

**40V DUAL N-CHANNEL ENHANCEMENT MODE MOSFET**

**Product Summary**

| $V_{(BR)DSS}$ | $R_{DS(on) Max}$               | $I_D$<br>$T_A = +25^{\circ}C$ |
|---------------|--------------------------------|-------------------------------|
| 40V           | 27m $\Omega$ @ $V_{GS} = 10V$  | 7.1A                          |
|               | 47m $\Omega$ @ $V_{GS} = 4.5V$ | 5.4A                          |

**Description**

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

**Applications**

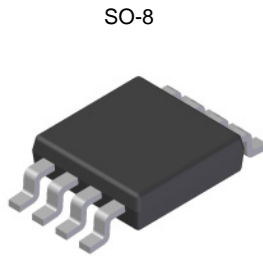
- Motor Control
- Backlighting
- DC-DC Converters
- Power Management Functions

**Features and Benefits**

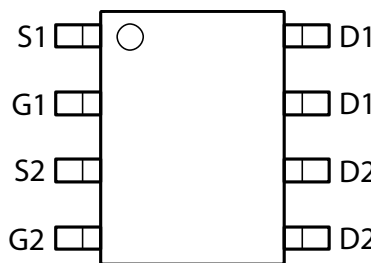
- Low on-resistance
- Fast switching speed
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

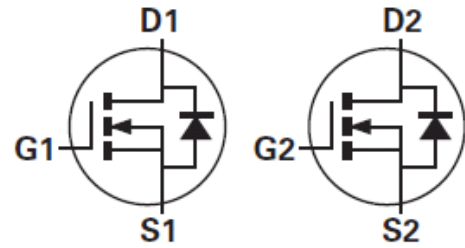
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.074 grams (approximate)



Top View



Top View



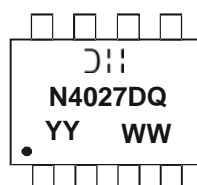
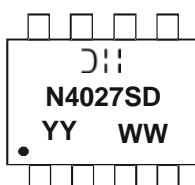
Equivalent Circuit

**Ordering Information** (Note 4)

| Part Number    | Compliance | Case | Packaging          |
|----------------|------------|------|--------------------|
| DMN4027SSD-13  | Standard   | SO-8 | 2500 / Tape & Reel |
| DMN4027SSDQ-13 | Automotive | SO-8 | 2500 / Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  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**



⑆ = Manufacturer's Marking  
 N4027SD = Product Type Marking Code for DMN4027SSD-13  
 N4027DQ = Product Type Marking Code for DMN4027SSDQ-13  
 YYWW = Date Code Marking  
 YY = Year (ex: 09 = 2009)  
 WW = Week (01-53)

