

High-Mu Triode

ENVIRONMENTAL TESTS

NUVISTOR TYPE

LIFE TESTS

For Condenser-Microphone Preamplifiers, Piezoelectric- and Ceramic-Pickup Preamplifiers, and Other Voltage Amplifier Applications Requiring Amplification of Extremely Small Signals at DC to 200 kc/s

ELECTRICAL CHARACTERISTICS

Bogey Values

Heater Voltage, (DC or AC)	E_f	6.3	V
Heater Current at $E_f = 6.3$ V	I_f	100	mA
Heater Input	P_f	0.63	W
Direct Interelectrode Capacitances			
Without external shield			
Input: G to (K, S, H)	c_i	3.4	pF
Output: P to (K, S, H)	c_o	1.7	pF
Plate to cathode	c_{pk}	0.20	pF
Grid to cathode	c_{gk}	2.6	pF
Heater to cathode	c_{hk}	1.0	pF

CLASS A₁ AMPLIFIER

For Following Characteristics see Conditions

Amplification Factor	μ	127	
Plate Resistance (Approx.)	r_p	41	k Ω
Transconductance	g_m	3100	μ mho
DC Plate Current	I_b	1.5	mA
Cutoff DC Grid Voltage for $I_b = 10$ μ A.	$E_{c(co)}$	-1.7	V

Conditions

Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	120	V
Grid Supply Voltage	E_{cc}	0	V
Cathode Resistor	R_k	200	Ω
Metal Shell. Connected to system ground			

ABSOLUTE MAXIMUM RATINGS

For operation as a Class-A₁ Amplifier Tube at frequencies up to 200 kc/s

Plate Supply Voltage	E_{bb}	330	V
DC Plate Voltage	E_b	250	V
Grid Voltage			
Peak positive value.	e_{cm}	0	V
DC positive value.	E_c	0	V
DC negative value.	E_c	-55	V
Peak Heater-Cathode Voltage.	e_{hkm}	± 100	V
Heater Voltage, DC or AC	E_f	5.7 to 6.9	V
Instantaneous Voltage. See Breakdown-Voltage Characteristics Curve			
Between base pins and metal shell			
Average Cathode Current.	$I_{k(av)}$	2	mA
Plate Dissipation.	P_b	0.3	W
Envelope Temperature ^c	T_E	150	$^{\circ}$ C



MAXIMUM CIRCUIT VALUES

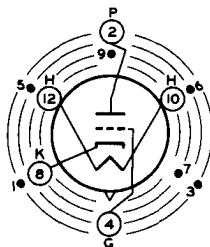
Grid-Circuit Resistance

For fixed-bias operation	$R_g(\text{ckt})$	50	$M\Omega$
For cathode-bias operation	$R_g(\text{ckt})$	100	$M\Omega$

MECHANICAL CHARACTERISTICS

Operating Position	Any
Type of Cathode	Coated Unipotential
Maximum Overall Length (l_m)	0.800 in
Maximum Seated Length (l_{sm})	0.625 in
Maximum Diameter (d_m)	0.440 in
Weight (Approx.)	1.9 g
Dimensional Outline	JEDEC No. 4-4
Envelope	JEDEC Designation MT4
Base ^a	Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-65)
Basing Designation for BOTTOM VIEW	12AQ

- Pin 1^b - Do Not Use
 Pin 2 - Plate
 Pin 3^b - Do Not Use
 Pin 4 - Grid
 Pin 5^b - Do Not Use
 Pin 6^b - Do Not Use
 Pin 7^b - Do Not Use
 Pin 8 - Cathode
 Pin 9^b - Do Not Use
 Pin 10 - Heater
 Pin 11 - Omitted
 Pin 12 - Heater



