

PL3-500Z HIGH-MU POWER TRIODE



The Penta PL3-500Z is a high-mu power triode with a maximum plate dissipation rating of 500 watts. Cooling is by radiation and forced air through the base, along the envelope, and over the plate seal and radiator-type plate connector. It is intended for use as a zero-bias Class AB2 amplifier in radio-frequency or audio applications. By eliminating the bias supply, zero grid bias operation greatly simplifies circuitry design. When operated in a cathode-driven circuit, a power gain of as much as twenty times is achievable.

ELECTRICAL CHARACTERISTICS

Filament

Voltage $\pm 5\%$	5.0 V
Current @ 5.0 volts	14.6 A

Average Amplification Factor	130
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Direct Interelectrode Capacitances-grounded filament

Input	8.3 pF
Output	0.07 pF
Feedback	4.7 pF

Direct Interelectrode Capacitances-grounded grid

Input	8.3 pF
Output	4.7 pF
Feedback	0.07 pF

Maximum Rating Frequency

CW	110 MHz
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MECHANICAL CHARACTERISTICS

Base	5 Pin Special
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Net Weight	7.0 Ounces
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Maximum Overall Dimensions

Length	6.10 Inches
Diameter	3.44 Inches

Mounting Position	Vertical, base up or down
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Maximum Operating Temperatures

Base Seals	200°C.
Plate Seals	225°C.

Cooling	Radiation and forced air
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Recommended Socket Chimney Combination	PL410 & PL406
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P E N T A L A B O R A T O R I E S , I N C .

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ELECTRON TUBES FOR INDUSTRY



PL3-500Z

COOLING

Forced air cooling of the base, base seals, envelope, plate seal, and plate connector is required for all classes of operation when the PL3-500Z is operated at or near the maximum plate dissipation rating. A total of 14 c.f.m. of cooling air, properly distributed to the base, envelope, and plate seal area is required. Such cooling is most conveniently provided by means of a pressurized chassis upon which the standard tube socket is mounted in a special cut-out, in conjunction with a PL406 air-control chimney. Alternatively, a commercially available air-distribution type socket may be used with the PL3-500Z.

Air at the proper pressure and quantity may be obtained from a small centrifugal blower rated at about 100 c.f.m. of free air. Cooling is adequate when the base seal temperatures do not exceed 200° C and the plate seal temperature does not exceed 225° C. At lower dissipation ratings, it may be possible to operate the PL3-500Z with less extensive cooling apparatus; however, in all cases, air flow rates in excess of the minimum requirements will tend to prolong the tube's useful life.

MOUNTING

It is mandatory that the PL3-500Z be operated in a vertical position, with the base either up or down. Severe shocks or vibration will result in damage to the tube, and should be avoided.

ZERO-BIAS OPERATION

At plate voltages exceeding 2500 volts, operation at zero bias is not recommended as maximum plate dissipation may be exceeded. A zener diode placing positive bias on the cathode or other fixed voltage source may be used to reduce zero signal plate current at plate potentials exceeding 2500 volts.

CLASS C OPERATION

Although designed for linear amplifier use, the PL500Z may be operated as a class C power amplifier or oscillator or as a plate-modulated RF power amplifier. When operating at plate voltages of below 3000 volts, the zero bias characteristic of the tube can be advantageous.

INPUT CIRCUIT

In order to maintain the highest degree of linearity and greatest power output when the PL3-500Z is used as a grounded grid RF amplifier, the use of a resonant tank in the cathode circuit is advised. With a single ended amplifier, for best results it is recommended that the cathode tank circuit operate at a Q of five or greater.

CAUTION:

As is the case with all vacuum tubes, the PL3-500Z is pumped to a very high vacuum. As a result, severe shocks to the fragile glass envelope will result in breakage, followed by implosion. Safety glasses and protective clothing should be worn to provide protection from flying glass fragments in the event of breakage.