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

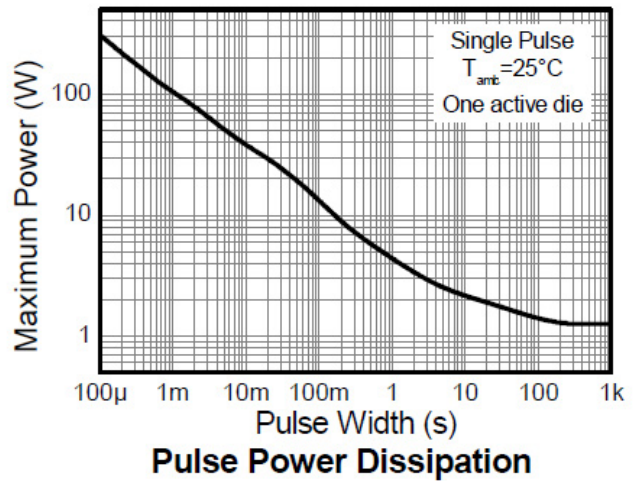
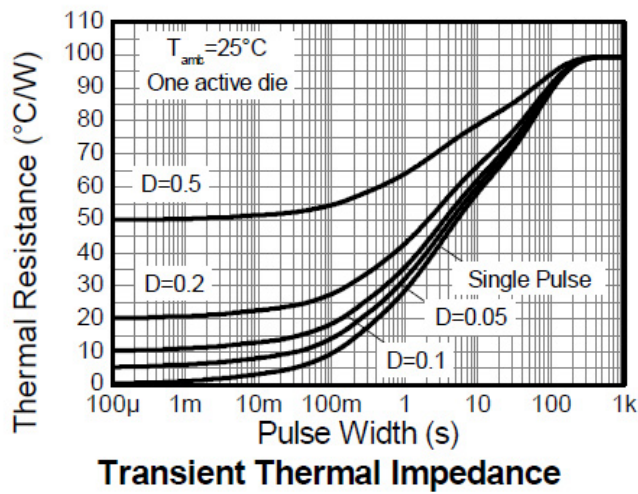
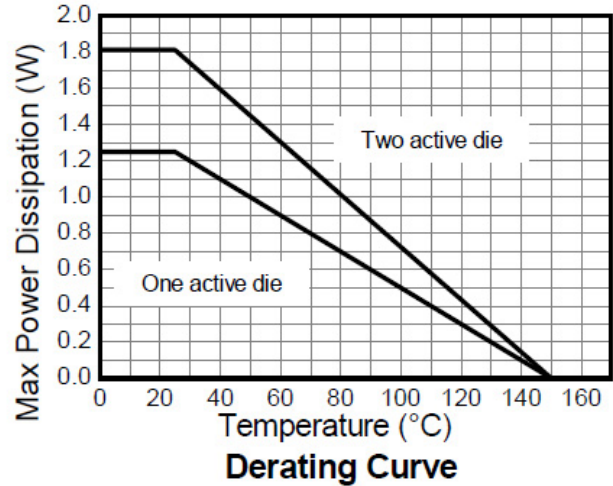
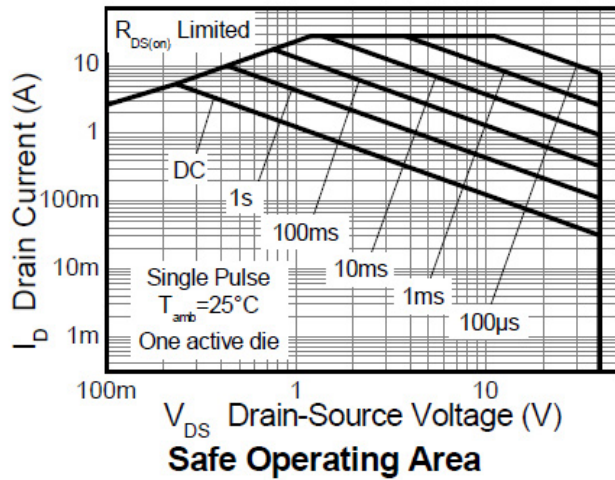
| Characteristic                         |                       | Symbol                           | Value | Unit |
|--|-----------------------|----------------------------------|-------|------|
| Drain-Source Voltage                   |                       | V <sub>DSS</sub>                 | 40    | V    |
| Gate-Source Voltage                    |                       | V <sub>GS</sub>                  | ±20   | V    |
| Continuous Drain Current               | V <sub>GS</sub> = 10V | (Notes 7)                        | 7.1   | A    |
|  |                       | T <sub>A</sub> = +70°C (Notes 7) | 5.7   |      |
|  |                       | (Notes 6)                        | 5.4   |      |
| Pulsed Drain Current                   | V <sub>GS</sub> = 10V | I <sub>DM</sub>                  | 28.0  | A    |
| Continuous Source Current (Body diode) |                       | I <sub>S</sub>                   | 3.3   | A    |
| Pulsed Source Current (Body diode)     |                       | I <sub>SM</sub>                  | 28.0  | A    |

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

| Characteristic                              |                | Symbol                            | Value | Unit       |
|---|----------------|-----------------------------------|-------|------------|
| Power Dissipation<br>Linear Derating Factor | (Notes 6 & 9)  | P <sub>D</sub>                    | 1.25  | W<br>mW/°C |
|   | (Notes 6 & 10) |                                   | 10.0  |            |
|   | (Notes 7 & 9)  |                                   | 1.8   |            |
|   |                |                                   | 14.3  |            |
| Thermal Resistance, Junction to Ambient     | (Notes 6 & 9)  | R <sub>θJA</sub>                  | 2.14  | °C/W       |
|   | (Notes 6 & 10) |                                   | 17.2  |            |
|   | (Notes 7 & 9)  |                                   | 100   |            |
| Thermal Resistance, Junction to Lead        | (Notes 9 & 11) | R <sub>θJL</sub>                  | 70    | °C/W       |
| Operating and Storage Temperature Range     |                | T <sub>J</sub> , T <sub>STG</sub> | 58    |            |
|   |                |                                   | 53    | °C         |

