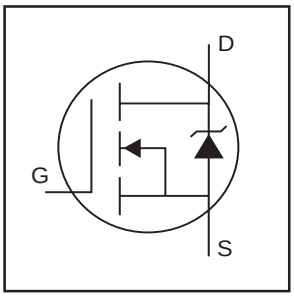
International
IOR Rectifier

PD - 91615B

# 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

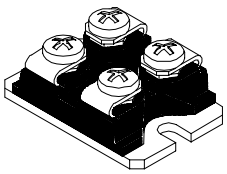
$R_{DS(on)}$ = 0.13Ω

$I_D$ = 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.



SOT-227

## Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---|---|---|---|
| $I_D$ @ $T_C$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 38 | A |
| $I_D$ @ $T_C$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V | 24 | |
| $I_{DM}$ | Pulsed Drain Current ① | 150 | |
| $P_D$ @$T_C$ = 25°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 |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | °C |
| $V_{ISO}$ | Insulation Withstand Voltage (AC-RMS) | 2.5 | kV |
| | Mounting torque, M4 srew | (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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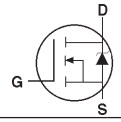
## Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| | 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/°C | Reference to 25°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 | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| $g_{fs}$ | 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°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, 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 | —— | | $R_G$ = 10Ω (Internal) |
| $t_f$ | Fall Time | —— | 330 | —— | | $R_D$ = 8Ω, 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, 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°C, $I_S$ = 38A, $V_{GS}$ = 0V ④ |
| $t_{rr}$ | Reverse Recovery Time | —— | 830 | 1300 | ns | $T_J$ = 25°C, $I_F$ = 38A |
| $Q_{rr}$ | Reverse RecoveryCharge | —— | 15 | 22 | µC | di/dt = 100A/µs 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°C, L = 0.80mH $R_G$ = 25Ω, $I_{AS}$ = 38A. (See Figure 12)

③ $I_{SD}$ ≤ 38A, di/dt ≤ 410A/µs, $V_{DD}$ ≤ $V_{(BR)DSS}$, $T_J$ ≤ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.



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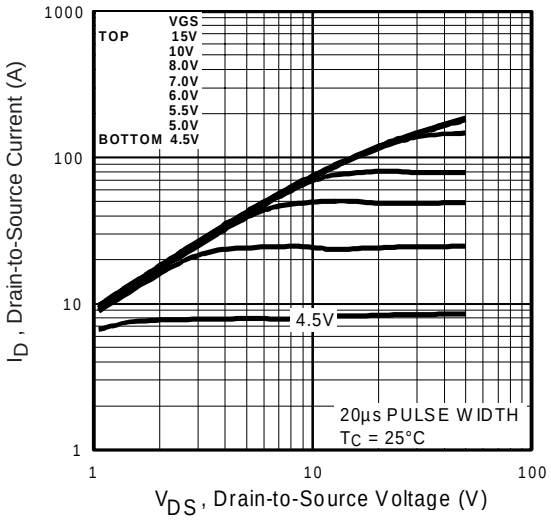


