

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE3040Q 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.

Application

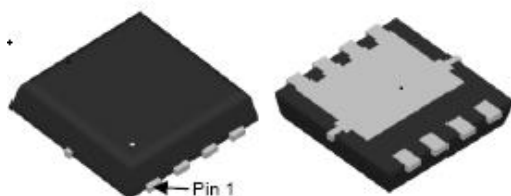
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

100% UIS TESTED!
100% ΔV_{ds} TESTED!

General Features

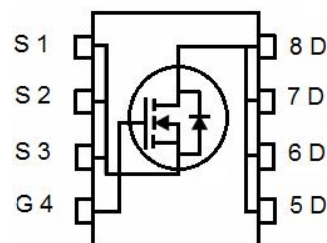
- $V_{DS} = 30V, I_D = 40A$
 $R_{DS(ON)} = 5.7m\Omega$ (typical) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 10.0m\Omega$ (typical) @ $V_{GS} = 4.5V$
- High density cell design for ultra low R_{dson}
- Very low on-resistance $R_{DS(on)}$
- Good stability and uniformity with high E_{AS}
- 150 °C operating temperature
- Pb-free lead plating

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 |
|----------------|----------|----------------|-----------|------------|------------|
| NCE3040Q | NCE3040Q | DFN 3.3x3.3-8L | Ø330mm | 12mm | 5000 units |

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} | ± 20 | V |
| Drain Current-Continuous (Note 1) | I_D | 40 | A |
| Drain Current-Continuous ($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 28.3 | A |
| Pulsed Drain Current | I_{DM} | 160 | A |
| Maximum Power Dissipation | P_D | 35 | W |
| Derating factor | | 0.28 | W/ $^\circ C$ |
| Single pulse avalanche energy (Note 5) | 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 (Note 2) | $R_{\theta JC}$ | 3.6 | $^\circ C/W$ |
|---|-----------------|-----|--------------|

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

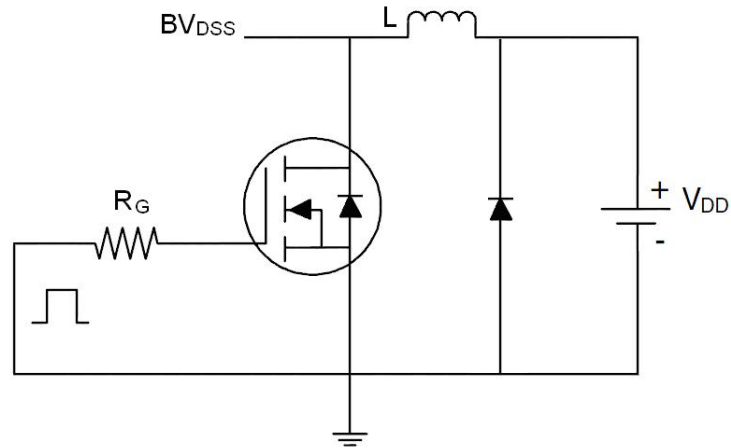
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 30 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=30V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1 | 1.5 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=20A$ | - | 5.7 | 7.0 | m Ω |
| | | $V_{GS}=4.5V, I_D=20A$ | - | 10 | 14 | |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=20A$ | 20 | - | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$ | - | 1650 | - | PF |
| Output Capacitance | C_{oss} | | - | 205 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 177 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=15V, I_D=20A$ $V_{GS}=10V, R_{GEN}=6\Omega$ | - | 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 | | - | 5 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=15V, I_D=20A,$ $V_{GS}=10V$ | - | 32.3 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 4.9 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 6.9 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V_{SD} | $V_{GS}=0V, I_S=20A$ | - | 0.85 | 1.2 | V |
| Diode Forward Current | I_S | | - | - | 40 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^\circ C, I_F = 20A$ $di/dt = 100A/\mu s$ (Note3) | - | - | 27 | nS |
| Reverse Recovery Charge | Q_{rr} | | - | - | 20 | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

