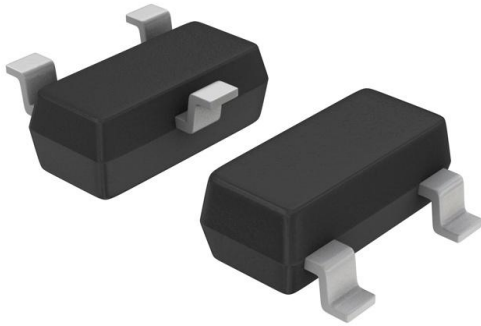


IRLML6401TRPBF Datasheet

www.digi-electronics.com



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	IRLML6401TRPBF-DG
Manufacturer	Infineon Technologies
Manufacturer Product Number	IRLML6401TRPBF
Description	MOSFET P-CH 12V 4.3A SOT23
Detailed Description	P-Channel 12 V 4.3A (Ta) 1.3W (Ta) Surface Mount Micro3™/SOT-23



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

IRLML6401TRPBF

Series:

HEXFET®

FET Type:

P-Channel

Drain to Source Voltage (Vdss):

12 V

Drive Voltage (Max Rds On, Min Rds On):

1.8V, 4.5V

Vgs(th) (Max) @ Id:

950mV @ 250µA

Vgs (Max):

±8V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

Micro3™/SOT-23

Base Product Number:

IRLML6401

Manufacturer:

Infineon Technologies

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

4.3A (Ta)

Rds On (Max) @ Id, Vgs:

50mOhm @ 4.3A, 4.5V

Gate Charge (Qg) (Max) @ Vgs:

15 nC @ 5 V

Input Capacitance (Ciss) (Max) @ Vds:

830 pF @ 10 V

Power Dissipation (Max):

1.3W (Ta)

Mounting Type:

Surface Mount

Package / Case:

TO-236-3, SC-59, SOT-23-3

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

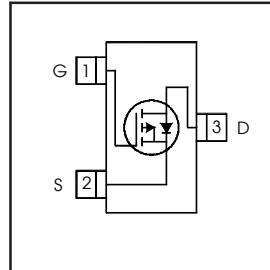
1 (Unlimited)

ECCN:

EAR99

- 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
- RoHS Compliant, Halogen-Free

HEXFET® Power MOSFET



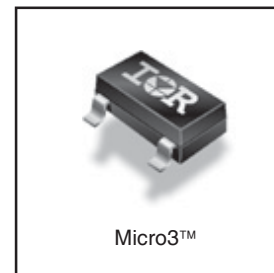
$$V_{DS} = -12V$$

$$R_{DS(on)} = 0.05\Omega$$

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.



Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRLML6401TRPbF	Micro3™ (SOT-23)	Tape and Reel	3000	IRLML6401TRPbF

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain- Source Voltage	-12	V
$I_D @ T_A = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ -4.5V$	-4.3	A
$I_D @ T_A = 70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ -4.5V$	-3.4	
I_{DM}	Pulsed Drain Current ①	-34	
$P_D @ T_A = 25^\circ\text{C}$	Power Dissipation	1.3	W
$P_D @ T_A = 70^\circ\text{C}$	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

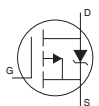


IRLML6401PbF

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	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	$V_{DS} = V_{GS}, I_D = -250\mu A$
g_{fs}	Forward Transconductance	8.6	—	—	S	$V_{DS} = -10V, I_D = -4.3A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	-1.0	μA	$V_{DS} = -12V, V_{GS} = 0V$
		—	—	-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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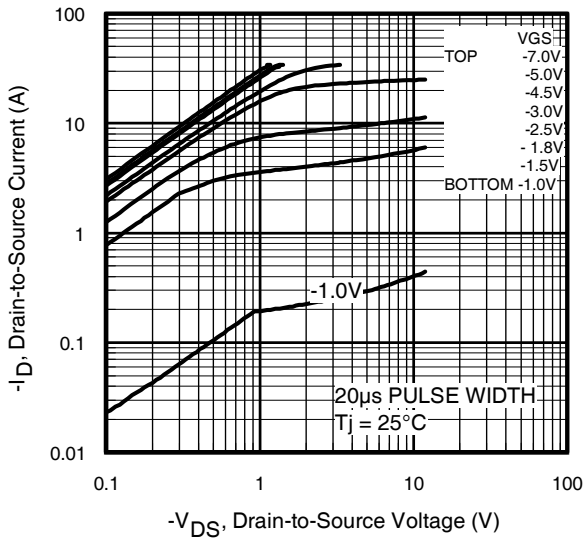


