



ELECTRONIC TUBE REFERENCE

12AX7EH

Voltage - Dual Triode (similar) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Modern high-gain 12AX7-family twin triode intended for low-frequency voltage amplification, designed primarily for audio preamplifier stages requiring substantial voltage gain.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	6.3 V / 343 mA	PARALLEL HEATER	6.3 V / 343 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
TRANSCONDUCTANCE	0.0014 S
AMPLIFICATION FACTOR	83
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	1.2 W
MAXIMUM CATHODE CURRENT	8 mA
Representative section for two electrically identical triodes.	

SECTION2 Triode	
TRANSCONDUCTANCE	0.0014 S
AMPLIFICATION FACTOR	83
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	1.2 W
MAXIMUM CATHODE CURRENT	8 mA
Second physical triode section; electrically identical twin section.	

12AX7EH – Miniature Twin Triode Vacuum Tube

The **12AX7EH** (along with its variants **12AX7SV** and **12AX7EH gold**) is a miniature twin triode vacuum tube featuring equipotential (indirectly heated) cathodes. It is designed specifically for the amplification of low-frequency voltage in radio engineering devices and electronic circuits. The tube incorporates two independent triode sections within a single compact glass envelope, sharing a common heater structure that supports both series and parallel power supply configurations.

Physical Dimensions and Mechanical Construction

The 12AX7EH is constructed in a miniature glass envelope. The physical dimensions and mechanical tolerances of the tube are specified as follows:

- **Maximum Overall Height:** 56.5 mm
- **Envelope Diameter:** 22.5 mm (with a tolerance of -2 mm, establishing an effective diameter range of 20.5 mm to 22.5 mm)
- **Pin Circle Diameter:** 12 mm
- **Pin Diameter:** 1 mm (with a tolerance of +0.03 mm to -0.07 mm)
- **Pin Spacing:** The pins are arranged in a circular pattern with an angular spacing of 36° between adjacent pins, covering a total arc of 288° (8 x 36°) for the nine-pin layout.

Pinout and Electrode Connections

The tube utilizes a standard miniature nine-pin base. The electrode connections for the individual triode sections and the shared heater are assigned to the pins as follows:

Pin Number	Electrode Designation
1	Second triode plate (anode)
2	Second triode grid
3	Second triode cathode

Pin Number	Electrode Designation
4	Heater
5	Heater
6	First triode plate (anode)
7	First triode grid
8	First triode cathode
9	Heater

The heater is connected to pins 4, 5, and 9, allowing the filament supply to be configured in either a series or parallel arrangement depending on the application requirements.

Heater and Power Supply Configurations

The heater of the 12AX7EH can be operated under two distinct electrical configurations, each with specific nominal voltage ranges and current consumption limits:

- **Parallel Connection:** The heater is operated at a nominal filament voltage of 6.3 V, with an allowable operating range of 6.0 V to 6.6 V. Under this parallel configuration, the heater current is rated between a minimum of 320 mA and a maximum of 365 mA.
- **Series Connection:** The heater is operated at a nominal filament voltage of 12.6 V, with an allowable operating range of 12.0 V to 13.2 V. Under this series configuration, the heater current is rated between a minimum of 160 mA and a maximum of 183 mA.

Electrical Parameters and Operating Points

The nominal electrical characteristics of the 12AX7EH are evaluated under a standard set of operating conditions. Unless otherwise specified, these parameters are measured at a filament voltage of either 6.3 V or 12.6 V, a plate voltage of 250 V, and a grid bias voltage of -2.0 V:

- **Plate Current:** The typical plate current for each triode section ranges from a minimum of 0.75 mA to a maximum of 2.1 mA.
- **Slope of Characteristic (Transconductance):** The minimum transconductance is specified at 1.4 mA/V.
- **Amplification Factor:** The minimum amplification factor (μ) is 83.
- **Grid Reverse Current:** The maximum allowable grid reverse current is 0.2 μ A, measured with a grid circuit resistance of 1.0 M Ω .
- **Cutoff Characteristics:** The plate current at the beginning of the characteristic (near cutoff) is restricted to a maximum of 30 μ A, measured at a grid voltage of -4.5 V (with plate voltage at 250 V).
- **Cathode-to-Heater Insulation:** The insulation resistance between the cathode and the heater is a minimum of 20 M Ω , measured with an applied cathode-to-heater voltage of ± 200 V.

