

HEXFET® POWER MOSFET

IRFY440CM

N-CHANNEL

500 Volt, 0.85Ω HEXFET

HEXFET 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.

Product Summary

Part Number	BV _{DSS}	R _{DS(on)}	I _D
IRFY440CM	500V	0.85Ω	7.0A

Features

- Hermetically sealed
- Electrically isolated
- Simple Drive Requirements
- Ease of Paralleling
- Ceramic eyelets

Absolute Maximum Ratings

	Parameter	IRFY440CM	Units
I _D @ V _{GS} =10V, T _C = 25°C	Continuous Drain Current	7.0	A
I _D @ V _{GS} =10V, T _C = 100°C	Continuous Drain Current	4.4	
I _{DM}	Pulsed Drain Current ①	28	
P _D @ T _C = 25°C	Max. Power Dissipation	100	W
	Linear Derating Factor	0.8	W/K⑤
V _{GS}	Gate-to-Source Voltage	±20	V
E _{AS}	Single Pulse Avalance Energy ②	510	mJ
I _{AR}	Avalance Current ①	7.0	A
E _{AR}	Repetitive Avalanche Energy ①	10	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		
	Lead Temperature	300 (0.063 in (1.6mm) from case for 10 sec)	
	Weight	4.3(typical)	g

IRFY440CM Device

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

Parameter	Min	Typ	Max	Units	Test Conditions
BV _{DSS}	500	—	—	V	V _{GS} = 0V, I _D = 1.0mA
ΔBV _{DSS} /ΔT _J	—	0.78	—	V/°C	Reference to 25°C, I _D = 1.0mA
R _{DS(on)}	—	—	0.85	Ω	V _{GS} = 10V, I _D = 4.4A ④
	—	—	0.95	Ω	V _{GS} = 10V, I _D = 7.0A
V _{GS(th)}	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	4.7	—	—	S (r)	V _{DS} ≥ 15V, I _{DS} = 4.4A ④
I _{DSS}	—	—	25	μA	V _{DS} = 0.8 × max. rating, V _{GS} = 0V
	—	—	250	μA	V _{DS} = 0.8 × max. rating V _{GS} = 0V, T _J = 125°C
I _{GSS}	—	—	100	nA	V _{GS} = 20V
I _{GSS}	—	—	-100	nA	V _{GS} = -20V
Q _g	27.3	—	68.5	nC	V _{GS} = 10V, I _D = 7.0A
Q _{gs}	2.0	—	12.5	nC	V _{DS} = Max. Rating x 0.5
Q _{gd}	11.1	—	42.4	nC	see figures 6 and 13
t _{d(on)}	—	—	21	ns	V _{DD} = 250V, I _D = 7.0A, R _G = 9.1Ω
t _r	—	—	73	ns	V _{GS} = 10V
t _{d(off)}	—	—	72	ns	see figure 10
t _f	—	—	51	ns	see figure 10
L _D	—	8.7	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.
L _S	—	8.7	—	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.
C _{iss}	—	1300	—	pF	V _{GS} = 0V, V _{DS} = 25V
C _{oss}	—	310	—	pF	f = 1.0MHz.
C _{rss}	—	120	—	pF	see figure 5

Source-Drain Diode Ratings and Characteristics

Parameter	Min	Typ	Max	Units	Test Conditions
I _S	—	—	7.0	A	Modified MOSFET symbol showing the integral reverse p-n junction rectifier.
ISM	—	—	28	A	
V _{SD}	—	—	1.5	V	T _J = 25°C, I _S = 7.0A, V _{GS} = 0V ④
t _{rr}	—	—	700	ns	T _J = 25°C, I _F = 7.0A, di/dt ≤ 100 A/μs
Q _{RR}	—	—	8.9	μC	V _{DD} ≤ 50 V ④
t _{on}	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	—	—	1.25	K/W	Typical socket mount Mounting surface flat, smooth
R _{thJA} Junction-to-Ambient	—	—	80	K/W	
R _{thCS} Case-to-Sink	—	0.21	—	K/W	

