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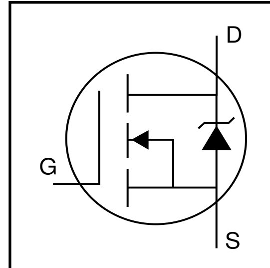
International
IOR Rectifier

PD - 9.1323B

IRL3303S/L

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- Surface Mount (IRL3303S)
- Low-profile through-hole (IRL3303L)
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated



V_{DSS} = 30V

$R_{DS(on)}$ = 0.026Ω

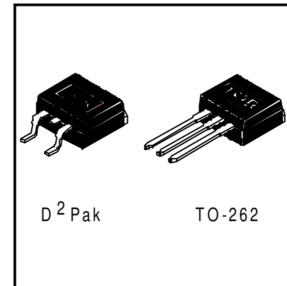
I_D = 38A

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D^2Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D^2Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.

The through-hole version (IRL3303L) is available for low-profile applications.



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V⑤	38	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V⑤	27	
I_{DM}	Pulsed Drain Current ①⑤	140	
P_D @T_A = 25°C	Power Dissipation	3.8	W
P_D @T_C = 25°C	Power Dissipation	68	W
	Linear Derating Factor	0.45	W/°C
V_{GS}	Gate-to-Source Voltage	±16	V
E_{AS}	Single Pulse Avalanche Energy②⑤	130	mJ
I_{AR}	Avalanche Current①	20	A
E_{AR}	Repetitive Avalanche Energy①	6.8	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑤	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

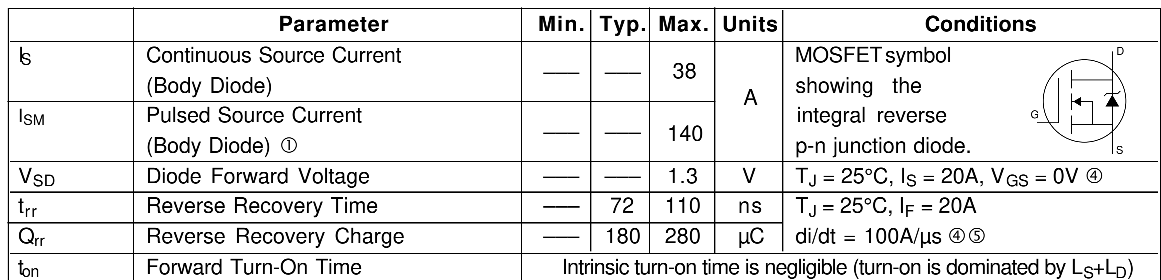
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	2.2	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted,steady-state)**	——	40	

8/25/97

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.035	——	V/°C	Reference to 25°C, I_D = 1mA⑤
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	——	0.026	Ω	V_{GS} = 10V, I_D = 20A ④
		——	——	0.040		V_{GS} = 4.5V, I_D = 17A ④ T_J = 150°C
$V_{GS(th)}$	Gate Threshold Voltage	1.0	——		V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	12	——	——	S	V_{DS} = 25V, I_D = 20A⑤
I_{DSS}	Drain-to-Source Leakage Current	——	——	25	µA	V_{DS} = 30V, V_{GS} = 0V
		——	——	250		V_{DS} = 24V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -16V
Q_g	Total Gate Charge	——	——	26	nC	I_D = 20A
Q_{gs}	Gate-to-Source Charge	——	——	8.8		V_{DS} = 24V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	——	15		V_{GS} = 4.5V, See Fig. 6 and 13 ④⑤
$t_{d(on)}$	Turn-On Delay Time	——	7.4	——		V_{DD} = 15V
t_r	Rise Time	——	200	——		I_D = 20A
$t_{d(off)}$	Turn-Off Delay Time	——	14	——		R_G = 6.5Ω
t_f	Fall Time	——	36	——		R_D = 0.7Ω, See Fig. 10 ④⑤
L_S	Internal Source Inductance	——	7.5	——	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	——	870	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	340	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	170	——		f = 1.0MHz, See Fig. 5⑤

