

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)}$                            | $I_D$ max<br>$T_A = 25^\circ\text{C}$ (Note 5) |
|---------------|---|--|
| 30V           | 12.5m $\Omega$ @ $V_{GS} = 10\text{V}$  | 11.7A  |
|               | 14.8m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 10.8A  |

## 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.

- DC-DC Converters
- Power management functions



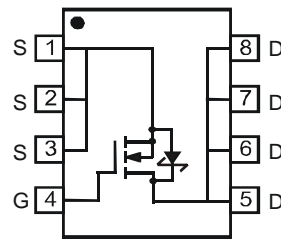
Top View

## Features

- DIOFET utilizes a unique patented process to monolithically integrate a MOSFET and a Schottky in a single die to deliver:
  - Low  $R_{DS(ON)}$  - minimizes conduction losses
  - Low  $V_{SD}$  - reducing the losses due to body diode conduction
  - Low  $Q_{rr}$  - lower  $Q_{rr}$  of the integrated Schottky reduces body diode switching losses
  - Low gate capacitance ( $Q_g/Q_{gs}$ ) ratio – reduces risk of shoot-through or cross conduction currents at high frequencies
  - Avalanche rugged –  $I_{AR}$  and  $E_{AR}$  rated
- **Lead Free, RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **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
- Terminal Connections: See Diagram Below
- Weight: 0.072 grams (approximate)



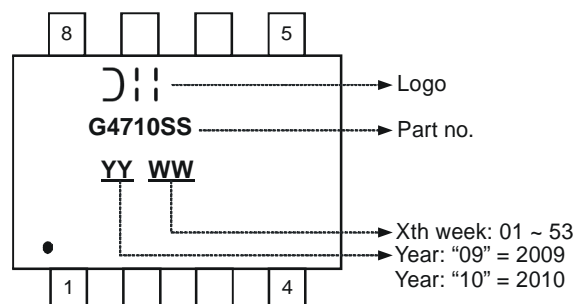
Top View  
Internal Schematic

## Ordering Information (Note 3)

| Part Number   | Case | Packaging          |
|---------------|------|--------------------|
| DMG4710SSS-13 | SO-8 | 2500 / Tape & Reel |

- Notes:
1. No purposefully added lead.
  2. Diodes Inc.'s "Green" policy can be found on our website at <http://www.diodes.com>.
  3. For packaging details, go to our website at <http://www.diodes.com>.

## Marking Information



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

| Characteristic   |              |                       | Symbol           | Value | Unit |
|--|--------------|-----------------------|------------------|-------|------|
| Drain-Source Voltage                                     |              |                       | V <sub>DSS</sub> | 30    | V    |
| Gate-Source Voltage                                      |              |                       | V <sub>GSS</sub> | ±12   | V    |
| Continuous Drain Current (Note 4) V <sub>GS</sub> = 10V  | Steady State | T <sub>A</sub> = 25°C | I <sub>D</sub>   | 8.8   | A    |
|  |              | T <sub>A</sub> = 85°C |                  | 6.3   |      |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 10V  | t ≤ 10 sec   | T <sub>A</sub> = 25°C | I <sub>D</sub>   | 11.7  | A    |
|  |              | T <sub>A</sub> = 85°C |                  | 8.5   |      |
| Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V | t ≤ 10 sec   | T <sub>A</sub> = 25°C | I <sub>D</sub>   | 10.8  | A    |
|  |              | T <sub>A</sub> = 85°C |                  | 7.8   |      |
| Pulsed Drain Current (Note 6)                            |              |                       | I <sub>DM</sub>  | 90    | A    |
| Avalanche Current (Notes 6 & 7)                          |              |                       | I <sub>AR</sub>  | 13    | A    |
| Repetitive Avalanche Energy (Notes 6 & 7) L = 0.3mH      |              |                       | E <sub>AR</sub>  | 25.4  | mJ   |

