

Contents

Features	1
Block Diagram	1
Pin Assignment	1
Absolute Maximum Ratings	2
Electrical characteristics	2
Definition of Terms	3
Load conditions	4
Typical performance characteristics	5
Dimensions.....	7

LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR IC

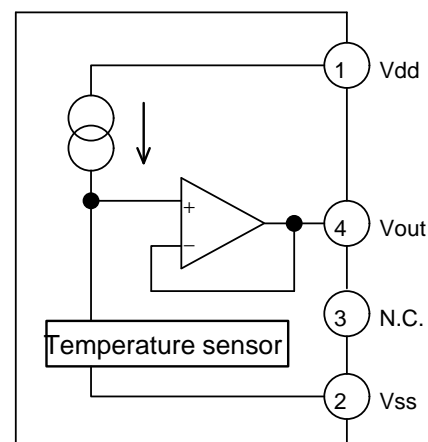
S-8120ANP

The S-8120AMP is a ultra-small packaged high-precision temperature sensor IC that outputs voltage with a temperature coefficient of $-8.5\text{mV}/^\circ\text{C}$ and a temperature accuracy of $\pm 2.5^\circ\text{C}$. A temperature sensor, a constant current circuit and an operational amplifier are integrated on a single chip to be able to operate at 2.4V. The operating temperature ranges from -40°C to $+100^\circ\text{C}$. The S-8120AMP is superior in linearity over conventional temperature sensors like thermistors. It can be applied to an ever expanding wide range of applications that call for high-precision thermal control.

■ Features

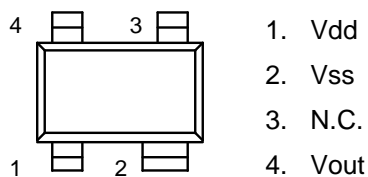
- Temperature accuracy : $\pm 2.5^\circ\text{C}$ ($-30^\circ\text{C} \sim +100^\circ\text{C}$)
- Linear Output Voltage : $-8.5\text{mV}/^\circ\text{C}$
 $T_a = -30^\circ\text{C}$: 1.823 V typ.
 $T_a = +30^\circ\text{C}$: 1.326 V typ.
 $T_a = +100^\circ\text{C}$: 0.718 V typ.
- Nonlinearity : $\pm 0.5\%$ typ. ($-20^\circ\text{C} \sim +80^\circ\text{C}$)
- Vss standard output
- Low voltage operation : Vdd min. = 2.4 V
- Low current consumption : Idd typ. = $4.5\mu\text{A}$ ($+25^\circ\text{C}$)
- Ultra-small plastic package (SC-82AB)

■ Block Diagram



■ Pin Assignment

SC-82AB



(Top view)

LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR IC

S-8120ANP

■ Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Power supply Voltage (V _{ss} =0.0V)	V _{dd}	6.5	V
Output voltage	V _{out}	V _{ss} ~ V _{dd}	V
Operating temperature	T _{opr}	-40 ~ +100	°C
Storage temperature	T _{stg}	-55 ~ +125	°C

■ Electrical characteristics

(40°C ≤ T_a ≤ +100°C, V_{dd}=5V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply Voltage (V _{ss} =0.0V)	V _{dd}		2.4	—	6.0	V
Output voltage	V _{out}	T _a = -30°C	1.802	1.823	1.844	V
		T _a = +30°C	1.305	1.326	1.347	V
		T _a = +100°C	0.697	0.718	0.739	V
Temperature sensitivity	V _{se}	-30 ≤ T _a ≤ +100°C	-8.78	-8.50	-8.22	mV/°C
Nonlinearity	ΔNL	-20 ≤ T _a ≤ +80°C	—	±0.5	—	%
Operating temperature	T _{opr}		-40	—	+100	V
Current consumption	I _{dd}	T _a = +25°C	—	4.5	10.0	μA

