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# FDMS86255ET150

## N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

150 V, 63 A, 12.4 mΩ

### Features

- Extended T<sub>J</sub> rating to 175°C
- Shielded Gate MOSFET Technology
- Max r<sub>DS(on)</sub> = 12.4 mΩ at V<sub>GS</sub> = 10 V, I<sub>D</sub> = 10 A
- Max r<sub>DS(on)</sub> = 15.5 mΩ at V<sub>GS</sub> = 6 V, I<sub>D</sub> = 8 A
- Advanced Package and Silicon combination for low r<sub>DS(on)</sub> and high efficiency
- Next generation enhanced body diode technology, engineered for soft recovery
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

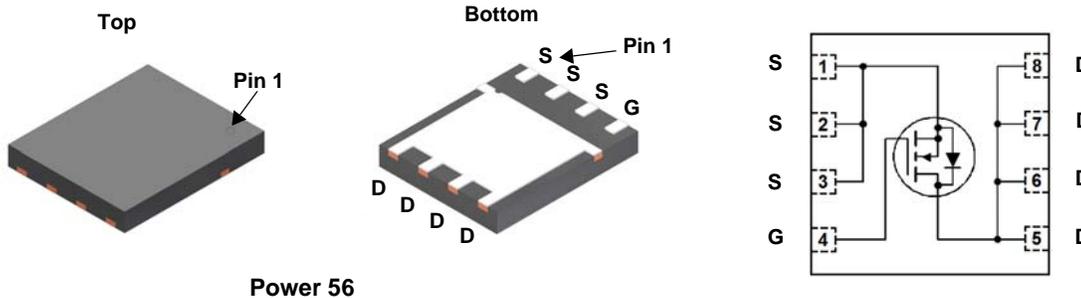


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

### Applications

- OringFET / Load Switching
- Synchronous rectification
- DC-DC Conversion



Power 56

### MOSFET Maximum Ratings T<sub>A</sub> = 25 °C unless otherwise noted

| Symbol                            | Parameter  | Rated                            | Units  |
|-----------------------------------|--|----------------------------------|--------|
| V <sub>DS</sub>                   | Drain to Source Voltage                          | 150                              | V      |
| V <sub>GS</sub>                   | Gate to Source Voltage                           | ±20                              | V      |
| I <sub>D</sub>                    | Drain Current -Continuous                        | T <sub>C</sub> = 25 °C (Note 5)  | 63     |
|                                   | -Continuous                                      | T <sub>C</sub> = 100°C (Note 5)  | 44     |
|                                   | -Continuous                                      | T <sub>A</sub> = 25 °C (Note 1a) | 10     |
|                                   | -Pulsed  | (Note 4)                         | 276    |
| E <sub>AS</sub>                   | Single Pulse Avalanche Energy                    | (Note 3)                         | 541 mJ |
| P <sub>D</sub>                    | Power Dissipation                                | T <sub>C</sub> = 25 °C           | 136    |
|                                   | Power Dissipation                                | T <sub>A</sub> = 25 °C (Note 1a) | 3.3    |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Junction Temperature Range | -55 to +175                      | °C     |

### Thermal Characteristics

|                  |   |     |      |
|------------------|---|-----|------|
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case              | 1.1 | °C/W |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 1a) | 45  |      |

### Package Marking and Ordering Information

| Device Marking | Device         | Package  | Reel Size | Tape Width | Quantity   |
|----------------|----------------|----------|-----------|------------|------------|
| FDMS86255ET    | FDMS86255ET150 | Power 56 | 13 "      | 12 mm      | 3000 units |

FDMS86255ET150 N-Channel Shielded Gate PowerTrench<sup>®</sup> MOSFET

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

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

### Off Characteristics

|                                      |   |   |     |     |           |                      |
|--------------------------------------|---|---|-----|-----|-----------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$              | 150 |     |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | 109 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = 120\ \text{V}, V_{GS} = 0\ \text{V}$              |     |     | 1         | $\mu\text{A}$        |
| $I_{GSS}$                            | 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                         | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$                            | 2.0 | 3.0  | 4.0  | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$          |     | -11  |      | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = 10\ \text{V}, I_D = 10\ \text{A}$                          |     | 9.5  | 12.4 | m $\Omega$           |
|  |  | $V_{GS} = 6\ \text{V}, I_D = 8\ \text{A}$                            |     | 11.5 | 15.5 |                      |
|  |  | $V_{GS} = 10\ \text{V}, I_D = 10\ \text{A}, T_J = 125^\circ\text{C}$ |     | 19   | 25   |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = 5\ \text{V}, I_D = 10\ \text{A}$                           |     | 35   |      | S                    |

