

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE3035Q 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.

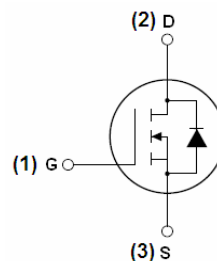
### General Features

- $V_{DS} = 30V, I_D = 35A$   
 $R_{DS(ON)} < 7.0m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 11m\Omega @ V_{GS} = 4.5V$
- 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
- Special process technology for high ESD capability

### Application

- Secondary side synchronous rectifier
- High side switch in POL DC/DC converter

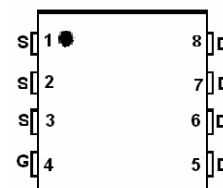
**100% UIS TESTED!**



Schematic diagram



Marking and pin assignment



DFN 3x3 EP top view

### Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| NCE3035Q       | NCE3035Q | DFN 3x3 EP     | -         | -          | -        |

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ 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                          | $I_D$          | 35         | A             |
| Pulsed Drain Current                              | $I_{DM}$       | 120        | A             |
| Maximum Power Dissipation                         | $P_D$          | 35         | W             |
| Derating factor                                   |                | 0.28       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$       | 150        | 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> | $R_{\theta JC}$ | 3.6 | °C/W |
|--|-----------------|-----|------|

## Electrical Characteristics (TC=25°C unless otherwise noted)

| Parameter  | Symbol       | Condition   | Min | Typ  | Max       | Unit       |
|--|--------------|---|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |   |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$   | 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   | 1.6  | 3         | V          |
| Drain-Source On-State Resistance                     | $R_{DS(on)}$ | $V_{GS}=10V, I_D=12A$   | -   | 6.5  | 7.0       | m $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=10A$  | -   | 9    | 11        |            |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=10V, I_D=12A$   | 30  | -    | -         | S          |
| <b>Dynamic Characteristics</b> <sup>(Note 4)</sup>   |              |   |     |      |           |            |
| Input Capacitance                                    | $C_{iss}$    | $V_{DS}=15V, V_{GS}=0V,$<br>$F=1.0MHz$                                    | -   | 2330 | -         | PF         |
| Output Capacitance                                   | $C_{oss}$    |   | -   | 460  | -         | PF         |
| Reverse Transfer Capacitance                         | $C_{rss}$    |   | -   | 230  | -         | PF         |
| <b>Switching Characteristics</b> <sup>(Note 4)</sup> |              |   |     |      |           |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=15V, I_D=12A$<br>$V_{GS}=10V, R_{GEN}=6\Omega$                    | -   | 18   | -         | nS         |
| Turn-on Rise Time                                    | $t_r$        |   | -   | 10   | -         | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |   | -   | 34   | -         | nS         |
| Turn-Off Fall Time                                   | $t_f$        |   | -   | 10   | -         | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=15V, I_D=12A,$<br>$V_{GS}=10V$                                    | -   | 45   | -         | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |   | -   | 9.4  | -         | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |   | -   | 7.7  | -         | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |   |     |      |           |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=12A$  | -   | 0.85 | 1.2       | V          |
| Diode Forward Current <sup>(Note 2)</sup>            | $I_S$        |   | -   | -    | 35        | A          |
| Reverse Recovery Time                                | $t_{rr}$     | $T_J = 25^\circ C, I_F = 12A$<br>$di/dt = 100A/\mu s$ <sup>(Note 3)</sup> | -   | -    | 47        | nS         |
| Reverse Recovery Charge                              | $Q_{rr}$     |   | -   | -    | 25        | nC         |
| Forward Turn-On Time                                 | $t_{on}$     | 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,  $t \leq 10$  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:  $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

