

E I M A C
Division of Varian
S A N C A R L O S
C A L I F O R N I A

3-500Z
HIGH-MU
POWER TRIODE

The EIMAC 3-500Z 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 3-500Z in a cathode-driven circuit.

GENERAL CHARACTERISTICS

ELECTRICAL

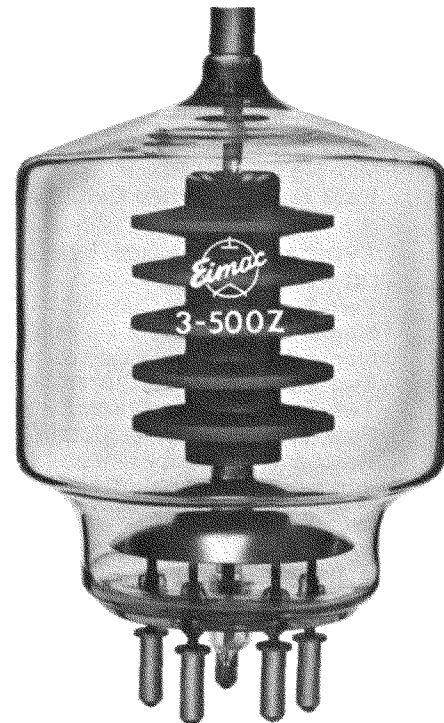
Filament: Thoriated Tungsten

Voltage	5.0	V
Current	14.5	A
Amplification Factor (Average)	160	

Interelectrode Capacitances (Average):*

Grid-Filament	7.4	pF
Grid-Plate	4.1	pF
Plate-Filament	0.07	pF

Frequency for Maximum Ratings. 110 MHz



MECHANICAL

Base	5 Pin Special
Basing	See Drawing
Mounting Position	Vertical, base down or up
Cooling	Radiation and Forced Air
Heat-Dissipating Plate Connector	HR-6
Recommended Socket	EIMAC SK-410
Recommended Chimney	EIMAC SK-406
Maximum Operating Temperatures:	
Plate Seal	225°C
Base Seals	200°C
Maximum Over-all Dimensions:	
Height	5.875 in
Diameter	3.438 in
Net Weight	7 oz

*In Shielded Fixture



R-F LINEAR AMPLIFIER GROUNDED-GRID, CLASS-B

MAXIMUM RATINGS

DC PLATE VOLTAGE	-----	4000	VOLTS
DC PLATE CURRENT	-----	0.400	AMP
PLATE DISSIPATION	-----	500	WATTS
GRID DISSIPATION	-----	20	WATTS

TYPICAL OPERATION (Single-Tone Conditions)

DC Plate Voltage	-----	3000	V
Zero-Sig DC Plate Current*	-----	160	mA
Max-Sig DC Plate Current	-----	370	mA
Max-Sig DC Grid Current	-----	115	mA
Driving Impedance	-----	115	ohms
Resonant Load Impedance	-----	5000	ohms
Max-Sig Driving Power	-----	30	W
Peak Envelope Plate Output Power	---	750	W

TYPICAL OPERATION (Minimum Distortion Products)*

DC Plate Voltage	-----	2000	V
Zero-Sig DC Plate Current*	-----	95	mA
Single-Tone DC Plate Current	-----	400	mA
Single-Tone DC Grid Current	-----	130	mA
Two-Tone DC Plate Current	-----	270	mA
Two-Tone DC Grid Current	-----	80	mA
Peak Envelope Useful Output Power	---	500	W
Resonant Load Impedance	-----	2750	ohms
Intermodulation Distortion Products	---	-38	dB

TYPICAL OPERATION (Minimum Distortion Products at 1 KW PEP Input)**

DC Plate Voltage	-----	2500	V
Zero-Sig DC Plate Current*	-----	130	mA
Single-Tone DC Plate Current	-----	400	mA
Single-Tone DC Grid Current	-----	120	mA
Two-Tone DC Plate Current	-----	280	mA
Two-Tone DC Grid Current	-----	70	mA
Peak Envelope Useful Output Power	---	600	W
Resonant Load Impedance	-----	3450	ohms
Intermodulation Distortion Products	---	-33	dB

TYPICAL OPERATION (Minimum Distortion Products at 1500 volts Plate Voltage)**

DC Plate Voltage	-----	1500	V
Zero-Sig DC Plate Current*	-----	65	mA
Single-Tone DC Plate Current	-----	400	mA
Single-Tone DC Grid Current	-----	130	mA
Two-Tone DC Plate Current	-----	260	mA
Two-Tone DC Grid Current	-----	80	mA
Peak Envelope Useful Output Power	---	330	W
Resonant Load Impedance	-----	1600	ohms
Intermodulation Distortion Products	---	-46	dB

