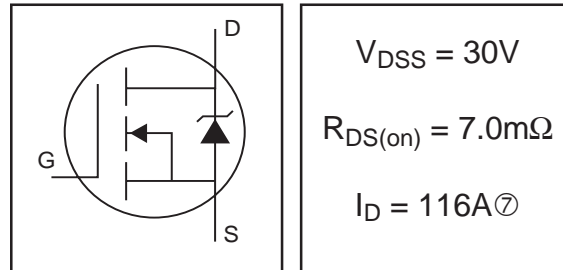


- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- 100% R_G Tested

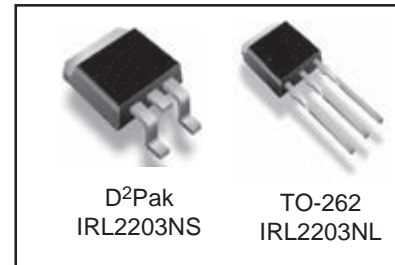
HEXFET® Power MOSFET



Description

Advanced HEXFET® Power MOSFETs 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 D²Pak 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 D²Pak 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 (IRL2203NL) is available for low-profile applications.



Absolute Maximum Ratings

Symbol	Parameter	Max	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	116 (7)	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	82	
I_{DM}	Pulsed Drain Current (1)	400	
$P_D @ T_A = 25^\circ C$	Power Dissipation	3.8	W
$P_D @ T_C = 25^\circ C$	Power Dissipation	180	W
	Linear Derating Factor	1.2	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
I_{AR}	Avalanche Current (1)	60	A
E_{AR}	Repetitive Avalanche Energy (1)	18	mJ
dv/dt	Peak Diode Recovery dv/dt (3)	5.0	V/ns
T_J	Operating Junction and Storage Temperature Range	-55 to + 175	°C
T_{STG}	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Junction-to-Case (2)	—	0.85	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount, steady state) (2)(3)	—	40	

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	30	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.029	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	7.0		V _{GS} = 10V, I _D = 60A ④
		—	—	10		V _{GS} = 4.5V, I _D = 48A ④
V _{GS(th)}	Gate Threshold Voltage	1.0	—	3.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	73	—	—	S	V _{DS} = 25V, I _D = 60A ④
I _{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V _{DS} = 30V, V _{GS} = 0V
		—	—	250		V _{DS} = 24V, V _{GS} = 0V, T _J = 125°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	—	—	60	nC	I _D = 60A
Q _{gs}	Gate-to-Source Charge	—	—	14		V _{DS} = 24V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	33		V _{GS} = 4.5V, See Fig. 6 and 13
R _G	Gate Resistance	0.2	—	3.0	Ω	
t _{d(on)}	Turn-On Delay Time	—	11	—		V _{DD} = 15V
t _r	Rise Time	—	160	—		I _D = 60A
t _{d(off)}	Turn-Off Delay Time	—	23	—		R _G = 1.8Ω
t _f	Fall Time	—	66	—		V _{GS} = 4.5V, See Fig. 10 ④
L _D	Internal Drain Inductance	—	4.5	—	Nh	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	7.5	—		
C _{iss}	Input Capacitance	—	3290	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	1270	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	170	—		f = 1.0MHz, See Fig. 5
E _{AS}	Single Pulse Avalanche Energy ②	—	1320 ⑤	290 ⑥	mJ	I _{AS} = 60A, L = 0.16mH

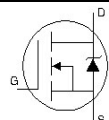
Source-Drain Ratings and Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	116 ⑦	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①	—	—	400		
V _{SD}	Diode Forward Voltage	—	—	1.2	V	T _J = 25°C, I _S = 60A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	56	84	ns	T _J = 25°C, I _F = 60A
Q _{rr}	Reverse Recovery Charge	—	110	170	nC	di/dt = 100A/μs ④
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting T_J = 25°C, L = 0.16mH R_G = 25Ω, I_{AS} = 60A, V_{GS} = 10V (See Figure 12)
- ③ I_{SD} ≤ 60A, di/dt ≤ 110A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C
- ④ Pulse width ≤ 400μs; duty cycle ≤ 2%.

