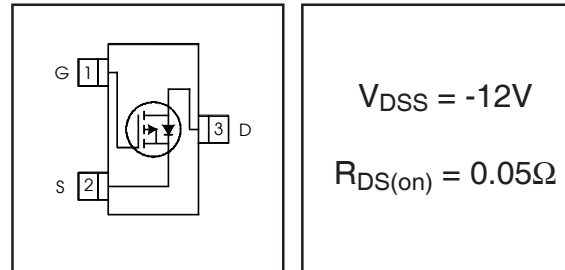


# IRLML6401PbF

HEXFET® Power MOSFET

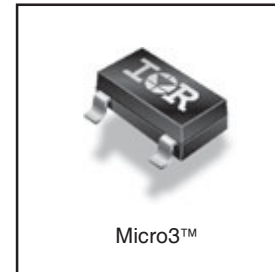
- Ultra Low On-Resistance
- P-Channel MOSFET
- SOT-23 Footprint
- Low Profile (<1.1mm)
- Available in Tape and Reel
- Fast Switching
- 1.8V Gate Rated
- Lead-Free



## Description

These P-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.



## Absolute Maximum Ratings

	Parameter	Max.	Units
$V_{DS}$	Drain- Source Voltage	-12	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-4.3	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-3.4	
$I_{DM}$	Pulsed Drain Current ①	-34	
$P_D @ T_A = 25^\circ C$	Power Dissipation	1.3	W
$P_D @ T_A = 70^\circ C$	Power Dissipation	0.8	
	Linear Derating Factor	0.01	W/°C
$E_{AS}$	Single Pulse Avalanche Energy②	33	mJ
$V_{GS}$	Gate-to-Source Voltage	$\pm 8.0$	V
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150	°C

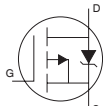
## Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient③	75	100	°C/W

