

# Amperex

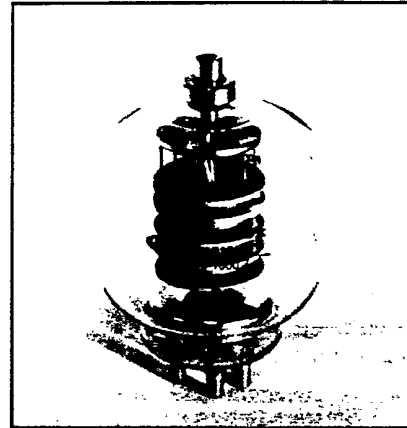
## 8164 3-1000Z HIGH MU POWER TRIODE

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 +/-0.37		Volts
Current	20		Amps (nominal)
Amplification Factor (Average) (Mu)	200		
Interelectrode Capacitance (Grounded Cathode)			
Input	<u>Min.</u> 15.0	<u>Max.</u> 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

 **Richardson Electronics, Ltd.**

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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

**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

**TYPICAL OPERATION — Zero Bias —  
Cathode Driven**

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
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

8164

3-1000Z

HIGH MU POWER TRIODE

**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.

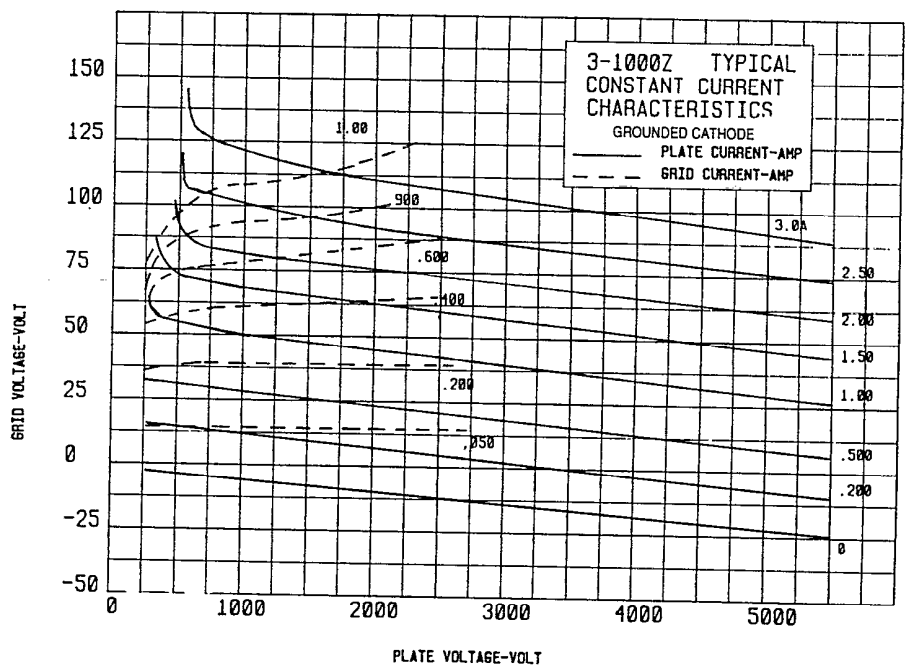
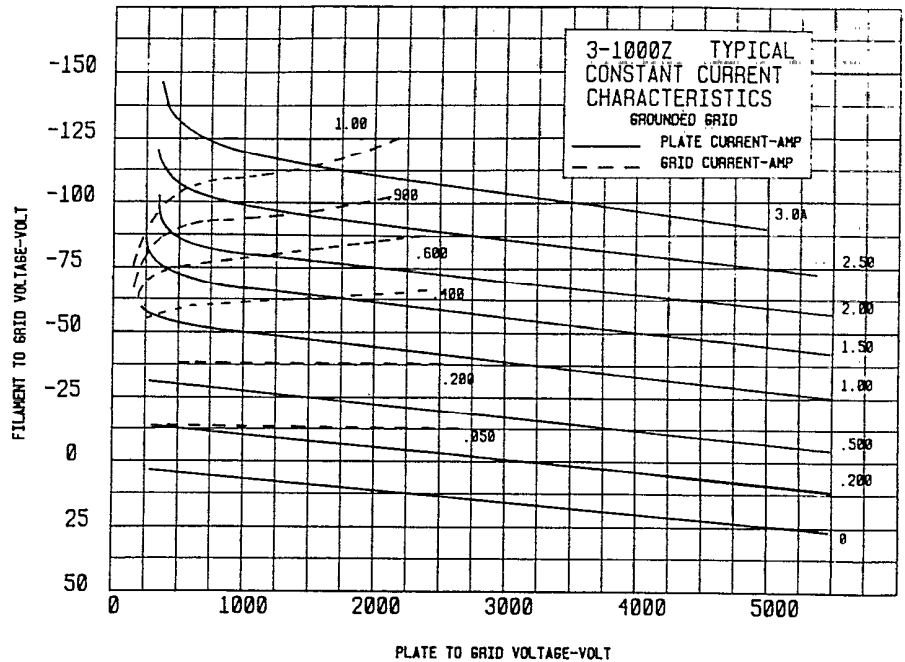
When a socket other than the SK-510 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate seal. In all cases, air flow rates in excess of the minimum requirements, will prolong tube life.

