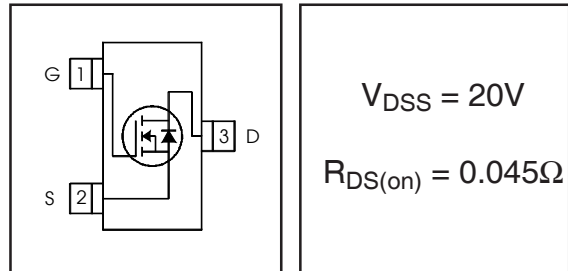


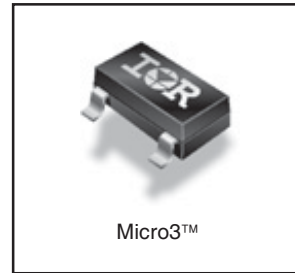
- Ultra Low On-Resistance
- N-Channel MOSFET
- SOT-23 Footprint
- Low Profile (<1.1mm)
- Available in Tape and Reel
- Fast Switching
- Lead-Free
- RoHS Compliant, Halogen-Free

HEXFET® Power MOSFET



**Description**

These N-Channel 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 battery and load management.



A thermally enhanced large pad leadframe has been incorporated into the standard SOT-23 package to produce a HEXFET Power MOSFET with the industry's smallest footprint. This package, dubbed the Micro3™, is ideal for applications where printed circuit board space is at a premium. The low profile (<1.1mm) of the Micro3 allows it to fit easily into extremely thin application environments such as portable electronics and PCMCIA cards. The thermal resistance and power dissipation are the best available.

| Base Part Number | Package Type     | Standard Pack |          | Orderable Part Number |
|------------------|------------------|---------------|----------|-----------------------|
|                  |                  | Form          | Quantity |                       |
| IRLML2502TRPbF   | Micro3™ (SOT-23) | Tape and Reel | 3000     | IRLML2502TRPbF        |

**Absolute Maximum Ratings**

|                          | Parameter                                 | Max.         | Units |
|--------------------------|---|--------------|-------|
| $V_{DS}$                 | Drain- Source Voltage                     | 20           | V     |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 4.2          | A     |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 3.4          |       |
| $I_{DM}$                 | Pulsed Drain Current ①                    | 33           |       |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation                         | 1.25         | W     |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation                         | 0.8          |       |
|                          | Linear Derating Factor                    | 0.01         | W/°C  |
| $V_{GS}$                 | Gate-to-Source Voltage                    | $\pm 12$     | V     |
| $T_J, T_{STG}$           | Junction and Storage Temperature Range    | -55 to + 150 | °C    |

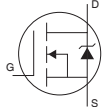
**Thermal Resistance**

|                 | Parameter                    | Typ. | Max. | Units |
|-----------------|------------------------------|------|------|-------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient③ | 75   | 100  | °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  | —    | 0.01  | —     | V/°C  | Reference to 25°C, I <sub>D</sub> = 1.0mA                          |
| R <sub>DS(on)</sub>                    | Static Drain-to-Source On-Resistance | —    | 0.035 | 0.045 | Ω     | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.2A ②                    |
|  |                                      | —    | 0.050 | 0.080 |       | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 3.6A 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         |
| ΔV <sub>GS(th)</sub>                   | Gate Threshold Voltage Coefficient   | —    | -3.2  | —     | mV/°C |  |
| g <sub>fs</sub>                        | Forward Transconductance             | 5.8  | —     | —     | S     | V <sub>DS</sub> = 10V, I <sub>D</sub> = 4.0A                       |
| 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                    | —    | 8.0   | 12    | nC    | I <sub>D</sub> = 4.0A  |
| Q <sub>gs</sub>                        | Gate-to-Source Charge                | —    | 1.8   | 2.7   |       | V <sub>DS</sub> = 10V  |
| Q <sub>gd</sub>                        | Gate-to-Drain ("Miller") Charge      | —    | 1.7   | 2.6   |       | V <sub>GS</sub> = 5.0V ②   |
| t <sub>d(on)</sub>                     | Turn-On Delay Time                   | —    | 7.5   | —     | ns    | V <sub>DD</sub> = 10V  |
| t <sub>r</sub>                         | Rise Time                            | —    | 10    | —     |       | I <sub>D</sub> = 1.0A  |
| t <sub>d(off)</sub>                    | Turn-Off Delay Time                  | —    | 54    | —     |       | R <sub>G</sub> = 6Ω  |
| t <sub>f</sub>                         | Fall Time                            | —    | 26    | —     |       | R <sub>D</sub> = 10Ω ②   |
| C <sub>iss</sub>                       | Input Capacitance                    | —    | 740   | —     | pF    | V <sub>GS</sub> = 0V   |
| C <sub>oss</sub>                       | Output Capacitance                   | —    | 90    | —     |       | V <sub>DS</sub> = 15V  |
| C <sub>rss</sub>                       | Reverse Transfer Capacitance         | —    | 66    | —     |       | f = 1.0MHz   |

