

# TNG250N40TL

## N-Channel Enhancement Mode Power MOSFET

### Product Summary

- $V_{DS} = 40V, I_D = 250A$
- $R_{DS(on)} < 2m\Omega @ V_{GS} = 10V$
- $R_{DS(on)} < 3.2m\Omega @ V_{GS} = 7.5V$

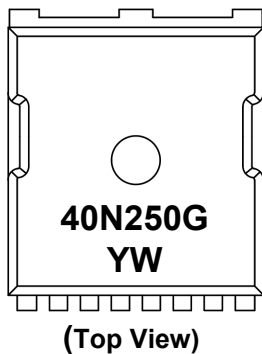
### Features

- Advanced Split Gate Trench Technology
- RoHS Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 1
- 100% Avalanche Tested
- 100% DVDS

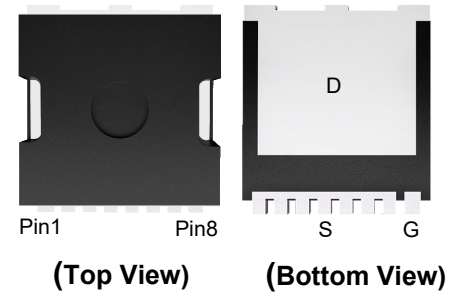
### Application

- Power Tool Appliances
- High Power Inverter System
- BMS Appliances

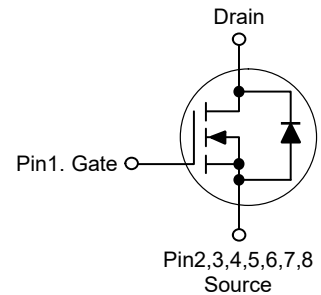
### Marking Code



### TOLL



### Schematic Diagram



### Absolute Maximum Ratings

Ratings at 25°C case temperature unless otherwise specified.

| Parameter                                      | Symbol         | Value       | Unit |
|--|----------------|-------------|------|
| Drain-Source Voltage                           | $V_{DS}$       | 40          | V    |
| Gate-Source Voltage                            | $V_{GS}$       | $\pm 20$    | V    |
| Drain Current-Continuous                       | $I_D$          | 250         | A    |
| Drain Current-Pulsed <sup>Note1</sup>          | $I_{DM}$       | 1000        | A    |
| Maximum Power Dissipation                      | $P_D$          | 300         | W    |
| Single Pulse Avalanche Energy <sup>Note2</sup> | $E_{AS}$       | 1692        | mJ   |
| Junction and Storage Temperature Range         | $T_J, T_{STG}$ | -55 to +175 | °C   |

### Thermal Characteristics

|                                      |                 |     |      |
|--------------------------------------|-----------------|-----|------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.5 | °C/W |
|--------------------------------------|-----------------|-----|------|

## Electrical Characteristics

(T<sub>J</sub>=25°C unless otherwise specified)

| Parameter                                     | Symbol              | Condition  | Min | Typ    | Max  | Unit |
|---|---------------------|--|-----|--------|------|------|
| Off Characteristics                           |                     |  |     |        |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA  | 4   |        | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V  |     | -      | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   |     | -      | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |  |     |        |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                     | 2.0 | 3.0    | 3.8  | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =100A   |     | 1.2    | 1.5  | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =100A  |     | 90     | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |  |     |        |      |      |
| Input Capacitance                             | C <sub>iss</sub>    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                       | -   | 5834.6 | -    | pF   |
| Output Capacitance                            | C <sub>oss</sub>    |  | -   | 2320.5 | -    | pF   |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>    |  | -   | 70     | -    | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |  |     |        |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> =20V, I <sub>D</sub> =100A<br>V <sub>GS</sub> =10V, R <sub>G</sub> =1.6Ω     | -   | 14.5   | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |  | -   | 8      | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |  | -   | 58     | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |  | -   | 10     | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =20V, I <sub>D</sub> =100A,<br>V <sub>GS</sub> =10V                          | -   | 91     | -    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |  | -   | 29.4   |      | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |  | -   | 19     |      | nC   |
| Drain-Source Diode Characteristics            |                     |  |     |        |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =100A  |     |        | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |  | -   | -      | 250  | A    |
| Reverse Recovery Time                         | t <sub>rr</sub>     | T <sub>J</sub> = 25°C, I <sub>F</sub> = I <sub>S</sub><br>di/dt = 100A/μs <sup>(Note3)</sup> | -   | -      | 38   | nS   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |  | -   | -      | 125  | nC   |

## Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=20V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

Typical Characteristic Curves

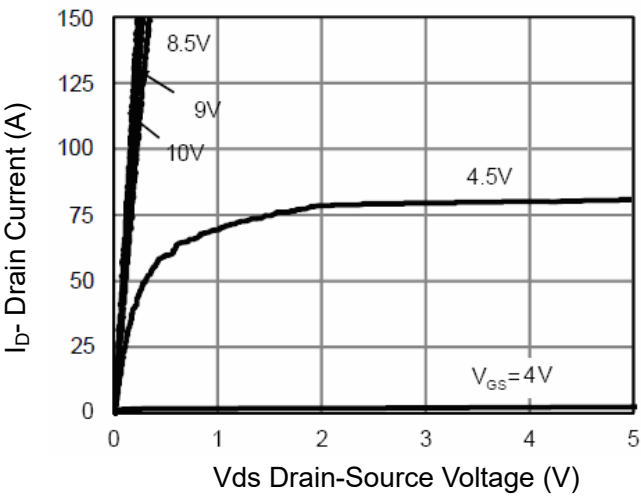


Figure 1 Output Characteristics

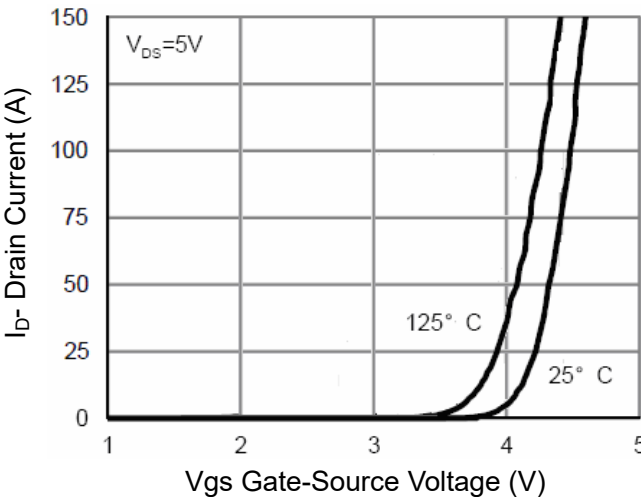


Figure 2 Transfer Characteristics

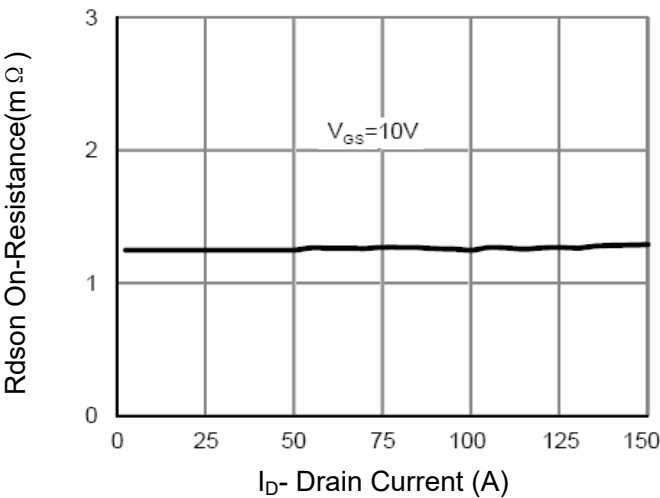