- ⑤ This is a typical value at device destruction and represents operation outside rated limits.
- ⑥ This is a calculated value limited to T_J = 175°C .
- ⑦ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
- ⑧ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑨ R_θ is measured at T_J approximately 90°C



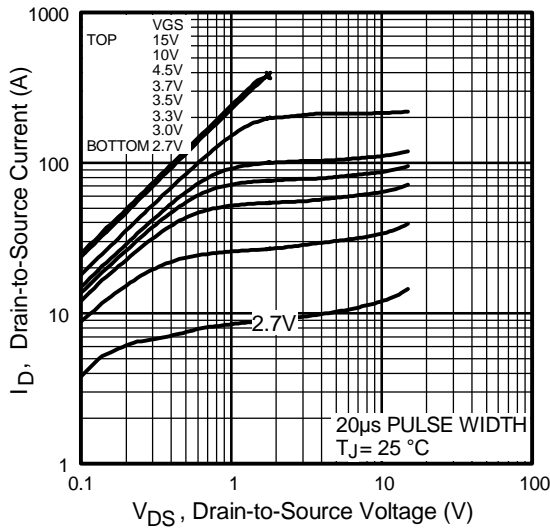


Fig 1. Typical Output Characteristics

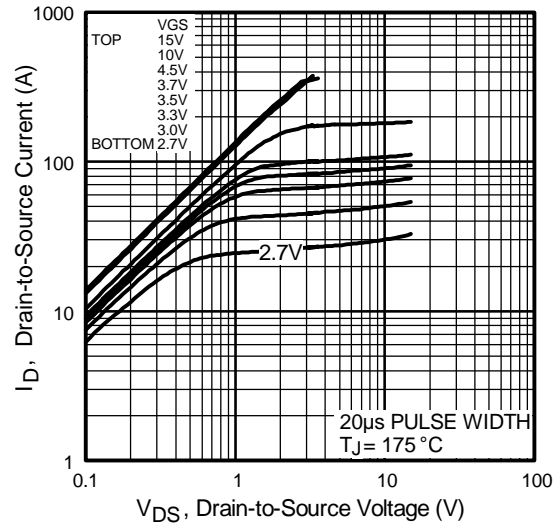


