# FH4504TL

## N-Channel Trench Power MOSFET

### ◆ General Description

The FH4504TL is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. This high density process is especially tailored to minimize on-state resistance.

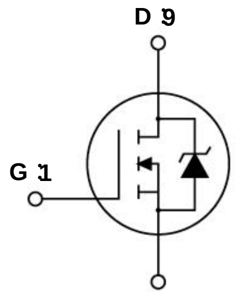
### ◆ Applications

- High power inverter system
- LCD TV appliances
- Load Switch

### ◆ Features

| Parameter | Typ. | Unit |
|---|---|---|
| $V_{DS}$ | 40 | V |
| $I_D$ (@ $V_{GS}$ = 10V) | 250 | A |
| $R_{DS(ON)}$ (@ $V_{GS}$ = 10V) (Typ) | 1.2 | mΩ |
| $R_{DS(ON)}$ (@ $V_{GS}$ = 4.5V) (Typ) | 1.9 | mΩ |

- Surface-mounted package
- Advanced trench cell design
- Super Trench

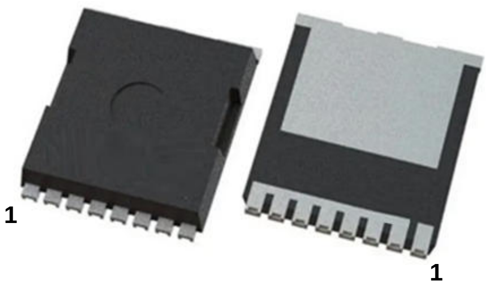



Schematic diagram

Top view


Marking and pin assignment

TOLL-8L




Top view　　Bottom View

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | $T_C$ = 25 ℃ | 40 | - | V |
| $V_{GS}$ | Gate-Source Voltage | $T_C$ = 25 ℃ | - | ±20 | V |
| $I_D$* *** | Drain Current ( DC ) | $T_C$ = 25 ℃, $V_{GS}$ = 10 V | - | 250 | A |
| $I_{DM}$**,*** | Drain Current ( Pulsed ) | $T_C$ = 25 ℃, $V_{GS}$ = 10 V | - | 1300 | A |
| $P_{tot}$ | Drain power dissipation | $T_C$ = 25 ℃ | - | 300 | W |
| $T_{stg}$ | Storage Temperature | | -55 | 150 | ℃ |
| $T_J$ | Junction Temperature | | - | 150 | ℃ |
| $I_S$ | Continuous-Source Current | $T_C$ = 25 ℃ | - | 250 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy | $V_{DD}$=40V , L=1.0mH | - | 1052 | mJ |
| $R_{\theta JA}$** | Thermal Resistance- Junction to Ambient | | - | 40 | ℃/W |
| $R_{\theta JC}$** | Thermal Resistance- Junction to Case | | - | 0.5 | |

Notes：

* Surface Mounted on minimum footprint pad area.

