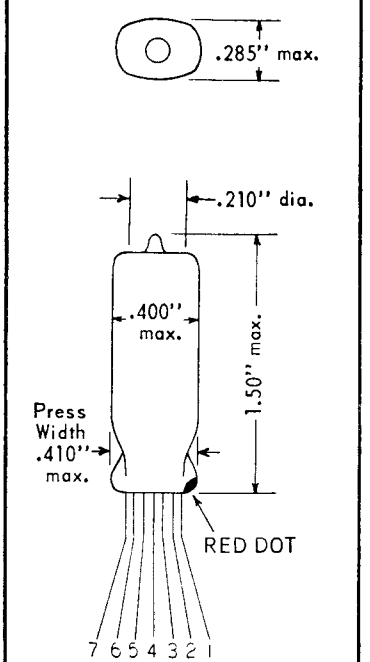
# TYPE CK5829WA

The CK5829WA is a heater-cathode type double diode of flat press-flat bulb subminiature construction, designed for use as a general purpose rectifier capable of operation in the UHF region and for use as a low current power rectifier. This type is characterized by low heater power, long life, and stable performance. It is designed for service where severe conditions of high temperature and mechanical shock or vibration are encountered. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.




## MECHANICAL DATA

ENVELOPE: T-2X3 Glass

BASE: None (0.016" tinned flexible leads. Length: 1.5" min. Spacing: 0.048" center-to-center)

TERMINAL CONNECTIONS: *(Red Dot is adjacent to lead 1)*

| | |
|---|---|
| Lead 1 Plate, Unit #2 | Lead 5 Heater |
| Lead 2 Cathode, Unit #2 | Lead 6 Plate, Unit #1 |
| Lead 3 Heater | Lead 7 Cathode, Unit #1 |
| Lead 4 Internal Shield | |

MECHANICAL RATINGS:

| | |
|---|---|
| Maximum Impact Acceleration (Shock Test - Note 2) | 450 G |
| Maximum Uniform Acceleration (Centrifuge Test - Note 3) | 1000 G |
| Maximum Vibrational Acceleration (100 Hour Fatigue Test - Note 4) | 2.5 G |
| Maximum Bulb Temperature | 220 °C |

MOUNTING POSITION: Any

## ELECTRICAL DATA

CAUTION-----To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are directly related to the degree that regulation of the heater voltage is maintained at its center rated value.

| RATINGS AND NORMAL OPERATION: | MIL-E-1B SYMBOL | ABSOLUTE MINIMUM | NORMAL TEST CONDITIONS (Note 6) | NORMAL OPERATION (Note 5) | ABSOLUTE MAXIMUM | MIL-E-1B UNITS |
|---|---|---|---|---|---|---|
| Heater Voltage (Note 7) | Ef: | 6.0 | 6.3 | 6.3 | 6.6 | V |
| Plate Supply Voltage (RMS) (each plate) | Epp/p: | ---- | 117 | 117 | 130 | Vac |
| Load Resistance | RL: | ---- | 14,000 | 14,000 | ---- | ohms |
| Filter Input Capacitance | CL: | ---- | 8 | 8 | ---- | μf |
| Peak Inverse Plate Voltage | epx: | ---- | ---- | ---- | 360 | v |
| Steady State Peak Plate Current (each plate) | ib/p: | ---- | ---- | 25 | 27.5 | ma |
| DC Output Current (each plate) | Io/p: | ---- | ---- | 5.0 | 5.0 | mAdc |
| Peak Transient Plate Current (each plate) | i surge: | ---- | ---- | ---- | 175 | ma |
| Heater-Cathode Voltage | Ehk: | ---- | ---- | ---- | 360 | V |

**CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)**

| TEST | CONDITIONS | AQL % | MIL-E-1B SYMBOL | MIN. | LAL | BOGIE | UAL | MAX. | MIL-E-1B UNITS |
|---|---|---|---|---|---|---|---|---|---|
| Continuity and Tap Shorts: | | 0.4 | | | | | | | |
| **ACCEPTANCE TEST GROUP A.** | **COMBINED AQL = 2.5%** | | | | | | | | |
| Heater Current: | | 0.65 | If: | 138 | ---- | 150 | ---- | 162 | mA |

Tentative Data

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RAYTHEON MANUFACTURING COMPANY

RECEIVING TUBE AND SEMICONDUCTOR OPERATIONS

September 15, 1955 NEWTON 58, MASS.

## ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

| TEST | CONDITIONS | AQL % | MIL-E-1B SYMBOL | MIN. | LAL | BOGIE | UAL | MAX. | MIL-E-1B UNITS |
|---|---|---|---|---|---|---|---|---|---|
| **ACCEPTANCE GROUP A (cont'd)** | | | | | | | | | |
| Heater-Cathode Leakage (1): | Ehk=+100 Vdc | 0.65 | Ihk (1): | ---- | ---- | ---- | 2 | 10 | μAdc |
| Heater-Cathode Leakage (2): | Ehk=-100 Vdc | 0.65 | Ihk (2): | ---- | ---- | ---- | -2 | -10 | μAdc |
| Operation: | Full Wave Operation | 0.65 | Io: | 9.0 | 9.5 | 10.0 | ---- | ---- | mAdc |
| Emission: | Es=6.5 Vdc | 0.65 | Is: | 15 | 16.5 | ---- | ---- | ---- | mAdc |
| **ACCEPTANCE TESTS GROUP B** | | | | | | | | | |
| Insulation of Electrodes: | Ef=6.3 V Ep-all=-300 Vdc | 2.5 | Rp-all: | 100 | ---- | ---- | ---- | ---- | Meg. |
| Subminiature Lead Fatigue Test: | | 2.5 | ---- | 4.0 | ---- | ---- | ---- | ---- | Arcs. |
| **ACCEPTANCE TESTS GROUP C** | | | | | | | | | |
| Plate Current: | Ebb=0: RP=40,000 ohms | 6.5 | Ib: | 2 | ---- | ---- | ---- | 20 | μAdc |
| Plate Current Difference Between Diodes: | Ebb=0; RP=40,000 ohms | 6.5 | △Ib: | ---- | ---- | ---- | ---- | 5 | μAdc |
| Capacitance: | Without Shield: 6.5 | | | | | | | | |
| | Plate #1 to Plate #2 | | C: | 0.06 | ---- | 0.09 | ---- | 0.12 | μμf |
| | Plate #1 to all others tied together (except Plate #2) | | C: | 1.9 | ---- | 2.7 | ---- | 3.5 | μμf |
| | Plate #2 to all others tied together (except Plate #1) | | C: | 1.7 | ---- | 2.5 | ---- | 3.3 | μμf |
| | Cathode #1 to all others tied together | | C: | 2.4 | ---- | 3.3 | ---- | 4.2 | μμf |
| | Cathode #2 to all others tied together | | C: | 2.8 | ---- | 3.7 | ---- | 4.6 | μμf |
| | Cathode #1 to Heater | | C: | 1.1 | ---- | 1.7 | ---- | 2.2 | μμf |
| | Cathode #2 to Heater | | C: | 1.3 | ---- | 1.9 | ---- | 2.5 | μμf |

| TEST | CONDITIONS | AQL % | MIL-E-1B SYMBOL | MIN. | MAX. | MIL-E-1B UNITS |
|---|---|---|---|---|---|---|
| **ACCEPTANCE TESTS GROUP D** | | | | | | |
| Shock: | Hammer Angle=30° (Note 2) | | | | | |
| Post Shock Limits | | | | | | |
| Heater-Cathode Leakage (1): | Ehk=+100 Vdc | | Ihk (1): | ---- | 15 | μAdc |
| Heater-Cathode Leakage (2): | Ehk=-100 Vdc | | Ihk (2): | ---- | -15 | μAdc |
| Operation: | | | Io: | 7.0 | ---- | mAdc |
| Fatigue: | 96 Hours (Note 4) | | | | | |
| Post Fatigue Limits | | | | | | |
| Heater-Cathode Leakage (1): | Ehk=+100 Vdc | | Ihk (1): | ---- | 15 | μAdc |
| Heater-Cathode Leakage (2): | Ehk=-100 Vdc | | Ihk (2): | ---- | -15 | μAdc |
| Operation: | | | Io: | 7.0 | ---- | mAdc |
| **ACCEPTANCE TESTS GROUP E** | | | | | | |
| Glass Strain (Thermal Shock): | | 10 | | | | |
| Visual and Mechanical Inspection | Major Combined | 0.4 | | | | |
| | Minor A Combined | 2.5 | | | | |
| | Minor B Per Item | 6.5 | | | | |
| **ACCEPTANCE LIFE TESTS** | | | | | | |
| Heater Cycling: | Ef=7.5 V; Eb=0 V; Ehk=140 Vac; 1 min. on, 1 min. off | | | 2000 | ---- | cycles |
| 100 Hour Survival Rate Life Test: | TA=room; Ehk=Eo+117 Vac | | | | | |
| 100 Hour Survival Rate Life Test End Points: | | | | | | |

