

# TN120N40TE

## N-Channel Enhancement Mode Power MOSFET

### TO-252

### Product Summary

- $V_{DS} = 40V, I_D = 120A$
- $R_{DS(on)} < 3.4m\Omega @ V_{GS} = 10V$
- $R_{DS(on)} < 4.2m\Omega @ V_{GS} = 4.5V$

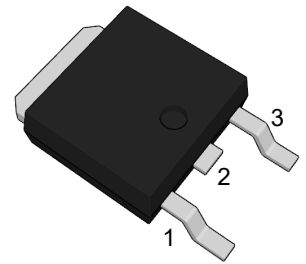
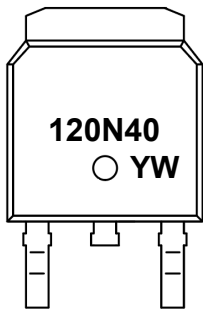
### Features

- Advanced Trench Technology
- 100% Avalanche Tested
- RoHS Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3

### Application

- DC-DC Converters
- Power Management Functions
- Backlighting

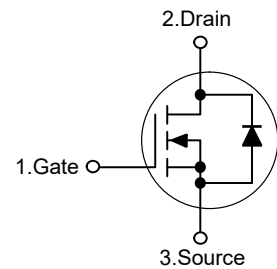
### Marking Code



(Top View)

| Pin | Description |
|-----|-------------|
| 1   | Gate        |
| 2   | Drain       |
| 3   | Source      |

### 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                       | $I_D$     | 120         | A    |
| Drain Current-Pulsed <sup>Note1</sup>          | $I_{DM}$  | 360         | A    |
| Maximum Power Dissipation                      | $P_D$     | 22          | W    |
| Single Pulse Avalanche Energy <sup>Note2</sup> | $E_{AS}$  | 145         | mJ   |
| Junction Temperature                           | $T_J$     | 150         | °C   |
| Storage Temperature Range                      | $T_{STG}$ | -55 to +150 | °C   |

### Thermal Characteristics

|                                      |                 |     |      |
|--------------------------------------|-----------------|-----|------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.7 | °C/W |
|--------------------------------------|-----------------|-----|------|

Electrical Characteristics

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

| Characteristics                                | Test Condition  | Symbols             | Min | Typ  | Max  | Units |
|--|---|---------------------|-----|------|------|-------|
| Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA  | BV <sub>DSS</sub>   | 40  | -    | -    | V     |
| Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A   | R <sub>DS(ON)</sub> | -   | 2.5  | 3.2  | mΩ    |
|  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A  |                     | -   | 3.8  | 5.3  |       |
| Gate -Threshold Voltage                        | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                                  | V <sub>GS(th)</sub> | 1.2 | 1.7  | 2.2  | V     |
| Drain -Source Leakage Current                  | V <sub>DS</sub> =40V , V <sub>GS</sub> =0V , T <sub>J</sub> =25℃                          | I <sub>DSS</sub>    | -   | -    | 1    | μA    |
|  | V <sub>DS</sub> =40V , V <sub>GS</sub> =0V , T <sub>J</sub> =55℃                          |                     | -   | -    | 5    |       |
| Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  | I <sub>GSS</sub>    | -   | -    | ±100 | nA    |
| Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =20A  | g <sub>FS</sub>     | -   | 75   | -    | S     |
| Gate Resistance                                | V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz  | R <sub>g</sub>      | -   | 1.5  | -    | Ω     |
| Total Gate Charge(4.5V)                        | V <sub>DS</sub> =20V<br>V <sub>GS</sub> =4.5V<br>I <sub>D</sub> =20A                      | Q <sub>g</sub>      | -   | 22.7 | -    | nC    |
| Gate-Source Charge                             |   | Q <sub>gs</sub>     | -   | 7.5  | -    |       |
| Gate-Drain Charge                              |   | Q <sub>gd</sub>     | -   | 5.5  | -    |       |
| Turn-on delay time                             | V <sub>DD</sub> =20V<br>V <sub>GS</sub> =10V<br>R <sub>G</sub> =3Ω<br>I <sub>D</sub> =20A | t <sub>d(on)</sub>  | -   | 10   | -    | ns    |
| Rise Time                                      |   | T <sub>r</sub>      | -   | 5    | -    |       |
| Turn-Off Delay Time                            |   | t <sub>d(OFF)</sub> | -   | 33   | -    |       |
| Fall Time                                      |   | t <sub>f</sub>      | -   | 6.5  | -    |       |
| Input Capacitance                              | V <sub>DS</sub> =20V<br>V <sub>GS</sub> =0V<br>f=1.0MHz                                   | C <sub>iss</sub>    | -   | 2648 | -    | pF    |
| Output Capacitance                             |   | C <sub>oss</sub>    | -   | 899  | -    |       |
| Reverse Transfer Capacitance                   |   | C <sub>rss</sub>    | -   | 71   | -    |       |
| Continuous Source Current <sup>1,6</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current  | I <sub>S</sub>      | -   | -    | 30   | A     |
| Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25℃                            | V <sub>SD</sub>     | -   | -    | 1    | V     |

