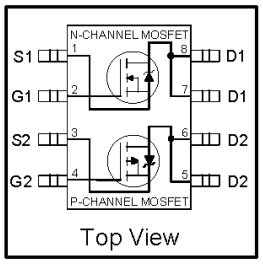
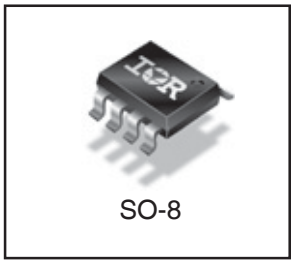
International
IOR Rectifier

IRF7309TRPbF-1

HEXFET® Power MOSFET

	N-CH	P-CH	V
V_{DS}	30	-30	V
$R_{DS(on)\ max}$ (@V_{GS} = 10V)	0.05	0.10	Ω
$Q_{g\ (max)}$	25	25	nC
I_D (@T_A = 25°C)	4.0	-3.0	A





Features		Benefits
Industry-standard pinout SO-8 Package	⇒	Multi-Vendor Compatibility
Compatible with Existing Surface Mount Techniques		Easier Manufacturing
RoHS Compliant, Halogen-Free		Environmentally Friendlier
MSL1, Industrial qualification		Increased Reliability

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF7309PbF-1	SO-8	Tape and Reel	4000	IRF7309TRPbF-1

Absolute Maximum Ratings

Parameter		Max.		Units
		N-Channel	P-Channel	
I_D @ T_A = 25°C	10 Sec. Pulse Drain Current, V_{GS} @ 10V	4.7	-3.5	A
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	4.0	-3.0	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	3.2	-2.4	A
I_{DM}	Pulsed Drain Current ①	16	-12	A
P_D @T_A = 25°C	Power Dissipation (PCB Mount)**	1.4		W
	Linear Derating Factor (PCB Mount)**	0.011		W/°C
V_{GS}	Gate-to-Source Voltage	± 20		V
dv/dt	Peak Diode Recovery dv/dt ②	6.9	-6.0	V/ns
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150		°C

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Amb. (PCB Mount, steady state)**	——–	——–	90	°C/W

** When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	30	—	—	V	V_{GS} = 0V, I_D = 250µA
		P-Ch	-30	—	—		V_{GS} = 0V, I_D = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.032	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	-0.037	—		Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch	—	—	0.050	Ω	V_{GS} = 10V, I_D = 2.4A ③
			—	—	0.080		V_{GS} = 4.5V, I_D = 2.0A ③
		P-Ch	—	—	0.10		V_{GS} = -10V, I_D = -1.8A ③
			—	—	0.16		V_{GS} = -4.5V, I_D = -1.5A ③
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.0	—	—	V	V_{DS} = V_{GS}, I_D = 250µA
		P-Ch	-1.0	—	—		V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	N-Ch	5.2	—	—	S	V_{DS} = 15V, I_D = 2.4A ③
		P-Ch	2.5	—	—		V_{DS} = -24V, I_D = -1.8A ③
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	—	—	25		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
		P-Ch	—	—	-25		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	N-P	—	—	±100		V_{GS} = ± 20V
Q_g	Total Gate Charge	N-Ch	—	—	25	nC	N-Channel I_D = 2.6A, V_{DS} = 16V, V_{GS} = 4.5V ③ P-Channel I_D = -2.2A, V_{DS} = -16V, V_{GS} = -4.5V
		P-Ch	—	—	25		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	—	2.9		
		P-Ch	—	—	2.9		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	—	7.9		
		P-Ch	—	—	9.0		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	6.8	—	ns	N-Channel V_{DD} = 10V, I_D = 2.6A, R_G = 6.0Ω, R_D = 3.8Ω ③ P-Channel V_{DD} = -10V, I_D = -2.2A, R_G = 6.0Ω, R_D = 4.5Ω
		P-Ch	—	11	—		
t_r	Rise Time	N-Ch	—	21	—		
		P-Ch	—	17	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	22	—		
		P-Ch	—	25	—		
t_f	Fall Time	N-Ch	—	7.7	—		
		P-Ch	—	18	—		
L_D	Internal Drain Inductace	N-P	—	4.0	—	nH	Between lead tip and center of die contact
L_S	Internal Source Inductance	N-P	—	6.0	—		
C_{iss}	Input Capacitance	N-Ch	—	520	—	pF	N-Channel V_{GS} = 0V, V_{DS} = 15V, f = 1.0MHz ④ P-Channel V_{GS} = 0V, V_{DS} = -15V, f = 1.0MHz
		P-Ch	—	440	—		
C_{oss}	Output Capacitance	N-Ch	—	180	—		
		P-Ch	—	200	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	72	—		
		P-Ch	—	93	—		

