PD - 90710B

International
IOR Rectifier

IRFMG40

1000V, N-CHANNEL

HEXFET® MOSFET TECHNOLOGY

POWER MOSFET
THRU-HOLE (TO-254AA)

Product Summary

Part Number	$R_{DS(on)}$	I_D
IRFMG40	3.5Ω	3.9A

TO-254AA

HEXFET® 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
- Light-weight

Absolute Maximum Ratings

	Parameter		Units
I_D @ V_{GS} = 10V, T_C = 25°C	Continuous Drain Current	3.9	A
I_D @ V_{GS} = 10V, T_C = 100°C	Continuous Drain Current	2.5	
I_{DM}	Pulsed Drain Current ①	16	
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	530	mJ
I_{AR}	Avalanche Current ①	3.9	A
E_{AR}	Repetitive Avalanche Energy ①	12.5	mJ
dv/dt	Peak Diode Recovery dv/dt ③	1.0	V/ns
T_J T_{STG}	Operating Junction Storage Temperature Range	-55 to 150	°C
	Lead Temperature	300(0.063in./1.6mm from case for 10 sec)	
	Weight	9.3 (Typical)	g

For footnotes refer to the last page

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

	Parameter	Min	Typ	Max	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	1000	—	—	V	V_{GS} = 0V, I_D = 1.0mA
$\Delta BV_{DSS}/\Delta T_J$	Temperature Coefficient of Breakdown Voltage	—	1.4	—	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	—	—	3.5	Ω	V_{GS} = 10V, I_D = 2.5A ④
		—	—	4.2		V_{GS} = 10V, I_D = 3.9A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 250μA
g_{fs}	Forward Transconductance	3.3	—	—	S (℧)	V_{DS} > 15V, I_{DS} = 2.5A ④
I_{DSS}	Zero Gate Voltage Drain Current	—	—	25	μA	V_{DS}= 800V ,V_{GS}=0V
		—	—	250		V_{DS} = 800V, 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		V_{GS} = -20V
Q_g	Total Gate Charge	—	—	120	nC	V_{GS} =10V, I_D =3.9A V_{DS} = 400V ⑤
Q_{gs}	Gate-to-Source Charge	—	—	12		
Q_{gd}	Gate-to-Drain (‘Miller’) Charge	—	—	75		
$t_{d(on)}$	Turn-On Delay Time	—	—	30	ns	V_{DD} = 400V, I_D = 3.9A, V_{GS} =10V,R_G = 9.1Ω ⑤
t_r	Rise Time	—	—	50		
$t_{d(off)}$	Turn-Off Delay Time	—	—	170		
t_f	Fall Time	—	—	50		
$L_S + L_D$	Total Inductance	—	6.8	—	nH	Measured from Drain lead (6mm / 0.25in. from package) to Source lead (6mm /0.25in. from package)
C_{iss}	Input Capacitance	—	1700	—	pF	V_{GS} = 0V, V_{DS} = 25V f = 1.0MHz
C_{oss}	Output Capacitance	—	250	—		
C_{rss}	Reverse Transfer Capacitance	—	100	—		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min	Typ	Max	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	3.9	A	
I_{SM}	Pulse Source Current (Body Diode) ①	—	—	16		
V_{SD}	Diode Forward Voltage	—	—	1.8	V	T_j = 25°C, I_S = 3.9A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	—	1000	nS	T_j = 25°C, I_F = 3.9A, di/dt ≤ 100A/μs V_{DD} ≤ 50V ④
Q_{RR}	Reverse Recovery Charge	—	—	5.6	μC	
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_{thCS}	Case-to-sink	—	0.21	—		
R_{thJA}	Junction-to-Ambient	—	—	48		Typical socket mount

