XC31B series is Discontinued.

XC31B Series

TOIREX

ETR0901_002a

CMOS Temperature Sensor

■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℃ to +80℃. The XC31B comes in a mini molded SOT-25 and USP-6B packages with a supply current of only 7 μA (@VOUT=2.0V) and as such, is suitable for use with various portable devices. Output voltage is selectable in 0.1V increments within a range of 2.0V to 6.0V (at 25℃).

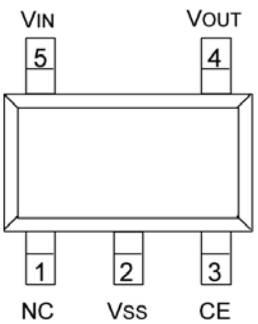
■APPLICATIONS

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

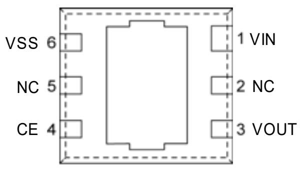
■FEATURES

Operating Voltage Range : 3.0V ~ 10.0V
Output Voltage Range : 2.0V~ 6.0V
Output Voltage Accuracy : ±3%
Detectable Temperature Range : -30℃ ~ +80℃
Output Voltage Temp. Coefficient : -3900ppm/℃ (TYP.)
Low Power Consumption : 7 μA (@VOUT=2.0V)
Packages : SOT-25, USP-6B
Environmentally Friendly : EU RoHS Compliant, Pb Free

■PIN CONFIGURATION



SOT-25
(TOP VIEW)



USP-6B
(BOTTOM VIEW)

*The dissipation pad for the USP-6B package should be solder-plated in recommended mount pattern and metal masking so as to enhance mounting strength and heat release.
If the pad needs to be connected to other pins, it should be connected to the Vss pin.

■PIN ASSIGNMENT

PIN NUMBER		PIN NAME	FUNCTION
SOT-25	USP-6		
1	2, 5	NC	No Connection
2	6	VSS	Ground
3	4	CE	Chip Enable
4	3	VOUT	Output
5	1	VIN	Power Supply

■PRODUCT CLASSIFICATION

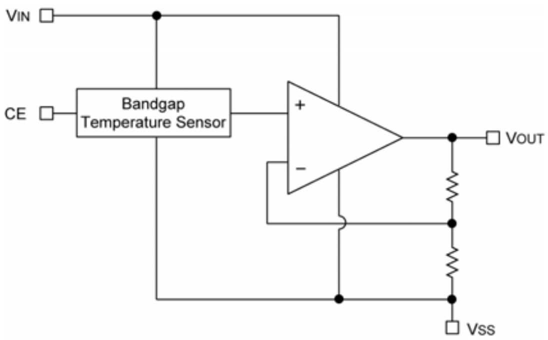
●Ordering Information

XC31B①②③④⑤⑥⑦-⑧ (*1)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Polarity of Output Voltage	P	+ (Positive)
②	Temperature Coefficient	N	- (Negative)
③④	Output Voltage (25℃)	20~60	e.g. 20=2.0V, 30=3.0V
⑤	Revision Character	A ~	-
⑥⑦-⑧	Packages Taping Type (*2)	MR	SOT-25
		MR-G	SOT-25
		DR	USP-6B

(*1) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.
(*2) The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: ⑥R-⑧ Reverse orientation: ⑥L-⑧)

■BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATINGS

Ta=25℃, 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	SOT-25	Pd	150	mW
	USP-6B		100	
Operating Temperature Range		Topr	−30 ～ +80	℃
Storage Temperature Range		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}=100 μA, 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/℃
Linearity Margin Error	T_L (*4)	-30℃≦Ta≦80℃	—	1	3.5	%
Load Regulation	ΔVOUT	V_{IN}=4.0V 1 μA≦I_{OUT}≦100 μA	—	2.0	—	mV
Supply Current 1	I_{SS1}	V_{IN}=V_{CE}=4.0V, Ta=25℃	—	7	17	μA
Supply Current 2	I_{SS2}	V_{IN}=4.0V, V_{CE}=V_{SS}, 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}=100 μA (*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}=100 μA, 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/℃
Linearity Margin Error	T_L (*4)	-30℃≦Ta≦80℃	—	1	3.5	%
Load Regulation	ΔV_{OUT}	V_{IN}=6.0V 1 μA≦I_{OUT}≦100 μA	—	3.0	—	mV
Supply Current 1	I_{SS1}	V_{IN}=V_{CE}=6.0V, Ta=25℃	—	8	18	μA
Supply Current 2	I_{SS2}	V_{IN}=6.0V, V_{CE}=V_{SS}, 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℃.
*2: When output current exceed 100 μA, 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:

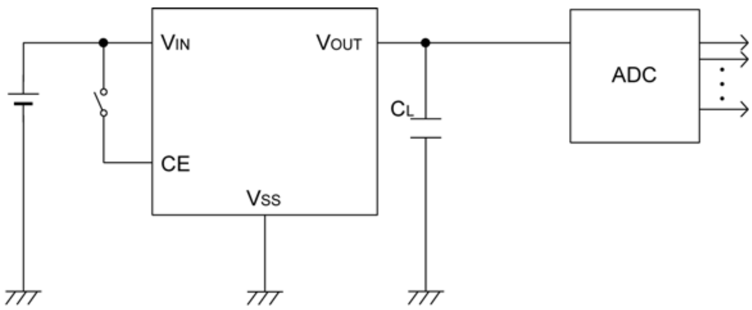
$$T_D = \frac{\Delta V_{OUT}}{Ta \cdot V_{OUT}}$$

*4: Linearity margin error (T_L) is calculated as follows:

$$T_L = \frac{emax}{Tse \cdot \Delta Ta}$$

where emax = maximum error.
The maximum error is the maximum difference between the actual measured value and the value on an approximated straight line.

■TYPICAL APPLICATION CIRCUIT



CL：0.01μF（ceramic capacitor）

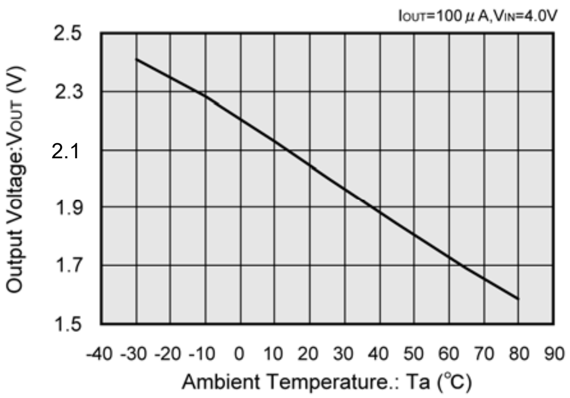
■NOTE ON USE

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 (VIN) is switched on or when the power drastically fluctuates. The chip enable (CE) function is effective for helping to avoid overshoot and also in saving consumption current.

