



ELECTRONIC TUBE REFERENCE

13P1S

Power - Beam (NOT sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

BEAMPOWER

Beam tetrode documented in bilingual Russian technical literature; available source establishes its tetrode construction but does not clearly support a narrower functional application.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	8
NOMINAL HEATER	13 V / 750 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Beam Power	
TRANSCONDUCTANCE	0.0075 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	6 W
<i>Published ratings/characteristics promoted where clearly identified; additional bilingual values retained as parameters.</i>	

13P1S Output Beam Tetrode

The **13P1S** (also designated as **13Π1C**) is an octal-base output beam tetrode designed primarily for the amplification of low-frequency power. It features an indirectly heated oxide-coated cathode and is housed in a glass envelope. The tube is engineered to withstand demanding environmental and mechanical conditions, making it suitable for applications requiring high reliability.

Mechanical Construction and Pinout

The 13P1S is enclosed in a glass bulb with a standard octal base. It has a maximum weight of 50 grams. The physical dimensions of the tube are characterized by a maximum overall height of 92 mm and a maximum bulb diameter of 33 mm. The base pins have a diameter of 2.4 ± 0.1 mm, and the central key (spigot) has a maximum diameter of 8 mm.

The tube is designed to operate reliably under severe environmental conditions, including:

- Ambient temperatures ranging from -60 °C to $+70$ °C.
- Relative humidity levels of 95% to 98% at an ambient temperature of $+20$ °C.
- Mechanical vibration loads up to 2.5 g.

The octal base connections, viewed from the bottom of the tube, are assigned as follows:

- **Pin 2:** Heater (h)
- **Pin 3:** Anode and Grid 3 (a, g3) - internally connected
- **Pin 4:** Grid 2 / Screen Grid (g2)
- **Pin 5:** Grid 1 / Control Grid (g1)
- **Pin 7:** Heater (h)
- **Pin 8:** Cathode (k)

Electrical Characteristics and Typical Operation

The 13P1S operates with a nominal heater voltage of 13 V. The heater current is rated at 750 ± 80 mA.

Heater Power Calculation: Using the nominal heater voltage ($U_h = 13$ V) and the nominal heater current ($I_h = 0.75$ A), the nominal heater power consumption is calculated as: $P_h = 13 \text{ V} \times 0.75 \text{ A} = 9.75 \text{ W}$

Under typical static operating conditions, the electrical characteristics of the 13P1S are defined as follows:

- **Anode Voltage (U_a):** 26 V
- **Grid 2 Voltage ($U_{[g2]}$ (/tubes/G2)):** 26 V
- **Grid 1 Voltage (U_{g1}):** 0 V
- **Anode Current (I_a):** 42 ± 10 mA
- **Grid 2 Current ($I_{[g2]}$ (/tubes/G2)):** ≤ 4 mA
- **Transconductance (S):** 7.5 ± 1.5 mA/V
- **Internal Resistance (R_i):** $1.5 \text{ k}\Omega$

The interelectrode capacitances of the device are:

- **Input Capacitance (Grid 1 to Cathode, C_{g1k}):** 15.5 ± 2.5 pF
- **Output Capacitance (Anode to Cathode, C_{ak}):** 13.0 ± 2.5 pF
- **Feedback Capacitance (Grid 1 to Anode, C_{g1a}):** ≤ 2.5 pF

Operating Points and Power Amplification

The 13P1S is rated for both single-ended (single-cycle) and push-pull low-frequency power amplifier configurations. The specific operating points and performance metrics for these configurations are detailed below.

Single-Ended (Single-Cycle) Operation

Under single-ended operating conditions, the tube is configured with:

- **Anode Load Resistance (R_a):** 750 Ω
- **Input AC Grid Voltage ($U_{g1\sim\text{eff}}$):** 5.5 V
- **Minimum Output Power (P_k):** 220 mW

Push-Pull Operation

For push-pull configurations utilizing two 13P1S tubes, two distinct operating conditions are established:

- **Condition 1 (Power Output):** At an input AC grid voltage ($U_{g1\sim\text{eff}}$) of 11 V and an anode load resistance (R_a) of 1.5 k Ω , the push-pull stage delivers an output power (P_k) of 550 mW.
- **Condition 2 (Distortion Limit):** At an input AC grid voltage ($U_{g1\sim\text{eff}}$) of 8.5 V and an anode load resistance (R_a) of 1.5 k Ω , the push-pull stage operates with a distortion factor (k_f) of 10%.

Maximum and Minimum Permissible Ratings

To ensure the reliability and guaranteed service life of 2000 hours, the operating conditions of the 13P1S must be maintained within the following absolute limits:

Parameter	Minimum Value	Maximum Value
Heater Voltage (U_h)	11.7 V	14.3 V
Anode Voltage (U_a)	—	110 V
Grid 2 Voltage ($U_{[g2] (/tubes/G2)}$)	—	80 V
Anode Dissipation (P_a)	—	6 W
Grid 2 Dissipation ($P_{[g2] (/tubes/G2)}$)	—	1 W
Heater-to-Cathode Voltage (U_{kh})	—	100 V

Analysis of Characteristic Curves

The electrical behavior of the 13P1S is further illustrated by its family of characteristic curves, which detail the relationships between electrode voltages and currents.