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

For footnotes refer to the last page

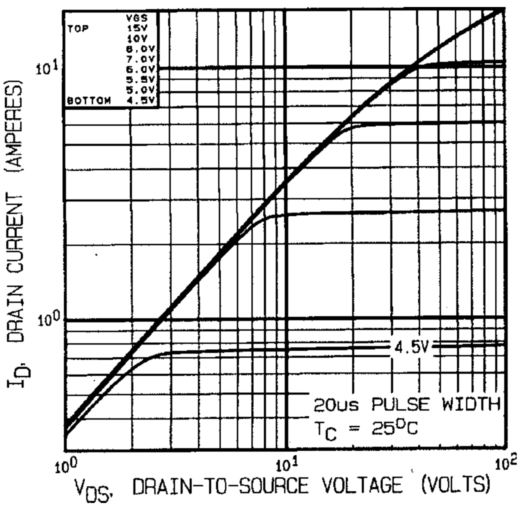


Fig 1. Typical Output Characteristics

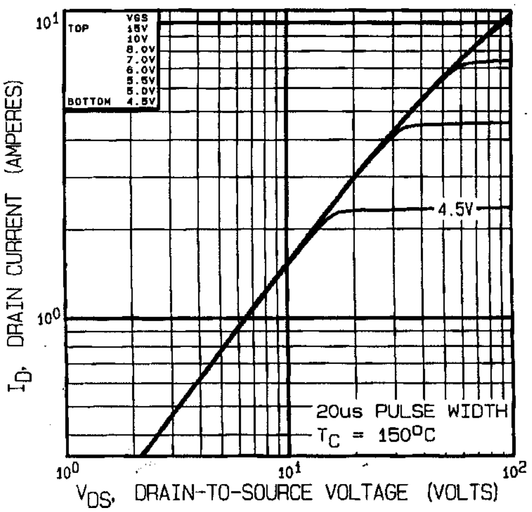


Fig 2. Typical Output Characteristics

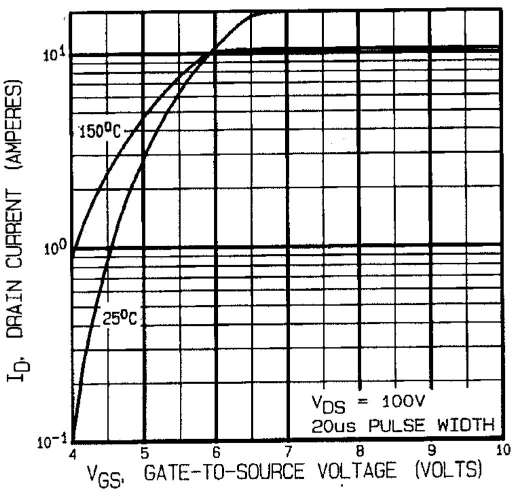


Fig 3. Typical Transfer Characteristics

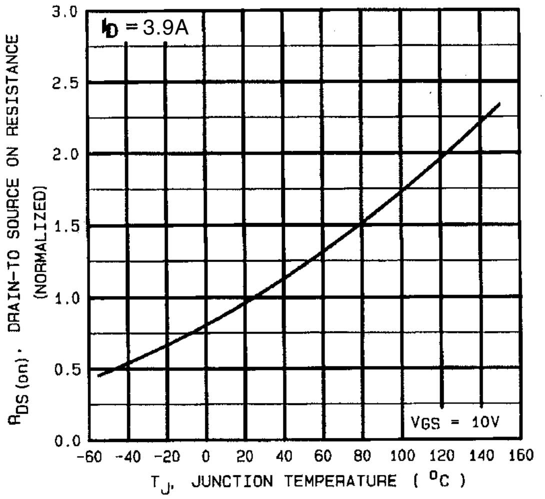
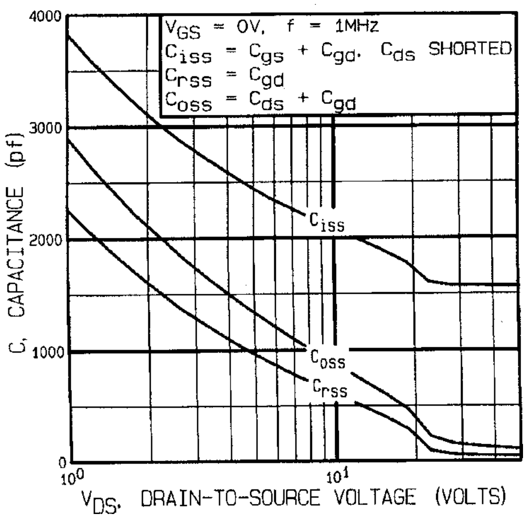


