

ELECTRONIC TUBE REFERENCE

12D4

Rectifier - Damper Diode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
RECTIFIER

Indirectly heated television damping diode and half-wave rectifier, explicitly documented as a heater-rating variant of the 6DA4 family.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	5
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
MAXIMUM PLATE DISSIPATION	5.5 W
PEAK INVERSE VOLTAGE	4400 V
NOMINAL OUTPUT CURRENT	125 mA
PEAK FORWARD CURRENT	900 mA
MAXIMUM HEATER-CATHODE VOLTAGE	900 V
WARM-UP TIME	11 s
Promoted values are limited to values explicitly present in this supplied 12-V datasheet block; additional published values are retained in parameter rows.	

12D4 — Half-Wave Vacuum Rectifier

An indirectly heated, glass-octal half-wave rectifier designed for television horizontal damper service in series heater-string receiver designs.

Overview

The **12D4** is a power-handling half-wave vacuum rectifier designed specifically for service as a damping diode (damper tube) in the horizontal deflection circuits of television receivers. It is optimized for use in television receivers employing series-connected heater strings, particularly where the picture-tube heater is wired in series with other heaters. To minimize heater voltage surges across individual tubes during start-up, the 12D4 features a closely controlled heater warm-up characteristic.

The 12D4 belongs to a family of functionally identical damper diodes that includes the **6DA4** and the **17D4**. These three types share identical physical dimensions, internal construction, and electrical ratings, differing only in their heater voltage and current specifications.

Heater Characteristics and Controlled Warm-up

The 12D4 incorporates a coated unipotential cathode. Because it is designed for series-string operation, its heater is rated for both alternating current (AC) and direct current (DC) operation, and its warm-up time is tightly controlled.

Parameter	12D4 Value	<u>6DA4</u> Comparison	<u>17D4</u> Comparison
Heater Voltage (AC or DC)	12.6 V	6.3 V	16.8 V
Heater Current	0.6 A	1.2 A	0.45 A
Average Heater Warm-up Time	11 seconds	—	11 seconds

Heater Warm-up Definition and Calculation

The controlled heater warm-up time is defined by a standardized test method. It is the time required for the voltage across the heater to reach 80% of its rated value when four times the rated heater voltage is applied to a test circuit.

For the 12D4, the target 80% voltage is calculated as: $12.6\text{ V} \times 0.8 = 10.08\text{ V}$

The test voltage applied is calculated as: $12.6\text{ V} \times 4 = 50.4\text{ V}$

The test circuit consists of the tube heater connected in series with an external resistance. The value of this series resistance is calculated using the following formula: $R_{\text{series}} = \frac{3 \times V_{\text{rated}}}{I_{\text{rated}}}$

Using the rated values for the 12D4 (12.6 V and 0.6 A), the calculation is: $R_{\text{series}} = \frac{3 \times 12.6\text{ V}}{0.6\text{ A}} = 63\text{ }\Omega$

Mechanical Construction and Pinout

The 12D4 is constructed in a T-9 glass bulb and utilizes an octal base. It can be operated in any mounting position. To ensure reliable operation and prevent overheating, the tube must be adequately ventilated, as is typical for power-handling devices.

Physical Dimensions

- **Maximum Overall Length:** 3-5/16 inches
- **Maximum Seated Length:** 2-3/4 inches
- **Maximum Diameter:** 1-9/32 inches

Base Configurations and Basing

The tube uses the **4CG** basing designation, viewed from the bottom. Depending on the manufacturer and production run, the 12D4 may be supplied with one of several base types, including:

- Intermediate-Shell Octal 5-Pin, Arrangement 2 (JEDEC Group 1, No. B5-82)
- Intermediate-Shell Octal 6-Pin, Arrangement 1 (JEDEC Group 1, No. B6-8)
- Short Intermediate-Shell Octal 5-Pin with External Barriers, Arrangement 2 (JEDEC Group 1, No. B5-85)
- Short Intermediate-Shell Octal 6-Pin with External Barriers, Arrangement 1 (JEDEC Group 1, No. B6-60)

On 5-pin bases, pin 1 is omitted, along with pins 4 and 6. On 6-pin bases, pin 1 is present but is internally connected to pin 2.

The pin connections are assigned as follows:

- **Pin 1:** Same as Pin 2 (omitted on 5-pin bases)
- **Pin 2:** Internal Connection (Do Not Use)
- **Pin 3:** Cathode
- **Pin 4:** Omitted (must not be used as a tie point)
- **Pin 5:** Plate
- **Pin 6:** Omitted (must not be used as a tie point)
- **Pin 7:** Heater
- **Pin 8:** Heater

Critical Wiring Constraint: Socket terminals 1, 2, 4, and 6 must not be used as circuit tie points. Pin 2 is an internal connection, and pins 1, 4, and 6 are either omitted or reserved, meaning any external connections to these terminals could interfere with tube operation or cause voltage breakdown.

