

# N-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

- ✓ Surface-mounted package
- ✓ Super Trench
- ✓ Tj max 175°
- ✓ Advanced trench cell design
- ✓ MSL1

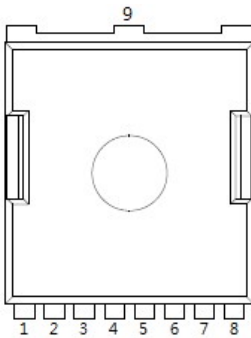
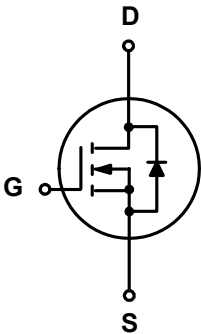
### 1.2 Applications

- ✓ Power Tool appliances
- ✓ BMS appliances
- ✓ High power inverter system

### 1.3 Quick reference

- ✓  $BV \geq 150 \text{ V}$
- ✓  $P_{tot} \leq 375 \text{ W}$
- ✓  $I_D \leq 250 \text{ A}$
- ✓  $R_{DS(ON)} \leq 4.5 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$
- ✓  $R_{DS(ON)} \leq 5.5 \text{ m}\Omega @ V_{GS} = 6 \text{ V}$

## 2. Pin Description

| Pin           | Description | Simplified Outline                                                                                            | Symbol                                                                                |
|---------------|-------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1             | Gate(G)     |  <p>Top View<br/>TOLL</p> |  |
| 2,3,4,5,6,7,8 | Source(S)   |                                                                                                               |                                                                                       |
| 9             | Drain(D)    |                                                                                                               |                                                                                       |

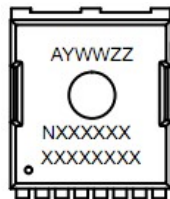
### 3. Limiting Values

| Symbol              | Parameter                               | Conditions                                      | Min | Max  | Unit |
|---------------------|-----------------------------------------|-------------------------------------------------|-----|------|------|
| V <sub>DS</sub>     | Drain-Source Voltage                    | T <sub>C</sub> = 25 °C                          | 150 | -    | V    |
| V <sub>GS</sub>     | Gate-Source Voltage                     | T <sub>C</sub> = 25 °C                          | -   | ±25  | V    |
| I <sub>D</sub> *    | Drain Current ( DC )                    | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = 10 V  | -   | 250  | A    |
|                     |                                         | T <sub>C</sub> = 100 °C, V <sub>GS</sub> = 10 V | -   | 120  | A    |
| I <sub>DM</sub> *   | Drain Current ( Pulsed )                | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = 10 V  | -   | 680  | A    |
| P <sub>tot</sub>    | Drain power dissipation                 | T <sub>C</sub> = 25 °C                          | -   | 375  | W    |
| T <sub>stg</sub>    | Storage Temperature                     |                                                 | -55 | 175  | °C   |
| T <sub>J</sub>      | Junction Temperature                    |                                                 | -   | 175  | °C   |
| I <sub>S</sub>      | Continuous-Source Current               | T <sub>C</sub> = 25 °C                          | -   | 250  | A    |
| I <sub>AS</sub>     | Single Pulsed Avalanche Current         | V <sub>DD</sub> =100V , L=0.05mH                | -   | 160  | A    |
| E <sub>AS</sub>     | Single Pulsed Avalanche Energy          | V <sub>DD</sub> =100V , L=1.0mH                 | -   | 1250 | mJ   |
| R <sub>θJA</sub> ** | Thermal Resistance- Junction to Ambient |                                                 | -   | 32.8 | °C/W |
| R <sub>θJC</sub> ** |                                         |                                                 | -   | 0.4  |      |

Notes :

- \* Pulse width ≤ 300 μs, duty cycle ≤ 2 %
- \*\* Surface Mounted on minimum footprint pad area.
- \*\*\* Limited by bonding wire

### 4. Marking Information

| Product Name | Marking                                                                               |
|--------------|---------------------------------------------------------------------------------------|
| UP0415T      |  |

### 5. Ordering Code

| Product Name | Package | Reel Size | Tape width | Quantity | Note |
|--------------|---------|-----------|------------|----------|------|
| UP0415T      | TOLL-8L |           |            | 2000     |      |

Note: UOE defines “ Green ” as lead-free ( RoHS compliant ) and halogen free ( Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C )

