

International IOR Rectifier HEXFET® POWER MOSFET

Provisional Data Sheet No. PD 9.1287B

IRFY140CM

N-CHANNEL

100 Volt, 0.077Ω 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
IRFY140CM	100V	0.077Ω	16*A

Features

- Hermetically Sealed
- Electrically Isolated
- Simple Drive Requirements
- Ease of Paralleling
- Ceramic Eyelets

Absolute Maximum Ratings

	Parameter	IRFY140CM	Units
I _D @ V _{GS} =10V, T _C = 25°C	Continuous Drain Current	16*	A
I _D @ V _{GS} =10V, T _C = 100°C	Continuous Drain Current	16*	
I _{DM}	Pulsed Drain Current ①	100	
P _D @ T _C = 25°C	Max. Power Dissipation	100	W
	Linear Derating Factor	0.8	W/K ⑤
V _{GS}	Gate-to-Source Voltage	±20	V
E _{AS}	Single Pulse Avalanche Energy ②	230	mJ
I _{AR}	Avalanche Current ①	16*	A
E _{AR}	Repetitive Avalanche Energy ①	10	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.5	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

*I_D current limited by pin diameter

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Electrical Characteristics @ $T_j = 25^\circ\text{C}$ (Unless Otherwise Specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	$V_{GS} = 0V, I_D = 1.0mA$
$\Delta BV_{DSS}/\Delta T_j$	Temperature Coefficient of Breakdown Voltage	—	0.1	—	$V/^\circ\text{C}$	Reference to 25°C , $I_D = 1.0mA$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	0.077	Ω	$V_{GS} = 10V, I_D = 16A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	9.1	—	—	S (④)	$V_{DS} \geq 15V, I_{DS} = 16A$ ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	25	μA	$V_{DS} = 0.8 \times \text{max. rating}, V_{GS} = 0V$
		—	—	250		$V_{DS} = 0.8 \times \text{max. rating}$ $V_{GS} = 0V, T_j = 25^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Forward	—	—	100	nA	$V_{GS} = 20V$
I_{GSS}	Gate-to-Source Leakage Reverse	—	—	-100		$V_{GS} = -20V$
Q_g	Total Gate Charge	30	—	59	nC	$V_{GS} = 10V, I_D = 16A$
Q_{gs}	Gate-to-Source Charge	2.4	—	12		$V_{DS} = \text{Max. Rating} \times 0.5$
Q_{gd}	Gate-to-Drain ("Miller") Charge	12	—	30.7		see figures 6 and 13
$t_{d(on)}$	Turn-On Delay Time	—	—	21		$V_{DD} = 50V, I_D = 16A, R_G = 9.1\Omega$
t_r	Rise Time	—	—	145	ns	$V_{GS} = 10V$
$t_{d(off)}$	Turn-Off Delay Time	—	—	64		see figure 10
t_f	Fall Time	—	—	105		
L_D	Internal Drain Inductance	—	8.7	—	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.
L_S	Internal Source Inductance	—	8.7	—		Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.
C_{iss}	Input Capacitance	—	1660	—	pF	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1.0MHz$. see figure 5
C_{oss}	Output Capacitance	—	550	—		
C_{rss}	Reverse Transfer Capacitance	—	120	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	16	A	Modified MOSFET symbol showing the integral reverse p-n junction rectifier.
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	100		
V_{SD}	Diode Forward Voltage	—	—	1.5	V	$T_j = 25^\circ\text{C}, I_S = 16A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	—	400	ns	$T_j = 25^\circ\text{C}, I_F = 16A, di/dt \leq 100 A/\mu s$
Q_{RR}	Reverse Recovery Charge	—	—	2.4	μC	$V_{DD} \leq 50V$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by $L_S + L_D$.				

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	1.25	K/W ⑤	Typical socket mount Mounting surface flat, smooth
R_{thJA}	Junction-to-Ambient	—	—	80		
R_{thCS}	Case-to-Sink	—	0.21	—		