Fig 2. Typical Output Characteristics

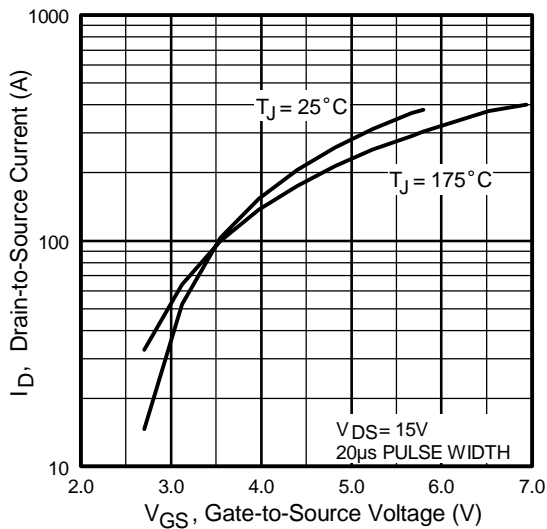


Fig 3. Typical Transfer Characteristics

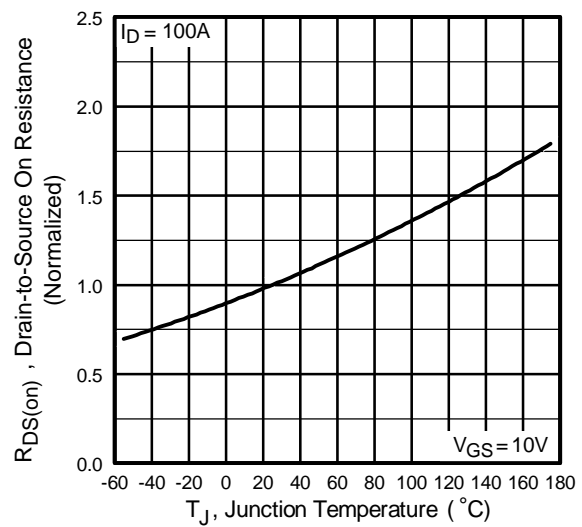


Fig 4. Normalized On-Resistance Vs. Temperature

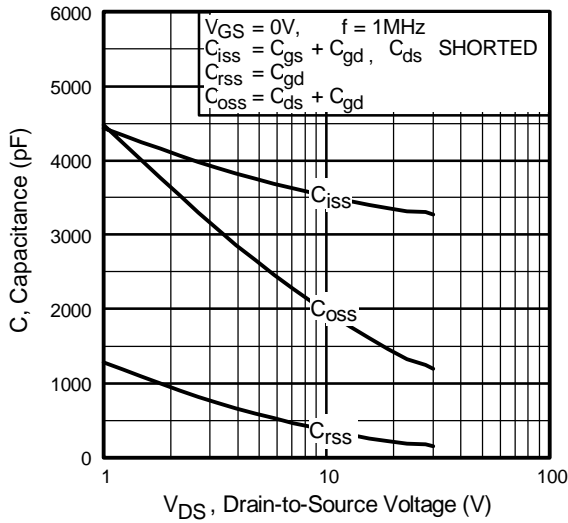


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

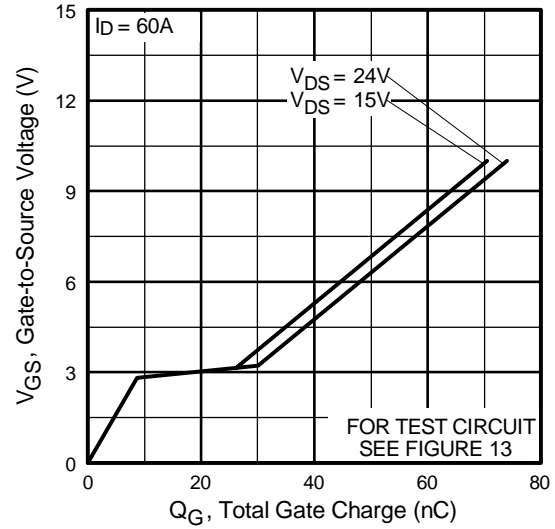


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

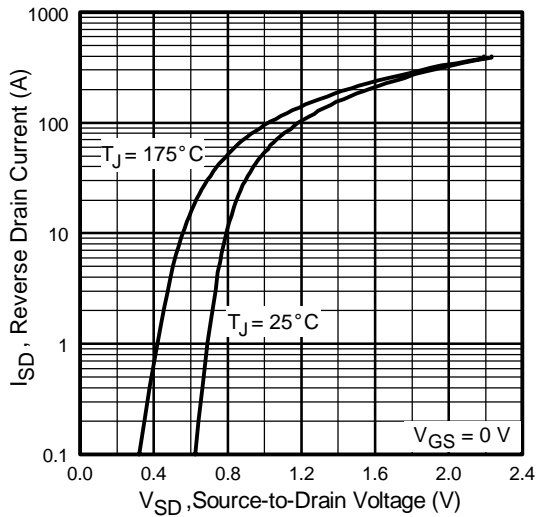