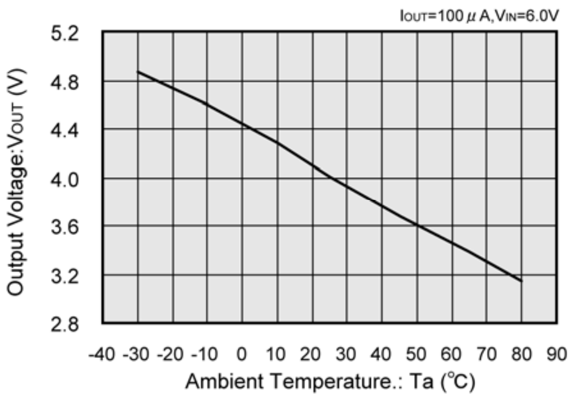
■TYPICAL PERFORMANCE CHARACTERISTICS

(1) Output Voltage vs. Ambient Temperature

XC31BPN20A（2.0V）

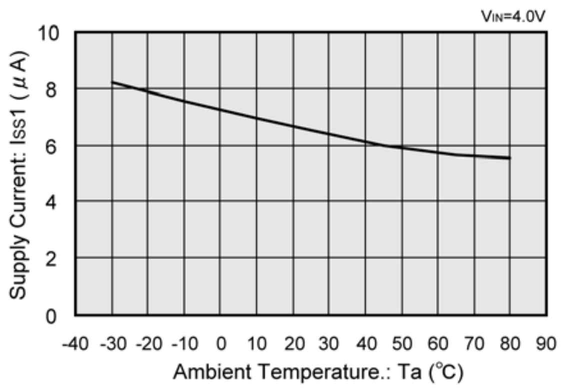


XC31BPN40A（4.0V）

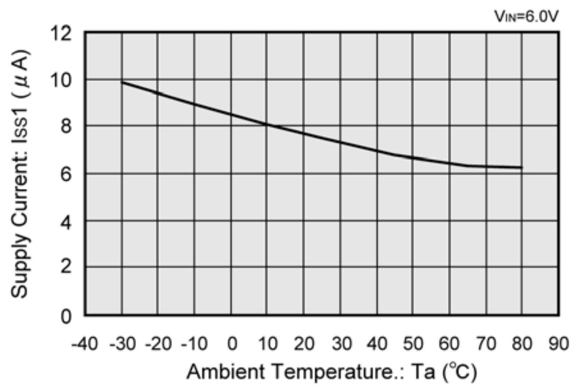


(2) Supply Current vs. Ambient Temperature

XC31BPN20A（2.0V）

