



**THE DATASHEET OF
DMN4009LK3-13**





Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ | I_D $T_A = 25^\circ C$ |
|---------------|--------------------------------|-----------------------------|
| 40V | 8.5m Ω @ $V_{GS} = 10V$ | 27.6A |
| | 14m Ω @ $V_{GS} = 4.5V$ | 21.5A |

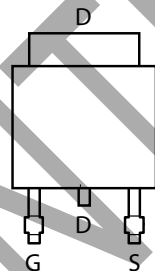
Description and Applications

This new generation 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.

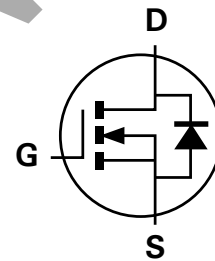
- Backlighting
- DC-DC Converters
- Power management functions



TOP VIEW



PIN OUT -TOP VIEW



Equivalent Circuit

Features and Benefits

- Low on-resistance
- Fast switching speed
- "Green" component and RoHS compliant (Note 1)

Mechanical Data

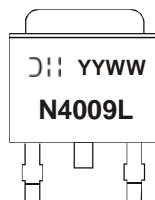
- Case: TO252-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202,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

Ordering Information (Note 1)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|---------|--------------------|-----------------|-------------------|
| DMN4009LK3-13 | N4009L | 13 | 16 | 2,500 |

Note: 1. Diodes, Inc. defines "Green" products as those which are Eu 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



$\text{D}||$ = Manufacturer's Marking
 N4009L = Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last two digits of year (ex: 09 = 2009)
 WW = Week (01-52)

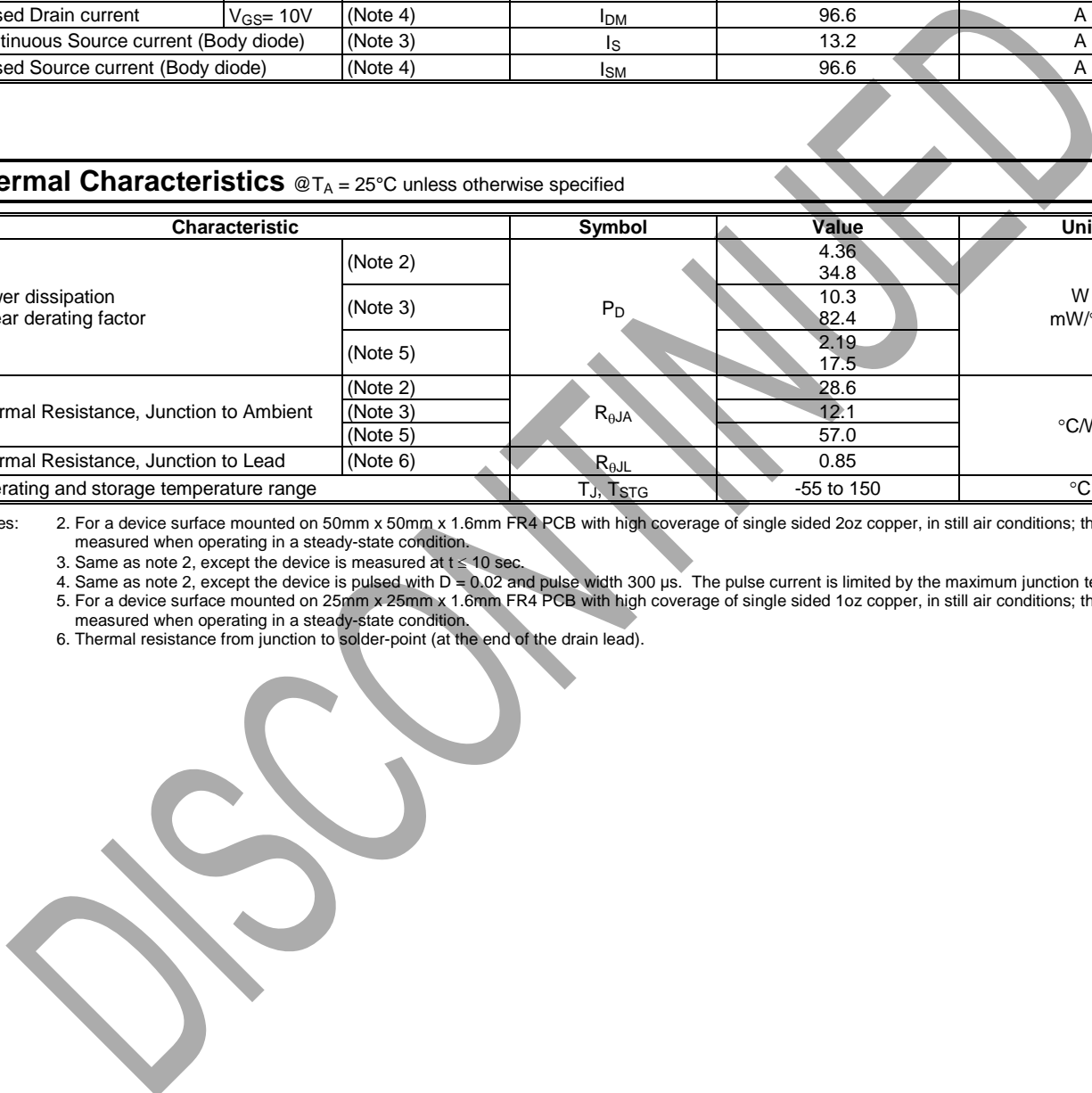
Maximum Ratings @T_A = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Unit |
|--|-----------------------|-------------------------------|------------------|-------|------|
| Drain-Source voltage | | | V _{DSS} | 40 | V |
| Gate-Source voltage | | | V _{GS} | ±20 | V |
| Continuous Drain current | V _{GS} = 10V | (Note 3) | I _D | 27.6 | A |
| | | T _A =70°C (Note 3) | | 22.1 | |
| | | (Note 2) | | 18.0 | |
| Pulsed Drain current | V _{GS} = 10V | (Note 4) | I _{DM} | 96.6 | A |
| Continuous Source current (Body diode) | | | I _S | 13.2 | A |
| Pulsed Source current (Body diode) | | | I _{SM} | 96.6 | A |

