



## N-Channel Enhancement Mode Power MOSFET

### Description

The PED645K uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. It can be used in a wide variety of applications. It is ESD protected.

### General Features

- $V_{DS} = 18V$ ,  $I_D = 10A$

$R_{DS(ON)} < 6.5m\Omega @ V_{GS}=4.5V$

$R_{DS(ON)} < 7m\Omega @ V_{GS}=3.8V$

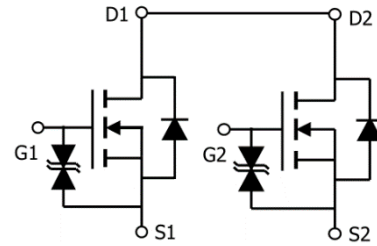
$R_{DS(ON)} < 8.5m\Omega @ V_{GS}=2.5V$

ESD Rating: 2000V HBM

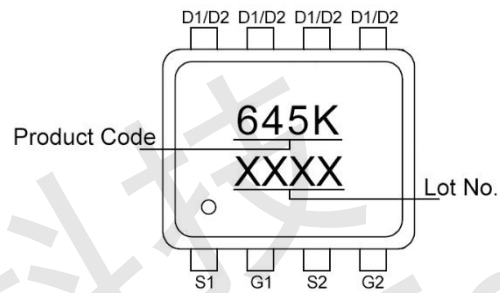
- High Power and current handing capability
- Lead free product is acquired
- Surface Mount Package

### Application

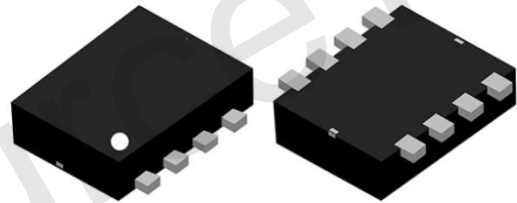
- PWM applications
- Load switch
- Power management
- Battery protection



Schematic diagram



Marking and pin assignment



DFN3x3-8L

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Parameter  | Symbol         | Rating     | Unit |
|--|----------------|------------|------|
| Drain-Source Voltage                             | $V_{DS}$       | 18         | V    |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V    |
| Drain Current-Continuous                         | $I_D$          | 10         | A    |
| Drain Current-Continuous (TA=70°C )              | $I_D$          | 8          | A    |
| Pulsed Drain Current (Note 1)                    | $I_{DM}$       | 40         | A    |
| Maximum Power Dissipation                        | $P_D$          | 2          | W    |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | °C   |

### Thermal Characteristic

|  |                 |      |      |
|--|-----------------|------|------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 62.5 | °C/W |
|--|-----------------|------|------|



**Electrical Characteristics (TA=25°C unless otherwise noted)**

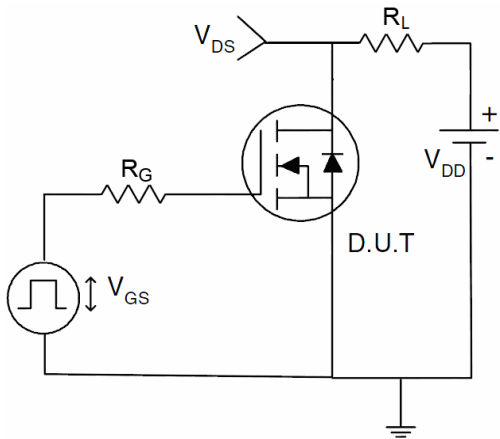
| Parameter                                 | Symbol       | Condition   | Min  | Typ  | Max      | Unit       |
|---|--------------|---|------|------|----------|------------|
| <b>Off Characteristics</b>                |              |   |      |      |          |            |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                 | 18   | -    | -        | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=16V, V_{GS}=0V$                                   | -    | -    | 1        | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 10V, V_{DS}=0V$                               | -    | -    | $\pm 10$ | $\mu A$    |
| <b>On Characteristics (Note 3)</b>        |              |   |      |      |          |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                             | 0.45 | 0.65 | 1.0      | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=6A$                                     | 4    | 5    | 6.5      | m $\Omega$ |
|   |              | $V_{GS}=3.8V, I_D=5.5A$                                   | 4.5  | 5.2  | 7        | m $\Omega$ |
|   |              | $V_{GS}=2.5V, I_D=5.5A$                                   | 5    | 5.9  | 8.5      | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=7A$                                       | -    | 70   | -        | S          |
| <b>Dynamic Characteristics (Note 4)</b>   |              |   |      |      |          |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=10V, V_{GS}=0V,$<br>$F=1.0MHz$                    | -    | 1920 | -        | pF         |
| Output Capacitance                        | $C_{oss}$    |   | -    | 295  | -        | pF         |
| Reverse Transfer Capacitance (Note 4)     | $C_{rss}$    |   | -    | 285  | -        | pF         |
| <b>Switching Characteristics</b>          |              |   |      |      |          |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=10V, R_L=1.35\Omega,$<br>$V_{GS}=5V, R_G=3\Omega$ | -    | 2.5  | -        | nS         |
| Turn-on Rise Time                         | $t_r$        |   | -    | 7.2  | -        | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |   | -    | 4.5  | -        | nS         |
| Turn-Off Fall Time                        | $t_f$        |   | -    | 10.8 | -        | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=10V, I_D=7A,$<br>$V_{GS}=4.5V$                    | -    | 17.5 | -        | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |   | -    | 4.5  | -        | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |   | -    | 7    | -        | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |   |      |      |          |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=1A$                                       | -    | -    | 1.2      | V          |

