

### Description

The ACE432 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between  $V_{REF}$  (approximately 1.24V) to 8V with two external resistors.

The device has a typical output impedance of 0.30Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excellent replacement for Zener diodes in many applications.

The ACE432 is characterized for operation from 0°C to 105°C, and two package options (SOT-23-3 and TO-92) allow the designer the opportunity to select the proper package for their applications.

### Features

- Low voltage operation (1.24V)
- Adjustable output voltage  $V_D = V_{REF}$  to 8V
- Wide operating current range 60μA to 100mA
- Low dynamic output impedance 0.30Ω (Typ.)
- Trimmed bandgap design up ±0.5%
- ESD rating is 2.5KV (Per MIL-STD-883D)

### Application

- Linear Regulators
- Adjustable Supplies
- Switching Power Supplies
- Battery Operated Computers
- Instrumentation
- Computer Disk Drives

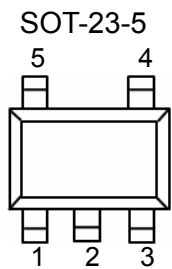
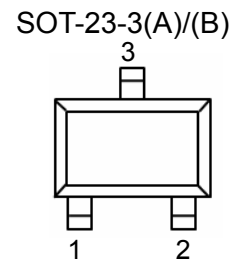
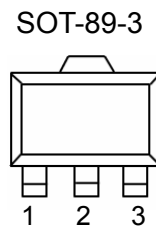
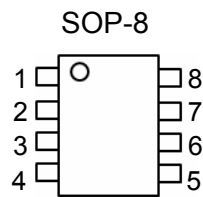
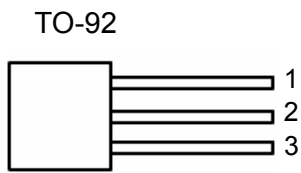
### Absolute Maximum Ratings

Parameter	Symbol	Max	Unit
Cathode to Anode Voltage <sup>(Note 2)</sup>	$V_{KA}$	8	V
Continuous Cathode Current	$I_{KA}$	150	mA
Reference Input Current	$I_{REF}$	3	mA
Thermal resistance junction to ambient TO-92 SOP-8 SOT-89-3 SOT-23-3 SOT-23-5	$\theta_{JA}$	220 150 120 230 230	°C/W
Operating junction temperature	$T_J$	150	°C
Storage temperature range	$T_{STG}$	- 45 to 150	°C
Lead temperature (soldering) 10sec	$T_{LEAD}$	260	°C

Note 1: Exceeding these rating could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

Note 2: Voltage values are with respect to the anode terminal unless otherwise noted.

### Packaging Type

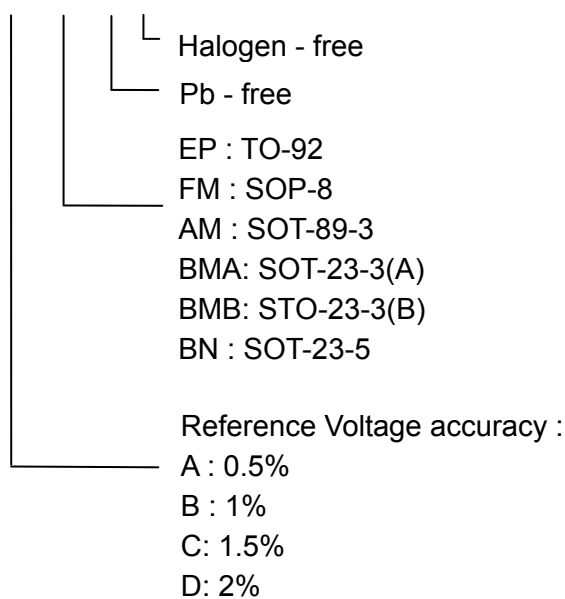


Pin	TO-92	SOP-8	SOT-89-3	SOT-23-3(A)	SOT-23-3(B)	SOT-23-5
Cathode	1	1	3	2	1	3
Anode	2	2.3.6.7	2	3	3	5
Ref	3	8	1	1	2	4
NC		4.5				1.2

### Ordering information

#### Selection Guide

ACE432 XX XXX + H



### Power Dissipation Table

Package	$\theta_{JA}$ ( $^{\circ}\text{C}/\text{W}$ )	Df(mW/ $^{\circ}\text{C}$ ) $T_A \geq 25^{\circ}\text{C}$	$T_A \leq 25^{\circ}\text{C}$ Power rating(mW)	$T_A = 50^{\circ}\text{C}$ Power rating(mW)	$T_A = 75^{\circ}\text{C}$ Power rating (mW)
EP	220	6.41	568	455	341
BM	230	3.50	543	435	326

Note:

1. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into Thermal shutdown.

