

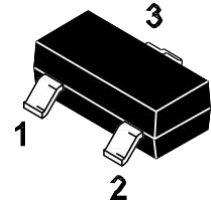
TN2309PSA

P-Channel Enhancement Mode Power MOSFET

Features

- Halogen and Antimony Free
- $V_{DS} = -60V, I_D = -2A$
 $R_{DS(on)} < 200m\Omega @ V_{GS} = -10V$

SOT-23



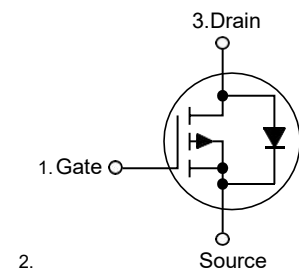
1. Gate 2. Source 3. Drain

Marking Code: S9

Applications

- PWM applications
- Load switch
- Power management

Schematic Diagram



Absolute Maximum Ratings

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	$-I_D$	2	A
Drain Current-Pulsed ^{Note1}	$-I_{DM}$	8	A
Maximum Power Dissipation	P_D	0.9	W
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C

Thermal Characteristics

Thermal Resistance, Junction-to-Ambient ^{Note2}	$R_{\theta JA}$	139	°C/W
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Electrical Characteristics

(Ta=25°C unless otherwise specified)