### Dynamic Characteristics

|           |                              |   |     |      |      |          |
|-----------|------------------------------|---|-----|------|------|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 75\ \text{V}, V_{GS} = 0\ \text{V},$<br>$f = 1\ \text{MHz}$ |     | 3200 | 4480 | pF       |
| $C_{oss}$ | Output Capacitance           |   |     | 291  | 410  | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |   |     | 11   | 20   | pF       |
| $R_g$     | Gate Resistance              |   | 0.1 | 0.7  | 2.1  | $\Omega$ |

### Switching Characteristics

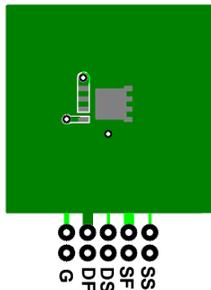
|              |                               |  |   |     |    |    |    |
|--------------|-------------------------------|--|---|-----|----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = 75\ \text{V}, I_D = 10\ \text{A},$<br>$V_{GS} = 10\ \text{V}, R_{GEN} = 6\ \Omega$ |   | 21  | 34 | ns |    |
| $t_r$        | Rise Time                     |  |   | 4.5 | 10 | ns |    |
| $t_{d(off)}$ | Turn-Off Delay Time           |  |   | 28  | 45 | ns |    |
| $t_f$        | Fall Time                     |  |   | 6.2 | 12 | ns |    |
| $Q_g$        | Total Gate Charge             |  | $V_{GS} = 0\ \text{V to } 10\ \text{V}$ |     | 45 | 63 | nC |
| $Q_g$        | Total Gate Charge             |  | $V_{GS} = 0\ \text{V to } 6\ \text{V}$  |     | 29 | 41 | nC |
| $Q_{gs}$     | Gate to Source Charge         | $V_{DD} = 75\ \text{V},$<br>$I_D = 10\ \text{A}$   |   | 14  |    | nC |    |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |  |   | 8.8 |    | nC |    |

### Drain-Source Diode Characteristics

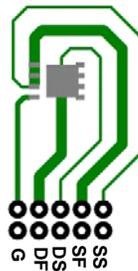
|          |                                       |   |  |     |     |    |
|----------|---------------------------------------|---|--|-----|-----|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\ \text{V}, I_S = 1.9\ \text{A}$ (Note 2)    |  | 0.7 | 1.2 | V  |
|          |                                       | $V_{GS} = 0\ \text{V}, I_S = 10\ \text{A}$ (Note 2)     |  | 0.8 | 1.3 |    |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = 10\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$ |  | 87  | 139 | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |   |  | 165 | 264 | nC |

#### Notes:

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta CA}$  is determined by the user's board design.



a.  $45^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b.  $115^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

3.  $E_{AS}$  of 541 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\ \text{mH}$ ,  $I_{AS} = 19\ \text{A}$ ,  $V_{DD} = 150\ \text{V}$ ,  $V_{GS} = 10\ \text{V}$ . 100% tested at  $L = 0.1\ \text{mH}$ ,  $I_{AS} = 60\ \text{A}$ .

