# Lonten N-channel 30V, 51A, 5.2mΩ Power MOSFET

## Description

These N-Channel enhancement mode power field effect transistors are using split gate trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

## Features

- 30V,51A, $R_{DS(on),max}$ =5.2mΩ@$V_{GS}$ = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

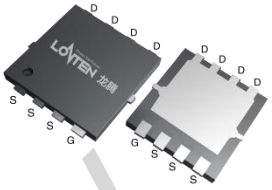
## Applications

- Motor Drives
- UPS
- DC-DC Converter

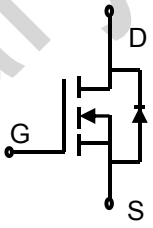
## Product Summary

| | |
|---|---|
| $V_{DSS}$ | 30V |
| $R_{DS(on),max}$@ $V_{GS}$=10V | 5.2mΩ |
| $I_D$ | 51A |

## Pin Configuration



PRPAK3×3




N-Channel MOSFET



## Absolute Maximum Ratings

$T_C$ = 25°C unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 30 | V |
| Continuous drain current ( $T_C$ = 25°C ) | $I_D$ | 51 | A |
| ( $T_C$ = 100°C ) | | 35 | A |
| Pulsed drain current[1)] | $I_{DM}$ | 153 | A |
| Gate-Source voltage | $V_{GSS}$ | ±20 | V |
| Avalanche energy[2)] | $E_{AS}$ | 16.2 | mJ |
| Power Dissipation | $P_D$ | 28 | W |
| Storage Temperature Range | $T_{STG}$ | -55 to +150 | °C |
| Operating Junction Temperature Range | $T_J$ | -55 to +150 | °C |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 4.5 | °C/W |
| Thermal Resistance Junction-to-Ambient | $R_{\theta JA}$ | 60 | °C/W |

## Package Marking and Ordering Information

| Device | Device Package | Marking |
|---|---|---|
| LSGNE03R052WB | PRPAK3X3 | 03R052 |

## Electrical Characteristics

$T_J$ = 25°C unless otherwise noted

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0 V, $I_D$=250uA | 30 | --- | --- | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 1.2 | 1.7 | 2.5 | V |
| Drain-source leakage current | $I_{DSS}$ | $V_{DS}$=30 V, $V_{GS}$=0V | --- | --- | 1 | μA |
| Gate leakage current, Forward | $I_{GSSF}$ | $V_{GS}$=20 V, $V_{DS}$=0 V | --- | --- | 100 | nA |
| Gate leakage current, Reverse | $I_{GSSR}$ | $V_{GS}$=-20 V, $V_{DS}$=0 V | --- | --- | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10 V, $I_D$=20 A | --- | 4.2 | 5.2 | mΩ |
| | | $V_{GS}$=4.5 V, $I_D$=15 A | --- | 6.5 | 9 | mΩ |
| Forward transconductance | $g_{fs}$ | $V_{DS}$ =5V , $I_D$=20A | --- | 66 | --- | S |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, F = 1MHz | --- | 1115 | --- | pF |
| Output capacitance | $C_{oss}$ | | --- | 437 | --- | |
| Reverse transfer capacitance | $C_{rss}$ | | --- | 56 | --- | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 15V,$V_{GS}$=10V, $I_D$ = 20A $R_G$=3.3Ω | --- | 7.1 | --- | ns |
| Rise time | $t_r$ | | --- | 19 | --- | |
| Turn-off delay time | $t_{d(off)}$ | | --- | 19.3 | --- | |
| Fall time | $t_f$ | | --- | 3.4 | --- | |
| Gate resistance | Rg | $V_{GS}$=0 V,$V_{DS}$=0 V, F=1MHz | --- | 1.6 | --- | Ω |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DS}$=15V, $I_D$=20A, $V_{GS}$= 10 V | --- | 2.9 | --- | nC |
| Gate to drain charge | $Q_{gd}$ | | --- | 3.5 | --- | |
| Gate charge total | $Q_g$ | | --- | 16.5 | --- | |
| **Drain-Source diode characteristics and Maximum Ratings** | | | | | | |
| Continuous Source Current | $I_S$ | | --- | --- | 23 | A |
| Pulsed Source Current[3)] | $I_{SM}$ | | --- | --- | 69 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V, $I_S$=20A, $T_J$=25℃ | --- | --- | 1.2 | V |

Notes:

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

2: $V_{DD}$=25V, $V_{GS}$=10V, L=0.1mH, $I_{AS}$=18A, Starting $T_J$=25℃.

