Programmable Precision Referenc

Description

The TL431K is three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output Voltage may be set to any value between V_{ref} (approximately 2.495V) and 36 V with two external resistors.These devices have provides a very sharp turn-on characteristic,making these device excellent replacement for zener diodes in many applications.

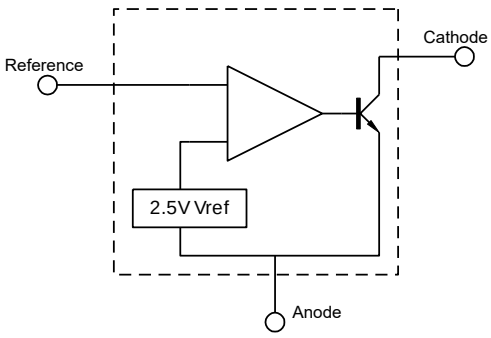
Features

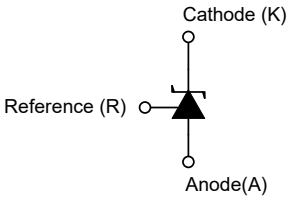
- Wide programmable prise output voltage from 2.495V to 36V
- Sink current capability from 0.5mA to 100mA.
- Low output noise
- Wide Operating Range of -40 to 125℃

Application

- Adjustable voltage and current references
- Voltage monitoring
- Replacement of zener diode
- Comparator with integrated reference

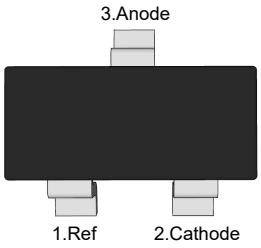
Functional block diagram





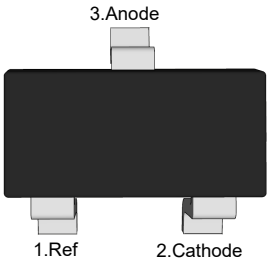
Pin Distribution

SOT-23



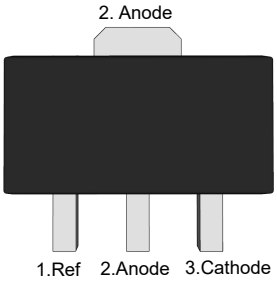
(Top View)

SOT-23-3



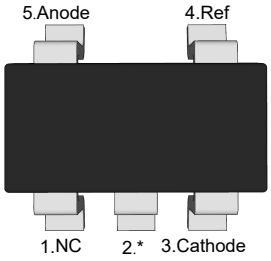
(Top View)

SOT-89



(Top View)

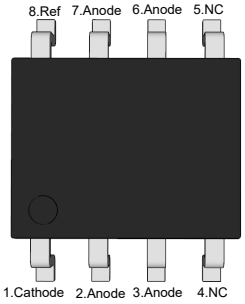
SOT-23-5



(Top View)

NC:No internal connection
*: Attached to substrate and must be connected to Anode or left open

SOP-8



(Top View)

Ordering Information

TL431K□ □

└Package Type
□□(Blank): SOT-23
SC: SOT-23-3
SQ: SOT-89
SE: SOT-23-5
PA: SOP-8

└V_{REF} tolerance
□(Blank): 1%
A: 0.5%
B: 0.4%

Orderable Device	Voltage Tolerance	Package	Reel (inch)	Package Qty (PCS)	Eco Plan Note	MSL Level	Marking Code
TL431K	1%	SOT-23	7	3000	RoHS & Green	MSL1	431K
TL431KA	0.5%	SOT-23	7	3000	RoHS & Green	MSL1	431KA
TL431KB	0.4%	SOT-23	7	3000	RoHS & Green	MSL1	431KB
TL431KSC	1%	SOT-23-3	7	3000	RoHS & Green	MSL3	431KC
TL431KASC	0.5%	SOT-23-3	7	3000	RoHS & Green	MSL3	431KAC
TL431KBSC	0.4%	SOT-23-3	7	3000	RoHS & Green	MSL3	431KBC
TL431KSQ	1%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	431K
TL431KASQ	0.5%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	431KA
TL431KBSQ	0.4%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	431KB
TL431KSE	1%	SOT-23-5	7	3000	RoHS & Green	MSL3	431KE
TL431KASE	0.5%	SOT-23-5	7	3000	RoHS & Green	MSL3	431KAE
TL431KBSE	0.4%	SOT-23-5	7	3000	RoHS & Green	MSL3	431KBE
TL431KPA	1%	SOP-8	13	4000	RoHS & Green	MSL3	431KP
TL431KAPA	0.5%	SOP-8	13	4000	RoHS & Green	MSL3	431KAP
TL431KBPA	0.4%	SOP-8	13	4000	RoHS & Green	MSL3	431KBP

Note:

RoHS: TN defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials.

Green: TN defines "Green" to mean Halogen-Free and Antimony-Free.

Absolute Maximum Ratings (Ta=25℃ unless otherwise specified)

Parameter	Symbol	Value	Units
Cathode Voltage	V_{KA}	37	V
Cathode Current Range(Continuous)	I_{KA}	-100 ~ +150	mA
Reference Input Current Range	I_{REF}	-0.05 ~ +10	mA
Operating Temperature	T_{OPR}	-40 ~ +125	℃
Storage Temperature Range	T_{STG}	-65 ~ +150	℃

Note:Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units
Cathode Voltage	V_{KA}	V_{REF}	36	V
Cathode Current	I_{KA}	0.5	100	mA

Thermal Information

Parameter	Symbol	Value		Units
Junction-to-Ambient thermal resistance	$R_{\theta JA}$	SOT-23	416	°C/W
		SOT-23-3	416	°C/W
		SOT-23-5	416	°C/W
		SOT-89	156	°C/W
		SOP-8	208	°C/W

Electrical Characteristics (Ta=25°C unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Reference Input Voltage [Fig1]	V_{REF}	$V_{KA}=V_{REF}$, $I_{KA}=10mA$	1%(Accuracy)	2.470	2.495	2.520	V
			0.5%(Accuracy)	2.483	2.495	2.507	V
			0.4%(Accuracy)	2.485	2.495	2.505	V
Deviation of Reference Input Voltage Over Temperature [Fig1]	ΔV_{REF}	$V_{KA}=V_{REF}$, $I_{KA}=10mA$ $T_{MIN} \le T_A \le T_{MAX}$		--	--	25	mV
Ratio of Change in Reference Input Voltage to The Change in Cathode Voltage [Fig2]	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA}=10mA$	$\Delta V_{KA}=10V \sim V_{REF}$	--	-1.0	-2.7	mV/V
			$\Delta V_{KA}=36V \sim 10V$	--	-1.0	-2.0	
Reference Input Current [Fig2]	I_{REF}	$I_{KA}=10mA$, R1=10KΩ, R2=∞		--	1	2	μA
Deviation of Reference Input Current Over Full Temperature Range [Fig2]	ΔI_{REF}	$I_{KA}=10mA$, R1=10KΩ, R2=∞, T_A=full Temperature		--	0.2	0.4	μA
Minimum Cathode Current for Regulation [Fig1]	$I_{KA(MIN)}$	$V_{KA}=V_{REF}$		--	50	85	μA
Off-State Cathode Current [Fig3]	$I_{KA(OFF)}$	$V_{KA}=36V$, $V_{REF}=0$		--	0.05	0.5	μA
Dynamic Impedance	Z_{KA}	$V_{KA}=V_{REF}$, $I_{KA}=1 \sim 100mA$, f≤1.0KHz		--	--	0.5	Ω