**Thermal Characteristics**

| Characteristic  | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation (Note 4)  | P <sub>D</sub>                    | 1.54        | W    |
| Thermal Resistance, Junction to Ambient @T <sub>A</sub> = 25°C (Note 4) | R <sub>θJA</sub>                  | 81          | °C/W |
| Power Dissipation (Note 5)  | P <sub>D</sub>                    | 2.8         | W    |
| Thermal Resistance, Junction to Ambient @T <sub>A</sub> = 25°C (Note 5) | R <sub>θJA</sub>                  | 45          | °C/W |
| Operating and Storage Temperature Range                                 | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**Electrical Characteristics** @ T<sub>A</sub> = 25°C unless otherwise stated

| Characteristic                                   | Symbol              | Min  | Typ   | Max  | Unit | Test Condition  |
|--|---------------------|------|-------|------|------|---|
| <b>OFF CHARACTERISTICS (Note 8)</b>              |                     |      |       |      |      |   |
| Drain-Source Breakdown Voltage                   | BV <sub>DSS</sub>   | 30   | -     | -    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA  |
| Zero Gate Voltage Drain Current                  | I <sub>DSS</sub>    | -    | -     | 0.1  | mA   | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V   |
| Gate-Source Leakage                              | I <sub>GSS</sub>    | -    | -     | ±100 | nA   | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V  |
| <b>ON CHARACTERISTICS (Note 8)</b>               |                     |      |       |      |      |   |
| Gate Threshold Voltage                           | V <sub>GS(th)</sub> | 1.0  | -     | 2.3  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  |
| Static Drain-Source On-Resistance                | R <sub>DS(on)</sub> | -    | 9.5   | 12.5 | mΩ   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 11.7A   |
|  |                     | -    | 11.5  | 14.8 |      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10.8A  |
| Forward Transfer Admittance                      | Y <sub>fs</sub>     | -    | 22    | -    | S    | V <sub>DS</sub> = 5V, I <sub>D</sub> = 11.7A  |
| Diode Forward Voltage                            | V <sub>SD</sub>     | -    | 0.38  | 0.6  | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A   |
| Maximum Body-Diode + Schottky Continuous Current | I <sub>S</sub>      | -    | -     | 5    | A    | -   |
| <b>DYNAMIC CHARACTERISTICS (Note 9)</b>          |                     |      |       |      |      |   |
| Input Capacitance                                | C <sub>iss</sub>    | -    | 1849  | -    | pF   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                  |
| Output Capacitance                               | C <sub>oss</sub>    | -    | 158   | -    | pF   |   |
| Reverse Transfer Capacitance                     | C <sub>rss</sub>    | -    | 123   | -    | pF   |   |
| Gate Resistance                                  | R <sub>g</sub>      | 0.54 | 2.68  | 4.82 | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz  |
| Total Gate Charge V <sub>GS</sub> = 4.5V         | Q <sub>g</sub>      | -    | 18.5  | -    | nC   | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V,<br>I <sub>D</sub> = 11.7A                     |
| Total Gate Charge V <sub>GS</sub> = 10V          | Q <sub>g</sub>      | -    | 43    | -    | nC   |   |
| Gate-Source Charge                               | Q <sub>gs</sub>     | -    | 4.7   | -    | nC   |   |
| Gate-Drain Charge                                | Q <sub>gd</sub>     | -    | 4.0   | -    | nC   |   |
| Turn-On Delay Time                               | t <sub>D(on)</sub>  | -    | 6.62  | -    | ns   |   |
| Turn-On Rise Time                                | t <sub>r</sub>      | -    | 8.73  | -    | ns   | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 10V,<br>R <sub>G</sub> = 3Ω, R <sub>L</sub> = 1.2Ω |
| Turn-Off Delay Time                              | t <sub>D(off)</sub> | -    | 36.41 | -    | ns   |   |
| Turn-Off Fall Time                               | t <sub>f</sub>      | -    | 4.69  | -    | ns   |   |

- Notes:
- Device mounted on FR-4 PCB with minimum recommended pad layout. The value in any given application depends on the user's specific board design.
  - Device mounted on 1" x 1" FR-4 PCB with high coverage 1 oz. Copper, single sided, device is measured at t ≤ 10 sec.
  - Repetitive rating, pulse width limited by junction temperature.
  - I<sub>AR</sub> and E<sub>AR</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = 25°C
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to production testing.

