

## NCE N-Channel Super Trench II Power MOSFET

### Description

The NCEP18N10AQ uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### Application

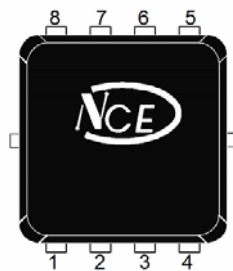
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

### General Features

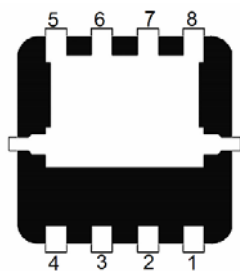
- $V_{DS} = 100V, I_D = 35A$
- $R_{DS(ON)} = 16.0m\Omega$  (typical) @  $V_{GS} = 10V$
- $R_{DS(ON)} = 18.0m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

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

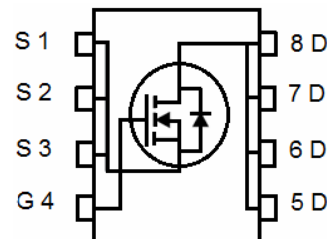
### DFN 3.3X3.3



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

| Device Marking | Device      | Device Package | Reel Size | Tape width | Quantity |
|----------------|-------------|----------------|-----------|------------|----------|
| NCEP18N10AQ    | NCEP18N10AQ | DFN3.3X3.3-8L  | -         | -          | -        |

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

| Parameter                                         | Symbol             | Limit      | Unit          |
|---------------------------------------------------|--------------------|------------|---------------|
| Drain-Source Voltage                              | $V_{DS}$           | 100        | V             |
| Gate-Source Voltage                               | $V_{GS}$           | $\pm 20$   | V             |
| Drain Current-Continuous                          | $I_D$              | 35         | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )   | $I_D(100^\circ C)$ | 25         | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 140        | A             |
| Maximum Power Dissipation                         | $P_D$              | 48         | W             |
| Derating factor                                   |                    | 0.39       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 115        | 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> | $R_{\theta JC}$ | 2.6 | $^\circ C/W$ |
|----------------------------------------------------------|-----------------|-----|--------------|

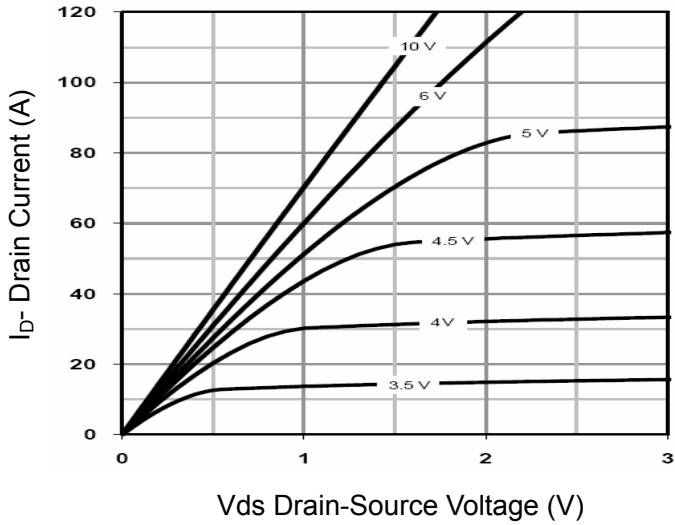
## Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                 | Symbol       | Condition                                                              | Min | Typ    | Max       | Unit       |
|-------------------------------------------|--------------|------------------------------------------------------------------------|-----|--------|-----------|------------|
| <b>Off Characteristics</b>                |              |                                                                        |     |        |           |            |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                              | 100 |        | -         | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=100V, V_{GS}=0V$                                               | -   | -      | 1         | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                            | -   | -      | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |                                                                        |     |        |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                          | 1.2 | 1.7    | 2.2       | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=10V, I_D=17.5A$                                                | -   | 16     | 18        | m $\Omega$ |
|                                           |              | $V_{GS}=4.5V, I_D=17.5A$                                               | -   | 20     | 22        | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=17.5A$                                                 | 20  | -      | -         | S          |
| <b>Dynamic Characteristics</b> (Note 4)   |              |                                                                        |     |        |           |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=50V, V_{GS}=0V,$<br>$F=1.0\text{MHz}$                          | -   | 1719.5 | -         | PF         |
| Output Capacitance                        | $C_{oss}$    |                                                                        | -   | 147.4  | -         | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |                                                                        | -   | 16     | -         | PF         |
| <b>Switching Characteristics</b> (Note 4) |              |                                                                        |     |        |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=50V, I_D=17.5A$<br>$V_{GS}=10V, R_G=3\Omega$                   | -   | 14     | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |                                                                        | -   | 16     | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |                                                                        | -   | 28     | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |                                                                        | -   | 8      | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=50V, I_D=17.5A,$<br>$V_{GS}=10V$                               | -   | 37.6   | -         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |                                                                        | -   | 6.5    | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |                                                                        | -   | 9.5    | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |                                                                        |     |        |           |            |
| Diode Forward Voltage                     | $V_{SD}$     | $V_{GS}=0V, I_S=17.5A$                                                 | -   |        | 1.2       | V          |
| Diode Forward Current                     | $I_S$        |                                                                        | -   | -      | 35        | A          |
| Reverse Recovery Time                     | $t_{rr}$     | $T_J = 25^\circ\text{C}, I_F = 17.5A$<br>$di/dt = 100A/\mu s$ (Note 3) | -   | 43     | -         | nS         |
| Reverse Recovery Charge                   | $Q_{rr}$     |                                                                        | -   | 90     | -         | nC         |

