Bulletin PD-20865 rev. A 04/06

International
IOR Rectifier

# MBR16..PbF Series

## SCHOTTKY RECTIFIER 16 Amp

$I_{F(AV)}$ = 16Amp
$V_R$ = 35-45V

### Major Ratings and Characteristics

| Characteristics | Values | Units |
|---|---|---|
| $I_{F(AV)}$ Rectangular waveform | 16 | A |
| $V_{RRM}$ | 35-45 | V |
| $I_{FSM}$ @ tp = 5 µs sine | 1800 | A |
| $V_F$ @16 Apk, $T_J$ = 125°C | 0.57 | V |
| $T_J$ | -65 to 150 | °C |

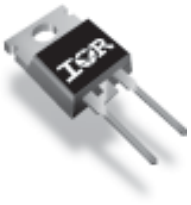
### Description/ Features

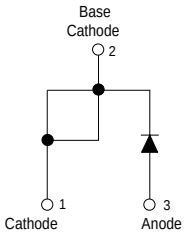
The MBR16..PbF Schottky rectifier has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150°C junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 150°C $T_J$ operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead-Free ("PbF" suffix)

## Case Styles

MBR16..PbF






**TO-220AC**

## Voltage Ratings

| | Part number | MBR1635PbF | MBR1645PbF |
|---|---|---|---|
| $V_R$ | Max. DC Reverse Voltage (V) | 35 | 45 |
| $V_{RWM}$ | Max. Working Peak Reverse Voltage (V) | | |

## Absolute Maximum Ratings

| | Parameters | MBR16.. | Units | Conditions | |
|---|---|---|---|---|---|
| $I_{F(AV)}$ | Max. Average Forward Current | 16 | A | @ $T_C$ = 134 °C (Rated $V_R$) | |
| $I_{FSM}$ | Non-Repetitive Peak Surge Current | 1800 | A | 5µs Sine or 3µs Rect. pulse | Following any rated load condition and with rated $V_{RRM}$ applied |
| | | 150 | | Surge applied at rated load condition halfwave single phase 60Hz | |
| $E_{AS}$ | Non-Repetitive Avalanche Energy | 24 | mJ | $T_J$ = 25 °C, $I_{AS}$ = 3.6 Amps, L = 3.7 mH | |
| $I_{AR}$ | Repetitive Avalanche Current | 3.6 | A | Current decaying linearly to zero in 1 µsec Frequency limited by $T_J$ max. $V_A$ = 1.5 x $V_R$ typical | |

## Electrical Specifications

| | Parameters | MBR16.. | Units | Conditions | |
|---|---|---|---|---|---|
| $V_{FM}$ | Max. Forward Voltage Drop (1) | 0.63 | V | @ 16A | $T_J$ = 25 °C |
| | | 0.57 | V | @ 16A | $T_J$ = 125 °C |
| $I_{RM}$ | Max. Instantaneus Reverse Current | 0.2 | mA | $T_J$ = 25 °C | Rated DC voltage |
| | (1) | 40 | mA | $T_J$ = 125 °C | |
| $C_T$ | Max. Junction Capacitance | 1400 | pF | $V_R$ = 5$V_{DC}$ (test signal range 100Khz to 1Mhz) 25°C | |
| $L_S$ | Typical Series Inductance | 8.0 | nH | Measured from top of terminal to mounting plane | |
| dv/dt | Max. Voltage Rate of Change (Rated $V_R$) | 10000 | V/ µs | | |

(1) Pulse Width < 300µs, Duty Cycle <2%

## Thermal-Mechanical Specifications

| | Parameters | | MBR16.. | Units | Conditions |
|---|---|---|---|---|---|
| $T_J$ | Max. Junction Temperature Range | | -65 to 150 | °C | |
| $T_{stg}$ | Max. Storage Temperature Range | | -65 to 175 | °C | |
| $R_{thJC}$ | Max. Thermal Resistance Junction to Case | | 1.50 | °C/W | DC operation |
| $R_{thCS}$ | Typical Thermal Resistance, Case to Heatsink | | 0.50 | °C/W | Mounting surface, smooth and greased |
| wt | Approximate Weight | | 2 (0.07) | g (oz.) | |
| T | Mounting Torque | Min. | 6 (5) | Kg-cm (lbf-in) | |
| | | Max. | 12 (10) | | |
| | Case Style | | TO-220AC | | JEDEC |
| | Marking Device | | MBR1645 | | |

