



YU-338 PLANAR TRIODE

The YU-338 is a planar triode of ceramic/metal construction and rugged design for use in highly linear amplifier service up to 1.5 GHz.

The YU-338 may be used as an amplifier or an oscillator in continuous wave (CW) or grid/plate-pulsed mode. In TV translator service, which simultaneously transmits video and aural signals in the same channel, the intermodulation distortion level is better than -54 dB.

GENERAL CHARACTERISTICS¹

ELECTRICAL

Cathode: Oxide Coated, Unipotential

Heater Voltage	5.7 ± 0.15 Volts
Heater Current at 5.7 Volts	5.6 Amperes
Amplification Factor (Average)	80
Transconductance (Average):	
I _b =250 mA	45 mmhos

Direct Interelectrode Capacitance² (Grounded Cathode):

C _{in}	15.2 pF
C _{out}	0.065 pF
C _{gp}	7.0 pF
Frequency of Maximum Rating	1.5 GHz

MECHANICAL

Maximum Overall Dimensions:

Length	3.189 in; 81.0 mm
Diameter	3.200 in; 81.3 mm
Net Weight	42.3 oz; 1200 gm
Operating Position	Any

Maximum Operating Temperature:

Ceramic/Metal Seals	250°C
Cooling	Forced Air

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Heater: Current at 5.7 Volts	5.5	5.8	A
Cathode Warm-up Time	300	—	Sec

Interelectrode Capacitance²
(Grounded Cathode Connection):

C _{in}	14.5 - 16.0 pF
C _{out}	0.07 pF
C _{gp}	6.5 - 7.5 pF

¹ Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. Varian Power Grid Tube Products should be consulted before using this information for final equipment design.

² Capacitance values are for a cold tube as measured in a special shielded fixture. When the cathode is heated to the proper temperature, the grid-cathode capacitance will increase from the cold value by approximately 2 pF due to thermal expansion of the cathode.

**YU-338****AMPLIFIER OR OSCILLATOR****ABSOLUTE MAXIMUM RATINGS:**

DC Plate Voltage	3000 Volts
Peak Pulse Plate Voltage	3500 Volts
DC Plate Current	0.6 Ampere
Plate Dissipation	1500 Watts
DC Grid Voltage	-200 Volts
Peak Grid to Cathode Voltage	-300, +30 Volts
DC Grid Current	0.05 Ampere
Grid Dissipation	1.5 Watts

TYPICAL OPERATION:

Class A linear amplifier in TV translator service, aural and video signals simultaneously.

Frequency	760 MHz
Heater Voltage	5.7 Volts
DC Plate Voltage	2400 Volts
DC Grid Voltage (Approximate)	22 Volts

DC Plate Current	350 Milliampere
Gain	16 dB
Power Output (Peak Sync)	200 Watts
IMD (3-Tone Test)	-54 dB ³

³ Typically, IMD 3-tone test data observed are -55 to -57 dB depending on the cavity/circuit and adjustments made.

Typical Operation values are obtained by measurement or by calculation from published characteristic curves. To obtain the specified plate current at the specified bias and plate voltages, adjustment of the rf grid voltage is assumed. If this procedure is followed, there will be little variation in output power when the tube is replaced, even though there may be some variation in grid current. The grid current which occurs when the desired plate current is obtained is incidental and varies from tube to tube. These current variations cause no performance degradation providing the circuit maintains the correct voltage in the presence of the current variations.

APPLICATION**MECHANICAL**

For general application information, please refer to the Planar Triode Operating Instructions booklet. These operating instructions should be consulted before designing new applications around the YU-338 tube.

The cathode and grid flanges should not be altered in any way, such as by machining or filing, since the final seal could be damaged.

ELECTRICAL

ABSOLUTE MAXIMUM RATINGS - Values shown for each type of service are based on the "absolute system" and are not to be exceeded under any service conditions. These ratings are limiting values outside which the serviceability of the tube may be impaired. In order not to exceed absolute ratings, the equipment designer is responsible for determining an average design value for each rating by a safety factor so that the absolute values will never be exceeded under usual conditions of supply voltage variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

HEATER VOLTAGE - One of the most important factors affecting tube life and ultimate performance is the heater voltage. The heater voltage value indicated under GENERAL CHARACTERISTICS/ELECTRICAL is the nominal value used when evaluating the tube during the manufacturing process.

