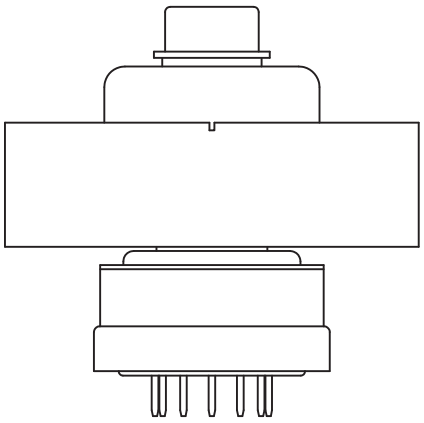


3CX800A7

Hi Mu Power Triode

The 3CX800A7 is a compact power triode intended for use as a cathode-driven Class AB2 or Class B amplifier in rf applications including the VHF band. As a linear amplifier, high power gain may be obtained without sacrifice of low intermodulation distortion characteristics. Low grid interception and high amplification factor combine to make the 3CX800A7 drive power low for a tube of this power capacity. A single 3CX800A7 will deliver 750 watts PEP and 750 watts key-down CW output power to 350 MHz. The 3CX800A7 is useful to 450 MHz. The anode is forced-air cooled for 800 watts of dissipation.

General Characteristics

Electrical

Cathode	Oxide Coated, Unipotential	
Heater Voltage	13.5 ± 0.6	V
Heater Current, at 13.5 volts	1.5	A
Cathode-Heater Potential (maximum)	± 150	V
Minimum Warm-up Time	3	Min
Amplification Factor (approximate)	200	
Direct Interelectrode Capacitance (grid grounded)		
Cin	26.0	pF
Cout	6.1	pF
Cpk	0.05	pF
Highest Frequency for Maximum Ratings	350	MHz

Mechanical

Maximum Overall Dimensions		
Length	2.52 (64.01)	inch (mm)
Diameter	2.53 (64.26)	inch (mm)
Net Weight	11.5 (326)	oz. (gm)
Operating Position	Any	
Cooling	Forced Air	
Maximum Operating Temperature:		
Ceramic/Metal Seals or Anode Core	250°	C

Revised 21 May 2012

P E N T A L A B O R A T O R I E S
9740 COZYCROFT AVENUE * CHATSWORTH * CALIFORNIA 91311
(800) 421-4219 * (818) 882-3872 * FAX: (818) 882-3968

Absolute Maximum Ratings
(up to 350 MHz)

DC Plate Voltage[3]	2250	Volts
DC Plate Current	0.6	Ampere
Plate Dissipation	800	Watts
Grid Current	0.06	Ampere
Grid Dissipation	4.0	Watts

Typical Operation
Class AB2 Cathode Driven CW/SSB

Plate Voltage	2200	Vdc
Cathode Bias Voltage	+8.2	Vdc
Zero-Signal Plate Current[1]	15	mAdc
CW Plate Current	500	mAdc
CW Power Input	1100	W
Peak Envelope Power Input	1100	w
Two-Tone Plate Current[5]	313	mAdc
CW Grid Current[1]	36	mAdc
Two-Tone Grid Current[1,5]	16	mAdc
Peak rf Cathode Voltage[1]	64	v
Peak Driving Power[1]	23	w
Useful Power Output[4]	750	W
Useful Power Output, PEP[4]	750	w
Cathode Input Impedance	54	Ohms
Resonant Load Impedance	2700	Ohms
Intermodulation Distortion[2]		
3rd Order Products	-36	dB
5th Order Products	-32	dB

1. Approximate Value
2. Ref. Against 1 tone of a 2-equal-tone signal
3. Plate voltage may rise to 2500 volts maximum under no-signal conditions to account for power supply regulation.
4. Measured at the load.
5. Value will be lower with voice modulation for the same PEP level.

Pulse Modulator or Regulator

Absolute Maximum Ratings
See Pulse Derating Chart for pulse durations over 100 microseconds

DC Plate Voltage	3500	Volts
Average Plate Dissipation	800	Watts
Peak Plate Current (average during pulse)	8	Amperes
Average Plate Current	0.6	Ampere
Average Grid Current	0.06	Ampere
Grid Dissipation (average)	4	Watts

Typical operation values are obtained by actual measurement or by calculation from published characteristics curves. Adjustment of the rf drive voltage to obtain the specified plate current at the specified bias and plate 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 may vary from tube to tube. This current variation causes no performance degradation providing the circuit maintains the correct grid/cathode voltage in the presence of the current variation.

