



ACE306

Low Voltage Detector with Built-in Delay Circuit / SSD

Description

ACE306 is a series of high precision voltage detector with ultra low current consumption (500nA typ. at V_{dd}=3.0V) and a built-in delay circuit. It can work at very low voltage, which makes it perfect for system reset.

ACE306 is composed of high precision voltage reference, comparator, delay circuit, output driver and resistor array. Internally preset detect voltage has a low temperature drift and requires no external trimming.

Two type of output, CMOS and N-channel open-drain are available.

Features

- High-precision detection Voltage : $\pm 2\%$
- Detection Voltage : 0.9V~6.0V (in 0.1V steps)
- Built-in Power on Reset Delay Time circuit::Refer to Selection Guide
- Operating Voltage range : 0.7V~10V
- Ultra-low current consumption : 500nA typ. (at V_{DD} = 3.0V)
- Two Output forms : CMOS and N-channel open-drain (Active Low)

Application

- Power monitor for portable equipment such as PDA, DSC, Mobile phone, Notebook, MP3
- CPU and Logic Circuit Reset
- Battery Checker
- Battery Back-up Circuit
- Power Failure Detector

Absolute Maximum Ratings

Parameter	Max	Unit
Input Voltage	-0.3~12	V
Output Voltage	-0.3~12	V
Output Current	70	mA
Power Dissipation	150	mW
Ambient temperature	-40~85	°C
Storage temperature	-40~125	°C

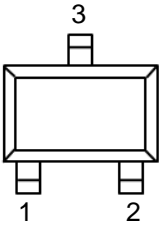


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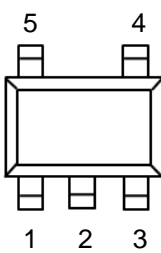
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Packaging Type

SOT-23-3



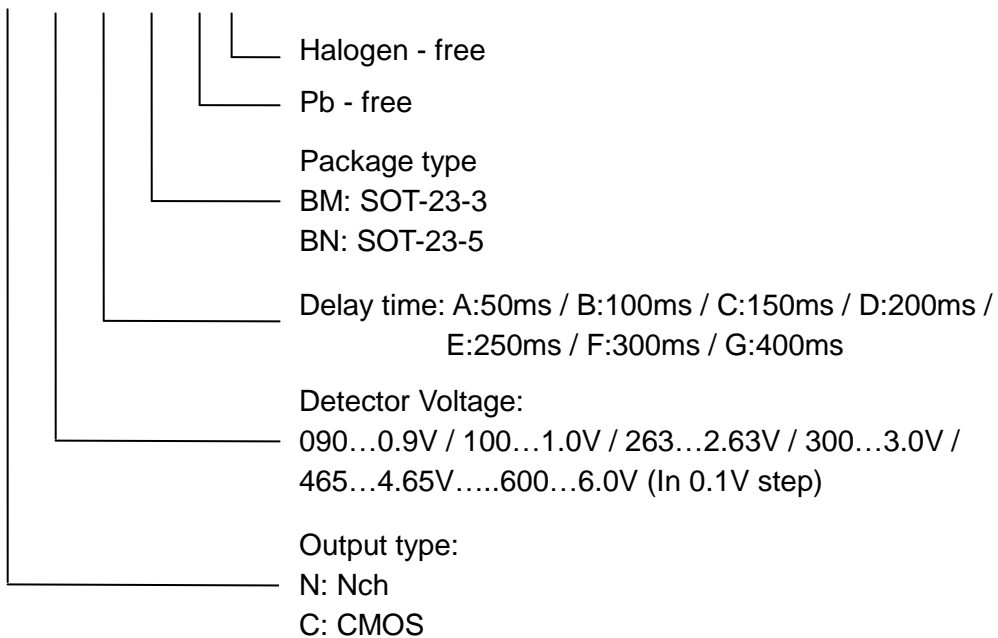
SOT-23-5



SOT-23-3	SOT-23-5	Description	Function
2	3	V _{SS}	GND Pin
1	1	V _{OUT}	Voltage detection output pin
3	2	V _{DD}	Voltage input Pin
	4	NC	No connection
	5	CD	Connection pin for delay capacitor

Ordering information

ACE306 X XXX X XX + H

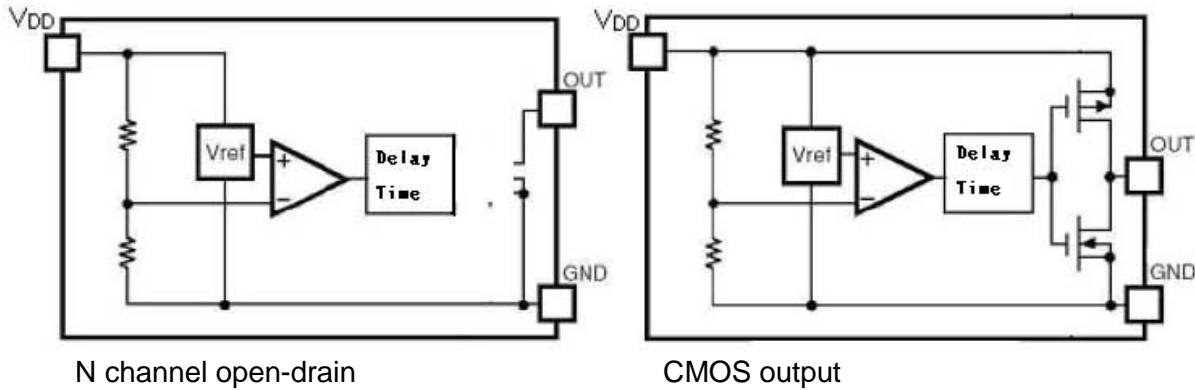




Recommended Work Conditions

Item	Min	Typ.	Max	Unit
Input Voltage (V _{in})	0.7		10	V
Ambient Temperature (T _J)	-40	25	85	°C

