

International  
**IR** Rectifier

**MBRB4045CTPbF**  
**MBR4045CT-1PbF**

**SCHOTTKY RECTIFIER**

**40 Amp**

$$I_{F(AV)} = 40\text{Amp}$$

$$V_R = 45\text{V}$$

#### Major Ratings and Characteristics

Characteristics	Values	Units
$I_{F(AV)}$ Rectangular waveform (Per Device)	40	A
$I_{FRM}$ @ $T_C = 118^\circ\text{C}$ (Per Leg)	40	A
$V_{RRM}$	45	V
$I_{FSM}$ @ $t_p = 5\ \mu\text{s}$ sine	900	A
$V_F$ @ $20\text{Apk}, T_J = 125^\circ\text{C}$	0.58	V
$T_J$ range	-65 to 150	$^\circ\text{C}$

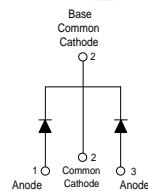
#### Description/Features

This center tap Schottky rectifier has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to  $150^\circ\text{C}$  junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- $150^\circ\text{C}$   $T_J$  operation
- Center tap TO-220, D<sup>2</sup>Pak and TO-262 packages
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead-Free ("PbF" suffix)

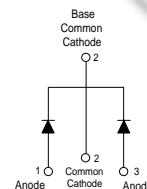
#### Case Styles

MBRB4045CTPbF



**D<sup>2</sup>PAK**

MBR4045CT-1PbF



**TO-262**

## MBRB4045CTPbF, MBR4045CT-1PbF

Bulletin PD-21047 rev. A 07/06

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## Voltage Ratings

Parameters	MBRB4045CTPbF, MBR4045CT-1PbF
$V_R$ Max. DC Reverse Voltage (V)	45
$V_{RWM}$ Max. Working Peak Reverse Voltage (V)	

## Absolute Maximum Ratings

Parameters	Values	Units	Conditions
$I_{F(AV)}$ Max. Average Forward Current (Per Leg) (Per Device)	20	A	@ $T_C = 118^\circ\text{C}$ , (Rated $V_R$ )
	40		
$I_{FRM}$ Peak Repetitive Forward Current (Per Leg)	40	A	Rated $V_R$ , square wave, 20kHz $T_C = 118^\circ\text{C}$
$I_{FSM}$ Max. Peak One Cycle Non-Repetitive Surge Current (Per Leg)	900	A	5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse 10ms Sine or 6ms Rect. pulse
	210		
$E_{AS}$ Non-Repetitive Avalanche Energy (Per Leg)	20	A	$T_J = 25^\circ\text{C}$ , $I_{AS} = 3\text{Amps}$ , $L = 4.40\text{mH}$ Following any rated load condition and with rated $V_{RRM}$ applied
$I_{AR}$ Repetitive Avalanche Current (Per Leg)	3	A	Current decaying linearly to zero in 1 $\mu\text{sec}$ Frequency limited by $T_J$ max. $V_A = 1.5 \times V_R$ typical

## Electrical Specifications

Parameters	Values	Units	Conditions
$V_{FM}$ Max. Forward Voltage Drop (1)	0.60	V	@ 20A $T_J = 25^\circ\text{C}$
	0.78	V	@ 40A
	0.58	V	@ 20A $T_J = 125^\circ\text{C}$
	0.75	V	@ 40A
$I_{RM}$ Max. Instantaneous Reverse Current (1)	1	mA	$T_J = 25^\circ\text{C}$ Rated DC voltage
	50	mA	$T_J = 100^\circ\text{C}$
	95	mA	$T_J = 125^\circ\text{C}$
$C_T$ Max. Junction Capacitance	900	pF	$V_R = 5V_{DC}$ (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$
$L_S$ Typical Series Inductance	8.0	nH	Measured from top of terminal to mounting plane
$dv/dt$ Max. Voltage Rate of Change	10000	V/ $\mu\text{s}$	(Rated $V_R$ )

