

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$            | $I_D$<br>$T_A = +25^\circ C$ |
|---------------|-------------------------|------------------------------|
| 60V           | 68mΩ @ $V_{GS} = 10V$   | 8.5A                         |
|               | 100mΩ @ $V_{GS} = 4.5V$ | 7.0A                         |

## Description

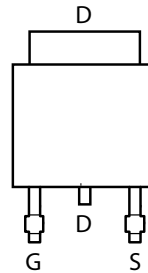
This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

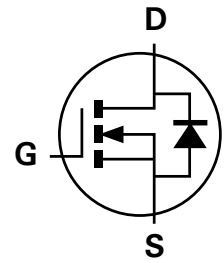
- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply



TOP VIEW



PIN OUT - TOP VIEW



Equivalent Circuit

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

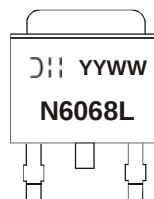
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method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

## Ordering Information (Note 4)

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

- Note:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



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

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

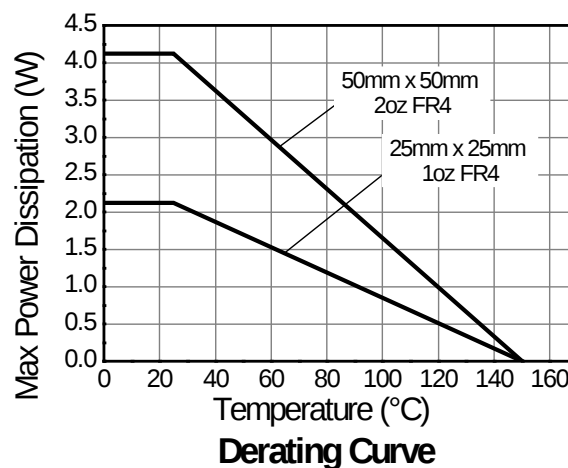
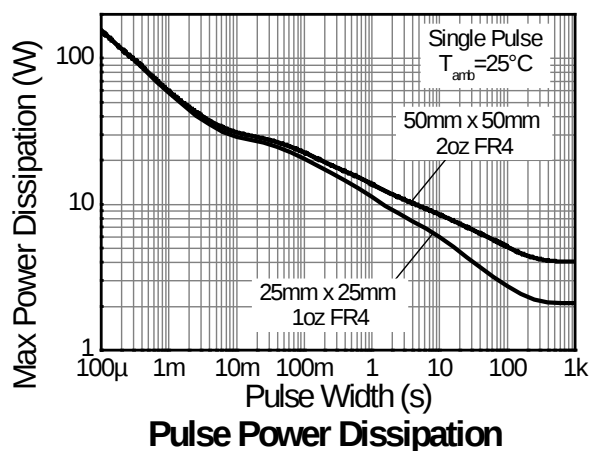
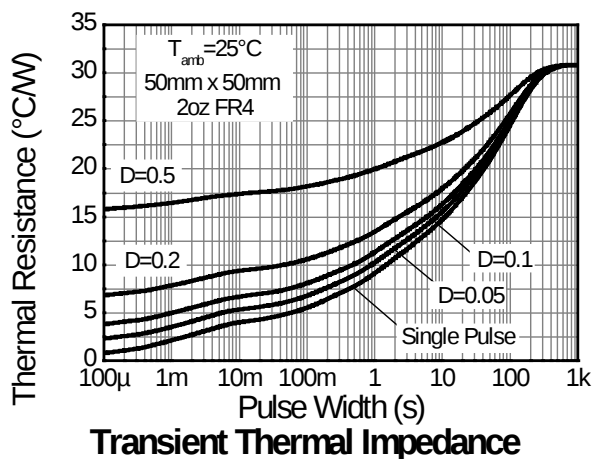
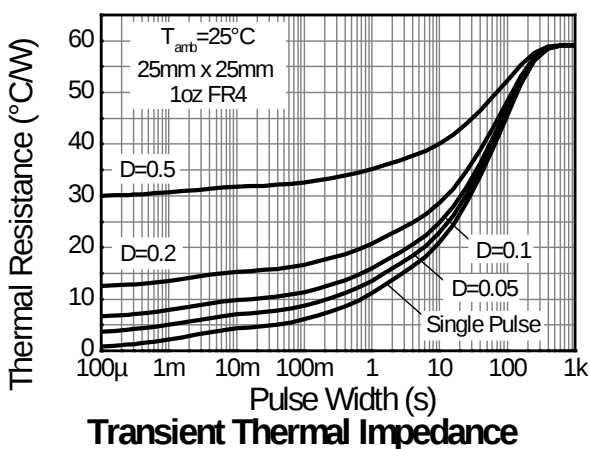
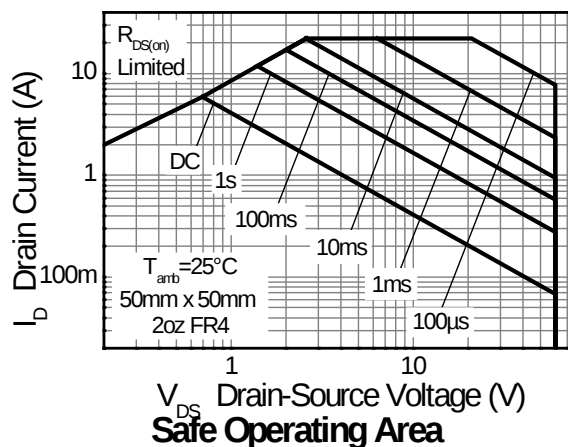
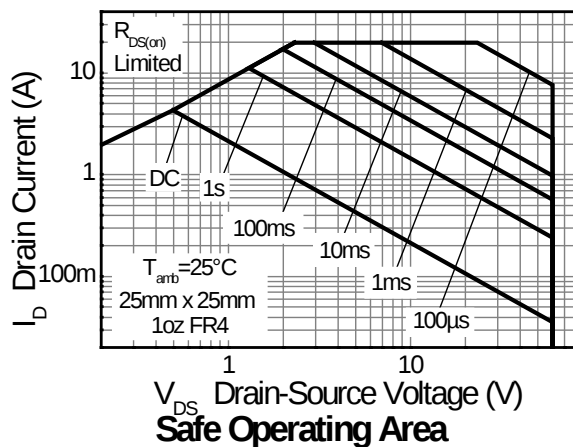
| Characteristic                         |                       |                                | Symbol           | Value | Unit |