Source-Drain Ratings and Characteristics



	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	38	A	MOSFET symbol showing the integral reverse p-n junction diode. (D, G, S)
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	140		
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 20A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	72	110	ns	T_J = 25°C, I_F = 20A
Q_{rr}	Reverse Recovery Charge	——	180	280	µC	di/dt = 100A/µs ④⑤
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 fig. 11)

② V_{DD} = 15V, starting T_J = 25°C, L = 470µH R_G = 25Ω, I_{AS} = 20A. (See Figure 12)

③ $I_{SD} \le$ 20A, di/dt ≤ 140A/µs, $V_{DD} \le V_{(BR)DSS}$, $T_J \le$ 175°C

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

⑤ Uses IRL3303 data and test conditions.

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

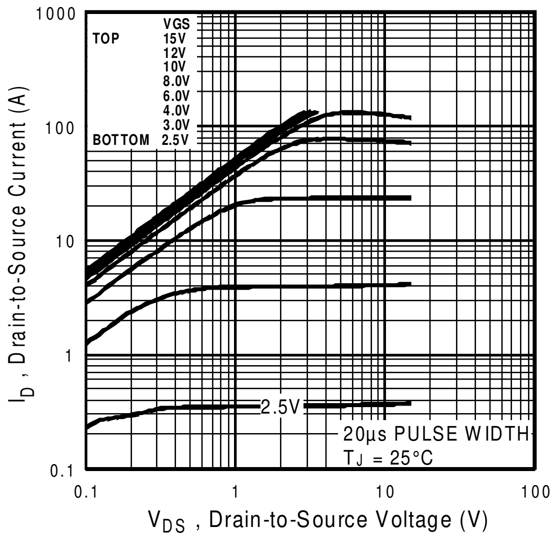


Fig 1. Typical Output Characteristics

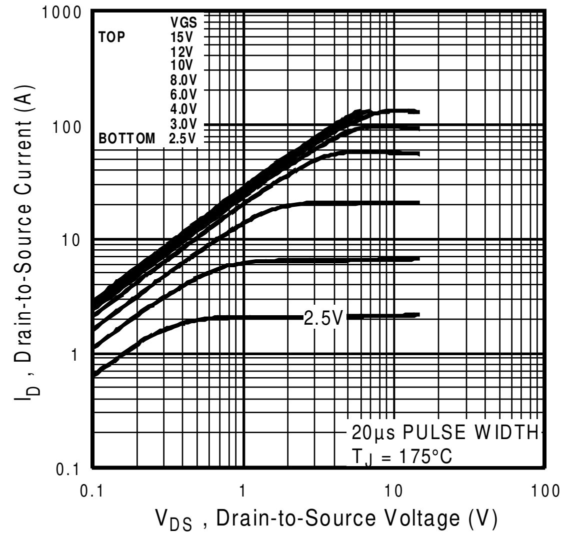


