

**Description:**

The SSR1680 is an accurate, ultra-low power consumption voltage detector IC, fabricated with advanced CMOS process. The SSR1680 consists of a comparator, a voltage reference unit, a resistor divider, two output drivers, and a hysteresis circuit.

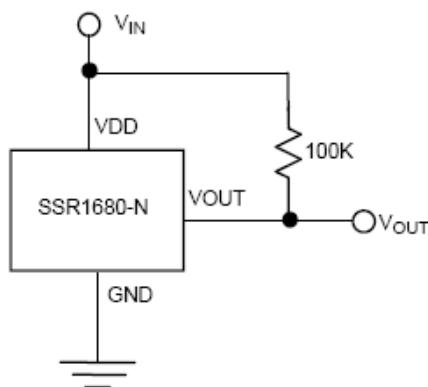
The consumption current is so low that it can often be ignored when compared to the battery self-discharge current. The values of detection and hysteresis voltage are set internally and are accurately controlled by trimming techniques. There are three types of output: N-ch open-drain, P-ch open-drain, and CMOS. SOT-23 is available to save board space.

**Features:**

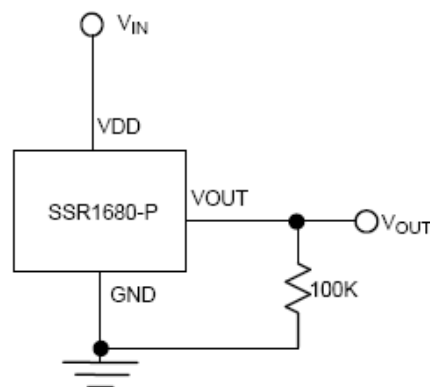
- Ultra-Low Quiescent Current.
- 1.5V to 10.0V Input Voltage Operation.
- Flexible Detection Voltage Setting 0.1V Step in the Range of 1.6V to 6.0V
- High Detection Voltage Accuracy at  $\pm 2.5\%$ .
- Built-In Detection Voltage Hysteresis.
- Three Output Types: N-ch, P-ch and CMOS.
- Space Saving Packages: SOT-23.

**Applications:**

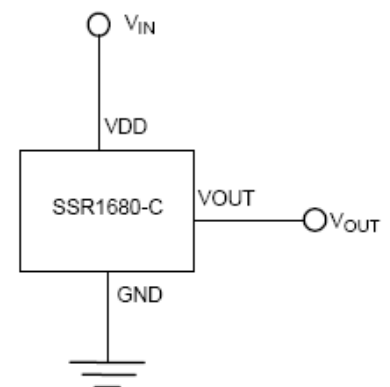
- Battery Checker for Battery-Operated Systems.
- CPU & Logic Circuit Reset.
- Memory Back-up Circuit.
- Level Discriminator.
- Power Failure Detector.

**Typical application circuit:**


Voltage Level Indicator  
(N-ch Open-Drain Output)

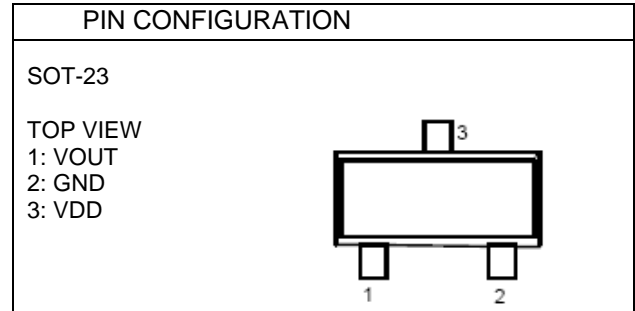
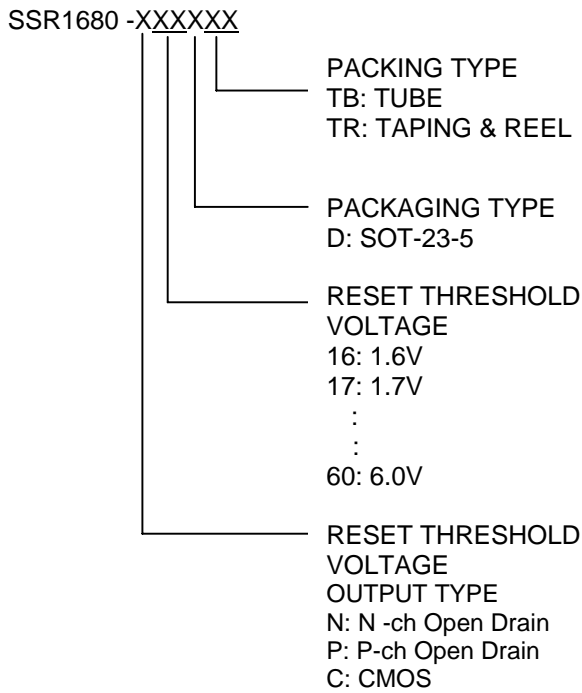


