

## N-Channel Enhancement Mode Power MOSFET

### Description

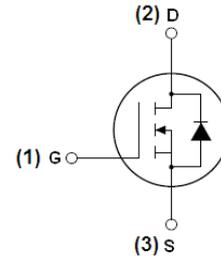
The RM35N30DN uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS} = 30V, I_D = 35A$   
 $R_{DS(ON)} < 5.5m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 9.5m\Omega @ V_{GS} = 4.5V$
- 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

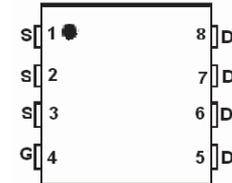
- Secondary side synchronous rectifier
- High side switch in POL DC/DC converter
- Halogen-free



Schematic diagram



Marking and pin assignment



DFN 3x3 EP top view

**100% UIS TESTED!**

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| 35N30          | RM35N30DN | 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)

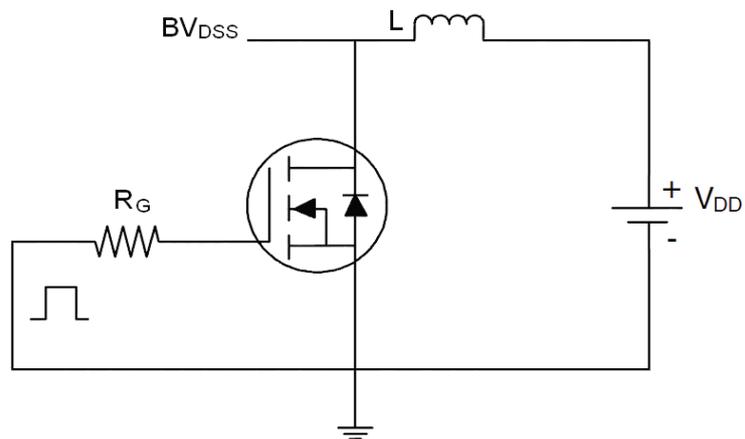
| Parameter  | Symbol       | Condition  | Min | Typ  | Max       | Unit       |
|--|--------------|--|-----|------|-----------|------------|
| <b>Off Characteristics</b>                           |              |  |     |      |           |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$  | 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                     | $R_{DS(on)}$ | $V_{GS}=10V, I_D=12A$  | -   | 4.8  | 5.5       | m $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=10A$   | -   | 8.2  | 9.5       |            |
| 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>$F=1.0MHz$                               | -   | 1265 | -         | PF         |
| Output Capacitance                                   | $C_{oss}$    |  | -   | 600  | -         | PF         |
| Reverse Transfer Capacitance                         | $C_{rss}$    |  | -   | 130  | -         | 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>$V_{GS}=10V$                               | -   | 19   | -         | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |  | -   | 2.7  | -         | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |  | -   | 2.5  | -         | 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>            | $I_S$        |  | -   | -    | 25        | A          |
| Reverse Recovery Time                                | $t_{rr}$     | $T_J = 25^\circ C, I_F = 12A$<br>$di/dt = 100A/\mu s$ (Note3)        | -   | -    | 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:

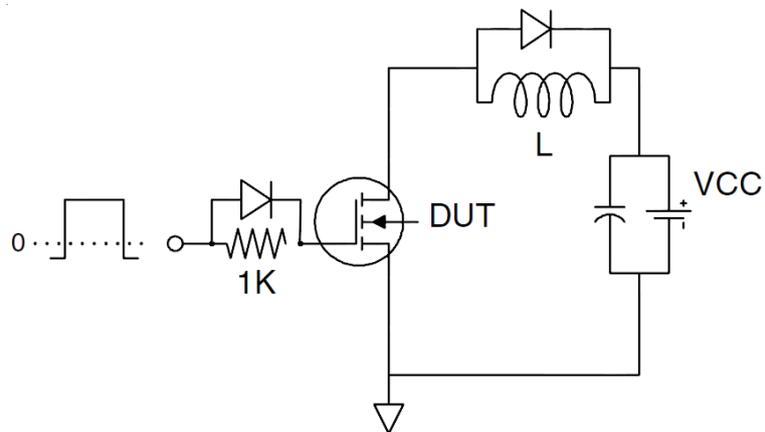
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.1mH, R_g=25\Omega$