Figure 1. Test Circuit for $V_{KA} = V_{REF}$

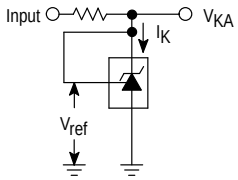


Figure 2. Test Circuit for $V_{KA} > V_{REF}$

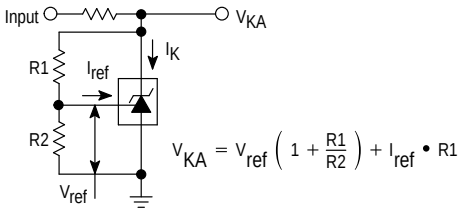
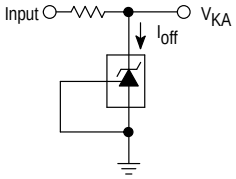
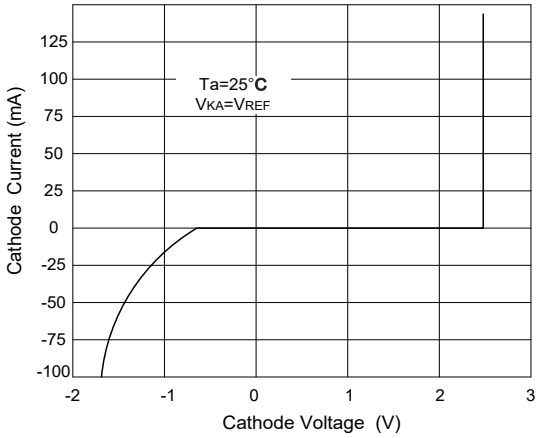
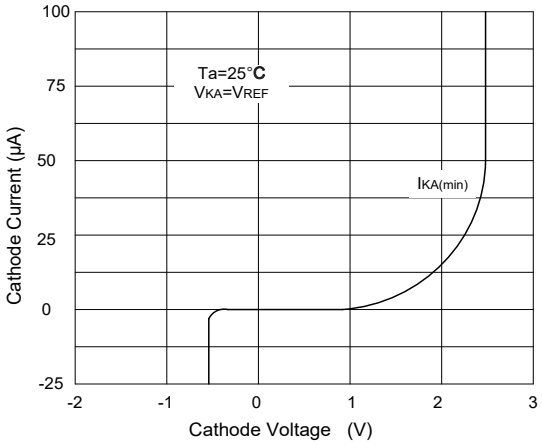