(1) Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2%

## Thermal-Mechanical Specifications

Parameters	Values	Units	Conditions
$T_J$ Max. Junction Temperature Range	-65 to 150	$^\circ\text{C}$	
$T_{stg}$ Max. Storage Temperature Range	-65 to 175	$^\circ\text{C}$	
$R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Leg)	1.5	$^\circ\text{C}/\text{W}$	DC operation
$R_{thCS}$ Typical Thermal Resistance Case to Heatsink	0.50	$^\circ\text{C}/\text{W}$	Mounting surface, smooth and greased Only for TO-220
$R_{thJA}$ Max. Thermal Resistance Junction to Ambient	50	$^\circ\text{C}/\text{W}$	DC operation For D <sup>2</sup> Pak and TO-262
wt Approximate Weight	2 (0.07)	g (oz.)	
T Mounting Torque	Min. 6 (5)	Kg-cm (lbf-in)	Non-lubricated threads
	Max. 12 (10)		
Device Marking	MBRB4045CT	Case style D <sup>2</sup> Pak	
	MBR4045CT-1	Case style TO-262	

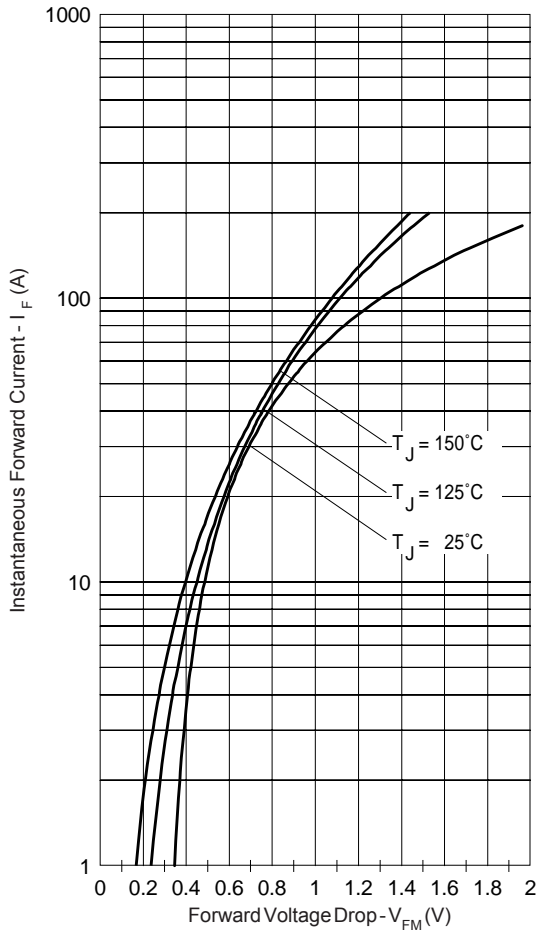


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

