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## FDD8447L\_F085

N-Channel PowerTrench® MOSFET

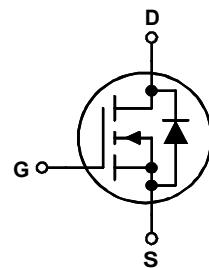
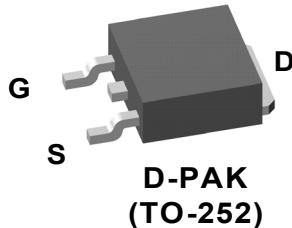
40V, 50A, 11.0mΩ

### Features

- Typ  $r_{DS(on)} = 7.0\text{m}\Omega$  at  $V_{GS} = 10\text{V}$ ,  $I_D = 14\text{A}$
- Typ  $r_{DS(on)} = 8.5\text{m}\Omega$  at  $V_{GS} = 4.5\text{V}$ ,  $I_D = 11\text{A}$
- Fast Switching
- Qualified to AEC Q101
- RoHS Compliant

### Applications

- Inverter
- Power Supplies
- Automotive Engine Control
- Power Train Management
- Solenoid and Motor Drivers
- Electronic Transmission
- Primary Switch for 12V and 24V Systems



## MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol            | Parameter   | Ratings      | Units                     |
|-------------------|---|--------------|---------------------------|
| $V_{DSS}$         | Drain to Source Voltage (Note 1)  | 40           | V                         |
| $V_{GS}$          | Gate to Source Voltage  | $\pm 20$     | V                         |
| $I_D$             | Drain Current Continuous ( $T_C < 80^\circ\text{C}$ , $V_{GS} = 10\text{V}$ ) | 50           | A                         |
|                   | Pulsed  | See Figure 4 |                           |
| $E_{AS}$          | Single Pulse Avalanche Energy (Note 2)  | 40           | $\text{mJ}$               |
| $P_D$             | Power Dissipation   | 65           | W                         |
|                   | Derate above $25^\circ\text{C}$   | 0.43         | $\text{W}/^\circ\text{C}$ |
| $T_J$ , $T_{STG}$ | Operating and Storage Temperature   | -55 to + 175 | $^\circ\text{C}$          |

## Thermal Characteristics

|                 |   |     |                           |
|-----------------|---|-----|---------------------------|
| $R_{\theta JC}$ | Maximum Thermal Resistance Junction to Case                                     | 2.3 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-252, 1in <sup>2</sup> copper pad area | 40  | $^\circ\text{C}/\text{W}$ |

## Package Marking and Ordering Information

| Device Marking | Device        | Package       | Reel Size | Tape Width | Quantity   |
|----------------|---------------|---------------|-----------|------------|------------|
| FDD8447L       | FDD8447L_F085 | D-PAK(TO-252) | 13"       | 12mm       | 2500 units |

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

### Off Characteristics

|            |                                   |  |    |   |           |               |
|------------|-----------------------------------|--|----|---|-----------|---------------|
| $B_{VDSS}$ | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$    | 40 | - | -         | V             |
| $I_{DSS}$  | Zero Gate Voltage Drain Current   | $V_{DS} = 32\text{V}$ , $V_{GS} = 0\text{V}$     | -  | - | 1         | $\mu\text{A}$ |
| $I_{GS}$   | Gate to Source Leakage Current    | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$ | -  | - | $\pm 100$ | nA            |

### On Characteristics

|              |                                  |  |     |      |      |                  |
|--------------|----------------------------------|--|-----|------|------|------------------|
| $V_{GS(th)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$                             | 1.0 | 1.9  | 3.0  | V                |
| $r_{DS(on)}$ | Drain to Source On Resistance    | $I_D = 14\text{A}$ , $V_{GS} = 10\text{V}$                             | -   | 7.0  | 8.5  | $\text{m}\Omega$ |
|              |                                  | $I_D = 11\text{A}$ , $V_{GS} = 4.5\text{V}$                            | -   | 8.5  | 11.0 |                  |
|              |                                  | $I_D = 14\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 125^\circ\text{C}$ | -   | 10.4 | 14.0 |                  |
|              |                                  | $I_D = 14\text{A}$ , $V_{DS} = 5\text{V}$                              | -   | 58   | -    |                  |
| $g_{FS}$     | Forward Transconductance         |  |     |      |      | S                |

