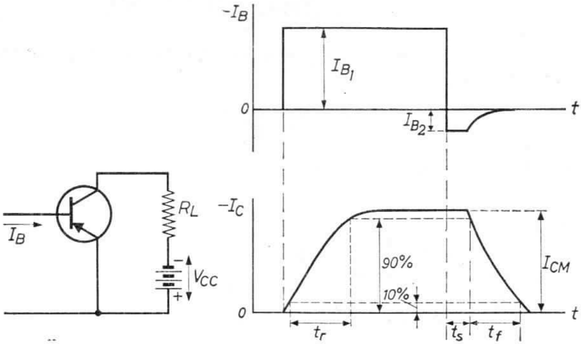
τ_C = time constant with current feed / constante de temps avec alimentation par courant / Zeitkonstante mit Stromspeisung

τ_V = time constant with voltage feed / constante de temps avec alimentation par tension / Zeitkonstante mit Spannungsspeisung

τ_S = desaturation time constant / constante de temps de désaturation / Entsättigungszeitkonstante

τ_C ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) = 45 < 70 µsec
τ_C ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) = 30 < 50 µsec
τ_V ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) = 45 < 70 µsec
τ_V ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) = 40 < 55 µsec
τ_S ($-V_{CE}$ = 0 V; $-I_{BM}$ = 50 mA) = 30 < 50 µsec

Operating characteristics in "on-off" switching circuits (continued)
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit" (suite)
Betriebsdaten für "Ein-Aus"-Schalteranwendung (Fortsetzung)



Formulae for the calculation of switching times
Formules pour la calculation de temps de commutation
Formeln zur Berechnung der Schaltdauer

Rise time
Temps de montée
Anstiegszeit

$$t_r = \tau_C \ln \frac{h_{FE}\,|I_{B1}|}{h_{FE}\,|I_{B1}| - |I_{CM}|}$$

Fall time
Temps de retombée
Abfallzeit

$$t_f = \tau_C \ln \left\{1 + \frac{|I_{CM}|}{h_{FE} \cdot |I_{B2}|}\right\}$$

Storage time
Temps d'accumulation
Speicherzeit

$$t_s = \tau_S \ln \frac{|I_{B1}| + |I_{B2}|}{\frac{|I_{CM}|}{h_{FE}} + |I_{B2}|}$$

V_{CC}	=	14	14	V
R_L	=	14	2,3	Ω
$-I_{CM}$	=	1	6	A
$-I_{B1}$	=	35	260	mA
I_{B2}	=	8,7	65	mA
t_r	=	20	20	µsec
t_s	=	15	15	µsec
t_f	=	40	35	µsec

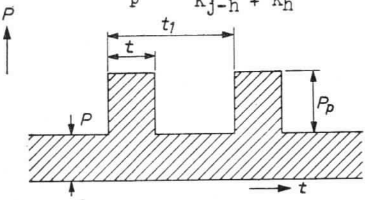
Determination of the peak power ratings

For a pulse duration, shorter than the temperature stabilisation time

$$P_p = \frac{T_{j\ max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

For a pulse duration, longer than the temperature stabilisation time

$$P_p = \frac{T_{j\ max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = pulse duration

t_1 = pulse period

δ = t/t_1 = duty factor

P = constant power dissipation

P_p = permissible pulse power dissipation over P

K_h = heat-sink thermal resistance (see page D)

K_t = function of t and δ (see page E)

K_{j-h}[1] = value of K_t for durations longer than the temperature stabilisation time

$T_{j\ max}$ = maximum permissible junction temperature

T_{amb} = ambient temperature

Temperature stabilisation time = 1 sec (see page E)

Example: to determine the peak power rating for P = 5 W, t = 1msec, δ = 0.1, K_h = 4.25 $^{o}C/W$ and T_{amb} = 25 ^{o}C

From t = 1 msec and δ = 0.1 it follows that K_t = 0.28 $^{o}C/W$ (See page E)

$$P_p = \frac{90 - 25 - (2.0 + 4.25) \times 5}{0.28 + 0.1 \times 4.25} \approx 47.5 \text{ W}$$

[1]) K_{j-h} is the thermal resistance between junction and heat sink (K_{j-h} = 1.5 + 0.5 $^{o}C/W$, see page 3)

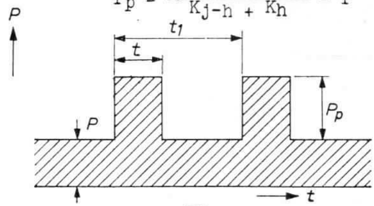
Détermination des valeurs limites des puissances de crête

Pour une durée d'impulsion, plus courte que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Pour une durée d'impulsion, plus longue que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = durée de l'impulsion

t_1 = période de l'impulsion

δ = t/t_1 = facteur de marche

P = dissipation de puissance continue

P_p = dissipation de puissance d'impulsion admissible au-dessus de P

K_h = résistance thermique de la plaque de refroidissement (voir page D)

K_t = fonction de t et δ (voir page E)

K_{j-h}[1]) = valeur de K_t pour une durée plus longue que la durée pour la stabilisation de la température

$T_{j\,max}$ = température des jonctions maximum admissible

T_{amb} = température ambiante

Durée pour la stabilisation de la température = 1 sec (voir page E)

Exemple: Déterminer la valeur limite de la puissance de crête pour P = 5 W, t = 1 msec, δ = 0,1, K_h = 4,25 °C/W et T_{amb} = 25°C

Pour t = 1 msec et δ = 0,1 on peut lire de la page E que K_t = 0,28 °C/W

Il en résulte: $P_p = \frac{90 - 25 - (2{,}0 + 4{,}25).5}{0{,}28 + 0{,}1.4{,}25} \approx 47{,}5$ W

1) K_{j-h} est la résistance thermique entre les jonctions et la plaque de refroidissement (K_{j-h} = 1,5 + 0,5 °C/W, voir page 3)

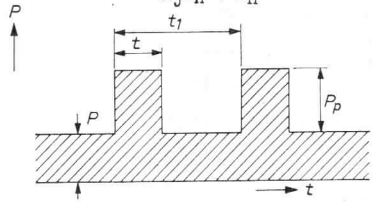
Bestimmung der Grenzwerte von Impulsleistungen

Für eine Impulsdauer, kürzer als die Zeit zur Temperaturstabilisierung ist

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Für eine Impulsdauer, länger als die Zeit zur Ausgleichung der Temperatur ist

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = Impulsdauer

t_1 = Impulsperiode

δ = t/t_1 = Arbeitsfaktor

P = konstante Verlustleistung

P_p = die über P hinaus erlaubte Impuls-Verlustleistung

K_h = Wärmewiderstand der Kühlplatte (siehe Seite D)

K_t = eine Funktion von t und δ (siehe Seite E)

K_{j-h}[1]) = Wert von K_t für eine längere Dauer als die Zeit zur Ausgleichung der Temperatur

$T_{j\,max}$ = max. erlaubte Kristalltemperatur

T_{amb} = Umgebungstemperatur

Zeit zur Ausgleichung der Temperatur =1 Sek. (siehe Seite E)

Beispiel: Der Grenzwert der Impuls-Verlustleistung zu bestimmen, wenn P = 5 W, t = 1 m , δ = 0,1, K_h = 4,25 °C/W und T_{amb} = 25 °C

Für t = 1 msec und δ = 0,1 ist nach Seite E K_t = 0,28 °C/W

$$\text{Damit wird } P_p = \frac{90 - 25 - (2{,}0 + 4{,}25).5}{0{,}28 + 0{,}1.4{,}25} \approx 47{,}5\ \text{W}$$

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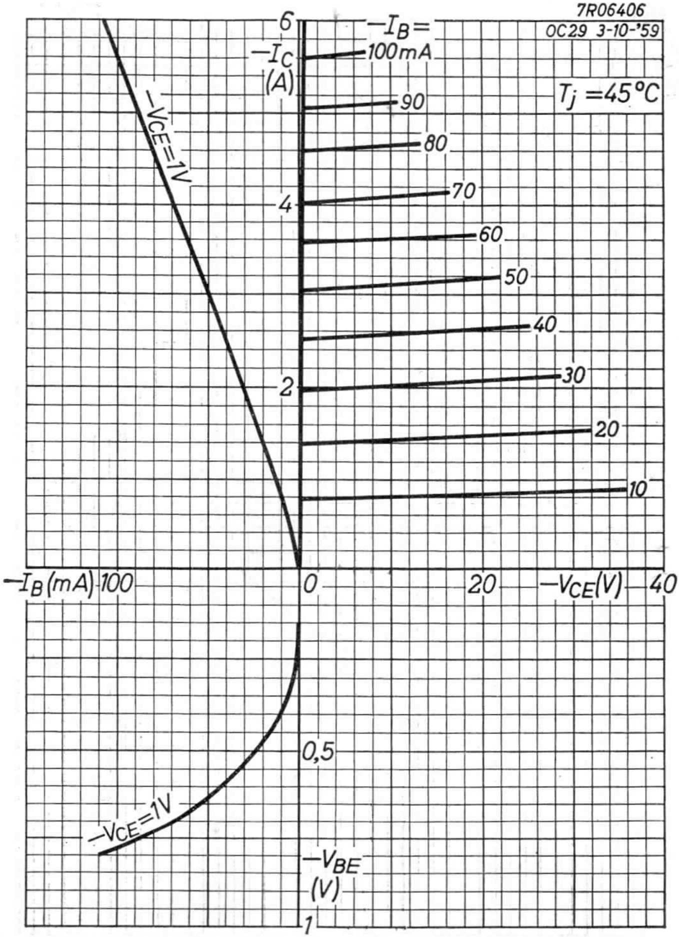
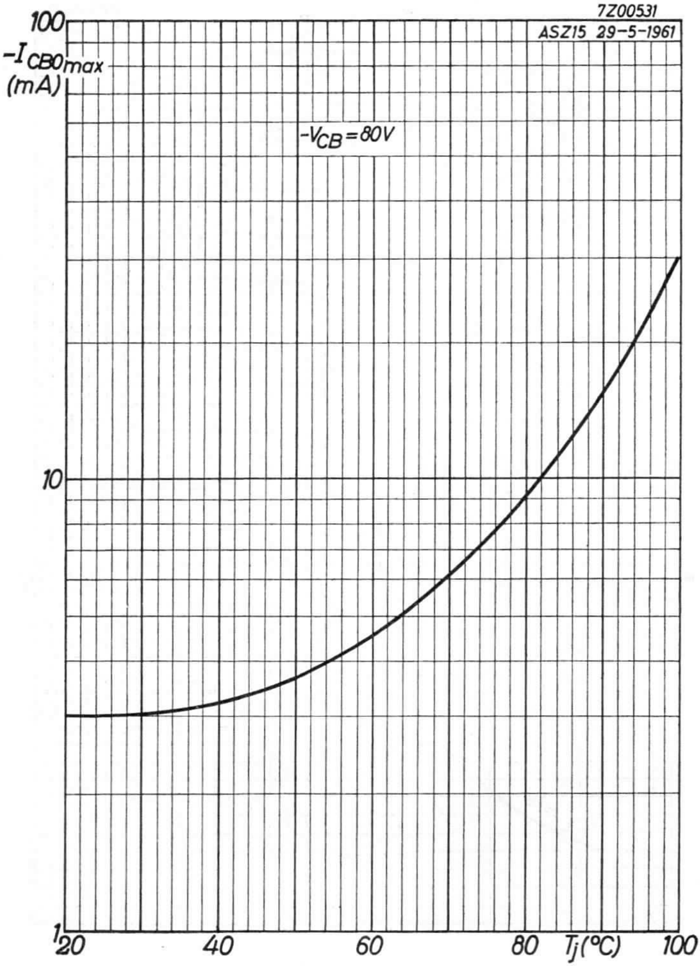
1) K_{j-h} ist der thermische Widerstand zwischen Kristall und Kühlplatte (K_{j-h} = 1,5 + 0,5 °C/W, siehe Seite 3)


7R06406
OC29 3-10-'59
T_j =45°C
$-I_B$=
100mA
90
80
70
60
50
40
30
20
10
$-I_C$ (A)
6
4
2
$-V_{CE}$=1V
$-I_B$(mA)
100
0
20
$-V_{CE}$(V)
40
0,5
$-V_{BE}$ (V)
1

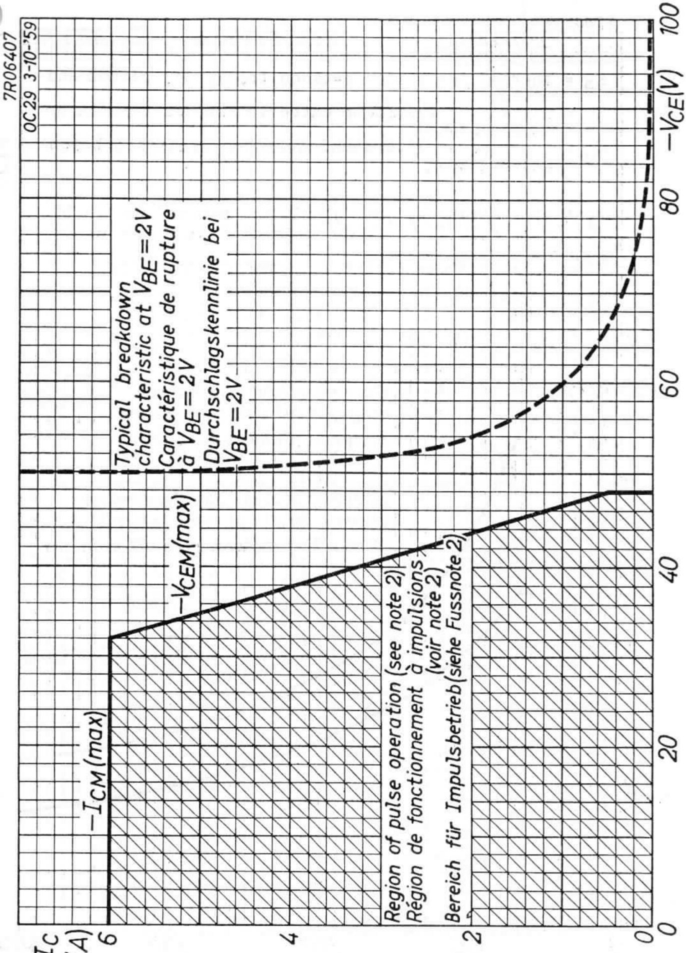
ASZ 16 **PHILIPS**



B

PHILIPS

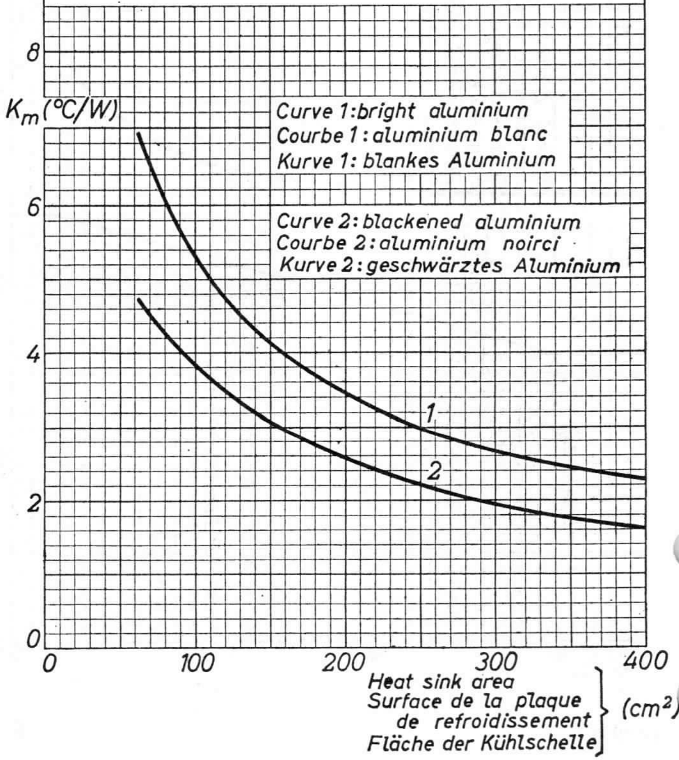
ASZ16



7Z00209

K_m = thermal resistance between transistor bottom and ambience
K_m = résistance thermique entre le fond du transistor et l'ambiance
K_m = thermischer Widerstand zwischen Transistorboden und Umgebung

Heat sink material: 3 mm aluminium, mounted vertically
Plaque de refroidissement: aluminium de 3 mm, montée verticalement
Kühlschelle: 3 mm-Aluminium, senkrecht montiert



