

# International IOR Rectifier

## POWER MOSFET THRU-HOLE (TO-257AA)

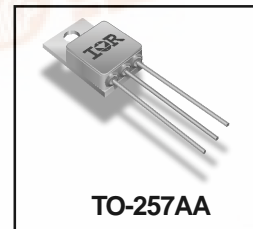
## IRFY440C, IRFY440CM

### 500V, N-CHANNEL HEXFET<sup>®</sup> MOSFET TECHNOLOGY

#### Product Summary

Part Number	R <sub>DS(on)</sub>	I <sub>D</sub>	Eyelets
IRFY440C	0.85 Ω	7.0A	Glass
IRFY440CM	0.85 Ω	7.0A	Glass

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.



TO-257AA

#### Features:

- Simple Drive Requirements
- Ease of Paralleling
- Hermetically Sealed
- Electrically Isolated
- Ceramic Eyelets
- Ideally Suited For Space Level Applications

#### Absolute Maximum Ratings

	Parameter		Units
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 25°C	Continuous Drain Current	7.0	A
I <sub>D</sub> @ V <sub>GS</sub> = 10V, T <sub>C</sub> = 100°C	Continuous Drain Current	4.4	
I <sub>DM</sub>	Pulsed Drain Current ①	28	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Max. Power Dissipation	100	W
	Linear Derating Factor	0.8	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	±20	V
EAS	Single Pulse Avalanche Energy ②	510	mJ
I <sub>AR</sub>	Avalanche Current ①	7.0	A
EAR	Repetitive Avalanche Energy ①	10	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
T <sub>J</sub>	Operating Junction	-55 to 150	°C
T <sub>STG</sub>	Storage Temperature Range		
	Lead Temperature	300(0.063in./1.6mm from case for 10 sec)	
	Weight	4.3 (Typical)	g



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

	Parameter	Min	Typ	Max	Units	Test Conditions
BVDSS	Drain-to-Source Breakdown Voltage	500	—	—	V	VGS = 0V, ID = 1.0mA
ΔBVDSS/ΔTJ	Temperature Coefficient of Breakdown Voltage	—	0.78	—	V/°C	Reference to 25°C, ID = 1.0mA
RDS(on)	Static Drain-to-Source On-State Resistance	—	—	0.85	Ω	VGS = 10V, ID = 4.4A ④
VGS(th)	Gate Threshold Voltage	2.0	—	4.0	V	VDS = VGS, ID = 250μA
gfs	Forward Transconductance	4.7	—	—	S (r)	VDS > 15V, IDS = 4.4A ④
IDSS	Zero Gate Voltage Drain Current	—	—	25	μA	VDS = 400V, VGS = 0V
		—	—	250		VDS = 400V, VGS = 0V, TJ = 125°C
IGSS	Gate-to-Source Leakage Forward	—	—	100	nA	VGS = 20V
IGSS	Gate-to-Source Leakage Reverse	—	—	-100		VGS = -20V
Qg	Total Gate Charge	—	—	68.5	nC	VGS = 10V, ID = 7.0A
Qgs	Gate-to-Source Charge	—	—	12.5		VDS = 250V
Qgd	Gate-to-Drain ('Miller') Charge	—	—	42.4		see figures 6 and 13
td(on)	Turn-On Delay Time	—	—	21	ns	VDD = 250V, ID = 7.0A, RG = 9.1Ω
tr	Rise Time	—	—	73		
td(off)	Turn-Off Delay Time	—	—	72		
tf	Fall Time	—	—	51		
LS + LD	Total Inductance	—	6.8	—	nH	Measured from drain lead (6mm/0.25in. from package) to source lead (6mm/0.25in. from package )
Ciss	Input Capacitance	—	1300	—	pF	VGS = 0V, VDS = 25V f = 1.0MHz see figure 5
Coss	Output Capacitance	—	310	—		
Crss	Reverse Transfer Capacitance	—	120	—		

**Source-Drain Diode Ratings and Characteristics**

	Parameter	Min	Typ	Max	Units	Test Conditions
IS	Continuous Source Current (Body Diode)	—	—	7.0	A	
ISM	Pulse Source Current (Body Diode) ①	—	—	28		
VSD	Diode Forward Voltage	—	—	1.5	V	Tj = 25°C, IS = 7.0A, VGS = 0V ④
trr	Reverse Recovery Time	—	—	700	nS	Tj = 25°C, IF = 7.0A, di/dt ≤ 100A/μs
QRR	Reverse Recovery Charge	—	—	8.9	μC	VDD ≤ 50V ④
ton	Forward Turn-On Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by LS + LD.				

