TN54 Series

Low Dropout Regulators

Description

The TN54 Series is a high input voltage,low quiescent current,low-dropout linear regulator able to provide 300mA load current. The LDO features very fast response against line voltage transient and load current transient, and ensures no overshoot voltage during the LDO start up and short circuit recovery.

The device features integrated short-circuit and thermal shutdown protection.

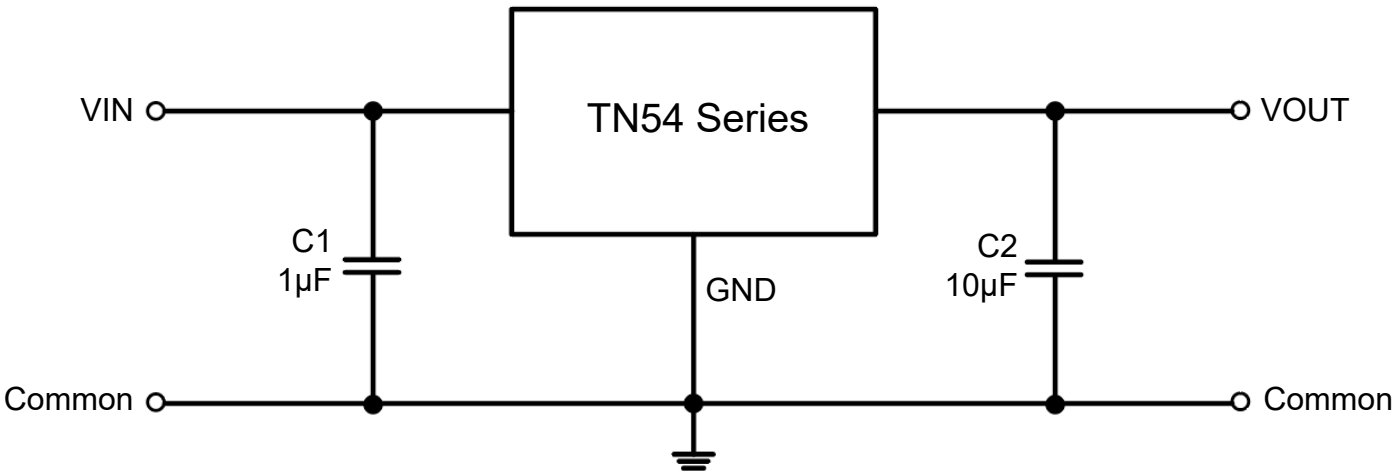
Features

- High Input Voltage Rating: Up to 55V
- Maximum Output Current: 350mA
- Standard Fixed Output Voltage Options: 1.8V,2.8V,3V,3.3V,5V,6V
- Low Quiescent Current: 2.1uA
- PSRR=85dB@1KHz
- Low Dropout: 350mV @ 100mA
- Low Output Voltage Accuracy: ±2%
- Fast Transient Response
- Thermal Shutdown Protection,Current Limiting Protection
- Available Packages: SOT-23, SOT-23-3, SOT-89, SOT-89-5, SOT-23-5, DFN1x1-4L and DFN2x2C-6L

Applications

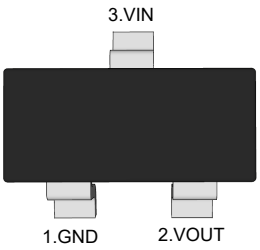
- Battery-Powered Equipment
- Smoke Detector and Sensor
- Micro Controller Applications

Typical Application Circuit



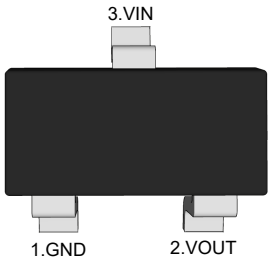
Pin Distribution

SOT-23



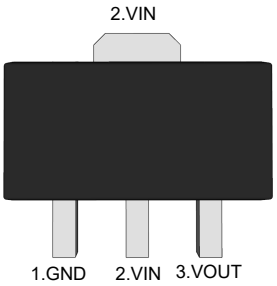
(Top View)

SOT-23-3



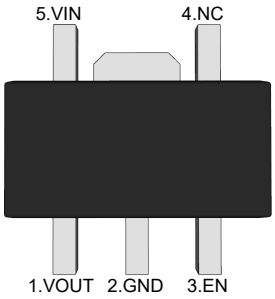
(Top View)

SOT-89



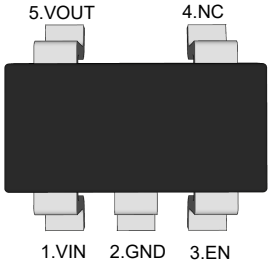
(Top View)

SOT-89-5



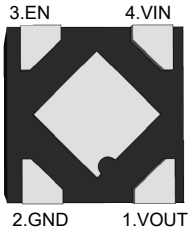
(Top View)

SOT-23-5



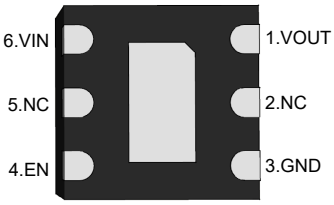
(Top View)

DFN1x1-4L



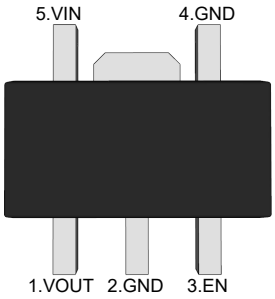
(Bottom View)

DFN2x2C-6L



Bottom View

SOT-89-5



(Top View)

PJ54-A Series

Functional Pin Description

Pin Name	Pin Function
EN	Chip Enable (Active High). Note that this pin is high impedance
NC	NO Connected
GND	Ground
VOUT	Output Voltage
VIN	Power Input Voltage

Ordering Information

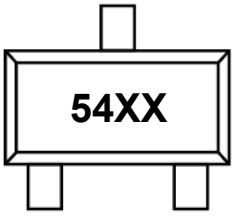
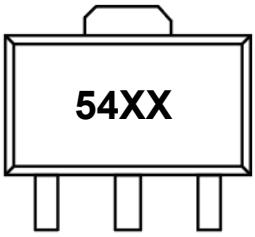
TN54 □□□□□

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

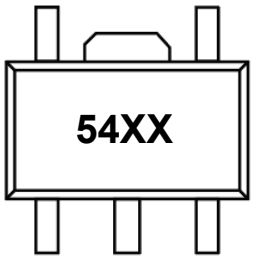
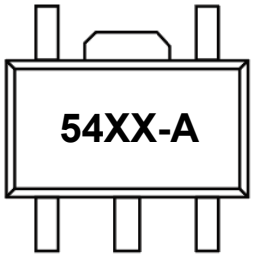
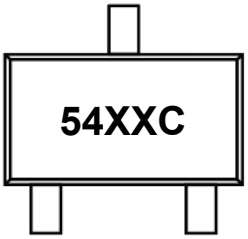
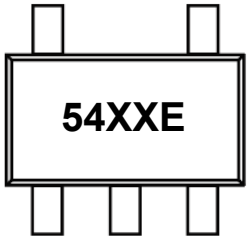
Package Type
SA:SOT-23 SC:SOT-23-3 SQ:SOT-89
SR:SOT-89-5 SE:SOT-23-5
DE:DFN1x1-4L DFC:DFN2x2C-6L

Output Voltage
18 : 1.8V 28 : 2.8V 30 : 3V
33 : 3.3V 50 : 5V 60 : 6V

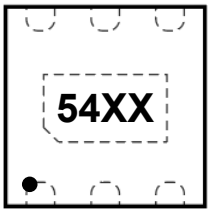
Output current tap
M : 350mA

Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan Note1	MSL Level	Marking Code
TN54M18SA	SOT-23	7	3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28SA						
TN54M30SA						
TN54M33SA						
TN54M50SA						
TN54M60SA						
TN54M18SQ	SOT-89	7/13	1000/3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28SQ						
TN54M30SQ						
TN54M33SQ						
TN54M50SQ						
TN54M60SQ						

Ordering Information Continue

Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan Note1	MSL Level	Marking Code
TN54M18SR	SOT-89-5	7/13	1000/3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28SR						
TN54M30SR						
TN54M33SR						
TN54M50SR						
TN54M60SR						
TN54M18SR-A	SOT-89-5	7/13	1000/3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28SR-A						
TN54M30SR-A						
TN54M33SR-A						
TN54M50SR-A						
TN54M60SR-A						
TN54M18SC	SOT-23-3	7	3000	RoHS & Green	MSL3	 XX:Output Voltage e.g. 18:1.8V
TN54M28SC						
TN54M30SC						
TN54M33SC						
TN54M50SC						
TN54M60SC						
TN54M18SE	SOT-23-5	7	3000	RoHS & Green	MSL3	 XX:Output Voltage e.g. 18:1.8V
TN54M28SE						
TN54M30SE						
TN54M33SE						
TN54M50SE						
TN54M60SE						