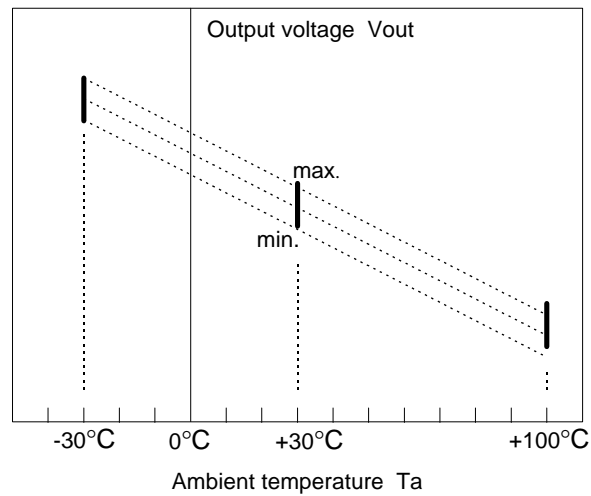
LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR

S-8120ANP

■ Definition of terms

1. Output voltage (V_{out})

Output voltage V_{out} is defined as the voltage between measured pin-4 and V_{ss} .
 V_{out} is linearly proportional to ambient temperature.
 S-8120AMP is tested for V_{out} at -30°C , $+30^{\circ}\text{C}$ and $+100^{\circ}\text{C}$.

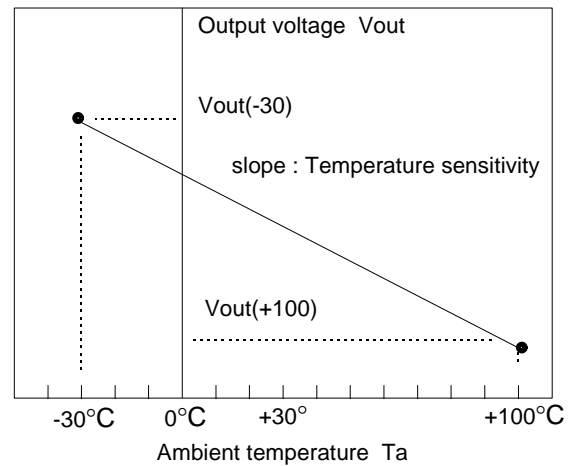


2. Temperature sensitivity (V_{se})

Temperature sensitivity V_{se} is defined as the average slope of the V_{out} versus T_a curve using the following formula.

$$V_{se} = \frac{\{V_{out}(+100) - V_{out}(-30)\}}{130}$$

$V_{out}(+100)$: Output voltage at $T_a = +100^{\circ}\text{C}$
 $V_{out}(-30)$: Output voltage at $T_a = -30^{\circ}\text{C}$

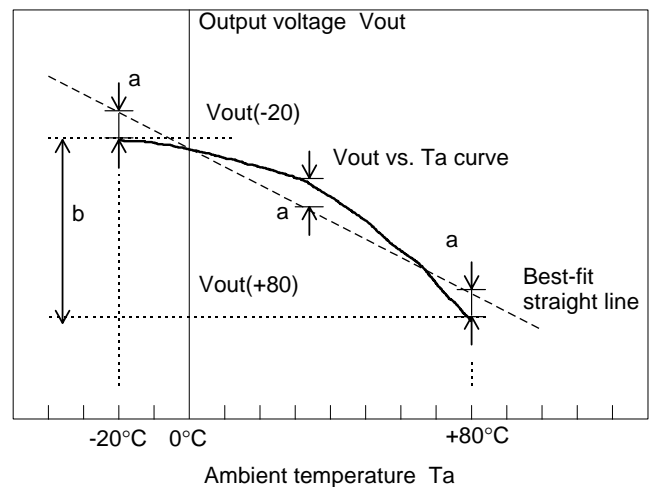


3. Nonlinearity ΔNL

Nonlinearity ΔNL is defined as the deviation of the V_{out} versus T_a curve from the best-fit straight line over the device's rated temperature range.

$$\Delta NL = \frac{a}{b} \sim 100$$

a : The maximum deviation of the V_{out} vs. T_a curve from the best-fit straight line between -20°C and $+80^{\circ}\text{C}$.
 b : The difference of the output voltage between -20°C and $+80^{\circ}\text{C}$.



LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR

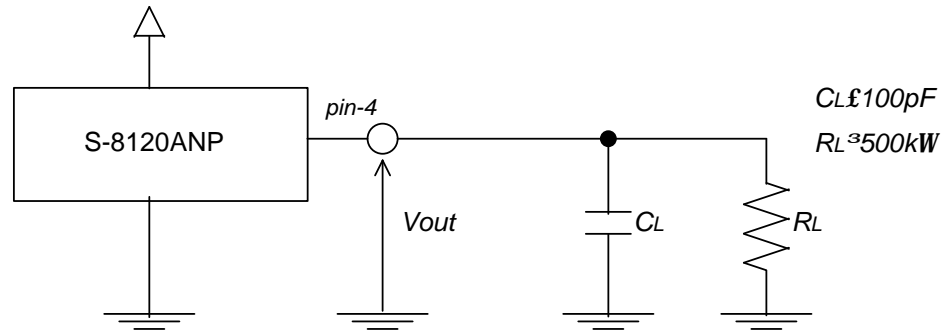
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■ Load conditions

Load capacitance : $C_L \leq 100\text{pF}$

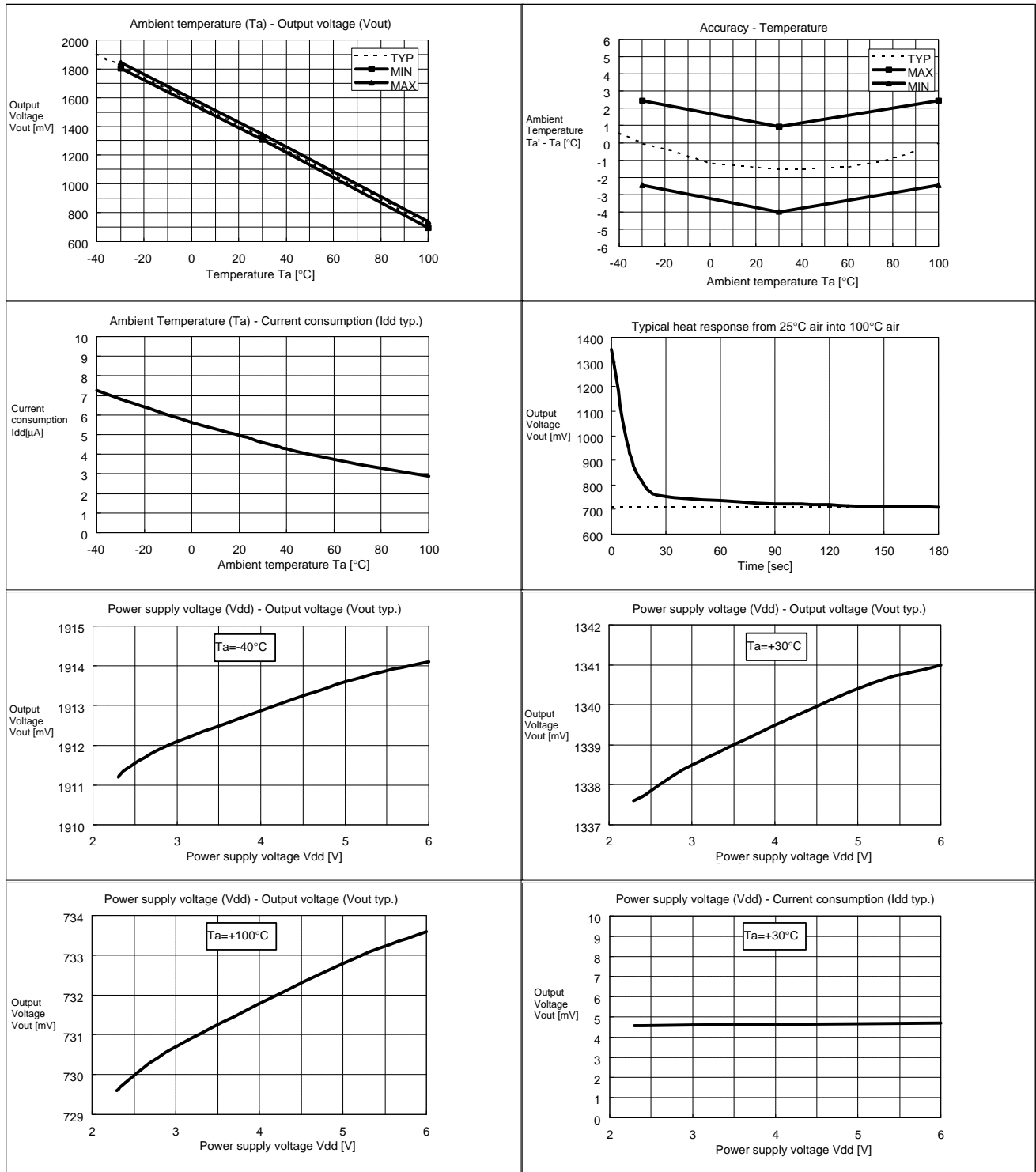
Load resistance : $R_L \geq 500\text{k}\Omega$

(Note : Do NOT connect a pull-up resistor to Vout pin.)



LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR S-8120ANP

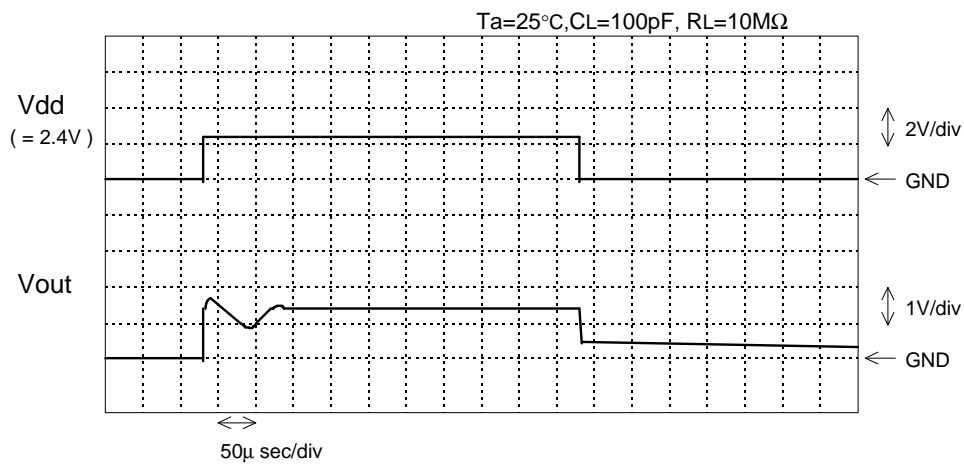
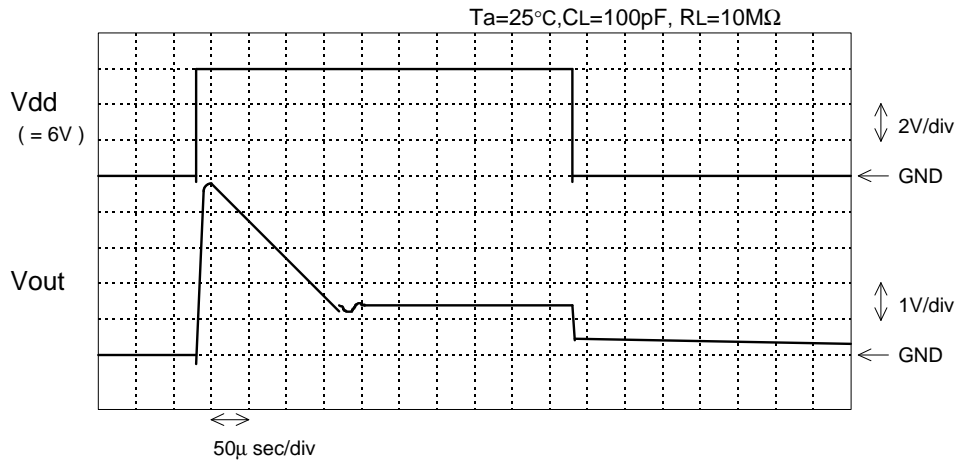
Typical performance characteristics



