

# Section 4.7

## TEMPERATURE SENSOR SPECIFICATIONS

### ● Description

The S-8100B is a high-precision temperature sensor controller, integrated on a single chip with a linear output scale factor of  $-8.1\text{mV}/^\circ\text{C}$ . The S-8100B is a small package alternative for conventional thermal measurement, such as thermistors. It is based on the CMOS process technology, allowing the output to be routed over extended cable lengths. It is composed of a temperature sensor, a constant current circuit, and an operational amplifier. The temperature range is from  $-40^\circ\text{C}$  to  $+100^\circ\text{C}$ . The S-8100B offers a high degree of linearity and can be used for a wide range of temperature control applications.

### ● Features

- Linear output voltage:  $-8.1\text{mV}/^\circ\text{C}$
- Linearity:  $\pm 1.0\%$
- Temperature Range:  $-40^\circ\text{C}$  to  $+100^\circ\text{C}$
- Repeatability:  $\pm 0.3\%$
- Ultra low power current consumption:  
     $10\mu\text{A}$  ( $25^\circ\text{C}$ ) typ.
- Compact 3-pin package SOT-89-3

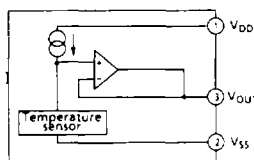
### ● Applications

- Remote sensing
- Heater systems
- Medical indicators/monitors
- Air conditioners
- Climate controllers
- Overheating circuitry for computers
- Appliances

### ● Pin Assignments

1	$V_{DD}$
2	$V_{SS}$
3	$V_{OUT}$

### ● Block Diagram



### ● Electrical Characteristics

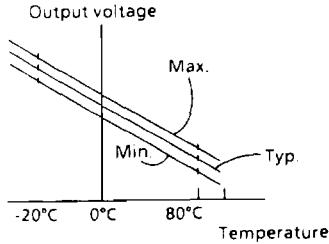
Item	Symbol	Conditions	Min.	Typ.	Max.
Power supply voltage	$V_{DD}$		3.0V	5.0V	6.0V
Temperature sensitivity	$V_{SE}$	$-20^\circ\text{C} \leq T_a \leq +80^\circ\text{C}$	--	$-8.14\text{mV}/^\circ\text{C}$	
Output voltage	$V_{OUT}$	$T_a = -20^\circ\text{C}$	1.852V	1.900V	1.964V
		$T_a = +30^\circ\text{C}$	1.452V	1.497V	1.564V
		$T_a = +80^\circ\text{C}$	1.039V	1.085V	1.151V
Linearity	$\Delta\text{NL}$	from $-20^\circ\text{C}$ to $+80^\circ\text{C}$	--	--	$\pm 1.0\%$
Reproducibility	$\Delta V_{OUT}$		--	--	$\pm 0.3\%$
Operating temperature	$T_{opr}$	$\Delta\text{NL} \leq \pm 2.0\%$	$-40^\circ\text{C}$	--	$100^\circ\text{C}$
Storage temperature	$T_{stg}$		$-55^\circ\text{C}$		$125^\circ\text{C}$
Current consumption	$I_{DD}$	$T_a = +25^\circ\text{C}$	--	$10\mu\text{A}$	$20\mu\text{A}$

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## TEMPERATURE SENSOR SPECIFICATIONS

### ● Definition of Terms

**Deviation of  $V_{OUT}$**   
 Maximum output voltage difference at  $-20^{\circ}\text{C}$ ,  $30^{\circ}\text{C}$ , and  $80^{\circ}\text{C}$

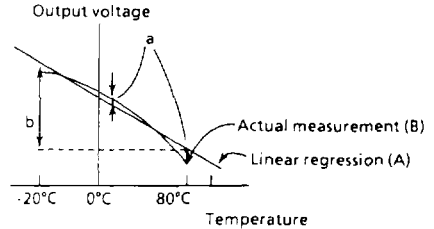


### Linearity ( $\Delta\text{NL}$ )

$$\Delta\text{NL} = a/b$$

a: Maximum output voltage difference between (A) and (B)