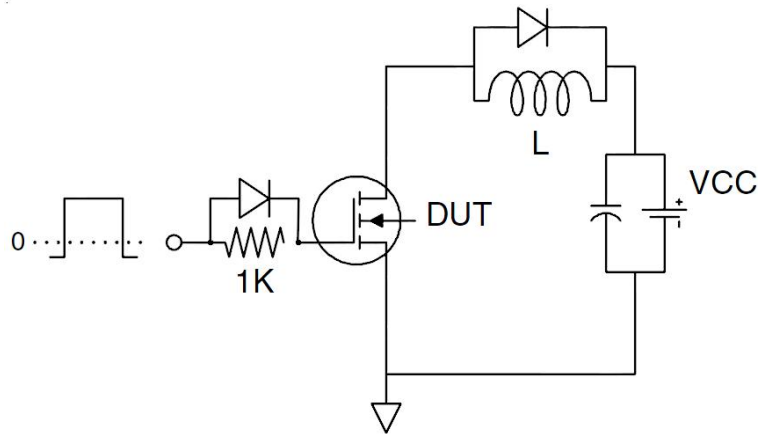
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

Test Circuit

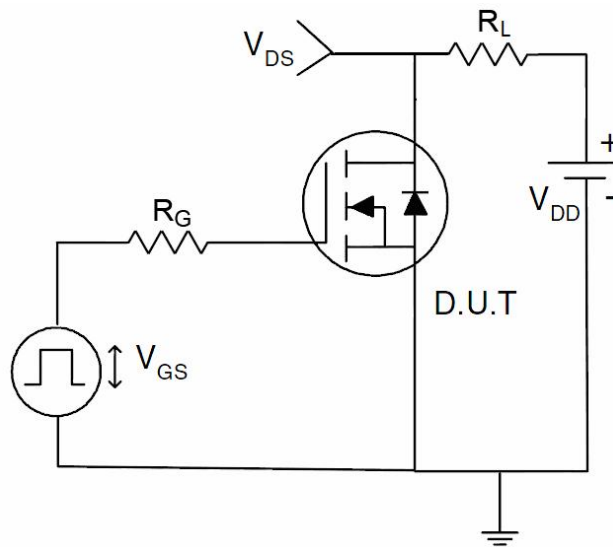
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