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

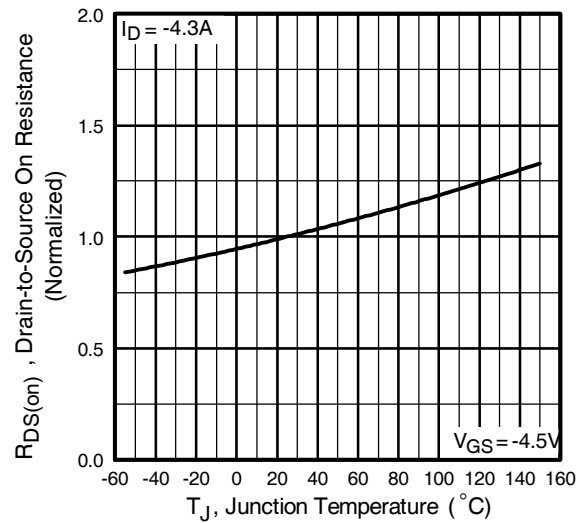
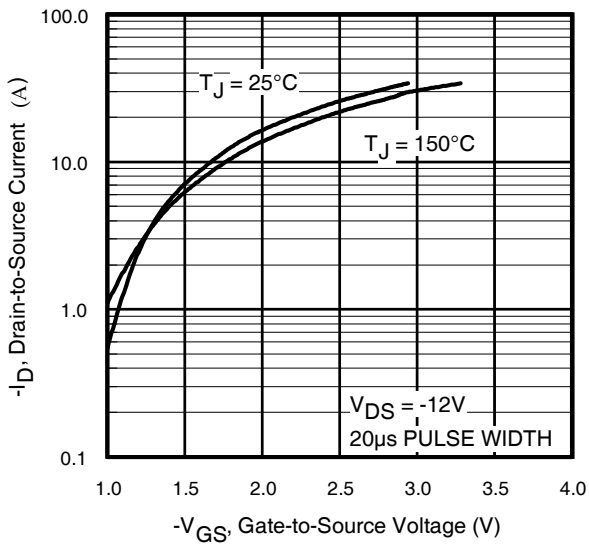
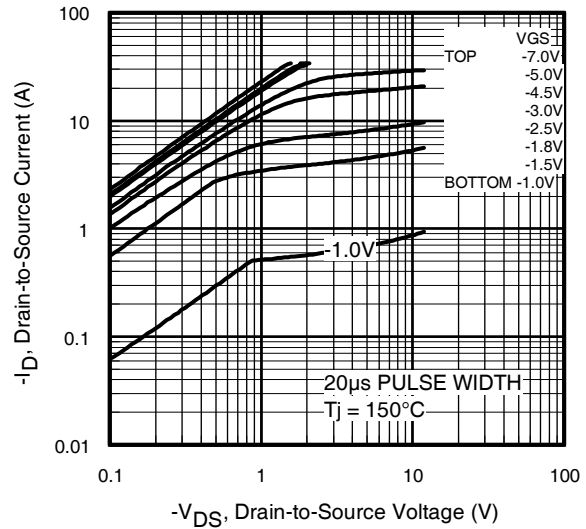
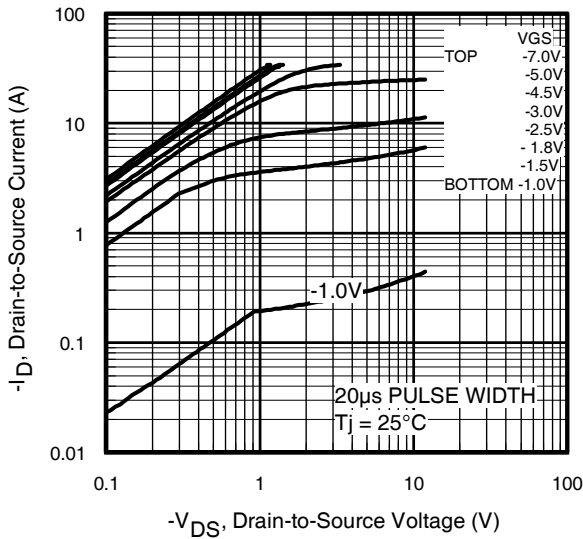
	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-12	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.007	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.050	$\Omega$	$V_{GS} = -4.5V, I_D = -4.3A$ ②
		—	—	0.085		$V_{GS} = -2.5V, I_D = -2.5A$ ②
		—	—	0.125		$V_{GS} = -1.8V, I_D = -2.0A$ ②
$V_{GS(th)}$	Gate Threshold Voltage	-0.40	-0.55	-0.95	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
$g_{fs}$	Forward Transconductance	8.6	—	—	S	$V_{DS} = -10V, I_D = -4.3A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-1.0	$\mu A$	$V_{DS} = -12V, V_{GS} = 0V$
		—	—	-25		$V_{DS} = -9.6V, V_{GS} = 0V, T_J = 55^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -8.0V$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 8.0V$
$Q_g$	Total Gate Charge	—	10	15	nC	$I_D = -4.3A$
$Q_{gs}$	Gate-to-Source Charge	—	1.4	2.1		$V_{DS} = -10V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	2.6	3.9		$V_{GS} = -5.0V$ ②
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{DD} = -6.0V$
$t_r$	Rise Time	—	32	—		$I_D = -1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	250	—		$R_D = 6.0\Omega$
$t_f$	Fall Time	—	210	—		$R_G = 89\Omega$ ②
$C_{iss}$	Input Capacitance	—	830	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	180	—		$V_{DS} = -10V$
$C_{rss}$	Reverse Transfer Capacitance	—	125	—		$f = 1.0\text{MHz}$