Fig 4. Normalized On-Resistance Vs. Temperature



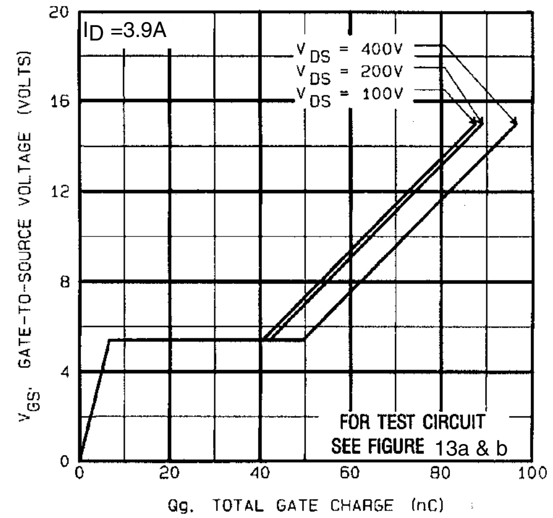
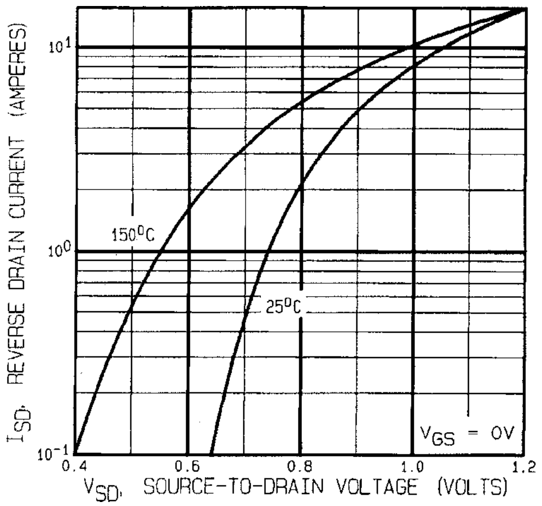


