Description

The TN75C Series is a group of positive voltage output 3-terminal linear regulator, capable of delivering 150mA current and working under 40V input voltage. It also features extremely low standby current which is only 5uA, while still keeps very fast load transient response capability. With the extremely low 5uA standby current, TN75C Series can greatly improve natural life of batteries.

TN75C includes high accuracy voltage reference, error amplifier, and current limit circuit and output driver module. TN75C has well load transient response and good temperature characteristic. And it uses trimming technique to guarantee output voltage accuracy within ±2%. TN75C can provide 3.0V,3.3V,5.0V,9.0V,12V output value. It also can be customized on command.

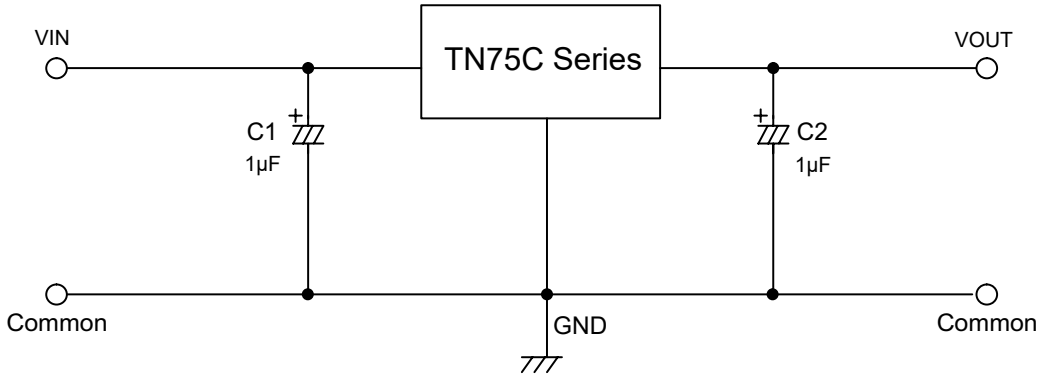
Features

- Wide Input Voltage Range: 3V~40V
- Maximum Output Current :150mA
- Standard Fixed Output Voltage Options: 3V~12V(customized by every 0.1V step)
- Low Power Consumption : 5.0uA（Typ.）
- PSRR=50dB@1KHz
- Low Dropout Voltage:740mV@I_{OUT}=100mA
- Low Output Voltage Accuracy : ±2%
- Current Limit and Short Protection
- Over Temperature Protection
- Available Packages : SOT-23, SOT-23-3 and SOT-89

Applications

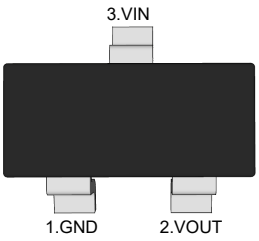
- Wearables
- Toys
- Smart Home Application
- Battery Powered Equipment

Typical Application Circuit



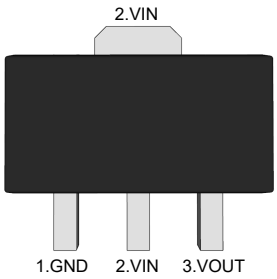
Pin Distribution

SOT-23



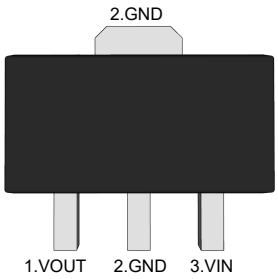
(Top View)

SOT-89



(Top View)

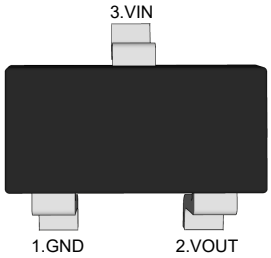
SOT-89



(Top View)

PJ75C-A Series

SOT-23-3



(Top View)

Functional Pin Description

Pin Name	Pin Function
GND	Ground
VOUT	Output Voltage
VIN	Power Input Voltage

Ordering Information

TN75C □□□□□

Pin arrangement version number
□(Blank): Normal pin arrangement version
A: A version pin arrangement

Package Type
SA : SOT-23 SC : SOT-23-3
SQ : SOT-89

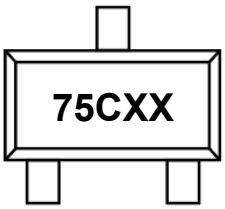
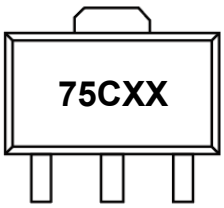
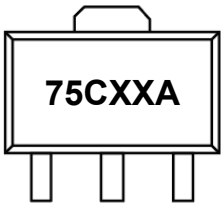
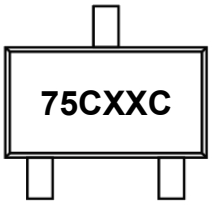
Output Voltage
3V~12V(customized by every 0.1V step)
For example, 30 means product outputs 3.0V

Output current tap
L: 150mA

C: Revision NO.

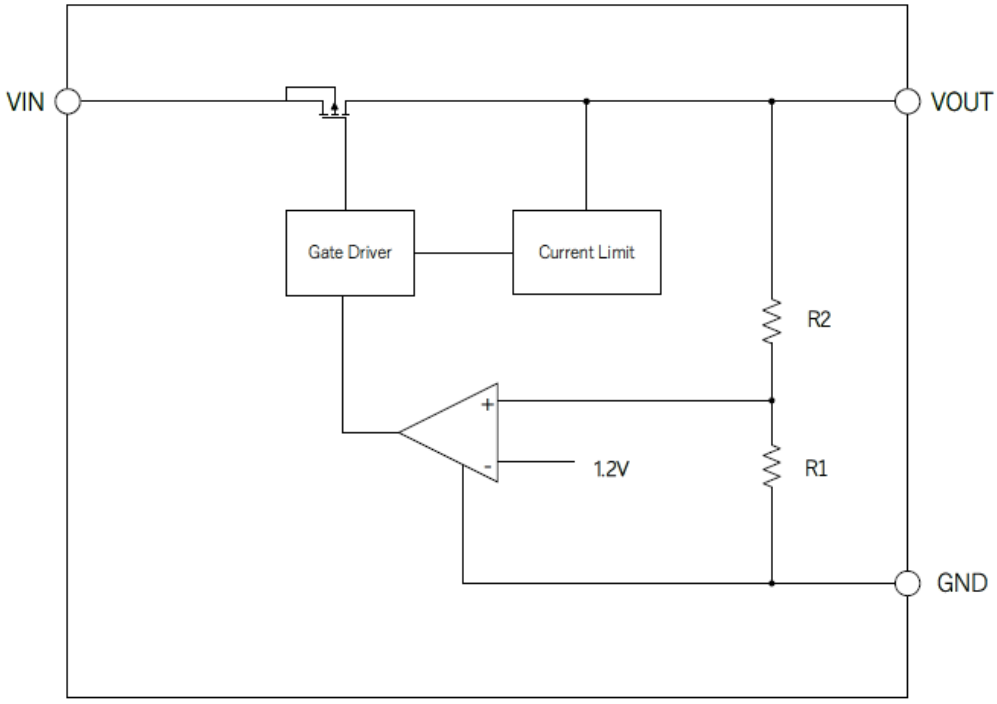
Series NO.