## Source-Drain Ratings and Characteristics

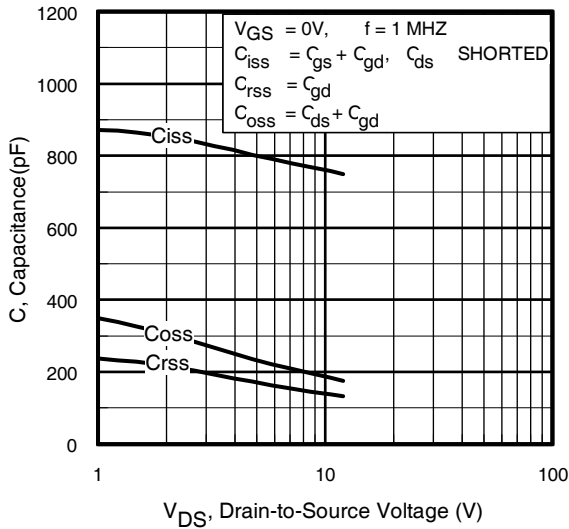
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-1.3	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-34		
$V_{SD}$	Diode Forward Voltage	—	—	-1.2	V	$T_J = 25^\circ\text{C}, I_S = -1.3A, V_{GS} = 0V$ ②
$t_{rr}$	Reverse Recovery Time	—	22	33	ns	$T_J = 25^\circ\text{C}, I_F = -1.3A$
$Q_{rr}$	Reverse Recovery Charge	—	8.0	12	nC	$di/dt = -100A/\mu s$ ②

### Notes:

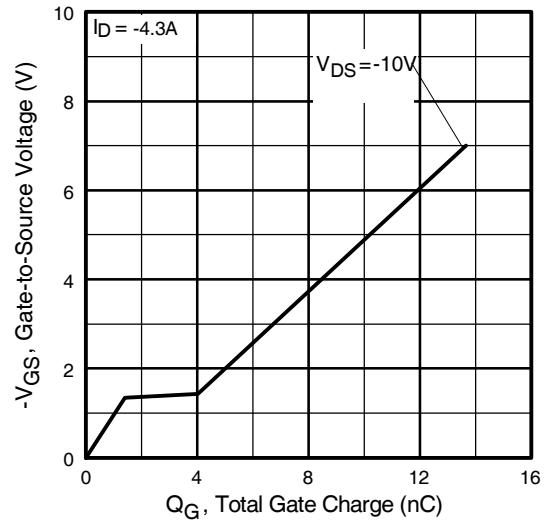
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ③ Surface mounted on 1" square single layer 1oz. copper FR4 board, steady state.
- ④ Starting  $T_J = 25^\circ\text{C}, L = 3.5\text{mH}$   
 $R_G = 25\Omega, I_{AS} = -4.3A$ .



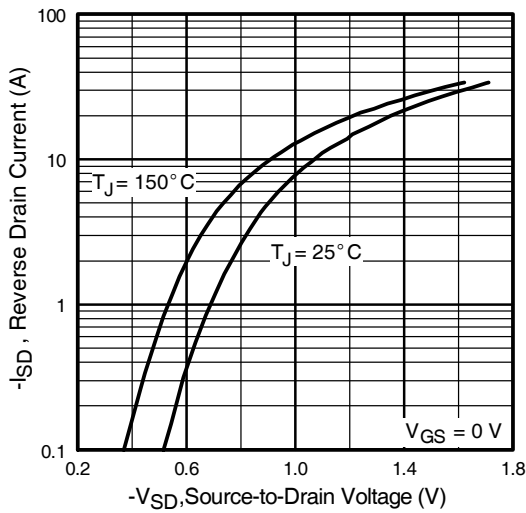
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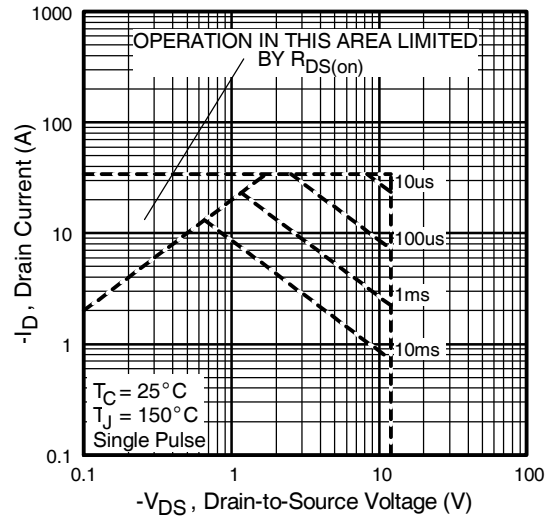
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



