XC31B Series

CMOS Temperature Sensor

◆Low Power Consumption : 7μA
◆Operating Voltage Range : 3.0V ~ 10.0V
◆Output Voltage Temp. Coefficient
: TYP -3900ppm/°C
◆SOT-25 Package

■Applications

●Mobile phones
●Portable AV equipment
●Palm top computers, PDA
●Battery powered equipment

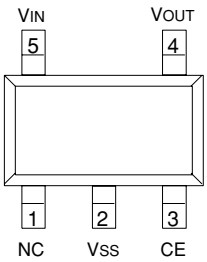
■General Description

The XC31B series are ultra small CMOS temperature sensor ICs. As a bandgap type temperature sensor is built-into the XC31B, linearity, in comparison to thermistor type temperature sensors, is much better.
The operating temperature range of the series is from -30°C to +80°C.The XC31B comes in a mini molded SOT-25 package with a quiescent current of only 7μA(2.0V) and as such, is suitable for use with various portable devices.
Output voltage is selectable in 0.1V steps within a range of 2.0V to 6.0V (at 25°C).

■Features

Operating Voltage Range	: 3.0V ~ 10.0V
Output Voltage Range	: 2.0V ~ 6.0V
Output Voltage Accuracy	: ±3%
Detectable Temperature Range	: -30°C ~ +80°C
Output Voltage Temp. Coefficient	: TYP -3900ppm/°C
Low Power Consumption	: 7 μA (2.0V)

■Pin Configuration



SOT-25
(TOP VIEW)

■Pin Assignment

PIN NUMBER	PIN NAME	FUNCTION
1	NC	No Connection
2	VSS	Ground
3	CE	Chip Enable
4	VOUT	Output
5	VIN	Power Supply

■Product Classification

●Ordering Information

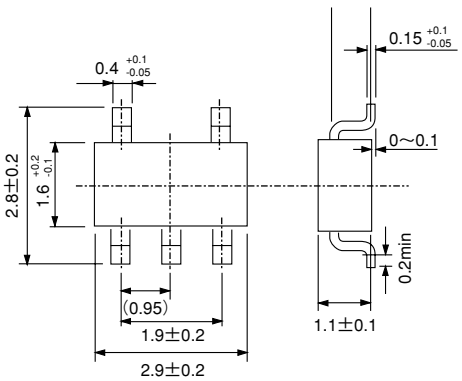
XC31Bxxxxxxx

a b c d e f

DESIGNATOR	DESCRIPTION	DESIGNATOR	DESCRIPTION
a	Polarity of Output Voltage P: + (Positive)	e	Package Type M=SOT–25
b	Temperature Coefficient N: – (Negative)	f	Device Orientation R = Embossed Tape (Standard Feed) L = Embossed Tape (Reverse Feed)
c	Output Voltage (25°C) 20 = 2.0V 30 = 3.0V		
d	Revision Character A ～		

■Packaging Information

●SOT-25



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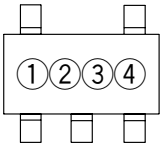
■Marking



SOT-25
(TOP VIEW)

①Based on internal standards

②Represents the integer of the Output Voltage

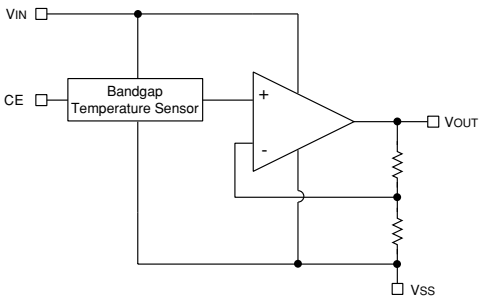
SYMBOL	VOLTAGE (V)
2	2.③
3	3.③
4	4.③
5	5.③
6	6.③

③Represents the decimal number point of the Output Voltage

SYMBOL	VOLTAGE (V)
0	②.0
1	②.1
2	②.2
3	②.3
4	②.4
5	②.5
6	②.6
7	②.7
8	②.8
9	②.9

④Represents the assembly lot no.

