



ELECTRONIC TUBE REFERENCE

12BK6

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

CONSOLIDATED TECHNICAL
DATA

3 SECTIONS

CONSTRUCTION

DIODE-DIODE-TRIODE

Double-diode high-mu triode for radio detection, AVC generation, and subsequent voltage amplification. Two diode sections handle signal and control-voltage rectification while the triode provides useful audio-frequency gain.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7BT-0-2	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Diode

No fixed ratings recorded.

Values promoted from the supplied Sylvania source where explicitly published.

SECTION2 Diode

No fixed ratings recorded.

Values promoted from the supplied Sylvania source where explicitly published.

SECTION3 Triode	
PLATE RESISTANCE	62500 Ω
TRANSCONDUCTANCE	0.0016 S
AMPLIFICATION FACTOR	100
MAXIMUM PLATE VOLTAGE	300 V
<i>Values promoted from the supplied Sylvania source where explicitly published.</i>	

12BK6 — High-Mu Double-Diode Triode

The **12BK6** is a miniature, multi-unit vacuum tube containing two high-perveance diodes and a single high-mu triode in one envelope. It is designed for use in radio receivers where it can perform the combined functions of AM detection, automatic volume control (AVC), and audio voltage amplification. The tube features a 7-pin miniature construction and is designed to operate with a 12.6 V heater supply.

Mechanical Specifications and Pinout

The 12BK6 is constructed in a T-5 1/2 glass bulb with an E7-1 miniature button 7-pin base. The physical dimensions of the tube are as follows:

Dimension	Value
Maximum Diameter	3/4 inch
Maximum Overall Length	2 5/8 inches
Maximum Seated Height	2 3/8 inches

The tube can be operated in any mounting position. The basing arrangement (designated as 7BT or 7BT-0-2) provides the following pin connections, viewed from the bottom of the tube:

- **Pin 1:** Grid (Triode)
- **Pin 2:** Cathode and Diode Shield
- **Pin 3:** Heater
- **Pin 4:** Heater
- **Pin 5:** Diode Plate #2
- **Pin 6:** Diode Plate #1
- **Pin 7:** Plate (Triode)

The internal diode shielding is connected directly to Pin 2 (along with the cathode), which reduces undesirable audio coupling between the diode units and the triode section.

Heater and Cathode Characteristics

The 12BK6 utilizes a coated unipotential cathode. The heater is designed for operation on either AC or DC power.

Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	150 mA (0.15 A)
Calculated Heater Power	1.89 W

The calculated heater power is derived from the nominal values: $\text{Power} = 12.6 \text{ V} * 0.150 \text{ A} = 1.89 \text{ W}$. The maximum rating for the voltage between the heater and the cathode is 90 V.

Triode Electrical Characteristics and Class A1 Operation

The triode section of the 12BK6 is a high- μ voltage amplifier. Typical operating conditions and electrical characteristics under Class A1 amplifier service are specified at two distinct plate voltage points:

Parameter	Operating Point A	Operating Point B
Plate Voltage	100 V	250 V
Grid Voltage	-1 V	-2 V
Plate Current	0.5 mA	1.2 mA
Plate Resistance	80,000 Ω	62,500 Ω
Transconductance	1,250 μS	1,600 μS
Amplification Factor (μ)	100	100

The fundamental triode relationship where amplification factor is approximately equal to transconductance multiplied by plate resistance is verified by the typical characteristics:

- At 100 V Plate Voltage: $0.00125 \text{ S} * 80,000 \Omega = 100$
- At 250 V Plate Voltage: $0.00160 \text{ S} * 62,500 \Omega = 100$

The calculated plate power dissipation at these typical operating points is:

- At 100 V Plate Voltage: $100 \text{ V} * 0.0005 \text{ A} = 0.05 \text{ W}$ (50 mW)
- At 250 V Plate Voltage: $250 \text{ V} * 0.0012 \text{ A} = 0.30 \text{ W}$ (300 mW)

Diode Unit Characteristics

The two diode units are independent of each other, except for their common cathode connection and the internal shielding. They are designed with high perveance to ensure high rectification efficiency even when handling low-level signals.

- **Maximum Continuous Diode Current:** 1.0 mA per plate.
- **Diode Current at 10 V DC:** When a DC potential of 10 V is applied to an individual diode plate, the resulting current is specified as:
 - Minimum: 1.5 mA
 - Average: 4.0 mA

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12BK6 are specified both with and without an external shield. When an external shield is used, it is standard RMA shield #316 connected to Pin 2 (cathode).

Capacitance Parameter	Without Shield	With Shield
Diode #1 Input: 1P to (h + k + i.s.)	1.0 pF	1.0 pF
Diode #2 Input: 2P to (h + k + i.s.)	1.0 pF	1.0 pF
Diode #1 Plate to Triode Grid (maximum): 1P to G	0.013 pF	0.01 pF

(Note: *h* represents heater, *k* represents cathode, and *i.s.* represents internal shield).

