

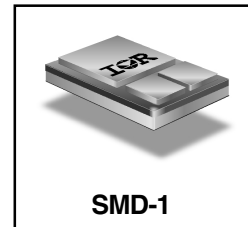
**POWER MOSFET
SURFACE MOUNT (SMD-1)**

**IRFN054
60V, N-CHANNEL
HEXFET® MOSFET TECHNOLOGY**

Product Summary

Part Number	R _{DS(on)}	I _D
IRFN054	0.020 Ω	55A*

HEXFET® MOSFET technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry design achieves very low on-state resistance combined with high transconductance. HEXFET transistors also feature all of the well-established advantages of MOSFETs, such as voltage control, very fast switching, ease of paralleling and electrical parameter temperature stability. They are well-suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, high energy pulse circuits, and virtually any application where high reliability is required. The HEXFET transistor's totally isolated package eliminates the need for additional isolating material between the device and the heatsink. This improves thermal efficiency and reduces drain capacitance.



SMD-1

Features:

- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Electrically Isolated
- Dynamic dv/dt Rating
- Surface mount
- Light-weight

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	40	
I _{DM}	Pulsed Drain Current ①	256	
P _D @ T _C = 25°C	Max. Power Dissipation	150	W
	Linear Derating Factor	1.2	W/°C
V _{GS}	Gate-to-Source Voltage	±20	V
E _{AS}	Single Pulse Avalanche Energy ②	480	mJ
I _{AR}	Avalanche Current ①	55	A
E _{AR}	Repetitive Avalanche Energy ①	15	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
T _J	Operating Junction	-55 to 150	°C
T _{STG}	Storage Temperature Range		
	Package Mounting Surface Temperature	300(for 5 seconds)	
	Weight	2.6 (Typical)	g

*Current is limited by package

For footnotes refer to the last page

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

	Parameter	Min	Typ	Max	Units	Test Conditions
BV _{DSS}	Drain-to-Source Breakdown Voltage	60	—	—	V	V _{GS} = 0V, I _D = 1.0mA
ΔBV _{DSS} /ΔT _J	Temperature Coefficient of Breakdown Voltage	—	0.68	—	V/°C	Reference to 25°C, I _D = 1.0mA
R _{DS(on)}	Static Drain-to-Source On-State Resistance	—	—	0.020 0.031	Ω	V _{GS} = 10V, I _D = 40A ④ V _{GS} = 10V, I _D = 55A
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	20	—	—	S (r)	V _{DS} > 15V, I _{DS} = 40A ④
I _{DSS}	Zero Gate Voltage Drain Current	—	—	25 250	μA	V _{DS} = 48V, V _{GS} = 0V V _{DS} = 48V, V _{GS} = 0V, T _J = 125°C
I _{GSS}	Gate-to-Source Leakage Forward	—	—	100	nA	V _{GS} = 20V
I _{GSS}	Gate-to-Source Leakage Reverse	—	—	-100	nA	V _{GS} = -20V
Q _g	Total Gate Charge	—	—	88	nC	V _{GS} = 10V, I _D = 55A V _{DS} = 30V
Q _{gs}	Gate-to-Source Charge	—	—	45	nC	
Q _{gd}	Gate-to-Drain ('Miller') Charge	—	—	105	nC	
t _{d(on)}	Turn-On Delay Time	—	—	33	ns	V _{DD} = 30V, I _D = 55A, V _{GS} = 10V, R _G = 2.35Ω
t _r	Rise Time	—	—	180	ns	
t _{d(off)}	Turn-Off Delay Time	—	—	100	ns	
t _f	Fall Time	—	—	100	ns	
L _S + L _D	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to center of source pad.
C _{iss}	Input Capacitance	—	1660	—	pF	V _{GS} = 0V, V _{DS} = 25V f = 1.0MHz
C _{oss}	Output Capacitance	—	2000	—	pF	
C _{rss}	Reverse Transfer Capacitance	—	340	—	pF	

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	—	—	256	A	
V _{SD}	Diode Forward Voltage	—	—	2.5	V	T _j = 25°C, I _S = 55A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	—	280	nS	T _j = 25°C, I _F = 55A, di/dt ≤ 100A/μs
Q _{RR}	Reverse Recovery Charge	—	—	2.2	μC	V _{DD} ≤ 50V ④
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	—	—	0.83	°C/W	

