



ELECTRONIC TUBE REFERENCE

12J3L

Voltage - Pentode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Russian pentode documented in bilingual manufacturer literature with guaranteed electrical characteristics. The surviving source information establishes pentode operation but does not clearly identify a specialized application or cutoff class.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	8
NOMINAL HEATER	12.6 V / 74 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
TRANSCONDUCTANCE	0.0017 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	225 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM SCREEN DISSIPATION	0.7 W
<p>Russian 12Zh3L (12J3L) communications pentode with external shield and eight-pin octal base, intended for heater-series-string communication equipment. Nominal heater 12.6 V, approximately 74 mA. Maximum normal plate 250 V and screen 225 V, plate dissipation 2 W, screen dissipation 0.7 W; 300 V screen is a switch-on-only condition. Typical transconductance approximately 1.7 mA/V. Manufacturer guarantee 3000 h and -60 to +70°C environmental endurance.</p>	

12J3L — Pentode Vacuum Tube

An indirectly heated pentode vacuum tube designed for high-reliability communication lines, featuring a loctal base and robust environmental and mechanical durability.

Overview

The **12J3L** is a pentode vacuum tube designed for use in communication lines, specifically optimized for applications where the cathode is connected in series. The tube is enclosed in a glass bulb and is equipped with an external metal screen (shield) and a loctal base.

Engineered to operate reliably under severe environmental and mechanical stress, the 12J3L is highly resistant to extreme temperatures, high humidity, vibration, and impact. It has a maximum weight of 35 grams and comes with a guaranteed service life of 3000 hours.

Construction and Environmental Durability

The 12J3L features a glass envelope surrounded by an integrated external metal screen that provides electrical shielding. The tube is terminated in an 8-pin loctal base. It is designed to withstand harsh operating environments, with specified resistance to the following conditions:

- **Ambient Temperature Range:** -60 °C to +70 °C
- **Relative Humidity:** 95% to 98% at an ambient temperature of +20 °C
- **Vibration Resistance:** Capable of withstanding vibration loads up to 2.5 g
- **Impact Resistance:** Capable of withstanding multiple impact loads up to 12 g

Pinout and Physical Dimensions

The 12J3L utilizes an 8-pin loctal base. The pin connections, viewed from the bottom of the tube, are assigned as follows:

Pin	Electrode Connection
1	Heater (<i>h</i>)
2	Grid 3 and Shield (<i>g3, s</i>)
3	Anode / Plate (<i>a</i>)
4	Grid 3 and Shield (<i>g3, s</i>)
5	Grid 2 / Screen Grid (<i>g2</i>)
6	Cathode (<i>k</i>)
7	Grid 1 / Control Grid (<i>g1</i>)

Pin	Electrode Connection
8	Heater (h)

Physically, the tube has a maximum overall height of 59 mm, a maximum seated height of 50 mm, and a main body height of 46.2 mm. The top cap of the metal screen has a diameter of 20 mm.

Electrical Characteristics and Operating Points

The typical electrical characteristics of the 12J3L are measured under a standard set of operating conditions. The nominal operating point is defined with a heater voltage of 12.6 V, a plate voltage of 150 V, a screen grid (grid 2) voltage of 75 V, a control grid (grid 1) voltage of -2.1 V, and the suppressor grid (grid 3) at 0 V.

Parameter	Value / Range	Conditions / Notes
Heater Voltage (U_h)	12.6 V	Nominal
Heater Current (I_h)	74 ± 4 mA	
Plate Voltage (U_a)	150 V	Nominal
Grid 2 Voltage ($U_{[g2]}$ (/tubes/G2))	75 V	Nominal
Grid 1 Voltage (U_{g1})	-2.1 V	Nominal
Grid 3 Voltage (U_{g3})	0 V	Nominal
Plate Current (I_a)	$2.3 +1.0 / -0.9$ mA	At nominal operating point
Grid 2 Current ($I_{[g2]}$ (/tubes/G2))	0.55 ± 0.35 mA	At nominal operating point
Transconductance (S)	$1.7 +0.4 / -0.5$ mA/V	At nominal operating point
Plate Resistance (R_i)	≥ 0.9 M Ω	For 80% of tubes
Plate Resistance (R_i)	≥ 0.5 M Ω	For 20% of tubes
Equivalent Noise Resistance (R_{eqv})	4.5 k Ω	Measured at $I_a = 2$ mA
Vibration Noise (U)	≤ 150 mV	
Plate Current at Cutoff (I_{az})	≤ 100 μ A	Measured at $U_{g1} = -7$ V

