TN60H04BNTE

N-Channel Enhancement Mode Power MOSFET

Product Summary

- V_{DS}= 600V,I_D= 4A
- $R_{DS(on)}$< 2.3Ω @V_{GS}= 10V

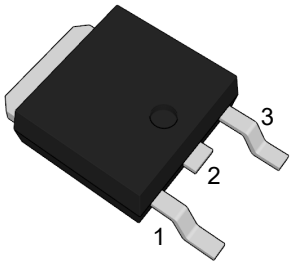
Features

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

Application

- AC-DC Switching Power Supplies
- DC-DC Power Converter
- High Voltage High-Bridge PWM Motor Driver

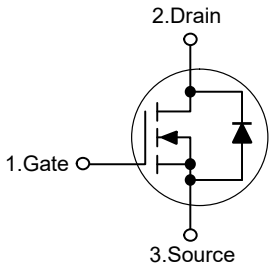
TO-252



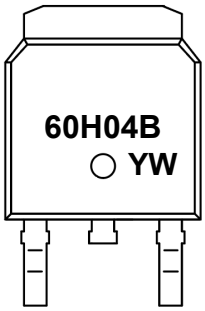
(Top View)

Pin	Description
1	Gate
2	Drain
3	Source

Schematic Diagram



Marking Code



Absolute Maximum Ratings

Ratings at 25℃ case temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	±30	V
Drain Current-Continuous	I_D	4	A
Drain Current-Pulsed Note1	I_{DM}	16	A
Maximum Power Dissipation	P_D	147	W
Single Pulse Avalanche Energy Note2	E_{AS}	170	mJ
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C

Thermal Characteristics

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.85	°C/W

Electrical Characteristics

(T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Off characteristics						
BV_{DSS}	Drain to source breakdown voltage	V_{GS}=0V, I_D=250uA	600			V
ΔBV_{DSS} / ΔT_J	Breakdown voltage temperature coefficient	I_D=250uA, referenced to 25°C		0.5		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=610V, V_{GS}=0V			1	uA
		V_{DS}=488V, T_C=125°C			50	uA
I_{GSS}	Gate to source leakage current, forward	V_{GS}=30V, V_{DS}=0V			100	nA
	Gate to source leakage current, reverse	V_{GS}=-30V, V_{DS}=0V			-100	nA
On characteristics						
$V_{GS(TH)}$	Gate threshold voltage	V_{DS}=V_{GS}, I_D=250uA	2.5		4.5	V
$R_{DS(ON)}$	Drain to source on state resistance	V_{GS}=10V, I_D = 2A		2	2.2	Ω
Gfs	Forward Transconductance	V_{DS} = 30 V, I_D = 2A		3.3		S
Dynamic characteristics						
C_{iss}	Input capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz		586		pF
C_{oss}	Output capacitance			71		
C_{rss}	Reverse transfer capacitance			7.6		
$t_{d(on)}$	Turn on delay time	V_{DS}=300V, I_D=4A, R_G=25Ω (note 4,5)		12		ns
tr	Rising time			27		
$t_{d(off)}$	Turn off delay time			33		
t_f	Fall time			25		
Q_g	Total gate charge	V_{DS}=480V, V_{GS}=10V, I_D=4A (note 4,5)		17		nC
Q_{gs}	Gate-source charge			8		
Q_{gd}	Gate-drain charge			5		

Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			4	A
I_{SM}	Pulsed source current				16	A
V_{SD}	Diode forward voltage drop.	I_S=4A, V_{GS}=0V			1.5	V
T_{rr}	Reverse recovery time	I_S=4A, V_{GS}=0V, dI_F/dt=100A/us		366		ns
Q_{rr}	Reverse recovery Charge			1.9		uC

※. Notes

1. Repeatitive rating : pulse width limited by junction temperature.
2. L = 21mH, I_{AS} = 4A, V_{DD} = 50V, R_G=25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4A, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Staring T_J =25°C
4. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%.
5. Essentially independent of operating temperature.

