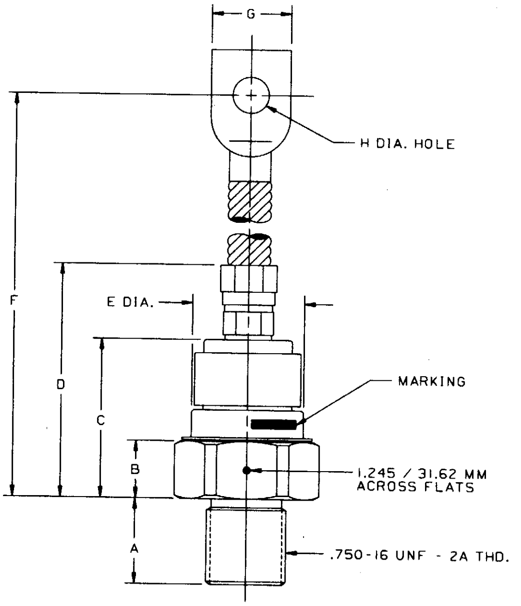
POWEREX

R602_ _25/ R603_ _25

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

250 Amperes Average
1600 Volts



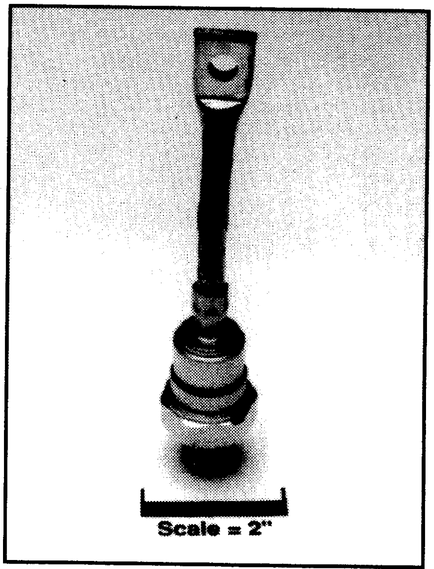
CASE NUMBER R60
NOMINAL DIMENSIONS

STRIKE DISTANCE = .48 INCH / 12.2 MM MIN.
CREEPAGE DISTANCE = .48 INCH / 12.2 MM MIN.

SYM.	A	B	C	D	E	F	G	H	J	K
INCHES	.81	.55	1.50	2.30	1.05	5.44	.73	.343	-----	-----
MM	20.6	14.0	38.1	58.4	26.7	138.2	18.5	8.71	-----	-----

ALL DIMENSIONS ARE REFERENCE

R602_ _25/R603_ _25 (Outline Drawing)



R602_ _25/R603_ _25
Fast Recovery Rectifier
250 Amperes Average, 1600 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
- ☐ Special Selection of Recovery Characteristics Available

Applications:

- ☐ Inverters
- ☐ Choppers
- ☐ Transmitters
- ☐ Free Wheeling Diode

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
R602 (Standard Polarity)	400	04	250	25	1.0	HS	DO-9	YA
	600	06						
	800	08						
	1000	10						
R603 (Reverse Polarity)	1200	12						
	1400	14						
	1600	16						

Example: Type R602 rated at 250A average with V_{RRM} = 1600V, Recovery Time = 1.0μsec, order as:

Type				Voltage		Current		Time	Leads	
R	6	0	2	1	6	2	5	HS	Y	A

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Absolute Maximum Ratings

Characteristics	Symbol	R602_ _25/R603_ _25	Units
RMS Forward Current	$I_{F(rms)}$	400	Amperes
Average Forward Current	$I_{F(av)}$	250	Amperes
One-half Cycle Surge Current	I_{FSM}	4500	Amperes
I^2t (for Fusing), Times ≥ 8.3 milliseconds	I^2t	85000	A^2sec
Storage Temperature	T_{stg}	-40 to +190	°C
Operating Temperature	T_j	-40 to +150	°C
Mounting Torque		360	in-lb

Electrical and Thermal Characteristics

Characteristics	Symbol	Test Conditions	R602_ _25/R603_ _25	Units
Current - Conducting State Maximums				
Forward Voltage Drop	V_{FM}	$T_j = 25°C$, $I_{FM} = 800A$	2.0	Volts
Voltage - Blocking State Maximums				
Repetitive Peak Reverse Voltage (Rated Limit)	V_{RRM}		1600	Volts
Non-rep. Trans. Peak Rev. Voltage (Rated Limit)	V_{RSM}	t ≤ 5.0msec	1800	Volts
Reverse Leakage Current, mA peak	I_{RRM}	T_j at max., V_{RRM} = Rated	50	mA
Switching				
Maximum Reverse Recovery Time	t_{rr}	$I_{FM} = 785A$, $t_p = 100\mu sec$, $di_R/dt = 25A/\mu sec$, $T_C = 25°C$	1.0	µsec
Thermal				
Maximum Resistance, Junction to Case	$R_{\theta(j-c)}$		0.17	°C/Watt
Maximum Resistance, Case to Sink (Lubricated)	$R_{\theta(c-s)}$		0.10	°C/Watt

