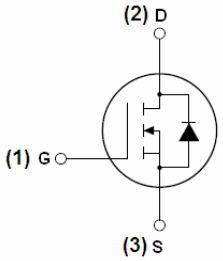
# FNK N-Channel Enhancement Mode Power MOSFET

## Description

The FNK03N06F 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.




**Schematic diagram**

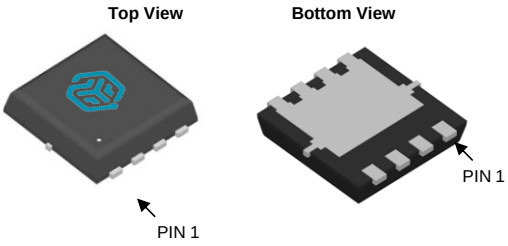
## General Features

- $V_{DS}$ =30V,$I_D$ =80A
  $R_{DS(ON)}$<7.0mΩ @ $V_{GS}$=10V
  $R_{DS(ON)}$ <12mΩ@ $V_{GS}$=4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high $E_{AS}$
- Excellent package for good heat dissipation


**Marking and pin assignment**

## Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply




## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| 03N06F | FNK03N06F | DFN3.3*3.3 | - | - | - |

## Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 80 | A |
| Drain Current-Continuous($T_C$=100℃) | $I_D$ (100℃) | 50 | A |
| Pulsed Drain Current | $I_{DM}$ | 320 | A |
| Maximum Power Dissipation | $P_D$ | 100 | W |
| Derating factor | | 0.56 | W/℃ |
| Single pulse avalanche energy (Note 5) | $E_{AS}$ | 150 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case (Note 2) | $R_{\theta JC}$ | 1.5 | ℃/W |

## Electrical Characteristics ($T_A$=25℃unless otherwise noted)

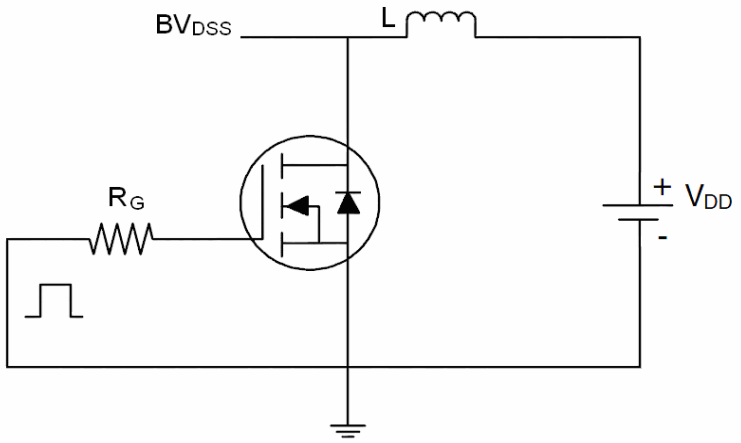
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 30 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=30V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics (Note 3)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 0.85 | | 1.35 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=10A | - | 5.4 | 7.0 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$=4.5A | - | 7.0 | 12 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=24A | 20 | - | - | S |
| **Dynamic Characteristics (Note4)** | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=15V,$V_{GS}$=0V, F=1.0MHz | - | 2060 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 320 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 235 | - | PF |
| **Switching Characteristics (Note 4)** | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=10V,$I_D$=30A $V_{GS}$=10V,$R_{GEN}$=2.7Ω | - | 20 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 15 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 60 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 10 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=10V,$I_D$=30A, $V_{GS}$=10V | - | 51 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 14 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 11 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=24A | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 80 | A |
| Reverse Recovery Time | $t_{rr}$ | TJ = 25°C, IF = 80A di/dt = 100A/μs (Note3) | - | 32 | 50 | nS |
| Reverse Recovery Charge | Qrr | | - | 12 | 20 | nC |

