



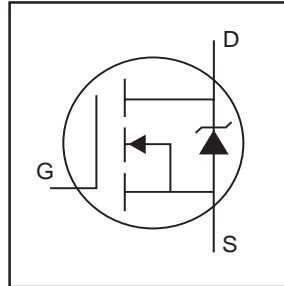
**THE DATASHEET OF
FA38SA50LC**



FA38SA50LC

HEXFET® Power MOSFET

- Fully Isolated Package
- Easy to Use and Parallel
- Low On-Resistance
- Dynamic dv/dt Rating
- Fully Avalanche Rated
- Simple Drive Requirements
- Low Drain to Case Capacitance
- Low Internal Inductance

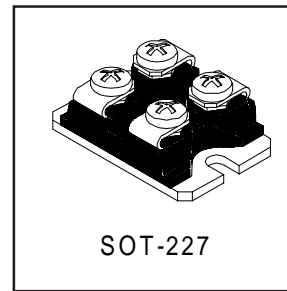


$V_{DSS} = 500V$
$R_{DS(on)} = 0.13\Omega$
$I_D = 38A$

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-227 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 500 watts. The low thermal resistance of the SOT-227 contribute to its wide acceptance throughout the industry.



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	38	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	24	
I_{DM}	Pulsed Drain Current ①	150	
$P_D @ T_C = 25^\circ C$	Power Dissipation	500	W
	Linear Derating Factor	4.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②	580	mJ
I_{AR}	Avalanche Current①	38	A
E_{AR}	Repetitive Avalanche Energy①	50	mJ
dv/dt	Peak Diode Recovery dv/dt ③	16	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2.5	kV
	Mounting torque, M4 screw	(1.3N•M)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.25	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.05	—	

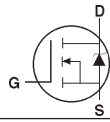
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Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	$V_{GS} = 0V, I_D = 1.0mA$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.66	—	$V/^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.13	Ω	$V_{GS} = 10V, I_D = 23A$ 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	22	—	—	S	$V_{DS} = 25V, I_D = 23A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	50	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	500		$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -20V$
Q_g	Total Gate Charge	—	280	420	nC	$I_D = 38A$
Q_{gs}	Gate-to-Source Charge	—	37	55		$V_{DS} = 400V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	150	220		$V_{GS} = 10V, \text{ See Fig. 6 and 13 } ④$
$t_{d(on)}$	Turn-On Delay Time	—	42	—	ns	$V_{DD} = 250V$
t_r	Rise Time	—	340	—		$I_D = 38A$
$t_{d(off)}$	Turn-Off Delay Time	—	200	—		$R_G = 10\Omega$ (Internal)
t_f	Fall Time	—	330	—		$R_D = 8\Omega, \text{ See Fig. 10 } ④$
L_s	Internal Source Inductance	—	5.0	—	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	—	6900	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1600	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	580	—		$f = 1.0MHz, \text{ See Fig. 5}$

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	38	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	150		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 38A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	830	1300	ns	$T_J = 25^\circ\text{C}, I_F = 38A$
Q_{rr}	Reverse Recovery Charge	—	15	22	μC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② Starting $T_J = 25^\circ\text{C}, L = 0.80mH$
 $R_G = 25\Omega, I_{AS} = 38A.$ (See Figure 12)
- ③ $I_{SD} \leq 38A, di/dt \leq 410A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.



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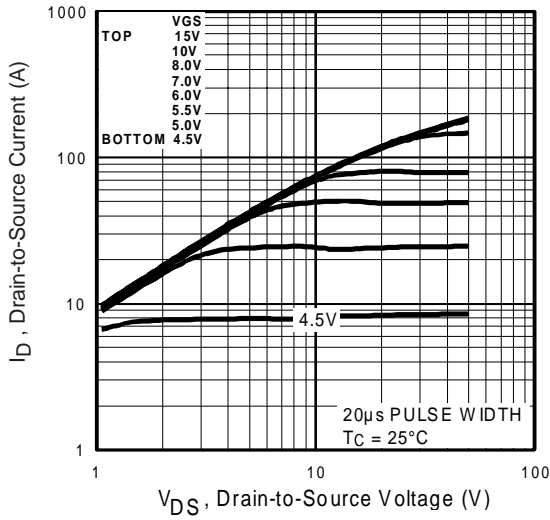