Note :

1.The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.

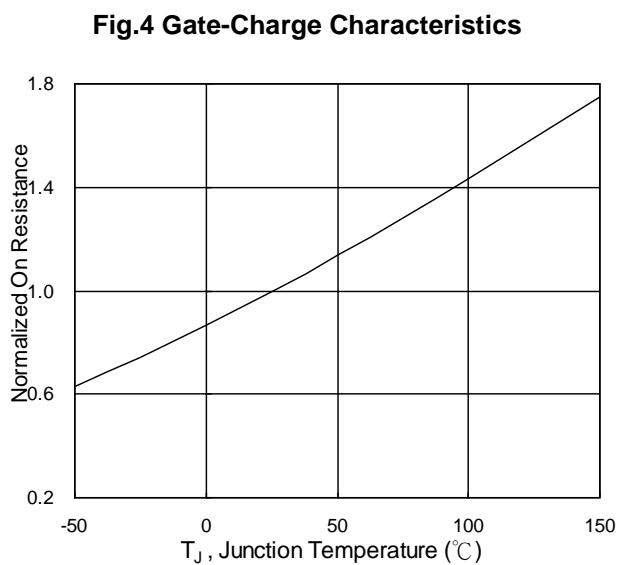
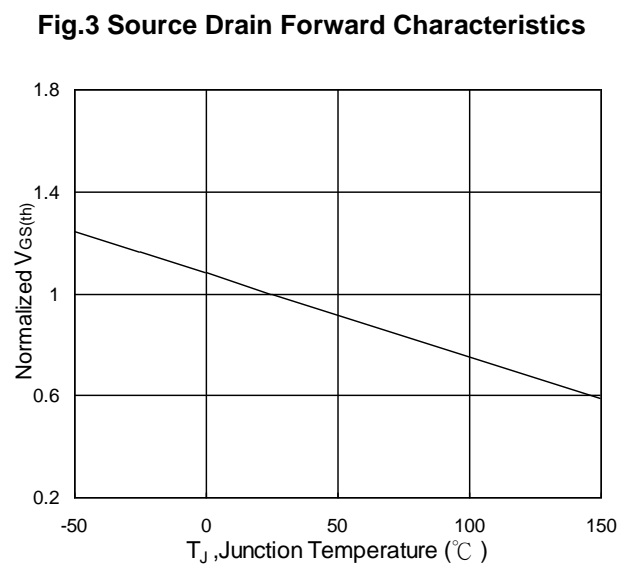
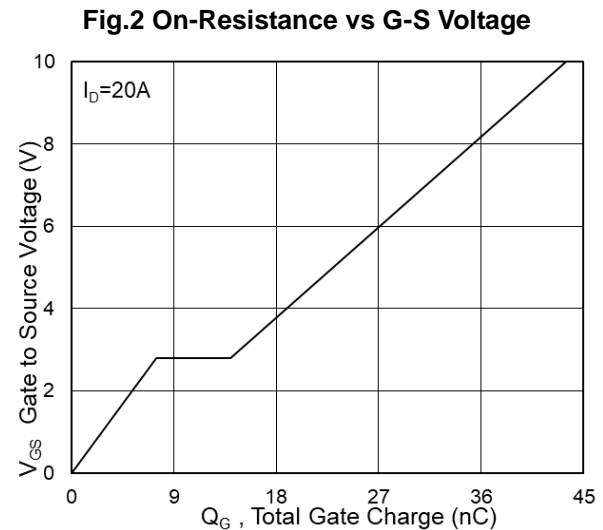
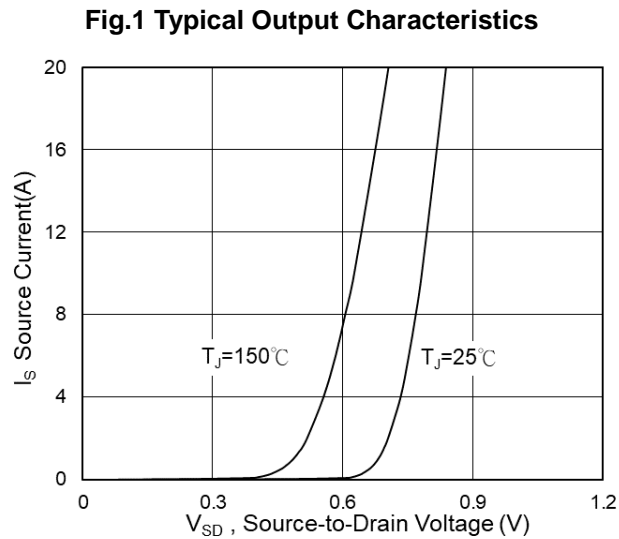
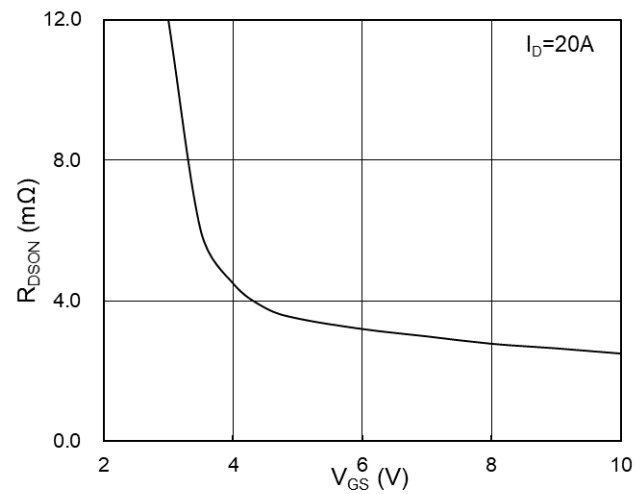
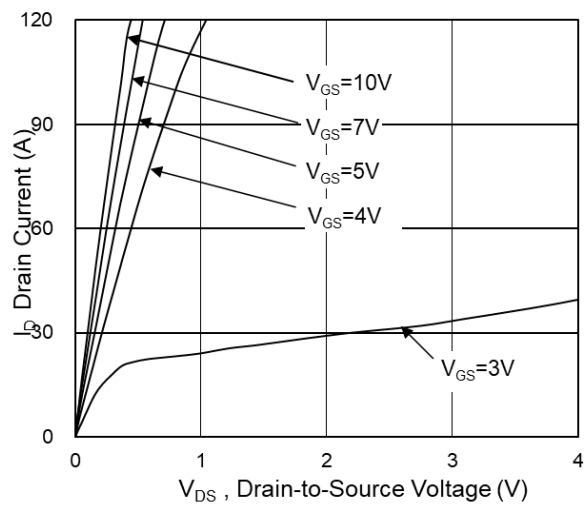
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V DD =25V,V GS =10V,L=0.1mH,I AS =54A