**Source-Drain Rating and Characteristics**

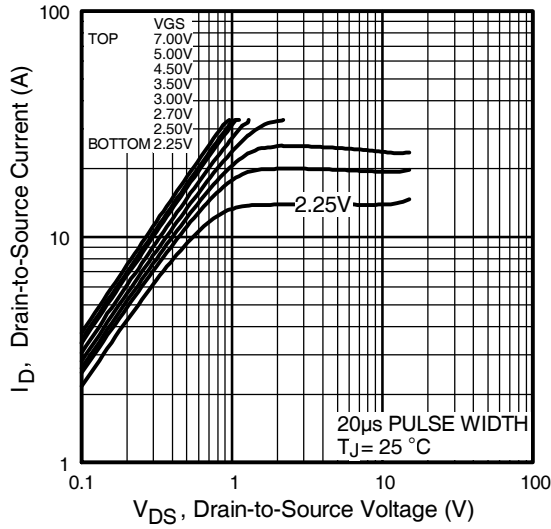
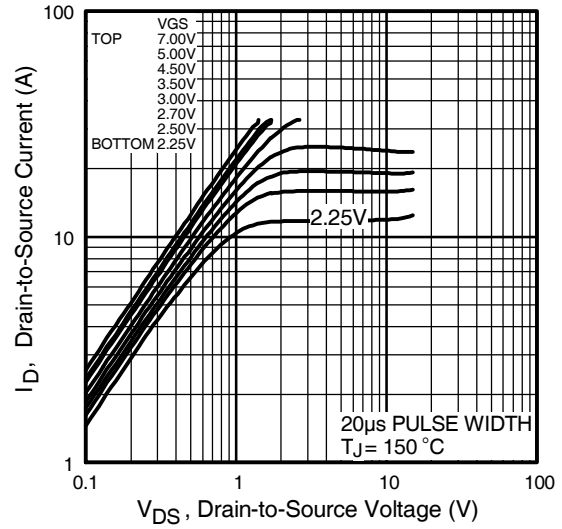
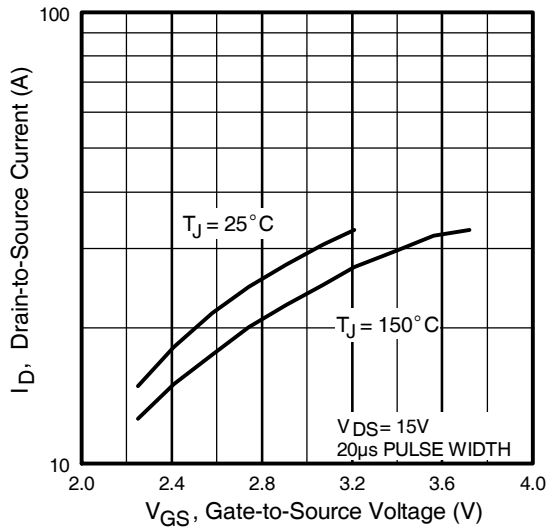
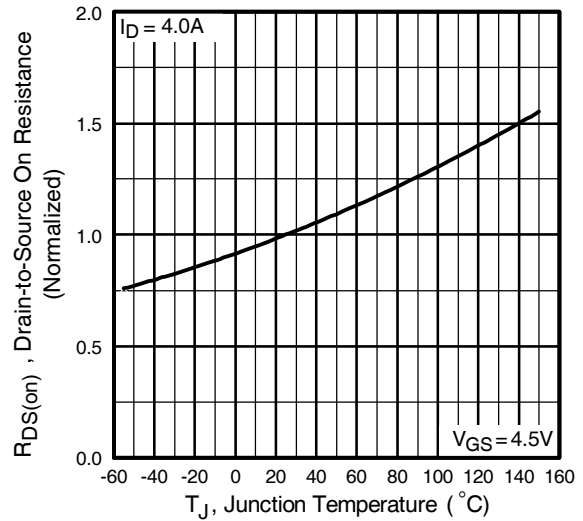
|                 | Parameter                                 | Min. | Typ. | Max. | Units | Conditions   |
|-----------------|---|------|------|------|-------|--|
| I <sub>S</sub>  | Continuous Source Current<br>(Body Diode) | —    | —    | 1.3  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I <sub>SM</sub> | Pulsed Source Current<br>(Body Diode) ①   | —    | —    | 33   |       |  |
| V <sub>SD</sub> | Diode Forward Voltage                     | —    | —    | 1.2  | V     | T <sub>J</sub> = 25°C, I <sub>S</sub> = 1.3A, V <sub>GS</sub> = 0V ②   |
| t <sub>rr</sub> | Reverse Recovery Time                     | —    | 16   | 24   | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = 1.3A   |
| Q <sub>rr</sub> | Reverse Recovery Charge                   | —    | 8.6  | 13   | nC    | di/dt = 100A/μs ②  |

