Bulletin PD-21019 rev. A 07/06

International
IOR Rectifier

# MBRB20...CTPbF
# MBR20...CT-1PbF

## SCHOTTKY RECTIFIER

## 20 Amp

$I_{F(AV)}$ = 20Amp
$V_R$ = 80/ 100V

### Major Ratings and Characteristics

| Characteristics | | Values | Units |
|---|---|---|---|
| $I_{F(AV)}$ | Rectangular waveform (Per Device) | 20 | A |
| $I_{FRM}$ | @$T_C$ = 133°C (PerLeg) | 20 | A |
| $V_{RRM}$ | | 80/90/100 | V |
| $I_{FSM}$ | @ tp = 5 µs sine | 850 | A |
| $V_F$ | @ 10 Apk, $T_J$ = 125°C | 0.70 | V |
| $T_J$ | range | - 65 to 150 | °C |

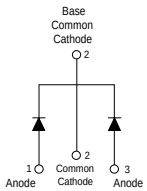
### Description/ Features

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° C junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 150° C $T_J$ operation
- Center tap TO-220, $D^2$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

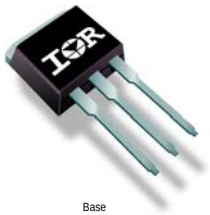
## Case Styles

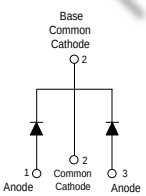
MBRB20...CTPbF




**$D^2$PAK**

MBR20...CT-1PbF






**TO-262**

## Voltage Ratings

| | Parameters | MBRB2080CT MBR2080CT-1 | MBRB2090CT MBR2090CT-1 | MBRB20100CT MBR20100CT-1 |
|---|---|---|---|---|
| $V_R$ | Max. DC Reverse Voltage (V) | 80 | 90 | 100 |
| $V_{RWM}$ | Max. Working Peak Reverse Voltage (V) | | | |

## Absolute Maximum Ratings

| | Parameters | Values | Units | Conditions |
|---|---|---|---|---|
| $I_{F(AV)}$ | Max. Average Forward (Per Leg) | 10 | A | @ $T_C$ = 133° C, (Rated $V_R$) |
| | Current (Per Device) | 20 | | |
| $I_{FRM}$ | Peak Repetitive Forward Current (Per Leg) | 20 | A | Rated $V_R$, square wave, 20kHz $T_C$ = 133° C |
| $I_{FSM}$ | Non Repetitive Peak Surge Current | 850 | A | 5µs Sine or 3µs Rect. pulse — Following any rated load condition and with rated $V_{RRM}$ applied |
| | | 150 | | Surge applied at rated load conditions halfwave, single phase, 60Hz |
| $I_{RRM}$ | Peak Repetitive Reverse Surge Current | 0.5 | A | 2.0 µsec 1.0 KHz |
| $E_{AS}$ | Non-Repetitive Avalanche Energy | 24 (Per Leg) | mJ | $T_J$ = 25 °C, $I_{AS}$ = 2 Amps, L = 12 mH |

## Electrical Specifications

| | Parameters | Values | Units | Conditions | |
|---|---|---|---|---|---|
| $V_{FM}$ | Max. Forward Voltage Drop (1) | 0.80 | V | @ 10A | $T_J$ = 25 °C |
| | | 0.95 | V | @ 20A | |
| | | 0.70 | V | @ 10A | $T_J$ = 125 °C |
| | | 0.85 | V | @ 20A | |
| $I_{RM}$ | Max. Instantaneus Reverse Current (1) | 0.10 | mA | $T_J$ = 25 °C | Rated DC voltage |
| | | 6 | mA | $T_J$ = 125 °C | |
| $V_{F(TO)}$ | Threshold Voltage | 0.433 | V | $T_J$ = $T_J$ max. | |
| $r_t$ | Forward Slope Resistance | 15.8 | mΩ | | |
| $C_T$ | Max. Junction Capacitance | 400 | 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 | 10000 | V/ µs | (Rated $V_R$) | |

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

## Thermal-Mechanical Specifications

| | Parameters | | Values | 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 (Per Leg) | | 2.0 | °C/W | DC operation |
| $R_{thCS}$ | Typical Thermal Resistance Case to Heatsink | | 0.50 | °C/W | Mounting surface, smooth and greased Only for TO-220 |
| $R_{thJA}$ | Max. Thermal Resistance Junction to Ambient | | 50 | °C/W | DC operation For $D^2$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) | | |
| | Marking Device | | MBRB20...CT | | Case style $D^2$Pak |
| | | | MBR20...CT-1 | | Case style TO-262 |