Block diagram



Electrical Characteristics

ACE306N090DBM+ (0.9V) (T_{opt}=25°C, Unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V _{DET}	Detector Threshold		0.882	0.9	0.918	V
I _{SS}	Current consumption	V _{DD} =2.9V		1	1.5	uA
V _{DDH}	Maximum operating voltage				10	V
V _{DDL}	Minimum Operating voltage			0.5		V
I _{OUT}	Output current	Nch V _{DS} =0.05V, V _{DD} =0.7V V _{DS} =0.50V, V _{DD} =0.8V	0.01 0.05	0.05 0.50		mA
		Pch V _{DS} =-2.1V, V _{DD} =4.50V	1.0	2.0		mA



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ACE306N270DBM+ (2.7V) (T_{opt}=25°C, Unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V _{DET}	Detector Threshold		2.646	2.7	2.754	V
I _{SS}	Current consumption	V _{DD} =4.7V		0.5	1	uA
V _{DDH}	Maximum operating voltage				10	V
V _{DDL}	Minimum Operating voltage			0.5		V
I _{OUT}	Output current	Nch V _{DS} =0.05V, V _{DD} =0.7V	0.01	0.05		mA
		Pch V _{DS} =-2.1V, V _{DD} =4.50V	1.0	2.0		mA

ACE306N300DBM+ (3.0V) (T_{opt}=25°C, Unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V _{DET}	Detector Threshold		2.94	3.0	3.06	V
I _{SS}	Current consumption	V _{DD} =5.0V		0.5	1	uA
V _{DDH}	Maximum operating voltage				10	V
V _{DDL}	Minimum Operating voltage			0.5		V
I _{OUT}	Output current	Nch V _{DS} =0.05V, V _{DD} =0.7V	0.01	0.05		mA
		Pch V _{DS} =-2.1V, V _{DD} =4.50V	1.0	2.0		mA

ACE306N340DBM+ (3.4V) (T_{opt}=25°C, Unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V _{DET}	Detector Threshold		3.332	3.4	3.468	V
I _{SS}	Current consumption	V _{DD} =5.0V		0.5	1	uA
V _{DDH}	Maximum operating voltage				10	V
V _{DDL}	Minimum Operating voltage			0.5		V
I _{OUT}	Output current	Nch V _{DS} =0.05V, V _{DD} =0.7V	0.01	0.05		mA
		Pch V _{DS} =-2.1V, V _{DD} =4.50V	1.0	2.0		mA



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ACE306N440DBM+ (4.4V) (T_{opt}=25°C, Unless otherwise specified)

Symbol	Parameter	Conditions	Reference data			Unit
			Min.	Typ.	Max.	
-V _{DET}	Detector Threshold		4.312	4.4	4.488	V
I _{SS}	Current consumption	V _{DD} =6.4V		0.5	1	uA
V _{DDH}	Maximum operating voltage				10	V
V _{DDL}	Minimum Operating voltage			0.5		V
I _{OUT}	Output current	Nch V _{DS} =0.05V, V _{DD} =0.7V	0.01	0.05		mA
		Pch V _{DS} =-2.1V, V _{DD} =8.0V	1.5	3.0		mA

Electrical Characteristics By Detector Threshold

Part Number	Detector Threshold			Supply Current1			Supply Current2		
	-V _{det} [V]			I _{ss1} [uA]			I _{ss2} [uA]		
	Min	Typ	Max	Condition	Typ	Max	Condition	Typ	Max
ACE306X090XXX+	0.882	0.900	0.918	V _{dd} = (-V _{det}) +0.1V	0.5	1.0	V _{dd} = (-V _{det}) +2V	1.0	1.5
ACE306X100XXX+	0.980	1.000	1.020						
ACE306X110XXX+	1.078	1.100	1.122						
ACE306X120XXX+	1.176	1.200	1.224						
ACE306X130XXX+	1.274	1.300	1.326						
ACE306X140XXX+	1.372	1.400	1.428						
ACE306X150XXX+	1.470	1.500	1.530						
ACE306X160XXX+	1.568	1.600	1.632						
ACE306X170XXX+	1.666	1.700	1.734						
ACE306X180XXX+	1.764	1.800	1.836						
ACE306X190XXX+	1.862	1.900	1.938						
ACE306X200XXX+	1.960	2.000	2.040						
ACE306X210XXX+	2.058	2.100	2.142						
ACE306X220XXX+	2.156	2.200	2.244						
ACE306X230XXX+	2.254	2.300	2.346						
ACE306X240XXX+	2.352	2.400	2.448						
ACE306X250XXX+	2.450	2.500	2.550						
ACE306X260XXX+	2.548	2.600	2.652						
ACE306X270XXX+	2.646	2.700	2.754						
ACE306X280XXX+	2.744	2.800	2.856						
ACE306X290XXX+	2.842	2.900	2.958						
ACE306X300XXX+	2.940	3.000	3.060				0.5	1.0	