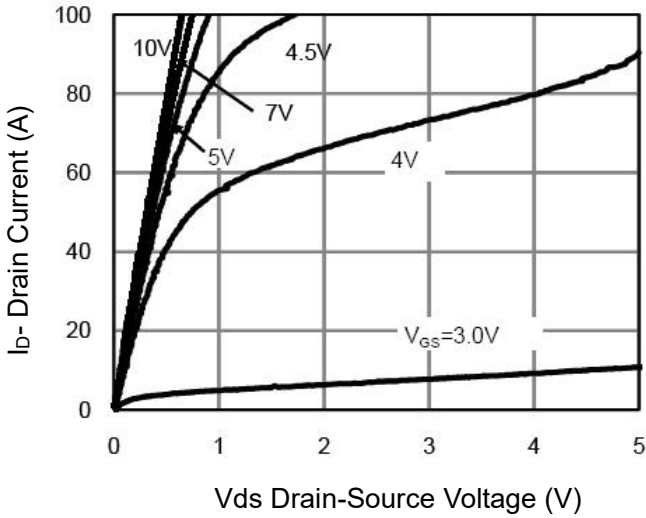


Figure 1 Output Characteristics

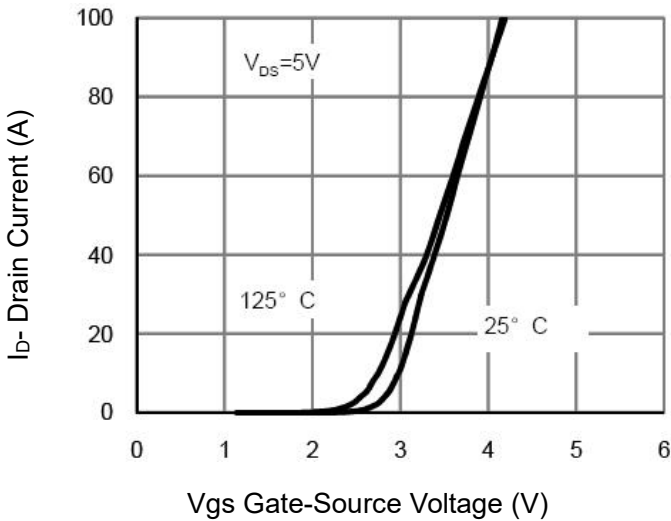


Figure 2 Transfer Characteristics

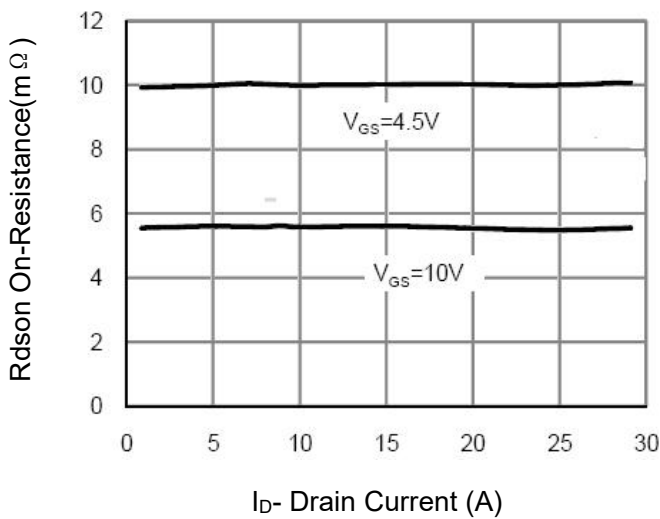


Figure 3 Rdson- Drain Current

