

ELECTRONIC TUBE REFERENCE

12AE6A

Voltage - Triode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Improved low-voltage double-diode triode for automobile-radio detector and voltage-amplifier service. Two diode sections provide detection and control-voltage rectification while the triode is optimized for automotive supply voltages.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7BT	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

7BT - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – 1G1	A	G1 – Control Grid	CONNECTED
PIN2 – K	A	K – Cathode	CONNECTED
PIN3 – H	–	H – Heater	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – 2P	B	P – Plate (Anode)	CONNECTED
PIN6 – 3P	C	P – Plate (Anode)	CONNECTED
PIN7 – 1P	A	P – Plate (Anode)	CONNECTED

SECTION RATINGS

SECTION1 Diode
<i>No fixed ratings recorded.</i>
<i>Diode 1.</i>

SECTION2 Diode
<i>No fixed ratings recorded.</i>
<i>Diode 2.</i>

SECTION3 Triode	
PLATE RESISTANCE	13000 Ω
TRANSCONDUCTANCE	0.0013 S
AMPLIFICATION FACTOR	16.7
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	20 mA
MAXIMUM HEATER-CATHODE VOLTAGE	230 V
Medium-mu triode.	

12AE6A — Double-Diode Triode Vacuum Tube

An indirectly heated, miniature multi-unit tube combining a medium-mu triode and two independent diodes for detector, AVC, and audio-frequency voltage amplifier service in low-voltage mobile applications.

Overview

The **12AE6A** (also designated as **12AE6-A**) is a miniature duplex-diode triode designed primarily for use in automobile radio receivers. The tube integrates a medium-mu triode section with two diode units sharing a common unipotential cathode. It is specifically engineered to operate with its plate and heater potentials supplied directly from a standard 12-volt automotive storage battery, eliminating the need for a high-voltage B+ power supply.

In typical receiver circuits, the two diode units function as an audio detector and an automatic volume control (AVC) rectifier, while the triode section serves as an audio-frequency (AF) voltage amplifier operating into a low-impedance load.

Mechanical Design and Basing

The 12AE6A is constructed in a miniature T-5 1/2 glass envelope with a 7-pin miniature button base (E7-1 designation). The tube is designed to operate reliably in any mounting position.

Physical Dimensions

Dimension	Value
Maximum Overall Length	2.125 inches
Maximum Seated Height	1.875 inches
Maximum Diameter	0.750 inches
Bulb Type	T-5 1/2
Base Type	Miniature Button 7-Pin (E7-1)

Terminal Connections and Basing Diagram

Under the JEDEC 7BT basing standard, the pin assignments viewed from the bottom of the tube are as follows:

Pin Number	Connection	Symbol
Pin 1	Triode Control Grid	G / Tg
Pin 2	Common Cathode	K
Pin 3	Heater	H
Pin 4	Heater	H
Pin 5	Diode Number 2 Plate	2P / Dp
Pin 6	Diode Number 1 Plate	1P / Dp
Pin 7	Triode Plate	P / Tp

Heater and Automotive Supply Limits

The 12AE6A features a coated unipotential cathode. The heater is designed for nominal 12.6-volt operation, but because it is intended for direct automotive battery connection, it must tolerate the voltage fluctuations of a vehicle's electrical system.

- **Nominal Heater Voltage:** 12.6 V (AC or DC)
- **Nominal Heater Current:** 150 mA (0.15 A)
- **Heater Supply Limits:** 10.0 V to 15.9 V

When operated in automotive service, the heater voltage must not fall below 10.0 volts or exceed 15.9 volts. While these extreme variations can be tolerated for short periods, continuous operation near these limits compromises performance at the low end and reduces the tube's life expectancy at the high end. Improving supply-voltage regulation significantly enhances equipment reliability.

Additionally, the maximum heater-cathode voltage rating is restricted to **30 Volts** (with the heater either positive or negative with respect to the cathode).

