# DMN6068LK3

## 60V N-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ | $I_D$ $T_A = 25°C$ |
|---|---|---|
| 60V | 68mΩ @ $V_{GS}$ = 10V | 8.5A |
| | 100mΩ @ $V_{GS}$ = 4.5V | 7.0A |

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **"Green" component and RoHS compliant (Note 1)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

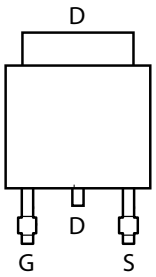
- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply

## Mechanical Data

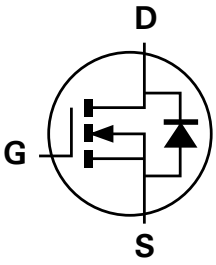
- Case: TO252-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (approximate)

TO252-3L

TOP VIEW




PIN OUT -TOP VIEW



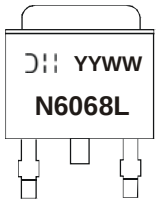

Equivalent Circuit

## Ordering Information (Note 1)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|
| DMN6068LK3-13 | N6068L | 13 | 16 | 2,500 |

Note: 1. Diodes, Inc. defines "Green" products as those which are RoHS compliant and contain no halogens or antimony compounds; further information about Diodes Inc.'s "Green" Policy can be found on our website. For packaging details, go to our website.

## Marking Information




= Manufacturer's Marking
N6068L = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 09 = 2009)
WW = Week (01-52)

## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

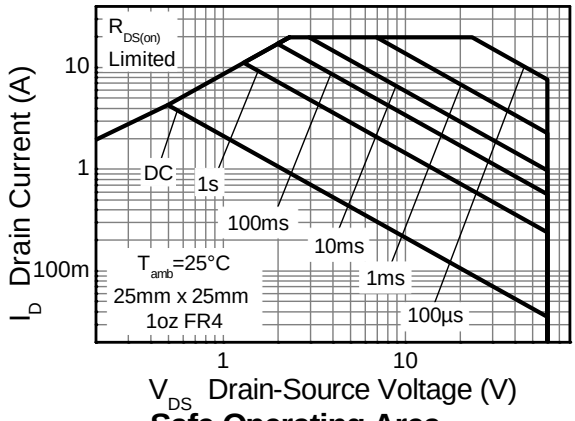
| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source voltage | | | $V_{DSS}$ | 60 | V |
| Gate-Source voltage | | (Note 2) | $V_{GS}$ | ±20 | V |
| Single Pulsed Avalanche Energy | | (Note 8) | $E_{AS}$ | 37.5 | mJ |
| Single Pulsed Avalanche Current | | (Note 8) | $I_{AS}$ | 5.0 | A |
| Continuous Drain current | $V_{GS}$ = 10V | (Note 4) | $I_D$ | 8.5 | A |
| | | $T_A$ = 70°C (Note 4) | | 6.8 | |
| | | (Note 3) | | 6.0 | |
| Pulsed Drain current | $V_{GS}$= 10V | (Note 5) | $I_{DM}$ | 22.2 | A |
| Continuous Source current (Body diode) | | (Note 4) | $I_S$ | 10.2 | A |
| Pulsed Source current (Body diode) | | (Note 5) | $I_{SM}$ | 22.2 | A |

## Thermal Characteristics @$T_A$ = 25°C unless otherwise specified

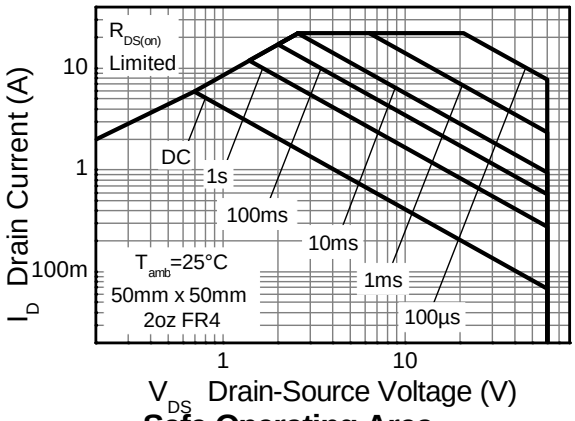
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power dissipation<br>Linear derating factor | (Note 3) | $P_D$ | 4.12<br>33 | W<br>mW/°C |
| | (Note 4) | | 8.49<br>67.9 | |
| | (Note 6) | | 2.12<br>16.9 | |
| Thermal Resistance, Junction to Ambient | (Note 3) | $R_{\theta JA}$ | 30.3 | °C/W |
| | (Note 4) | | 14.7 | |
| | (Note 6) | | 59.0 | |
| Thermal Resistance, Junction to Lead | (Note 7) | $R_{\theta JL}$ | 3.09 | |
| Operating and storage temperature range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