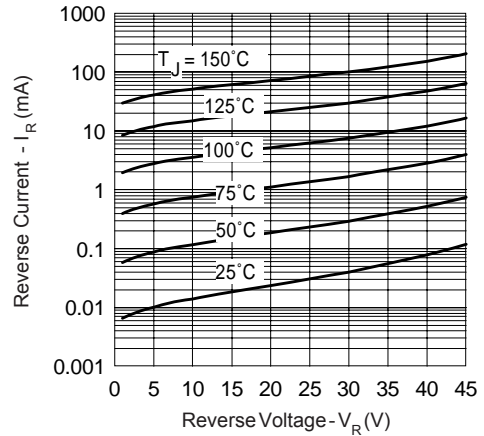


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

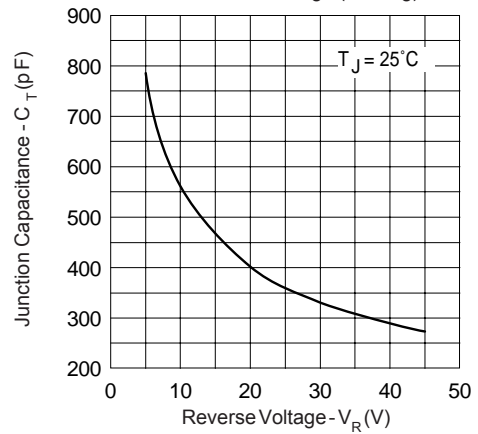


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

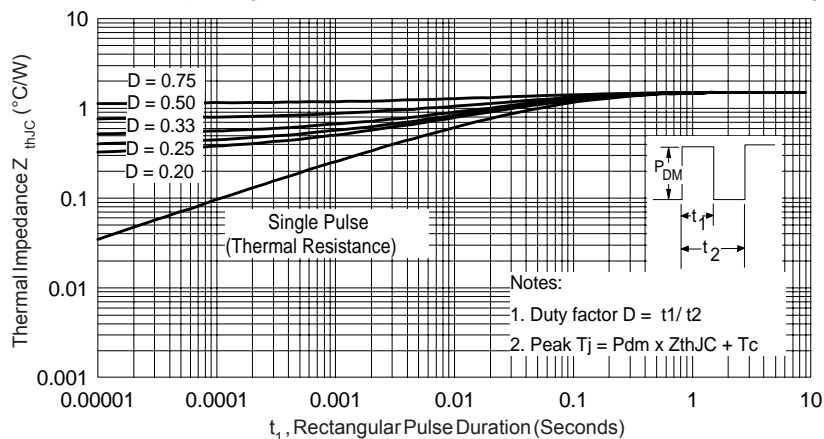


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

MBRB4045CTPbF, MBR4045CT-1PbF

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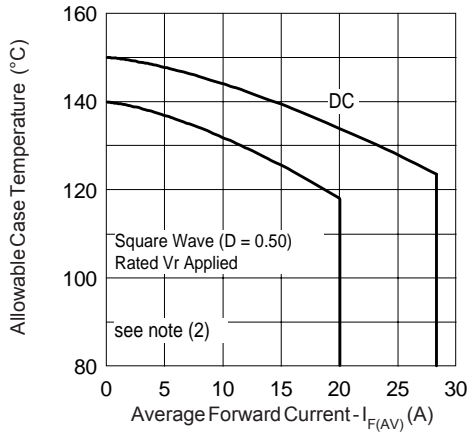


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current

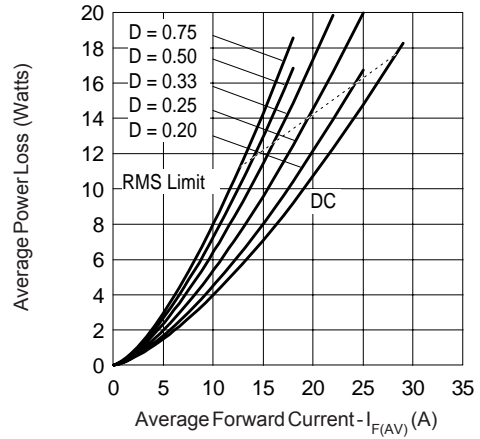


Fig. 6 - Forward Power Loss Characteristics

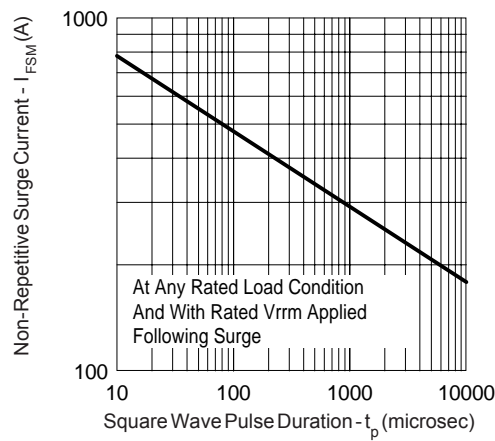


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

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- (2) Formula used:  $T_c = T_j - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;  
 $P_d = \text{Forward Power Loss} = I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);  
 $P_{d_{REV}} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = \text{rated } V_R$