## Test Circuit

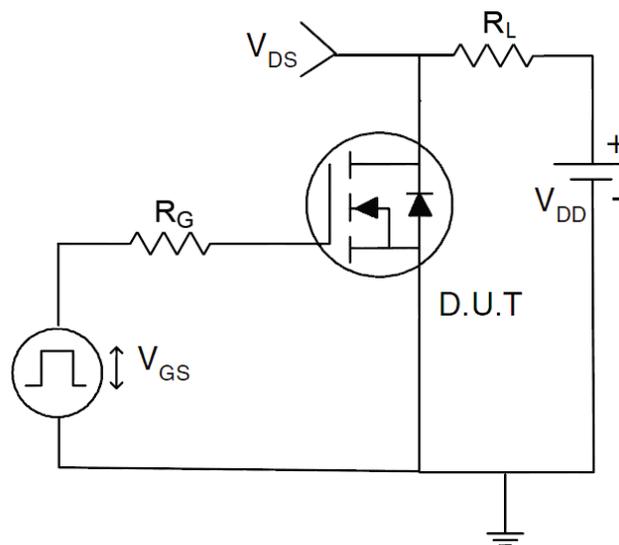
### 1) $E_{AS}$ Test Circuits



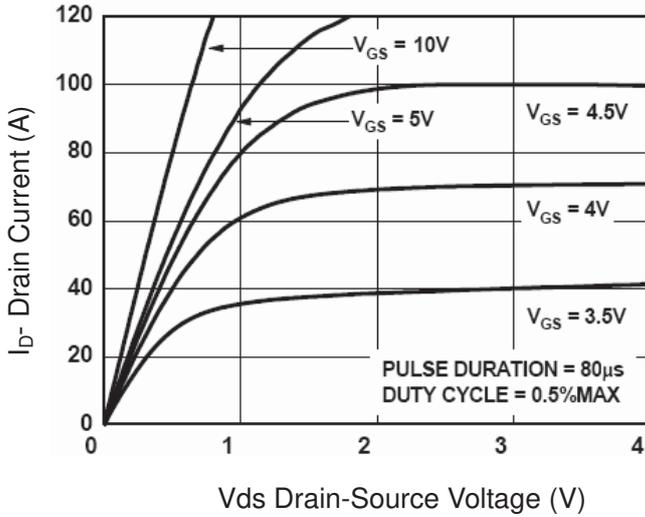
### 2) Gate Charge Test Circuit



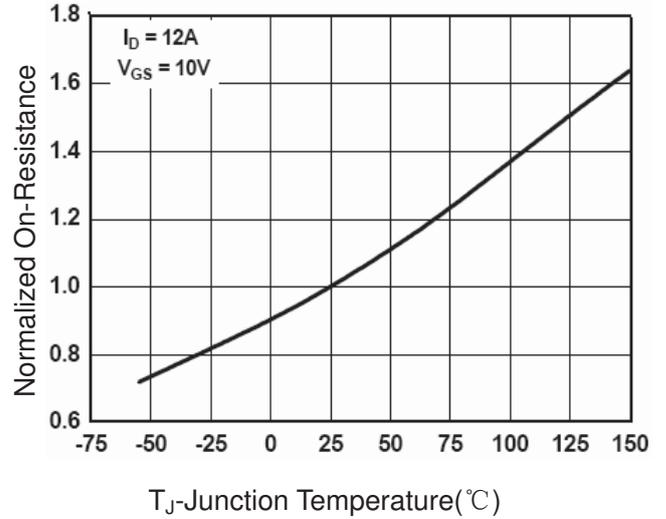
### 3) Switch Time Test Circuit



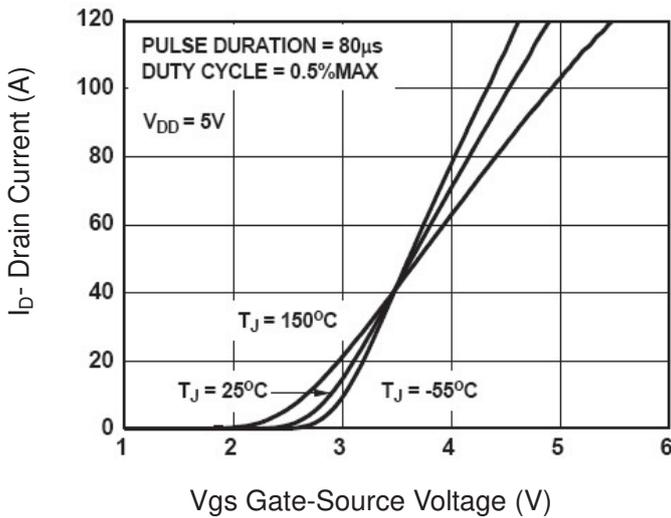