Direct Interelectrode Capacitances

Measured without an external shield, the approximate capacitances of the 12D4 are:

- **Heater to Cathode:** 3.0 pF
- **Plate to Cathode and Heater:** 6.0 pF
- **Cathode to Plate and Heater:** 8.0 pF

Damper Service Ratings

The 12D4 is rated under the Design-Maximum system. These ratings represent the limiting values at which satisfactory tube life can be expected in a typical television receiver under the worst probable operating conditions (including supply-voltage variations, control adjustments, load variations, and environmental conditions).

The ratings are specified for operation in a standard 525-line, 30-frame television system, where the duty cycle of the horizontal voltage pulse does not exceed 15% of one horizontal scanning cycle (which equates to 10 microseconds).

Rating Parameter	Design-Maximum Value
Peak Inverse Plate Voltage	4400 max. V
Peak Plate Current	900 max. mA
DC Plate Current	155 max. mA
Plate Dissipation	5.5 max. W
Heater-Cathode Voltage (Heater Negative to Cathode)	
— Total DC and Peak (Peak Value)	4400 max. V
— DC Component (Average Value)	900 max. V
Heater-Cathode Voltage (Heater Positive to Cathode)	
— Total DC and Peak (Peak Value)	300 max. V
— DC Component (Average Value)	100 max. V

Electrical Characteristics and Plate Curves

Under typical operating conditions, the 12D4 exhibits a low internal voltage drop, which is highly desirable for efficient damper service.

- **Tube Voltage Drop:** 21 Volts at a plate current of 250 mA.

Average Plate Characteristics

The relationship between plate current and plate voltage is illustrated by the average plate characteristic curve. Under rated heater conditions:

- At a plate potential of **10 Volts**, the plate current is approximately **90 mA**.
- At a plate potential of **20 Volts**, the plate current rises to approximately **220 mA**.
- At a plate potential of **30 Volts**, the plate current reaches approximately **450 mA**.

- At a plate potential of **40 Volts**, the plate current is approximately **680 mA**.
- At a plate potential of **50 Volts**, the plate current reaches its peak rated continuous value of **900 mA**.

This steep curve demonstrates the low internal resistance of the diode, allowing it to conduct heavily with minimal voltage drop across the tube, thereby minimizing plate dissipation and maximizing efficiency in horizontal deflection circuits.

Technical Summary

The **12D4** is a specialized glass octal half-wave vacuum rectifier designed for television horizontal damper service. Featuring a T-9 envelope, a 4CG pinout, and a unipotential cathode, it is optimized for series heater-string applications with its 12.6 V, 0.6 A heater and an 11-second controlled warm-up time. It is electrically identical to the [6DA4](#) and [17D4](#) except for its heater ratings. The tube is capable of handling peak inverse voltages up to 4400 V and peak plate currents of 900 mA, with a low internal voltage drop of 21 V at 250 mA. Proper ventilation and adherence to socket wiring restrictions (avoiding pins 1, 2, 4, and 6 as tie points) are required to ensure reliable operation in television receiver circuits.



SOURCE OPERATING CONDITIONS

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak inverse voltage	4400 V	—
Peak plate current	900 mA	—
DC plate current	155 mA	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater-to-cathode capacitance	3 pF	—
Plate-to-cathode/heater capacitance	6 pF	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Westinghouse Data Book

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

1965 WESTINGHOUSE DATA BOOK

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak inverse voltage maximum	4400 V	—
DC output/plate current maximum	125 mA	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater-cathode voltage maximum	900 V	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Television damping diode	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater-to-cathode capacitance	3 pF	—
Cathode-to-plate-and-heater capacitance	8 pF	—


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterVoltageNominal	12.6 V	—
HeaterCurrentNominal	600 mA	—
Maximum Plate Dissipation	5.5 W	DamperService


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.

Section 1 · Rectifier

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current	600 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate to cathode and heater	6	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Cathode to plate and heater	8	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater to cathode	3	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Arrangement 2 (JEDEC Group 1, No.65-82), – published value 1	2	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Arrangement 2 (JEDEC Group 1, No.65-82), – published value 2	1	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Arrangement 2 (JEDEC Group 1, No.65-82), – published value 3	82	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Arrangement 1 (JEDEC Group 1, No. B6-8), – published value 1	1	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Arrangement 1 (JEDEC Group 1, No. B6-8), – published value 2	1	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
Arrangement 1 (JEDEC Group 1, No. B6-8), – published value 3	8	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
with External Barriers, Arrangement 2	2	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
with External Barriers, Arrangement 1	1	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 1~Same as – 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~Same as – published value 2	3	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 2 – 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 – published value 2	5	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 2 -Internal – 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 -Internal – published value 2	7	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Connection	8	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	600 mA	Nominal heater rating

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PEAK INVERSE PLATE VOLTAGE`	4400 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
PEAK PLATE CURRENT	900 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
DC PLATE CURRENT	155 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
PLATE DISSIPATION	5.5 mA	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	4400 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Neater positive with respect to cathode	300 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate dissipation	5.5 W	PublishedOn12VSheet

TUBE TINKER

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