

## P-Channel Enhancement Mode Power MOSFET

### Description

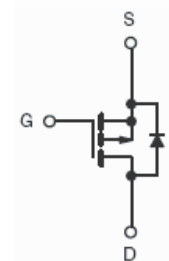
The RM12P30S8 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a load switch or in PWM applications.

### General Features

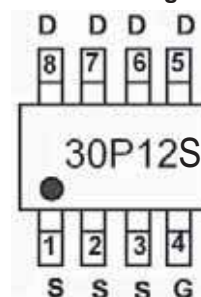
- $V_{DS} = -30V, I_D = -12A$   
 $R_{DS(ON)} < 25m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 16m\Omega @ V_{GS} = -10V$
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

### Application

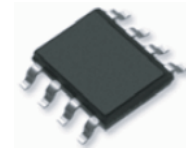
- PWM applications
- Load switch
- Power management
- Halogen-free
- P/N suffix V means AEC-Q101 qualified, e.g:RM12P30S8V



Schematic diagram



Marking and pin assignment



SOP-8 top view

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity   |
|----------------|-----------|----------------|-----------|------------|------------|
| 30P12S         | RM12P30S8 | SOP-8          | Ø330mm    | 12mm       | 4000 units |

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

| Parameter  | Symbol         | Limit      | Unit       |
|--|----------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | -30        | V          |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V          |
| Drain Current-Continuous                         | $I_D$          | -12        | A          |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | -48        | A          |
| Maximum Power Dissipation                        | $P_D$          | 3          | 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> | $R_{\theta JA}$ | 41.67 | $^\circ C/W$ |
|---|-----------------|-------|--------------|

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

| Parameter                  | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------|--------|-----------|-----|-----|-----|------|
| <b>Off Characteristics</b> |        |           |     |     |     |      |

| Parameter  | Symbol       | Condition  | Min | Typ  | Max       | Unit       |
|--|--------------|--|-----|------|-----------|------------|
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=-250\mu A$                                 | -30 | -33  | -         | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=-30V, V_{GS}=0V$                                   | -   | -    | -1        | $\mu A$    |
| Gate-Body Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> <sup>(Note 3)</sup>        |              |  |     |      |           |            |
| Gate Threshold Voltage                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$                             | -1  | -1.5 | -3        | V          |
| Drain-Source On-State Resistance                     | $R_{DS(ON)}$ | $V_{GS}=-10V, I_D=-10A$                                    | -   | 11.5 | 15        | m $\Omega$ |
|  |              | $V_{GS}=-4.5V, I_D=-7A$                                    | -   | 18   | 25        | m $\Omega$ |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=-10V, I_D=-10A$                                    | 20  | -    | -         | S          |
| <b>Dynamic Characteristics</b> <sup>(Note 4)</sup>   |              |  |     |      |           |            |
| Input Capacitance                                    | $C_{ISS}$    | $V_{DS}=-15V, V_{GS}=0V,$<br>$F=1.0MHz$                    | -   | 1750 | -         | PF         |
| Output Capacitance                                   | $C_{OSS}$    |  | -   | 215  | -         | PF         |
| Reverse Transfer Capacitance                         | $C_{RSS}$    |  | -   | 180  | -         | PF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |  |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=-15V, I_D=-10A,$<br>$V_{GS}=-10V, R_{GEN}=1\Omega$ | -   | 9    | -         | nS         |
| Turn-on Rise Time                                    | $t_r$        |  | -   | 8    | -         | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |  | -   | 28   | -         | nS         |
| Turn-Off Fall Time                                   | $t_f$        |  | -   | 10   | -         | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=-15V, I_D=-10A, V_{GS}=-10V$                       | -   | 24   | -         | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |  | -   | 3.5  | -         | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |  | -   | 6    | -         | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |  |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=-2A$                                       | -   | -    | -1.2      | V          |

