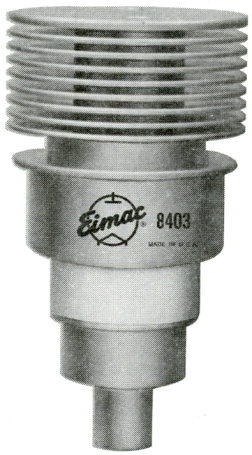
The EIMAC Type 8403 is a planar triode featuring frequency stability and an arc resistant cathode of high emission capability assuring stable operation under adverse conditions involving a wide ambient temperature range and varying plate dissipation. This construction, in combination with the proper 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[1]

### 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] | |
| Cin | 8.0 pF |
| Cout (maximum) | 0.065 pF |
| Cgp | 3.1 pF |
| Cut-off Bias (maximum)[3] | -30 V max |
| 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 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

| | Min. | Max. | |
|---|---|---|---|
| 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 | $\mu$s |
| DUTY FACTOR [2] | .0033 | |

OPERATING CONDITIONS for 8403 in Representative Application

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 | $\mu$s |
| 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 |
| DC Plate Voltage | 900 | Vdc |
| DC Grid Voltage (Approx.) | -20 | Vdc |
| DC Plate Current | 140 | mAdc |
| DC Grid Current | 15 | mAdc |
| Useful CW Power Output | 25 | W |

1. Using EIMAC radiator PN 158601.

## 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 |

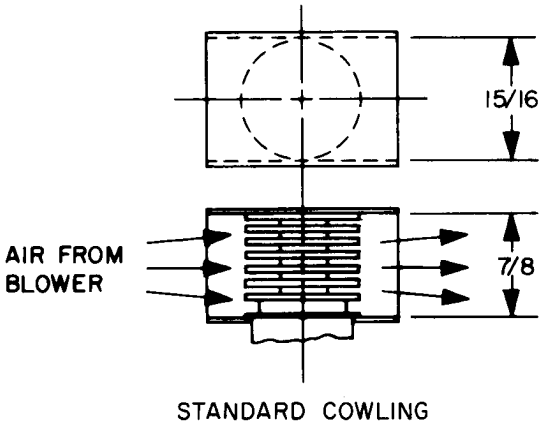
| | | |
|---|---|---|
| AVERAGE PLATE DISSIPATION | | |
| Forced Air Cooling 1. | 100 | WATTS |
| GRID DISSIPATION (average) | 1.5 | WATTS |
| PULSE DURATION[2] | 6.0 | $\mu$s |
| CUT-OFF MU | 60 | |
| DUTY | .0033 | |

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.

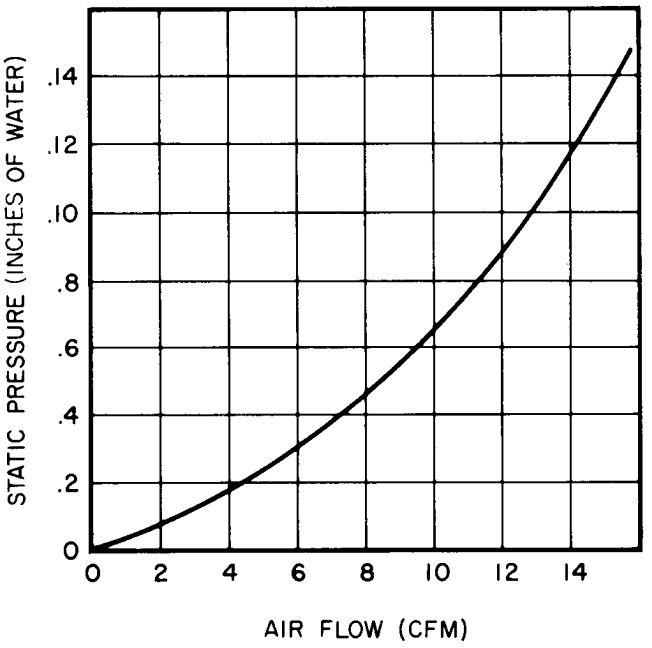
## APPLICATION

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.

