

ELECTRONIC TUBE REFERENCE

10DA7

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA  
2 SECTIONS  
CONSTRUCTION  
TRIODE-TRIODE

Dissimilar dual triode developed for television vertical deflection, combining a medium-mu oscillator section with a low-mu, high-dissipation output amplifier capable of substantial pulse operation.

GENERAL CHARACTERISTICS

|                     |                   |                      |               |
|---------------------|-------------------|----------------------|---------------|
| BASE DESIGNATION    | 9NF               | BASE PINS            | 9             |
| NOMINAL HEATER      | 10.6 V / 500 mA   | PARALLEL HEATER      | – / –         |
| HEATING             | Indirect          | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes | SECTION CONSTRUCTION | Dissimilar    |

9NF - TERMINAL PINOUT

| TERMINAL | SECTION | ELEMENT              | STATUS    |
|----------|---------|----------------------|-----------|
| PIN1     | –       | D2 – 2nd Dynode      | CONNECTED |
| PIN2     | –       | IS – Internal Screen | CONNECTED |
| PIN2     | –       | K – Cathode          | CONNECTED |
| PIN3     | –       | D2 – 2nd Dynode      | CONNECTED |
| PIN4     | –       | H – Heater           | CONNECTED |
| PIN5     | –       | H – Heater           | CONNECTED |
| PIN6     | –       | G1 – Control Grid    | CONNECTED |
| PIN7     | –       | D1 – 1st Dynode      | CONNECTED |
| PIN8     | –       | G2 – Screen Grid     | CONNECTED |
| PIN8     | –       | G3 – Suppressor Grid | CONNECTED |
| PIN9     | –       | P – Plate (Anode)    | CONNECTED |

SECTION RATINGS

| SECTION1 Triode                                       |               |
|-------------------------------------------------------|---------------|
| PLATE RESISTANCE                                      | 7700 $\Omega$ |
| TRANSCONDUCTANCE                                      | 0.0026 S      |
| AMPLIFICATION FACTOR                                  | 20            |
| MAXIMUM PLATE VOLTAGE                                 | 330 V         |
| MAXIMUM PLATE DISSIPATION                             | 1.5 W         |
| MAXIMUM CATHODE CURRENT                               | 22 mA         |
| <i>Vertical-deflection oscillator triode section.</i> |               |

| SECTION2 Triode                                      |               |
|------------------------------------------------------|---------------|
| PLATE RESISTANCE                                     | 1100 $\Omega$ |
| TRANSCONDUCTANCE                                     | 0.0047 S      |
| AMPLIFICATION FACTOR                                 | 6.3           |
| MAXIMUM PLATE VOLTAGE                                | 330 V         |
| MAXIMUM PLATE DISSIPATION                            | 10 W          |
| MAXIMUM CATHODE CURRENT                              | 40 mA         |
| <i>Vertical-deflection amplifier triode section.</i> |               |

# 10DA7 — Dissimilar Double Triode Vacuum Tube

The **10DA7** is a miniature 9-pin double triode containing two highly dissimilar triode sections in a single envelope. It is specifically designed for television receiver applications, combining a medium-mu triode (Section 1) intended for vertical oscillator service with a high-dissipation, low-mu triode (Section 2) intended for vertical deflection amplifier service. This integration allows the tube to perform both the oscillation and high-current output amplification functions required for the vertical sweep of large 90° picture tubes.

## Mechanical Specifications and Pinout

The 10DA7 is constructed in a T-6 1/2 glass envelope with a miniature button 9-pin base (designation 9EF). The physical dimensions of the tube are compact, allowing for space-efficient layout designs in television chassis.

| Physical Dimension | Value   |
|--------------------|---------|
| Bulb Type          | T-6 1/2 |

| Physical Dimension     | Value                   |
|------------------------|-------------------------|
| Maximum Diameter       | 7/8 inch (0.875 in)     |
| Maximum Overall Length | 2 5/8 inches (2.625 in) |
| Maximum Seated Height  | 2 3/8 inches (2.375 in) |
| Mounting Position      | Any                     |

The 9EF base connection layout, viewed from the bottom of the tube, assigns separate pins to each electrode of the two independent triode sections, with the exception of the heater:

- **Pin 1:** Plate (Section 1)
- **Pin 2:** Control Grid (Section 1)
- **Pin 3:** No Connection (NC)
- **Pin 4:** Heater
- **Pin 5:** Heater
- **Pin 6:** Plate (Section 2)
- **Pin 7:** Control Grid (Section 2)
- **Pin 8:** Cathode (Section 2)
- **Pin 9:** Cathode (Section 1)

This configuration ensures that the two triodes remain electrically independent, allowing them to operate at different bias levels and in separate circuit stages.