Figure 3  $R_{ds(on)}$ - Drain Current

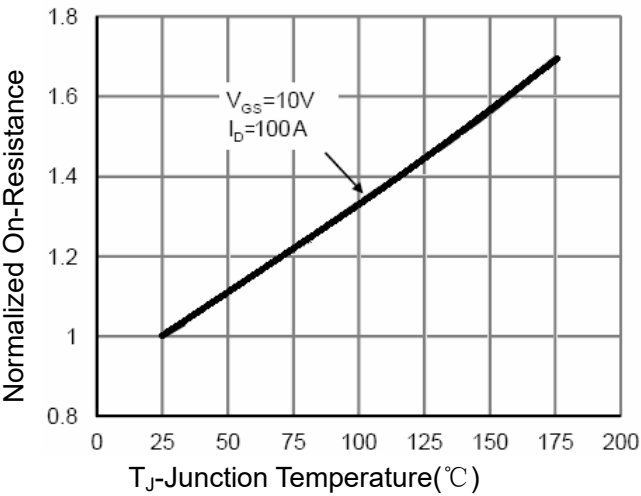


Figure 4  $R_{ds(on)}$ -Junction Temperature

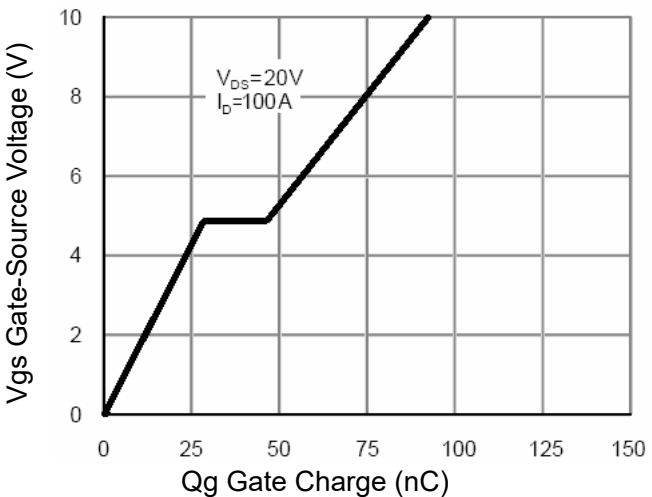


Figure 5 Gate Charge

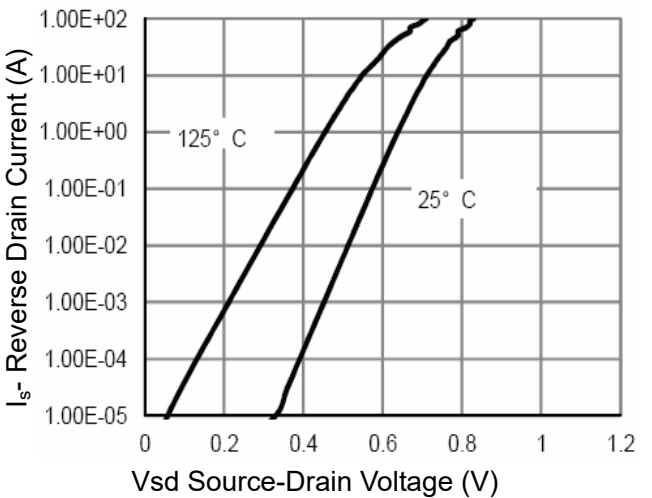


Figure 6 Source- Drain Diode Forward

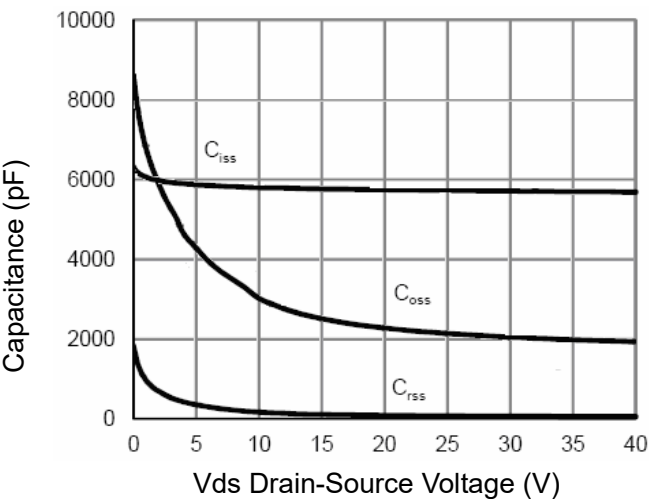


