

Description

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.

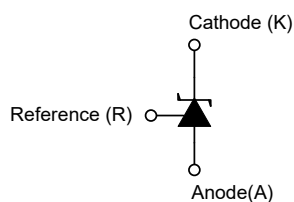
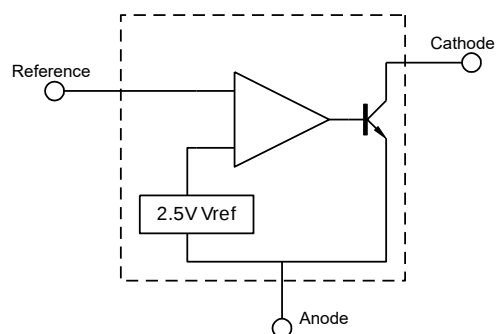
Features

- Wide programmable prise 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

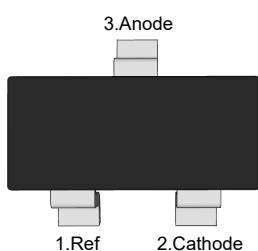
- Adjustable voltage and current references
- Voltage monitoring
- Replacement of zener diode
- Comparator with integrated reference

Functional block diagram



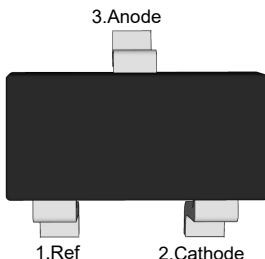
Pin Distribution

SOT-23



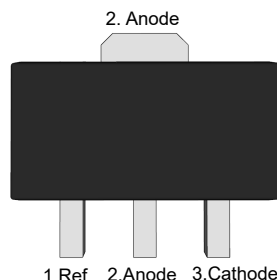
(Top View)

SOT-23-3



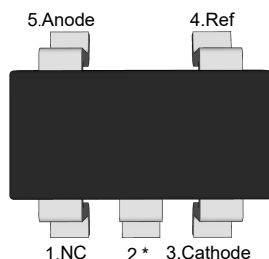
(Top View)

SOT-89



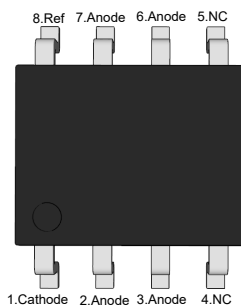
(Top View)

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: PJ 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: PJ 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

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

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Input Voltage ^{Fig1}	V_{REF}	$V_{KA}=V_{REF}$, $I_{KA}=10mA$	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}	$V_{KA}=V_{REF}$, $I_{KA}=10mA$ $T_{MIN} \leq T_A \leq T_{MAX}$	--	16	25	mV
Ratio of Change in Reference Input Voltage to The Change in Cathode Voltage ^{Fig2}	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA}=10mA$	$\Delta V_{KA}=10V \sim V_{REF}$ --	-1.0	-2.7	mV/V
			$\Delta V_{KA}=36V \sim 10V$ --	-1.0	-2.0	
Reference Input Current ^{Fig2}	I_{REF}	$I_{KA}=10mA$, $R1=10K\Omega$, $R2=\infty$	--	1	2	μA
Deviation of Reference Input Current Over Full Temperature Range ^{Fig2}	ΔI_{REF}	$I_{KA}=10mA$, $R1=10K\Omega$, $R2=\infty$, $T_A=full\ Temperature$	--	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}	$V_{KA}=V_{REF}$, $I_{KA}=1 \sim 100mA$, $f \leq 1.0KHz$	--	0.2	0.5	Ω

