HIGH PRECISION BUILT-IN DELAY CIRCUIT
ULTRA-LOW VOLTAGE DETECTOR

A4809

Description

The A4809 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 circuits. The A4809 can work at very low voltage, which makes it perfect for system reset.

The A4809 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.

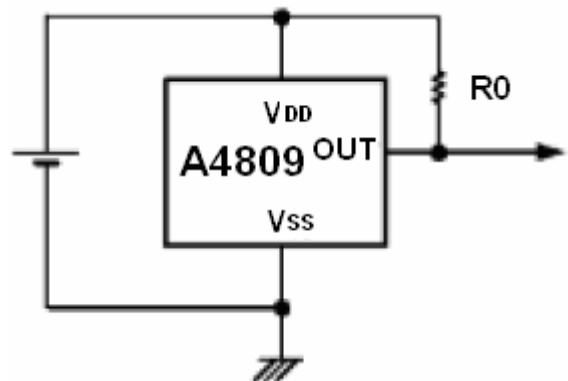A4809 is available in SOT-23 package.

Features

- High-Precision Detection Voltage: $\pm 2\%$
- Detection Voltage: 0.9V~6.0V(in 0.1V step)
- Ultra-Low Current Consumption: 0.5uA typ. (at V_{DD}=3.0V)
- Built-in Power on Reset Delay Time circuit
- Operating Voltage Range: 0.7V~10V
- Two Output Forms: CMOS and N-Channel Open-Drain
- SOT-23 Package

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

Ordering Information

SOT-23	Part Number
Top View	**A4809E3-XXDZ** XX: Detector Voltage 090=0.9V 100=1.0V… D: Delay Time A-G, see below table Z: C=CMOS N=Nch

Delay Time (Table)					
A	50ms	D	200ms	G	400ms
B	100ms	E	250ms		
C	150ms	F	300ms		

Typical Application

1. R0 is necessary for CMOS output products
2. The value of R0 need to be selected in different application, typical value is 470KΩ

Pin Description
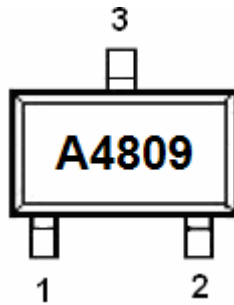
Pin #	Name	Function
1	V_{SS}	GND Pin
2	V_{OUT}	Voltage Detection Output Pin
3	V_{DD}	Voltage Input Pin

Absolute Maximum Ratings

Input Voltage Range	0.3V~12V
Output Voltage Range	0.3V~12V
Maximum Output Current	70mA
Maximum Power Dissipation	150mW
Ambient Temperature	-40~+70°C
Storage Temperature (Ts)	-40~+125°C
Lead Temperature and Time	260°C, 10S

Electrical Characteristics

(Test Condition: Topt=25°C, unless otherwise noted.)

1. A4809-09D (0.9V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
-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 Pch V_{DS}=-2.1V, V_{DD}=4.5V	0.01 0.05 1.0	0.05 0.50 2.0		mA

2. A4809-27D (2.7V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
-V_{DET}	Detector Threshold		2.646	2.70	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 Pch V_{DS}=-2.1V, V_{DD}=4.5V	0.01 1.0	0.05 2.0		mA

3. A4809-30D (3.0V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
-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 Pch V_{DS}=-2.1V, V_{DD}=4.5V	0.01 1.0	0.05 2.0		mA

4. A4809-34D (3.4V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$-V_{DET}$	Detector Threshold		3.332	3.4	3.468	V
Iss	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}=4.5V	1.0	2.0		

5. A4809-44D (4.4V)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$-V_{DET}$	Detector Threshold		4.312	4.4	4.488	V
Iss	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		