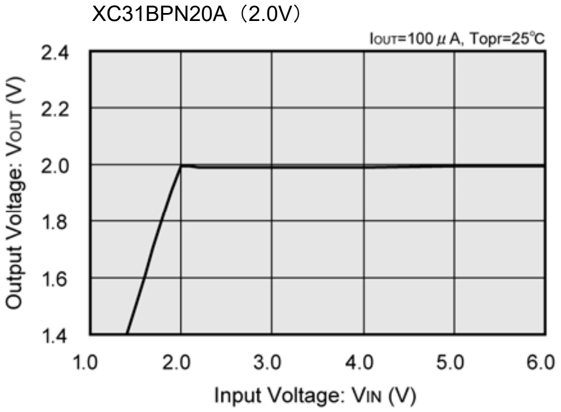


XC31BPN40A（4.0V）

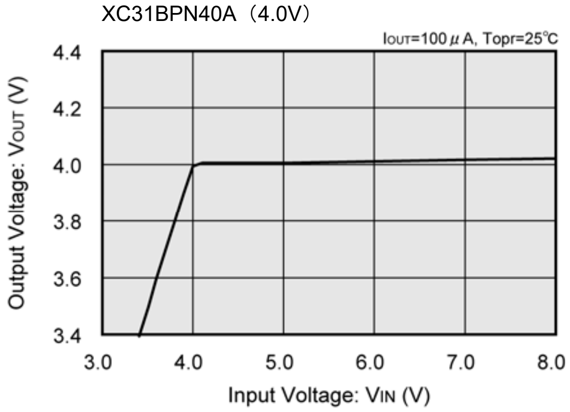


(3) Output Voltage vs. Input Voltage

XC31BPN20A（2.0V）



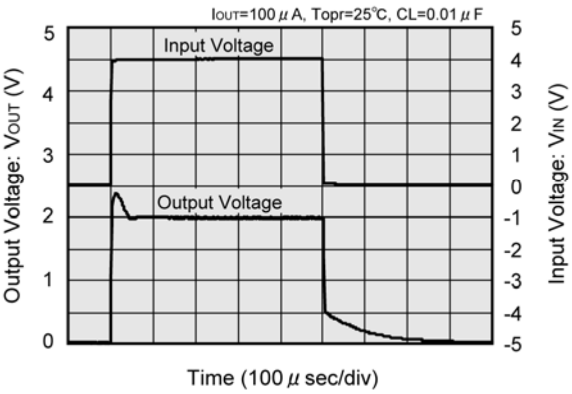
XC31BPN40A（4.0V）



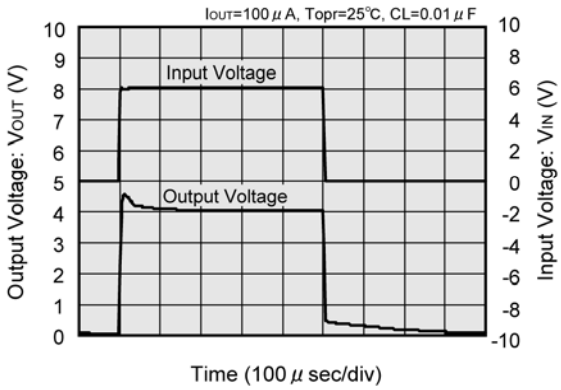
■TYPICAL PERFORMANCE CHARACTERISTICS(Continued)

