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# FDMS015N04B

## N-Channel PowerTrench® MOSFET

40 V, 100 A, 1.5 mΩ



### Features

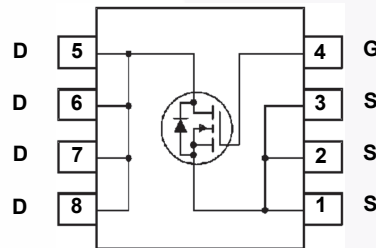
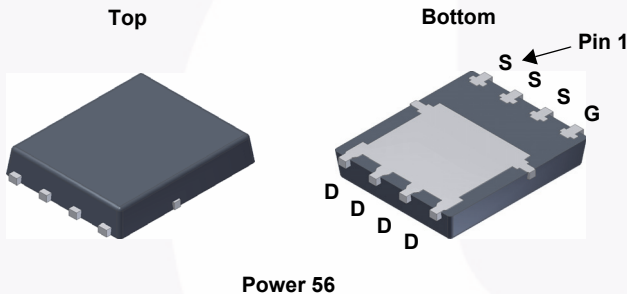
- $R_{DS(on)} = 1.13 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$
- Advanced Package and Silicon Combination for Low  $R_{DS(on)}$  and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

### Applications

- Synchronous Rectification for ATX / Server
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



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

| Symbol         | Parameter                               | FDMS015N04B   | Unit             |
|----------------|---|---|------------------|
| $V_{DSS}$      | Drain to Source Voltage                 | 40  | V                |
| $V_{GSS}$      | Gate to Source Voltage                  | $\pm 20$  | V                |
| $I_D$          | Drain Current                           | - Continuous ( $T_C = 25^\circ\text{C}$ )           | 100              |
|                |   | - Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1a) | 31.3             |
| $I_{DM}$       | Drain Current                           | - Pulsed (Note 2)                                   | 400              |
| $E_{AS}$       | Single Pulsed Avalanche Energy          | (Note 3)  | 526              |
| $P_D$          | Power Dissipation                       | ( $T_C = 25^\circ\text{C}$ )                        | 104              |
|                |   | ( $T_A = 25^\circ\text{C}$ ) (Note 1a)              | 2.5              |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range | -55 to +150   | $^\circ\text{C}$ |

### Thermal Characteristics

| Symbol          | Parameter   | FDMS015N04B | Unit                      |
|-----------------|---|-------------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max.              | 1.2         | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. (Note 1a) | 50          |                           |

## Package Marking and Ordering Information

| Device Marking | Device      | Package  | Reel Size | Tape Width | Quantity   |
|----------------|-------------|----------|-----------|------------|------------|
| FDMS015N04B    | FDMS015N04B | Power 56 | 13 "      | 12 mm      | 3000 units |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|------|------|------|------|
|--------|-----------|-----------------|------|------|------|------|

### Off Characteristics

|                                |   |  |    |    |           |                            |
|--------------------------------|---|--|----|----|-----------|----------------------------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$              | 40 | -  | -         | V                          |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$ | -  | 37 | -         | $\text{mV}/^\circ\text{C}$ |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$              | -  | -  | 1         | $\mu\text{A}$              |
| $I_{GSS}$                      | Gate to Body Leakage Current              | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$          | -  | -  | $\pm 100$ | nA                         |

### On Characteristics

|              |                                      |   |     |      |     |                  |
|--------------|--------------------------------------|---|-----|------|-----|------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage               | $V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$    | 2.0 | -    | 4.0 | V                |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$ | -   | 1.13 | 1.5 | $\text{m}\Omega$ |
| $g_{FS}$     | Forward Transconductance             | $V_{DS} = 5 \text{ V}, I_D = 50 \text{ A}$  | -   | 171  | -   | S                |