Fig 7. Typical Source-Drain Diode Forward Voltage

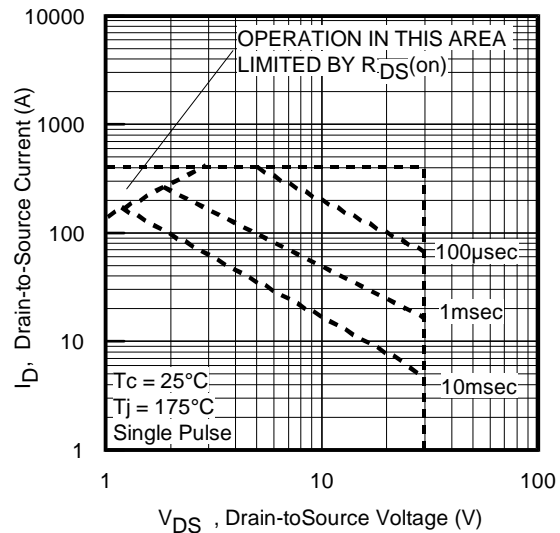


Fig 8. Maximum Safe Operating Area

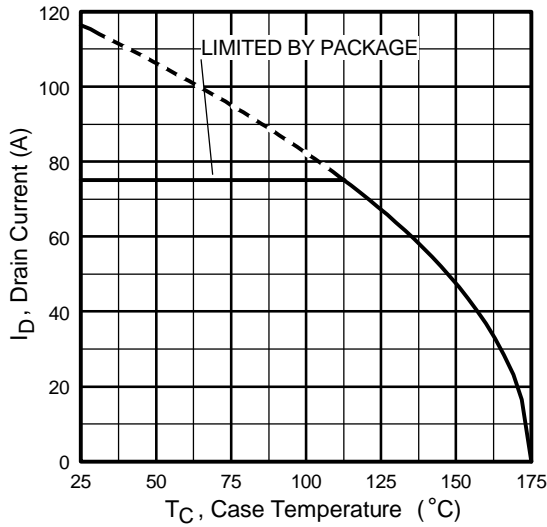


Fig 9. Maximum Drain Current Vs. Case Temperature



Fig 10a. Switching Time Test Circuit

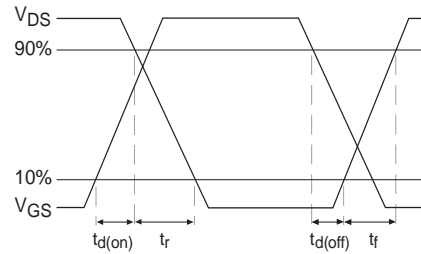


Fig 10b. Switching Time Waveforms

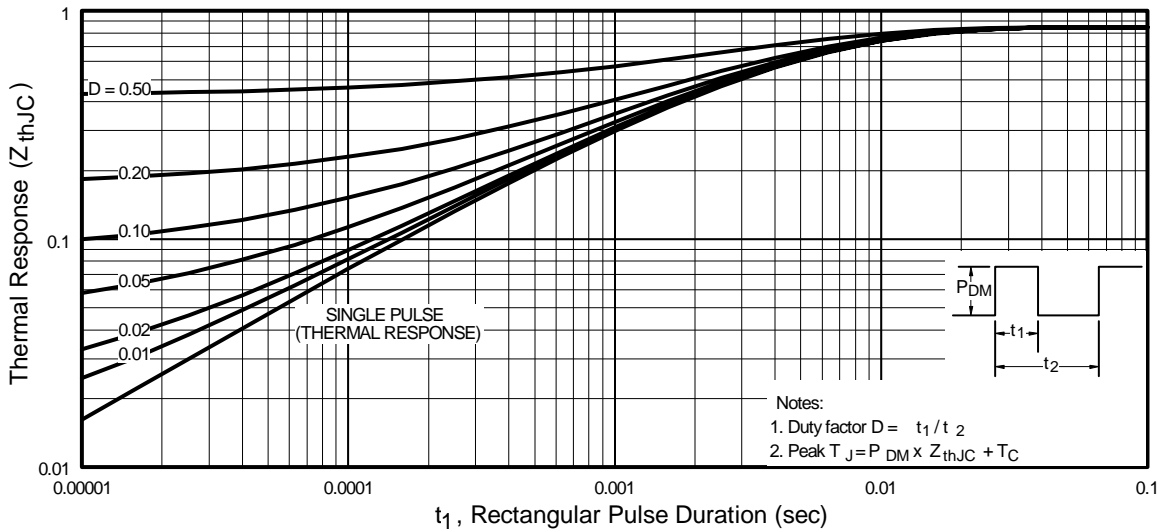


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

