



ELECTRONIC TUBE REFERENCE

12J5

Voltage - Triode (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

General-purpose indirectly heated triode for voltage amplification and related receiving-equipment service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	60	BASE PINS	8
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
PLATE RESISTANCE	7700 Ω
TRANSCONDUCTANCE	0.0026 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	300 V
Except for heater ratings, datasheet states identical to 6J5; referenced full electrical data are not reproduced in approved input.	

12J5 — General-Purpose Medium-Mu Triode

An indirectly heated, single-section general-purpose vacuum tube designed for service as an amplifier, oscillator, or detector in electronic equipment.

Overview

The **12J5** is a general-purpose medium-mu triode containing a single triode system within a metal envelope. It is designed for versatile application as a voltage amplifier, oscillator, or detector. Except for its heater ratings, the 12J5 is electrically identical to the [6J5](#) triode.

The 12J5 family includes the standard metal-envelope **12J5**, as well as the glass-envelope **12J5-GT** and ruggedized **12J5-WGT** variants. These designations share the same fundamental electrical characteristics and operating parameters but differ in their physical construction, dimensions, and interelectrode capacitances.

Construction, Heater, and Base Pinout

The 12J5 features a coated unipotential cathode. The heater is designed for operation from either an AC or DC supply.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.15 A
Calculated Heater Power	1.89 W
Cathode Type	Coated Unipotential

The standard 12J5 is housed in an MT-8 metal shell envelope with a B6-23 small wafer octal 6-pin base. The glass-envelope 12J5-GT and 12J5-WGT variants utilize glass bulbs with octal bases, corresponding to outline drawings 9-11 or 9-41. The tube can be mounted and operated in any position.

The basing arrangement follows the **RMA 6Q** bottom-view configuration, which provides the following pin connections:

- **Pin 1:** Metal Shell
- **Pin 2:** Heater
- **Pin 3:** Plate
- **Pin 5:** Grid
- **Pin 7:** Heater
- **Pin 8:** Cathode

Maximum Ratings

The maximum ratings for the 12J5 are established under the design-center system. Operating the tube beyond these limits can impair performance and reduce service life.

Rating	Design-Center Limit
Maximum Plate Voltage	300 V

Rating	Design-Center Limit
Maximum Positive DC Grid Voltage	0 V
Maximum Plate Dissipation	2.5 W
Maximum Total Cathode Current	20 mA
Maximum DC Heater-Cathode Voltage	90 V

Additionally, the DC resistance in the grid circuit under maximum rated conditions must not exceed 1.0 megohm.

Electrical Characteristics and Class A Operation

The 12J5 provides moderate amplification with a relatively low plate resistance. Typical Class A1 amplifier operating points are documented at two distinct plate voltages:

Parameter	Operating Point A	Operating Point B
Plate Voltage	90 V	250 V
Grid Bias Voltage	0 V	-8 V
Plate Current	10 mA	9.0 mA
Plate Resistance	6,700 Ω	7,700 Ω
Transconductance	3,000 μS	2,600 μS
Amplification Factor (μ)	20	20

The relationship between these parameters is consistent with the triode formula where transconductance multiplied by plate resistance approximates the amplification factor (e.g., $0.0026 \text{ S} \times 7,700 \Omega = 20.02$, which is approximately 20).

Resistance-Coupled Amplifier Service

The 12J5 is highly suited for resistance-coupled audio amplifier stages. It can be operated using either cathode bias (with a cathode resistor, R_k) or grid-leak bias (where $R_k = 0$ and the grid resistor R_{g1} is set to 10 megohms).

The following table details typical operating conditions for various plate supply voltages (E_{bb}), plate load resistors (R_p), grid resistors (R_{g1}), and following-stage grid resistors (R_s). The maximum output voltage (E_o) is the maximum RMS voltage output for 5% total harmonic distortion, and the voltage gain is measured at an output level of 2.0 V RMS.

Cathode-Bias Operation

For cathode-bias configurations, the value of the grid resistor R_{g1} is non-critical.