### Dynamic Characteristics

|               |                                    |  |          |      |      |          |
|---------------|------------------------------------|--|----------|------|------|----------|
| $C_{iss}$     | Input Capacitance                  | $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$<br>$f = 1 \text{ MHz}$                   | -        | 6560 | 8725 | pF       |
| $C_{oss}$     | Output Capacitance                 |  | -        | 2795 | 3720 | pF       |
| $C_{rss}$     | Reverse Transfer Capacitance       |  | -        | 162  | -    | pF       |
| $C_{oss(er)}$ | Energy Releated Output Capacitance | $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$  | -        | 3896 | -    | pF       |
| $Q_{g(tot)}$  | Total Gate Charge at 10V           | $V_{DS} = 20 \text{ V}, I_D = 50 \text{ A}$<br>$V_{GS} = 0 \text{ V to } 10 \text{ V}$ | -        | 91   | 118  | nC       |
| $Q_{gs}$      | Gate to Source Gate Charge         |  | -        | 26   | -    | nC       |
| $Q_{gs2}$     | Gate Charge Threshold to Plateau   |  | -        | 9    | -    | nC       |
| $Q_{gd}$      | Gate to Drain "Miller" Charge      |  | (Note 4) | -    | 16   | -        |
| ESR           | Equivalent Series Resistance       | $f = 1 \text{ MHz}$  | -        | 1.4  | -    | $\Omega$ |

### Switching Characteristics

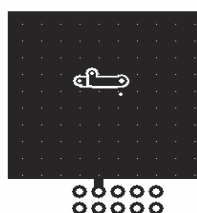
|              |                     |  |          |    |     |    |
|--------------|---------------------|--|----------|----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 20 \text{ V}, I_D = 50 \text{ A}$<br>$V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$ | -        | 34 | 78  | ns |
| $t_r$        | Turn-On Rise Time   |  | -        | 24 | 58  | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |  | -        | 71 | 152 | ns |
| $t_f$        | Turn-Off Fall Time  |  | (Note 4) | -  | 26  | 62 |

### Drain-Source Diode Characteristics

|          |  |   |   |     |     |    |
|----------|--|---|---|-----|-----|----|
| $I_S$    | Maximum Continuous Drain to Source Diode Forward Current | -   | - | 100 | A   |    |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current     | -   | - | 400 | A   |    |
| $V_{SD}$ | Drain to Source Diode Forward Voltage                    | $V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$ | - | -   | 1.3 | V  |
| $t_{rr}$ | Reverse Recovery Time                                    | $V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$ | - | 78  | -   | ns |
| $Q_{rr}$ | Reverse Recovery Charge                                  | $di_F/dt = 100 \text{ A}/\mu\text{s}$         | - | 90  | -   | nC |

#### Notes:

1.  $R_{\theta JA}$  is determined with the device mounted on a  $1 \text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5 \text{ in.}$  board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a.  $50^\circ\text{C}/\text{W}$  when mounted on a  $1 \text{ in}^2$  pad of 2 oz copper.