- Notes:
5. AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  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. Same as note (3), except the device is measured at t ≤ 10 sec.
  8. Same as note (3), except the device is pulsed with D = 0.02 and pulse width 300µs. The pulse current is limited by the maximum junction temperature.
  9. For a dual device with one active die.
  10. For a device with two active die running at equal power.
  11. Thermal resistance from junction to solder-point (at the end of the drain lead).

**Thermal Characteristics**

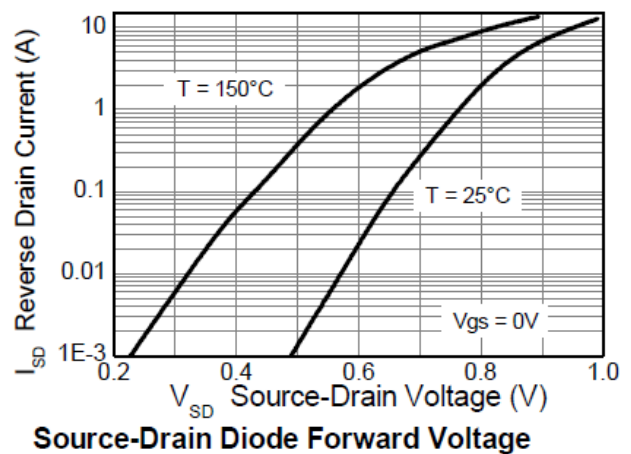
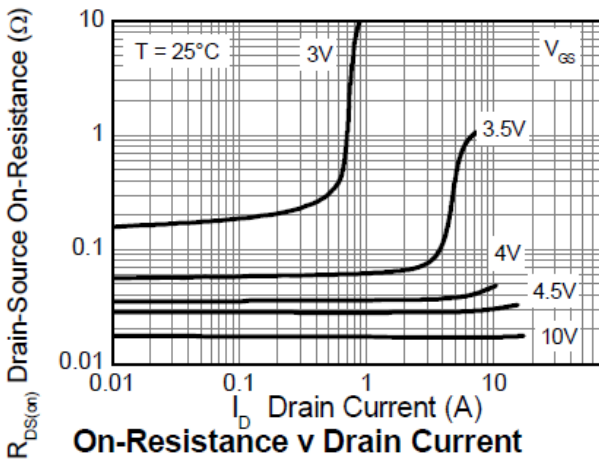
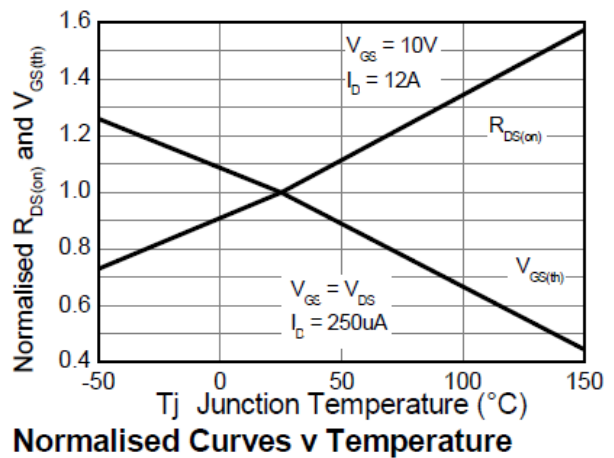
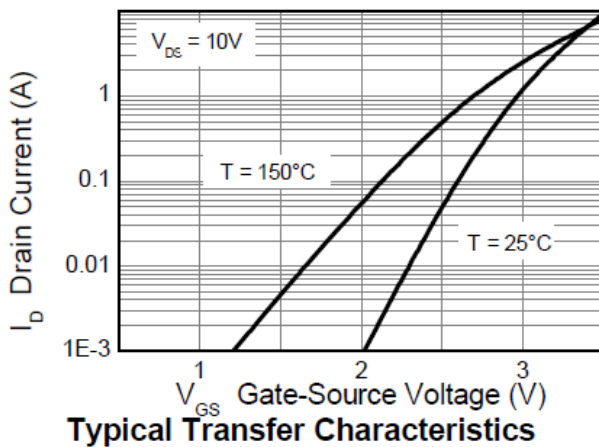
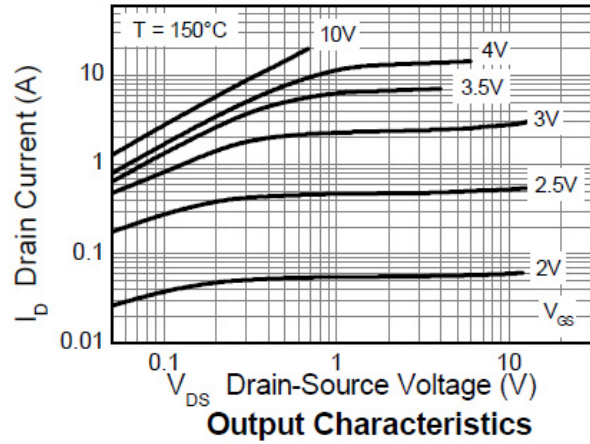
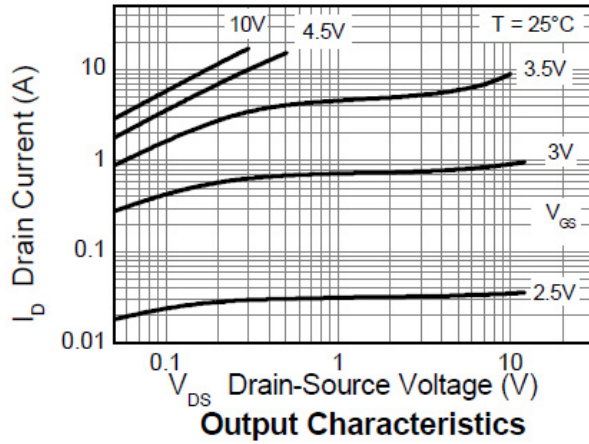


