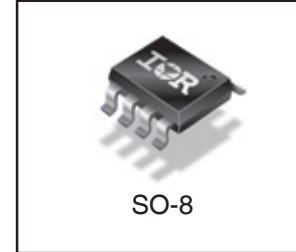
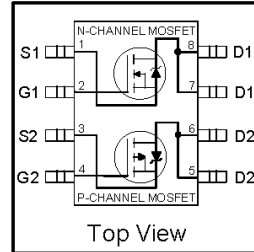


HEXFET® Power MOSFET

	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 (@ $T_A = 25^\circ C$)	4.0	-3.0	A



Features

Industry-standard pinout SO-8 Package
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1, Industrial qualification



Benefits

Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
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	
$I_D @ T_A = 25^\circ C$	10 Sec. Pulse Drain Current, $V_{GS} @ 10V$	4.7	-3.5	A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	4.0	-3.0	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	3.2	-2.4	A
I_{DM}	Pulsed Drain Current Φ	16	-12	A
$P_D @ T_A = 25^\circ C$	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 $dv/dt \Phi$	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 @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
		P-Ch	-30	—	—		$V_{GS} = 0V, I_D = -250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.032	—	$V/^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
		P-Ch	—	-0.037	—		Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(ON)}$	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
			—	—	0.10		$V_{GS} = -10V, I_D = -1.8A$ ③
		P-Ch	—	—	0.16		$V_{GS} = -4.5V, I_D = -1.5A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.0	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		P-Ch	-1.0	—	—		$V_{DS} = V_{GS}, I_D = -250\mu A$
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		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
		P-Ch	—	—	-25		$V_{DS} = -24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	N-P	—	—	± 100		$V_{GS} = \pm 20V$
Q_g	Total Gate Charge	N-Ch	—	—	25	nC	N-Channel $I_D = 2.6A, V_{DS} = 16V, V_{GS} = 4.5V$ ③
		P-Ch	—	—	25		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	—	2.9	nC	P-Channel $I_D = -2.2A, V_{DS} = -16V, V_{GS} = -4.5V$ ③
		P-Ch	—	—	2.9		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	—	7.9	nC	N-Channel $V_{DD} = 10V, I_D = 2.6A, R_G = 6.0\Omega$ $R_D = 3.8\Omega$ ③
		P-Ch	—	—	9.0		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	6.8	—	ns	P-Channel $V_{DD} = -10V, I_D = -2.2A, R_G = 6.0\Omega$ $R_D = 4.5\Omega$ ③
		P-Ch	—	11	—		
t_r	Rise Time	N-Ch	—	21	—	ns	
		P-Ch	—	17	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	22	—	ns	
		P-Ch	—	25	—		
t_f	Fall Time	N-Ch	—	7.7	—	ns	
		P-Ch	—	18	—		
L_D	Internal Drain Inductance	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 $V_{GS} = 0V, V_{DS} = 15V, f = 1.0\text{MHz}$ ③
		P-Ch	—	440	—		
C_{oss}	Output Capacitance	N-Ch	—	180	—	pF	P-Channel $V_{GS} = 0V, V_{DS} = -15V, f = 1.0\text{MHz}$ ③
		P-Ch	—	200	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	72	—	pF	
		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	A	
		P-Ch	—	—	-12		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.0	V	$T_J = 25^{\circ}\text{C}$, $I_S = 1.8\text{A}$, $V_{GS} = 0\text{V}$ ③
		P-Ch	—	—	-1.0		$T_J = 25^{\circ}\text{C}$, $I_S = -1.8\text{A}$, $V_{GS} = 0\text{V}$ ③
t_{rr}	Reverse Recovery Time	N-Ch	—	47	71	ns	N-Channel $T_J = 25^{\circ}\text{C}$, $I_F = 2.6\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$
		P-Ch	—	53	80		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	56	84	nC	P-Channel $T_J = 25^{\circ}\text{C}$, $I_F = -2.2\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$ ④
		P-Ch	—	66	99		
t_{on}	Forward Turn-On Time	N-P	Intrinsic turn-on time is negligible (turn-on is dominated by $I_S + L_D$)				

