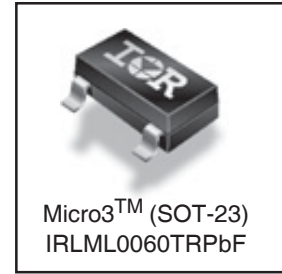
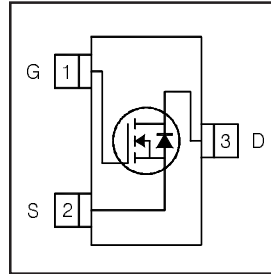


IRLML0060TRPbF

HEXFET® Power MOSFET

V_{DS}	60	V
$V_{GS\ Max}$	± 16	V
$R_{DS(on)\ max}$ (@ $V_{GS} = 10V$)	92	mΩ
$R_{DS(on)\ max}$ (@ $V_{GS} = 4.5V$)	116	mΩ



Application(s)

- Load/ System Switch

Features and Benefits

Features

Industry-standard pinout
Compatible with existing Surface Mount Techniques
RoHS compliant containing no lead, no bromide and no halogen
MSL1, Industrial qualification

results in
⇒

Benefits

Multi-vendor compatibility
Easier manufacturing
Environmentally friendly
Increased reliability

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	60	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	2.7	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	2.1	
I_{DM}	Pulsed Drain Current	11	W
$P_D @ T_A = 25^\circ C$	Maximum Power Dissipation	1.25	
$P_D @ T_A = 70^\circ C$	Maximum Power Dissipation	0.80	
	Linear Derating Factor	0.01	
V_{GS}	Gate-to-Source Voltage	± 16	V
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ③	—	100	°C/W
$R_{\theta JA}$	Junction-to-Ambient ($t < 10s$) ④	—	99	

ORDERING INFORMATION:

See detailed ordering and shipping information on the last page of this data sheet.

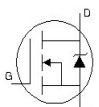
Notes ① through ④ are on page 10

www.irf.com

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.06	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	98	116	$m\Omega$	$V_{GS} = 4.5V, I_D = 2.2A$ ②
		—	78	92		$V_{GS} = 10V, I_D = 2.7A$ ②
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.5	V	$V_{DS} = V_{GS}, I_D = 25\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 60V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 60V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
R_G	Internal Gate Resistance	—	1.6	—	Ω	
g_{fs}	Forward Transconductance	7.6	—	—	S	$V_{DS} = 25V, I_D = 2.7A$
Q_g	Total Gate Charge	—	2.5	—	nC	$I_D = 2.7A$
Q_{gs}	Gate-to-Source Charge	—	0.7	—		$V_{DS} = 30V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	1.3	—		$V_{GS} = 4.5V$ ②
$t_{d(on)}$	Turn-On Delay Time	—	5.4	—	ns	$V_{DD} = 30V$ ②
t_r	Rise Time	—	6.3	—		$I_D = 1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	6.8	—		$R_G = 6.8\Omega$
t_f	Fall Time	—	4.2	—		$V_{GS} = 4.5V$
C_{iss}	Input Capacitance	—	290	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	37	—		$V_{DS} = 25V$
C_{riss}	Reverse Transfer Capacitance	—	21	—		$f = 1.0\text{MHz}$

Source - Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	1.6	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	11		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 2.7A, V_{GS} = 0V$ ②
t_{rr}	Reverse Recovery Time	—	14	21	ns	$T_J = 25^\circ\text{C}, V_R = 30V, I_F = 1.6A$
Q_{rr}	Reverse Recovery Charge	—	13	20	nC	$di/dt = 100A/\mu s$ ②