Ordering Information Continue

Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan Note	MSL Level	Marking Code
TN75CL30SA	SOT-23	7	3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 30:3.0V
TN75CL33SA						
TN75CL50SA						
TN75CL90SA						
TN75CL120SA						
TN75CL30SQ	SOT-89	7/13	1000/3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 30:3.0V
TN75CL33SQ						
TN75CL50SQ						
TN75CL90SQ						
TN75CL120SQ						
TN75CL30SQ-A	SOT-89	7/13	1000/3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 30:3.0V
TN75CL33SQ-A						
TN75CL50SQ-A						
TN75CL90SQ-A						
TN75CL120SQ-A						
TN75CL30SC	SOT-23-3	7	3000	RoHS & Green	MSL3	 XX:Output Voltage e.g. 30:3.0V
TN75CL33SC						
TN75CL50SC						
TN75CL90SC						
TN75CL120SC						

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.

Function Block Diagram



Absolute Maximum Ratings

Ratings at 25℃ ambient temperature unless otherwise specified.

Parameter		Value	Unit
Input Voltage		42	V
Output Voltage		-0.3 ~ +20	V
Power Dissipation	SOT-23	300	mW
	SOT-23-3	400	mW
	SOT-89	600	mW
Thermal Resistance,Junction-to-Ambient	SOT-23	380	°C/W
	SOT-23-3	300	°C/W
	SOT-89	180	°C/W
Operating Junction Temperature		125	°C
Operating Ambient Temperature		-40 ~ +85	°C
Storage Temperature Range		-55 ~ +125	°C
Lead Temperature & Time		260°C, 10S	--
ESD Voltage	HBM	2	KV

Note1: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect.

Recommended Operating Conditions

Parameter	Value	Unit
Supply Voltage	3~40	V
Maximum Output Current	150	mA
Operating Ambient Temperature	-40 ~ +85	°C

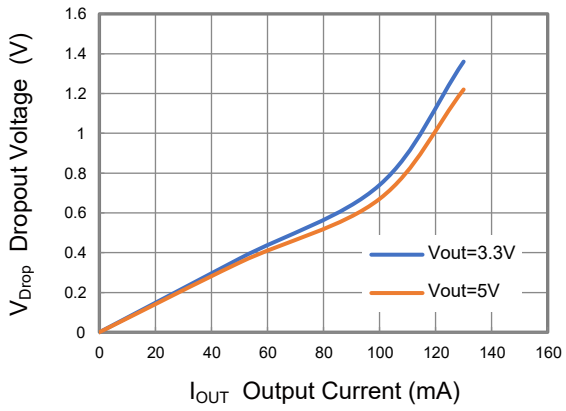
Electrical Characteristics

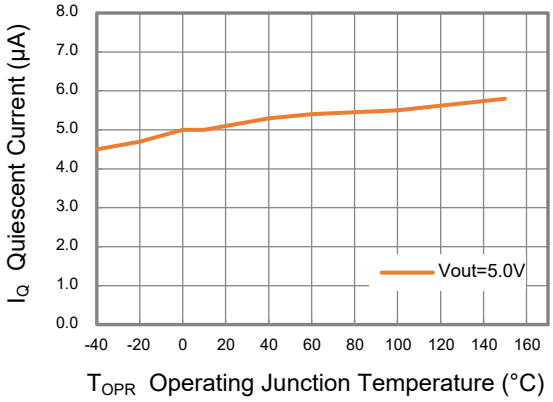
(All tests are conducted under ambient temperature 25°C and within a short period of time 20ms.)

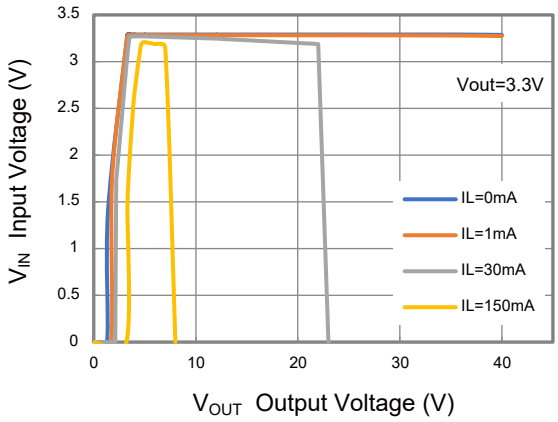
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		3	--	40	V
Output Voltage	V_{OUT}		3	--	12	V
Output Voltage Accuracy	ΔV_{OUT}		-2	--	+2	%
Maximum Output Current	$I_{OUT(Max)}$	V_{IN}-V_{OUT}=2V	150	--	--	mA
Quiescent Current	I_Q	I_{OUT}=0mA	--	5	10	μA
Dropout Voltage	V_{DROP}	V_{OUT} >3V, I_{OUT}=100mA	--	740	1000	mV
Line Regulation	ΔV_{LINE}	I_{OUT}=1mA	--	0.01	0.1	%/V
Load Regulation	ΔV_{LOAD}	1mA<I_{OUT}<100mA	--	2	4	%
Current Limit	I_{Limit}		--	200	--	mA
Short Current	I_{Short}	OUT Short to GND	--	200	--	mA
Power Supply Rejection Ratio	PSRR	V_{OUT}=3.3V, I_{OUT}=1mA, f=1KHz	--	50	--	dB
Startup Time	t_{Start}		--	500	--	μS
OTP			--	165	--	°C
OTP hysteresis			--	30	--	°C

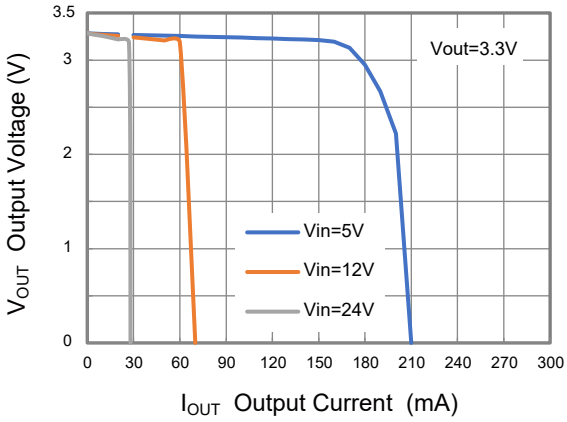
Typical Characteristics Curves

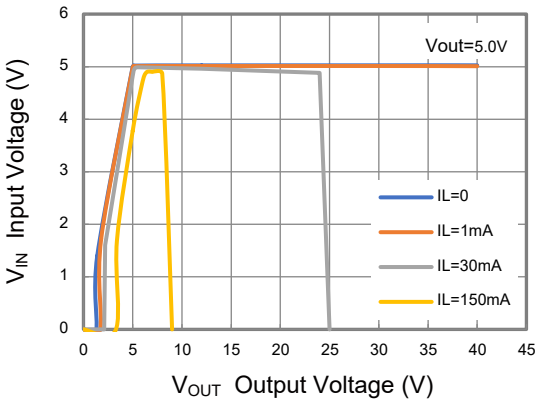
C_{IN}=C_{OUT}=1uF,T_A=25℃,unless otherwise specified.

