



ELECTRONIC TUBE REFERENCE

12SQ7

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

CONSOLIDATED TECHNICAL
DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Double-diode high-mu triode widely used for radio detection, AVC, and first audio voltage amplification. The two diodes provide signal and control-voltage rectification while the triode supplies substantial voltage gain after detection.

GENERAL CHARACTERISTICS

BASE DESIGNATION	80	BASE PINS	8
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Diode

No fixed ratings recorded.

Published promoted fields populated semantically; identical repeated sections compressed.

SECTION2 Diode

No fixed ratings recorded.

Physical diode section added in approved section-structure reconciliation.

SECTION3 Triode	
PLATE RESISTANCE	91000 Ω
TRANSCONDUCTANCE	0.0011 S
AMPLIFICATION FACTOR	100
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	0.5 W
<i>Published promoted fields populated semantically; identical repeated sections compressed.</i>	

12SQ7 — Double-Diode High-Mu Triode Vacuum Tube

An indirectly heated multi-unit vacuum tube combining two independent diode plates and a single high-mu triode within a single envelope, designed for detector, automatic volume control (AVC), and audio preamplifier service.

Overview

The **12SQ7** and its glass-envelope counterpart, the [12SQ7GT](#), are multi-unit receiving tubes designed for use in radio receivers. These devices combine two diode units and a high-mu triode system in a single envelope, sharing a common coated unipotential cathode. This configuration makes them highly suited for service as combined detectors, AVC sources, and high-gain audio voltage amplifiers.

The tube is designed with a nominal **12.6 V** heater supply, drawing **0.15 A** of current. It is available in both a metal shell configuration (12SQ7) and a glass bulb configuration ([12SQ7GT](#)), both utilizing an eight-pin international octal base.

Physical Construction and Basing

The 12SQ7 family is produced in two distinct physical styles, which share identical electrical characteristics but differ in envelope material, dimensions, and interelectrode capacitances:

- **12SQ7 (Metal Shell):** Features a metal envelope (MT8 bulb) with a small wafer 8-pin octal base. It has a maximum overall length of **2-5/8 inches**, a maximum seated height of **2-1/16 inches**, and a maximum diameter of **1-5/16 inches**.
- **[12SQ7GT](#) (Glass Bulb):** Features a glass envelope (T-9 bulb) with a small wafer 8-pin octal base with a metal sleeve. It has a maximum overall length of **3-5/16 inches**, a maximum seated height of **2-3/4 inches**, and a maximum diameter of **1-5/16 inches**.

Both versions can be mounted in **any position**.

Octal Base Pin Connections

Using the standard **8Q** basing arrangement, the connections viewed from the underside of the base are as follows:

Pin	Connection	Description
Pin 1	S	Shell (12SQ7) or Metal Sleeve (12SQ7GT)
Pin 2	G	Triode Control Grid
Pin 3	K	Common Cathode
Pin 4	<u>P2</u>	Diode Plate 2
Pin 5	P1	Diode Plate 1
Pin 6	P	Triode Plate (Anode)
Pin 7	H	Heater
Pin 8	H	Heater

Heater and Electrical Ratings

The heater is designed for operation from either an AC or DC supply. The maximum ratings are interpreted according to the RMA Standard M8-210:

Parameter	Value	Rating Type
Heater Voltage	12.6 V	Nominal
Heater Current	0.15 A (150 mA)	Nominal
Calculated Heater Power	1.89 W	Calculated ($12.6\text{ V} \times 0.15\text{ A}$)
Maximum Plate Voltage	300 V	Absolute Maximum
Maximum Heater-Cathode Voltage	90 V	Absolute Maximum
Maximum Diode Current (Each Plate)	1.0 mA	Continuous Operation
Minimum Diode Current (Each Plate)	0.8 mA	With 10 V DC Applied

Typical Operating Characteristics (Class A1 Triode)

The triode section of the 12SQ7 is a high- μ voltage amplifier. Under typical Class A1 operating conditions, the triode exhibits the following characteristics at two standard plate voltage points:

Parameter	Point A	Point B
Plate Voltage	100 V	250 V
Grid Voltage	-1 V	-2 V
Plate Current	0.4 mA	0.9 mA
Plate Resistance (r_p)	110,000 Ω	91,000 Ω
Transconductance (g_m)	900 μ mhos	1,100 μ mhos
Amplification Factor (μ)	100	100

Diode Units

The two diode plates are placed around the common cathode structure. They are electrically independent of the triode unit, except for sharing the cathode. These diodes are intended for signal detection and generating automatic volume control (AVC) bias. The continuous current rating per diode plate is restricted to a maximum of **1.0 mA**.

