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FDB2710

N-Channel PowerTrench® MOSFET

250 V, 50 A, 42.5 mΩ

Features

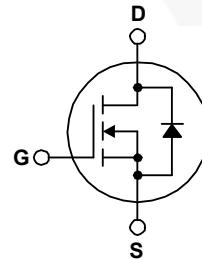
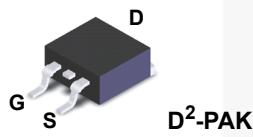
- $R_{DS(on)} = 36.3 \text{ mΩ}$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 25 \text{ A}$
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- Low Gate Charge
- High Power and Current Handling Capability

General Description

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

Applications

- Synchronous Rectification
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



Absolute Maximum Ratings

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

| Symbol | Parameter | FDB2710 | Unit |
|----------------|--|---|--|
| V_{DS} | Drain-Source Voltage | 250 | V |
| V_{GS} | Gate-Source voltage | ± 30 | V |
| I_D | Drain Current | <ul style="list-style-type: none"> - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$) | <ul style="list-style-type: none"> 50 31.3 |
| I_{DM} | Drain Current | <ul style="list-style-type: none"> - Pulsed (Note 1) | See Figure 9 |
| E_{AS} | Single Pulsed Avalanche Energy | (Note 2) | mJ |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | V/ns |
| P_D | Power Dissipation | <ul style="list-style-type: none"> ($T_C = 25^\circ\text{C}$) - Derate above 25°C | <ul style="list-style-type: none"> 260 2.1 |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | °C |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | °C |

Thermal Characteristics

| Symbol | Parameter | FDB2710 | Unit |
|-----------------|--|---------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max. | 0.48 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (minimum pad of 2 oz copper), Max. | 62.5 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (1 in ² pad of 2 oz copper), Max. | 40 | °C/W |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|---------|---------------------|-----------|------------|-----------|
| FDB2710 | FDB2710 | D ² -PAK | 330 mm | 24 mm | 800 units |

Electrical Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|--|-----|------|----------|--------------------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{\text{GS}} = 0\text{V}$, $I_D = 250\mu\text{A}$, $T_J = 25^\circ\text{C}$ | 250 | -- | -- | V |
| $\Delta\text{BV}_{\text{DSS}} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, Referenced to 25°C | -- | 0.25 | -- | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{\text{DS}} = 250\text{V}$, $V_{\text{GS}} = 0\text{V}$ $V_{\text{DS}} = 250\text{V}$, $V_{\text{GS}} = 0\text{V}$, $T_C = 125^\circ\text{C}$ | -- | -- | 1 500 | μA μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{\text{GS}} = 30\text{V}$, $V_{\text{DS}} = 0\text{V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{\text{GS}} = -30\text{V}$, $V_{\text{DS}} = 0\text{V}$ | -- | -- | -100 | nA |
| On Characteristics | | | | | | |
| $V_{\text{GS(th)}}$ | Gate Threshold Voltage | $V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250\mu\text{A}$ | 3.0 | 4.0 | 5.0 | V |
| $R_{\text{DS(on)}}$ | Static Drain-Source On-Resistance | $V_{\text{GS}} = 10\text{V}$, $I_D = 25\text{A}$ | -- | 36.3 | 42.5 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{\text{DS}} = 10\text{V}$, $I_D = 25\text{A}$ | -- | 63 | -- | S |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{\text{DS}} = 25\text{V}$, $V_{\text{GS}} = 0\text{V}$, $f = 1.0\text{MHz}$ | -- | 5470 | 7280 | pF |
| C_{oss} | Output Capacitance | | -- | 426 | 570 | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 97 | 146 | pF |
| Switching Characteristics | | | | | | |
| $t_{\text{d(on)}}$ | Turn-On Delay Time | $V_{\text{DD}} = 125\text{V}$, $I_D = 50\text{A}$ $V_{\text{GS}} = 10\text{V}$, $R_{\text{GEN}} = 25\Omega$ | -- | 80 | 170 | ns |
| t_r | Turn-On Rise Time | | -- | 252 | 515 | ns |
| $t_{\text{d(off)}}$ | Turn-Off Delay Time | | -- | 112 | 235 | ns |
| t_f | Turn-Off Fall Time | | -- | 154 | 320 | ns |
| Q_g | Total Gate Charge | $V_{\text{DS}} = 125\text{V}$, $I_D = 50\text{A}$ $V_{\text{GS}} = 10\text{V}$ | -- | 78 | 101 | nC |
| Q_{gs} | Gate-Source Charge | | -- | 34 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | -- | 18 | -- | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I_S | Maximum Continuous Drain-Source Diode Forward Current | $V_{\text{GS}} = 0\text{V}$, $I_S = 50\text{A}$ | -- | -- | 50 | A |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 150 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{\text{GS}} = 0\text{V}$, $I_S = 50\text{A}$ | -- | -- | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $V_{\text{GS}} = 0\text{V}$, $I_S = 50\text{A}$ $dI/dt = 100\text{A}/\mu\text{s}$ | -- | 163 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | | -- | 1.3 | -- | μC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 1\text{mH}$, $I_{\text{AS}} = 17\text{A}$, $V_{\text{DD}} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{\text{SD}} \leq 50\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{\text{DD}} \leq \text{BV}_{\text{DSS}}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

