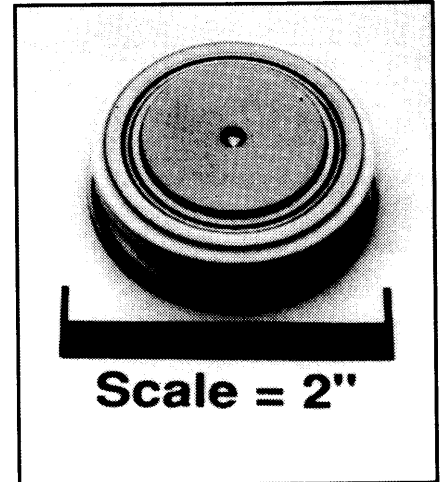
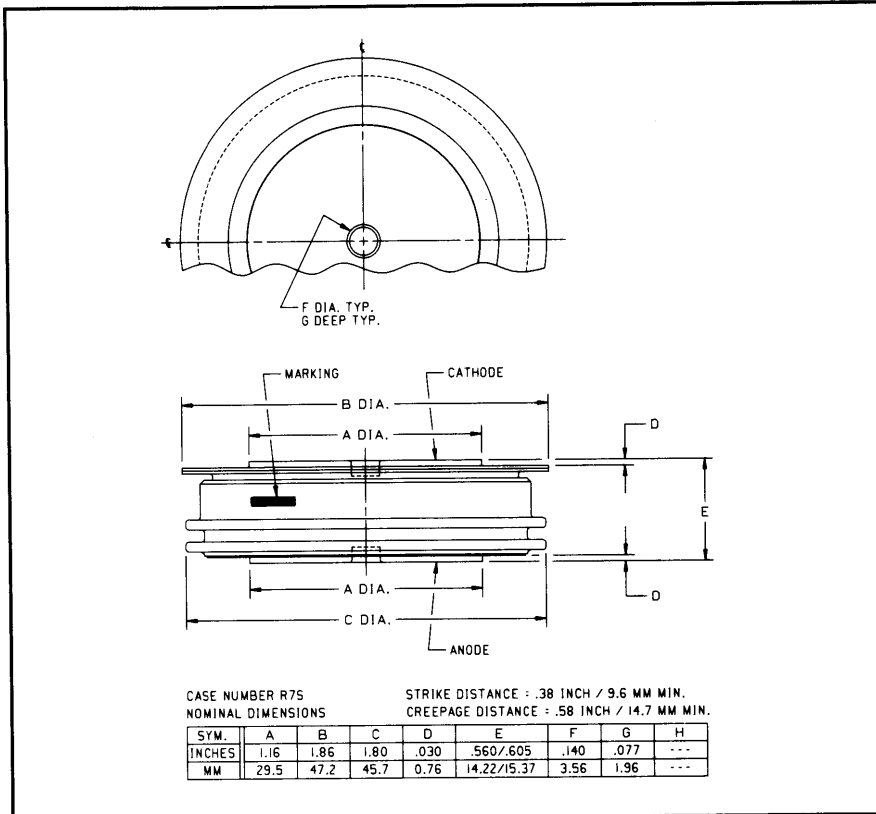


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**Fast Recovery Rectifier**  
 1000 Amperes Average  
 1600 Volts



R7S2\_10  
 Fast Recovery Rectifier  
 1000 Amperes Average, 1600 Volts

R7S2\_10 (Outline Drawing)

### Ordering Information:

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

| Type | Voltage                     |      | Current                   |      | Recovery Time             |      | Leads |      |
|------|-----------------------------|------|---------------------------|------|---------------------------|------|-------|------|
|      | V <sub>RRM</sub><br>(Volts) | Code | I <sub>F(av)</sub><br>(A) | Code | t <sub>rr</sub><br>(μsec) | Code | Case  | Code |
| R7S2 | 400                         | 04   | 1000                      | 10   | 2.0                       | ES   | R7S   | OO   |
|      | 600                         | 06   |                           |      |                           |      |       |      |
|      | 800                         | 08   |                           |      |                           |      |       |      |
|      | 1000                        | 10   |                           |      |                           |      |       |      |
|      | 1200                        | 12   |                           |      |                           |      |       |      |
|      | 1400                        | 14   |                           |      |                           |      |       |      |
|      | 1600                        | 16   |                           |      |                           |      |       |      |

