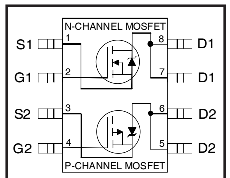
International
IOR Rectifier

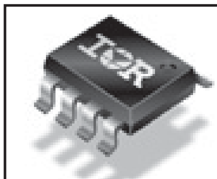
IRF9389PbF

	N-CH	P-CH	
V_{DS}	30	-30	V
$R_{DS(on)}$ max	27	64	mΩ
Q_g (typical)	6.8	8.1	nC
I_D (@T_A = 25°C)	6.8	-4.6	A

HEXFET® Power MOSFET



Top View


SO-8

Applications
- High and Low Side Switches for Inverter
- High and Low Side Switches for Generic Half-Bridge

Features		Benefits
High and low-side MOSFETs in a single package		Increased power density
High-side P-Channel MOSFET		Easier drive circuitry
Industry-standard pinout	results in	Multi-vendor compatibility
Compatible with existing surface mount techniques	⇒	Easier manufacturing
RoHS compliant containing no Lead, no Bromide and no Halogen		Environmentally friendlier
MSL1, Consumer qualification		Increased reliability

Base Part Number	Package Type	Standard Pack		Orderable part number
		Form	Quantity	
IRF9389PbF	SO-8	Tube/Bulk	95	IRF9389PbF
		Tape and Reel	4000	IRF9389TRPbF

Absolute Maximum Ratings

	Parameter	Max.		Units
		N-Channel	P-Channel	
V_{GS}	Gate-to-Source Voltage	±20	±20	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	6.8	-4.6	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	5.4	-3.7	A
I_{DM}	Pulsed Drain Current ①	34	-23	A
P_D @T_A = 25°C	Power Dissipation	2.0		W
P_D @T_A = 70°C	Power Dissipation	1.3		W
	Linear Derating Factor	0.016		W/°C
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150		°C

Thermal Resistance

	Parameter	Typ.	Max	Units
$R_{\theta JL}$	Junction-to-Drain Lead ④	——	20	°C/W
$R_{\theta JA}$	Junction-to-Ambient ③	——	62.5	°C/W

Static @ T_J = 25°C (unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	N-Ch	30	—	—	V	V_{GS} = 0V, I_D = 250μA
		P-Ch	-30	—	—		V_{GS} = 0V, I_D = -250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.03	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	0.02	—		Reference to 25°C, I_D = -1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	N-Ch	—	22	27	mΩ	V_{GS} = 10V, I_D = 6.8A ②
			—	33	40		V_{GS} = 4.5V, I_D = 5.4A ②
		P-Ch	—	51	64	mΩ	V_{GS} = -10V, I_D = -4.6A ②
			—	82	103		V_{GS} = -4.5V, I_D = -3.7A ②
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.3	1.8	2.3	V	V_{DS} = V_{GS}, I_D = 10μA
		P-Ch	-1.3	-1.8	-2.3		V_{DS} = V_{GS}, I_D = -10μA
I_{DSS}	Drain-to-Source Leakage Current	N-Ch	—	—	1.0	μA	V_{DS} = 24V, V_{GS} = 0V
		P-Ch	—	—	-1.0		V_{DS} = -24V, V_{GS} = 0V
		N-Ch	—	—	150		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
		P-Ch	—	—	-150		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	N-Ch	—	—	100	nA	V_{GS} = 20V
		P-Ch	—	—	-100		V_{GS} = -20V
	Gate-to-Source Reverse Leakage	N-Ch	—	—	-100		V_{GS} = -20V
		P-Ch	—	—	100		V_{GS} = 20V
gfs	Forward Transconductance	N-Ch	8.2	—	—	S	V_{DS} = 15V, I_D = 5.4A
		P-Ch	4.1	—	—		V_{DS} = -15V, I_D = -3.7A
Q_g	Total Gate Charge	N-Ch	—	6.8	14	nC	N-Channel
		P-Ch	—	8.1	16		V_{GS} = 10V, V_{DS} = 15V, I_D = 6.8A
Q_{gs}	Gate-to-Source Charge	N-Ch	—	1.4	—		
		P-Ch	—	1.3	—		P-Channel
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	0.98	—		V_{GS} = -10V, V_{DS} = -15V, I_D = -4.6A
		P-Ch	—	2.1	—		
R_G	Gate Resistance	N-Ch	—	2.2	4.4	Ω	
		P-Ch	—	9.4	19		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	5.1	—	ns	N-Channel
		P-Ch	—	8.0	—		V_{DD} = 15V, V_{GS} = 4.5V ②
t_r	Rise Time	N-Ch	—	4.8	—		I_D = 1.0A, R_G = 6.2Ω
		P-Ch	—	14	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	4.9	—		P-Channel
		P-Ch	—	17	—		V_{DD} = -15V, V_{GS} = -4.5V ②
t_f	Fall Time	N-Ch	—	3.9	—		I_D = -1.0A, R_G = 6.8Ω
		P-Ch	—	15	—		
C_{iss}	Input Capacitance	N-Ch	—	398	—	pF	N-Channel
		P-Ch	—	383	—		V_{GS} = 0V, V_{DS} = 15V, ƒ = 1.0MHz
C_{oss}	Output Capacitance	N-Ch	—	82	—		
		P-Ch	—	104	—		P-Channel
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	36	—		V_{GS} = 0V, V_{DS} = -15V, ƒ = 1.0KHz
		P-Ch	—	64	—		

Diode Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode	N-Ch	—	—	2.0	A	
		P-Ch	—	—	-2.0		
I_{SM}	Pulsed Source Current (Body Diode)	N-Ch	—	—	34		
		P-Ch	—	—	-23		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.2	V	T_J = 25°C, I_S = 2.0A, V_{GS} = 0V ②
		P-Ch	—	—	-1.2		T_J = 25°C, I_S = -2.0A, V_{GS} = 0V ②
t_{rr}	Reverse Recovery Time	N-Ch	—	8.4	13	ns	N-Channel: T_J = 25°C, I_F = 2.0A,
		P-Ch	—	11	17		V_{DD} = 15V, di/dt = 102/μs ②
Q_{rr}	Reverse Recovery Charge	N-Ch	—	2.3	3.5	nC	P-Channel: T_J = 25°C, I_F = -2.0A,
		P-Ch	—	4.8	7.2		V_{DD} = -15V, di/dt = 102/μs ②

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 16)

② Pulse width ≤ 400μs; duty cycle ≤ 2%.

