BL8509D

Low Voltage Detector with Built-in Delay Circuit

Outline:

BL8509D is a series of high precision voltage detector with ultra low current consumption (500nA typ. at VDD=VTH+1V) and a built-in delay circuit. It can work at very low voltage, which makes it perfect for system reset.

BL8509D 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.

BL8509D is available in SOT-23,SOT-23-3,SOT-23-5 which is Pb free.

Features:

- High-precision detection Voltage: ±2%
- Detection Voltage: 1.6V~5.0V (in 0.1V steps)
- Built-in Power on Reset Delay Time circuit:: Refer to Selection Guide
- Operating Voltage range: 1.0V~6.0V
- Ultra-low current consumption: 0.9uA typ. (at VDD=3V)
- 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

Selection Guide:

8509D-*XXX X X XX*

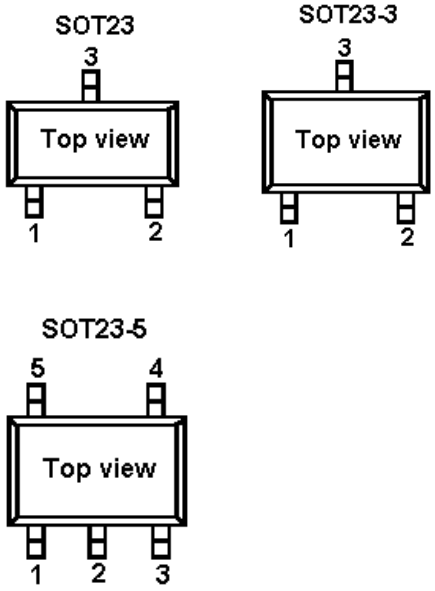
Package type:
RM: SOT-23-3
RN: SOT-23-5
RO: SOT-23

Output type:
N: Nch
C: CMOS

Delay time:
A: 240mS
B: 50mS
C: 100mS
D: 200mS
E: 400mS

Detector voltage:
090……0.9V
100……1.0V
263……2.63V
293……2.93V
300……3.0V
465……4.65V
……
600……6.0V
(In 0.1V step)

Pin Alignment:



Product Mark Information：

Top View：VZXYW

Product Name	Top Side Mark(VZ)	Output Type
BL8509D-263	H1	Nchannel
BL8509D-293	H2	Nchannel
BL8509D-263	I1	CMOS
BL8509D-293	I2	CMOS

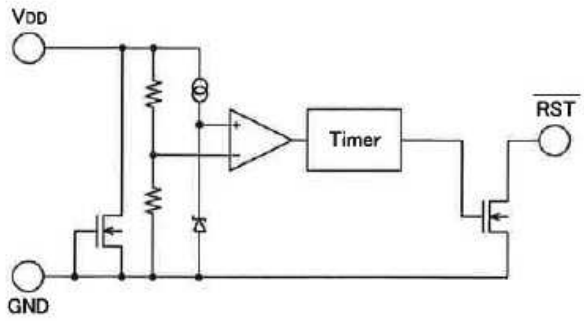
Top Side Mark(X)	Delay Times
A	240mS
B	50mS
C	100mS
D	200mS
E	400mS

Means assembly year and weeks						
Year	2010	2011	2012	2013	…	
Y	0	1	2	3	…	
Week	1	…	26	27	…	52
W	A	…	Z	$\overline{A}$	…	$\overline{Z}$

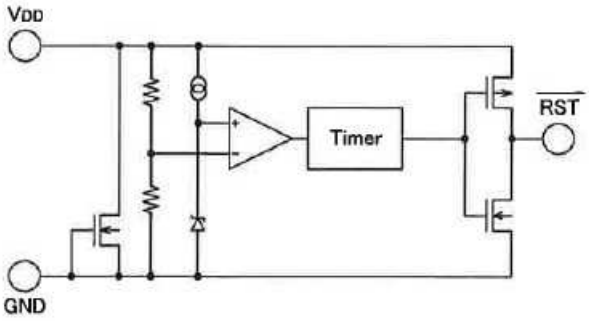
Pin Description:

PIN Number			PIN Name	Function
SOT-23	SOT-23-3	SOT-23-5		
1	1	3	VSS	GND Pin
2	2	1	VOUT	Voltage detection output Pin
3	3	2	VDD	Voltage input Pin
-	-	4	NC	No connection
-	-	5	NC	No connection

Block diagram:



