

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

12BS3A

1 SECTION
CONSTRUCTION
RECTIFIER

Rectifier - Damper Diode electronic tube

Novar half-wave vacuum rectifier designed as a television horizontal-deflection damper tube, with approximately 5 kV peak-inverse capability and controlled warm-up.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9HP	BASE PINS	9
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

9HP - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	–	IC
PIN2	–	P – Plate (Anode)	CONNECTED
PIN3	–	–	IC
PIN4	–	H – Heater	CONNECTED
PIN5	–	H – Heater	CONNECTED
PIN6	–	–	IC
PIN7	–	P – Plate (Anode)	CONNECTED
PIN8	–	–	IC
PIN9	–	K – Cathode	CONNECTED

SECTION RATINGS

SECTION 1 Rectifier	
MAXIMUM PLATE DISSIPATION	6 W
PEAK INVERSE VOLTAGE	5000 V
NOMINAL OUTPUT CURRENT	200 mA
PEAK FORWARD CURRENT	1.1 A
FORWARD VOLTAGE DROP	12 V
WARM-UP TIME	11 s
<i>12-V heater variant; promoted electrical fields carried from the explicitly referenced 6BS3A parent datasheet already present in the project corpus. Additional 12-V heater data remains source-specific.</i>	

12BS3A — Half-Wave Vacuum Rectifier

The 12BS3A is a novar-type, indirectly heated half-wave vacuum rectifier designed specifically for service as a damper diode in the horizontal-deflection circuits of television receivers.

Overview

The **12BS3A** is a high-voltage half-wave vacuum rectifier designed for damper service in horizontal-deflection circuits, primarily in black-and-white and color television receivers. Utilizing a novar nine-pin construction, the tube is engineered to withstand the high peak inverse voltages and peak currents characteristic of television scanning systems.

The 12BS3A is electrically identical to the [6BS3A](#) and [17BS3A](#) (as well as the combined designations [12BS3A/12DW4A](#), [17BS3A](#), and [17BS3A/17DW4A](#)) except for its heater ratings. It is also closely related to the prototype [12BS3](#), sharing identical electrical characteristics but incorporating physical modifications to the envelope and base.

Physical Construction, Dimensions, and Basing

The 12BS3A features a **Novar T-9** glass bulb construction with a button 9-pin base (designated **E9-89**). The physical dimensions of the tube are:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.625 inches
- **Maximum Overall Height:** 3.005 inches

Compared to the older [12BS3](#), the **12BS3A** features a shorter bulb and a base design that places the exhaust tip at the bottom of the tube.

Basing Arrangement and Socket Precautions

The tube utilizes the **9HP** basing diagram. The pin connections, viewed from the bottom of the base, are arranged as follows:

- **Pin 1:** Internal Connection (Do Not Use)
- **Pin 2:** Plate
- **Pin 3:** Internal Connection (Do Not Use)
- **Pin 4:** Heater
- **Pin 5:** Heater
- **Pin 6:** Internal Connection (Do Not Use)
- **Pin 7:** Plate
- **Pin 8:** Internal Connection (Do Not Use)
- **Pin 9:** Cathode

Because damper service involves extremely high pulse voltages, specific wiring and socketing precautions must be observed:

- **Tie Points:** Socket terminals 1, 3, 6, and 8 must not be used as tie points for auxiliary circuitry.
- **Arc-Over and Leakage Prevention:** It is strongly recommended that the socket clips corresponding to pins 1, 3, 6, and 8 be physically removed from the tube socket. This modification increases the physical spacing between active elements, reducing the risk of high-voltage arc-over and minimizing electrical leakage.
- **Ventilation:** As a power-handling device that generates significant heat during normal operation, the 12BS3A requires adequate ventilation within the equipment chassis to prevent thermal damage.

Heater Characteristics

The 12BS3A incorporates an indirectly heated, coated unipotential cathode. The heater is designed for series-string or parallel operation, featuring a controlled warm-up time to ensure reliable operation in series-connected heater chains.

Parameter	Value
Heater Voltage (AC or DC)	12.6 V
Heater Current	0.600 ± 0.040 A
Average Heater Warm-up Time	11 seconds

Comparison with Related Types

While sharing the same internal structure and electrical ratings, related family members differ in their heater configurations:

- **6BS3A:** Designed for 6.3 V, 1.2 A heater operation.
- **17BS3A** (and **17BS3A/17DW4A**): Designed for 16.8 V, 0.45 A heater operation with an average warm-up time of 11 seconds.

Electrical Characteristics and Damper Service Ratings

The 12BS3A is rated under the **Design-Maximum Rating System** for operation in television receivers utilizing a standard 525-line, 30-frame scanning system.

Direct Interelectrode Capacitances

The approximate direct interelectrode capacitances of the 12BS3A, measured without an external shield, are:

- **Plate to Cathode and Heater:** 6.5 pF
- **Cathode to Plate and Heater:** 9.0 pF
- **Heater to Cathode:** 2.8 pF

Maximum Ratings for Damper Service

Depending on the specific manufacturing run and design standards, two distinct sets of Design-Maximum ratings are documented for this tube family. Designers must adhere strictly to these limits, ensuring that no single value is exceeded under the worst-case operating conditions.