3: Pulse Test：Pulse Width ≤300μs, Duty Cycle≤2%.

## Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

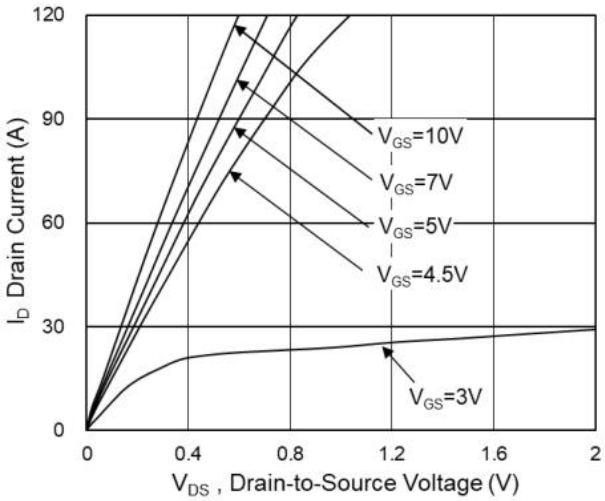



Figure 2. Transfer Characteristics

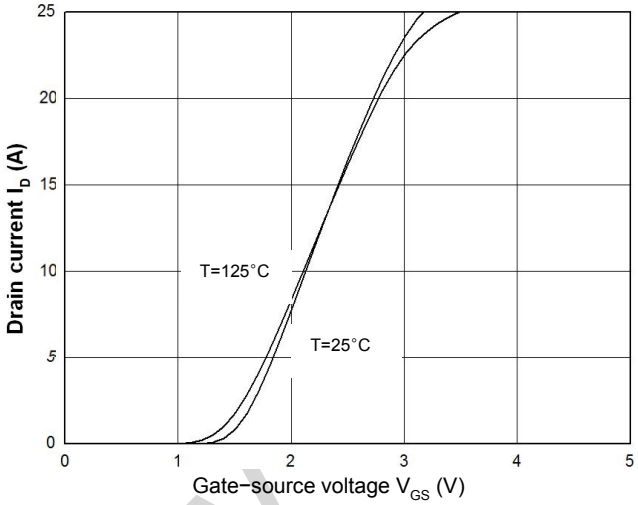



Figure 3. Capacitance Characteristics

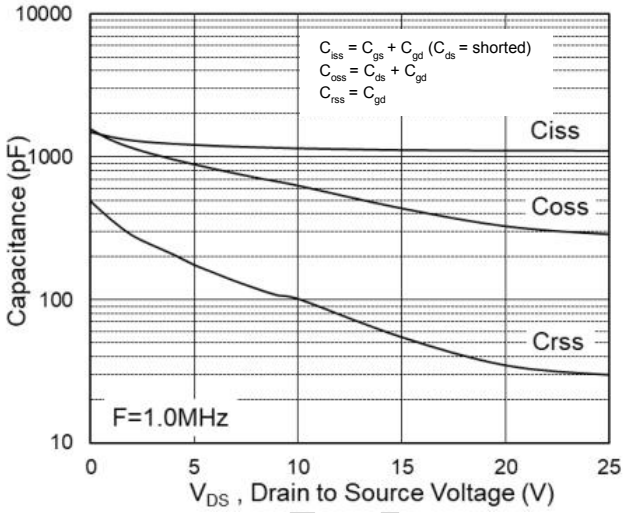