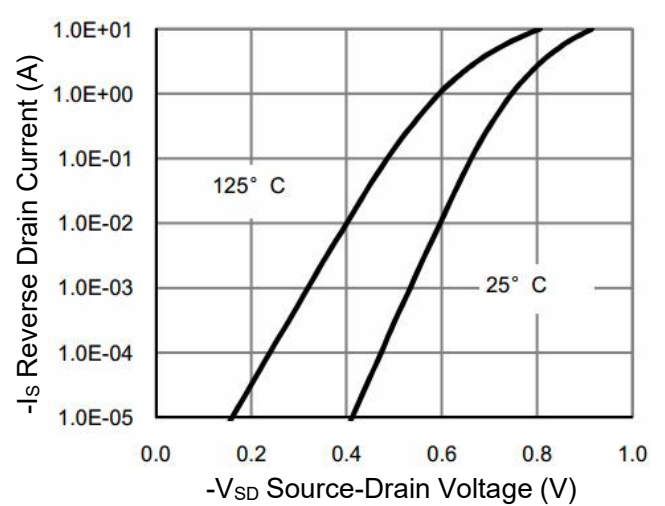
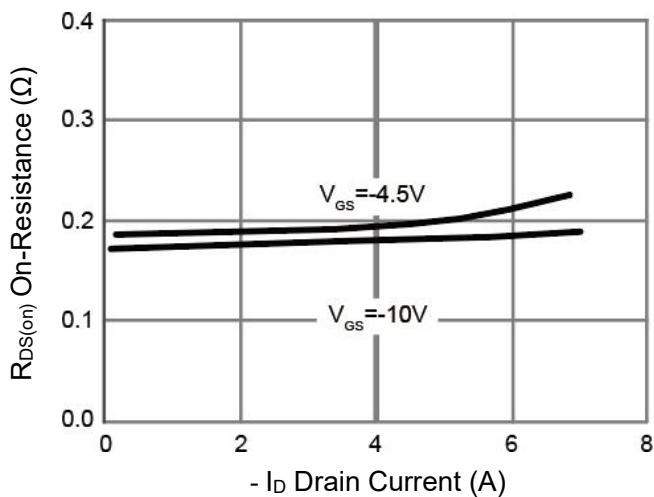
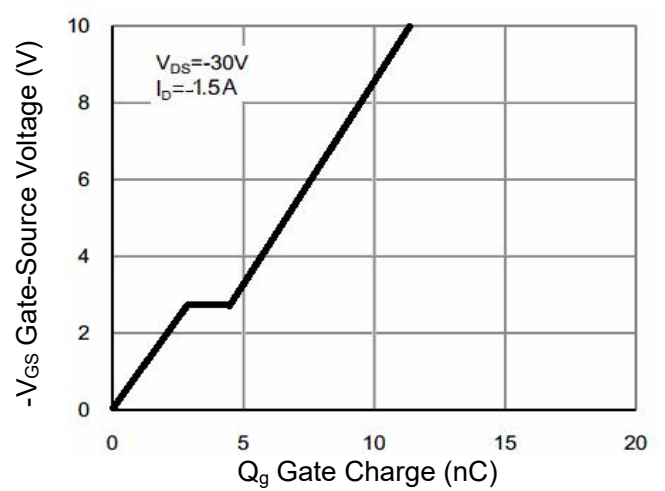
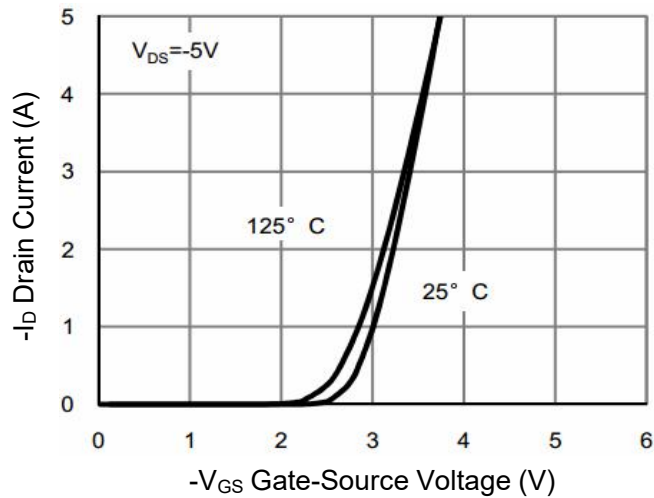
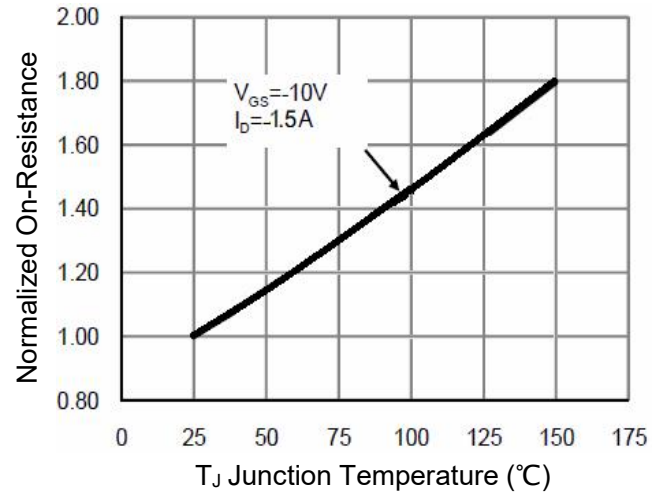
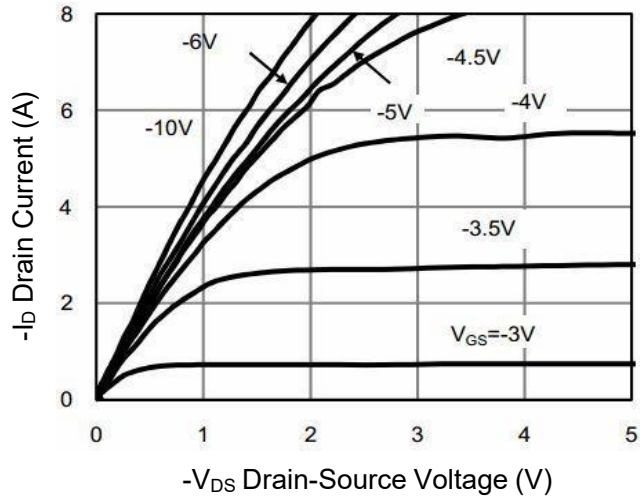
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	-V _{(BR)DSS}	V _{GS} =0V,I _D =-250μA	60	--	--	V
Zero Gate Voltage Drain Current	-I _{DSS}	V _{DS} =-60V,V _{GS} =0V	--	--	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	--	--	±100	nA
Gate Threshold Voltage ^{Note3}	-V _{GS(th)}	V _{DS} =V _{GS} ,I _D =-250μA	1.0	1.8	3.0	V
Drain-Source On-Resistance ^{Note3}	R _{DS(on)}	V _{GS} =-10V,I _D =-2A	--	175	200	mΩ
		V _{GS} =-4.5V,I _D =-1A	--	190	300	mΩ
Forward Transconductance ^{Note3}	g _{FS}	V _{DS} =-5V,I _D =-1A	--	4	--	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-30V,V _{GS} =0V,f=1MHz	--	444.2	--	pF
Output Capacitance	C _{oss}		--	19.6	--	pF
Reverse Transfer Capacitance	C _{rss}		--	17.9	--	pF
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, I _D =-1.5A V _{GS} =-10V,R _{GEN} =3Ω	--	40	--	nS
Turn-on Rise Time	t _r		--	35	--	nS
Turn-off Delay Time	t _{d(off)}		--	15	--	nS
Turn-off Fall Time	t _f		--	10	--	nS
Total Gate Charge	Q _g	V _{DS} =-30V,I _D =-1.5A, V _{GS} =-10V	--	11.3	--	nC
Gate-Source Charge	Q _{gs}		--	2.7	--	nC
Gate-Drain Charge	Q _{gd}		--	1.6	--	nC
Source-Drain Diode Characteristics						
Diode Forward Voltage ^{Note3}	-V _{SD}	V _{GS} =0V,I _S =-2A	--	--	1.2	V
Diode Forward Current ^{Note2}	-I _S		--	--	2	A