## 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

# RATING AND CHARACTERISTICS CURVES (RM12P30S8)

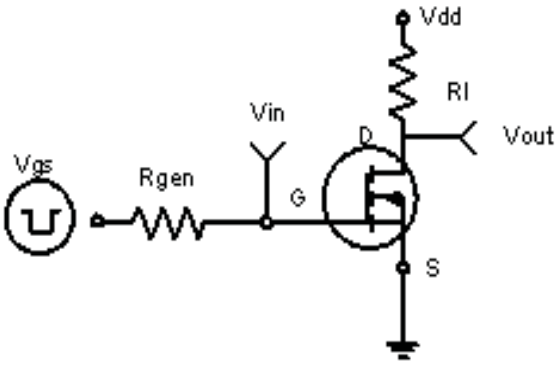


Figure 1: Switching Test Circuit

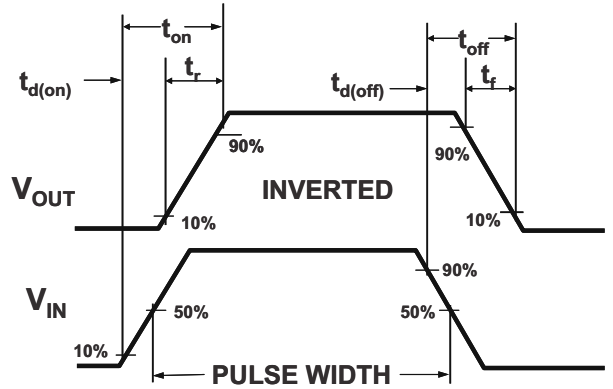


Figure 2: Switching Waveforms

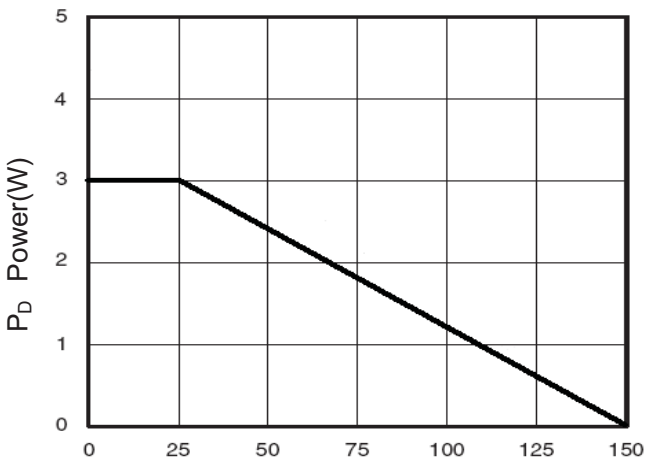


Figure 3 Power Dissipation

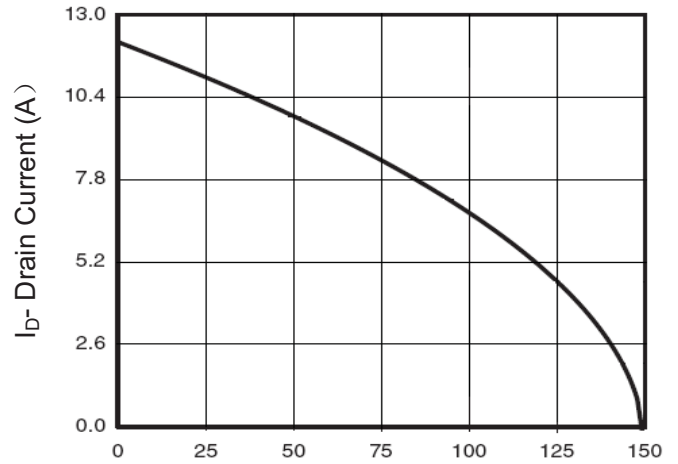