## 6. Electrical Characteristics ( $T_A=25^\circ$ Unless Otherwise Noted )

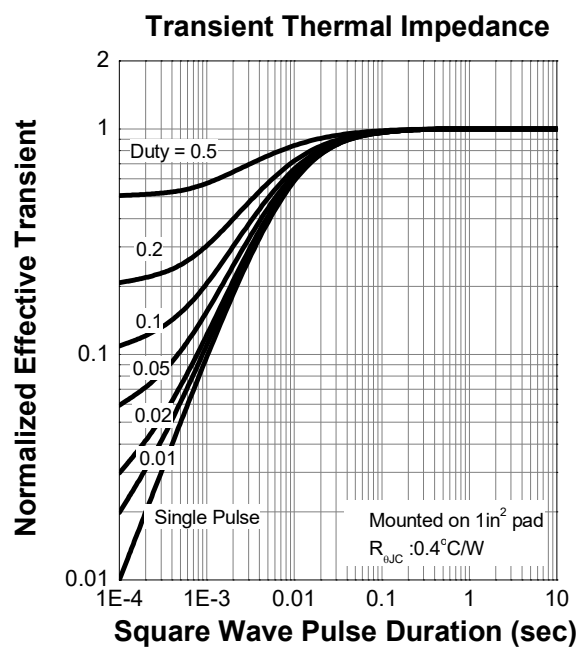
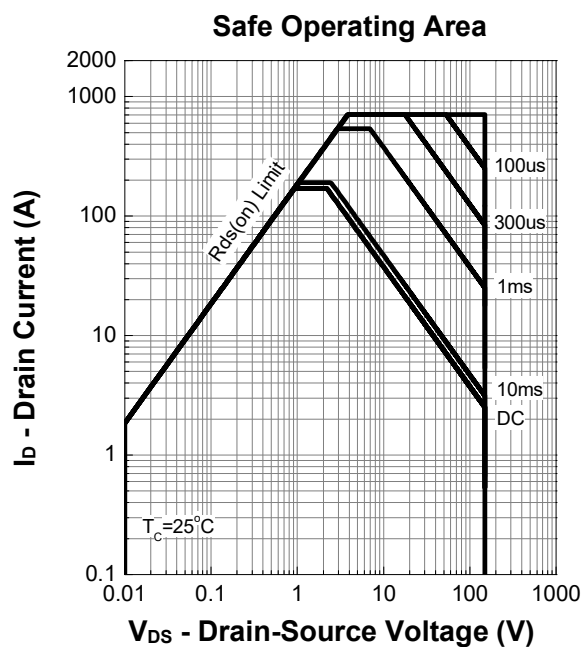
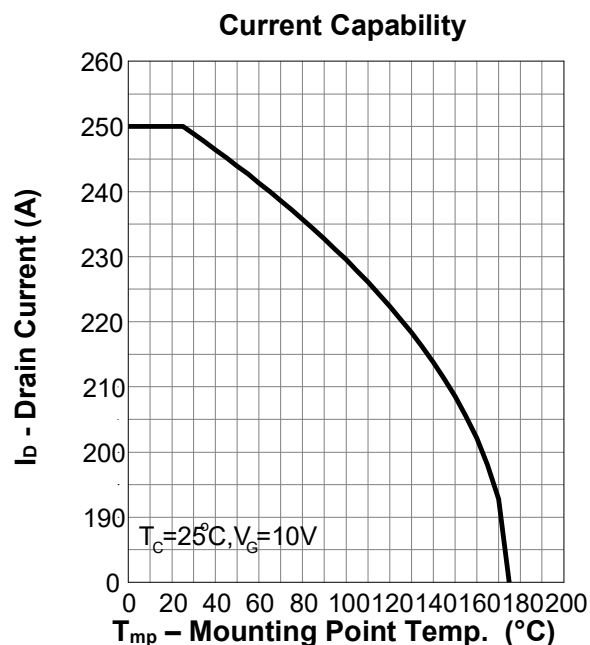
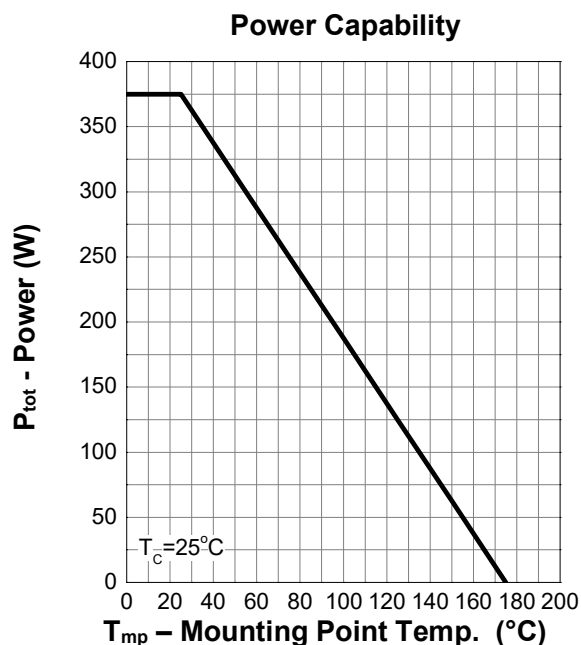
| Symbol                                   | Parameter                      | Conditions                                                                                                                    | Min | Typ  | Max  | Unit |
|------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics                   |                                |                                                                                                                               |     |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage | V <sub>GS</sub> = 0 V, I <sub>DS</sub> = 250 μA                                                                               | 150 | -    | -    | V    |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage         | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA                                                                  | 2   | -    | 4    | V    |
| I <sub>DSS</sub>                         | Drain Leakage Current          | V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V                                                                                | -   | -    | 1    | μA   |
| I <sub>GSS</sub>                         | Gate Leakage Current           | V <sub>GS</sub> = 0 V, V <sub>GS</sub> = ± 25 V                                                                               | -   | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>         | On-State Resistance            | V <sub>GS</sub> = 10 V, I <sub>DS</sub> = 50 A                                                                                | -   | 3.8  | 4.5  | m Ω  |
|                                          |                                | V <sub>GS</sub> = 6 V, I <sub>DS</sub> = 25 A                                                                                 | -   | 4.5  | 5.5  |      |
| Diode Characteristics                    |                                |                                                                                                                               |     |      |      |      |
| V <sub>SD</sub> <sup>a</sup>             | Diode Forward Voltage          | I <sub>SD</sub> = 50 A, V <sub>GS</sub> = 0 V                                                                                 | -   | -    | 1.3  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time          | I <sub>DS</sub> = 50 A, V <sub>GS</sub> = 0 V<br>di <sub>SD</sub> /dt = 100 A/μs                                              | -   | 115  | -    | nS   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge        |                                                                                                                               | -   | 480  | -    | nC   |