### Dynamic Characteristics

|              |                               |   |                              |   |    |          |
|--------------|-------------------------------|---|------------------------------|---|----|----------|
| $C_{iss}$    | Input Capacitance             | $V_{DS} = 20\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ | -                            | 1970  | -  | pF       |
| $C_{oss}$    | Output Capacitance            |   | -                            | 250   | -  | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |   | -                            | 150   | -  | pF       |
| $R_g$        | Gate Resistance               | $f = 1\text{MHz}$   | -                            | 1.27  | -  | $\Omega$ |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V      |   | $V_{GS} = 0$ to $10\text{V}$ | -   | 37 | nC       |
| $Q_{g(5)}$   | Total Gate Charge at 5V       |   | $V_{GS} = 0$ to $5\text{V}$  | $V_{DD} = 20\text{V}$<br>$I_D = 14\text{A}$ | 20 | nC       |
| $Q_{gs}$     | Gate to Source Gate Charge    |   |                              | $V_{GS} = 10\text{V}$                       | -  | nC       |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |   |                              | -   | 7  | nC       |

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Switching Characteristics**

|              |                     |   |   |    |    |    |
|--------------|---------------------|---|---|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 20\text{ V}$ , $I_D = 1\text{ A}$ ,<br>$V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\Omega$ | - | 12 | 21 | ns |
| $t_r$        | Rise Time           |   | - | 12 | 21 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |   | - | 38 | 61 | ns |
| $t_f$        | Fall Time           |   | - | 9  | 18 | ns |

**Drain-Source Diode Characteristics**

|          |                               |   |   |     |     |    |
|----------|-------------------------------|---|---|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD} = 14\text{A}$                                       | - | 0.8 | 1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time         | $I_F = 14\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | 22  | 29  | ns |
| $Q_{rr}$ | Reverse Recovery Charge       |   | - | 11  | 14  | nC |

## Notes:

- 1: Starting  $T_J = 25^\circ\text{C}$  to  $175^\circ\text{C}$ .
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.05\text{mH}$ ,  $I_{AS} = 40\text{A}$

This product has been designed to meet the extreme test conditions and environment demanded by the automotive industry. For a copy of the requirements, see AEC Q101 at: <http://www.aecouncil.com/>  
All Fairchild Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

