

ELECTRONIC TUBE REFERENCE

12AV5GA

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

Beam-power tube designed for television horizontal-deflection output, combining substantial current capability, 11 W plate dissipation, and high pulse-voltage ratings for driving CRT line-output transformers.

GENERAL CHARACTERISTICS

BASE DESIGNATION	6CK	BASE PINS	6
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

6CK - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – Pin 1	A	G1 – Control Grid	CONNECTED • verified
PIN2 – Pin 2	–	H – Heater	CONNECTED • verified
PIN3 – Pin 3	A	BP – Beam-Forming Plate	CONNECTED • verified
PIN3 – Pin 3	A	K – Cathode	CONNECTED • verified
PIN5 – Pin 5	A	P – Plate (Anode)	CONNECTED • verified
PIN7 – Pin 7	–	H – Heater	CONNECTED • verified
PIN8 – Pin 8	A	G2 – Screen Grid	CONNECTED • verified

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	14500 Ω
TRANSCONDUCTANCE	0.0059 S
AMPLIFICATION FACTOR	4.8
MAXIMUM PLATE VOLTAGE	550 V
MAXIMUM SCREEN VOLTAGE	175 V
MAXIMUM PLATE DISSIPATION	11 W
MAXIMUM SCREEN DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	110 mA
Published source values promoted where applicable; additional published data retained as parameters.	

12AV5GA — Beam Power Pentode

A glass octal beam power pentode designed for horizontal-deflection amplifier service in television receivers, featuring controlled heater warm-up characteristics for series-string operation.

Overview

The **12AV5GA** is a beam power pentode (also classified as a beam power tube) primarily designed for horizontal-deflection amplifier service in television receivers. It is specifically tailored for use in television sets employing 600 mA series-connected heater strings. To prevent voltage surges across other heaters in the series string during start-up, the thermal characteristics of the 12AV5GA heater are controlled to ensure a coordinated warm-up cycle.

The tube is identical in its electrical ratings, physical dimensions, and operating characteristics to the [6AV5GA](#), [17AV5GA](#), and [25AV5GA](#), differing only in its heater voltage, current, and warm-up specifications.

Construction, Physical Dimensions, and Base

The 12AV5GA is constructed with a glass envelope using either a **T-11** or **T-12** bulb configuration. It features a coated unipotential cathode and is designed to be mounted in any physical position.

Physical Dimensions

- **Maximum Overall Height:** 4.250 inches
- **Maximum Seated Height:** 3.688 inches (3-11/16 inches)
- **Maximum Diameter:** 1.563 inches (1-9/16 inches for the T-12 bulb)

Base and Pinout

The tube utilizes a **short medium shell 6-pin octal base** with a **6CK** basing arrangement. The pin connections, viewed from the bottom of the base, are as follows:

Pin	Electrode Connection
1	Grid No. 1 (Control Grid)
2	Heater
3	Cathode, Grid No. 3 (Beam Plates)
7	Heater
8	Grid No. 2 (Screen Grid)
Cap	Plate (Anode)

Heater Specifications and Warm-up Control

The heater of the 12AV5GA is designed for AC or DC operation. Its thermal characteristics are controlled to minimize voltage surges during the warm-up cycle when operated in series with other similarly controlled tubes.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.6 A (600 mA)
Average Heater Warm-up Time	11.0 seconds
Calculated Heater Power	7.56 W

Note on Heater Power Calculation: The calculated heater power of **7.56 W** is derived from the product of the nominal heater voltage (12.6 V) and the nominal heater current (0.6 A).

Heater Warm-up Definition

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value (10.08 V) when four times the rated heater voltage (50.4 V) is applied to a test circuit. This test circuit consists of the tube heater connected in series with an external resistance equal to three times the nominal heater operating resistance.

Heater-Cathode Voltage Ratings

The insulation between the heater and cathode is rated to withstand significant potential differences, categorized by polarity:

- **Heater Negative with Respect to Cathode:**
 - Maximum Total DC and Peak Voltage: 200 V
- **Heater Positive with Respect to Cathode:**
 - Maximum DC Voltage: 100 V
 - Maximum Total DC and Peak Voltage: 200 V

Direct Interelectrode Capacitances

The approximate direct interelectrode capacitances of the 12AV5GA, measured without an external shield, are:

- **Grid No. 1 to Plate:** 0.5 pF
- **Input (Grid No. 1 to Cathode, Heater, Grid No. 2, and Grid No. 3):** 14 pF
- **Output (Plate to Cathode, Heater, Grid No. 2, and Grid No. 3):** 7.0 pF

Electrical Characteristics and Typical Operating Points

The 12AV5GA can be operated as a Class A1 amplifier in either a pentode or triode configuration. The typical operating conditions and characteristics are outlined below:

Class A1 Pentode Connection

Under typical pentode operating conditions, the screen grid (Grid No. 2) is maintained at a constant potential separate from the plate:

- **Plate Voltage:** 250 V (60 V for short-interval knee measurement)
- **Grid No. 2 Voltage:** 150 V
- **Grid No. 1 Voltage:** -22.5 V (0 V for short-interval knee measurement)
- **Plate Resistance (Approximate):** 14,500 Ω
- **Transconductance:** 5,900 μ mhos
- **Plate Current:** 57 mA (260 mA during short-interval knee measurement)
- **Grid No. 2 Current:** 2.1 mA (26 mA during short-interval knee measurement)
- **Grid No. 1 Voltage for $I_b = 1.0$ mA (Approximate):** -43 V

Note on Short-Interval Measurements: The operating point at 60 V plate voltage and 0 V grid bias represents the instantaneous plate knee values. These values must only be applied for a very short interval to prevent thermal damage to the tube.

Class A1 Triode Connection

When operated with the screen grid (Grid No. 2) tied directly to the plate, the tube exhibits the following triode characteristics:

- **Plate Voltage:** 150 V
- **Grid No. 2 Voltage:** 150 V (tied to plate)

- **Grid No. 1 Voltage:** -22.5 V
- **Amplification Factor (μ):** 4.3

Horizontal-Deflection Amplifier Service and Ratings

In television receivers, the 12AV5GA operates under demanding pulsed conditions. The ratings for this service are interpreted according to the **Design-Center Rating System** (or Design-Maximum Values depending on the specific standard applied) for operation in a 525-line, 30-frame television system.

Maximum Ratings

- **DC Plate Voltage:** 550 V
- **Peak Positive-Pulse Plate Voltage (Absolute Maximum):** 5,500 V
- **Peak Negative-Pulse Plate Voltage:** 1,250 V
- **DC Grid No. 2 Voltage:** 175 V
- **Peak Negative-Pulse Grid No. 1 Voltage:** 300 V
- **Peak Cathode Current:** 400 mA
- **Average Cathode Current:** 110 mA
- **Grid No. 2 Input:** 2.5 W
- **Plate Dissipation:** 11 W
- **Maximum Bulb Temperature (at hottest point):** 210 °C

Operating Constraints and Circuit Values

- **Pulse Duration:** The peak positive-pulse plate voltage rating of 5,500 V is an absolute maximum value that must never be exceeded. The duration of this pulse must not exceed 15% of a horizontal scanning cycle, which corresponds to approximately 10 microseconds in a standard television system.
- **Grid No. 1 Circuit Resistance:**
 - Maximum Grid No. 1 Circuit Resistance: 0.47 M
- **Tube Protection:** In stages operating with grid-leak bias, an adequate cathode-bias resistor or other suitable protective means must be employed to safeguard the tube against excessive current in the event that excitation is lost.

Characteristic Curves and Interpretation

The published characteristic curves for the 12AV5GA illustrate its behavior under various voltage and current conditions:

- **Plate Characteristics (Pentode Connection):** At a fixed screen-grid voltage ($E_{c2} = 150\text{ V}$), the plate current (I_b) curves show a very sharp knee at low plate voltages. For $E_{[c1]}(/tubes/C1) = 0\text{ V}$, the plate current rises rapidly to 260 mA at $E_b = 60\text{ V}$ and remains relatively flat as plate voltage increases up to 400 V. As the control grid bias ($E_{[c1]}(/tubes/C1)$) becomes more negative (from -5 V down to -30 V), the plate current decreases, demonstrating effective control grid action.

- **Screen-Grid Voltage Scaling:** Curves of plate current versus plate voltage at $E_{c1}(/tubes/C1) = 0$ V for various screen-grid voltages (E_{c2} from 75 V to 200 V) show that the height of the plate knee is highly dependent on the screen-grid potential. Higher screen voltages significantly increase the peak current capability of the tube.
- **Transfer Characteristics:** Transfer curves plotting plate current and screen-grid current against Grid No. 1 voltage at a plate voltage of 250 V show that the tube approaches cutoff (plate current below 1.0 mA) at approximately -43 V when $E_{c2} = 150$ V, and near -60 V when $E_{c2} = 200$ V.

Similar and Related Designations

The 12AV5GA belongs to a family of identical beam power pentodes designed for different heater supply configurations. These related types are identical in construction, physical dimensions, basing, and electrical ratings, except for their heater characteristics:

- **6AV5GA:** Designed for standard parallel heater circuits, requiring a heater supply of **6.3 V** at **1.2 A**.
- **17AV5GA:** Designed for series-string television receivers, requiring a heater supply of **16.8 V** at **0.45 A** (450 mA), with a controlled warm-up time of 11 seconds.
- **25AV5GA:** Designed for series-string television receivers, requiring a heater supply of **25 V** at **0.3 A** (300 mA).

While these tubes share identical internal structures and electrical ratings, they cannot be directly substituted for one another without modifying the heater supply circuit to match the specific voltage and current requirements of the replacement tube.