Figure 4 Drain Current

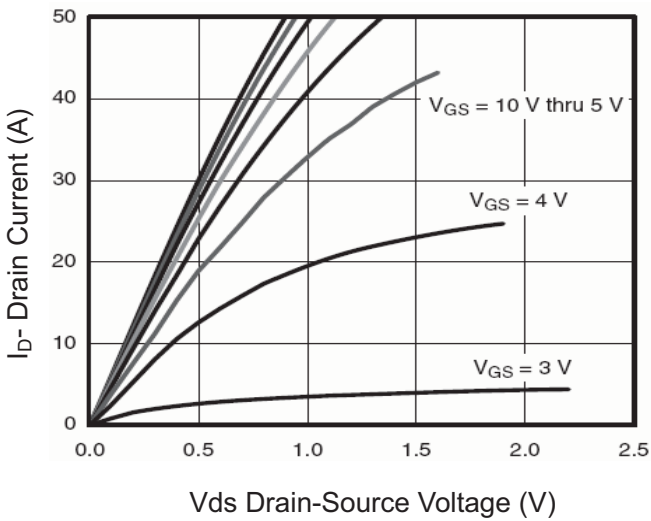


Figure 5 Output Characteristics

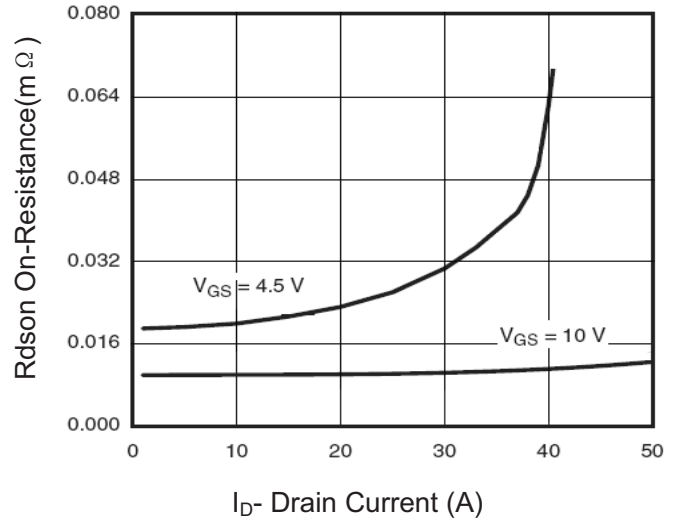
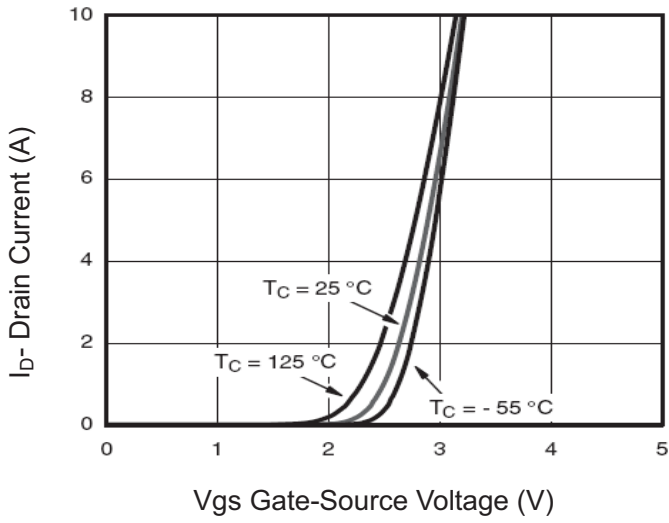
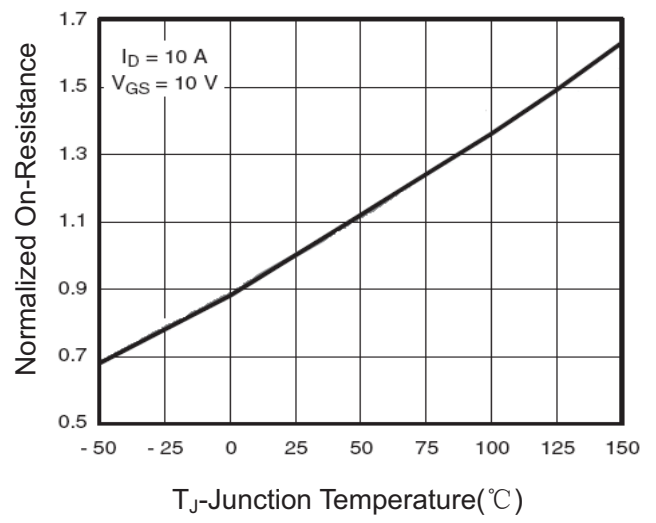


Figure 6 Drain-Source On-Resistance

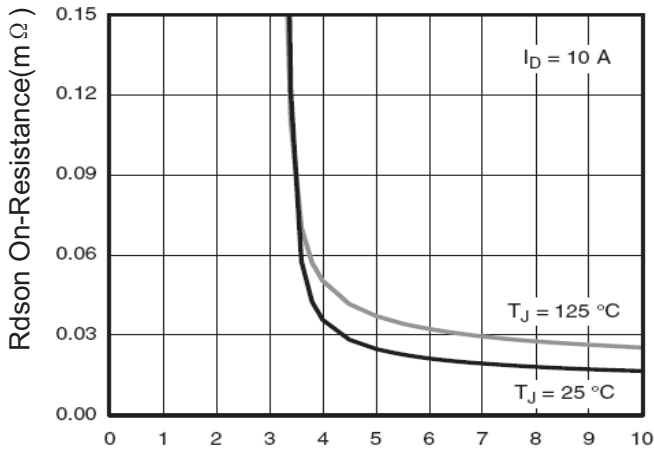
# RATING AND CHARACTERISTICS CURVES (RM12P30S8)