Voltage Level Indicator  
(P-ch Open-Drain Output)



Voltage Level Indicator  
(CMOS Output)

**Ordering Information:**



**Marking Diagram:**

Part No.	Marking
SSR1680-N16FTR	U16NG
SSR1680-P16FTR	U16PG
SSR1680-C16FTR	U16CG
SSR1680-N17FTR	U17NG
SSR1680-P17FTR	U17PG
SSR1680-C17FTR	U17CG
SSR1680-N59FTR	U59NG
SSR1680-P59FTR	U59PG
SSR1680-C59FTR	U59CG
SSR1680-N60FTR	U60NG
SSR1680-P60FTR	U60PG
SSR1680-C60FTR	U60CG



**Absolute Maximum Ratings:**

Supply Voltage (VDD).....	10V
Output Voltage.....	V <sub>DD</sub> -0.3V to 10V
Output Current.....	20mA
Operating Temperature Range .....	-40°C to 85°C
Storage Temperature Range .....	-65°C ~ 150°C
Junction Temperature .....	125°C
Lead Temperature (Soldering) 10 sec. ....	260°C

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Test Circuit**

Refer to "TYPICAL APPLICATION CIRCUIT".

**Electrical Characteristics (T<sub>A</sub>=25°C, unless otherwise specified.) (Note 1)**

PARAMETER	TEST CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Detector Voltage		V <sub>DET</sub>	0.975	1.0	1.025	V <sub>DET</sub>
Detector Threshold Hysteresis		V <sub>HYS</sub>	0.03	0.05	0.07	V <sub>DET</sub>
Supply Current	V <sub>DD</sub> =2.0V	I <sub>DD</sub>		0.7	1.1	μA
	V <sub>DD</sub> =3.0V			0.9	1.5	
	V <sub>DD</sub> =4.5V			1.3	2.0	
	V <sub>DD</sub> =6.0V			1.8	2.7	
	V <sub>DD</sub> =10.0V			3.2	4.8	
Operation Voltage		V <sub>DD</sub>	1.5		10	V
Output Current	V <sub>DS</sub> =0.5V, V <sub>DD</sub> =2.4V	I <sub>OUT</sub> (Nch)		3.24		mA
	V <sub>DS</sub> =0.5V, V <sub>DD</sub> =3.6V			5.85		
	V <sub>DS</sub> =0.5V, V <sub>DD</sub> =4.6V			7.74		
	V <sub>DS</sub> =0.5V, V <sub>DD</sub> =6.0V			10.44		
Output Current	V <sub>DS</sub> =-2.1V, V <sub>DD</sub> =4.5V	I <sub>OUT</sub> (Pch)	2	3.5		mA
Temperature Coefficienc				±150		ppm/°C
Output Delay Time		T <sub>DELAY</sub>			200	μS

**Note: 1.** Specifications are production tested at T<sub>A</sub>=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Typical Performance Characteristics