Figure 7 Capacitance vs Vds

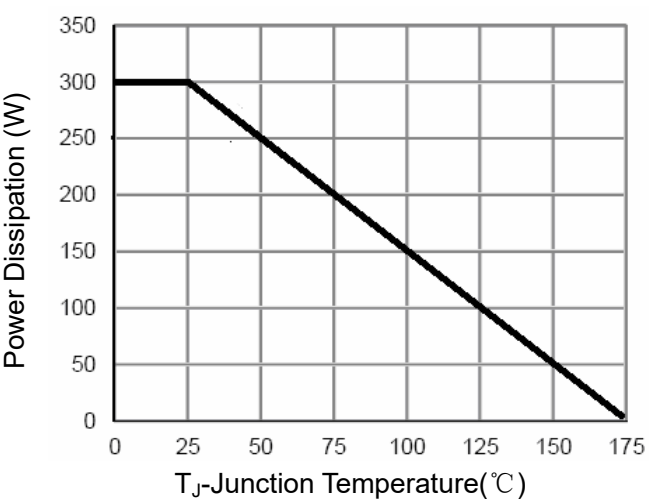


Figure 9 Power De-rating

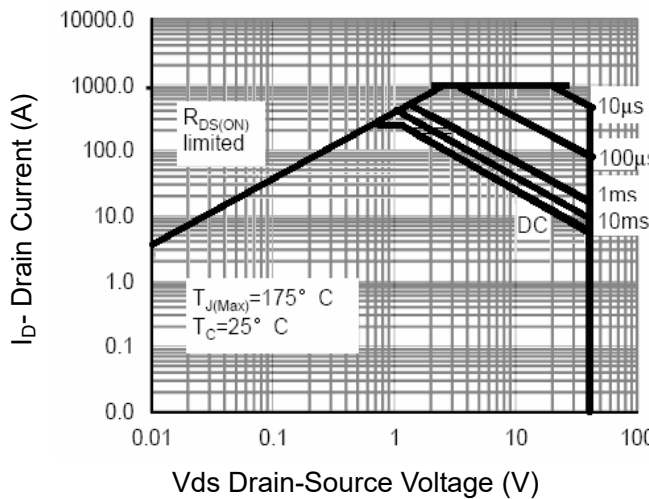


Figure 8 Safe Operation Area

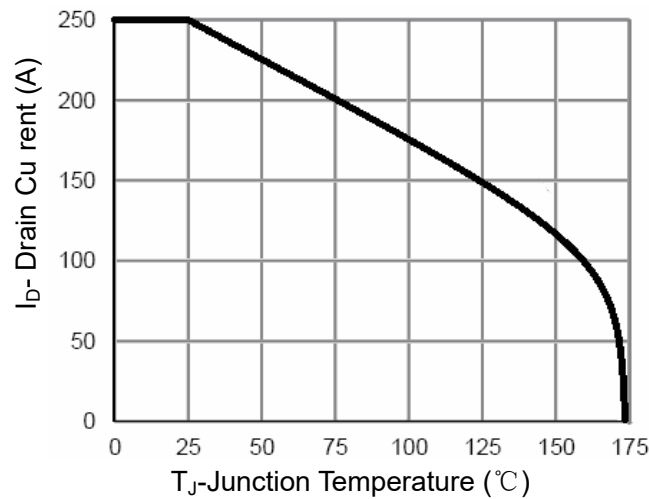


Figure 10 Current De-rating

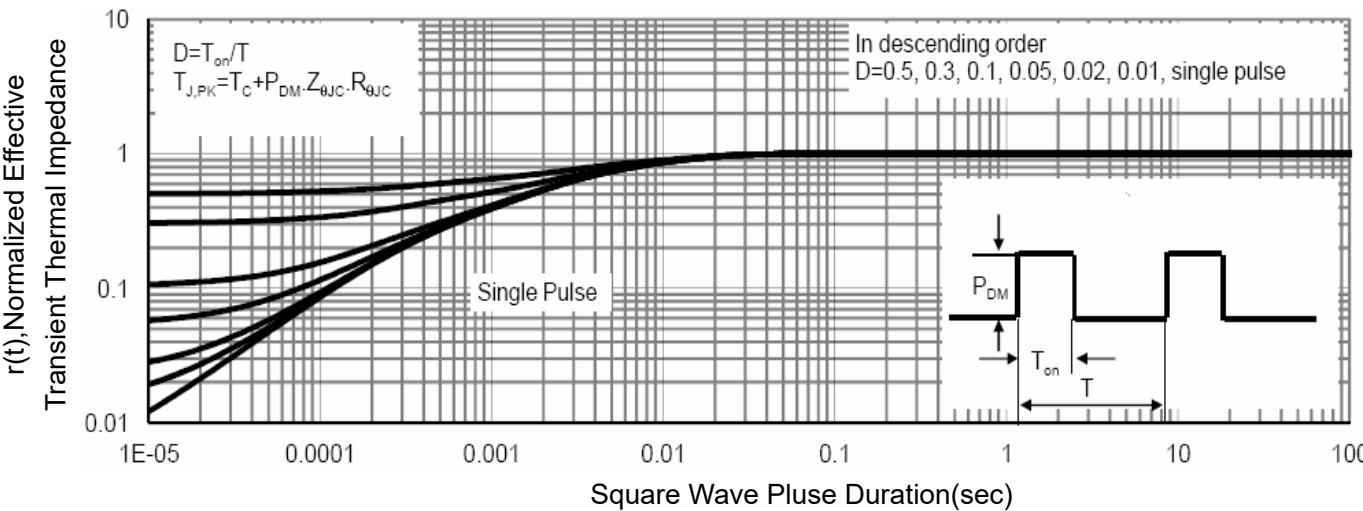
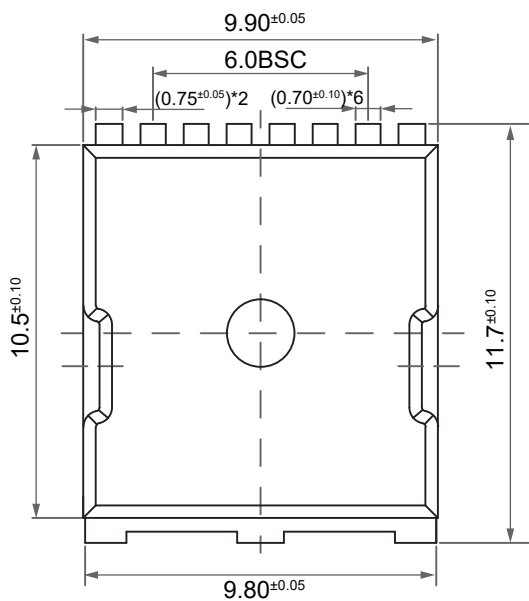