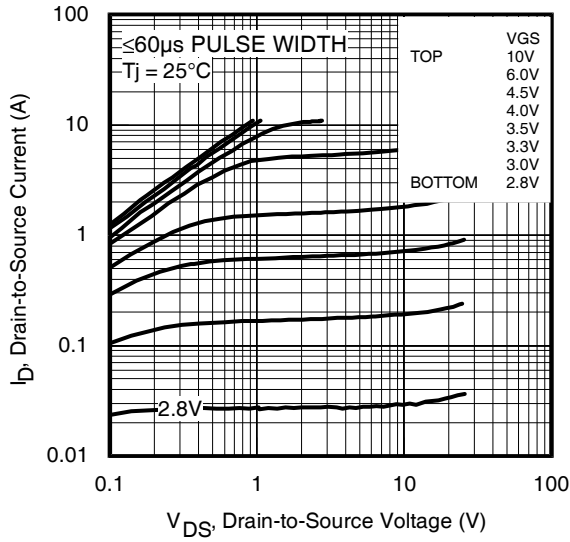


Fig 1. Typical Output Characteristics

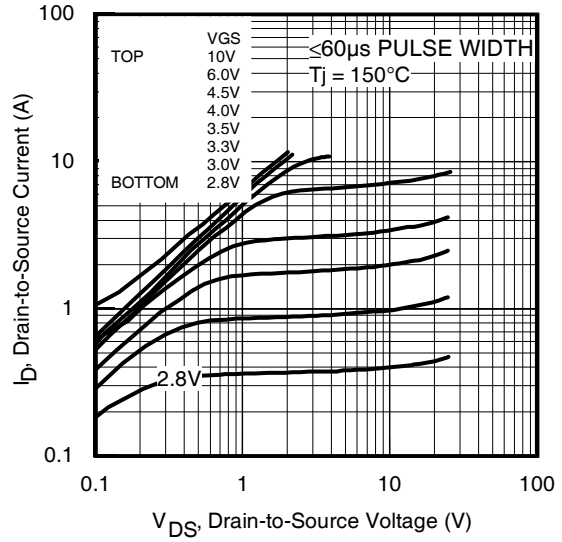


Fig 2. Typical Output Characteristics

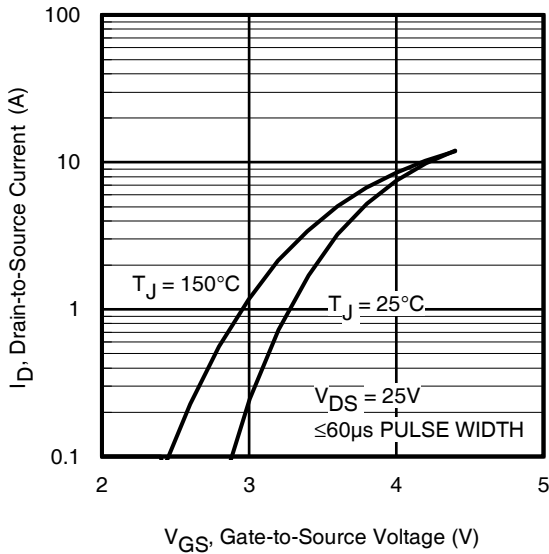


Fig 3. Typical Transfer Characteristics

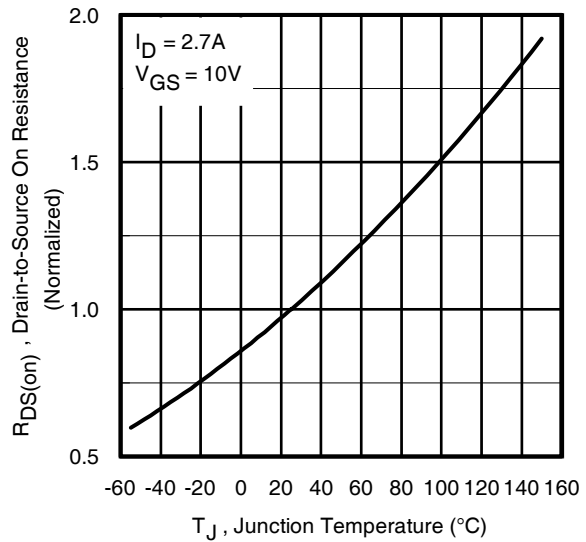


Fig 4. Normalized On-Resistance vs. Temperature

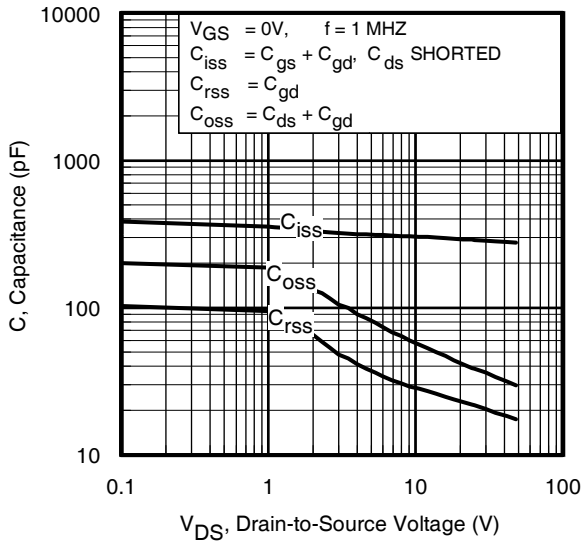