## Test Circuit

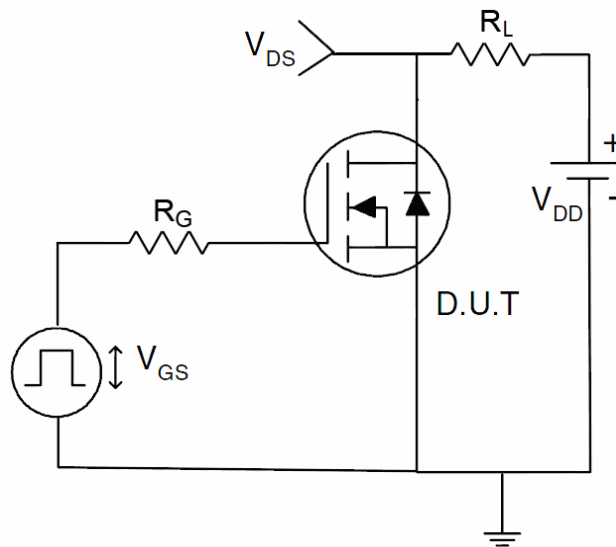
### 1) E<sub>AS</sub> Test Circuits



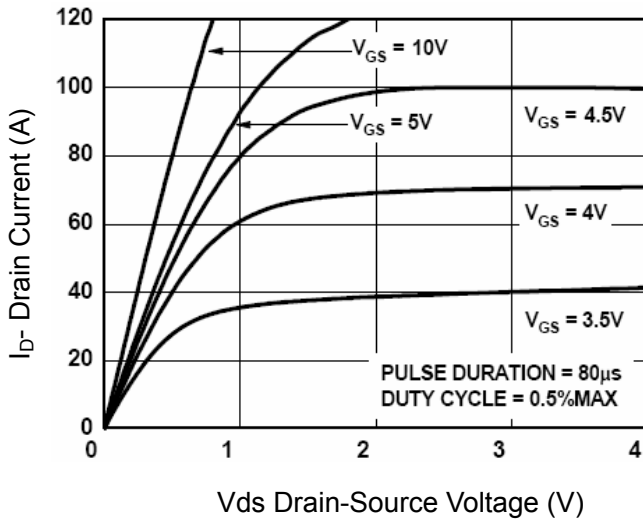
### 2) Gate Charge Test Circuit



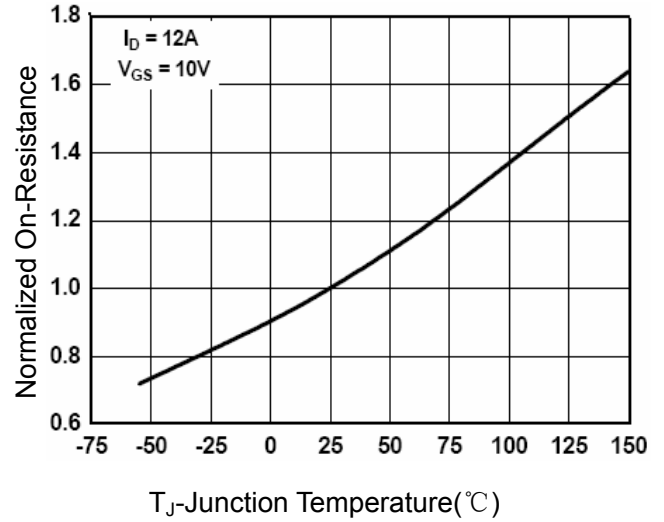
### 3) Switch Time Test Circuit



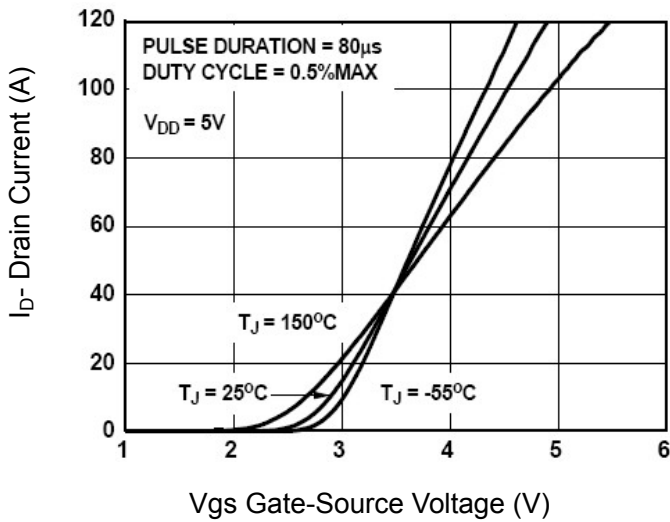
## Typical Electrical and Thermal Characteristics (Curves)