PL3-500Z

TYPICAL OPERATION--CATHODE DRIVEN RF LINEAR AMPLIFIER

Plate Voltage	1500	2000	2500	3000	3500	Vdc
Cathode Voltage	0	0	0	+10	+15	Vdc
Zero Signal Plate Current	65	95	130	62	53	mAdc
Single-Tone Plate Current (CW)	400	400	400	400	400	mAdc
Two-Tone Plate Current	260	270	280	268	262	mAdc
Single-Tone Grid Current	130	130	120	108	108	mAdc
Two-Tone Grid Current	80	80	70	60	58	mAdc
Single-Tone Power Input	600	800	1000	1200	1400	W
Useful Output Power (CW or PEP)	330	500	600	740	890	W
Resonant Load Impedance	1600	2750	3450	4200	5000	Ω
Intermodulation Distortion Products						
Third Order	-46	-38	-33	-40	-40	db
Fifth Order	---	---	---	-46	-45	db
Driving Impedance	94	102	100	115	115	Ω
Maximum Signal Driving Power	49	49	46	46	46	W

MAXIMUM RATINGS

DC Plate Voltage	-----	4000 Volts
DC Plate Current	-----	0.4 Ampere
Plate Dissipation	-----	500 Watts
Grid Dissipation	-----	20 Watts

TYPICAL OPERATION--RF POWER AMPLIFIER OR OSCILLATOR

	GRID DRIVEN		CATHODE DRIVEN		
Plate Voltage	3000	3500	3000	3500	Vdc
Grid Voltage	-10	-75	-10	-75	Vdc
Plate Current	350	300	333	350	mAdc
Grid Current	115	115	108	118	mAdc
Peak RF Cathode/Grid Voltage	110	187	95	200	V
Approximate Driving Power	14	22	35	81	W
Plate Input Power	1050	1050	1000	1225	W
Plate Dissipation	330	200	300	305	W
Useful Output Power	720	850	700	920	W
Resonant Load Impedance	4200	5700	4800	5500	Ω

MAXIMUM RATINGS

DC Plate Voltage	-----	4000 Volts
DC Plate Current	-----	0.35 Ampere
Plate Dissipation	-----	500 Watts
Grid Dissipation	-----	20 Watts



PL3-500Z

TYPICAL OPERATION--PLATE MODULATED GRID DRIVEN RF POWER AMPLIFIER

Plate Voltage	-----	3000 Vdc
Grid Voltage	-----	-100 Vdc
Plate Current	-----	275 mAdc
Grid Current	-----	120 mAdc
Peak RF Grid Voltage	-----	200 V
Calculated Driving Power	-----	25 W
Plate Input Power	-----	825 W
Plate Dissipation	-----	185 W
Plate Output Power	-----	640 W

MAXIMUM RATINGS

DC Plate Voltage	-----	3000 Volts
DC Plate Current	-----	0.275 Ampere
Plate Dissipation	-----	330 Watts
Grid Dissipation	-----	20 Watts

TYPICAL OPERATION--AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR

Plate Voltage	-----	3000 Volts
Grid Voltage	-----	0 Ampere
Zero-Signal Plate Current	-----	300 mAdc
Maximum Signal Plate Current	-----	770 mAdc
Maximum Signal Grid Current	-----	244mAdc
Peak AF Grid Voltage	-----	100 V
Peak Driving Power	-----	25 W
Plate Input Power	-----	2310 W
Maximum Signal Plate Dissipation	-----	890 W
Plate Output Power	-----	1420 W
Plate to Plate Load Resistance	-----	8600 Ω

MAXIMUM RATINGS

DC Plate Voltage	-----	4000 Volts
DC Plate Current	-----	0.4 Ampere
Plate Dissipation	-----	500 Watts
Grid Dissipation	-----	20 Watts