Typical Characteristic Curves

Fig. 1. On-state characteristics

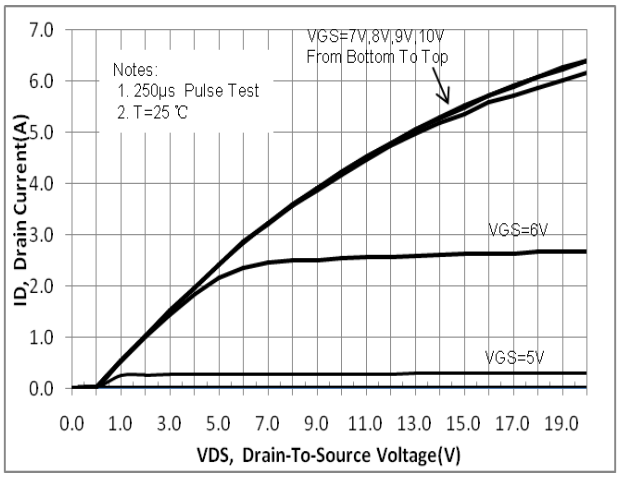


Fig. 2. On-resistance variation vs. drain current and gate voltage

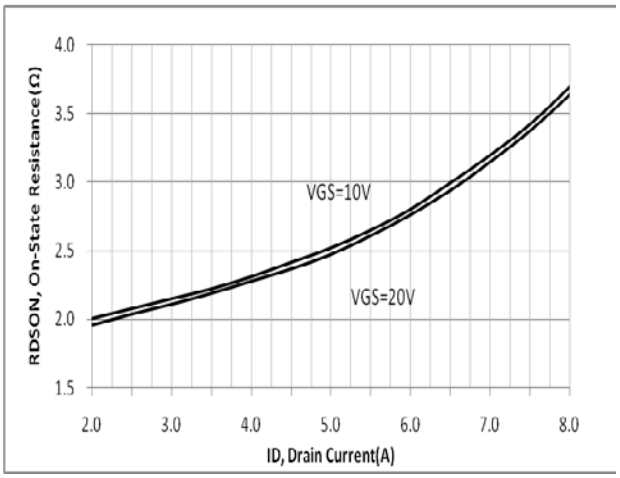


Fig. 3. Gate charge characteristics

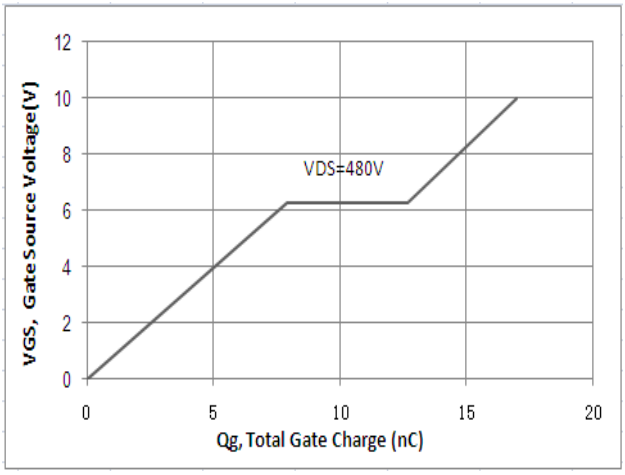


Fig. 4. On state current vs. diode forward voltage

