The EIMAC Type 8403 is a planar triode featuring frequency stability and an arc resistant cathode of high emission capability assuring stable operation under adverse conditions involving a wide ambient temperature range and varying plate dissipation. This construction, in combination with the proper plate series impedance, reduces to a minimum the possibility of cathode failures due to voltage surges. Other features of this type include high transconductance, high mu, and low interelectrode capacitances coupled with the great mechanical strength of metal/ceramic construction. The cathode is an indirectly heated disc requiring only minimal heater power. The design of the tube permits operation from low frequencies up to 3.0 GHz as a grid-pulsed, plate-pulsed, or CW oscillator, amplifier, or frequency multiplier.

GENERAL CHARACTERISTICS

ELECTRICAL

Cathode: Oxide Coated, Unipotential

Heater: Voltage ............................................... 6.3 ± 0.3 V
        Current, at 6.3 volts .................................. 1.3 A

Transconductance (Average):
        $I_b = 160$ mA (200 mA/cm$^2$) ...................... 30 mmhos

Amplification Factor (Average): ......................... 80

Direct Interelectrode Capacitance (grounded cathode) $^2$
        $C_{in}$ .................................................. 8.0 pF
        $C_{out}$ (maximum) ................................. 0.065 pF
        $C_{pp}$ ................................................. 3.1 pF

Cut-off Bias (maximum)$^3$ ............................... -30 V max

Frequency of Maximum Rating:
        CW .......................................................... 2500 MHz
        Plate or Grid-Pulsed ............................... 3000 MHz

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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 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 thermal expansion of the cathode.

3. Measured with one milliampere plate current and a plate voltage of 1 kVdc.
MECHANICAL

Maximum Overall Dimensions:

Length .................................................. 2.386 in; 60.60 mm
Diameter .................................................. 1.264 in; 32.11 mm
Net Weight .............................................. 2.04 oz; 58 gm
Operating Position .................................... Any
Maximum Operating Temperature:

Ceramic/Metal Seals ................................... 250°C
Anode Core .............................................. 250°C
Cooling .................................................. Forced Air
Terminals ................................................ Coaxial, special

ENVIRONMENTAL

Shock, 11 ms, non-operating .......................... 60 G
Vibration, operating, all axis ......................... 10 G
Altitude .................................................. 60,000 ft.

RANGE VALUES FOR EQUIPMENT DESIGN

Heater: Current at 6.3 volts .......................... 1.20 1.40 A
Cathode Warmup Time .................................. 60 --- sec.
Interelectrode Capacitance 1

Cin ...................................................... 7.5 9.0 pF
Cout .................................................... --- 0.065 pF
Cgp ..................................................... 2.95 3.25 pF

1. Capacitance value 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.

GRID PULSED OR PLATE PULSED AMPLIFIER
OR OSCILLATOR

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE(grid pulsed) ..................... 2500 VOLTS
PEAK PULSE PLATE VOLTAGE
(plate pulsed) ......................................... 3500 VOLTS
DC GRID VOLTAGE ..................................... -150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE
Grid negative to cathode .............................. -750 VOLTS
Grid positive to cathode ................................ 250 VOLTS
PULSE PLATE CURRENT ............................... 5.0 AMPERES
PULSE GRID CURRENT ................................ 2.0 AMPERES
AVERAGE PLATE DISSIPATION
Forced Air Cooling 1 .................................. 100 WATTS
GRID DISSIPATION (Average) ......................... 2.0 WATTS
FREQUENCY .............................................. 3.0 GHz
PULSE DURATION 2 .................................... 6.0 µs
DUTY FACTOR 2 ......................................... .0033

GRID PULSED OSCILLATOR

Frequency .............................................. 1.09 GHz
Heater Voltage ........................................ 6.3 V
DC Plate Voltage ....................................... 2000 Vdc
DC Grid Voltage ....................................... -150 Vdc
Peak Video Plate Current ............................ 4.0 a
Peak Video Grid Current ............................. 1.0 a
Useful Power Output (Approx.) ....................... 1000 w
Pulse Duration ........................................ 0.5 µs
Duty Factor ............................................ .005

1. Using EIMAC radiator PN 158601.

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 ............. 2500 VOLTS
DC GRID VOLTAGE ............. -150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE
  Grid negative to cathode .... -400 VOLTS
  Grid positive to cathode ... 30 VOLTS
DC PLATE CURRENT ............ 150 MILLIAMPERES
DC GRID CURRENT ............. 45 MILLIAMPERES
AVERAGE PLATE DISSIPATION
  Forced air cooling\(^1\) ....... 100 WATTS
  GRID DISSIPATION (Average) .. 2 WATTS
FREQUENCY .................... 2.5 GHz

OPERATING CONDITIONS for 8403 in Representative Application

GROUNDED GRID CW OSCILLATOR

Frequency .................................. 2500 GHz
Heater Voltage .......................... 6.0 V
"C Plate Voltage ..................... 900 Vdc
\(\Delta\)C Grid Voltage (Approx.) .... -20 Vdc
DC Plate Current ..................... 140 mAcd
DC Grid Current ..................... 15 mAcd
Useful CW Power Output .......... 25 W

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PULSE MODULATOR AND PULSE AMPLIFIER SERVICE

ABSOLUTE MAXIMUM RATINGS:

DC PLATE VOLTAGE ............. 3000 VOLTS
PEAK PLATE VOLTAGE ........... 3500 VOLTS
DC GRID VOLTAGE ............. -150 VOLTS
INSTANTANEOUS PEAK GRID-CATHODE VOLTAGE
  Grid negative to cathode .... -750 VOLTS
  Grid positive to cathode ... +150 VOLTS
PULSE CATHODE CURRENT ....... 7.5 AMPERES
DC PLATE CURRENT ............. 150 MILLIAMPERES

AVERAGE PLATE DISSIPATION

Forced Air Cooling\(^1\) ............. 100 WATTS
GRID DISSIPATION (average) .... 1.5 WATTS
PULSE DURATION \(^2\) ................. 6.0 \(\mu\)s
CUT-OFF MU ...................... 60
DUTY .................................... 0.003

1. Using EIMAC radiator PN 158601.

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.

