



## ELECTRONIC TUBE REFERENCE

# 15EW6

Voltage - Pentode Sharp Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

**1 SECTION**

CONSTRUCTION

**PENTODE**

Sharp-cutoff seven-pin miniature pentode designed for television intermediate-frequency amplifier service. Its fixed-gain high-frequency characteristics suit IF stages in television receivers.

## GENERAL CHARACTERISTICS

|                     |                   |                      |               |
|---------------------|-------------------|----------------------|---------------|
| BASE DESIGNATION    | —                 | BASE PINS            | 7             |
| NOMINAL HEATER      | 15 V / 150 mA     | PARALLEL HEATER      | — / —         |
| HEATING             | Indirect          | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes | SECTION CONSTRUCTION | Similar       |

## SECTION RATINGS

|                            |                 |
|----------------------------|-----------------|
| <b>SECTION 1</b> Pentode   |                 |
| PLATE RESISTANCE           | 200000 $\Omega$ |
| TRANSCONDUCTANCE           | 0.014 S         |
| MAXIMUM PLATE VOLTAGE      | 330 V           |
| MAXIMUM SCREEN VOLTAGE     | 330 V           |
| MAXIMUM PLATE DISSIPATION  | 3.1 W           |
| MAXIMUM SCREEN DISSIPATION | 0.65 W          |

*Reference-only heater variant; source states identical to 6EW6 except listed ratings.*

## 15EW6 — Sharp-Cutoff Pentode

*An indirectly heated, sharp-cutoff pentode miniature receiving tube designed for intermediate-frequency (IF) amplifier service in color and monochrome television receivers.*

# Overview

The **15EW6** is a high-transconductance, sharp-cutoff pentode housed in a compact 7-pin miniature glass envelope. It is specifically engineered for intermediate-frequency (IF) amplifier stages in television receivers. The tube features a coated unipotential cathode and is designed to operate in any mounting position.

Electrically, the 15EW6 is identical to the [6EW6](#) except for its heater ratings. While the [6EW6](#) is designed for standard 6.3 V parallel heater circuits, the 15EW6 is optimized with a 15.0 V, 150 mA heater, making it suitable for series-string heater arrangements. It belongs to a family of closely related sharp-cutoff pentodes that includes the [4EW6](#), [5EW6](#), and [6EW6](#).

## Physical Construction and Pinout

The 15EW6 is constructed in a miniature T-5 1/2 glass bulb with a miniature button 7-pin base. Its physical dimensions conform to standard miniature specifications:

- **Maximum Overall Height:** 2.125 inches (2 1/8")
- **Maximum Seated Height:** 1.875 inches (1 7/8")
- **Maximum Diameter:** 0.750 inches (3/4")

The tube utilizes the **7CM** basing configuration. When viewed from the bottom of the base, the pin connections are as follows:

| Pin Number | Electrode Connection                             |
|------------|--------------------------------------------------|
| 1          | Grid No. 1 (Control Grid)                        |
| 2          | Cathode                                          |
| 3          | Heater                                           |
| 4          | Heater                                           |
| 5          | Plate                                            |
| 6          | Grid No. 2 (Screen Grid)                         |
| 7          | Grid No. 3 (Suppressor Grid) and Internal Shield |

Grid No. 3 and the internal shield are connected together internally and brought out to Pin 7. This allows the suppressor grid and shield to be tied directly to the cathode or grounded at the socket, which provides effective electrostatic shielding between the input (Grid No. 1) and output (Plate) circuits.

## Heater Specifications and Operation

The heater of the 15EW6 is designed for series-string operation where a constant current is maintained. The electrical specifications of the heater are:

- **Nominal Heater Voltage:** 15.0 V (AC or DC)
- **Heater Voltage Tolerance:**  $\pm 10\%$  (13.5 V to 16.5 V)
- **Nominal Heater Current:** 0.150 A (with a design tolerance of  $\pm 0.009$  A)
- **Calculated Heater Power:**  $15.0 \text{ V} \times 0.150 \text{ A} = 2.25 \text{ W}$

Unlike its related variants, the [4EW6](#) and [5EW6](#) (which feature a controlled 11-second warm-up time), the 15EW6 does not have a specified controlled heater warm-up time.

To ensure reliable operation and prevent insulation breakdown, the voltage difference between the heater and the cathode must not exceed the following limits:

- **Heater Negative with Respect to Cathode:** Maximum total DC and peak voltage of 200 V.
- **Heater Positive with Respect to Cathode:** Maximum DC component of 100 V, with a maximum total DC and peak voltage of 200 V.