Figure 11 Normalized Maximum Transient Thermal Impedance

Package Outline

TOLL

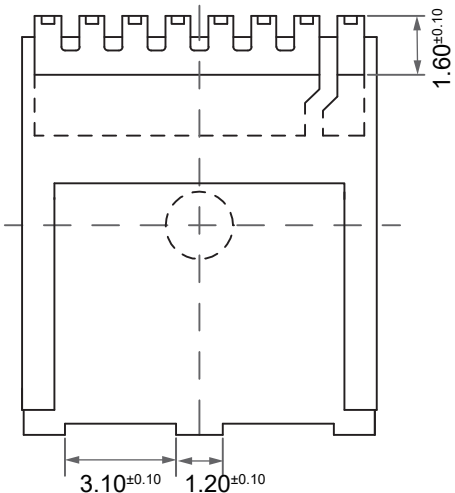
Dimensions in mm



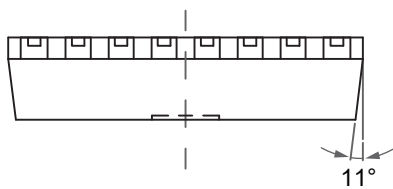
TOP VIEW



SIDE VIEW



BOTTOM VIEW



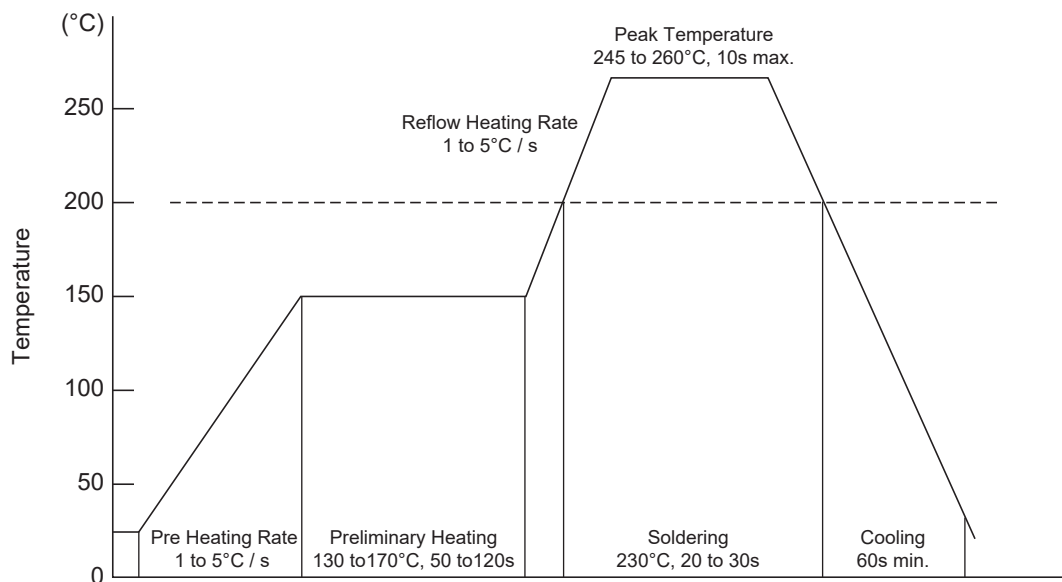
FRONT VIEW

Ordering Information

| Device      | Package | Shipping               |