Maximum Ratings and Capacitances

All maximum ratings are established under the Design-Center Rating System (EIA Standard RS-239). These values represent the limits within which a bogey tube will operate reliably under normal environmental and supply variations.

Design-Center Maximum Ratings

- **Plate Voltage:** 30 V
- **DC Cathode Current:** 20 mA
- **Grid-Circuit Resistance:** 10 Megohms
- **Continuous Diode Current (Each Diode):** 1.0 mA

Direct Interelectrode Capacitances

These values represent typical capacitances measured without an external shield:

- **Grid to Plate (Tg to Tp):** 2.0 pF
- **Input (Tg to h+k):** 1.8 pF
- **Output (Tp to h+k):** 1.1 pF
- **Diode Plate to Diode Plate (Dp to Dp):** 0.9 pF

Typical Operating Characteristics

The triode section of the 12AE6A is characterized under Class A1 amplifier conditions at a typical plate potential of 12.6 volts. Two distinct operating points are documented based on the biasing method:

Triode Section Characteristics

Parameter	Fixed Bias (Point A)	Grid-Resistor Bias (Point B)
Heater Potential	12.6 V	12.6 V
Plate Potential	12.6 V	12.6 V
Grid Potential	0 V	—
Grid Resistor	0 Ω	10 M Ω
Plate Current	1.0 mA	0.32 mA
Transconductance	1,300 μ mhos	715 μ mhos
Plate Resistance	13,000 Ω	20,000 Ω

Parameter	Fixed Bias (Point A)	Grid-Resistor Bias (Point B)
Amplification Factor	16.7	14.3

Under the grid-resistor bias condition (Point B), an average contact potential is developed across the 10-Megohm grid resistor to establish the operating bias.

Diode Section Characteristics

Each of the two diode units is capable of independent detection. When a test potential of 10 volts DC is applied to either diode plate, the average resulting diode current is **2.0 mA**.

Curve Analysis

The average plate characteristics show that at a plate potential of 12.6 volts, the triode section delivers a highly linear plate current response. With the grid voltage (E_c) set to 0 volts, the plate current reaches approximately 1.0 mA. As negative grid bias is applied, the plate current decreases, reaching cutoff near -2.25 volts when operating at the maximum rated plate voltage of 30 volts.

Technical Summary

The **12AE6A** is a specialized **7-pin miniature duplex-diode triode** designed for low-voltage automotive applications. Operating directly from a **12.6 V** battery supply, it provides a compact, single-envelope solution for detection, AVC rectification, and AF voltage amplification. With a maximum plate voltage rating of **30 V**, a cathode current limit of **20 mA**, and a triode amplification factor of **14.3 to 16.7**, the 12AE6A is optimized for reliable operation within the fluctuating electrical environments of mobile receiver systems.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

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 1 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average diode current	1 mA	EachDiode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average diode current at 10 V applied	2 mA	EachDiode

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 3 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	12.6 V	ClassA1;TriodeSection
Plate current	1 mA	ClassA1;TriodeSection
Grid voltage	0 V	ClassA1;TriodeSection
Grid circuit resistance	10 Mohm	TriodeSection
Resistance-coupled plate supply voltage	14.4 V	TriodeSection;ResistanceCoupled



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Continuous Diode Current	1 mA	EachDiode

1968 GENERAL ELECTRIC CO

Section 2 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Continuous Diode Current	1 mA	EachDiode

1968 GENERAL ELECTRIC CO

Section 3 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	12.6 V	OperatingPoint1
Amplification Factor	16.7	OperatingPoint1
Plate Resistance	13000 ohm	OperatingPoint1
Transconductance	1300 uS	OperatingPoint1
Plate Current	1 mA	OperatingPoint1
Plate Voltage	12.6 V	OperatingPoint2
Amplification Factor	14.3	OperatingPoint2
Plate Resistance	20000 ohm	OperatingPoint2
Transconductance	715 uS	OperatingPoint2
Plate Current	0.32 mA	OperatingPoint2

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