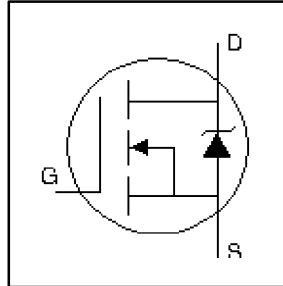


HEXFET® Power MOSFET

- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Logic-Level Gate Drive
- $R_{DS(ON)}$ Specified at $V_{GS} = 4V$ & $5V$
- $150^{\circ}C$ Operating Temperature



$$V_{DSS} = 200V$$

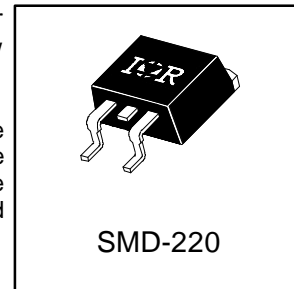
$$R_{DS(on)} = 0.40\Omega$$

$$I_D = 9.0A$$

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 SMD-220 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 SMD-220 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.



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^{\circ}C$	Continuous Drain Current, V_{GS} @ 5.0V	9.0	A
I_D @ $T_C = 100^{\circ}C$	Continuous Drain Current, V_{GS} @ 5.0V	5.7	
I_{DM}	Pulsed Drain Current ①	36	
P_D @ $T_C = 25^{\circ}C$	Power Dissipation	74	W
P_D @ $T_C = 25^{\circ}C$	Power Dissipation (PCB Mount)**	3.1	
	Linear Derating Factor	0.59	W/ $^{\circ}C$
	Linear Derating Factor (PCB Mount)**	0.025	
V_{GS}	Gate-to-Source Voltage	± 10	V
E_{AS}	Single Pulse Avalanche Energy ②	250	mJ
I_{AR}	Avalanche Current ①	9.0	A
E_{AR}	Repetitive Avalanche Energy ①	7.4	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	$^{\circ}C$
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance


	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	1.7	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount)**	—	—	40	
$R_{\theta JA}$	Junction-to-Ambient	—	—	62	

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

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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	200	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.27	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.40	Ω	$V_{GS} = 5.0V, I_D = 5.4A$ ①
		—	—	0.50		$V_{GS} = 4.0V, I_D = 4.5A$ ②
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	4.8	—	—	S	$V_{DS} = 50V, I_D = 5.4A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 200V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 160V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 10V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -10V$
Q_g	Total Gate Charge	—	—	40	nC	$I_D = 9.0A$
Q_{gs}	Gate-to-Source Charge	—	—	5.5		$V_{DS} = 160V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	24		$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	8.0	—	ns	$V_{DD} = 100V$
t_r	Rise Time	—	57	—		$I_D = 9.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	38	—		$R_G = 6.0\Omega$
t_f	Fall Time	—	33	—		$R_D = 11\Omega$, 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	—	1100	—	pF	$V_{GS} = 0V$
C_{OSS}	Output Capacitance	—	220	—		$V_{DS} = 25V$
C_{RSS}	Reverse Transfer Capacitance	—	70	—		$f = 1.0\text{MHz}$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	9.0	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	36		
V_{SD}	Diode Forward Voltage	—	—	2.0	V	$T_J = 25^\circ\text{C}, I_S = 9.0A, V_{GS} = 0V$ ②
t_{rr}	Reverse Recovery Time	—	230	350	ns	$T_J = 25^\circ\text{C}, I_F = 9.0A$
Q_{rr}	Reverse Recovery Charge	—	1.7	2.6	μC	$di/dt = 100A/\mu s$ ③
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)

③ $I_{SD} \leq 9.0A, di/dt \leq 120A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

② $V_{DD} = 25V, \text{ starting } T_J = 25^\circ\text{C}, L = 4.6\text{mH}, R_G = 25\Omega, I_{AS} = 9.0A. (\text{ See Figure 12 })$

