

Description**Programmable Precision Reference**

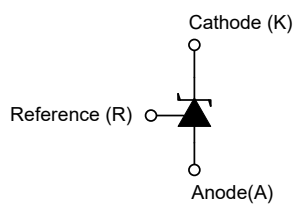
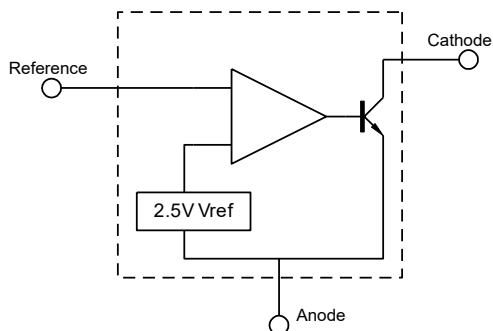
The TL431L is three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output Voltage may be set to any value between V_{ref} (approximately 2.5V) and 36 V with two external resistors. These devices have provides a very sharp turn-on characteristic, making these device excellent replacement for zener diodes in many applications.

Features

- Wide programmable output voltage from 2.5V to 36V
- Sink current capability from 0.5mA to 100mA.
- Low output noise
- Wide Operating Range of -40 to 125°C

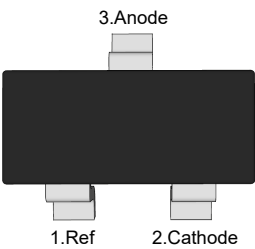
Application

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

Functional block diagram

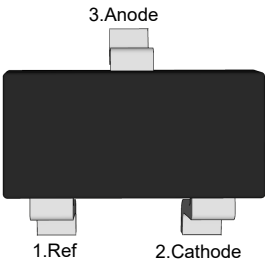
Pin Distribution

SOT-23



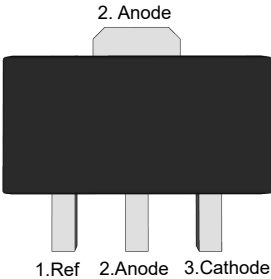
(Top View)

SOT-23-3



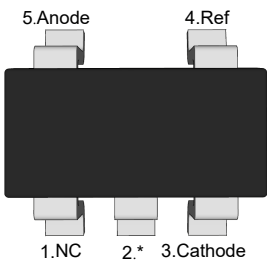
(Top View)

SOT-89



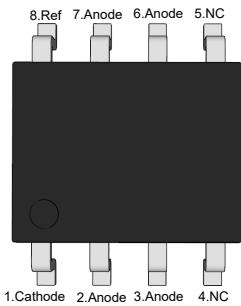
(Top View)

SOT-23-5



(Top View)

SOP-8



(Top View)

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

Ordering Information

TL431L □ □

└ 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%

Orderable Device	Voltage Tolerance	Package	Reel (inch)	Package Qty (PCS)	Eco Plan ^{Note}	MSL Level	Marking Code
TL431L	1%	SOT-23	7	3000	RoHS & Green	MSL1	431L
TL431LA	0.5%	SOT-23	7	3000	RoHS & Green	MSL1	431LA
TL431LSC	1%	SOT-23-3	7	3000	RoHS & Green	MSL3	431LC
TL431LASC	0.5%	SOT-23-3	7	3000	RoHS & Green	MSL3	431LAC
TL431LSQ	1%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	431L
TL431LASQ	0.5%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	431LA
TL431LSE	1%	SOT-23-5	7	3000	RoHS & Green	MSL3	431LE
TL431LASE	0.5%	SOT-23-5	7	3000	RoHS & Green	MSL3	431LAE
TL431LPA	1%	SOP-8	13	4000	RoHS & Green	MSL3	431LP
TL431LAPA	0.5%	SOP-8	13	4000	RoHS & Green	MSL3	431LAP

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°C 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	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