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

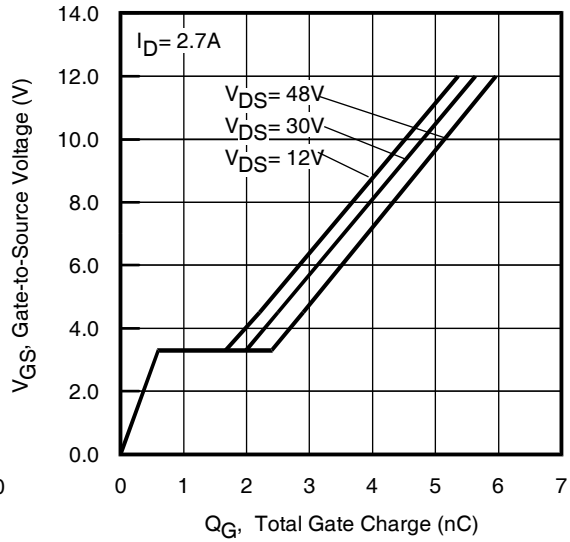


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

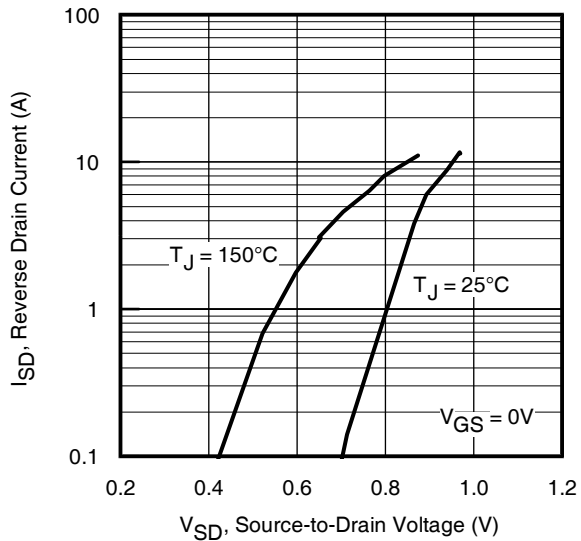


Fig 7. Typical Source-Drain Diode Forward Voltage

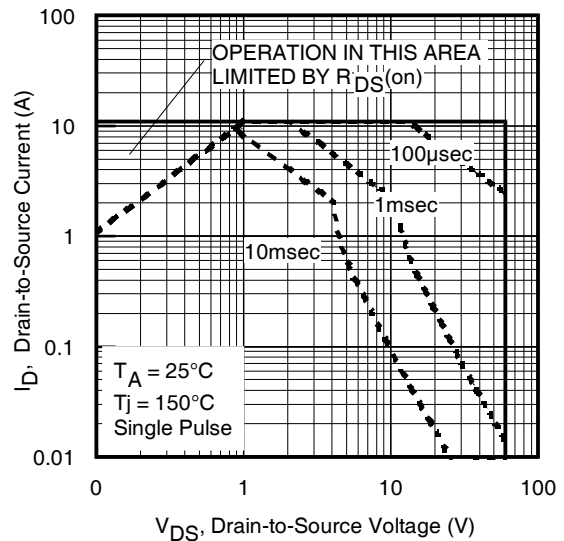


Fig 8. Maximum Safe Operating Area

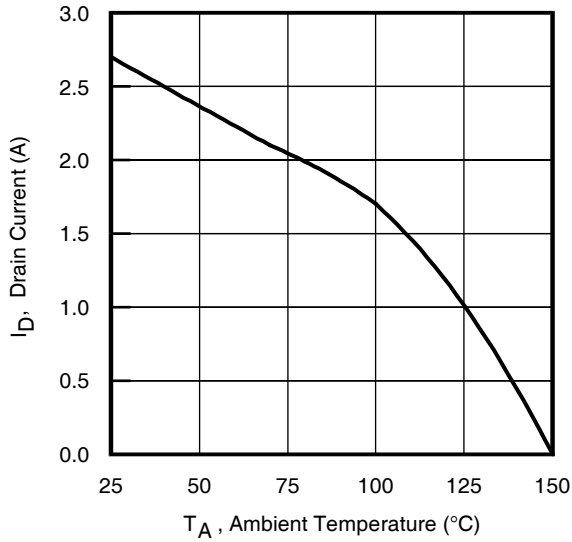


