

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

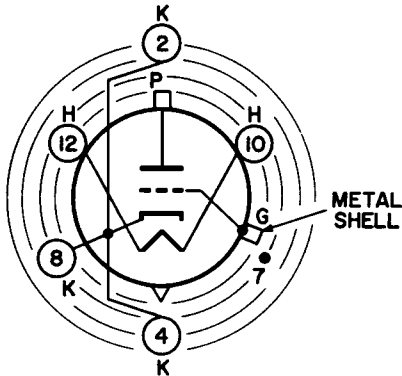
MECHANICAL CHARACTERISTICS

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 7^c - 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 Characteristics Curve		
Between top cap or base pins 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	$R_{g(ckt)}$			
For fixed-bias or cathode-bias operation:				
For $T_E \leq 150^\circ\text{C}$		50	50	kΩ
For $T_E > 150^\circ\text{C}$	See Grid-Circuit-Resistance Rating Chart			



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 $E_f = 6.3 \text{ V}$, $E_{g\text{-all}} = -100 \text{ V}$.
- Note 10: With $E_f = 6.3 \text{ V}$, $E_{p\text{-all}} = -300 \text{ V}$.
- 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 ± 0.2	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, $R_k = 150 \Omega$, $R_p = 2$ 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 minutes

OFF, $E_{hk} = -180$ V continuously ON

Rejection Criteria

Heater-cathode shorts, and heater and cathode discontinuities

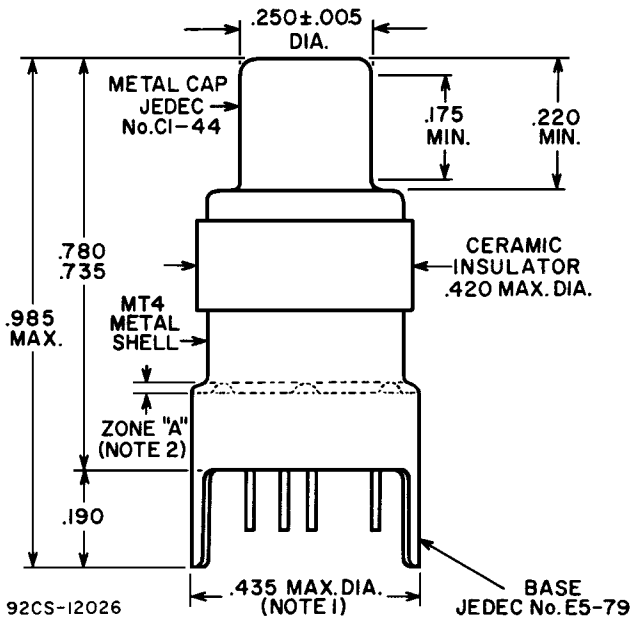


Intermittent Operation (2, 20, 100, 500, and 1000 Hours)
Operating Conditions

$E_f = 6.3$ 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 mho
$\Delta I_{gm}/t$	-	± 10	-	-	-	-	-	-	%
P_o (useful) . . .	-	-	-	-	1.0	-	0.9	-	W
I_c	-	-	-	-0.2	-	-	-	-	μ A

