

SLN60P03T

30V P-Channel MOSFET

General Description

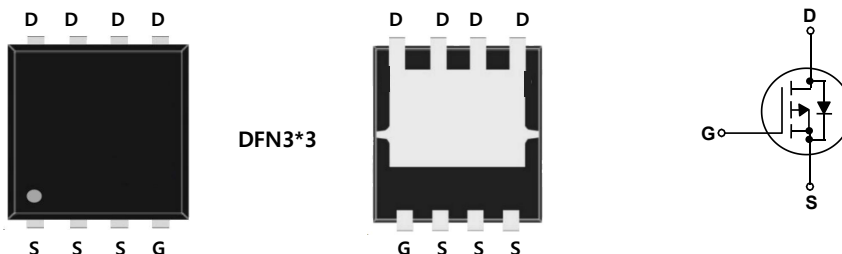
This Power MOSFET is produced using Msemitek's advanced TRENCH technology. This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

Application

- PWM Application
- Load Switch
- Power Management

Features

- P-Channel: -30V -60A
 - $R_{DS(on)Typ} = 7.4m\Omega @ V_{GS} = -10V$
 - $R_{DS(on)Typ} = 11.5m\Omega @ V_{GS} = -4.5V$
- Very Low On-resistance $R_{DS(ON)}$
- Low C_{rss}
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings

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

| Symbol | Parameter | SLN60P03T | Units |
|-----------------|---|-------------|---------------------------|
| V_{DSS} | Drain-Source Voltage | -30 | V |
| I_D | Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$) | -60 | A |
| | | -39 | A |
| I_{DM} | Drain Current - Pulsed (Note 1) | -180 | A |
| V_{GSS} | Gate-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulsed Avalanche Energy | 196 | mJ |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | 50 | W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 2.5 | $^\circ\text{C}/\text{W}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300 | $^\circ\text{C}$ |

* Drain current limited by maximum junction temperature.

Package Marking

| Part Number | Top Marking | Package | Packing Method | MOQ | QTY |
|-------------|-------------|---------|----------------|------|-------|
| SLN60P03T | SLN60P03T | DFN3*3 | Tape & Reel | 5000 | 50000 |

Electrical Characteristics

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Off Characteristics

| | | | | | | |
|------------|------------------------------------|--|-----|----|------|---------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -30 | -- | -- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | -1 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|--|------|------|------|------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -1.2 | -1.6 | -2.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = -10\text{ V}, I_D = -20\text{ A}$ | -- | 7.4 | 9.5 | m Ω |
| | | $V_{GS} = -4.5\text{ V}, I_D = -20\text{ A}$ | -- | 11.5 | 14.5 | |

Dynamic Characteristics

| | | | | | | |
|------------|------------------------------|--|----|------|---|----|
| C_{iss} | Input Capacitance | $V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | -- | 2497 | - | pF |
| C_{oss} | Output Capacitance | | -- | 240 | - | pF |
| C_{riss} | Reverse Transfer Capacitance | | -- | 230 | - | pF |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|---|--|-----|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}, R_L = 3\text{ }\Omega, I_D = -30\text{ A}, T_J = 25^\circ\text{C}$ | -- | 14 | -- | ns |
| t_r | Turn-On Rise Time | | -- | 20 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 56 | -- | ns |
| t_f | Turn-Off Fall Time | | -- | 48 | -- | ns |
| Q_g | Total Gate Charge | | $V_{DS} = -15\text{ V}, I_D = -20\text{ A}, V_{GS} = -10\text{ V}$ | -- | 32 | -- |
| Q_{gs} | Gate-Source Charge | -- | | 6.6 | -- | nC |
| Q_{gd} | Gate-Drain Charge | -- | | 8.0 | -- | nC |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | |
|----------|---|----|---|------|---|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | -- | - | -60 | A |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | -- | - | -180 | A |
| V_{SD} | Drain to Source Diode Forward Voltage, $V_{GS} = 0\text{ V}, I_{SD} = -20\text{ A}, T_J = 25^\circ\text{C}$ | -- | - | -1.2 | V |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition: $T_J = 25^\circ\text{C}, V_{DD} = -20\text{ V}, V_G = -10\text{ V}, R_G = 25\text{ }\Omega, L = 0.5\text{ mH}$.
3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 0.5\%$

