

ELECTRONIC TUBE REFERENCE

12G2

Voltage - Triode (with diode, heptode or hexode) electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS
CONSTRUCTION
DIODE-DIODE-TRIODE

Russian 12G2 (12Г2) metal-envelope double-diode triode for low-frequency detection and voltage preamplification, with 12.6 V 0.15 A heater and triode amplification factor approximately 100.

GENERAL CHARACTERISTICS

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

SECTION RATINGS

SECTION1 Diode
No fixed ratings recorded.
Published ratings/characteristics promoted where clearly identified; additional bilingual values retained as parameters.
SECTION2 Diode
No fixed ratings recorded.
Published ratings/characteristics promoted where clearly identified; additional bilingual values retained as parameters.

SECTION3 Triode	
PLATE RESISTANCE	85000 Ω
TRANSCONDUCTANCE	0.00115 S
AMPLIFICATION FACTOR	100
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	1 W
<i>Mashpriborintorg 1970 Russian/English 12Г2 (12G2) double diode-triode, triode section. Typical heater 12.6 V 0.15 A, Va 250 V, Vg -2 V, Ia 1.15±0.65 mA, rp 85 kΩ, gm 1.15±0.35 mA/V = 0.00115±0.00035 A/V, mu 100±15. Maximum plate voltage 300 V, plate dissipation 1 W. Heater allowed 11.3-13.9 V; heater-cathode max 100 V. Datasheet gives three interelectrode capacitances 2.8, 3, 16 pF but electrode labels uncertain, not promoted. Maximum diode current ~1 mA ambiguous, not assigned. Shared cathode connection not established from available basing diagram. Metal octal envelope, operating temperature -60 to +70 °C, humidity 95-98% at +20 °C, mass max 40 g, guaranteed life 1500 h.</i>	

12G2 — Double Diode-Triode Vacuum Tube

An indirectly heated double diode-triode vacuum tube designed for low-frequency detection and pre-amplification in radio receivers and audio-frequency voltage amplifiers.

Overview

The **12G2** (also designated as **12Г2**) is a multi-unit vacuum tube containing two diodes and a single high-mu triode within a single metal envelope. The diode and triode sections share a common indirectly heated, oxide-coated cathode. This tube is primarily designed for AM signal detection, automatic gain control (AGC) rectification, and subsequent low-frequency voltage pre-amplification.

By combining these functions into a single envelope, the 12G2 allows designers to minimize the physical component count in compact receiver designs. Its rugged metal construction provides excellent electrical shielding and mechanical durability, making it highly reliable under diverse operating conditions.

Construction, Physical Dimensions, and Environmental Specifications

The 12G2 is enclosed in a robust metal envelope and is equipped with a standard octal base. The metal case acts as an integrated electrostatic shield, eliminating the need for external shielding components in sensitive RF or audio circuits.

The physical dimensions and mechanical properties of the tube are as follows:

- **Maximum overall height:** 67 mm
- **Maximum base diameter:** 33 mm
- **Maximum envelope diameter:** 27 mm
- **Maximum weight:** 40 grams

The tube is engineered to withstand harsh environmental conditions, making it suitable for mobile or rugged applications. It is rated to operate reliably within an ambient temperature range of **-60 °C to +70 °C** and can tolerate a relative humidity of **95% to 98%** at an ambient temperature of **+20 °C**. The manufacturer guarantees a minimum service life of **1500 hours**.

Heater and Pinout Configuration

The 12G2 features an indirectly heated, oxide-coated cathode. The heater is designed for a nominal 12.6 V supply, making it suitable for series-string heater chains or 12 V electrical systems.

Heater Parameter	Value
Nominal Heater Voltage (U_h)	12.6 V
Nominal Heater Current (I_h)	150 ± 15 mA
Permissible Heater Voltage Range	11.3 V to 13.9 V

Heater Power Calculation: Using the nominal heater voltage of 12.6 V and the nominal heater current of 150 mA (0.15 A), the calculated nominal heater power consumption is: $12.6 \text{ V} \times 0.15 \text{ A} = 1.89 \text{ W}$

The tube utilizes an octal base with the following pin assignments (viewed from the bottom of the tube):

Pin Number	Connection
Pin 1	Metal envelope/shield (b)
Pin 2	Triode control grid (g)
Pin 3	Cathode (k) (common to triode and diodes)
Pin 4	Diode 2 (<u>D2</u>)
Pin 5	Diode 1 (<u>D1</u>)
Pin 6	Triode plate/anode (aT)
Pin 7	Heater (h)
Pin 8	Heater (h)

Because the cathode is shared between the diode and triode sections, the bias arrangements for the triode amplifier must be designed with consideration for the common cathode potential, which also affects the diode detection circuits. Pin 1 connects directly to the metal envelope, providing a low-impedance path to ground for shielding.

Electrical Characteristics and Operating Points

The triode section of the 12G2 is a high- μ voltage amplifier. Under typical Class A operating conditions, the triode section exhibits the following electrical characteristics:

Parameter	Value
Triode Plate Voltage (U_{aT})	250 V
Triode Grid Voltage (U_{gT})	-2 V
Triode Plate Current (I_{aT})	$\$1.15 \pm 0.65$ mA
Transconductance (S_T)	$\$1.15 \pm 0.35$ mA/V
Amplification Factor (μ)	$\$100 \pm 15$
Plate Resistance (R_i)	85 k Ω
Effective Output Voltage (U_{eff})	≥ 9 V

The high amplification factor ($\mu \approx 100$) enables the triode section to provide substantial voltage gain, which is ideal for pre-amplifying weak audio signals from the diode detector before they are passed to a power output stage.