2.  $T_J$ : Junction Temperature Calculation  $T_J = T_A + (P_D \times \theta_{JA})$

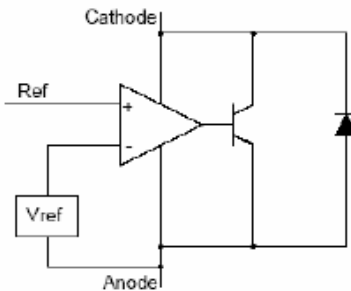
The  $\theta_{JA}$  numbers are guidelines for the thermal performance of the device/PC-board system. All of the above assume no Ambient airflow.

3.  $\theta_{JA}$  : Thermal Resistance-Junction to Ambient, Df: Derating factor,  $P_o$ : Power consumption

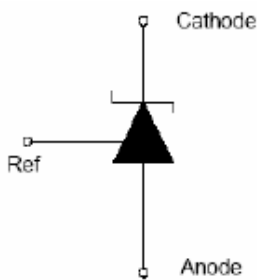
### Electrical Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	$V_{REF}$	$V_{KA} = V_{REF}$ , $I_{KA} = 10\text{mA}$ Test Circuit #1	1.234	1.240	1.246	V
			1.228	1.240	1.252	
			1.211	1.240	1.259	
			1.215	1.240	1.265	
Deviation of reference voltage over full temperature range	$V_{I(DEV)}$	$V_{KA} = V_{REF}$ , $I_{KA} = 10\text{mA}$ $T_A = 0^{\circ}\text{C}$ to $105^{\circ}\text{C}$ Test Circuit #1		10	25	mV
Ratio of change in reference voltage to the change in cathode voltage	$\Delta V_{REF}/\Delta V_{KA}$	$I_{KA} = 10\text{mA}$ $\Delta V_{KA} = 8\text{V}$ to $V_{REF}$ Test Circuit #2		-1.0	-2.7	mV/V
Reference current	$I_{REF}$	$I_{KA} = 10\text{mA}$ , $R1 = 10\text{K}\Omega$ , $R2 = \infty$ Test Circuit #2		0.15	2	$\mu\text{A}$
Deviation of Reference current over full temperature range	$I_{I(DEV)}$	$I_{KA} = 10\text{mA}$ , $T_A = 0^{\circ}\text{C}$ to $105^{\circ}\text{C}$ $R1 = 10\text{K}\Omega$ , $R2 = \infty$ Test Circuit #2		0.10	0.50	$\mu\text{A}$
Minimum cathode current for regulation	$I_{MIN}$	$V_{KA} = V_{REF}$ Test Circuit #1		60	100	$\mu\text{A}$
Off-state cathode current	$I_{OFF}$	$V_{KA} = 8\text{V}$ , $V_{REF} = 0$ Test Circuit #3		0.04	0.8	$\mu\text{A}$
Dynamic impedance	$ Z_{KA} $	$I_{KA} = 100\mu\text{A} - 80\text{mA}$ $V_{KA} = V_{REF}$ , $f \leq 1\text{KHz}$ Test Circuit #1		0.3	1.0	$\Omega$