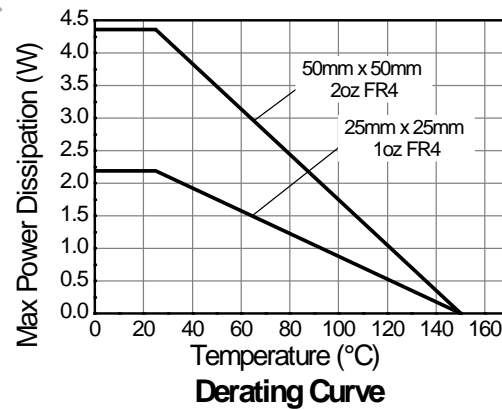
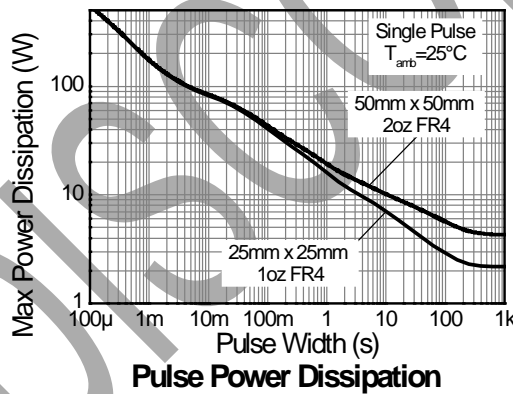
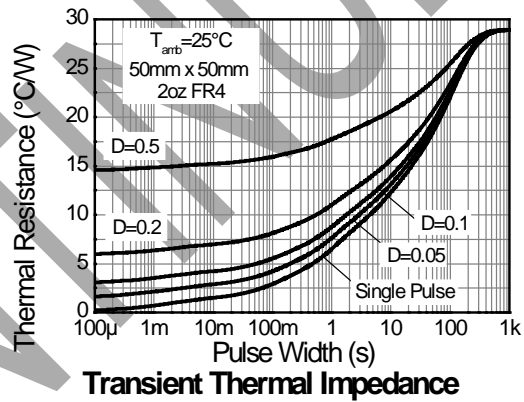
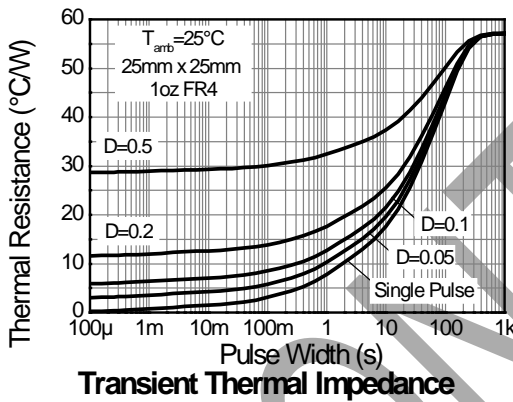
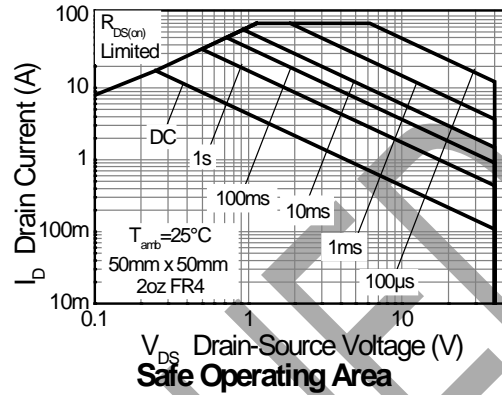
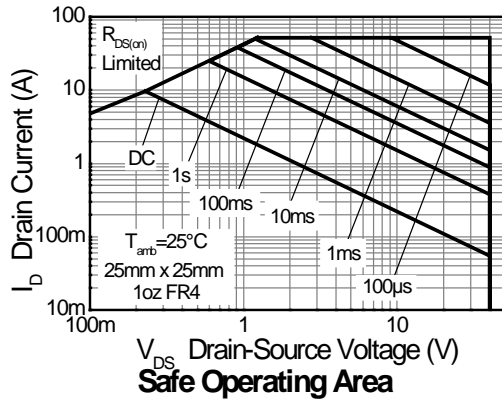
Thermal Characteristics @T_A = 25°C unless otherwise specified