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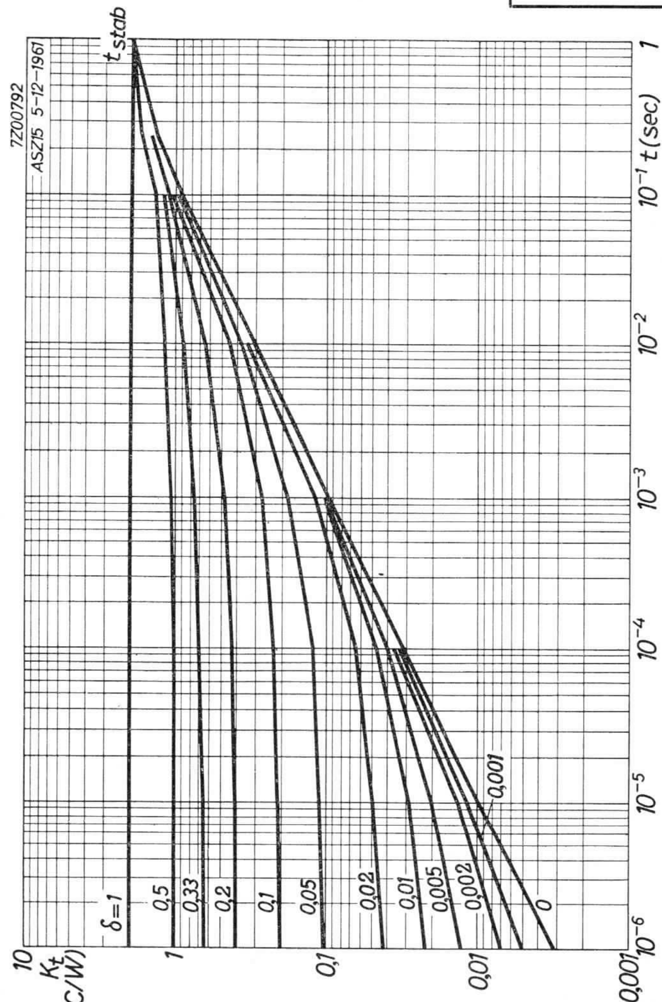

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E

PHILIPS ASZ 17

Low spread medium gain GERMANIUM POWER TRANSISTOR of the p-n-p type for use in switching circuits at medium voltages and high currents

TRANSISTOR DE PUISSANCE À CRISTAL DE GERMANIUM du type p-n-p avec dispersion faible et amplification moyenne pour l'utilisation dans des circuits de commutation de tensions moyennes et courants élevés

p-n-p-GERMANIUM-LEISTUNGSTRANSISTOR mit geringer Streuung und mittlerer Verstärkung für Schalteranwendungen mit mittleren Spannungen und hohen Strömen

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-V_{CB}$	= max.	60 V [1]
$-V_{CE}$	= max.	48 V [2]
$-V_{EB}$	= max.	20 V
$-I_C$	= max.	6 A
I_E	= max.	7,2 A
$-I_B$ (t_{av} = max. 20 msec)	= max.	1 A
$-I_{BM}$	= max.	2 A
P_C ($T_m \leqq 45\ ^{\circ}C$)	= max.	30 W [3]
T_j continuous operation / service continu / Dauerbetrieb	= max.	90 °C
T_j intermittent operation / service intermittent / aussetzender Betrieb	= max.	100 °C [4]
Storage temperature / Température d'emmagasinage / Lagerungstemperatur	=	-55 °C/+75 °C

[1]) When switched from a thermally stable on-state with maximum junction temperature to an unstabilised cut-off, the max. voltage rating is always permissible as long as $T_{amb} \leqq 55\ ^{\circ}C$ and $K_{tot} \leqq 9\ ^{\circ}C/W$

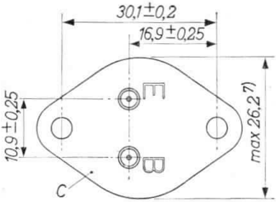
Dans le cas de commutation à la température max. de la jonction d'une condition "en circuit" thermiquement stable à une condition de coupure non stabilisée la valeur max. de cette tension est permise, tant que $T_{amb} \leqq 55\ ^{\circ}C$ et $K_{tot} \leqq 9\ ^{\circ}C/W$

Wenn bei der max. Kristalltemperatur von einem thermisch stabilen "Ein"-Zustand in einen nicht stabilisierten gesperrten Zustand umgeschaltet wird, ist der max. Wert dieser Spannung immer zulässig wenn $T_{amb} \leqq 55\ ^{\circ}C$ und $K_{tot} \leqq 9\ ^{\circ}C/W$

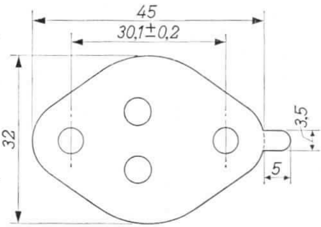
[2])[3])[4]) See pages 3,4; voir pages 3,4; siehe Seite 3,4.

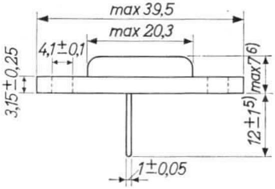
ASZ 17 PHILIPS

Dimensions in mm
Dimensions en mm
Abmessungen in mm

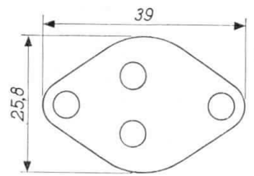


Mica insulation, 0.05 mm
Isolement de mica,0,05 mm
Glimmerisolierung,0,05 mm

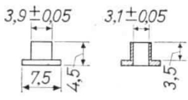




Lead washer, 1 mm
Plaque de plomb, 1 mm
Bleischeibe, 1 mm



Insulation tubes
Isolateurs de traversée
Durchführungsisolatoren



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5) 6) 7)
The following dimensions of a former execution differ from those stated above:
Les dimensions suivantes d'une exécution antérieure diffèrent des dimensions mentionnées ci-dessus:
Die folgenden Abmessungen einer älteren Ausführung unterscheiden sich von den obengenannten Abmessungen:

5) 9,5 ± 1,2 mm

6) max. 10,4 mm

7) max. 26,6 mm

Thermal data
Données thermiques
Thermische Daten

Junction temperature rise to transistor bottom	$K_m \leqq 1.5$ °C/W
Temperature rise of transistor bottom to heat sink when mounted with lead washer of 1 mm and with mica washer	$K \leqq 0.5$ °C/W
Augmentation de la température de la jonction par rapport au fond du transistor	$K_m \leqq 1,5$ °C/W
Augmentation de la température du fond du transistor par rapport à la plaque de refroidissement, lorsqu'il est monté avec une plaque de plomb de 1 mm et avec une plaque de mica	$K \leqq 0,5$ °C/W
Temperaturerhöhung des Kristalls in Bezug auf den Transistorboden	$K_m \leqq 1,5$ °C/W
Temperaturerhöhung des Transistorbodens in Bezug auf die Kühlplatte wenn der Transistor mit einer 1 mm-Bleischeibe und einer Glimmerscheibe montiert ist	$K \leqq 0,5$ °C/W

Page 1; Seite 1

[2]) For-I_C > 0.5 A please refer to page C. During switch-off transients higher voltages are allowed as long as an energy dissipation of 8 mWsec is not exceeded
Pour-I_C > 0,5 A voir page C. Pendant le régime transitoire après une mise hors circuit des tensions plus élevées sont admissibles tant qu'une dissipation d'énergie de 8 mWsec n'est pas surpassée
Für-I_C > 0,5 A siehe Seite C. Während der Ausgleichsvorgänge nach einer Ausschaltung sind höhere Spannungen erlaubt, wenn nur ein Energieverbrauch von 8 mWsek nicht überschritten wird

[3]) T_m = temperature of transistor bottom. At $T_m > 45$ °C, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, where K_m is the thermal resistance from junction to transistor bottom.

T_m = température du fond du transistor. Lorsque $T_m >$ 45 °C, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, K_m est la résistance thermique de la jonction jusqu'au fond du transistor

T_m = Temperatur des Transistorbodens. Wenn $T_m > 45$ °C, ist $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, wo K_m der thermische Widerstand zwischen Kristall und Transistorboden ist

Characteristics
Caractéristiques
Kenndaten

Transistor bottom temperature
Température du fond du transistor = 25 °C
Temperatur des Transistorbodens

$-I_{CBO}$	$(-V_{CB} = 0{,}5$ V)		< 0,1 mA
$-V_{CE}$	(V_{BE} = 2 V, $-I_C$ = 0,5 A)	> 48	V 8)
$-V_{CE}$	(V_{BE} = 2 V, $-I_C$ = 6 A)	> 32	V 8)
$-I_B$	($-V_{CB}$ = 0 V, I_E = 1 A)	> 13	< 38 mA
$-I_B$	($-V_{CB}$ = 0 V, I_E = 6 A)	> 130	< 285 mA
$-V_{BE}$	($-V_{CB}$ = 0 V, I_E = 1 A)		< 0,8 V
$-V_{BE}$	($-V_{CB}$ = 0 V, I_E = 6 A)	> 0,4	< 1,4 V

Page 1; Seite 1

4) Total duration max. 200 hours. Likelihood of full performance of a circuit at this temperature is also dependent upon the type of application
Durée totale 200 heures au max. La probabilité de fonctionnement optimum d'un circuit à cette température est aussi dépendante du genre d'application
Gesamtdauer max. 200 Stunden. Die Wahrscheinlichkeit optimaler Wirkung einer Schaltung bei dieser Temperatur wird auch von der Verwendungsart bestimmt

8) Measured under pulsed conditions to prevent excessive dissipation. Care should also be taken not to exceed the maximum energy dissipation of 8 mWsec.
Mesuré avec des impulsions pour prévenir une dissipation excessive. En outre il faut veiller à ne pas surpasser la dissipation d'énergie max. de 8 mWsec.
Zur Vermeidung einer übermässigen Verlustleistung gemessen mit Impulsen. Es soll darauf geachtet werden dass der maximale Energieverbrauch von 8 mWsek nicht überschritten wird.

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

T_m = transistor bottom temperature = 25 °C, unless otherwise specified
T_m = température du fond du transistor = 25 °C, sauf indication différente
T_m = Temperatur des Transistorbodens = 25 °C, wenn nicht anders angegeben

Column I: Setting of the transistor and typical (average) measuring results of new transistors
II: Characteristic range values for equipment design
Colonne I: Valeurs pour le réglage du transistor et les résultats moyens de mesures de transistors neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
Spalte I: Einstelldaten des Transistors und mittlere Messergebnisse neuer Transistoren
II: Charakteristischer Wertbereich für Gerätentwurf

	I	II			I	II
$-V_{CB}$ =	14	V		$-V_{CB}$ =	6	V
T_m =	100	°C		I_E =	1	A
$-I_{CBO}$ =		< 20 mA		$f_{\alpha b}$ =	250	kc/s
$-V_{CB}$ =	60	V		$-V_{CB}$ =	12	V
T_m =	100	°C		I_E =	0	mA
$-I_{CBO}$ =		< 30 mA		C_c =	160	pF
$-V_{CB}$ =	48	V		$-V_{EB}$ =	6	V
I_E =	0	mA		I_C =	0	mA
T_m =	100	°C		C_e =	165	pF
$-V_{EB}$ =		< 0,5 V		$-I_C$ =	6	A
V_{PT} =	9)	> 60 V		$-I_B$ =	10)	
				$-V_{CEK}$ =	0,5	< 1,0 V

9) Punch through voltage
Tension de perforation
Durchschlagsspannung

10) $-I_B$ = the value at which $-I_C$ = 6.6 A when $-V_{CE}$ = 2 V
la valeur à laquelle $-I_C$ = 6,6 A lorsque $-V_{CE}$ = 2 V
der Wert bei dem $-I_C$ = 6,6 A wenn $-V_{CE}$ = 2 V

Characteristics (continued)
Caractéristiques (suite) $T_m = 25\ ^{\circ}C$
Kenndaten (Fortsetzung)

Large signal characteristics
Caractéristiques pour grands signaux
Kenndaten für grosse Signale

	I	II	
$-V_{CE}$ =	1		V
$-I_C$ =	1		A
h_{FE} =		25-75	
$-V_{CE}$ =	1		V
$-I_C$ =	6		A
h_{FE} =		20-45	

Operating characteristics in "on-off" switching circuits
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit"
Betriebsdaten für "Ein-Aus"-Schalteranwendung

Fundamental switching parameters
Paramètres fondamentaux de commutation
Grundlegende Parameter für Schalteranwendung

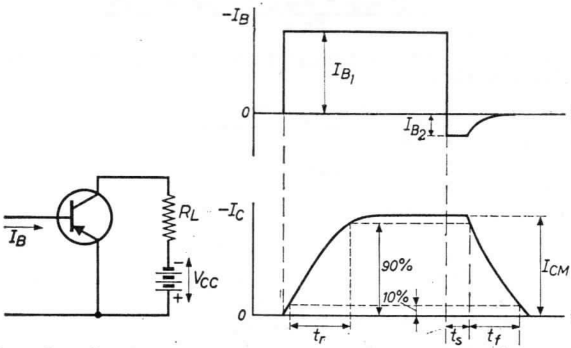
τ_c = time constant with current feed / constante de temps avec alimentation par courant / Zeitkonstante mit Stromspeisung

τ_v = time constant with voltage feed / constante de temps avec alimentation par tension / Zeitkonstante mit Spannungsspeisung

→ τ_s = desaturation time constant / constante de temps de désaturation / Entsättigungszeitkonstante

τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A)	=	45	< 70 μsec
τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A)	=	30	< 50 μsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A)	=	45	< 70 μsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A)	=	40	< 55 μsec
τ_s ($-V_{CE}$ = 0 V; $-I_{BM}$ = 50 mA)	=	30	< 50 μsec

Operating characteristics in "on-off" switching circuits (continued)
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit" (suite)
Betriebsdaten für "Ein-Aus"-Schalteranwendung (Fortsetzung)



Formulae for the calculation of switching times
Formules pour la calculation de temps de commutation
Formeln zur Berechnung der Schaltdauer

Rise time
Temps de montée
Anstiegszeit

$$t_r = \tau_c \ln \frac{h_{FE} \cdot |I_{B1}|}{h_{FE} \cdot |I_{B1}| - |I_{CM}|}$$

Fall time
Temps de retombée
Abfallzeit

$$t_f = \tau_c \ln \left\{ 1 + \frac{|I_{CM}|}{h_{FE} \cdot |I_{B2}|} \right\}$$

Storage time
Temps d'accumulation
Speicherzeit

$$t_s = \tau_s \ln \frac{|I_{B1}| + |I_{B2}|}{\frac{|I_{CM}|}{h_{FE}} + |I_{B2}|}$$

V_{CC}	=	14	14	V
R_L	=	14	2,3	Ω
$-I_{CM}$	=	1	6	A
$-I_{B_1}$	=	55	400	mA
I_{B_2}	=	13,7	100	mA
t_r	=	20	20	µsec
t_s	=	15	15	µsec
t_f	=	40	35	µsec

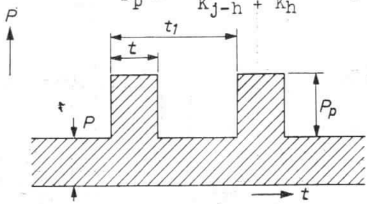
Determination of the peak power ratings

For a pulse duration, shorter than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

For a pulse duration, longer than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t	= pulse duration
t_1	= pulse period
δ	= t/t_1 = duty factor
P	= constant power dissipation
P_p	= permissible pulse power dissipation over P
K_h	= heat-sink thermal resistance (see page D)
K_t	= function of t and δ (see page E)
K_{j-h}[1])	= value of K_t for durations longer than the temperature stabilisation time
$T_{j\,max}$	= maximum permissible junction temperature
T_{amb}	= ambient temperature

Temperature stabilisation time = 1 sec (see page E)

Example: to determine the peak power rating for P = 5 W, t = 1msec, δ = 0.1, K_h = 4.25 °C/W and T_{amb} = 25 °C

From t = 1 msec and δ = 0.1 it follows that K_t = 0.28 °C/W (See page E)

$$P_p = \frac{90 - 25 - (2.0 + 4.25) \times 5}{0.28 + 0.1 \times 4.25} \approx 47.5\ \text{W}$$

[1]) K_{j-h} is the thermal resistance between junction and heat sink (K_{j-h} = 1.5 + 0.5 °C/W, see page 3)

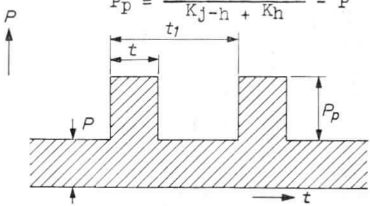
Détermination des valeurs limites des puissances de crête

Pour une durée d'impulsion, plus courte que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Pour une durée d'impulsion, plus longue que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = durée de l'impulsion

t_1 = période de l'impulsion

δ = t/t_1 = facteur de marche

P = dissipation de puissance continue

P_p = dissipation de puissance d'impulsion admissible au-dessus de P

K_h = résistance thermique de la plaque de refroidissement (voir page D)

K_t = fonction de t et δ (voir page E)

K_{j-h}[1] = valeur de K_t pour une durée plus longue que la durée pour la stabilisation de la température

$T_{j\,max}$ = température des jonctions maximum admissible

T_{amb} = température ambiante

Durée pour la stabilisation de la température = 1 sec (voir page E)

Exemple: Déterminer la valeur limite de la puissance de crête pour P = 5 W, t = 1 msec, δ = 0,1, K_h = 4,25 °C/W et T_{amb} = 25°C

