

ELECTRONIC TUBE REFERENCE

6CW4

Nuvistor Tubes (all numbers) electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
TRIODE

High-mu Nuvistor triode used as a grounded-cathode neutralized VHF RF amplifier in television and FM tuners.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12AQ	BASE PINS	5
NOMINAL HEATER	6.3 V / 135 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	6600 Ω
TRANSCONDUCTANCE	0.0098 S
AMPLIFICATION FACTOR	65
MAXIMUM PLATE VOLTAGE	135 V
MAXIMUM SCREEN VOLTAGE	130 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM CATHODE CURRENT	15 mA
Published promoted values applied where applicable; additional ratings and operating data retained as parameters.	

6CW4 — High-Mu Nuvistor VHF RF Amplifier

Triode

An indirectly heated metal-shell Nuvistor for neutralized grounded-cathode amplification in television and FM receiver tuners.

Overview

The **6CW4** is a **high-mu Nuvistor receiving triode** designed for **grounded-cathode, neutralized VHF radio-frequency amplifier** stages. RCA specifies its use in the VHF tuners of **color and black-and-white television receivers** and **FM receivers**. Its compact metal-shell construction, relatively high transconductance, and low interelectrode capacitances are documented in detailed manufacturer data.

The **2CW4** and **13CW4** are explicitly identified as electrically corresponding variants with different heater ratings. The 6CW4 uses the familiar **6.3 V heater**, drawing **0.135 A**, rather than the lower-voltage or higher-voltage heaters of those related types.

Construction, Base, and Mechanical Form

The 6CW4 is a **single indirectly heated triode** with a coated unipotential cathode, grid, and plate in a compact **MT4 metal-shell Nuvistor** package. RCA identifies a **medium ceramic-wafer five-contact Nuvistor base, JEDEC E5-65**, with **12AQ** basing. It requires a dedicated Nuvistor socket, not a standard noval miniature socket.

RCA's detailed HB3 documentation lists **0.800 inch maximum overall length**, **0.625 inch maximum seated length**, and **0.440 inch maximum diameter**. The tube may be mounted in **any position**.

The detailed basing sheet assigns the plate to **pin 2**, grid to **pin 4**, cathode to **pin 8**, and heater to **pins 10 and 12** in the manufacturer's indexed Nuvistor diagram. Other positions are marked **do not use**; the shortened pin and large index lug are significant for correct socket orientation.

Heater and Cathode

Heater parameter	Value
Nominal voltage	6.3 V
Nominal current	0.135 A
Calculated heater power	0.851 W
Supply	AC or DC
Maximum peak heater-cathode voltage	±100 V

RCA's detailed heater rating specifies **6.3 ± 0.6 V** under its stated design-maximum convention. Sylvania's condensed table rounds the current to **130 mA**, while RCA gives **135 mA**.

The low heater power is consistent with the compact receiving-tuner role for which the tube is specified.

VHF Neutralized RF Amplifier Service

The manufacturer's intended circuit is a **grounded-cathode RF amplifier**. The grid is the input electrode and the plate circuit provides the output. In VHF applications, feedback through the small grid-to-plate capacitance can influence gain and stability; the specified **neutralized** circuit arrangement is intended to compensate for unwanted input-output coupling.

RCA explicitly includes both monochrome and color television tuner service, as well as FM receiver front ends. The manufacturer data describe a specialized receiving RF amplifier, not an audio power-output or transmitter tube.

Electrical Characteristics

RCA supplies both a characteristic test condition and a representative operating condition:

Characteristic	Characteristic point	Operating example
Plate supply voltage	110 V	70 V
Cathode resistor	130 Ω	—
Grid resistor	—	47 k Ω
Plate current	7.0 mA	7.2 mA
Transconductance	9,800 μmhos	12,500 μmhos
Plate resistance	6,600 Ω	5,440 Ω
Amplification factor	65	68

The tube is therefore a **high-mu triode** with amplification factor approximately **65-68** and transconductance approximately **9.8-12.5 mA/V** at the published operating points.

These characteristics are consistent with $\mu \approx g_m \times r_p$: $0.0098 \text{ S} \times 6,600 \text{ } \Omega \approx 65$, and $0.0125 \text{ S} \times 5,440 \text{ } \Omega \approx 68$.