## Direct Interelectrode Capacitances

The 15EW6 is designed with very low feedback capacitance to prevent instability in high-gain high-frequency amplifier stages. The capacitances are specified both with and without an external shield (EIA No. 316) connected to the cathode:

| Capacitance Parameter                      | With External Shield | Without External Shield |
|--------------------------------------------|----------------------|-------------------------|
| Grid No. 1 to Plate (Max.)                 | 0.03 pF              | 0.04 pF                 |
| Input: g1 to (h + k + <u>g2</u> + g3 + IS) | 10.0 pF              | 10.0 pF                 |
| Output: p to (h + k + <u>g2</u> + g3 + IS) | 3.4 pF               | 2.4 pF                  |

## Design-Maximum Ratings

The ratings of the 15EW6 are established under the Design-Maximum Rating System. These represent limiting values of operating and environmental conditions that should not be exceeded under the worst probable conditions in a bogey device:

- **Maximum Plate Voltage:** 330 V
- **Maximum Grid No. 2 (Screen) Supply Voltage:** 330 V
- **Maximum Grid No. 2 (Screen) Voltage:** See Screen Rating Chart (dependent on dissipation)
- **Maximum Positive DC Grid No. 1 Voltage:** 0 V
- **Maximum Plate Dissipation:** 3.1 W
- **Maximum Grid No. 2 (Screen) Dissipation:** 0.65 W

# Typical Operating Conditions and Characteristics

When operated as a Class A1 amplifier, the typical operating parameters and characteristics of the 15EW6 are:

- **Plate Voltage:** 125 V
- **Grid No. 3 (Suppressor):** Connected to cathode at the socket
- **Grid No. 2 (Screen) Voltage:** 125 V
- **Cathode Bias Resistor:** 56  $\Omega$
- **Plate Resistance (Approx.):** 0.2 M $\Omega$
- **Transconductance:** 14,000  $\mu\text{mhos}$
- **Plate Current:** 11 mA
- **Grid No. 2 (Screen) Current:** 3.2 mA
- **Grid No. 1 Voltage (Approx.) for Plate Current of 20  $\mu\text{A}$ :** -3.5 V

## Operating Point Calculations

Using the typical operating values, the following parameters can be calculated:

- **Total Cathode Current ( $I_k$ ):**  $I_b + I_{c2} = 11 \text{ mA} + 3.2 \text{ mA} = 14.2 \text{ mA}$  (or  $0.0142 \text{ A}$ )
- **Calculated Grid No. 1 Bias Voltage ( $E_{c1}(\text{tubes}/C1)$ ):**  $I_k \times R_k = 0.0142 \text{ A} \times 56 \Omega \approx 0.795 \text{ V}$  (negative with respect to the cathode)
- **Calculated Plate Dissipation:**  $125 \text{ V} \times 0.011 \text{ A} = 1.375 \text{ W}$  (well within the 3.1 W maximum limit)
- **Calculated Grid No. 2 Dissipation:**  $125 \text{ V} \times 0.0032 \text{ A} = 0.40 \text{ W}$  (well within the 0.65 W maximum limit)

## Analysis of Characteristic Curves

The performance of the 15EW6 across its operating range is defined by several key characteristic curves:

- **Screen Rating Chart:** This chart outlines the area of permissible operation for Grid No. 2. The maximum screen dissipation is 0.65 W. For screen voltages up to approximately 165 V, the maximum dissipation remains constant at 0.65 W. Above 165 V, the maximum allowable dissipation decreases linearly, reaching 0 W at 330 V.
- **Plate Characteristics:** The plate current ( $I_b$ ) curves exhibit a sharp knee. At a screen voltage ( $E_{c2}$ ) of 125 V and Grid No. 3 at 0 V, the plate current rises rapidly as plate voltage increases from 0 V to approximately 50 V, after which it flattens out, demonstrating very high plate resistance. For a control grid voltage ( $E_{c1}(\text{tubes}/C1)$ ) of 0 V, the plate current levels off at approximately 24 mA, while the screen current ( $I_{c2}$ ) levels off at approximately 7 mA. As the control grid is biased more negatively, both plate and screen currents scale down. At  $E_{c1}(\text{tubes}/C1) = -1.0 \text{ V}$ , the plate current is approximately 6 mA, and at  $E_{c1}(\text{tubes}/C1) = -2.0 \text{ V}$ , it drops below 1 mA.
- **Transfer Characteristics:** The transfer curves plot plate current against Grid No. 1 voltage for various screen voltages ( $E_{c2} = 50, 75, 100, 125 \text{ V}$ ). At  $E_{c2} = 125 \text{ V}$ , the tube exhibits a sharp cutoff characteristic, with plate current approaching zero at approximately -3.5 V. At lower screen voltages,

the cutoff point shifts in a positive direction (e.g., cutting off at approximately -1.5 V when  $E_{c2} = 50$  V).