| Dynamic Characteristics <sup>b</sup>     |                                |                                                                                                                               |     |      |      |      |
| C <sub>iss</sub>                         | Input Capacitance              | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 75 V<br>Frequency = 1 MHz                                                            | -   | 9320 | -    | pF   |
| C <sub>oss</sub>                         | Output Capacitance             |                                                                                                                               | -   | 570  | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance   |                                                                                                                               | -   | 60   | -    |      |
| t <sub>d(on)</sub>                       | Turn-on Delay Time             | V <sub>DS</sub> = 75 V, V <sub>GEN</sub> = 10 V,<br>R <sub>G</sub> = 3.9 Ω, R <sub>L</sub> = 1.5 Ω,<br>I <sub>DS</sub> = 50 A | -   | 24   | -    | nS   |
| t <sub>r</sub>                           | Turn-on Rise Time              |                                                                                                                               | -   | 70   | -    |      |
| t <sub>d(off)</sub>                      | Turn-off Delay Time            |                                                                                                                               | -   | 112  | -    |      |
| t <sub>f</sub>                           | Turn-off Fall Time             |                                                                                                                               | -   | 75   | -    |      |
| Gate Charge Characteristics <sup>b</sup> |                                |                                                                                                                               |     |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge              | V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 10 V,<br>I <sub>DS</sub> = 50 A                                                     | -   | 158  | -    | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge             |                                                                                                                               | -   | 48   | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge              |                                                                                                                               | -   | 39   | -    |      |