## Heater and Warm-Up Characteristics

The 10DA7 features a coated unipotential cathode structure heated by a series-string compatible heater. The heater is designed with a controlled warm-up time to ensure reliable operation in series-connected heater strings.

| Heater Parameter              | Value        |
|-------------------------------|--------------|
| Nominal Heater Voltage        | 10.5 V       |
| Nominal Heater Current        | 0.6 A        |
| Calculated Heater Power       | 6.3 W        |
| Heater Supply Type            | AC or DC     |
| Heater Warm-Up Time (Approx.) | 11.0 seconds |

The heater warm-up time is defined under specific test conditions: the time required for the voltage across the heater to reach 80% of its rated voltage (8.4 V) after applying four times the rated heater voltage (42.0 V) to a circuit consisting of the tube heater in series with an external resistance equal to three times the nominal heater operating resistance.

## Heater-Cathode Voltage Ratings

To prevent insulation breakdown between the heater and the independent cathodes, the following maximum voltage limits must be observed:

- **Heater Negative with respect to Cathode:** 200 V max.
- **Heater Positive with respect to Cathode:** 200 V max (with the DC component restricted to a maximum of 100 V).

## Electrical Characteristics and Typical Operating Points

The two sections of the 10DA7 are optimized for entirely different roles, resulting in highly contrasting electrical characteristics under typical Class A operating conditions.

| Parameter                      | Section 1 (Medium-Mu)  | Section 2 (Low-Mu)     |
|--------------------------------|------------------------|------------------------|
| Plate Voltage                  | 250 V                  | 150 V                  |
| Control-Grid Voltage           | -8 V                   | -17.5 V                |
| Plate Resistance (Approx.)     | 7,700 $\Omega$         | 1,100 $\Omega$         |
| Transconductance               | 2,600 $\mu\text{mhos}$ | 5,700 $\mu\text{mhos}$ |
| Amplification Factor ( $\mu$ ) | 20                     | 6.3                    |
| Plate Current                  | 9.0 mA                 | 40 mA                  |

## Cutoff and Zero-Bias Characteristics

- **Section 1 Cutoff:** The control-grid voltage required to reduce plate current to 50  $\mu\text{A}$  (at transconductance of 30  $\mu\text{mhos}$ ) is approximately -16.5 V.
- **Section 2 Cutoff:** The control-grid voltage required to reduce plate current to 0.5 mA is approximately -42 V.
- **Section 2 Zero-Bias Plate Current:** At a plate voltage of 60 V and zero grid bias, Section 2 conducts a high plate current of 80 mA, demonstrating its capability to deliver the high peak currents necessary for vertical deflection.

## Maximum Ratings

The maximum ratings for the 10DA7 are established under the Design Center System. These limits must not be exceeded under the worst-case operating conditions of supply voltage variation, component tolerances, and signal modulation.

| Rating                | Section 1 (Oscillator) | Section 2 (Amplifier) |
|-----------------------|------------------------|-----------------------|
| Maximum Plate Voltage | 300 V                  | 500 V                 |

| Rating                                              | Section 1 (Oscillator) | Section 2 (Amplifier) |
|-----------------------------------------------------|------------------------|-----------------------|
| Maximum Peak Positive Pulse Plate Voltage           | —                      | 1,800 V               |
| Maximum Peak Negative Pulse Control-Grid Voltage    | -400 V                 | -400 V                |
| Maximum Negative DC Control-Grid Voltage            | -50 V                  | -50 V                 |
| Maximum Plate Dissipation                           | 2.0 W                  | 6.0 W                 |
| Maximum Cathode Current                             | 20 mA                  | 40 mA                 |
| Maximum Control-Grid Circuit Resistance (Self-Bias) | 2.2 MΩ                 | 2.2 MΩ                |

The peak pulse ratings (such as the 1,800 V peak positive plate pulse and the -400 V peak negative grid pulse) are specified for operation in a standard 525-line, 30-frame television system. For these pulse ratings to apply, the duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.

