



ELECTRONIC TUBE REFERENCE

10Z1L

Voltage - Pentode Sharp Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Russian universal short-characteristic pentode designed for voltage and power amplification and high-frequency oscillation to about 200 MHz. Manufacturer documentation specifies a 2,500-hour service-life guarantee and broad amplifier/oscillator capability.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	10 V / —	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
TRANSCONDUCTANCE	0.001702 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	225 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM SCREEN DISSIPATION	0.7 W
<p>Russian 10Zh1L short-characteristic pentode for voltage and power gain and oscillation to 200 MHz. Heater 10 V, current uncertain. gm 1.702 mA/V retained; former amplification factor 100 unsupported. Maximum plate 250 V, screen 225 V, plate dissipation 2 W, screen dissipation 0.7 W. Switch-on voltages are not continuous maxima. Service life 2500 h.</p>	

10Z1L — Universal Pentode with a Short Characteristic Curve

The **10Z1L** is a universal pentode designed for the amplification of voltage and power, as well as the generation of high-frequency oscillations at frequencies up to 200 MHz. It features a short grid characteristic curve and is engineered for reliable operation under demanding environmental and mechanical conditions.

Construction, Physical Dimensions, and Pinout

The 10Z1L is constructed with a glass bulb envelope and is equipped with an external metal screen to minimize electromagnetic interference. It features a flat base with a central locating key and an indirectly heated, oxide-coated cathode.

The physical dimensions of the device are characterized by:

- **Maximum overall height:** 69 mm
- **Maximum seated height:** 60 mm
- **Top cap/shield diameter:** 20 mm
- **Maximum weight:** 35 g

The tube is designed with an 8-pin base configuration. The pin connections, viewed from the bottom of the tube, are assigned as follows:

Pin Number	Electrode Connection
Pin 1	Heater (h)
Pin 2	Grid 3 and internal shield (g3, s)
Pin 3	Anode / Plate (a)
Pin 4	Grid 3 and internal shield (g3, s)
Pin 5	Grid 2 (g2)
Pin 6	Cathode (k)
Pin 7	Grid 1 (g1)
Pin 8	Heater (h)

Electrical Characteristics and Operating Points

The nominal electrical characteristics of the 10Z1L are specified at a standard Class A operating point. Under these conditions, the heater is supplied with a nominal 10 V, and Grid 3 is held at ground potential.

Standard Operating Conditions and Parameters

Parameter	Symbol	Value / Range
Heater Voltage	U _h	10 V
Heater Current	I _h	93 ± 7 mA
Plate Voltage	U _a	150 V
Grid 2 Voltage	U _{g2}	75 V
Grid 1 Voltage	U _{g1}	-2.1 V
Grid 3 Voltage	U _{g3}	0 V
Plate Current	I _a	2.6 ± 1.2 mA
Grid 2 Current	I _{g2}	≤ 1.2 mA
Transconductance	S	1.7 (+0.4, -0.5) mA/V
Equivalent Noise Resistance	R _{eqv}	4.5 kΩ

The internal plate resistance (R_i) varies across production lots:

- For 80% of tubes: 0.9 MΩ
- For 20% of tubes: 0.5 MΩ

Cutoff and Power Output Characteristics

- **Plate Cutoff Current (I_{az}):** When Grid 1 bias is increased to -7 V, the plate current drops to ≤ 100 μA.
- **Output Power (P_k):** The tube is capable of delivering an output power of ≤ 0.5 W under the following specific operating conditions:
 - Plate Voltage (U_a): 250 V
 - Grid 2 Voltage (U_{g2}): 250 V
 - Effective Input Signal Voltage (U_{g1~eff}): 2.8 V
 - Cathode Bias Resistor (R_k): 500 Ω
 - Plate Load Resistor (R_a): 35 kΩ
 - Grid 2 Resistor (R_{g2}): 20 kΩ

Interelectrode Capacitances

The capacitive coupling between the internal electrodes of the 10Z1L is kept low to facilitate high-frequency operation:

Capacitance Parameter	Symbol	Value
Input Capacitance	Cg1k	3.7 \u00b1 0.3 pF
Output Capacitance	Cak	4.0 \u00b1 0.35 pF
Grid 1 to Plate Capacitance	Cg1a	\u2264 0.01 pF
Plate to Cathode Capacitance	Ca-k	0.007 pF