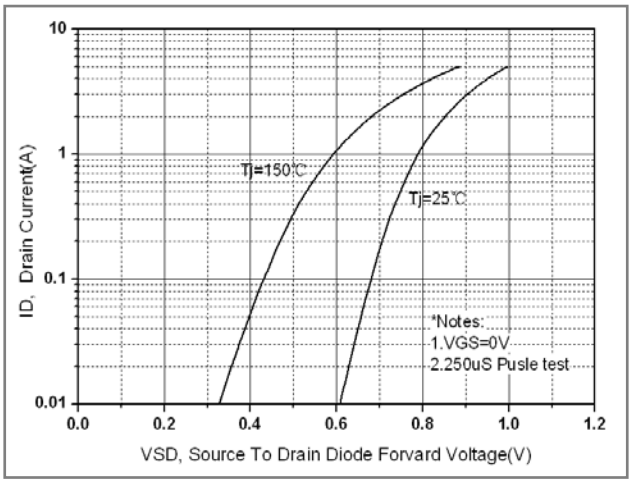


Fig 5. Breakdown Voltage Variation vs. Junction Temperature

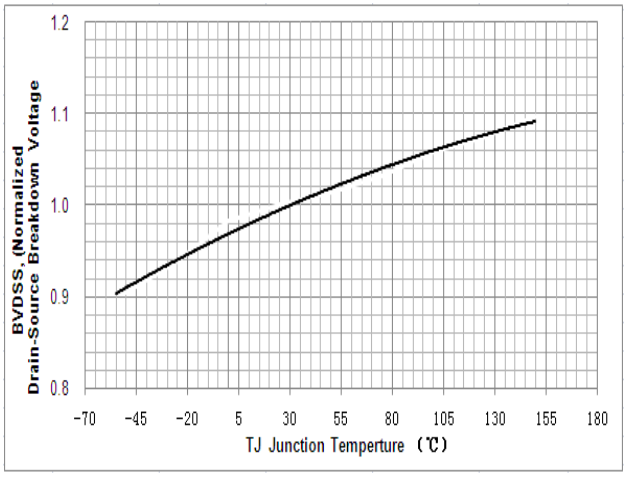


Fig. 6. On resistance variation vs. junction temperature

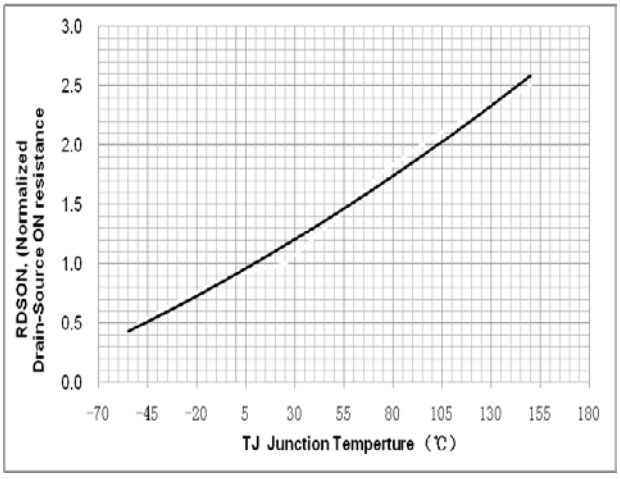


Fig. 7. Maximum safe operating area（TO-251）

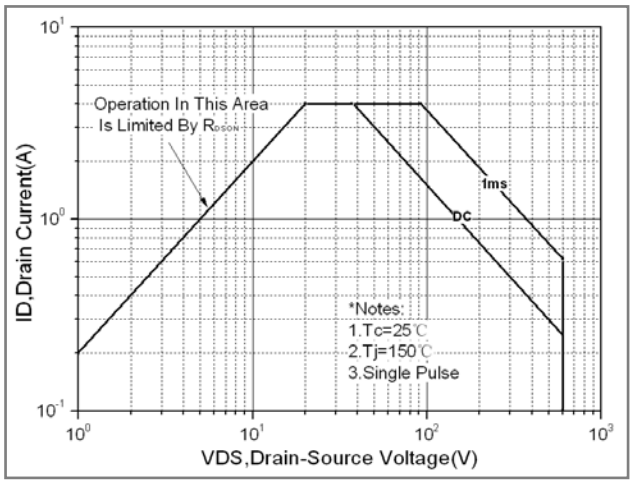