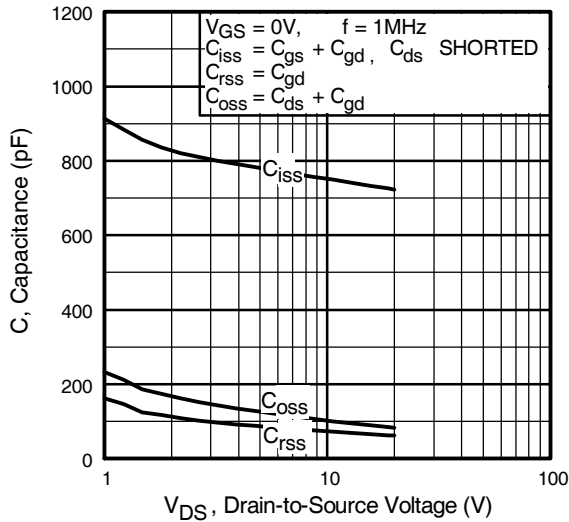
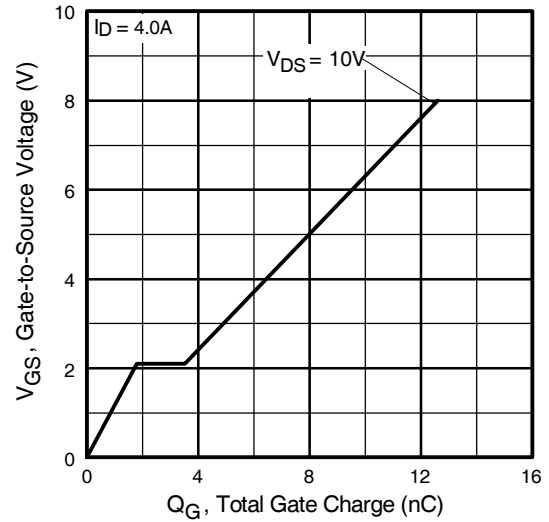
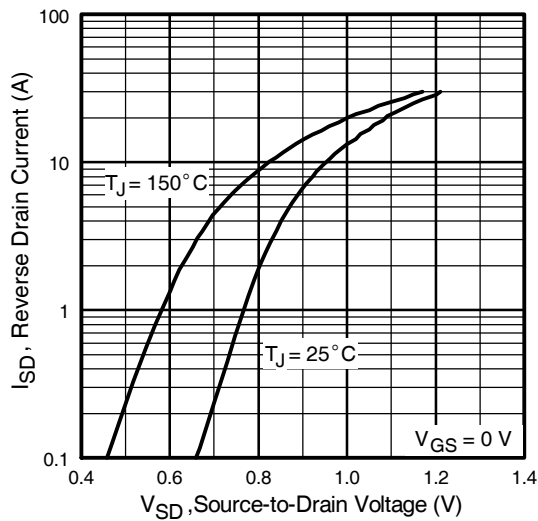
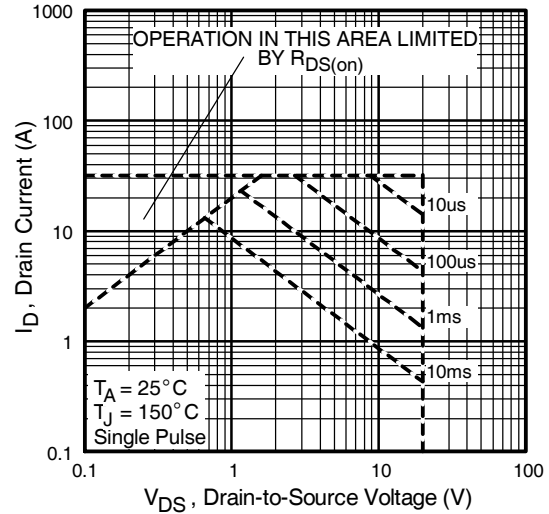
**Notes:**