③ Surface mounted on 1 in square Cu board

④ R_θ is measured at T_J approximately 90°C

N-Channel

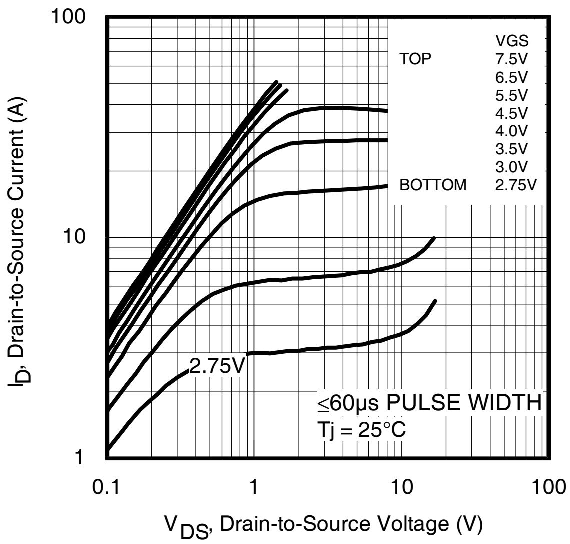


Fig 1. Typical Output Characteristics

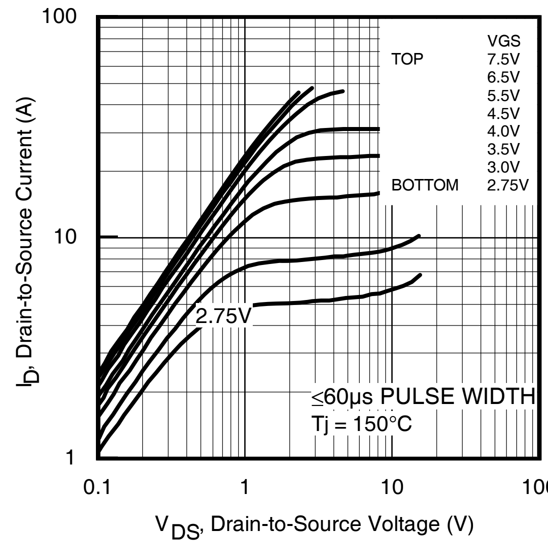


Fig 2. Typical Output Characteristics

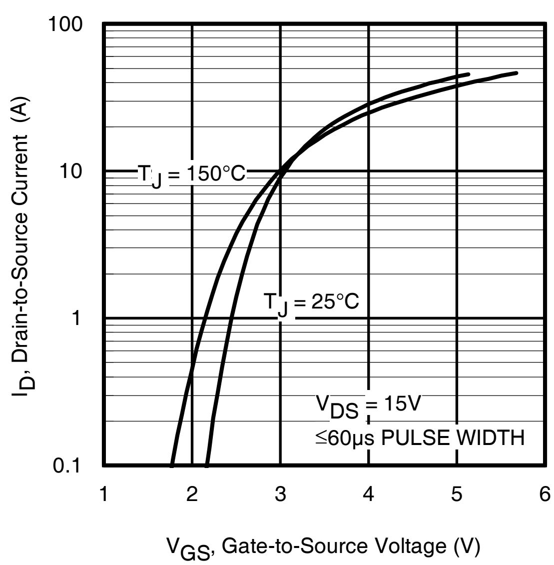


Fig 3. Typical Transfer Characteristics

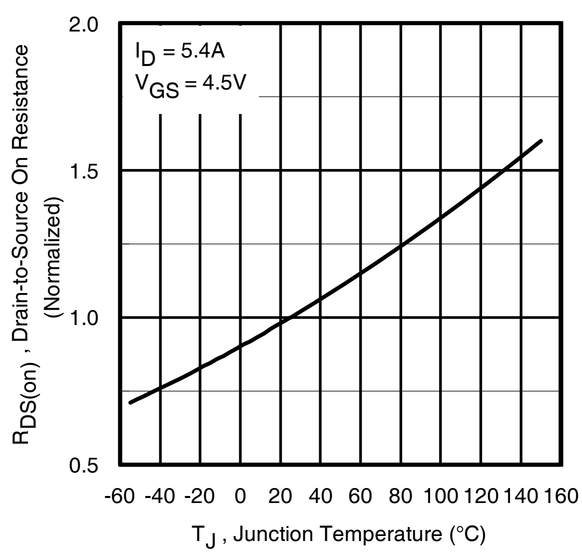


Fig 4. Normalized On-Resistance vs. Temperature

N-Channel

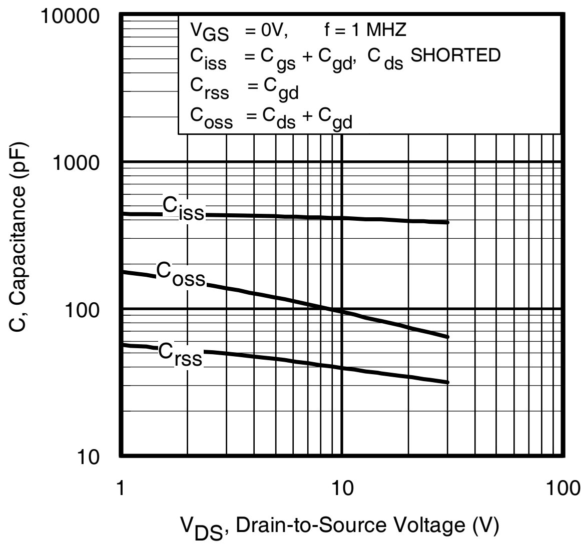


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

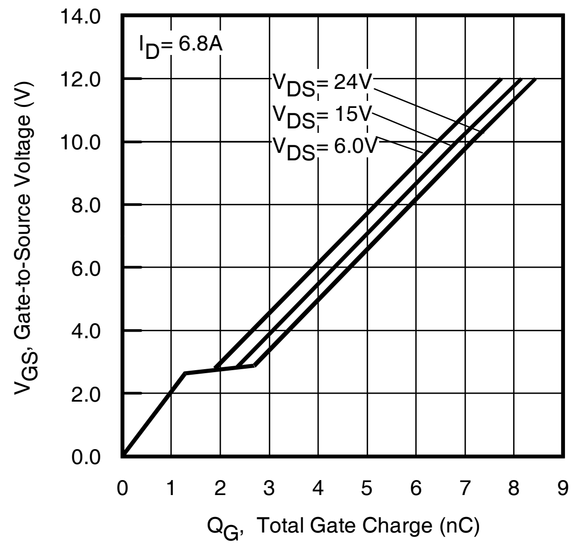