N channel open-drain



CMOS output

Absolute Maximum Ratings：

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	VDDmax	7	V
Output Voltage	RST,$\overline{RST}$	GND-0.3 ～VDDmax+0.3 (CMOS Type) GND-0.3 ～7 (Open Drain Type)	V
Input Current	IDD	20	mA
Output Current	IOUT	20	mA
Power Dissipation	PD	150 (Not attached PCB)	mW
Operating Temperature	Topr	-40 ～ +105	℃
Storage Temperature	Tstg	-65 ～ +150	℃

Recommended Work Conditions：

PARAMETER	SYMBOL	RATING	UNIT
Operating Temperature	Topr	-40 ～ +105	℃

Electrical Characteristics：

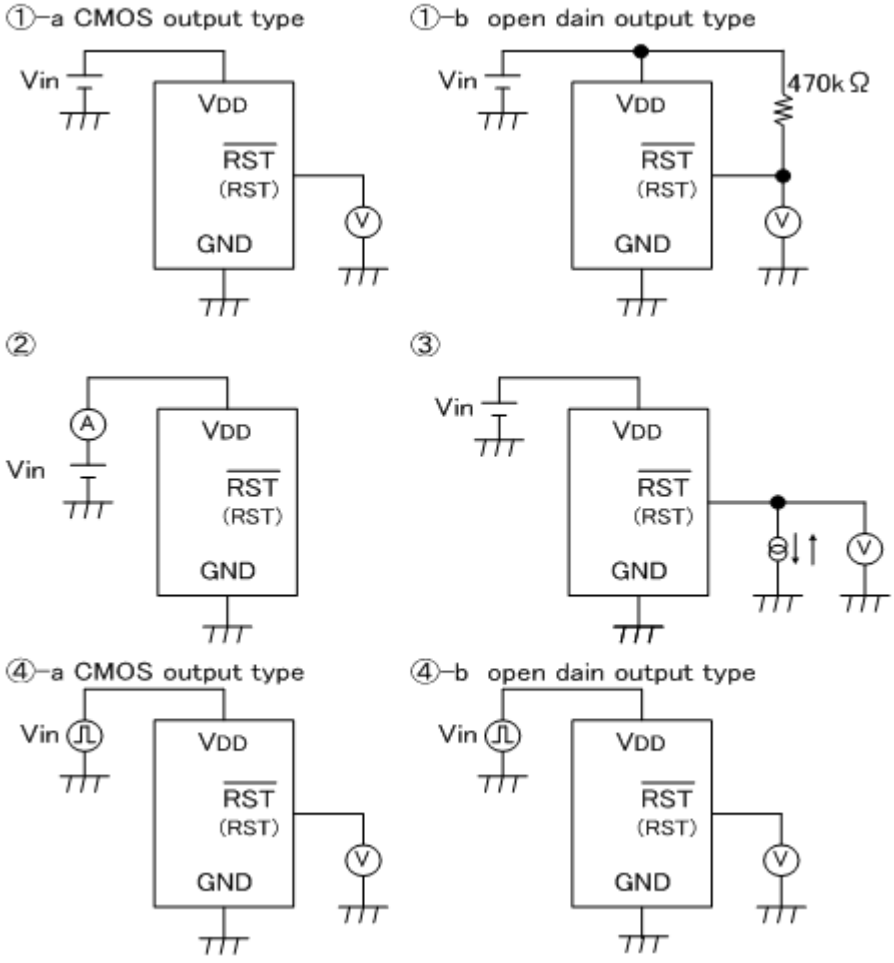
Parameter	Symbol	Test Condition		MIN.	TYP.	MAX.	Unit	Circuit
Operating voltage	VDD	Ta=0 to 70℃		1.0	-	6.0	V	①
		Ta=-40 to 105℃		1.1	-	6.0		
Supply Current	IDD	VDD=VTH+1V		—	0.5	2.0	μA	②
Reset Threshold	VTH	VTH=4.63V	Ta=25℃	4.584	4.630	4.676	V	①
			Ta=-40 to 85℃	4.500	-	4.750		
			Ta=85 to 105℃	4.400	-	4.860		
		VTH=4.38V	Ta=25℃	4.336	4.380	4.424		
			Ta=-40 to 85℃	4.250	-	4.500		
			Ta=85 to 105℃	4.160	-	4.560		
		VTH=3.08V	Ta=25℃	3.049	3.080	3.111		
			Ta=-40 to 85℃	3.000	-	3.150		
			Ta=85 to 105℃	2.920	-	3.230		
		VTH=2.93V	Ta=25℃	2.901	2.930	2.959		
			Ta=-40 to 85℃	2.850	-	3.000		
			Ta=85 to 105℃	2.780	-	3.080		
		VTH=2.63V	Ta=25℃	2.604	2.630	2.656		
			Ta=-40 to 85℃	2.550	-	2.700		
			Ta=85 to 105℃	2.500	-	2.760		
		VTH=1.6～5.0V (0.1V step)	Ta=25℃	-1.0	-	1.0	%	
			Ta=-40 to 85℃	-2.5	-	2.5		
			Ta=85 to 105℃	-5.0	-	5.0		
Reset Threshold Temp. Coefficient	VTH/⊿T			—	30	—	ppm/℃	①
RST output voltage Low (active L type)	VOL	VDD=VTH-0.1V, Isink=1.2mA VTH≦3.08V		—	—	0.3	V	③
		VDD=VTH-0.1V, Isink=3.2mA VTH＞3.08V		—	—	0.4		
RST output voltage High (active L type)	VOH	VDD=VTH+1V Isink=500μA VTH≦3.08V		0.8*VDD	—	—	V	
		VDD=VTH+1V, Isink=800μA VTH＞3.08V		VDD-1.5	—	—		
RST output voltage low (active H type)	VOL	VDD=VTH+1V, Isink=1.2mA VTH≦3.08V		—	—	0.3	V	
		VDD=VTH+1V, Isink=3.2mA VTH＞3.08V		—	—	0.4		
RST output voltage High (active H type)	VOH	VDD=VTH-0.1V Isink=500μA VTH≦3.08V		0.8*VDD	—	—	V	
		VDD=VTH-0.1V, Isink=800μA VTH＞3.08V		VDD-1.5	—	—		

