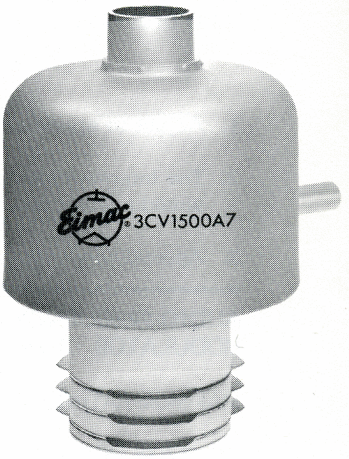
3CV1500A7

TECHNICAL DATA

HIGH-MU
POWER TRIODE

The 3CV1500A7 is an integral-boiler, ceramic/metal, vapor cooled zero-bias triode, intended for Class AB2 linear amplifier service in either grid driven or cathode driven configuration. Except for the anode dissipation rating, the 3CV1500A7 is electrically identical to the EIMAC 8283/3CX-1000A7.

The 3CV1500A7 is especially recommended when the ambient noise level must be reduced to a minimum, since high-pressure/high-volume forced-air cooling is not required.



GENERAL CHARACTERISTICS[1]

ELECTRICAL

Filament: Thoriated-tungsten Mesh		
Voltage	5.0 ± 0.25	V
Current, at 5.0 volts	30	A
Amplification Factor (average)	200	
Direct Interelectrode Capacitances (grounded filament) [2]		
Cin	32.0	pF
Cout	0.15	pF
Cgp	14.0	pF
Direct Interelectrode Capacitances (grounded grid) [2]		
Cin	32.0	pF
Cout	14.0	pF
Cpk	0.15	pF
Frequency of Maximum Rating:		
CW	220	MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as a 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 shielded fixture in accordance with Electronic Industries Association Standard RS-191.

MECHANICAL

Maximum Overall Dimensions:	
Length	5.110 in; 129.8 mm
Diameter	3.355 in; 85.2 mm
Net Weight	2.38 lb; 1.08 kg
Operating Position	Vertical, base down
Maximum Operating Temperature:	
Ceramic/metal seals	250°C
Cooling	Vapor and Forced Air
Base	Special Breechlock
Recommended Socket	EIMAC SK-861

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RADIO FREQUENCY LINEAR AMPLIFIER CATHODE DRIVEN Class AB_2

MAXIMUM RATINGS:

DC PLATE VOLTAGE	3500	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	45	WATTS

1. Adjust to specified zero-signal dc plate current.
2. The intermodulation distortion products are referenced against one tone of a two equal tone signal.
3. Approximate values.

TYPICAL OPERATION (Frequencies to 30 MHz)
Class AB2 Peak Envelope or Modulation Crest Conditions

Plate Voltage	2000	2500	3500	Vdc
Grid Voltage[1]	0	0	-12	Vdc
Zero-Signal Plate Current	238	305	129	mAdc
Single Tone Plate Current	875	800	857	mAdc
Two-Tone Plate Current	600	585	590	mAdc
Single-Tone Grid Current[3]	230	205	225	mAdc
Two-Tone Grid Current[3]	130	120	120	mAdc
Peak rf Drive Voltage[3]	80	74	110	v
Peak Driving Power	80	60	100	w
Plate Dissipation	800	830	940	W
Useful Output Power	940	1170	2060	W
Resonant Load Impedance	1100	1670	2300	Ω
Intermodulation Distortion Products[2]				
3rd Order	-29	-31	-31	db
5th Order	-37	-40	-39	db

AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR Class AB_2, Grid Driven(Sinusoidal Wave)

MAXIMUM RATINGS (Per Tube)

DC PLATE VOLTAGE[1]	3500	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	45	WATTS

1. See zero-bias operation in Application Section.
2. Approximate value.
3. Per Tube.
4. Nominal drive power is one-half peak power.