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

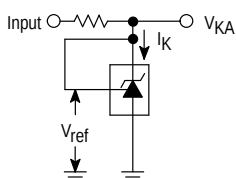


Figure 2. Test Circuit for $V_{KA} > V_{REF}$

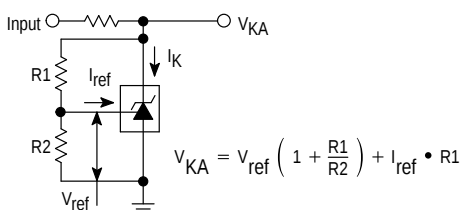
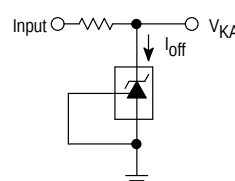
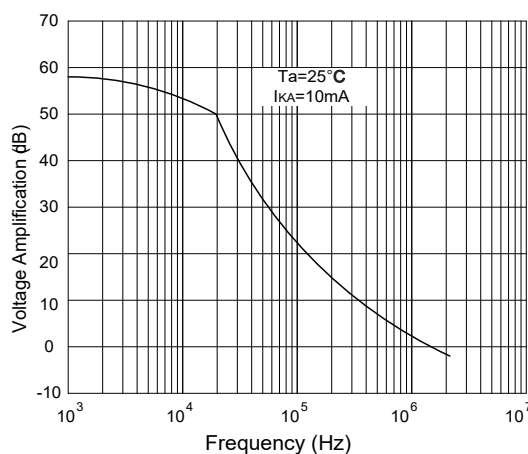
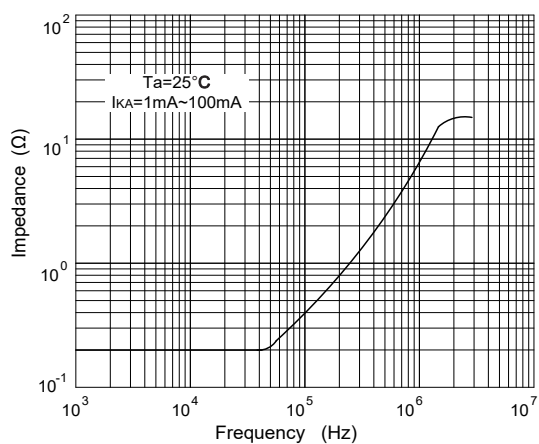
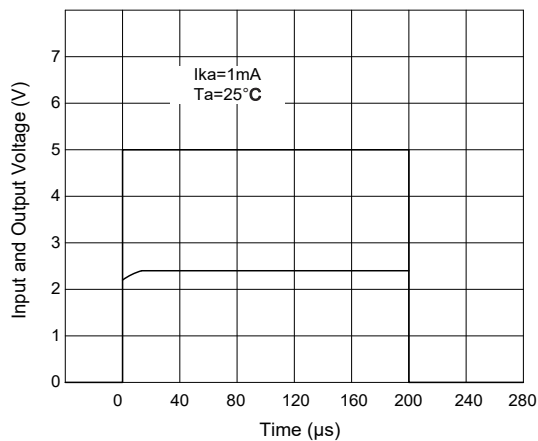
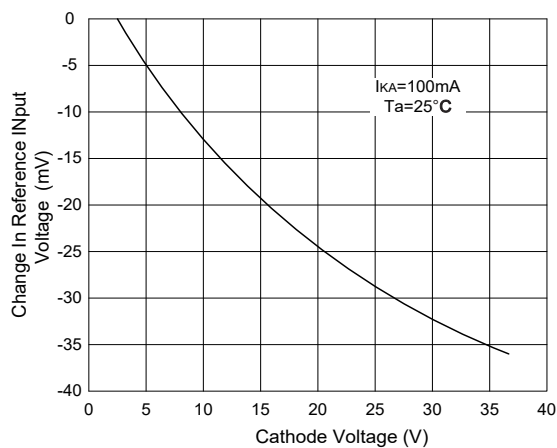
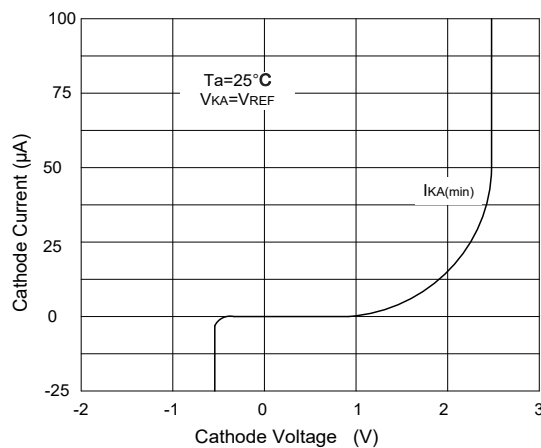
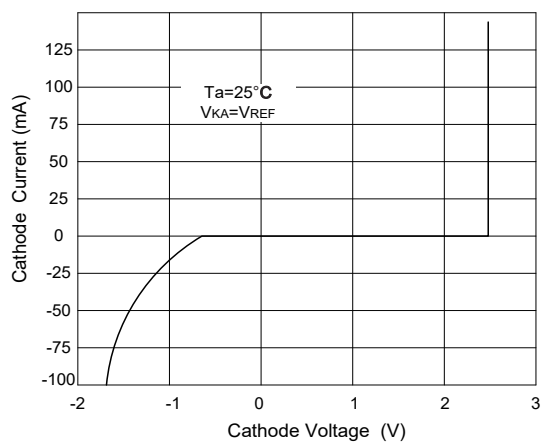


