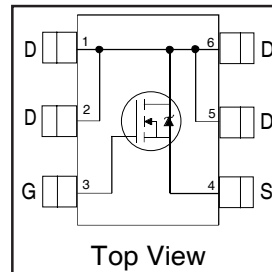


# IRLMS2002PbF

HEXFET® Power MOSFET

- Ultra Low On-Resistance
- N-Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- 2.5V Rated
- Lead-Free

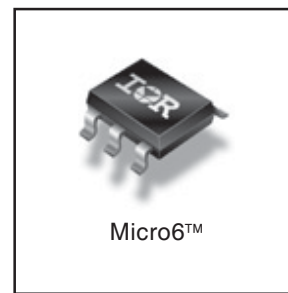


$V_{DSS} = 20V$
$R_{DS(on)} = 0.030\Omega$

## Description

These N-Channel MOSFETs from International Rectifier utilize advanced processing techniques to achieve the extremely low on-resistance per silicon area. This benefit provides the designer with an extremely efficient device for use in battery and load management applications.

The Micro6™ package with its customized leadframe produces a HEXFET® power MOSFET with  $R_{DS(on)}$  60% less than a similar size SOT-23. This package is ideal for applications where printed circuit board space is at a premium. Its unique thermal design and  $R_{DS(on)}$  reduction enables a current-handling increase of nearly 300% compared to the SOT-23.



## Absolute Maximum Ratings

	Parameter	Max.	Units
$V_{DS}$	Drain- Source Voltage	20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	6.5	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	5.2	
$I_{DM}$	Pulsed Drain Current ①	20	
$P_D @ T_A = 25^\circ C$	Power Dissipation	2.0	W
$P_D @ T_A = 70^\circ C$	Power Dissipation	1.3	
	Linear Derating Factor	0.016	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 12$	V
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150	°C

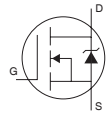
## Thermal Resistance

	Parameter	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient③	62.5	°C/W

## Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.016	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.030	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6.5A ②
		—	—	0.045		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 5.2A ②
V <sub>GS(th)</sub>	Gate Threshold Voltage	0.60	—	1.2	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	13	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 6.5A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	1.0	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
		—	—	25		V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 70°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	-100	nA	V <sub>GS</sub> = -12V
	Gate-to-Source Reverse Leakage	—	—	100		V <sub>GS</sub> = 12V
Q <sub>g</sub>	Total Gate Charge	—	15	22	nC	I <sub>D</sub> = 6.5A
Q <sub>gs</sub>	Gate-to-Source Charge	—	2.2	3.3		V <sub>DS</sub> = 10V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	3.5	5.3		V <sub>GS</sub> = 5.0V ②
t <sub>d(on)</sub>	Turn-On Delay Time	—	8.5	—	ns	V <sub>DD</sub> = 10V
t <sub>r</sub>	Rise Time	—	11	—		I <sub>D</sub> = 1.0A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	36	—		R <sub>G</sub> = 6.0Ω
t <sub>f</sub>	Fall Time	—	16	—		R <sub>D</sub> = 10Ω ②
C <sub>iss</sub>	Input Capacitance	—	1310	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	150	—		V <sub>DS</sub> = 15V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	36	—		f = 1.0MHz

## Source-Drain Ratings and Characteristics

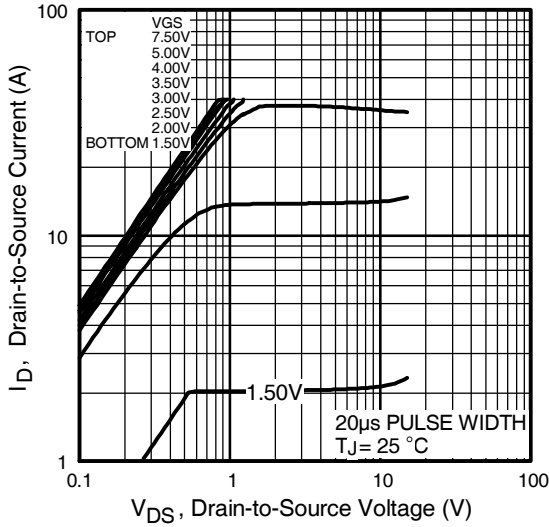
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	2.0	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	20		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.2	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 1.7A, V <sub>GS</sub> = 0V ②
t <sub>rr</sub>	Reverse Recovery Time	—	19	29	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 1.7A
Q <sub>rr</sub>	Reverse Recovery Charge	—	13	20	nC	di/dt = 100A/μs ②