TYPICAL OPERATION (Two Tubes)

Plate Voltage	2000	2500	Vdc
Grid Voltage	0	0	Vdc
Zero-Signal Plate Current	400	500	mAdc
Max. Signal Plate Current	2.0	2.0	Adc
Max. Signal Grid Current[2]	590	480	mAdc
Peak af Grid Voltage[3]	95	90	v
Peak Driving Power[4]	25	44	w
Plate Input Power	4000	5000	W
Max. Signal Plate Dissipation	1650	1900	W
Plate Output Power	2350	3100	W
Load Resistance (plate to plate)	1900	2580	Ω

NOTE: TYPICAL OPERATION data are obtained by measurement or calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid current. The grid current which results when the desired plate current is obtained is incidental and varies from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. If grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater: Current at 5.0 volts	28.0	33.0	A
Cathode Warmup Time	5	---	sec.
Interelectrode Capacitance[1] (grounded grid connection)			
Cin	29.0	35.0	pF
Cout	12.0	16.0	pF
Cpk	---	0.2	pF

1. Capacitance values are for a cold tube as measured in a special shielded fixture in accordance with Electronic Industries Association Standard RS-191.

APPLICATION

MECHANICAL

MOUNTING - The 3CV1500A7 must be mounted with its axis vertical, base down, with sufficient clearance for an insulated makeup water line to connect to the side of the integral anode boiler and an outlet steam line to attach to the top of the boiler. The use of the EIMAC socket SK-861 is recommended.

COOLING - Cooling is accomplished by the presence of distilled water at a controlled level in the integral anode boiler. The energy dissipated by the anode causes the water to boil at the anode surface, to be converted into steam and carried away to a condenser. This boiling action keeps the anode surface at approximately 100°C.

The water in the boiler must be maintained at the correct level, as shown on the outline drawing for the tube. This is normally accomplished with a special control unit, mounted with the correct relationship to the tube so as to maintain the water level in the tube boiler at the specified level. A condenser unit is used to convert the steam back to water, which is then returned to reservoir/control-box/boiler system.

Forced-air cooling of the tube base is required, with 15 cfm minimum directed across and through the socket and base of the tube. Air flow should be applied simultaneously with the application of electrode voltages, including the filament, and may be removed simultaneously with the removal of filament voltage.

ELECTRICAL

FILAMENT - Rated filament voltage for the 3CV1500A7 is 5.0 volts. Filament voltage, as measured at the socket, should be maintained at this value to obtain optimum performance and maximum tube life. In no case should it be allowed to deviate from 5.0 volts by more than plus or minus five per cent.

INPUT CIRCUIT - When the 3CV1500A7 is operated as grounded-grid rf amplifier, the use of a resonant tank in the cathode circuit is recommended 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.

CLASS-C OPERATION - Although designed for Class-AB2 service, the 3CV1500A7 may be operated as a Class-C power amplifier or oscillator, or as a plate-modulated rf amplifier. The zero-bias characteristic can be used to advantage in Class-C amplifiers by employing only grid leak bias. If driving power fails, 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 2500 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 2500 volts. Straight Class-C or Class-AB2 operation is, of course, permissible up to 3500 volts where other ratings are not exceeded. Higher plate voltage may be used with the proper bias.

PLATE DISSIPATION - The plate dissipation of 1500 watts attainable through vapor cooling provides a large margin of safety in most applications. The rating may be exceeded during tuning for brief periods.

Since the tube anode is usually at high potential to ground, water and steam connections to the anode are made through insulating tubing. These insulating sections should be long enough so that column resistance is above 100,000 ohms per 1000 supply volts. It is essential that high purity water be used to minimize power loss and corrosion of metal fittings. Good distilled or deionized water will have a resistance of 1 to 2 megohms per cm3. Water should be discarded if resistivity falls to 50,000 ohms cm3.