4.The power dissipation is limited by 150℃ junction temperature

5.The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

Typical Characteristic Curves



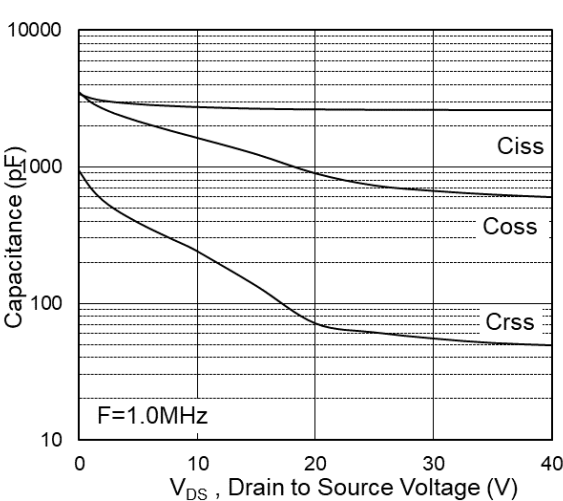


Fig.7 Capacitance

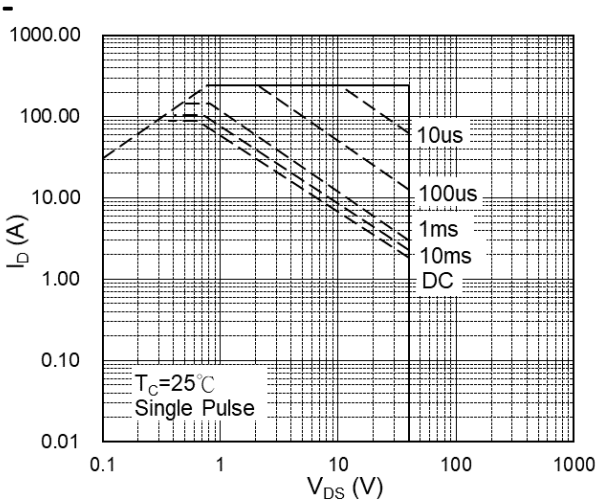


