ACE301P

Low Power Voltage Detector

Description

The ACE301P series devices are a set of three terminal low power voltage detectors implemented in CMOS technology. Each voltage detector in the series detects a particular fixed voltage ranging from 0.9V to 4.2V for ACE301P(X)L , 3.6V to 7.0V for ACE301P(X)H. The voltage detectors consist of a high-precision and low power consumption standard voltage source as well as a comparator, hysteresis circuit, and an output driver (CMOS inverter or NMOS open drain). CMOS technology ensures low power consumption.

ACE301P series are available in SOT-23-3 package.

Standard products are Pb-free and Halogen-free.

Features

- High input voltage (up to 10V for ACE301P(X)L and 15V for ACE301P(X)H)
- Low power consumption
- Low temperature coefficient
- Built-in hysteresis characteristic
- Output voltage accuracy: tolerance ±2％
- SOT-23-3 package

Application

- Battery checkers
- Level selectors
- Power failure detectors
- Microcomputer reset
- Battery memory backup
- Non-volatile RAM signal storage protectors

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Input Voltage	V_{IN}	－0.3 ~11(ACE301P(X)L)	V
		－0.3 ~16(ACE301P(X)H)	
Power dissipation	P_{DMAX}	0.3	W
Thermal Resistance	$R_{\theta JA}$	250	°C/W
Ambient Temperature	T_A	-40~85	°C
Storage temperature	T_{STG}	-50~125	°C

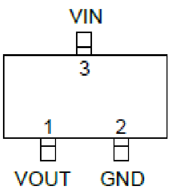
Note: Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability

RECOMMANDED OPERATING RANGE

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{IN}	0.7 to 10(ACE301P(X)L)	V
		1.5 to 15(ACE301P(X)H)	
Operating Temperature	T_{OPT}	-40 to +85	°C

Packaging Type

SOT-23-3



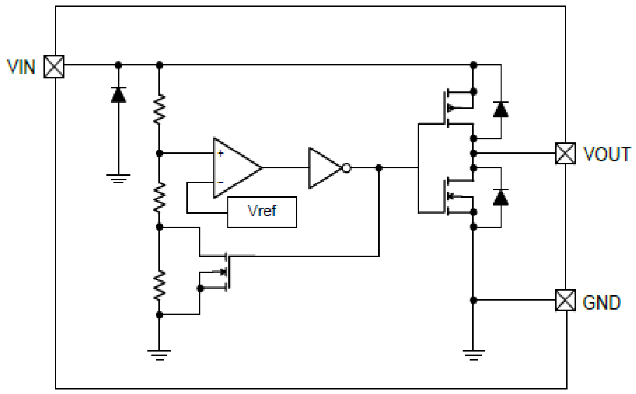
SOT-23-3	Description	I/O	Function
1	VOUT	O	Output
2	GND	GND	Ground
3	VIN	Power	Input

Ordering information

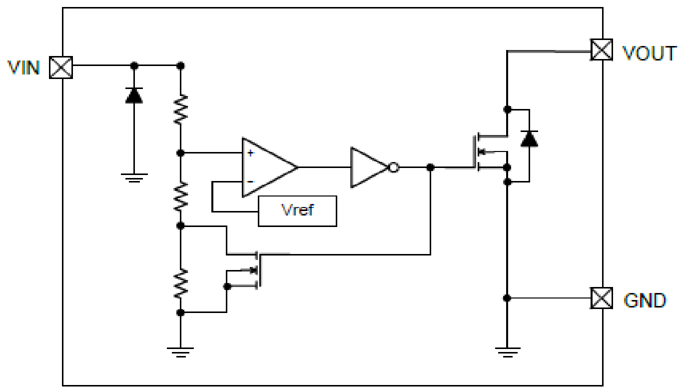
ACE301P X XXX XX + H

- Halogen - free
- Pb - free
- BM: SOT-23-3
- Detector Voltage : Ex : L0.9V=L09 / L1.0V=L10……/ L4.2V=L42
  H3.6V=H36 / L3.9V=H39…../ H7.0V=H70
- Output type N: Nch / C: CMOS