Ordering Information Continue

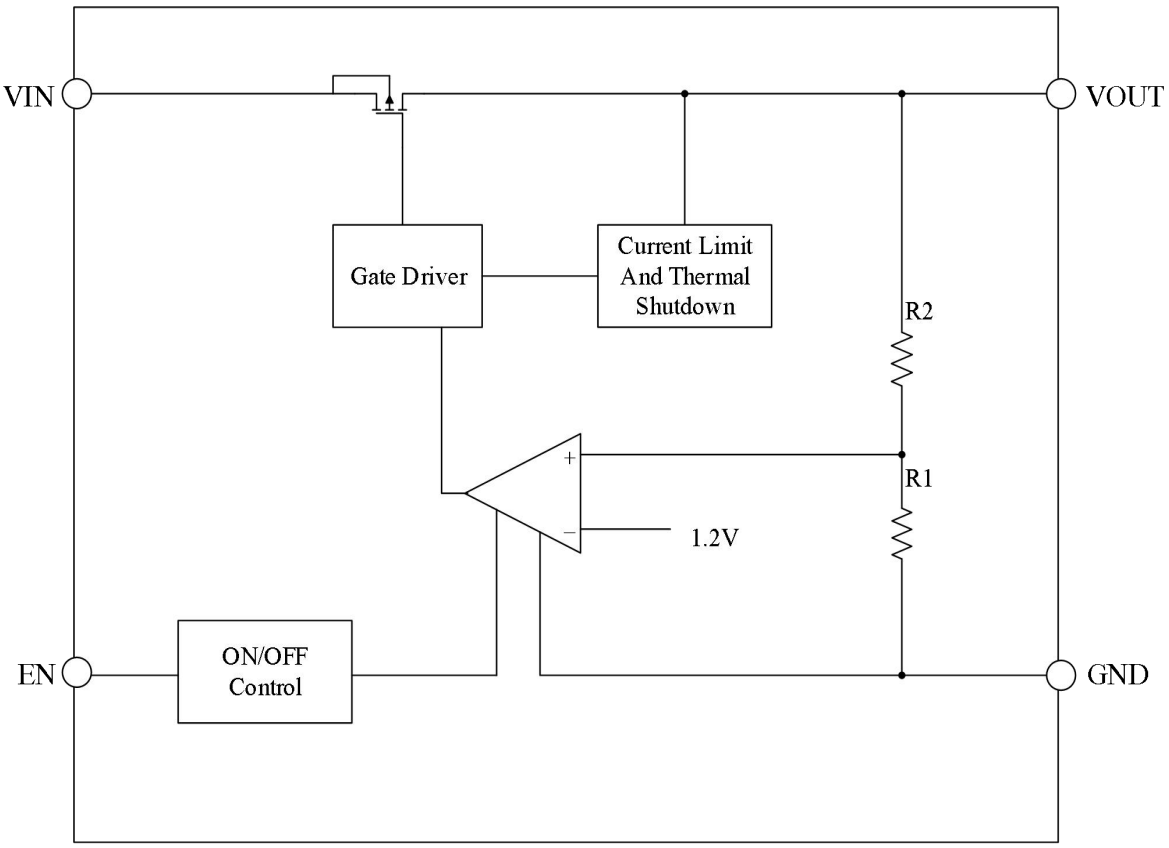
Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan Note1	MSL Level	Marking Code
TN54M18DE	DFN1x1-4L	7	10000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28DE						
TN54M30DE						
TN54M33DE						
TN54M50DE						
TN54M60DE						
TN54M18DFC	DFN2x2C-6L	7	3000	RoHS & Green	MSL1	 XX:Output Voltage e.g. 18:1.8V
TN54M28DFC						
TN54M30DFC						
TN54M33DFC						
TN54M50DFC						
TN54M60DFC						

Note1:

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 Note2

Ratings at 25℃ ambient temperature unless otherwise specified.

Parameter		Value	Unit
VIN to GND Voltage		-0.3 ~ +55	V
VOUT to GND Voltage		-0.3 ~ +6	V
VOUT to VIN Voltage		-55 ~ +0.3	V
EN to GND Voltage		-0.3 ~ +55	V
Output Current		Internally limited	--
Power Dissipation	SOT-23	320	mW
	SOT-23-3	500	mW
	SOT-89	920	mW
	SOT-89-5	920	mW
	SOT-23-5	500	mW
	DFN1x1-4L	500	mW
	DFN2x2C-6L	1700	mW
Thermal Resistance,Junction-to-Ambient	SOT-23	380	°C/W
	SOT-23-3	250	°C/W
	SOT-89	135	°C/W
	SOT-89-5	135	°C/W
	SOT-23-5	250	°C/W
	DFN1x1-4L	250	°C/W
	DFN2x2C-6L	73	°C/W
Operating Ambient Temperature		-40 ~ +85	°C
Junction temperature		150	°C
Storage temperature range		-40 ~ +150	°C

Note2: Exceed these limits to damage to the device, exposure to absolute maximum rating conditions may affect the reliability of the chip.

Recommended Operating Conditions

Parameter	Value	Unit
Supply Voltage	3~45	V
Maximum Output Current	350	mA
Operating Ambient Temperature	-40 ~ +85	°C

Electrical Characteristics

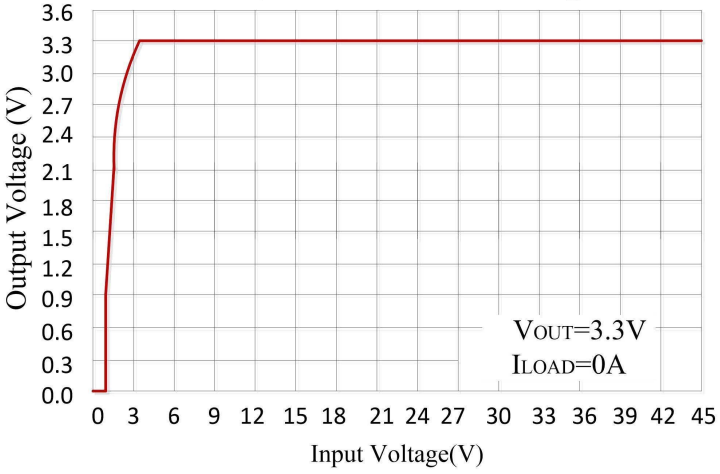
(V_{IN}=V_{OUT}+1, C_{IN}=1μF, C_{OUT}=10μF, T_A=25℃ , unless otherwise noted.)

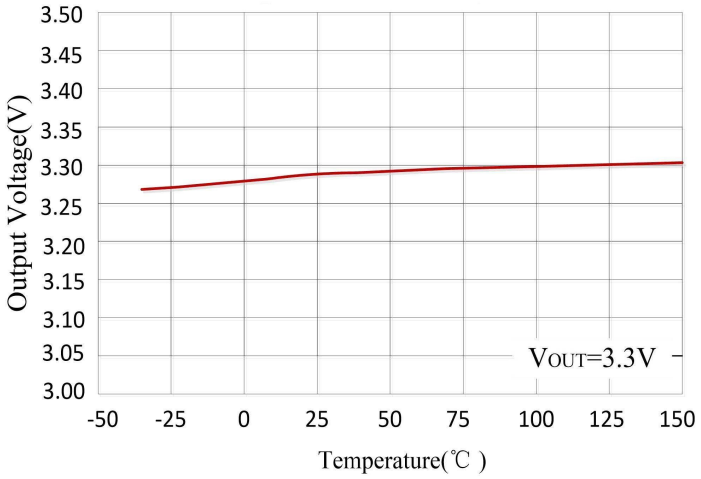
Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}		3	--	45	V
Output Voltage Accuracy		ΔV_{OUT}	V_{IN}=12V, I_{OUT}=10mA	-2	--	+2	%
Quiescent Current		I_Q	V_{IN}=12V, I_{OUT}=0mA	--	2.1	--	μA
Maximum Output Current		I_{OUT_Max}		300	350	--	mA
Dropout Voltage Note3		V_{DROP}	V_{IN}=V_{OUTNOM}-0.1V, I_{OUT}=10mA	--	35	--	mV
			V_{IN}=V_{OUTNOM}-0.1V, I_{OUT}=100mA	--	350	--	
Line Regulation		ΔV_{LINE}	V_{OUTNOM}+0.5V≤V_{IN}≤40V I_{OUT}=1mA	--	0.01	--	%/V
Load Regulation		ΔV_{LOAD}	V_{IN}=12V, 1mA<I_{OUT}<100mA	--	0.02	--	%/mA
Current Limit		I_{LIM}		--	500	--	mA
EN Input Threshold	Logic Low	V_{IL}		--	--	0.4	V
	Logic High	V_{IH}		1	--	--	V
Output Noise Voltage		V_N	10Hz~100KHz,C_{OUT}=1μF V_{OUT}=3V	--	110	--	μV_{RMS}
Power Supply Rejection Ratio		PSRR	V_{IN}=12V,I_{OUT}=10mA f=1KHz,V_{OUT}=3.3V	--	85	--	dB
Thermal Shutdown Temperature		T_{SHDN}	Shutdown, Temp increasing	--	150	--	°C
Thermal Reset Temperature		T_{SHDN}	Reset, Temp decreasing	--	140	--	°C

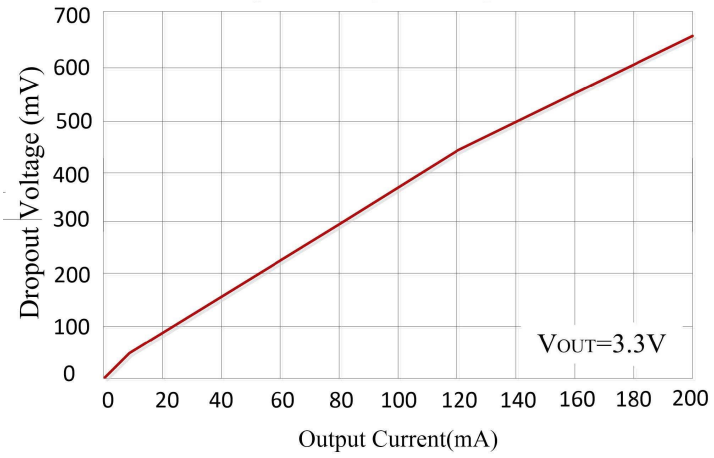
Note3: The dropout voltage difference is the voltage difference between the input and output, where the output voltage is 2% lower than its nominal value.

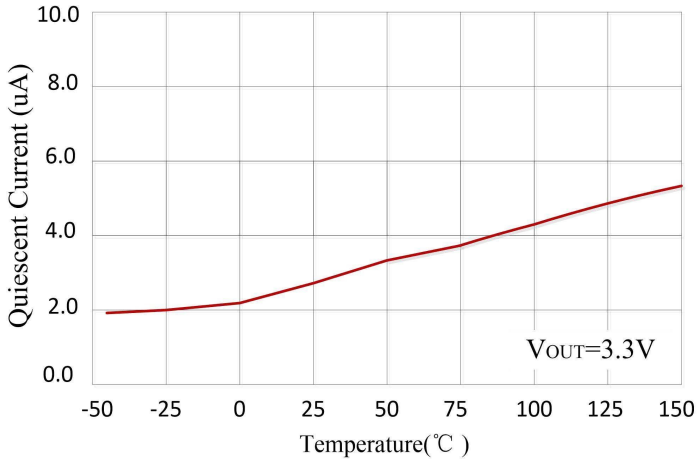
Typical Characteristic Curves

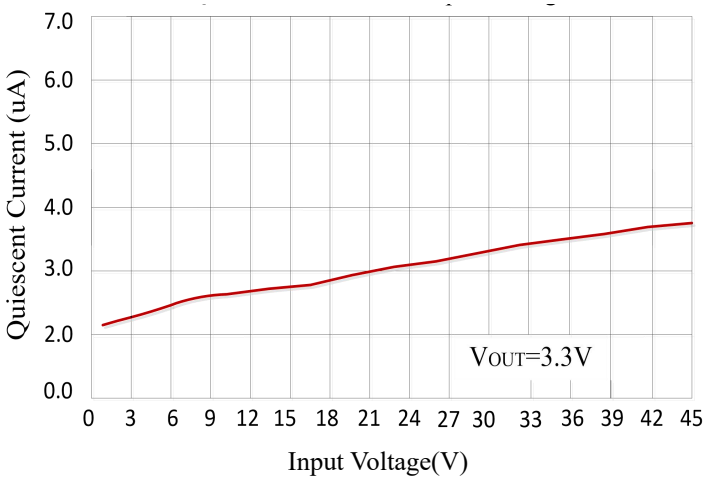
Test Condition: T_A=25°C,Iout=1mA, C_{OUT}=10uF, unless otherwise noted