Optimum heater voltage for a specific use may, or may not be, the same value. Due to the many possible applications, no general definition of optimum heater voltage can be given. Many applications require low heater voltage to assure the longest possible tube life. When the heater of a planar triode is energized by a dc source, its useful life is always shorter than with equivalent ac operation. Heater life under dc conditions is extended by connecting the common heater/cathode terminal to the positive side of the heater supply.

The tube's initial cold heater resistance is such that damaging filament current in excess of 25 amps can occur without current limiting. When operated after the 300 second warm-up period, the heater current is within the noted range values. To eliminate possible damage to the tube, a maximum of 20 amps peak for 500 milliseconds is recommended, and a commercial soft-start thermistor, or equivalent current limiting device, is recommended.

INTERLOCKS - An interlock device will ensure that cooling water and air flow is established before application of electrical power, including the heater. The circuit should be arranged so that rf drive cannot be applied in the absence of normal plate voltage.

INTERELECTRODE CAPACITANCE - In most applications, the actual internal interelectrode capacitance of a tube is influenced by variables such as stray capacitance to the chassis; capacitance added by the socket used; stray capacitance between the tube terminals; and wiring effects. To measure the actual capacitance values within the tube and reduce stray capacitance to a minimum, the

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industry and military services use a standard test procedure described in Electronic Industries Association Standard RS-191. This procedure requires a test fixture to effectively shield all external tube leads from each other and eliminate any capacitance reading to "ground". This test is performed on a cold tube. The capacitance values shown in the manufacturer's technical data or test specifications are normally taken in accordance with Standard RS-191.

The equipment designer is cautioned to make allowance to 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.

DISSIPATION RATINGS - Maximum dissipation ratings must be respected to avoid tube damage. An exception is plate dissipation which may be permitted to rise above the rated maximum for up to 10 seconds, during tuning for instance.

GRID OPERATION - The maximum control grid dissipation is 1.5 Watts which is approximately determined by the product of the dc grid current and the peak positive grid voltage. A protective spark-gap device should be connected between the control grid and the cathode to guard against excessive voltage.

OPERATING HAZARDS

Proper use and safe operating practices while using power tubes are the responsibility of equipment manufacturers and users of these tubes. All persons who work with or are exposed to power tubes or equipment which utilizes such tubes must take precautions to protect themselves against possible serious bodily injury. Do not be careless around such products.

The operation of this tube may involve the following hazards, any one of which, in the absence of safe operating practices and precautions, could result in serious harm to personnel. Please review the following hazards as well as the detailed operating hazards sheet enclosed with each tube or request a copy from Varian.

CAUTION-HIGH VOLTAGE - Operating voltage for the YU-338 can be deadly, so the equipment must be designed properly and operating precautions must be followed. Design equipment so that no one can come in contact with high voltages. All equipment must include safety enclo-

FAULT PROTECTION - In addition to the normal plate over-current and coolant interlocks, the tube must be protected from damage caused by an internal arc which may occur at high plate voltage. No more than four (4) joules of energy may be dissipated in the tube structure.

A protective resistance of 10 - 50 ohms should be connected in series with the tube anode (in the B+ lines) to absorb power supply stored energy in the event of an internal arc occurrence. If the power supply stored energy is high, it is recommended that an electronic crowbar be utilized in the circuitry design. This type circuit will discharge power supply capacitors in a few microseconds after the start of an arc.

To conduct a protection test to verify adequate tube protection, short circuit the HV power supply to ground through a vacuum switch or other suitable high-speed, high-voltage switch and a 6-inch (15.24 cm) length of #40 AWG (0.070 mm) soft copper wire. If the total energy delivered is less than four (4) joules, the wire will remain intact, verifying adequate protection.