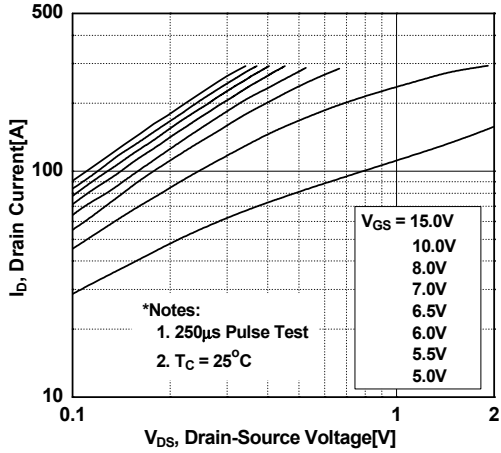


b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

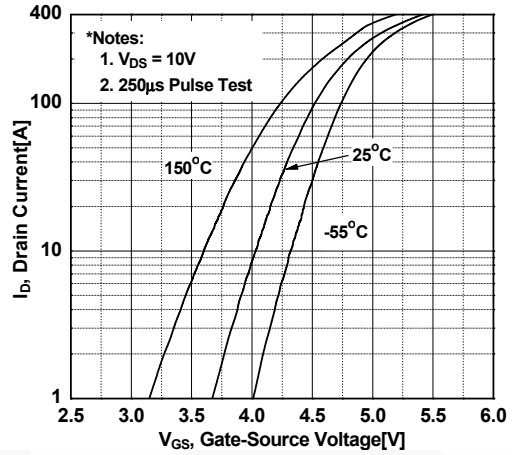
- Repetitive rating; pulse-width limited by maximum junction temperature.
- $L = 3 \text{ mH}, I_{AS} = 18.72 \text{ A}$ , starting  $T_J = 25^\circ\text{C}$ .
- Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

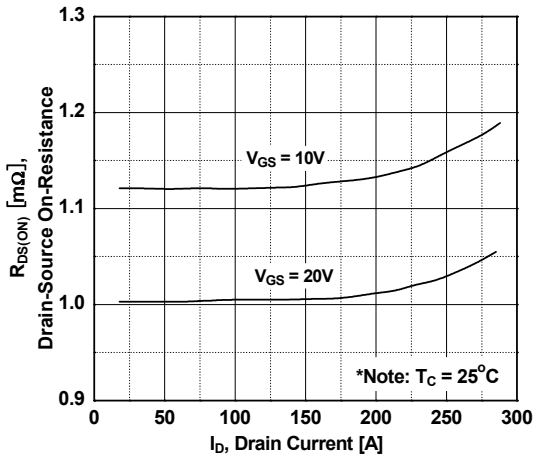
**Figure 1. On-Region Characteristics**



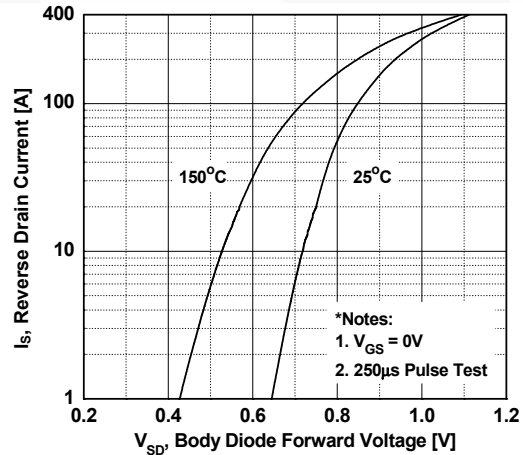
**Figure 2. Transfer Characteristics**



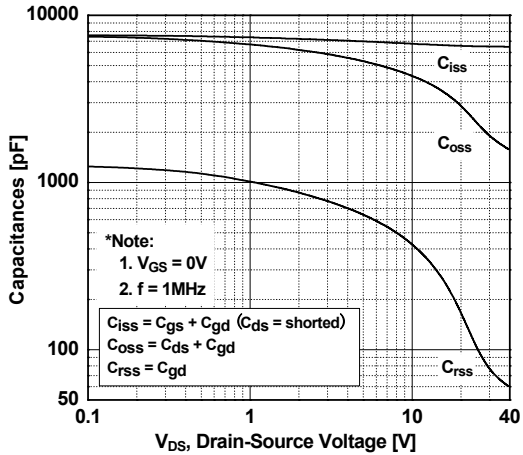
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



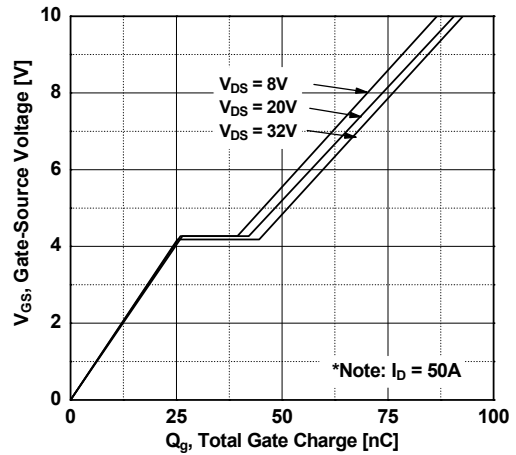
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