Pour t = 1 msec et δ = 0,1 on peut lire de la page E que K_t = 0,28 °C/W

Il en résulte: $P_p = \frac{90 - 25 - (2,0 + 4,25).5}{0,28 + 0,1.4,25} \approx 47,5$ W

[1]) K_{j-h} est la résistance thermique entre les jonctions et la plaque de refroidissement (K_{j-h} = 1,5 + 0,5 °C/W, voir page 3)

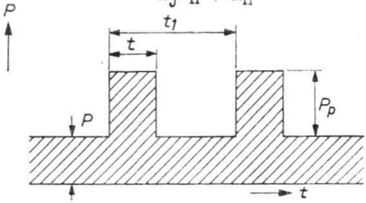
Bestimmung der Grenzwerte von Impulsleistungen

Für eine Impulsdauer, kürzer als die Zeit zur Temperaturstabilisierung ist

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Für eine Impulsdauer, länger als die Zeit zur Ausgleichung der Temperatur ist

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t	= Impulsdauer
t_1	= Impulsperiode
δ	= t/t_1 = Arbeitsfaktor
P	= konstante Verlustleistung
P_p	= die über P hinaus erlaubte Impuls-Verlustleistung
K_h	= Wärmewiderstand der Kühlplatte (siehe Seite D)
K_t	= eine Funktion von t und δ (siehe Seite E)
K_{j-h}[1]	= Wert von K_t für eine längere Dauer als die Zeit zur Ausgleichung der Temperatur
$T_{j\,max}$	= max. erlaubte Kristalltemperatur
T_{amb}	= Umgebungstemperatur

Zeit zur Ausgleichung der Temperatur =1 Sek. (siehe Seite E)

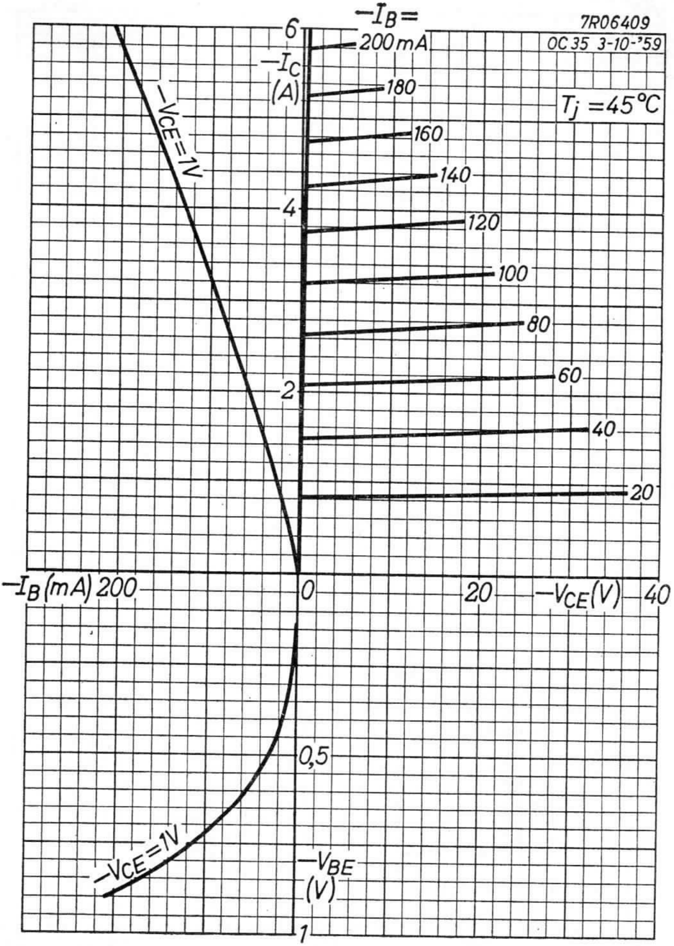
Beispiel: Der Grenzwert der Impuls-Verlustleistung zu bestimmen, wenn P = 5 W, t = 1 m , δ = 0,1, K_h = 4,25 °C/W und T_{amb} = 25 °C

Für t = 1 msec und δ = 0,1 ist nach Seite E K_t = 0,28 °C/W

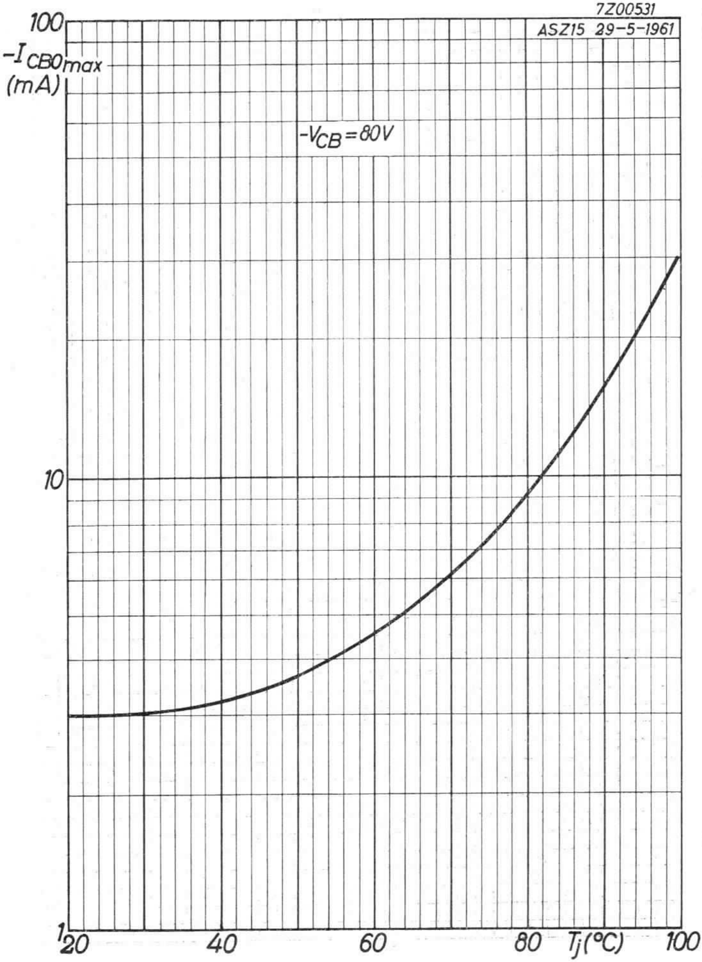
$$\text{Damit wird } P_p = \frac{90 - 25 - (2,0 + 4,25).5}{0,28 + 0,1.4,25} \approx 47,5 \text{ W}$$

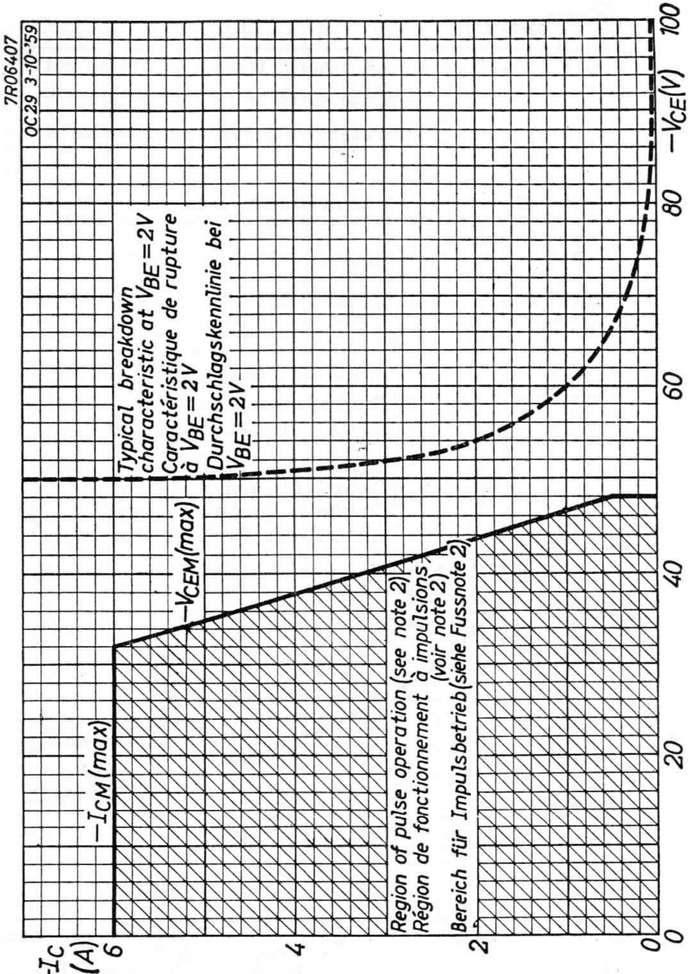
[1]) K_{j-h} ist der thermische Widerstand zwischen Kristall und Kühlplatte (K_{j-h} = 1,5 + 0,5 °C/W, siehe Seite 3)

PHILIPS ASZ 17



12.12.1961


7Z00531
ASZ15 29-5-1961
100
$-I_{CB0max}$
(mA)
$-V_{CB}=80V$
10
1
20
40
60
80
T_j(°C)
100

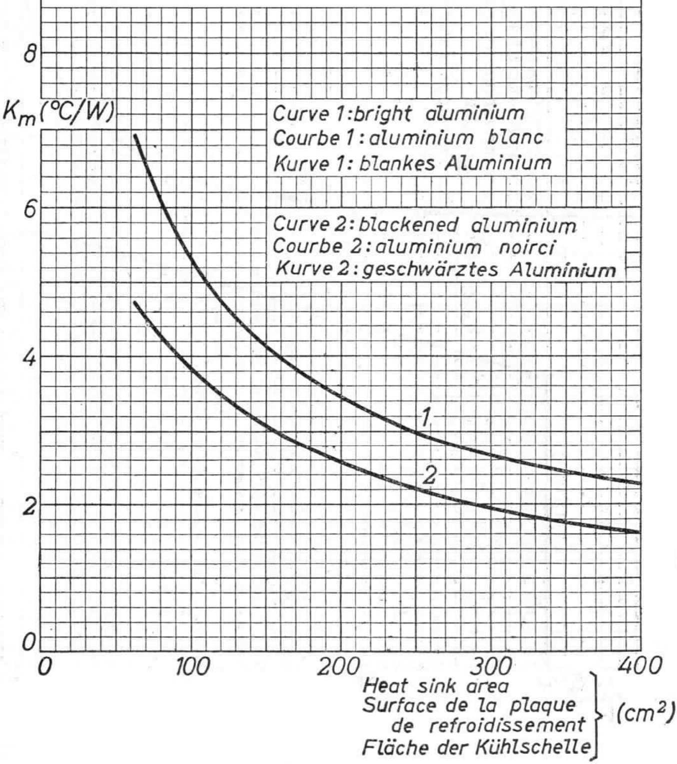

7R06407
OC29 3-10-'59
Typical breakdown characteristic at $V_{BE}=2V$
Caractéristique de rupture à $V_{BE}=2V$
Durchschlagskennlinie bei $V_{BE}=2V$
$-V_{CEM(max)}$
$-I_{CM(max)}$
Region of pulse operation (see note 2)
Région de fonctionnement à impulsions (voir note 2)
Bereich für Impulsbetrieb (siehe Fussnote 2)
$-I_C$ (A)
6
4
2
0
$-V_{CE}$(V)
0
20
40
60
80
100

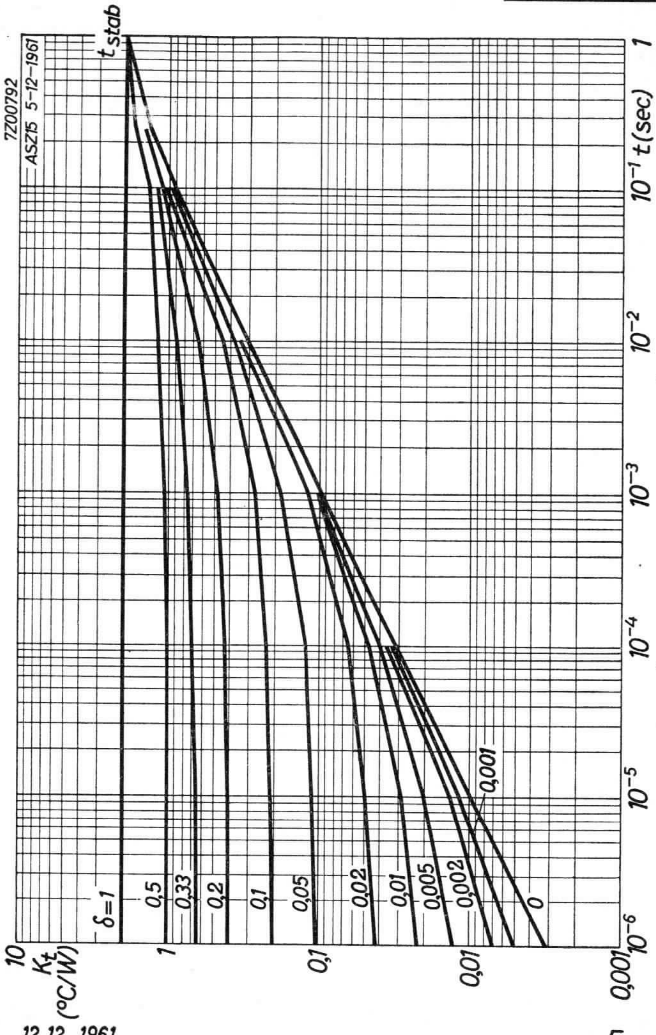
7Z00209

22-7-'60

K_m = thermal resistance between transistor bottom and ambience
K_m = résistance thermique entre le fond du transistor et l'ambiance
K_m = thermischer Widerstand zwischen Transistorboden und Umgebung

Heat sink material: 3 mm aluminium, mounted vertically
Plaque de refroidissement: aluminium de 3 mm, montée verticalement
Kühlschelle: 3 mm-Aluminium, senkrecht montiert




7Z00792
ASZ15 5-12-1961
t_{stab}
t(sec)
1
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
K_t (°C/W)
10
1
0,1
0,01
0,001
δ=1
0,5
0,33
0,2
0,1
0,05
0,02
0,01
0,005
0,002
0,001
0

12.12.1961

E

PHILIPS ASZ 18

High gain GERMANIUM POWER TRANSISTOR of the p-n-p type for use in switching circuits at high voltages and currents
TRANSISTOR DE PUISSANCE À CRISTAL DE GERMANIUM du type p-n-p avec amplification élevée pour l'utilisation dans des circuits de commutation de tensions et courants élevés
p-n-p-GERMANIUM-LEISTUNGSTRANSISTOR mit grosser Verstärkung für Schalteranwendungen mit hohen Spannungen und Strömen

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

	$-V_{CB}$	= max.	80 V [1])
	$-V_{CE}$	= max.	60 V [2])
	$-V_{EB}$	= max.	40 V
	$-I_C$	= max.	6 A
	I_E	= max.	7,2 A
	$-I_B$ (t_{av} = max. 20 msec)	= max.	1 A
	$-I_{BM}$	= max.	2 A
	P_C ($T_m \leq 45\ ^oC$)	= max.	30 W [3])
T_j	continuous operation service continu Dauerbetrieb	= max.	90 ^oC
T_j	intermittent operation service intermittent aussetzender Betrieb	= max.	100 ^oC [4])
	Storage temperature Température d'emmagasinage Lagerungstemperatur	=	$-55^oC/+75\ ^oC$

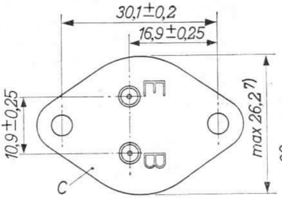
[1]) When switched from a thermally stable on-state with maximum junction temperature to an unstabilised cut-off, the max. voltage rating is always permissible as long as $T_{amb} \leq 55\ ^oC$ and $K_{tot} \leq 9\ ^oC/W$

Dans le cas de commutation à la température max. de la jonction d'une condition "en circuit" thermiquement stable à une condition de coupure non stabilisée la valeur max. de cette tension est permise, tant que $T_{amb} \leq 55\ ^oC$ et $K_{tot} \leq 9\ ^oC/W$

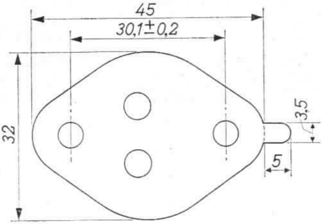
Wenn bei der max. Kristalltemperatur von einem thermisch stabilen "Ein"-Zustand in einen nicht stabilisierten gesperrten Zustand umgeschaltet wird, ist der max. Wert dieser Spannung immer zulässig wenn $T_{amb} \leq 55\ ^oC$ und $K_{tot} \leq 9\ ^oC/W$

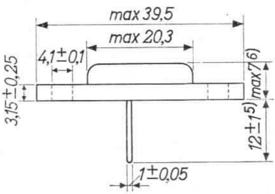
[2])[3])[4]) See pages 3,4; voir pages 3,4; siehe Seite 3,4.