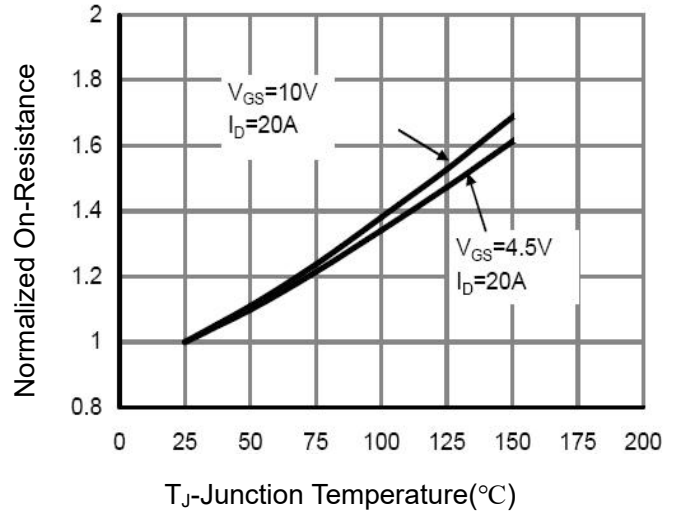


Figure 4 Rdson-Junction Temperature

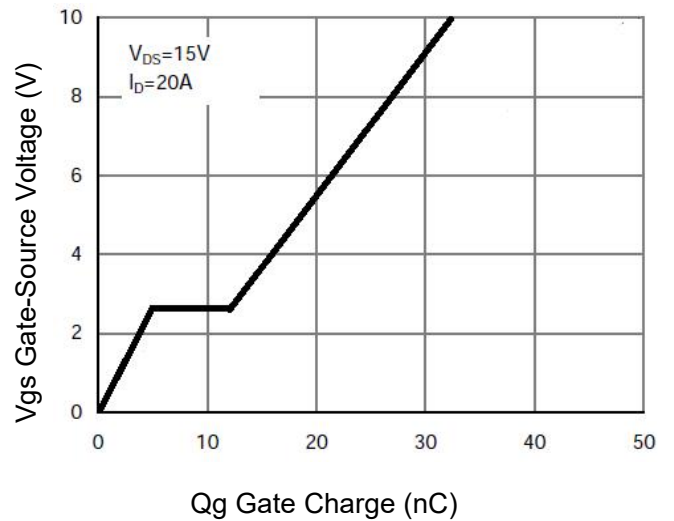


Figure 5 Gate Charge

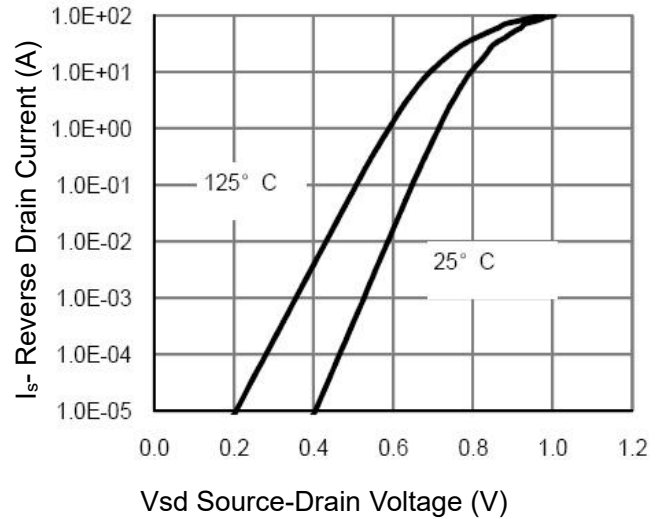
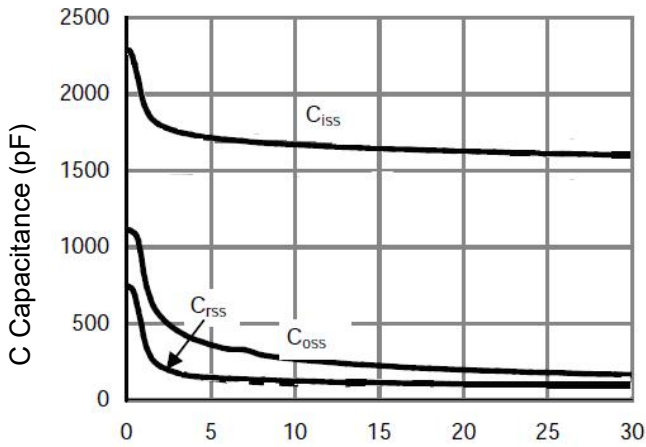
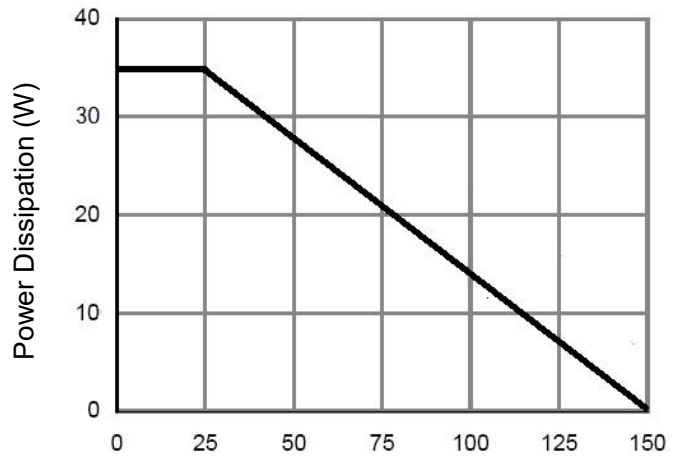