Technical Summary

The **12AV5GA** is a rugged, glass octal beam power pentode optimized for horizontal-deflection amplifier service in television receivers. It features a **12.6 V, 0.6 A** heater with a controlled **11-second warm-up time** designed for 600 mA series-string operation. Housed in a T-11 or T-12 bulb with a 6-pin octal base (6CK basing), the tube is capable of handling peak positive plate pulses up to **5,500 V** and peak cathode currents up to **400 mA**. Under typical Class A1 pentode conditions, it exhibits a transconductance of **5,900 %mhos** and a plate resistance of **14,500**, making it a highly capable power amplifier within its specified ratings.



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 · Beam Power

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak positive plate voltage	5500 V	HorizontalDeflection



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 · Beam Power

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warmup Time	11 s	—
Peak Cathode Current	400 mA	—



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 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak positive pulse plate voltage	5500 V	HorizontalDeflection
Peak negative pulse plate voltage	-1250 V	HorizontalDeflection
Maximum grid #2 voltage	175 V	HorizontalDeflection
Maximum plate dissipation	11 W	HorizontalDeflection
Maximum grid #2 dissipation	2.5 W	HorizontalDeflection
Maximum DC cathode current	110 mA	HorizontalDeflection
Maximum peak cathode current	400 mA	HorizontalDeflection
Plate voltage	250 V	AverageCharacteristics
Plate current	57 mA	AverageCharacteristics
Grid #2 current	2.1 mA	AverageCharacteristics

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	14500 ohm	AverageCharacteristics
Transconductance	5900 uS	AverageCharacteristics
Triode amplification factor	4.3	TriodeConnection

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #1-to-plate capacitance	0.7 pF	—
Input capacitance	16 pF	—
Output capacitance	8 pF	—



SOURCE DATA APPENDIX

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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warm-up Time (Average) –	11 s	Other
Peak value max	200 V	Other;PublishedValue1
Peak value max	200 V	Other;PublishedValue2
Average value	100 V	Other;PublishedValue1
Average value	100 V	Other;PublishedValue2
Average value	100 V	Other;PublishedValue3
DC Plate Voltage	550 V	MaximumRating
Peak Positive-Pulse Plate Voltage* (Absolute Maximum)	5500 V	MaximumRating
Peak Negative-Pulse Plate Voltage	1250 V	MaximumRating
DC Grid-No	2 V	MaximumRating;PublishedValue1
DC Grid-No	175 V	MaximumRating;PublishedValue2
Peak Negative-Pulse Grid-No.1 Voltage	300 V	MaximumRating
Peak Cathode Current	400 mA	MaximumRating
Average Cathode Current	110 mA	MaximumRating
Grid-No	2 W	MaximumRating;PublishedValue1
Grid-No	2.5 W	MaximumRating;PublishedValue2
Plate Dissipation ^{tt}	11 W	MaximumRating
Grid-No. I-Circuit Resistance	0.47 megohm	MaximumCircuitValue
Maximum Plate Voltage	550 V	Section1;Promoted
Maximum Screen Voltage	150 V	Section1;Promoted
Maximum Plate Dissipation	11 W	Section1;Promoted
Maximum Screen Dissipation	2.5 W	Section1;Promoted
Maximum Cathode Current	110 mA	Section1;Promoted

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Plate	0 pF	Capacitance;PublishedValue1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Plate	5 pF	Capacitance;PublishedValue2
Grid No.1 to Cathode, Heater, Grid No	2 pF	Capacitance;PublishedValue1
Grid No.1 to Cathode, Heater, Grid No	14 pF	Capacitance;PublishedValue2
Plate to Cathode, Heater, Grid No	2 pF	Capacitance;PublishedValue1
Plate to Cathode, Heater, Grid No	7 pF	Capacitance;PublishedValue2

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	60 V	Characteristic;PublishedValue1
Plate Voltage	250 V	Characteristic;PublishedValue2
Plate Voltage	150 V	Characteristic;PublishedValue3
Grid-No	2 V	Characteristic;PublishedValue1
Grid-No	1 V	Characteristic;PublishedValue2
Grid-No	180 V	Characteristic;PublishedValue3
Grid-No	150 V	Characteristic;PublishedValue4
Grid-No	1 V	Characteristic;PublishedValue1
Grid-No	0 V	Characteristic;PublishedValue2
Grid-No	-22.5 V	Characteristic;PublishedValue3
Grid-No	-22.5 V	Characteristic;PublishedValue4
Plate Resistance –	14500 ohm	Characteristic
Plate Current IM	57 mA	Characteristic
Grid-No.1 Voltage (Approx.) for plate current of	26 mA	Characteristic;PublishedValue1
Grid-No.1 Voltage (Approx.) for plate current of	2.1 mA	Characteristic;PublishedValue2
Published value	1 mA	Characteristic;PublishedValue1
Published value	-43 mA	Characteristic;PublishedValue2
Plate Resistance	14500 ohm	Section1;Promoted
Transconductance	5900 uS	Section1;Promoted

An independent reference for electronic tubes, vacuum tubes,
and their source documents.

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