

## 40V DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

### Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$ max                      | $I_D$ max (A)<br>$T_A = 25^\circ\text{C}$<br>(Notes 3 & 5) |
|---------------|---------------------------------------|------------------------------------------------------------|
| 40V           | 25m $\Omega$ @ $V_{GS} = 10\text{V}$  | 7.4                                                        |
|               | 40m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 6.2                                                        |

### Description and Applications

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.

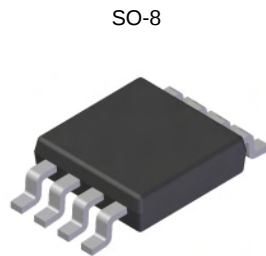
- Motor control
- Backlighting
- DC-DC Converters
- Printer equipment

### Features and Benefits

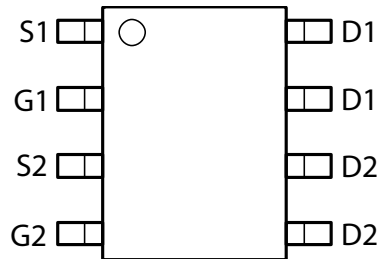
- Low  $R_{DS(on)}$  – Minimizes conduction losses
- Fast switching speed – Minimizes switching losses
- "Green" component and RoHS compliant (Note 1)
- Qualified to AEC-Q101 Standards for High Reliability

### Mechanical Data

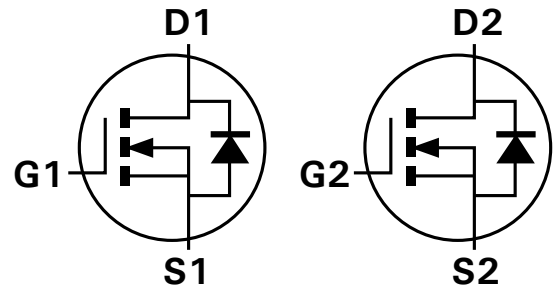
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208
- Weight: 0.074 grams (approximate)



Top View



Pin-Out Top View



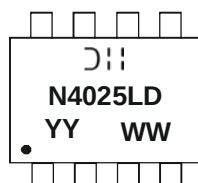
Device symbol

### Ordering Information (Note 1)

| Product       | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---------------|---------|--------------------|-----------------|-------------------|
| DMN4025LSD-13 | N4025LD | 13                 | 12              | 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



DII = Manufacturer's Marking  
 N4025LD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 10 = 2010)  
 WW = Week (01 - 53)

**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

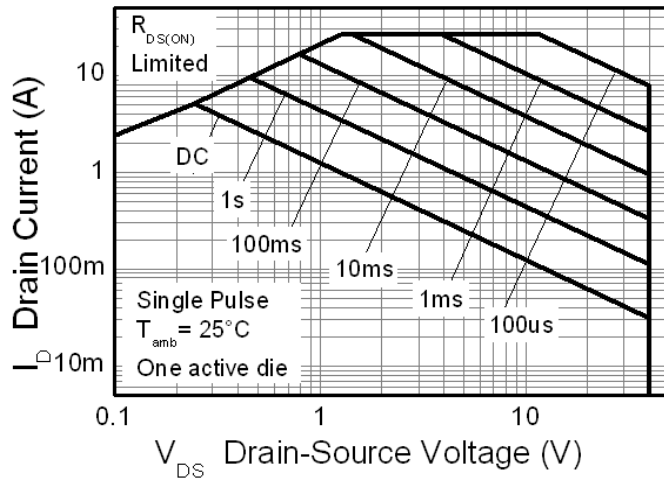
| Characteristic                         |                       |                                     | Symbol           | Value | Units |
|----------------------------------------|-----------------------|-------------------------------------|------------------|-------|-------|
| Drain-Source Voltage                   |                       |                                     | V <sub>DSS</sub> | 40    | V     |
| Gate-Source Voltage                    |                       |                                     | V <sub>GSS</sub> | ±20   |       |
| Continuous Drain Current               | V <sub>GS</sub> = 10V | (Notes 3 & 5)                       | I <sub>D</sub>   | 7.4   | A     |
|                                        |                       | T <sub>A</sub> = 70°C (Notes 3 & 5) |                  | 5.8   |       |
|                                        |                       | (Notes 2 & 5)                       |                  | 5.6   |       |
|                                        |                       | (Notes 2 & 6)                       |                  | 6.7   |       |
| Pulsed Drain Current                   | V <sub>GS</sub> = 10V | (Notes 4 & 5)                       | I <sub>DM</sub>  | 29.0  |       |
| Continuous Source Current (Body diode) |                       | (Notes 3 & 5)                       | I <sub>S</sub>   | 3.0   |       |
| Pulsed Source Current (Body diode)     |                       | (Notes 4 & 5)                       | I <sub>SM</sub>  | 29.0  |       |