**Notes:**

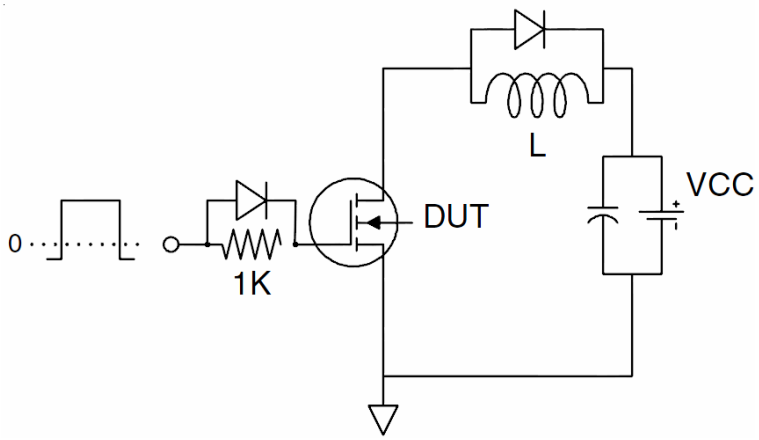
**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production
**5.** EAS condition：Tj=25℃,$V_{DD}$=15V,$V_G$=10V,L=0.5mH, Rg=25Ω