Fig 9. Maximum Drain Current vs. Ambient Temperature

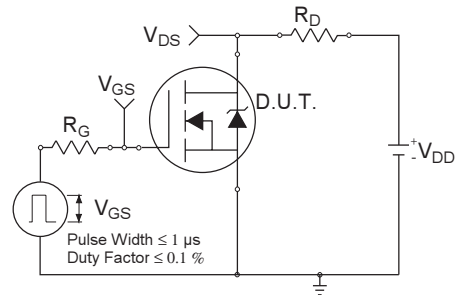


Fig 10a. Switching Time Test Circuit

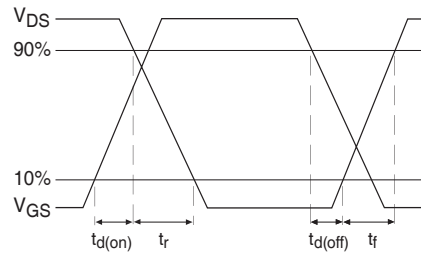


Fig 10b. Switching Time Waveforms

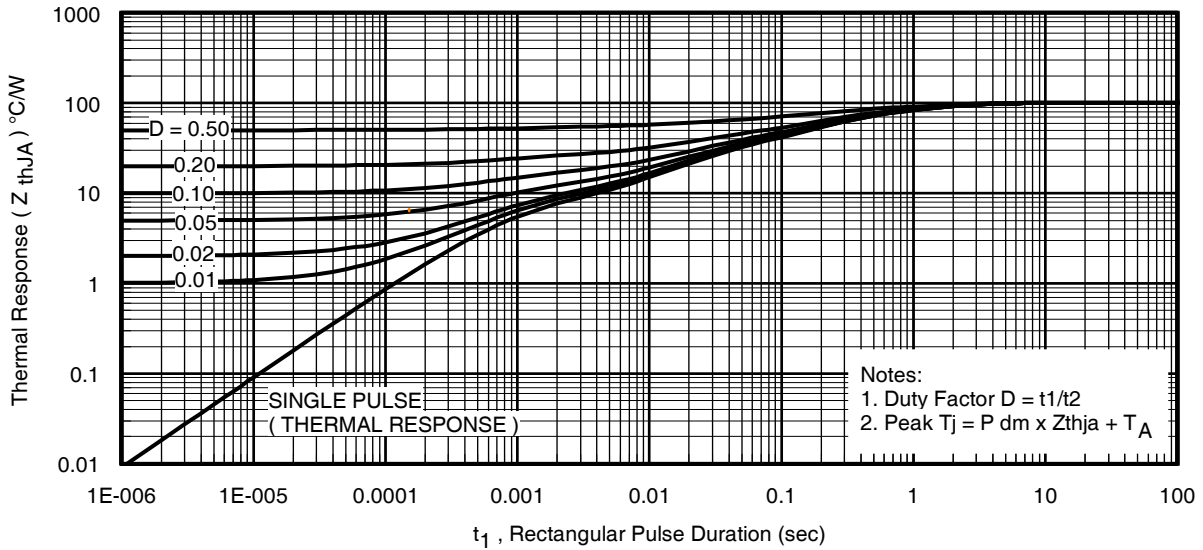


Fig 11. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

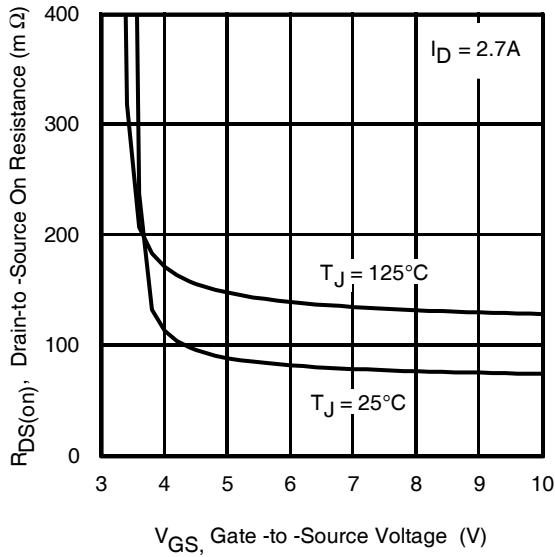


