

## N-Channel Enhancement Mode Power MOSFET

## Description

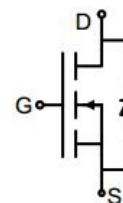
The GT013N04D5C uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

## General Features

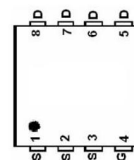
- $V_{DS}$  40V
- $I_D$  (at  $V_{GS} = 10V$ ) 270A
- $R_{DS(ON)}$  (at  $V_{GS} = 10V$ ) < 0.85m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS} = 4.5V$ ) < 1.2m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

## Application

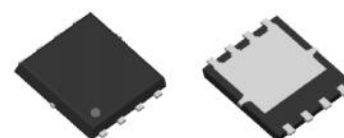
- Power switch
- DC/DC converters



Schematic diagram



pin assignment



DFN5X6-8L

## Ordering Information

| Device      | Package   | Marking  | Packaging    |
|-------------|-----------|----------|--------------|
| GT013N04D5C | DFN5*6-8L | GT013N04 | 5000pcs/Reel |

Absolute Maximum Ratings  $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                        | Symbol                    | Value      | Unit             |
|--------------------------------------------------|---------------------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$                  | 40         | V                |
| Continuous Drain Current                         | $T_C = 25^\circ\text{C}$  | 270        | A                |
|                                                  | $T_C = 100^\circ\text{C}$ | 170        |                  |
| Pulsed Drain Current (note1)                     | $I_{DM}$                  | 1080       | A                |
| Gate-Source Voltage                              | $V_{GS}$                  | $\pm 20$   | V                |
| Power Dissipation                                | $P_D$                     | 138        | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$                  | 380        | mJ               |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$            | -55 To 150 | $^\circ\text{C}$ |

## Thermal Resistance

| Parameter                               | Symbol     | Value | Unit               |
|-----------------------------------------|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50    | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                | $R_{thJC}$ | 0.9   | $^\circ\text{C/W}$ |

| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |                                                                          |       |      |      |      |
|--------------------------------------------------------------|----------------------|--------------------------------------------------------------------------|-------|------|------|------|
| Parameter                                                    | Symbol               | Test Conditions                                                          | Value |      |      | Unit |
|                                                              |                      |                                                                          | Min.  | Typ. | Max. |      |
| Static Parameters                                            |                      |                                                                          |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                             | 40    | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V                              | --    | --   | 1    | μA   |
| Gate-Source Leakage                                          | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20V                                                   | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA               | 1.1   | 1.7  | 2.4  | V    |
| Drain-Source On-Resistance                                   | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A                              | --    | 0.73 | 0.85 | mΩ   |
|                                                              |                      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 40A                             | --    | 1.0  | 1.2  |      |
| Forward Transconductance                                     | g <sub>FS</sub>      | V <sub>GS</sub> = 5V, I <sub>D</sub> = 50A                               | --    | 60   | --   | S    |
| Dynamic Parameters                                           |                      |                                                                          |       |      |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 20V,<br>f = 0.5MHz            | --    | 6100 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                          | --    | 3800 | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                          | --    | 80   | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> = 20V,<br>I <sub>D</sub> = 50A,<br>V <sub>GS</sub> = 10V | --    | 88   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                          | --    | 14   | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                          | --    | 12   | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = 20V,<br>I <sub>D</sub> = 50A,<br>R <sub>G</sub> = 5Ω   | --    | 36   | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                          | --    | 45   | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                          | --    | 44   | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                          | --    | 28   | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                          |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                    | --    | --   | 270  | A    |
| Body Diode Voltage                                           | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 50A, V <sub>GS</sub> = 0V       | --    | --   | 1.2  | V    |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      | I <sub>F</sub> = 50A, V <sub>GS</sub> = 0V<br>di/dt=100A/us              | --    | 56   | --   | nC   |
| Reverse Recovery Time                                        | T <sub>rr</sub>      |                                                                          | --    | 43   | --   | ns   |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. EAS condition :  $T_J = 25^{\circ}\text{C}$ ,  $V_{DD} = 40V$ ,  $V_{GS} = 10V$ ,  $L = 0.5mH$ ,  $R_G = 25\Omega$

