

FDMS030N06B

N-Channel PowerTrench® MOSFET

60 V, 100 A, 3 mΩ

Features

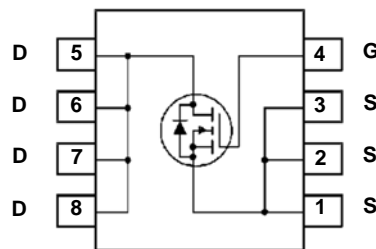
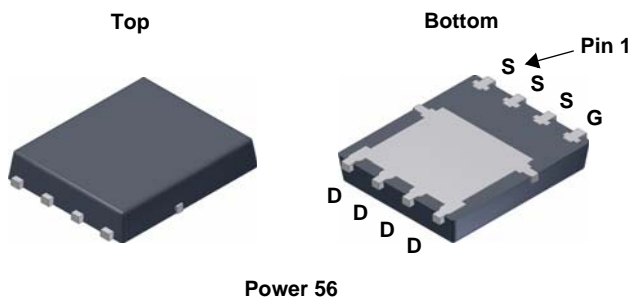
- $R_{DS(on)} = 2.4 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$
- Advanced Package and Silicon Combination for Low $R_{DS(on)}$ and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

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 / Telecom PSU
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies
- Renewable system



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

| Symbol | Parameter | | FDMS030N06B | Unit |
|----------------|---|---|-------------|------------------|
| V_{DSS} | Drain to Source Voltage | | 60 | V |
| V_{GSS} | Gate to Source Voltage | | ± 20 | V |
| I_D | Drain Current | - Continuous ($T_C = 25^\circ\text{C}$) (Note 1) | 100 | A |
| | | - Continuous ($T_A = 25^\circ\text{C}$) (Note 2a) | 22.1 | |
| I_{DM} | Drain Current | - Pulsed (Note 3) | 400 | A |
| E_{AS} | Single Pulsed Avalanche Energy (Note 4) | | 248 | mJ |
| P_D | Power Dissipation | ($T_C = 25^\circ\text{C}$) | 104 | W |
| | | ($T_A = 25^\circ\text{C}$) (Note 2a) | 2.5 | W |
| T_J, T_{STG} | Operating and Storage Temperature Range | | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | | FDMS030N06B | 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 2a) | | 50 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-------------|----------|-----------|------------|------------|
| FDMS030N06B | FDMS030N06B | 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 | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 60 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, Referenced to 25°C | - | 0.03 | - | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$ | - | - | 1 | μA |
| I_{GSS} | Gate to Body Leakage Current | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|--------------------------------------|---|-----|-----|-----|------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 2.5 | 3.3 | 4.5 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 50\text{A}$ | - | 2.4 | 3.0 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS} = 10\text{V}, I_D = 50\text{A}$ | - | 119 | - | S |

Dynamic Characteristics

| | | | | | | | |
|---------------|-----------------------------------|--|----------|------|------|----|----|
| C_{iss} | Input Capacitance | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ | - | 5685 | 7560 | pF | |
| C_{oss} | Output Capacitance | | - | 1720 | 2290 | pF | |
| C_{rss} | Reverse Transfer Capacitance | | - | 59 | - | pF | |
| $C_{oss(er)}$ | Energy Related Output Capacitance | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$ | - | 2504 | - | pF | |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{DS} = 30\text{V}, I_D = 50\text{A}$ $V_{GS} = 0\text{V to } 10\text{V}$ | - | 75 | - | nC | |
| Q_{gs} | Gate to Source Gate Charge | | - | 30 | - | nC | |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 14 | - | nC | |
| $V_{plateau}$ | Gate Plateau Voltage | | (Note 5) | - | 5.4 | - | V |
| Q_{sync} | Total Gate Charge Sync. | $V_{DS} = 0\text{V}, I_D = 50\text{A}$ | (Note 6) | - | 66.2 | - | nC |
| Q_{oss} | Output Charge | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$ | - | 174 | - | nC | |

Switching Characteristics

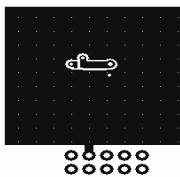
| | | | | | | |
|--------------|------------------------------|---|----------|------|-----|----------|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 30\text{V}, I_D = 50\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$ | - | 39 | 88 | ns |
| t_r | Turn-On Rise Time | | - | 20 | 50 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 52 | 114 | ns |
| t_f | Turn-Off Fall Time | | (Note 5) | - | 16 | 42 |
| ESR | Equivalent Series Resistance | $f = 1\text{MHz}$ | - | 1.05 | - | Ω |

