

Description

The TL431H 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 2.500V) and 36 V with two external resistors. These devices have provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

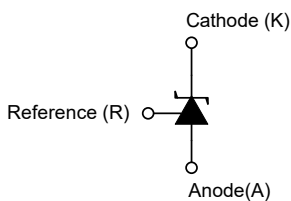
Feature

- Wide programmable prise output voltage from 2.500V to 36V
- Low output noise
- Wide Operating Range of -40 to 125°C

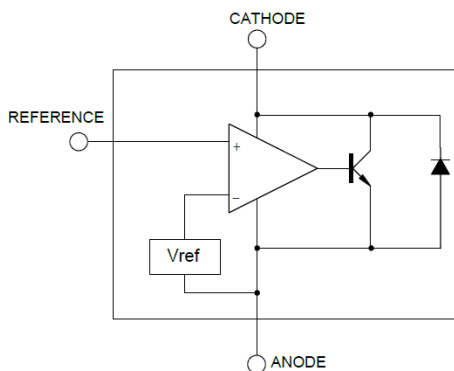
Application

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

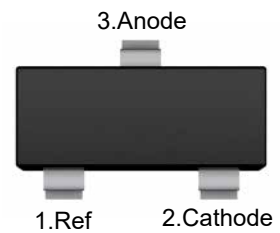
Schematic diagram



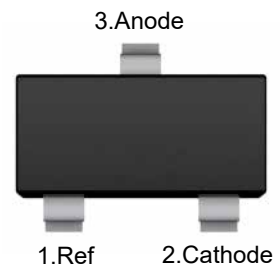
Functional block diagram



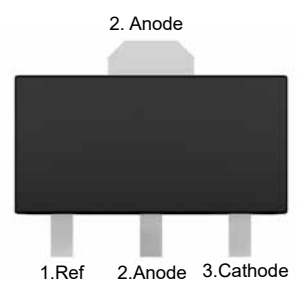
SOT-23



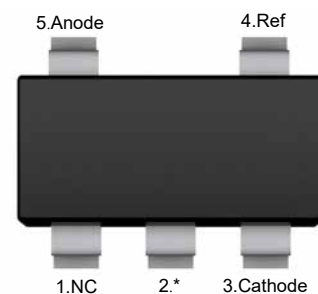
SOT-23-3



SOT-89

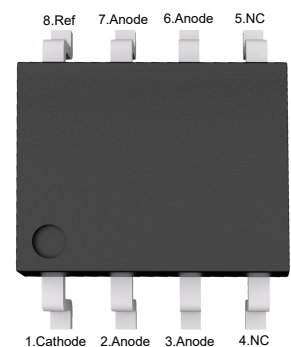


SOT-23-5



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

SOP-8



NC: No internal connection



Ordering Information

TL431H-□ □

└ 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
TL431H	1%	SOT-23	7	3000	RoHS & Green	MSL1	431H
TL431HA	0.5%	SOT-23	7	3000	RoHS & Green	MSL1	431HA
TL431HB	0.4%	SOT-23	7	3000	RoHS & Green	MSL1	431HB
TL431HSC	1%	SOT-23-3	7	3000	RoHS & Green	MSL3	431HC
TL431HASC	0.5%	SOT-23-3	7	3000	RoHS & Green	MSL3	431HAC
TL431HBSC	0.4%	SOT-23-3	7	3000	RoHS & Green	MSL3	431HBC
TL431HSQ	1%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	T431H
TL431HASQ	0.5%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	T431HA
TL431HBSQ	0.4%	SOT-89	7 / 13	1000 / 3000	RoHS & Green	MSL1	T431HB
TL431HSE	1%	SOT-23-5	7	3000	RoHS & Green	MSL3	431HE
TL431HASE	0.5%	SOT-23-5	7	3000	RoHS & Green	MSL3	431HAE
TL431HBSE	0.4%	SOT-23-5	7	3000	RoHS & Green	MSL3	431HBE
TL431HPA	1%	SOP-8	13	4000	RoHS & Green	MSL3	431HP
TL431HAPA	0.5%	SOP-8	13	4000	RoHS & Green	MSL3	431HAP
TL431HBPA	0.4%	SOP-8	13	4000	RoHS & Green	MSL3	431HBP

