ELECTRONIC TUBE REFERENCE

117Z3

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
RECTIFIER

Miniature cathode-type half-wave rectifier for three-way portable receivers. Its 117 V heater permits direct line-series operation while supplying modest DC current for portable receiver power supplies.

General characteristics

BASE DESIGNATION	4CB	**BASE PINS**	7
NOMINAL HEATER	117 V / 40 mA	**PARALLEL HEATER**	— / —
HEATING	Indirect	**SERIES OPERATION**	Not specified
CATHODE ARRANGEMENT	Separate cathodes	**SECTION CONSTRUCTION**	Similar

Section ratings

SECTION1 Rectifier

PEAK INVERSE VOLTAGE	330 V
NOMINAL OUTPUT CURRENT	90 mA
PEAK FORWARD CURRENT	540 mA
FORWARD VOLTAGE DROP	22.5 V
MAXIMUM HEATER-CATHODE VOLTAGE	175 V

Published handbook ratings and operating characteristics reviewed.

117Z3 — Miniature Half-Wave Vacuum Rectifier

A miniature, close-spaced, half-wave high-vacuum rectifier designed for direct across-the-line operation in three-way portable receivers.

Overview

The **117Z3** is a miniature high-vacuum diode designed for half-wave rectifier service. It features a coated unipotential cathode and a high-voltage heater rated at **117 V**. This high heater voltage rating is specifically designed to permit direct operation across standard AC or DC power lines, eliminating the need for an external series dropping resistor or ballast. The tube is primarily intended for use in compact, line-operated equipment such as three-way portable radio receivers.

Physical Construction, Base, and Pinout

The 117Z3 is constructed in a compact **T-5 1/2** glass bulb. It has a maximum overall length of **2 5/8 inches**, a maximum seated height of **2 3/8 inches**, and a maximum diameter of **3/4 inch**. The tube is designed to be mounted in **any position**.

It utilizes a **miniature button 7-pin base** with a **4CB** basing connection configuration. The pin connections, viewed from the bottom of the tube, are assigned as follows:

Pin Number	Connection	Description
Pin 1	NC	No Connection (Do not use as a tie post)
Pin 2	K	Cathode
Pin 3	H	Heater
Pin 4	H	Heater
Pin 5	NC	No Connection
Pin 6	P	Plate
Pin 7	NC	No Connection

A critical installation constraint is specified for Pin 1: **do not use Pin #1 on the socket as a tie post** for external circuit connections.

Heater and Maximum Ratings

The 117Z3 incorporates a coated unipotential cathode heated by a robust filament designed for direct line voltage. The heater and maximum ratings, interpreted according to the **RMA Standard MB-210**, are detailed below:

Heater Characteristics

- **Heater Voltage:** 117 V (AC or DC)
- **Heater Current:** 40 mA (0.04 A)
- **Calculated Heater Power:** 4.68 W (calculated as 117 V * 0.04 A)

Maximum Ratings

- **Maximum AC Plate Voltage (RMS):** 117 V
- **Maximum Peak Inverse Voltage:** 330 V
- **Maximum Steady-State Peak Plate Current:** 540 mA
- **Maximum Steady-State DC Output Current:** 90 mA
- **Maximum Transient Peak Plate Current:** 2.5 A
- **Maximum DC Heater-Cathode Voltage:**
  - **Cathode Positive:** 175 V
  - **Cathode Negative:** 100 V

Typical Operating Conditions and Characteristics

When operated as a standard half-wave rectifier, the typical operating parameters are:

Parameter	Typical Value
Heater Voltage	117 V
Heater Current	40 mA
AC Plate Supply Voltage (RMS)	117 V
DC Output Voltage	110 V
DC Output Current	90 mA
Effective Plate Supply Impedance	20 Ω
Input Condenser	30 µF

Tube Voltage Drop

The internal voltage drop of the 117Z3 is relatively low due to its close-spaced design. The tube voltage drop is rated at **22.5 Volts** when measured with the tube conducting a direct current of **180 mA**.

Performance Curves and Filter Design

The electrical performance of the 117Z3 is characterized by two primary sets of curves:

Plate Characteristics

The plate characteristic curve plots **Plate Milliamperes** against **DC Plate Volts** with a heater voltage of 117 Volts. The curve illustrates the diode's forward conduction behavior:

- At low plate voltages, current rises gradually.
- At a DC plate potential of approximately 22.5 V, the current reaches the rated 180 mA.

- The curve continues upward, showing that the tube can conduct up to approximately 550 mA as the DC plate voltage approaches 47 V.