Fig 1. Typical Output Characteristics

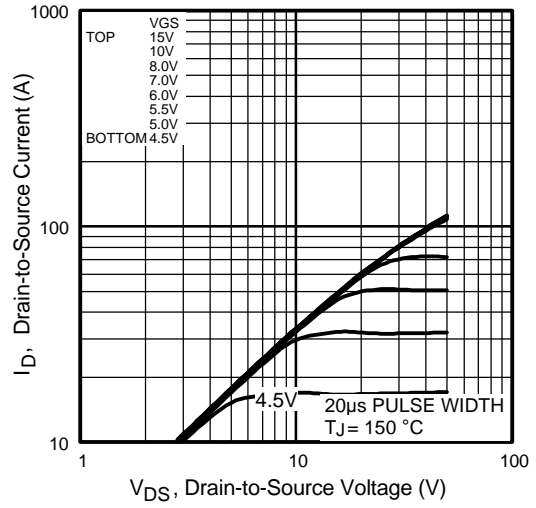


Fig 2. Typical Output Characteristics

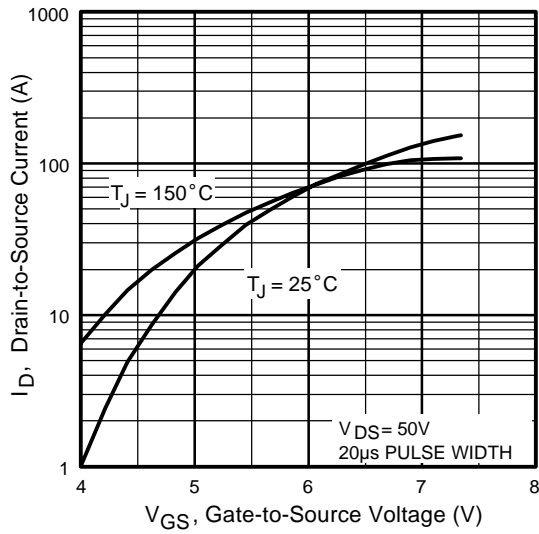


Fig 3. Typical Transfer Characteristics

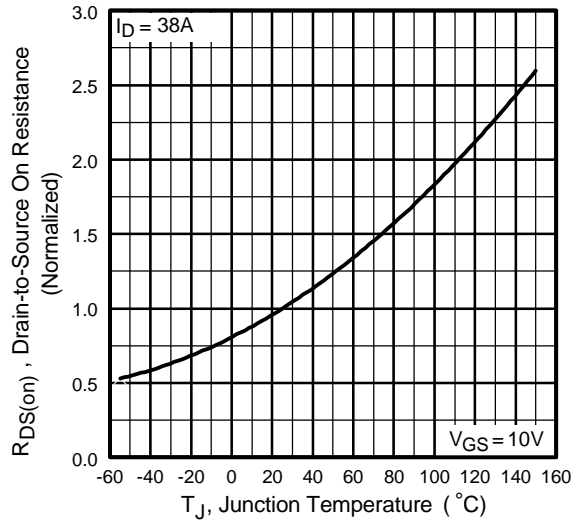


Fig 4. Normalized On-Resistance Vs. Temperature

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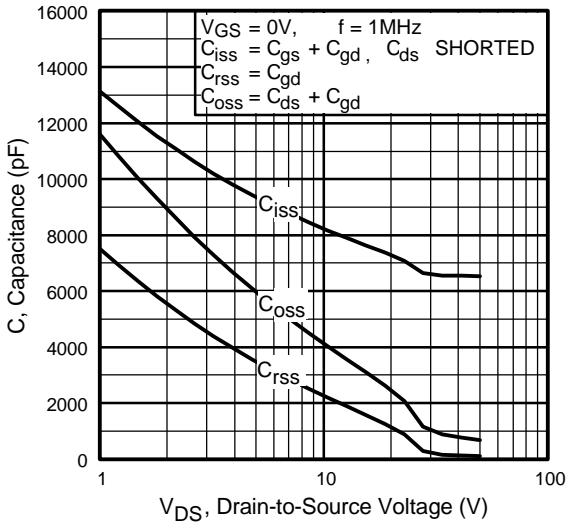


