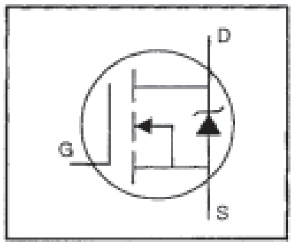
PD- 95228

International
IOR Rectifier

IRFL210PbF

HEXFET® Power MOSFET

- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead-Free



V_{DSS} = 200V

$R_{DS(on)}$ = 1.5Ω

I_D = 0.96A

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-223 package is designed for surface-mounting using vapor phase, infra red, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25W is possible in a typical surface mount application.

SOT-223

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10 V	0.96	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10 V	0.60	
I_{DM}	Pulsed Drain Current ①	7.7	
P_D @ T_C = 25°C	Power Dissipation	3.1	W
P_D @ T_A = 25°C	Power Dissipation (PCB Mount)**	2.0	
	Linear Derating Factor	0.025	W/°C
	Linear Derating Factor (PCB Mount)**	0.017	
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	50	mJ
I_{AR}	Avalanche Current ①	0.96	A
E_{AR}	Repetitive Avalanche Energy ①	0.31	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
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{θJC}$	Junction-to-PCB	—	—	40	°C/W
$R_{θJA}$	Junction-to-Ambient (PCB mount)**	—	—	60	

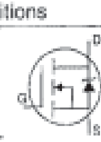
** When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

04/28/04

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	—	—	V	V_{GS}=0V, I_D= 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.30	—	V/°C	Reference to 25°C, I_D= 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	1.5	Ω	V_{GS}=10V, I_D=0.58A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D= 250µA
g_{fs}	Forward Transconductance	0.51	—	—	S	V_{DS}=50V, I_D=0.58A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	µA	V_{DS}=200V, V_{GS}=0V
		—	—	250		V_{DS}=160V, V_{GS}=0V, T_J=125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS}=20V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS}=-20V
Q_g	Total Gate Charge	—	—	8.2	nC	I_D=3.3A
Q_{gs}	Gate-to-Source Charge	—	—	1.8		V_{DS}=160V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	4.5		V_{GS}=10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	8.2	—	ns	V_{DD}=100V
t_r	Rise Time	—	17	—		I_D=3.3A
$t_{d(off)}$	Turn-Off Delay Time	—	14	—		R_G=24Ω
t_f	Fall Time	—	8.9	—		R_D=30Ω See Figure 10 ④
L_D	Internal Drain Inductance	—	4.0	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact 
L_S	Internal Source Inductance	—	6.0	—		
C_{iss}	Input Capacitance	—	140	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	53	—		V_{DS}= 25V
C_{rss}	Reverse Transfer Capacitance	—	15	—		f=1.0MHz See Figure 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	0.96	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	7.7		
V_{SD}	Diode Forward Voltage	—	—	2.0	V	T_J=25°C, I_S=0.96A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	150	310	ns	T_J=25°C, I_F=3.3A
Q_{rr}	Reverse Recovery Charge	—	0.60	1.4	µC	di/dt=100A/µs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

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

② V_{DD}=50V, starting T_J=25°C, L=81mH R_G=25Ω, I_{AS}=0.96A (See Figure 12)

