Contents

The S-8100BF is a high-precision temperature compensation IC, integrated on a single chip with a linear output voltage of $-8.1mV/K$. It is composed of a temperature sensor, a constant current circuit, and an operational amplifier. Its temperature range is from $-40°C$ to $+100°C$. The S-8100BF has much better linearity than other temperature sensors such as thermistors. It can be used for a wide application range of temperature controls.

■ Features

- Linear output voltage : $-8.1mV/K(-8.1mV/°C)$
  - $Ta = -20°C$: 1.900V
  - $Ta = +30°C$: 1.497V
  - $Ta = +80°C$: 1.085V
- Linearity : $\pm 1.0\%$ $(-20°C$ to $+80°C)$
- Repeatability : $\pm 0.3\%$
- V_{SS} standard output
- Built-in operational amplifier
- Current consumption : $10\mu A$ $(25°C)$ typ.
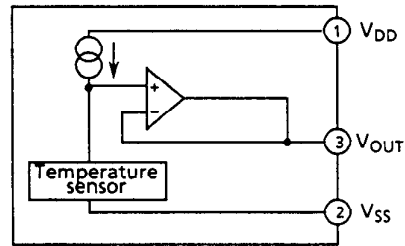- Compact 3-pin plastic package

■ Block Diagram

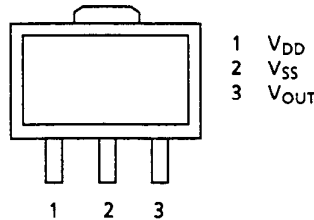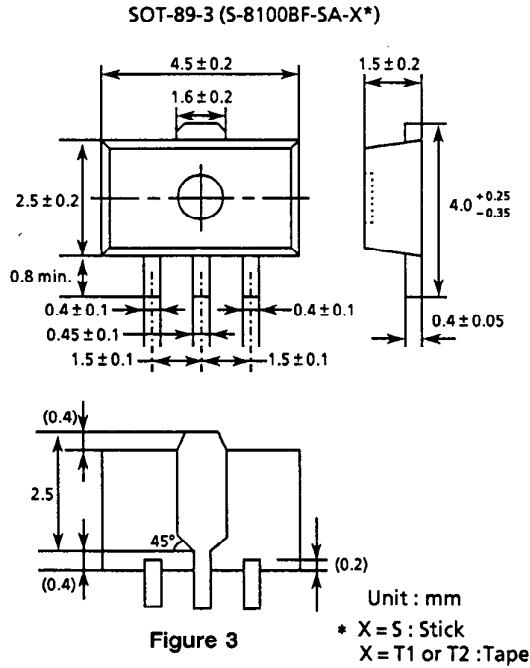**Figure 1**

■ Pin Arrangement

SOT-89-3

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

Figure 2

1

■ **Dimensions**

SOT-89-3 (S-8100BF-SA-X*)

Figure 3

Unit : mm
* X = S : Stick
  X = T1 or T2 : Tape

■ **Absolute Maximum Ratings**

Table 1

Parameter	Symbol	Ratings	Unit
Power supply voltage (V_{SS} = 0V)	V_{DD}	6	V
Input / output voltage	V_{IN}, V_{OUT}	V_{SS} to V_{DD}	V
Operating temperature	T_{opr}	– 40 to + 100	°C
Strage temperature	T_{stg}	– 55 to + 125	°C

■ **Electrical Characteristics**

Table 2

($-40°C \leq Ta \leq +100°C$, $V_{DD} = 5.0$ V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}		3.0	5.0	5.5	V
Temperature sensitivity	V_{SE}	$-20°C \leq Ta \leq +80°C$	—	– 8.14	—	mV / °C
Output voltage	V_{OUT}	Ta = – 20°C	1.852	1,900	1.964	V
		Ta = + 30°C	1.452	1.497	1.564	V
		Ta = + 80°C	1.039	1.085	1.151	V
Linearity	$\triangle NL$	– 20°C to + 80°C	—	—	± 1.0	%
Reproducibility	$\triangle V_{OUT}$		—	—	± 0.3	%
Operating temperature	T_{opr}	$\triangle NL \leq \pm 2.0\%$	– 40	—	100	°C
Current consumption	I_{DD}	Ta = + 25°C	—	10	20	μA
Output resistance	R_o	Ta = + 25°C	—	50	—	$k\Omega$

2

■ Definition of Terms

1. Deviation of V_{OUT}

Maximum output voltage difference at -20°C, 30°C, and 80°C

2. Linearity ($\triangle$NL)
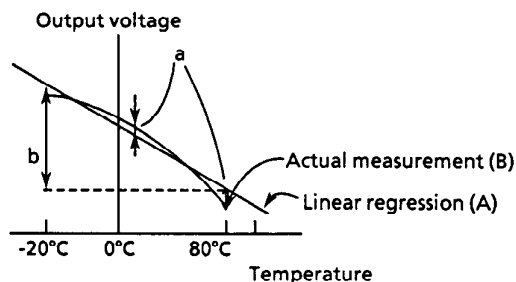
$$\triangle NL = \frac{a}{b}$$

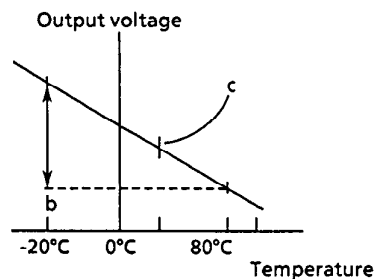a : Maximum output voltage difference between (A) and (B)

b : Output voltage
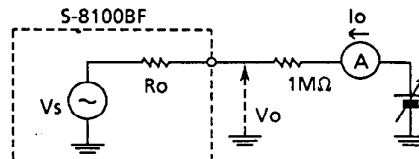
3. Reproducibility ($\triangle V_{OUT}$)

$$\triangle V_{OUT} = \frac{c}{b}$$

Maximum output voltage difference between before and after long-term reliability tests (1000H, high temperature and high humidity, etc.)
(Long-term reliability test at high temperature and under high humidity)