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 (Operating temperature range applies 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 Junction Temperature	T_{OPR}	-40 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C
ESD(Human Body Model)	$V_{ESD(HBM)}$	8000	V

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
Operating Ambient Temperature Range	T_{OPR}	-40	125	°C

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 TL431H(1%)	2.475	2.500	2.525	V
		TL431HA(0.5%)	2.488	2.500	2.512	V
		TL431HB(0.4%)	2.490	2.500	2.510	V
Deviation of Reference Input Voltage Over Temperature ^{Fig1}	ΔV _{REF}	V _{KA} =V _{REF} , I _{KA} =10mA T _{MIN} ≤ T _A ≤ T _{MAX}	--	4.5	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	--	-0.5	-2.0	
Reference Input Current ^{Fig2}	I _{REF}	I _{KA} =10mA, R1=10KΩ, R2=∞	--	1.5	4	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}	--	0.3	0.5	mA
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	--	0.15	0.5	Ω

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

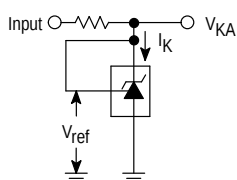


Figure 2. Test Circuit for V_{KA} > V_{REF}

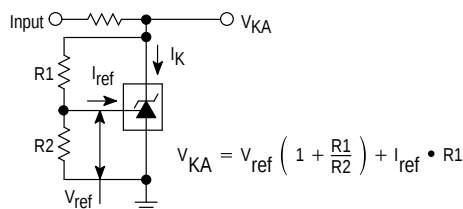
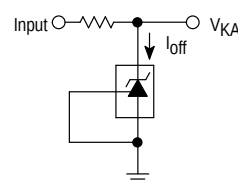
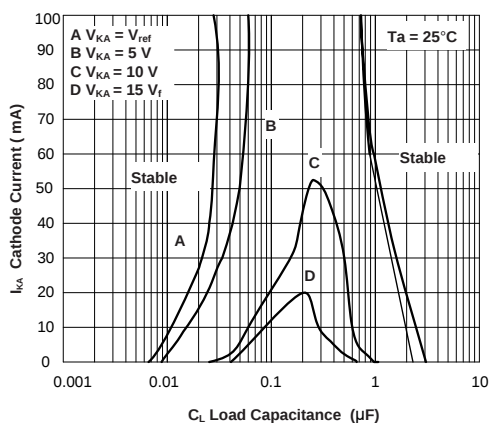
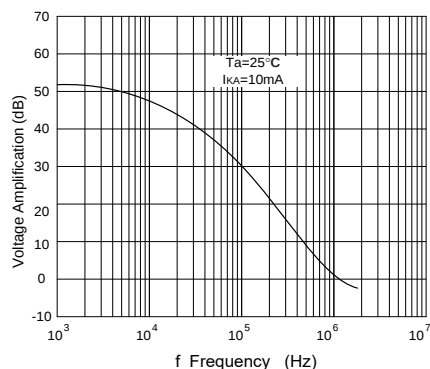
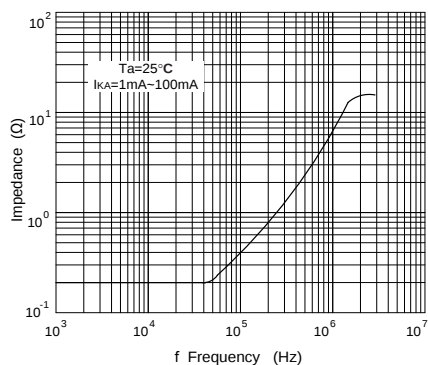
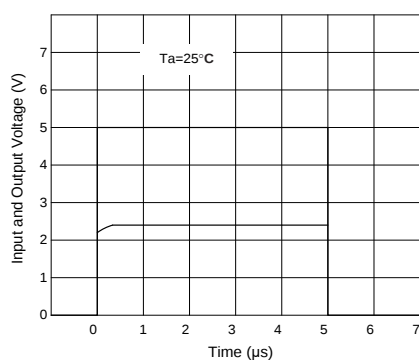
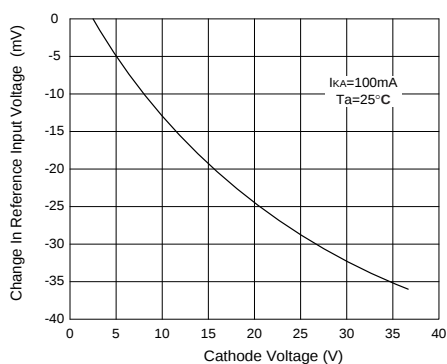
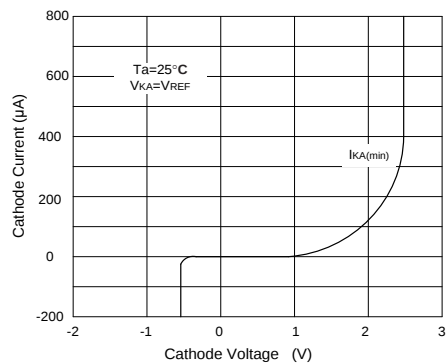
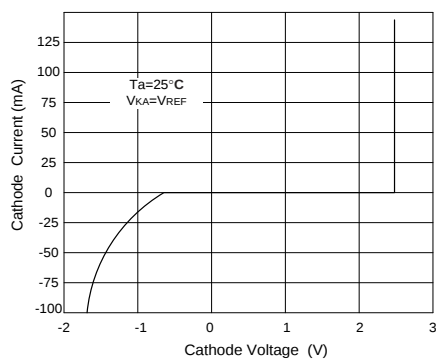