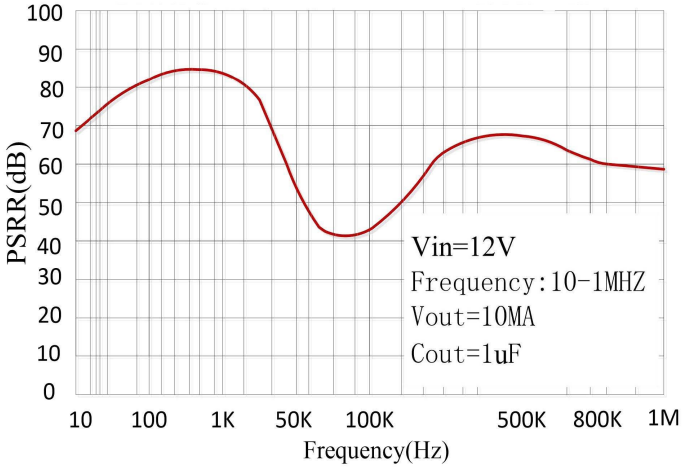




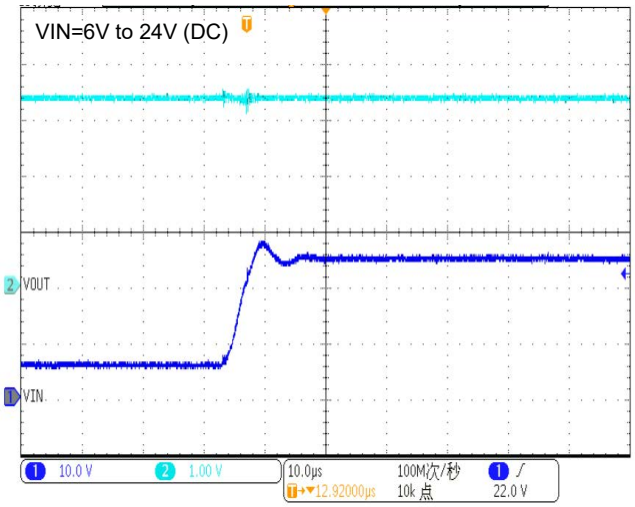




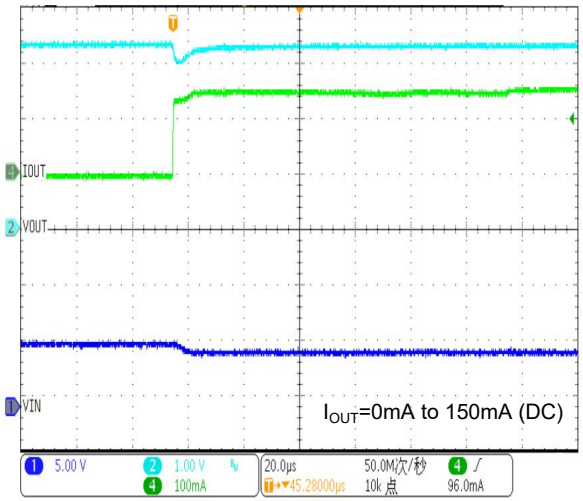




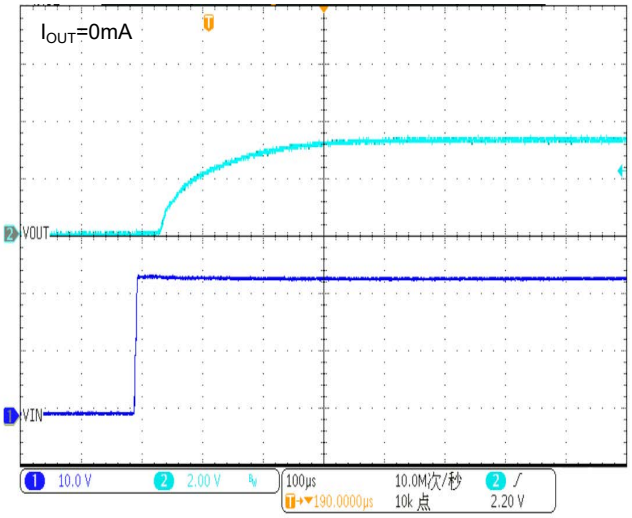
Line transient



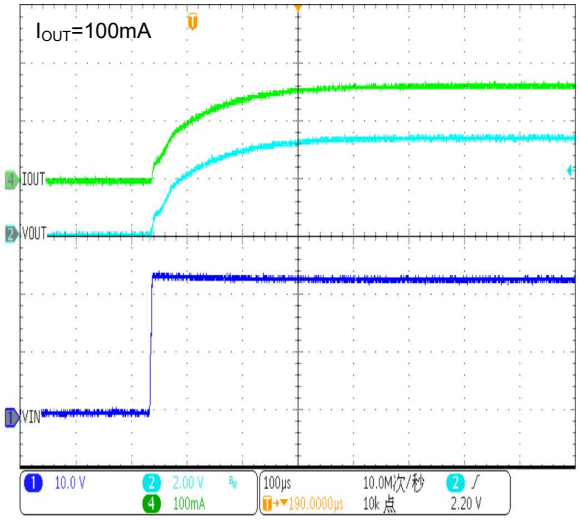
Load transient



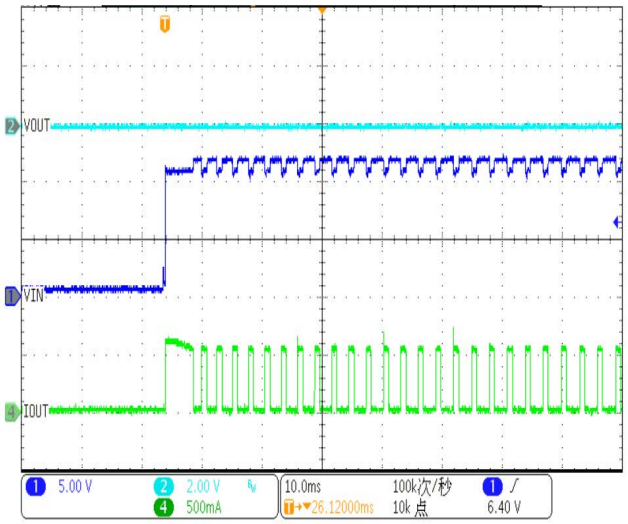
No-load start



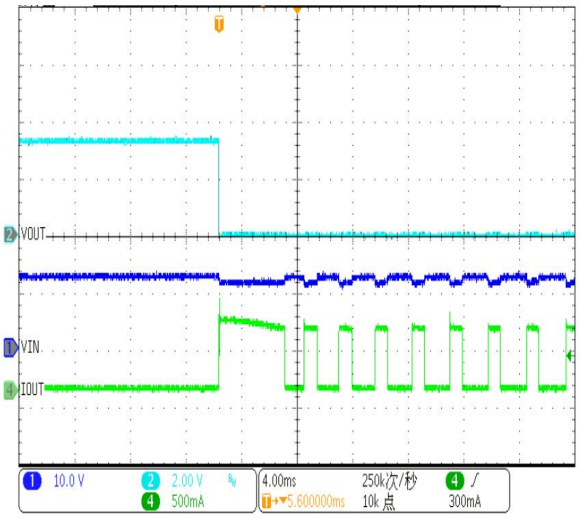
Start with load



Short-circuit Power-on



Power-on short



Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended minimum output capacitance is 10μF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

EN Pin Operation

The TN54 Series is turned on by setting the EN pin to “H”. Since the EN pin is neither pulled down nor pulled up internally, do not set it in floating status. When the EN pin is not used, connect the EN pin with VIN to keep the LDO in operating mode.

Current Limit and Short Circuit Protection

When output current at VOUT pin is higher than current limit threshold or the VOUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a pre-designed level to prevent over-current and thermal damage.