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

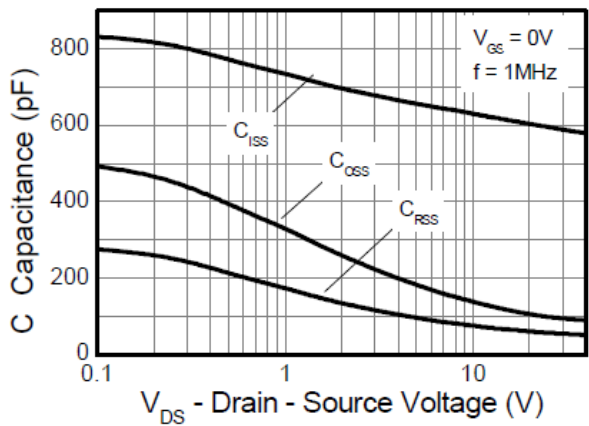
| Characteristic                              | Symbol              | Min | Typ   | Max   | Unit | Test Condition   |
|---|---------------------|-----|-------|-------|------|--|
| <b>OFF CHARACTERISTICS</b>                  |                     |     |       |       |      |  |
| Drain-Source Breakdown Voltage              | BV <sub>DSS</sub>   | 40  | —     | —     | 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> = 40V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                         | I <sub>GSS</sub>    | —   | —     | ±100  | nA   | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS</b>                   |                     |     |       |       |      |  |
| 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> | —   | 0.017 | 0.027 | Ω    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A   |
|   |                     |     | 0.031 | 0.047 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A  |
| Forward Transconductance (Notes 12 & 13)    | g <sub>fs</sub>     | —   | 22.8  | —     | S    | V <sub>DS</sub> = 15V, I <sub>D</sub> = 7A   |
| Diode Forward Voltage (Note 12)             | V <sub>SD</sub>     | —   | 0.86  | 1.1   | V    | I <sub>S</sub> = 7A, V <sub>GS</sub> = 0V  |
| Reverse recovery time (Note 13)             | t <sub>rr</sub>     | —   | 12.1  | —     | ns   | I <sub>S</sub> = 2.1A, di/dt = 100A/μs   |
| Reverse recovery charge (Note 13)           | Q <sub>rr</sub>     | —   | 5.1   | —     | nC   |  |
| <b>DYNAMIC CHARACTERISTICS (Note 13)</b>    |                     |     |       |       |      |  |
| Input Capacitance                           | C <sub>iSS</sub>    | —   | 604   | —     | pF   | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V<br>f = 1MHz                                    |
| Output Capacitance                          | C <sub>oSS</sub>    | —   | 106   | —     | pF   |  |
| Reverse Transfer Capacitance                | C <sub>rSS</sub>    | —   | 59.6  | —     | pF   |  |
| Total Gate Charge (Note 14)                 | Q <sub>g</sub>      | —   | 6.3   | —     | nC   | V <sub>GS</sub> = 4.5V   |
| Total Gate Charge Note 14)                  | Q <sub>g</sub>      | —   | 12.9  | —     | nC   | V <sub>GS</sub> = 10V  |
| Gate-Source Charge Note 14)                 | Q <sub>gs</sub>     | —   | 2.4   | —     | nC   |  |
| Gate-Drain Charge Note 14)                  | Q <sub>gd</sub>     | —   | 3.3   | —     | nC   |  |
| Turn-On Delay Time Note 14)                 | t <sub>D(on)</sub>  | —   | 3.1   | —     | ns   | V <sub>DD</sub> = 20V, V <sub>GS</sub> = 10V<br>I <sub>D</sub> = 1A, R <sub>G</sub> ≅ 6.0Ω |
| Turn-On Rise Time Note 14)                  | t <sub>r</sub>      | —   | 3.1   | —     | ns   |  |
| Turn-Off Delay Time (Note 14)               | t <sub>D(off)</sub> | —   | 15.4  | —     | ns   |  |
| Turn-Off Fall Time Note 14)                 | t <sub>f</sub>      | —   | 7.5   | —     | 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.