Notes :

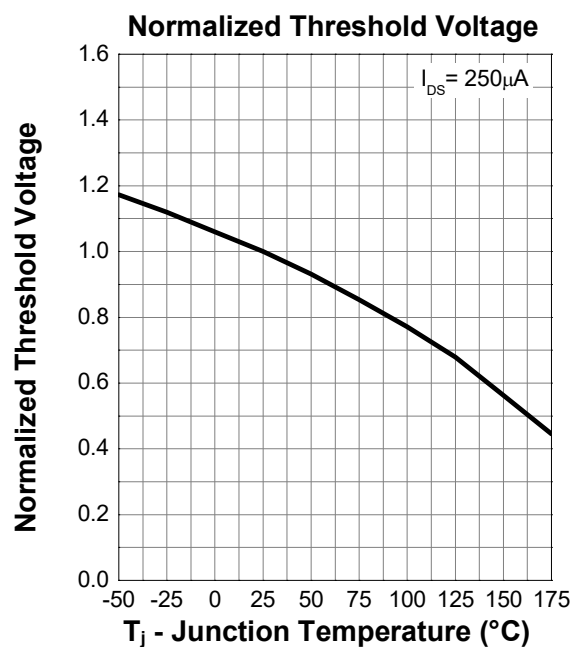
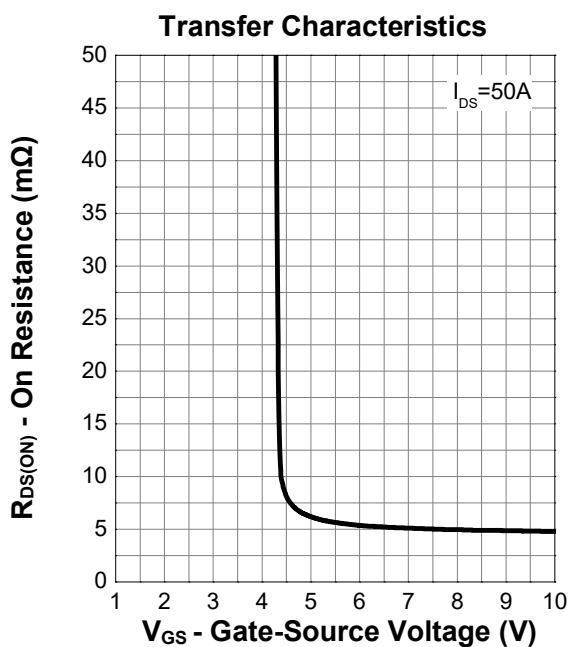
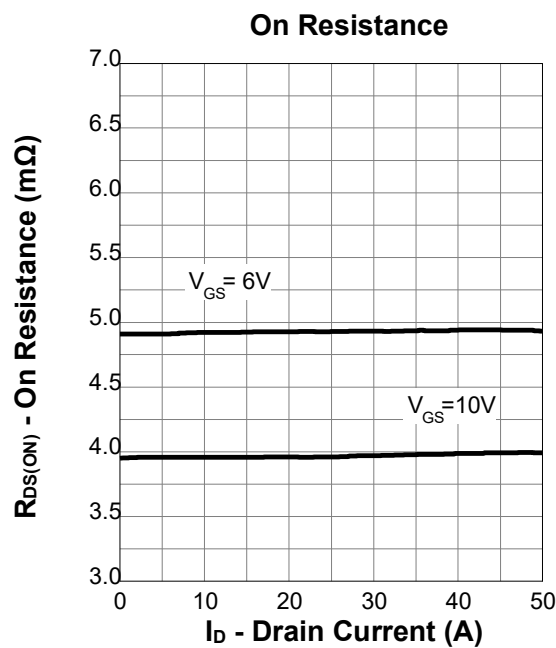
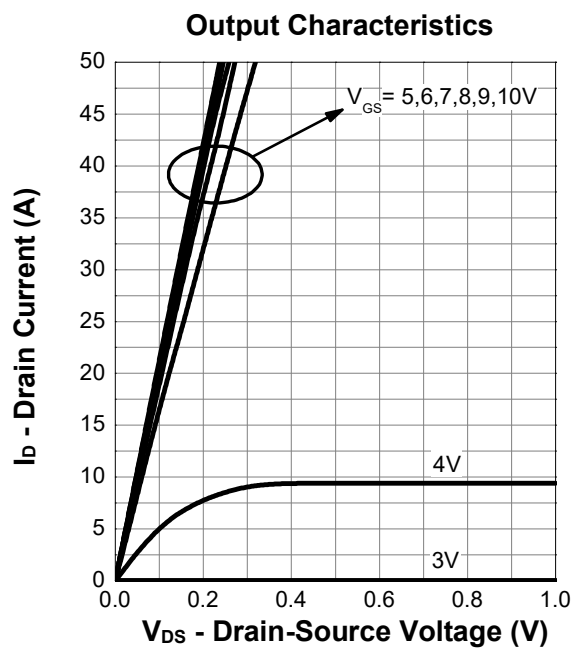
a : Pulse test ; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

