



ELECTRONIC TUBE REFERENCE

12SW7

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

CONSOLIDATED TECHNICAL
DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Dissimilar-characteristic twin triode designed for Class-A amplifier service; despite its current database grouping, the available source describes a dual-triode rather than diode-triode construction.

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 promoted fields populated semantically; identical repeated sections compressed.

SECTION2 Diode

No fixed ratings recorded.

Second physical diode section added to represent the documented double-diode triode construction.

SECTION3 Triode

PLATE RESISTANCE	15500 Ω
TRANSCONDUCTANCE	0.0011 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2.5 W

Published promoted fields populated semantically; identical repeated sections compressed.

12SW7 — Duplex-Diode Medium-Mu Triode Vacuum Tube

An indirectly heated, metal-shell duplex-diode triode designed for detector, automatic volume control (AVC) rectifier, and low-frequency voltage amplifier service in mobile, battery-operated, and AC/DC receivers.

Overview

The **12SW7** is a multi-unit vacuum tube containing two diode plates and a single medium-mu triode within a compact, single-ended metal envelope. The two diode units and the triode section share a common unipotential cathode. This design is optimized for space-saving applications in radio receivers, where it can simultaneously perform AM detection, generate automatic volume control (AVC) bias, and provide the first stage of audio voltage amplification.

The tube is specifically engineered for operation in equipment where the primary power is derived from a 12-cell storage-battery supply, which presents a nominal design-center plate supply voltage of **26.6 V**. It is also fully rated for conventional high-voltage operation up to **250 V** in standard AC, storage-battery, and AC/DC receivers.

Construction, Heater, and Pinout

The 12SW7 is constructed with a rugged metal shell (MT-8G bulb outline) and a small wafer 8-pin octal base. The internal structure features a single, coated unipotential cathode sleeve. The two diode plates are placed symmetrically around this cathode, while the triode grid and plate assemblies are built around another portion of the same cathode sleeve. This common-cathode arrangement requires that both the diode detectors and the triode amplifier share the same cathode potential.

Heater Characteristics

The heater is designed for either AC or DC operation:

- **Nominal Heater Voltage:** 12.6 V
- **Nominal Heater Current:** 0.15 A
- **Calculated Heater Power:** 1.89 W (calculated as 12.6 V * 0.15 A)

Physical Dimensions and Mounting

- **Mounting Position:** Any
- **Maximum Overall Length:** 2-5/8 inches
- **Maximum Seated Length:** 2-1/16 inches
- **Maximum Diameter:** 1-5/16 inches

Pin Connections (8Q Bottom View)

The 12SW7 uses the **8Q** basing arrangement, which provides the following pinout connections:

- **Pin 1:** Metal Shell (internally connected to provide shielding when grounded)
- **Pin 2:** Triode Grid
- **Pin 3:** Cathode (common to triode and diode units)
- **Pin 4:** Diode Plate No. 2
- **Pin 5:** Diode Plate No. 1
- **Pin 6:** Triode Plate
- **Pin 7:** Heater
- **Pin 8:** Heater

Direct Interelectrode Capacitances

The capacitances of the triode unit, measured approximately with the metal shell connected directly to the cathode, are:

- **Grid to Plate:** 2.4 μpF
- **Grid to Cathode (Input):** 3.0 μpF
- **Plate to Cathode (Output):** 2.8 μpF

Electrical Characteristics and Operating Points

The triode section of the 12SW7 is a medium-mu voltage amplifier. It is characterized by two distinct typical operating points representing low-voltage battery service and standard high-voltage amplifier service.

Typical Class A1 Operating Points

Parameter	Low-Voltage Operation	High-Voltage Operation
Plate Voltage	26.5 V	250 V
Grid Voltage	0 V (via grid resistor)	-9 V (fixed supply)
Grid Resistor	2.0 M Ω	—
Plate Current	1.1 mA	9.5 mA

Parameter	Low-Voltage Operation	High-Voltage Operation
Plate Resistance	15,500 Ω	8,500 Ω
Transconductance	1,100 μmhos	1,900 μmhos
Amplification Factor (μ)	17	16

Maximum Ratings (Design-Center Values)