Fig 1. Typical Output Characteristics

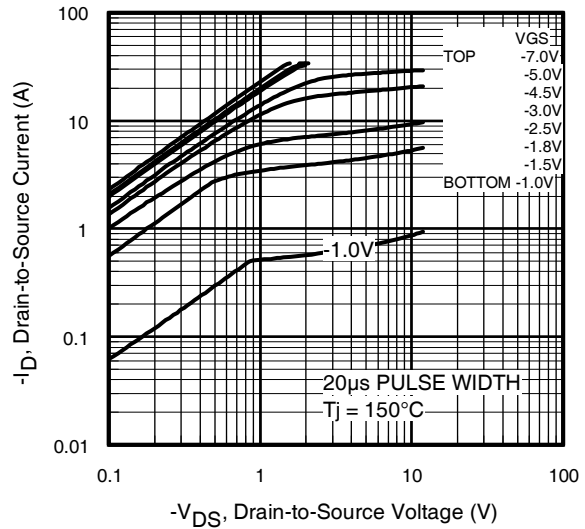


Fig 2. Typical Output Characteristics

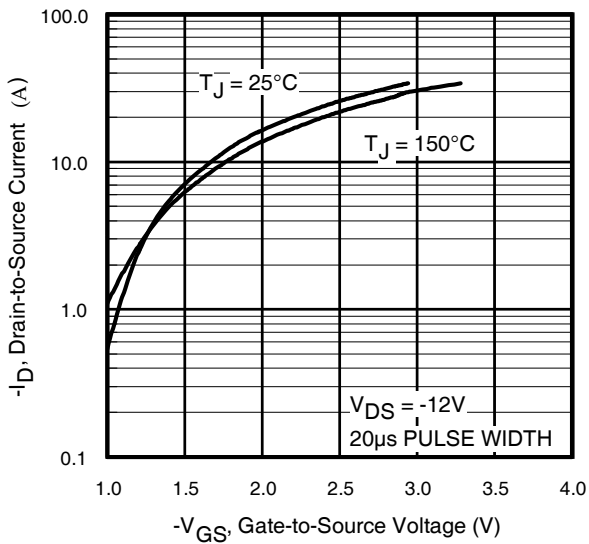


Fig 3. Typical Transfer Characteristics