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

② N-Channel $I_{SD} \leq 2.4A, di/dt \leq 73A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
P-Channel $I_{SD} \leq -1.8A, di/dt \leq 90A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

③ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

N-Channel

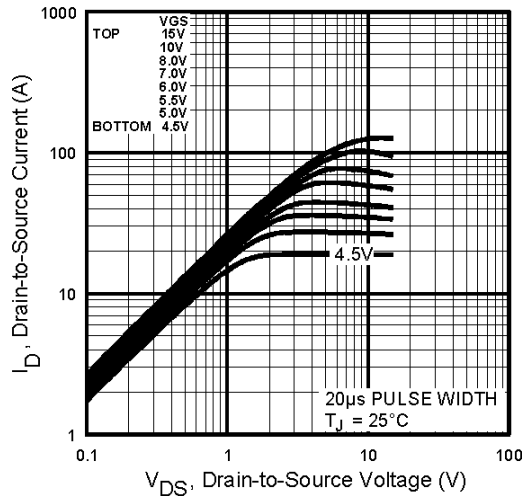


Fig 1. Typical Output Characteristics,
 $T_J = 25^\circ\text{C}$

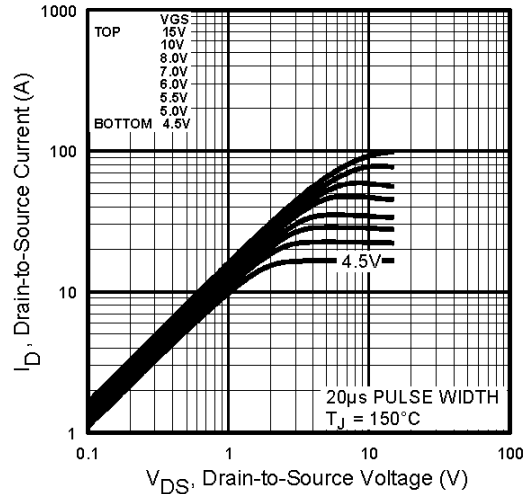


Fig 2. Typical Output Characteristics,