**Thermal Resistance**

	Parameter	Min	Typ	Max	Units	Test Conditions
RthJC	Junction-to-Case	—	—	1.25	°C/W	Typical socket mount
RthCS	Case-to-sink	—	0.21	—		
RthJA	Junction-to-Ambient	—	—	80		

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

For footnotes refer to the last page

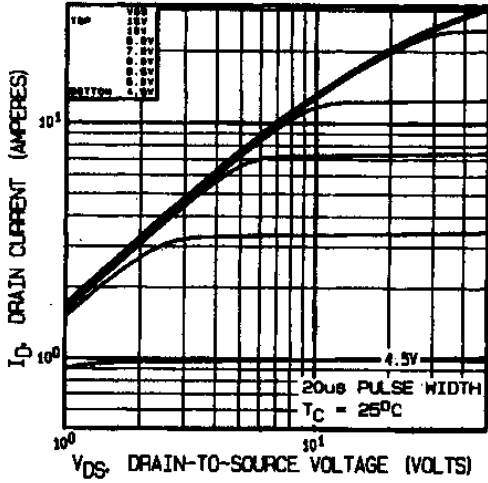


Fig 1. Typical Output Characteristics

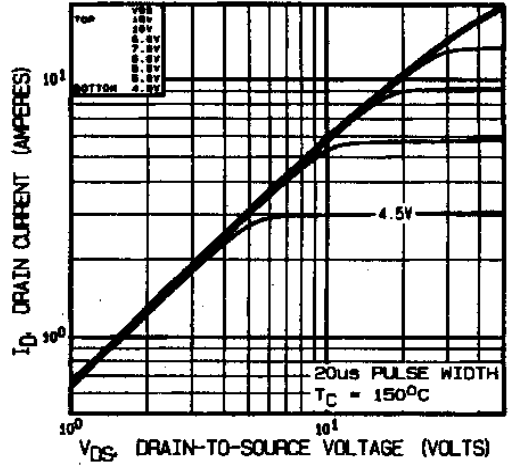


Fig 2. Typical Output Characteristics

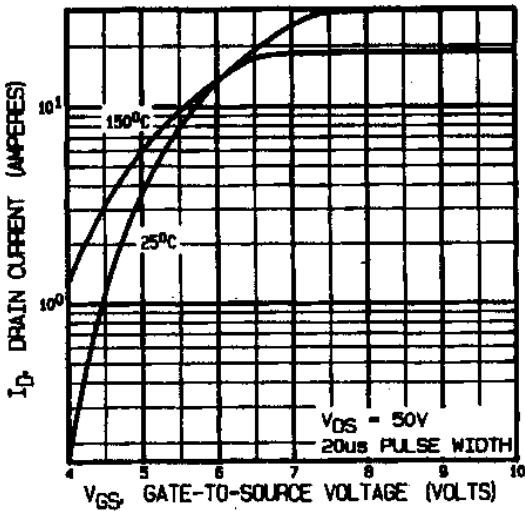


Fig 3. Typical Transfer Characteristics