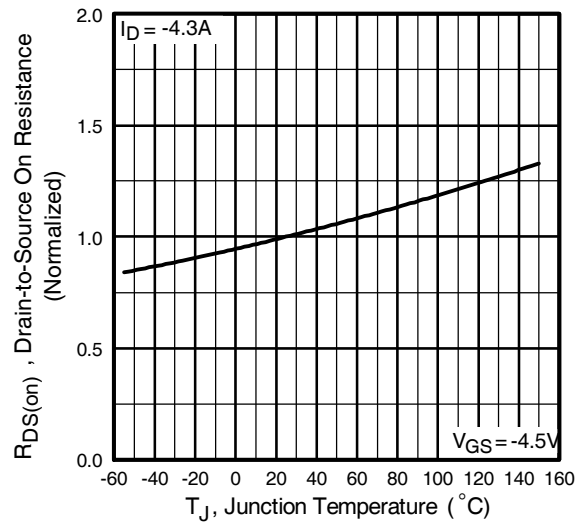
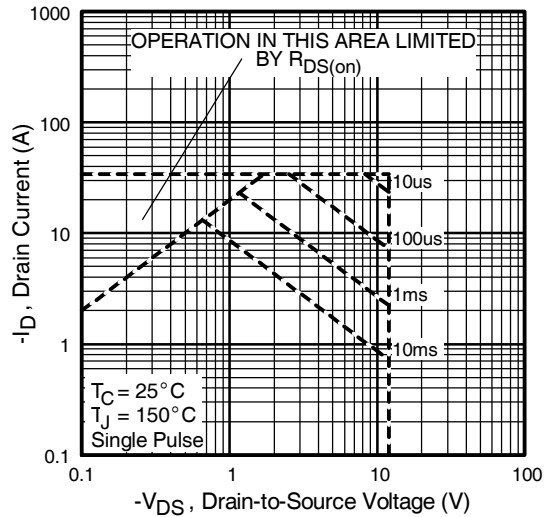
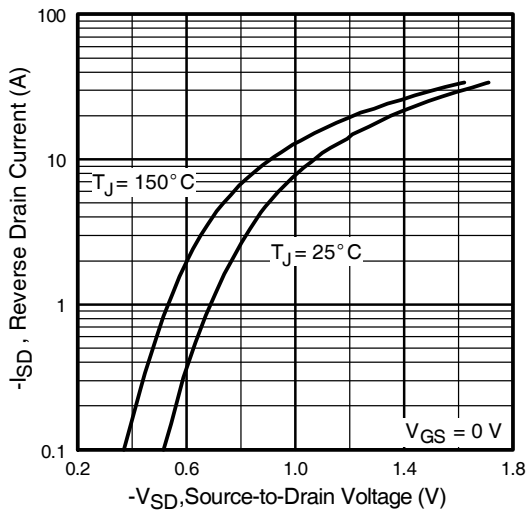
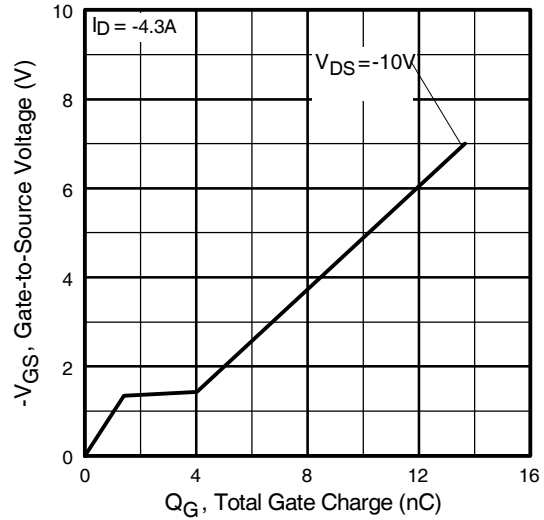
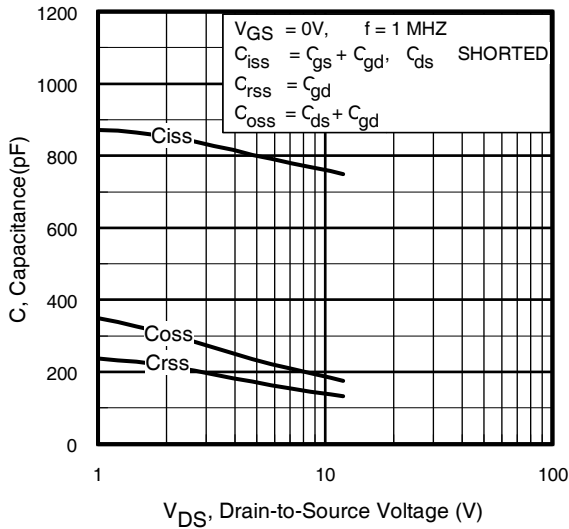