| Characteristic | | Symbol | Value | Unit |
|---|----------|-----------------------------------|------------|------------|
| Power dissipation Linear derating factor | (Note 2) | P _D | 4.36 | W mW/°C |
| | | | 34.8 | |
| | (Note 3) | | 10.3 | |
| | | | 82.4 | |
| | (Note 5) | | 2.19 | |
| Thermal Resistance, Junction to Ambient | (Note 2) | R _{θJA} | 17.5 | °C/W |
| | (Note 3) | | 28.6 | |
| | (Note 5) | | 12.1 | |
| Thermal Resistance, Junction to Lead | (Note 6) | R _{θJL} | 0.85 | |
| Operating and storage temperature range | | T _J , T _{STG} | -55 to 150 | °C |

- Notes:
2. 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.
 3. Same as note 2, except the device is measured at t ≤ 10 sec.
 4. 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.
 5. 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.
 6. Thermal resistance from junction to solder-point (at the end of the drain lead).



Thermal Characteristics



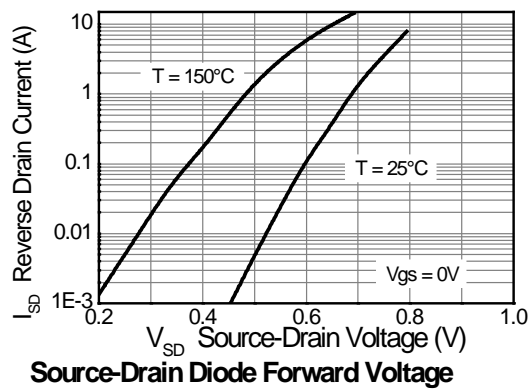
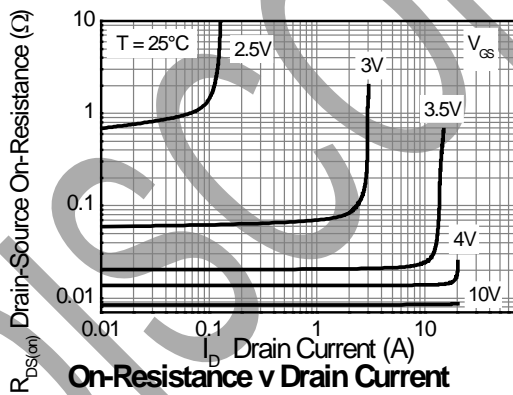
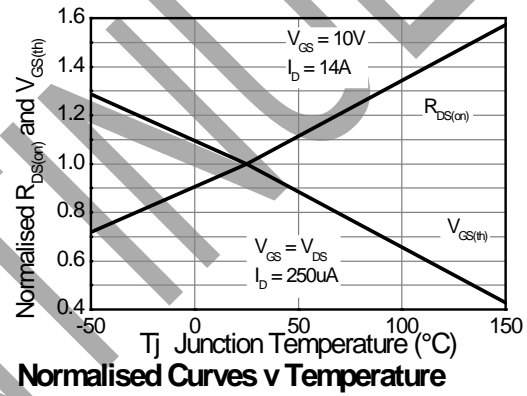
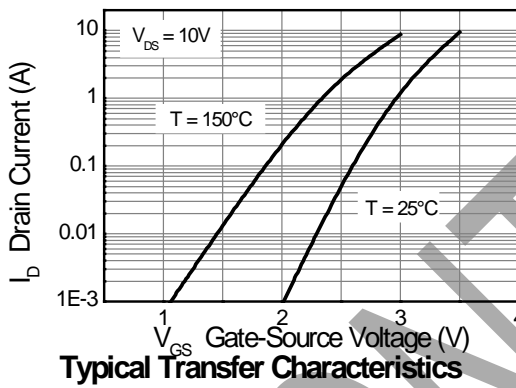
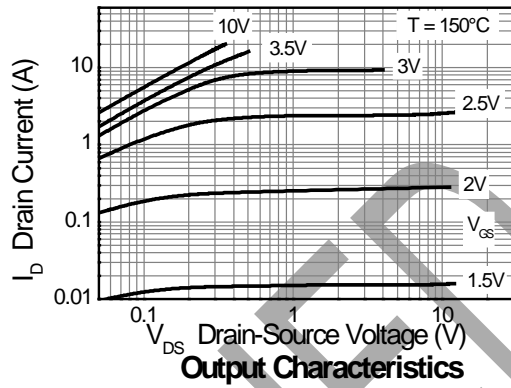
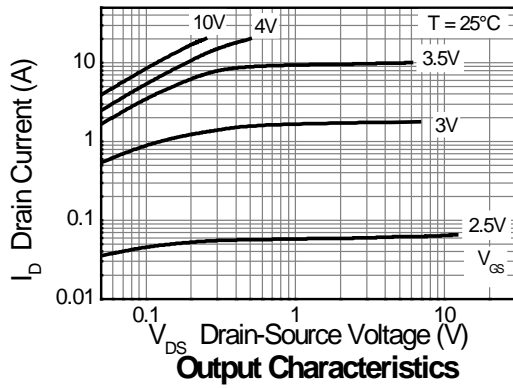
Electrical Characteristics @T_A = 25°C unless otherwise specified