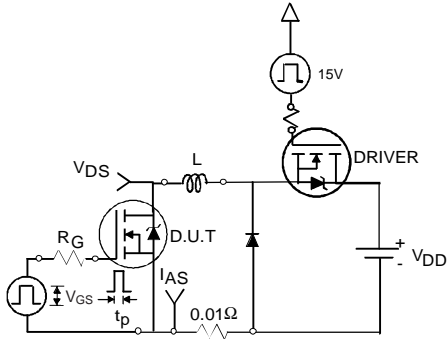


Fig 12a. Unclamped Inductive Test Circuit

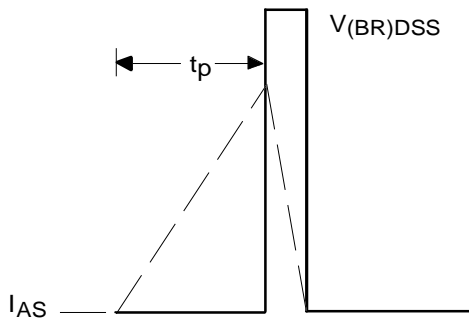


Fig 12b. Unclamped Inductive Waveforms

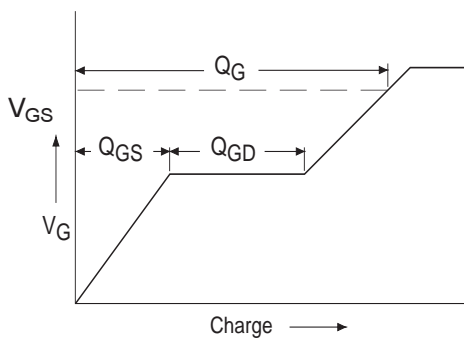


Fig 13a. Basic Gate Charge Waveform

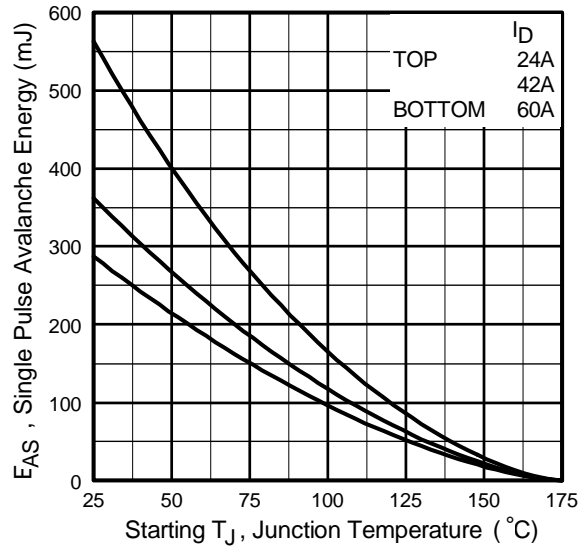


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

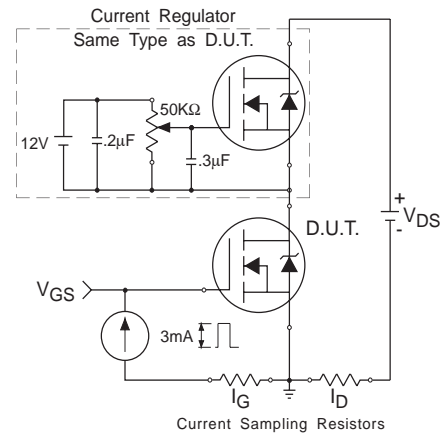
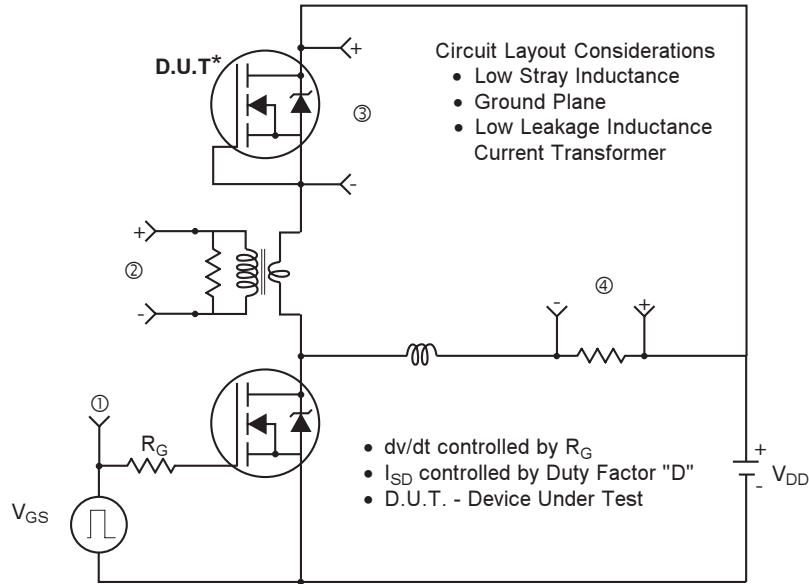
