

# IRLMS1503PbF

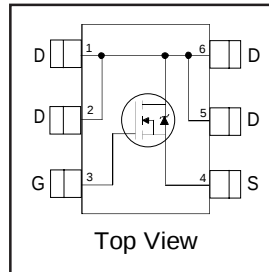
HEXFET® Power MOSFET

- Generation V Technology
- Micro6 Package Style
- Ultra Low  $R_{DS(on)}$
- N-Channel MOSFET
- Lead-Free

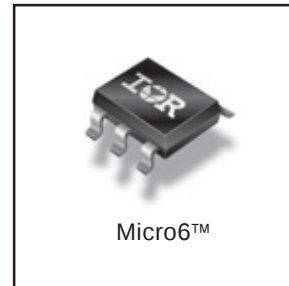
## Description

Fifth Generation HEXFET® power MOSFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET® power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of 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. It's unique thermal design and  $R_{DS(on)}$  reduction enables a current-handling increase of nearly 300% compared to the SOT-23.



|                           |
|---------------------------|
| $V_{DSS} = 30V$           |
| $R_{DS(on)} = 0.10\Omega$ |



## Absolute Maximum Ratings

|                          | Parameter                                | Max.         | Units |
|--------------------------|------------------------------------------|--------------|-------|
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 3.2          | A     |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 2.6          |       |
| $I_{DM}$                 | Pulsed Drain Current ①                   | 18           |       |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation                        | 1.7          | W     |
|                          | Linear Derating Factor                   | 13           | mW/°C |
| $V_{GS}$                 | Gate-to-Source Voltage                   | $\pm 20$     | V     |
| $dv/dt$                  | Peak Diode Recovery $dv/dt$ ②            | 5.0          | V/ns  |
| $T_J, T_{STG}$           | Junction and Storage Temperature Range   | -55 to + 150 | °C    |

## Thermal Resistance Ratings

|                 | Parameter                     | Min. | Typ. | Max | Units |
|-----------------|-------------------------------|------|------|-----|-------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient ④ | —    | —    | 75  | °C/W  |

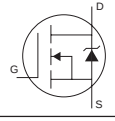
# IRLMS1503PbF

International  
**IR** Rectifier

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

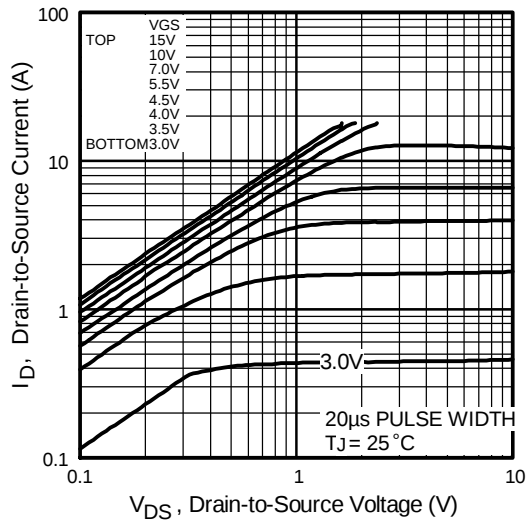
|                                 | Parameter                            | Min. | Typ.  | Max.  | Units               | Conditions                                           |
|---------------------------------|--------------------------------------|------|-------|-------|---------------------|------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 30   | —     | —     | V                   | $V_{GS} = 0V, I_D = 250\mu A$                        |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.037 | —     | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1mA$        |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —     | 0.100 | $\Omega$            | $V_{GS} = 10V, I_D = 2.2A$ ③                         |
|                                 |                                      | —    | —     | 0.20  |                     | $V_{GS} = 4.5V, I_D = 1.1A$ ③                        |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 1.0  | —     | —     | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                    |
| $g_{fs}$                        | Forward Transconductance             | 1.1  | —     | —     | S                   | $V_{DS} = 10V, I_D = 1.1A$                           |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —     | 1.0   | $\mu A$             | $V_{DS} = 24V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —     | 25    |                     | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —     | -100  | nA                  | $V_{GS} = -20V$                                      |
|                                 | Gate-to-Source Reverse Leakage       | —    | —     | 100   |                     | $V_{GS} = 20V$                                       |
| $Q_g$                           | Total Gate Charge                    | —    | 6.4   | 9.6   | nC                  | $I_D = 2.2A$                                         |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | 1.1   | 1.7   |                     | $V_{DS} = 24V$                                       |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | 1.9   | 2.8   |                     | $V_{GS} = 10V$ , See Fig. 6 and 9 ③                  |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 4.6   | —     | ns                  | $V_{DD} = 15V$                                       |
| $t_r$                           | Rise Time                            | —    | 4.4   | —     |                     | $I_D = 2.2A$                                         |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 10    | —     |                     | $R_G = 6.0\Omega$                                    |
| $t_f$                           | Fall Time                            | —    | 2.0   | —     |                     | $R_D = 6.7\Omega$ , See Fig. 10 ③                    |
| $C_{iss}$                       | Input Capacitance                    | —    | 210   | —     | pF                  | $V_{GS} = 0V$                                        |
| $C_{oss}$                       | Output Capacitance                   | —    | 90    | —     |                     | $V_{DS} = 25V$                                       |
| $C_{rss}$                       | Reverse Transfer Capacitance         | —    | 32    | —     |                     | $f = 1.0MHz$ , See Fig. 5                            |