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

② Pulse width ≤ 300μs; 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


**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

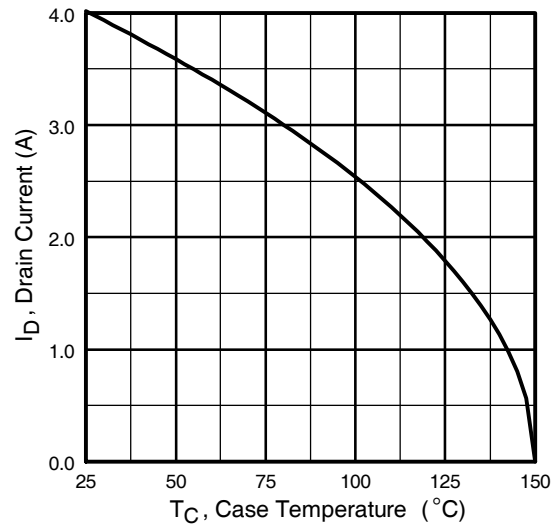


Fig 9. Maximum Drain Current Vs. Case Temperature

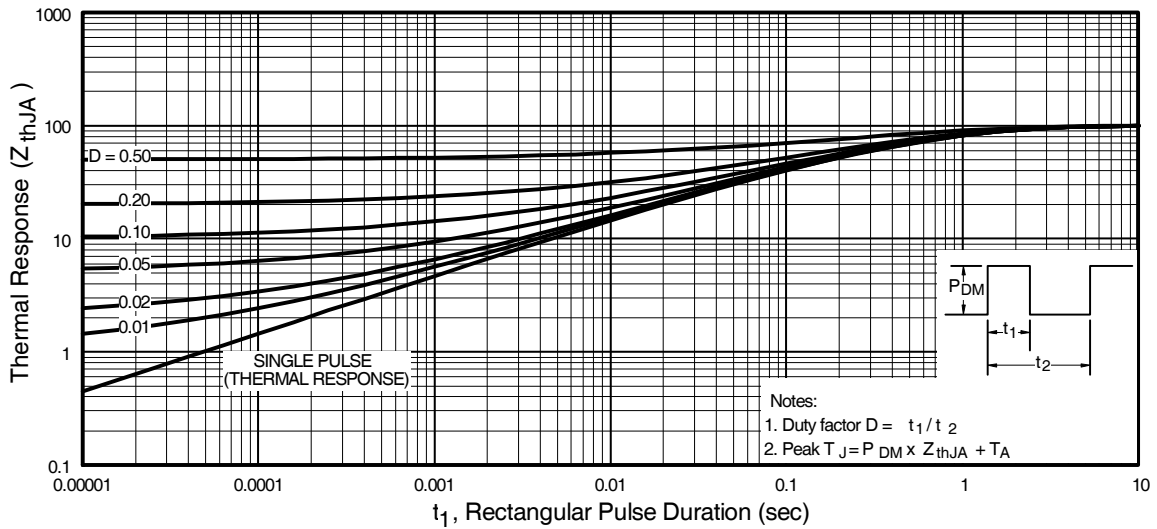
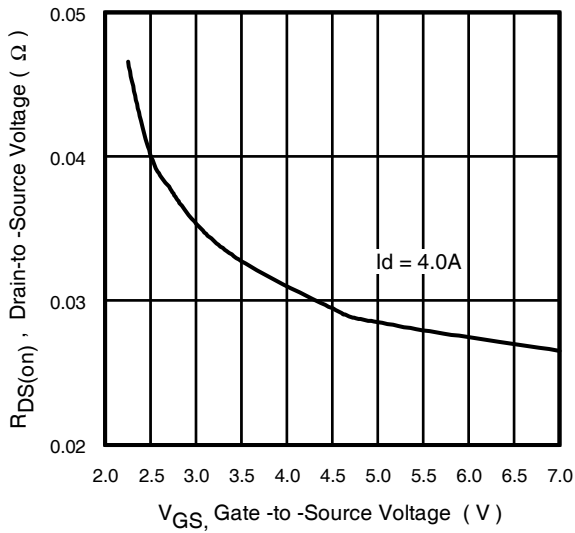
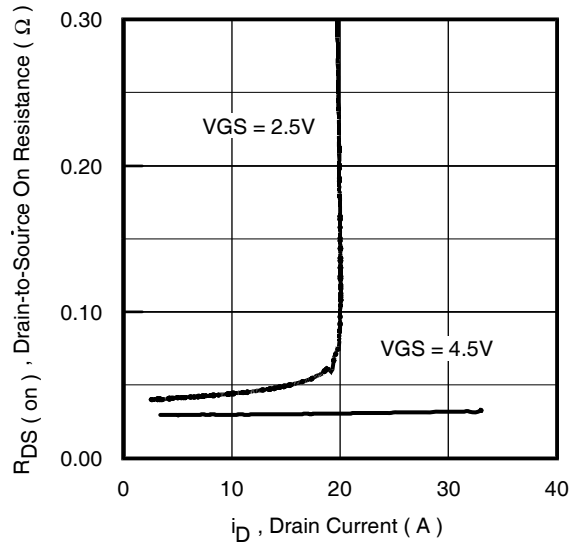
