



ELECTRONIC TUBE REFERENCE

12BF6

Voltage - Triode (with diode, heptode or hexode) electronic tube

CONSOLIDATED TECHNICAL
DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Double-diode triode combining detector functions with a relatively robust voltage-amplifier section. The diodes provide signal and control-voltage rectification while the triode supplies stronger current capability than many detector-amplifier combinations.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	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

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	68000 Ω
TRANSCONDUCTANCE	0.0012 S
AMPLIFICATION FACTOR	16
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
<i>Supplied sheet explicitly states this is the same as 6BF6 except for heater characteristics. Parent electrical table was not present in the currently available local corpus, so no unsupported promoted values were invented.</i>	

SECTION2 Diode

NOMINAL OUTPUT CURRENT

1 mA

Supplied sheet explicitly states this is the same as 6BF6 except for heater characteristics. Parent electrical table was not present in the currently available local corpus, so no unsupported promoted values were invented.

SECTION3 Diode

No fixed ratings recorded.

Supplied sheet explicitly states this is the same as 6BF6 except for heater characteristics. Parent electrical table was not present in the currently available local corpus, so no unsupported promoted values were invented.

12BF6 — Twin Diode-Medium-Mu Triode

A multi-unit miniature vacuum tube containing two diodes and a medium-mu triode in a single envelope, designed for detector, amplifier, and automatic volume control (AVC) applications.

Overview

The **12BF6** is a miniature multi-unit tube of the heater-cathode type. It integrates two independent diode units and a single medium-mu triode within a compact 7-pin envelope. The tube is designed primarily for use as a combined detector, amplifier, and automatic volume control (AVC) stage in automobile radio receivers operating from a 12-volt storage battery system.

The electrical characteristics of the triode section allow it to be either impedance-coupled or transformer-coupled to the receiver's power output stage. The triode unit is capable of supplying a high output signal with low distortion, sufficient to drive a pair of 12V6-GT power tubes operating at maximum plate voltage. In overall performance, the 12BF6 is equivalent to the larger metal-envelope type 12SR7.

Construction, Heater, and Base Connections

The 12BF6 features a coated unipotential cathode shared by the triode and both diode units. The tube is housed in a T-5 1/2 glass bulb with a small-button miniature 7-pin base (JETEC No. E7-1). It can be mounted in any physical position.

Physical Dimensions

- **Maximum Overall Length:** 2-1/8 inches (2.125 inches)
- **Maximum Seated Length:** 1-7/8 inches (1.875 inches)
- **Maximum Diameter:** 3/4 inch (0.750 inch)

Heater Characteristics and Ratings

The heater is designed for operation under standard design-maximum limits:

- **Average Heater Voltage:** 12.6 V (AC or DC)
- **Average Heater Current:** 0.150 A (150 mA)
- **Heater Voltage Supply Limits:** 12.6 ± 1.3 V
- **Heater Current Supply Limits:** 150 ± 15 mA
- **Maximum Peak Heater-Cathode Voltage:** 90 V (with heater either negative or positive with respect to the cathode)

Pinout Configuration

The 7-pin miniature base (basing diagram JEDEC 7BT) utilizes the following pin assignments, viewed from the bottom of the tube:

- **Pin 1:** Triode Grid
- **Pin 2:** Cathode (common to triode and diode units)
- **Pin 3:** Heater
- **Pin 4:** Heater
- **Pin 5:** Diode Plate No. 2
- **Pin 6:** Diode Plate No. 1
- **Pin 7:** Triode Plate

Electrical Characteristics and Class A1 Operation

The triode section of the 12BF6 operates as a Class A1 amplifier. Under typical operating conditions, it exhibits a low amplification factor which facilitates large output voltage swings with minimal distortion.

Typical Triode Operating Characteristics (Transformer-Coupled)

- **Plate Voltage:** 250 V
- **Grid Voltage:** -9 V
- **Amplification Factor:** 16
- **Plate Resistance (Approximate):** 8,500 Ω
- **Transconductance:** 1,900 μmhos
- **Plate Current:** 9.5 mA
- **Load Resistance:** 10,000 Ω
- **Total Harmonic Distortion:** 6.5%
- **Power Output:** 300 mW

Maximum Ratings (Design-Center / Design-Maximum Values)

