MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MBR6035
MBR6045, H, H1

MBR6045 is a
Motorola Preferred Device

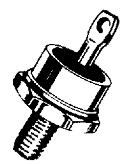
SWITCHMODE POWER RECTIFIERS

using a platinum barrier metal in a large area metal-to-silicon power diode State-of-the-art geometry features epitaxial construction with oxide passivation and metal overlap contact. Ideally suited for use as rectifiers in low-voltage, high-frequency inverters, free-wheeling diodes, and polarity-protection diodes

- Guaranteed Reverse Avalanche
- Guardring for dv/dt Stress Protection
- 150°C Operating Junction Temperature
- Low Forward Voltage

SCHOTTKY RECTIFIERS

60 AMPERES
35 AND 45 VOLTS



CASE 257-01
DO-203AB
METAL

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MAXIMUM RATINGS

Rating	Symbol	MBR6035 MBR6035B	MBR6045, H, H1* MBR6045B	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	35	45	Volts
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 kHz) T_C = 100°C	I_{FRM}	120		Amps
Average Rectified Forward Current (Rated V_R) T_C = 100°C	I_O	60		Amps
Peak Repetitive Reverse Surge Current (2 0 μs 1 0 kHz) See Figure 7	I_{RRM}	2 0		Amps
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	800		Amps
Operating Junction Temperature	T_J	-65 to + 150		°C
Storage Temperature	T_{stg}	-65 to +175		°C
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/μs

THERMAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0 85	1 0	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Typ	Max	Unit
Instantaneous Forward Voltage (1)	v_F			Volts
(i_F = 60 Amp, T_C = 25°C)		0 65	0 70	
(i_F = 60 Amp, T_C = 125°C)		0 57	0 60	
(i_F = 120 Amp, T_C = 125°C)		0 70	0 76	
Instantaneous Reverse Current (1)	I_R			mA
(Rated Voltage, T_C = 25°C)		0 1	0 3	
(Rated Voltage, T_C = 125°C)		55	100	
Capacitance (V_R = 1 0 Vdc, 100 kHz ≤ 1 0 MHz)	C_t	3000	3700	pF

*H and H1 devices include extra testing
(1) Pulse Test Pulse Width = 300 μs, Duty Cycle = 2 0%

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FIGURE 1 — TYPICAL FORWARD VOLTAGE