Application

Mechanical

Cooling - Forced-air cooling must be provided to maintain the anode core and seal temperatures at a safe operating temperature. Cooling data are shown for incoming cooling air at 25˚C and 50˚C, and represent the minimum requirements to limit tube temperatures to 225˚C.

Cooling Air at 25° C

	Sea Level		5000 Feet	
Anode Dissipation W	Flow Rate cfm	Pressure Drop Inch of water	Flow Rate cfm	Pressure Drop Inch of water
400	6	0.09	7	0.10
600	11	0.20	14	0.23
800	19	0.50	23	0.57

Cooling Air at 50° C

	Sea Level		5000 Feet	
Anode Dissipation W	Flow Rate cfm	Pressure Drop Inch of water	Flow Rate cfm	Pressure Drop Inch of water
400	8	0.10	10	0.12
600	16	0.31	19	0.35
800	27	0.79	33	0.88

Cooling must be applied before or simultaneously with electrode voltages, including the heater, and may be removed simultaneously with them. In all cases temperature of the anode and the ceramic/metal seals is the limiting factor, and the designer is encouraged to use temperature-sensitive paint or other temperature sensing devices in connection with any equipment design before the layout is finalized. It should also be noted it is not good practice to operate at, or close to, the absolute maximum temperature rating for the metal/ceramic seals. Where long life and consistent performance are factors cooling in excess of minimum requirements is normally beneficial.

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 serviceability of the tube may be impaired. In order not to be exceed absolute ratings the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating by a safety factor so the absolute values will never be exceeded under any usual conditions of supply-voltage variation, load variation, or manufacturing variation in the equipment itself. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

Heater/Cathode Operation - The rated heater voltage for the 3CX800A7 is 13.5 volts, as measured at the base of the tube, and variations should be restricted to plus or minus 0.6 volt for long life and consistent performance.

Cathode Warm-up Time - In normal service it is recommended the heater voltage be applied for a minimum of three minutes before anode voltage and rf drive voltage are applied, to allow for proper conditioning of the cathode surface.

High Voltage - Normal operating voltages used with this tube are deadly. 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 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.**

Input Circuit - When this tube is operated as a 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 two or more.

Grid and Plate Current Limitations - Note that grid current is a function of drive power and amplifier loading and can vary widely during tuning and loading. Under no circumstances should grid current exceed 60 mAdc during tuning or operation of the tube.

The maximum plate current rating is 600 mAdc. Drive level should be restricted during tuning periods so this rating is not exceeded. For monitoring purposes, peak meter readings on voice (taking into account inertia of the meter) will be approximately 200 mAdc. Under no circumstances is the plate current meter reading to exceed the maximum plate current rating of 600 mAdc.

Intermodulation Distortion - Typical Operating Conditions, with distortion values included, are the result of data taken during actual operation at 2 MHz. Intermodulation values listed are those measured at the full peak-envelope power noted and are referenced against one tone of a two-equal-tone signal.

Fault Protection - All power tubes operate at voltages which can cause severe damage in the event of an arc, especially in cases where large amounts of power supply stored energy are involved. Some means of protection is advised in all cases, and it is recommended that a series resistor be used in the lead from the power supply to the anode circuit to limit peak current and help dissipate the energy in the event of a tube or circuit arc. A resistance of 50 ohms, with at least a 25W rating, in the positive plate power supply lead will help protect the tube in the event of an arc.

VHF Operation - The base pin connection to the grid may be used at frequencies to 30 MHz. Above 30 MHz the available contact collets or grid bypass capacitor assembly are recommended. VHF driving power will be greater than the typical values shown on page 2 because of higher circuit losses.

Radio-Frequency Radiation - Exposure to strong rf fields should be avoided, especially at frequencies above 300 MHz, where energy absorption by the human body is significant. The human eye is particularly sensitive. Prolonged exposure to rf radiation should be limited to 10 milliwatts per square centimeter. It is generally accepted that exposure to "high levels" of rf radiation can result in severe injury, including blindness.

Operating Hazards

Proper use and safe operating practices with respect to power tubes are the responsibility of equipment manufactures and users of such tubes. All persons who work with or are exposed to power tubes or equipment which utilize 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:

A High Voltage - Normal operating voltages can be deadly. Always remember: **High voltage can kill**.

