

ELECTRONIC TUBE REFERENCE

10C8

Voltage - Triode Pentode electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

PENTODE-TRIODE

Triode-pentode for series-string television receivers, combining separate signal-amplifier functions in one miniature envelope.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9DA	BASE PINS	9
NOMINAL HEATER	10.5 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

SECTION1 Pentode	
PLATE RESISTANCE	190000 Ω
TRANSCONDUCTANCE	0.008 S
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM SCREEN DISSIPATION	0.55 W
MAXIMUM CATHODE CURRENT	18 mA
<i>Pentode section. MaxPlateDissipation uses the higher published vertical-deflection rating; Class-A 2.2 W retained as parameter.</i>	

SECTION2 Triode	
PLATE RESISTANCE	12000 Ω
TRANSCONDUCTANCE	0.0044 S
AMPLIFICATION FACTOR	53
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM CATHODE CURRENT	12 mA

10C8 — Miniature Triode-Pentode Vacuum Tube

The **10C8** is a miniature, multi-section vacuum tube containing a high- μ triode and a power pentode within a single glass envelope. It is designed specifically for use in compact television receivers employing 300-milliampere series-string heater circuits. The pentode section is engineered for general-purpose amplification or, when triode-connected, as a vertical-deflection amplifier. The high- μ triode section is designed for service as a vertical oscillator, audio-frequency (AF) voltage amplifier, sync separator, clipper, or amplifier.

The tube features a controlled heater warm-up characteristic to ensure reliable operation in series-connected heater strings, alongside a compact physical footprint, low power requirements, and high performance capabilities when operating at the low DC supply voltages typical of these receiver designs.

Construction, Heater, and Pinout

The 10C8 is constructed with coated unipotential cathodes for both sections. The heater is designed for series-string applications and has a controlled warm-up time.

Heater Characteristics

The nominal heater parameters and the specific test conditions for the controlled warm-up characteristic are:

Parameter	Value
Heater Voltage (AC or DC)	10.5 V
Heater Current	0.3 ± 6% A
Heater Warm-up Time	11 Seconds

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value (8.4 V) when four times the rated heater voltage (42.0 V) is applied to a circuit consisting of the tube heater in series with a specific resistance. This series resistance is calculated as:

$$\text{Resistance} = 3 \times \frac{\text{Rated Heater Voltage}}{\text{Rated Heater Current}} = 3 \times \frac{10.5 \text{ V}}{0.3 \text{ A}} = 105 \Omega$$

Mechanical Specifications and Basing

The 10C8 is housed in a T-6 1/2 glass envelope with a small button 9-pin E9-1 base. It can be mounted in any position.

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

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

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

Interelectrode Capacitances

The direct interelectrode capacitances of the 10C8 are measured without an external shield. The internal shield is connected to Pin 9 (along with the pentode cathode and grid number 3).

Pentode Section Capacitances

- **Grid-Number 1 to Plate (maximum):** 0.04 μF
- **Input (Grid 1 to Cathode, Heater, Screen, Suppressor, and Shield):** 7.0 μF
- **Output (Plate to Cathode, Heater, Screen, Suppressor, and Shield):** 2.2 μF

Triode Section Capacitances

- **Grid to Plate:** 1.6 μF
- **Input (Grid to Cathode and Heater):** 2.4 μF
- **Output (Plate to Cathode and Heater):** 0.20 μF

Inter-Section Capacitances

- **Pentode Grid-Number 1 to Triode Plate (maximum):** 0.008 μF
- **Triode Grid to Pentode Plate (maximum):** 0.006 μF
- **Pentode Plate to Triode Plate (maximum):** 0.06 μF

Electrical Characteristics and Typical Operation

The 10C8 sections exhibit distinct electrical characteristics optimized for their respective roles. Typical operating points are established for Class A1 amplifier service.

Typical Operating Points

Parameter	Pentode Section (Triode Connection*)	Pentode Section (Pentode Connection)	Triode Section
Plate Voltage	135 V	135 V	250 V
Screen Voltage	—	135 V	—
Grid-Number 1 Voltage	0 V**	—	—
Cathode-Bias Resistor	—	100 Ω	390 Ω
Amplification Factor	40	—	53
Plate Resistance (approximate)	—	190,000 Ω	12,000 Ω
Transconductance	—	8,000 μmhos	4,400 μmhos

Parameter	Pentode Section (Triode Connection*)	Pentode Section (Pentode Connection)	Triode Section
Plate Current	33 mA	11.5 mA	7.3 mA
Screen Current	—	3.2 mA	—
Grid-Number 1 Voltage for $I_b = 50 \mu\text{A}$ (approx.)	—	-6 V	—
Grid-Number 1 Voltage for $I_b = 10 \mu\text{A}$ (approx.)	—	—	-10 V

* Screen connected to plate. ** Applied for a short interval (two seconds maximum) to prevent damage to the tube.

The triode-connected pentode section provides a lower amplification factor ($\mu = 40$) but is capable of handling higher plate current (33 mA at 135 V) compared to the high- μ triode section ($\mu = 53$, $I_b = 7.3 \text{ mA}$ at 250 V).

Maximum Ratings

The maximum ratings for the 10C8 are defined under the Design-Maximum system. These ratings represent the limiting values at which satisfactory tube life can be expected under the worst probable operating conditions.

