FAIRCHILD SEMICONDUCTOR®

February 2011

# FDB110N15A

## N-Channel PowerTrench® MOSFET

**150V, 92A, 11mΩ**

## Features

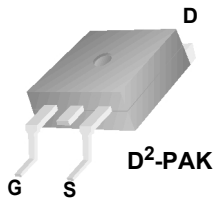
- $R_{DS(on)}$ = 9.25mΩ ( Typ.)@ $V_{GS}$ = 10V, $I_D$ = 92A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

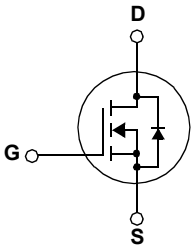
## Description

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

## Application

- DC to DC Converters
- Synchronous Rectification for Telecommunication PUS
- Battery Charger
- AC Motor Drives and Uninterruptible Power Supplies
- Off-line UPS




## MOSFET Maximum Ratings $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | | | Ratings | Units |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | | 150 | V |
| $V_{GSS}$ | Gate to Source Voltage | | | ±20 | V |
| $I_D$ | Drain Current | -Continuous ($T_C$ = 25°C) | | 92 | A |
| | | -Continuous ($T_C$ = 100°C) | | 65 | |
| $I_{DM}$ | Drain Current | - Pulsed | (Note 1) | 369 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy | | (Note 2) | 365 | mJ |
| dv/dt | Peak Diode Recovery dv/dt | | (Note 3) | 6.0 | V/ns |
| $P_D$ | Power Dissipation | ($T_C$ = 25°C) | | 234 | W |
| | | - Derate above 25°C | | 1.56 | W/°C |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | | -55 to +175 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | | | 300 | °C |

## Thermal Characteristics

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 0.64 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 62.5 | |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDB110N15A | FDB110N15A | D2-PAK | 330mm | 24mm | 800 |

## Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 150 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250μA, Referenced to 25°C | - | 0.09 | - | V/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 120V, $V_{GS}$ = 0V | - | - | 1 | μA |
| | | $V_{DS}$ = 120V, $T_C$ = 150°C | - | - | 500 | |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 2.0 | - | 4.0 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10V, $I_D$ = 92A | - | 9.25 | 11.0 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 10V, $I_D$ = 92A (Note 4) | - | 118 | - | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 75V, $V_{GS}$ = 0V, f = 1MHz | - | 3390 | 4510 | pF |
| $C_{oss}$ | Output Capacitance | | - | 334 | 445 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 14 | - | pF |
| $C_{oss}$(er) | Engry Releted Output Capacitance | $V_{DS}$ = 75V, $I_D$ = 92A | - | 583 | - | pF |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{GS}$ = 10V, $V_{DS}$ = 75V, $I_D$ = 92A (Note 4, 5) | - | 47 | 61 | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | - | 16 | - | nC |
| $Q_{gs2}$ | Gate Charge Threshold to Plateau | | - | 7.9 | - | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | - | 9.7 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 75V, $I_D$ = 92A, $V_{GS}$ = 10V, $R_{GEN}$ = 4.7Ω (Note 4, 5) | - | 25 | 60 | ns |
| $t_r$ | Turn-On Rise Time | | - | 26 | 62 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 46 | 102 | ns |
| $t_f$ | Turn-Off Fall Time | | - | 14 | 38 | ns |
| ESR | Equivalent Series Resistance (G-S) | Drain Open, f = 1MHz | - | 2.5 | - | Ω |
| **Drain-Source Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 92 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 369 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_{SD}$ = 92A | - | - | 1.25 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0V, $I_{SD}$ = 92A, $V_{DD}$ = 75V, $dI_F/dt$ = 100A/μs (Note 4) | - | 89 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 255 | - | nC |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 3mH, $I_{AS}$ = 15.6A, $R_G$ = 25Ω, Starting $T_J$ = 25°C
3. $I_{SD} \le$ 92A, di/dt ≤ 200A/μs, $V_{DD} \le BV_{DSS}$, Starting $T_J$ = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Dual Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

