



ELECTRONIC TUBE REFERENCE

19Y3

Rectifier - Half Wave electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

RECTIFIER

Half-wave high-vacuum rectifier for electronic power supplies. Its 19 V series-string heater and substantial current capability suit transformerless and general mains-operated equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9BM	BASE PINS	9
NOMINAL HEATER	19 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
PEAK INVERSE VOLTAGE	700 V
NOMINAL OUTPUT CURRENT	180 mA
FORWARD VOLTAGE DROP	15 V
MAXIMUM HEATER-CATHODE VOLTAGE	550 V
<i>Published voltage drop is 15 V at 180 mA dc.</i>	

19Y3 — Half-Wave High-Vacuum Rectifier

The **19Y3** is an indirectly heated half-wave high-vacuum rectifier designed primarily for series-connected heater strings in television and radio receivers. Housed in a miniature glass envelope with a nine-pin base, it provides reliable high-voltage rectification with moderate current capabilities.

Physical Construction and Basing

The 19Y3 features a miniature construction utilizing a T6½ glass bulb. It is designed to be mounted in any position. The physical dimensions of the tube are as follows:

Dimension	Value
Maximum Overall Length	78.5 mm (3 3/32 inches) or 3 1/16 inches
Maximum Seated Height	71.5 mm (2 13/16 inches)
Bulb Length (excluding tip)	2 7/16 inches ± 3/32 inch
Maximum Diameter	22.2 mm (7/8 inch)

The tube uses a small button noval 9-pin base with a JETEC 9BM basing designation. The pin connections, viewed from the underside of the base, are assigned as follows:

- **Pin 1:** Internal Connection (IC) / No Connection (NC)
- **Pin 2:** Internal Connection (IC) / No Connection (NC)
- **Pin 3:** Cathode
- **Pin 4:** Heater
- **Pin 5:** Heater
- **Pin 6:** Internal Connection (IC) / No Connection (NC)
- **Pin 7:** Internal Connection (IC) / No Connection (NC)
- **Pin 8:** Internal Connection (IC) / No Connection (NC)
- **Pin 9:** Plate (Anode)

Heater and Cathode Ratings

The 19Y3 is equipped with a coated unipotential cathode. The heater is specifically rated for series-string operation:

- **Heater Voltage:** 19 V
- **Heater Current:** 0.3 A (300 mA)

Due to its application in series-connected heater circuits, the tube is designed to withstand significant potential differences between the heater and the cathode. The maximum heater-cathode voltage ratings are defined as:

- **Peak Heater-Cathode Voltage (cathode positive with respect to heater):** 550 V
- **Peak Heater-Cathode Voltage (heater negative):** 550 V (applicable with a mains voltage of 220 V RMS or less, plus a maximum DC component of 250 V)
- **DC Component of Heater-Cathode Voltage:** 250 V
- **AC Component of Heater-Cathode Voltage:** 220 V (RMS)

Maximum Ratings and Operating Constraints

To ensure reliable operation and prevent damage to the tube, several limiting values must be observed during circuit design. These maximum ratings are specified for half-wave rectifier service:

- **Maximum Peak Inverse Plate Voltage:** 700 V
- **Maximum RMS Supply Voltage:** 250 V
- **Maximum DC Output Current:** 180 mA
- **Maximum Filter Input (Reservoir) Capacitor:** 60 μ F

When two tubes are operated in parallel, the maximum reservoir capacitor limit may be increased to 100 μ F, provided that each plate is connected with the minimum specified total effective supply impedance.

Minimum Supply Impedance Requirements

The tube requires a minimum total effective plate supply impedance (limiting resistance) to protect the cathode from excessive peak currents during turn-on and steady-state operation. This minimum resistance depends directly on the applied AC input voltage:

- **250 V RMS Input:** 100 Ω minimum
- **240 V RMS Input:** 80 Ω minimum
- **230 V RMS Input:** 60 Ω minimum
- **220 V RMS Input:** 40 Ω minimum
- **200 V RMS Input:** 30 Ω minimum
- **127 V RMS Input:** 0 Ω minimum

Typical Operating Conditions

The 19Y3 can be operated under several typical combinations of input voltage and supply impedance. In typical applications utilizing a 60 μ F filter input capacitor, the tube delivers a highly consistent DC output voltage across a range of standard mains supplies:

Parameter	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5
AC Input Voltage (RMS)	250 V	240 V	220 V	200 V	127 V
Filter Input Capacitor	60 μ F	60 μ F	60 μ F	60 μ F	60 μ F
Total Effective Plate Supply Impedance	125 Ω	105 Ω	65 Ω	30 Ω	0 Ω

Parameter	Condition 1	Condition 2	Condition 3	Condition 4	Condition 5
DC Output Current	180 mA	180 mA	180 mA	180 mA	180 mA
DC Output Voltage	195 V	195 V	195 V	195 V	127 V

At a standard DC output current of 180 mA, the typical tube voltage drop is 15 V.