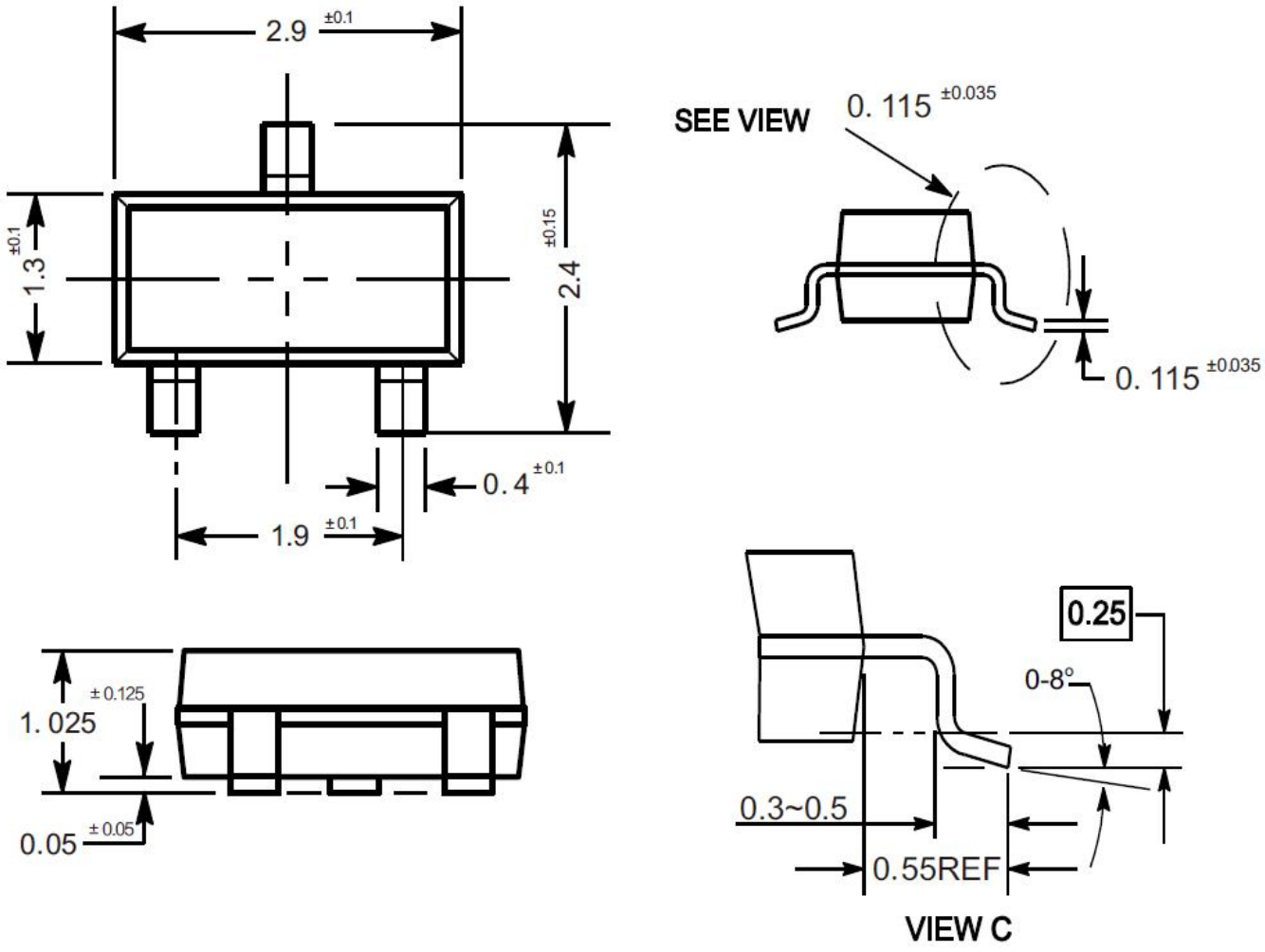
Thermal Protection

The TN54 Series has internal thermal sense and protection circuits. When excessive power dissipation happens on the device, such as short circuit at the output pin or very heavy load current with a large voltage drop across the device, the internal thermal protection circuit will be triggered, and it will shut down the power MOSFET to prevent the LDO from damage. As soon as excessive thermal condition is removed and the temperature of the device drops down, the thermal protection circuit will lease the control of the power MOSFET, and the LDO device goes to normal operation.