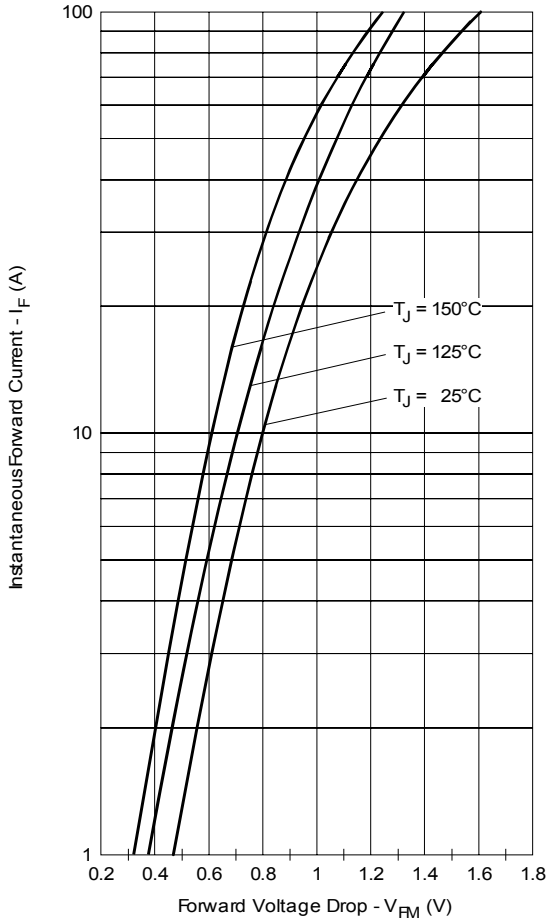



Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

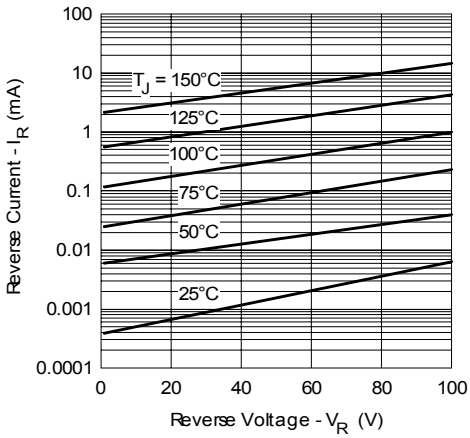



Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

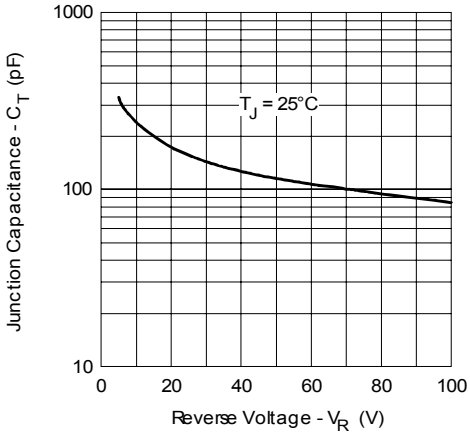



Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

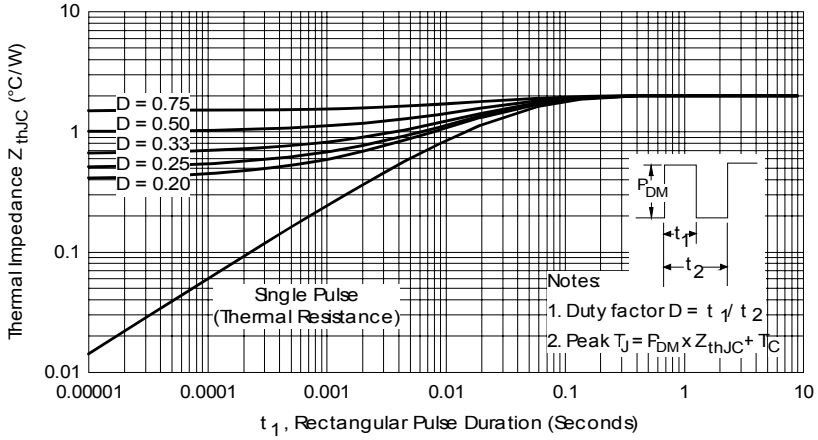



Fig. 4 - Max. Thermal Impedance $Z_{thJC}$ Characteristics (Per Leg)

