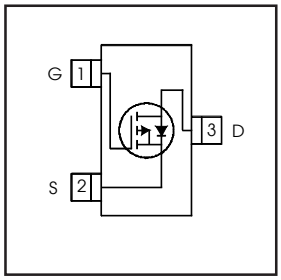
International
IOR Rectifier

PD - 93756D

IRLML6401

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



V_{DSS} = -12V

$R_{DS(on)}$ = 0.05Ω



Micro3™

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°C	Continuous Drain Current, V_{GS} @ -4.5V	-4.3	A
I_D @ T_A= 70°C	Continuous Drain Current, V_{GS} @ -4.5V	-3.4	
I_{DM}	Pulsed Drain Current ①	-34	
P_D @T_A = 25°C	Power Dissipation	1.3	W
P_D @T_A = 70°C	Power Dissipation	0.8	
	Linear Derating Factor	0.01	W/°C
E_{AS}	Single Pulse Avalanche Energy④	33	mJ
V_{GS}	Gate-to-Source Voltage	± 8.0	V
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

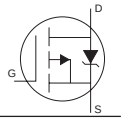
	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient③	75	100	°C/W

04/29/03

Electrical Characteristics @ T_J = 25°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 = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.007	—	V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.050	Ω	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 = -250µA
g_{fs}	Forward Transconductance	8.6	—	—	S	V_{DS} = -10V, I_D = -4.3A
I_{DSS}	Drain-to-Source Leakage Current	—	—	-1.0	µA	V_{DS} = -12V, V_{GS} = 0V
		—	—	-25		V_{DS} = -9.6V, V_{GS} = 0V, T_J = 55°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} = -5.0V②
$t_{d(on)}$	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 = 6.0Ω
t_f	Fall Time	—	210	—		R_G = 89Ω 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 = 1.0MHz

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°C, I_S = -1.3A, V_{GS} = 0V ②
t_{rr}	Reverse Recovery Time	—	22	33	ns	T_J = 25°C, I_F = -1.3A
Q_{rr}	Reverse RecoveryCharge	—	8.0	12	nC	di/dt = -100A/µs ②

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 300µs; duty cycle ≤ 2%.

③ Surface mounted on 1" square single layer 1oz. copper FR4 board, steady state.

④ Starting T_J = 25°C, L = 3.5mH R_G = 25Ω, I_{AS} = -4.3A.