Figure 3. Test Circuit for I_{OFF}



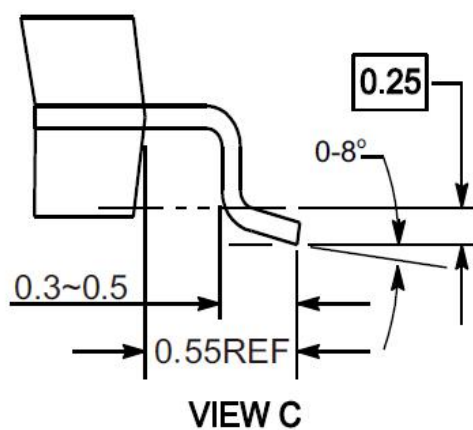
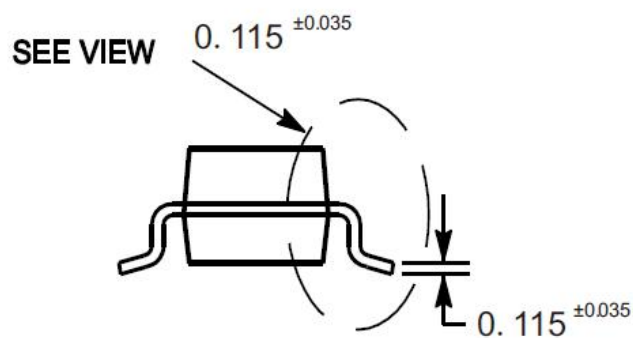
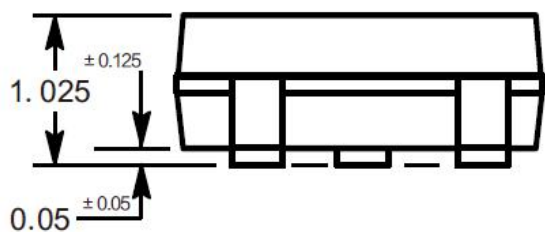
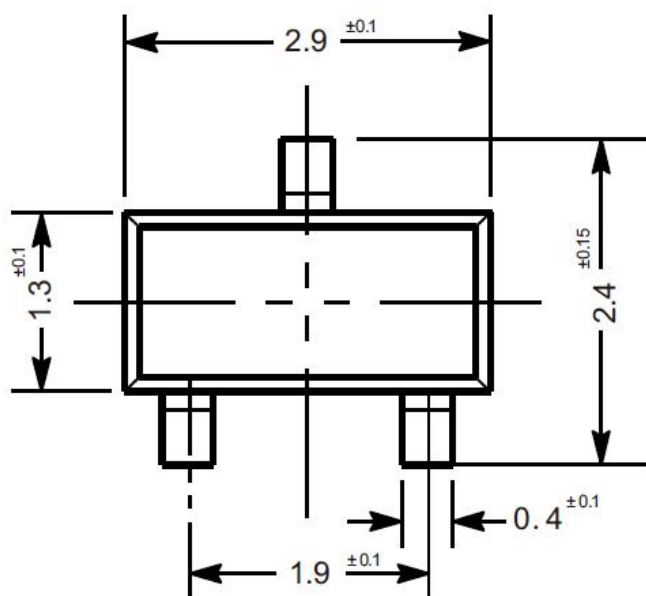
Typical Characteristic Curves



