

### Description

The HM30N02D uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

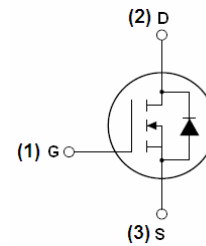
- $V_{DS} = 20V, I_D = 30A$   
 $R_{DS(ON)} < 8m\Omega @ V_{GS} = 4.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Application

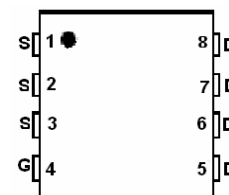
- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply

**100% UIS TESTED!**

**100%  $\Delta V_{ds}$  TESTED!**



Schematic diagram



Marking and pin assignment

### Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| HM30N02D       | HM30N02D | DFN5X6-8L      | -         | -          | -        |

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ 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                          | $I_D$              | 30         | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )   | $I_D(100^\circ C)$ | 21         | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 90         | A             |
| Maximum Power Dissipation                         | $P_D$              | 60         | W             |
| Derating factor                                   |                    | 0.48       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 200        | mJ            |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$     | -55 To 150 | $^\circ C$    |

### Thermal Characteristic

|  |                 |     |              |
|--|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 2.1 | $^\circ C/W$ |
|--|-----------------|-----|--------------|

**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

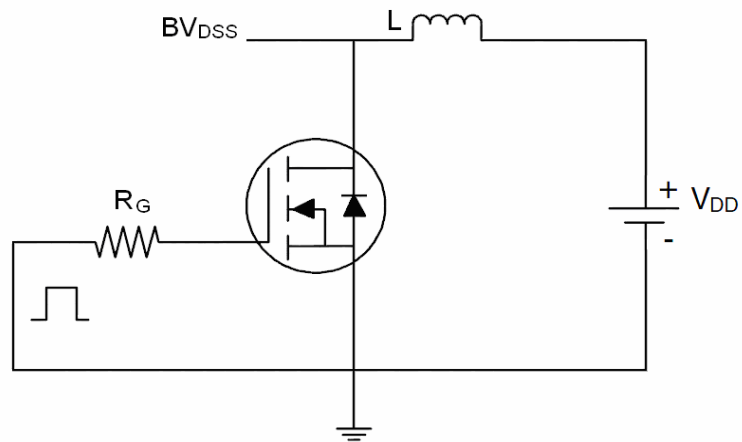
| Parameter                                 | Symbol              | Condition   | Min | Typ  | Max  | Unit |
|---|---------------------|---|-----|------|------|------|
| <b>Off Characteristics</b>                |                     |   |     |      |      |      |
| Drain-Source Breakdown Voltage            | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA   | 20  | -    | -    | V    |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V   | -   | -    | 1    | μA   |
| Gate-Body Leakage Current                 | I <sub>GSS</sub>    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V  | -   | -    | ±100 | nA   |
| <b>On Characteristics (Note 3)</b>        |                     |   |     |      |      |      |
| Gate Threshold Voltage                    | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA  | 0.5 | 0.8  | 1.4  | V    |
| Drain-Source On-State Resistance          | R <sub>DS(ON)</sub> | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20 A   | -   | 5.5  | 8    | mΩ   |
|   |                     | V <sub>GS</sub> =2.5V, I <sub>D</sub> =15A  |     | 8    | 11   | mΩ   |
| Forward Transconductance                  | g <sub>FS</sub>     | V <sub>DS</sub> =10V, I <sub>D</sub> =20A   | 15  | -    | -    | S    |
| <b>Dynamic Characteristics (Note4)</b>    |                     |   |     |      |      |      |
| Input Capacitance                         | C <sub>iss</sub>    | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V,<br>F=1.0MHZ  | -   | 2000 | -    | PF   |
| Output Capacitance                        | C <sub>oss</sub>    |   | -   | 500  | -    | PF   |
| Reverse Transfer Capacitance              | C <sub>rss</sub>    |   | -   | 200  | -    | PF   |
| <b>Switching Characteristics (Note 4)</b> |                     |   |     |      |      |      |
| Turn-on Delay Time                        | t <sub>d(on)</sub>  | V <sub>DD</sub> =10V, I <sub>D</sub> =2A, R <sub>L</sub> =1Ω<br>V <sub>GS</sub> =4.5V, R <sub>G</sub> =3Ω | -   | 6.4  | -    | nS   |
| Turn-on Rise Time                         | t <sub>r</sub>      |   | -   | 17.2 | -    | nS   |
| Turn-Off Delay Time                       | t <sub>d(off)</sub> |   | -   | 29.6 | -    | nS   |
| Turn-Off Fall Time                        | t <sub>f</sub>      |   | -   | 16.8 | -    | nS   |
| Total Gate Charge                         | Q <sub>g</sub>      | V <sub>DS</sub> =10V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =10V  | -   | 27   |      | nC   |
| Gate-Source Charge                        | Q <sub>gs</sub>     |   | -   | 6.5  |      | nC   |
| Gate-Drain Charge                         | Q <sub>gd</sub>     |   | -   | 6.4  |      | nC   |
| <b>Drain-Source Diode Characteristics</b> |                     |   |     |      |      |      |
| Diode Forward Voltage (Note 3)            | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =10A  | -   |      | 1.2  | V    |
| Diode Forward Current (Note 2)            | I <sub>S</sub>      |   | -   | -    | 30   | A    |
| Reverse Recovery Time                     | t <sub>rr</sub>     | T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A<br>di/dt = 100A/μs (Note3)                                    | -   | 25   | -    | nS   |
| Reverse Recovery Charge                   | Q <sub>rr</sub>     |   | -   | 24   | -    | nC   |
| Forward Turn-On Time                      | t <sub>on</sub>     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)                                      |     |      |      |      |