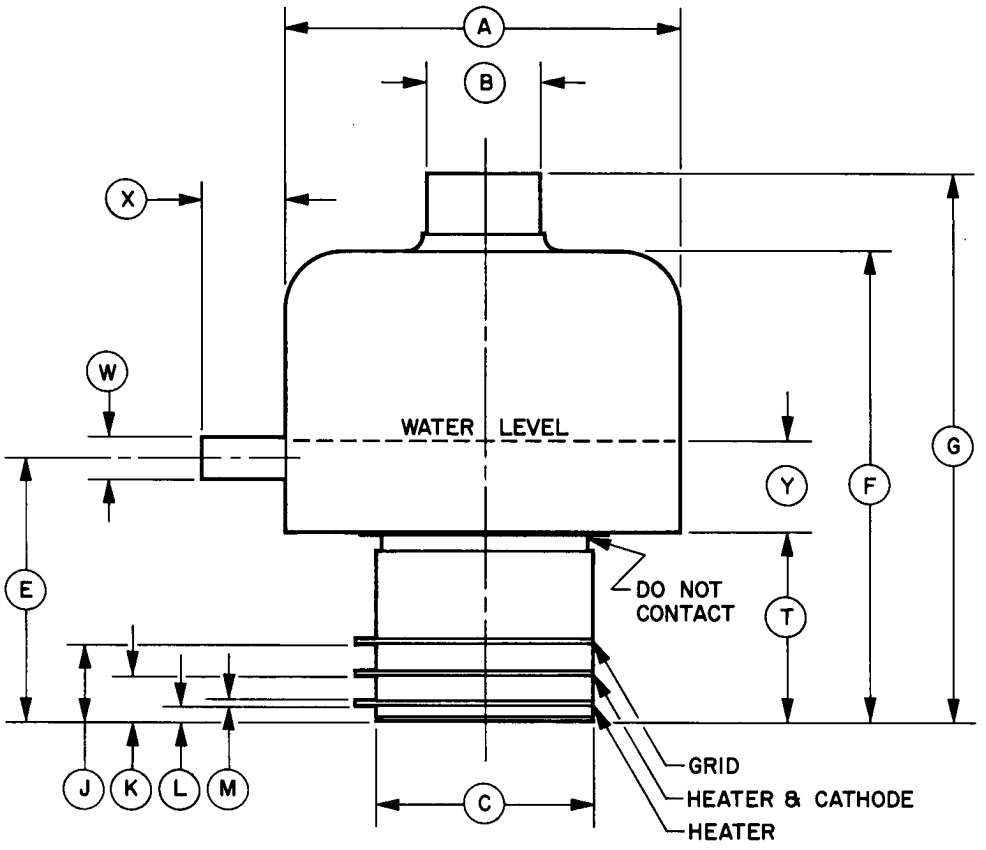
HIGH VOLTAGE - Normal operating voltages used with the 3CV1500A7 are deadly, and the equipment must be designed properly and operating precautions must be followed. Design all equipment so that no one can come in contact with high voltages. All equipment must include safety enclosures for high-voltage circuits and terminals, with interlock switches to open primary circuits of the power supply and to discharge high-voltage condensers whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that HIGH VOLTAGE CAN KILL.

