

## N-Channel Enhancement Mode MOSFET

### 1. Product Information

#### 1.1 Features

- ☒ Surface-mounted package
- ☒ Very low on-resistance  $R_{DS(ON)}$
- ☒  $T_J$  max 175°C
- ☒ Advanced trench cell design
- ☒ MSL1

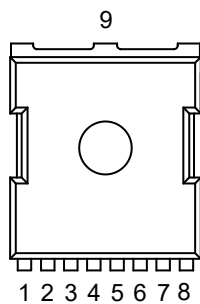
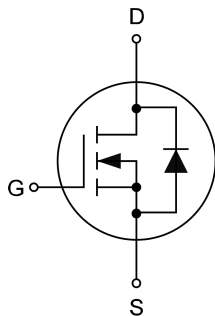
#### 1.2 Applications

- ☒ Motor drivers
- ☒ BMS appliances
- ☒ DC/DC converter

#### 1.3 Quick reference

- ☒  $BV \geq 40\text{ V}$
- ☒  $P_D \leq 230\text{ W}$
- ☒  $I_D \leq 300\text{ A}$
- ☒  $R_{DS(ON)} \leq 1.3\text{ m}\Omega @ V_{GS} = 10\text{ V}$

### 2. Pin Description

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

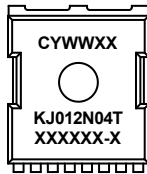
## 3. Limiting Values

| Symbol                            | Parameter                                        | Conditions                                  | Min | Max  | Unit |
|-----------------------------------|--------------------------------------------------|---------------------------------------------|-----|------|------|
| V <sub>DS</sub>                   | Drain-Source Voltage                             | T <sub>c</sub> =25℃                         | 40  | -    | V    |
| V <sub>GS</sub>                   | Gate-Source Voltage                              | T <sub>c</sub> =25℃                         | -   | ±20  | V    |
| I <sub>D</sub>                    | Continuous Drain Current                         | T <sub>c</sub> =25℃, V <sub>GS</sub> =10 V  | -   | 300  | A    |
|                                   |                                                  | T <sub>c</sub> =100℃, V <sub>GS</sub> =10 V | -   | 212  | A    |
| I <sub>DM</sub> *                 | Pulsed Drain Current                             | T <sub>c</sub> =25℃, V <sub>GS</sub> =10 V  | -   | 1200 | A    |
| E <sub>AS</sub>                   | Single Pulsed Avalanche Energy                   | V <sub>DD</sub> =35 V, L=0.5 mH             | -   | 462  | mJ   |
| P <sub>D</sub>                    | Drain Power Dissipation                          | T <sub>c</sub> =25℃                         | -   | 230  | W    |
| T <sub>J</sub> , T <sub>stg</sub> | Operating Junction and Storage Temperature Range |                                             | -55 | 175  | ℃    |
| R <sub>θJA</sub>                  | Thermal Resistance-Junction to Ambient           |                                             | -   | 50   | ℃/W  |
| R <sub>θJC</sub>                  | Thermal Resistance-Junction to Case              |                                             | -   | 0.65 |      |

Notes:

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

## 4. Marking Information

| Product Name | Marking                                                                               |
|--------------|---------------------------------------------------------------------------------------|
| KJ012N04T    |  |

## 5. Ordering Code

| Product Name | Package | Reel size | Tape width | Quantity (pcs) |
|--------------|---------|-----------|------------|----------------|
| KJ012N04T    | TOLL-8L | 13"       | 24 mm      | 2000           |

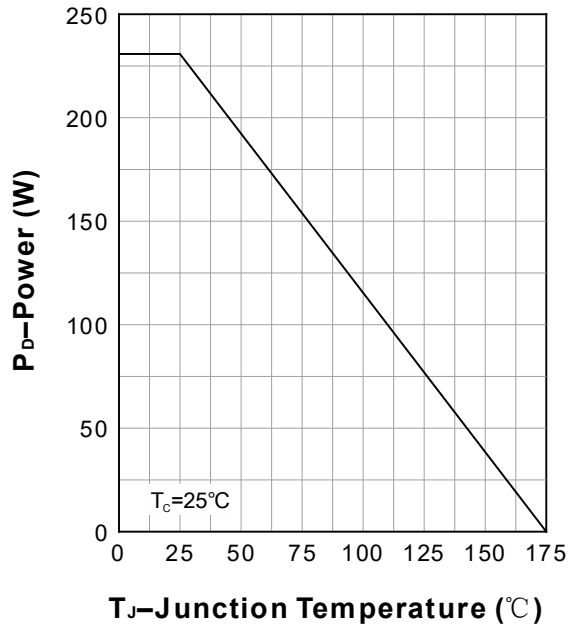
Note: KUAJIEXIN defines "Green" as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC/JEDEC J-STD-020C).