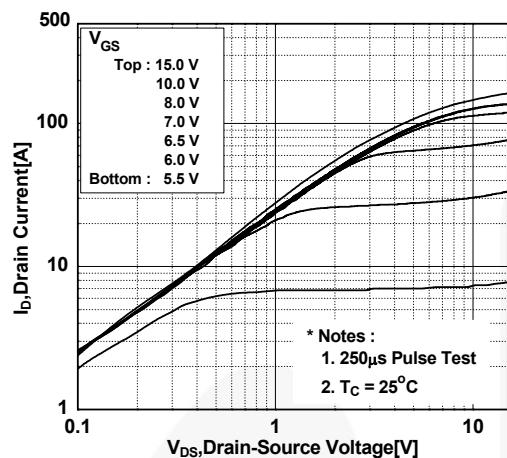


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

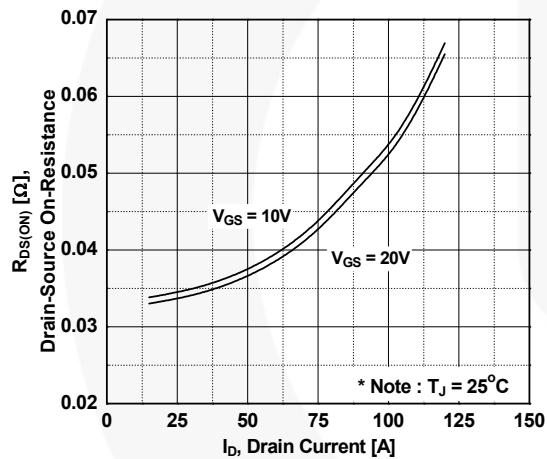


Figure 5. Capacitance Characteristics

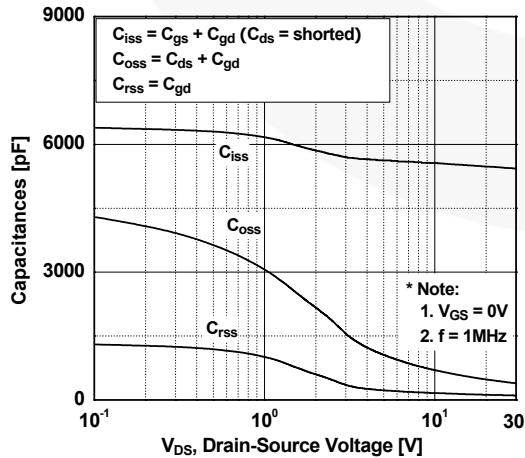


Figure 2. Transfer Characteristics

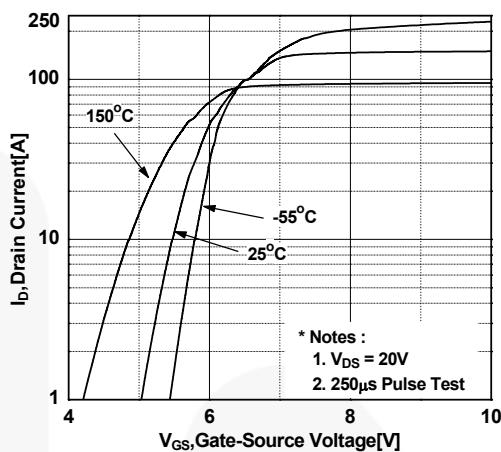


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

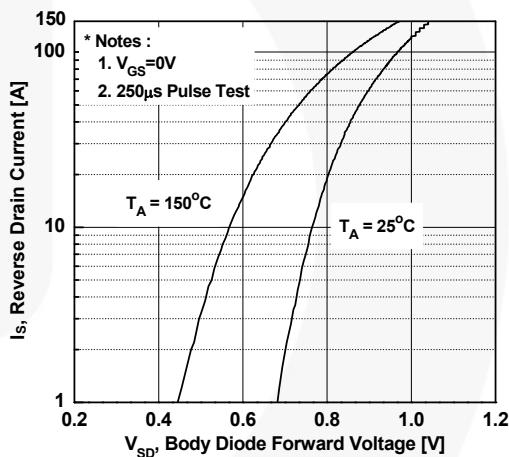
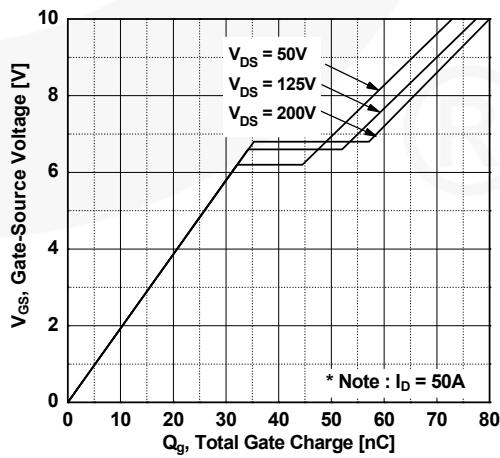


