20-AMPERE SILICON RECTIFIERS

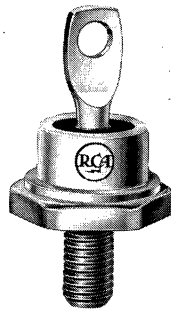
1N248C–1N250C
1N1195A–1N1198A

File No. 6

Applications:

In power supplies for mobile equipment, dc-to-dc converters, battery chargers, dynamic braking systems, aircraft and missile power supplies, high-power transmitter and rf-generator power supplies, machine-tool controls, dc-motor power supplies, and in other heavy-duty industrial and military equipment.

Stud-Mounted Types for Industrial and Military Power Supplies



JEDEC DO-5

- available in reverse-polarity versions: 1N248-RC, 1N249-RC, 1N250-RC, 1N1195-RA, 1N1196-RA, 1N1197-RA, 1N1198-RA
- designed to meet stringent military mechanical and environmental specifications
- diffused-junction process — exceptional uniformity of characteristics
- hermetic seals
- welded construction
- low thermal resistance
- low leakage current
- low forward voltage drop
- JEDEC DO-5 outline
- high output current: up to

84 amperes — 6 rectifiers in 3-phase, full-wave bridge circuit

60 amperes — 4 rectifiers in single-phase full-wave bridge circuit

HALF-WAVE RECTIFIER SERVICE

Maximum Ratings:

Absolute-Maximum Values for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load

	1N248-C	1N249-C	1N250-C	1N1195-A	1N1196-A	1N1197-A	1N1198-A
PEAK INVERSE VOLTS	55	110	220	300	400	500	600
RMS SUPPLY VOLTS	39	77	154	212	284	355	424
DC BLOCKING VOLTS	50	100	200	300	400	500	600
FORWARD AMPERES:							
Average DC:							
At 150° C case temperature. .	20	20	20	20	20	20	20
At other temperatures	See Rating Chart I						
PEAK RECURRENT AMPERES . . .	90	90	90	90	90	90	90
PEAK SURGE AMPERES:♦							
(One-half cycle, sine wave) . . .	350	350	350	350	350	350	350
(For more than one cycle). . .	See Rating Chart IV						
CASE TEMPERATURE:							
Operating and Storage .	← -65 to +175° C →						

Characteristics at 150° C Case Temperature

Max. Forward Voltage Drop● (Volts) . . .	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Max. Reverse Current● (Ma.)	3.8	3.6	3.4	3.2	2.5	2.2	1.5

♦ Superimposed on device operating within the maximum specified voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal equilibrium conditions.

● At maximum peak inverse voltage, average forward amperes = 20, and averaged over one complete cycle.

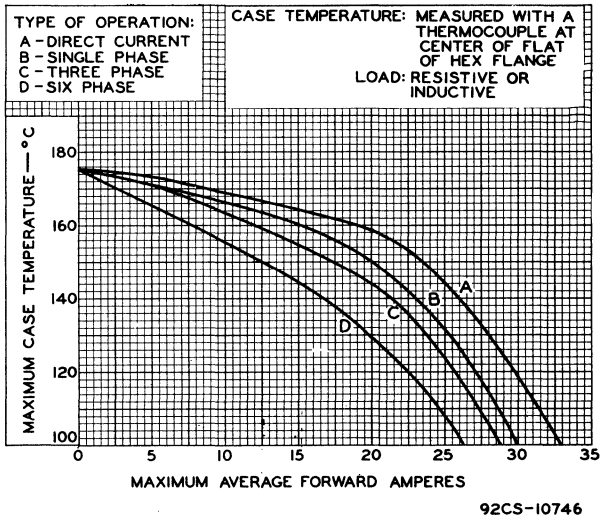


Fig. 1 - Rating Chart 1 for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
1N248C–1N250C, 1N1195A–1N1198A 5/66
Reprinted from 1N248C–1N250C, 1N1195A–1N1198A 1/61

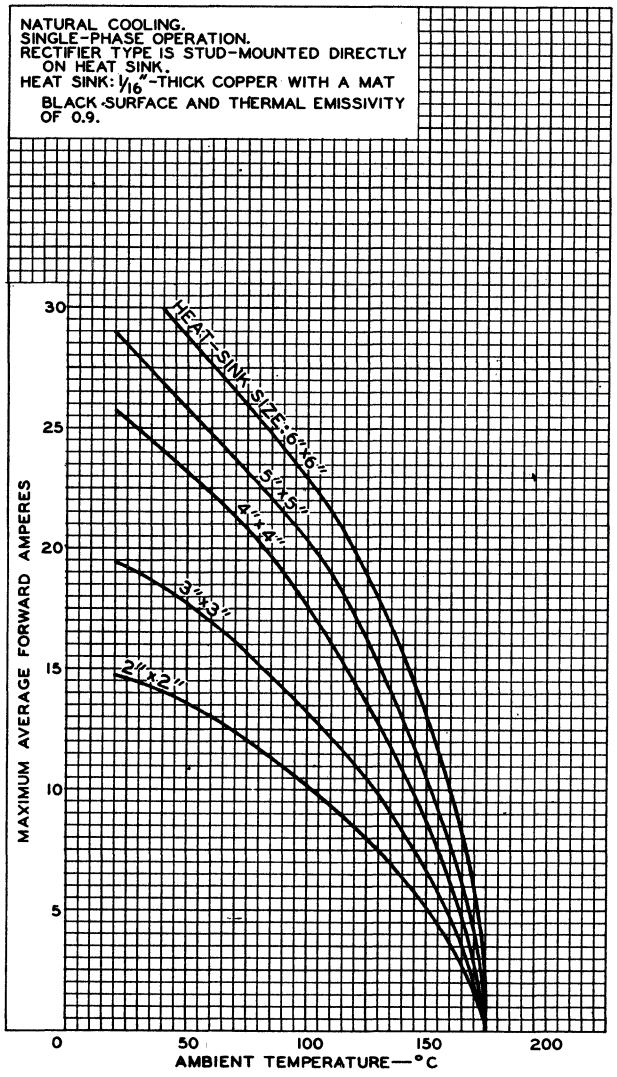


Fig. 2 - Rating Chart II for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

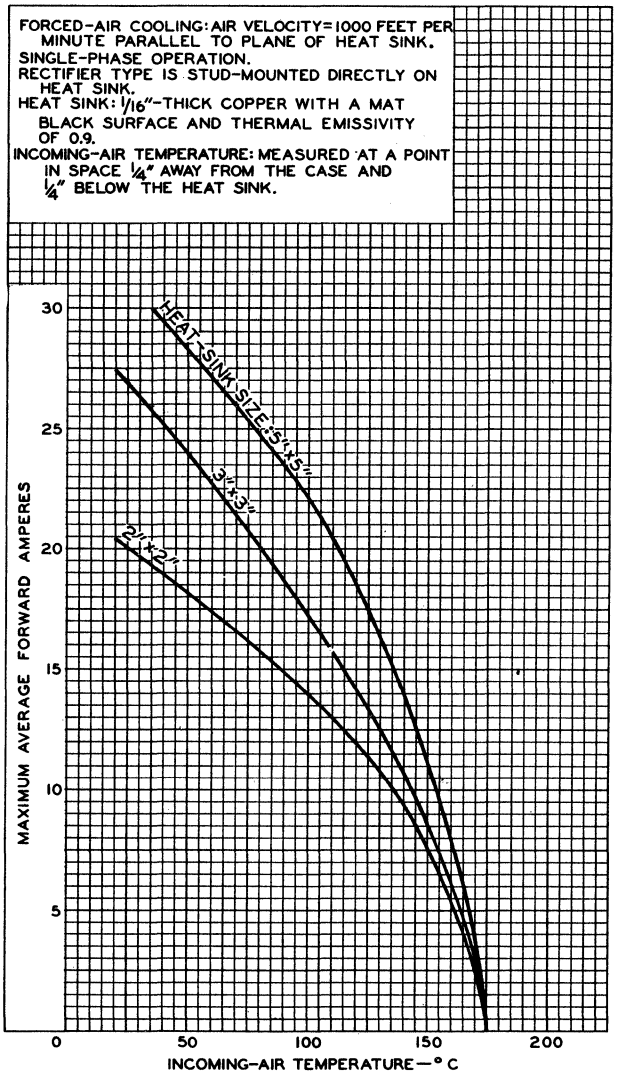


Fig. 3 - Rating Chart III for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

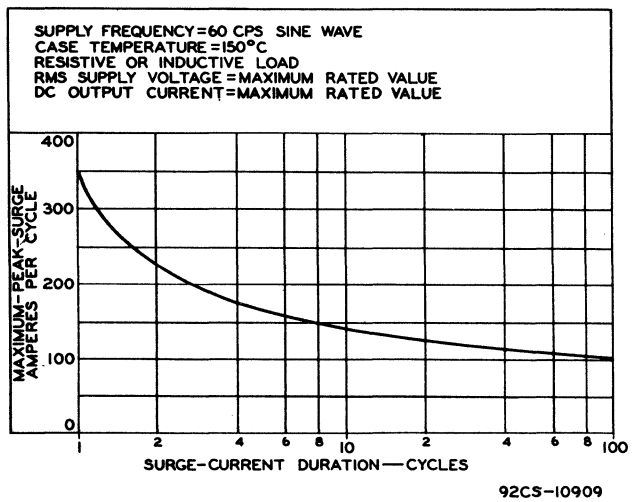


Fig. 4 - Rating Chart IV for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

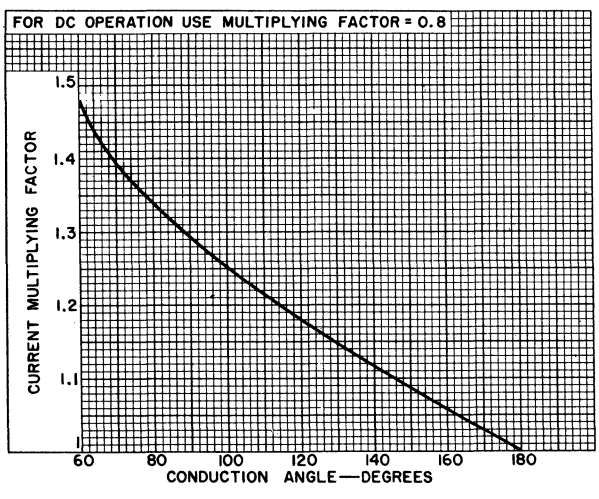


Fig. 5 - Chart V for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

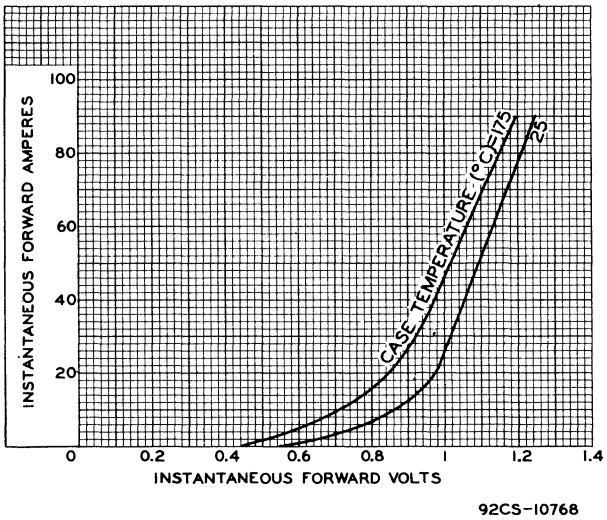


Fig. 6 – Typical Forward Characteristics for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

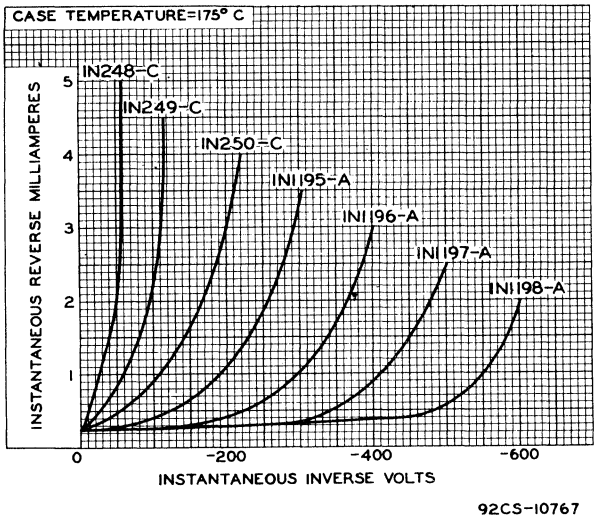


Fig. 7 – Typical Reverse Characteristics for Types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, 1N1198-A, and corresponding reverse-polarity versions.

OPERATING CONSIDERATIONS

Because these rectifiers may operate at voltages which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the rectifier.

The recommended installation torque is 26 to 36 inch-pounds applied to a 1/4-28 UNF-2A hex nut assembled on thread.

The applied torque during installation should not exceed 75 inch-pounds.

Use of Rating Charts

Chart V is used in conjunction with Rating Charts II and III to determine maximum average forward amperes per rectifier unit for polyphase operation and dc operation. The procedure for the use of Chart V is as follows:

Step 1: From Chart V determine the current-multiplying factor for the applicable conduction angle. (For dc operation use current multiplying factor of 0.8.)

Step 2: Divide the required load current in amperes by the number of rectifier circuit branches — as shown in the following Table — to determine average forward amperes per rectifier element.

Type of Operation	No. of Circuit Branches
Single-Phase, Full-Wave:	
Center-Tapped	2
Bridge	2
Three-Phase:	
Wye	3
Double Wye	6
Bridge	6
Six-Phase Star	6

Step 3: Multiply average forward amperes established in Step 2 by the current multiplying factor established in Step 1 to determine adjusted average forward amperes per rectifier element, for use with Rating Chart II or Rating Chart III.

Step 4: Using the product obtained in Step 3, determine from Rating Chart II or Rating Chart III either (a) the maximum allowable incoming-air temperature or ambient temperature for a given heat-sink size, or (b) the minimum heat-sink size for a given incoming-air temperature or ambient temperature.

Example

Conditions:

(a) Three-phase, half-wave operation; conduction angle = 120°
(b) Desired output current = 45 amperes
(c) Forced-air cooling; incoming-air temperature = 90° C

Problem:

Determine minimum heat-sink size.

Procedure:

Step 1: From Chart V, the current multiplying factor for a conduction angle of 120° is 1.18.

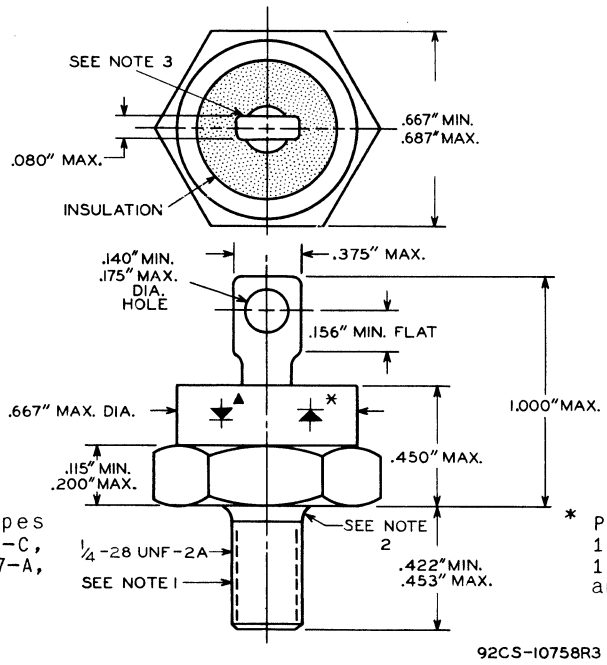
Step 2: For three-phase half-wave operation the number of rectifier circuit branches is three. The average forward current through each rectifier element is, therefore, 45/3, or 15 amperes.

Step 3: Multiplying average forward amperes (15) obtained in Step 2 by the current multiplying factor (1.18) obtained in Step 1 yields 17.7 adjusted average forward amperes.

Step 4: From Rating Chart III, for forced-air cooling, the minimum heat-sink size for the conditions shown in Step 3 is 3" x 3".

DIMENSIONAL OUTLINE

JEDEC DO-5



▲ Polarity symbol for types 1N248-C, 1N249-C, 1N250-C, 1N1195-A, 1N1196-A, 1N1197-A, and 1N1198-A.

* Polarity symbol for types 1N248-RC, 1N249-RC, 1N250-RC, 1N1195-RA, 1N1196-RA, 1N1197-RA, and 1N1198-RA.

NOTE 1: MUST WITHSTAND TORQUE OF 30 INCH-POUNDS APPLIED TO 1/4-28 UNF-2A NUT ASSEMBLED ON THREAD.

NOTE 2: ANGULAR ORIENTATION OF THIS TERMINAL UNDEFINED.

NOTE 3: DEVICE CAN BE USED IN ANY POSITION.

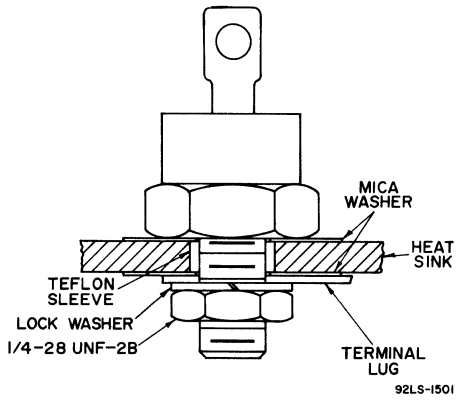


Fig. 8 - Suggested Mounting Arrangement.

RCA DIFFUSED JUNCTION SILICON RECTIFIERS

1N440B 1N443B
1N441B 1N444B
1N442B 1N445B

RCA-1N440B, 1N441B, 1N442B, 1N443B, 1N444B, and 1N445B are hermetically sealed silicon rectifiers of the diffused-junction type, designed for use in power supplies of magnetic amplifiers, radio receivers, dc blocking circuits, power supplies, and other military and industrial applications.

These devices have dc forward-current ratings to 0.75 ampere at an ambient temperature of 25°C, and peak reverse voltage ratings of 100, 200, 300, 400, 500 and 600 volts, respectively.

The 1N440B through 1N445B feature (1) sturdy and compact mount structure, (2) axial leads for flexibility of circuit connections, (3) welded hermetic seals—every unit is pressure-tested to assure protection against moisture and contamination, (4) superior junction formation made possible by a diffusion process with very precise controls. In addition, these devices are designed to meet the following stringent environmental, mechanical and life requirements of prime importance in military applications: (a) special temperature-cycling tests to assure stable performance over the entire operating temperature range, (b) special coating to provide protection against the effects of severe environmental conditions,

DIFFUSED-JUNCTION SILICON RECTIFIERS

FLANGED-CASE AXIAL-LEAD TYPES

For Power-Supply Applications In Industrial and Military Electronic Equipment

FEATURES:

- **stringent environmental and mechanical tests to insure dependable performance in industrial and military applications**
- **hermetically sealed JEDEC DO-1 package**
- **wide operating-temperature range:**
  1N440B, 1N441B, 1N442B, 1N443B -65 to +165°C
  1N444B, 1N445B -65 to +150°C

RECTIFIER SERVICE

Absolute-Maximum Ratings, for a Supply Frequency of 60 Hz:

	1N440B	1N441B	1N442B	1N443B	1N444B	1N445B	UNITS
PEAK REVERSE VOLTAGE	100	200	300	400	500	600	V
RMS SUPPLY VOLTAGE							
For resistive or inductive loads	70	140	210	280	350	420	V
DC REVERSE (BLOCKING) VOLTAGE	100	200	300	400	500	600	V
FORWARD CURRENT:[a]							
DC:							
at T_A = 50°C	750	750	750	750	650	650	mA
at T_A = 100°C	500	500	500	500	425	400	mA
at T_A = 150°C	250	250	250	250	0	0	mA
Peak, Repetitive	3.5	3.5	3.5	3.5	3.5	3.5	A
Surge, One-Cycle	15	15	15	15	15	15	A
TEMPERATURE RANGE (Ambient):							
Operating	165	165	165	165	150	150	°C
Storage	← -65 to +175 →						°C

[a] For maximum dc forward current values at ambient temperatures other than those specified, See Rating Chart Fig. 1.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
1N440B thru 1N445B 9-66
Supersedes issue dated 5-59

Characteristics, at Ambient Temperature (T_A) = 25°C:

CHARACTERISTICS	1N440B	1N441B	1N442B	1N443B	1N444B	1N445B	UNITS
Maximum Forward Voltage Drop (DC) at full load current.	1.5	1.5	1.5	1.5	1.5	1.5	V
Maximum Reverse Current (DC) at maximum peak reverse voltage	0.3	0.75	1	1.5	1.75	2	μA
Maximum Reverse Current (averaged over 1 complete cycle of supply voltage): at maximum rated PRV, T_A = 150°C	100	100	200	200	200	200	μA

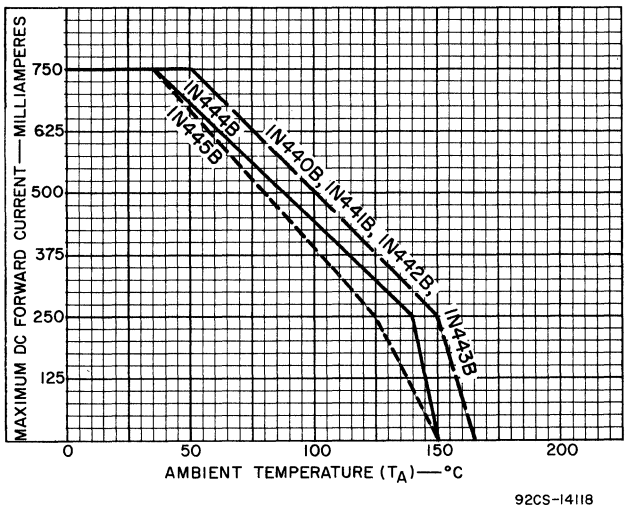


Fig. 1 - Rating Chart for RCA-1N440B through 1N445B.

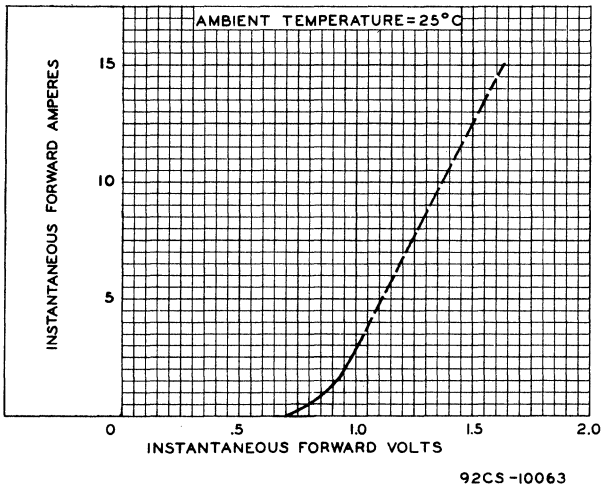


Fig. 2 - Typical Forward Voltage and Current Characteristic for RCA-1N440B through 1N445B.

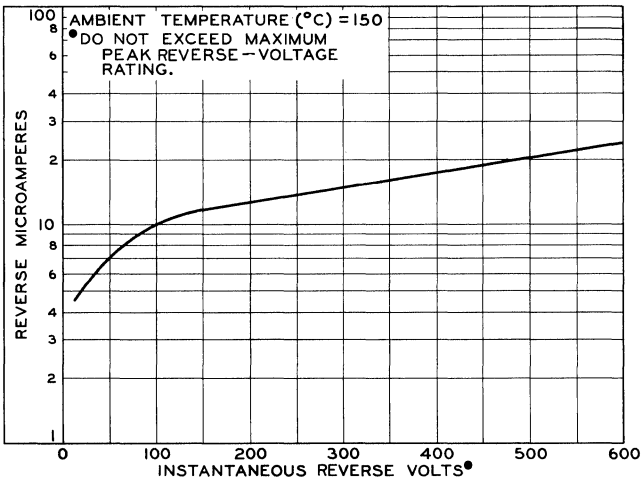


Fig.3 - Typical Dynamic Reverse Characteristic for RCA-1N440B through 1N445B.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

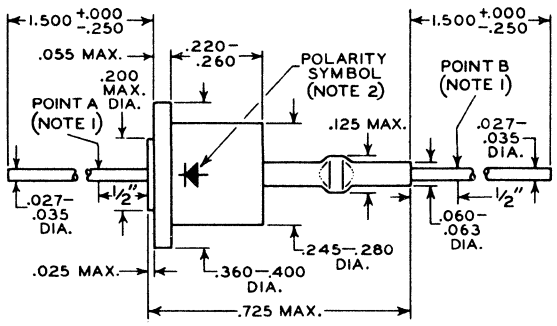
The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

The *flexible leads* of these rectifiers are usually soldered to the circuit elements. It is desirable in all soldering operations to provide some slack or an expansion elbow in the leads to prevent excessive tension on the leads. It is important during the soldering operation to avoid excessive heat in order to prevent possible damage to the rectifiers. To absorb some of the heat, grip the flexible lead of the rectifier between the case and the soldering point with a pair of pliers.

When dip soldering is employed in the assembly of printed circuitry using these rectifiers, the temperature of the solder should not exceed 255° C for a maximum immersion period of 10 seconds. Furthermore, the leads should not be dip soldered beyond points A and B indicated on the Dimensional Outline Drawing.

Because the metal cases of these rectifiers may operate at voltages which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the rectifier. It is recommended that these rectifiers be mounted on the underside of the chassis.

DIMENSIONAL OUTLINE
for Types
1N440B, 1N441B, 1N442B, 1N443B, 1N444B, 1N445B



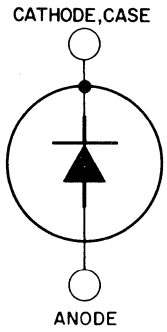
DIMENSIONS IN INCHES

92CS-9728RI

NOTE 1: DO NOT DIP SOLDER BEYOND POINTS A AND B.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

TERMINAL DIAGRAM
for Types
1N440B, 1N441B, 1N442B, 1N443B, 1N444B, 1N445B



RCA DIFFUSED JUNCTION SILICON RECTIFIERS

1N536 1N539
1N537 1N540
1N538 1N547
1N1095

RCA-1N536, 1N537, 1N538, 1N539, 1N540, 1N547, and 1N1095 are hermetically sealed silicon rectifiers of the diffused-junction type. They are specifically designed for use in power supplies of industrial and military equipment capable of operating at dc forward currents up to 750 milliamperes and temperatures ranging from -65° to +165°C.

These silicon rectifiers have peak reverse voltage ratings from 50 to 600 volts, and a maximum reverse current of 5 microamperes at rated peak reverse voltage and ambient temperature of 25°C.

These silicon rectifiers are designed to meet the following stringent environmental, mechanical, and life requirements of prime importance in military applications: (1) sturdy and compact mount structure, (2) axial leads for flexibility of circuit connections, (3) welded hermetic seals — every unit pressure tested to assure protection against moisture and contamination, (4) superior junction formation made possible by a diffusion process with very precise controls, (5) special temperature cycling tests to assure stable performance over the entire operating temperature range, and (6) special coating to provide against effects of severe environmental conditions.

DIFFUSED-JUNCTION SILICON RECTIFIERS

Flanged-Case Axial-Lead Types

For Power-Supply Applications In Industrial and Military Electronic Equipment

FEATURES:

- **wide operating-temperature range -65 to +165°C.**
- **stringent environmental, and mechanical tests to insure dependable performance in Industrial and Military Applications.**
- **peak reverse voltages from 50 to 600 V.**
- **max. dc forward current = 250 mA at T_A = 150°C .**
- **hermetically sealed JEDEC DO-1 package.**

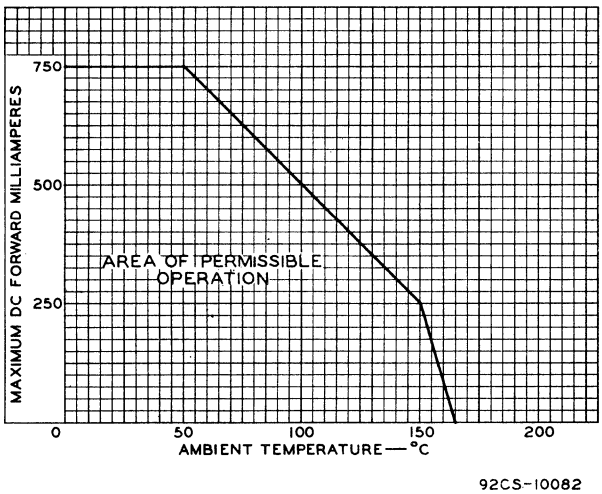


Fig.1 - Rating Chart

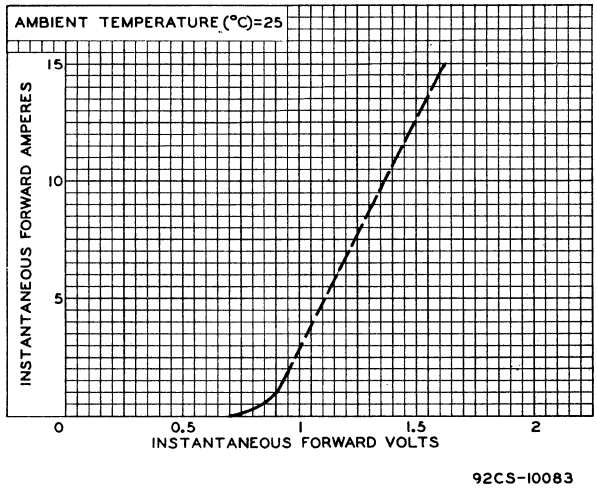


Fig.2 - Typical Forward Voltage and Current Characteristic.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
1N536 through 1N540, 1N547, 1N1095 9-66
Supersedes issue dated 5-59

RECTIFIER SERVICE

Absolute-Maximum Ratings, for a Supply Frequency of 60 Hz:

	1N536	1N537	1N538	1N539	1N540	1N1095	1N547	UNITS
PEAK REVERSE VOLTAGE	50	100	200	300	400	500	600	V
RMS SUPPLY VOLTAGE For resistive or inductive loads	35	70	140	210	280	350	420	V
DC REVERSE (BLOCKING) VOLTAGE	50	100	200	300	400	500	400	V
FORWARD CURRENT*: DC: For resistive or inductive loads:								
T_A = 50°C	750	750	750	750	750	750	750	mA
T_A = 100°C	500	500	500	500	500	500	500	mA
T_A = 150°C	250	250	250	250	250	250	250	mA
SURGE, one cycle	15	15	15	15	15	15	15	A
OPERATING FREQUENCY	100	100	100	100	100	100	100	kHz
TEMPERATURE RANGE (Ambient):								
Operating	← -65 to +165 →							°C
Storage	← -65 to +175 →							°C

* For maximum dc forward current values at ambient temperatures other than those specified, see Rating Chart, Fig.1.

CHARACTERISTICS, at Ambient Temperature (T_A) = 25°C:

	1N536	1N537	1N538	1N539	1N540	1N547	1N1095	UNITS
Maximum Forward Voltage Drop (DC) at a load current of 500 mA	1.1	1.1	1.1	1.1	1.1	1.2	1.2	V
Maximum Reverse Current (DC) at maximum peak reverse voltage	5	5	5	5	5	5	5	μA
Maximum Reverse Current (Averaged over 1 complete cycle of supply voltage): at maximum rated PRV, T_A = 150°C	0.4	0.4	0.3	0.3	0.3	0.35	0.3	mA

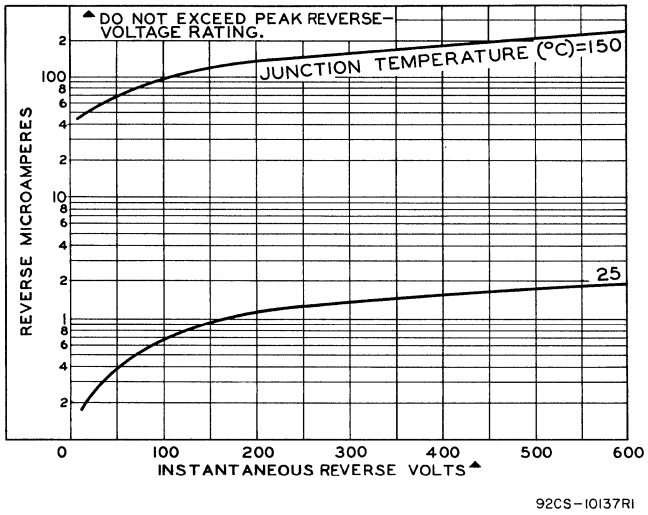


Fig.3 - Typical Dynamic Reverse Characteristics.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

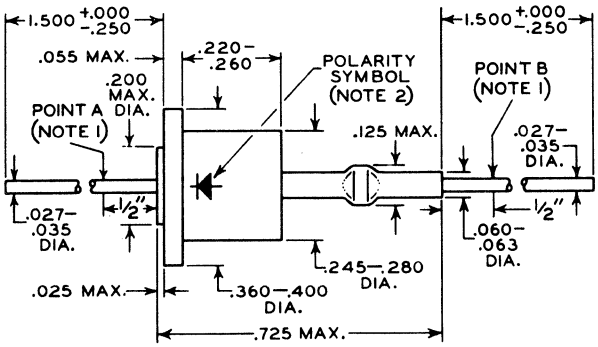
A *surge-limiting impedance* should always be used in series with the rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

The flexible leads of the 1N536 to 1N540, 1N1095 and 1N547 are usually soldered to the circuit elements. It is desirable in all soldering operations to provide some slack or an expansion elbow in the leads to prevent excessive tension on the leads. It is important during the soldering operation to avoid excessive heat in order to prevent possible damage to the rectifiers. To absorb some of the heat, grip the flexible lead of the rectifier between the case and the soldering point with a pair of pliers.