Block diagram



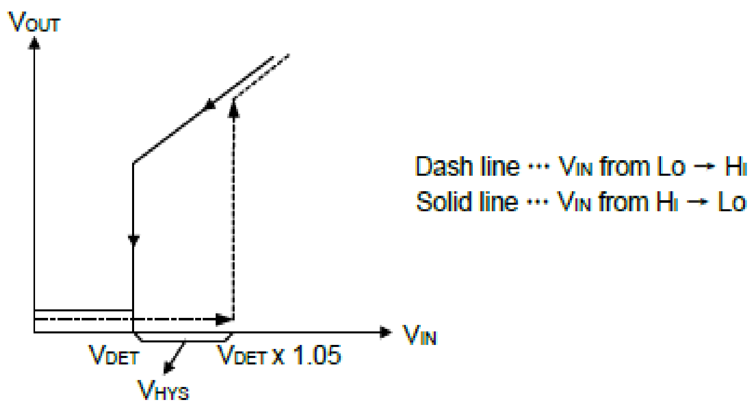
CMOS output



N-ch Open Drain Output

Output Table & Curve

V_{DD}	$V_{DD} > V_{DET}(+)$	$V_{DD} \le V_{DET}(-)$	Output type
V_{OUT}	Hi-Z	V_{SS}	N-ch
V_{OUT}	V_{IN}	V_{SS}	CMOS



Selection Table

Part No	Det. Voltage	Hys. Width	Output	Max. Voltage
ACE301PCL09	0.9V	4%	CMOS	10V
ACE301PNL09	0.9V	4%	NMOS	10V
ACE301PCL10	1.0V	4%	CMOS	10V
ACE301PNL10	1.0V	4%	NMOS	10V
ACE301PCL11	1.1V	4%	CMOS	10V
ACE301PNL11	1.1V	4%	NMOS	10V
…	…	…	…	…
ACE301PCL36	3.6V	4%	CMOS	10V
ACE301PNL36	3.6V	4%	NMOS	10V

Part No	Det. Voltage	Hys. Width	Output	Max. Voltage
ACE301PCH36	3.6V	0.18V	CMOS	15V
ACE301PNH36	3.6V	0.18V	NMOS	15V
ACE301PCH39	3.9V	0.195V	CMOS	15V
ACE301PNH39	3.9V	0.195V	NMOS	15V
ACE301PCH40	4.0V	0.2V	CMOS	15V
ACE301PNH40	4.0V	0.2V	NMOS	15V
ACE301PCH44	4.4V	0.22V	CMOS	15V
ACE301PNH44	4.4V	0.22V	NMOS	15V
ACE301PCH50	5.0V	0.25V	CMOS	15V
ACE301PNH50	5.0V	0.25V	NMOS	15V
ACE301PCH70	7.0V	0.35V	CMOS	15V
ACE301PNH70	7.0V	0.35V	NMOS	15V

Electrical Characteristics:

ACE301P(X)L (V_{DF} =0.8V~4.2V, T_A=25℃)

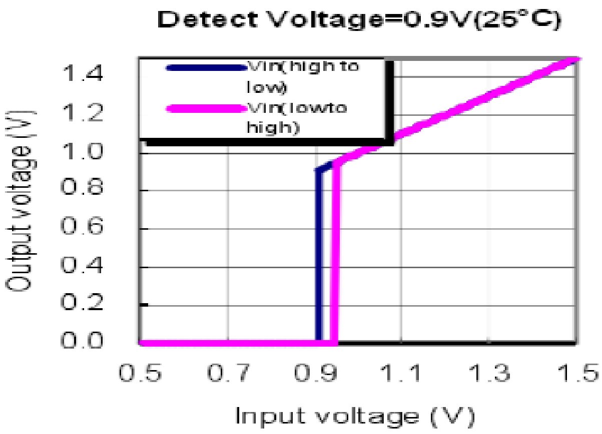
Parameter	Symbol	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
Detection voltage	V_{DET}	VDF=0.8V~2.2V	V_{DF}×0.98	V_{DF}	V_{DF}×1.02	V
		VDF=2.3V~5.0V				
Hysteresis width	V_{HYS}		0.02×V_{DET}	0.04×V_{DET}	0.08×V_{DET}	V
Operating Current	I_{IN}	V_{IN} =1.5V		0.7	2.3	uA
		V_{IN} =2.0V		0.8	2.7	
		V_{IN} =3.0V		0.9	3.0	
		V_{IN} =4.0V		1.0	3.2	
		V_{IN} =5.0V		1.1	3.6	
Operating voltage	V_{IN}		0.7		10	V
Output Sink Current	I_{OL}	V_{IN}=2V, V_{OUT}=0.2V	0.5	1		mA
Temperature coefficient	$\frac{\Delta V_{DET}}{V_{DF}\Delta T_a}$	-25℃<T_A<125℃		±100		ppm°C