Source-Drain Ratings and Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	N-Ch	—	—	1.8	A	
		P-Ch	—	—	-1.8		
I_{SM}	Pulsed Source Current (Body Diode) ①	N-Ch	—	—	16		
		P-Ch	—	—	-12		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.0	V	T_J = 25°C, I_S = 1.8A, V_{GS} = 0V ③
		P-Ch	—	—	-1.0		T_J = 25°C, I_S = -1.8A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	N-Ch	—	47	71	ns	N-Channel T_J = 25°C, I_F = 2.6A, di/dt = 100A/µs P-Channel ④ T_J = 25°C, I_F = -2.2A, di/dt = 100A/µs
		P-Ch	—	53	80		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	56	84	nC	
		P-Ch	—	66	99		
t_{on}	Forward Turn-On Time	N-P	Intrinsic turn-on time is neglegible (turn-on is dominated by L_S+L_D)				

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 23)

② N-Channel I_{SD} ≤ 2.4A, di/dt ≤ 73A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C
P-Channel I_{SD} ≤ -1.8A, di/dt ≤ 90A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

N-Channel

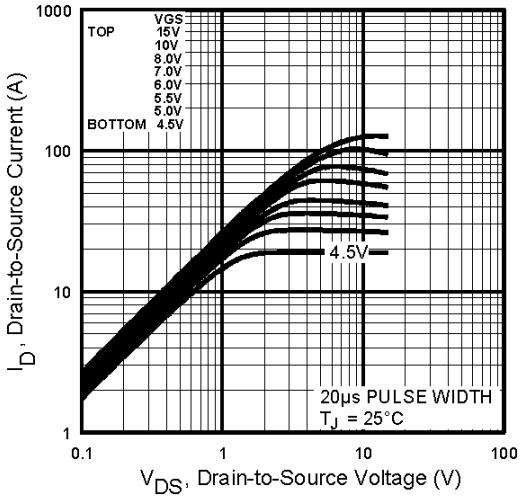


Fig 1. Typical Output Characteristics, T_J = 25ºC

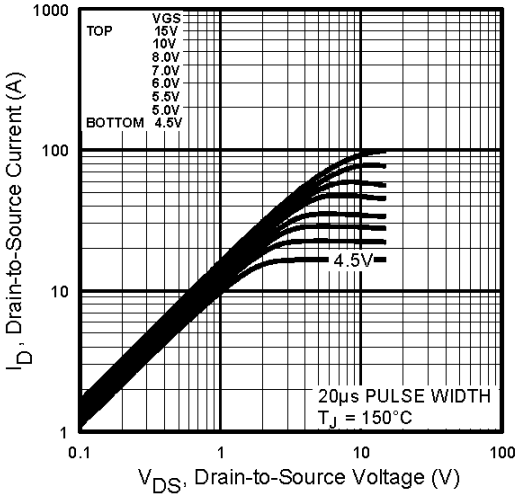


Fig 2. Typical Output Characteristics, T_J = 150ºC

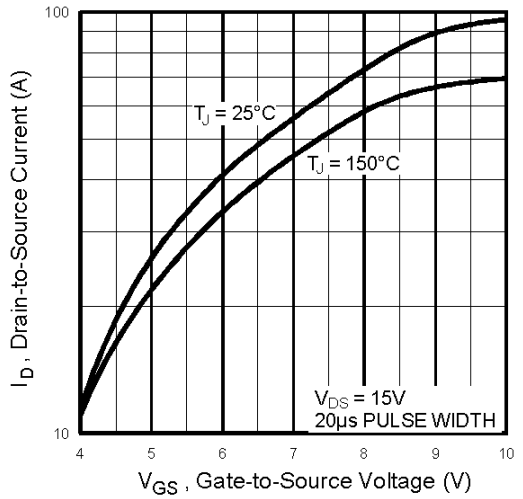


Fig 3. Typical Transfer Characteristics

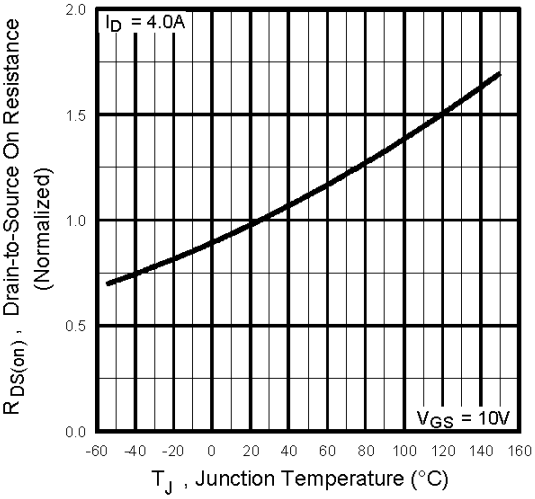


Fig 4. Normalized On-Resistance Vs. Temperature

N-Channel

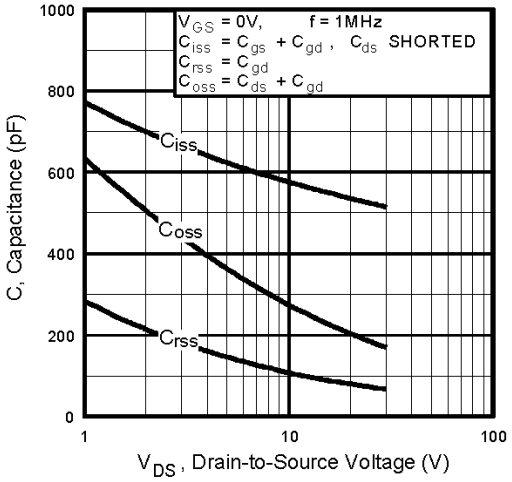


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

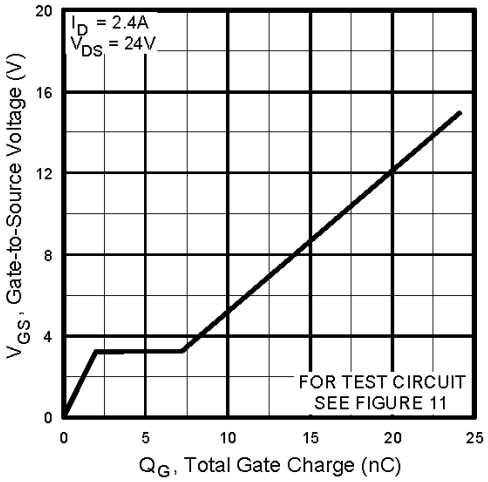


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

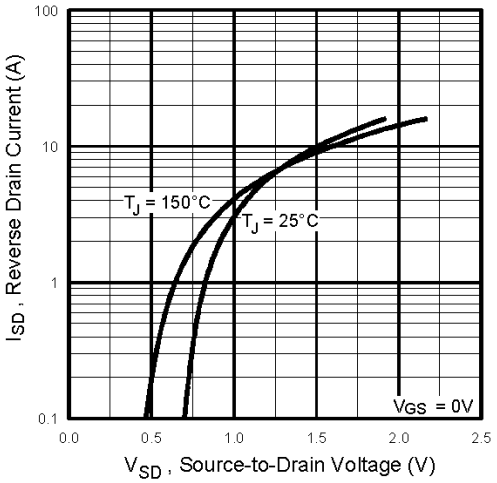


Fig 7. Typical Source-Drain Diode Forward Voltage

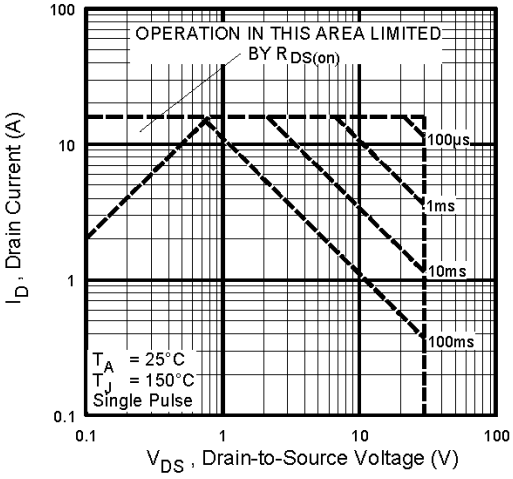


Fig 8. Maximum Safe Operating Area

N-Channel

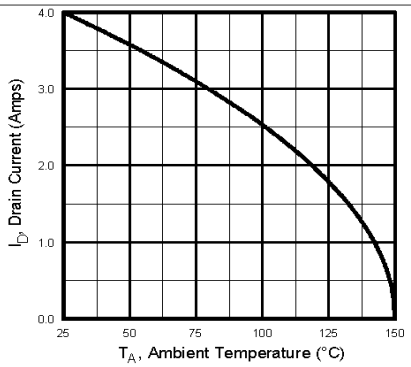


Fig 9. Max. Drain Current Vs. Ambient Temp.