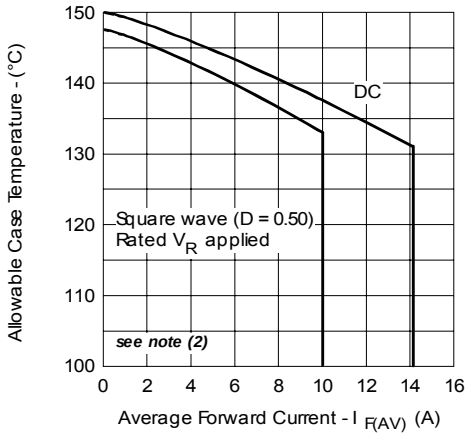



Fig. 5 - Max. Allowable Case Temperature
Vs. Average Forward Current (Per Leg)

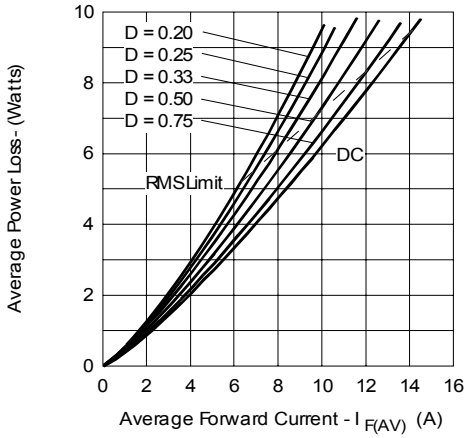



Fig. 6 - Forward Power Loss Characteristics
(Per Leg)

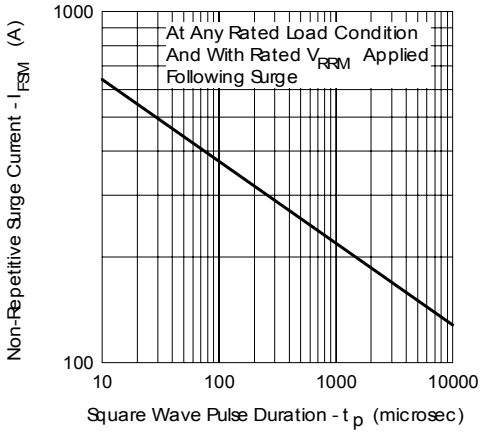
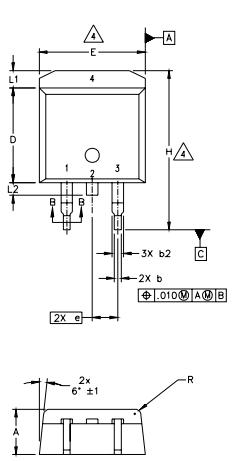



Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

**(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 $V_R$

## 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 [.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 DIMENSION: 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 | |
| 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 | .028 | |
| θ | 90° | 93° | 90° | 93° | |

LEAD ASSIGNMENTS

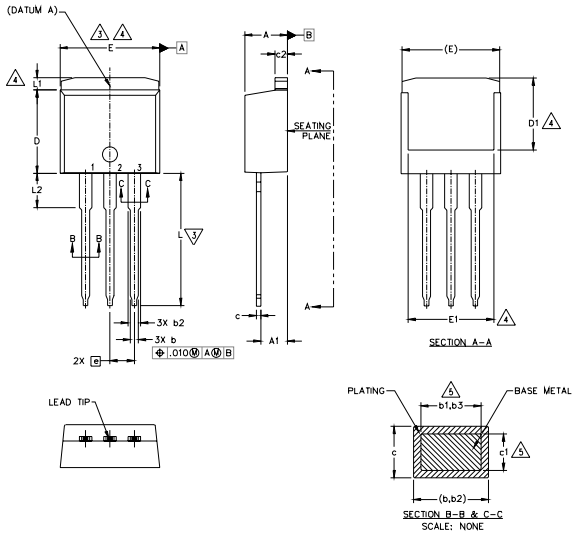
HEXFET
1.– GATE
2, 4.– DRAIN
3.– SOURCE

IGBTs, CoPACK
1.– GATE
2, 4.– COLLECTOR
3.– EMITTER

DIODES
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* PART DEPENDENT.