Fig 2. Typical Output Characteristics

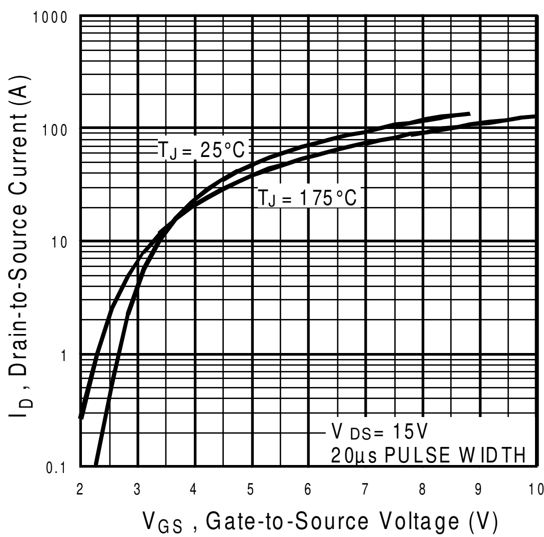


Fig 3. Typical Transfer Characteristics

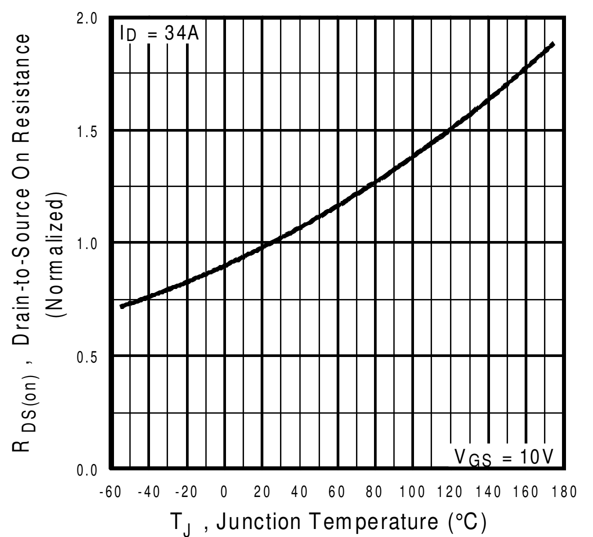


Fig 4. Normalized On-Resistance Vs. Temperature

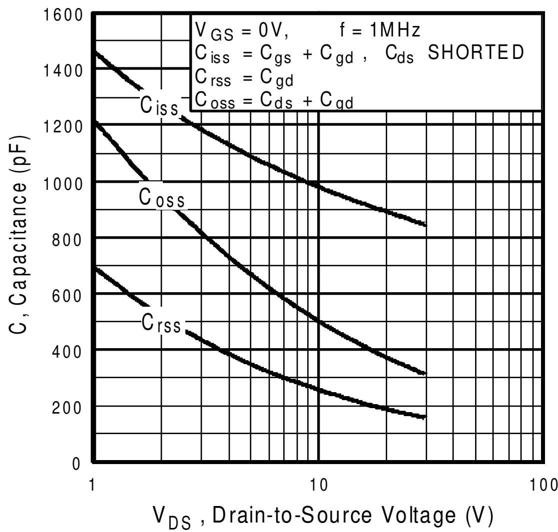


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

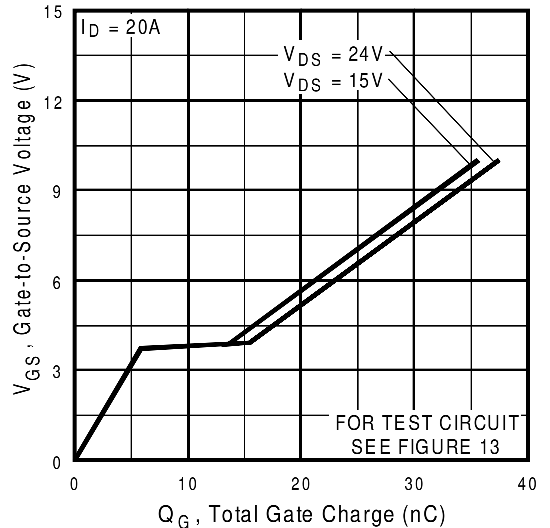


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

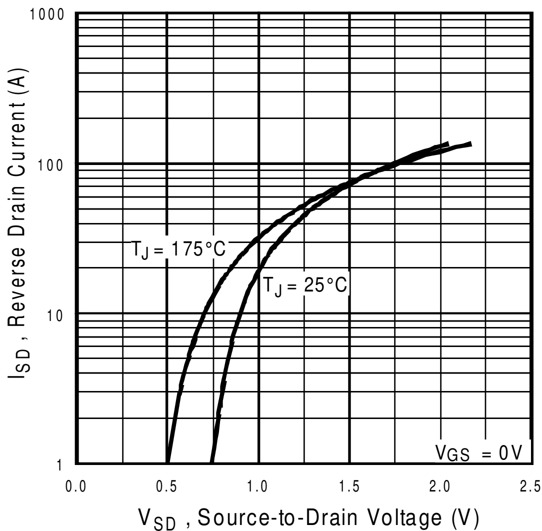