For more detailed information, Application Bulletin #17, "Fault Protection," is available upon request.

SPECIAL APPLICATIONS - To operate this tube under conditions different from those specified in this datasheet, contact the Varian Power Grid Tube Products marketing department, 301 Industrial Way, San Carlos, CA 94070, 415• 592-1221 for information and recommendations.

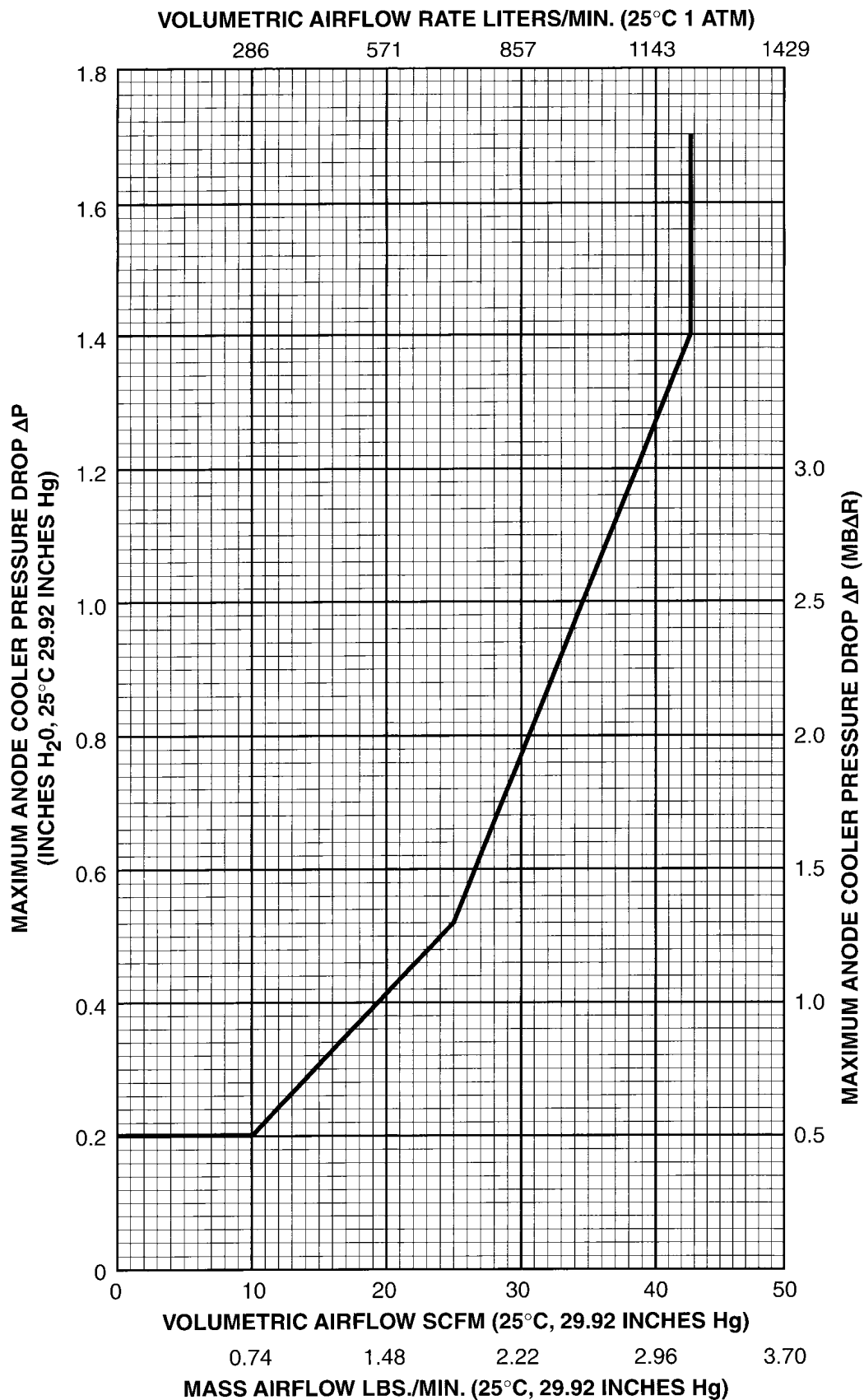
asures for high voltage circuits and terminals, with interlock switches to open the primary circuits of the power supply and to discharge high voltage capacitors whenever access doors are opened. Interlock switches must not be bypassed or "cheated" to allow operation with access doors open. Always remember that **HIGH VOLTAGE CAN KILL.**