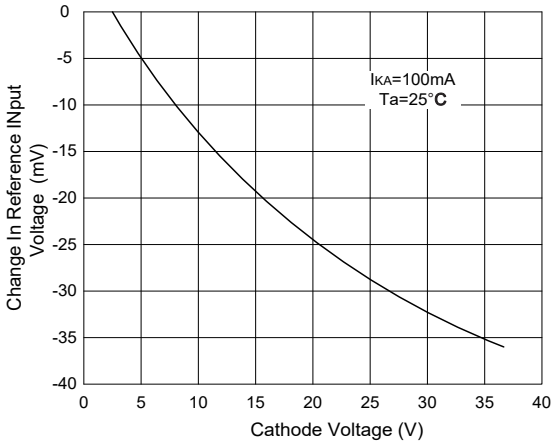
Figure 3. Test Circuit for I_{OFF}

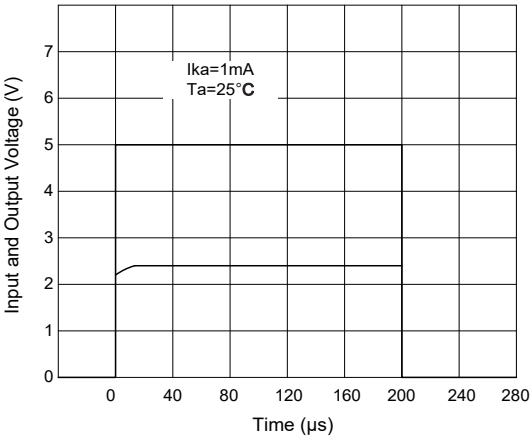


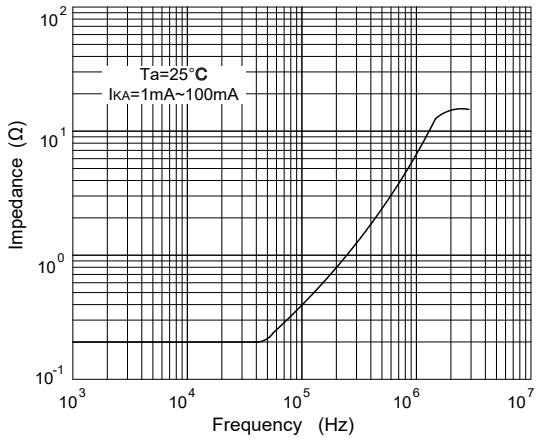
Typical Characteristic Curves

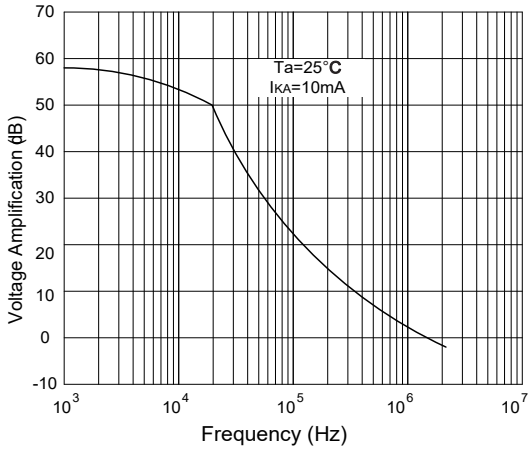








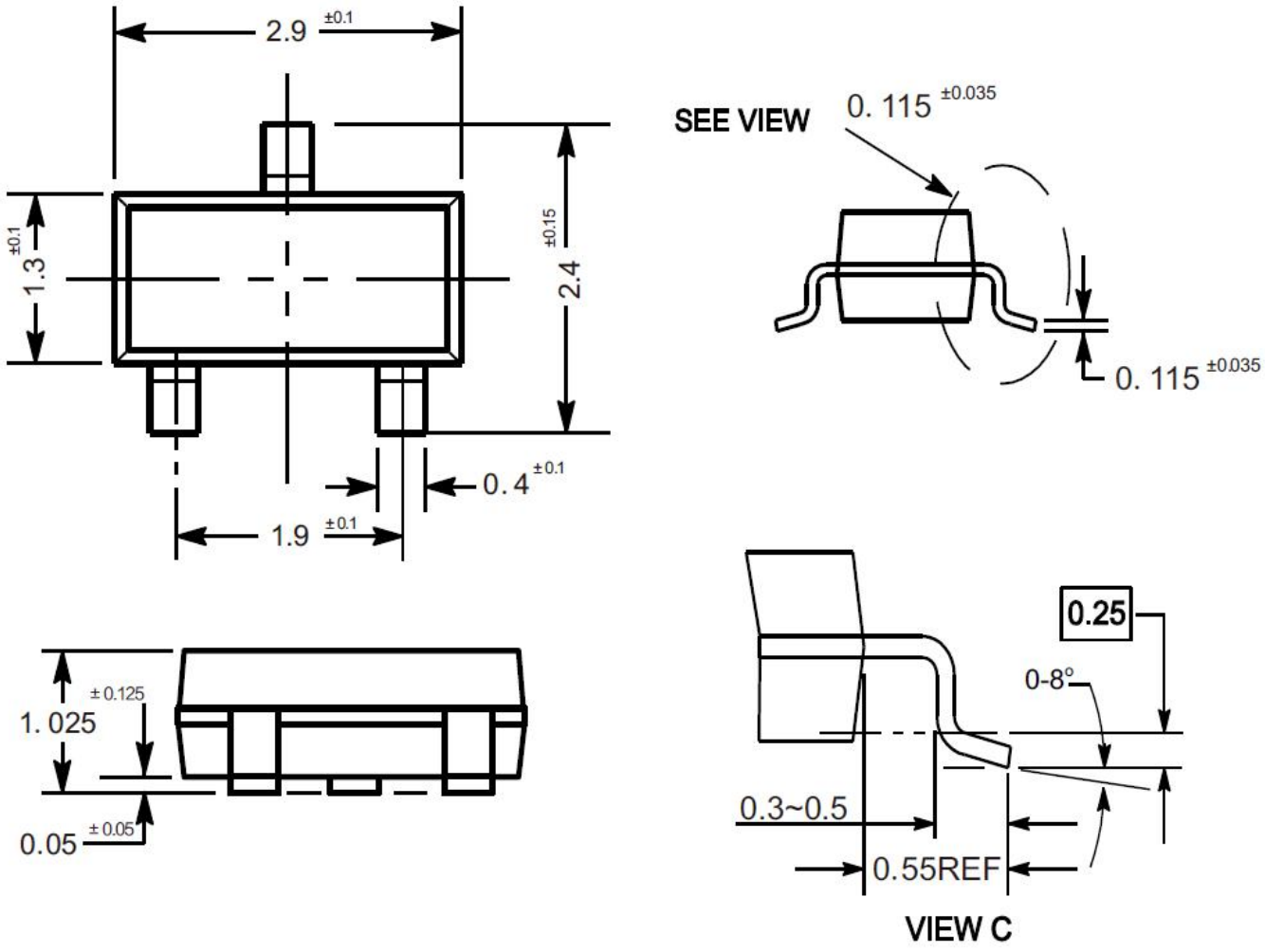




Package Outline

SOT-23