**Figure 1. On-Region Characteristics**

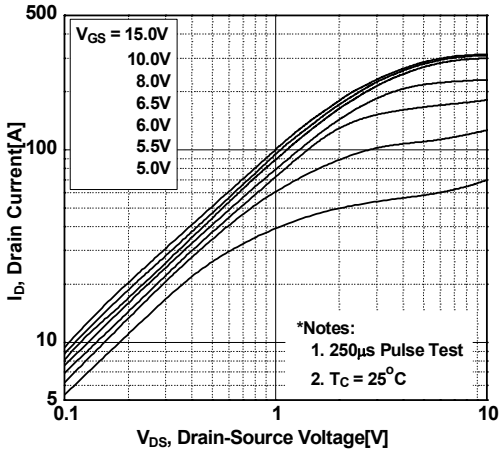



**Figure 2. Transfer Characteristics**

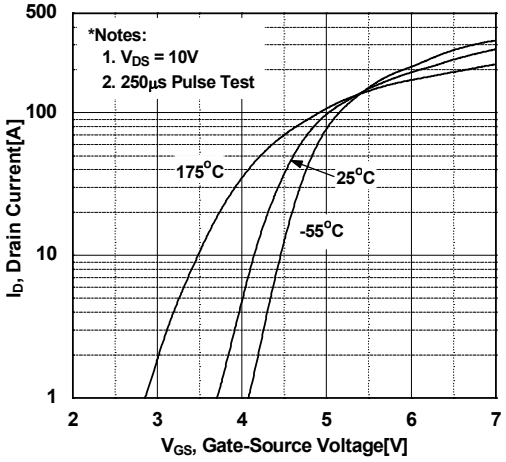



**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**

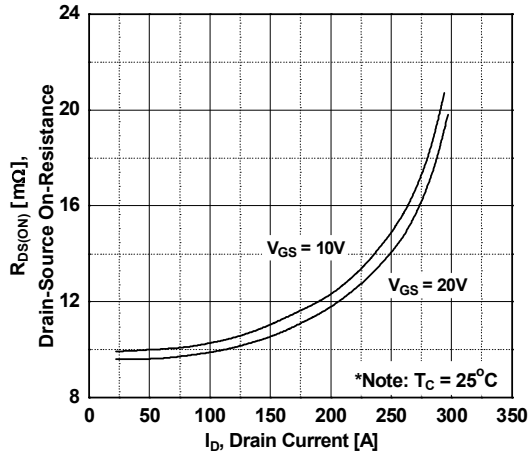



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

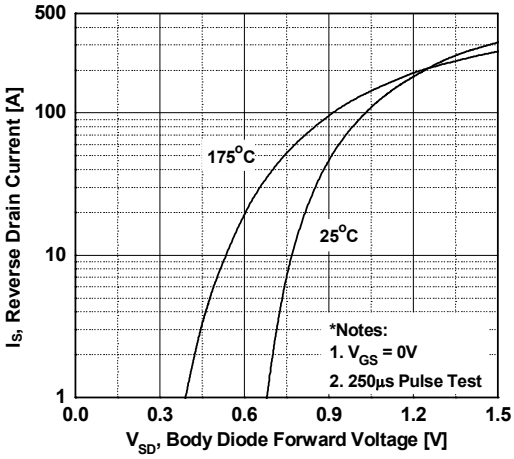



**Figure 5. Capacitance Characteristics**

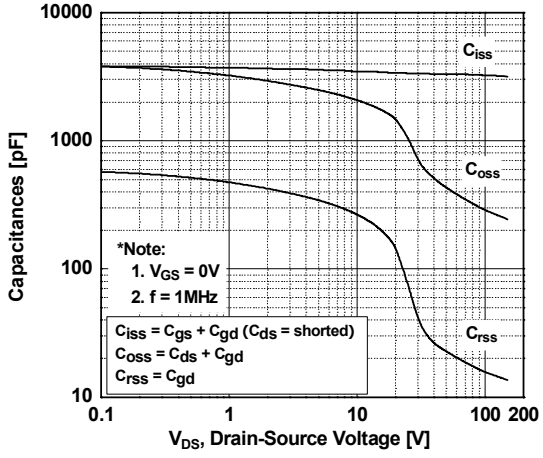
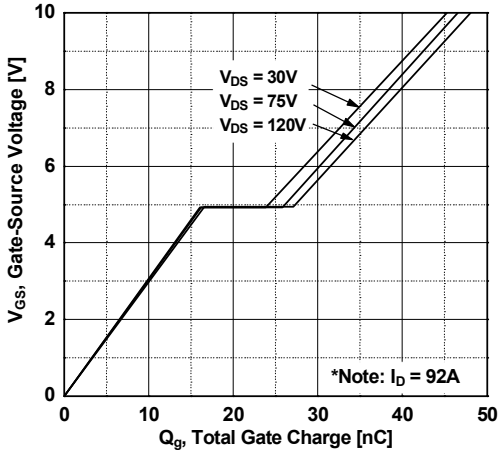