4. Pulse  $I_D$  please refer to Fig.11 SOA curve for detail.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted

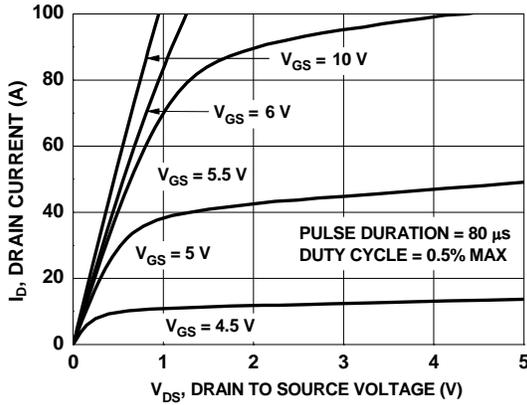


Figure 1. On-Region Characteristics

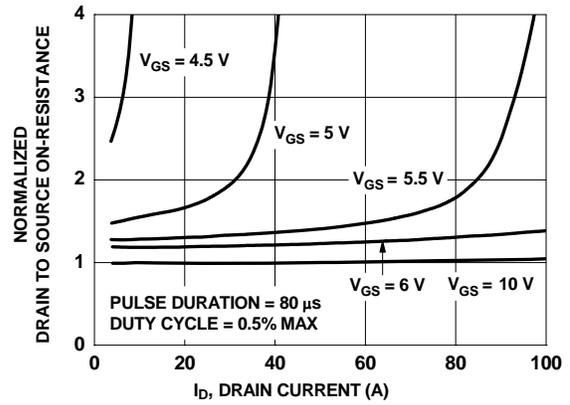


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

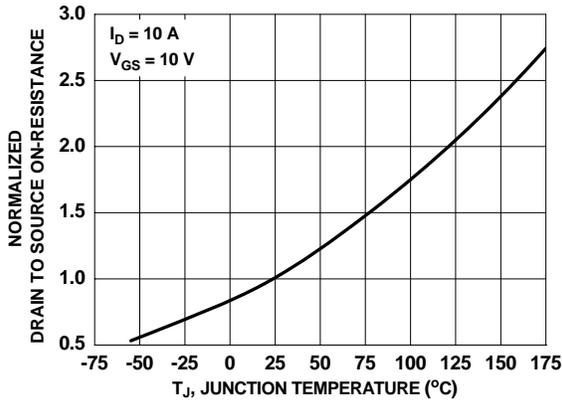


Figure 3. Normalized On-Resistance vs Junction Temperature

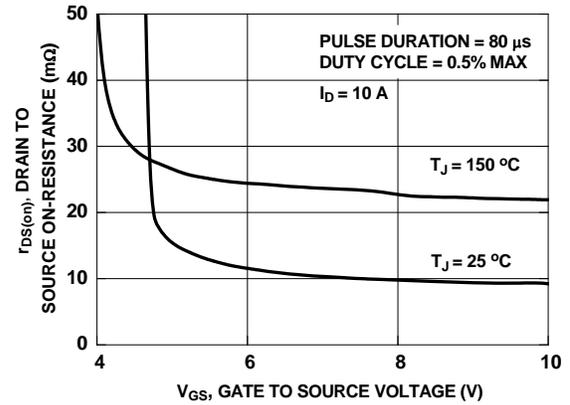


Figure 4. On-Resistance vs Gate to Source Voltage

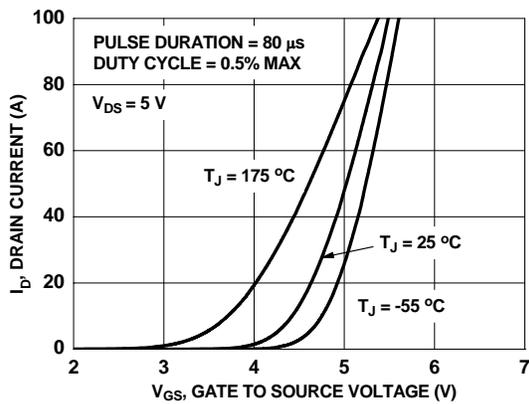


