



ELECTRONIC TUBE REFERENCE

12DW7EH

Voltage - Dual Triode (dissimilar) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Modern dissimilar twin triode combining 12AX7-like high gain with 12AU7-like lower-mu current capability, useful where voltage amplification and driver functions are required together.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	6.3 V / 325 mA	PARALLEL HEATER	6.3 V / 325 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode	
TRANSCONDUCTANCE	0.0014 S
AMPLIFICATION FACTOR	75
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	1.2 W
<i>High-gain first triode.</i>	

SECTION2 Triode	
TRANSCONDUCTANCE	0.00235 S
AMPLIFICATION FACTOR	13
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.75 W
<i>Lower-mu second triode / phase inverter.</i>	

12DW7EH — Miniature Twin Triode Vacuum Tube

The **12DW7EH** is a miniature, indirectly heated twin triode vacuum tube featuring equipotential cathodes. It is uniquely designed as an asymmetrical double triode where the two sections have distinct electrical characteristics optimized for different roles: the first triode section is designed as a high-gain voltage amplifier, while the second triode section is designed as a lower-impedance phase inverter or driver. The tube is primarily intended for the amplification of low-frequency voltages in radio engineering and audio devices.

Physical Construction and Pin Configuration

The 12DW7EH is housed in a miniature glass envelope with a maximum overall height of 56.5 mm and a nominal diameter of 22.5 mm (with a tolerance of -2 mm). The tube features a 9-pin base arrangement with a circular pin layout.

The electrode connections are arranged to keep the two triode systems electrically independent, except for the heater filament which is shared via a center-tapped configuration. The pin assignments are as follows:

Pin Number	Electrode Designation
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 (center tap)

The heater configuration utilizing pins 4, 5, and 9 allows the tube to be operated with either a parallel or series filament supply connection.

Heater and Cathode Characteristics

The 12DW7EH is designed for flexible heater supply integration, accommodating both 6.3 V and 12.6 V systems. The electrical requirements and limits for the heater and cathode insulation are detailed below:

- **Parallel Connection (6.3 V nominal):**
 - Filament voltage range: 6.0 V to 6.6 V
 - Heater current: 300 mA to 350 mA
- **Series Connection (12.6 V nominal):**
 - Filament voltage range: 12.0 V to 13.2 V
 - Heater current: 150 mA to 175 mA
- **Cathode-Heater Insulation:**
 - Maximum cathode-to-heater voltage: ± 200 V
 - Minimum insulation resistance: 20 M Ω (measured at a cathode-heater voltage of ± 200 V with either 6.3 V or 12.6 V filament supply)

Electrical Parameters and Operating Points

The two triode sections of the 12DW7EH exhibit highly dissimilar electrical characteristics, reflecting their specialized roles as a high-mu voltage amplifier (first triode) and a medium-mu driver/phase inverter (second triode). The nominal parameters for each section under specified test conditions are outlined below:

First Triode (Voltage Amplifier)

The first triode is characterized by high amplification and low plate current, making it ideal for small-signal preamplification.

- **Plate Voltage:** 250 V
- **Grid Voltage:** -2.0 V
- **Plate Current:** 0.75 mA (minimum) to 2.0 mA (maximum)
- **Slope of Characteristic (Transconductance):** Minimum 1.4 mA/V
- **Amplification Factor (μ):** Minimum 75
- **Grid Reverse Current:** Maximum 0.2 μ A (with a grid circuit resistance of 1.0 M Ω)
- **Cutoff Plate Current:** Maximum 35 μ A (measured at a grid voltage of -4.0 V)

Second Triode (Phase Inverter / Driver)

The second triode is designed for higher current capability and lower plate resistance, suitable for driving subsequent stages or acting as a phase splitter.

- **Plate Voltage:** 250 V
- **Grid Voltage:** -8.5 V
- **Plate Current:** 7.8 mA (minimum) to 13.5 mA (maximum)
- **Slope of Characteristic (Transconductance):** 1.75 mA/V (minimum) to 3.0 mA/V (maximum)
- **Amplification Factor (μ):** Minimum 13
- **Grid Reverse Current:** Maximum 0.2 μ A (with a grid circuit resistance of 0.25 M Ω)
- **Cutoff Plate Current:** Maximum 100 μ A (measured at a grid voltage of -24.0 V)

Limiting Values and Ratings

To ensure reliable operation and prevent premature failure, the 12DW7EH must be operated within its maximum limiting values. These absolute limits apply to both sections unless specified otherwise:

Parameter	First Triode	Second Triode
Maximum Plate Voltage	330 V	330 V
Maximum Cathode Current	9 mA	22 mA
Maximum Plate Power Dissipation	1.2 W	3.3 W
Maximum Grid Circuit Resistance (Fixed Bias)	1.0 M Ω	0.25 M Ω
Maximum Grid Circuit Resistance (Self-Bias)	2.2 M Ω	1.0 M Ω
Maximum Cathode-Heater Voltage	± 200 V	± 200 V

Characteristic Curves and Behavior

The graphical characteristics of the 12DW7EH highlight the distinct behaviors of its two internal triode systems.

First Triode Curves

The transfer characteristics (I_p vs. E_g) for the first triode, plotted at a filament voltage of 6.3 V, show the relationship between grid voltage and plate current at plate voltages of 200 V, 250 V, and 300 V. The curves demonstrate a sharp cutoff characteristic, with plate current approaching zero as the grid bias reaches approximately -3.5 V to -4.0 V.

The plate characteristics (I_p vs. E_p) are plotted for grid voltages ranging from 0 V to -3.5 V in steps of 0.5 V. These curves exhibit a relatively flat slope, which is characteristic of a high plate resistance and high amplification factor. The plate current remains below 11 mA across the entire safe operating region shown.

Second Triode Curves

In contrast, the transfer characteristics (I_p vs. E_g) for the second triode show a much wider grid voltage span. Plotted at plate voltages of 200 V, 250 V, and 300 V, the plate current decreases more gradually, requiring a grid bias of -14 V to -24 V to achieve cutoff depending on the plate voltage.

The plate characteristics (I_p vs. E_p) for the second triode are plotted for grid voltages of 0 V, -2 V, -4 V, -6 V, -8.5 V, -10 V, -12 V, and -14 V. The curves are significantly steeper than those of the first triode,

indicating a much lower plate resistance. This allows the second triode to conduct substantially higher plate currents, reaching up to 50 mA under low-bias, high-voltage conditions, which is consistent with its higher plate dissipation rating of 3.3 W.

Technical Summary

The **12DW7EH** is a specialized, miniature twin triode featuring two highly asymmetrical triode sections in a single glass envelope. The first section is a high- μ voltage amplifier (minimum $\mu = 75$) designed for low-current, high-gain preamplification. The second section is a lower- μ , higher-current driver and phase inverter (minimum $\mu = 13$, maximum plate dissipation of 3.3 W) designed for driving power stages or handling larger signal swings.

With a flexible heater design supporting both 6.3 V parallel and 12.6 V series operation, and a robust cathode-to-heater insulation rating of ± 200 V, the 12DW7EH provides a compact, dual-purpose solution for low-frequency voltage amplification and phase inversion in high-fidelity audio and radio engineering applications.