Plate Characteristics ($I_a, I_{g2} = f(U_a)$)

The plate characteristic curves are plotted at a nominal heater voltage (U_h) of 13 V and a screen grid voltage ($U_{[g2]}(/tubes/G2)$) of 26 V. These curves display the anode current (I_a , represented by solid lines) and screen grid current ($I_{[g2]}(/tubes/G2)$, represented by dashed lines) as a function of anode voltage (U_a) across a range of control grid bias voltages (U_{g1}) from 0 V down to -10 V in steps of 2 V.

- At $U_{g1} = 0$ V, the anode current rises rapidly as anode voltage increases from 0 V, demonstrating low knee voltage characteristics before transitioning into a flatter, pentode-like plate resistance region.
- As the control grid bias (U_{g1}) becomes more negative, the overall anode current level decreases progressively.
- The screen grid current ($I_{[g2]}(/tubes/G2)$) is highest at low anode voltages and decreases as the anode voltage rises, reflecting the partition of space charge between the screen grid and the anode.

Transfer Characteristics ($I_a, I_{g2} = f(U_{g1})$)

The transfer characteristics are plotted at a nominal heater voltage (U_h) of 13 V and a screen grid voltage ($U_{[g2]}(/tubes/G2)$) of 26 V, for three distinct anode voltages ($U_a = 16$ V, 26 V, and 36 V).

- The curves show that anode current (I_a) increases as the control grid voltage (U_{g1}) moves from a negative bias toward 0 V.
- Higher anode voltages shift the transfer curve slightly upward, resulting in higher anode current for a given grid bias.
- The control grid cutoff voltage is approximately -12 V, where both anode and screen grid currents approach zero.

Technical Summary

The **13P1S** is a robust, glass-envelope output beam tetrode featuring an octal base and an indirectly heated cathode. Operating with a nominal 13 V heater, it is optimized for low-voltage, low-frequency power amplification, delivering up to 220 mW in single-ended service and 550 mW in push-pull configurations. With a guaranteed service life of 2000 hours and high resistance to extreme temperatures, humidity, and mechanical vibration, the 13P1S is well-suited for reliable operation in demanding environments.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X Russian

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

195X RUSSIAN

Section 1 · Beam Power

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Service life	2000 h	Fapanruposannas poaroseunocts 2000 uwacos. Service life guarantee: 2000 hr.
Source symbol U,	13 V	U, 13V Ug O P, %) 550 mW
Published electrical parameter	550 mW	U, 13V Ug O P, %) 550 mW
Source symbol I,	75080 mA	I, 75080 mA I 42+10 mA k%) <109,
Source symbol I	42+10 mA	I, 75080 mA I 42+10 mA k%) <109,
Source symbol U,	2 V	U, 2V I, <4mA S 75+1,5 mA/V
Source symbol I,	<4 mA	U, 2V I, <4mA S 75+1,5 mA/V
Source symbol S	75+1.5 mA/V	U, 2V I, <4mA S 75+1,5 mA/V
Source symbol Uy	26 V	Uy 26V P) =220 mW R, 1,5 kQ
Published electrical parameter	220 mW	Uy 26V P) =220 mW R, 1,5 kQ
Source symbol R,	1.5 kΩ	Uy 26V P) =220 mW R, 1,5 kQ
Published electrical parameter	5.5 V	1) B opHOTAKTHOM peXKHMe IpH Ug1~efi=5,5 V u R,=750Q.
Published electrical parameter	750 Ω	1) B opHOTAKTHOM peXKHMe IpH Ug1~efi=5,5 V u R,=750Q.
Published electrical parameter	55 V	Under single-cycle operation at Ugf ~eif =55 Vand R, =750 Q.
Published electrical parameter	11 V	2) B ABYXTakTHOM pexkuMe (LIS JBYX JaMI) IpH Ugl~eff= 11V u R, =15 kQ.
Published electrical parameter	15 kΩ	2) B ABYXTakTHOM pexkuMe (LIS JBYX JaMI) IpH Ugl~eff= 11V u R, =15 kQ.
Published electrical parameter	1.5 kΩ	Under push-pull operation (for the both tubes) at U gl ~eif =11V and R, = 1,5 kQ.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Published electrical parameter	8.5 V	3) B ABYXTakTHOM peXuMe IpH Ug1~eff=8,5 VuR,=15 k.
Published electrical parameter	85 V	Under push-pull operation at U gl~ef =85V and R, = 1.5 kQ.
Source symbol Cglk	15.5+2.5 pF	Cglk 15,5+2,5 pF
Source symbol C.k	13.025 pF	C.k 13,025 pF
Source symbol Cgla	<2.5 pF	Cgla < 2,5 pF
Source symbol U,	143 V	U, 143V 11,7V
Source symbol V	11.7 V	U, 143V 11,7V
Source symbol U,	110 V	U, 110V
Source symbol Ug2	80 V	Ug2 80V
Source symbol P,	6 W	P, 6W
Source symbol U,	100 V	U, 100V
Source symbol Z	8 mA	Z 8 max
Published electrical parameter	92 V	92 v /
Source symbol Pads	16 V	40 4\~ Pads 16V 3 L 2020
Published electrical parameter	13 V	I, U,=13V I, U,=13V
Published electrical parameter	26 V	— = =l Ugpo=26V - — =1, Uyy=26V



SOURCE DATA APPENDIX

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 · Beam Power

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Guaranteed service life	2000 h	PublishedGuarantee
Transconductance	75 mA/V	PublishedElectricalCharacteristics

TUBE TINKER

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