

**END OF LIFE**

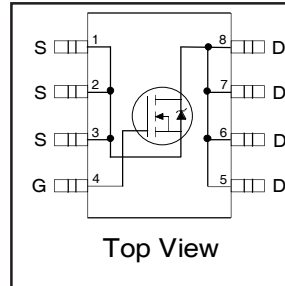
International  
**IR** Rectifier

PD - 96112B

**IRF7413QPbF**

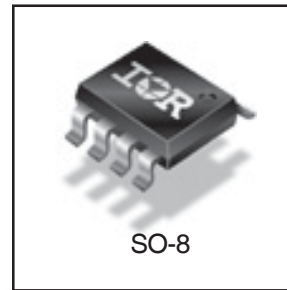
HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- N Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- 150°C Operating Temperature
- Lead-Free



$V_{DS} = 30V$

$R_{DS(on)} = 0.011\Omega$



**Description**

These HEXFET® Power MOSFET's in SO-8 package utilize the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of these HEXFET Power MOSFET's are a 150°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These benefits combine to make this design an extremely efficient and reliable device for use in a wide variety of applications. The efficient SO-8 package provides enhanced thermal characteristics making it ideal in a variety of power applications. This surface mount SO-8 can dramatically reduce board space and is also available in Tape & Reel.

Base part number	Orderable part number	Package Type	Standard Pack		EOL Notice	Replacement Part Number
			Form	Quantity		
IRF7413QPbF	IRF7413QTRPbF	SO-8	Tape and Reel	4000	EOL 529	<a href="#">Please search the EOL part number on IR's website for guidance</a>
	IRF7413QPbF	SO-8	Tube	95	EOL 529	

**Absolute Maximum Ratings**

Symbol	Parameter	Max	Units
$V_{DS}$	Drain-to-Source Voltage	30	V
$V_{GS}$	Gate-to-Source Voltage	± 20	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	13	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	9.2	
$I_{DM}$	Pulsed Drain Current ①	58	
$P_D @ T_A = 25^\circ C$	Power Dissipation	2.5	W
	Linear Derating Factor	0.02	mW/°C
$E_{AS}$	Single Pulse Avalanche Energy ②	260	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to +150	°C

**Thermal Resistance Ratings**

Symbol	Parameter	Typ	Max	Units
$R_{\theta JL}$	Junction-to-Drain Lead ④	—	20	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑤⑥	—	50	

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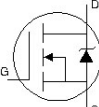
# IRF7413QPbF

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## Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.034	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	—	0.011	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7.3A ④
		—	—	0.018		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3.7A ④
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	10	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 3.7A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	12	μA	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V
		—	—	25		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	-100	nA	V <sub>GS</sub> = -20V
	Gate-to-Source Reverse Leakage	—	—	100		V <sub>GS</sub> = 20V
Q <sub>g</sub>	Total Gate Charge	—	52	79	nC	I <sub>D</sub> = 7.3A
Q <sub>gs</sub>	Gate-to-Source Charge	—	6.1	9.2		V <sub>DS</sub> = 24V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	16	23		V <sub>GS</sub> = 10V, See Fig. 6 and 9 ④
R <sub>G</sub>	Gate Resistance	1.2	—	3.7		
t <sub>d(on)</sub>	Turn-On Delay Time	—	8.6	—	ns	V <sub>DD</sub> = 15V
t <sub>r</sub>	Rise Time	—	50	—		I <sub>D</sub> = 7.3A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	52	—		R <sub>G</sub> = 6.2 Ω
t <sub>f</sub>	Fall Time	—	46	—		R <sub>G</sub> = 2.0Ω, See Fig. 10 ④
C <sub>iss</sub>	Input Capacitance	—	1800	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	680	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	240	—		f = 1.0MHz, See Fig. 5

## Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	3.1	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	58		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.0	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 7.3A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	74	110	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 7.3A
Q <sub>rr</sub>	Reverse Recovery Charge	—	200	300	nC	di/dt = 100A/μs ③