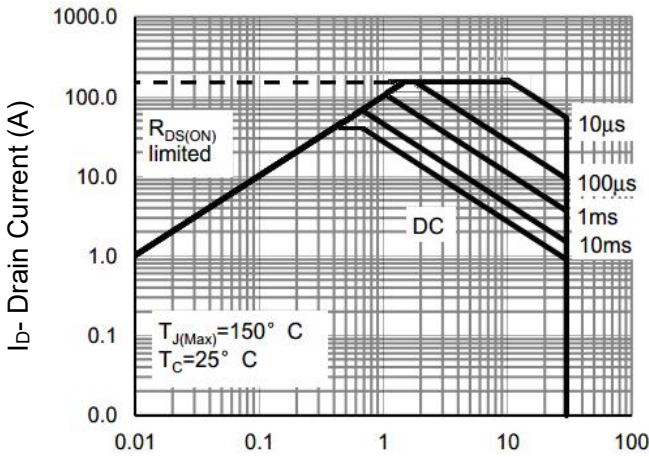
Figure 6 Source- Drain Diode Forward



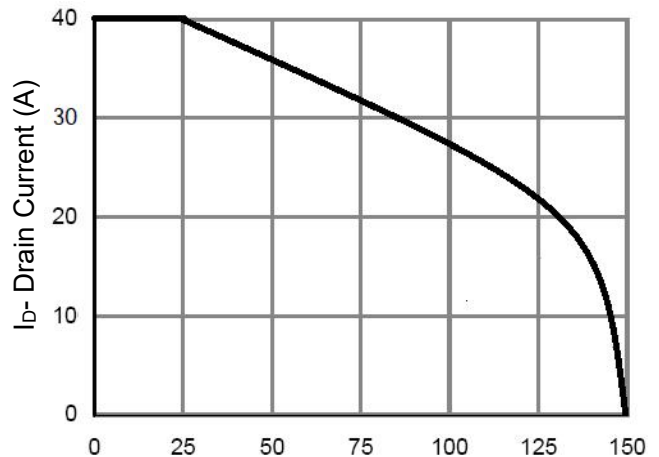
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