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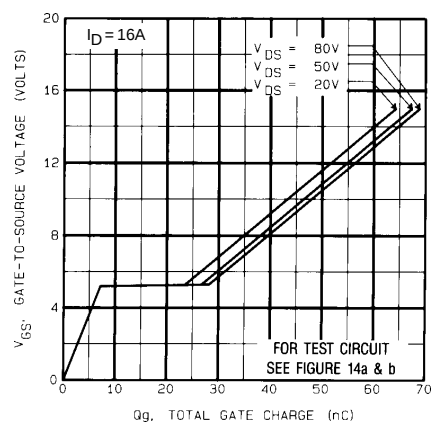
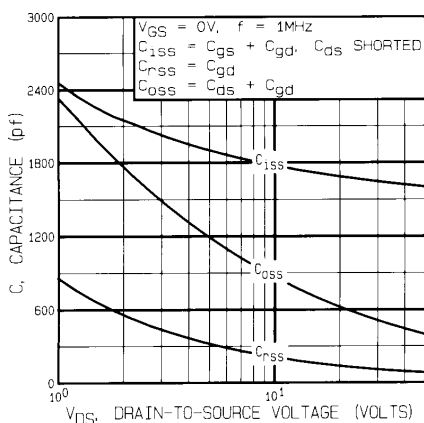
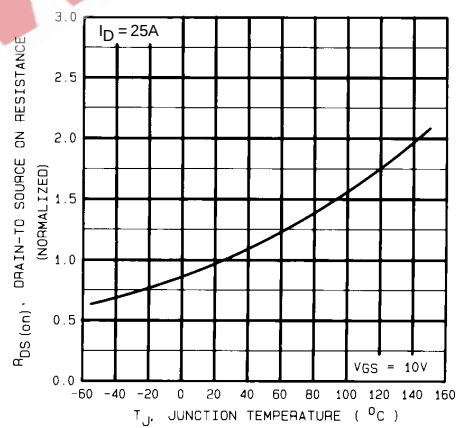
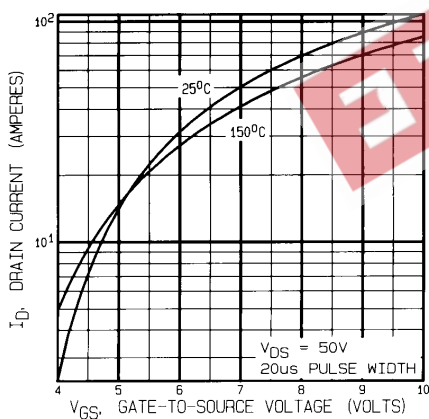
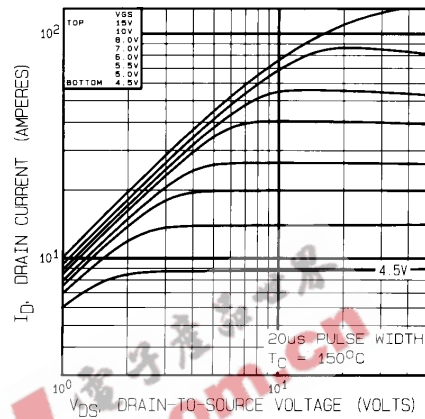
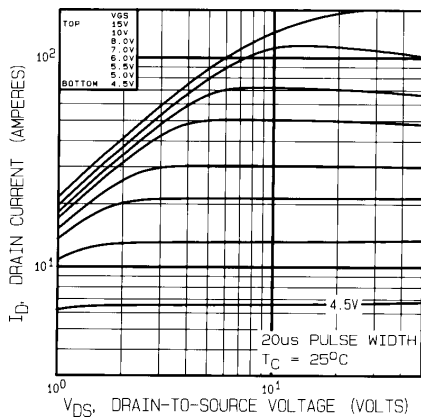


Fig. 5 — Typical Capacitance Vs. Drain-to-Source Voltage

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

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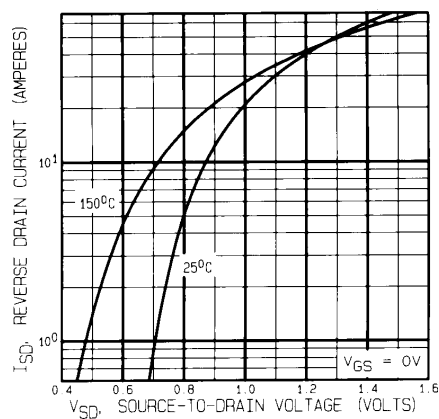