## Source-Drain Ratings and Characteristics

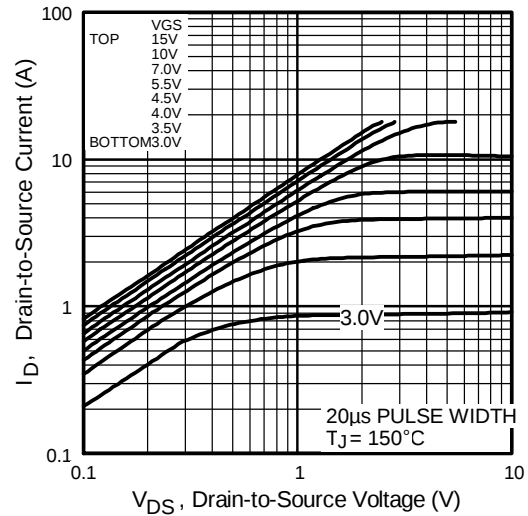
|          | Parameter                              | Min. | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|----------------------------------------|------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —    | —    | 1.7  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —    | —    | 18   |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —    | —    | 1.2  | V     | $T_J = 25^\circ\text{C}, I_S = 2.2A, V_{GS} = 0V$ ③                                                                                                  |
| $t_{rr}$ | Reverse Recovery Time                  | —    | 36   | 54   | ns    | $T_J = 25^\circ\text{C}, I_F = 2.2A$                                                                                                                 |
| $Q_{rr}$ | Reverse Recovery Charge                | —    | 39   | 58   | nC    | $di/dt = 100A/\mu s$ ③                                                                                                                               |

### Notes:

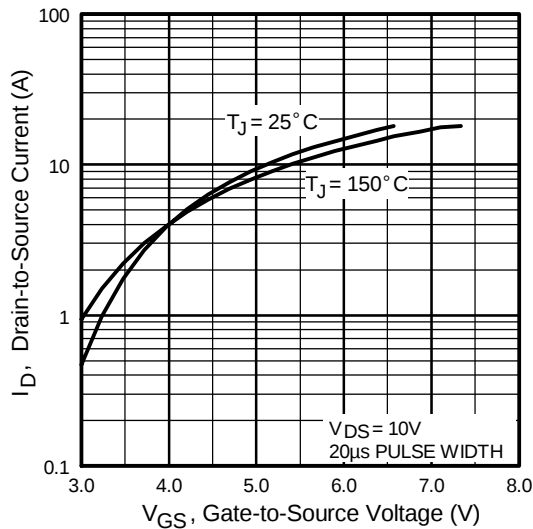
- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ②  $I_{SD} \leq 2.2A$ ,  $di/dt \leq 150A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$
- ③ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ④ Surface mounted on FR-4 board,  $t \leq 5sec$ .