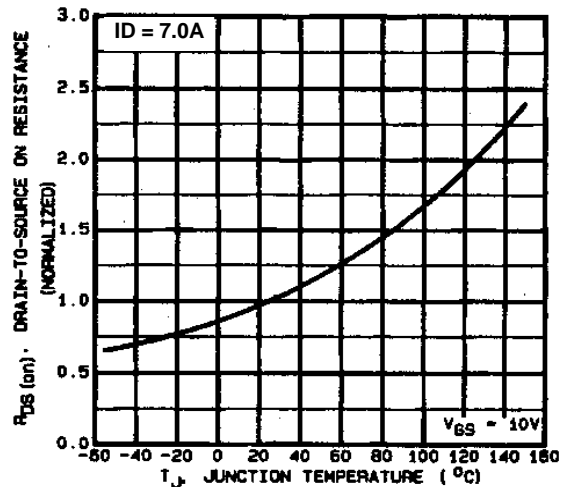


Fig 4. Normalized On-Resistance  
 Vs. Temperature

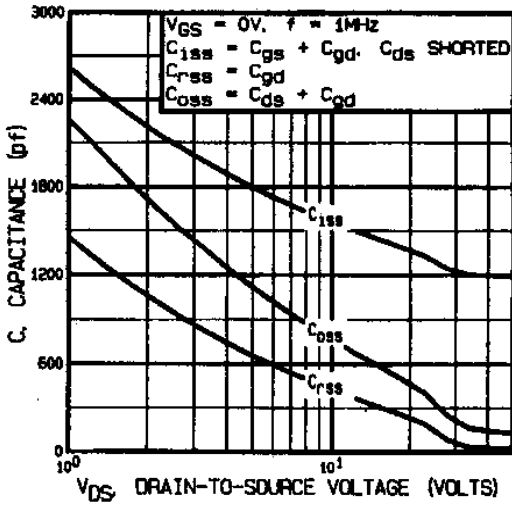


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

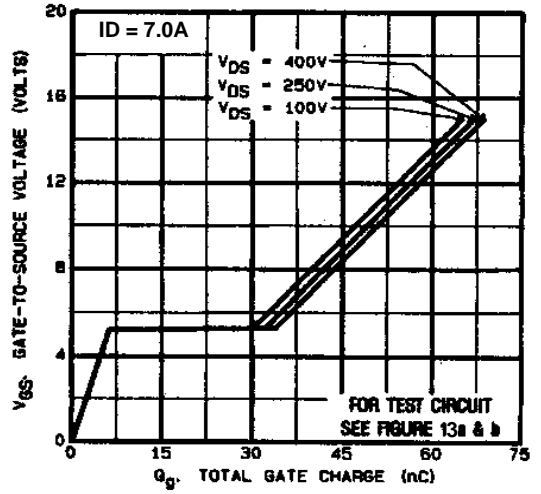


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

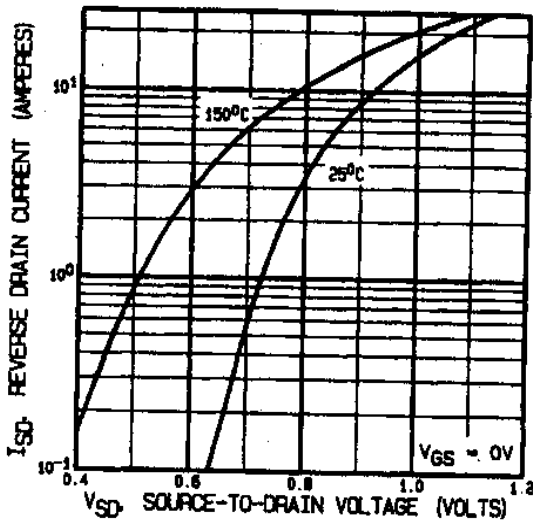


Fig 7. Typical Source-Drain Diode Forward Voltage

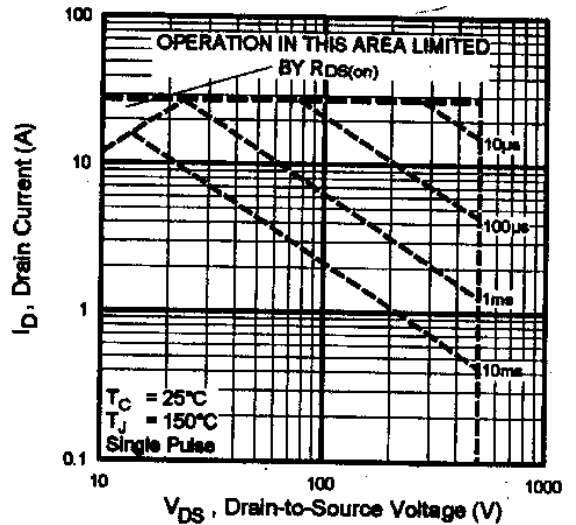
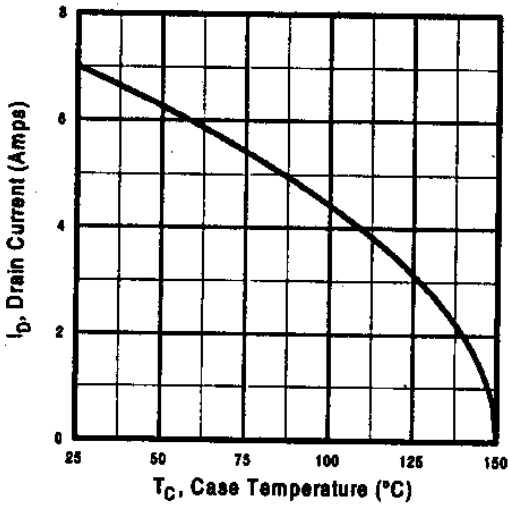
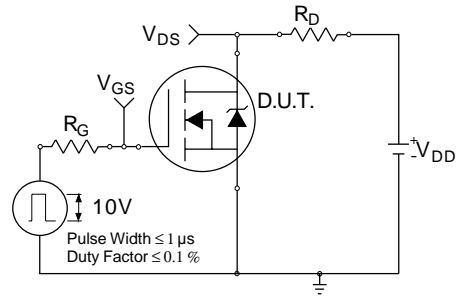