 $T_J = 150^\circ\text{C}$

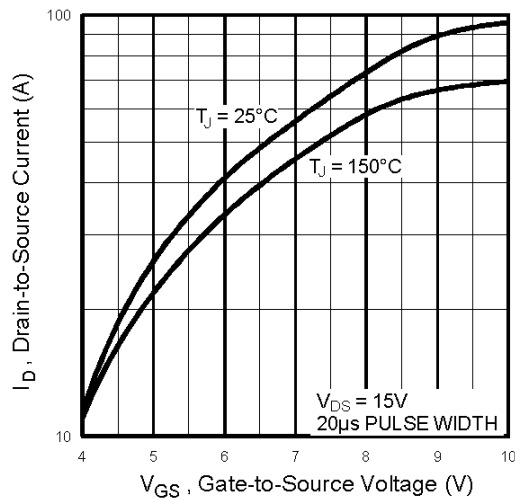


Fig 3. Typical Transfer Characteristics

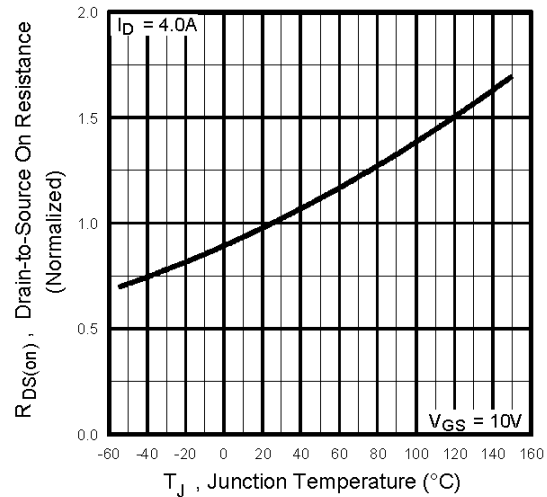
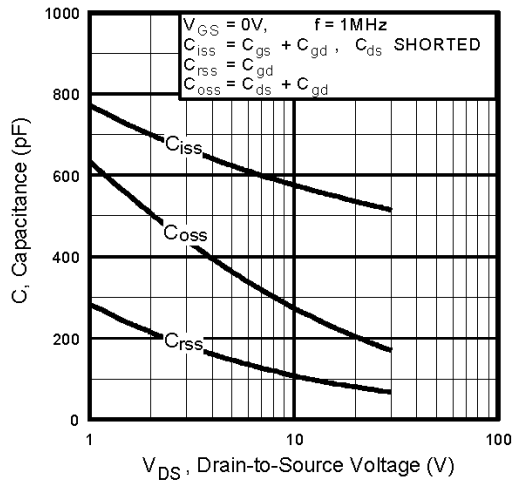
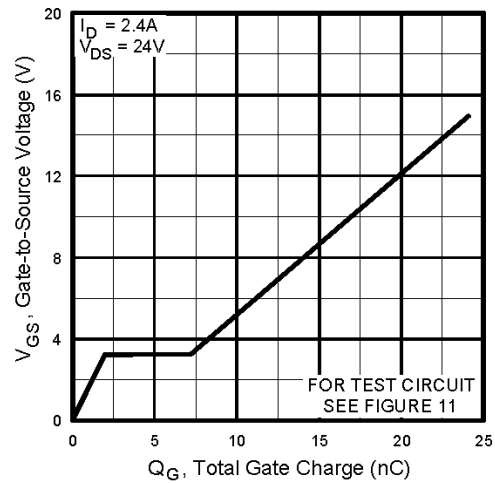
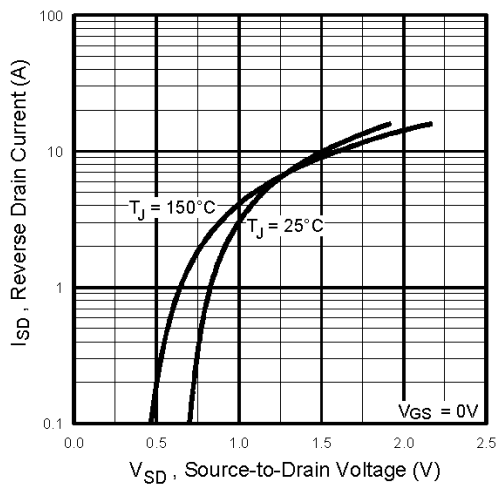
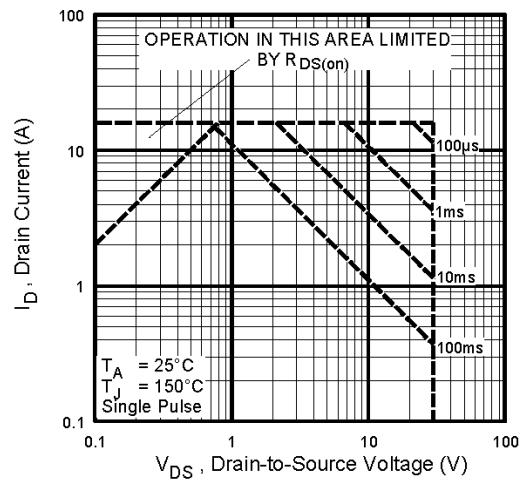


Fig 4. Normalized On-Resistance
Vs. Temperature

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

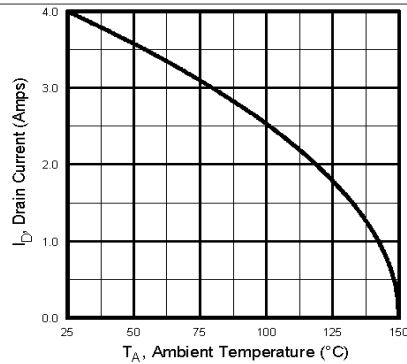


Fig 9. Max. Drain Current Vs. Ambient Temp.

