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# FDMS015N04B

## N-Channel PowerTrench® MOSFET

40 V, 100 A, 1.5 mΩ

### Features

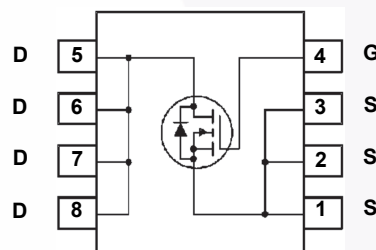
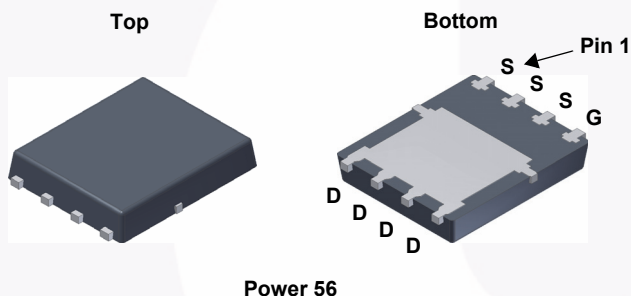
- $R_{DS(on)} = 1.13 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$
- Advanced Package and Silicon Combination for Low  $R_{DS(on)}$  and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### 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         | A                |
|                |   | - Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1a) | 31.3        |                  |
| $I_{DM}$       | Drain Current                           | - Pulsed (Note 2)                                   | 400         | A                |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 3) |   | 526         | mJ               |
| $P_D$          | Power Dissipation                       | ( $T_C = 25^\circ\text{C}$ )                        | 104         | W                |
|                |   | ( $T_A = 25^\circ\text{C}$ ) (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         | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | 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 | -         | 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 | 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 Related 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     |  | - | 16   | -    | nC       |
| ESR           | Equivalent Series Resistance      | $f = 1\ \text{MHz}$  | - | 1.4  | -    | $\Omega$ |

### Switching Characteristics

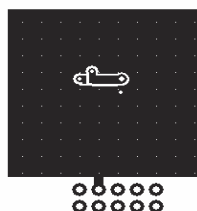
|              |                     |   |   |    |     |    |
|--------------|---------------------|---|---|----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 20\ \text{V}$ , $I_D = 50\ \text{A}$<br>$V_{GS} = 10\ \text{V}$ , $R_G = 4.7\ \Omega$ | - | 34 | 78  | ns |
| $t_r$        | Turn-On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

### Drain-Source Diode Characteristics

|                 |  |   |   |     |     |    |
|-----------------|--|---|---|-----|-----|----|
| I <sub>S</sub>  | Maximum Continuous Drain to Source Diode Forward Current | -   | - | 100 | A   |    |
| I <sub>SM</sub> | Maximum Pulsed Drain to Source Diode Forward Current     | -   | - | 400 | A   |    |
| V <sub>SD</sub> | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 50 A | - | -   | 1.3 | V  |
| t <sub>rr</sub> | Reverse Recovery Time                                    | V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 50 A | - | 78  | -   | ns |
| Q <sub>rr</sub> | Reverse Recovery Charge                                  | dI <sub>F</sub> /dt = 100 A/μs                | - | 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.

