International
IOR Rectifier

PD - 94348A

HEXFET® POWER MOSFET
SURFACE MOUNT (SMD-1)

IRL7N1404
40V, N-CHANNEL

Product Summary

Part Number	BV_{DSS}	$R_{DS(on)}$	I_D
IRL7N1404	40V	0.006Ω	55A*


SMD-1

Seventh Generation HEXFET® power MOSFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon unit 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 device for use in a wide variety of applications.

These devices are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers and high-energy pulse circuits.

Features:

- Low $R_{DS(on)}$
- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Light Weight
- Surface Mount
- LogicGate Drive

Absolute Maximum Ratings

	Parameter		Units
I_D @ V_{GS} = 10V, T_C = 25°C	Continuous Drain Current	55*	A
I_D @ V_{GS} = 10V, T_C = 100°C	Continuous Drain Current	55*	
I_{DM}	Pulsed Drain Current ①	220	
P_D @ T_C = 25°C	Max. Power Dissipation	100	W
	Linear Derating Factor	0.8	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	300	mJ
I_{AR}	Avalanche Current ①	55	A
E_{AR}	Repetitive Avalanche Energy ①	10	mJ
dv/dt	Peak Diode Recovery dv/dt ③	2.0	V/ns
T_J T_{STG}	Operating Junction Storage Temperature Range	-55 to 150	°C
	Package Mounting Surface Temp.	300 (for 5s)	
	Weight	2.6 (Typical)	g

* Current is limited by package

For footnotes refer to the last page

Electrical Characteristics @ Tj = 25°C (Unless Otherwise Specified)

	Parameter	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	40	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	0.041	—	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	0.006	Ω	V_{GS} = 10V, I_D = 55A ④
		—	—	0.008		V_{GS} = 4.5V, I_D = 55A
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	93	—	—	S (℧)	V_{DS} =10V, I_{DS} = 55A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	20	µA	V_{DS} = 40V ,V_{GS}=0V
		—	—	250		V_{DS} = 32V, V_{GS} = 0V, T_J =125°C
I_{GSS}	Gate-to-Source Leakage Forward	—	—	200	nA	V_{GS} = 20V
I_{GSS}	Gate-to-Source Leakage Reverse	—	—	-200		V_{GS} = -20V
Q_g	Total Gate Charge	—	—	115	nC	V_{GS} =5.0V, I_D = 55A V_{DS} = 32V
Q_{gs}	Gate-to-Source Charge	—	—	37		
Q_{gd}	Gate-to-Drain ('Miller') Charge	—	—	45		
$t_{d(on)}$	Turn-On Delay Time	—	—	40	ns	V_{DD} = 20V, I_D = 55A, V_{GS} = 5.0V, R_G = 2.5Ω
t_r	Rise Time	—	—	356		
$t_{d(off)}$	Turn-Off Delay Time	—	—	63		
t_f	Fall Time	—	—	96		
$L_S + L_D$	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to the center of source pad
C_{iss}	Input Capacitance	—	6470	—	pF	V_{GS} = 0V, V_{DS} = 25V f = 1.0MHz
C_{oss}	Output Capacitance	—	1600	—		
C_{rss}	Reverse Transfer Capacitance	—	165	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	55*	A	
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	220		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_j = 25°C, I_S = 55A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	—	125	ns	T_j = 25°C, I_F = 55A, di/dt ≤ 100A/µs V_{DD} ≤ 25V ④
Q_{RR}	Reverse Recovery Charge	—	—	230	nC	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

* Current is limited by package

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	1.25	°C/W	

Note: Corresponding Spice and Saber models are available on the G&S Website.