**Notes:**

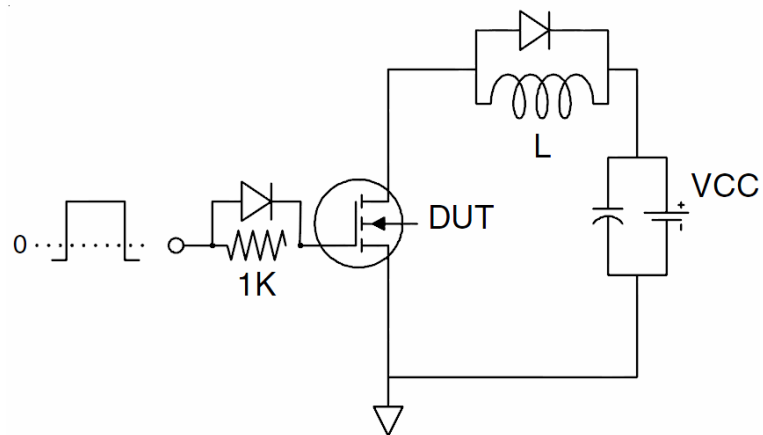
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E<sub>AS</sub> condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=10V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω.

Test circuit

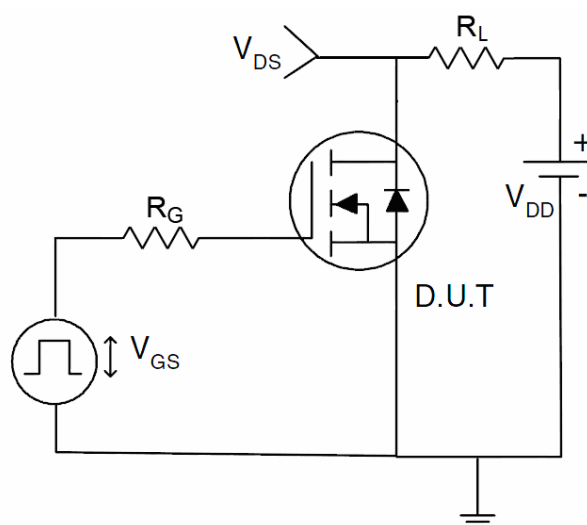
1)  $E_{AS}$  Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