Outlines Table

NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994  
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]  
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.  
 4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.  
 5. CONTROLLING DIMENSIONS: INCH.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	4
b1	0.51	0.89	.020	.035	4
b2	1.14	1.78	.045	.070	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86		.270		
E	9.65	10.67	.380	.420	3
E1	6.22		.245		
e	2.54	BSC	.100	BSC	
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1		1.65	.065		
L2	1.27	1.78	.050	.070	
L3	0.25	BSC	.010	BSC	
L4	4.78	5.28	.188	.208	
m	17.78		.700		
m1	8.89		.350		
n	11.43		.450		
o	2.08		.082		
p	3.81		.150		
R	0.51	0.71	.020	.026	
θ	90°	93°	90°	93°	

**LEAD ASSIGNMENTS**

**HEXFET**  
 1.- GATE  
 2, 4.- DRAIN  
 3.- SOURCE

**IGBTs, CoPACK**  
 1.- GATE  
 2.- COLLECTOR  
 3.- EMITTER

**DIODES**  
 1.- ANODE \*  
 2, 4.- CATHODE  
 3.- ANODE

\* PART DEPENDENT.

**Conform to JEDEC outline D<sup>2</sup>Pak (SMD-220)**  
 Dimensions in millimeters and (inches)

NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994  
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]  
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.  
 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.  
 5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.  
 6. CONTROLLING DIMENSIONS: INCH.  
 7.- OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b1(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	5
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86		.270		4
E	9.65	10.67	.380	.420	3,4
E1	6.22		.245		4
e	2.54	BSC	.100	BSC	
L	13.46	14.10	.530	.555	
L1		1.65		.065	
L2	3.56	3.71	.140	.146	

**LEAD ASSIGNMENTS**

**HEXFET**  
 1.- GATE  
 2.- DRAIN  
 3.- SOURCE  
 4.- DRAIN

**IGBTs, CoPACK**  
 1.- GATE  
 2.- COLLECTOR  
 3.- EMITTER  
 4.- COLLECTOR

**Modified JEDEC outline TO-262**  
 Dimensions in millimeters and (inches)

MBRB4045CTPbF, MBR4045CT-1PbF

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Part Marking Information

**D<sup>2</sup>PAK**

EXAMPLE: THIS IS A MBRB3045CT  
LOT CODE 8024  
ASSEMBLED ON WW 02, 2000

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

INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE

PART NUMBER

DATE CODE  
YEAR 0 = 2000  
WEEK 02  
P = LEAD-FREE

**TO-262**

EXAMPLE: THIS IS A MBR4045CT-1  
LOT CODE 1789  
ASSEMBLED ON WW 19, 2002

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

INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE

PART NUMBER

DATE CODE  
YEAR 2 = 2002  
WEEK 19  
P = LEAD-FREE

Tape & Reel Information

SECTION Y-Y

NOTES:

- 1.0 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.02
- 2.0 CAMBER NOT TO EXCEED 1mm in 100mm
- 3.0 MATERIAL: CONDUCTIVE BLACK STYRENIC ALLOY
- 4.0 K<sub>0</sub> MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
- 5.0 MEASURED FROM CENTRELINE OF SPROCKET HOLE TO CENTRELINE OF POCKET
- 6.0 VENDOR: (OPTIONAL)
- 7.0 MUST ALSO MEET REQUIREMENTS OF EIA STANDAR #EIA-481A TAPING OF SURFACE MOUNT COMPONENTS FOR AUTOMATIC PLACEMENT
- 8.0 SURFACE RESISTIVITY OF MOLDED MATL. MUST MEASURE LESS OR EQUAL TO 10<sup>6</sup> OHMS PER SQUARE. MEASURED IN ACCORDANCE TO PROCEDURE GIVEN IN ASTM D-257 & ASTM D-991
- 9.0 TOTAL LENGTH PER REEL MUST BE 45 METERS
- 10.0 © CRITICAL

A <sub>0</sub>	10.50	+/-	0.1
B <sub>0</sub>	15.80	+/-	0.1
B <sub>2</sub>	10.25	+/-	0.1
K <sub>0</sub>	4.90	+/-	0.1
F	11.50	+/-	0.1
P <sub>1</sub>	16.00	+/-	0.1
W	24.00	+/-	0.3