## RATING AND CHARACTERISTICS CURVES (RM35N30DN)



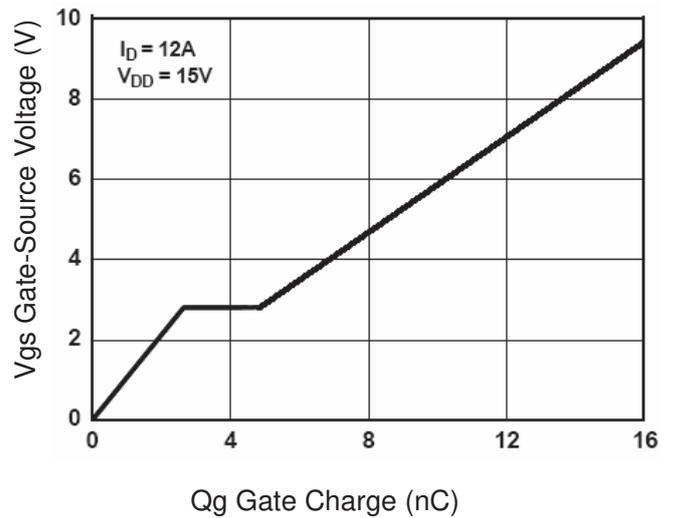
**Figure 1 Output Characteristics**



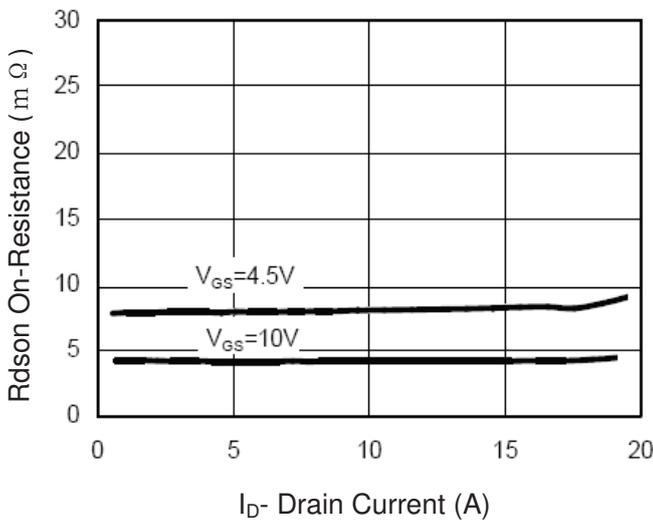
**Figure 4  $R_{dson}$ -Junction Temperature**



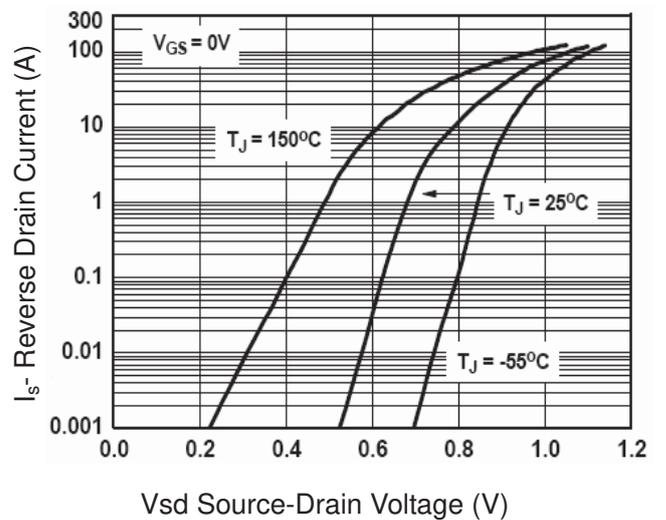
**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**