In addition to the standard operating point, the tube is capable of delivering an output power (P_k) of ≥ 0.5 W under the following specific test conditions:

- Plate Voltage (U_a) = Grid 2 Voltage ($U_{[g2]}(/tubes/G2)$) = 250 V
- Effective Grid 1 Signal Voltage ($U_{g1\sim eff}$) = 2.8 V
- Grid 2 Resistor ($R_{[g2]}(/tubes/G2)$) = 20 k Ω
- Cathode Resistor (R_k) = 500 Ω
- Non-linear Distortion Factor (k_f) = 10%

Interelectrode Capacitances

The 12J3L has low interelectrode capacitances, which are critical for maintaining stability in high-frequency applications. The specified values are:

Capacitance Parameter	Value
Grid 1 to Cathode (C_{g1k})	3.7 ± 0.3 pF
Plate to Cathode (C_{ak})	4.0 ± 0.35 pF
Grid 1 to Plate (C_{g1a})	≤ 0.007 pF
Plate to Cathode (C_{a-k})	≤ 0.007 pF

Maximum and Minimum Permissible Ratings

To ensure reliable operation and prevent damage, the operating conditions of the 12J3L must be maintained within the following maximum and minimum limits:

Rating	Minimum Limit	Maximum Limit
Heater Current (I_h)	74 mA	77 mA
Plate Voltage (U_a)	—	250 V
Plate Voltage at Switch-In (U_a at moment of switching in)	—	300 V
Grid 2 Voltage ($U_{[g2]}(/tubes/G2)$)	—	225 V
Grid 2 Voltage at Switch-In ($U_{[g2]}(/tubes/G2)$ at moment of switching in)	—	300 V
Plate Dissipation (P_a)	—	2 W
Grid 2 Dissipation ($P_{[g2]}(/tubes/G2)$)	—	0.7 W

Rating	Minimum Limit	Maximum Limit
Cathode Current (I_k)	—	11 mA
Heater-to-Cathode Voltage (U_{kh})	—	250 V

Characteristic Curves and Triode Connection

The electrical behavior of the 12J3L is illustrated by several sets of characteristic curves:

- **Plate Characteristics (I_a vs. U_a):** Under standard pentode operation ($U_h = 12.6$ V, $U_{g2}(/tubes/G2) = 75$ V, $U_{g3} = 0$ V), the plate current curves exhibit a classic pentode shape. The curves are flat and horizontal across a wide range of plate voltages (from approximately 50 V up to 250 V), demonstrating high plate resistance. These curves are plotted for control grid voltages (U_{g1}) ranging from 0 V to -4 V in 0.5 V increments.
- **Transfer Characteristics ($I_a, I_{g2}(/tubes/G2)$ vs. U_{g1}):** At a plate voltage of 150 V, the transfer curves show the relationship of plate current (solid lines) and screen grid current (dashed lines) as a function of control grid bias. Curves are provided for screen grid voltages ($U_{g2}(/tubes/G2)$) of 75 V and 100 V, showing how higher screen voltage shifts the curves to the left and increases overall current.
- **Screen Grid Characteristics ($I_{g2}(/tubes/G2)$ vs. U_a):** These curves show the screen grid current behavior under the same conditions as the plate characteristics, illustrating how screen current decreases as plate voltage increases, eventually stabilizing at a low value.
- **Triode Connection (I_a vs. U_a):** The 12J3L can also be operated in a triode configuration. In this mode, the plate characteristics are plotted for control grid voltages (U_{g1}) from 0 V down to -14 V in 2 V steps, showing typical triode-like curves where plate current rises more steeply with plate voltage.

Technical Summary

The **12J3L** is a robust, loctal-base pentode vacuum tube designed for series-connected cathode communication lines. Operating with a nominal 12.6 V heater, it provides a transconductance of 1.7 mA/V, a plate resistance of ≥ 0.9 M Ω (for the majority of units), and a plate dissipation rating of up to 2 W. Its mechanical and environmental ruggedness, combined with its low interelectrode capacitances (such as a grid-to-plate capacitance of ≤ 0.007 pF), makes it a highly stable and reliable choice for communication and industrial applications.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1970 Russian Tubes Mashpriborintorg

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

1970 RUSSIAN TUBES MASHPRIBORINTORG

Section 1 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Guaranteed service life	3000 h	PublishedGuarantee
Transconductance	1.71 mA/V	PublishedElectricalCharacteristics

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