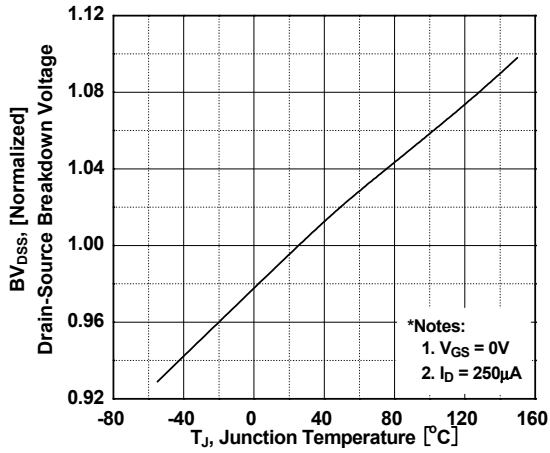


**Figure 6. Gate Charge Characteristics**

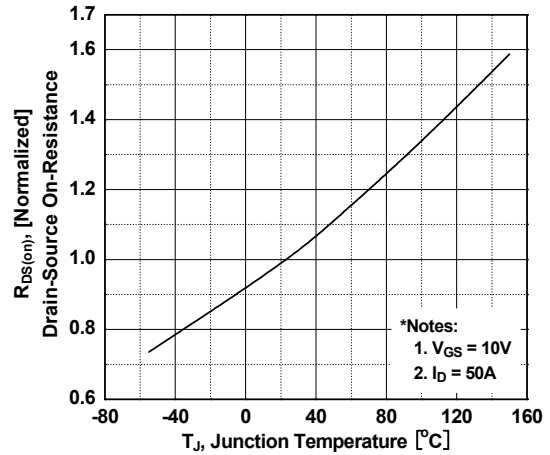


**Typical Performance Characteristics** (Continued)

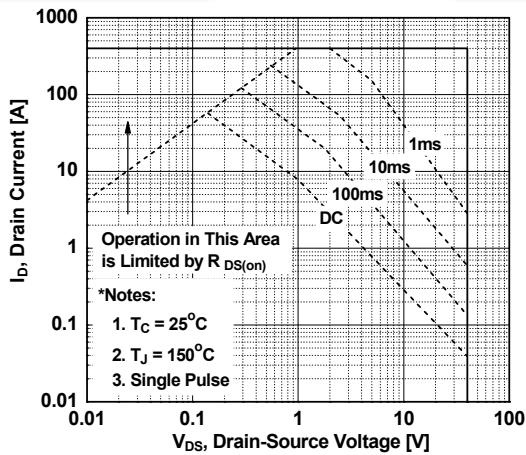
**Figure 7. Breakdown Voltage Variation vs. Temperature**



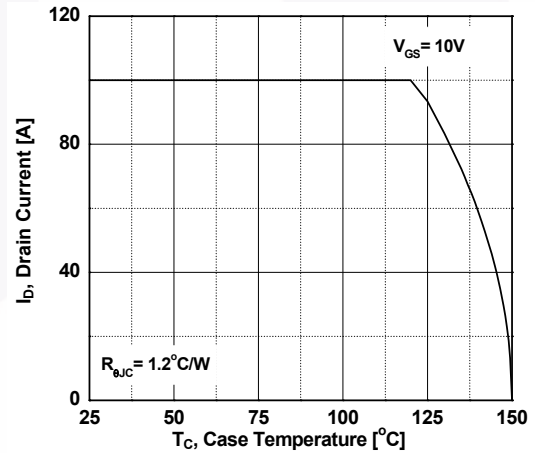
**Figure 8. On-Resistance Variation vs. Temperature**



