

## N-Channel Enhancement Mode Power MOSFET

**Description**

The GT010N10TLA uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

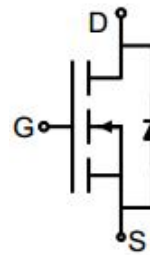
AEC-Q101 Qualified

**General Features**

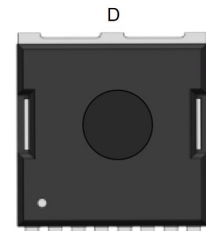
- $V_{DS}$  100V
- $I_D$  (at  $V_{GS} = 10V$ ) 400A
- $R_{DS(ON)}$  (at  $V_{GS} = 10V$ ) < 1.35m $\Omega$
- 100% Avalanche Tested
- RoHS Compliant

**Application**

- Power switch
- DC/DC converters



Schematic diagram



G<sub>1</sub> S<sub>2</sub> S<sub>3</sub> S<sub>4</sub> S<sub>5</sub> S<sub>6</sub> S<sub>7</sub> S<sub>8</sub>

TOLL-8L

**Ordering Information**

| Device      | Package | Marking  | Packaging    |
|-------------|---------|----------|--------------|
| GT010N10TLA | TOLL-8L | GT010N10 | 2000pcs/Reel |

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

| Parameter                                        | Symbol         | Value      | Unit             |
|--------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 100        | V                |
| Continuous Drain Current                         | $I_D$          | 400        | A                |
|                                                  |                | 287        |                  |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 1600       | A                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V                |
| Power Dissipation                                | $P_D$          | 480        | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$       | 1056       | mJ               |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 To 175 | $^\circ\text{C}$ |

**Thermal Resistance**

| Parameter                               | Symbol     | Value | Unit               |
|-----------------------------------------|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50    | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.32  | $^\circ\text{C/W}$ |

| 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                             | 100   | --    | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = 100V, 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               | 2.0   | 3.0   | 4.0  | V    |
| Drain-Source On-Resistance                                   | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 50A                              | --    | 1.15  | 1.35 | mΩ   |
| Forward Transconductance                                     | g <sub>FS</sub>      | V <sub>GS</sub> = 5V, I <sub>D</sub> = 50A                               | --    | 58    | --   | S    |
| Dynamic Parameters                                           |                      |                                                                          |       |       |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 50V,<br>f = 0.2MHz            | --    | 13200 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                          | --    | 4220  | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                          | --    | 55    | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> = 50V,<br>I <sub>D</sub> = 50A,<br>V <sub>GS</sub> = 10V | --    | 220   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                          | --    | 53    | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                          | --    | 54    | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = 50V,<br>I <sub>D</sub> = 50A,<br>R <sub>G</sub> = 1.6Ω | --    | 40    | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                          | --    | 23    | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                          | --    | 67    | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                          | --    | 22    | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                          |       |       |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                    | --    | --    | 400  | 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              | --    | 325   | --   | nC   |
| Reverse Recovery Time                                        | T <sub>rr</sub>      |                                                                          | --    | 128   | --   | ns   |

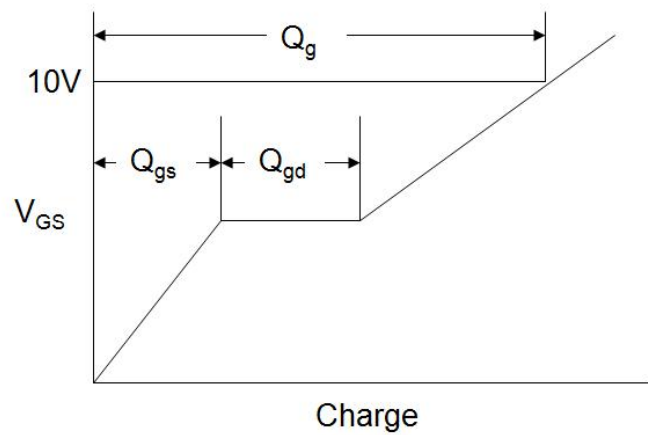
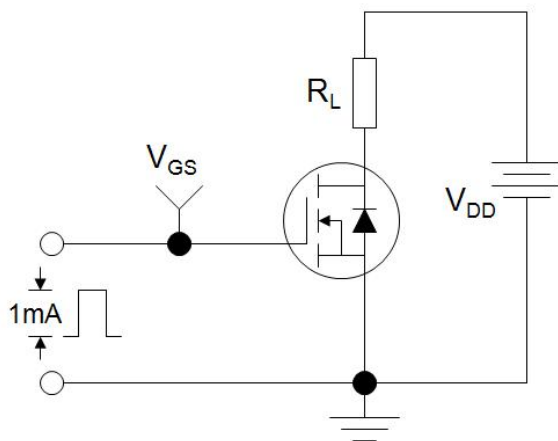
## Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J = 25^{\circ}\text{C}, V_{DD} = 50V, V_{GS} = 10V, L = 0.5mH, R_g = 25\Omega$