Triode Matching and Variant Differences

While the general electrical parameters are shared across the family, the matching tolerance between the two triode sections within a single envelope differs significantly between the standard and gold-plated variants:

- **12AX7EH and 12AX7SV:** The maximum allowable difference in plate current between the first and second triode sections is $\pm 40\%$.
- **12AX7EH gold:** The plate current difference between the two triode sections is tightly matched, with a maximum allowable difference of $\pm 15\%$.

Limiting Values and Maximum Ratings

To ensure reliable operation and prevent premature failure, the operating conditions of the 12AX7EH must be maintained within the following absolute limiting values:

Parameter	Minimum	Maximum
Plate Voltage	—	330 V
Cathode Current	—	9 mA
Power Dissipation (per plate)	—	1.2 W
Cathode-to-Heater Voltage	—	± 200 V
Grid Circuit Resistance (Fixed Bias)	—	1.0 M Ω
Grid Circuit Resistance (Self-Bias)	—	2.2 M Ω

Characteristic Curves and Behavior

The electrical behavior of the 12AX7EH is characterized by two primary sets of curves, which describe the relationship between electrode voltages and plate current:

Transfer Characteristics (I_p vs. E_g)

The transfer curves plot plate current (I_p) in milliamperes against grid voltage (E_g) in volts at a constant filament voltage of 6.3 V. These curves are provided for three distinct plate voltages:

- $E_p = 200$ V
- $E_p = 250$ V
- $E_p = 300$ V

As the grid voltage is swept from 0 V down to -3.5 V, the plate current decreases. At a plate voltage of 250 V, the plate current drops from approximately 10 mA at $E_g = 0$ V to near-cutoff levels as the grid bias becomes more negative than -3.0 V. Higher plate voltages shift the transfer curve to the left, requiring a more negative grid bias to achieve the same plate current or to reach cutoff.

Plate Characteristics (I_p vs. E_p)

The plate curves plot plate current (I_p) in milliamperes against plate voltage (E_p) in volts up to 300 V, at a constant filament voltage of 6.3 V. Individual curves are plotted for grid bias voltages (E_g) from 0 V to -3.5 V in steps of 0.5 V:

- At $E_g = 0$ V, the plate current rises rapidly with increasing plate voltage, reaching approximately 10 mA at a plate voltage of roughly 160 V.
- As the grid bias is made progressively more negative (e.g., -1.0 V, -2.0 V, -3.0 V), the curves shift to the right. For instance, at $E_g = -2.0$ V, the plate current begins to rise significantly only after the plate voltage exceeds 100 V, reflecting the typical high- μ triode behavior where the grid voltage exerts strong control over the plate current.

Technical Summary

The **12AX7EH** is a versatile, high- μ miniature twin triode designed for low-frequency voltage amplification. It features a flexible heater design that can be operated at 6.3 V (320–365 mA) in parallel or 12.6 V (160–183 mA) in series. Each independent triode section is capable of handling up to 330 V on the plate, with a maximum plate dissipation of 1.2 W and a maximum cathode current of 9 mA. Under typical operating conditions ($E_p = 250$ V, $E_g = -2.0$ V), the tube provides a minimum transconductance of 1.4 mA/V and a minimum amplification factor of 83. The **12AX7EH gold** variant offers identical electrical ratings but features significantly tighter matching between the two triode sections, restricting the plate current difference to $\pm 15\%$ compared to the $\pm 40\%$ limit of the standard 12AX7EH and [12AX7SV](#) models.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

2026 Electro Harmonix Gold

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

2026 ELECTRO HARMONIX GOLD

Section 1 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	1.2 mA	Plate 250 V; Grid -2 V