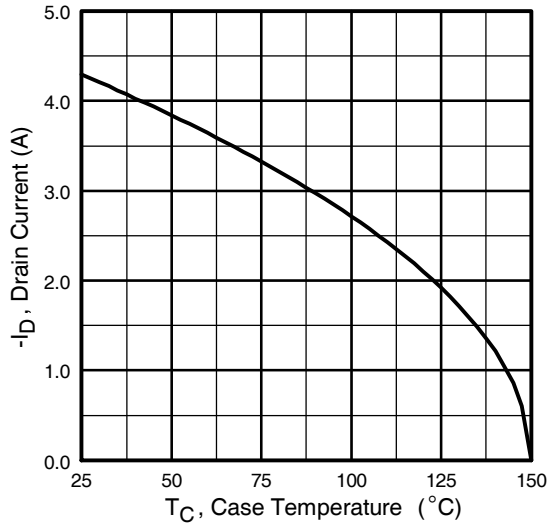
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



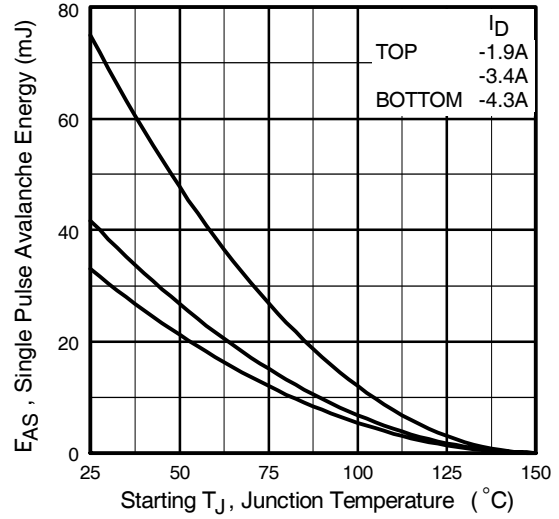
**Fig 7.** Typical Source-Drain Diode Forward Voltage