Fig 4. Normalized On-Resistance Vs. Temperature



IRLML6401PbF



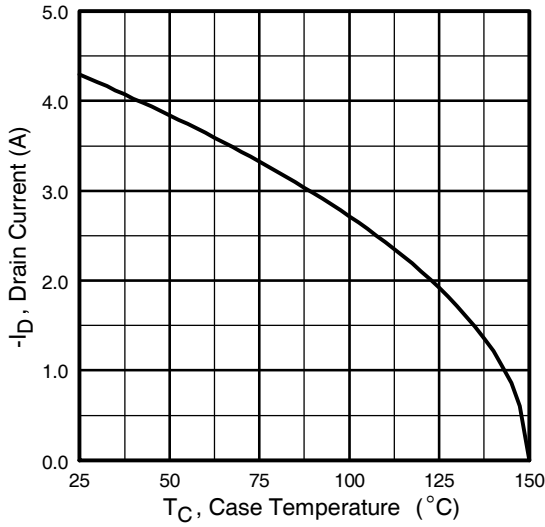


Fig 9. Maximum Drain Current Vs. Case Temperature

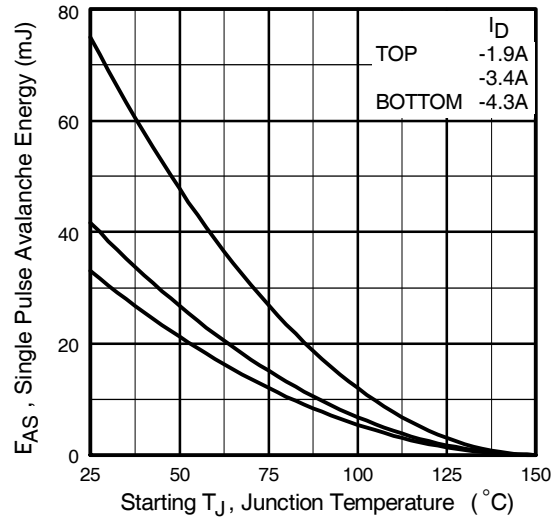


Fig 10. Maximum Avalanche Energy Vs. Drain Current

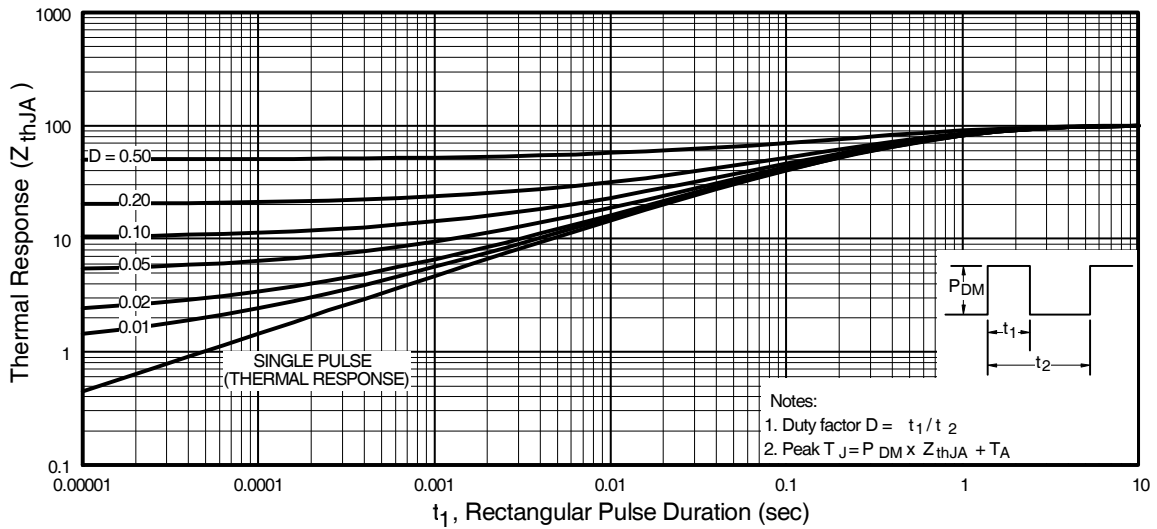


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

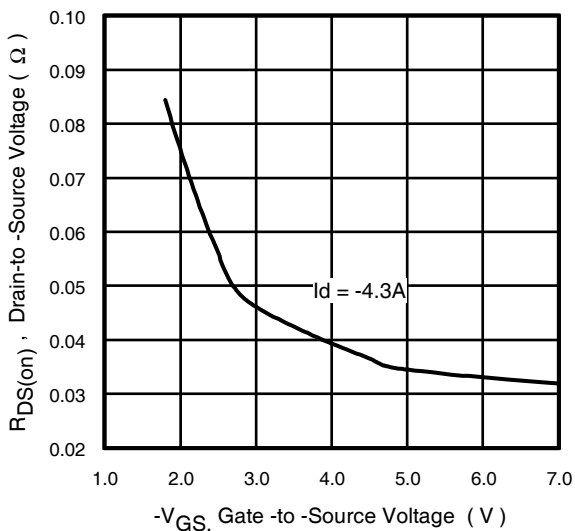