When dip soldering is employed in the assembly of printed circuitry using these rectifiers, the temperature of the solder should not exceed 255° C for a maximum immersion period of 10 seconds. Furthermore, the leads should not be dip soldered beyond points A and B indicated on the Outline Drawing.

Because the cases of these rectifiers may operate at potentials which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the rectifier. It is recommended that these rectifiers be mounted on the underside of the chassis.

DIMENSIONAL OUTLINE



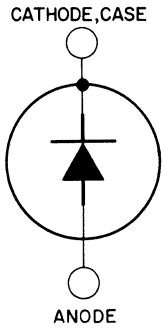
DIMENSIONS IN INCHES

92CS-9728RI

NOTE 1: DO NOT DIP SOLDER BEYOND POINTS A AND B.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

TERMINAL DIAGRAM



40-AMPERE SILICON RECTIFIERS

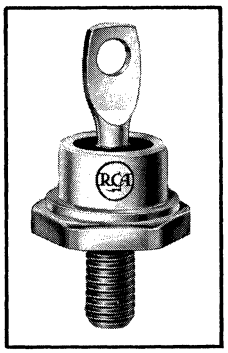
1N1183A 1N1184A
1N1186A–1N1190A

File No. 38

RCA-1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, and 1N1190A are 40-ampere, diffused-junction silicon rectifiers suitable for use in generator-type power supplies for mobile electrical and electronic equipment, in dc-to-dc converters and battery chargers, and in power supplies for aircraft, marine, and missile equipment, transmitters, and rf generators. They are also extremely useful in power supplies for dc motors, in welding and electroplating equipment, in dc-blocking applications, in magnetic amplifiers, and in a wide variety of other applications in heavy-duty industrial and military equipment.

These rectifiers are conservatively rated to permit continuous operation at maximum ratings in applications requiring high reliability under severe operating conditions. In addition, they utilize a special zirconium-alloy mounting stud which can withstand installation torques of up to 50 inch-pounds—a feature of significant value in applications involving mechanical shock and vibration.

Stud-Mounted Types for Industrial and Military Power Supplies



JEDEC DO-5

- low thermal resistance
- low forward voltage drop
- welded construction
- low leakage current
- JEDEC DO-5 Outline
- high output current:
  up to 160 amperes — 6 rectifiers in 3-phase, full-wave bridge circuit
  up to 120 amperes — 4 rectifiers in single-phase, full-wave bridge circuit
- available in reverse-polarity versions: 1N1183RA, 1N1184RA, 1N1186RA, 1N1187RA, 1N1188RA, 1N1189RA, 1N1190RA
- extra-high-strength zirconium-alloy mounting stud—withstands installation torque of up to 50 inch-pounds
- designed to meet stringent military mechanical and environmental specifications
- diffused-junction process — exceptional uniformity and stability of characteristics
- hermetic seals

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings *for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load*

	1N1183A	1N1184A	1N1186A	1N1187A	1N1188A	1N1189A	1N1190A
PEAK REVERSE VOLTS	50	100	200	300	400	500	600
RMS SUPPLY VOLTS	35	70	140	212	284	355	424
DC BLOCKING VOLTS	50	100	200	300	400	500	600
AVERAGE FORWARD AMPERES:							
At 150° C case temperature	40						
At other case temperatures	See Fig. 1						
PEAK SURGE AMPERES:[a]							
One-half cycle, sine wave	800						
For more than one cycle	See Fig. 5						
PEAK RECURRENT AMPERES	195						
CASE TEMPERATURE RANGE:							
Operating and storage	-65 to +200° C						
Characteristics:							
Max. Forward Voltage Drop (Volts)[b]	0.65						
Max. Reverse Current (Ma):							
Dynamic[b]	2.5	2.5	2.5	2.5	2.2	2	1.8
Static[c]	0.015						
Max. Thermal Resistance, Junction-to-Case	1° C/watt						

[a] Superimposed on device operating within the maximum specified voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

[b] Average value for one complete cycle, at maximum peak reverse voltage, maximum average forward amperes = 40, and case temperature (°C) = 150.

[c] DC value, at maximum peak reverse voltage and case temperature (°C) = 25.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.
Trademark(s) ® Registered
Marca(s) Registrada(s)
Printed in U.S.A.
1N1183A–1N1184A, 1N1186A–1N1190A 5/66
Reprinted from 1N1183A–1N1184A, 1N1186A–1N1190A 7/63

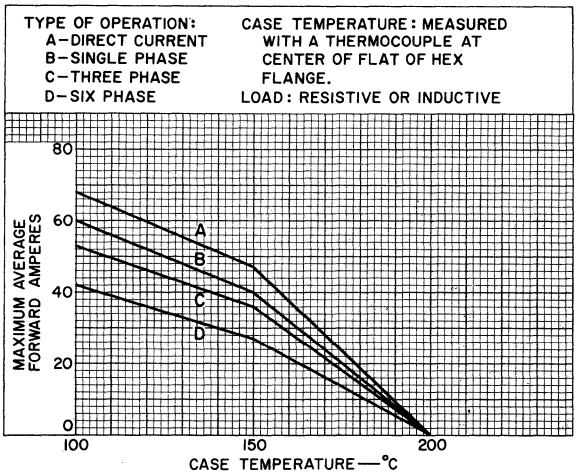


Fig. 1 - Rating Chart for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

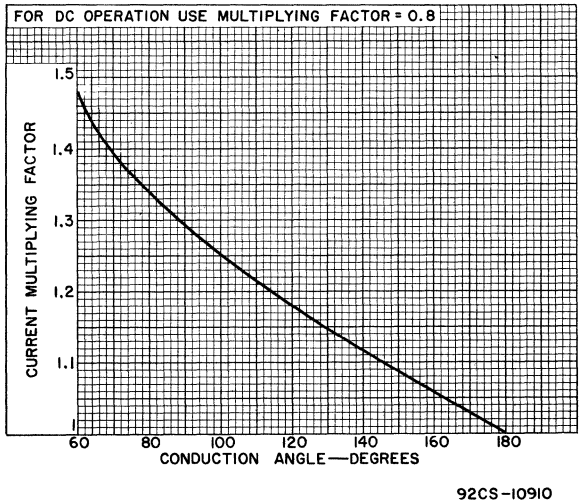


Fig. 2 - Current-Multiplying-Factor Chart for Polyphase and DC operation for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

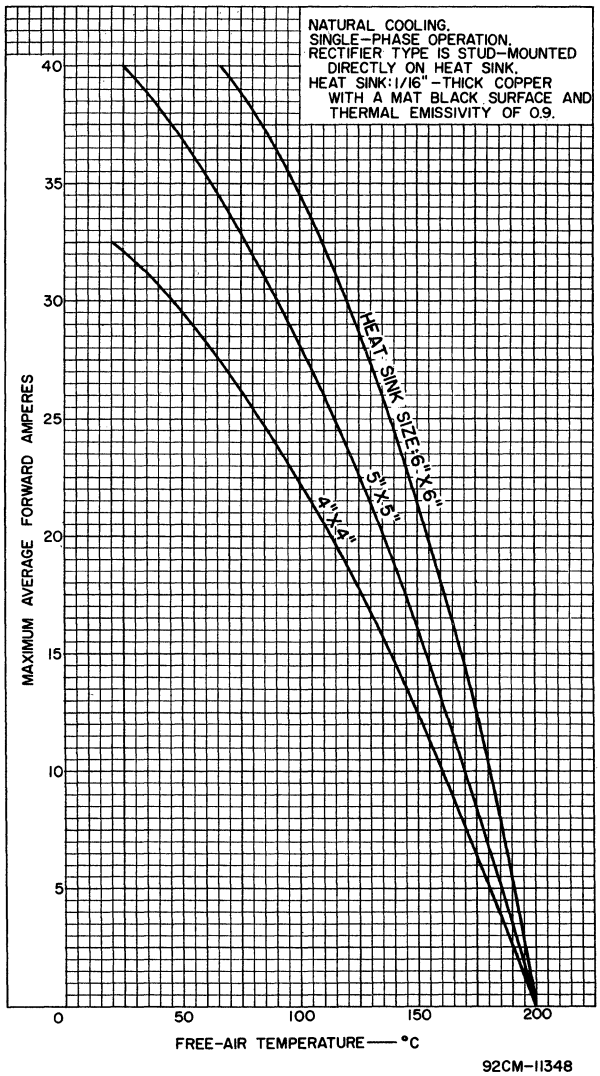


Fig. 3 - Operation Guidance Chart for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

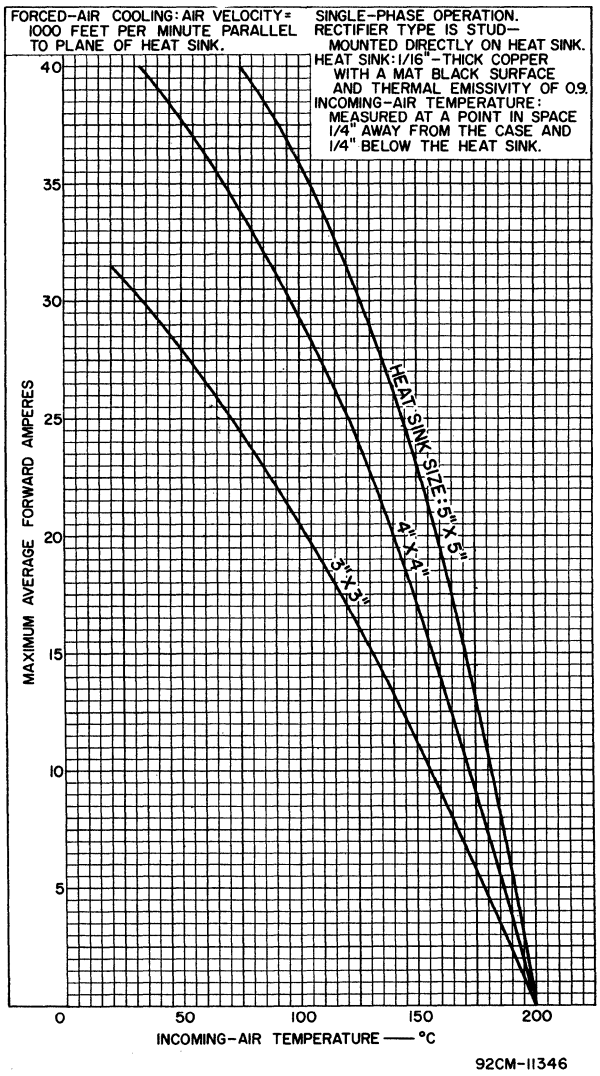


Fig. 4 - Operation Guidance Chart for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

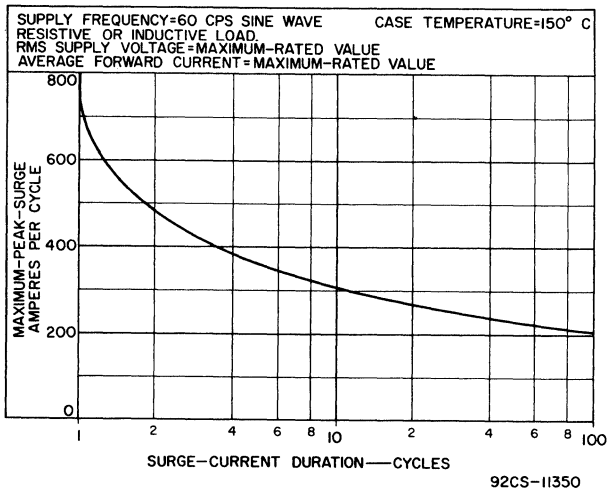


Fig. 5 - Surge-Current Rating Chart for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

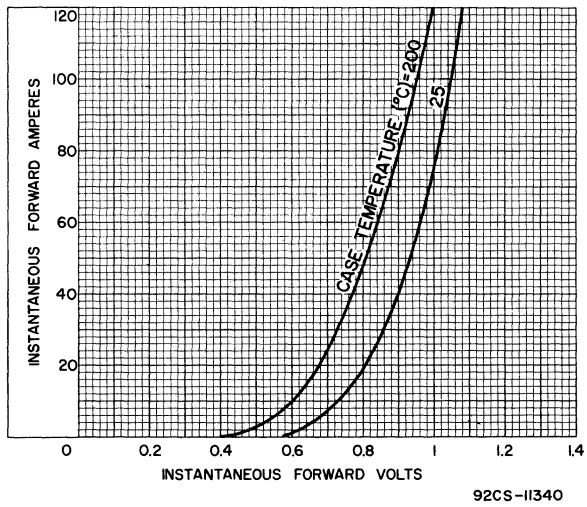


Fig. 6 - Typical Forward Characteristics for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

OPERATING CONSIDERATIONS

Because these rectifiers may operate at voltages which are dangerous, care should be taken in the design of equipment to prevent personnel from coming in contact with the rectifier.

The recommended torque is 26 to 36 inch-pounds applied to 1/4-28 UNF-2B hex nut assembled on thread.

The applied torque during installation should not exceed 50 inch-pounds.

Use of Rating Charts and Guidance Charts for Heat-Sink Operation.

The fundamental consideration in the application of these silicon rectifiers is the current—case-temperature relationship established in Fig. 1. Figs. 3 and 4 are guidance charts for operation of these devices with heat sinks in single-phase circuits.

Fig. 2 is used in conjunction with Fig. 3 and Fig. 4 to determine maximum heat-sink sizes or maximum average forward amperes per rectifier cell for polyphase operation and dc operation. The procedure for the use of Figs. 2, 3, and 4 is as follows:

Step 1: From Fig. 2 determine the current-multiplying factor for the applicable conduction angle. (For dc operation use current-multiplying factor of 0.8).

Step 2: Divide the required load current in amperes by the number of current paths — as shown in the following Table — to determine average forward amperes per rectifier cell.

Type of Operation	No. of Current Paths
Single-Phase, Full-Wave:	
Center-Tapped	2
Bridge	2
Three-Phase:	
Wye	3
Double Wye	6
Bridge	3
Six-Phase Star	6

Step 3: Multiply average forward amperes established in Step 2 by the current-multiplying factor established in Step 1 to determine adjusted average forward amperes per rectifier cell, for use with Fig. 3 or Fig. 4.

Step 4: Using the product obtained in Step 3, determine from Fig. 3 or Fig. 4 either (a) the maximum allowable free-air temperature or incoming-air temperature for a given heat-sink size, or (b) the minimum heat-sink size for a given free-air temperature or incoming-air temperature.

Example

Conditions:

(a) Three-phase, half-wave (wye) operation, conduction angle = 120°

(b) Desired output current = 90 amperes

(c) Forced-air cooling; incoming-air temperature = 90° C

Problem:

Determine minimum heat-sink size.

Procedure:

Step 1: From Fig. 2, the current multiplying factor for a conduction angle of 120° is 1.18.

Step 2: For three-phase half-wave operation the number of current paths is three. The average forward current through each rectifier cell is, therefore, 90/3, or 30 amperes.

Step 3: Multiplying average forward amperes (30) obtained in Step 2 by the current-multiplying factor (1.18) obtained in Step 1 yields 35.4 adjusted forward amperes.

Step 4: From Fig. 4, for forced-air cooling, the minimum heat-sink size for the conditions shown is 5" x 5".

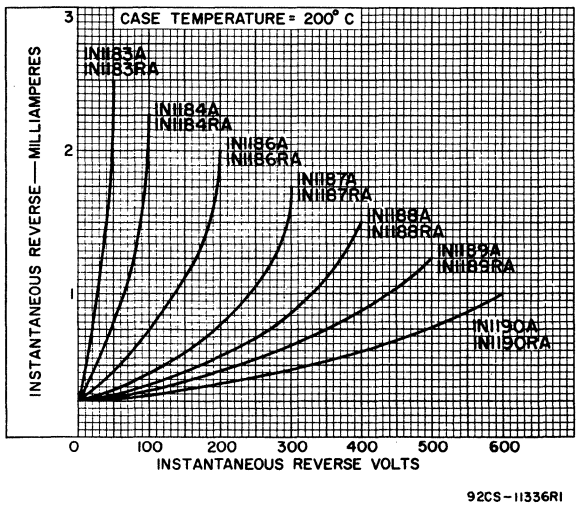
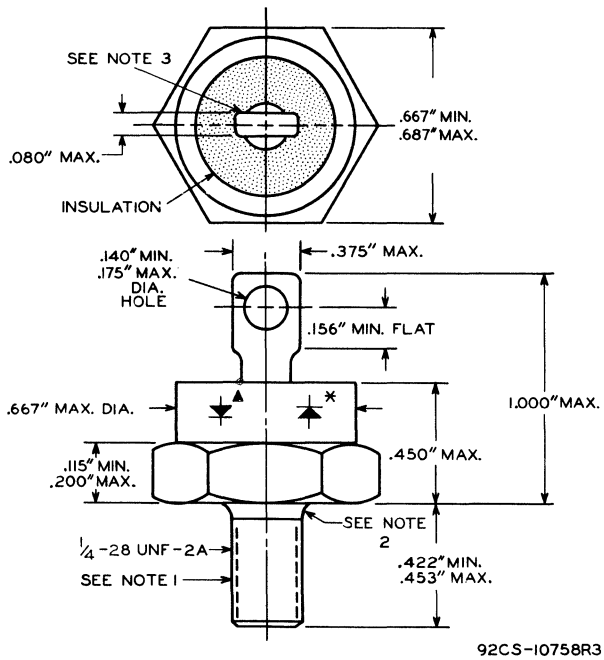


Fig. 7 - Typical Reverse Characteristics for Types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, 1N1190A, and corresponding reverse-polarity versions.

DIMENSIONAL OUTLINE
JEDEC DO-5



▲ Polarity symbol for types 1N1183A, 1N1184A, 1N1186A, 1N1187A, 1N1188A, 1N1189A, and 1N1190A.

* Polarity symbol for types 1N1183RA, 1N1184RA, 1N1186RA, 1N1187RA, 1N1188RA, 1N1189RA, and 1N1190RA.

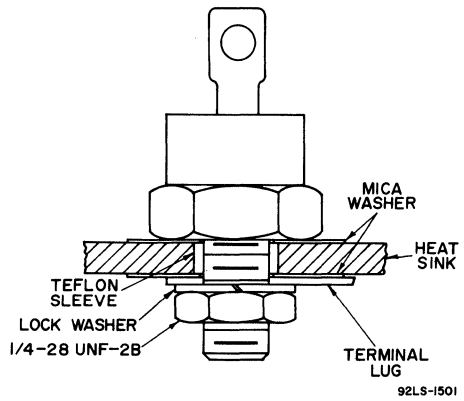


Fig. 8 - Suggested Mounting Arrangement for applications requiring that rectifier be electrically insulated from heat sink. For direct mounting omit mica and teflon washers. (Mounting components of the type shown are furnished with each rectifier. The increase in thermal resistance with these mounting components is approximately 1.5° C/watt.)

NOTE 1: MUST WITHSTAND TORQUE OF 30 INCH-POUNDS APPLIED TO 1/4-28 UNF-2B NUT ASSEMBLED ON STUD THREAD.

NOTE 2: DIAMETER OF UNTHREADED PORTION: 0.249" MAXIMUM, 0.220" MINIMUM.

NOTE 3: ANGULAR ORIENTATION OF THIS TERMINAL UNDEFINED.

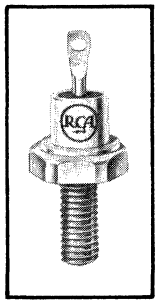
12-AMPERE SILICON RECTIFIERS

1N1199A
1N1200A
1N1202A-1N1206A

File No. 20

Used in generator-type power supplies for mobile equipment; in dc-to-dc converters, battery chargers, and machine-tool controls; in power supplies for aircraft, marine, and missile equipment, for dc motors, transmitters, rf generators, welding equipment, and electroplating systems; in dc-blocking service, and in a wide variety of other applications in military and industrial equipment.

Stud-Mounted Types for Industrial and Military Power Supplies



JEDEC DO-4

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings *for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load*

	1N1199-A	1N1200-A	1N1202-A	1N1203-A	1N1204-A	1N1205-A	1N1206-A
PEAK REVERSE VOLTS	50	100	200	300	400	500	600
TRANSIENT REVERSE VOLTS, NON-REPETITIVE (5-msec max. duration and case temperature range of 0 to 200° C)	100	200	350	450	600	700	800
RMS SUPPLY VOLTS	35	70	140	212	284	355	424
DC BLOCKING VOLTS	50	100	200	300	400	500	600
AVERAGE FORWARD AMPERES:							
At 150° C case temperature	12	12	12	12	12	12	12
At other case temperatures	← See Fig. 1 →						
PEAK RECURRENT AMPERES	50	50	50	50	50	50	50
PEAK SURGE AMPERES:●							
One-half cycle, sine wave	240	240	240	240	240	240	240
For one or more than one cycle	← See Fig. 4 →						
CASE-TEMPERATURE RANGE: Operating and Storage	← -65 to +200° C →						
Characteristics:							
Max. Forward Voltage Drop▲ (Volts)	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Max. Reverse Current (Ma.):							
Dynamic▲	3	2.5	2	1.75	1.5	1.25	1
Static●	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Max. Thermal Resistance, Junction-to-Case	← 2°C/Watt →						

- **available in reverse-polarity versions: 1N1199-RA, 1N1200-RA, 1N1202-RA, 1N1203-RA, 1N1204-RA, 1N1205-RA, 1N1206-RA**
- **designed to meet stringent military mechanical and environmental specifications**
- **diffused-junction process — exceptional uniformity and stability of characteristics**
- **hermetic seals**
- **welded construction**
- **low thermal resistance**
- **low leakage current**
- **low forward voltage drop**
- **JEDEC DO-4 outline**
- **high output current:**
  - **up to 30 amperes — 6 rectifiers in 3-phase, full-wave bridge circuit**
  - **up to 24 amperes — 4 rectifiers in single-phase full-wave bridge circuit**

● Superimposed on device operating within the maximum voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

▲ Average value for one complete cycle at case temperature of 150° C and at maximum rated voltage and average forward current.

● DC value, at maximum peak reverse voltage, and case temperature (°C) = 25.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
1N1199A, 1N1200A, 1N1202A–1N1206A 5/66
Reprinted from 1N1199A, 1N1200A, 1N1202A–1N1206A 10/61

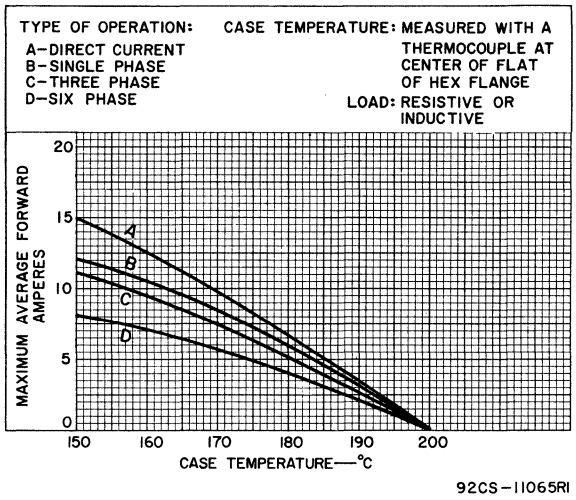


Fig. 1 - Rating Chart for all Types.

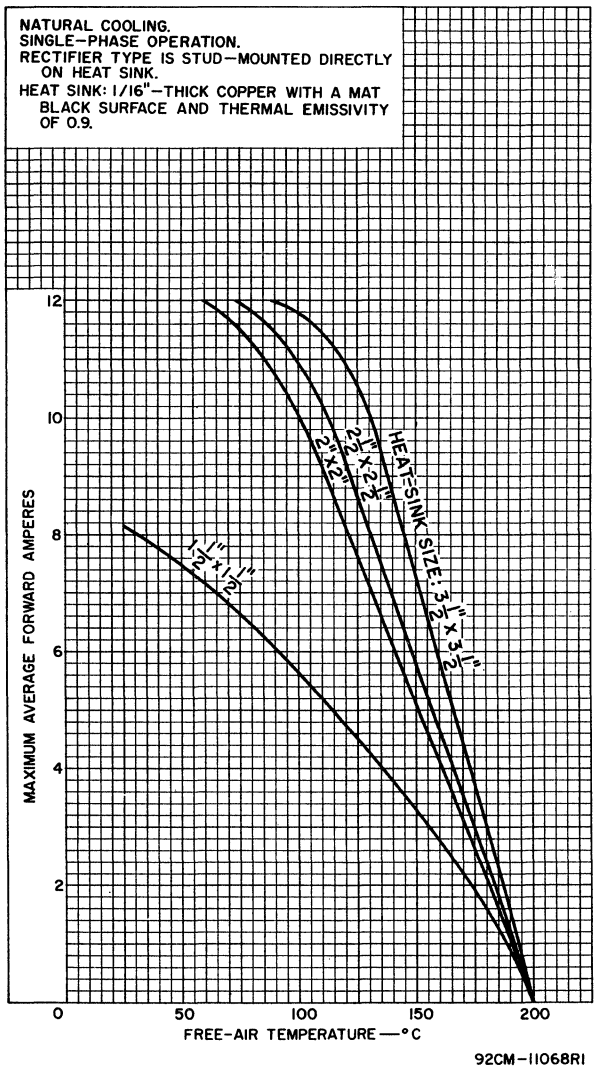


Fig. 2 - Operation Guidance Chart for all Types and corresponding reverse-polarity versions.

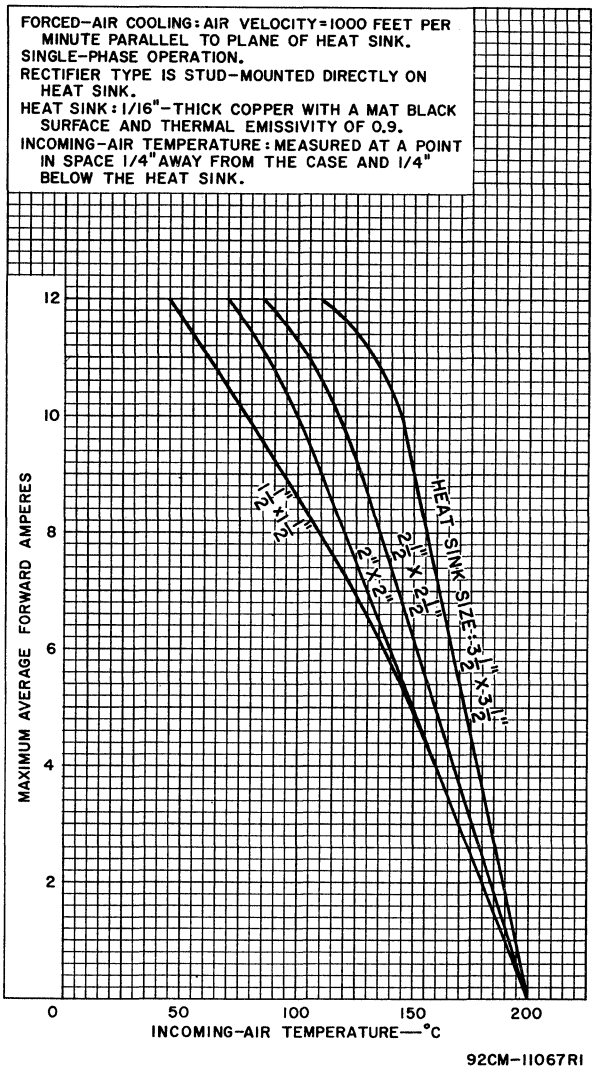


Fig. 3 - Operation Guidance Chart for all Types and corresponding reverse-polarity versions.

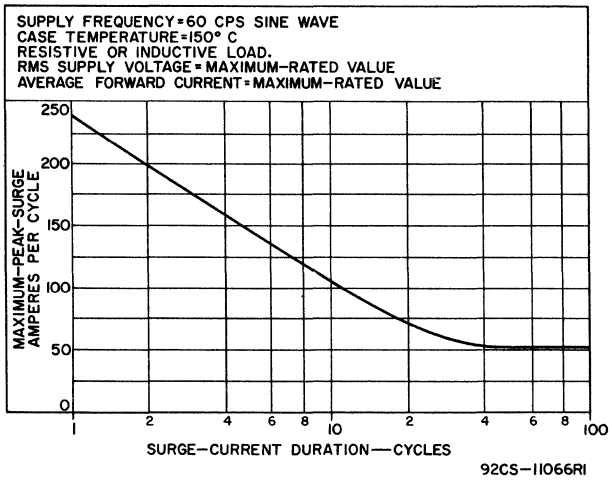


Fig. 4 - Peak-Surge-Current Rating Chart for all Types and corresponding reverse-polarity versions.

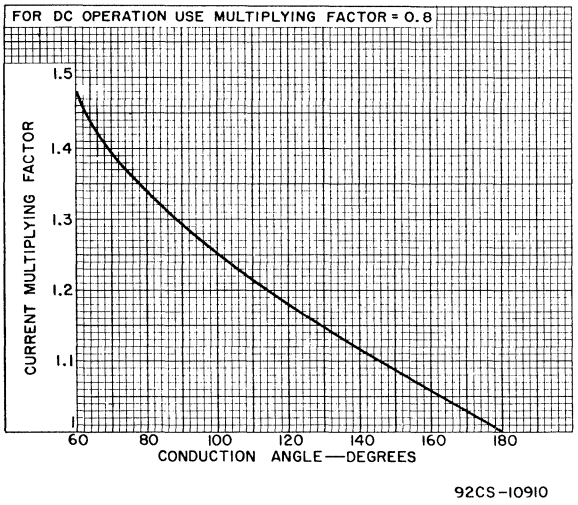


Fig. 5 - Current-Multiplying-Factor Chart for Polyphase and DC operation for all Types and corresponding reverse-polarity versions.

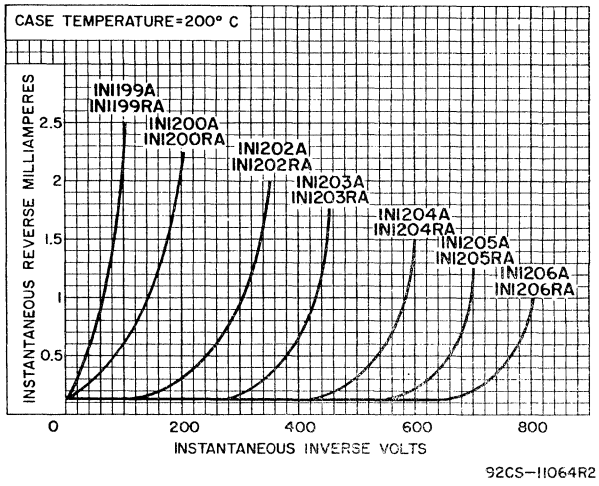


Fig. 7 - Typical Reverse Characteristics for all Types and corresponding reverse-polarity versions.

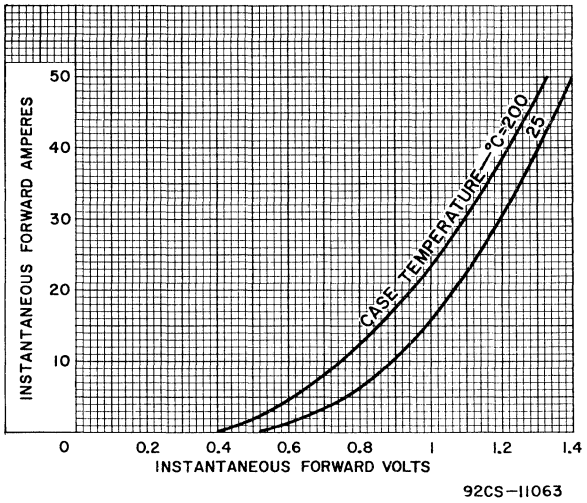


Fig. 6 - Typical Forward Characteristics for all Types and corresponding reverse-polarity versions.

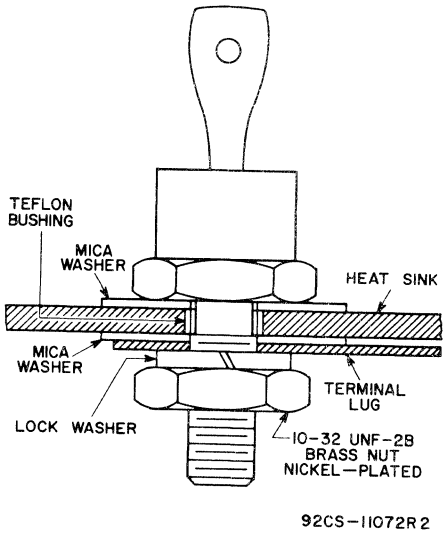


Fig. 8 - Suggested Mounting Arrangement. (Mounting components of the type shown are furnished with each rectifier cell. The increase in thermal resistance with these mounting components is approximately 3 °C/watt.)

OPERATING CONSIDERATIONS

Because these rectifiers may operate at voltages which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the rectifier.

The recommended installation torque is 15 to 20 inch-pounds applied to a 10/32 UNF-2B hex nut assembled on stud thread.