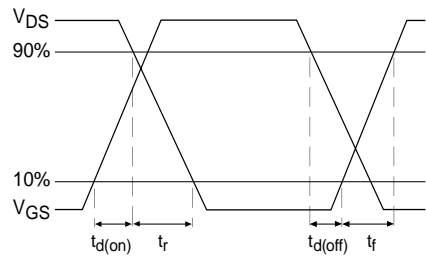
Fig 8. Maximum Safe Operating Area



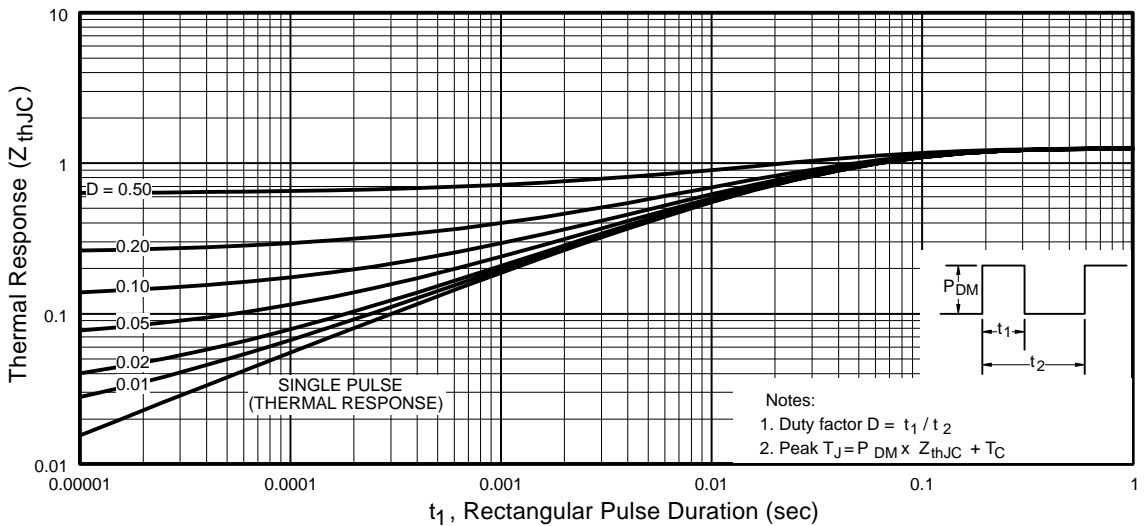
**Fig 9.** Maximum Drain Current Vs. Case Temperature