## Typical Characteristics

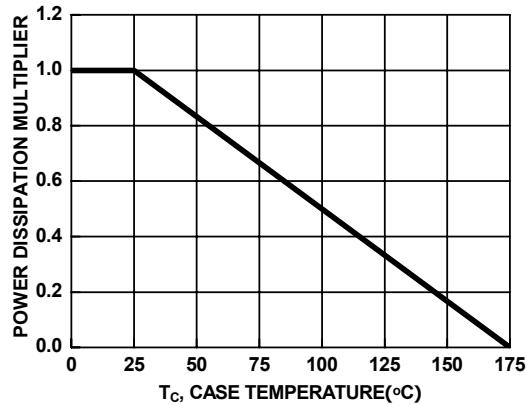


Figure 1. Normalized Power Dissipation vs Case Temperature

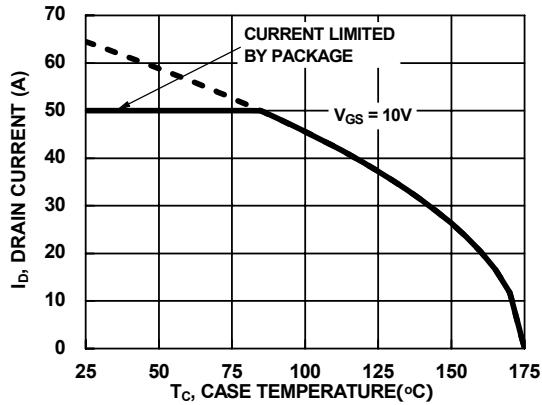


Figure 2. Maximum Continuous Drain Current vs Case Temperature

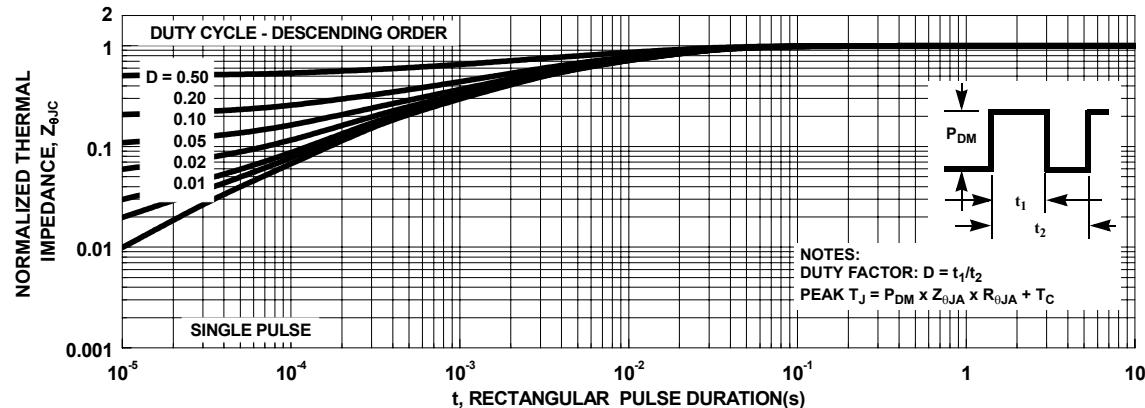


Figure 3. Normalized Maximum Transient Thermal Impedance

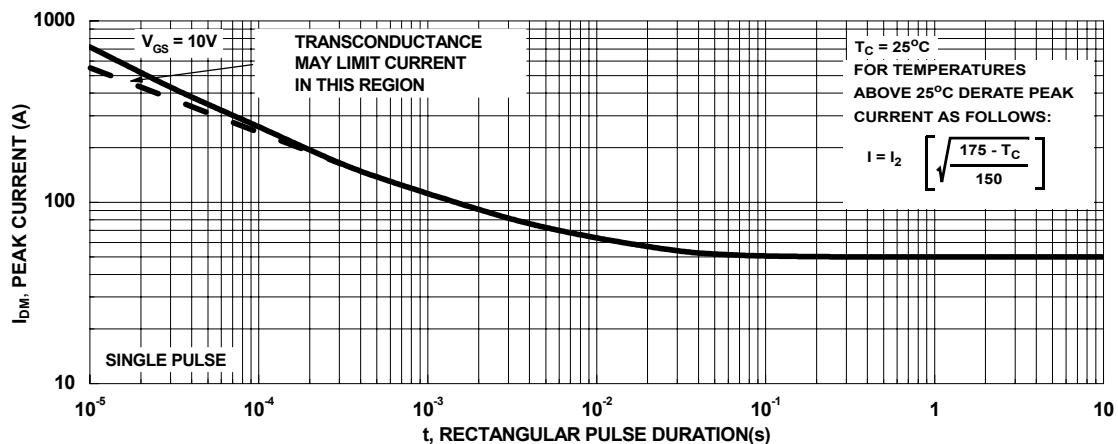


Figure 4. Peak Current Capability

## Typical Characteristics

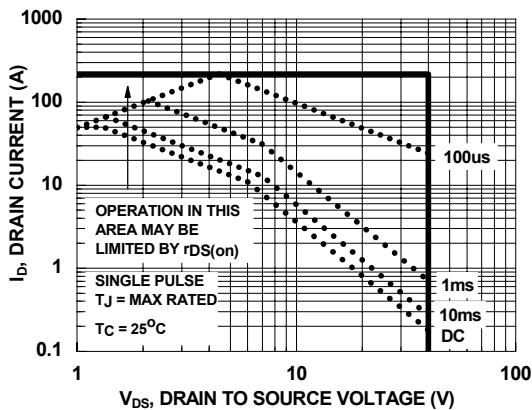
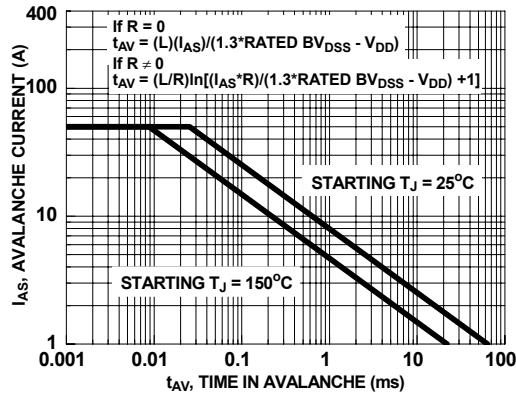