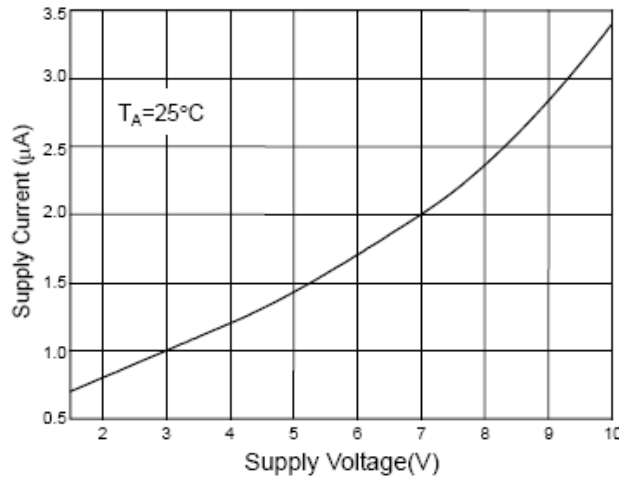


Fig. 1 Supply Current vs. Supply Voltage

N-ch Driver Sinking Current vs. V<sub>DS</sub>

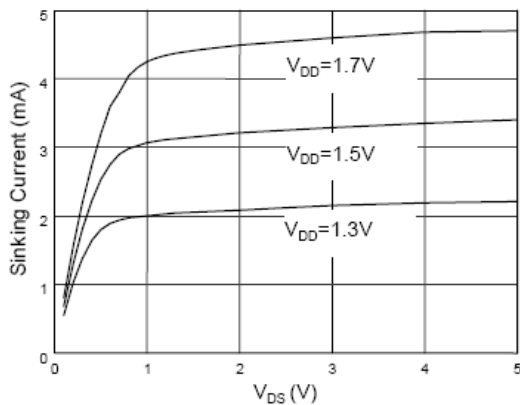


Fig. 2 V<sub>DET</sub>=1.8V

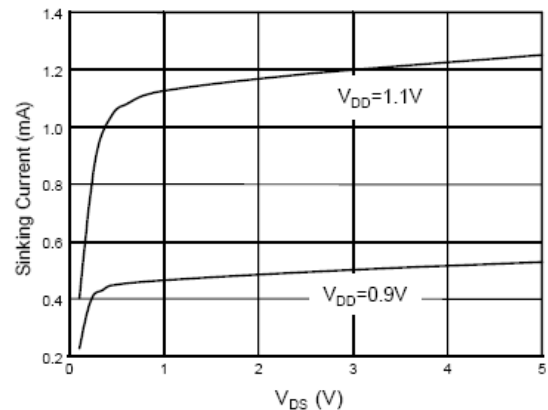


Fig. 3 V<sub>DET</sub>=1.8V

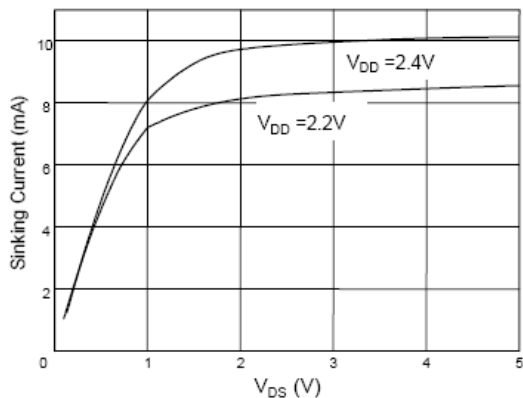


Fig. 4 V<sub>DET</sub>=2.5V

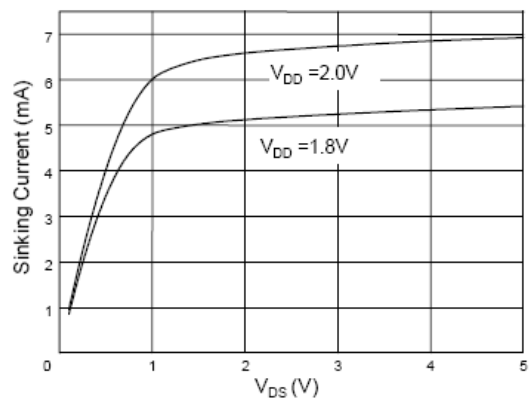


Fig. 5 V<sub>DET</sub>=2.5V

Technical Data  
Data Sheet N1591 Rev. -