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

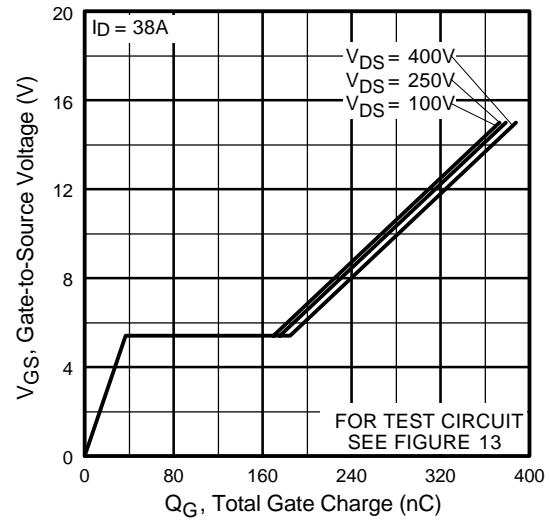


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

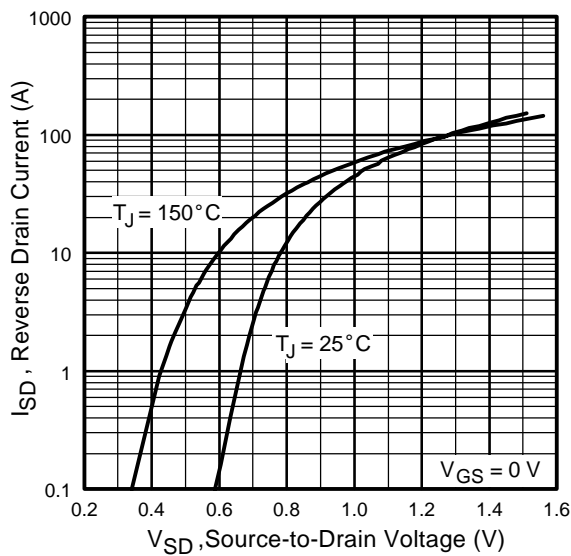


Fig 7. Typical Source-Drain Diode Forward Voltage

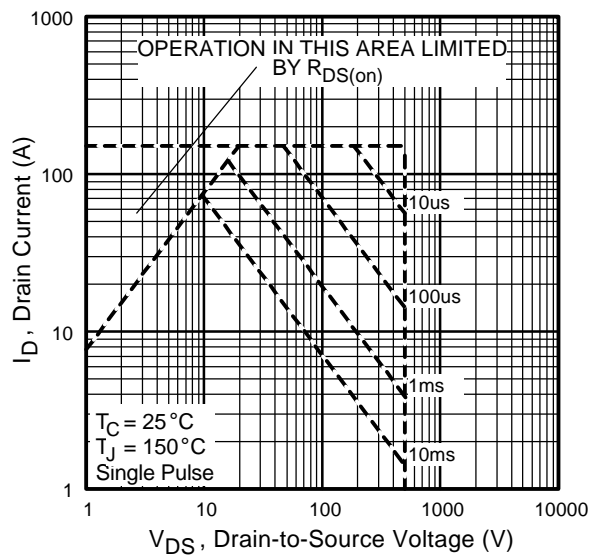


Fig 8. Maximum Safe Operating Area



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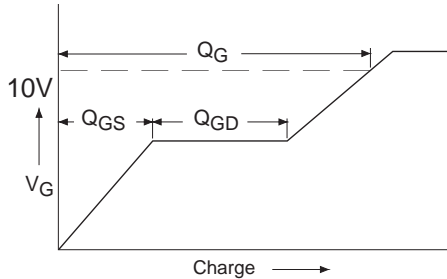