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

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



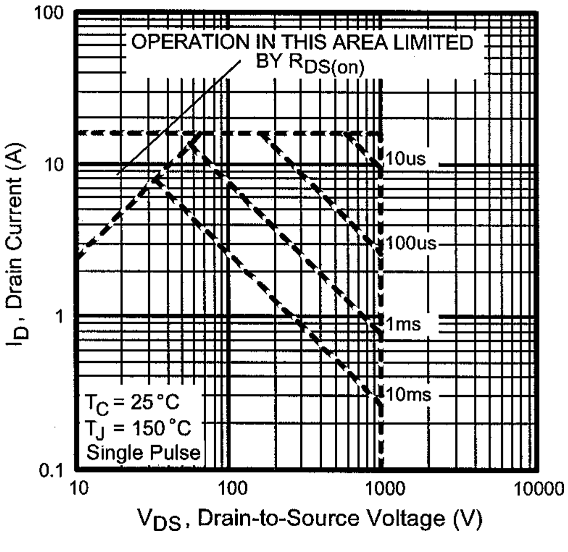


Fig 7. Typical Source-Drain Diode Forward Voltage

Fig 8. Maximum Safe Operating Area

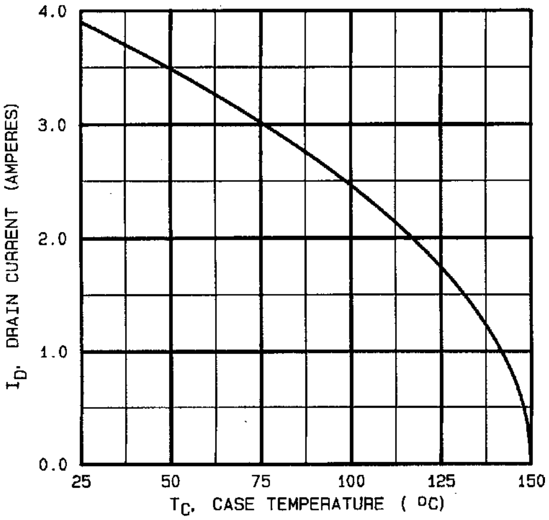


Fig 9. Maximum Drain Current Vs. Case Temperature

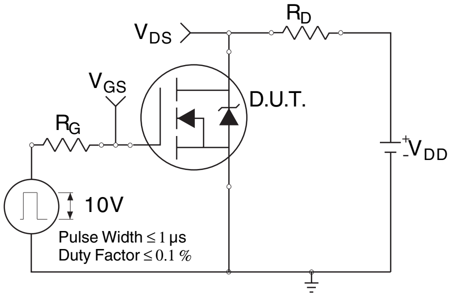


Fig 10a. Switching Time Test Circuit

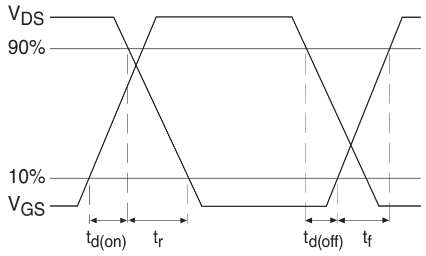


Fig 10b. Switching Time Waveforms

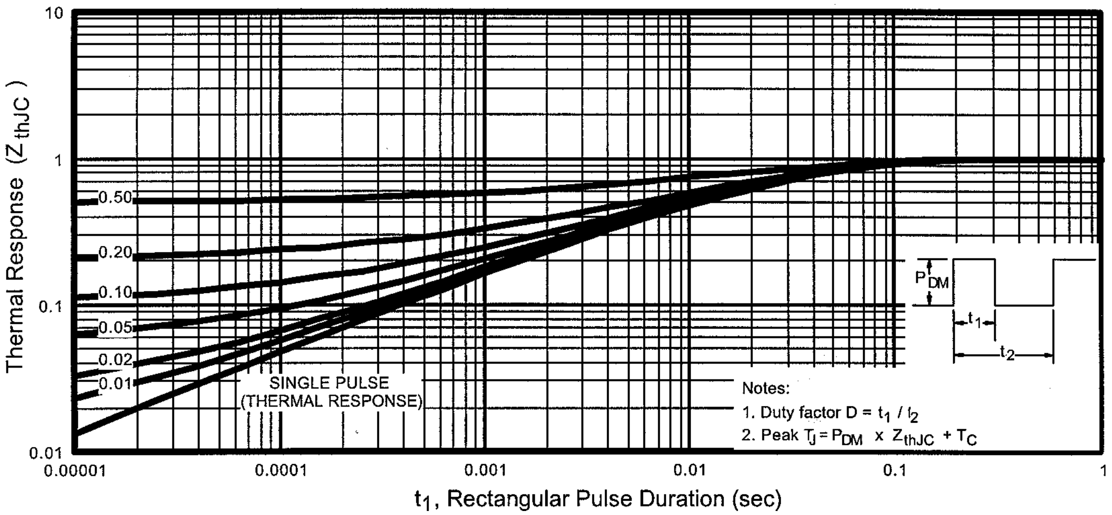


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

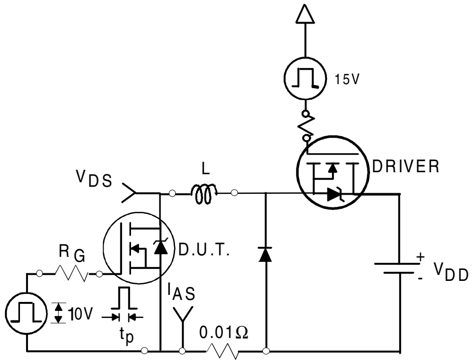


Fig 12a. Unclamped Inductive Test Circuit

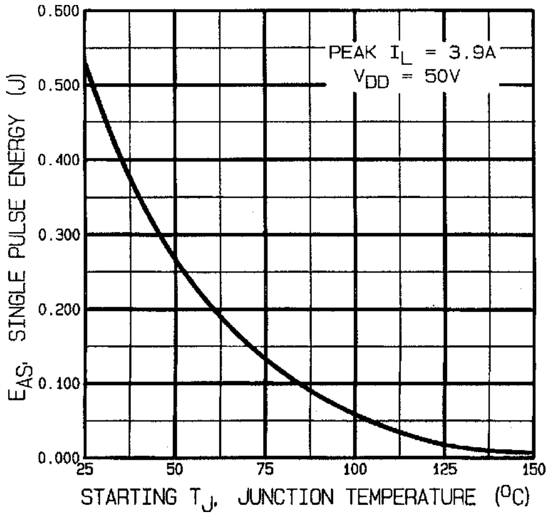


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

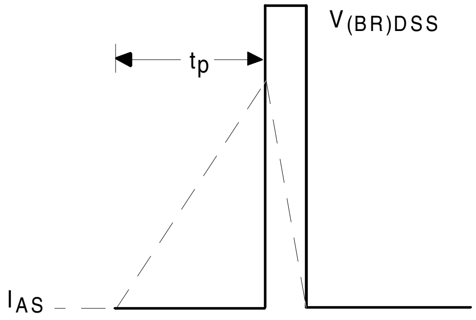