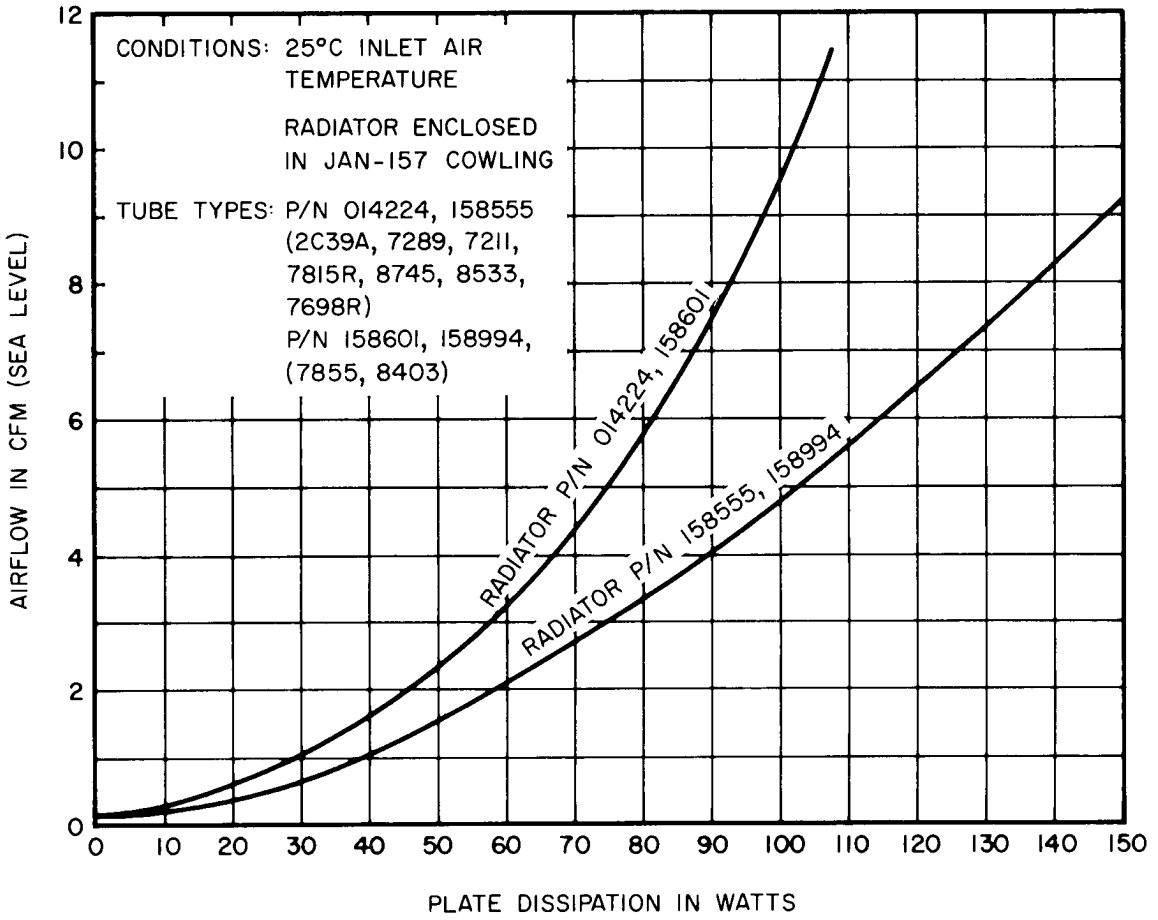
## AIRFLOW VS STATIC PRESSURE WITH STANDARD COWLING JAN-157

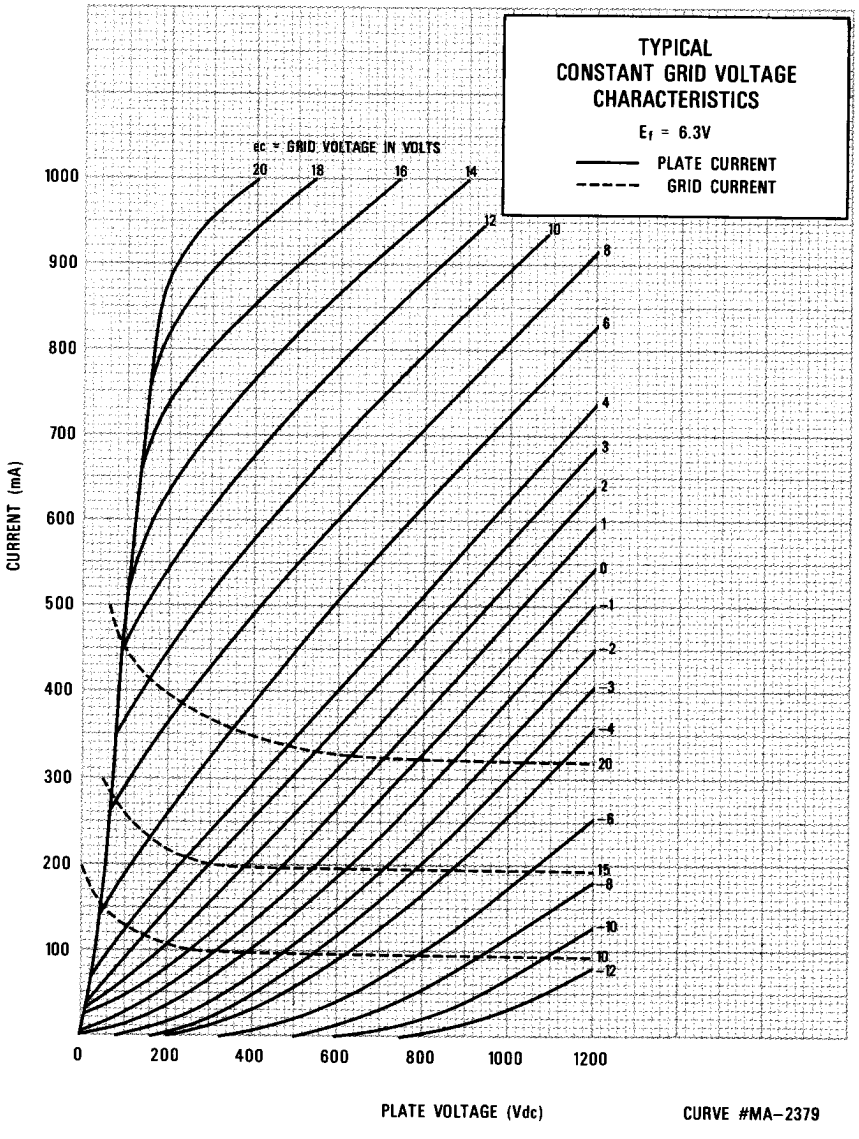


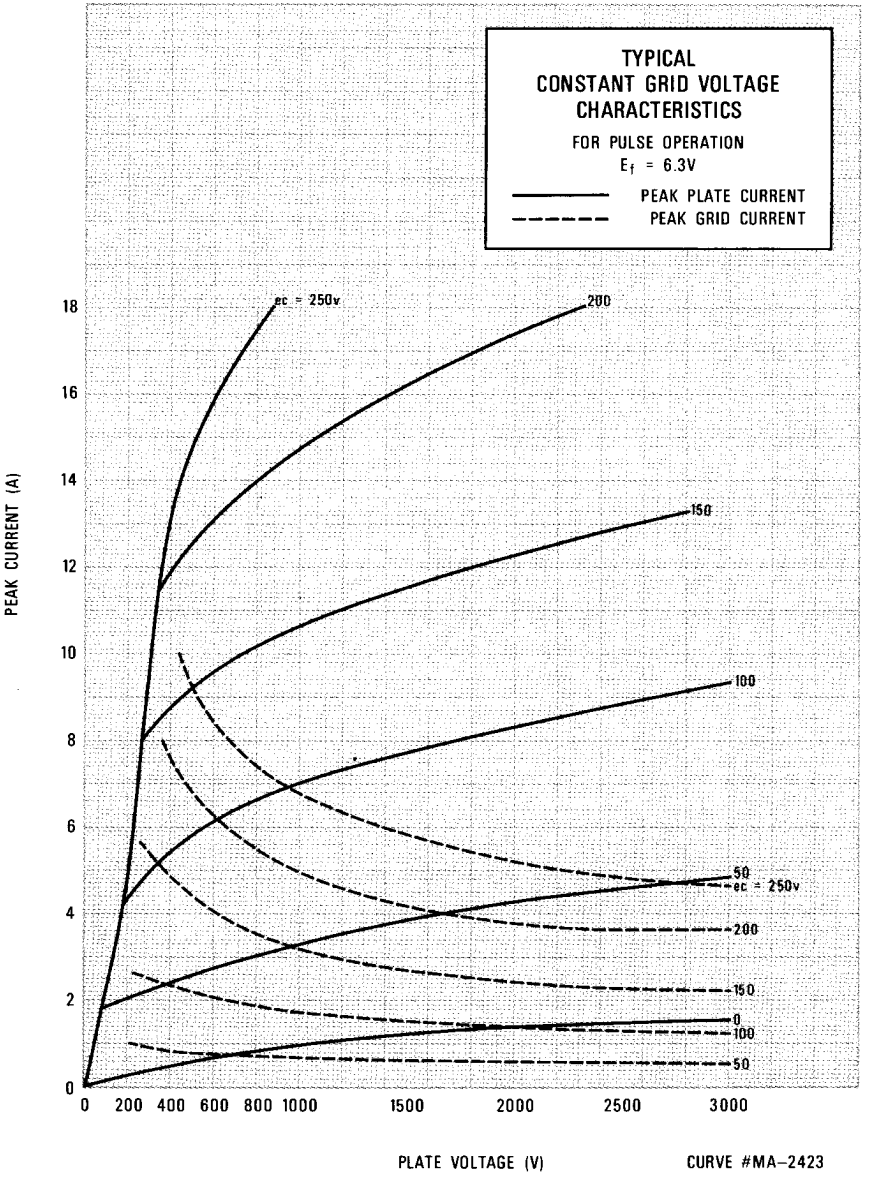

## STANDARD COWLING (JAN-157)

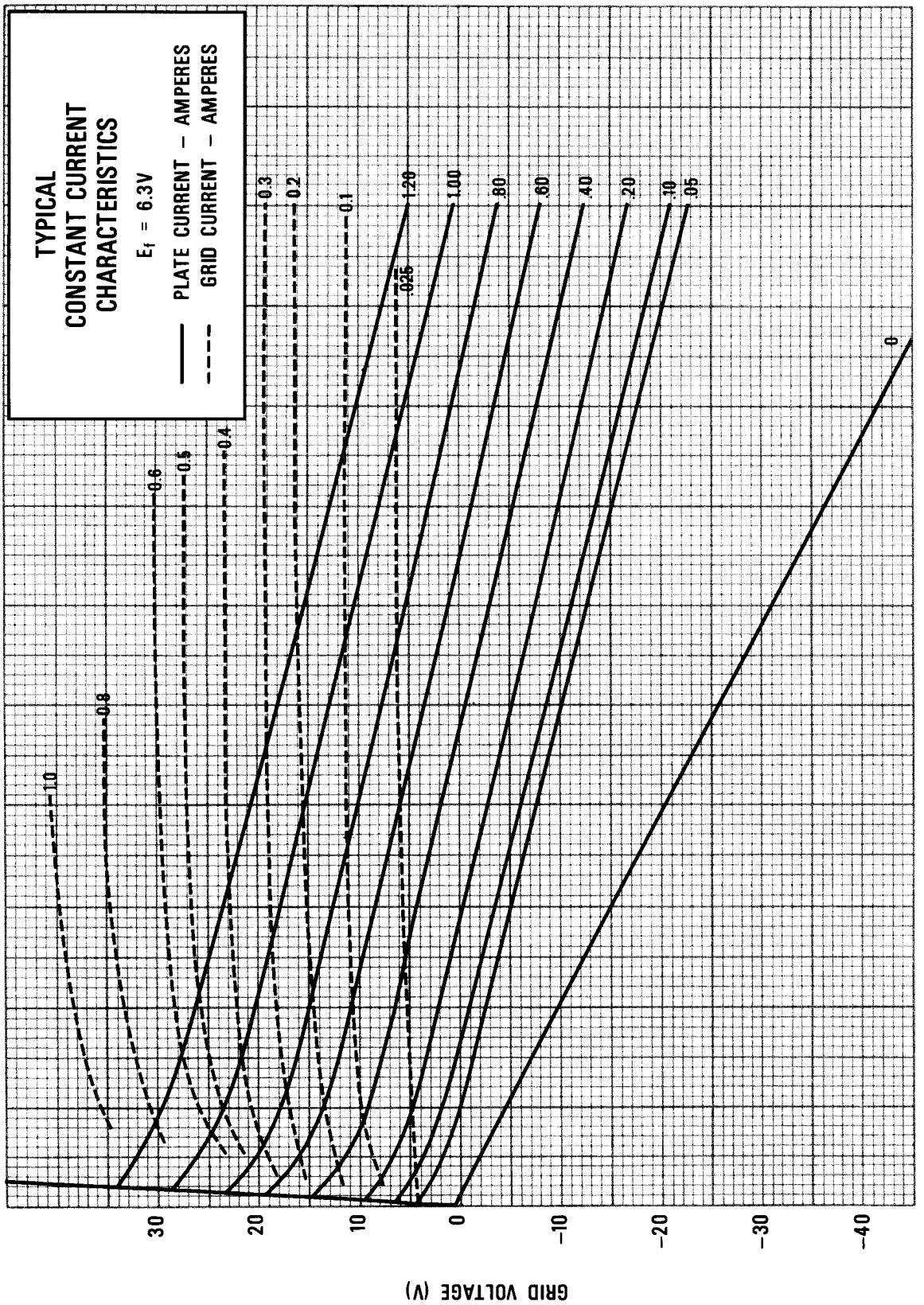



## MAXIMUM PLATE DISSIPATION VS COOLING AIRFLOW

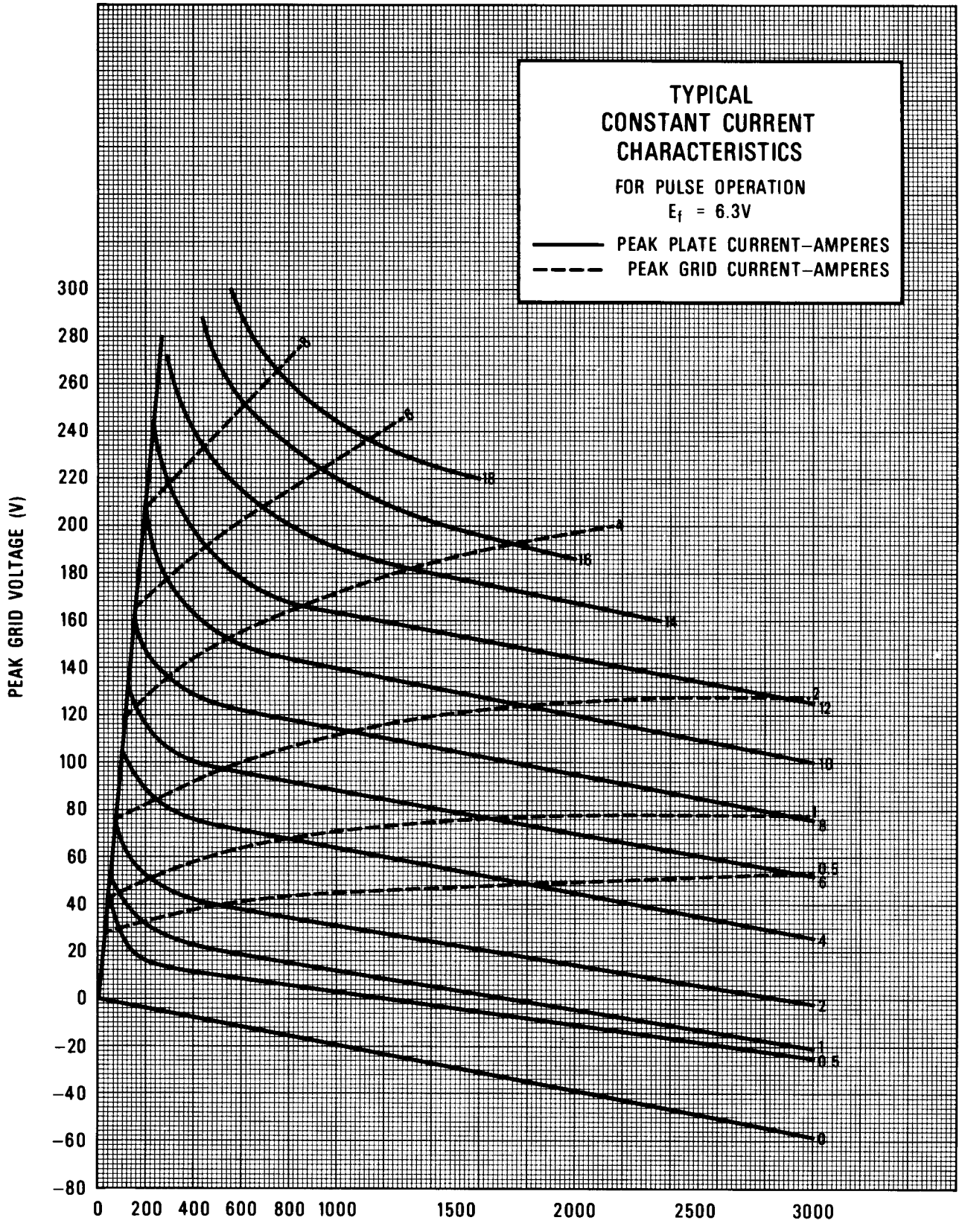


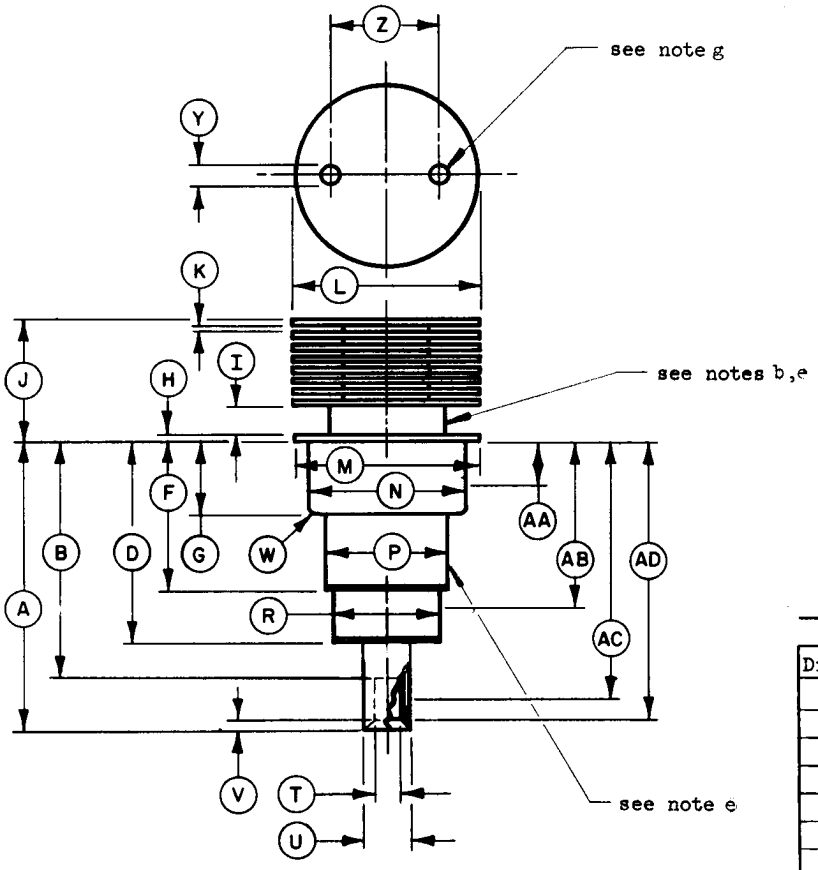

TYPICAL
CONSTANT GRID VOLTAGE
CHARACTERISTICS
$E_f$ = 6.3V
PLATE CURRENT