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

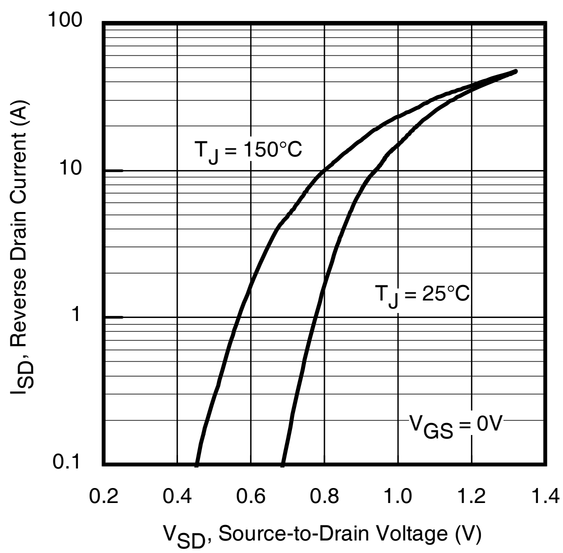


Fig 7. Typical Source-Drain Diode Forward Voltage

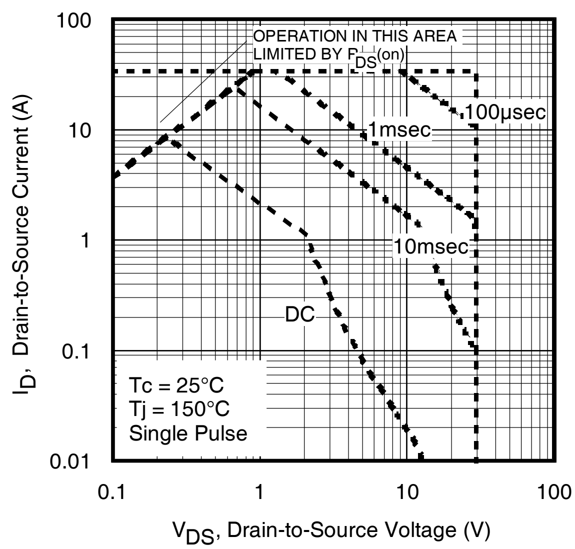


Fig 8. Maximum Safe Operating Area

N-Channel

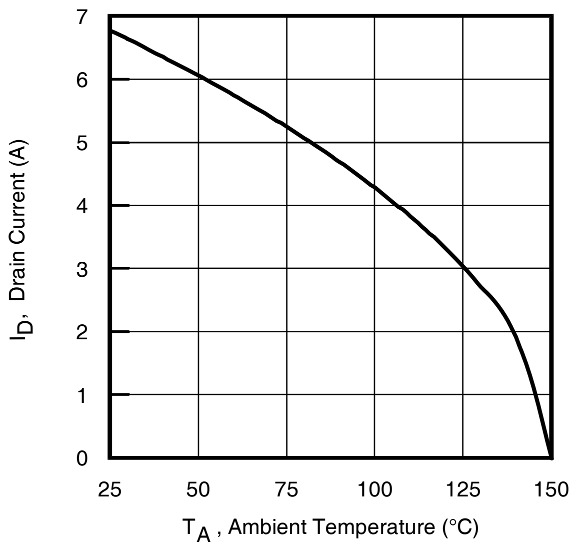


Fig 9. Maximum Drain Current vs. Ambient Temperature

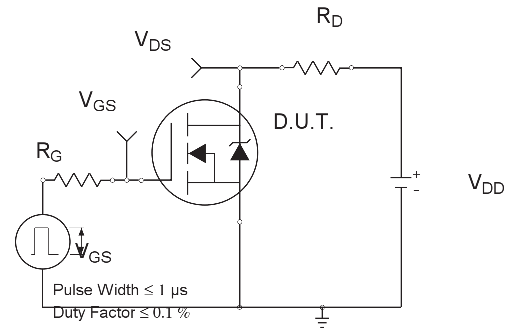


Fig 10a. Switching Time Test Circuit

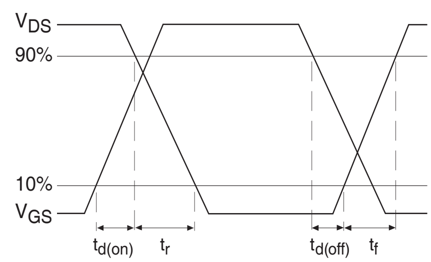


Fig 10b. Switching Time Waveforms

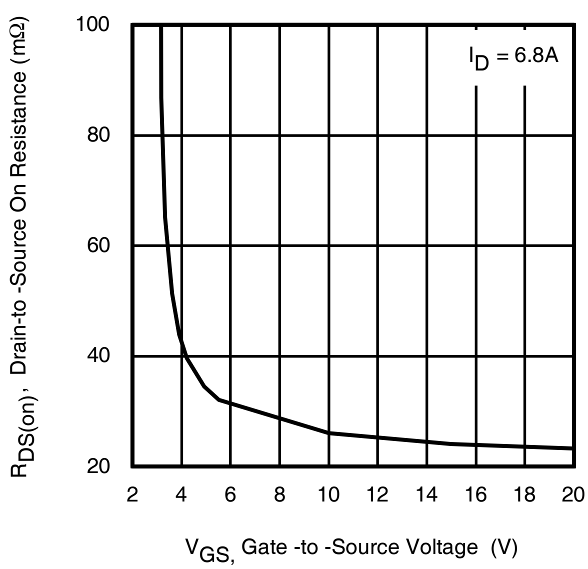


Fig 11. Typical On-Resistance vs. Gate Voltage