③ I_{SD}≤3.3A, di/dt≤70A/µs, V_{DD}≤$V_{(BR)DSS}$, T_J≤150°C

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

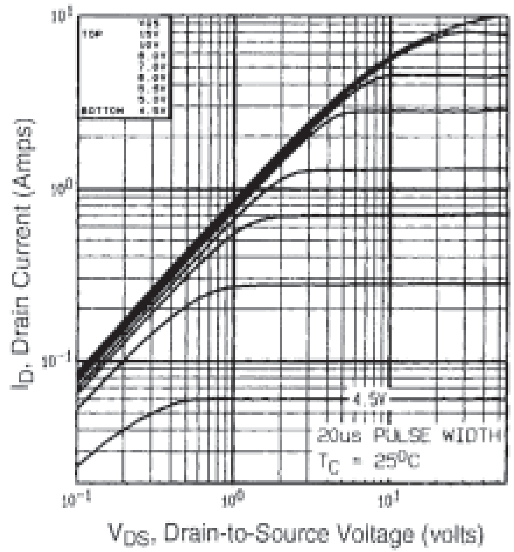


Fig 1. Typical Output Characteristics, T_C=25°C

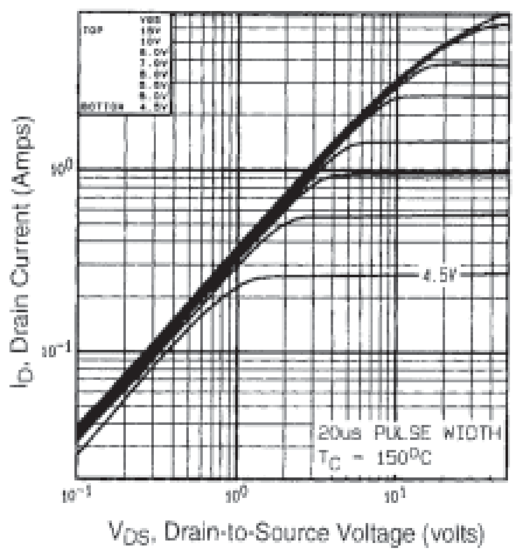


Fig 2. Typical Output Characteristics, T_C=150°C

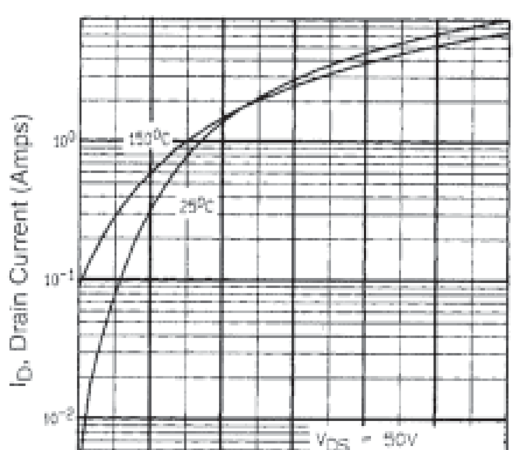


Fig 3. Typical Transfer Characteristics