Fig. 8. Transient thermal response curve（TO-251）

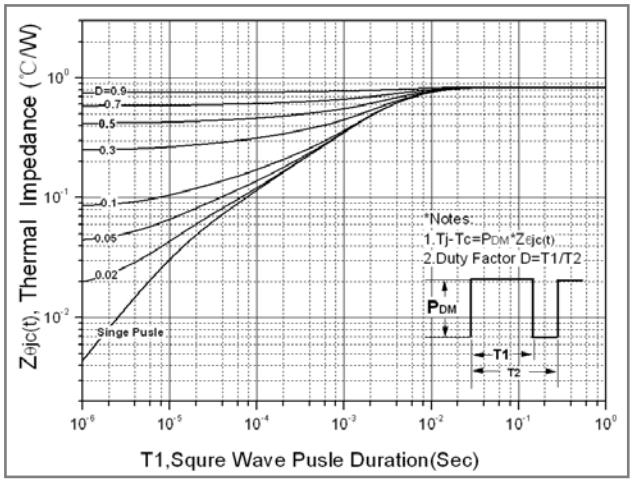


Fig. 9. Maximum safe operating area（TO-252）

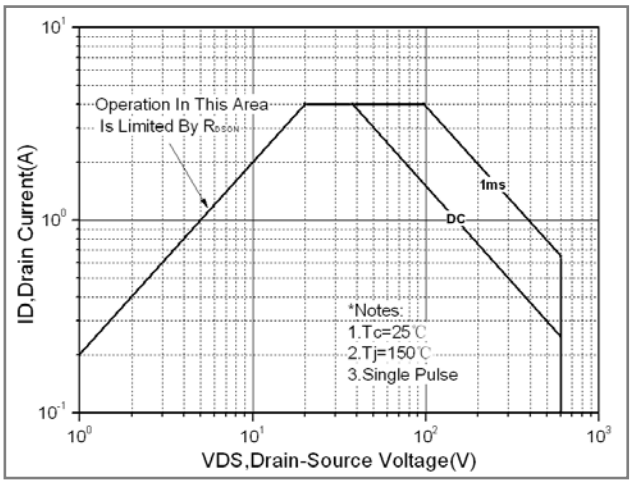


Fig. 10. Transient thermal response curve（TO-252）

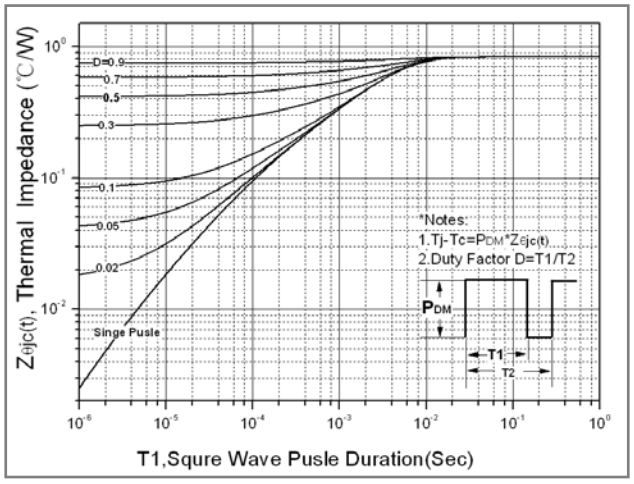
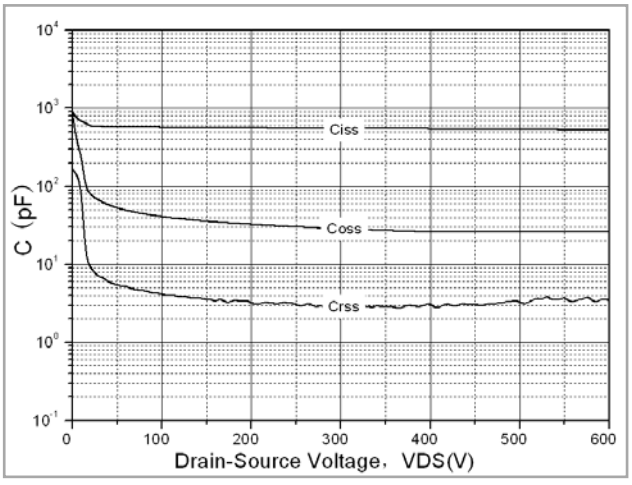