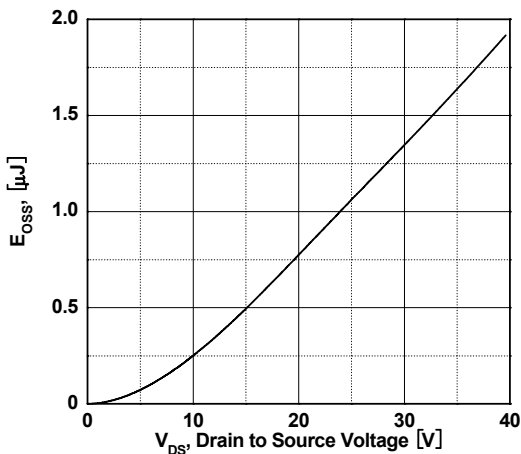
**Figure 9. Maximum Safe Operating Area**



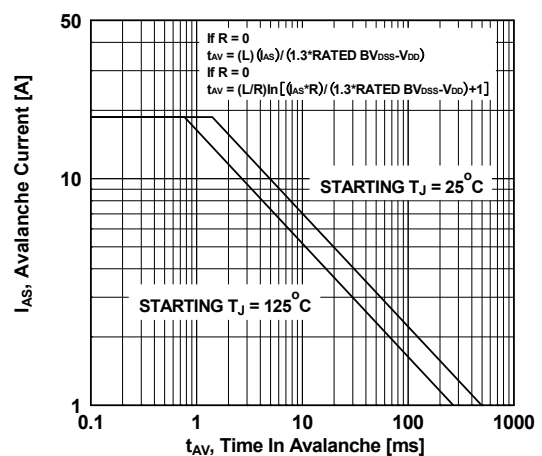
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. E\_oss vs. Drain to Source Voltage**