Figure 3. Test Circuit for I_{OFF}



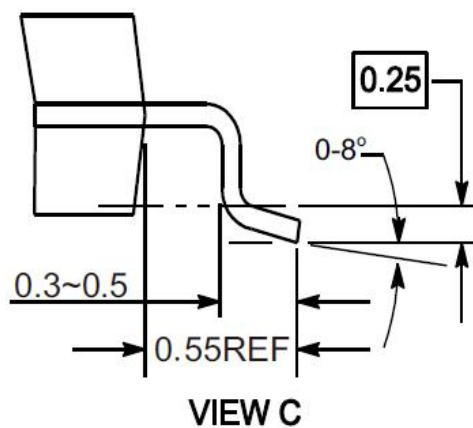
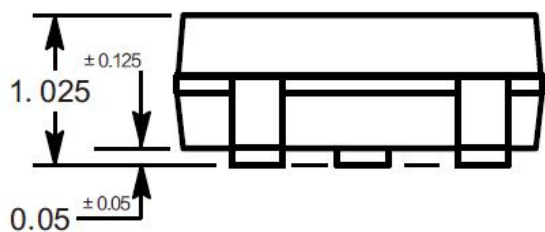
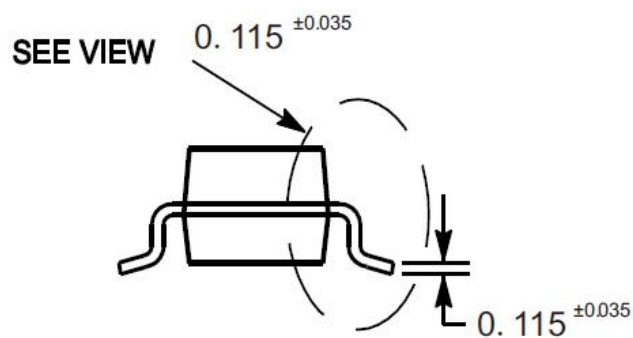
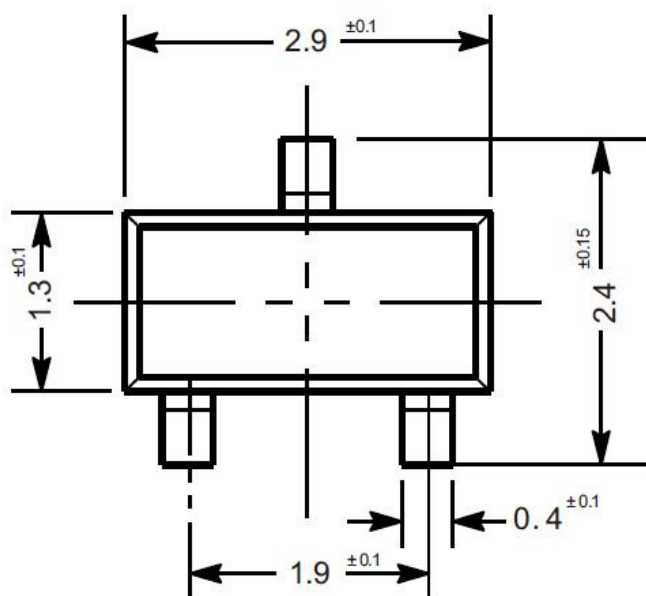
Typical Characteristic Curves