Fig 7. Typical Source-Drain Diode Forward Voltage

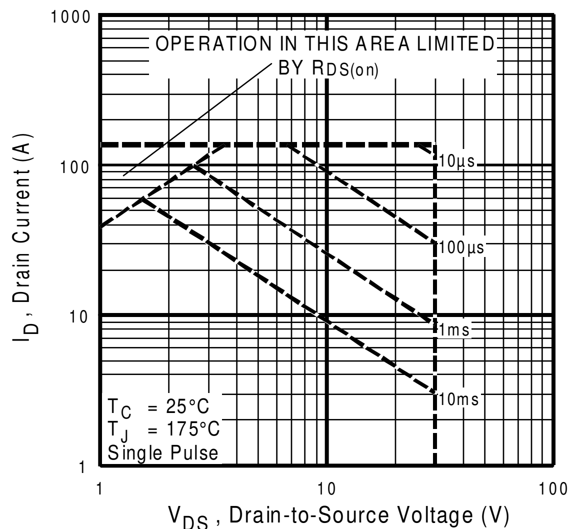


Fig 8. Maximum Safe Operating Area

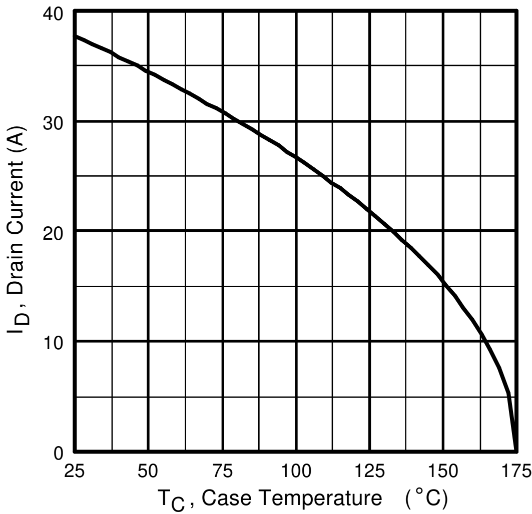


Fig 9. Maximum Drain Current Vs. Case Temperature

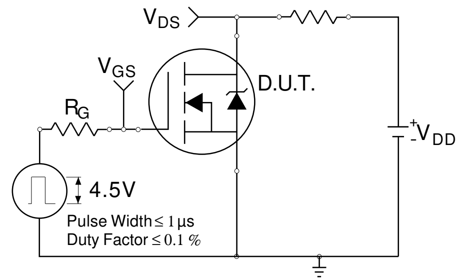


Fig 10a. Switching Time Test Circuit

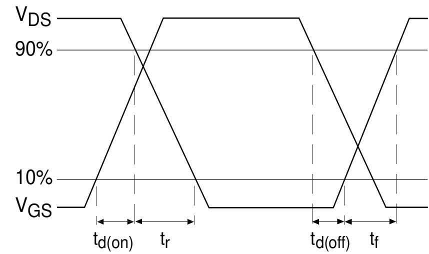


Fig 10b. Switching Time Waveforms

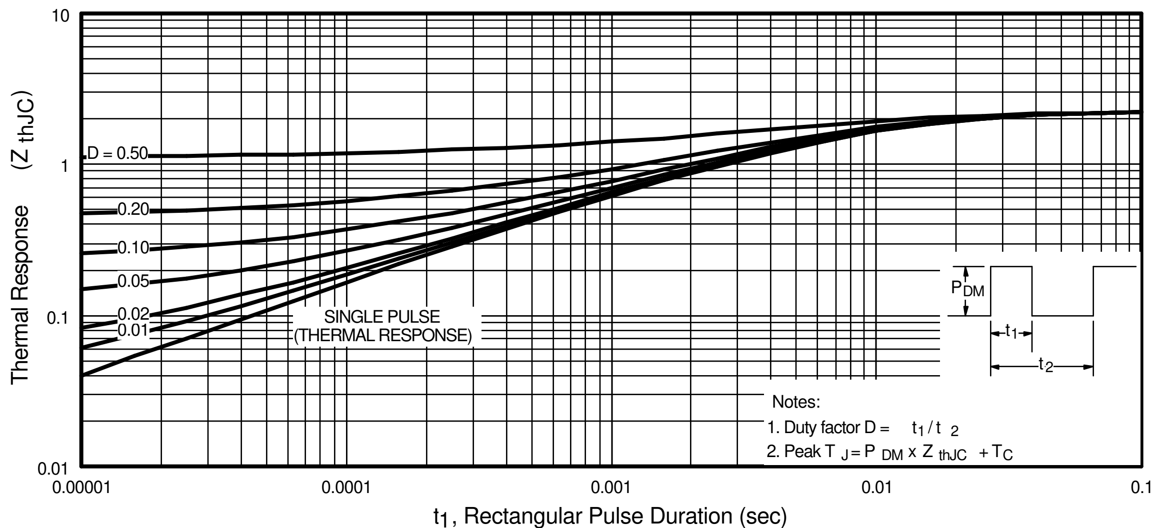


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