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 40 | — | — | V | I _D = 250μA, V _{GS} = 0V |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | 0.5 | μA | V _{DS} = 40V, 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 7) | R _{DS(on)} | — | — | 8.5 | m• | V _{GS} = 10V, I _D = 14A |
| | | | | 14 | | V _{GS} = 4.5V, I _D = 11A |
| Forward Transconductance (Notes 7 & 8) | g _{fs} | — | 35.3 | — | S | V _{DS} = 15V, I _D = 12A |
| Diode Forward Voltage (Note 7) | V _{SD} | — | 0.82 | 1.0 | V | I _S = 14A, V _{GS} = 0V |
| Reverse recovery time (Note 8) | t _{rr} | — | 141 | — | ns | I _S = 14A, di/dt = 100A/μs |
| Reverse recovery charge (Note 8) | Q _{rr} | — | 872 | — | nC | |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iss} | — | 2072 | — | pF | V _{DS} = 20V, V _{GS} = 0V f = 1MHz |
| Output Capacitance | C _{oss} | — | 338 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 193 | — | pF | |
| Total Gate Charge | Q _g | — | 21 | — | nC | V _{GS} = 4.5V |
| Total Gate Charge | Q _g | — | 42 | — | nC | V _{GS} = 10V |
| Gate-Source Charge | Q _{gs} | — | 7.3 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 10.7 | — | nC | |
| Turn-On Delay Time (Note 9) | t _{D(on)} | — | 7.8 | — | ns | V _{DD} = 20V, V _{GS} = 10V I _D = 14A, R _G ≅ 6.0Ω |
| Turn-On Rise Time (Note 9) | t _r | — | 18.5 | — | ns | |
| Turn-Off Delay Time (Note 9) | t _{D(off)} | — | 37.3 | — | ns | |
| Turn-Off Fall Time (Note 9) | t _f | — | 14.9 | — | ns | |