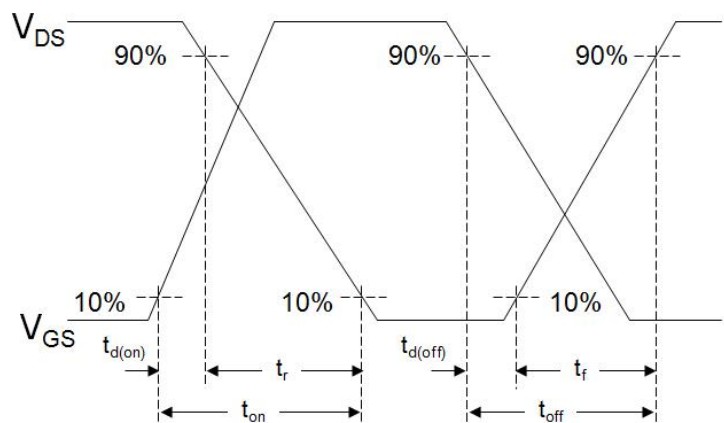
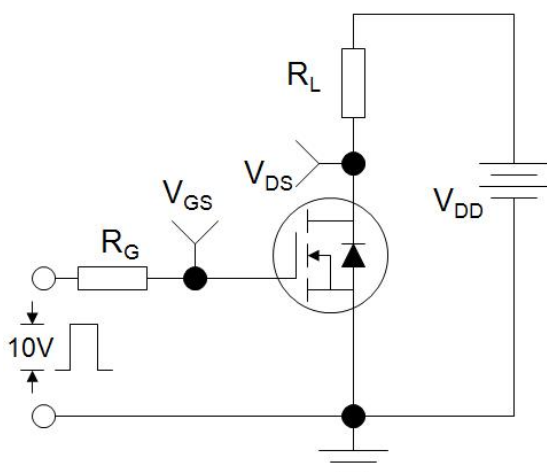
The table shows the minimum avalanche energy, which is 2916mJ when the device is tested until failure

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

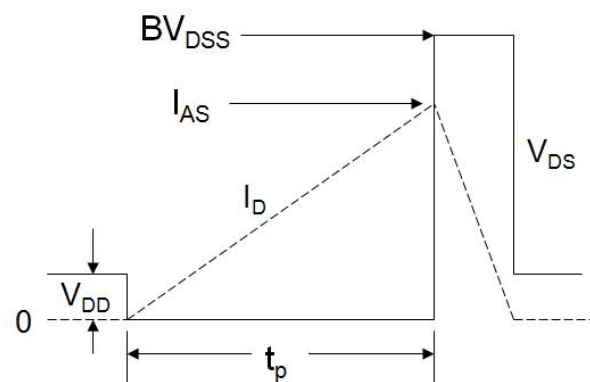
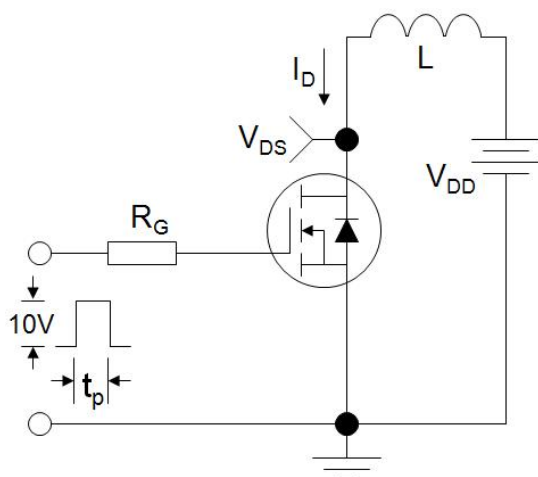
### Gate Charge Test Circuit



