GLOW-DISCHARGE TRIODE

MINIATURE TYPE, COLD-CATHODE, GLOW DISCHARGE TRIODE FOR USE PRIMARILY AS A RELAY CONTROL TUBE IN "ON-OFF" LOW CURRENT ELECTRICAL CIRCUITS. OUTLINES SECTION, 5C; REQUIRES MINIATURE 7-CONTACT SOCKET.

MAXIMUM RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Anode and Starter-Electrode Voltage:</td>
<td>200 volts</td>
</tr>
<tr>
<td>Inverse</td>
<td>200 volts</td>
</tr>
<tr>
<td>Forward</td>
<td></td>
</tr>
<tr>
<td>Cathode Current:</td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td>100 mA</td>
</tr>
<tr>
<td>Average*</td>
<td>25 mA</td>
</tr>
<tr>
<td>Peak Starter-Electrode Current:</td>
<td>100 mA</td>
</tr>
<tr>
<td>With starter-electrode voltage positive</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>-60 to +75 °C</td>
</tr>
</tbody>
</table>

TYPICAL OPERATING CONDITIONS

For Relay Service with 60-Hz Supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Anode Supply Voltage (RMS)</td>
<td>117 volts</td>
</tr>
<tr>
<td>AC Starter-Electrode Voltage:</td>
<td></td>
</tr>
<tr>
<td>Max. Peak Positive Pre-Firing Voltage</td>
<td>70 volts</td>
</tr>
<tr>
<td>Min. Peak Positive Triggering Voltage</td>
<td>35 volts</td>
</tr>
<tr>
<td>Min. Firing Voltage (Sum of In-Phase Instantaneous Pre-Firing Voltage and Instantaneous Triggering Voltage)</td>
<td>105 volts</td>
</tr>
</tbody>
</table>

* These ratings apply to the 5823 when it is operated from a power supply having a frequency of 60 Hz.

* Averaged over any interval of 15 seconds max.

Refer to chart at end of section.

SHARP-CUTOFF PENTODE

MINIATURE TYPE USED AS AUDIO AMPLIFIER IN THE INPUT STAGES OF MEDIUM-GAIN PUBLIC-ADDRESS SYSTEMS, HOME SOUND RECORDERS, AND AUDIO SYSTEMS. OUTLINES SECTION, 6B; REQUIRES MINIATURE 9-CONTACT SOCKET. FOR OPERATION AS RESISTANCE-COUPLED AMPLIFIER, REFER TO RESISTANCE-COUPLED AMPLIFIER SECTION.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (ac/dc)</td>
<td>6.3 volts</td>
</tr>
<tr>
<td>Heater Current</td>
<td>0.15 ampere</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td>±100 max volts</td>
</tr>
<tr>
<td>Direct Inter-electrode Capacitances:</td>
<td></td>
</tr>
<tr>
<td>Pentode Connection:</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to Plate</td>
<td>0.11 max pF</td>
</tr>
<tr>
<td>Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3</td>
<td>2.7 pF</td>
</tr>
<tr>
<td>Plate to Cathode, Heater, Grid No.2, and Grid No.3</td>
<td>2.4 pF</td>
</tr>
<tr>
<td>Triode Connection*:</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to Plate</td>
<td>1.4 pF</td>
</tr>
<tr>
<td>Grid No.1 to Cathode and Heater</td>
<td>1.4 pF</td>
</tr>
<tr>
<td>Plate to Cathode and Heater</td>
<td>0.85 pF</td>
</tr>
</tbody>
</table>

* Grid No.2 and grid No.3 connected to plate.
**Class A, Amplifier**

**MAXIMUM RATINGS (Design-Maximum Values)**
- **Triode Connection**
  - Plate Voltage: 275 volts
  - Grid-No.2 (Screen-Grid) Voltage: See curve page 300
  - Grid-No.2 Supply Voltage: 330 volts
  - Grid-No.1 (Control-Grid) Voltage: 55 volts
  - Positive-bias value: 0 volts
  - Negative-bias value: 55 volts
  - Plate Dissipation: 1.7 watts
  - Grid-No.2 Input: 0.25 watt
  - For grid-No.2 voltages up to 165 volts
  - For grid-No.2 voltages between 165 and 300 volts

**CHARACTERISTICS**
- **Triode Connection**
  - Plate Voltage: 100 volts
  - Grid No.3: Connected to cathode at socket
  - Grid-No.2 Voltage: 100 volts
  - Grid-No.1 Voltage: -3 volts
  - Amplification Factor: 31
  - Plate Resistance (Approx.): 0.017 2 megohms
  - Transconductance: 1240 1.8 μmhos
  - Plate Current: 2.2 mA
  - Grid-No.2 Current: 0.4 mA
  - Grid-No.1 Voltage (Approx.) for plate current of 10 μA: -8 volts

**MAXIMUM CIRCUIT VALUE**
- **Grid-No.1-Circuit Resistance**: 2.2 megohms

* Grid No.2 and grid No.3 connected to plate.