RCA also specifies approximately **-4 V** grid voltage at **10 μ A** plate current under the stated measurement condition.

Maximum Ratings and Plate-Circuit Resistance

The RCA design-maximum data include:

Rating	Value
Maximum plate voltage	135 V
Maximum plate-supply voltage, conditional	300 V

Rating	Value
Maximum cathode current	15 mA
Maximum negative grid voltage	55 V
Maximum peak positive grid voltage	0 V
Maximum plate dissipation	1.5 W , under stated conditions
Maximum fixed-bias grid-circuit resistance	0.5 MΩ
Maximum cathode-bias grid-circuit resistance	2.2 MΩ

The detailed RCA HB3 data clarify that **1.5 W maximum plate dissipation** applies with at least **5,000 Ω series plate-circuit resistance**; for smaller series resistance, the manufacturer directs the designer to a plate-dissipation rating chart.

RCA permits a **300 V plate supply** only with appropriate plate-circuit resistance and operating conditions that prevent the actual plate voltage and dissipation from exceeding their stated limits.

Sylvania lists a 1.0 W plate-dissipation maximum in its family table. This difference should be retained as a manufacturer-specific rating rather than automatically replaced by RCA's higher conditional figure.

The RCA rating applies at metal-shell temperatures up to **135°C**.

Interelectrode Capacitances

The approximate direct capacitances are:

Measurement	Value
Grid to plate	0.92 pF
Grid to cathode, heater, and shell	4.3 pF
Plate to cathode, heater, and shell	1.8 pF
Plate to cathode	0.18 pF
Heater to cathode	1.6 pF in RCA data

Sylvania's shielded table gives approximately **1.3 pF** heater-to-cathode capacitance. Measurement definitions and manufacturer context should be preserved when comparing the values.

These small capacitances are important in VHF tuned amplifiers, particularly the grid-to-plate capacitance associated with neutralization.

Plate Curves and Thermal Considerations

The six-page RCA HB3 sheet includes **average plate characteristics**, **transfer characteristics**, **mechanical drawings**, and a **plate-dissipation-versus-series-resistance rating chart**. These expand on the brief receiving-manual table and show why plate supply voltage, actual electrode voltage, and series resistance must be treated separately.

The metal-shell temperature limit is another important distinction from ordinary glass receiving tubes. Thermal conditions must be considered when installing the 6CW4 in compact tuner assemblies.

Related Heater Variants

Type	Heater voltage	Heater current
2CW4	2.1 V	0.450 A
6CW4	6.3 V	0.135 A
13CW4	13.5 V	0.060 A

RCA explicitly identifies the three CW4 types as having corresponding electrical characteristics except for their heater ratings. Their heater circuits are therefore not directly interchangeable without considering the supply.

Technical Summary

The **6CW4** is a **6.3 V / 135 mA high-mu Nuvistor triode** for **neutralized grounded-cathode VHF RF amplification** in **television and FM tuners**. It provides approximately **65-68 amplification factor**, **9.8-12.5 mA/V transconductance**, **5.44-6.6 kΩ plate resistance**, and about **7 mA** plate current at its published operating points.

Its compact metal-shell construction, **12AQ Nuvistor basing**, low interelectrode capacitances, and detailed conditional plate-dissipation limits characterize a specialized receiving front-end RF amplifier rather than a general-purpose audio triode.