### Switch Time Test Circuit

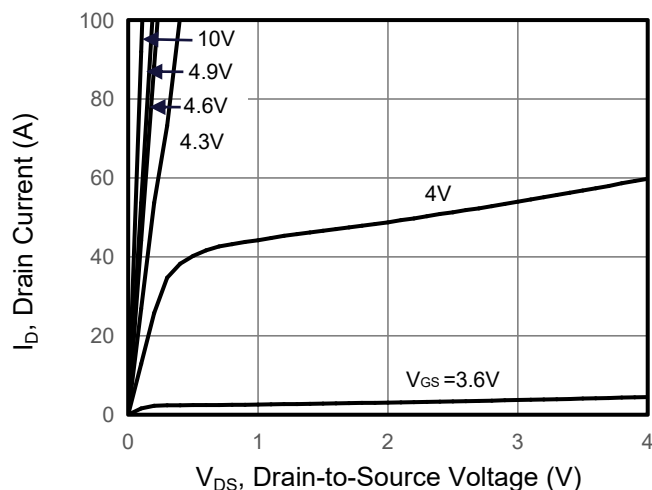


### EAS Test Circuit

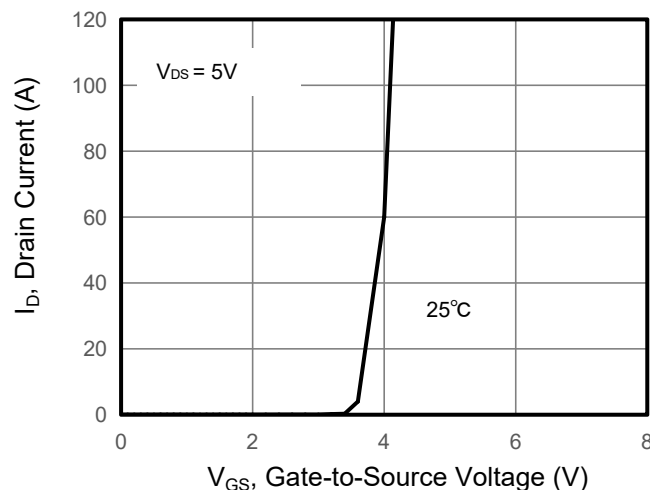


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

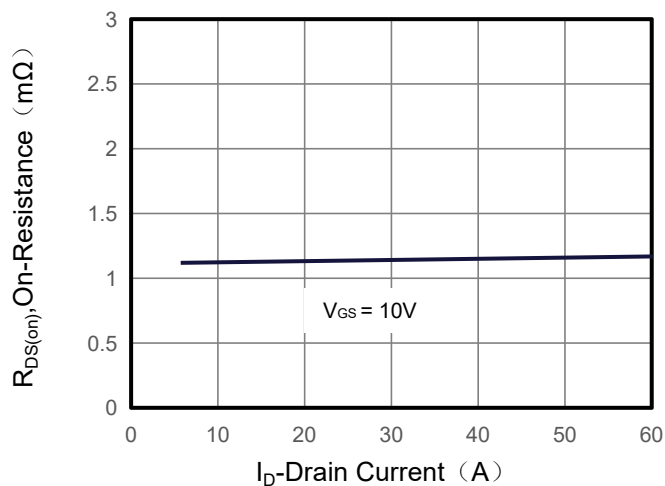
**Figure 1. Output Characteristics**



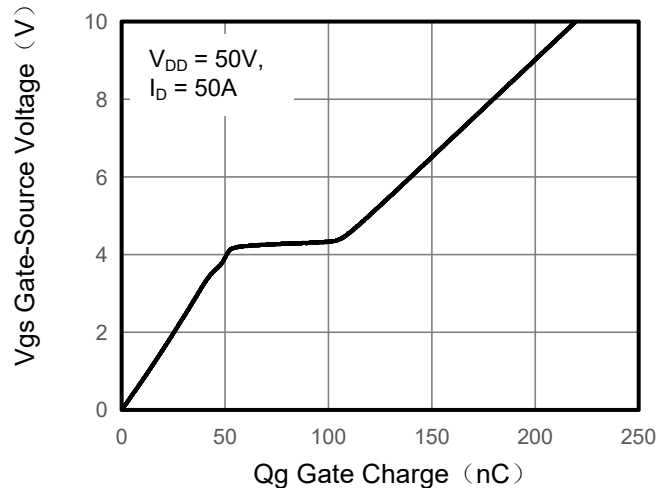
**Figure 2. Transfer Characteristics**



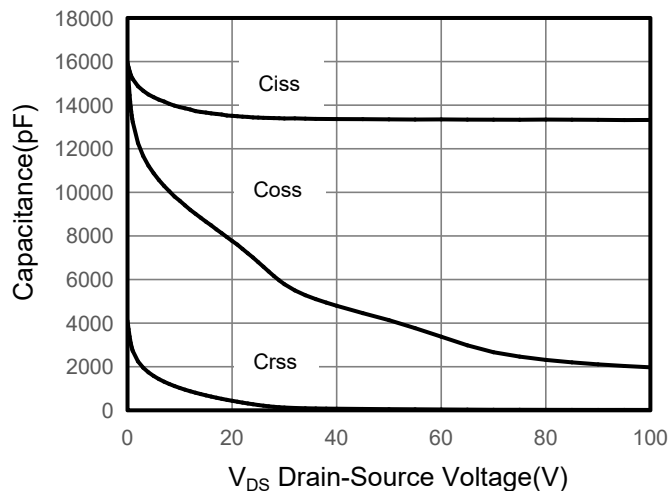
**Figure 3. Drain Source On Resistance**