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

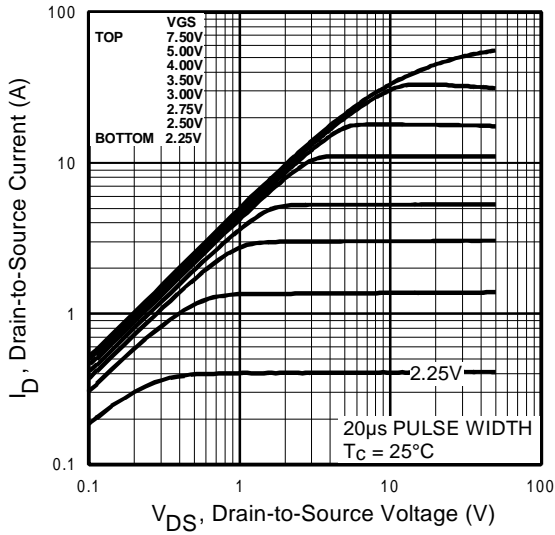


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

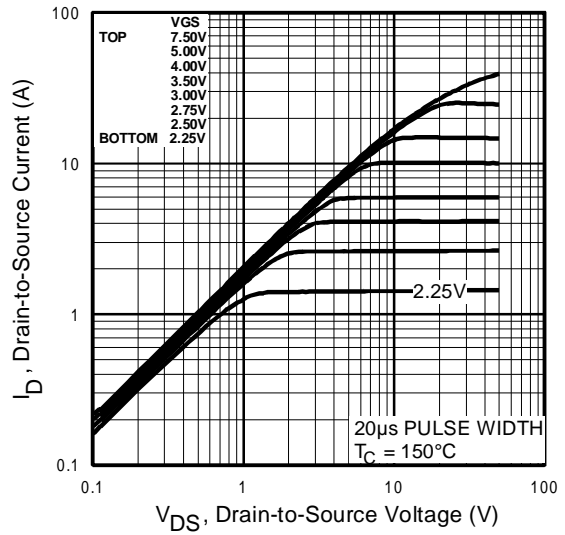


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

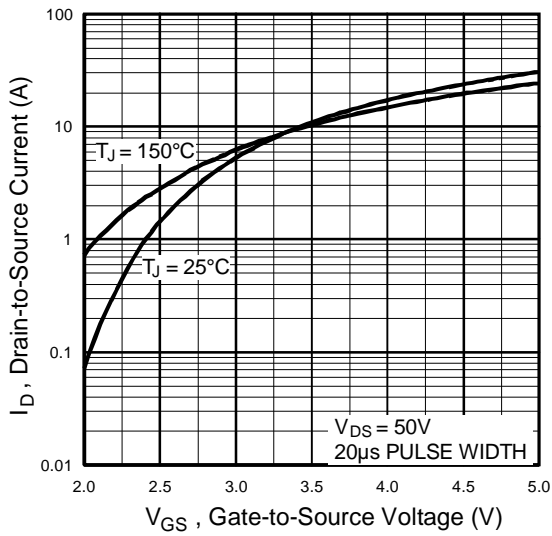


Fig 3. Typical Transfer Characteristics

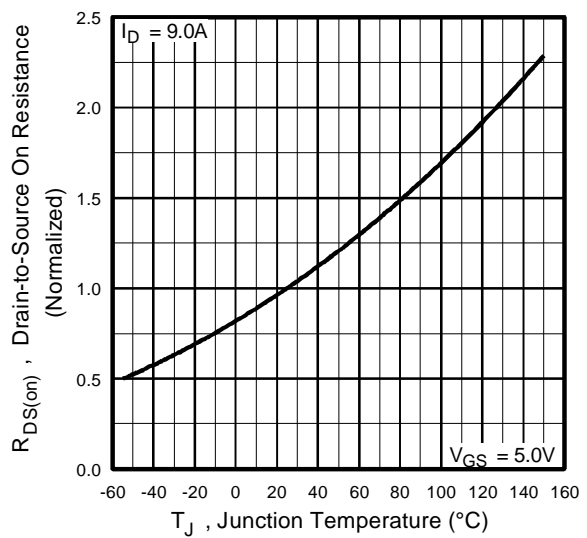


Fig 4. Normalized On-Resistance