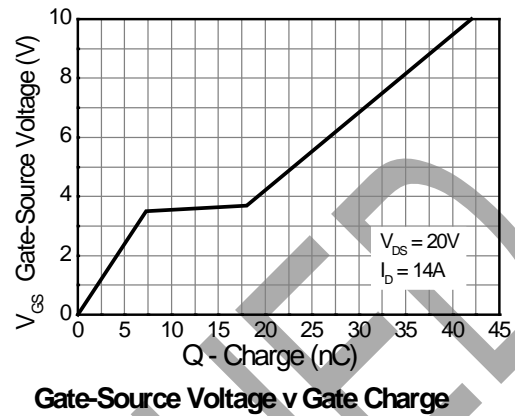
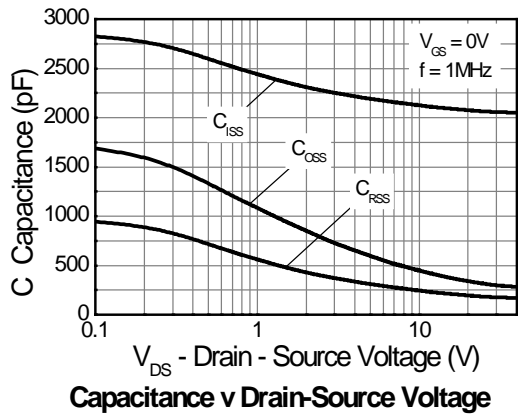
- Notes:
7. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
 8. For design aid only, not subject to production testing.
 9. Switching characteristics are independent of operating junction temperatures.

DISCONTINUED

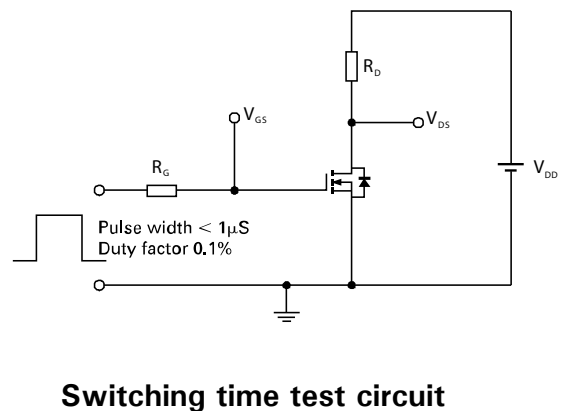
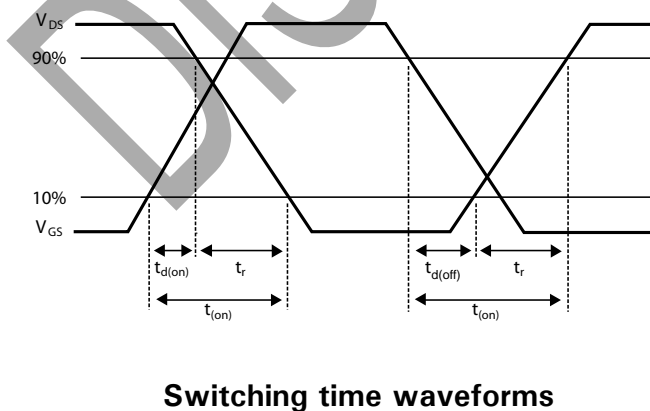
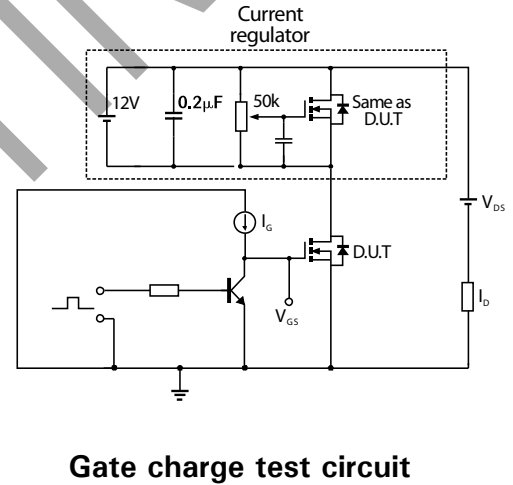
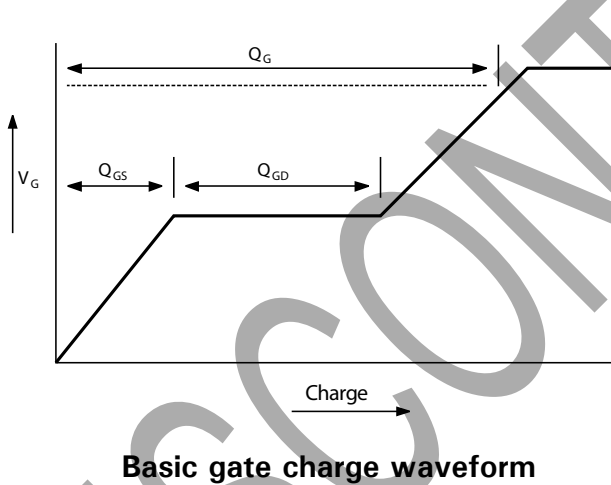
Typical Characteristics