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

For footnotes refer to the last page

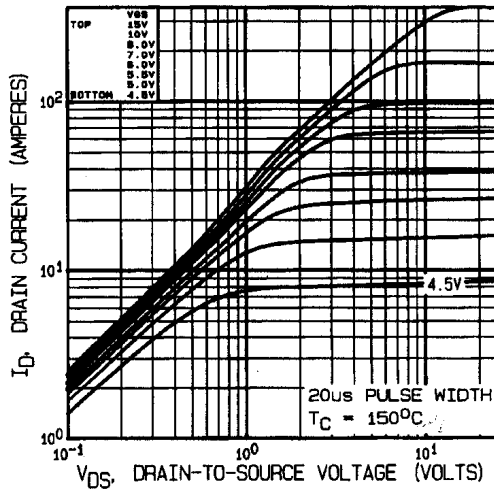


Fig 1. Typical Output Characteristics

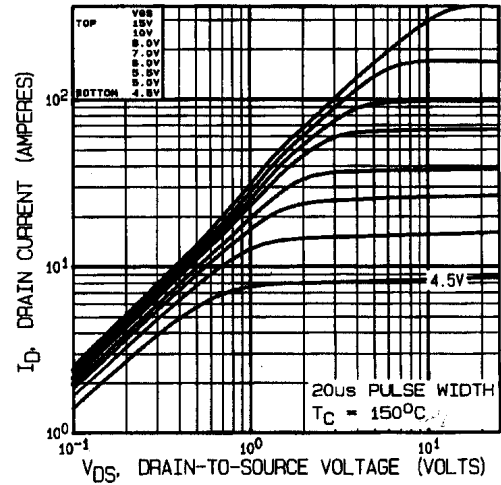


Fig 2. Typical Output Characteristics

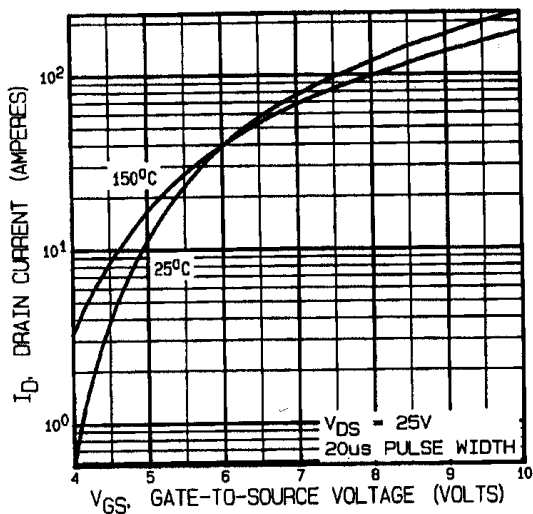


Fig 3. Typical Transfer Characteristics

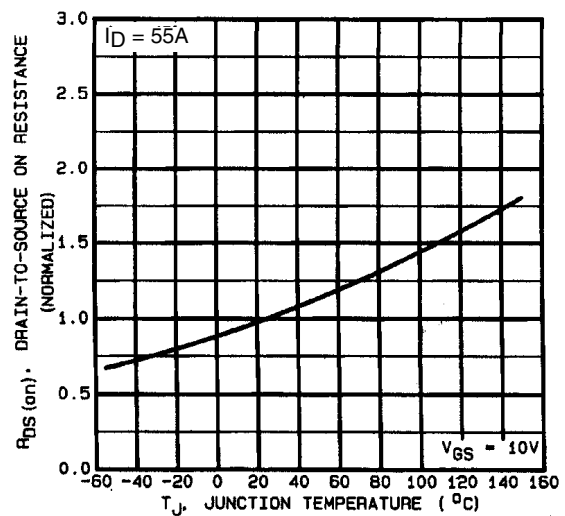


Fig 4. Normalized On-Resistance
Vs. Temperature

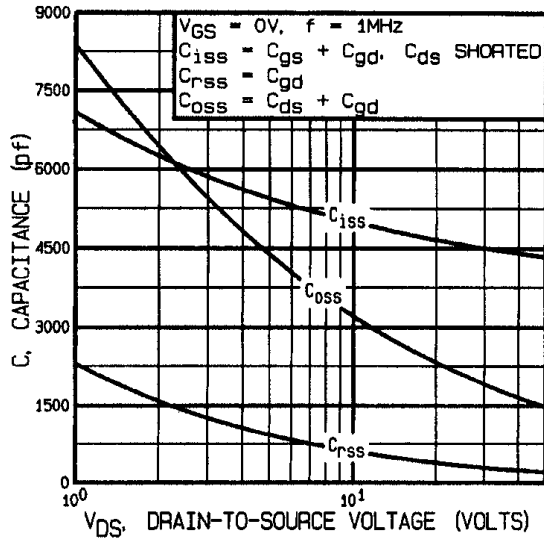