**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

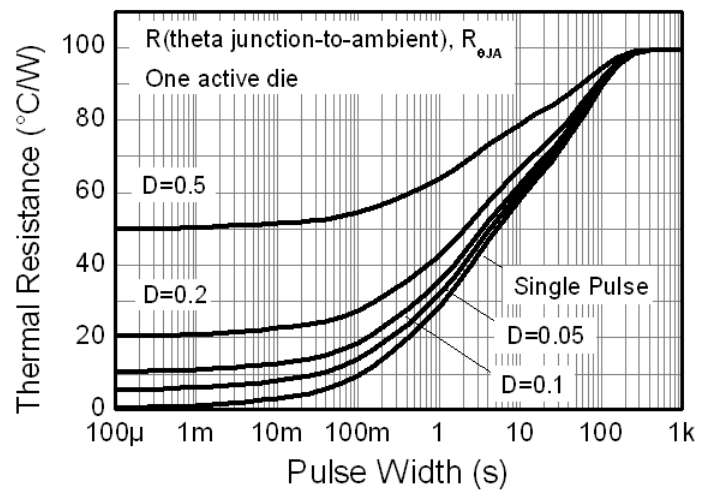
| Characteristic                              |               | Symbol                            | Value | Unit       |
|---------------------------------------------|---------------|-----------------------------------|-------|------------|
| Power Dissipation<br>Linear Derating Factor | (Notes 2 & 5) | P <sub>D</sub>                    | 1.25  | W<br>mW/°C |
|                                             |               |                                   | 10    |            |
|                                             | (Notes 2 & 6) |                                   | 1.8   |            |
|                                             | (Notes 3 & 5) |                                   | 14.3  |            |
| Thermal Resistance, Junction to Ambient     | (Notes 2 & 5) | R <sub>θJA</sub>                  | 2.14  | °C/W       |
|                                             | (Notes 2 & 6) |                                   | 17.2  |            |
|                                             | (Notes 3 & 5) |                                   | 100   |            |
| Thermal Resistance, Junction to Lead        | (Notes 2 & 6) | R <sub>θJL</sub>                  | 70    | °C/W       |
|                                             | (Notes 3 & 5) |                                   | 58    |            |
| Operating and Storage Temperature Range     |               | T <sub>J</sub> , T <sub>STG</sub> | 51    | °C         |

- Notes:
2. 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.
  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 300μs.
  5. For a dual device with one active die.
  6. For a device with two active die running at equal power.
  7. Thermal resistance from junction to solder-point (at the end of the drain lead).