Package Outline

SOT-23

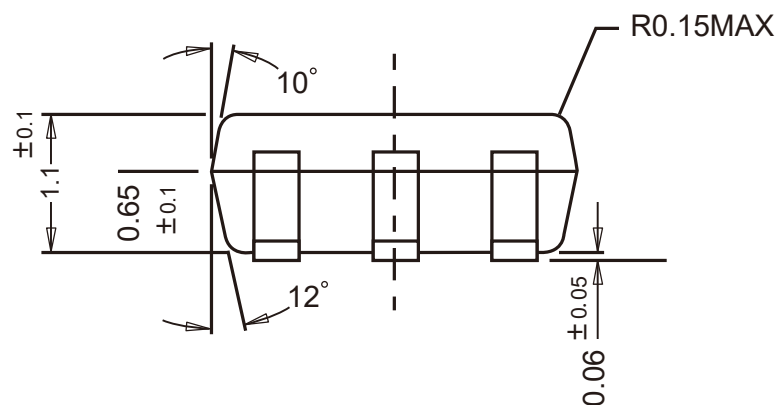
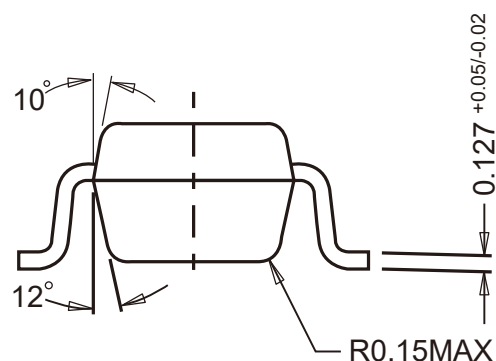
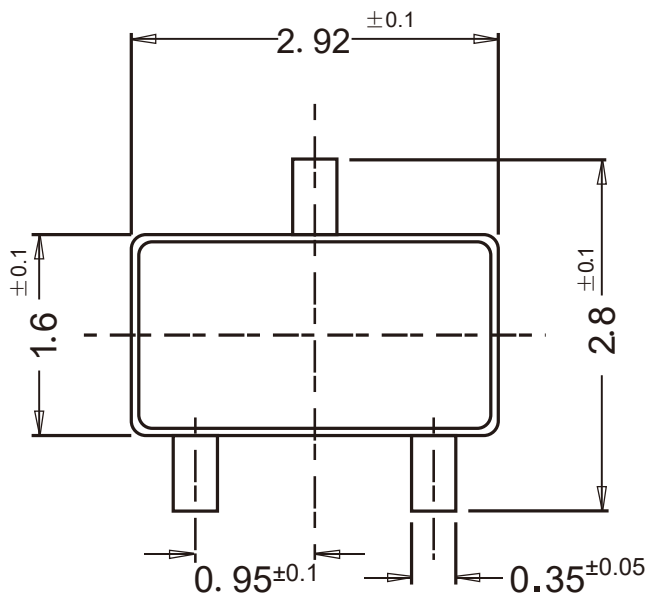
Dimensions in mm



