Contents

CMOS TEMPERATURE COMPENSATION IC

S-8100BF

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 : ±1.0% (−20°C to +80°C)
- Repeatability : ±0.3%
- V_{SS} standard output
- Built-in operational amplifier
- Current consumption : 10μA (25°C) typ.
- Compact 3-pin plastic package

■ Block Diagram

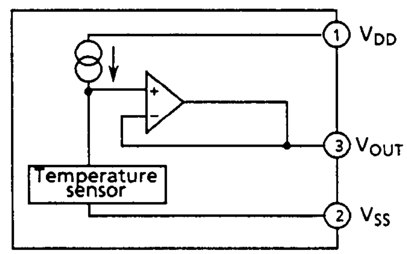
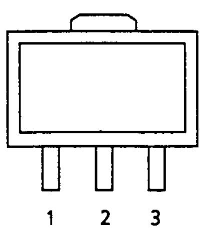


Figure 1

■ Pin Arrangement

SOT-89-3

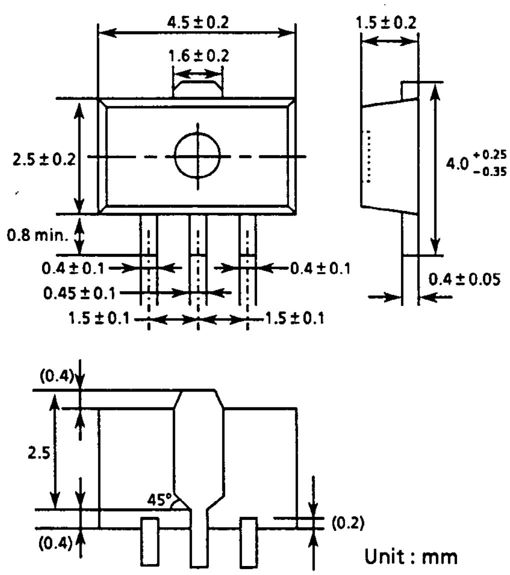


1 V_{DD}
2 V_{SS}
3 V_{OUT}

Figure 2

■ Dimensions

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



Unit : mm

Figure 3

* 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

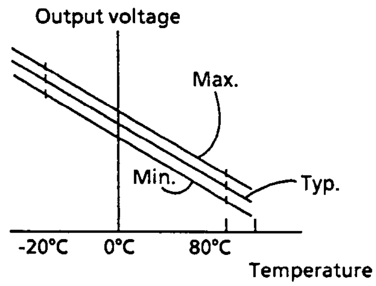
(− 40°C ≦ Ta ≦ + 100°C, V_{DD} = 5.0 V)

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 ≦ Ta ≦ + 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	△NL	− 20°C to + 80°C	—	—	± 1.0	%
Reproducibility	△V_{OUT}		—	—	± 0.3	%
Operating temperature	T_{opr}	△NL ≦ ± 2.0%	− 40	—	100	°C
Current consumption	I_{DD}	Ta = + 25°C	—	10	20	µA
Output resistance	R_o	Ta = + 25°C	—	50	—	kΩ

Definition of Terms

1. Deviation of V_{OUT}

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

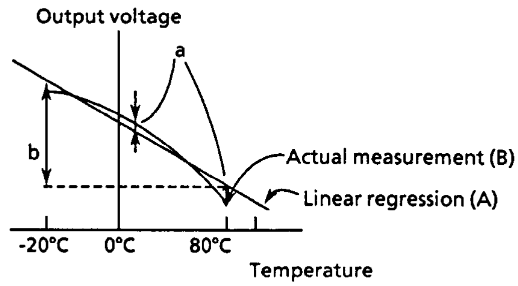


2. Linearity (△NL)

$$\triangle NL = \frac{a}{b}$$

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

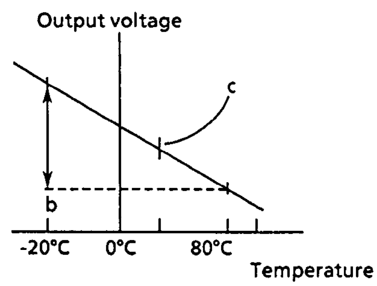
b : Output voltage



3. Reproducibility ($\triangle V_{OUT}$)

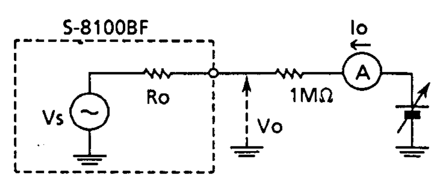
$$\triangle V_{OUT} = \frac{c}{b}$$

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)