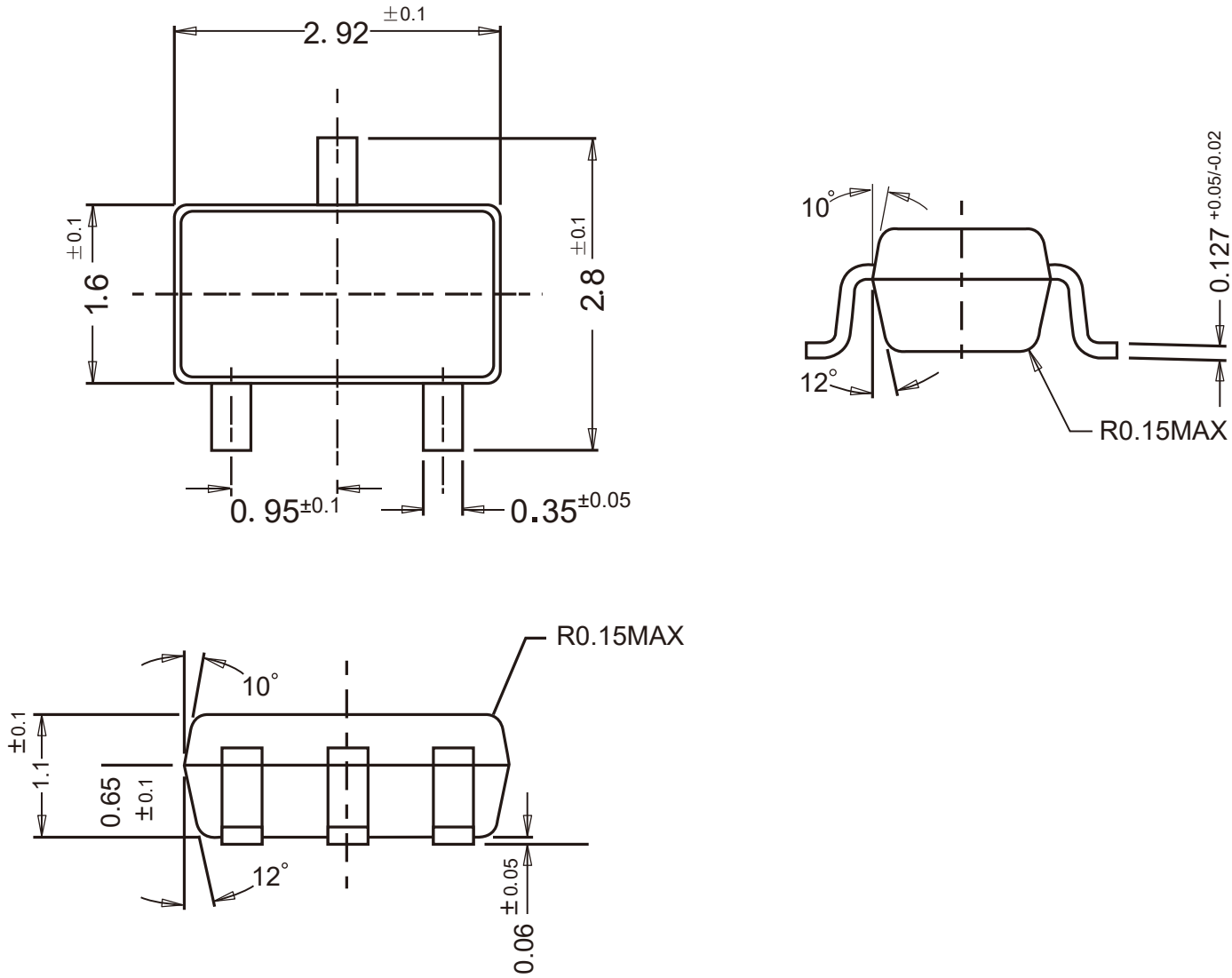
Dimensions in mm



Package Outline

SOT-23-3

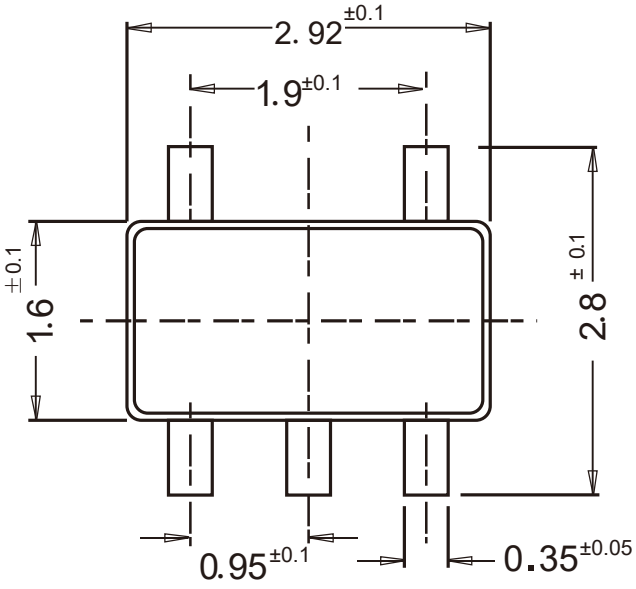
Dimensions in mm

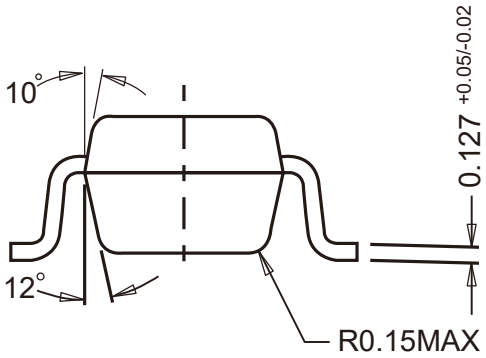


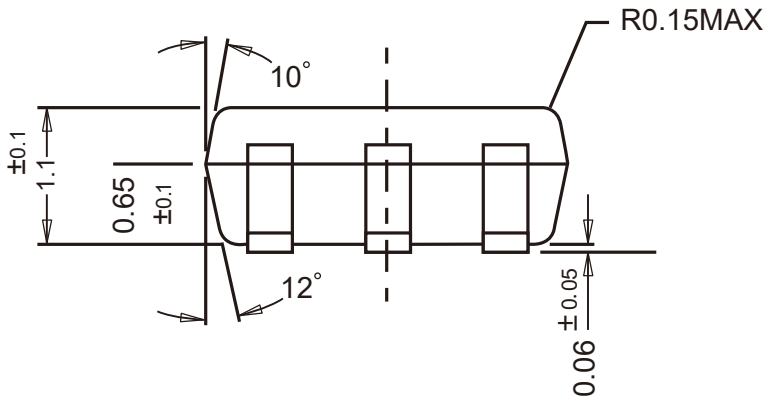
Package Outline

SOT-23-5

Dimensions in mm



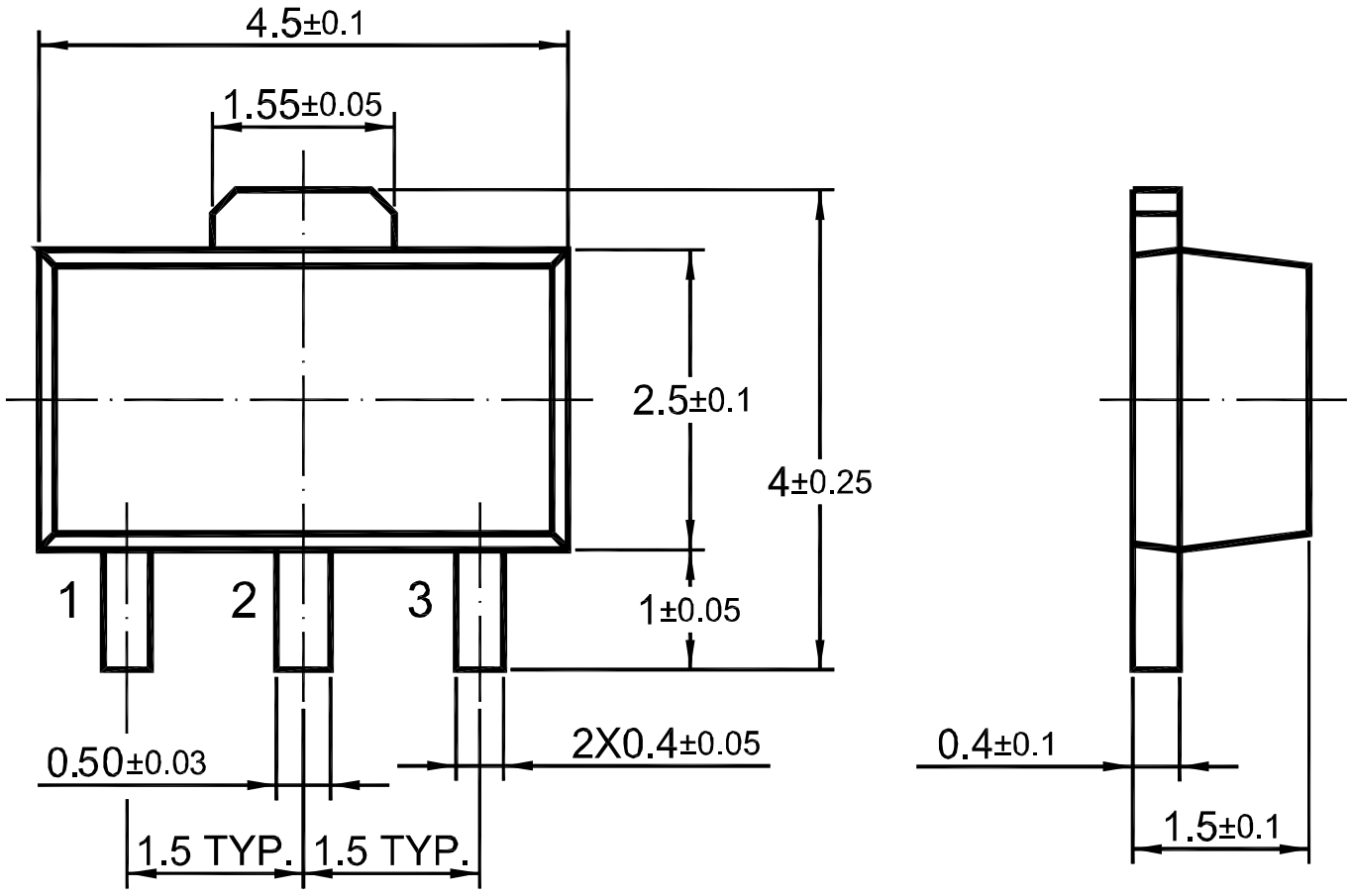