DIMENSIONAL OUTLINE
JEDEC No. 4-6

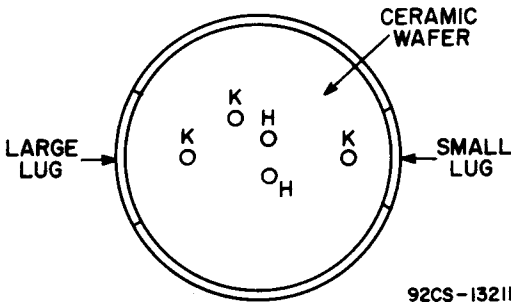


DIMENSIONS IN INCHES

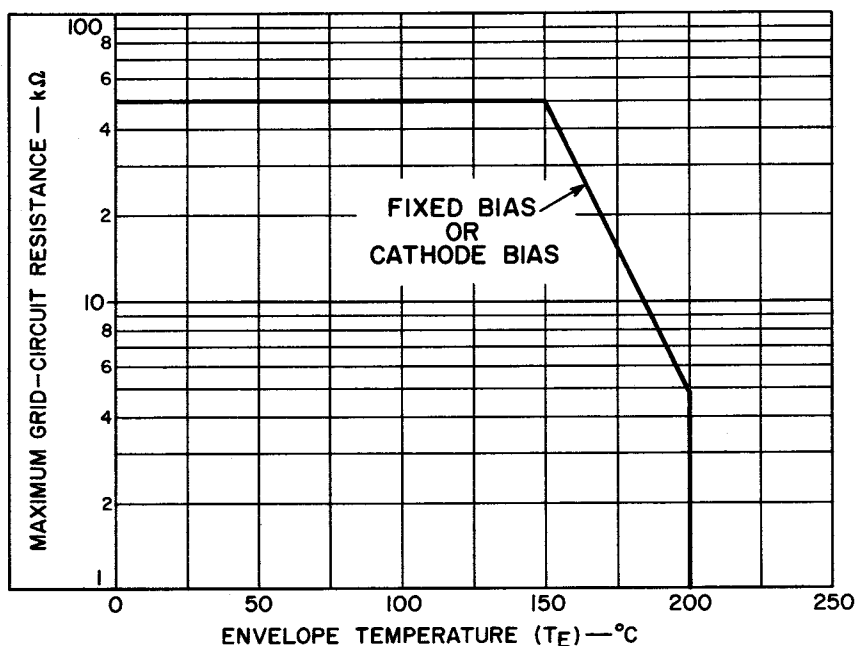
Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.