Notes:
2. AEC-Q101 $V_{GS}$ maximum is ±16V.
3. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
4. Same as note 2, except the device is measured at t ≤ 10 sec.
5. Same as note 2, except the device is pulsed with D = 0.02 and pulse width 300 µs. The pulse current is limited by the maximum junction temperature.
6. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
7. Thermal resistance from junction to solder-point (at the end of the drain lead).
8. UIS in production with L = 3.0mH, $I_{AS}$ = 5.0A, $R_G$ = 25Ω, $V_{DD}$ = 50V, starting $T_J$ = 25°C

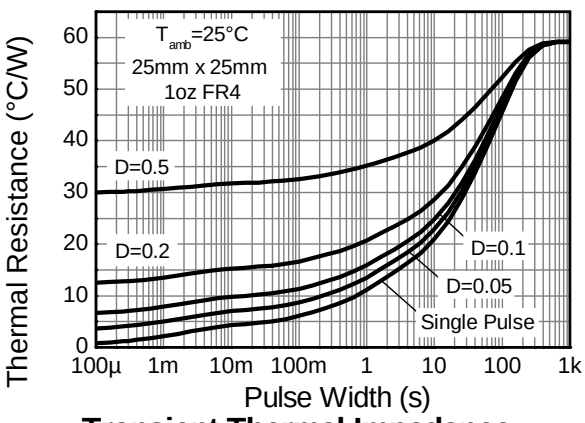
## Thermal Characteristics



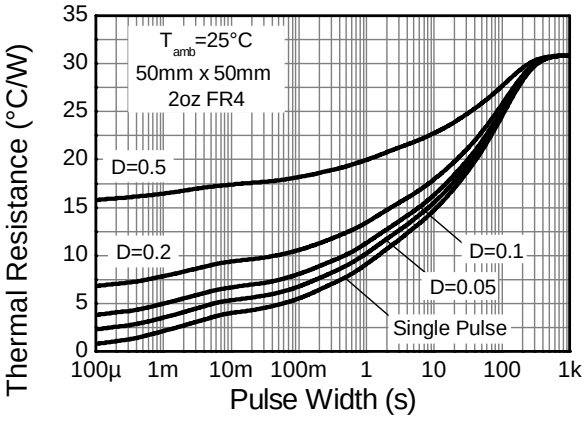

**Safe Operating Area**



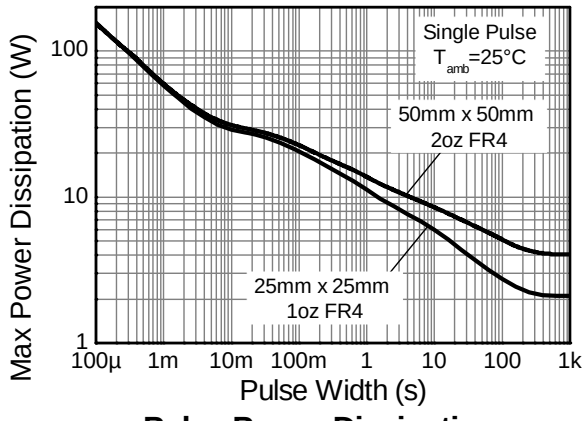

**Safe Operating Area**



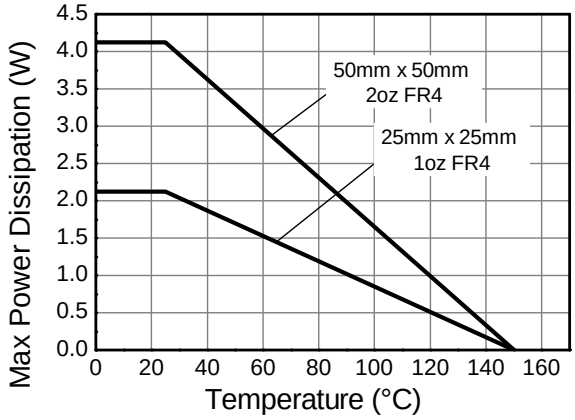

**Transient Thermal Impedance**




**Transient Thermal Impedance**




**Pulse Power Dissipation**



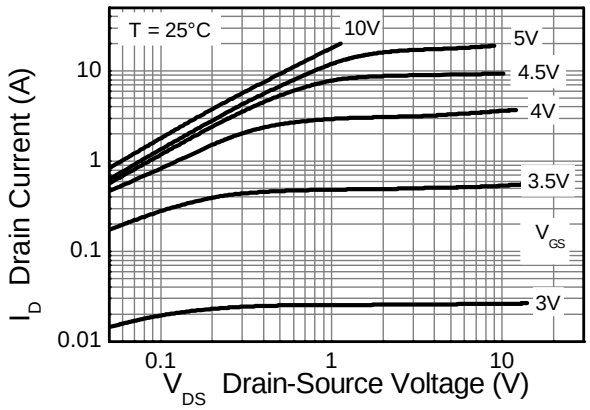

**Derating Curve**

## Electrical Characteristics @$T_A$ = 25°C unless otherwise specified

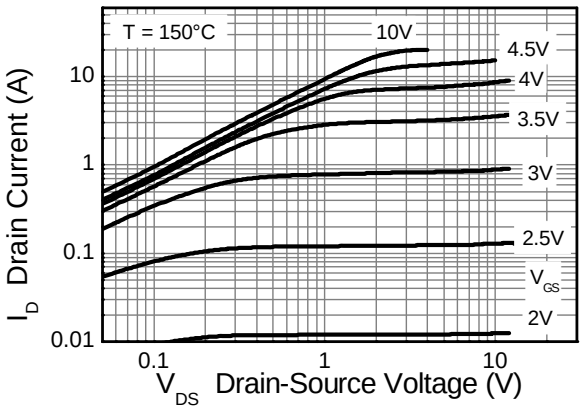
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | — | — | V | $I_D$ = 250μA, $V_{GS}$= 0V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 0.5 | μA | $V_{DS}$= 60V, $V_{GS}$= 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$= ±20V, $V_{DS}$= 0V |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1.0 | — | 3.0 | V | $I_D$= 250μA, $V_{DS}$= $V_{GS}$ |
| Static Drain-Source On-Resistance (Note 9) | $R_{DS\ (ON)}$ | — | — | 0.068 | Ω | $V_{GS}$= 10V, $I_D$= 12A |