Ultra Low Power Voltage Detector

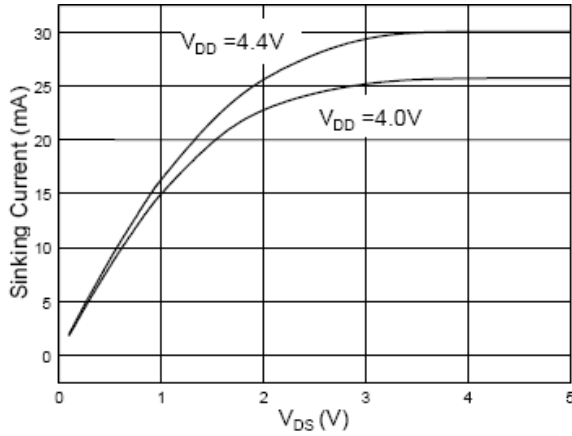


Fig. 6  $V_{DET}=4.5V$

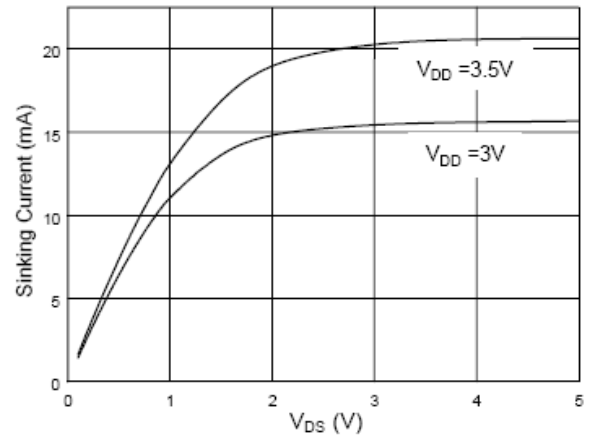


Fig. 7  $V_{DET}=4.5V$

P-ch Driver Output Current vs.  $V_{DS}$

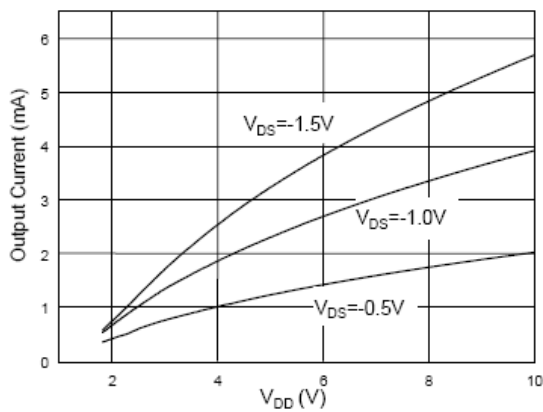


Fig. 8  $V_{DET}=1.8V$

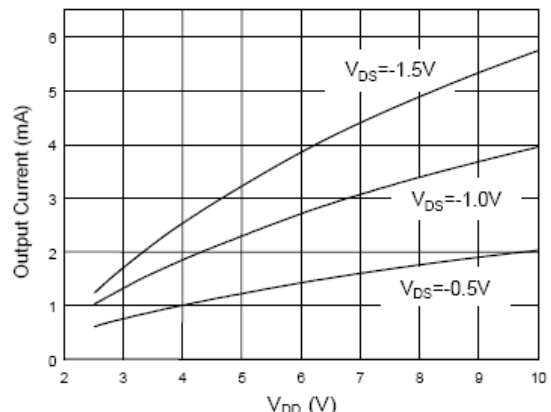


Fig. 9  $V_{DET}=2.5V$

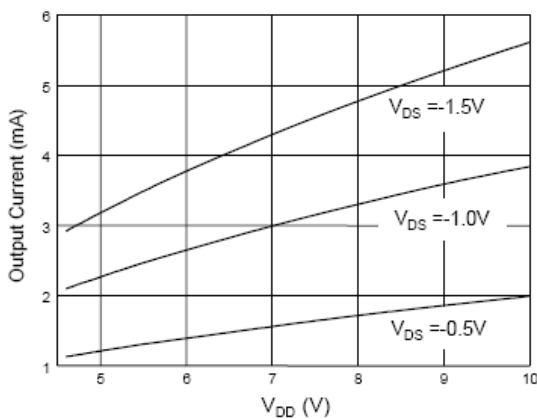
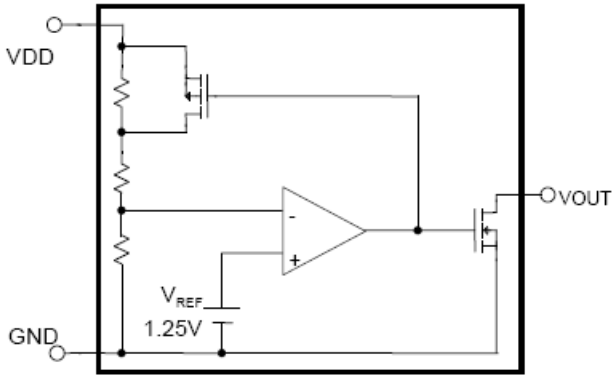
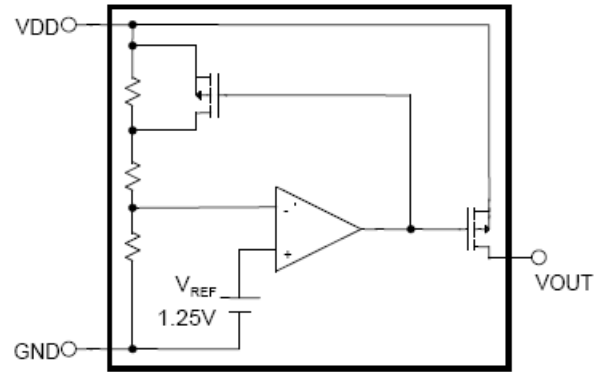


