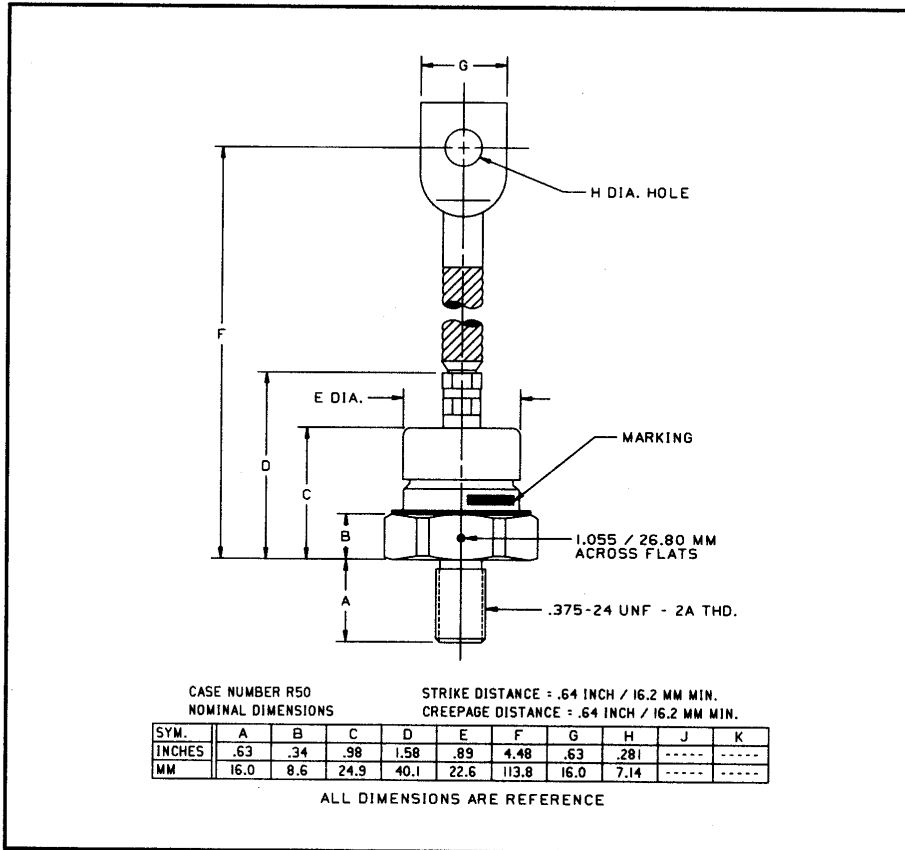


Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (412) 925-7272
Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

Fast Recovery Rectifier
175 Amperes Average
1400 Volts



R502__18/R503__18
Fast Recovery Rectifier
175 Amperes Average, 1400 Volts

Features:

- Fast Recovery Times
- Soft Recovery Characteristics
- Standard and Reverse Polarities
- Flag Lead and Stud Top Terminals Available
- High Surge Current Ratings
- High Rated Blocking Voltages
- Special Electrical Selection for Parallel and Series Operation
- Glazed Ceramic Seal Gives High Voltage Creepage and Strike Paths

Applications:

- Inverters
- Choppers
- Transmitters
- Free Wheeling Diode

R502__18/R503__18 (Outline Drawing)

Ordering Information:

Select the complete part number you desire from the following table:

| Type | Voltage | | Current | | Recovery Time | | Leads | |
|-----------------------------|--------------------------|------|------------------------|------|------------------------|------|-------|------|
| | V _{RRM} (Volts) | Code | I _{F(av)} (A) | Code | t _{rr} (μsec) | Code | Case | Code |
| R502 (Standard Polarity) | 200 | 02 | 175 | 18 | 1.5 | FS | DO-8 | WA |
| | 400 | 04 | | | | | | |
| | 600 | 06 | | | | | | |
| | 800 | 08 | | | | | | |
| R503 (Reverse Polarity) | 1000 | 10 | | | | | | |
| | 1200 | 12 | | | | | | |
| | 1400 | 14 | | | | | | |

Example: Type R502 rated at 175A average with V_{RRM} = 1400V, Recovery Time = 1.5 μsec and standard flexible lead, order as:

| Type | Voltage | | | Current | | Time | Leads | | | |
|------|---------|---|---|---------|---|------|-------|----|---|---|
| R | 5 | 0 | 2 | 1 | 4 | 1 | 8 | FS | W | A |