## 6. Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

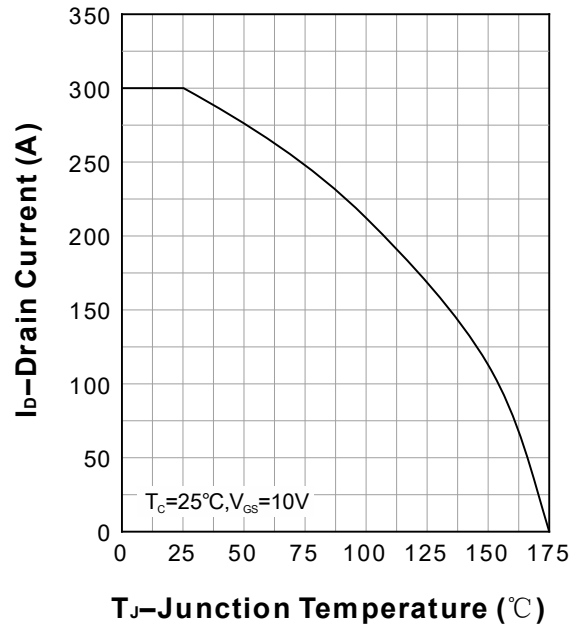
| Symbol                  | Parameter                             | Conditions                                                                              | Min | Typ   | Max  | Unit |
|-------------------------|---------------------------------------|-----------------------------------------------------------------------------------------|-----|-------|------|------|
| Static Characteristics  |                                       |                                                                                         |     |       |      |      |
| BV <sub>DSS</sub>       | Drain-Source Breakdown Voltage        | V <sub>GS</sub> =0 V, I <sub>DS</sub> =250 μA                                           | 40  | -     | -    | V    |
| V <sub>GS(th)</sub>     | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250 μA                              | 1.0 | 1.7   | 2.5  | V    |
| I <sub>DSS</sub>        | Zero Gate Voltage Source Current      | V <sub>DS</sub> =40 V, V <sub>GS</sub> =0 V                                             | -   | -     | 1    | μA   |
| I <sub>GSS</sub>        | Gate-Body Leakage Current             | V <sub>DS</sub> =0 V, V <sub>GS</sub> =±20 V                                            | -   | -     | ±100 | nA   |
| R <sub>DS(ON)</sub>     | Drain-Source On-Resistance            | V <sub>GS</sub> =10 V, I <sub>DS</sub> =30 A                                            | -   | 1.1   | 1.3  | mΩ   |
|                         |                                       | V <sub>GS</sub> =4.5 V, I <sub>DS</sub> =20 A                                           | -   | 2.0   | 2.8  | mΩ   |
| V <sub>SD</sub>         | Diode Forward Voltage                 | I <sub>SD</sub> =30 A, V <sub>GS</sub> =0 V                                             | -   | -     | 1.2  | V    |
| I <sub>S</sub>          | Maximum Body-Diode Continuous Current |                                                                                         | -   | -     | 300  | A    |
| Dynamic Characteristics |                                       |                                                                                         |     |       |      |      |
| C <sub>iss</sub>        | Input Capacitance                     | V <sub>DS</sub> =20 V, V <sub>GS</sub> =0 V, Frequency=1 MHz                            | -   | 14650 | -    | pF   |
| C <sub>oss</sub>        | Output Capacitance                    |                                                                                         | -   | 850   | -    |      |
| C <sub>rss</sub>        | Reverse Transfer Capacitance          |                                                                                         | -   | 112   | -    |      |
| Switching Parameters    |                                       |                                                                                         |     |       |      |      |
| Q <sub>g</sub>          | Total Gate Charge                     | V <sub>DS</sub> =20 V, V <sub>GS</sub> =10 V, I <sub>DS</sub> =30 A                     | -   | 94    | -    | nC   |
| Q <sub>gs</sub>         | Gate-Source Charge                    |                                                                                         | -   | 16    | -    |      |
| Q <sub>gd</sub>         | Gate-Drain Charge                     |                                                                                         | -   | 18    | -    |      |
| t <sub>d(on)</sub>      | Turn-on Delay Time                    | V <sub>DS</sub> =20 V, V <sub>GS</sub> =10 V, R <sub>G</sub> =3 Ω, I <sub>D</sub> =30 A | -   | 14    | -    | ns   |
| t <sub>r</sub>          | Turn-on Rise Time                     |                                                                                         | -   | 10    | -    |      |
| t <sub>d(off)</sub>     | Turn-off Delay Time                   |                                                                                         | -   | 100   | -    |      |
| t <sub>f</sub>          | Turn-off Fall Time                    |                                                                                         | -   | 17    | -    |      |
| t <sub>rr</sub>         | Body Diode Reverse Recovery Time      | V <sub>GS</sub> =0 V, I <sub>SD</sub> =30 A, dI <sub>SD</sub> /dt=100 A/μs              | -   | 30    | -    | ns   |
| Q <sub>rr</sub>         | Body Diode Reverse Recovery Charge    |                                                                                         | -   | 23    | -    | nC   |