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

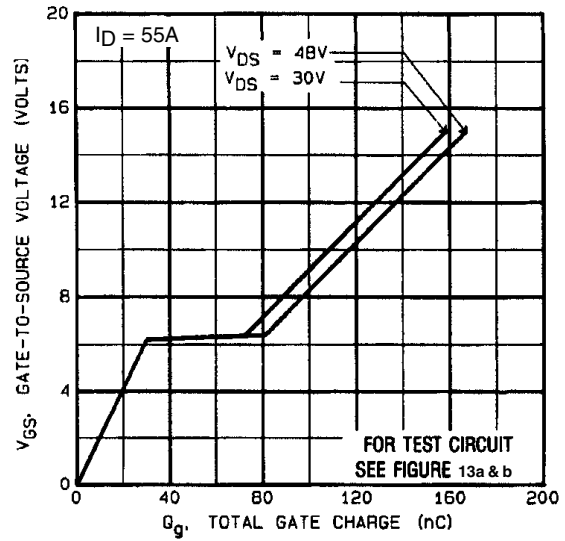


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

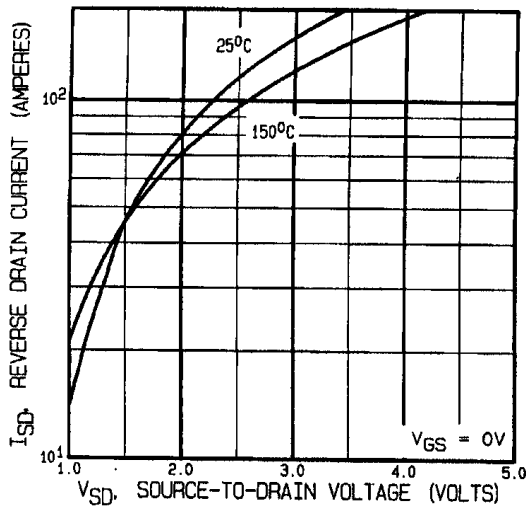


Fig 7. Typical Source-Drain Diode Forward Voltage

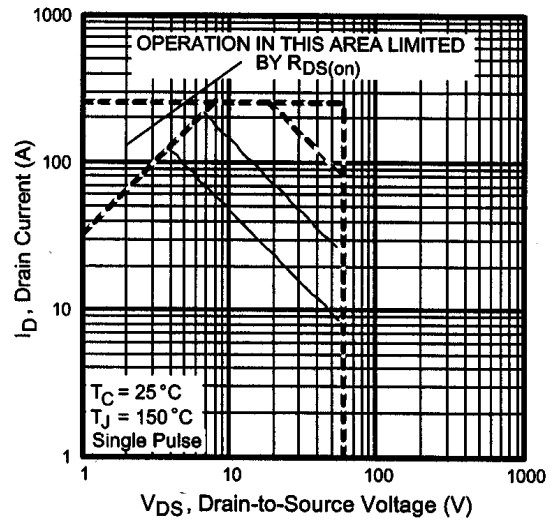


Fig 8. Maximum Safe Operating Area

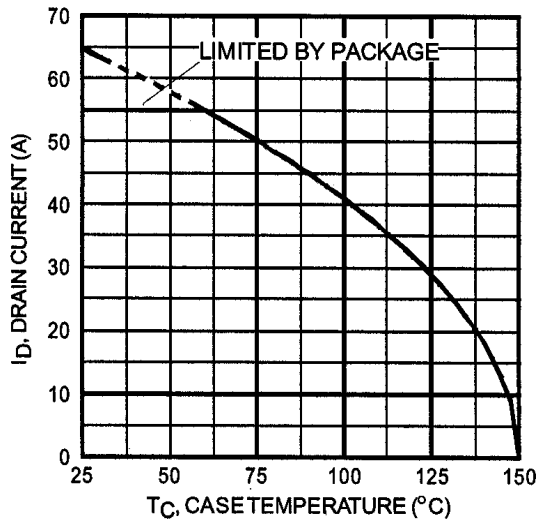


Fig 9. Maximum Drain Current Vs. Case Temperature

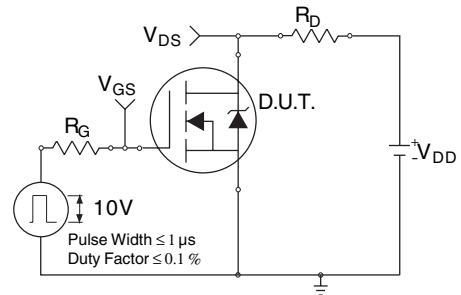


Fig 10a. Switching Time Test Circuit