IRFY440CM Device

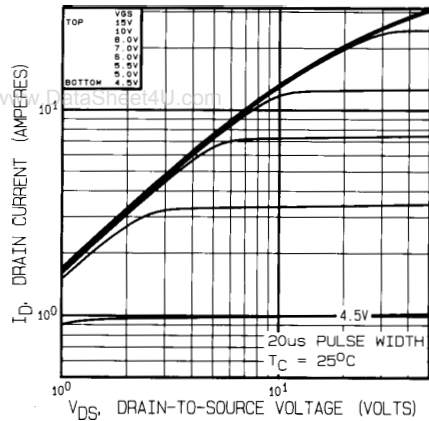


Fig. 1 — Typical Output Characteristics
 $T_C = 25^\circ\text{C}$

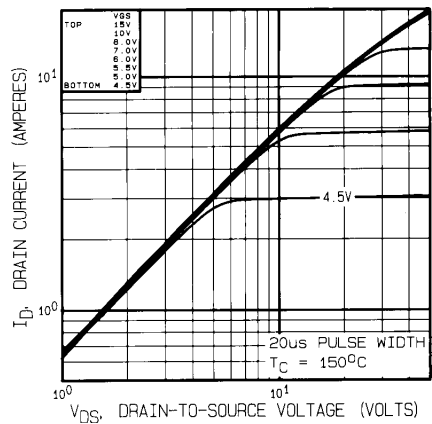


Fig. 2 — Typical Output Characteristics
 $T_C = 150^\circ\text{C}$

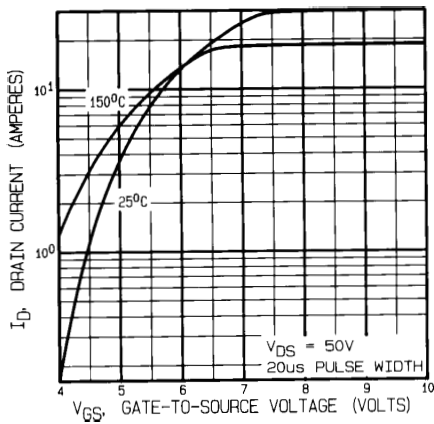


Fig. 3 — Typical Transfer Characteristics

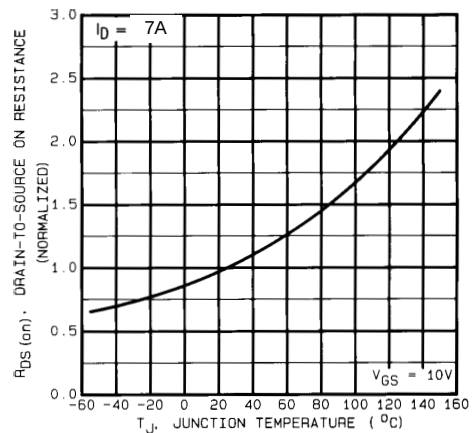


Fig. 4 — Normalized On-Resistance Vs. Temperature

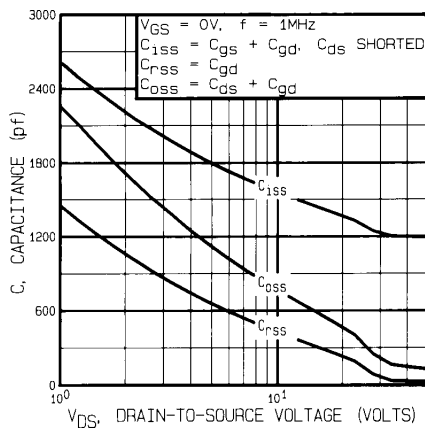


Fig. 5 — Typical Capacitance Vs. Drain-to-Source Voltage

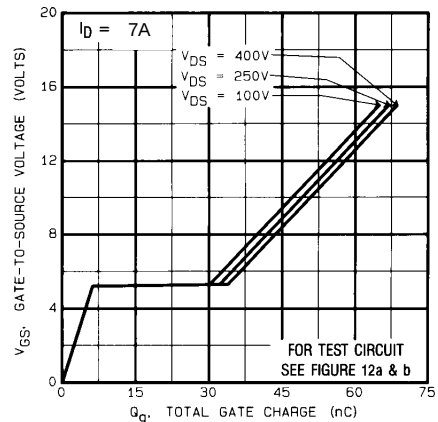


Fig. 6 — Typical Gate Charge Vs. Gate-to-Source Voltage

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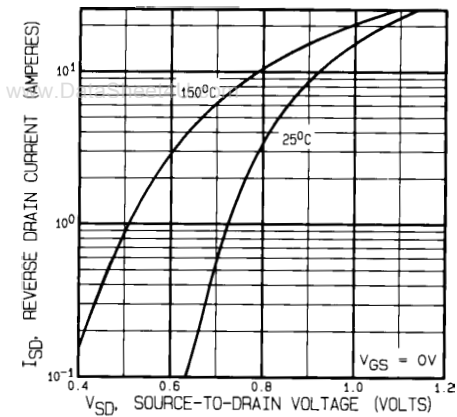