** Pulse width ≤ 300 µs, duty cycle ≤ 2 %

*** Maximum current rating is package limited.

## Electrical Characteristics ($T_A$ = 25 °C Unless Otherwise Noted)

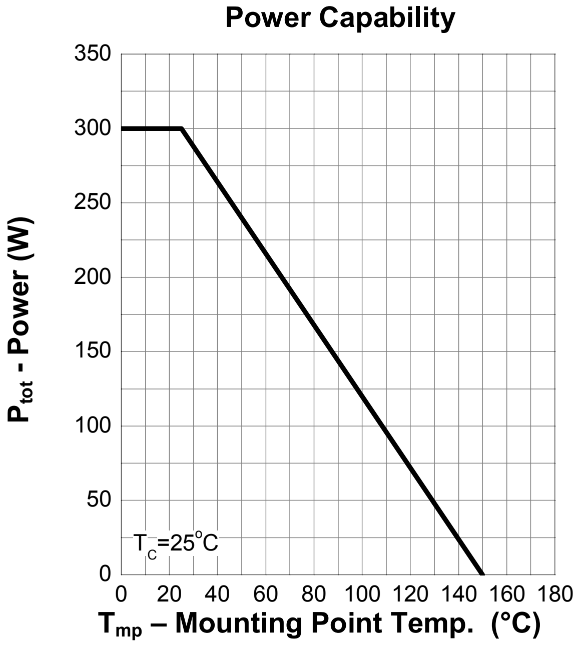
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 μA | | 40 | - | - | V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_{DS}$ = 250 μA | | 1.5 | 2.0 | 2.5 | V |
| $I_{DSS}$ | Zero Gate Voltage Source Current | $V_{DS}$ = 32 V, $V_{GS}$ = 0 V | | - | - | 1 | μA |
| | | | $T_J$ = 85 ℃ | - | - | 30 | μA |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$ = ± 20 V, $V_{DS}$ = 0 V | | - | - | ± 100 | nA |
| $R_{DS(ON)}$ [a] | Drain-Source On-State Resistance | $V_{GS}$ = 10 V, $I_D$ = 20 A | | - | 1.2 | 1.5 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 10 A | | - | 1.9 | 2.5 | |
| **Diode Characteristics** | | | | | | | |
| $V_{SD}$ [a] | Diode Forward Voltage | $I_{SD}$ = 20 A, $V_{GS}$ = 0 V | | - | - | 1.3 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$ = 20 A, $dI_{SD}/dt$ = 100 A/μs | | - | 68 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | - | 92 | - | nC |
| **Dynamic Characteristics** [b] | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0 V, $V_{DS}$ = 20 V<br>Frequency = 1 MHz | | - | 4925 | - | pF |
| $C_{oss}$ | Output Capacitance | | | - | 1655 | - | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | - | 122 | - | |
| $t_d$(on) | Turn-on Delay Time | $V_{DS}$ = 20 V, $V_{GEN}$ = 10 V,<br>$R_G$ = 4.5 Ω, $R_L$ = 1 Ω,<br>$I_{DS}$ = 20 A | | - | 16 | - | ns |
| $t_r$ | Turn-on Rise Time | | | - | 48 | - | |
| $t_d$(off) | Turn-off Delay Time | | | - | 75 | - | |
| $t_f$ | Turn-off Fall Time | | | - | 42 | - | |
| **Gate Charge Characteristics** [b] | | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 20 V, $V_{GS}$ = 10 V,<br>$I_{DS}$ = 20 A | | - | 81 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | | - | 18 | - | |
| $Q_{gd}$ | Gate-Drain Charge | | | - | 15 | - | |

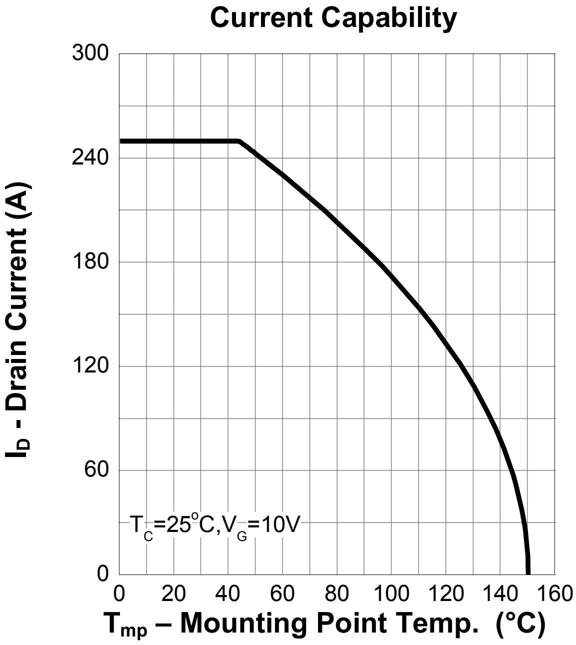
Notes :

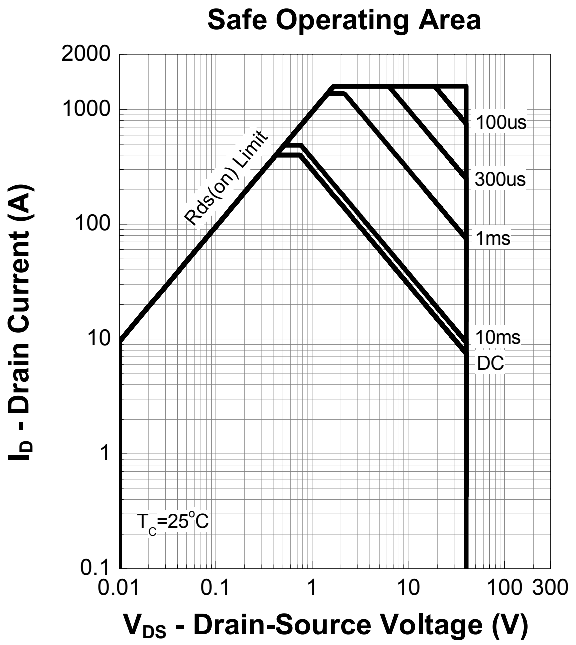
a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