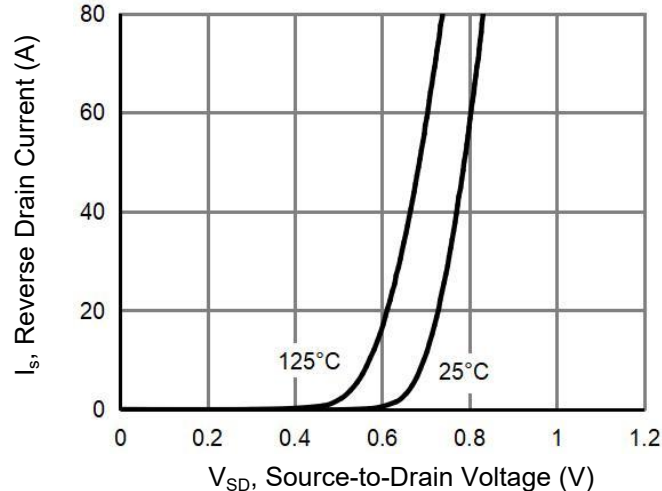
**Figure 4. Gate Charge**



**Figure 5. Capacitance**

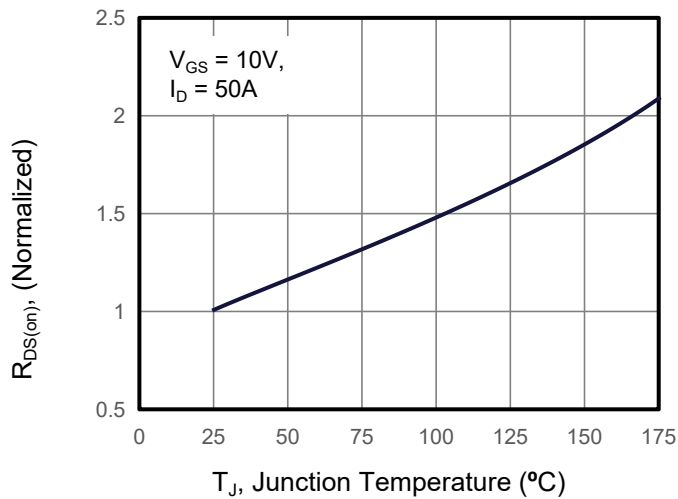


**Figure 6. Source-Drain Diode Forward**

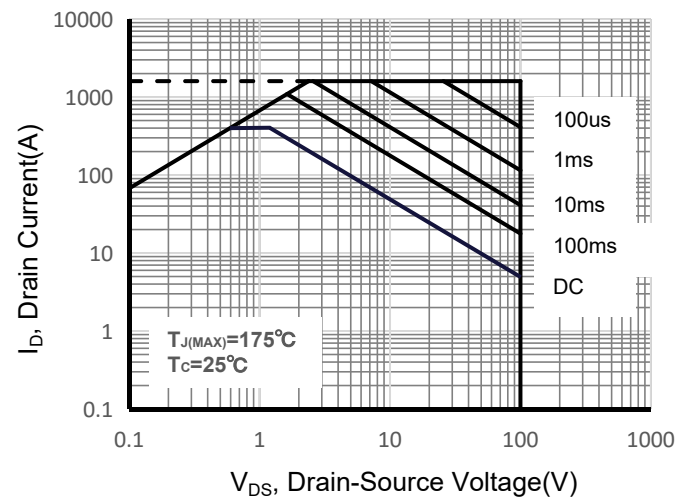


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

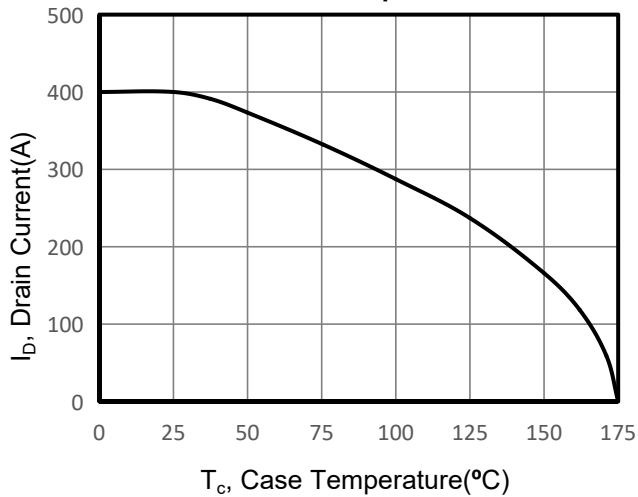
**Figure 7. Drain-Source On-Resistance**