Maximum Ratings

The following maximum ratings are established under the Design Center system (interpreted according to RMA Standard M8-210):

Rating Parameter	Limit
Maximum Heater Voltage	12.6 V
Maximum Heater-Cathode Voltage	90 V
Maximum Plate Voltage (DC)	300 V
Maximum Positive DC Grid Voltage	0 V
Maximum Continuous Diode Current (each plate)	1.0 mA

Analysis of Characteristic Curves

The electrical behavior of the 12BK6 is further illustrated by its characteristic curves:

- **Triode Plate Characteristics:** The curves of plate current versus plate voltage show that at a grid bias of 0 V, the plate current rises rapidly with plate voltage, reaching approximately 3.5 mA at 150 V. As the grid bias is made more negative (down to -5.0 V), the curves shift to the right, demonstrating typical high-mu triode cutoff behavior where higher plate voltages are required to initiate plate current.
- **Diode Characteristics:** The diode curves plot the DC voltage developed by the diode against the rectified microamperes for various load resistance values (ranging from 0.1 MΩ to 2 MΩ) at an RMS signal input of 30 V. These curves show that higher load resistances yield a higher developed DC voltage for a given rectified current, illustrating the rectification efficiency of the high-perveance diode units.
- **Triode Parameter Curves:** Curves plotting transconductance, plate resistance, and amplification factor against grid voltage show that the amplification factor remains relatively stable near 100 over a wide range of grid bias voltages, while the transconductance decreases and plate resistance increases as the grid bias becomes more negative.

Related Designations

The 12BK6 is part of a family of double-diode triodes with similar internal structures but different heater ratings. The designations **6BK6** and **26BK6** represent tubes with identical electrical characteristics and pinouts, differing only in their heater requirements.

Technical Summary

The **12BK6** is a 7-pin miniature double-diode triode featuring a high-mu triode (amplification factor of 100) and two high-perveance diodes sharing a common unipotential cathode. Operating with a 12.6 V, 150 mA heater, the tube is optimized for detection and audio amplification in compact receiver designs. Its internal shielding, connected to the cathode on Pin 2, minimizes capacitive coupling between the diode and triode sections, ensuring clean signal processing. With a maximum plate voltage rating of 300 V and a maximum continuous diode current of 1.0 mA per plate, the 12BK6 provides a reliable, space-saving solution for multi-function stage designs.



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 3 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	1.2 mA	PlateVoltage=250V



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 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	300 V	Typical operating conditions



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 2 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DIODE $>t_i$	0 pF	Published datasheet; operating column 1
DIODE $>t_i$	2 pF	Published datasheet; operating column 2
DIODE !	1 pF	Published datasheet; operating column 1
DIODE !	0.013 pF	Published datasheet; operating column 2
DIODE !	0.01 pF	Published datasheet; operating column 3
MAXIMUM DIODE CURRENT EACH PLATE FOR CONTINUOUS	0 mA	Published datasheet; operating column 1
MAXIMUM DIODE CURRENT EACH PLATE FOR CONTINUOUS	1 mA	Published datasheet; operating column 2

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
AVERAGE DIODE CURRENT EACH PLATE WITH	10 mA	Published datasheet; operating column 1
AVERAGE DIODE CURRENT EACH PLATE WITH	4 mA	Published datasheet; operating column 2

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 3 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAX	12.6 mA	Published datasheet; operating column 1
MAX	150 mA	Published datasheet; operating column 2
MAXIMUM HEATER-CATHODE VOLTAGE	90 V	Published datasheet
MAXIMUM PLATE VOLTAGE	300 V	Published datasheet
GRID VOLTAGE	-1 V	Published datasheet; operating column 1
GRID VOLTAGE	-2 V	Published datasheet; operating column 2
TRANSCONDUCTANCE	1 μ S	Published datasheet; operating column 1
TRANSCONDUCTANCE	250 μ S	Published datasheet; operating column 2
$E_f =$	12.6 V	Published datasheet
YO RMS Signal Input =	30 V	Published datasheet
E_{fm}	12.6 V	Published datasheet

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HEATER VOLTAGE	12.6 V	Published datasheet
HEATER CURRENT LSO	150 mA	Published datasheet
PLATE CURRENT	0.5 mA	Published datasheet; operating column 1
PLATE CURRENT	1.2 mA	Published datasheet; operating column 2
PLATE RESISTANCE	80 ohm	Published datasheet; operating column 1
PLATE RESISTANCE	0 ohm	Published datasheet; operating column 2
PLATE RESISTANCE	62 ohm	Published datasheet; operating column 3
Amplification factor	100	Published datasheet; promoted section value