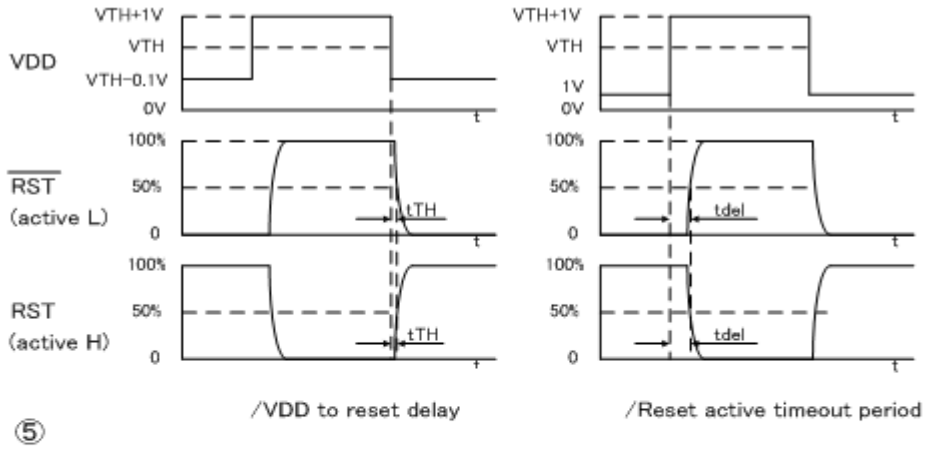
(Note1)This device is tested at Ta=25℃, over temperature limits guaranteed by design only.
(Note2)The parameter is guaranteed by design.

Parameter	Symbol	Tdel Rank		MIN.	TYP.	MAX.	Unit	Circuit
Reset active timeout period	t_{del}	A	Ta=-40 to 85℃	140	240	310	ms	④
			Ta=85 to 105℃	100	-	840		
		B	Ta=-40 to 85℃	35	50	65		
			Ta=85 to 105℃	25	-	98		
		C	Ta=-40 to 85℃	70	100	130		
			Ta=85 to 105℃	49	-	195		
		D	Ta=-40 to 85℃	140	200	260		
			Ta=85 to 105℃	98	-	390		
		E	Ta=-40 to 85℃	280	400	520		
			Ta=85 to 105℃	196	-	780		
VDD to Reset Delay	t_{TH}	VDD=（V_{TH}+1V） to (V_{TH}-100mV) (Note2)		—	20	—	μs	④
Output Leakage Current (active L,open drain type)	I_{LEAK}	VDD=V_{RST}=7V		—	—	0.1	μA	⑤

(Note1) This device is tested at Ta=25℃, over temperature limits guaranteed by design only .
(Note2) The parameter is guaranteed by design.

