



# ACE302A

## Low Voltage Detector with Built-in Delay Circuit

### Description

The ACE302A Series is a series of high-precision voltage detectors with a built-in delay time generator of fixed time. developed using CMOS process.

The detection voltage is fixed internally, with an accuracy of  $\pm 2.0\%$ . Internal oscillator and counter timer can delay the release signal without external parts, delay times 210 ms Two output forms, NMOS open-drain and CMOS output are available.

### Features

- High-precision detection Voltage :  $\pm 2\%$
- Detection Voltage : 1.5V~6.0V (10mV steps)
- Operating Voltage range : 0.95V~7.0V
- Ultra-low current consumption :  $0.9\mu\text{A}@3.5\text{V}(\text{Typ.})$
- Two Output forms: CMOS and N-channel open-drain (Active Low)
- Hysteresis characteristics:  $-\text{VDET} * 5\%(\text{Typ.})$
- Delay time: 210 ms(Typ.)

### Application

- Memory battery back-up circuits
- Power-on reset circuits
- Power failure detection
- Power monitor for portable equipment such as notebook computers, digital cameras, PDA, and cellular phones
- Constant voltage power monitors for cameras, video equipment and communication devices
- Power monitor for microcomputers and reset for CPUs

### Absolute Maximum Rating

( $T_a=25^\circ\text{C}$ , unless otherwise specified)

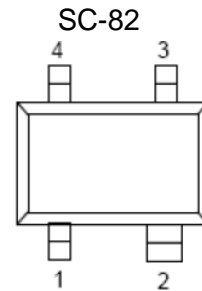
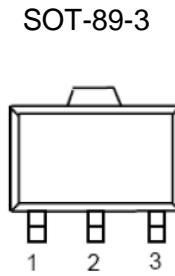
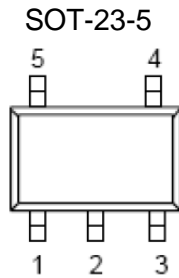
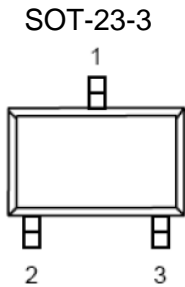
Parameter	Max	Unit
Power supply voltage( $V_{DD}$ )	$V_{SS} - 0.3 \sim V_{SS} + 8$	V
Output voltage( $V_{OUT}$ )	$V_{SS} - 0.3 \sim V_{SS} + 8$	V
Power dissipation(PD)	250	mW
	500	mW
	500	mW
	250	mW
Operating ambient temperature( $T_{opr}$ )	$-40 \sim +85$	$^\circ\text{C}$
Storage temperature( $T_{stg}$ )	$-40 \sim +125$	$^\circ\text{C}$
Soldering Temperature & Time( $T_{solder}$ )	$260^\circ\text{C}, 10\text{s}$	



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### Packaging Type



SOT-23-3	SOT-23-5	SOT-89-3	SC-82	Description	Function
1	2	2	2	V <sub>DD</sub>	Voltage input Pin
2	1	1	1	V <sub>OUT</sub>	Voltage detection output pin
3	3	3	4	V <sub>SS</sub>	GND Pin
	4		3	NC	No connection
	5			NC	No connection

### Ordering information

ACE302A X XXX XX + H

Halogen - free

Pb - free

BM: SOT-23-3

BN: SOT-23-5

AM: SOT-89-3

QM: SC-82

Detector Voltage:

090...0.9V / 100...1.0V / 263...2.63V / 300...3.0V /  
465...4.65V.....600...6.0V (In 0.1V step)

Output type:

N: Nch

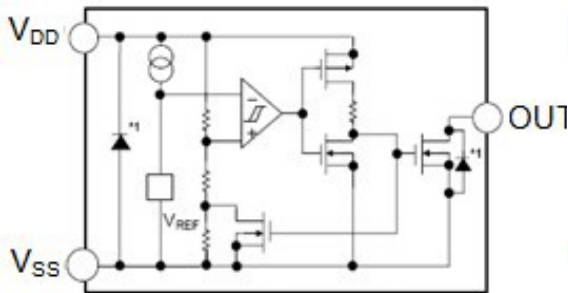
C: CMOS



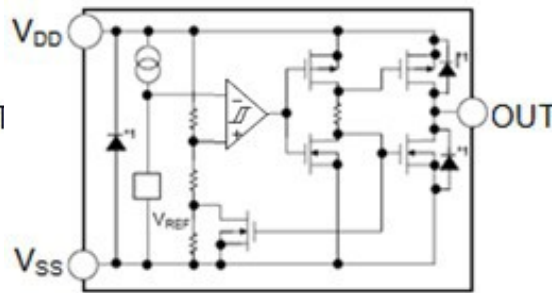
# ACE302A

## Low Voltage Detector with Built-in Delay Circuit

### Block diagram



N channel open-drain



CMOS output

### Electrical Characteristics

(Ta=25°C, unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit	
			Min.	Typ.	Max.		
$-V_{DET}$	Detection Voltage*1	-	$-V_{DET(S)} \times 0.98$	$-V_{DET(S)}$	$-V_{DET(S)} \times 1.02$	V	
$V_{HYS}$	Hysteresis Width	-	$0.02 \times -V_{DET(S)}$	$0.05 \times -V_{DET(S)}$	$0.08 \times -V_{DET(S)}$	V	
$I_{SS}$	Current Consumpti	$V_{DD} = -V_{DET} + 0.5V$	ACE302A C/N20~26	-	1.0	3.0	$\mu A$
			ACE302A C/N26~39	-	1.2	3.2	$\mu A$
			ACE302A C/N39~60	-	1.5	3.5	$\mu A$
$V_{DD}$	Operating Voltage	-	0.95	-	7	V	
$I_{OUT}$	Output current	NMOS: $V_{OUT} = 0.5V$ $V_{DD} = -V_{DET} - 0.5V$	ACE302A C/N20~26	3.0	13.0	-	mA
			ACE302A C/N26~39	3.0	15.0	-	mA
			ACE302A C/N39~60	3.0	18.0	-	mA
		PMOS: $V_{DD} - V_{OUT} = 0.5V$ $V_{DD} = -V_{DET} + 0.5V$	ACE302A C/N20~26	1.5	4.0	-	mA
			ACE302A C/N26~39	1.5	6.0	-	mA
			ACE302A C/N39~60	1.5	8.0	-	mA
$I_{LEAK}$	Leakage Current	Only for NMOS open-drain output products, $V_{DD} = 8.0V$ , $V_{OUT} = 8.0V$	-	-	1.0	$\mu A$	
	Temperature Coefficient	$T_a = -40^\circ C \sim +85^\circ C$	-	$\pm 120$	$\pm 360$	ppm/ $^\circ C$	
$T_{PLH}$	Delay time	$V_{in} = V_{det} + 0.5V$	130	210	290	ms	

\*1.  $-V_{DET}$ : Actual detection voltage value,  $-V_{DET(S)}$ : Specified detection voltage value



### Function description

When a voltage higher than the release voltage ( $+V_{DET}$ ) is applied to the voltage input pin ( $V_{DD}$ ), the voltage will gradually fall. When a voltage higher than the detect voltage ( $-V_{DET}$ ) is applied to  $V_{DD}$ , output ( $V_{OUT}$ ) will be equal to the input at  $V_{DD}$ . Note that high impedance exists at  $V_{OUT}$  with the N-channel open drain configuration. If the pin is pulled up,  $V_{OUT}$  will be equal to the pull up voltage.