**Figure 3  $R_{dson}$ - Drain Current**



**Figure 6 Source- Drain Diode Forward**

## RATING AND CHARACTERISTICS CURVES (RM35N30DN)

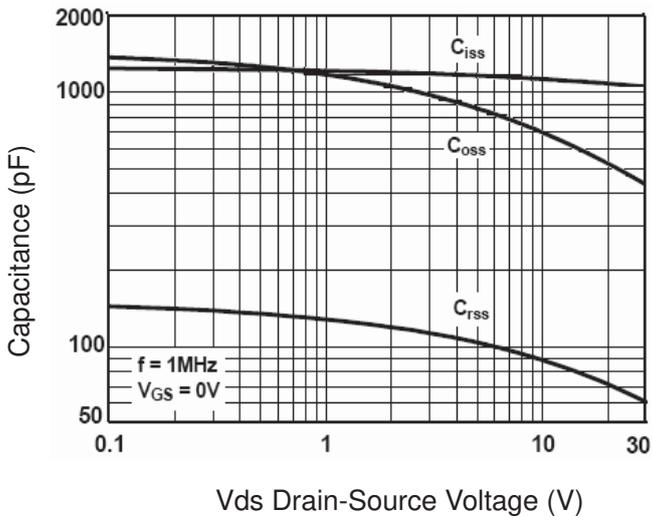


Figure 7 Capacitance vs Vds

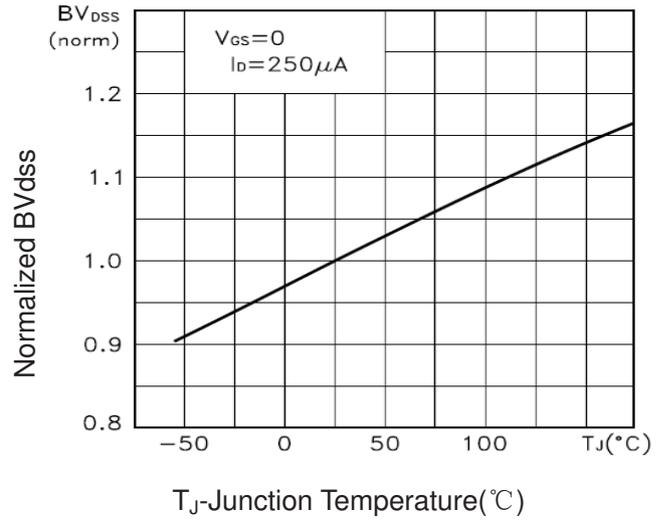


Figure 9  $BV_{DSS}$  vs Junction Temperature

