

N-Channel Enhancement Mode Power MOSFET

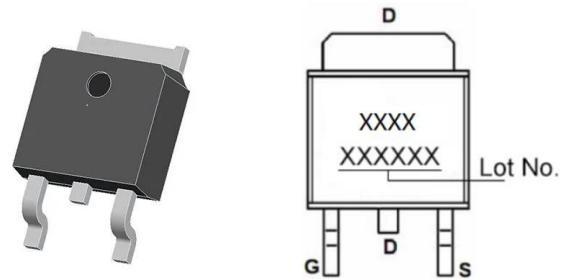
Description

The Power Device is produced using advanced TRENCH technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

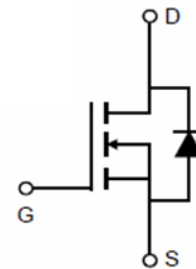
Features

- $V_{DS}=60V$, $I_D=50A$
- $R_{DS(ON)TYP} = 14m\Omega @ V_{GS} = 10V$
- Low gate charge (typical 33nC)
- High ruggedness
- Fast switching
- Good stability and uniformity with high EAS
- Improved dv/dt capability



TO252-2L TOP VIEW

Marking and Pin Assignment



Schematic diagram

Applications

- DC/DC Converters in Computing, Servers
- Isolated DC/DC Converters in Telecom and Industrial
- Uninterruptible Power Supply

100% UIS TESTED!

100% ΔV_{ds} TESTED!



Package Marking and Ordering Information

| Device | Marking | Package | Packing | Reel (pcs) |
|----------|---------|---------|---------|------------|
| SL50N06D | | TO-252 | Reel | 2500 |

Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|----------------|-------------------------|------------------|
| Drain-source Voltage | V_{DS} | 60 | V |
| Gate-source Voltage | V_{GS} | ± 30 | V |
| Continuous Drain Current | I_D | $T_C=25^\circ\text{C}$ | 50 |
| | | $T_C=100^\circ\text{C}$ | 30 |
| Pulsed Drain Current($T_C=25^\circ\text{C}$, T_p Limited By T_{jmax}) ^(note1) | I_{DM} | 200 | A |
| Maximum Power Dissipation($T_C=25^\circ\text{C}$) | P_D | 60 | W |
| Avalanche energy , single Pulse($L=0.5\text{mH}$) ^(note2) | E_{AS} | 450 | mJ |
| Peak Diode Recovery dv/dt ^(note3) | dv/dt | 4.5 | V/ns |
| Operating Junction And Storage Temperature | T_j, T_{stg} | -55 To 175 | $^\circ\text{C}$ |
| Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | T_L | 300 | $^\circ\text{C}$ |

Thermal Resistance

| Parameter | Symbol | Max | Unit |
|---------------------|-----------------|------|---------------------------|
| Junction-to-Case | $R_{\theta JC}$ | 2.5 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | $^\circ\text{C}/\text{W}$ |

Note:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. $I_{AS}=50\text{A}$, $V_{DD}=50\text{V}$, $R_g=25\Omega$,Starting $T_j=25^\circ\text{C}$.
3. $I_{SD} \leq 50\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_j = 25^\circ\text{C}$.
4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
5. Essentially independent of operating temperature.

Electrical Characteristic (TC=25°C unless otherwise noted)