Package Outline

SOT-23

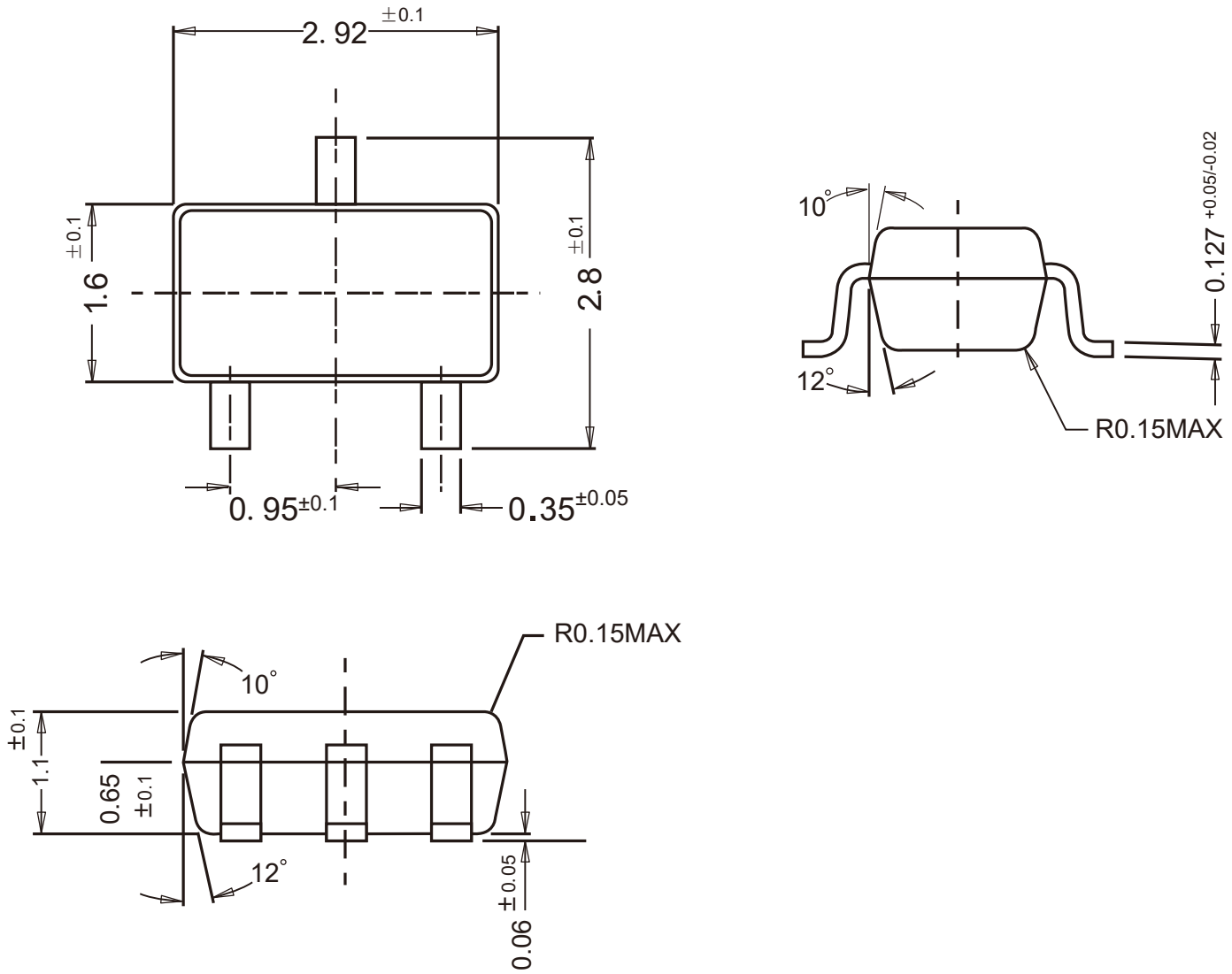
Dimensions in mm



Package Outline

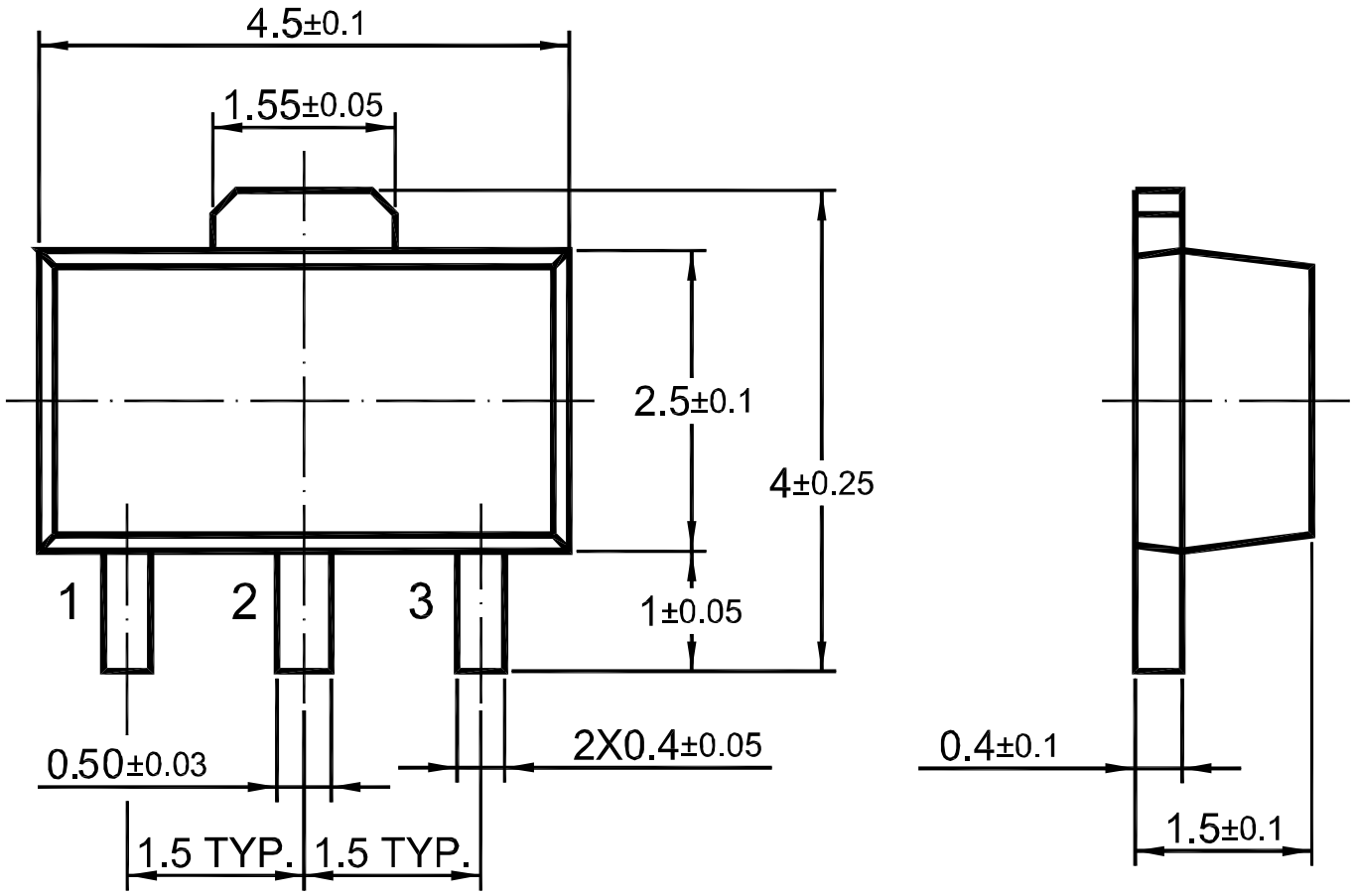
SOT-23-3

Dimensions in mm



Package Outline

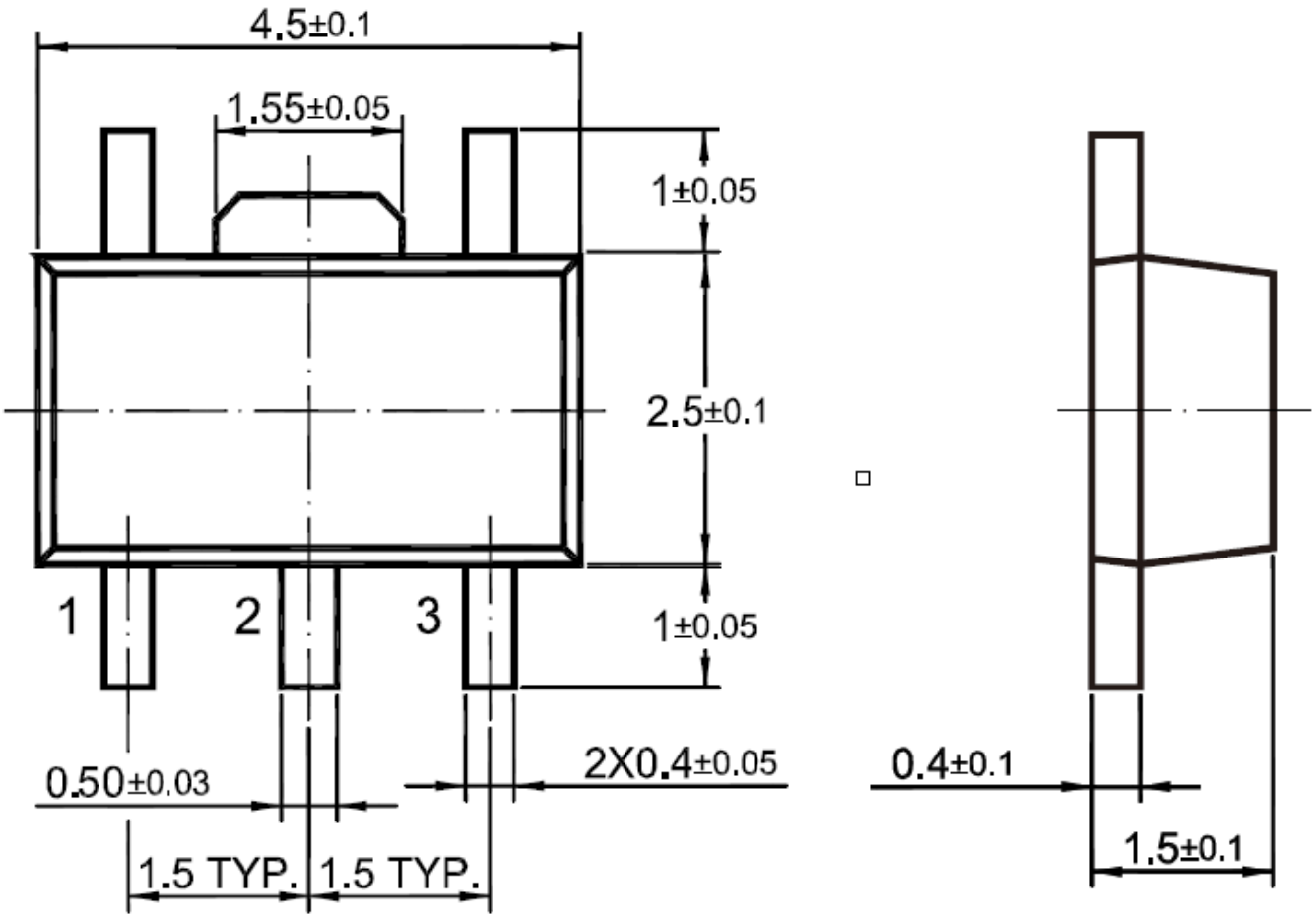
SOT-89
Dimensions in mm



Package Outline

SOT-89-5

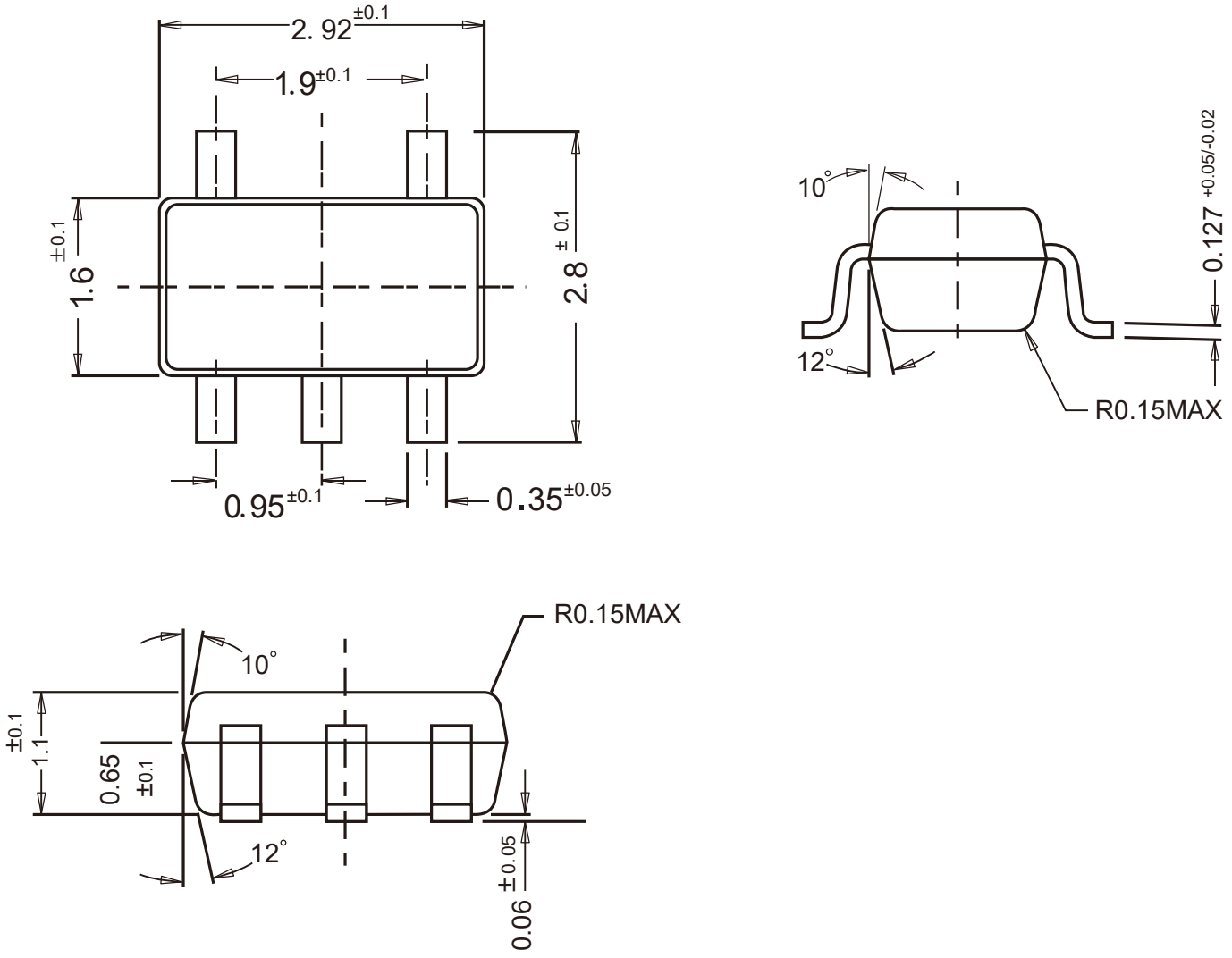
Dimensions in mm



Package Outline

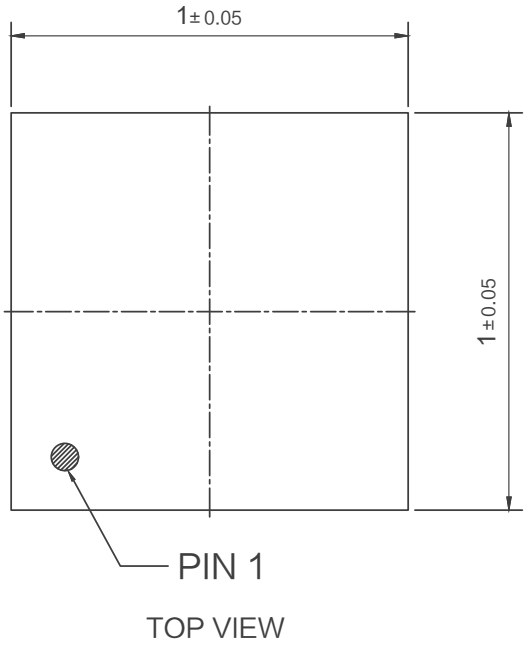
SOT-23-5

Dimensions in mm

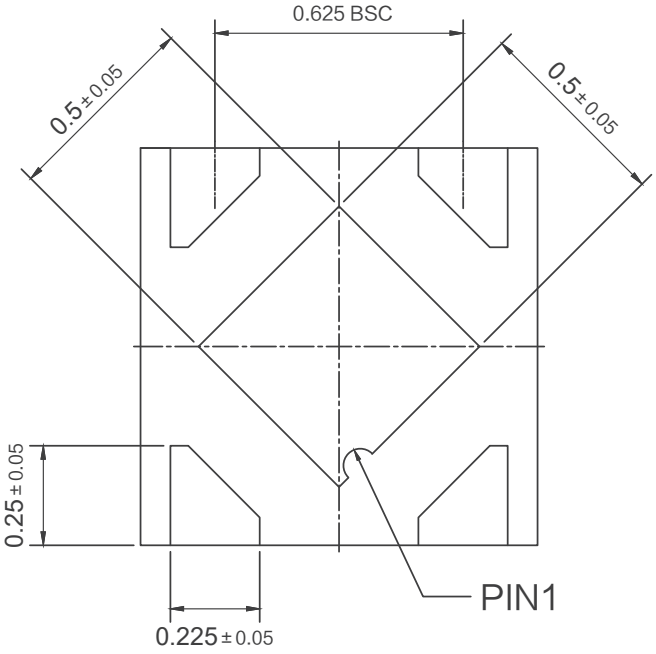


Package Outline

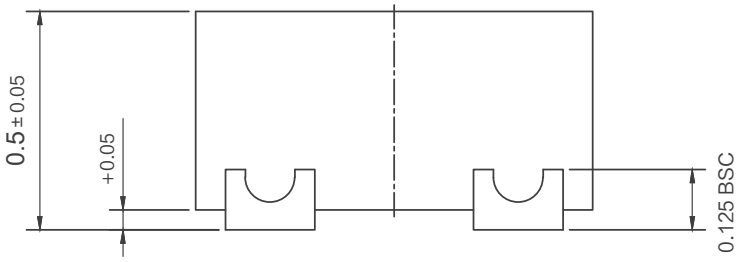
DFN1x1-4L
Dimensions in mm



TOP VIEW



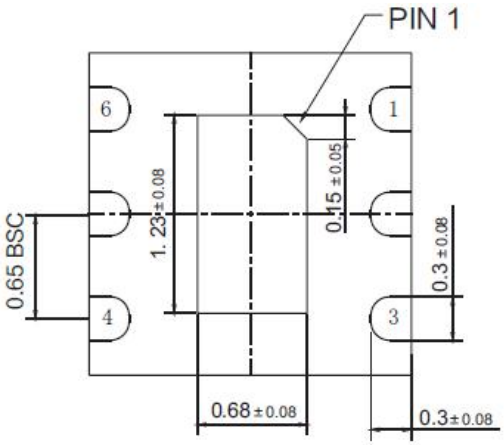
BOTTOM VIEW