Figure 4. Gate Charge Waveform

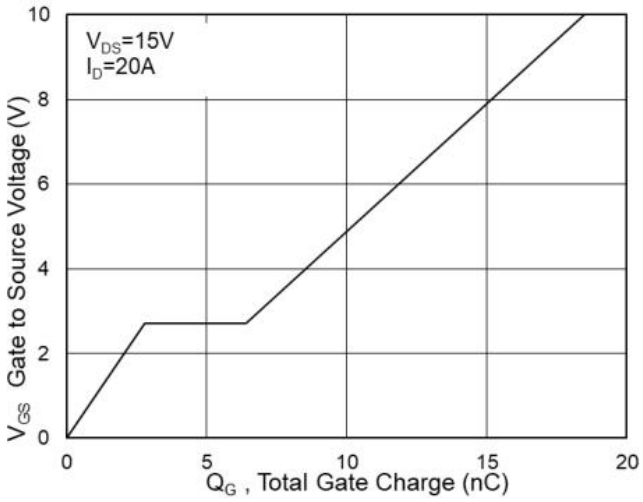



Figure 5. Body-Diode Characteristics

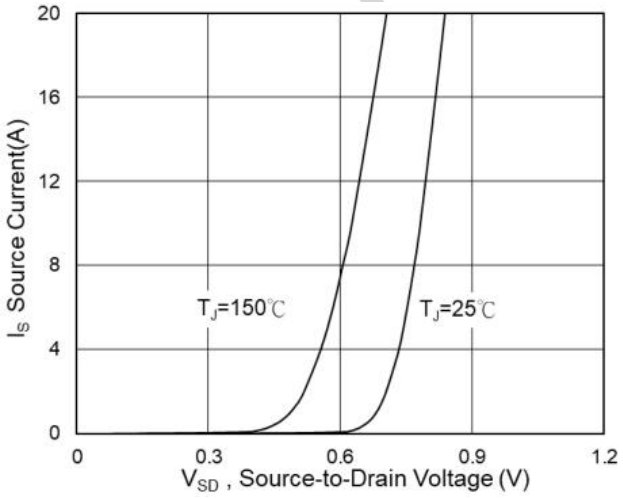



Figure 6. Rdson-Drain Current

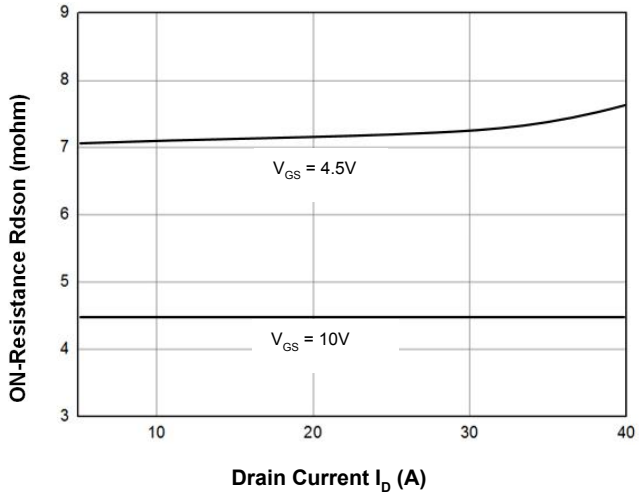


Figure 7. Rdson-Junction Temperature

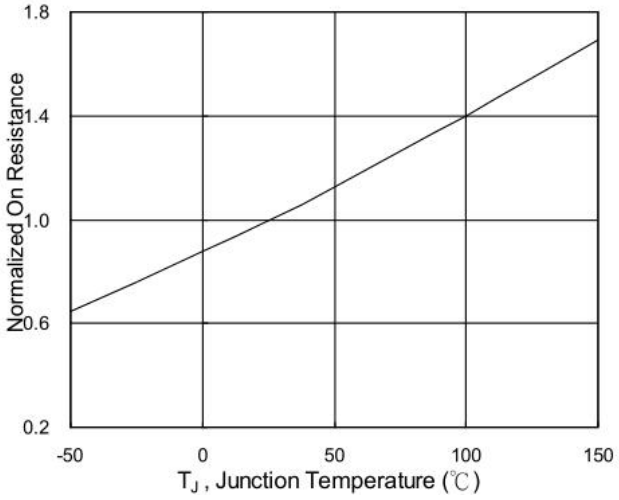



