

Power Triode

NUVISTOR TYPE

ENVIRONMENTAL TESTS

LIFE TEST

For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 Gc/s in Aircraft, Industrial, Military, and Other Equipment Operating Under Conditions of Severe Shock and Vibration.

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage (AC or DC)	E_f	6.3	V
Heater Current at $E_f = 6.3$ V.	I_f	150	mA
Heater Input.	P_f	0.95	W
Direct Interelectrode Capacitances			
Without external shield			
Input: K to (G,S,H).	c_i	6.0	pF
Output: P to (G,S,H).	c_o	1.2	pF
Heater to cathode	c_{hk}	1.4	pF

Class A₁ Amplifier

For following characteristics, see Conditions

Amplification Factor.	μ	60	70	
Plate Resistance (Approx.).	r_p	6300	5400	Ω
Transconductance.	g_m	9500	13000	μmho
DC Plate Current.	I_b	9	11.5	mA
Cutoff DC Grid Voltage for				
$I_b = 10 \mu\text{A}$	$E_c(\text{co})$	-	-5	V

Conditions

Heater Voltage.	E_f	6.3	6.3	V
Plate Supply Voltage.	E_{bb}	150	110	V
Grid Supply Voltage.	E_{cc}	0	0	V
Cathode Resistor.	R_k	150	47	Ω

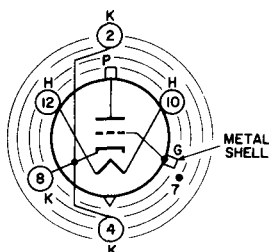
MECHANICAL CHARACTERISTICS

Operating Position.		Any
Type of Cathode	Coated Unipotential	
Minimum Overall Length (l_m)		0.985 in
Maximum Seated Length (l_{sm})		0.780 in
Maximum Diameter (d_m)		0.440 in
Weight (Approx.).		2.2 g
Dimensional Outline	JEDEC No.4-6	
Envelope.	JEDEC MT4	
Top Cap ^a	Small (JEDEC C1-44)	
Base ^b	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)	



Basing Designation for BOTTOM VIEW. 12CT

- Pin 2 - Cathode
Pin 4 - Cathode
Pin 7c - Do Not Use
Pin 8 - Cathode
Pin 10 - Heater
Pin 12 - Heater
Metal Shell - Grid
Top Cap - Plate



INDEX = LARGE LUG
• = SHORT PIN—IC

ABSOLUTE MAXIMUM RATINGS

For Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Tube Operation at frequencies up to 1.2 Gc/s

		CCS ^d	ICAS ^e	
Plate Supply Voltage.	E_{bb}	500	500	V
DC Plate Voltage.	E_b	250	300	V
Grid Voltage				
Peak positive value	e_{cm}	4	5	V
DC positive value	E_c	0	0	V
DC negative value	E_c	-100	-100	V
Peak Heater-Cathode Voltage . .	e_{hkm}	± 100	± 100	V
Heater Voltage, AC or DC. . .	E_f	5.7 to 6.9	5.7 to 6.9	V
Instantaneous Voltage		See Breakdown-Voltage		
Between top cap or base pins		Characteristics Curve		
and metal shell				
Average Grid Current.	$I_{c(av)}$	5	6	mA
Average Cathode Current . . .	$I_{k(av)}$	25	30	mA
Plate Dissipation	P_b	2.5	2.7	W
Envelope Temperature.	T_E	200	200	°C

MAXIMUM CIRCUIT VALUES

	CCS	ICAS
Grid-Circuit Resistance $R_g(\text{ckt})$		
For fixed-bias or cathode-bias operation:		
For $T_E \leq 150^\circ \text{C}$	50	50 $\text{k}\Omega$
For $T_E > 150^\circ \text{C}$	See <i>Grid-Circuit-Resistance Rating Chart</i>	



TYPICAL OPERATION — CCS

As Cathode-Drive RF Power Amplifier

Frequency	f	1	1.2	Gc/s
Heater Voltage.	E _f	6.3	6.3	V
DC Plate-to-Grid Voltage.	E _{bg}	180	180	V
DC Cathode-to-Grid Voltage.	E _{kg}	5.5	5.5	V
From grid resistor of	R _g	1200	1200	Ω
Average Plate Current	I _{b(av)}	20	20	mA
Average Grid Current.	I _{c(av)}	4.5	4	mA
Driving Power (Approx.)	P _g	150	250	mW
Useful Power Output (Approx.) ^g	P _o	1.4	1.2	W

As RF Oscillator

Frequency	f	1	Gc/s
Heater Voltage.	E _f	6.3	V
DC Plate Voltage.	E _b	180	V
DC Grid Voltage	E _c	-5.5	V
From grid resistor of	R _g	1200	Ω
Average Plate Current	I _{b(av)}	21	mA
Average Grid Current.	I _{c(av)}	4.5	mA
Useful Power Output (Approx.) ^g	P _o	1.25	W