The applied torque during installation should not exceed 25 inch-pounds.

Use of Rating Charts and Operation Guidance Chart.

Fig. 5 is used in conjunction with Fig. 2 and Fig. 3 to determine maximum average forward amperes per rectifier cell for polyphase operation and dc operation. The procedure for the use of Fig. 5 is as follows:

Step 1: From Fig. 5 determine the current-multiplying factor for the applicable conduction angle. (For dc operation use current multiplying factor of 0.8.)

Step 2: Divide the required load current in amperes by the number of rectifier circuit branches — as shown in the following Table — to determine average forward amperes per rectifier cell.

Type of Operation	No. of Circuit Branches
Single-Phase, Full-Wave:	
Center-Tapped	2
Bridge	2
Three-Phase:	
Wye	3
Double Wye	6
Bridge	3
Six-Phase Star	6

Step 3: Multiply average forward amperes established in Step 2 by the current-multiplying factor established in Step 1 to determine adjusted average forward amperes per rectifier cell, for use with Fig.2 or Fig.3.

Step 4: Using the product obtained in Step 3, determine from Fig.2 or Fig.3 either (a) the maximum allowable incoming-air temperature or ambient temperature for a given heat-sink size, or (b) the minimum heat-sink size for a given incoming-air temperature or ambient temperature.

Example

Conditions:

(a) Three-phase, half-wave (wye) operation, conduction angle = 120°

(b) Desired output current = 30 amperes

(c) Forced-air cooling; incoming-air temperature = 90° C

Problem:

Determine minimum heat-sink size.

Procedure:

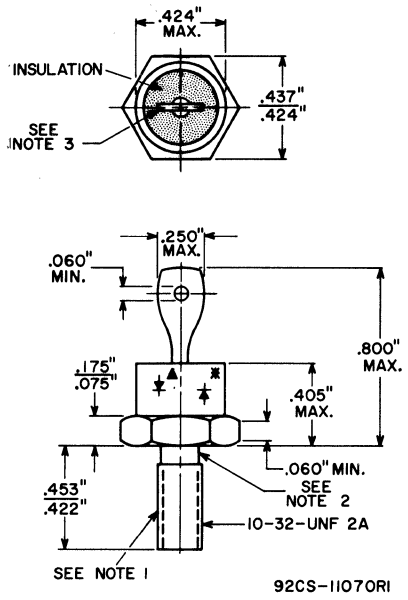
Step 1: From Fig.5, the current multiplying factor for a conduction angle of 120° is 1.18.

Step 2: For three-phase half-wave operation the number of rectifier circuit branches is three. The average forward current through each rectifier cell is, therefore, 30/3, or 10 amperes.

Step 3: Multiplying average forward amperes (10) obtained in Step 2 by the current-multiplying factor (1.18) obtained in Step 1 yields 11.8 adjusted forward amperes.

Step 4: From Fig.3, for forced-air cooling, the minimum heat-sink size for the conditions shown is 2-1/2" x 2-1/2".

DIMENSIONAL OUTLINE
JEDEC DO-4



▲ Polarity symbol for types 1N1199-A, 1N1200-A, 1N1202-A, 1N1203-A, 1N1204-A, 1N1205-A, and 1N1206-A.

* Polarity symbol for types 1N1199-RA, 1N1200-RA, 1N1202-RA, 1N1203-RA, 1N1204-RA, 1N1205-RA, and 1N1206-RA.

Note 1: Normal installation torque is 15 to 20 inch-pounds applied to a 10/32 UNF-2B hex nut assembled on stud thread. The applied torque during installation should not exceed 25 inch-pounds.

Note 2: Diameter of unthreaded portion: 0.189" max., 0.163" min.

Note 3: Angular orientation of this terminal is undefined.

Note 4: The device may be operated in any position.

6-AMPERE SILICON RECTIFIERS

1N1341B 1N1342B
1N1344B-1N1348B

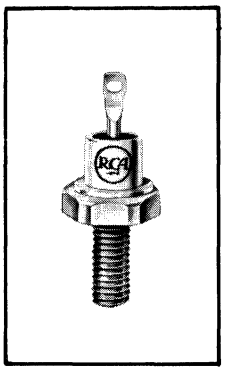
File No. 58

These silicon rectifiers are intended for use in generator-type power supplies for mobile equipment; in dc-to-dc converters, power supplies for dc motors, transmitters, rf generators, welding equipment, and electroplating systems; in dc-blocking service, magnetic amplifiers, and in a wide variety of other applications in industrial equipment.

Stud-Mounted

Types for Industrial

Power Supplies



JEDEC DO-4

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings *for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load*

	1N1341B	1N1342B	1N1344B	1N1345B	1N1346B	1N1347B	1N1348B
PEAK REVERSE VOLTS	50	100	200	300	400	500	600
TRANSIENT REVERSE VOLTS, NON-REPETITIVE (5-msec max. duration and case temperature range of 0 to 200° C.	100	200	350	450	600	700	800
RMS SUPPLY VOLTS	35	70	140	212	284	355	424
DC BLOCKING VOLTS	50	100	200	300	400	500	600
AVERAGE FORWARD AMPERES: At 150° C case temperature	6	6	6	6	6	6	6
At other case temperatures	← See Fig.1 →						
PEAK RECURRENT AMPERES	25	25	25	25	25	25	25
PEAK SURGE AMPERES:[a] One-half cycle, sine wave	160	160	160	160	160	160	160
CASE-TEMPERATURE RANGE: Operating and Storage	← -65 to +200° C →						
Characteristics:							
Max. Forward Voltage Drop[b] (Volts)	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Max. Reverse Current[b] (Ma.): Dynamic	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Static[c]	0.004	0.004	0.004	0.004	0.004	0.004	0.004

[a] Superimposed on device operating within the maximum voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

[b] Average value for one complete cycle at case temperature of 150° C and at maximum rated voltage and average forward current.

[c] DC value, at maximum peak reverse voltage, and case temperature (°C) = 25.

- Available in reverse-polarity versions: 1N1341RB, 1N1342RB, 1N1344RB, 1N1345RB, 1N1346RB, 1N1347RB, 1N1348RB
- Designed to meet stringent mechanical and environmental specifications
- Diffused-junction process — exceptional uniformity and stability of characteristics
- Hermetic seals
- Welded construction
- Low thermal resistance
- Low leakage current
- Low forward voltage drop
- JEDEC DO-4 outline
- High output current:
  up to 15 amperes — 6 rectifiers in 3-phase, full-wave bridge circuit
  up to 12 amperes — 4 rectifiers in single-phase full-wave bridge circuit

RATING CHART

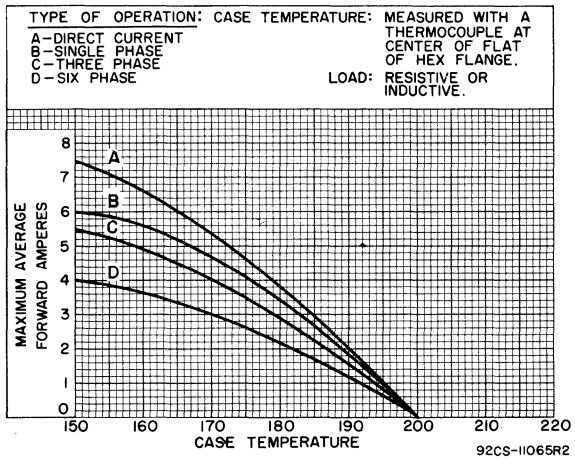


Fig.1

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

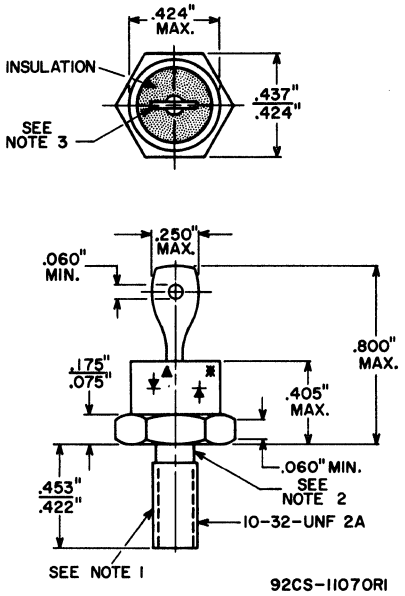
Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.

1N1341B, 1N1342B, 1N1344B–1N1348B 5/66

Reprinted from 1N1341B, 1N1341B, 1N1344B–1N1348B 5/64

DIMENSIONAL OUTLINE
JEDEC DO-4



▲ Polarity symbol for types 1N1341B, 1N1342B, 1N1344B, 1N1345B, 1N1346B, 1N1347B, and 1N1348B

*Polarity symbol for types 1N1341RB, 1N1342RB, 1N1344RB, 1N1345RB, 1N1346RB, 1N1347RB, and 1N1348RB

Note 1: Normal installation torque is 15 to 20 inch-pounds applied to a 10/32 UNF-2B hex nut assembled on stud thread. The applied torque during installation should not exceed 25 inch-pounds.

Note 2: Diameter of unthreaded portion: 0.189" max., 0.163" min.

Note 3: Angular orientation of this terminal is undefined.

Note 4: The device may be operated in any position.

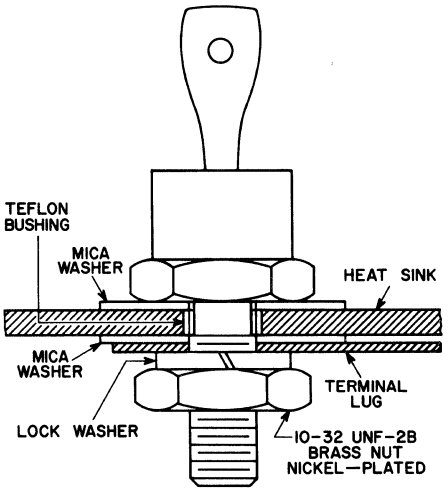


Fig. 2 - Suggested Mounting Arrangement. (Mounting components of the type shown are furnished with each rectifier cell. The increase in thermal resistance with these mounting components is approximately 3 °C/watt.)

5-AMPERE SILICON RECTIFIERS

1N1612–1N1616

File No. 18

Types 1N1612 through 1N1616 are intended for use in generator-type power supplies for mobile equipment; in dc-to-dc converters, battery chargers, and machine-tool controls; in power supplies for aircraft, marine, and missile equipment, for dc motors, transmitters, rf generators, welding equipment, and electroplating systems; in dc-blocking service, magnetic amplifiers, and in a wide variety of other applications in military and industrial equipment.

The 1N1612 through 1N1616 utilize a special copper-alloy mounting stud which can withstand an installation torque of 25-inch pounds — a feature of primary importance in applications critical as to shock and vibration. In addition, these rectifiers are conservatively rated to permit continuous operation at maximum ratings in applications requiring high reliability under severe operating conditions.

Stud-Mounted Types for Industrial and Military Power Supplies

JEDEC DO-4

- **available in reverse-polarity versions: 1N1612-R, 1N1613-R, 1N1614-R, 1N1615-R, 1N1616-R**
- extra-high-strength copper-alloy mounting stud — withstands installation torque of 25 inch-pounds
- designed to meet stringent military mechanical and environmental specifications
- diffused-junction process — exceptional uniformity and stability of characteristics
- low thermal resistance
- welded construction
- hermetic seals
- low leakage current
- low forward voltage drop
- JEDEC DO-4 outline
- high output current:
  up to 14 amperes — 6 rectifiers in 3-phase, full-wave bridge circuit
  up to 10 amperes — 4 rectifiers in single-phase full-wave bridge circuit

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings *for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load*

	1N1612	1N1613	1N1614	1N1615	1N1616
PEAK REVERSE VOLTS.	50	100	200	400	600
RMS SUPPLY VOLTS.	35	70	140	280	420
DC BLOCKING VOLTS.	50	100	200	400	600
AVERAGE FORWARD AMPERES:					
At 135° C case temperature .	5	5	5	5	5
At other case temperatures.	← See Rating Chart →				
PEAK RECURRENT AMPERES. . . .	15	15	15	15	15
CASE TEMPERATURE RANGE:					
Operating and Storage. . .	← -65 to +175° C →				

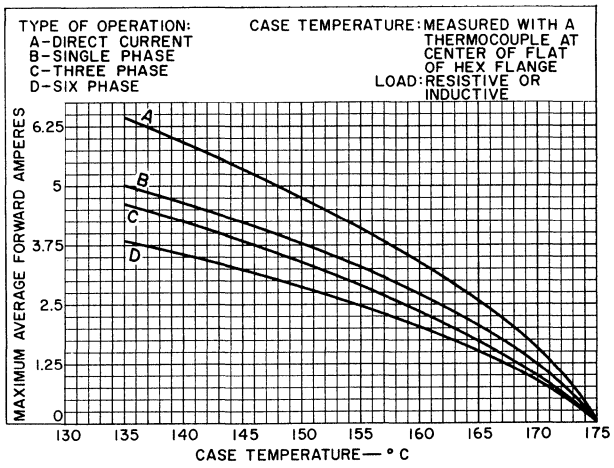


Fig. 1 - Rating Chart for all Types and corresponding reverse-polarity versions.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
1N1612–1N1616 5/66
Reprinted from 1N1612–1N1616 9/61.

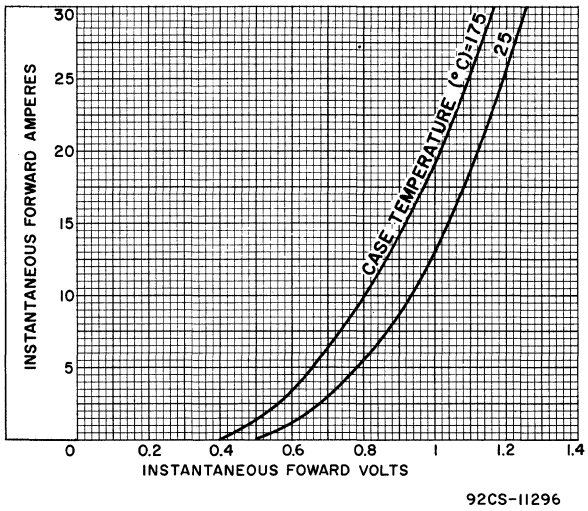


Fig. 2 - Typical Forward Characteristics for all Types and corresponding reverse-polarity versions.

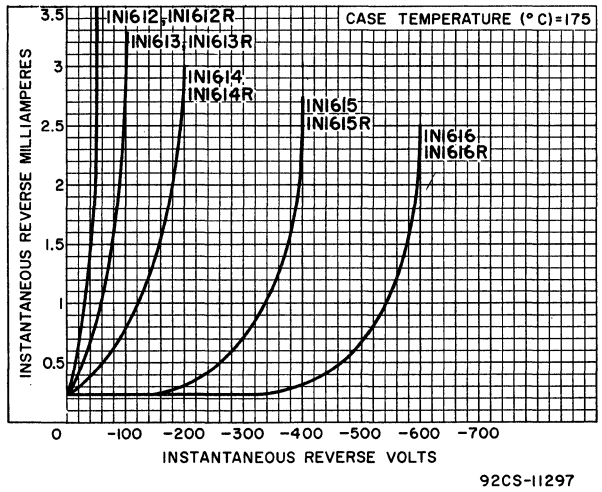


Fig. 3 - Typical Reverse Characteristics for all Types and corresponding reverse-polarity versions.

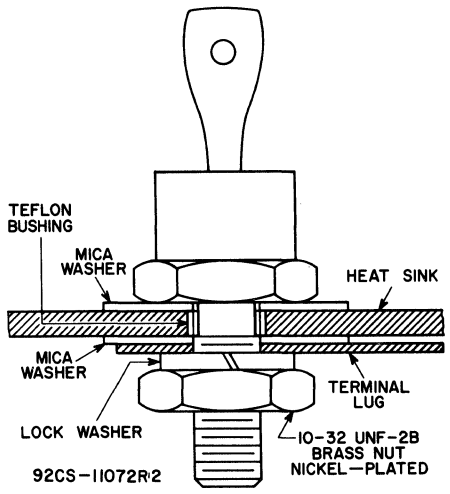


Fig. 4 - Suggested Mounting Arrangement.

Characteristics:	1N1612	1N1613	1N1614	1N1615	1N1616
Max. Forward Voltage Drop (Volts): At 25° C case temperature and dc forward current = 10 amperes.	1.5	1.5	1.5	1.5	1.5
Max. Reverse Current (Ma): Dynamic[a] . . .	1	1	1	1	1
Static[b] . . .	0.01	0.01	0.01	0.01	0.01

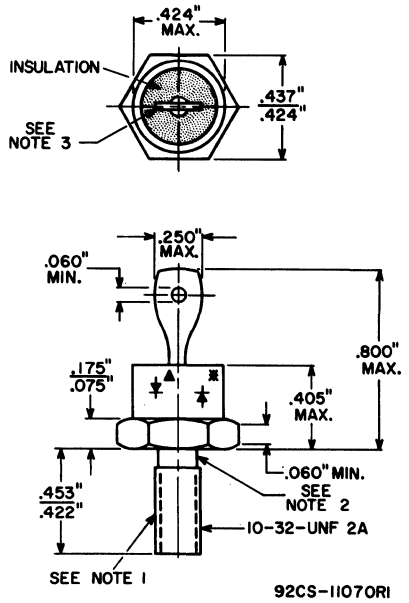
[a] Average value for one complete cycle, at maximum peak reverse voltage, forward amperes = 5, and case temperature (°C) = 150.

[b] DC value, at maximum peak reverse voltage, and case temperature (°C) = 25.

OPERATING CONSIDERATIONS

Because these rectifiers may operate at voltages which are dangerous, care should be taken in the design of equipment to prevent personnel from coming in contact with the rectifier.

DIMENSIONAL OUTLINE (JEDEC DO-4)



▲ Polarity symbol for types 1N1612 through 1N1616.

* Polarity symbol for types 1N1612-R through 1N1616-R.

Note 1: The recommended installation torque is 15 to 20 inch-pounds applied to a 10/32 UNF-2B hex nut assembled on stud thread. The applied torque during installation should not exceed 25 inch-pounds.

Note 2: Diameter of unthreaded portion: 0.189" max., 0.163" min.

Note 3: Angular orientation of this terminal is undefined.

Note 4: This device may be operated in any position.

DIFFUSED-JUNCTION SILICON RECTIFIERS

Flanged-Case Axial-Lead Types

For Power-Supply Applications In Commercial and Industrial Electronic Equipment

RCA-1N1763A and 1N1764A are hermetically sealed silicon rectifiers of the diffused-junction type, designed for use in power supplies of color and black-and-white television receivers, radio receivers, phonographs, high-fidelity amplifier systems, and other electronic equipment for commercial and industrial applications.

RCA-1N1763A and 1N1764A supersede and are unilaterally interchangeable with RCA-1N1763 and 1N1764, respectively. The new rectifiers incorporate all of the superior performance and reliability features which have gained industry acceptance for their RCA prototypes, and, in addition, offer substantially higher dc-output-current capabilities, lower reverse (leakage) currents, lower forward voltage drop, and a wider operating-temperature range.

Both devices have dc forward-current ratings of 1 ampere — resistive or inductive load, and 0.75 ampere — capacitive load at free-air temperatures up to 75°C (natural convection cooling). They can provide dc output currents of up to 2 amperes to capacitive loads when attached to simple heat sinks (see OPERATING CONSIDERATIONS).

RCA-1N1763A has a peak-reverse-voltage rating of 400 volts, and is intended for applications in which the rectifier operates directly from an ac power line supplying up to 140 volts rms for capacitive loads, or up to 280 volts rms for resistive or inductive loads.

RCA-1N1764A has a peak-reverse-voltage rating of 500 volts, and is intended for applications in which the rectifier operates from an ac line through a step-up transformer supplying up to 175 volts rms for capacitive loads, or up to 350 volts rms for resistive or inductive loads.

RCA-1N1763A and 1N1764A have an operating-temperature range of -65°C to +135°C. They utilize the JEDEC DO-1 flanged-case, axial-lead package which provides flexibility of installation in both hand-wired and printed-circuit equipment designs. These new rectifiers, like their RCA prototypes, are conservatively rated and incorporate the following design features: (1) welded, hermetically sealed case for protection against moisture and contamination; (2) superior junction characteristics made possible by a precisely controlled diffusion process; (3) extensive and rigorous quality-control procedures.

Features:

- high dc-output-current capability:
  - a) with natural convection cooling:
    - 1 ampere - resistive or inductive load } to 75°C T_{FA}
    - 3/4 ampere - capacitive load } to 75°C T_{FA}
  - b) with simple heat sinks:
    - 2 amperes - capacitive load } to 105°C T_C
    - up to 2 amperes - capacitive load } to 75°C T_{FA}
- low dc reverse (leakage) currents: 5 μa max. at 25°C; 100 μa max. at 75°C
- low forward voltage drop: 1.2 volts max. at a dc forward current of 1 ampere
- wide operating-temperature range: -65°C to +135°C
- hermetically sealed JEDEC DO-1 package
- unilaterally interchangeable with Types 1N1763 and 1N1764

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
1N1763A, 1N1764A 6-66
Reprinted from Issue dated 3-65

RECTIFIER SERVICE

Absolute-Maximum Ratings, *for a Supply Frequency of 60 cps:*

	Type 1N1763A	Type 1N1764A	
PEAK REVERSE VOLTAGE	400	500	max. volts
RMS SUPPLY VOLTAGE:			
For operation with resistive or inductive loads	280	350	max. volts
For operation with capacitive loads	140	175	max. volts
	At Free-Air Temperatures Up to 75°C / Above 75°C	*At Free-Air Temperatures* Up to 75°C / Above 75°C	
FORWARD CURRENT:			
For operation with resistive or inductive loads:			
AVERAGE (DC)	1 / See *Fig.1*	1 / See *Fig.1*	max. amp
For operation with capacitive loads:			
AVERAGE (DC)	0.75 / See *Fig.1*	0.75 / See *Fig.1*	max. amp
PEAK RECURRENT	5 / See *Fig.1*	5 / See *Fig.1*	max. amp
SURGE, for "turn-on" transient of 2 milliseconds duration	35 / See *Fig.1*	35 / See *Fig.1*	max. amp
TEMPERATURE RANGE (FREE-AIR):			
Operating	-65 to +135	-65 to +135	°C
Storage	-65 to +150	-65 to +150	°C

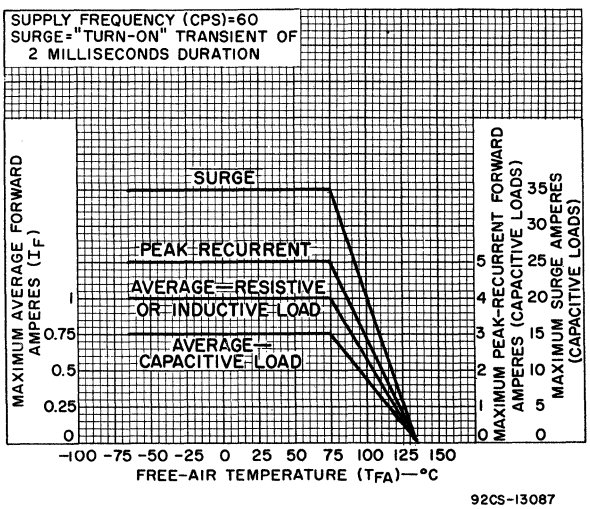


Fig.1 - Rating Chart for RCA-1N1763A and 1N1764A

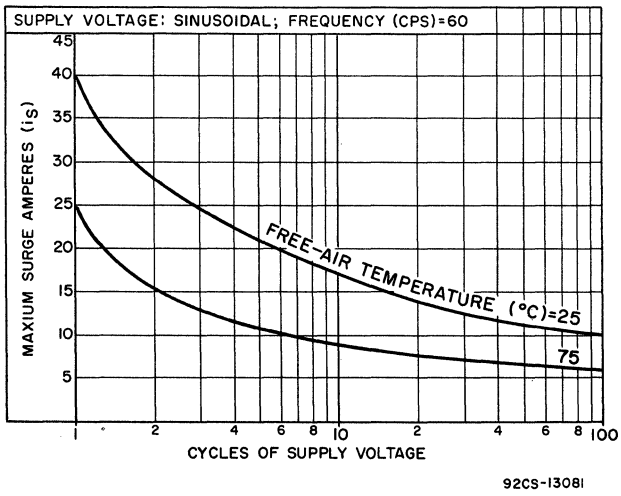


Fig.2 - Repetitive Surge Current Rating Chart for RCA-1N1763A and 1N1764A

Characteristics, *at a Free-Air Temperature of 25°C:*

	Type 1N1763A	Type 1N1764A	
Maximum Instantaneous Forward Voltage at an Instantaneous Forward Current of 1 ampere. . . .	1.2	1.2	volts
Maximum DC Reverse Current;			
At a Peak Reverse Voltage of 400 volts	5	-	μa
At a Peak Reverse Voltage of 500 volts	-	5	μa

Characteristics, *at a Free-Air Temperature of 75°C:*

Maximum DC Reverse Current:			
At a Peak Reverse Voltage of 400 volts	0.1	-	ma
At a Peak Reverse Voltage of 500 volts	-	0.1	ma

Typical Performance Characteristics, *at a Free-Air Temperature of 25°C:*

	Type 1N1763A			Type 1N1764A			
Half-Wave Rectifier Service:							
RMS Supply Voltage.	117	117	117	150	150	150	volts
Filter-Input Capacitor (C).	100	200	350	100	200	350	μF
Surge-Limiting Resistance[#].	5.6	5.6	5.6	6.8	6.8	6.8	ohms
DC Output Voltage at Input to Filter (Approx.):							
At half-load current of 375 ma.	140	145	150	180	185	190	volts
At full-load current of 750 ma.	125	130	140	155	160	170	volts
Voltage Regulation (Approx.):							
Half-load current to full-load current. .	15	15	10	25	25	20	volts
Half-Wave Voltage-Doubler Service:							
RMS Supply Voltage.	117	117	117	150	150	150	volts
Filter-Input Capacitor (C).	100	200	350	100	200	350	μF
Surge-Limiting Resistance[#].	5.6	5.6	5.6	6.8	6.8	6.8	ohms
DC Output Voltage at Input to Filter (Approx.):							
At half-load current of 375 ma.	255	265	275	325	340	350	volts
At full-load current of 750 ma.	225	240	255	285	305	325	volts
Voltage Regulation (Approx.):							
Half-load current to full-load current. .	30	25	20	40	35	25	volts
Full-Wave Voltage-Doubler Service:							
RMS Supply Voltage.	117	117	117	150	150	150	volts
Filter Input Capacitor (C).	100	200	350	100	200	350	μF
Surge-Limiting Resistance[#].	5.6	5.6	5.6	6.8	6.8	6.8	ohms
DC Output Voltage at Input to Filter (Approx.):							
At half-load current of 375 ma.	275	280	290	350	355	365	volts
At full-load current of 750 ma.	250	260	275	320	330	345	volts
Voltage Regulation (Approx.):							
Half-load current to full-load current. .	25	20	15	30	25	20	volts

[#] The transformer series resistance or other resistance in the rectifier supply circuit may be deducted from the value shown.

OPERATING CONSIDERATIONS

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

Maximum ratings for these devices have been established with connections made to the extreme ends of the leads. For conservative equipment designs, the 1N1763A and 1N1764A should be operated with connections made as close as possible to the device case.

The Maximum Forward Current Ratings for RCA-1N1763A and 1N1764A given on page 1 and in Fig.1 apply specifically for operation of these rectifiers in free air (natural convection cooling). RCA-1N1763A and 1N1764A can, however, provide Average (DC) Forward Currents of **up to 2 amperes with capacitive load** if these rectifiers are attached to simple heat sinks. The Peak Recurrent Forward Current capabilities of these rectifiers are also substantially higher than those shown in the Maximum Ratings when the rectifiers are attached to heat sinks.

Fig.5 shows the DC and Peak Recurrent Forward Current capabilities of RCA-1N1763A and 1N1764A for capacitive, resistive, or inductive loads, when operation is based on **case temperature** (measured at the intersection of the cathode lead and the case flange).

Figs.6a, 6b, 6c, 6d, and 6e, show the DC and Peak Recurrent Forward Current capabilities of RCA-1N1763A and 1N1764A for capacitive, resistive, or inductive loads when these rectifiers are mounted on simple, rectangular heat sinks of various sizes, and operation is based on free-air temperature.

Fig.7 shows two suggested methods for attaching RCA-1N1763A or 1N1764A to a heat sink. The flange of the rectifier case may also be soldered directly to a heat sink, provided the flange temperature during soldering does not exceed 235°C for a maximum period of 10 seconds. **Permanent damage to the rectifier may result if these limits are exceeded.**

A **surge-limiting impedance** should always be used in series with either of the rectifiers described in this bulletin. The value of this impedance must be sufficient to limit the "turn-on" surge current to the value specified in the Maximum Ratings. This impedance may be provided by the power-transformer windings, or by an external resistor or choke.

The flexible leads of RCA-1N1763A and 1N1764A are usually soldered to the circuit elements. It is desirable in all installations to provide some slack or an expansion elbow in each lead to prevent excessive tension on the leads. Manual soldering should be done carefully and quickly to avoid damage to the rectifier by excessive heating. To minimize heating of the rectifier junction during manual soldering, grip the flexible lead being soldered between the case and the soldering point with a pair of pliers.

When dip soldering used in the assembly of printed circuits using RCA-1N1763A or 1N1764A, the temperature of the solder should not exceed 255°C for a maximum immersion period of 10 seconds. The leads should not be dip soldered beyond points "A" and "B" indicated on the DIMENSIONAL OUTLINE drawing.

Because the cases of these rectifiers may operate at potentials which are dangerous, care should be taken in the design of equipment to prevent personnel from coming in contact with the rectifiers. It is recommended that these rectifiers be mounted on the under side of the equipment chassis.

Figs.8, 9, 10, and 11, show typical dc-output voltage characteristics of RCA-1N1763A and 1N1764A as functions of dc load current, for conventional half-wave, half-wave voltage-doubler, and full-wave voltage-doubler circuits. The solid portions of these curves extend to the maximum dc forward current values given in the maximum ratings on page 1. The dashed portions of the curves show typical performance at the higher current values permissible when the rectifiers are attached to heat sinks.

It is important to note that the amount of ac ripple present in the output of any of the rectifier circuits shown increases rapidly with increasing load currents. If operation is intended at the maximum current values shown on the dashed portions of the curves, it will generally be necessary to include additional filter circuits to achieve satisfactory hum levels.

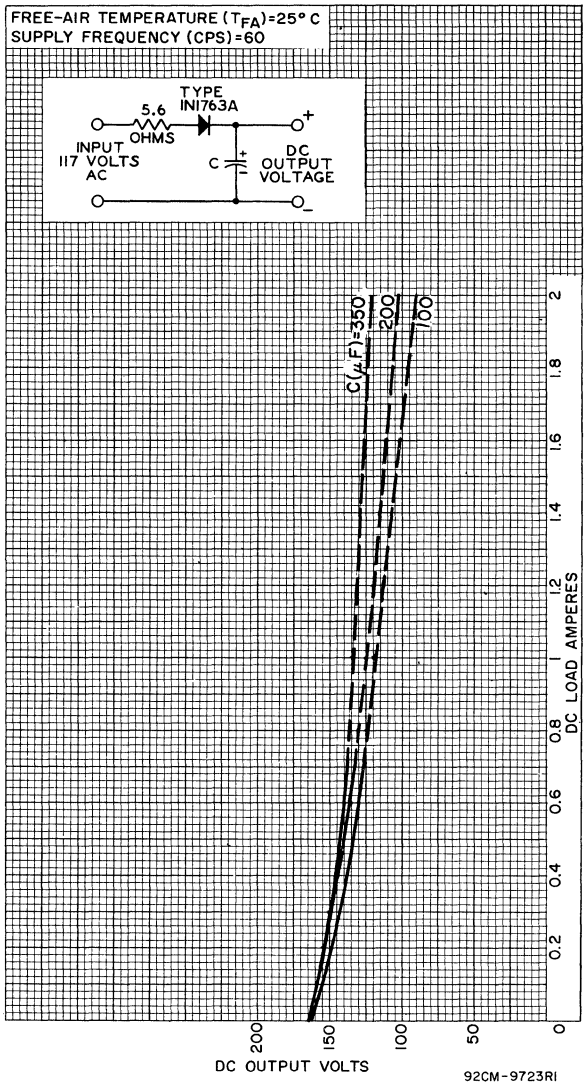


Fig. 8 - Typical Operation Characteristics for RCA-1N1763A in Half-Wave Rectifier Service.

