

ELECTRONIC TUBE REFERENCE

12AU8

Voltage - Triode Pentode electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
PENTODE-TRIODE

Sharp-cutoff pentode plus medium-mu triode for television video/IF amplification and sync or sweep-oscillator service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9DM	BASE PINS	9
NOMINAL HEATER	12.6 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	10000 Ω
TRANSCONDUCTANCE	0.007 S
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	3 W
MAXIMUM SCREEN DISSIPATION	1 W
Published promoted fields populated semantically; identical repeated sections compressed.	

SECTION2 Triode	
PLATE RESISTANCE	5200 Ω
TRANSCONDUCTANCE	0.0049 S
AMPLIFICATION FACTOR	40
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
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12AU8 — Triode-Pentode Miniature Vacuum Tube

An indirectly heated, multi-section miniature valve combining a sharp-cutoff pentode and a medium-mu triode within a single envelope, designed for television receiver applications.

Overview

The **12AU8** is a 9-pin miniature vacuum tube containing two electrically independent sections: a sharp-cutoff pentode and a medium-mu triode. Each section is constructed with its own separate cathode, allowing them to operate independently in distinct circuit stages.

The tube is designed primarily for use in monochrome and color television receivers. Within these systems, the pentode section is specifically suited for service as a video amplifier, video intermediate-frequency (IF) amplifier, and sound IF amplifier. The triode section is intended for use as a sweep oscillator, sync amplifier, separator, or clipper. Except for its heater ratings, the 12AU8 is electrically and physically identical to the [6AU8](#).

Physical Construction, Heater, and Pinout

The 12AU8 is housed in a T-6½ glass bulb with a miniature button 9-pin base (designated JEDEC E9-1) and conforms to the JEDEC 6-3 outline drawing. The tube can be mounted and operated in any physical position.

Heater Characteristics

The tube features a coated unipotential cathode structure. The heater is designed for series or parallel operation on either AC or DC supplies.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.300 ± 0.030 A

Heater Parameter	Value
Heater Warm-up Time (Approx.)	11.0 s

The heater warm-up time is defined under specific test conditions: it is the time required for the voltage across the heater to reach 80% of its rated voltage after applying four times the rated heater voltage to a circuit consisting of the tube heater in series with a resistance valued at three times the nominal heater operating resistance.

Pin Connections

The JEDEC 9DY basing diagram provides the following pinout configuration, viewed from the bottom of the tube:

- **Pin 1:** Triode Cathode (IK)
- **Pin 2:** Triode Grid (G)
- **Pin 3:** Triode Plate (P)
- **Pin 4:** Heater (H)
- **Pin 5:** Heater (H)
- **Pin 6:** Pentode Grid #3, Pentode Cathode, Internal Shield (G3, K_p, IS)
- **Pin 7:** Pentode Grid #1 (G1)
- **Pin 8:** Pentode Grid #2 / Screen Grid (G2)
- **Pin 9:** Pentode Plate (P)

Direct Interelectrode Capacitances

These capacitance values are measured directly without the use of an external shield:

Capacitance Parameter	Pentode Section	Triode Section
Grid to Plate	0.044 pF	2.2 pF
Input	7.5 pF	2.6 pF
Output	2.4 pF	0.34 pF

Additionally, the capacitive coupling between the independent internal sections is rated as follows:

- **Pentode Grid #1 to Triode Plate:** 0.005 pF
- **Triode Grid to Pentode Plate:** 0.002 pF
- **Pentode Plate to Triode Plate:** 0.12 pF

Maximum Ratings

The maximum ratings for the 12AU8 are established under the Design-Maximum System. These represent limiting values that must not be exceeded under the worst probable operating conditions, taking into

account supply-voltage variations, component tolerances, equipment control adjustments, load variations, and environmental factors.