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

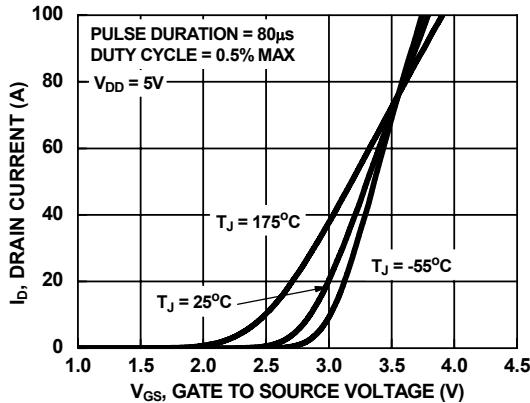


Figure 7. Transfer Characteristics

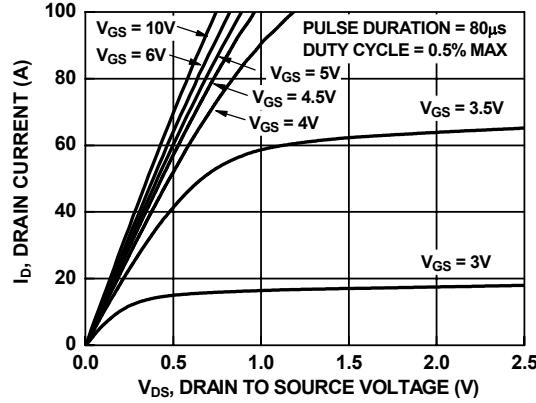


Figure 8. Saturation Characteristics

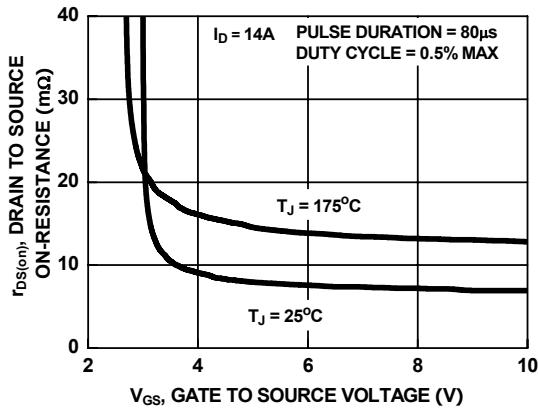


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

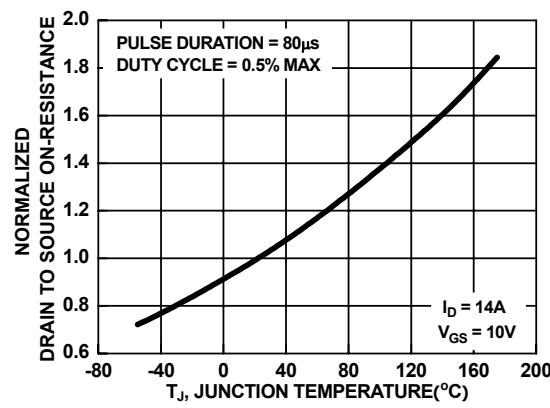


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

## Typical Characteristics

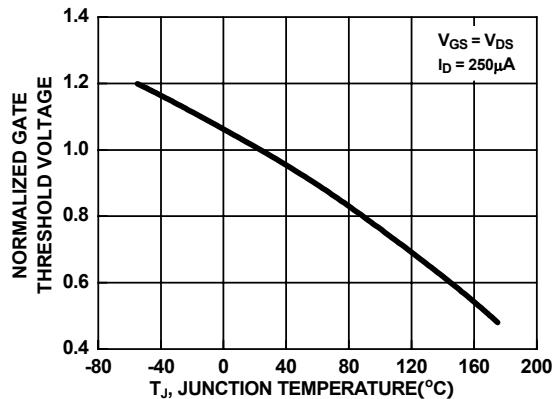