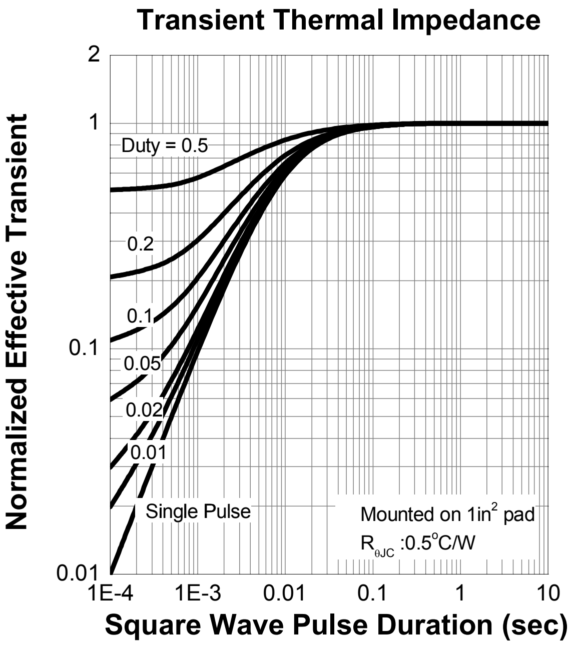
b : Guaranteed by design, not subject to production testing