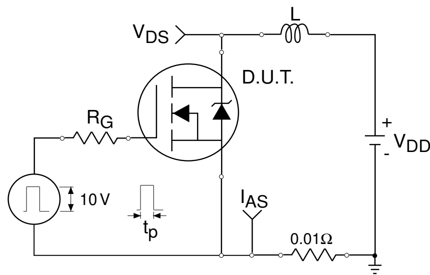


Fig 12a. Unclamped Inductive Test Circuit

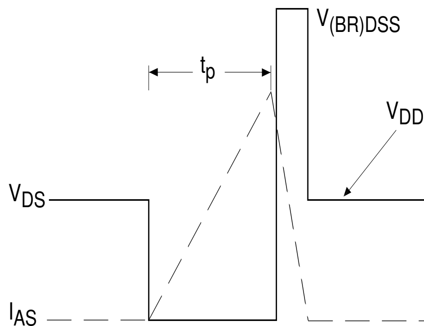


Fig 12b. Unclamped Inductive Waveforms

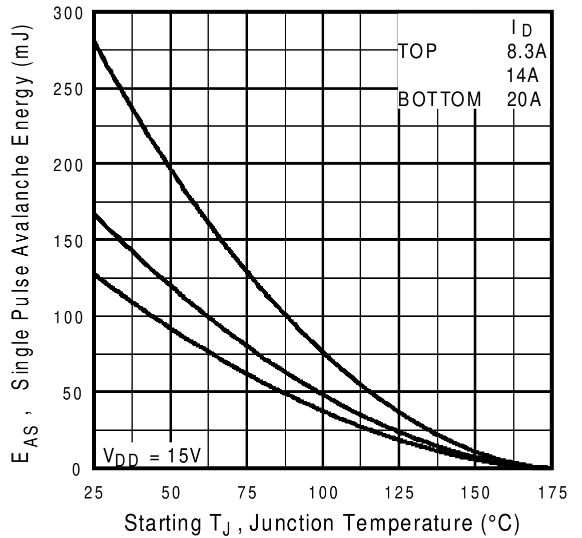


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

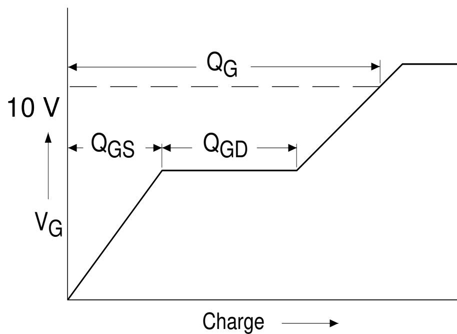


Fig 13a. Basic Gate Charge Waveform

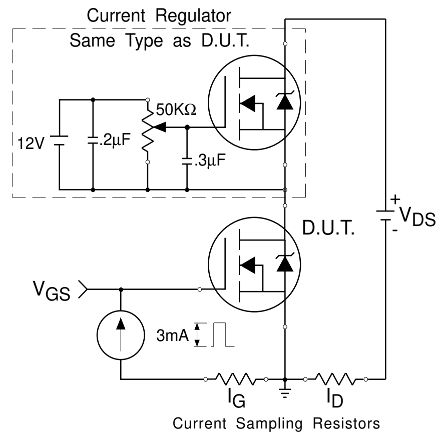
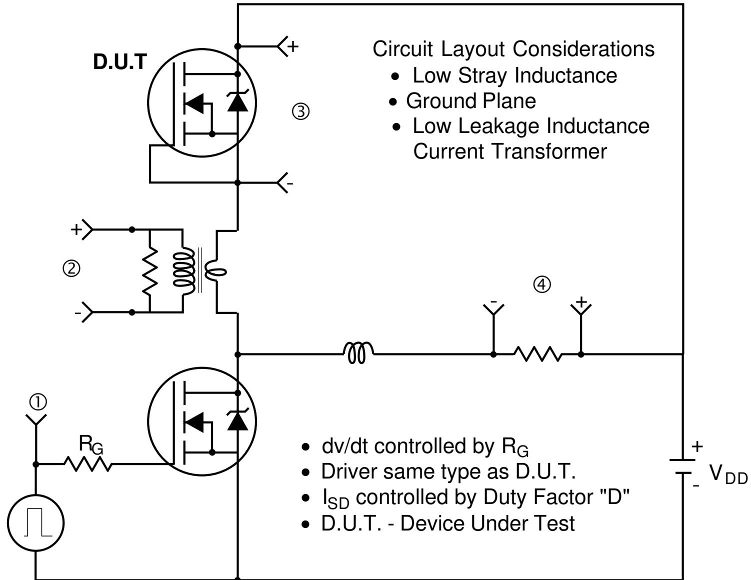
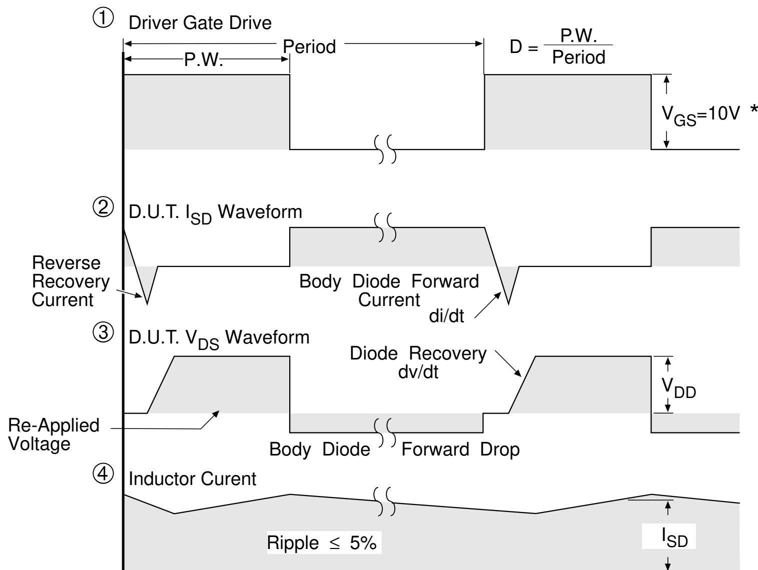