**Notes:**

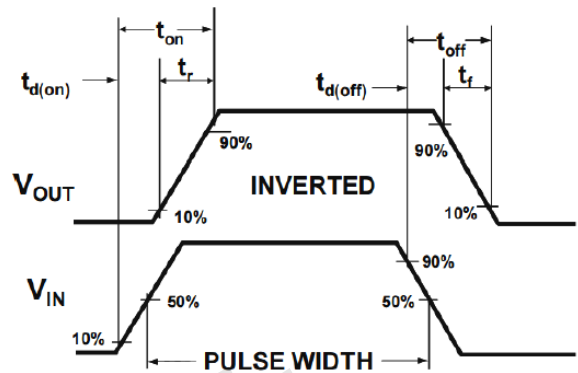
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to product.



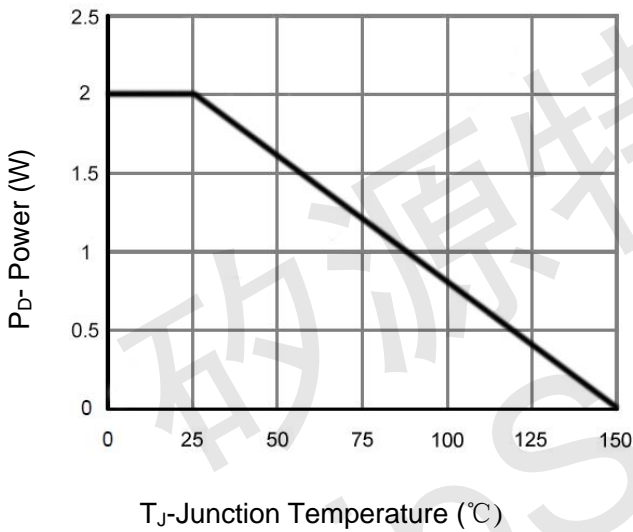
**Typical Electrical and Thermal Characteristics**