### Notes:

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )

② Starting T<sub>J</sub> = 25°C, L = 9.8mH  
R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 7.3A. (See Figure 12)

③ I<sub>SD</sub> ≤ 7.3A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>,  
T<sub>J</sub> ≤ 150°C

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

⑤ Surface mounted on FR-4 board

⑥ R<sub>θ</sub> is measured at T<sub>J</sub> approximately 90°C

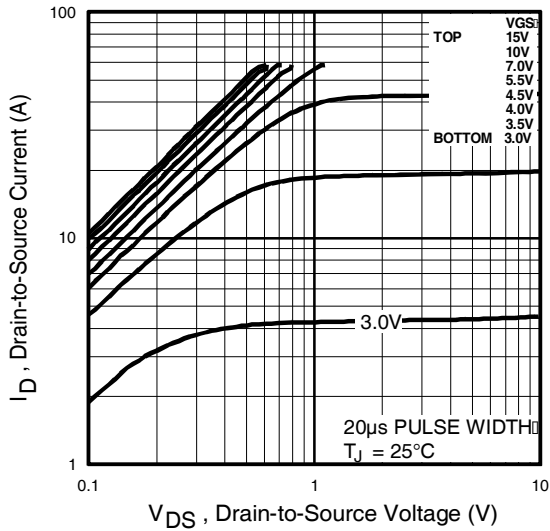


Fig 1. Typical Output Characteristics

