

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

12DZ6

1 SECTION
CONSTRUCTION
PENTODE

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

Low-voltage remote-cutoff pentode for automobile and other 12 V RF/IF amplifier applications with direct battery-supply operation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7BK	BASE PINS	7
NOMINAL HEATER	12.6 V / 190 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7BK - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – G1	A	G1 – Control Grid	CONNECTED
PIN2 – G3	A	G3 – Suppressor Grid	CONNECTED
PIN2 – IS	A	IS – Internal Screen	CONNECTED
PIN3 – H	–	H – Heater	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – P	A	P – Plate (Anode)	CONNECTED
PIN6 – G2	A	G2 – Screen Grid	CONNECTED
PIN7 – K	A	K – Cathode	CONNECTED

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	25000 Ω
TRANSCONDUCTANCE	0.0038 S
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM SCREEN VOLTAGE	16 V
<i>Promoted values are limited to values explicitly present in this supplied 12-V datasheet block; additional published values are retained in parameter rows.</i>	

12DZ6 — Remote-Cutoff Pentode

The **12DZ6** is a miniature, remote-cutoff pentode designed primarily for use as a radio-frequency (RF) amplifier in automobile radio receivers. It is specifically engineered to operate with its plate and screen grid voltages supplied directly from a 12-volt storage battery (typically a 6-cell storage-battery system), eliminating the need for a high-voltage B+ power supply. The tube features a 7-pin miniature construction and an indirectly heated, coated unipotential cathode.

Construction, Mechanical Specifications, and Pinout

The 12DZ6 is housed in a T-5 1/2 glass envelope with a small-button miniature 7-pin base (JEDEC No. E7-1). It can be operated in any mounting position.

Physical Dimensions

- **Maximum Overall Length:** 2-1/8 inches
- **Maximum Seated Length:** 1-7/8 inches
- **Length, Base Seat to Bulb Top (excluding tip):** 1-1/2 inches $\pm$ 3/32 inch
- **Diameter:** 0.650 to 0.750 inches

Pin Connections (Basing Designation 7BK)

Viewed from the bottom of the tube, the 7-pin base configuration provides the following connections:

- **Pin 1:** Grid Number 1 (Control Grid)
- **Pin 2:** Grid Number 3 (Suppressor Grid) and Internal Shield
- **Pin 3:** Heater
- **Pin 4:** Heater
- **Pin 5:** Plate
- **Pin 6:** Grid Number 2 (Screen Grid)
- **Pin 7:** Cathode

Heater Characteristics and Automotive Operation

The 12DZ6 features a coated unipotential cathode. The heater is designed for operation on either AC or DC.

Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.190 A
Heater Supply	AC or DC

Automotive Voltage Variations

Because the tube is designed for direct operation from automotive electrical systems, its heater is rated to withstand the voltage fluctuations typical of a 12-volt storage battery (6-cell system) under charge and discharge conditions:

- **Absolute Voltage Range:** Under no circumstances should the heater voltage fall below 10.0 volts or exceed 15.9 volts.
- **Recommended Range for Longest Life:** 11 to 14 volts.
- **Operation Effects:** Operating at or near the absolute limits of 10.0 V or 15.9 V results in a sacrifice in performance at the lower limit and a reduction in life expectancy at the upper limit. Equipment reliability is significantly enhanced by improved supply-voltage regulation.

Electrical Ratings

The maximum ratings for the 12DZ6 are established under the Design-Maximum System (or Design-Center System depending on the standard applied):

Rating	Value
Maximum Plate Voltage	16 V
Maximum Screen (Grid No. 2) Voltage	16 V
Maximum Positive DC Grid No. 1 Voltage	0 V
Maximum Heater-Cathode Voltage (Heater Positive)	16 V
Maximum Heater-Cathode Voltage (Heater Negative)	16 V
Maximum Grid No. 1 Circuit Resistance	10 MΩ
Maximum Grid No. 3 Circuit Resistance	10 MΩ

The suppressor grid (Grid No. 3) must be connected directly to the cathode at the socket.

Typical Operating Conditions and Characteristics

In typical Class A1 amplifier service, the 12DZ6 operates with low electrode potentials, matching the nominal 12.6 V battery supply:

- **Heater Voltage:** 12.6 V
- **Plate Voltage:** 12.6 V
- **Grid No. 3 (Suppressor) Supply Voltage:** 0 V (connected to cathode)
- **Grid No. 2 (Screen) Voltage:** 12.6 V
- **Grid No. 1 (Control Grid) Supply Voltage:** 0 V
- **Grid No. 1 Resistor (Bypassed):** 10 M Ω
- **Grid No. 3 Resistor (Bypassed):** 10 M Ω
- **Plate Resistance (Approximate):** 25,000 Ω
- **Transconductance:** 3,800 μ mhos
- **Plate Current:** 4.5 mA
- **Screen Current (Grid No. 2 Current):** 2.2 mA

Remote-Cutoff Action

To achieve remote-cutoff characteristics for automatic volume control (AVC) or automatic gain control (AGC) applications, a negative bias can be applied to the control grid. With an approximate bias of -10 V applied to Grid No. 1 (and Grid No. 3 in some configurations), the transconductance is reduced to approximately 10 μ mhos.

Interelectrode Capacitances

The direct interelectrode capacitances of the 12DZ6 are measured without an external shield.

- **Grid No. 1 to Plate (Maximum):** 0.05 pF to 0.15 pF
- **Input (Grid No. 1 to Cathode, Grid No. 3 & Internal Shield, Grid No. 2, and Heater):** 9.5 pF
- **Output (Plate to Cathode, Grid No. 3 & Internal Shield, Grid No. 2, and Heater):** 4.0 pF

These low capacitances, particularly the very low grid-to-plate feedback capacitance, make the tube highly stable in high-frequency RF amplifier stages.