■Block Diagram



■Absolute Maximum Ratings

Ta = 25°C, VSS = 0V

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	VIN	−0.3 ～ 12	V
Output Voltage	VOUT	−0.3 ～ 12	V
CE Pin Voltage	VCE	−0.3 ～ VIN+0.3	V
Output Current	IOUT	20	mA
Power Dissipation	Pd	150	mW
Operating Ambient Temperature	Topr	−40 ～ +85	℃
Storage Temperature	Tstg	−40 ～ +125	℃

■Electrical Characteristics

XC31BPN20A $V_{OUT}(T)^{1)}$=2.0V

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			-	10	V
Output Voltage	V_{OUT}	I_{OUT}=100 μA[2], V_{IN}=4.0V, Ta=25℃	1.94	2.0	2.06	V
Detectable Temperature Range			-30		+80	℃
Output Voltage Temperature Coefficient	T_D[3]	I_{OUT}=100μA, V_{IN}=4.0V -30℃≤Ta≤80℃	-3400	-3900	-4400	ppm/℃
Temperature Sensitivity	T_{SE}	-30℃≤Ta≤80℃	-6.8	-7.8	-8.8	mV/℃
Liniarity Margin Error	T_L[4]	-30℃≤Ta≤80℃		1	3.5	%
Load Stability	△V_{OUT}	V_{IN}=4.0V 1μA≤IOUT≤100μA		2.0		mV
Supply Current 1	$I_{SS}1$	V_{IN}=V_{CE}=4.0V, Ta=25℃		7	17	μA
Supply Current 2	$I_{SS}2$	V_{IN}=4.0V, V_{CE}=VSS, Ta=25℃			0.1	μA
CE "High" Level Voltage	V_{CEH}		1.5			V
CE "Low" Level Voltage	V_{CEL}				0.3	V

XC31BPN40A $V_{OUT}(T)^{1)}$=4.0V

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			-	10	V
Output Voltage	V_{OUT}	I_{OUT}=100μA[2], V_{IN}=6.0V,Ta=25℃	3.88	2.0	4.12	V
Detectable Temperature Range			-30		+80	℃
Output Voltage Temperature Coefficient	T_D[3]	I_{OUT}=100μA, V_{IN}=6.0V -30℃≤Ta≤80℃	-3400	-3900	-4400	ppm/℃
Temperature Sensitivity	T_{SE}	-30℃≤Ta≤80℃	-13.6	-15.6	-17.6	mV/℃
Liniarity Margin Error	T_L[4]	-30℃≤Ta≤80℃		1	3.5	%
Load Stability	△V_{OUT}	VIN=6.0V 1μA≤IOUT≤100μA		3.0		mV
Supply Current 1	$I_{SS}1$	V_{IN}=V_{CE}=6.0V, Ta=25℃		8	18	μA
Supply Current 2	$I_{SS}2$	V_{IN}=6.0V, V_{CE}=VSS, Ta=25℃			0.1	μA
CE "High" Level Voltage	V_{CEH}		1.5			V
CE "Low" Level Voltage	V_{CEL}				0.3	V

Note:

1) $V_{OUT}(T)$=Specified Output Voltage at 25°C.
2) Should output current exceed 100μA, output voltage drop will increase.
   If this IC is to be used in applications where such currents are required, please use a buffer on the output.
3) Output voltage temperature coefficient T_D is defined as

$$T_D = \frac{\triangle V_{OUT}}{\triangle Ta \cdot V_{OUT}}$$

4) Liniarity margin error is calculated as follows,

$$T_L = \frac{e_{max}}{Tse \cdot \triangle Ta}$$

where e_{max} = maximum error.
The maximum error is the maximum difference between the actual measured value and the value on an approximated straight line.

