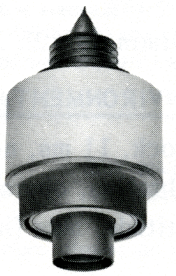
Y654

TECHNICAL DATA

PLANAR TRIODE
HIGH MU

The Y654 is a miniature ceramic/metal rugged planar triode for advanced airborne, ground, and space applications up to 3.0 GHz.

The Y654 may be used as an amplifier, oscillator, or frequency multiplier in the C-W mode, grid- or plate-pulsed mode, as well as a modulator or regulator tube. In addition to the low interelectrode capacitance, high transconductance and amplification factor the Y654 has an arc-resistant cathode to assure stable, reliable, and long-life operation under adverse conditions, and a specially supported grid structure.



The Y654 is supplied without radiator and may be conduction, convection, heat sink, or liquid cooled. Radiators for forced air cooling, as well as heat sink adaptors, permitting an anode dissipation up to 300 watts, can be furnished on separate order.

GENERAL CHARACTERISTICS[1]

ELECTRICAL

Cathode: Oxide Coated, Unipotential	
Heater: Voltage	6.3 ± 0.3 V
Current, at 6.3 volts	1.30 A
Transconductance (Average):	
(200 mA/cm^2)	50
Amplification Factor (Average)	135
Direct Interelectrode Capacitance (grounded cathode)[2]	
Cin	9.75 pF
Cout	0.065 pF max.
Cgp	1.05 pF
Cut-off Bias[3]	-20 V
Frequency of Maximum Rating:	
CW	2500 MHz
Plate or Grid-Pulsed	3000 MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.
2. Capacitance values for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pF due to thermal expansion of the cathode.
3. Measured with one milliampere plate current and a plate voltage of 1 kVdc.

MECHANICAL

Maximum Overall Dimensions:	
Length	1.370 in; 34.75 mm
Diameter	0.785 in; 19.94 mm

(Effective 6-30-75) Printed in U.S.A.

Net Weight	0.56 oz; 16.0 gm
Operating Position	Any
Maximum Operating Temperature:	
Ceramic/Metal Seals	250°C
Anode Core	250°C
Cooling	Conduction, convection, forced air, or liquid
Terminals	Coaxial special

ENVIRONMENTAL

Shock, 11 ms, non-operating	60 G
Vibration, operating, all axes 55 to 500 Hz	10 G
Altitude, max (in a suitably designed circuit)	70,000 ft.

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater Current at 6.3 volts	1.20	1.40	A
Cathode Warmup Time	60	---	sec.
Interelectrode Capacitance[1] (grounded cathode connection)			
Cin	8.5	11.0	pF
Cout	---	0.065	pF
Cgp	0.90	1.20	pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 1 pf due to the thermal expansion of the cathode.

GRID PULSED OR PLATE PULSED AMPLIFIER OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE (grid pulsed)	8000	VOLTS
PEAK PULSE PLATE VOLTAGE (plate pulsed)	10,000	VOLTS
DC GRID VOLTAGE	-200	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-750	VOLTS
Grid positive to cathode	150	VOLTS
PULSE PLATE CURRENT	6.0	AMPERES
PULSE GRID CURRENT	2.5	AMPERES
AVERAGE PLATE DISSIPATION		
Forced Air Cooling[1]	300	WATTS
GRID DISSIPATION (Average)	1.5	WATTS
FREQUENCY	3.0	GHz
PULSE DURATION[2]	6.0	μs
DUTY FACTOR[2]	.0033	

OPERATING CONDITIONS IN REPRESENTATIVE APPLICATION

GRID PULSED AMPLIFIER

Frequency	1.1	GHz
Heater Voltage	6.3	V
DC Plate Voltage	4000	Vdc
DC Grid Voltage	-80	Vdc
Peak Video Plate Current	1.8	a
Plate Efficiency	35	%
Pulse Drive Power (approx.)	200	w
Useful Power Output (approx.)	2500	w
Gain	11	db
Duty Factor	0.02	