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|--------------|-------|------|-----------|------------|--|
| | | Min. | Typ. | Max. | | |
| Off Characteristic | | | | | | |
| Drain-source breakdown voltage | BV_{DSS} | 60 | - | - | V | $V_{GS}=0V, I_D=250\mu A$ |
| Zero gate voltage drain current | I_{DSS} | - | - | 1 | μA | $V_{DS}=60V, V_{GS}=0V$ |
| Gate-source leakage current | I_{GSS} | - | - | ± 100 | nA | $V_{GS}=\pm 25V, V_{DS}=0V$ |
| On Characteristics | | | | | | |
| Gate threshold voltage | $V_{GS(th)}$ | 1.0 | 1.6 | 2.5 | V | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 14 | 16 | m Ω | $V_{GS}=10V, I_D=25A,$ |
| Transconductance (note4) | G_{fs} | - | 24 | - | S | $V_{DS}=25V, I_D=25A$ |
| Dynamic Characteristic | | | | | | |
| Input Capacitance | C_{iss} | - | 2800 | - | PF | $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ |
| Output Capacitance | C_{oss} | - | 110 | - | | |
| Reverse Transfer Capacitance | C_{rss} | - | 103 | - | | |
| Switching Characteristics | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | - | 15 | - | nS | $V_{DD}=30V, I_D=25A,$ $R_G=25\Omega$ (note4,5) |
| Turn-on Rise time | t_r | - | 105 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 60 | - | | |
| Turn-off Fall time | t_f | - | 65 | - | | |
| Gate Total Charge | Q_G | - | 27 | - | nC | $V_{GS}=4.5V, V_{DS}=30V, I_D=20A$ (note4,5) |
| Gate-Source Charge | Q_{gs} | - | 14 | - | | |
| Gate-Drain Charge | Q_{gd} | - | 6 | - | | |
| Drain-Source Diode Characteristics | | | | | | |
| Body Diode Forward Voltage | V_{SD} | - | - | 1.4 | V | $V_{GS}=0V, I_{SD}=50A$ |
| Body Diode Forward Current | I_S | - | - | 50 | A | - |
| Body Diode Reverse Recovery Time | T_{rr} | - | 60 | - | ns | $T_J=25^\circ C, I_{SD}=50A, V_{GS}=0V,$ $d_i/d_t=100A/\mu s$ (note4) |
| Body Diode Reverse Recovery Charge | Q_{rr} | - | 80 | - | nC | |