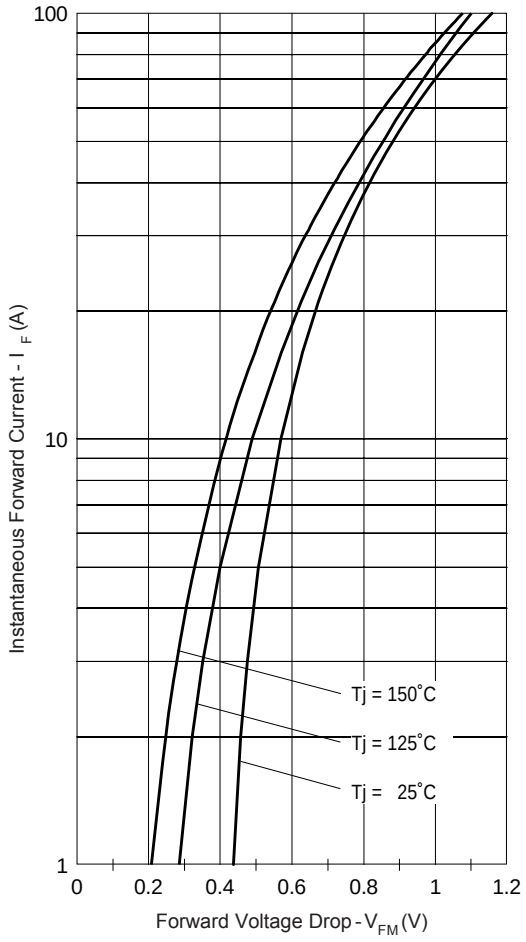



**Fig. 1 - Maximum Forward Voltage Drop Characteristics**

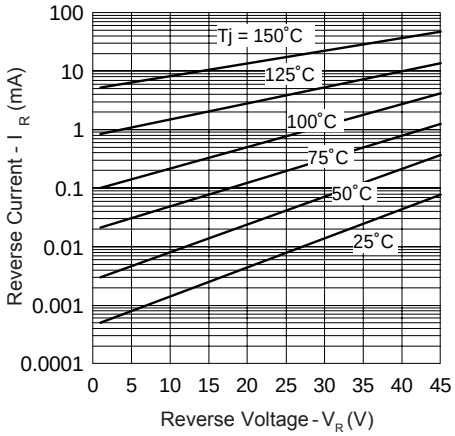



**Fig. 2 - Typical Values of Reverse Current Vs. Reverse Voltage**

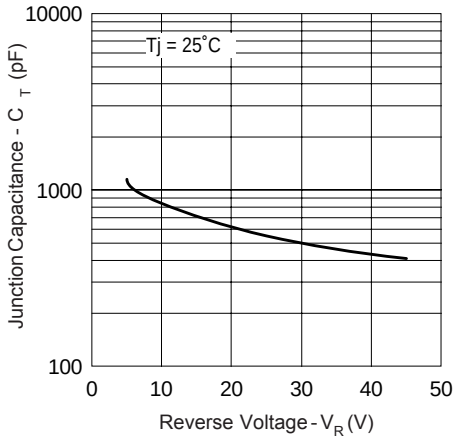



**Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage**

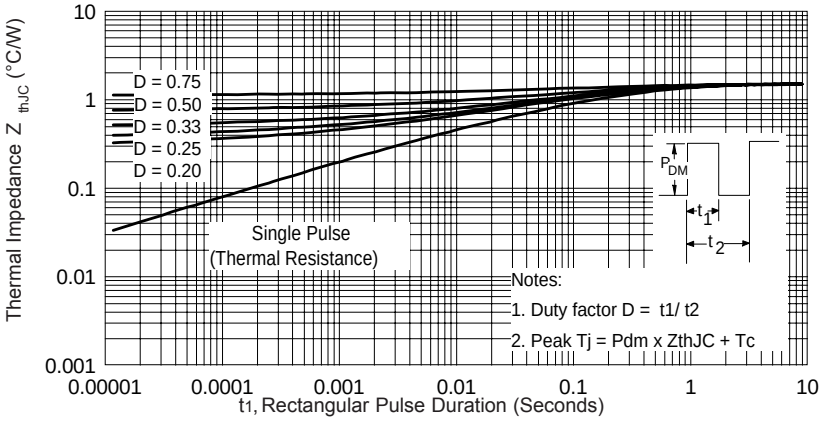