1. Using one of the EIMAC radiators shown on the cooling curves.

2. For applications using longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Devices Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

PULSE MODULATOR AND PULSE AMPLIFIER SERVICE

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	10,000	VOLTS
PEAK PLATE VOLTAGE	12,000	VOLTS
DC GRID VOLTAGE	-150	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-750	VOLTS
Grid positive to cathode	100	VOLTS
PULSE CATHODE CURRENT	9.0	AMPERES
DC PLATE CURRENT	190	MILLIAMPERES

AVERAGE PLATE DISSIPATION		
Forced Air Cooling[1]	300	WATTS
GRID DISSIPATION (Average)	1.5	WATTS
PULSE DURATION[2]	6.0	μs
CUT-OFF Mu	90	

1. Using one of the EIMAC radiators shown on the cooling curves.
2. For applications using longer pulse duration and/or higher duty cycle consult the nearest Varian Electron Tube & Devices Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

CW RF POWER AMPLIFIER OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE	7500	VOLTS
DC GRID VOLTAGE	-200	VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE		
Grid negative to cathode	-400	VOLTS
Grid positive to cathode	30	VOLTS
DC PLATE CURRENT	300	MILLIAMPERES
DC GRID CURRENT	45	MILLIAMPERES

AVERAGE PLATE DISSIPATION		
Forced Air Cooling[1]	300	WATTS
GRID DISSIPATION (Average)	1.5	WATTS

1. Using one of the EIMAC radiators shown on the cooling curves.

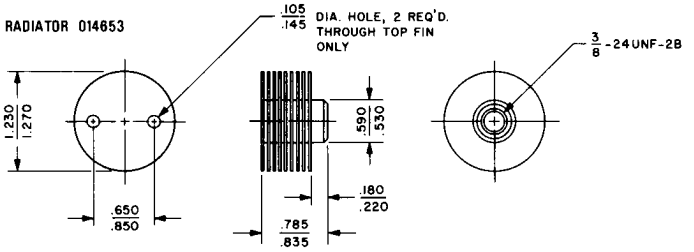
APPLICATION

COOLING - The Y654 can be cooled by conduction, convection, forced air, or liquid cooling. The tube is designed to permit high-temperature operation up to the limit indicated. However, if long life is the prime objective, tube terminal and seal temperatures should be kept well below 250°C. If forced air cooling is provided, auxiliary air flow, apart from the air flowing thru the radiator, should be provided to cool the tube envelope and other tube terminals. Some conduction cooling is always provided thru the contact terminals. However, these terminals usually exhibit poor heat transfer, often having a temperature gradient across them as high as 50°C. Cooling curves are given for four standard radiators which are suitable for use with the Y654. Special cooling designs are available upon request.

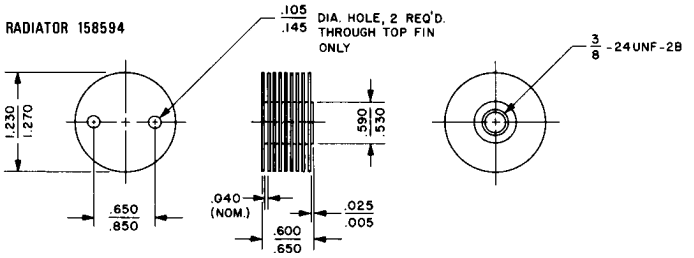
For unusual operating conditions contact the nearest Varian Electron Tube and Devices Field Office or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.

For general operating information refer to EIMAC bulletin #15, "Operating Data for Planar Triodes."

