

# Amperex

**8164**  
**3-1000Z**  
**HIGH MU POWER TRIODE**

The Amperex 8164/3-1000Z is a compact power triode intended to be used as a zero-bias Class-B amplifier in audio or radio-frequency applications. Operation with zero grid bias simplifies associated circuitry by eliminating the bias supply. In addition, grounded-grid operation is attractive since a power gain as high as twenty times can be obtained with the 8164/3-1000Z in a cathode driven circuit.

## GENERAL CHARACTERISTICS

### **ELECTRICAL**

Filament : Thoriated Tungsten

Voltage

7.5  $\pm$ 0.37 Volts

Current

20 Amps (nominal)

Amplification Factor (Average) (Mu)

200

Interelectrode Capacitance (Grounded Cathode)

Input

| <u>Min.</u> | <u>Max.</u> |    |
|-------------|-------------|----|
| 15.0        | 19.0        | pf |

Output

|   |     |    |
|---|-----|----|
| — | 0.3 | pf |
|---|-----|----|

Grid-Plate

|     |     |    |
|-----|-----|----|
| 6.0 | 9.0 | pf |
|-----|-----|----|

Interelectrode Capacitance (Grounded Grid)

Input

|      |      |    |
|------|------|----|
| 15.0 | 19.0 | pf |
|------|------|----|

Output

|     |     |    |
|-----|-----|----|
| 6.0 | 9.0 | pf |
|-----|-----|----|

Plate-Cathode

|   |     |    |
|---|-----|----|
| — | 0.3 | pf |
|---|-----|----|

Frequency for Maximum Ratings

|   |     |     |
|---|-----|-----|
| — | 110 | MHz |
|---|-----|-----|

### **MECHANICAL**

Base

5 Pin Special

Mounting Position

Vertical, base down or up

Cooling

Radiation and forced air

Recommended Heat-Dissipating

Plate Connector

HR-8

Recommended Socket

SK-510

Recommended Chimney

SK-516

Maximum Operating Temperatures :

Plate Seal

225°C

Base Seals

200°C

Maximum Over-all Dimensions :

Height

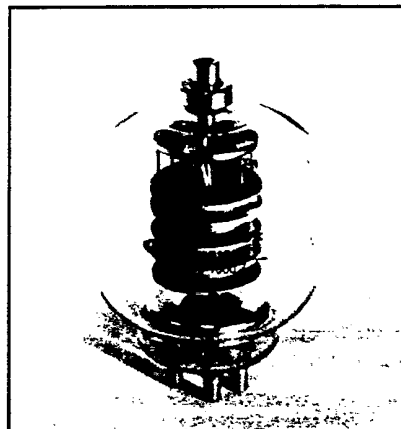
200 mm

Diameter

133 mm

Net Weight

0,62 kg



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### RADIO FREQUENCY

#### **POWER AMPLIFIER, Class C**

|                   |           |       |
|-------------------|-----------|-------|
| MAXIMUM RATINGS   |           |       |
| DC PLATE VOLTAGE  | 6000 max. | volts |
| DC PLATE CURRENT  | 700 max.  | mA    |
| GRID DISSIPATION  | 50 max.   | watts |
| PLATE DISSIPATION | 1000 max. | watts |

### TYPICAL OPERATION

|                      |      |       |       |
|----------------------|------|-------|-------|
| DC Plate Voltage     | 4500 | 6000  | volts |
| DC Grid Voltage      | - 75 | - 100 | volts |
| DC Plate Current     | 700  | 700   | mA    |
| DC Grid Current      | 240  | 250   | mA    |
| Peak RF Grid Voltage | 200  | 230   | volts |
| Grid Driving Power   | 48   | 57    | watts |
| Power Output         | 2250 | 3200  | watts |

#### **PLATE MODULATED RF AMPLIFIER Class C**

|                   |           |       |
|-------------------|-----------|-------|
| MAXIMUM RATINGS   |           |       |
| DC PLATE VOLTAGE  | 4500 max. | volts |
| DC PLATE CURRENT  | 550 max.  | mA    |
| GRID DISSIPATION  | 50 max.   | watts |
| PLATE DISSIPATION | 670 max.  | watts |