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

Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Reference Input Voltage ^{Fig1}	V _{REF}	V _{KA} =V _{REF} , I _{KA} =10mA	TL431LA(0.5%)	2.488	2.500	2.512	V
			TL431L(1%)	2.475	2.500	2.525	V
Deviation of Reference Input Voltage Over Temperature ^{Fig1}	ΔV _{REF}	V _{KA} =V _{REF} , I _{KA} =10mA T _{MIN} ≤ T _A ≤ T _{MAX}		--	16	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	ΔV _{KA} =10V~V _{REF}	--	-1.0	-2.7	mV/V
			ΔV _{KA} =36V~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~ 100mA, f≤1.0KHz		--	0.2	0.5	Ω

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

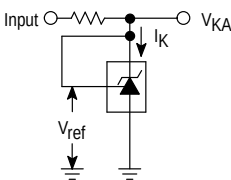


Figure 2. Test Circuit for V_{KA} > V_{REF}

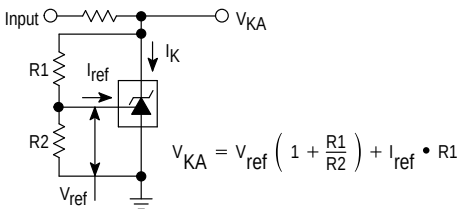
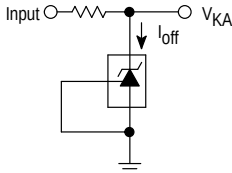
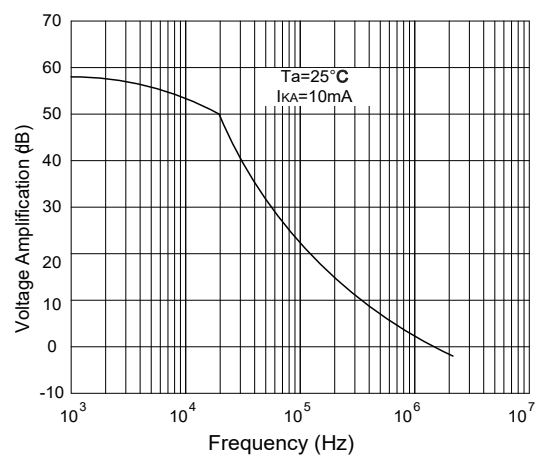
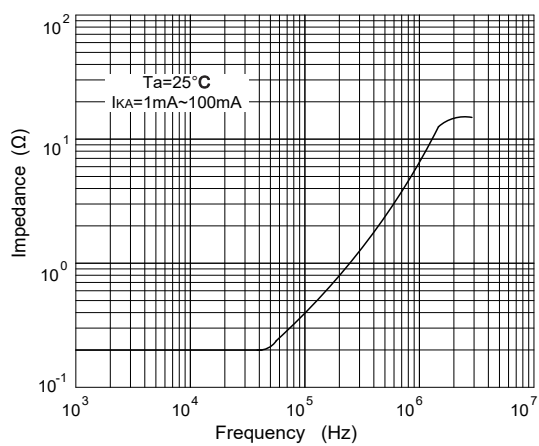
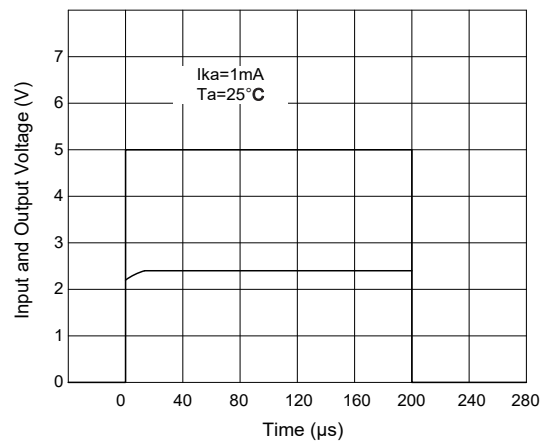
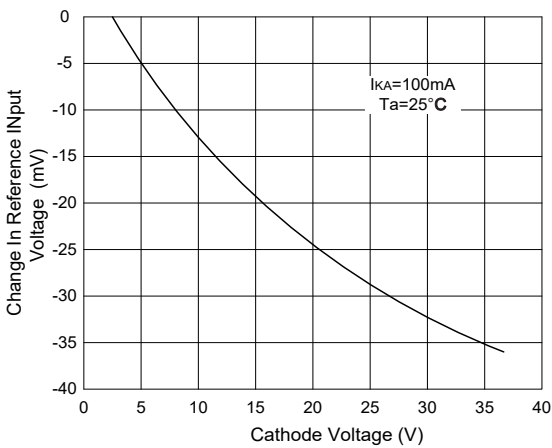
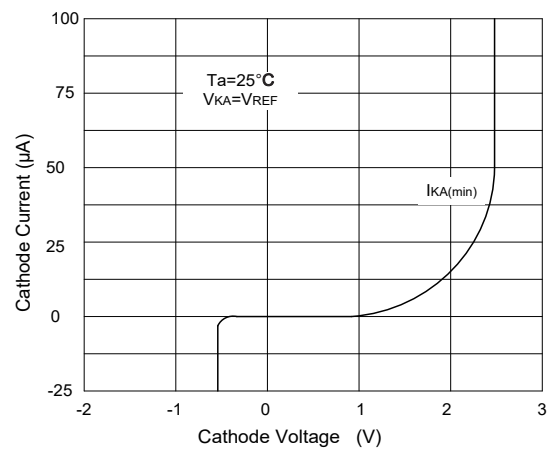
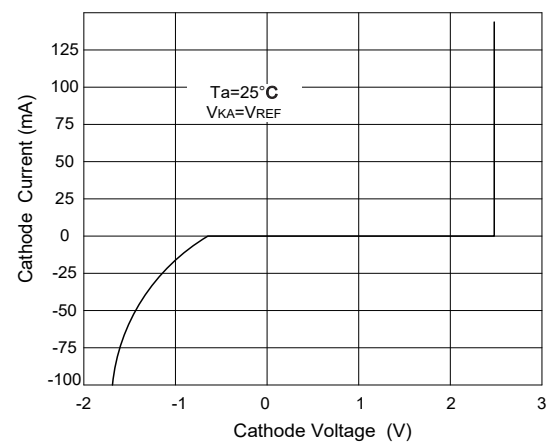