- **Maximum Plate Voltage:** 250 V
- **Maximum Plate Dissipation:** 2.5 W
- **Maximum Peak Heater-Cathode Voltage (Heater negative with respect to cathode):** 90 V
- **Maximum Peak Heater-Cathode Voltage (Heater positive with respect to cathode):** 90 V

Resistance-Coupled Amplifier Operation

The 12SW7 is frequently employed as a resistance-coupled audio preamplifier. Typical operating conditions are specified for three plate supply voltages, utilizing a standard load resistance of 0.1 M Ω and a grid resistor of 0.25 M Ω :

Parameter	90 V Supply	180 V Supply	300 V Supply
Plate Supply Voltage	90 V	180 V	300 V
Load Resistance	0.1 M Ω	0.1 M Ω	0.1 M Ω
Grid Resistor	0.25 M Ω	0.25 M Ω	0.25 M Ω
Cathode Resistor	4,400 Ω	4,100 Ω	3,800 Ω
Cathode Bypass Condenser	0.9 μF	0.9 μF	1.1 μF
Blocking Condenser	0.01 μF	0.01 μF	0.015 μF
Peak Voltage Output	19 V	43 V	68 V
Voltage Gain (at 5.0 V RMS)	10	10	10

Note on Operating Voltages: The actual operating voltage at the triode plate is a calculated value, determined by subtracting the voltage drop across the load resistance and the cathode resistor from the main plate supply voltage. The peak voltage output is measured across the grid resistor at the grid-current point.

Diode and Triode Curves

The performance of both the diode and triode sections can be interpreted through their characteristic curves:

- **Diode Unit Curves:** The diode curves illustrate the relationship between the rectified current (in microamperes) and the developed DC voltage across various load resistors (ranging from 0.1 M Ω to 2.0 M Ω) under different RMS signal inputs. For example, with an RMS signal input of 30 V and a load resistor of 2.0 M Ω , the diode develops approximately -38 V of DC bias. This demonstrates the tube's capability to generate substantial AVC bias voltages from typical intermediate-frequency (IF) signals.
- **Triode Plate Curves:** The plate family curves plot plate current (I_b) against plate voltage (E_b) for grid bias voltages (E_c) from 0 V to -33 V. At zero bias, the plate current rises rapidly, reaching 10 mA at a plate voltage of approximately 130 V. Increasing the negative grid bias shifts the conduction threshold to the right; at a grid bias of -9 V, a plate voltage of approximately 170 V is required to initiate conduction.
- **Triode Characteristics Curves:** At a fixed plate voltage of 250 V, these curves show the variation of amplification factor (μ), plate resistance (r_p), and transconductance (g_m) relative to plate current (I_b). As plate current increases from 2 mA to 15 mA, the transconductance rises from 1,000 μ mhos to approximately 2,200 μ mhos, while the plate resistance decreases from 15,000 Ω to 7,500 Ω . The amplification factor remains highly stable, staying within a narrow range of 15 to 17.

Related Designations and Comparisons

The 12SW7 is closely related to several other duplex-diode triodes in the receiving tube family. Except for its specific heater ratings, the 12SW7 shares identical electrical ratings and characteristics with the following 6.3-volt types:

- [6R7](#)
- [6R7G](#)
- [6R7GT](#)
- [6SR7](#)
- [6SR7GT](#)
- [26C6](#)

Additionally, the 12SW7 shares the same electrical ratings and characteristics as the [12SR7GT](#), but is distinguished by its single-ended metal shell construction rather than a glass envelope. These comparisons are useful for understanding the tube's design lineage, but they do not imply unrestricted physical or electrical substitution without verifying heater supply compatibility and envelope clearances.

Technical Summary

The **12SW7** is an octal-based, metal-shell duplex-diode medium- μ triode featuring a shared 12.6 V, 0.15 A heater and a common unipotential cathode. It is uniquely suited for dual-voltage applications, operating efficiently at a low-voltage design center of 26.6 V for mobile battery systems, or at conventional high-voltage levels up to 250 V.

With an amplification factor of 16 to 17, a transconductance of 1,100 to 1,900 μmhos , and a plate resistance of 8,500 to 15,500 Ω , the triode section provides reliable low-frequency voltage amplification. Simultaneously, the two independent diode plates allow for efficient AM detection and AVC generation. Housed in a robust metal envelope with an 8Q basing configuration, the 12SW7 represents a highly integrated and compact solution for mid-twentieth-century receiver designs.