Electrical Characteristics By Detector Threshold

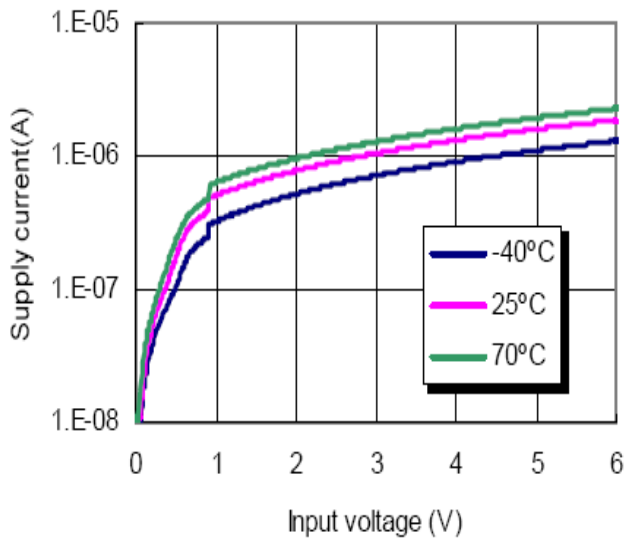| Part No.	Detector Threshold -V$_{DET}$(V)			Detector Threshold Hysteresis V$_{HYS}$(V)			Supply Current Iss1 (uA)			Supply Current 2 Iss2 (uA)		
	Min	Typ	Max	Min	Typ	Max	Condition	Typ	Max	Condition	Typ	Max
A4809-09	0.882	0.900	0.918	0.018	0.036	0.054						
A4809-10	0.980	1.000	1.020	0.020	0.040	0.060						
A4809-11	1.078	1.100	1.122	0.022	0.044	0.066						
A4809-12	1.176	1.200	1.224	0.024	0.048	0.072						
A4809-13	1.274	1.300	1.326	0.026	0.052	0.078						
A4809-14	1.372	1.400	1.428	0.028	0.056	0.084					1.0	1.5
A4809-15	1.470	1.500	1.530	0.030	0.060	0.090						
A4809-16	1.568	1.600	1.632	0.032	0.064	0.096						
A4809-17	1.666	1.700	1.734	0.034	0.068	0.102						
A4809-18	1.764	1.800	1.836	0.036	0.072	0.108						
A4809-19	1.862	1.900	1.938	0.038	0.076	0.114						
A4809-20	1.960	2.000	2.040	0.040	0.080	0.120						
A4809-21	2.048	2.100	2.142	0.042	0.084	0.126						
A4809-22	2.156	2.200	2.244	0.044	0.088	0.132						
A4809-23	2.254	2.300	2.346	0.046	0.092	0.138						
A4809-24	2.352	2.400	2.448	0.048	0.096	0.144						
A4809-25	2.450	2.500	2.550	0.050	0.100	0.150						
A4809-26	2.548	2.600	2.652	0.052	0.104	0.156						
A4809-27	2.646	2.700	2.754	0.054	0.108	0.162						
A4809-28	2.744	2.800	2.856	0.056	0.112	0.168						
A4809-29	2.842	2.900	2.958	0.058	0.116	0.174						
A4809-30	2.940	3.000	3.060	0.060	0.120	0.180						
A4809-31	3.038	3.100	3.162	0.062	0.124	0.186						
A4809-32	3.136	3.2	3.264	0.064	0.128	0.192						
A4809-33	3.234	3.300	3.366	0.066	0.132	0.198	V$_{DD}$= (-V$_{DET}$) +0.1V	0.5	1.0	V$_{DD}$= (-V$_{DET}$)+2V		
A4809-34	3.332	3.400	3.468	0.068	0.136	0.204						
A4809-35	3.430	3.500	3.570	0.070	0.140	0.210						
A4809-36	3528	3.600	3.672	0.p72	0.144	0.216						
A4809-37	3.626	3.700	3.774	0.074	0.148	0.222						
A4809-38	3.724	3.800	3.876	0.076	0.152	0.228						
A4809-39	3.822	3.900	3.978	0.078	0.156	0.234						
A4809-40	3.920	4.000	4.080	0.080	0.160	0.240					0.5	1.0
A4809-41	4.018	4.100	4.182	0.082	0.164	0.246						
A4809-42	4.116	4.200	4.284	0.084	0.168	0.252						
A4809-43	4.214	4.300	4.386	0.086	0.172	0.258						
A4809-44	4.312	4.400	4.488	0.088	0.176	0.264						
A4809-45	4.410	4.500	4.590	0.090	0.180	0.270						
A4809-46	4.508	4.600	4.692	0.092	0.184	0.276						
A4809-47	4.606	4.700	4.794	0.094	0.188	0.282						
A4809-48	4.704	4.800	4.896	0.096	0.192	0.288						
A4809-49	4.802	4.900	4.998	0.098	0.196	0.294						
A4809-50	4.900	5.000	5.100	0.100	0.200	0.300						
A4809-51	4.998	5.100	5.202	0.102	0.204	0.306						
A4809-52	5.096	5.200	5.304	0.104	0.208	0.312						
A4809-53	5.194	5.300	5.406	0.106	0.212	0.318						
A4809-54	5.292	5.400	5.508	0.108	0.216	0.324						
A4809-55	5.390	5.500	5.610	0.110	0.220	0.330						
A4809-56	5.488	5.600	5.712	0.112	0.224	0.336						
A4809-57	5.586	5.700	5.814	0.114	0.228	0.342						
A4809-58	5684	5.800	5.916	0.116	0.232	0.348						
A4809-59	5.782	5.900	6.018	0.118	0.236	0.354						
A4809-60	5.880	6.000	6.120	0.120	0.240	0.360						