A-F AMPLIFIER OR MODULATOR, CLASS-B

MAXIMUM RATINGS (PER TUBE)

DC PLATE VOLTAGE	-----	4000	VOLTS
DC PLATE CURRENT	-----	0.400	AMP
PLATE DISSIPATION	-----	500	WATTS
GRID DISSIPATION	-----	20	WATTS

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

DC Plate Voltage	-----	3000	V
DC Grid Voltage	-----	0	V
Zero-Sig DC Plate Current*	-----	300	mA
Max-Sig DC Plate Current	-----	770	mA
Max-Sig DC Grid Current	-----	244	mA
Driving Power	-----	25	W
Peak A-F Driving Voltage (per tube)	---	100	V
Load Resistance, Plate-to-Plate	-----	8600	ohms
Max-Sig Plate Output Power	-----	1420	W

R-F POWER AMPLIFIER OR OSCILLATOR, CLASS-C

MAXIMUM RATINGS

DC PLATE VOLTAGE	-----	4000	VOLTS
DC PLATE CURRENT	-----	0.350	AMP
PLATE DISSIPATION	-----	500	WATTS
GRID DISSIPATION	-----	20	WATTS

TYPICAL OPERATION

DC Plate Voltage	-----	3500	V
DC Plate Current	-----	300	mA
DC Grid Voltage	-----	-75	V
DC Grid Current	-----	115	mA
Peak R-F Grid Voltage	-----	187	V
Grid Driving Power	-----	22	W
Plate Output Power	-----	850	W

R-F POWER AMPLIFIER PLATE-MODULATED

MAXIMUM RATINGS

DC PLATE VOLTAGE	-----	3000	VOLTS
DC PLATE CURRENT	-----	0.275	AMP
PLATE DISSIPATION	-----	320	WATTS
GRID DISSIPATION	-----	20	WATTS

TYPICAL OPERATION (Carrier Condition)

DC Plate Voltage	-----	3000	V
DC Plate Current	-----	275	mA
DC Grid Voltage	-----	-100	V
DC Grid Current	-----	120	mA
Peak R-F Grid Voltage	-----	200	V
Grid Driving Power	-----	25	W
Plate Output Power	-----	640	W

NOTE: In most cases, "TYPICAL OPERATION" data are obtained by calculation from published characteristic curves and confirmed by direct tests. No allowance for circuit losses, either input or output, has been made. Exceptions are distinguished by a listing of "Useful" output power as opposed to "Plate" output power. Values appearing in these groups have been obtained from existing equipment(s) and the output power is that measured at the load.

*Approximate Value

**Measured data from a single tube.

APPLICATION

Mounting: The 3-500Z must be operated vertically, base up or down. A flexible connecting strap should be provided between the heat dissipating plate connector and the external plate circuit. The tube must be protected from severe vibration and shock.

Socket: The EIMAC SK-410 air system socket and SK-406 chimney are recommended for use with the 3-500Z. When a socket other than the SK-410 is used, provisions must be made for equivalent cooling of the base, the envelope, and the plate lead.

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. Air-flow requirements to maintain the above maximum temperatures are tabulated below. (For operation below 30 MHz.)

Base-to-Anode Air Flow		
Anode Dissipation (Watts)	Air Flow (CFM)	Pressure Drop (inches-WC)
300	6.6	.023
400	10.3	.052
500	13.0	.082

In all cases, air flow rates in excess of the minimum requirements will prolong tube life. NOTE: Two 3-500Z tubes in a single amplifier, chassis mounted, may be adequately cooled by use of a fan so mounted as to pressurize the space below the sockets. Fans suitable for use at or near sea level are Pamotor Model 2000, or Model 6500.

Class-C Operation: Although specifically designed for class-B service, the 3-500Z may be operated as a class-C power amplifier or oscillator or as a plate-modulated radio-frequency power amplifier. The zero-bias characteristic of the 3-500Z can be used to advantage in class-C amplifiers operating at plate voltages of 3000 volts or below by employing only grid-leak bias. If driving power fails, plate dissipation is then kept to a low value because the tube will be operating at the normal static zero-bias conditions.