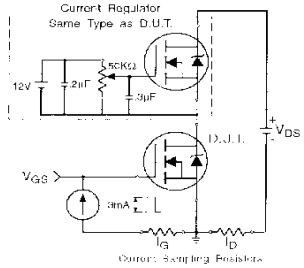


Fig 11a. Gate Charge Test Circuit

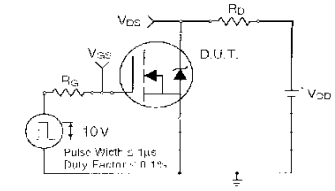


Fig 10a. Switching Time Test Circuit

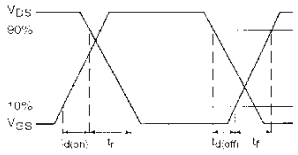


Fig 10b. Switching Time Waveforms

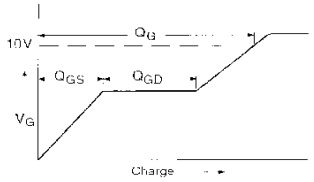


Fig 11b. Basic Gate Charge Waveform

P-Channel

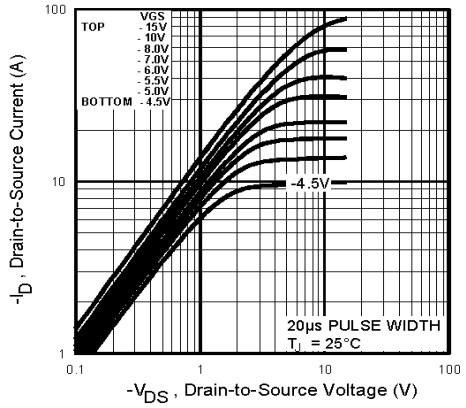


Fig 12. Typical Output Characteristics, T_J = 25ºC

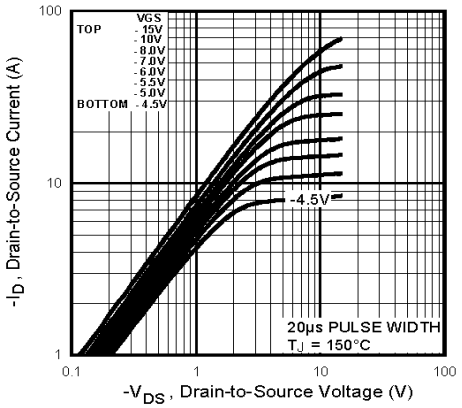


Fig 13. Typical Output Characteristics, T_J = 150ºC

P-Channel

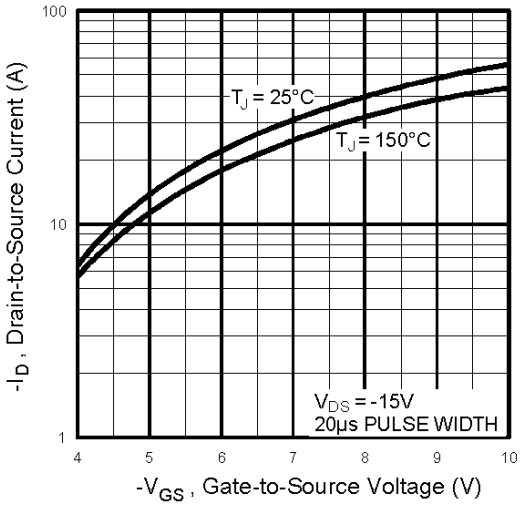