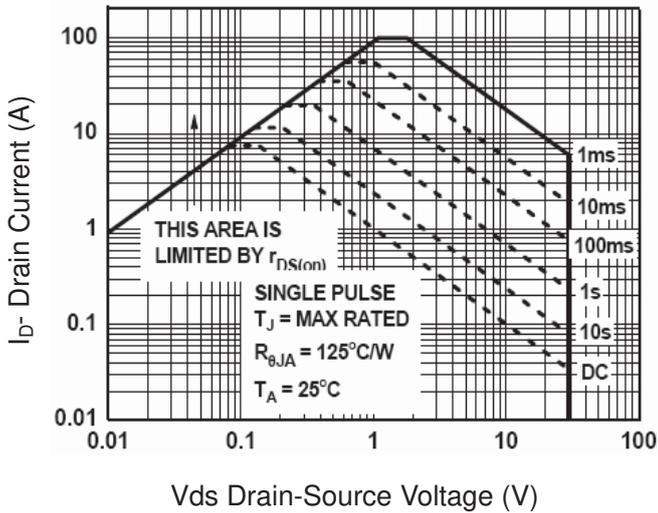


Figure 8 Safe Operation Area

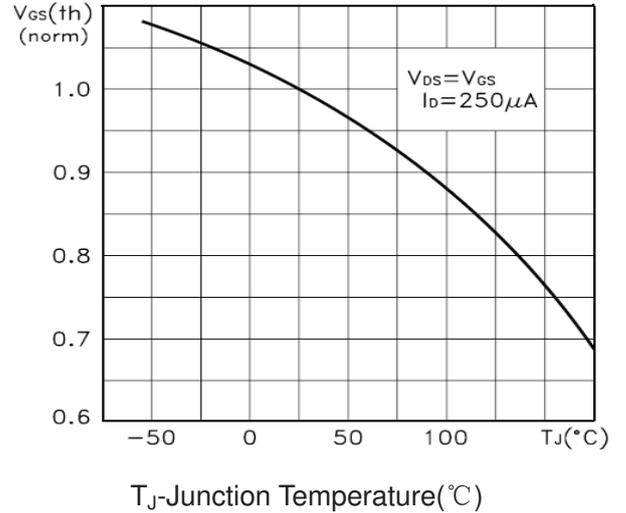


Figure 10  $V_{GS(th)}$  vs Junction Temperature

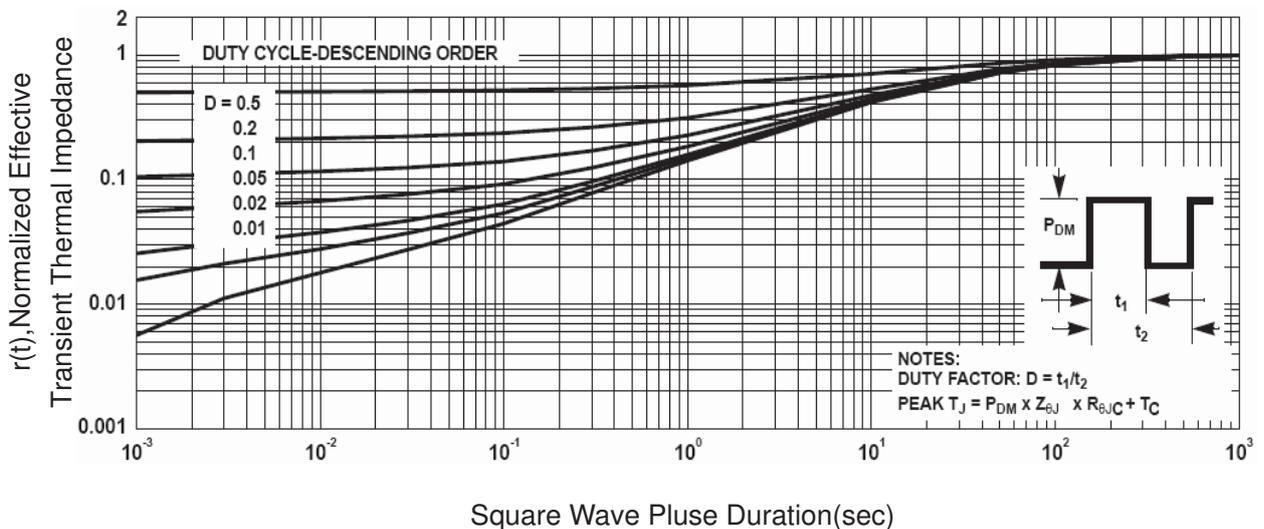
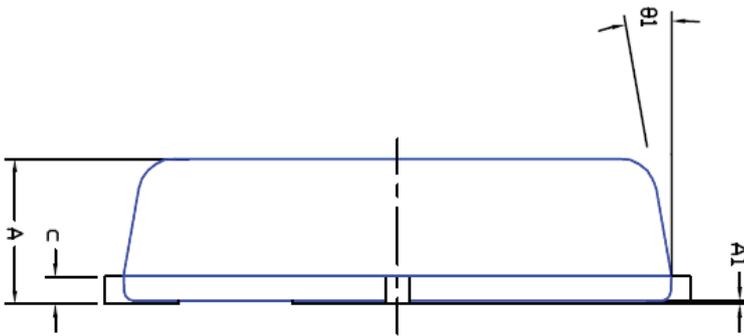
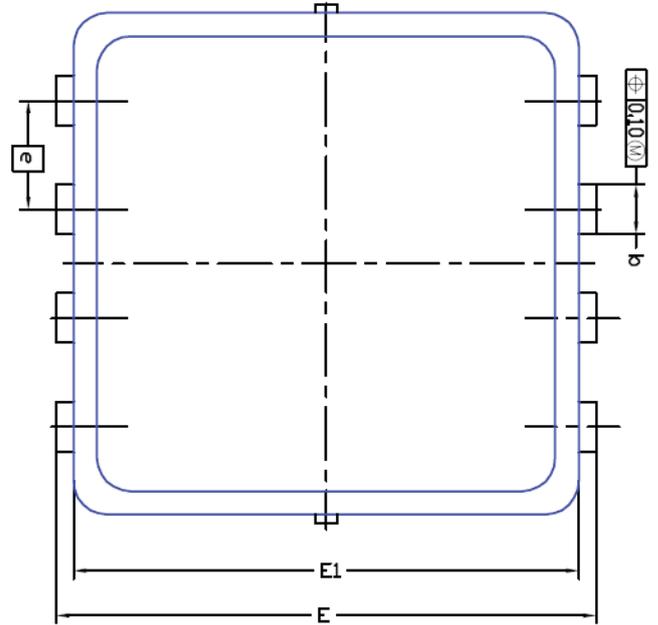
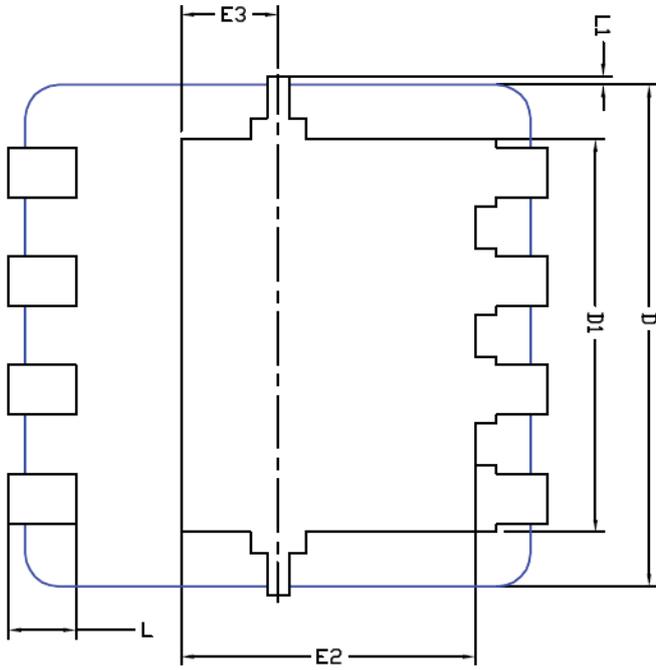


