

VCXO ICs with Built-in Variable Capacitor

■ GENERAL DESCRIPTION

The XC2311 Series is VCXO (Voltage Controlled Crystal Oscillator) ICs with built-in variable capacitor diode.

With the originally developed variable capacitor diode and a constant-voltage circuit built-in, the series achieves the wide variable frequency range, frequency stability to supply voltage and low power consumption.

By combining with the AT-cut crystal oscillator, the ultra small and highly accurate Frequency Voltage Controlled Crystal Oscillator of 16 to 50MHz can be formed.

The small SOT-26, USP-6C, and SOP-8 packages make high density mounting possible.

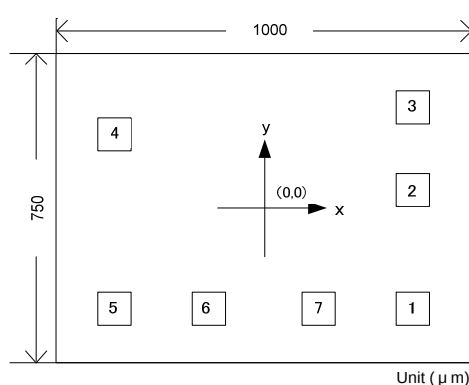
■ APPLICATIONS

- VCXO modules
- Communication equipment

■ FEATURES

- Supply Voltage Range** : 2.6V ~ 3.6V
 - Output Frequency Range** : 16MHz ~ 50MHz
(V2B0 = 16MHz~36MHz,
V3B0 = 30MHz~50MHz)*
 - Pull Range** : more than ± 110 ppm
(XC2311V2B0xx,
Vc = 1.65V $\pm$ 1.35V)
 - Output Waveform Symmetry** : 50% / ± 5 %
 - Operating Ambient Temperature** : - 40 ~ +85
 - Supply Current** : 3mA (TYP.)
(when VDD is 3.6V, 27MHz
and output is enable)
 - CMOS Output**
 - Ultra Small Packages** : SOT-26, USP-6C, SOP-8
 - Chip Form** : Chip size 1000 x 750 μ m
- * Please refer to the Electrical Characteristics for versions' details.

■ CHIP PAD LAYOUT



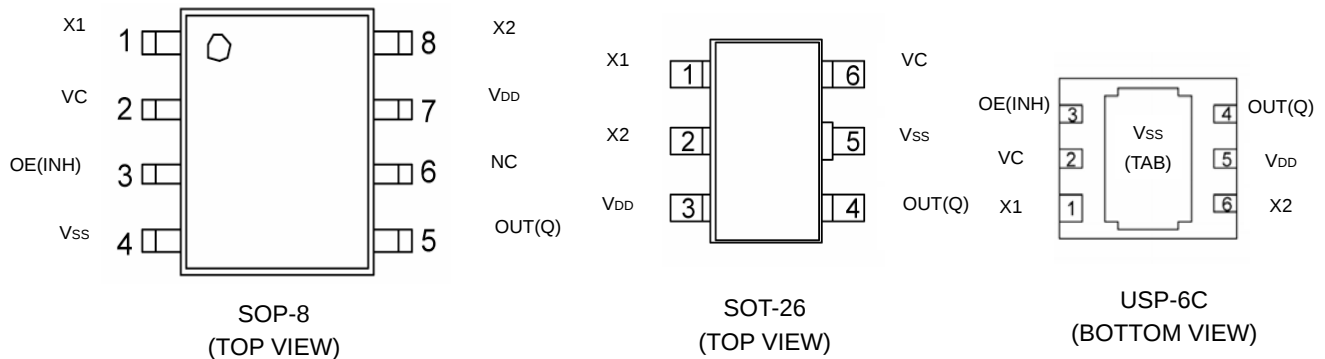
■ PAD COORDINATE

PAD NAME	PAD No.	X (μ m)	Y (μ m)
VC	1	359	-244
OE (/INH)	2	359	44
VSS	3	359	244
OUT(Q)	4	-359	179
VDD	5	-359	-244
X2	6	-132	-244
X1	7	132	-244

* The coordinate origin of XY-coordinate is a chip center.