### Notes:

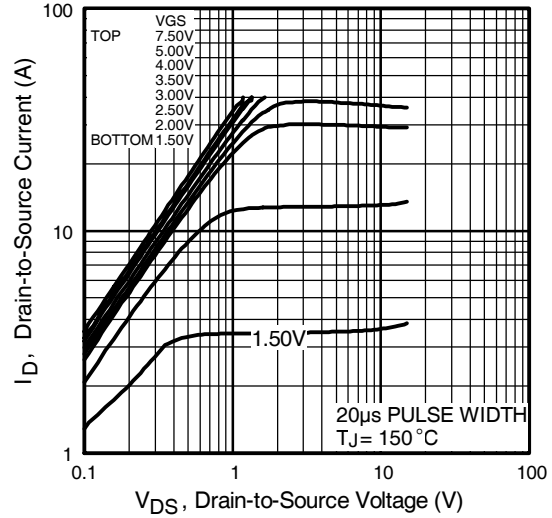
① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )

② Pulse width ≤ 400μs; duty cycle ≤ 2%.

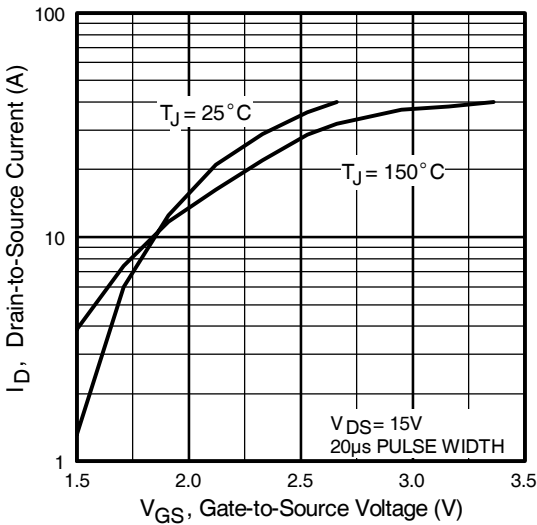
③ Surface mounted on FR-4 board, t ≤ 5sec.



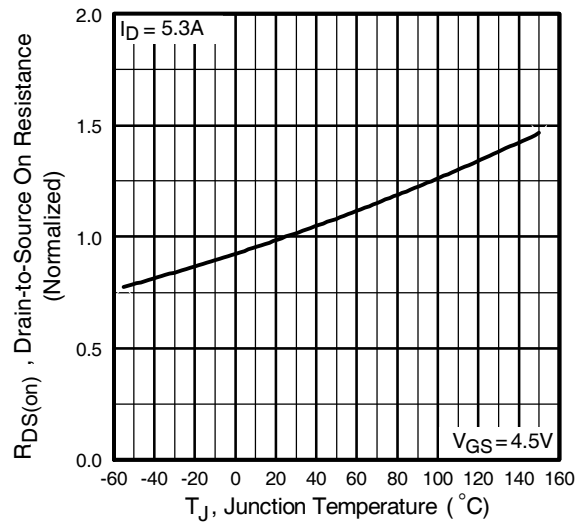
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



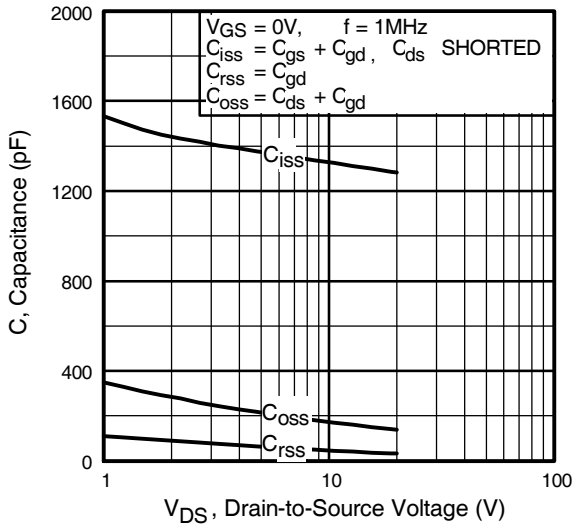
**Fig 3.** Typical Transfer Characteristics