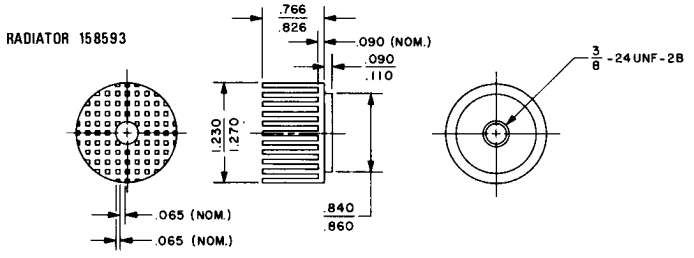
RADIATOR 014653



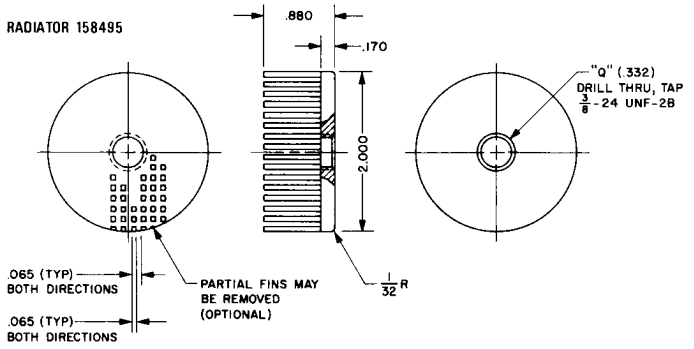
RADIATOR 158594



RADIATOR 158593



RADIATOR 158495



COMBINED CORRECTION FACTORS FOR INLET AIR TEMPERATURE AND ALTITUDE

(RELATIVE TO 25°C AND SEA LEVEL)

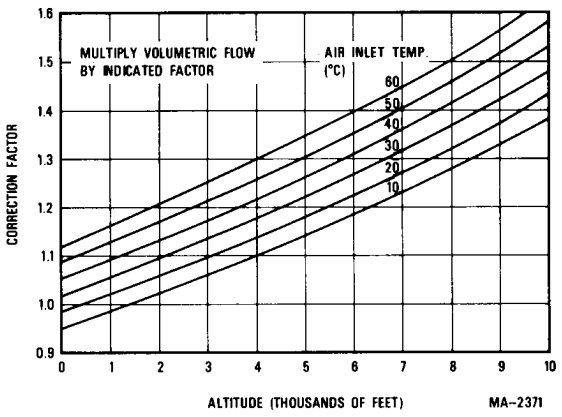
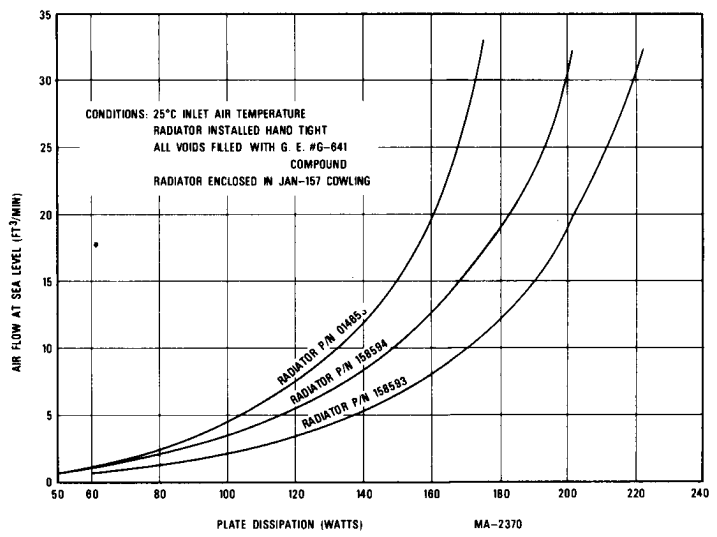
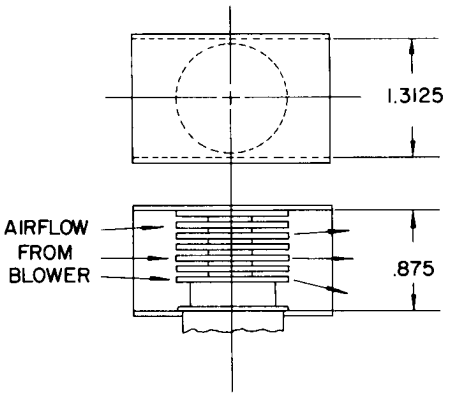