For footnotes refer to the last page

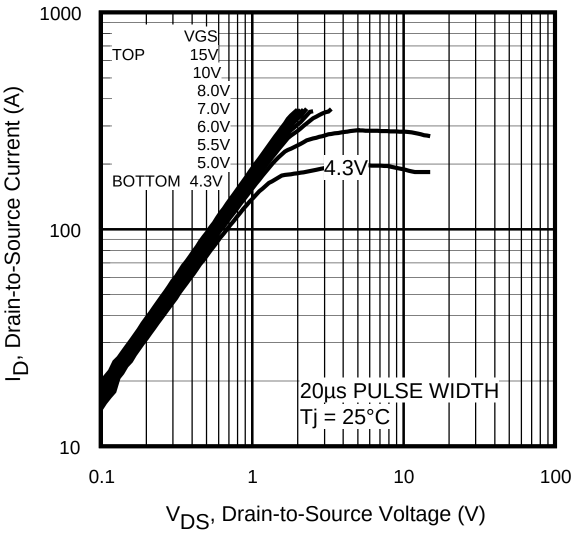


Fig 1. Typical Output Characteristics

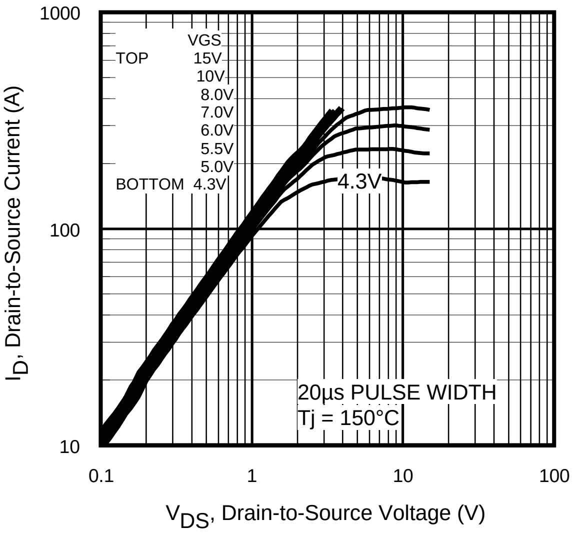


Fig 2. Typical Output Characteristics

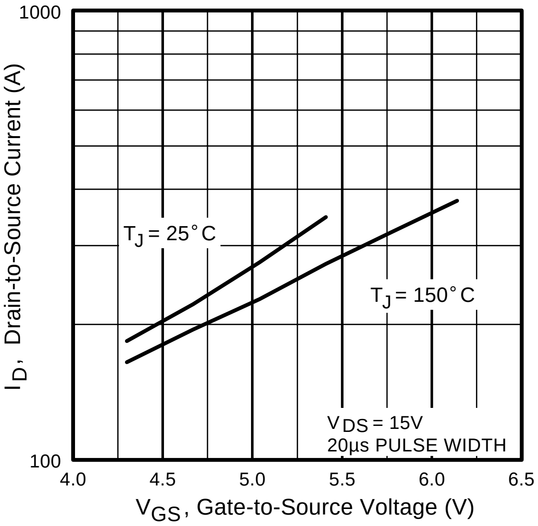


Fig 3. Typical Transfer Characteristics

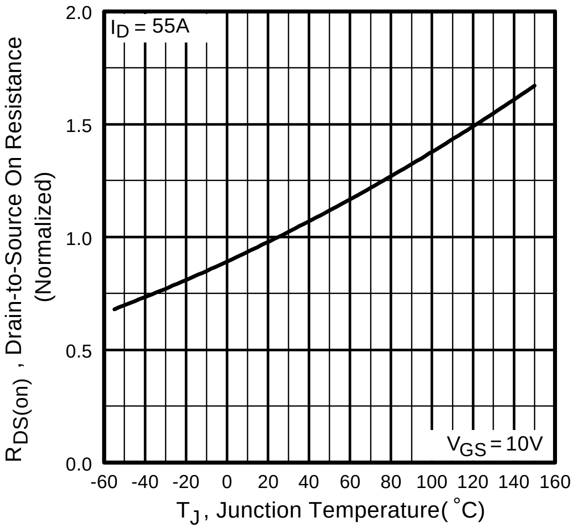


Fig 4. Normalized On-Resistance
Vs. Temperature

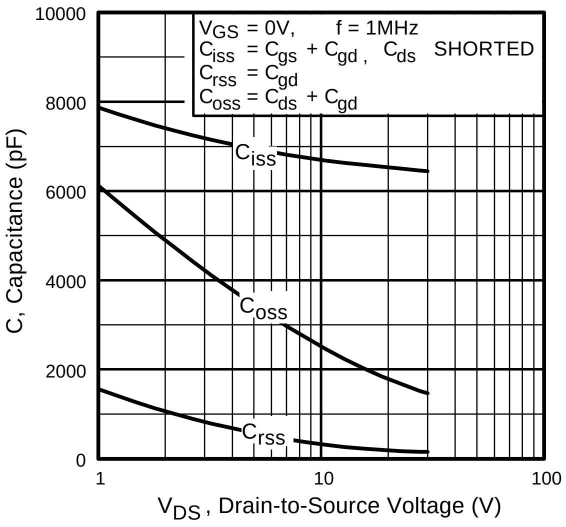


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

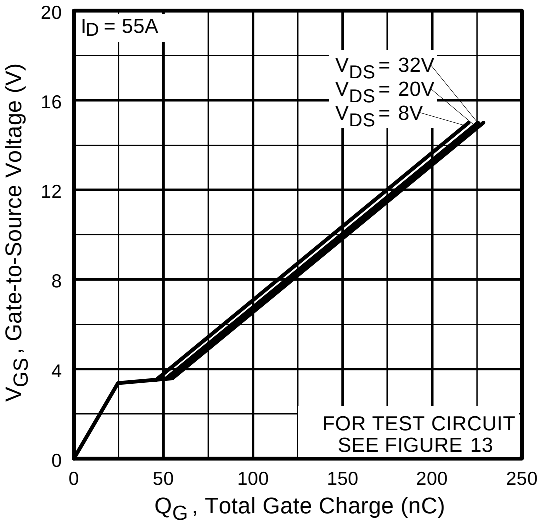


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