Interelectrode Capacitances

The interelectrode capacitances of the triode section are kept low to maintain stability and prevent high-frequency roll-off in audio-frequency applications:

- **Grid-to-cathode capacitance (C_{g1k}):** 2.8 pF
- **Plate-to-cathode capacitance (C_{ak}):** 3 pF
- **Grid-to-plate capacitance (C_{g1a}):** 1.6 pF

Maximum and Minimum Permissible Ratings

To ensure the longevity and reliable operation of the 12G2, circuit designs must respect the following maximum and minimum limits:

Rating Parameter	Maximum Limit	Minimum Limit
Heater Voltage (U_h)	13.9 V	11.3 V
Plate Voltage (U_a)	300 V	—
Triode Plate Dissipation (P_{aT})	1 W	—
Peak Diode Current (I_D)	1 mA	—
Heater-to-Cathode Voltage (U_{kh})	100 V	—

The peak diode current limit of 1 mA is a critical design constraint for the detection and AGC circuits, requiring appropriate load resistance to prevent excessive current through the diode anodes. The heater-

to-cathode voltage limit of 100 V must be strictly observed, especially in circuits where the cathode is elevated above ground potential.

Characteristic Curves and Interpretation

The behavior of the 12G2 is illustrated by its characteristic curves, which detail the relationships between electrode voltages and currents.

Diode Characteristics

The diode current curve ($I_D = f(U_D)$) shows a highly linear relationship over a wide range of applied diode voltages. At a nominal heater voltage of 12.6 V, the diode current increases steadily with positive diode voltage, reaching approximately 4.2 mA at an applied potential of 14 V. This linearity is highly beneficial for minimizing distortion in low-frequency AM detection.

Triode Plate Characteristics

The triode plate family of curves ($I_{aT} = f(U_{aT})$) plots plate current against plate voltage for various grid bias voltages ranging from 0 V down to -3.5 V.

- At a typical operating plate voltage of 250 V and a grid bias of -2 V, the plate current sits at the nominal value of approximately 1.15 mA.
- As the grid bias becomes more negative (e.g., -3 V), the curves shift to the right, requiring higher plate voltages to maintain the same plate current.
- The relatively flat slope of these curves reflects the high plate resistance ($R_i = 85 \text{ k}\Omega$) of the high- μ triode.

Triode Transfer Characteristics

The transfer curves ($I_{aT} = f(U_{gT})$) show plate current as a function of grid voltage for several plate voltages (150 V, 200 V, 250 V, 300 V, and 350 V).

- At a plate voltage of 250 V, the triode reaches cutoff (where plate current approaches zero) at approximately -3.5 V to -4 V of grid bias.
- The curves demonstrate a smooth, predictable transconductance slope ($ST \approx 1.15 \text{ mA/V}$) in the operating region around -2 V bias, ensuring low-distortion voltage amplification when biased correctly.

Technical Summary

The **12G2** is a specialized, metal-envelope **double diode-triode** designed for detection and pre-amplification in low-frequency applications. Featuring an octal base and a 12.6 V heater, it integrates two independent diodes and a high- μ triode ($\mu = 100$) sharing a common cathode. With its rugged construction, wide environmental tolerance (-60 °C to +70 °C), and built-in shielding, the 12G2 provides an efficient, space-saving solution for radio receiver front-ends and audio pre-amplifiers, delivering reliable performance over a guaranteed 1500-hour service life.

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 · Diode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Source symbol aroseysocTb	1500 W	FapanTHpoBanHnas ponaroseysocTb 1500 wacos. Service life guarantee: 1500 hr.
Service life	1500 h	FapanTHpoBanHnas ponaroseysocTb 1500 wacos. Service life guarantee: 1500 hr.
Source symbol U,	126 V	U, 126V U _{et} !) =9V R, 85kQ
Published electrical parameter	9 V	U, 126V U _{et} !) =9V R, 85kQ
Source symbol R,	85 kΩ	U, 126V U _{et} !) =9V R, 85kQ
Source symbol I,	15015 mA	I, 15015 mA Ly 1,150,65 mA
Published electrical parameter	150.65 mA	I, 15015 mA Ly 1,150,65 mA
Source symbol U,	250 V	U, 250V Sy 1,15+0,35 mA/V
Source symbol Sy	1.15+0.35 mA/V	U, 250V Sy 1,15+0,35 mA/V
Published electrical parameter	2 V	Uy —2V " 10015
Source symbol Cqix	2.8 pF	Cqix 2.8 pF
Source symbol C,	3 pF	C, 3pF
Source symbol Cg	1 A	Cg1a 16 pF
Source symbol Cg1a	16 pF	Cg1a 16 pF
Source symbol Uy	139 V	Uy 139V 113V
Source symbol V	113 V	Uy 139V 113V
Source symbol U,	300 V	U, 300V
Source symbol Pt	1 W	Pt 1W
Published electrical parameter	1 mA	I,) 1mA

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Source symbol Uy,	100 V	Uy, 100V
Source symbol AMOAUTYZHOE	3 h	1) AMOAUTYZHOE 3Ha4eHUE,
Published electrical parameter	27 mA	@27 max
Source symbol F	33 mA	F33max
Published electrical parameter	126 V	4 / Uy =126V
Published electrical parameter	7 V	// I — 7 V4 (&



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 · Diode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Guaranteed service life	1500 h	PublishedGuarantee

1970 RUSSIAN TUBES MASHPRIBORINTORG

Section 3 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Triode transconductance	1.15 mA/V	TriodeSection
Triode plate resistance	85 k0hm	TriodeSection

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