Fig 14. Typical Transfer Characteristics

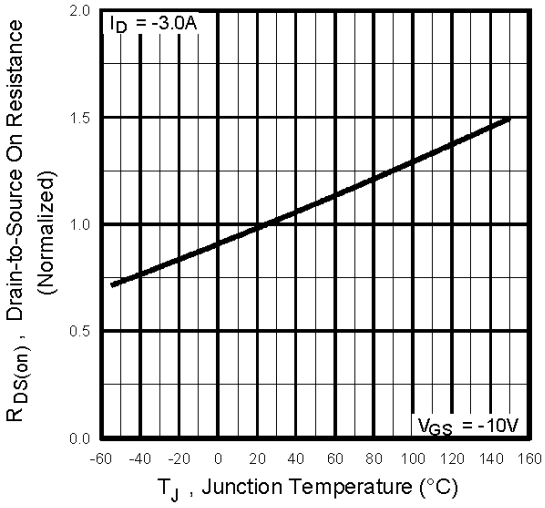


Fig 15. Normalized On-Resistance Vs. Temperature

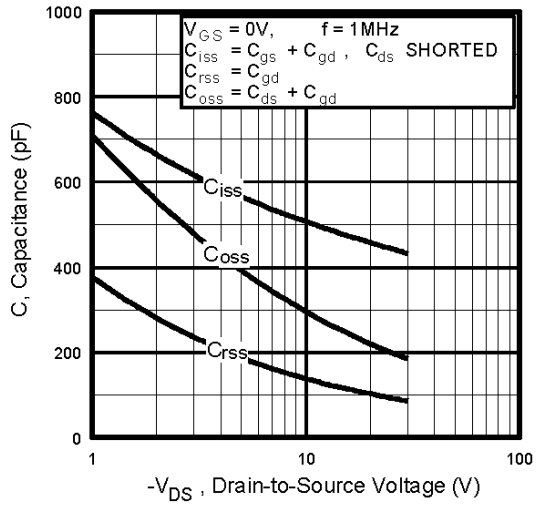


Fig 16. Typical Capacitance Vs. Drain-to-Source Voltage

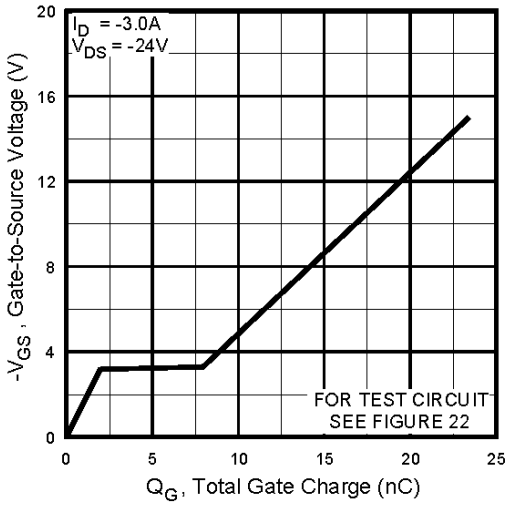


Fig 17. Typical Gate Charge Vs. Gate-to-Source Voltage

P-Channel

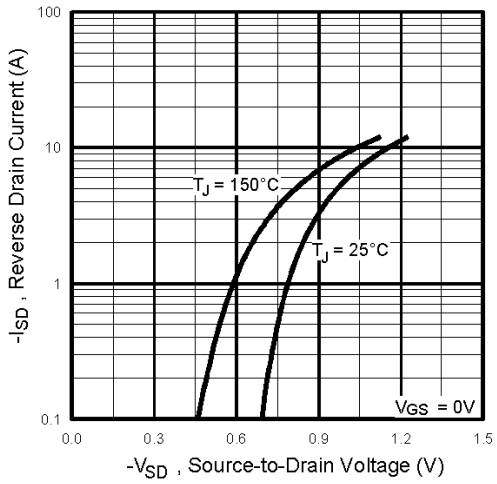


Fig 18. Typical Source-Drain Diode Forward Voltage

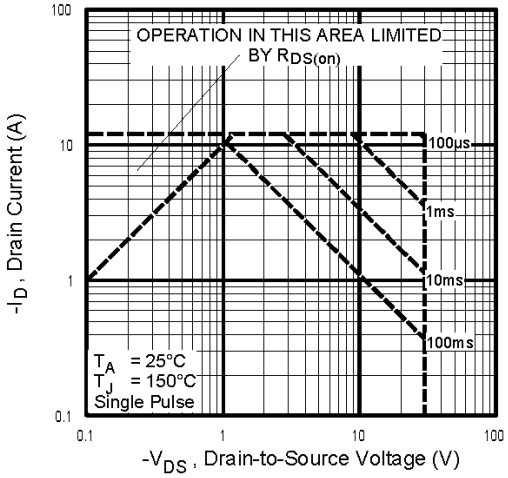


Fig 19. Maximum Safe Operating Area

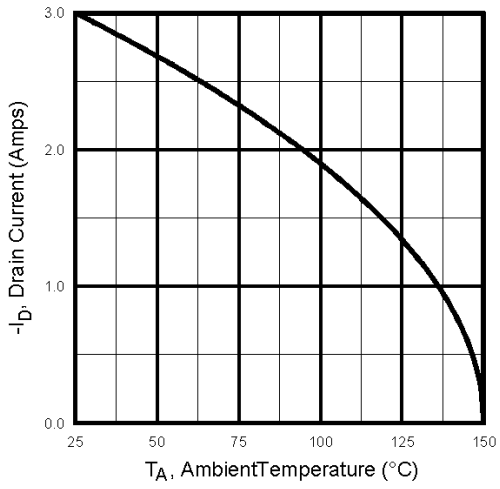


Fig 20. Max.Drain Current Vs. Ambient Temp.

