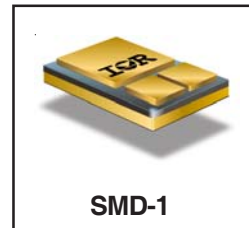


**POWER MOSFET  
 SURFACE MOUNT (SMD-1)**

**IRFN054  
 60V, N-CHANNEL  
 HEXFET<sup>®</sup> MOSFET TECHNOLOGY**

**Product Summary**

Part Number	RDS(on)	Id
IRFN054	0.020 Ω	55A*



HEXFET<sup>®</sup> 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.

**Features:**

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

**Absolute Maximum Ratings**

	Parameter		Units
Id @ VGS = 10V, TC = 25°C	Continuous Drain Current	55*	A
Id @ VGS = 10V, TC = 100°C	Continuous Drain Current	40	
IDM	Pulsed Drain Current ①	220	
PD @ TC = 25°C	Max. Power Dissipation	150	W
	Linear Derating Factor	1.2	W/°C
VGS	Gate-to-Source Voltage	±20	V
EAS	Single Pulse Avalanche Energy ②	480	mJ
IAR	Avalanche Current ①	55	A
EAR	Repetitive Avalanche Energy ①	15	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
TJ	Operating Junction	-55 to 150	°C
TSTG	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

[www.irf.com](http://www.irf.com)

**Electrical Characteristics @ T<sub>j</sub> = 25°C (Unless Otherwise Specified)**

	Parameter	Min	Typ	Max	Units	Test Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 1.0mA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Temperature Coefficient of Breakdown Voltage	—	0.68	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-State Resistance	—	—	0.020	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 40A <sup>④</sup>
		—	—	0.031		
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Transconductance	20	—	—	S	V <sub>DS</sub> > 15V, I <sub>DS</sub> = 40A <sup>④</sup>
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	—	—	25	μA	V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 48V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
		—	—	250		
I <sub>GSS</sub>	Gate-to-Source Leakage Forward	—	—	100	nA	V <sub>GS</sub> = 20V V <sub>GS</sub> = -20V
I <sub>GSS</sub>	Gate-to-Source Leakage Reverse	—	—	-100		
Q <sub>g</sub>	Total Gate Charge	—	—	160	nC	V <sub>GS</sub> = 10V, I <sub>D</sub> = 55A V <sub>DS</sub> = 30V
Q <sub>gs</sub>	Gate-to-Source Charge	—	—	48		
Q <sub>gd</sub>	Gate-to-Drain ('Miller') Charge	—	—	67		
t <sub>d(on)</sub>	Turn-On Delay Time	—	—	33	ns	V <sub>DD</sub> = 30V, I <sub>D</sub> = 55A, V <sub>GS</sub> = 10V, R <sub>G</sub> = 2.35Ω
t <sub>r</sub>	Rise Time	—	—	180		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	—	100		
t <sub>f</sub>	Fall Time	—	—	100		
LS + LD	Total Inductance	—	4.0	—	nH	Measured from the center of drain pad to center of source pad.
C <sub>iss</sub>	Input Capacitance	—	4265	—	pF	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1746	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	493	—		

**Source-Drain Diode Ratings and Characteristics**

	Parameter	Min	Typ	Max	Units	Test Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	55*	A	
I <sub>SM</sub>	Pulse Source Current (Body Diode) <sup>①</sup>	—	—	220		
V <sub>SD</sub>	Diode Forward Voltage	—	—	2.5	V	T <sub>j</sub> = 25°C, I <sub>S</sub> = 55A, V <sub>GS</sub> = 0V <sup>④</sup>
t <sub>rr</sub>	Reverse Recovery Time	—	—	280	ns	T <sub>j</sub> = 25°C, I <sub>F</sub> = 55A, di/dt ≤ 100A/μs
Q <sub>RR</sub>	Reverse Recovery Charge	—	—	2.2	μC	V <sub>DD</sub> ≤ 50V <sup>④</sup>
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by LS + LD.				