Figure 11 Normalized Maximum Transient Thermal Impedance

# DFN3X3 EP Package Information



| DIM. | MILLIMETERS |       |       | INCHES    |        |        |
|------|-------------|-------|-------|-----------|--------|--------|
|      | MIN         | NOM   | MAX   | MIN       | NOM    | MAX    |
| A    | 0.700       | 0.80  | 0.900 | 0.0276    | 0.0315 | 0.0354 |
| A1   | 0.00        | ---   | 0.05  | 0.000     | ---    | 0.002  |
| b    | 0.24        | 0.30  | 0.35  | 0.009     | 0.012  | 0.014  |
| c    | 0.10        | 0.152 | 0.25  | 0.004     | 0.006  | 0.010  |
| D    | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| D1   | 2.35 BSC    |       |       | 0.093 BSC |        |        |
| E    | 3.20 BSC    |       |       | 0.126 BSC |        |        |
| E1   | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| E2   | 1.75 BSC    |       |       | 0.069 BSC |        |        |
| E3   | 0.575 BSC   |       |       | 0.023 BSC |        |        |
| e    | 0.65 BSC    |       |       | 0.026 BSC |        |        |
| L    | 0.30        | 0.40  | 0.50  | 0.0118    | 0.0157 | 0.0197 |
| L1   | 0           | ---   | 0.100 | 0         | ---    | 0.004  |
| θ1   | 0°          | 10°   | 12°   | 0°        | 10°    | 12°    |

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