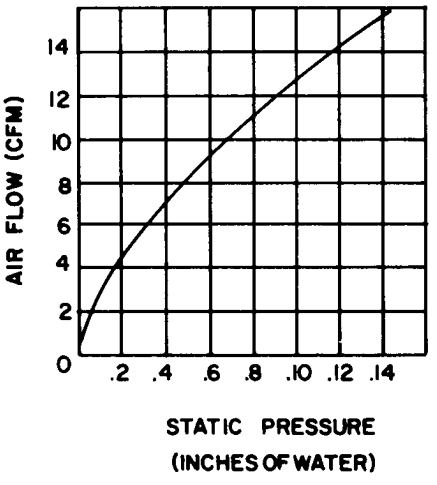
PLATE DISSIPATION VARIATION WITH COOLING AIR FLOW



AIRFLOW vs STATIC PRESSURE WITH STANDARD COWLING JAN-157



-STANDARD COWLING-
FOR 014653, 158594, 158593
RADIATORS



AIRFLOW COWLING FOR EIMAC "PIN" RADIATOR PART #158495

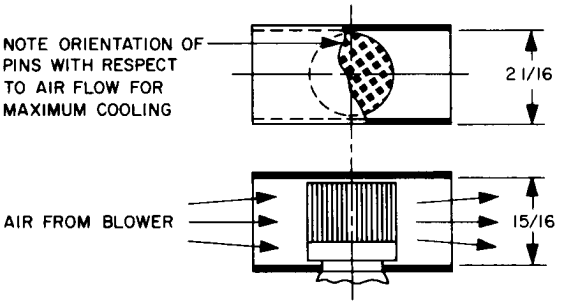
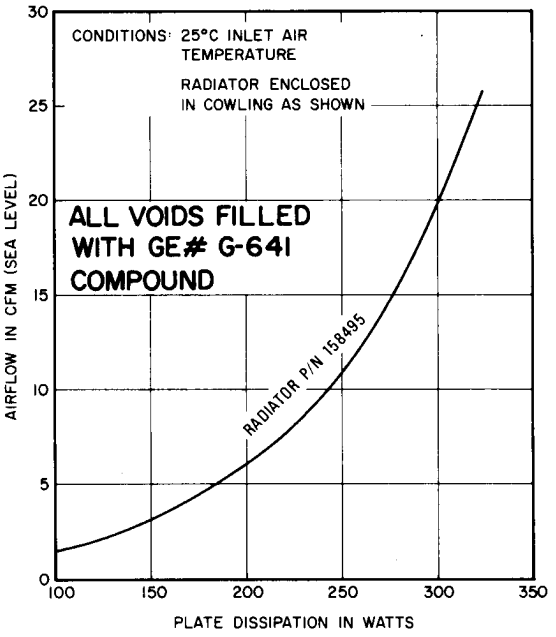
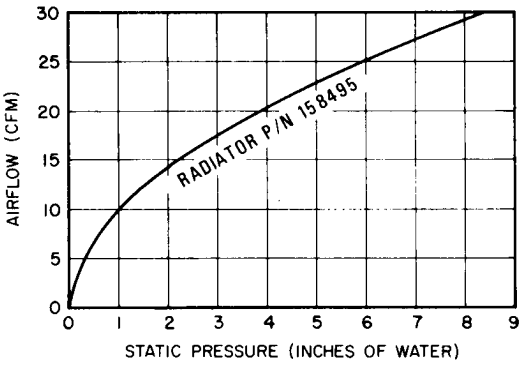