GRID CURRENT
ec = GRID VOLTAGE IN VOLTS
20
18
16
14
12
10
8
6
4
3
2
1
0
-1
-2
-3
-4
20
-6
15
-8
-10
10
-12
CURRENT (mA)
1000
900
800
700
600
500
400
300
200
100
0
200
400
600
800
1000
1200
PLATE VOLTAGE (Vdc)
CURVE #MA-2379


TYPICAL
CONSTANT GRID VOLTAGE
CHARACTERISTICS
FOR PULSE OPERATION
$E_f$ = 6.3V
PEAK PLATE CURRENT
PEAK GRID CURRENT
ec = 250v
200
150
100
50
ec = 250v
200
150
0
100
50
PEAK CURRENT (A)
18
16
14
12
10
8
6
4
2
0
0
200
400
600
800
1000
1500
2000
2500
3000
PLATE VOLTAGE (V)
CURVE #MA-2423




CURVE #MA–2380


TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
FOR PULSE OPERATION
$E_f$ = 6.3V
PEAK PLATE CURRENT–AMPERES
PEAK GRID CURRENT–AMPERES
PEAK GRID VOLTAGE (V)
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
–20
–40
–60
–80
0
200
400
600
800
1000
1500
2000
2500
3000
PLATE VOLTAGE (V)
CURVE #MA–2422




| ELECTRODE CONTACT DIMS. (see note a,f) | | | | |
|---|---|---|---|---|
