

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

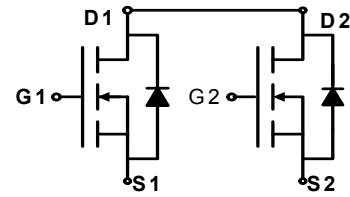
The NCE8205B uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

- $V_{DS} = 20V, I_D = 6.5A$   
 $R_{DS(ON)} < 27m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 22m\Omega @ V_{GS}=4.5V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

### Application

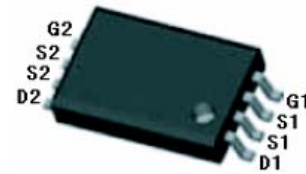
- Battery protection
- Load switch
- Power management



Schematic diagram



Marking and pin assignment



Tssop-8 top view

### Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity   |
|----------------|----------|----------------|-----------|------------|------------|
| 8205B          | NCE8205B | TSSOP-8        | Ø330mm    | 12mm       | 3000 units |

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

| Parameter  | Symbol         | Limit      | Unit       |
|--|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | 20         | V          |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V          |
| Drain Current-Continuous                         | $I_D$          | 6.5        | A          |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | 25         | A          |
| Maximum Power Dissipation                        | $P_D$          | 1.5        | W          |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ C$ |

### Thermal Characteristic

|   |                 |    |              |
|---|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup> | $R_{\theta JA}$ | 83 | $^\circ C/W$ |
|---|-----------------|----|--------------|

### Electrical Characteristics ( $T_A=25^\circ C$ unless otherwise noted)

| Parameter                       | Symbol     | Condition                 | Min | Typ | Max | Unit    |
|---------------------------------|------------|---------------------------|-----|-----|-----|---------|
| <b>Off Characteristics</b>      |            |                           |     |     |     |         |
| Drain-Source Breakdown Voltage  | $BV_{DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 20  | -   | -   | V       |
| Zero Gate Voltage Drain Current | $I_{DSS}$  | $V_{DS}=20V, V_{GS}=0V$   | -   | -   | 1   | $\mu A$ |

|   |              |  |     |      |           |            |
|---|--------------|--|-----|------|-----------|------------|
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 12V, V_{DS}=0V$                            | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |  |     |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                          | 0.5 | 0.7  | 1.2       | V          |
| Drain-Source On-State Resistance          | $R_{DS(ON)}$ | $V_{GS}=4.5V, I_D=4.5A$                                | -   | 15   | 22        | m $\Omega$ |
|   |              | $V_{GS}=2.5V, I_D=3.5A$                                | -   | 19   | 27        | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=4.5A$                                  | -   | 10   | -         | S          |
| <b>Dynamic Characteristics</b> (Note4)    |              |  |     |      |           |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=10V, V_{GS}=0V,$<br>$F=1.0MHz$                 | -   | 900  | -         | PF         |
| Output Capacitance                        | $C_{oss}$    |  | -   | 220  | -         | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |  | -   | 100  | -         | PF         |
| <b>Switching Characteristics</b> (Note 4) |              |  |     |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=10V, I_D=1A$<br>$V_{GS}=4.5V, R_{GEN}=6\Omega$ | -   | 10   | 20        | nS         |
| Turn-on Rise Time                         | $t_r$        |  | -   | 11   | 25        | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |  | -   | 35   | 70        | nS         |
| Turn-Off Fall Time                        | $t_f$        |  | -   | 30   | 60        | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=10V, I_D=6A,$<br>$V_{GS}=4.5V$                 | -   | 12   | 15        | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |  | -   | 2.3  | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |  | -   | 1    | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |  |     |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=1.7A$                                  | -   | 0.75 | 1.2       | V          |
| Diode Forward Current (Note 2)            | $I_S$        |  | -   | -    | 6.5       | A          |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