b : Guaranteed by design, not subject to production testing

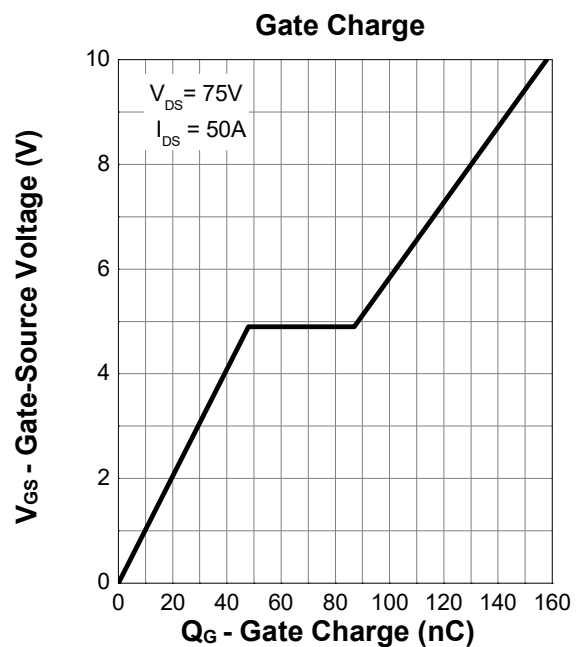
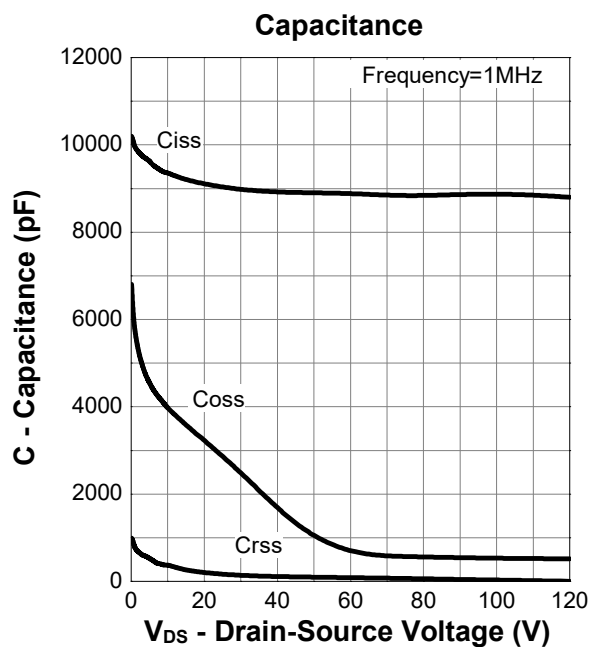
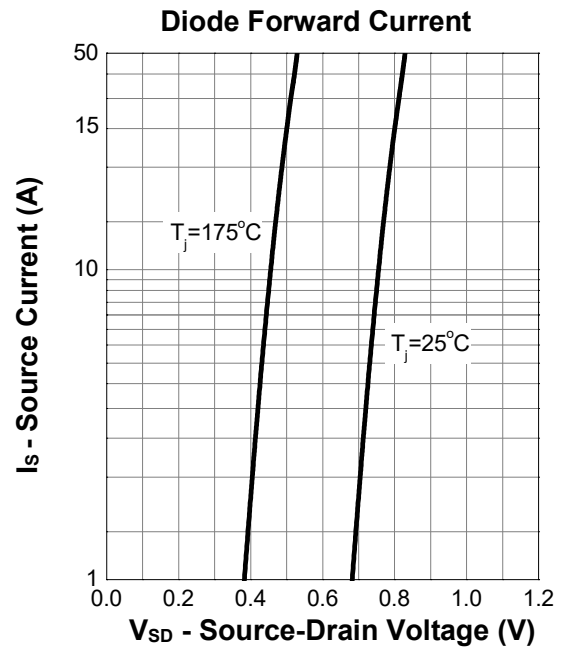
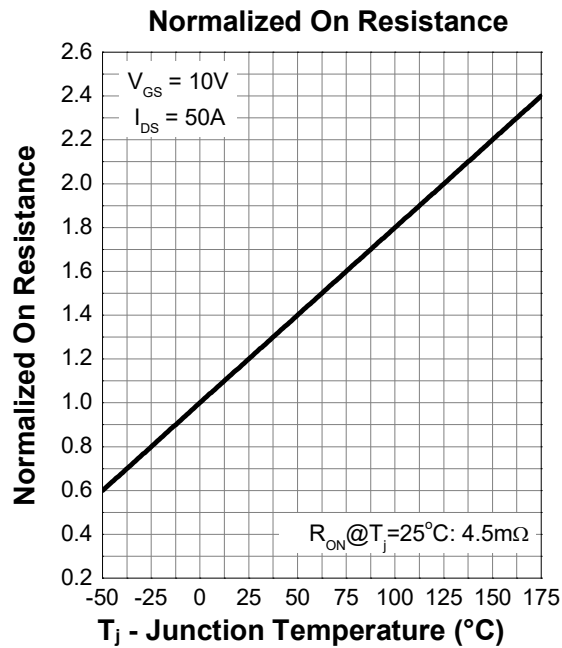
## 7. Typical Characteristics