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

MODIFIED BOTTOM VIEW
With Element Connections Indicated
and Short Pin Not Shown

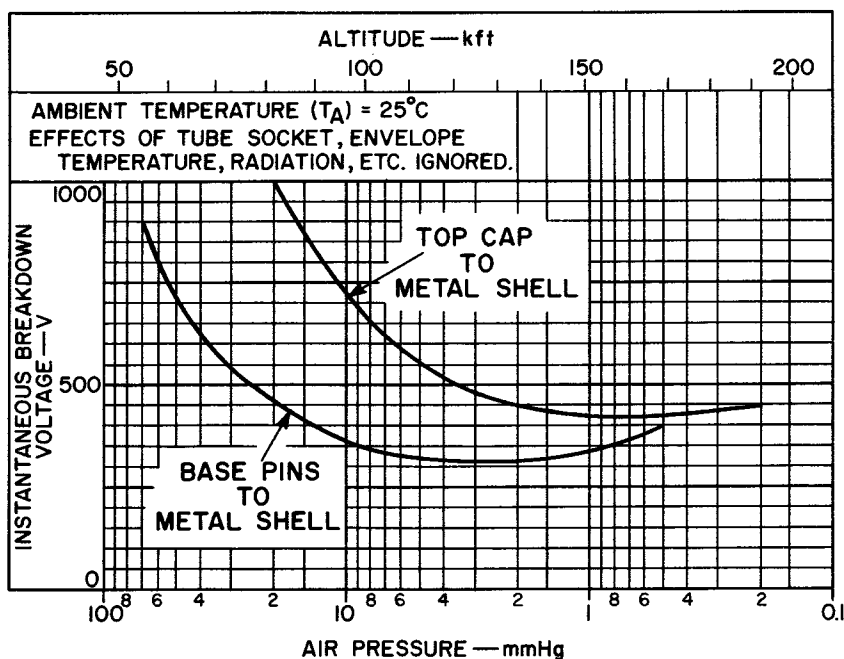


Grid-Circuit-Resistance Rating Chart



92CS-13119R1

