



ELECTRONIC TUBE REFERENCE

12AX7SV

Voltage - Dual Triode (similar) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Modern high-gain 12AX7-family miniature twin triode intended for low-frequency voltage amplification, principally suited to audio preamplifier stages requiring substantial 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
<i>Representative section for two electrically identical triodes.</i>	

SECTION2 Triode	
TRANSCONDUCTANCE	0.0014 S
AMPLIFICATION FACTOR	83
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	1.2 W
<i>Second physical triode section; electrically identical twin section.</i>	

12AX7SV — Miniature Twin Triode Vacuum Tube

The **12AX7SV** is a miniature twin triode vacuum tube designed with equipotential cathodes, engineered specifically to amplify low-frequency voltage in radio engineering devices. It contains two independent triode sections within a single glass envelope, sharing a versatile heater arrangement that supports both series and parallel configurations.

Physical Construction and Pin Configuration

The 12AX7SV is constructed in a miniature glass envelope with a maximum overall height of 56.5 mm and a maximum diameter of 22.5 mm (with a tolerance of -2 mm). The base is a 9-pin miniature design featuring a pin circle diameter of 12 mm. The pins are spaced at 36-degree intervals, spanning a total angle of 288 degrees across the eight gaps. Each pin has a nominal diameter of 1 mm, with a tolerance of +0.03 mm to -0.07 mm.

The electrode-to-lead connections are arranged as follows:

Pin	Connection
1	Second triode plate
2	Second triode grid
3	Second triode cathode
4	Heater
5	Heater
6	First triode plate
7	First triode grid
8	First triode cathode
9	Heater

This pinout allows the two triode sections to be operated independently, with separate cathode, grid, and plate connections for each section.

Heater and Filament Ratings

The heater of the 12AX7SV is designed for versatile powering configurations, supporting both parallel and series connections:

Parameter	Parallel Connection	Series Connection
Nominal Voltage	6.3 V	12.6 V
Voltage Range	6.0 V to 6.6 V	12.0 V to 13.2 V
Heater Current	320 to 365 mA	160 to 183 mA

The insulation between the cathode and the heater is rated to withstand a maximum voltage of ± 200 V. Under this maximum voltage, the insulation resistance is guaranteed to be at least 20 M Ω .

Electrical Parameters and Operating Conditions

The electrical characteristics of the 12AX7SV are specified under standard test conditions where the plate voltage is 250 V and the grid bias is -2.0 V (with either a 6.3 V or 12.6 V filament supply). Under these conditions, the tube exhibits the following nominal parameters:

Parameter	Minimum	Maximum	Conditions
Plate Current	0.75 mA	2.1 mA	$E_p = 250$ V, $E_g = -2.0$ V
Amplification Factor (μ)	83	—	$E_p = 250$ V, $E_g = -2.0$ V
Transconductance (Slope)	1.4 mA/V	—	$E_p = 250$ V, $E_g = -2.0$ V
Grid Reverse Current	—	0.2 μ A	$E_p = 250$ V, $E_g = -2.0$ V, $R_g = 1.0$ M Ω
Plate Current Difference	—	$\pm 40\%$	Between triodes 1 and 2
Cutoff Plate Current	—	30 μ A	$E_p = 250$ V, $E_g = -4.5$ V
Cathode-Heater Insulation	20 M Ω	—	$V_{kh} = \pm 200$ V

At a more negative grid bias of -4.5 V (with plate voltage at 250 V), representing the beginning of the characteristic (near cutoff), the plate current drops to a maximum of 30 μ A.

Limiting Values and Operating Constraints

To ensure reliable operation and prevent premature failure, the 12AX7SV must be operated within its specified limiting values:

Parameter	Limit Value
Maximum Plate Voltage	330 V
Maximum Cathode Current	9 mA
Maximum Plate Dissipation (per triode)	1.2 W
Maximum Cathode-to-Heater Voltage	±200 V
Maximum Grid Circuit Resistance (Fixed Bias)	1.0 MΩ
Maximum Grid Circuit Resistance (Self-Bias)	2.2 MΩ

Characteristic Curves and Behavior

The electrical behavior of the 12AX7SV is further illustrated by its characteristic curves under a 6.3 V filament supply:

- Transfer Characteristics (Ip vs. Eg):** At plate voltages of 200 V, 250 V, and 300 V, the plate current decreases as the grid voltage becomes more negative. For example, at a plate voltage of 250 V, the plate current is approximately 1.2 mA at a grid bias of -2.0 V, and approaches cutoff (under 30 μA) as the grid bias reaches -4.5 V.
- Plate Characteristics (Ip vs. Ep):** The family of curves for grid voltages ranging from 0 V to -3.5 V (in 0.5 V steps) shows that for any given grid bias, the plate current rises as the plate voltage increases. At a grid bias of 0 V, the plate current rises rapidly with plate voltage, whereas at more negative grid biases (such as -3.0 V or -3.5 V), the onset of plate current is delayed to higher plate voltages, demonstrating typical high-mu triode control characteristics.

Related Designations

The 12AX7SV shares its physical dimensions, electrical parameters, and limiting values with the [12AX7EH](#). Both tubes are miniature twin triodes designed for low-frequency voltage amplification.

Technical Summary

The **12AX7SV** is a miniature, high-mu twin triode vacuum tube featuring equipotential cathodes and a flexible dual-voltage heater (6.3 V parallel or 12.6 V series). It is designed for low-frequency voltage amplification in radio engineering applications. With a minimum amplification factor of 83, a transconductance of at least 1.4 mA/V, and a maximum plate dissipation of 1.2 W per section, the 12AX7SV provides high voltage gain and reliable performance within its maximum plate voltage rating of 330 V and cathode current limit of 9 mA.