Rectifier Operation Curves

The rectifier operation curves plot **DC Output Volts at Input to Filter** against **DC Load Milliamperes** under the following conditions:

- Heater Voltage: 117 V
- AC Supply Voltage: 117 V RMS
- Total Effective Plate-Supply Impedance: 15 Ohms
- Filter Type: Condenser Input to Filter

The curves compare three different input condenser values: **8 µF**, **16 µF**, and **40 µF**:

- **Capacitance Effect:** Larger input capacitances provide significantly higher DC output voltages across the entire load range. For example, at a DC load current of 90 mA:
  - An **8 µF** input condenser delivers a DC output voltage of approximately **80 V**.
  - A **16 µF** input condenser delivers approximately **95 V**.
  - A **40 µF** input condenser maintains a higher output of approximately **105 V to 110 V**.
- **Regulation:** All three curves exhibit a downward slope as load current increases, representing the typical regulation behavior of a half-wave rectifier circuit.

Related Designations and Comparisons

The 117Z3 shares close technical relationships with other line-voltage rectifiers:

- **117Z4GT:** The 117Z3 is described as having the same general characteristics as the **117Z4GT**. However, they differ in physical construction and basing. The 117Z4GT utilizes a larger glass envelope (9-5 outline) and a **5AA** base connection. Additionally, the 117Z4GT has a slightly higher maximum peak inverse voltage rating of **350 V** compared to the 117Z3's **330 V**, while sharing the same heater ratings (117 V, 40 mA) and typical tube voltage drop (22.5 V at 180 mA).
- **70L7GT:** The rectifier portion of the **70L7GT** (a multi-unit tube containing a rectifier and a beam power amplifier) is noted as being somewhat similar to the 117Z3.

Technical Summary

The **117Z3** is a miniature, 7-pin half-wave high-vacuum rectifier tube featuring a **117 V, 40 mA** heater designed for direct line-voltage operation. Housed in a compact **T-5 1/2** glass envelope with a **4CB** base connection, it provides a space-saving power supply solution for three-way portable receivers. With a maximum DC output current rating of **90 mA**, a maximum peak inverse voltage of **330 V**, and a low internal voltage drop of **22.5 V** at 180 mA, the 117Z3 delivers efficient rectification without requiring a power transformer or dropping resistor.

SOURCE OPERATING CONDITIONS

SOURCE PDF

195X General Electric Essential Characteristics

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

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Heater/filament voltage	**117 V**	Published heater/filament rating
Heater/filament current	**40 mA**	Published heater/filament rating
Tube voltage drop	**2.5 V**	At 180 mA DC

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
DC output current	**90 mA**	RectifierService
Peak inverse voltage	**330 V**	RectifierService
RMS supply voltage per plate	**117 V**	RectifierService
Peak current	**540 mA**	RectifierService

SOURCE DATA APPENDIX

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 · Rectifier

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
AC Plate Supply Voltage RMS	**117 V**	CapacitorInputFilter

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DC Output Voltage	**110 V**	CapacitorInputFilter
Effective Plate Supply Impedance	**20 ohm**	CapacitorInputFilter
Input Condenser	**30 uF**	CapacitorInputFilter
Designed For Service |In Three-Wway Portable Receivers. The	**117 V**	—
Cathode Positive	**175 V**	—
Cathode Negative	**100 V**	—
Max Imum Ac Plate Voltage [Rms]	**117 V**	—
Maximum Peak Inverse Voltage	**330 V**	—
Max Imum Steady-State Peak Plate Current	**540 mA**	—
Max Imum Steady-State Dc Output Current	**90 mA**	—
Ac Plate Supply Voltage(Rms]	**117 V**	—
Dc Output Current	**90 mA**	—
Effective Plate Supply [Mpedance	**20 ohm**	—

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
F =	**117 V**	—
Ef =	**117 V**	—
Ep =	**117 V**	—
Pedance =	**15 ohm**	—

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.

Section 1 · Rectifier

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
AC plate supply voltage RMS	**117 V**	HalfWaveRectifier
DC output voltage	**105 V**	HalfWaveRectifier
DC output current	**90 mA**	HalfWaveRectifier
Effective plate-supply impedance	**20 ohm**	HalfWaveRectifier
Input capacitor	**30 uF**	CapacitorInputFilter
Transient peak plate current	**2.5 A**	HalfWaveRectifier
Steady state peak plate current	**540 mA**	HalfWaveRectifier

Tube Tinker

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