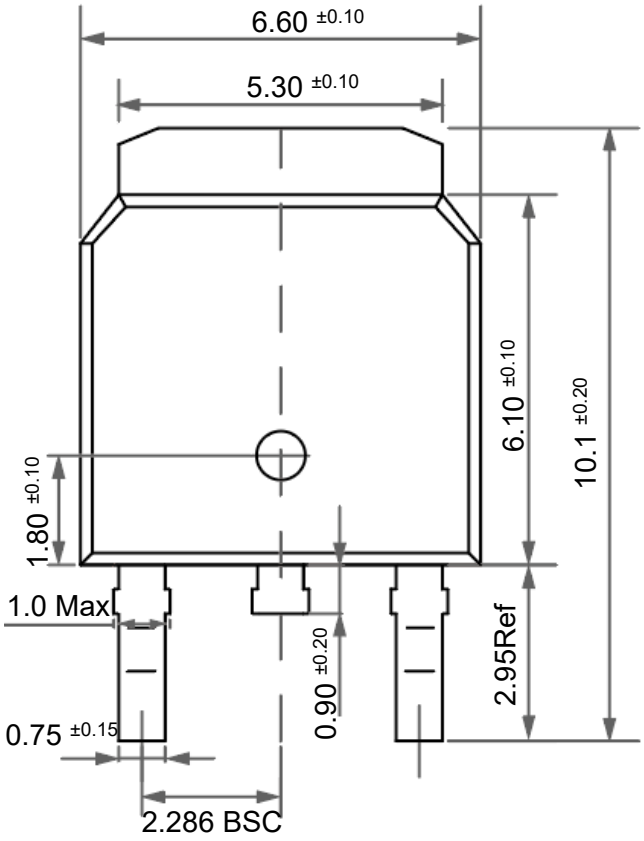
Fig. 11. Capacitance Characteristics



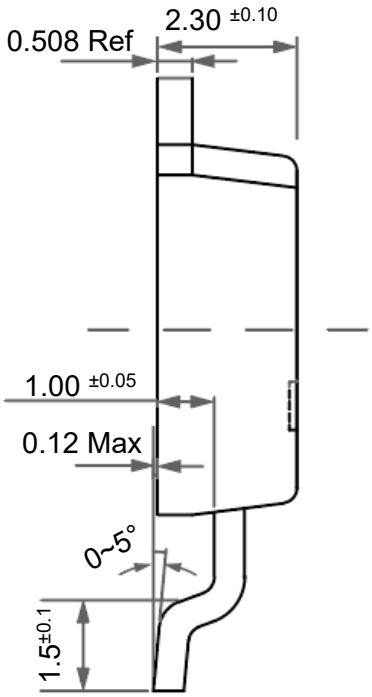
Package Outline

TO-252

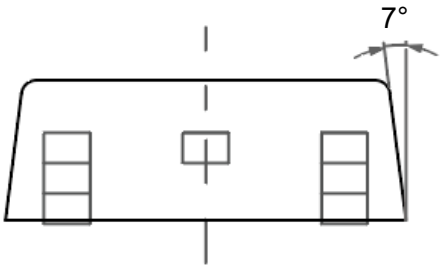
Dimensions in mm



Front View



Side View



