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 CHARACTERISTICS¹

ELECTRICAL
Cathode: Oxide Coated, Unipotential
Heater: Voltage ........................................... $6.3 \pm 0.3 \text{ V}$
  Current, at 6.3 volts ................................... $1.30 \text{ A}$
Transconductance (Average):
  (200 mA/cm²) ........................................... 50
Amplification Factor (Average) ................................ $135$
Direct Interelectrode Capacitance (grounded cathode)²
  Cin ........................................... $9.75 \text{ pF}$
  Cout ........................................... $0.065 \text{ pF max.}$
  Cgp ........................................... $1.05 \text{ pF}$
Cut-off Bias³ ........................................... $-20 \text{ V}$
Frequency of Maximum Rating:
  C-W ........................................... $2500 \text{ MHz}$
  Plate or Grid-Pulsed ................................ $3000 \text{ MHz}$

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) © 1974, 1975 by Varian

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

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current at 6.3 volts</td>
<td>1.20</td>
<td>1.40 A</td>
</tr>
<tr>
<td>Cathode Warmup Time</td>
<td>60 sec.</td>
<td>--- sec.</td>
</tr>
<tr>
<td>Interelectrode Capacitance (grounded cathode connection)</td>
<td>8.5</td>
<td>11.0 pF</td>
</tr>
<tr>
<td>Cin</td>
<td>8.5</td>
<td>11.0 pF</td>
</tr>
<tr>
<td>Cout</td>
<td>---</td>
<td>0.065 pF</td>
</tr>
<tr>
<td>Cgp</td>
<td>0.90</td>
<td>1.20 pF</td>
</tr>
</tbody>
</table>

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:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE (grid pulsed)</td>
<td>8000 VOLS</td>
<td></td>
</tr>
<tr>
<td>PEAK PULSE PLATE VOLTAGE (plate pulsed)</td>
<td>10,000 VOLS</td>
<td></td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-200 VOLS</td>
<td></td>
</tr>
<tr>
<td>INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE Grid negative to cathode</td>
<td>-750 VOLS</td>
<td></td>
</tr>
<tr>
<td>Grid positive to cathode</td>
<td>150 VOLS</td>
<td></td>
</tr>
<tr>
<td>PULSE PLATE CURRENT</td>
<td>6.0 AMPERES</td>
<td></td>
</tr>
<tr>
<td>PULSE GRID CURRENT</td>
<td>2.5 AMPERES</td>
<td></td>
</tr>
<tr>
<td>AVERAGE PLATE DISSIPATION Forced Air Cooling 1</td>
<td>300 WATTS</td>
<td></td>
</tr>
<tr>
<td>GRID DISSIPATION (Average)</td>
<td>1.5 WATTS</td>
<td></td>
</tr>
<tr>
<td>FREQUENCY</td>
<td>3.0 GHz</td>
<td></td>
</tr>
<tr>
<td>PULSE DURATION 2</td>
<td>6.0 μs</td>
<td></td>
</tr>
<tr>
<td>DUTY FACTOR 2</td>
<td>.0033</td>
<td></td>
</tr>
</tbody>
</table>

OPERATING CONDITIONS IN REPRESENTATIVE APPLICATION GRID PULSED AMPLIFIER

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1.1 GHz</td>
<td></td>
</tr>
<tr>
<td>Heater Voltage</td>
<td>6.3 V</td>
<td></td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>4000 Vdc</td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-80 Vdc</td>
<td></td>
</tr>
<tr>
<td>Peak Video Plate Current</td>
<td>1.8 a</td>
<td></td>
</tr>
<tr>
<td>Plate Efficiency</td>
<td>35 %</td>
<td></td>
</tr>
<tr>
<td>Pulse Drive Power (approx.)</td>
<td>200 w</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (approx.)</td>
<td>2500 w</td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>11 db</td>
<td></td>
</tr>
<tr>
<td>Duty Factor</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

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 ........... 46 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."
AIRFLOW vs STATIC PRESSURE WITH STANDARD COWLNG JAN-157

NOTE ORIENTATION OF PINS WITH RESPECT TO AIR FLOW FOR MAXIMUM COOLING

AIR FROM BLOWER

PLATE DISSIPATION VARIATION WITH COOLING AIRFLOW

CONDITIONS: 25°C INLET AIR TEMPERATURE
RADIATOR ENCLOSED IN COWLNG AS SHOWN

ALL VOIDS FILLED WITH GE# G-641 COMPOUND

STATIC PRESSURE (INCHES OF WATER)

AIR FLOW (CFM)

10
20
30
0 100 150 200 250 300 350
PLATE DISSIPATION IN WATTS

AIR FLOW IN CFM (SEA LEVEL)

5
10
15
20
25
30
0 .2 .4 .6 .8 1.0 1.2 1.4
STATIC PRESSURE (INCHES OF WATER)

0 5 10 15 20 25 30
AIR FLOW (CFM)

RADIATOR P/N 158495

RADIATOR P/N 158495

- STANDARD COWLNG -
FOR 014653, 158594, 158593 RADIATORS