Fig. 10  $V_{DET}=4.5V$

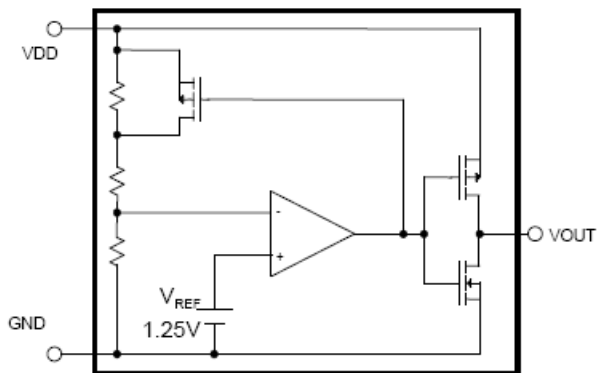
**Block Diagram**



N-ch open drain output



P-ch open drain output



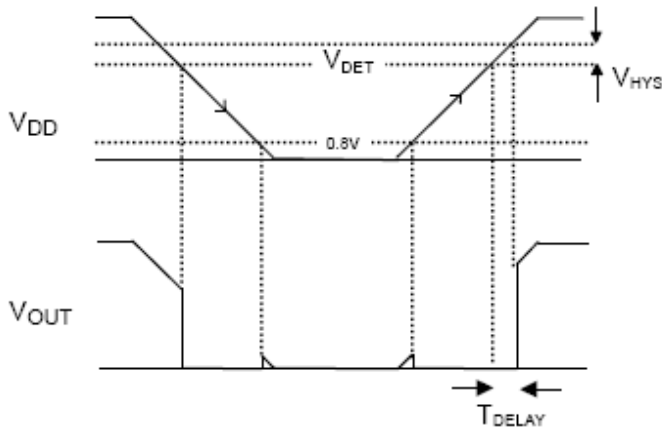
CMOS output

**Pin Descriptions**

- VDD** - Power Supply and Detected Voltage Input.
- GND** - Ground.
- VOUT** - Detector Output.

**Application Information**

The timing diagram of VDD and VOUT is shown as below:



The guaranteed minimum operation voltage of SSR1680 is 1.5V. As the supply voltage (VDD) is reduced below 1.5V, the performance degrades, N-ch or P-ch driving capacity degrades, and the supply current decreases. SSR1680 isn't functioning when VDD down to 0.8V.

**Application Example**

$$V_{OUT-ADJ} = V_{DET} \frac{R_1 + R_2}{R_2}$$

$$\text{Hysteresis Voltage} = V_{HYS} \frac{R_1 + R_2}{R_2}$$

In some application, divided resistors are used to obtain detector threshold voltage as figure11 shown. If the value of resistor, R1, sets extremely large, voltage drop may occur resulting from the start-up current of IC, and detector threshold may oscillation.

