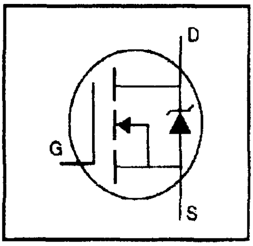
PD-9.1008

International Rectifier IOR

IRF720S

HEXFET® Power MOSFET

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



V_{DSS} = 400V

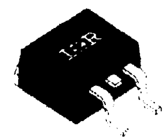
$R_{DS(on)}$ = 1.8Ω

I_D = 3.3A

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.*



SMD-220

Absolute Maximum Ratings

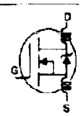
	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10 V	3.3	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10 V	2.1	
I_{DM}	Pulsed Drain Current ①	13	
P_D @ T_C = 25°C	Power Dissipation	50	W
P_D @ T_A = 25°C	Power Dissipation (PCB Mount)**	3.1	
	Linear Derating Factor	0.40	W/°C
	Linear Derating Factor (PCB Mount)**	0.025	
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	190	mJ
I_{AR}	Avalanche Current ①	3.3	A
E_{AR}	Repetitive Avalanche Energy ①	5.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.0	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

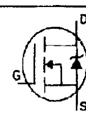
	Parameter	Min.	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case	—	—	2.5	°C/W
$R_{θJA}$	Junction-to-Ambient (PCB mount)**	—	—	40	
$R_{θJA}$	Junction-to-Ambient	—	—	62	

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

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	400	—	—	V	V_{GS}=0V, I_D= 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.51	—	V/°C	Reference to 25°C, I_D= 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	1.8	Ω	V_{GS}=10V, I_D=2.0A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D= 250μA
g_{fs}	Forward Transconductance	1.7	—	—	S	V_{DS}=50V, I_D=2.0A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V_{DS}=400V, V_{GS}=0V
		—	—	250		V_{DS}=320V, 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	—	—	20	nC	I_D=3.3A
Q_{gs}	Gate-to-Source Charge	—	—	3.3		V_{DS}=320V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	11		V_{GS}=10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	10	—	ns	V_{DD}=200V
t_r	Rise Time	—	14	—		I_D=3.3A
$t_{d(off)}$	Turn-Off Delay Time	—	30	—		R_G=18Ω
t_f	Fall Time	—	13	—		R_D=56Ω See Figure 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact 
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	410	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	120	—		V_{DS}= 25V
C_{rss}	Reverse Transfer Capacitance	—	47	—		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)	—	—	3.3	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	13		
V_{SD}	Diode Forward Voltage	—	—	1.6	V	T_J=25°C, I_S=3.3A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	270	600	ns	T_J=25°C, I_F=3.3A
Q_{rr}	Reverse Recovery Charge	—	1.4	3.0	μC	di/dt=100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is neglegible (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=30mH R_G=25Ω, I_{AS}=3.3A (See Figure 12)

③ I_{SD}≤3.3A, di/dt≤65A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤150°C