As Cathode-Drive Frequency Doubler

Output Frequency.	f _o	1	Gc/s
Heater Voltage.	E _f	6.3	V
DC Plate-to-Grid Voltage.	E _{bg}	180	V
DC Cathode-to-Grid Voltage.	E _{kg}	8.5	V
From grid resistor of	R _g	1200	Ω
Average Plate Current	I _{b(av)}	18.5	mA
Average Grid Current.	I _{c(av)}	3	mA
Driving Power (Approx.)	P _g	300	mW
Useful Power Output (Approx.) ^g	P _o	0.7	W

^a Designed to mate with "1/4-inch" connector generally available from your local RCA Distributor.

^b Designed to mate with Cinch Mfg. Co. socket No.133 65 10 041, Cinch-Jones Sales-Division Distributor socket Designation SNS-3, or equivalent.

^c Pin 7 is of a length such that its end does not touch the socket insertion plane.

^d Continuous Commercial Service.

^e Intermittent Commercial and Amateur Service. No operating or ON period exceeds 5 minutes and every ON period is followed by an OFF or standby period of the same or greater duration.

^f Measured on metal shell in Zone "A" (See *Dimensional Outline*).

^g Measured at load.

INITIAL CHARACTERISTICS LIMITS

	Note	Min	Max	
Heater Current.	1	140	160	mA
Direct Interelectrode Capacitances	2			
Cathode to plate.	-	-	0.046	pF
Input: K to (G,S,H).	-	5.0	7.0	pF
Output: P to (G,S,H).	-	0.9	1.5	pF
Heater to cathode	-	1.1	1.7	pF
Amplification Factor.	3	50	90	



	Note	Min	Max	
Transconductance (1)	4	7500	11500	μmho
Transconductance (2)	3	10500	15500	μmho
Plate Current (1)	4	6.5	11.5	mA
Plate Current (2)	3	8.5	14.5	mA
Cutoff Plate Current	5	-	50	μA
Useful Power Output	6	1.1	-	W
Total Grid Current	7	-	-0.1	μA
Heater-Cathode Leakage Current	8	-	± 5	μA
Leakage Resistance				
Between grid and all other electrodes connected together . .	9	5	-	$\text{G}\Omega$
Between plate and all other electrodes connected together . .	10	10	-	$\text{G}\Omega$
Inoperatives	11	✓		

Note 1: With $E_f = 6.3 \text{ V}$.

Note 2: Measured without external shield.

Note 3: With $E_f = 6.3 \text{ V}$, $E_{bb} = 110 \text{ V}$, $E_{cc} = 0 \text{ V}$, $R_k = 47 \Omega$, $C_k = 1000 \mu\text{f}$.

Note 4: With $E_f = 6.3 \text{ V}$, $E_{bb} = 150 \text{ V}$, $E_{cc} = 0 \text{ V}$, $R_k = 150 \Omega$, $C_k = 1000 \mu\text{f}$.

Note 5: With $E_f = 6.3 \text{ V}$, $E_b = 150 \text{ V}$, $E_c = -7 \text{ V}$.

Note 6: Measured at load in cathode-drive rf-power-amplifier circuit with $f = 1 \text{ Gc/s}$, $E_f = 6.3 \text{ V}$, $E_{bg} = 175 \text{ V}$, $E_{kg} = 6 \text{ V}$ from $R_g = 1200 \Omega$, $I_{b(av)} = 23 \text{ mA max}$, $I_{c(av)} = 5 \text{ mA max}$, $P_g = 150 \text{ mW}$, circuit tuned for maximum $P_o(\text{useful})$.

Note 7: With $E_f = 6.3 \text{ V}$, $E_b = 150 \text{ V}$, $E_{cc} = -1.3 \text{ V}$, $R_g = 0 \Omega$.

Note 8: With $E_f = 6.3 \text{ V}$, $E_{hk} = \pm 100 \text{ V}$.

Note 9: With $E_f = 6.3 \text{ V}$, $E_{g-all} = -100 \text{ V}$.

Note 10: With $E_f = 6.3 \text{ V}$, $E_{p-all} = -300 \text{ V}$.