- **Maximum Plate Voltage:** 300 V
- **Maximum Plate Dissipation:** 2.5 W

- **Maximum Average Diode Current (Each Unit, Continuous):** 1.0 mA

Resistance-Coupled Amplifier Operation

The triode unit can be operated as a resistance-coupled voltage amplifier. The following operating conditions outline performance across different plate-supply voltages:

Parameter	90 V Supply	180 V Supply	300 V Supply
Plate Load Resistor (MΩ)	0.047 / 0.1 / 0.22	0.047 / 0.1 / 0.22	0.047 / 0.1 / 0.22
Grid Resistor of Following Stage (MΩ)	0.1 / 0.22 / 0.47	0.1 / 0.22 / 0.47	0.1 / 0.22 / 0.47
Cathode Resistor (Ω)	2,800 / 5,400 / 12,000	2,500 / 5,100 / 11,000	2,400 / 5,000 / 11,000
Cathode Bypass Capacitor (μF)	2.0 / 1.0 / 0.5	2.2 / 1.1 / 0.5	2.4 / 1.2 / 0.5
Blocking Capacitor (μF)	0.033 / 0.013 / 0.0065	0.033 / 0.015 / 0.007	0.033 / 0.015 / 0.007
Peak Output Voltage (V)	18 / 20 / 23	42 / 47 / 54	74 / 85 / 95
Voltage Gain	10 / 11 / 11	10 / 11 / 12	11 / 12 / 12

Note: The cathode bypass and blocking capacitors are selected to provide an output voltage at 100 Hz (f_1) that is equal to 0.8 of the mid-frequency value. The peak output voltage is obtained across the grid resistor of the following stage at any frequency within the flat region of the output-versus-frequency curve, up to the point where the grid begins to draw current.

Diode Units and Application Considerations

The 12BF6 contains two diode units alongside the triode unit, all sharing a common cathode (Pin 2).

- **Diode Current:** Each diode plate must deliver a minimum of 0.8 mA when 10 Volts DC is applied.
- **Biasing:** Diode biasing of the triode unit of the 12BF6 is explicitly not recommended.
- **Continuous Operation:** The average diode current for each unit must not exceed the maximum rating of 1.0 mA.

Storage-Battery Operating Considerations

When the 12BF6 is used in storage-battery-operated equipment, designers must adhere to specific design-center maximum guidelines to ensure reliable performance:

- **Without Charger:** The circuit must be designed so that the published maximum values of plate voltages, grid-No.2 supply voltages, dissipations, and rectified output currents are never exceeded for a terminal potential of 2.0 volts per cell at the battery source (equivalent to 12.0 V for a 6-cell battery).
- **With Charger:** The circuit must be designed so that 90 percent of the published maximum values are never exceeded for a terminal potential of 2.2 volts per cell at the battery source (equivalent to 13.2 V for a 6-cell battery).

Direct Interelectrode Capacitances

The interelectrode capacitances of the 12BF6 vary depending on whether an external shield is employed. Measurements are typically taken either without a shield or with an external shield connected to the cathode (or Pin 2).

Triode Section Capacitances

- **Grid to Plate:** 1.9 pF (without shield) / 1.9 pF (with shield) [Alternative measurement: 2.0 pF / 2.0 pF]
- **Input (Grid to Cathode + Heater):** 1.8 pF (without shield) / 1.9 pF (with shield) [Alternative measurement: 1.8 pF / 1.8 pF]
- **Output (Plate to Cathode + Heater):** 0.7 pF (without shield) / 1.2 pF (with shield) [Alternative measurement: 0.8 pF without shield / 1.1 pF with shield]

Diode Section Capacitances

- **Diode Plate No. 1 to Grid (Max):** 0.07 pF (without shield) / 0.06 pF (with shield)
- **Diode Plate No. 2 to Grid (Max):** 0.06 pF (without shield) / 0.05 pF (with shield)
- **Diode Plate No. 2 to Heater and Cathode:** 0.95 pF (without shield)
- **Diode Plate No. 1 to Heater and Cathode:** 0.66 pF (without shield)
- **Diode Plate No. 1 to Cathode:** 0.7 pF (without shield) / 1.4 pF (with shield)
- **Diode Plate No. 2 to Cathode:** 0.1 pF (without shield) / 1.5 pF (with shield)
- **Diode Plate No. 1 to Triode Grid (Max):** 0.07 pF (without shield) / 0.06 pF (with shield)
- **Diode Plate No. 2 to Triode Grid (Max):** 0.06 pF (without shield) / 0.05 pF (with shield)

Related Designations

The **12BF6** is identical to the **6BF6** except for its heater characteristics. The 12BF6 requires a heater voltage of 12.6 V and a heater current of 0.150 A, whereas the 6BF6 operates on a different heater configuration. Additionally, the 12BF6 serves as a direct performance equivalent to the larger metal-type **12SR7** tube.