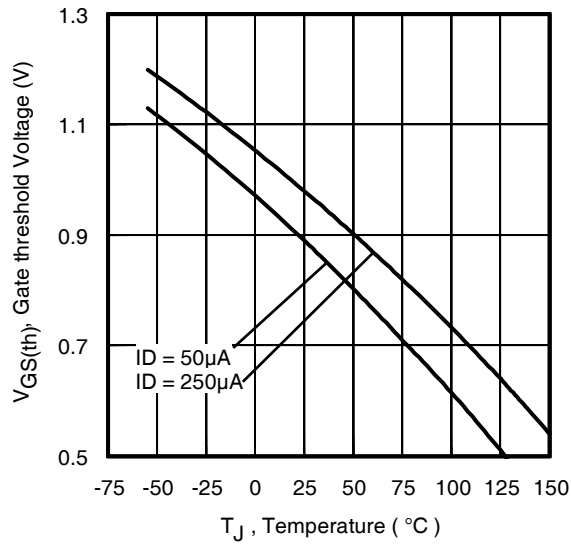


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

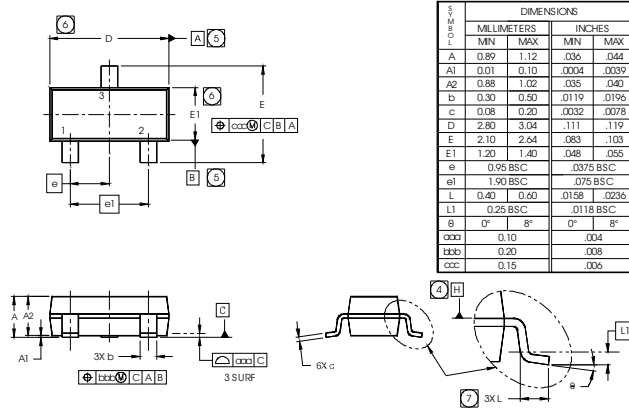

**Fig 11.** On-Resistance Vs. Gate Voltage

**Fig 12.** On-Resistance Vs. Drain Current

**Fig 13.** Threshold Voltage Vs. Temperature



# IRLML2502PbF

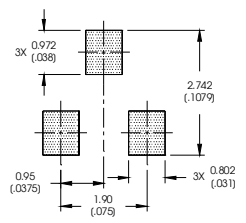
## Micro3 (SOT-23) (Lead-Free) Package Outline