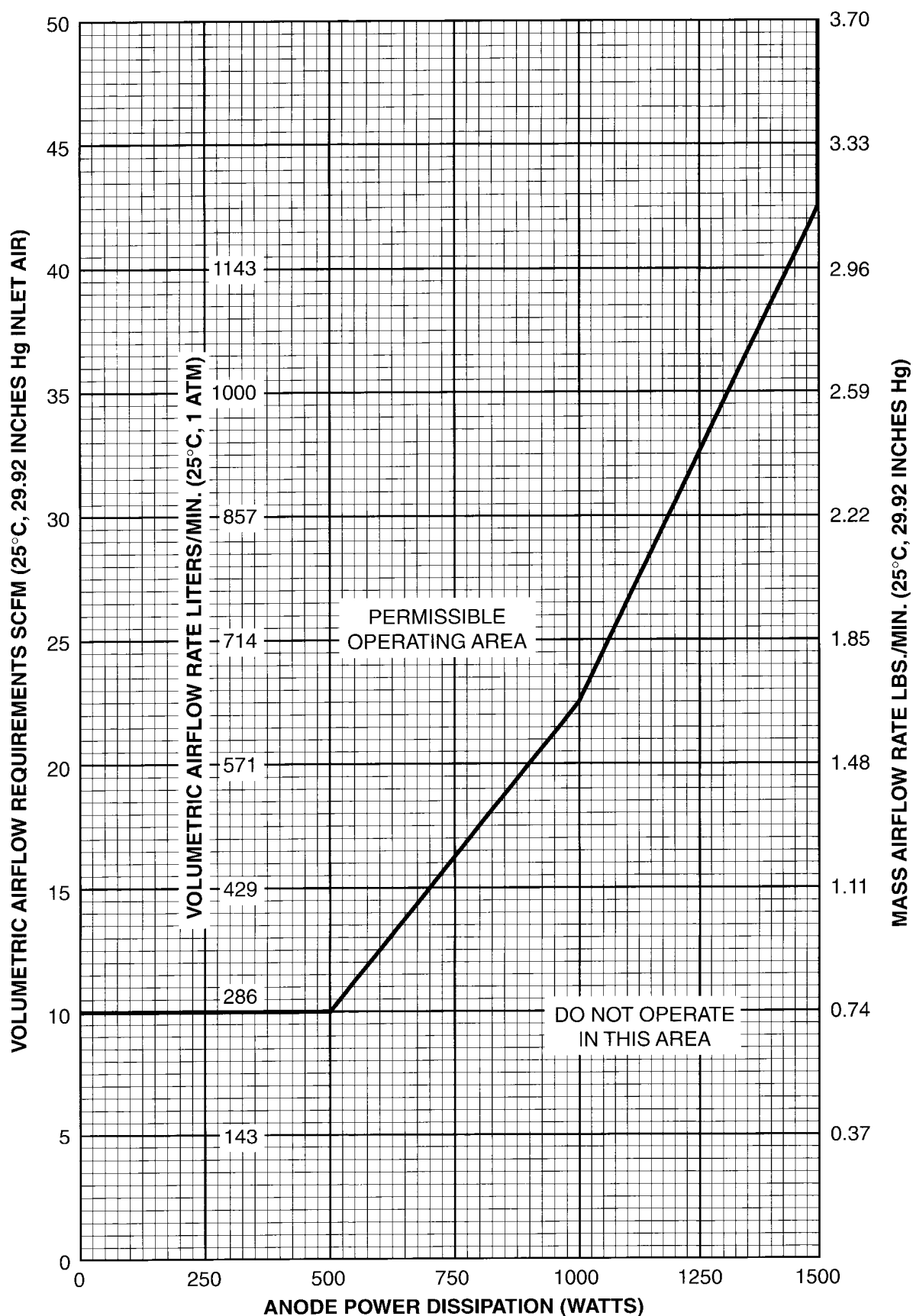
RF RADIATION - Exposure to strong rf fields should be avoided, even at relatively low frequencies. The dangers of rf radiation are more severe at UHF and microwave frequencies and can cause serious bodily and eye injuries. **CARDIAC PACEMAKERS MAY BE AFFECTED.**