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



**Fig 10b.** Switching Time Waveforms



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

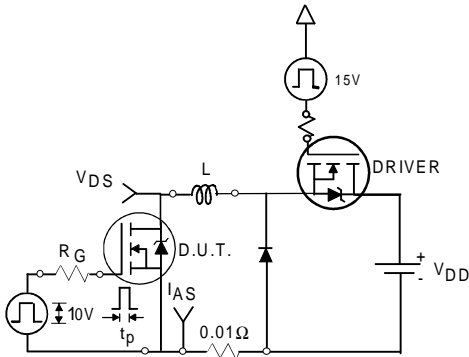


Fig 12a. Unclamped Inductive Test Circuit

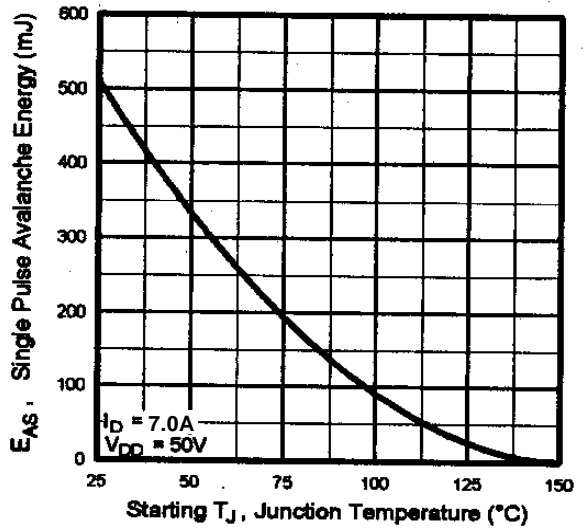


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

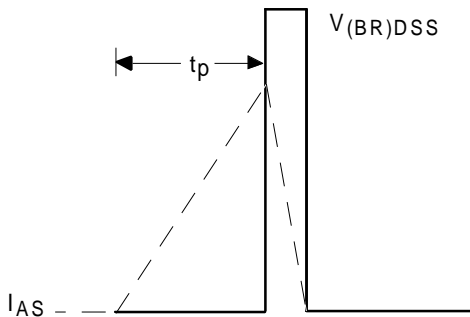


Fig 12b. Unclamped Inductive Waveforms

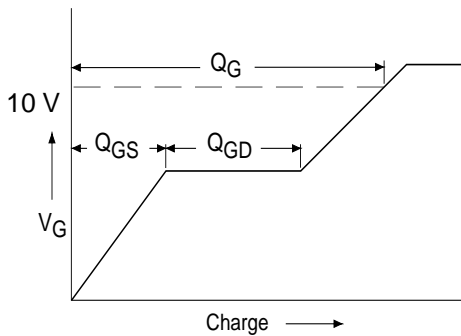


Fig 13a. Basic Gate Charge Waveform

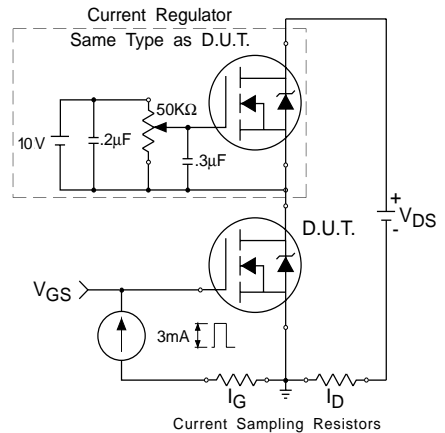
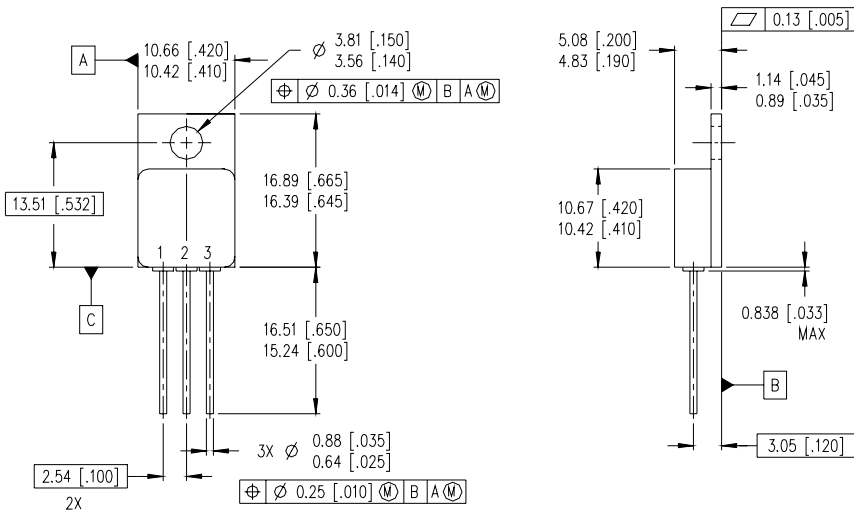


Fig 13b. Gate Charge Test Circuit

**Footnotes:**

- ① Repetitive Rating; Pulse width limited by maximum junction temperature.
- ②  $V_{DD} = 50V$ , starting  $T_J = 25^{\circ}C$ ,  $L = 20mH$   
Peak  $I_L = 7.0A$ ,  $V_{GS} = 10V$
- ③  $I_{SD} \leq 7.0A$ ,  $di/dt \leq 100A/\mu s$ ,  
 $V_{DD} \leq 500V$ ,  $T_J \leq 150^{\circ}C$
- ④ Pulse width  $\leq 300 \mu s$ ; Duty Cycle  $\leq 2\%$

**Case Outline and Dimensions — TO-257AA**



**NOTES:**

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-257AA.

**LEGEND**

- D - DRAIN
- S - SOURCE
- G - GATE