P- Channel Typical Characteristics

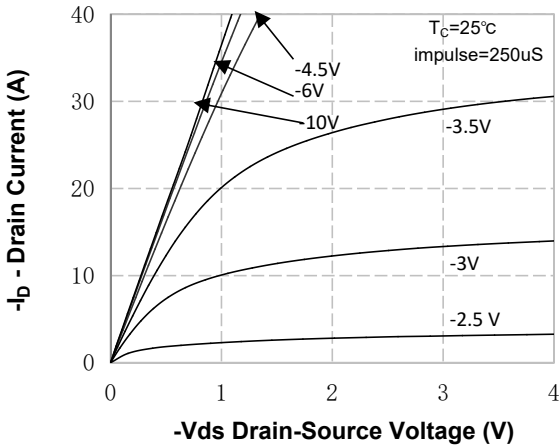


Figure 1. On-Region Characteristics

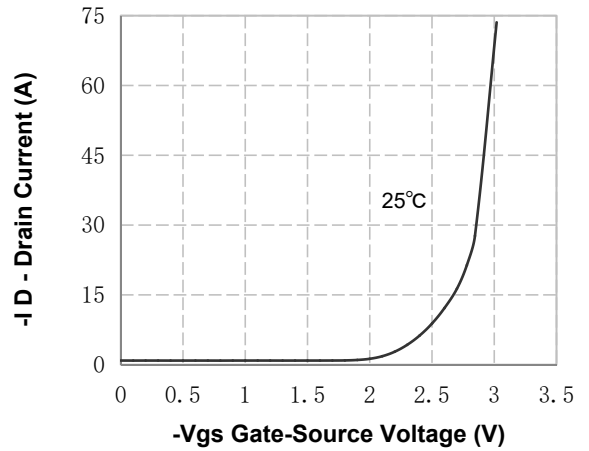


Figure 2. Transfer Characteristics

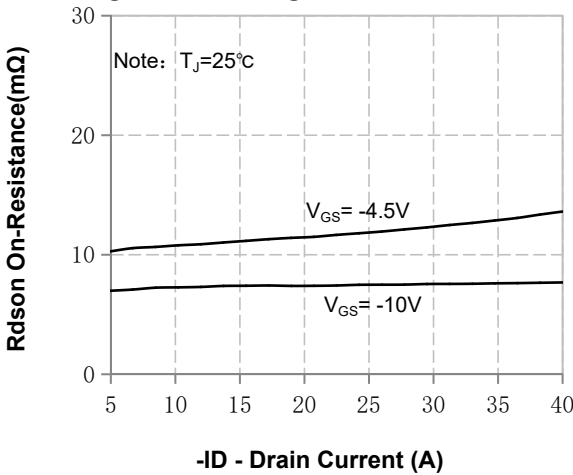


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

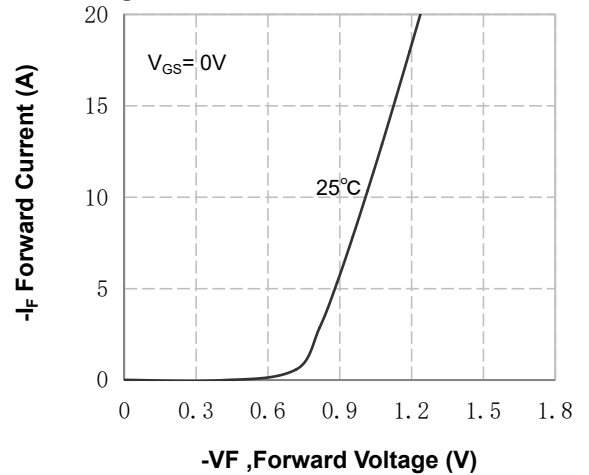


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

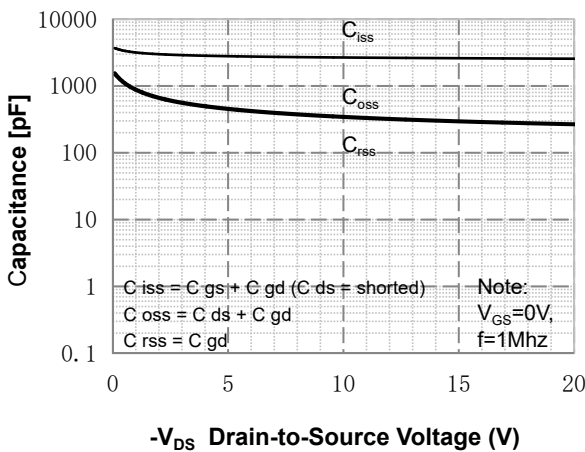


Figure 5. Capacitance Characteristics

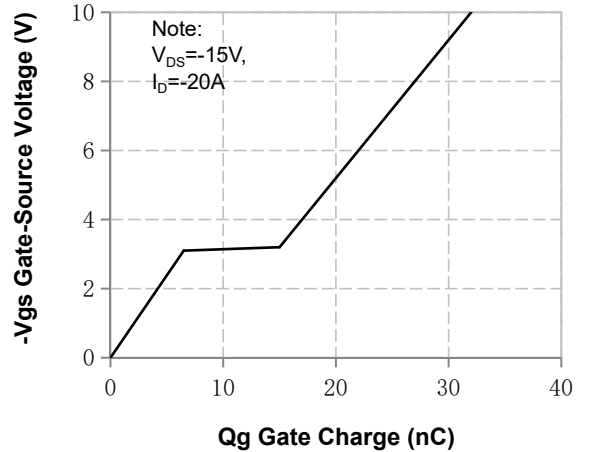


Figure 6. Gate Charge Characteristics

P- Channel Typical Characteristics (Continued)