T_J-Junction Temperature(°C)
Figure 9 Power De-rating



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



T_J-Junction Temperature(°C)
Figure 10 ID Current- Junction Temperature

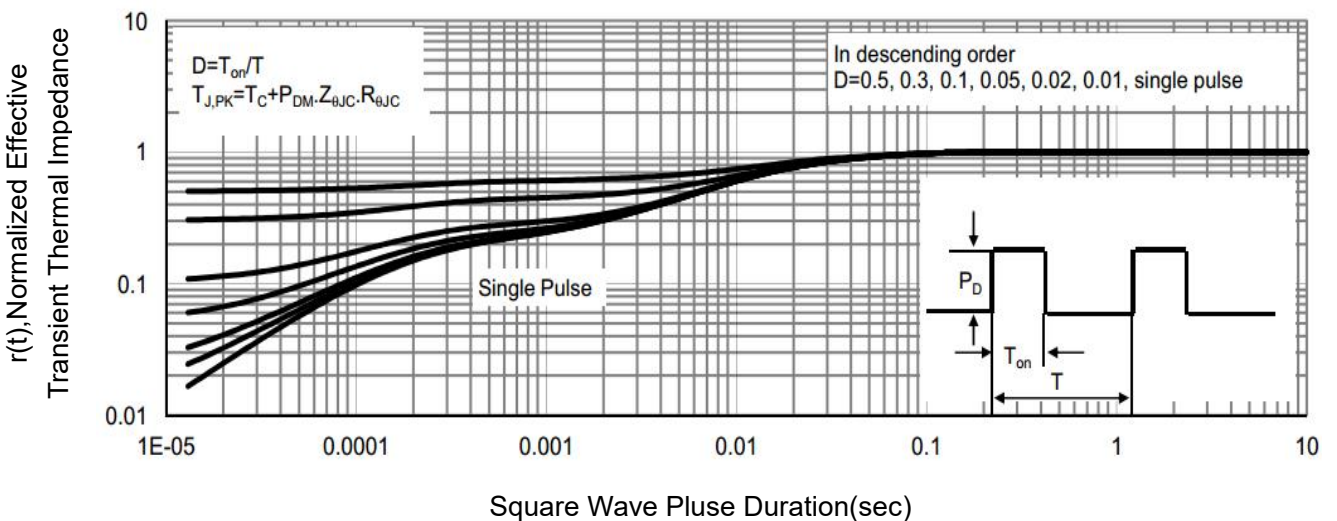
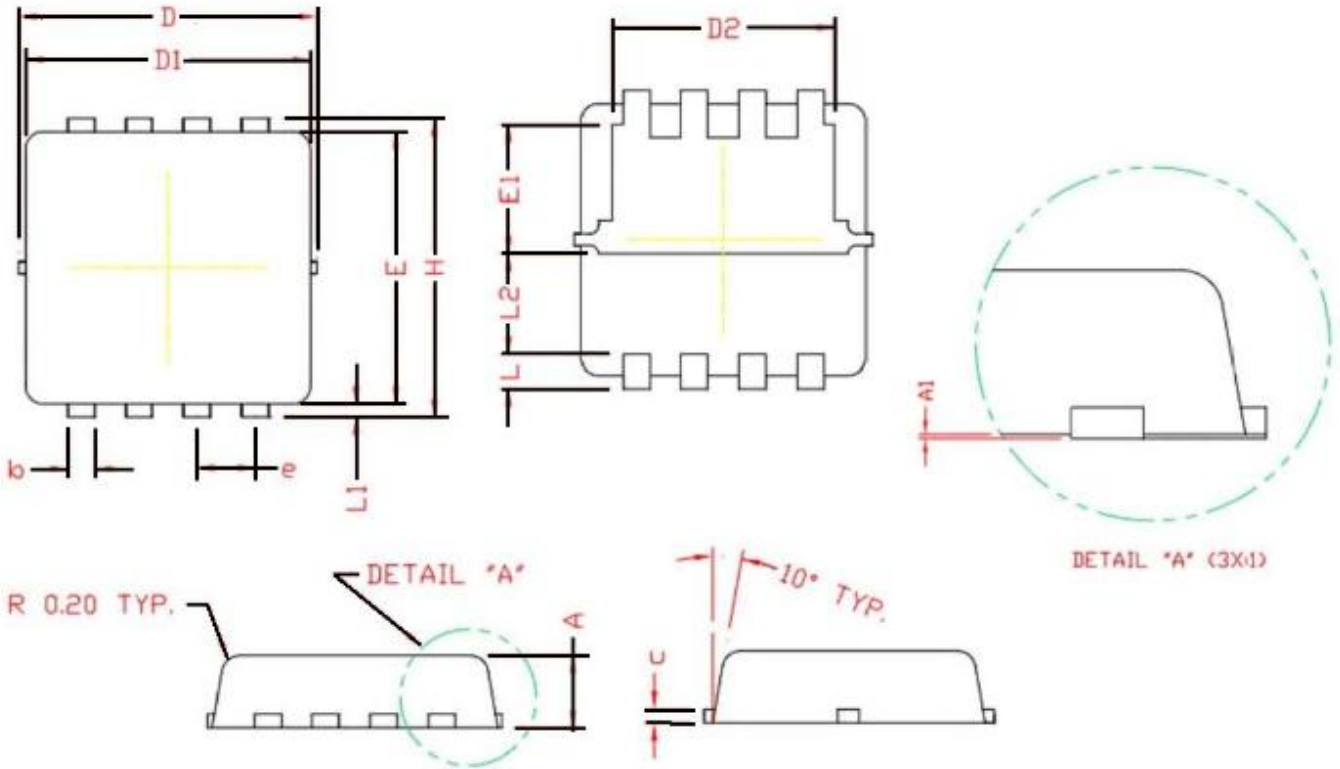


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3.3X3.3-8L 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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