Figure 5. Transfer Characteristics

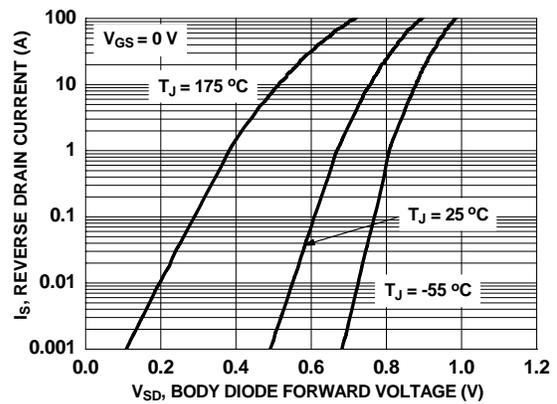
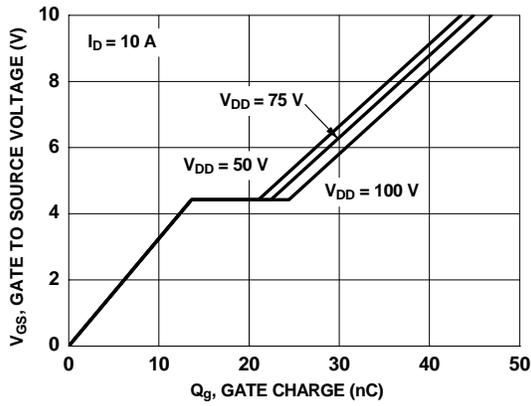
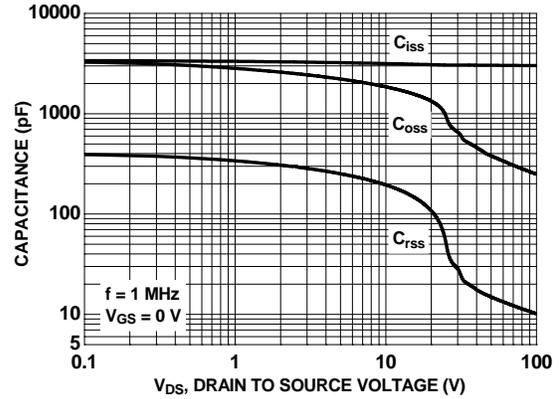


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

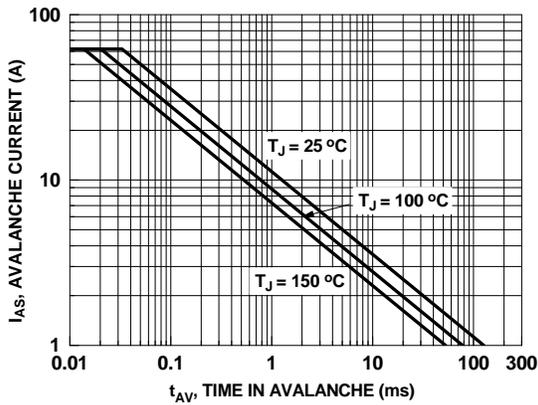
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



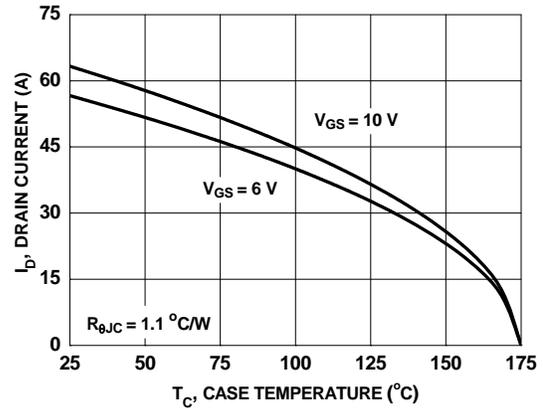
**Figure 7. Gate Charge Characteristics**



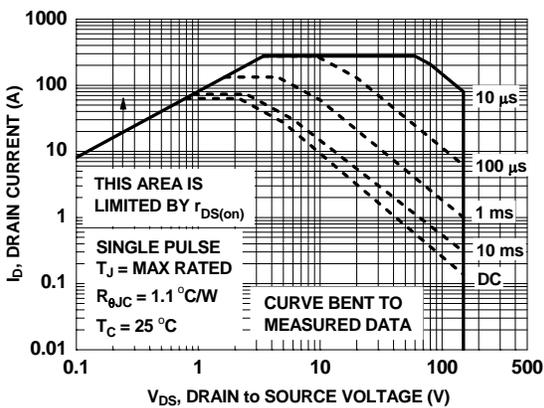
**Figure 8. Capacitance vs Drain to Source Voltage**



