

ELECTRONIC TUBE REFERENCE

2DS4

Nuvistor Tubes (all numbers) electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
TRIODE

Nuvistor triode used as an RF amplifier in VHF television and FM tuners.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12AQ	BASE PINS	5
NOMINAL HEATER	2.1 V / 450 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	5400 Ω
TRANSCONDUCTANCE	0.0125 S
AMPLIFICATION FACTOR	68
MAXIMUM PLATE VOLTAGE	135 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM CATHODE CURRENT	15 mA
Electrical characteristics of 6DS4 except heater; extended-cutoff characteristic.	

2DS4 — Extended-Cutoff High-Mu Nuvistor VHF Triode

An indirectly heated, 2.1-volt Nuvistor RF amplifier triode for neutralized grounded-cathode operation in television and FM tuners.

Overview

The **2DS4** is a **high-mu Nuvistor triode with extended-cutoff characteristics**, intended for VHF radio-frequency amplification in television and FM receivers. RCA identifies the 2DS4 as the low-voltage-heater version of the **6DS4**, with the same signal-electrode characteristics except for heater ratings. Its specific receiving application is a **grounded-cathode, neutralized RF amplifier** in color or black-and-white television tuners and FM receiver front ends.

The extended-cutoff designation in RCA's technical data distinguishes the DS4 family from an otherwise similar general-purpose high-mu triode. Its published grid-voltage-versus-plate-current test points describe the approach to low plate current at increasingly negative grid bias.

Construction, Heater, and Physical Form

The 2DS4 uses a **metal-shell Nuvistor** structure and a dedicated Nuvistor socket. Sylvania describes a ceramic-wafer five-contact arrangement, **E5-65**, with **12AQ basing**. The published maximum diameter is **0.440 inch** and maximum seated height **0.625 inch**; the listed overall height is approximately **0.600 inch** in the Sylvania extract, so mechanical clearances should be checked against the actual outline drawing.

Heater property	Value
Heater voltage	2.1 V
Heater current	0.450 A
Average heater warm-up time	8 seconds
Calculated heater power	0.945 W
Heater supply	AC or DC
Peak heater-to-cathode voltage	±100 V maximum

The heater rating is a principal difference from the **6DS4**, which uses a **6.3 V heater** drawing approximately **0.135–0.138 A** in the published references. RCA's dedicated 2DS4 entry also specifies the 450 mA heater with a tolerance of approximately 30 mA.

VHF RF Amplifier Application

The manufacturer specifies **grounded-cathode, neutralized VHF amplifier** service. In this arrangement the RF input drives the grid relative to the cathode, while the output is developed in the plate circuit. Neutralization is relevant because the tube's finite grid-to-plate capacitance couples some output signal back toward the input.

The documentation explicitly names **FM receivers**, **color television receivers**, and **black-and-white television receivers**. It does not identify the 2DS4 as an audio power tube or a transmitter output tube.

Typical Electrical Characteristics

The RCA and Sylvania data provide two representative operating conditions:

Characteristic	Condition A	Condition B
Plate supply or stated operating voltage	110 V	70 V
Cathode resistor	130 Ω	—
Grid resistor	—	47 k Ω
Plate current	6.5 mA	7.0 mA
Transconductance	9,000 μmhos	12,500 μmhos
Plate resistance	7,000 Ω	5,440 Ω
Amplification factor	63	68

The figures reflect a high- μ , relatively high-transconductance receiving triode. The relationship $\mu \approx g_m \times r_p$ is consistent with both conditions: $0.009 \text{ S} \times 7,000 \Omega \approx 63$, while $0.0125 \text{ S} \times 5,440 \Omega \approx 68$.

Extended-Cutoff Behavior

RCA specifies approximate grid voltages of **−5 V** at **100 μ A plate current** and **−6.8 V** at **10 μ A plate current** under the stated characteristic test conditions. These values characterize the low-current region of the tube's transfer behavior. They should not be treated as universal cutoff voltages at every plate voltage or load.

Maximum Ratings

RCA publishes the following Class A1 design-maximum limits:

Rating	Value
Maximum plate voltage	135 V
Maximum plate-supply voltage, conditional	300 V
Maximum cathode current	15 mA
Maximum negative grid voltage	55 V
Maximum peak positive grid voltage	0 V
Maximum plate dissipation	1.5 W
Maximum fixed-bias grid-circuit resistance	Approximately 0.5 MΩ

Rating	Value
Maximum cathode-bias grid-circuit resistance	2.2 MΩ

The 300 V plate-supply allowance requires a sufficiently large plate-circuit resistance to keep dissipation within its stated limit under all operating conditions. RCA also specifies the ratings for metal-shell temperatures up to **125°C**.