| | | | | 0.100 | | $V_{GS}$= 4.5V, $I_D$= 6A |
| Forward Transconductance (Notes 9 & 10) | $g_{fs}$ | — | 19.7 | — | S | $V_{DS}$= 15V, $I_D$= 12A |
| Diode Forward Voltage (Note 9) | $V_{SD}$ | — | 0.98 | 1.15 | V | $I_S$= 12A, $V_{GS}$= 0V |
| Reverse recovery time (Note 10) | $t_{rr}$ | | 145 | — | ns | $I_S$= 12A, di/dt= 100A/μs |
| Reverse recovery charge (Note 10) | $Q_{rr}$ | — | 929 | — | nC | |
| **DYNAMIC CHARACTERISTICS (Note 10)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 502 | — | pF | $V_{DS}$= 30V, $V_{GS}$= 0V<br>f= 1MHz |
| Output Capacitance | $C_{oss}$ | — | 45.7 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 27.1 | — | pF | |
| Total Gate Charge | $Q_g$ | — | 5.55 | — | nC | $V_{GS}$= 4.5V |
| Total Gate Charge | $Q_g$ | — | 10.3 | — | nC | $V_{GS}$= 10V<br>$V_{DS}$= 30V<br>$I_D$= 12A |
| Gate-Source Charge | $Q_{gs}$ | — | 1.6 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 3.5 | — | nC | |
| Turn-On Delay Time (Note 11) | $t_{D(on)}$ | — | 3.6 | — | ns | $V_{DD}$= 30V, $V_{GS}$= 10V<br>$I_D$= 12A, $R_G \cong$ 6.0Ω |
| Turn-On Rise Time (Note 11) | $t_r$ | — | 10.8 | — | ns | |
| Turn-Off Delay Time (Note 11) | $t_{D(off)}$ | — | 11.9 | — | ns | |
| Turn-Off Fall Time (Note 11) | $t_f$ | — | 8.7 | — | ns | |

Notes:
9. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
10. For design aid only, not subject to production testing.
11. Switching characteristics are independent of operating junction temperatures.