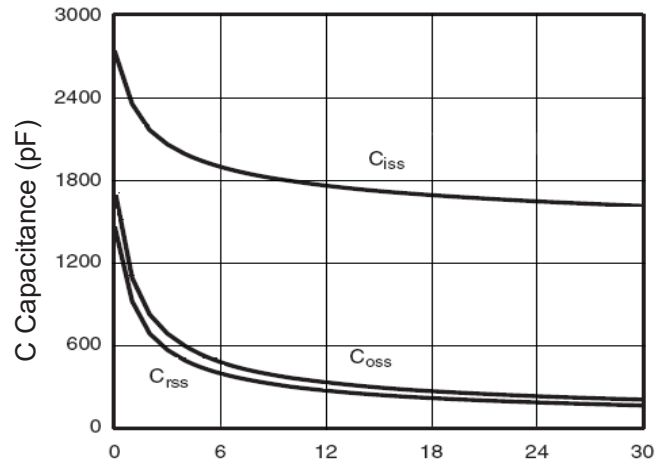
Vgs Gate-Source Voltage (V)  
**Figure 7 Transfer Characteristics**



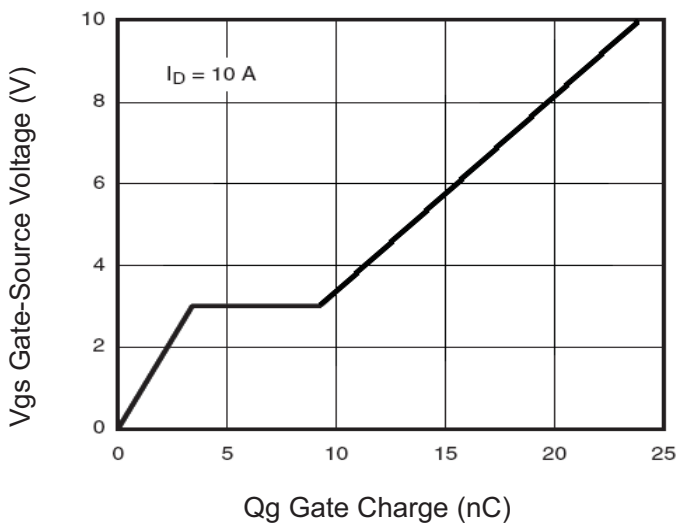
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 8 Drain-Source On-Resistance**



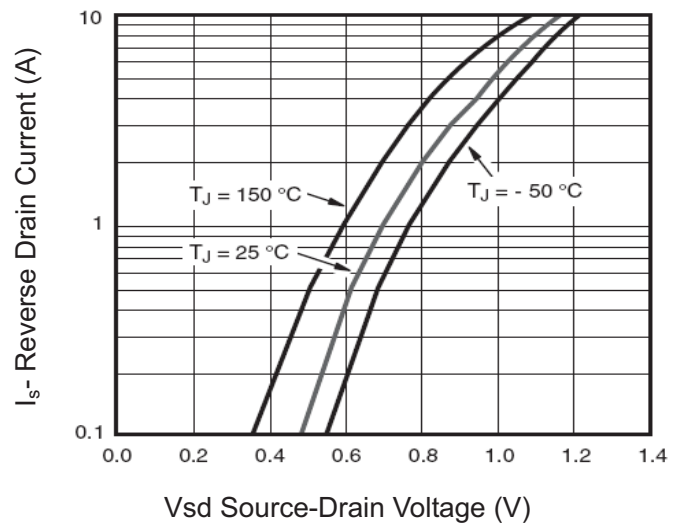
Vgs Gate-Source Voltage (V)  
**Figure 9 Rdson vs Vgs**