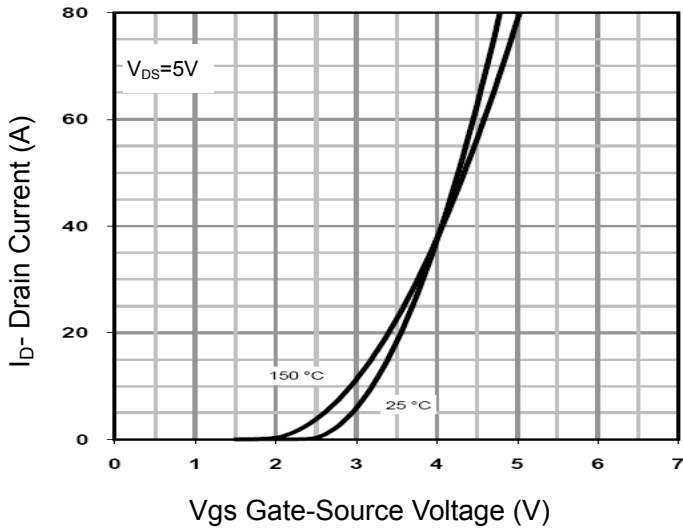
### Notes:

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
5. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

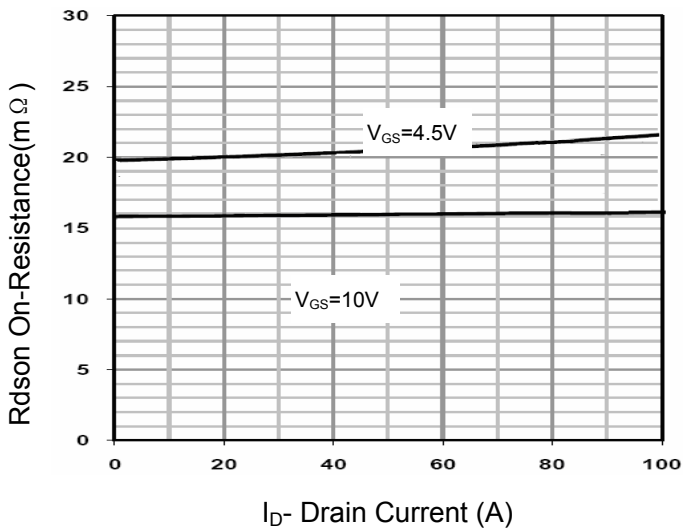
## Typical Electrical and Thermal Characteristics