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ACE306X310XXX+	3.038	3.100	3.162					
ACE306X320XXX+	3.136	3.200	3.264					
ACE306X330XXX+	3.234	3.300	3.366					
ACE306X340XXX+	3.332	3.400	3.468					
ACE306X350XXX+	3.430	3.500	3.570					
ACE306X360XXX+	3.528	3.600	3.672					
ACE306X370XXX+	3.626	3.700	3.774					
ACE306X380XXX+	3.724	3.800	3.876					
ACE306X390XXX+	3.822	3.900	3.978					
ACE306X400XXX+	3.920	4.000	4.080					
ACE306X410XXX+	4.018	4.100	4.182					
ACE306X420XXX+	4.116	4.200	4.284					
ACE306X430XXX+	4.214	4.300	4.386					
ACE306X440XXX+	4.312	4.400	4.488					
ACE306X450XXX+	4.410	4.500	4.590					
ACE306X460XXX+	4.508	4.600	4.692					
ACE306X470XXX+	4.606	4.700	4.794					
ACE306X480XXX+	4.704	4.800	4.896					
ACE306X490XXX+	4.802	4.900	4.998					
ACE306X500XXX+	4.900	5.000	5.100					
ACE306X510XXX+	4.998	5.100	5.202					
ACE306X520XXX+	5.096	5.200	5.304					
ACE306X530XXX+	5.194	5.300	5.406					
ACE306X540XXX+	5.292	5.400	5.508					
ACE306X550XXX+	5.390	5.500	5.610					
ACE306X560XXX+	5.488	5.600	5.712					
ACE306X570XXX+	5.586	5.700	5.814					
ACE306X580XXX+	5.684	5.800	5.916					
ACE306X590XXX+	5.782	5.900	6.018					
ACE306X600XXX+	5.880	6.000	6.120					



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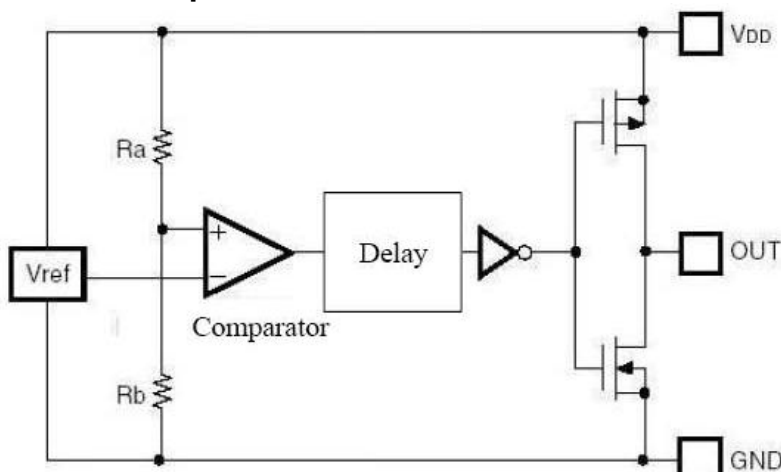
Low Voltage Detector with Built-in Delay Circuit / SSD

Output Current1			Output Current2				Minimum Operating Voltage		Detector Threshold Temperature Coefficient	
Iout1[mA]			Iout2[mA]				VDDL[V]		-VDET/ Tppm/°C	
Condition	Min.	Typ.	Condition		Min.	Typ.	Typ.	Max.	Condition	Typ.
NCH, VDS=0.05V, VDD=0.7V	0.01	0.05	NCH, VDS=0.5V	VDD=0.85V	0.1	0.5	0.5	0.7	-40°C Topt 85°C	100
				VDD=1.0V	0.2	1.0				
				VDD=1.5V	1.0	2.0				

Electrical Characteristics By Output Delay Time

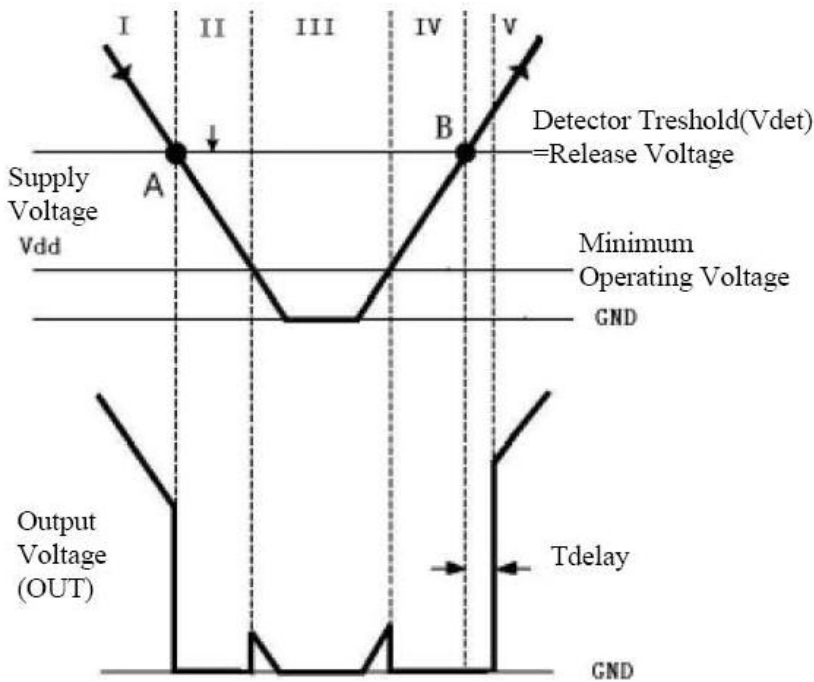
Part Number	Test Condition	Output Delay Time			Unit
		Min	Typ	Max	
ACE306XXXXAXX+	VDD=1.0V to Vdet+1.0V	45	50	55	ms
ACE306XXXXBXX+		90	100	110	
ACE306XXXXCXX+		135	150	165	
ACE306XXXXDXX+		180	200	220	
ACE306XXXXEXX+		225	250	275	
ACE306XXXXFXX+		270	300	330	
ACE306XXXXGXX+		360	400	440	