N- Channel Typical Characteristics

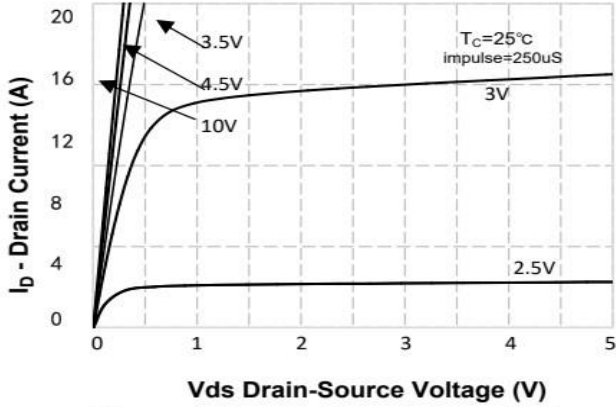


Figure 1. On-Region Characteristics

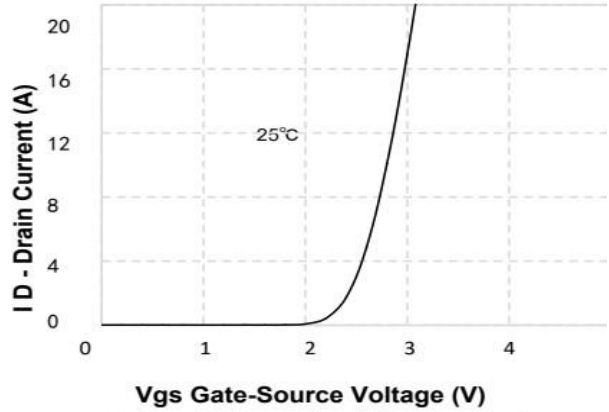


Figure 2. Transfer Characteristics

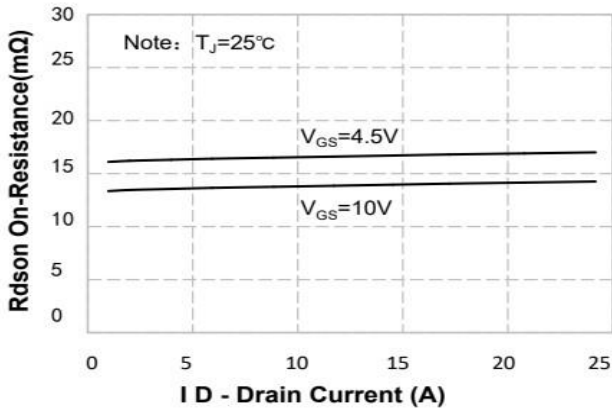


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

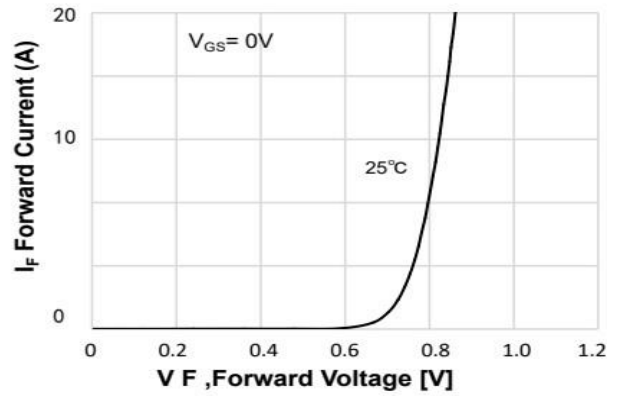


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

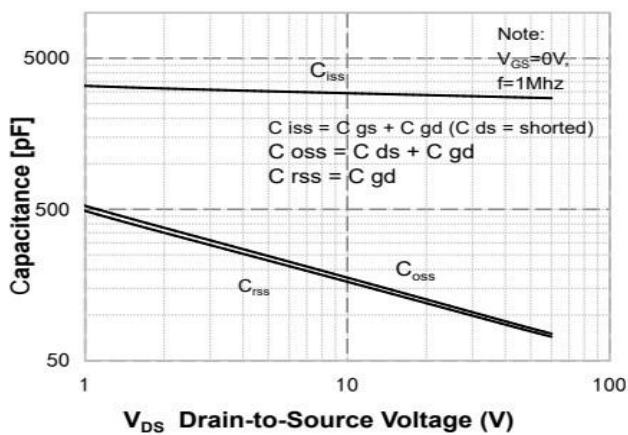


Figure 5. Capacitance Characteristics

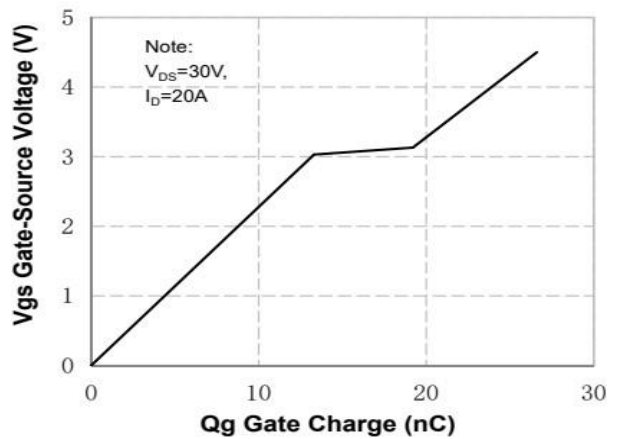


Figure 6. Gate Charge Characteristics

N- Channel Typical Characteristics (Continued)