## 7. Typical Electrical and Thermal Characteristics

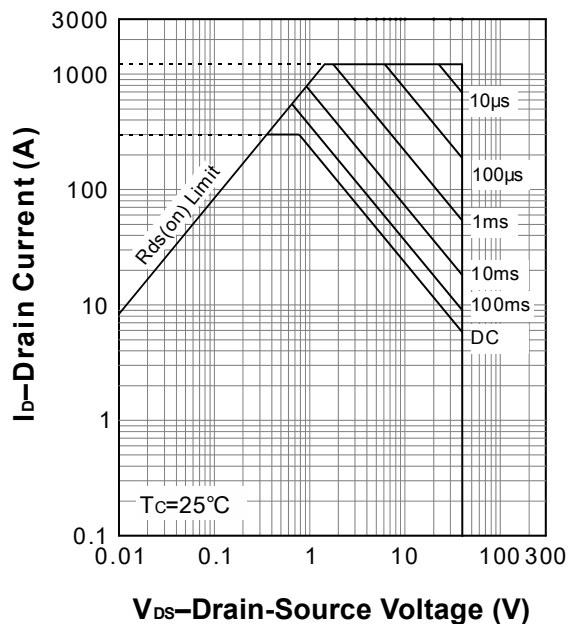
**Power Capability**



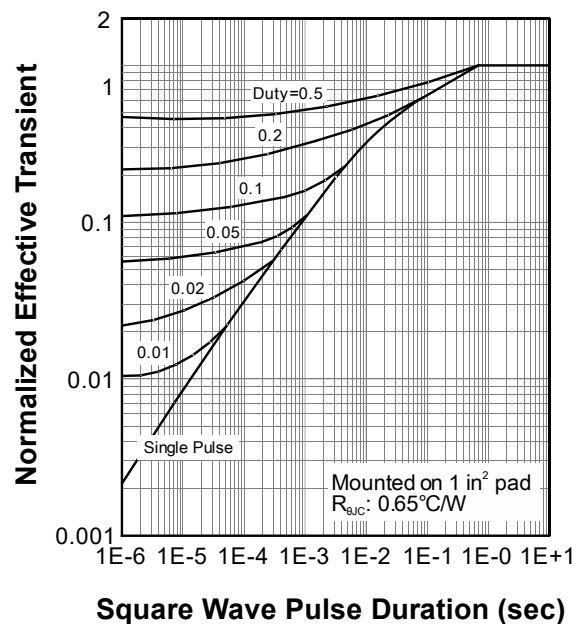
**Current Capability**



**Safe Operating Area**

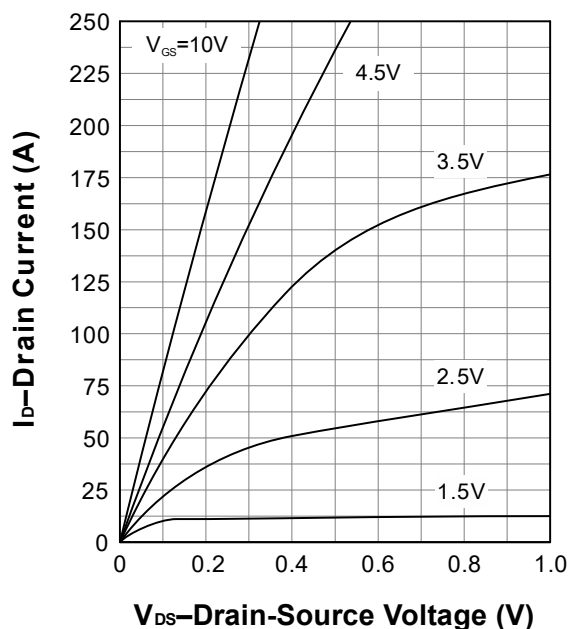