## Test Circuit

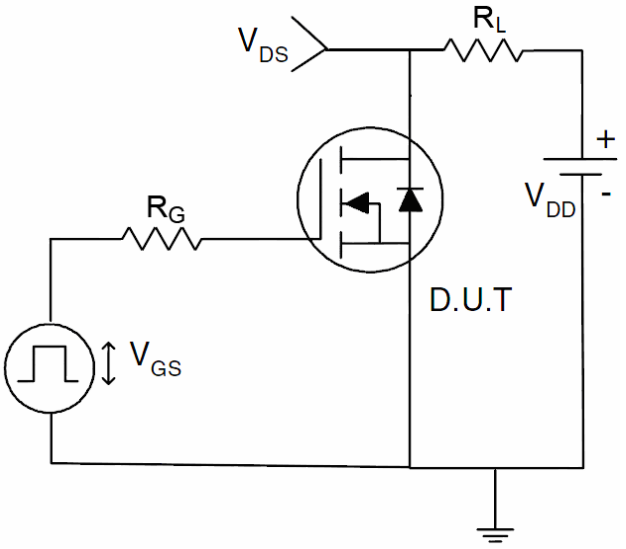
### 1) $E_{AS}$ Test Circuits




### 2) Gate Charge Test Circuit:




### 3) Switch Time Test Circuit:



## Typical Electrical and Thermal Characteristics (Curves)

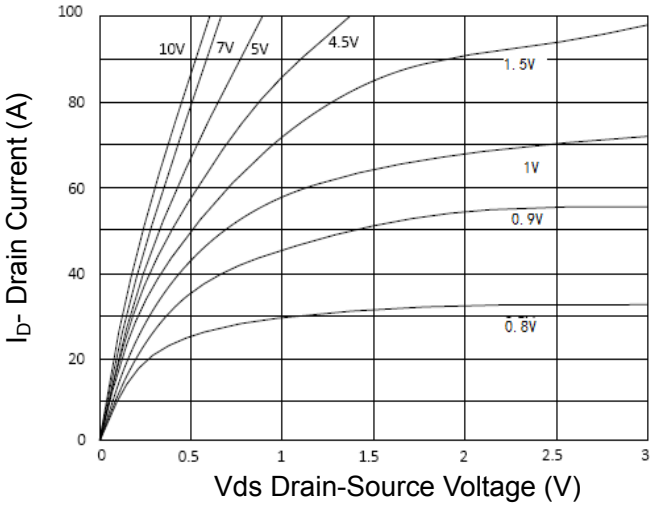



**Figure 1 Output Characteristics**

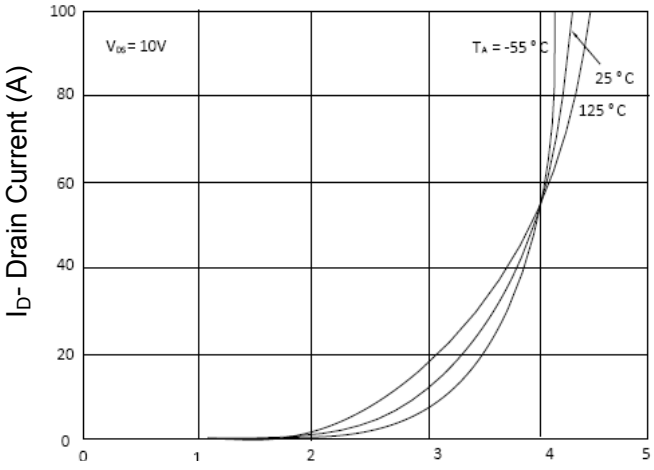



**Figure 2 Transfer Characteristics**

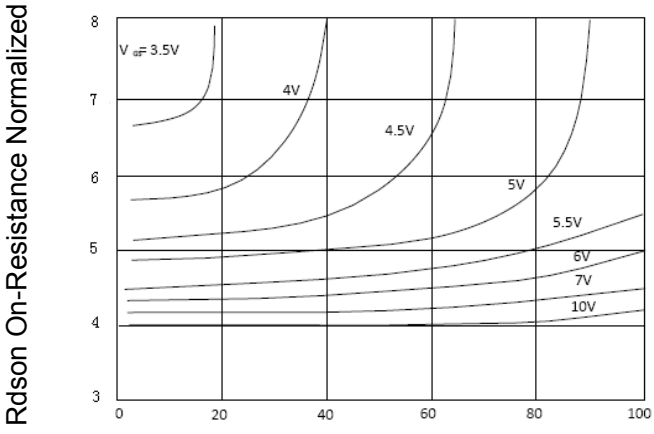