Package Outline

SOT-23-3

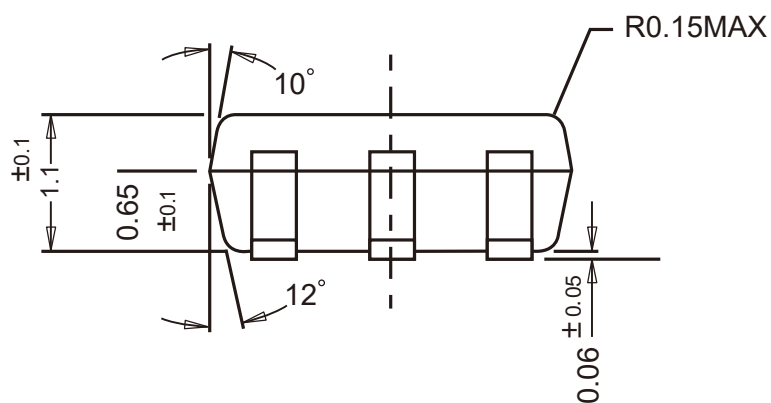
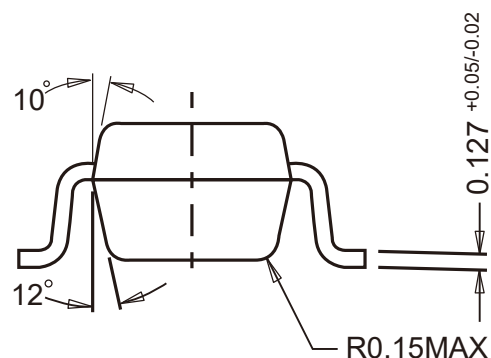
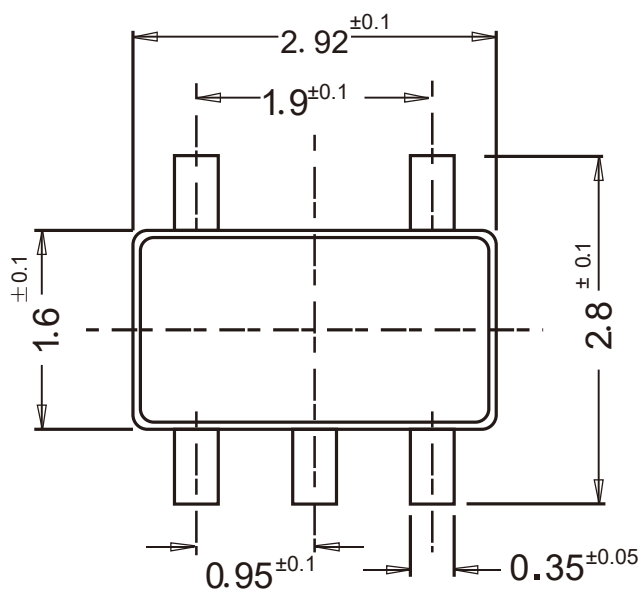
Dimensions in mm