- **Transconductance ( $g_m$ ) Characteristics:** The transconductance curves show that  $g_m$  is highly sensitive to both control grid bias and screen voltage. At  $E_{c2} = 125$  V and  $E_{[c1]}(/tubes/C1) = 0$  V, the transconductance peaks near 16,000  $\mu\text{mhos}$ . At the typical operating bias of approximately -0.8 V, the transconductance is 14,000  $\mu\text{mhos}$ . Reducing the screen voltage significantly lowers the available transconductance; for example, at  $E_{c2} = 50$  V and  $E_{[c1]}(/tubes/C1) = 0$  V, the peak transconductance is limited to approximately 8,000  $\mu\text{mhos}$ .

## Related Tube Designations and Comparisons

The 15EW6 belongs to a family of sharp-cutoff pentodes that share identical physical dimensions, internal structures, and electrical characteristics, differing only in their heater configurations. These related types include:

- **6EW6:** The prototype of the family, designed with a standard **6.3 V, 400 mA** heater for parallel AC or DC operation.
- **4EW6:** A variant designed for series-string circuits with a **4.2 V, 600 mA** heater and a controlled 11-second warm-up time.
- **5EW6:** A variant designed for series-string circuits with a **5.6 V, 450 mA** heater and a controlled 11-second warm-up time.

While these tubes are identical in their plate, screen, and grid characteristics, they are not directly interchangeable without modifying the heater supply circuit. The 15EW6 is specifically optimized for 150 mA series-string applications.

## Technical Summary

The **15EW6** is a high-performance, sharp-cutoff pentode housed in a 7-pin miniature envelope. It is engineered for television IF amplifier service, offering an exceptionally high transconductance of **14,000  $\mu\text{mhos}$**  at a typical operating point of 125 V on the plate and screen. Its low grid-to-plate capacitance of **0.03 pF** (shielded) ensures stable, high-gain amplification at high frequencies. With a **15.0 V, 150 mA** heater, the 15EW6 is a specialized component for series-string television receiver designs, delivering robust and reliable performance within its design-maximum ratings.



## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 1961 Tung Sol

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

1961 TUNG SOL

## Section 1 · Pentode

| OTHER              |                 |                  |
|--------------------|-----------------|------------------|
| PARAMETER          | PUBLISHED VALUE | CONDITION / NOTE |
| Heater Warmup Time | 11 s            | —                |



## SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

# 1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

## Section 1 · Pentode

| OTHER                      |                 |                  |
|----------------------------|-----------------|------------------|
| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE |
| Typical plate voltage      | 125 V           | ClassA           |
| Typical screen voltage     | 125 V           | ClassA           |
| Typical plate current      | 7.7 mA          | ClassA           |
| Typical screen current     | 3.2 mA          | ClassA           |
| Maximum plate voltage      | 330 V           | PromotedValue    |
| Maximum screen voltage     | 330 V           | PromotedValue    |
| Maximum plate dissipation  | 3.1 W           | PromotedValue    |
| Maximum screen dissipation | 0.65 W          | PromotedValue    |

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Grid-to-plate capacitance | 0.03 pF         | WithShield       |

| PARAMETER          | PUBLISHED VALUE | CONDITION / NOTE |
|--------------------|-----------------|------------------|
| Input capacitance  | 10 pF           | WithShield       |
| Output capacitance | 3.4 pF          | WithShield       |

| CHARACTERISTICS  |                 |                  |
|------------------|-----------------|------------------|
| PARAMETER        | PUBLISHED VALUE | CONDITION / NOTE |
| Plate resistance | 200000 ohm      | PromotedValue    |
| Transconductance | 0.014 A/V       | PromotedValue    |



SOURCE DATA APPENDIX

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 |
| HeaterOrFilamentVoltageNominal | 15 V            | —                |
| HeaterOrFilamentCurrentNominal | 150 mA          | —                |

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