\*Current is limited by package

**Thermal Resistance**

	Parameter	Min	Typ	Max	Units	Test Conditions
R <sub>thJC</sub>	Junction-to-Case	—	—	0.83	°C/W	

**Note:** Corresponding Spice and Saber models are available on International Rectifier Website.

For footnotes refer to the last page

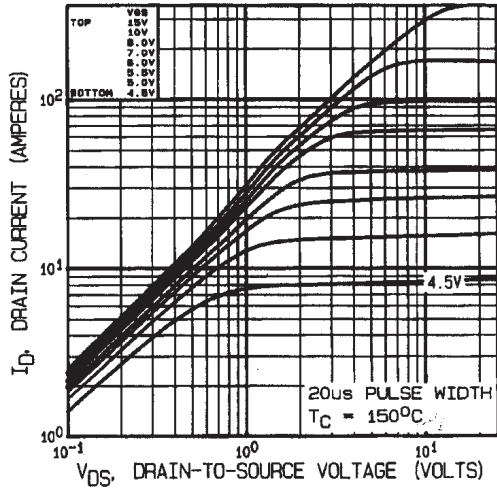


Fig 1. Typical Output Characteristics

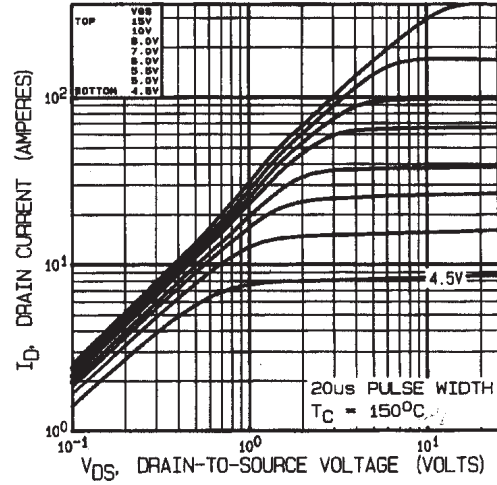


Fig 2. Typical Output Characteristics

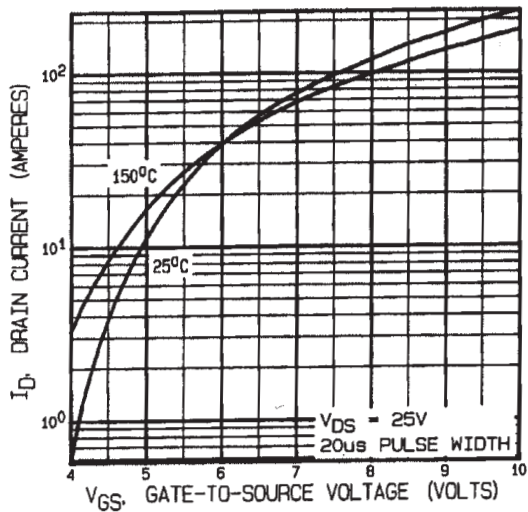