Block Diagram

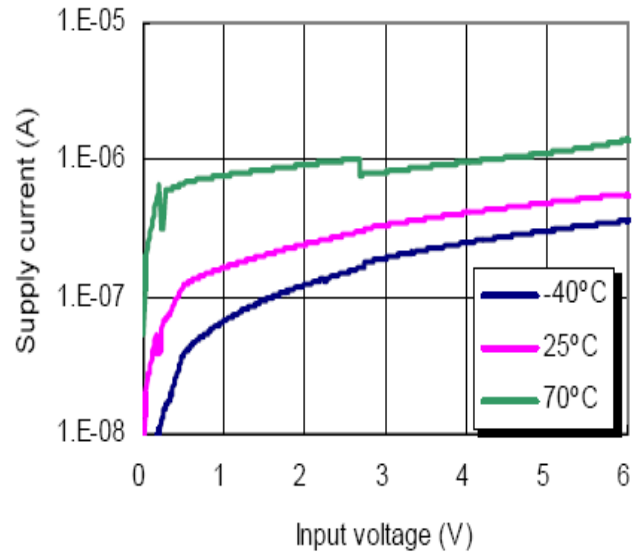1. N Channel Open-Drain
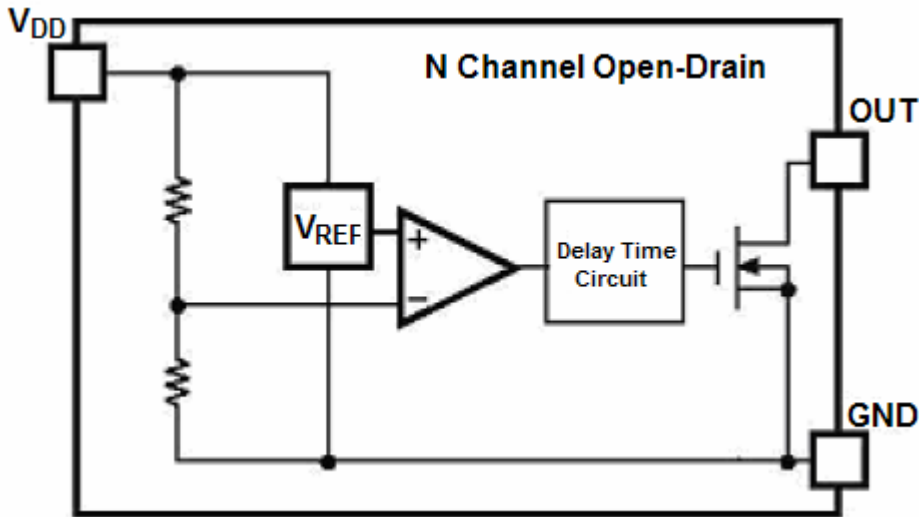
2. CMOS Output
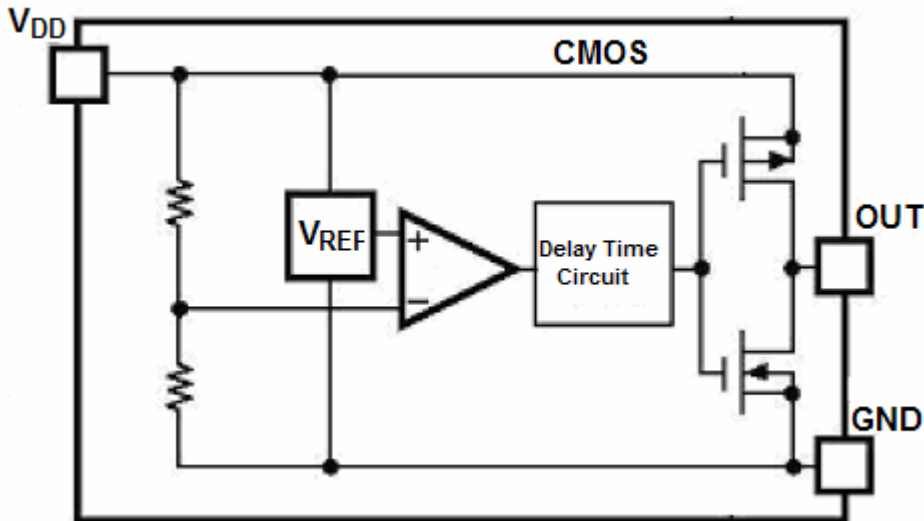
Typical Performance Characteristics

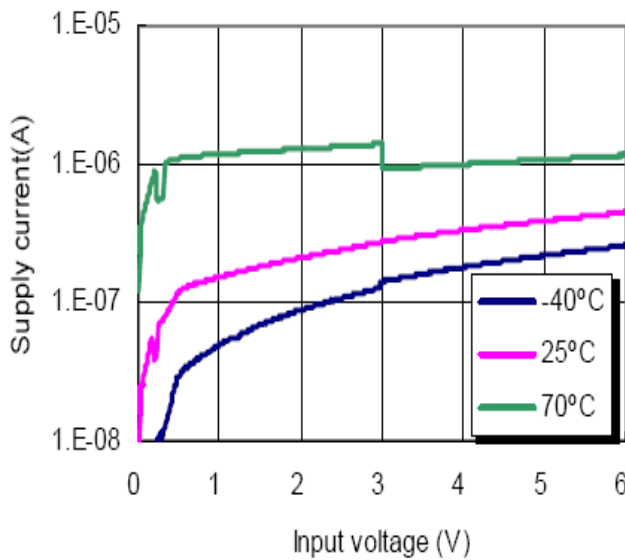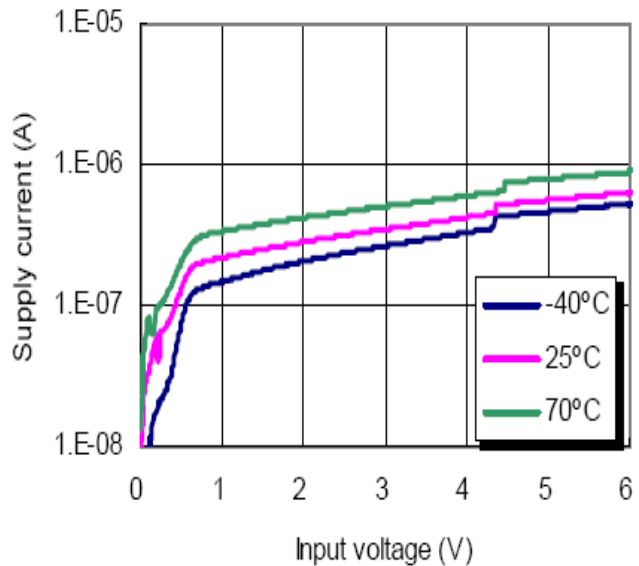1. Output Voltage vs. Input Voltage

