

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA
Designers Data Sheet
**SUBMINIATURE SIZE, AXIAL LEAD MOUNTED
FAST RECOVERY POWER RECTIFIERS**

...designed for special applications such as dc power supplies, inverters, converters, ultrasonic systems, choppers, low RF interference and free-wheeling diodes. A complete line of fast recovery rectifiers having typical recovery time of 350 nanoseconds providing high efficiency at frequencies to 100 kHz.

DESIGNER'S DATA FOR "WORST CASE" CONDITIONS

The Designers Data Sheet permits the design of most circuits entirely from the information presented. Limit curves — representing device characteristic boundaries — are given to facilitate "worst case" design.

MAXIMUM RATINGS

Rating	Symbol	MR810	MR811	MR812	MR813	MR814	MR816	MR817	MR818	Unit
Peak Repetitive Reverse Voltage	V_{RRM}									Volts
Working Peak Reverse Voltage	V_{RWM}	50	100	200	300	400	600	800	1000	
DC Blocking Voltage	V_R									
Non-Repetitive Peak Reverse Voltage	V_{RSM}	100	200	300	400	500	600	1000	1200	Volts
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	140	210	280	420	560	700	Volts
Average Rectified Forward Current (Single phase, resistive load, $T_A = 75^\circ\text{C}$)	I_O	1.0								Amps
Non-Repetitive Peak Surge Current (surge applied at rated load conditions) ($T_A = 75^\circ\text{C}$)	I_{FSM}	30								Amps
Operating Junction Temperature	T_J	-65 to +150								$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +175								$^\circ\text{C}$

THERMAL CHARACTERISTICS

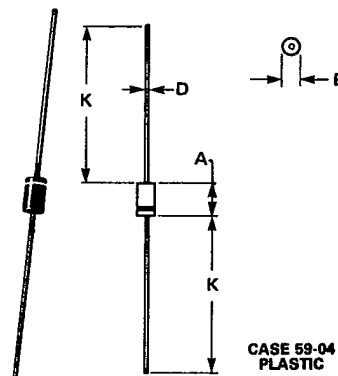
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient (Typical Printed Circuit Board Mounting)	$R_{\theta JA}$	65	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage ($I_F = 3.14 \text{ Amp}$, $T_J = 150^\circ\text{C}$)	V_F	—	1.1	1.2	Volts
Forward Voltage ($I_F = 1.0 \text{ Amp}$, $T_A = 25^\circ\text{C}$)	V_F	—	1.0	1.2	Volts
Reverse Current (rated dc voltage) $T_A = 25^\circ\text{C}$ $T_A = 100^\circ\text{C}$	I_R	—	10 50	10 100	μA

REVERSE RECOVERY CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Recovery Time ($I_F = 1.0 \text{ Amp}$ to $V_R = 30 \text{ Vdc}$) (Figure 21) ($I_F = 20 \text{ mA}$, $I_R = 2.0 \text{ mA}$, Tektronix S-Plug-In) (Figure 22)	t_{rr}	—	350 15	750 30	ns μs
Reverse Recovery Current ($I_F = 1.0 \text{ Amp}$ to $V_R = 30 \text{ Vdc}$) (Figure 21)	$I_{RM(REC)}$	—	—	30	Amps

**MR810 thru MR814
MR816 thru MR818**
**FAST RECOVERY
POWER RECTIFIERS
50-1000 VOLTS
1 AMPERE**

NOTES:

1. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
2. POLARITY DENOTED BY CATHODE BAND.
3. LEAD DIAMETER NOT CONTROLLED WITHIN "F" DIMENSION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.97	6.60	0.235	0.260
B	2.79	3.05	0.110	0.120
D	0.76	0.86	0.030	0.034
K	27.94	—	1.100	—

MECHANICAL CHARACTERISTICS

CASE: Transfer Molded Plastic

FINISH: External leads are plated and are readily solderable

POLARITY: Cathode indicated by Polarity band

WEIGHT: 0.4 Grams (Approximately)