| Dim. in Inches | | Dim. | Dim. in Millim. | |
| Min. | Max. | | Min. | Max. |
| .035 | .361 | AA | .89 | 9.17 |
| 1.021 | 1.101 | AB | 25.93 | 27.97 |
| 1.219 | 1.413 | AC | 30.96 | 35.89 |
| 1.160 | 1.500 | AD | 29.46 | 38.10 |

| DIMENSIONAL DATA (Note a) | | | | | |
|---|---|---|---|---|---|
| Dim. in Inches | | | Dim. in Millimeters | | |
| Min. | Max. | Dim. | MIN. | MAX. | |
| 1.500 | 1.560 | A | 38.10 | 39.62 | |
| | 1.214 | B | | 30.84 | |
| 1.125 | 1.165 | D | 28.58 | 29.59 | |
| .800 | .840 | F | 20.32 | 21.34 | |
| .462 | .477 | G | 11.73 | 12.12 | |
| | .040 | H | | 1.02 | |
| .125 | .185 | I | 3.18 | 4.70 | |
| .766 | .826 | J | 19.46 | 20.98 | |
| .025 | .046 | K | .64 | 1.17 | |
| 1.234 | 1.264 | L | 31.34 | 32.11 | |
| 1.180 | 1.195 | M | 29.97 | 30.35 | |
| 1.025 | 1.035 | N | 26.04 | 26.29 | |
| .752 | .792 | P | 19.10 | 20.12 | |
| .655 | .665 | R | 16.64 | 16.89 | |
| .213 | .223 | T | 5.41 | 5.66 | |
| .315 | .325 | U | 8.00 | 8.26 | |
| | .086 | V | | 2.18 | |
| | .100 | W | | 2.54 | |
| .105 | .145 | Y | 2.67 | 3.68 | |
| .650 | .850 | Z | 16.51 | 21.59 | |
| | | | | | |
| | | | | | |

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:

| Contact Surface | TIR Max. | Reference |
|---|---|---|
| Anode | .020 | Cathode |
| Grid | .020 | Cathode |
| Heater | .012 | Cathode |

d. Dias. N,R,T & U shall apply throughout entire lenght 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