Detector Threshold=0.9V

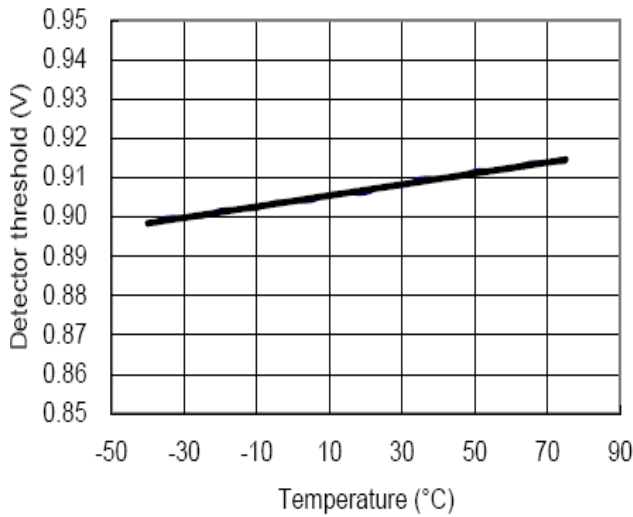Detector Threshold=2.7V

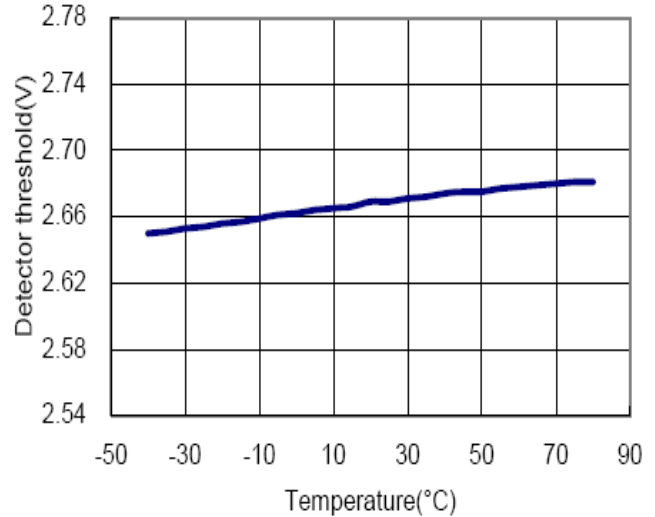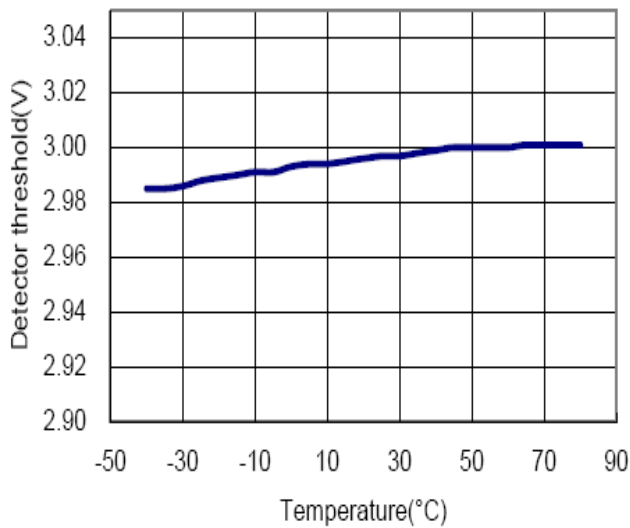Detector Threshold=3.0V