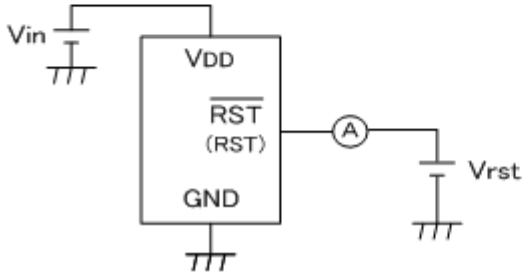
Test Circuit:



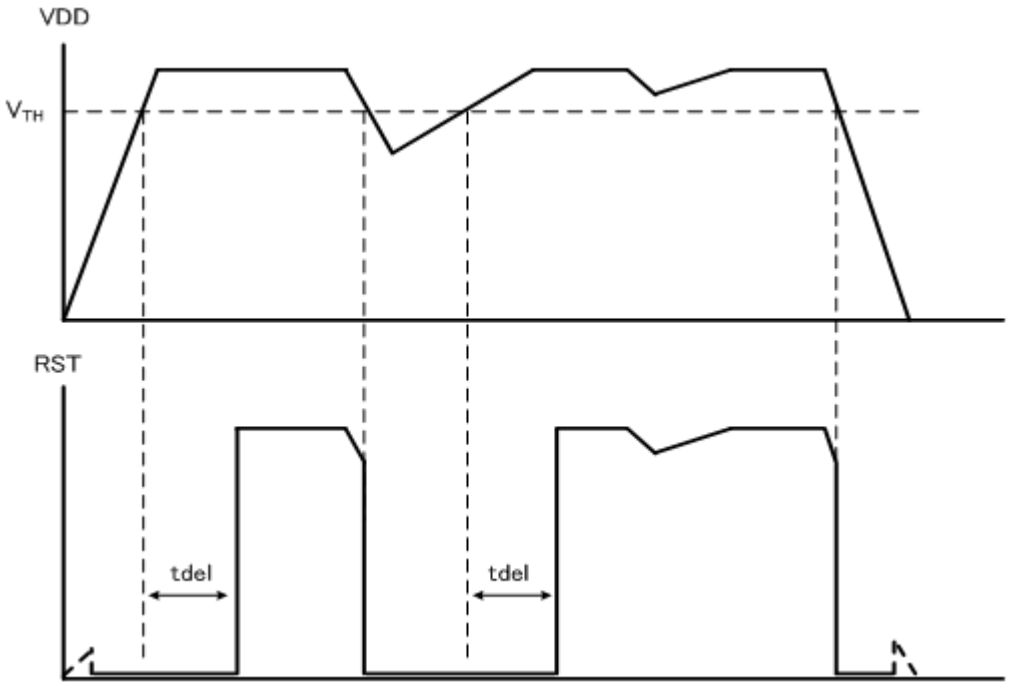


/VDD to reset delay　　/Reset active timeout period

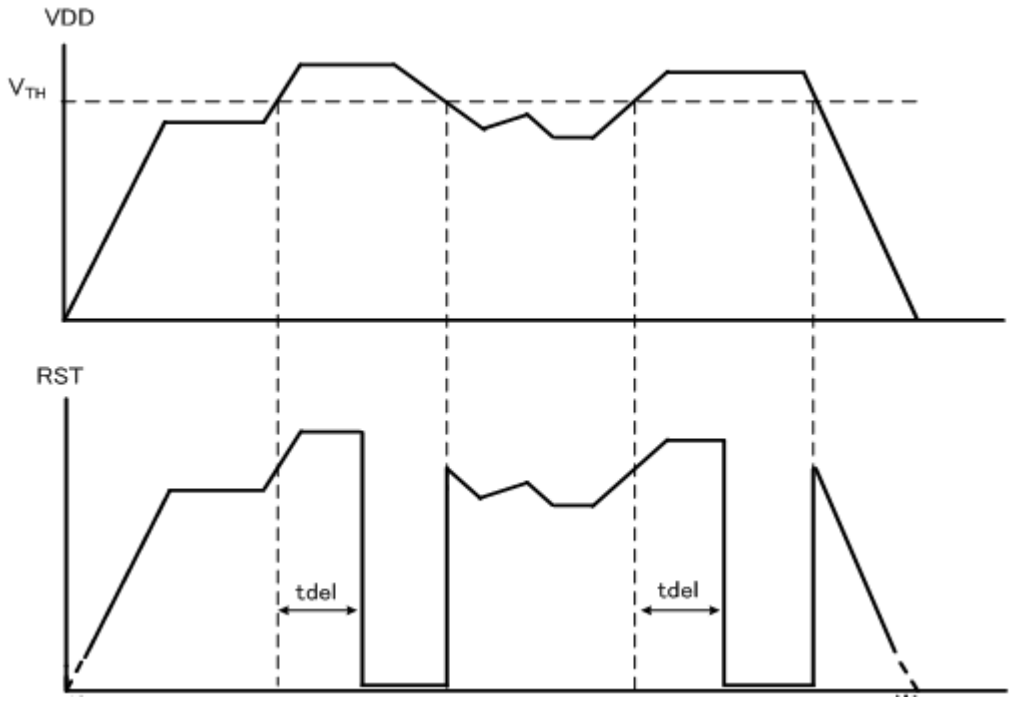
⑤



Timing Chart：