**Fig. 4 - Max. Thermal Impedance $Z_{thJC}$ Characteristics**

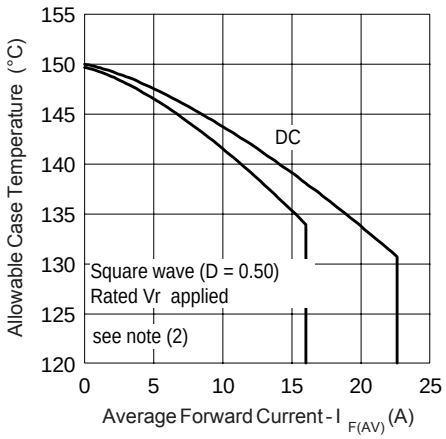



**Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current**

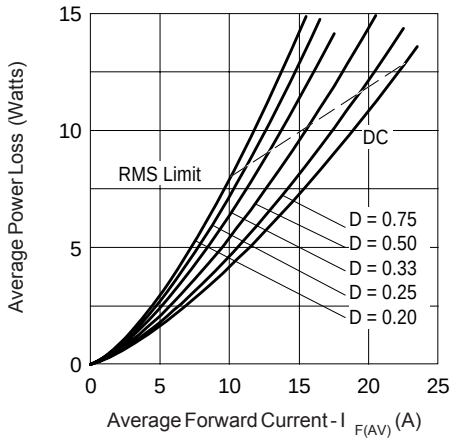



**Fig. 6 - Forward Power Loss Characteristics**

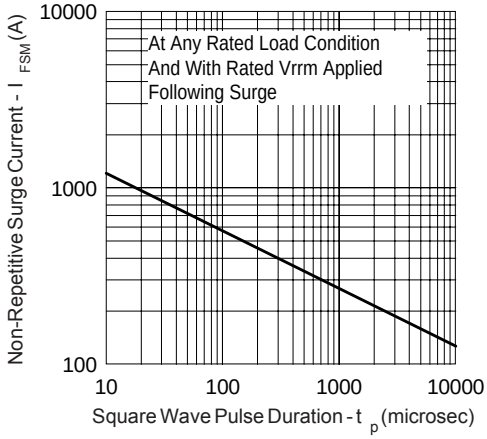



**Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)**

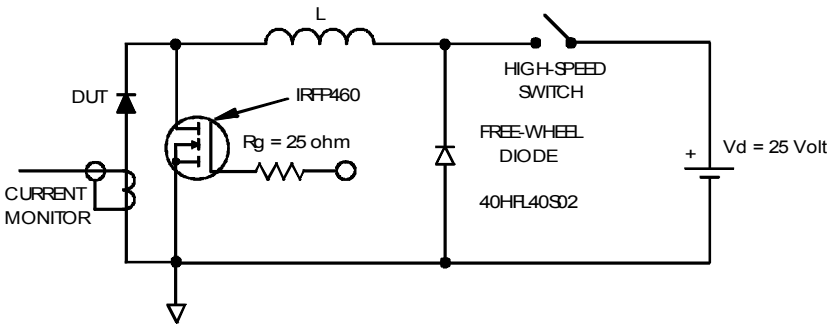
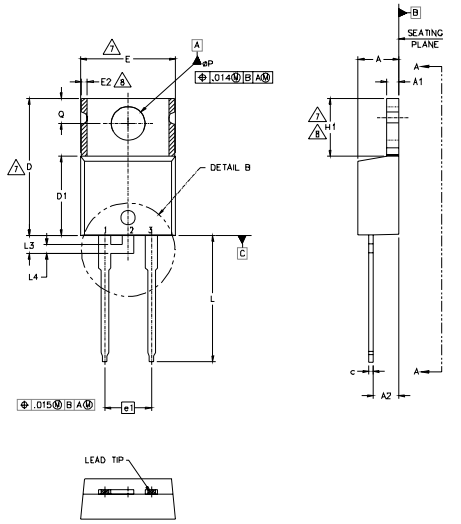