Drain-Source Diode Characteristics

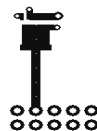
| | | | | | | |
|----------|--|---|---|-----|------|----|
| I_S | Maximum Continuous Drain to Source Diode Forward Current | - | - | 100 | A | |
| I_{SM} | Maximum Pulsed Drain to Source Diode Forward Current | - | - | 400 | A | |
| V_{SD} | Drain to Source Diode Forward Voltage | $V_{GS} = 0\text{V}, I_{SD} = 50\text{A}$ | - | - | 1.25 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{V}, I_{SD} = 50\text{A}$ | - | 71 | - | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F/dt = 100\text{A}/\mu\text{s}$ | - | 85 | - | nC |

Notes:

- Silicon limited I_D rating = 147A
- $R_{\theta JA}$ is determined with the device mounted on a 1in^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 1in^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
- $L = 0.3\text{mH}, I_{AS} = 40.7\text{A}, V_{DD} = 50\text{V}, V_{GS} = 10\text{V}$ Starting $T_J = 25^\circ\text{C}$
- Essentially Independent of Operating Temperature Typical Characteristics
- See the test circuit in page 6

Typical Performance Characteristics

Figure 1. On-Region Characteristics

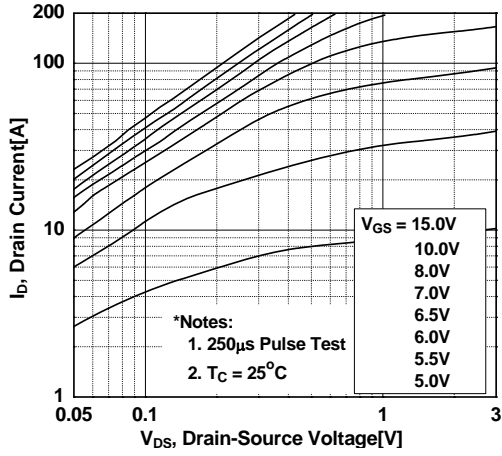


Figure 2. Transfer Characteristics

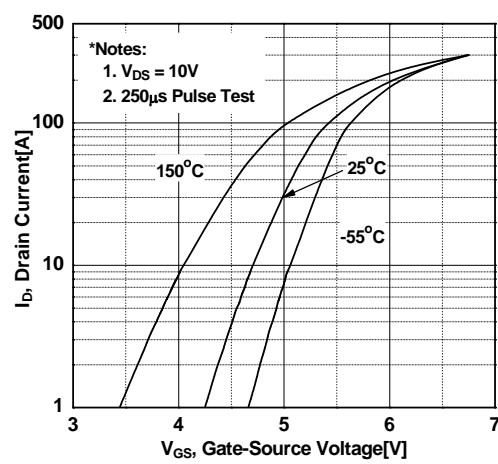


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

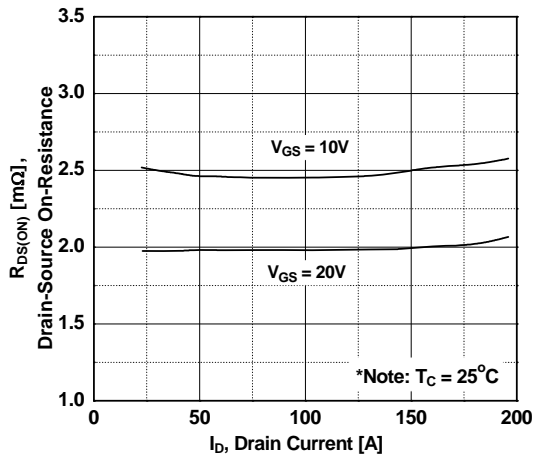


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

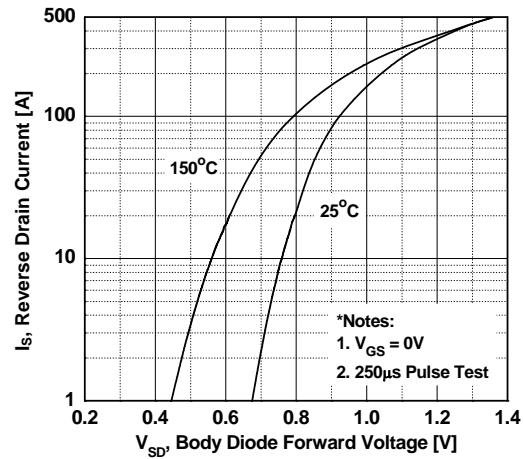


Figure 5. Capacitance Characteristics

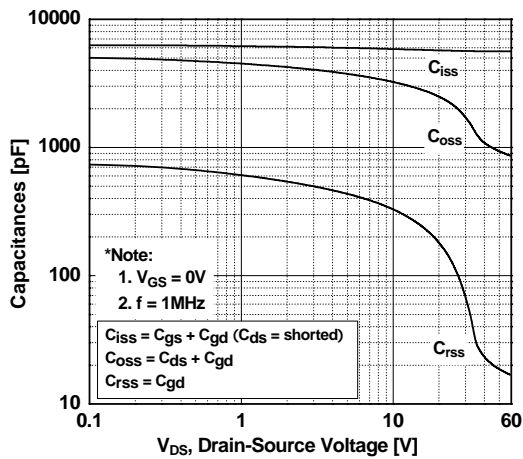
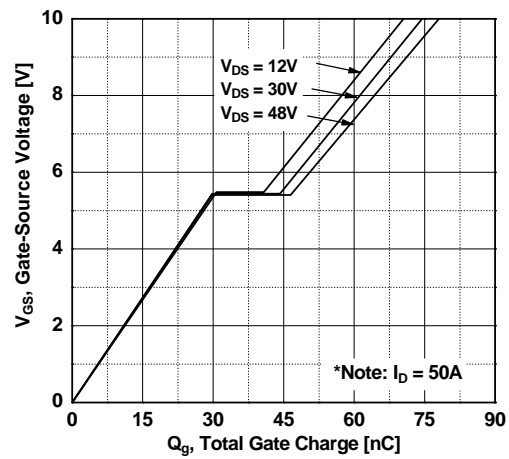