Figure 3. Test Circuit for I_{OFF}



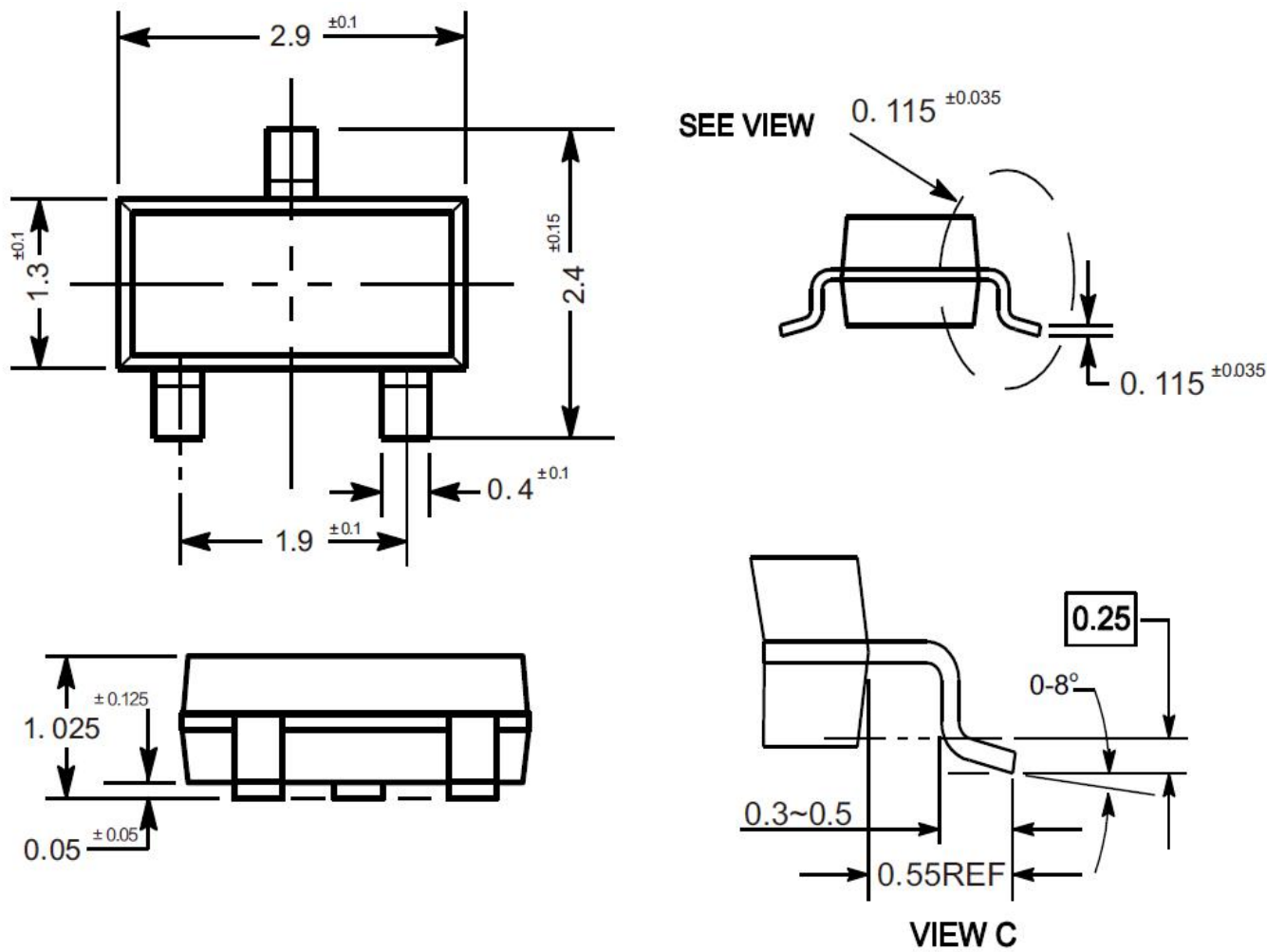
Typical Characteristic Curves



Package Outline

SOT-23

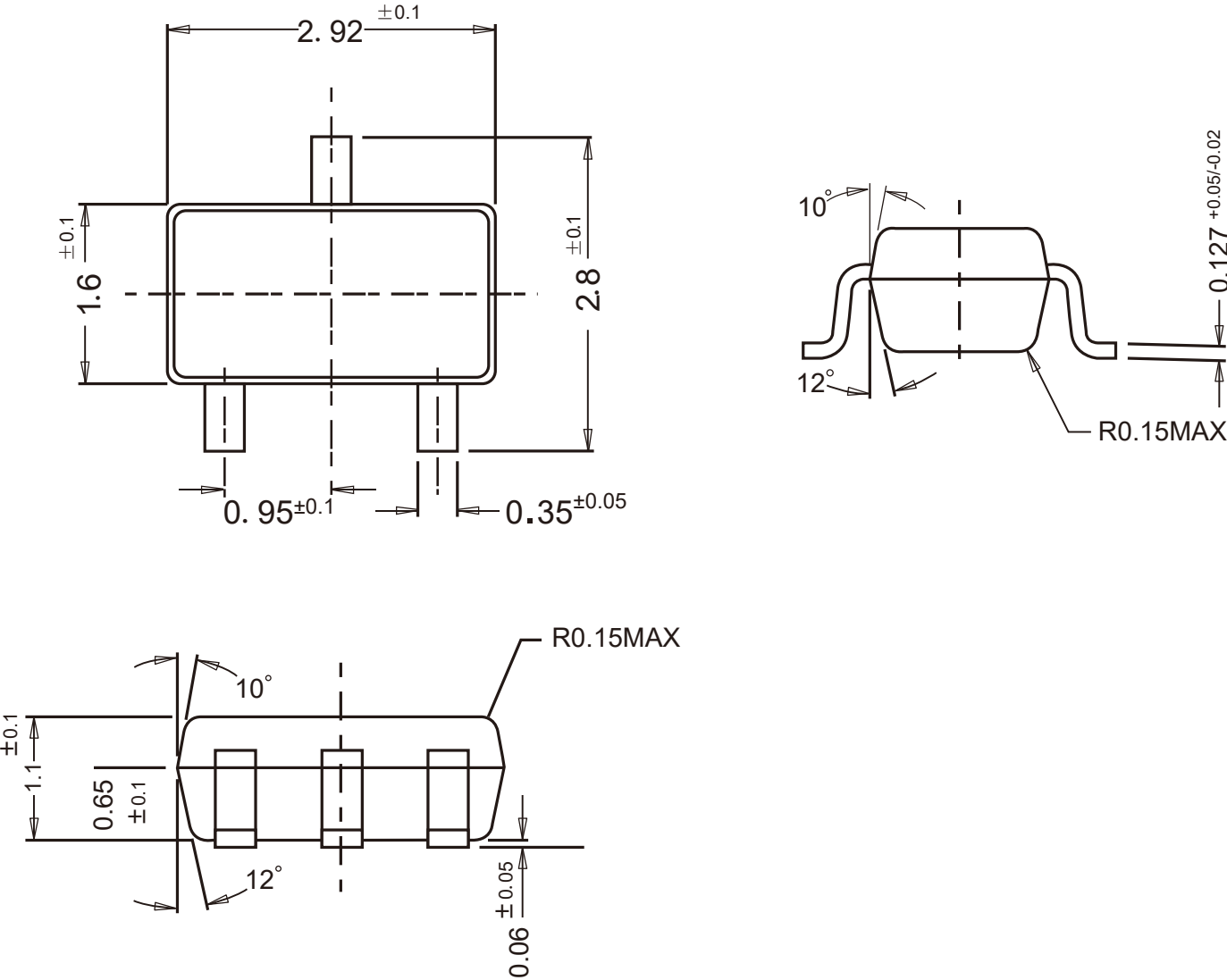
Dimensions in mm



Package Outline