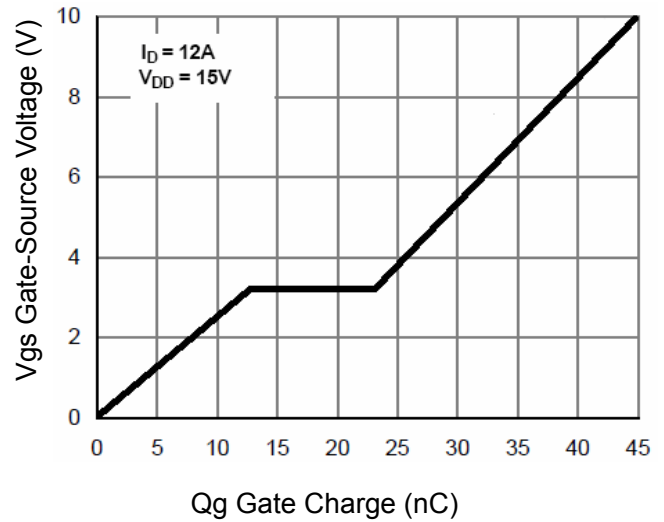
**Figure 1 Output Characteristics**



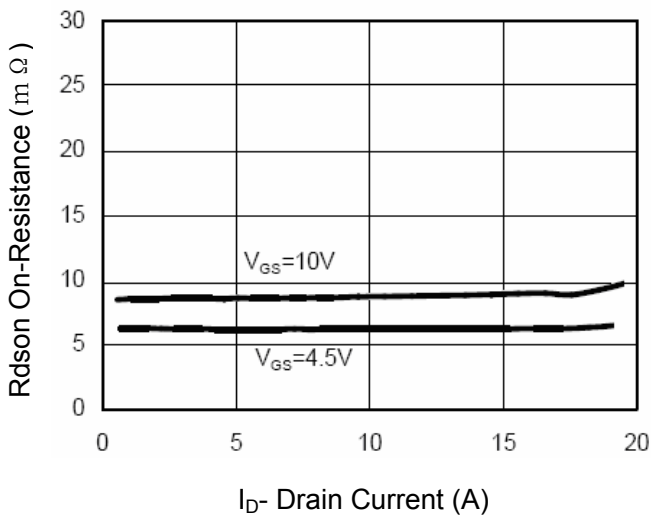
**Figure 4 Rds(on)-Junction Temperature**