**Figure 6. Gate Charge Characteristics**



## Typical Performance Characteristics (Continued)

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

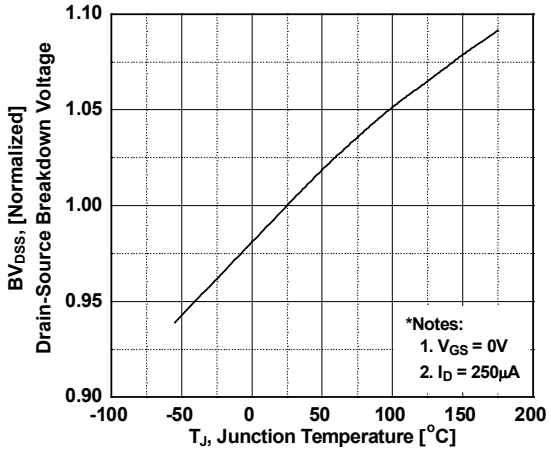



**Figure 8. On-Resistance Variation vs. Temperature**

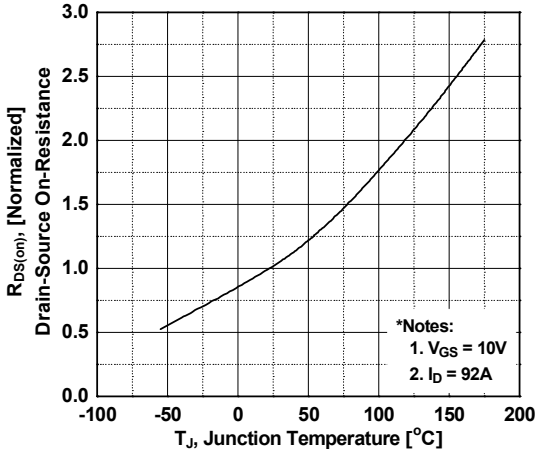