**Fig 1.** Typical Output Characteristics

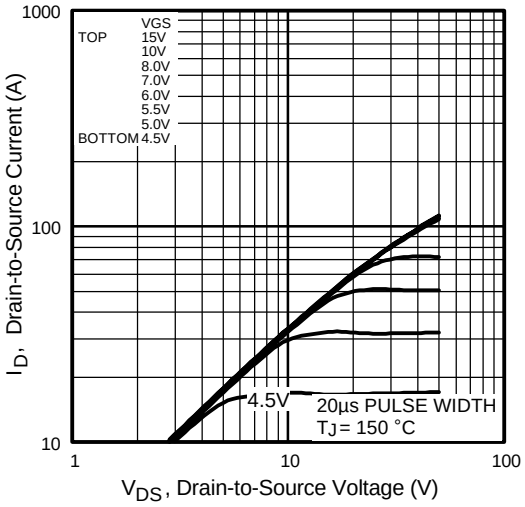


**Fig 2.** Typical Output Characteristics

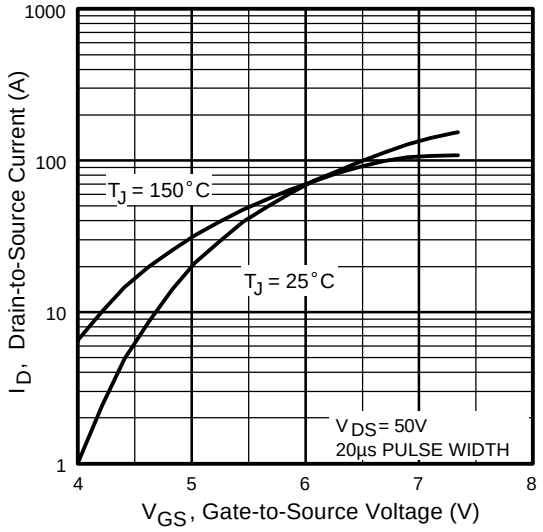


**Fig 3.** Typical Transfer Characteristics

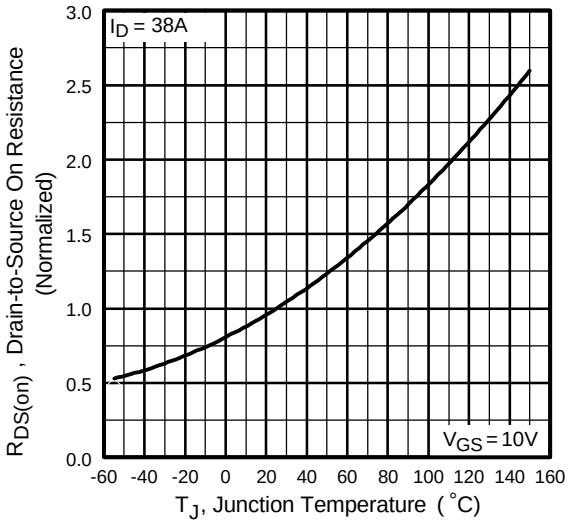


**Fig 4.** Normalized On-Resistance Vs. Temperature



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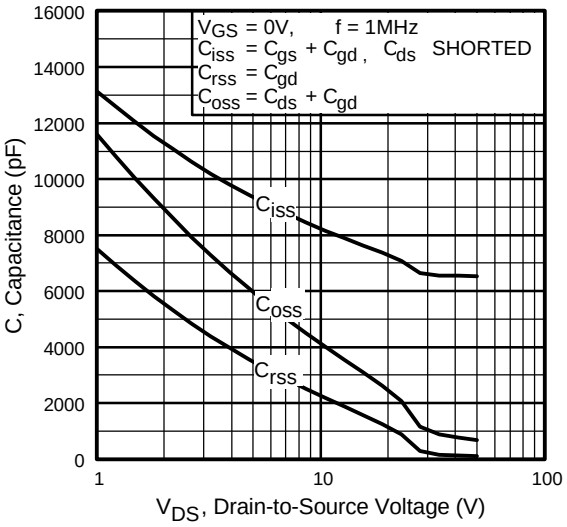