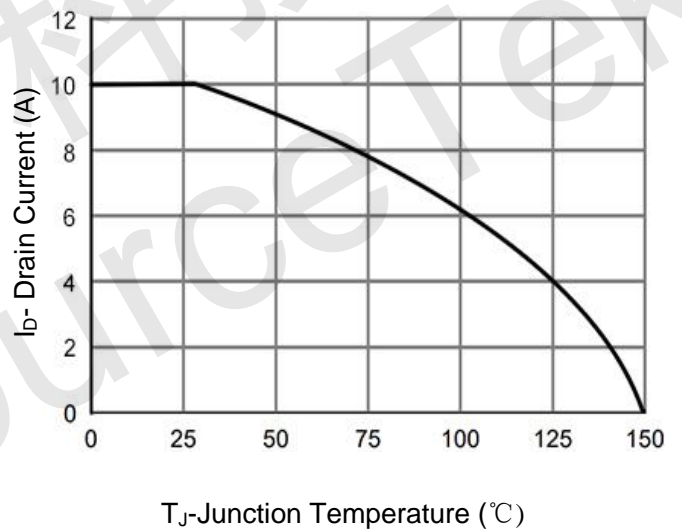
**Figure 1 Switching Test Circuit**



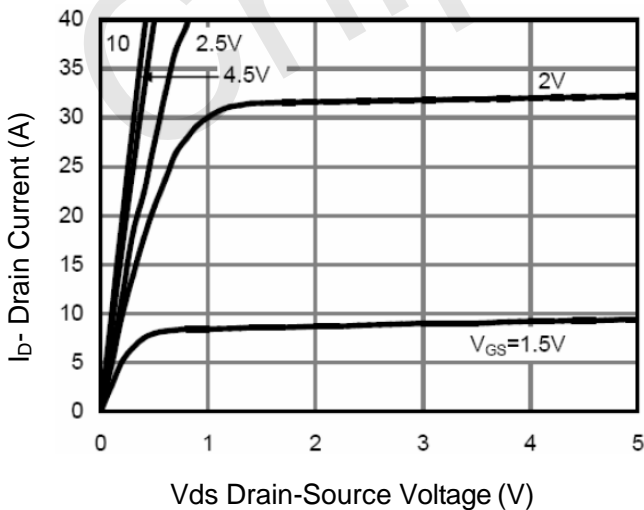
**Figure 2 Switching Waveform**



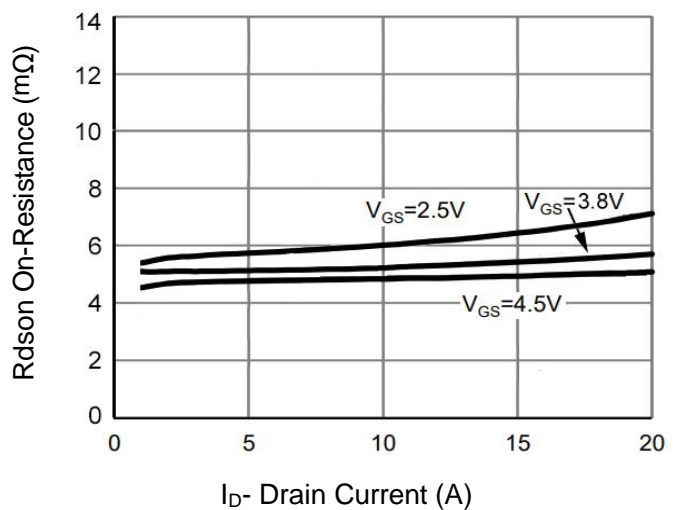
**Figure 3 Power Dissipation**



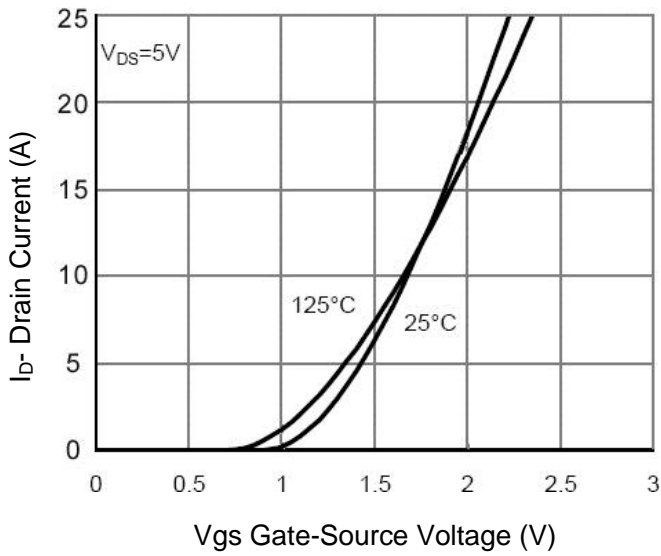
**Figure 4 Drain Current**



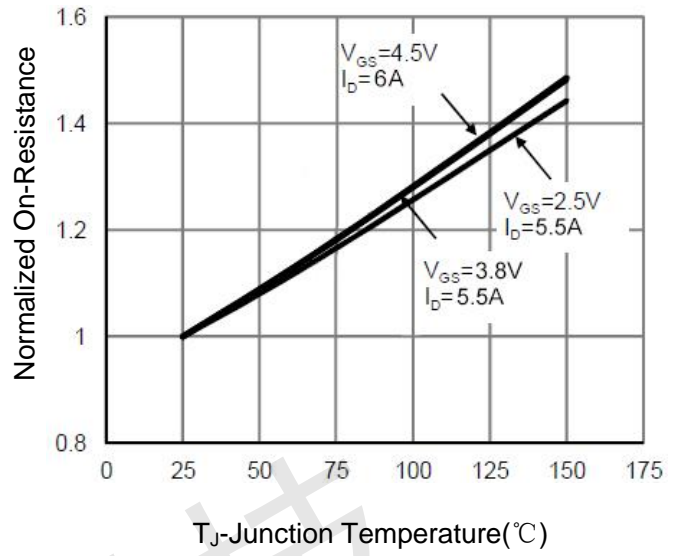
