

ELECTRONIC TUBE REFERENCE

12MD8

Voltage - Triple Triode electronic tube

CONSOLIDATED TECHNICAL DATA
3 SECTIONS
CONSTRUCTION
TRIODE-TRIODE-TRIODE

Medium-mu triode for matrixing circuits in color and black-and-white television receivers.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9RQ	BASE PINS	9
NOMINAL HEATER	12.6 V / 450 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	5500 Ω
TRANSCONDUCTANCE	0.0031 S
AMPLIFICATION FACTOR	17
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3 W
Published ratings and characteristics extracted from the approved source. Pulse-only ratings are retained as parameter rows rather than substituted for continuous ratings.	

SECTION2 Triode	
PLATE RESISTANCE	5500 Ω
TRANSCONDUCTANCE	0.0031 S
AMPLIFICATION FACTOR	17
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3 W
<i>Physical triode row restored under current one-row-per-physical-section policy.</i>	

SECTION3 Triode	
PLATE RESISTANCE	5500 Ω
TRANSCONDUCTANCE	0.0031 S
AMPLIFICATION FACTOR	17
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3 W
<i>Physical triode row restored under current one-row-per-physical-section policy.</i>	

12MD8 — Medium-Mu Triple Triode

The **12MD8** is a Novar-type vacuum tube containing three electrically distinct triode units that share a common cathode within a single T-9 glass envelope. Designed primarily for use in the matrixing circuits of color and black-and-white television receivers, it functions as a chroma matrixing amplifier. The 12MD8 is identical to the [6MD8](#) except for its heater ratings and heater arrangement.

Construction, Heater, and Common Cathode

The 12MD8 features a Novar T-9 construction with a button 9-pin base (E9-75 or E9-89). Unlike tubes with independent cathodes, the three triode units in the 12MD8 share a single, common cathode. This structural design simplifies wiring in matrixing applications but requires all three sections to operate at the same cathode potential.

The heater is designed for series string operation with a controlled warm-up time.

Heater Parameter	Value
Heater Arrangement	Series
Heater Voltage (AC/DC)	12.6 V
Heater Current	0.45 A (450 mA)

Heater Parameter	Value
Average Heater Warm-up Time	11 seconds

To ensure reliable operation and prevent insulation breakdown, the voltage difference between the heater and the common cathode must be kept within specified limits:

- **Heater negative with respect to cathode:** The maximum total DC and peak voltage is **200 V**.
- **Heater positive with respect to cathode:** The maximum DC voltage is **100 V**, and the maximum total DC and peak voltage is **200 V** (alternatively specified as an average value of 100 V and a peak value of 200 V).

Pinout and Physical Dimensions

The 12MD8 utilizes the **9RQ** basing diagram, which distributes the connections for the three plates, three grids, common cathode, and heater across the nine pins of the Novar base:

Pin Number	Electrode Connection
Pin 1	Plate, Triode Unit 3 (PT3)
Pin 2	Plate, Triode Unit 2 (PT2)
Pin 3	Plate, Triode Unit 1 (PT1)
Pin 4	Heater
Pin 5	Heater
Pin 6	Grid, Triode Unit 1 (GT1)
Pin 7	Common Cathode (K)
Pin 8	Grid, Triode Unit 2 (GT2)
Pin 9	Grid, Triode Unit 3 (GT3)

The physical dimensions of the T-9 envelope are as follows:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.580 inches
- **Maximum Overall Height:** 2.960 inches

Electrical Characteristics and Class A1 Operation

Each of the three triode units in the 12MD8 is designed as a medium-mu amplifier. Under typical Class A1 operating conditions, each section exhibits the following electrical characteristics:

- **Plate Voltage:** 250 V

- **Grid Voltage:** -10.5 V
- **Plate Current:** 11.5 mA
- **Amplification Factor (μ):** 17
- **Plate Resistance (r_a):** 5500, (approximate)
- **Transconductance (g_m):** 3100 μ mhos

The fundamental triode relationship is demonstrated by this typical calculation:

Calculated Amplification Factor = 0.0031 S x 5500 ohms = 17.05

This calculated value closely matches the specified amplification factor of 17.

The cutoff characteristics of each triode section are also defined:

- At a grid voltage of **-14 V**, the plate current decreases to **4 mA**.
- For a plate current of **50 μ A**, the required grid voltage is approximately **-23 V**.