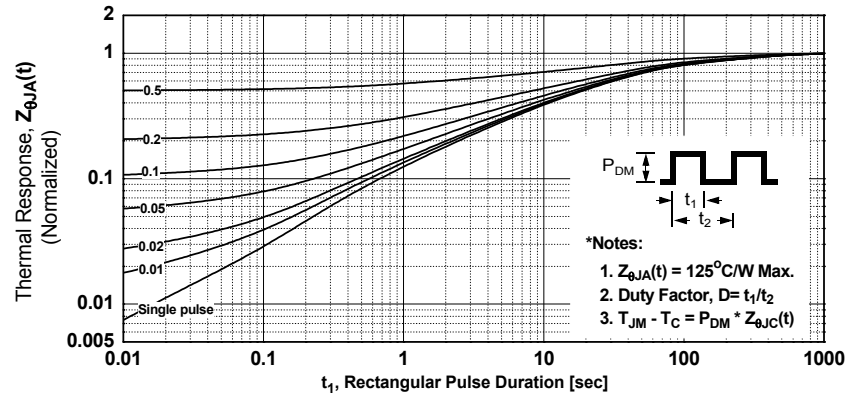


**Figure 12. Unclamped Inductive Switching Capability**

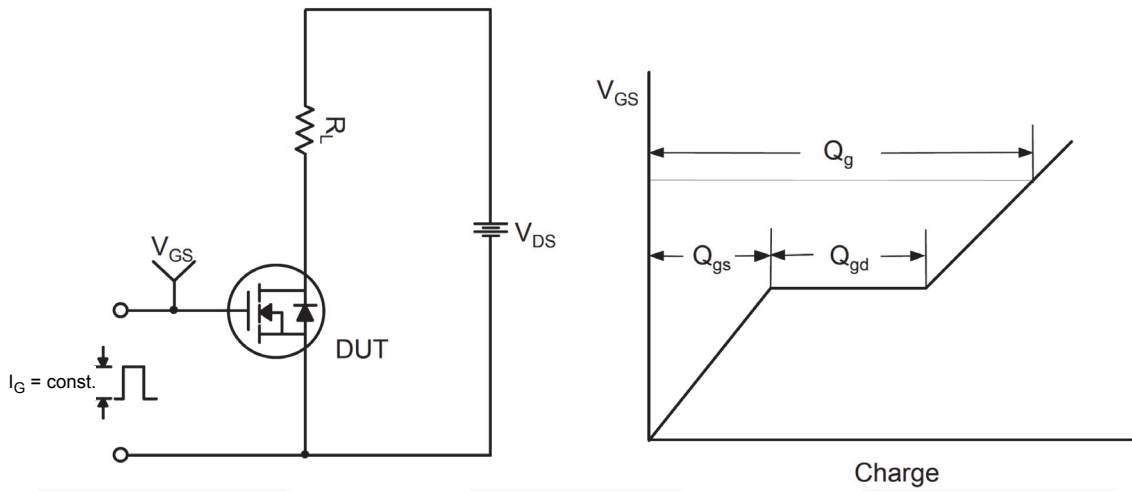


Typical Performance Characteristics (Continued)

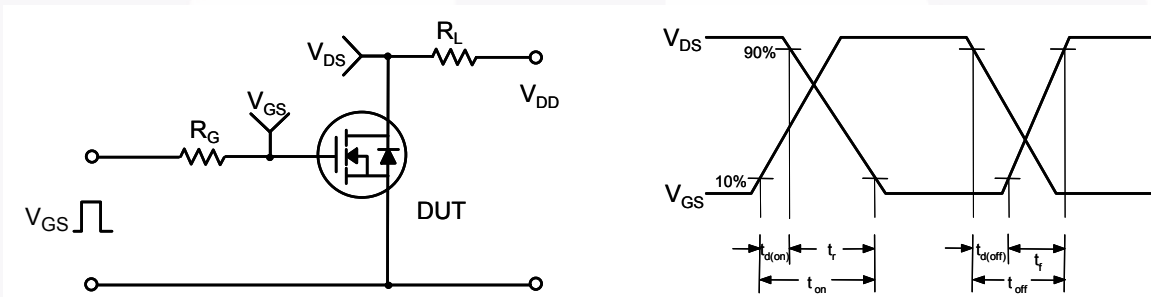
Figure 13. Transient Thermal Response Curve