Dimensions in millimeters and (inches)

## Ordering Information Table

Device Code																	
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;"><b>MBR</b></td> <td style="padding: 5px;"><b>B</b></td> <td style="padding: 5px;"><b>40</b></td> <td style="padding: 5px;"><b>45</b></td> <td style="padding: 5px;"><b>CT</b></td> <td style="padding: 5px;"><b>-1</b></td> <td style="padding: 5px;"><b>TRL</b></td> <td style="padding: 5px;"><b>PbF</b></td> </tr> <tr> <td style="text-align: center;">①</td> <td style="text-align: center;">②</td> <td style="text-align: center;">③</td> <td style="text-align: center;">④</td> <td style="text-align: center;">⑤</td> <td style="text-align: center;">⑥</td> <td style="text-align: center;">⑦</td> <td style="text-align: center;">⑧</td> </tr> </table>	<b>MBR</b>	<b>B</b>	<b>40</b>	<b>45</b>	<b>CT</b>	<b>-1</b>	<b>TRL</b>	<b>PbF</b>	①	②	③	④	⑤	⑥	⑦	⑧
<b>MBR</b>	<b>B</b>	<b>40</b>	<b>45</b>	<b>CT</b>	<b>-1</b>	<b>TRL</b>	<b>PbF</b>										
①	②	③	④	⑤	⑥	⑦	⑧										
<b>1</b>	- Essential Part Number																
<b>2</b>	- B = Surface Mount																
<b>3</b>	- Current Rating (40 = 40A)																
<b>4</b>	- Voltage code (45 = 45V)																
<b>5</b>	- CT = Essential Part Number																
<b>6</b>	- "-1" = TO-262																
<b>7</b>	- <ul style="list-style-type: none"> <li>• none = Tube (50 pieces)</li> <li>• TRL = Tape &amp; Reel (Left Oriented - for D<sup>2</sup>Pak only)</li> <li>• TRR = Tape &amp; Reel (Right Oriented - for D<sup>2</sup>Pak only)</li> </ul>																
<b>8</b>	- <ul style="list-style-type: none"> <li>• none = Standard Production</li> <li>• PbF = Lead-Free</li> </ul>																

## MBRB4045CTPbF, MBR4045CT-1PbF

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MBR4045CT
*****
*   This model has been developed by   *
*   Wizard SPICE MODEL GENERATOR (1999) *
*   (International Rectifier Corporation) *
*   Contains proprietary Information   *
*****
*   SPICE Model Diode is composed by a *
*   simple diode plus paralalled VCG2T *
*****
.SUBCKT MBR4045CT ANO CAT
D1 ANO 1 DMOD (0.07089)
*Define diode model
.MODEL DMOD D(IS=1.41031849705903E-04A,N=1.12223892649545,BV=49V,
+ IBV=0.267178064395486A,RS= 0.000581298,CJO=2.94926944579954E-08,
+ VJ=0.779269989906853,XTI=2, EG=0.730300626417364)
*****
*Implementation of VCG2T
VX 1 2 DC 0V
R1 2 CAT TRES 1E-6
.MODEL TRES RES(R=1,TC1=19.7716341798827)
GP1 ANO CAT VALUE={-ABS(I(VX))*(EXP((( -2.531689E-03/19.77164)*(V(2,CAT)*1E6)/
(I(VX)+1E-6)-1))+1)*6.454822E-02*ABS(V(ANO,CAT)))-1}
*****
.ENDS MBR4045CT

Thermal Model Subcircuit
.SUBCKT MBR4045CT 5 1

CTHERM1      5   4   1.84E+00
CTHERM2      4   3   1.74E+01
CTHERM3      3   2   9.36E+01
CTHERM4      2   1   1.30E+03

RTHERM1      5   4   4.55E-01
RTHERM2      4   3   5.76E-01
RTHERM1      3   2   3.12E-01
RTHERM1      2   1   1.49E-01

.ENDS MBR4045CT

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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.

International  
**IR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
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Visit us at [www.irf.com](http://www.irf.com) for sales contact information. 07/06