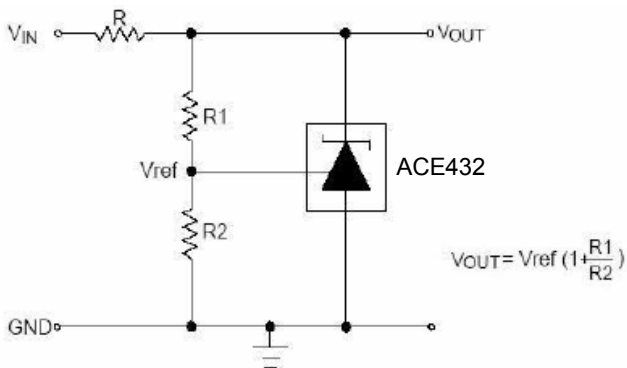
## Block Diagram



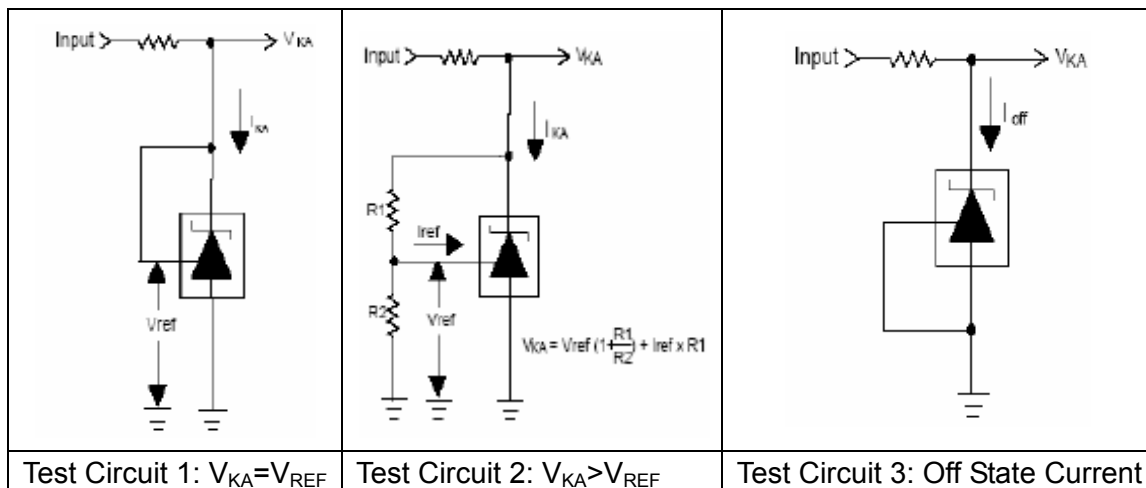
## Symbol Diagram



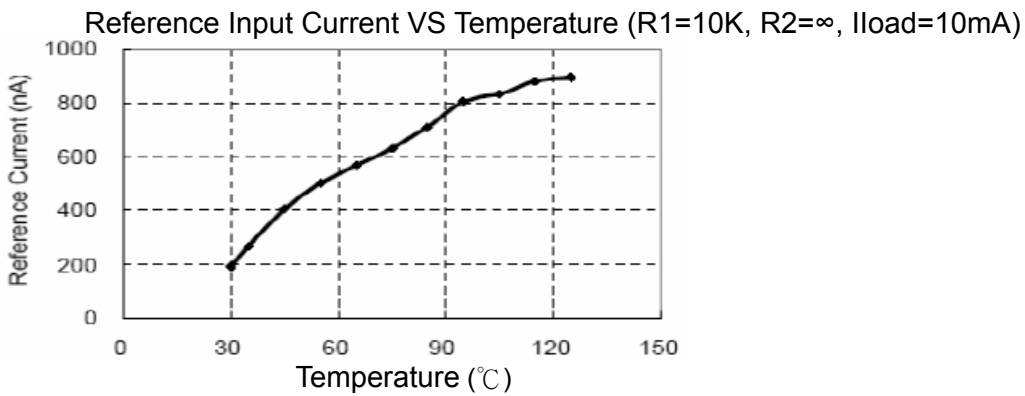
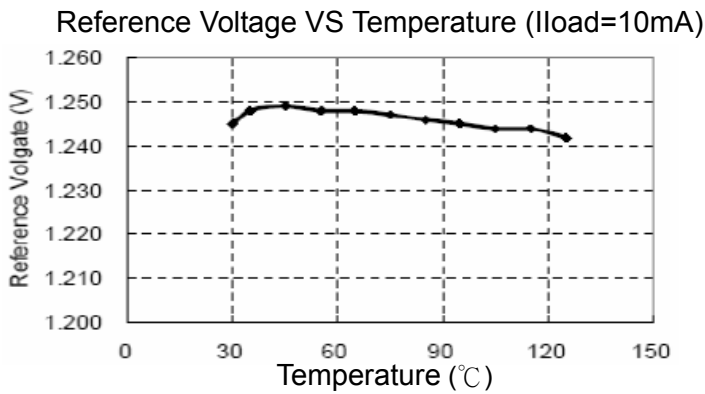
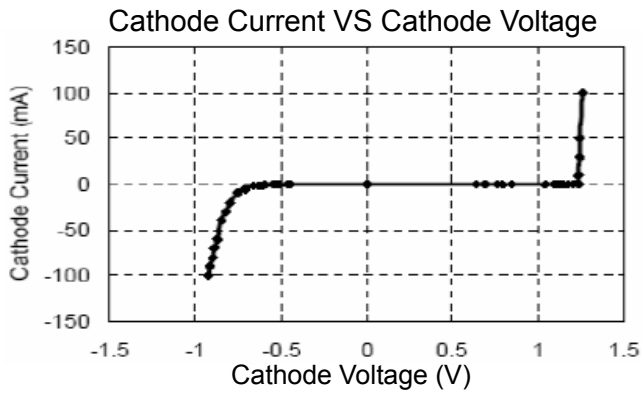
## Typical Applications