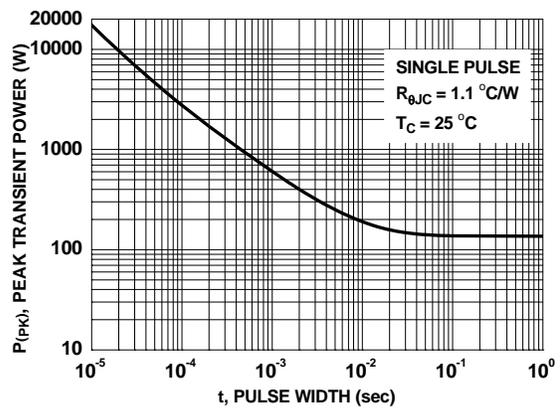
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

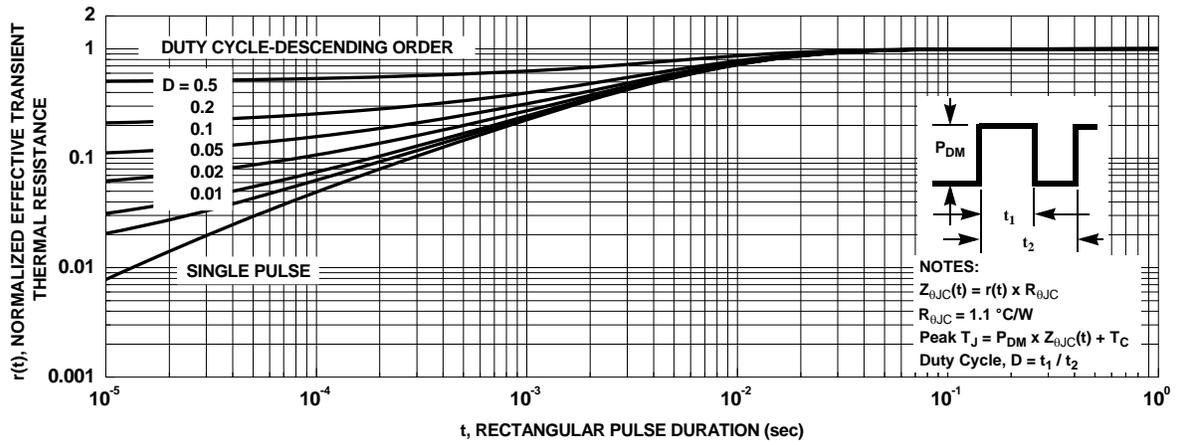


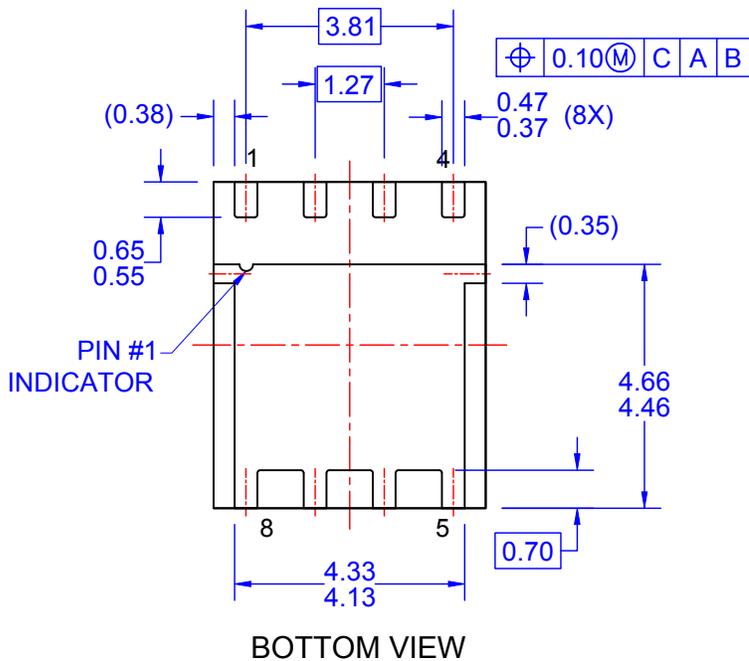
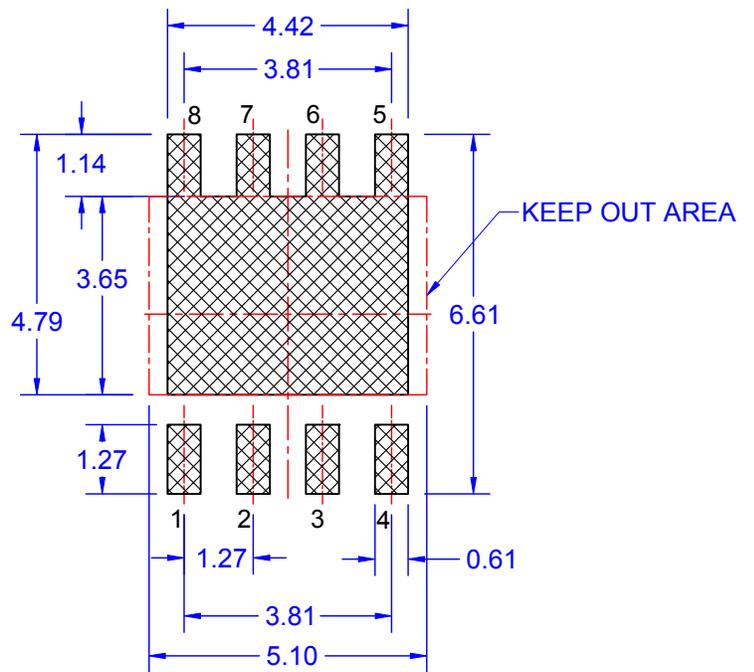
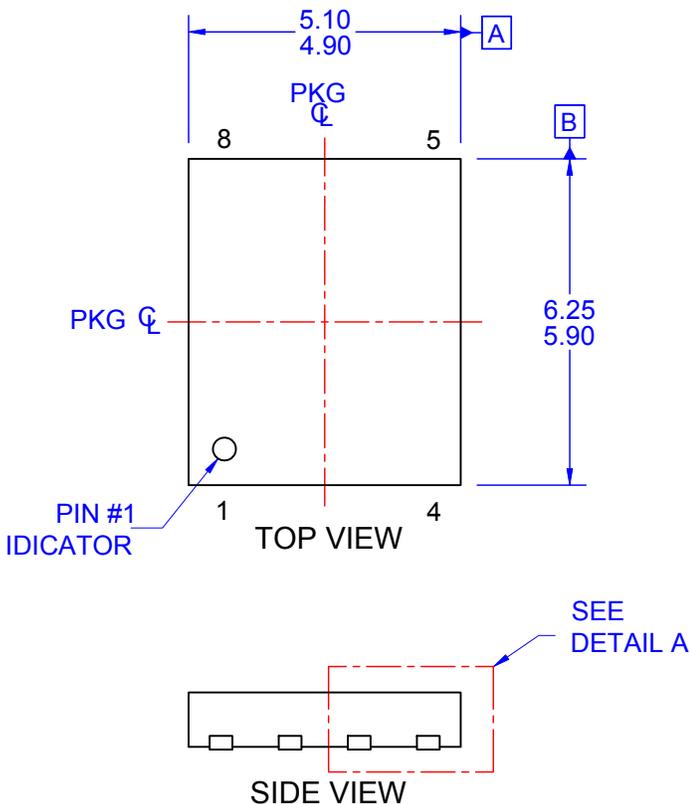
**Figure 11. Forward Bias Safe Operating Area**



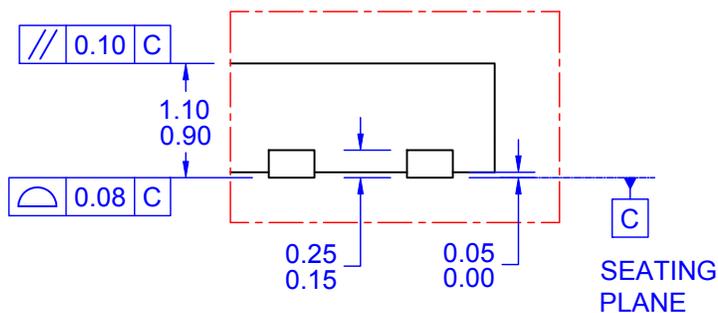
**Figure 12. Single Pulse Maximum Power Dissipation**

**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted





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  - C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
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**DETAIL A**  
SCALE: 2:1



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