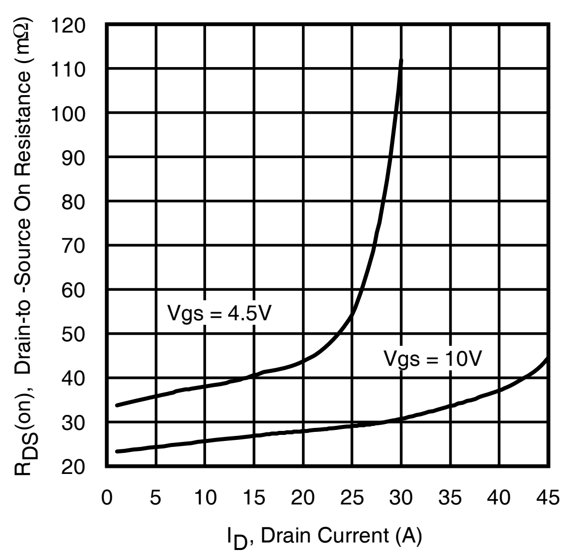


Fig 12. Typical On-Resistance vs. Drain Current

N-Channel

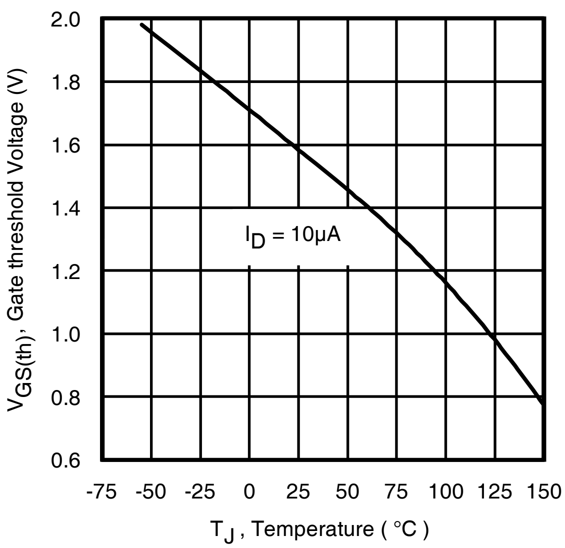


Fig 13. Threshold Voltage vs. Temperature

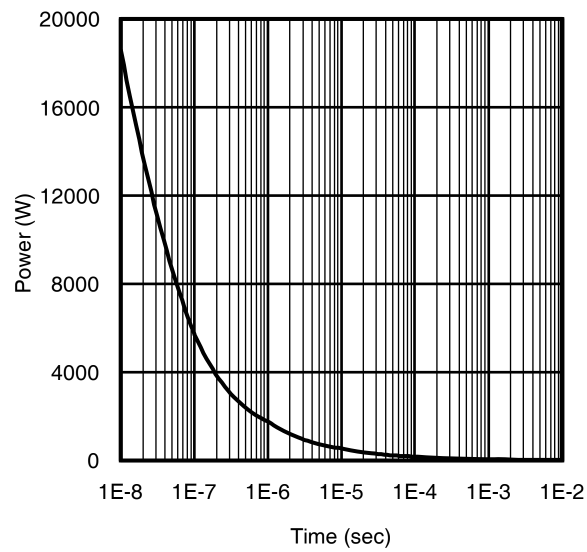


Fig 14. Typical Power vs. Time

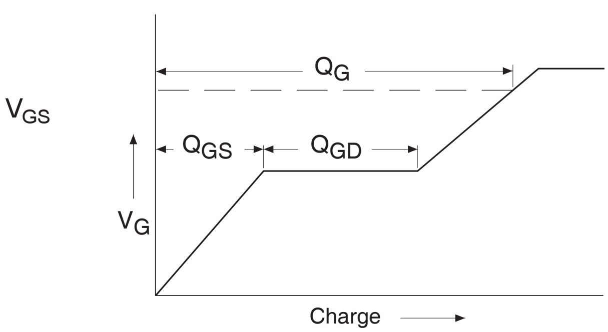


Fig 15a. Basic Gate Charge Waveform

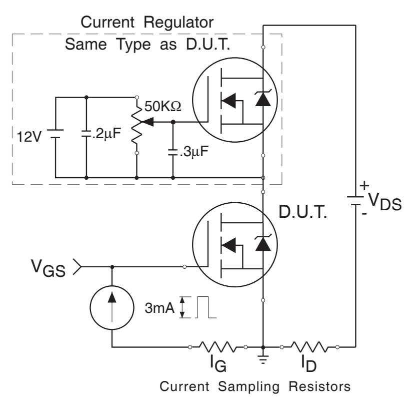


Fig 15b. Gate Charge Test Circuit

N and P-Channel

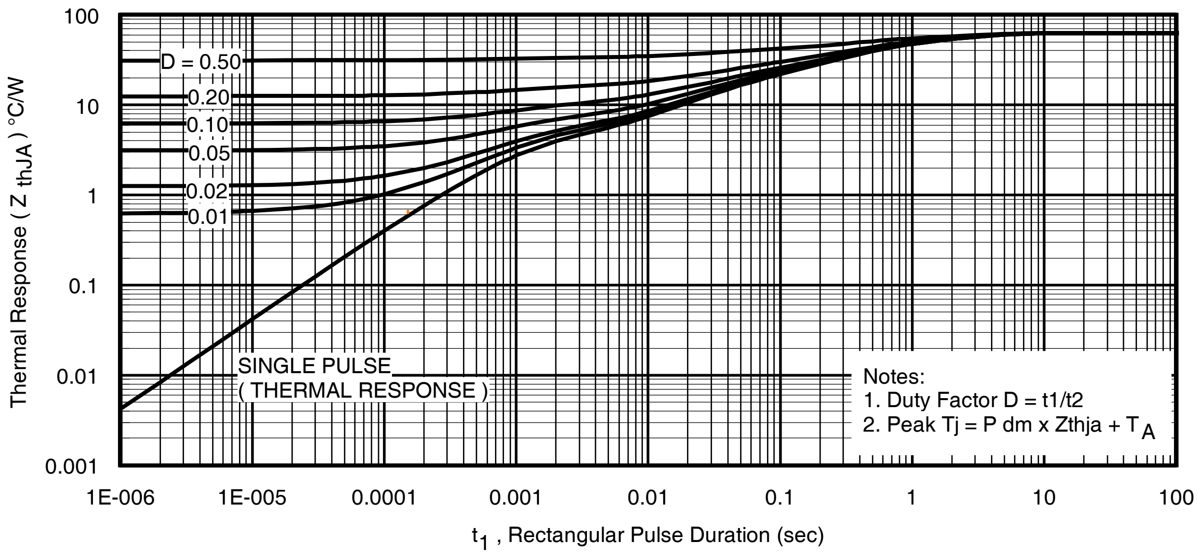


Fig 16. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

P-Channel

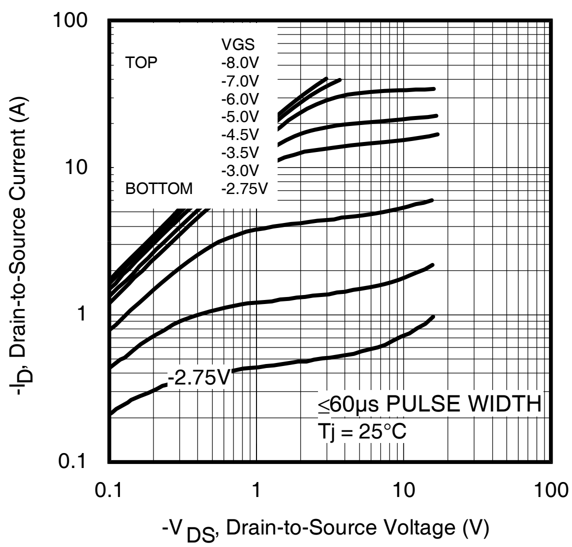