PLATE DISSIPATION VARIATION WITH COOLING AIRFLOW





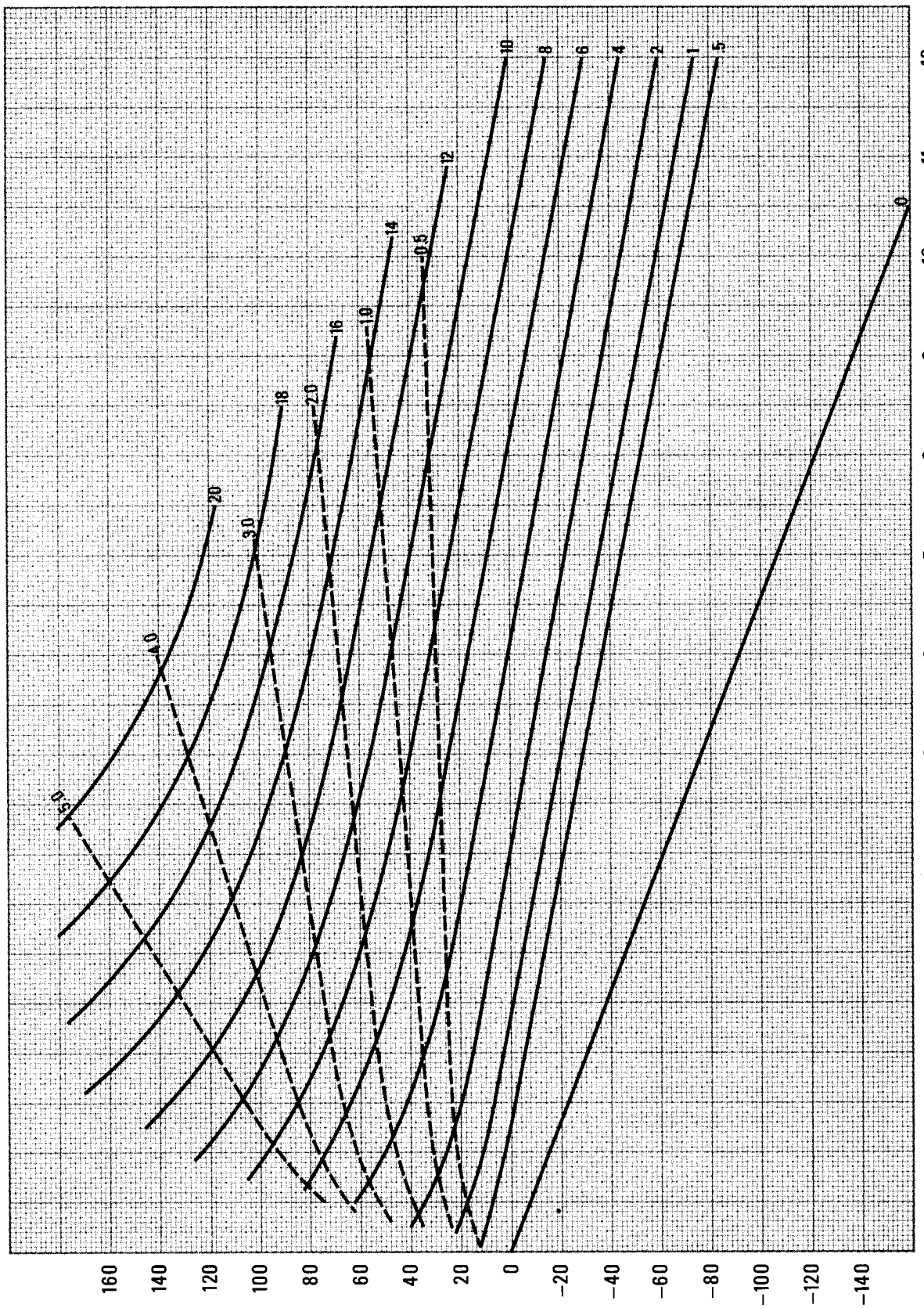
TYPICAL CONSTANT CURRENT CHARACTERISTICS

FOR PULSE OPERATION

E_f = 6.3V

——— PLATE CURRENT – AMPERES