Parameter	Rating Set A	Rating Set B
Peak Inverse Plate Voltage (Pulse duration $\leq$ 15% of duty cycle / 10 μ s)	5500 V	5000 V
Peak Plate Current	1200 mA	1100 mA
Average Plate Current	200 mA	200 mA
Plate Dissipation	6.5 W	6.0 W
Heater-Cathode Peak Voltage (Heater positive with respect to cathode)	+300 V	+300 V
Heater-Cathode Peak Voltage (Heater negative with respect to cathode)	-5500 V	-5000 V
Heater-Cathode Average Voltage (Heater positive with respect to cathode)	+100 V	+100 V
Heater-Cathode Average Voltage (Heater negative with respect to cathode)	-900 V	-900 V

Parameter	Rating Set A	Rating Set B
Maximum Bulb Temperature (At hottest point)	180 °C	—

Note on Pulse Duration: The peak inverse plate voltage ratings are valid only when the pulse duration does not exceed 15% of a horizontal scanning cycle, which corresponds to a maximum of 10 microseconds in a standard television receiver.

Instantaneous Tube Voltage Drop

The internal resistance of the rectifier is characterized by its instantaneous voltage drop at specific plate current levels:

- At an instantaneous plate current of **250 mA**, the tube voltage drop is typically **19 V**.
- At an instantaneous plate current of **140 mA**, the tube voltage drop is typically **12 V**.

These low voltage drop figures indicate high efficiency and low internal losses during the conduction phase of the horizontal deflection cycle.

Technical Summary

The **12BS3A** is a specialized **novar-type, half-wave vacuum rectifier** designed for high-stress damper service in television horizontal-deflection circuits. Operating with a **12.6 V, 0.6 A** heater with an average warm-up time of **11 seconds**, it provides robust performance under high-voltage pulse conditions.

The tube is capable of handling peak inverse plate voltages up to **5000 V or 5500 V** and peak plate currents up to **1100 mA or 1200 mA**, depending on the rating system applied. Its physical design features a **T-9 bulb** with a bottom exhaust tip and a **9HP** basing configuration. Safe operation requires strict adherence to socket wiring guidelines—specifically leaving pins 1, 3, 6, and 8 unconnected and removing their socket clips—to prevent high-voltage arc-over and ensure long-term reliability.

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 1 · Rectifier

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Current – published value 1	600 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current – published value 2	40 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Warm-up time (Average)	11	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 voltage	5000 V	InheritedFromReferencedParent 6BS3A

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1975 RCA RC30

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

1975 RCA RC30

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage (ac/dc) 6-3 12.6	16.8 V	Published in approved 17DW4A target datasheet entry; Section1
Heater Current 1-2 0.6	450 mA	Published in approved 17DW4A target datasheet entry; Section1
Heater Warm-up Time (Average) – 11	11 seconds	Published in approved 17DW4A target datasheet entry; Section1
Peak Inverse Plate Voltage*	5000 V	Published in approved 17DW4A target datasheet entry; Section1
Peak Plate Current	1100 mA	Published in approved 17DW4A target datasheet entry; Section1
Average Plate Current	200 mA	Published in approved 17DW4A target datasheet entry; Section1
Peak value -f300 –	-5000 V	Published in approved 17DW4A target datasheet entry; Section1
Average value +100	900 V	Published in approved 17DW4A target datasheet entry; Section1
Tube Voltage Drop for plate current of	140 mA	Published in approved 17DW4A target datasheet entry; Section1
Tube Voltage Drop for plate current of 140 mA	12 V	Published in approved 17DW4A target datasheet entry; Section1
£ Pulse duration must not exceed 15% of a horizontal scanning cycle (	10 microseconds	Published in approved 17DW4A target datasheet entry; Section1
Heater Voltage (ac/dc) 3.15 4.2	6.3 V	Published in approved 17DW4A target datasheet entry; Section1
Heater Current 0.6 0.45	300 mA	Published in approved 17DW4A target datasheet entry; Section1
Heater Warm-up Time (Average) 11	11 seconds	Published in approved 17DW4A target datasheet entry; Section1
Plate Voltage (Each Unit)	300 V	Published in approved 17DW4A target datasheet entry; Section1
Peak positive value	50 V	Published in approved 17DW4A target datasheet entry; Section1
DC negative value	50 V	Published in approved 17DW4A target datasheet entry; Section1
DC positive value	3 V	Published in approved 17DW4A target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No.2 (Screen-Grid) Voltage	150 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.1 (Control-Grid) Voltage, Negative bias value	50 V	Published in approved 17DW4A target datasheet entry; Section1
Cathode Current	12 mA	Published in approved 17DW4A target datasheet entry; Section1
Plate Dissipation (Each Unit)	1.1 W	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Input	0.75 W	Published in approved 17DW4A target datasheet entry; Section1
Plate Voltage (Each Unit) 100	100 V	Published in approved 17DW4A target datasheet entry; Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate to Cathode and Heater	6.5 pF	Published in approved 17DW4A target datasheet entry; Section1
Heater to Cathode z	8 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No. 3 to Plate (Each Unit)	1.9 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No.1 to All Other Electrodes	6 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No.3 to All Other Electrodes (Each Unit)	3.6 pF	Published in approved 17DW4A target datasheet entry; Section1
Plate to All Other Electrodes (Each Unit)	3 pF	Published in approved 17DW4A target datasheet entry; Section1

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No-3 Voltage (Each Unit) -10	0 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Voltage 67.6	67.5 V	Published in approved 17DW4A target datasheet entry; Section1
Plate Current (Each Unit)	2.2 mA	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Current 6.5	3.3 mA	Published in approved 17DW4A target datasheet entry; Section1
Cathode Current 6.6	7.8 mA	Published in approved 17DW4A target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage 100	100 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.3 Voltage 0	0 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Voltage 67.5	67.5 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.3 Transconductance	180 μS	Published in approved 17DW4A target datasheet entry; Section1

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