



ELECTRONIC TUBE REFERENCE

12DY8

Voltage Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TETRODE-TRIODE

Sharp-cutoff triode-tetrode combination in nine-pin miniature construction for signal and control applications.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	12.6 V / 350 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	6000 Ω
TRANSCONDUCTANCE	0.0067 S
AMPLIFICATION FACTOR	40
MAXIMUM PLATE VOLTAGE	16 V
Published source values promoted where applicable.	

SECTION2 Tetrode	
PLATE RESISTANCE	300000 Ω
TRANSCONDUCTANCE	0.006 S
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM SCREEN VOLTAGE	16 V
Published source values promoted where applicable.	

12DY8 — Sharp-Cutoff Triode-Tetrode Vacuum Tube

A miniature, 9-pin double-section tube featuring a sharp-cutoff tetrode designed for relay service in automotive "signal-seeker" applications, and a general-purpose sharp-cutoff triode.

Overview

The **12DY8** is a multi-section miniature vacuum tube containing a triode and a tetrode within a single envelope. It is specifically designed for mobile and automotive applications where the plate and screen voltages are supplied directly from a nominal 12-volt automotive storage battery.

The tetrode section is engineered and controlled for relay-driving service in automatic "signal-seeker" radio tuning systems. The triode section is designed as a general-purpose sharp-cutoff voltage amplifier. Because the tube operates at low electrode potentials directly from the vehicle's electrical system, it eliminates the need for a high-voltage vibrator power supply or step-up transformer for these stages.

Mechanical Specifications and Pinout

The 12DY8 is constructed in a **T-6 1/2** glass bulb with an **E9-1** miniature button 9-pin base. It utilizes the **9JD** basing arrangement and can be mounted in any physical position.

The tube features a coated unipotential cathode structure. The internal connections, viewed from the bottom of the base, are as follows:

Pin	Connection
1	Grid No. 1 (Tetrode)
2	Cathode
3	Grid No. 2 / Screen Grid (Tetrode)
4	Heater
5	Heater
6	Plate (Tetrode)
7	Cathode, Internal Shield
8	Plate (Triode)
9	Grid (Triode)

The cathode is shared or internally tied between the two sections, with Pin 7 additionally connecting to the internal electrostatic shield to minimize coupling between the triode and tetrode sections.

Heater and Design-Maximum Ratings

The heater is designed to withstand the wide voltage fluctuations typical of automotive electrical systems. While the nominal heater rating is 12.6 V, the heater is specified to operate reliably over a range of 10.0 to 15.9 V.

Heater Characteristics

- **Heater Voltage:** 12.6 V (nominal)
- **Heater Current:** 0.35 A (350 mA)
- **Heater Supply:** AC or DC
- **Calculated Heater Power:** $12.6\text{ V} \times 0.35\text{ A} = 4.41\text{ W}$ (calculated from nominal ratings)

Design-Maximum Ratings

The design-maximum ratings represent the limiting values of operating and environmental conditions for a bogey device. These limits must not be exceeded under the worst probable operating conditions.

Parameter	Triode Section	Tetrode Section	Unit
Maximum Plate Voltage	16	16	Volts
Maximum Grid No. 2 Voltage	—	16	Volts
Maximum Grid No. 1 Resistance	10	10	Megohms
Maximum Heater-Cathode Voltage	16	16	Volts

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12DY8 are measured without an external shield:

Capacitance	Triode Section	Tetrode Section
Grid to Plate	1.5 pF	0.74 pF
Input	2.0 pF	11.0 pF
Output	2.0 pF	3.0 pF

The low grid-to-plate capacitance of the tetrode section (0.74 pF) is characteristic of its screened construction, which reduces internal feedback.

Typical Operating Conditions and Characteristics

Under typical Class A amplifier conditions, both sections are operated with a plate supply of 12.6 V, matching the nominal battery voltage:

Parameter	Triode Section	Tetrode Section
Plate Voltage	12.6 V	12.6 V
Grid No. 2 (Screen) Voltage	—	12.6 V
Grid No. 1 Voltage	0 V	Developed via contact potential
Grid No. 1 Resistor	—	2.2 MΩ
Plate Current	1.2 mA	14 mA
Grid No. 2 (Screen) Current	—	2 mA
Transconductance	2,000 μmhos	6,000 μmhos
Amplification Factor (μ)	20	—
Plate Resistance (approx.)	10,000 Ω	5,000 Ω
Grid Voltage for Cutoff (approx.)	-2.0 V (for Ib = 10 uAdc)	-9.0 V (for Ib = 20 uAdc)

The tetrode section exhibits a high transconductance of 6,000 μmhos at a plate current of 14 mA, which provides the necessary current swing to actuate low-voltage relays.

Tetrode Relay Service (Typical Operation)

The tetrode section is specifically designed to drive a control relay in automotive "signal-seeker" radio systems. To ensure reliable operation across the full range of automotive battery voltages, typical operating conditions are defined for the two extreme supply limits (10.0 V and 15.0 V):

Parameter	Low-Voltage Limit	High-Voltage Limit
Heater Voltage	10.0 V	15.0 V
Plate Supply Voltage	10.0 V	15.0 V
Grid No. 2 Voltage	10.0 V	15.0 V
Grid No. 1 Voltage	Developed via contact potential	-6.0 V
Grid No. 1 Resistor	10 MΩ	0 MΩ
Plate Load Resistor	700 Ω	700 Ω
Plate Current	5.0 mA (Minimum)	3.0 mA (Maximum)

Operational Analysis

- **Low-Voltage State (10.0 V):** This condition simulates a weak battery or cranking state. With a 10 MΩ grid resistor, the grid bias is determined solely by contact potential. Under these conditions, the tetrode is biased to conduct heavily, guaranteeing a minimum plate current of 5.0 mA through the 700 Ω relay coil to ensure the relay pulls in or remains securely closed.
- **High-Voltage State (15.0 V):** This condition simulates an active charging system. To release the relay or keep it inactive, a negative bias of -6.0 V is applied to Grid No. 1. Despite the higher supply voltage, this bias successfully cuts down the plate current to a maximum of 3.0 mA, ensuring the relay drops out reliably.