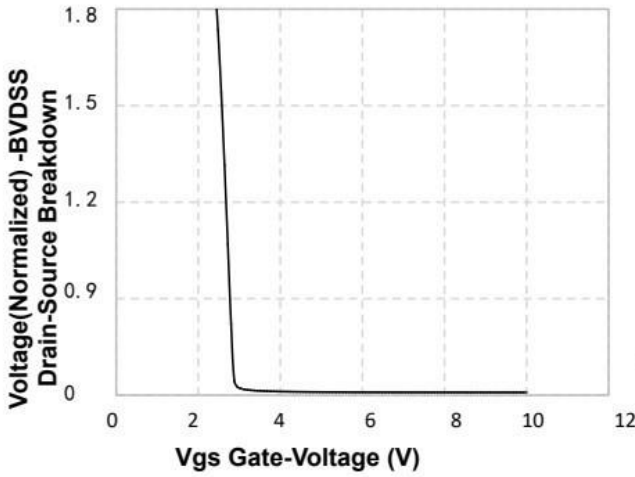


Figure 7. Breakdown Voltage Variation vs Gate-Voltage

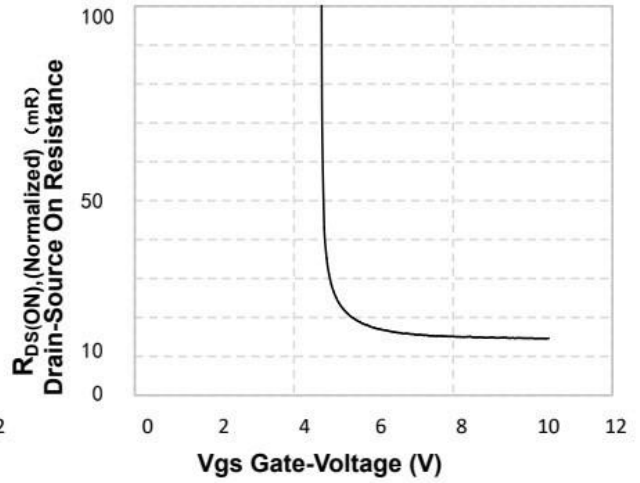


Figure 8. On-Resistance Variation vs Gate Voltage

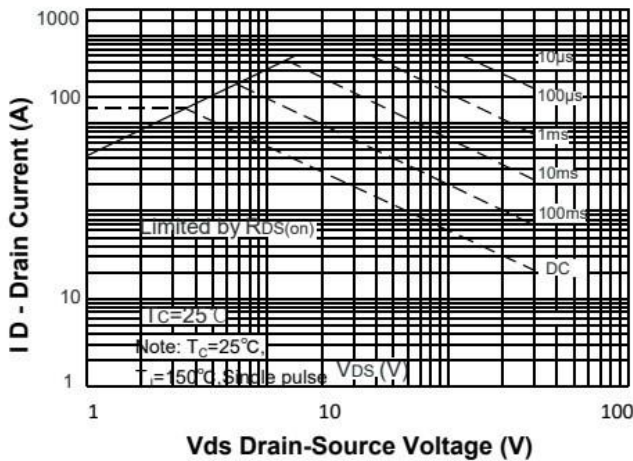


Figure 9. Maximum Safe Operating Area