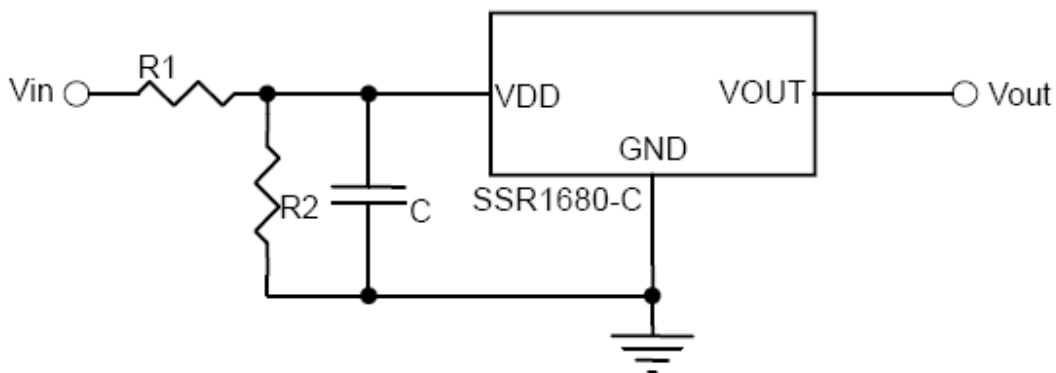


Fig.11 Detector threshold adjustable circuit

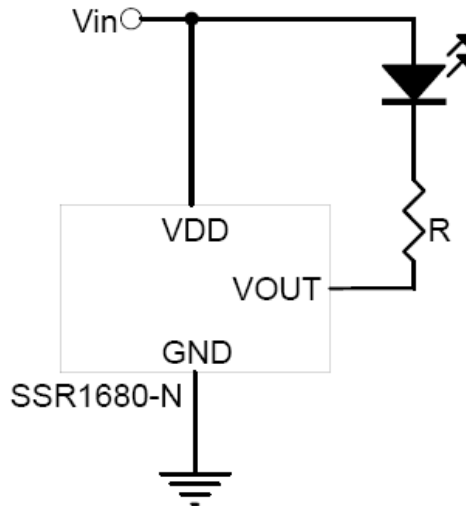


Fig.12 Voltage indicator circuit, lights when low power

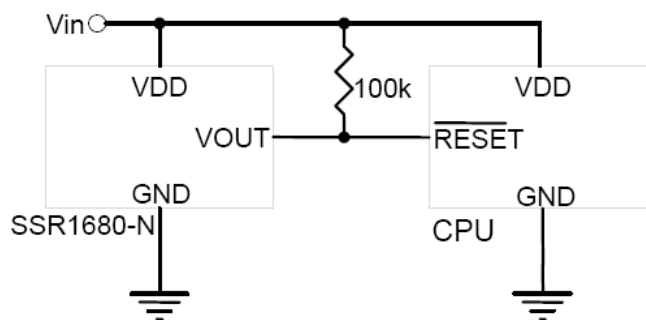


Fig.13 The input voltage of AIC1680 and CPU are the same

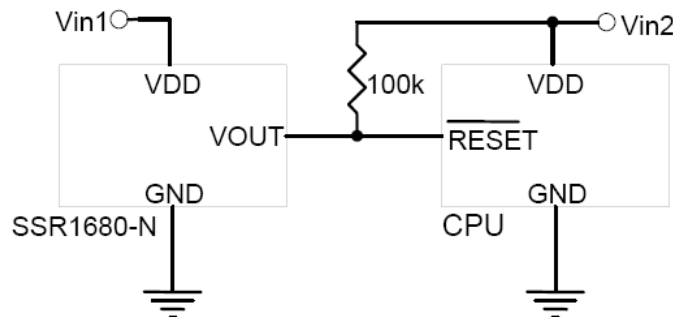


Fig.14 The input voltage of AIC1680 and CPU are not equal



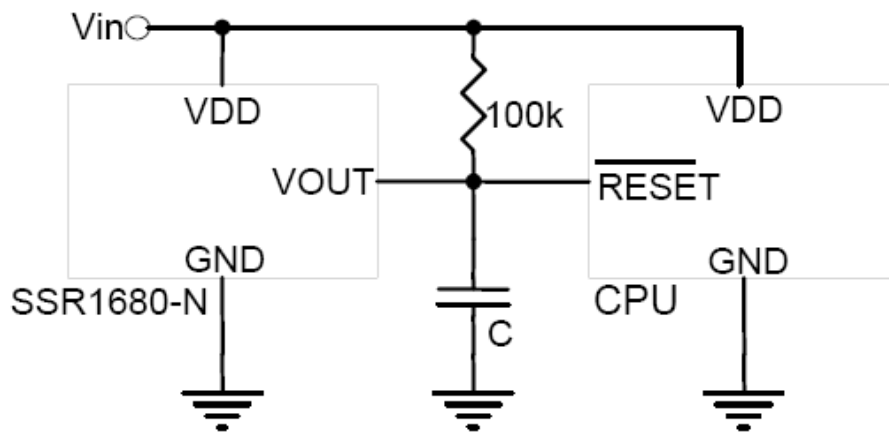


Fig.15 Output delay time-1