Fig 12. Typical On-Resistance Vs. Gate Voltage

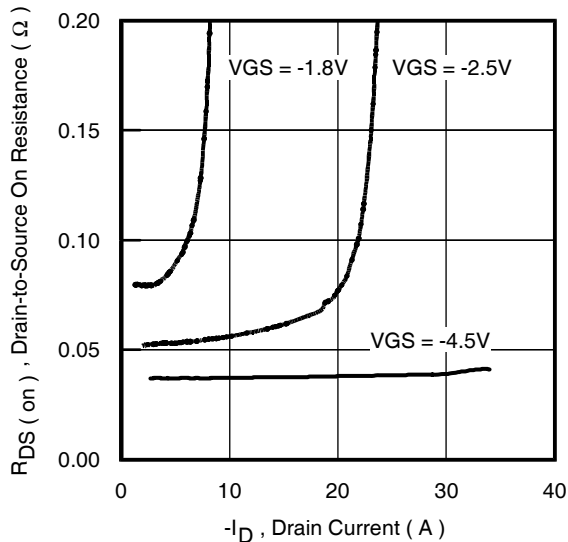


Fig 13. Typical On-Resistance Vs. Drain Current

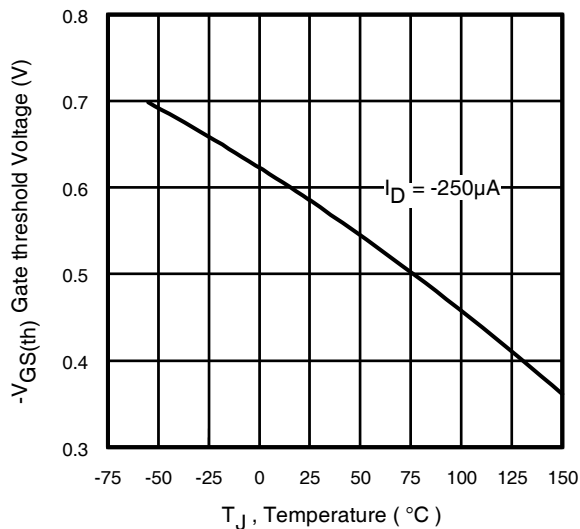
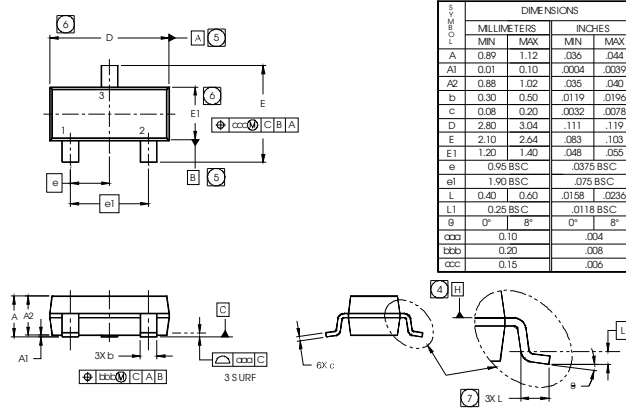


Fig 14. Typical Threshold Voltage Vs. Junction Temperature



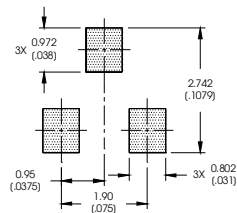
IRLML6401PbF

Micro3 (SOT-23) (Lead-Free) Package Outline
 Dimensions are shown in millimeters (inches)