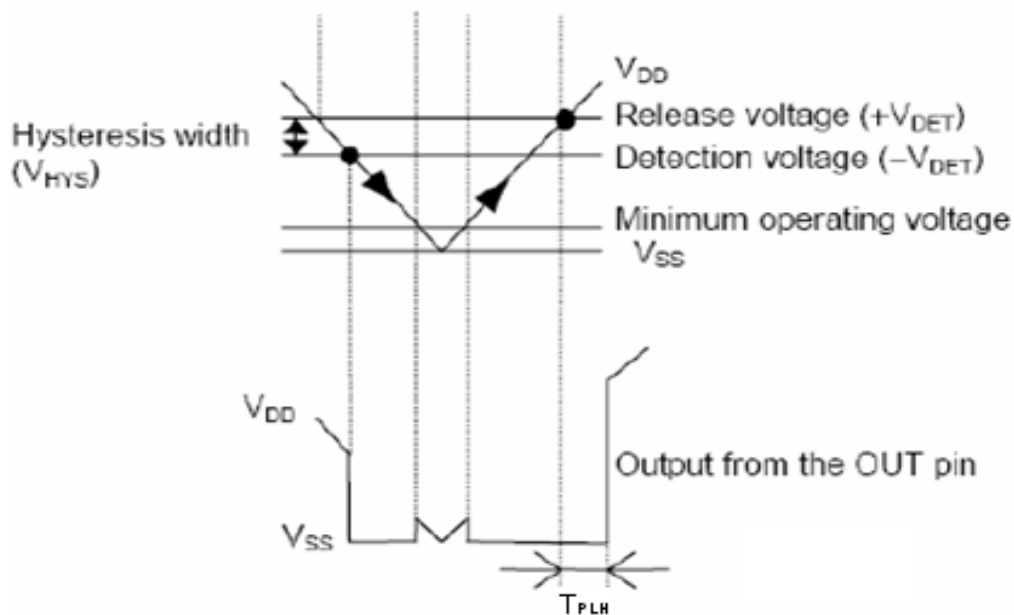
When  $V_{DD}$  falls below  $-V_{DET}$ ,  $V_{OUT}$  will be equal to the ground voltage ( $V_{SS}$ ) level (detect state). Note that this also applies to N-channel open drain configurations.

When  $V_{DD}$  falls to a level below that of the minimum operating voltage ( $V_{MIN}$ ) output will become unstable. Because the output pin is generally pulled up with N-channel open drain configurations, output will be equal to pull up voltage.

When  $V_{DD}$  rises above the  $V_{SS}$  level (excepting levels lower than minimum operating voltage),  $V_{OUT}$  will be equal to  $V_{SS}$  until  $V_{DD}$  reaches the  $+V_{DET}$  level.

Although  $V_{DD}$  will rise to a level higher than  $+V_{DET}$ ,  $V_{OUT}$  maintains ground voltage level via the delay circuit.

Following transient delay time,  $V_{DD}$  will be output at  $V_{OUT}$ . Note that high impedance exists with the N-channel open drain configuration and that voltage will be dependent on pull up