|----------------------------------------|-----------------------|--------------------------------|------------------|-------|------|
| Drain-Source voltage                   |                       |                                | V <sub>DSS</sub> | 60    | V    |
| Gate-Source voltage                    | (Note 5)              |                                | V <sub>GS</sub>  | ±20   | V    |
| Single Pulsed Avalanche Energy         | (Note 11)             |                                | E <sub>AS</sub>  | 37.5  | mJ   |
| Single Pulsed Avalanche Current        | (Note 11)             |                                | I <sub>AS</sub>  | 5.0   | A    |
| Continuous Drain current               | V <sub>GS</sub> = 10V | (Note 7)                       | I <sub>D</sub>   | 8.5   | A    |
|                                        |                       | T <sub>A</sub> = 70°C (Note 7) |                  | 6.8   |      |
|                                        |                       | (Note 6)                       |                  | 6.0   |      |
| Pulsed Drain current                   | V <sub>GS</sub> = 10V | (Note 8)                       | I <sub>DM</sub>  | 22.2  | A    |
| Continuous Source current (Body diode) | (Note 7)              |                                | I <sub>S</sub>   | 10.2  | A    |
| Pulsed Source current (Body diode)     | (Note 8)              |                                | I <sub>SM</sub>  | 22.2  | A    |