B RF Radiation - Exposure to strong rf fields should be avoided, even at relatively low frequencies. OSHA standards recommend that prolonged exposure be limited to 10 milliwatts per square centimeter.

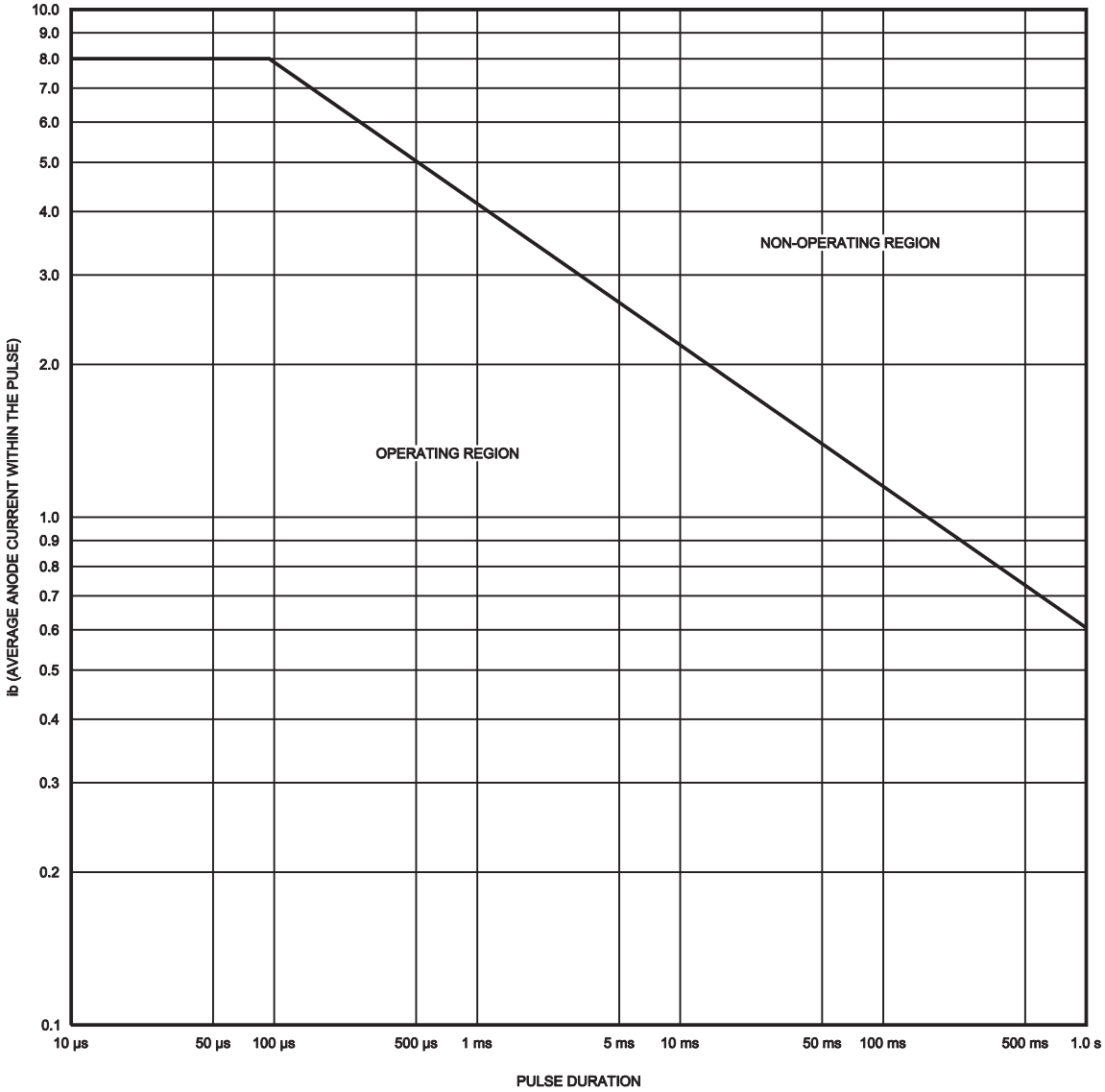
C Hot Surfaces - Surfaces of air-cooled radiators and other parts of tubes can reach temperatures of several hundred degrees C and cause serious burns if touched for several minutes after all power is removed.