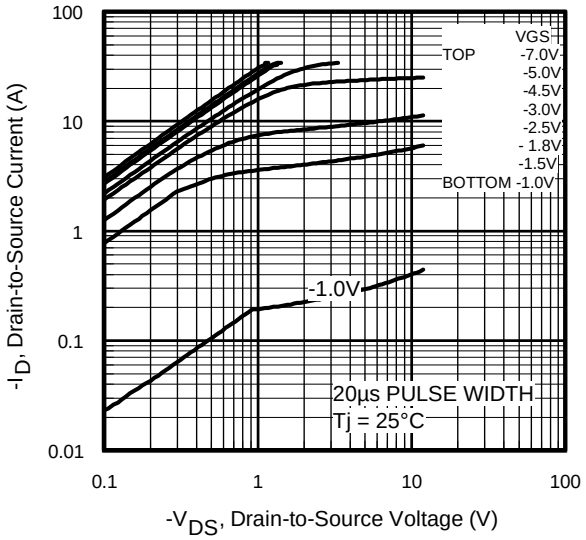


Fig 1. Typical Output Characteristics

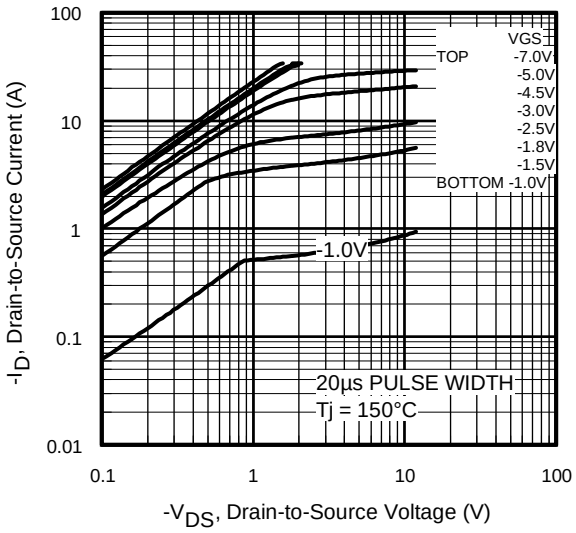


Fig 2. Typical Output Characteristics

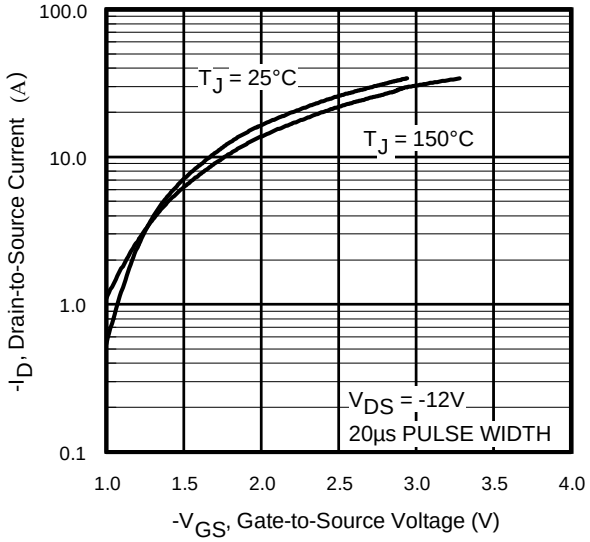


Fig 3. Typical Transfer Characteristics

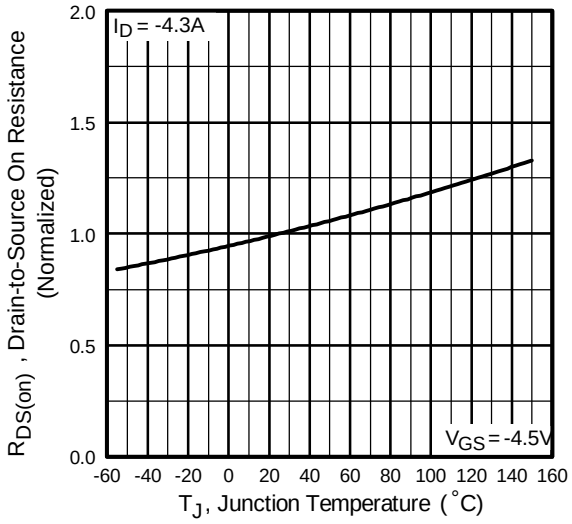


Fig 4. Normalized On-Resistance Vs. Temperature

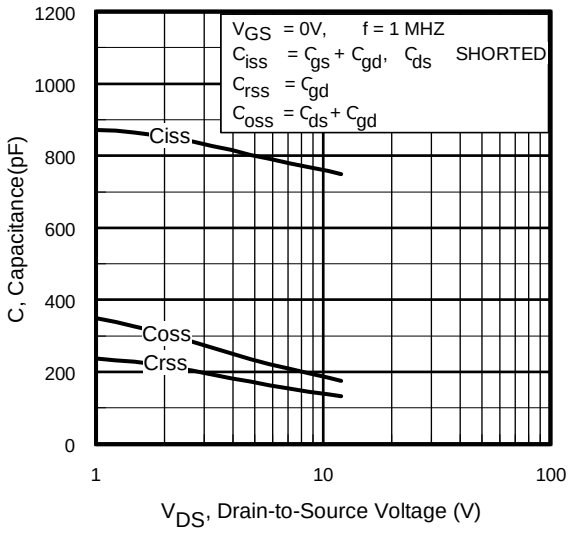


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

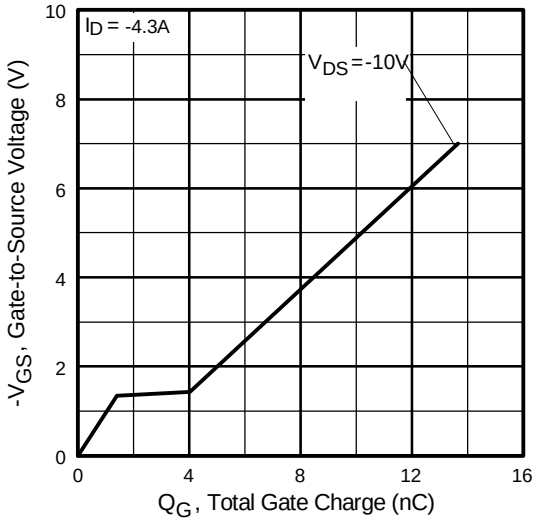