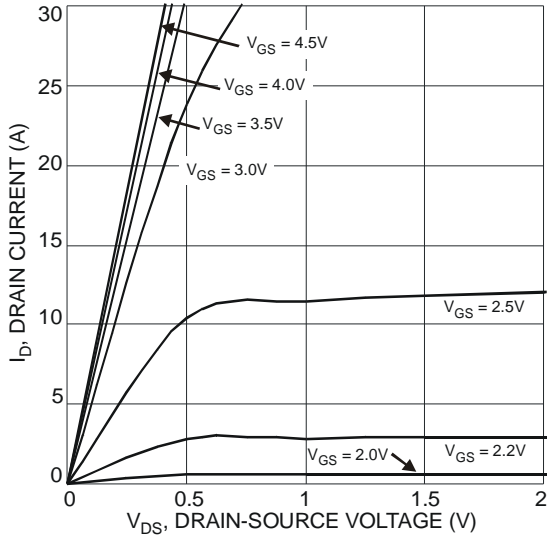


Fig. 1 Typical Output Characteristic

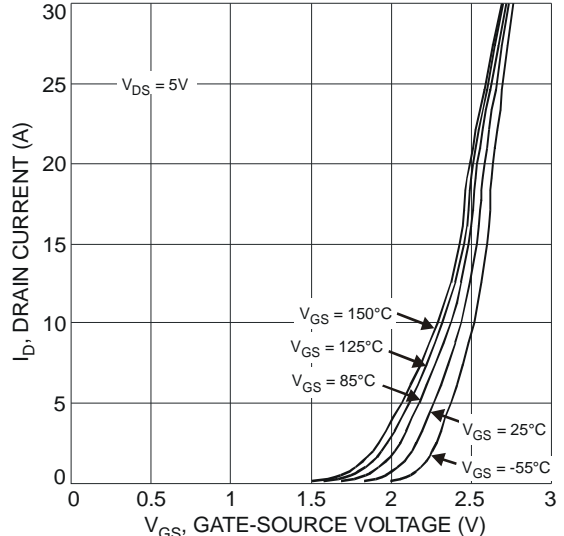


Fig. 2 Typical Transfer Characteristic

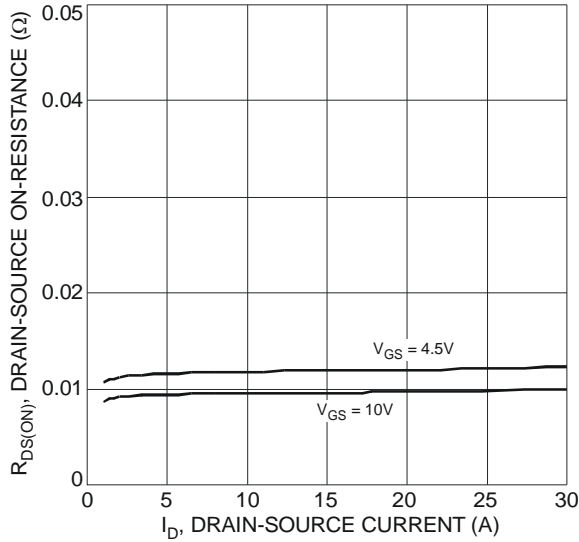


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

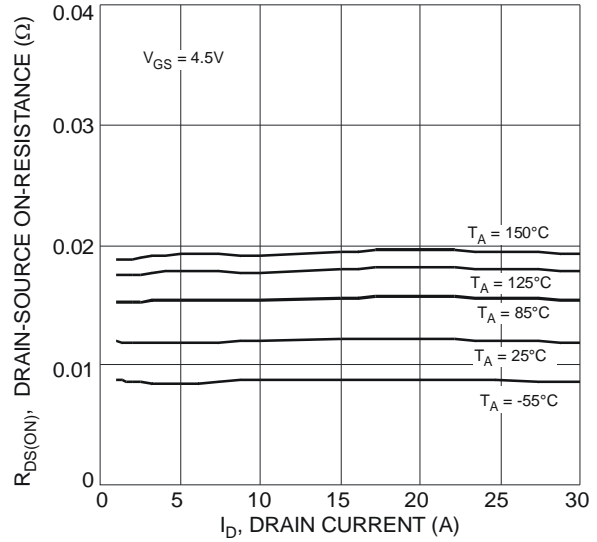