**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

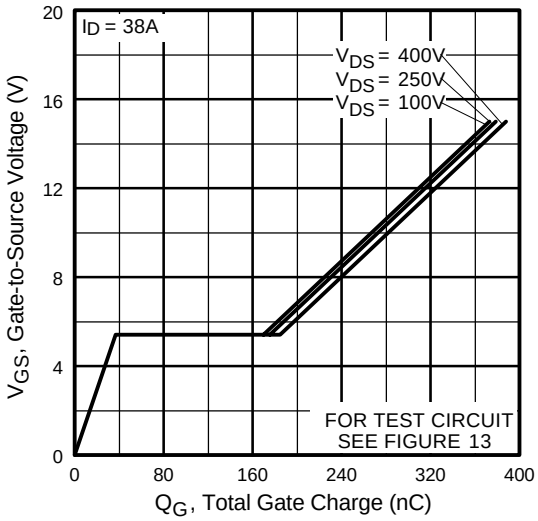


**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

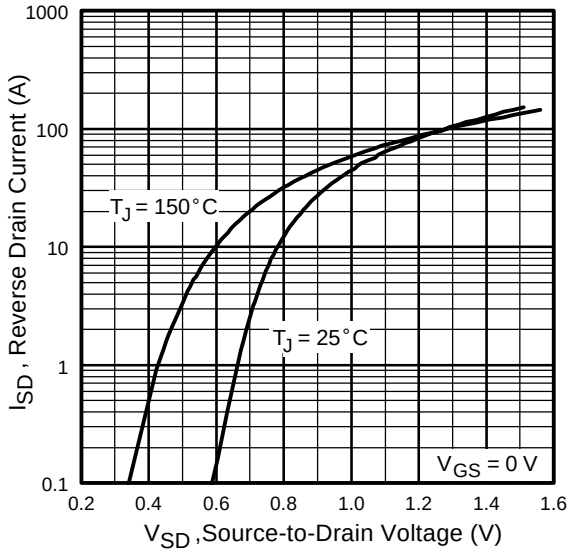


**Fig 7.** Typical Source-Drain Diode Forward Voltage

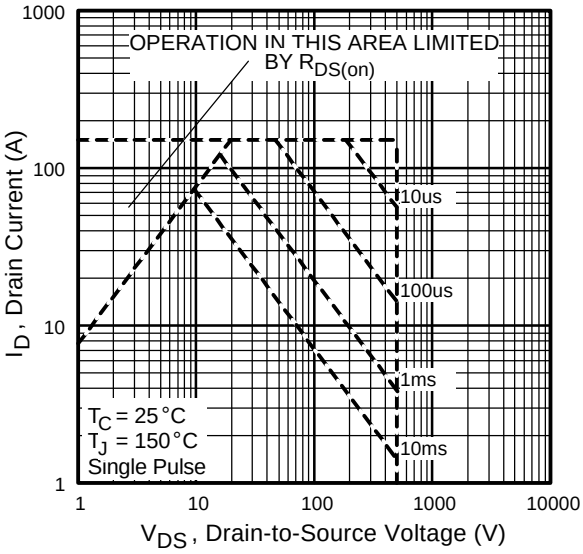


**Fig 8.** Maximum Safe Operating Area



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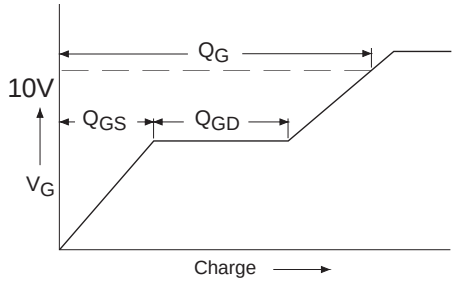