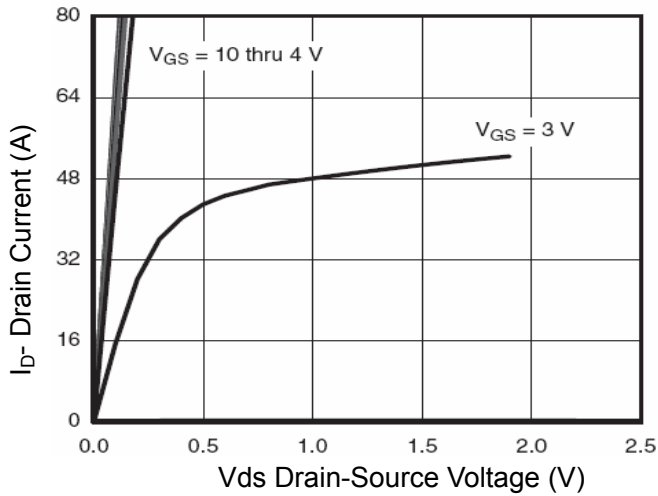


Figure 1 Output Characteristics

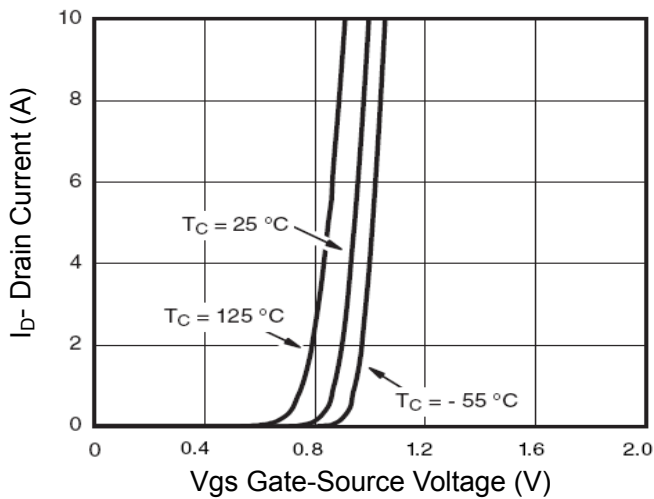


Figure 2 Transfer Characteristics

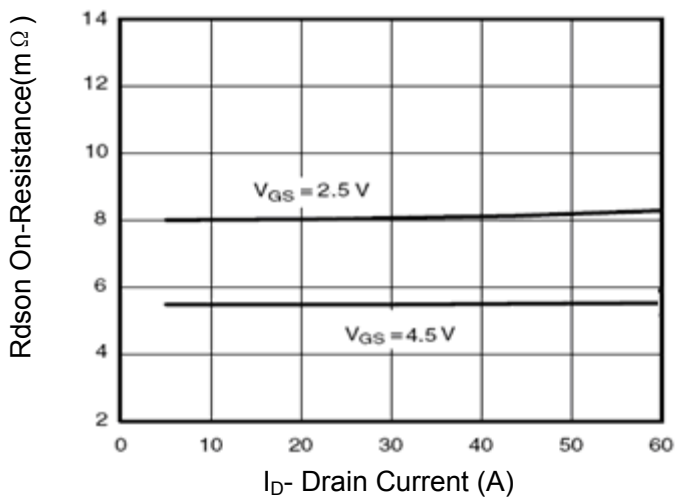


Figure 3 Rds(on)- Drain Current

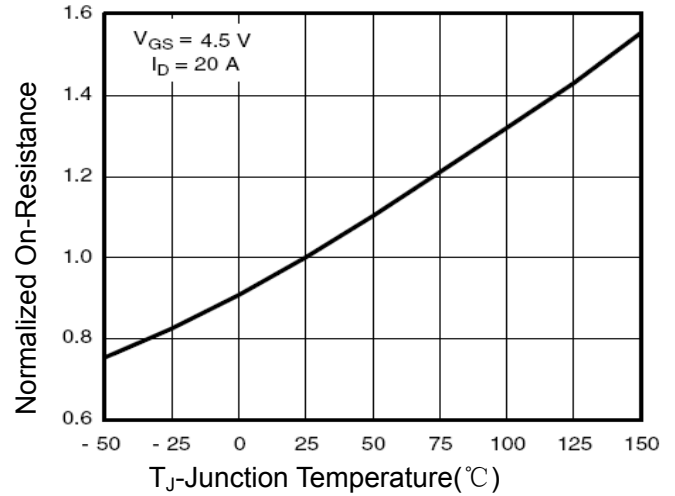


Figure 4 Rds(on)-Junction Temperature

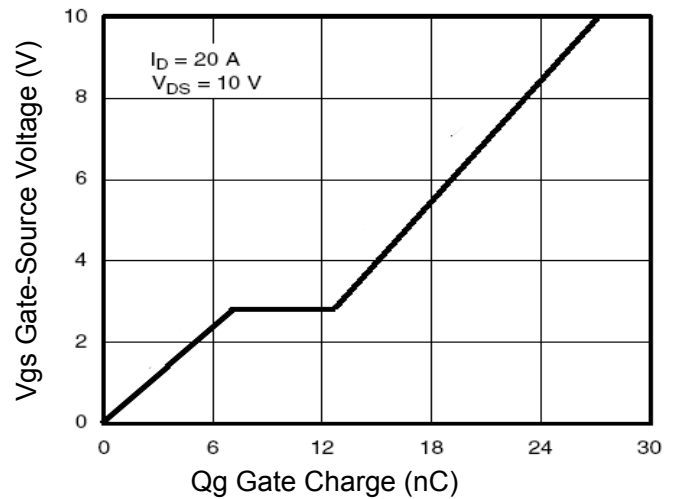


Figure 5 Gate Charge

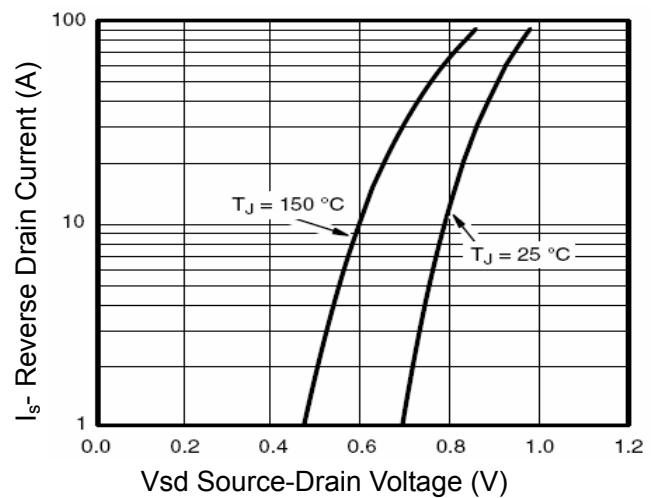


Figure 6 Source- Drain Diode Forward

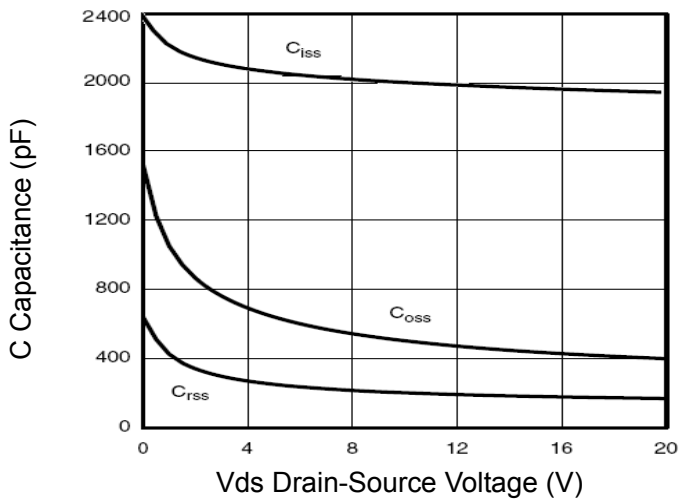


Figure 7 Capacitance vs Vds

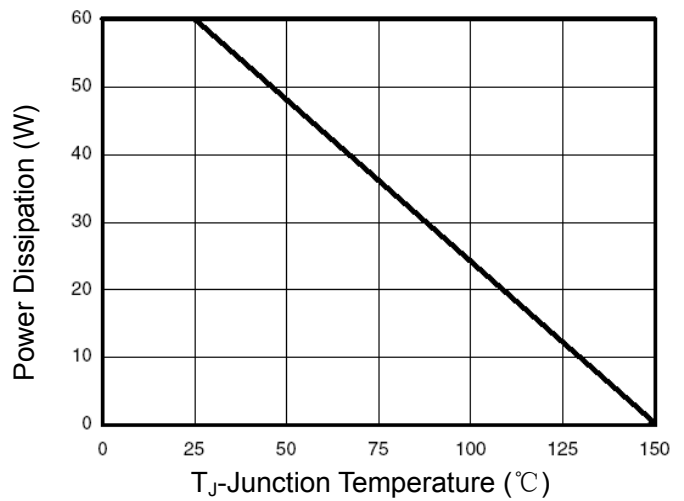


Figure 9 Power De-rating