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit





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

Fig 14. For N-Channel HEXFETS

D^2Pak Package Outline

10.54 (.415)
10.29 (.405)
1.40 (.055)
MAX.
- A -
2
1.78 (.070)
1.27 (.050)
1 3
15.49 (.610)
14.73 (.580)
3X 1.40 (.055)
1.14 (.045)
3X 0.93 (.037)
0.69 (.027)
5.08 (.200)
0.25 (.010) M B A M

4.69 (.185)
4.20 (.165)
- B -
1.32 (.052)
1.22 (.048)
2.79 (.110)
2.29 (.090)
5.28 (.208)
4.78 (.188)
0.55 (.022)
0.46 (.018)
1.39 (.055)
1.14 (.045)

10.16 (.400)
REF.
6.47 (.255)
6.18 (.243)
2.61 (.103)
2.32 (.091)
8.89 (.350)
REF.

MINIMUM RECOMMENDED FOOTPRINT

11.43 (.450)
8.89 (.350)
17.78 (.700)
3.81 (.150)
2.08 (.082)
2X
2.54 (.100)
2X

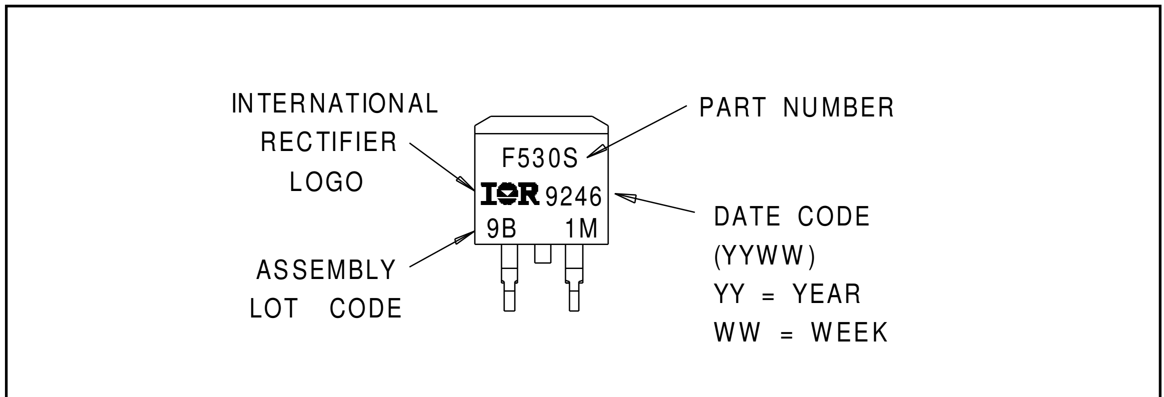
NOTES:

1 DIMENSIONS AFTER SOLDER DIP.
2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3 CONTROLLING DIMENSION : INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

Part Marking Information

D^2Pak



Package Outline

TO-262 Outline

10.54 [.415]
10.29 [.405]
-A-
4
10.54 [.415]
9.91 [.390]
1.15 [.045]
MIN.
1 2 3
-C-
14.09 [.555]
13.47 [.530]
4.06 [.160]
3.55 [.140]
3X 1.40 [.055]
1.15 [.045]
3X 0.93 [.037]
0.69 [.027]
2.54 [.100]
2X
0.36 [.014] M B A M

4.69 [.185]
4.20 [.165]
-B-
1.32 [.052]
1.22 [.048]
3X 0.55 [.022]
0.46 [.018]
2.92 [.115]
2.64 [.104]