Figure 8. $V_{GS(th)}$-Junction Temperature

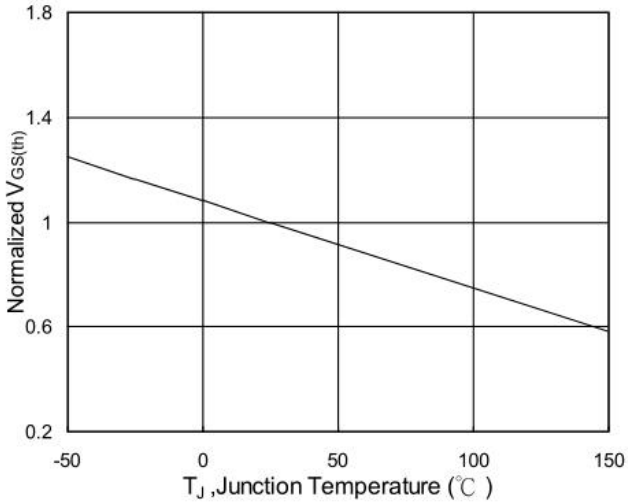



Figure 9. On-Resistance vs. Gate-to-Source voltage

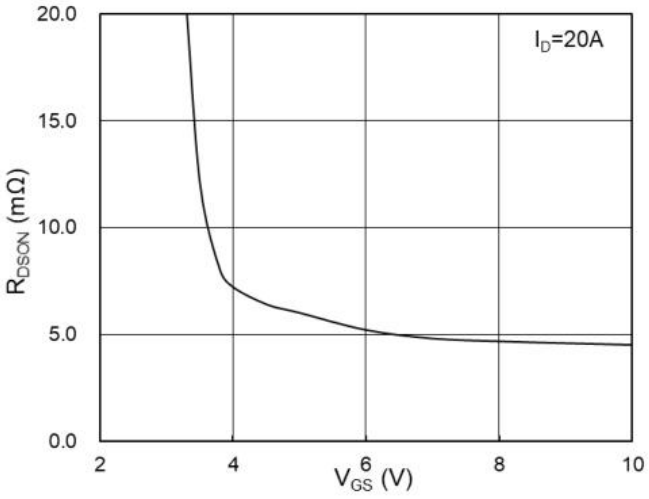



Figure 10: Safe Operating Area

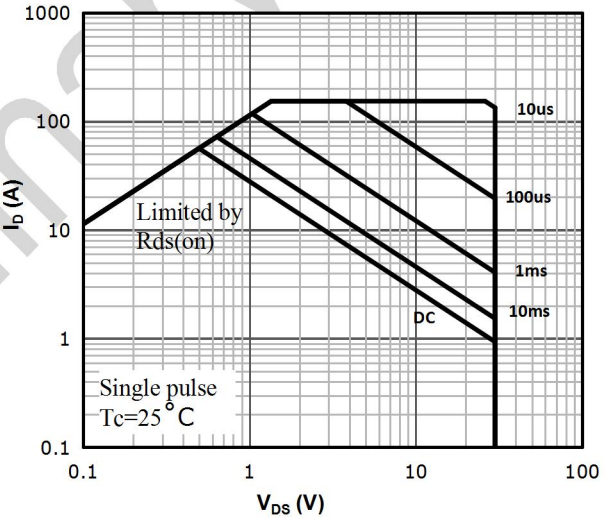
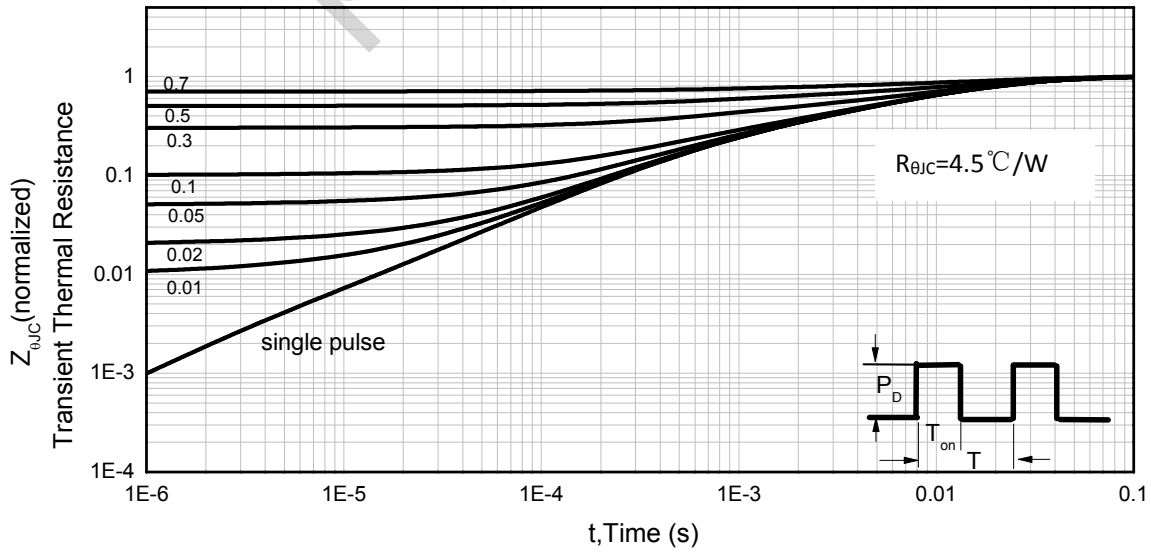
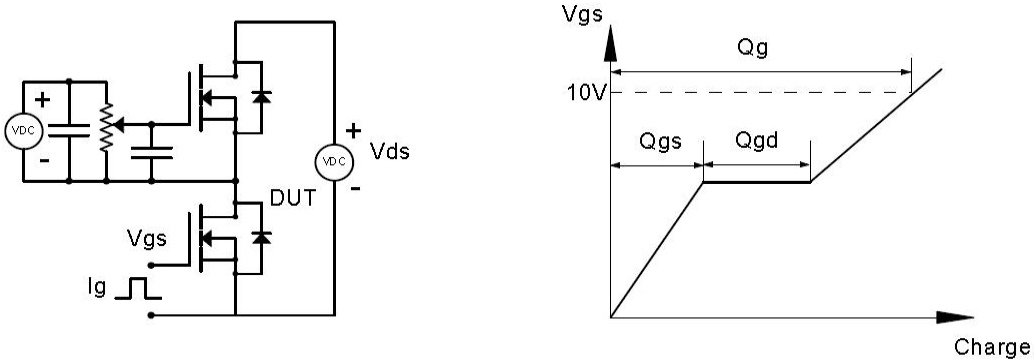