Dimensions in mm
Dimensions en mm
Abmessungen in mm

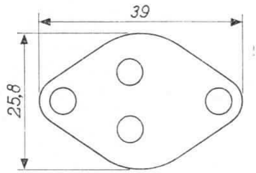


Mica insulation, 0.05 mm
Isolement de mica, 0,05 mm
Glimmerisolierung, 0,05 mm

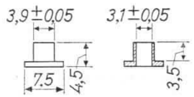




Lead washer, 1 mm
Plaque de plomb, 1 mm
Bleischeibe, 1 mm



Insulation tubes
Isolateurs de traversée
Durchführungsisolatoren



5) 6) 7)
The following dimensions of a former execution differ from those stated above:
Les dimensions suivantes d'une exécution antérieure diffèrent des dimensions mentionnées ci-dessus:
Die folgenden Abmessungen einer älteren Ausführung unterscheiden sich von den obengenannten Abmessungen:

5) 9,5 ± 1,2 mm

6) max. 10,4 mm

7) max. 26,6 mm

Tentative data. Vorläufige Daten
Caractéristiques provisoires

Thermal data
Données thermiques
Thermische Daten

Junction temperature rise to transistor bottom	$K_m \leqq 1.5\ ^oC/W$
Temperature rise of transistor bottom to heat sink when mounted with lead washer of 1 mm and with mica washer	$K \leqq 0.5\ ^oC/W$
Augmentation de la température de la jonction par rapport au fond du transistor	$K_m \leqq 1,5\ ^oC/W$
Augmentation de la température du fond du transistor par rapport à la plaque de refroidissement, lorsqu'il est monté avec une plaque de plomb de 1 mm et avec une plaque de mica	$K \leqq 0,5\ ^oC/W$
Temperaturerhöhung des Kristalls in Bezug auf den Transistorboden	$K_m \leqq 1,5\ ^oC/W$
Temperaturerhöhung des Transistorbodens in Bezug auf die Kühlplatte wenn der Transistor mit einer 1 mm-Bleischeibe und einer Glimmerscheibe montiert ist	$K \leqq 0,5\ ^oC/W$

Page 1; Seite 1

[2]) For-I_C > 0.5 A please refer to page C. During switch-off transients higher voltages are allowed as long as an energy dissipation of 8 mWsec is not exceeded
Pour-I_C > 0,5 A voir page C. Pendant le régime transitoire après une mise hors circuit des tensions plus élevées sont admissibles tant qu'une dissipation d'énergie de 8 mWsec n'est pas surpassée
Für-I_C > 0,5 A siehe Seite C. Während der Ausgleichsvorgänge nach einer Ausschaltung sind höhere Spannungen erlaubt, wenn nur ein Energieverbrauch von 8 mWsek nicht überschritten wird

[3]) T_m = temperature of transistor bottom. At $T_m > 45\ ^oC$, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, where K_m is the thermal resistance from junction to transistor bottom.

T_m = température du fond du transistor. Lorsque $T_m >$ 45 ^oC, $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, K_m est la résistance thermique de la jonction jusqu'au fond du transistor

T_m = Temperatur des Transistorbodens. Wenn $T_m > 45\ ^oC$, ist $P_{C_{max}} = \frac{T_{j_{max}} - T_m}{K_m}$, wo K_m der thermische Widerstand zwischen Kristall und Transistorboden ist

Characteristics
Caractéristiques
Kenndaten

Transistor bottom temperature
Température du fond du transistor = 25 °C
Temperatur des Transistorbodens

$-I_{CBO}$ ($-V_{CB}$ = 0,5 V)			< 0,1	mA
$-V_{CE}$ (V_{BE} = 2 V; $-I_C$ = 0,5 A)	>	60		V [8]
$-V_{CE}$ (V_{BE} = 2 V; $-I_C$ = 6 A)	>	32		V [8]
$-I_B$ ($-V_{CB}$ = 0 V; I_E = 1 A)	>	9	< 33	mA
$-I_B$ ($-V_{CB}$ = 0 V; I_E = 6 A)	>	90	< 285	mA
$-V_{BE}$ ($-V_{CB}$ = 0 V; I_E = 1 A)			< 0,8	V
$-V_{BE}$ ($-V_{CB}$ = 0 V; I_E = 6 A)			< 1,6	V

Page 1; Seite 1

[4]) Total duration max. 200 hours. Likelihood of full performance of a circuit at this temperature is also dependent upon the type of application
Durée totale 200 heures au max. La probabilité de fonctionnement optimum d'un circuit à cette température est aussi dépendante du genre d'application
Gesamtdauer max. 200 Stunden. Die Wahrscheinlichkeit optimaler Wirkung einer Schaltung bei dieser Temperatur wird auch von der Verwendungsart bestimmt

[8]) Measured under pulsed conditions to prevent excessive dissipation. Care should also be taken not to exceed the maximum energy dissipation of 8 mWsec.
Mesuré avec des impulsions pour prévenir une dissipation excessive. En outre il faut veiller à ne pas surpasser la dissipation d'énergie max. de 8 mWsec.
Zur Vermeidung einer übermässigen Verlustleistung gemessen mit Impulsen. Es soll darauf geachtet werden dass der maximalen Energieverbrauch von 8 mWsek nicht überschritten wird

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

T_m = transistor bottom temperature = 25 °C, unless otherwise specified
T_m = température du fond du transistor = 25 °C, sauf indication différente
T_m = Temperatur des Transistorbodens = 25 °C, wenn nicht anders angegeben

Column I: Setting of the transistor and typical (average) measuring results of new transistors
II: Characteristic range values for equipment design
Colonne I: Valeurs pour le réglage du transistor et les résultats moyens de mesures de transistors neufs
II: Gamme de valeurs caractéristiques pour l'étude d'équipements
Spalte I: Einstelldaten des Transistors und mittlere Messergebnisse neuer Transistoren.
II: Charakteristischer Wertbereich für Gerätentwurf

	I	II	
$-V_{CB}$ =	14		V
T_m =	100		°C
$-I_{CBO}$ =		< 20	mA
$-V_{CB}$ =	80		V
T_m =	100		°C
$-I_{CBO}$ =		< 30	mA
$-V_{CB}$ =	60		V
I_E =	0		mA
T_m =	100		°C
$-V_{EB}$ =		< 0,5	V
V_{PT} =	9)	> 80	V

	I	II	
$-V_{CB}$ =	6		V
I_E =	1		A
$f_{\alpha b}$ =	250		kc/s
$-V_{CB}$ =	12		V
I_E =	0		mA
c_c =	160		pF
$-V_{EB}$ =	6		V
I_C =	0		mA
c_e =	165		pF
$-I_C$ =	6		A
$-I_B$ =	10)		
$-V_{CEK}$ =	0,5	< 1,0	V

9) Punch through voltage
Tension de perforation
Durchschlagsspannung

10) $-I_B$ = { the value at which $-I_C$ = 6.6 A when $-V_{CE}$ = 2 V
la valeur à laquelle $-I_C$ = 6,6 A lorsque $-V_{CE}$ = 2 V
der Wert bei dem $-I_C$ = 6,6 A wenn $-V_{CE}$ = 2 V

Characteristics (continued)
Caractéristiques (suite) $T_m = 25\ ^oC$
Kenndaten (Fortsetzung)

Large signal characteristics
Caractéristiques pour grands signaux
Kenndaten für grosse Signale

	I	II	
$-V_{CE}$ =	1		V
$-I_C$ =	1		A
h_{FE} =		30-110	
$-V_{CE}$ =	1		V
$-I_C$ =	6		A
h_{FE} =		20-65	

Operating characteristics in "on-off" switching circuits
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit"
Betriebsdaten für "Ein-Aus"-Schalteranwendung

Fundamental switching parameters
Paramètres fondamentaux de commutation
Grundlegende Parameter für Schalteranwendung

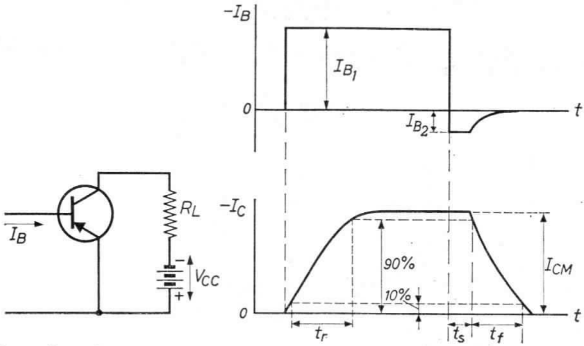
τ_c = time constant with current feed / constante de temps avec alimentation par courant / Zeitkonstante mit Stromspeisung

τ_v = time constant with voltage feed / Constante de temps avec alimentation par tension / Zeitkonstante mit Spannungsspeisung

τ_s = desaturation time constant / constante de temps de désaturation / Entsättigungszeitkonstante

τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) = 45 < 70 µsec
τ_c ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) = 30 < 50 µsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 1 A) = 45 < 70 µsec
τ_v ($-V_{CE}$ = 4 V; $-I_{CM}$ = 6 A) = 40 < 55 µsec
τ_s ($-V_{CE}$ = 0 V; $-I_{BM}$ = 50 mA) = 30 < 50 µsec

Operating characteristics in "on-off" switching circuits (continued)
Caractéristiques d'utilisation dans des circuits de commutation "en circuit-hors circuit" (suite)
Betriebsdaten für "Ein-Aus"-Schalteranwendung (Fortsetzung)



Formulae for the calculation of switching times
Formules pour la calculation de temps de commutation
Formeln zur Berechnung der Schaltdauer

Rise time
Temps de montée
Anstiegszeit

$$t_r = \tau_c \ln \frac{h_{FE}|I_{B1}|}{h_{FE}|I_{B1}| - |I_{CM}|}$$

Fall time
Temps de retombée
Abfallzeit

$$t_f = \tau_c \ln \left\{ 1 + \frac{|I_{CM}|}{h_{FE}|I_{B2}|} \right\}$$

Storage time
Temps d'accumulation
Speicherzeit

$$t_s = \tau_s \ln \frac{|I_{B1}| + |I_{B2}|}{\frac{|I_{CM}|}{h_{FE}} + |I_{B2}|}$$

V_{CC}	=	28	28	V
R_L	=	28	4,7	Ω
$-I_{CM}$	=	1	6	A
$-I_{B1}$	=	50	400	mA
I_{B2}	=	12,5	100	mA
t_r	=	20	20	µsec
t_s	=	15	15	µsec
t_f	=	40	35	µsec

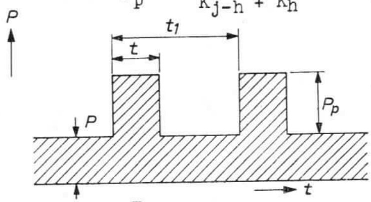
Determination of the peak power ratings

For a pulse duration, shorter than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

For a pulse duration, longer than the temperature stabilisation time

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = pulse duration
t_1 = pulse period
δ = t/t_1 = duty factor
P = constant power dissipation
P_p = permissible pulse power dissipation over P
K_h = heat-sink thermal resistance (see page D)
K_t = function of t and δ (see page E)
K_{j-h}[1] = value of K_t for durations longer than the temperature stabilisation time
$T_{j\,max}$ = maximum permissible junction temperature
T_{amb} = ambient temperature
Temperature stabilisation time = 1 sec (see page E)

Example: to determine the peak power rating for P = 5 W, t = 1msec, δ = 0.1, K_h = 4.25 °C/W and T_{amb} = 25 °C

From t = 1 msec and δ = 0.1 it follows that K_t = 0.28 °C/W (See page E)

$$P_p = \frac{90 - 25 - (2.0 + 4.25) \times 5}{0.28 + 0.1 \times 4.25} \approx 47.5 \text{ W}$$

[1]) K_{j-h} is the thermal resistance between junction and heat sink (K_{j-h} = 1.5 + 0.5 °C/W, see page 3)

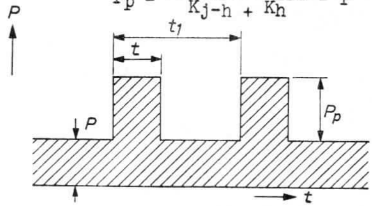
Détermination des valeurs limites des puissances de crête

Pour une durée d'impulsion, plus courte que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Pour une durée d'impulsion, plus longue que la durée pour la stabilisation de la température

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t	= durée de l'impulsion
t_1	= période de l'impulsion
δ	= t/t_1 = facteur de marche
P	= dissipation de puissance continue
P_p	= dissipation de puissance d'impulsion admissible au-dessus de P
K_h	= résistance thermique de la plaque de refroidissement (voir page D)
K_t	= fonction de t et δ (voir page E)
K_{j-h}[1]	= valeur de K_t pour une durée plus longue que la durée pour la stabilisation de la température
$T_{j\,max}$	= température des jonctions maximum admissible
T_{amb}	= température ambiante

Durée pour la stabilisation de la température = 1 sec (voir page E)

Exemple: Déterminer la valeur limite de la puissance de crête pour P = 5 W, t = 1 msec, δ = 0,1, K_h = 4,25 °C/W et T_{amb} = 25°C

Pour t = 1 msec et δ = 0,1 on peut lire de la page E que K_t = 0,28 °C/W

Il en résulte: $P_p = \frac{90 - 25 - (2{,}0 + 4{,}25).5}{0{,}28 + 0{,}1.4{,}25} \approx 47{,}5$ W

---

[1]) K_{j-h} est la résistance thermique entre les jonctions et la plaque de refroidissement (K_{j-h} = 1,5 + 0,5 °C/W, voir page 3)

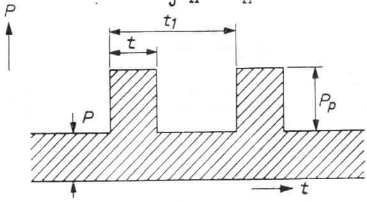
Bestimmung der Grenzwerte von Impulsleistungen

Für eine Impulsdauer, kürzer als die Zeit zur Temperaturstabilisierung ist

$$P_p = \frac{T_{j\,max} - T_{amb} - (K_{j-h} + K_h)P}{K_t + \delta \cdot K_h}$$

Für eine Impulsdauer, länger als die Zeit zur Ausgleichung der Temperatur ist

$$P_p = \frac{T_{j\,max} - T_{amb}}{K_{j-h} + K_h} - P$$



t = Impulsdauer

t_1 = Impulsperiode

δ = t/t_1 = Arbeitsfaktor

P = konstante Verlustleistung

P_p = die über P hinaus erlaubte Impuls-Verlustleistung

K_h = Wärmewiderstand der Kühlplatte (siehe Seite D)

K_t = eine Funktion von t und δ (siehe Seite E)

K_{j-h}[1] = Wert von K_t für eine längere Dauer als die Zeit zur Ausgleichung der Temperatur

$T_{j\,max}$ = max. erlaubte Kristalltemperatur

T_{amb} = Umgebungstemperatur

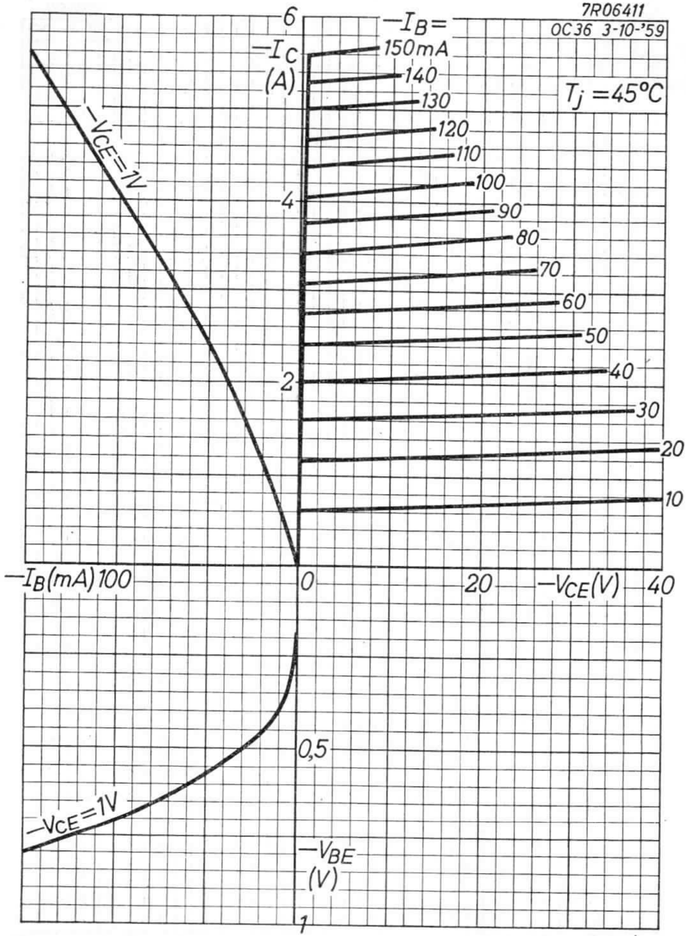
Zeit zur Ausgleichung der Temperatur =1 Sek. (siehe Seite E)