4. Output resistance (R_O)

$$R_O = \frac{\Delta V_O}{\Delta I_O}$$

3

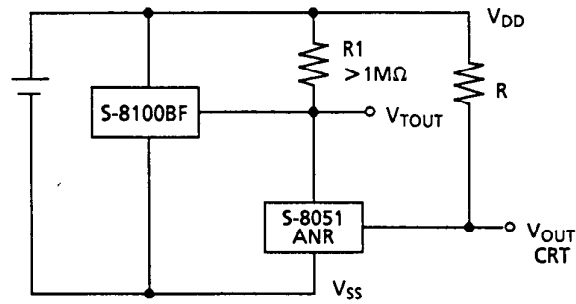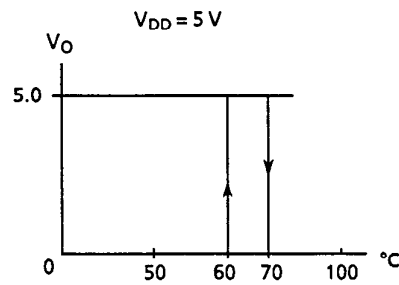■ **Application Temperature Switch**

● Block Diagram

Figure 4

· Any desired temperature can be detected by combining the S-8100BF with a Seiko Instruments voltage detector and operating within the temperature range of the voltage detector.

● Output waveform

For the S-8051ANR, this becomes the 70°C temperature switch.

Figure 5

Note: Because the output impedance of the S-8100BF's 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 in Figure 6.
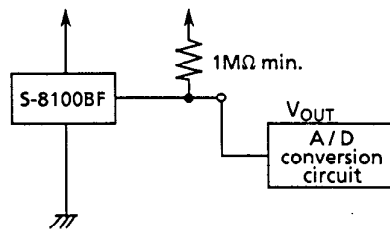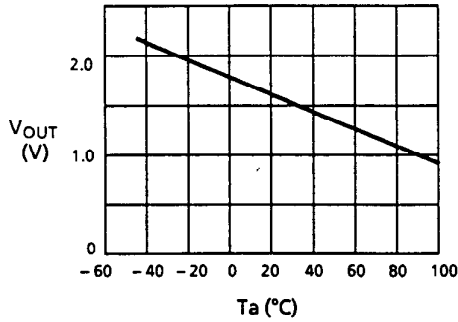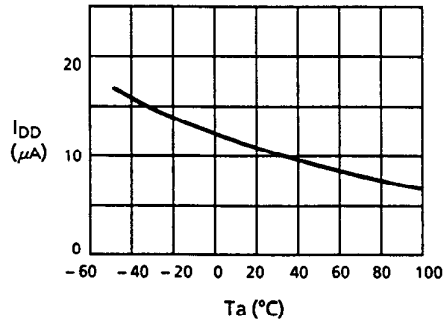

Figure 6

4

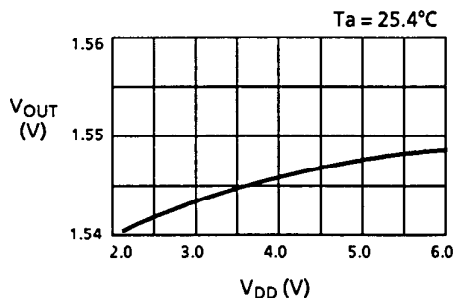■ **Characteristics**

1. Ambient temperature (Ta)
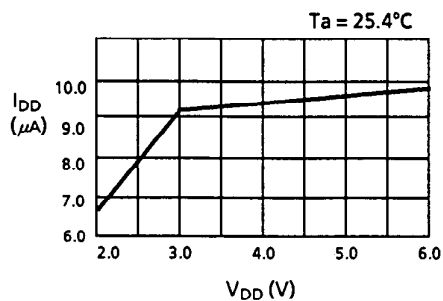   – Output voltage (V_{OUT})

2. Ambient temperature (Ta)
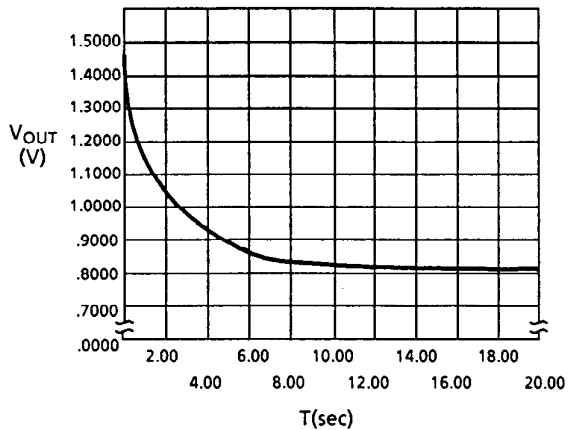   – Current comsumption (I_{DD})

3. Power supply voltage (V_{DD})
   – Output voltage (V_{OUT})

4. Power supply voltage (V_{DD})
   – Current consumption (I_{DD})

5. Heat response

25°C→100°C

T_1 = 8 sec
T_2 = 2 sec

T_1: 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.

T_2: 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.

5