

ELECTRONIC TUBE REFERENCE

12FT6

Voltage - Triode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Double-diode triode for second-detector and audio-driver service in hybrid automobile radios. The diodes recover and rectify the signal while the low-voltage triode drives subsequent transistorized circuitry.

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 Triode	
PLATE RESISTANCE	7600 Ω
TRANSCONDUCTANCE	0.0019 S
AMPLIFICATION FACTOR	15
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	20 mA
<i>Triode audio-driver section; published ratings/characteristics promoted where applicable.</i>	

SECTION2 Diode	
NOMINAL OUTPUT CURRENT	1 mA
<i>Representative of two identical diodes.</i>	

SECTION3 Diode	
<i>No fixed ratings recorded.</i>	
<i>Added approved missing physical diode section row.</i>	

12FT6 — Duo-Diode-Triode Miniature Vacuum Tube

An indirectly heated, multi-unit miniature vacuum tube designed for low-voltage detection and audio driver applications in automotive receiver circuits.

Overview

The **12FT6** is a multi-unit miniature vacuum tube containing two diodes and one high-mu triode in a single envelope. It is specifically designed for service in hybrid (tube and transistor) automobile radio receivers that operate directly from a standard 12-volt storage battery. In these systems, the 12FT6 performs the dual functions of second detector and audio driver amplifier, operating its heater and plate circuits directly from the vehicle's battery supply without the need for a high-voltage step-up power supply.

Physical Construction and Basing

The 12FT6 is constructed in a T-5 1/2 glass bulb utilizing a miniature 7-pin base. The tube features a coated unipotential cathode and is designed to operate in any mounting position.

The physical dimensions of the device are:

- **Maximum overall length:** 2-1/8 inches

- **Maximum seated height:** 1-7/8 inches
- **Maximum diameter:** 3/4 inch

The bottom view of the miniature 7-pin base (7BT designation) provides the following pin connections:

- **Pin 1:** Grid
- **Pin 2:** Cathode
- **Pin 3:** Heater
- **Pin 4:** Heater
- **Pin 5:** Diode Plate 2
- **Pin 6:** Diode Plate 1
- **Pin 7:** Triode Plate

Heater Characteristics and Automotive Design

The heater of the 12FT6 is engineered specifically for the demanding electrical environment of automotive applications. While the nominal heater rating is **12.6 V** at **0.15 A** (suitable for either AC or DC operation), the heater is designed to operate over a wide voltage range of **10.0 to 15.9 V**. This wide operating range ensures that the tube continues to function reliably and safely despite the voltage fluctuations commonly encountered in automotive electrical systems during battery charging or discharging.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12FT6, measured without an external shield, are:

- **Grid to Plate:** 2.0 μF
- **Input:** 1.8 μF
- **Output:** 1.1 μF
- **Diode 1 to Diode 2:** 0.9 μF

Maximum Ratings

The maximum ratings for the 12FT6 are established under the Design Center System. These limits must be respected to ensure reliable operation and longevity:

Parameter	Rating
Heater Voltage	12.6 V
Maximum Plate Voltage	30 V
Maximum Cathode Current	20 mA
Maximum Average Diode Current	1 mA

Parameter	Rating
Maximum Grid #1 Resistance	10 MΩ
Maximum Peak Heater-to-Cathode Voltage	±30 V

The maximum ratings are designed with an adequate safety factor to withstand the wide variations in supply voltages typical of automotive battery service.

Typical Operating Conditions and Characteristics

The triode section of the 12FT6 operates as a Class A amplifier. Because it is designed for low-voltage hybrid systems, its typical operating points are specified at a plate voltage of 12.6 V:

Parameter	Operating Point A	Operating Point B
Heater Voltage	12.6 V	12.6 V
Heater Current	0.15 A	0.15 A
Plate Voltage	12.6 V	12.6 V
Grid #1 Voltage	0 V	—
Grid #1 Circuit Resistance	0 Ω	2.2 MΩ
Plate Resistance (Approx.)	7,600 Ω	13,000 Ω
Transconductance	1,900 μmhos	1,000 μmhos
Amplification Factor	15.0	14.0
Plate Current	2.0 mA	0.6 mA

For the diode units, the average diode current is **3.0 mA** per diode when a potential of 10 volts is applied to each diode.