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

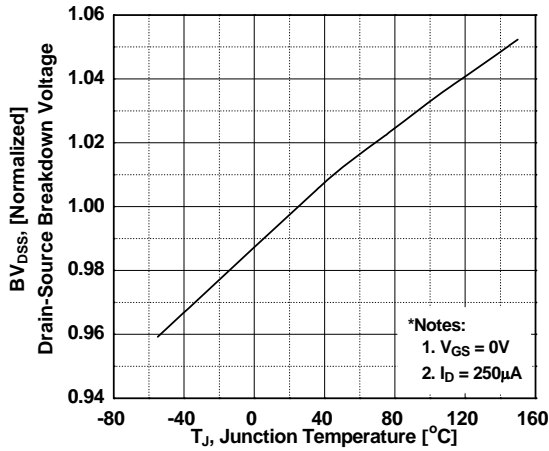


Figure 8. On-Resistance Variation vs. Temperature

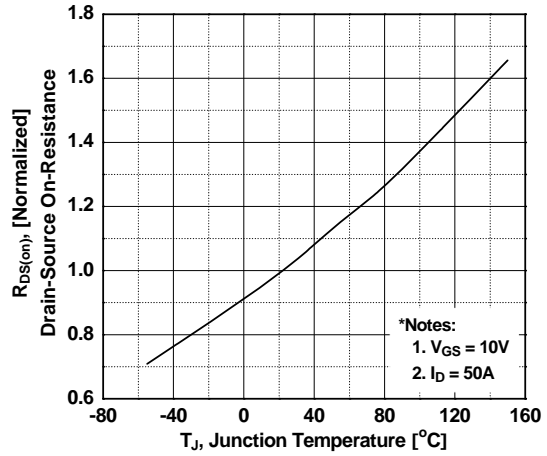


Figure 9. Maximum Safe Operating Area vs. Ambient Temperature