Vs. Temperature

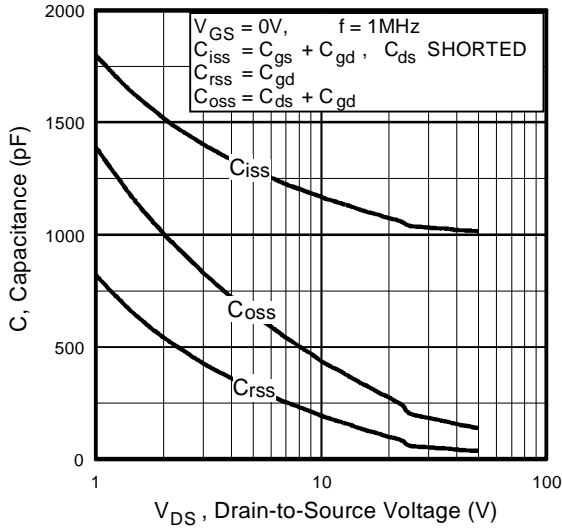


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

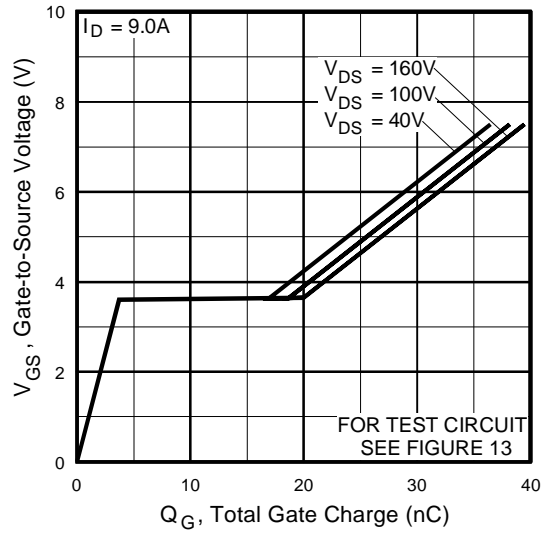


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

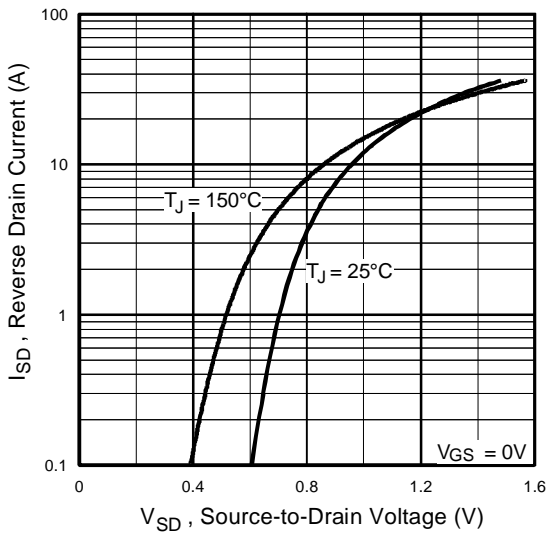


Fig 7. Typical Source-Drain Diode Forward Voltage

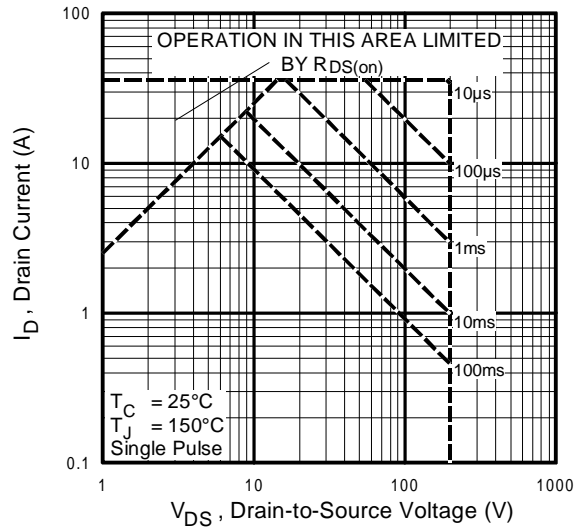


Fig 8. Maximum Safe Operating Area