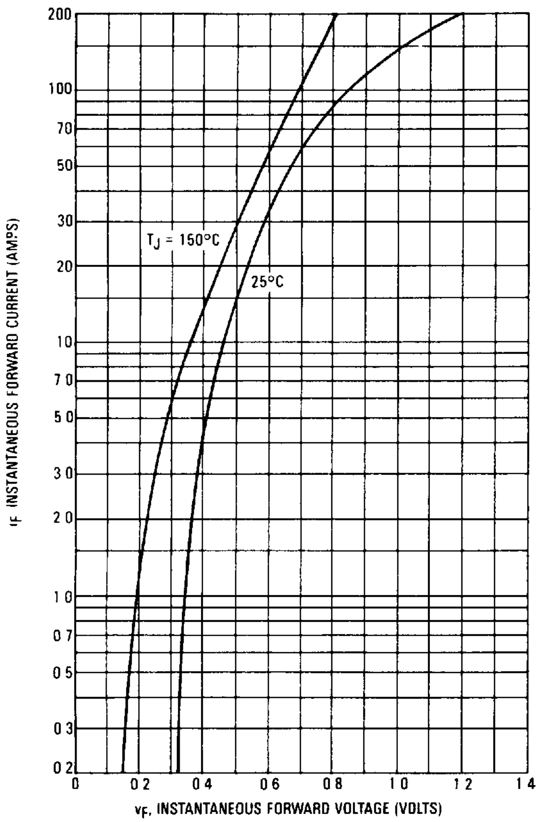


FIGURE 2 — TYPICAL REVERSE CURRENT

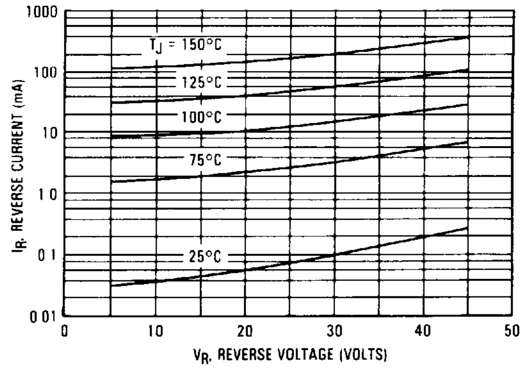


FIGURE 3 — MAXIMUM SURGE CAPABILITY

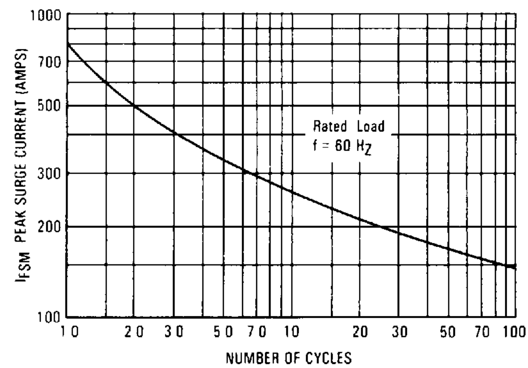
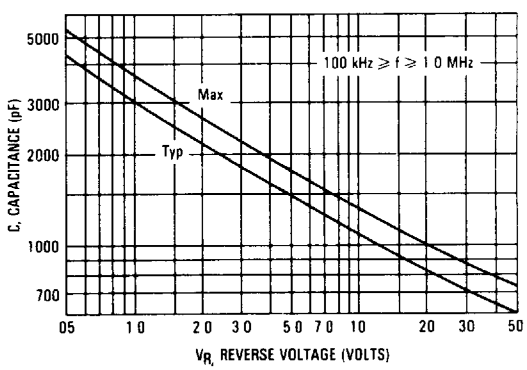


FIGURE 4 — CAPACITANCE



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 per cent at 2 0 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

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FIGURE 5 — FORWARD CURRENT DERATING

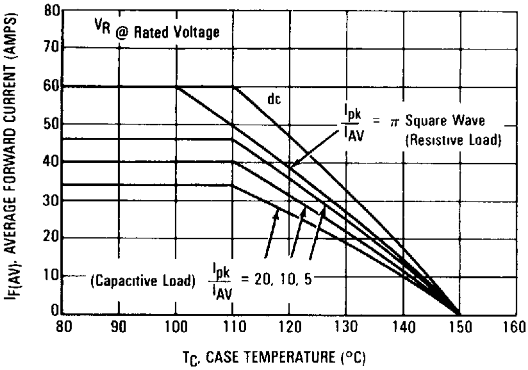
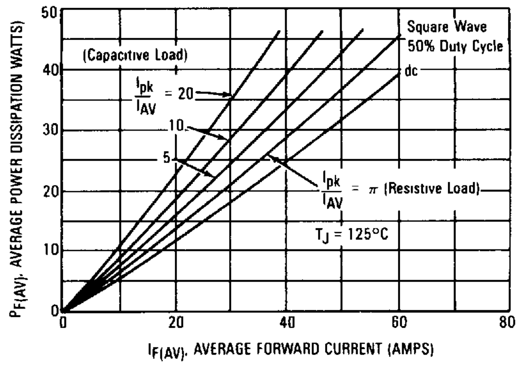
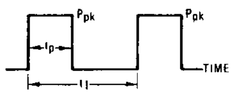