R_p (M Ω)	R_s (M Ω)	$E_{bb} = 90$ V			$E_{bb} = 180$ V			$E_{bb} = 300$ V		
		R_k (Ω)	Gain	E_o (V)	R_k (Ω)	Gain	E_o (V)	R_k (Ω)	Gain	E_o (V)
0.10	0.10	3,300	14	13	2,200	14	26	1,800	14	40
0.10	0.24	3,600	14	16	2,700	15	33	2,200	15	51
0.24	0.24	7,500	14	16	5,100	15	30	4,300	15	44
0.24	0.51	9,100	14	19	6,800	15	39	5,100	15	54
0.51	0.51	13,000	14	16	9,100	15	30	6,800	16	40
0.51	1.00	15,000	14	19	10,000	16	32	7,500	16	45

Grid-Leak Bias Operation

In grid-leak bias configurations, the cathode is grounded directly ($R_k = 0$), and the grid resistor R_{g1} is fixed at 10 megohms.

R_p (M Ω)	R_s (M Ω)	$E_{bb} = 90$ V		$E_{bb} = 180$ V		$E_{bb} = 300$ V	
		Gain	E_o (V)	Gain	E_o (V)	Gain	E_o (V)
0.24	0.24	15	13	16	33	17	46
0.24	0.51	16	17	17	38	18	62
0.51	0.51	16	14	18	32	18	53
0.51	1.00	17	18	18	41	19	68

Interelectrode Capacitances

The direct interelectrode capacitances of the 12J5 differ depending on the envelope construction and shielding conditions.

For the metal-envelope **12J5**, measured with the metal shell connected to the cathode:

- **Grid to Plate:** 3.4 pF
- **Input (Grid to Cathode + Heater + Shell):** 3.4 pF
- **Output (Plate to Cathode + Heater + Shell):** 3.6 pF

For the glass-envelope **12J5-GT** and **12J5-WGT** variants, measured without an external shield:

- **Grid to Plate:** 3.8 pF
- **Output:** 5.0 pF

Characteristic Curves and Interpretation

The behavior of the 12J5 across its operating range is illustrated by its characteristic curves:

- **Average Plate Characteristics (Positive Grid Region):** Under positive grid bias conditions (up to $E_c = +20$ V), the plate current rises significantly, and grid current flows. This region is relevant for specialized pulse or oscillator applications where the grid is driven positive.
- **Average Plate Characteristics (Negative Grid Region):** In normal Class A amplifier service, the grid is maintained negative (from 0 V down to -22 V). The curves show that plate current varies linearly with grid voltage over a wide range of plate voltages up to 500 V, confirming the tube's low-distortion characteristics.
- **Dynamic Characteristics vs. Plate Current:** At a constant plate voltage of 250 V, the amplification factor (μ) remains remarkably stable at approximately 20 across a plate current range of 2 mA to 15 mA. Over this same range, as plate current increases, the plate resistance (R_p) decreases from over 15,000 Ω to approximately 7,000 Ω , while the transconductance (G_m) rises from under 1,200 μS to over 3,000 μS .

Technical Summary

The **12J5** is an octal-based, general-purpose medium- μ triode featuring a 12.6 V, 0.15 A heater and a coated unipotential cathode. It is designed for reliable service as an amplifier, oscillator, or detector. With an amplification factor of 20, a typical transconductance of 2,600 to 3,000 μS , and a plate resistance of 6,700 to 7,700 Ω , the tube provides a balanced combination of moderate gain and low output impedance. The availability of detailed resistance-coupled amplifier operating data for both cathode-bias and grid-leak bias configurations highlights its adaptability in classic audio and voltage amplifier designs.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X General Electric Essential Characteristics

Published test conditions and operating points. Values on this page are preserved as reported by this source.

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	3.6 pF	—
Output capacitance	5 pF	—
Grid-to-plate capacitance	3.4 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	90 V	ClassA
Grid voltage	0 V	ClassA
Plate current	10 mA	ClassA
Plate voltage	250 V	ClassA
Grid voltage	-8 V	ClassA
Plate current	9 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	7700 ohm	ClassA;PlateVoltage=250V
Transconductance	2600 uS	ClassA;PlateVoltage=250V