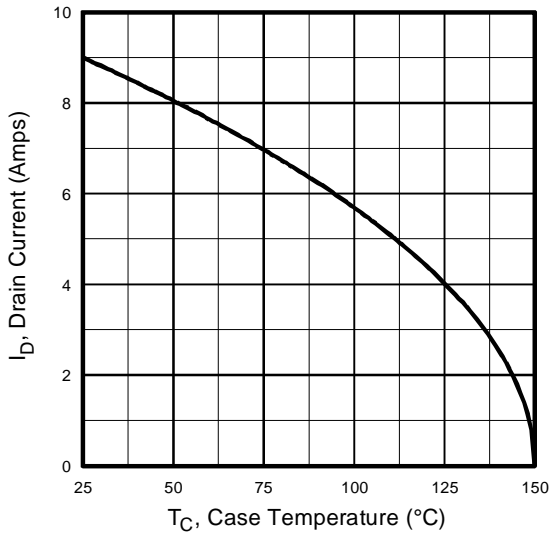


Fig 9. Maximum Drain Current Vs. Case Temperature

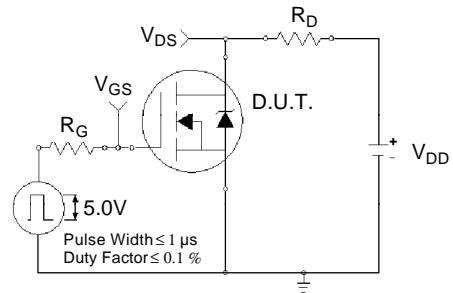


Fig 10a. Switching Time Test Circuit

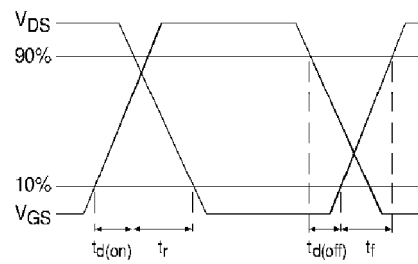


Fig 10b. Switching Time Waveforms

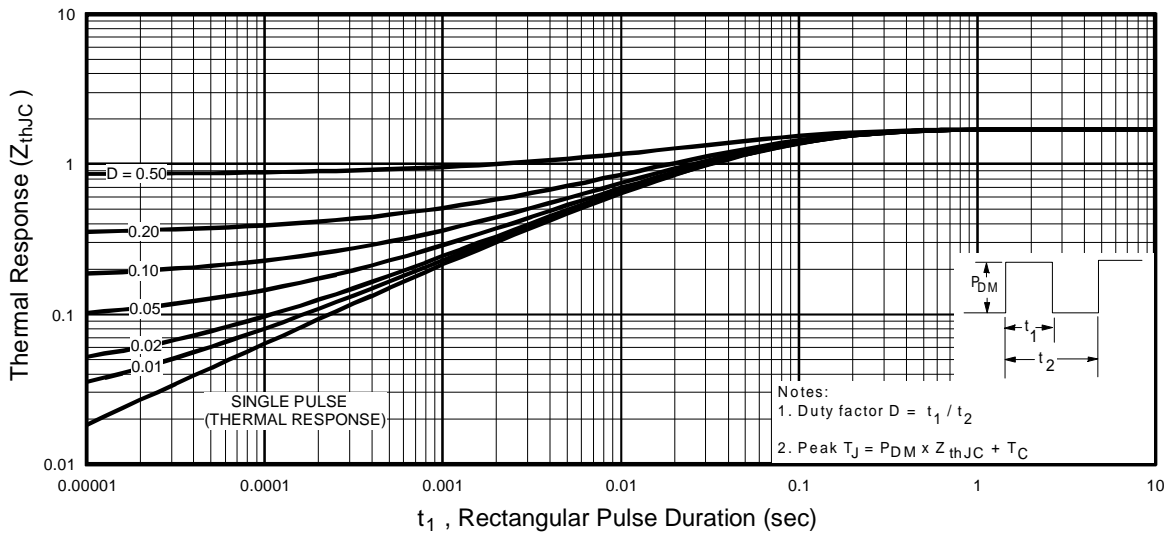


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

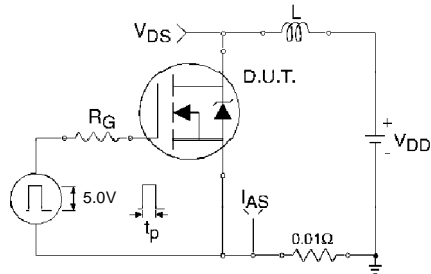


Fig 12a. Unclamped Inductive Test Circuit