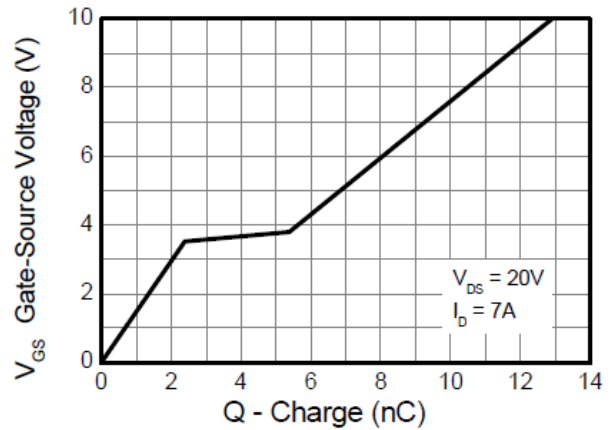
**Typical Characteristics**



**Typical Characteristics (cont.)**

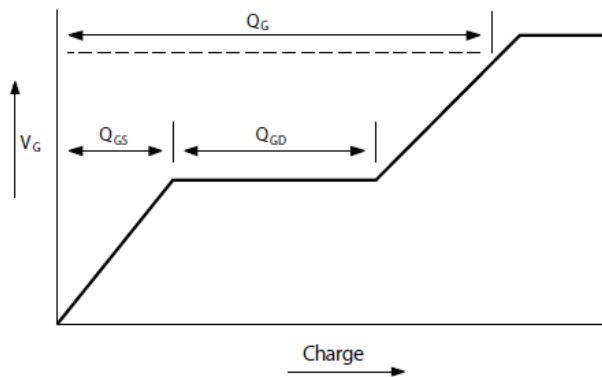


**Capacitance v Drain-Source Voltage**

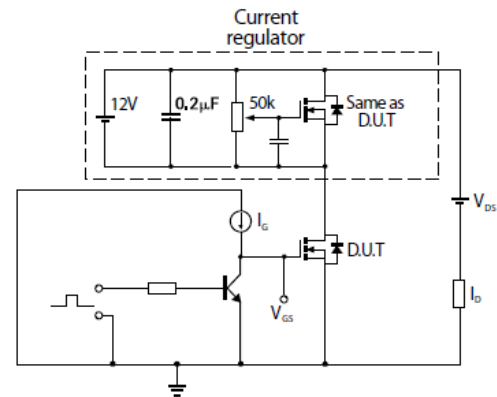


**Gate-Source Voltage v Gate Charge**

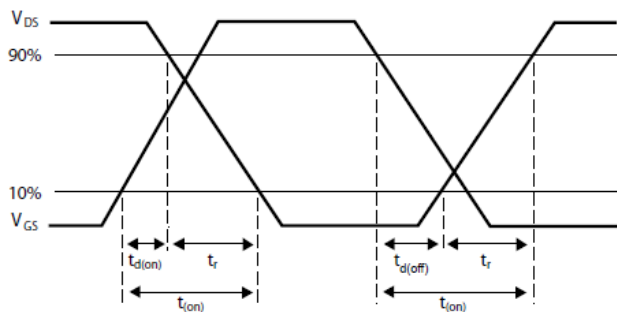
**Test Circuits**



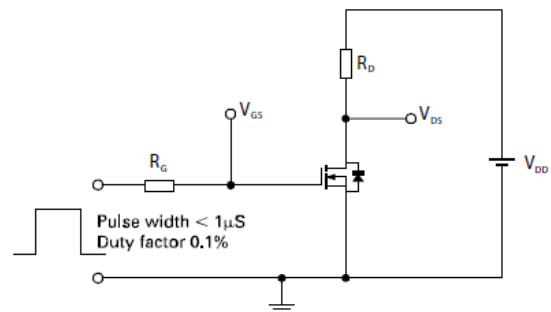
**Basic gate charge waveform**



**Gate charge test circuit**



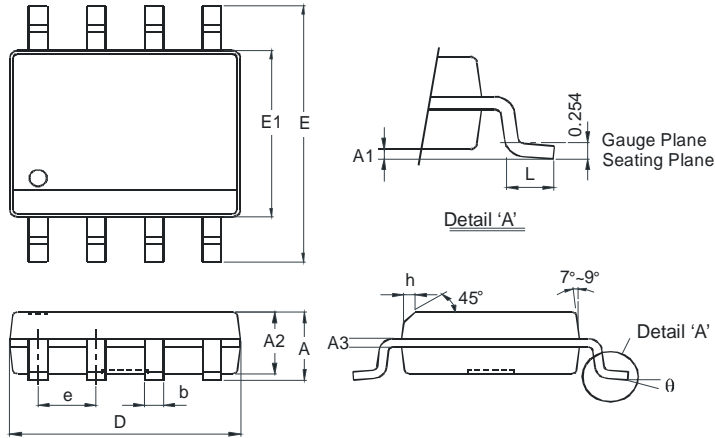
**Switching time waveforms**



**Switching time test circuit**

## Package Outline Dimensions

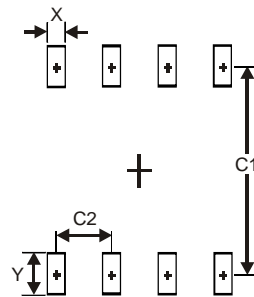
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SO-8                 |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | -        | 1.75 |
| A1                   | 0.10     | 0.20 |
| A2                   | 1.30     | 1.50 |
| A3                   | 0.15     | 0.25 |
| b                    | 0.3      | 0.5  |
| D                    | 4.85     | 4.95 |
| E                    | 5.90     | 6.10 |
| E1                   | 3.85     | 3.95 |
| e                    | 1.27 Typ |      |
| h                    | -        | 0.35 |
| L                    | 0.62     | 0.82 |
| θ                    | 0°       | 8°   |
| 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) |
|------------|---------------|
| X          | 0.60          |
| Y          | 1.55          |
| C1         | 5.4           |
| C2         | 1.27          |

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