Package Outline

SOT-23

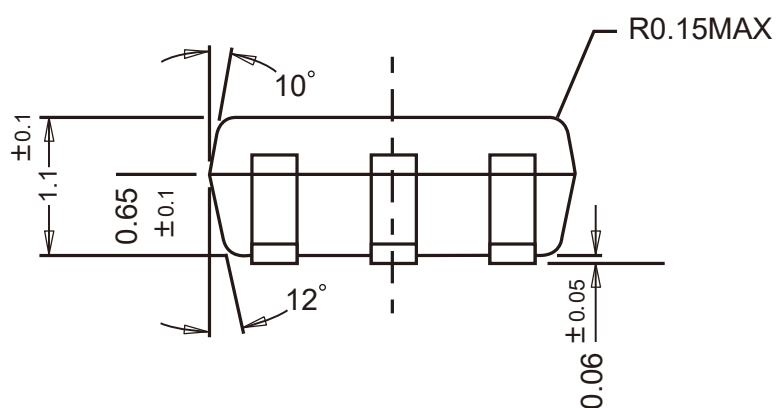
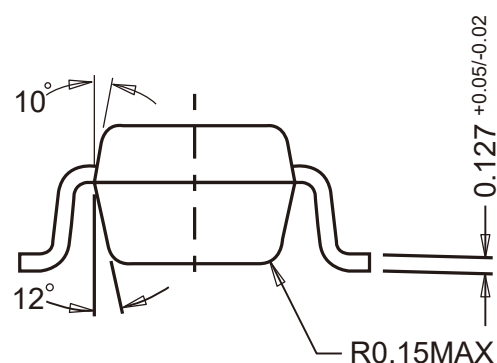
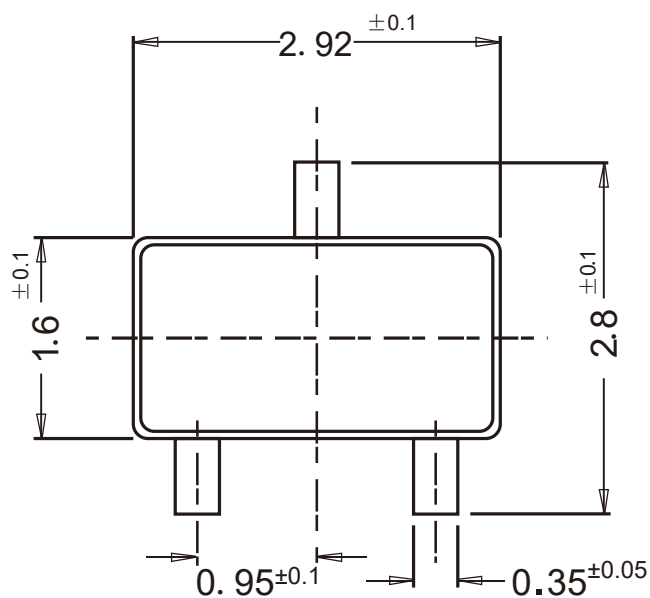
Dimensions in mm



Package Outline

SOT-23-3

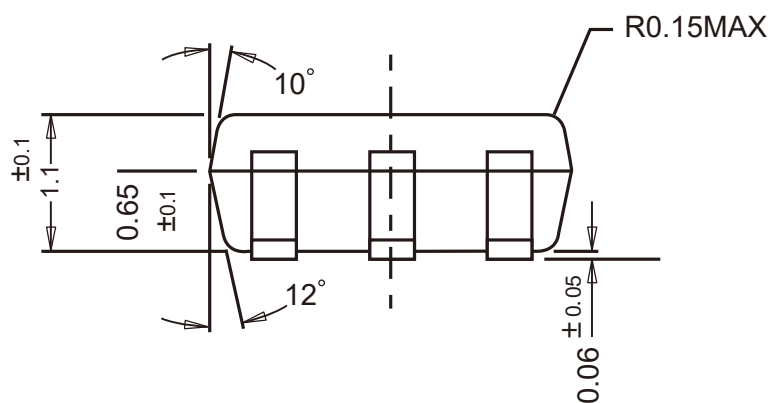
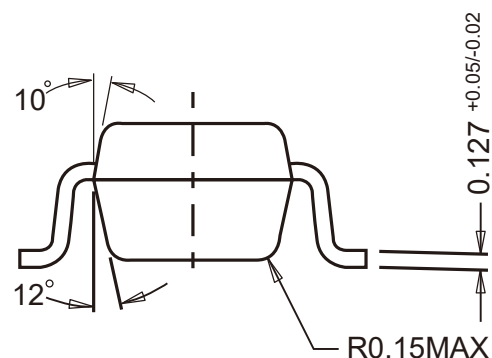
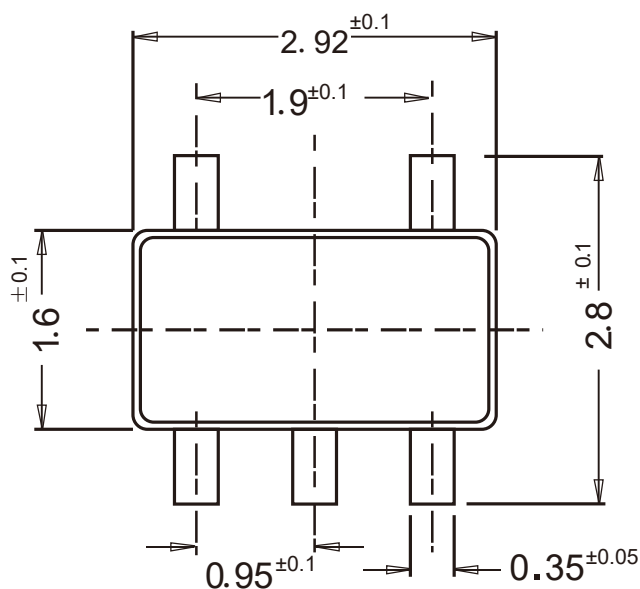
Dimensions in mm



