

ELECTRONIC TUBE REFERENCE

12CT8

Voltage - Triode Pentode electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

PENTODE-TRIODE

Triode-pentode for television video-amplifier and synchronization service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9DA	BASE PINS	9
NOMINAL HEATER	12.6 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

9DA - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – 2P	B	P – Plate (Anode)	CONNECTED
PIN2 – 2G1	B	G1 – Control Grid	CONNECTED
PIN3 – 2K	B	K – Cathode	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – H	–	H – Heater	CONNECTED
PIN6 – 1P	A	P – Plate (Anode)	CONNECTED
PIN7 – 1G2	A	G2 – Screen Grid	CONNECTED
PIN8 – 1G1	A	G1 – Control Grid	CONNECTED
PIN9 – 1G3	A	G3 – Suppressor Grid	CONNECTED
PIN9 – IS	A	IS – Internal Screen	CONNECTED
PIN9 – K	A	K – Cathode	CONNECTED

SECTION RATINGS

SECTION0 Pentode	
PLATE RESISTANCE	150000 Ω
TRANSCONDUCTANCE	0.007 S
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.75 W
MAXIMUM SCREEN DISSIPATION	0.9 W

SECTION1 Triode	
PLATE RESISTANCE	8200 Ω
TRANSCONDUCTANCE	0.0049 S
AMPLIFICATION FACTOR	40
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W

12CT8 — Miniature Triode-Pentode Vacuum Tube

The **12CT8** is a miniature multi-unit vacuum tube containing an independent triode and a sharp-cutoff pentode within a single envelope. Designed primarily for use in compact television receivers employing 300-milliampere series-string heater circuits, the tube is engineered to deliver high performance at the low DC supply voltages typical of these designs. The pentode section is optimized for service as a video amplifier, while the triode section is intended for applications such as a synchronization (sync) amplifier, separator, clipper, or vertical sweep oscillator.

The 12CT8 is closely related to the **6AUS8**, sharing similar general operating principles but differing in its heater ratings, physical envelope length, basing arrangement, and maximum electrical ratings.

Heater Specifications and Basing Configuration

The 12CT8 features a controlled heater warm-up characteristic, which is essential for maintaining voltage balance and preventing heater damage in series-connected heater strings. The heater is designed for operation from either an AC or DC supply.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.3 $\pm$ 6% A

Heater Parameter	Value
Calculated Heater Power	3.78 W
Controlled Warm-up Time	11 s

Calculated from the nominal heater voltage of 12.6 V and current of 0.3 A, the heater power is $12.6 \text{ V} \times 0.3 \text{ A} = 3.78 \text{ W}$.

The controlled warm-up time is defined as 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. This test circuit consists of the tube heater connected in series with a resistance equal to three times the nominal heater voltage divided by the nominal heater current.

Mechanical Dimensions and Basing

The tube is housed in a T-6 1/2 glass envelope with an E9-1 small button 9-pin base. It can be mounted in any physical position.

- **Maximum Overall Length:** 2 3/16 inches
- **Maximum Seated Height:** 1 15/16 inches
- **Maximum Diameter:** 7/8 inches

The 12CT8 utilizes the **RETMA 9DA** basing diagram, which provides the following pin connections (viewed from the bottom of the tube):

Pin Number	Connection
1	Triode Plate
2	Triode Grid
3	Triode Cathode
4	Heater
5	Heater
6	Pentode Plate
7	Pentode Grid Number 2 (Screen Grid)
8	Pentode Grid Number 1 (Control Grid)
9	Pentode Cathode, Grid Number 3 (Suppressor Grid), and Internal Shield

Direct Interelectrode Capacitances

The interelectrode capacitances of the 12CT8, measured without an external shield, are detailed below. These values define the high-frequency performance limits and the degree of isolation between the triode and pentode sections.

Capacitance Parameter	Pentode Section	Triode Section
Grid-Number 1 to Plate	0.044 μpF	2.2 μpF
Input	7.5 μpF	2.4 μpF
Output	2.4 μpF	0.19 μpF

Cross-section capacitances between the independent triode and pentode elements are kept to a minimum to prevent unwanted signal coupling:

- **Pentode Grid-Number 1 to Triode Plate (Max):** 0.010 μpF
- **Triode Grid to Pentode Plate (Max):** 0.016 μpF
- **Pentode Plate to Triode Plate (Max):** 0.16 μpF

Typical Operating Characteristics

The two sections of the 12CT8 operate with distinct electrical characteristics optimized for their respective roles. The pentode section provides high transconductance and high plate resistance, making it suitable for wideband video amplification. The triode section offers a moderate amplification factor and lower plate resistance, ideal for pulse-shaping and sweep-generation circuits.