Fig. 7 — Typical Source-to-Drain Diode Forward Voltage

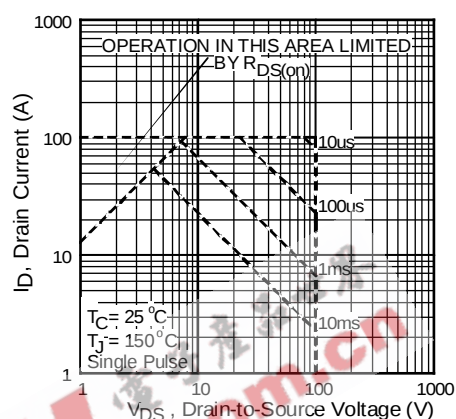


Fig. 8 — Maximum Safe Operating Area

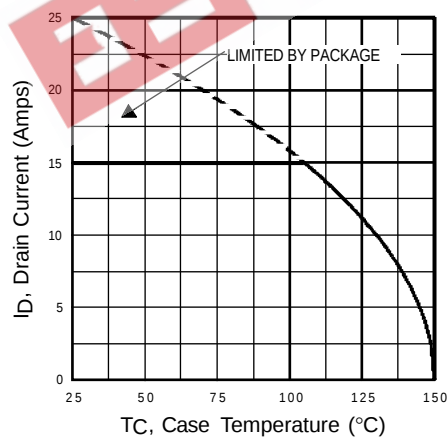


Fig. 9 — Maximum Drain Current Vs. Case Temperature

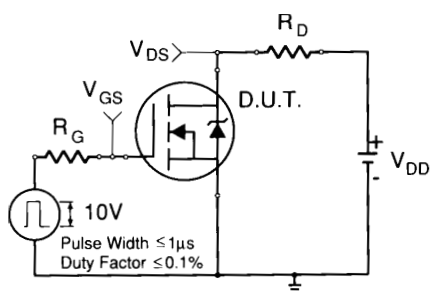


Fig. 10a — Switching Time Test Circuit

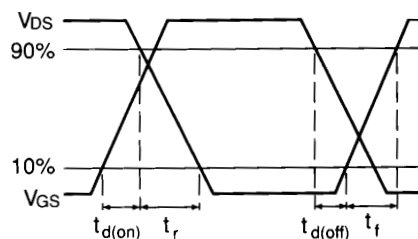


Fig. 10b — Switching Time Waveforms

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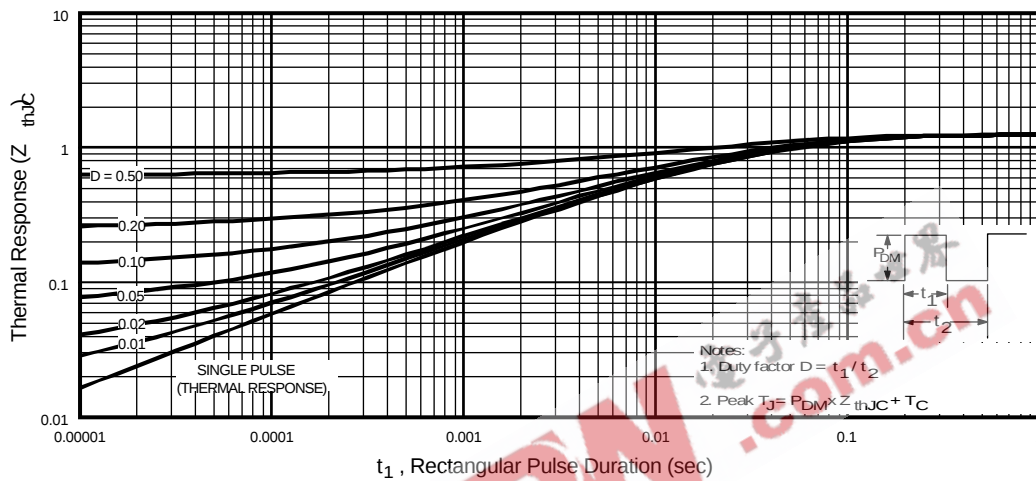