HOT SURFACES - External surfaces of the tube may reach temperatures up to 200° C and higher. In addition to the anode, the cathode insulator and cathode/heater surfaces may remain hot for an extended time after the tube is shut off. To prevent serious burns, take care to avoid any bodily contact with these surfaces both during, and for a reasonable cool-down period after, tube operation.



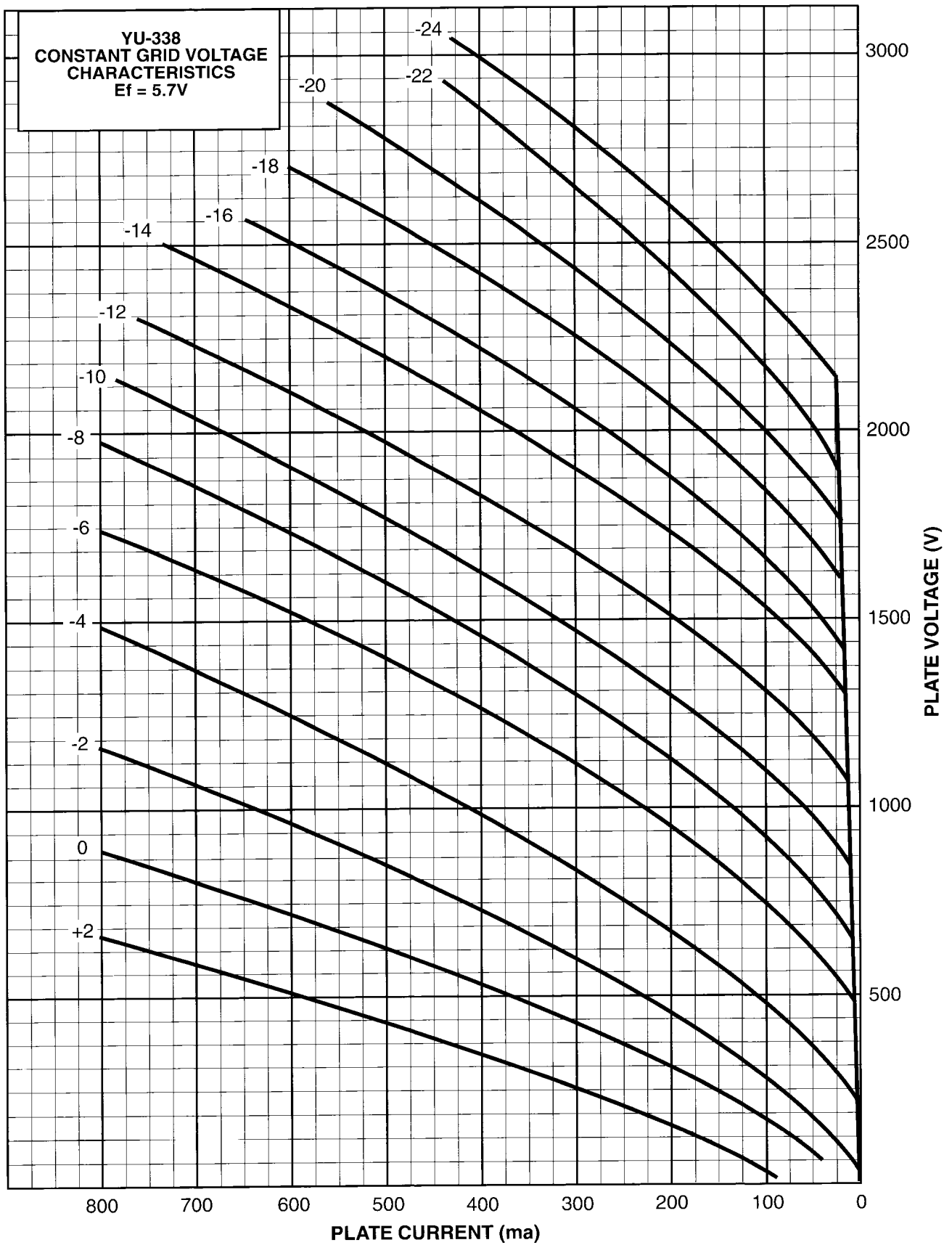
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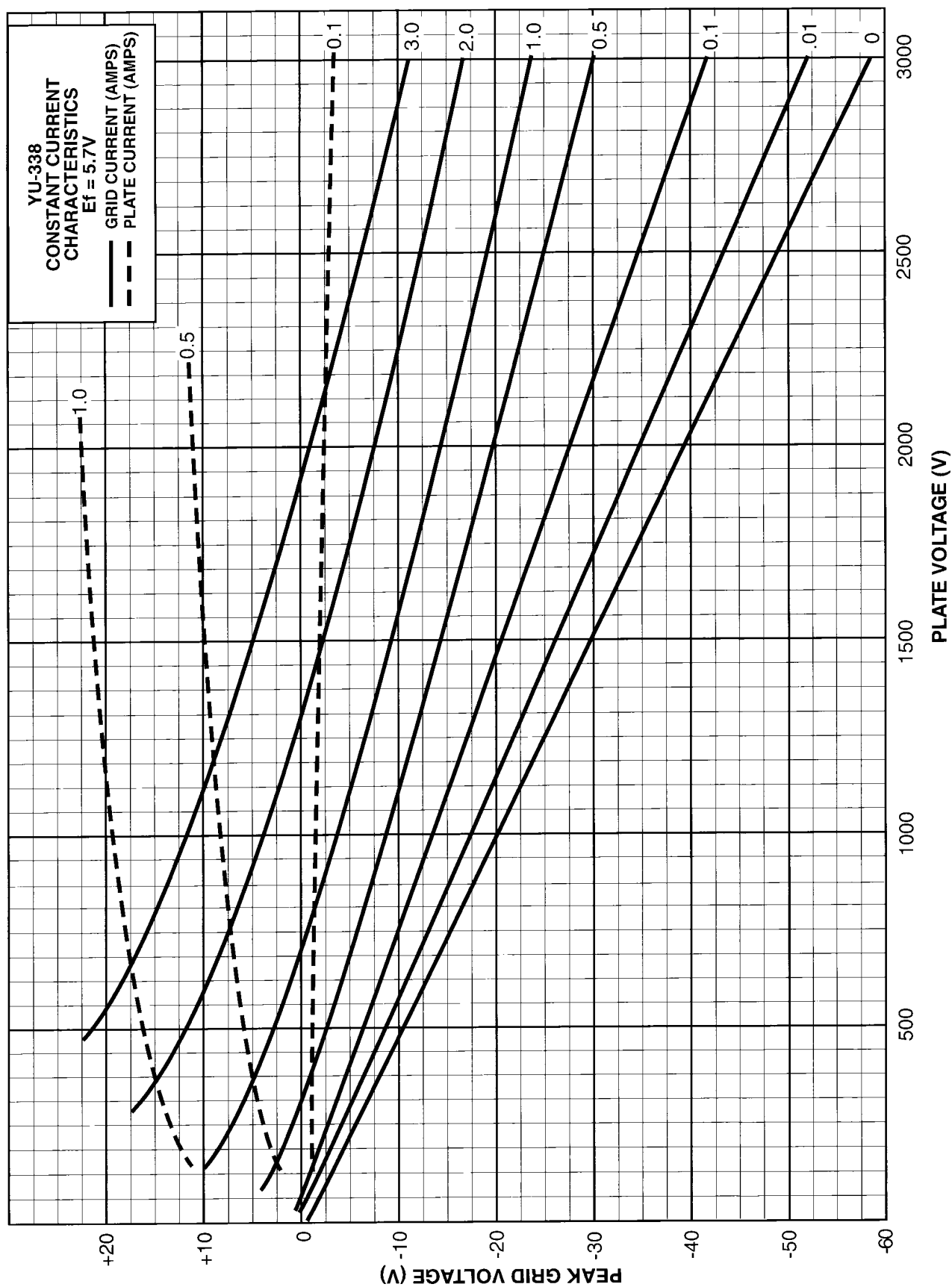