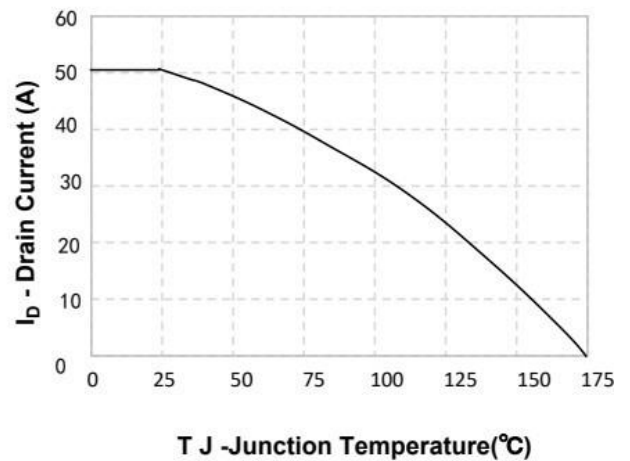


Figure 10. Maximum PContinuous Drain Current vs Case Temperature

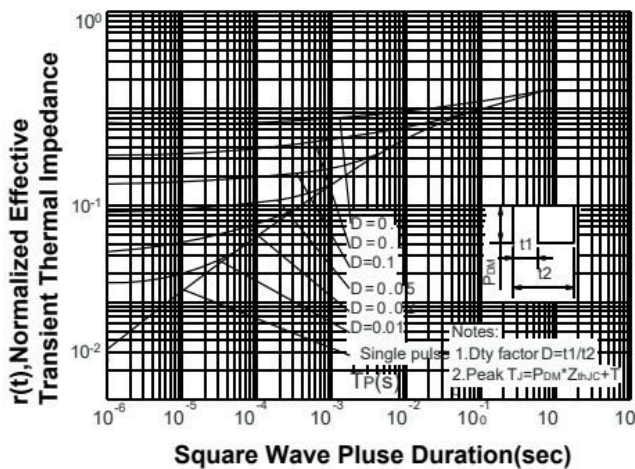
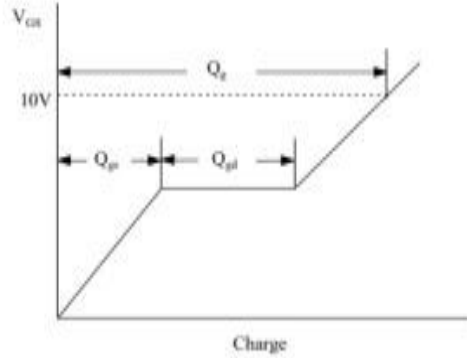
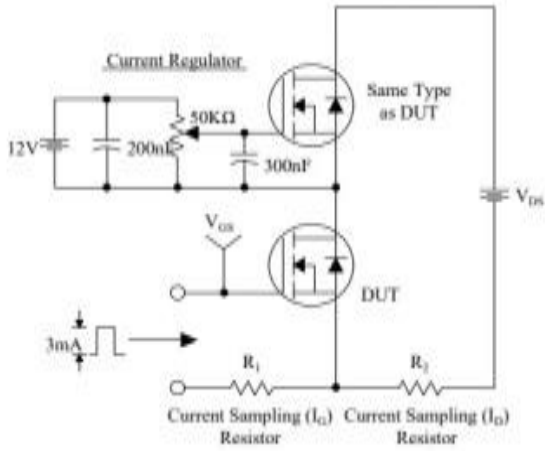
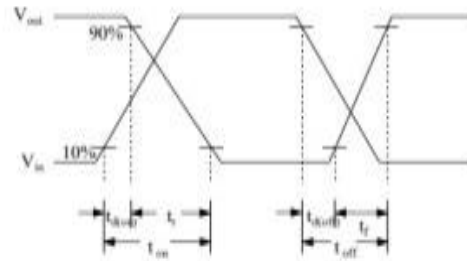
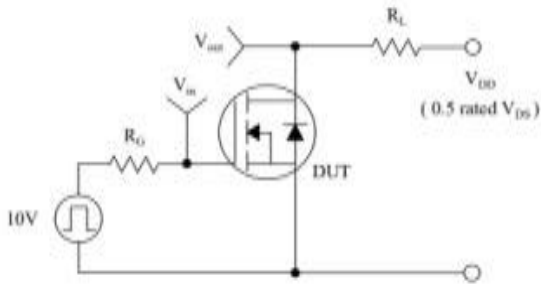