Pad Size	80 x 80 μ m
Chip Thickness	200 $\pm$ 10 μ m

PIN CONFIGURATION



PIN ASSIGNMENT

• SOP-8

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	Vc	I	Oscillation Frequency Control Input
3	OE (/INH)	I	Output Control Input
4	Vss	-	(-) Ground
5	OUT (Q)	O	Output
6	NC	-	No Connection
7	VDD	-	(+) Power Supply
8	X2		Crystal Oscillator Connection (Output)

• SOT-26 Note : No OE (/INH) function available.

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	X2		Crystal Oscillator Connection (Output)
3	VDD	-	(+) Power Supply
4	OUT (Q)	O	Output
5	Vss	-	(-) Ground
6	Vc	I	Oscillation Frequency Control Input

• USP-6C

PIN NUMBER	PIN NAME	I/O	FUNCTIONS
1	X1	I	Crystal Oscillator Connection (Input)
2	Vc	I	Oscillation Frequency Control Input
3	OE (/INH)	I	Output Control Input
TAB	Vss	-	(-) Ground
4	OUT (Q)	O	Output
5	VDD	-	(+) Power Supply
6	X2	-	Crystal Oscillator Connection (Output)

OE (/INH), OUT (Q) PIN FUNCTION

OE (/INH)	OUT (Q)
"H" or OPEN	Clock Output
"L"	High Impedance

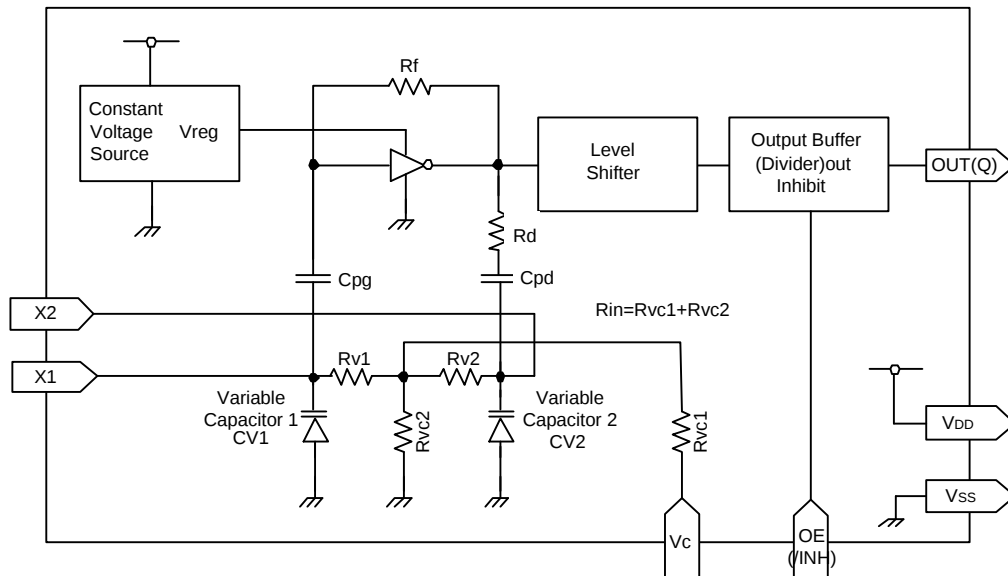
■ PRODUCT INFORMATION

- Ordering Information

XC2311 _____

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	VCXO product	V	: Fixed number
	Oscillation Frequency	2	: 16MHz ~ 36MHz
		3	: 30MHz ~ 50MHz
	-	B	: Fixed number
	-	0	: Fixed number
	Package	S	: SOP-8
		M	: SOT-26
		E	: USP-6C
		C	: Chip form
	Device Orientation	R	: Embossed tape, standard feed
		L	: Embossed tape, reverse feed
		T	: Chip tray

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

Vss=0V, Ta=25°C

PARAMETER		SYMBOL	RATINGS			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage		VDD	VSS-0.5	-	+7.0	V
Input Voltage		VIN	VSS-0.5	-	VDD +0.5	V
Output Voltage		VOUT	VSS-0.5	-	VDD +0.5	V
Output Current		IOUT	-	-	30	mA
Power Dissipation	SOP-8	Pd	300			mW
	SOT-26		250			
	USP-6C		100			
Operating Ambient Temperature		Topr	-40	-	+85	
Storage Temperature Range		Tstg	-55	-	+125	

■ RECOMMENDED OPERATING CONDITIONS

● XC2311VxB0 Series

Recommended Operating Conditions : Vss = 0V, Ta = -40 ~ +85

Unless otherwise stated, the item is common in XC2311V2B0 or XC2311V3B0.