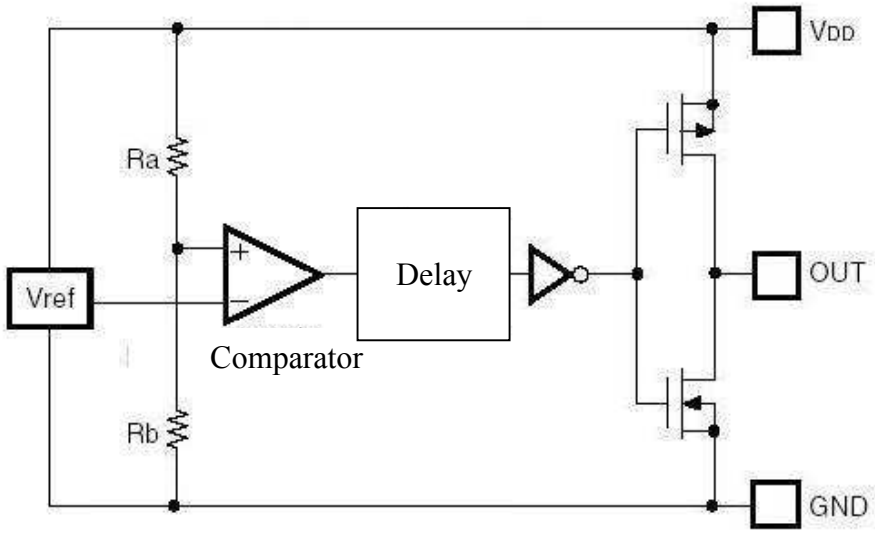


VDD＜1V region is, it will be operating limits, The output is undefined.



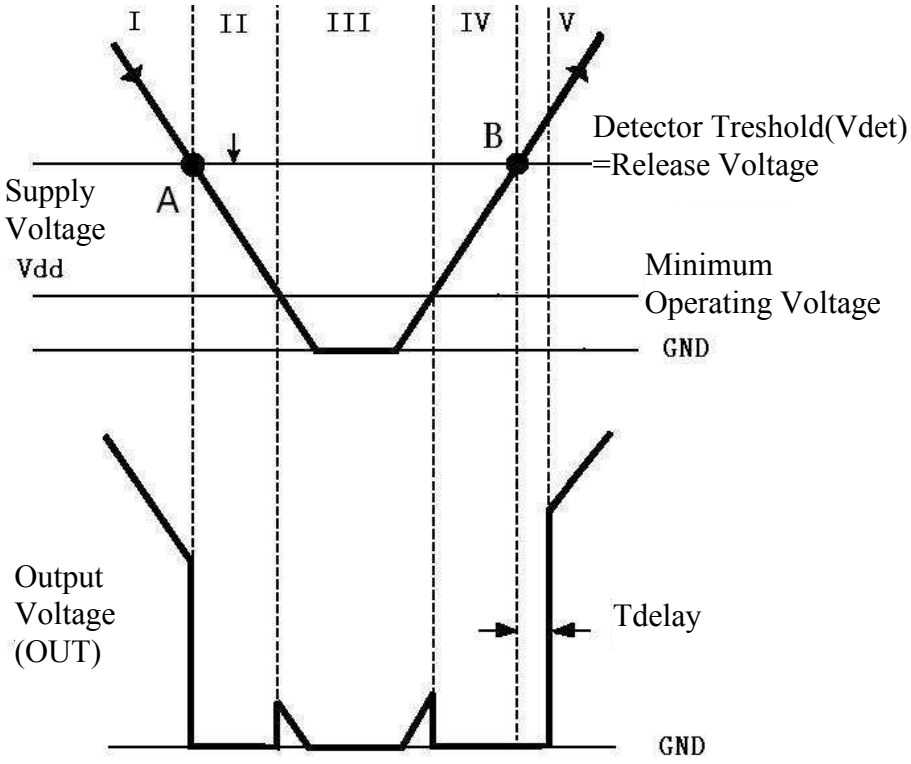
VDD＜1V region is, it will be operating limits, The output is undefined.