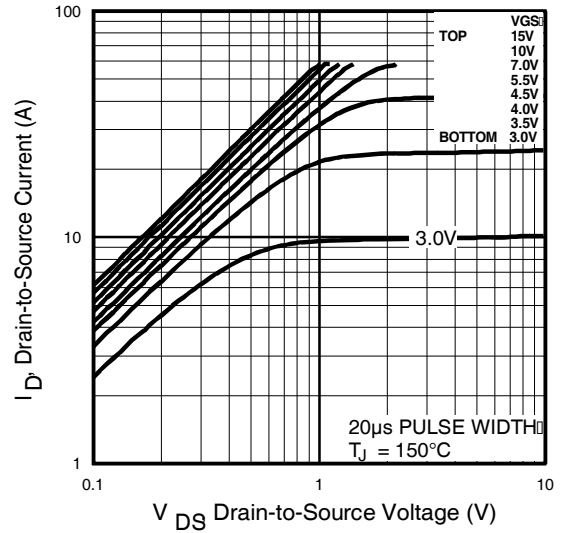


Fig 2. Typical Output Characteristics

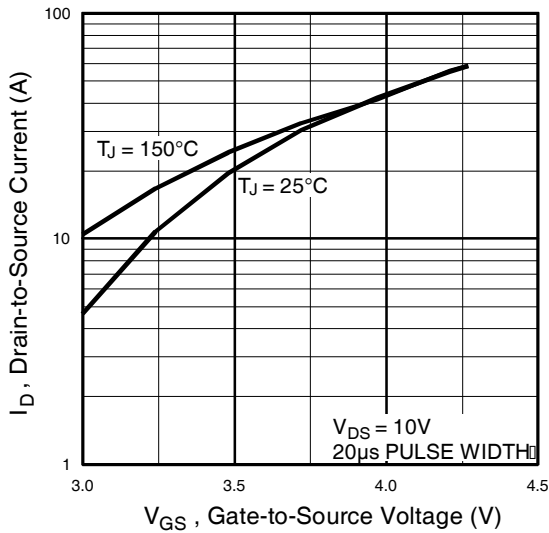


Fig 3. Typical Transfer Characteristics

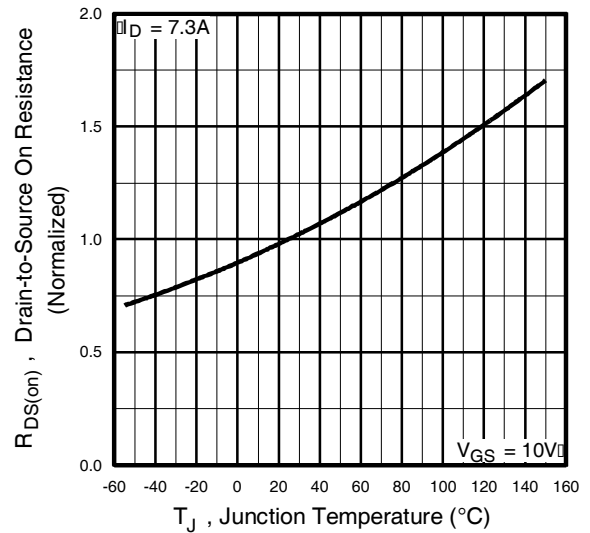
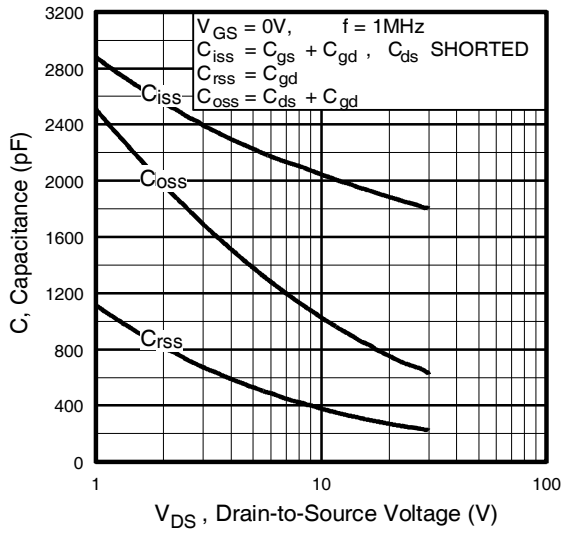
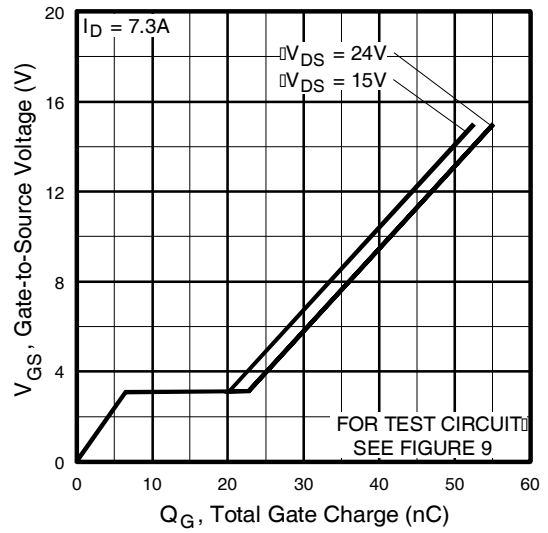


Fig 4. Normalized On-Resistance Vs. Temperature

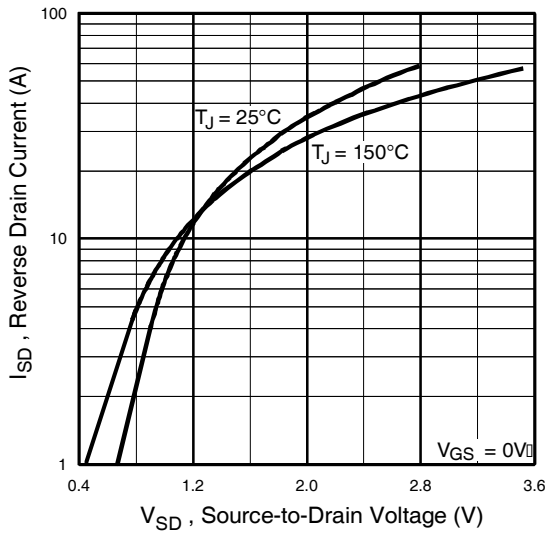
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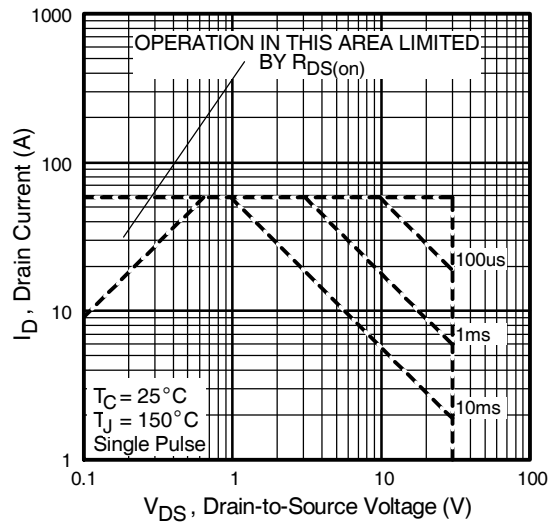
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