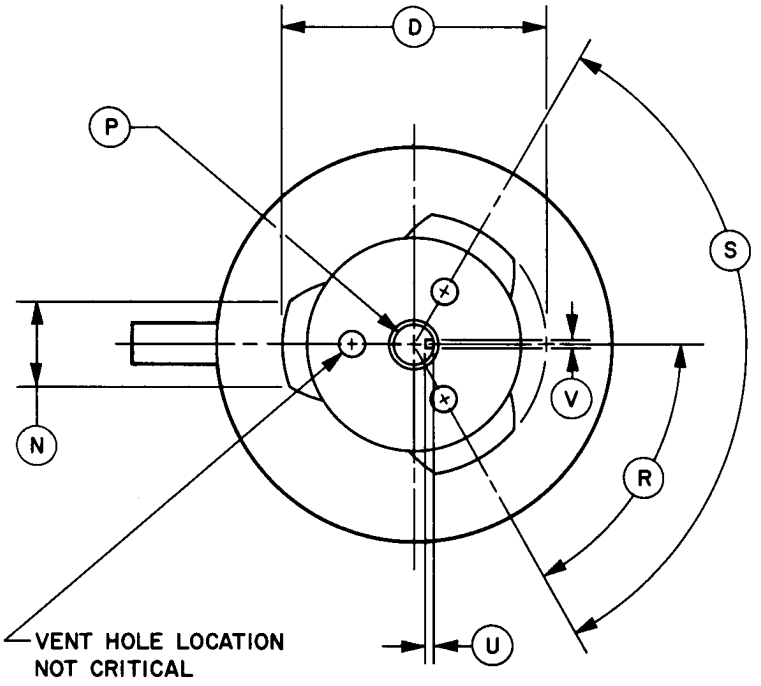
RADIO FREQUENCY RADIATION - Avoid exposure to strong rf fields even at relatively low frequency. Absorption of rf energy by human tissue is dependent on frequency. Under 30 MHz, most of the energy will pass completely through the human body with little attenuation or heating effect. Public health agencies are concerned with the hazard, however, even at these frequencies, and it is worth noting that some commercial dielectric heating units actually operate at frequencies as low as the 13 and 27 MHz bands.

INTERELECTRODE CAPACITANCE - The actual internal interelectrode capacitance of a tube is influenced by many variables in most applications, such as stray capacitance to the chassis, capacitance added by the socket used, stray capacitance between tube terminals, and wiring effects. To control the actual capacitance values within the tube, as the key component involved, the industry and the Military Services use a standard test procedure as described in Electronic Industries Association Standard RS-191. This requires the use of specially constructed test fixtures which effectively shield all external tube leads from each other and eliminates any capacitance reading to "ground". The test is performed on a cold tube. Other factors being equal, controlling internal tube capacitance in this way normally assures good interchangeability of tubes over a period of time, even when the tube may be made by different manufacturers. The capacitance values shown in the manufacturer's technical data, or test specifications, normally are taken in accordance with Standard RS-191.

The equipment designer is therefore cautioned to make allowance for the actual capacitance values which will exist in any normal application. Measurements should be taken with the socket and mounting which represent approximate final layout if capacitance values are highly significant in the design.

SPECIAL APPLICATION - If it is desired to operate this tube under conditions widely different from those listed here, write to Power Grid Tube Division, EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070, for information and recommendations.