R502_18/R503_18
Fast Recovery Rectifier
 175 Amperes Average, 1400 Volts

Absolute Maximum Ratings

| Characteristics | Symbol | R502_18/R503_18 | Units |
|---|--------------|-----------------|--------------------|
| RMS Forward Current | $I_{F(rms)}$ | 275 | Amperes |
| Average Forward Current | $I_{F(av)}$ | 175 | Amperes |
| One-half Cycle Surge Current | I_{FSM} | 3500 | Amperes |
| I^2t (for Fusing), Times = 8.3 milliseconds | I^2t | 51000 | A ² sec |
| Storage Temperature | T_{stg} | -40 to +190 | °C |
| Operating Temperature | T_j | -40 to +150 | °C |
| Mounting Torque (Lubricated) | | 120 | in-lb |

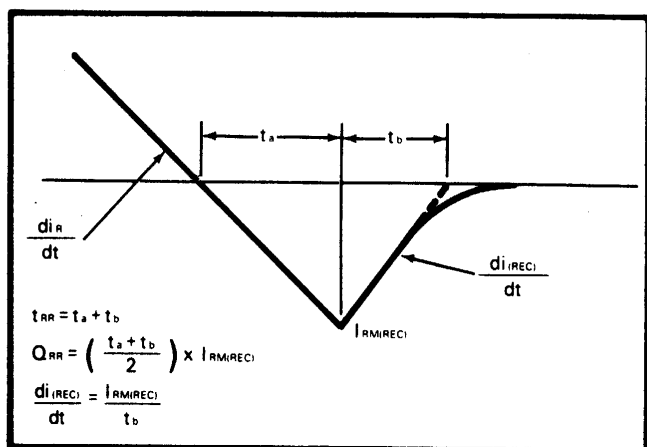
Electrical and Thermal Characteristics

| Characteristics | Symbol | Test Conditions | R502_18/R503_18 | Units |
|---|-------------------|--|-----------------|-----------------|
| Current - Conducting State Maximums | | | | |
| Forward Voltage Drop | V_{FM} | $T_j = 25^\circ\text{C}, I_{FM} = 470\text{A}$ | 1.65 | Volts |
| Voltage - Blocking State Maximums | | | | |
| Repetitive Peak Reverse Voltage (Rated Limit) | V_{RRM} | | 1400 | Volts |
| Non-rep. Trans. Peak Rev. Voltage (Rated Limit) | V_{RSM} | $V \leq 5.0\text{msec}$ | 1600 | Volts |
| Reverse Leakage Current, mA peak | I_{RRM} | T_j at max., $V_{RRM} = \text{Rated}$ | 45 | mA |
| Switching | | | | |
| Maximum Reverse Recovery Time | t_{rr} | $I_{FM} = 314\text{A}, t_p = 40\mu\text{sec},$ $di_F/dt = 25\text{A}/\mu\text{sec}, T_C = 25^\circ\text{C}$ | 1.5 | μsec |
| Thermal | | | | |
| Maximum Resistance, Junction to Case | $R_{\theta(j-c)}$ | | 0.28 | °C/Watt |
| Maximum Resistance, Case to Sink (Lubricated) | $R_{\theta(c-s)}$ | | 0.12 | °C/Watt |

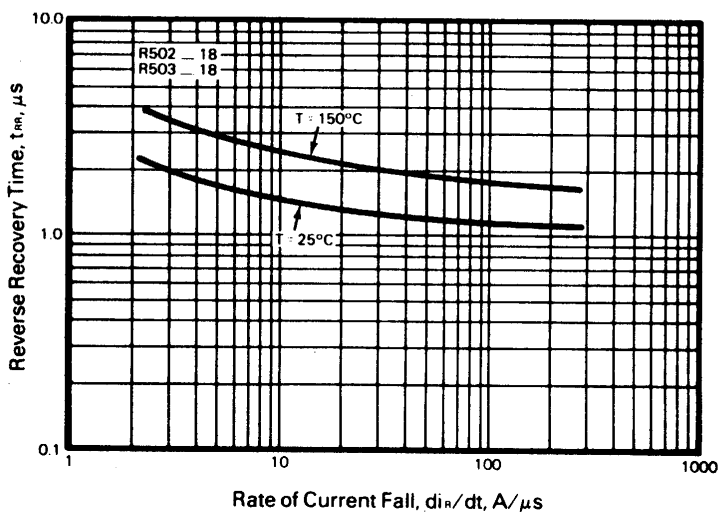
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (412) 925-7272
 Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