LEAD ASSIGNMENTS

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

NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

Part Marking Information

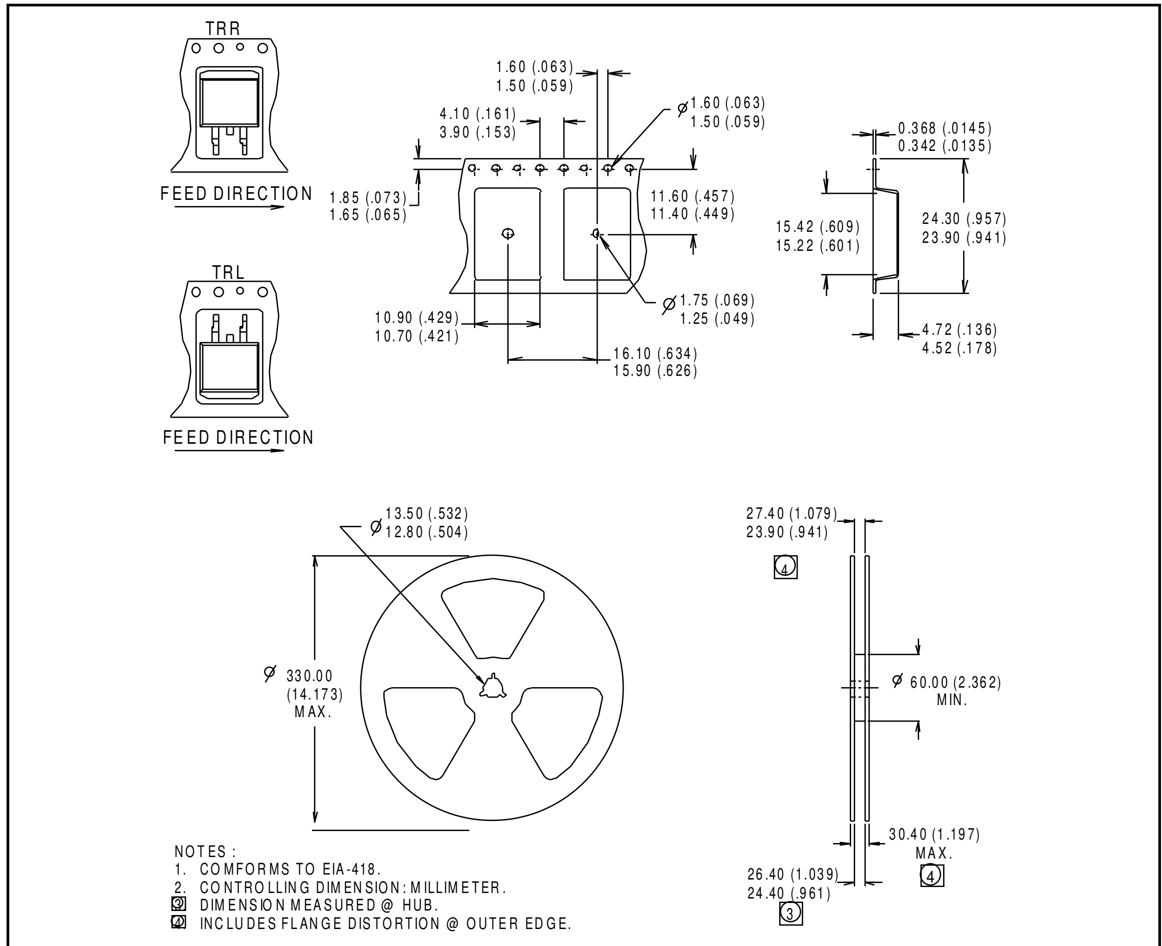
TO-262

EXAMPLE: THIS IS AN IRL3103L
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

INTERNATIONAL RECTIFIER LOGO
ASSEMBLY LOT CODE
IRL3103L
IOR 719C
17 89
PART NUMBER
DATE CODE
YEAR 7 = 1997
WEEK 19
LINE C

Tape & Reel Information

D2Pak



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