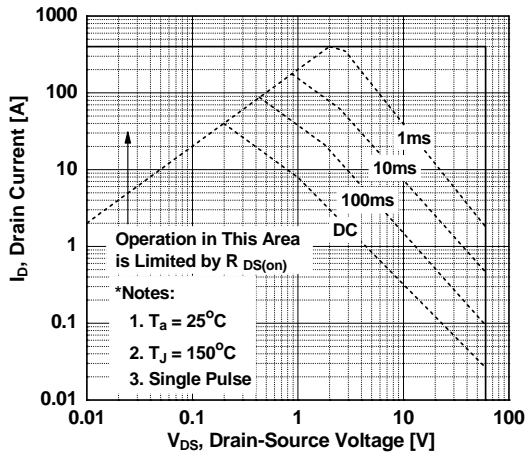


Figure 10. Maximum Drain Current

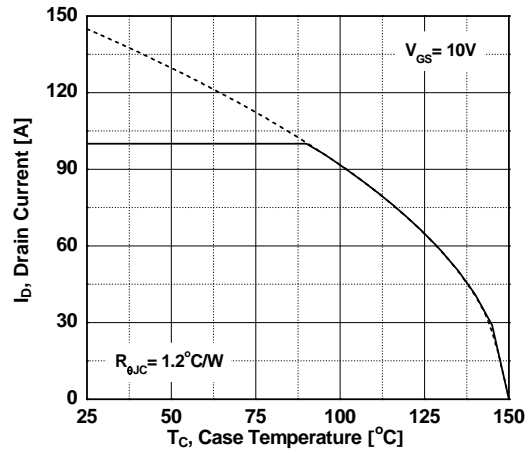


Figure 11. E_oss vs. Drain to Source Voltage

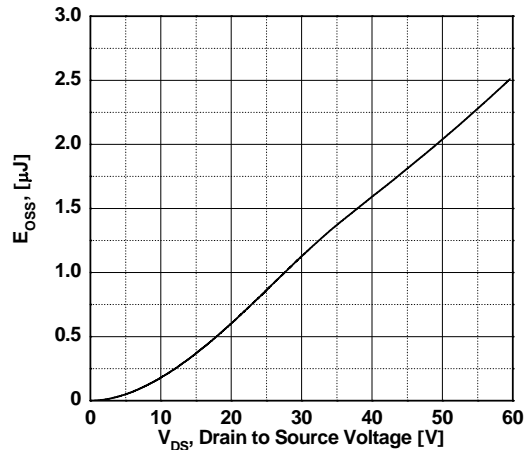
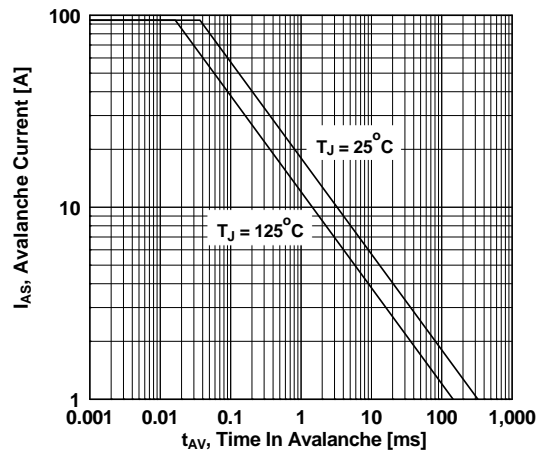
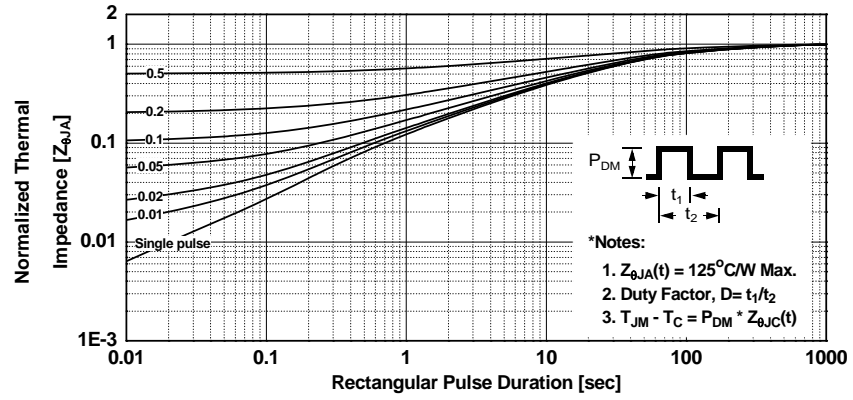