## Typical Characteristics

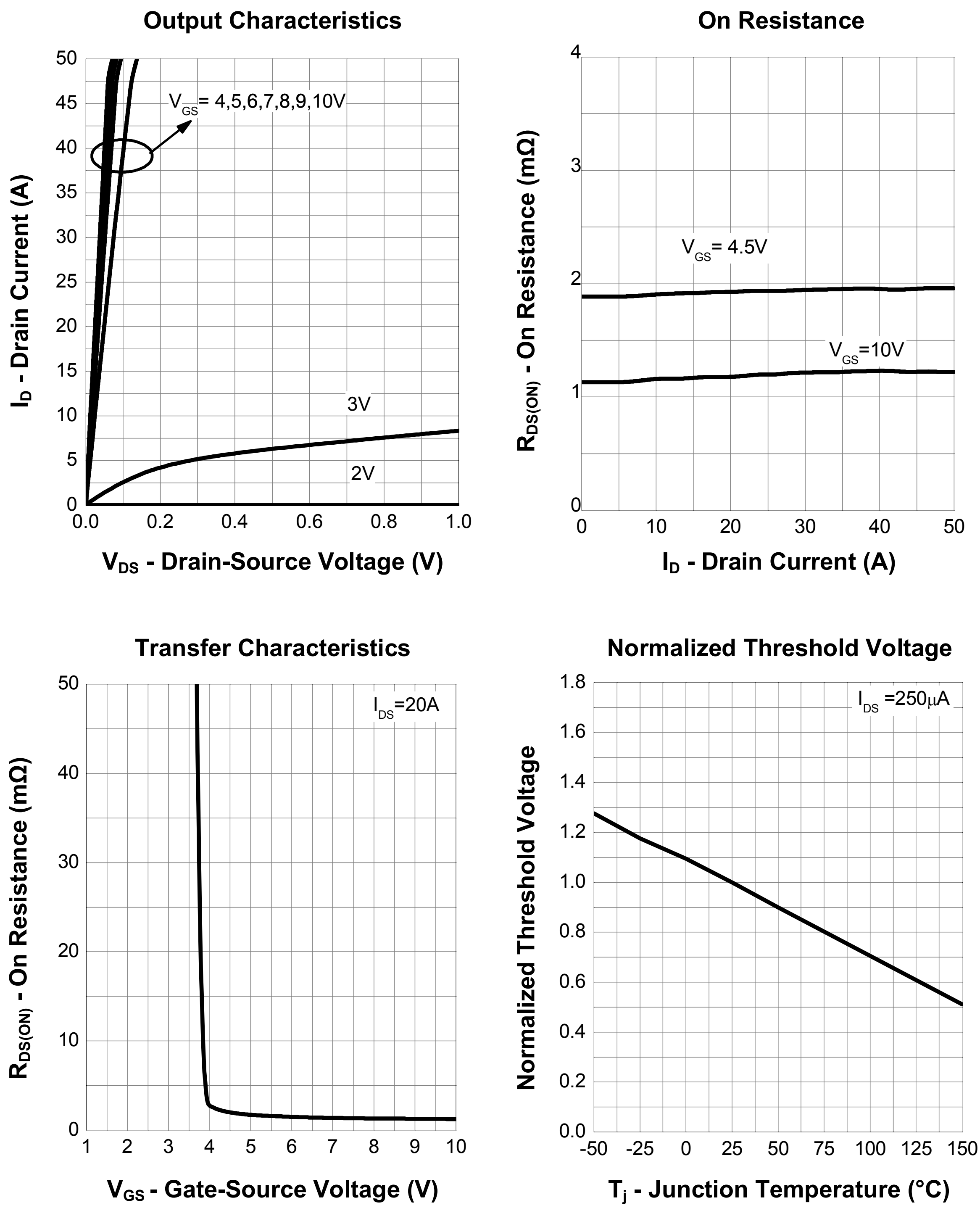


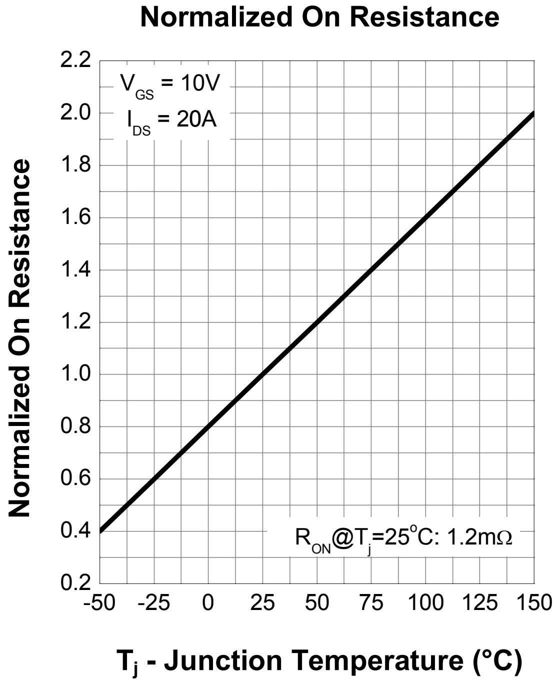



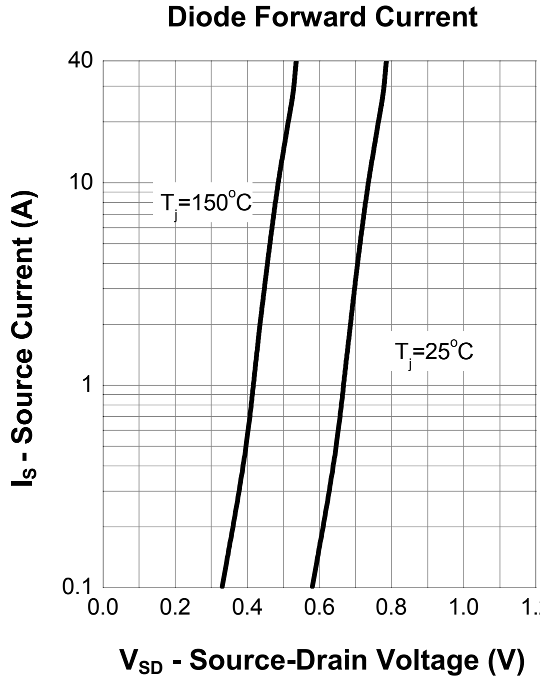



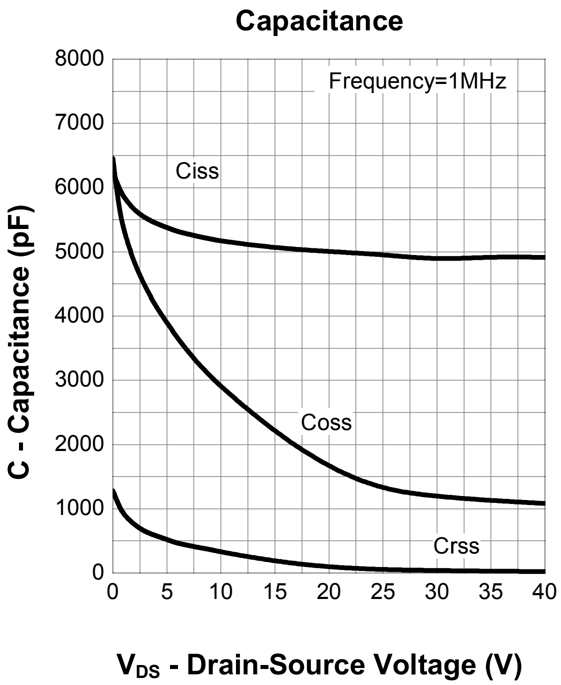
## Typical Characteristics ( Cont.)