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

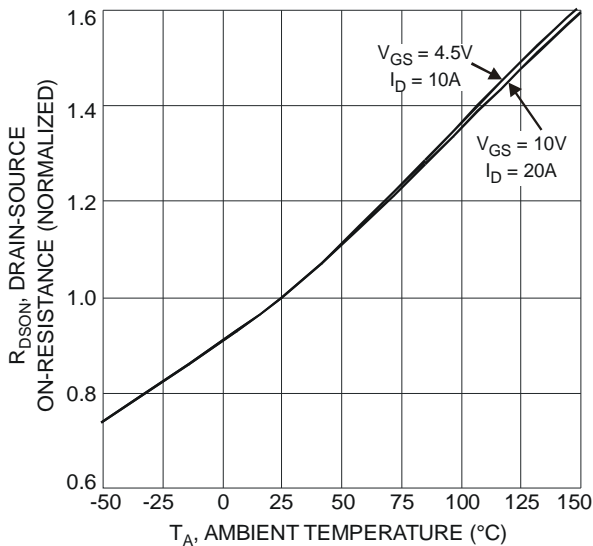


Fig. 5 On-Resistance Variation with Temperature

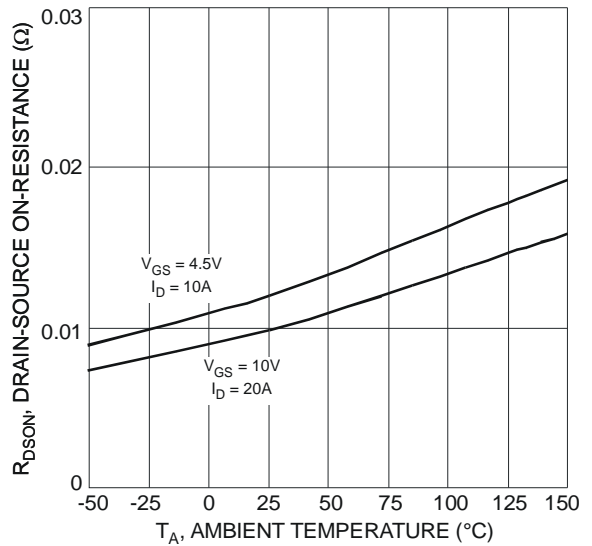


Fig. 6 On-Resistance Variation with Temperature

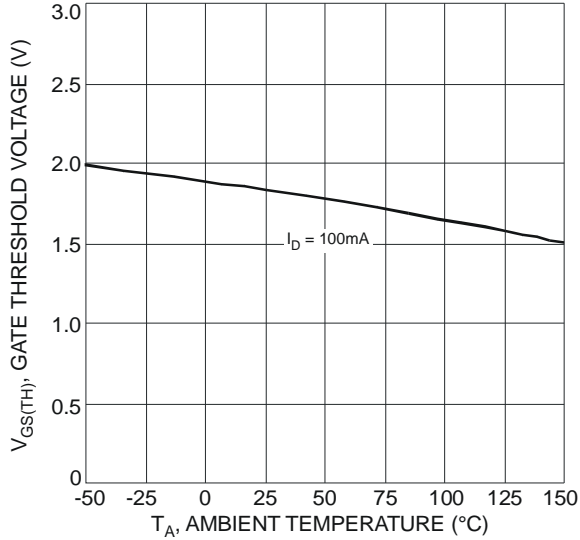


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