Fig 17. Typical Output Characteristics

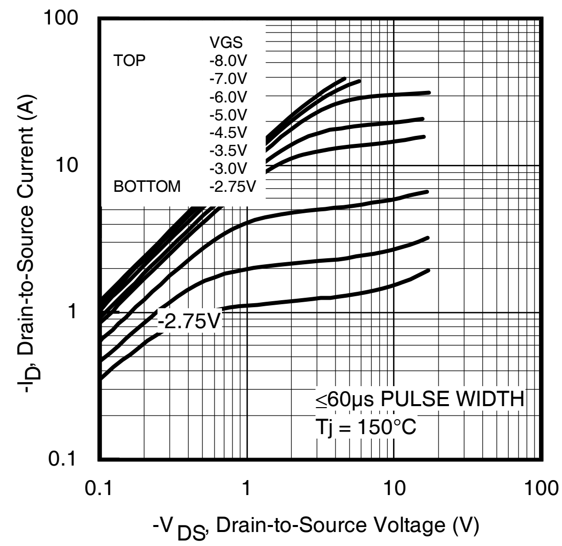


Fig 18. Typical Output Characteristics

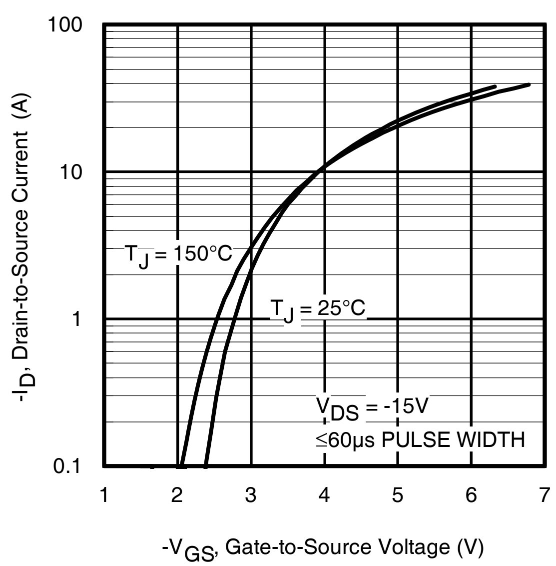


Fig 19. Typical Transfer Characteristics

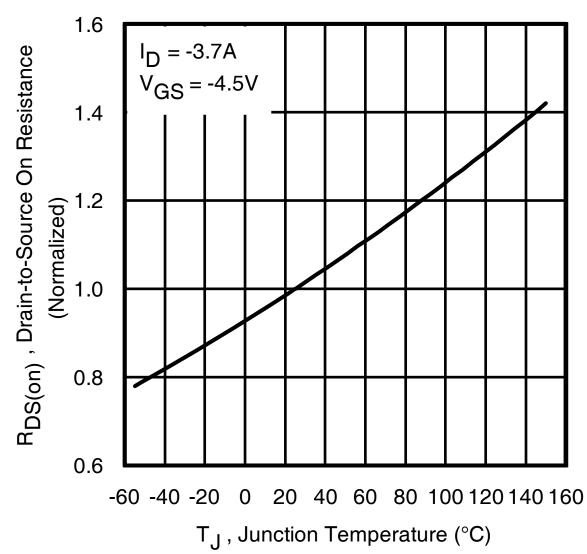


Fig 20. Normalized On-Resistance vs. Temperature

P-Channel

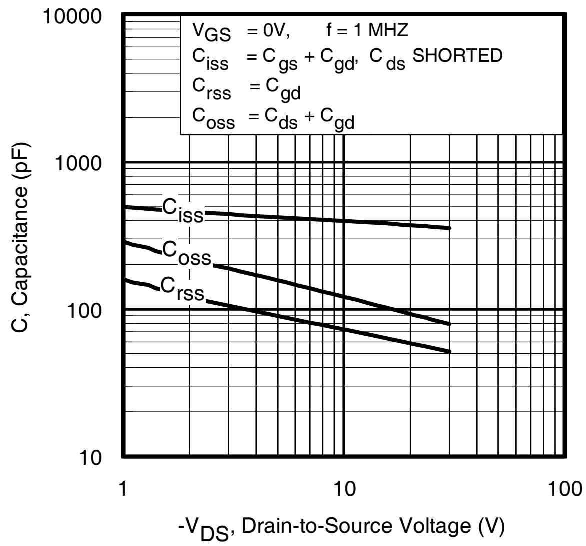


Fig 21. Typical Capacitance vs. Drain-to-Source Voltage

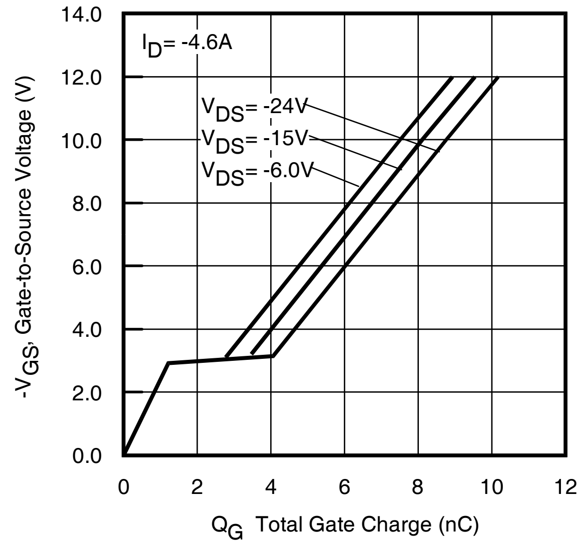


Fig 22. Typical Gate Charge vs. Gate-to-Source Voltage

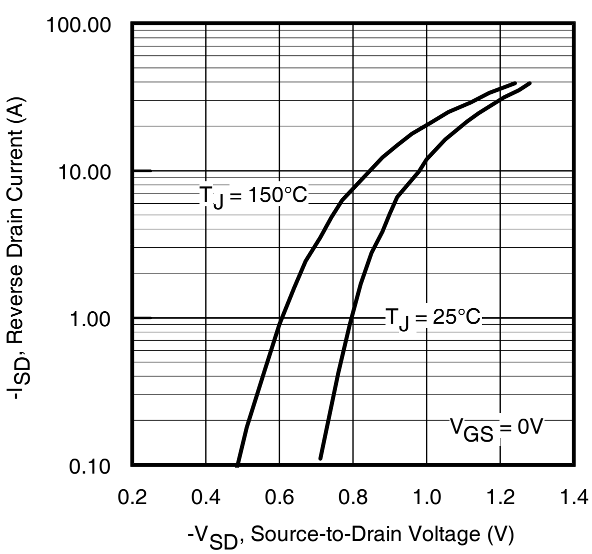


Fig 23. Typical Source-Drain Diode Forward Voltage