Fig.8 Safe Operating Area

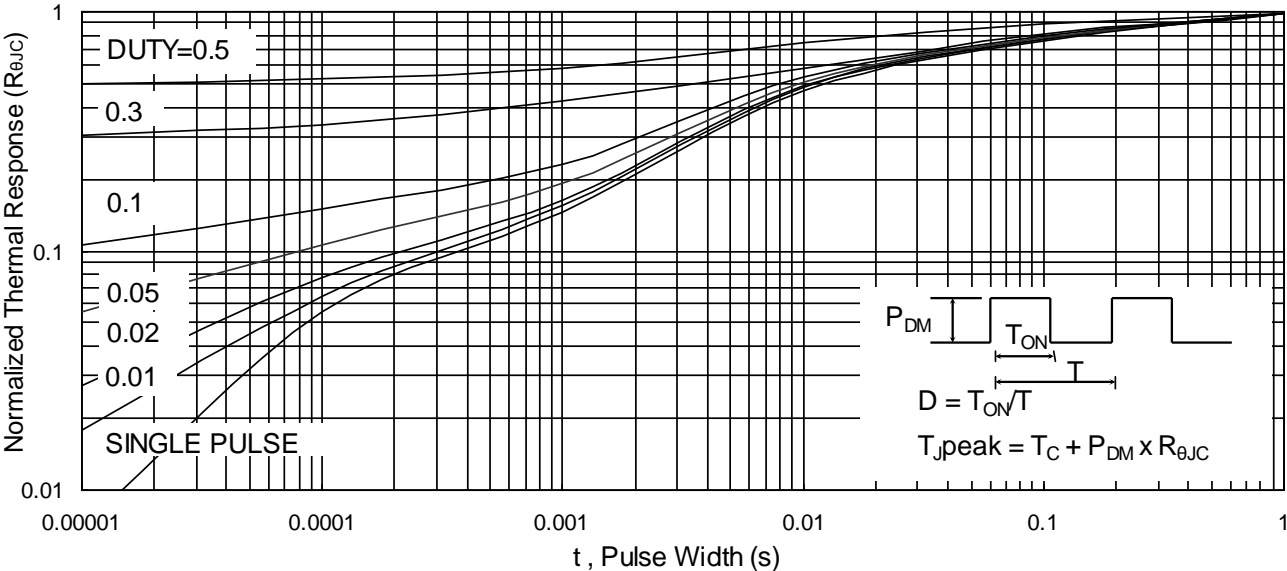


Fig.9 Normalized Maximum Transient Thermal Impedance

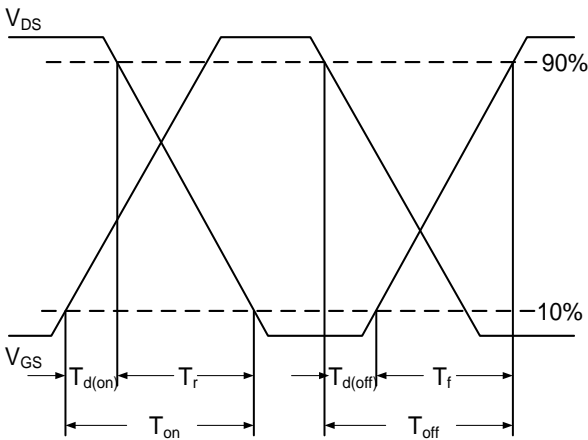


Fig.10 Switching Time Waveform

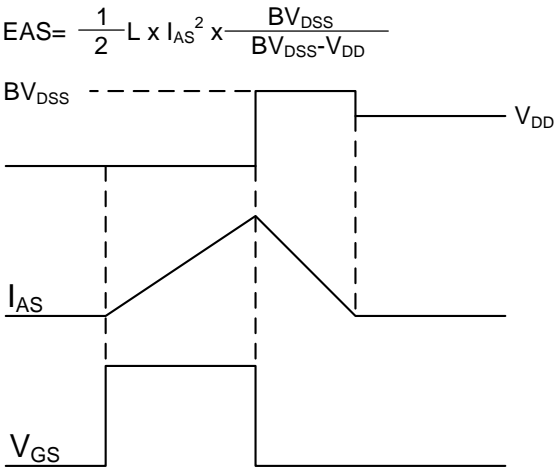
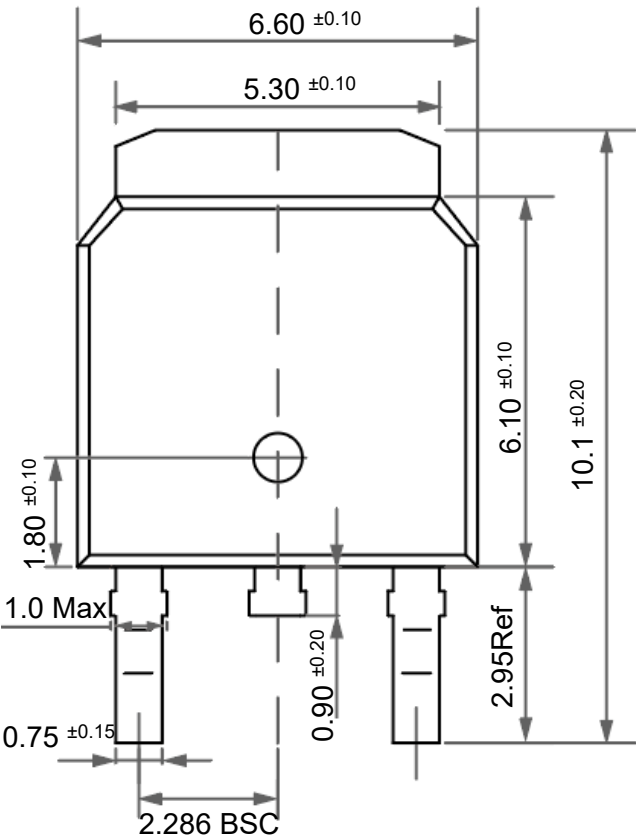