MR810 thru MR814, MR816 thru MR818

FIGURE 1 – FORWARD VOLTAGE

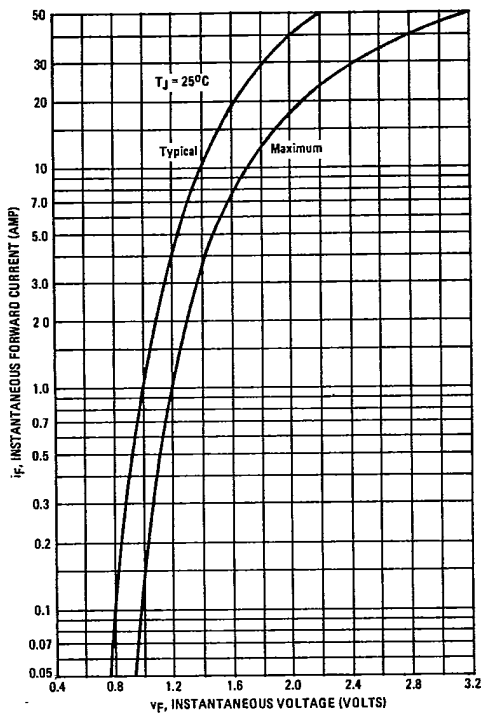


FIGURE 2 – MAXIMUM SURGE CAPABILITY

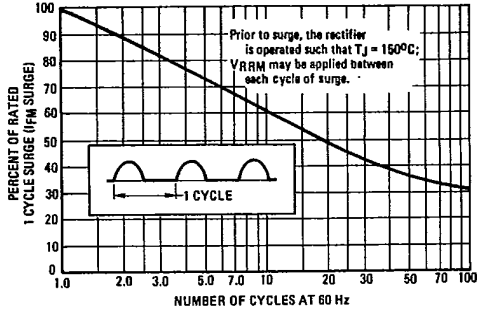


FIGURE 3 – TEMPERATURE COEFFICIENT

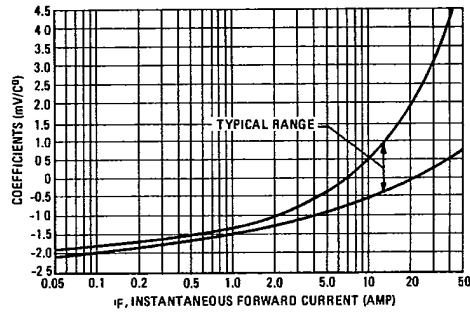


FIGURE 4 – FORWARD POWER DISSIPATION

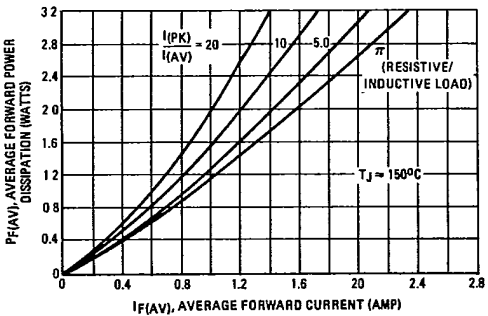
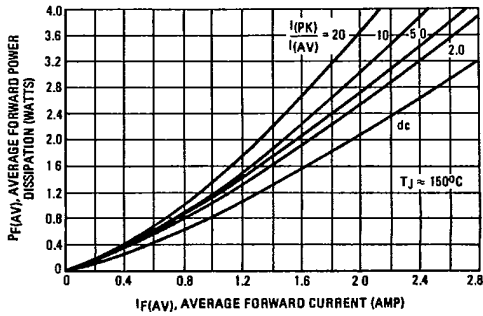


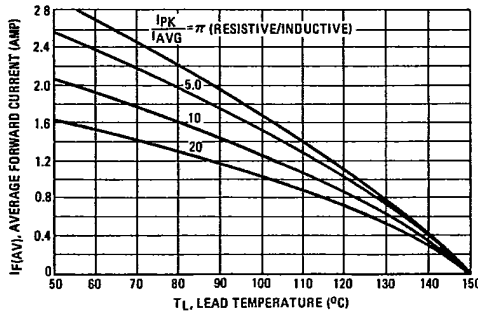
FIGURE 5 – FORWARD POWER DISSIPATION



MR810 thru MR814, MR816 thru MR818

MAXIMUM CURRENT RATINGS
(SEE NOTES 1 and 2)