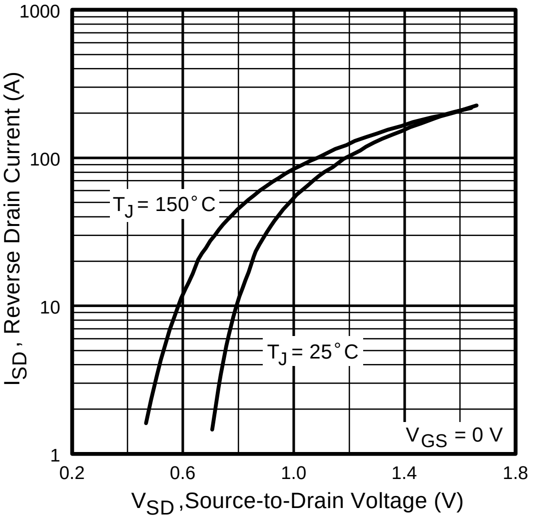


Fig 7. Typical Source-Drain Diode Forward Voltage

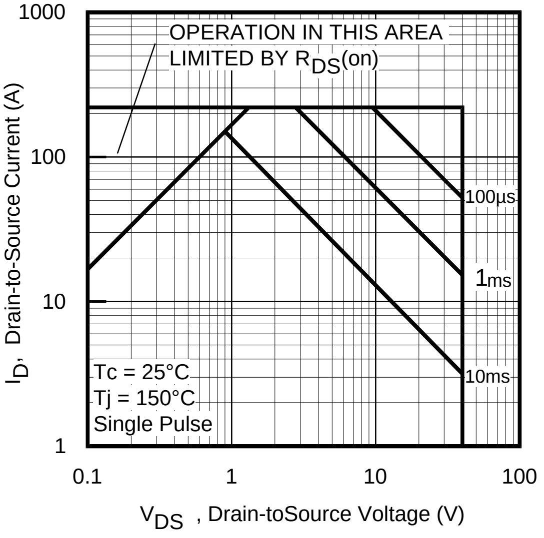


Fig 8. Maximum Safe Operating Area

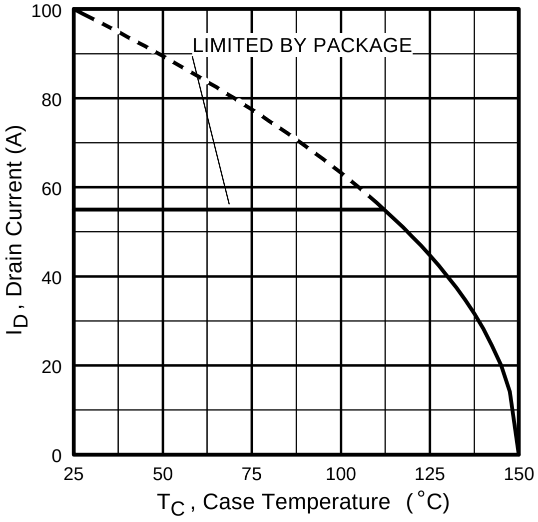


Fig 9. Maximum Drain Current Vs. Case Temperature

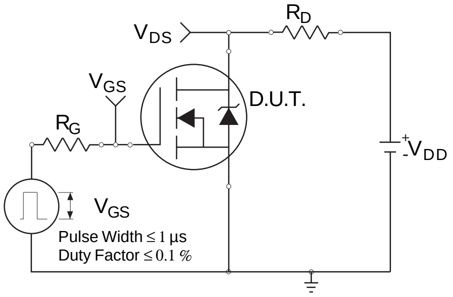


Fig 10a. Switching Time Test Circuit

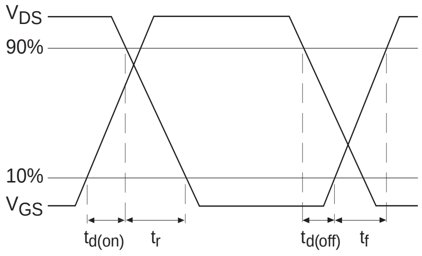


Fig 10b. Switching Time Waveforms

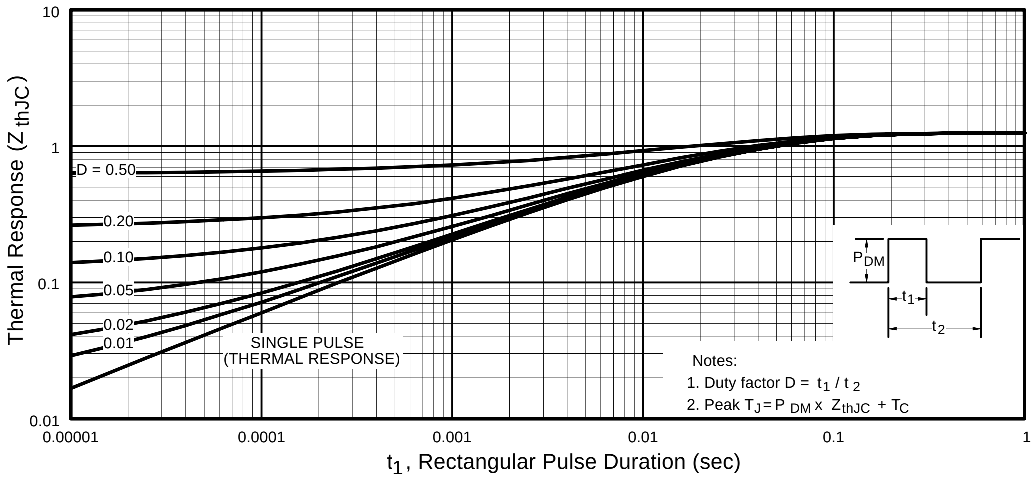


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

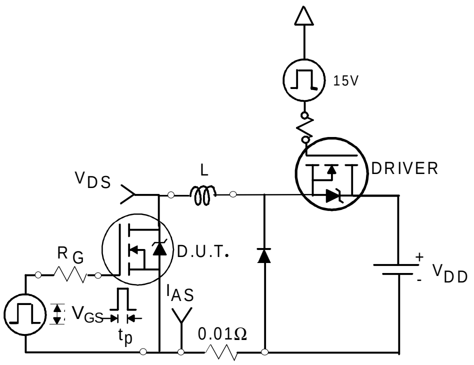