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

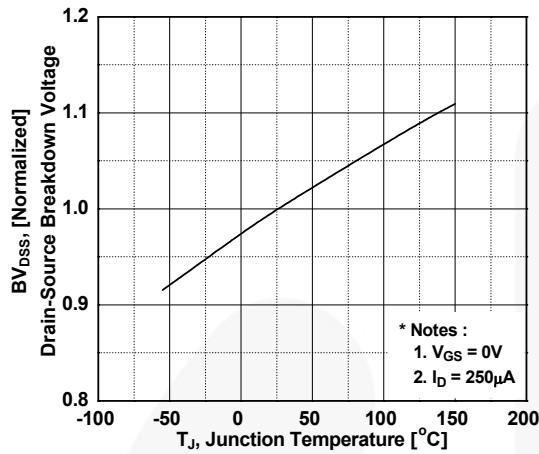


Figure 9. Maximum Safe Operating Area

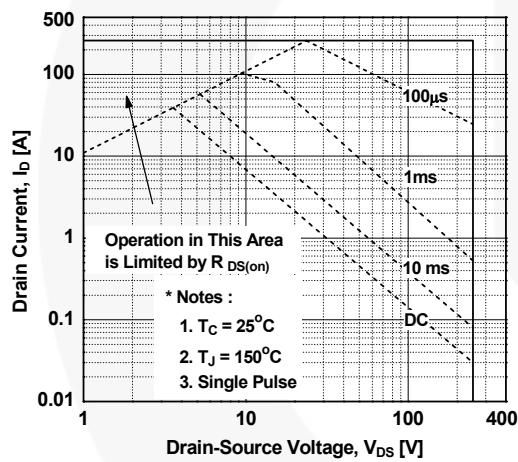


Figure 8. On-Resistance Variation vs. Temperature

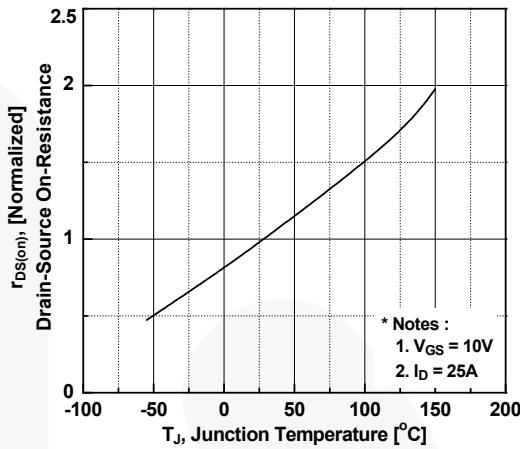