**Example:** Type R7S2 rated at 1000A average with V<sub>RRM</sub> = 1600V,  
 Recovery Time = 2.0 μsec, order as:

| Type    | Voltage |   | Current |   | t <sub>rr</sub> | Leads |   |
|---------|---------|---|---------|---|-----------------|-------|---|
| R 7 S 2 | 1       | 2 | 1       | 0 | ES              | O     | O |

### Features:

- Fast Recovery Times
- Soft Recovery Characteristics
- High Surge Current Ratings
- Special Selection of t<sub>rr</sub> and Q<sub>rr</sub> available
- Low Thermal Impedance
- Low Profile Package

### Applications:

- Inverters
- Choppers
- Transmitters
- Free Wheeling Diode

## R7S2\_\_10

### Fast Recovery Rectifier

1000 Amperes Average, 1600 Volts

### Absolute Maximum Ratings

| Characteristics                                    | Symbol       | R7S2__10         | Units       |
|--|--------------|------------------|-------------|
| RMS Forward Current                                | $I_{F(rms)}$ | 1550             | Amperes     |
| Average Forward Current                            | $I_{F(av)}$  | 1000             | Amperes     |
| One-half Cycle Surge Current                       | $I_{FSM}$    | 11,000           | Amperes     |
| $I^2t$ (for Fusing), Times = 8.3 milliseconds      | $I^2t$       | 504000           | $A^2sec$    |
| Max. $I^2t$ Package (for Times = 8.3 milliseconds) | $I^2t$       | $50 \times 10^6$ | $A^2sec$    |
| Storage Temperature                                | $T_{stg}$    | -40 to +190      | $^{\circ}C$ |
| Operating Temperature                              | $T_j$        | -40 to +150      | $^{\circ}C$ |
| Mounting Force                                     |              | 2000 to 2400     | lbs         |

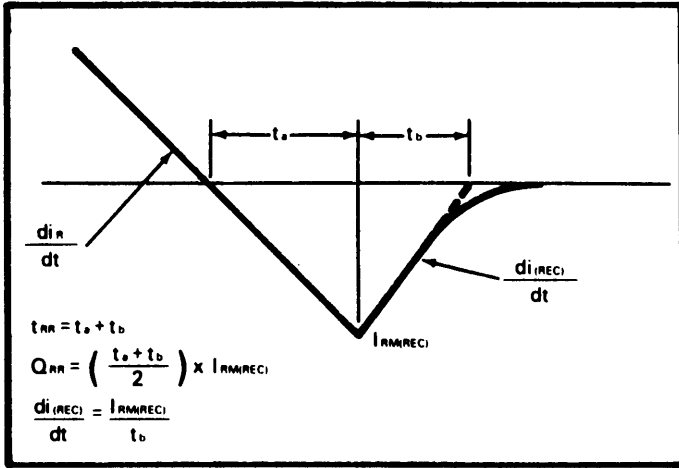
### Electrical and Thermal Characteristics

| Characteristics                                 | Symbol            | Test Conditions   | R7S2__10 | Units            |
|---|-------------------|---|----------|------------------|
| <b>Current - Conducting State Maximums</b>      |                   |   |          |                  |
| Forward Voltage Drop                            | $V_{FM}$          | $T_j = 25^{\circ}C, V_{IFM} = 1500A$  | 1.65     | Volts            |
| <b>Voltage - Blocking State Maximums</b>        |                   |   |          |                  |
| Repetitive Peak Reverse Voltage (Rated Limit)   | $V_{RRM}$         |   | 1400     | Volts            |
| Non-rep. Trans. Peak Rev. Voltage (Rated Limit) | $V_{RSM}$         | $t \leq 5.0msec$  | 1600     | Volts            |
| Reverse Leakage Current, mA peak                | $I_{RRM}$         | $T_j$ at max., $V_{RRM} = \text{Rated}$   | 50       | mA               |
| <b>Switching</b>                                |                   |   |          |                  |
| Maximum Reverse Recovery Time                   | $t_{rr}$          | $I_{FM} = 1500, t_p = 190 \mu sec,$<br>$di_F/dt = 25A/\mu sec, T_C = 25^{\circ}C$ | 2.0      | $\mu sec$        |
| <b>Thermal</b>                                  |                   |   |          |                  |
| Maximum Resistance, Junction to Case            | $R_{\theta(j-c)}$ |   | 0.035    | $^{\circ}C/Watt$ |
| Maximum Resistance, Case to Sink (Lubricated)   | $R_{\theta(c-s)}$ |   | 0.020    | $^{\circ}C/Watt$ |