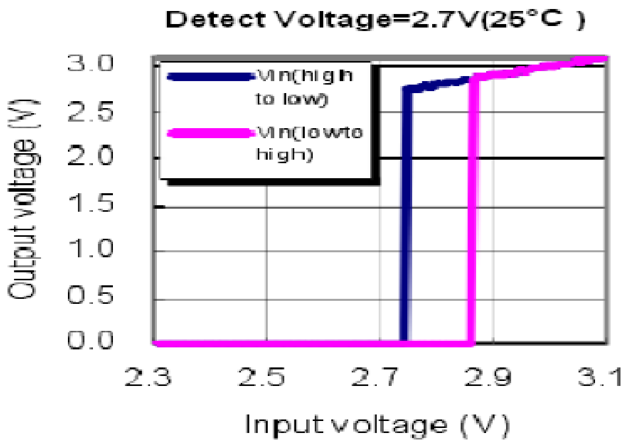
ACE301P(X)H (V_{DF} =3.6V~7.0V, T_A=25℃)

Parameter	Symbol	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
Detection voltage	V_{DET}	VDF=2.2V~7.0V	V_{DF}×0.98	V_{DF}	V_{DF}×1.02	V
Hysteresis width	V_{HYS}		0.02×V_{DET}	0.05×V_{DET}	0.1×V_{DET}	V
Operating Current	I_{IN}	V_{IN} =8V, no load		2	3	uA
Operating voltage	V_{IN}		1.5		15	V
Output Sink Current	I_{OL}	VDF=2.2~2.7V,V_{IN}=2V, V_{OUT}=0.2V	0.5	1		mA
		VDF=3~4V,V_{IN}=2V, V_{OUT}=0.2V	1.2	2.5		
		VDF=4.4~7V,V_{IN}=2V, V_{OUT}=0.2V	3	6		
Temperature coefficient	$\frac{\Delta V_{DET}}{V_{DF}\Delta T_a}$	-25℃<T_A<125℃		±0.9		mV/°C