Fig.11 Unclamped Inductive Switching Wave

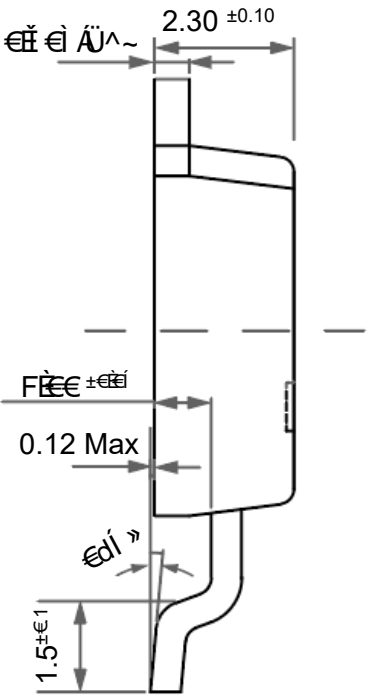
Package Outline

TO-252

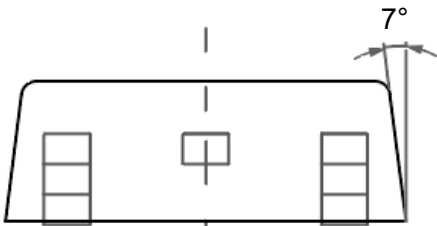
Dimensions in mm



Front View



Side View



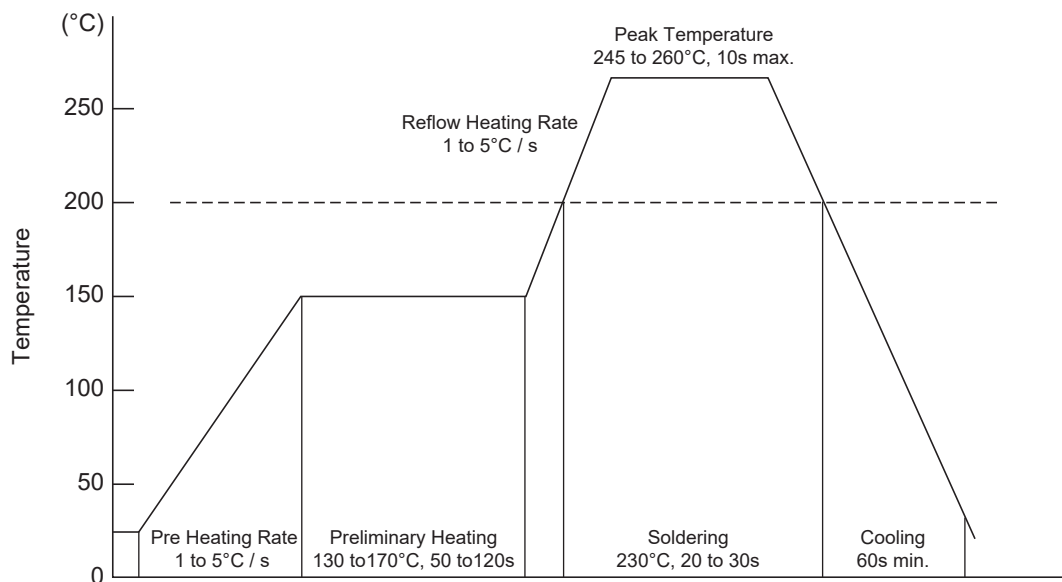
Bottom View

Ordering Information