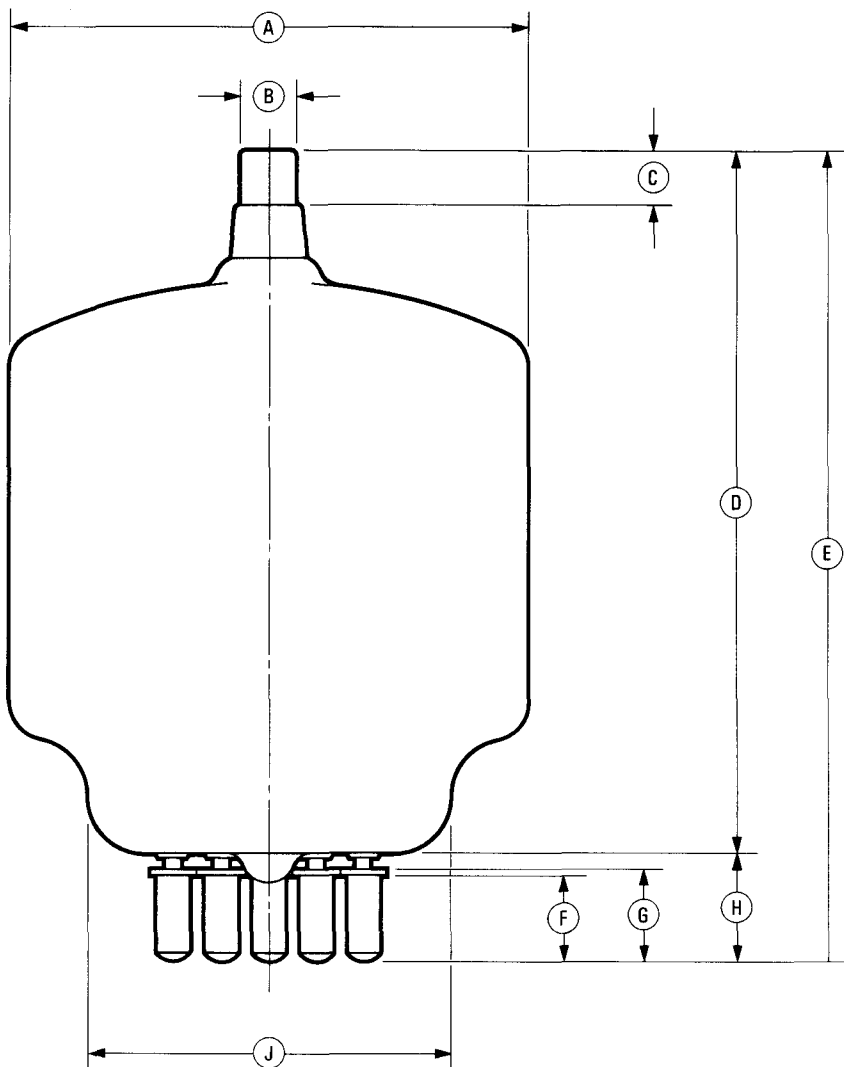
Filament Operation: The rated filament voltage for the 3-500Z is 5.0 volts. Filament voltage, as measured at the socket, must be maintained within the range of 4.75 to 5.25 volts to obtain maximum tube life.

Intermodulation Distortion: Typical operating conditions with distortion values included are the result of data taken during actual operation at 2 megahertz. Intermodulation values listed are those measured at the full peak envelope power noted.

Input Circuit: When the 3-500Z is operated as a grounded-grid r-f amplifier, the use of a resonant tank in the cathode circuit is recommended in order to obtain greatest linearity and power output. For best results with a single-ended amplifier it is suggested that the cathode tank circuit operate at a "Q" of five or more.

Special Applications: If it is desired to operate this tube under conditions widely different from those given here, write to Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California, for information and recommendations.

3-500Z OUTLINE DRAWING AND PIN CONNECTIONS



DIMENSIONS IN INCHES

DIMENSIONAL DATA

REF.	MIN.	MAX.	NOM.
A		3 7/16 D	
B			.355 D
C			.355
D			4 27/32
E	5 3/8	5 7/8	
F	1/2	5/8	
G	9/16	11/16	
H			25/32
J		2-1/2 D	
K			30° TYP.
L	.185 D	.191 D	
M			11/4 D.P.C.

NOTE:

BASE PINS (L) ARE SO ALIGNED THAT THEY CAN BE FREELY INSERTED INTO A GAUGE 1/4" THICK WITH HOLE DIA'S OF .204 LOCATED ON TRUE CENTERS BY THE GIVEN DIMENSIONS (K) & (M).