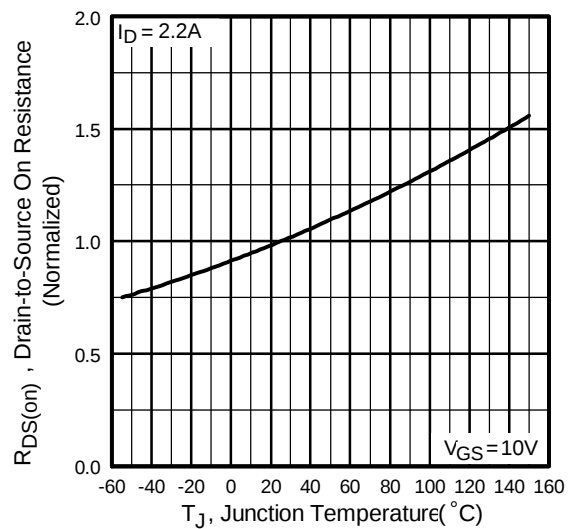
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



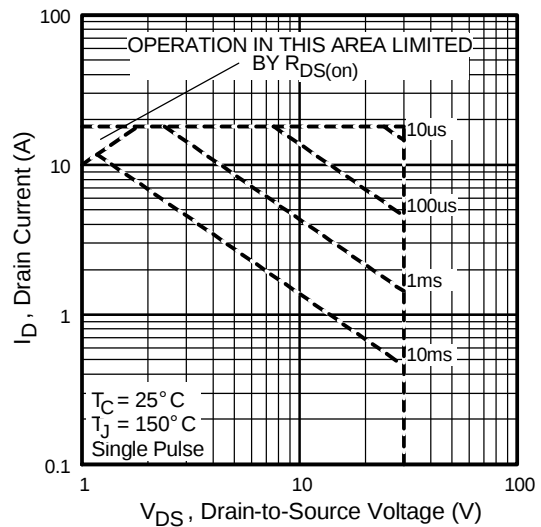
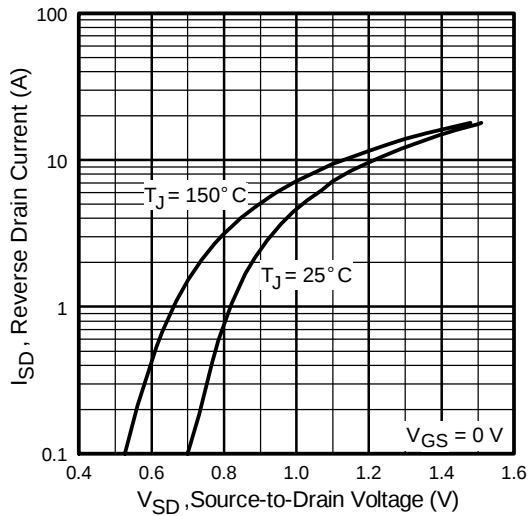
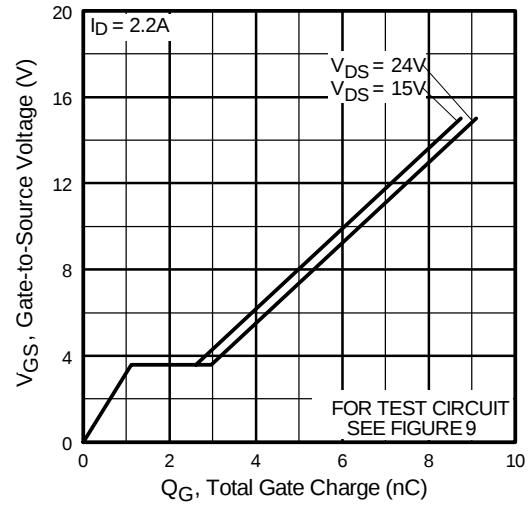
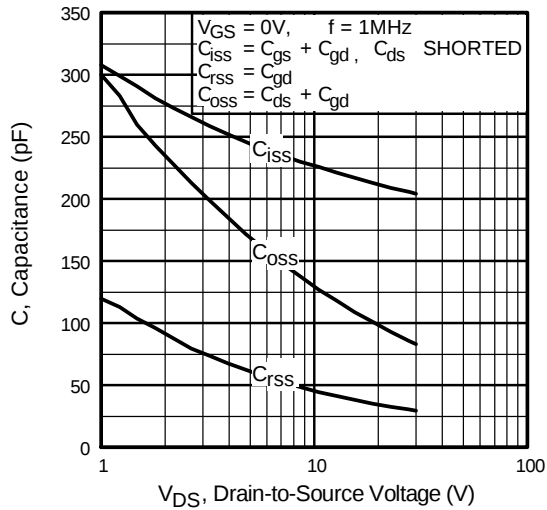
**Fig 3.** Typical Transfer Characteristics