The typical operating parameters for each section are as follows:

Parameter	Pentode Section	Triode Section
Plate Voltage	200 V	150 V
Screen Voltage (Grid-Number 2)	125 V	—
Cathode-Bias Resistor	82 Ω	150 Ω
Amplification Factor (μ)	—	40
Plate Resistance (approximate)	150,000 Ω	8,200 Ω
Transconductance	7,000 μmhos	4,900 μmhos
Plate Current	15 mA	9.0 mA
Screen Current	3.4 mA	—
Grid-Number 1 Voltage (approx. for $I_b = 100 \mu\text{A}$)	-8 V	-6.5 V

Design-Maximum Ratings and Circuit Design Limits

The design-maximum ratings represent the limiting values for a bogie tube. To ensure reliable operation and satisfactory tube life, circuit designers must ensure that these limits are not exceeded under the worst probable operating conditions, including supply-voltage variations, component tolerances, and environmental changes.

Rating	Pentode Section	Triode Section
Maximum Plate Voltage	300 V	300 V
Maximum Screen-Supply Voltage	300 V	—
Maximum Screen Voltage	See Screen Rating Chart	—
Maximum Positive DC Grid-Number 1 Voltage	0 V	0 V
Maximum Plate Dissipation	2.75 W	2.5 W
Maximum Screen Dissipation	0.9 W	—
Heater-Cathode Voltage Limits		
Heater Positive with Respect to Cathode (DC Component)	100 V	100 V
Heater Positive with Respect to Cathode (Total DC & Peak)	200 V	200 V
Heater Negative with Respect to Cathode (Total DC & Peak)	200 V	200 V
Maximum Grid-Number 1 Circuit Resistance		
With Fixed Bias	0.25 M Ω	0.5 M Ω
With Cathode Bias	1.0 M Ω	1.0 M Ω

Screen Dissipation and Voltage Limits

The screen grid (Grid-Number 2) of the pentode section is subject to a coordinated limit between screen voltage and screen dissipation. The permissible operating region is defined by a boundary where screen dissipation must not exceed 0.9 Watts for screen voltages up to approximately 165 Volts. Above this voltage, the maximum allowable screen dissipation decreases linearly, reaching 0 Watts at a screen voltage of 300 Volts.

Analysis of Graphical Characteristics

The behavior of the 12CT8 under varying operating conditions is illustrated by its characteristic curves, which provide insight into the tube's performance in practical circuits.

Triode Section Curves

- **Average Plate Characteristics:** The triode plate curves show plate current plotted against plate voltage for grid voltages ranging from +6.0 V down to -15 V. At positive grid voltages, grid current curves are also provided, showing significant grid current when the grid is driven positive (e.g., at $E_c = +6.0$ V).
- **Average Transfer Characteristics:** These curves plot plate current against grid voltage for plate voltages of 100, 150, 200, 250, and 300 Volts. They demonstrate the sharp cutoff behavior of the triode, with plate current approaching zero near -6.5 V grid bias when $E_b = 150$ V, and near -10 V when $E_b = 300$ V.
- **Dynamic Characteristics:** The curves for amplification factor, plate resistance, and transconductance plotted against plate current show that the triode's transconductance rises rapidly as plate current increases, peaking near 6,000 μmhos at $I_b = 20$ mA. Over the same range, the plate resistance falls from over 20,000 Ohms at very low currents to approximately 6,000 Ohms at higher currents, while the amplification factor remains relatively stable between 35 and 45.

Pentode Section Curves

- **Average Plate Characteristics (Zero Bias):** At a control grid voltage of 0 Volts, the plate current is shown as a function of plate voltage for screen voltages of 50, 75, 100, 125, and 150 Volts. These curves exhibit the typical knee characteristic of a pentode, where plate current rises rapidly below 50 Volts and then flattens out, showing high dynamic plate resistance.
- **Average Plate Characteristics (Fixed Screen Voltage):** With the screen voltage held at 125 Volts, the plate and screen currents are plotted against plate voltage for control grid voltages from +6.0 V down to -6.0 V. A boundary line representing the 2.75-Watt plate dissipation limit is superimposed on the plate characteristics, defining the safe continuous operating envelope.
- **Average Transfer Characteristics:** These curves plot plate and screen currents against control grid voltage for screen voltages from 50 to 150 Volts at a constant plate voltage of 200 Volts. The curves show that the pentode section has a sharp-cutoff characteristic, with plate current reaching cutoff near -5 V for $E_{c2} = 100$ V and near -7 V for $E_{c2} = 150$ V.
- **Transconductance Characteristics:** The transconductance of the pentode section is plotted against control grid voltage for various screen voltages. At $E_{c2} = 125$ V and zero grid bias, the transconductance exceeds 8,000 μmhos , falling smoothly as the grid is biased more negatively.

Technical Summary

The **12CT8** is a versatile, high-performance miniature triode-pentode designed for series-string television applications. Its controlled 11-second heater warm-up time and 12.6 V, 0.3 A heater ratings make it ideal for 300 mA series heater circuits. The pentode section, with its high transconductance of 7,000 μmhos and plate resistance of 150,000 Ohms, is optimized for video amplifier service. The triode section, featuring an amplification factor of 40 and a transconductance of 4,900 μmhos , is well-suited for sync

processing and sweep oscillator duties. By combining these two distinct, shielded sections in a single compact 9-pin envelope, the 12CT8 enables efficient and space-saving circuit designs in television receivers.

TUBE TINKER

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

[Catalog](#) [Tube types](#) [Full books](#) [Blog](#) [Feedback & corrections](#)

© 2026 Tube Tinker