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**5881**
Refer to chart at end of section.

**5896**
Refer to chart at end of section.

**5899**
Refer to chart at end of section.

**5902**
Refer to chart at end of section.

**5915**
Refer to chart at end of section.

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**5963**
**MEDIUM-MU TWIN TRIODE**

Industrial Type

Miniature type medium-mu twin triode used for “on-off” control applications involving long periods of operation under cutoff conditions. Outlines section, 6B; requires miniature 9-contact socket.
**Technical Data**

**Heater Arrangement**
- Heater Voltage (ac/dc) .......... 12.6 ±10% volts
- Heater Current .................. 0.15 ampere
- Heater-Cathode Voltage:
  - Peak value ................... ±90 max.
  - Average value ................. ±90 max.

**Direct Interelectrode Capacitances (Approx.)**:
- Grid to Plate ................. 1.5 pF
- Grid to Cathode and Heater .... 1.9 pF
- Plate to Cathode and Heater .... 0.5 pF
- Grid of Unit No.1 to grid of Unit No.2 0.1 max.

**Frequency Divider in Computer Service and “On-Off” Control Service**
**Values for Each Unit**

**Maximum Ratings (Absolute-Maximum Values)**
- Plate Voltage ..................... 250 volts
- Grid Voltage:
  - Negative bias value .......... 100 watts
  - Positive bias value .......... 200 watts
- Plate Dissipation ................ 2.5 watts
- Grid Input ........................ 0.5 watt
- Cathode Current:
  - Peak ................................ 20 mA
  - DC .................................. ±90 max. volts
- Bulb Temperature (At hottest point on bulb surface) 120 °C

**Typical Operation as Frequency Halfer**

<table>
<thead>
<tr>
<th>Cutoff Condition</th>
<th>Zero-Bias Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>20000</td>
<td>20000</td>
</tr>
<tr>
<td>47000</td>
<td>47000</td>
</tr>
<tr>
<td>0</td>
<td>5.1</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values**
- Grid-Circuit Resistance:
  - For fixed-bias operation 0.5 megohm
  - For cathode-bias operation 1 megohm

**Class A, Amplifier (Each Unit)**

**Characteristics**
- Plate Voltage ..................... 67.5 volts
- Grid Voltage ........................ 0 volts
- Amplification Factor .............. 21
- Plate Resistance (Approx.) ......... 6600 ohms
- Transconductance ................ 3200 μmhos
- Plate Current ...................... 8.5 mA

Refer to chart at end of section.

**Medium-Mu Twin Triode**

**5965 Industrial Type**

Miniature type medium-mu twin triode used for “on-off” control applications involving long periods of operation under cutoff conditions. Outlines section, 6B; requires miniature 9-contact socket.

**Heater Arrangement**
- Heater Voltage (ac/dc) .......... 12.6 ±10% volts
- Heater Current .................. 0.225 ampere
- Heater-Cathode Voltage:
  - Peak value ................... ±200 max.
  - Average value ................. ±100 max.
Direct Interelectrode Capacitances (Approx.)

<table>
<thead>
<tr>
<th></th>
<th>Unit No. 1</th>
<th>Unit No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid to Plate</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Grid to Cathode and Heater</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Plate to Cathode and Heater</td>
<td>0.5</td>
<td>0.38</td>
</tr>
<tr>
<td>Plate of Unit No.1 to plate of Unit No.2</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

Frequency Divider in Computer Service

AND "On-Off" Control Service

Values are for Each Unit

MAXIMUM RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>330 volts</td>
</tr>
<tr>
<td>Grid Voltage:</td>
<td></td>
</tr>
<tr>
<td>Negative bias value</td>
<td>150 volts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>2.4 watts</td>
</tr>
<tr>
<td>Total for both units</td>
<td>4.4 watts</td>
</tr>
<tr>
<td>DC Current</td>
<td>16.5 mA</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>165 °C</td>
</tr>
</tbody>
</table>

TYPICAL OPERATION IN COMPUTER SERVICE

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cutoff</th>
<th>Conduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Supply Voltage</td>
<td>150 volts</td>
<td></td>
</tr>
<tr>
<td>Plate Load Resistor</td>
<td>7200 ohms</td>
<td></td>
</tr>
<tr>
<td>Plate Current</td>
<td>10.5 mA</td>
<td></td>
</tr>
<tr>
<td>Grid Voltage (Approx.) for grid current of 140 μA</td>
<td>less than 1 volt</td>
<td></td>
</tr>
<tr>
<td>Grid Voltage (Approx.) for plate current of 150 μA</td>
<td>5.5 volts</td>
<td></td>
</tr>
<tr>
<td>Difference in Grid Voltage Between Units (For plate current of 150 μA per unit)</td>
<td>1.5 volts</td>
<td></td>
</tr>
</tbody>
</table>

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:
- For fixed-bias operation: 0.1 megohm
- For cathode-bias operation: 0.5 megohm

CHARACTERISTICS

Class A, Amplifier (Each Unit)

6005

Refer to chart at end of section.