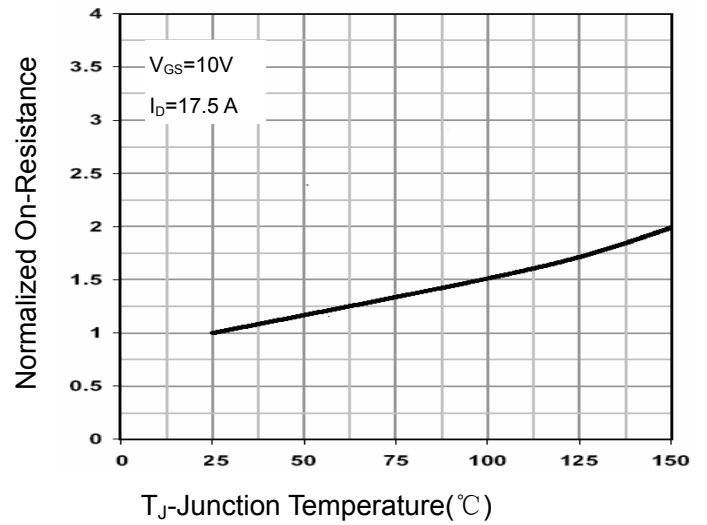
**Figure 1 Output Characteristics**



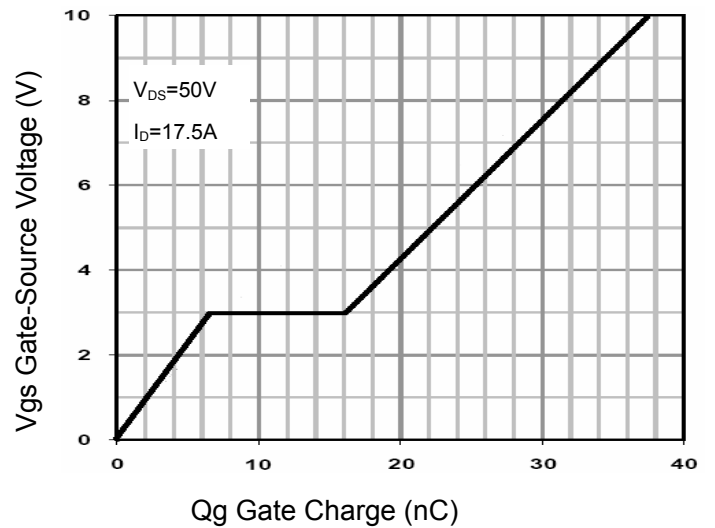
**Figure 2 Transfer Characteristics**



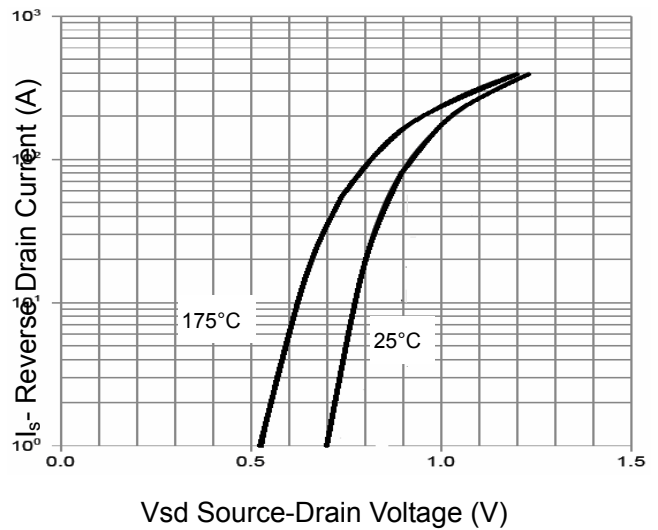
**Figure 3 Rdson- Drain Current**



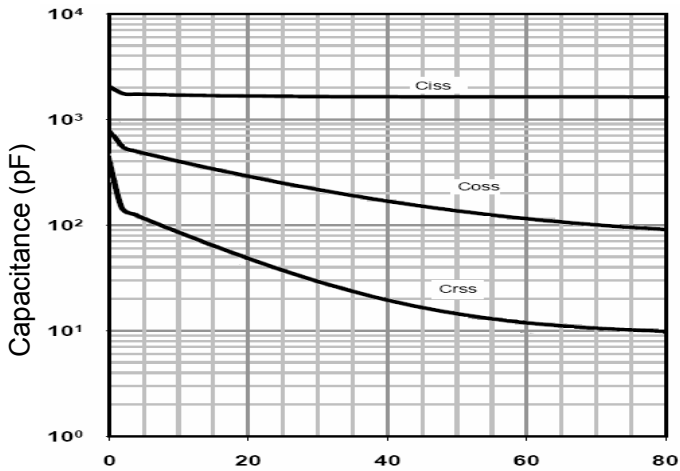