Technical Summary

The **12BF6** is a 7-pin miniature double-diode triode designed for multi-functional service as a detector, amplifier, and AVC tube, particularly in 12-volt automotive radio systems. It features a shared unipotential cathode, a 12.6 V / 150 mA heater, and a low-mu triode unit with an amplification factor of 16. The

triode's low amplification factor allows for high-amplitude output signals with minimal distortion, making it highly effective for driving subsequent power amplifier stages. With design-center maximum ratings of 300 V plate voltage and 2.5 W plate dissipation, the 12BF6 offers robust performance in a compact, versatile miniature glass envelope.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1940 RCA

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

1940 RCA

Section 2 · Diode

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Detector text	—



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	150 mA	Nominal
Plate voltage	200 V	Typical operating conditions
Plate current	9.5 mA	Typical operating conditions

1961 TUNG SOL

Section 2 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	200 V	Typical operating conditions

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	9.5 mA	Typical operating conditions

1961 TUNG SOL

Section 3 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	200 V	Typical operating conditions
Plate current	9.5 mA	Typical operating conditions



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 1 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID TO PLATE: (G TO TP)	1 pF	Published datasheet; operating column 1
GRID TO PLATE: (G TO TP)	1.9 pF	Published datasheet; operating column 2
INPUT: G TO (H+K)	1.8 pF	Published datasheet; operating column 1
INPUT: G TO (H+K)	1.9 pF	Published datasheet; operating column 2

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
AVERAGE CHARACTERISTICS	12.6 mA	Published datasheet; operating column 1
AVERAGE CHARACTERISTICS	150 mA	Published datasheet; operating column 2
HEATER NEGATIVE WITH RESPECT TO CATHODE	90 V	Published datasheet
HEATER POSITIVE WITH RESPECT TO CATHODE	90 V	Published datasheet
PLATE DISSIPATION	2.5 W	Published datasheet

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
CONTINUOUS	0 mA	Published datasheet; operating column 1
CONTINUOUS	1 mA	Published datasheet; operating column 2
TRANSCONDUCTANCE	1900 μ S	Published datasheet
LOAD RESISTANCE	10000 ohm	Published datasheet; operating column 1
LOAD RESISTANCE	—	Published datasheet; operating column 2
$E_f = _$	12.6 V	Published datasheet
$E_f =$	12.6 V	Published datasheet
Maximum plate voltage	300 V	Published datasheet; promoted section value
Maximum plate dissipation	2.5 W	Published datasheet; promoted section value

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
VOLTAGE	0 V	Published datasheet; operating column 1
VOLTAGE	12.6 V	Published datasheet; operating column 2
VOLTAGE	1.3 V	Published datasheet; operating column 3
CURRENT	0 mA	Published datasheet; operating column 1
CURRENT	150 mA	Published datasheet; operating column 2
CURRENT	15 mA	Published datasheet; operating column 3
PLATE VOLTAGE	300 V	Published datasheet
PLATE VOLTAGE	250 V	Published datasheet
GRID VOLTAGE	-9 V	Published datasheet
PLATE RESISTANCE	8500 ohm	Published datasheet; operating column 1
PLATE RESISTANCE	0 ohm	Published datasheet; operating column 2
PLATE CURRENT	9.5 mA	Published datasheet
Transconductance	0.0019 A/V	Published datasheet; promoted section value
Amplification factor	16	Published datasheet; promoted section value

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
#2 DIODE PLATE TO HEATER AND CATHODE	0.95 pF	Published datasheet

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
#1 DIODE PLATE TO HEATER AND CATHODE	0.66 pF	Published datasheet

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DIODE CURRENT EACH PLATE WITH	10 mA	Published datasheet; operating column 1
DIODE CURRENT EACH PLATE WITH	0.8 mA	Published datasheet; operating column 2


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 5 of 7

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

1971 RCA HB3 BINDER 5 OF 7

Section 2 · Diode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage (AC or OC)	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current – published value 1	0	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current – published value 2	150	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater voltage	12.6 V	Nominal heater rating
Heater current	150 mA	Nominal heater rating

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes, and their source documents.