SYMBOL	DIMENSIONS			
	MILLIMETERS		INCHES	
A	MIN	MAX	MIN	MAX
A	0.89	1.12	.035	.044
A1	0.01	0.10	.004	.009
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		0.0375 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.40	0.60	.0158	.0236
L1	0.25 BSC		.0118 BSC	
g	0°	8°	0°	8°
g1	0.10		.004	
h1	0.20		.008	
h2	0.15		.006	

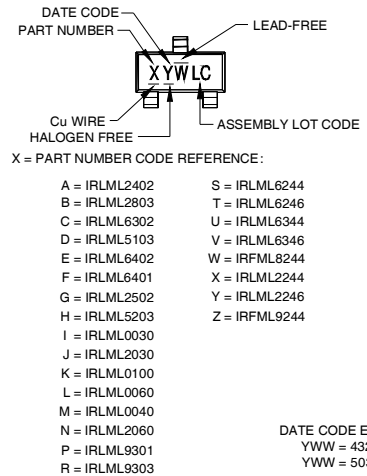
RECOMMENDED FOOT PRINT



- 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



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

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

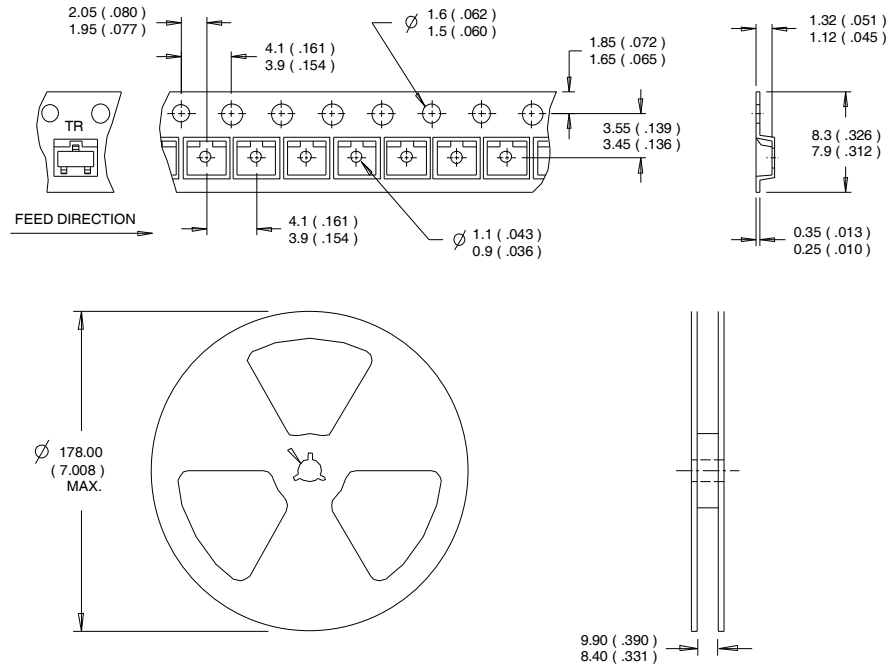
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>



IRLML6401PbF

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>



IRLML6401PbF

Qualification information[†]

Qualification level	Consumer (per JEDEC JESD47F ^{††} guidelines)	
Moisture Sensitivity Level	Micro3™ (SOT-23)	MSL1 (per 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>

^{††} Applicable version of JEDEC standard at the time of product release

Revision History

Date	Comment
4/28/2014	<ul style="list-style-type: none"> • Updated data sheet with new IR corporate template. • Updated package outline & part marking on page 7. • Added Qualification table -Qual level "Consumer" on page 9. • Added bullet point in the Benefits "RoHS Compliant, Halogen -Free" on page 1.

International
 Rectifier

IR WORLD HEADQUARTERS: 101 N. Sepulveda Blvd., El Segundo, California 90245, USA
 To contact International Rectifier, please visit <http://www.irf.com/whoto-call/>

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