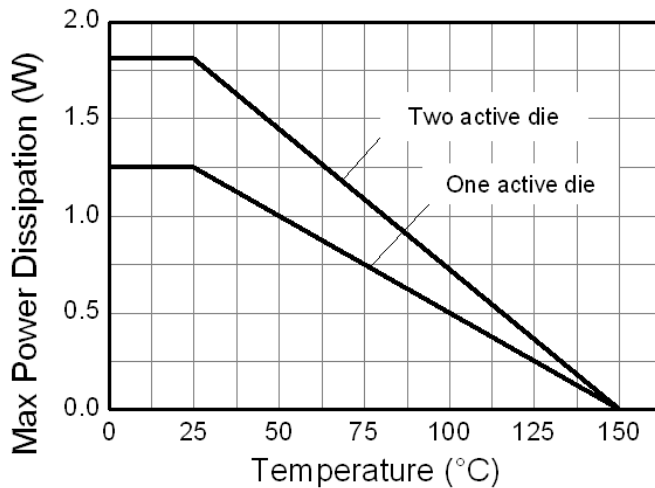
## Thermal Characteristics



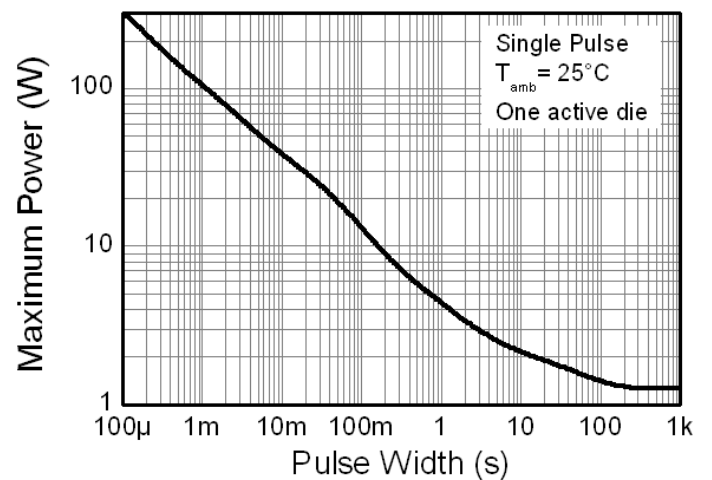
**N-channel Safe Operating Area**



**Transient Thermal Impedance**



**Derating Curve**

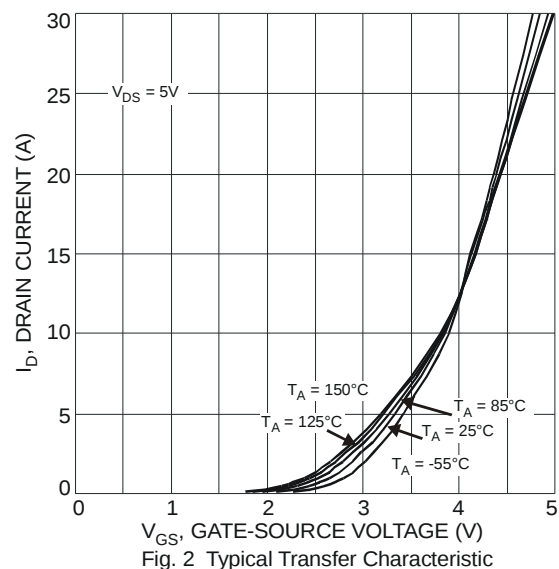
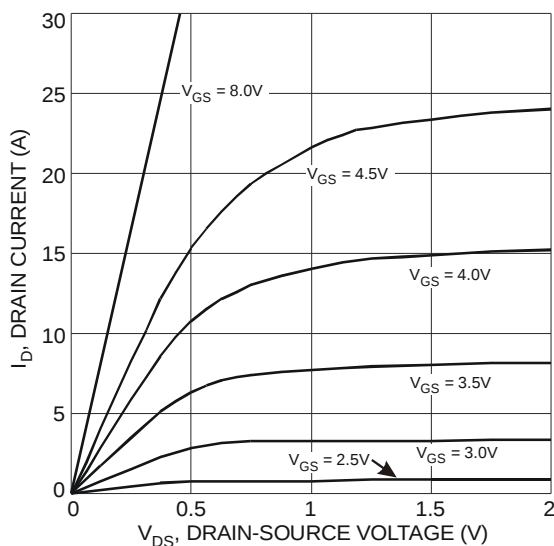