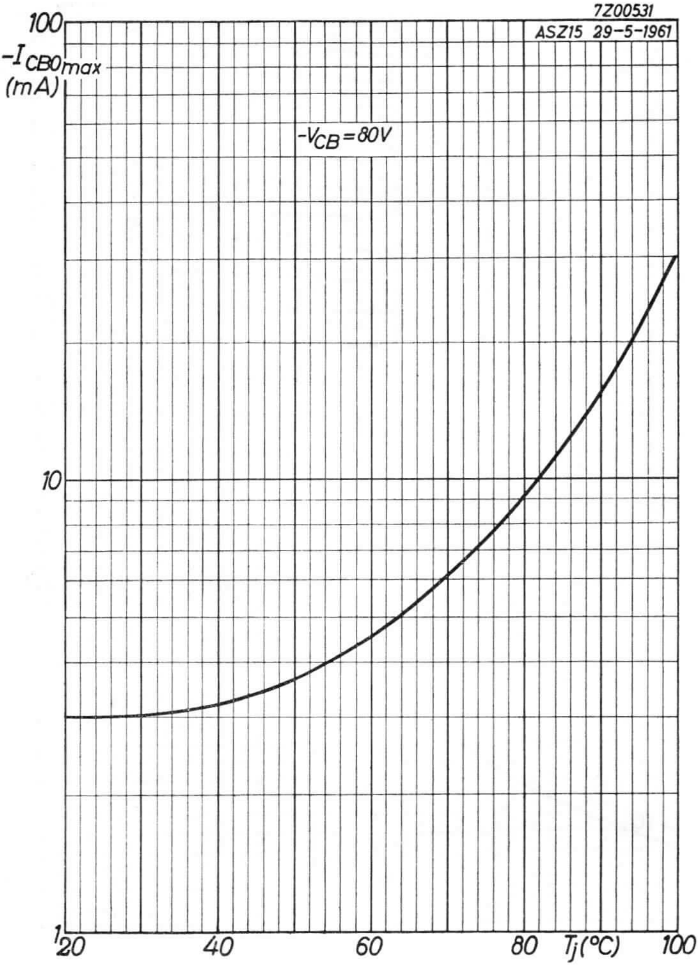
Beispiel: Der Grenzwert der Impuls-Verlustleistung zu bestimmen, wenn P = 5 W, t = 1 m , δ = 0,1, K_h = 4,25 °C/W und T_{amb} = 25 °C

Für t = 1 msec und δ = 0,1 ist nach Seite E K_t = 0,28 °C/W

$$\text{Damit wird } P_p = \frac{90 - 25 - (2{,}0 + 4{,}25).5}{0{,}28 + 0{,}1.4{,}25} \approx 47{,}5\ \text{W}$$

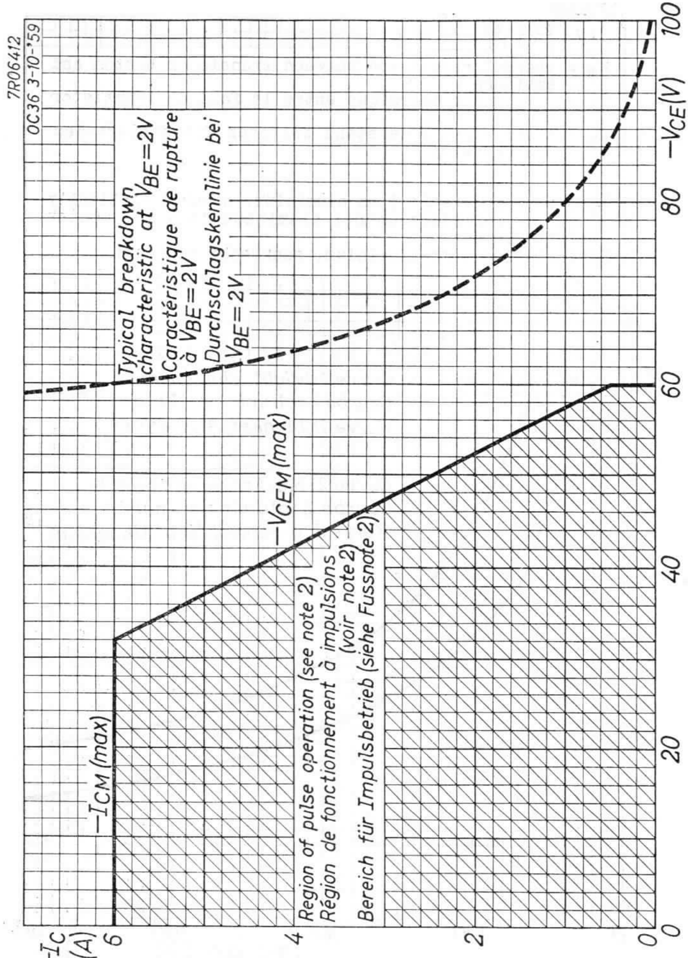
[1]) K_{j-h} ist der thermische Widerstand zwischen Kristall und Kühlplatte (K_{j-h} = 1,5 + 0,5 °C/W, siehe Seite 3)


7R06411
OC36 3-10-'59
$T_j = 45°C$
$-I_C$ (A)
6
4
2
$-I_B=$
150mA
140
130
120
110
100
90
80
70
60
50
40
30
20
10
$-V_{CE}=1V$
$-I_B$(mA) 100
0
20
$-V_{CE}$(V)
40
0,5
$-V_{BE}$ (V)
1
$-V_{CE}=1V$


7Z00531
ASZ15 29-5-1961
100
$-I_{CB0max}$
(mA)
$-V_{CB}$=80V
10
1
20
40
60
80
T_j(°C)
100

PHILIPS

ASZ18

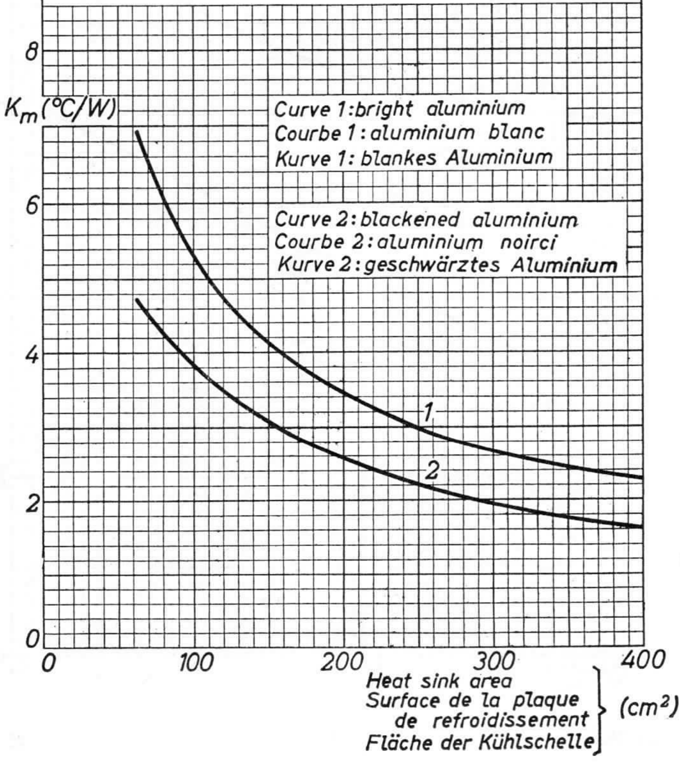


7Z00209

22-7-'60

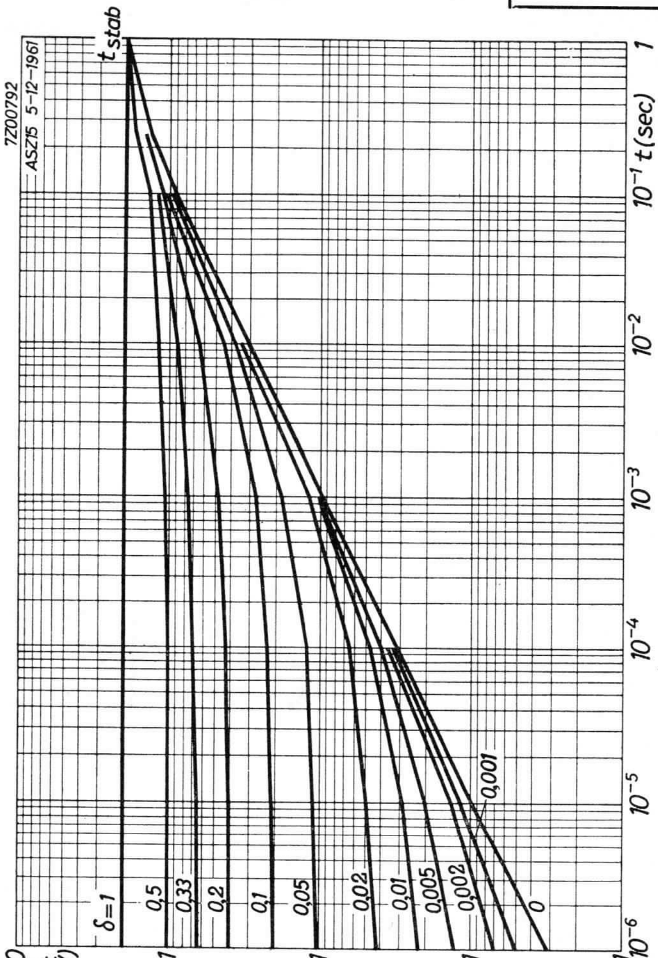
K_m = thermal resistance between transistor bottom and ambience
K_m = résistance thermique entre le fond du transistor et l'ambiance
K_m = thermischer Widerstand zwischen Transistorboden und Umgebung

Heat sink material: 3 mm aluminium, mounted vertically
Plaque de refroidissement: aluminium de 3 mm, montée verticalement
Kühlschelle: 3 mm-Aluminium, senkrecht montiert



PHILIPS

ASZ18



12.12.1961

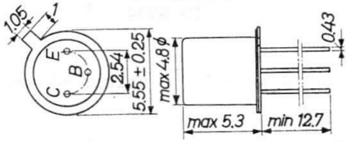
E

PHILIPS

ASZ21

ALLOY-DIFFUSED TRANSISTOR of the p-n-p type in metal envelope for high-speed saturated logic applications

Dimensions in mm



LIMITING VALUES (Absolute max. values)

Collector		
Voltage (base reference)	$-V_{CB}$	= max. 20 V
Voltage (emitter reference)	$-V_{CE}$	= max. 15 V
Current		
Peak	$-I_{CM}$	= max. 50 mA
D.C. and average (averaging time max. 20 msec)	$-I_C$	= max. 30 mA
	(t_{av}	= max. 20 msec)
Emitter		
Reverse current [1]		
Peak	$-I_{EM}$	= max. 10 mA
D.C. and average (averaging time max. 20 msec)	$-I_E$	= max. 5 mA
	(t_{av}	= max. 20 msec)
Base		
Current		
Peak	$-I_{BM}$	= max. 10 mA
D.C. and average (averaging time max. 20 msec)	$-I_B$	= max. 5 mA
	(t_{av}	= max. 20 msec)
Dissipation		
Total dissipation	P_{tot}	= max. 275 mW
Temperatures		
Storage temperature	T_S	= -55 °C to +75 °C
Junction temperature	T_j	= max. 75 °C

[1]) When the current is not limited the voltage must be less than 2.5 V

THERMAL DATA

Thermal resistance from junction to ambience in free air	K = max. 0.50 °C/mW
Thermal resistance from junction to case	K = max. 0.18 °C/mW

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

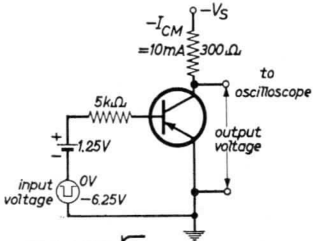
Collector current	
$-I_C$ { $-V_{CE}$ = 15 V; $-V_{EB}$ = 0.2 V; T_{amb} = 60 °C }	< 60 µA
Emitter current at I_C = 0 mA	
$-I_{EBO}$ ($-V_{EB}$ = 0.5 V; I_C = 0 mA)	< 2 µA
Base current	
$-I_B$ { $-V_{CE}$ = 15 V; $-V_{EB}$ = 0.2 V; T_{amb} = 60 °C }	< 60 µA
Collector voltage	
$-V_{CB}$ { $-I_C$ = 100 µA; I_E = 0 mA; T_{amb} = 60 °C }	> 20 V
$-V_{CE}$ ($-I_C$ = 100 µA; V_{BE} = 0 V)	> 15 V
$-V_{CE}$ ($-I_C$ = 5 mA; $-I_B$ = 0 mA)	> 9 V
$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 1 mA)	< 0.35 V
$-V_{CE}$ ($-I_C$ = 50 mA; $-I_B$ = 3 mA)	< 1.10 V
Emitter voltage	
$-V_{EB}$ { $-I_E$ = 100 µA; I_C = 0 mA; T_{amb} = 60 °C }	> 2.5 V
Base voltage	
$-V_{BE}$ ($-I_C$ = 10 mA; $-I_B$ = 0.44 mA)	> 0.25 V < 0.5 V
D.C. current amplification factor	
h_{FE} ($-V_{CE}$ = 0.5 V; $-I_C$ = 10 mA)	> 30
h_{FE} ($-V_{CE}$ = 1.0 V; $-I_C$ = 30 mA)	> 50

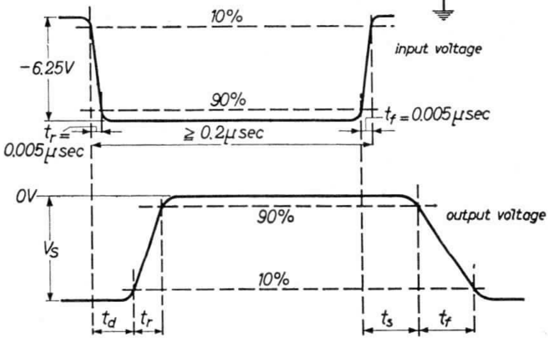
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

$T_{amb} = 25\ ^{o}C$

Base voltage		
$-V_{BE}$ ($-I_C$ = 30 mA; $-I_B$ = 0.9 mA)	> 0.35 V < 0.75 V	
Frequency at which $\lvert h_{fe}\rvert = 1$		
f_1 (I_E = 10 mA; $-V_{CB}$ = 2 V)	>	300 Mc/s
Collector capacitance		
c_c ($-V_{CB}$ = 6 V; I_E = 0 mA)	<	5 pF
Emitter capacitance		
c_e ($-V_{EB}$ = 1 V; I_C = 0 mA)	<	12 pF

Transient behaviour

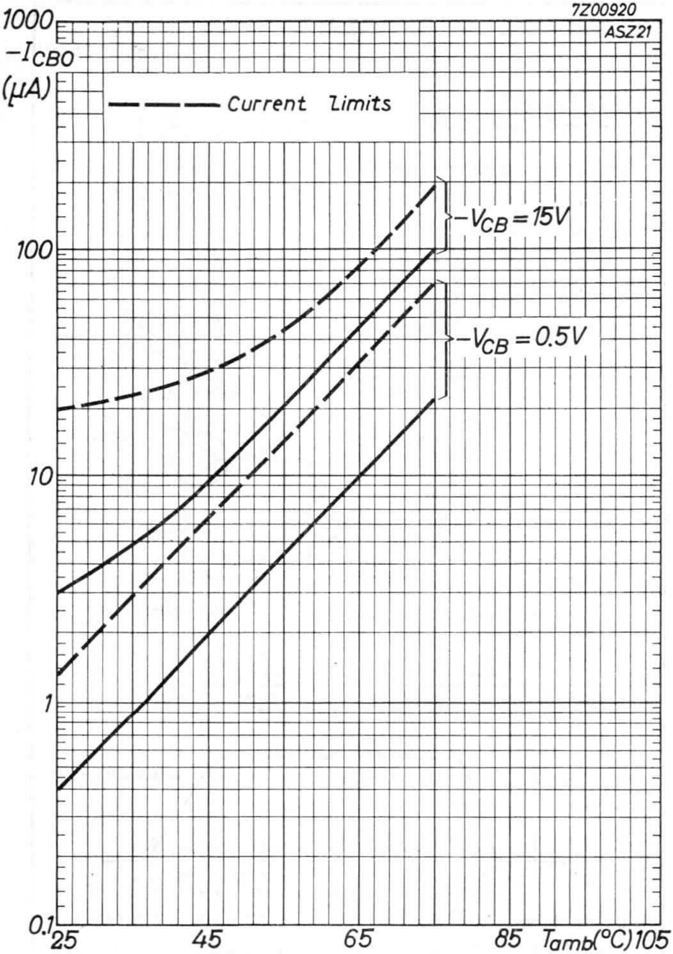




Delay time	t_d = 0.03 µsec	> 0.015 µsec	< 0.040 µsec
Rise time	t_r = 0.02 µsec	> 0.010 µsec	< 0.035 µsec
Storage time	t_s = 0.04 µsec	> 0.025 µsec	< 0.060 µsec
Fall time	t_f = 0.04 µsec	> 0.025 µsec	< 0.055 µsec