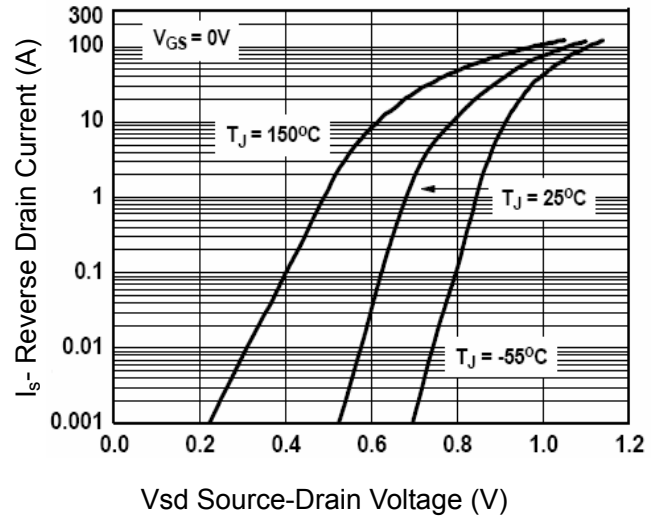
**Figure 2 Transfer Characteristics**



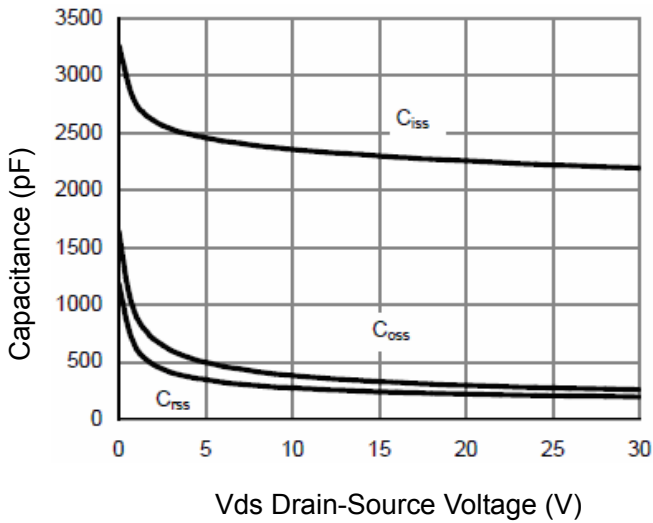
**Figure 5 Gate Charge**



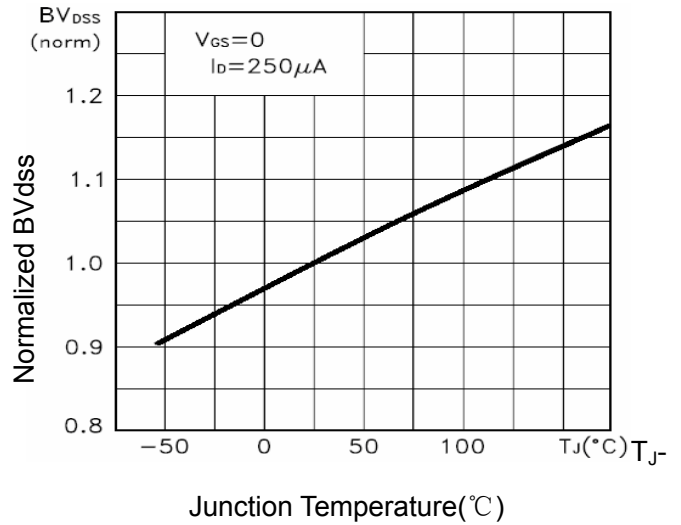
**Figure 3 Rds(on)- Drain Current**



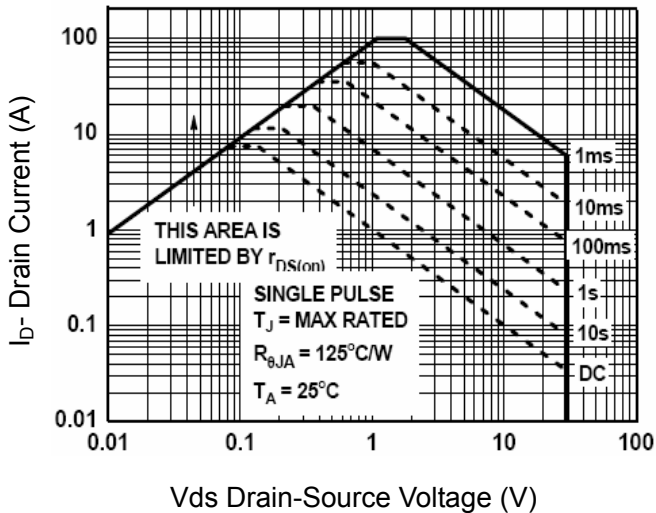
**Figure 6 Source- Drain Diode Forward**



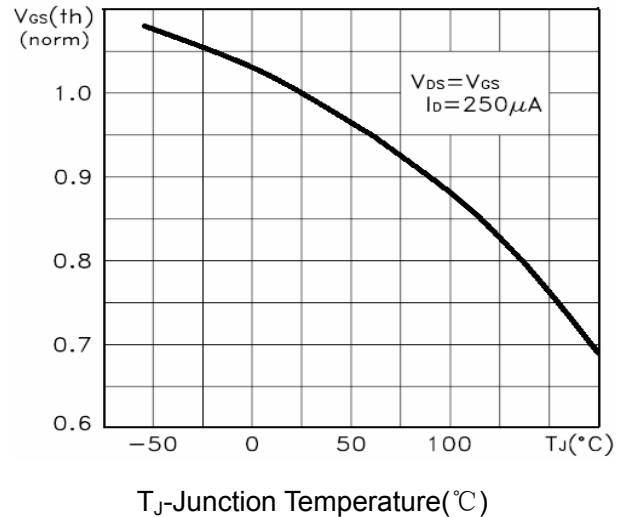
Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



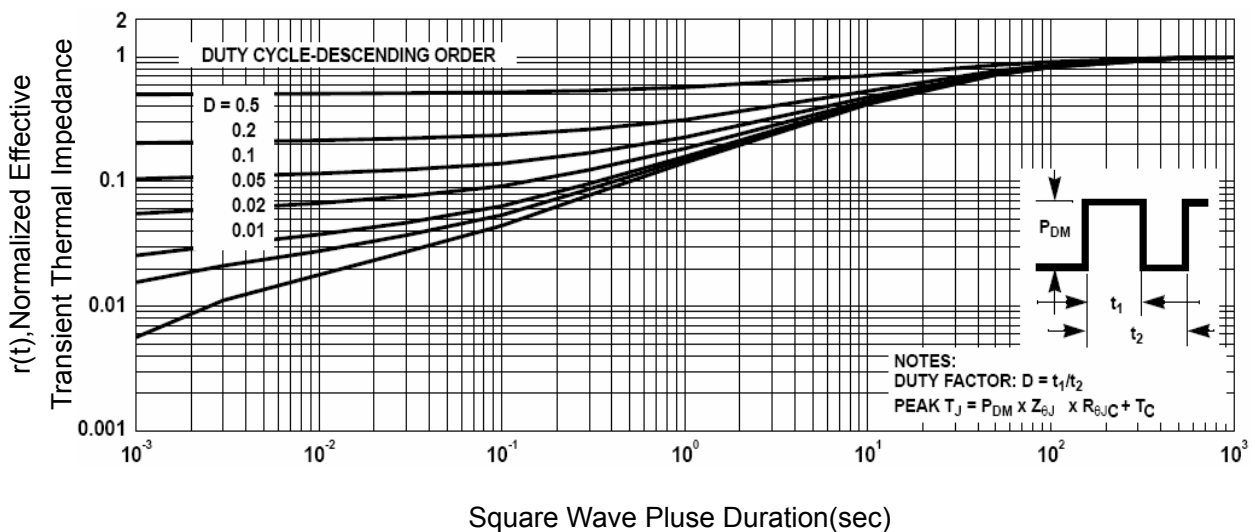
Junction Temperature(°C)  
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