**Pulse Power Dissipation**

**Electrical Characteristics**  $T_A = 25^\circ\text{C}$  unless otherwise specified

| Characteristic                             | Symbol       | Min | Typ   | Max       | Unit          | Test Condition                                                       |
|--------------------------------------------|--------------|-----|-------|-----------|---------------|----------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS</b>                 |              |     |       |           |               |                                                                      |
| Drain-Source Breakdown Voltage             | $BV_{DSS}$   | 40  | —     | —         | V             | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                        |
| Zero Gate Voltage Drain Current            | $I_{DSS}$    | —   | —     | 1.0       | $\mu\text{A}$ | $V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$                         |
| Gate-Source Leakage                        | $I_{GSS}$    | —   | —     | $\pm 100$ | nA            | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$                     |
| <b>ON CHARACTERISTICS</b>                  |              |     |       |           |               |                                                                      |
| Gate Threshold Voltage                     | $V_{GS(th)}$ | 0.8 | 1.3   | 1.8       | V             | $I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$                           |
| Static Drain-Source On-Resistance (Note 8) | $R_{DS(on)}$ | —   | 0.013 | 0.025     | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 3\text{A}$                            |
|                                            |              |     | 0.028 | 0.040     |               | $V_{GS} = 4.5\text{V}$ , $I_D = 3\text{A}$                           |
| Forward Transconductance (Notes 8 & 9)     | $g_{fs}$     | —   | 12.6  | —         | S             | $V_{DS} = 5\text{V}$ , $I_D = 3\text{A}$                             |
| Diode Forward Voltage (Note 8)             | $V_{SD}$     | —   | 0.7   | 1.0       | V             | $I_S = 1\text{A}$ , $V_{GS} = 0\text{V}$                             |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>    |              |     |       |           |               |                                                                      |
| Input Capacitance                          | $C_{iss}$    | —   | 1790  | —         | pF            | $V_{DS} = 20\text{V}$ , $V_{GS} = 0\text{V}$<br>$f = 1\text{MHz}$    |
| Output Capacitance                         | $C_{oss}$    | —   | 160   | —         |               |                                                                      |
| Reverse Transfer Capacitance               | $C_{rss}$    | —   | 120   | —         |               |                                                                      |
| Gate Resistance                            | $R_g$        | —   | 1.03  | —         | $\Omega$      | $V_{DS} = 0\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$      |
| Total Gate Charge (Note 10)                | $Q_g$        | —   | 16.0  | —         | nC            | $V_{GS} = 4.5\text{V}$<br>$V_{DS} = 20\text{V}$<br>$I_D = 3\text{A}$ |
| Total Gate Charge (Note 10)                | $Q_g$        | —   | 37.6  | —         |               |                                                                      |
| Gate-Source Charge (Note 10)               | $Q_{gs}$     | —   | 7.8   | —         |               |                                                                      |
| Gate-Drain Charge (Note 10)                | $Q_{gd}$     | —   | 6.6   | —         |               |                                                                      |
| Turn-On Delay Time (Note 10)               | $t_{D(on)}$  | —   | 8.1   | —         | ns            | $V_{DD} = 20\text{V}$ , $V_{GS} = 10\text{V}$<br>$I_D = 3\text{A}$   |
| Turn-On Rise Time (Note 10)                | $t_r$        | —   | 15.1  | —         |               |                                                                      |
| Turn-Off Delay Time (Note 10)              | $t_{D(off)}$ | —   | 24.3  | —         |               |                                                                      |
| Turn-Off Fall Time (Note 10)               | $t_f$        | —   | 5.3   | —         |               |                                                                      |

Notes: 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$   
 9. For design aid only, not subject to production testing.  
 10. Switching characteristics are independent of operating junction temperatures.