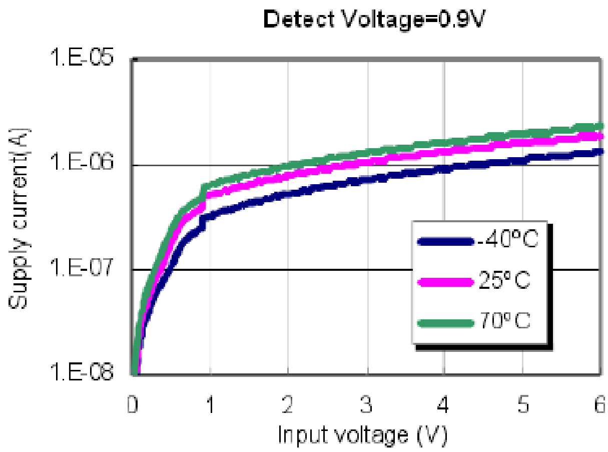
Typical Performance Characteristics

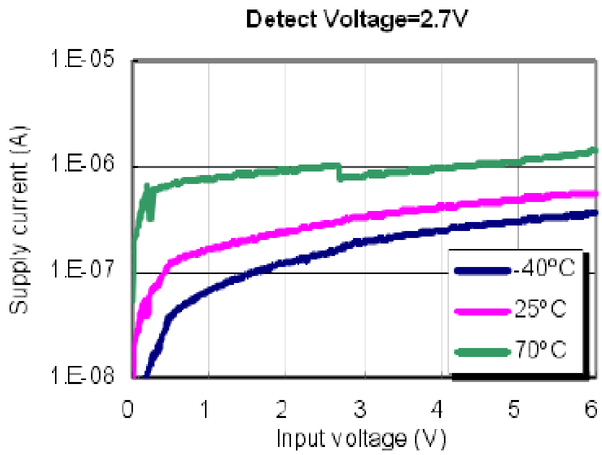
(1) Output Voltage vs Input voltage



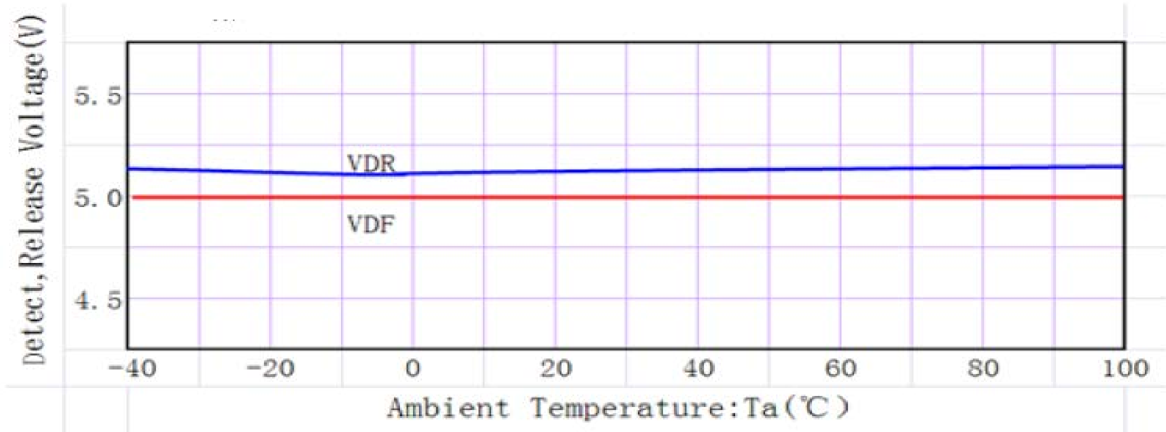


(2) Supply Current vs. Input Voltage





(3) Detect, Release Voltage vs. Ambient Temperature

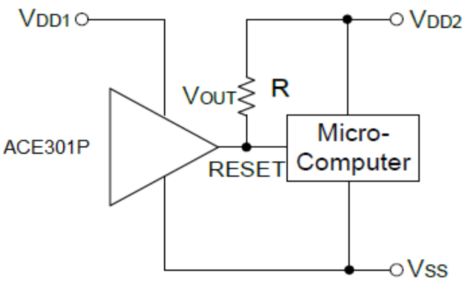


Application Information

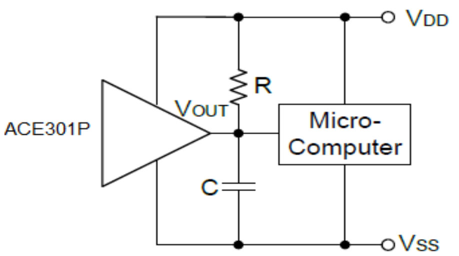
Microcomputer Reset Circuit

Normally a reset circuit is required to protect the microcomputer system from malfunctions due to power line interruptions. The following examples show how different output configurations perform a reset function in various systems.

NMOS open drain output application for separate power supply

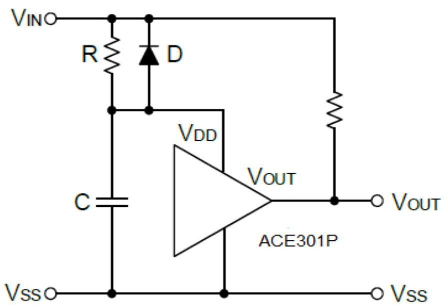


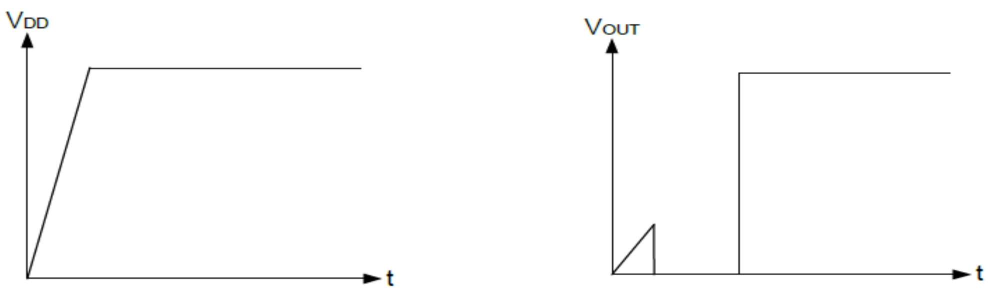
NMOS open drain output application with R-C delay