## Test Circuits

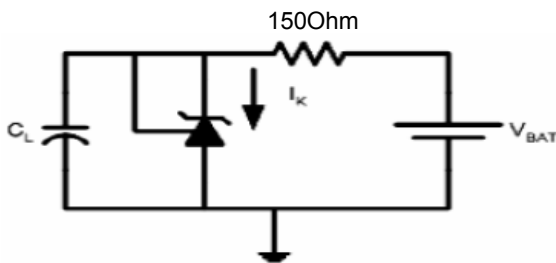
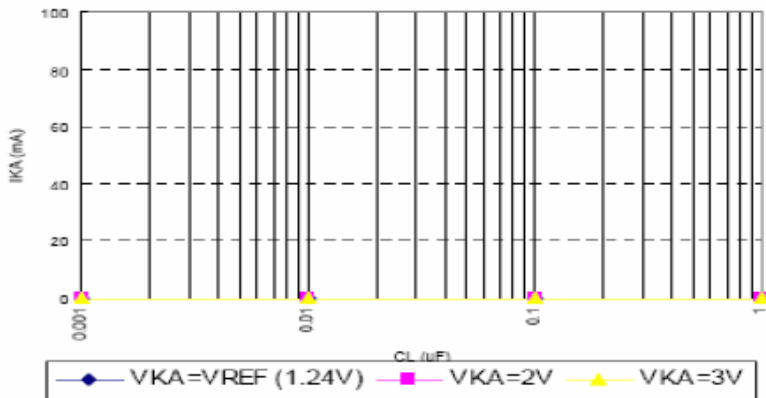


