



ELECTRONIC TUBE REFERENCE

19AU4

Rectifier - Damper Diode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

RECTIFIER

Indirectly heated high-voltage diode designed for television horizontal-frequency damper service and the large repetitive line-scan pulses encountered in direct-drive circuits.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	6
NOMINAL HEATER	18.9 V / 600 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
MAXIMUM PLATE DISSIPATION	6 W
PEAK INVERSE VOLTAGE	4500 V
NOMINAL OUTPUT CURRENT	175 mA
PEAK FORWARD CURRENT	1.05 A
FORWARD VOLTAGE DROP	25 V
MAXIMUM HEATER-CATHODE VOLTAGE	4500 V
WARM-UP TIME	11 s
<i>Source-derived section; promoted fields populated where applicable.</i>	

19AU4 — Half-Wave Vacuum Rectifier and Damper Diode

The **19AU4** is a single, indirectly heated half-wave vacuum rectifier designed specifically for television horizontal frequency damper service. It is engineered to withstand high-voltage pulses of line frequency between its cathode and both its heater and plate elements, making it highly suitable for "direct drive" circuits. The tube is commonly utilized as a damper diode in the horizontal-deflection circuits of black-and-white television receivers operating with series-heater strings.

A closely related variant, the **19AU4GTA**, shares identical electrical and physical characteristics with the standard 19AU4, except for its higher maximum DC output and peak plate current ratings.

Mechanical Specifications and Pinout

The 19AU4 is constructed with a T-9 glass bulb envelope and can be mounted in any position. It features a short intermediate-shell octal base with either 5 or 6 pins, incorporating external barriers (JETEC designations B5-85 or B6-60).

Physical Dimensions

- **Maximum Overall Length:** 3-3/8 to 3-13/16 inches
- **Maximum Seated Length:** 3-1/4 inches
- **Maximum Diameter:** 1-9/32 inches

Pin Connections

The tube utilizes the **4CG** bottom-view pinout configuration. The electrical connections are assigned as follows:

Pin Number	Element
Pin 1	No Connection (Omitted on 5-pin base)
Pin 2	No Connection
Pin 3	Cathode (K)
Pin 4	No Connection
Pin 5	Plate (P)
Pin 6	No Connection
Pin 7	Heater (H)
Pin 8	Heater (H)

To prevent high-voltage arc-over and minimize electrical leakage, socket terminals #1, #2, #4, and #6 must not be used as tie points. It is recommended that socket clips for these unused pins be completely removed from the tube socket.

Heater Ratings and Controlled Warm-Up

The 19AU4 features a coated unipotential cathode heated by a filament designed for series-string applications.

- **Heater Voltage (AC or DC):** 18.9 V
- **Heater Current:** 0.6 A (600 mA)

Controlled Warm-Up Time

The heater is designed with a controlled warm-up time of approximately 11.0 seconds to ensure reliable operation in series-heater strings. This warm-up characteristic is defined by a specific test circuit where a supply voltage of four times the rated heater voltage is applied in series with a resistance equal to three times the nominal heater operating resistance. The warm-up time is the duration required for the voltage across the heater to reach 80% of its rated value (15.1 V).

- **Calculated Nominal Heater Resistance:** $R_{\text{heater}} = \frac{V_{\text{heater}}}{I_{\text{heater}}} = \frac{18.9 \text{ V}}{0.6 \text{ A}} = 31.5 \Omega$
- **Calculated Test Circuit Supply Voltage:** $V_{\text{supply}} = 4 \times 18.9 \text{ V} = 75.6 \text{ V}$
- **Calculated Test Circuit Series Resistance:** $R_{\text{series}} = 3 \times 31.5 \Omega = 94.5 \Omega$

When operating the tube in series-heater strings, the use of a series resistor—preferably one with a negative temperature coefficient—is recommended to minimize initial voltage surges during startup.

Electrical Ratings and Damper Service Limits

The ratings of the 19AU4 and [19AU4GTA](#) are defined under the Design-Center System, except where noted as Absolute Maximum values. These limits are specified for operation in a standard 525-line, 30-frame television system (FCC standards), where the duty cycle of the horizontal voltage pulse does not exceed 15% of the scanning cycle (or a maximum duration of 10 Is).

Operating Limits

Parameter	19AU4	19AU4GTA	Rating Type
Peak Inverse Plate Voltage	4500 V	4500 V	Absolute Maximum
Maximum DC Plate Current	175 mA	190 mA	Design-Center
Maximum Steady State Peak Plate Current	1050 mA	1150 mA	Design-Center

Parameter	19AU4	<u>19AU4GTA</u>	Rating Type
Maximum Plate Dissipation	6.0 W	6.0 W	Design-Center

Heater-Cathode Voltage Ratings

Because the damper diode cathode is subjected to high-voltage pulses during horizontal retrace, the heater-cathode insulation is heavily reinforced:

- **Heater Negative with Respect to Cathode:**
 - **DC Component:** 900 V maximum
 - **Total DC and Peak:** 4500 V (Absolute Maximum)
- **Heater Positive with Respect to Cathode:**
 - **DC Component:** 100 V maximum
 - **Total DC and Peak:** 300 V (Design-Center)

Equipment designs must ensure that these Design-Center ratings are not exceeded under normal line-voltage variations (typically 117 V line-center $\pm 10\%$). Absolute Maximum ratings must never be exceeded under any conditions of supply-voltage, load, or manufacturing variations.

Typical Characteristics and Plate Curves

Under typical operating conditions, the 19AU4 exhibits a low internal voltage drop, which maximizes efficiency in horizontal deflection circuits.

- **Average Tube Voltage Drop:** 25 V (measured with the tube conducting a forward current of 350 mA).