Power-on Reset Circuit

With several external components, the NMOS open drain type of the ACE301P series can be used to perform a power-on reset function as shown:

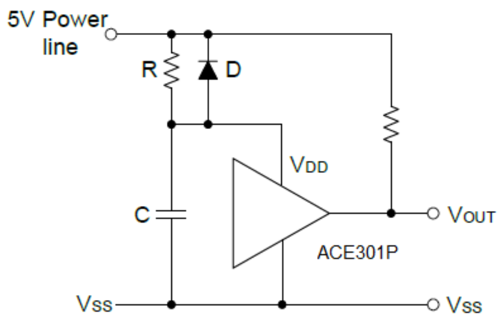




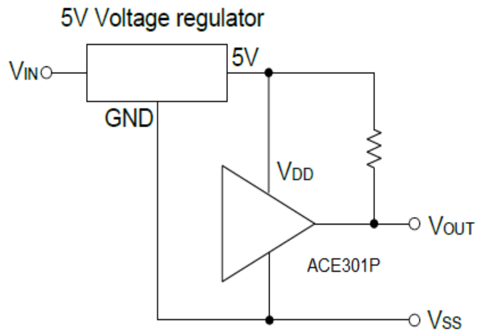
5V Power Line Monitoring Circuit

Generally, a minimum operating voltage of 4.5V is guaranteed in a 5V power line system.

5V power line monitor with power-on reset



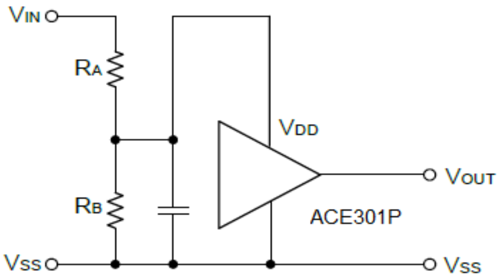
With 5V voltage regulator



Change of Detectable Voltage

If the required voltage is not found in the standard product selection table, it is possible to change it by using external resistance dividers or diodes.

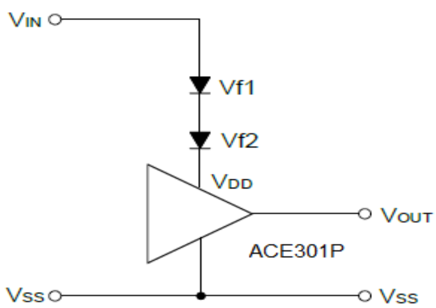
Varying the detectable voltage with a resistance divider



$$\text{Detectable voltage} = \frac{R_A + R_B}{R_B} \times V_{DET}$$

$$\text{Hysteresis width} = \frac{R_A + R_B}{R_B} \times V_{HYS}$$

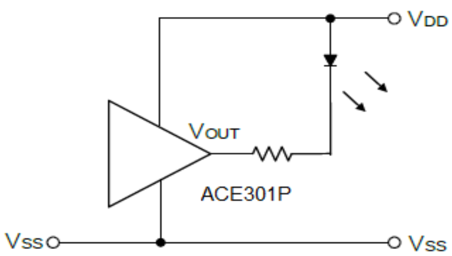
Varying the detectable voltage with a diode



$$\text{Detectable Voltage} = V_{f1} + V_{f2} + V_{DET}$$

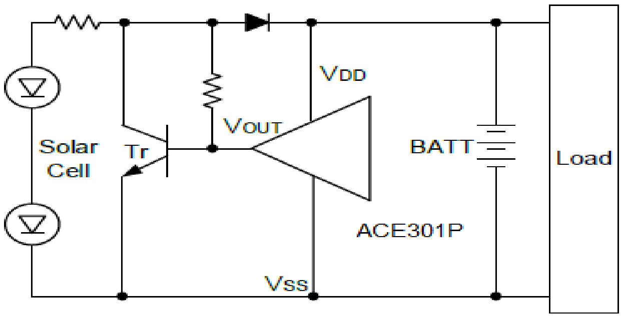
Malfunction Analysis

The following circuit demonstrates the way a circuit analyzes malfunctions by monitoring the variation or spike noise of power supply voltage.