Maximum Ratings and Circuit Values

The 12MD8 is rated under the Design-Maximum Rating System. These limits must not be exceeded under the worst-case operating conditions:

- **Maximum Plate Voltage:** 330 V
- **Maximum Grid Voltage (Positive-bias value):** 0 V
- **Maximum Plate Dissipation (per section):** 3 Watts
- **Maximum Grid-Circuit Resistance (for fixed-bias operation):** 1 Megohm

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12MD8 are measured without an external shield. Units 1 and 2 are identical in their capacitive characteristics, while Unit 3 exhibits slight differences due to its physical positioning within the envelope:

Capacitance Parameter	Unit 1	Unit 2	Unit 3
Grid to Plate	3.0 pF	3.0 pF	3.0 pF
Input (Grid to Cathode and Heater)	3.6 pF	3.6 pF	3.4 pF
Output (Plate to Cathode and Heater)	0.48 pF	0.48 pF	0.36 pF

Average Plate Characteristics

The average plate characteristics of each triode unit illustrate the relationship between plate voltage, grid bias, and plate current.

At a grid bias of **0 V**, the plate current rises rapidly with plate voltage, reaching approximately **30 mA** at **140 V** and **40 mA** at **170 V**. As the grid is biased more negatively, the curves shift to the right. For example, at a grid bias of **-10.5 V**, the plate current is **11.5 mA** when the plate voltage is **250 V**. At a grid bias of **-20 V**, conduction begins around **200 V** on the plate, and the plate current reaches **10 mA** at approximately **370 V**.

Technical Summary

The **12MD8** is a **Novar-based, medium-mu triode** featuring a **common cathode** and a **12.6 V, 0.45 A series heater** with an average warm-up time of **11 seconds**. It is specifically designed for **chroma matrixing amplifier** service in color and black-and-white television receivers. Each of its three triode units provides an amplification factor of **17**, a transconductance of **3100 μmhos** , and a plate resistance of **5500**, under typical Class A1 operating conditions. With a maximum plate voltage rating of **330 V** and a plate dissipation limit of **3 Watts** per section, the 12MD8 offers a compact and efficient solution for television matrixing circuits requiring three matched medium-mu triode stages sharing a common cathode potential.

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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warm-up Time (Average) –	11 s	Other
Peak value	200 V	Other;PublishedValue1
Peak value	200 V	Other;PublishedValue2
Average value	100 V	Other;PublishedValue1
Average value	100 V	Other;PublishedValue2
Plate Voltage	330 V	MaximumRating
Grid Voltage, Positive-bias value	0 V	MaximumRating
Plate Dissipation	3 W	MaximumRating
Grid-Circuit Resistance, for fixed-bias operation	1 megohm	MaximumCircuitValue
Maximum Plate Voltage	330 V	Section1
Maximum Plate Dissipation	3 W	Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	3 pF	Capacitance;PublishedValue1
Grid to Plate	3 pF	Capacitance;PublishedValue2
Grid to Plate	3 pF	Capacitance;PublishedValue3
Grid to Cathode and Heater	3.6 pF	Capacitance;PublishedValue1
Grid to Cathode and Heater	3.6 pF	Capacitance;PublishedValue2
Grid to Cathode and Heater	3.4 pF	Capacitance;PublishedValue3
Plate to Cathode and Heater	0.48 pF	Capacitance;PublishedValue1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate to Cathode and Heater	0.48 pF	Capacitance;PublishedValue2
Plate to Cathode and Heater	0.36 pF	Capacitance;PublishedValue3

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	2 V	Characteristic
Grid Voltage	-10.5 V	Characteristic
PLATE	92 V	Characteristic
Plate Current	11.5 mA	Characteristic
Plate Current for grid voltage of –	14 V	Characteristic;PublishedValue1
Plate Current for grid voltage of –	4 V	Characteristic;PublishedValue2
Grid Voltage (Approx.) for plate current of	50 V	Characteristic;PublishedValue1
Grid Voltage (Approx.) for plate current of	-23 V	Characteristic;PublishedValue2
Plate Resistance	5500 ohm	Section1
Transconductance	3100 uS	Section1
Amplification Factor	17	Section1

TUBE TINKER

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