Permissible Ratings and Environmental Limits

To ensure reliable operation and achieve the guaranteed service life of 2500 hours, the operating conditions must be maintained within the following absolute maximum and minimum limits:

Rating Parameter	Minimum Limit	Maximum Limit
Heater Voltage (Uh)	8.5 V	11.6 V
Plate Voltage (Ua)	\u2014	250 V
Plate Voltage at Switch-on (Ua)	\u2014	300 V
Grid 2 Voltage (Ug2)	\u2014	225 V
Grid 2 Voltage at Switch-on (Ug2)	\u2014	300 V
Plate Dissipation (Pa)	\u2014	2 W
Grid 2 Dissipation (Pg2)	\u2014	0.7 W
Cathode Current (Ik)	\u2014	11 mA
Heater-to-Cathode Voltage (Ukh)	\u2014	100 V

Environmental and Mechanical Durability

The 10Z1L is designed to withstand harsh environmental conditions and mechanical stress:

- **Ambient Temperature Range:** -60 \u00b0C to +70 \u00b0C
- **Relative Humidity:** 95% to 98% (measured at an ambient temperature of +20 \u00b0C)
- **Vibration Resistance:** Withstands vibration loads up to 2.5 g
- **Impact Resistance:** Withstands multiple impact loads up to 12 g

Characteristic Curves and Triode Connection

The electrical behavior of the 10Z1L is further illustrated by its characteristic curves under various operating configurations:

- **Plate Characteristics (I_a vs. U_a):** At a nominal heater voltage of 10 V, Grid 2 voltage of 75 V, and Grid 3 voltage of 0 V, the plate current (I_a) curves for Grid 1 voltages (U_{g1}) from 0 V to -4 V exhibit a classic pentode profile. The curves rise sharply at low plate voltages (below 30 V) and flatten out almost horizontally across the remainder of the voltage range up to 250 V, demonstrating high dynamic plate resistance.
- **Grid 2 Current Characteristics (I_{g2} vs. U_a):** Under the same operating conditions, the Grid 2 current (I_{g2}) is highest when the plate voltage is near zero. As the plate voltage increases and begins to collect electrons, the Grid 2 current drops rapidly, stabilizing at a low level (typically below 2 mA) for plate voltages above 50 V.
- **Transfer Characteristics (I_a , I_{g2} vs. U_{g1}):** At a plate voltage of 150 V and heater voltage of 10 V, the transfer curves show the relationship of plate and Grid 2 currents to the control grid bias. Curves plotted for Grid 2 voltages of 75 V and 100 V show a smooth reduction in both currents as the control grid bias becomes more negative, with plate current approaching complete cutoff near -6 V to -8 V.
- **Triode-Connected Characteristics (I_a vs. U_a):** When configured in a triode connection at a heater voltage of 10 V, the tube exhibits triode-like behavior. The plate current curves rise more steeply and continuously with increasing plate voltage. These curves are plotted for Grid 1 bias values ranging from 0 V down to -14 V, showing a wider bias range compared to the pentode mode.

Technical Summary

The **10Z1L** is a robust, high-frequency universal pentode featuring an indirectly heated oxide-coated cathode, an integrated external metal shield, and a flat 8-pin base. Operating with a nominal 10 V heater supply, it is optimized for voltage and power amplification as well as high-frequency oscillation up to 200 MHz.

With a guaranteed service life of 2500 hours, the tube is highly resistant to extreme temperatures (-60 \u00b0C to +70 \u00b0C), high humidity, and mechanical shocks up to 12 g. Its electrical parameters include a transconductance of 1.7 mA/V, a plate resistance of 0.5 to 0.9 M\u03a9, and low interelectrode capacitances (such as a grid-to-plate capacitance of \u2264 0.01 pF), making it a highly stable and versatile choice for high-frequency and general-purpose amplification.