Pulse Derating Chart

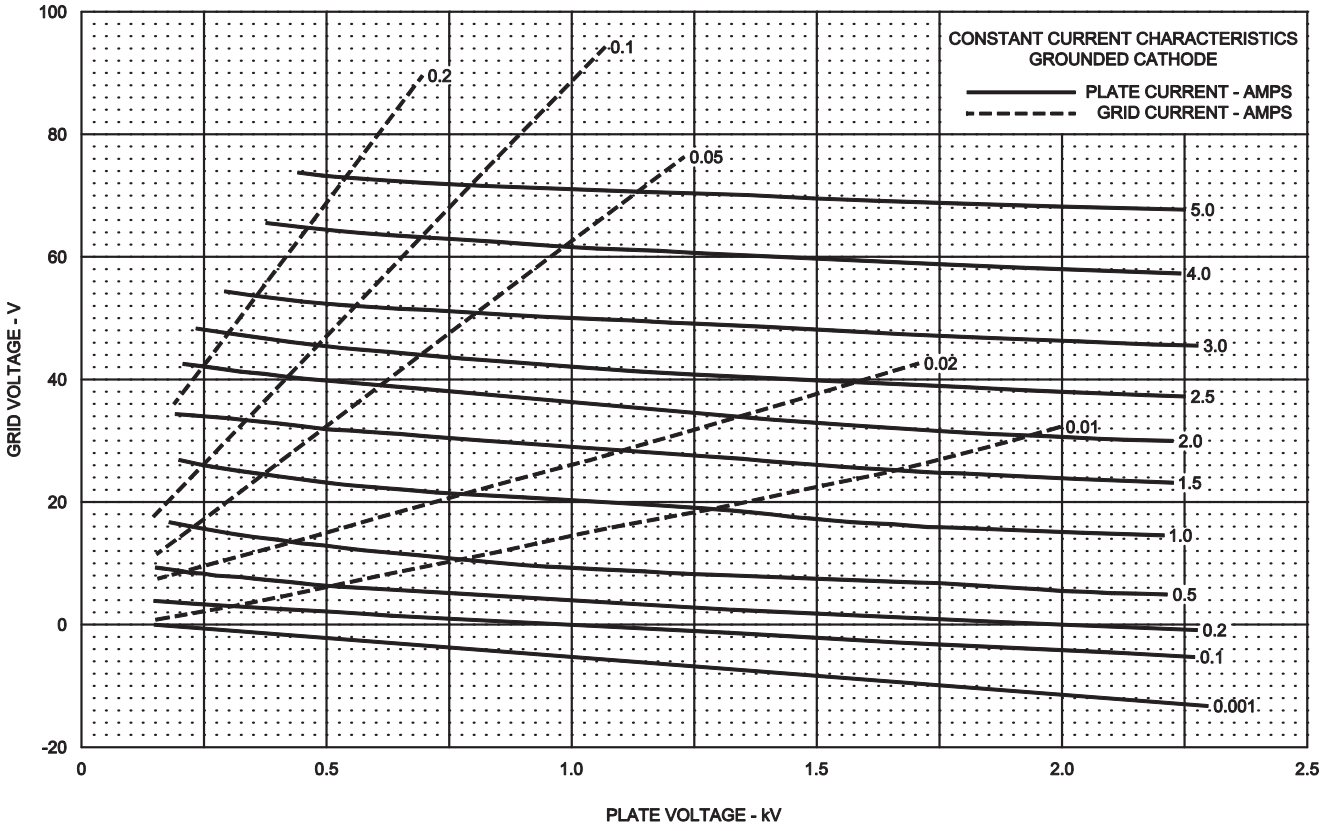
Pulse Modulator Service

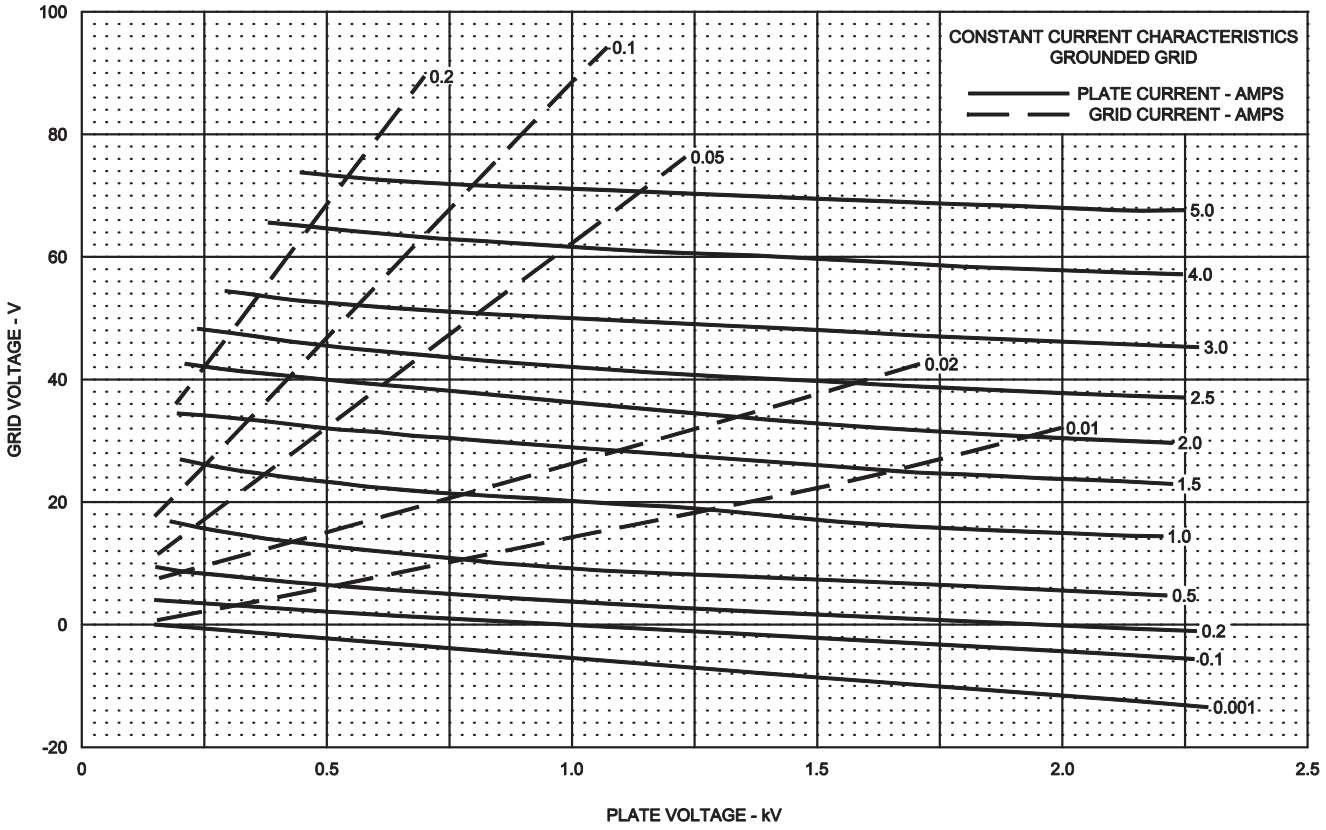
Pulse anode current (ib) capability is dependant on pulse duration (tp) and duty factor (Du). Maximum ib for a given tp is shown; maximum Du may then be derived from the relationship:

$$0.6 = ib \sqrt{Du}$$

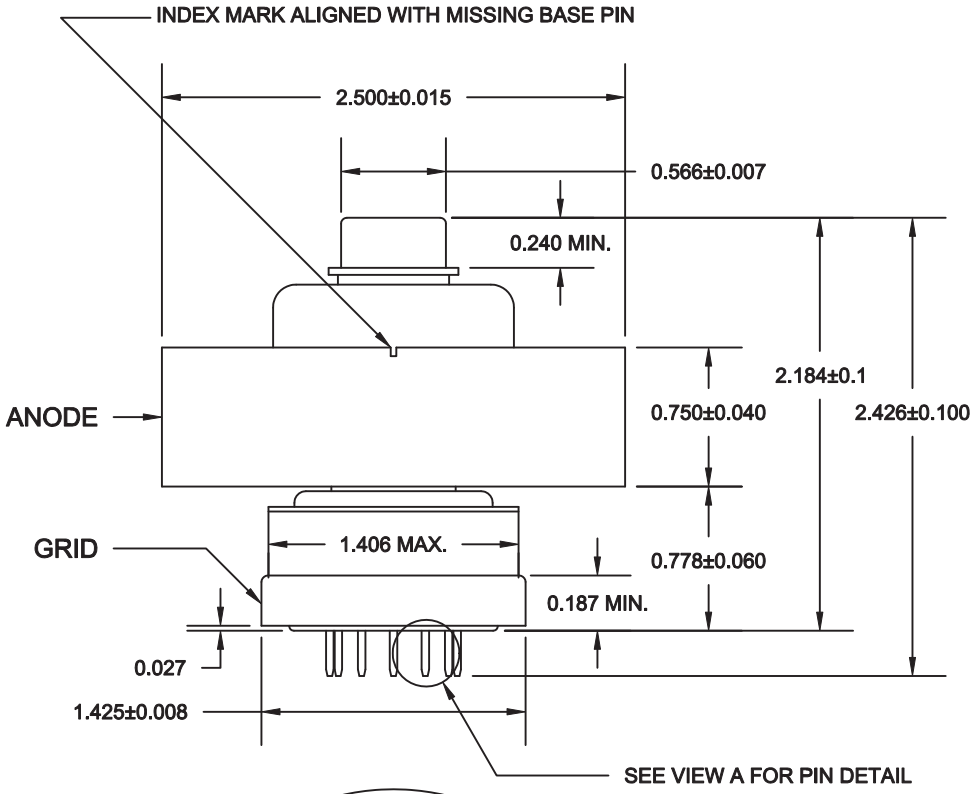


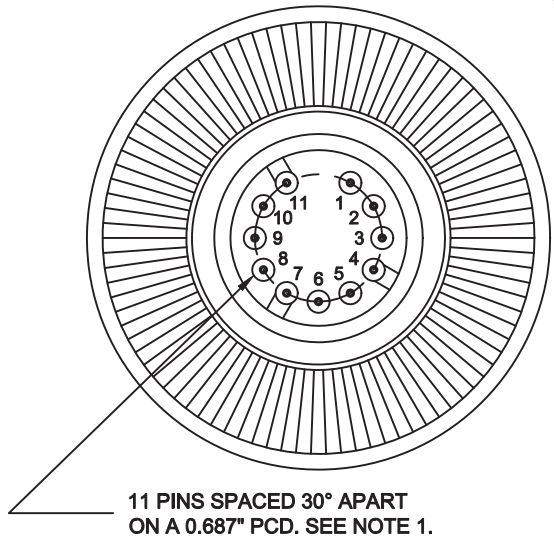
Typical Constant Current Characteristics

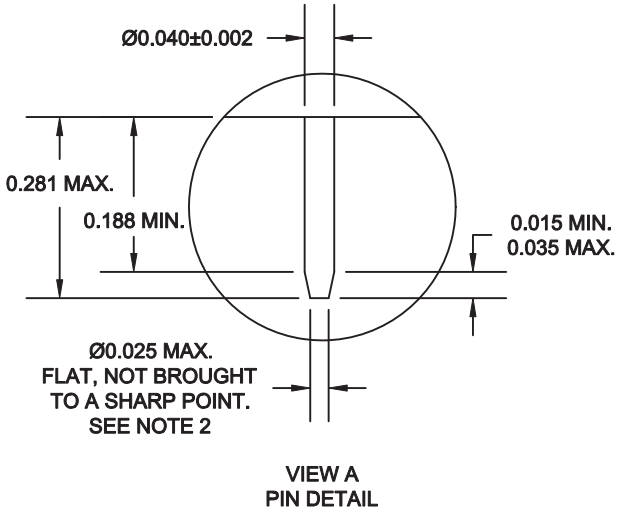




Dimensional Data







NOTES:

1. Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from flat-plate gauge (JEDEC No. GE11-1) having a thickness of 0.250" and twelve holes with diameters of 0.0520" ± 0.0005" inch so located on a 0.6780" ± 0.0005" diameter circle that the distance along the chord between any 2 adjacent hole centers is 0.1778" ± 0.0005".
2. This dimension around the periphery of any individual pin may vary within the limits shown. The surface of the pin is convex or conical in shape and not brought to a sharp point.

Pin-out

Pin	Element
1	Cathode
2	Cathode
3	Cathode
4	Grid
5	Heater
6	Heater
7	Grid
8	Cathode
9	Cathode
10	Cathode
11	Grid