Direct Interelectrode Capacitances

Measured without an external shield, the approximate capacitances are:

- **Heater to Cathode (H to K):** 4.0 pF
- **Plate to Cathode and Heater (P to $[H + K]$):** 8.5 pF
- **Cathode to Plate and Heater (K to $[P + H]$):** 11.5 pF

Plate Characteristics

The average plate characteristics at a heater voltage of 18.9 V follow a typical diode space-charge curve. The conduction begins smoothly at 0 V:

- At **10 V** plate voltage, the plate current is approximately 75 mA.
- At **20 V** plate voltage, the plate current rises to a range of 200 to 250 mA.
- At **30 V** plate voltage, the plate current is approximately 450 mA.
- At **40 V** plate voltage, the plate current reaches approximately 600 to 700 mA.

- At **50 V** plate voltage, the plate current reaches approximately 1000 mA (represented as a dashed curve above 250 mA in some characterizations).
- At approximately **60 V** plate voltage, the plate current reaches its maximum rated peak value of 1050 mA.

Technical Summary

The **19AU4** and its high-current counterpart, the **19AU4GTA**, are specialized half-wave vacuum rectifiers housed in T-9 glass envelopes with octal bases. Designed specifically for television damper service, they feature an 18.9 V, 0.6 A heater with a controlled 11-second warm-up time optimized for series-string operation. The tube is characterized by its ability to withstand peak inverse voltages up to 4500 V and peak heater-cathode voltages up to 4500 V (heater negative). With a low typical voltage drop of 25 V at 350 mA, the 19AU4 provides efficient damping performance in television horizontal-deflection circuits.

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 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
plate voltage of	4500 V	plate voltage of 4500 volts (absolute), the 19AU4 Maximum Ratings, Design-Center Values Except as Noted:
175 milliamperes, Designed with insulation (ABSOLUTE MAXIMUM)®, . L .	4500 V	175 milliamperes, Designed with insulation (ABSOLUTE MAXIMUM)®, . L 4500® max. volts
PEAK PLATE CURRENT o o & o ¢ o o & &	1050 mA	PEAK PLATE CURRENT o o & o ¢ o o & & 1050 max. ma
DC PLATE CURRENT & & ¢ o o o o« & + &	175 mA	DC PLATE CURRENT & & ¢ o o o o« & + & 175 max. ma
peak pulses between heater and cathode of as PLATE DISSIPATION: & « « o o o o o«	6 W	peak pulses between heater and cathode of as PLATE DISSIPATION: & « « o o o o o« 6 max. watts
much as	4500 V	much as 4500 volts (absolute) with a dc component PEAK HEATER-CATHOOE VOLTAGE:
up to	19 V	up to 900 volts, the 19AU4 provides flexibility Heater negative with respect to o
in choice of deflection circuits. cathode (Absolute Maximum)	4500 V	in choice of deflection circuits. cathode (Absolute Maximum) . . . 4500% max. volts
This type is designed with a	300 V	This type is designed with a 600-mil!liampere cathode . . . 300+ max. volts
GENERAL DATA volta?e pulse does not exceed	15	GENERAL DATA volta?e pulse does not exceed 15 per cent of one hori-
zontal scanning cycle, In a	30	zontal scanning cycle, In a 525-line, 30-frame system,
Electrical	10	Electrical: 15 per cent of one horizontal scanning cycle is 10

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
voltage {(AC or DC} + . v & & « o	18.9 V	voltage {(AC or DC} + . v & & « o 4 & 18.9 volts Under no circumstances should this absolute value be
Currents o o o + o & o o o o	600 mA	Currents o o o + o & o o o o 2 o & =« 0.6 amp
warm=Up Time {Average)	900 V	warm=Up Time {Average) 11 seconds The dc component must not exceed 900 volts.
Heater warm-up time is defined as the time required The dc component must not exceed	100 V	Heater warm—up time is defined as the time required The dc component must not exceed 100 volts.
to	15.1 V	to 15.1 volts.
Plate to heater and cathode	8.5 pF	Plate to heater and cathode. 8.5 uuf
Heater to cathode. . . « . + « + + &	4 pF	Heater to cathode. . . « . + « + + & 4.0 uuf
E ϕ = RATED HEATER VOLTAGE OF TUBE UNDER TEST. within £ [	0	E ϕ = RATED HEATER VOLTAGE OF TUBE UNDER TEST. within £ [0 per cent of line—center voltage value
I g = RATED HEATER CURRENT OF TUBE UNDER TEST. of	17 V	I g = RATED HEATER CURRENT OF TUBE UNDER TEST. of 17 volts.
Fig	1	Fig.1 - Test Circuit for Determining data for peak inverse plate voltage and peak
E f =	189 V	E f =189 VOLTS
92CM-9125T	9125	92CM-9125T



TUBE TINKER
ELECTRON TUBE DATABASE

SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Rectifier

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



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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warmup Time	11 s	—
Steady State Peak Plate Current	1050 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average Tube Voltage Drop	25 V	TubeConducting350mA



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater-to-cathode capacitance	4 pF	WholeTube
Plate-to-cathode-and-heater capacitance	8.5 pF	WholeTube
Cathode-to-plate-and-heater capacitance	11.5 pF	WholeTube
Average tube voltage drop at 350 mA	25 V	WholeTube

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater warm-up time	11 s	WholeTube

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum peak inverse plate voltage	4500 V	WholeTube
Maximum DC plate current	150 mA	WholeTube
Maximum steady-state peak plate current	1050 mA	WholeTube
Maximum plate dissipation	6.5 W	WholeTube
Maximum heater-cathode voltage total negative DC and peak	4500 V	WholeTube