Detector Threshold=4.4V

2. Detector Threshold vs. Temperature
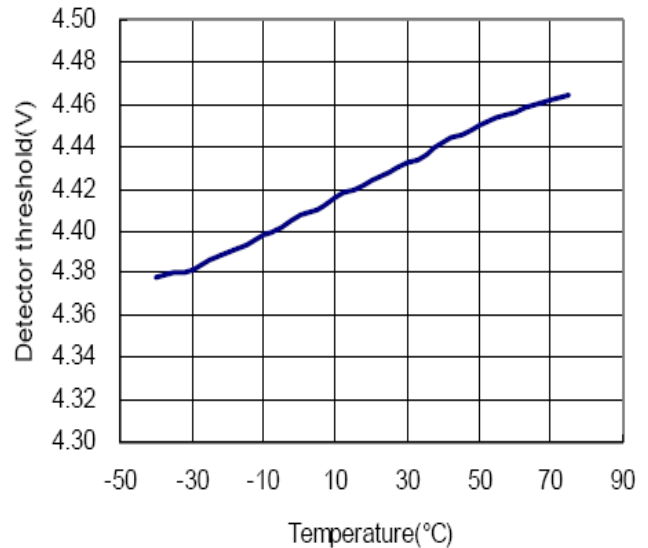
Detector Threshold=0.9V
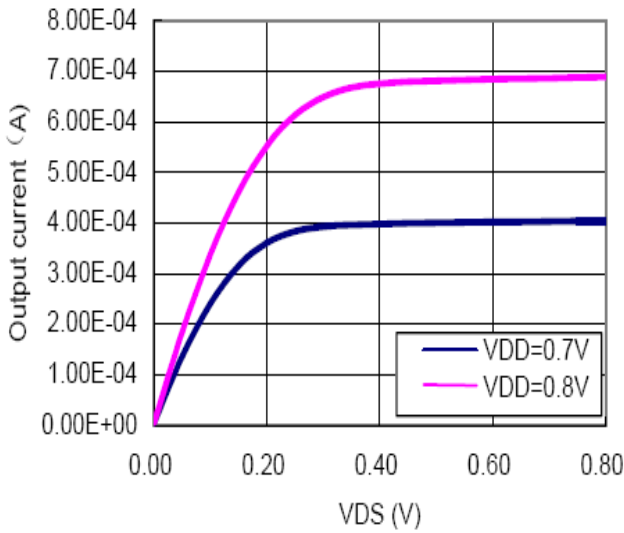
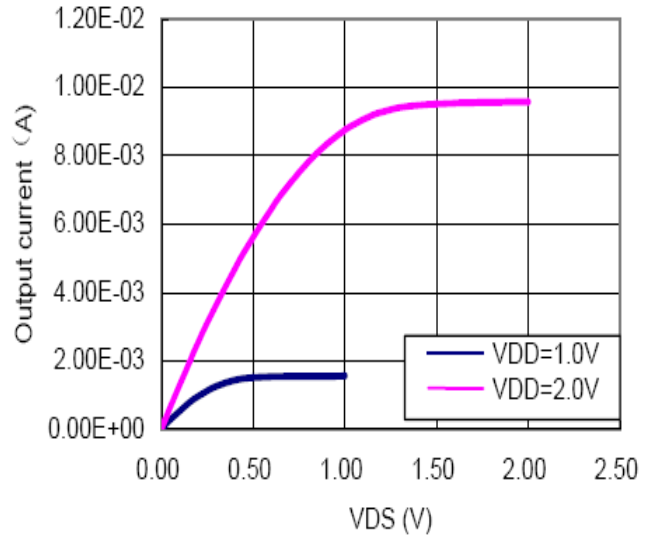Detector Threshold=2.7V
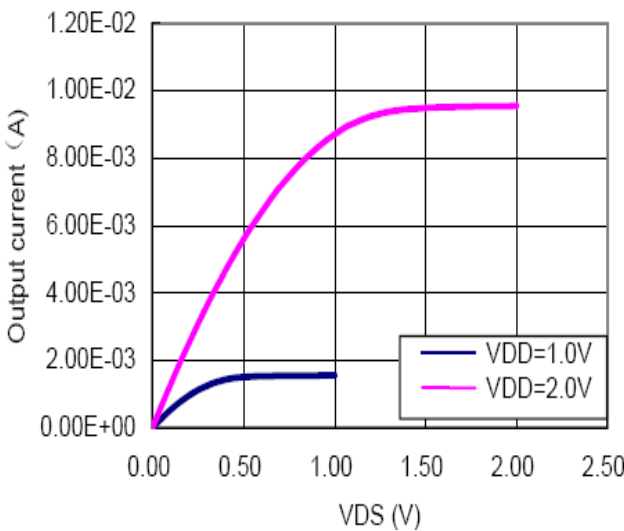
Detector Threshold=3.0V

Detector Threshold=4.4V
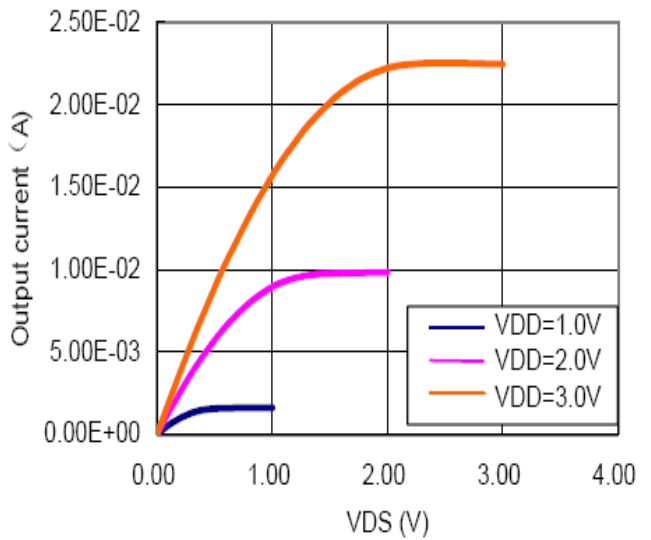
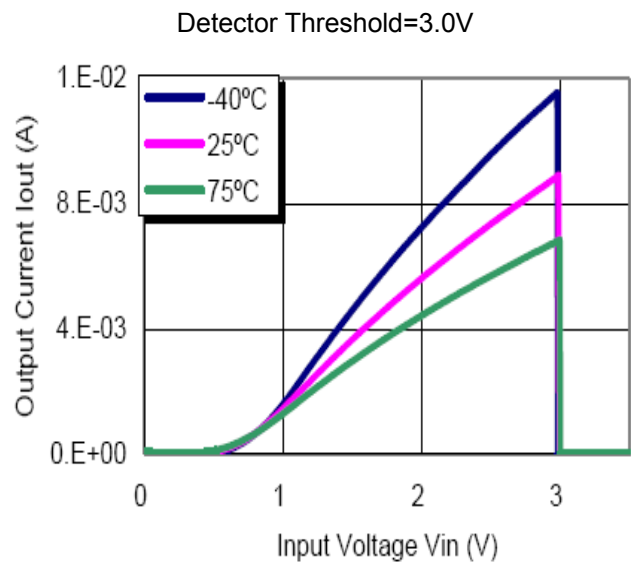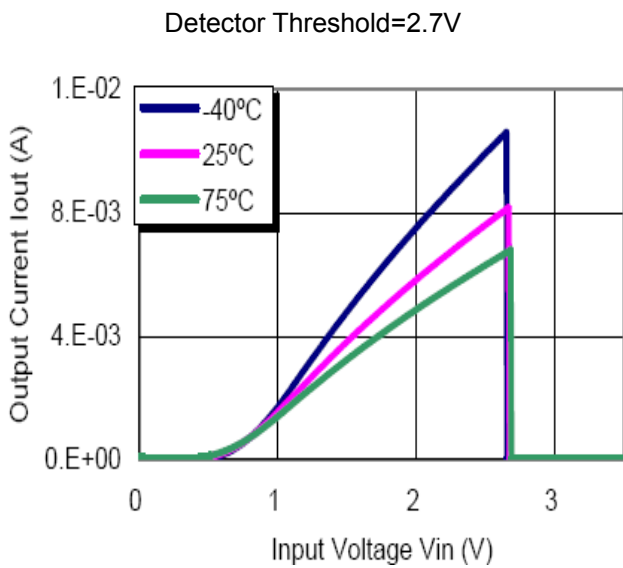3. Nch Driver Output Current vs. V_{DS}