Fig 9a. Basic Gate Charge Waveform

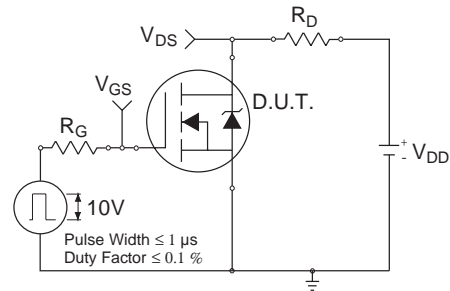


Fig 10a. Switching Time Test Circuit

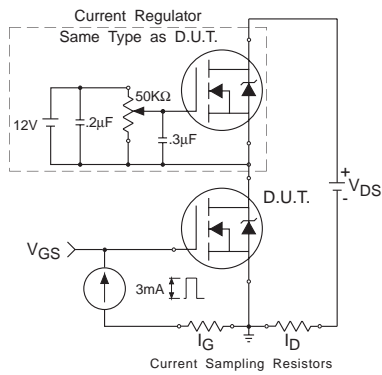


Fig 9b. Gate Charge Test Circuit

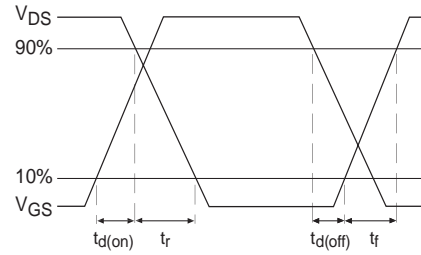


Fig 10b. Switching Time Waveforms

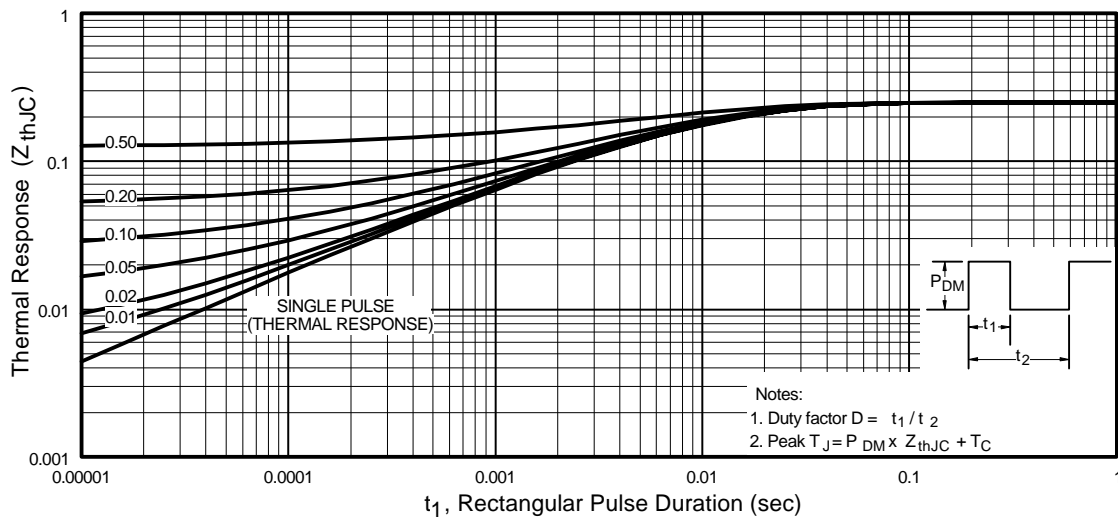


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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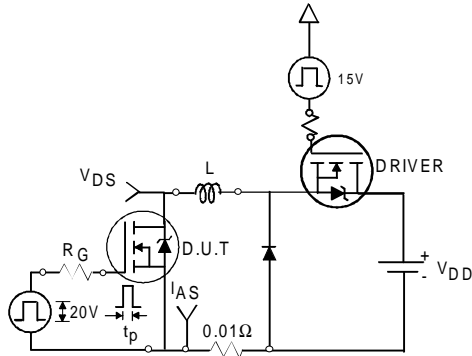