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

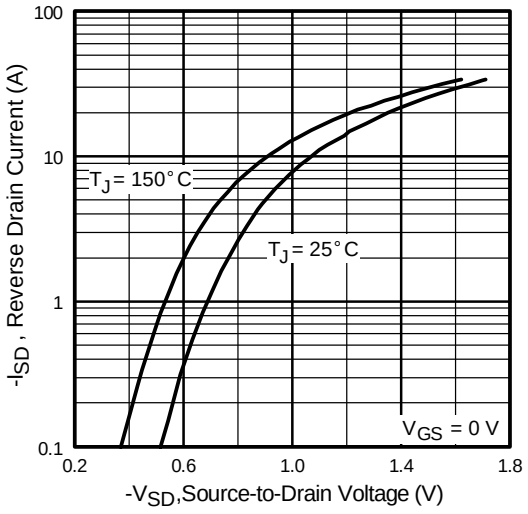


Fig 7. Typical Source-Drain Diode Forward Voltage

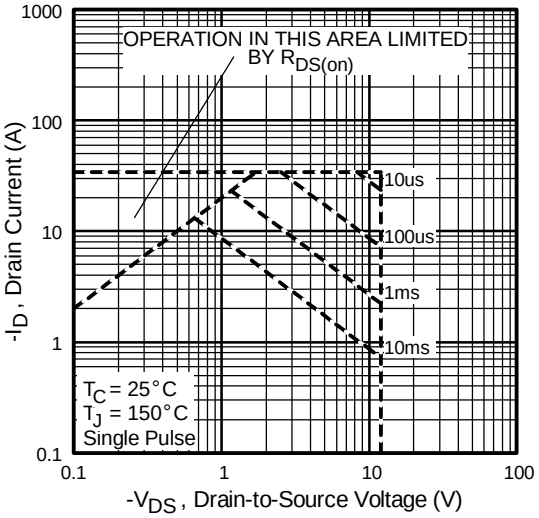


Fig 8. Maximum Safe Operating Area

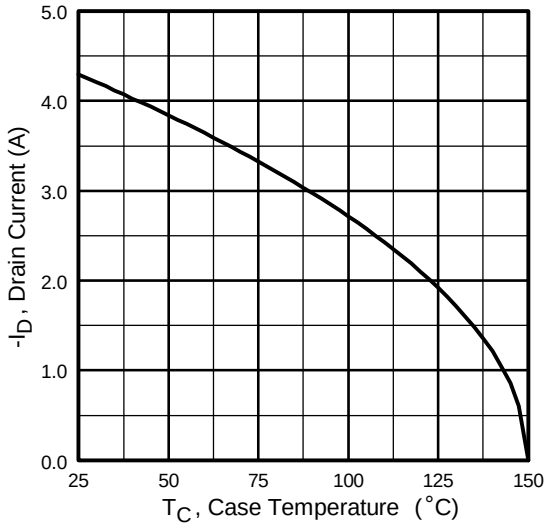


Fig 9. Maximum Drain Current Vs. Case Temperature

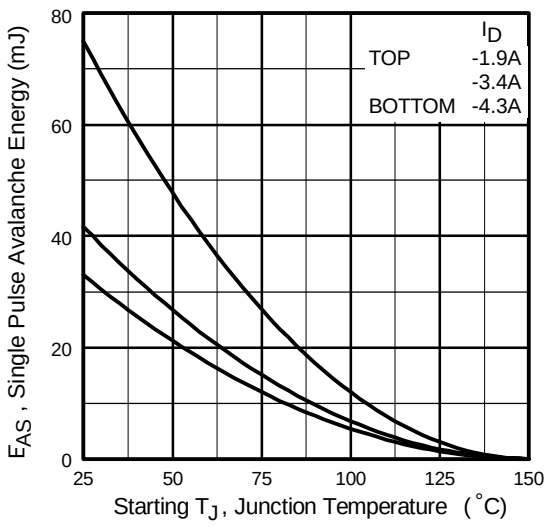


Fig 10. Maximum Avalanche Energy Vs. Drain Current

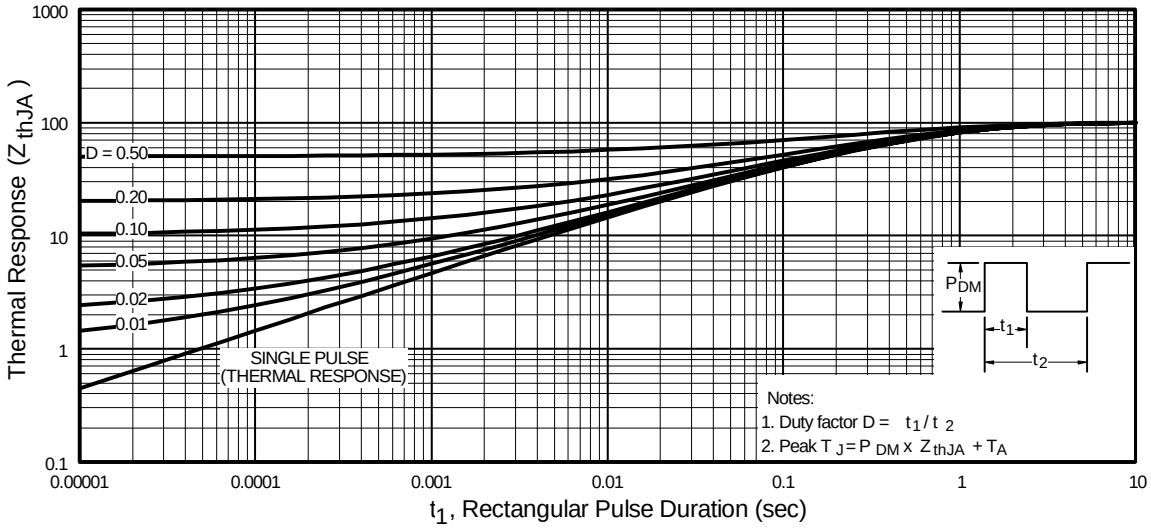