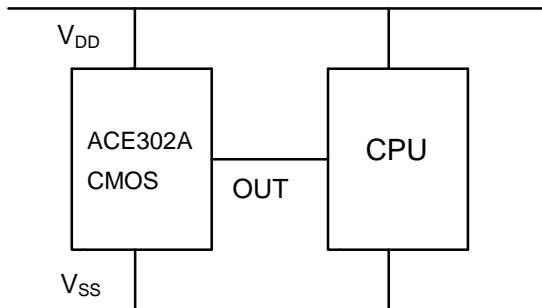


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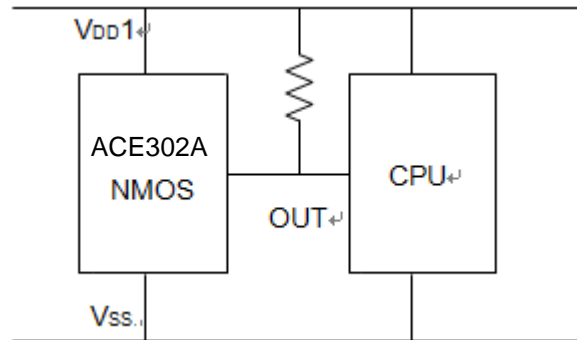
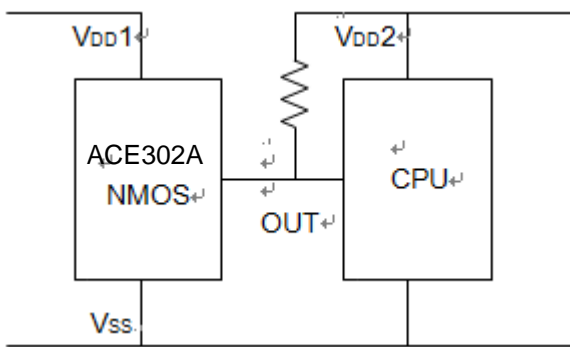
## Low Voltage Detector with Built-in Delay Circuit

### Typical application Circuits

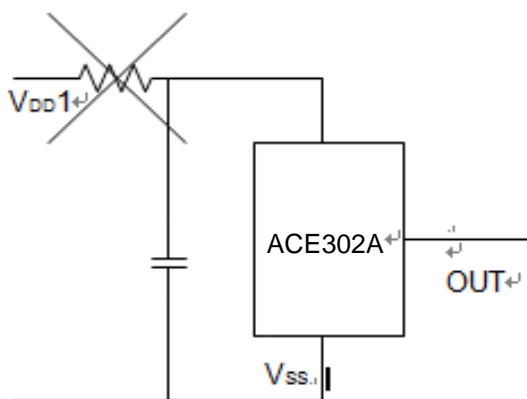
C:CMOS output:



NMOS open-drain:



Forbidden Circuits



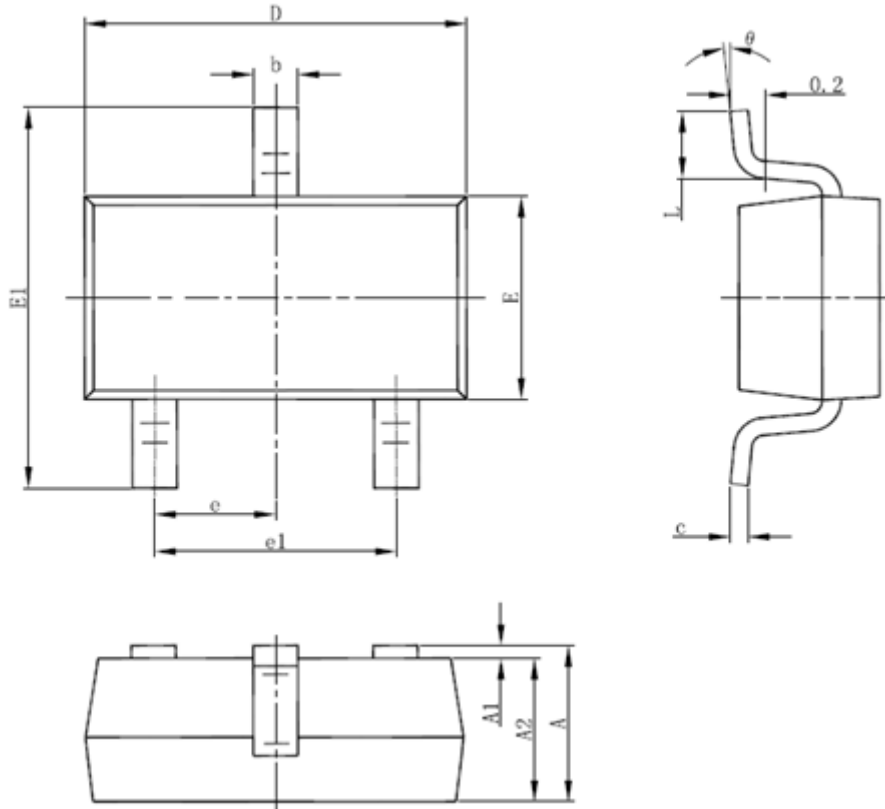


# ACE302A

## Low Voltage Detector with Built-in Delay Circuit

### Packing Information

#### SOT-23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

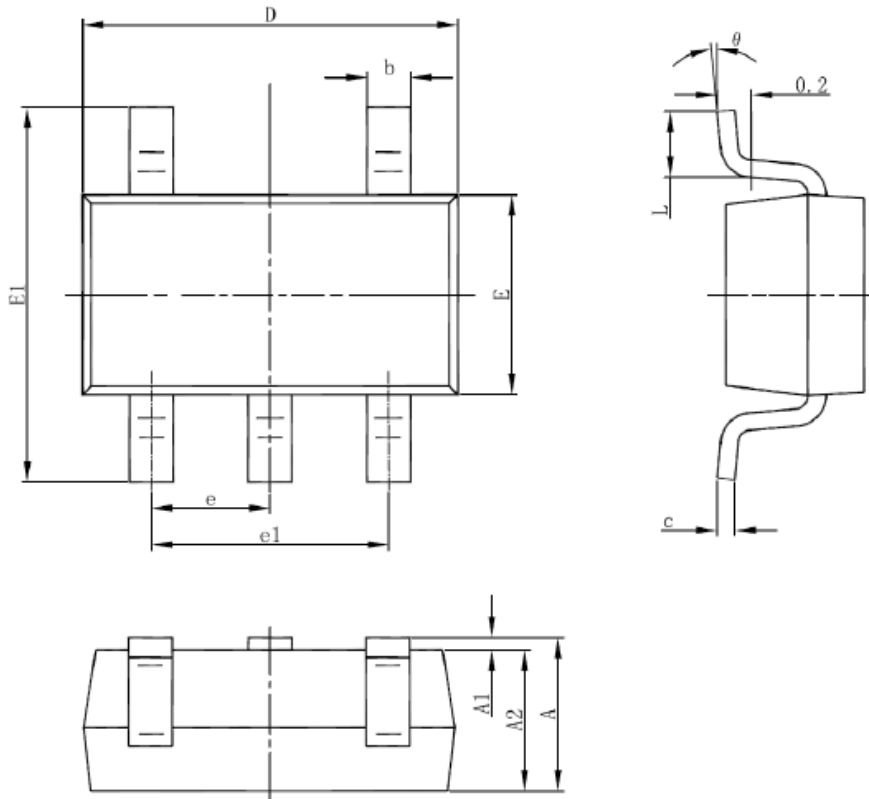


# ACE302A

## Low Voltage Detector with Built-in Delay Circuit

### Packing Information

SOT-23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

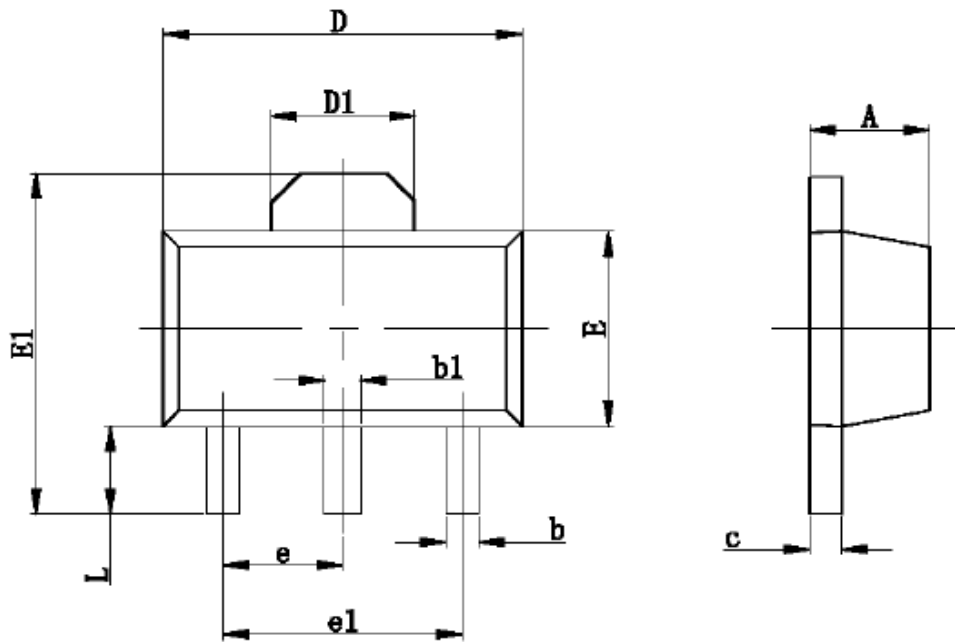


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## Low Voltage Detector with Built-in Delay Circuit

### Packing Information

SOT-89-3



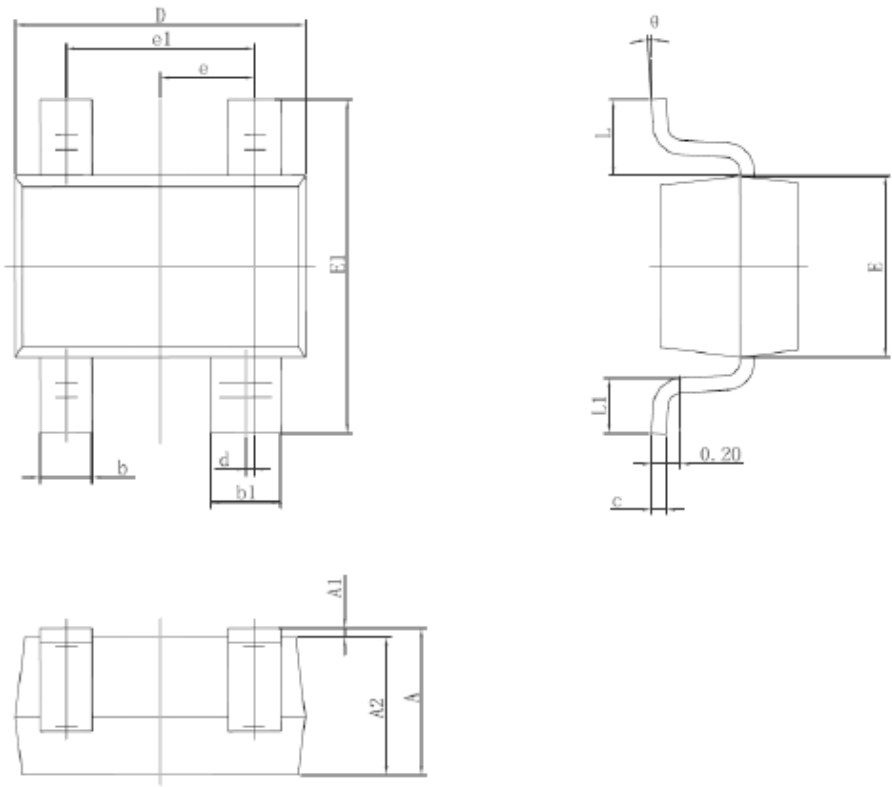
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047





**Packing Information**

**SC-82**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.250	0.400	0.010	0.016
b1	0.350	0.500	0.014	0.020
c	0.080	0.150	0.003	0.006
d	0.050 TYP.		0.002 TYP.	
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.525 REF.		0.021 REF.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°



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### 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 sued 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.

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