## ELECTRICAL DATA (cont'd)

CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)(cont'd)

| TEST | CONDITIONS | AQL % | MIL-E-1B SYMBOL | MIN. | MAX. | MIL-E-1B UNITS |
|---|---|---|---|---|---|---|
| **ACCEPTANCE LIFE TESTS (cont'd)** | | | | | | |
| Inoperatives: | (Typical Sample Size=200 tubes) | 0.65 | | | | |
| Electrode Insulation: | | | Rp-all: | 50 | ----- | Meg. |
| Operation: | | | Io: | 7.0 | ----- | mAdc |
| Heater Current: | (Typical Sample Size=25 tubes) | 1.0 | If: | 138 | 162 | mA |
| Heater-Cathode Leakage (1): | | | Ihk (1): | 0 | 20 | μAdc |
| Heater-Cathode Leakage (2): | | | Ihk (2): | 0 | -20 | μAdc |

| TEST | CONDITIONS | AQL % | MIL-E-1B SYMBOL | MIN. | MAX. | MIL-E-1B UNITS | Max. defects per characteristic |
|---|---|---|---|---|---|---|---|
| 500 Hour Intermittent High Temperature Life Test (1): 500 Hour Intermittent High Temperature Life Test (1) End Points: | TA=175°C; Ehk=Eo+117 Vac (Typical Sample Size=20 tubes) (Total allowable combined defects=4 tubes) | | | | | | |
| Inoperatives: | | | | | | | 1 |
| Electrode Insulation: | | | Rp-all: | 50 | ----- | Meg. | 4 |
| Heater Current: | | | If: | 135 | 165 | mA | 4 |
| Heater-Cathode Leakage (1): | | | Ihk: (1) | 0 | 20 | μAdc | 2 |
| Heater-Cathode Leakage (2): | | | Ihk: (2) | 0 | -20 | μAdc | |
| Operation: | | | Io: | 7.0 | ----- | mAdc | 4 |
| 1000 Hour Intermittent Life Test (2): | TA=175°C | | | | | | |
| | Ehk=Eo+117 Vac | | | | | | |
| 1000 Hour Intermittent Life Test (2): | Limits not established. | | | | | | |
| | Read for same characteristics as for Life Test (1): | | | | | | |
| 1000 Hour Intermittent Life Test (2) End Points: | TA=Room | | | | | | |
| | Ehk=Eo+117 Vac | | | | | | |
| 5000 Hour Intermittent Life Test (3): | Limits not established | | | | | | |
| | Read for same characteristics as for Life Test (1). | | | | | | |
| 5000 Hour Intermittent Life Test (3) End Points: | | | | | | | |

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1B, "Inspection Instructions for Electron Tubes," and MIL-STD-105A.

Note 2: Test conditions and acceptance criteria per Shock Test procedures of MIL-E-1B basic specifications.

Note 3: Centrifuge Test with forces applied in any direction.

Note 4: Test conditions and acceptance criteria per Fatigue Test procedures of MIL-E-1B basic specifications.

Note 5: These normal values represent conditions of which control of reliability may be expected.

Note 6: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

Note 7: For most applications the performance will not be adversely affected by ±5% heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.

RAYTHEON

RELIABLE SUBMINIATURE DOUBLE DIODE

AVERAGE PLATE CHARACTERISTICS