**Transient Thermal Impedance**

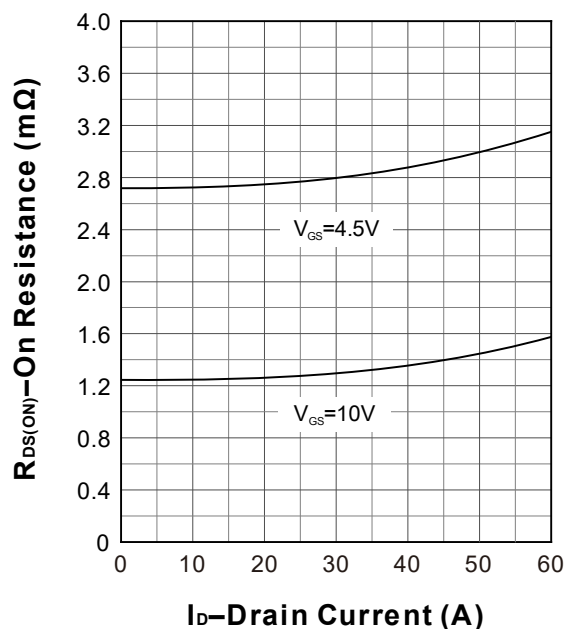


## 7. Typical Characteristics(cont.)

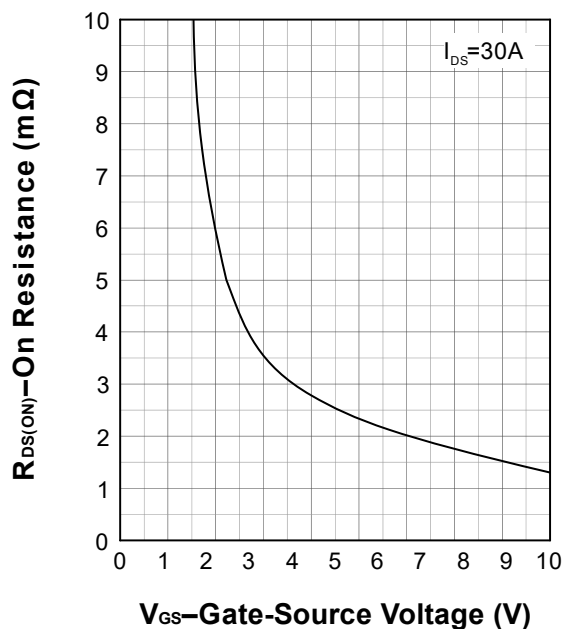
**Output Characteristics**



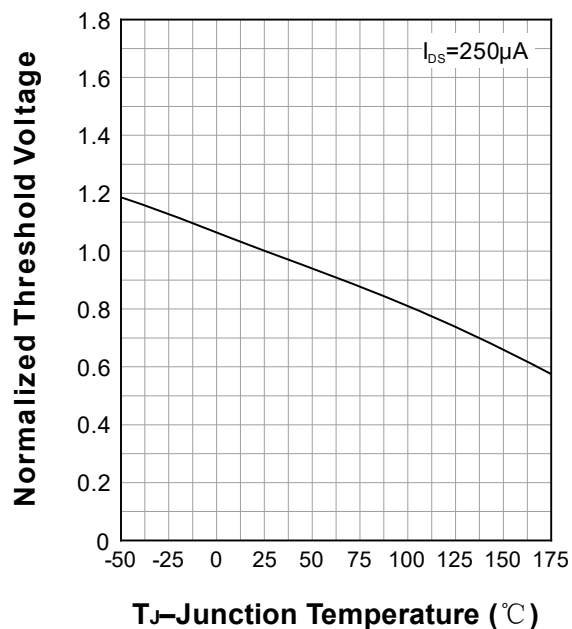