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.

$$V_{DET} = V_{REF} * (1 + Ra/Rb)$$

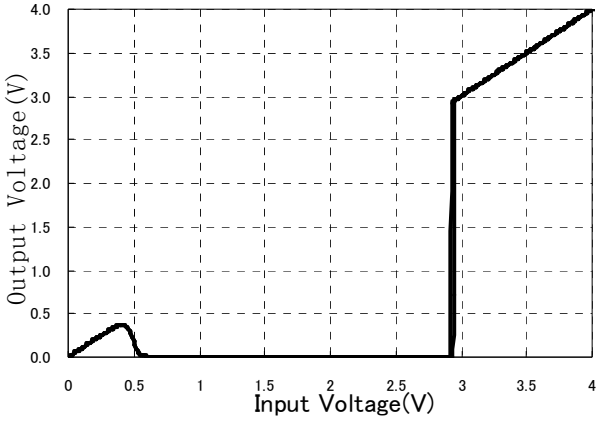


No.	Operation status	Output status
I	V_{DD}>V_{det}	Output voltage is equal to the supply voltage
II	V_{DD} drops below V_{det}	Output voltage equals to GND level
III	V_{DD} drops further below V_{DDL}	Output voltage is undefined
IV	V_{DD} rises above V_{DDL}	Output voltage equals to GND level
V	V_{DD}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