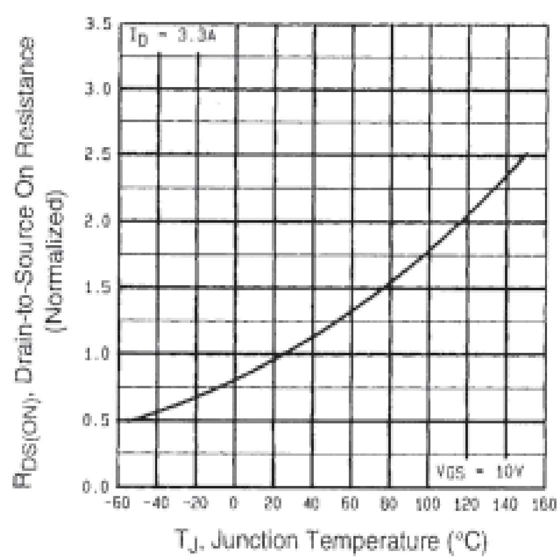


Fig 4. Normalized On-Resistance Vs. Temperature

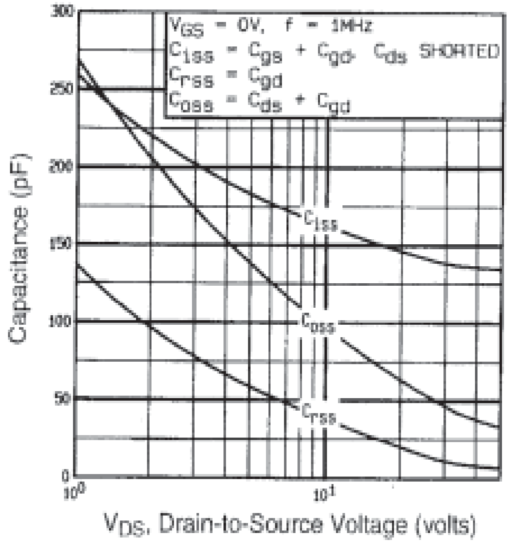


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

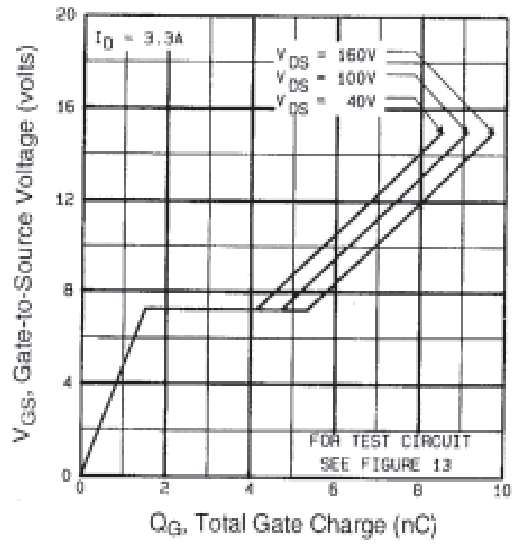


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

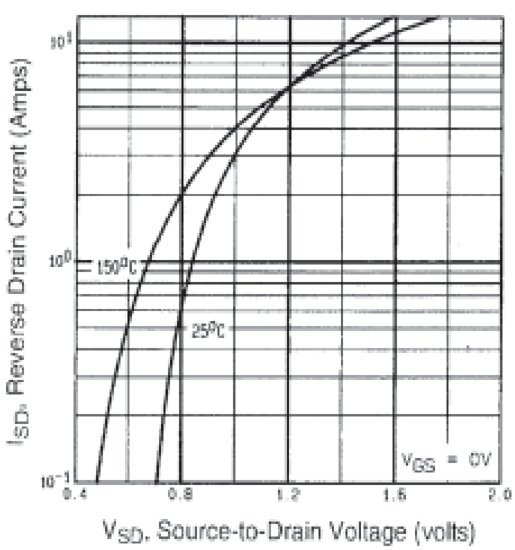


Fig 7. Typical Source-Drain Diode Forward Voltage

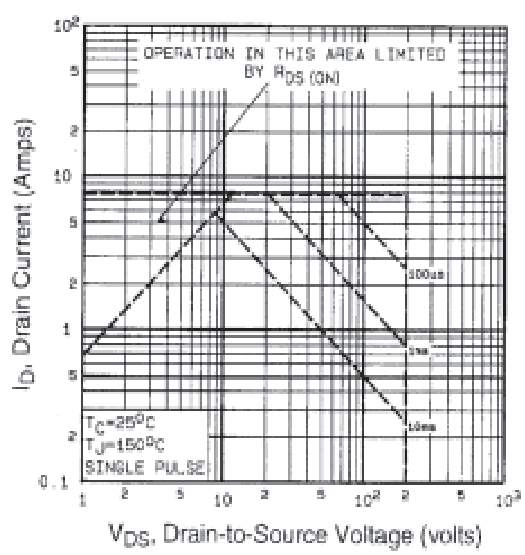