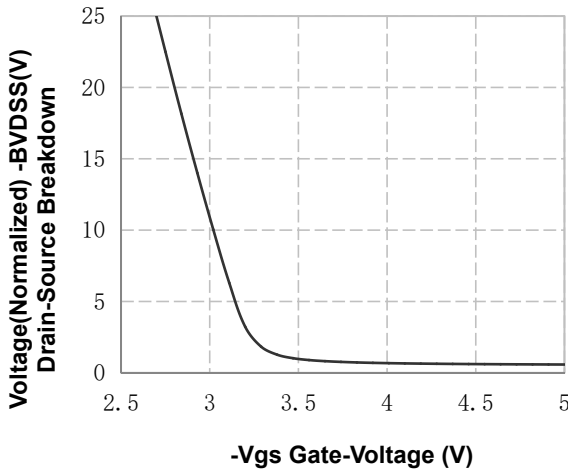


Figure 7. Breakdown Voltage Variation vs Gate-Voltage

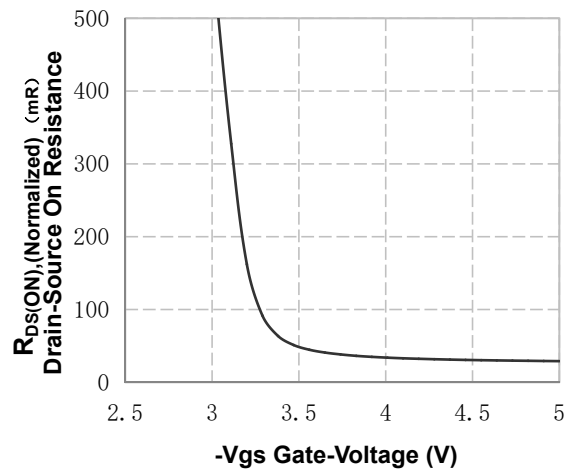


Figure 8. On-Resistance Variation vs Gate Voltage

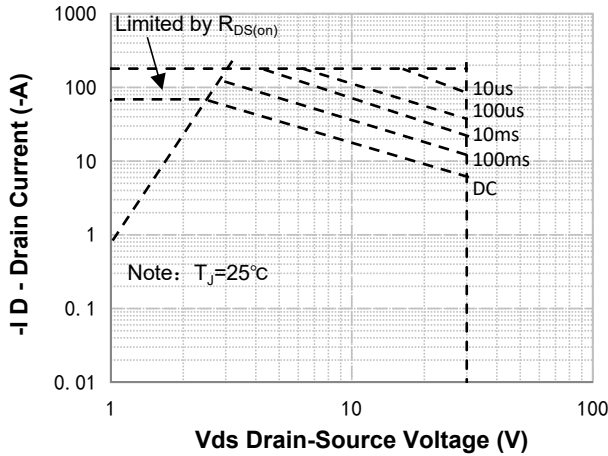


Figure 9. Maximum Safe Operating Area