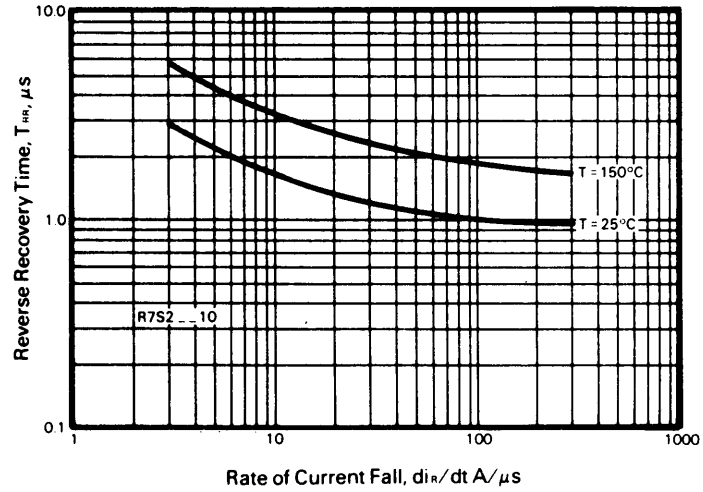
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**R7S2\_10**  
**Fast Recovery Rectifier**  
 1000 Amperes Average, 1600 Volts

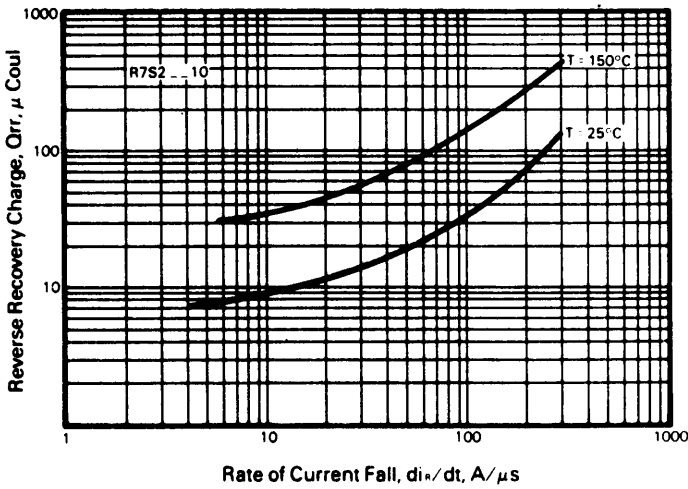
Reverse Recovery Wave Form



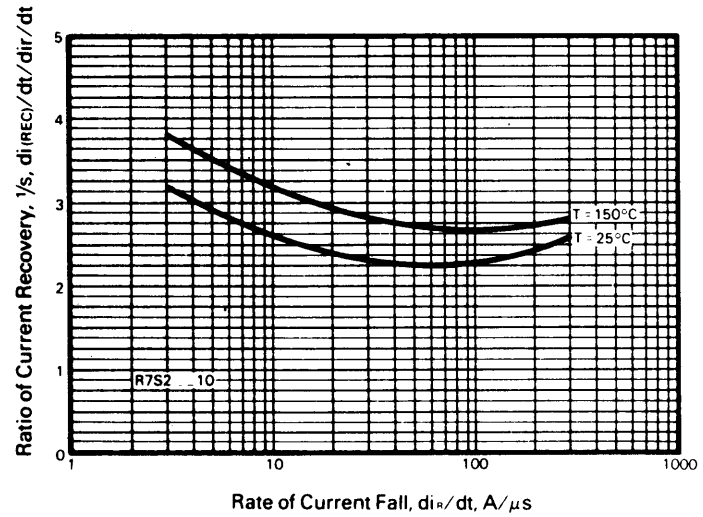
Typical Reverse Recovery Time Vs. Rate of Current Fall