**Figure 9. Maximum Safe Operating Area vs. Case Temperature**

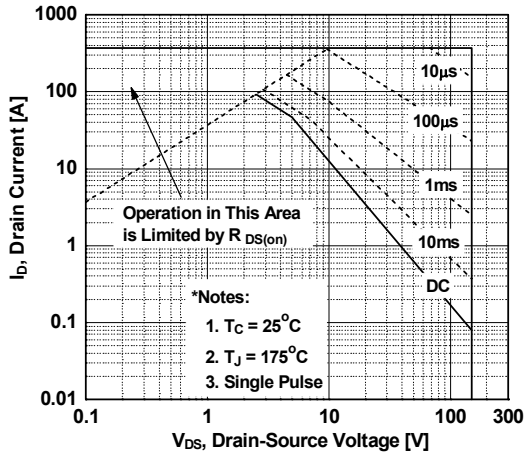



**Figure 10. Maximum Drain Current**

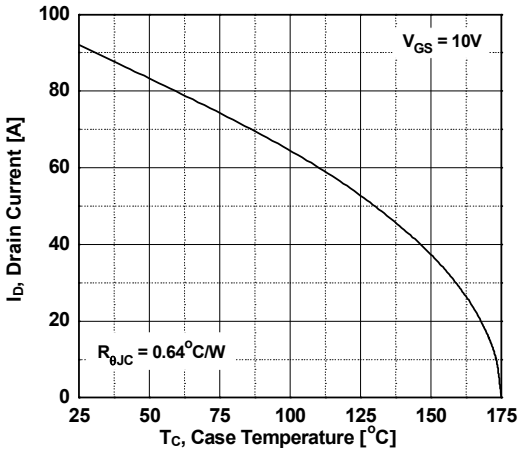
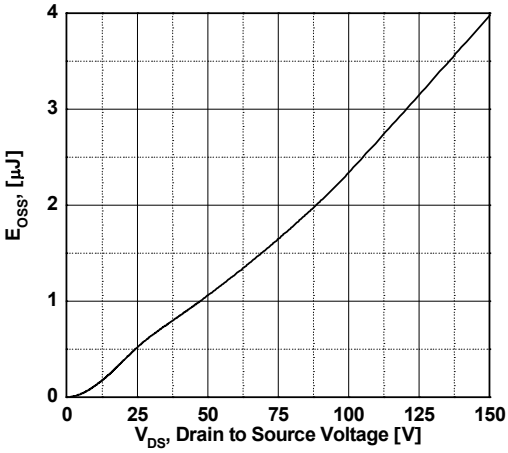
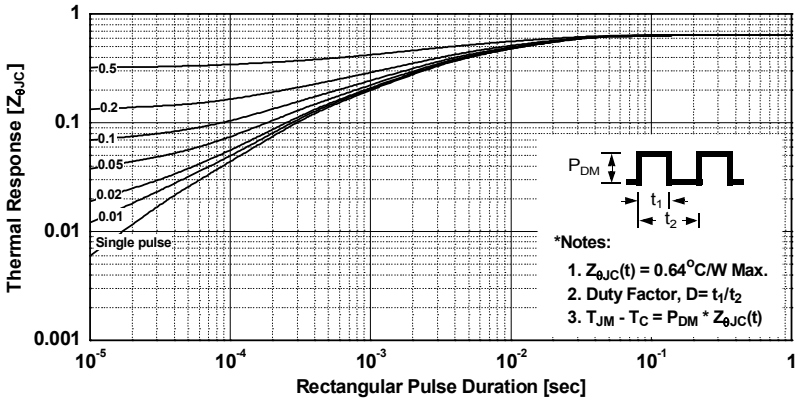