A4809-09

A4809-27

A4809-30

A4809-40

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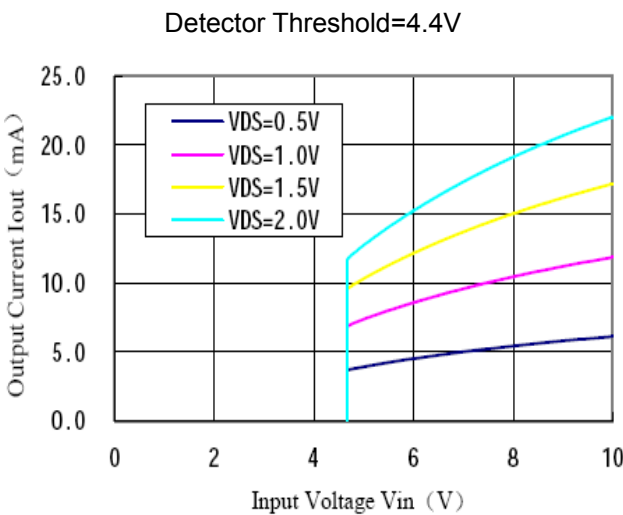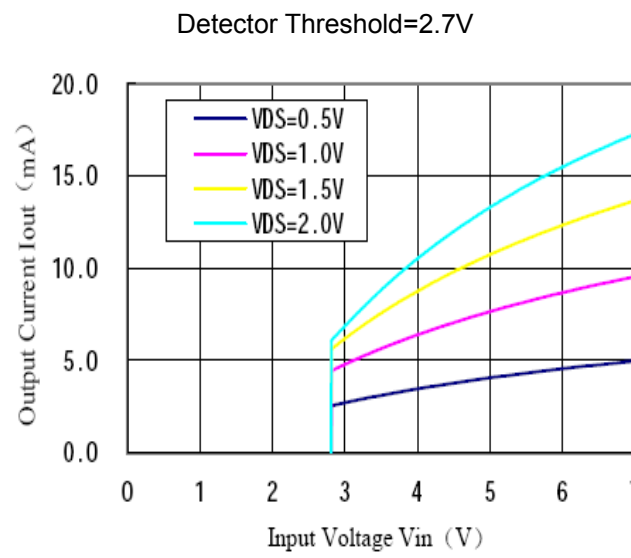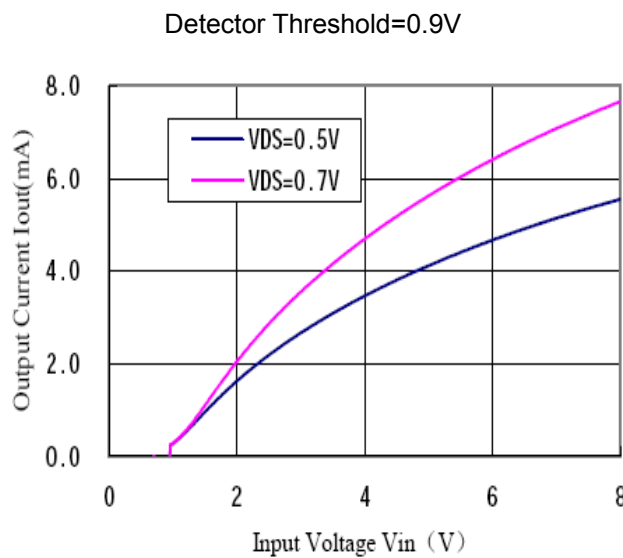
Detailed Information
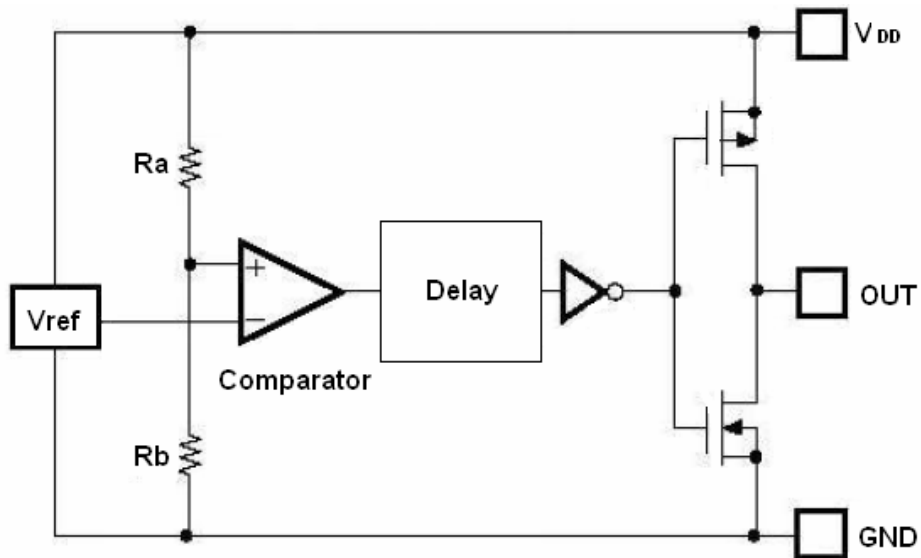
High precision low temperature co-efficiency reference voltage is applies to the negative input of a comparator. Input voltage, divided by resistor array of Ra and Rb, is applied to the positive input of the comparator. Output of the comparator passes a delay circuit and a series of buffer to drive the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