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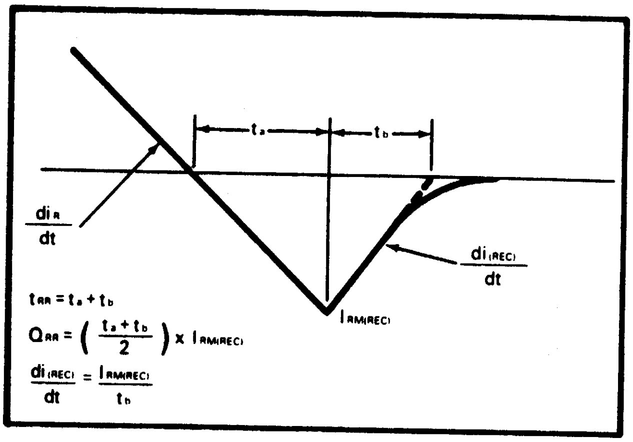
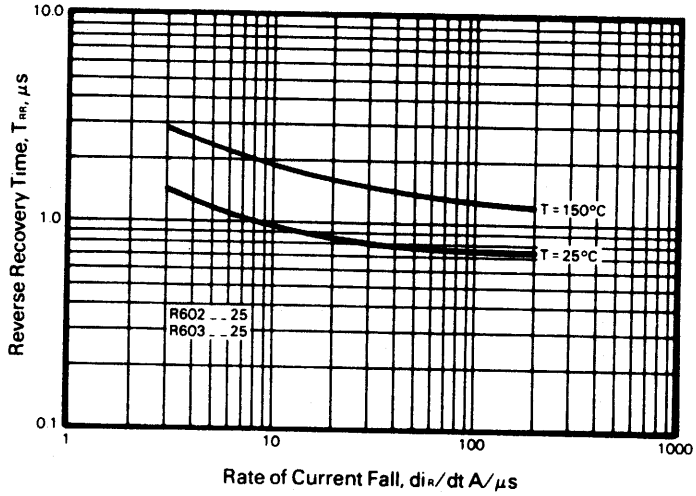
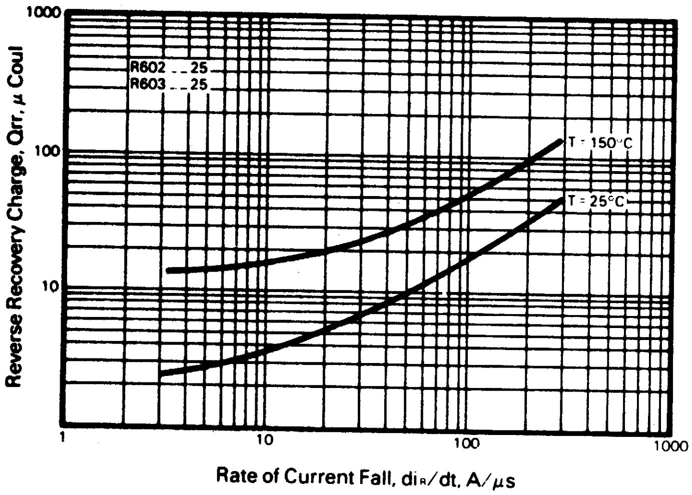
Reverse Recovery Wave Form



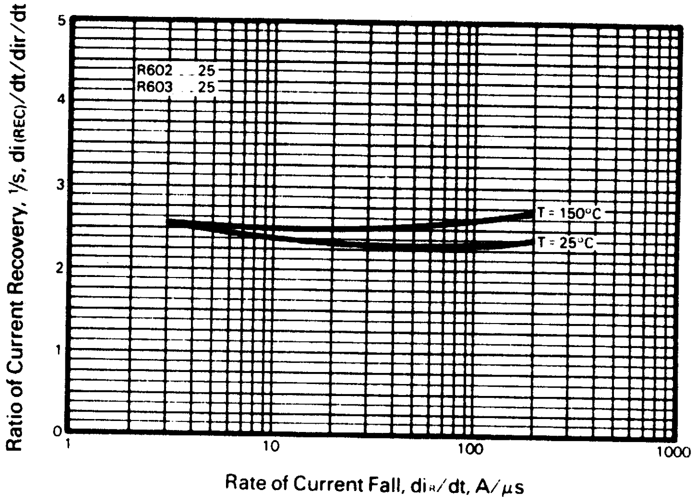
Typical Reverse Recovery Time Vs. Rate of Current Fall



