

HEXFET® POWER MOSFET

IRFN440
JANTX2N7222U
JANTXV2N7222U

[REF:MIL-PRF-19500/596]

N - CHANNEL

500 Volt, 0.85Ω MOSFET

HEXFET® power MOSFET technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry achieves very low on-state resistance combined with high transconductance.

HEXFET® power MOSFET 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 and high-energy pulse circuits.

The surface mount device (SMD-1) package represents another step in the continual evolution of surface mount technology. The SMD-1 will give designers the extra flexibility they need to increase circuit board density. International Rectifier has engineered the SMD-1 package to meet the specific needs of the power market by increasing the size of the bottom source pads, thereby enhancing the thermal and electrical performance.

Product Summary

Part Number	BV _{DSS}	R _{DS(on)}	I _D
IRFN440	500V	0.85Ω	8.0A

Features:

- Avalanche Energy Ratings
- Dynamic dv/dt Rating
- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Surface Mount
- Light Weight

Absolute Maximum Ratings

	Parameter		Units
I _D @ V _{GS} = 10V, T _C = 25°C	Continuous Drain Current	8.0	A
I _D @ V _{GS} = 10V, T _C = 100°C	Continuous Drain Current	5.0	
I _{DM}	Pulsed Drain Current ①	32	
P _D @ T _C = 25°C	Max. Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
V _{GS}	Gate-to-Source Voltage	±20	V
E _{AS}	Single Pulse Avalanche Energy ②	700	mJ
I _{AR}	Avalanche Current ①	8.0	A
E _{AR}	Repetitive Avalanche Energy ①	12.5	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	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