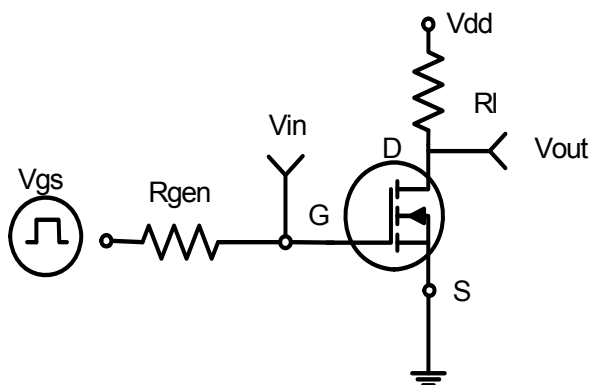


Figure 1: Switching Test Circuit

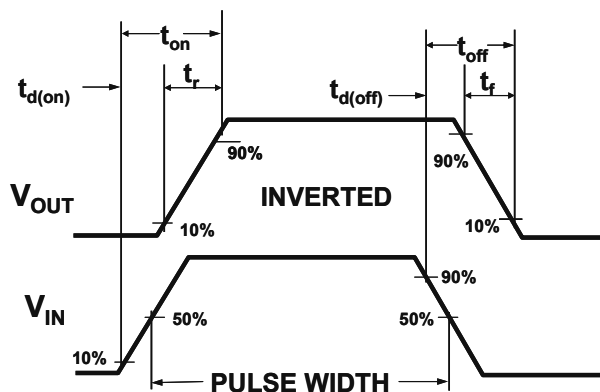


Figure 2: Switching Waveforms

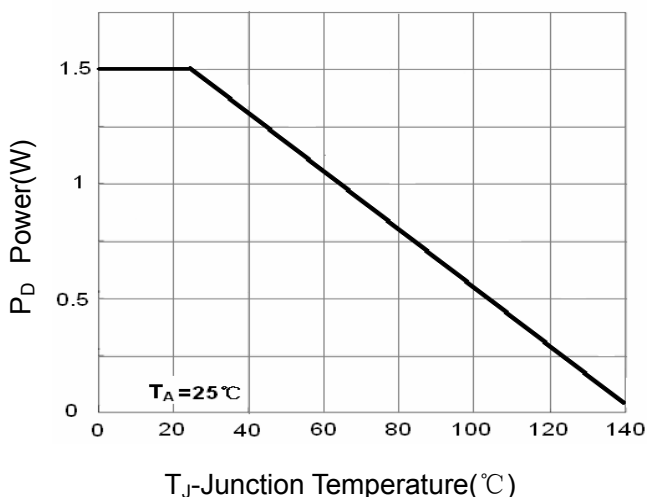


Figure 3 Power Dissipation

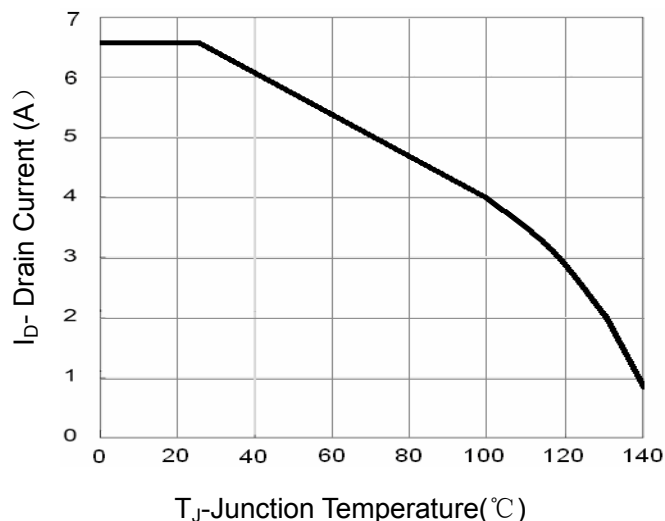


Figure 4 Drain Current

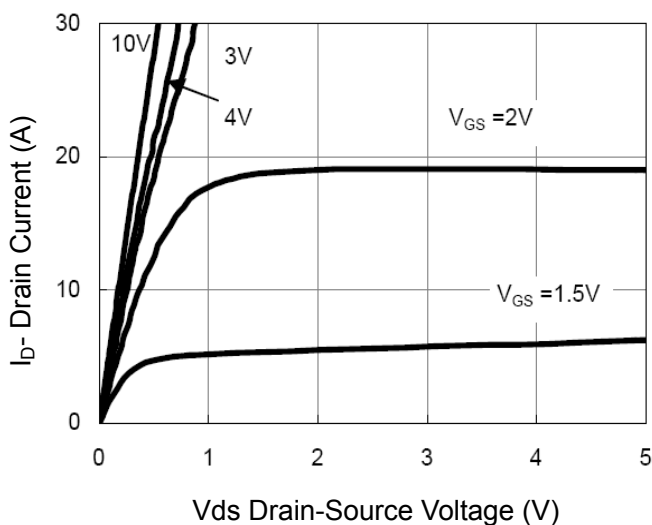


Figure 5 Output Characteristics