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

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

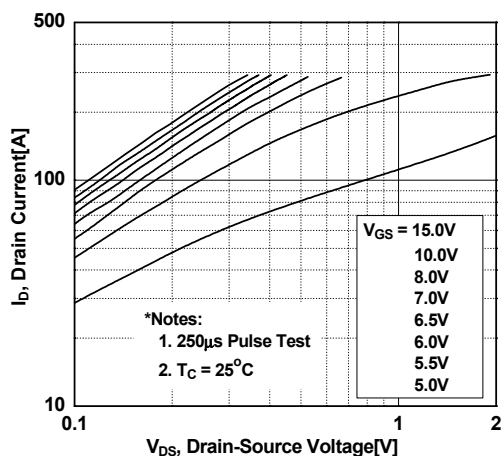


Figure 2. Transfer Characteristics

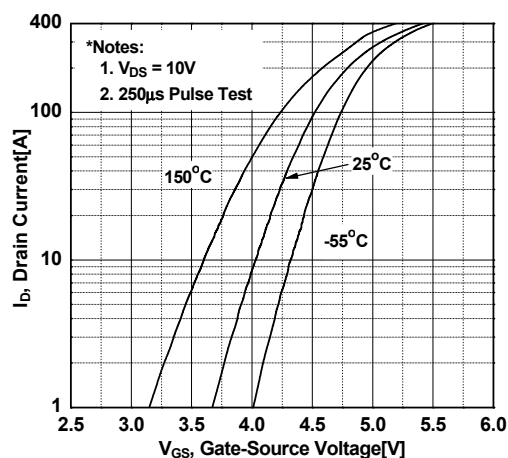


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

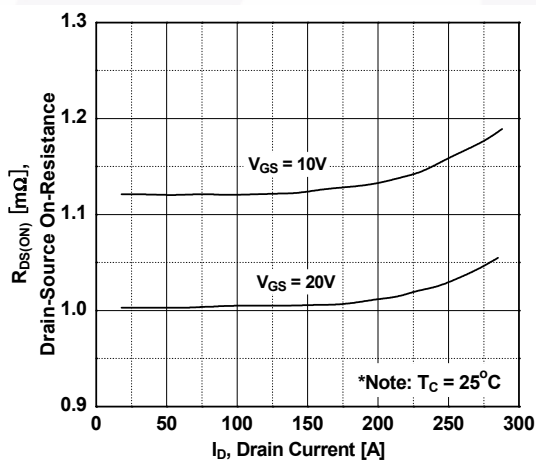


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

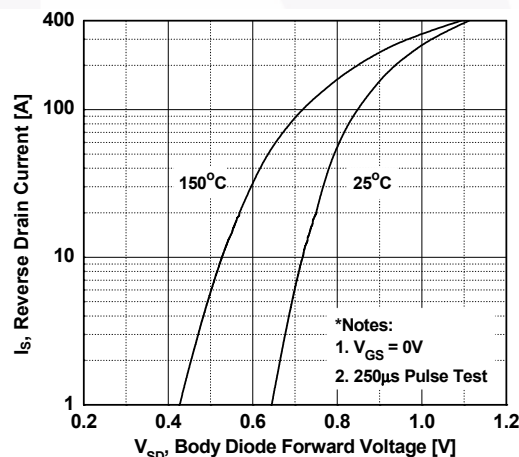


Figure 5. Capacitance Characteristics

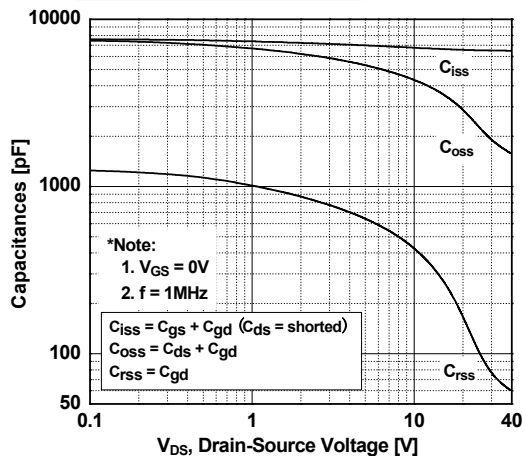
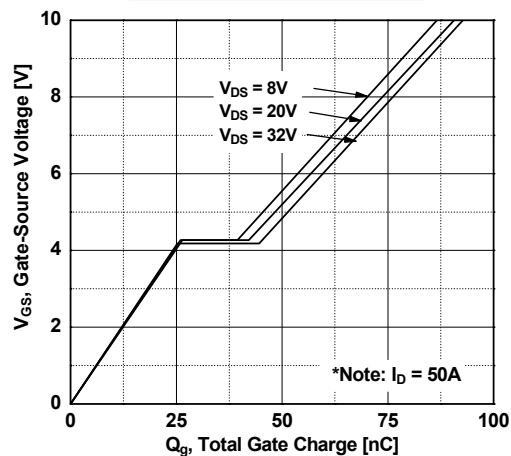