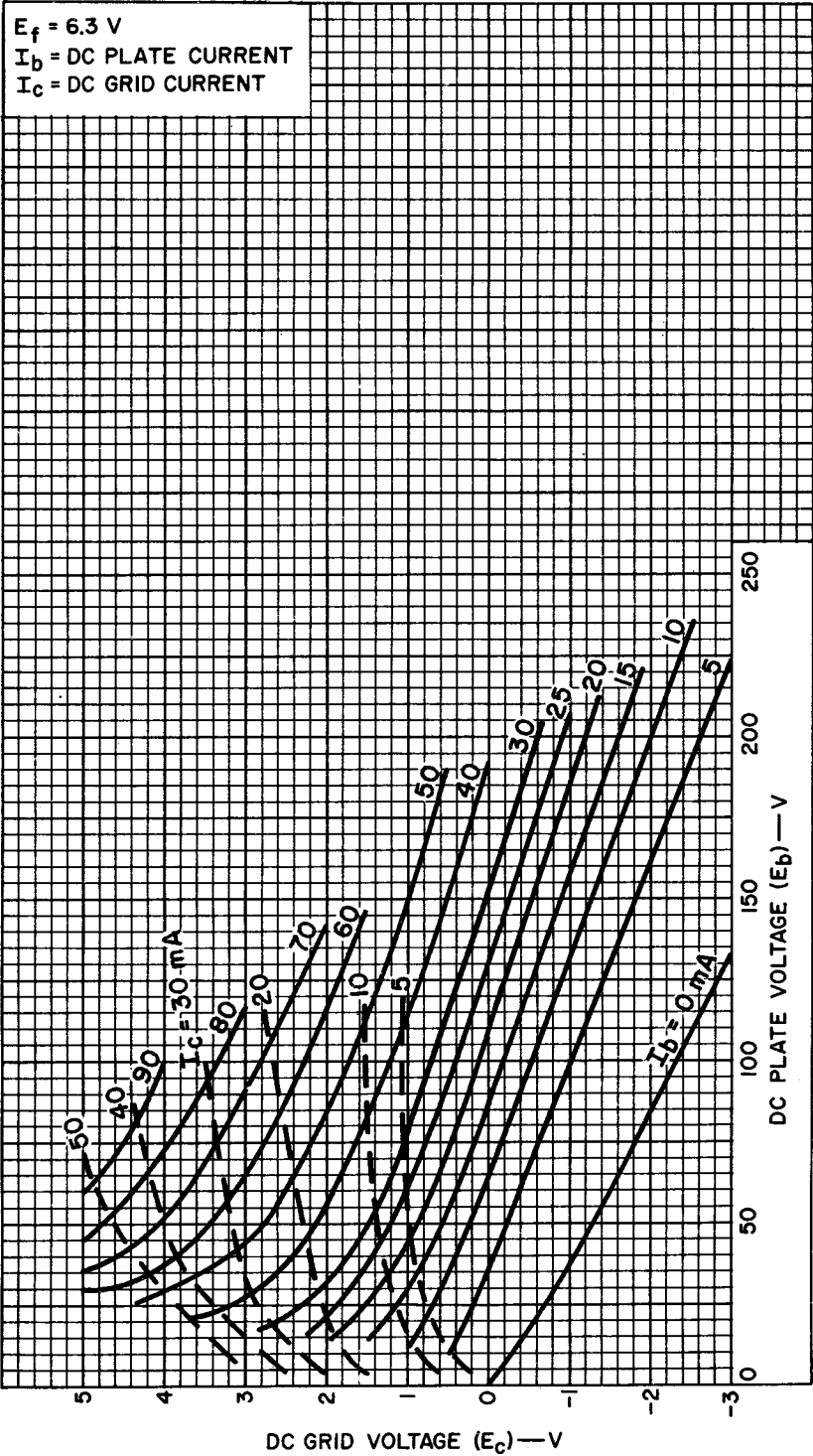
Breakdown-Voltage Characteristics



92CS-13117R1



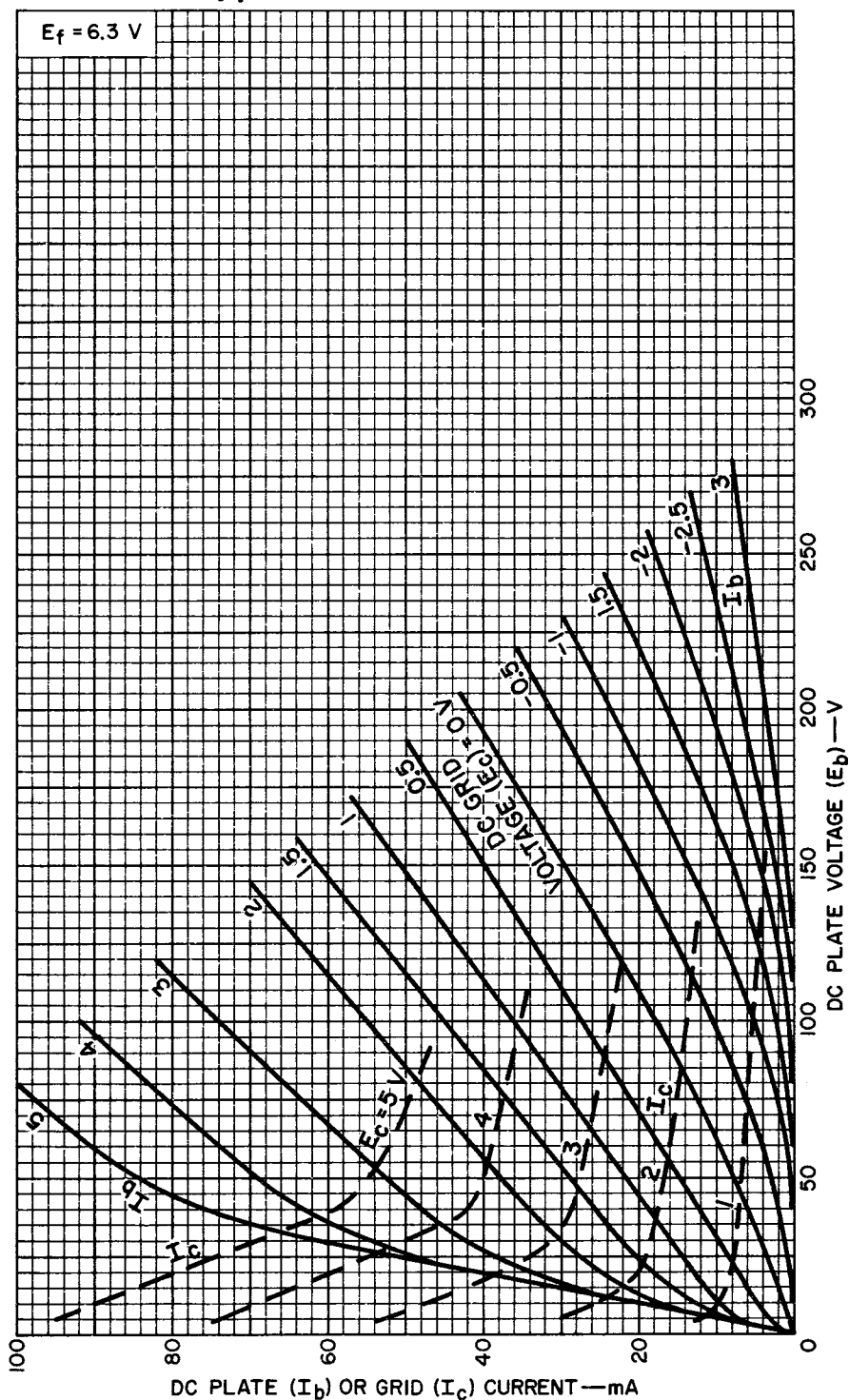
Typical Constant-Current Characteristics



92CM-13220



Typical Characteristics



92CM-13219