LOW-VOLTAGE C-MOS HIGH-PRECISION TEMPERATURE SENSOR

S-8120ANP

Start up response

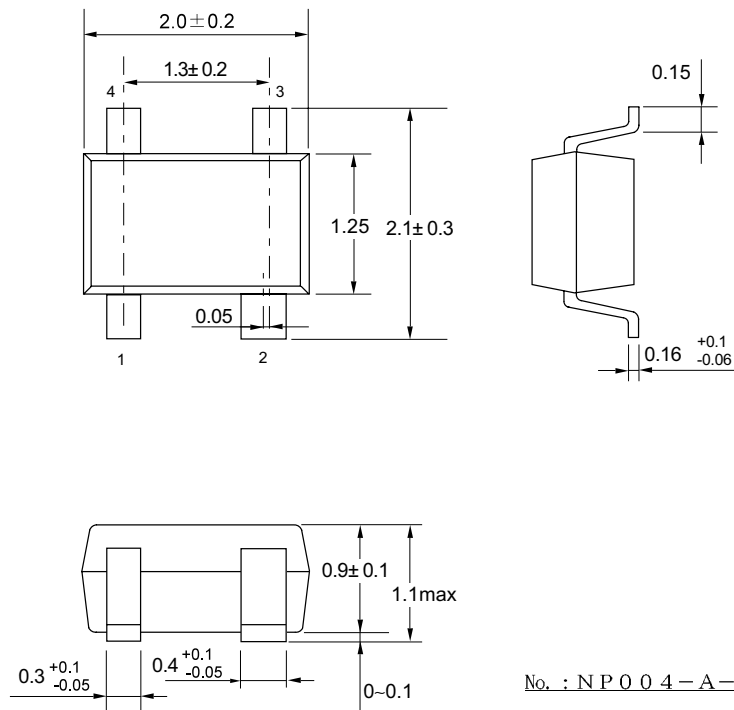


SC-82AB

NP004-A 990531

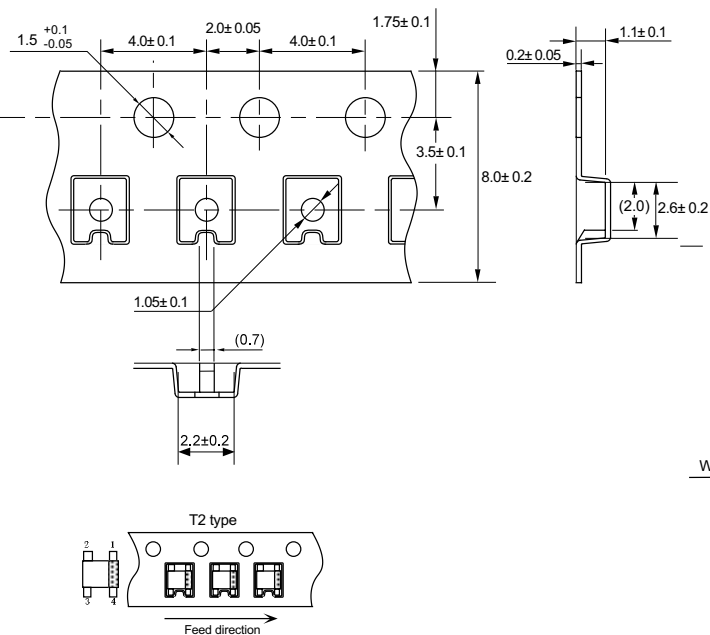
Unit:mm

●Dimensions



No. : NP004-A-P-SD-1.0

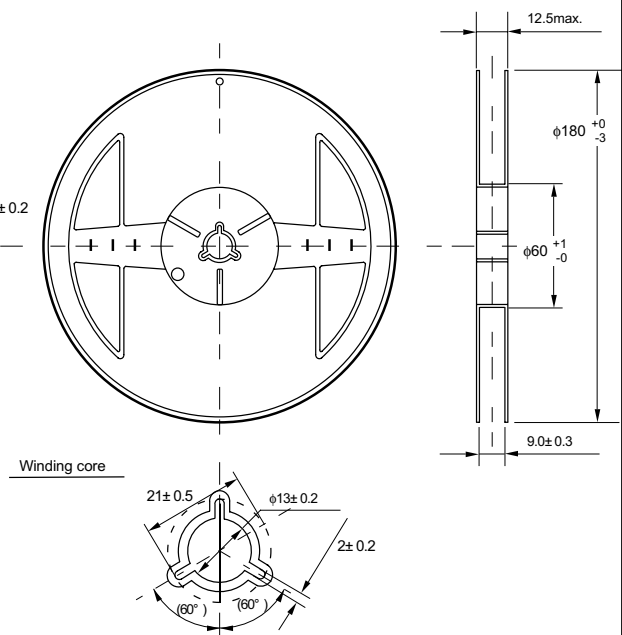
●Taping Specifications



No. : NP004-A-C-SD-1.0

●Reel Specifications

1 reel holds 3000 ICs.



No. : NP004-A-R-SD-1.0

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