### TYPICAL OPERATION

|                        |       |       |
|------------------------|-------|-------|
| DC Plate Voltage       | 4500  | volts |
| DC Grid Voltage        | - 100 | volts |
| DC Plate Current       | 500   | mA    |
| DC Grid Current        | 170   | mA    |
| Drive Power            | 35    | watts |
| Output Power (carrier) | 1765  | watts |

### TYPICAL OPERATION — Zero Bias — Cathode Driven

#### **RADIO FREQUENCY LINEAR AMPLIFIER Class B**

|                   |           |       |
|-------------------|-----------|-------|
| MAXIMUM RATINGS   |           |       |
| DC PLATE VOLTAGE  | 6000 max. | volts |
| DC PLATE CURRENT  | 800 max.  | mA    |
| GRID DISSIPATION  | 50 max.   | watts |
| PLATE DISSIPATION | 1000 max. | watts |

|                                     |      |      |       |
|-------------------------------------|------|------|-------|
| DC Plate Voltage                    | 2500 | 3000 | volts |
| Zero-Signal DC Plate Current        | 162  | 175  | mA    |
| Max-Signal DC Plate Current         | 800  | 670  | mA    |
| Max-Signal DC Grid Current          | 254  | 300  | mA    |
| Max-Signal Drive Power              | 30   | 65   | watts |
| Plate Output Power                  | 1050 | 1360 | watts |
| Intermodulation Distortion Products | - 35 | —    | db    |

#### **AUDIO FREQUENCY AMPLIFIER OR MODULATOR Class B**

|                            |           |       |
|----------------------------|-----------|-------|
| MAXIMUM RATINGS (PER TUBE) |           |       |
| DC PLATE VOLTAGE           | 6000 max. | volts |
| DC PLATE CURRENT           | 800 max.  | mA    |
| PLATE DISSIPATION          | 1000 max. | watts |
| GRID DISSIPATION           | 50 max.   | watts |

### TYPICAL OPERATION (Sinusoidal Wave, Two Tubes, Grid Driven)

|                         |      |        |       |
|-------------------------|------|--------|-------|
| DC PLATE VOLTAGE        | 3000 | 5000   | volts |
| DC GRID VOLTAGE         | 0    |        |       |
| ZERO SIG                |      |        |       |
| DC PLATE CURRENT        | 300  | 200    | mA    |
| MAX-SIG                 |      |        |       |
| DC PLATE CURRENT        | 1450 | 1000   | mA    |
| MAX-SIG                 |      |        |       |
| DC GRID CURRENT         | 485  | 310    | mA    |
| DRIVING POWER           | 48   | 28     | watts |
| PEAK AF DRIVING VOLTAGE | 100  | 90     | volts |
| LOAD RESISTANCE         |      |        |       |
| PLATE TO PLATE          | 3940 | 10,200 | ohms  |
| MAX-SIG PLATE           |      |        |       |
| OUTPUT POWER            | 2540 | 3560   | watts |

## APPLICATION

**MOUNTING** — The 3-1000Z must be operated vertically, base up or base down. A flexible connecting strap should be provided between the HR8 cooler on the plate terminal and the external plate circuit. The tube must be protected from severe vibration and shock.

**COOLING** — Forced-air cooling is required to maintain the base seals at a temperature below 200°C and the plate seal at a temperature below 225°C. When using the SK-510 Air-System Socket and SK-516 Chimney, a minimum air flow rate of 25 cubic feet per minute at a static pressure of approximately 0.43 inch of water, as measured at the socket at sea level, is required to provide adequate cooling at an inlet air temperature of 50°C. Above 30 MHz, the required air flow is increased to 35 cubic feet per minute at a static pressure of approximately 0.8 inch of water, as measured at the SK-510 socket. Cooling air must be supplied to the tube even when the filament alone is on during standby periods.

When a socket other than the SK-510 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate seal. In all cases, air flow rates in excess of the minimum requirements, will prolong tube life.