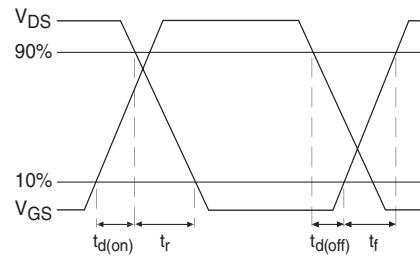


Fig 10b. Switching Time Waveforms

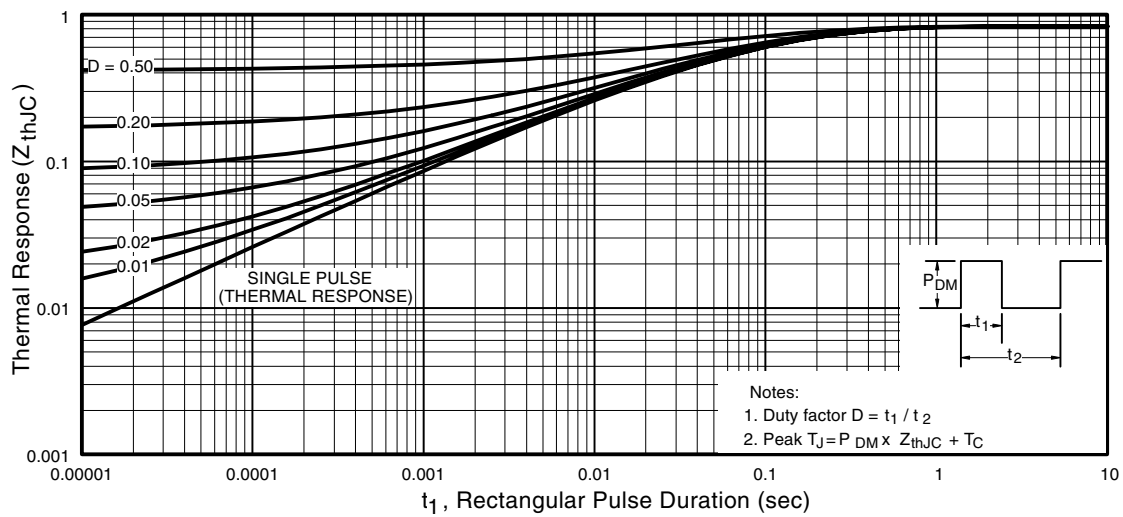


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

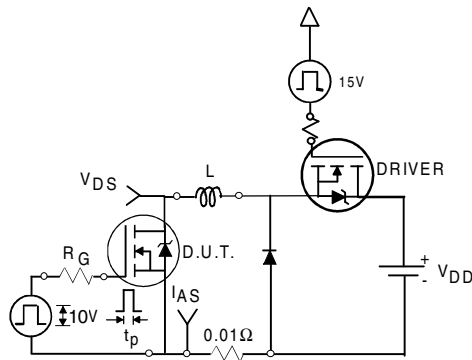


Fig 12a. Unclamped Inductive Test Circuit

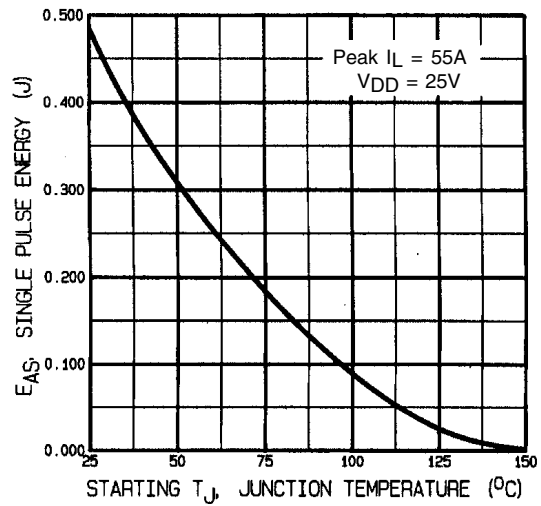
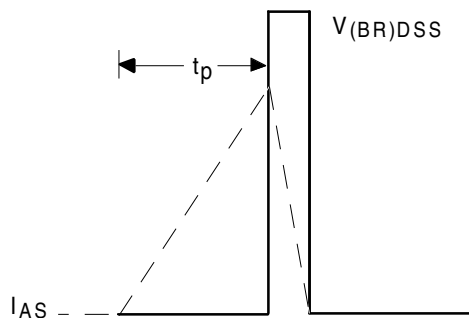
Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

Fig 12b. Unclamped Inductive Waveforms

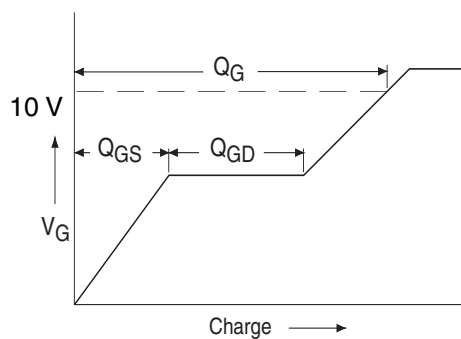