**Fig 9a.** Basic Gate Charge Waveform

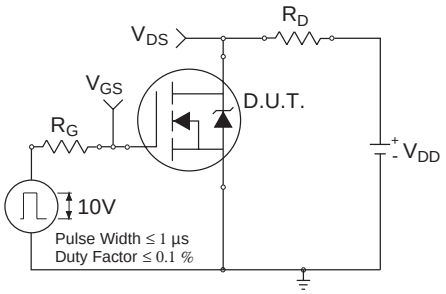


**Fig 10a.** Switching Time Test Circuit

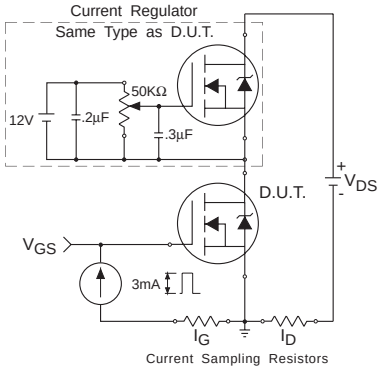


**Fig 9b.** Gate Charge Test Circuit

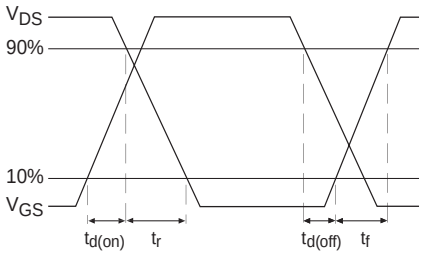


**Fig 10b.** Switching Time Waveforms

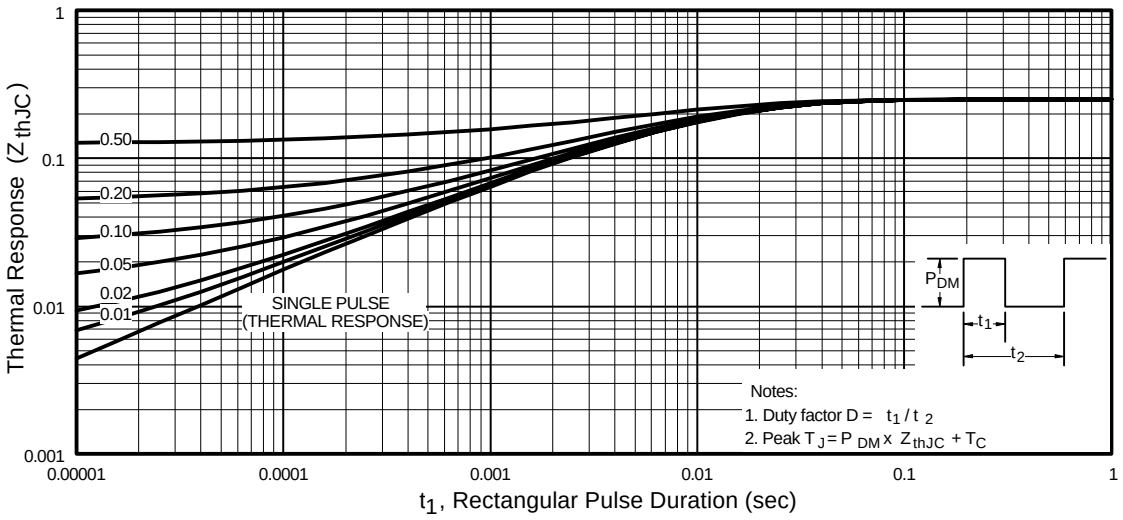


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



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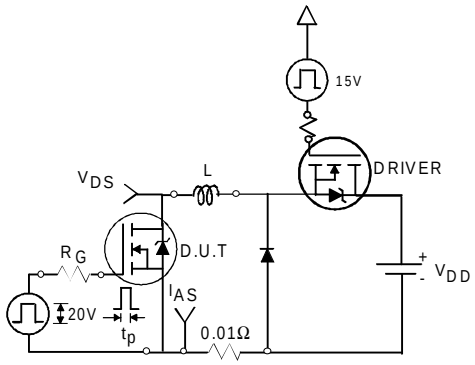


**Fig 12a.** Unclamped Inductive Test Circuit

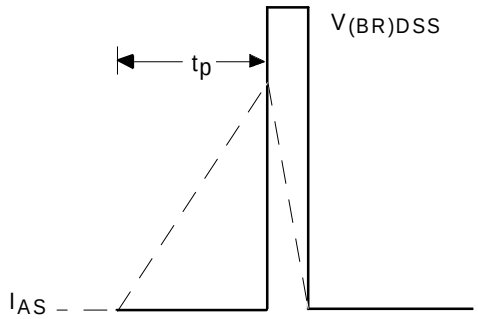


**Fig 12b.** Unclamped Inductive Waveforms

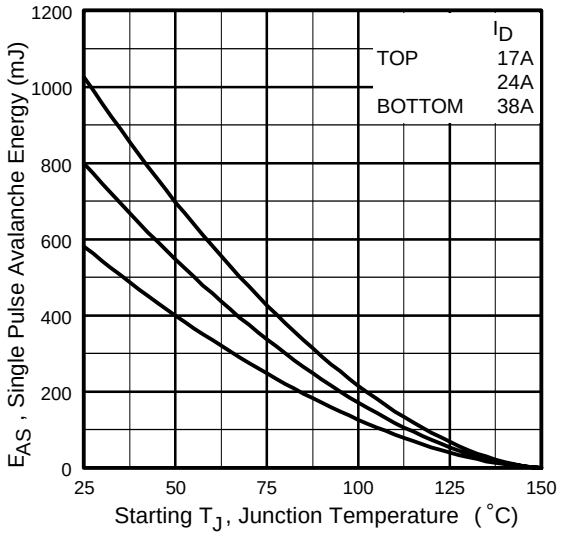


**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current



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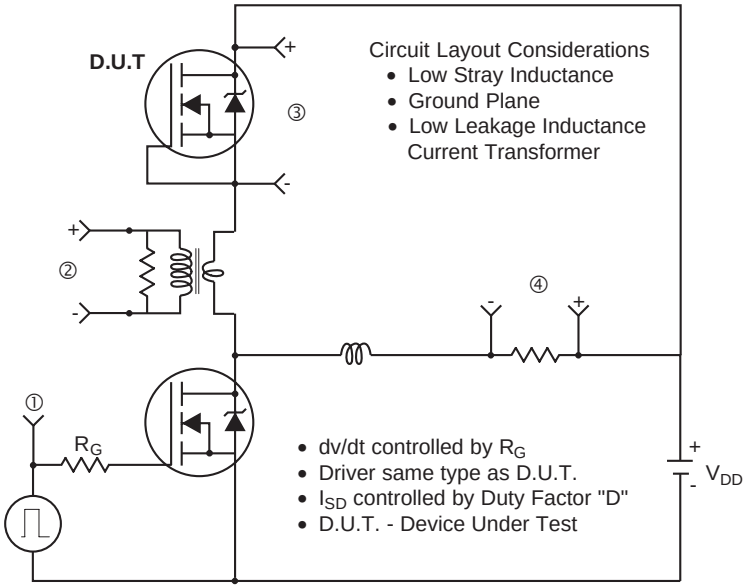
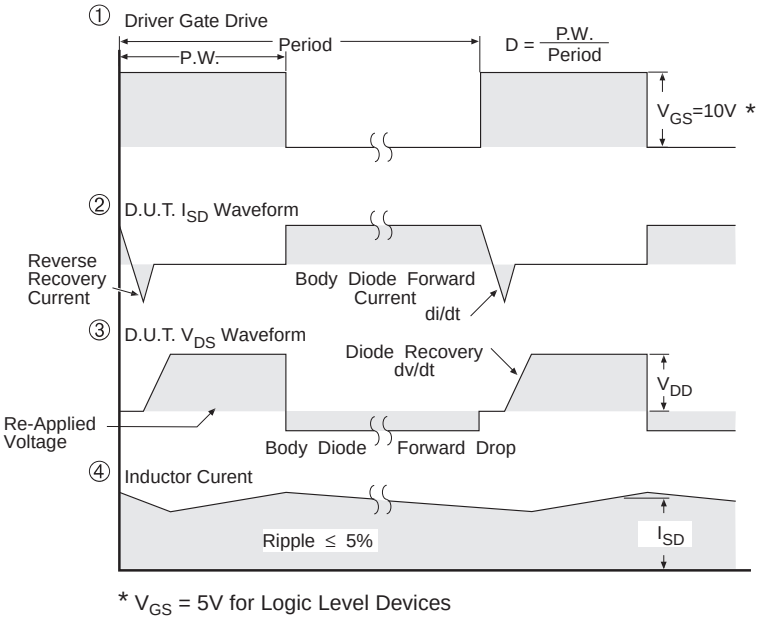
## Peak Diode Recovery dv/dt Test Circuit