**Figure 11. Eoss vs. Drain to Source Voltage**

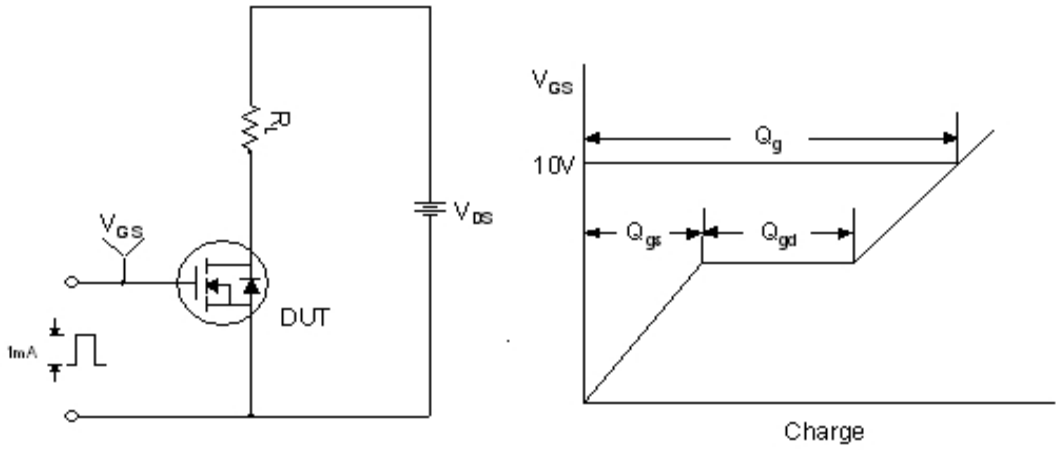


## Typical Performance Characteristics (Continued)

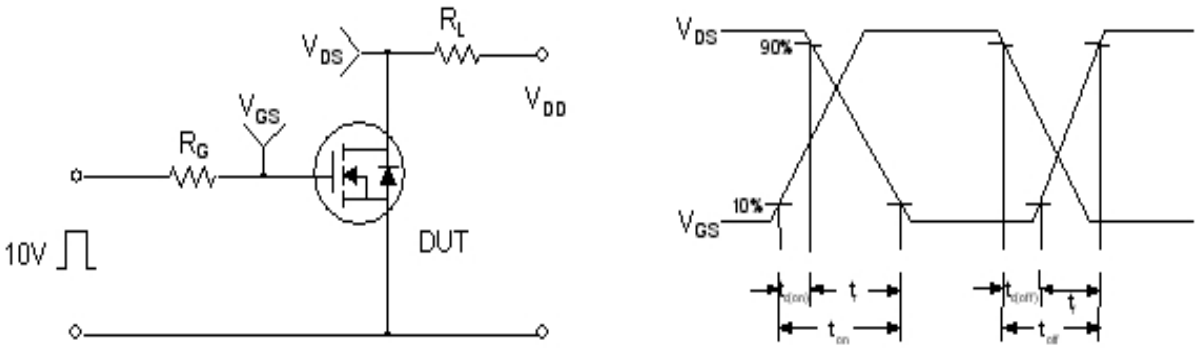
**Figure 12. Transient Thermal Response Curve**