**Typical Characteristics**


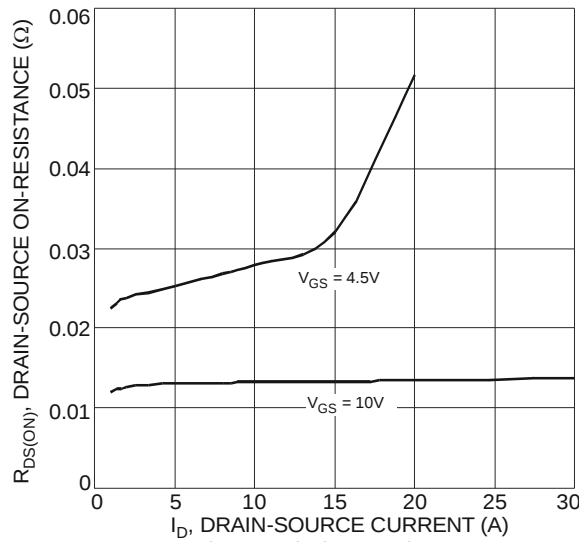


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

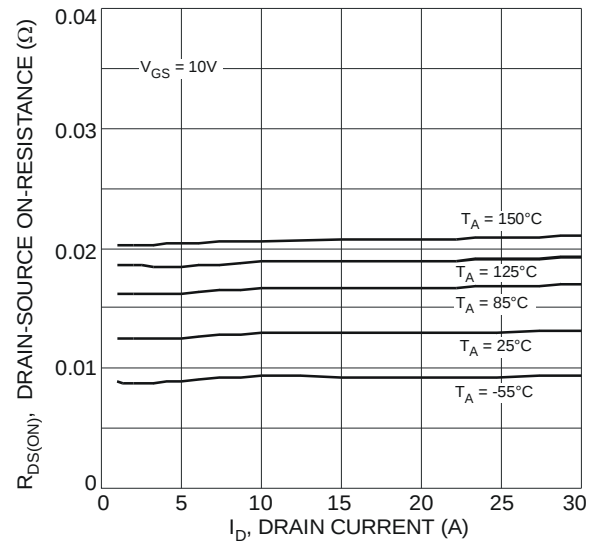


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

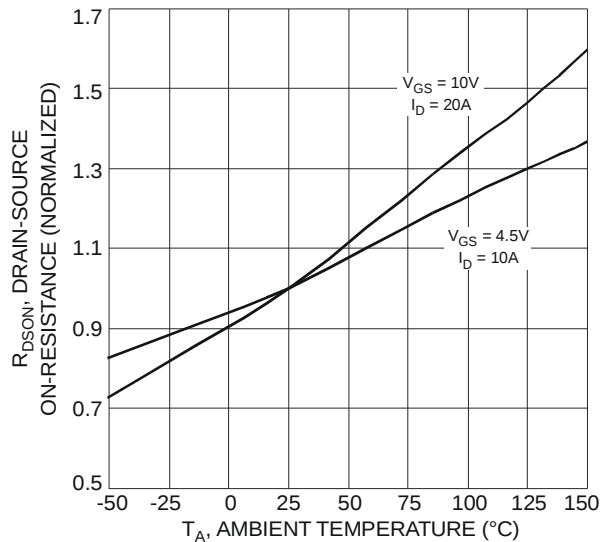


Fig. 5 On-Resistance Variation with Temperature

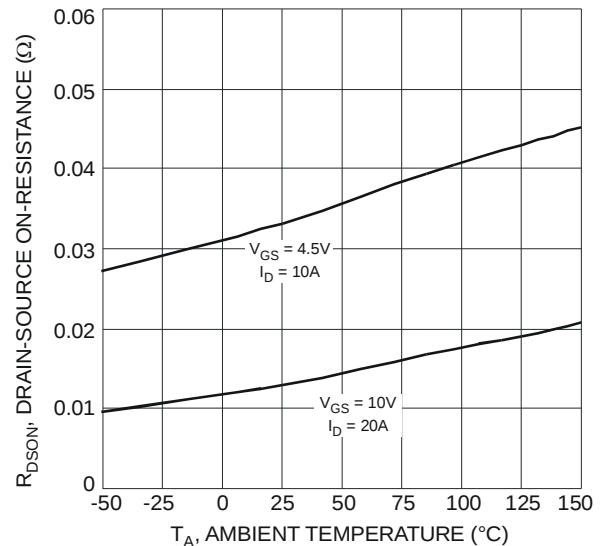


Fig. 6 On-Resistance Variation with Temperature