Fig 12a. Unclamped Inductive Test Circuit

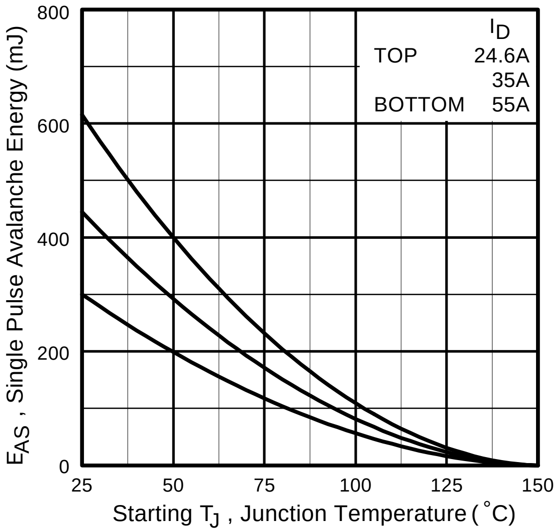


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

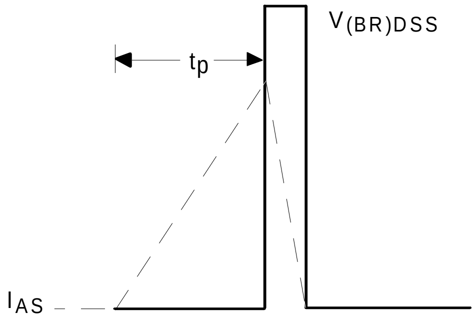
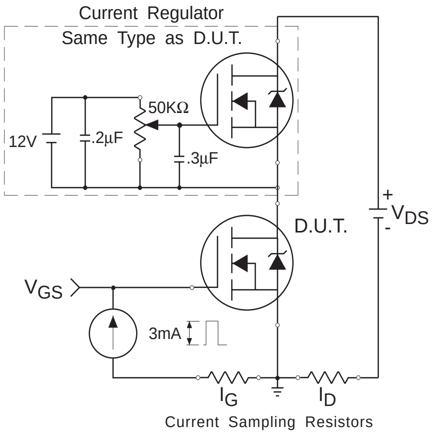


Fig 12b. Unclamped Inductive Waveforms



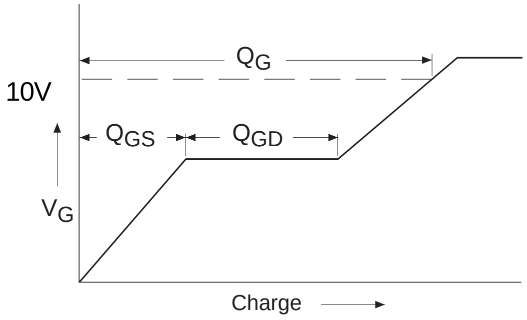


Fig 13a. Basic Gate Charge Waveform

Fig 13b. Gate Charge Test Circuit

Footnotes:

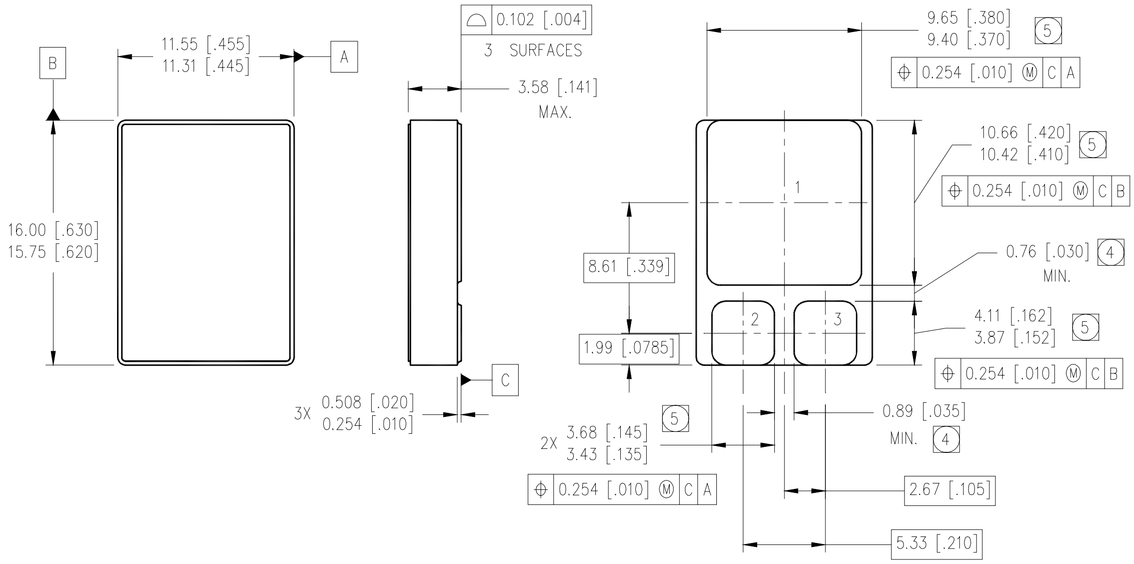
① Repetitive Rating; Pulse width limited by maximum junction temperature.

② V_{DD} = 25 V, Starting T_J = 25°C, L= 0.2mH
Peak I_{AS} = 55A, V_{GS} = 10V, R_G= 25Ω

③ $I_{SD} \leq 55A$, di/dt ≤ 166A/µs,
$V_{DD} \leq 55V$, $T_J \leq 150°C$

④ Pulse width ≤ 300 µs; Duty Cycle ≤ 2%

Case Outline and Dimensions — SMD-1



NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M−1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

④ DIMENSION INCLUDES METALLIZATION FLASH.

⑤ DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

PAD ASSIGNMENTS

1 = DRAIN
2 = GATE
3 = SOURCE

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.
Data and specifications subject to change without notice. 04/02