Vds Drain-Source Voltage (V)  
**Figure 10 Capacitance vs Vds**



Qg Gate Charge (nC)  
**Figure 11 Gate Charge**



Vsd Source-Drain Voltage (V)  
**Figure 12 Source-Drain Diode Forward**

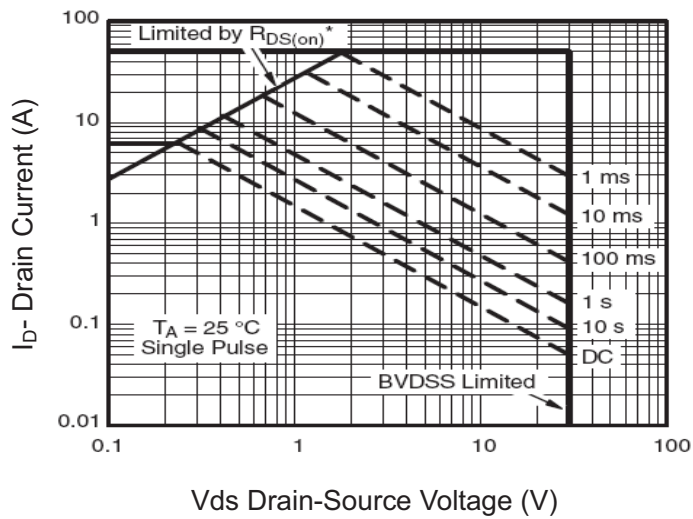


Figure 13 Safe Operation Area

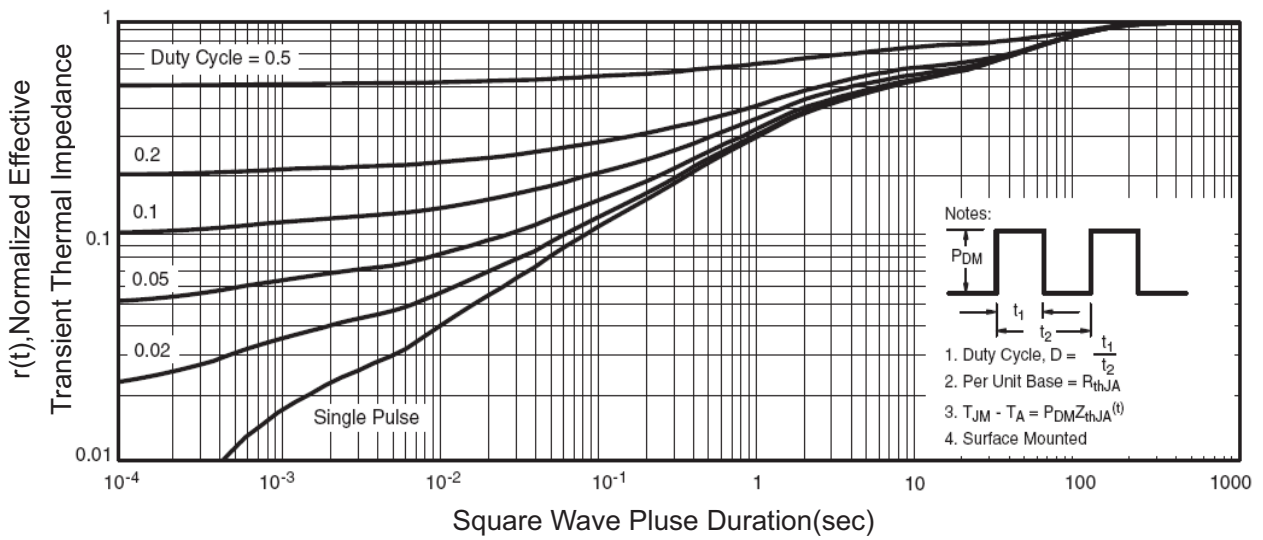
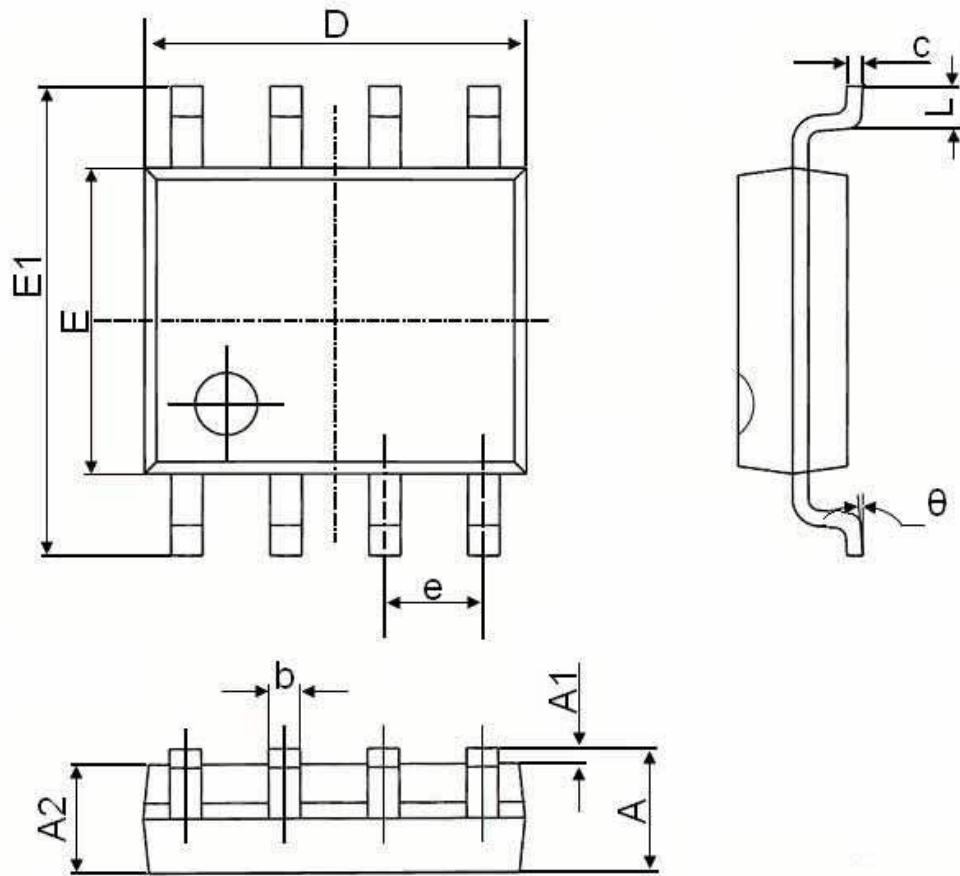