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

**Fig 13.** For N-Channel HEXFETS



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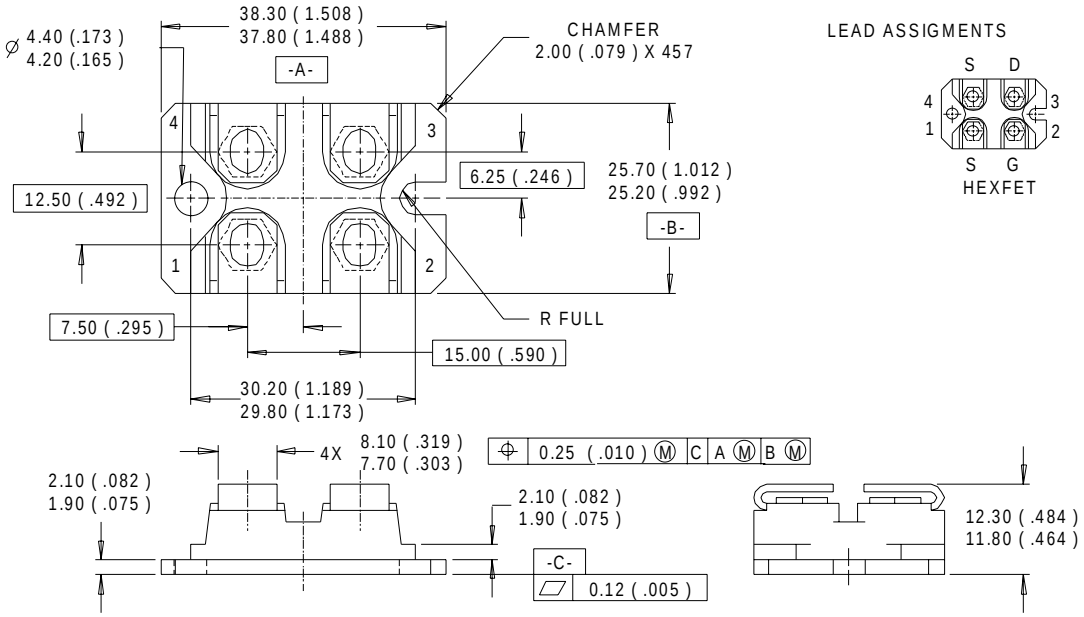
## SOT-227 Package Details

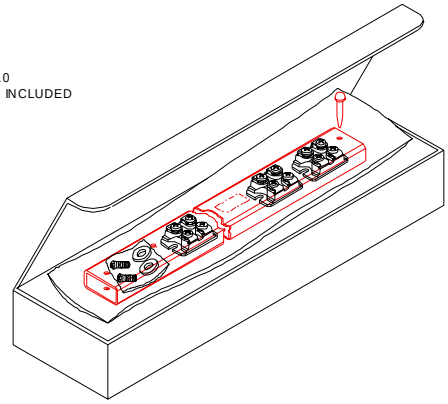



LEAD ASSIGMENTS




## Tube

QUANTITY PER TUBE IS 10
M4 SREW AND WASHER INCLUDED



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>>Vishay(威世)

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