Figure 11. Transient Thermal Response Curve

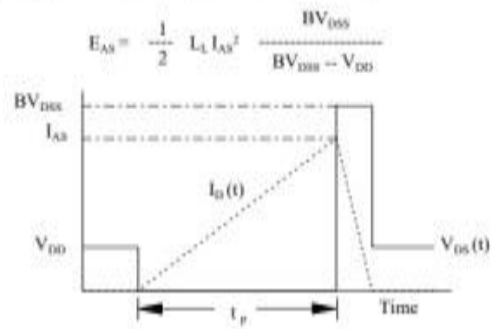
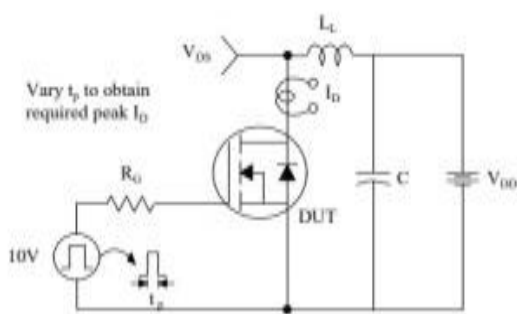
Gate Charge Test Circuit & Waveform



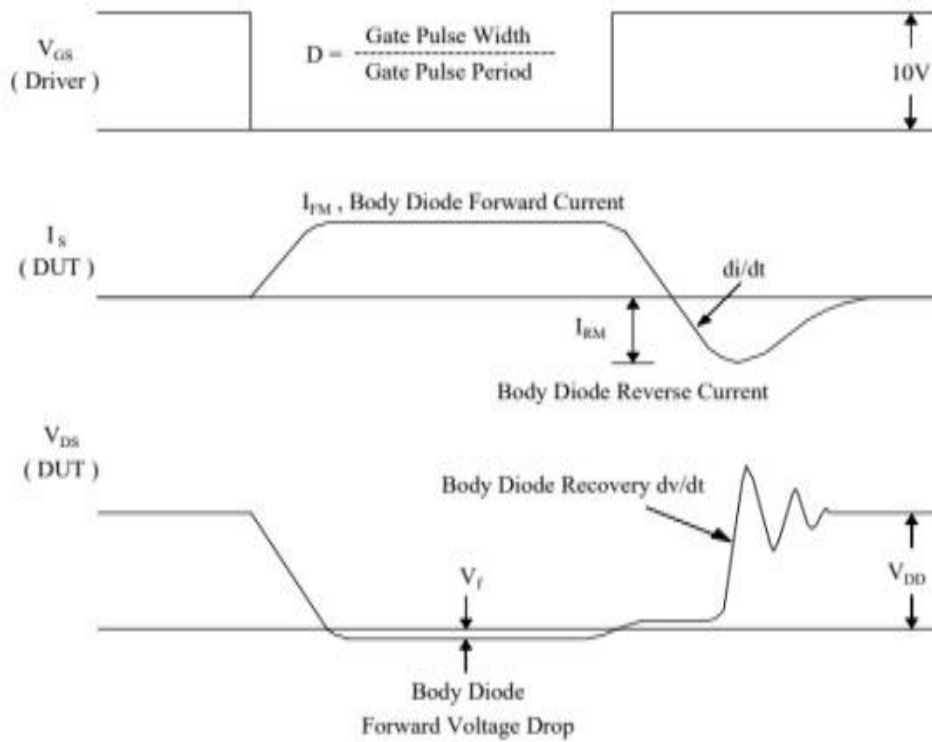
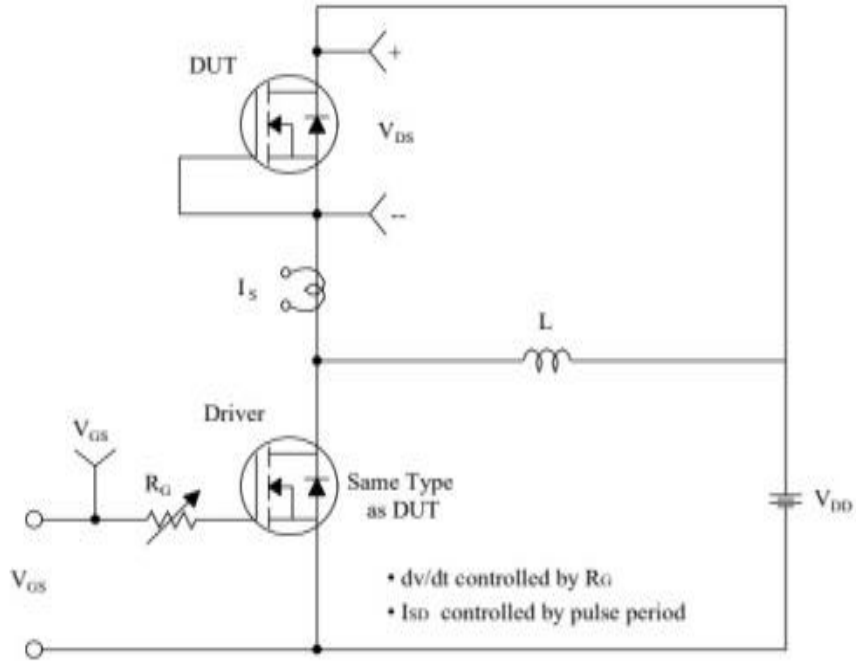
Resistive Switching Test Circuit & Waveforms