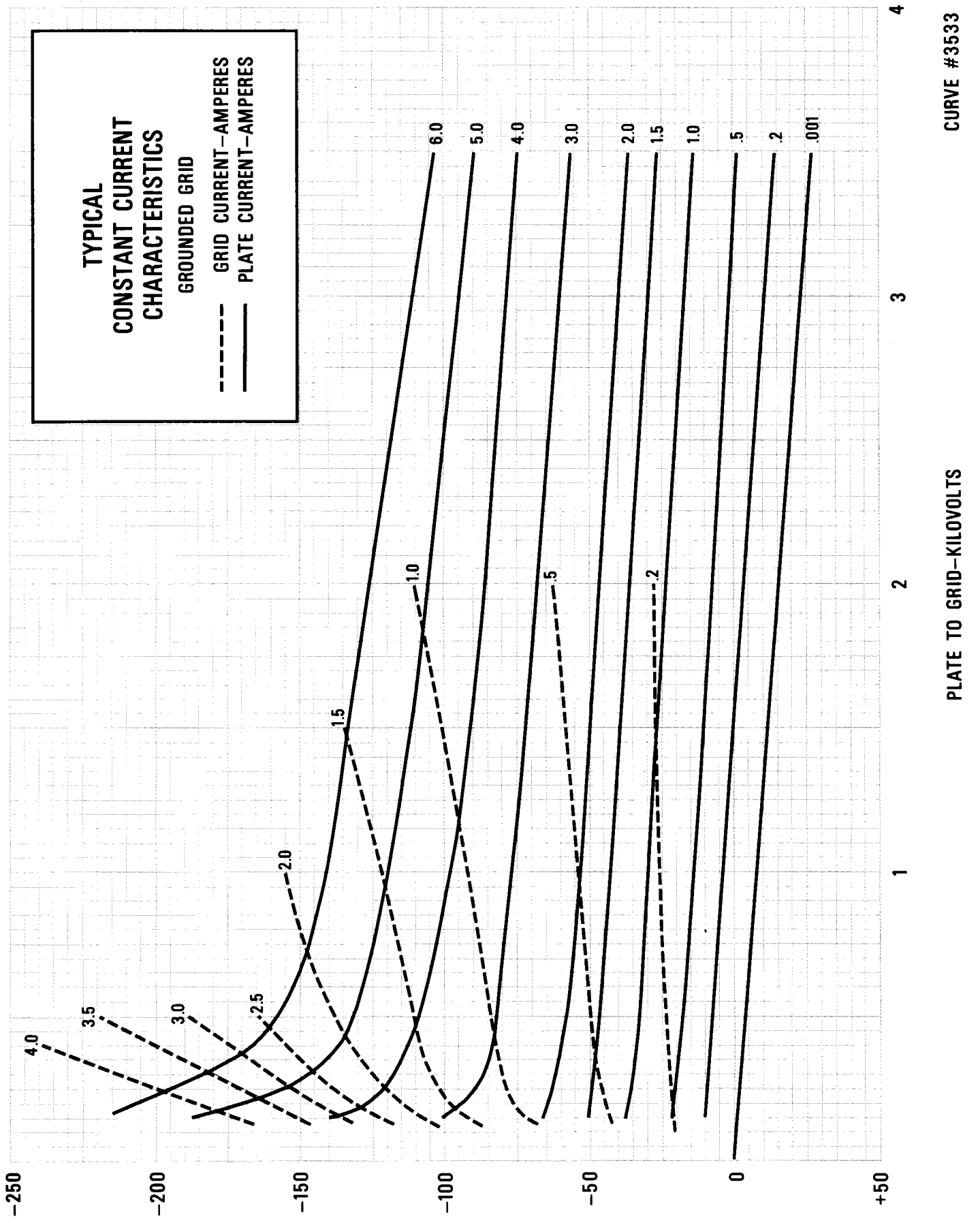




DIMENSIONAL DATA

DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	--	--	3.355	--	--	85.22
B	--	--	1.000	--	--	25.40
C	1.870	1.900	--	47.50	48.26	--
D	2.250	2.300	--	57.15	58.42	--
E	--	--	2.400	--	--	60.96
F	4.190	4.315	--	106.43	109.60	--
G	4.850	5.110	--	123.19	129.79	--
J	0.690	0.710	--	17.53	18.03	--
K	0.415	0.435	--	10.54	11.05	--
L	0.140	0.165	--	3.57	4.19	--
M	0.020	0.030	--	0.50	0.76	--
N	0.700	0.800	--	17.78	20.32	--
P	0.314	0.316	--	7.98	8.03	--
R	55°	65°	--	55°	65°	--
S	115°	125°	--	115°	125°	--
T	--	--	1.720	--	--	43.69
U	0.025	0.048	--	0.64	1.22	--
V	0.045	0.070	--	1.14	1.78	--
W	--	--	0.375	--	--	9.53
X	--	--	0.750	--	--	19.05
Y	0.500	1.000	--	--	--	--

NOTES:
1. REF. DIMENSIONS ARE FOR INFO. ONLY & ARE NOT REQUIRED FOR INSPECTION PURPOSES.


TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
GROUNDED GRID
GRID CURRENT–AMPERES
PLATE CURRENT–AMPERES
CATHODE TO GRID–VOLTS
PLATE TO GRID–KILOVOLTS
CURVE #3533
−250
−200
−150
−100
−50
0
+50
1
2
3
4
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
.2
6.0
5.0
4.0
3.0
2.0
1.5
1.0
.5
.2
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