PARAMETER	SYMBOL	CONDITIONS	RATINGS			UNITS
			MIN.	TYP.	MAX.	
Operating Supply Voltage	VDD	-	2.6	3.3	3.6	V
"H" Level Input Voltage	VIH	OE (/INH) Pin	0.7 x VDD	-	-	V
"L" Level Input Voltage	VIL	OE (/INH) Pin	-	-	0.3 x VDD	V
Input Voltage	VIN	OE (/INH) Pin	VSS	-	VDD	V
Control Voltage	VC	2.6V ≤ VDD ≤ 3.6V	0	-	VDD + 1.0	V
Oscillation Frequency Range	f0	XC2311V2B0	16	-	36	MHz
		XC2311V3B0	30	-	50	MHz

■ ELECTRICAL CHARACTERISTICS

● XC2311VxB0 Series

Condition : Unless otherwise stated, V_{SS} = 0V, V_{DD} = 3.3V, V_C = 1.65V, T_a = 25 and the item is common in XC2311V2B0 or XC2311V3B0.

PARAMETER	SYMBOL	CONDITIONS	RATINGS			UNITS
			MIN.	TYP.	MAX.	
Pull Range	fcntr	V _C = 1.65 ± 1.35V (*1), XC2311V2B0, 27MHz	± 110	-	-	ppm
		V _C = 1.65 ± 1.35V (*1), XC2311V3B0, 47MHz	± 100	-	-	
Operating Supply Current	I _{DD1}	XC2311V2B0, V _{DD} =3.6V, f _{osc} =27MHz, CL=15pF	-	3.0	5.0	mA
		XC2311V3B0, V _{DD} =3.6V, f _{osc} =47MHz, CL=15pF	-	6.0	12.0	
Supply Current Disable (*3)	I _{DD2}	f _{osc} =27MHz, CL=15pF, OE(/INH)= "L"	-	1.0	2.0	mA
		f _{osc} =47MHz, CL=15pF, OE(/INH)= "L"	-	1.5	3.0	
"H" Level Output Voltage	V _{OH}	I _{OH} = -5mA	V _{DD} -0.4	-	-	V
"L" Level Output Voltage	V _{OL}	I _{OL} = 5mA	-	-	0.4	V
Input Pull-up Resistance	R _{up}	OE(/INH) = 0V	1.0	2.5	5.0	MΩ
Output Off Leak Current (*3)	I _{oz}	V _{DD} = 3.6V, OE(/INH) = "L"	-	-	10	μA
Output Waveform Symmetry	DUTY	CL = 15pF	45	50	55	%
Input Resistance (*2)	R _{in}	Between the V _C and the Ground pins	100	-	-	kΩ
Pull Range Linearity (*2)	L _{in}	V _C = 1.65 ± 1.35V (*1)	-	-	10	%
Cut-off Frequency at Modulation (*2)	f _c	V _C = 1.65 ± 1.35V (*1), Sine wave input	15	-	-	kHz
Output Rise Time (*2)	tr	XC2311V2B0, CL = 15pF (from 10% to 90%)	-	4.5	-	ns
		XC2311V3B0, CL = 15pF (from 10% to 90%)	-	3.0	-	
Output Fall Time (*2)	tf	XC2311V2B0, CL = 15pF (from 10% to 90%)	-	4.5	-	ns
		XC2311V3B0, CL = 15pF (from 10% to 90%)	-	3.0	-	
Output Enable Delay Time (*2), (*3)	t _{pe}	-	-	-	100	ns
Output Disable Delay Time (*2), (*3)	t _{pd}	-	-	-	100	ns
Oscillation Start-up Time (*2)	t _{start}	-	-	1.5	-	ms
Feedback Resistance (*2)	R _f	-	-	100	-	kΩ
DC Block Capacity (*2)	C _{pg}	-	13	16	19	pF
DC Block Capacity (*2)	C _{pd}	-	40	50	60	pF
Output Load Capacity (*2)	CL	XC2311V2B0, CMOS level	-	15	30	pF
		XC2311V3B0, CMOS level	-	-	15	