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

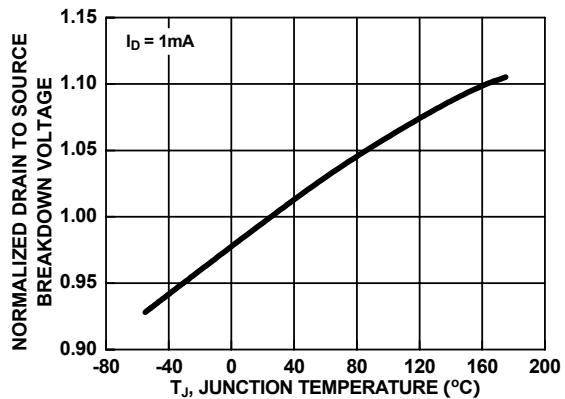


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

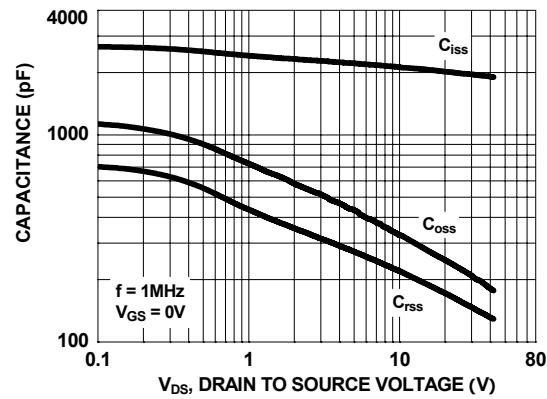


Figure 13. Capacitance vs Drain to Source Voltage

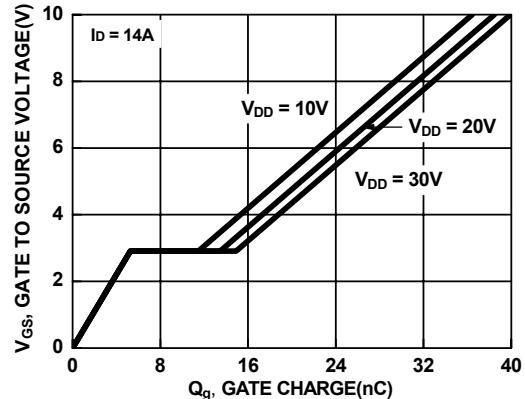
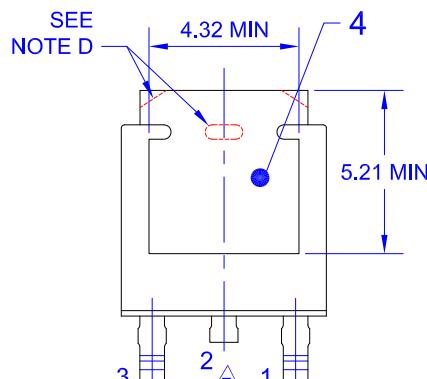
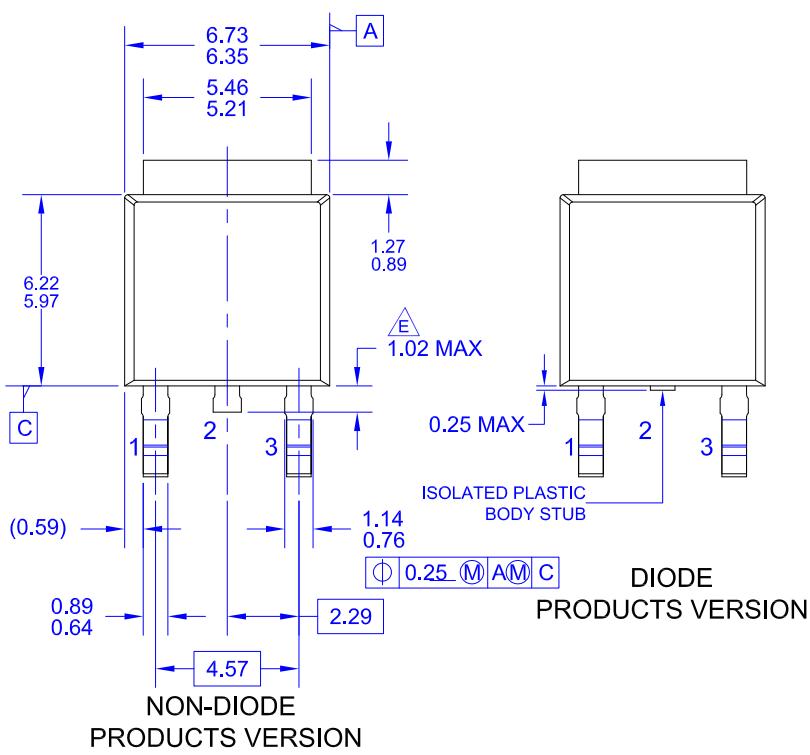
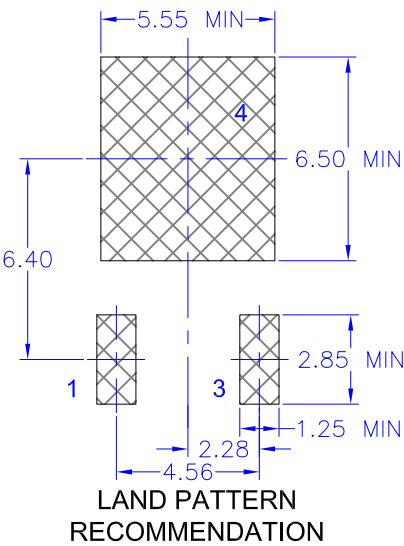