– – – – GRID CURRENT – AMPERES

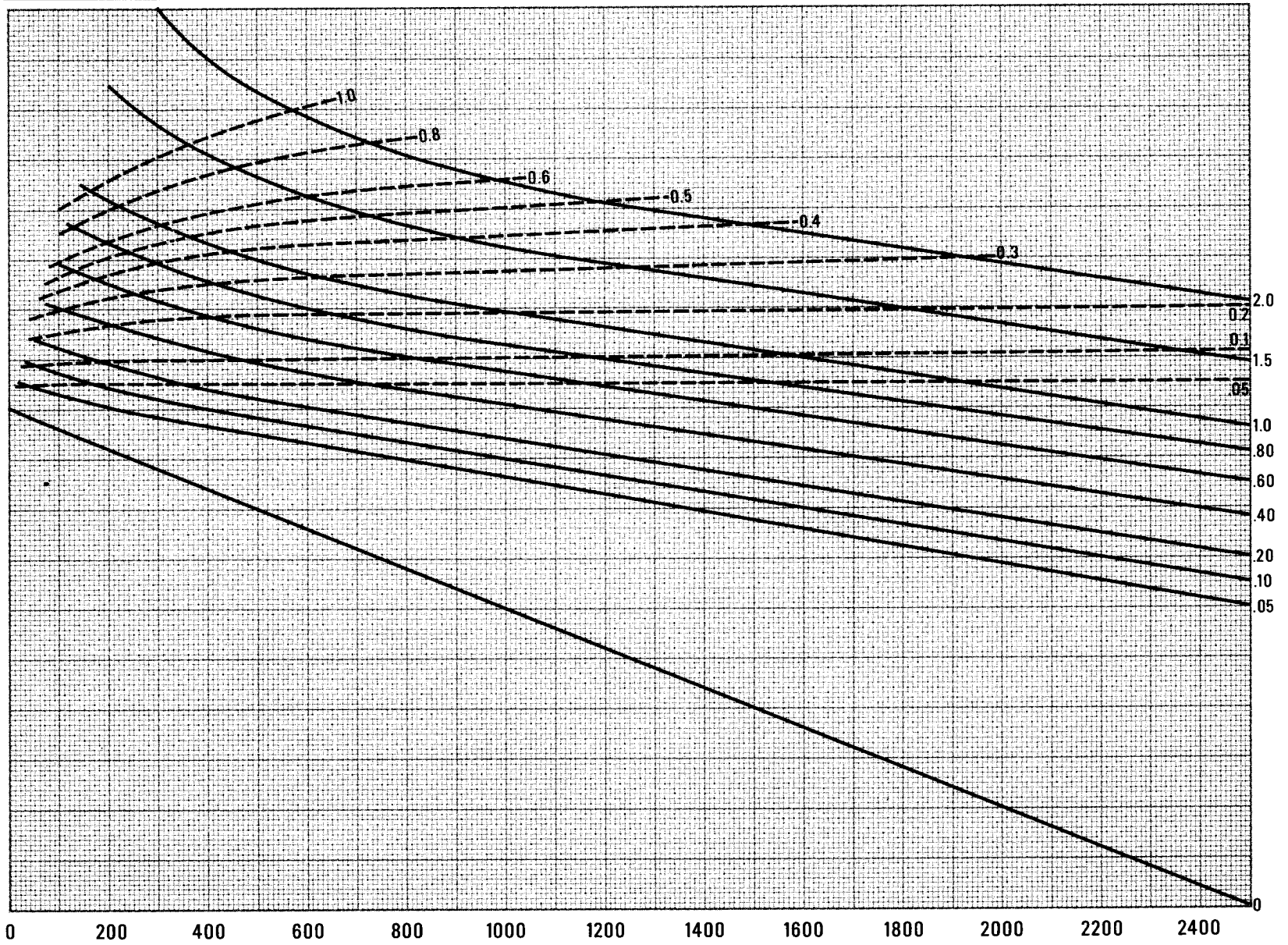


CURVE #MA–2467

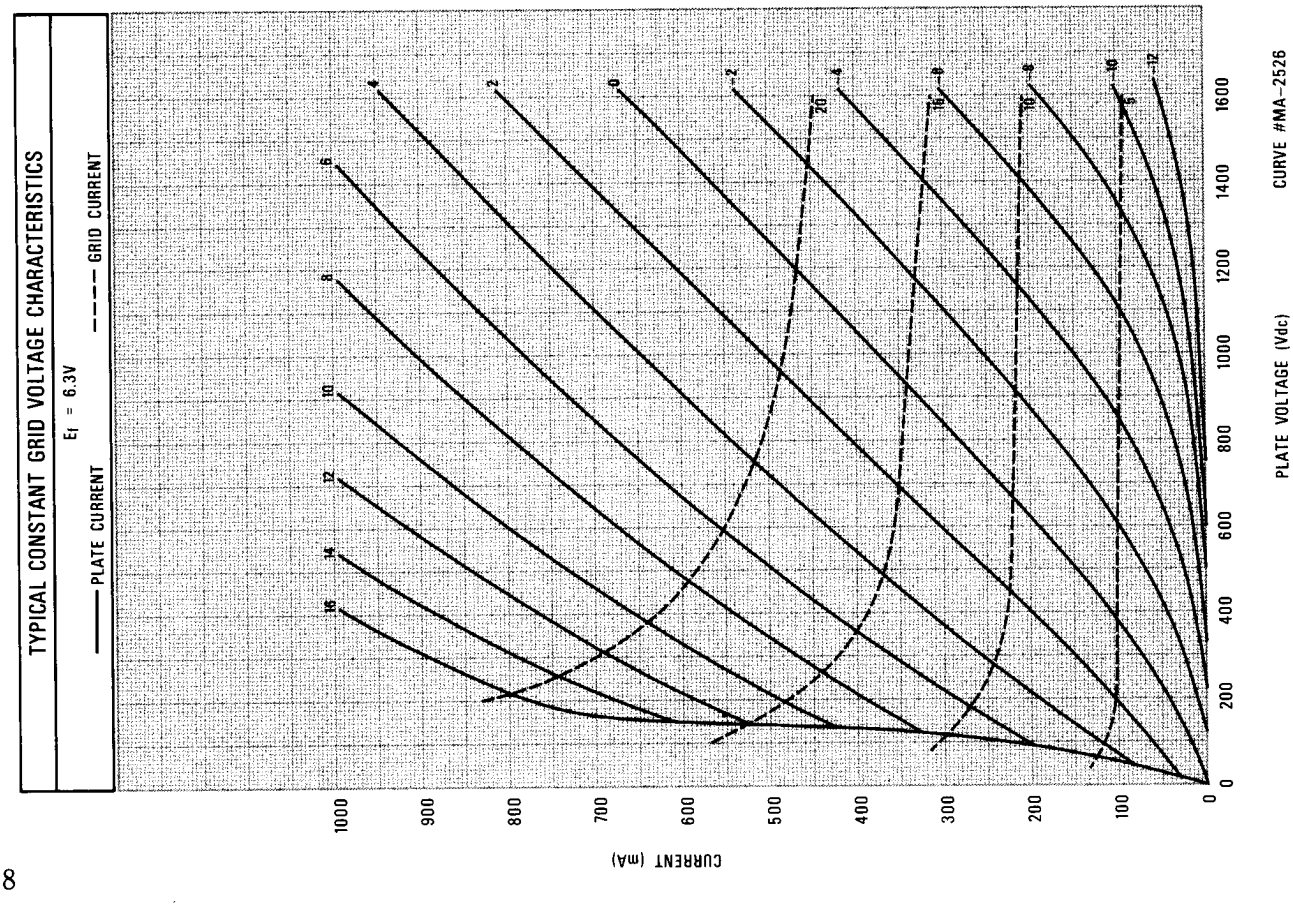
TYPICAL CONSTANT CURRENT CHARACTERISTICS

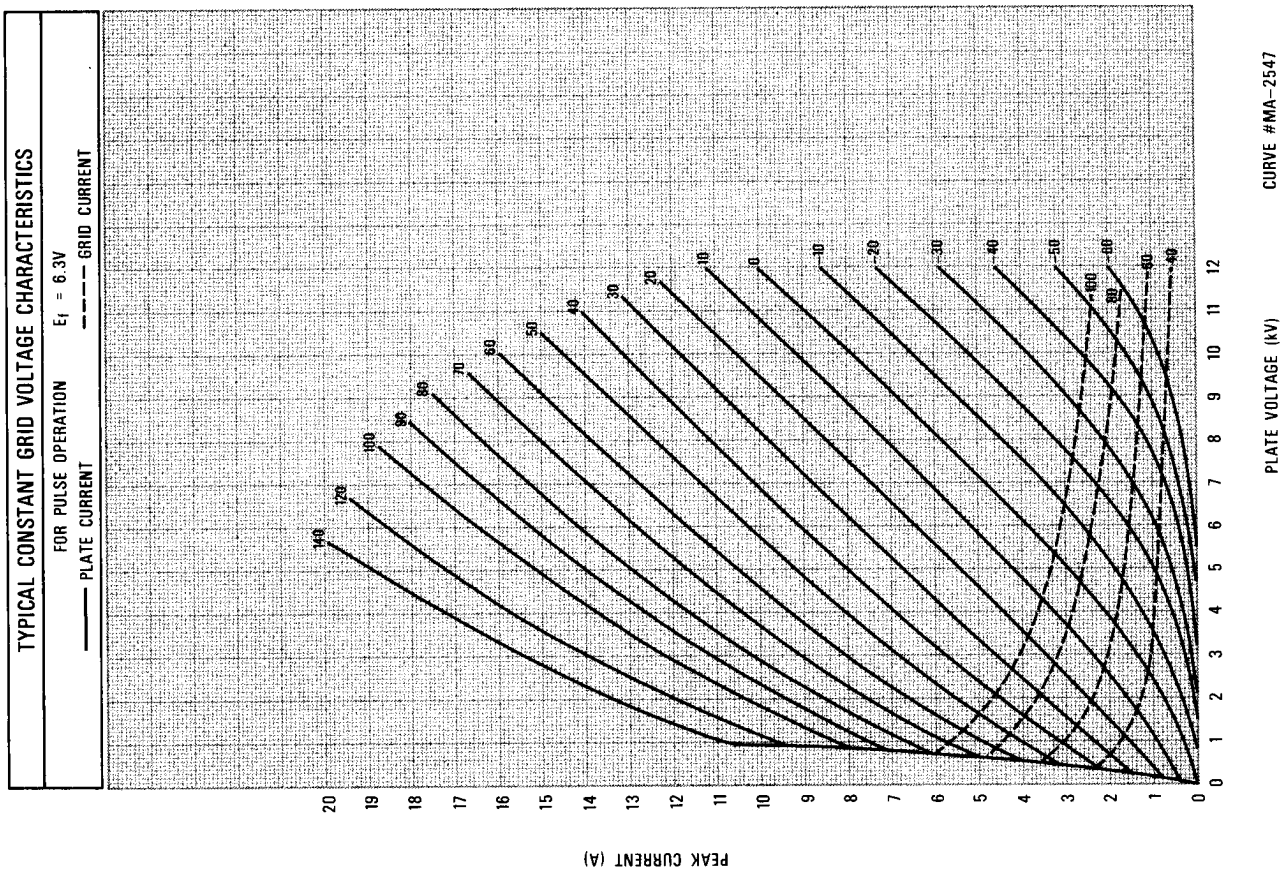
E_f = 6.3V

——— PLATE CURRENT – AMPERES - - - - GRID CURRENT – AMPERES



CURVE #MA–2527


TYPICAL CONSTANT GRID VOLTAGE CHARACTERISTICS
E_f = 6.3V
PLATE CURRENT
GRID CURRENT
CURRENT (mA)
PLATE VOLTAGE (Vdc)
CURVE #MA-2526


TYPICAL CONSTANT GRID VOLTAGE CHARACTERISTICS
FOR PULSE OPERATION
E_f = 6.3V
PLATE CURRENT
GRID CURRENT
PEAK CURRENT (A)
PLATE VOLTAGE (kV)
CURVE #MA-2547