SOURCE OPERATING CONDITIONS

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

1971 RCA HB3 BINDER 4 OF 7

Section 1 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
1 Voltage (AC or DC) – published value 1	1 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
1 Voltage (AC or DC) – published value 2	6.3 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
1 Voltage (AC or DC) – published value 3	0.6 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Current at heater volts = 6.3 – published value 1	6.3 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Current at heater volts = 6.3 – published value 2	0 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Current at heater volts = 6.3 – published value 3	135 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Grid'to plate	0.92 pF	Published datasheet value; multiple values represent separate source-table limits or conditions.
Grid to cathode, shell, and heater	4.3 pF	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate to cathode, shell, and heater	1.8 pF	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate to cathode	0.18 pF	Published datasheet value; multiple values represent separate source-table limits or conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater to cathode	1.6 pF	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Supply Voltage	110 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Grid Supply Voltage	0 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Cathode Resistor	130 ohm	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Resistance (Approx)	6600 ohm	Published datasheet value; multiple values represent separate source-table limits or conditions.
Transconductance	9800	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Current	7 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.
Grid Voltage (Approx.) for plate $\mu_a = 10$ – published value 1	10 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Grid Voltage (Approx.) for plate $\mu_a = 10$ – published value 2	-4 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Pin 2 -Plate	2	Published datasheet value; multiple values represent separate source-table limits or conditions.
Pin 4 -Grid	4	Published datasheet value; multiple values represent separate source-table limits or conditions.
Pin 10 -Heater	10	Published datasheet value; multiple values represent separate source-table limits or conditions.
Pin 12 -Heater	12	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Voltage	70 V	Published datasheet value; multiple values represent separate source-table limits or conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid Resistor	47000 ohm	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Resistance (Approx)	5440 ohm	Published datasheet value; multiple values represent separate source-table limits or conditions.
Transconductance	12500	Published datasheet value; multiple values represent separate source-table limits or conditions.
Plate Current	7.2 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.
voltage of 300 volts may be used provided sufficient	300 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
at the plate of the tube to 135 volts under conditions of maximum-rated	135 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
plate dissipation (1.5 watts)	1.5 W	Published datasheet value; multiple values represent separate source-table limits or conditions.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
respect to cathode	100 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
PLATE SUPPLY VOLTAGE	300 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
PLATE VOLTAGE	135 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Negative-bias value	55 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
Peak-positive value	0 V	Published datasheet value; multiple values represent separate source-table limits or conditions.
CATHODE CURRENT	15 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
resistance of 5000 ohms – published value 1	5000 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.
resistance of 5000 ohms – published value 2	1.5 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.
For fixed-bias operation	0.5 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.
For cathode-bias operation	2.2 mA	Published datasheet value; multiple values represent separate source-table limits or conditions.



SOURCE OPERATING CONDITIONS

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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)	8 s	Other
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue1
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue2
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue3
Plate Supply Voltage	300 V	MaximumRating
Plate Voltage	135 V	MaximumRating
Negative-bias value	55 V	MaximumRating
Peak positive value	0 V	MaximumRating
Cathode Current	15 mA	MaximumRating
Plate Dissipation	1.5 W	MaximumRating
Plate Supply Voltage	110 V	TypicalOperation;PublishedValue1
Plate Supply Voltage	70 V	TypicalOperation;PublishedValue2

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-Bias Resistor	130 V	TypicalOperation;PublishedValue1
Cathode-Bias Resistor	0 V	TypicalOperation;PublishedValue2
Grid Resistor –	4 ohm	TypicalOperation;PublishedValue1
Grid Resistor –	0 ohm	TypicalOperation;PublishedValue2
Plate Resistance (Approx.)	6600 ohm	TypicalOperation;PublishedValue1
Plate Resistance (Approx.)	5440 ohm	TypicalOperation;PublishedValue2
Plate Current	7 mA	TypicalOperation;PublishedValue1
Plate Current	7.2 mA	TypicalOperation;PublishedValue2
Grid Voltage (Approx,) for plate current of	10 V	TypicalOperation;PublishedValue1
Grid Voltage (Approx,) for plate current of	-4 V	TypicalOperation;PublishedValue2
For fixed-bias operation	0.5 megohm	MaximumCircuitValue
For cathode-bias operation	2.2 megohm	MaximumCircuitValue
* A plate supply voltage of	300 V	MaximumCircuitValue
in the plate circuit to limit the plate dissipation to	1.5 W	MaximumCircuitValue
PLATE	92 V	MaximumCircuitValue;PublishedValue1
PLATE	524 V	MaximumCircuitValue;PublishedValue2
Maximum Plate Voltage	135 V	Section1
Maximum Plate Dissipation	1.5 W	Section1
Maximum Cathode Current	15 mA	Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	0.92 pF	Capacitance
Grid to Cathode. Heater, and Shell	4.3 pF	Capacitance
Plate to Cathode, Heater, and Shell	1.8 pF	Capacitance
Plate to Cathode	0.18 pF	Capacitance
Heater to Cathode	1.6 pF	Capacitance

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance	6600 ohm	Section1
Transconductance	9800 uS	Section1
Amplification Factor	65	Section1

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