|-------------|---------|------------------------|
| TNG250N40TL | TOLL    | 2,000PCS/Reel&13inches |

## Conditions of Soldering and Storage

### ◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

### ◆ Conditions of hand soldering

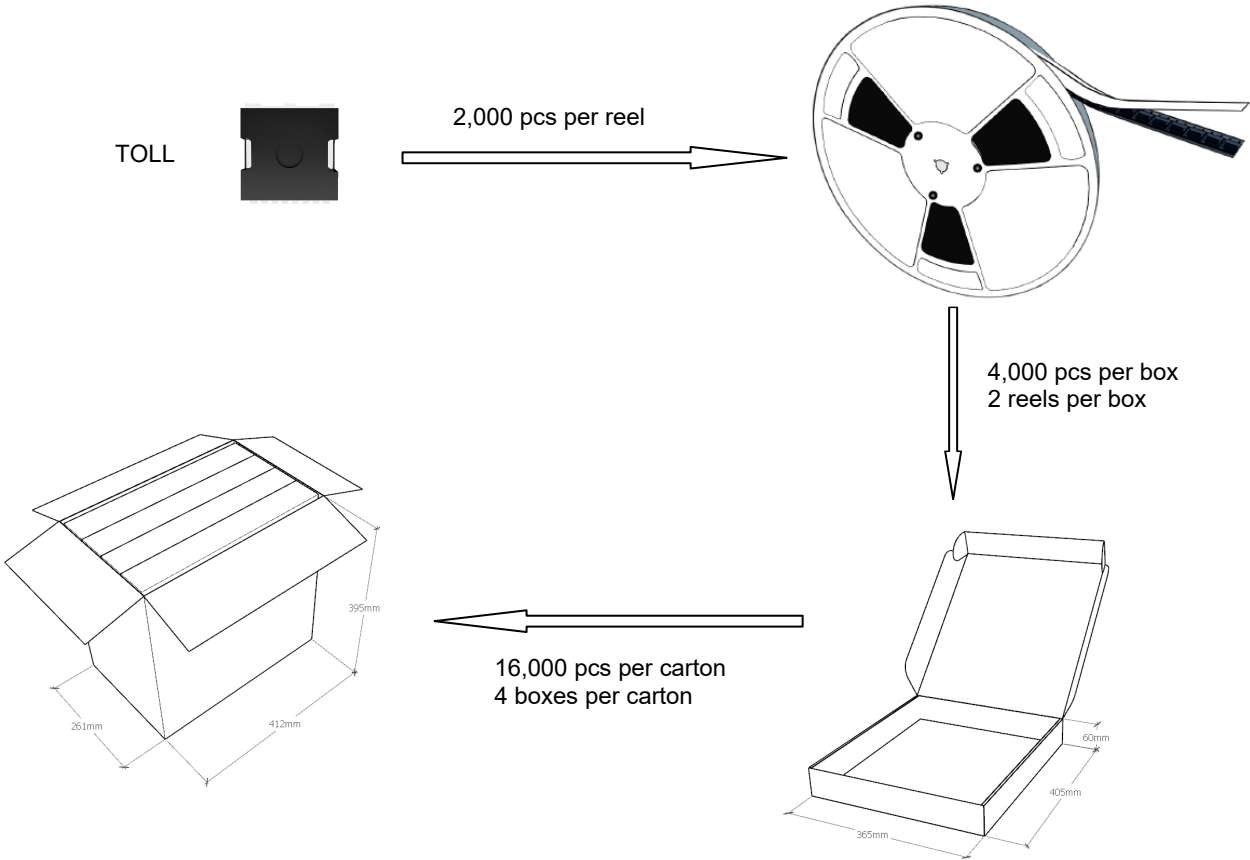
- Temperature: 300°C
- Time: 3s max.
- Times: one time

