



ELECTRONIC TUBE REFERENCE

12A6

Power - Beam Single (NOT sweep) (under 10W) electronic tube

CONSOLIDATED TECHNICAL
DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

Beam-power output tube designed for audio-frequency power amplification in receiving equipment, providing Class-A output service from a 12.6 V heater supply.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Beam Power	
PLATE RESISTANCE	70000 Ω
TRANSCONDUCTANCE	0.003 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	7.5 W
MAXIMUM SCREEN DISSIPATION	1.5 W
<i>Published promoted values applied where semantically applicable; additional table values retained in section parameters.</i>	

12A6 — Beam Power Amplifier

An indirectly heated metal beam power tetrode designed for high-efficiency audio power output in automotive and AC/DC receivers.

Overview

The **12A6** is a metal-envelope beam power tube designed primarily for use in the output stage of car radios and AC/DC receivers where the supply voltage exceeds 110 volts. It features an indirectly heated, coated unipotential cathode and is configured as a beam power tetrode to provide high power sensitivity and efficiency at moderate plate and screen voltages. The tube is housed in a standard metal shell with an octal base, allowing for robust mechanical and thermal performance.

Physical Construction and Pin Connections

The 12A6 is constructed with a metal shell envelope designated as **MT-8** and utilizes a small wafer octal 7-pin base. The physical dimensions of the device are compact, conforming to the following maximum specifications:

- **Maximum overall length:** 3-1/4 inches
- **Maximum seated height:** 2-11/16 inches
- **Maximum diameter:** 1-5/16 inches

The tube is designed to operate reliably when mounted in **any position**. The electrical connections are routed through an octal base layout (7AC bottom view), with the following pin assignments:

Pin Number	Electrode Connection
Pin 1	Metal Shell (or No Connection)
Pin 2	Heater
Pin 3	Plate (Anode)
Pin 4	Screen Grid (Grid No. 2)
Pin 5	Control Grid (Grid No. 1)
Pin 6	No Pin (NP)
Pin 7	Heater
Pin 8	Cathode and Beam Plates

Heater Ratings and Interelectrode Capacitances

The 12A6 heater is designed for operation from either an alternating or direct current supply. The nominal heater characteristics are:

- **Heater Voltage:** 12.6 V (AC or DC)
- **Heater Current:** 0.15 A
- **Calculated Heater Power:** 1.89 W

When operated with the metal shell connected to the cathode, the direct interelectrode capacitances of the tube are:

- **Input Capacitance** (Control Grid to all other electrodes except Plate): 9.0 pF
- **Output Capacitance** (Plate to all other electrodes except Control Grid): 9.0 pF
- **Grid-to-Plate Capacitance** (Control Grid to Plate): 0.3 pF

Maximum Electrical Ratings

The maximum ratings for the 12A6 are defined under the design-center system. These limits represent the absolute boundaries within which the tube must be operated to ensure longevity and reliable performance:

- **Maximum Plate Voltage:** 250 V
- **Maximum Screen (Grid No. 2) Voltage:** 250 V
- **Maximum Plate Dissipation:** 7.5 W
- **Maximum Screen Dissipation:** 1.5 W

Typical Operating Conditions and Characteristics

The 12A6 is typically operated as a Class A1 (or Class A) audio single-tube amplifier. The tube can be configured at different operating points depending on the available supply voltage. The table below details the typical operating parameters at 180 V and 250 V:

Parameter	180 V Operating Point	250 V Operating Point
Plate Voltage	180 V	250 V
Screen Voltage	180 V	250 V
Control Grid (Grid No. 1) Voltage	-8.5 V	-12.5 V
Peak A-F Grid Voltage	—	12.5 V
Cathode Bias Resistor	350 Ω	350 Ω
Zero-Signal Plate Current	21 mA	30 mA
Maximum-Signal Plate Current	—	32 mA
Zero-Signal Screen Current	2.6 mA	3.5 mA
Maximum-Signal Screen Current	—	5.5 mA
Plate Resistance (approximate)	92,000 Ω	70,000 Ω

Parameter	180 V Operating Point	250 V Operating Point
Transconductance (Mutual Conductance)	2,700 μmhos (2.7 mA/V)	3,000 μmhos (3.0 mA/V)
Optimum Load Resistance	8,000 Ω	7,500 Ω
Power Output	1.6 W	2.8 to 3.4 W
Total Harmonic Distortion	7%	7%

Performance Curves and Circuit Design

Characteristic Curves

The electrical behavior of the 12A6 is illustrated by several sets of characteristic curves:

- **Pentode Connection:** The average plate characteristics show plate current and screen current plotted against plate voltage for control grid voltages ranging from +10 V down to -25 V, with the screen voltage fixed at 250 V.
- **Triode Connection:** For triode-connected operation (where the screen grid is tied directly to the plate), the average plate characteristics map plate current and grid current against plate voltage for grid voltages from +20 V to -50 V.
- **Operation Characteristics:** Under typical operating conditions (12.6 V heater, 250 V plate and screen, -12.5 V control grid bias, and an 8.8 V RMS input signal), the relationship between load resistance, power output, and total harmonic distortion is highly non-linear. As the load resistance increases from 2,000 Ω to 10,000 Ω , the power output rises and plateaus near 3.5 W. However, the total harmonic distortion reaches a distinct minimum of approximately 7% at a load resistance of 7,000 to 7,500 Ω , confirming this range as the optimum load for high-fidelity audio reproduction.

Circuit Design Constraints

To prevent thermal runaway and maintain stable operation, the direct-current resistance in the control grid circuit must be strictly limited:

- **Maximum Grid-Circuit Resistance (Fixed Bias):** 0.1 M
- **Maximum Grid-Circuit Resistance (Cathode Bias):** 0.5 M

Furthermore, in applications where the cathode is not directly connected to the heater, the potential difference between the heater and cathode must be kept as low as possible to minimize the risk of insulation breakdown and hum injection.

Technical Summary

The **12A6** is an octal-based, metal-envelope beam power tetrode featuring a 12.6 V, 0.15 A heater and a maximum plate dissipation rating of 7.5 W. Optimized for Class A1 audio output stages in automotive and AC/DC receivers, it typically delivers between 1.6 W and 3.4 W of power output into an optimum load of

7,500 to 8,000 Ω with approximately 7% total harmonic distortion. Its compact physical footprint, flexible mounting options, and well-defined operating characteristics make it a highly efficient choice for moderate-power audio amplification.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1948 Brimar Radio Valve Manual

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

1948 BRIMAR RADIO VALVE MANUAL

Section 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode Voltage	180 V	ClassA
Anode Current	21 mA	ClassA
Screen Voltage	180 V	ClassA
Screen Current	2.6 mA	ClassA
Control Grid Voltage	-8.5 V	ClassA
Cathode Bias Resistor	350 ohm	ClassA
Optimum Load	8000 ohm	ClassA
Power Output	1.6 W	ClassA
Anode Voltage	250 V	ClassA
Anode Current	30 mA	ClassA
Screen Voltage	250 V	ClassA
Screen Current	3.5 mA	ClassA
Control Grid Voltage	-12.5 V	ClassA
Optimum Load	7500 ohm	ClassA
Power Output	2.8 W	ClassA

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1958 Brimar Radio Valve No 7

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

1958 BRIMAR RADIO VALVE NO 7

Section 1 · Beam Power

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	12.6 V	—
Heater Current	150 mA	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Power Output	3.4 W	ClassA;PlateVoltage=250V



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1960 RCA Industrial and Communications Types

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

1960 RCA INDUSTRIAL AND COMMUNICATIONS TYPES

Section 1 · Beam Power

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentVoltage	12.6 V	—
HeaterOrFilamentCurrent	150 mA	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Power Output	3.4 W	ClassA



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 3 of 7

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

1971 RCA HB3 BINDER 3 OF 7

Section 1 · Beam Power

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater#	1	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Voltage	12.6 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Current	0.15	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Direct Interelectrode Capacitances I APD rOX.): o	0	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid to Plate	0.3	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 1 - Shell – published value 1	1	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 1 - Shell – published value 2	5	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Heater – published value 1	2	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Heater – published value 2	7	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 3 -Plate – published value 1	3	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 3 -Plate – published value 2	8	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid	-12.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Peak A-F Grid Voltage	12.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Resistance	70000 ohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Transconductance	3000	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Load Resistance	7500 ohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
_ E { =12.6 VOLTS PLATE VOLTS =250 – published value 1	12.6 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
_ E { =12.6 VOLTS PLATE VOLTS =250 – published value 2	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
_ E { =12.6 VOLTS PLATE VOLTS =250 – published value 3	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Voltage	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Dissipation	7.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Dissipation	1.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Max.-Signal Plate Current	32 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Max.-Signal Screen Current	5.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Max.-Signal Power Output	3.4 W	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

TUBE TINKER

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