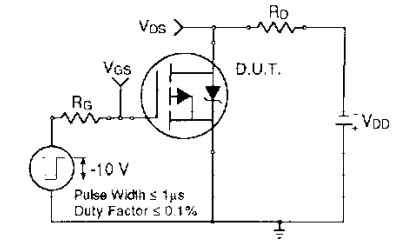


Fig 21a. Switching Time Test Circuit

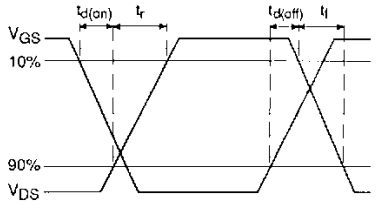


Fig 21b. Switching Time Waveforms

P-Channel

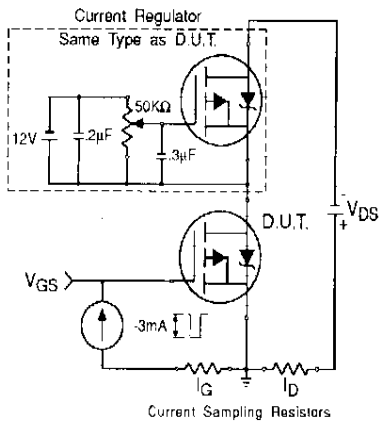


Fig 22b. Gate Charge Test Circuit