| Device     | Package | Shipping               |
|------------|---------|------------------------|
| TN120N40TE | TO-252  | 2,500PCS/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

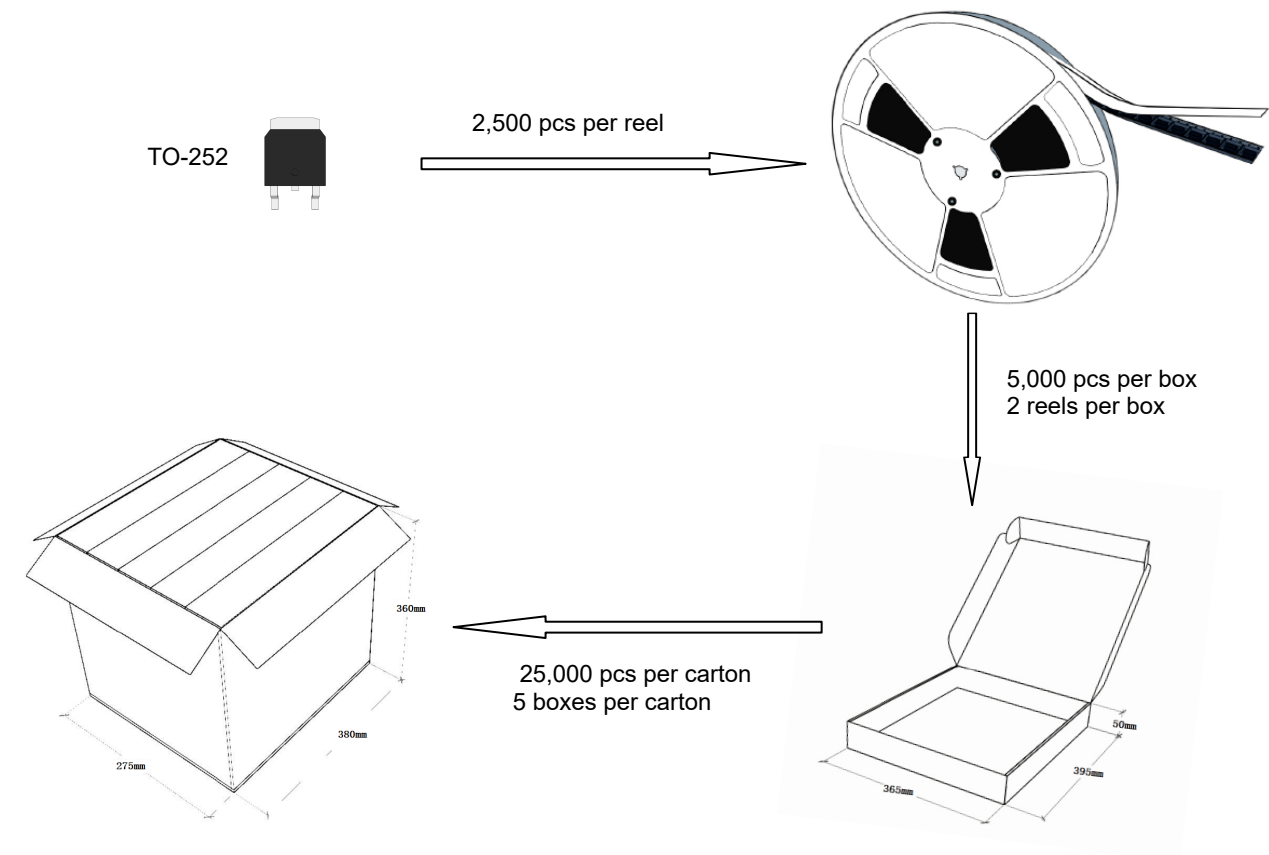
- Temperature: 300°C
- Time: 3s max.
- Times: one time