INDEX= LARGE LUG
 ●= SHORT PIN—IC

TYPICAL OPERATION

In High-Input-Impedance, Cathode-Follower Circuit

Heater Voltage	E_f	6.3	V
Plate Supply Voltage	E_{bb}	150	V
Cathode Bias Resistor (Bypassed)	$R_k(\text{bias})$	3.3	$k\Omega$
Cathode Load Resistor	$R_k(\text{load})$	15	$k\Omega$
Grid Resistor	R_g	100	$M\Omega$
Input Resistance (Approx.)	R_i	1	$G\Omega$
Output Resistance (Approx.)			
Source resistance (R_s) = 1 $G\Omega$	R_o	7	$k\Omega$
Average Grid Current	$I_{c(av)}$	-0.1	nA
Average Plate Current	$I_{b(av)}$	0.3	mA

^a Designed to mate with Cinch Mfg. Co. Socket No. 133 65 92 025, 133 65 91 034, or equivalent.

^b Pins 1, 3, 5, 6, 7, and 9 are of a length such that their ends do not touch the socket insertion plane.

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

INITIAL CHARACTERISTICS LIMITS

	Note	Min	Max	
Heater Current	1	90	110	mA
Direct Interelectrode Capacitances				
Grid to plate.	2	-	0.7	pF
Input: G to (K, S, H).	2	3.0	3.8	pF
Output: P to (K, S, H)	2	1.5	1.9	pF
Plate to cathode	2	0.17	0.23	pF
Grid to cathode.	2	2.2	3.0	pF
Heater to cathode.	2	0.8	1.2	pF
Amplification Factor	3	95	160	
Transconductance	3	2200	4000	μ mho
Plate Current.	3	0.7	2.3	mA
Cutoff Plate Current	4	-	200	μ A
AC Voltage Amplification	5	7	-	V
Total Grid Current	6	-	-0.05	μ A
Heater-Cathode Leakage Current . . .	7	-	± 5	μ A
Leakage Resistance				
Between grid and all other electrodes connected together . .	8	50	-	Ω
Between plate and all other electrodes connected together . .	9	100	-	Ω
Inoperatives	10		$\checkmark$	

Note 1: With $E_f = 6.3$ V.

Note 2: Measured without external shield.

Note 3: With $E_f = 6.3$ V, $E_{bb} = 120$ V, $E_{cc} = 0$ V, $R_k = 200 \Omega$, $C_k = 1000 \mu F$, metal shell grounded.

Note 4: With $E_f = 6.3$ V, $E_b = 120$ V, $E_c = -1.7$ V, metal shell grounded.

Note 5: With $E_f = 6.3$ V, $E_{bb} = 120$ V, $E_{cc} = 0$ V, $R_g = 10 M\Omega$, $C_c(in) = 0.1 \mu F$, grid-signal-source internal impedance $< 2500 \Omega$, $E_g = 0.2$ V (rms, 60 c/s, sinewave), $R_p = 0.5 M\Omega$, $C_c(out) = 0.5 \mu F$. RMS voltage component measured across the series plate resistor with a $5 M\Omega$ (min.) input impedance vacuum-tube voltmeter.

Note 6: With $E_f = 6.3$ V, $E_b = 200$ V, $E_{cc} = -1$ V, $R_g = 1 M\Omega$, metal shell grounded.

Note 7: With $E_f = 6.3$ V, $E_{hk} = \pm 100$ V.

Note 8: With $E_f = 6.3$ V, $E_{g-all} = -100$ V, metal shell grounded.

Note 9: With $E_f = 6.3$ V, $E_{p-all} = -300$ V, metal shell grounded.

Note 10: 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 ± 0.2 ms

Operating Conditions during Test

$E_f = 6.3$ V, $E_{bb} = 120$ V, $E_{cc} = 0$ V, $R_k = 200 \Omega$, $R_g = 1 M\Omega$, $E_{hk} = 100$ V.