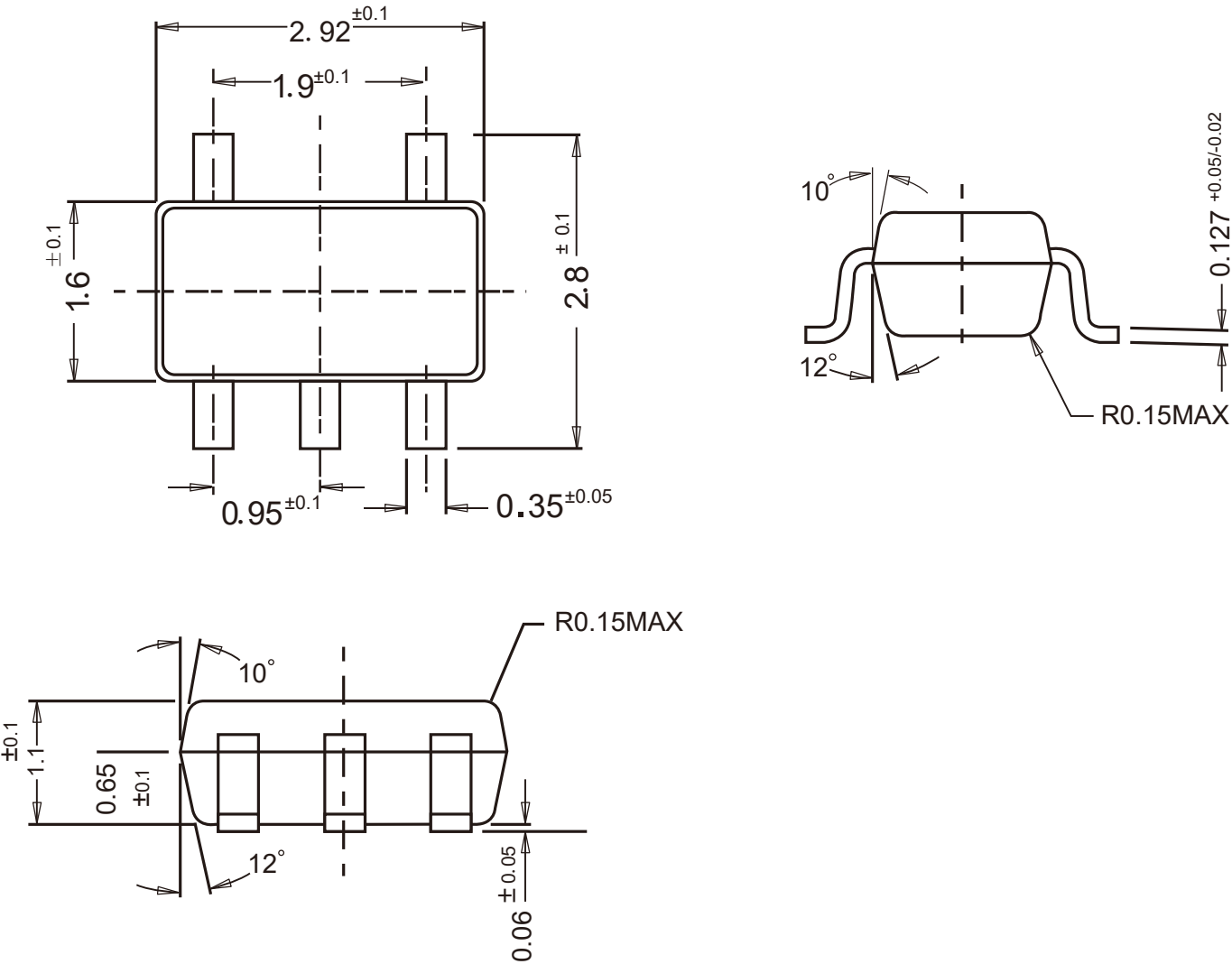
SOT-23-3

Dimensions in mm



Package Outline

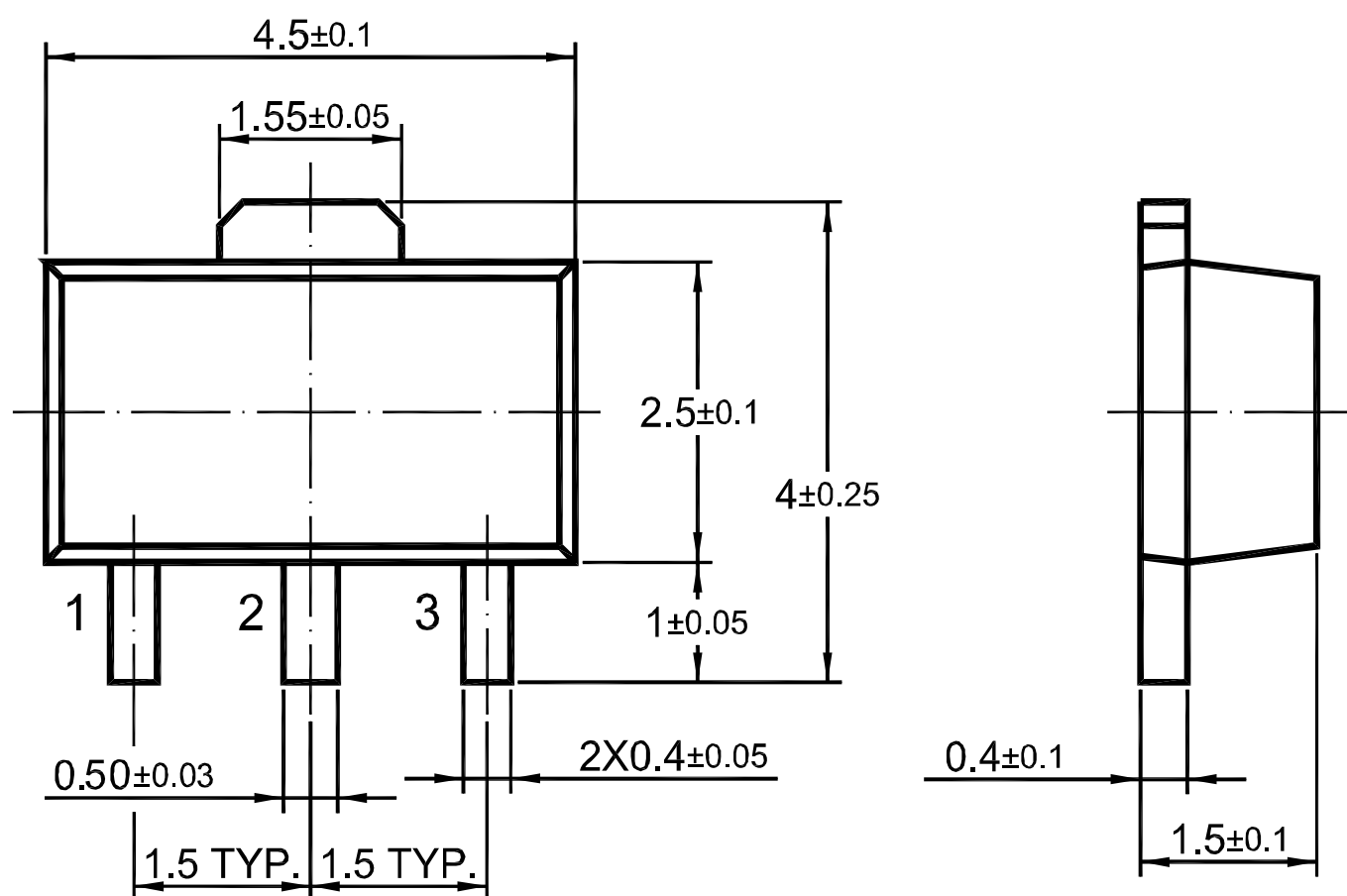
SOT-23-5
Dimensions in mm



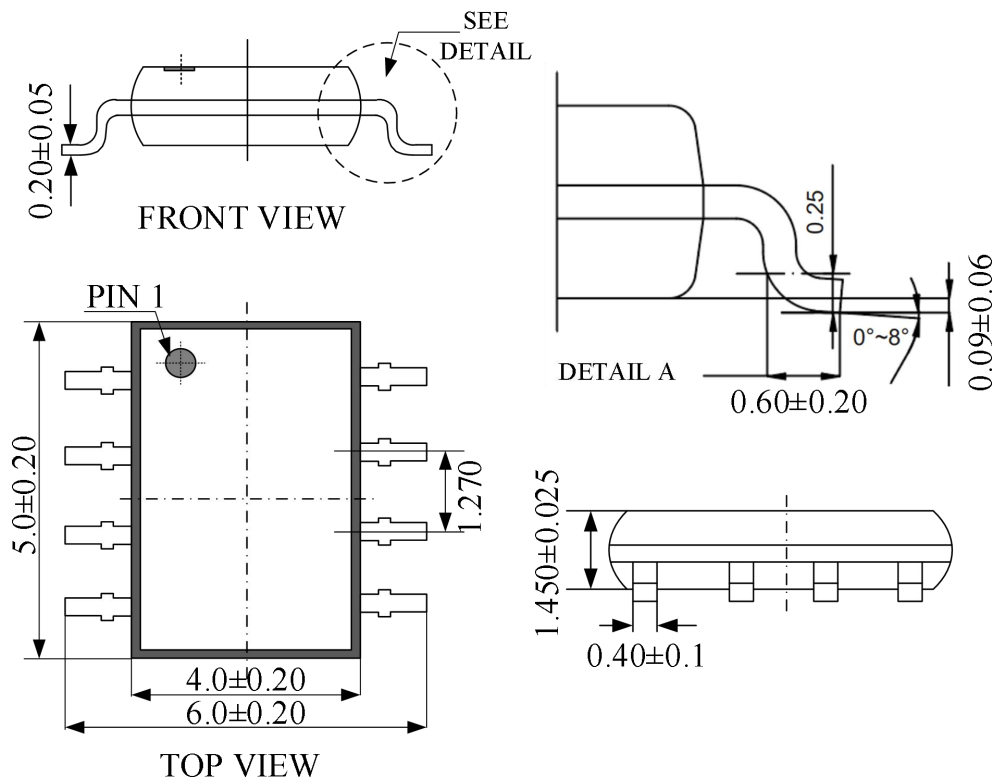
Package Outline

SOT-89

Dimensions in mm



Outline Drawing – SOP-8(Dimensions in mm)



Package Information

Package Type	Description	Quantity (pcs)	Standard
SOP-8	Reel -13" tape	4000	EIA-481

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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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.

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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.

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