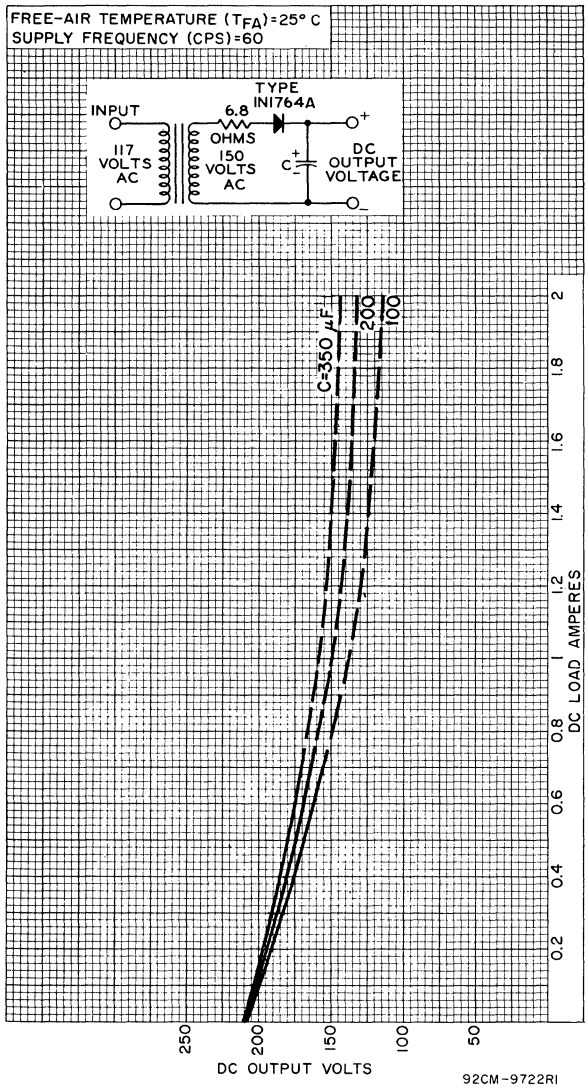


Fig. 9 - Typical Operation Characteristics for RCA-1N1764A in Half-Wave Rectifier Service.

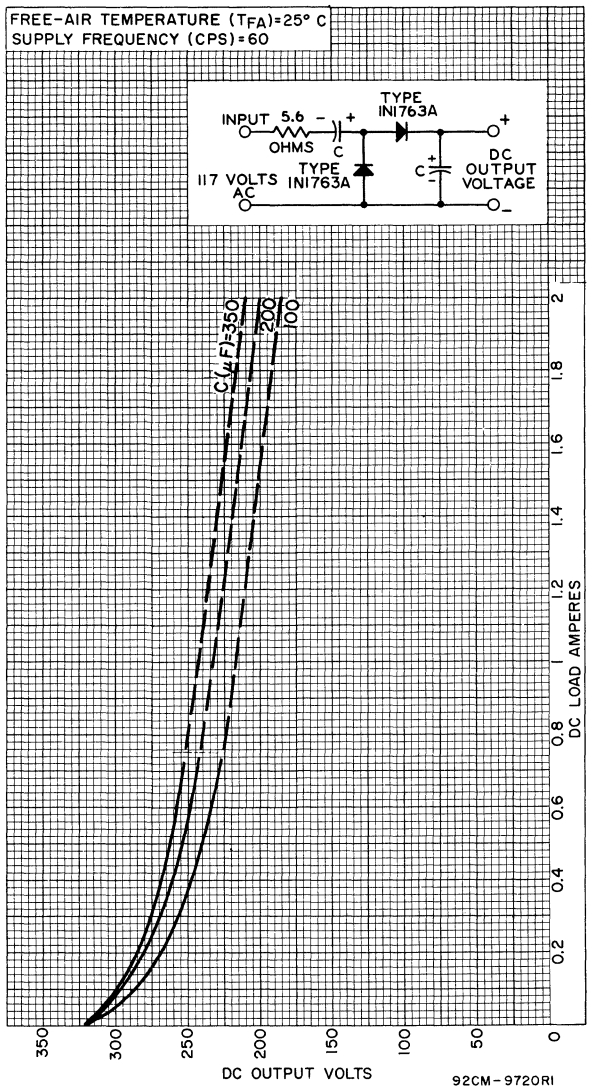


Fig. 10 - Typical Operation Characteristics of RCA-1N1763A in Half-Wave Voltage-Doubler Service.

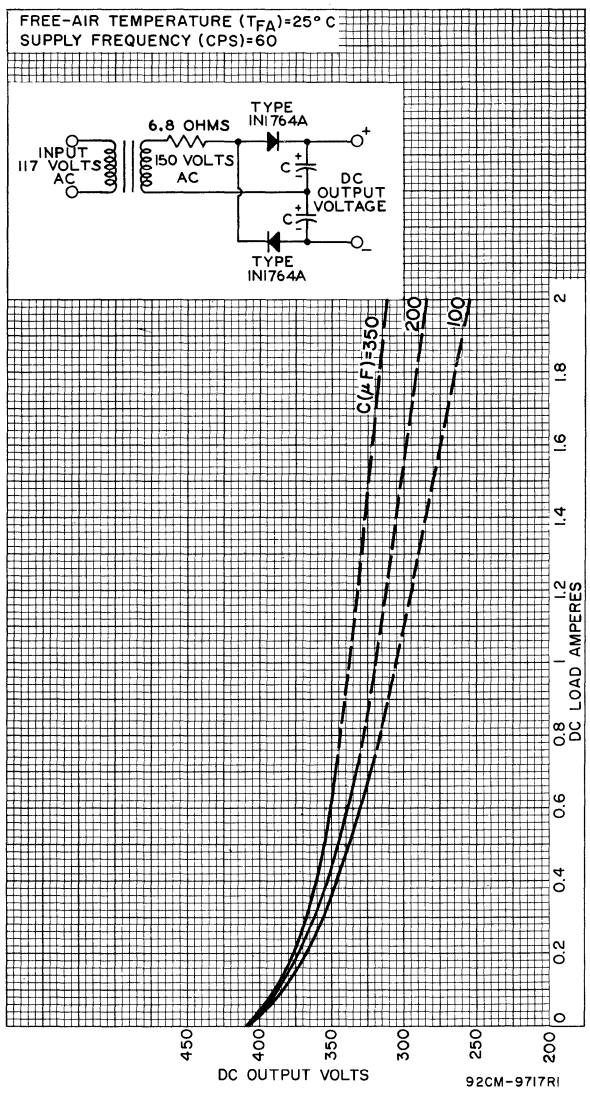
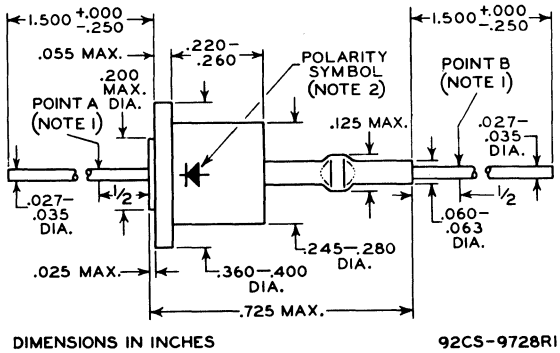


Fig. 11 - Typical Operation Characteristics of RCA-1N1764A in Full-Wave Voltage-Doubler Service.

DIMENSIONAL OUTLINE (JEDEC-DO-1)
FOR RCA-1N1763A and 1N1764A



NOTE 1: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

NOTE 2: DO NOT DIP SOLDER BEYOND POINTS "A" AND "B".

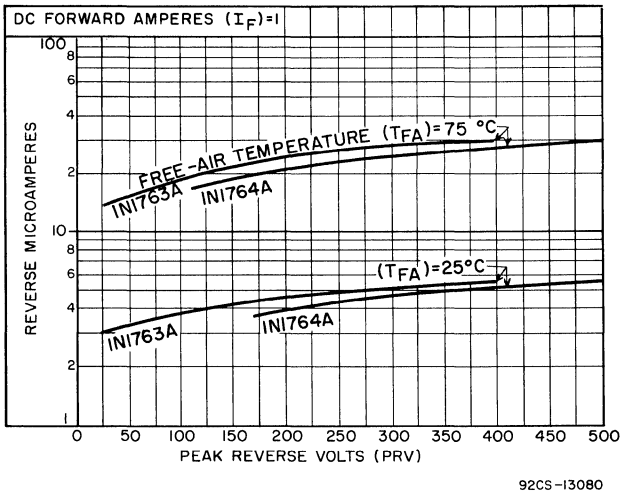


Fig. 3 - Typical Dynamic Reverse Current Characteristics for RCA-1N1763A and 1N1764A.

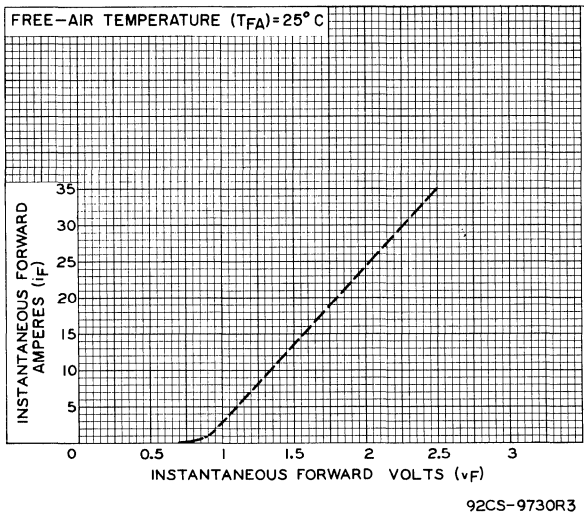


Fig. 4 - Typical Forward Voltage and Current Characteristics for RCA-1N1763A and 1N1764A.

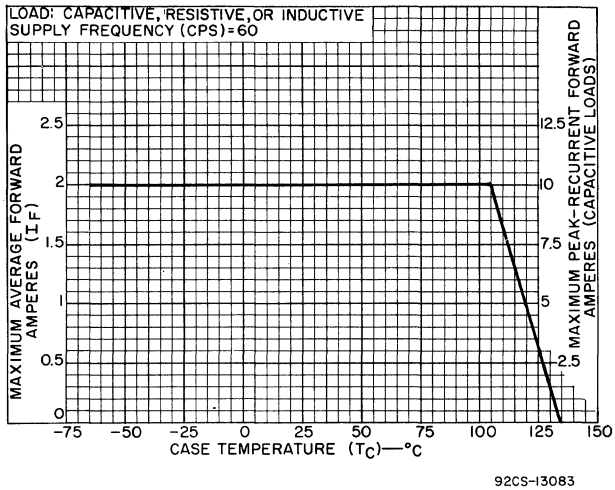
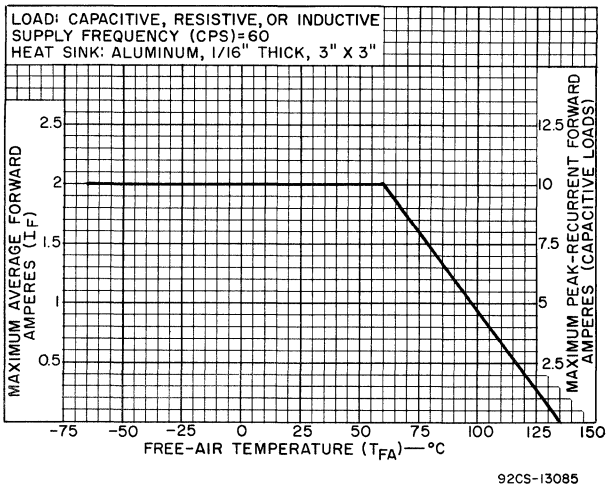
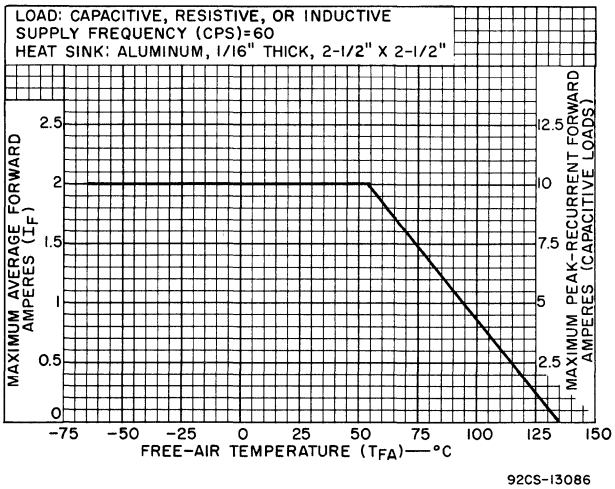


Fig. 5 - Forward-Current Capabilities of RCA-1N1763A and 1N1764A for Operation with Heat Sink at Case Temperatures from -65°C to +135°C.

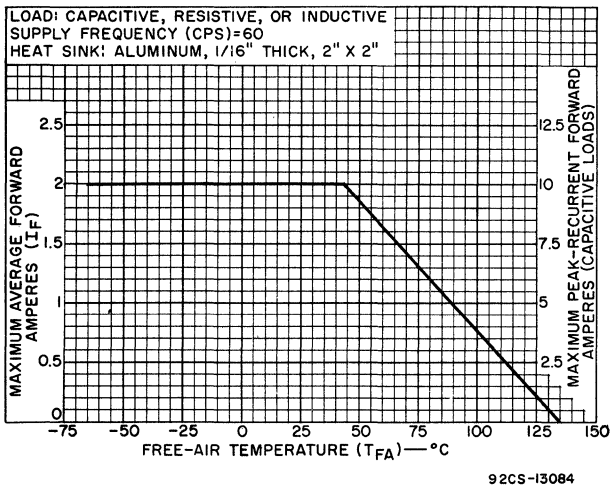


a) 3" x 3" Heat Sink.

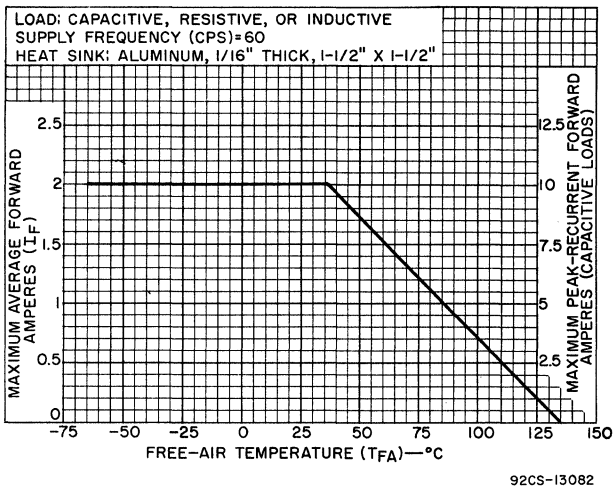


b) 2-1/2" x 2-1/2" Heat Sink.

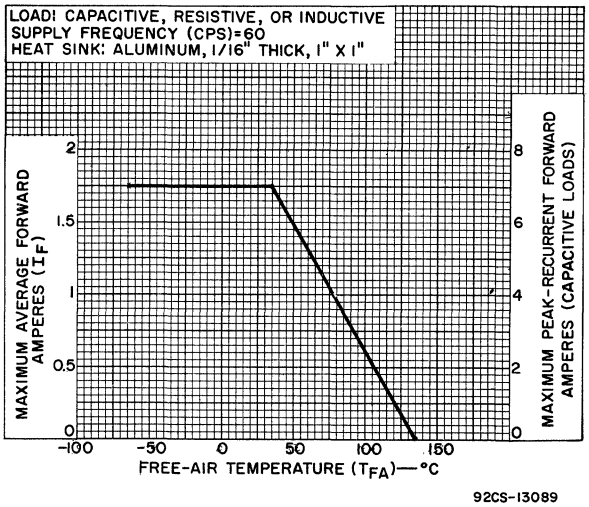
Figs. 6a and 6b - Forward-Current Capabilities of RCA-1N1763A and 1N1764A for Operation with Heat Sinks.



c) 2" x 2" Heat Sink.

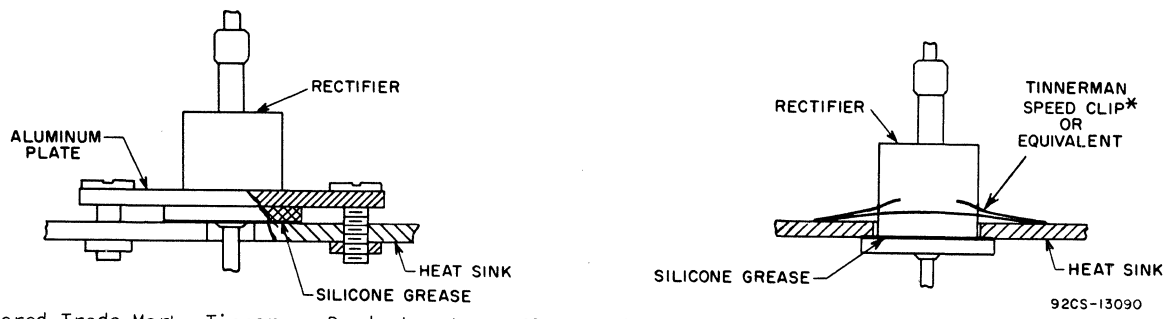


d) 1-1/2" x 1-1/2" Heat Sink.



e) 1" x 1" Heat Sink.

Figs.6c, 6d, and 6e - Forward-Current Capabilities of RCA-1N1763A and 1N1764A for Operation with Heat Sinks.



* Registered Trade Mark, Tinnerman Products, Inc., Cleveland 1, Ohio.

Fig.7 – Suggested Methods for Attaching RCA-1N1763A 1N1764A to Heat Sink

RCA DIFFUSED JUNCTION SILICON RECTIFIERS

1N2858A 1N2859A 1N2860A 1N2861A 1N2862A 1N2863A 1N2864A

DIFFUSED-JUNCTION SILICON RECTIFIERS

Flanged-Case Axial-Lead Types For General-Purpose Applications In Industrial And Commercial Electronic Equipment

RCA-1N2858A, 1N2859A, 1N2860A, 1N2861A, 1N2862A, 1N2863A, and 1N2864A are hermetically sealed silicon rectifiers of the diffused-junction type, designed for use in a variety of applications in industrial and commercial electronic equipment.

RCA-1N2858A through 1N2864A supersede and are unilaterally interchangeable with RCA-1N2858 through 1N2864, respectively. The new rectifiers incorporate all of the superior performance and reliability features which have gained industry acceptance for their RCA prototypes, and, in addition, offer substantially higher dc output-current capabilities, lower reverse (leakage) currents, and a wider operating-temperature range.

All seven of these new rectifier types have maximum dc-forward-current ratings of 1 ampere for resistive or inductive loads and 0.75 ampere for capacitive loads at free-air temperatures up to 75°C (natural convection cooling). They are also capable of providing dc output currents of up to 2 amperes with capacitive loads when attached to simple heat sinks (see OPERATING CONSIDERATIONS).

RCA-1N2858A through 1N2864A differ only in peak-reverse-voltage ratings (see Maximum Ratings chart). They are rated for operation at free-air temperatures from -65° to +135°C, and utilize the JEDEC DO-1 flange-type, axial-lead rectifier package which provides flexibility of installation in both hand-wired and printed-circuit equipment designs.

These new rectifiers, like their RCA prototypes, are conservatively rated, and incorporate the following design features and special tests which contribute to their outstanding performance and reliability: (1) junctions of extremely high uniformity produced by a special, precisely controlled diffusion process, (2) rugged internal mount structure, (3) hermetically sealed cases, (4) prolonged treatment at high temperatures to stabilize characteristics, (5) pressure tests of seals for protection against moisture and contamination, (6) tests for forward and reverse characteristics at 25°C, and (7) high-temperature dynamic tests under full-load conditions.

Features:

- high dc-output-current capability:
  - 1 ampere - resistive or inductive load } to 75°C with natural convection cooling
  - 3/4 ampere - capacitive load } to 75°C with natural convection cooling
  - up to 2 amperes - capacitive load } to 105°C with simple heat sinks
- low dynamic reverse current:
  - 0.1 ma max. at 50°C
  - 0.3 ma max. at 75°C
- low dc forward voltage drop:
  - 1.2 volts max. at 25°C with 1 ampere dc forward current
- wide operating-temperature range:
  - -65° to +135°C
- hermetically sealed JEDEC DO-1 package
- unilaterally interchangeable with Types 1N2858 through 1N2864
- specially processed and tested for high reliability and stability of characteristics

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
1N2858A through 1N2864A 6-66
Reprinted from Issue dated 3-65

RECTIFIER SERVICE

Absolute-Maximum Ratings, *for a Supply Frequency of 60 cps:*

	1N2858A	1N2859A	1N2860A	1N2861A	1N2862A	1N2863A	1N2864A	
PEAK REVERSE VOLTAGE	50	100	200	300	400	500	600	max. volts
RMS SUPPLY VOLTAGE:								
For resistive or inductive loads	35	70	140	210	280	350	420	max. volts
For capacitive loads	17	35	70	105	140	175	210	max. volts
DC REVERSE (BLOCKING) VOLTAGE	50	100	200	300	400	500	600	max. volts
FORWARD CURRENT:								
For resistive or inductive loads:								
AVERAGE (DC): At T_{FA} up to 75°C	1	1	1	1	1	1	1	max. amp
AVERAGE (DC): At T_{FA} above 75°C	See *Fig.1*							
For capacitive loads:								
AVERAGE (DC): At T_{FA} up to 75°C	0.75	0.75	0.75	0.75	0.75	0.75	0.75	max. amp
AVERAGE (DC): At T_{FA} above 75°C	See *Fig.1*							
PEAK RECURRENT: At T_{FA} up to 75°C	5	5	5	5	5	5	5	max. amp
PEAK RECURRENT: At T_{FA} above 75°C	See *Fig.1*							
SURGE, for "turn-on" transient of 2 milliseconds duration:								
At T_{FA} up to 75°C	35	35	35	35	35	35	35	max. amp
At T_{FA} above 75°C	See *Fig.1*							
SURGE, repetitive, at T_{FA} = 25°C:								
For one cycle of supply voltage	40	40	40	40	40	40	40	max. amp
For more than one cycle of supply voltage	See *Fig.2*							
TEMPERATURE RANGE (FREE-AIR)								
Operating	-65 to +135							°C
Storage	-65 to +150							°C

Characteristics:

	1N2858A	1N2859A	1N2860A	1N2861A	1N2862A	1N2863A	1N2864A	
Maximum Forward Voltage Drop (DC) at I_F = 1 Ampere, T_{FA} = 25°C	1.2	1.2	1.2	1.2	1.2	1.2	1.2	volts
Maximum Dynamic Reverse Current (Averaged over 1 Complete Cycle of Supply Voltage): at Maximum Rated PRV:								
T_{FA} = 50°C	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ma
T_{FA} = 75°C	0.3	0.3	0.3	0.3	0.3	0.3	0.3	ma

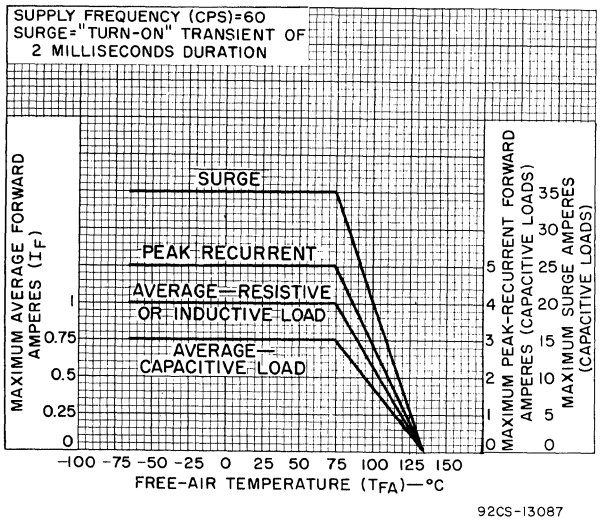


Fig. 1 - Rating Chart for RCA-1N2858A through 1N2864A.

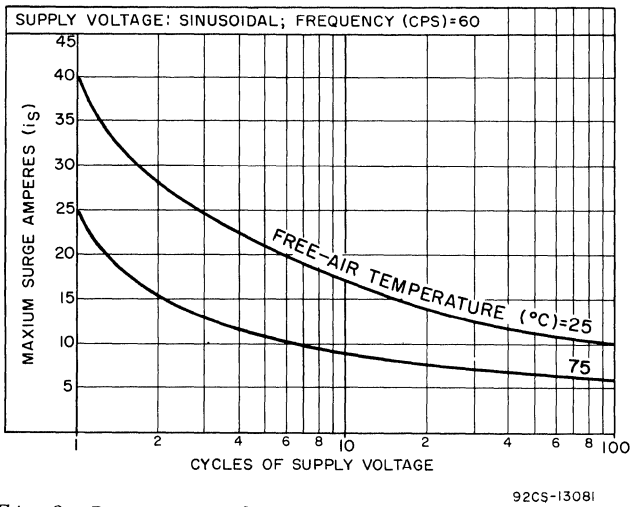


Fig. 2 - Repetitive Surge Current Rating Chart for RCA-1N2858A through 1N2864A.

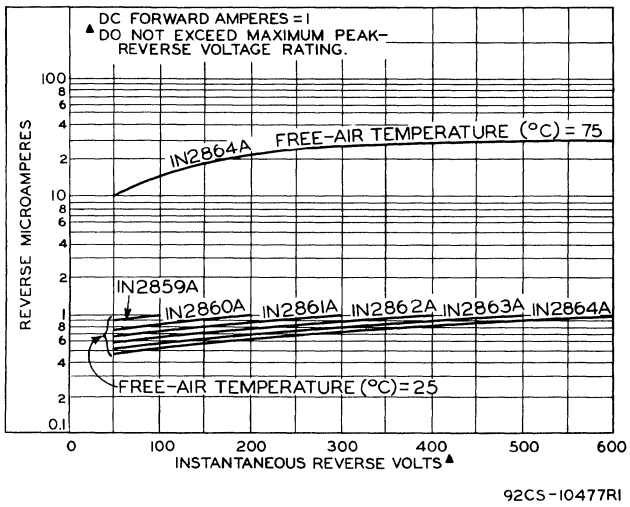


Fig. 3 - Typical Dynamic Reverse Characteristics for RCA-1N2858A through 1N2864A.

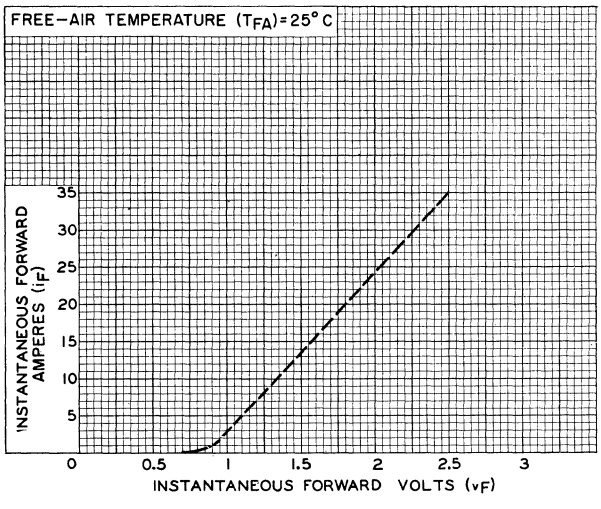


Fig. 4 - Typical Forward Voltage and Current Characteristic for RCA-1N2858A through 1N2864A.

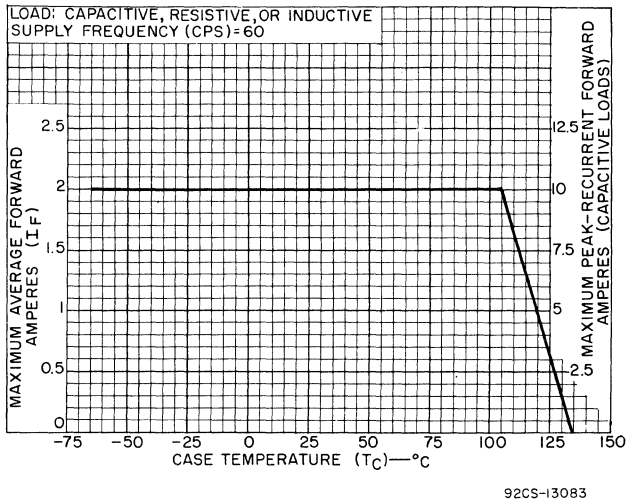
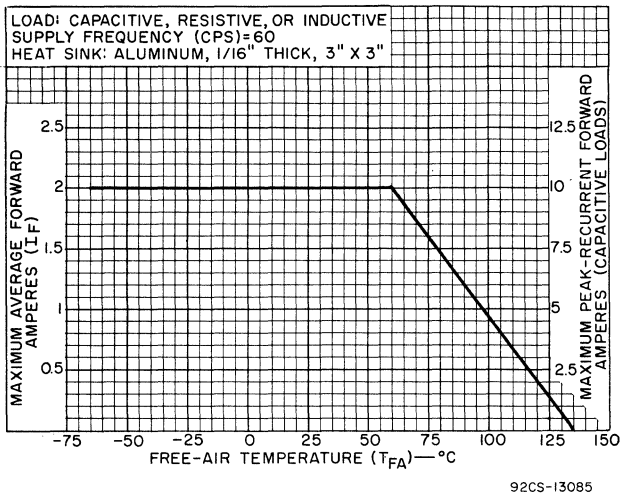
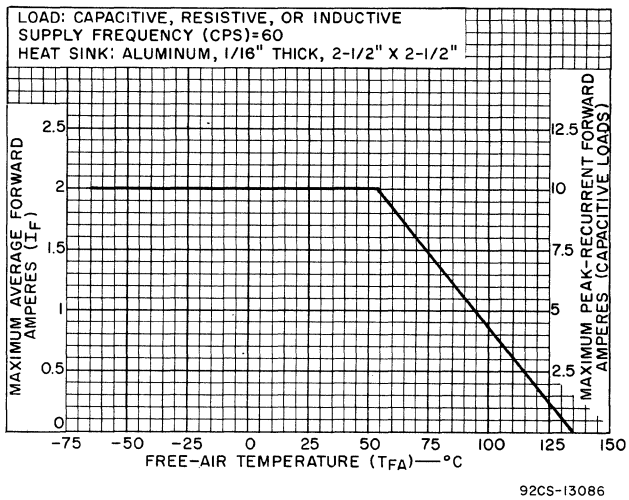


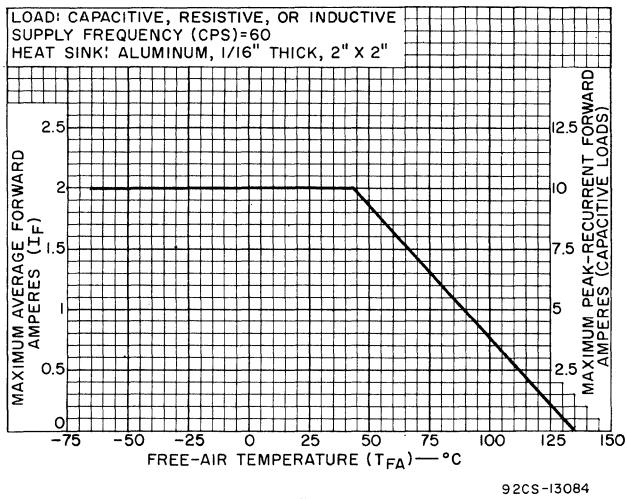
Fig. 5 - Forward-Current Capabilities of RCA-1N2858A through 1N2864A for Operation with Heat Sink at Case Temperatures from -65°C to +135°C.



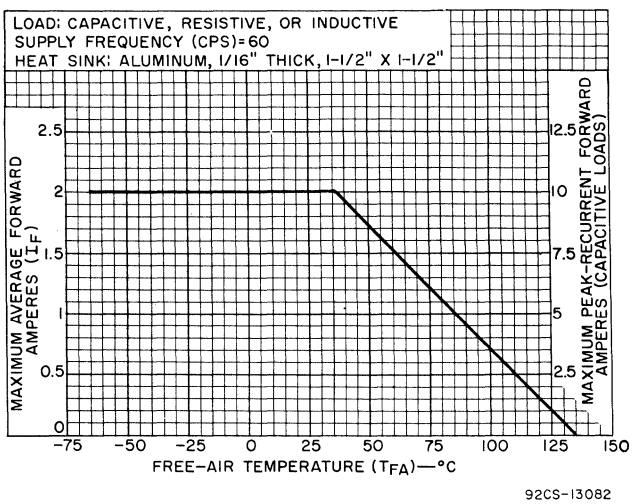
a) 3" x 3" Heat Sink.



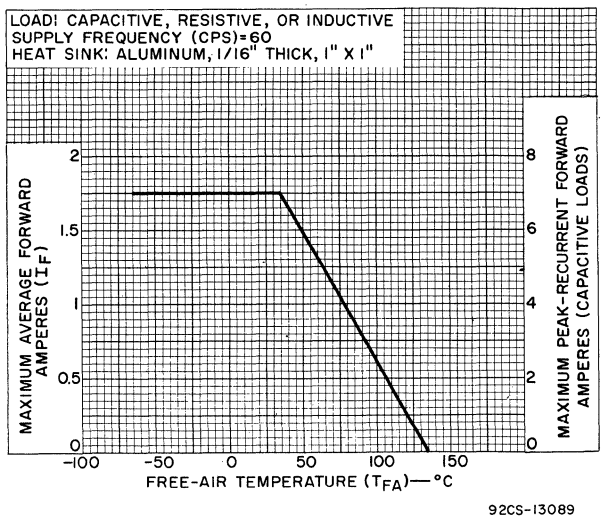
b) 2-1/2" x 2-1/2" Heat Sink.



c) 2" x 2" Heat Sink.



d) 1-1/2" x 1-1/2" Heat Sink.



e) 1" x 1" Heat Sink.

Figs.6a, 6b, 6c, 6d, and 6e - Forward-Current Capabilities of RCA-1N2858A through 1N2864A for Operation with Heat Sinks.