$V_{DET} = V_{REF} * (1 = Ra / Rb)$
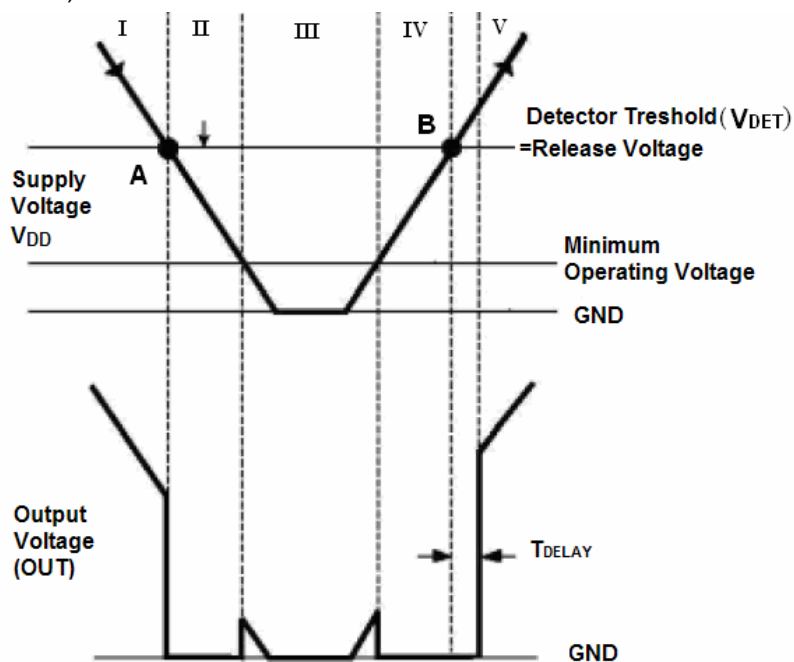
| No	Operation Status	Output Status
I	$V_{DD} > V_{DET}$	Output voltage is equal to the supply voltage
II	V_{DD} drops below V_{DET}	Output voltage equals to GND level
III	V_{DD} drops further below V_{DDL}	Output voltage is undefined
IV	V_{DD} rises above V_{DDL}	Output voltage equals to GND level
V	V_{DD} rises above V_{DET}	Output voltage equals to supply voltage after T delay