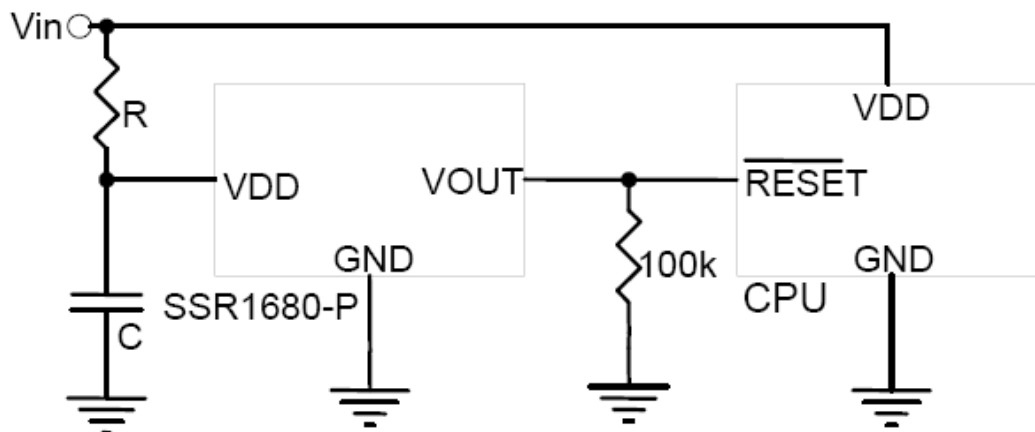
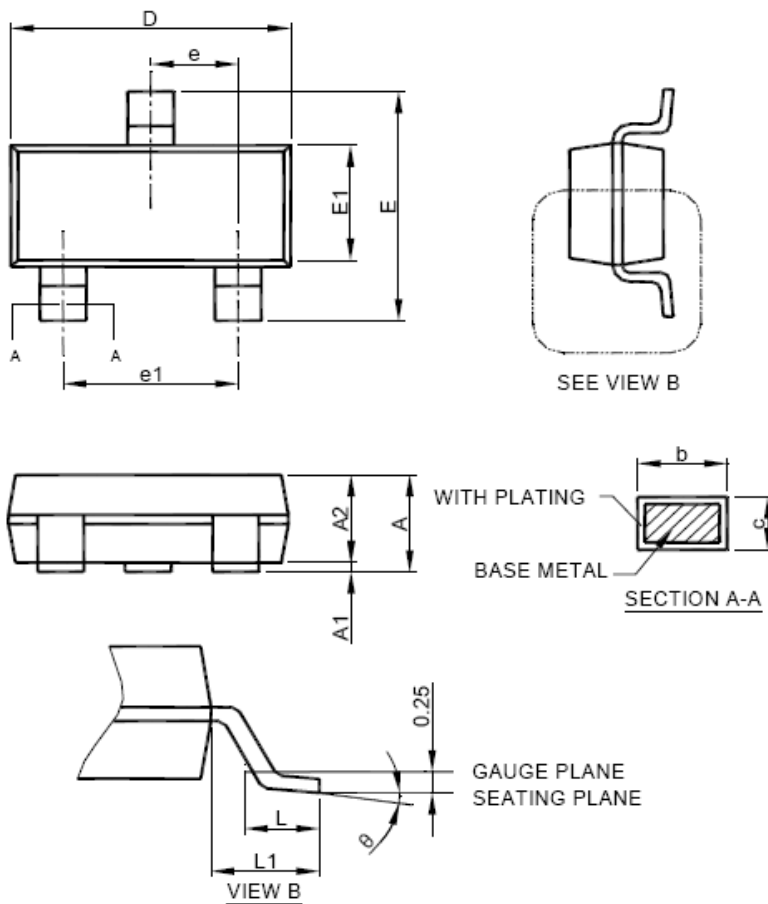


Fig.16 Output delay time-2

Physical Dimensions

SOT-23 (unit: mm)



SYMBOL	SOT-23	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
$\theta$	0°	8°

Note: 1. Refer to JEDEC MO-178.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.

3. Dimension "E1" does not include inter-lead flash or protrusions.

4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.



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