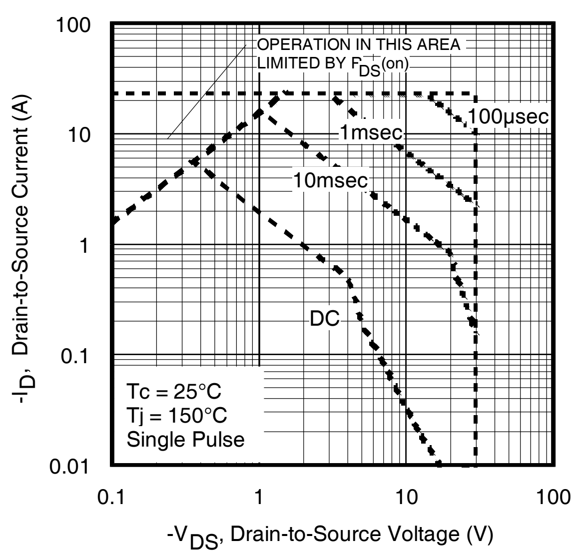


Fig 24. Maximum Safe Operating Area

P-Channel

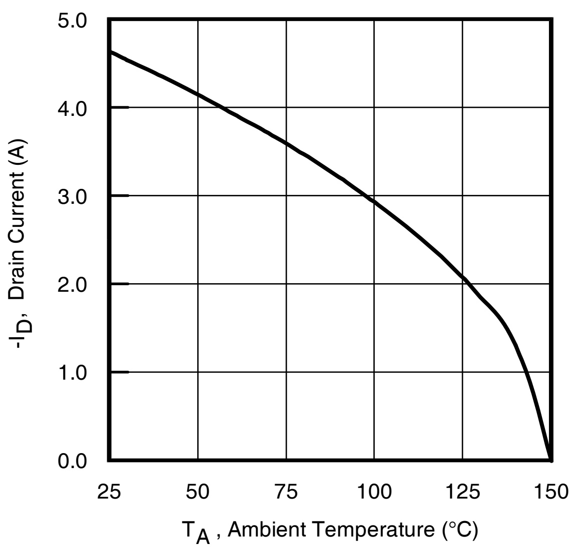


Fig 25. Maximum Drain Current vs. Ambient Temperature

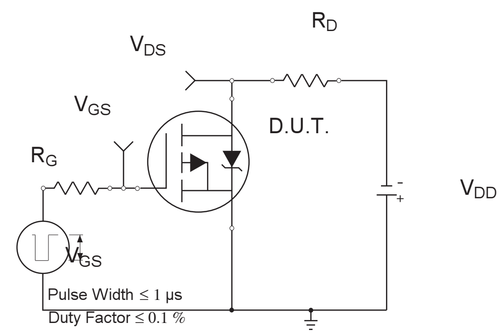


Fig 26a. Switching Time Test Circuit

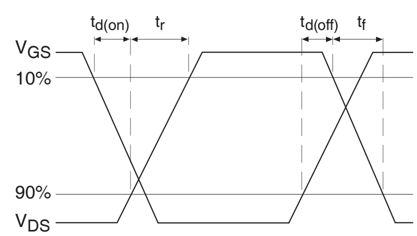


Fig 26b. Switching Time Waveforms

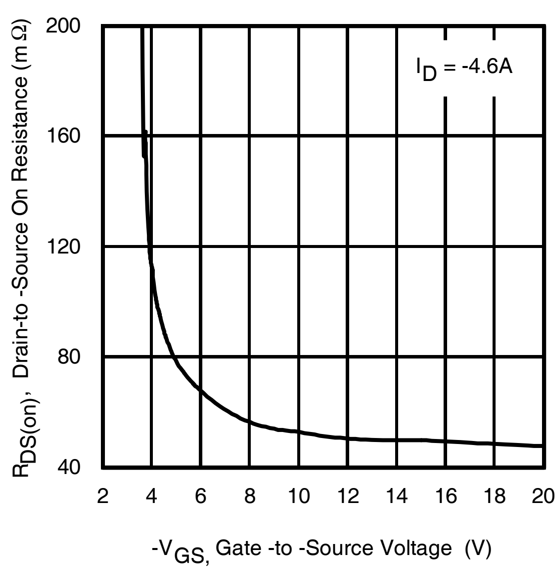


Fig 27. Typical On-Resistance vs. Gate Voltage

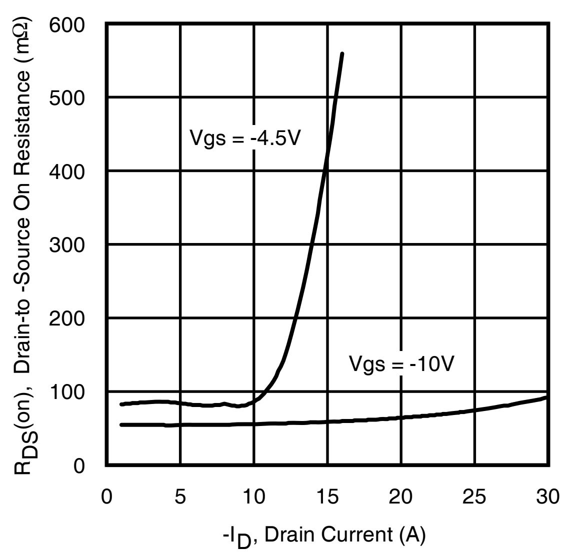


Fig 28. Typical On-Resistance vs. Drain Current

P-Channel

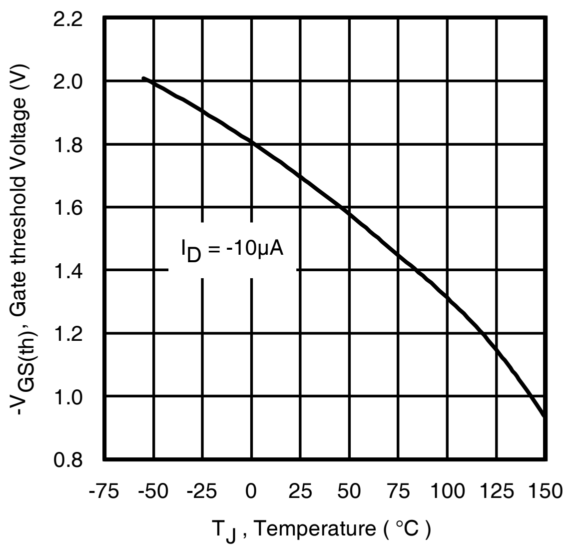