## Typical Performance Characteristics

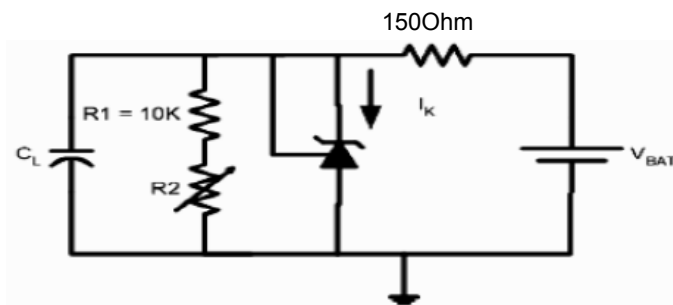


## Typical Performance Characteristics

### Stability Boundary Condition



Test Circuit for  $V_{KA} = V_{REF}$

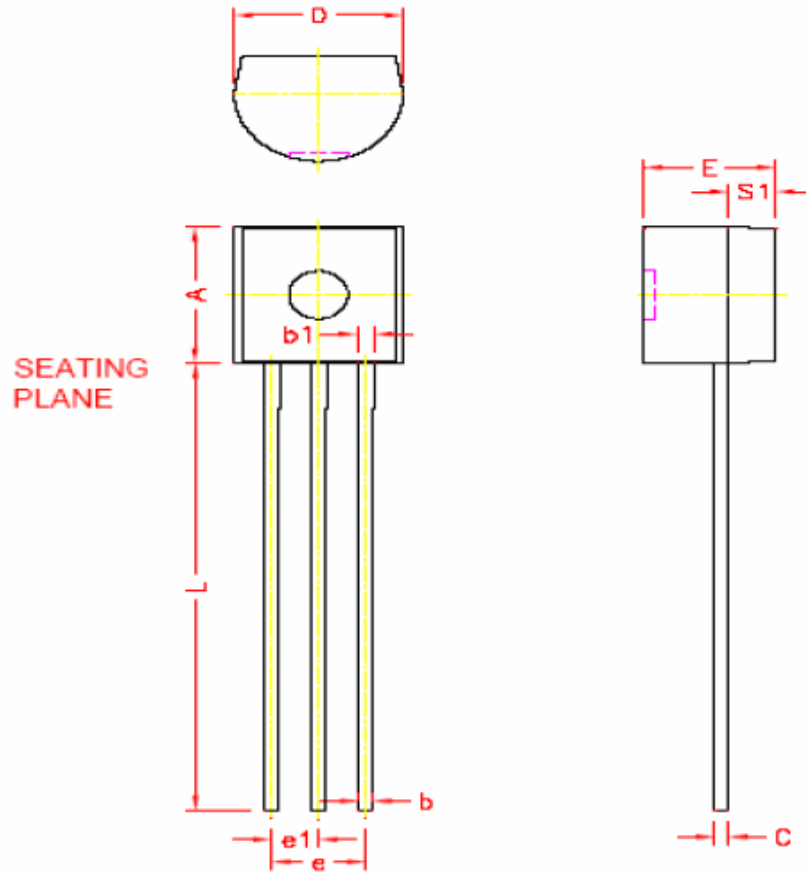


Test Circuit for  $V_{KA} = 2V, 3V$

The areas under the curves represent conditions that may cause the device to oscillate. For  $V_{KA} = 2V$  and  $3V$  curves,  $R_2$  and  $V_{BAT}$  were adjusted to establish the initial  $V_{KA}$  and  $1K$  conditions with  $C_L = 0$ .  $V_{BAT}$  and  $C_L$  then were adjusted to determine the ranges of stability. As the graph suggested, ACE432 is unconditional stable with  $I_K$  from 0 to 100mA and with  $C_L$  from 0.001 $\mu F$  to 1 $\mu F$ .