Typical Reverse Recovery Charge Vs. Rate of Current Fall



Typical Ratio of Current Recovery to Rate of Current Fall



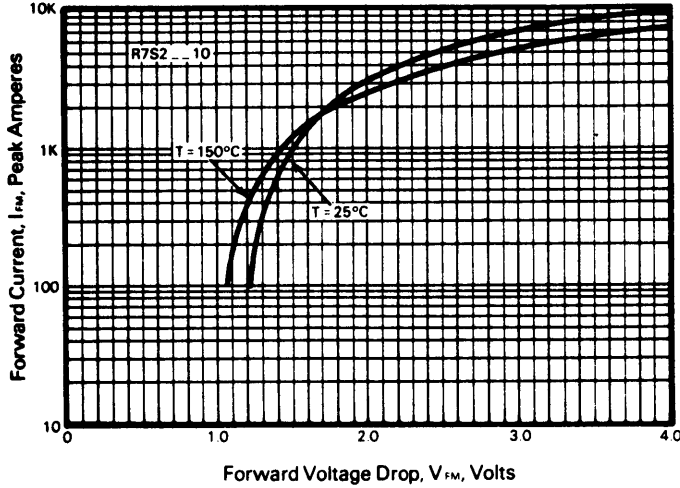
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## R7S2 \_10

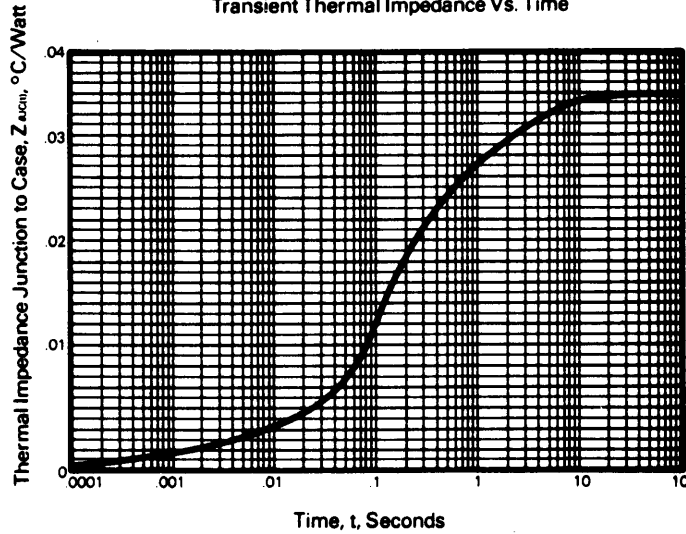
### Fast Recovery Rectifier

1000 Amperes Average, 1600 Volts

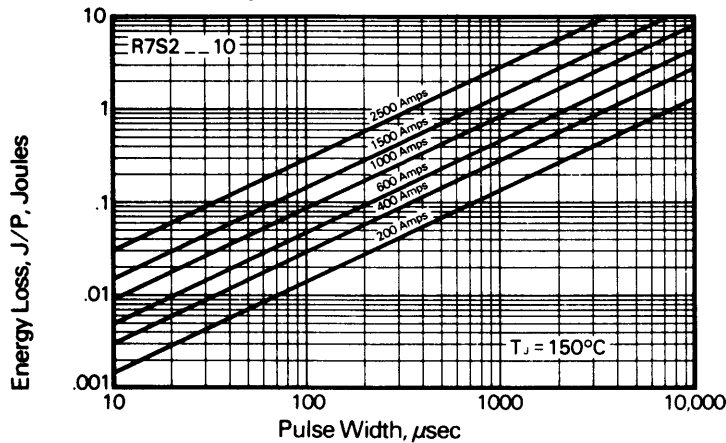
Forward Current Vs. Forward Voltage Drop



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/ $\mu\text{sec}$

$T_{rr}$  = Reverse Recovery Time in Microseconds

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

$F$  = Operating Frequency in Hertz

$T_{C(max)}$  = Maximum Allowable Case Temperature in  $^\circ\text{C}$ .

$T_j$  = Maximum Operating Junction Temperature in  $^\circ\text{C}$ .

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