Class A1 Amplifier Service

Rating	Pentode Section	Triode Section
Plate Voltage	300 V	300 V
Screen-Supply Voltage	300 V	—
Screen Voltage	See Screen Rating Chart	—
Positive DC Grid-Number 1 Voltage	0 V	0 V
Plate Dissipation	2.2 W	2.0 W
Screen Dissipation	0.55 W	—
Heater-Cathode Voltage (Heater Positive to Cathode)		

Rating	Pentode Section	Triode Section
— DC Component	100 V	100 V
— Total DC and Peak	200 V	200 V
Heater-Cathode Voltage (Heater Negative to Cathode)		
— Total DC and Peak	200 V	200 V
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

Vertical Oscillator and Amplifier Service

For vertical deflection and oscillator applications, the ratings are tailored to the pulsed nature of the television sweep circuits. The pentode section is rated for vertical deflection amplifier service in a triode connection (screen connected to plate), while the triode section is rated for vertical oscillator service.

Rating	Vertical Deflection Amplifier (Pentode Section, Triode Connection*)	Vertical Oscillator Service (Triode Section)
DC Plate Voltage	300 V	300 V
Peak Positive Pulse Plate Voltage	1000 V**	—
Peak Negative Grid Voltage	250 V	400 V
Plate Dissipation	2.5 W***	1.0 W
DC Cathode Current	18 mA	12 mA
Peak Cathode Current	55 mA	35 mA
Heater-Cathode Voltage (Heater Positive to Cathode)		
— DC Component	100 V	100 V
— Total DC and Peak	200 V	200 V

Rating	Vertical Deflection Amplifier (Pentode Section, Triode Connection*)	Vertical Oscillator Service (Triode Section)
Heater-Cathode Voltage (Heater Negative to Cathode)		
— Total DC and Peak	200 V	200 V
Grid Circuit Resistance		
— With Fixed Bias	—	2.2 M Ω
— With Cathode Bias	2.2 M Ω	2.2 M Ω
— With Grid-Leak Bias	2.2 M Ω	2.2 M Ω

* Screen connected to plate. ** For operation in a 525-line, 30-frame television system. The duty cycle of the voltage pulse must not exceed 15 percent of one scanning cycle. *** In stages operating with grid-leak bias, an adequate cathode-bias resistor or other suitable means is required to protect the tube in the absence of excitation.

Screen Rating Chart

The pentode screen grid (Grid Number 2) dissipation is bounded by both voltage and wattage limits. The maximum permissible screen dissipation is 0.55 Watts for screen voltages up to approximately 165 Volts. Above this voltage, the maximum allowable dissipation decreases linearly, reaching 0 Watts at a screen voltage of 300 Volts.

Analysis of Characteristic Curves

The average plate and transfer characteristics of the 10C8 sections illustrate their performance under varying bias and voltage conditions.

Triode Section Curves

The plate characteristics for the triode section show plate current (I_b) plotted against plate voltage (E_b) for grid voltages (E_c) ranging from +4.0 Volts down to -9.0 Volts. At a typical plate voltage of 250 Volts, the curves demonstrate a highly linear relationship between grid voltage and plate current in the region of -1.0 to -4.0 Volts. The transfer characteristics confirm this linearity, showing a steady transconductance (g_m) of approximately 4,400 μ mhos and an amplification factor (μ) that remains relatively constant around 53 across a wide range of plate currents.

Pentode Section Curves

The pentode section curves are provided for both pentode and triode connections:

- **Triode-Connected Pentode:** With the screen grid tied to the plate, the plate characteristics resemble those of a low- μ power triode. The curves show rapid increases in plate current with plate voltage, reflecting a low plate resistance and a triode amplification factor of approximately 40.
- **Pentode Connection:** With the screen grid maintained at a constant potential (such as 135 Volts or 150 Volts), the plate characteristics display the classic pentode knee. Above approximately 50 Volts on the plate, the plate current curves flatten out, indicating a very high plate resistance (approximately 190,000 Ohms) and making the section highly suitable for high-gain voltage amplification or constant-current drive applications. The screen current (I_{c2}) curves mirror the plate current behavior at low plate voltages, rising as plate voltage drops below the knee.

Technical Summary

The **10C8** is a versatile, space-saving **triode-pentode** designed for **300 mA series-string television receivers**. It features a **10.5 V, 0.3 A heater** with a controlled **11-second warm-up time** to prevent voltage imbalances in series-connected heater strings.

The **pentode section** provides high transconductance (8,000 μmhos) and can be operated as a pentode amplifier or triode-connected as a vertical-deflection amplifier capable of handling peak positive pulse plate voltages up to 1000 V. The **high- μ triode section** ($\mu = 53$) is optimized for vertical oscillator, AF voltage amplifier, or sync circuit functions. With its compact T-6 1/2 envelope, 9-pin miniature base, and robust design-maximum ratings, the 10C8 provides a highly integrated solution for television sweep and signal processing stages.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	300 V	—
Plate Voltage	300 V	—
Plate Voltage	1000 V	—
Plate Voltage	135 V	—
Plate Voltage	10 V	—
Plate Voltage	10 V	—
Screen Voltage	1 V	—
Screen Voltage	135 V	—
Plate Dissipation	2.2 W	—
Plate Dissipation	2.5 W	—
ScreenDissipation	0.55 W	—
Plate Current	33 mA	—
Plate Current	1 mA	—
Screen Current	3.2 mA	—
Transconductance	8000 uS	—
Amplification Factor	53	—
Amplification Factor	40	—
Plate Resistance	190000 ohm	—
Grid Voltage	250 V	—
ClassAPlateDissipation	2.2 W	ClassA
Peak Positive Pulse Plate Voltage	1000 V	VerticalDeflection
Peak Cathode Current	55 mA	VerticalDeflection

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	135 V	AverageCharacteristics
Screen Voltage	135 V	AverageCharacteristics

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GridNumber1toPlateCapacitance	0.04 pF	—

1968 GENERAL ELECTRIC CO

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
VerticalServicePlateDissipation	1 W	VerticalOscillator
Peak Cathode Current	35 mA	VerticalOscillator
Plate Voltage	250 V	AverageCharacteristics

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