Fig. 11 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

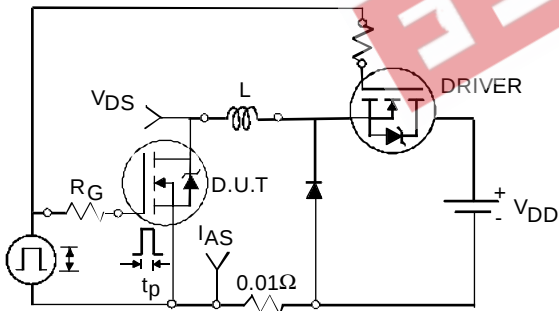


Fig. 12a — Unclamped Inductive Test Circuit

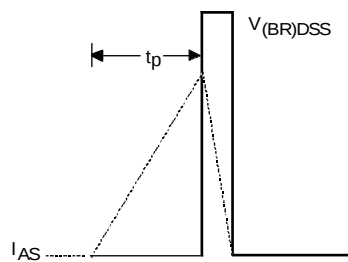


Fig. 12b — Unclamped Inductive Waveforms

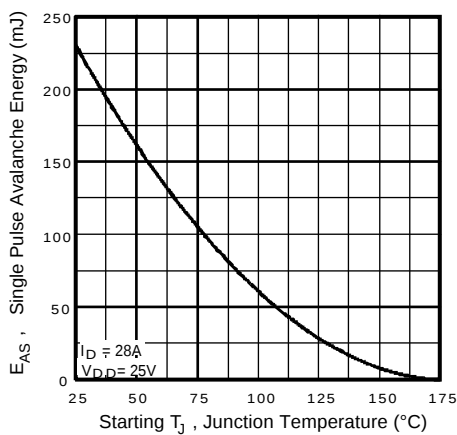


Fig. 12c — Max. Avalanche Energy vs. Current

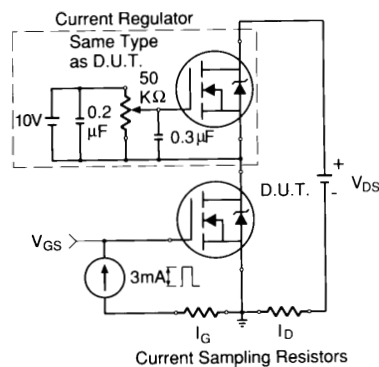


Fig. 13a — Gate Charge Test Circuit

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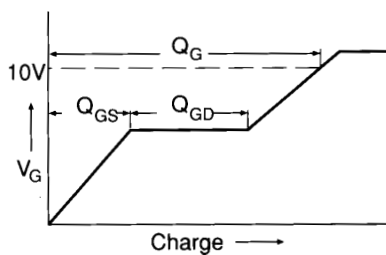
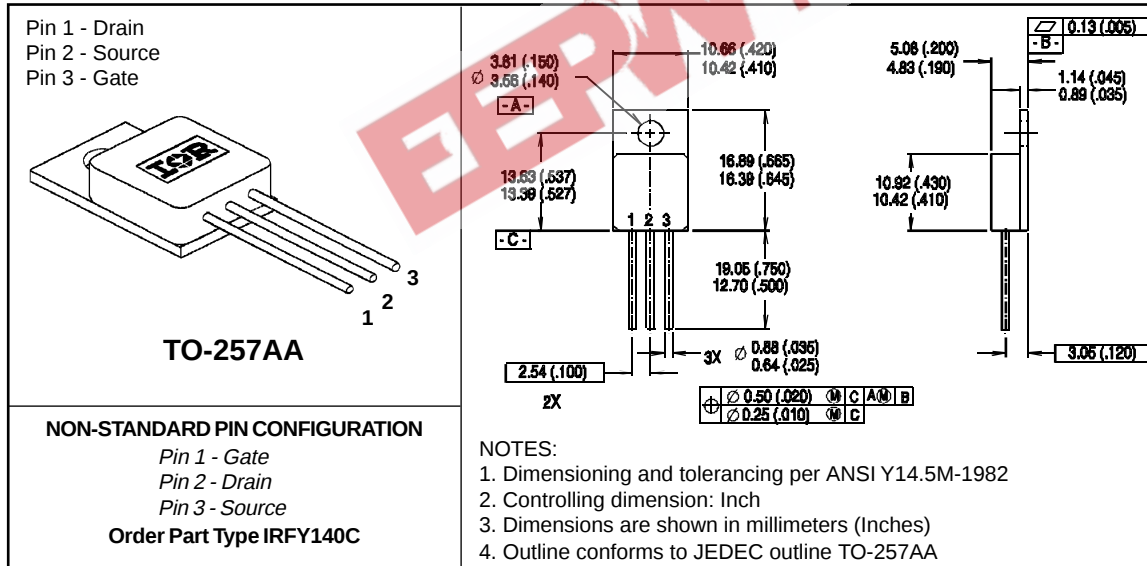


Fig. 13b — Basic Gate Charge Waveform

Notes:

- ① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 11).
- ② @ $V_{DD} = 25V$, Starting $T_J = 25^\circ C$,
 $EAS = [0.5 * L * (I_L^2) * [BVDSS/(BVDSS - V_{DD})]]$
 Peak $I_L = 16A$, $V_{GS} = 10V$, $25 \leq R_G \leq 200\Omega$ (figure 12)
- ③ $I_{SD} \leq 16A$, $di/dt \leq 170A/\mu s$, $V_{DD} \leq BVDSS$, $T_J \leq 150^\circ C$
- 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 — TO-257AA



CAUTION

BERYLLIA 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
IR Rectifier

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Data and specifications subject to change without notice.

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