Figure 11. Normalized Maximum Transient Thermal Impedance (RthJC)

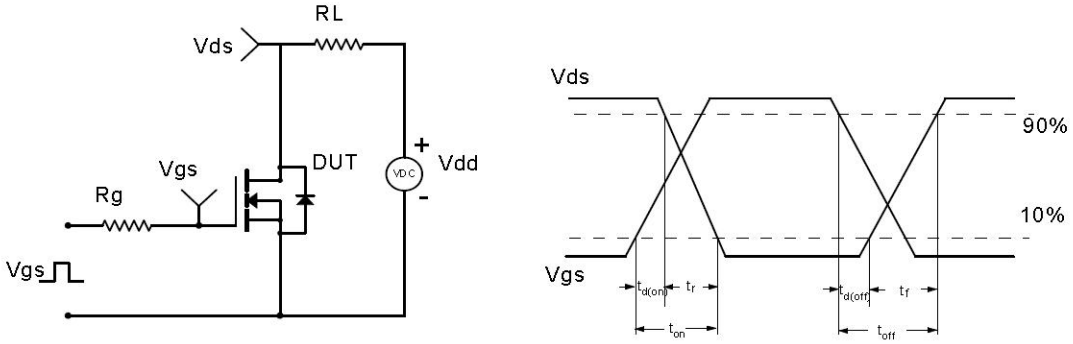


## Test Circuit & Waveform

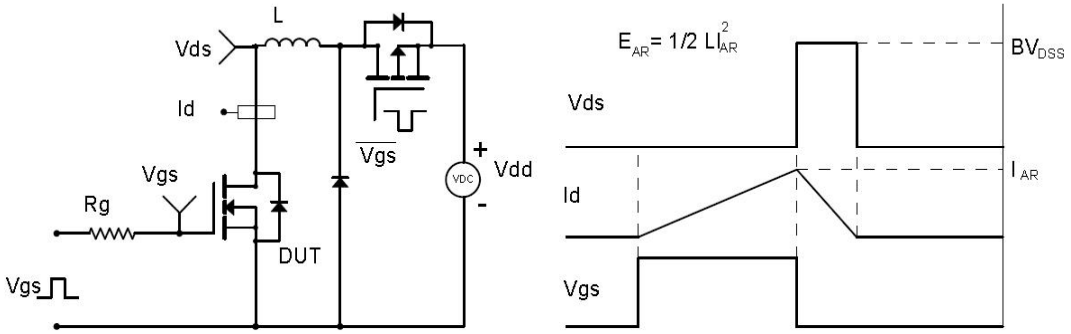
Gate Charge Test Circuit & Waveform



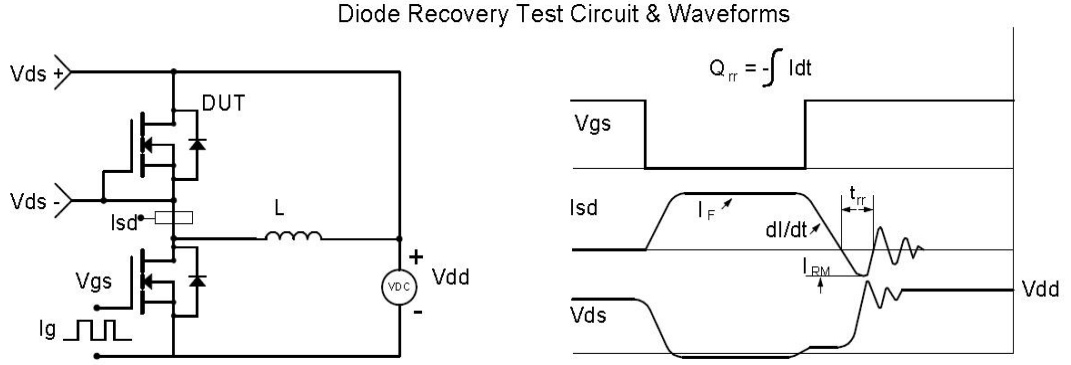

Resistive Switching Test Circuit & Waveforms



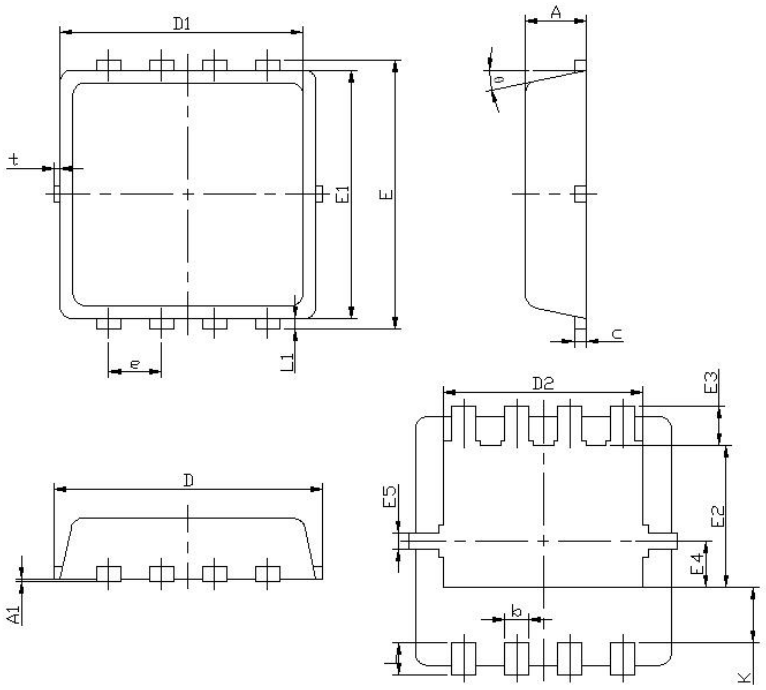

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



## Mechanical Dimensions for PRPAK3×3




| DIMENSIONS IN MILLITMETERS | | | DIMENSIONS IN INCHES | |
|---|---|---|---|---|
| SYMBOL | MIN | MAX | MIN | MAX |
| A | 0.70 | 0.90 | 0.028 | 0.035 |
| A1 | - | 0.15 | - | 0.006 |
| b | 0.20 | 0.40 | 0.008 | 0.016 |
| c | 0.10 | 0.25 | 0.004 | 0.010 |
| D | 3.00 | 3.60 | 0.118 | 0.142 |
| D1 | 2.90 | 3.25 | 0.114 | 0.128 |
| D2 | 2.25 | 2.69 | 0.089 | 0.106 |
| E | 3.00 | 3.60 | 0.118 | 0.142 |
| E1 | 2.90 | 3.20 | 0.114 | 0.126 |
| E2 | 1.54 | 2.2 | 0.061 | 0.087 |
| E3 | 0.28 | 0.65 | 0.011 | 0.026 |
| E4 | 0.37 | 0.77 | 0.015 | 0.030 |
| E5 | 0.075 | 0.3 | 0.003 | 0.012 |
| e | 0.6 | 0.7 | 0.024 | 0.028 |
| K | 0.52 | 0.89 | 0.020 | 0.035 |
| L | 0.15 | 0.5 | 0.006 | 0.020 |
| L1 | 0.05 | 0.5 | 0.002 | 0.020 |
| t | - | 0.2 | - | 0.008 |
| θ | 9° | 14° | 9° | 14° |

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