Fig 8. Maximum Safe Operating Area

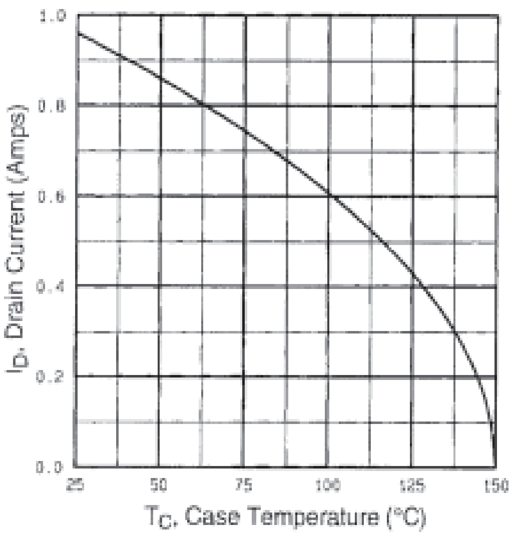


Fig 9. Maximum Drain Current Vs. Case Temperature

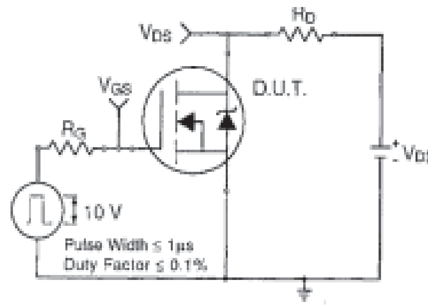


Fig 10a. Switching Time Test Circuit

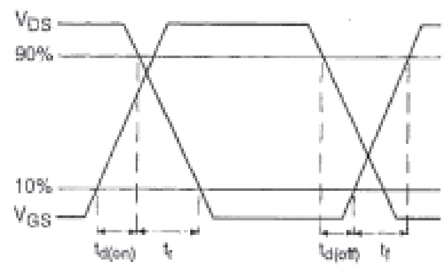


Fig 10b. Switching Time Waveforms

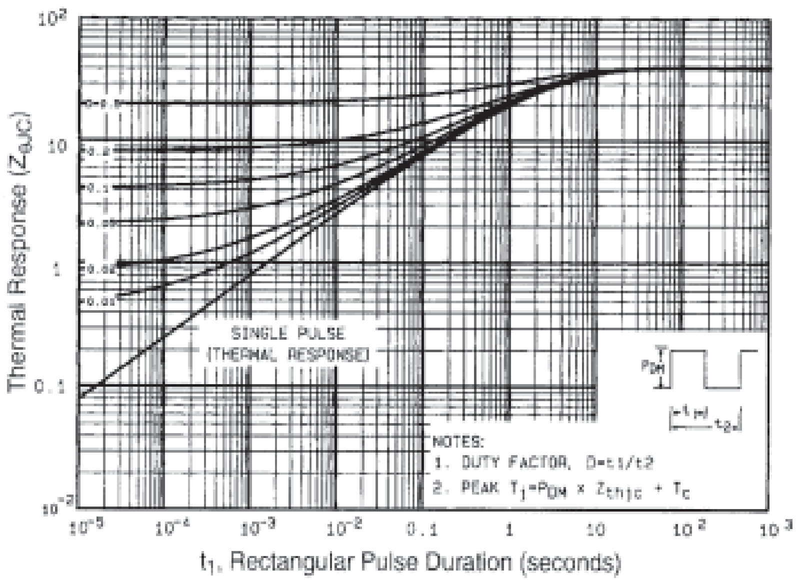


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

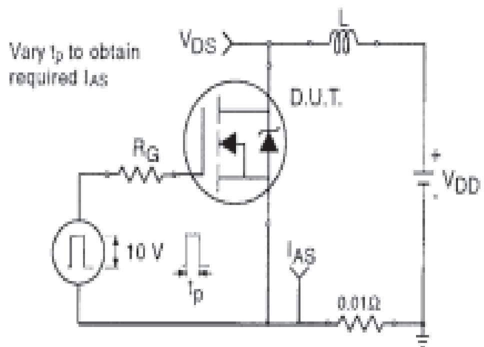