**Figure 5 Output Characteristics**



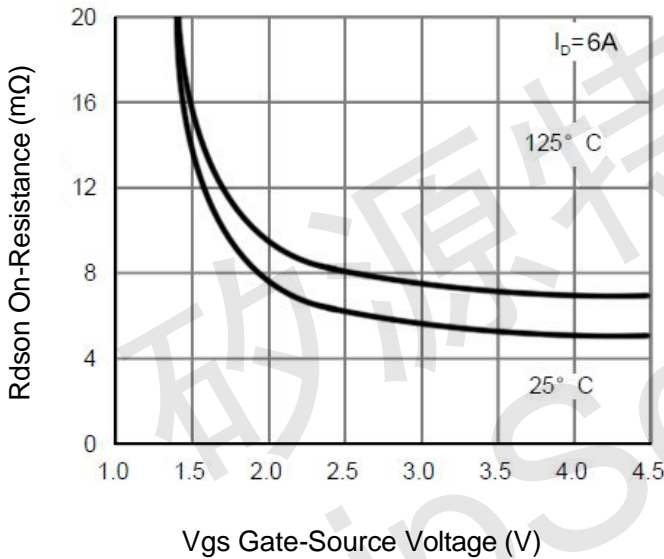
**Figure 6 R<sub>dson</sub> vs Drain Current**



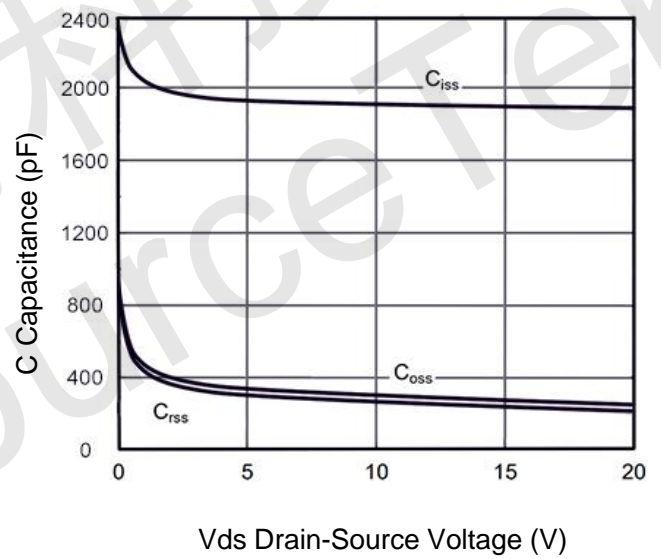
**Figure 7 Transfer Characteristics**



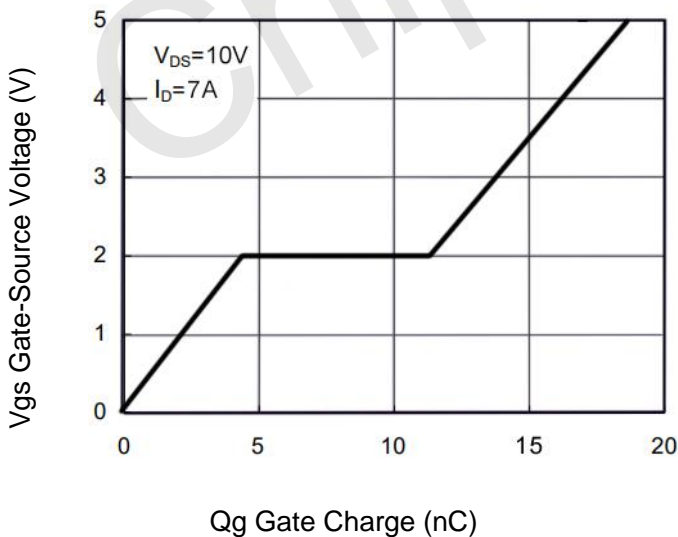
**Figure 8 Rdson vs Junction Temperature**