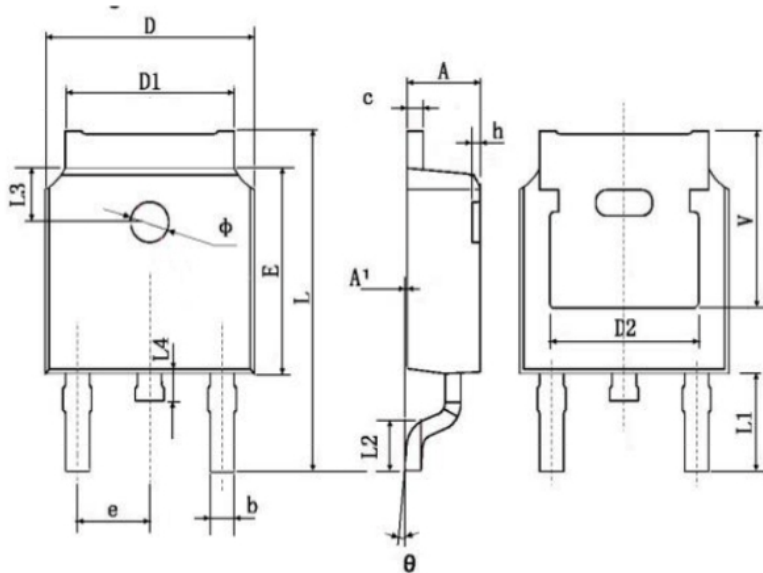


Unclamped Inductive Switching Test Circuit & Waveforms



Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Information
TO-252 DPAK


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.250 | 2.350 | 0.089 | 0.093 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.458 | 0.558 | 0.018 | 0.022 |
| D | 6.550 | 6.650 | 0.259 | 0.263 |
| D1 | 5.234 | 5.434 | 0.207 | 0.215 |
| D2 | 4.826 TYP. | | 0.191 TYP. | |
| E | 6.050 | 6.150 | 0.239 | 0.243 |
| e | 2.236 | 2.336 | 0.088 | 0.092 |
| L | 9.820 | 10.220 | 0.388 | 0.404 |
| L1 | 3.000 TYP. | | 0.119 TYP. | |
| L2 | 1.400 | 1.600 | 0.055 | 0.063 |
| L3 | 1.800 TYP. | | 0.071 TYP. | |
| L4 | 0.700 | 0.900 | 0.028 | 0.036 |
| φ | 1.150 | 1.250 | 0.045 | 0.049 |
| θ | 0° | 3° | 0° | 3° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.399 TYP | | 0.213 TYP | |