



ELECTRONIC TUBE REFERENCE

12DF5

Rectifier - Full Wave electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

RECTIFIER-RECTIFIER

Twin-diode full-wave rectifier with separate cathodes and a center-tapped heater, suitable for capacitor-input and choke-input filter supplies. The separate cathodes provide flexible power-supply circuit arrangements.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9B5	BASE PINS	9
NOMINAL HEATER	12.6 V / 450 mA	PARALLEL HEATER	6.3 V / 900 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	1275 V
NOMINAL OUTPUT CURRENT	100 mA
PEAK FORWARD CURRENT	350 mA
FORWARD VOLTAGE DROP	40 V
MAXIMUM HEATER-CATHODE VOLTAGE	450 V
Representative row for identical repeated diode/triode sections.	

SECTION2 Rectifier	
PEAK INVERSE VOLTAGE	1275 V
NOMINAL OUTPUT CURRENT	100 mA
PEAK FORWARD CURRENT	350 mA
FORWARD VOLTAGE DROP	40 V
MAXIMUM HEATER-CATHODE VOLTAGE	450 V
<i>Physical rectifier section 2; electrical properties populated from the same published ratings applicable to the identical rectifier path.</i>	

12DF5 — Double Diode Miniature Full-Wave Rectifier

The **12DF5** is a miniature double diode full-wave rectifier designed for power supply applications requiring relatively high output current capabilities. It features a center-tapped heater, separate cathode connections, and a compact 9-pin miniature construction.

Construction, Physical Dimensions, and Pinout

The 12DF5 is constructed in a T-6 1/2 glass bulb with a miniature button 9-pin base (9BS). The tube is designed to be mounted in any position.

Physical Dimensions

- **Maximum overall length:** 2 3/8 inches
- **Maximum seated height:** 2 1/8 inches
- **Maximum diameter:** 7/8 inches

Heater and Cathode Design

The tube features a coated unipotential cathode and a center-tapped heater. This center-tapped configuration allows the heater to be operated in either a series or parallel arrangement:

- **Series connection:** 12.6 V at 0.45 A
- **Parallel connection:** 6.3 V at 0.9 A

The heater can be supplied with either AC or DC.

Pin Connections

The 9BS base provides separate connections for each cathode and plate, allowing independent operation of the two diode sections. The pinout configuration, viewed from the bottom of the tube, is as follows:

Pin	Connection
1	Cathode (Diode 1) [1K]
2	No Connection [NC]
3	Plate (Diode 2) [2P]
4	Heater [H]
5	Heater [H]
6	Plate (Diode 1) [1P]
7	No Connection [NC]
8	Cathode (Diode 2) [2K]
9	Heater Tap [HT]

Maximum Ratings

The 12DF5 is rated for rectifier service under the following absolute limits:

Parameter	Rating
Maximum peak inverse plate voltage	1275 V
Maximum AC plate supply voltage (each plate, RMS)	450 V
Maximum steady-state peak plate current (each plate)	350 mA
Maximum transient peak plate current (each plate)	2.0 A
Maximum AC heater-cathode voltage (RMS)	225 V
Maximum DC heater-cathode voltage (heater negative with respect to cathode)	450 V
Maximum DC output current	Subject to operating curves

Typical Operating Conditions and Characteristics

Under typical operating conditions, the 12DF5 exhibits an average tube voltage drop of 40 V when each plate is conducting 100 mA.

The tube can be operated in full-wave rectifier circuits using either capacitor-input or choke-input filters. Typical operating parameters for both configurations are detailed below:

Parameter	Capacitor Input	Choke Input
Heater Voltage (Series / Parallel)	12.6 V / 6.3 V	12.6 V / 6.3 V
Heater Current (Series / Parallel)	0.45 A / 0.9 A	0.45 A / 0.9 A
AC Plate Supply Voltage per Plate (RMS, no load)	325 V	450 V
Filter Input Condenser	40 μ F	—
Filter Input Choke	—	10 H
Effective Plate Supply Resistance per Plate	82 Ω	—
DC Output Current at Filter	100 mA	100 mA
DC Output Voltage at Filter	330 V	360 V

Rectifier Performance and Design Considerations

The operational limits of the 12DF5 are highly dependent on the choice of filter input and the operating plate supply voltage.