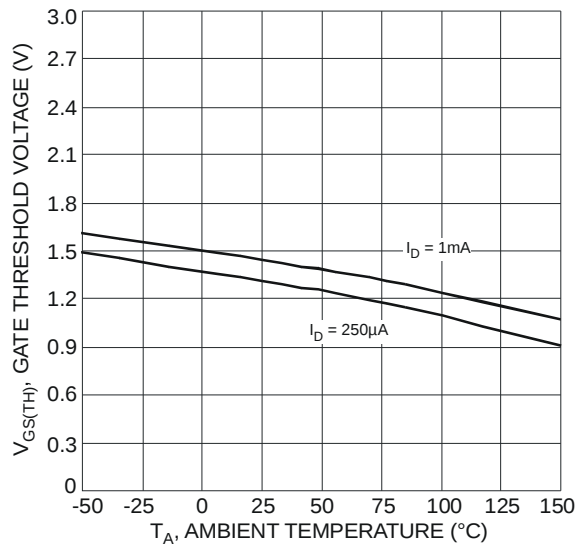


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

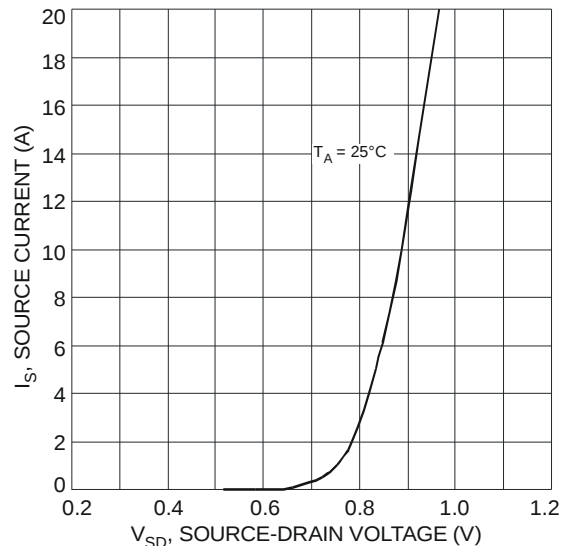


Fig. 8 Diode Forward Voltage vs. Current

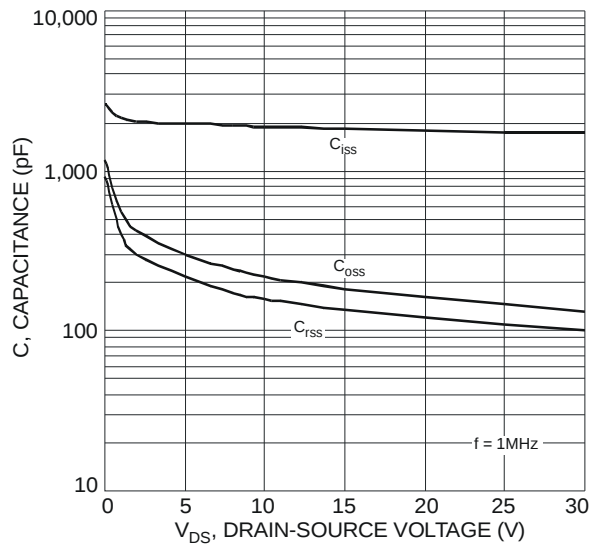


Fig. 9 Typical Total Capacitance

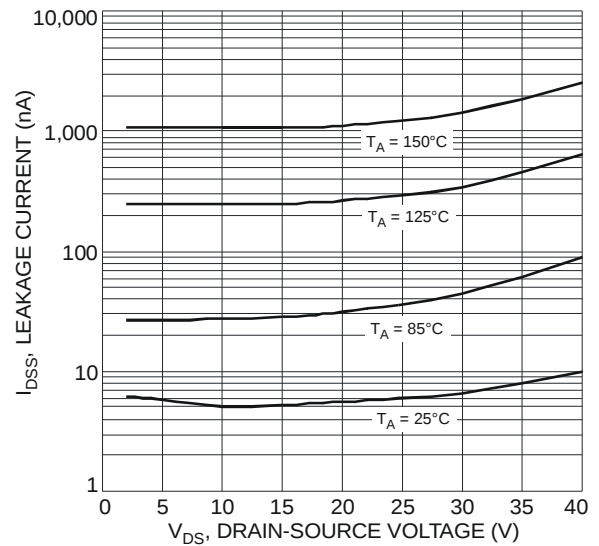


Fig. 10 Typical Leakage Current  
vs. Drain-Source Voltage

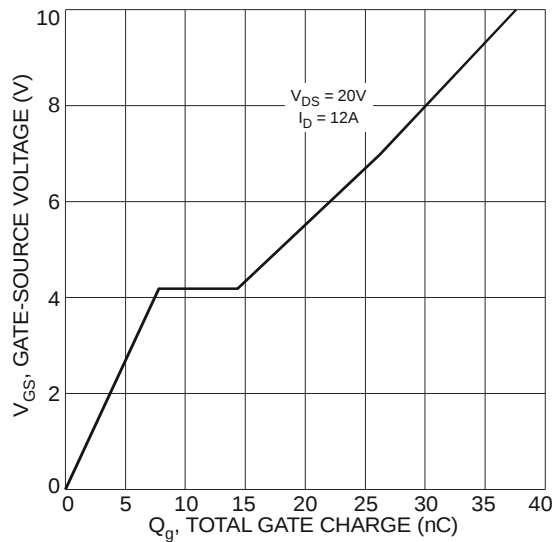
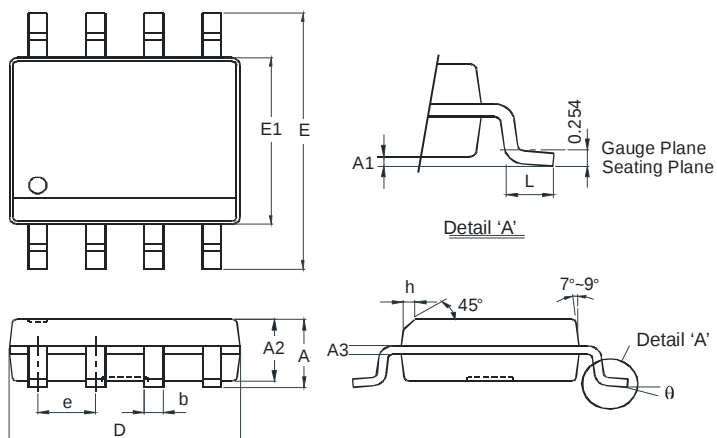


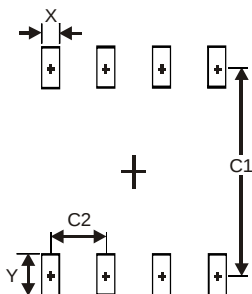
Fig. 11 Gate-Charge Characteristics

## Package Outline Dimensions



| 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



| Dimensions | Value (in mm) |
|------------|---------------|
| X          | 0.60          |
| Y          | 1.55          |
| C1         | 5.4           |
| C2         | 1.27          |

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