b: Output voltage: Max.  $\pm 1\%$  in S-8100B

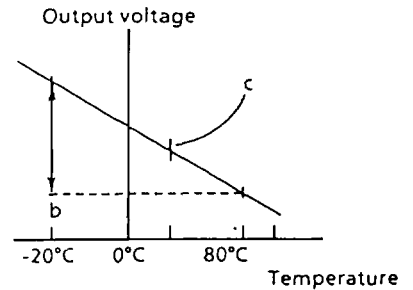


### Reproducibility ( $\Delta V_{OUT}$ )

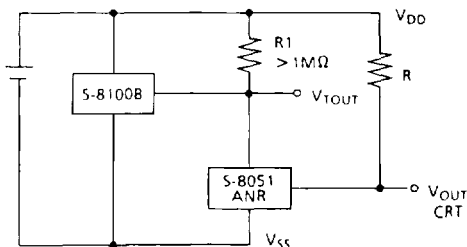
$$\Delta V_{OUT} = c/d$$

c: Maximum output voltage difference between before and after long-term reliability tests (1000hrs, high temperature and high humidity, etc.)

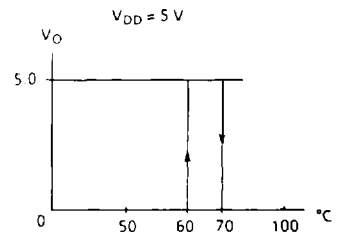
d: Max.  $\pm 0.3\%$  in S-8100B (Long-term reliability test at high temperature and under high humidity)



Any desired temperature can be detected by combining the S-8100B with a detector (operating within temperature range of detector).



### Output Waveform

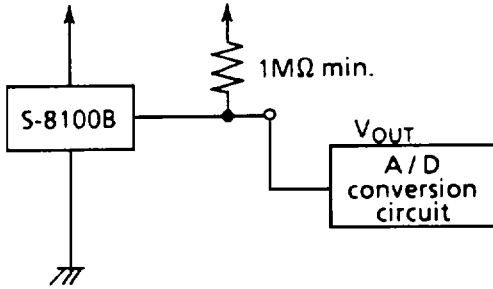


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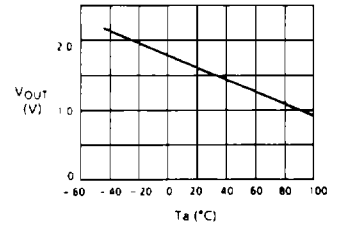
## TEMPERATURE SENSOR SPECIFICATIONS

### ● Typical Operating Characteristics

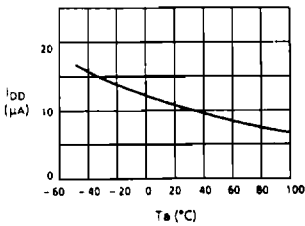
**Note:** Because the output impedance of the S-8100B CMOS output buffer is high, the output voltage level may fall because of contact with external circuits. If this happens, apply pull-up resistance as shown.



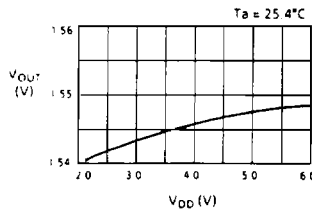
**V<sub>OUT</sub> vs Ta**



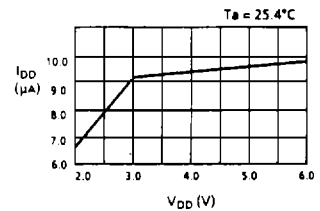
**I<sub>DD</sub> vs Ta**



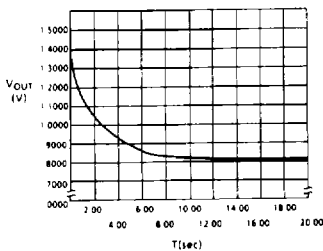
**V<sub>OUT</sub> vs V<sub>DD</sub>**



**I<sub>DD</sub> vs V<sub>DD</sub>**



**Heat Response (SIP Type)**  
**V<sub>OUT</sub> vs Ta**



25°C → 100°C

T1 = 8 sec

T2 = 2 sec

T1: Time required for output voltage to reach 95% of attainable voltage when a package is put into 100°C of water from 25°C of air.

T2: Time required for output voltage to reach 65% of attainable voltage when a package is put into 100°C of water from 25°C of air.