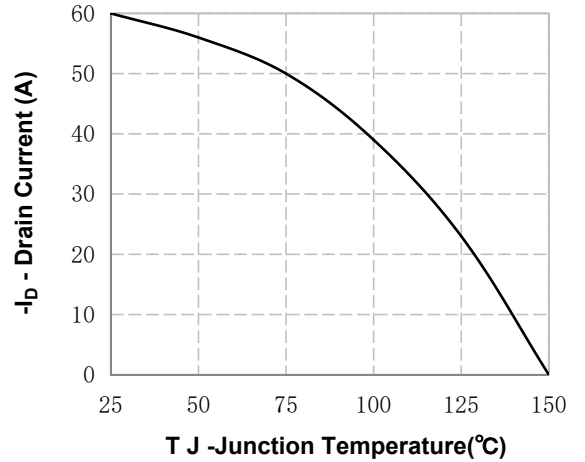


Figure 10. Maximum PContinuous Drain Current vs Temperature

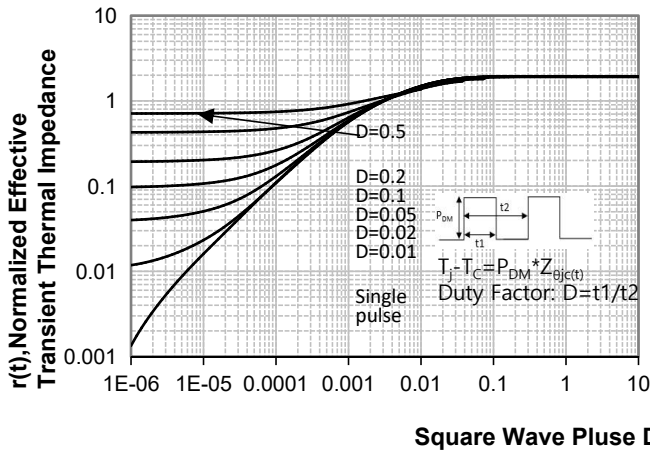
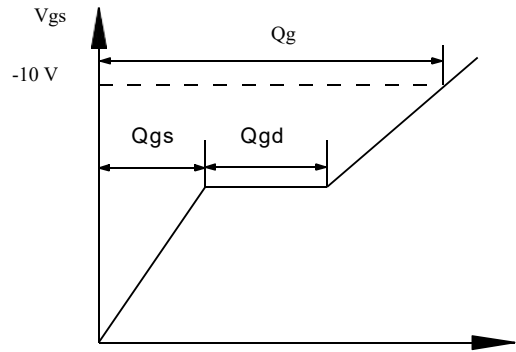
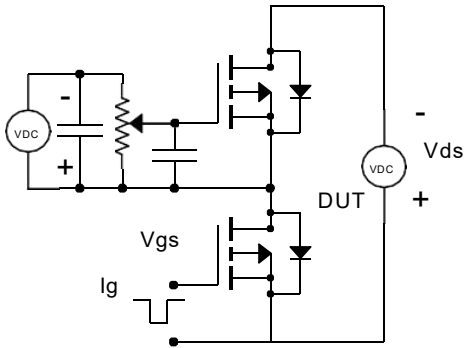
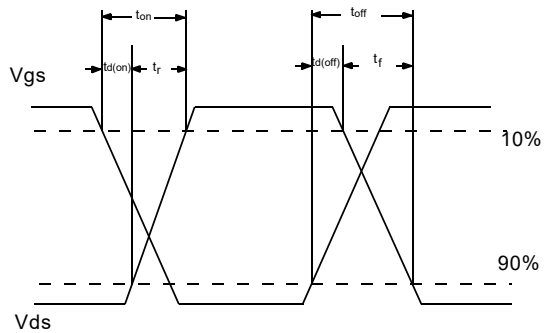
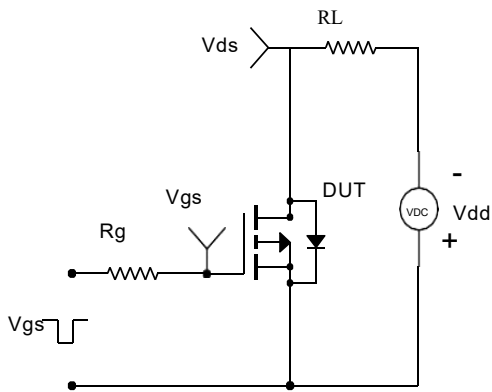