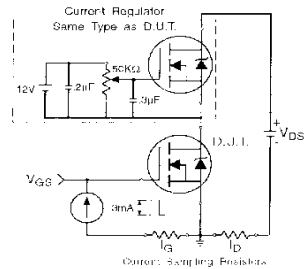


Fig 11a. Gate Charge Test Circuit

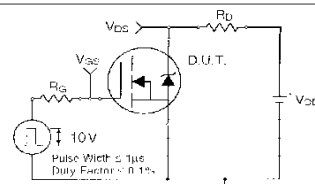


Fig 10a. Switching Time Test Circuit

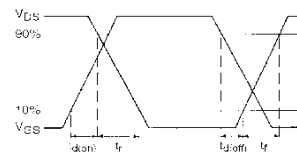


Fig 10b. Switching Time Waveforms

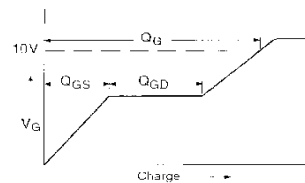


Fig 11b. Basic Gate Charge Waveform

P-Channel

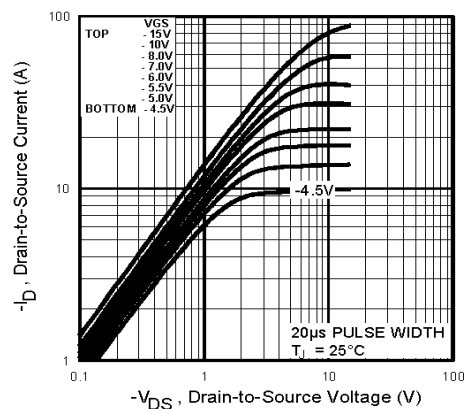


Fig 12. Typical Output Characteristics, $T_J = 25^\circ\text{C}$

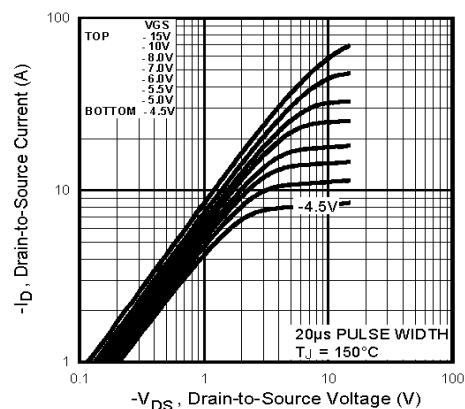
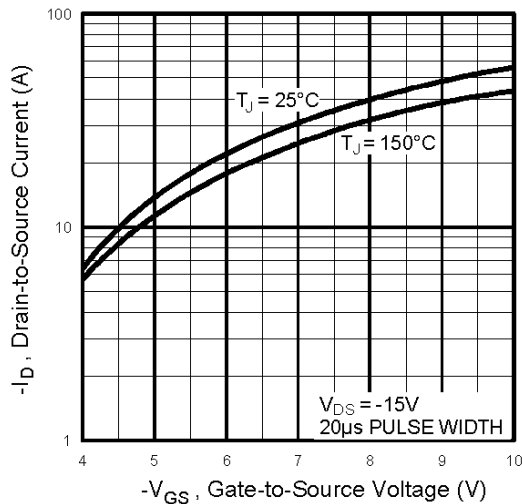
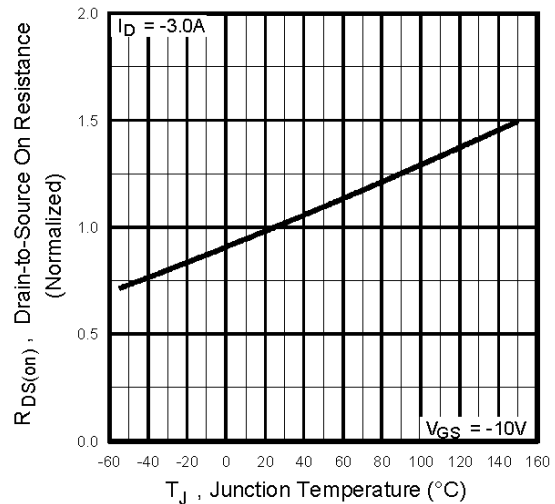
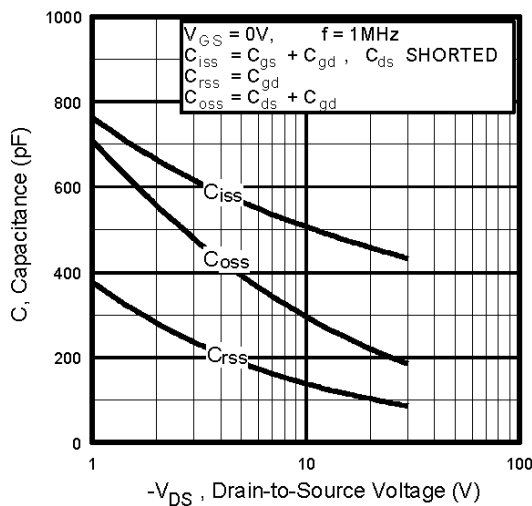