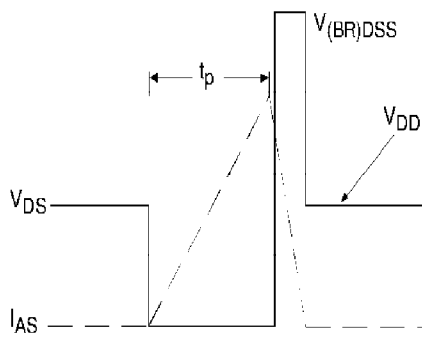


Fig 12b. Unclamped Inductive Waveforms

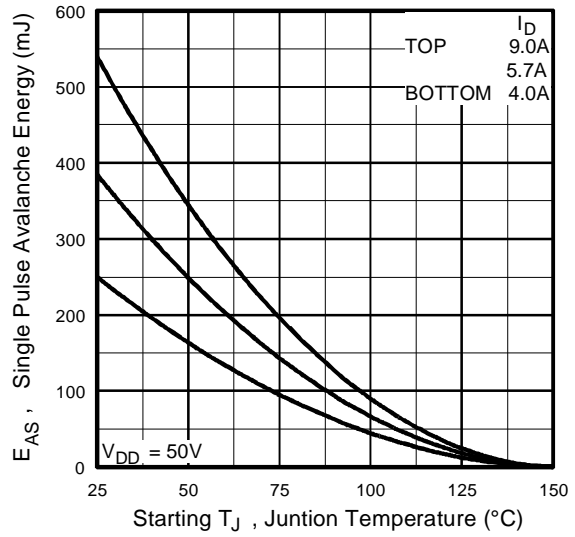


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

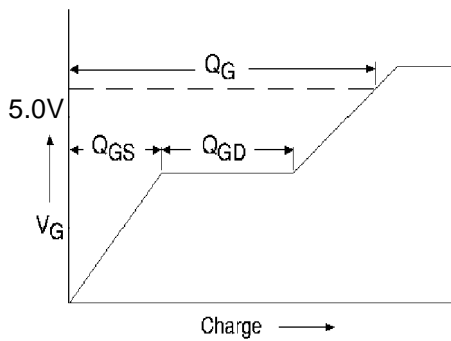


Fig 13a. Basic Gate Charge Waveform

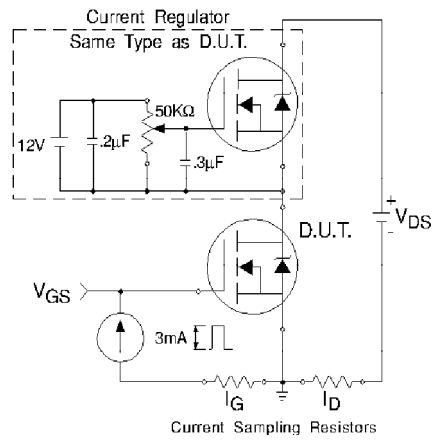
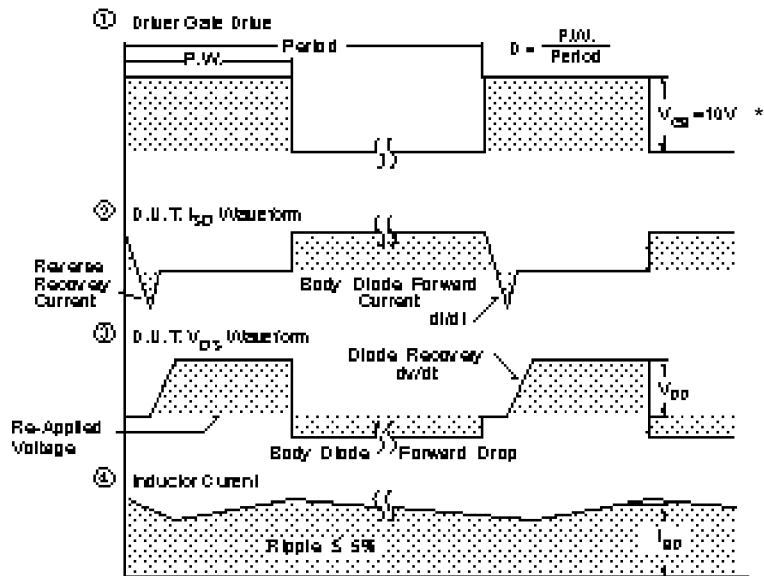
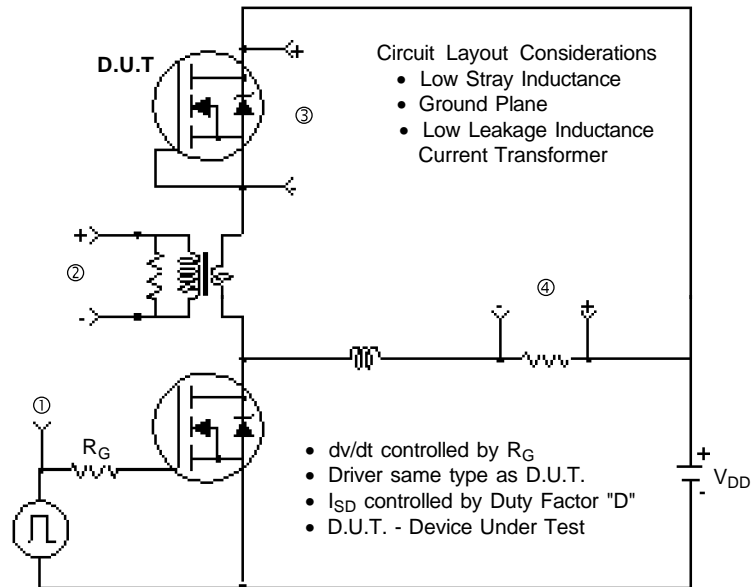