**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.

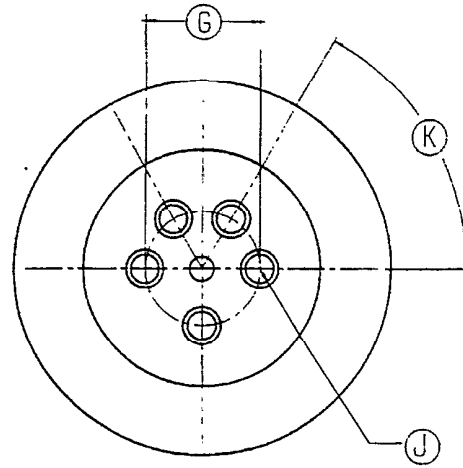
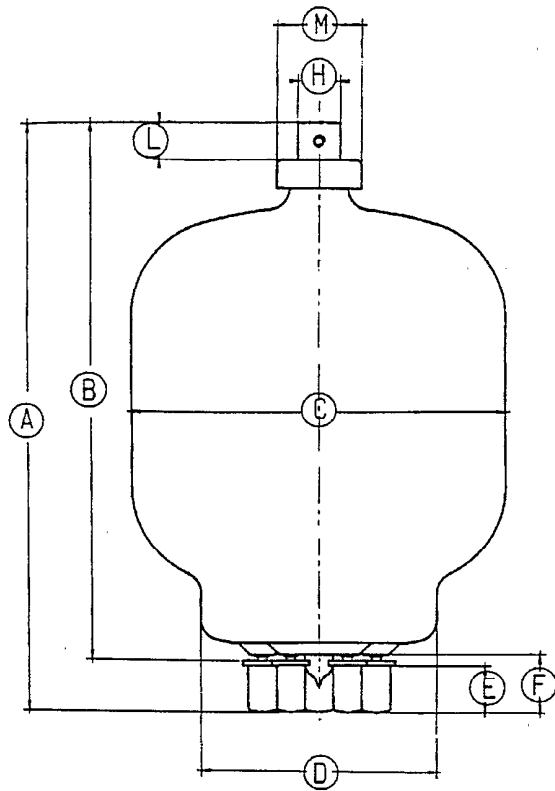
**CLASS C OPERATION** — Although designed for Class B service, the 3-1000Z may be operated as a Class-C power amplifier or oscillator or as a plate-modulated RF amplifier. The zero-bias characteristics can be used to advantage in Class-C amplifiers by employing only grid leak bias. If driving power falls, 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.



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3-1000Z  
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BOTTOM VIEW

31000Z

DIMENSIONAL DATA						
DIM	INCHES			MILLIMETERS		
	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