Fig 12b. Unclamped Inductive Waveforms

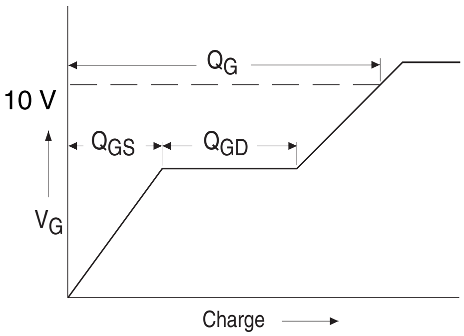


Fig 13a. Basic Gate Charge Waveform

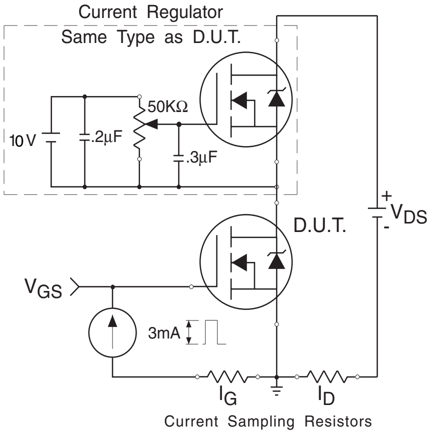
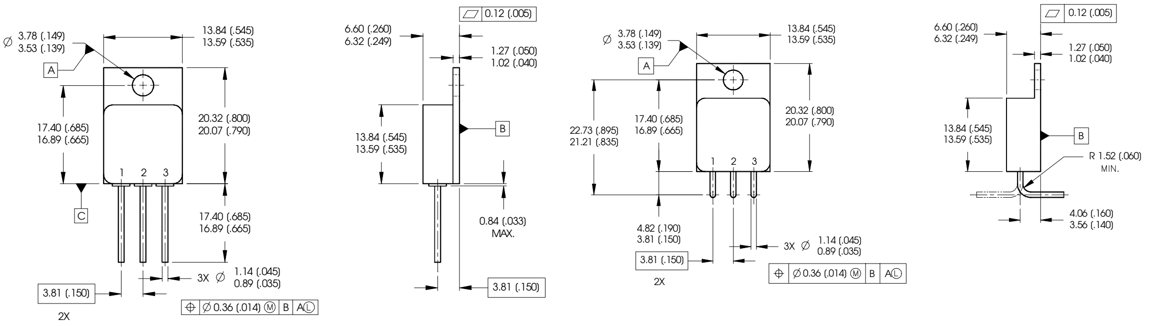


Fig 13b. Gate Charge Test Circuit

Footnotes:

① Repetitive Rating; Pulse width limited by maximum junction temperature.
② V_{DD} = 50V, starting T_J = 25°C, L= 69mH Peak I_L = 3.9A, V_{GS} = 10V
③ $I_{SD} \leq 3.9A$, di/dt ≤ 100A/µs, $V_{DD} \leq 1000V$, $T_J \leq 150°C$
④ Pulse width ≤ 300 µs; Duty Cycle ≤ 2%
⑤ Equipment limitation

Case Outline and Dimensions — TO-254AA



NOTES:
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE TO-254AA.

PIN ASSIGNMENTS
1 = DRAIN
2 = SOURCE
3 = GATE

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.

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