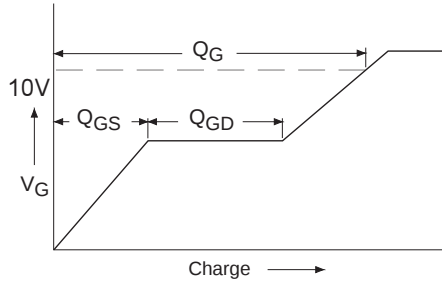


**Fig 4.** Normalized On-Resistance Vs. Temperature

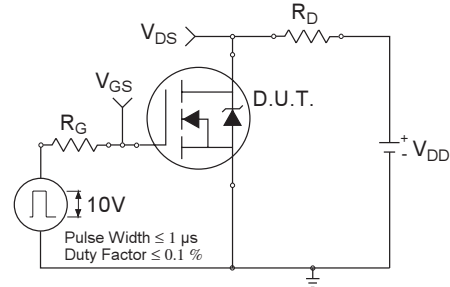
# IRLMS1503PbF

International  
**IR** Rectifier

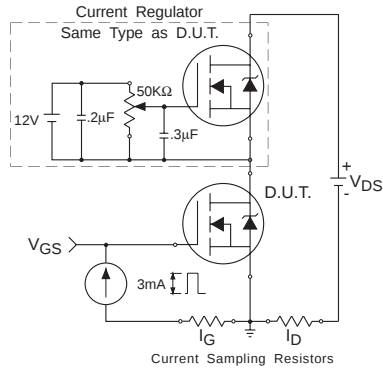




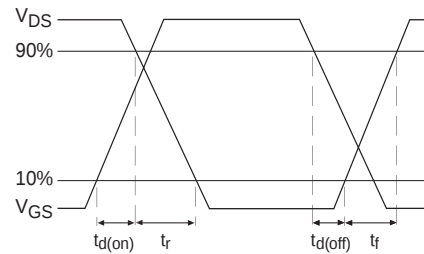
**Fig 9a. Basic Gate Charge Waveform**



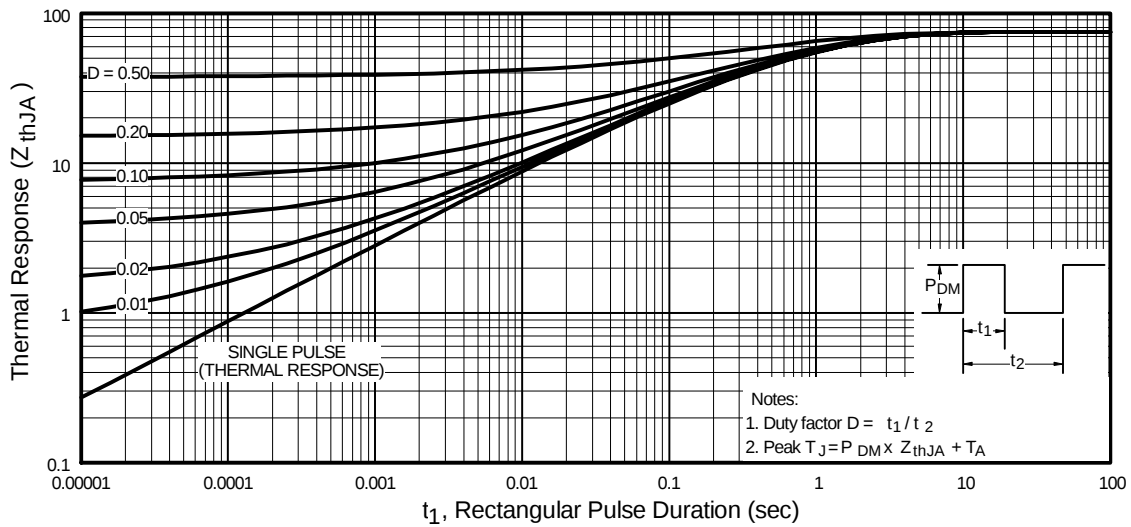
**Fig 10a. Switching Time Test Circuit**