Fig. 8 - Unclamped Inductive Test Circuit

**(2)** Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
$Pd$ = Forward Power Loss = $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$ (see Fig. 6);
$Pd_{REV}$ = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; $I_R @ V_{R1}$ = rated $V_R$ applied

## Outline Table




NOTES:
1.- DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.- LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.- DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5.- DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
6.- CONTROLLING DIMENSION : INCHES.
7.- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8.- DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
9.- OUTLINE CONFORMS TO JEDEC TO-220, D2 (min) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

| SYMBOL | DIMENSIONS | | | | NOTES |
|---|---|---|---|---|---|
| | MILLIMETERS | | INCHES | | |
| | MIN. | MAX. | MIN. | MAX. | |
| A | 3.56 | 4.83 | .140 | .190 | |
| A1 | 0.51 | 1.40 | .020 | .055 | |
| A2 | 2.03 | 2.92 | .080 | .115 | |
| b | 0.38 | 1.01 | .015 | .040 | |
| b1 | 0.38 | 0.97 | .015 | .038 | 5 |
| b2 | 1.14 | 1.78 | .045 | .070 | |
| b3 | 1.14 | 1.73 | .045 | .068 | 5 |
| c | 0.36 | 0.61 | .014 | .024 | |
| c1 | 0.36 | 0.56 | .014 | .022 | 5 |
| D | 14.22 | 16.51 | .560 | .650 | 4 |
| D1 | 8.38 | 9.02 | .330 | .355 | |
| D2 | 11.68 | 12.88 | .460 | .507 | 7 |
| E | 9.65 | 10.67 | .380 | .420 | 4,7 |
| E1 | 6.86 | 8.89 | .270 | .350 | 7 |
| E2 | – | 0.76 | – | .030 | 8 |
| e | 2.54 BSC | | .100 BSC | | |
| e1 | 5.08 BSC | | .200 BSC | | |
| H1 | 5.84 | 6.86 | .230 | .270 | 7,8 |
| L | 12.70 | 14.73 | .500 | .580 | |
| L1 | – | 6.35 | – | .250 | 3 |
| L3 | 1.78 | 2.13 | .070 | .084 | |
| L4 | 0.76 | 1.27 | .030 | .050 | 3 |
| øP | 3.53 | 3.73 | .139 | .147 | |
| Q | 2.54 | 3.05 | .100 | .120 | |

LEAD ASSIGNMENTS
DIODES
1+2- CATHODE
3 - ANODE

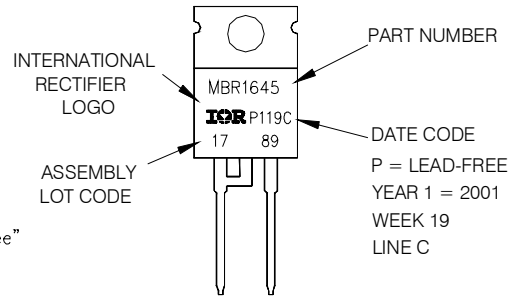
**Conform to JEDEC outline TO-220AC**

## Part Marking Information

IRXC Assembly Line - SubCon Assembly Line

EXAMPLE: THIS IS A MBR1645
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

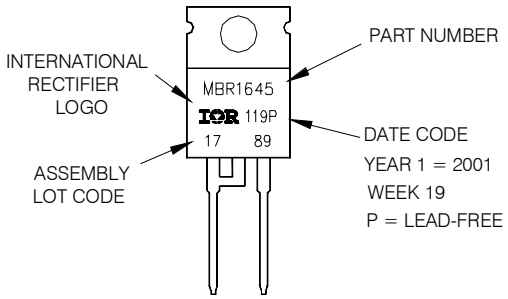
Note: "P" in the beginning of date code indicates "Lead-Free"




IRMX Assembly Line

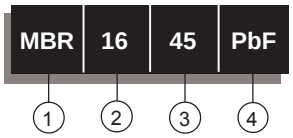
EXAMPLE: THIS IS A MBR1645
LOT CODE 1789
ASSEMBLED ON WW 19, 2001
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position indicates "Lead-Free"



## Ordering Information Table

**Device Code**




1 - Schottky MBR Series
2 - Currrent Rating (16 = 16A)
3 - Voltage Ratings (35 = 35V, 45 = 45V)
4 - • none = Standard Production
• PbF = Lead-Free

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

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