Fig 3. Typical Transfer Characteristics

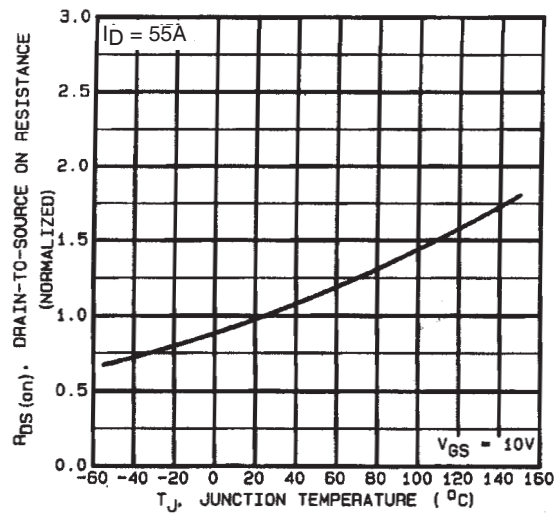
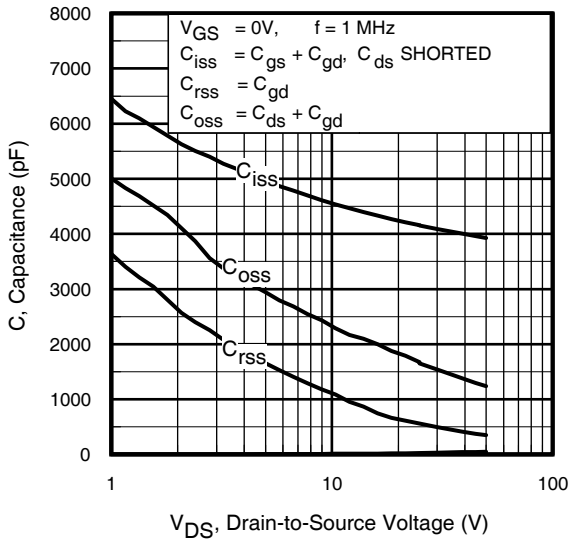
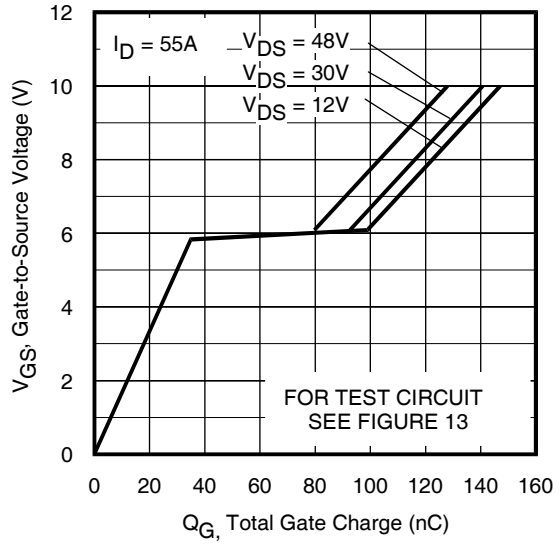


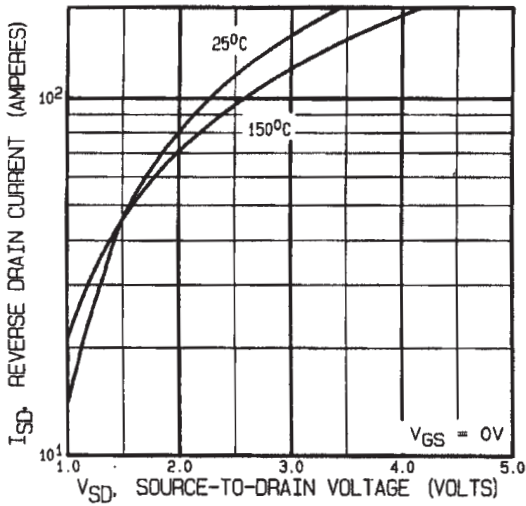
Fig 4. Normalized On-Resistance Vs. Temperature



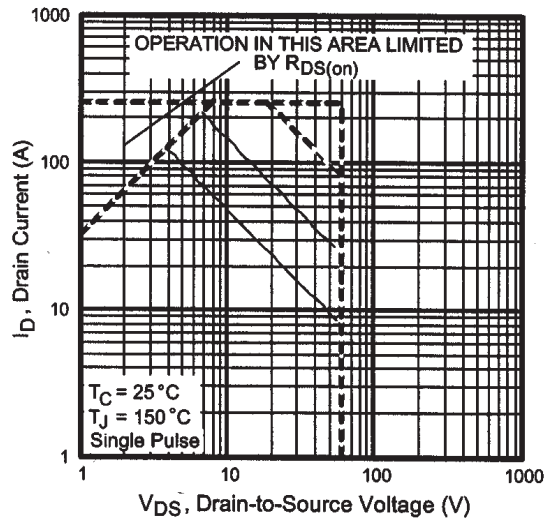
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



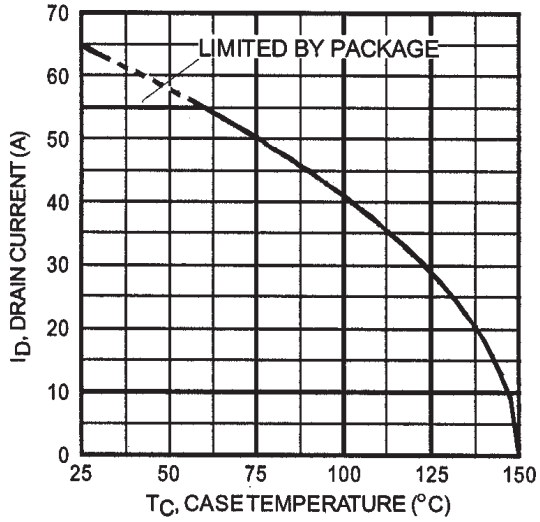
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