Figure 10. Maximum Drain Current vs. Case Temperature

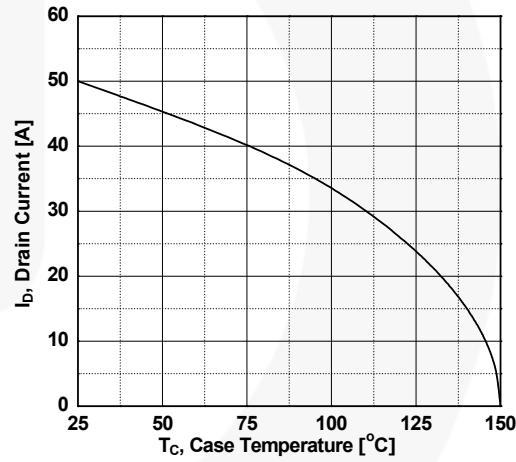


Figure 11. Transient Thermal Response Curve

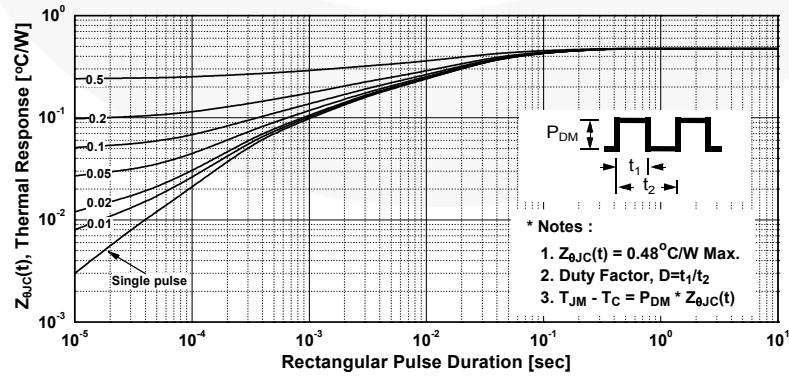


Figure 12. Gate Charge Test Circuit & Waveform

