DIGITRON™ Semiconductors

High-reliability discrete products
and engineering services since 1977

MBR6015L-MBR6030L

60A LOW LEAKAGE RECTIFIERS

FEATURES:

- Available as “HR” (high reliability) screened per MIL-PRF-19500, JANTX level. Add “HR” suffix to base part number
- Available Non-RoHS (standard) or RoHS compliant (add PBF suffix)

MAXIMUM RATINGS

Rating	Symbol	MBR6015L	MBR6020L	MBR6025L	MBR6030L	Unit
Peak repetitive reverse voltage **Working peak reverse voltage** **DC blocking voltage**	V_{RRM} V_{RWM} V_R	15	20	25	30	V
Average rectified forward current (Rated V_R)	$I_{F(AV)}$	60 @ T_C = 120°C				A
Peak repetitive forward current (Rated V_R, square wave, 20 kHz)	I_{FRM}	150 @ T_C = 90°C				A
Peak repetitive reverse surge current (2.0µs, 1.0 kHz)	I_{RRM}	2				A
Non-repetitive peak surge current (surge applied at rated load conditions, halfwave, single phase, 60Hz)	I_{FSM}	1000				A
Operating junction temperature range	T_J	-65 to +150				°C
Storage junction temperature range	T_{stg}	-65 to +175				°C
Voltage rate of change (Rated V_R)	dv/dt	1000				V/µs
Maximum thermal resistance Junction to case	$R_{\Theta JC}$	0.8				°C/W

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	MBR6015L	MBR6020L	MBR6025L	MBR6030L	Unit
Maximum instantaneous forward voltage (1) (I_F = 30A, T_C = 25°C) (I_F = 60A, T_C = 25°C) (I_F = 30A, T_C = 150°C) (I_F = 60A, T_C = 150°C)	V_F	 0.42 0.48 0.30 0.38				V
Maximum instantaneous reverse current (1) (Rated dc voltage, T_C = 25°C) (Rated dc voltage, T_C = 125°C)	I_R	 50 280				mA
Capacitance (V_R = 1Vdc, 100 kHz ≤ f ≤ 1MHz)	C_t	6000				pF

Note 1: Pulse test: Pulse width = 300µs, duty cycle = 2.0%.

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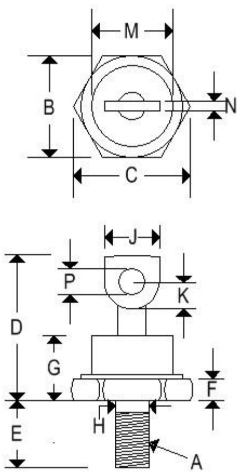
MECHANICAL CHARACTERISTICS

Case	DO-5(R)
Marking	Alpha-numeric
Normal polarity	Cathode is stud
Reverse polarity	Anode is stud (add “R” suffix)



	DO-5(R)			
	Inches		**Millimeters**	
	Min	**Max**	**Min**	**Max**
A	¼-28 UNF2A threads			
B	0.669	0.688	16.990	17.480
C	-	0.794	-	20.160
D	-	1.000	-	25.400
E	0.422	0.453	10.720	11.510
F	0115	0.200	2.920	5.080
G	-	0.450	-	11.430
H	0.220	0.249	5.580	6.320
J	0.250	0.375	6.350	9.530
K	0.156	-	3.960	-
M	-	0.667	-	16.940
N	0.030	0.080	0.760	2.030
P	0.140	0.175	3.560	4.450