Note 11: Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

ENVIRONMENTAL TESTS

High-Impact, Short-Duration Shock

Peak Impact Acceleration 1000 g

Duration of approximate half-sine-wave

mechanical-shock pulse $0.8 \pm 0.2 \text{ ms}$

Operating Conditions during Test

$E_f = 6.3 \text{ V}$, $E_{bb} = 150 \text{ V}$, $E_{cc} = -1.3 \text{ V}$, $R_g = 50 \text{ k}\Omega$, $E_{hk} = 100 \text{ V}$

Post-Shock Limits and Rejection Criteria

	Min	Max	
ΔI_{gm}	-	± 15	%
I_c	-	-0.1	μA
I_{hk}	-	± 10	μA

ERpm (Variable-Frequency-Vibration Test

Limits) over vibration-frequency range of:

3 to 6 kc/s 100 mV

6 to 15 kc/s 1000 mV

Tap and Permanent Shorts, and Discontinuities . ✓



Low-Impact, Long-Duration Shock

Peak Impact Acceleration	50	g
Duration of approximate half-sine-wave mechanical-shock pulse	11 ± 2	ms

Condition during Test

No tube-element voltages are applied.

Post-Shock Limits and Rejection Criteria

Same as those specified above for the High-Impact, Short-Duration Shock Test

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall)	5 to 500 to 5	c/s
Peak Displacement (5 to 50 and 50 to 5 c/s).	0.040	in
Peak-to-peak value.	0.080	in
Peak Vibrational Acceleration (50 to 500 to 50 c/s).	10	g
Period of 1 sweep cycle (Approx.) (5 to 500 to 5 c/s).	15	m
Duration of Test (Overall).	9	h
Along each of 3 mutually perpendicular axes.	3	h

Operating Condition during Test $E_f = 6.3$ V**Post-Sweep-Frequency-Vibration-Fatigue****Limits and Rejection Criteria**

Same as those specified above for the High-Impact, Short-Duration Shock Test

Variable-Frequency Vibration

Vibration-Frequency Range (Overall)	3 to 15	kc/s
Peak Vibrational Acceleration in X_1 position.	1	g
Period of 1 sweep cycle (3 to 15 kc/s).	7	s

Operating Conditions during Test $E_f = 6.3$ V, $E_{bb} = 150$ V, $E_{cc} = 0$ V, $R_k = 150$ Ω , $R_p = 2$ k Ω **Limits**

Min Max

 E_{rpm} over vibration-frequency range of:

3 to 6 kc/s	-	80	mV
6 to 15 kc/s.	-	700	mV

LIFE TESTS**Heater Cycling**

Duration of Test.	2000	cycles
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Operating Conditions $E_f = 8.5$ V cycled 1 minute ON and 2 minutesOFF, $E_{hk} = -180$ V continuously ON**Rejection Criteria**

Heater-cathode shorts, and heater and cathode discontinuities



Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

Operating Conditions

 $E_f = 6.3$ cycled 110 minutes ON and 10 minutes OFF,

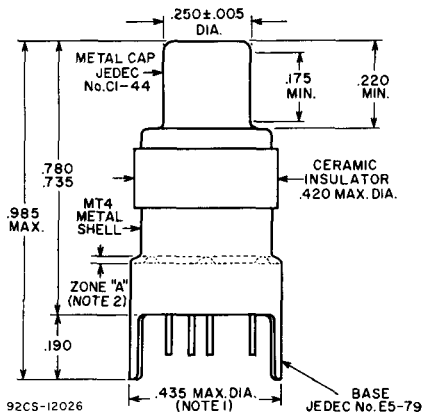
 $E_{bb} = 150$ V, $E_{cc} = 0$ V, $R_g = 50$ k Ω , $P_b = 2.4$ W,

 $T_E = 150^\circ$ C min

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
I_{gm}	-	-	6700	-	-	-	-	-	μ mo
$\Delta I_{gm}/t$	-	± 10	-	-	-	-	-	-	%
$P_o(\text{useful})$	-	-	-	-	1.0	-	0.9	-	W
I_c	-	-	-	-0.2	-	-	-	-	μ A

DIMENSIONAL OUTLINE

JEDEC No. 4-6



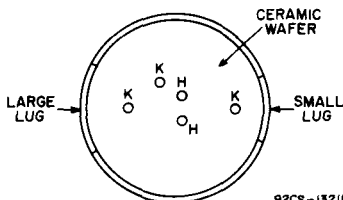
DIMENSIONS IN INCHES

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

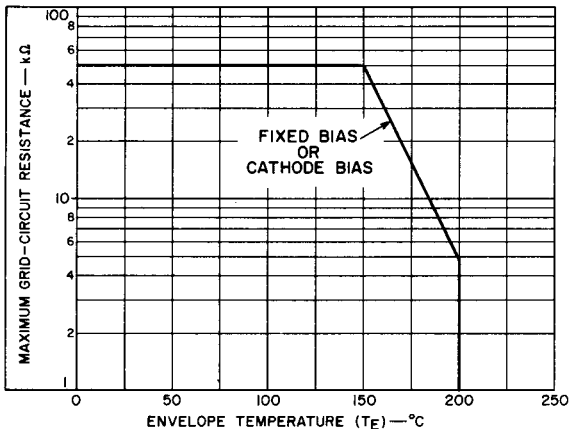
Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW

With Element Connections Indicated
and Short Pin Not Shown

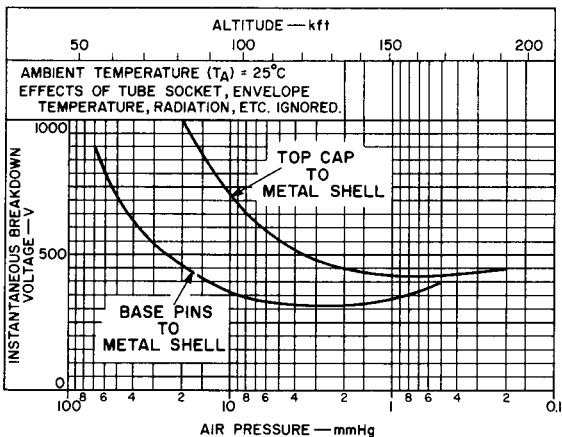


Grid-Circuit-Resistance Rating Chart



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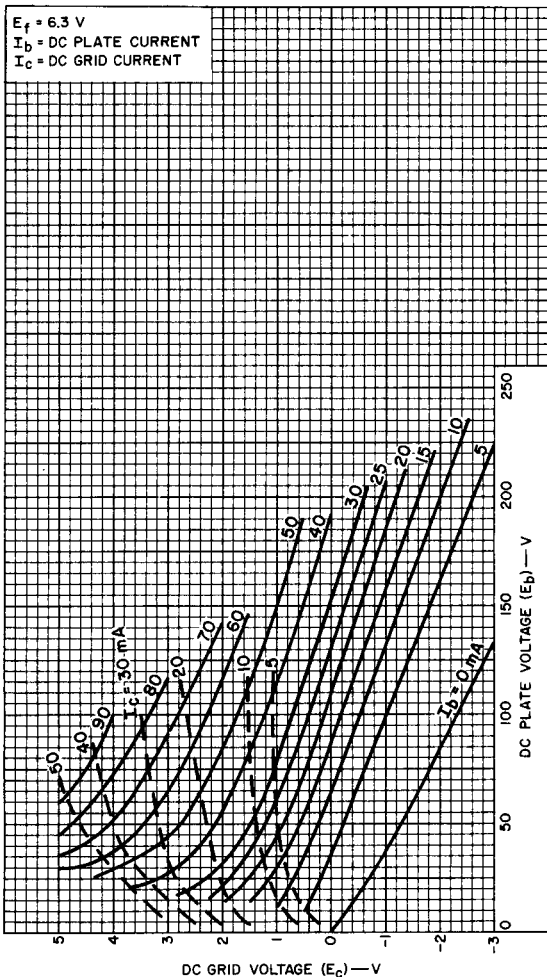
Breakdown-Voltage Characteristics



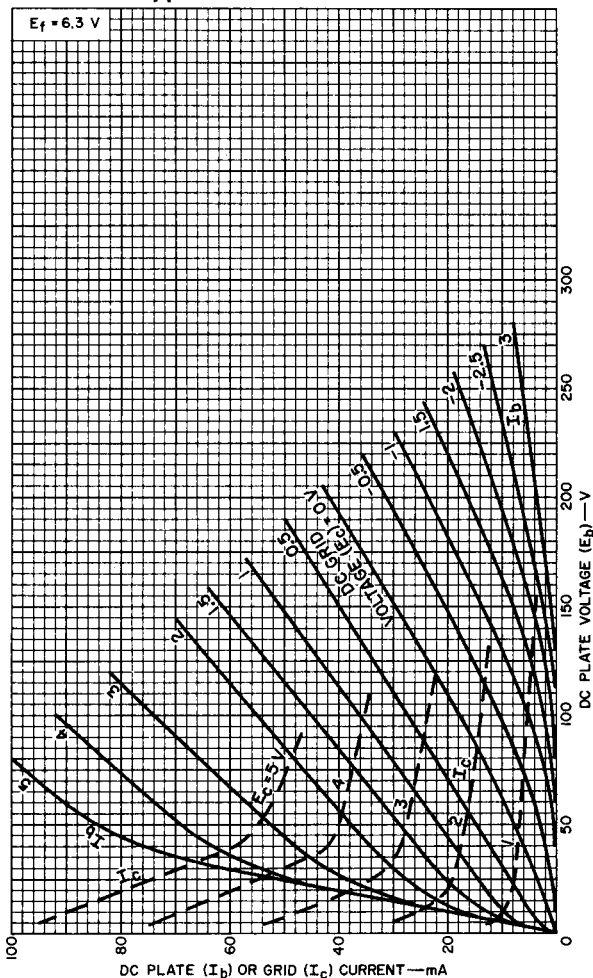
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Typical Constant-Current Characteristics



Typical Characteristics



92CM-13219