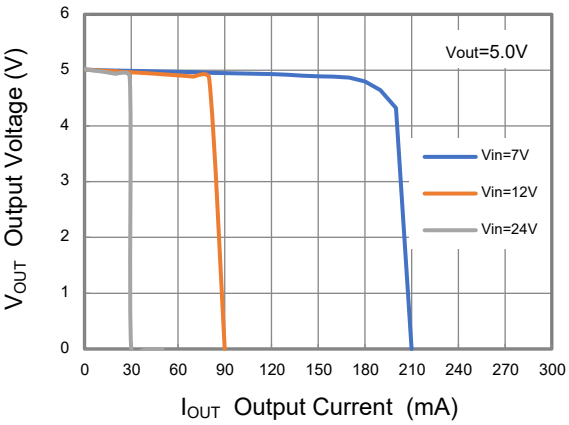


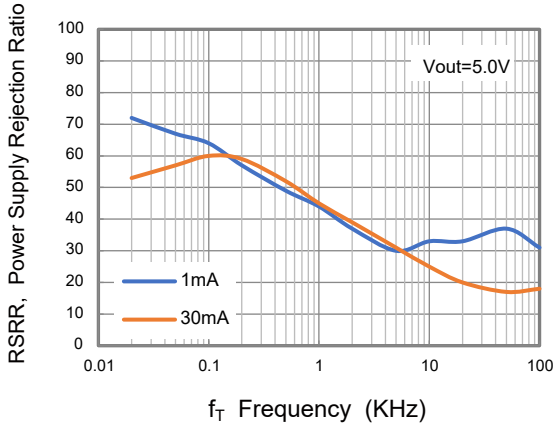


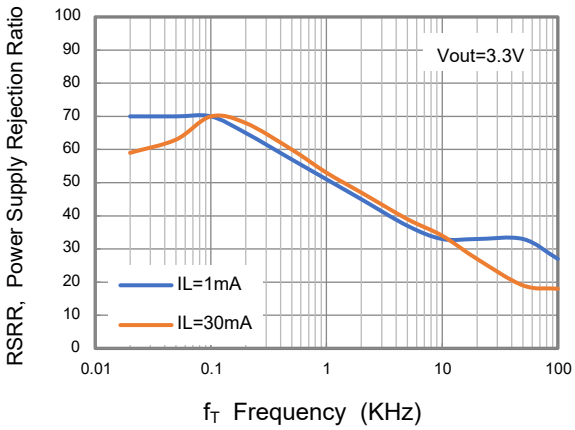




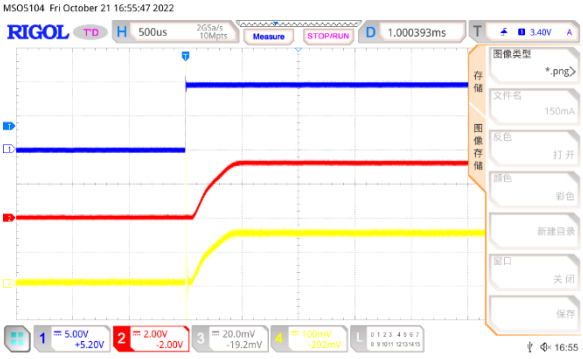








V_{IN} fast on 150mA, V_{OUT}=3.3V



V_{IN} fast off 150mA, V_{OUT}=3.3V

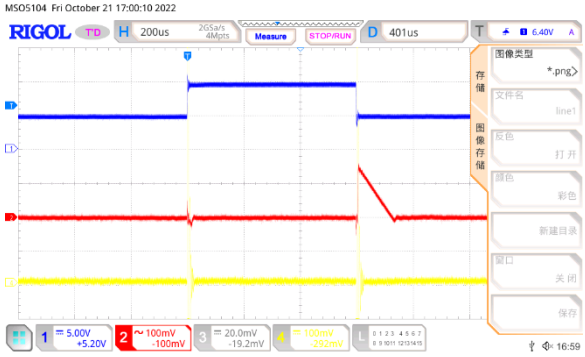
V_{IN} fast on 150mA, V_{OUT}=5.0V

V_{IN} fast off 150mA,V_{OUT}=5.0V

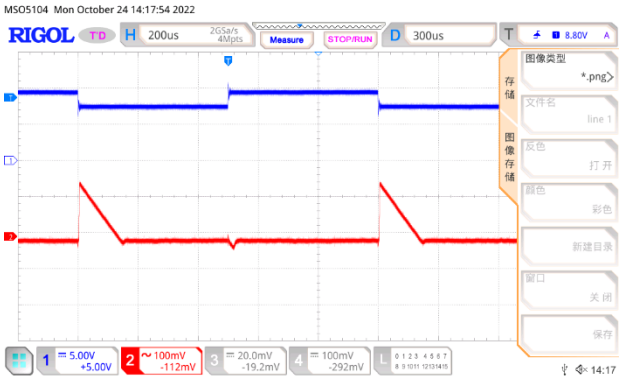
V_{IN} slow on/off 150mA, V_{OUT}=3.3V

V_{IN} slow on/off 150mA, V_{OUT}=5.0V

Line transient V_{OUT}=3.3V, I_{OUT}=1mA



Line transient V_{OUT}=5.0V, I_{OUT}=1mA



Load transient V_{OUT}=3.3V, I_{OUT}=1mA-50mA

Load transient V_{OUT}=5.0V, I_{OUT}=1mA-40mA

Function Descriptions

A minimum of 1uF capacitor must be connected from Vout to ground to insure stability. Input capacitor of 1uF is recommended to ensure the input voltage does not sag below the minimum dropout voltage during load transient event. Vin pin must always be dropout voltage higher than Vout in order for the device to regulate properly.

Applications Information

Like any low-dropout regulators, TN75C requires input and output decoupling capacitors. These capacitors must be correctly selected for good performance. Both input and output capacitors are recommended to be placed as close to chip pin as possible.

Capacitor Selection

A Normally, use a 1uF capacitor on the input and a 1uF capacitor on the output of the TN75C. Larger input capacitor values and lower ESR (X5R, X7R) provide better supply noise rejection and transient response.