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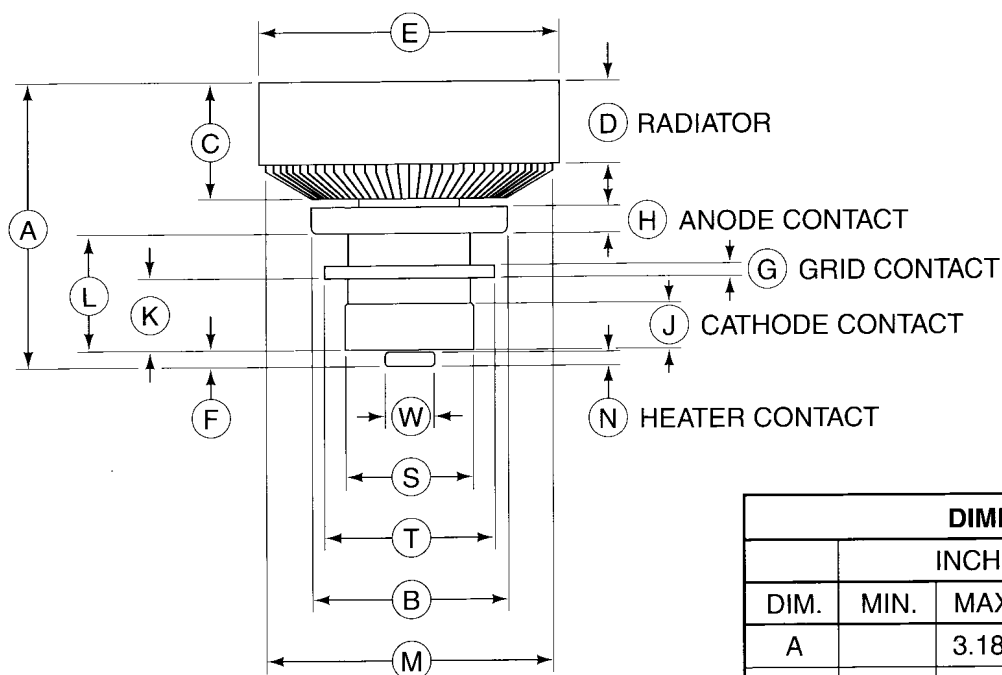
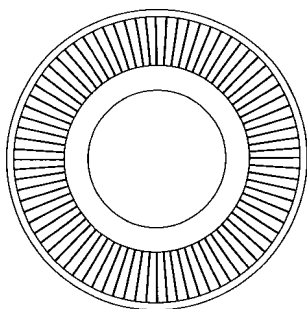


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DIMENSIONAL DATA						
	INCHES			MILLIMETERS		
DIM.	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A		3.189			81.00	
B	2.100	2.122		53.34	53.90	
C	1.240	1.260		31.50	32.00	
D	.865	.885		21.97	22.48	
E	3.120	3.200		79.25	81.28	
F	.205	.268		5.21	6.80	
G	.115	.125		2.92	3.18	
H	.275			6.98		
J	.415			6.98		
K	.707	.747		17.96	18.97	
L	1.181	1.260		30.00	32.00	
M			3.125			79.38
N	.185	.205		4.70	5.21	
S	1.415	1.436		35.94	36.47	
T	1.795	1.825		45.59	46.35	
W	.515	.535		13.08	13.59	

1. Reference dimensions are for information only and are not required for inspection.