Figure 6. Gate Charge Characteristics



## Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

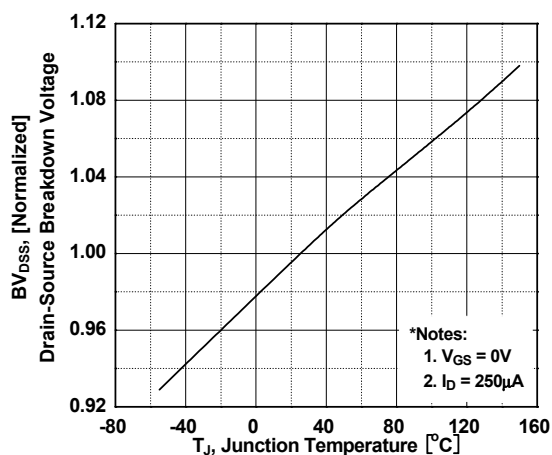


Figure 8. On-Resistance Variation vs. Temperature

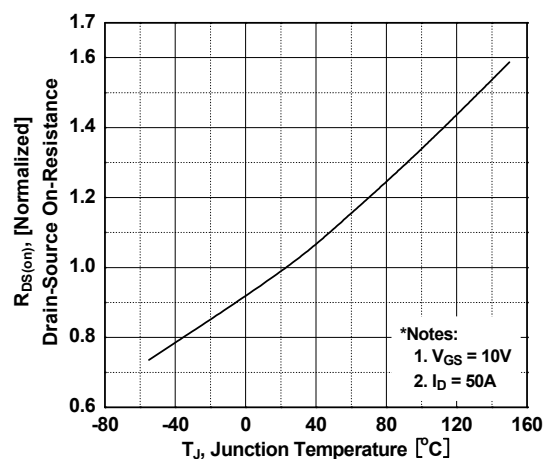


Figure 9. Maximum Safe Operating Area

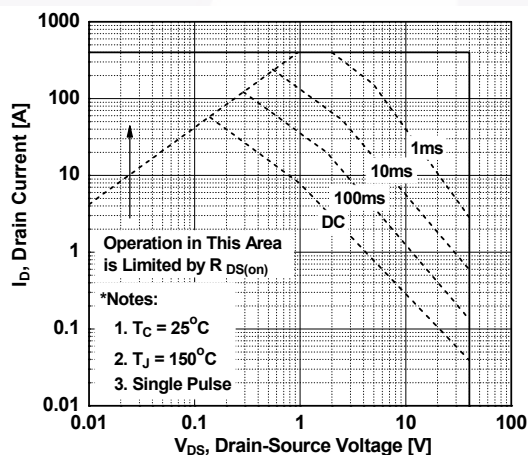


Figure 10. Maximum Drain Current vs. Case Temperature

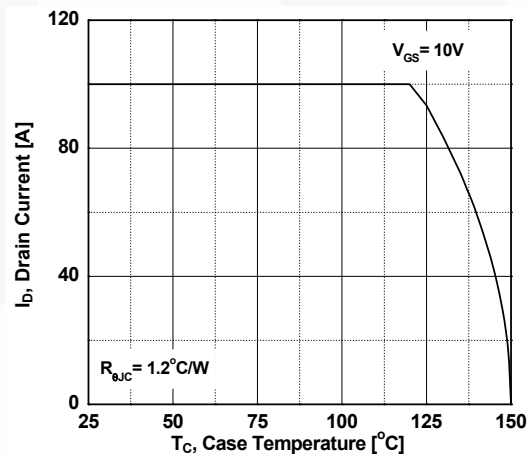


Figure 11. Eoss vs. Drain to Source Voltage

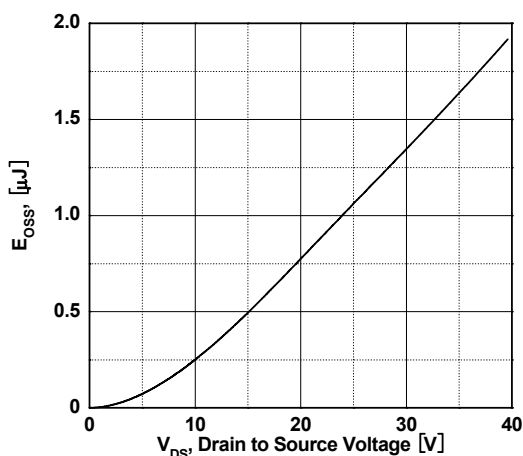
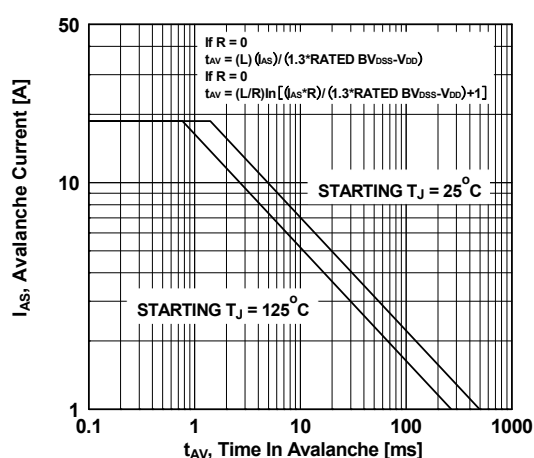