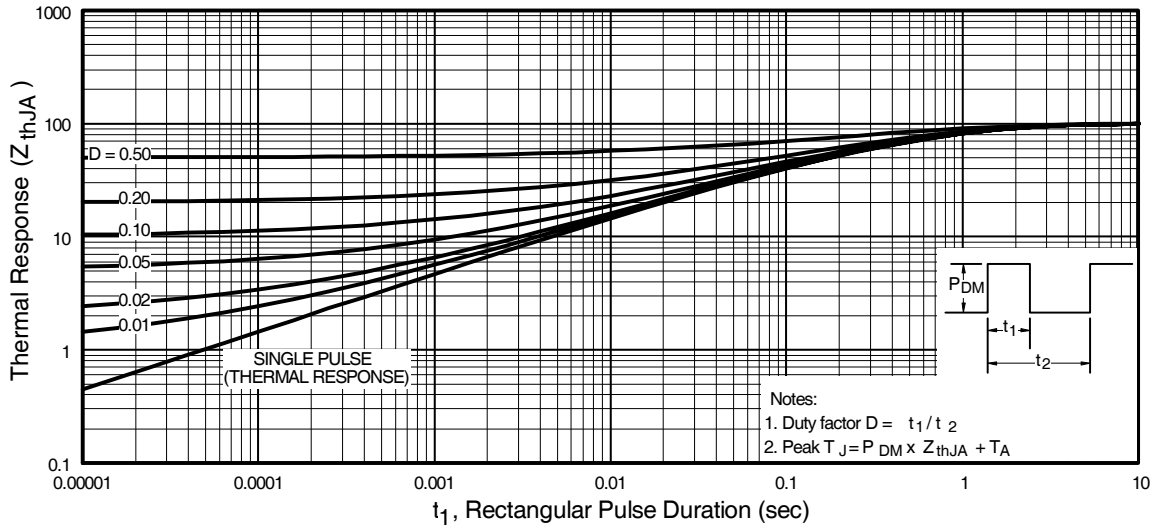
**Fig 8.** Maximum Safe Operating Area



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



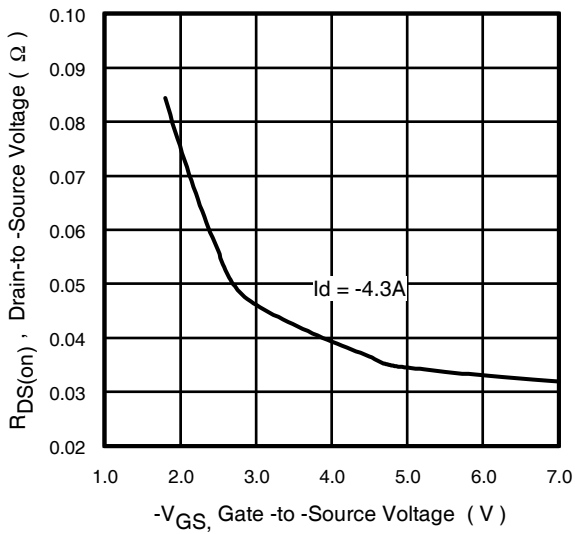
**Fig 10.** Maximum Avalanche Energy Vs. Drain Current



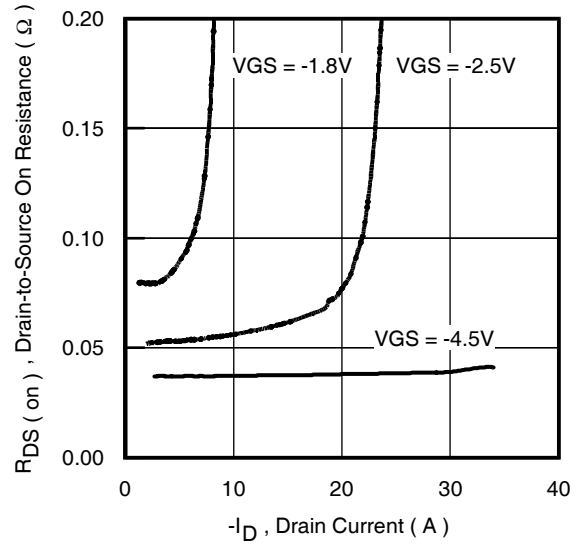
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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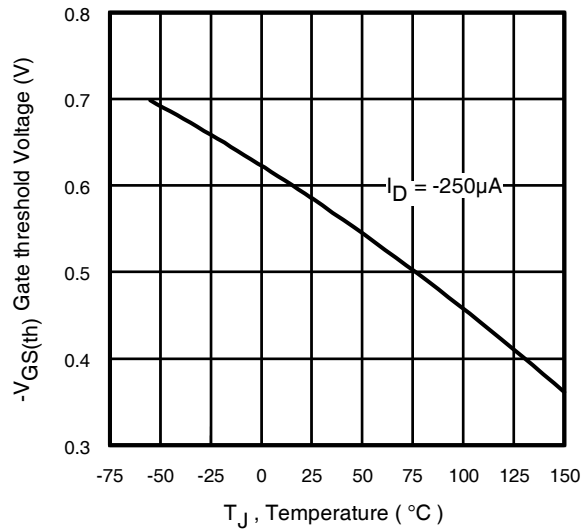
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**Fig 12.** Typical On-Resistance Vs. Gate Voltage