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

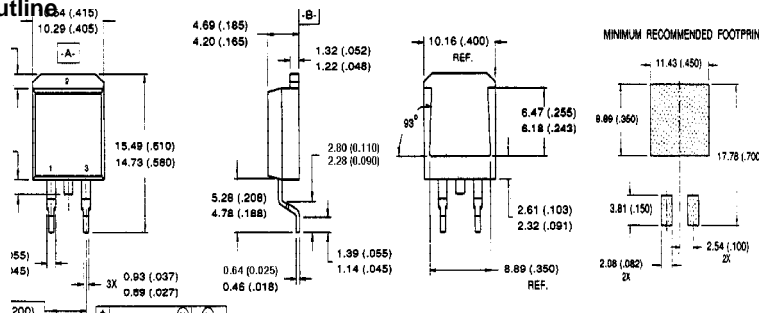
Fig 14. For N-Channel HEXFETS

IRL630S



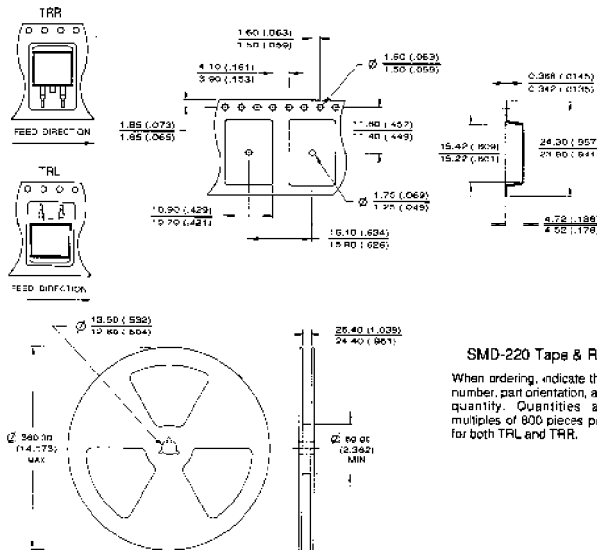
Package Outline

SMD-220 Outline



Tape and Reel Information

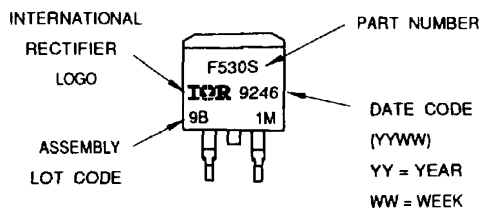
SMD-220



SMD-220 Tapes & Reel

When ordering, indicate the part number, part orientation, and the quantity. Quantities are in multiples of 800 pieces per reel for both TRL and TRR.

Part Marking Information



EXAMPLE: THIS IS AN IRF530S WITH ASSEMBLY LOT CODE 9B1M



WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: (44) 0883 713215
IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 3L1, Tel: (905) 475 1897 **IR GERMANY:** Saalburgstrasse 157, 61350 Bad Homburg Tel: 6172 37066 **IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: (39) 1145 10111
IR FAR EAST: K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo 171 Tel: (03)3983 0641 **IR SOUTHEAST ASIA:** 315 Outram Road, #10-02 Tan Boon Liat Building, 0316 Tel: 65 221 8371

Data and specifications subject to change without notice.