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

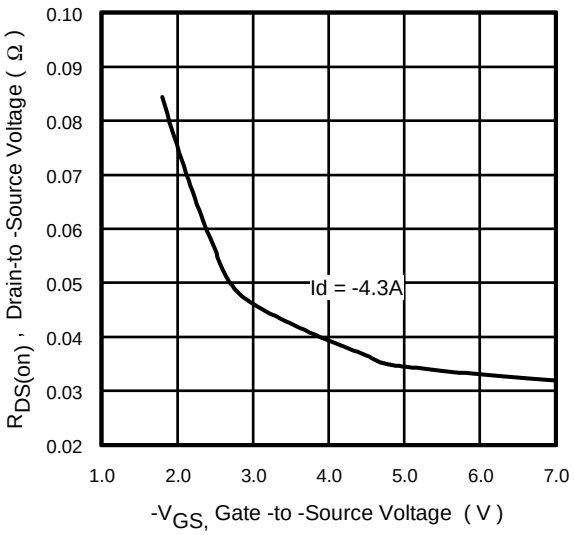


Fig 12. Typical On-Resistance Vs. Gate Voltage

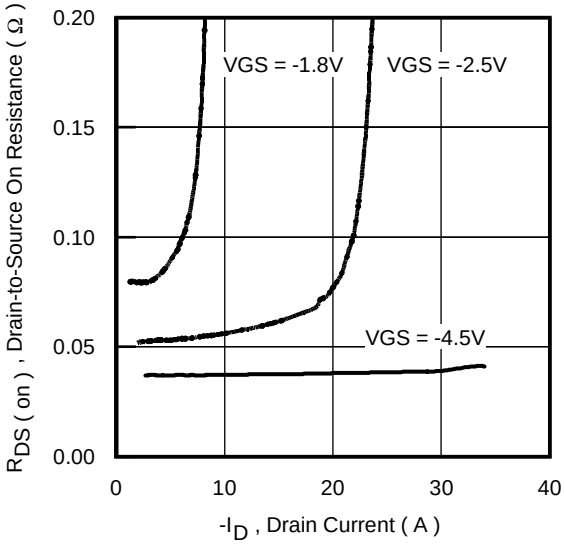


Fig 13. Typical On-Resistance Vs. Drain Current

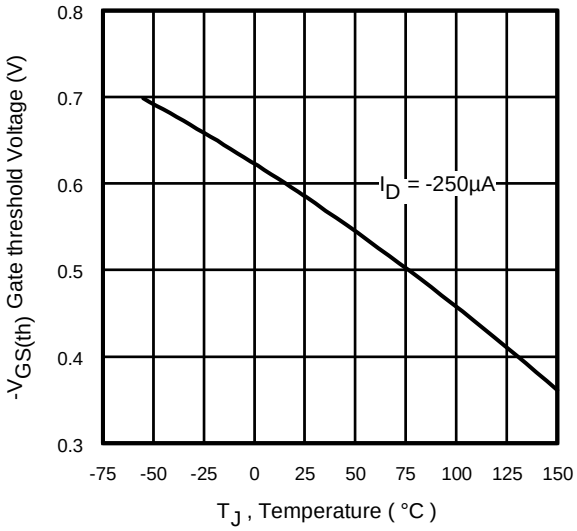
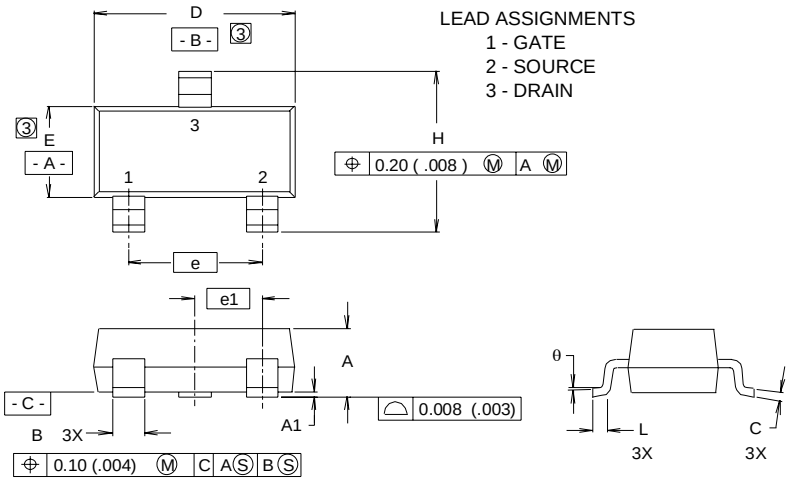


Fig 14. Typical Threshold Voltage Vs. Junction Temperature

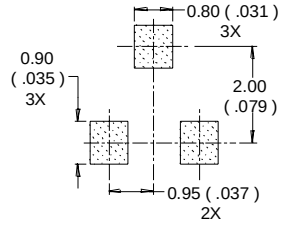
Micro3™ Package Outline

Dimensions are shown in millimeters (inches)



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.032	.044	0.82	1.11
A1	.001	.004	0.02	0.10
B	.015	.021	0.38	0.54
C	.004	.006	0.10	0.15
D	.105	.120	2.67	3.05
e	.0750 BASIC		1.90 BASIC	
e1	.0375 BASIC		0.95 BASIC	
E	.047	.055	1.20	1.40
H	.083	.098	2.10	2.50
L	.005	.010	0.13	0.25
θ	0°	8°	0°	8°

MINIMUM RECOMMENDED FOOTPRINT



NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION : INCH.
3 DIMENSIONS DO NOT INCLUDE MOLD FLASH.