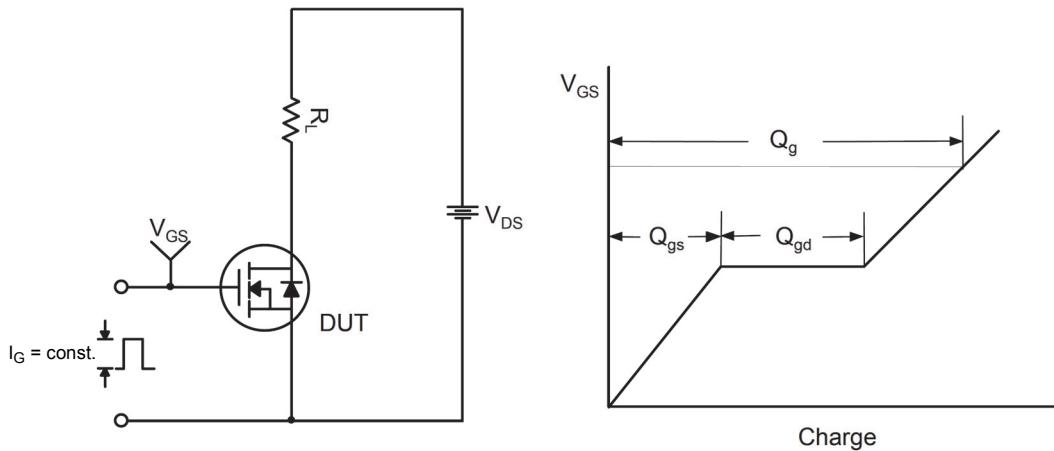


Figure 13. Resistive Switching Test Circuit & Waveforms

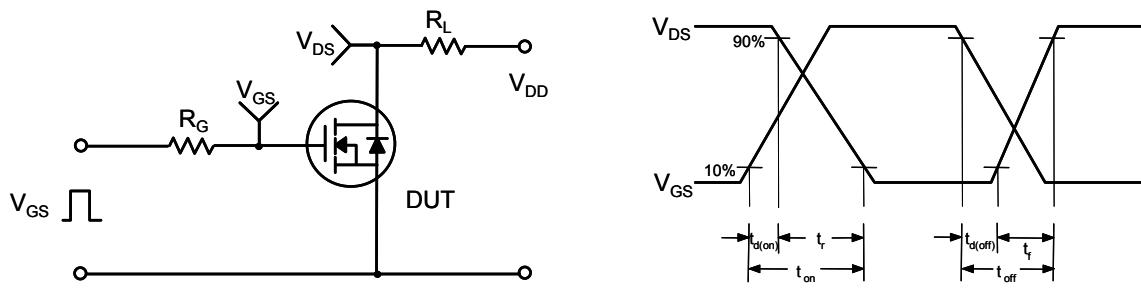


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

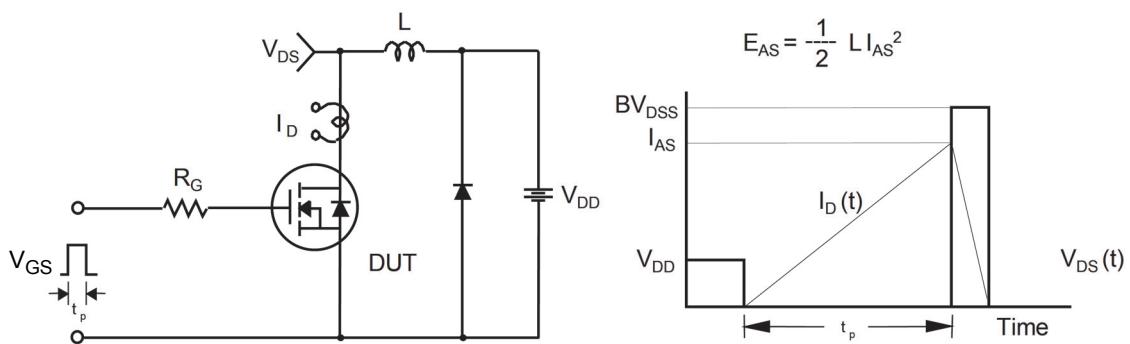
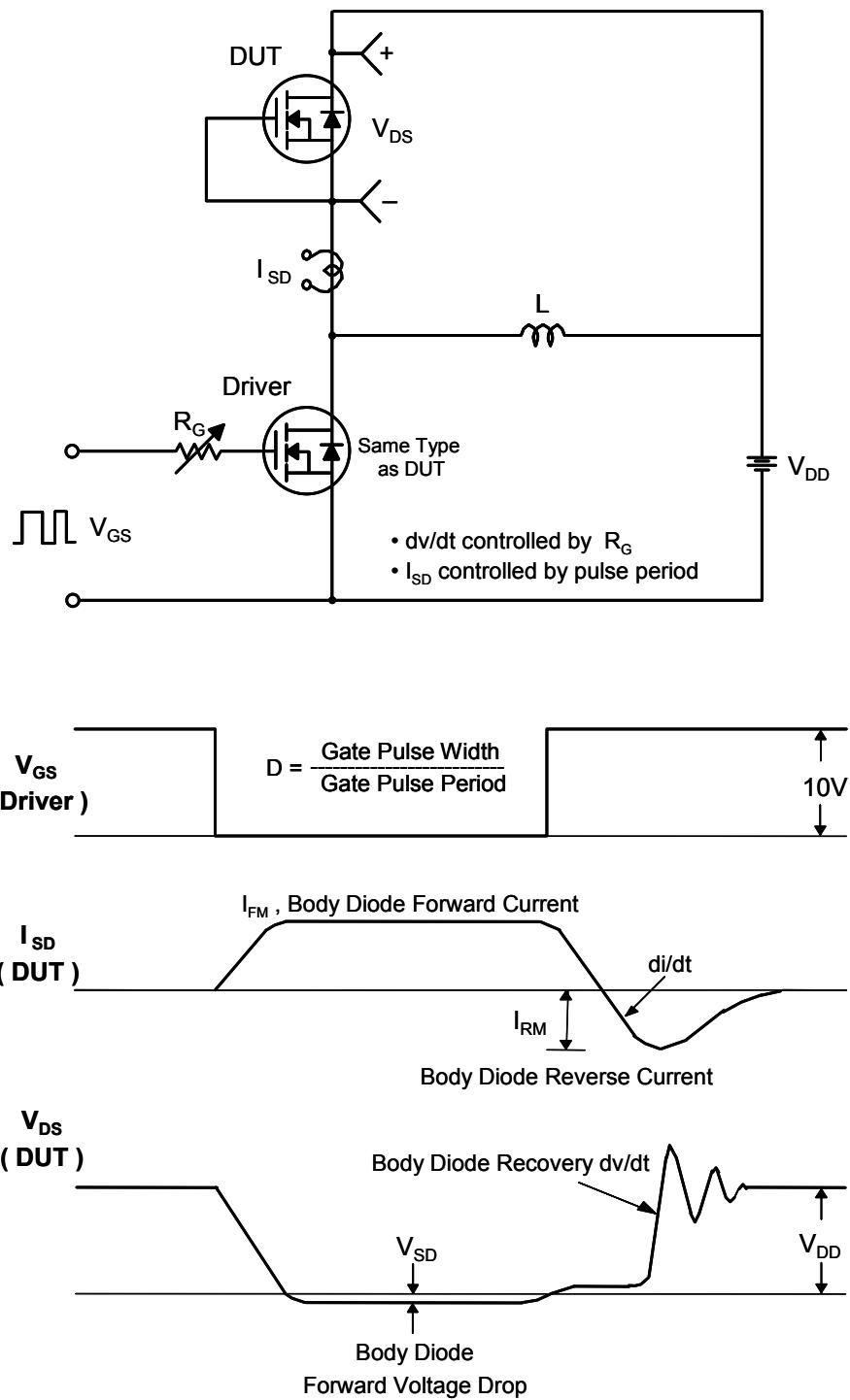