Packing Information

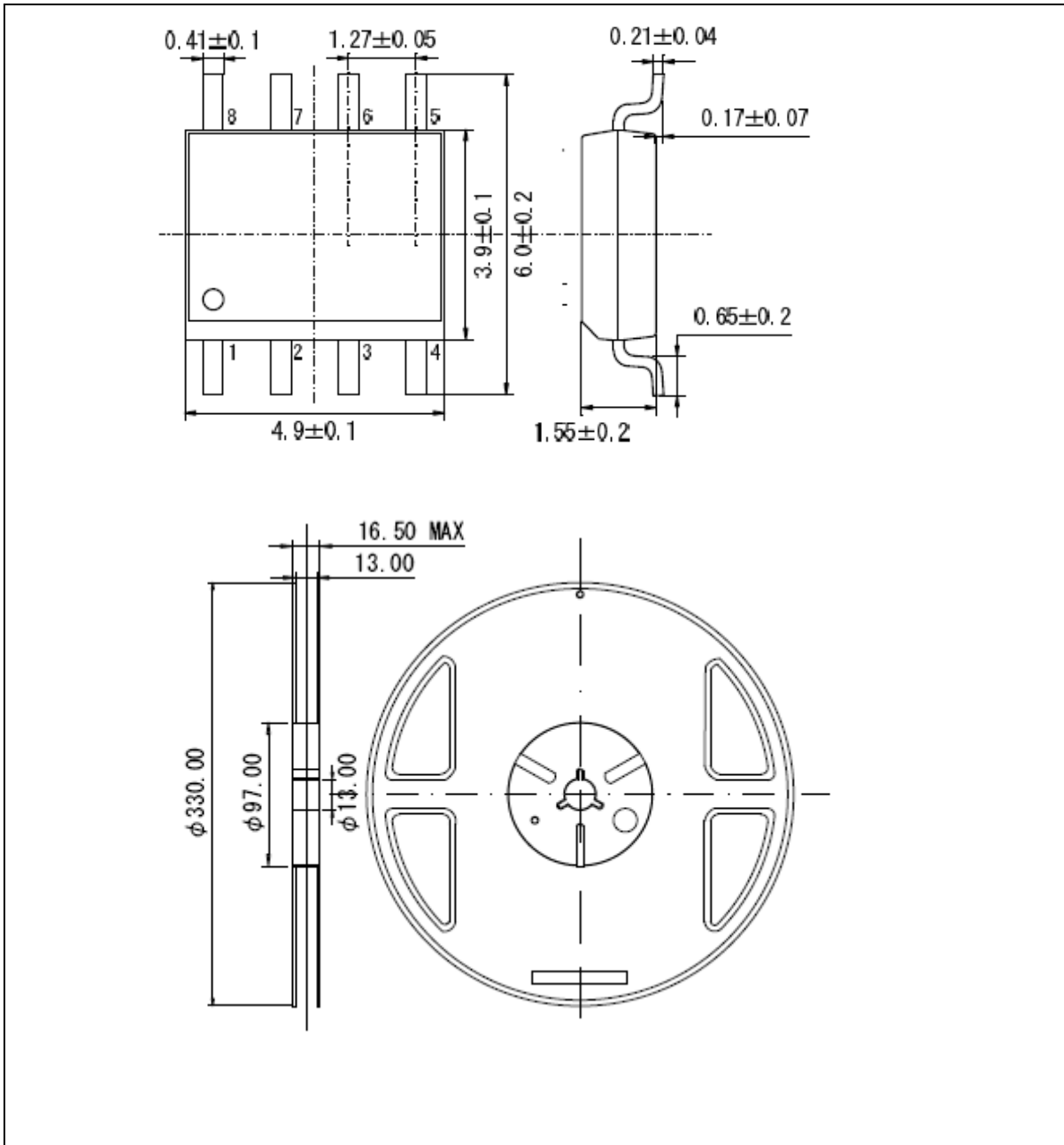
TO-92



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	4.45	4.70	D	4.44	4.7
S1	1.02	—	E	3.30	3.81
b	0.36	0.51	L	12.70	—
b1	0.36	0.76	e1	1.15	1.39
C	0.36	0.51	e	2.42	2.66