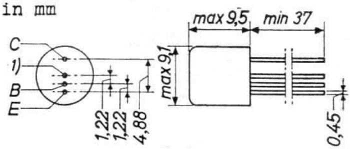
ASZ21

PHILIPS



ALLOY-DIFFUSED JUNCTION TRANSISTOR of the p-n-p type in metal can for generating short duration pulses
TRANSISTOR À JONCTIONS du type p-n-p EN TECHNIQUE ALLIAGE-DIFFUSION dans un boîtier métallique pour la production d'impulsions à courte durée
p-n-p-FLÄCHENTRANSISTOR NACH DEM DIFFUSIONSLEGIERUNGS-VERFAHREN in Metallgehäuse zur Erzeugung von Impulsen kurzer Dauer

Dimensions in mm
Dimensions en mm
Abmessungen in mm



Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

$-I_{CM}$	= max.	100 mA
$-I_{CQ}$	= max.	2 mA [2]
$-V_{EB}$	= max.	2 V
P_{tot}	= max.	$\frac{T_{jmax} - T_{amb}}{K}$ [3]
T_j	= max.	75 °C

Storage temperature
Température d'emmagasinage = -55 °C/+75 °C
Lagerungstemperatur

[1] Interlead shield and metal case
Blindage entre les connexions et boîtier métallique
Abschirmung zwischen den Anschlüssen und Metallgehäuse

[2] Quiescent avalanche
Courant de collecteur de repos
Kollektorruhestrom

[3] See also pages A and B
Voir aussi pages A et B
Siehe auch Seiten A und B

<u>Thermal data.</u> Thermal resistance

from junction to ambience in free air	K	≦ 0.6 °C/mW
from junction to case	K	≦ 0.5 °C/mW

<u>Données thermiques.</u> Résistance thermique

entre les jonctions et l'ambiance à l'air libre	K	≦ 0,6 °C/mW
entre les jonctions et le boîtier	K	≦ 0,5 °C/mW

<u>Thermische Daten.</u> Wärmewiderstand

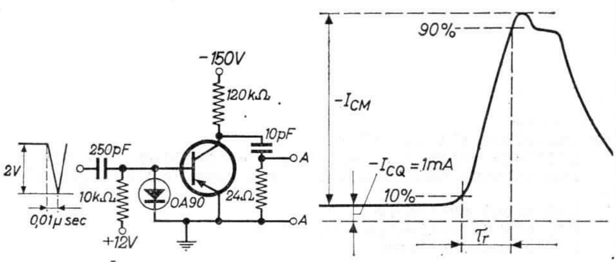
zwischen Kristall und Umgebung in freier Luft	K	≦ 0,6 °C/mW
zwischen Kristall und Gehäuse	K	≦ 0,5 °C/mW

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

T_{amb} = 25 °C

$-V_{CB}$ = 6 V	$-I_{CBO}$ = 2,0 µA	< 8,0 µA		
$-V_{EB}$ = 0,5 V	$-I_{EBO}$ = 0,1 µA	< 0,5 µA		
$-I_C$ = 1 mA; I_E = 0 mA	$-V_{CB}$ = 24 V	> 15 V	< 30 V	
$-V_{CB}$= 6 V; I_E = 0 mA	$c_{b'c}$	< 4,0 pF		

Collector current pulse
Impulsion du courant de collecteur
Kollektorstromimpuls



$-I_{CM}$ = 40	< 60 mA [1]
τ_r	< 0,001 µsec

[1]) See page 3
Voir page 3
Siehe Seite 3

Collector current pulse (continued)
Impulsion du courant de collecteur (suite)
Kollektorstromimpuls (Fortsetzung)

Terminals A : to sampling oscilloscope
Bornes A : pour oscilloscope stroboscopique
Anschlussklemmen A: nach stroboskopischem Oszillographen

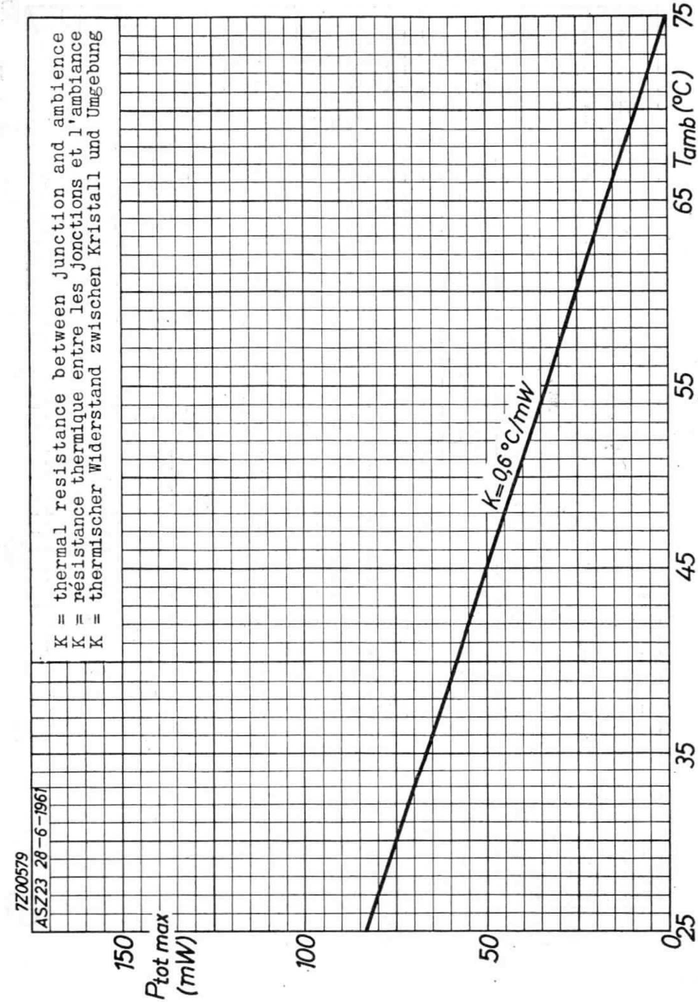
The resistance of 24 Ω should be a non inductive type and may be conveniently obtained by four lengths of coaxial cable in parallel with short circuit terminations (Each length = 1.5 m, Z_o = 95 Ω)
La résistance de 24 Ω doit être non-inductive et peut être obtenue par quatre pièces de câble coaxial en parallèle avec les extrémités en court-circuit (chaque pièce de 1,5 m, Z_o = 95 Ω)
Der Widerstand von 24 Ω soll induktionsfrei sein und kann mittels vier parallelgeschalteten Koaxialkabelstücke mit kurzgeschlossenen Enden erhalten werden (jedes Stück 1,5 m, Z_o = 95 Ω)

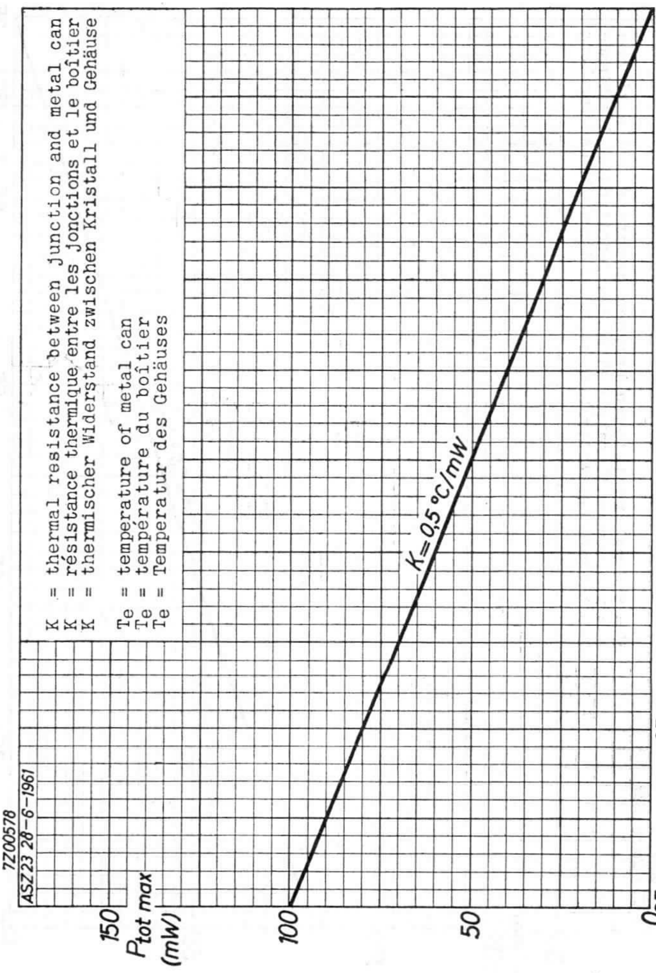
---

[1]) Higher values may be achieved in the circuit shown provided the collector circuit capacitance < 15 pF
Des valeurs plus élevées peuvent être obtenues dans le circuit page 2, si la capacité du circuit de collecteur est < 15 pF
Wenn die Kapazität der Kollektorschaltung < 15 pF ist, können in der angegebenen Schaltung höhere Werte erhalten werden

PHILIPS

ASZ 23




K = thermal resistance between junction and metal can
K = résistance thermique entre les jonctions et le boîtier
K = thermischer Widerstand zwischen Kristall und Gehäuse
Te = temperature of metal can
Te = température du boîtier
Te = Temperatur des Gehäuses
K=0,5 °C/mW
7Z00578
ASZ23 28-6-1961
150
Ptot max
(mW)
100
50
0
25
35
45
55
65
75
Te (°C)

GERMANIUM p-n-p DIFFUSED ALLOY POWER TRANSISTORS for use in line deflection output (AU101) and driver (AU102) circuits

LIMITING VALUES (Absolute maximum values)

			AU101	AU102
Collector				
Voltage (base reference)	$-V_{CB}$	= max.	120 V	40 V
Voltage (emitter reference)	$-V_{CE}$	= max.	120 V [1]	40 V
Current	$-I_C$	= max.	10	A
Base				
Current	$\lvert I_B \rvert$	= max.	2 [2]	A
Dissipation				
Total dissipation	P_{tot}	= max.	10	W [3]
Temperatures				
Continuous junction temperature	T_j	= max.	90	°C
Junction temperature, incidentally (total duration max. 200 hrs)	T_j	= max.	100	°C
	(t	= max.	200	hrs)
Storage temperature	T_s	=	−55 °C to +75 °C	

THERMAL DATA

Thermal resistance from junction to transistor base	K_{j-m}	= max. 2.0 °C/W
Thermal resistance from junction to ambience (mounting with mica washer on blackened 2 mm copper heat sink of at least 120 cm²)	K_{j-amb}	= max. 5.5 °C/W

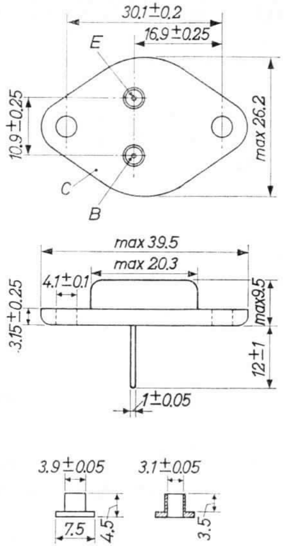
[1]) See also page G

[2]) Transgression up to 3 A peak is allowed during the turn-on and turn-off time

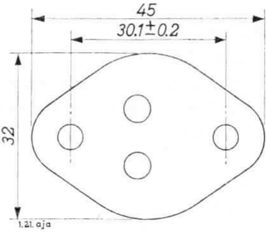
[3]) During switching off the peak dissipation is limited by the max. allowable transient energy of 300 μWsec

PHILIPS

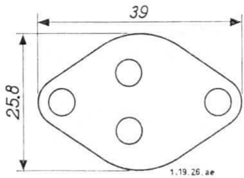
Dimensions in mm



Insulation tube



Mica insulation 0.05 mm



Lead washer 1 mm

The collector is connected to the case

Accessories for mounting

0.05 mm mica plate and insulation tubes	56201A
1 mm lead washer	56201B

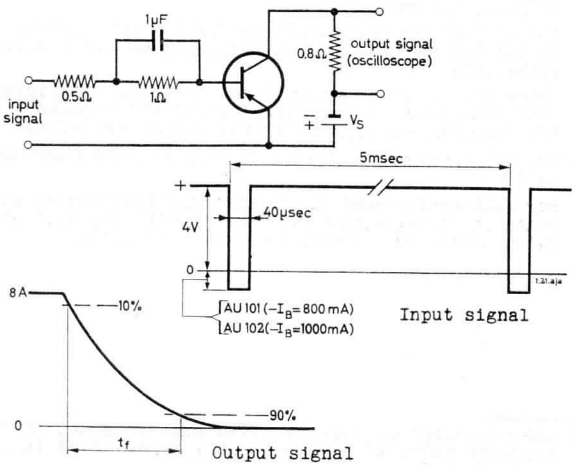
CHARACTERISTICS at a transistor base temperature $T_m = 25\ ^oC$

	AU101	AU102
Collector-base leakage current		
$-I_{CBO}$ ($-V_{CB}$ = 120 V; I_E = 0 mA)	< 10 mA	
$-I_{CBO}$ ($-V_{CB}$ = 40 V; I_E = 0 mA)		< 10 mA
Base current		
$-I_B$ (V_{CB} = 0 V; I_E = 10 mA)	> 200 mA < 730 mA	< 1250 mA

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

T_{amb} = 25 °C unless otherwise specified

	AU101	AU102
Collector-base leakage current	See page F	
Emitter-base breakdown voltage		
$-V_{EB(b.d.)}$ ($-I_E$ = 50 mA; I_C = 0 mA)	> 1 V	> 1 V
Collector-emitter saturation voltage		
$-V_{CE}$ ($-I_C$ = 10 mA; $-I_B$ = 1.2 A; T_j = 100 °C)	< 1 V	< 1 V
Floating emitter-base potential		
$-V_{EB}$ ($-V_{CB}$ = 120 V; T_j = 100 °C)	< 0.5 V	
Frequency at which $\|h_{fe}\|$ = 1		
f_1 (I_E = 0.5 A; $-V_{CB}$ = 2 V)	> 400 kc/s	> 400 kc/s
Fall time from $-I_C$ = 8 A		
t_f (T_j = 90 °C; see figures below)	< 2.6 µsec	< 3.9 µsec

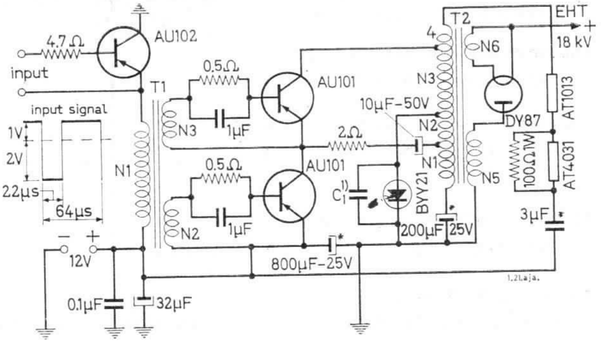


Input signal

Output signal

PHILIPS

OPERATING CHARACTERISTICS in typical horizontal deflection circuit for 110° deflection cathode ray tubes with an EHT of 18 kV and a fly-back ratio of 22%



Operating notes

1. Stable continuous operation up to an ambient temperature of 50 °C is ensured, provided each transistor AU101 has been mounted on a blackened heat sink (2 mm copper) of at least 120 cm².

2. The circuit has been developed for a supply voltage of 12 V ± 3%, with a maximum variation of 0.1 V during operation.

   Other values of stabilized supply voltage, slightly deviating from 12 V, require small modifications of the circuit, especially of the output transformer.

3. The tolerance of the values of resistors and capacitors is 10 %.

   For full performance in transistorized deflection circuits it is necessary that the capacitors, indicated by an asteristik, shall be of good quality.