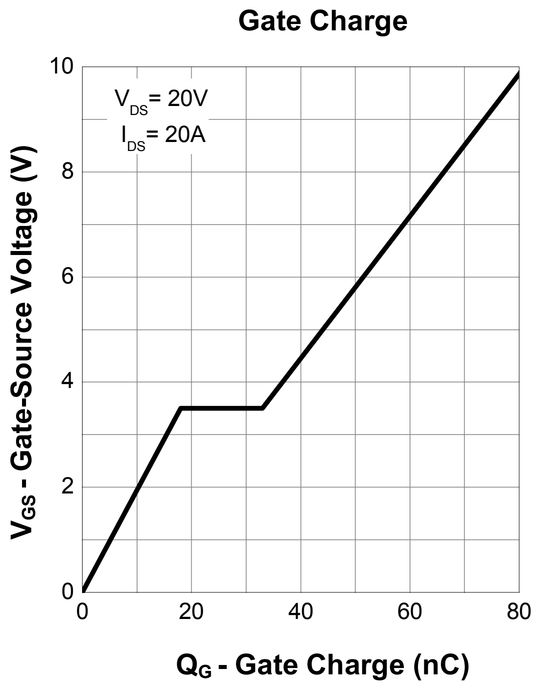


## Typical Characteristics (Cont.)

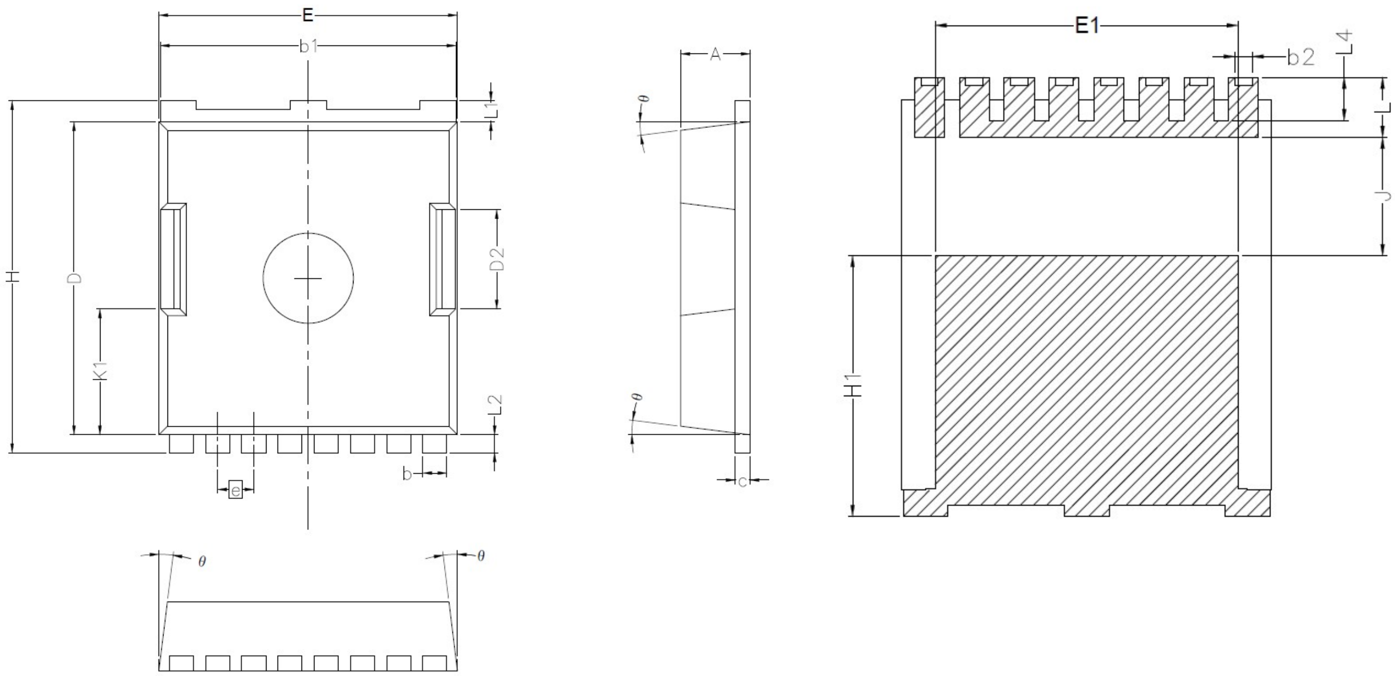


## Package Information ：TOLL-8L




| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | **MIN.** | **MAX.** |
| A | 2.20 | 2.40 |
| b | 0.90 | 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° |