



ELECTRONIC TUBE REFERENCE

13J41S

Voltage - Pentode High Frequency (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

High-frequency voltage-amplifier pentode designed for long-distance cable-telephone underwater equipment. Its specialized communications role emphasizes reliable RF or carrier-frequency signal amplification in submerged repeater systems.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	13.3 V / 295 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	500000 Ω
TRANSCONDUCTANCE	0.0041 S
MAXIMUM PLATE VOLTAGE	100 V
MAXIMUM SCREEN VOLTAGE	100 V
MAXIMUM CATHODE CURRENT	3.2 mA
<i>Values promoted where clearly identifiable from Russian source.</i>	

13J41S — High-Frequency Voltage Amplifier Pentode

A specialized, long-life, high-reliability pentode designed for high-frequency voltage amplification in underwater telecommunication systems.

Overview

The **13J41S** (transliterated from the Russian **13Ж41С**) is a high-reliability, long-life pentode designed specifically for high-frequency voltage amplification. Its primary application is in amplifiers for underwater long-distance high-frequency telephone cable communication equipment. The tube is constructed in a glass envelope with flexible leads, has a mass of approximately 50 grams, and features an exceptional rated operating life of over 100,000 hours.

Construction, Heater, and Physical Characteristics

The 13J41S is built to withstand demanding environmental conditions, ensuring long-term stability in remote or inaccessible locations such as undersea cable repeaters. It features a glass envelope with flexible wire leads designed for direct soldering into circuits, which eliminates contact resistance and mechanical failures associated with traditional tube sockets.

Heater Characteristics

The tube utilizes an indirectly heated cathode. The heater is designed for operation from a nominal 13.3 V supply.

Heater Parameter	Value
Nominal heater voltage (U_H)	$13.3 \pm 0.9 \text{ V}$
Nominal heater current (I_H)	295^{+4}_{-5} mA
Permissible heater current range	$290 - 299 \text{ mA}$
Heating method	Indirect

Mechanical and Environmental Limits

The mechanical construction of the 13J41S is highly ruggedized, with specified resistance to external mechanical and thermal stresses:

- **Vibration acceleration (5 to 50 Hz):** 10 g
- **Vibration acceleration (50 to 300 Hz):** 1.5 g
- **Single shocks (peak acceleration):** 300 g
- **Continuous acceleration:** 100 g
- **Ambient temperature range (transport and storage):** -60 to $+70 \text{ }^{\circ}\text{C}$
- **Maximum bulb temperature:** $50 \text{ }^{\circ}\text{C}$

Pinout and Electrode Connections

The 13J41S features a 6-lead configuration. The flexible leads are connected to the internal electrodes as follows:

Lead Number	Electrode Connection
1	Anode (a)
2	Heater (p)
3	Cathode (k) and Grid 3 (g_3 / c_3) (internally connected)
4	Grid 1 (g_1 / c_1)
5	Grid 2 (g_2 / c_2)
6	Heater (p)

By internally connecting the suppressor grid (Grid 3) directly to the cathode, the tube simplifies external wiring and optimizes high-frequency performance.

Electrical Characteristics and Operating Points

The nominal electrical characteristics of the 13J41S are defined under the following specific operating conditions:

- **Heater Voltage (U_H):** 13.3 V
- **Anode Voltage (U_a):** 80 V
- **Grid 2 Voltage (U_{c2}):** 80 V
- **Cathode Bias Resistor (R_k):** $800\ \Omega$

Under these conditions, the tube exhibits the following typical parameters:

Parameter	Value
Anode current (I_a)	$2^{+0.3}_{-0.2}\text{ mA}$
Grid 2 current (I_{c2})	$(0.5 \pm 0.2)\text{ mA}$
Cathode current in pulse	$\geq 2.5\text{ mA}$
Transconductance (g_m)	$(4.1 \pm 0.7)\text{ mA/V}$
Plate resistance (r_p)	$500\text{ k}\Omega$
Reverse Grid 1 current ($I_{[c1] (/tubes/C1)_{rev}}$)	$\leq 0.02\ \mu\text{A}$
Vibration noise voltage (at $R_a = 10\text{ k}\Omega$)	$\leq 200\text{ mV}$

Leakage Currents

To maintain high input impedance and stable operation, the 13J41S is rated for extremely low leakage currents:

- **Anode to all other electrodes** (at $U_a = 200\text{ V}$): $\leq 2\text{ }\mu\text{A}$
- **Cathode to heater**: $\leq 10\text{ }\mu\text{A}$
- **Grid 1 to cathode**: $\leq 1\text{ }\mu\text{A}$
- **Grid 1 to all other electrodes**: $\leq 2\text{ }\mu\text{A}$

Interelectrode Capacitances

The low interelectrode capacitances of the 13J41S support its application in high-frequency voltage amplification, minimizing signal degradation and feedback:

- **Input capacitance (C_{in})**: $(11 \pm 1.2)\text{ pF}$
- **Output capacitance (C_{out})**: $(3 \pm 0.7)\text{ pF}$
- **Transfer capacitance (C_{gp})**: $\leq 0.04\text{ pF}$

The exceptionally low transfer capacitance of $\leq 0.04\text{ pF}$ minimizes the Miller effect, allowing stable high-frequency gain without self-oscillation.

Maximum Operating Limits

To ensure the rated longevity and reliability of the device, the operating conditions must not exceed the following maximum limits:

Parameter	Maximum Limit
Anode Voltage (U_a)*	100 V
Grid 2 Voltage (U_{c2})	100 V
Cathode Current (I_k)	3.2 mA
Heater-to-Cathode Voltage (Heater positive)	110 V
Grid 1 Circuit Resistance (R_{g1})	$0.5\text{ M}\Omega$
Bulb Temperature	50 °C

Note: The original documentation contains a typographical label "Ток анода" (Anode current) in the maximum limits table, but lists the value in Volts ("100 B"), which represents the maximum Anode Voltage (U_a).

Reliability and Lifetime Criteria

The 13J41S is designed for extreme reliability, with a guaranteed operating life of **at least 100,000 hours**. At the end of this lifetime, the tube is evaluated against the following degradation criteria:

- **Reverse Grid 1 Current:** $\leq 0.5 \mu\text{A}$
- **Transconductance Decrease:** $\leq 30\%$ of the initial nominal value

These strict criteria ensure that even after more than 11 years of continuous operation, the tube retains a high level of performance, making it ideal for inaccessible installations.

Technical Summary

The **13J41S** is a highly specialized, long-life high-frequency pentode featuring a glass envelope with flexible leads and a mass of 50 grams. Operating with a nominal 13.3 V heater, it is optimized for low – noise, high – frequency voltage amplification under low – voltage conditions (80 V anode and screen grid). With a transconductance of 4.1 mA/V , a high plate resistance of $500 \text{ k}\Omega$, and an exceptionally low transfer capacitance of $\leq 0.04 \text{ pF}$, it delivers stable and reliable gain. Its outstanding design feature is its rated operating life of over 100,000 hours, combined with high resistance to mechanical shock and vibration, making it a premier choice for undersea telecommunication systems.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1981 Russian Tubes Katsnelson and Larionov

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

1981 RUSSIAN TUBES KATSNELSON AND LARIONOV

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Screen current	2 mA	Published Russian-source value; OCR-normalized.
Transconductance	7 V	Published Russian-source value; OCR-normalized.
Transfer capacitance	0.04 pF	Published Russian-source value; OCR-normalized.
Service life	9	Published Russian-source value; OCR-normalized.
Plate current	100 V	Published Russian-source value; OCR-normalized.
Heater current	2957 mA	Nominal/published heater value.

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