**Figure 14. Gate Charge Test Circuit & Waveform**



**Figure 15. Resistive Switching Test Circuit & Waveforms**



**Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms**

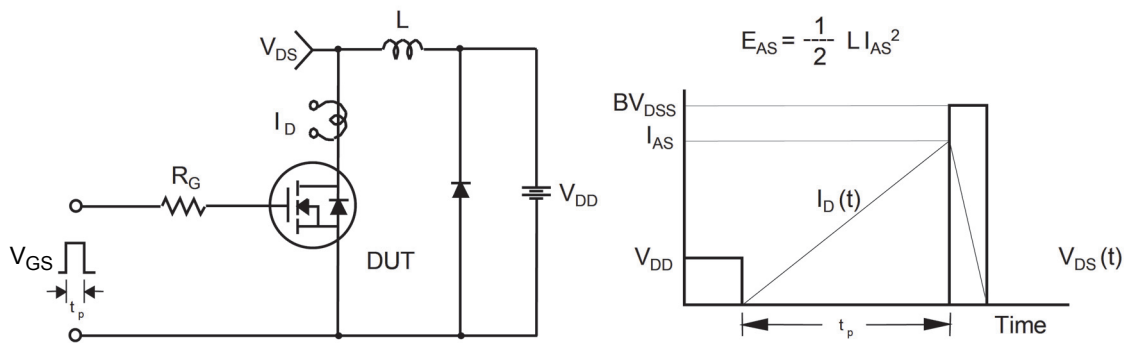
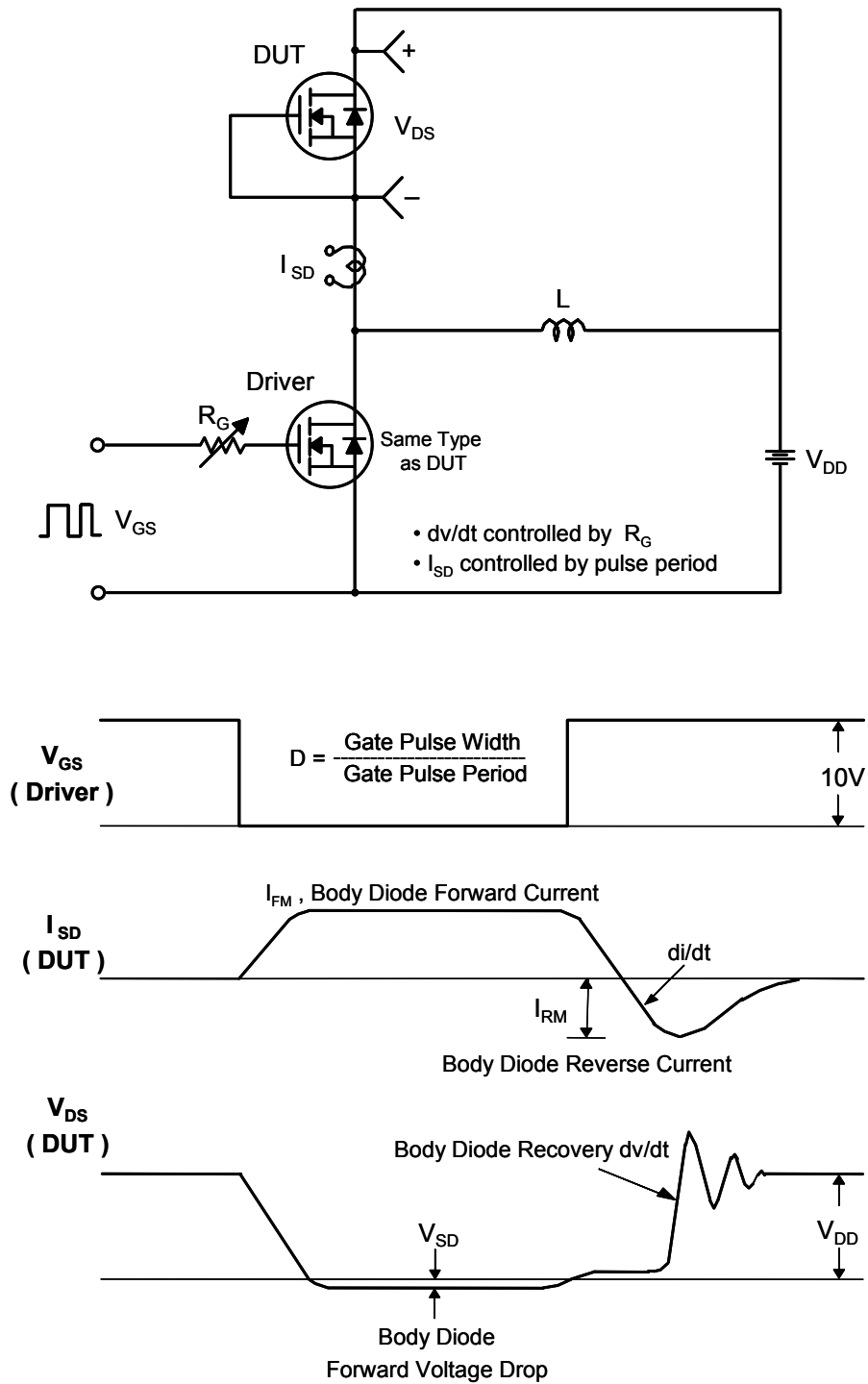
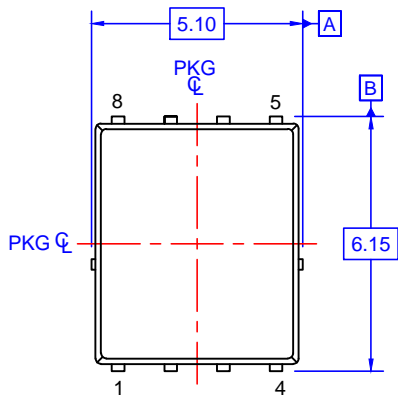