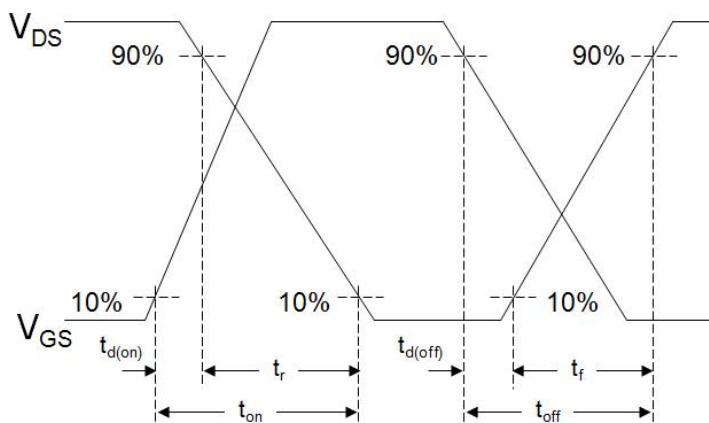
The table shows the minimum avalanche energy, which is 1056mJ when the device is tested until failure

3. Identical low side and high side switch with identical  $R_G$

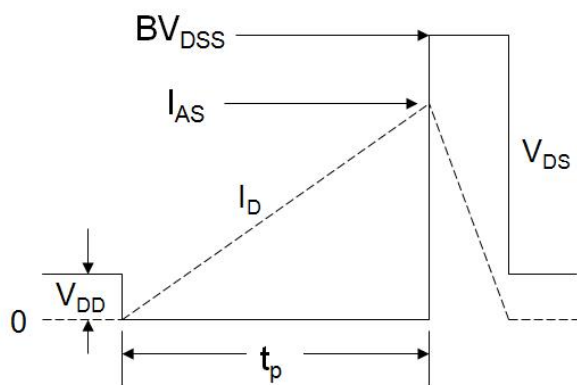
### Gate Charge Test Circuit



### Switch Time Test Circuit



### EAS Test Circuit



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics

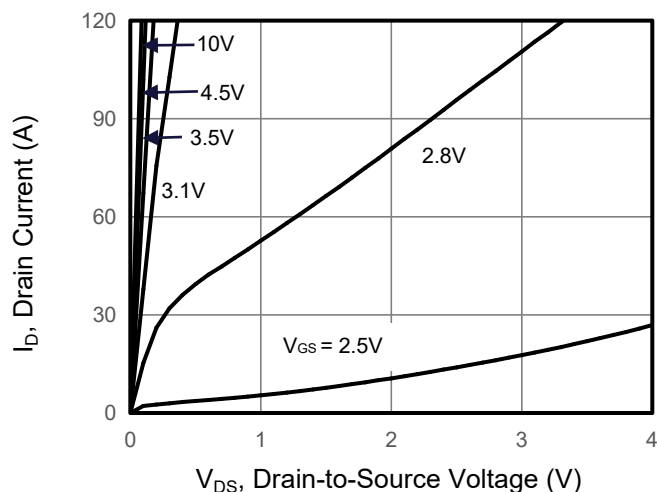


Figure 2. Transfer Characteristics

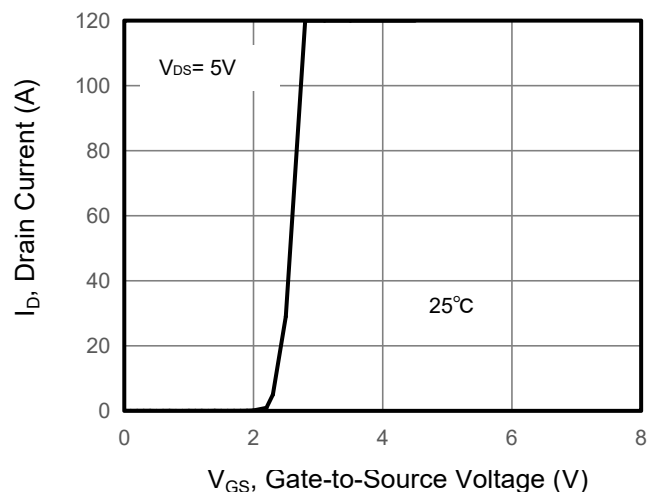


Figure 3. Drain Source On Resistance

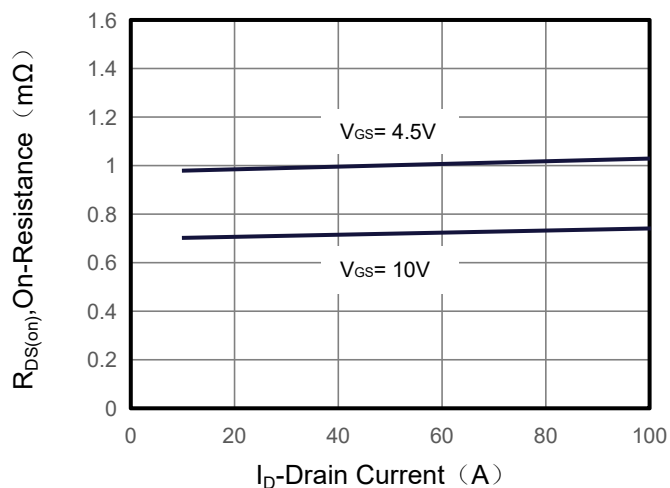


Figure 4. Gate Charge

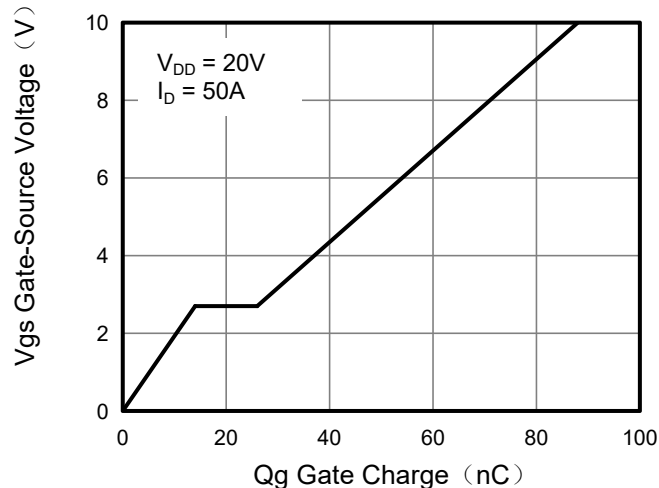


Figure 5. Capacitance

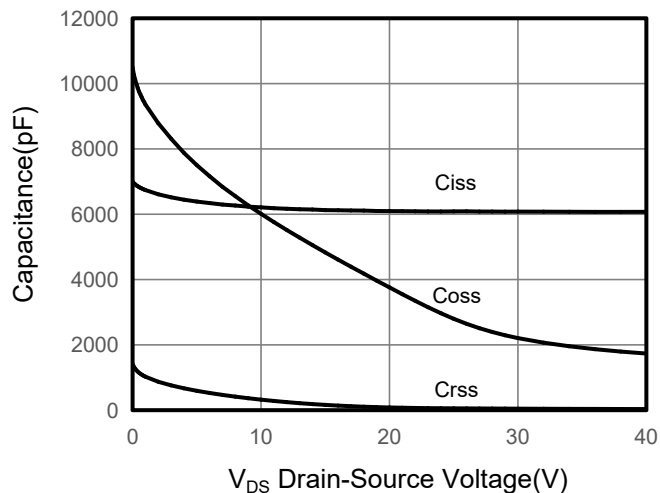
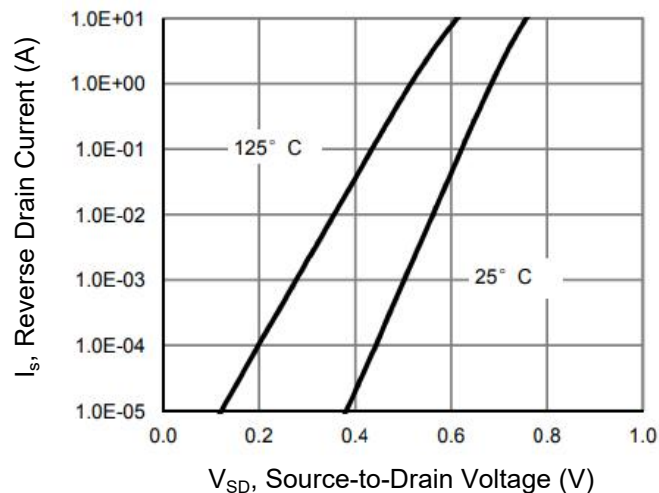
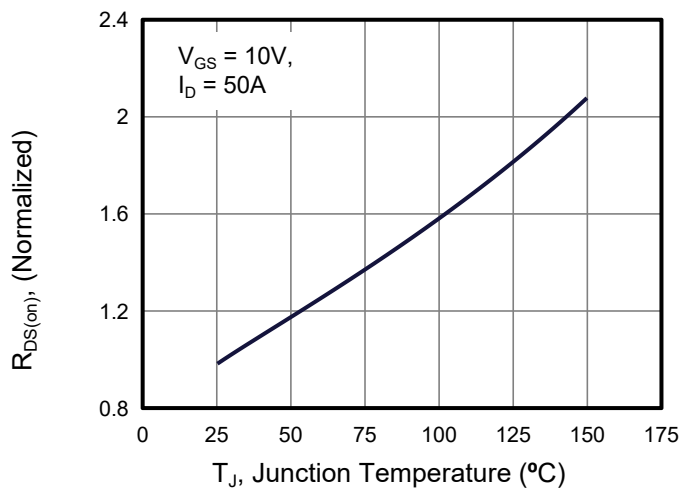