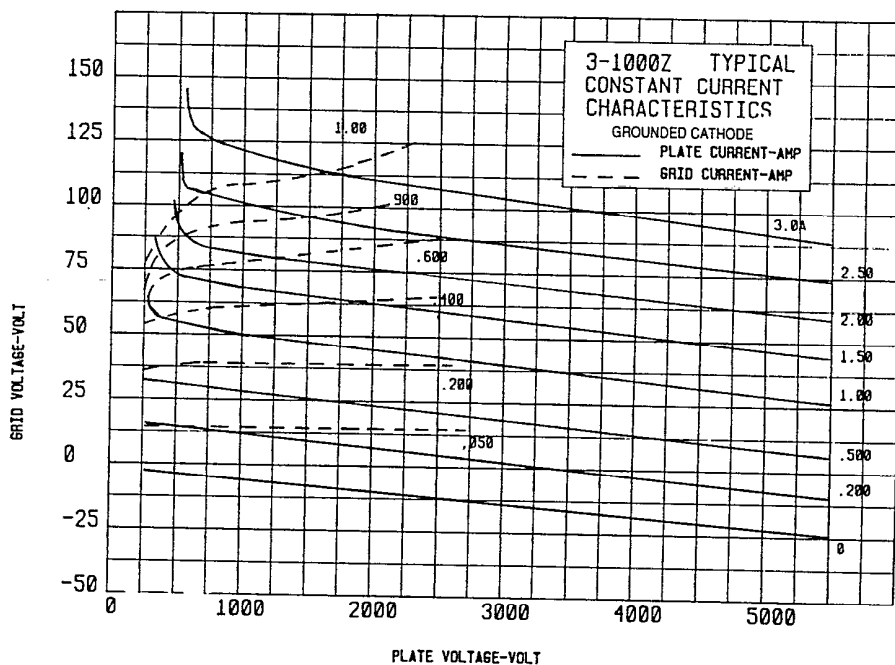
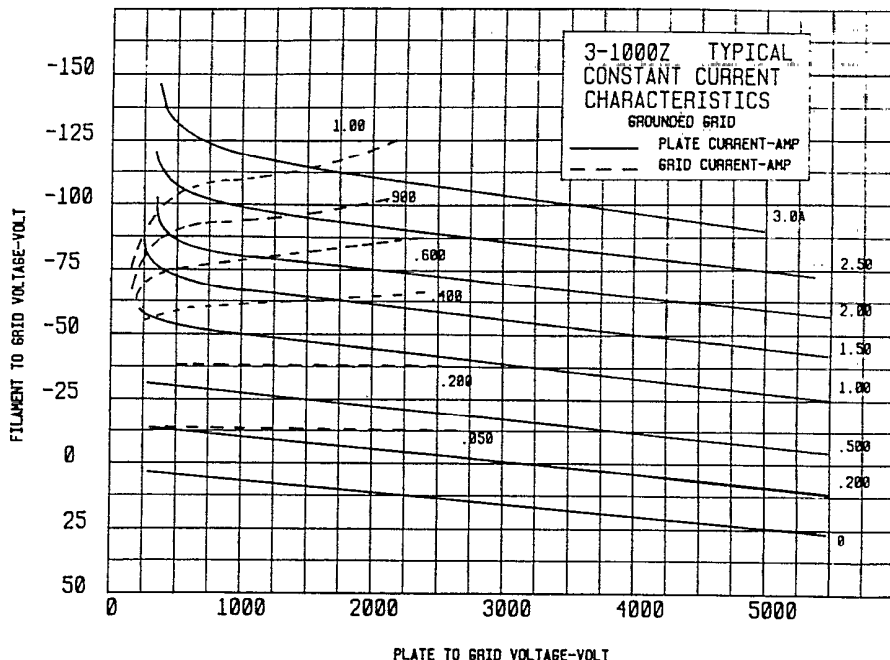
**FILAMENT OPERATION** — The rated filament voltage for the 3-1000Z is 7.5 volts. Filament voltage, as measured at the socket, must be maintained within the range of 7.13 to 7.87 volts to obtain maximum tube life. Operation at reduced voltage decreases emission capability, but increases life expectancy.

**CLASS C OPERATION** — Although designed for Class B service, the 3-1000Z may be operated as a Class-C power amplifier or oscillator or as a plate-modulated RF amplifier. The zero-bias characteristics can be used to advantage in Class-C amplifiers by employing only grid leak bias. If driving power falls, plate dissipation is kept to a low level since the tube will operate at normal, static zero-bias conditions.