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 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Source symbol mo	200 MHz	HANl BBICOKOH uwacToTHl (mo 200 MHz). quency oscillation (up to 200 MHz).
Source symbol to	200 MHz	HANl BBICOKOH uwacToTHl (mo 200 MHz). quency oscillation (up to 200 MHz).
Source symbol B0	3 A	npu teMmneparype +20°C, a taxkike K BO3AEHCTBHIO relative humidity of 95 to 98% at +20°C, as well
Source symbol aroeeusocTs	2500 µA	FapantupoBannas posaroeeusocTs 2500 uacos. Service life guarantee: 2500 hr.
Service life	2500 h	FapantupoBannas posaroeeusocTs 2500 uacos. Service life guarantee: 2500 hr.
Source symbol U,	10 V	U, 10V Ug 0 S 1,702 mA/V
Source symbol S	1.702 mA/V	U, 10V Ug 0 S 1,702 mA/V
Published electrical parameter	7 mA	I, 9%7mA I, 26x1,2mA R;%) 09 MQ
Source symbol I,	26±1.2 mA	I, 9%7mA I, 26x1,2mA R;%) 09 MQ
Published electrical parameter	9 MΩ	I, 9%7mA I, 26x1,2mA R;%) 09 MQ
Source symbol U,	150 V	U, 150V I,,") 100 pA R;9) 05 MQ
Published electrical parameter	100 pA	U, 150V I,,") 100 pA R;9) 05 MQ
Published electrical parameter	5 MΩ	U, 150V I,,") 100 pA R;9) 05 MQ
Source symbol I,	<12 mA	Ugp BV I, <12mA Reqy 45 kQ
Source symbol Reqy	45 kΩ	Ugp BV I, <12mA Reqy 45 kQ
Published electrical parameter	21 V	Uy —21V P, =05W

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Published electrical parameter	5 W	Uy —21V P, =05W
Published electrical parameter	250 V	Uy=Ug=250V,
Published electrical parameter	28 V	U gl~ef =28V, R, =500 Q, R, =35 k@, Ryp=20 kQ.
Published electrical parameter	500 Ω	U gl~ef =28V, R, =500 Q, R, =35 k@, Ryp=20 kQ.
Published electrical parameter	20 kΩ	U gl~ef =28V, R, =500 Q, R, =35 k@, Ryp=20 kQ.
Source symbol Coix	3703 pF	Coix 3703 pF Cgra 001 pF
Source symbol Cgra	1 pF	Coix 3703 pF Cgra 001 pF
Source symbol Cae	40035 pF	Cae 40035 pF Cax 0007 pF
Source symbol Cax	7 pF	Cae 40035 pF Cax 0007 pF
Source symbol U,	116 V	U, 116V 85V P, 2w
Source symbol V	85 V	U, 116V 85V P, 2w
Source symbol P,	2 W	U, 116V 85V P, 2w
Source symbol U,	250 V	U, 250 V Pg2 0,7 W
Source symbol Pg2	0.7 W	U, 250 V Pg2 0,7 W
Source symbol u,H	300 V	u,H 300V I 11 mA
Source symbol I	11 mA	u,H 300V I 11 mA
Source symbol Uy	100 V	Ug2 225 'V Uy 100V
Published electrical parameter	300 V	Ug2) 300V
Published electrical parameter	3 A	12 3ax. 738 177
Source symbol a	5 V	;] -a5v 74 5\$
Published electrical parameter	-1.5 V	-1.5v - .
Source symbol g	-2 V	g -2V - 1 T
Published electrical parameter	75 V	, 75V Wi 2yl
Published electrical parameter	3 V	3% . 3V L// A
Source symbol A	3.5 V	A 3.5V A A A" L4

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Published electrical parameter	-4 V	-4V Ps
Published electrical parameter	10 V	U, =10V _ Up,=10V
Published electrical parameter	150 V	Ugo =75V — =1y U, =150V
Source symbol g	1-0 V	\ \ g1 -0V D5V 1\ 48k 20 -45% -9V 391 -4, / Il /11 / l@“
Source symbol D	5 V	\ \ g1 -0V D5V 1\ 48k 20 -45% -9V 391 -4, / Il /11 / l@“
Published electrical parameter	-9 V	\ \ g1 -0V D5V 1\ 48k 20 -45% -9V 391 -4, / Il /11 / l@“
Published electrical parameter	7 A	2“\: R . A4 2 7 A
Published electrical parameter	1 W	0 50 1w 150 200 Ug .V 0 “00 200 Ug.V

TUBE TINKER

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