Function description



High precision low temperature co-efficiency reference voltage is applied to the negative input of a comparator. Input voltage, divided by resistor array of Ra and Rb, is applied to the positive input of the comparator. Output of the comparator passes a delay circuit and a series of buffer to drive the output CMOS pair.

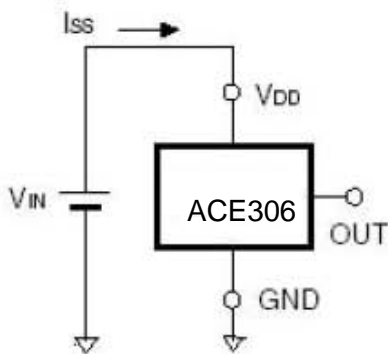
$$V_{DET} = V_{REF} * (1 + R_a/R_b)$$



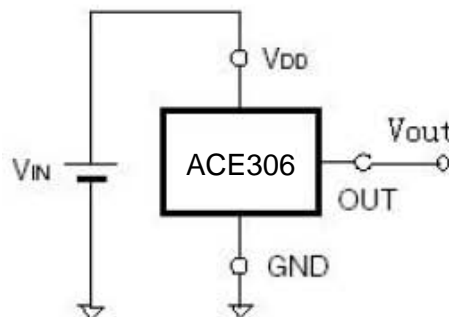
No	Operation status	Output status
I	$V_{DD} > V_{det}$	Output voltage is equal to the supply voltage
II	V_{DD} drops below V_{det}	Output voltage equals to GND level
III	V_{DD} drops further below V_{DDL}	Output voltage is undefined
IV	V_{DD} rises above V_{DDL}	Output voltage equals to GND level
V	V_{DD} rises above V_{det}	Output voltage equals to supply voltage after T_{delay}

Typical Circuits

(1) Supply current test circuit

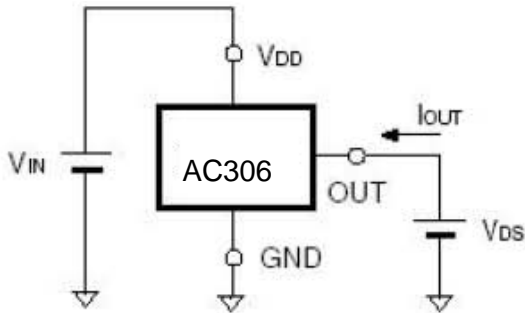


(2) Detector threshold test circuit

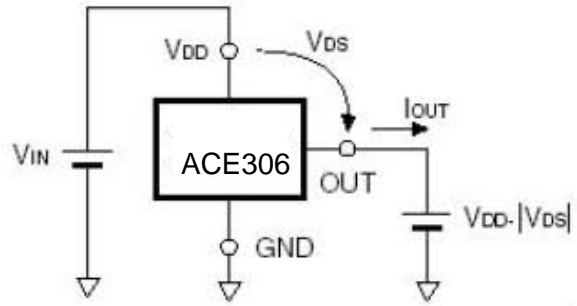




(3) NCH Drive Output Current Test Circuit



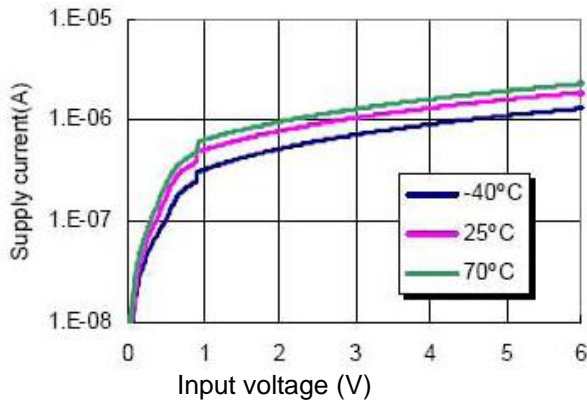
(2) PCH Drive Output Current Test Circuit