Figure 12. Unclamped Inductive Switching Capability

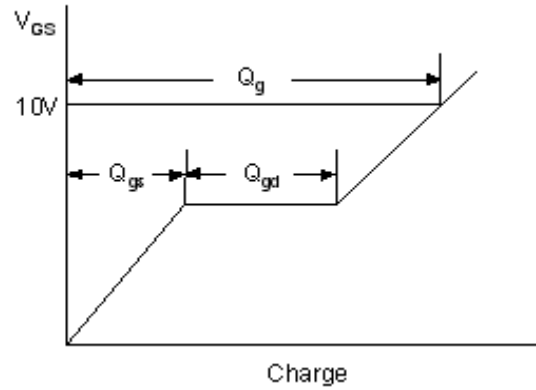
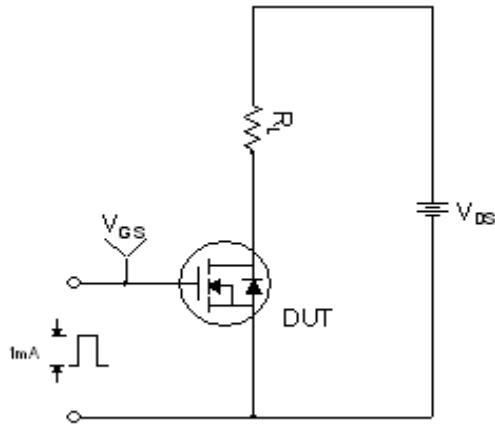


Typical Performance Characteristics (Continued)

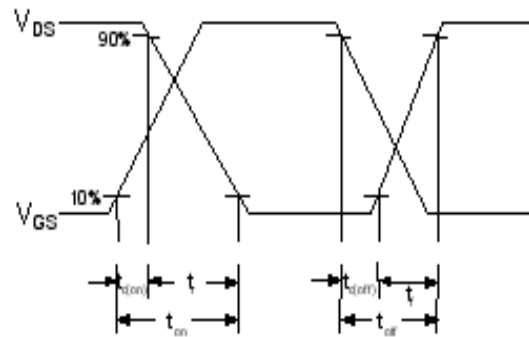
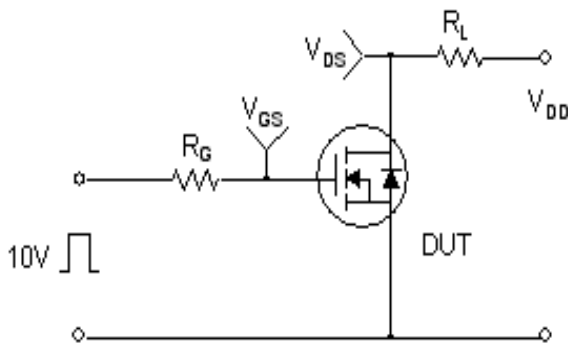
Figure 13. Transient Thermal Response Curve



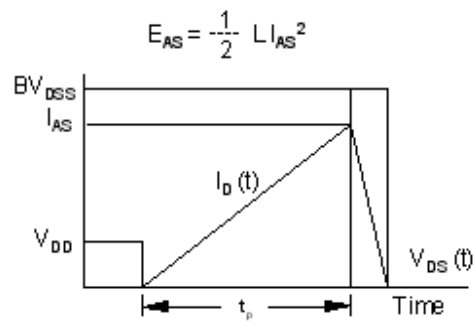
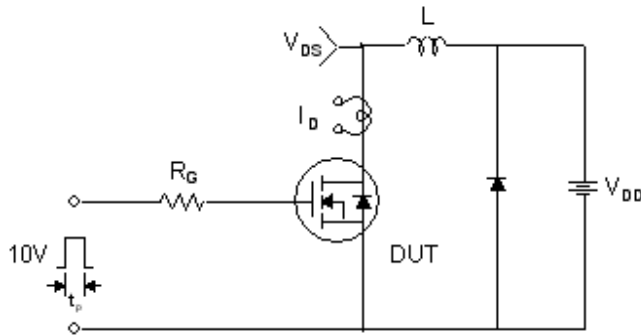
Gate Charge Test Circuit & Waveform