R502 18/R503 18
Fast Recovery Rectifier
 175 Amperes Average, 1400 Volts

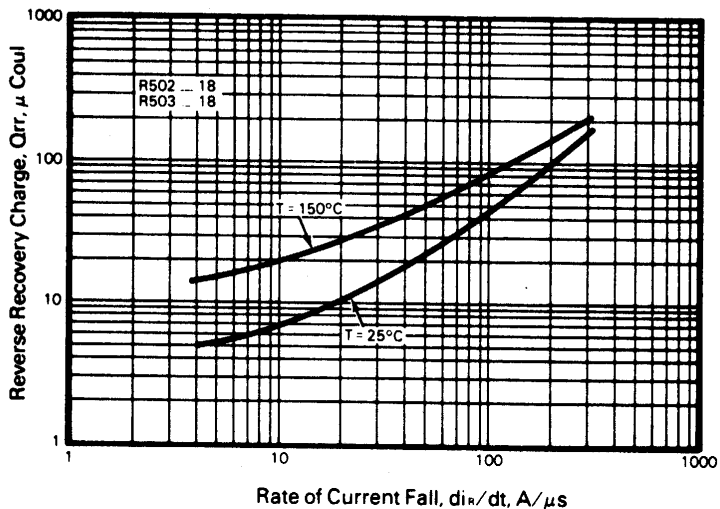
Reverse Recovery Wave Form



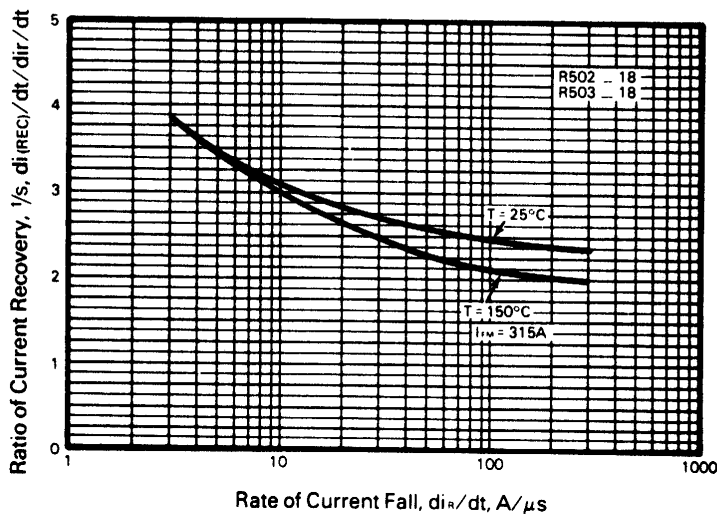
Typical Ratio of Current Recovery to Rate of Current Fall