### ◆ Storage conditions

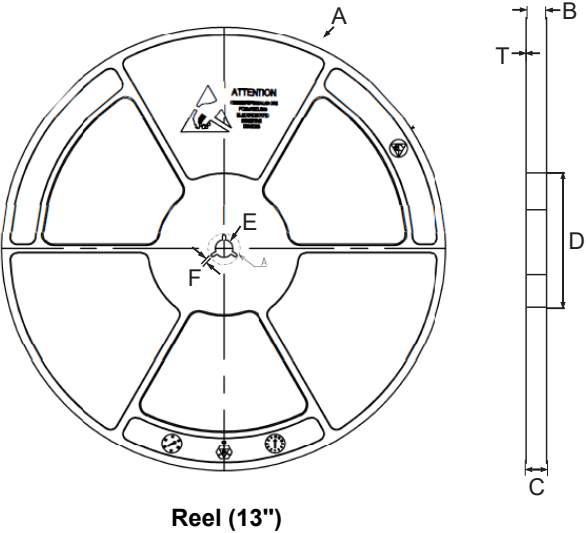
- **Temperature**  
5 to 40°C
- **Humidity**  
30 to 80% RH
- **Recommended period**  
One year after manufacturing

Package Specifications

- The method of packaging

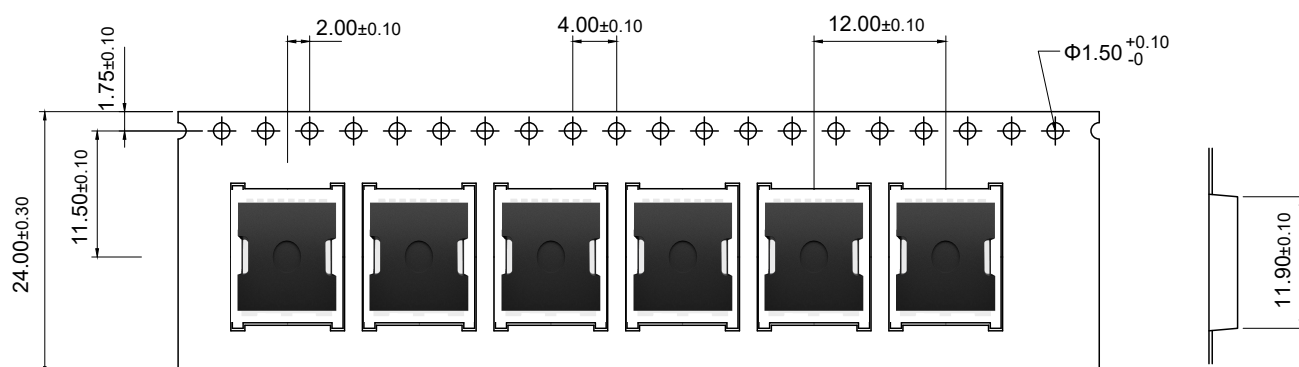


◆ reel data



| Symbol | Value(unit:mm)      |
|--------|---------------------|
| A      | $\Phi 330.2 \pm 1$  |
| B      | $25 \pm 0.5$        |
| C      | $29.2 \pm 2$        |
| D      | $\Phi 100 \pm 0.5$  |
| E      | $\Phi 13.4 \pm 0.2$ |
| F      | $2.3 \pm 0.2$       |
| T      | $2.1 \pm 0.2$       |


## ◆ Embossed tape data



## Contact Information

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For additional information, please contact your local Sales Representative.

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The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

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