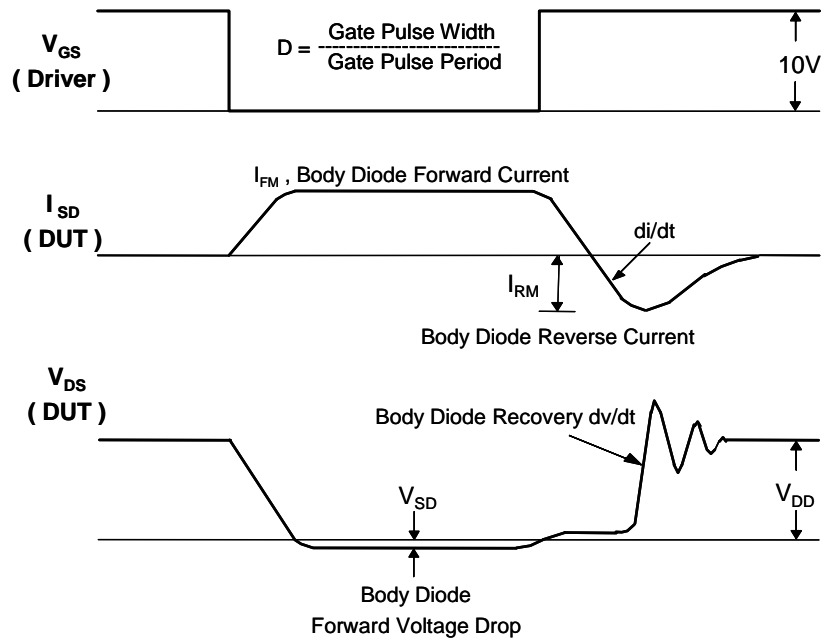
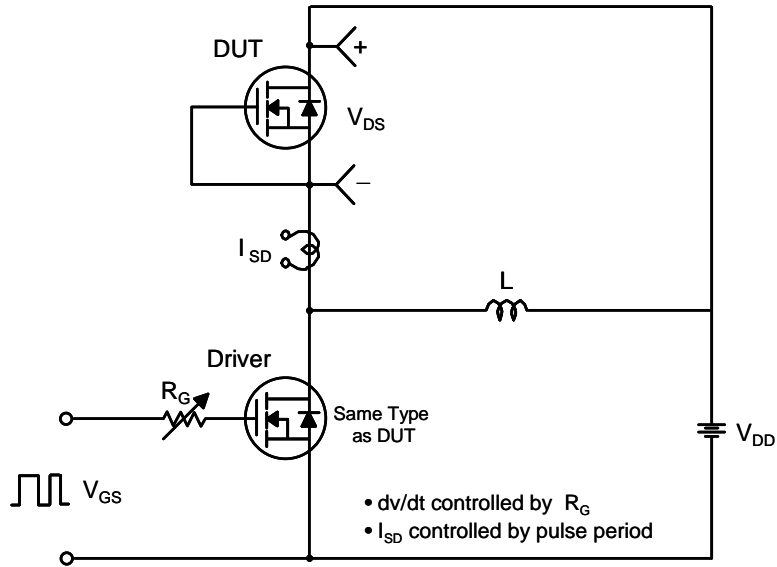
Resistive Switching Test Circuit & Waveforms



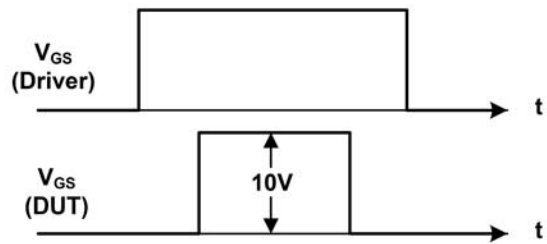
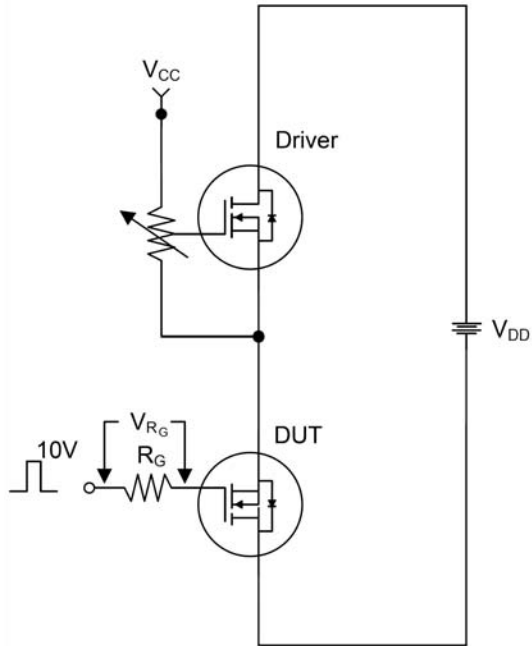
Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms

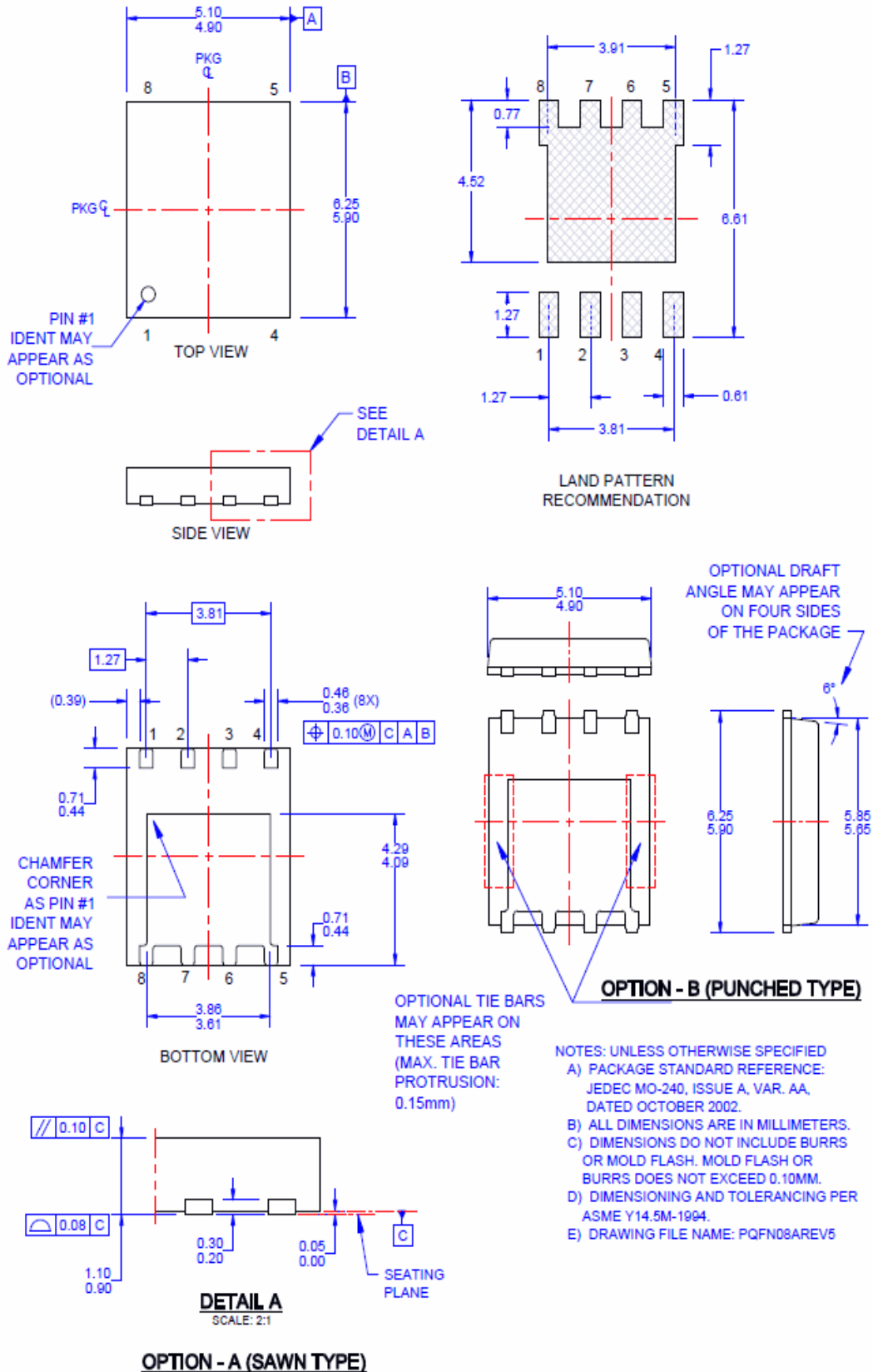


Total Gate Charge Q_{sync} . Test Circuit & Waveforms



$$Q_{sync} = \frac{1}{R_G} \cdot \int V_{R_G}(t) dt$$


Dimensional Outline and Pad Layout





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