Fig 12a. Unclamped Inductive Test Circuit

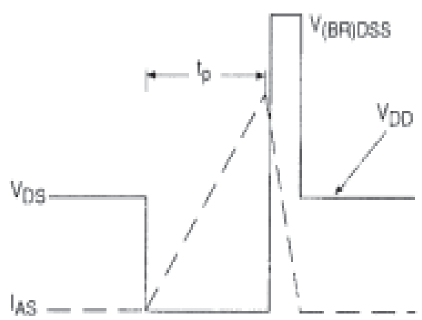


Fig 12b. Unclamped Inductive Waveforms

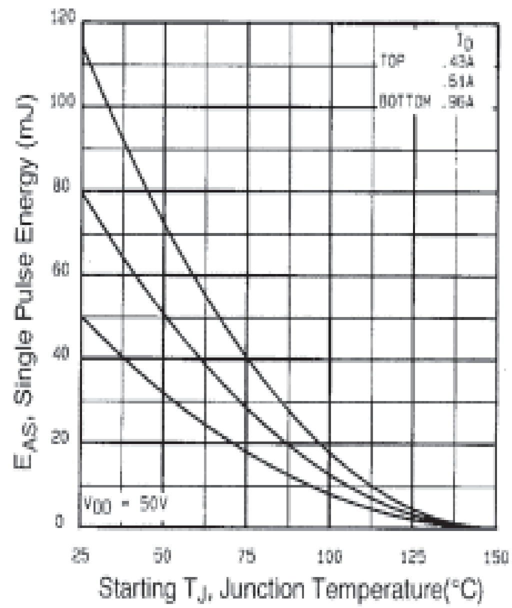


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

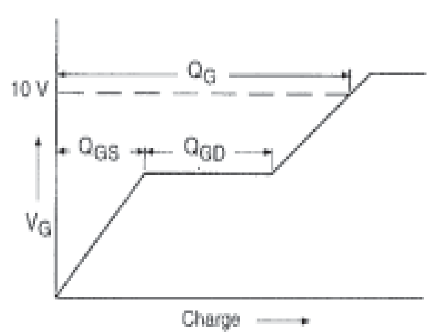


Fig 13a. Basic Gate Charge Waveform

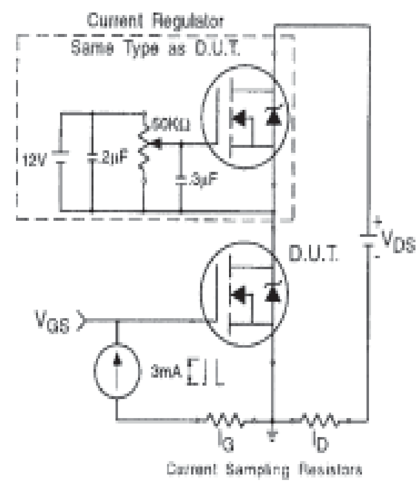
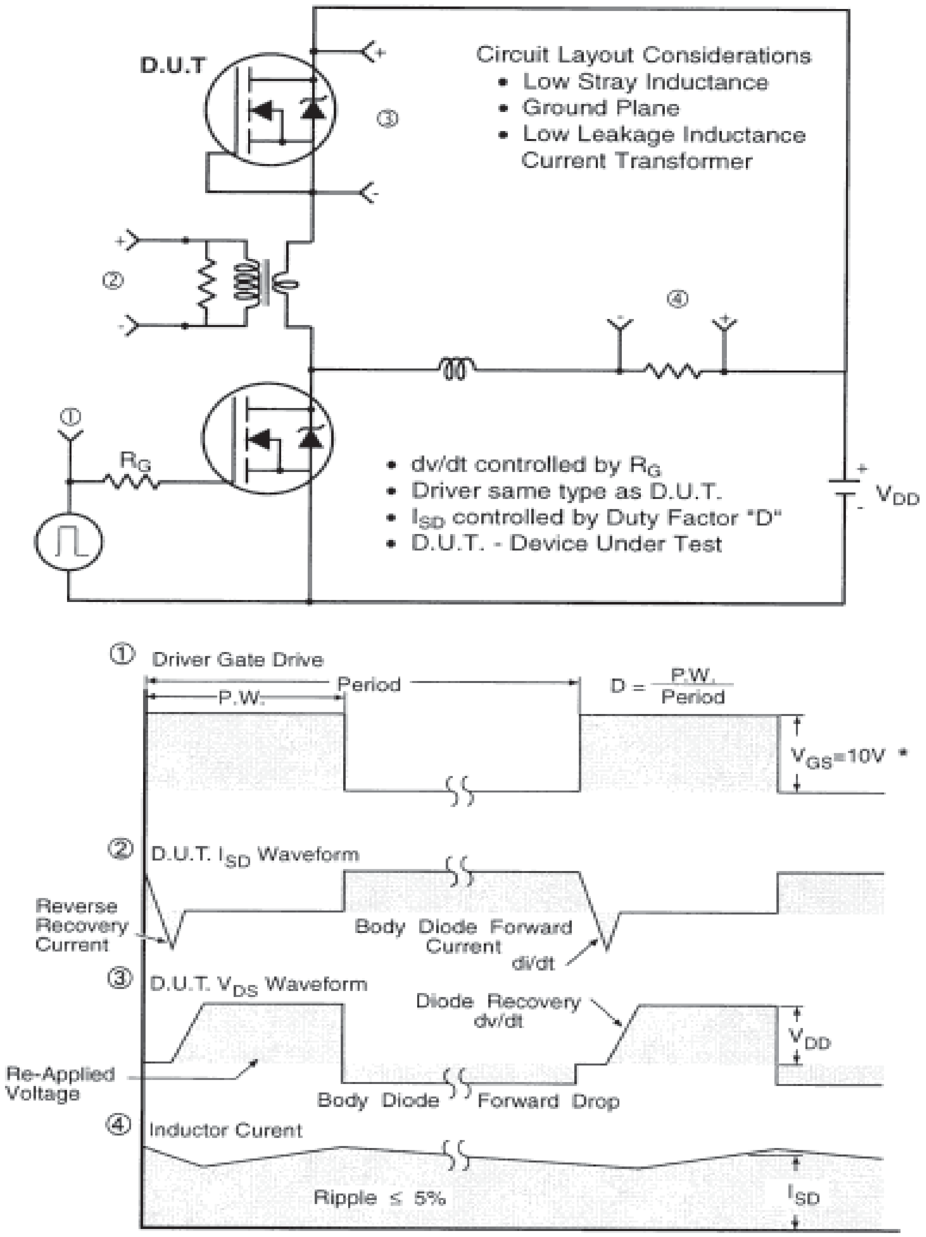