**Figure 4 Rdson-Junction Temperature**



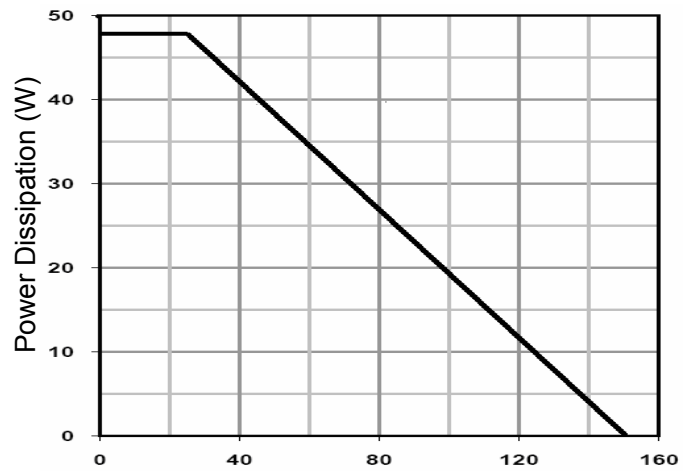
**Figure 5 Gate Charge**



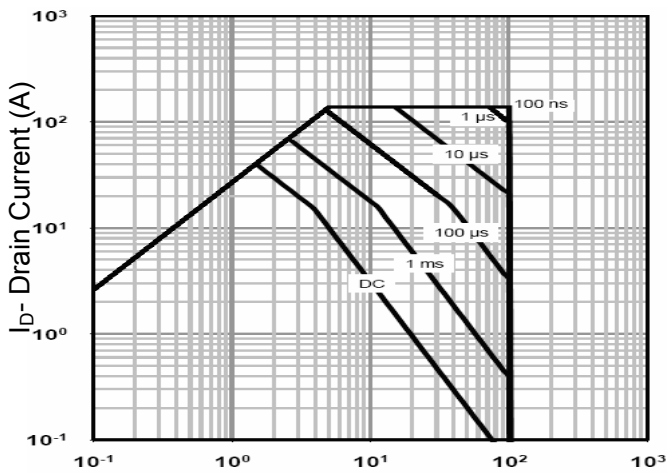
**Figure 6 Source- Drain Diode Forward**



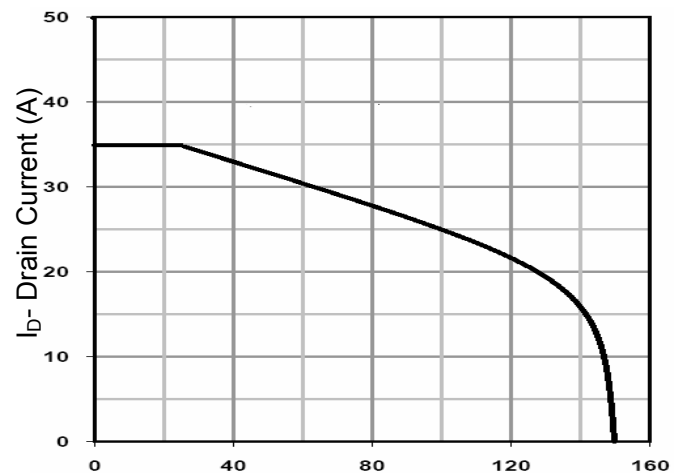
Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