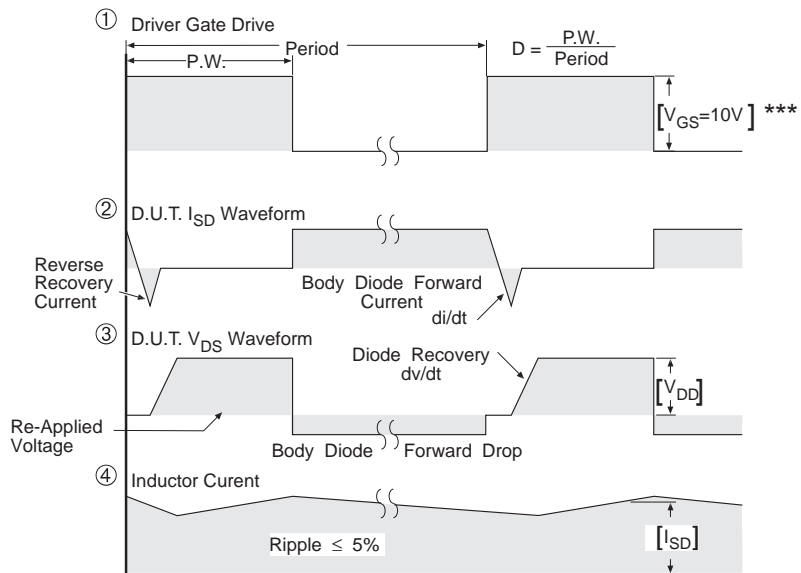


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity of D.U.T for P-Channel

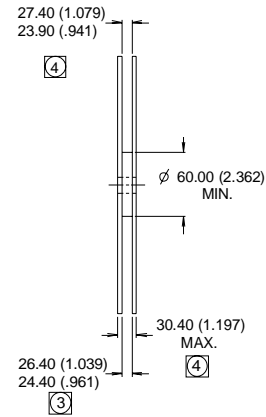
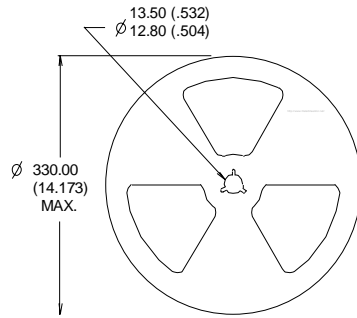
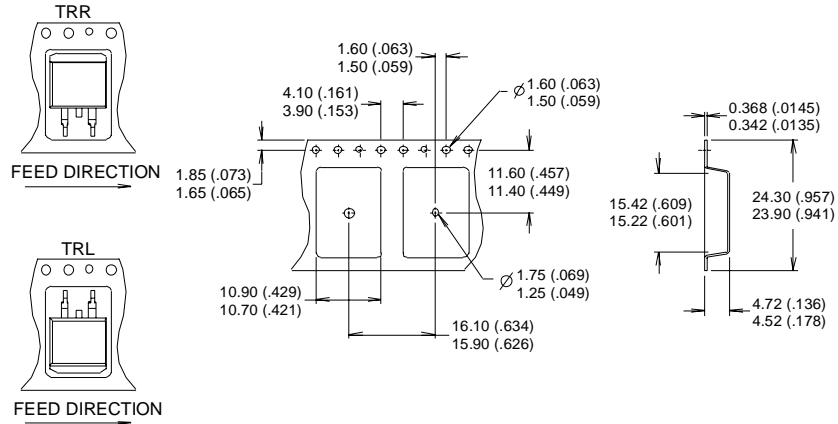


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

Fig 14. For N-channel HEXFET® power MOSFETs

D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



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