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

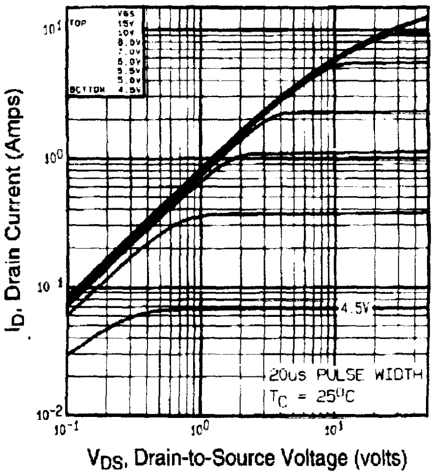


Fig 1. Typical Output Characteristics, T_C=25°C

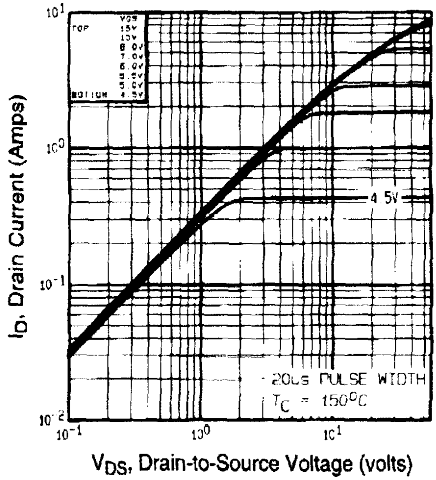


Fig 2. Typical Output Characteristics, T_C=150°C

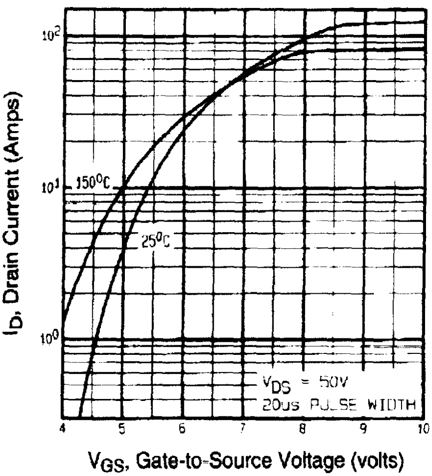


Fig 3. Typical Transfer Characteristics

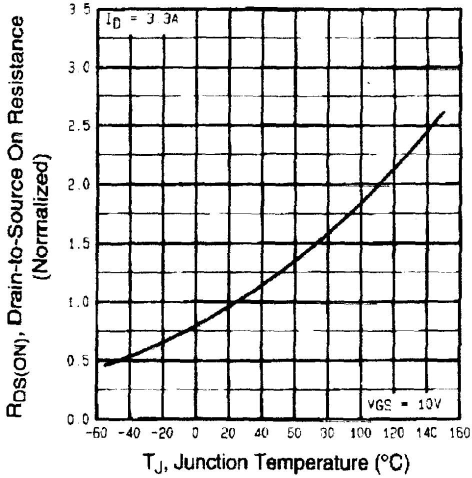


Fig 4. Normalized On-Resistance Vs. Temperature

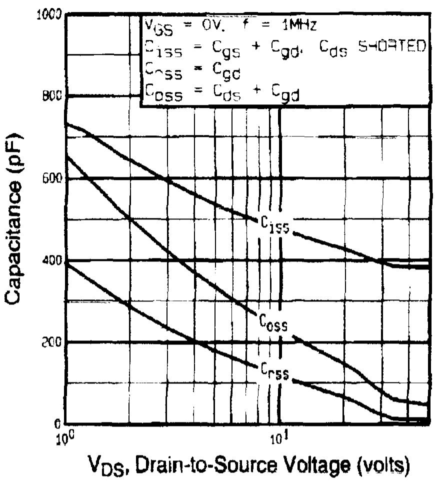


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

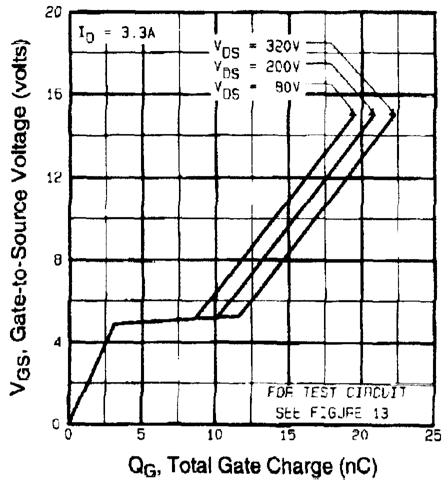


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

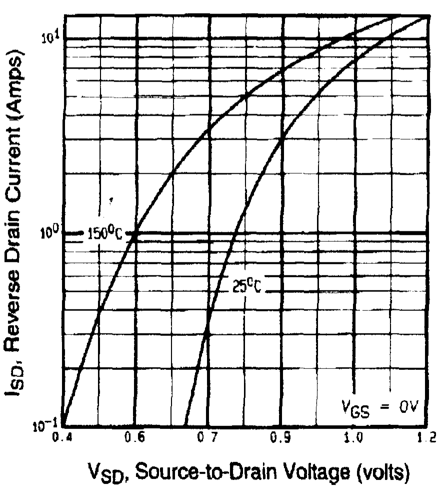


Fig 7. Typical Source-Drain Diode Forward Voltage

