

ELECTRONIC TUBE REFERENCE

12SN7GT

Voltage - Dual Triode (similar) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Octal medium-mu twin triode for resistance-coupled amplification, phase inversion, and driver applications, offering moderate gain with substantially greater current capability than high-mu voltage-amplifier types.

GENERAL CHARACTERISTICS

BASE DESIGNATION	8BD	BASE PINS	8
NOMINAL HEATER	12.6 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

8BD - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – 2G1	B	G1 – Control Grid	CONNECTED
PIN2 – 2P	B	P – Plate (Anode)	CONNECTED
PIN3 – 2K	B	K – Cathode	CONNECTED
PIN4 – 1G1	A	G1 – Control Grid	CONNECTED
PIN5 – 1P	A	P – Plate (Anode)	CONNECTED
PIN6 – 1K	A	K – Cathode	CONNECTED
PIN7 – H	–	H – Heater	CONNECTED
PIN8 – H	–	H – Heater	CONNECTED

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	6700 Ω
TRANSCONDUCTANCE	0.003 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	20 mA
<i>Published promoted fields populated semantically; identical repeated sections compressed.</i>	

SECTION2 Triode	
PLATE RESISTANCE	6700 Ω
TRANSCONDUCTANCE	0.003 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	20 mA
<i>Second identical physical triode section; added to align rows with SectionCount.</i>	

12SN7GT — Medium-Mu Twin Triode Vacuum Tube

An indirectly heated, dual-section receiving valve designed for use as a resistance-coupled amplifier, or as a combined vertical oscillator and vertical deflection amplifier in television receivers.

Overview

The **12SN7GT** is a general-purpose medium-mu double triode containing two electrically independent triode systems within a single glass envelope. Each section features its own cathode, control grid, and plate, while sharing a common heater. The tube is housed in a T-9 glass bulb with an eight-pin intermediate-shell octal base. It is designed for versatile applications, including low-frequency voltage amplification, resistance-coupled circuits, and television vertical deflection and oscillator stages.

The 12SN7GT operates with a nominal heater supply of **12.6 V** at **0.3 A**. Its design provides a moderate amplification factor of **20** per section, combined with relatively low plate resistance, making it highly effective in both consumer audio and television sweep circuits.

Construction, Physical Dimensions, and Pinout

The 12SN7GT features **coated unipotential cathodes** and independent electrode structures for each triode section. This physical separation allows the two triodes to be operated in separate stages or with different bias arrangements, provided the maximum heater-to-cathode voltage limits are respected.

Physical Dimensions

The tube is constructed with a T-9 glass bulb and can be mounted in **any position**. Its physical dimensions are as follows:

- **Maximum overall length:** 3 5/16 inches
- **Maximum seated height:** 2 3/4 inches
- **Maximum bulb diameter:** 1 9/32 inches

Pin Connections (8BD Basing)

The 12SN7GT uses an intermediate-shell 8-pin octal base designated **8BD**. When viewed from the bottom of the base, the pin connections are assigned as follows:

Pin	Electrode Connection
Pin 1	Grid, Triode Section 2 (G_2)
Pin 2	Plate, Triode Section 2 (P_2)
Pin 3	Cathode, Triode Section 2 (K_2)
Pin 4	Grid, Triode Section 1 (G_1)
Pin 5	Plate, Triode Section 1 (P_1)
Pin 6	Cathode, Triode Section 1 (K_1)
Pin 7	Heater (H)
Pin 8	Heater (H)

The electrodes of Section 1 are connected to pins 4, 5, and 6, while the electrodes of Section 2 are connected to pins 1, 2, and 3.

Heater and Interelectrode Capacitances

The heater of the 12SN7GT is designed for either AC or DC operation. The electrical specifications of the heater and the direct interelectrode capacitances (measured without an external shield) are detailed below:

Heater Specifications

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.3 A
- **Calculated Heater Power:** 3.78 W

Direct Interelectrode Capacitances

Because the two triode sections are housed in close proximity within the same envelope, small interelectrode capacitances exist. These values differ slightly between the two sections due to internal layout:

Capacitance Parameter	Section 1 (Pins 4, 5, 6)	Section 2 (Pins 1, 2, 3)
Grid to Plate	3.8 μF	4.0 μF
Input	2.8 μF	3.0 μF
Output	0.8 μF	1.2 μF

These capacitances are relevant in high-frequency or high-gain cascade designs, where capacitive coupling between electrodes can influence circuit stability and input impedance.