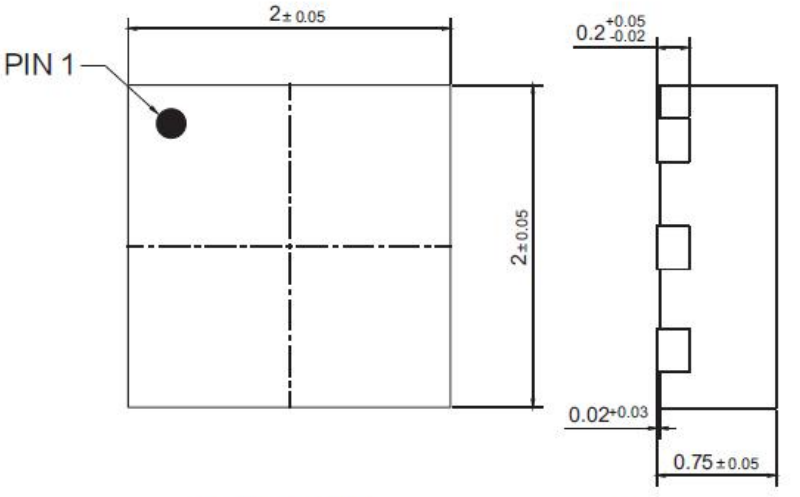
SIDE VIEW

Package Outline

DFN2x2C-6L
Dimensions in mm



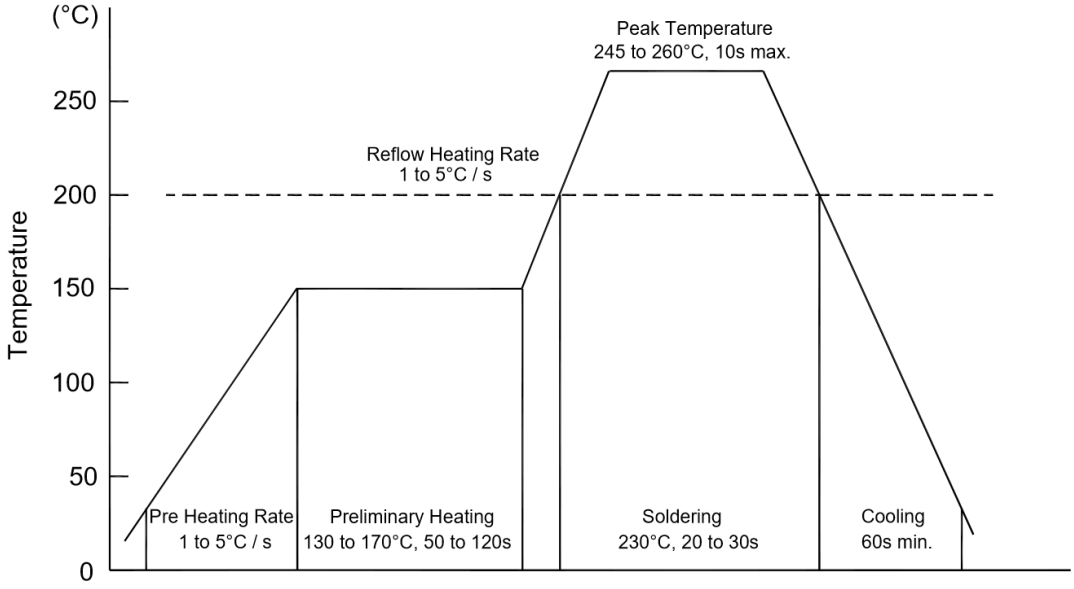
BOTTOM VIEW



TOP VIEW SIDE VIEW

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

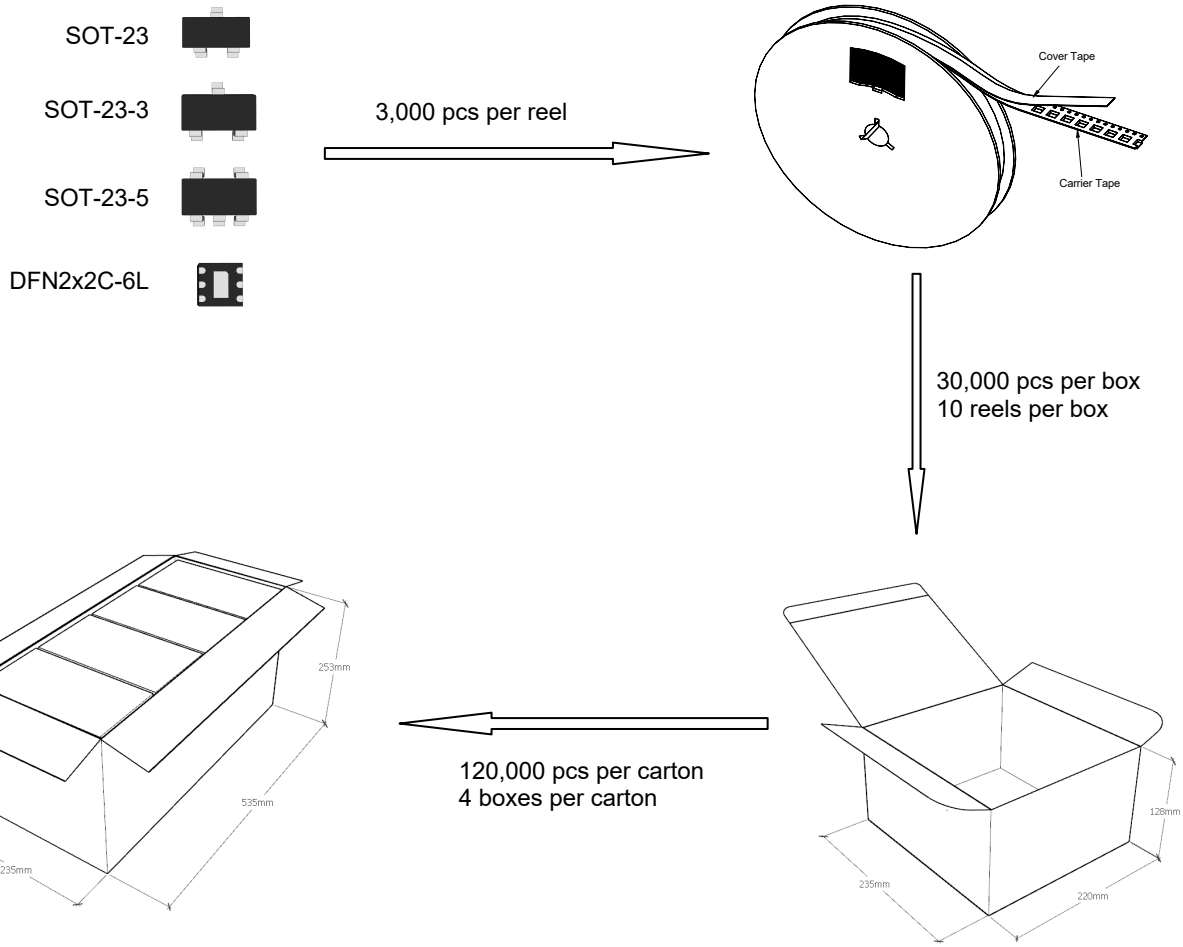
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

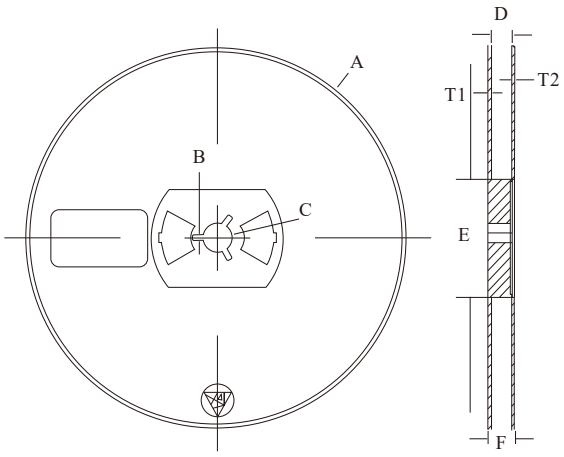
- **Temperature**
  5 to 40°C
- **Humidity**
  30 to 80% RH
- **Recommended period**
  One year after manufacturing

Package Specifications (SOT-23/SOT-23-3/SOT-23-5/DFN2x2C-6L)

- The method of packaging



◆ **reel data**

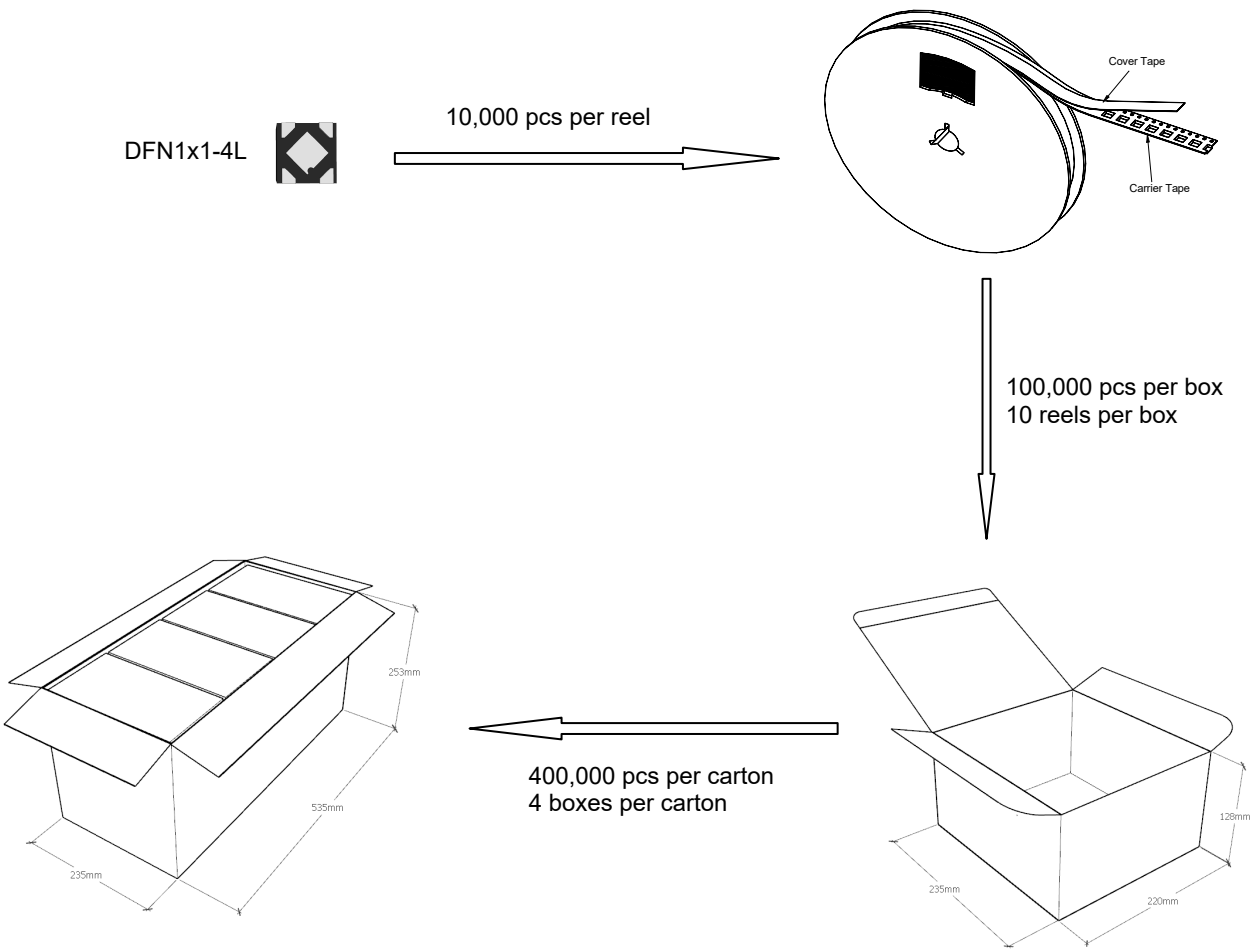


Reel (7")