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

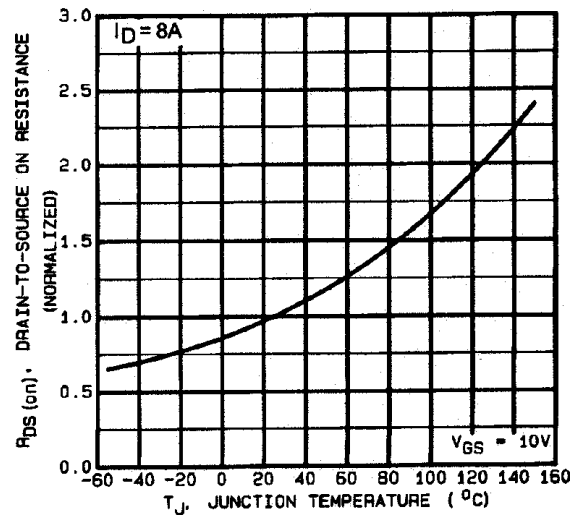
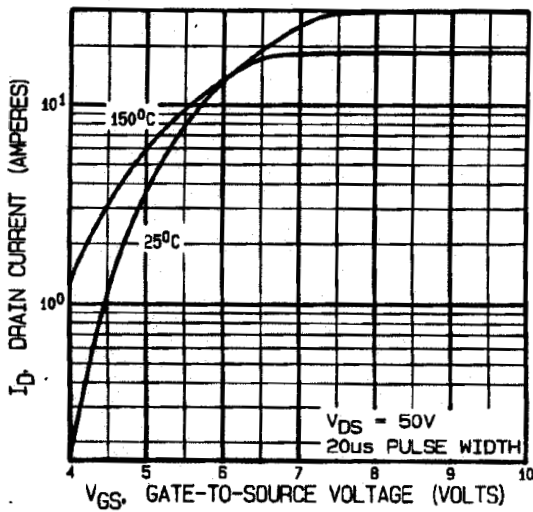
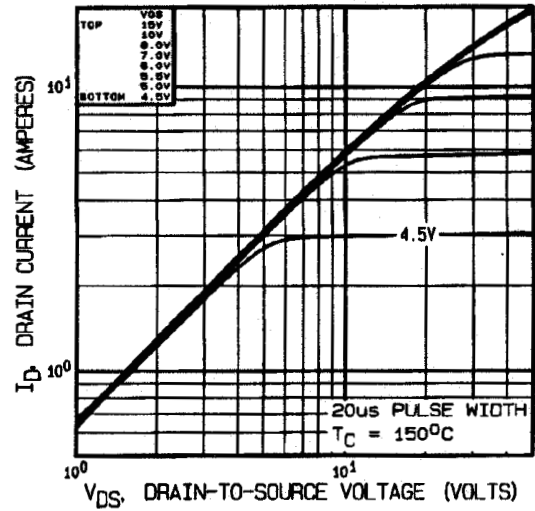
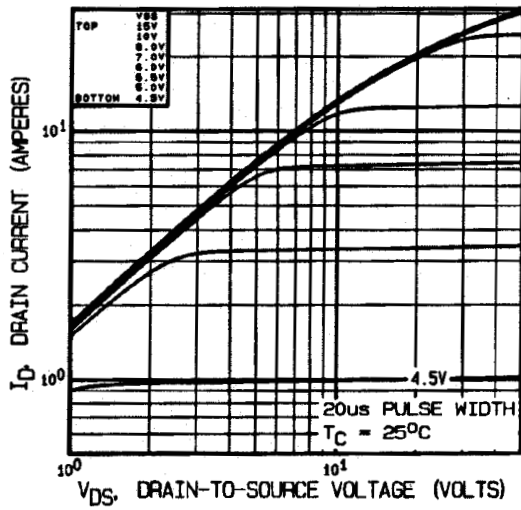
	Parameter	Min	Typ	Max	Units	Test Conditions
B _V D _{SS}	Drain-to-Source Breakdown Voltage	500	—	—	V	V _{GS} = 0V, I _D = 1.0mA
ΔB _V D _{SS} /ΔT _J	Temperature Coefficient of Breakdown Voltage	—	0.78	—	V/°C	Reference to 25°C, I _D = 1.0mA
R _{DS(on)}	Static Drain-to-Source On-State Resistance	—	—	0.85 0.95	Ω	V _{GS} = 10V, I _D = 5.0A ④ V _{GS} = 10V, I _D = 8.0A
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	4.7	—	—	S (r)	V _{DS} > 15V, I _{DS} = 5.0A ④
I _{DSS}	Zero Gate Voltage Drain Current	—	—	25 250	μA	V _{DS} = 0.8 x Max Rating, V _{GS} = 0V V _{DS} = 0.8 x Max Rating 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	—	—	68.5	nC	V _{GS} = 10V, I _D = 8.0A
Q _{gs}	Gate-to-Source Charge	—	—	12.5	nC	V _{DS} = Max Rating x 0.5
Q _{gd}	Gate-to-Drain ('Miller') Charge	—	—	42.4	nC	
t _{d(on)}	Turn-On Delay Time	—	—	21	ns	V _{DD} = 250V, I _D = 8.0A, R _G = 9.1Ω, V _{GS} = 10V
t _r	Rise Time	—	—	73	ns	
t _{d(off)}	Turn-Off Delay Time	—	—	72	ns	
t _f	Fall Time	—	—	51	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	—	1300	—	pF	V _{GS} = 0V, V _{DS} = 25V f = 1.0MHz
C _{oss}	Output Capacitance	—	310	—	pF	
C _{rss}	Reverse Transfer Capacitance	—	120	—	pF	

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I _S	Continuous Source Current (Body Diode)	—	—	8.0	A	
I _{SM}	Pulse Source Current (Body Diode) ①	—	—	32	A	
V _{SD}	Diode Forward Voltage	—	—	1.5	V	T _j = 25°C, I _S = 8.0A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	—	700	ns	T _j = 25°C, I _F = 8.0A, di/dt ≥ 100A/μs
Q _{RR}	Reverse Recovery Charge	—	—	8.9	μC	V _{DD} ≤ 30V ④
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L _S + L _D .				

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R _{thJC}	Junction-to-Case	—	—	1.0	°C/W	
R _{thJ-PCB}	Junction-to-PC board	—	4.0	—	°C/W	Soldered to a copper-clad PC board