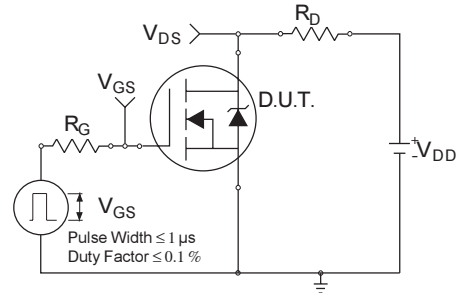
**Fig 7.** Typical Source-Drain Diode Forward Voltage



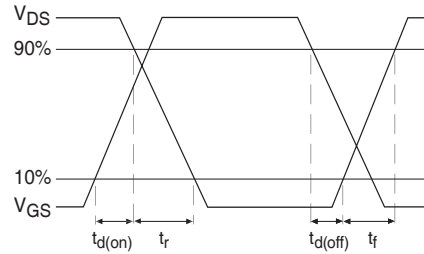
**Fig 8.** Maximum Safe Operating Area



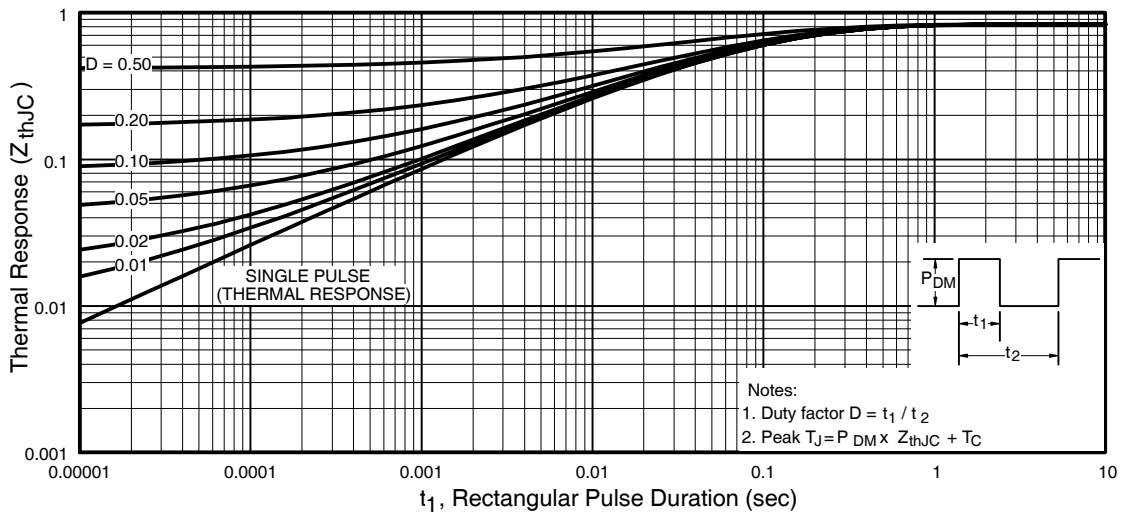
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit



**Fig 10b.** Switching Time Waveforms



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

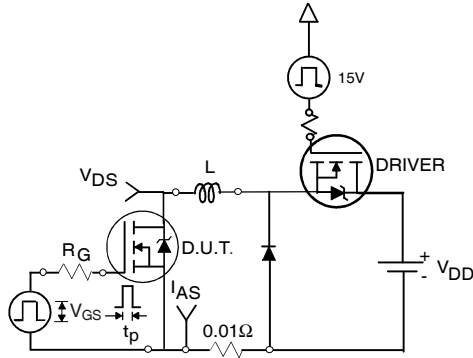


Fig 12a. Unclamped Inductive Test Circuit

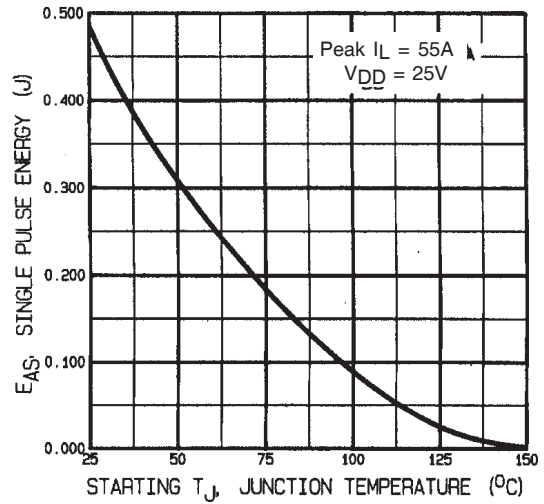


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

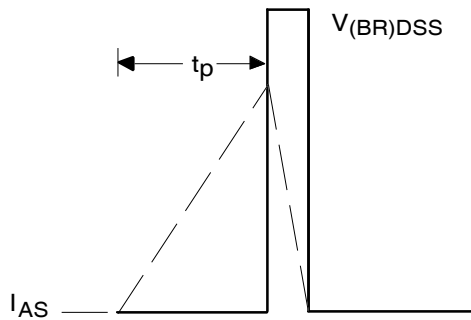


Fig 12b. Unclamped Inductive Waveforms

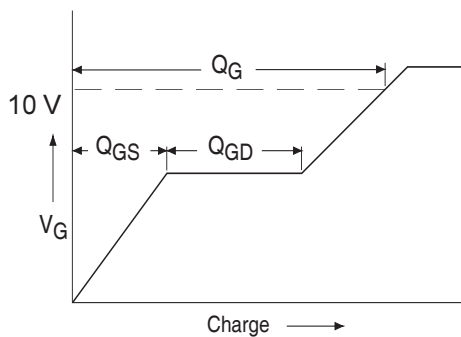


Fig 13a. Basic Gate Charge Waveform

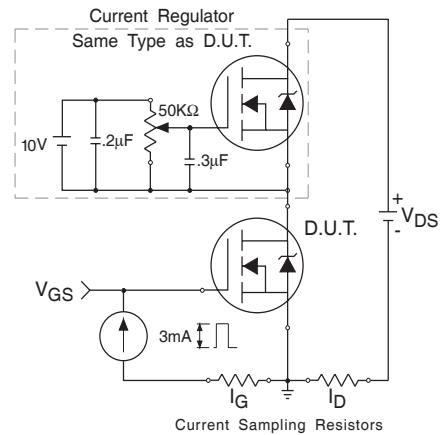
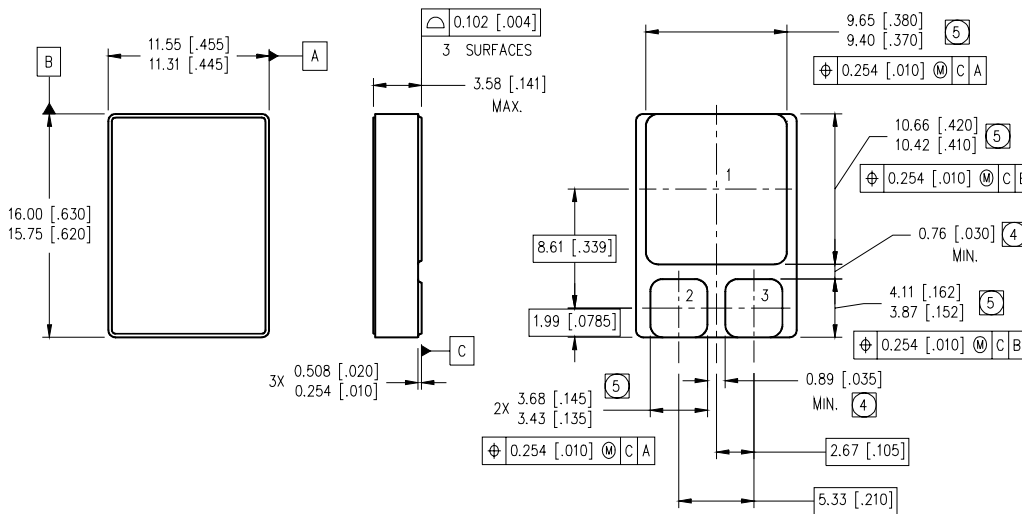


Fig 13b. Gate Charge Test Circuit

**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