Average Plate Characteristics and Curves

The plate characteristic curves for the 12DY8 illustrate the distinct behaviors of the two sections:

- **Triode Section:** The plate current curves plotted against plate voltage (from 0 to 25 V) show a standard triode profile. At a grid bias of 0 V, the plate current rises smoothly, reaching approximately 1.1 mA at the typical 12.6 V operating point. Increasing the negative grid bias shifts the curves to the right; at a bias of -2.0 V, the plate current is nearly cut off at low plate voltages.
- **Tetrode Section:** The tetrode curves are plotted with the screen grid (Grid No. 2) held constant at 12.6 V. At low plate voltages (below 5 V), the curves display the typical tetrode "knee" where secondary emission effects occur. Above 5 V, the plate current flattens out significantly, demonstrating a high dynamic plate resistance. At a grid bias of 0 V, the plate current reaches approximately 18 mA at a plate voltage of 12.6 V. Applying a negative bias of -6.0 V reduces the plate current to less than 1 mA across the entire plate voltage range, confirming the sharp-cutoff characteristic required for positive relay control.

Technical Summary

The **12DY8** is a specialized **9-pin miniature triode-tetrode** designed for direct operation from a **12-volt automotive battery**. It features a **12.6 V, 0.35 A** heater capable of withstanding supply variations from **10.0 to 15.9 V**.

The **triode section** serves as a general-purpose voltage amplifier with an amplification factor of **20** and a transconductance of **2,000 μmhos**. The **tetrode section** is a high-transconductance (**6,000 μmhos**), sharp-cutoff device optimized for **relay-driving service** in automatic tuning systems. By operating both plates and screens directly at 12.6 V, the 12DY8 provides a compact, efficient solution for automotive electronics without requiring high-voltage power conversion.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 2 · Tetrode

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Service	Relay service	—



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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	225 mA	Nominal
Plate voltage	1616 V	Typical operating conditions
Screen voltage	10.015.0 V	Typical operating conditions
Plate current	1.214 mA	Typical operating conditions

1961 TUNG SOL

Section 2 · Tetrode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	225 mA	Nominal

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	1616 V	Typical operating conditions
Screen voltage	10.015.0 V	Typical operating conditions
Plate current	1.214 mA	Typical operating conditions



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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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 2 · Tetrode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
SCREEN VOLTAGES ARE OBTAINED DIRECTLY FROM A	12 V	SCREEN VOLTAGES ARE OBTAINED DIRECTLY FROM A 12 VOLT AUTOAACTIVE STORAGE
HEATER VOLTAGE B	12.6 V	HEATER VOLTAGE B 12.6 12.6 VOLTS
HEATER VOLTAGE	12.6 V	HEATER VOLTAGE 12.6 12,6 VOLTS
HEATER CURRENT	350 mA	HEATER CURRENT 0.35 0.35 AMP.
PLATE VOLTAGE	12.6 V	PLATE VOLTAGE 12.6 - 12.6 VOLTS
GRID H2 VOLTAGE	12.6 V	GRID H2 VOLTAGE --- 12.6 VOLTS
GRID #1 RESISTOR	2.2 MΩ	GRID #1 RESISTOR --- 2.2 MEGOHMS
AMPLIFICATION FACTOR	20 A	AMPLIFICATION FACTOR 20 ____
PLATE RESISTANCE (APPROX.)	10000 Ω	PLATE RESISTANCE (APPROX.) 10000 5000 OHMS
PLATE CURRENT	1.2 mA	PLATE CURRENT 1.2 14 MA.
SCREEN CURRENT	2 mA	SCREEN CURRENT --- 2 MA.
GRID VOLTAGE FOR I b =	10 V	GRID VOLTAGE FOR I b = 10 μADC —2.0 ---- VOLTS
GRID VOLTAGE FOR I b =	20 V	GRID VOLTAGE FOR I b = 20 μHoc --- —9,0 VOLTS
HEATER VOLTAGE	10 V	HEATER VOLTAGE 10.0 15.0 VOLTS
PLATE SUPPLY VOLTAGE	10 V	PLATE SUPPLY VOLTAGE 10.0 15.0 VOLTS
GRID #	2 V	GRID #2 VOLTAGE 10.0 15.0 voLTs

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID #	1 V	GRID #1 VOLTAGE (NOTE C) —6.0 VOLTS
PLATE CURRENT (MIN.)	5 mA	PLATE CURRENT (MIN.) 5.0 (MAX.) 3.0 MA.
THE HEATER IS THEREFORE DESIGNED TO OPERATE OVER THE	10 V	THE HEATER IS THEREFORE DESIGNED TO OPERATE OVER THE 10.0 TO 15.9 VOLTAGE RANGE ENCOUNTERED IN

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM PLATE VOLTAGE	16 V	MAXIMUM PLATE VOLTAGE 16 VOLTS
i MAXIMUM GRID #	2 V	i MAXIMUM GRID #2 VOLTAGE --- 16 VOLTS
MAXIMUM GRID #	1 mA	MAXIMUM GRID #1 RESISTANCE 10 10 •MEGOHMS
i MAXIMUM HEATER —CATHODE VOLTAGE	16 V	i MAXIMUM HEATER —CATHODE VOLTAGE 16 VOLTS