Fig. 7 — Typical Source-to-Drain Diode Forward Voltage

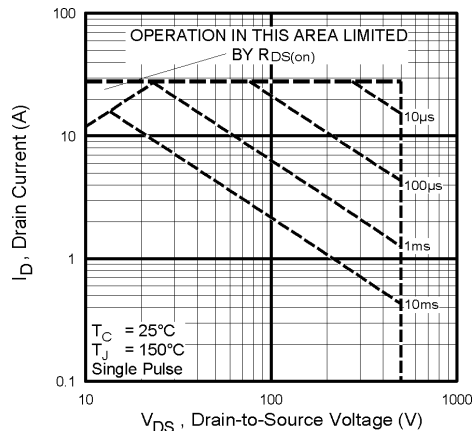


Fig. 8 — Maximum Safe Operating Area

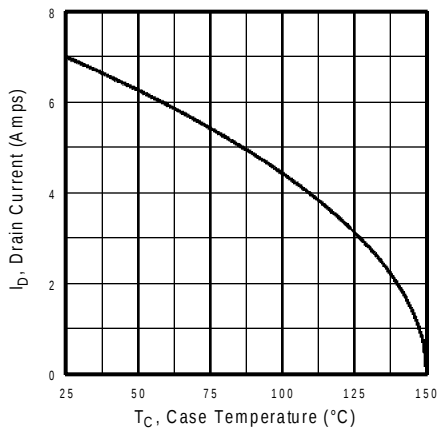


Fig. 9 — Maximum Drain Current Vs. Case Temperature

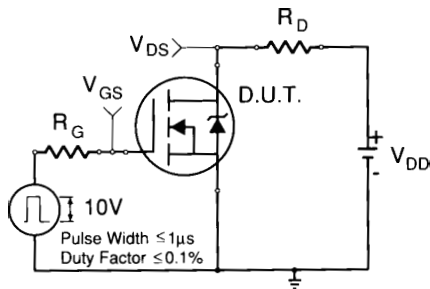


Fig. 10a — Switching Time Test Circuit

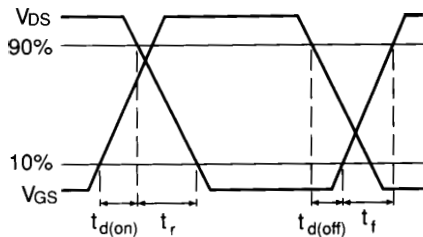


Fig. 10b — Switching Time Waveforms

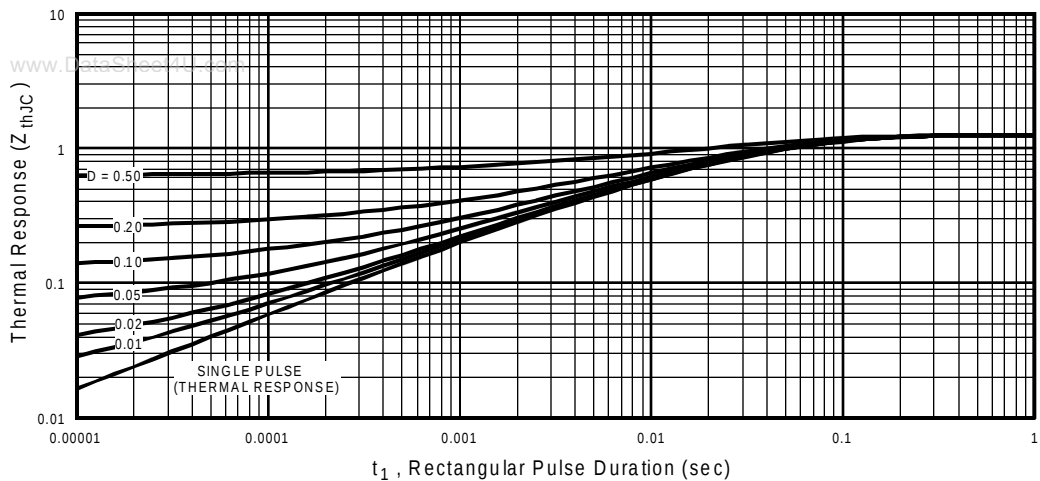


Fig. 11 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

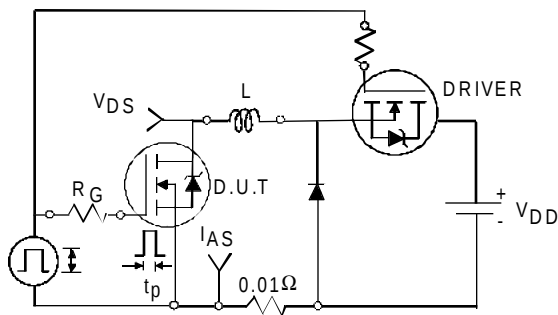


Fig. 12a — Unclamped Inductive Test Circuit