Input-Output (Dropout) Voltage

A regulator's minimum input-to-output voltage differential (dropout voltage) determines the lowest usable supply voltage. In battery-powered systems, this determines the useful end-of-life battery voltage. Because the device uses a PMOS, its dropout voltage is a function of drain to source on resistance, RDS (on), multiplied by the load current:

$$V_{DROP} = V_{IN} - V_{OUT} = R_{DS\ (on)} \times I_{OUT}$$

Current Limit and Thermal Shutdown Protection

In order to prevent overloading or thermal condition from damaging the device, TN75C has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

Thermal Considerations

The TN75C series can deliver a current of up to 150mA over the full operating junction temperature range. However, the maximum output current must be controlled at higher ambient temperature to ensure the junction temperature does not exceed 150°C. With all possible conditions, the junction temperature must be within the range specified under operating conditions. Power dissipation can be calculated based on the output current and the voltage drop across regulator.

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

The final operating junction temperature for any set of conditions can be estimated by the following thermal equation:

$$P_{D\ (max)} = (T_{J\ (max)} - T_A) / R_{\theta JA}$$

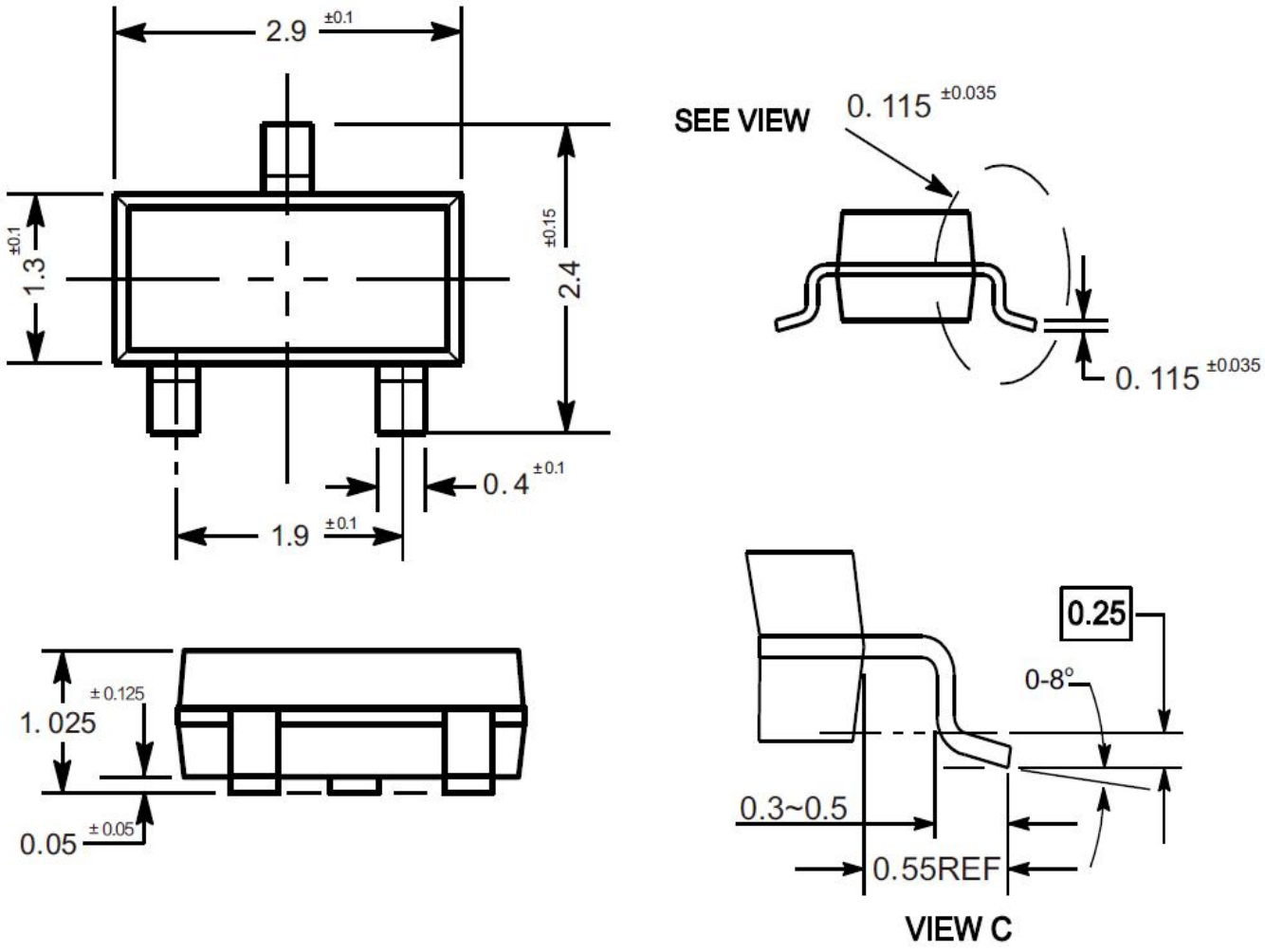
Where Tj (max) is the maximum junction temperature of the die (150°C) and Ta is the maximum ambient temperature. When junction temperature exceeds 150°C, over temperature protection may be triggered to prevent device from over heat.

PCB Layout

An input capacitance of 1uF is required between the TN75C input pin and ground (the amount of the capacitance may be increased without limit), this capacitor must be located a distance of not more than 1cm from the input and return to a clean analog ground. Input capacitor can filter out the input voltage spikes caused by the surge current due to the inductive effect of the package pin and the printed circuit board’s routing wire. Otherwise, the actual voltage at the Vin pin may exceed the absolute maximum rating. The output capacitor also must be located a distance of not more than 1cm from output to a clean analog ground. Because it can filter out the output spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board’s routing wire.