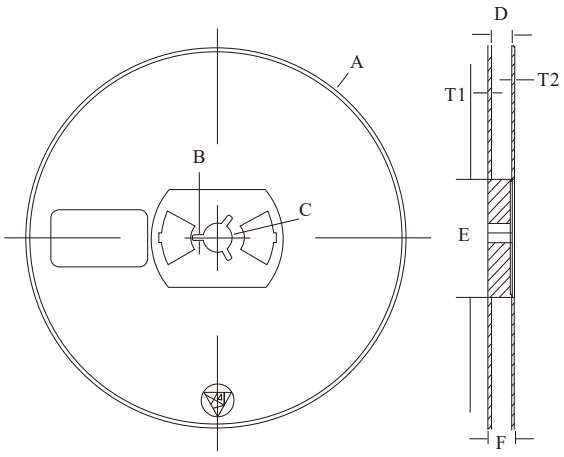
Symbol	Value (unit: mm)
A	Ø 177.8±1
B	2.7±0.2
C	Ø 13.5±0.2
E	Ø 54.5±0.2
F	12.3±0.3
D	9.6+2/-0.3
T1	1.0±0.2
T2	1.2±0.2

Package Specifications (DFN1x1-4L)

- The method of packaging



◆ **reel data**

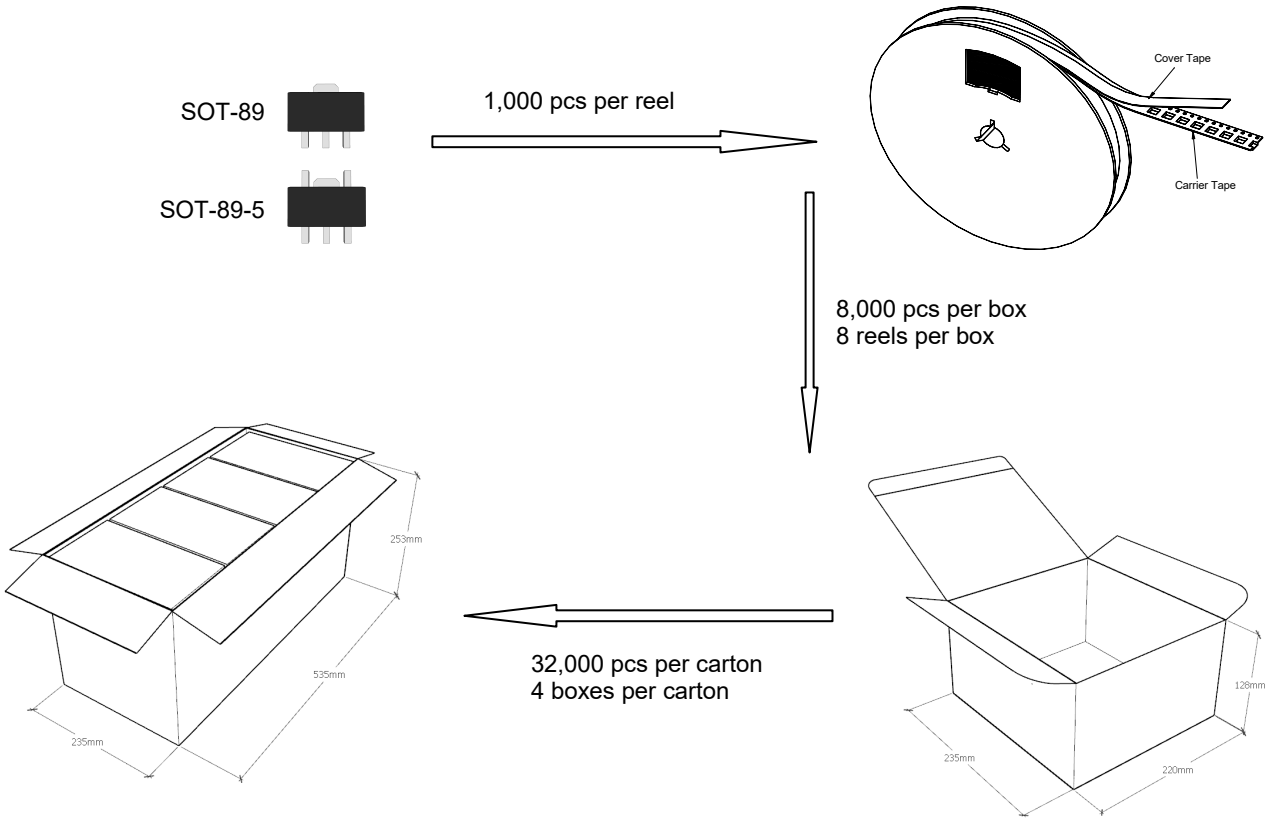


Reel (7")

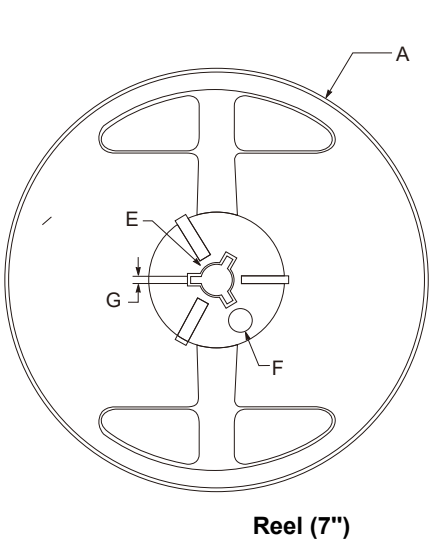
Symbol	Value (unit: mm)
A	Ø 177.8±1
B	2.7±0.2
C	Ø 13.5±0.2
E	Ø 54.5±0.2
F	12.3±0.3
D	9.6+2/-0.3
T1	1.0±0.2
T2	1.2±0.2

Package Specifications (SOT-89/SOT-89-5)

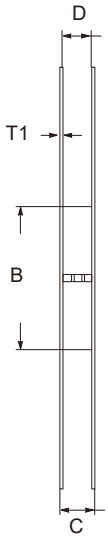
- The method of packaging (1,000PCS/Reel&7inches)



◆ **reel data**



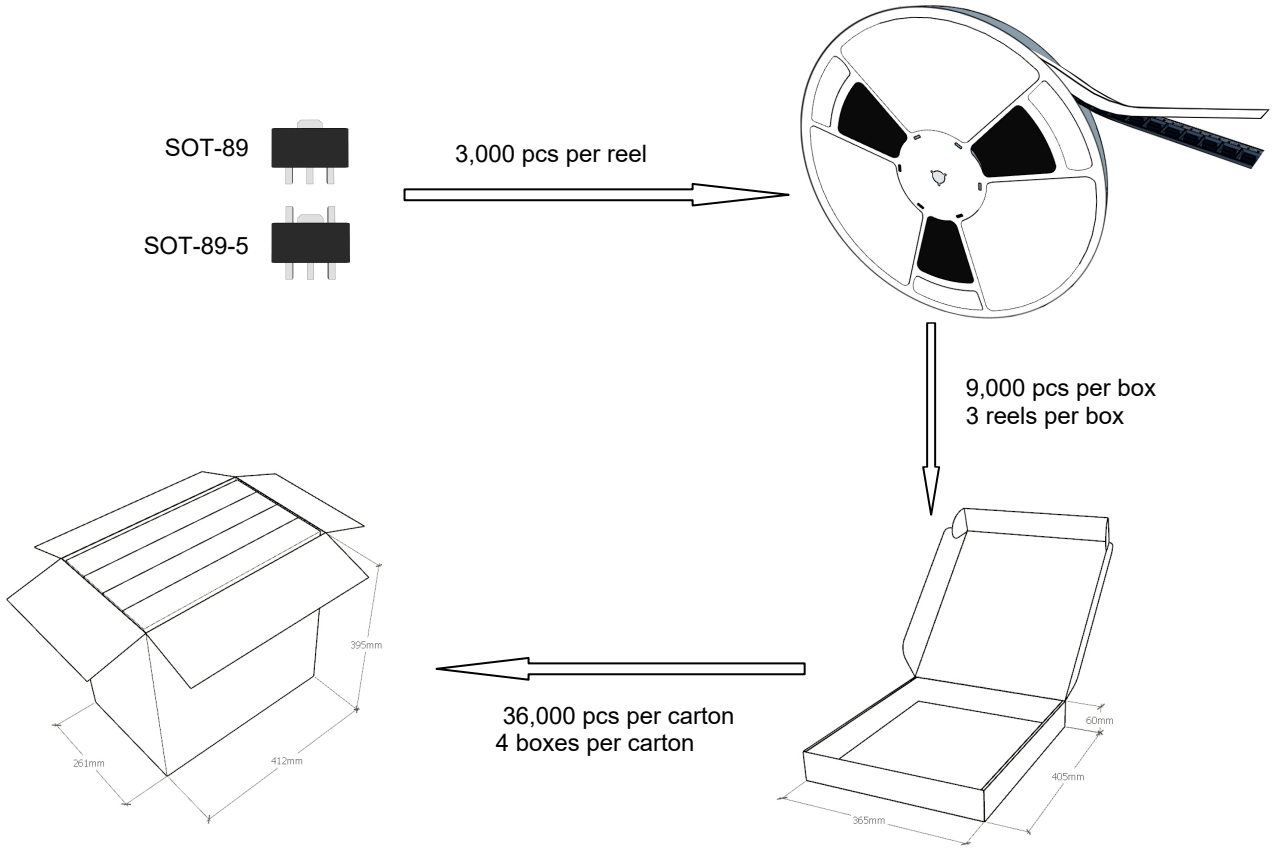
Reel (7")