**Fig 9b. Gate Charge Test Circuit**

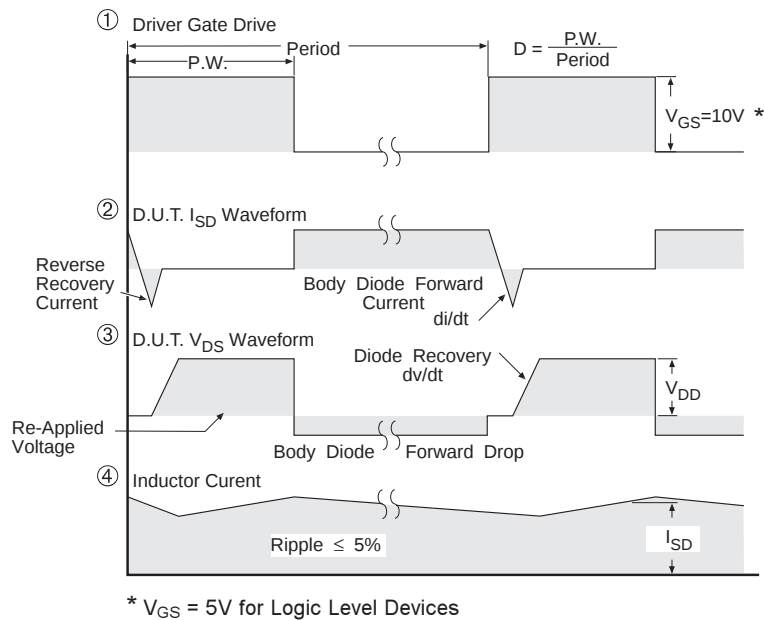
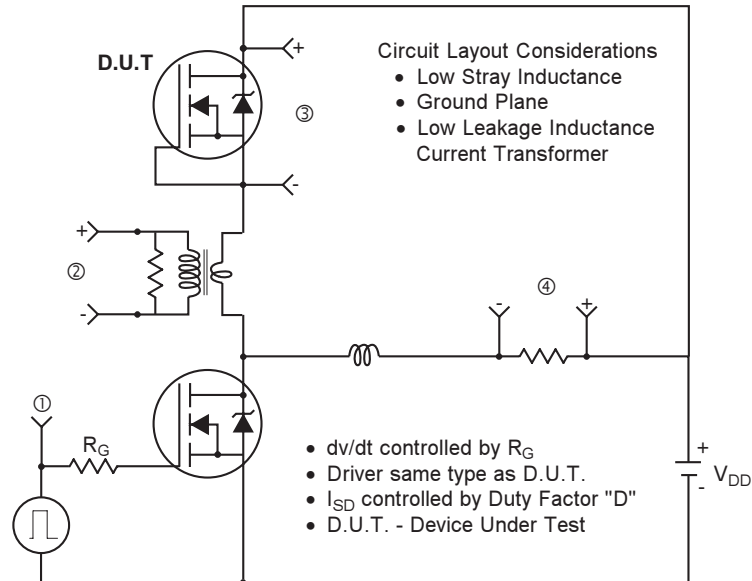