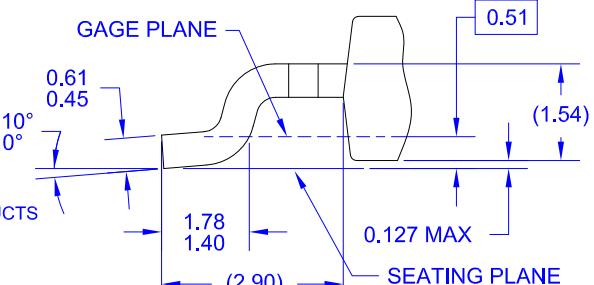
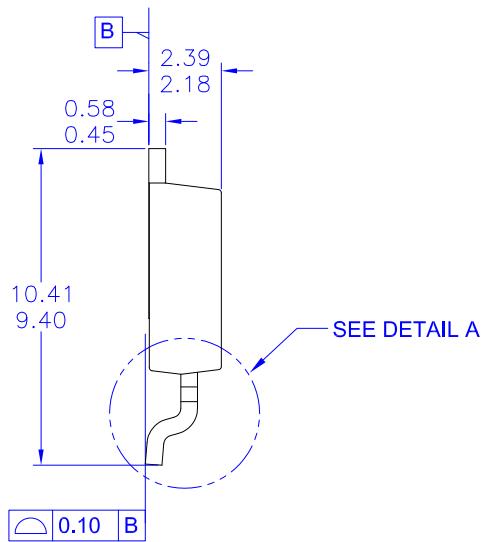
Figure 14. Gate Charge vs Gate to Source Voltage



NON-DIODE  
PRODUCTS VERSION



LAND PATTERN  
RECOMMENDATION



DETAIL A  
(ROTATED -90°)  
SCALE: 12X

NOTES: UNLESS OTHERWISE SPECIFIED  
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252,  
ISSUE C, VARIATION AA.

B) ALL DIMENSIONS ARE IN MILLIMETERS.  
C) DIMENSIONING AND TOLERANCING PER

ASME Y14.5M-2009.

D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED  
CORNERS OR EDGE PROTRUSION.

E) TRIMMED METAL CENTER LEAD IS PRESENT ON FOR NON-DIODE PRODUCTS

F) DIMENSIONS ARE EXCLUSIVE OF BURS,  
MOLD FLASH AND TIE BAR EXTRUSIONS.

G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD  
TO228P991X239-3N.

H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV11

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