Package Outline

SOT-89

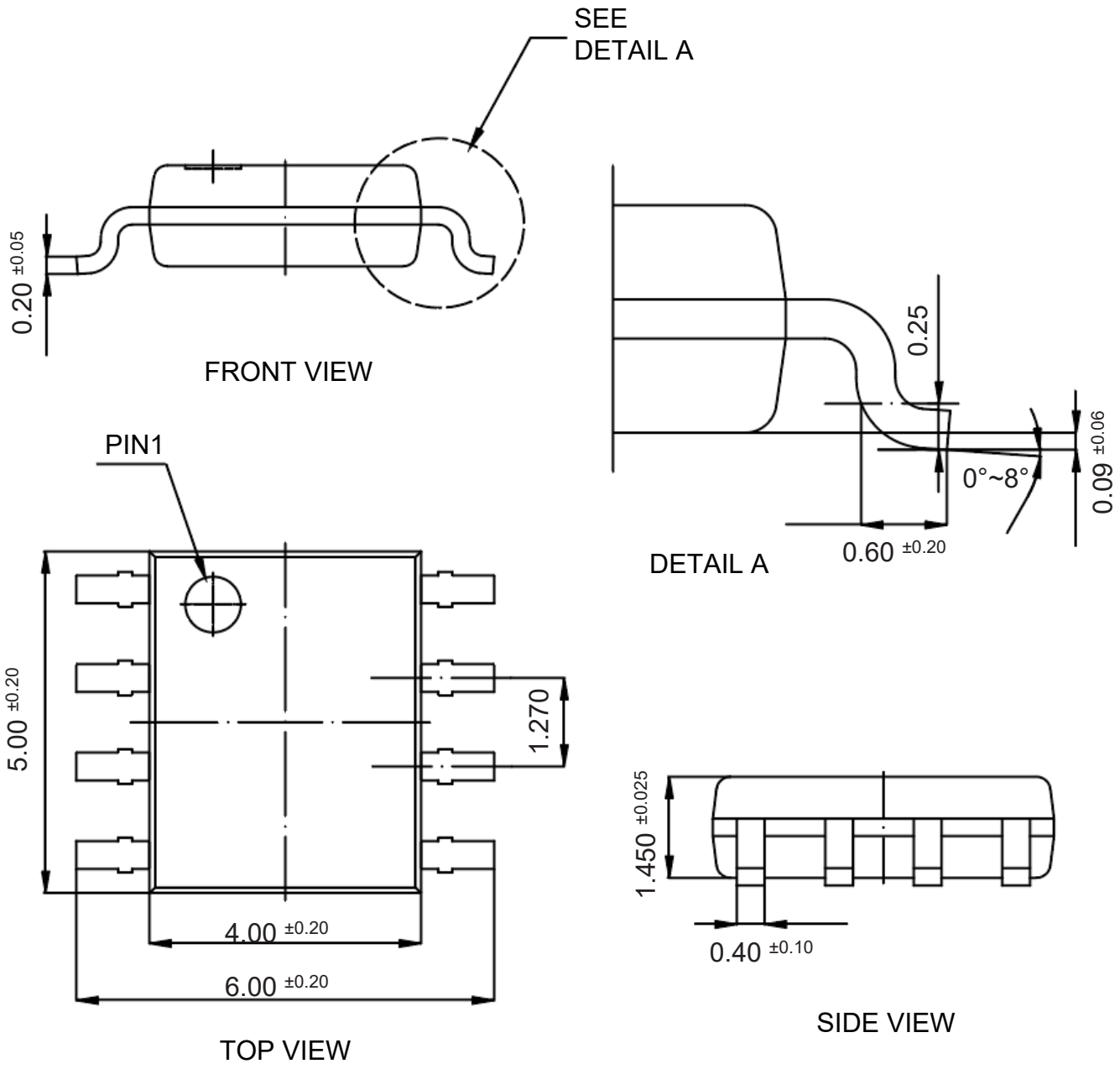
Dimensions in mm



Package Outline

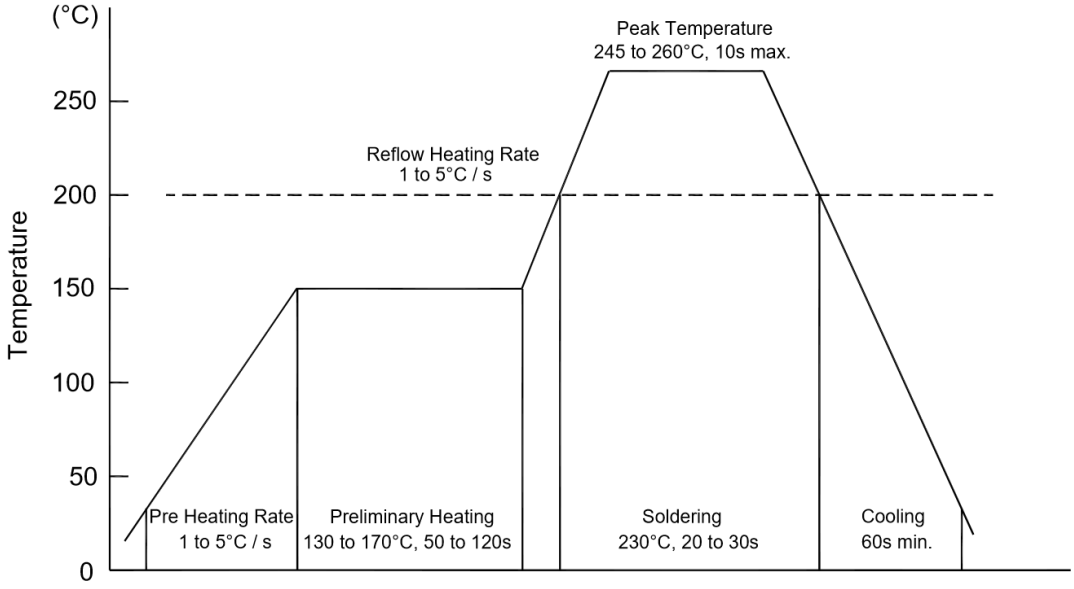
SOP-8

Dimensions in mm



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

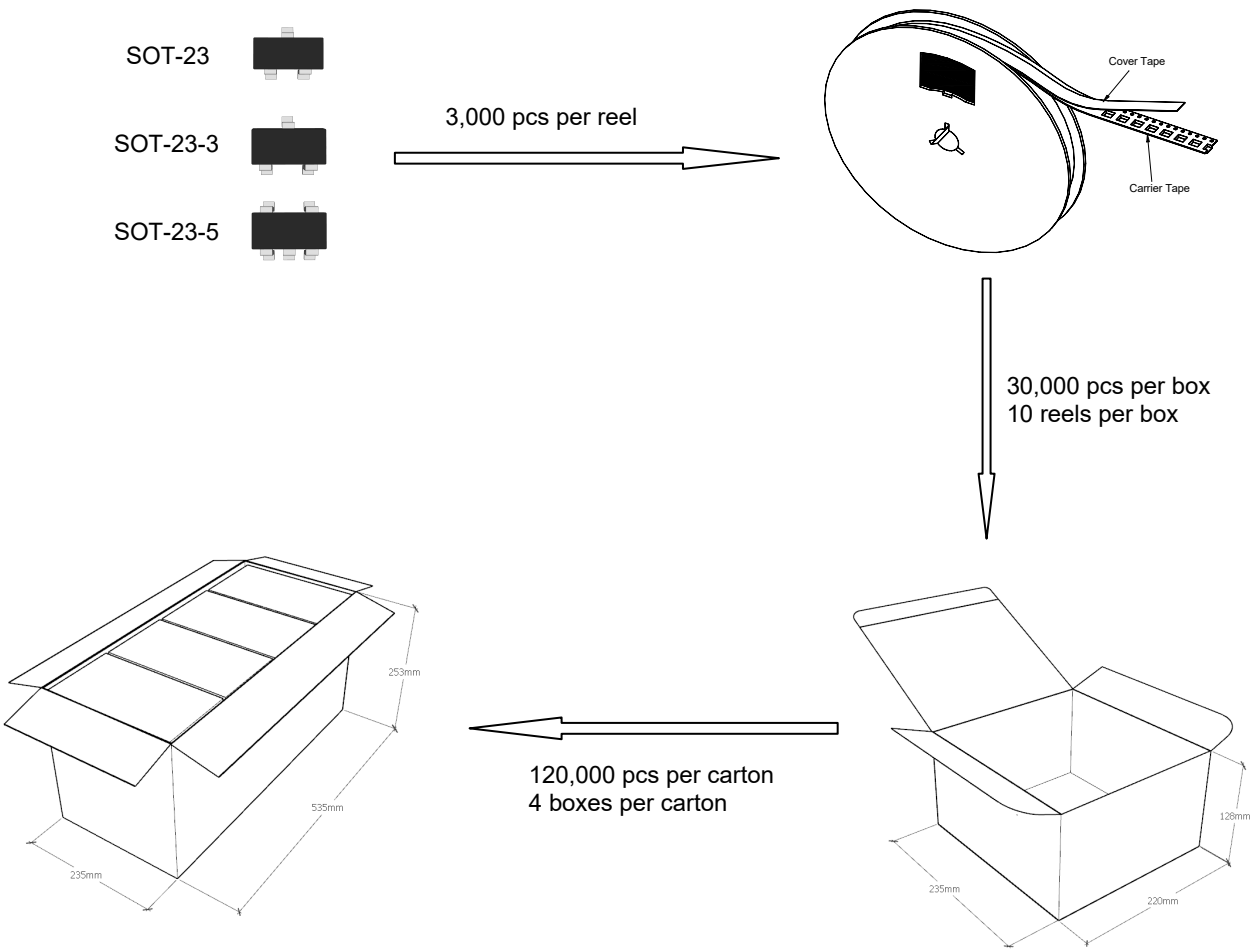
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