SINE WAVE INPUT

FIGURE 6 - EFFECT OF LEAD LENGTHS,
RESISTIVE LOAD

SQUARE WAVE INPUT

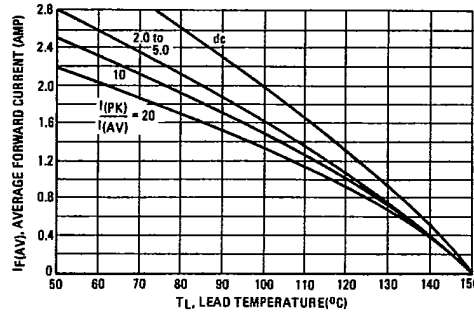
FIGURE 7 - EFFECT OF LEAD LENGTHS,
RESISTIVE LOAD

FIGURE 8 - 1/8" LEAD LENGTH, VARIOUS LOADS

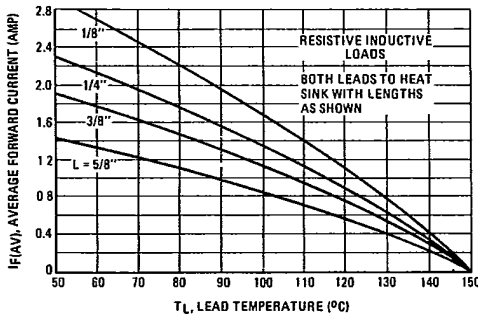
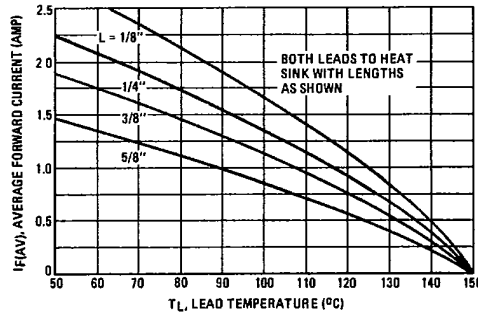
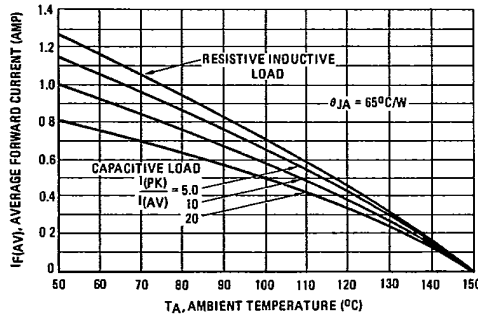
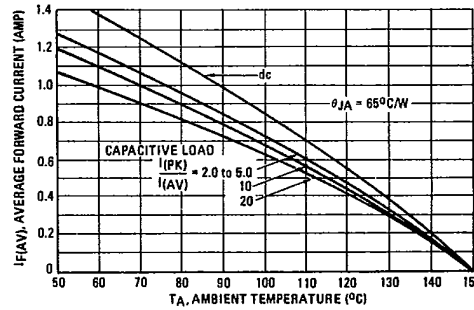
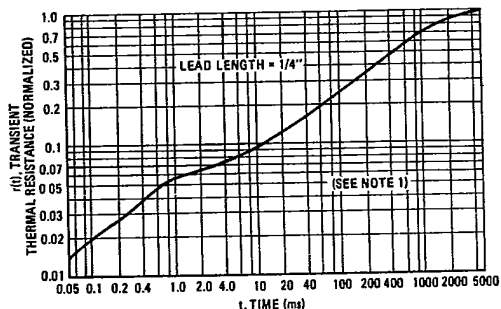


FIGURE 9 - 1/8" LEAD LENGTH, VARIOUS LOADS

FIGURE 10 - PRINTED CIRCUIT BOARD MOUNTING,
VARIOUS LOADSFIGURE 11 - PRINTED CIRCUIT BOARD MOUNTING,
VARIOUS LOADS

MR810 thru MR814, MR816 thru MR818

FIGURE 12 - THERMAL RESPONSE



NOTE 1

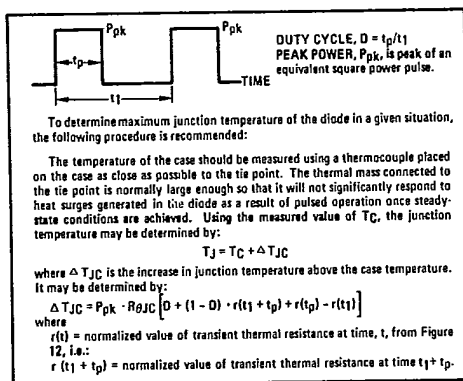
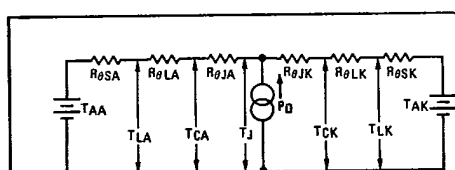


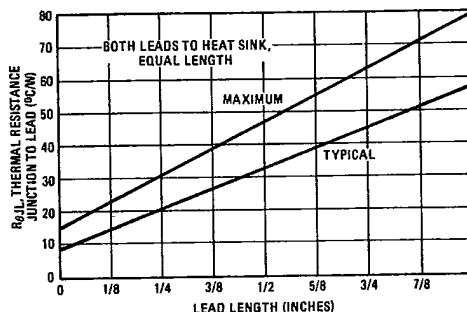
FIGURE 14 - THERMAL CIRCUIT MODEL



Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. For a given total lead length, lowest values occur when one side of the rectifier is brought as close as possible to the heat sink. Terms in the model signify:

T_A = Ambient Temperature
 T_L = Lead Temperature
 T_C = Case Temperature
 T_J = Junction Temperature
(Subscripts A and K refer to anode and cathode sides respectively.)
Values for thermal resistance components are:
 $R_{\theta L} = 112^\circ\text{C/W}$ Typically and 128°C/W Maximum
 $R_{\theta J} = 18^\circ\text{C/W}$ Typically and 30°C/W Maximum
The maximum lead temperature may be calculated as follows:
 $T_L = 150^\circ - \Delta T_{JL}$
 ΔT_{JL} can be calculated as shown in NOTE 1 or it may be approximated as follows:
 $\Delta T_{JL} = R_{\theta JL} \cdot P_F$; P_F may be formulated for sine-wave operation from Figure 3 or from Figure 4 for square-wave operation.