Figure 12. Unclamped Inductive Switching Capability



## Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve

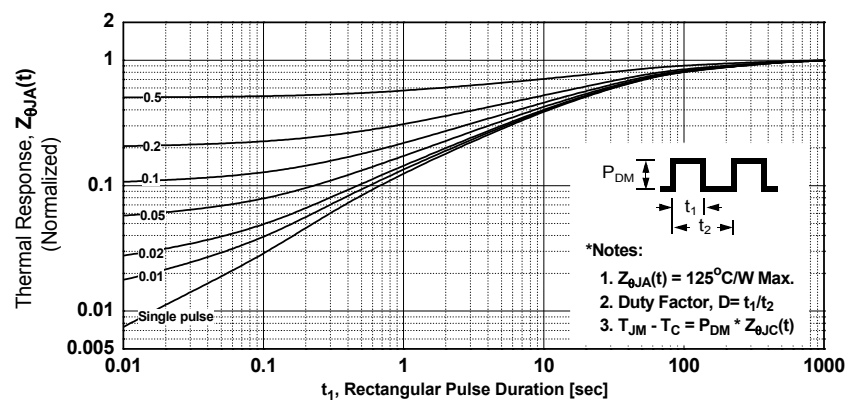


Figure 14. Gate Charge Test Circuit & Waveform

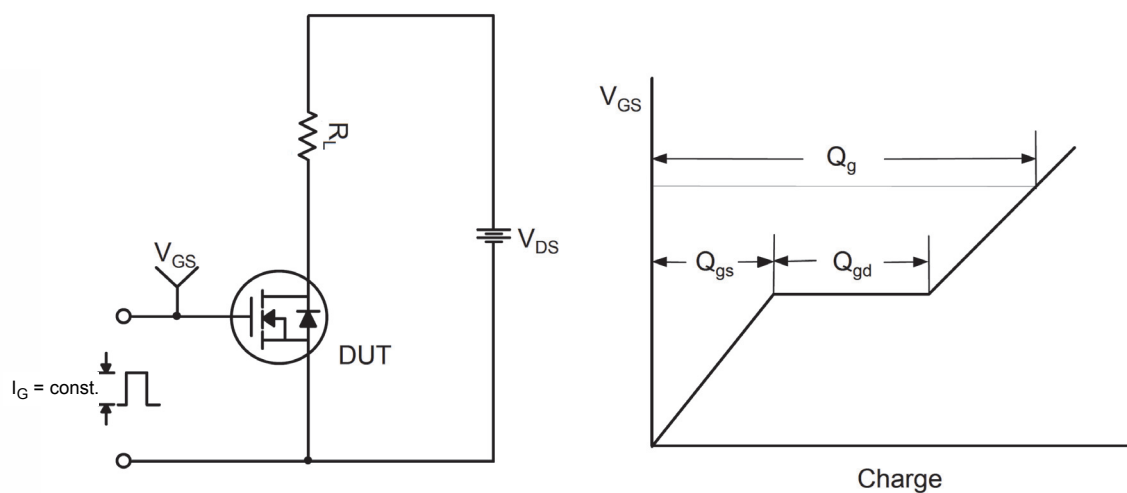


Figure 15. Resistive Switching Test Circuit & Waveforms

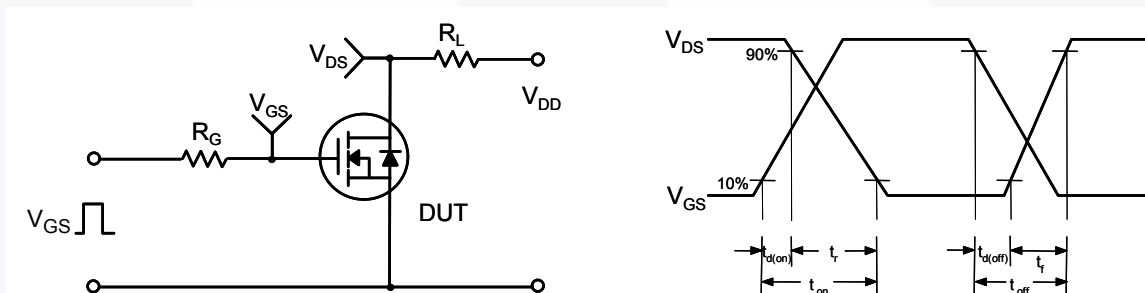