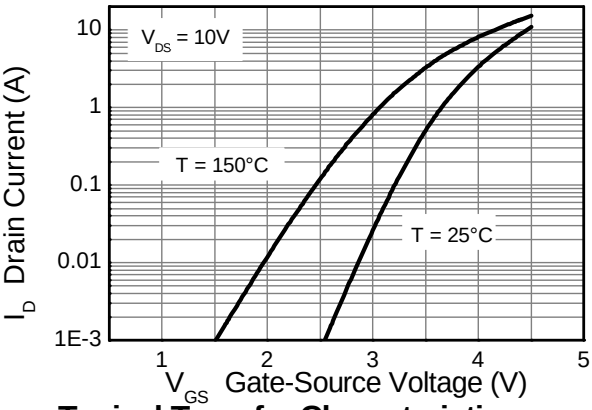
## Typical Characteristics



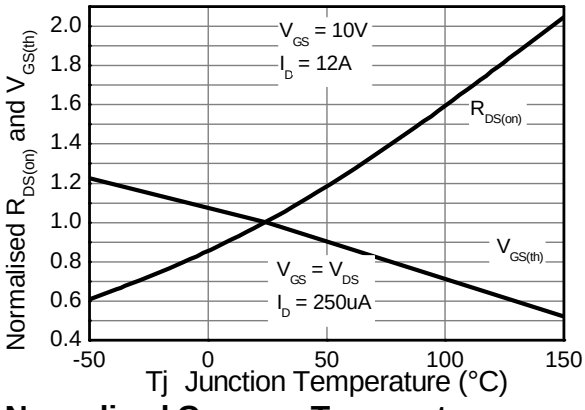

**Output Characteristics**



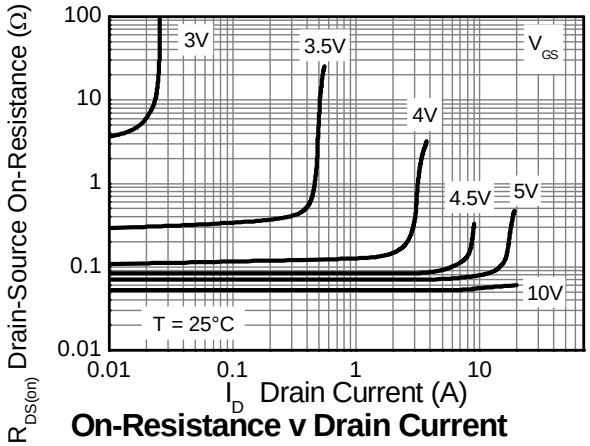

**Output Characteristics**



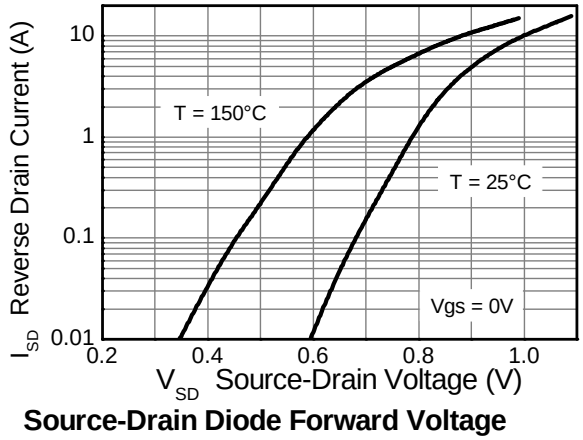

**Typical Transfer Characteristics**




**Normalised Curves v Temperature**

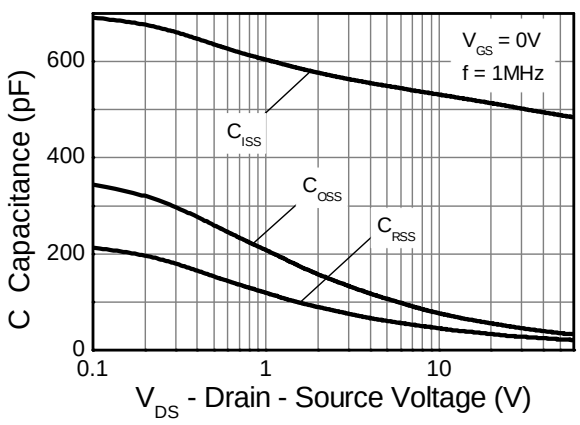



**On-Resistance v Drain Current**

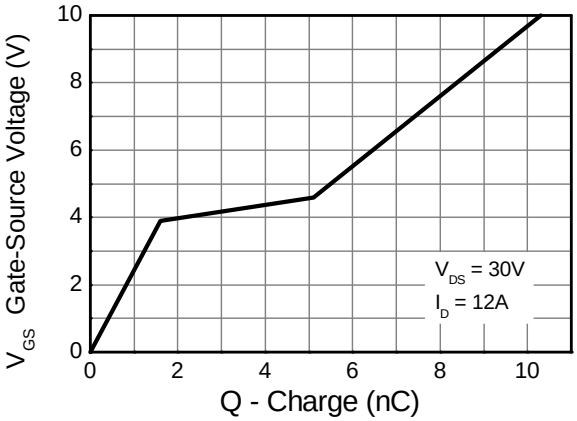



**Source-Drain Diode Forward Voltage**

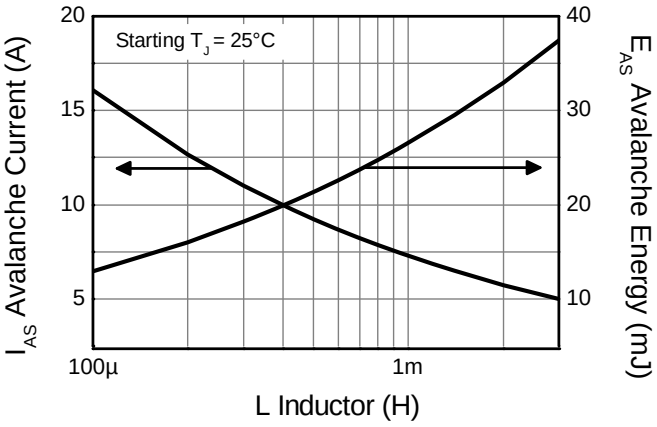
## Typical Characteristics - continued




**Capacitance v Drain-Source Voltage**

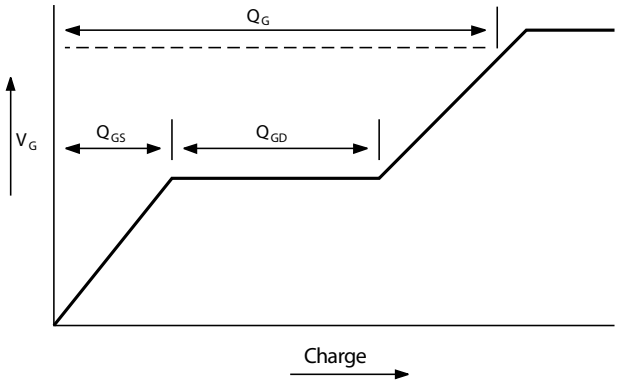