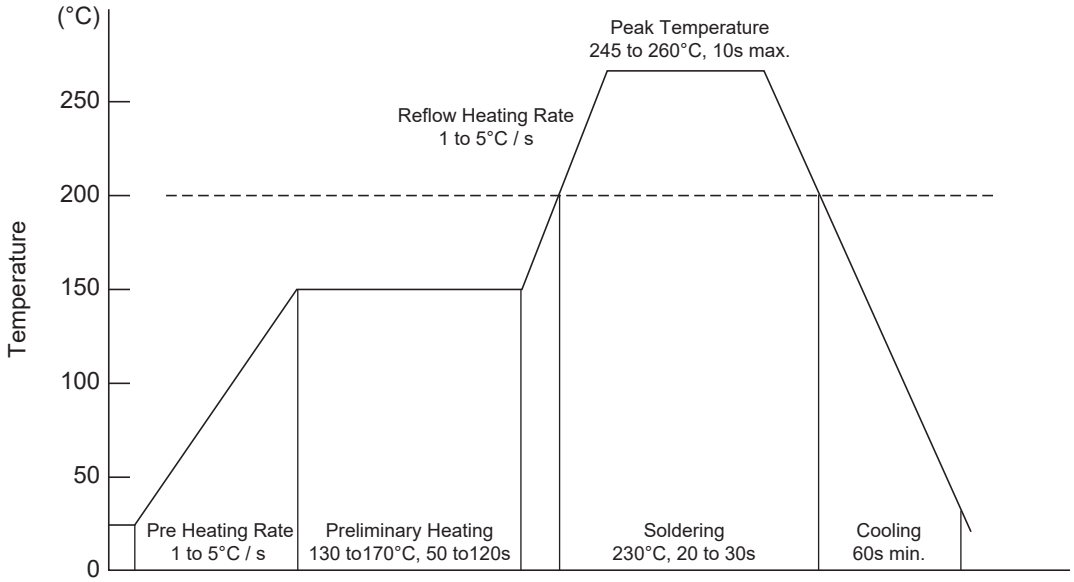
Bottom View

Ordering Information

Device	Package	Shipping
TN60H04BNTE	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

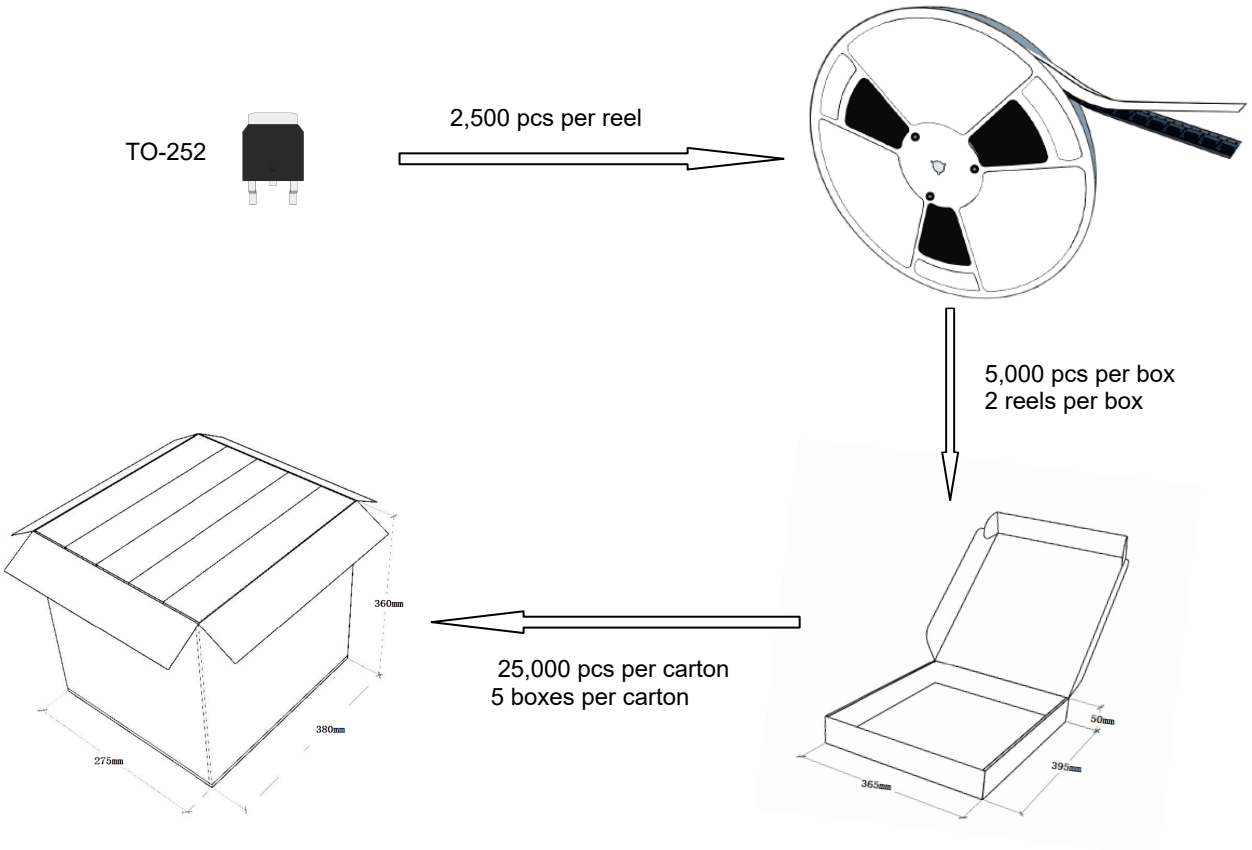
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