(4) Input Transient Response 1

XC31BPN20A（2.0V）

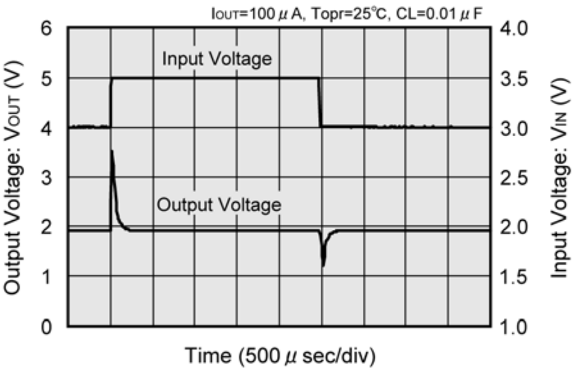


XC31BPN40A（4.0V）

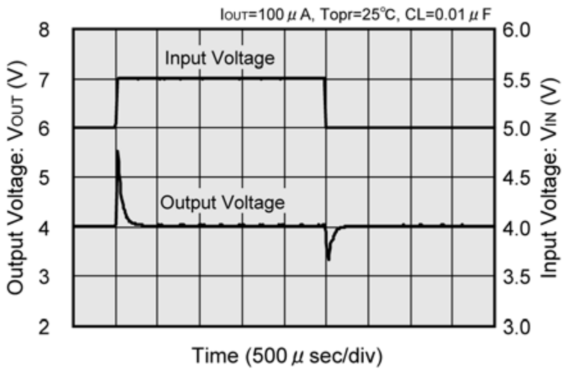


(5) Input Transient Response 2

XC31BPN20A（2.0V）

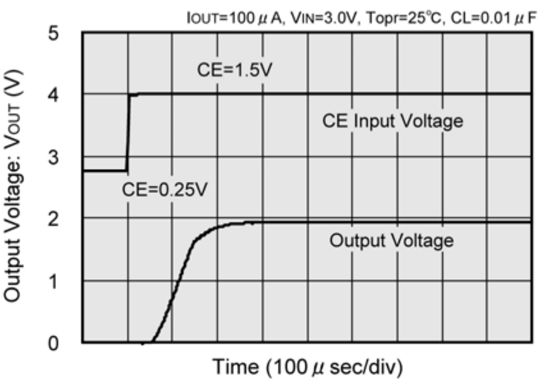


XC31BPN40A（4.0V）

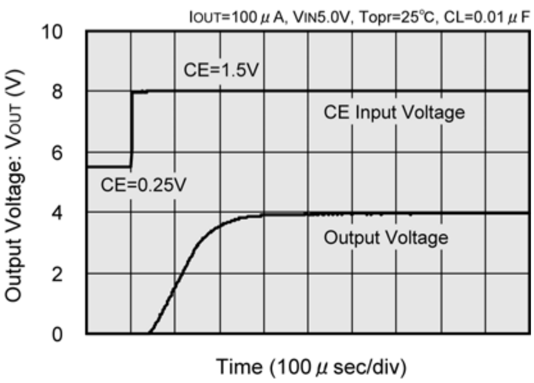


(6) CE Pin Transient Response

XC31BPN20A（2.0V）

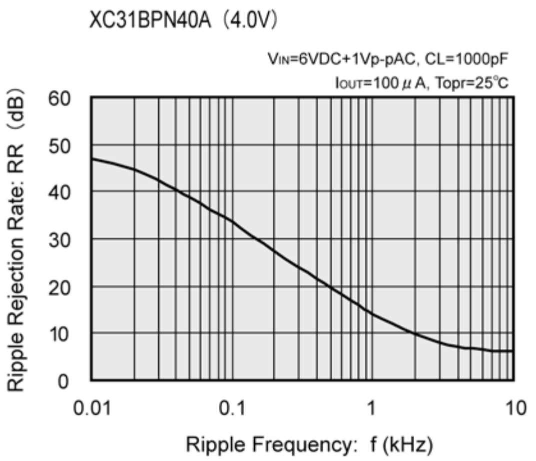


XC31BPN40A（4.0V）



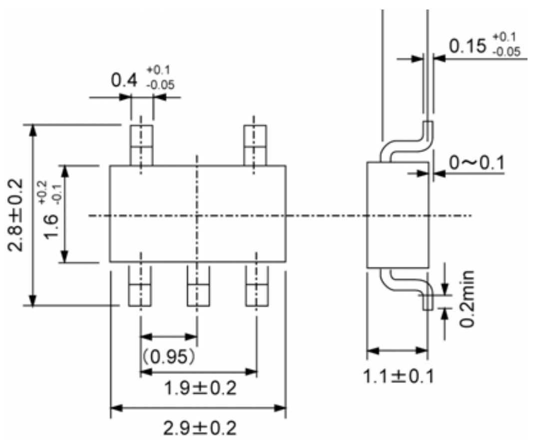
■TYPICAL PERFORMANCE CHARACTERISTICS(Continued)