**On Resistance**



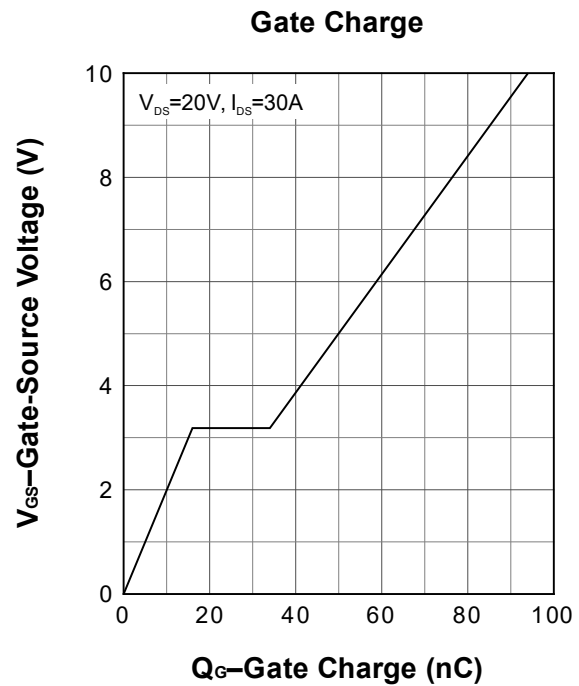
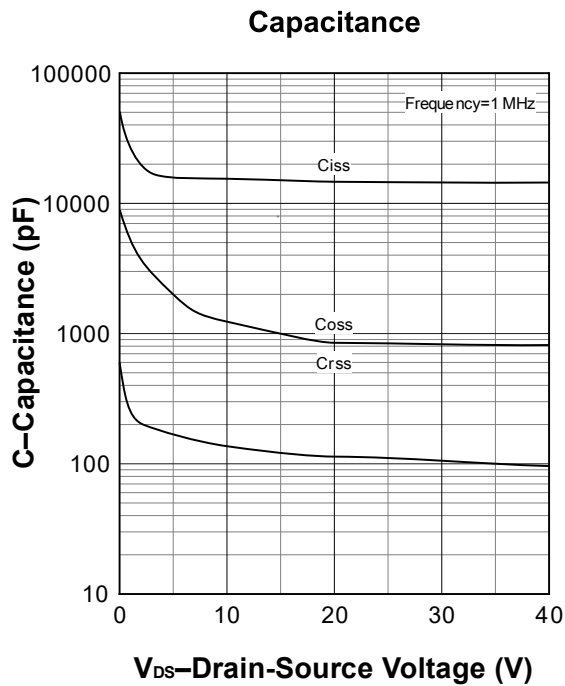
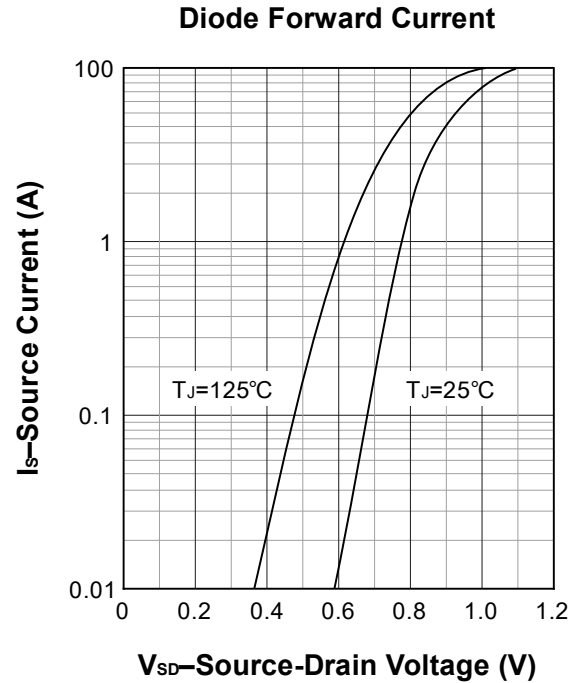
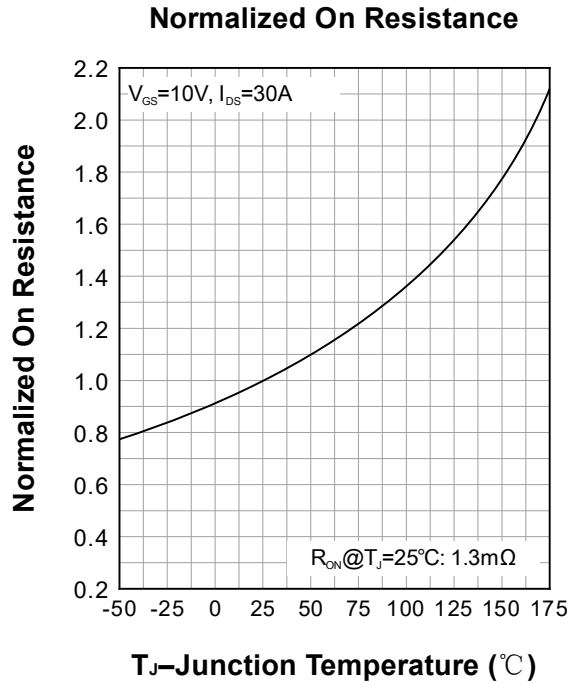
**Transfer Characteristics**