**Fig 7.** Typical Source-Drain Diode Forward Voltage

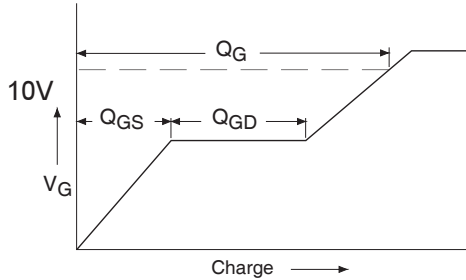


**Fig 8.** Maximum Safe Operating Area

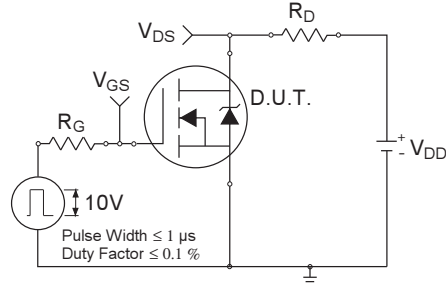
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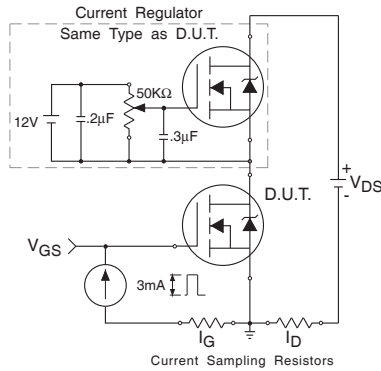
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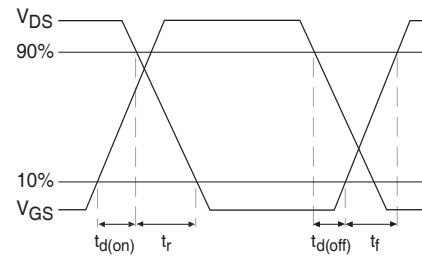
**Fig 9a. Basic Gate Charge Waveform**