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

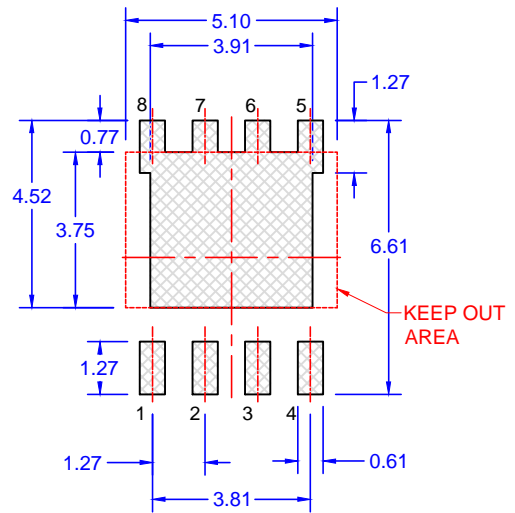
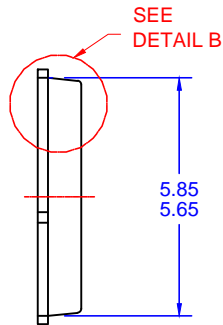




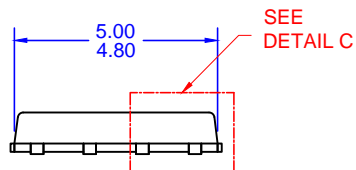
PQFN8 5X6, 1.27P  
CASE 483AE  
ISSUE A



TOP VIEW

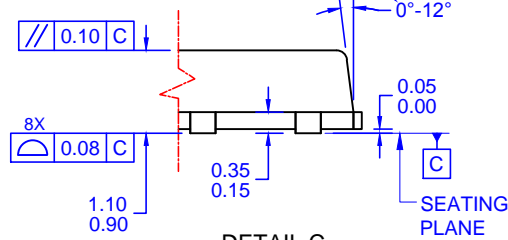


LAND PATTERN RECOMMENDATION

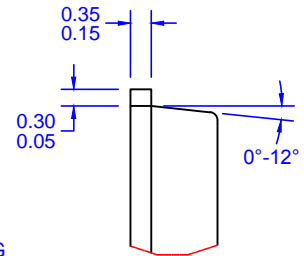


SIDE VIEW

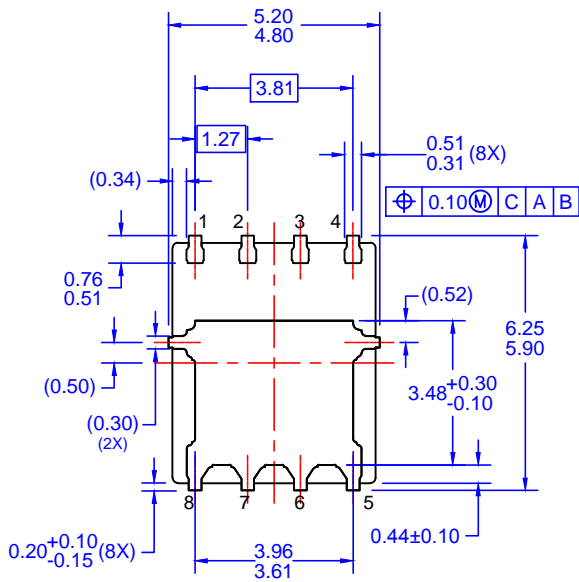
OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



DETAIL C  
SCALE: 2:1



DETAIL B  
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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