PL3-500Z

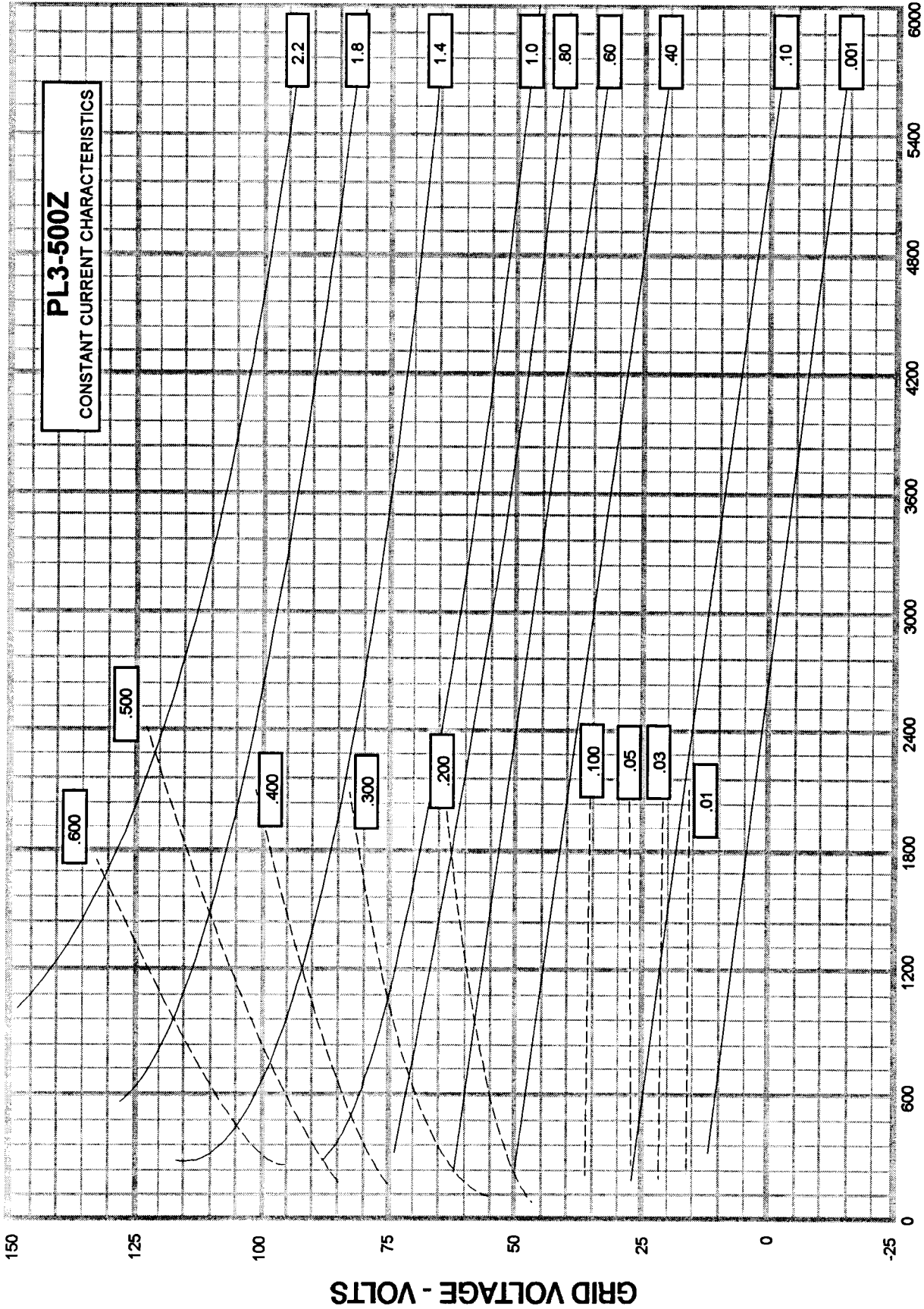


PLATE VOLTAGE - VOLTS