[1]) The capacitor C_1 must be given such a value, that a fly-back pulse of 14 µsec width is obtained (about 0.22 µF, 400 V)

COIL DATA

Transformer T_1

Core: Ferroxcube pot core type S 35/23
Type number: K3 001 04 (3B5; air gap 0.18 mm)

N1: 18 turns
N2: 7 turns
N3: 7 turns
} 0.4 mm Cu wire, enamelled, soldering quality

Transformer T_2 (See fig.below)

Core: U-core ferroxcube 3C5
Type number VK 235 50

N1: 16 turns
N2: 3 turns
N3: 13 turns
N4: 7 turns
} 0.5 mm Cu wire, enamelled, soldering quality

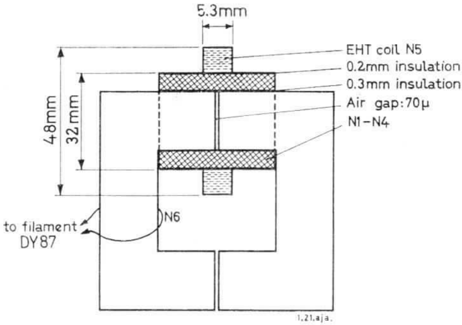
N5: 2400 turns 0.08 mm Cu wire, enamelled, soldering quality

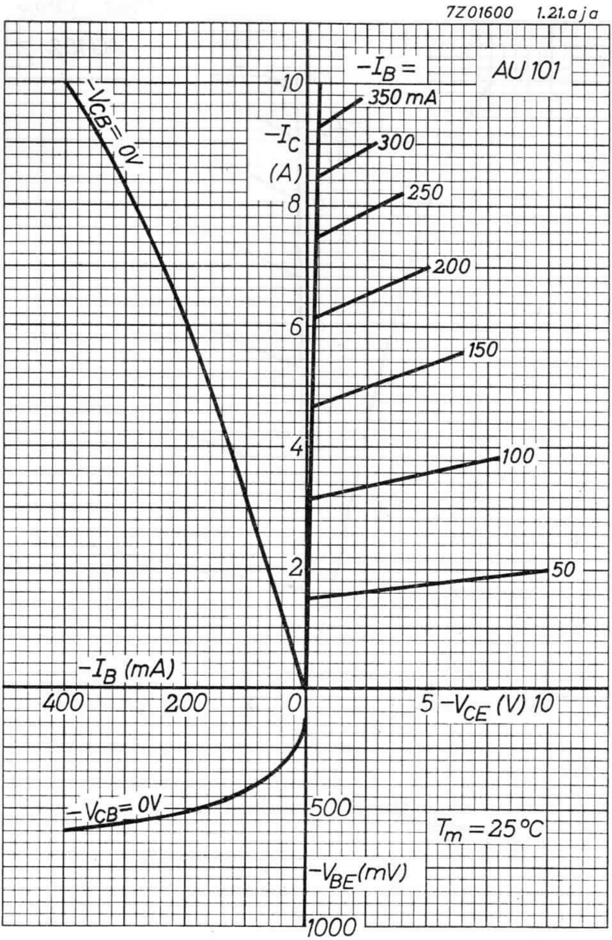
N6: 1 turn

Winding method:

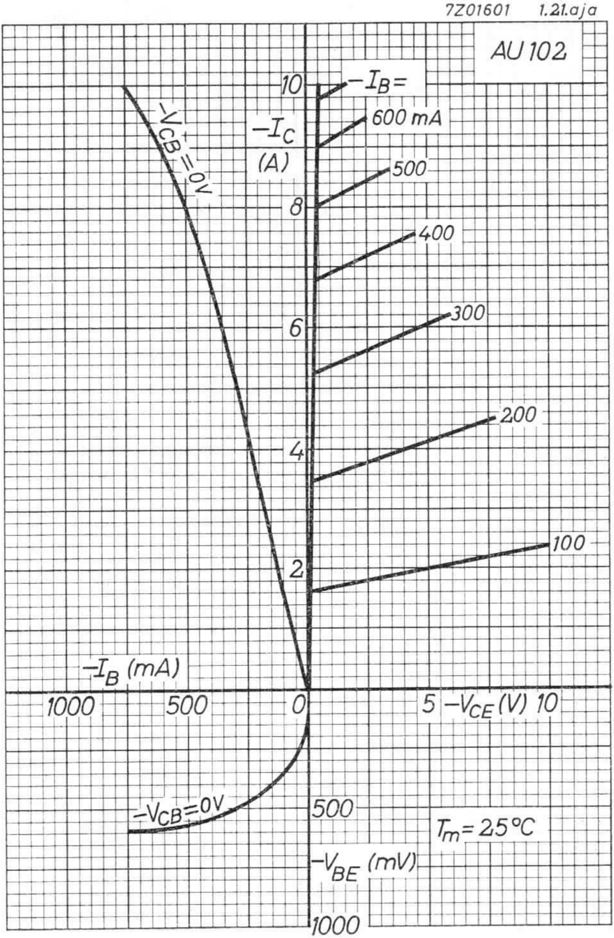
N1-N4: Cylindrically wound
N1 and N2 form a single winding tapped at 16 turns
N3 and N4 form a single winding tapped at 13 turns
Windings N1 + N2 and N3 + N4 are to be wound simultaneously

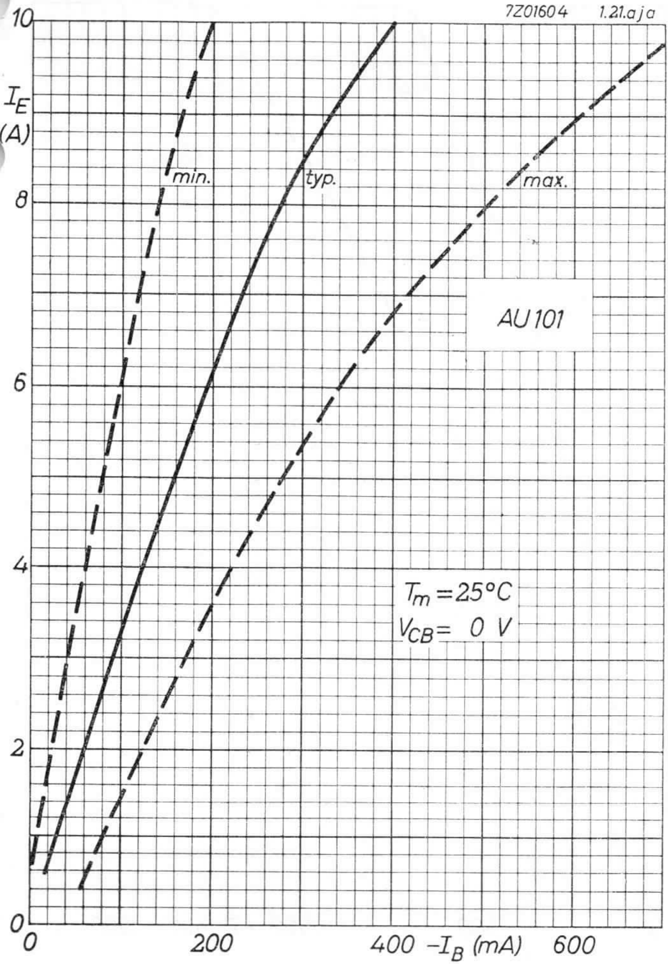
N5 : Cylindrically wound

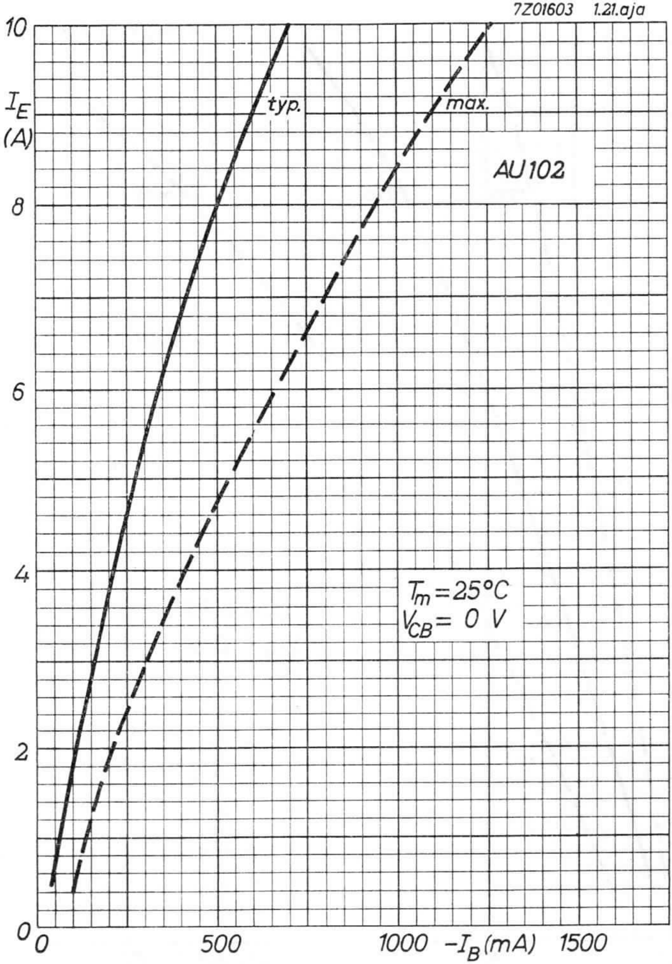


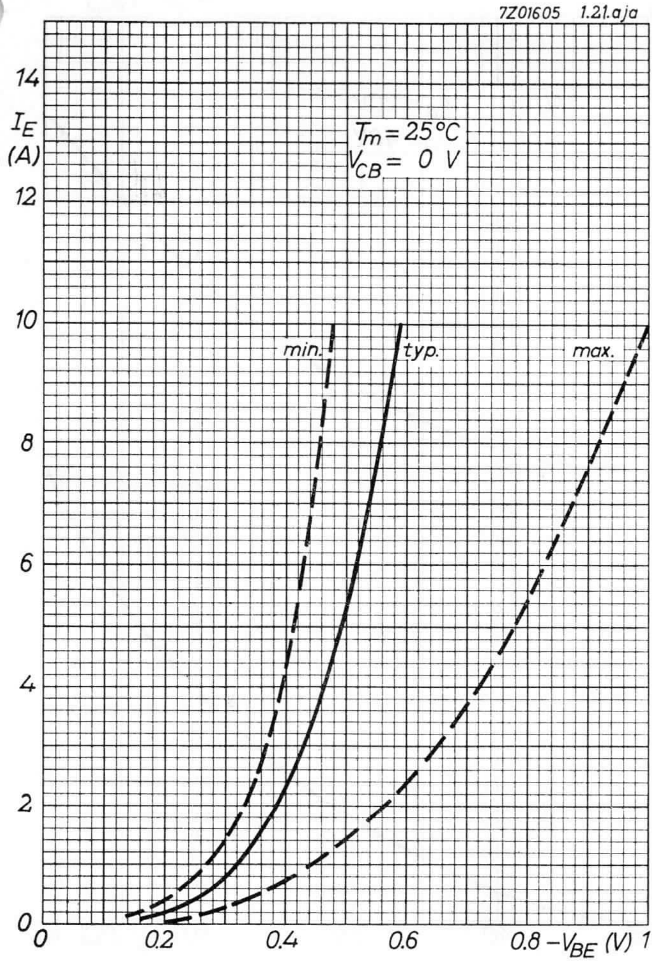

7Z01600 1.21.a j a
$-I_B =$
AU 101
350 mA
300
250
200
150
100
50
10
$-I_C$
(A)
8
6
4
2
$-V_{CB} = 0V$
$-I_B$ (mA)
400
200
0
5
$-V_{CE}$ (V)
10
$-V_{CB} = 0V$
500
$T_m = 25\,°C$
$-V_{BE}$ (mV)
1000

PHILIPS

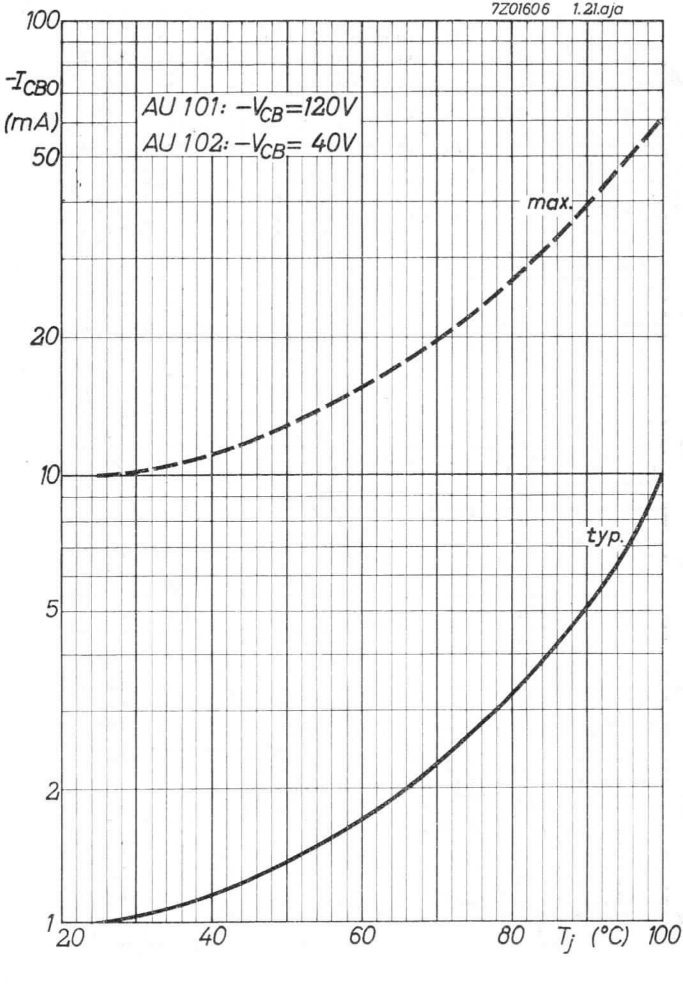

7Z01601 1.21.aja
AU 102
$-I_B$ =
600 mA
500
400
300
200
100
$-I_C$
(A)
10
8
6
4
2
0
$-V_{CB}$ = 0V
$-I_B$ (mA)
1000
500
5
$-V_{CE}$ (V)
10
$-V_{CB}$=0V
500
$-V_{BE}$ (mV)
1000
T_m= 25°C

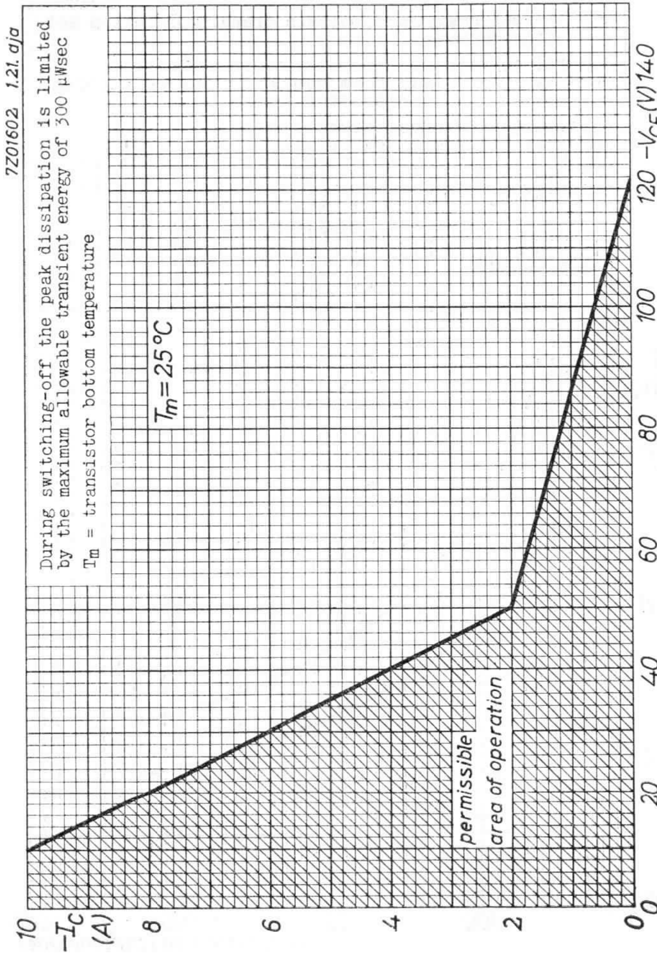

7Z01604 1.21.aja
10
I_E
(A)
8
6
4
2
0
0
200
400 $-I_B$ (mA) 600
min.
typ.
max.
AU101
$T_m = 25°C$
$V_{CB} = 0$ V


7Z01603 1.21.aja
10
I_E
(A)
8
6
4
2
0
0
500
1000
$-I_B$ (mA)
1500
typ.
max.
AU102
$T_m = 25°C$
$V_{CB} = 0$ V


7Z01605 1.21.aja
14
I_E
(A)
12
10
8
6
4
2
0
$T_m = 25\,°C$
$V_{CB} = 0\ V$
min.
typ.
max.
0
0.2
0.4
0.6
0.8 $-V_{BE}$ (V) 1

PHILIPS


7Z01606 1.21.aja
$-I_{CBO}$ (mA)
AU 101: $-V_{CB}$=120V
AU 102: $-V_{CB}$= 40V
max.
typ.
100
50
20
10
5
2
1
20
40
60
80
T_j (°C)
100


7Z01602 1.21. aja
During switching-off the peak dissipation is limited by the maximum allowable transient energy of 300 µWsec
T_m = transistor bottom temperature
T_m=25°C
permissible area of operation
$-I_C$ (A)
10
8
6
4
2
0
0
20
40
60
80
100
120 $-V_{CE}$(V) 140