**Figure 3 Rdson- Drain Current**

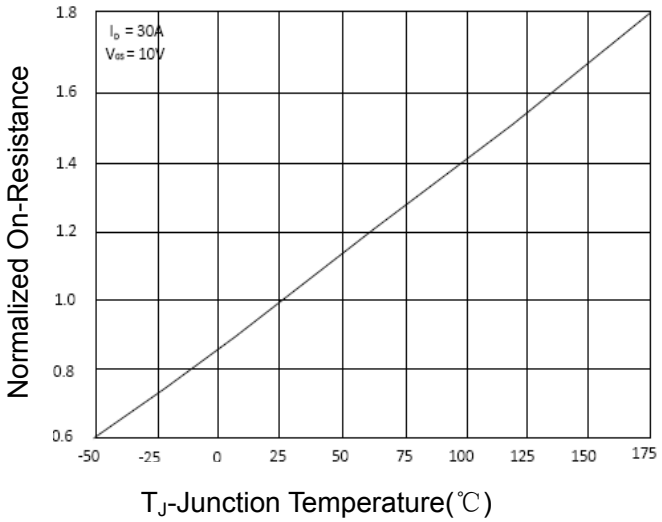



**Figure 4 Rdson-Junction Temperature**

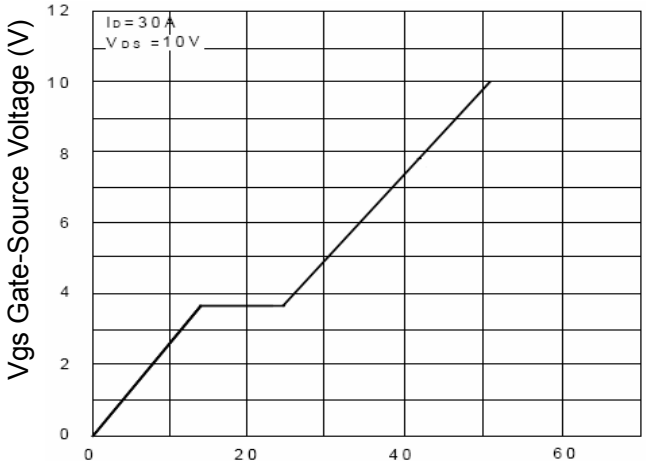



**Figure 5 Gate Charge**

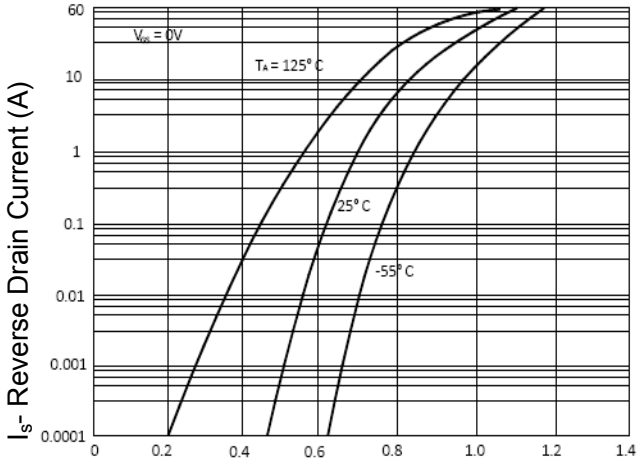



**Figure 6 Source- Drain Diode Forward**

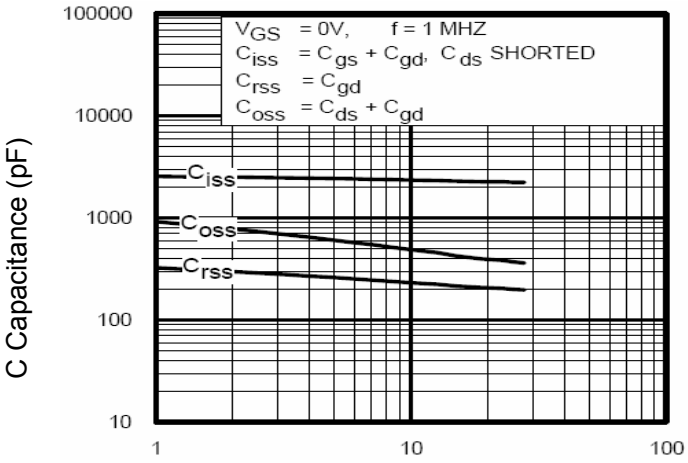



**Figure 7 Capacitance vs Vds**

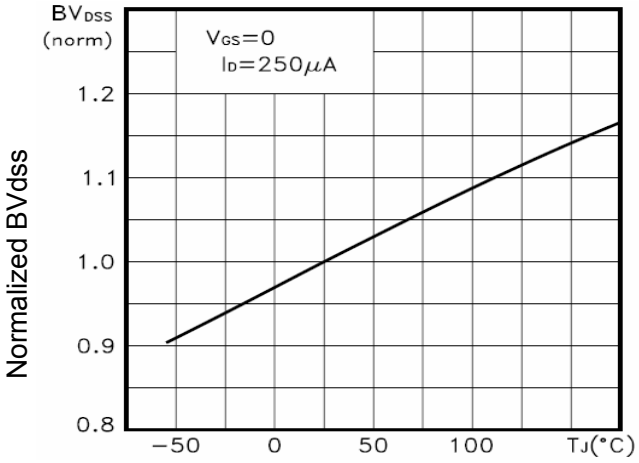