Average Characteristics and Curves

The average characteristics of the 12DZ6 illustrate its performance under low-voltage conditions.

- **Plate Current vs. Plate Voltage:** At a screen voltage of 12.6 V and Grid No. 3 connected to the cathode, the plate current curves show a typical pentode knee. For a control grid voltage of 0 V, the plate current rises rapidly and levels off above a few volts of plate potential, reaching approximately 4.5 mA at 12.6 V plate voltage.

- **Transconductance and Currents vs. Grid No. 1 Voltage:** At a constant plate and screen voltage of 12.6 V, as the Grid No. 1 voltage is varied from 0 V down to -8 V or -10 V, the transconductance smoothly decreases from 3,800 μmhos toward zero, demonstrating the remote-cutoff characteristic. The plate current and screen current follow a similar downward trend, with screen current dropping from 2.2 mA at 0 V bias.

Technical Summary

The **12DZ6** is a 7-pin miniature remote-cutoff pentode designed for low-voltage operation directly from a 12-volt automotive storage battery. With a heater rating of 12.6 V at 0.190 A, it operates reliably under the voltage fluctuations of automotive electrical systems (10.0 V to 15.9 V). At its typical Class A1 operating point of 12.6 V on the plate and screen, it provides a transconductance of 3,800 μmhos , a plate resistance of approximately 25,000 ohms, and a plate current of 4.5 mA. Its remote-cutoff characteristic allows for effective gain control, making it highly suitable for RF amplifier stages in automotive receivers without requiring a high-voltage power supply.



SOURCE OPERATING CONDITIONS

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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 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	16 V	Typical operating conditions
Screen voltage	16 V	Typical operating conditions
Plate current	4.5 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 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID #	1 mA	GRID #1 TO PLATE (MAX.) 0.05 •— μuf
HEATER VOLTAGE	12.6 V	HEATER VOLTAGE 12.6A VOLTS
HEATER NEGATIVE WITH RESPECT TO CATHODE	16 V	HEATER NEGATIVE WITH RESPECT TO CATHODE 16 VOLTS
HEATER VOLTAGE BE LESS THAN	10 V	HEATER VOLTAGE BE LESS THAN 10.0 VOLTS OR MORE THAN 15.9 VOLTS. THESE EXTREME VARIATIONS IX
PLATE VOLTAGE	12.6 V	PLATE VOLTAGE 12,6 VOLTS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
SCREEN VOLTAGE	12.6 V	SCREEN VOLTAGE 12.6 VOLTS
GRID #	1 V	GRID #1 SUPPLY VOLTAGE 0 VOLTS
PLATE RESISTANCE (APPROX.)	2 Ω	PLATE RESISTANCE (APPROX.) 2F 000 OHMS
PLATE CURRENT	4.5 mA	PLATE CURRENT 4,5 MA.
SCREEN CURRENT	2.2 mA	SCREEN CURRENT 2.2 MA.
GRIDS#	1 V	GRIDS#1 h #3 SUPPLY VOLTAGE (APPROX.) (GRID #1 TO PLATE)
GRID #	3 M Ω	GRID #3 RESISTOR (BYPASSED) 10 MEGOHMS

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM PLATE VOLTAGE]	6 V	MAXIMUM PLATE VOLTAGE]6 voL rs
MAXIMUM SCREEN VOLTAGE	16 V	MAXIMUM SCREEN VOLTAGE 16 voLrs
MAXIMUM POSITIVE DC GRID #	1 V	MAXIMUM POSITIVE DC GRID #1 VOLTAGE 0 VOLTS
MAXIMUM GRID #	1 mA	MAXIMUM GRID #1 CIRCUIT RESISTANCE 10 ME60HMS
MAXIMUM GRID #	3 mA	MAXIMUM GRID #3 CIRCUIT RESISTANCE * 10 MEGOHMS


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1968 General Electric Co

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1968 GENERAL ELECTRIC CO

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	4.5 mA	ClassA
Screen Current	2.2 mA	ClassA

SOURCE OPERATING CONDITIONS

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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 1 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage range (DC) – published value 1	10 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Voltage range (DC) – published value 2	15.9 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current (Approx.) at 12.6 volts – published value 1	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current (Approx.) at 12.6 volts – published value 2	0.19 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
internal shield, grid No.2, and heater. 9.5	9.5	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
shield, grid No.2, and heater	4	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	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate Voltage	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No.2 Voltage	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.1 Supply Voltage	0 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.1	10 Mohm	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.3 Resistor (Bypassed)	10 Mohm	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate Resistance (Approx)	25000 ohm	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Transconductance	3800	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate Current	4.5 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.2 Current	2.2 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
No.1 to plate (Fanhos) = S0	-10 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 1 -Grid No.1 – published value 1	1	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 1 -Grid No.1 – published value 2	4	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Pin 2 -Grid No.3, – published value 1	2	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 2 -Grid No.3, – published value 2	5	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Internal	6	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Shield	7	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 3 -Heater	3	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Positive-bias value	0 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID–Ns2 VOLTS=12.6	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
PLATE VOLTS=12.6	12.6 V	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	190 mA	Nominal heater rating

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to plate – published value 1	0 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid No.1 to plate – published value 2	5 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PLATE VOLTAGE	16 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID-No.2 (SCREEN-GRID) VOLTAGE	16 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater negative with respect to cathode. 16 max	16 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater positive with respect to cathode. 16 max	16 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Crid-No.1-Circuit Resistance	10 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Crid-No.3-Circuit Resistance	10 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

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