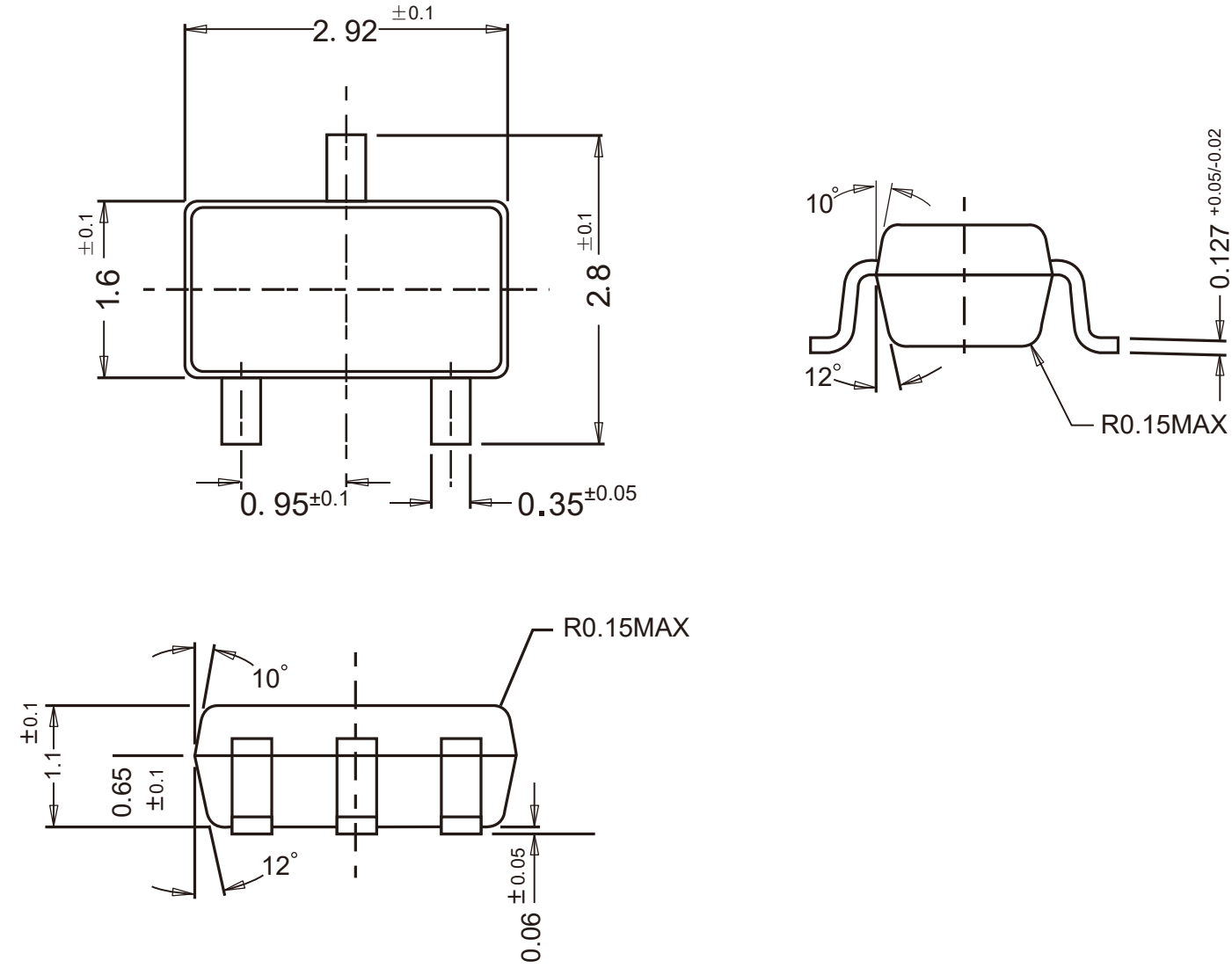
Package Outline

SOT-23
Dimensions in mm



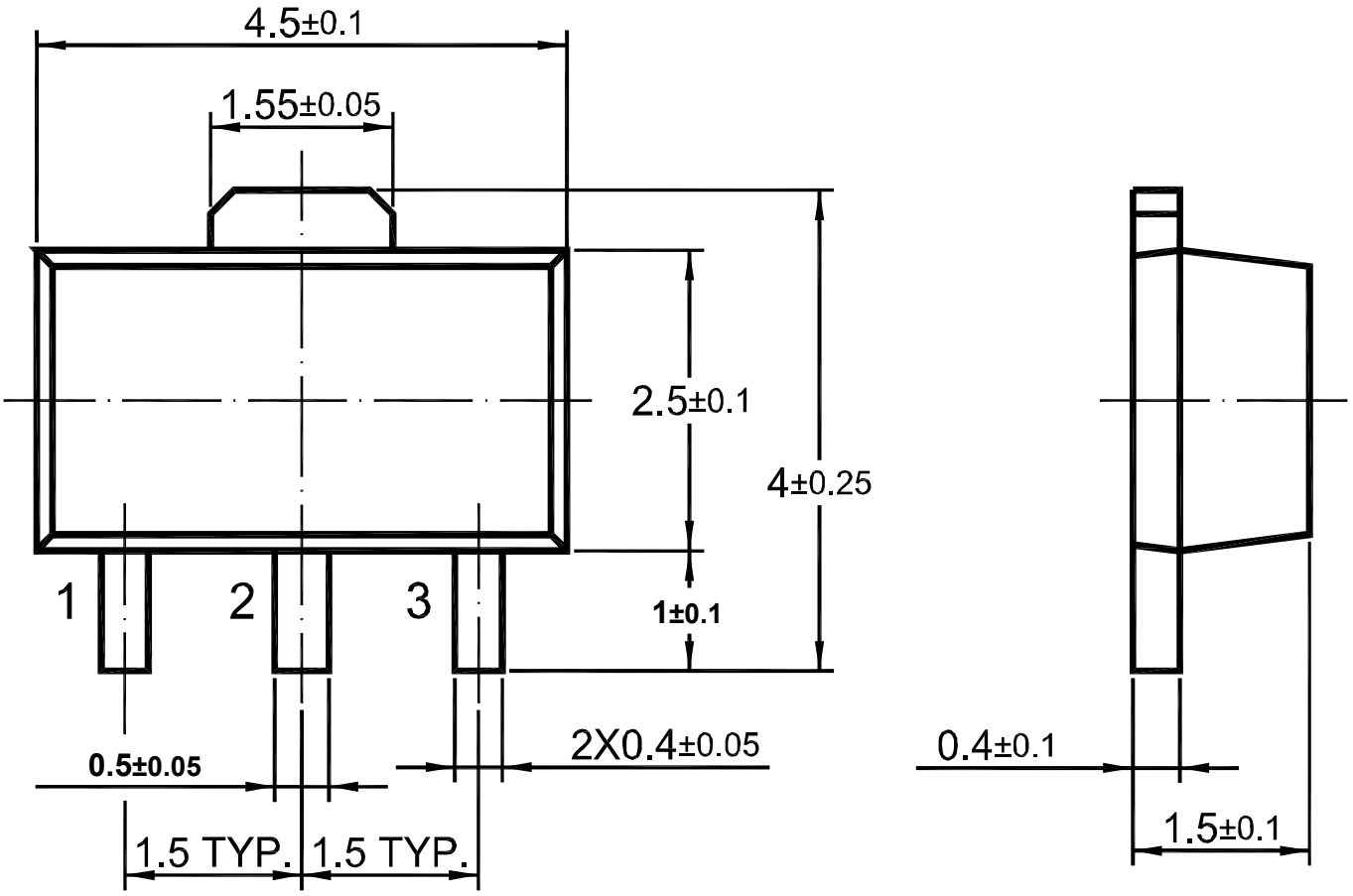
Package Outline

SOT-23-3
Dimensions in mm



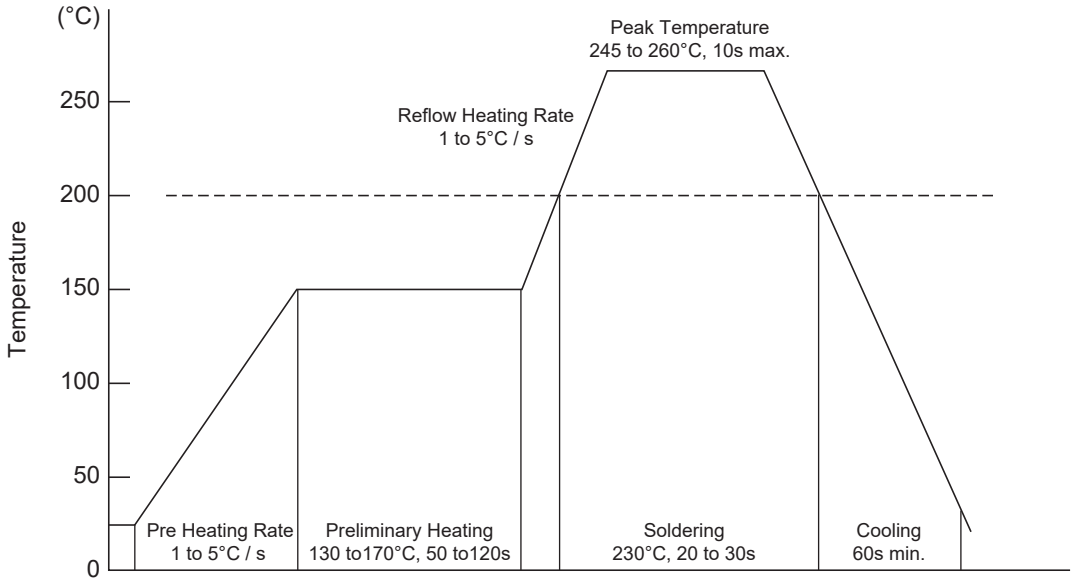
Package Outline

SOT-89
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