Electrical Characteristics and Class A1 Operation

At typical operating points, each triode section of the 12SN7GT exhibits moderate transconductance and low plate resistance. The nominal characteristics for Class A1 amplifier service are documented at two distinct operating points:

Parameter (Per Section)	Operating Point A	Operating Point B
Plate Voltage	90 V	250 V
Grid Voltage	0 V	-8.0 V
Plate Current	10 mA	9.0 mA
Plate Resistance (Approx.)	6,700 Ω	7,700 Ω
Transconductance	3,000 μmhos	2,600 μmhos
Amplification Factor (μ)	20	20
Plate Current (at $E_c = -12.5$ V)	—	1.3 mA
Grid Voltage (for $I_b = 10 \mu\text{A}$, Approx.)	-7.0 V	-18 V

The fundamental triode relationship ($\mu \approx g_m \times r_p$) is demonstrated by these operating points. For example, at Operating Point B: $0.0026 \text{ S} \times 7,700 \text{ }\Omega = 20.02$ This calculation closely aligns with the nominal amplification factor of 20.

Maximum Ratings and Service Categories

The 12SN7GT is rated under the **Design Center System**. Its maximum ratings vary depending on the specific application and service category. Designers must adhere to these limits to ensure reliable operation.

Rating Parameter	Class A1 Amplifier	Vertical Deflection Amplifier	Vertical Deflection Oscillator	Horizontal Deflection Oscillator
Heater Voltage	12.6 V	12.6 V	12.6 V	12.6 V
Max. Plate Voltage	300 V	300 V	300 V	300 V
Max. Peak Positive Plate Voltage	—	1,200 V	—	—
Max. Plate Dissipation (Each Plate)	3.5 W	3.5 W	3.5 W	3.5 W
Max. Plate Dissipation (Both Plates)	5.0 W	5.0 W	5.0 W	5.0 W
Max. Peak Negative Grid Voltage	—	250 V	400 V	600 V
Max. Cathode Current (DC / Average)	20 mA	20 mA	20 mA	20 mA
Max. Peak Cathode Current	—	70 mA	70 mA	300 mA
Max. Grid Circuit Resistance	1.0 M Ω	2.2 M Ω	2.2 M Ω	2.2 M Ω

Heater-Cathode Voltage Limits

The maximum allowable voltage difference between the heater and cathode is uniform across all service categories:

- **Heater negative with respect to cathode (Total DC and Peak):** 200 V
- **Heater positive with respect to cathode (DC):** 100 V
- **Heater positive with respect to cathode (Total DC and Peak):** 200 V

Television Deflection Service Conditions

The peak ratings specified for television vertical deflection amplifier service (such as the **1,200 V absolute maximum peak positive plate voltage**) are intended for operation in a **525-line, 30-frame scanning system**. For these ratings to apply, the duty cycle of the voltage pulse must not exceed **15% of one scanning cycle**.

Characteristic Curves and Interpretation

The electrical behavior of each 12SN7GT section is illustrated by its characteristic curves, which map plate current (I_b) against plate voltage (E_b) and grid voltage (E_c).

Plate Characteristics

The plate family of curves shows that at a grid bias of $E_c = 0$ V, plate current rises rapidly with plate voltage, reaching 10 mA at approximately 90 V. As the grid is biased more negatively, the curves shift to the right:

- At $E_c = -8$ V, a plate voltage of 250 V is required to establish a plate current of 9.0 mA.
- At $E_c = -12.5$ V and $E_b = 250$ V, the plate current is throttled down to approximately 1.3 mA.
- Complete cutoff (defined here as $I_b = 10$ μ A) occurs at a grid voltage of approximately -7.0 V when $E_b = 90$ V, and at -18 V when $E_b = 250$ V.

Positive grid region curves (up to $E_c = +6$ V) show the onset of grid current (I_c), which is relevant for specialized pulsing or oscillator applications where the grid is driven positive.