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

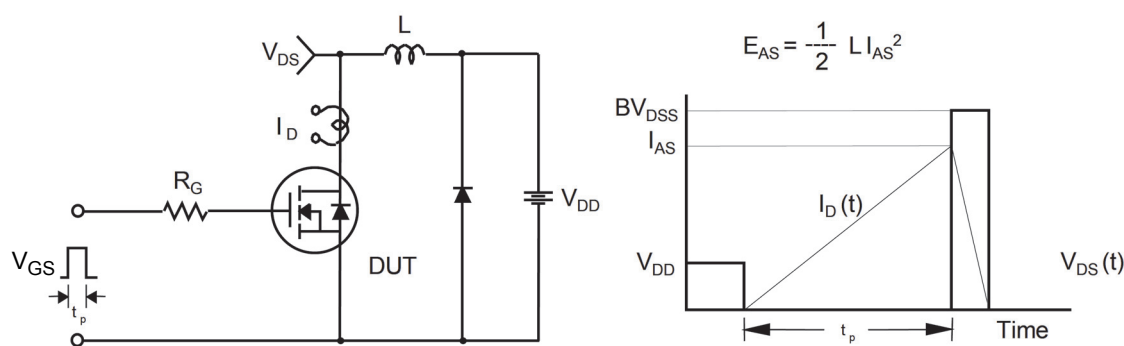
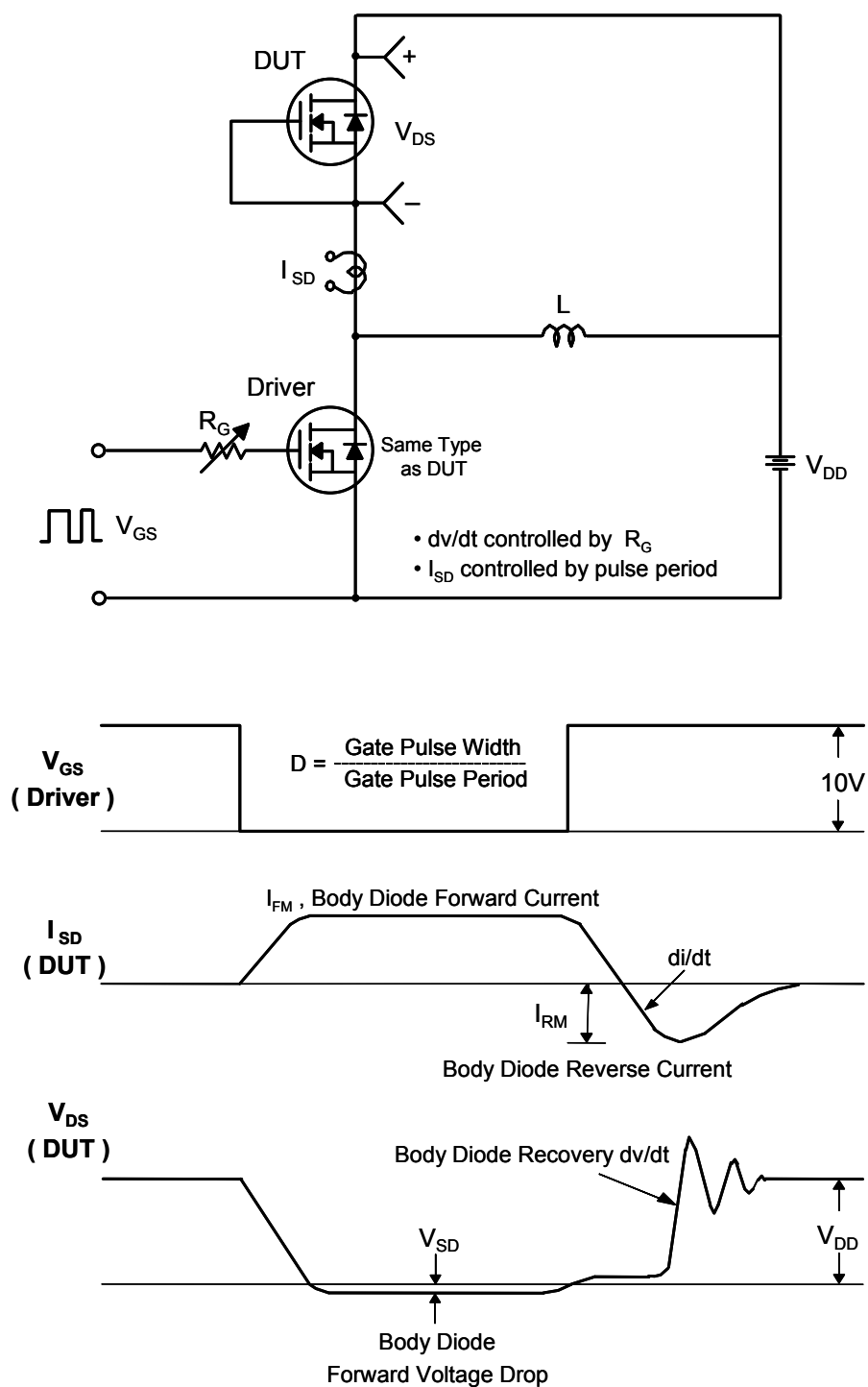
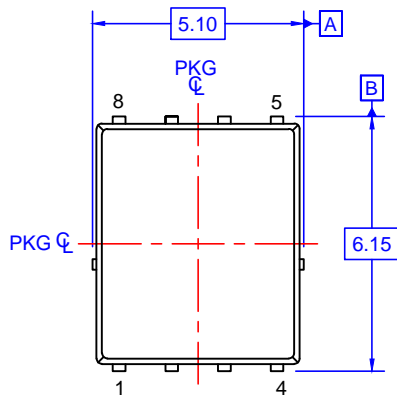