Fig 12a. Unclamped Inductive Test Circuit

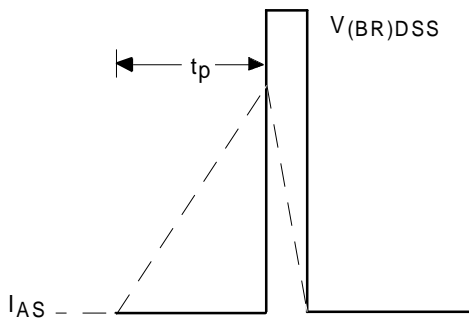


Fig 12b. Unclamped Inductive Waveforms

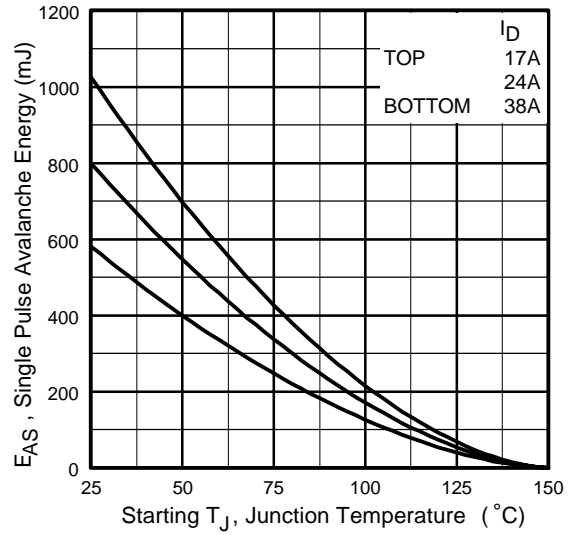
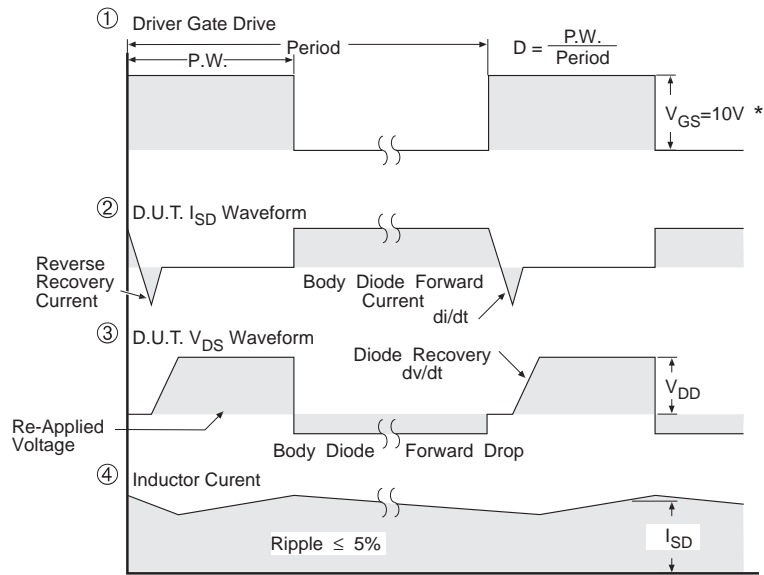
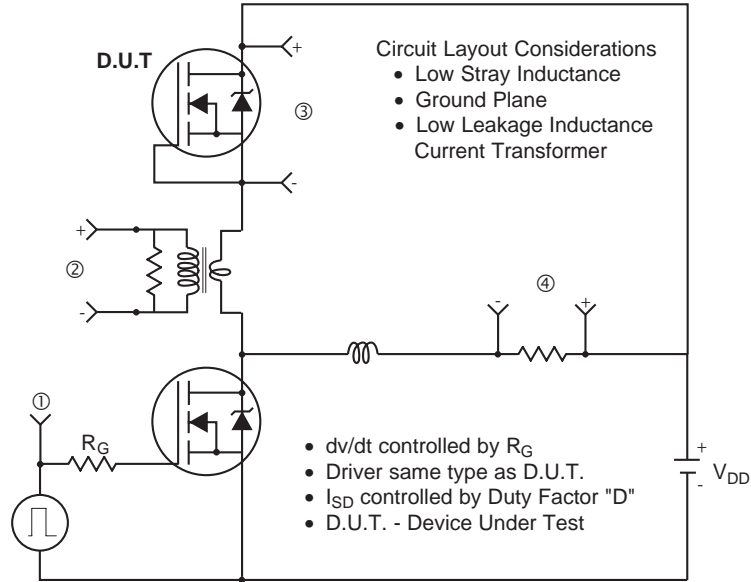