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

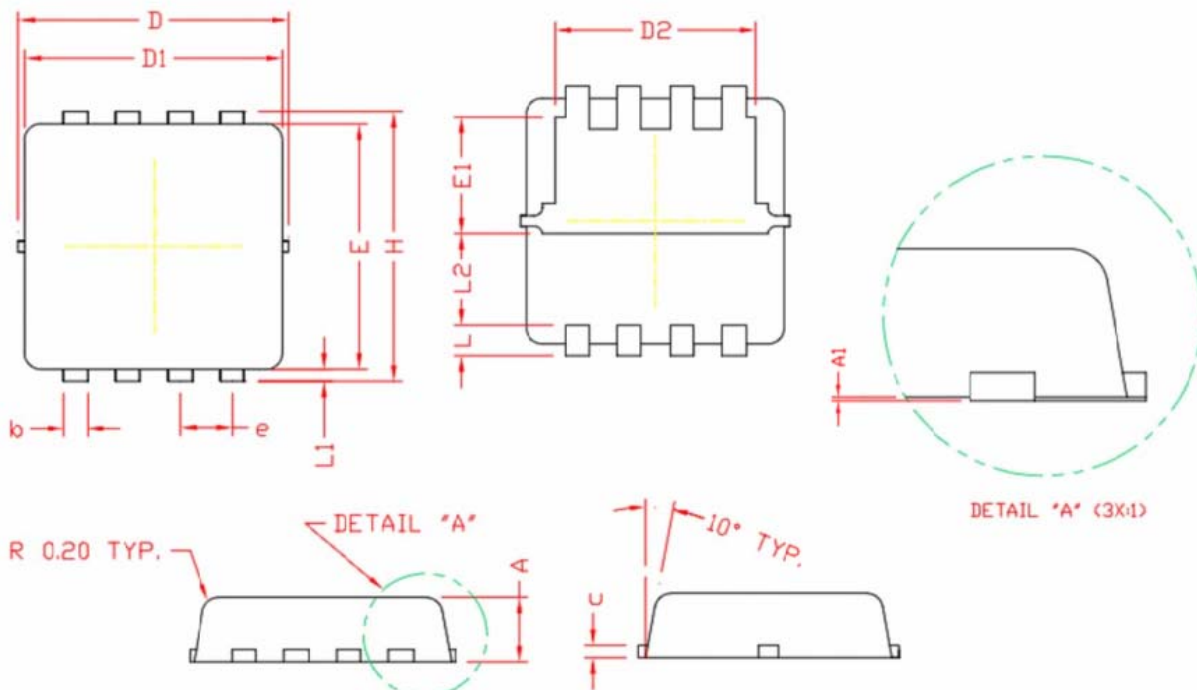


T<sub>J</sub>-Junction Temperature(°C)  
**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



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

## DFN3X3 EP Package Information



### COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN       | NOM  | MAX  |
|--------|-----------|------|------|
| A      | 0.70      | 0.80 | 0.90 |
| A1     | 0.00      | 0.03 | 0.05 |
| b      | 0.24      | 0.30 | 0.35 |
| c      | 0.10      | 0.15 | 0.20 |
| D      | 3.25      | 3.32 | 3.40 |
| D1     | 3.05      | 3.15 | 3.25 |
| D2     | 2.40      | 2.50 | 2.60 |
| E      | 3.00      | 3.10 | 3.20 |
| E1     | 1.35      | 1.45 | 1.55 |
| e      | 0.65 BSC. |      |      |
| H      | 3.20      | 3.30 | 3.40 |
| L      | 0.30      | 0.40 | 0.50 |
| L1     | 0.10      | 0.15 | 0.20 |
| L2     | 1.13 REF. |      |      |

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