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                              |           | Symbol                            | Value       | Unit       |
|---------------------------------------------|-----------|-----------------------------------|-------------|------------|
| Power dissipation<br>Linear derating factor | (Note 6)  | P <sub>D</sub>                    | 4.12        | W<br>mW/°C |
|                                             |           |                                   | 33          |            |
|                                             | (Note 7)  |                                   | 8.49        |            |
|                                             | (Note 9)  |                                   | 67.9        |            |
| Thermal Resistance, Junction to Ambient     | (Note 6)  | R <sub>θJA</sub>                  | 2.12        | °C/W       |
|                                             | (Note 7)  |                                   | 16.9        |            |
|                                             | (Note 9)  |                                   | 30.3        |            |
| Thermal Resistance, Junction to Lead        | (Note 10) | R <sub>θJL</sub>                  | 14.7        | °C/W       |
|                                             |           |                                   | 59.0        |            |
| Operating and storage temperature range     |           | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C         |

- Notes:
- AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  - 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.
  - Same as note 2, except the device is measured at t ≤ 10 sec.
  - 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.
  - 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.
  - Thermal resistance from junction to solder-point (at the end of the drain lead).
  - UIS in production with L = 3.0mH, I<sub>AS</sub> = 5.0A, R<sub>G</sub> = 25•, V<sub>DD</sub> = 50V, starting T<sub>J</sub> = 25°C