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

Peak Diode Recovery dv/dt Test Circuit



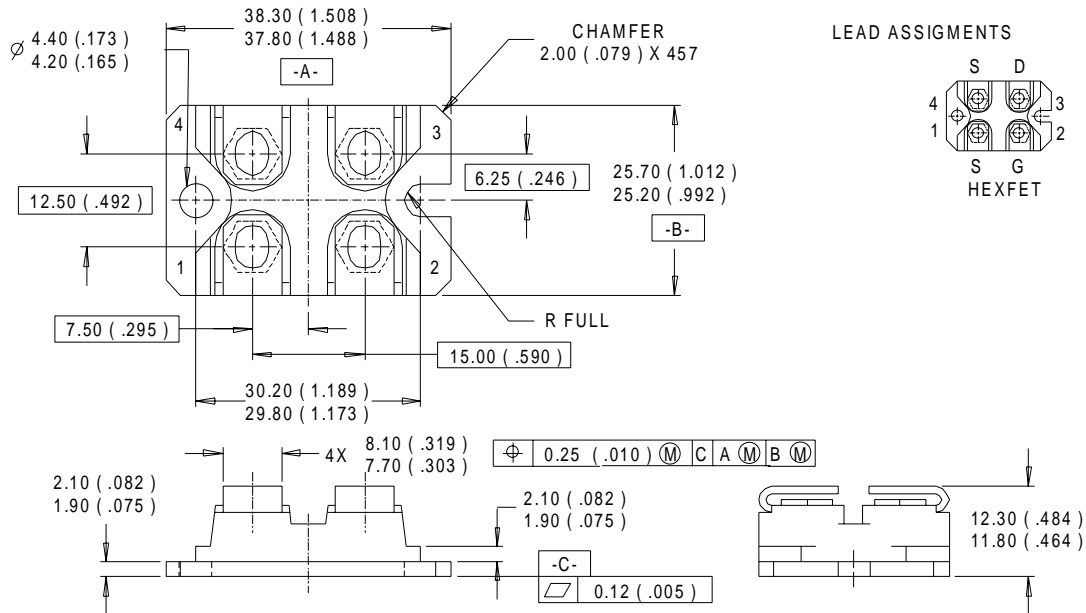
* $V_{GS} = 5V$ for Logic Level Devices

Fig 13. For N-Channel HEXFETS

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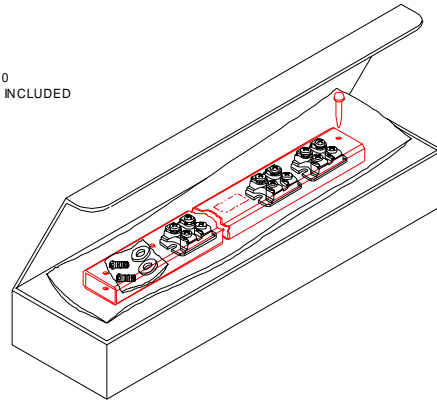


SOT-227 Package Details



Tube

QUANTITY PER TUBE IS 10
 M4 SREW AND WASHER INCLUDED



International
IOR Rectifier

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IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
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<http://www.irf.com/> Data and specifications subject to change without notice. 2/99

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