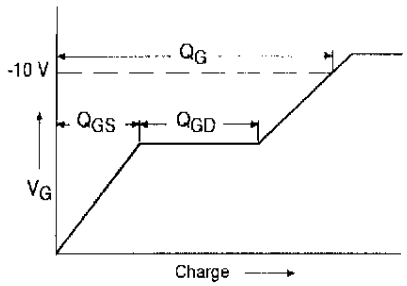


Fig 22b. Basic Gate Charge Waveform

N- and P-Channel

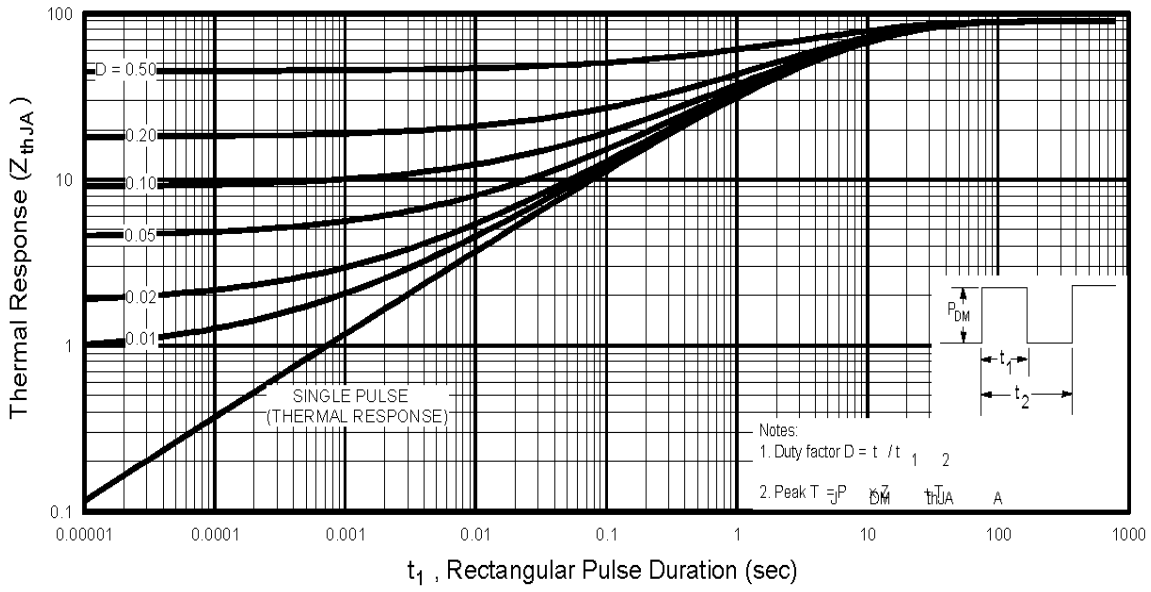
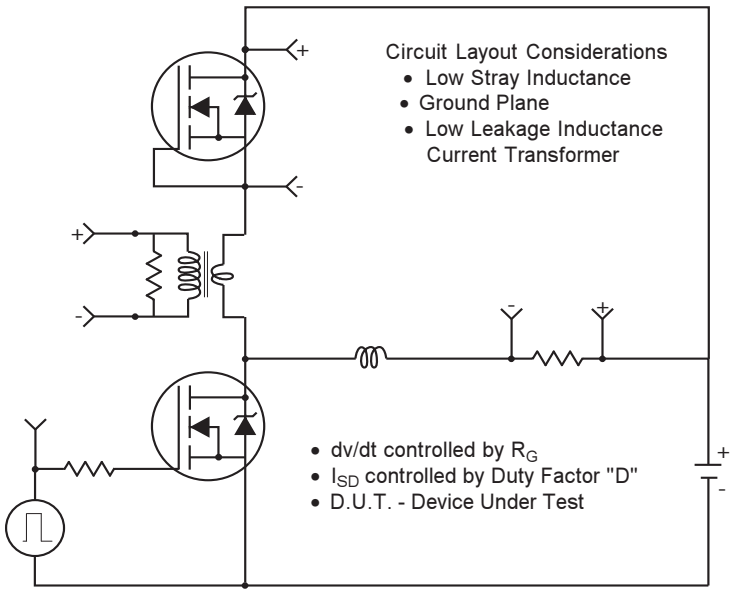
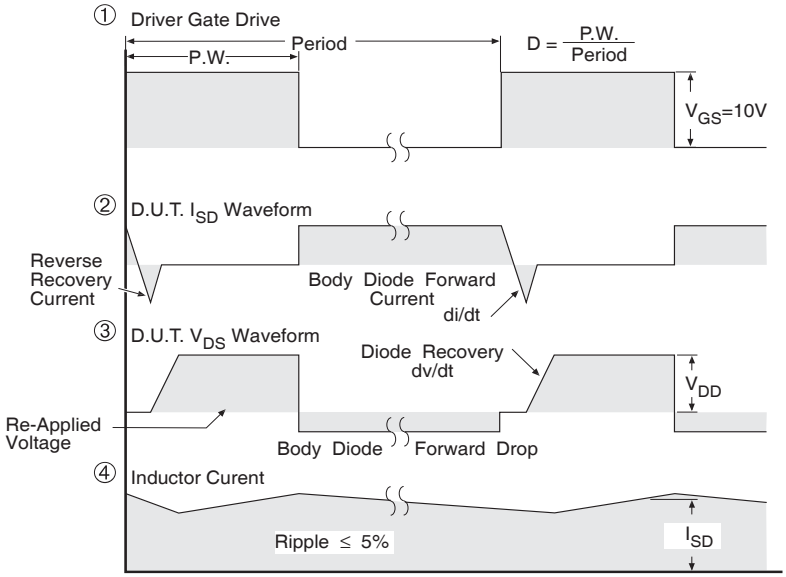