## 7. Typical Characteristics (cont.)

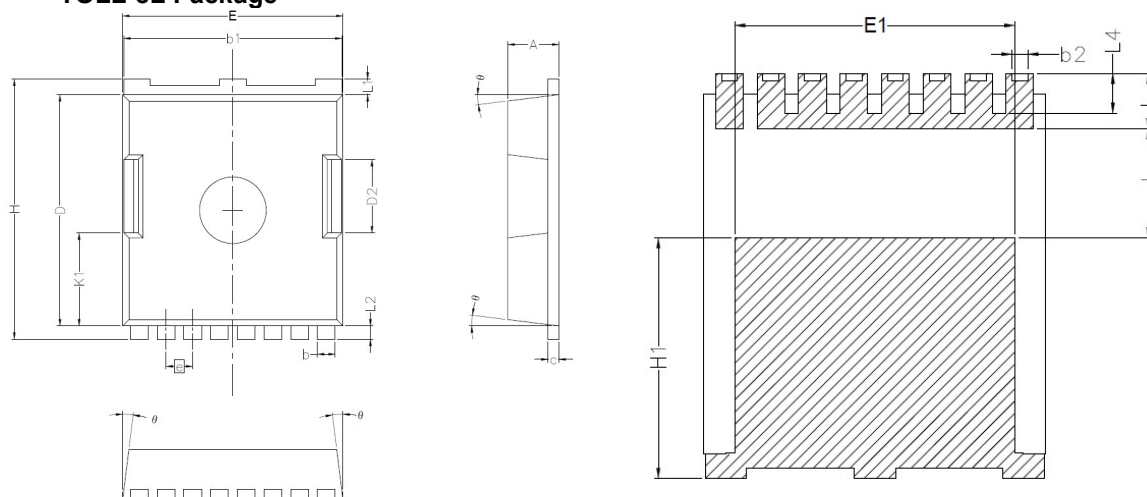


## 7. Typical Characteristics (cont.)



## 8. Package Dimensions

TOLL-8L Package



| Symbol   | Dimensions In Millimeters |       |
|----------|---------------------------|-------|
|          | MIN.                      | MAX.  |
| A        | 2.20                      | 2.40  |
| b        | 0.70                      | 0.90  |
| b1       | 9.70                      | 9.90  |
| b2       | 0.42                      | 0.50  |
| c        | 0.40                      | 0.60  |
| D        | 10.28                     | 10.58 |
| D2       | 3.10                      | 3.50  |
| E        | 9.70                      | 10.10 |
| E1       | 7.90                      | 8.30  |
| e        | 1.20BSC                   |       |
| H        | 11.48                     | 11.88 |
| H1       | 6.75                      | 7.15  |
| N        | 8                         |       |
| J        | 3.00                      | 3.30  |
| K1       | 3.98                      | 4.38  |
| L        | 1.40                      | 1.80  |
| L1       | 0.60                      | 0.80  |
| L2       | 0.50                      | 0.70  |
| L4       | 1.00                      | 1.30  |
| $\theta$ | 4°                        | 10°   |