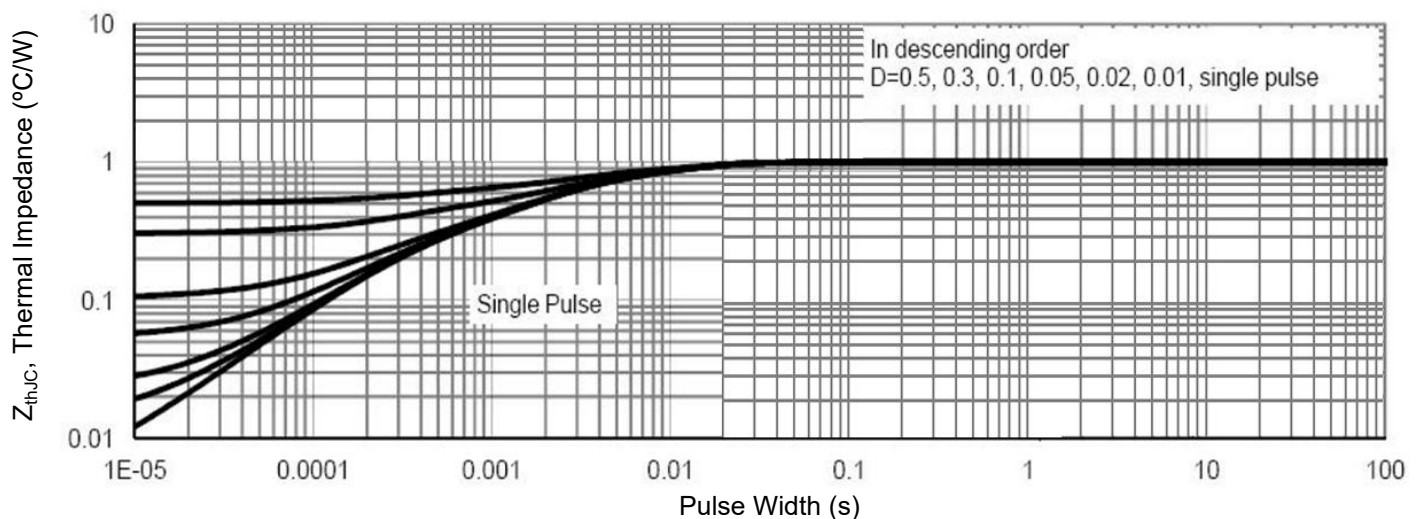
**Figure 8. Safe Operation Area**



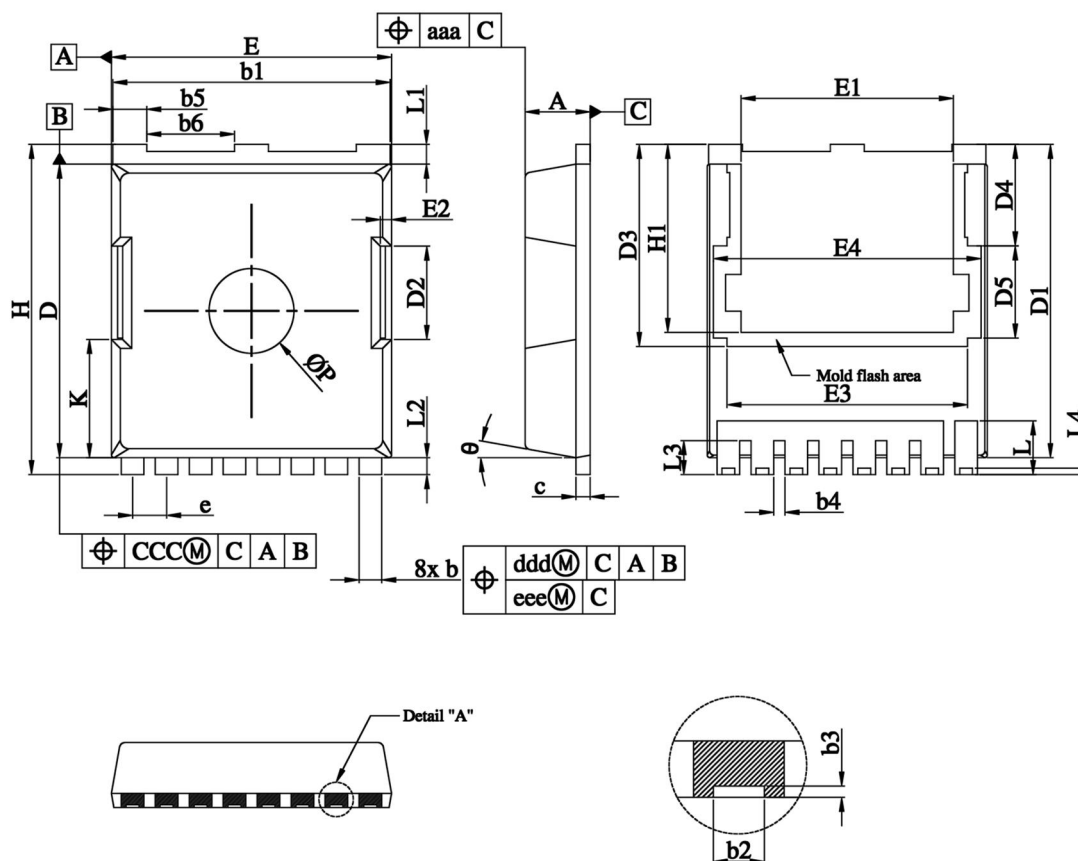
**Figure 9. Maximum Continuous Drain Current vs Case Temperature**



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



## TOLL-8L Package Information



| SYMBOL | COMMON     |         |       | SYMBOL | COMMON     |         |       |
|--------|------------|---------|-------|--------|------------|---------|-------|
|        | MILLIMETER |         |       |        | MILLIMETER |         |       |
|        | MIN.       | NOMINAL | MAX.  |        | MIN.       | NOMINAL | MAX.  |
| A      | 2.20       | 2.30    | 2.40  | E2     | 0.30       | 0.40    | 0.50  |
| b      | 0.70       | 0.80    | 0.90  | E3     | 8.50       |         |       |
| b1     | 9.70       | 9.80    | 9.90  | E4     | 9.46       |         |       |
| b2     | 0.36       | 0.45    | 0.55  | H      | 11.50      | 11.68   | 11.85 |
| b3     | 0.05       | 0.100   | /     | H1     | 6.55       | 6.65    | 6.75  |