	Min	Max
Post-Shock Limits and Rejection Criteria		
E_{Rp} (AC Voltage Amplification)	6	- V
I_c	-	-0.1 μA
I_{hk}	-	± 10 μA
E_{Rpm} (Variable-Frequency-Vibration Test Limits) over Vibration-Frequency Range of:		
3 to 6 kc/s	-	50 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 $\pm$ 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 & 50 to 5 c/s	0.040	in
Peak-to-peak value	0.080	in
Peak Vibrational Acceleration.	10	g
50 to 500 to 50 c/s		
Period of 1 Sweep Cycle (Approx.)	15	m
5 to 500 to 5 c/s		
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.	1	g
In X_1 position		
Period of 1 Sweep Cycle (3 to 15 kc/s)	7	s
Operating Conditions during Test		

$E_f = 6.3$ V, $E_{bb} = 120$ V, $E_{cc} = 0$ V, $R_k = 200$ Ω , $R_p = 2$ k Ω .

Limits	Min	Max
E_{Rpm} over Vibration-Frequency Range of:		
3 to 6 kc/s.	-	35 mV
6 to 15 kc/s.	-	700 mV



LIFE TESTS

Heater Cycling

Duration of Test 2000 cycles

Operating Conditions

$E_f = 8.5$ V cycled 1 minute ON and 2 minutes OFF, $E_{hk} = -180$ V continuously ON.

Rejection Criteria

Heater-Cathode Shorts, and Heater and Cathode Discontinuities.

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

Operating Conditions

$E_f = 6.3$ V cycled 110 minutes ON and 10 minutes OFF, $E_b = 120$ V,

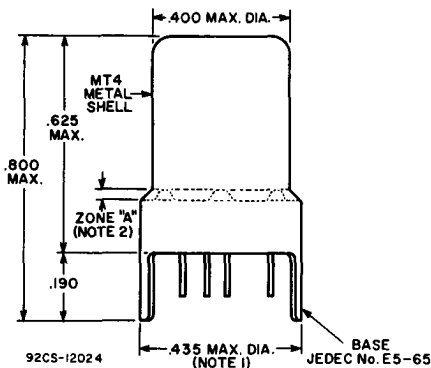
$E_{cc} = -1$ V, $E_{hk} = 100$ V, $R_k = 0 \Omega$, $R_g = 1$ M Ω , $P_b = 0.3$ W (approx.),

$T_E = 150^\circ\text{C}$ min.

End-Point Limits At	2 and 20		100		500		1000		h
	Min	Max	Min	Max	Min	Max	Min	Max	
g_m	-	-	2000	-	-	-	-	-	μmho
$\Delta g_m/t$	-	± 10	-	-	-	-	-	-	%
$\Delta E_{rp}/t$	-	-	-	-	-	± 10	-	± 15	%
Avg $ \Delta E_{rp}/t $	-	-	-	-	-	7	-	10	%
I_c	-	-	-	-0.05	-	-0.1	-	-0.1	μA
I_{hk}	-	-	-	-	-	± 10	-	± 10	μA