Figure 6. Source-Drain Diode Forward

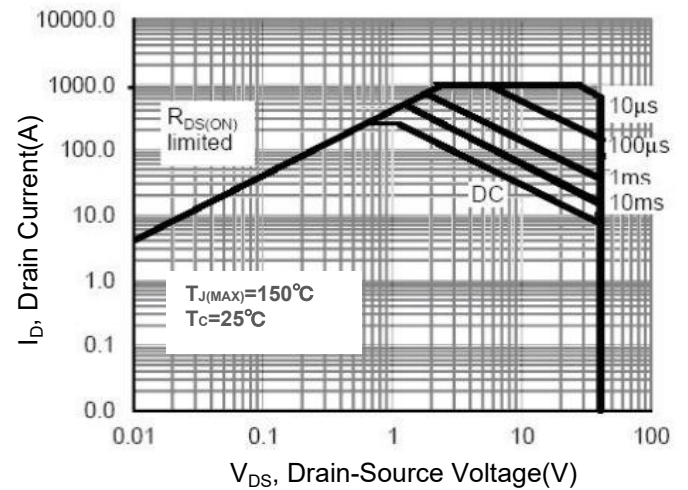


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

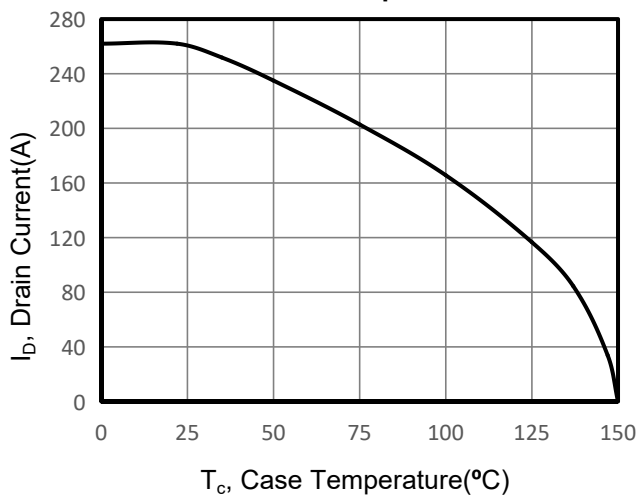
**Figure 7. Drain-Source On-Resistance**