| b4     | 0.30       | 0.40    | 0.50  | K      | 4.08       | 4.18    | 4.28  |
| b5     | 1.10       | 1.20    | 1.30  | L      | 1.60       | 1.90    | 2.10  |
| b6     | 3.00       | 3.10    | 3.20  | L1     | 0.50       | 0.70    | 0.90  |
| c      | 0.40       | 0.50    | 0.60  | L2     | 0.50       | 0.60    | 0.70  |
| D      | 10.28      | 10.38   | 10.55 | L3     | 1.00       | 1.20    | 1.30  |
| D1     | 10.98      | 11.08   | 11.18 | L4     | 0.13       | 0.23    | 0.33  |
| D2     | 3.20       | 3.30    | 3.40  | P      | 2.85       | 3.00    | 3.15  |
| D3     | 7.15       |         |       | θ      | 10° REF    |         |       |
| D4     | 3.59       |         |       | aaa    | 0.20       |         |       |
| D5     | 3.26       |         |       | ccc    | 0.20       |         |       |
| e      | 1.10       | 1.20    | 1.30  | ddd    | 0.25       |         |       |
| E      | 9.80       | 9.90    | 10.00 | eee    | 0.20       |         |       |
| E1     | 7.40       | 7.50    | 7.60  |        |            |         |       |