ELECTRONIC TUBE REFERENCE

12DU7

Voltage - Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA
3 SECTIONS
CONSTRUCTION
DIODE-DIODE-TETRODE

> Low-voltage automobile-radio diode-tetrode whose space-charge-grid section operates directly from the 12.6 V vehicle supply as an audio driver, with two diodes for detection.

General characteristics

BASE DESIGNATION	—	**BASE PINS**	9
NOMINAL HEATER	12.6 V / 250 mA	**PARALLEL HEATER**	— / —
HEATING	Indirect	**SERIES OPERATION**	Not specified
CATHODE ARRANGEMENT	Separate cathodes	**SECTION CONSTRUCTION**	Dissimilar

Section ratings

SECTION1 Diode

No fixed ratings recorded.

SECTION2 Tetrode

PLATE RESISTANCE	6000 Ω
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM SCREEN VOLTAGE	16 V

SECTION3 Diode

No fixed ratings recorded.

Added approved missing physical diode section row.

12DU7 — Duo-Diode Tetrode Vacuum Tube

The **12DU7** is a miniature duo-diode tetrode vacuum tube designed for use in automotive receiver applications. It combines a tetrode section and two independent diode units within a single envelope, serving as a combined detector, automatic volume control (AVC) rectifier, and audio power amplifier driver. The tube is specifically engineered to operate with its heater, plate, and screen grid (Grid No. 2) potentials supplied directly from a nominal 12-volt automotive storage battery, eliminating the need for a high-voltage vibrator power supply.

Mechanical Specifications and Basing

The 12DU7 is constructed in a miniature glass envelope with a 9-pin miniature button base. It utilizes the JEDEC 6-2 outline and JEDEC 9JX basing configuration.

Physical Dimensions

- **Bulb Type:** T-6 1/2 glass bulb
- **Base Type:** E9-1 miniature button 9-pin base
- **Maximum Overall Length:** 2.188 inches
- **Maximum Seated Height:** 1.938 inches
- **Maximum Diameter:** 0.875 inches
- **Mounting Position:** Any

Pinout Configuration (JEDEC 9JX)

Viewed from the bottom of the base, the pin connections are assigned as follows:

Pin Number	Electrode Connection
1	Grid No. 1 (G1)
2	Cathode (K)
3	Grid No. 2 (G2)
4	Heater (H)
5	Heater (H)
6	Plate (P)
7	Diode Plate No. 1 (DP)
8	Internal Connection (IC)
9	Diode Plate No. 2 (DP)

The cathode is a coated unipotential type, which is common to both the tetrode and diode sections.

Heater Characteristics

The heater of the 12DU7 is designed specifically for the electrical environment of automotive electrical systems.

Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.250 A (250 mA)
Heater Supply Type	AC or DC

Because automotive battery voltages fluctuate during charging and discharging cycles, the heater is designed to operate reliably over a wide voltage range of **10.0 to 15.9 volts**. The tube's design incorporates an adequate safety factor to withstand these variations without compromising performance or longevity.

Using the nominal heater voltage and current, the nominal heater power consumption is calculated as follows:

$$\text{Heater Power} = 12.6\ \text{V} \times 0.250\ \text{A} = 3.15\ \text{W}$$

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12DU7 are measured without an external shield. The values for the tetrode section and the coupling between sections are:

Measurement	Value
Tetrode Section:	
Grid No. 1 to Plate (g1 to p)	0.6 pF
Input: g1 to (h + Tk + g2)	11 pF
Output: p to (h + Tk + g2)	3.6 pF
Inter-section Coupling:	
Grid No. 1 to Diode Plate No. 1 (Max.)	0.22 pF
Grid No. 1 to Diode Plate No. 2 (Max.)	0.12 pF

Maximum Ratings

The maximum ratings for the 12DU7 are established under the **Design-Maximum System**. These ratings represent limiting values of operating and environmental conditions that should not be exceeded under the worst probable conditions in a bogey device.

Rating Parameter	Design-Maximum Value
Maximum Plate Voltage	16 V
Maximum Grid No. 2 (Screen) Voltage	16 V
Maximum Grid No. 1 Resistance	10 MΩ
Maximum Average Diode Current (Each Diode)	1.0 mA
Maximum Heater-Cathode Voltage:	
Heater Negative with respect to Cathode	16 V
Heater Positive with respect to Cathode	16 V

Typical Operating Conditions and Characteristics

In typical applications, the 12DU7 operates as an audio-frequency driver and detector with low supply voltages. The tetrode section is operated with a contact potential bias developed across a high-value grid resistor.

Tetrode Section (Class A Amplifier)

At a nominal operating point of 12.6 volts, the typical characteristics are:

Parameter	Value
Plate Voltage	12.6 V
Grid No. 2 Voltage	12.6 V
Grid No. 1 Resistor (Contact Potential Bias)	2.2 MΩ
AF Grid Voltage (RMS)	1.6 V
Plate Current	12 mA
Grid No. 2 Current	1.5 mA
Transconductance	6,200 µmhos
Plate Resistance (Approximate)	6,000 Ω
Load Resistance	2,700 Ω
Maximum Signal Power Output	25 mW
Total Harmonic Distortion	10%

The bias for Grid No. 1 is developed entirely via average contact potential across the specified 2.2 MΩ grid resistor, eliminating the need for an external bias supply or cathode resistor.

Diode Sections

The two diode plates are designed for detection and AVC rectification. Under typical test conditions, each diode exhibits the following characteristic:

- **Average Diode Current (with 10 V DC applied):** 1.3 mA per diode.

Technical Summary

The **12DU7** is a specialized **9-pin miniature duo-diode tetrode** designed for low-voltage automotive receiver service. Operating directly from a nominal **12.6 V** supply, it integrates an audio driver tetrode and two signal diodes in a single **T-6 1/2** envelope. The tetrode section features a high transconductance of **6,200 µmhos** and is capable of delivering **25 mW** of power output into a **2,700 Ω** load with 10% total harmonic distortion when driven by a **1.6 V RMS** signal. The heater is ruggedized to withstand the **10.0 to 15.9 V** range typical of automotive battery charging systems, making the 12DU7 a highly efficient and compact solution for hybrid vacuum-tube/transistor automotive radios of its era.

SOURCE OPERATING CONDITIONS

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SOURCE PDF

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

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Section 2 · Tetrode

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	**12.6 V**	AutomotiveBatteryService
Service	**Audio power-amplifier driver**	—

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