# Thermal Characteristics

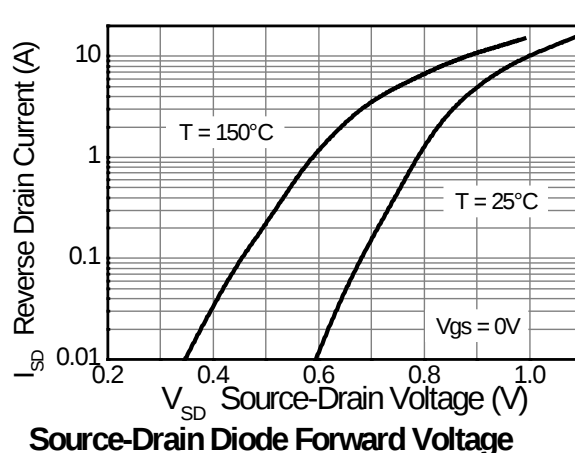
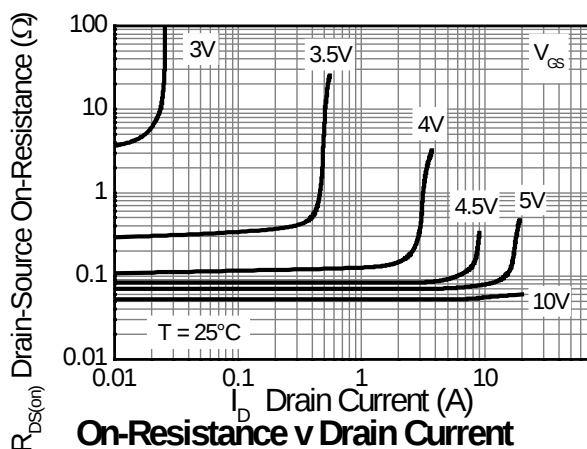
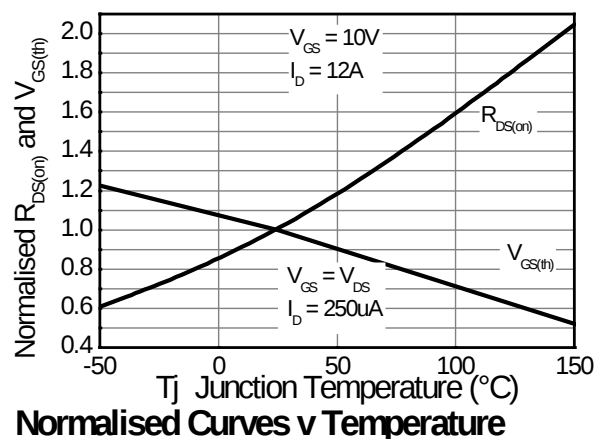
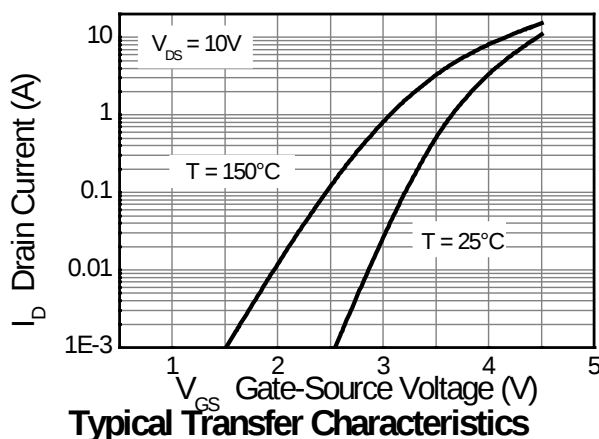
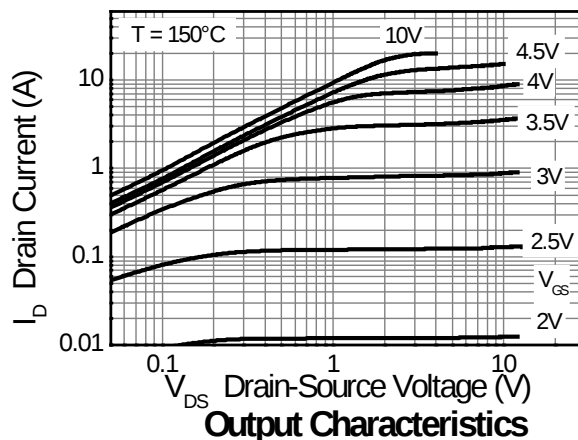
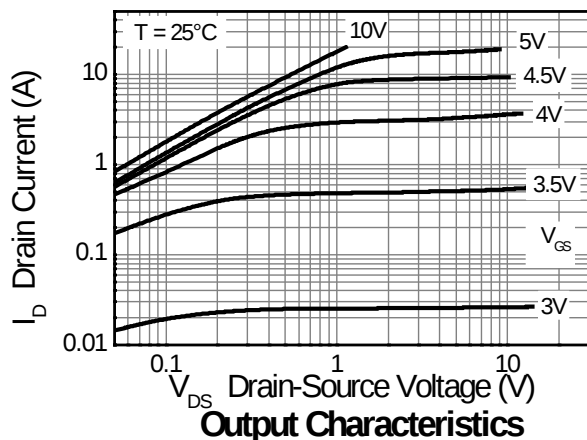