6005/6AQ5W

Refer to chart at end of section.

6005/6AQ5W/6095

Refer to chart at end of section.

6012

GAS THYRATRON

INDUSTRIAL TYPE

Glass octal negative-control gas-tetrode thyatron for use in relay and grid-controlled rectifier applications. Outlines section, 36; requires octal socket.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (ac/dc)</td>
<td>5.7</td>
<td>6.3</td>
<td>6.9 volts</td>
</tr>
<tr>
<td>Heater Current</td>
<td></td>
<td>2.6</td>
<td>2.85 amperes</td>
</tr>
<tr>
<td>Heater-Cathode Voltage:</td>
<td></td>
<td>+25, -100 max. volts</td>
<td></td>
</tr>
<tr>
<td>Cathode:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum heating time prior to tube conduction</td>
<td>30 seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum outage time without reheating</td>
<td>5 seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Cathode-Cathode Capacitances (Approx.):</td>
<td>0.23 pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to Anode</td>
<td></td>
<td>5.8</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to Cathode, Grid No.2, and Heater</td>
<td>3.9</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Anode to Cathode, Grid No.2, and Heater</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6CO
Ionization Time (Approx.):
For conditions: de anode volts = 100, grid-No.2 volts = 0,
grid-No.1 square-pulse volts = +50, and peak anode amperes
during conduction = 5 ........................................... 0.5 μs
See Table I

Deionization Time (Approx.)
Maximum Critical Grid-No.1 Current:
For conditions: ac anode-supply volts = 460 (rms), and average
anode amperes = 0.5 ........................................... 3 μA
Anode Voltage Drop (Approx.) .................................. 10 volts
Grid-No.1 Control Ratio (Approx.):
For conditions: grid-No.1 resistor (megohms) = 0, grid-No.2
resistor (megohms) = 0, and grid-No.2 volts = 0 ........... 150
Grid-No.2 Control Ratio (Approx.):
For conditions: grid-No.1 resistor (megohms) = 0, grid-No.2
resistor (megohms) = 0, and grid-No. volts = 0 ........... 650

Relay and Grid-Controlled Rectifier Service
For Anode-Supply Frequency of 60 Hz

MAXIMUM RATINGS (Absolute-Maximum Values)
Peak Anode Voltage:
  Forward .................................................. 650 volts
  Inverse .................................................. 1300 volts
Grid-No.2 (Shield-Grid) Voltage:
  Peak, before tube conduction ................................ −100 volts
  Average#, during tube conduction ......................... −10 volts
Grid-No.1 (Control-Grid) Voltage:
  Peak, before tube conduction ................................ −200 volts
  Average#, during tube conduction ......................... −10 volts
Cathode Current:
  Peak ...................................................... 5 amperes
  Average# .............................................. 0.5 amperes
  Fault, for duration of 0.1 second max. .................. 20 amperes
Average Grid-No.2 Current#
  +0.05 amperes
Average Grid-No.1 Current#
  +0.05 amperes
Ambient-Temperature Range .................................. −75 to +90 °C

MAXIMUM CIRCUIT VALUE
Grid-No.1-Circuit Resistance ................................. 2 megohms
# Averaged over any interval of 30 seconds maximum.

OPERATIONAL RANGE
OF CRITICAL GRID-No1 VOLTAGE

TYPE 6012 GRID-No2 (SHIELD) VOLTS=0
RANGES SHOWN ARE FOR TWO VALUES
OF GRID-No1 RESISTOR, 0.1 MEG. AND
2 MEG., AND TAKE INTO ACCOUNT INITIAL
DIFFERENCES BETWEEN INDIVIDUAL
TUBES AND SUBSEQUENT DIFFERENCES
DURING TUBE LIFE. FOR HEATER
VOLTAGE RANGE OF 5.7 TO 6.9 VOLTS
AND FOR AN AMBIENT TEMPERATURE
RANGE OF FROM −75° TO +90°C
RANGE FOR
2 MEGOHMS