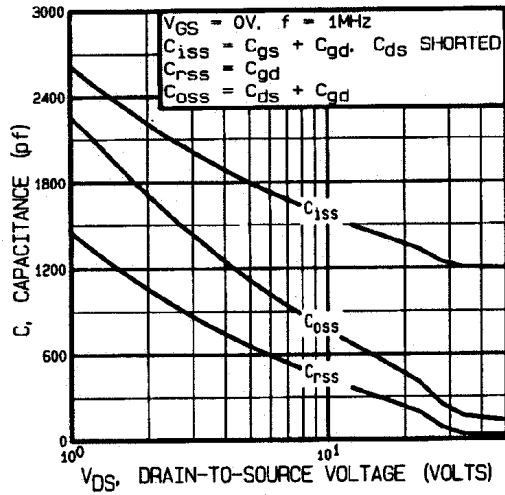


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

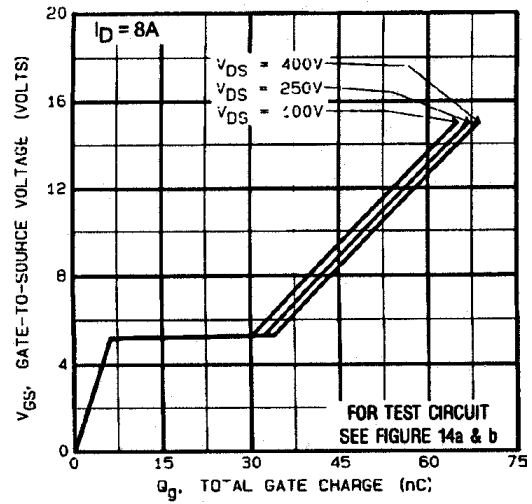


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

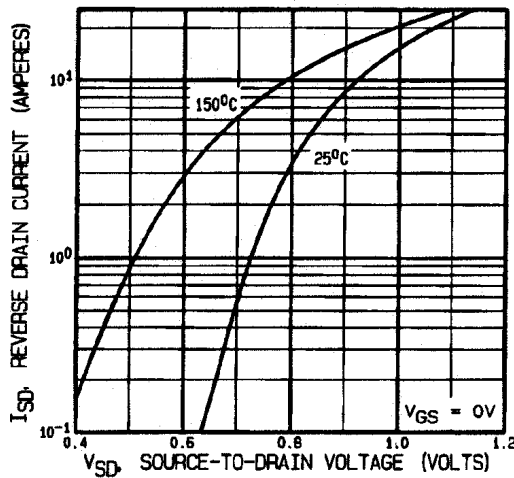


Fig 7. Typical Source-Drain Diode Forward Voltage

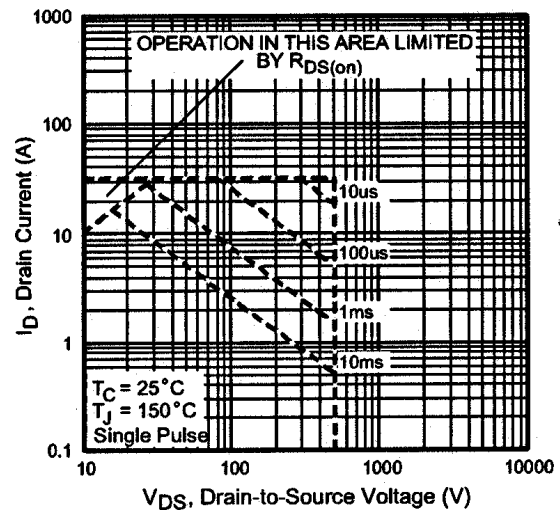


Fig 8. Maximum Safe Operating Area

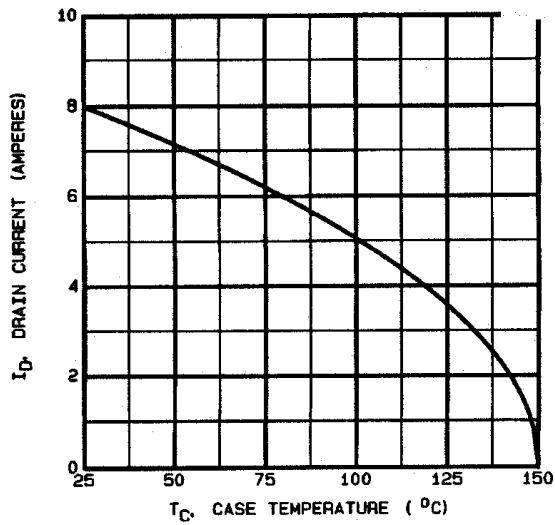


Fig 9. Maximum Drain Current Vs. Case Temperature

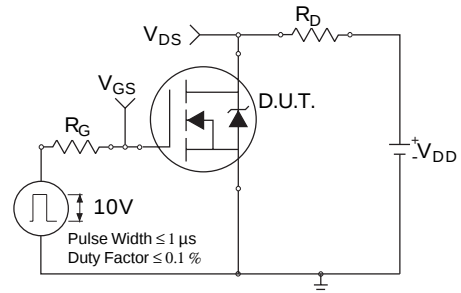


Fig 10a. Switching Time Test Circuit

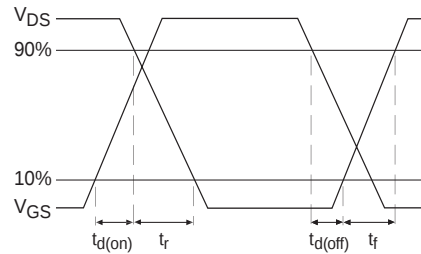