IRLML6401

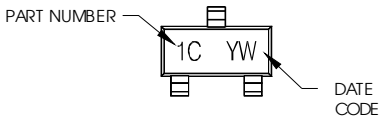
Part Marking Information

Micro3™

International
IOR Rectifier

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

EXAMPLE: THIS IS AN IRLML6302



PART NUMBER CODE REFERENCE:

1A = IRLML2402
1B = IRLML2803
1C = IRLML6302
1D = IRLML5103
1E = IRLML6402
1F = IRLML6401
1G = IRLML2502
1H = IRLML5203

DATE CODE EXAMPLES:

YWW = 9503 = 5C
YWW = 9532 = EF

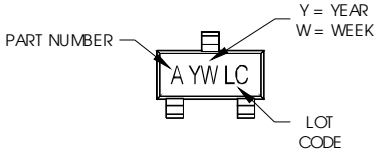
WW = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR

YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
1994	4	04	D
1995	5		
1996	6		
1997	7		
1998	8		
1999	9		
2000	0	24	X
		25	Y
		26	Z

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

YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
1994	D	30	D
1995	E		
1996	F		
1997	G		
1998	H		
1999	J		
2000	K	50	X
		51	Y
		52	Z

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



PART NUMBER CODE REFERENCE:

A = IRLML2402
B = IRLML2803
C = IRLML6302
D = IRLML5103
E = IRLML6402
F = IRLML6401
G = IRLML2502
H = IRLML5203

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

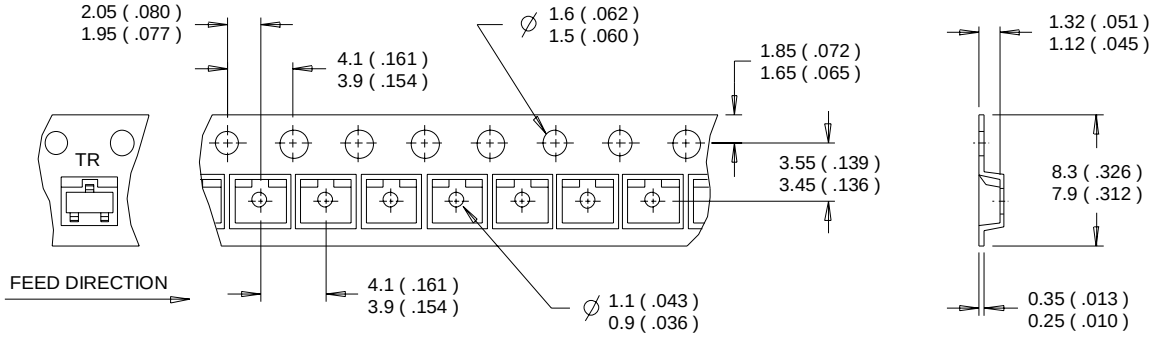
YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
1994	4	04	D
1995	5		
1996	6		
1997	7		
1998	8		
1999	9		
2000	0	24	X
		25	Y
		26	Z

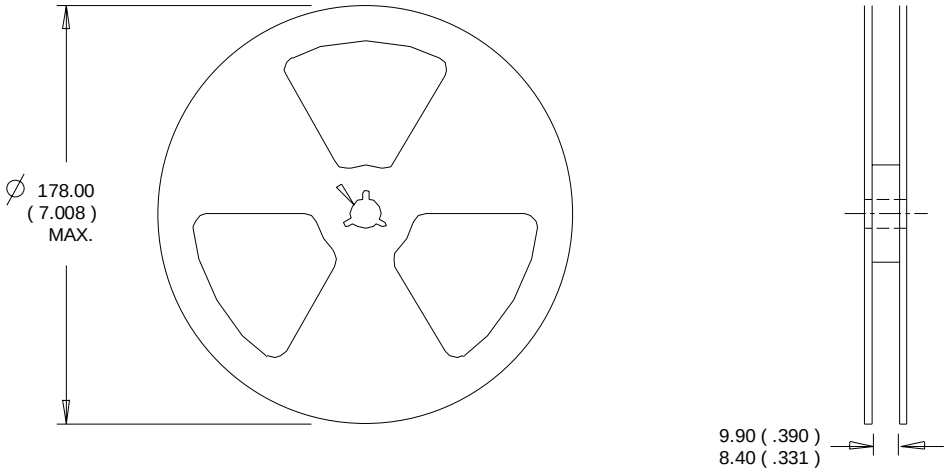
W = (27-52) IF PRECEDED BY A LETTER

YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
1994	D	30	D
1995	E		
1996	F		
1997	G		
1998	H		
1999	J		
2000	K	50	X
		51	Y
		52	Z

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
IOR Rectifier

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TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information. 04/03