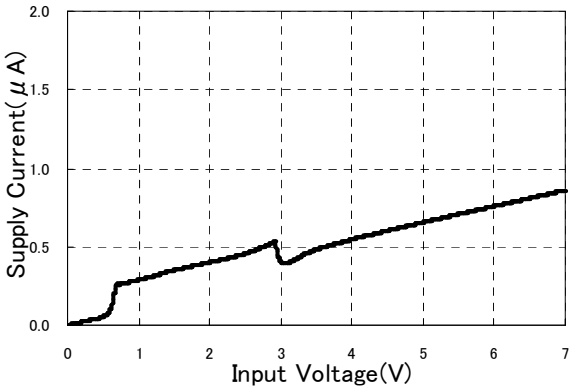
Typical Performance Characteristics：

1) Supply current VS. Input voltage

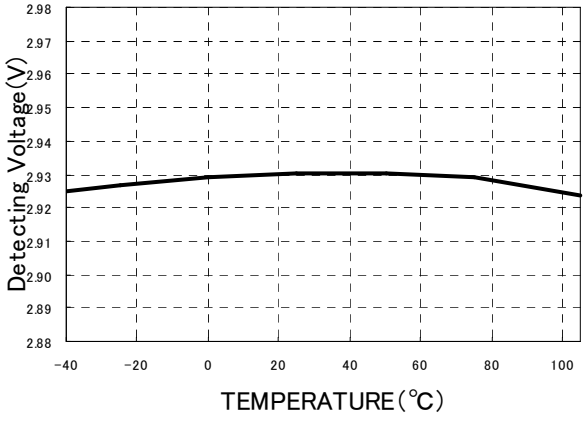
DETECTING VOLTAGE



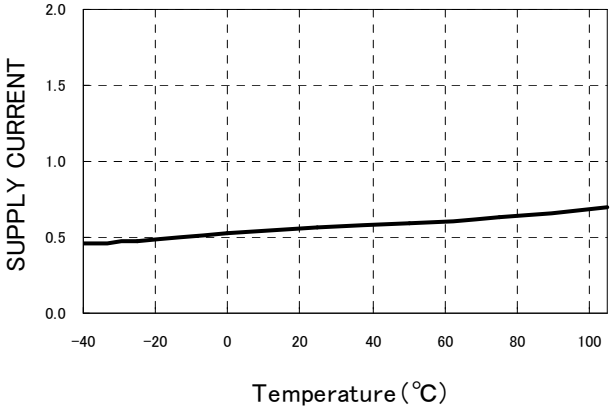
SUPPLY CURRENT



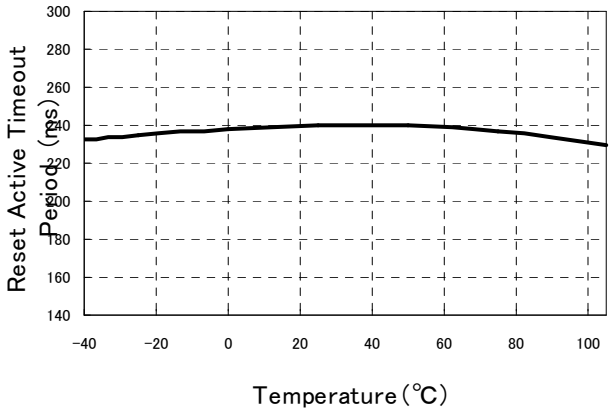
DETECTING VOLTAGE VS TEMPERATURE



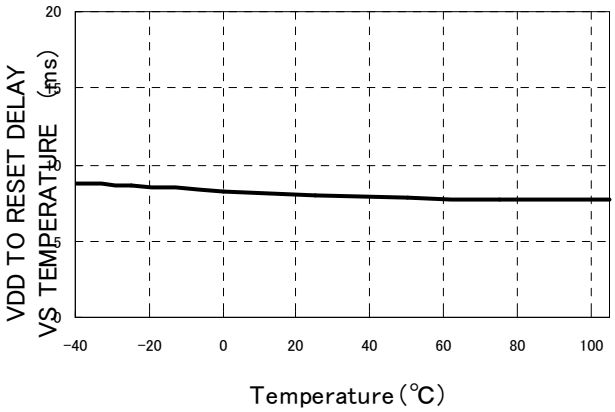
SUPPLY CURRENT
VS TEMPERATURE

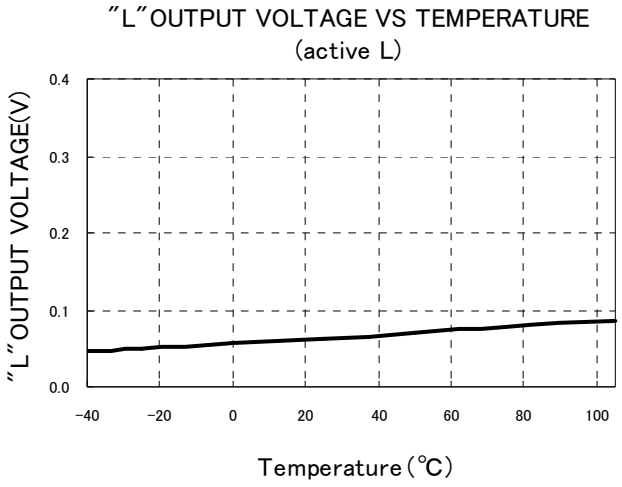


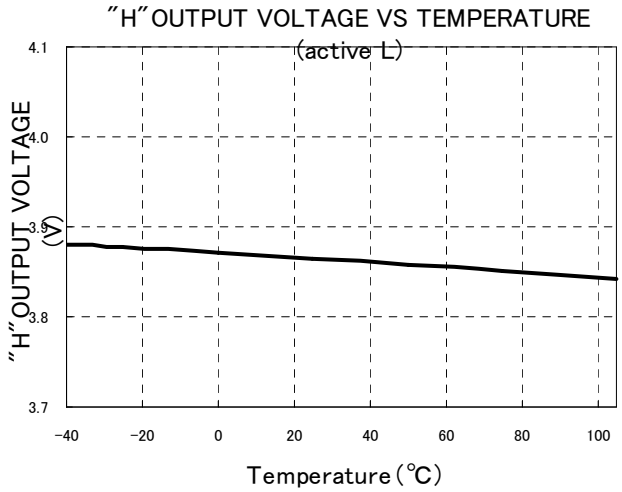
RESET ACTIVE TIMEOUT PERIOD
VS TEMPERATURE



VDD TO RESET DELAY VS TEMPERATURE
VS TEMPERATURE

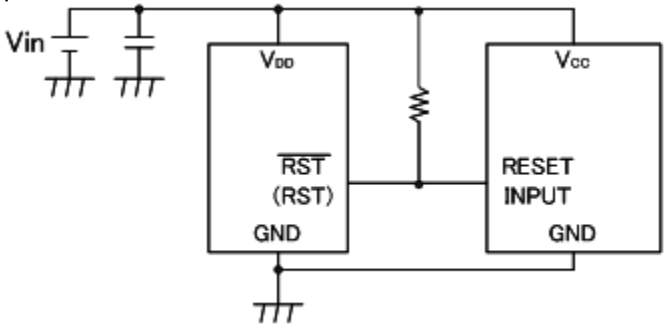




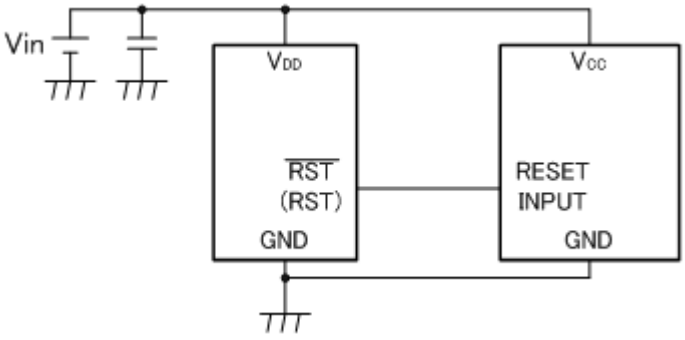


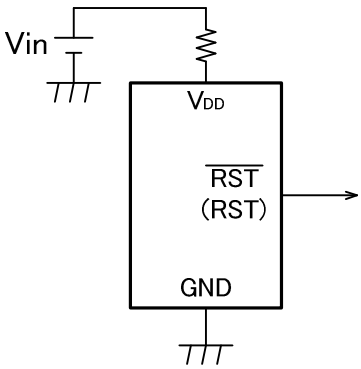
Typical applications：

Open drain OUTPUT



CMOS OUTPUT





Note：

Please note that there is any possibility of circuit oscillation when resistance put in the line VIN.