**Figure 9 $BV_{DSS}$ vs Junction Temperature**

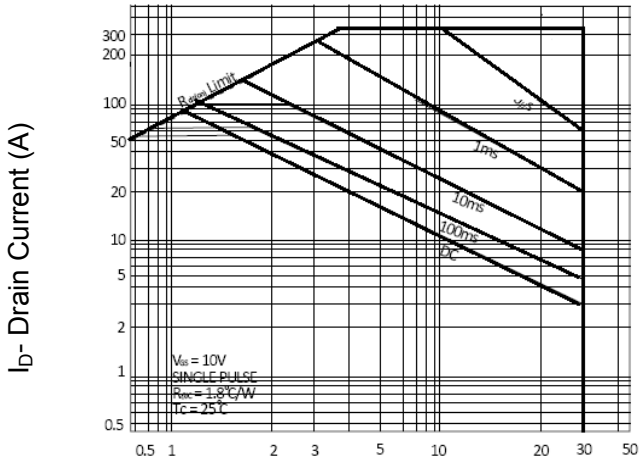



**Figure 8 Safe Operation Area**

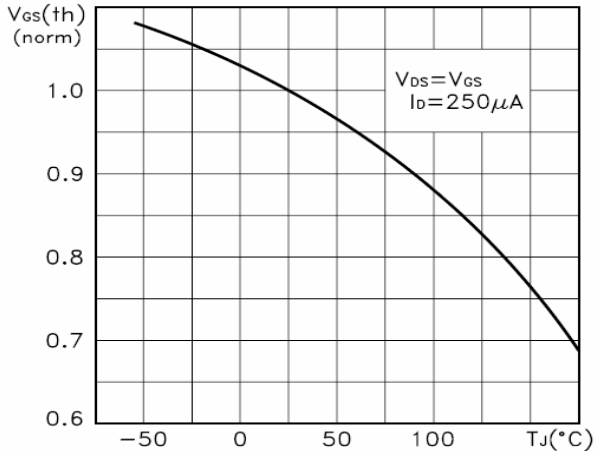



**Figure 10 $V_{GS(th)}$ vs Junction Temperature**

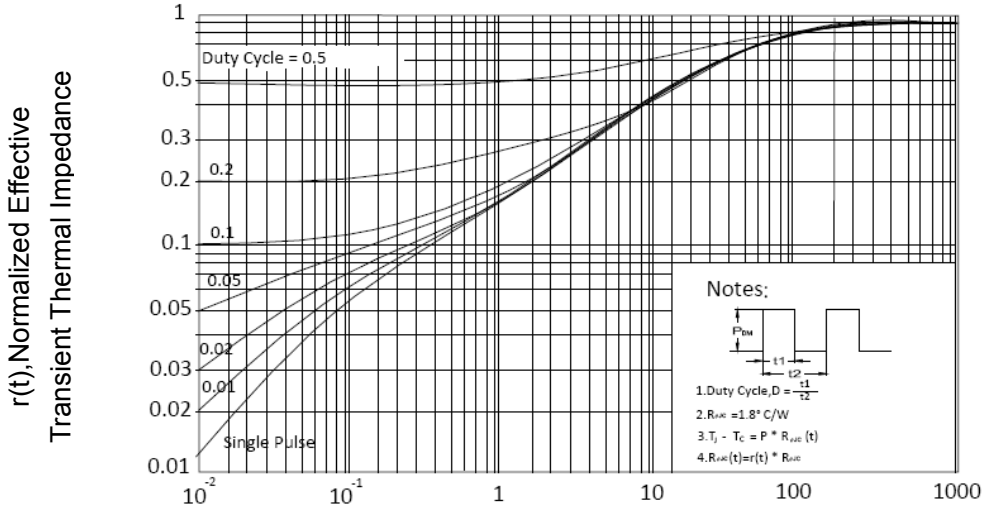
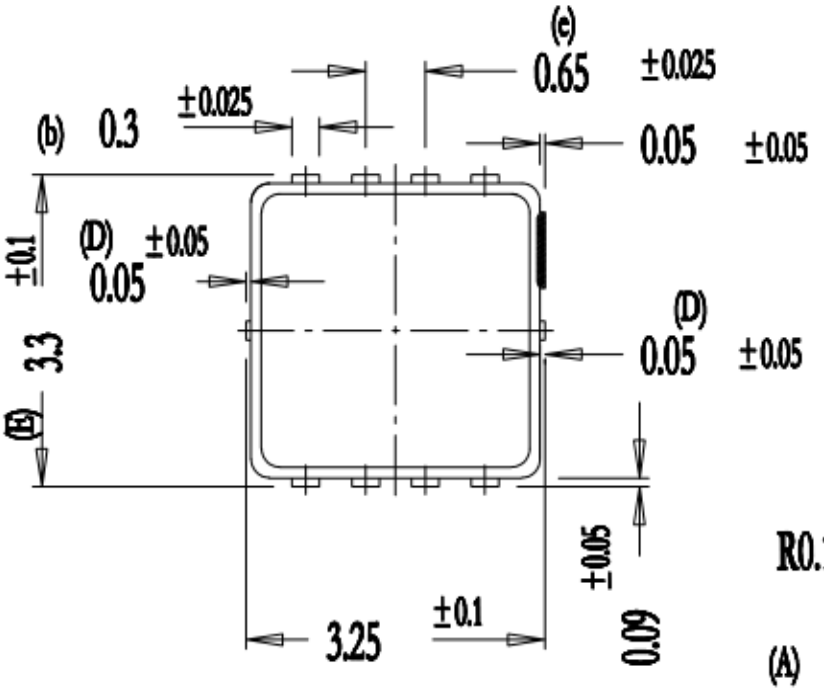
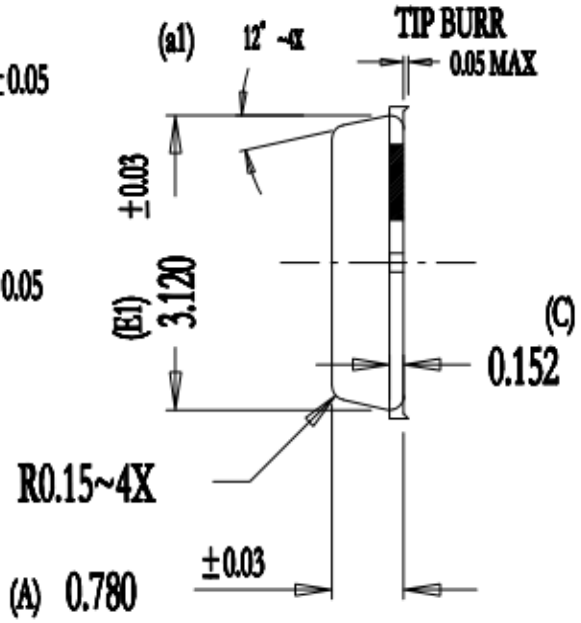
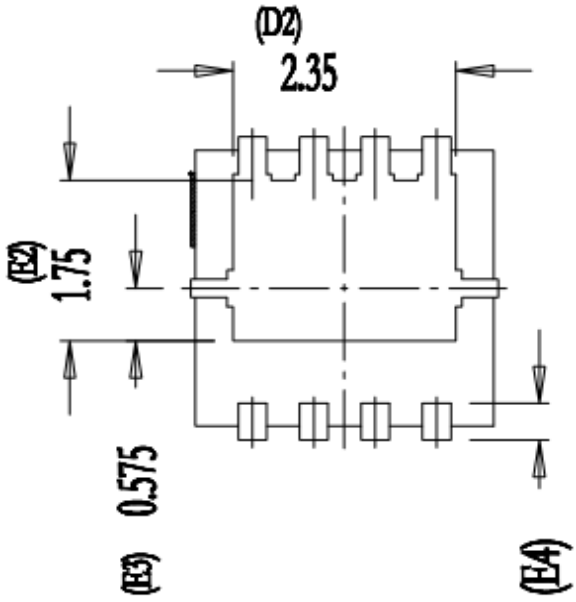