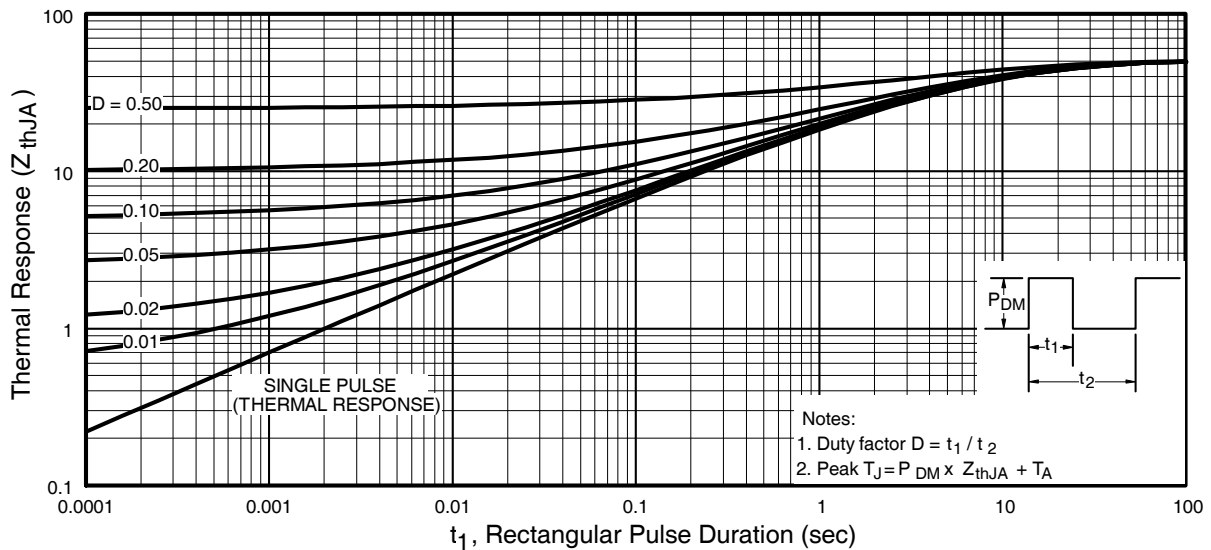
**Fig 10a. Switching Time Test Circuit**



**Fig 9b. Gate Charge Test Circuit**



**Fig 10b. Switching Time Waveforms**



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

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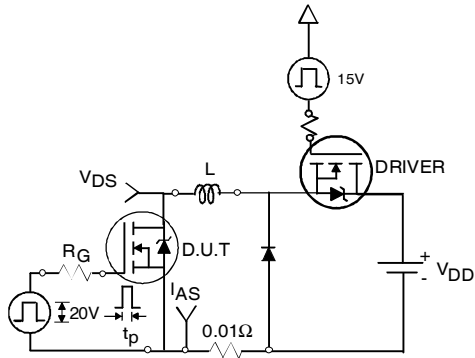