Rating Parameter	Pentode Section	Triode Section
Maximum Plate Voltage	300 V	300 V
Maximum Grid #2 (Screen) Supply Voltage	300 V	—
Maximum Grid #2 (Screen) Voltage	<i>See Rating Chart</i>	—
Maximum Positive DC Grid #1 Voltage	0 V	0 V
Maximum Plate Dissipation	3.0 W	2.5 W
Maximum Grid #2 Dissipation	1.0 W	—
Maximum Grid #1 Circuit Resistance:		
— Fixed Bias	0.25 M Ω	0.5 M Ω
— Cathode Bias	1.0 M Ω	1.0 M Ω
Maximum Heater-Cathode Voltage:		
— Heater Negative to Cathode (Total DC & Peak)	200 V	200 V
— Heater Positive to Cathode (DC)	100 V	100 V
— Heater Positive to Cathode (Total DC & Peak)	200 V	200 V

Typical Operating Conditions and Characteristics

When operated as a Class A1 amplifier, the typical operating parameters for each section are defined as follows:

Parameter	Pentode Section	Triode Section
Plate Voltage	200 V	150 V
Grid #2 Voltage	125 V	—
Cathode Bias Resistor	82 Ω	150 Ω

Parameter	Pentode Section	Triode Section
Amplification Factor (μ)	—	40
Plate Resistance (Approx.)	150,000 Ω	8,200 Ω
Transconductance	7,000 μmhos	4,900 μmhos
Plate Current	15 mA	9.0 mA
Grid #2 Current	3.4 mA	—
Grid #1 Voltage (Approx.) for $I_b = 100 \mu\text{A}$	-8 V	-6.5 V

Analysis of Characteristic Curves

Pentode Section Curves

- **Plate Characteristics:** At a screen grid voltage (E_{c2}) of 125 V, the plate current (I_b) rises rapidly at low plate voltages before flattening into a horizontal pentode knee. The curves demonstrate sharp-cutoff behavior as the negative grid #1 voltage (E_{c1} (/tubes/C1)) is increased down to -5.0 V. A boundary line for the maximum plate dissipation of 3.0 W restricts the safe operating region at higher plate voltages.
- **Positive Grid #1 Operation:** Under positive grid #1 bias conditions (up to +6.0 V), grid #1 current (I_{c1} (/tubes/C1)) and grid #2 current (I_{c2}) increase significantly, particularly at low plate voltages where the plate is less effective at collecting electrons.
- **Transfer Characteristics:** At a constant plate voltage (E_b) of 200 V, both plate current and screen grid current are plotted against grid #1 voltage for various screen potentials ($E_{c2} = 50 \text{ V to } 150 \text{ V}$). These curves show that higher screen voltages shift the transfer curves to the left, requiring a more negative grid bias to achieve cutoff.
- **Transconductance (g_m):** The transconductance curves show a steep rise as grid #1 bias approaches 0 V, peaking near 10,000 μmhos when the screen voltage is set to 150 V.
- **Screen Rating Chart:** The screen dissipation rating is bounded by a permissible operating area. Screen dissipation is allowed at its maximum of 0.6 W up to a screen potential of 150 V, above which it must be derated linearly down to 0 W at 300 V.

Triode Section Curves

- **Plate Characteristics:** The triode plate characteristics show plate current plotted against grid voltage (from 0 V to -14 V) and plate voltage (up to 400 V). The curves exhibit typical triode curvature, with a maximum plate dissipation limit line of 2.5 W defining the safe operating envelope.
- **Dynamic Characteristics:** Plots of transconductance (g_m), plate resistance (r_p), and amplification factor (μ) against plate current (I_b) reveal that the amplification factor remains remarkably stable near 40 across most of the operating range. Meanwhile, transconductance increases and plate resistance decreases as plate current rises.

Technical Summary

The **12AU8** is a versatile **9-pin miniature triode-pentode** designed for television receiver circuitry. It features a **12.6 V, 0.3 A heater** with a controlled warm-up time of approximately 11 seconds. The **sharp-cutoff pentode section** provides high transconductance (7,000 μmhos) and high plate resistance (150,000 Ω) for intermediate-frequency and video amplification. The **medium-mu triode section** features an amplification factor of 40 and a plate resistance of 8,200 Ω , making it highly suitable for sweep oscillator, sync separator, and clipper applications. Both sections are electrically independent with separate cathodes, allowing flexible circuit configurations within a single compact envelope.



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 1 · Pentode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PentodeGridToPlateCapacitance	0.04 pF	Section1

1961 TUNG SOL

Section 2 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TriodeGridToPlateCapacitance	2.2 pF	Section2



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	150 V	ClassA
Grid #2 voltage	125 V	ClassA
Plate current	10 mA	ClassA
Heater warm-up time	11 s	BothSections

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	150000 ohm	ClassA
Transconductance	6500 uS	ClassA

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	150 V	ClassA
Plate current	13.5 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	5200 ohm	ClassA
Transconductance	7700 uS	ClassA
Amplification factor	40	ClassA

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