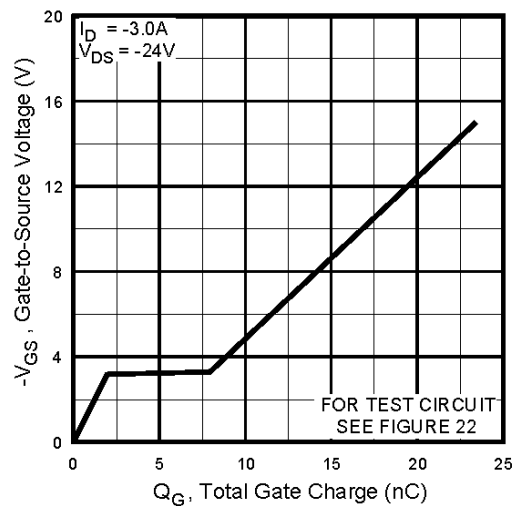
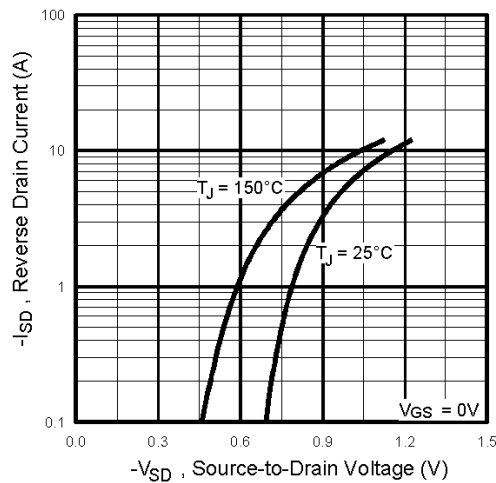
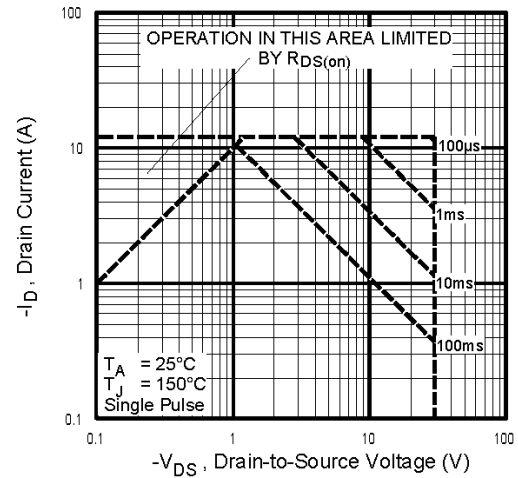
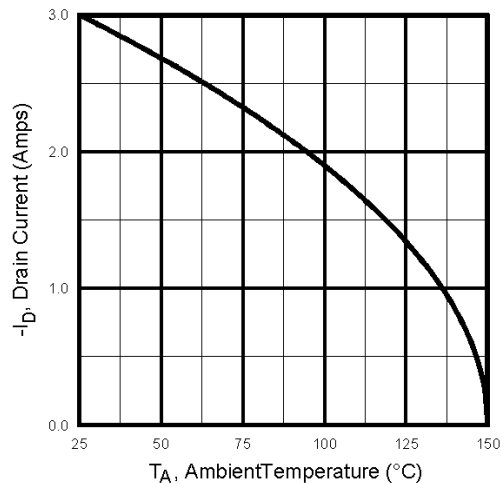
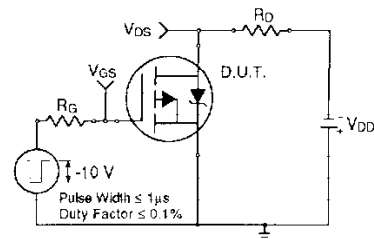
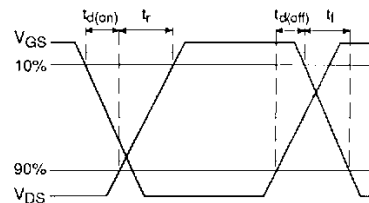
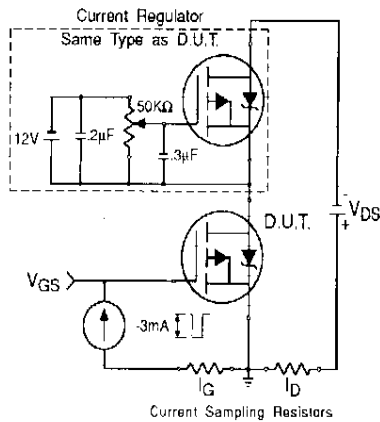
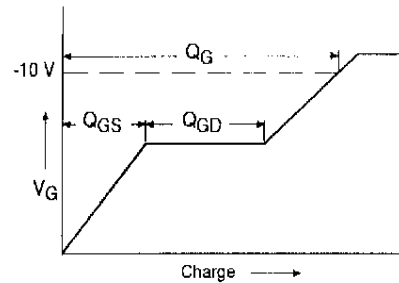