**Fig 10b. Switching Time Waveforms**



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

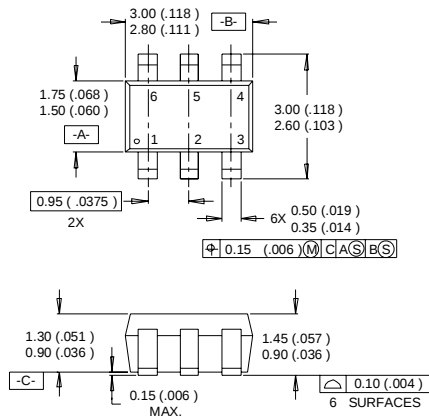
## Peak Diode Recovery dv/dt Test Circuit



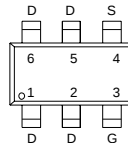
**Fig 13.** For N-channel HEXFET® power MOSFET s

## Micro6 (SOT23 6L) Package Outline

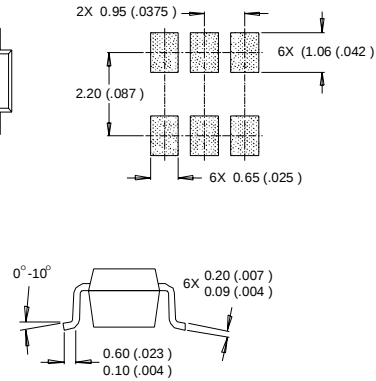
Dimensions are shown in millimeters (inches)



### LEAD ASSIGNMENTS



### RECOMMENDED FOOTPRINT

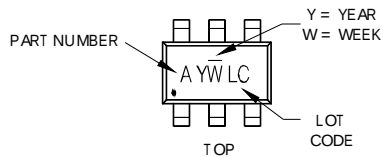


### NOTES :

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

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



### 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.

| 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

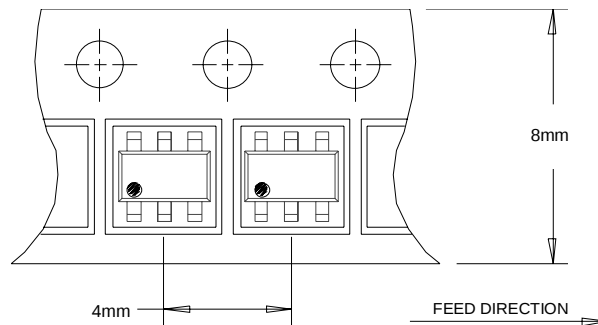
| YEAR | Y | WORK WEEK | W |
|------|---|-----------|---|
| 2001 | A | 27        | A |
| 2002 | B | 28        | B |
| 2003 | C | 29        | C |
| 2004 | D | 30        | D |
| 2005 | E |           |   |
| 2006 | F |           |   |
| 2007 | G |           |   |
| 2008 | H |           |   |
| 2009 | J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

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International  
**IR** Rectifier

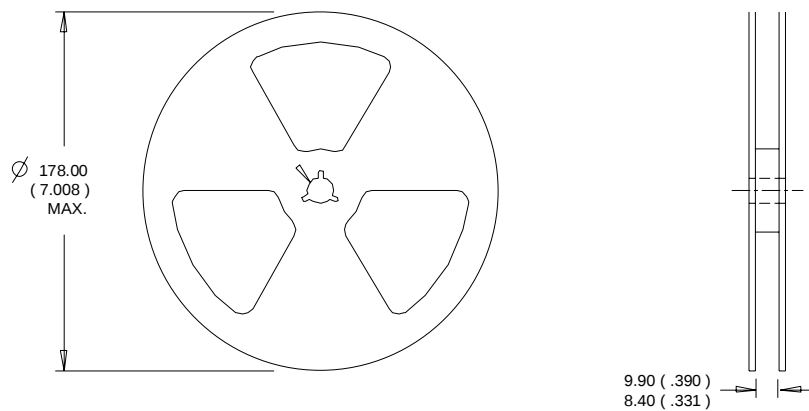
## Micro6 Tape & Reel Information

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  
**IR** Rectifier

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

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