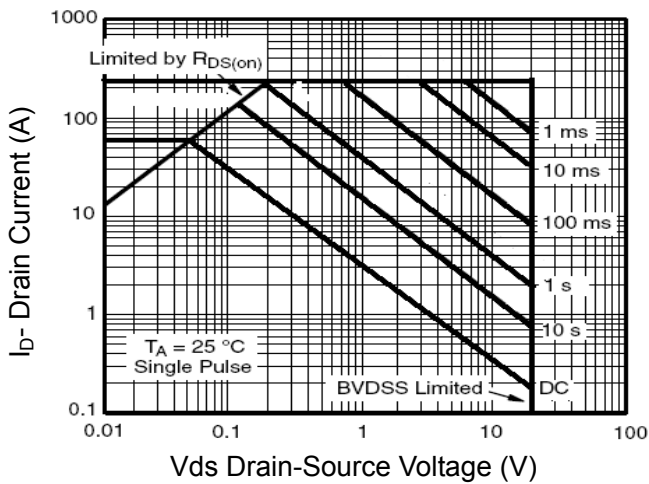


Figure 8 Safe Operation Area

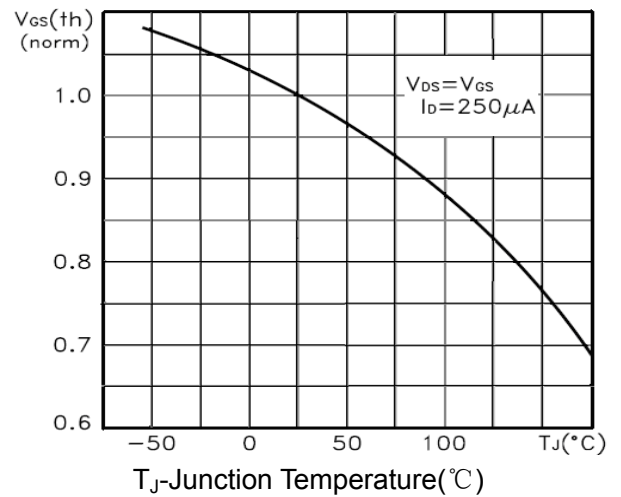


Figure 10 V<sub>GS(th)</sub> vs Junction Temperature

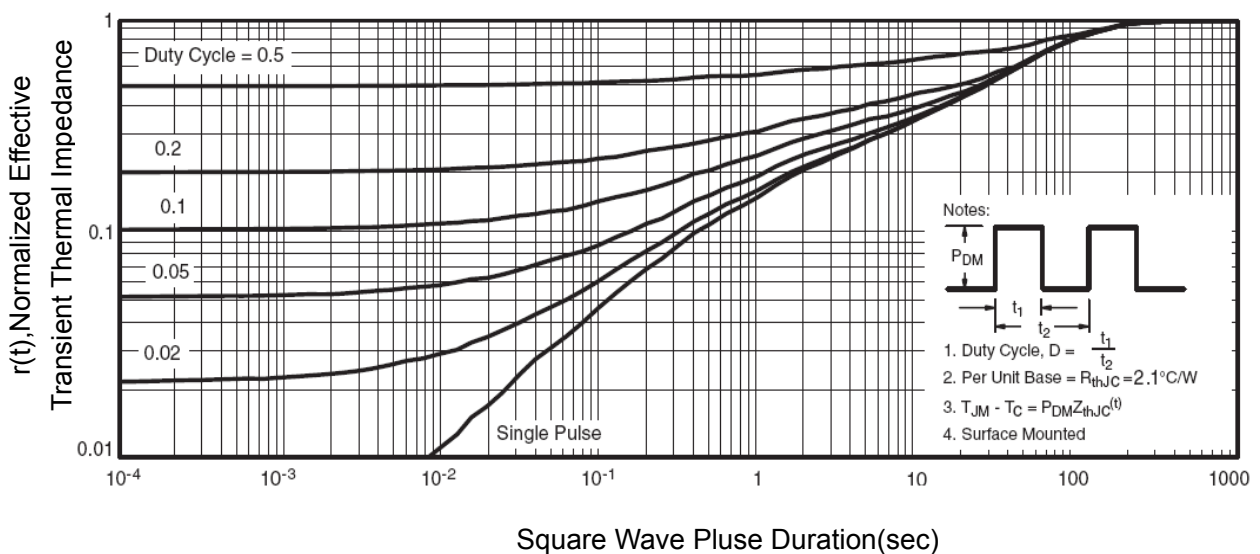
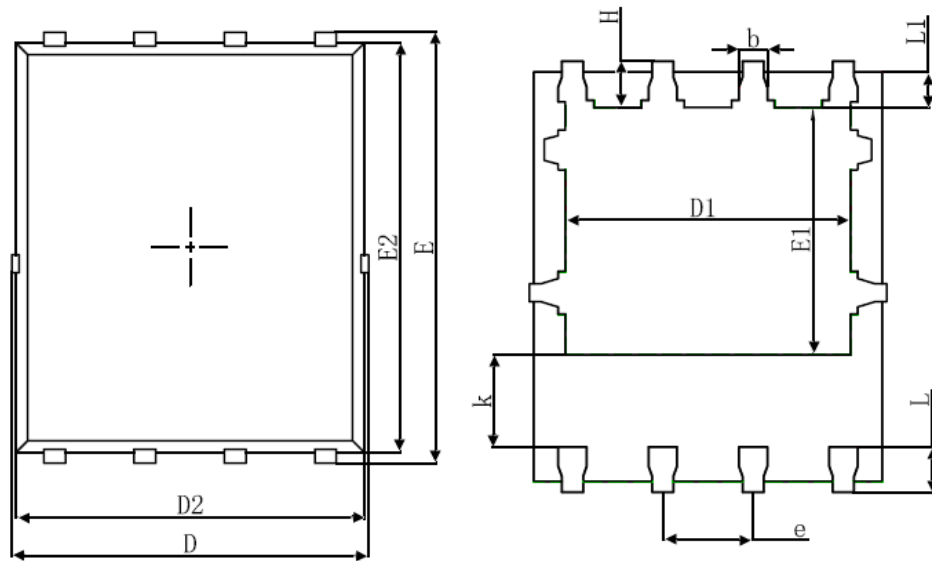


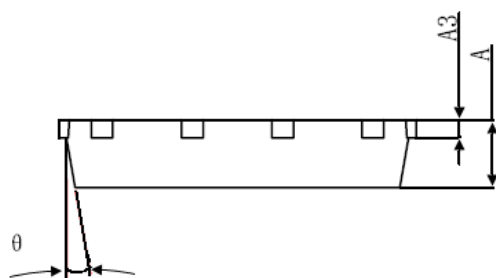
Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L Package Information



Top View  
[顶视图]

Bottom View  
[背视图]



Side View  
[侧视图]

| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min.                      | Max.  | Min.                 | Max.  |
| A        | 0.900                     | 1.000 | 0.035                | 0.039 |
| A3       | 0.254REF.                 |       | 0.010REF.            |       |
| D        | 4.944                     | 5.096 | 0.195                | 0.201 |
| E        | 5.974                     | 6.126 | 0.235                | 0.241 |
| D1       | 3.910                     | 4.110 | 0.154                | 0.162 |
| E1       | 3.375                     | 3.575 | 0.133                | 0.141 |
| D2       | 4.824                     | 4.976 | 0.190                | 0.196 |
| E2       | 5.674                     | 5.826 | 0.223                | 0.229 |
| k        | 1.190                     | 1.390 | 0.047                | 0.055 |
| b        | 0.350                     | 0.450 | 0.014                | 0.018 |
| e        | 1.270TYP.                 |       | 0.050TYP.            |       |
| L        | 0.559                     | 0.711 | 0.022                | 0.028 |
| L1       | 0.424                     | 0.576 | 0.017                | 0.023 |
| H        | 0.574                     | 0.726 | 0.023                | 0.029 |
| $\theta$ | 8°                        | 12°   | 8°                   | 12°   |