Load current and load resistance should be adjusted, which not over power dissipation level.

We shall not be liable for any trouble or damage caused by using this circuit .

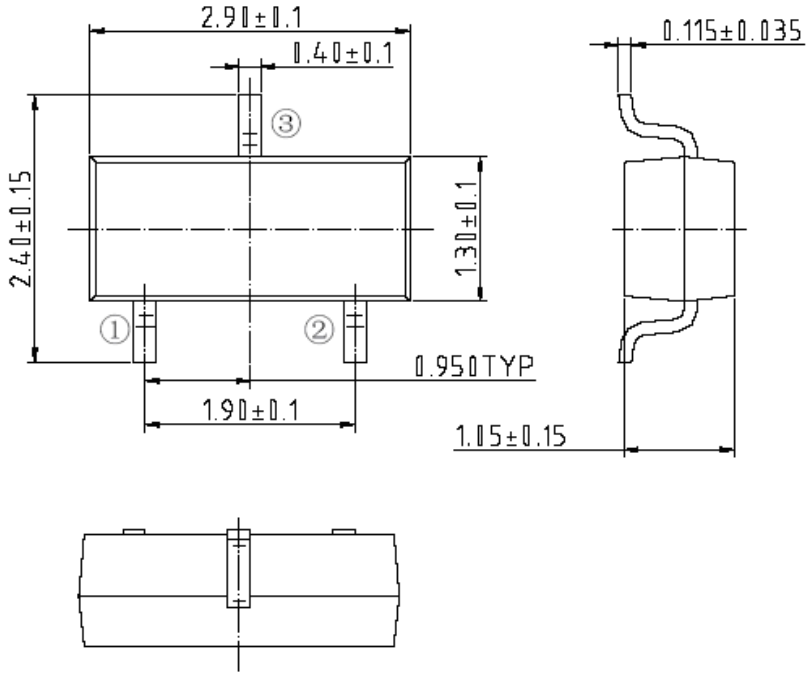
In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, Mitsumi Electric Co., Ltd. shall not be liable for any such problem, nor grant a license therefore.

Package Outline：

SOT-23:

Package	SOT23	Devices per reel	3000	Unit	mm

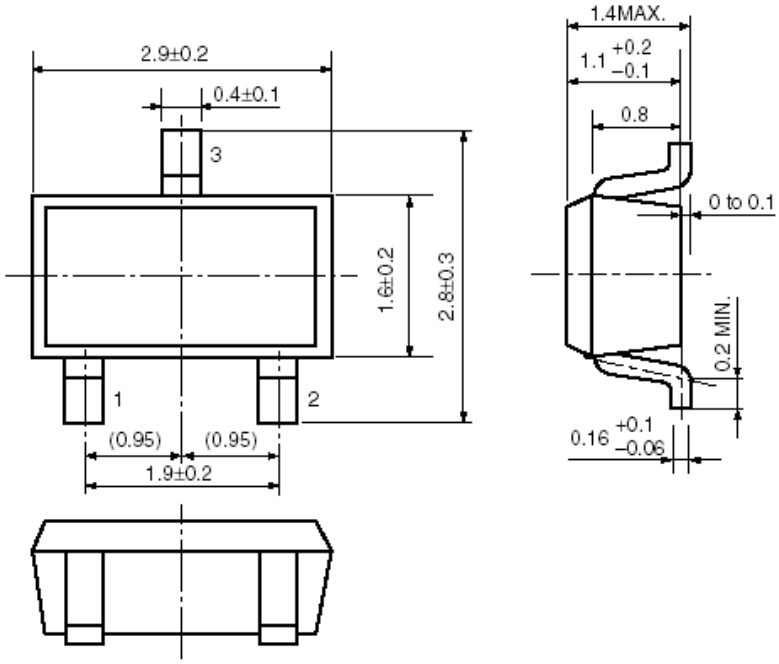
Package dimension：



SOT-23-3:

Package	SOT-23-3	Devices per reel	3000	Unit	mm

Package dimension：



SOT-23-5:

Package	SOT-23-5	Devices per reel	3000	Unit	mm

Package dimension：