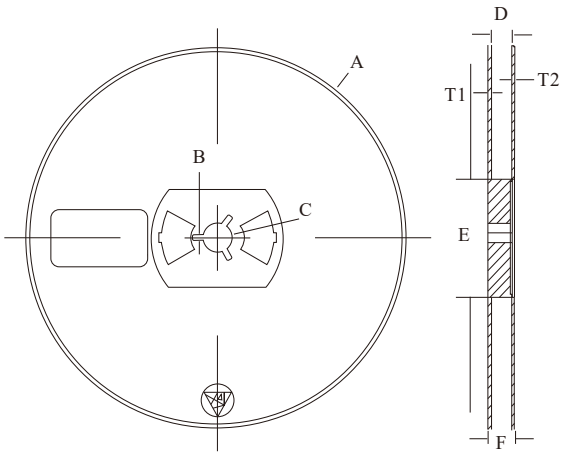
- **Temperature**
  5 to 40°C
- **Humidity**
  30 to 80% RH
- **Recommended period**
  One year after manufacturing

Package Specifications (SOT-23/SOT-23-3/SOT-23-5)

- The method of packaging



◆ **reel data**

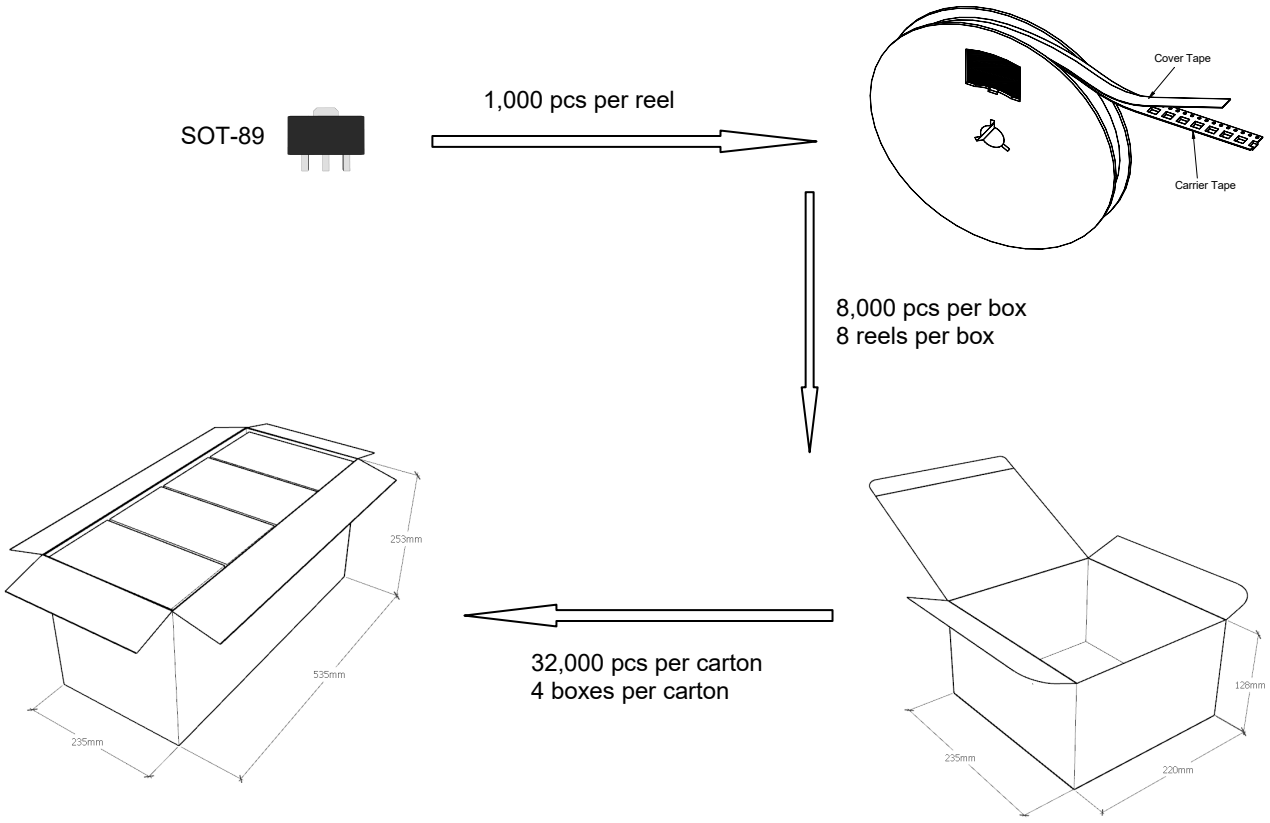


Reel (7")

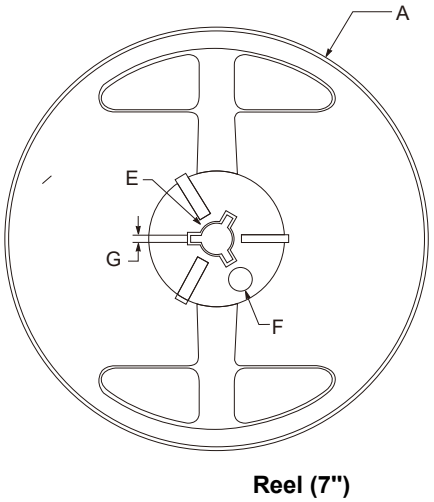
Symbol	Value (unit: mm)
A	Ø 177.8±1
B	2.7±0.2
C	Ø 13.5±0.2
E	Ø 54.5±0.2
F	12.3±0.3
D	9.6+2/-0.3
T1	1.0±0.2
T2	1.2±0.2

Package Specifications (SOT-89)

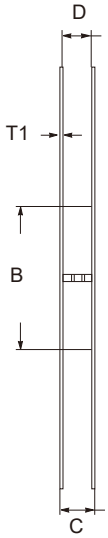
- The method of packaging (1,000PCS/Reel&7inches)