Fig 13a. Basic Gate Charge Waveform

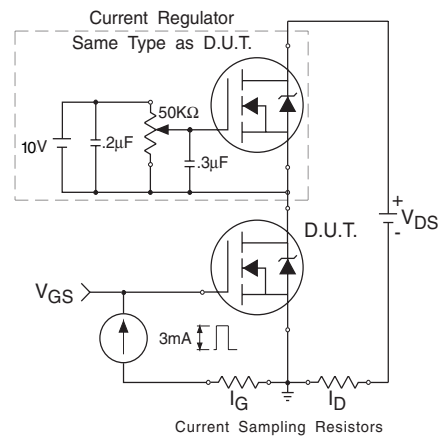
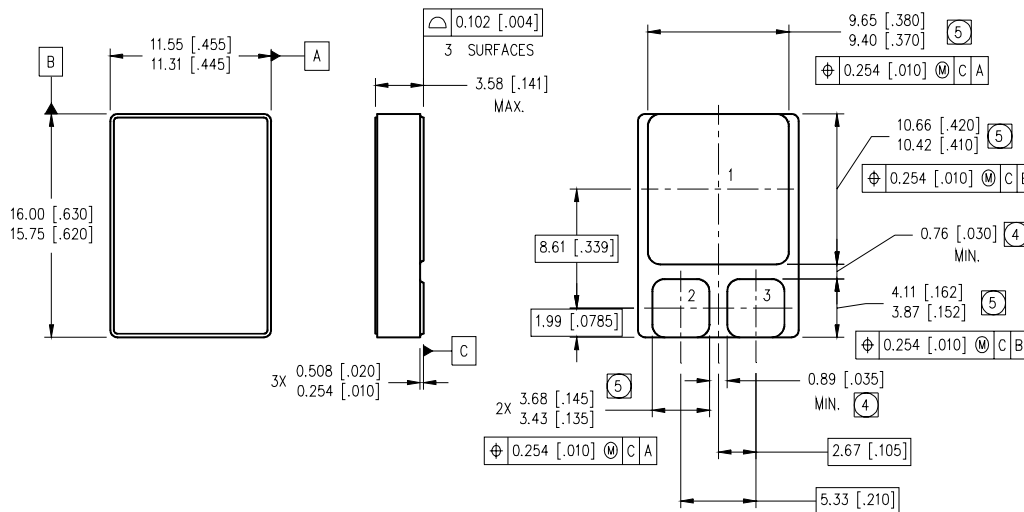


Fig 13b. Gate Charge Test Circuit

Footnotes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② $V_{DD} = 25V$, starting $T_J = 25^\circ C$, $L = 0.3mH$
Peak $I_L = 55A$, $V_{GS} = 10V$
- ③ $I_{SD} \leq 55A$, $di/dt \leq 200A/\mu s$,
 $V_{DD} \leq 60V$, $T_J \leq 150^\circ C$
- ④ Pulse width $\leq 300 \mu s$; Duty Cycle $\leq 2\%$

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