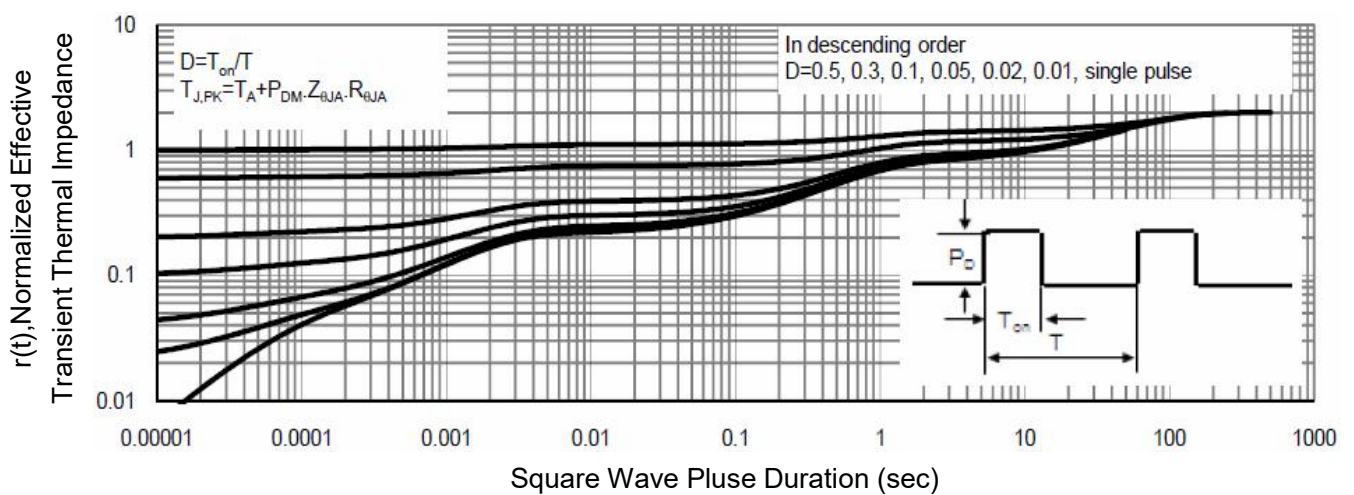
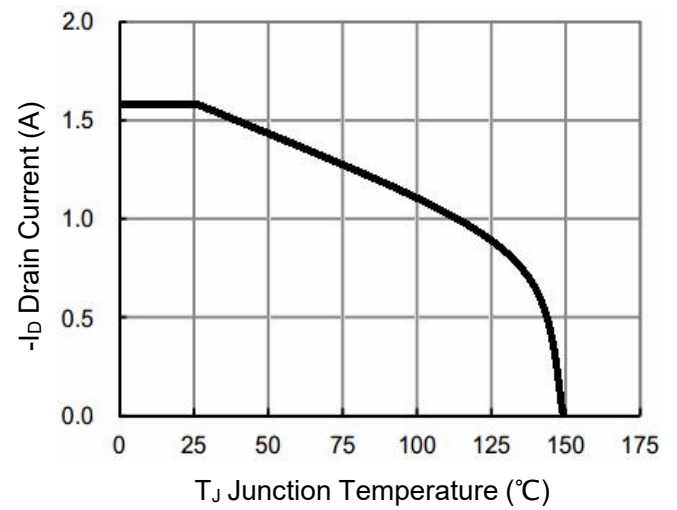
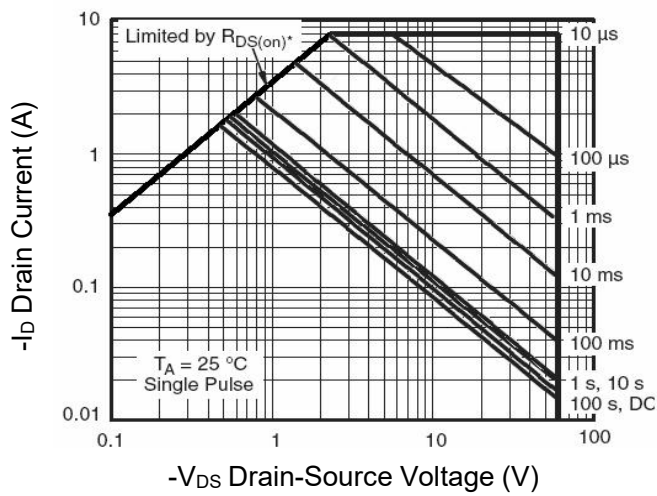
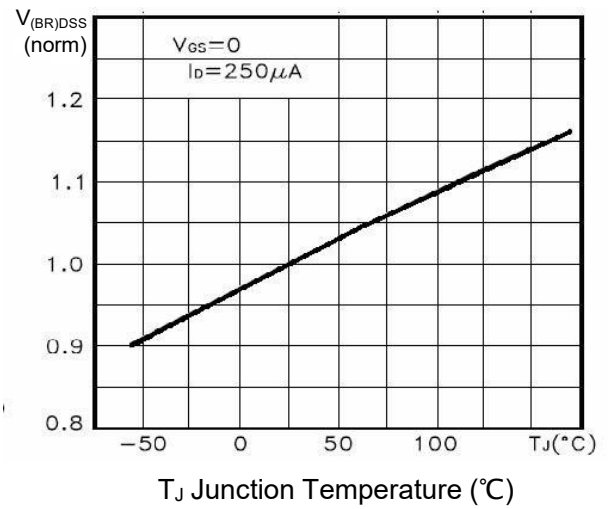
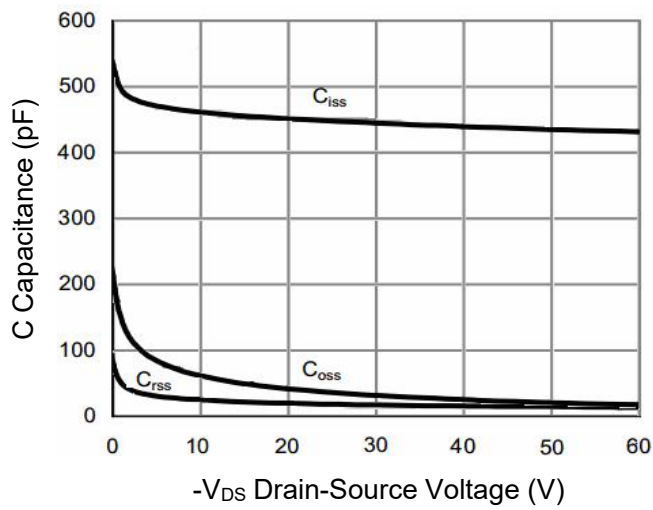
Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board, $t \leq 10$ sec.