Electrical Characteristics and Curves

The electrical behavior of the 19Y3 is characterized by its forward conduction and output regulation profiles.

Plate Conduction Characteristics

The plate current versus plate voltage relationship shows a typical diode forward conduction curve. Conduction begins immediately as voltage becomes positive:

- At **10 to 11 V** of plate potential, the current reaches approximately **100 mA**.
- At **18 V**, the current rises to approximately **200 mA**.
- At **20 V**, the current is approximately **270 mA**.
- At **25 V**, the current reaches **300 mA**.
- At **30 V**, the current is approximately **470 mA**, while reaching **400 mA** at approximately **31 V**.

Regulation and Output Performance

The DC output voltage versus DC output current curves demonstrate the regulation performance of the rectifier under load. As the output current increases from 0 to 200 mA, the output voltage exhibits a downward slope due to the internal resistance of the tube and the external supply impedance:

- With an AC input of **250 V RMS** and a supply impedance of **125 Ω**, the open-circuit output voltage starts at approximately **340 to 350 V** at 0 mA.
- As the load increases, the voltage drops, converging to exactly **195 V** at the rated **180 mA** output current.
- Similar convergence behavior is observed across the 200 V to 240 V input range when paired with their respective recommended supply impedances, ensuring a stable 195 V output at full load.

Related Designations

The [PY82](#) is a related rectifier type. In applications where two rectifiers are operated in parallel to achieve higher current capacity or larger reservoir capacitance (up to 100 µF), the operating guidelines and minimum limiting resistance per anode apply similarly to both the 19Y3 and the [PY82](#).

Technical Summary

The **19Y3** is a miniature, indirectly heated half-wave high-vacuum rectifier featuring a **19 V, 0.3 A** heater designed for series-connected operation. Housed in a **T6½** bulb with a **9-pin noval (JETEC 9BM)** base, it is capable of delivering up to **180 mA** of DC output current with a maximum peak inverse plate voltage of **700 V**. By adhering to the specified minimum plate supply impedance values (ranging from 0 Ω at 127 V to 100 Ω at 250 V), the tube provides reliable voltage rectification and stable output regulation in power supply applications.



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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum rms supply voltage	250 V	HalfWaveRectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Forward voltage drop test current	180 mA	ForwardVoltageDrop=15V



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Ferranti Technical Handbook

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

1961 FERRANTI TECHNICAL HANDBOOK

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
RMS anode voltage maximum	250 V	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Half-wave mains rectifier	—

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1999 Philips 0-D

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

1999 PHILIPS 0-D

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	19 V	Heater voltage 19 volts
Heater current	300 mA	Heater current 300 ma
Teak inverse plate voltage T0	0 V	Teak inverse plate voltage T00 volts
2.C. output current	180 mA	2.C. output current 180 ma
cathode positive with respect to heater)	550 V	cathode positive with respect to heater) 550 volts
D.C. component of heater- cathode voltage	250 V	D.C. component of heater-cathode voltage 250 volts
A.C.component of heater- cathode voltage	220 V	A.C.component of heater-cathode voltage 220 volts
A.C. input voltage 250 240 220 200	127 v	A.C. input voltage 250 240 220 200 127 voits
A.C. input voltage 250 240 220 200	127 V	A.C. input voltage 250 240 220 200 127 volts
plate supply 125 105 65 30	0 ohms	plate supply 125 105 65 30 0 ohms
D.C.output current 180 180 180 180	180 mA	D.C.output current 180 180 180 180 180 ma,
D.C.output voltage 195 195 195 195	127 V	D.C.output voltage 195 195 195 195 127 volts
creased to	100 pF	creased to 100 pF. In this case each plate
1:Input r.m.s. voltage	250 V	1:Input r.m.s. voltage = 250volts ; Rt = 1250 ; Cinp=60uF
2: Input r.m.s. voltage	240 V	2: Input r.m.s. voltage = 240 volts ; Rt = 10542 ; Cinp=60uF i
3: Input r.m.s. voltage	220 V	3: Input r.m.s. voltage =220volts iRt = 6502:Cinp=600F ;

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
4:Input r.m.s. voltage	200 V	4:Input r.m.s. voltage=200volts ;R _ç = 3042 iC _{inp} = 60uF
5:Input r.ms. voltage	127 V	5:Input r.ms. voltage= 127 volts ;R _t = 00} iC _{jnp} = 60UF

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filter input capacitor	60 pF	Filter input capacitor 60 pF 1)
capacitor 60 60 60 60	60 pF	capacitor 60 60 60 60 60 pF

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