Fig 23. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel
** Use P-Channel Driver for P-Channel Measurements

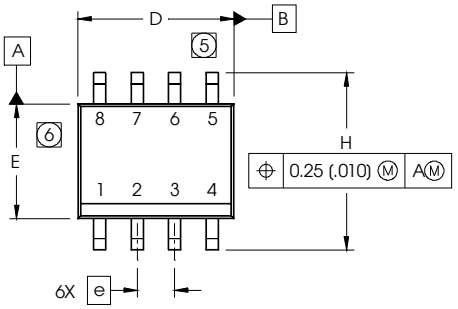


*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

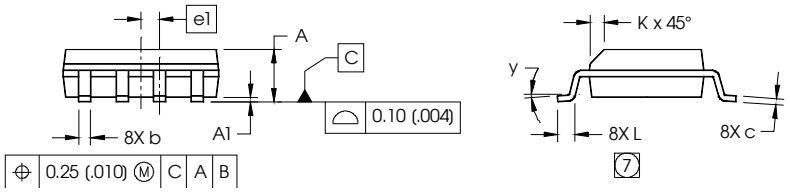
Fig 24. For N and P Channel HEXFETS

SO-8 Package Details

Dimensions are shown in milimeters (inches)



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	
e1	.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°



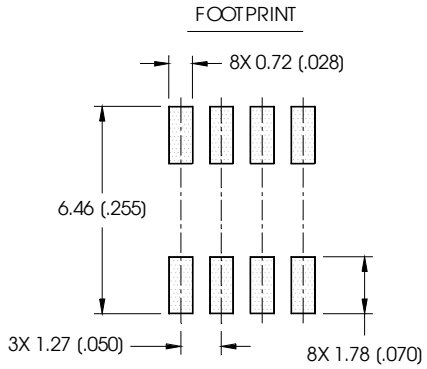
NOTES:

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).

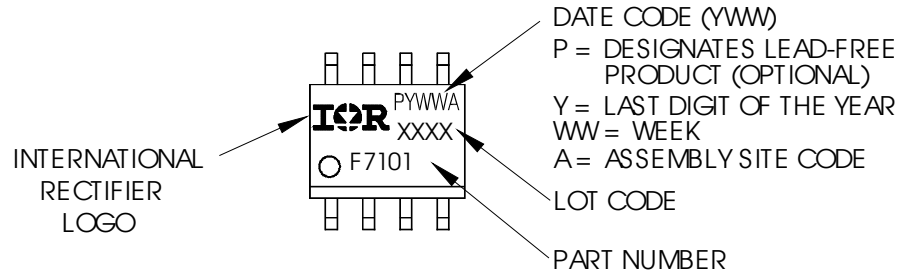
6 DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.010).

7 DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.



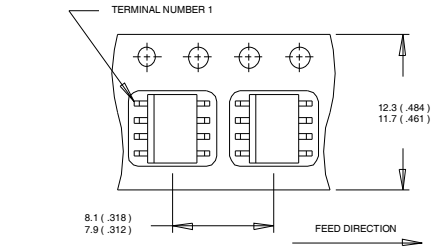
SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

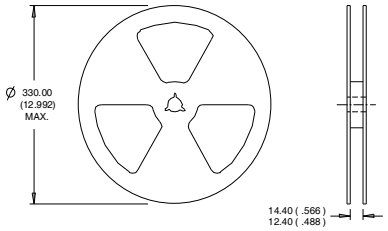


Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

SO-8 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.

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

Qualification information†

Qualification level	Industrial (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

Revision History

Date	Comments
10/16/2014	• Corrected part number from" IRF7309PbF-1" to "IRF7309TRPbF-1" -all pages • Removed the "IRF7309PbF-1" bulk part number from ordering information on page1

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