FIGURE 13 - THERMAL RESISTANCE



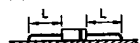
NOTE 2

Data shown for thermal resistance junction to ambient (θ_{JA}) for the mountings shown is to be used as typical guideline values for preliminary engineering or in case the tie point temperature cannot be measured.

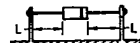
TYPICAL VALUES FOR θ_{JA} IN STILL AIR

MOUNTING METHOD	LEAD LENGTH, L (IN)				$R_{\theta JA}$
	1/8	1/4	1/2	3/4	
1	65	72	82	92	$^\circ\text{C/W}$
2	74	81	91	101	$^\circ\text{C/W}$
3			40		$^\circ\text{C/W}$

MOUNTING METHOD 1

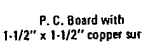


MOUNTING METHOD 2



Vector pin mounting

MOUNTING METHOD 3



P. C. Board with 1-1/2" x 1-1/2" copper surface



Board Ground Plane

MR810 thru MR814, MR816 thru MR818

TYPICAL DYNAMIC CHARACTERISTICS

FIGURE 15 - FORWARD RECOVERY TIME

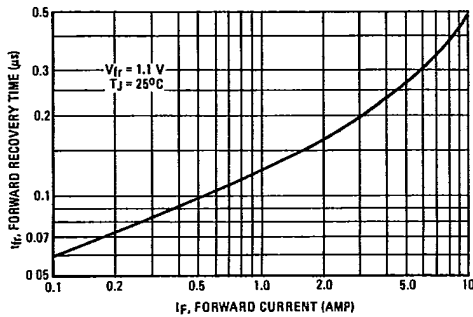
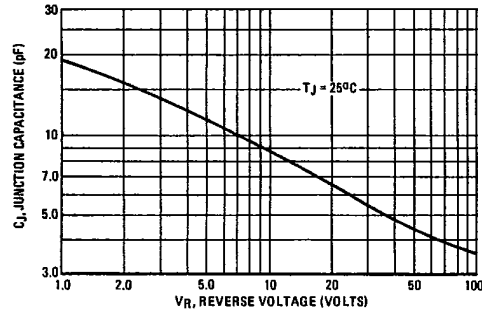


FIGURE 16 - JUNCTION CAPACITANCE



TYPICAL RECOVERED STORED CHARGE DATA
(SEE NOTE 3)

FIGURE 17 - $T_J = 25^\circ C$

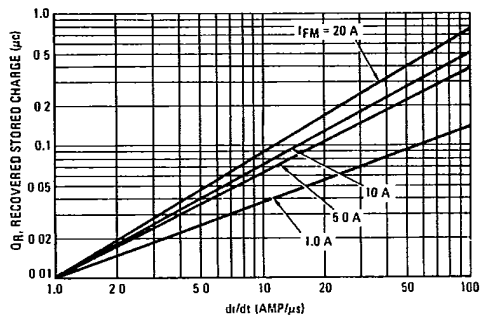


FIGURE 18 - $T_J = 75^\circ C$

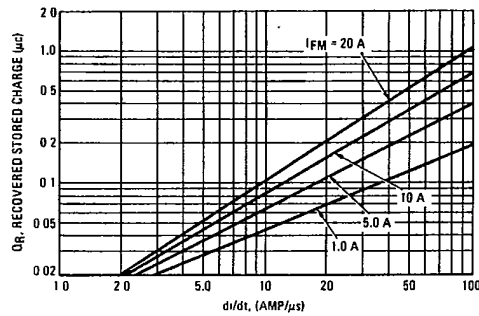


FIGURE 19 - $T_J = 100^\circ C$

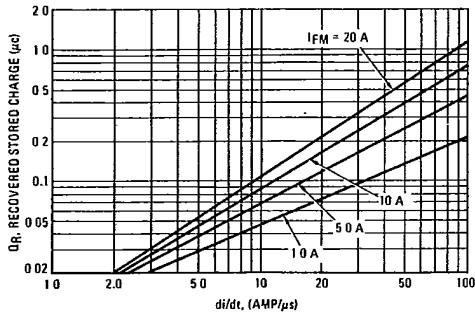


FIGURE 20 - $T_J = 150^\circ C$