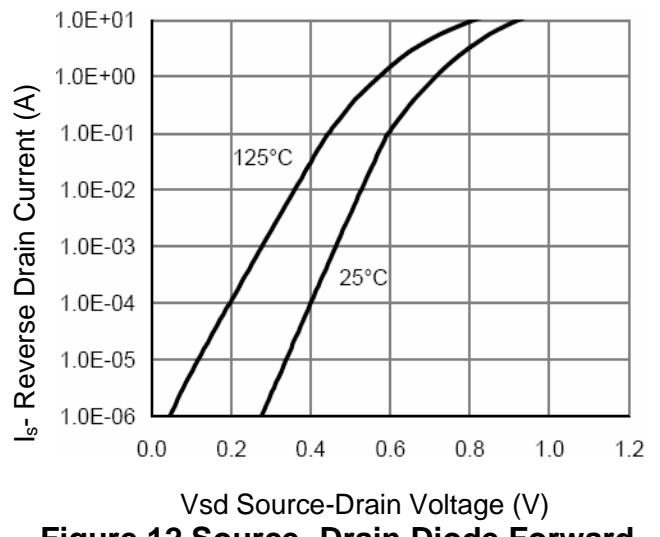
**Figure 9 Rdson vs Vgs**



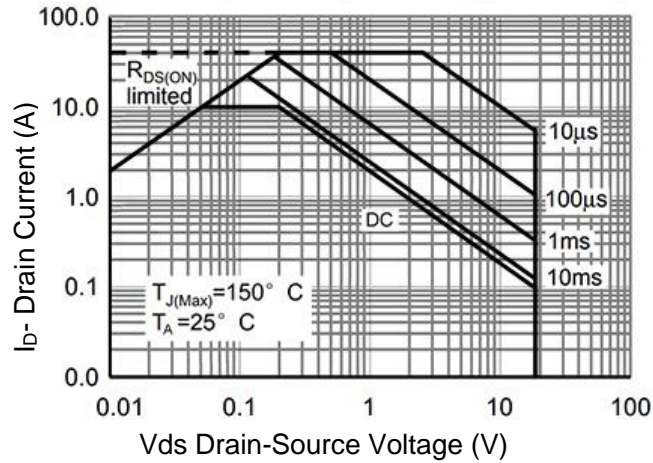
**Figure 10 Capacitance vs Vds**



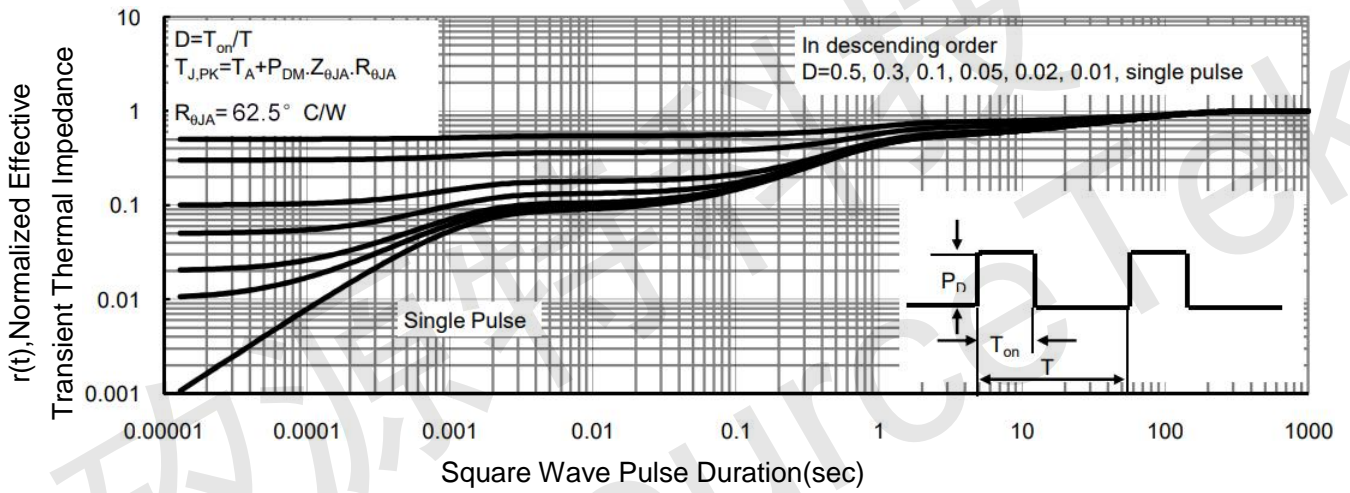
**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**