OPERATING CONSIDERATIONS

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment-component variation, equipment-control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

Maximum ratings for these devices have been established with connections made to the extreme ends of the leads. For conservative equipment designs, the 1N2858A through 1N2864A should be operated with connections made as close as possible to the device case.

The Maximum Forward Current Ratings for RCA-1N2858A through 1N2864A given on page 1 and in Fig.1 apply specifically for operation of these rectifiers in free air (natural convection cooling). RCA-1N2858A through 1N2864A can, however, provide Average (DC) Forward Currents of **up to 2 amperes with capacitive load** if these rectifiers are attached to simple heat sinks. The Peak Recurrent Forward Current capabilities of these rectifiers are also substantially higher than those shown in the Maximum Ratings when the rectifiers are attached to heat sinks.

Fig.5 shows the DC and Peak Recurrent Forward Current capabilities of RCA-1N2858A through 1N2864A for capacitive, resistive, or inductive loads, when operation is based on **case temperature** (measured at the intersection of the cathode lead and the case flange).

Figs. **6a, 6b, 6c, 6d,** and **6e** show the DC and Peak Recurrent Forward Current capabilities of RCA-1N2858A through 1N2864A for capacitive, resistive, or inductive loads when these rectifiers are mounted on simple, rectangular heat sinks of various sizes, and operation is based on **free-air temperature.**

Fig.7 shows two suggested methods for attaching RCA-1N2858A, 1N2859A, 1N2860A, 1N2861A, 1N2862A, 1N2863A, or 1N2864A to a heat sink. The flanges of these rectifiers may also be soldered directly to heat sinks, provided the flange temperature during soldering does not exceed **235°C** for a maximum period of 10 seconds.●

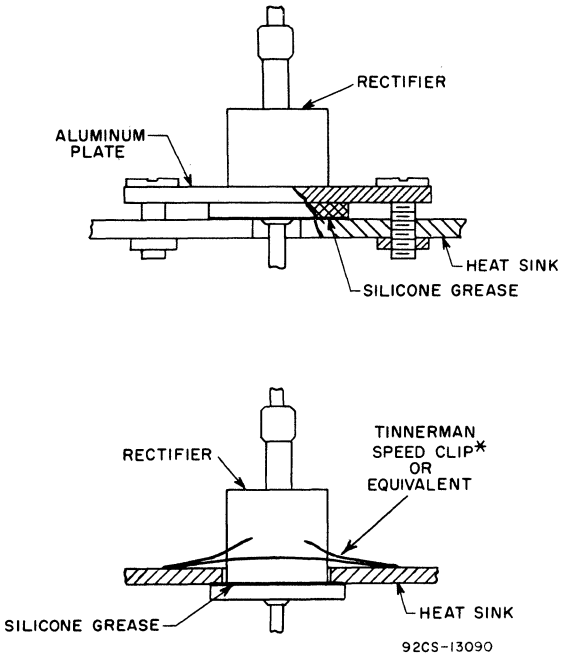
A **surge-limiting impedance** should always be used in series with any of the rectifiers described in this bulletin. The value of this impedance must be sufficient to limit the "turn-on" surge current to the value specified in the Maximum Ratings. This impedance may be provided by the power-transformer windings, or by an external resistor or choke.

The flexible leads of the rectifiers described in this bulletin are usually soldered to the circuit elements. It is desirable in all installations to provide some slack or an expansion elbow in each lead to prevent excessive tension on the leads. Manual soldering should be done carefully and quickly to avoid damage to the rectifier by excessive heating. To minimize heating of the rectifier junction during manual soldering, grip the flexible lead being soldered between the case and the soldering point with a pair of pliers.

When dip soldering is used in the assembly of printed circuits using these rectifiers, the temperature of the solder should not exceed 255°C for a maximum immersion period of 10 seconds. The leads should not be dip soldered beyond points "A" and "B" indicated on the DIMENSIONAL OUTLINE drawing.

Because the cases of these rectifiers may operate at potentials which are dangerous, care should be taken in the design of equipment to prevent personnel from coming in contact with the rectifiers. It is recommended that these rectifiers be mounted on the under side of the equipment chassis.

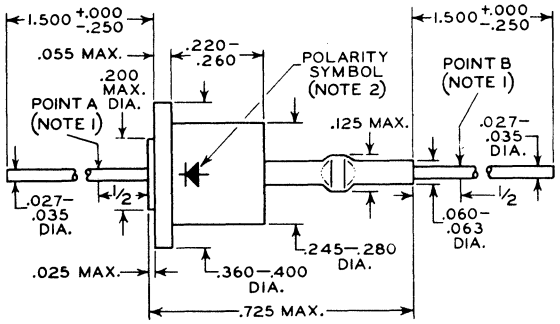
● Permanent damage to the rectifier may result if these limits are exceeded.



* Registered Trade Mark, Tinnerman Products, Inc., Cleveland 1, Ohio.

Fig. 7 - Suggested Methods for Attaching RCA-1N2858A through 1N2864A to Heat Sink.

DIMENSIONAL OUTLINE (JEDEC-DO-1) FOR RCA-1N2858A through 1N2864A



NOTE 1: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

NOTE 2: DO NOT DIP SOLDER BEYOND POINTS "A" AND "B".

RCA tunnel diodes 1N3128, 1N3129, 1N3130, and 1N3847—1N3860 are high-reliability germanium epitaxial inert-area tunnel diodes designed for a wide range of requirements in high-speed switching and high-frequency, small signal applications. These devices are capable of switching speeds ranging from 100 ps to 1,800 ps (typical), tightly controlled peak-point currents (±5%, ±10%), and dissipation capabilities from 2.5 mW to 100 mW. All types feature low capacitance, epitaxially grown junctions, and the RCA-developed ceramic-and-metal package for very low inductance.

Tunnel-diode types 1N3856—1N3860 may be used in extremely critical switching and small-signal applications requiring tight (±5%) control of peak-point currents and switching speeds as fast as 100 ps.

Tunnel-diode types 1N3130 and 1N3852—1N3855 may be used in switching and small-signal applications requiring tight (±5%) control of peak-point currents and switching speeds as fast as 160 ps.

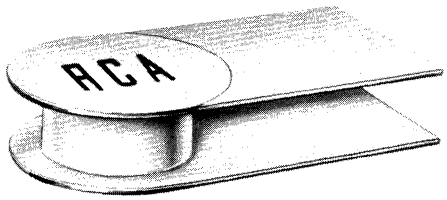
Tunnel-diode types 1N3128, 1N3129, and 1N3847—IN3851 are recommended in switching and small-signal applications requiring a peak-point-current control of ±10% and switching speeds in the 1,800 to 125 ps range.

Tunnel-rectifier types 1N3861, 1N3862, and 1N3863 may be employed as coupling devices in very-high-speed switching applications in memory systems and other critical equipment.

*Sometimes referred to as backward or back diodes.

- **Switching speeds as fast as 100 ps**
- **Peak-point currents of 5, 10, 20, 50, and 100 mA—controlled to ±5% and ±10%.**
- **RCA-developed ceramic-and-metal package—inductance only 0.4 nH (typical)**
- **Diodes have epitaxially grown junctions—assure low capacitance, mechanical ruggedness**
- **High peak-to-valley current ratios—minimum values as high as 8 to 1**

HIGH-RELIABILITY GERMANIUM TUNNEL DIODES AND TUNNEL RECTIFIERS* For Switching, Small-Signal, and Coupling Applications



H-1127

1N3128—1N3130
1N3847—1N3863

TYPICAL SWITCHING TIME VS. PEAK CURRENT-TO-CAPACITANCE RATIO

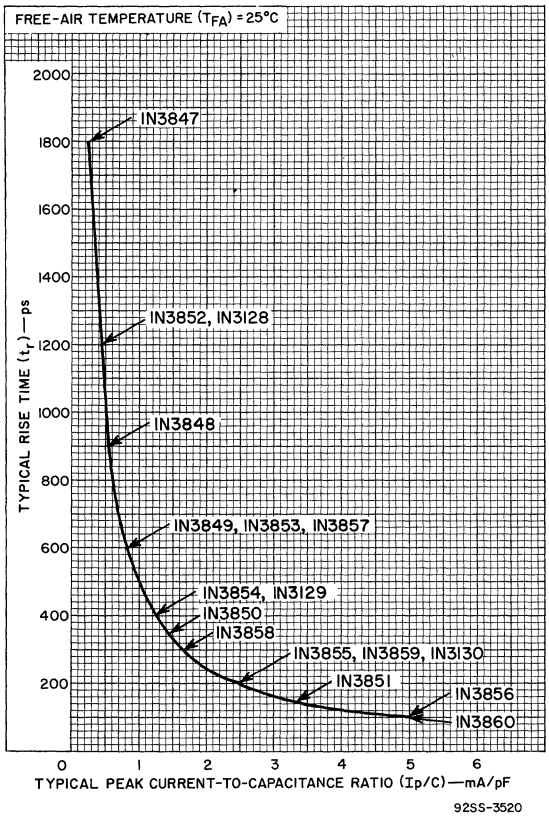


Fig.1

Printed in U.S.A.
1N3128—1N3130, 1N3847—1N3863 11/66
Supersedes issues dated 9/60 & 10/62, respectively.

MAXIMUM RATINGS

Absolute-Maximum Values:	Tunnel Diodes					Tunnel Rect.	
	1N3128, 1N3847, 1N3852, 1N3857	1N3848, 1N3853, 1N3858	1N3129, 1N3849, 1N3854, 1N3859	1N3130, 1N3850, 1N3855, 1N3860	1N3851, 1N3856	1N3861, 1N3862, 1N3863	
CONTINUOUS CURRENT:							
Forward . . . . . I_F	10	18	35	85	170	10	mA
Reverse . . . . . I_R	15	25	50	125	250	30	mA
DISSIPATION							
At T_{FA} = 25°C (Derate linearly to 0 mW at T_{FA} = 100°C)	5	10	20	50	100	10	mW
FREE-AIR TEMPERATURE RANGE							
Storage and Operating	← -35 to 100 →						°C
LEAD TEMPERATURE:							
For 3 s max. "See Soldering Instructions," pg.4.	← 175 →						°C

ELECTRICAL CHARACTERISTICS, *at Free-Air Temperature (T_{FA}) = 25°C*

TUNNEL DIODES

Type	I_p mA		I_p/C mA/pF	I_p/I_v	V_p mV		V_v mV	V_{pp}' mV		C^a mV	r_s ohms	t_r^b ps
	Min.	Max.	Typ.	Min.	Min.	Max.	Min.	Min.	Max.	Max.	Max.	Typ.
1N3128	4.75	5.25	0.45	8/1	40	80	280	445	530	15	3	1000
1N3129	19	21	1.27	8/1	50	100	300	475	575	20	2.5	300
1N3130	47.5	52.5	2.50	8/1	70	120	350	520	620	25	1.5	160
1N3847	4.5	5.5	0.25	6/1	–	–	–	430	590	25	3	1800
1N3848	9	11	0.55	6/1	–	–	–	440	600	25	2.5	900
1N3849	18	22	0.85	6/1	–	–	–	460	620	30	2	600
1N3850	45	55	1.45	6/1	–	–	–	530	640	40	1.5	350
1N3851	90	110	3.35	6/1	–	–	–	540	650	40	1	150
1N3852	4.75	5.25	0.45	8/1	50	90	330	490	560	15	3	1200
1N3853	9.5	10.5	0.85	8/1	55	95	350	510	580	15	2.5	600
1N3854	19	21	1.27	8/1	65	105	365	530	600	20	2	400
1N3855	47.5	52.5	2.50	8/1	80	130	380	550	620	25	1.5	200
1N3856	95	105	5.0	8/1	90	140	390	560	630	25	1	100
1N3857	4.75	5.25	0.85	8/1	50	90	330	490	560	8	3	600
1N3858	9.5	10.5	1.67	8/1	55	95	350	510	580	8	2.5	300
1N3859	19	21	2.50	8/1	65	105	365	530	600	10	2	200
1N3860	47.5	52.5	5.0	8/1	80	130	380	550	620	12	1.5	100

[a] Includes typical case capacitance of 0.8 pF

[b] Calculated from the relationship $t_r \simeq \frac{C}{2I_P}$

TUNNEL RECTIFIERS

Type	I_P mA		C^a pF	V_R mV (at I_R = 10 mA)	V_R mV (at I_R = 30 mA)	V_F mV (at I_F = 1 mA)
	Min.	Max.	Max.	Max.	Max.	Min.
1N3861	0.1	1	6	170	–	400
1N3862	0.1	1	4	150	300	420
1N3863	0.1	0.5	4	150	300	435

[a]Includes typical case capacitance of 0.4 pF.

DEFINITIONS OF SYMBOLS

The *static characteristic* symbols below for tunnel diodes and tunnel rectifiers are defined with respect to the characteristic curves shown in *Fig.2* and *Fig.3* respectively.

C_p = The residual capacitance between the diode terminals when the p-n junction is open-circuited.
I_F = Static forward current
I_R = Static reverse current
I_P = Peak-point forward current (the value of static forward current I_F flowing at the lowest positive voltage V at which $dI_F/dV = 0$).
I_P/C = Peak current–to–valley terminal capacitance ratio.
I_V = Valley-point current (the value of static forward current I_F flowing at the second lowest positive voltage V at which $dI_F/dV = 0$).
I_P/I_V = Peak-to-valley current ratio
V_F = The positive voltage greater than V_V at a specified forward current, I_F.
V_P = Peak-point voltage (the lowest value of positive voltage V at which $dI_F/dV = 0$).
V_V = Valley-point voltage (the second lowest value of positive voltage V at which $dI_F/dV = 0$).
V_{PP} = The positive voltage greater than V_V at which the static forward current I_F is equal to the peak-point forward current I_P.
V_{PP} = The positive voltage greater than V_V at which the static forward current I_F is equal to the maximum specified value of I_P.
V_R = Reverse voltage

The *dynamic characteristic* symbols below for tunnel diodes are defined with respect to the equivalent circuit shown in *Fig.4*. Because C_j and r_j are functions of the operating voltage, a statement of the operating voltage is necessary to define the equivalent circuit.

r_s = Total series resistance
L = Total series inductance
C = Terminal valley-point capacitance
C_j = Barrier capacitance of the intrinsic diode
r_j = Negative resistance of the intrinsic diode
t_r = Calculated rise time (approximate) for a germanium tunnel diode when switching from V_P to V_{PP} at a constant value of I_P. Calculated from the relationship.

$$t_r \simeq \frac{C\,(V_{PP} - V_P)}{(I_P - I_V)} \simeq \frac{C}{2\,I_P}$$

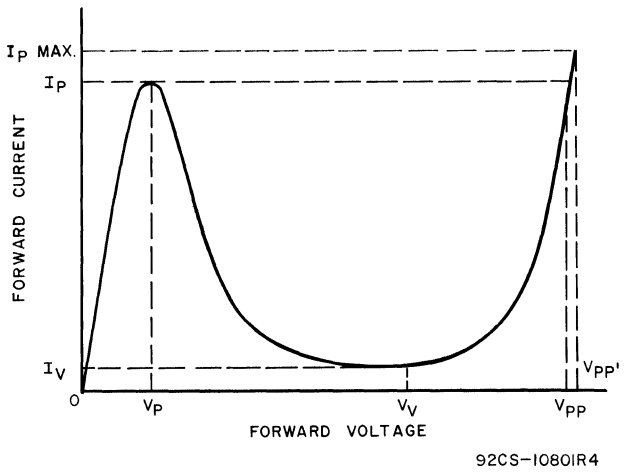
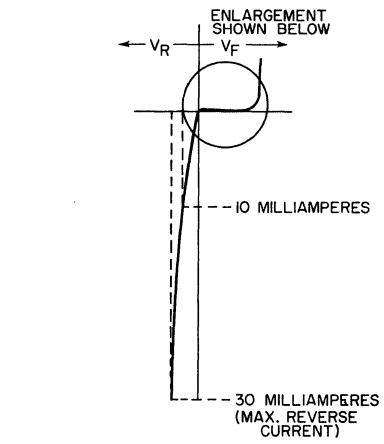


Fig.2 - Static forward characteristic of tunnel diode.



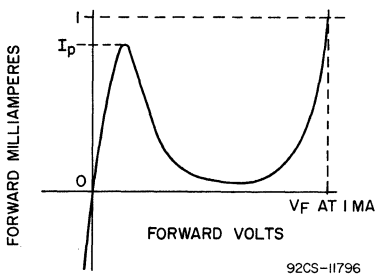


Fig.3 - Static characteristic of tunnel rectifier.

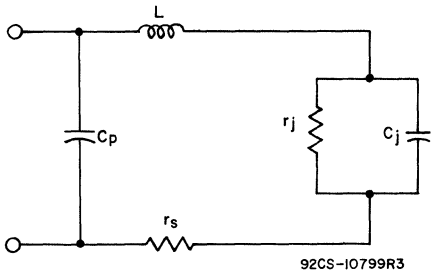
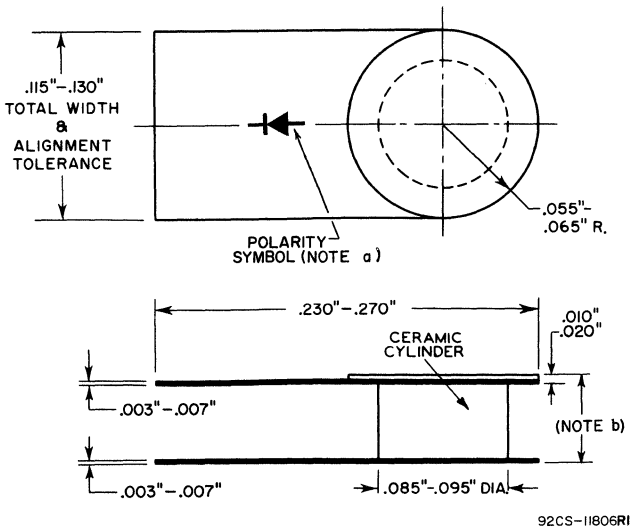


Fig.4 - Equivalent circuit of a tunnel diode in the negative-resistance region.

DIMENSIONAL OUTLINE FOR TUNNEL DIODE AND TUNNEL RECTIFIER TYPES 1N3128--1N3130 AND 1N3847--1N3863



[a] Arrow indicates direction of forward current flow as indicated by DC ammeter.

[b] Tunnel diode dimension .035—.055". Tunnel rectifier dimension .055—.075"

SOLDERING INSTRUCTIONS

A low-temperature solder, (such as Alpha #111 alloy, rosin-filled, or equivalent) should be used. The soldering iron tip temperature should not exceed 175°C and soldering time should not exceed 3 seconds. A pre-tinned circuit board should be used to minimize soldering time. To protect the junction against overheating, the tunnel diode or tunnel rectifier should be held with long-nose pliers, as shown in *Fig.5*.

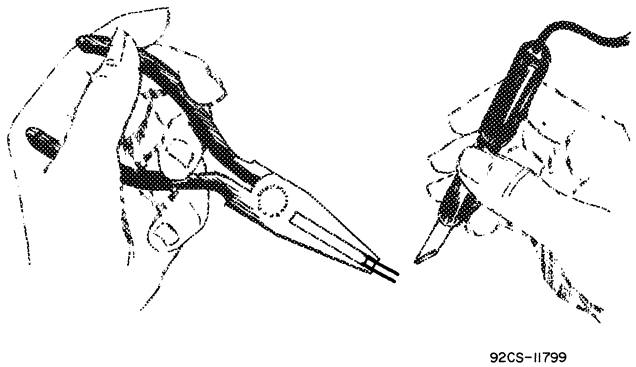
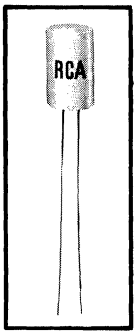


Fig.5 - Suggested method for holding tunnel diode or tunnel rectifier with straight tabs during soldering.

GERMANIUM SEMICONDUCTOR DIODE

Alloy Type for Temperature- and Voltage-Compensation Applications



RCA-1N2326 is a germanium, alloy-junction diode. It is designed to compensate for the effects of temperature and supply-voltage changes in the operation of class B push-pull audio-frequency power-amplifier stages utilizing transistor types 2N217, 2N270, 2N408, 2N2147, 2N2148, and similar types.

When used in the type of circuit shown in Fig. 1, the 1N2326 will maintain the bias voltage applied to the output stage within ± 0.015 volt of the desired value for supply-voltage variations up to ± 40%, and will simultaneously compensate for ambient-temperature variations over the range from -20° C to +71° C.

Because of the compensation provided by the 1N2326, supply batteries may be used to lower end-point voltages before audio distortion becomes objectionable, thereby extending useful battery life.

RCA-1N2326 is hermetically sealed in a metal case and has two flexible leads which may be soldered or welded to circuit elements.

TEMPERATURE- AND VOLTAGE-COMPENSATION SERVICE

Maximum Ratings, *Absolute-Maximum Values:*

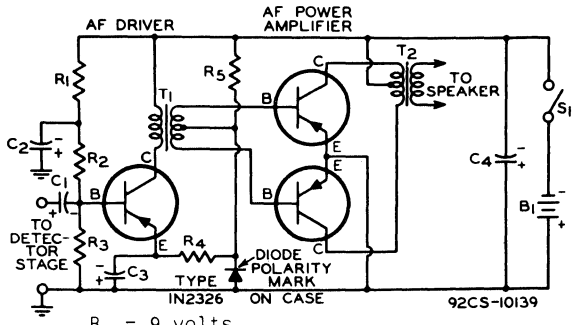
Reverse Voltage	-1 max.	volt
DC Forward Current	100 max.	ma
Peak Forward Current	200 max.	ma
Free-Air Temperature Range:		
Storage and Operating. . . .	-65 to +85	°C

Characteristics, at a Free-Air Temperature of 25° C:

	Min.	*Typ.*	*Max.*	
Forward Voltage Drop* for a dc forward current of 2 milliamperes . . .	120	135	150	millivolts
Forward Voltage Drop* for a dc forward current of 100 milliamperes . . .	240	260	280	millivolts

● The 1N2326 is not intended for operation with reverse voltages.

* Measured under conditions of thermal equilibrium.



B_1 = 9 volts
C_1 = 5 μf, electrolytic, 3 v.
C_2 = 1 μf, electrolytic, 6 v.
C_3 = 50 μf, electrolytic, 3 v.
C_4 = 100 μf, electrolytic, 10 v.
R_1 = 27,000 ohms, 0.5 watt
R_2 = 10,000 ohms, 0.5 watt
R_3 = 10,000 ohms, 0.5 watt
R_4 = 2,200 ohms, 0.5 watt
R_5 = 10,000 ohms, 0.5 watt
S_1 = Switch

T_1 = AF driver transformer, primary impedance (with a current of 1 milliampere flowing) = 10,000 ohms, secondary impedance (base-to-base) = 400 ohms.

T_2 = AF output transformer, primary impedance (collector-to-collector) = 500 ohms, secondary impedance matched to speaker.

Note 1: For AF driver stage transistor, use 2N407, 2N408, or similar type.

Note 2: For AF power-amplifier stage transistors use a pair of type 2N109, 2N217, 2N270, 2N407, 2N408 or similar types.

Note 3: Input signal voltage = 3 millivolts rms, input resistance = 2,000 ohms, power output = 250 milliwatts at 10% total harmonic distortion.

Fig. 1 - Typical Push-Pull Class B Audio Amplifier Circuit Utilizing Type 1N2326.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
1N2326 7-66
Supersedes issue dated 4-64

OPERATING CONSIDERATIONS

The *flexible leads* of the 1N2326 are usually soldered to the circuit elements. Soldering of the leads may be done to within 1/32 inch of the glass stem provided care is taken to conduct excessive heat away from the lead seals. Otherwise, the heat of the soldering operation may crack the glass seals of the leads and damage the diode.

The 1N2326 should not be connected into or disconnected from circuits with the power on because high transient currents may cause permanent damage to the diode or the associated circuits.

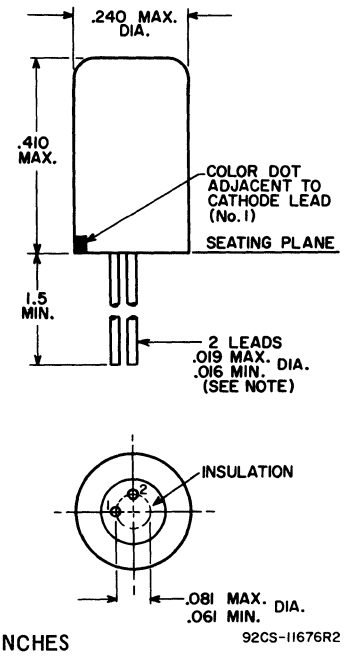
When dip soldering is employed in the assembly of printed circuits using the 1N2326, the temperature of the solder should not exceed 255° C for a maximum immersion period of 10 seconds.

PRINCIPLE OF OPERATION

The current through the diode is chosen so that at the reference ambient temperature the zero-signal collector current of the output transistors has the desired value. The diode will then maintain the zero-signal collector current essentially constant with variations in temperature or supply voltage.

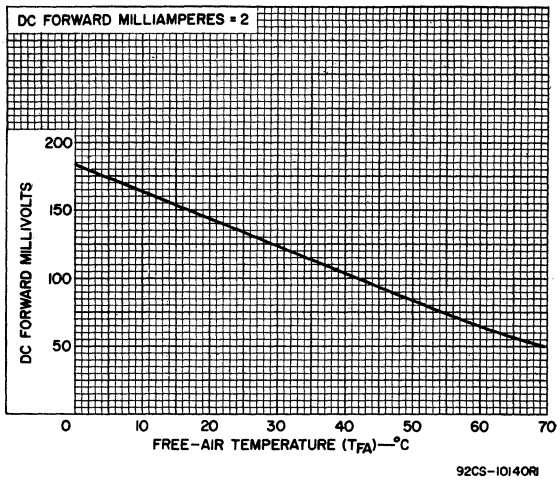
To avoid premature clipping in all applications and to insure continued operation of the 1N2326 under forward-bias conditions, the dc forward current of the diode should always be greater than the peak base current of each transistor in the output stage.

DIMENSIONAL OUTLINE



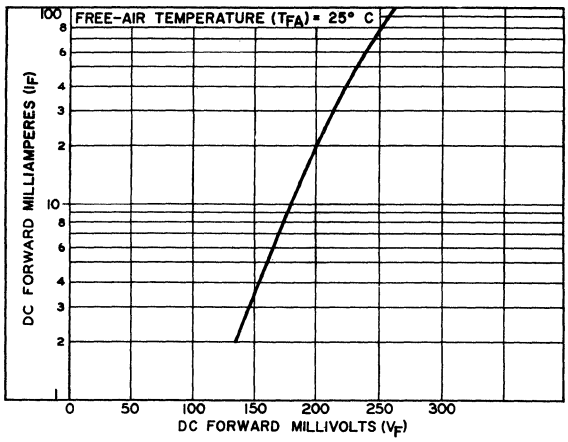
DIMENSIONS IN INCHES

92CS-11676R2



92CS-10140R1

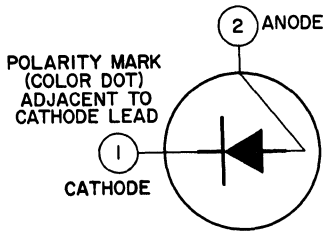
Fig. 2 - Typical Characteristic for Type 1N2326.



92CS-10141R2

Fig. 3 - Typical Characteristic for Type 1N2326.

TERMINAL DIAGRAM



NOTE 1: THE SPECIFIED LEAD DIAMETER APPLIES IN THE ZONE BETWEEN 0.050" AND 0.250" FROM THE BASE SEAT. BETWEEN 0.250" AND 1.50" A MAXIMUM OF 0.21" DIAMETER IS HELD.

NOTE 2: FORWARD (EASY) CURRENT FLOW THROUGH THE DEVICE IS IN THE DIRECTION TOWARD THE LEAD ADJACENT TO THE POLARITY MARK.

RCA DIFFUSED JUNCTION SILICON RECTIFIERS

Uninsulated Types / *Insulated Types*

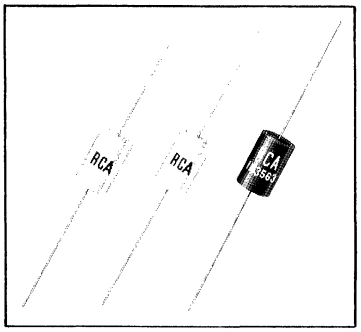
1N3193 1N3253
1N3194 1N3254
1N3195 1N3255
1N3196 1N3256
1N3563

File No. 41

RCA-1N3193, 1N3194, 1N3195, 1N3196, 1N3253, 1N3254, 1N3255, 1N3256, and 1N3563 are hermetically sealed silicon rectifiers of the diffused-junction type utilizing small cylindrical metal cases and axial leads. Types 1N3253, 1N3254, 1N3255, and 1N3256 are insulated versions of types 1N3193, 1N3194, 1N3195, and 1N3196, respectively. Type 1N3563 is an insulated rectifier which does not have an uninsulated equivalent. The 1N3563 is also provided with a special coating designed to protect the device against the effects of severe environmental conditions.

DIFFUSED-JUNCTION SILICON RECTIFIERS

FOR INDUSTRIAL AND CONSUMER-PRODUCT APPLICATIONS



1N3193 to 1N3196 *1N3253 to 1N3256* *1N3563*

- **cylindrical design with axial leads for simple handling and installation**
- **compact, hermetically sealed metal case (0.405" max. length; 0.240" max. dia.)**
- **insulated types 1N3253, 1N3254, 1N3255, 1N3256, and 1N3563 have transparent, high-dielectric-strength plastic sleeve over metal case**
- **high maximum forward-current ratings – up to 750 milliamperes at 75° C**
- **peak-reverse-voltage ratings – 200 to 1000 volts**
- **maximum free-air operating temperature – 100° C**
- **designed to meet stringent temperature-cycling and humidity requirements of critical industrial and consumer-product applications**

RECTIFIER SERVICE *(For a supply-line frequency of 60 cps)*

Maximum Ratings, *Absolute-Maximum Values:*

	For resistive or inductive load					*For capacitor-input filter*					
	1N3193 1N3253	1N3194 1N3254	1N3195 1N3255	1N3196 1N3256	1N3563	1N3193 1N3253	1N3194 1N3254	1N3195 1N3255	1N3196 1N3256	1N3563	
PEAK REVERSE VOLTAGE	200	400	600	800	1000	200	400	600	800	1000	volts
RMS SUPPLY VOLTAGE	140	280	420	560	700	70	140	210	280	350	volts
FORWARD CURRENT: For free-air temperatures up to 75°C. For free-air temperatures above 75°C, see Rating Chart.											
DC	750	750	750	500	400	500	500	500	400	300	ma
PEAK RECURRENT	-	-	-	-	-	6	6	6	5	4	amp
SURGE - For "turn-on" time of 2 milliseconds	-	-	-	-	-	35	35	35	35	35	amp
FREE-AIR-TEMPERATURE RANGE:											
Operating	← -65 to +100 →										°C
Storage	← -65 to +175 →										°C
LEAD TEMPERATURE:											
For 10 seconds maximum	← 255 →										°C

Characteristics, *At a Free-Air Temperature of 25°C:*

	1N3193 1N3253	1N3194 1N3254	1N3195 1N3255	1N3196 1N3256	1N3563	
Maximum Instantaneous Forward Voltage Drop at dc forward current of 0.5 ampere	1.2	1.2	1.2	1.2	1.2	volts
Maximum Reverse Current:						
Dynamic, at T_{FA} = 75°C*	0.2	0.2	0.2	0.2	0.2	ma
Static, at T_{FA} = 25°C**	0.005	0.005	0.005	0.005	0.005	ma

* At max. peak reverse voltage and max. dc forward current.

** At max. peak reverse voltage and zero forward current.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

1N3193-1N3196, 1N3253-1N3256, 1N3563 6-66
Supersedes ICE-268 issue dated 5-62

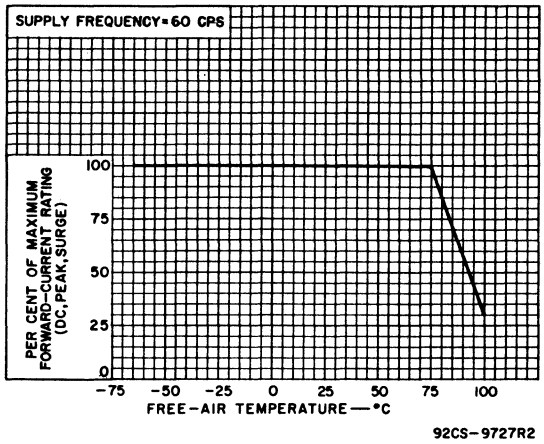


Fig.1 - Rating chart for types 1N3193 to 1N3196, 1N3253 to 1N3256, and 1N3563.

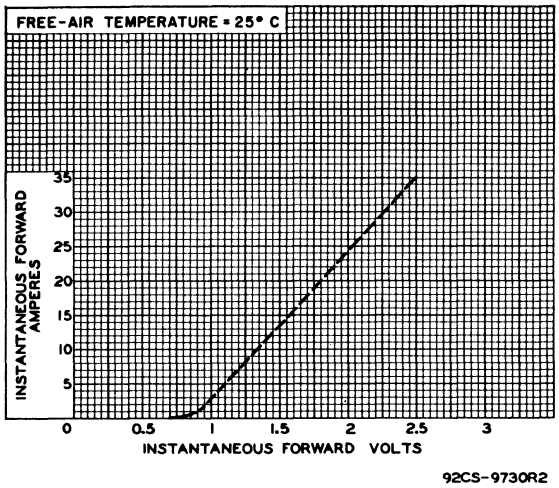


Fig.2 - Typical forward characteristics for types 1N3193 to 1N3196, 1N3253 to 1N3256, and 1N3563.