### Packing Information

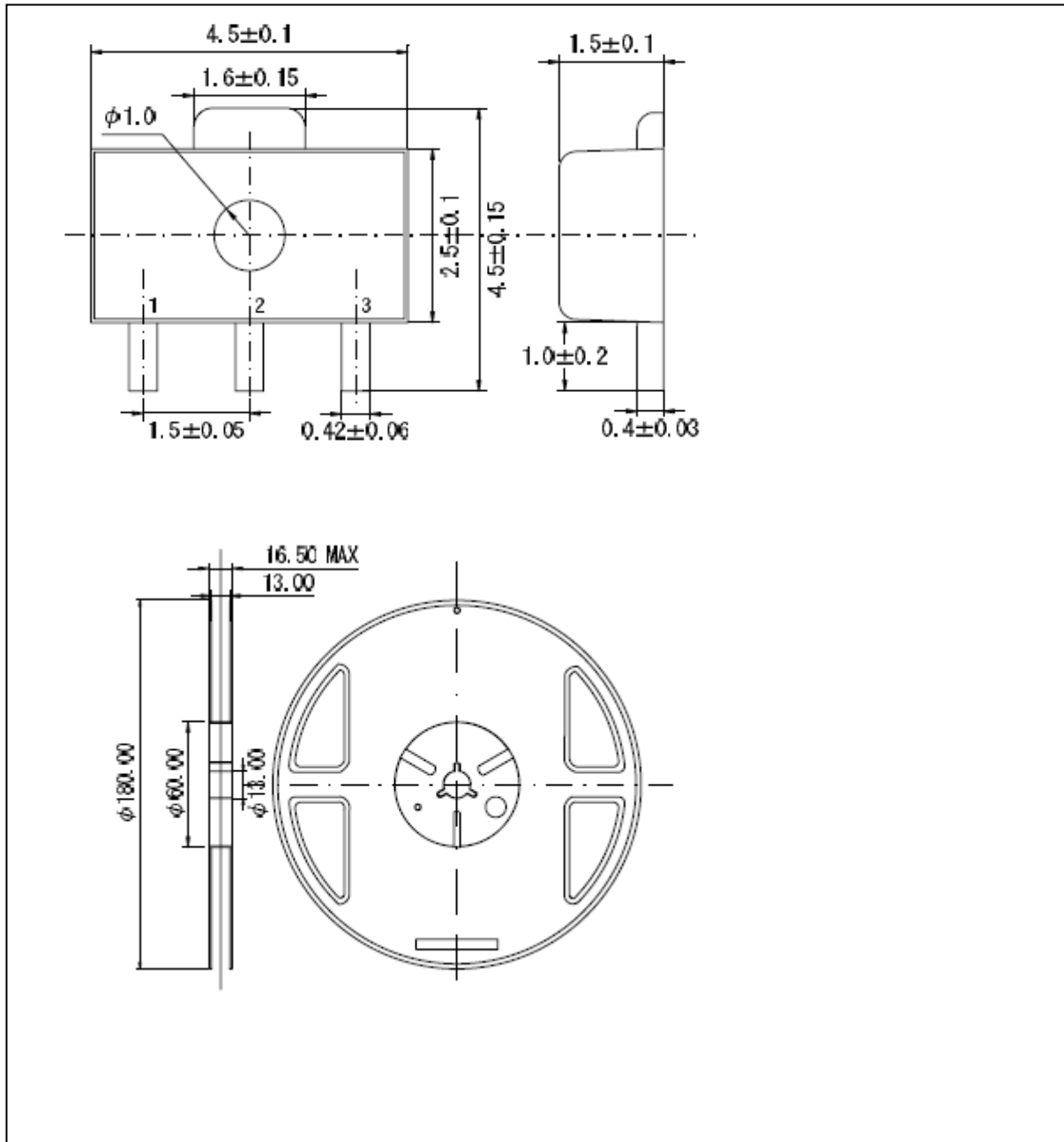
#### SOP-8





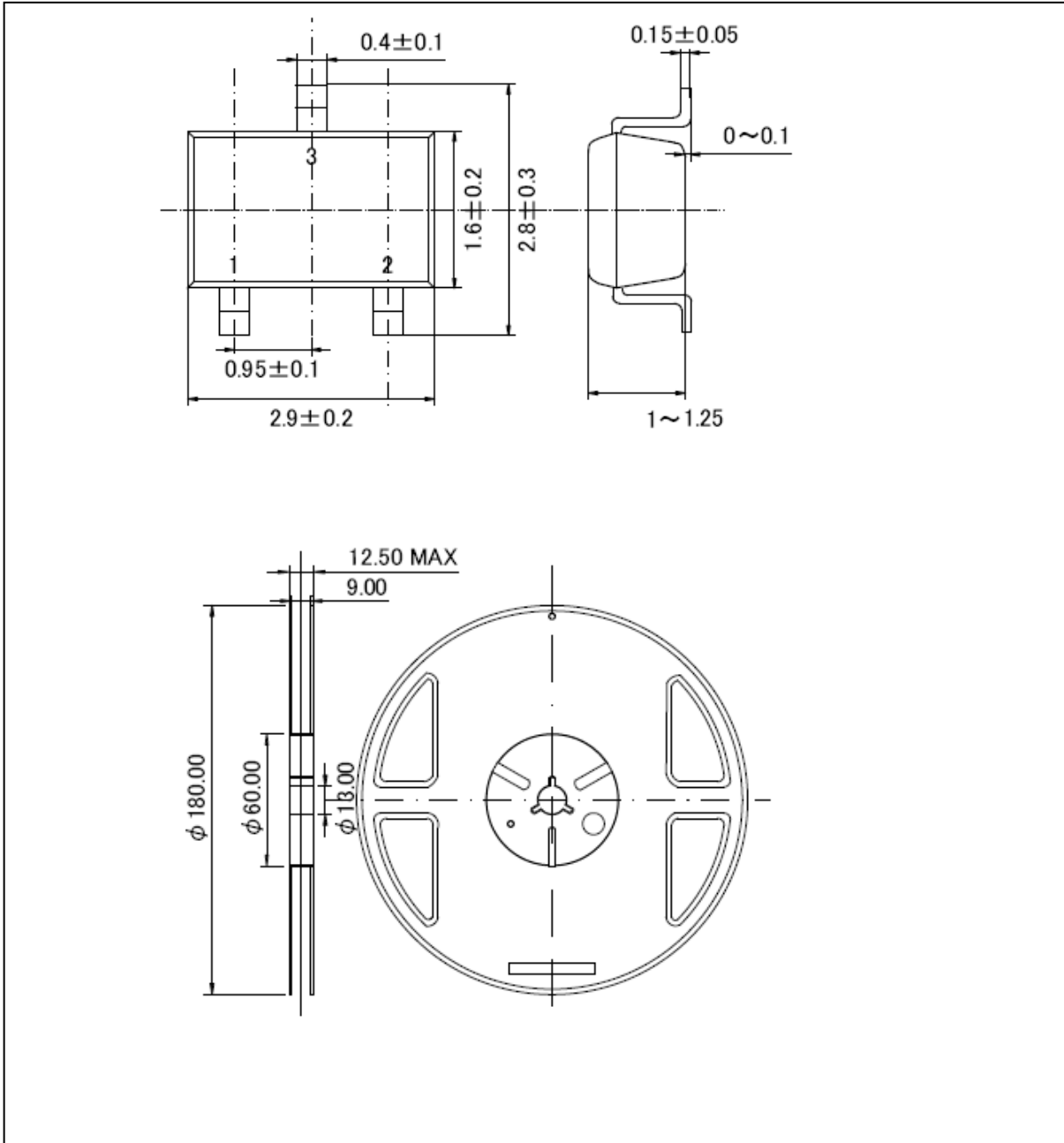
### Packing Information

SOT-89-3