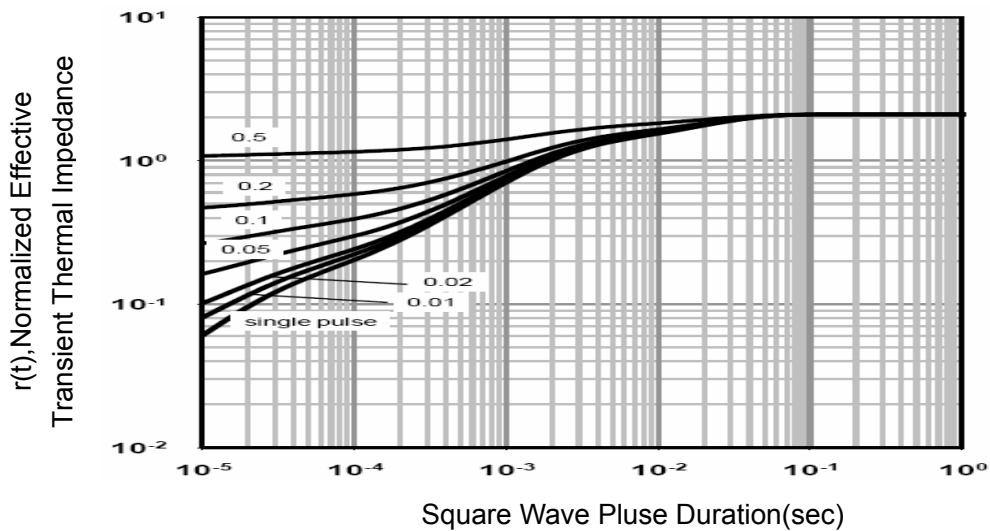
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power De-rating**