Figure 11. Transient Thermal Response Curve

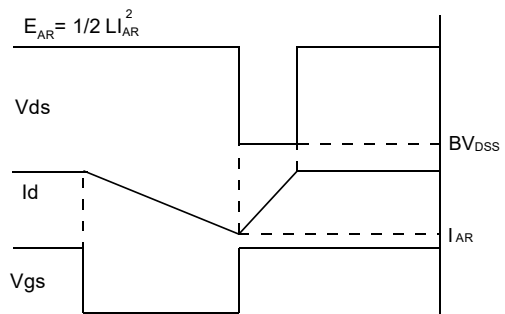
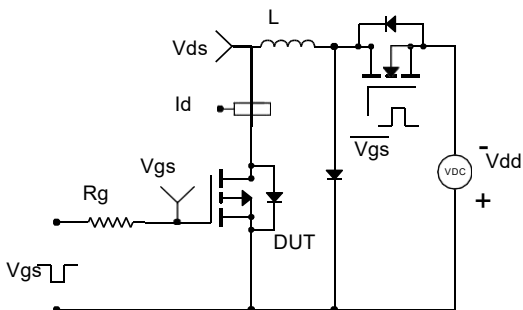
Gate Charge Test Circuit & Waveform



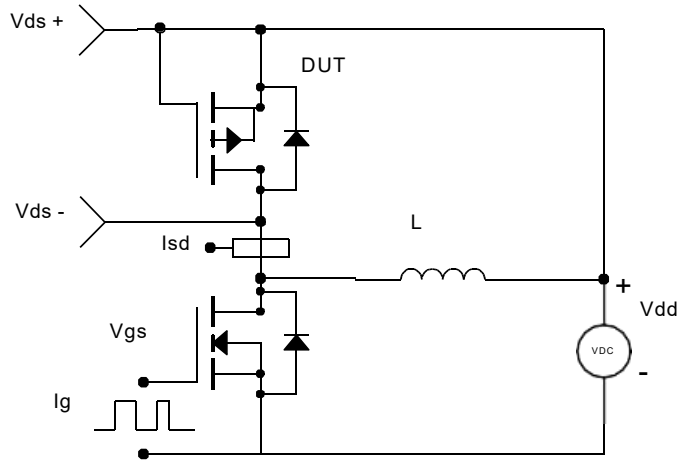
Resistive Switching Test Circuit & Waveforms



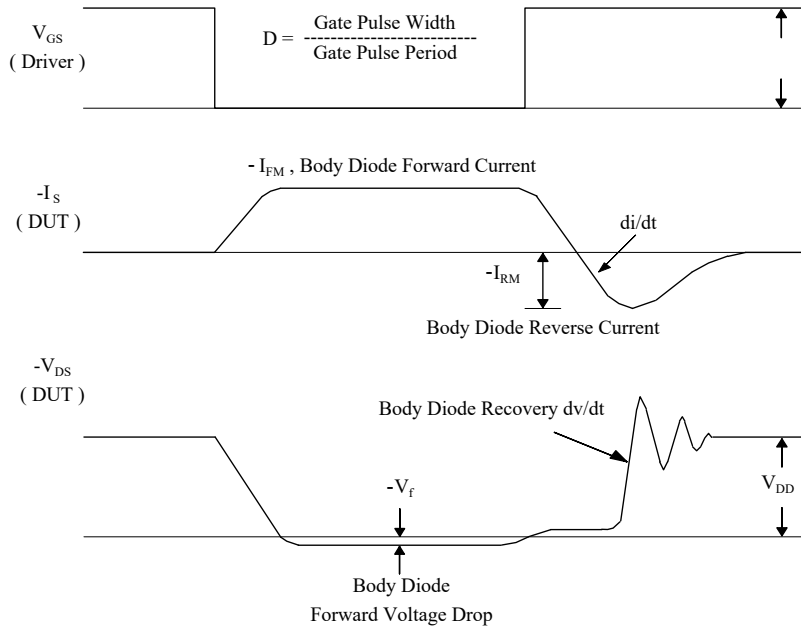
Unclamped Inductive Switching Test Circuit & Waveforms