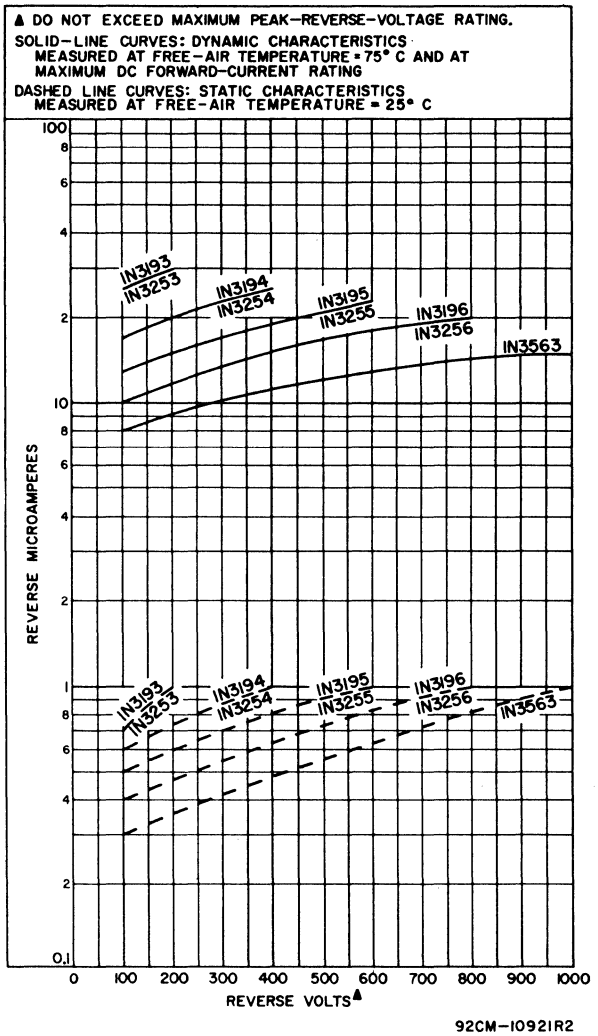


Fig.3 - Typical reverse characteristics for types 1N3193 to 1N3196, 1N3253 to 1N3256, and 1N3563.

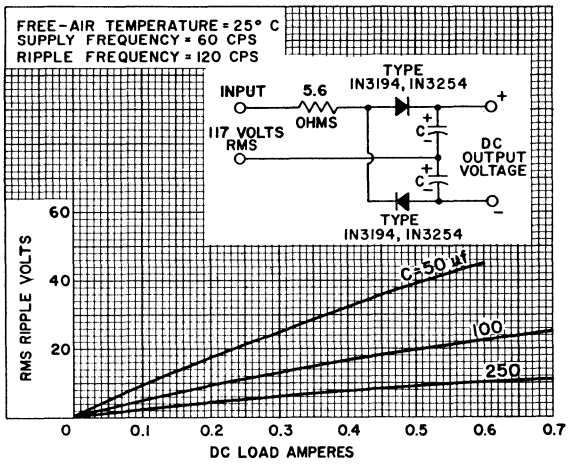


Fig.4 - Typical operation characteristics of types 1N3194 and 1N3254 in full-wave voltage-doubler service.

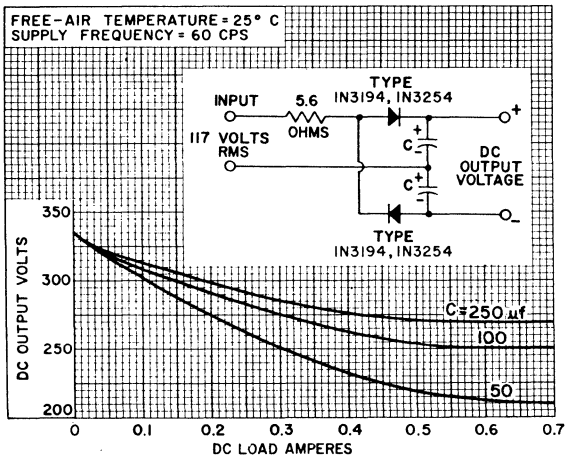


Fig.5 - Typical operation characteristics of types 1N3194 and 1N3254 in full-wave voltage-doubler service.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

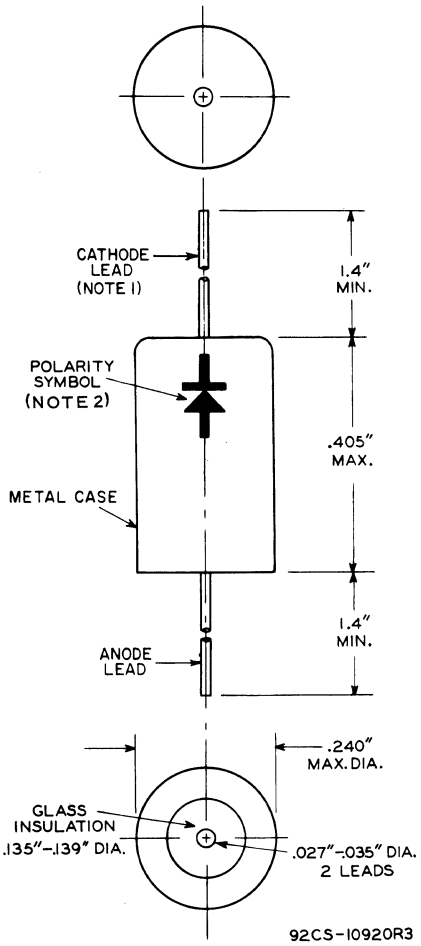
A *surge-limiting impedance* should always be used in series with the rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

The flexible leads of these rectifiers are usually soldered to the circuit elements. It is desirable in all soldering operations to provide some slack or an expansion elbow in the leads to prevent excessive tension on the leads. It is important during the soldering operation to avoid excessive heat in order to prevent possible damage to the rectifiers. To absorb some of the heat, grip the flexible lead of the rectifier between the case and the soldering point with a pair of pliers.

When dip soldering is employed in the assembly of printed circuits using these rectifiers, the temperature of the solder should not exceed 255° C for a maximum immersion period of 10 seconds. Furthermore, the leads should not be dip soldered within 0.25" of the metal case.

Because the cases of the 1N3193 to 1N3196 may operate at potentials which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the rectifier. It is recommended that these rectifiers be mounted on the underside of the chassis.

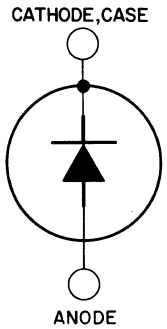
DIMENSIONAL OUTLINE
for Types 1N3193, 1N3194, 1N3195, 1N3196



NOTE 1: CONNECTED TO METAL CASE.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

TERMINAL DIAGRAM
for Types 1N3193 through 1N3196



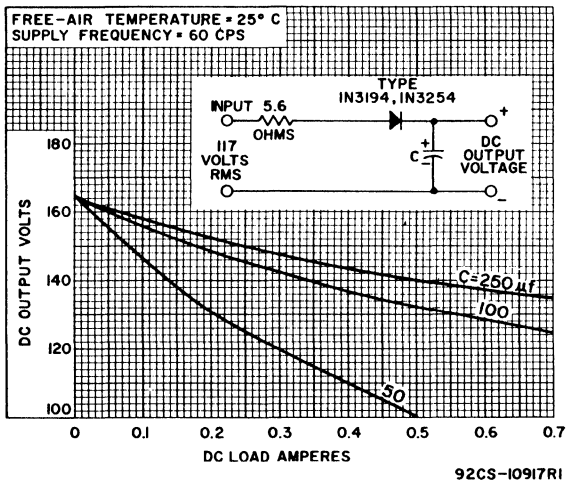


Fig.6 - Typical operation characteristics of types 1N3194 and 1N3254 in half-wave rectifier service.

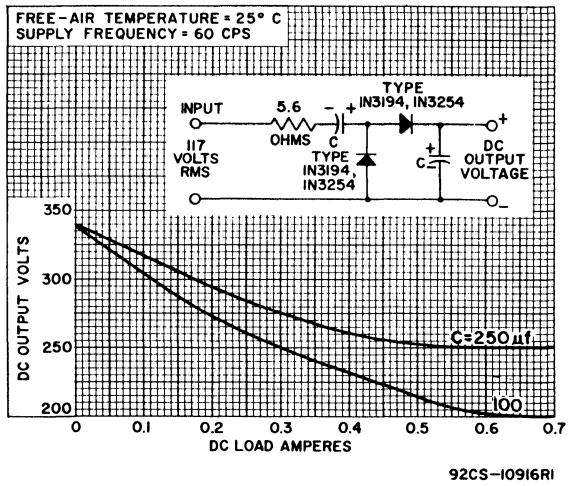


Fig.7 - Typical operation characteristics of types 1N3194 and 1N3254 in half-wave voltage-doubler service.

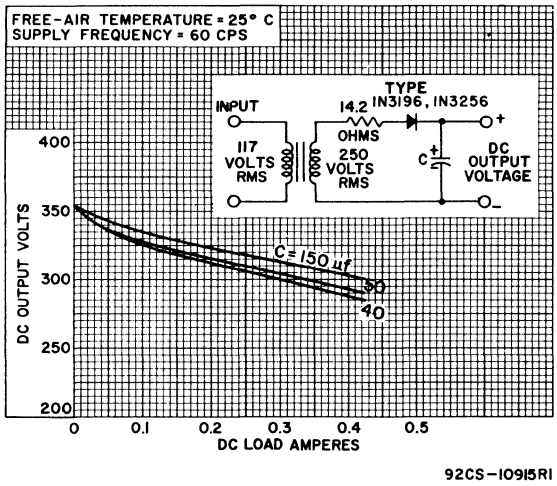


Fig.8 - Typical operation characteristics of types 1N3196 and 1N3256 in half-wave rectifier service.

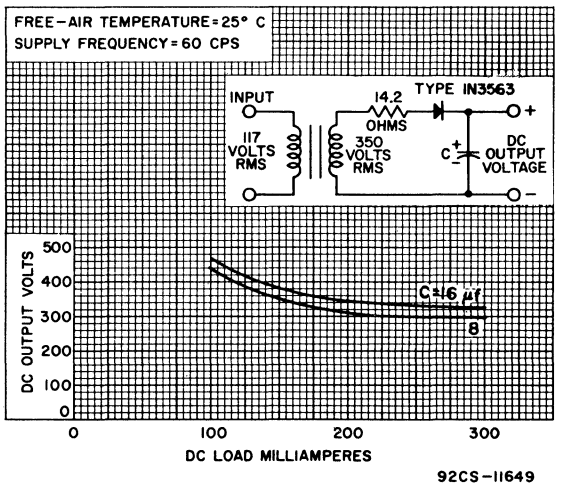


Fig.9 - Typical operation characteristics of type 1N3563 in half-wave rectifier service.

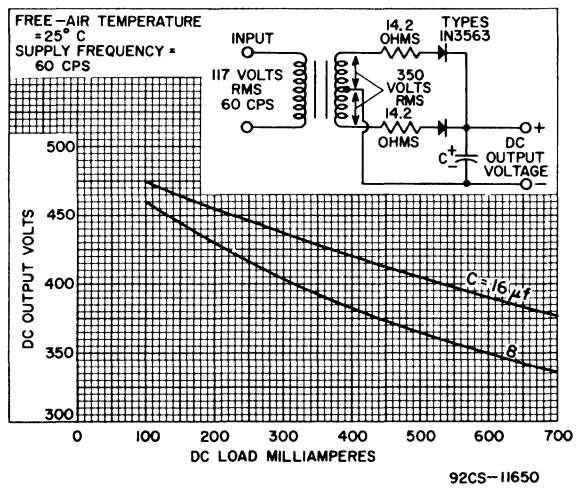
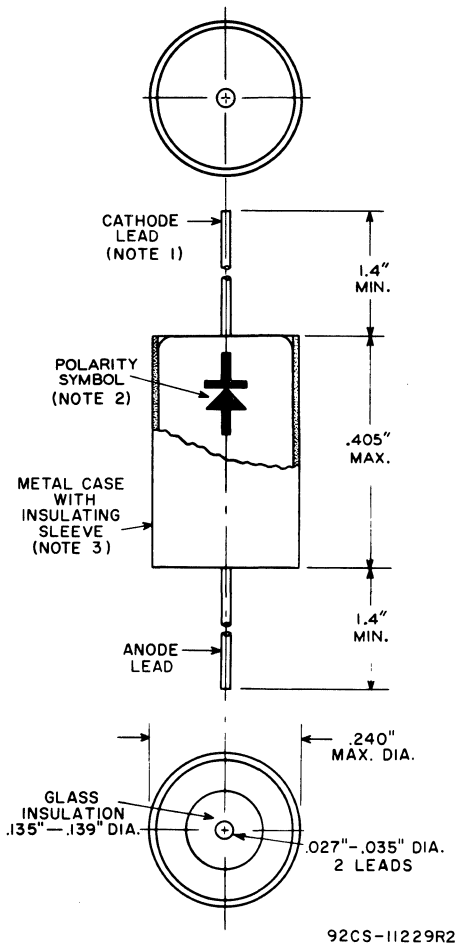


Fig.10 - Typical operation characteristics of type 1N3563 in full-wave rectifier service.

DIMENSIONAL OUTLINE
for Types 1N3253, 1N3254, 1N3255, 1N3256, 1N3563



Specifications of Insulating Sleeve

Material: Plastic

Wall Thickness: 0.002"

Dielectric Strength: 4500 volts/mil at 25° C
3150 volts/mil at 150° C

Moisture Absorption: 0.3%
Surface resistivity is not affected by moisture.

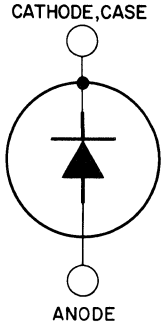
Degree of Transparency: Optically clear

NOTE 1: CONNECTED TO METAL CASE.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

NOTE 3: INSULATOR SLEEVE MAY EXTEND 1/16" BEYOND ENDS OF CASE.

TERMINAL DIAGRAM
for Types 1N3253 through 1N3256, and 1N3563



RCA DIFFUSED JUNCTION SILICON RECTIFIERS

1N3754
1N3755
1N3756

File No. 39

RCA-1N3754, 1N3755, and 1N3756 are hermetically sealed diffused-junction silicon rectifiers of single-ended design, utilizing the same small case used in the standard JEDEC TO-1 transistor package.

These rectifiers are intended for use in industrial and consumer-product applications.

RECTIFIER SERVICE

For power-supply frequency of 60 cps

Maximum Ratings, *Absolute-Maximum Values:*

	For capacitor-input filter			
	1N3754	*1N3755*	*1N3756*	
PEAK REVERSE VOLTAGE. .	100	200	400	volts
RMS SUPPLY VOLTAGE . .	35	70	140	volts
FORWARD CURRENT:				
For free-air temperatures up to 65° C. (For free-air temperatures above 65° C, see *Rating Chart, Fig.1.)*				
DC	125	125	125	ma
PEAK RECURRENT . . .	1.3	1.3	1.3	amp
SURGE - for "turn-on" time of 2 milliseconds at free-air temperature = 25° C.	30	30	30	amp
FREE-AIR-TEMPERATURE RANGE:				
Operating.	-65 to +100			°C
Storage.	-65 to +175			°C
LEAD TEMPERATURE:				
For 10 seconds maximum.	255	255	255	°C

Characteristics, *At a Free-Air Temperature (T_{FA}) of 25° C*

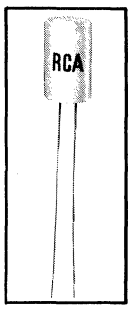
	1N3754	*1N3755*	*1N3756*	
Maximum Instantaneous Forward Voltage Drop (at dc forward current of 125 milliamperes). . . .	1	1	1	volt
Maximum Reverse Current:				
Dynamic[a], at free-air temperature = 65° C.	0.3	0.3	0.3	ma
Static[b], at free-air temperature = 25° C.	0.005	0.005	0.005	ma

[a] At maximum peak reverse voltage and maximum dc forward current.

[b] At maximum peak reverse voltage and zero forward current.

DIFFUSED-JUNCTION SILICON RECTIFIERS

For Industrial and Consumer-Product Applications



1N3754
1N3755
1N3756

FEATURES:

- rated to cover a wide range of low-power rectifier and diode applications — up to 400 peak reverse volts at 125 milliamperes
- cylindrical case with flexible leads — features single-ended design for ease of handling and installation
- compact, hermetically sealed metal TO-1 transistor case (0.410" max. length; 0.240" max. dia.) completely insulated from rectifier unit
- designed to meet stringent temperature-cycling and humidity requirements of critical industrial and comsumer-product applications
- maximum free-air operating temperature — 100° C

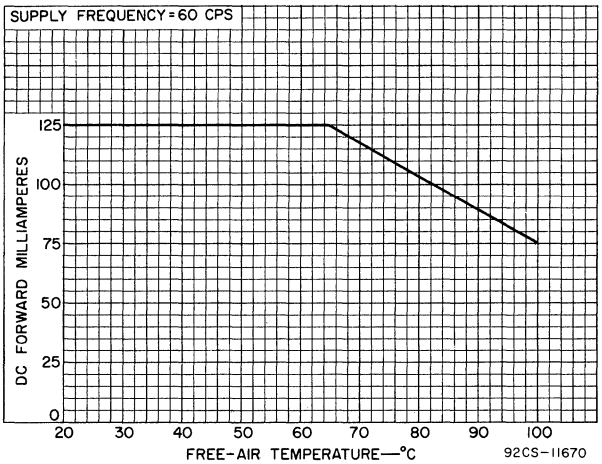


Fig. 1 - Rating Chart for Types 1N3754, 1N3755, 1N3756

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
1N3754 through 1N3756 7-66
Supersedes issue dated 5-62

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

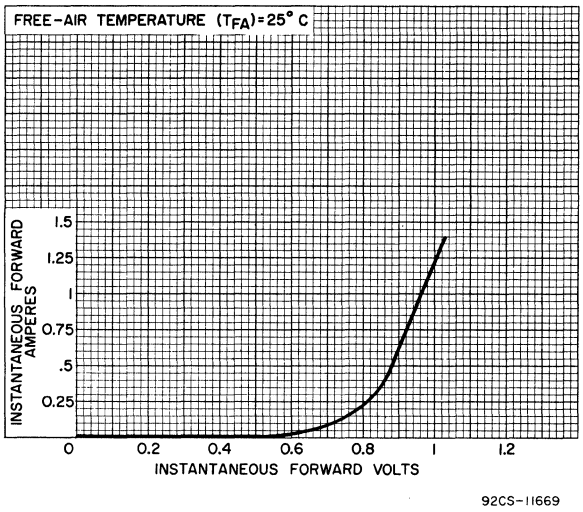


Fig. 2 - Typical Forward Characteristic for Types 1N3754, 1N3755, and 1N3756.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

A *surge-limiting impedance* should always be used in series with the rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

The *flexible leads* of these rectifiers are usually soldered to the circuit elements. It is desirable in all soldering operations to provide some slack or an expansion elbow in the leads to prevent excessive tension on the leads. It is important during the soldering operation to avoid excessive heat in order to prevent possible damage to the rectifiers. To absorb some of the heat, grip the flexible lead of the rectifier between the case and the soldering point with a pair of pliers.

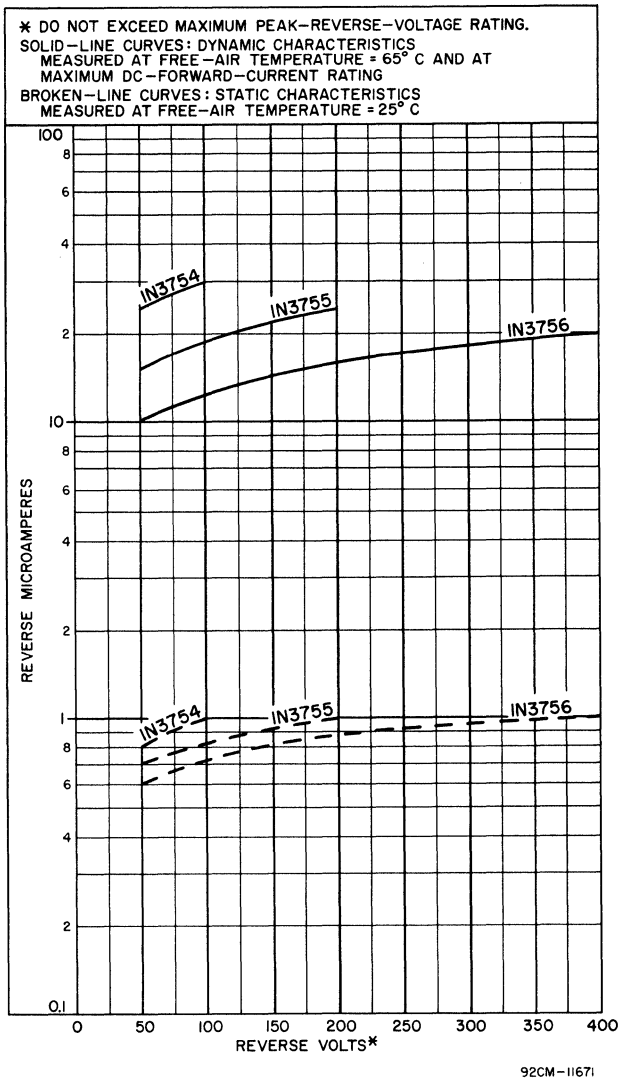


Fig. 3 - Typical Reverse Characteristics for Types 1N3754, 1N3755, and 1N3756.

When dip soldering is employed in the assembly of printed circuits using these rectifiers, the temperature of the solder should not exceed 255° C for a maximum immersion period of 10 seconds. Furthermore, the leads should not be dip soldered within 0.25" of the metal case.

The 1N3754, 1N3755, and 1N3756 are designed to provide reliable performance when operated within the maximum ratings shown in this bulletin. For measurement of the reverse characteristics of these devices, peak reverse voltages as high as 30 per cent above the maximum rated values may be applied for a period not exceeding 10 seconds. *Under no circumstances should peak reverse voltages greater than 30% above the maximum rated values be applied to these devices even momentarily.*

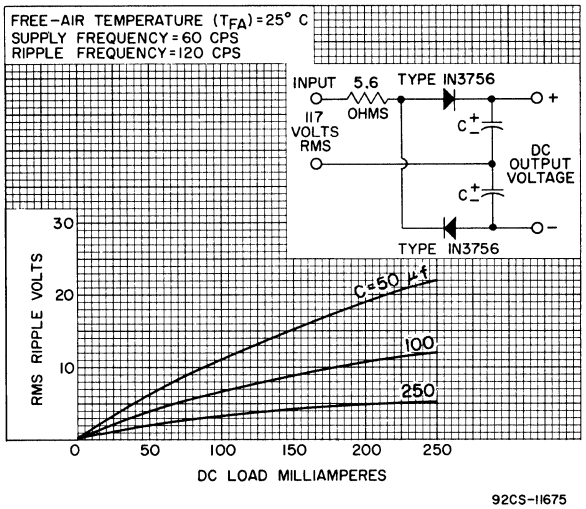


Fig. 4 - Typical Operation Characteristics for Types 1N3754, 1N3755, and 1N3756 in Full-Wave Voltage-Doubler Service.

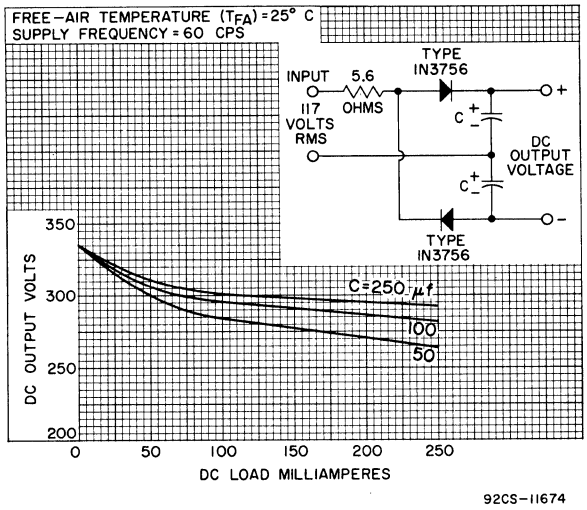


Fig. 5 - Typical Operation Characteristics for Types 1N3754, 1N3755, and 1N3756 in Full-Wave Voltage-Doubler Service.

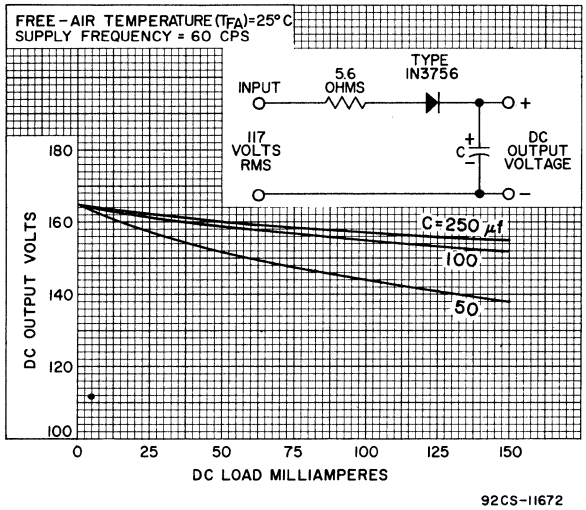


Fig. 6 - Typical Operation Characteristics for Types 1N3754, 1N3755, and 1N3756 in Half-Wave Rectifier Service.

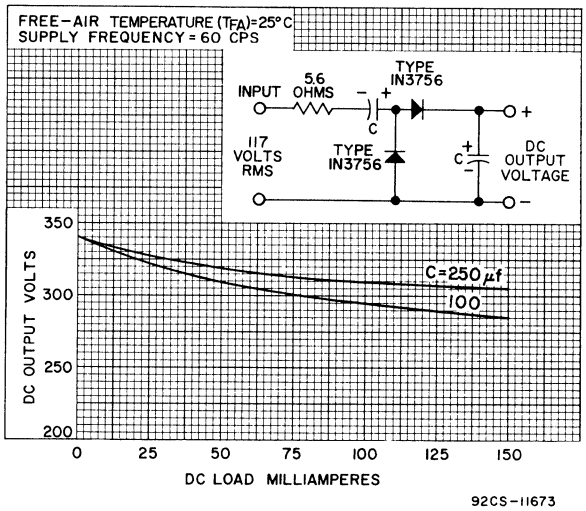
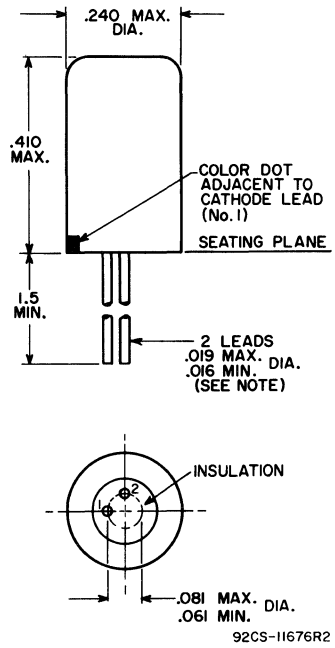


Fig. 7 - Typical Operation Characteristics for Types 1N3754, 1N3755, and 1N3756 in Half-Wave Voltage - Doubler Service.

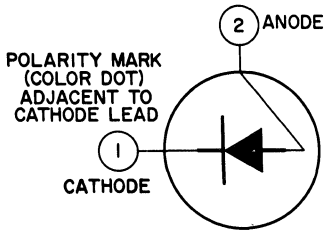
DIMENSIONAL OUTLINE



NOTE 1: THE SPECIFIED LEAD DIAMETER APPLIES IN THE ZONE BETWEEN 0.050" AND 0.250" FROM THE BASE SEAT. BETWEEN 0.250" AND 1.50" A MAXIMUM OF 0.21" DIAMETER IS HELD.

NOTE 2: FORWARD (EASY) CURRENT FLOW THROUGH THE DEVICE IS IN THE DIRECTION TOWARD THE LEAD ADJACENT TO THE POLARITY MARK.

TERMINAL DIAGRAM



RCA DIFFUSED JUNCTION SILICON RECTIFIERS

Uninsulated Types	*Insulated Types*
1N5211	1N5215
1N5212	1N5216
1N5213	1N5217
1N5214	1N5218

File No. 245

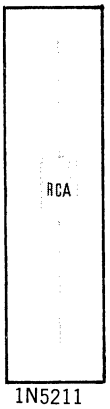
RCA-1N5211, 1N5212, 1N5213, 1N5214, 1N5215, 1N5216, 1N5217, and 1N5218* are hermetically sealed silicon rectifiers of the diffused-junction type utilizing small cylindrical metal cases and axial leads. Types 1N5215, 1N5216, 1N5217, and 1N5218 are insulated versions of types 1N5211, 1N5212, 1N5213, and 1N5214, respectively. These rectifiers feature dc forward current ratings of up to 1 A, a surge-current rating of 50A, low forward voltage drop, low leakage currents, and an operating-temperature range of -65°C to +175°C.

* Formerly Dev. Nos. TA2845C, TA2845B, TA2845A, TA2845, TA7048C, TA7048B, TA7048A, and TA7048, respectively.

SILICON RECTIFIERS

DIFFUSED-JUNCTION TYPES

For Industrial and Consumer-Product Applications



1N5211 through 1N5214

1N5215 through 1N5218

- cylindrical design with axial leads for simple handling and installation
- compact, hermetically sealed metal case (0.405" max. length; 0.240" max. dia.)
- types 1N5215 through 1N5218 have transparent, high-dielectric-strength plastic sleeve over metal case
- high maximum forward-current ratings — up to 1 ampere DC at 75°C
- peak-reverse-voltage ratings from 200 to 800 volts
- operation at ambient temperatures to +175°C

RECTIFIER SERVICE (For a supply-line frequency of 60 Hz)

Maximum Ratings, *Absolute-Maximum Values:*

	For resistive or inductive load				*For capacitor-input filter*					
	1N5211 1N5215	1N5212 1N5216	1N5213 1N5217	1N5214 1N5218	1N5211 1N5215	1N5212 1N5216	1N5213 1N5217	1N5214 1N5218		
PEAK REVERSE VOLTAGE	200	400	600	800	200	400	600	800	max.	V
RMS SUPPLY VOLTAGE	140	280	420	560	70	140	210	280	max.	V
FORWARD CURRENT: For ambient temperatures up to 75°C. For ambient temperatures above 75°C, see Rating Chart.										
DC	1	1	1	0.75	0.75	0.75	0.75	0.6	max.	A
PEAK RECURRENT	-	-	-	-	6	6	6	5	max.	A
SURGE — For "turn-on" time of 2 milliseconds	-	-	-	-	50	50	50	50	max.	A
AMBIENT-TEMPERATURE RANGE:										
Operating	←			-65 to +175				→		°C
Storage	←			-65 to +175				→		°C
LEAD TEMPERATURE: For 10 seconds maximum	←			255				→	max.	°C

Characteristics:

	1N5211 1N5215	1N5212 1N5216	1N5213 1N5217	1N5214 1N5218		
Maximum Instantaneous Forward Voltage Drop at dc forward current of 1 ampere and $T_A \leq 75°C$	1.2	1.2	1.2	1.2	max.	V
Maximum Reverse Current:						
Dynamic, at T_A = 75°C**	0.2	0.2	0.2	0.2	max.	mA
Static, at T_A = 25°C***	0.005	0.005	0.005	0.005	max.	mA

**At max. peak reverse voltage and max. dc forward current.

***At max. peak reverse voltage and zero forward current.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
1N5211 through 1N5218 2-67

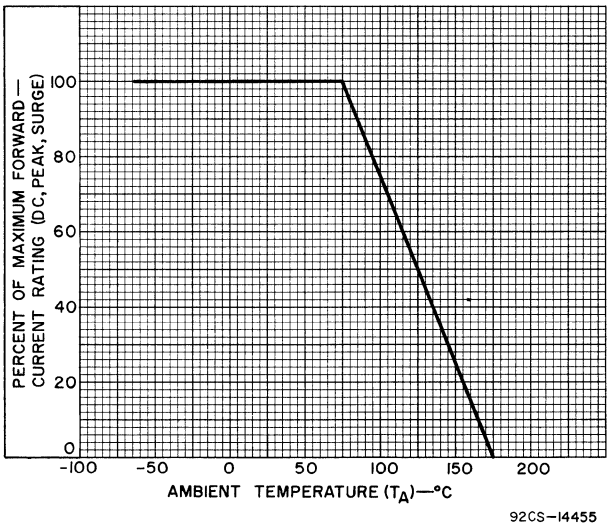


Fig.1 - Rating Chart for Types 1N5211 through 1N5218.