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

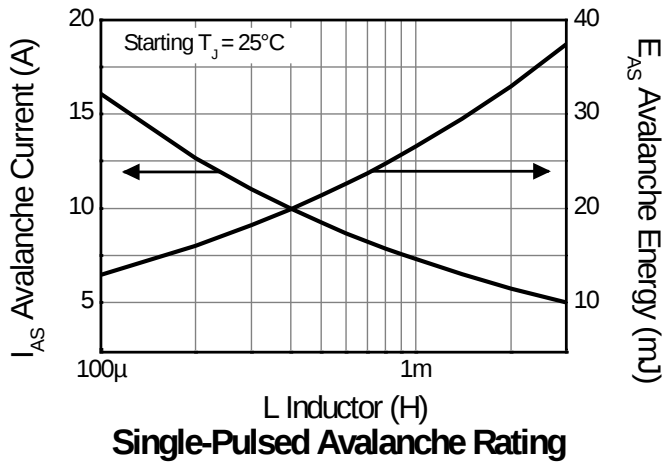
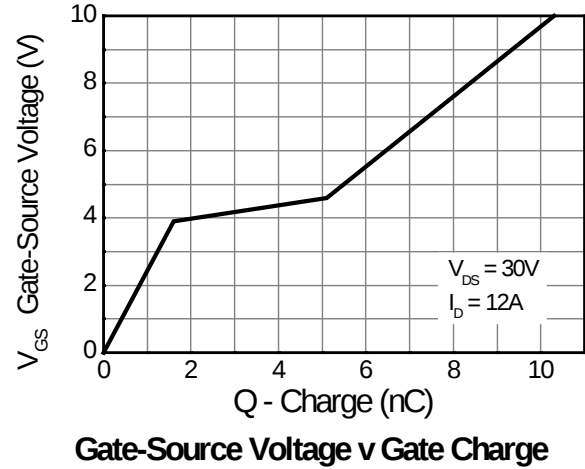
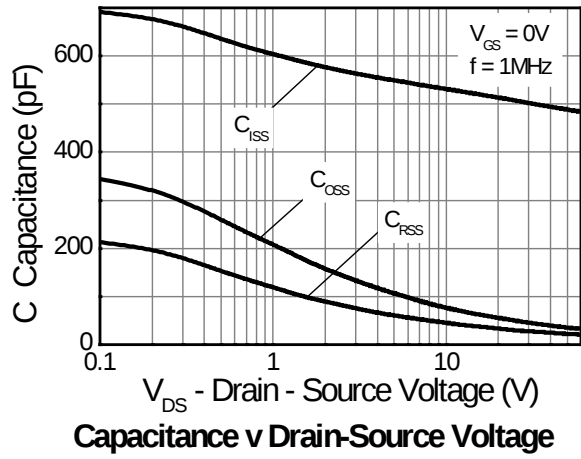
| Characteristic                              | Symbol               | Min | Typ  | Max   | Unit | Test Condition                                                                              |                                               |
|---------------------------------------------|----------------------|-----|------|-------|------|---------------------------------------------------------------------------------------------|-----------------------------------------------|
| OFF CHARACTERISTICS                         |                      |     |      |       |      |                                                                                             |                                               |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>    | 60  | —    | —     | V    | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                |                                               |
| Zero Gate Voltage Drain Current             | I <sub>DSS</sub>     | —   | —    | 0.5   | μA   | V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V                                                 |                                               |
| Gate-Source Leakage                         | I <sub>GSS</sub>     | —   | —    | ±100  | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                                |                                               |
| ON CHARACTERISTICS                          |                      |     |      |       |      |                                                                                             |                                               |
| Gate Threshold Voltage                      | V <sub>GS(th)</sub>  | 1.0 | —    | 3.0   | V    | I <sub>D</sub> = 250μA, V <sub>DS</sub> = V <sub>GS</sub>                                   |                                               |
| Static Drain-Source On-Resistance (Note 12) | R <sub>DS (ON)</sub> | —   | —    | 0.068 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A                                                 |                                               |
|                                             |                      |     |      | 0.100 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A                                                 |                                               |
| Forward Transconductance (Notes 12 & 13)    | g <sub>fs</sub>      | —   | 19.7 | —     | S    | V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A                                                 |                                               |
| Diode Forward Voltage (Note 12)             | V <sub>SD</sub>      | —   | 0.98 | 1.15  | V    | I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V                                                  |                                               |
| Reverse recovery time (Note 13)             | t <sub>rr</sub>      |     | 145  | —     | ns   | I <sub>S</sub> = 12A, di/dt= 100A/μs                                                        |                                               |
| Reverse recovery charge (Note 13)           | Q <sub>rr</sub>      | —   | 929  | —     | nC   |                                                                                             |                                               |
| DYNAMIC CHARACTERISTICS (Note 13)           |                      |     |      |       |      |                                                                                             |                                               |
| Input Capacitance                           | C <sub>ISS</sub>     | —   | 502  | —     | pF   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V<br>f= 1MHz                                      |                                               |
| Output Capacitance                          | C <sub>OSS</sub>     | —   | 45.7 | —     | pF   |                                                                                             |                                               |
| Reverse Transfer Capacitance                | C <sub>RSS</sub>     | —   | 27.1 | —     | pF   |                                                                                             |                                               |
| Total Gate Charge                           | Q <sub>g</sub>       | —   | 5.55 | —     | nC   | V <sub>GS</sub> = 4.5V                                                                      | V <sub>DS</sub> = 30V<br>I <sub>D</sub> = 12A |
| Total Gate Charge                           | Q <sub>g</sub>       | —   | 10.3 | —     | nC   | V <sub>GS</sub> = 10V                                                                       |                                               |
| Gate-Source Charge                          | Q <sub>gs</sub>      | —   | 1.6  | —     | nC   |                                                                                             |                                               |
| Gate-Drain Charge                           | Q <sub>gd</sub>      | —   | 3.5  | —     | nC   |                                                                                             |                                               |
| Turn-On Delay Time (Note 14)                | t <sub>D(on)</sub>   | —   | 3.6  | —     | ns   | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V<br>I <sub>D</sub> = 12A, R <sub>G</sub> ≅ 6.0Ω |                                               |
| Turn-On Rise Time (Note 14)                 | t <sub>r</sub>       | —   | 10.8 | —     | ns   |                                                                                             |                                               |
| Turn-Off Delay Time (Note 14)               | t <sub>D(off)</sub>  | —   | 11.9 | —     | ns   |                                                                                             |                                               |
| Turn-Off Fall Time (Note 14)                | t <sub>f</sub>       | —   | 8.7  | —     | ns   |                                                                                             |                                               |

Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%  
13. For design aid only, not subject to production testing.  
14. Switching characteristics are independent of operating junction temperatures.

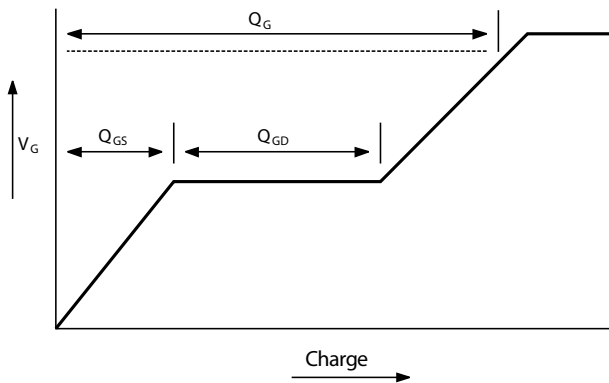
# Typical Characteristics



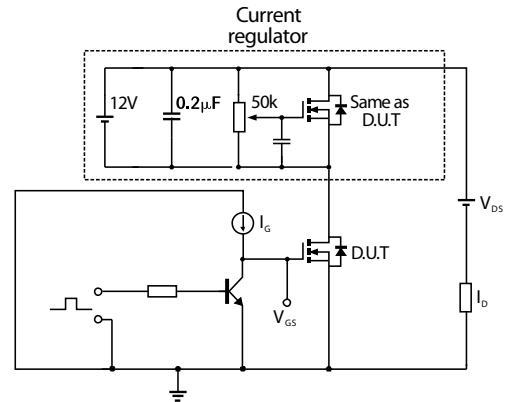
## Typical Characteristics - continued



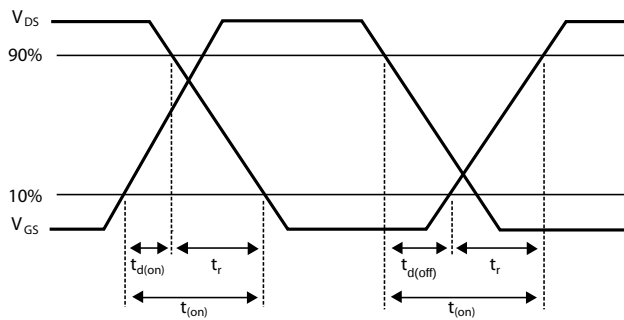
## Test Circuits



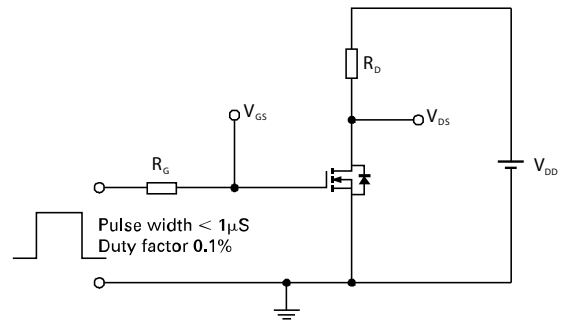
Basic gate charge waveform



Gate charge test circuit



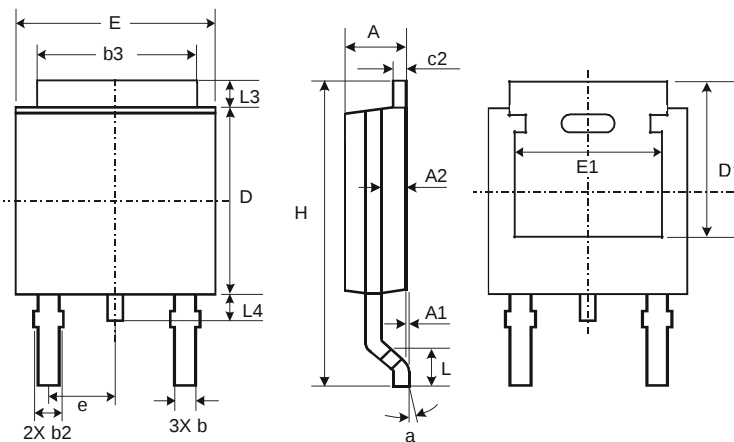
Switching time waveforms



Switching time test circuit

## Package Outline Dimensions

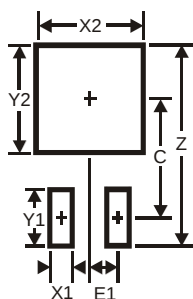
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| TO252                |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 2.19 | 2.39  | 2.29  |
| A1                   | 0.00 | 0.13  | 0.08  |
| A2                   | 0.97 | 1.17  | 1.07  |
| b                    | 0.64 | 0.88  | 0.783 |
| b2                   | 0.76 | 1.14  | 0.95  |
| b3                   | 5.21 | 5.46  | 5.33  |
| c2                   | 0.45 | 0.58  | 0.531 |
| D                    | 6.00 | 6.20  | 6.10  |
| D1                   | 5.21 | —     | —     |
| e                    | —    | —     | 2.286 |
| E                    | 6.45 | 6.70  | 6.58  |
| E1                   | 4.32 | —     | —     |
| H                    | 9.40 | 10.41 | 9.91  |
| L                    | 1.40 | 1.78  | 1.59  |
| L3                   | 0.88 | 1.27  | 1.08  |
| L4                   | 0.64 | 1.02  | 0.83  |
| a                    | 0°   | 10°   | —     |
| All Dimensions in mm |      |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 11.6          |
| X1         | 1.5           |
| X2         | 7.0           |
| Y1         | 2.5           |
| Y2         | 7.0           |
| C          | 6.9           |
| E1         | 2.3           |

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