

ELECTRONIC TUBE REFERENCE

1B46

Voltage Regulator electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

VOLTAGEREGULATOR

Miniature cold-cathode glow regulator providing approximately 82 V at very low current, typically around 1-2 mA.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9Z	BASE PINS	–
NOMINAL HEATER	– / –	PARALLEL HEATER	– / –
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Voltage Regulator	
REGULATOR VOLTAGE	82 V
MINIMUM REGULATOR CURRENT	1 mA
MAXIMUM REGULATOR CURRENT	2 mA
STARTING VOLTAGE	250 V
MAINTAINING VOLTAGE	82 V
Glow-discharge voltage-regulator section; current fields normalized to amperes.	

1B46 — Miniature Glow-Discharge Voltage Regulator

The **1B46** is a cold-cathode, gas-filled miniature voltage regulator designed to provide a stable voltage source in low-current electronic applications. Operating on the principle of glow discharge, this tube maintains a relatively constant voltage drop across its electrodes despite variations in supply voltage or circuit current, provided it is operated within its specified limits.

Physical Construction and Basing

The 1B46 is constructed with a **T-4 bulb** featuring a **metal shell** for robust physical protection and shielding. Its physical dimensions are highly compact, making it suitable for miniature equipment designs:

- **Maximum Overall Height:** 1.66 inches
- **Maximum Bulb Diameter:** 0.59 inches
- **Maximum Base Width:** 0.63 inches

The tube is designed for mounting in **any position**, allowing for flexible physical layouts.

Basing and Pin Connections

The 1B46 utilizes a **Double Contact Bayonet Candelabra** base, which is also designated as having a **9Z** basing configuration. The electrical connections are made through the bottom contacts of the bayonet base, which are designated as follows:

- **Anode:** Connected to one of the bottom contacts.
- **Cathode:** Connected to the other bottom contact.

Because the 1B46 is a cold-cathode device, it does not require a heater or filament. This eliminates the need for heater wiring, reduces power consumption, and minimizes heat generation within the equipment.

Electrical Characteristics and Ratings

The electrical operation of the 1B46 is defined by its ionization (starting) voltage, its regulated operating voltage, and its strict current limits.

Voltage and Current Specifications

- **Starting Voltage:** To initiate the glow discharge, a minimum voltage must be applied across the electrodes. One specification lists a minimum starting voltage of **250 V**, while another defines the maximum starting voltage required for ionization as **225 Vdc**.
- **Operating Voltage:** Once the gas inside the tube ionizes and conduction begins, the voltage drop across the tube stabilizes. The nominal operating voltage is approximately **82 Vdc**, with a minimum operating voltage of **79 Vdc** and a maximum operating voltage of **85 Vdc**.
- **Operating Current:** The tube must be operated within a narrow current range to maintain regulation and prevent damage. The minimum operating current is **1.0 mAdc**, and the maximum operating current is **2.0 mAdc**.
- **Regulation:** The maximum voltage regulation is rated at **3.0 Vdc**. This is defined as the maximum variation in operating voltage across the tube when the operating current varies within the specified range of 1.0 to 2.0 mAdc.

Parameter	Specification
Tube Type	Miniature Glow-Discharge Voltage Regulator

Parameter	Specification
Cathode Type	Cold
Nominal Operating Voltage	82 Vdc
Operating Voltage Range	79 to 85 Vdc
Operating Current Range	1.0 to 2.0 mAdc
Maximum Voltage Regulation	3.0 Vdc
Maximum Starting Voltage	225 Vdc
Minimum Starting Voltage	250 V (under specific supply conditions)

Circuit Application and Operating Conditions

In practical applications, the 1B46 is connected in parallel with the load to regulate the voltage across it. Because the tube has a very low internal resistance once ionized, it must always be operated with a series protective resistor to limit the current.

Typical Operating Point

A typical operating circuit for the 1B46 utilizes the following parameters:

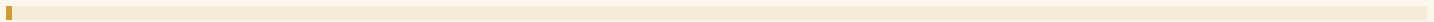
- **Anode Supply Voltage:** 250 Vdc
- **Operating Current:** 1.0 to 2.0 mAdc
- **Operating Voltage (Approx.):** 82 Vdc
- **Series Protective Resistance (Approx.):** 15,000 ohms

Series Resistance Requirements

Sufficient resistance must always be used in series with the tube to limit the current to a maximum of **2.0 mAdc** under continuous (steady-state) operation. In a practical shunt regulator circuit, the series resistor must drop the difference between the supply voltage and the regulated 82 V operating voltage, while carrying both the tube current and the load current. If the load is disconnected or varies, the series resistance must still be large enough to ensure that the current passing through the 1B46 does not exceed the 2.0 mAdc maximum rating.

Technical Summary

The **1B46** is a **miniature, cold-cathode, glow-discharge voltage regulator** housed in a **T-4 metal shell** with a **double contact bayonet candelabra (9Z)** base. It is designed to maintain a stable operating voltage of approximately **82 Vdc** (within a **79 to 85 Vdc** range) over a current range of **1.0 to 2.0 mAdc**, with a maximum voltage regulation of **3.0 Vdc**. To ensure safe and reliable operation, the tube must always be configured with an appropriate series protective resistor to prevent the operating current from exceeding its **2.0 mAdc** maximum limit.





SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Series Protective Resistance	15 ohms	Series Protective Resistance 15,000 ohms 15,000 ohms



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X Raytheon Special Purpose Tubes

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

195X RAYTHEON SPECIAL PURPOSE TUBES

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating voltage	82 V	—
Maximum regulation	3 V	1to2mA

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum operating current	1 mA	—
Maximum operating current	2 mA	—
Minimum starting-voltage supply	250 V	—