**Normalized Threshold Voltage**

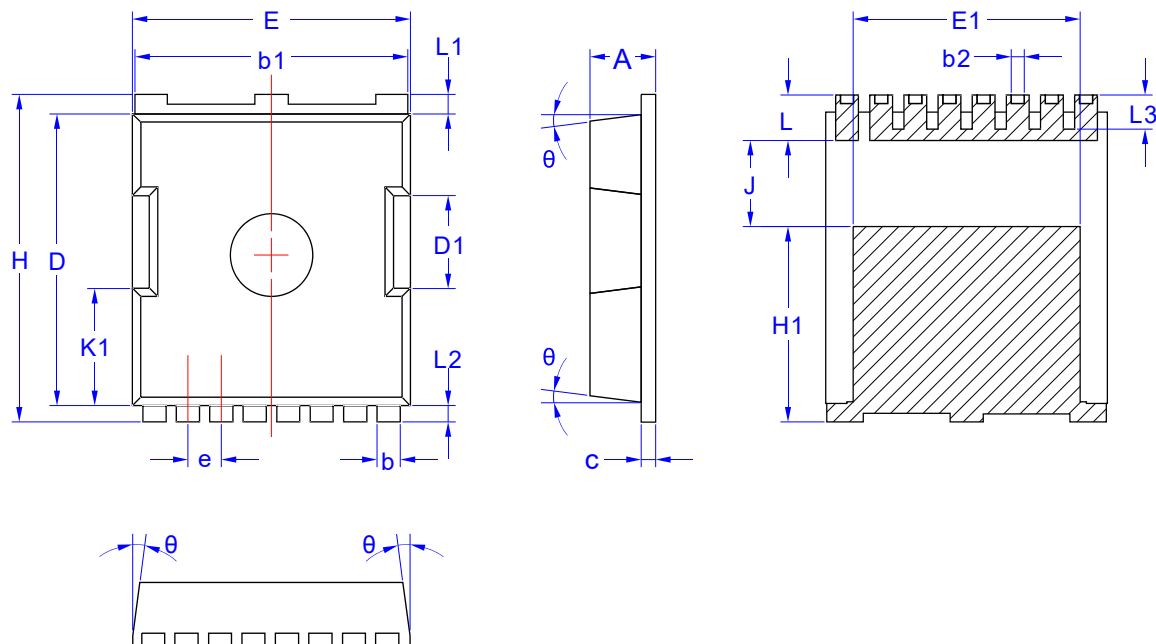


## 7. Typical Characteristics(cont.)



## 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 |
| D1     | 3.10                      | 3.50  |
| E      | 9.70                      | 10.10 |
| E1     | 7.90                      | 8.30  |
| e      | 1.20 BSC                  |       |

| Symbol   | Dimensions in Millimeters |       |
|----------|---------------------------|-------|
|          | MIN                       | MAX   |
| H        | 11.48                     | 11.88 |
| H1       | 6.75                      | 7.15  |
| 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  |
| L3       | 1.00                      | 1.30  |
| $\theta$ | 4°                        | 10°   |