**Conform to JEDEC outline $D^2Pak$ (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 [.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 DIMENSION: INCH.
7.– OUTLINE CONFORM TO JEDEC TO–262 EXCEPT A1(max.), b(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 | |
| b1 | 0.51 | 0.89 | .020 | .035 | 5 |
| b2 | 1.14 | 1.78 | .045 | .070 | |
| b3 | 1.14 | 1.73 | .045 | .068 | 5 |
| 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 | 4 |
| 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

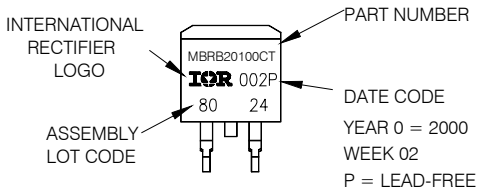
**Modified JEDEC outline TO-262**
Dimensions in millimeters and (inches)

## Part Marking Information

### D²PAK

EXAMPLE: THIS IS A MBRB20100CT
LOT CODE 8024
ASSEMBLED ON WW 02, 2000

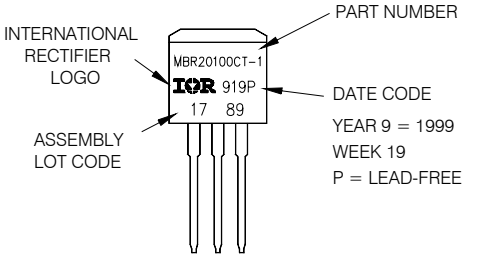
Note: "P" in assembly line position indicates "Lead-Free"



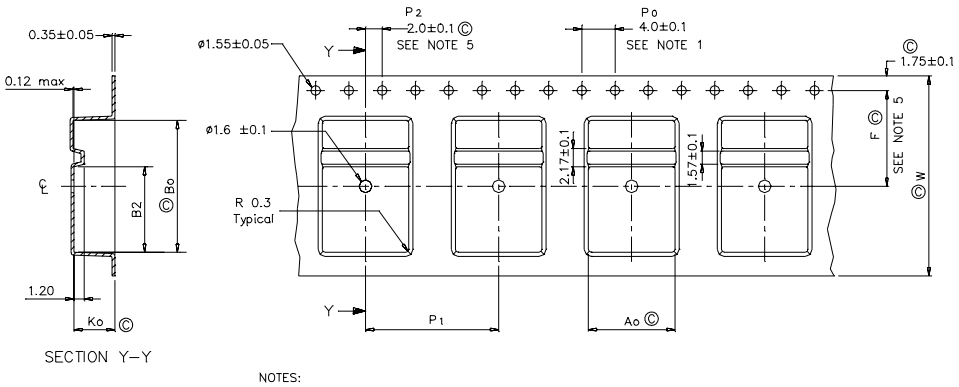

### TO-262

EXAMPLE: THIS IS A MBR20100CT-1
LOT CODE 1789
ASSEMBLED ON WW 19, 1999

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




## Tape & Reel Information



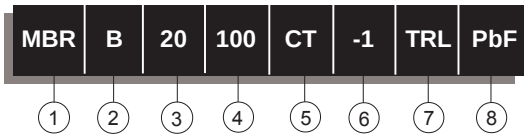

| | |
|---|---|
| Ao | 10.50 +/- 0.1 |
| Bo | 15.80 +/- 0.1 |
| B2 | 10.25 +/- 0.1 |
| Ko | 4.90 +/- 0.1 |
| F | 11.50 +/- 0.1 |
| P1 | 16.00 +/- 0.1 |
| W | 24.00 +/- 0.3 |

NOTES:
1.0 10 SPROCKET HOLE PITH CUMULATIVE TOLERANCE ±.02
2.0 CAMBER NOT TO EXCEED 1mm in 100mm
3.0 MATERIAL: CONDUCTIVE BLACK STYRENIC ALLOY
4.0 Ko 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 $10^6$ 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

Dimensions in millimeters and (inches)

## Ordering Information Table

**Device Code**




| | | |
|---|---|---|
| 1 | - | Essential Part Number |
| 2 | - | B = Surface Mount<br>None = TO-220 |
| 3 | - | Current Rating (20 = 20A) |
| 4 | - | Voltage code: Code = $V_{RRM}$ (080 = 80V, 090 = 90V, 100 = 100V) |
| 5 | - | CT = Essential Part Number |
| 6 | - | "-1" = TO-262 |
| 7 | - | • none = Tube (50 pieces)<br>• TRL = Tape & Reel (Left Oriented - for $D^2$Pak only)<br>• TRR = Tape & Reel (Right Oriented - for $D^2$Pak only) |
| 8 | - | • none = Standard Production<br>• 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.

International
IOR Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
Visit us at www.irf.com for sales contact information. 07/06