FIGURE 6 — POWER DISSIPATION



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 8 i e

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

FIGURE 7 — TEST CIRCUIT FOR dv/dt AND REVERSE SURGE CURRENT

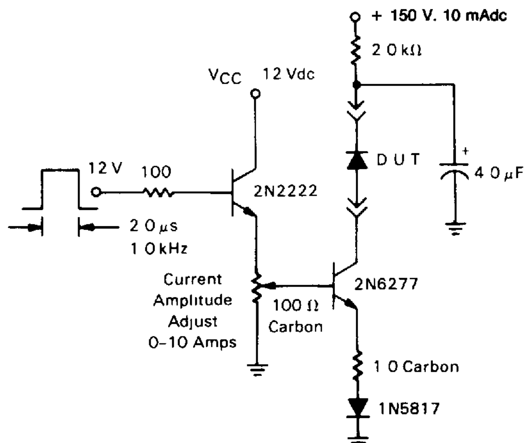


FIGURE 8 — THERMAL RESPONSE

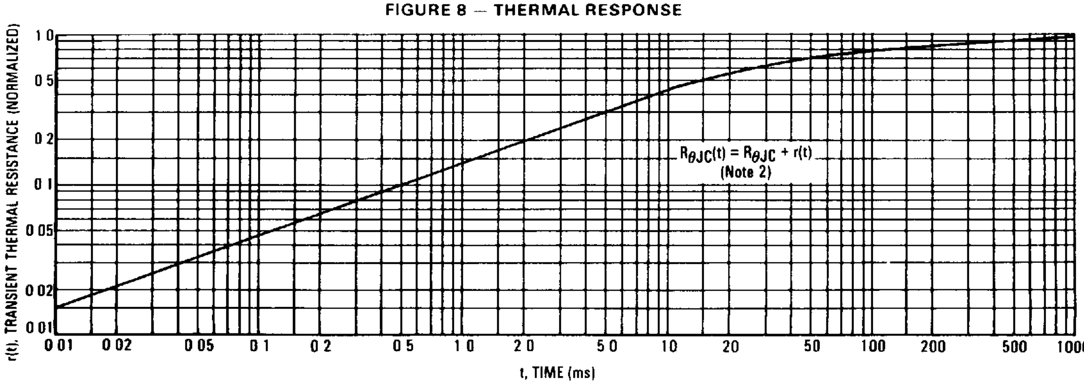


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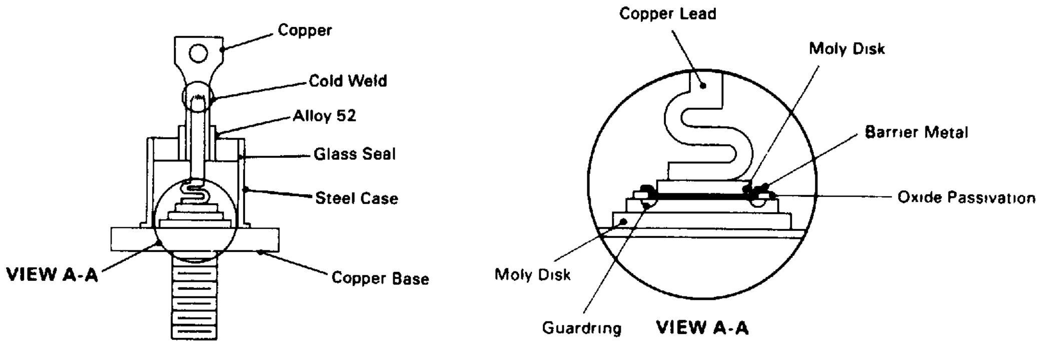
FIGURE 9 — SCHOTTKY RECTIFIER



Motorola builds quality and reliability into its Schottky Rectifiers First is the chip, which has an interface metal between the platinum-barrier metal and nickel-gold ohmic-contact metal to eliminate any possible interaction with the barrier The indicated guardring prevents dv/dt problems, so snubbers are not mandatory. The guardring also operates like a zener to absorb overvoltage transients

Second is the package There are molybdenum disks which closely match the thermal coefficient of expansion of silicon on each side of the chip The top copper lead has a stress relief feature which protects the die during assembly These two features give the unit the capability of passing stringent thermal fatigue tests for 5,000 cycles The top copper lead provides a low resistance to current and therefore does not contribute to device heating, a heat sink should be used when attaching wires

Third is the redundant electrical testing. The device is tested before assembly in "sandwich" form, with the chip between the moly disks It is tested again after assembly As part of the final electrical test, devices are 100% tested for dv/dt at 1,600 V/µs and reverse avalanche

HI-REL PROGRAM OPTIONS

The MBR6045 is also available with two levels of extra testing similar to "TX" screening and including Group A and B inspection programs Both the MBR6045H and MBR6045H1 go through 100% screening consisting of high temperature storage, temperature cycling, constant acceleration and hermetic seal testing prior to a sample being submitted to Group A and B inspection After completion of Group B inspection, the MBR6045H is available without additional screening MBR6045H1 devices are further processed through a high temperature reverse bias (HTRB) and forward burn-in Consult factory for details

MECHANICAL CHARACTERISTICS

CASE. Welded, hermetically sealed

FINISH All external surfaces corrosion resistant and terminal lead is readily solderable.

POLARITY: Cathode-to-Case

MOUNTING POSITION: Any

MOUNTING TORQUE: 25 in-lb max

SOLDER HEAT The excellent heat transfer property of the heavy duty copper anode terminal which transmits heat away from the die requires that caution be used when attaching wires Motorola suggests a heat sink be clamped between eyelet and the body during any soldering operation.