**Gate-Source Voltage v Gate Charge**

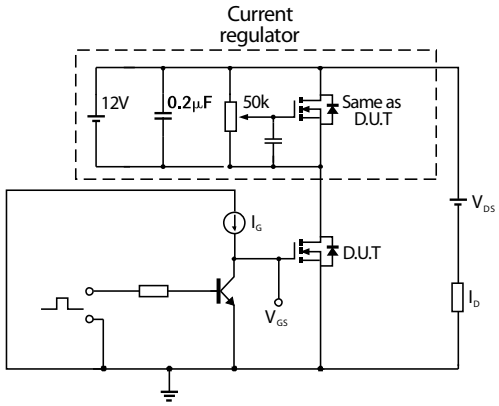



**Single-Pulsed Avalanche Rating**

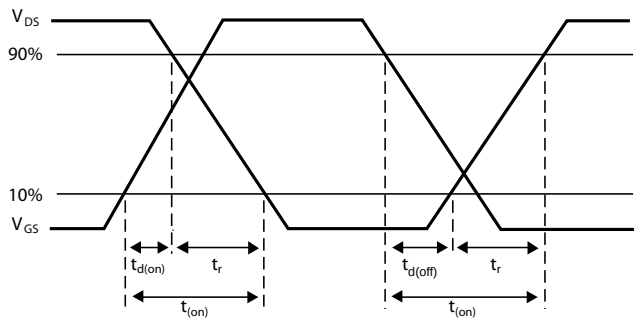
## Test Circuits



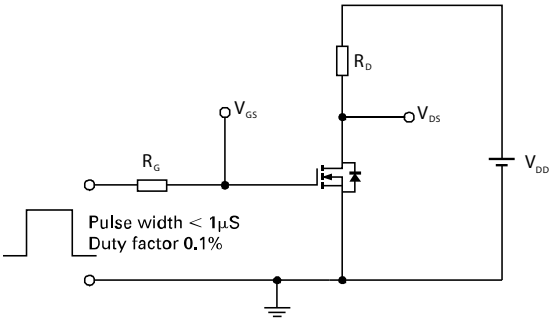

**Basic gate charge waveform**




**Gate charge test circuit**

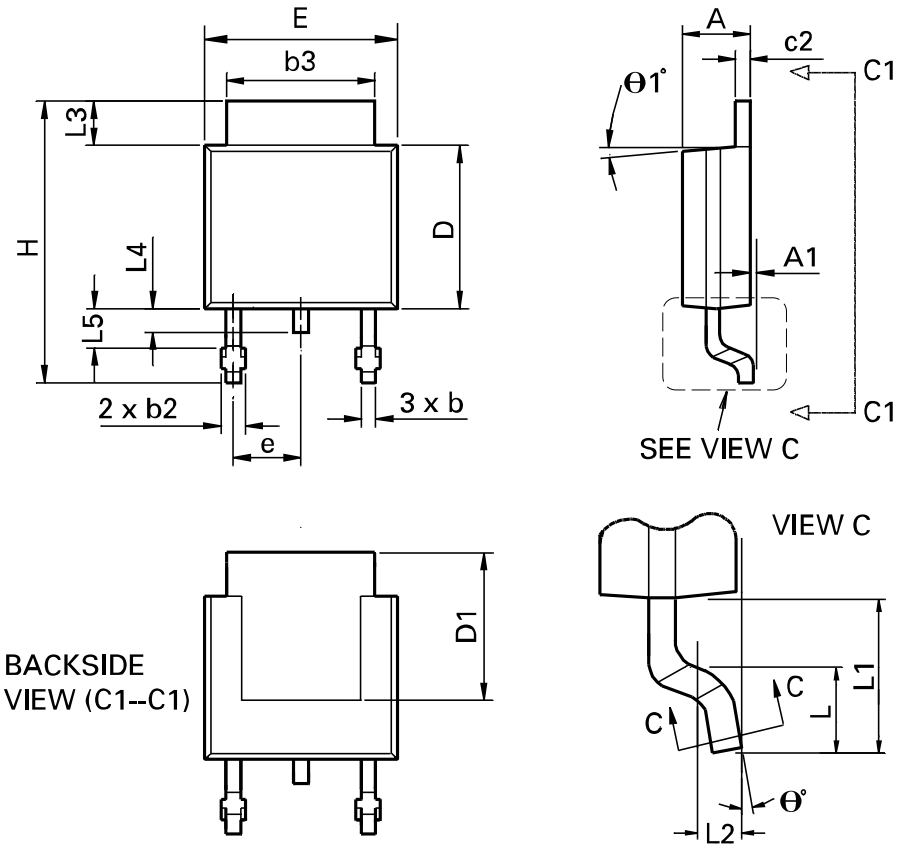



**Switching time waveforms**




**Switching time test circuit**

## Package Outline Dimensions




| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | | Min | Max | Min | Max |
| **A** | 0.086 | 0.094 | 2.18 | 2.39 | **e** | 0.090 BSC | | 2.29 BSC | |
| **A1** | - | 0.005 | - | 0.127 | **H** | 0.370 | 0.410 | 9.40 | 10.41 |
| **b** | 0.020 | 0.035 | 0.508 | 0.89 | **L** | 0.055 | 0.070 | 1.40 | 1.78 |
| **b2** | 0.030 | 0.045 | 0.762 | 1.14 | **L1** | 0.108 REF | | 2.74 REF | |
| **b3** | 0.205 | 0.215 | 5.21 | 5.46 | **L2** | 0.020 BSC | | 0.508 BSC | |
| **c** | 0.018 | 0.024 | 0.457 | 0.61 | **L3** | 0.035 | 0.065 | 0.89 | 1.65 |
| **c2** | 0.018 | 0.023 | 0.457 | 0.584 | **L4** | 0.025 | 0.040 | 0.635 | 1.016 |
| **D** | 0.213 | 0.245 | 5.41 | 6.22 | **L5** | 0.045 | 0.060 | 1.14 | 1.52 |
| **D1** | 0.205 | - | 5.21 | - | **θ1°** | 0° | 10° | 0° | 10° |
| **E** | 0.250 | 0.265 | 6.35 | 6.73 | **θ°** | 0° | 15° | 0° | 15° |
| **E1** | 0.170 | - | 4.32 | - | - | - | - | - | - |

## Suggested Pad Layout