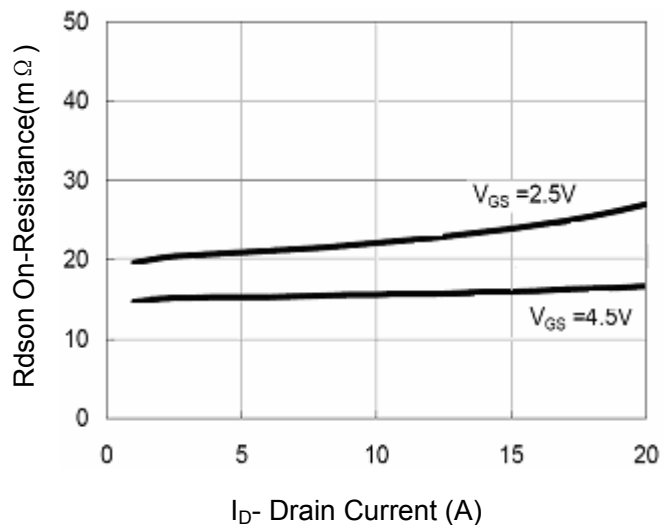


Figure 6 Drain-Source On-Resistance

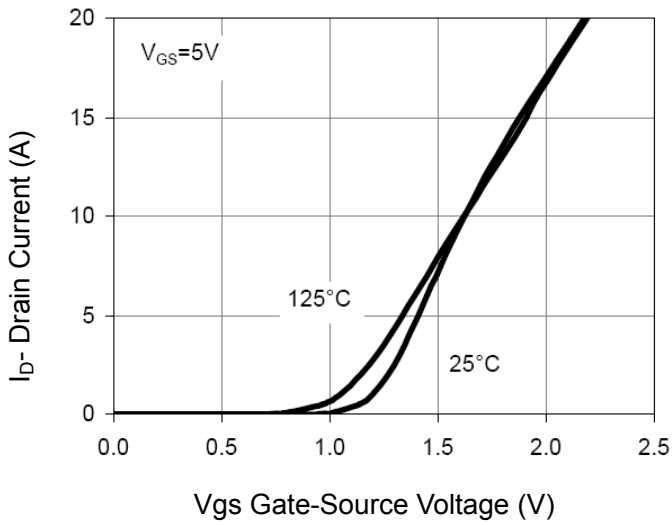


Figure 7 Transfer Characteristics

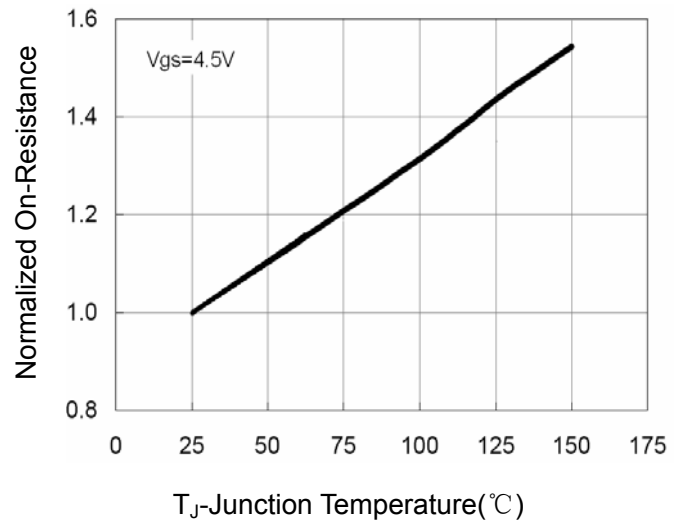


Figure 8 Drain-Source On-Resistance

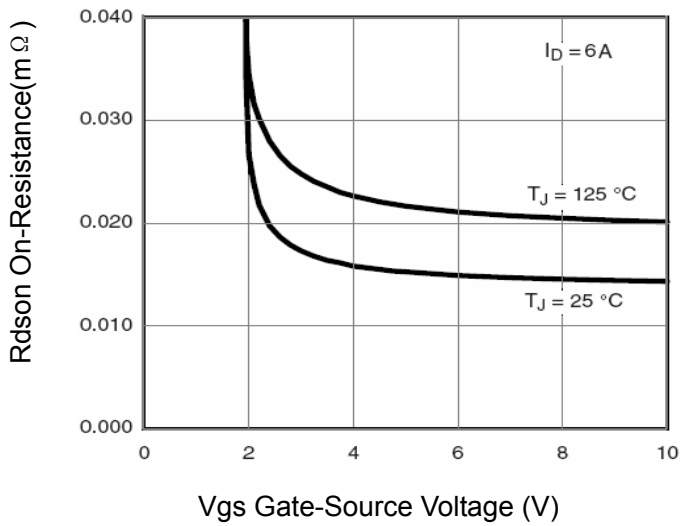


Figure 9 Rdson vs Vgs

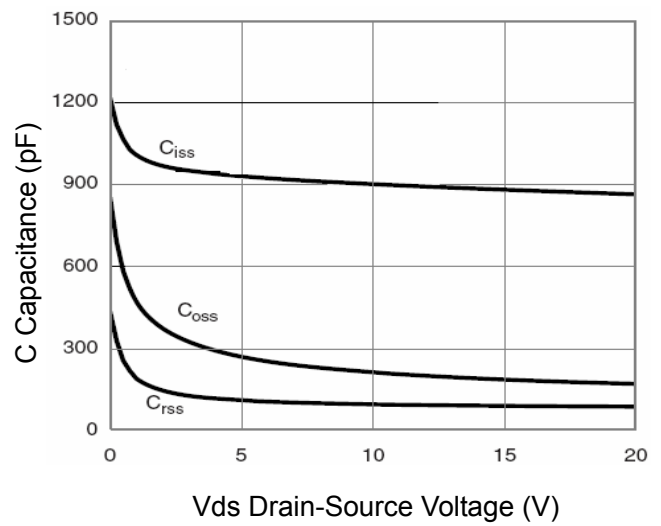


Figure 10 Capacitance vs Vds

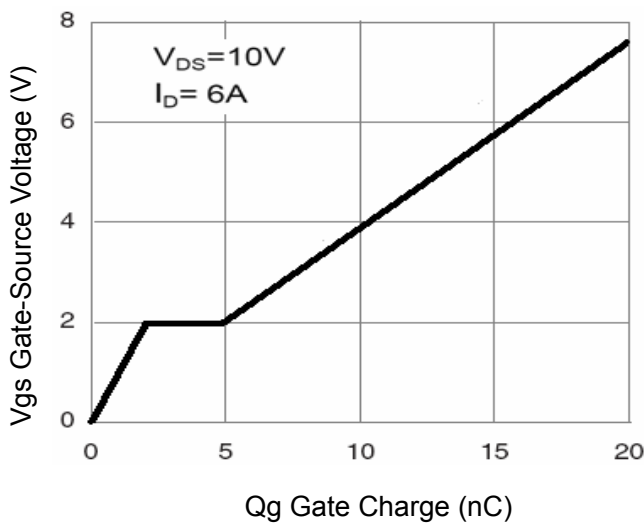