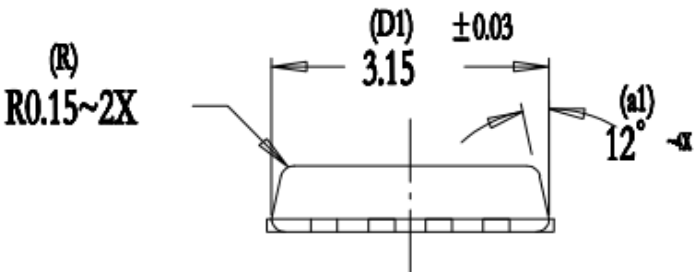

**Figure 11 Normalized Maximum Transient Thermal Impedance**

**DFN3.3* 3.3 Package Information**




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.75 | 0.78 | 0.81 |
| A1 | | — | |
| b | 0.297 | 0.3 | 0.35 |
| c | — | 0.152 | — |
| D | 0.00 | 0.05 | 0.1 |
| D1 | 3.12 | 3.15 | 3.18 |
| D2 | — | 2.35 | — |
| E | 3.2 | 3.3 | 3.4 |
| E1 | 3.09 | 3.12 | 3.15 |
| E2 | — | 1.75 | — |
| E3 | — | 0.575 | — |
| E4 | | | |
| R | — | 0.15 | — |
| e | 0.65BSC | | |
| | | | |
| a1° | — | 12° | — |

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