Fig 13. Typical Output Characteristics, $T_J = 150^\circ\text{C}$

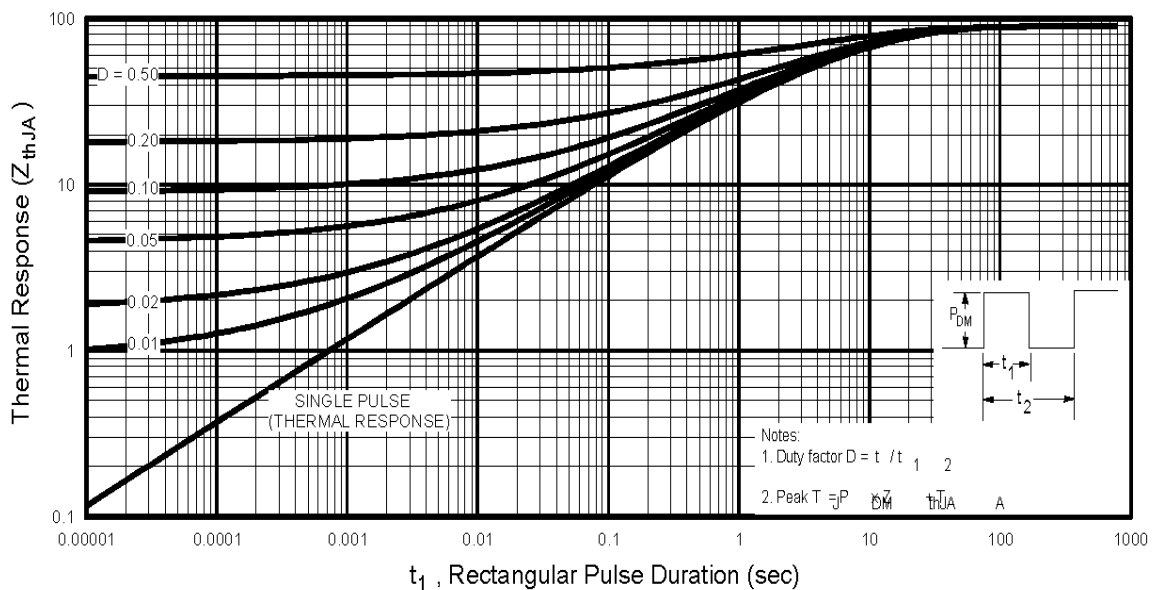
P-Channel

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

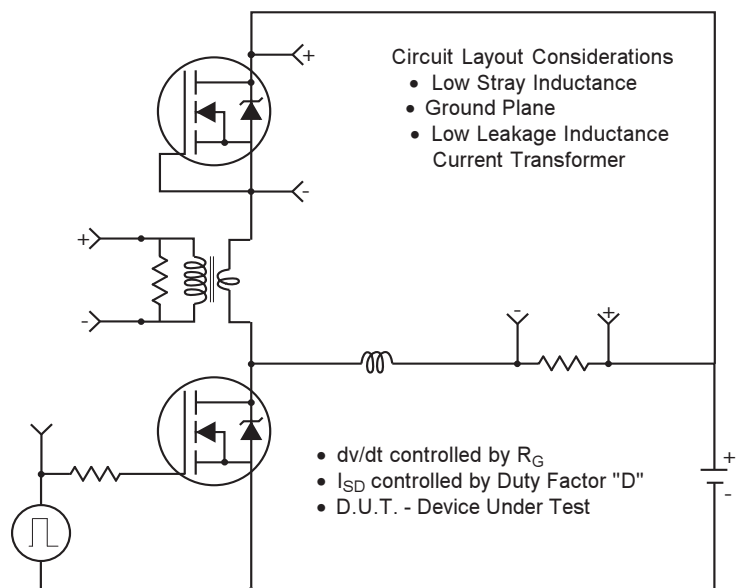
P-Channel


Fig 22b. Gate Charge Test Circuit

Fig 22b. Basic Gate Charge Waveform

N- and P-Channel

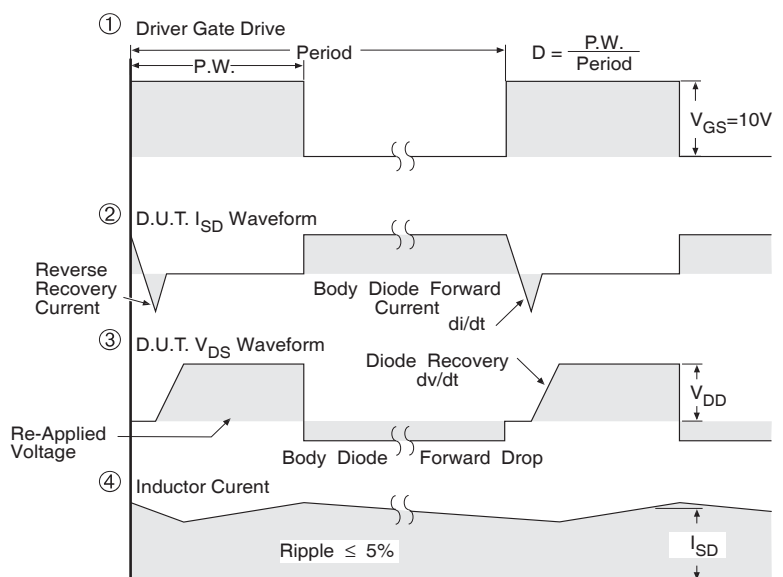

Fig 23. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel

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

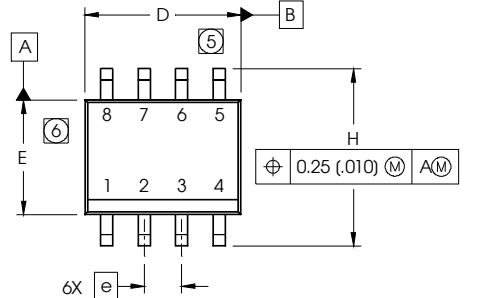


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

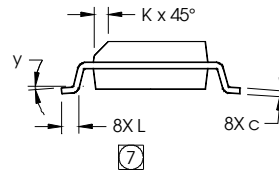
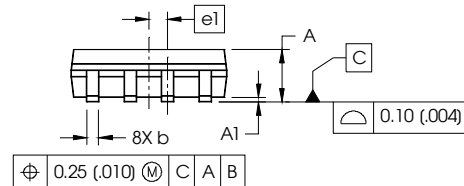