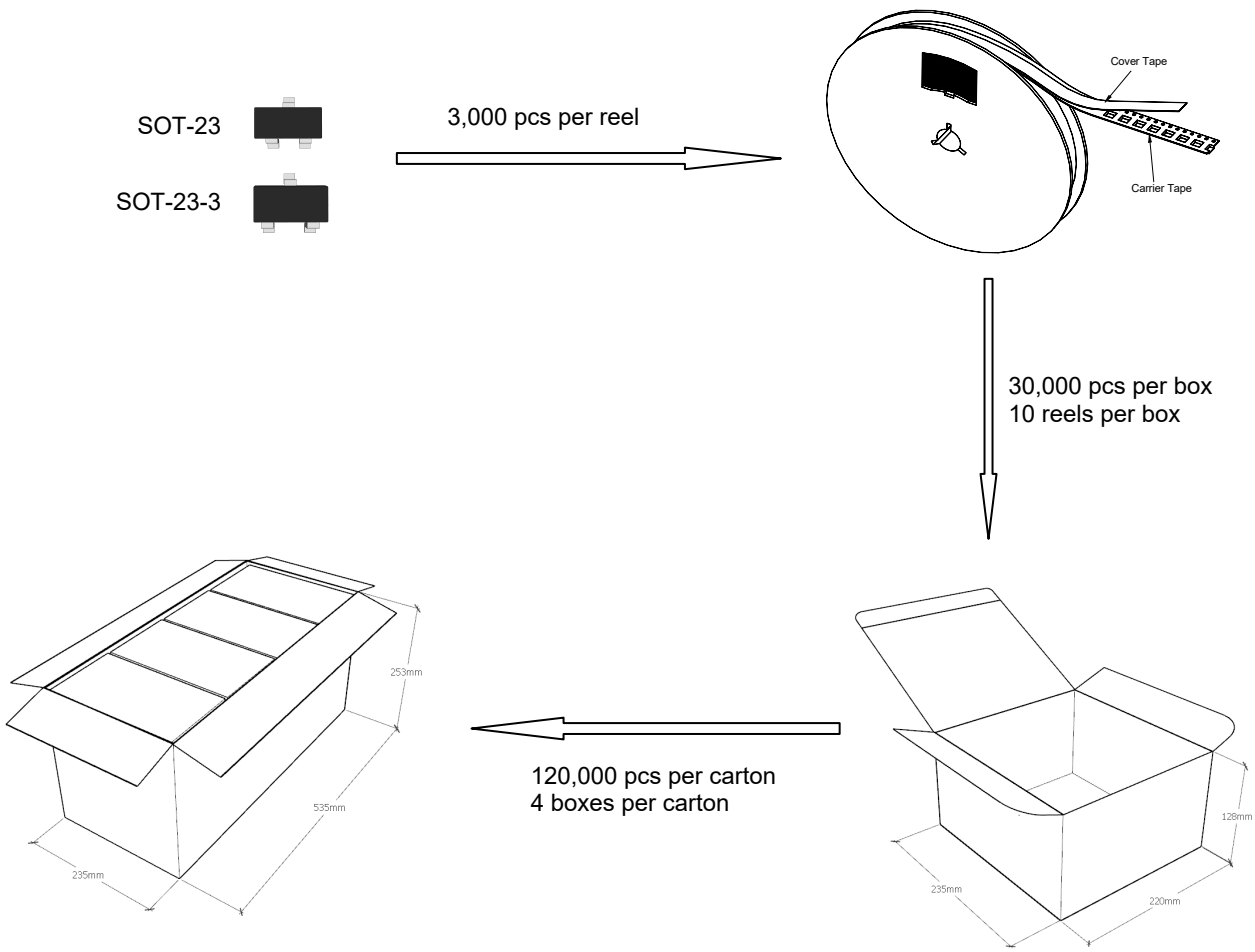
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

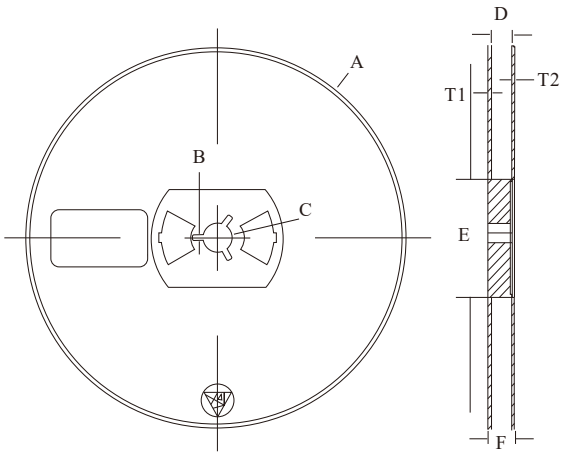
- **Temperature**
  5 to 40°C
- **Humidity**
  30 to 80% RH
- **Recommended period**
  One year after manufacturing