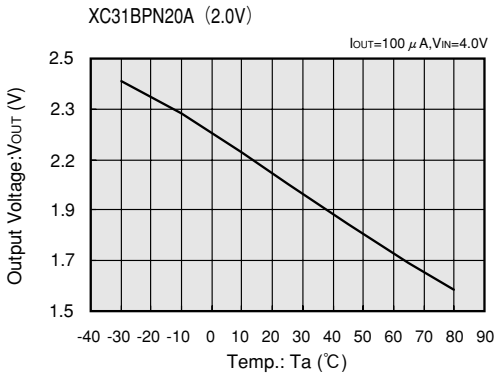
■Directions for use

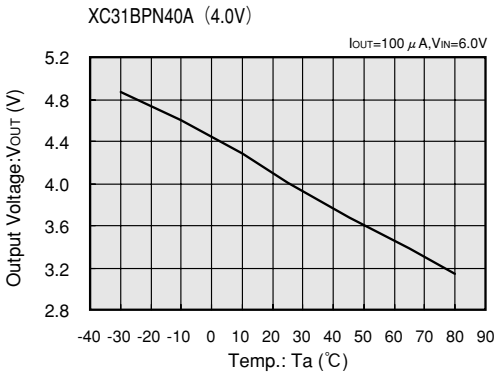
●Notes on Use

1. When the load capacitance CL is too large, oscillation may occur on the output signal.
2. Output signal overshoot will occur when the power (V_{IN}) is switched on or when the power drastically flucturates. The chip enable (CE) function is effective for helping to avoid overshoot and also in saving consumption current.

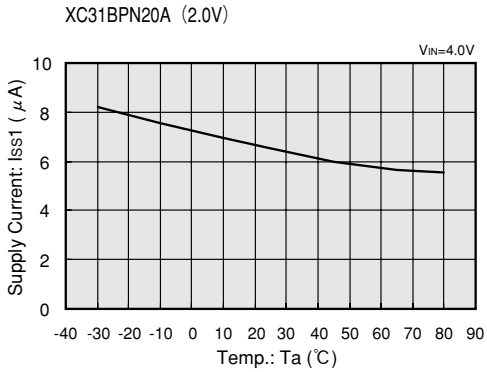
■Typical Performance Characteristics

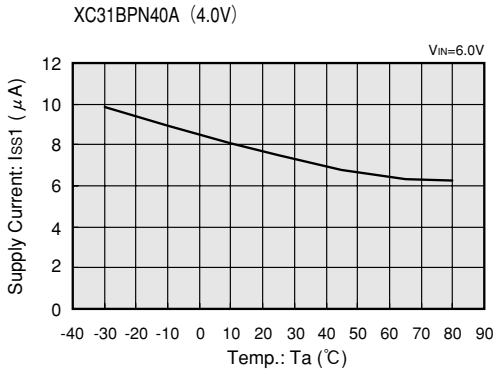
(1) OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



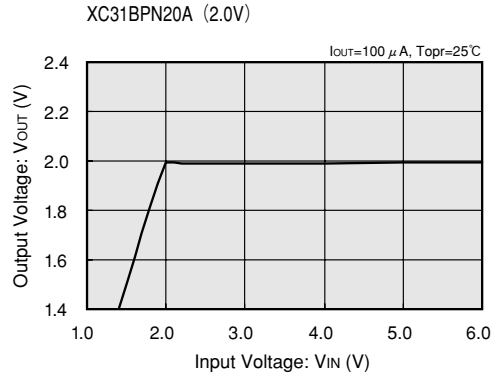


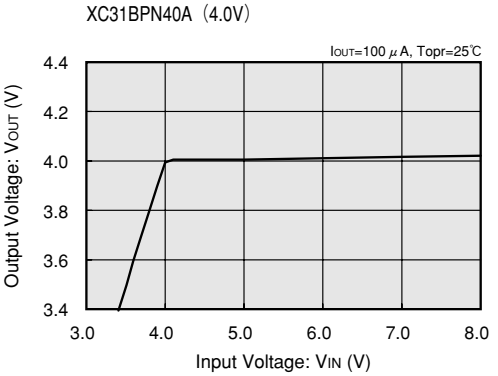
(2) SUPPLY CURRENT vs. AMBIENT TEMPERATURE





(3) OUTPUT VOLTAGE vs. INPUT VOLTAGE





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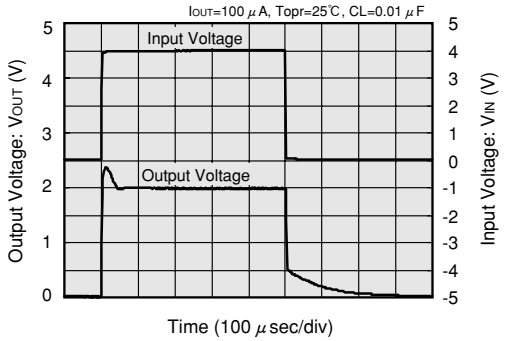
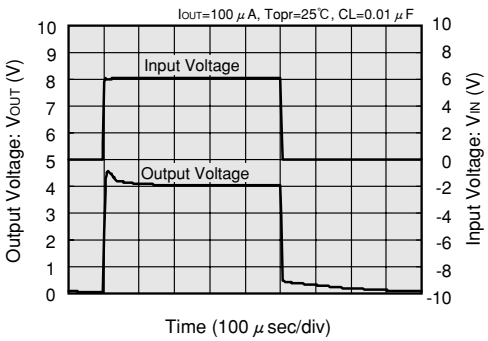
(4) INPUT TRANSIENT RESPONSE 1