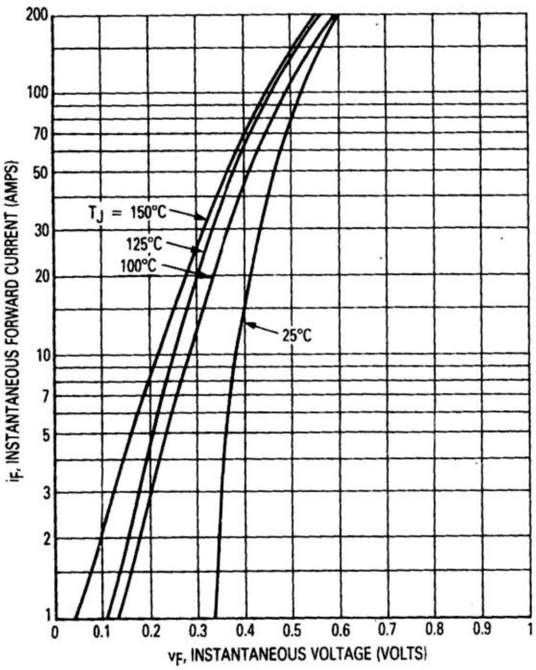


Figure 1. Typical Forward Voltage

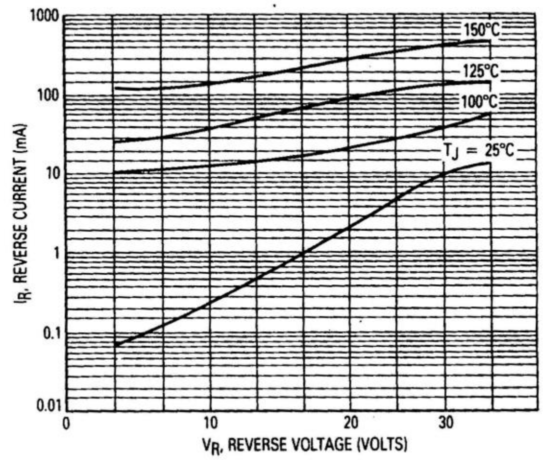


Figure 2. Typical Reverse Current*

*The curves shown are typical for the highest voltage device in the voltage grouping. Typical reverse current for lower voltage selections can be estimated from these same curves if V_R is sufficiently below rated V_R.

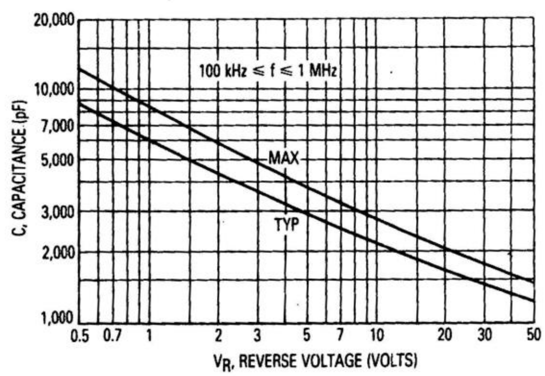


Figure 3. Capacitance

NOTE 1

HIGH FREQUENCY OPERATION

Since current flow in a Schottky rectifier is the result of majority carrier conduction, it is not subject to junction diode forward and reverse recovery transients due to minority carrier injection and stored charge. Satisfactory circuit analysis work may be performed by using a model consisting of an ideal diode in parallel with a variable capacitance. (See Figure 4.)

Rectification efficiency measurements show that operation will be satisfactory up to several megahertz. For example, relative waveform rectification efficiency is approximately 70 percent at 2 MHz, e.g., the ratio of dc power to RMS power in the load is 0.28 at this frequency, whereas perfect rectification would yield 0.406 for sine wave inputs. However, in contrast to ordinary junction diodes, the loss in waveform efficiency is not indicative of power loss; it is simply a result of reverse current flow through the diode capacitance, which lowers the dc output voltage.