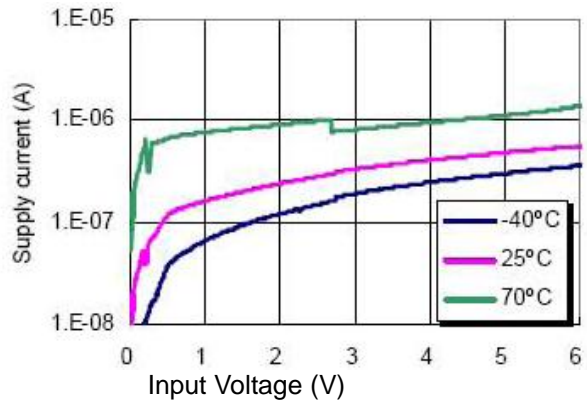
Typical Performance Characteristics

1. Supply current VS. Input Voltage

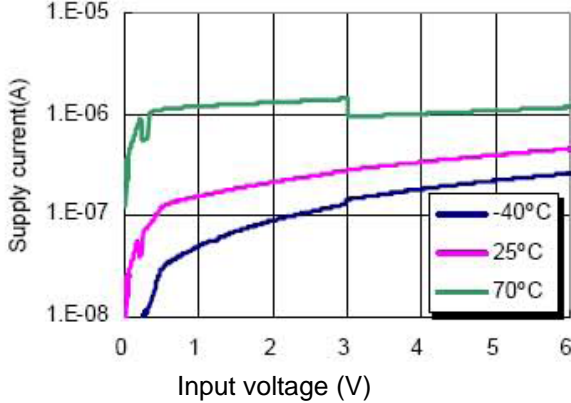
Detector threshold=0.9V



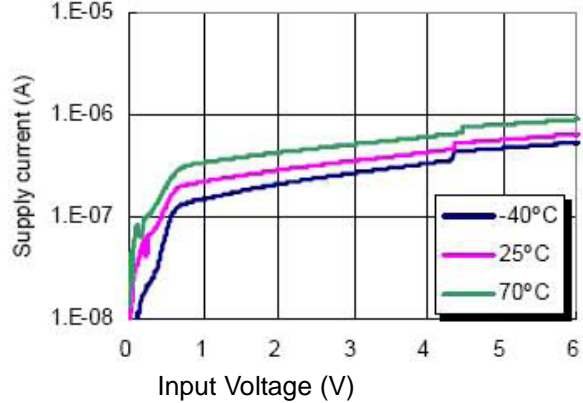
Detector threshold=2.7V



Detector threshold=3.0V

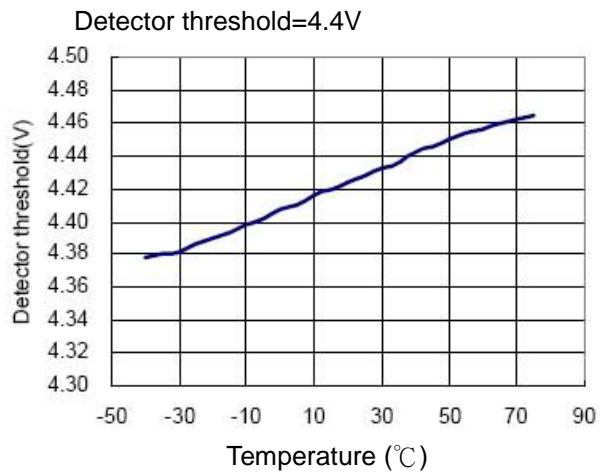
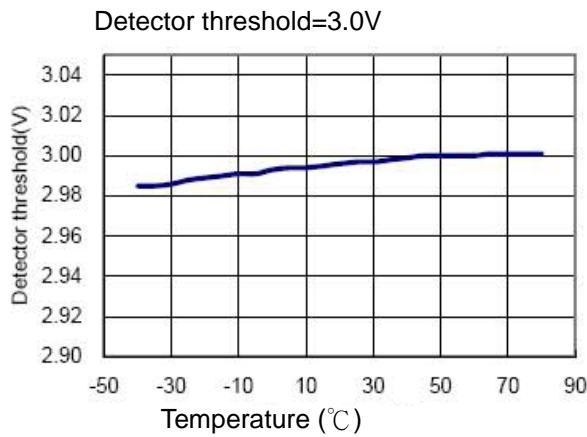
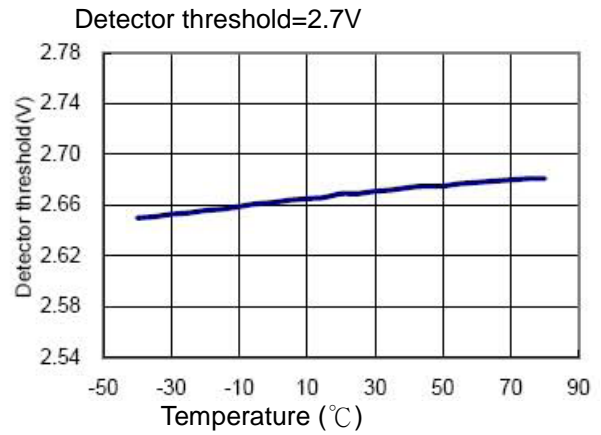
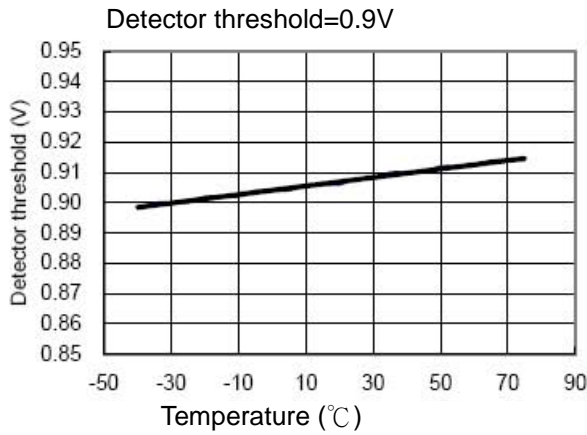