Typical Reverse Recovery Charge Vs. Rate of Current Turn Off

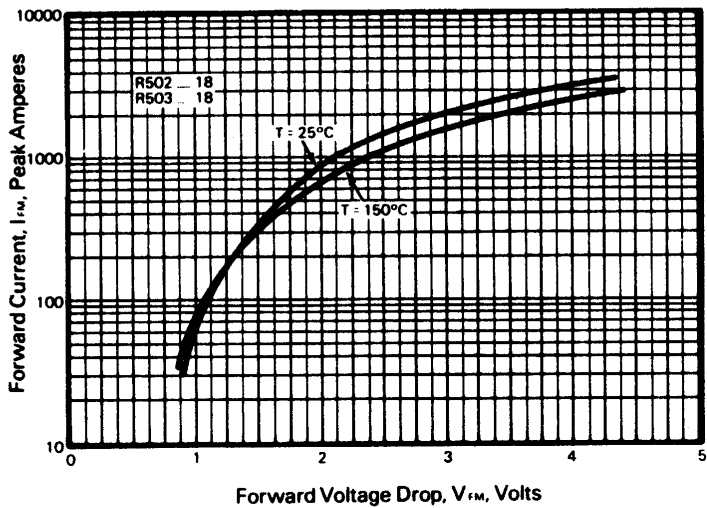


Typical Reverse Recovery Time Vs. Rate of Current Fall

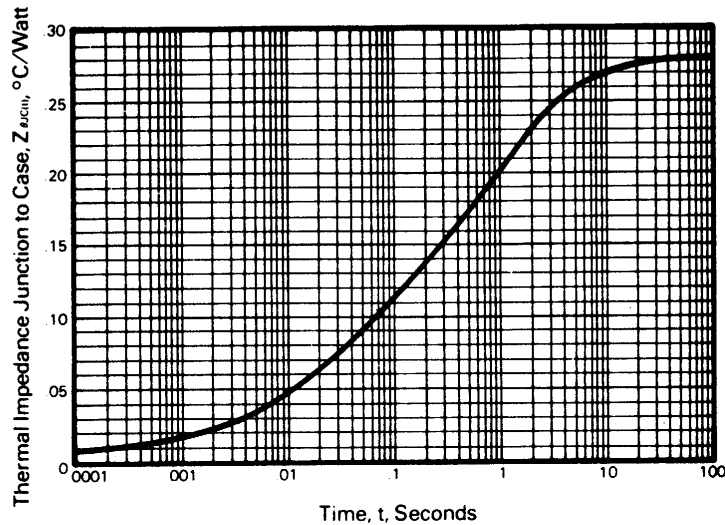


R502_18/R503_18
Fast Recovery Rectifier
 175 Amperes Average, 1400 Volts

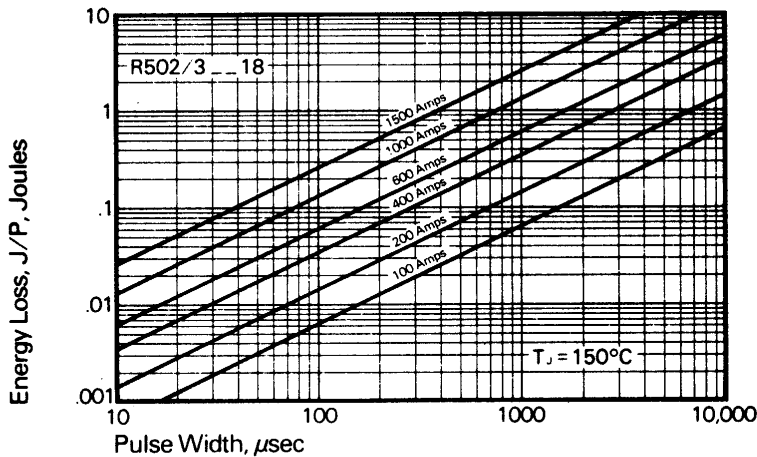
Forward Current Vs. Forward Voltage Drop



Transient Thermal Impedance Vs. Time



Energy Loss Per Pulse for Sinusoidal Pulses



Calculation of Fast Recovery Diodes and Allowable Case Temperature

1. Conduction Losses

$$P_{av(cond)} = J/P \times F$$

2. Reverse Recovery Losses (Approximate)

$$P_{av(sw)} = 1/4 \times V_R \times \frac{di_R}{dt} \times T_{rr}^2 \times \left(\frac{1/s}{1 + 1/s} \right)^2 \times F \times 1 \times 10^{-6}$$

3. Maximum Allowable Case Temperature

$$T_{C(max)} = T_j - (P_{av(cond)} + P_{av(sw)} \times R_{\theta(j-c)})$$

Where:

$P_{av(cond)}$ = Forward Conduction Power Loss in Watts

$P_{av(sw)}$ = Reverse Recovery Power Loss in Watts

J/P = Energy Loss per Pulse in Joules

F = Frequency in Hertz

V_R = Steady State Reverse Operating Voltage in Volts

di_R/dt = Rate of Decay of Forward Current in Amperes/ μ sec

T_{rr} = Reverse Recovery Time in Microseconds

$\frac{1}{S}$ = Ratio of Recovery di/dt ($\frac{di_F/dt}{di_R/dt}$)

F = Operating Frequency in Hertz

$T_{C(max)}$ = Maximum Allowable Case Temperature in °C.

T_j = Maximum Operating Junction Temperature in °C.

$R_{\theta(j-c)}$ = DC Junction to Case Thermal Impedance in °C/Watt.