Package Outline

SOT-23-5

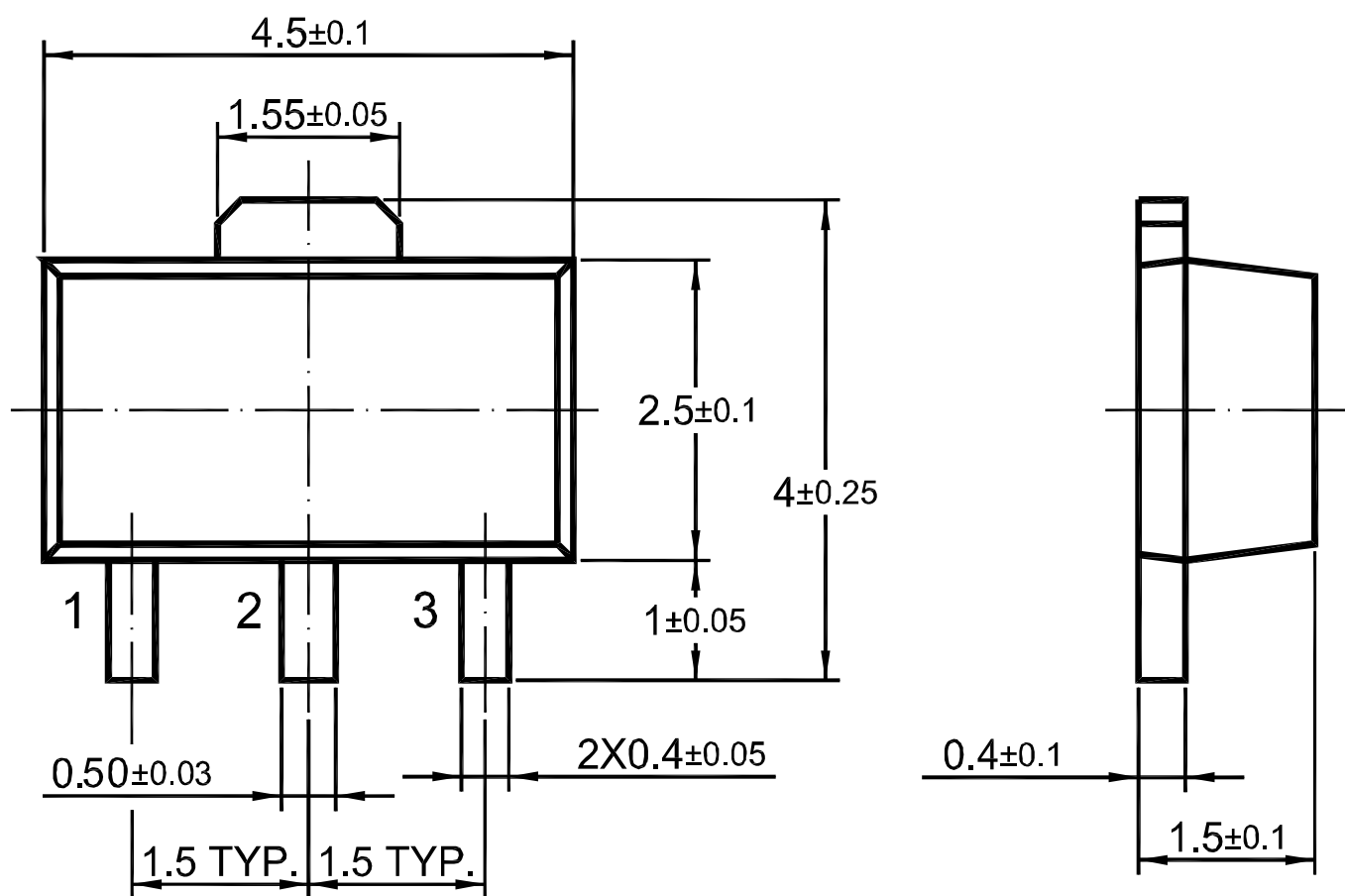
Dimensions in mm



Package Outline

SOT-89

Dimensions in mm



Package Outline

SOP-8

Dimensions in mm