Transfer Characteristics

The transfer curves plot plate current (I_b), plate resistance (r_p), and amplification factor (μ) against grid voltage for fixed plate potentials:

- **At $E_b = 100$ V:** As the grid voltage is varied from -7.5 V to 0 V, the plate resistance drops from a high value (exceeding 25 k Ω near cutoff) down to approximately 6.7 k Ω at zero bias. Over this same range, the amplification factor remains remarkably stable, hovering close to 20.
- **At $E_b = 250$ V:** As the grid voltage is varied from -15 V to 0 V, the plate resistance similarly decreases, stabilizing near 7.7 k Ω at the -8.0 V operating point, while the amplification factor remains constant at 20.

These curves demonstrate that the 12SN7GT maintains a highly linear amplification factor across a wide range of operating conditions, while its plate resistance and transconductance are highly dependent on the chosen bias point.

Related Designations and Variations

The **12SN7GT** is part of a family of medium-mu twin triodes. It is electrically identical to the **6SN7GT** in its triode characteristics, differing only in its heater requirements (the **6SN7GT** requires a 6.3 V, 0.6 A heater supply, whereas the 12SN7GT requires a 12.6 V, 0.3 A supply).

A closely related variant is the **12SN7-GTA**. While sharing the same base pinout and heater ratings, the 12SN7-GTA features significantly higher maximum ratings:

- **Maximum Plate Voltage:** 450 V (compared to 300 V for the 12SN7GT).
- **Maximum Plate Dissipation:** 5.0 Watts per plate and 7.5 Watts combined for both plates (compared to 3.5 Watts per plate and 5.0 Watts combined for the 12SN7GT).
- **Maximum Peak Positive Plate Voltage:** 1,500 V in vertical deflection service (compared to 1,200 V for the 12SN7GT).
- **Heater Warm-up Time:** The 12SN7-GTA features a controlled heater warm-up time designed specifically for series-string receiver service, a feature not specified for the standard 12SN7GT.

These differences mean that while a 12SN7-GTA can typically replace a 12SN7GT, the standard 12SN7GT must not be used in high-voltage or series-string circuits designed specifically around the higher ratings of the 12SN7-GTA.

Technical Summary

The **12SN7GT** is an octal-based, indirectly heated, medium-mu twin triode featuring two independent triode sections with separate cathodes and a shared 12.6 V, 0.3 A heater. Each section provides an amplification factor of **20**, a transconductance of **2,600 to 3,000 μmhos** , and an approximate plate resistance of **6,700 to 7,700 Ω** under typical Class A1 operating conditions.

Designed for resistance-coupled amplification and television sweep applications, the tube offers robust performance as a vertical oscillator, vertical deflection amplifier, or horizontal deflection oscillator. When designing circuits with the 12SN7GT, engineers must respect the 300 V maximum plate voltage, the 3.5 W individual (5.0 W combined) plate dissipation limits, and the specific duty-cycle limitations associated with its high-voltage pulsed deflection ratings.



SOURCE OPERATING CONDITIONS

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Triode

APPLICATION

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Service	Combined vertical oscillator and vertical-deflection amplifier	—



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 1 · Triode

CAPACITANCE

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	2.8 pF	Section1
Output capacitance	0.8 pF	Section1
Grid-to-plate capacitance	3.8 pF	Section1

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA;EachSection
Control-grid voltage	-8 V	ClassA;EachSection
Plate current	9 mA	ClassA;EachSection
Plate voltage	90 V	ClassA;EachSection

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Control-grid voltage	0 V	ClassA;EachSection
Plate current	10 mA	ClassA;EachSection

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	7700 Ω	EachSection
Transconductance	2600 μS	EachSection
Amplification factor	20	EachSection
Plate resistance	6700 Ω	EachSection
Transconductance	3000 μS	EachSection
Amplification factor	20	EachSection


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum combined plate dissipation	5 W	EachSection
Maximum peak positive plate voltage	1200 V	EachSection
Typical plate voltage	250 V	EachSection
Typical plate current	9 mA	EachSection
Maximum plate voltage	300 V	PromotedValue
Maximum plate dissipation	3.5 W	PromotedValue
Maximum cathode current	20 mA	PromotedValue

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	3.8 pF	Section1
Input capacitance	2.8 pF	Section1
Output capacitance	0.8 pF	Section1
Grid-to-plate capacitance	4 pF	Section2
Input capacitance	3 pF	Section2
Output capacitance	1.2 pF	Section2

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	6700 ohm	PromotedValue
Transconductance	0.003 A/V	PromotedValue
Amplification factor	20	PromotedValue