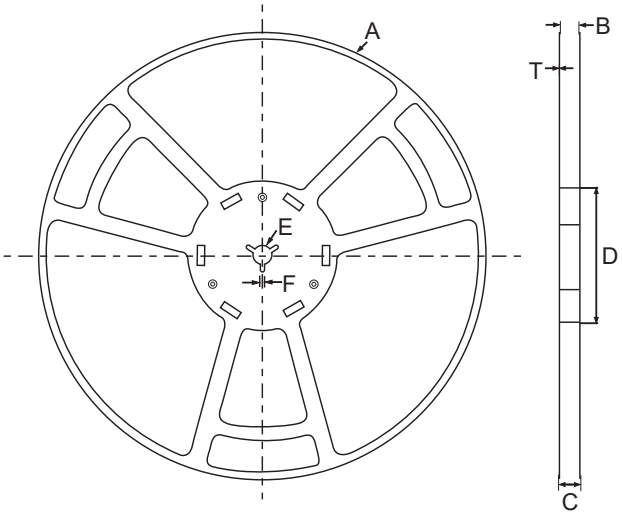
symbol	Value(unit:mm)
A	Φ179±1
B	60.5±0.2
C	15.3±0.3
D	12.5~13.7
E	Φ13.5±0.2
F	Φ10.0±0.2
G	2.7±0.2
T1	1.0±0.2

Package Specifications (SOT-89/SOT-89-5)

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



◆ **reel data**

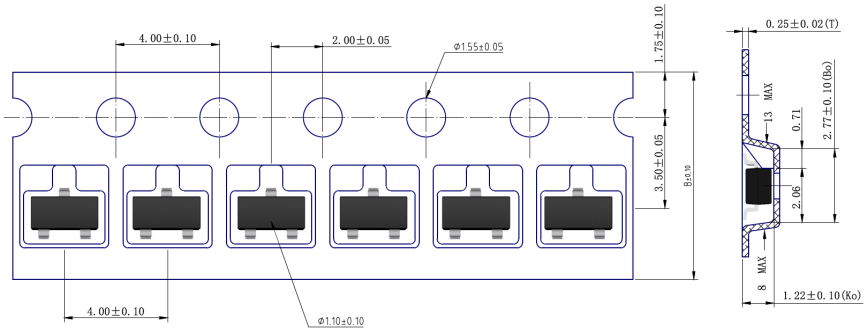


Reel (13")

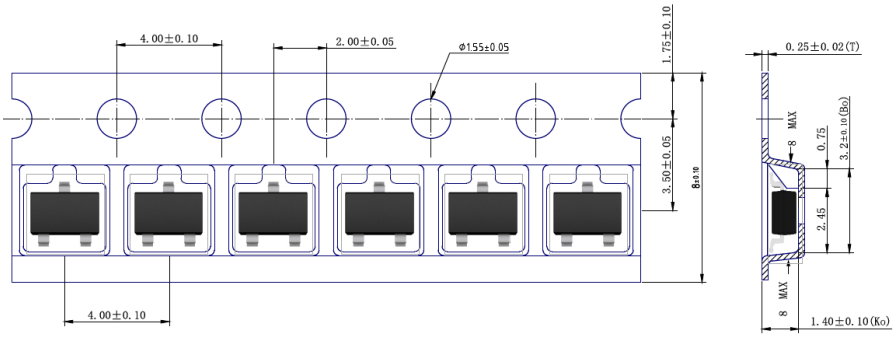
symbol	Value(unit:mm)
A	ϕ330±1
B	12.7±0.5
C	16.5±0.3
D	ϕ99.5±0.5
E	ϕ13.6±0.3
F	2.8±0.3
T	1.9±0.2

◆ Embossed tape data

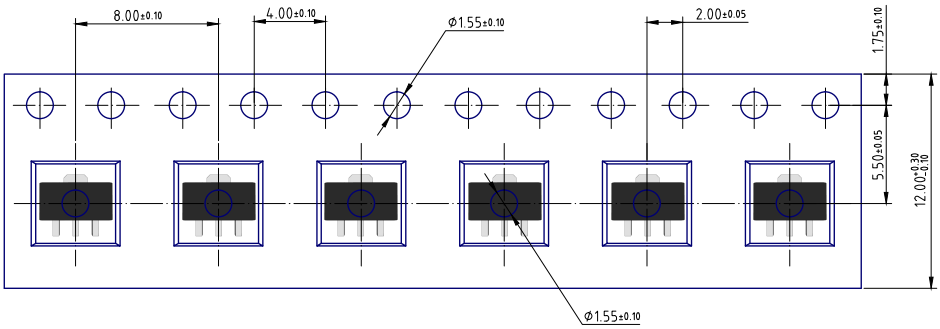
SOT-23



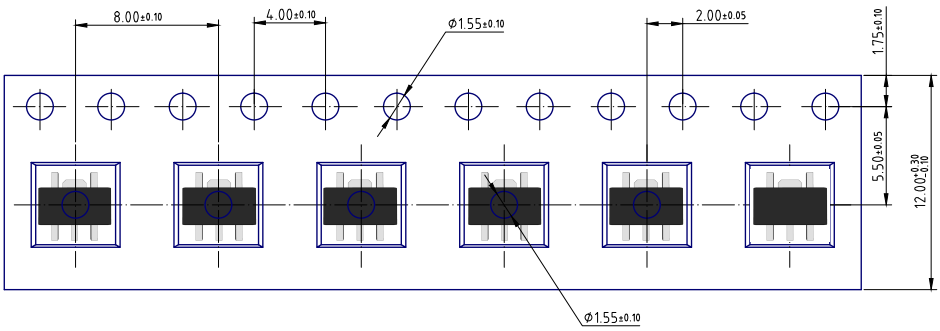
SOT-23-3



SOT-89

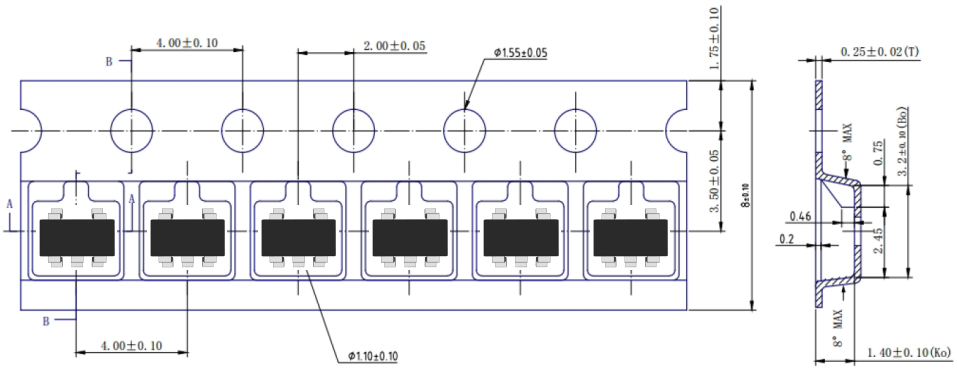


SOT-89-5

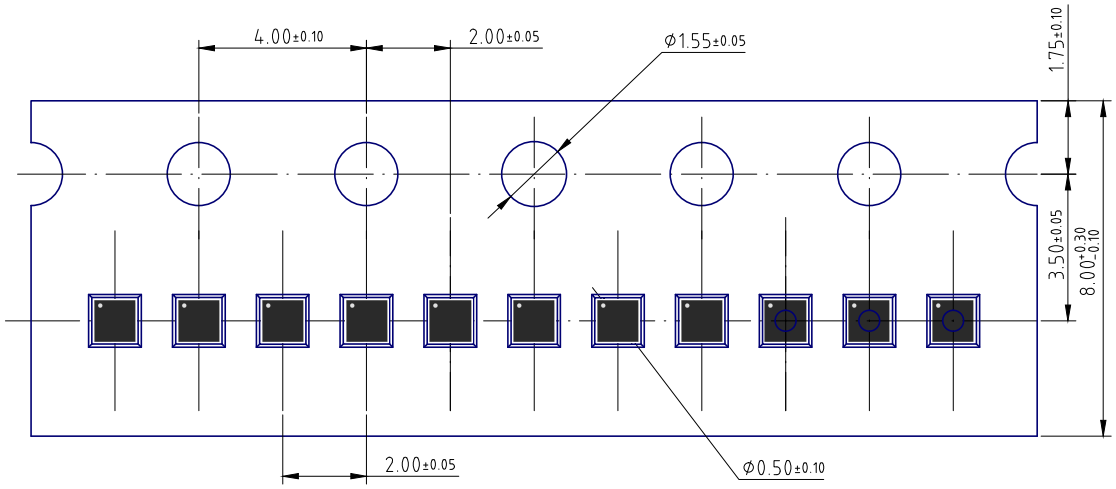


◆ **Embossed tape data**

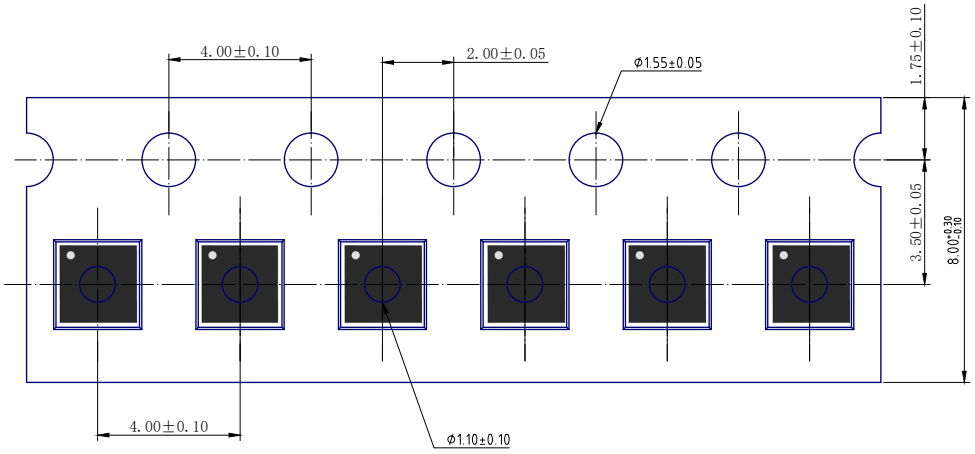
SOT-23-5



DFN1x1-4L



DFN2x2C-6L



Contact Information

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

For additional information, please contact your local Sales Representative.

® is registered trademarks of TANI Corporation.

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.