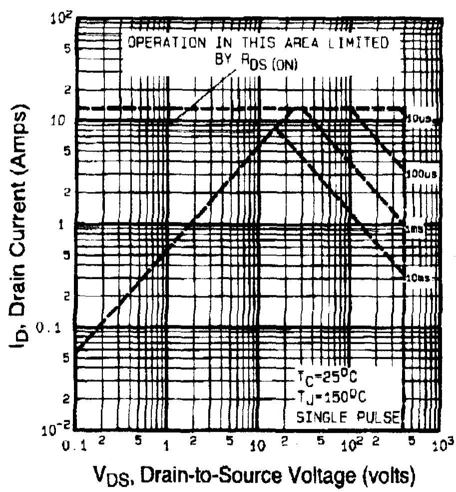


Fig 8. Maximum Safe Operating Area

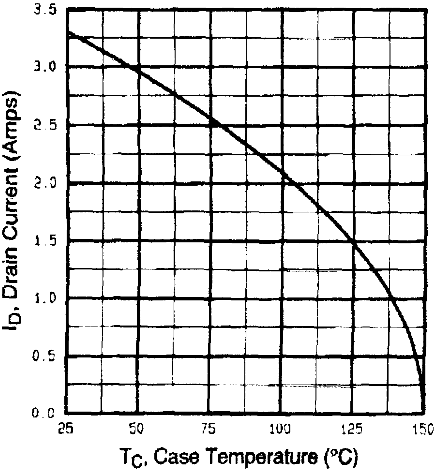


Fig 9. Maximum Drain Current Vs. Case Temperature

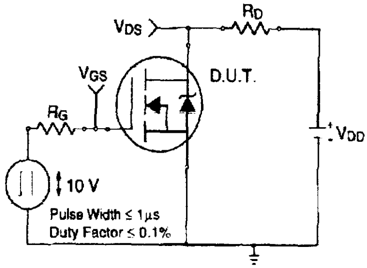


Fig 10a. Switching Time Test Circuit

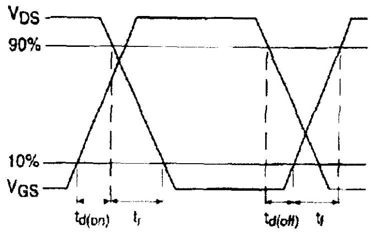


Fig 10b. Switching Time Waveforms

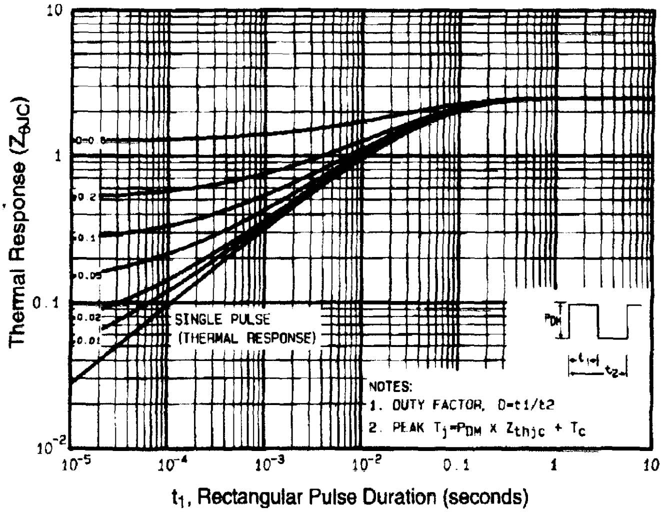


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

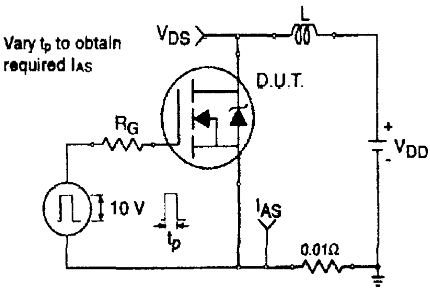


Fig 12a. Unclamped Inductive Test Circuit

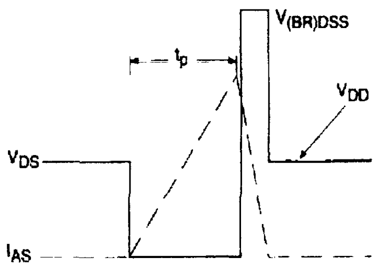


Fig 12b. Unclamped Inductive Waveforms

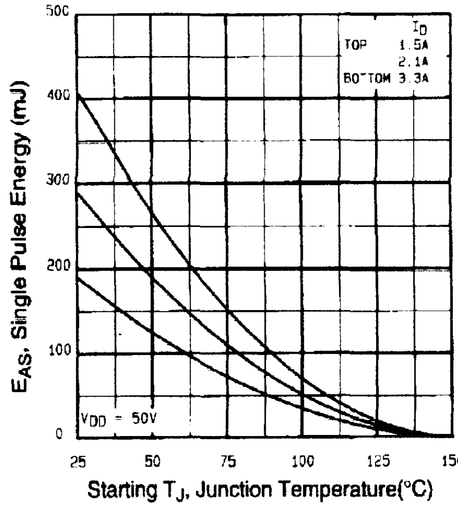


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