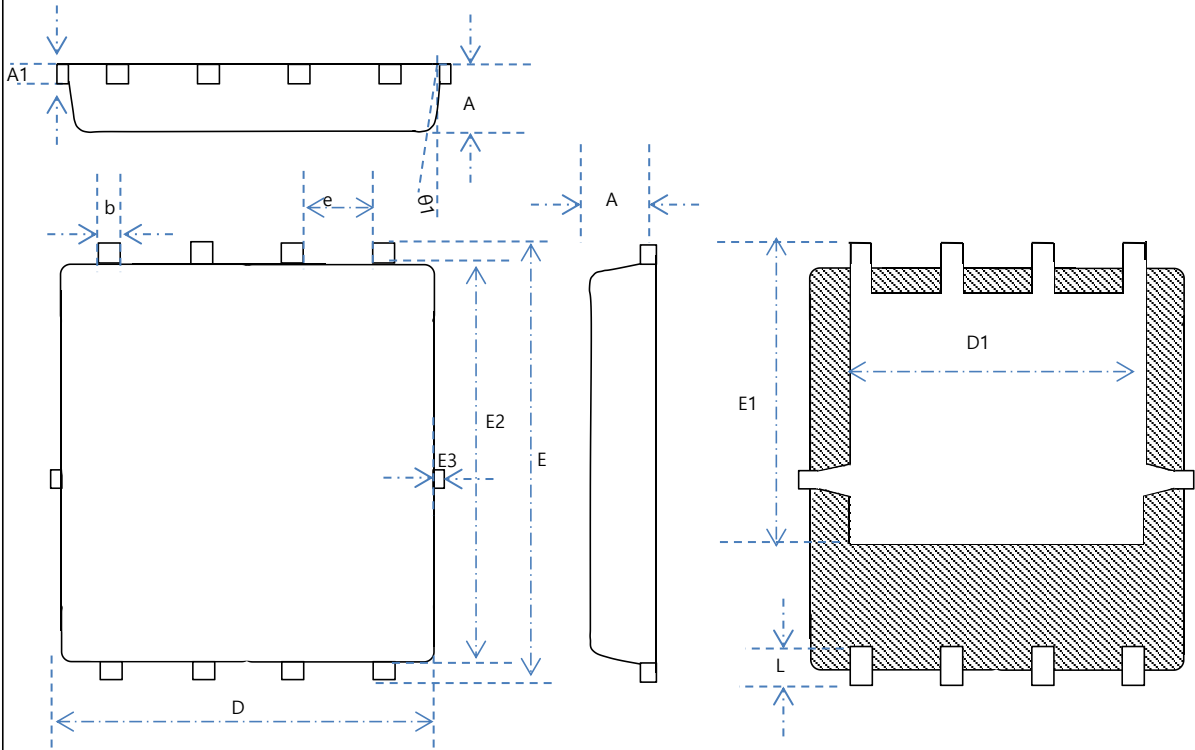
Peak Diode Recovery dv/dt Test Circuit & Waveforms



- dv/dt controlled by R_G
- I_{SD} controlled by pulse period



DFN 3*3 OUTLINE



| SYMBOL | Mechanical Dimensions/mm | | | SYMBOL | Mechanical Dimensions/mm | | |
|--------|--------------------------|-------|-------|--------|--------------------------|------|------|
| | MIN | NOM | MAX | | MIN | NOM | MAX |
| A | 0.725 | 0.775 | 0.825 | D | 3.05 | 3.15 | 3.25 |
| A1 | 0.152 REF | | | e | 0.65 TYPE | | |
| b | 0.27 | 0.32 | 0.37 | D1 | 2.25 | 2.45 | 2.65 |
| E | 3.25 | 3.35 | 3.45 | L | 0.28 | 0.38 | 0.48 |
| E1 | 1.63 | 1.73 | 1.83 | | | | |
| E2 | 3.0 | 3.1 | 3.2 | θ 1 | 8° | 10° | 12° |
| E3 | - | - | 0.10 | | | | |

| | | | | | | |
|---------|-----------------|------------|--------|----------|-------|--------------------|
| NAME | DFN 3*3 OUTLINE | UNIT | mm | DESIGNED | Shawn | THIRD ANGLE SYSTEM |
| DWGNO | | PAGE | 1 OF 1 | CHECKED | | |
| VERSION | Ver1.0 | ISSUE DATE | | APPROVED | | |

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