Package Outline

SOT-23-5

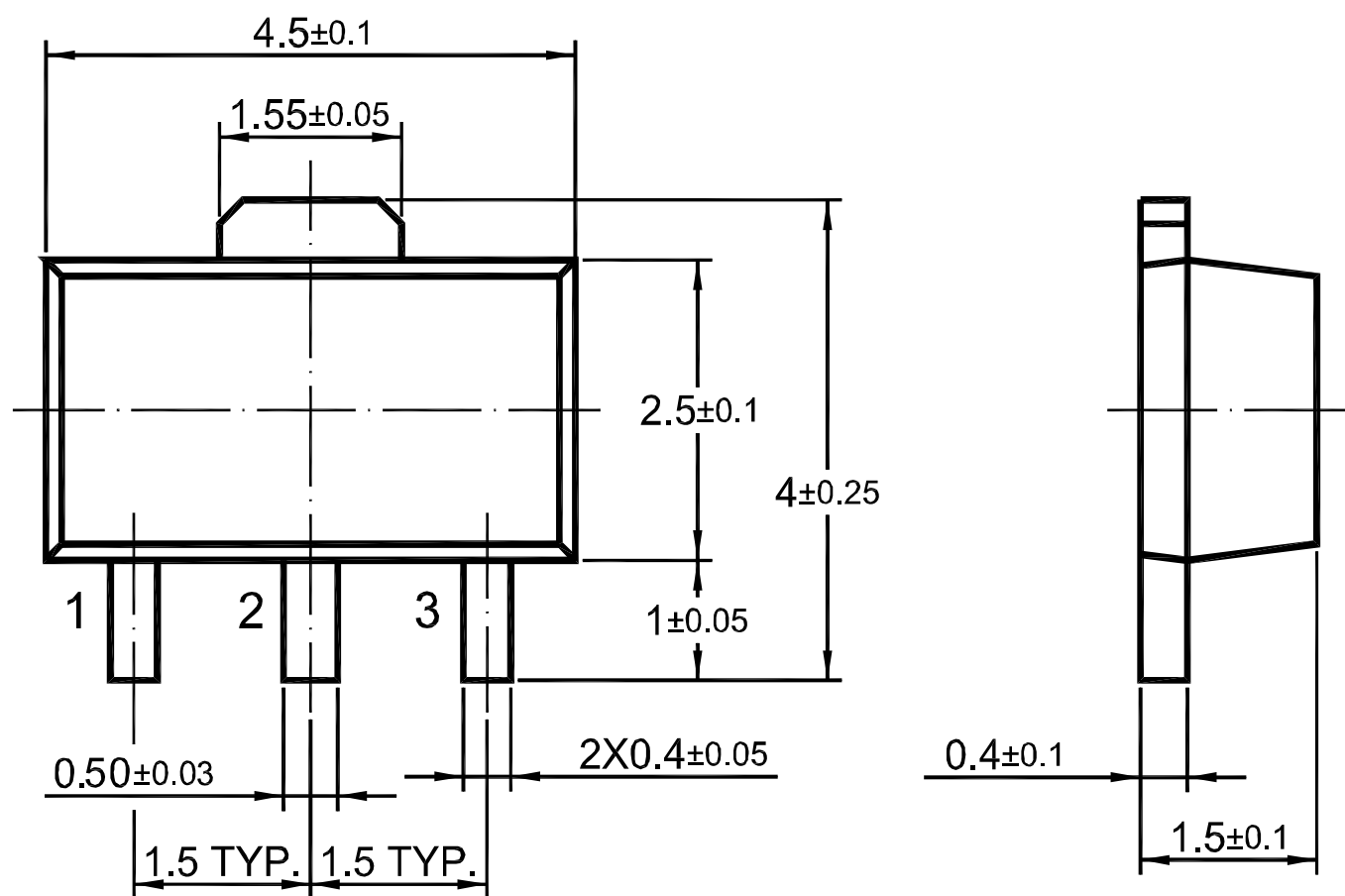
Dimensions in mm



Package Outline

SOT-89

Dimensions in mm



Package Outline

SOP-8

Dimensions in mm