DIMENSIONAL OUTLINE

JEDEC No. 4-4



DIMENSIONS IN INCHES

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

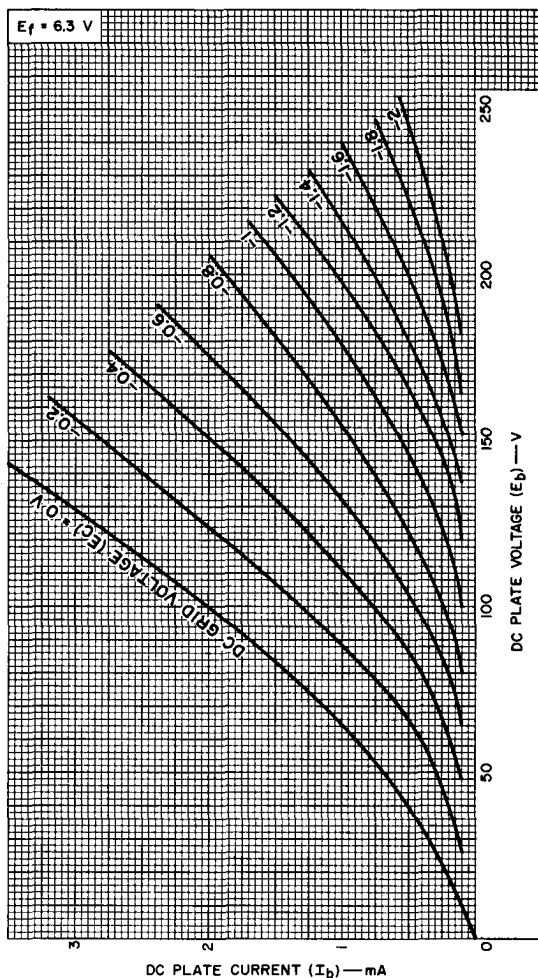
Note 2: Envelope temperature should be measured in zone "A".



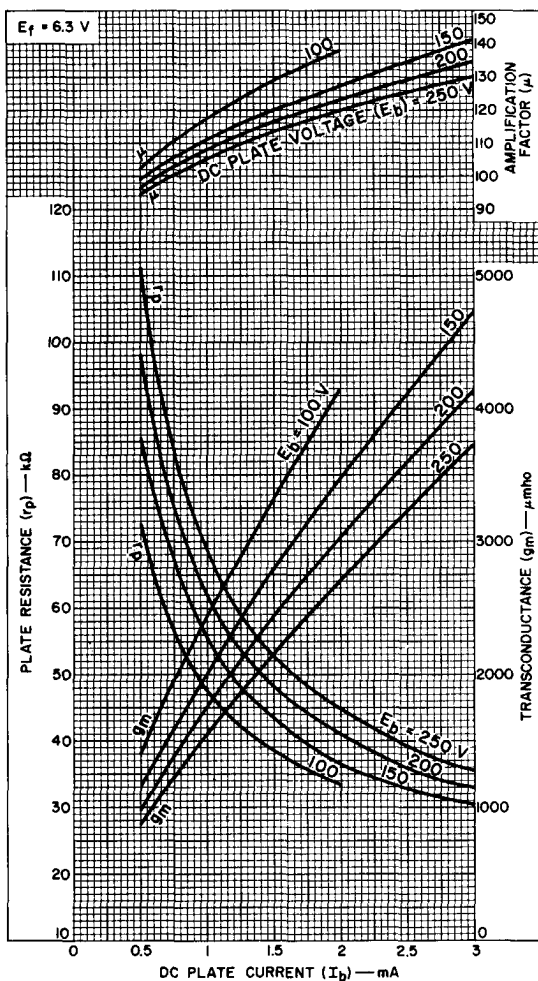
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Electronic Components and Devices Harrison, N. J.

DATA 3
10-65

Typical Plate Characteristics



Typical Characteristics



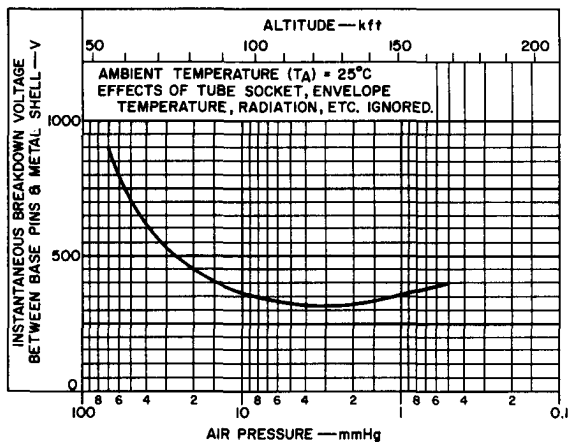
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DATA 4
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Breakdown-Voltage Characteristic



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