Fig 29. Threshold Voltage vs. Temperature

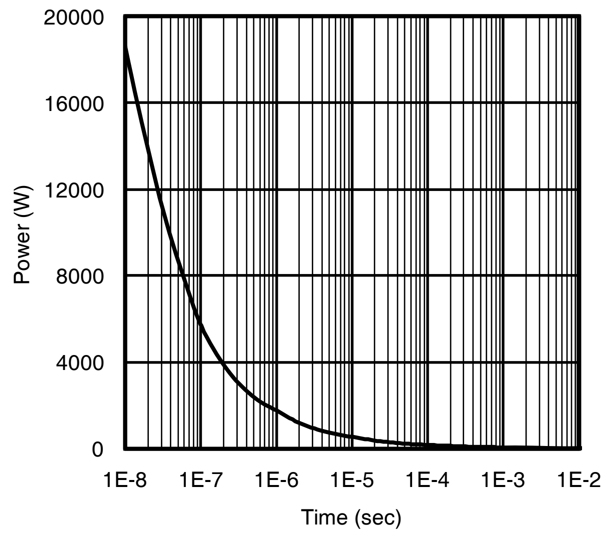


Fig 30. Typical Power vs. Time

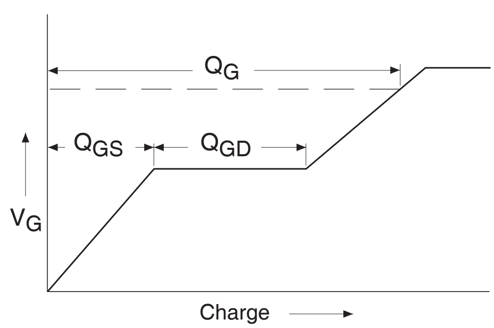


Fig 31a. Basic Gate Charge Waveform

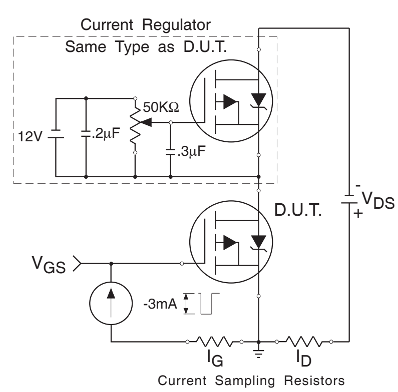
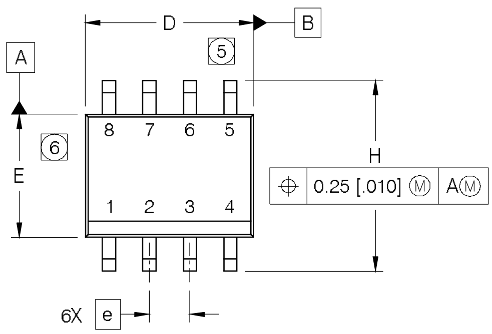
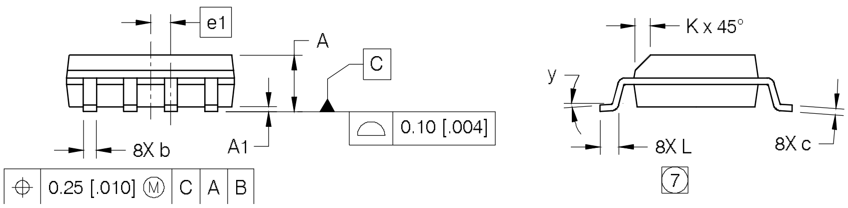


Fig 31b. Gate Charge Test Circuit

SO-8 Package Details



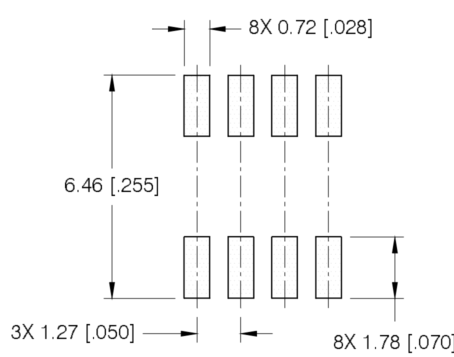
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e 1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



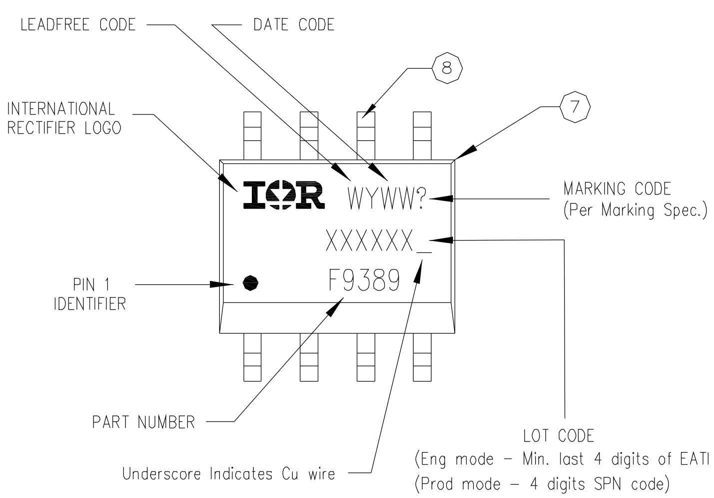
NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT

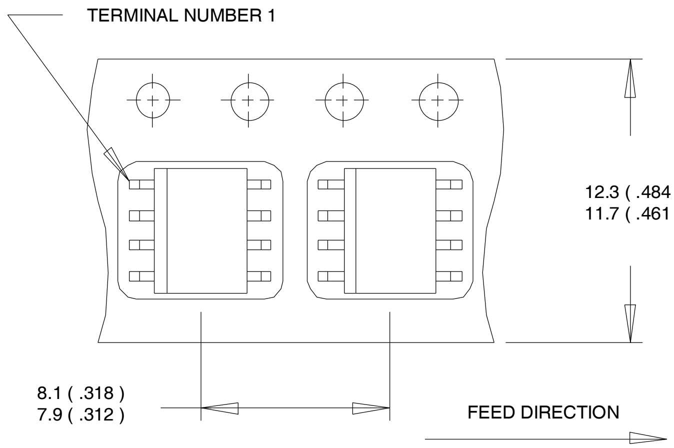


SO-8 Part Marking

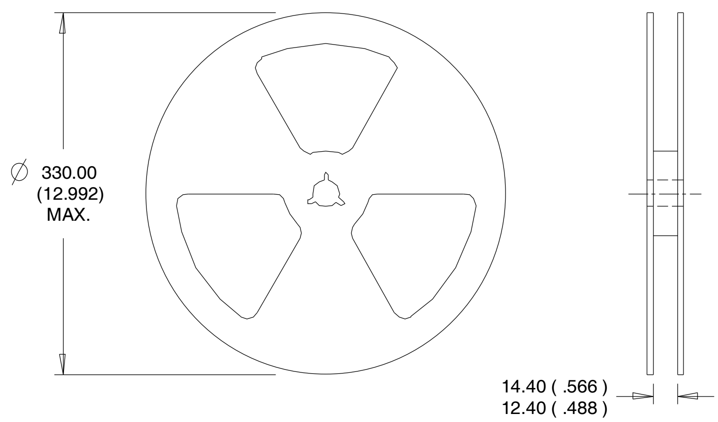


Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

Tape and Reel



NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



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

Qualification information†

Qualification level	Consumer (per JEDEC JESD47F †† guidelines)	
Moisture Sensitivity Level	SO-8	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.

International Rectifier

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