### ◆ Storage conditions

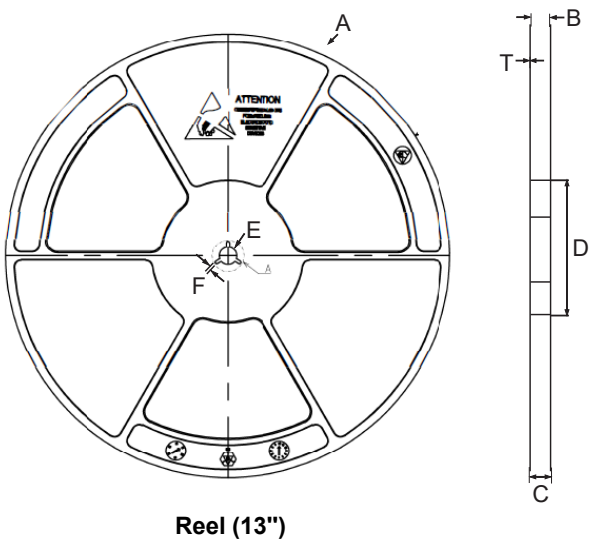
- **Temperature**  
5 to 40°C
- **Humidity**  
30 to 80% RH
- **Recommended period**  
One year after manufacturing

Package Specifications

- The method of packaging

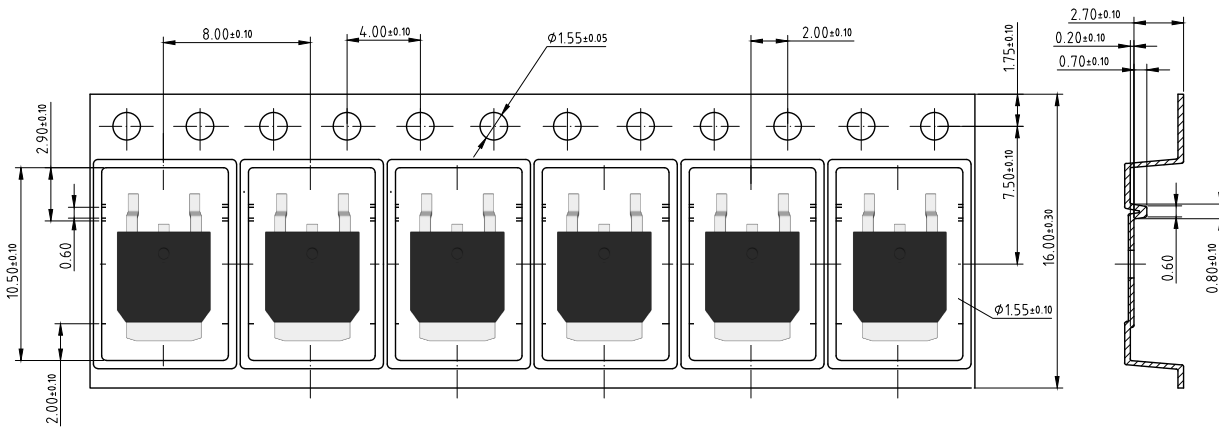


reel data



| Symbol | Value(unit:mm)     |
|--------|--------------------|
| A      | $\Phi 330.2\pm 1$  |
| B      | $17\pm 0.5$        |
| C      | $21.2\pm 2$        |
| 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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