Fig 12. Typical On-Resistance vs. Gate Voltage

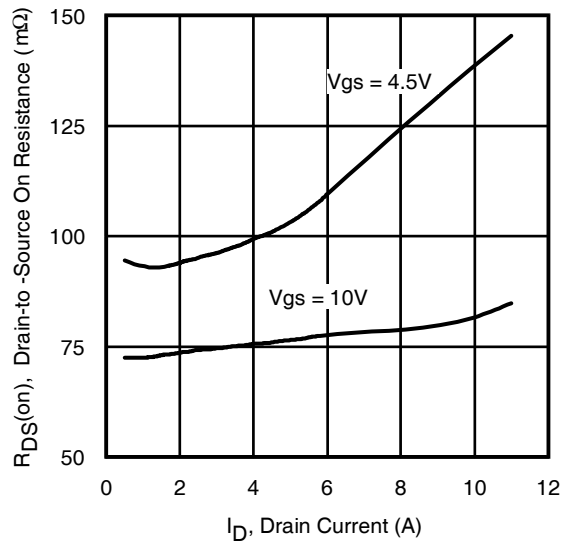


Fig 13. Typical On-Resistance vs. Drain Current

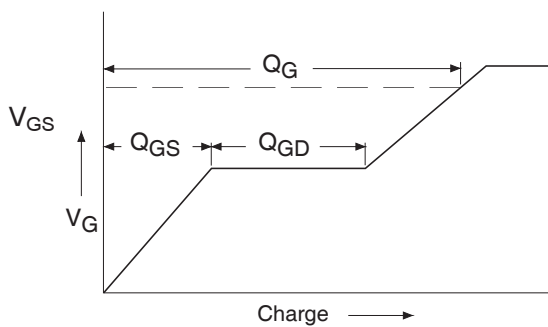


Fig 14a. Basic Gate Charge Waveform

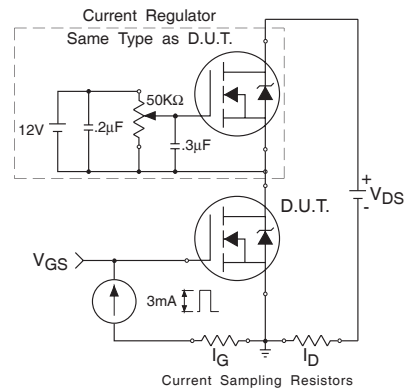


Fig 14b. Gate Charge Test Circuit

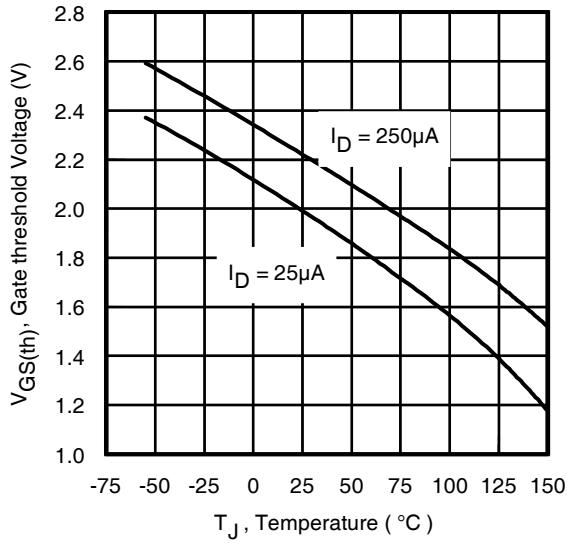


Fig 15. Typical Threshold Voltage vs. Junction Temperature