Test Circuits
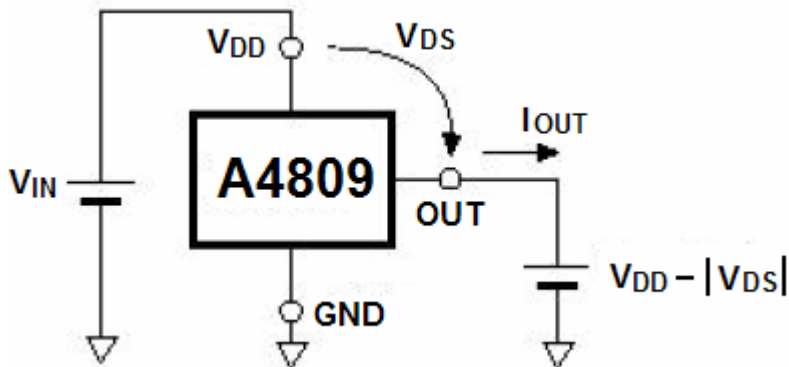
1. Supply Current
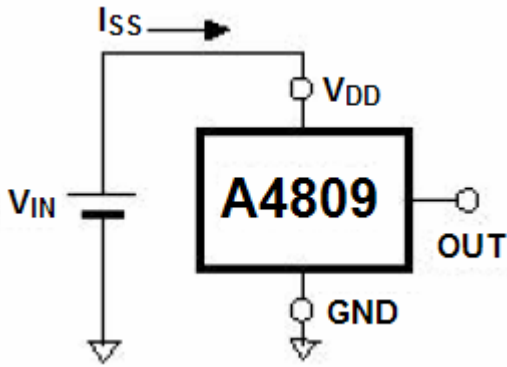
2. Detector Threshold
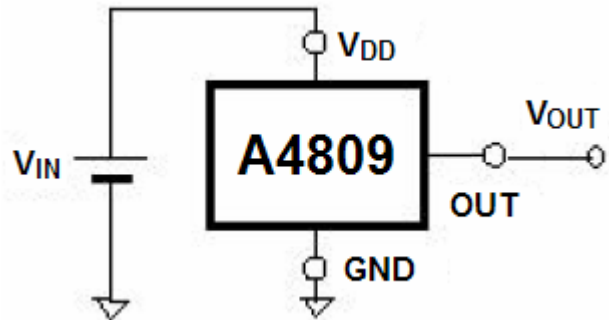
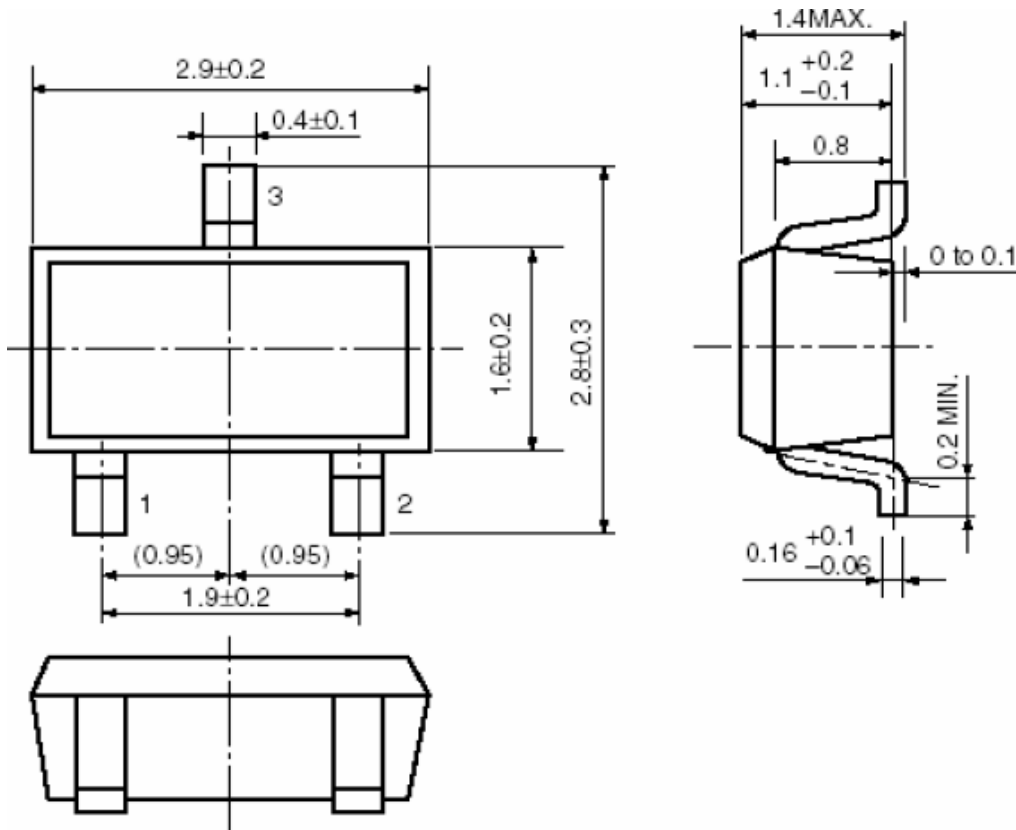3. Nch Drive Output Current
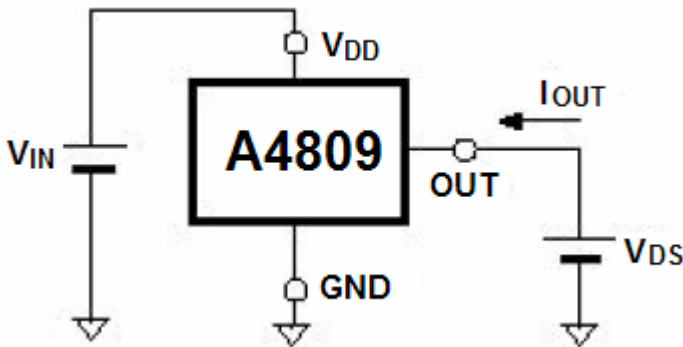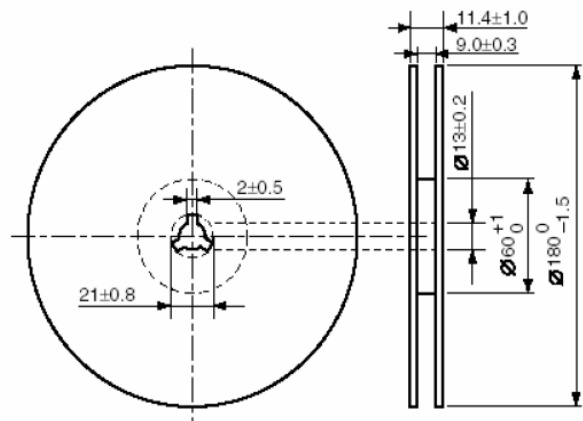

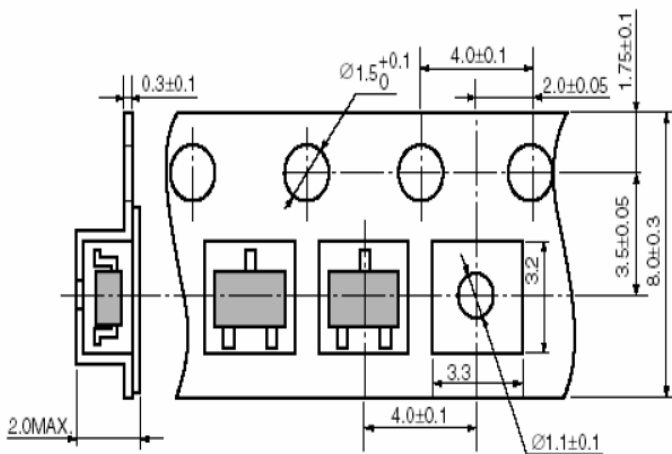4. Pch Drive Output Current

Package Information

Dimension in SOT-23   (Unit: mm)

Tape Dimension

Tape & Reel Dimension

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