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

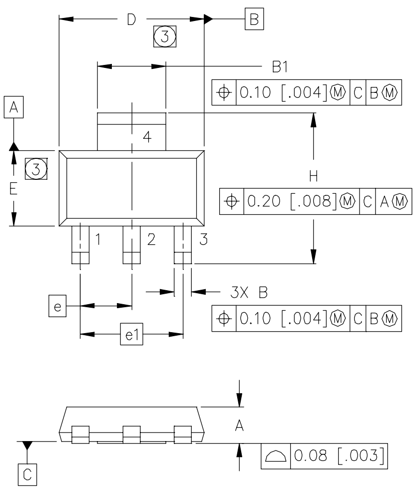


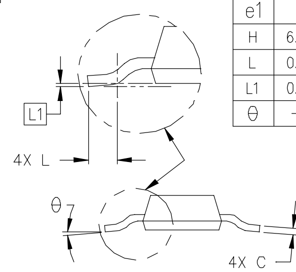
* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFETS

SOT-223 (TO-261AA) Package Outline

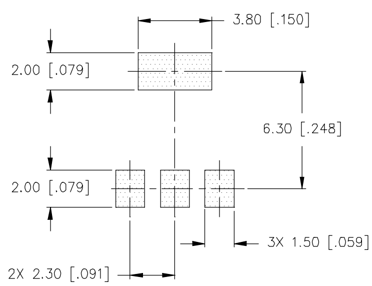
Dimensions are shown in milimeters (inches)





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.55	1.80	.061	.071
B	0.65	0.85	.026	.033
B1	2.95	3.15	.116	.124
C	0.25	0.35	.010	.014
D	6.30	6.70	.248	.264
E	3.30	3.70	.130	.146
e	2.30 BSC		.0905 BSC	
e1	4.60 BSC		.181 BSC	
H	6.71	7.29	.264	.287
L	0.91	—	.036	—
L1	0.061 BSC		.0024 BSC	
θ	—	10°	—	10°