XC31BPN20A（2.0V）

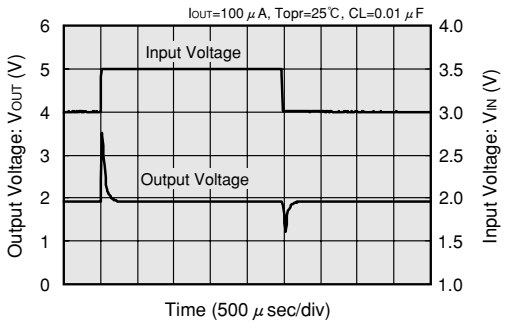


XC31BPN40A（4.0V）

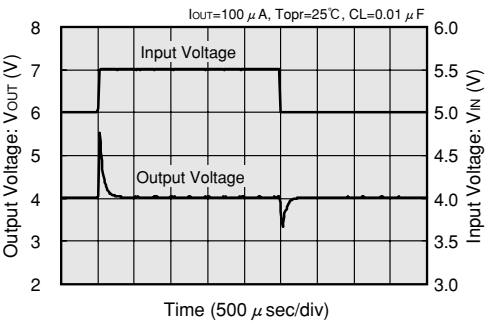


(5) INPUT TRANSIENT RESPONSE 2

XC31BPN20A（2.0V）

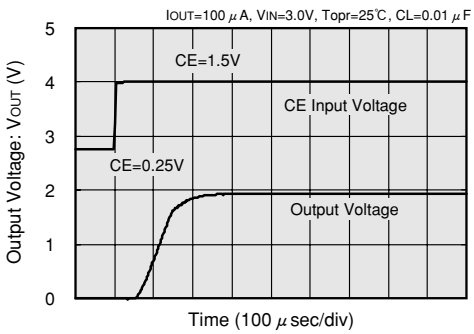


XC31BPN40A（4.0V）

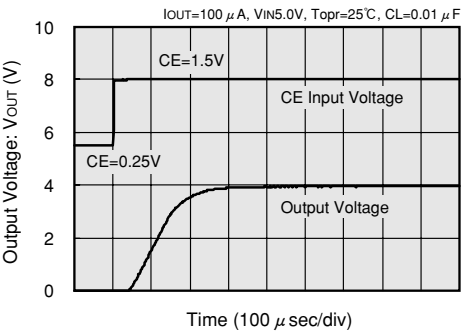


(6) CE PIN TRANSIENT RESPONSE

XC31BPN20A（2.0V）



XC31BPN40A（4.0V）



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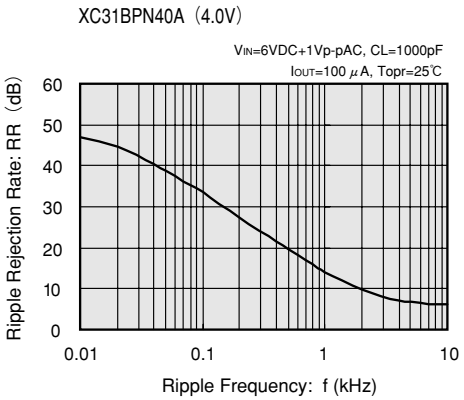
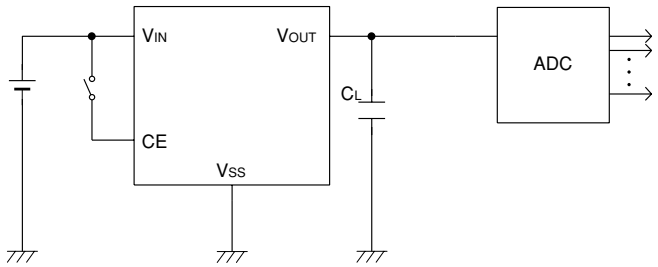
(7) RIPPLE REJECTION RATE



■Typical Application Circuit



CL：0.01 μF（ceramic capacitor）

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