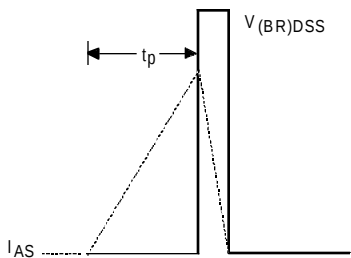


Fig. 12b — Unclamped Inductive Waveforms

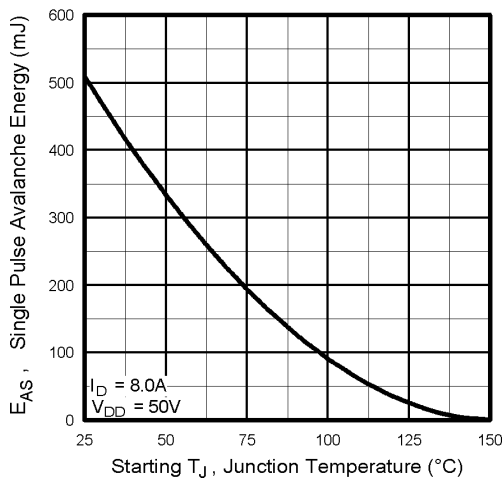


Fig. 12c — Max. Avalanche Energy vs. Current

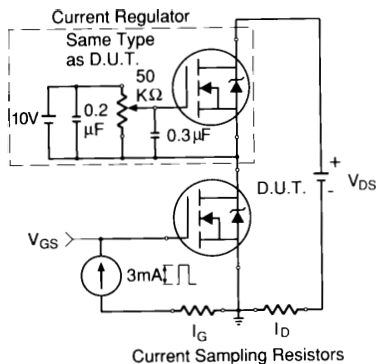


Fig. 13a — Gate Charge Test Circuit

IRFY440CM Device

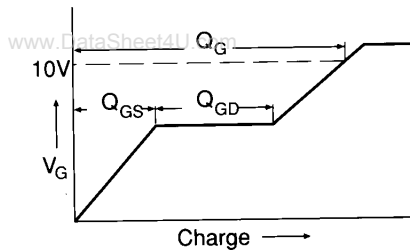
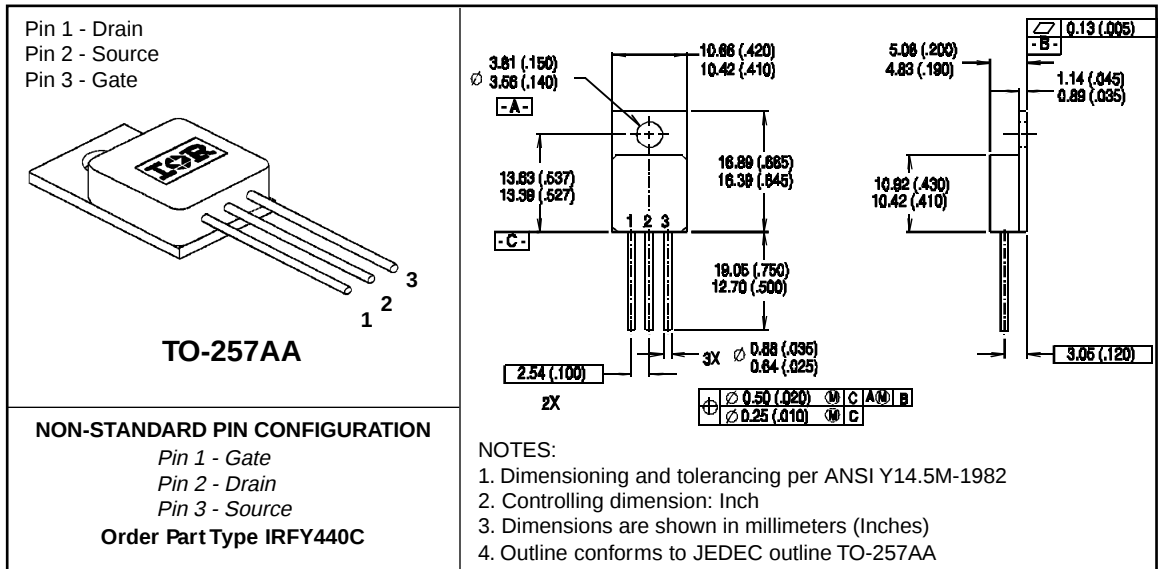


Fig. 13b — Basic Gate Charge Waveform

Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 11).
- ② @ $V_{DD} = 50V$, Starting $T_J = 25^\circ C$,
 $EAS = [0.5 * L * (I_L^2) * [BV_{DSS}/(BV_{DSS} - V_{DD})]]$
 Peak $I_L = 7A$, $V_{GS} = 10V$, $25 \leq R_G \leq 200\Omega$
- ③ $I_{SD} \leq 7.0A$, $di/dt \leq 100A/\mu s$, $V_{DD} \leq BV_{DSS}$, $T_J \leq 150^\circ C$
- ④ Pulse width $\leq 300 \mu s$; Duty Cycle $\leq 2\%$
- ⑤ $K/W = ^\circ C/W$ $W/K = W/^\circ C$

Case Outline and Dimensions



CAUTION

BERYLLIUM WARNING PER MIL-PRF-19500

Packages containing beryllia shall not be ground, sandblasted, machined or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

International
IOR Rectifier

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Data and specifications subject to change without notice

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