NOTE:

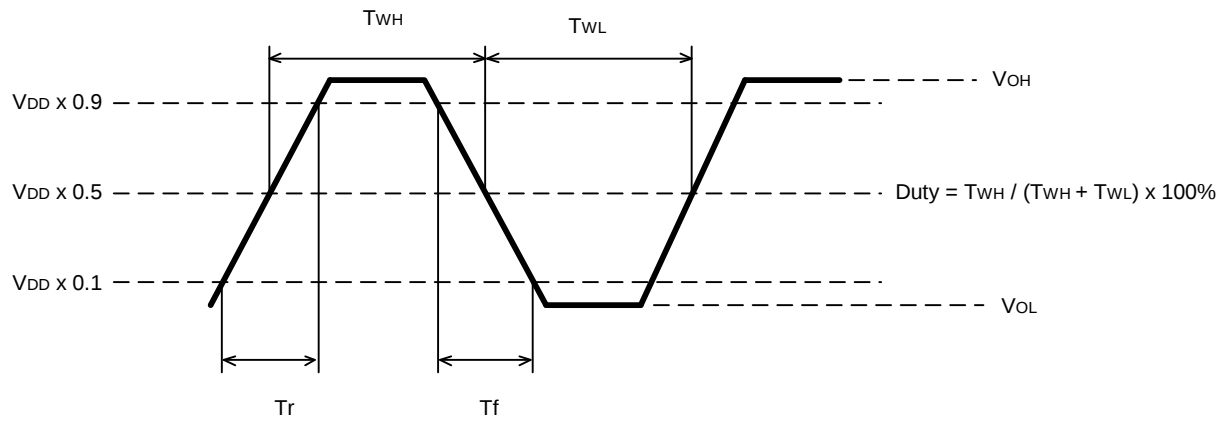
*1: Crystal Oscillator Equivalent Parameter, $\gamma = CO/C1 < 300$

*2: The value shown above indicates a design value.

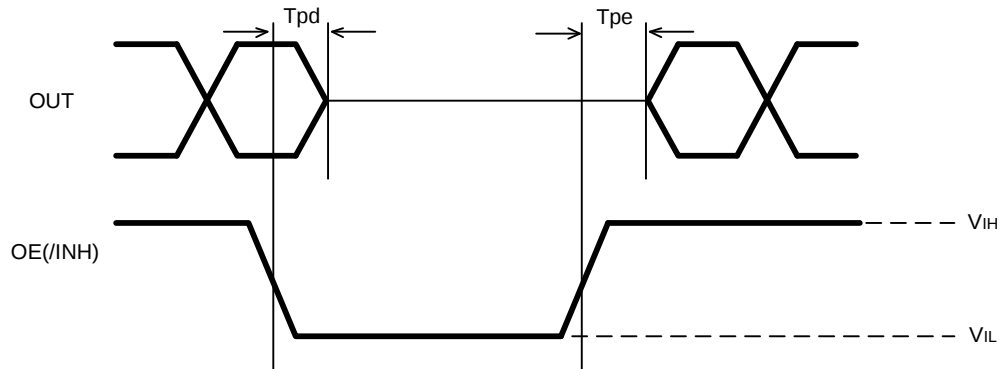
*3: For the SOT-26 package products, the OE (/INH) pin is fixed by an internal pull-up. No OE (/INH) function available.

■ OUTPUT WAVEFORMS (Duty, Tr, Tf, Tpe, Tpd)