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



■ Application Temperature Switch

- Block Diagram

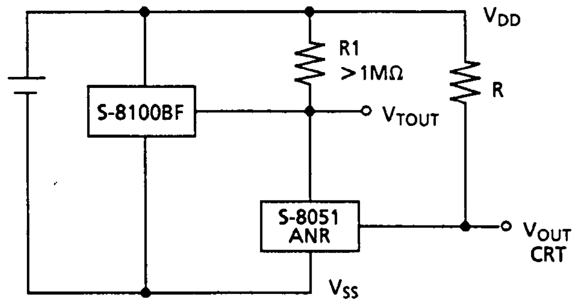
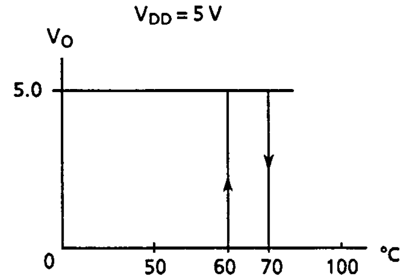


Figure 4

- 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.

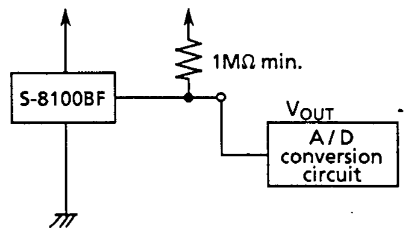
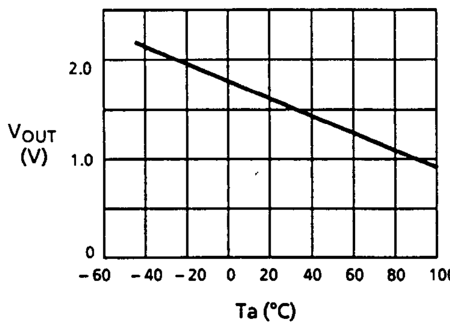


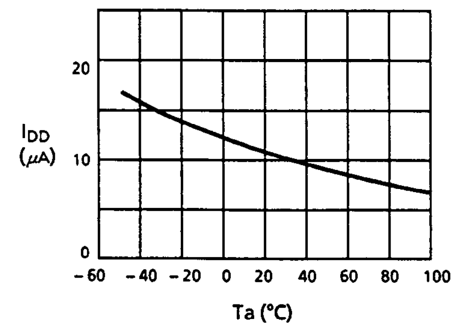
Figure 6

■ Characteristics

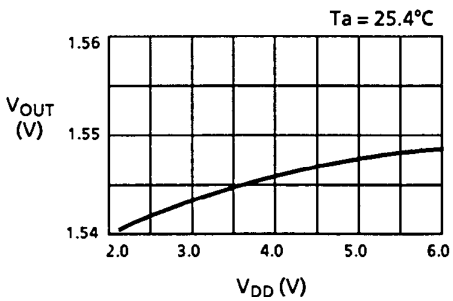
1. Ambient temperature (Ta) – Output voltage (V_{OUT})



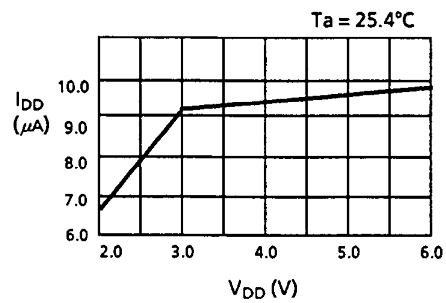
2. Ambient temperature (Ta) – Current comsumption (I_{DD})



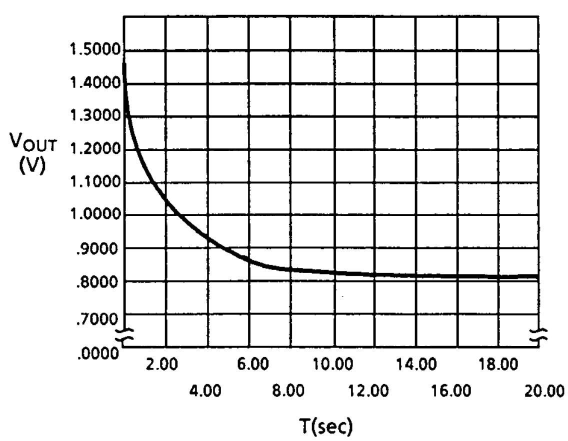
3. Power supply voltage (V_{DD}) – Output voltage (V_{OUT})



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.