ELECTRONIC TUBE REFERENCE

1754

Specialized - Thyratron electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
THYRATRON

Hydrogen-reservoir grid-controlled thyratron for high-repetition-rate, high-current, high-voltage pulse service. Reservoir control maintains suitable gas pressure for fast switching.

General characteristics

BASE DESIGNATION	_	**BASE PINS**	_
NOMINAL HEATER	6.3 V / 2.53 A	**PARALLEL HEATER**	_ / _
HEATING	Indirect	**SERIES OPERATION**	Not specified
CATHODE ARRANGEMENT	Separate cathodes	**SECTION CONSTRUCTION**	Similar

Section ratings

SECTION1 Thyratron

No fixed ratings recorded.

Published maximum ratings and characteristics promoted semantically from the approved source.

1754 — Heavy-Duty Hydrogen Thyratron

The **1754** is a heavy-duty, hot-cathode, grid-controlled gas thyratron equipped with an integrated hydrogen reservoir. It is designed specifically for high-repetition-rate pulsing service under conditions of high current and high voltage.

Overview and Applications

The 1754 is engineered to handle demanding pulse-generation and switching tasks. Its primary applications include:

- Switching or clipping in radar modulators
- Switching in welding circuits

- High-power pulse generators
- Magnetron aging

The tube utilizes a hydrogen gas medium, which is regulated by an internal reservoir to maintain optimal operating pressure.

Mechanical and Environmental Specifications

The physical construction and environmental limits of the 1754 are designed to support high-power operation:

- **Envelope**: T-40 glass bulb.
- **Top Cap**: Features a diameter of 0.500 inches and a height of 0.566 inches (±0.007 inches).
- **Mounting**: Must be mounted in a **vertical position only**. Clamping is permissible by the base only.
- **Cooling**: No cooling stream of air should be directly applied to the tube envelope.
- **Ambient Temperature Range**: -55 to 75°C.
- **External Fields**: The tube must be kept away from strong external fields that could cause unwanted ionization of the gas.

Heater and Hydrogen Reservoir Requirements

The 1754 requires separate electrical supplies for its cathode heater and its hydrogen reservoir.

Heater Characteristics

The cathode is an indirectly heated type requiring a significant heating current and a mandatory warm-up period before anode voltage is applied.

- **Heater Voltage**: 6.3 Volts (±7.5%)
- **Heater Current**: 25 to 33 Amperes
- **Cathode Heating Time**: 15 minutes minimum

Hydrogen Reservoir Function

The hydrogen reservoir controls the internal gas pressure of the thyratron. Adjusting the reservoir voltage controls the temperature of the reservoir capsule:

- **Increased Voltage**: Causes the capsule to emit hydrogen, increasing gas pressure.
- **Decreased Voltage**: Causes the capsule to absorb hydrogen, decreasing gas pressure.

This adjustment allows the operator to optimize the tube's performance for minimum deionization time, minimum arc-back, and minimum anode heating.

- **Reservoir Voltage**: 2.5 to 5.5 Volts. The optimum reservoir voltage for Operation 1 is printed on the base of each individual tube and must be held within ±5%.
- **Reservoir Current**: 3 to 6 Amperes at an operating voltage of 4.5 Volts.

Electrical Connections and Lead Designations

The 1754 does not use a standard pin-and-socket base. Instead, electrical connections are made via flexible leads extending from the base. The lead designations are:

- Cathode & Cathode Heater Center-Tap Lead
- Heater Leads (2)
- Grid Lead
- Reservoir Leads (2)
- Leads connected in base

The anode connection is made via the top cap.

Absolute Maximum Ratings

The following absolute maximum ratings must not be exceeded under any circumstances. Operating beyond these limits can cause immediate failure or severely degrade tube life.

Parameter	Absolute Maximum Rating
Peak Anode Voltage (epy)	25.0 kV
Peak Inverse Anode Voltage (epx)	25.0 kV (Must be at least 5% of epy)
Cathode Current Rate of Rise	5000 A/µs
Peak Anode Current (Ib)	1000 A
Peak Inverse Grid Voltage (egx)	450 V
Average Anode Current	1.0 A DC
Starting Anode Voltage	4 kV DC
Dissipation Factor	9.0 x 10^9 (Formula: epy x Ib x prr, up to 1500 pps)
Duty Cycle	0.001 (Formula: prr x tp = 0.001)

Grid Drive Requirements

To ensure reliable triggering and prevent jitter or misfiring, the grid drive circuit must deliver a robust pulse. These values are measured at the socket with the grid disconnected:

- **Peak Grid Voltage (egy)**: 700 Volts Minimum to 1000 Volts Maximum
- **Rate of Rise**: 0.35 µs Maximum
- **Grid Pulse Duration**: 2.0 µs Minimum
- **Drive Impedance**: 50 to 200 Ohms

- **Peak Inverse Grid Voltage (egx)**: 450 Volts

Operating Conditions and Circuit Constraints

Typical Operation (Operation 1)

Under typical resonant charging conditions, the 1754 operates with the following parameters:

- **Peak Anode Voltage (epy)**: 25 kV
- **Rate of Rise of Cathode Current**: 5000 A/µs
- **Peak Anode Current**: 1000 A
- **Anode Pulse Duration**: 2.5 µs
- **Pulse Repetition Rate**: 360 pps

Circuit-Specific Constraints and Design Considerations

- **Resonant Charging**: In typical pulse-forming network (PFN) charging circuits, transient voltage swings the instantaneous plate voltage to approximately double the power supply voltage. This transient swing must be factored into the peak anode voltage rating to ensure the 25.0 kV limit is not exceeded.
- **Instantaneous Starting**: Instantaneous starting is not recommended. If it is absolutely necessary, the maximum permissible peak anode voltage (epy) is restricted to 18.0 kV, and this voltage must be attained in no less than 0.04 µs.
- **Post-Pulse Inverse Voltage**: The peak inverse voltage must not exceed 5 kV during the first 25 µs immediately following the anode pulse.

SOURCE OPERATING CONDITIONS

1950 Sylvania

SOURCE PDF

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

1950 SYLVANIA

Section 1 · Thyratron

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Maximum Plate Voltage	**250000 V**	—
Maximum Cathode Current	**1000 A**	—
Peak Anode Voltage	**250 kV**	—
Peak Inverse Anode Voltage	**250 kV**	—
Peak Anode Current	**1000 A**	—
Cathode Current Rate of Rise	**5000 A/us**	—
Average Anode Current	**10 A**	—
Duty Cycle	**0.001**	—

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Starting Anode Voltage	**4 kV**	Maximum
Cathode Heating Time	**15 min**	—

TUBE TINKER

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