Resistance-Coupled Audio Amplifier Service

The high- μ triode section is commonly employed as a resistance-coupled voltage amplifier. The following table outlines typical operating conditions and performance metrics across various plate supply voltages (E_{bb}), load resistors (R_l), grid resistors (R_{g1}), and coupling resistors (R_c):

R_l (M Ω)	R_{g1} (M Ω)	R_c (M Ω)	E_{bb} (V)	R_k (Ω)	Voltage Gain	E_o (V RMS)
0.10	Non-Critical	0.10	90	4,300	22	5.0
0.10	Non-Critical	0.10	180	2,400	29	15
0.10	Non-Critical	0.10	300	2,000	31	28
0.24	Non-Critical	0.51	90	8,200	40	10

R_l (M Ω)	R_{g1} (M Ω)	R_c (M Ω)	E_{bb} (V)	R_k (Ω)	Voltage Gain	E_o (V RMS)
0.24	Non-Critical	0.51	180	4,700	50	26
0.24	Non-Critical	0.51	300	3,900	52	50
0.51	Non-Critical	1.0	90	15,000	43	11
0.51	Non-Critical	1.0	180	8,200	58	31
0.51	Non-Critical	1.0	300	6,200	62	56
0.24	10.0	0.24	90	Grid-Leak	39	4.5
0.24	10.0	0.24	180	Grid-Leak	45	19
0.24	10.0	0.24	300	Grid-Leak	49	38

Note: Voltage gain is measured at an output level of $E_o = 2.0$ V RMS. The listed E_o values represent the maximum RMS output voltage obtainable for 5% total harmonic distortion (THD). For grid-leak bias conditions, the cathode bias resistor (R_k) is omitted, and bias is developed across the 10-Megohm grid resistor (R_{g1}).

Interelectrode Capacitances

Direct interelectrode capacitances differ slightly between the metal and glass versions due to the shielding properties of the metal envelope:

Capacitance Parameter	12SQ7 (Metal Shell)	<u>12SQ7GT</u> (Glass Bulb)
Grid to Plate: G to P	1.6 μ F	1.8 μ F
Input: G to ($H + K$)	3.2 μ F	4.2 μ F
Output: P to ($H + K$)	3.0 μ F	3.4 μ F

Note: The 12SQ7 capacitances are measured with the metal shell connected to the cathode. The 12SQ7GT capacitances are measured with no external shield.

Characteristic Curves and Interpretation

Published curves for the 12SQ7 and 12SQ7GT provide detailed performance trends for both the triode and diode sections:

- **Triode Plate Curves:** Plotting plate current against plate voltage for grid biases ranging from +1.0 V down to −5.0 V shows that the triode operates linearly in the negative grid region with very low plate currents (typically under 2.0 mA).
- **Triode Transfer Curves:** At fixed plate voltages of 100 V and 250 V, these curves illustrate how transconductance (g_m), plate resistance (r_p), amplification factor (μ), and plate current (I_b) vary with grid bias. The amplification factor remains remarkably stable near 100 across a wide range of negative grid voltages, while transconductance drops rapidly as the grid bias becomes more negative.
- **Diode Characteristics:** Curves for each diode unit show the relationship between the DC voltage developed by the diode and the rectified microamperes. These curves cover various load resistances (from 0.1 Megohm to 2 Megohms) and RMS signal inputs up to 30 Volts, illustrating the rectification efficiency of the diode detectors.

Related Designations and Comparisons

The **12SQ7** is electrically identical to the **6SQ7** except for its heater ratings; the **6SQ7** operates on a 6.3 V, 0.3 A heater supply, whereas the 12SQ7 requires a 12.6 V, 0.15 A supply. Additionally, the ratings and electrical characteristics of the 12SQ7 are identical to those of the **14B6** double-diode triode. For characteristic curves, manufacturers also direct users to the **11D3** curves as a reference.

Technical Summary

The **12SQ7** and **12SQ7GT** are versatile, octal-base, multi-unit vacuum tubes containing **two independent diodes** and a **high-mu triode** sharing a **common cathode**. Operating with a **12.6 V, 0.15 A** heater, the triode section provides an amplification factor of **100**, a transconductance of **1,100 μmhos** , and a plate resistance of **91,000 Ω** under standard 250 V Class A1 conditions. Designed for compact radio receiver circuits, these tubes combine signal detection, AVC generation, and high-gain voltage amplification within a single metal or glass envelope.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1948 Brimar Radio Valve Manual

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

1948 BRIMAR RADIO VALVE MANUAL

Section 3 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode Voltage	250 V	—
Anode Current	0.9 mA	—
Grid Voltage	-2 V	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X General Electric Essential Characteristics

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

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 3 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	3.2 pF	Section1
Output capacitance	3 pF	Section1
Grid-to-plate capacitance	0.6 pF	Section1

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA
Control-grid voltage	-2 V	ClassA

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	1.1 mA	ClassA
Plate voltage	100 V	ClassA
Control-grid voltage	-1 V	ClassA
Plate current	0.5 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	85000 Ω	Section1
Transconductance	1175 μS	Section1
Amplification factor	100	Section1
Plate resistance	110000 Ω	Section1
Transconductance	925 μS	Section1
Amplification factor	100	Section1


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 3 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TriodeTransconductance	1100 μS	Section2

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