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

- The method of packaging



◆ **reel data**

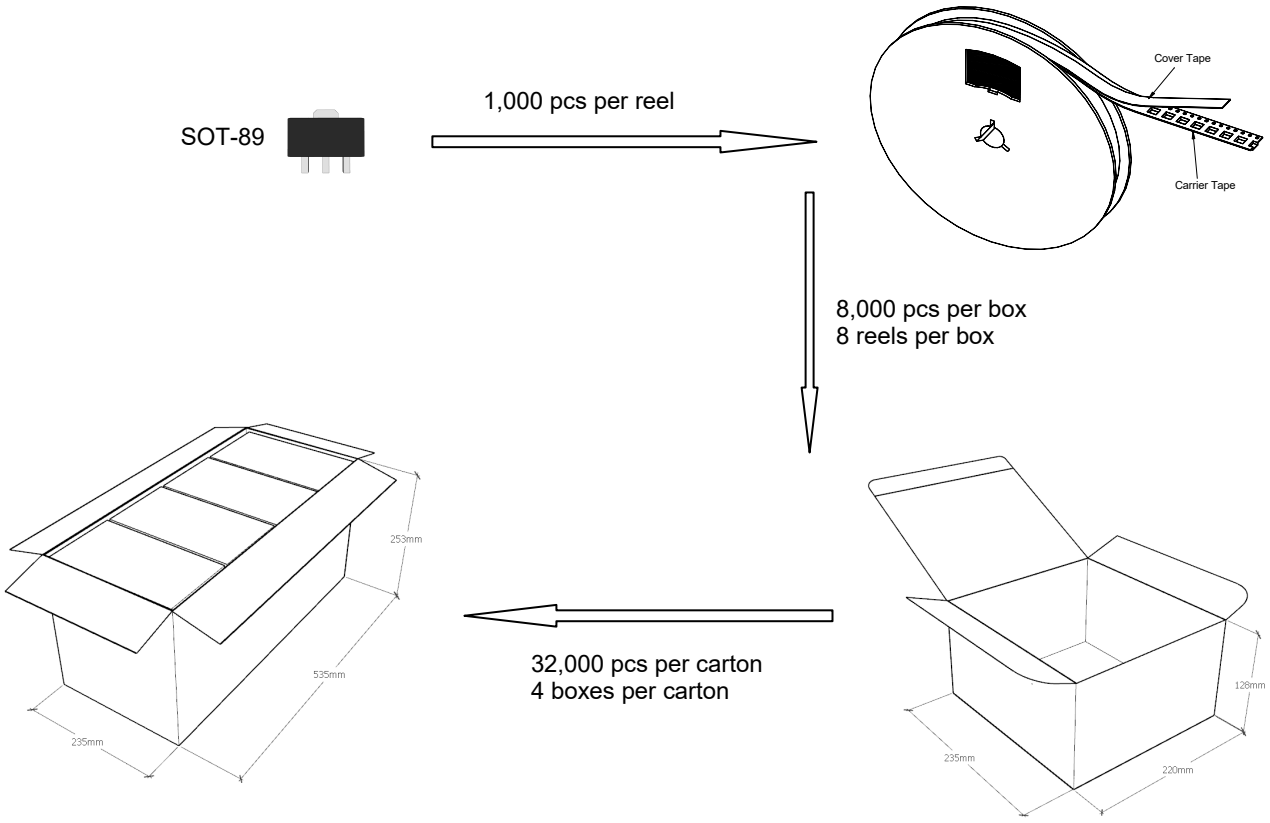


Reel (7")

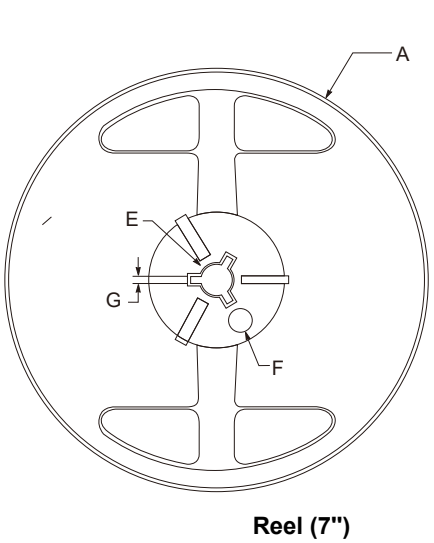
Symbol	Value (unit: mm)
A	Ø 177.8±1
B	2.7±0.2
C	Ø 13.5±0.2
E	Ø 54.5±0.2
F	12.3±0.3
D	9.6+2/-0.3
T1	1.0±0.2
T2	1.2±0.2

Package Specifications

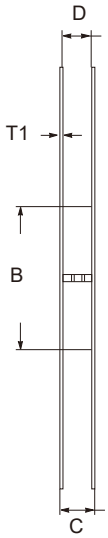
- The method of packaging (1,000PCS/Reel&7inches)



◆ **reel data**



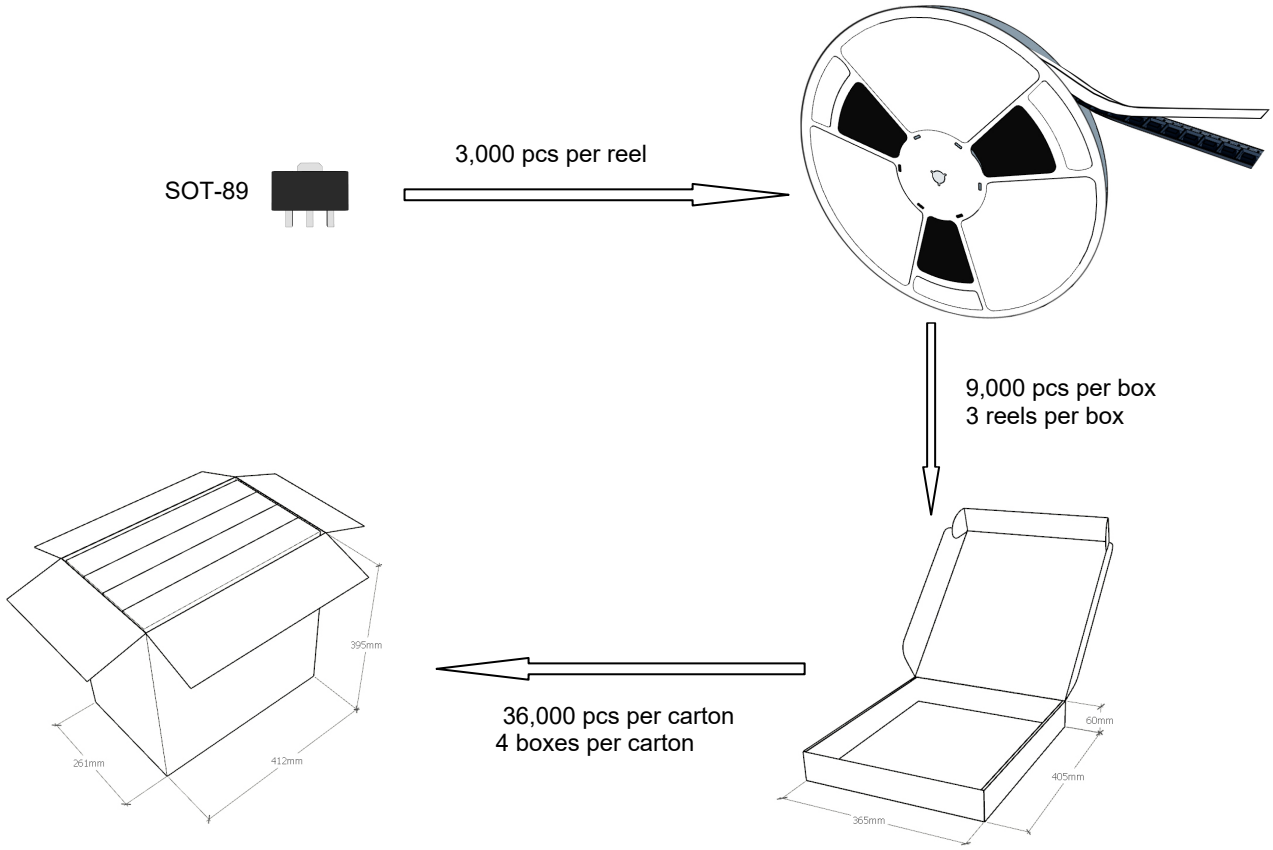
Reel (7")