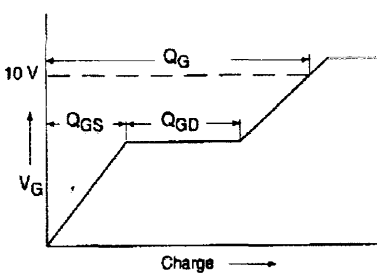


Fig 13a. Basic Gate Charge Waveform

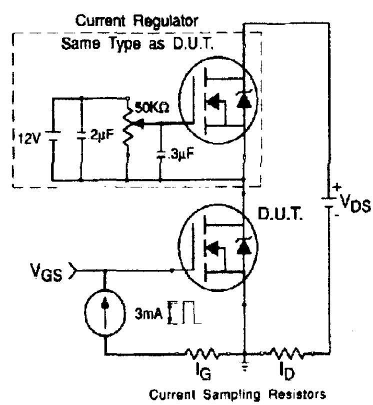


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit

Appendix B: Package Outline Mechanical Drawing

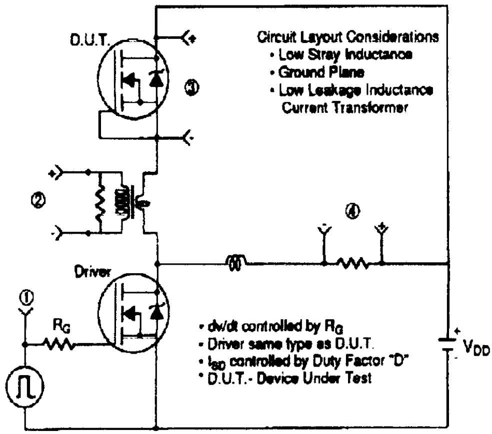
Appendix C: Part Marking Information

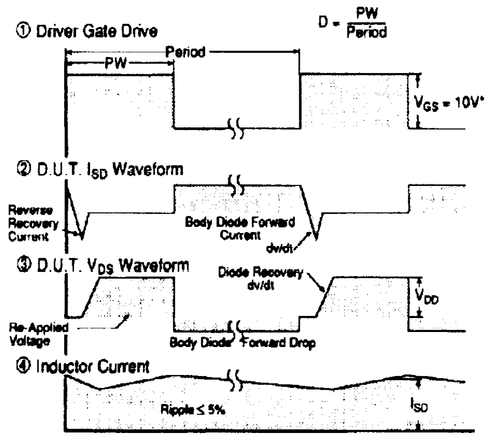
Appendix D: Tape & Reel Information

Appendix A

Peak Diode Recovery dv/dt Test Circuit

Fig 14. For N-Channel HEXFETs





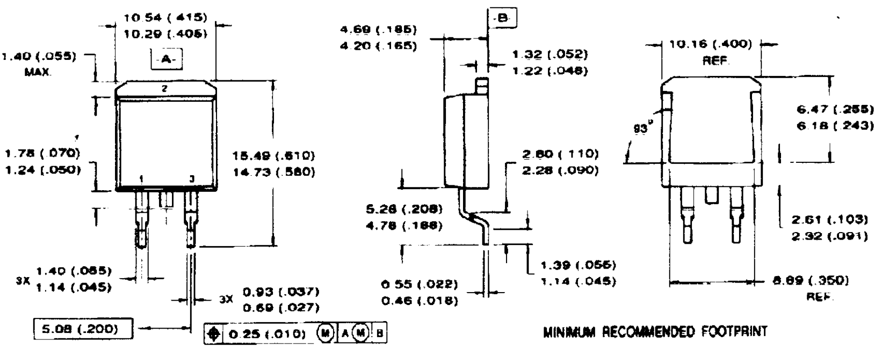
* V_{GS} = 5V for Logic Level Devices

Appendix B

Package Outline

SMD-220 Outline

Dimensions are shown in millimeters (inches)



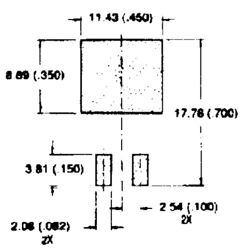
NOTES:

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

MINIMUM RECOMMENDED FOOTPRINT

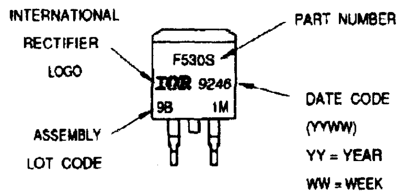


Part Marking Information

Appendix C

SMD-220

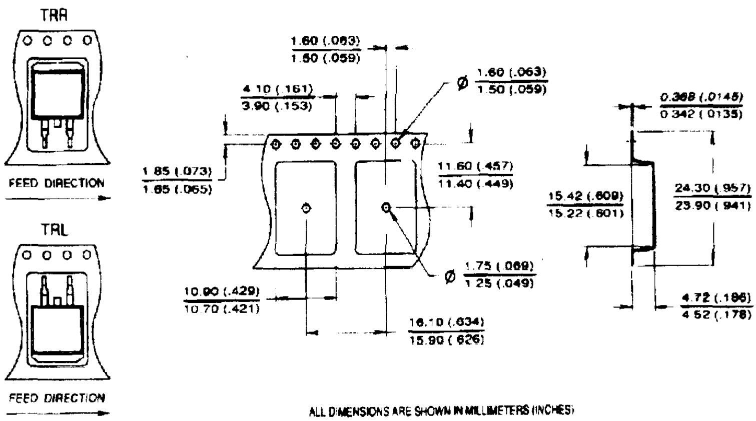
EXAMPLE: THIS IS AN IRF530S WITH ASSEMBLY LOT CODE 9B1M



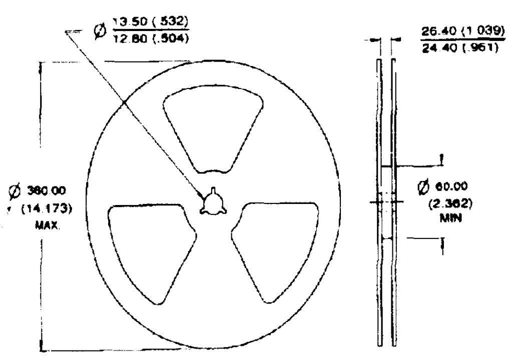
Tape & Reel Information

Appendix D

SMD-220 Tape & Reel



ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)



SMD-220 Tape & 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.

Printed on Signet recycled offset: made from 50% recycled waste paper, including 10% de-inked, post-consumer waste.

International IOR Rectifier

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