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

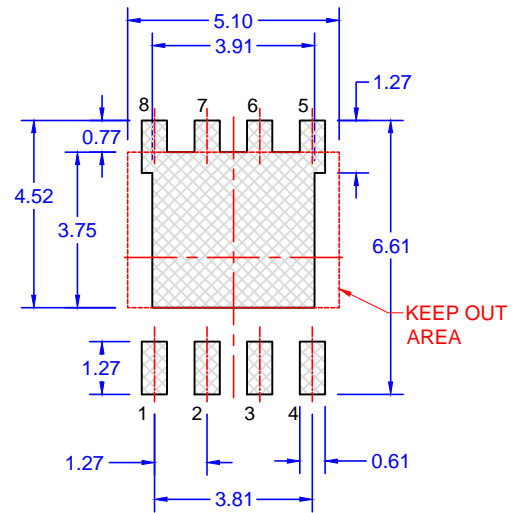
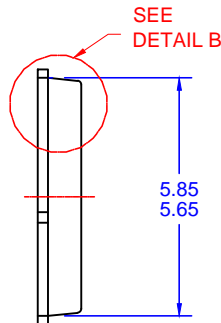




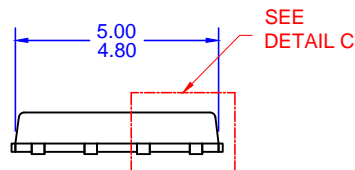
PQFN8 5X6, 1.27P  
CASE 483AE  
ISSUE A



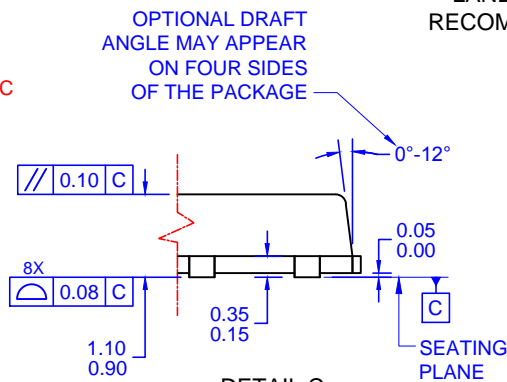
TOP VIEW



LAND PATTERN  
RECOMMENDATION

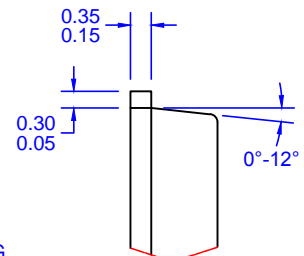


SIDE VIEW



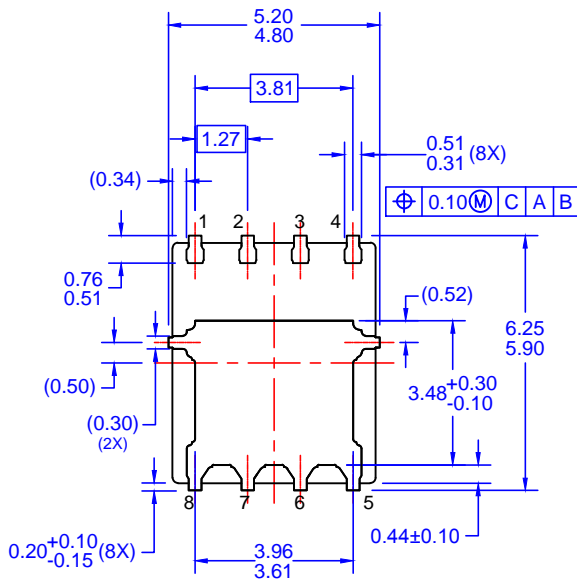
DETAIL C

SCALE: 2:1



DETAIL B

SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

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

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