Fig 12a. Unclamped Inductive Test Circuit

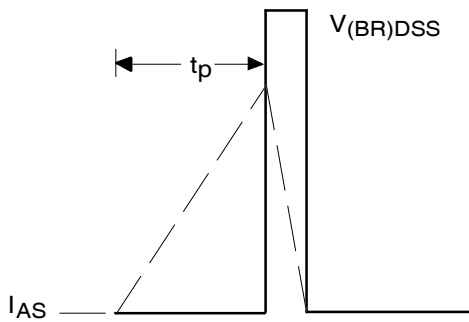


Fig 12b. Unclamped Inductive Waveforms

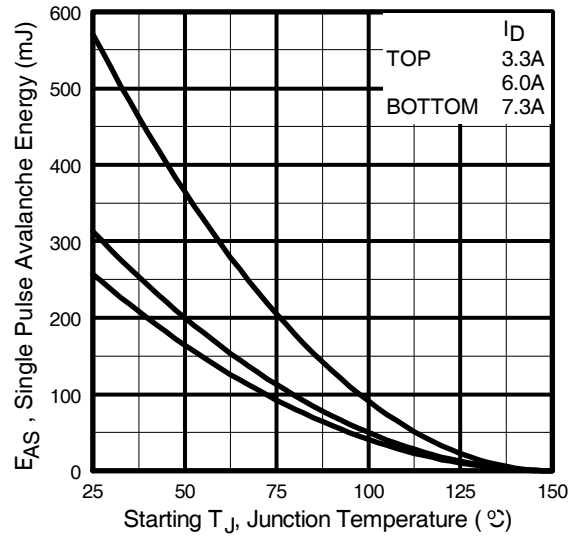


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

Peak Diode Recovery dv/dt Test Circuit

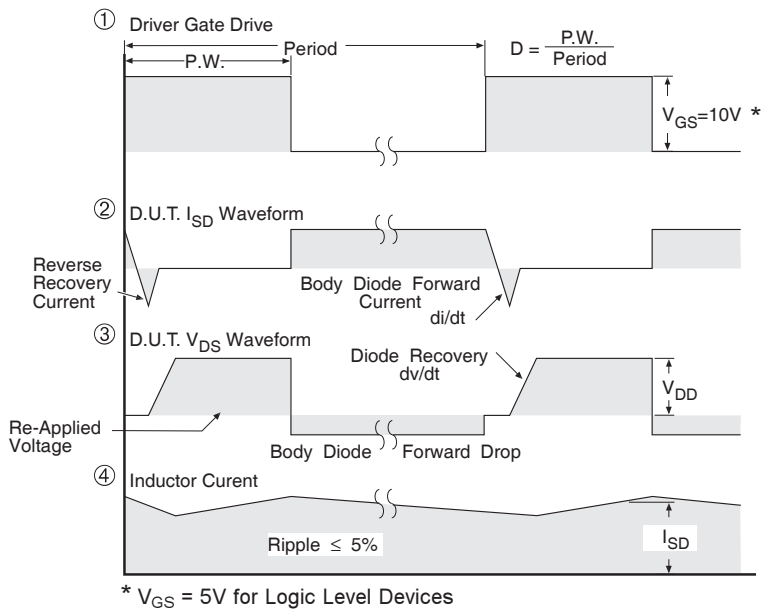
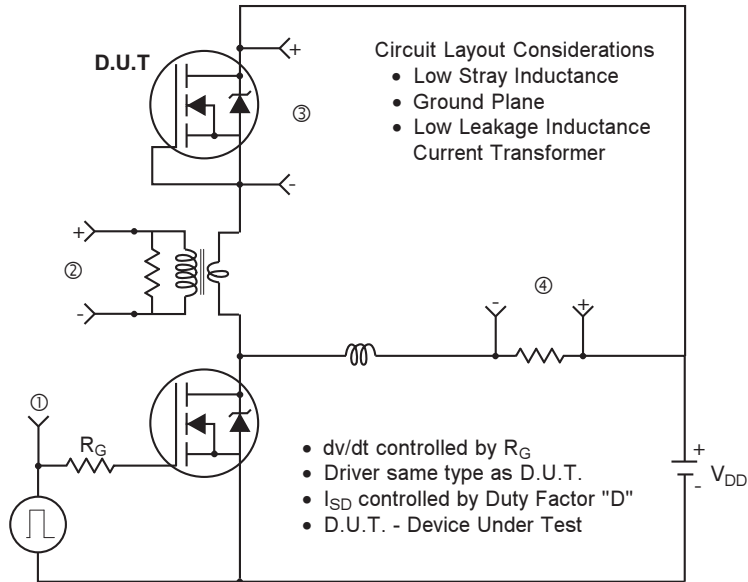


Fig 13. For N-Channel HEXFETS

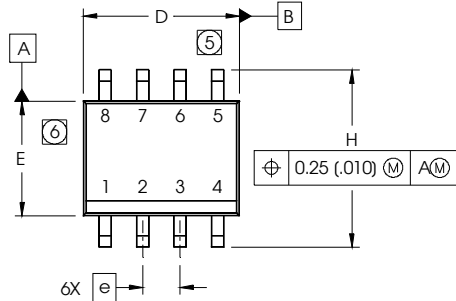
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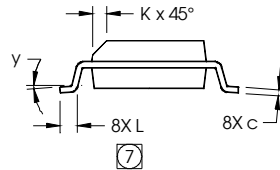
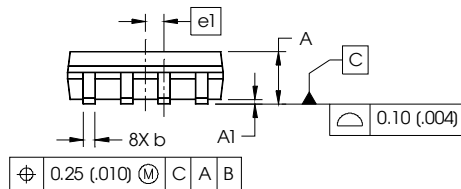
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## SO-8 Package Details

Dimensions are shown in millimeters (inches)