Detector threshold=4.4V



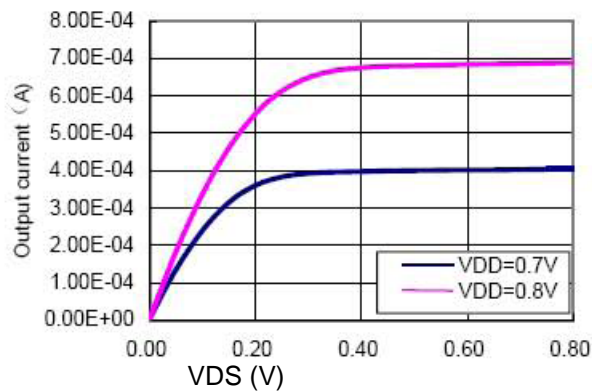


2. Detector Threshold VS. Temperature

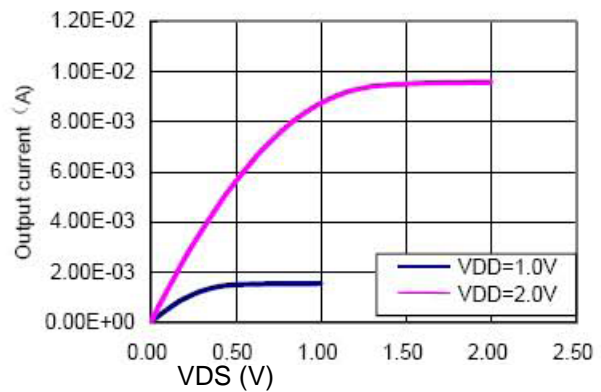


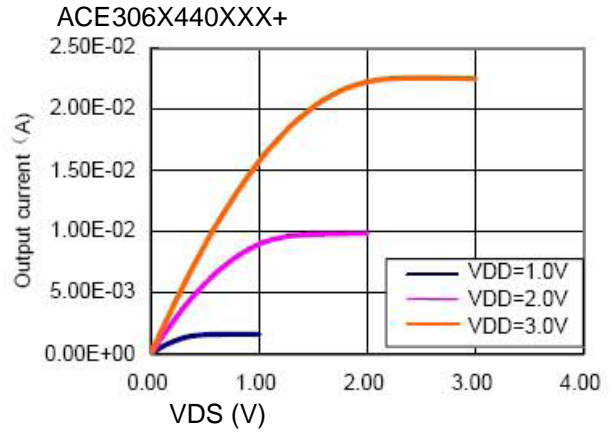
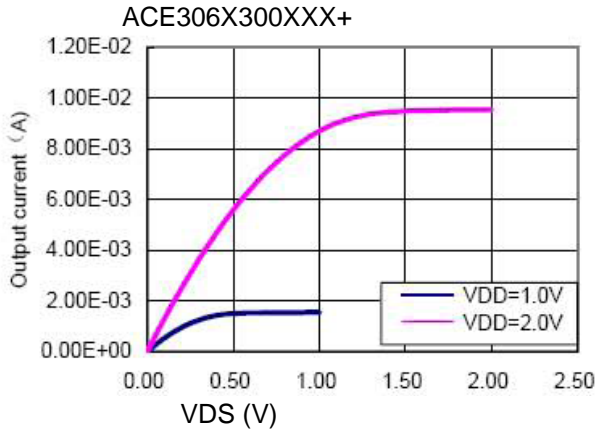
3. Nch Driver Output Current VS. V_{DS}

ACE306X090XXX+

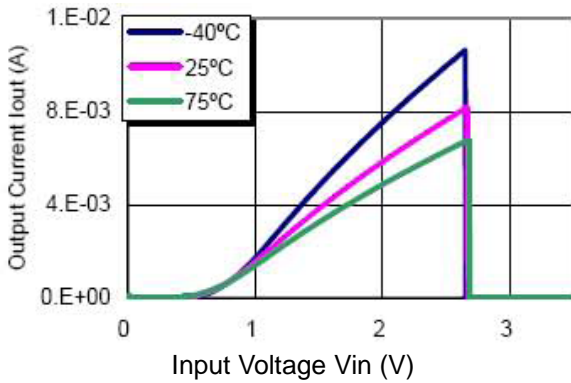


ACE306X270XXX+

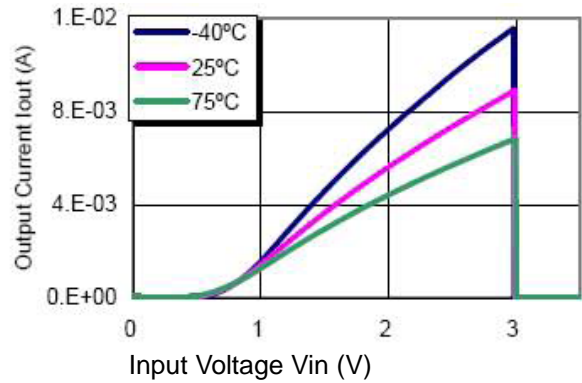




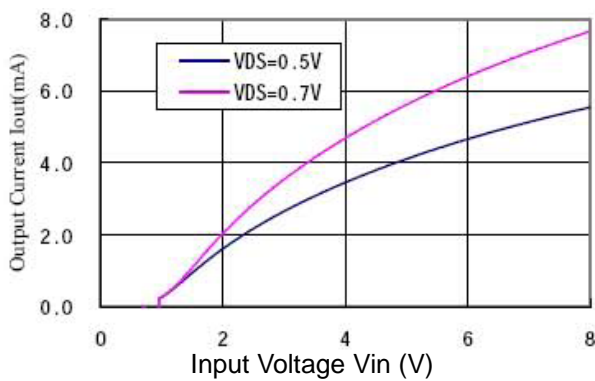
4. Nch Driver Output Current VS. Input Voltage
Detector threshold=2.7V