## Direct Interelectrode Capacitances

Because the two triode sections are housed in close proximity within a single miniature envelope, interelectrode capacitances are critical design considerations to prevent unwanted coupling or feedback. The capacitances are measured without an external shield:

| Capacitance Parameter          | Section 1           | Section 2          |
|--------------------------------|---------------------|--------------------|
| Grid to Plate ( $G_1$ to $P$ ) | 2.3 $\mu\text{F}$   | 6.9 $\mu\text{F}$  |
| Input ( $G_1$ to $K + H$ )     | 2.0 $\mu\text{F}$   | 5.5 $\mu\text{F}$  |
| Output ( $P$ to $K + H$ )      | 0.415 $\mu\text{F}$ | 0.82 $\mu\text{F}$ |

The larger capacitances of Section 2 reflect its physically larger electrode structure, which is designed to handle higher current and plate dissipation.

## Similar Types and Design Comparisons

The 10DA7 is closely related to other television deflection double triodes. Specifically, except for its heater ratings and controlled heater warm-up time, the 10DA7 is identical to the [6DA7](#) (which may also appear in historical references as the 6AD7). While the [6DA7](#) is designed for standard 6.3 V parallel heater circuits, the 10DA7 is tailored for 10.5 V series-string television receivers where controlled warm-up characteristics are mandatory to prevent heater voltage surges during receiver power-up.

## Technical Summary

The **10DA7** is a specialized, miniature 9-pin dissimilar double triode designed for vertical deflection circuits in television receivers. It features a **10.5 V, 0.6 A** heater with a controlled **11.0-second** warm-up time. Section 1 is a medium-mu triode ( $\mu = 20$ ) optimized for vertical oscillator service, while Section 2 is a low-mu, high-dissipation triode ( $\mu = 6.3$ , plate dissipation of 6.0 W) capable of handling peak positive plate pulses up to **1,800 V** for vertical amplifier service. This combination allows a single tube to drive the vertical sweep of large 90° picture tubes, reducing component count and chassis space.



## 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 · Triode

| OTHER              |                                |                  |
|--------------------|--------------------------------|------------------|
| PARAMETER          | PUBLISHED VALUE                | CONDITION / NOTE |
| Service            | Vertical deflection oscillator | Section1         |
| Heater Warmup Time | 11 s                           | —                |

1961 TUNG SOL

## Section 2 · Triode

| OTHER     |                               |                  |
|-----------|-------------------------------|------------------|
| PARAMETER | PUBLISHED VALUE               | CONDITION / NOTE |
| Service   | Vertical deflection amplifier | Section2         |



## SOURCE OPERATING CONDITIONS

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# 1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

## Section 1 · Triode

| OTHER                      |                 |                             |
|----------------------------|-----------------|-----------------------------|
| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE            |
| Plate voltage              | 270 V           | Section1;VerticalOscillator |
| Plate current              | 9 mA            | Section1;VerticalOscillator |
| Peak negative grid voltage | 400 V           | Section1;VerticalOscillator |

| CHARACTERISTIC      |                 |                  |
|---------------------|-----------------|------------------|
| PARAMETER           | PUBLISHED VALUE | CONDITION / NOTE |
| Heater warm-up time | 11 s            | WholeTube        |

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Triode

| OTHER                             |                 |                             |
|-----------------------------------|-----------------|-----------------------------|
| PARAMETER                         | PUBLISHED VALUE | CONDITION / NOTE            |
| Plate voltage                     | 150 V           | Section2;VerticalDeflection |
| Plate current                     | 40 mA           | Section2;VerticalDeflection |
| Peak positive pulse plate voltage | 1800 V          | Section2;VerticalDeflection |
| Peak negative grid voltage        | 400 V           | Section2;VerticalDeflection |