92CS-7748T1
Table 1

<table>
<thead>
<tr>
<th>DC Anode Volts</th>
<th>125</th>
<th>250</th>
<th>$R_{s1}$</th>
<th>$E_{cc1}$</th>
<th>$R_{s2}$</th>
<th>$E_{cc2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Anode Amperes</td>
<td>0.5</td>
<td>1.0</td>
<td>0.5</td>
<td>1.0</td>
<td>MΩ</td>
<td>volts</td>
</tr>
<tr>
<td>DEIONIZATION TIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>μS (Approx.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>225</td>
<td>250</td>
<td>275</td>
<td>0.001</td>
<td>-13</td>
<td>1000</td>
</tr>
<tr>
<td>350</td>
<td>375</td>
<td>450</td>
<td>475</td>
<td>0.1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>700</td>
<td>1100</td>
<td>1200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>125</td>
<td>100</td>
<td>125</td>
<td>0.001</td>
<td>-100</td>
<td>1000</td>
</tr>
<tr>
<td>125</td>
<td>150</td>
<td>150</td>
<td>175</td>
<td>0.1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>275</td>
<td>275</td>
<td>300</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Series resistor between grid No.2 and cathode.

6021
Refer to chart at end of section.

6072
Refer to chart at end of section.

6072A
Refer to chart at end of section.

6073
Refer to chart at end of section.

6073/0A2
Refer to chart at end of section.

6074
Refer to chart at end of section.

6074/0B2
Refer to chart at end of section.

6080 INDUSTRIAL TYPE
LOW-MU TWIN POWER TRIODE
Glass octal type used as a regulator tube in dc power supply units and in projection television booster scanning applications. Outlines section, 36; requires octal socket.

Heater Voltage .................................................. 6.3 ±10% volts
Heater Current .................................................. 2.5 amperes
Heater-Cathode Voltage: # Peak .................................. ±300 max. volts
Direct Interelectrode Capacitances (Approx.)
Grid to Plate (each unit) ........................................ 8 pF
Input (each unit) .................................................. 6 pF
Output (each unit) ............................................... 2.2 pF
Heater to Cathode (each unit) .................................. 11 pF
Grid of Unit No.1 to Grid of Unit No.2 ...................... 0.5 pF
Plate of Unit No.1 to Plate of Unit No.2 .................... 2 pF

Class A1 Amplifier (Each Unit)

CHARACTERISTICS
Plate-Supply Voltage ............................................. 135 volts
Cathode-Bias Resistor ......................................... 250 ohms
Amplification Factor ............................................ 2
Plate Resistance .................................................. 280 ohms
Transconductance ................................................. 7000 µmhos
Plate Current ..................................................... 125 mA

DC Amplifier (Each Unit)

MAXIMUM RATINGS (Absolute-Maximum Values)
Plate Voltage ..................................................... 250 volts
Plate Current .................................................... 125 mA
Plate Dissipation ................................................ 13 watts
Bulb Temperature (At hottest point on bulb surface) ...... 200 °C
MAXIMUM CIRCUIT VALUES
Grid-Circuit Resistance:
For cathode-bias operation ........................................ 1 megohm
For fixed-bias operation ........................................... 0.1 megohm
For combined fixed and cathode-bias operation* .................. 0.1 megohm

Booster Scanning Service (Each Unit)

MAXIMUM RATINGS (Absolute-Maximum Values)

For operation in a 525-line, 30-frame system

Peak Negative-Pulse Plate Voltage* .................................. 3000 volts
Peak Negative-Pulse Grid Voltage .................................... 2300 volts
DC Plate Current ...................................................... 125 mA
Plate Dissipation ..................................................... 13 watts

MAXIMUM CIRCUIT VALUES (For maximum rated conditions)

Grid-Circuit Resistance:
For cathode-bias operation ........................................ 1 megohm
For fixed-bias operation ............................................ not recommended

* When fixed bias is used, the plate circuit should contain a protective resistance to provide a minimum drop of 15 volts dc at the normal operating conditions.
* When combined fixed- and cathode-bias is used, the cathode-bias portion should have a minimum value of 7.5 volts dc at the normal operating conditions.
* Pulse duration must not exceed 15 per cent of one horizontal scanning cycle (10 microseconds).
* Operation of this tube is not recommended with a damper pulse between heater and cathode.

Special Ratings & Performance Data

SHOCK RATING
Impact Acceleration ................................................... 450 max. \( \kappa \)

FATIGUE RATING
Vibrational Acceleration ............................................. 2.5 max. \( \kappa \)

LOW-FREQUENCY VIBRATION PERFORMANCE
RMS Output Voltage .................................................. 200 max. mV

Refer to chart at end of section.

Refer to chart at end of section.

Refer to chart at end of section.

Refer to chart at end of section.

Refer to chart at end of section.

6080WA

6082

6101

6101/6J6WA

6111