Fig 24. For N and P Channel HEXFETS

SO-8 Package Details

Dimensions are shown in millimeters (inches)



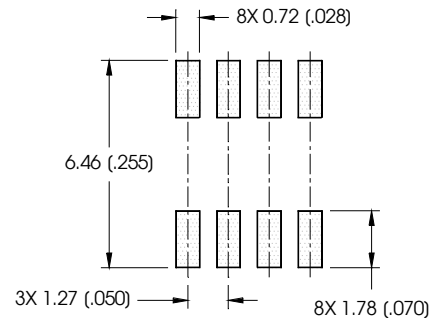
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



NOTES:

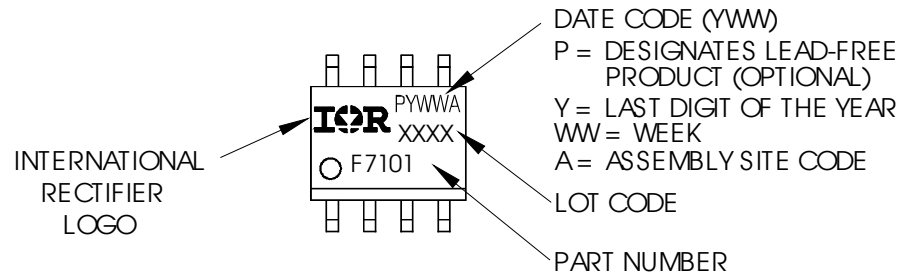
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
6. DIMENSION DOES NOT INCLUDE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

FOOTPRINT



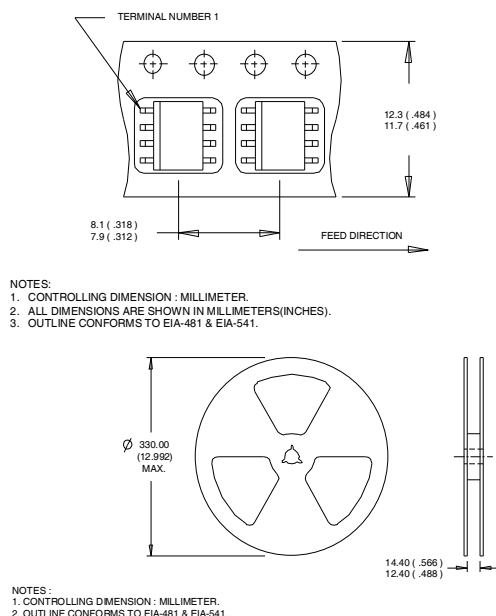
SO-8 Part Marking

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



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

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/>