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-263 2L (D²PAK)

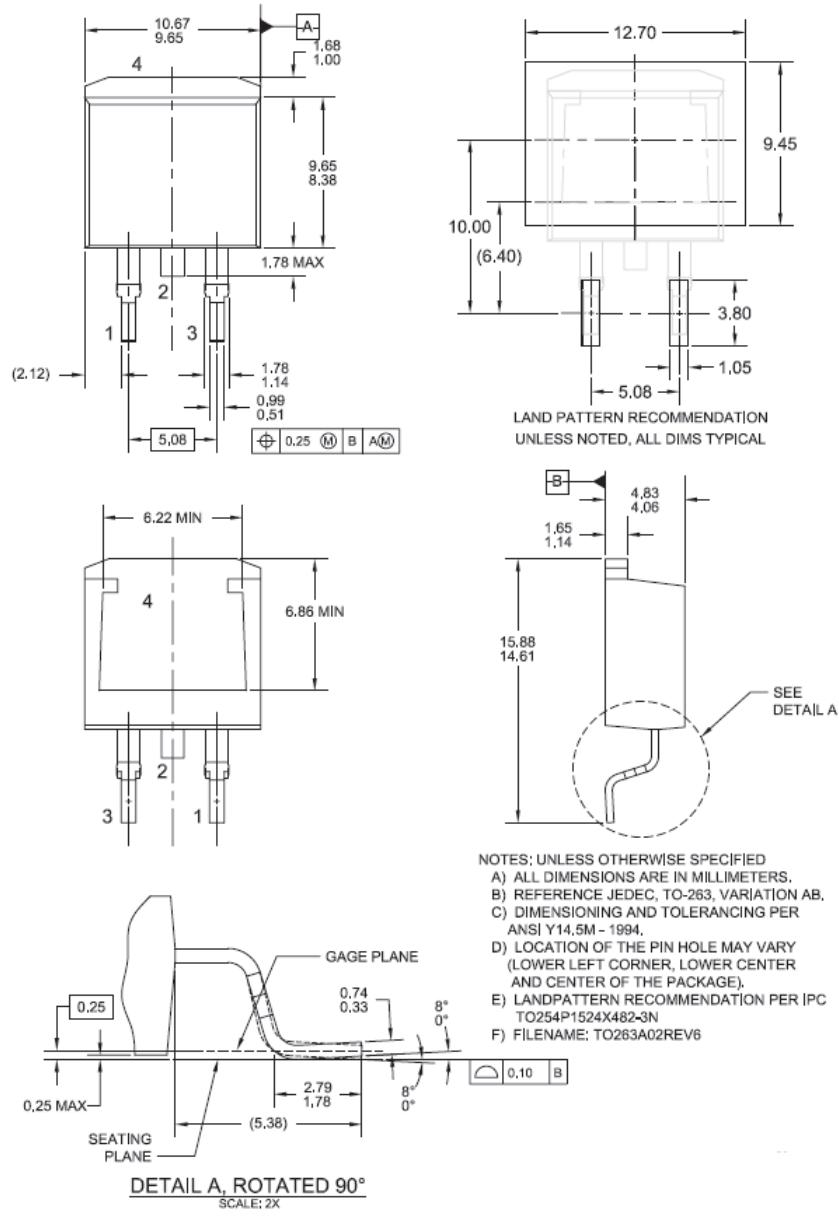


Figure 16. 2LD, TO263, Surface Mount

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Dimension in Millimeters



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