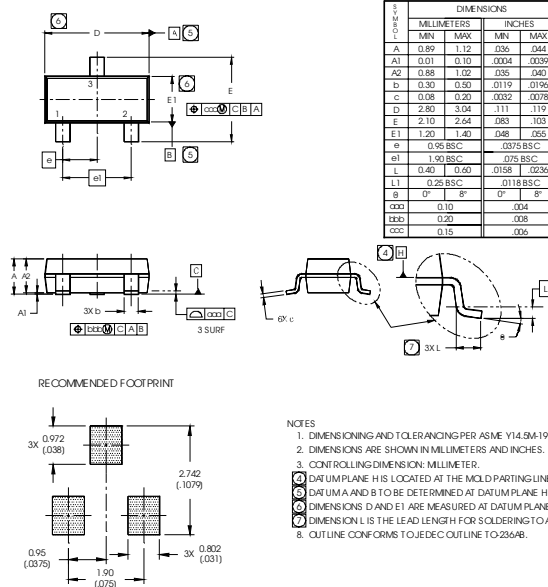
**Fig 13.** Typical On-Resistance Vs. Drain Current



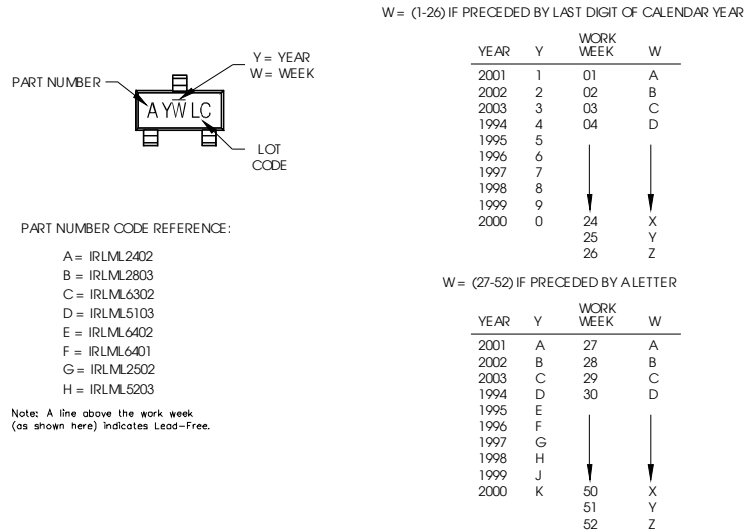
**Fig 14.** Typical Threshold Voltage Vs. Junction Temperature

## Micro3 (SOT-23) Package Outline

Dimensions are shown in millimeters (inches)



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

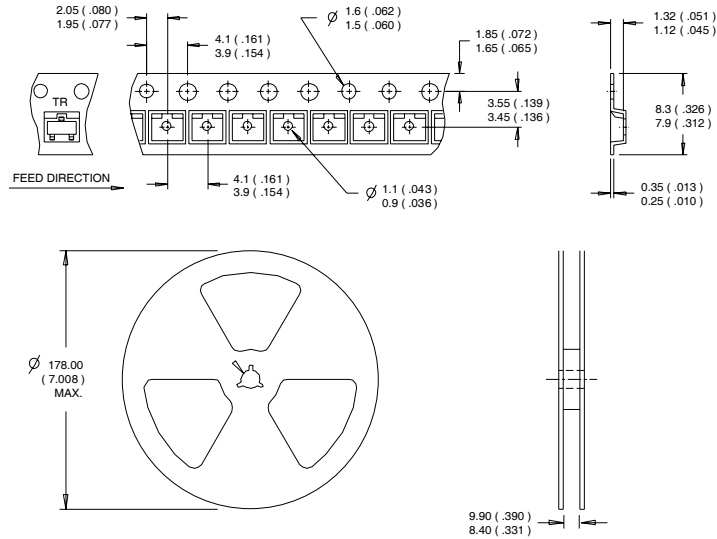


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## Micro3™ Tape & Reel Information

Dimensions are shown in millimeters (inches)



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

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

International  
**IR** Rectifier

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TAC Fax: (310) 252-7903

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