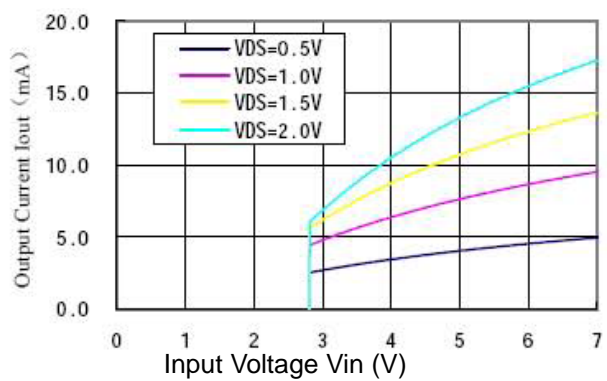
Detector threshold=3.0V



5. PCH Driver Output Current VS. Input Current
Detector threshold=0.9V

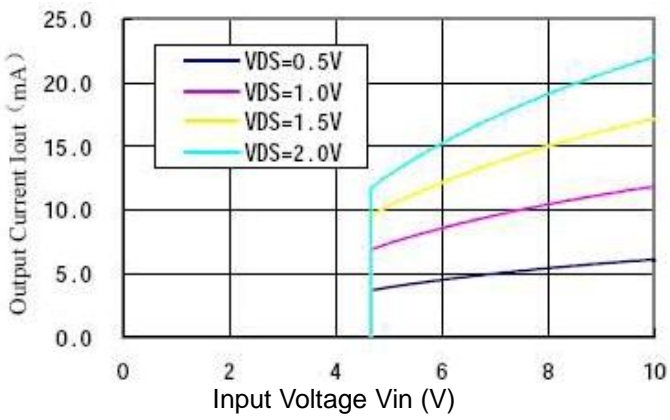


Detector threshold=2.7V

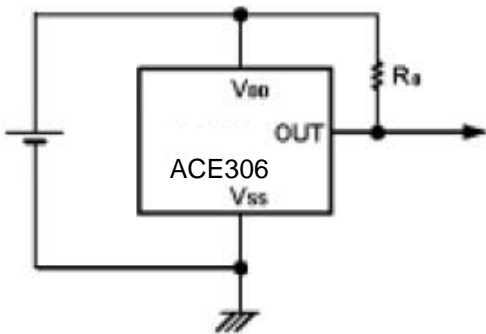




Detector threshold=4.4V



Typical Applications



Note:

1. R₀ is unnecessary for CMOS output products.
2. The value of R₀ need to be selected in different application, Typical value is 470kΩ