Technical Summary

The **12FT6** is a miniature, 7-pin duo-diode-triode designed for low-voltage automotive applications. By combining a triode amplifier with two independent diode detectors, it serves as an efficient second detector and audio driver in hybrid automobile receivers. Operating directly from a nominal 12-volt battery supply, the tube features a rugged heater designed to tolerate a 10.0 to 15.9 V range, a maximum plate voltage rating of 30 V, and typical triode amplification factors of 14 to 15.



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	—
Heater current	150 mA	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	2 pF	—

1961 TUNG SOL

Section 2 · Diode

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

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Diode-to-diode capacitance	0.9 pF	—



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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
WITH "A" AND "B" SUPPLY DIRECTLY FROM A	12 V	Published datasheet
HEATER VOLTAGE	12.6 V	Maximum ratings
MAXIMUM PLATE VOLTAGE	3 V	Maximum ratings; published column 1
MAXIMUM PLATE VOLTAGE	0 V	Maximum ratings; published column 2
MAXIMUM GRID #1 RESISTANCE	10000000 ohm	Maximum ratings
MAXIMUM PEAK HEATER TO CATHODE VOLTAGE ±	3 V	Maximum ratings; published column 1
MAXIMUM PEAK HEATER TO CATHODE VOLTAGE ±	0 V	Maximum ratings; published column 2
i HEATER CURRENT	150 mA	Typical operating conditions
i PLATE VOLTAGE	12.6 V	Typical operating conditions; published column 1
GRID #1 VOLTAGE	0 V	Typical operating conditions
GRID #1 CIRCUIT RESISTANCE	0 ohm	Typical operating conditions; published column 1
GRID #1 CIRCUIT RESISTANCE	22000000 ohm	Typical operating conditions; published column 2
PLATE RESISTANCE (APPROX.)	7600 ohm	Typical operating conditions; published column 1
PLATE RESISTANCE (APPROX.)	13 ohm	Typical operating conditions; published column 2
PLATE RESISTANCE (APPROX.)	0 ohm	Typical operating conditions; published column 3
TRANSCONDUCTANCE	1900 uS	Typical operating conditions; published column 1
TRANSCONDUCTANCE	1 uS	Typical operating conditions; published column 2
TRANSCONDUCTANCE	0 uS	Typical operating conditions; published column 3
PLATE CURRENT	2 mA	Typical operating conditions; published column 1
PLATE CURRENT	0.6 mA	Typical operating conditions; published column 2
THIS TUBE	1 V	Typical operating conditions; published column 1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
THIS TUBE	8 V	Typical operating conditions; published column 3
Maximum plate voltage	30 V	Published datasheet; promoted section value
Maximum cathode current	20 mA	Published datasheet; promoted section value

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID TO PLATE	2 pF	Interelectrode capacitances

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	7600 ohm	Published datasheet; promoted section value
Transconductance	0.0019 A/V	Published datasheet; promoted section value
Amplification factor	15	Published datasheet; promoted section value

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Diode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DIODE	1 pF	Interelectrode capacitances; published column 1
DIODE	2 pF	Interelectrode capacitances; published column 2
DIODE	0.9 pF	Interelectrode capacitances; published column 3

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM AVERAGE DIODE CURRENT	1 mA	Maximum ratings
WITH	10 V	Typical operating conditions; published column 1
WITH	3 V	Typical operating conditions; published column 2
Maximum/average diode output current	1 mA	Published datasheet; promoted section value

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average diode current at 10 V applied	3 mA	Each diode