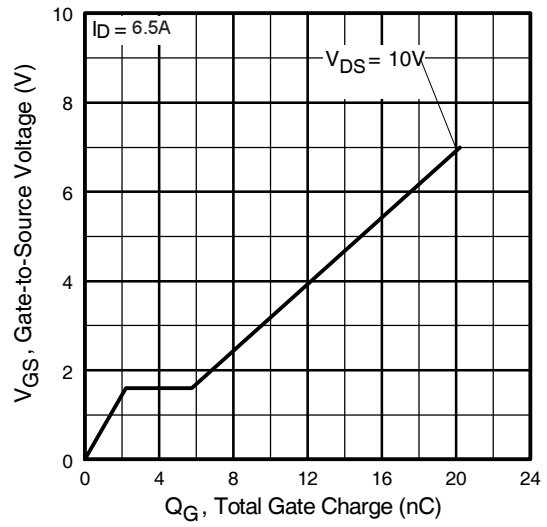
**Fig 4.** Normalized On-Resistance Vs. Temperature

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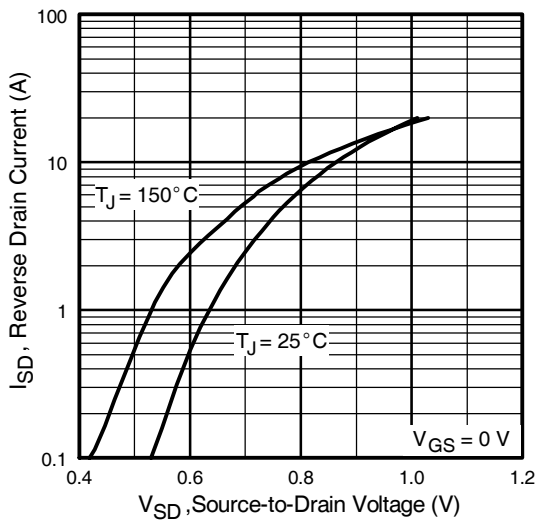
International  
**IR** Rectifier



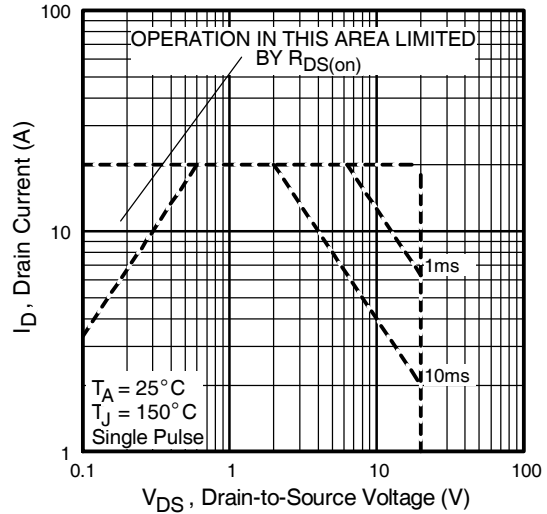
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



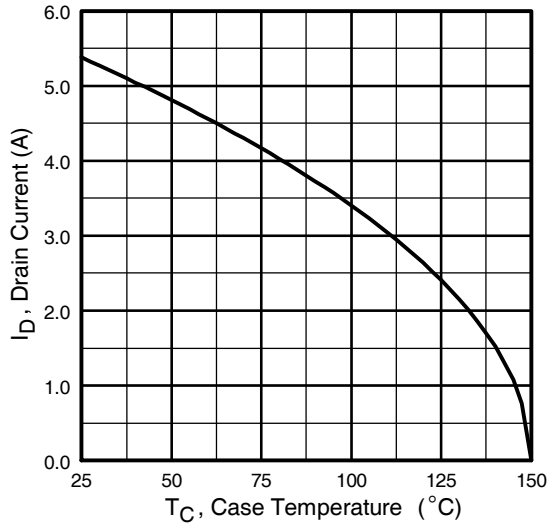
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



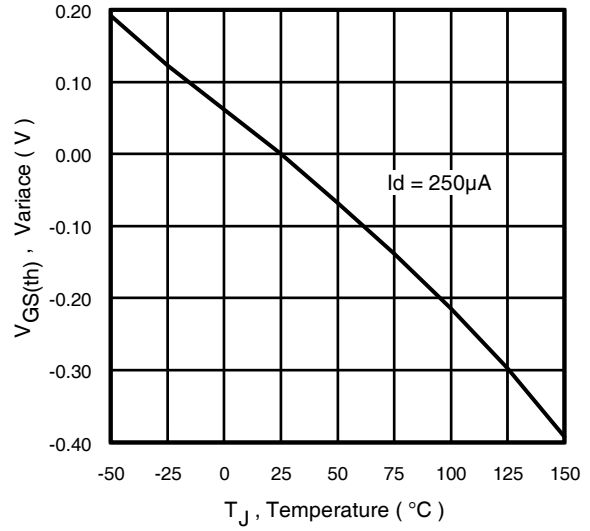
**Fig 7.** Typical Source-Drain Diode Forward Voltage