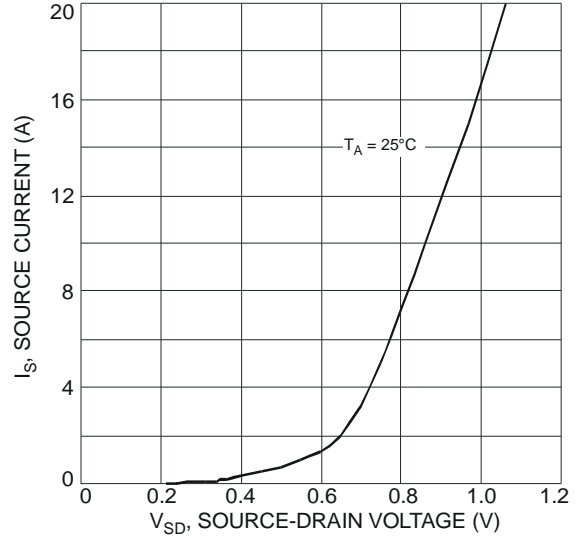


Fig. 8 Diode Forward Voltage vs. Current

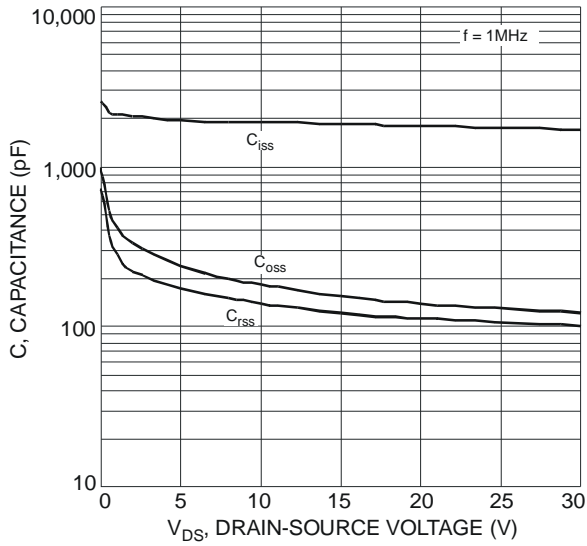


Fig. 9 Typical Total Capacitance

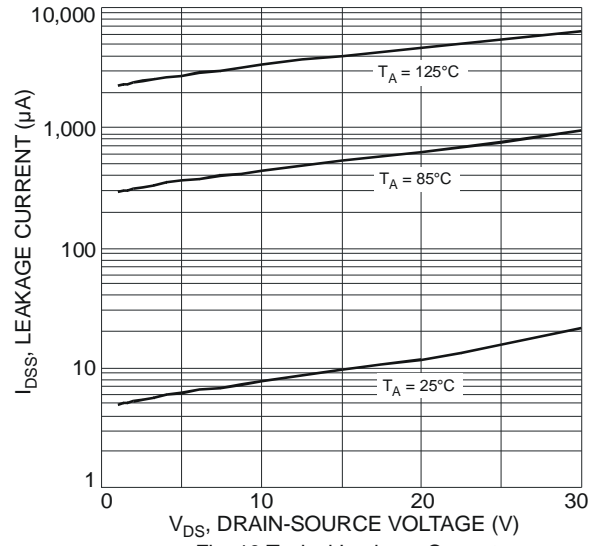


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

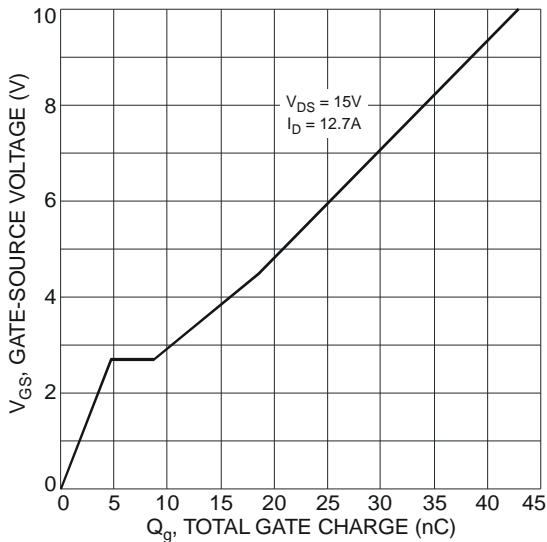