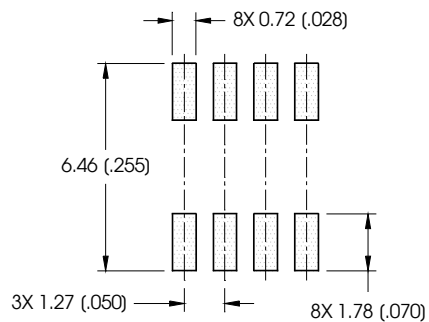
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40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



**NOTES:**

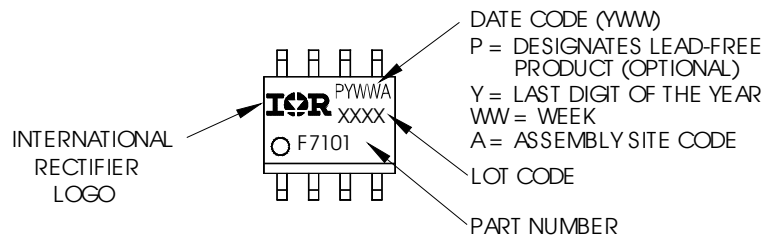
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤ DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 (.006).
- ⑥ DIMENSION DOES NOT 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)



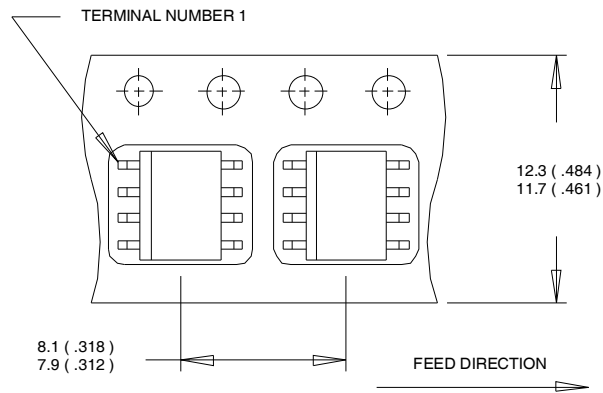
**Notes:**

1. For an Automotive Qualified version of this part please see <http://www.irf.com/product-info/auto/>
2. For the most current drawing please refer to IR website at <http://www.irf.com/package/>

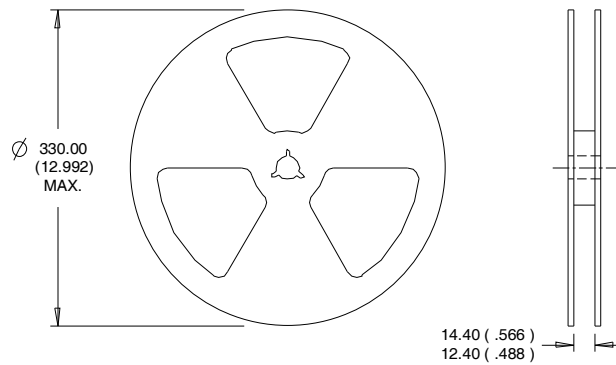


**SO-8 Tape and Reel**

Dimensions are shown in millimeters (inches)



- 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.

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

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# IRF7413QPbF

International  
**IR** Rectifier

### Qualification Information<sup>†</sup>

Qualification level	Industrial <sup>†</sup>	
	(per JEDEC JESD47F <sup>††</sup> guidelines)	
Moisture Sensitivity Level	SO-8	MSL1 (per JEDEC J-STD-020D <sup>††</sup> )
RoHS Compliant	Yes	

<sup>†</sup> Qualification standards can be found at International Rectifier's web site  
<http://www.irf.com/product-info/reliability>

<sup>††</sup> Applicable version of JEDEC standard at the time of product release.

### Revision History

Date	Comments
6/17/2014	• Added ordering information to reflect the End-Of-life

International  
**IR** Rectifier

**IR WORLD HEADQUARTERS:** 101 N. Sepulveda Blvd., El Segundo, California 90245, USA  
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[JANTXV2N5416U4](#) [SQM110N05-06L-GE3](#) [SIHF35N60E-GE3](#) [2SK2614\(TE16L1,Q\)](#) [2N7002KW-FAI](#)