Figure 14 Normalized Maximum Transient Thermal Impedance

## SOP-8 Package Information



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min.                      | Max.  | Min.                 | Max.  |
| A        | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1       | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2       | 1.350                     | 1.550 | 0.053                | 0.061 |
| b        | 0.330                     | 0.510 | 0.013                | 0.020 |
| c        | 0.170                     | 0.250 | 0.006                | 0.010 |
| D        | 4.700                     | 5.100 | 0.185                | 0.200 |
| E        | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1       | 5.800                     | 6.200 | 0.228                | 0.244 |
| e        | 1.270(BSC)                |       | 0.050(BSC)           |       |
| L        | 0.400                     | 1.270 | 0.016                | 0.050 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |

| Package       | Tube<br>(pcs/tube) | Tube<br>(pcs/inner box) | Tube<br>(pcs/cartoon) | Tape&Reel<br>(pcs/reel) | Tape&Reel<br>(pcs/inner box) | Tape&Reel<br>(pcs/cartoon) |
|---------------|--------------------|-------------------------|-----------------------|-------------------------|------------------------------|----------------------------|
| DFN           | 100                | 10,000                  | 100,000               | 2,500                   | 5,000                        | 40,000                     |
| SOP-8         | 100                | 10,000                  | 100,000               | 4,000                   | 4,000                        | 20,000                     |
| TSSOP-8       | 100                | 32,000                  | 128,000               | 3,000                   | 6,000                        | 48,000                     |
| SOT-23-3L     | —                  | —                       | —                     | 3,000                   | 30,000                       | 120,000                    |
| SOT-23-6L     | —                  | —                       | —                     | 3,000                   | 30,000                       | 120,000                    |
| SOT-23(6R)    | —                  | —                       | —                     | 3,000                   | 30,000                       | 120,000                    |
| SOT-363       | —                  | —                       | —                     | 3,000                   | 30,000                       | 120,000                    |
| SOT-523       | —                  | —                       | —                     | 3,000                   | 30,000                       | 120,000                    |
| SOT223        | —                  | —                       | —                     | 2,500                   | 2,500                        | 20,000                     |
| TO-220        | 50                 | 1,000                   | 5,000                 | —                       | —                            | —                          |
| TO-220F       | 50                 | 1,000                   | 10,000                | —                       | —                            | —                          |
| TO-247        | 30                 | 300                     | 1,200                 | —                       | —                            | —                          |
| TO-251        | 80                 | 4,000                   | 40,000                | —                       | —                            | —                          |
| TO-251S(4R)   | 80                 | 4,000                   | 40,000                | —                       | —                            | —                          |
| TO-252-2L(4R) | 80                 | 4,000                   | 40,000                | 2,500                   | 2,500                        | 25,000                     |
| TO-263-2L     | 50                 | 1,000                   | 10,000                | 800                     | 800                          | 8,000                      |
| TO-3P         | 30                 | 300                     | 3,000                 | —                       | —                            | —                          |
| TO-92         | —                  | —                       | —                     | 1,000(袋装)               | 10,000                       | 100,000                    |

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