Vds Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**

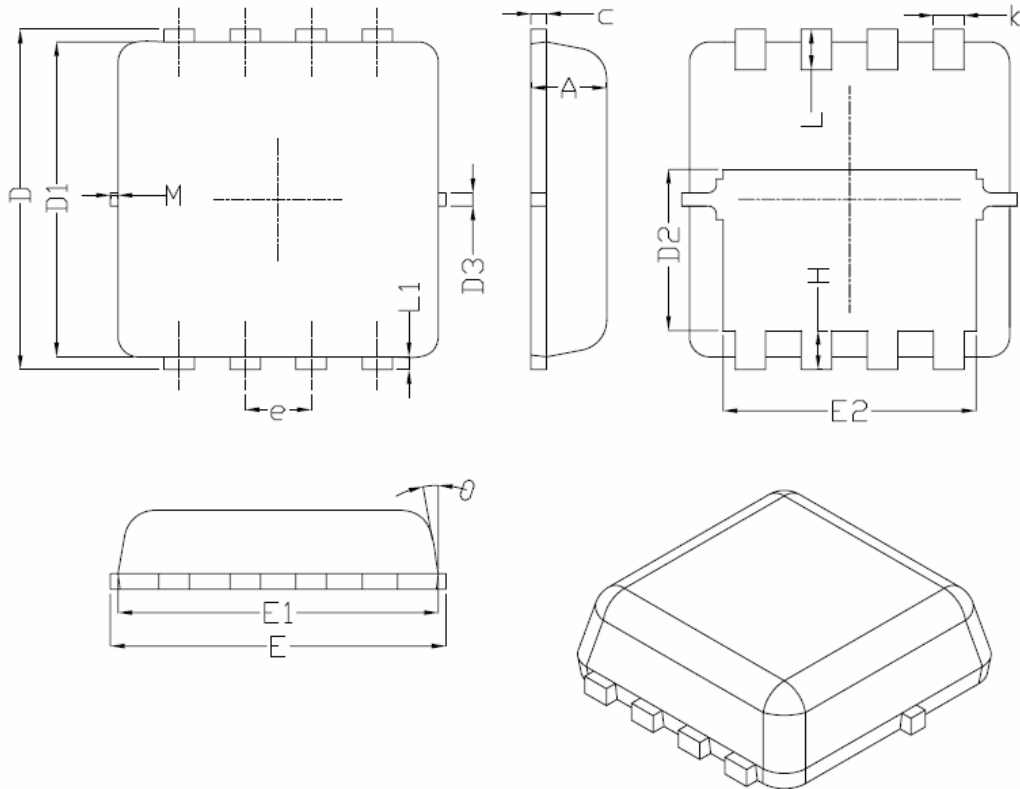


T<sub>J</sub>-Junction Temperature (°C)  
**Figure 10 Current De-rating**



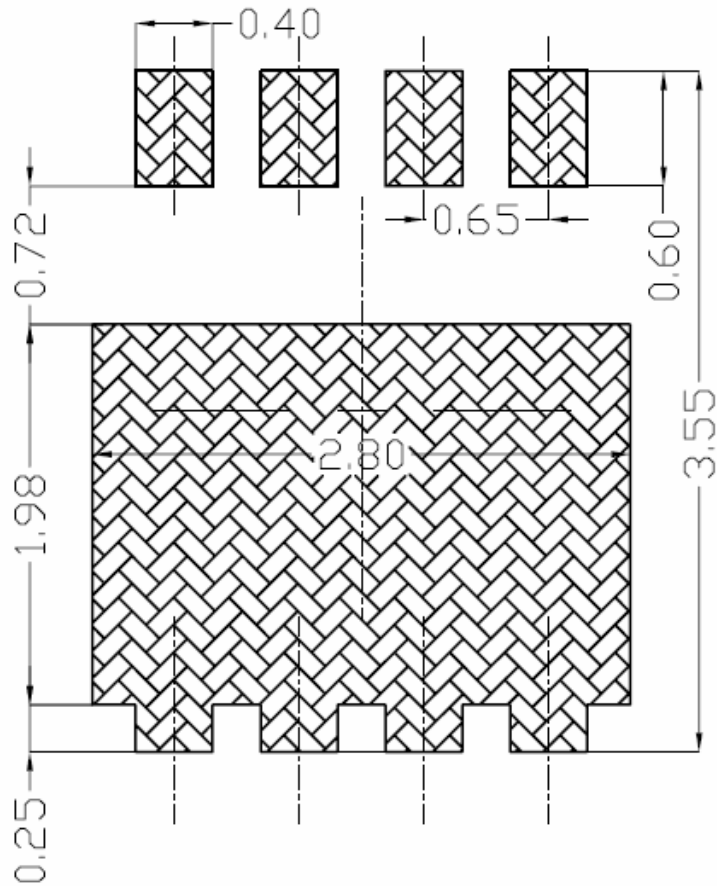
Square Wave Pluse Duration(sec)  
**Figure 11 Normalized Maximum Transient Thermal Impedance**

## DFN3.3X3.3-8L Package Information



| Symbol | Dimensions In Millimeters |      |      |
|--------|---------------------------|------|------|
|        | Min.                      | Nom. | Max. |
| A      | 0.70                      | 0.75 | 0.80 |
| b      | 0.25                      | 0.30 | 0.35 |
| c      | 0.10                      | 0.15 | 0.25 |
| D      | 3.25                      | 3.35 | 3.45 |
| D1     | 3.00                      | 3.10 | 3.20 |
| D2     | 1.48                      | 1.58 | 1.68 |
| D3     | -                         | 0.13 | -    |
| E      | 3.20                      | 3.30 | 3.40 |
| E1     | 3.00                      | 3.15 | 3.20 |
| E2     | 2.39                      | 2.49 | 2.59 |
| e      | 0.65BSC                   |      |      |
| H      | 0.30                      | 0.39 | 0.50 |
| L      | 0.30                      | 0.40 | 0.50 |
| L1     | -                         | 0.13 | -    |
| M      | *                         | *    | 0.15 |
| θ      |                           | 10°  | 12°  |

## Land Pattern (Only for Reference)



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