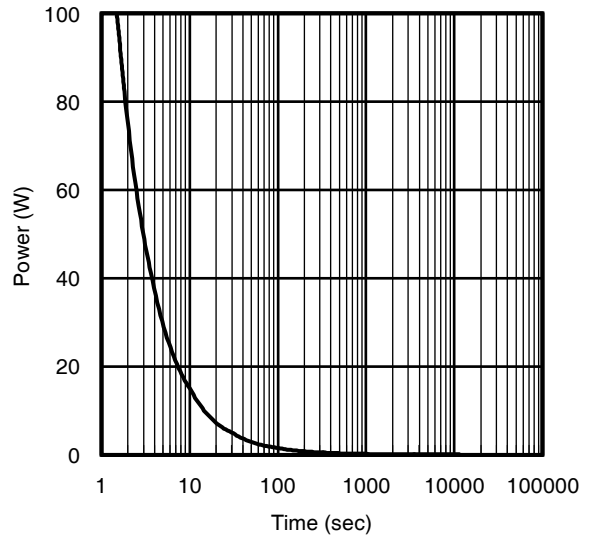


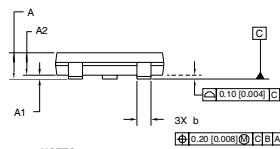
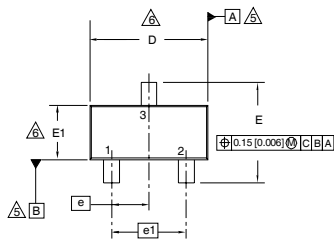
Fig 16. Typical Power vs. Time

IRLML0060TRPbF

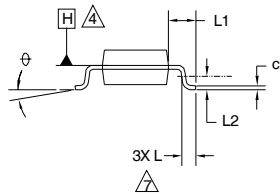
International
IR Rectifier

Micro3 (SOT-23) Package Outline

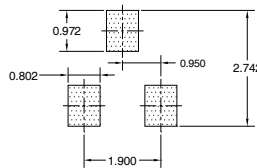
Dimensions are shown in millimeters (inches)



NOTES:



Recommended Footprint

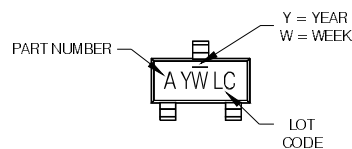


DIMENSIONS				
SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.89	1.12	0.035	0.044
A1	0.01	0.10	0.0004	0.004
A2	0.88	1.02	0.035	0.040
b	0.30	0.50	0.012	0.020
c	0.08	0.20	0.003	0.008
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E1	1.20	1.40	0.047	0.055
e	0.95	BSC	0.037	BSC
e1	1.90	BSC	0.075	BSC
L	0.40	0.60	0.016	0.024
L1	0.54	REF	0.021	REF
L2	0.25	BSC	0.010	BSC
⌀	0	8	0	8

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS (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. DIMENSIONS DOES NOT INCLUDE MOLD PROTRUSIONS OR INTERLEAD FLASH. MOLD PROTRUSIONS OR INTERLEAD FLASH SHALL NOT EXCEED 0.25 MM (0.010 INCH) PER SIDE.
7. DIMENSION L IS THE LEAD LENGTH FOR SOLDERING TO A SUBSTRATE.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-236 AB.

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

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



PART NUMBER CODE REFERENCE:

A = IRLML2402
 B = IRLML2803
 C = IRLML6302
 D = IRLML5103
 E = IRLML6402
 F = IRLML6401
 G = IRLML2502
 H = IRLML5203
 I = IRLML0030
 J = IRLML2030
 K = IRLML0100
 L = IRLML0060
 M = IRLML0040
 N = IRLML2060

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

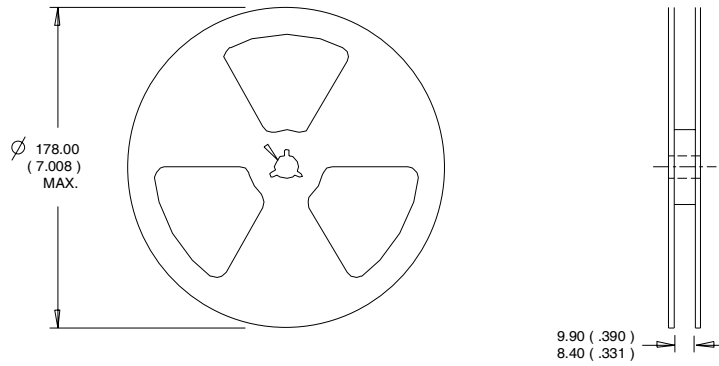
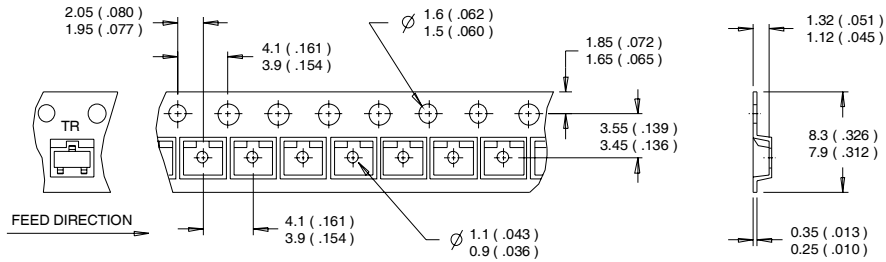
W = (27-52) IF PRECEDED BY A LETTER

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

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/>

IRLML0060TRPbF

International
IOR Rectifier

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRLML0060TRPbF	Micro3	Tape and Reel	3000	

Qualification information[†]

Qualification level	Consumer ^{††} (per JEDEC JESD47F ^{†††} guidelines)		
Moisture Sensitivity Level	Micro3	MSL1 (per IPC/JEDEC J-STD-020D ^{†††})	
RoHS compliant	Yes		

- † Qualification standards can be found at International Rectifier's web site
<http://www.irf.com/product-info/reliability>
- †† Higher qualification ratings may be available should the user have such requirements.
Please contact your International Rectifier sales representative for further information:
<http://www.irf.com/whoto-call/salesrep/>
- ††† Applicable version of JEDEC standard at the time of product release.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ③ Surface mounted on 1 in square Cu board.
- ④ Refer to [application note #AN-994](#).

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 for sales contact information.12/2009