Fig. 11 Gate-Charge Characteristics

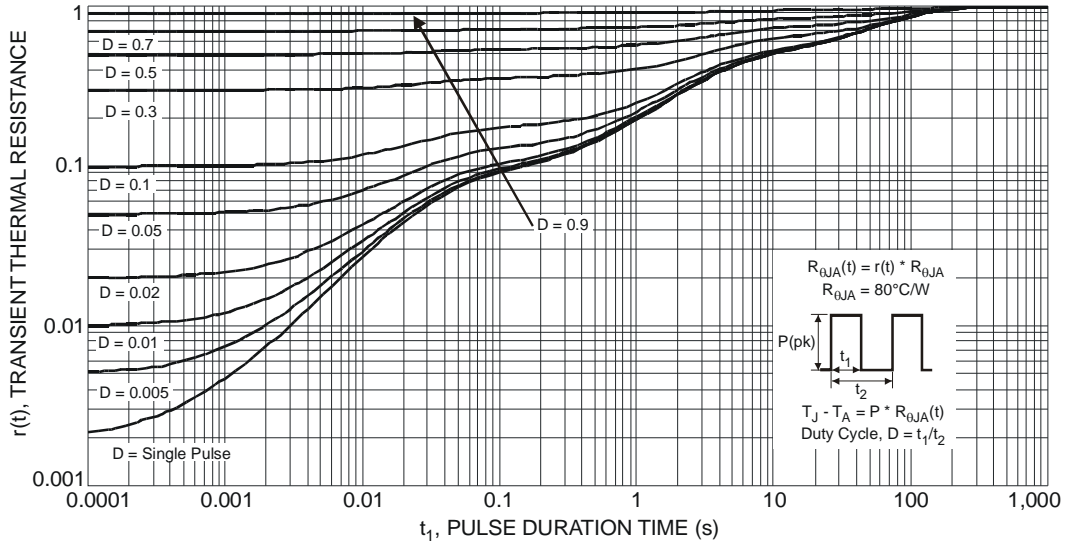
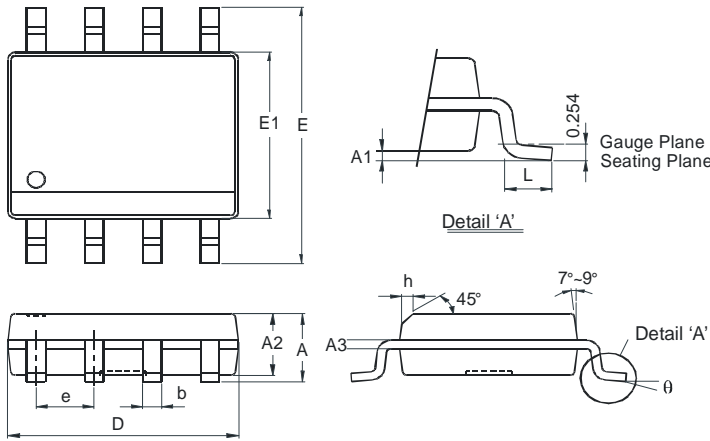


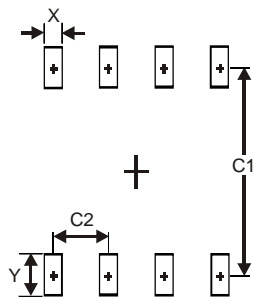
Fig. 12 Transient Thermal Response

**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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