Fig 10b. Switching Time Waveforms

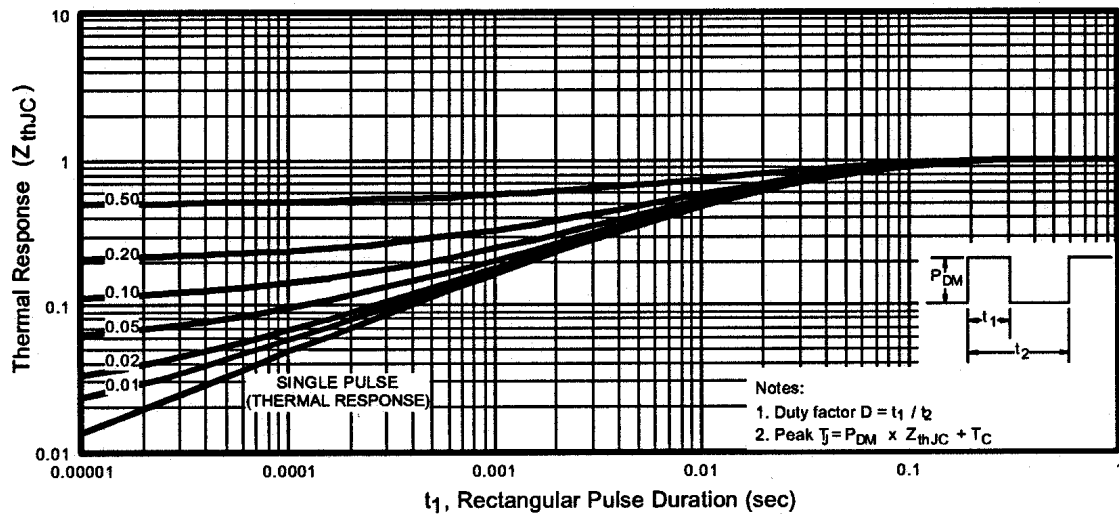


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

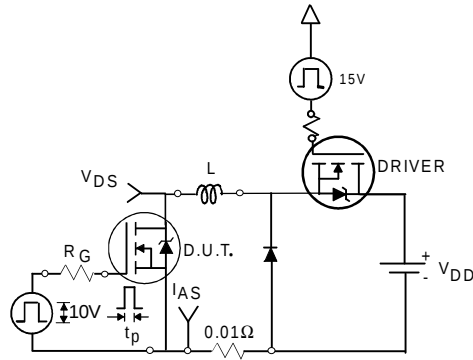


Fig 12a. Unclamped Inductive Test Circuit

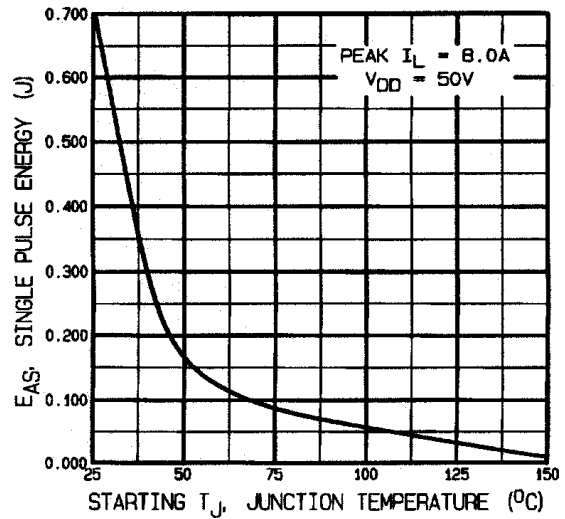


Fig 12c. Maximum Avalanche Energy
Vs. Drain Current

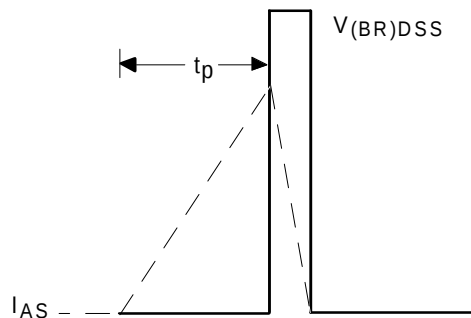


Fig 12b. Unclamped Inductive Waveforms

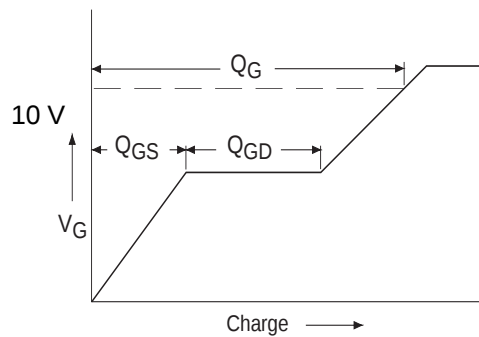


Fig 13a. Basic Gate Charge Waveform

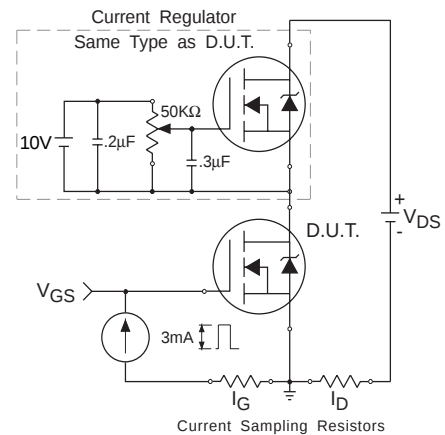
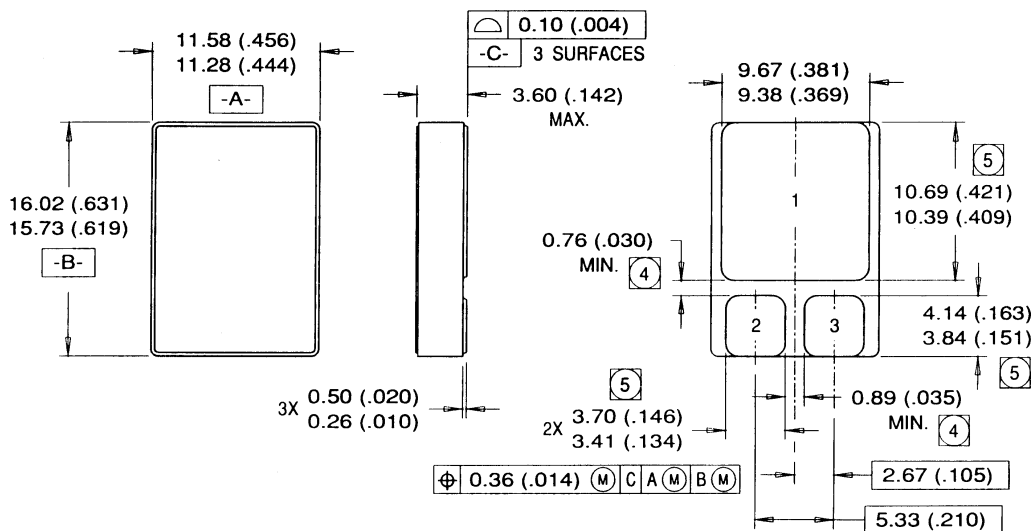


Fig 13b. Gate Charge Test Circuit

Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ② $V_{DD} = 25\text{ V}$, Starting $T_J = 25^\circ\text{C}$,
Peak $I_L = 8.0\text{ A}$, $V_{GS} = 10\text{ V}$, $25 \leq R_G \leq 200\Omega$
- ③ $I_{SD} \leq 8.0\text{ A}$, $di/dt \leq 100\text{ A}/\mu\text{s}$,
 $V_{DD} \leq 400\text{ V}$, $T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\text{ }\mu\text{s}$; Duty Cycle $\leq 2\%$

Case Outline and Dimensions — SMD-1



NOTES:

- 1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
- 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