◆ **reel data**



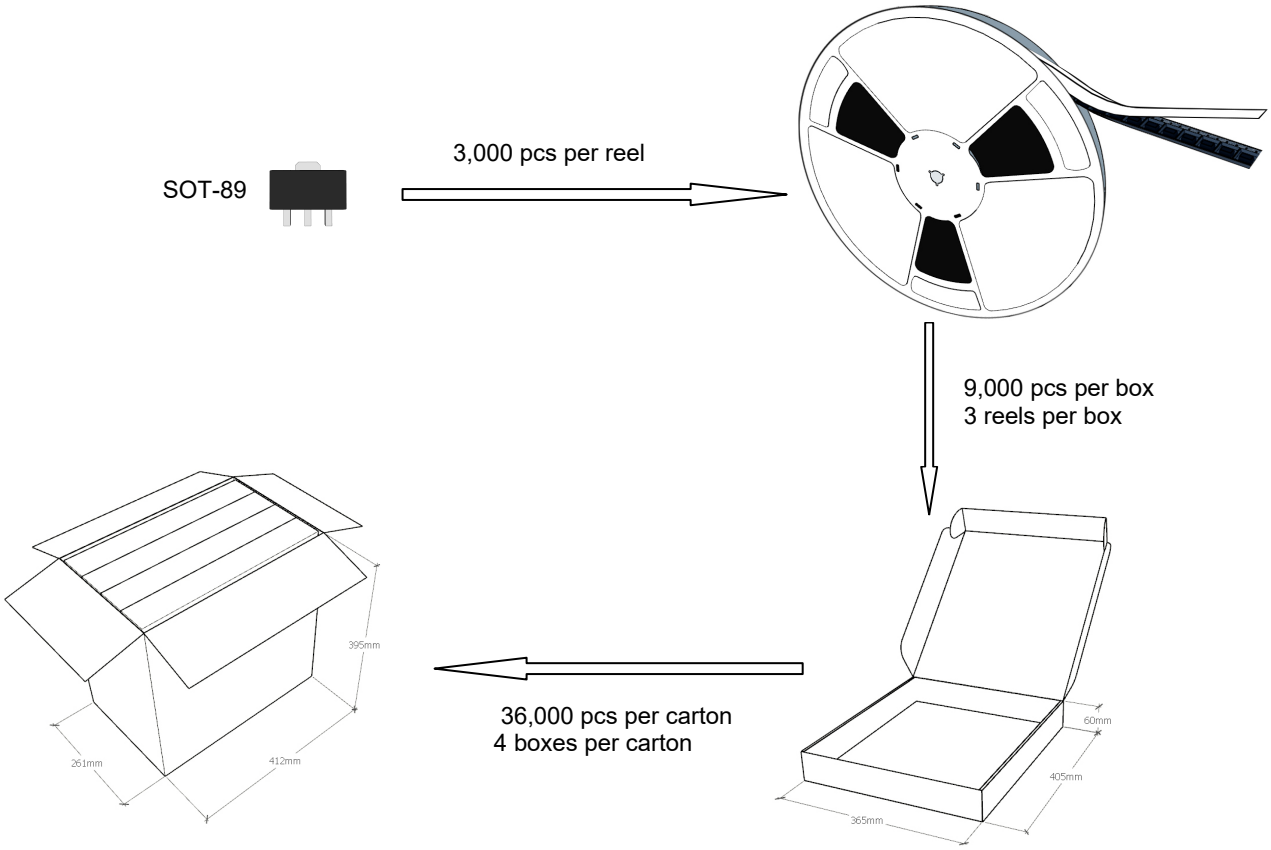
Reel (7")



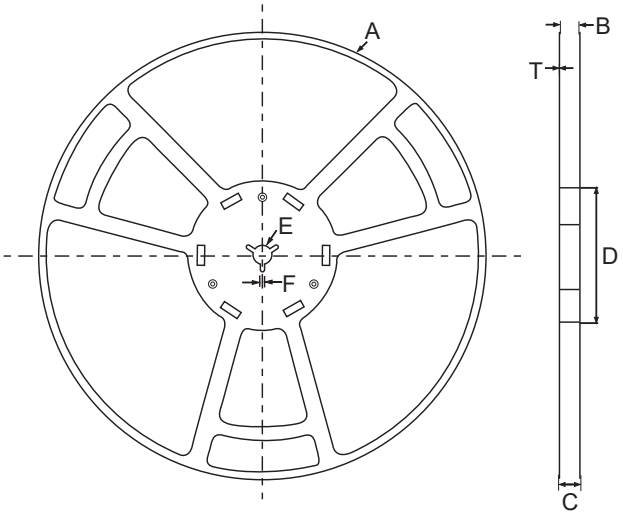
symbol	Value(unit:mm)
A	Φ179±1
B	60.5±0.2
C	15.3±0.3
D	12.5~13.7
E	Φ13.5±0.2
F	Φ10.0±0.2
G	2.7±0.2
T1	1.0±0.2

Package Specifications (SOT-89)

- The method of packaging (3,000PCS/Reel&13inches)



◆ **reel data**

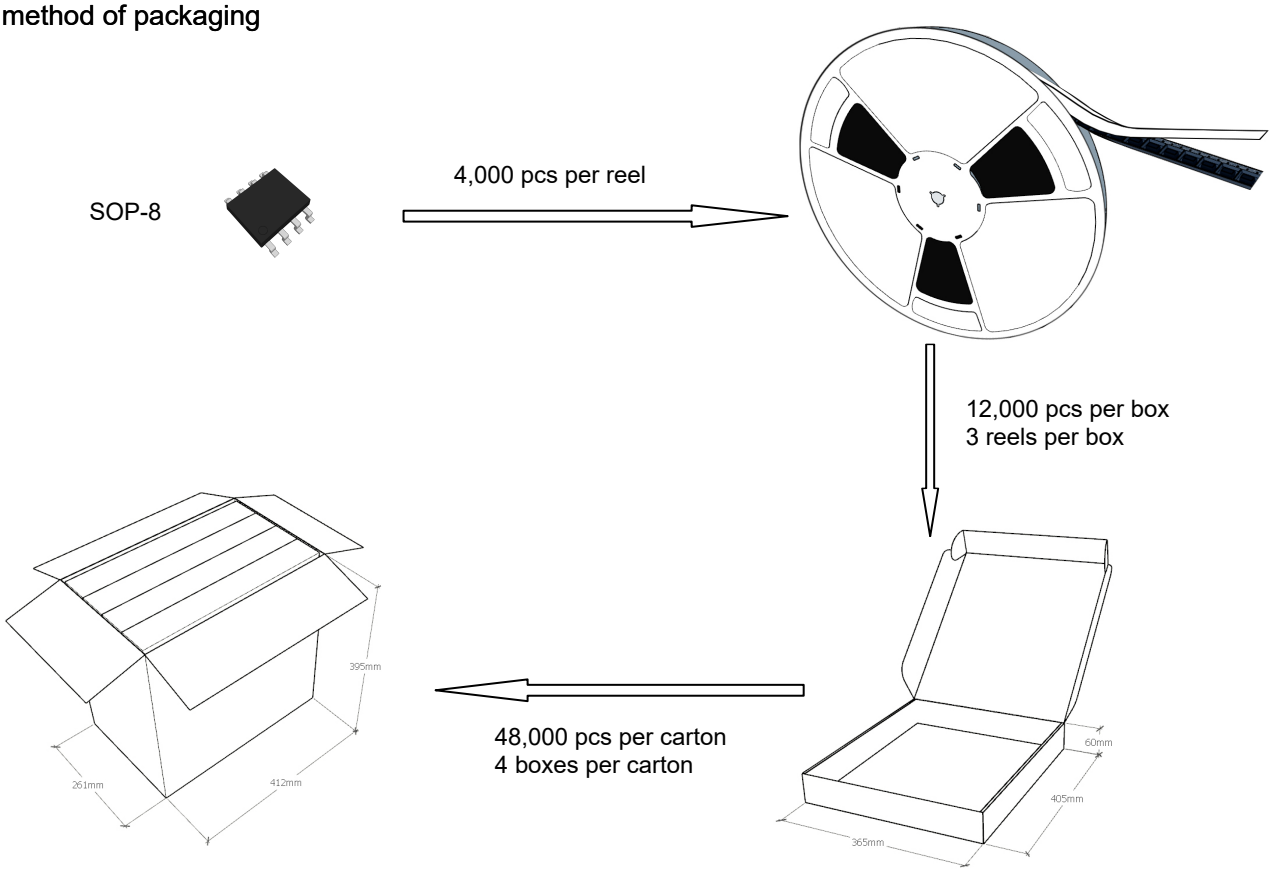


Reel (13")