Sylvania's design-maximum table lists a **1 W** plate-dissipation limit rather than RCA's **1.5 W**. This manufacturer difference should be preserved and the appropriate document consulted for the actual tube and equipment.

Interelectrode Capacitances

The RCA and Sylvania tables give approximate direct capacitances:

Measurement	Capacitance
Grid to plate	0.92 pF
Input: grid to cathode, heater, and shell	4.3 pF
Output: plate to cathode, heater, and shell	1.8 pF
Plate to cathode	0.18 pF
Heater to cathode	1.6 pF

These capacitances influence the tuning, loading, and feedback behavior of the specified VHF RF amplifier. The relatively small but nonzero grid-to-plate capacitance is especially relevant to neutralized operation.

Relationship to the 6DS4 and Other Nuvistors

The **2DS4** and **6DS4** are explicitly described by RCA as equivalent in their signal-electrode characteristics except for the heater. The 2DS4 uses **2.1 V at 450 mA**, while the **6DS4** uses **6.3 V at approximately 135 mA**.

The DS4 family is also related in general application to the CW4 high-mu Nuvistor RF amplifier family, but the RCA documentation separately identifies the DS4 as having **extended-cutoff characteristics**. That distinction should not be erased by treating every Nuvistor VHF triode as electrically identical.

Technical Summary

The **2DS4** is a **2.1 V / 450 mA high-mu extended-cutoff Nuvistor triode** for **neutralized grounded-cathode VHF RF amplification in FM and television tuners**. Its typical amplification factor is approximately **63-68**, transconductance **9-12.5 mA/V**, plate resistance **5.44-7 kΩ**, and plate current approximately **6.5-7 mA** at the published points.

The distinctive extended-cutoff transfer behavior, compact metal-shell construction, low interelectrode capacitances, and dedicated tuner application distinguish the 2DS4 from ordinary general-purpose receiving triodes.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 4 of 7

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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	2.1 V	—
Heater current	450 mA	—
Heater warm-up time	8 s	—
Plate voltage	70 V	ClassA
Plate current	8 mA	ClassA
Maximum plate voltage	135 V	—
Maximum plate dissipation	1.5 W	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	5400 ohm	ClassA
Transconductance	12500 uS	ClassA
Amplification factor	68	ClassA
Extended-cutoff characteristic	Present	RemoteCutoff

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 Voltage (ac/dc) 2.1	6.3 V	Published in approved target datasheet entry
Heater Current 0.45	136 mA	Published in approved target datasheet entry
Plate Voltage	135 V	Published in approved target datasheet entry
Grid Voltage, Negative-bias value	55 V	Published in approved target datasheet entry
Grid Voltage, Peak positive value	0 V	Published in approved target datasheet entry
Cathode Current	15 mA	Published in approved target datasheet entry
Plate Dissipation	1.5 W	Published in approved target datasheet entry
Plate Supply Voltage	110 V	Published in approved target datasheet entry
Grid Supply Voltage	0 V	Published in approved target datasheet entry
Cathode-Bias Resistor	130 ohm	Published in approved target datasheet entry
Plate Voltage	70 V	Published in approved target datasheet entry
Grid Supply Voltage	0 V	Published in approved target datasheet entry
Grid Resistor	47000 ohm	Published in approved target datasheet entry
Plate Resistance (Approx.)	5440 ohm	Published in approved target datasheet entry
Transconductance	12500 μ S	Published in approved target datasheet entry
Plate Current	7 mA	Published in approved target datasheet entry
For fixed-bias operation	0.6 Mohm	Published in approved target datasheet entry
For cathode-bias operation	2.2 Mohm	Published in approved target datasheet entry
• A plate supply voltage of	300 V	Published in approved target datasheet entry

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	0.92 pF	Published in approved target datasheet entry
Grid to Cathode, Heater, and Shell	4.3 pF	Published in approved target datasheet entry
Plate to Cathode, Heater, and Shell	1.8 pF	Published in approved target datasheet entry
Plate to Cathode	0.18 pF	Published in approved target datasheet entry
Heater to Cathode	1.6 pF	Published in approved target datasheet entry

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance (Approx.)	7000 ohm	Published in approved target datasheet entry
Plate Current	6.5 mA	Published in approved target datasheet entry
Grid Voltage (Approx.) for plate current of 10 Ilk — 6.8	5 V	Published in approved target datasheet entry