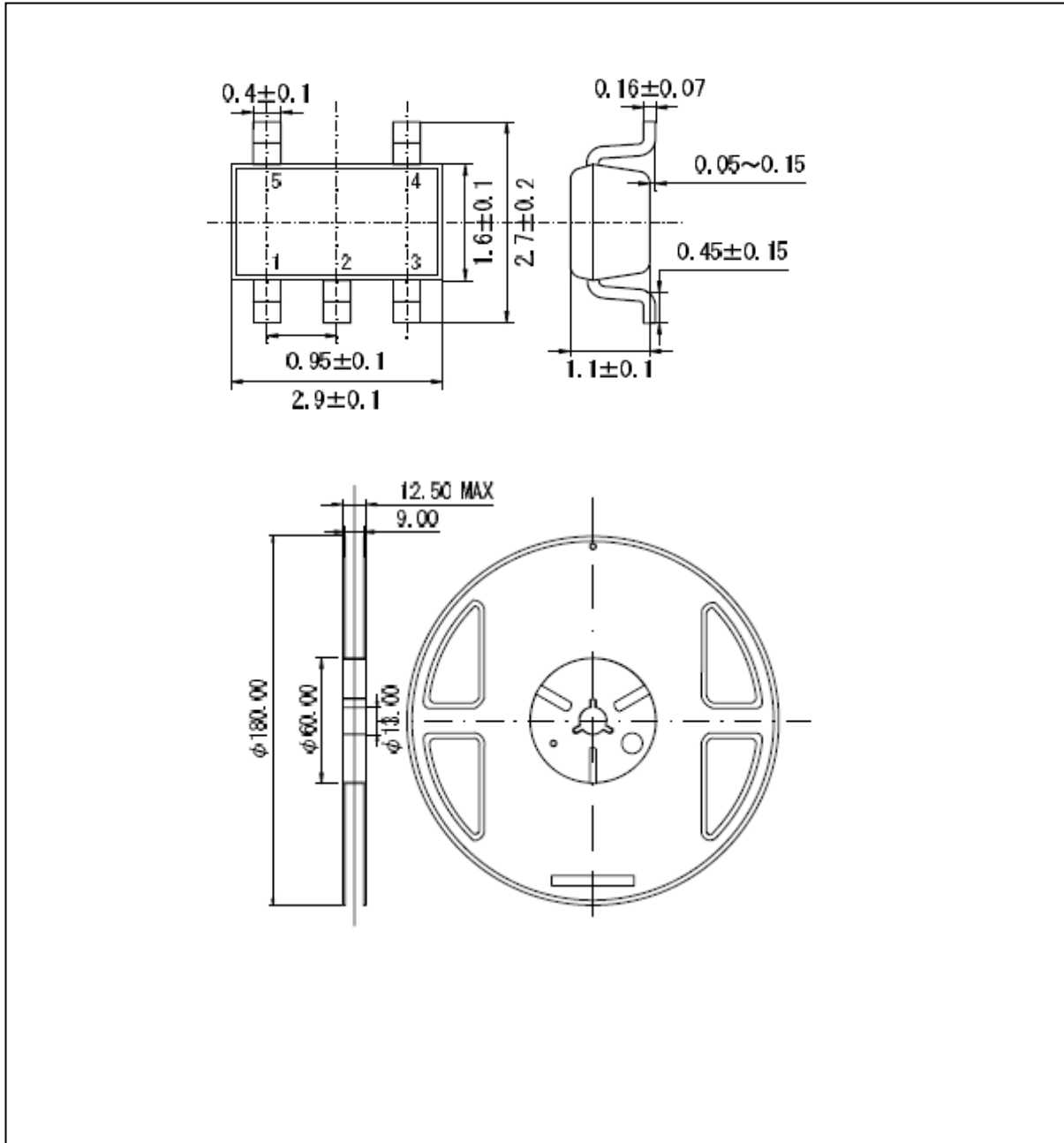
## Packing Information

### SOT-23-3



### Packing Information

SOT-23-5



### Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.