Figure 11 Gate Charge

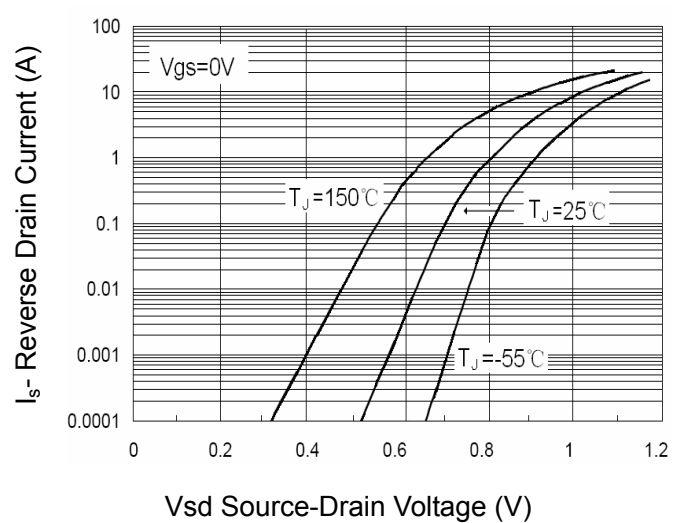


Figure 12 Source- Drain Diode Forward

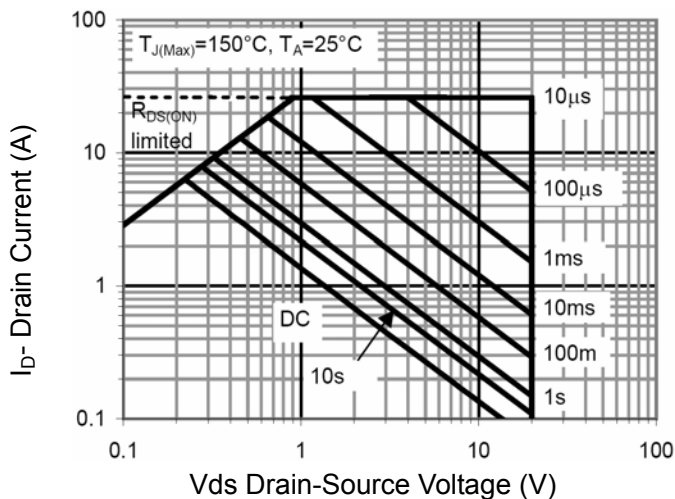


Figure 13 Safe Operation Area

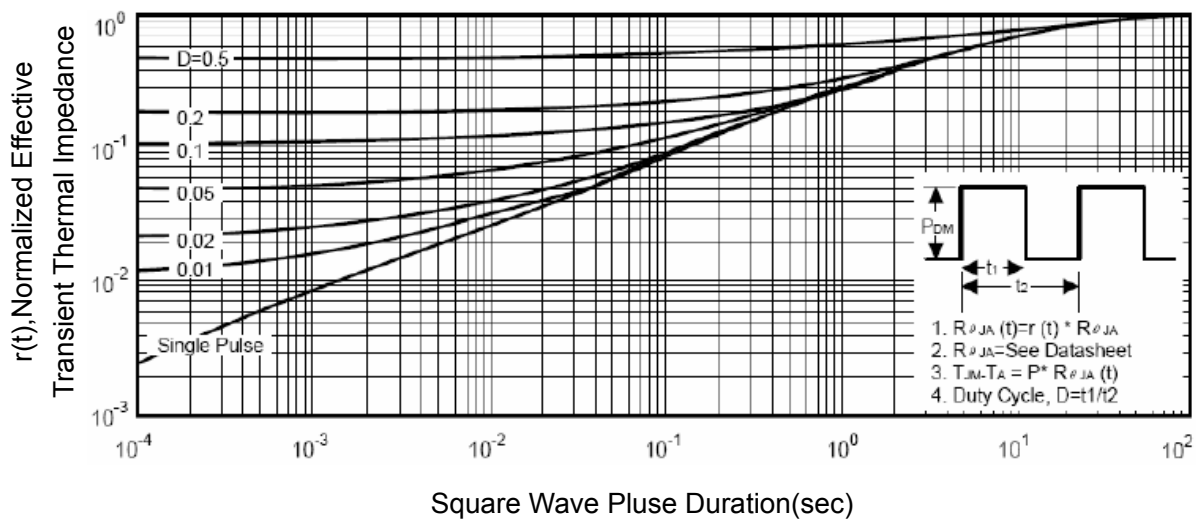
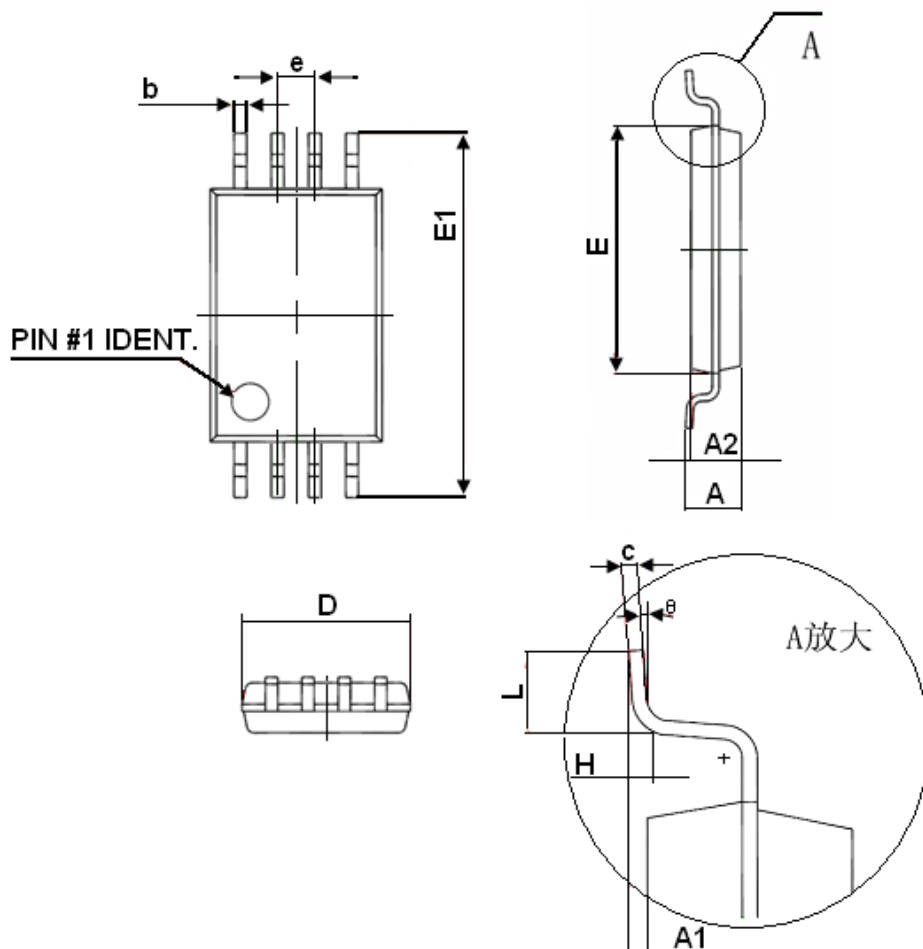


Figure 14 Normalized Maximum Transient Thermal Impedance

Tssop-8 Package Information



| Symbol   | Dimensions In Millimeters |       |
|----------|---------------------------|-------|
|          | Min                       | Max   |
| D        | 2.900                     | 3.100 |
| E        | 4.300                     | 4.500 |
| b        | 0.190                     | 0.300 |
| c        | 0.090                     | 0.200 |
| E1       | 6.250                     | 6.550 |
| A        |                           | 1.100 |
| A2       | 0.800                     | 1.000 |
| A1       | 0.020                     | 0.150 |
| e        | 0.65(BSC)                 |       |
| L        | 0.500                     | 0.700 |
| H        | 0.25(TYP)                 |       |
| $\theta$ | 1°                        | 7°    |



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