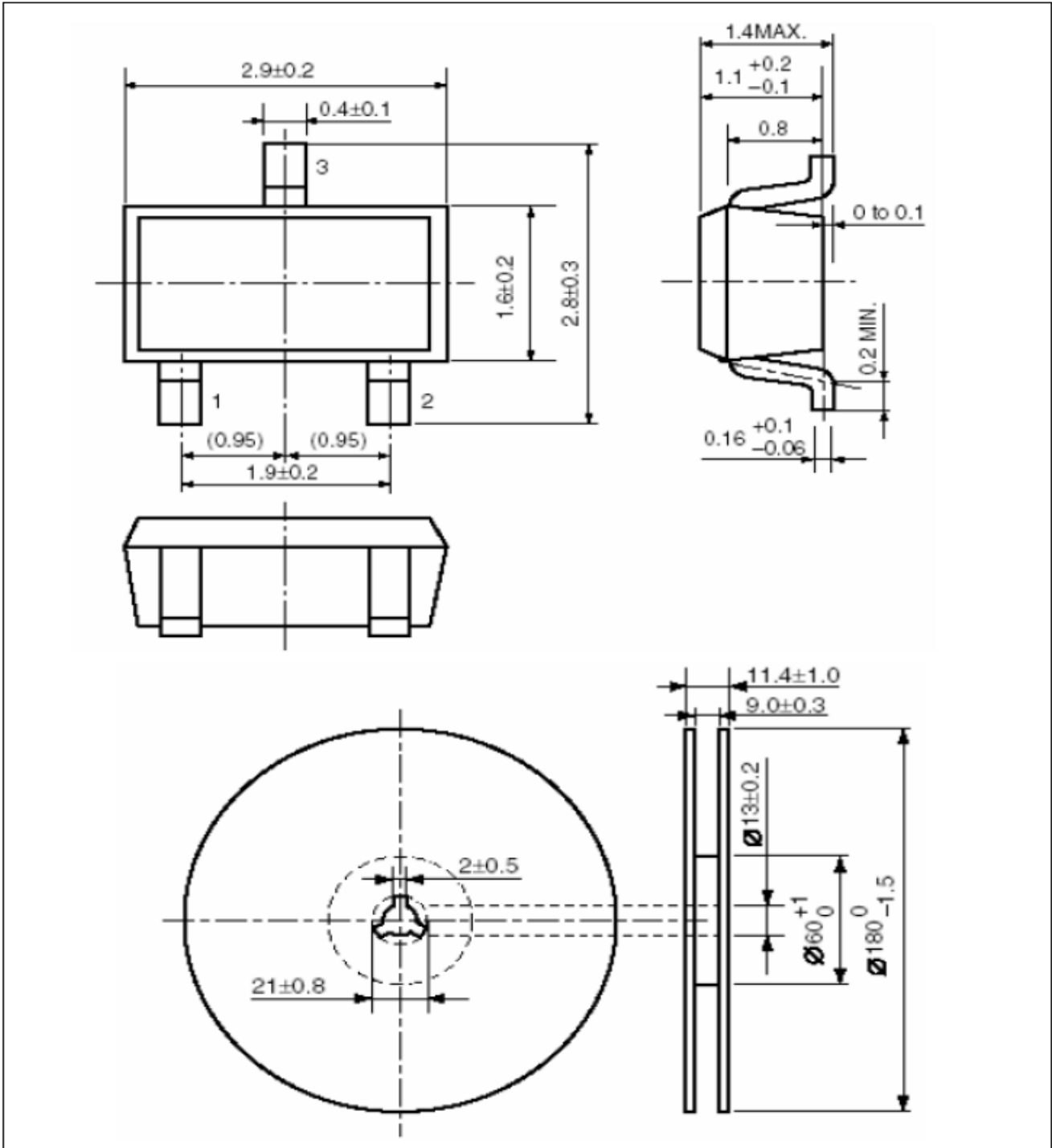


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Packing Information

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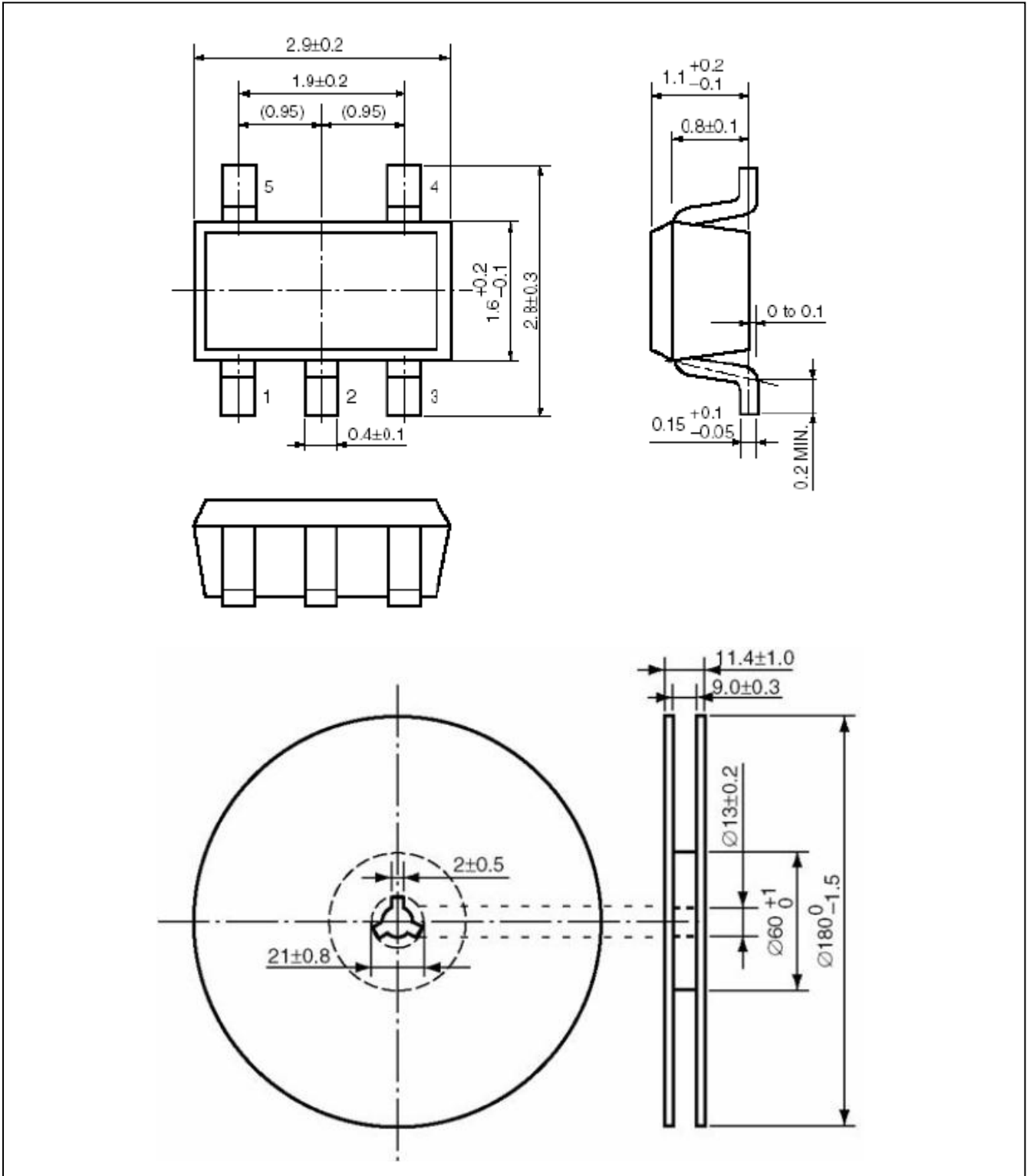


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Low Voltage Detector with Built-in Delay Circuit / SSD

Packing Information

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Low Voltage Detector with Built-in Delay Circuit / SSD

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.

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