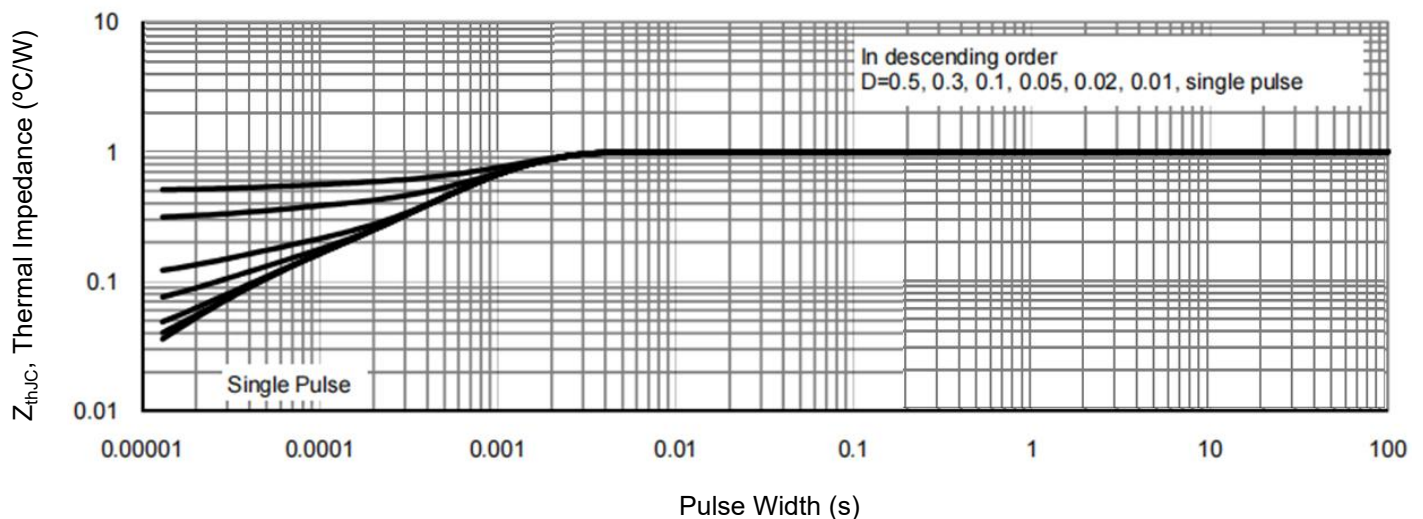
**Figure 8. Safe Operation Area**



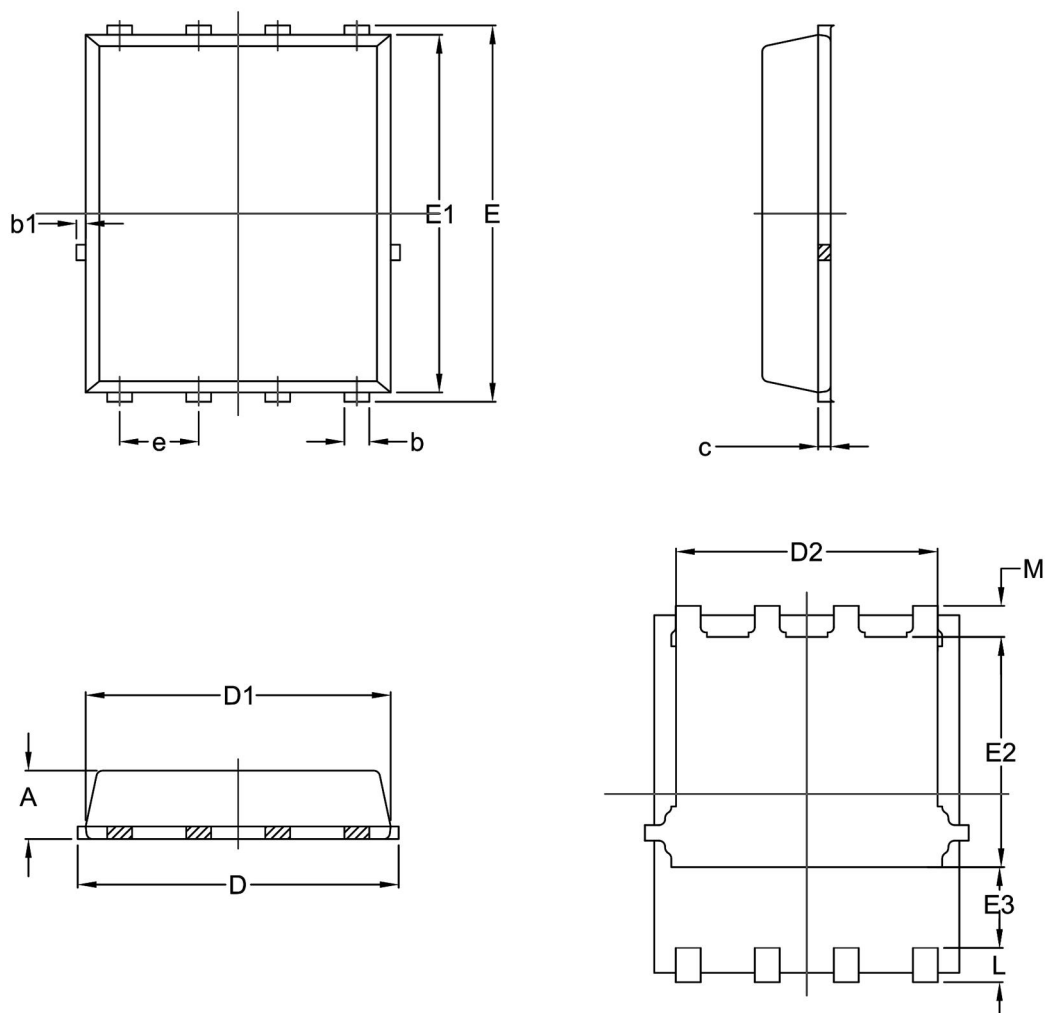
**Figure 9. Maximum Continuous Drain Current vs Case Temperature**



**Figure 10. Normalized Maximum Transient Thermal Impedance**



## DFN5X6-8L Package Information



| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | NOM  | MAX  |
| A   | 1.00        | 1.10 | 1.20 |
| b   | 0.30        | 0.40 | 0.50 |
| b1  | 0.02        | 0.15 | 0.22 |
| c   | 0.15        | 0.20 | 0.35 |
| D   | 4.95        | 5.15 | 5.35 |
| D1  | 4.80        | 4.90 | 5.00 |
| D2  | 4.00        | 4.20 | 4.40 |
| E   | 5.95        | 6.05 | 6.25 |
| E1  | 5.65        | 5.75 | 5.85 |
| E2  | 3.50        | 3.70 | 3.90 |
| E3  | 1.10        | /    | /    |
| e   | 1.27        |      |      |
| L   | 0.40        | 0.55 | 0.70 |
| M   | 0.35        | 0.50 | 0.65 |