3. Pulse Test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Typical Characteristic Curves

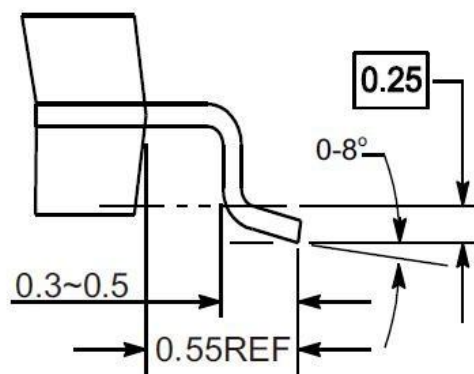
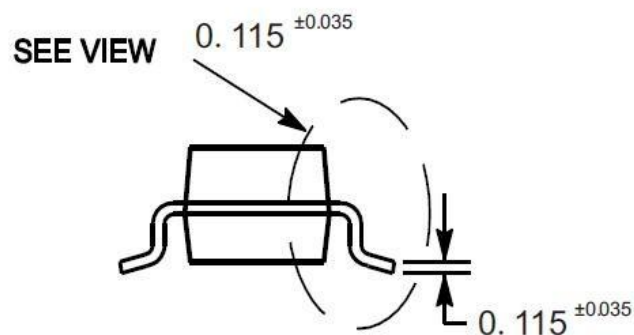
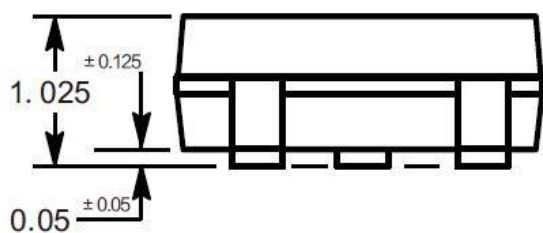
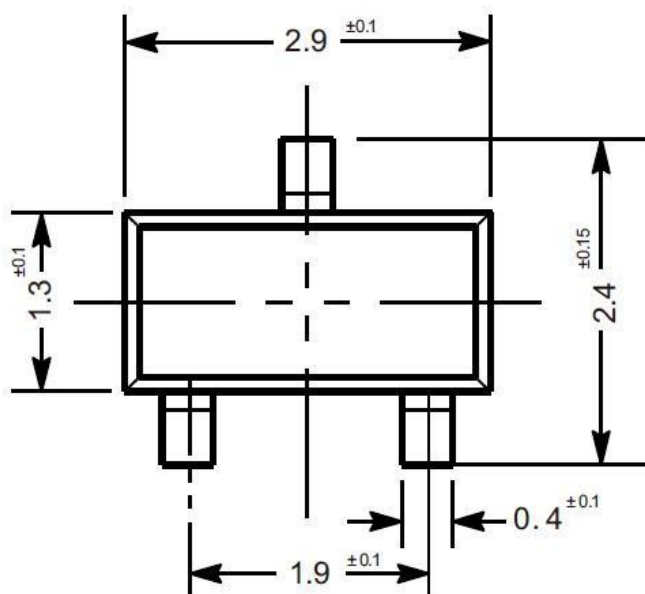