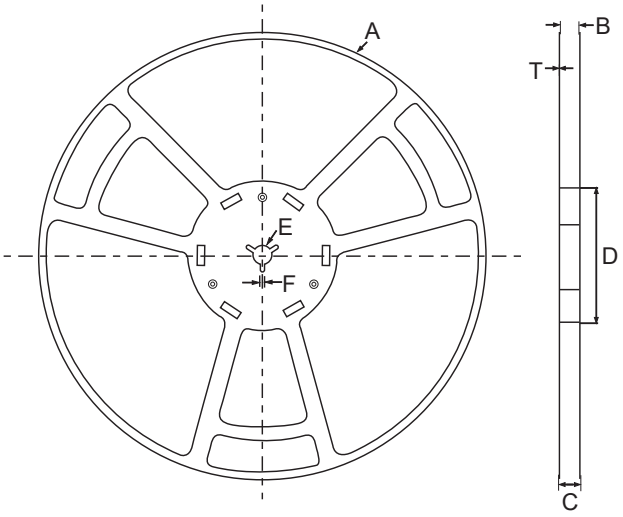
symbol	Value(unit:mm)
A	Φ179±1
B	60.5±0.2
C	15.3±0.3
D	12.5~13.7
E	Φ13.5±0.2
F	Φ10.0±0.2
G	2.7±0.2
T1	1.0±0.2

Package Specifications

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



◆ **reel data**

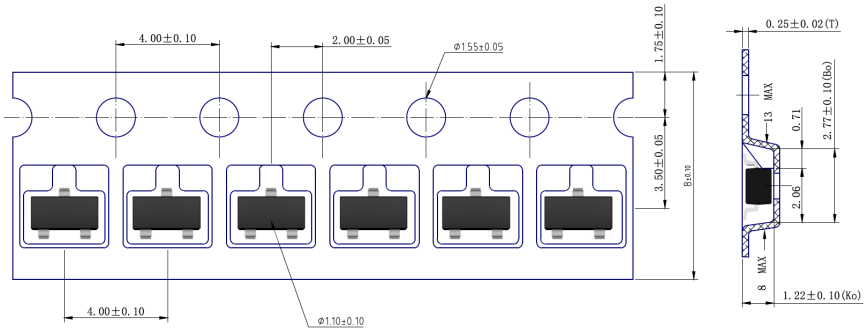


Reel (13")

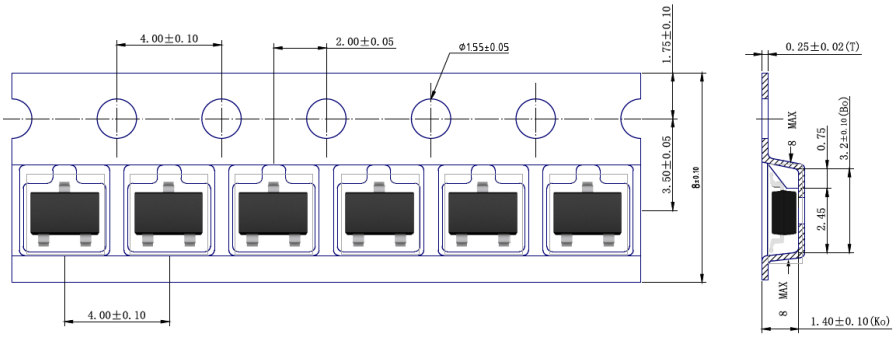
symbol	Value(unit:mm)
A	ϕ330±1
B	12.7±0.5
C	16.5±0.3
D	ϕ99.5±0.5
E	ϕ13.6±0.3
F	2.8±0.3
T	1.9±0.2

◆ Embossed tape data

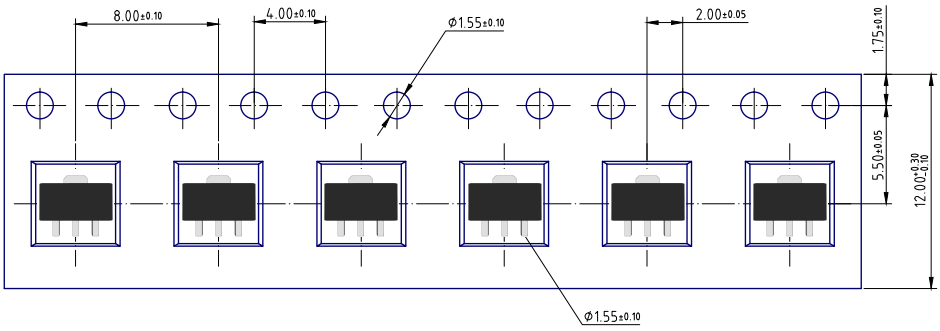
SOT-23



SOT-23-3



SOT-89



Contact Information

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

For additional information, please contact your local Sales Representative.

Product Specification Statement

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.

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.

TANI reserves the right to revise or update the product specification and the products at any time without prior notice, and the user's continued use of the product specification is considered an acceptance of these revisions and updates. Prior to purchasing and using the product, users should verify the above information with TANI to ensure that the prod uct specification is the most current, effective, and complete. If users are particularly concerned about product parameters, please consult TANI in detail or request relevant product test reports. Any data not explicitly mentioned in the product specification shall be subject to separate agreement.

Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. TANI shall assume no responsibility for any consequences resulting from such usage.

Users should also comply with relevant laws, regulations, policies, and standards when using the product specification. Users are responsible for the risks and liabilities arising from the use of the product specification and must ensure that it is not used for illegal purposes. Additionally, users should respect the intellectual property rights related to the product specification and refrain from infringing upon any third- party legal rights. TANI shall assume no responsibility for any disputes or controv ersies arising from the above-mentioned issues in any form.