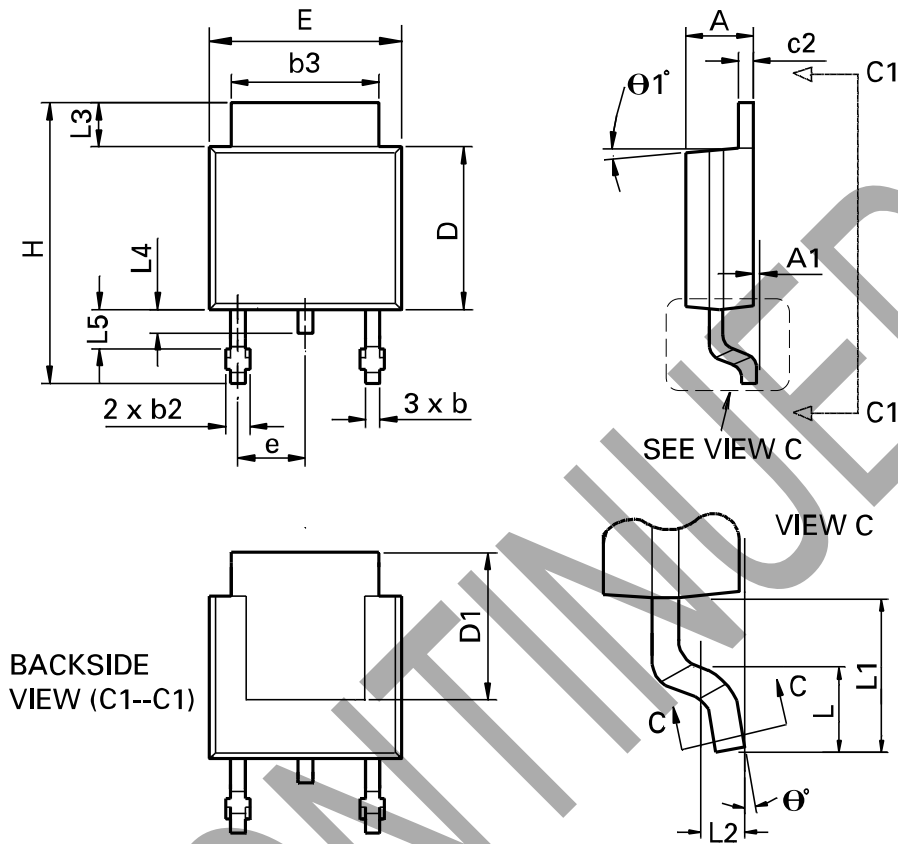
Typical Characteristics - continued



Test Circuits

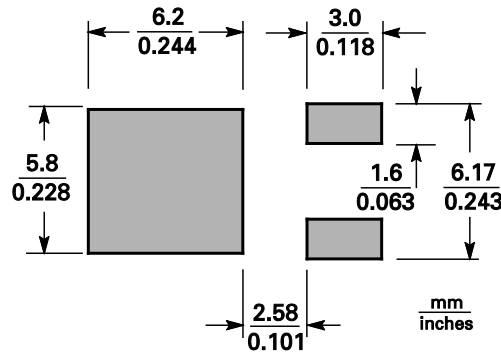


Package Outline Dimensions



| 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 | - | •1° | 0° | 10° | 0° | 10° |
| E | 0.250 | 0.265 | 6.35 | 6.73 | •° | 0° | 15° | 0° | 15° |
| E1 | 0.170 | - | 4.32 | - | - | - | - | - | - |

Suggested Pad Layout



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