Dimensions are shown in millimeters (inches)



| SYMBOL | DIMENSIONS  |      |           |       |
|--------|-------------|------|-----------|-------|
|        | MILLIMETERS |      | INCHES    |       |
|        | MIN         | MAX  | MIN       | MAX   |
| A      | 0.89        | 1.12 | .035      | .044  |
| A1     | 0.01        | 0.10 | .0004     | .0039 |
| A2     | 0.88        | 1.02 | .035      | .040  |
| b      | 0.30        | 0.50 | .0119     | .0196 |
| c      | 0.08        | 0.20 | .0032     | .0078 |
| D      | 2.80        | 3.04 | .111      | .119  |
| E      | 2.10        | 2.64 | .083      | .103  |
| E1     | 1.20        | 1.40 | .048      | .055  |
| e      | 0.95 BSC    |      | .0375 BSC |       |
| e1     | 1.90 BSC    |      | .075 BSC  |       |
| L      | 0.40        | 0.60 | .0158     | .0236 |
| L1     | 0.25 BSC    |      | .0118 BSC |       |
| ø      | 0"          | 8"   | 0"        | 8"    |
| øøø    | 0.10        |      | .004      |       |
| øøøø   | 0.20        |      | .008      |       |
| øøøøø  | 0.15        |      | .006      |       |

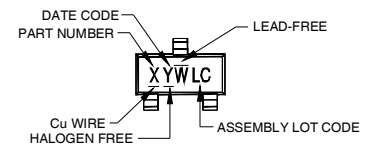
### RECOMMENDED FOOTPRINT



- NOTES
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
  2. DIMENSIONS ARE SHOWN IN MILLIMETERS AND INCHES.
  3. CONTROLLING DIMENSION: MILLIMETER.
  4. DATUM PLANE H IS LOCATED AT THE MOLD PARTING LINE.
  5. DATUM A AND B TO BE DETERMINED AT DATUM PLANE H.
  6. DIMENSIONS D AND E1 ARE MEASURED AT DATUM PLANE H.
  7. DIMENSION L IS THE LEAD LENGTH FOR SOLDERING TO A SUBSTRATE.
  8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-236AB.

## Micro3 (SOT-23 / TO-236AB) Part Marking Information

Notes: This part marking information applies to devices produced after 02/26/2001



- X = PART NUMBER CODE REFERENCE:
- |               |               |
|---------------|---------------|
| A = IRLML2402 | S = IRLML6244 |
| B = IRLML2803 | T = IRLML6246 |
| C = IRLML6302 | U = IRLML6344 |
| D = IRLML5103 | V = IRLML6346 |
| E = IRLML6402 | W = IRFML8244 |
| F = IRLML6401 | X = IRLML2244 |
| G = IRLML2502 | Y = IRLML2246 |
| H = IRLML5203 | Z = IRFML9244 |
| I = IRLML0030 |               |
| J = IRLML2030 |               |
| K = IRLML0100 |               |
| L = IRLML0060 |               |
| M = IRLML0040 |               |
| N = IRLML2060 |               |
| P = IRLML9301 |               |
| R = IRLML9303 |               |

DATE CODE EXAMPLE:  
 YWW = 432 = DF  
 YWW = 503 = 5C

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

| YEAR | Y    | WORK WEEK | W |
|------|------|-----------|---|
| 2011 | 2001 | 1 01      | A |
| 2012 | 2002 | 2 02      | B |
| 2013 | 2003 | 3 03      | C |
| 2014 | 2004 | 4 04      | D |
| 2015 | 2005 | 5         |   |
| 2016 | 2006 | 6         |   |
| 2017 | 2007 | 7         |   |
| 2018 | 2008 | 8         |   |
| 2019 | 2009 | 9         |   |
| 2020 | 2010 | 0 24      | X |
|      |      | 25        | Y |
|      |      | 26        | Z |