Package Outline

SOT-23

Dimensions in mm



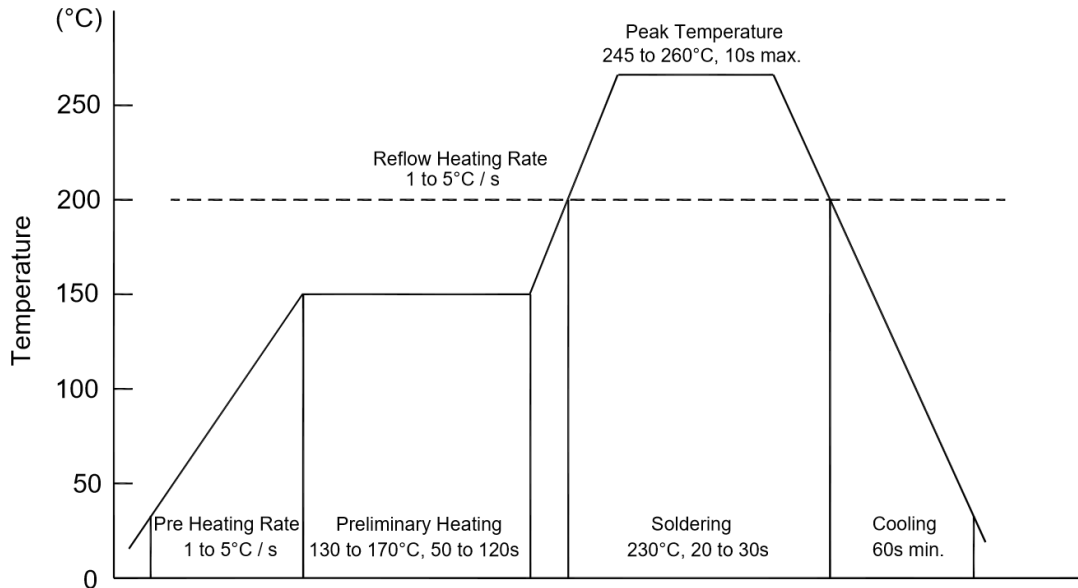
VIEW C

Ordering Information

Device	Package	Shipping
TN2309PSA	SOT-23	3,000PCS/Reel&7inches

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

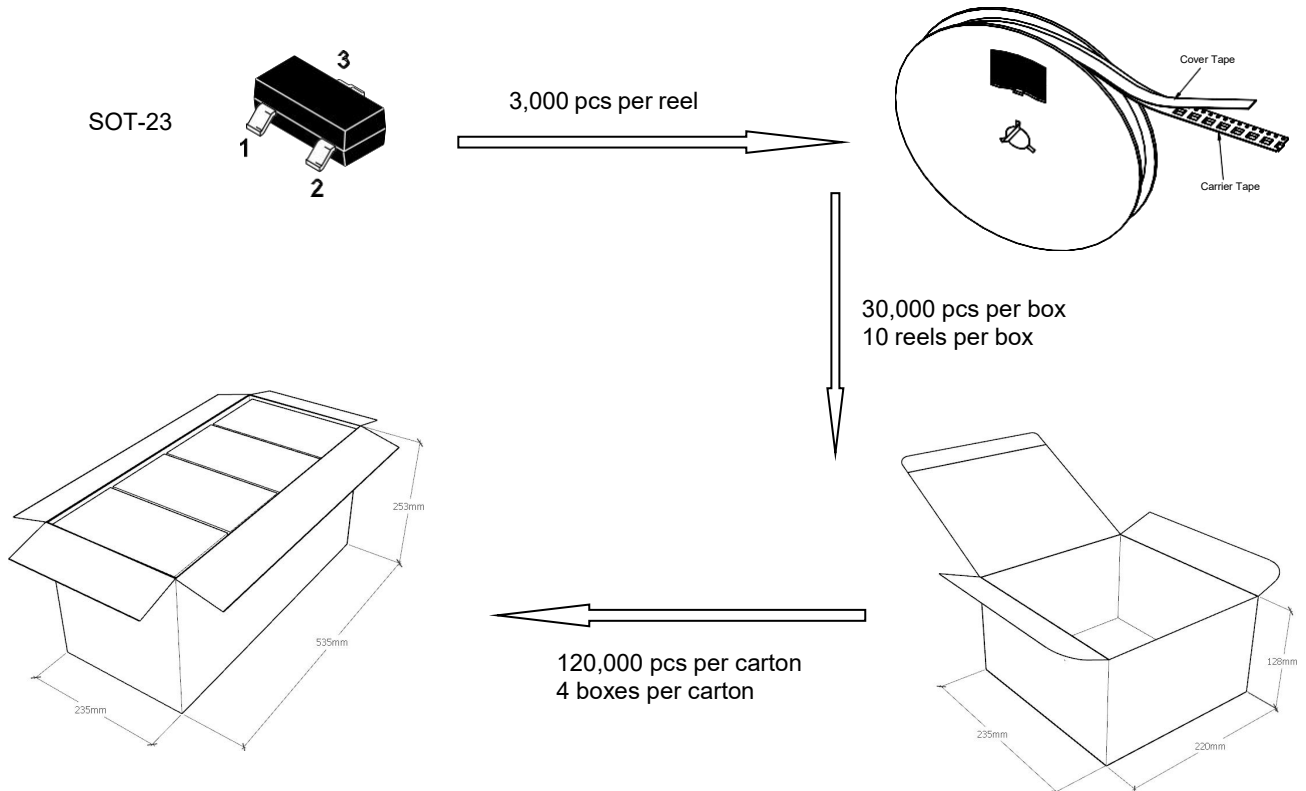
- Temperature: 370 °C
- Time: 3s max.
- Times: one time

◆ Storage conditions

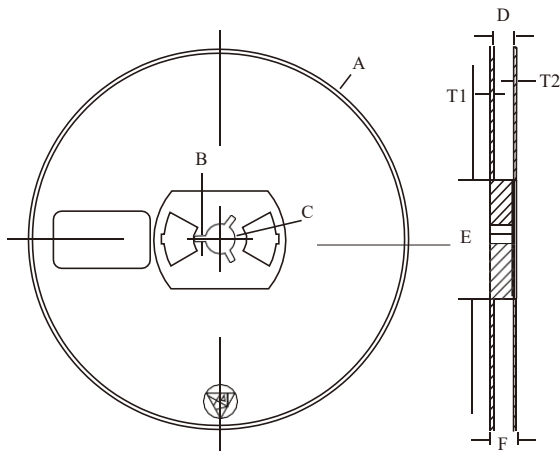
- **Temperature**
5 to 40 °C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing

Package Specifications

- The method of packaging



◆ Embossed tape and reel data



Reel (7")

Symbol	Value (unit: mm)
A	$\varnothing 177.8 \pm 1$
B	2.7 ± 0.2
C	$\varnothing 13.5 \pm 0.2$
E	$\varnothing 54.5 \pm 0.2$
F	12.3 ± 0.3
D	$9.6 +2/-0.3$
T1	1.0 ± 0.2
T2	1.2 ± 0.2