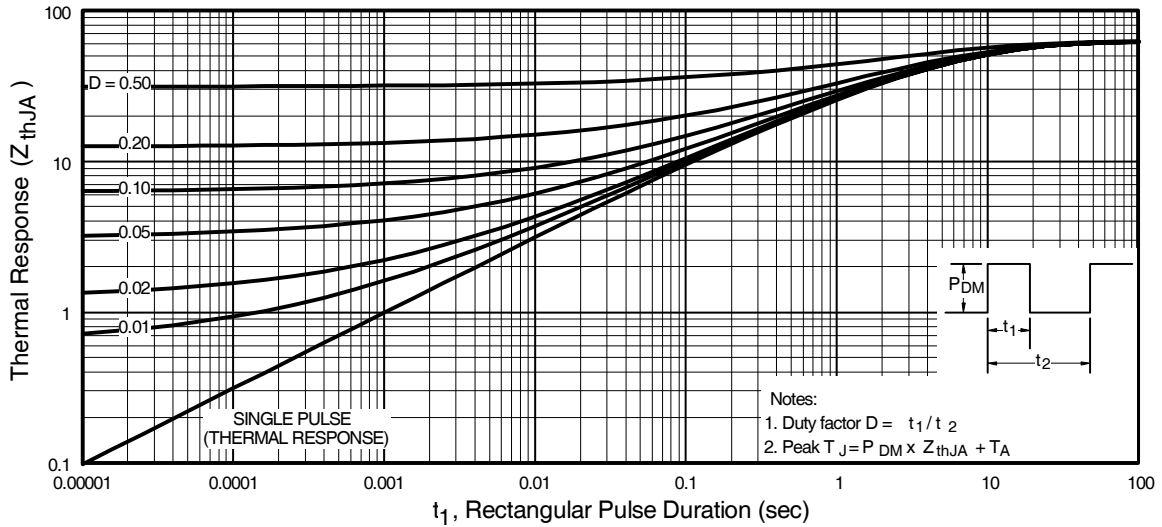
**Fig 8.** Maximum Safe Operating Area



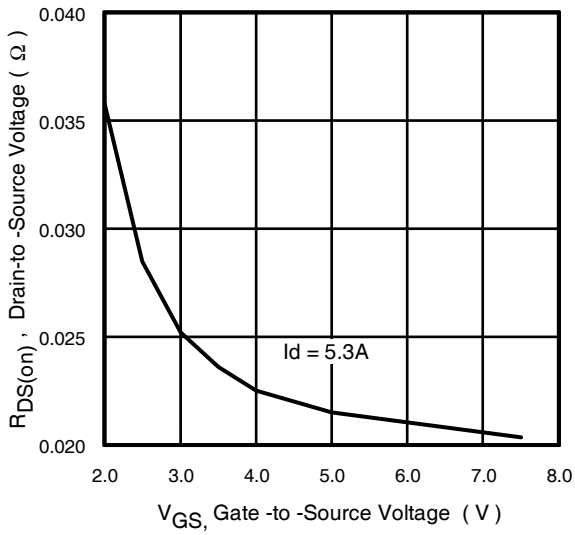
**Fig 9.** Maximum Drain Current Vs. Case Temperature



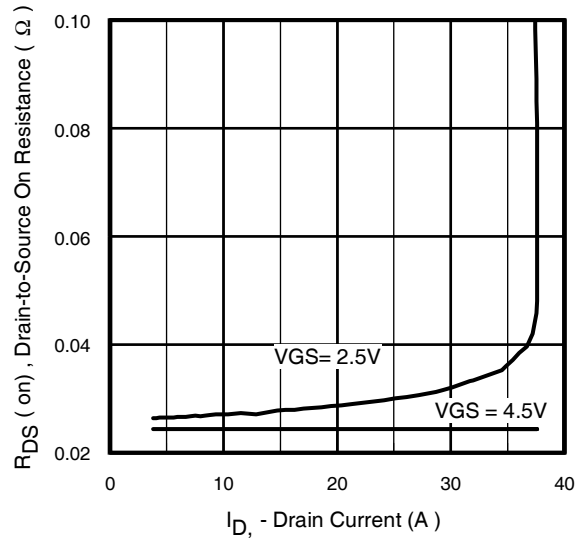
**Fig 10.** Typical  $V_{GS(th)}$  Variance Vs. Junction Temperature