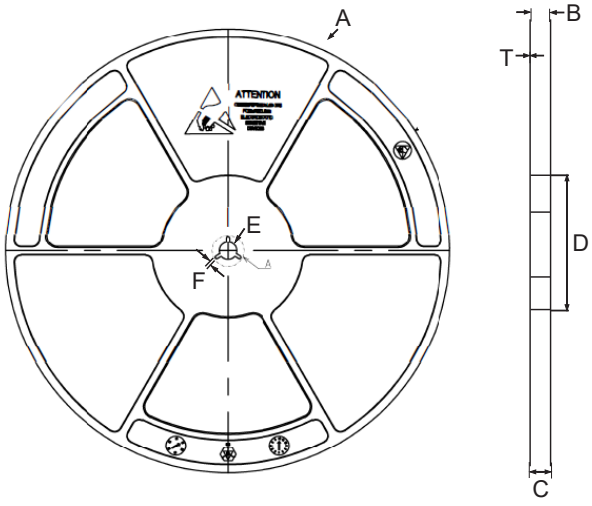
- **Temperature**
  5 to 40°C
- **Humidity**
  30 to 80% RH
- **Recommended period**
  One year after manufacturing

Package Specifications

- The method of packaging



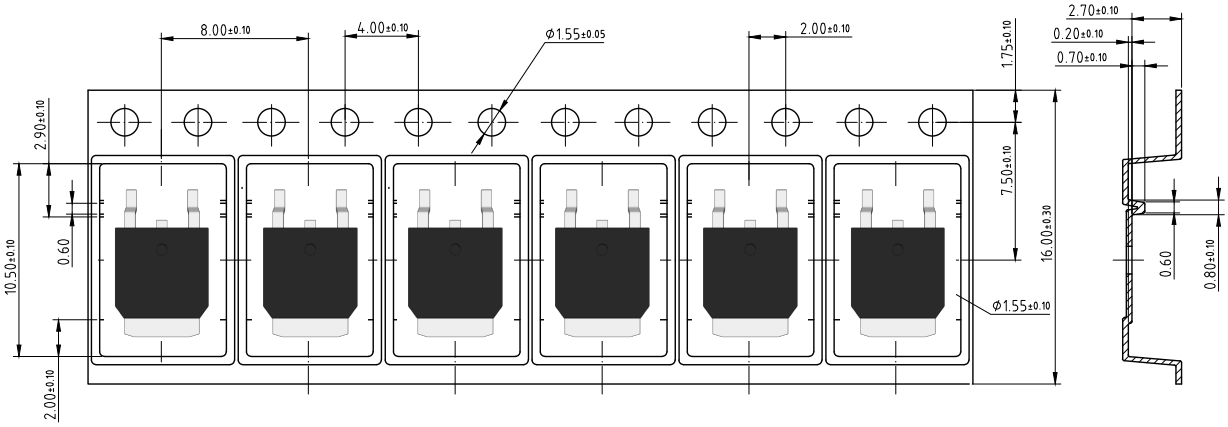
◆ **reel data**



Reel (13")

Symbol	Value(unit:mm)
A	Φ330.2±1
B	17±0.5
C	21.2±2
D	Φ100±0.5
E	Φ13.4±0.2
F	2.3±0.2
T	2.1±0.2

◆ **Embossed tape data**



Contact Information

TANI website: **http://www.tanisemi.com** Email:tani@tanisemi.com

For additional information, please contact your local Sales Representative.

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The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. TANI shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and TANI assumes no responsibility for the application of the product. TANI strives to provide accurate and up -to- date information to the best of our ability. However, due to technical, human, or other reasons, TANI cannot guarantee that the information provided in the product specification is entirely accurate and error-free. TANI shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications.

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