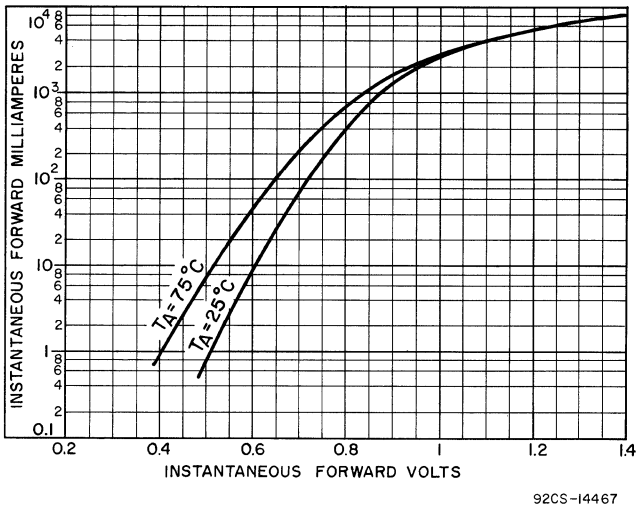


Fig.2 - Typical Forward Characteristics for Types 1N5211 through 1N5218.

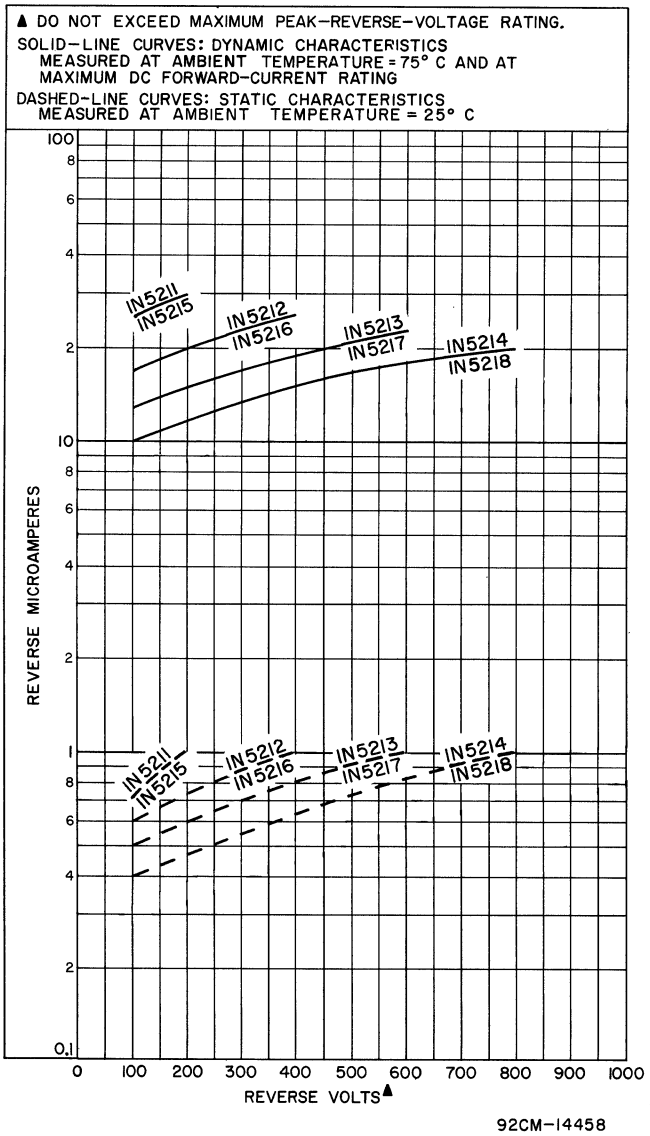


Fig.3 - Typical Reverse Characteristics for Types 1N5211 through 1N5218.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

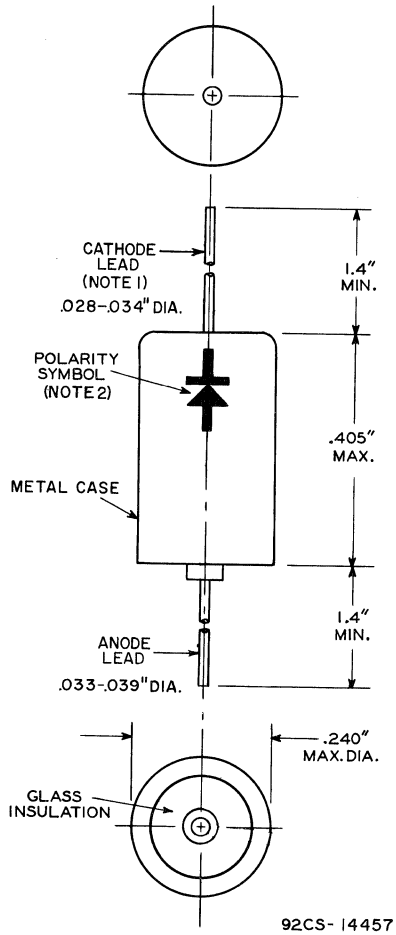
A *surge-limiting impedance* should always be used in series with the rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

The flexible leads of these rectifiers are usually soldered to the circuit elements. It is desirable in all soldering operations to provide some slack or an expansion elbow in the leads to prevent excessive tension on the leads. It is important during the soldering operation to avoid excessive heat in order to prevent possible damage to the rectifiers. To absorb some of the heat, grip the flexible lead of the rectifier between the case and the soldering point with a pair of pliers.

When dip soldering is employed in the assembly of printed circuits using these rectifiers, the temperature of the solder should not exceed 255°C for a maximum immersion period of 10 seconds. Furthermore, the leads should not be dip soldered within 0.25" of the metal case. *Best thermal performance will be obtained when connections to the rectifier leads are made at points not more than 0.75" from the case.*

Because the cases of these rectifiers may operate at potentials which are dangerous, care should be taken in the design of equipment to prevent the operator from coming in contact with the devices. It is recommended that these rectifiers be mounted on the underside of the chassis.

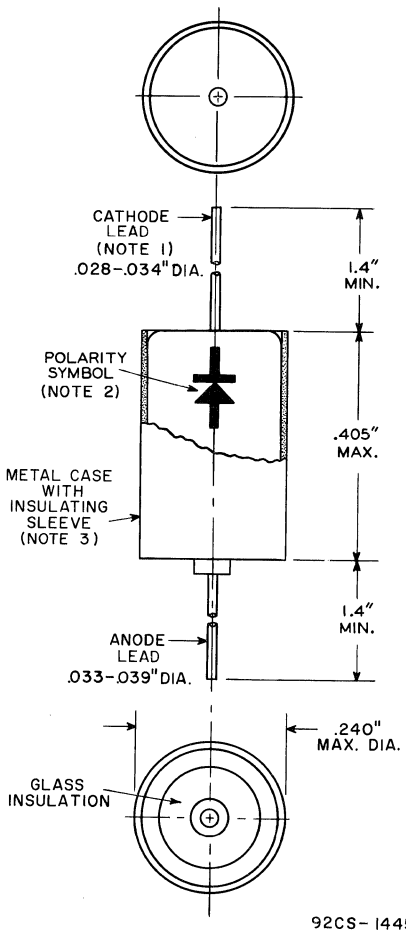
DIMENSIONAL OUTLINE
for Types 1N5211, 1N5212, 1N5213, 1N5214



NOTE 1: CONNECTED TO METAL CASE.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

DIMENSIONAL OUTLINE
for Types 1N5215, 1N5216, 1N5217, 1N5218



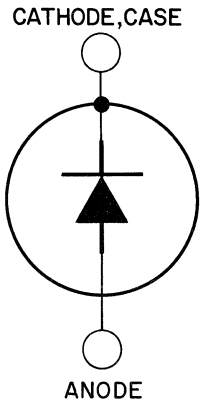
Insulating Sleeve Dielectric Strength: 2000 Volts Minimum

NOTE 1: CONNECTED TO METAL CASE.

NOTE 2: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

NOTE 3: INSULATING SLEEVE MAY EXTEND 1/16" BEYOND ENDS OF CASE.

TERMINAL DIAGRAM
for Types 1N5211 through 1N5218



HIGH-VOLTAGE SILICON RECTIFIERS

CR101–CR110

File No. 84

RCA CR101 through CR110 high-voltage rectifiers consist of series-connected, hermetically-sealed, RCA diffused-junction silicon-rectifier cells molded into a compact, rugged case of insulating material.

These high-voltage rectifiers, which are intended for use in industrial and military equipment, contain integral R-C networks designed to equalize the reverse voltages across the rectifier cells under both steady-state and transient conditions.

With Integral R-C Voltage-Equalizing Networks

Designed to Meet Stringent Military, Mechanical, and Environmental Specifications

FEATURES

- 1265 to 10,130 PRV
- Up to 1000 ma output per rectifier
- Up to 2.0 amp output for 4 rectifiers in single-phase, full-wave bridge circuit
- Up to 2.67 amp output for 6 rectifiers in a 3-phase full-wave bridge circuit
- Low forward voltage drop
- Withstand transient reverse voltages 20% above PRV ratings
- -65° C to +125° C operating and storage temperature range
- All identification markings permanently molded in case
- Case material flammability: self-quenching

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load.

	CR101	CR102	CR103	CR104	CR105	CR106	CR107	CR108	CR109	CR110
PEAK REVERSE VOLTS:										
REPETITIVE	1265	2530	3165	4430	5065	6330	7595	8230	9495	10,130
NON-REPETITIVE (Transient, for max. duration of 5 msec):										
At free-air temperatures from 60° C to 125° C	1520	3035	3800	5315	6080	7595	9115	9875	11,395	12,155 ←
At other free-air temperatures	← See *Fig. 1* →									
RMS SUPPLY VOLTS	895	1790	2240	3130	3580	4475	5370	5820	6710	7160
DC BLOCKING VOLTS	1265	2530	3165	4430	5065	6330	7595	8230	9495	10,130
AVERAGE FORWARD MILLIAMPERES:										
At 60° C free-air temperature	1000	925	825	700	700	650	600	600	600	600
At 100° C free-air temperature	385	355	315	270	270	250	230	230	230	230
At other free-air temperatures	← See *Fig. 2* →									
PEAK RECURRENT AMPERES	← 5 →									
PEAK SURGE AMPERES:[a]										
One-half cycle, sine wave	← 20 →									
For more than one cycle	← See *Fig. 3* →									
FREE-AIR TEMPERATURE RANGE:										
Operating and storage	← -65 to +125° C →									

For **Characteristics** and Footnotes see next page.

→ Indicates a change.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
CR101–CR110 5/66
Reprinted from CR101–CR110 9/65

Characteristics	CR101	CR102	CR103	CR104	CR105	CR106	CR107	CR108	CR109	CR110
Max. Forward Voltage Drop (Volts)[b]	1.2	2.4	3.0	4.2	4.8	6.0	7.2	7.8	9.0	9.6
Instantaneous Forward Voltage Drop	← See *Fig.4* →									
Max. Reverse Milliamperes:										
Dynamic[c]	← 0.3 →									
Static[d]	← 0.6 →									
Shunt Capacitance (pf):										
Maximum	600	320	250	175	160	125	105	100	90	80
Minimum	350	175	140	100	85	70	60	55	45	40

[a] Superimposed on device operating within the maximum specified voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

[b] Maximum full-cycle average forward voltage drop at maximum rated operating conditions.

[c] Maximum reverse current averaged over one complete cycle and for operation at the maximum ratings. For example, for the CR101 at 60° C free-air temperature: average forward milliamperes = 1000; peak reverse volts = 1265.

[d] At maximum rated dc blocking voltage and any temperature within the operating temperature range.

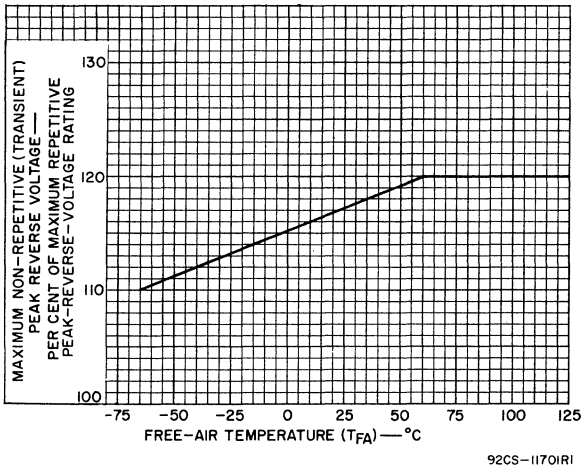


Fig. 1 - Rating chart for RCA CR101 through CR110.

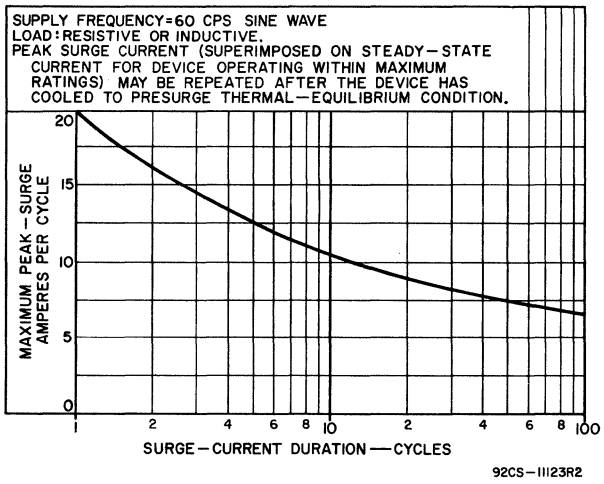
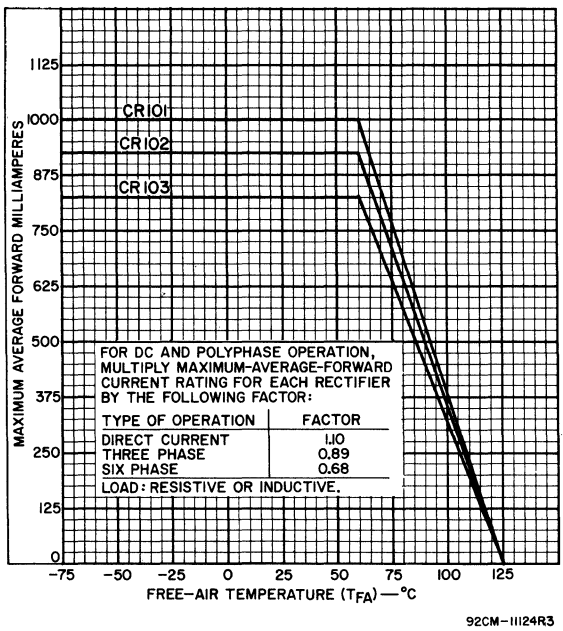


Fig. 3 - Peak surge-current rating chart for types CR101 through CR110.



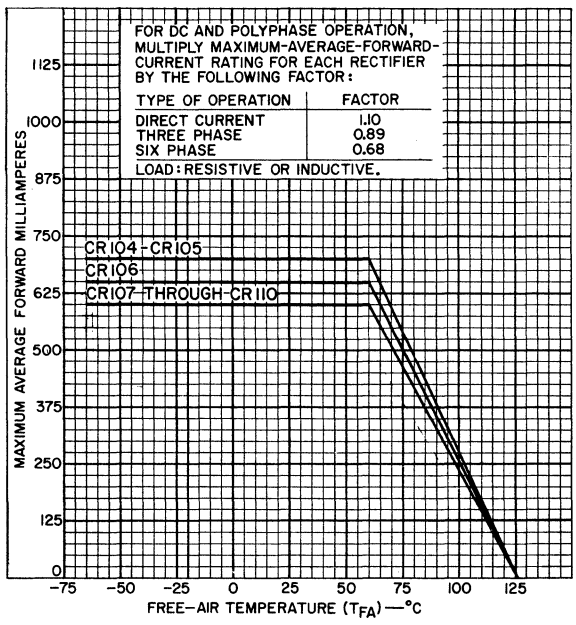


Fig. 2 - Rating charts for types CR101 through CR110 for dc, and 60-cps single-phase and polyphase operation.

OPERATING CONSIDERATIONS

A *surge-limiting impedance* should always be used in series with an RCA CR-series rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

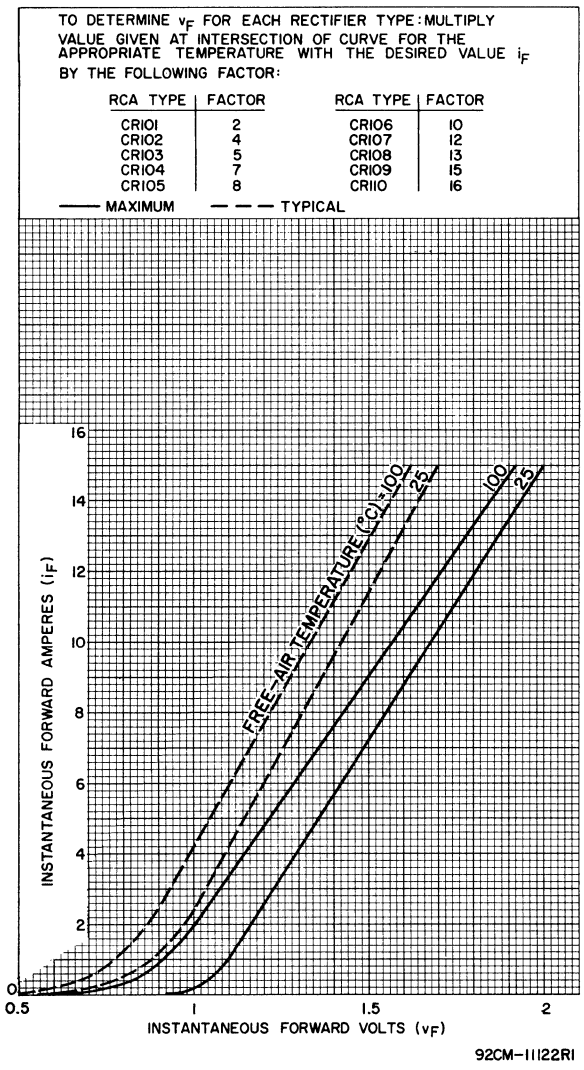


Fig. 4 - Typical forward characteristics for types CR101 through CR110.

RCA CR101 through CR110 high-voltage silicon rectifiers can be mounted in any position. It is recommended, however, that wherever possible these rectifiers be mounted on vertical surfaces to prevent accumulation of dust on the surfaces between the rectifier terminals.

RCA CR101 through CR110 are designed to operate at full ratings at altitudes up to 30,000 feet. For operation at altitudes above 10,000 feet, it is recommended that sufficient spacing be provided between rectifiers and between rectifiers and other components (including the chassis and enclosure) to prevent corona. If the applied voltage exceeds 5500 volts peak, the rectifiers should be mounted on standoff insulators at least 1-1/2 inches high.

When several RCA CR-series rectifiers are to be operated in series across a supply voltage of 20,000 volts peak or more, the protection afforded by the integral voltage-equalizing networks may not be adequate, depending on the circuit arrangement and the physical layout of the components. Consequently, additional protection against high transient voltages may be required in the design of the equipment. For additional information on this subject, write to RCA, Commercial Engineering, Harrison, New Jersey.

Because these CR-series rectifiers operate at voltages which are dangerous, care should be taken in the design and operation of the equipment to prevent personnel from coming in contact with the rectifiers.

Connections to the solder terminals of these rectifiers should be made with No. 16AWG (or smaller diameter) wire. Care should be exercised during the soldering operation to prevent overheating of the rectifier terminals. A clean, well-tinned iron is recommended to keep soldering time to a minimum.

During a period of prolonged heating: for example, during lead unwrapping, a heat sink such as the jaws of a pair of long-nose pliers should be used between the tip of the soldering iron and the rectifier case.

RCA CR101 through CR110 rectifiers are designed to meet the following rigorous environmental tests:

Moisture Resistance:
MIL-STD-202B, method 106A
MIL-S-19500B, paragraph 40.6

Salt Spray (Corrosion):
MIL-STD-202B, method 101A, Condition A (Length of test—96 hours)
MIL-S-19500B, paragraph 40.9

Shock:
MIL-STD-202B, method 202A
MIL-S-19500B, paragraph 40.10
The device is subjected to 5 blows in each of the orientations X_1, Y_1, and Z_1 with an acceleration of 50 G and a duration of approximately 11 msec.

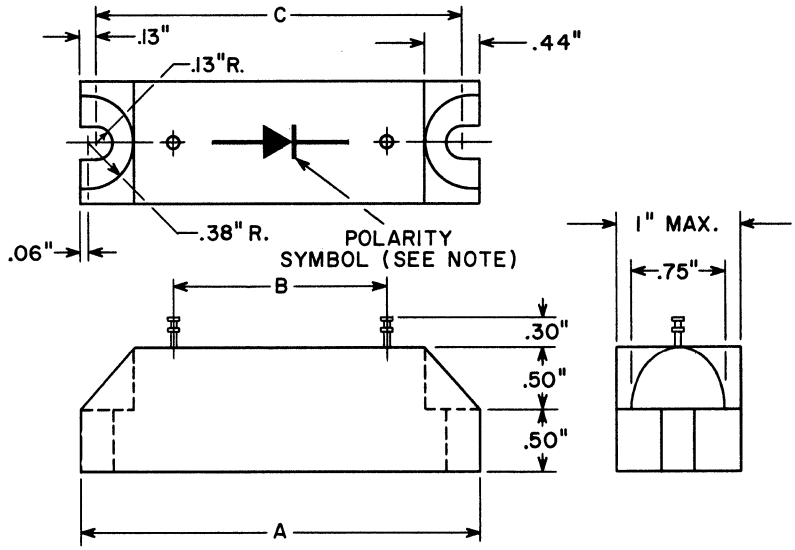
Vibration Fatigue:
MIL-S-19500B, paragraph 40.18
The device is subjected to a simple harmonic motion at any single frequency between 40 and 100 cps with a constant peak acceleration of 20 G. The vibration shall be applied for 32 hours minimum in each of the orientations X_1, Y_1, and Z_1 (a total of 96 hours minimum).

Vibration, Variable Frequency:
MIL-S-19500B, paragraph 40.20

Temperature Cycling:
MIL-STD-202B, method 102A, Condition C
MIL-S-19500B, paragraph 40.14

Barometric Pressure:
MIL-STD-202B, method 105B, Condition A (Operation at altitude of 30,000 feet)
MIL-S-19500B, paragraph 40.1

DIMENSIONAL OUTLINE



92CS-11121R2

NOTE: Arrow indicates direction of forward (easy) current flow as indicated by dc ammeter.

RCA Type	Maximum Overall Length (A) (inches)	Nominal Spacing Between Terminals (B) (inches)	Distance Between Centers of Mounting Holes* (C) (inches)	Weight (ounces)
CR101	2-3/8	1-1/8	2-1/8	2.0
CR102	2-3/8	1-1/8	2-1/8	2.0
CR103	2-3/8	1-1/8	2-1/8	2.1
CR104	3-1/4	1-3/4	3	3.0
CR105	3-1/4	1-3/4	3	3.1
CR106	4-1/2	3-1/4	4-1/4	4.2
CR107	4-1/2	3-1/4	4-1/4	4.4
CR108	4-1/2	3-1/4	4-1/4	4.5
CR109	5-1/2	4	5-1/4	5.4
CR110	5-1/2	4	5-1/4	5.5

*For 1/4-inch bolts.

HIGH-VOLTAGE SILICON RECTIFIERS

CR201 CR206
CR203 CR208
CR204 CR210
CR212

File No. 86

RCA CR201 through CR212 high-voltage rectifiers consist of series-connected, hermetically-sealed, RCA diffused-junction silicon-rectifier cells molded into a compact rugged case of insulating material.

These devices are intended for use in industrial and military applications requiring small, light-weight rectifiers with very high reliability, a dc output capability of 400 ma per unit over a wide temperature range, and repetitive peak-reverse-voltage-ratings from 1900 to 12,000 volts.

These rectifiers also feature low forward voltage drop, low leakage, and axial wire leads for simplicity of installation. The rectifier cells comprising each unit are precisely matched to assure equalization of internal voltages under both steady-state and transient conditions.

With Precisely Matched Cells for Internal Voltage Equalization

- Cells rigorously tested for dissipation capability under reverse voltage and current conditions
- 1900 to 12,000 PRV
- Withstand transient reverse voltages 20% above PRV ratings
- 400 ma output per rectifier
- Up to 800 ma output for 4 rectifiers in single-phase, full-wave bridge circuit
- Up to 1068 ma output for 6 rectifiers in 3-phase full-wave bridge circuit
- Designed to meet stringent electrical, mechanical, and environmental specifications
- Diffused-junction construction assures uniformity of characteristics
- Very small size, light weight—operate in any position
- Case material flammability: self-quenching
- No special heat sinks required
- Low forward voltage drop
- Low leakage

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load.

	CR201	CR203	CR204	CR206	CR208	CR210	CR212
PEAK REVERSE VOLTS:							
REPETITIVE	1900	3165	4800	6330	8000	10,000	12,000
NON-REPETITIVE (Transient, for max. duration of 5 msec):							
At free-air temperatures from 60° C to 125° C	2280	3800	5760	7595	9600	12,000	14,400 →
At other free-air temperatures	← See *Fig. 1* →						
RMS SUPPLY VOLTS	1345	2240	3395	4475	5655	7070	8485
DC BLOCKING VOLTS	1900	3165	4800	6330	8000	10,000	12,000
AVERAGE FORWARD MILLIAMPERES:							
At T_{FA} = 60° C	400	400	400	400	400	400	400
At T_{FA} = 100° C	155	155	155	155	155	155	155
At other free-air temperatures	← See *Fig. 2* →						
PEAK RECURRENT AMPERES	← 3 →						
PEAK SURGE AMPERES: [a]							
One-half cycle, sine wave	← 10 →						
For more than one cycle	← See *Fig. 3* →						
FREE-AIR TEMPERATURE RANGE:							
Operating and storage	← -65 to +125° C →						

For footnotes, see next page.

→ Indicates a change.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
CR201,CR203,CR204,CR206,
CR208,CR210,CR212 5/66

Reprinted from CR201,CR203,CR204,CR206,CR208, CR210,CR212 9/65

Characteristics:	CR201	CR203	CR204	CR206	CR208	CR210	CR212
Max. Forward Voltage Drop (Volts)[b]	1.8	3	3.6	6	6	7.2	9
Instantaneous Forward Voltage Drop	← See *Fig. 4* →						
Max. Reverse Milliamperes:							
Dynamic[c] at T_{FA} = 100° C	← 0.1 →						
Static[d] at T_{FA} = 25° C.	← 0.01 →						
Static[d] at T_{FA} = 100° C	← 0.2 →						

T_{FA} = free-air temperature.

[a] Superimposed on device operating within the maximum specified voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

[b] Maximum full-cycle average forward voltage drop at maximum rated operating conditions.

[c] Maximum reverse current averaged over one complete cycle and for operation at the maximum ratings. For example, for the CR201 at 60° C free-air temperature: average forward milliamperes = 400; peak reverse volts = 1900.

[d] At maximum rated dc blocking voltage and any temperature within the operating temperature range.

INSTALLATION AND OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

A *surge-limiting impedance* should always be used in series with the rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power transformer windings, or by an external resistor or choke.

Because these rectifiers operate at voltages which are dangerous, care should be taken in the design and operation of the equipment to prevent personnel from coming in contact with the rectifiers.

Care should be exercised during soldering of the wire leads of these rectifiers to prevent overheating of the rectifier cells. A clean, well-tinned iron should be used to keep soldering time to a minimum.

During a period of prolonged heating—for example, during lead unwrapping—a heat sink such as the jaws of a pair of long-nose pliers should be used between the tip of the soldering iron and the rectifier case.

RCA CR201 through CR212 rectifiers should not be used in series arrangements to obtain dc output voltages higher than those obtainable from single units. For information on special precision-matched units for use in such series arrangements, contact your nearest RCA Field Office.

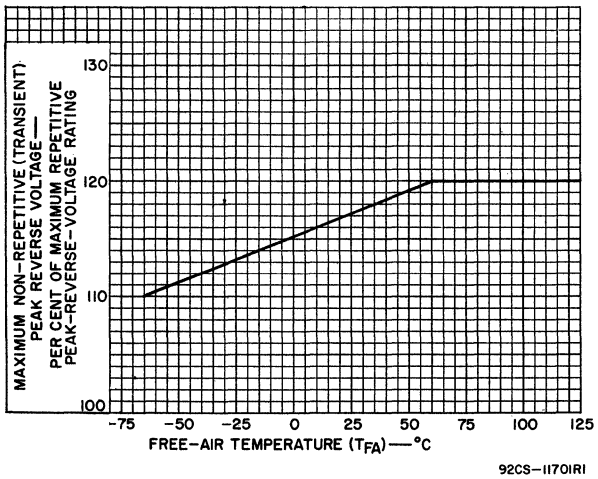


Fig. 1 - Rating chart for RCA CR201 through CR212.

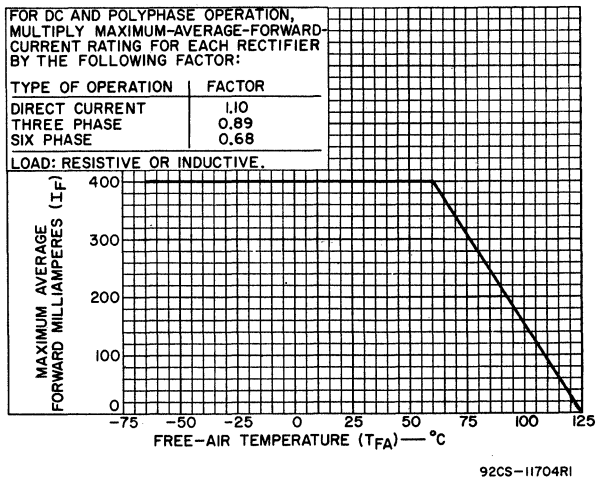


Fig. 2 - Rating chart for types CR201 through CR212 for dc, and 60 cps-single-phase and polyphase operation.

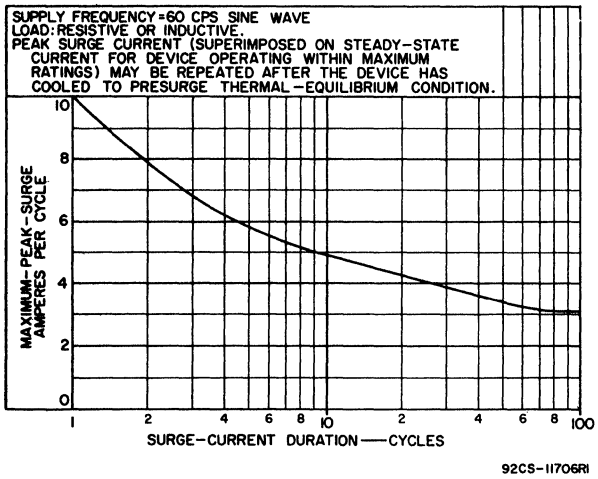


Fig. 3 - Peak surge-current rating chart for types CR201 through CR212.

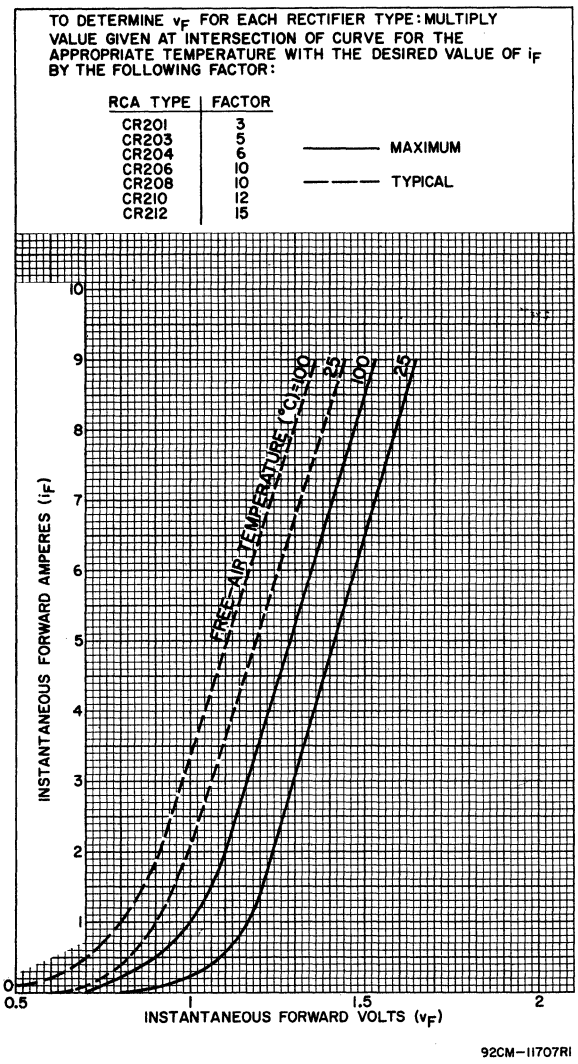
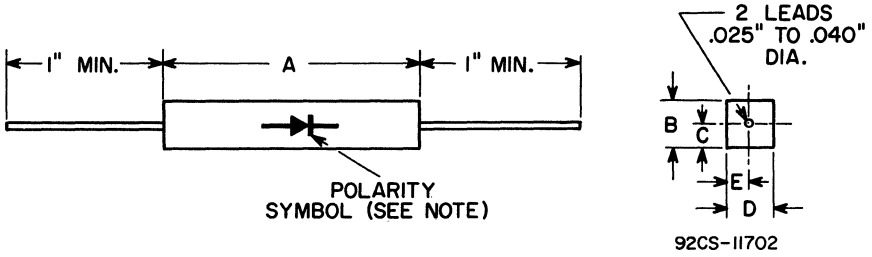


Fig. 4 - Typical forward characteristics for types CR201 through CR212.