MINIMUM RECOMMENDED FOOTPRINT



LEAD ASSIGNMENTS

1 = GATE
2 = DRAIN
3 = SOURCE
4 = DRAIN

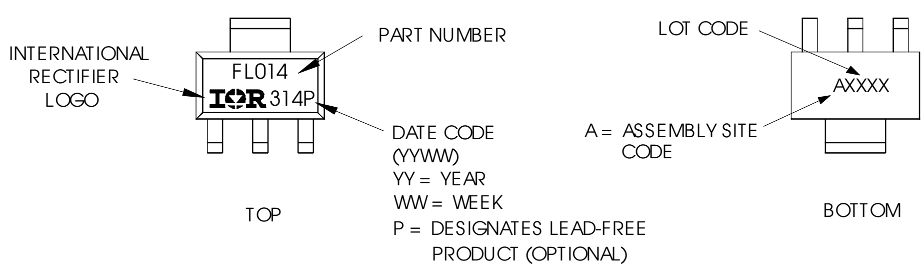
NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS DO NOT INCLUDE MOLD FLASH.
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO–261AA.
5. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

SOT-223 (TO-261AA) Part Marking Information

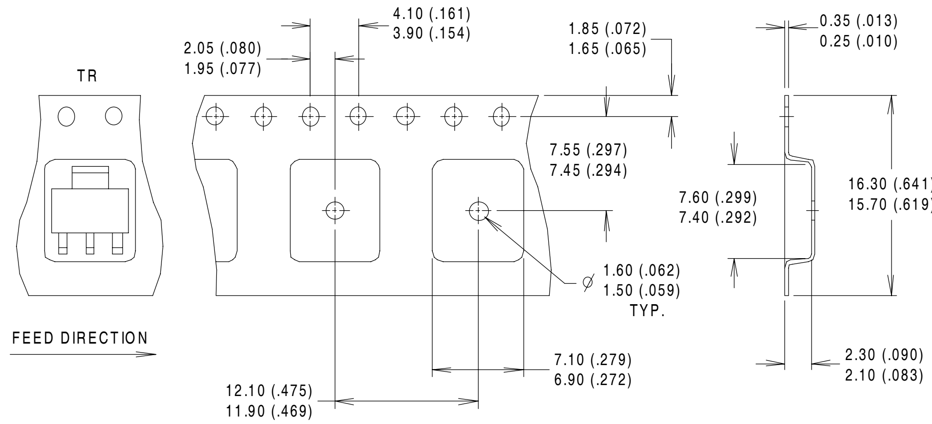
HEXFET PRODUCT MARKING

EXAMPLE: THIS IS AN IRFL014

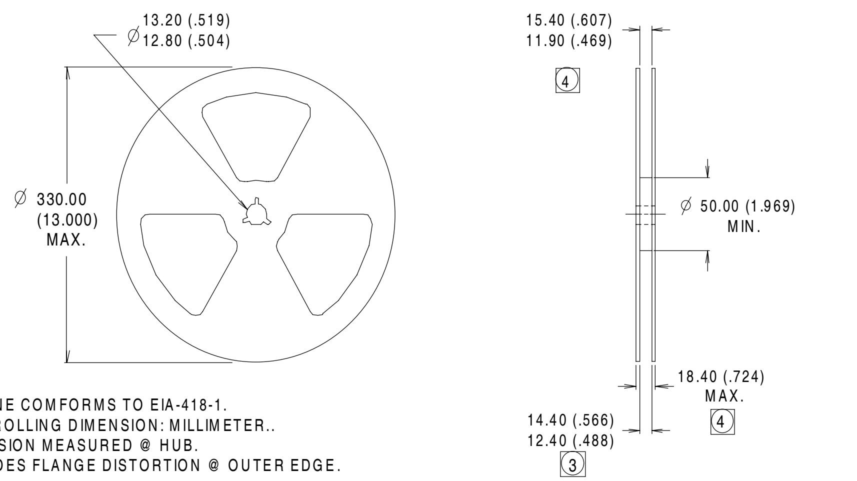


SOT-223 (TO-261AA) Tape & Reel Information

Dimensions are shown in milimeters (inches)



NOTES :
1. CONTROLLING DIMENSION: MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.
3. EACH Ø330.00 (13.00) REEL CONTAINS 2,500 DEVICES.



NOTES :
1. OUTLINE COMFORMS TO EIA-418-1.
2. CONTROLLING DIMENSION: MILLIMETER..
3. DIMENSION MEASURED @ HUB.
4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Data and specifications subject to change without notice.

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