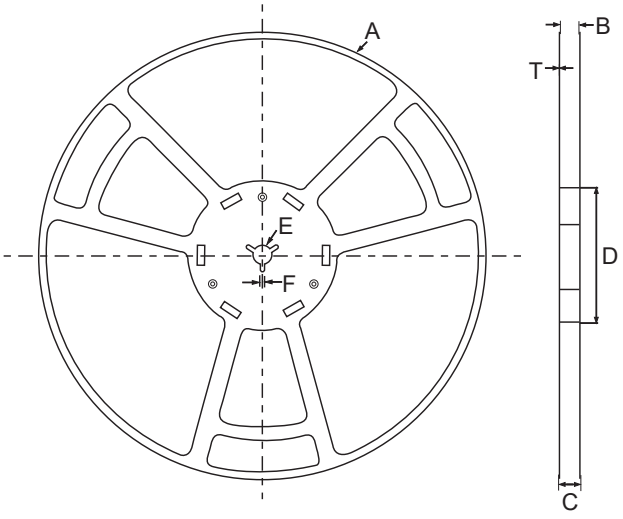
symbol	Value(unit:mm)
A	ϕ330±1
B	12.7±0.5
C	16.5±0.3
D	ϕ99.5±0.5
E	ϕ13.6±0.3
F	2.8±0.3
T	1.9±0.2

Package Specifications (SOP-8)

- The method of packaging



- **Embossed tape and reel data**

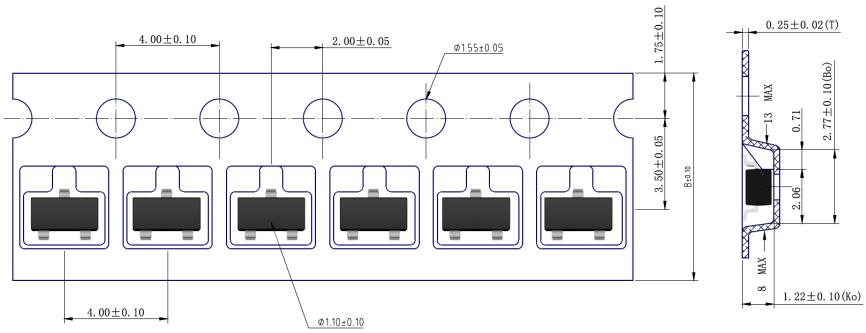


Reel (13")

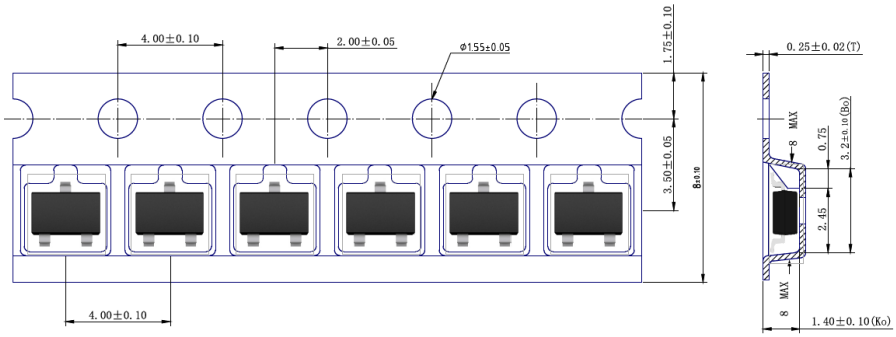
symbol	Value(unit:mm)
A	ϕ330±1
B	12.7±0.5
C	16.5±0.3
D	ϕ99.5±0.5
E	ϕ13.6±0.3
F	2.8±0.3
T	1.9±0.2

◆ Embossed tape data

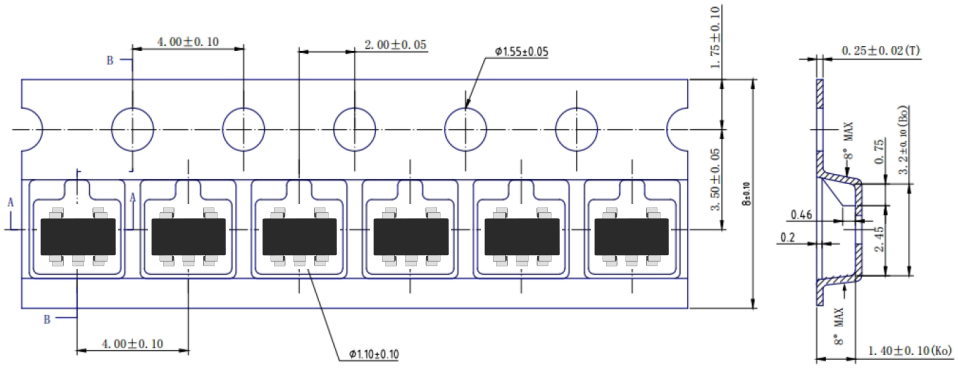
SOT-23



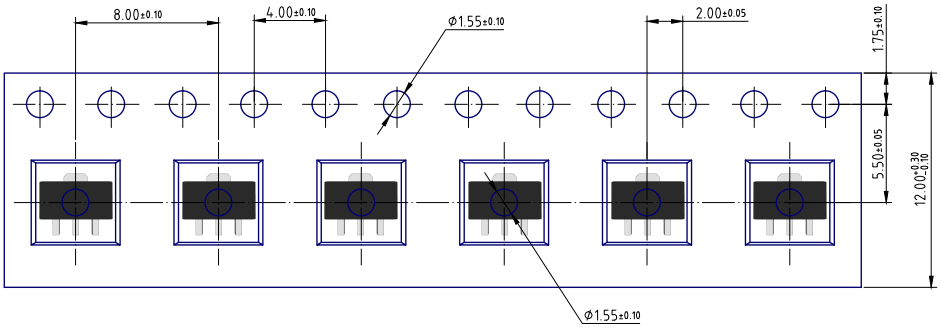
SOT-23-3



SOT-23-5

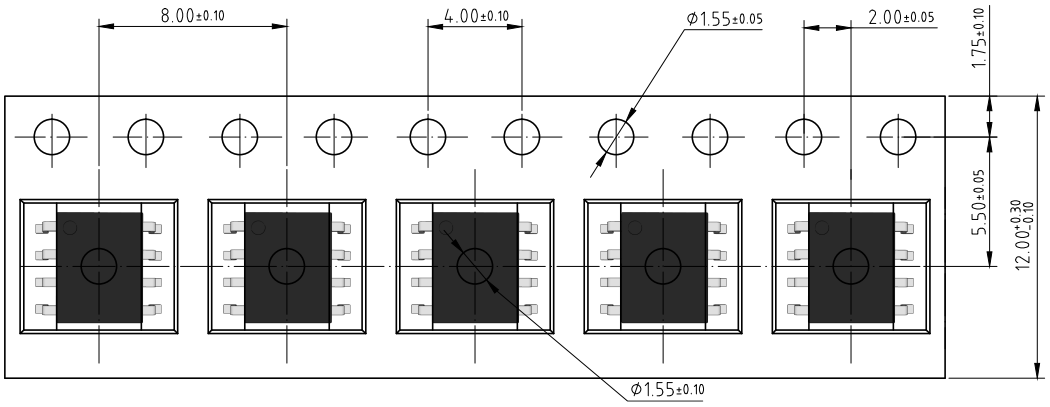


SOT-89



◆ **Embossed tape data**

SOP-8



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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