DC Output Current Limits

The maximum permissible DC output current varies with the applied AC plate supply voltage. For choke-input filters, the maximum DC output current remains constant at approximately 63 mA per plate for supply voltages up to 320 V RMS, after which it decreases to 50 mA per plate at 450 V RMS. For capacitor-input filters, the maximum DC output current is also 63 mA per plate at low voltages but begins to decrease earlier, falling to approximately 45 mA per plate at 350 V RMS and further to 31 mA per plate at 450 V RMS.

Rectification Efficiency

In capacitor-input configurations, the area of permissible operation is bounded by a steady-state peak plate current limit of 350 mA per plate. The relationship between rectification efficiency (defined as the ratio of DC output voltage at the filter input to the peak AC input voltage per plate without load) and the DC output current per plate defines the safe operating region.

Transient Protection and Plate Supply Resistance

To prevent damage from transient peak currents during startup or switching, a minimum effective plate supply resistance must be present in each plate circuit when using a capacitor-input filter. This resistance limits the transient peak plate current to a maximum of 2.0 A. The minimum required resistance increases with the AC plate supply voltage:

- At **200 V RMS** plate supply, the required minimum resistance is 0 Ω .
- At **300 V RMS** plate supply, the minimum resistance is approximately 75 Ω .
- At **400 V RMS** plate supply, the minimum resistance is approximately 140 Ω .
- At **450 V RMS** plate supply, the minimum resistance is approximately 170 Ω .

Technical Summary

The **12DF5** is a versatile, 9-pin miniature double diode full-wave rectifier featuring separate cathode connections and a center-tapped heater for 6.3 V or 12.6 V operation. With a peak inverse voltage rating of 1275 V and a steady-state peak plate current rating of 350 mA per plate, it is well-suited for compact power supply designs. When operating in typical full-wave rectifier circuits, it delivers a DC output of 100 mA at 330 V (capacitor input) or 360 V (choke input). Designers must ensure that the minimum effective plate supply resistance is maintained in capacitor-input circuits to limit transient currents to the rated 2.0 A maximum.

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 Per Plate	450 V	—
SteadyStatePeakPlateCurrentPerPlate	350 mA	—
TransientPeakPlateCurrentPerPlate	2 A	—
HeaterCathodeVoltageRMSMaximum	225 V	—

1961 TUNG SOL

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
AC Plate Supply Voltage Per Plate	450 V	—
AC Plate Supply Voltage Per Plate	450 V	—
SteadyStatePeakPlateCurrentPerPlate	350 mA	—
SteadyStatePeakPlateCurrentPerPlate	350 mA	—
TransientPeakPlateCurrentPerPlate	2 A	—
TransientPeakPlateCurrentPerPlate	2 A	—
HeaterCathodeVoltageRMSMaximum	225 V	—
HeaterCathodeVoltageRMSMaximum	225 V	—

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 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC plate supply voltage each plate RMS	450 V	FullWaveRectifier
Maximum transient peak plate current each plate	2 A	FullWaveRectifier
Maximum AC heater-cathode voltage RMS	225 V	FullWaveRectifier
Typical AC plate supply voltage	325 V	CapacitorInputFilter
Filter input capacitor	40 uF	CapacitorInputFilter
DC output current at filter	100 mA	CapacitorInputFilter
DC output voltage at filter	330 V	CapacitorInputFilter
Typical AC plate supply voltage	450 V	ChokeInputFilter
Filter input choke	10 H	ChokeInputFilter
DC output current at filter	100 mA	ChokeInputFilter
DC output voltage at filter	360 V	ChokeInputFilter

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC plate supply voltage each plate RMS	450 V	FullWaveRectifier
Maximum AC plate supply voltage each plate RMS	450 V	FullWaveRectifier
Maximum transient peak plate current each plate	2 A	FullWaveRectifier
Maximum transient peak plate current each plate	2 A	FullWaveRectifier

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum AC heater-cathode voltage RMS	225 V	FullWaveRectifier
Typical AC plate supply voltage	325 V	CapacitorInputFilter
Filter input capacitor	40 uF	CapacitorInputFilter
DC output current at filter	100 mA	CapacitorInputFilter
DC output voltage at filter	330 V	CapacitorInputFilter
Typical AC plate supply voltage	450 V	ChokeInputFilter
Filter input choke	10 H	ChokeInputFilter
DC output current at filter	100 mA	ChokeInputFilter
DC output voltage at filter	360 V	ChokeInputFilter

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