Typical Reverse Recovery Charge Vs. Rate of Current Fall



Typical Ratio of Current Recovery to Rate of Current Fall



![POWEREX]

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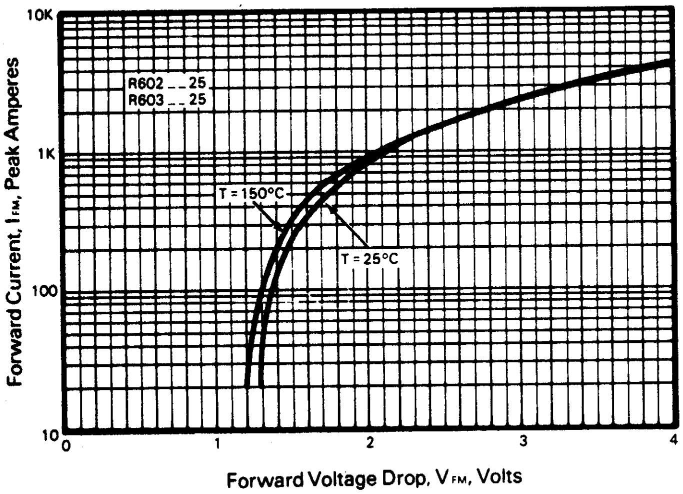
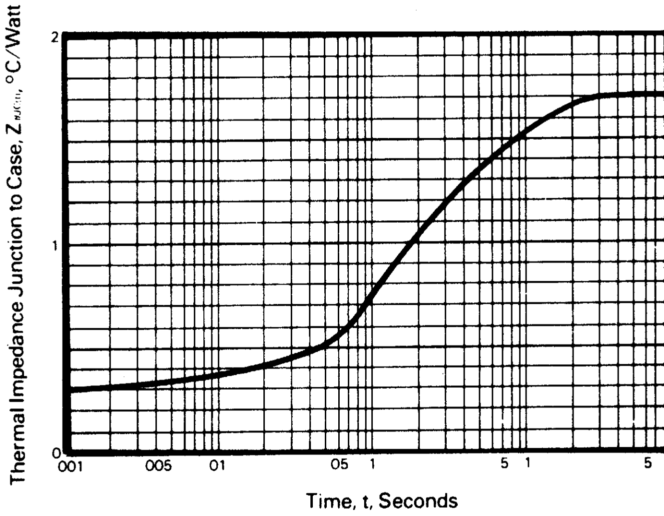
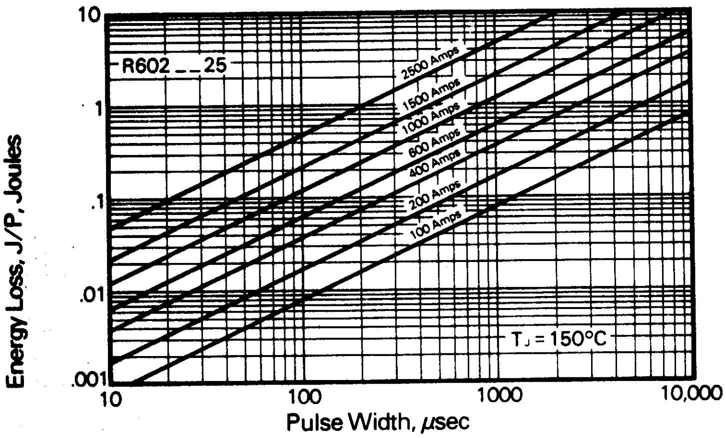
Forward Current Vs. Forward Voltage Drop



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

3. Maximum Allowable Case Temperature
   $T_{C(max)} = T_j - (P_{av(cond)} + P_{av(sw)} \times R_{\theta(j\text{-}c)})$

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/μsec
T_{rr}	= Reverse Recovery Time in Microseconds
$\frac{1}{\text{"S"}}$	= 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 °C.
T_j	= Maximum Operating Junction Temperature in °C.
$R_{\theta(j\text{-}c)}$	= DC Junction to Case Thermal Impedance in °C/Watt.