(7) Ripple Rejection Rate

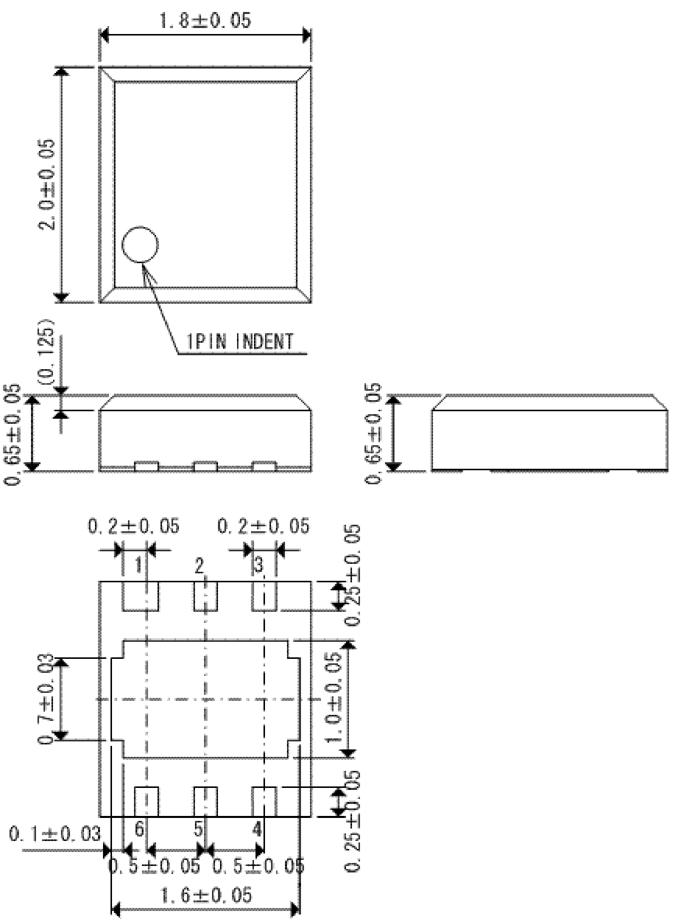


■PACKAGING INFORMATION

●SOT-25

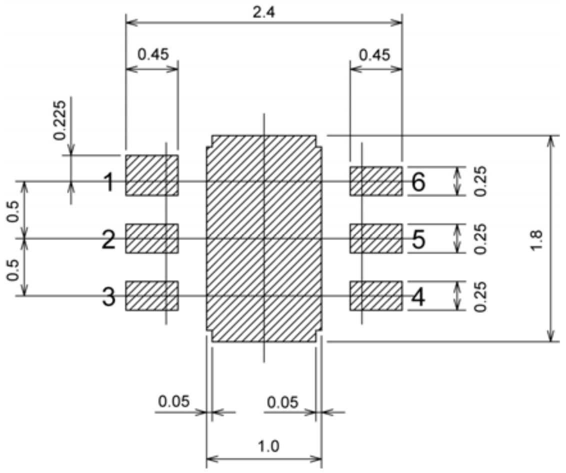


●USP-6B

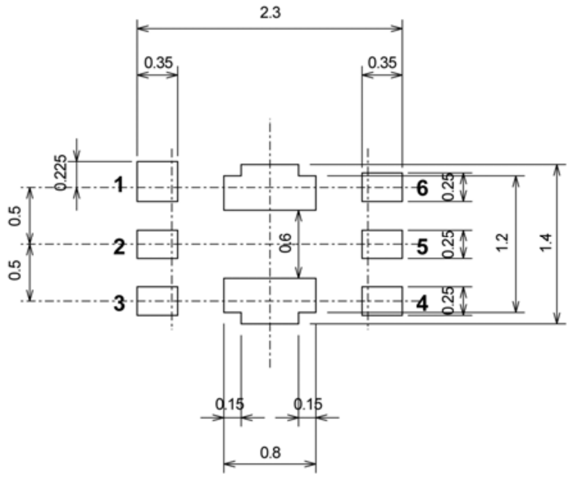


■PACKAGING INFORMATION (Continued)

●USP-6B Recommended Pattern Layout

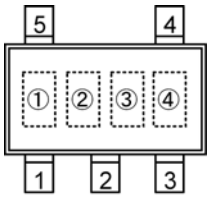


●USP-6B Recommended Metal Mask Design



■MARKING RULE

●SOT-25



SOT-25
(TOP VIEW)

① based on internal standards

② represents integer of output voltage

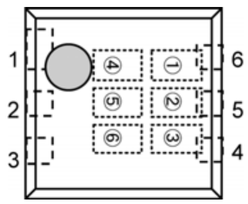
MARK	VOLTAGE (V)
2	2.x
3	3.x
4	4.x
5	5.x
6	6.x

③ represents decimal number point of output voltage

MARK	VOLTAGE (V)
0	x.0
1	x.1
2	x.2
3	x.3
4	x.4
5	x.5
6	x.6
7	x.7
8	x.8
9	x.9

④ represents assembly lot number
(Based on internal standards)

●USP-6B



USP-6B
(TOP VIEW)

① represents polarity of output voltage

MARK	POLARITY	PRODUCT SERIES
P	+	XC31BPN**AD*

② represents temperature coefficient

MARK	COEFFICIENT	PRODUCT SERIES
N	-	XC31BPN**AD*

③④ represents output voltage(25℃)
Ex)

MARK		VOLTAGE (V)	PRODUCT SERIES
③	④		
2	0	2.0	XC31BPN20AD*
3	0	3.0	XC31BPN30AD*

⑤ represents revision character
Ex)

MARK	PRODUCT SERIES
A	XC31BPN**AD*

⑥ represents production lot number
0~9, A~Z repeated. (G, I, J, O, Q, W excluded)
*No character inversion used.

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