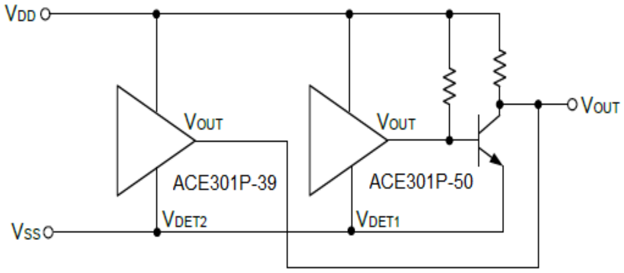
Charge Monitoring Circuit

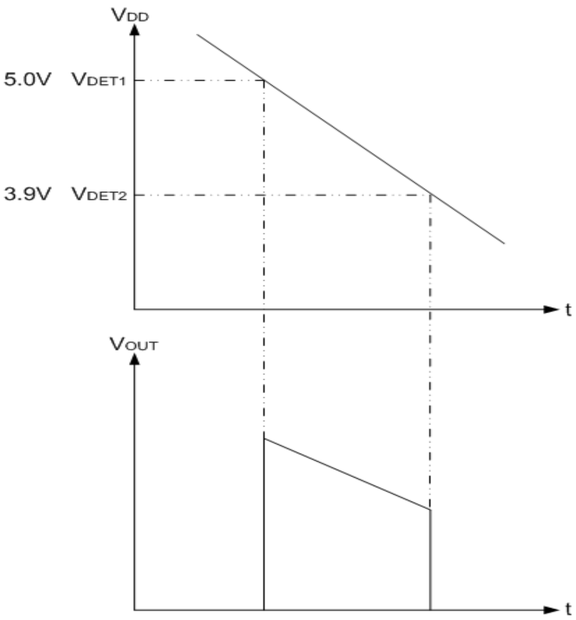
The following circuit shows a charged monitor for protection against battery deterioration by overcharging. When the voltage of the battery is higher than the set detectable voltage, the transistor turns onto bypass the charge current, protecting the battery from overcharging.



Level Selector

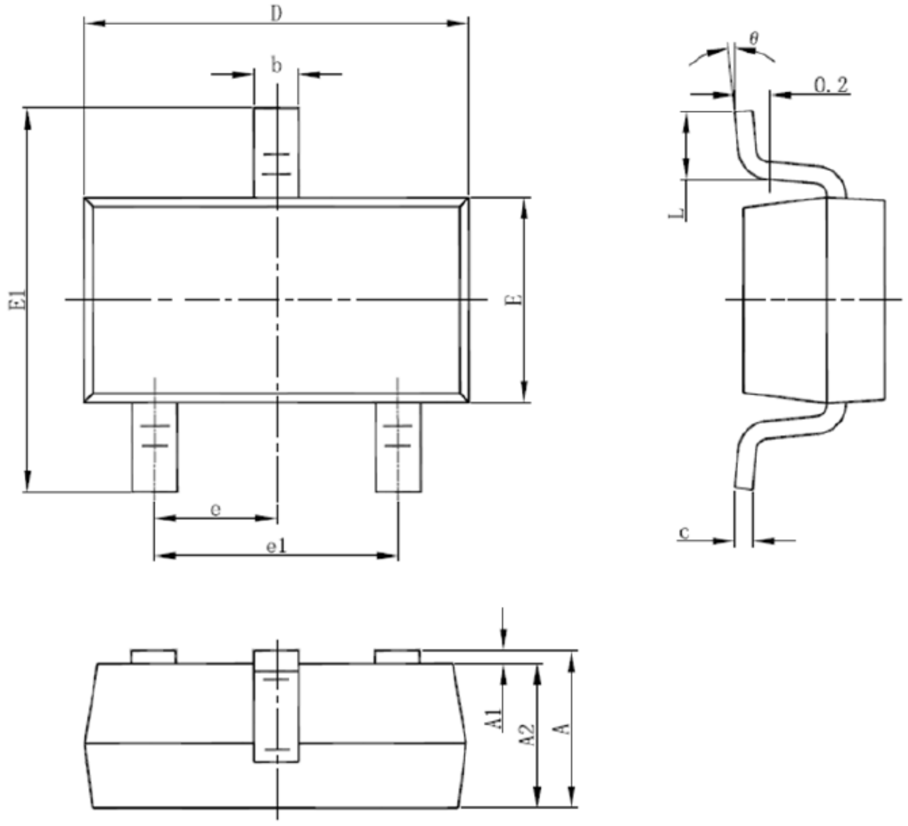
The following diagram illustrates a logic level selector.





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°

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 shoes 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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