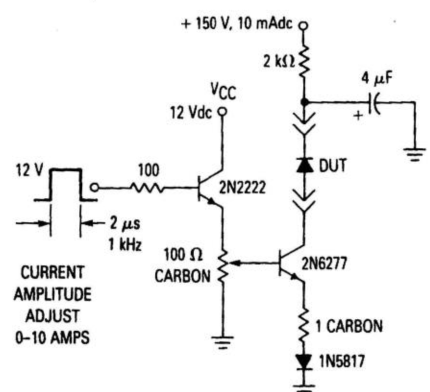


Figure 4. Test Circuit for dv/dt and Reverse Surge Current

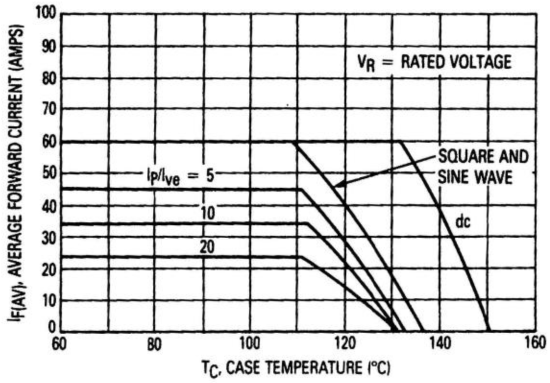


Figure 5. Forward Current Derating

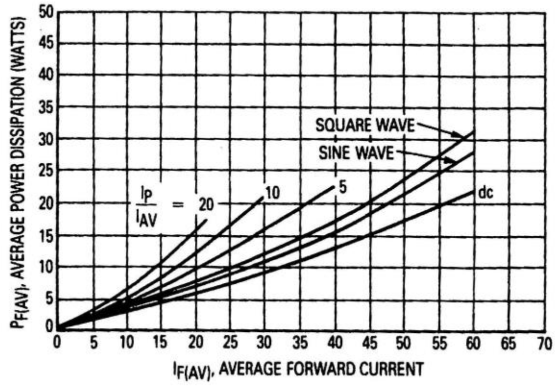
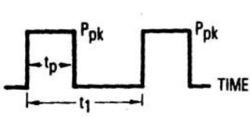


Figure 6. Power Dissipation

NOTE 2



DUTY CYCLE, $D = t_p/t_1$
PEAK POWER, P_{pk}, IS PEAK OF AN EQUIVALENT SQUARE POWER PULSE.

To determine maximum junction temperature of the diode in a given situation, the following procedure is recommended:

The temperature of the case should be measured using a thermocouple placed on the case. The thermal mass connected to the case is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of T_C, the junction temperature may be determined by:

$$T_J = T_C + \Delta T_{JC}$$

where ΔT_C is the increase in junction temperature above the case temperature. It may be determined by:

$$\Delta T_{JC} = P_{pk} \cdot R_{\theta JC}[D + (1 - D) \cdot r(t_1 + t_p) + r(t_p) - r(t_1)]$$

where

$r(t)$ = normalized value of transient thermal resistance at time, t, from Figure 7, i.e.:

$r(t_1 - t_p)$ = normalized value of transient thermal resistance at time $t_1 + t_p$.

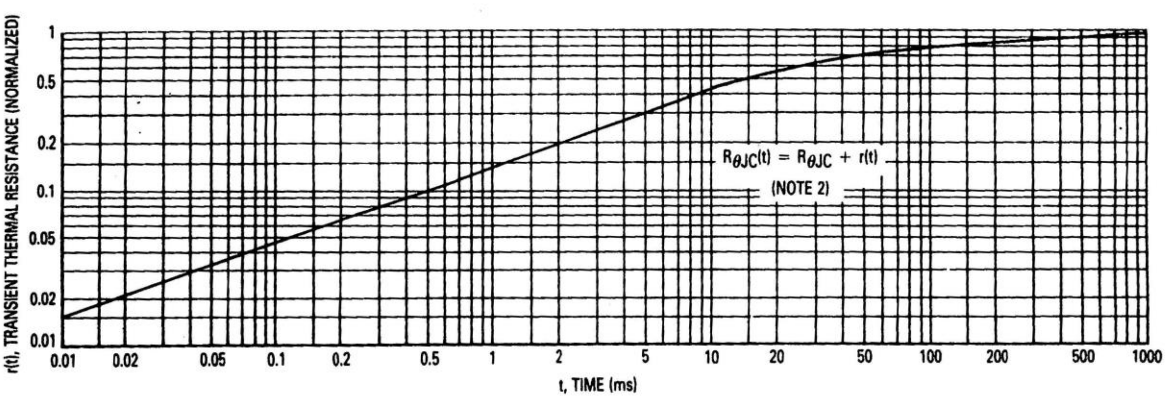


Figure 7. Thermal Response