**Figure 13 Safe Operation Area**

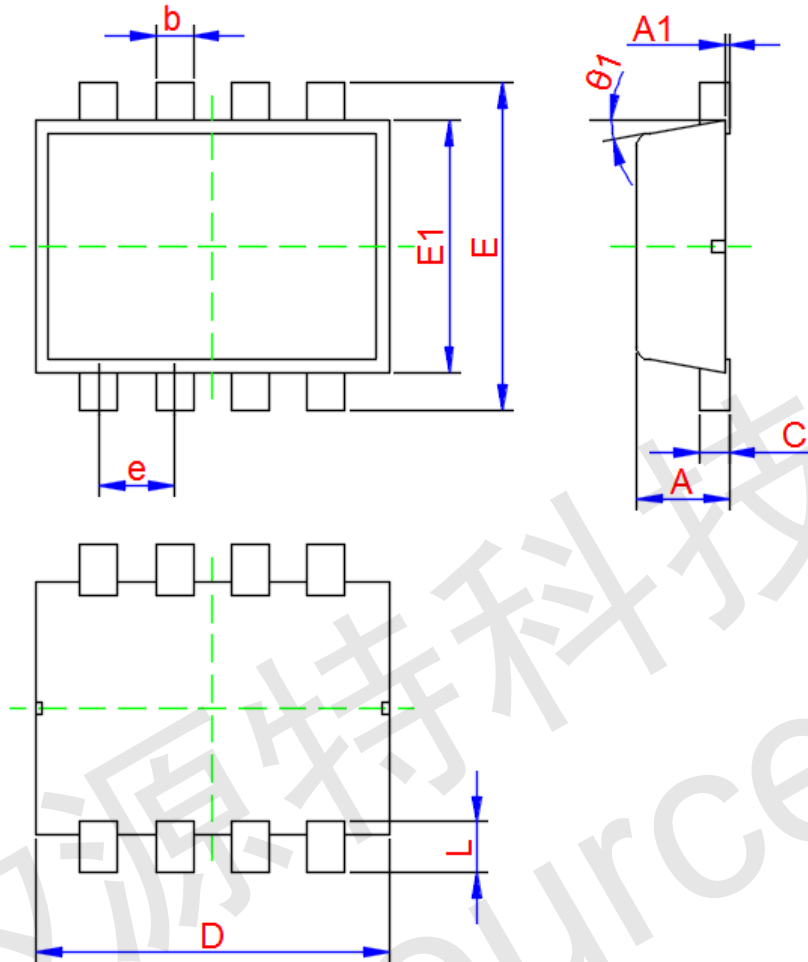


**Figure 14 Normalized Maximum Transient Thermal Impedance**





**DFN3x3-8L Package Information**



| Symbol | Dimensions In Millimeters |       |       |
|--------|---------------------------|-------|-------|
|        | Min.                      | Typ.  | Max.  |
| A      | 0.700                     | 0.800 | 0.900 |
| A1     | 0.000                     | -     | 0.050 |
| b      | 0.240                     | 0.300 | 0.350 |
| c      | 0.080                     | 0.150 | 0.250 |
| D      | 2.800                     | 2.900 | 3.000 |
| E      | 2.700                     | 2.800 | 2.900 |
| E1     | 2.200                     | 2.300 | 2.400 |
| e      | 0.650TYP.                 |       |       |
| L      | 0.200                     | 0.380 | 0.450 |
| Θ1     | 0°                        | 10°   | 12°   |