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



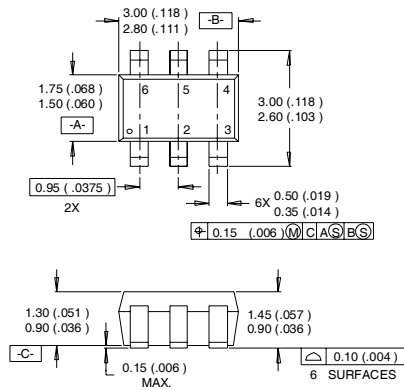
**Fig 12.** Typical On-Resistance Vs. Gate Voltage



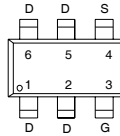
**Fig 13.** Typical On-Resistance Vs. Drain Current

## Micro6 (SOT23 6L) Package Outline

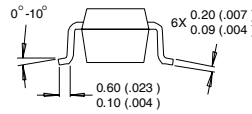
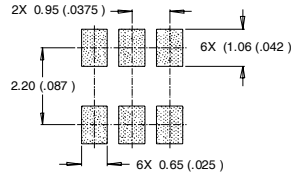
Dimensions are shown in millimeters (inches)



### LEAD ASSIGNMENTS



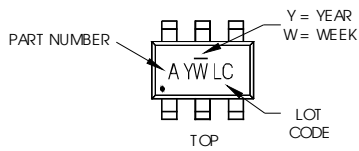
### RECOMMENDED FOOTPRINT



- NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).

## Micro6 (SOT23 6L) Part Marking Information

Micro6™



### PART NUMBER CODE REFERENCE:

- A = IRLMS1902
- B = IRLMS1503
- C = IRLMS6702
- D = IRLMS5703
- E = IRLMS6802
- F = IRLMS4502
- G = IRLMS2002
- H = IRLMS6803

Note: A line above the work week (as shown here) indicates Lead-Free.

W = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR

YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
2004	4	04	D
2005	5		
2006	6		
2007	7		
2008	8		
2009	9		
2010	0	24	X
		25	Y
		26	Z

W = (27-52) IF PRECEDED BY A LETTER

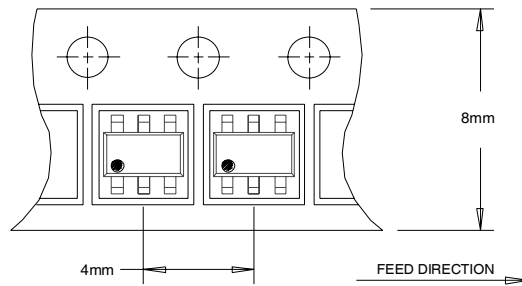
YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
2004	D	30	D
2005	E		
2006	F		
2007	G		
2008	H		
2009	J		
2010	K	50	X
		51	Y
		52	Z

# IRLMS2002PbF

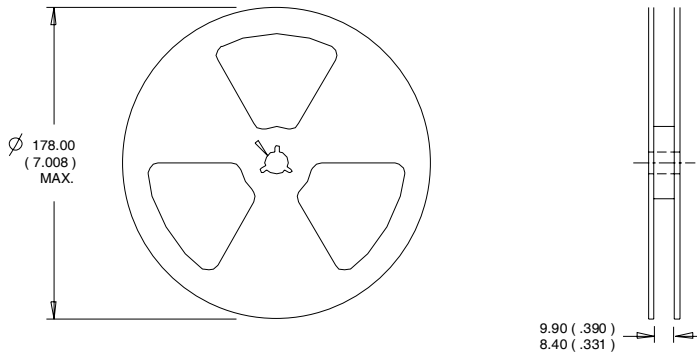
International  
**IOR** Rectifier

## Micro6 Tape & Reel Information

Dimensions are shown in millimeters (inches)



- NOTES:  
1. OUTLINE CONFORMS TO EIA-481 & EIA-541.



- NOTES:  
1. CONTROLLING DIMENSION : MILLIMETER.  
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

This product has been designed and qualified for the consumer market.  
Qualification Standards can be found on IR's Web site.  
Data and specifications subject to change without notice.

International  
**IOR** Rectifier

**IR WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105  
TAC Fax: (310) 252-7903

Visit us at [www.irf.com](http://www.irf.com) for sales contact information.  
Data and specifications subject to change without notice. 01/05

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