APPLICATION

For general application information please refer to the Planar Triode Operating Instruction Sheet. The operating instructions should be consulted prior to the designing of new requirements around the above tube type. For unusual and special applications consult the nearest Varian Electron Tube Field Office, or the Product Manager, EIMAC Division of Varian, Salt Lake City, Utah.
AIRFLOW VS STATIC PRESSURE WITH STANDARD COWLING JAN-157

STANDARD COWLING (JAN-157)

AIR FROM BLOWER

STANDARD COWLING

MAXIMUM PLATE DISSIPATION VS COOLING AIRFLOW

CONDITIONS: 25°C INLET AIR TEMPERATURE
RADIATOR ENCLODED IN JAN-157 COWLING
TUBE TYPES: P/N 014224, 158555
(2C39A, 7289, 7211, 7815R, 8745, 8533, 7698R)
P/N 158601, 158994, (7855, 8403)
TYPICAL CONSTANT CURRENT CHARACTERISTICS
FOR PULSE OPERATION
$E_f = 6.3V$

- PEAK PLATE CURRENT - AMPERES
- PEAK GRID CURRENT - AMPERES

PEAK GRID VOLTAGE (V)

PLATE VOLTAGE (V)

CURVE #MA-2422
**ELECTRODE CONTACT DIMS. (see note a,f)**

<table>
<thead>
<tr>
<th>Dim. in Inches</th>
<th>Dim. in Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Max.</td>
<td>Min. Max.</td>
</tr>
<tr>
<td>.035 .361</td>
<td>.89 9.17</td>
</tr>
<tr>
<td>1.021 1.101</td>
<td>25.93 27.97</td>
</tr>
<tr>
<td>1.219 1.413</td>
<td>30.96 35.89</td>
</tr>
<tr>
<td>1.150 1.500</td>
<td>29.46 38.10</td>
</tr>
</tbody>
</table>

**DIMENSIONAL DATA (Note a)**

<table>
<thead>
<tr>
<th>Dim. in Inches</th>
<th>Dim. in Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Max.</td>
<td>Min. Max.</td>
</tr>
<tr>
<td>1.500 1.560 A</td>
<td>38.10 39.62</td>
</tr>
<tr>
<td>1.214 B</td>
<td>30.84</td>
</tr>
<tr>
<td>1.125 1.165 D</td>
<td>28.58 29.52</td>
</tr>
<tr>
<td>.800 .840 F</td>
<td>20.32 21.34</td>
</tr>
<tr>
<td>.462 .477 G</td>
<td>11.73 12.12</td>
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<tr>
<td>.040 H</td>
<td>1.02</td>
</tr>
<tr>
<td>.125 .185 I</td>
<td>3.18 4.70</td>
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<tr>
<td>.766 .826 J</td>
<td>19.46 20.98</td>
</tr>
<tr>
<td>.025 .046 K</td>
<td>.64 1.17</td>
</tr>
<tr>
<td>1.234 1.264 L</td>
<td>31.34 32.11</td>
</tr>
<tr>
<td>1.180 1.195 M</td>
<td>29.97 30.35</td>
</tr>
<tr>
<td>1.025 1.035 N</td>
<td>26.04 26.29</td>
</tr>
<tr>
<td>.752 .792 P</td>
<td>19.10 20.12</td>
</tr>
<tr>
<td>.655 .665 R</td>
<td>16.64 16.89</td>
</tr>
<tr>
<td>.213 .223 T</td>
<td>5.41 5.66</td>
</tr>
<tr>
<td>.315 .325 U</td>
<td>8.00 8.26</td>
</tr>
<tr>
<td>.086 V</td>
<td>2.18</td>
</tr>
<tr>
<td>.100 W</td>
<td>2.54</td>
</tr>
<tr>
<td>.105 .145 Y</td>
<td>2.67 3.68</td>
</tr>
<tr>
<td>.650 .850 Z</td>
<td>16.51 21.59</td>
</tr>
</tbody>
</table>

**NOTES:**

a. Metric equivalents, to the nearest .01 mm, are given for general information only & are based on 1 inch = 25.4 mm.

b. This surface to be used to measure anode shank temperature.

c. Eccentricity of contact surfaces shall be gaged from center line of reference & shall be as follows:

<table>
<thead>
<tr>
<th>Contact Surface</th>
<th>TIR Max.</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anode</td>
<td>.020</td>
<td>Cathode</td>
</tr>
<tr>
<td>Grid</td>
<td>.020</td>
<td>Cathode</td>
</tr>
<tr>
<td>Heater</td>
<td>.012</td>
<td>Cathode</td>
</tr>
</tbody>
</table>

d. Dims. N, R, T & U shall apply throughout entire length as defined by dims. AA, AB, AC, AD respectively.

e. This surface shall not be used for clamping or locating.

f. Electrode Contact dims. are for socket design purposes & are not intended for inspection purposes.

g. Holes for tube extractor thru top fin only.