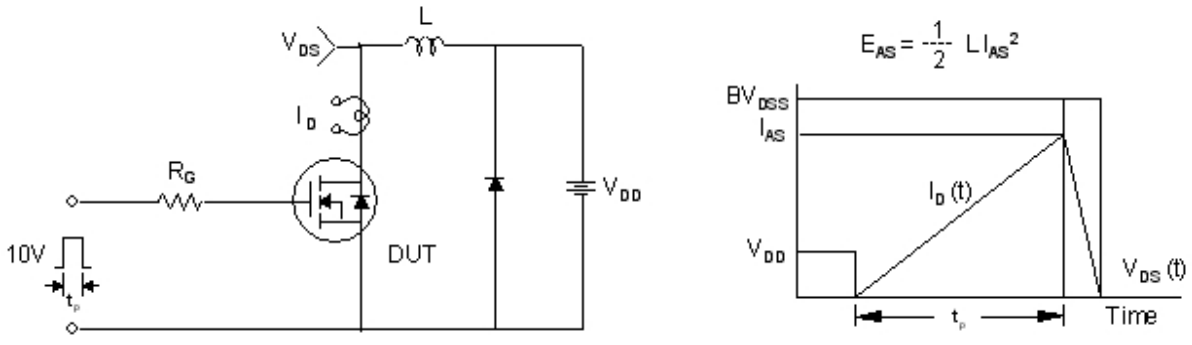
**Gate Charge Test Circuit & Waveform**



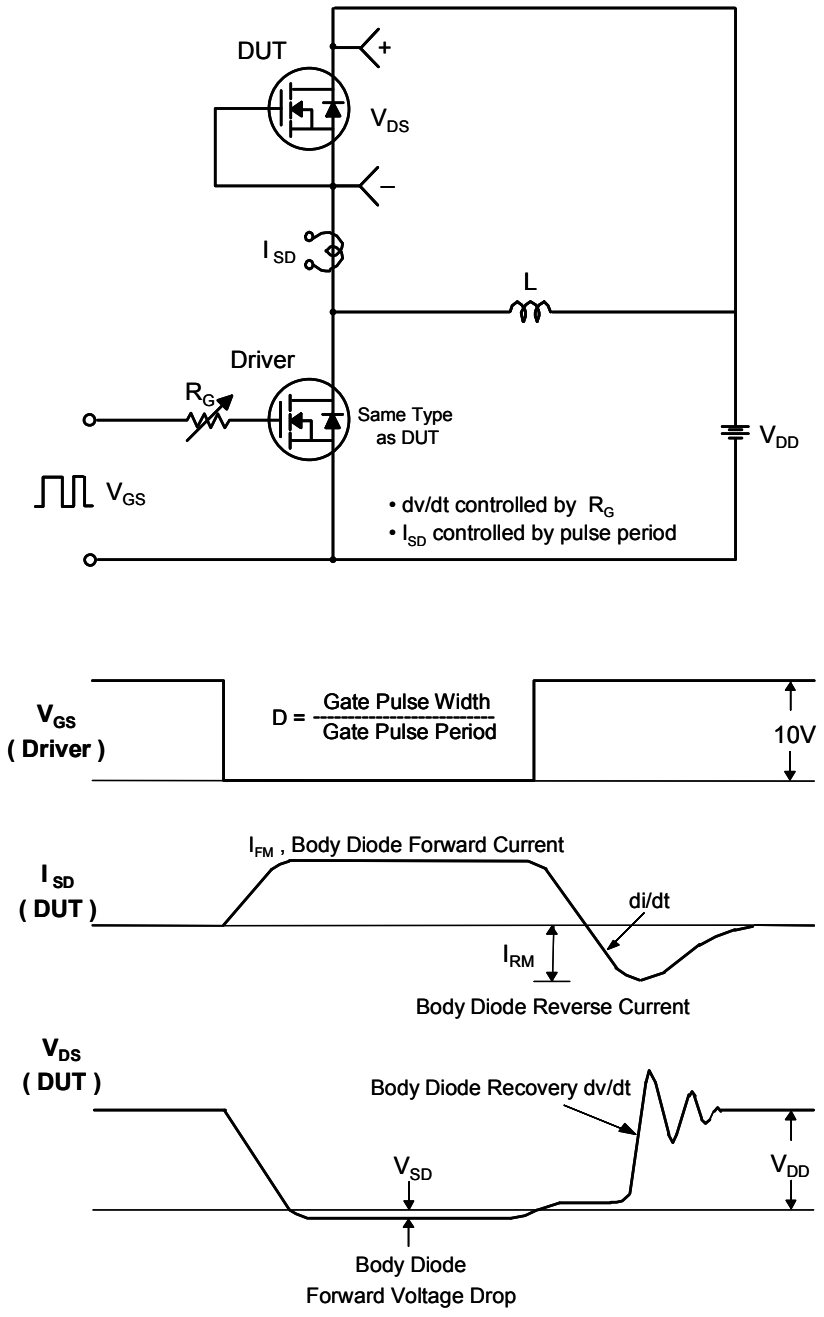

**Resistive Switching Test Circuit & Waveforms**




**Unclamped Inductive Switching Test Circuit & Waveforms**

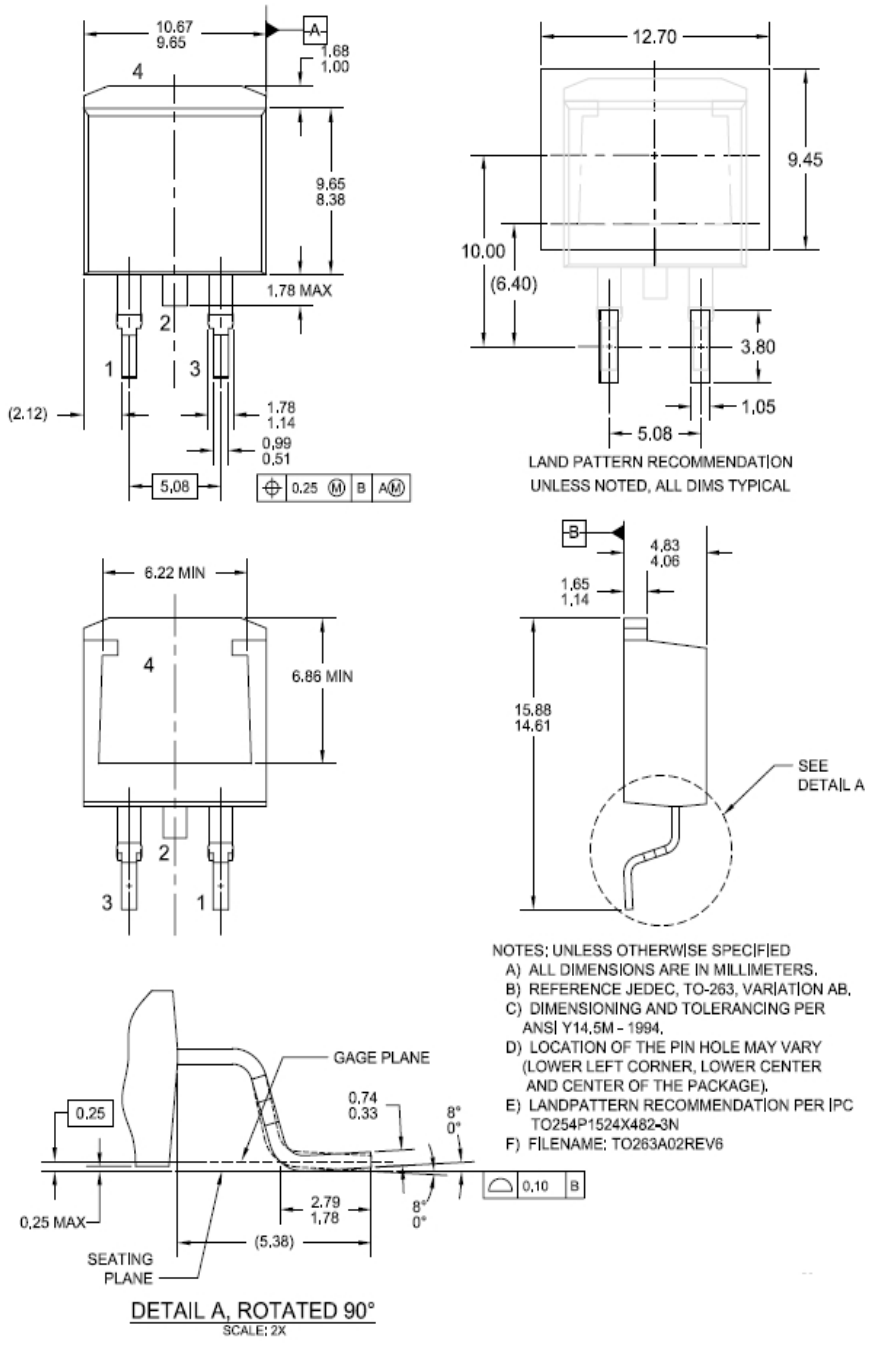


**Peak Diode Recovery dv/dt Test Circuit & Waveforms**



## Mechanical Dimensions

# D²PAK




Dimensions in Millimeters

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