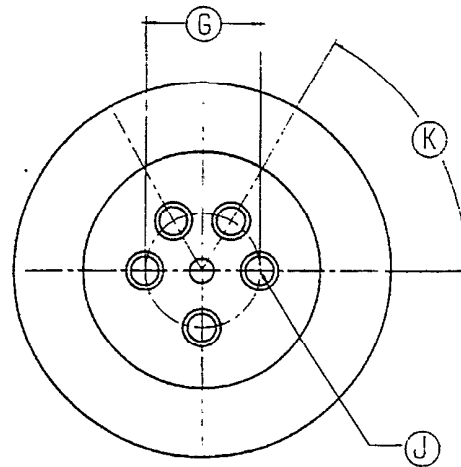
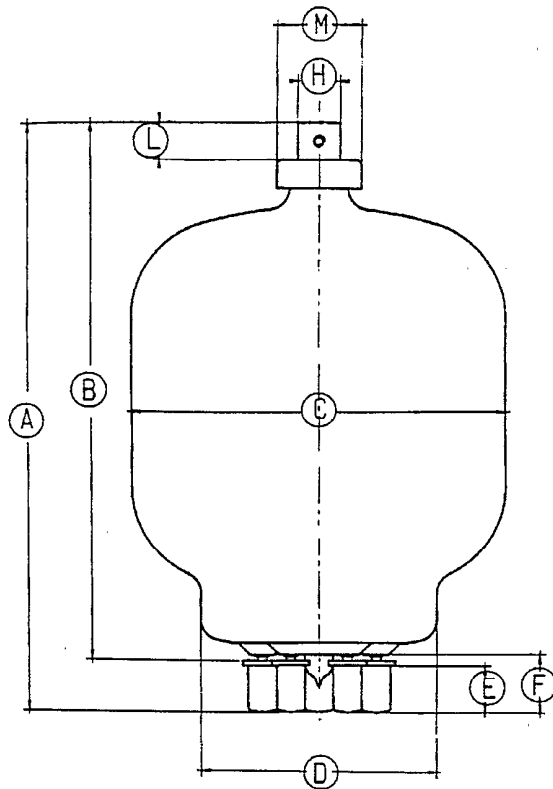
**ZERO-BIAS OPERATION** — Operating at zero-bias is not recommended with plate voltages over 3000 volts since plate dissipation may be exceeded. Similarly, the safety of zero-bias operation as mentioned above under "Class-C Operation" is not available at plate voltages above 3000 volts. Straight Class-C or Class-B operation is, of course, permissible up to 6000 volts where other ratings are not exceeded.

**INPUT CIRCUIT** — When the 3-1000Z is operated as a grounded-grid RF amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For better results with a single-ended amplifier, it is suggested that the cathode tank circuit operates at a "Q" of five or more.

## 8164 3-1000Z HIGH MU POWER TRIODE



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BOTTOM VIEW

31000Z

| DIMENSIONAL DATA |       |       |       |             |       |       |
|------------------|-------|-------|-------|-------------|-------|-------|
| INCHES           |       |       |       | MILLIMETERS |       |       |
| DIM              | MIN   | MAX   | REF   | MIN         | MAX   | REF   |
| A                | 7.500 | 7.875 | —     | 190.5       | 200   | —     |
| B                | 6.812 | 7.187 | —     | 173         | 182.5 | —     |
| C                | —     | 5.250 | —     | —           | 133.3 | —     |
| D                | 3.062 | 3.187 | —     | 77.77       | 80.95 | —     |
| E                | 0.531 | 0.656 | —     | 13.49       | 16.66 | —     |
| F                | 0.718 | 0.843 | —     | 18.24       | 21.41 | —     |
| G                | —     | —     | 1.500 | —           | —     | 38.10 |
| H                | 0.559 | 0.573 | —     | 14.20       | 14.55 | —     |
| J                | 0.371 | 0.377 | —     | 9.42        | 9.57  | —     |
| K                | —     | —     | 60°   | —           | —     | 60°   |
| L                | 0.484 | —     | —     | 12.29       | —     | —     |
| M                | —     | 1.125 | —     | —           | —     | 28.57 |

31000Z