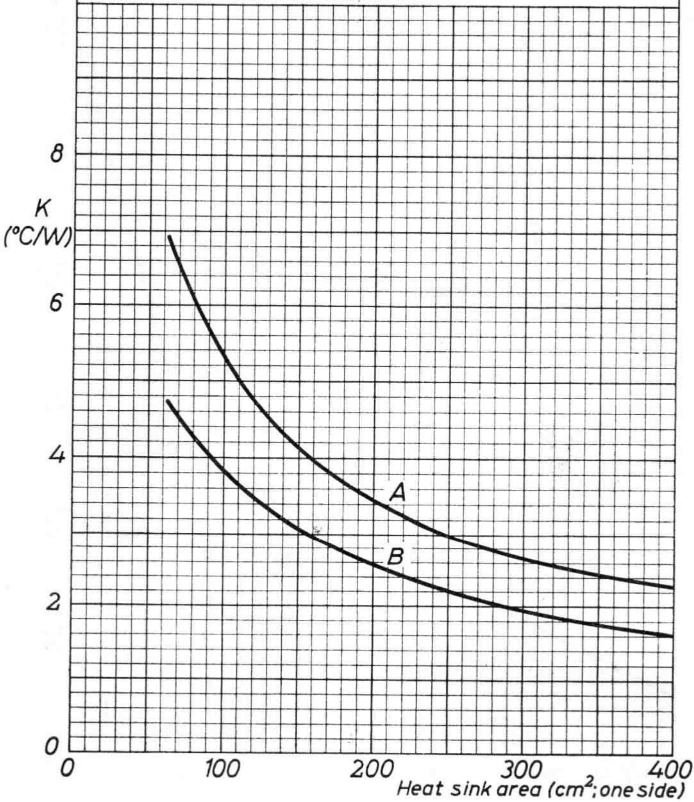
PHILIPS

7Z01615 1.21.aja

K = thermal resistance between transistor bottom and ambience

Natural convection
Heat sink material: 2 mm copper or 3 mm aluminium; mounted vertically

Curve A: Bright heat sink
Curve B: Blackened heat sink



X

PHILIPS **AUY10**

ALLOY-DIFFUSED GERMANIUM POWER TRANSISTOR of the p-n-p type for non-saturated switching applications
TRANSISTOR DE PUISSANCE AU GERMANIUM DU TYPE p-n-p EN TECHNIQUE ALLIAGE-DIFFUSÉ pour applications de commutation sans saturation
DIFFUSIONSLEGIERTER p-n-p-GERMANIUM-LEISTUNGSTRANSISTOR für Schalteranwendungen ohne Sättigung

Limiting values (Absolute max. values)
Caractéristiques limites (Valeurs max. absolues)
Grenzdaten (Absolute Maximalwerte)

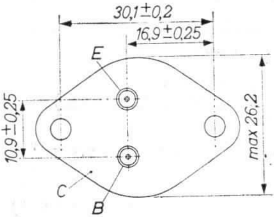
$-V_{CB}$	= max.	70 V [1]
$-V_{CE}$ (V_{BE} > 0,2 V)	= max.	60 V [2]
$-I_C$	= max.	700 mA [1]
I_E	= max.	750 mA
$-I_E$	= max.	50 mA
$-I_B$ (t_{av} = max. 20 msec)	= max.	50 mA
$-I_{BM}$	= max.	700 mA
P_{tot} (t_{av} = max. 20 msec)	= max.	6 W [3]
P_{tot} (t_{av} = max. 20 msec)	= max.	$\frac{T_{j\,max} - T_{amb}}{K}$ [4]
T_j	= max.	75 °C
Storage temperature Température d'emmagasinage Lagerungstemperatur	=	−55 °C/+75 °C

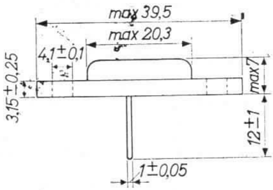
[1] See also page C. During switching-off operation outside region II of page C is permissible provided the inductance of the circuit ≦ 250 μH and the switch-off time ≦ 15 μsec.
Voir aussi page C. Pendant la mise hors circuit le fonctionnement en dehors de la région II de page C est permis pourvu que l'inductance du circuit ≦ 250 μH et la durée de la mise hors circuit ≦ 15 μsec.
Siehe auch Seite C. Während des Ausschaltens ist Betrieb ausserhalb des Bereiches II auf Seite C erlaubt wenn die Selbstinduktion der Schaltung ≦ 250 μH und die Ausschaltdauer ≦ 15 μSek.

[2] For common emitter operation due measures have to be taken to ensure electrical and thermal stability
Pour le fonctionnement à émetteur commun il faut prendre des mesures convenables pour assurer la stabilité électrique et thermique
Bei Betrieb in Emitterschaltung müssen geeignete Massnahmen getroffen werden zur Sicherung der elektrischen und thermischen Stabilität.

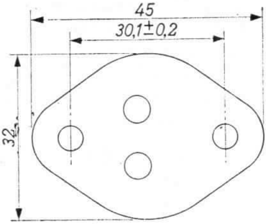
[3][4] See page 2; voir page 2; siehe Seite 2

Dimensions in mm
Dimensions en mm
Abmessungen in mm

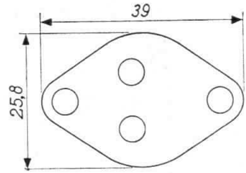




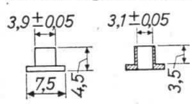
Mica insulation, 0.05 mm
Isolement de mica, 0,05 mm
Glimmerisolierung, 0,05 mm



Lead washer, 1 mm
Plaque de plomb, 1 mm
Bleischeibe, 1 mm



Insulation tubes
Isolateurs de traversée
Durchführungsisolatoren



3) Up to a transistor bottom temperature of 50 °C
Jusqu'à une température du fond du transistor de 50 °C
Bei einer Transistorbodentemperatur niedriger als 50 °C

4) At transistor bottom temperatures higher than 50 °C. K is the thermal resistance between junction and ambience
Aux températures du fond du transistor au-dessus de 50 °C. K est la résistance thermique entre les jonctions du transistor et l'ambiance
Bei Transistorbodentemperaturen höher als 50 °C. K ist der thermische Widerstand zwischen Transistorkristall und Umgebung.

THERMAL DATA. Thermal resistance between junction and transistor bottom K = max. 4.0 °C/W

Thermal resistance between transistor bottom and heat sink, when mounted with mica and lead washers (see page 2) K = max. 0.5 °C/W

DONNÉES THERMIQUES. Résistance thermique entre les jonctions et le fond du transistor K = max. 4,0 °C/W

Résistance thermique entre le fond du transistor et la plaque de refroidissement si le transistor est monté avec des plaques de mica et de plomb (voir page 2) K = max. 0,5 °C/W

THERMISCHE DATEN. Wärmewiderstand zwischen Kristall und Transistorboden K = max. 4,0 °C/W

Wärmewiderstand zwischen Transistorboden und Kühlplatte wenn der Transistor mit Glimmer- und Bleiplatten montiert ist (siehe Seite 2) K = max. 0,5 °C/W

Characteristics
Caractéristiques
Kenndaten

T_m = temperature of transistor bottom
T_m = température du fond du transistor
T_m = Temperatur des Transistorbodens

$-V_{CE}$ = 60 V	$-I_E$ = 1 mA
V_{BE} = 1 V	I_C = 0 mA
T_m = 60 °C	T_m = 60 °C
$-I_C$ < 1 mA	$-V_{EB}$ > 1,5 V
$-V_{CE}$ = 60 V	I_E = 600 mA
R_{BE} = 56 Ω	$-V_{CB}$ = 10 V
T_m = 60 °C	T_m = 60 °C
$-I_C$ < 2 mA	V_{EB} > 0,1 V
	I_E = 600 mA
	$-V_{CB}$ = 10 V
	T_m = 25 °C
	V_{EB} < 0,45 V

Characteristics (continued)
Caractéristiques (suite)
Kenndaten (Fortsetzung)

$-I_C$ = 3 mA	I_E = 600 mA		
I_E = 0 mA	$-V_{CB}$ = 30 V		
T_m = 60 °C	T_j = 75 °C		
$-V_{CB}$ > 70 V	$+I_B$ < 6 mA		

$-V_{CE}$ = 60 V	I_E = 600 mA
V_{BE} = 1 V	$-V_{CB}$ = 10 V
T_m = 60 °C	T_m = 25 °C
$-I_B$ < 1 mA	$-I_B$ < 15 mA

Characteristics range values for equipment design
Gammes de valeurs des caractéristiques pour l'étude d'équipements
Kenndatenbereiche für Gerätentwurf

T_{amb} = 25 °C

$-I_{CBO}$ { see page B / voir page B / siehe Seite B	$-V_{CB}$ = 10 V
	I_E = 0 mA
	c_c < 85 pF [2]
I_E = 300 mA	$-V_{CB}$ = 60 V
$-V_{CB}$ = 10 V	I_E = 0 mA
f_1[1] = 120 Mc/s > 60 Mc/s	c_c < 45 pF [2]

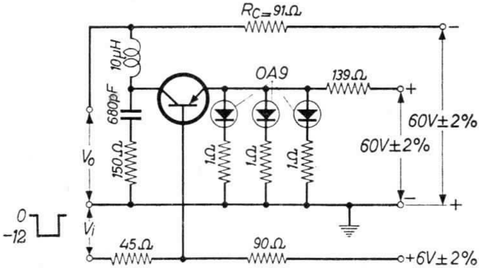
[1]) Frequency at which $|h_{fe}| = 1$
Fréquence à laquelle $|h_{fe}| = 1$
Frequenz bei der $|h_{fe}| = 1$

[2]) Collector capacitance
Capacité du collecteur
Kollektorkapazität

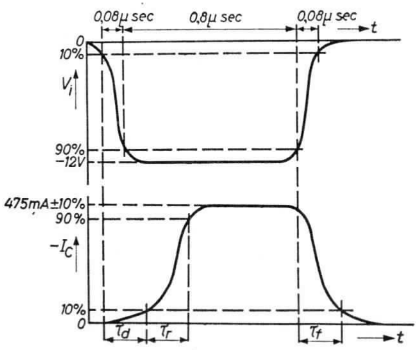
Characteristics range values for equipment design (continued)
Gammes de valeurs des caractéristiques pour l'étude d'équipements (suite)
Kenndatenbereiche für Gerätentwurf (Fortsetzung)

T_{amb} = 25 °C

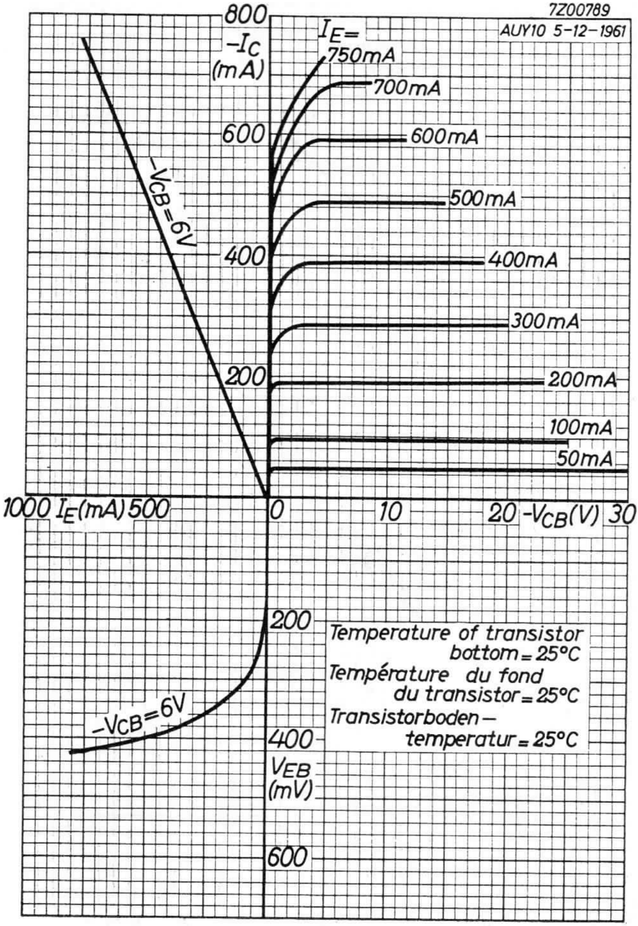
Transient response
Phénomènes transitoires
Ausgleichsvorgänge



Tolerance of resistors ± 2 %
Tolérance des résistances ± 2 %
Streuung der Widerstände ± 2 %



τ_d < 0,2 μsec
τ_r < 0,2 μsec
τ_f < 0,2 μsec


7Z00789
AUY10 5-12-1961
800
-I_C
(mA)
600
400
200
I_E=
750mA
700mA
600mA
500mA
400mA
300mA
200mA
100mA
50mA
$-V_{CB}=6V$
1000 I_E(mA) 500
0
10
20 $-V_{CB}$(V) 30
200
400
600
V_{EB}
(mV)
$-V_{CB}=6V$
Temperature of transistor bottom = 25°C
Température du fond du transistor = 25°C
Transistorboden-temperatur = 25°C

AUY10

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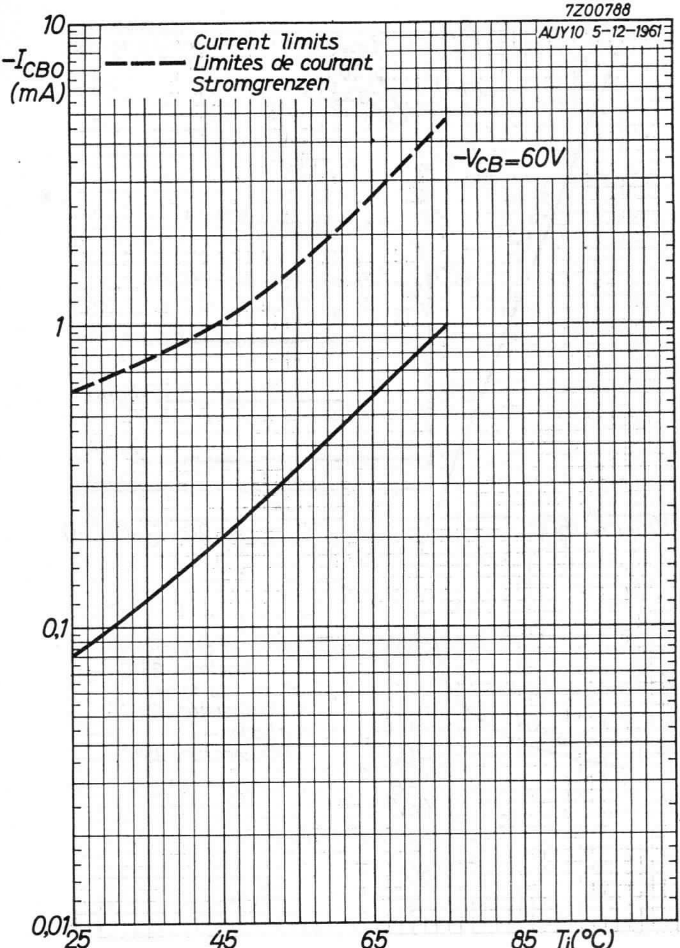
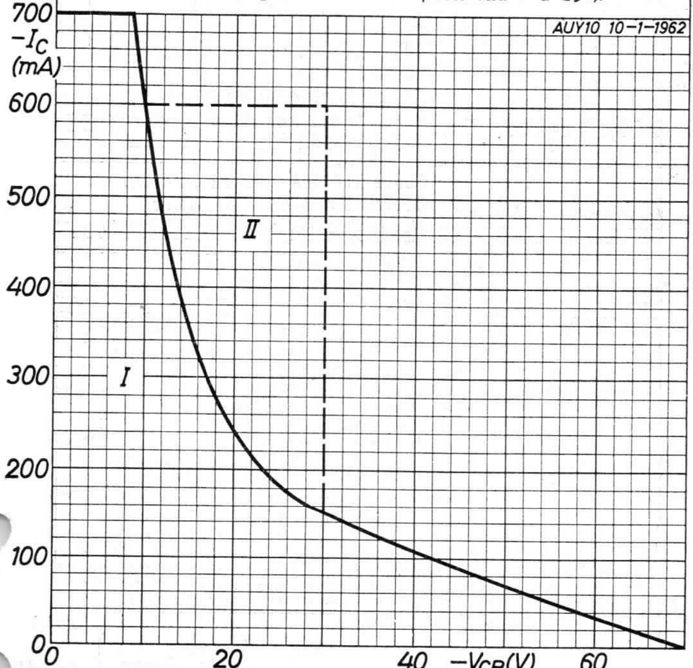


7Z00787

I = region of permissible D.C. operation up to T_j = 75 °C
I = région de fonctionnement à courant continu admissible jusqu'à T_j = 75 °C
I = zulässiger Verwendungsbereich für Gleichstrom bis T_j = 75 °C

II = additional permissible region of.pulse operation provided the pulse duration ≦ 10 μsec and δ ≦ 25 %
II = région additionnelle de fonctionnement à impulsions admissible si la durée de l'impulsion ≦ 10 μsec et δ ≦ 25 %
II = hinzukommender zulässiger Impulsverwendungsbereich wenn die Impulsdauer ≦ 10 μSek und δ ≦ 25 %



PHILIPS

7Z00209

OC 26 22-7-'60

K_m = thermal resistance between transistor bottom and ambience
K_m = résistance thermique entre le fond du transistor et l'ambiance
K_m = thermischer Widerstand zwischen Transistorboden und Umgebung

Heat sink material: 3 mm aluminium, mounted vertically
Plaque de refroidissement: aluminium de 3 mm, montée verticalement
Kühlschelle: 3 mm-Aluminium, senkrecht montiert