DIMENSIONAL OUTLINE



NOTE 1: ARROW INDICATES DIRECTION OF FORWARD (EASY) CURRENT FLOW AS INDICATED BY DC AMMETER.

TYPE	DIMENSIONS INCHES A	B	C	D	E	WEIGHT OUNCES
CR201	2	3/8	3/16	3/8	3/16	0.32
CR203	3-1/2	3/8	3/16	3/8	3/16	0.55
CR204	4-1/2	3/8	3/16	3/8	3/16	0.73
CR206	3-1/2	3/8	3/16	3/4	3/8	1.20
CR208	3-1/2	3/8	3/16	3/4	3/8	1.20
CR210	4-1/2	3/8	3/16	3/4	3/8	1.60
CR212	4-1/2	3/8	3/16	3/4	3/8	1.60

HIGH-VOLTAGE SILICON RECTIFIERS

CR301–CR354

File No. 60

RCA-CR301 through CR354 are high-voltage rectifiers consisting of series-connected, hermetically-sealed, RCA diffused-junction silicon-rectifier cells. The cells are specially selected, balanced dynamically under transient conditions to sustain reverse energy, processed to provide optimum performance and reliability, and fin-mounted to facilitate natural-air or forced-air cooling

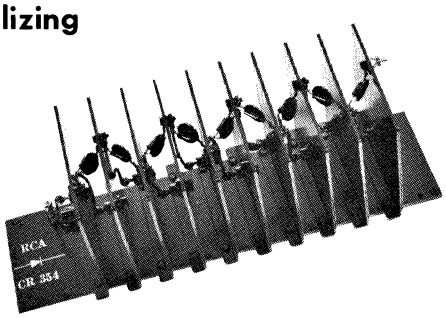
These high-voltage rectifiers, which are intended for use in industrial and military equipment, contain integral R-C networks designed to equalize the reverse voltages across the rectifier cells under both steady-state and transient conditions.

Fin-Mounted Types

Having Integral R-C

Voltage-Equalizing

Networks



Designed to Meet Stringent Military Mechanical and Environmental Specifications

FEATURES

- 2400 to 9600 PRV
- Up to 35 amperes output per rectifier (natural-air cooling)
- Up to 70 amperes output for 4 rectifiers in single-phase, full-wave bridge circuit (natural-air cooling)
- Up to 94 amperes output for 6 rectifiers in a 3-phase full-wave bridge circuit (natural-air cooling)
- Low forward voltage drop
- Ability to withstand transient reverse voltages 20% above PRV ratings
- Operating and storage temperature range of -55° C to +125° C
- Rectifiers may be series connected up to 20 KV*
- Extended current capability (up to 143%) with forced-air cooling
- Derating of these rectifier stacks from the Absolute-Maximum Rating values is not required.

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load

TABLE I

Peak Reverse Volts, Repetitive		2400	3600	4800	6000	7200	8400	9600
Average (DC) Forward Amperes: At 50° C free-air temperature	5	CR301	CR302	CR303	CR304	CR305	CR306	CR307
	9	CR311	CR312	CR313	CR314	CR315	CR316	CR317
	12	CR321	CR322	CR323	CR324	CR325	*	*
	17	CR331	CR332	CR333	CR334	CR335	*	*
	23	CR341	CR342	CR343	CR344	*	*	*
	35	CR351	CR352	CR353	CR354	*	*	*
Peak Reverse Volts, Non-Repetitive (Transient, for max. duration of 5 msec): At free-air temperatures from +50° C to +125° C		2880	4320	5760	7200	8640	10080	11520
At other free-air temperatures		← See *Fig.1* →						
RMS Supply Volts		1695	2545	3395	4240	5090	5935	6785
DC Blocking Volts		2400	3600	4800	6000	7200	8400	9600
Number of Cells Per Rectifier Stack		4	6	8	10	12	14	16

* Rectifier stacks having the same average (dc) forward ampere rating may be series connected to obtain these PRV ratings.

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Printed in U.S.A.
CR301-CR354 5/66
Reprinted from CR301-CR354 6/64

HALF-WAVE RECTIFIER SERVICE

Absolute-Maximum Ratings for Supply Frequency of 60 cps, Single-Phase Operation, and with Resistive or Inductive Load

TABLE II

	CR301 through CR307	CR311 through CR317	CR321 through CR325	CR331 through CR335	CR341 through CR344	CR351 through CR354
Average (DC) Forward Amperes:						
At 50° C free-air temperature	5	9	12	17	23	35
At 100° C free-air temperature	2.5	4.5	6	8.5	11.5	17.5
At other free-air temperatures and for forced-air cooling	← See *Figs. 2, 3, and 4* →					
RMS Forward Amperes at 50° C free-air temp.▲	7.85	14.1	18.85	26.6	36	55
Peak Surge Amperes:[a]						
Single cycle, sine wave, 60 cps	250	250	400	400	850	850
For more than one cycle	← See *Fig.5* →					
Temperature Range:						
Operating and storage	← -55° C to +125° C →					
Characteristics						
Instantaneous Forward Voltage Drop	← See *Fig.6* →					
Maximum Reverse Milliamperes:						
Dynamic[b]	← 1.5 ma →					
Static[c]	← 2.0 ma →					
Typical Cell Shunt Capacitance	← 0.01 μf →					

[a] Superimposed on device operating within the maximum specified voltage, current, and temperature ratings and may be repeated after sufficient time has elapsed for the device to return to the presurge thermal-equilibrium conditions.

[b] Maximum reverse current averaged over one complete cycle and for operation at the maximum ratings.

[c] At maximum rated dc blocking voltage and any temperature within the operating temperature range.

▲ To obtain rms forward amperes at other operating temperatures, multiply the average (dc) forward amperes by 1.57.

OPERATING CONSIDERATIONS

A *surge-limiting impedance* should always be used in series with an RCA CR-series rectifier. The impedance value must be sufficient to limit the surge current to the value specified under the maximum ratings. This impedance may be provided by the power-transformer windings, or by an external resistor or choke.

For *capacitive loads and for sub-cycle surge considerations* consult RCA Application Notes SMA-4 and SMA-15.

Each of the rectifier stacks in this CR-series has been coated with an epoxy phenolic resin to increase the rectifier's resistance to moisture and humidity, to increase thermal radiation and to improve voltage isolation.

RCA CR301 through CR354 high-voltage silicon rectifiers can be *mounted in* any position. It is recommended, however, that wherever possible these rectifiers be mounted on vertical surfaces to prevent accumulation of dust on the surfaces between the rectifier cells and to provide the maximum flow of cooling air.

When several RCA CR-series rectifiers are to be *operated in series* across a supply voltage of 20,000 volts peak or more, the protection afforded by the integral voltage-equalizing networks may not be adequate, depending on the circuit arrangement and the physical layout of the components. Consequently, additional protection against high transient voltages may be required in the design of the equipment. For additional information on this subject, write RCA, Commercial Engineering, Harrison, New Jersey.

Because these CR-series rectifiers operate at *voltages which are dangerous,* care should be taken in the design and operation of the equipment to prevent personnel from coming in contact with the rectifiers.

PEAK SURGE-CURRENT RATING CHART

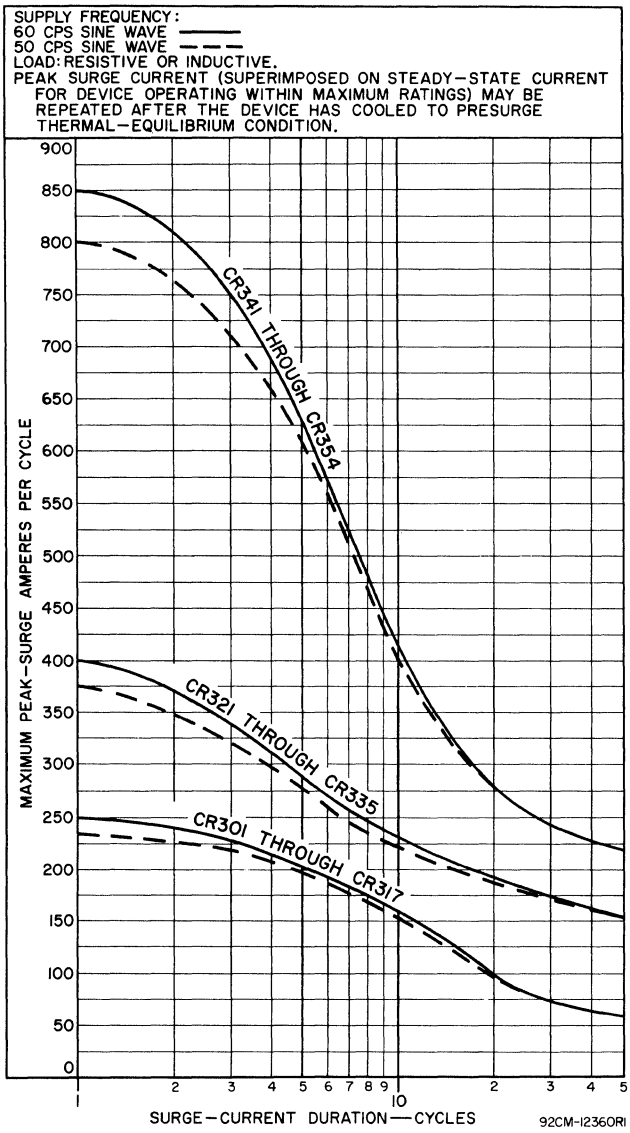


Fig.5

FORWARD CHARACTERISTICS

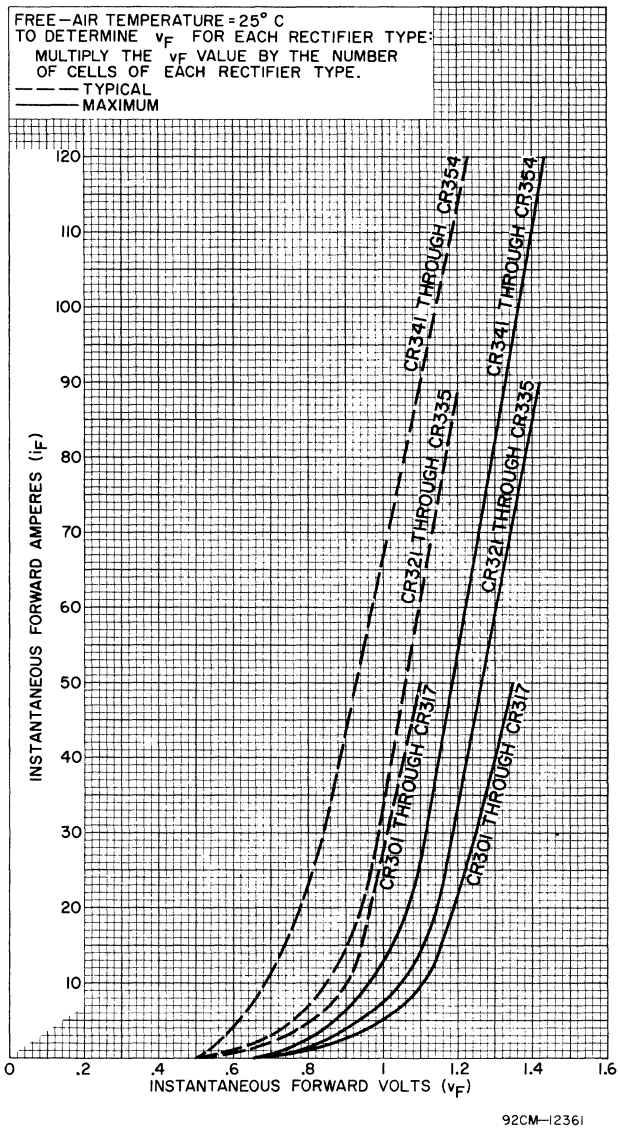
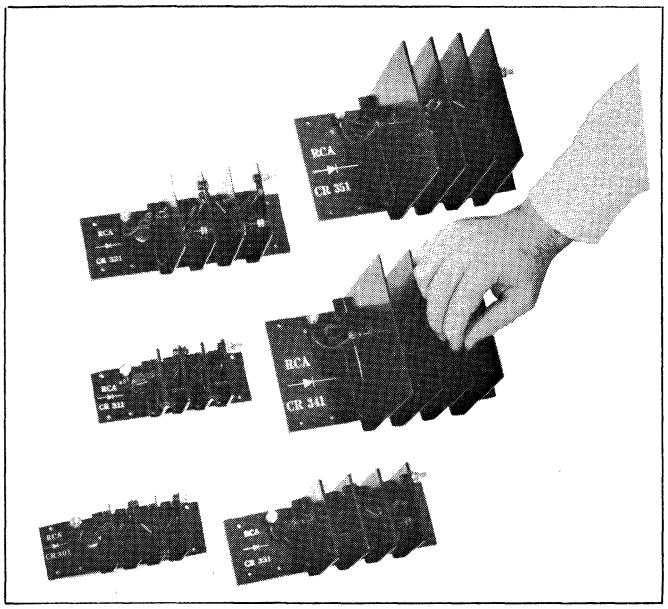
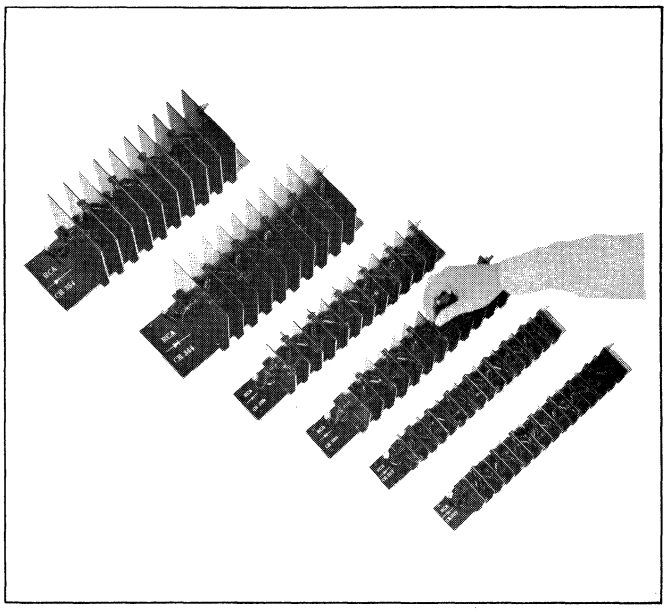


Fig.6

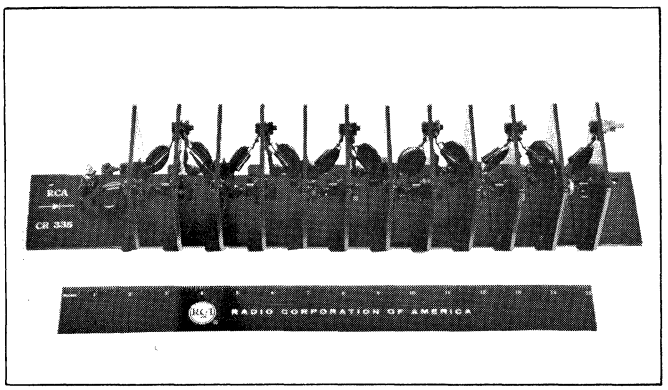
ILLUSTRATIONS SHOWING RELATIVE RECTIFIER SIZE



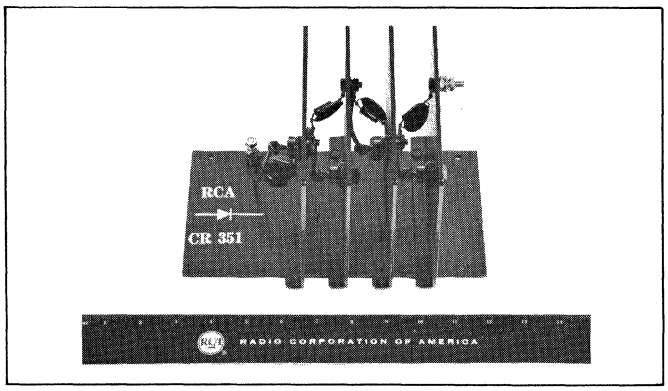
CR301, CR311, CR321, CR331, CR341, CR351



CR307, CR317, CR325, CR335, CR344, CR354



CR335



CR351

The modular design of the RCA CR301-series shown in the illustrations permits the rapid fabrication of stacked-rectifier units.

RATING CHART

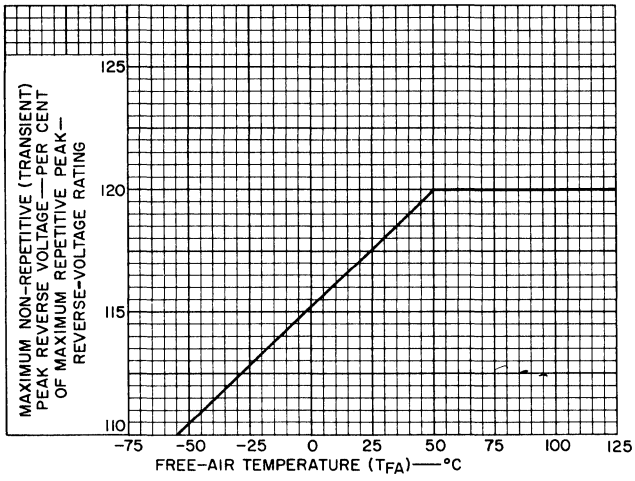


Fig.1

FORCED-AIR COOLING RATING CHART

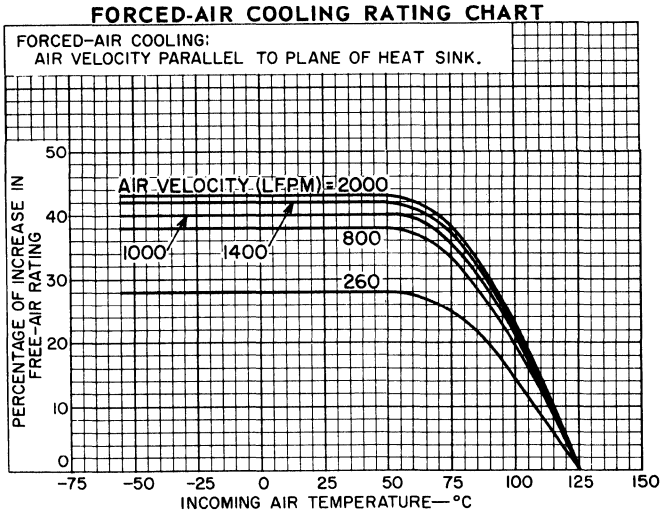
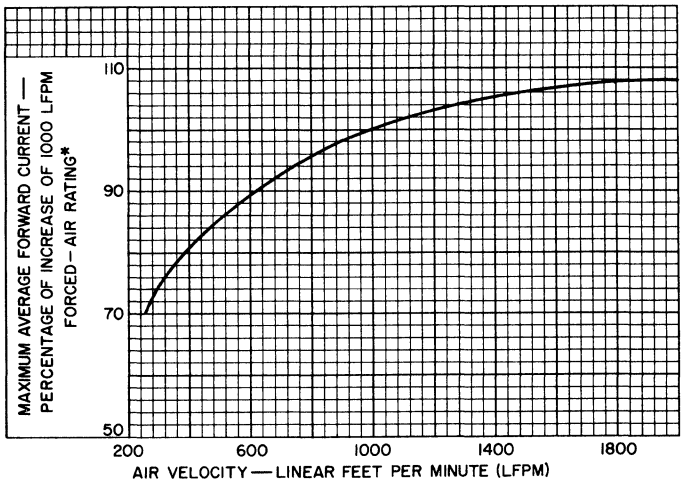


Fig.2

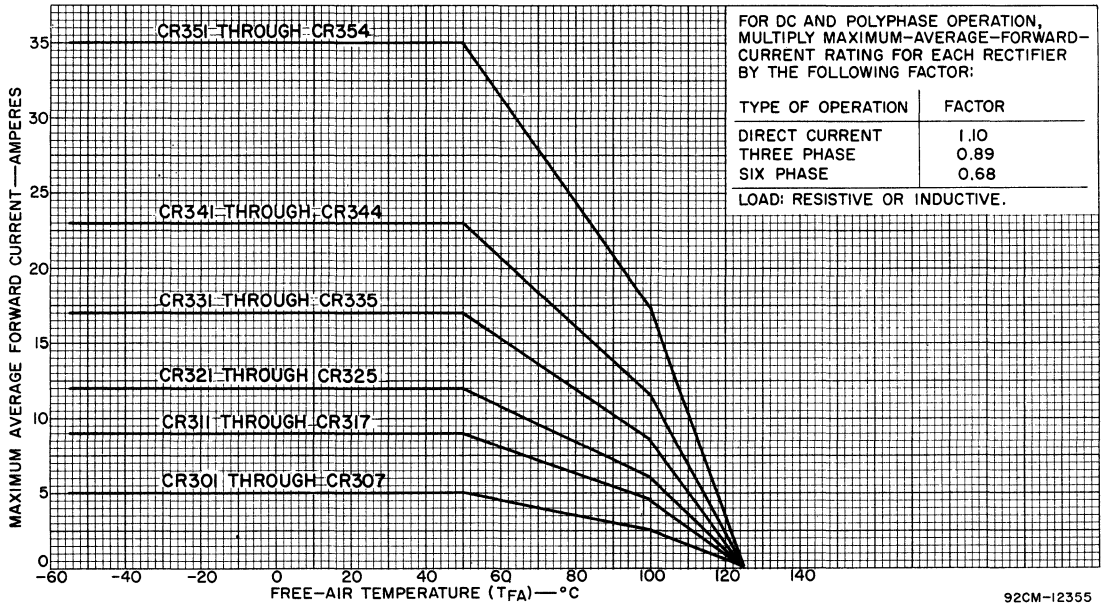
FORCED-AIR COOLING RATINGS AS A FUNCTION OF AIR VELOCITY



* This curve may be used in conjunction with the 1000 LFPM curve shown in Fig.2 to determine any percentage of increase in the free-air rating between 260 and 2000 LFPM. For example, at -50° C and 260 LFPM, the percentage increase above the free-air rating is 0.7 x 0.4 = 28%, or a total of 128% of the free-air rating, and at +100° C and 260 LFPM is 0.7 x 0.21 = 14.7%, or 114.7% of the free-air rating.

Fig.3

NATURAL-AIR COOLING RATING CHART FOR 50-60 CPS SINGLE-PHASE AND POLYPHASE OPERATION



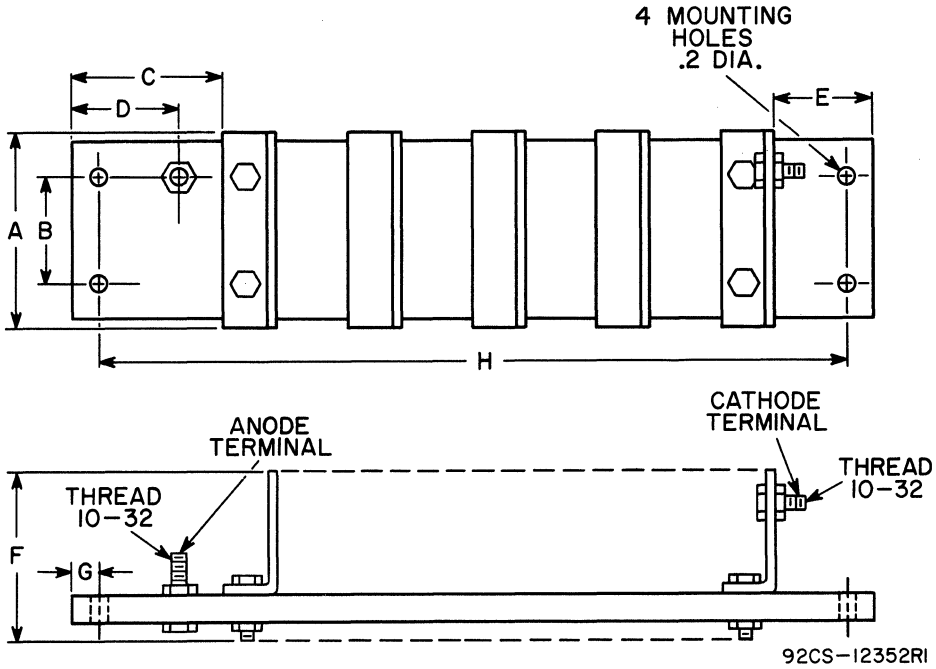
FOR DC AND POLYPHASE OPERATION, MULTIPLY MAXIMUM-AVERAGE-FORWARD-CURRENT RATING FOR EACH RECTIFIER BY THE FOLLOWING FACTOR:

TYPE OF OPERATION	FACTOR
DIRECT CURRENT	1.10
THREE PHASE	0.89
SIX PHASE	0.68

LOAD: RESISTIVE OR INDUCTIVE.

Fig.4

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

	A	B	C	D	E	F	G
CR301 through CR307	2-1/4	1-5/8	2	1-9/32	15/16	2	13/32
CR311 through CR317	2-1/4	1-5/8	2	1-9/32	15/16	2	13/32
CR321 through CR325	3	1-7/8	2-3/4	1-23/32	1-3/8	3-3/8	9/16
CR331 through CR335	3	1-7/8	2-3/4	1-23/32	1-3/8	3-3/8	9/16
CR341 through CR344	5-1/2	4	3	1-29/32	1-1/2	5-3/8	5/8
CR351 through CR354	5-1/2	4	3	1-29/32	1-1/2	5-3/8	5/8

"H" Dimension

CR301	CR302	CR303	CR304	CR305	CR306	CR307
5-1/4	7	8-3/4	10-1/2	12-1/4	14	15-3/4
CR311	CR312	CR313	CR314	CR315	CR316	CR317
5-1/4	7	8-3/4	10-1/2	12-1/4	14	15-3/4
CR321	CR322	CR323	CR324	CR325		
7-1/8	9-1/2	11-7/8	14-1/4	16-5/8		
CR331	CR332	CR333	CR334	CR335		
7-1/8	9-1/2	11-7/8	14-1/4	16-5/8		
CR341	CR342	CR343	CR344			
7-11/16	10-1/4	12-13/16	15-3/8			
CR351	CR352	CR353	CR354			
7-11/16	10-1/4	12-13/16	15-3/8			

HIGH-VOLTAGE RECTIFIER UNIT

CR273/8008

File No. 100

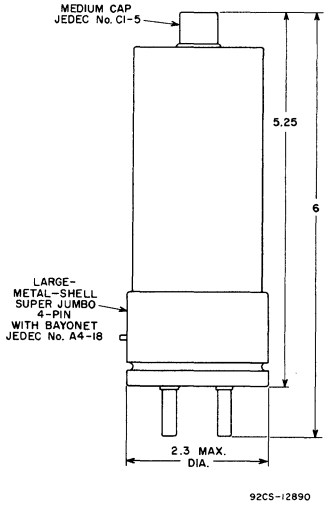
Direct Replacement Unit for Type 8008

RCA-CR273/8008 is a high-voltage rectifier unit consisting of series-connected, hermetically-sealed RCA diffused-junction silicon rectifier cells. It is intended specifically as a direct replacement for the half-wave mercury-vapor rectifier type 8008.

Because the CR273/8008 does not require filament power, care should be exercised when utilizing this device as a direct replacement for the 8008 to assure that the filament circuits of any tubes employed are not affected. The filament transformer primaries for the 8008 should be opened to prevent transformer core saturation and resultant high current flow through the primaries when separate filament supplies are used.

For voltage and current ratings of CR273/8008, refer to data for RCA type 8008.

DIMENSIONAL OUTLINE

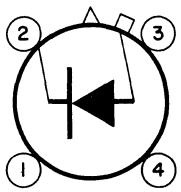


DIMENSIONS IN INCHES

Features of the CR273/8008 include–

- High Reliability
- Long Life
- Rugged, Compact Construction
- No Required Warm-Up Time
- Operating Temperature (At full ratings) -50° C to +60° C
- Storage Temperature -50° C to +110° C

BASING DIAGRAM
Bottom View



Pin 1: No connection
Pin 2: Cathode
Pin 3: No connection
Pin 4: No connection
Cap: Anode

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

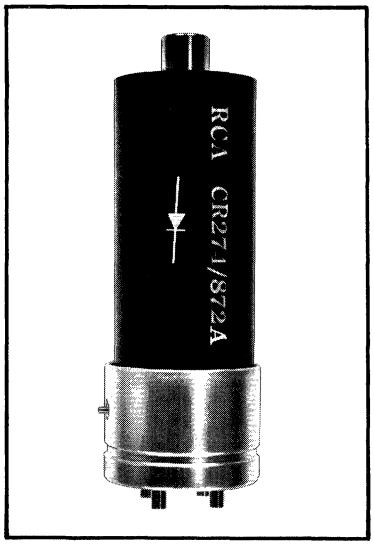
Printed in U.S.A.
CR273/8008 5/66
Reprinted from CR273/8008 10/65

HIGH-VOLTAGE RECTIFIER UNIT

CR274/872A

File No. 102

Direct Replacement Unit for Types 872 and 872A

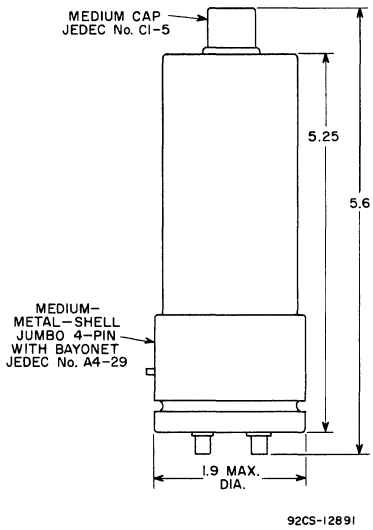


RCA-CR274/872A is a high-voltage rectifier unit consisting of series-connected, hermetically-sealed RCA diffused-junction silicon rectifier cells. It is intended specifically as a direct replacement for the half-wave mercury-vapor rectifier types 872 and 872A.

Because the CR274/872A does not require filament power, care should be exercised when utilizing this device as a direct replacement for the 872 or 872A to assure that the filament circuits of any tubes employed are not affected. The filament transformer primaries for the 872 or 872A should be opened to prevent transformer core saturation and resultant high current flow through the primaries when separate filament supplies are used.

For voltage and current ratings of CR274/872A, refer to data for RCA type 872A.

DIMENSIONAL OUTLINE

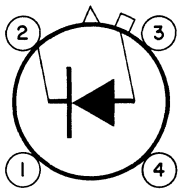


DIMENSIONS IN INCHES

Features of the CR274/872A include—

- High Reliability
- Long Life
- Rugged, Compact Construction
- No Required Warm-Up Time
- Operating Temperature (At full ratings) -50° C to +60° C
- Storage Temperature -50° C to +110° C

BASING DIAGRAM
Bottom View



Pin 1: No connection
Pin 2: Cathode
Pin 3: No connection
Pin 4: No connection
Cap: Anode

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
CR274/872A 5/66
Reprinted from CR274/872A 10/65

HIGH-VOLTAGE RECTIFIER UNIT

CR275/ 866A/3B28

File No. 104

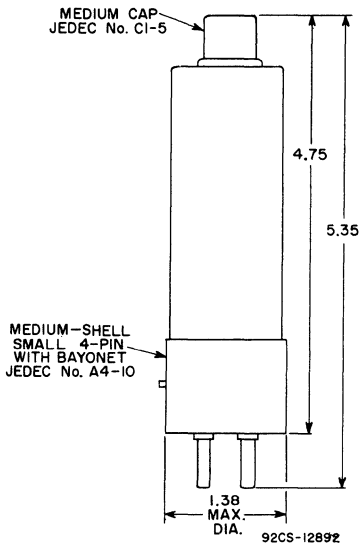
Direct Replacement Unit for Types 866, 866A, and 3B28

RCA-CR275/866A/3B28 is a high-voltage rectifier unit consisting of series-connected, hermetically-sealed RCA diffused-junction silicon rectifier cells. It is intended specifically as a direct replacement for the half-wave mercury-vapor types 866 and 866A, and the half-wave gas rectifier type 3B28.

Because the CR275/866A/3B28 does not require filament power, care should be exercised when utilizing this device as a direct replacement for the 866, 866A, or 3B28 to assure that the filament circuits of any tubes employed are not affected. The filament transformer primaries for the 866, 866A, or 3B28 should be opened to prevent transformer core saturation and resultant high current flow through the primaries when separate filament supplies are used.

For voltage and current ratings of CR275/866A/3B28, refer to data for RCA types 866A and 3B28.

DIMENSIONAL OUTLINE

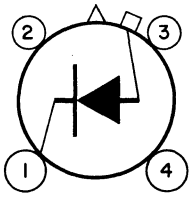


DIMENSIONS IN INCHES

Features of the CR275/866A/3B28 include–

- High Reliability
- Long Life
- Rugged, Compact Construction
- No Required Warm-Up Time
- **Operating Temperature (At full ratings) -50° C to +60° C**
- **Storage Temperature -50° C to +110° C**

BASING DIAGRAM
Bottom View



Pin 1: Cathode
Pin 2: No connection
Pin 3: No connection
Pin 4: No connection
Cap: Anode

RADIO CORPORATION OF AMERICA
ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

Trademark(s) ® Registered
Marca(s) Registrada(s)

Printed in U.S.A.
CR275/866A/3B28 5/66
Reprinted from CR275/866A/3B28 10/65