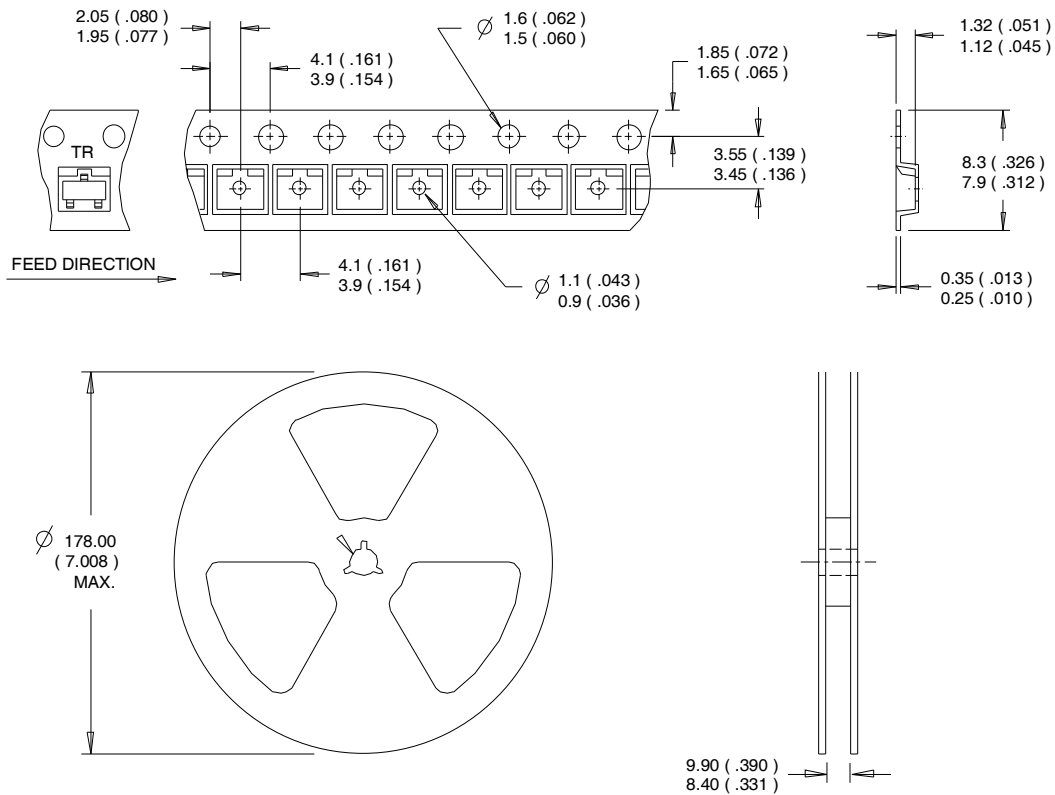
W = (27-52) IF PRECEDED BY A LETTER

| YEAR | Y    | WORK WEEK | W |
|------|------|-----------|---|
| 2011 | 2001 | A 27      | A |
| 2012 | 2002 | B 28      | B |
| 2013 | 2003 | C 29      | C |
| 2014 | 2004 | D 30      | D |
| 2015 | 2005 | E         |   |
| 2016 | 2006 | F         |   |
| 2017 | 2007 | G         |   |
| 2018 | 2008 | H         |   |
| 2019 | 2009 | J         |   |
| 2020 | 2010 | K 50      | X |
|      |      | 51        | Y |
|      |      | 52        | Z |

Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>

### Micro3™ Tape & Reel Information

Dimensions are shown in millimeters (inches)



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

Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>



**Qualification information<sup>†</sup>**

|                            |  |   |
|----------------------------|--|---|
| Qualification level        | Consumer<br>(per JEDEC JESD47F <sup>††</sup> guidelines) |   |
| Moisture Sensitivity Level | Micro3™ (SOT-23)   | MSL1<br>(per JEDEC J-STD-020D <sup>††</sup> ) |
| RoHS compliant             | Yes  |   |

<sup>†</sup> Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability>

<sup>††</sup> Applicable version of JEDEC standard at the time of product release

**Revision History**

| Date      | Comment   |
|-----------|---|
| 4/24/2014 | <ul style="list-style-type: none"> <li>• Updated data sheet with new IR corporate template.</li> <li>• Updated package outline &amp; part marking on page 7.</li> <li>• Added Qualification table -Qual level "Consumer" on page 9.</li> <li>• Added bullet point in the Benefits "RoHS Compliant, Halogen -Free" on page 1.</li> </ul> |