Duty / Tr, Tf: Output Duty, Output Rise / Fall Time

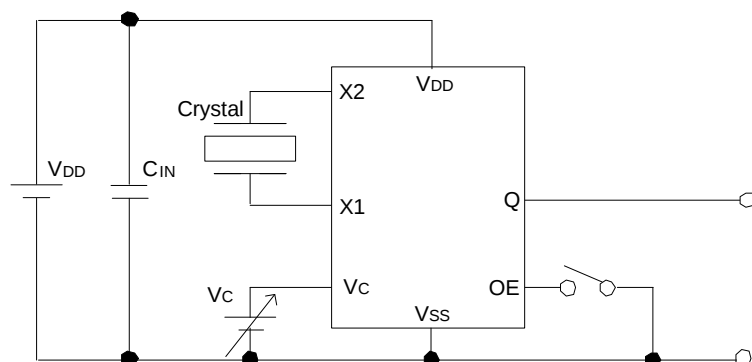


Tpe / Tpd: Output Enable / Disable Time



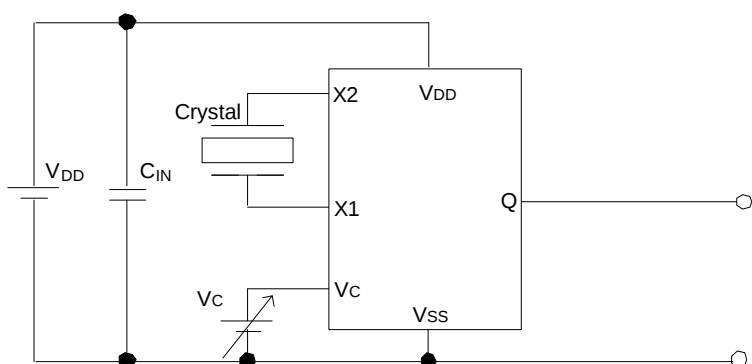
■ TYPICAL APPLICATION CIRCUITS

1) SOP-8 and USP-6C



*) Please mount the C_{IN} in a near position from both the VDD and the VSS pins as much as possible.

2) SOT-26



*) Please mount the C_{IN} in a near position from both the VDD and the VSS pins as much as possible.

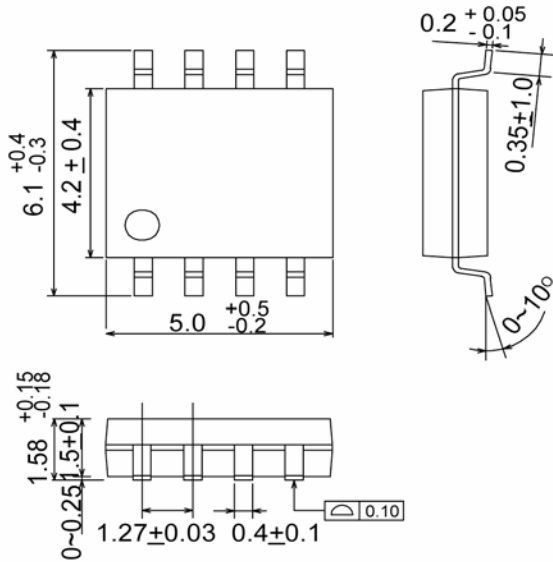
■ NOTE ON USE

The content described in this data sheet might be changed without an advance notice.

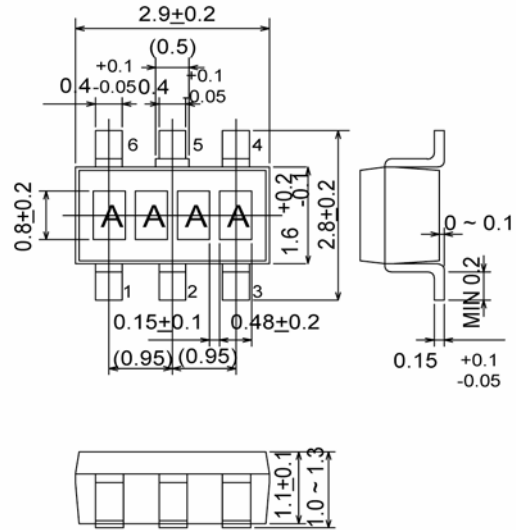
Please contact Torex, sales offices, or representatives to make the inquiry of latest information.

■ PACKAGING INFORMATION

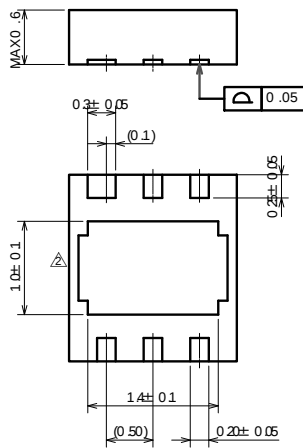
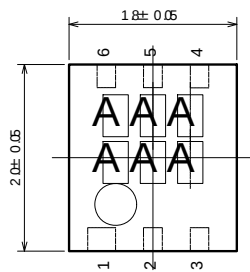
● SOP-8



● SOT-26



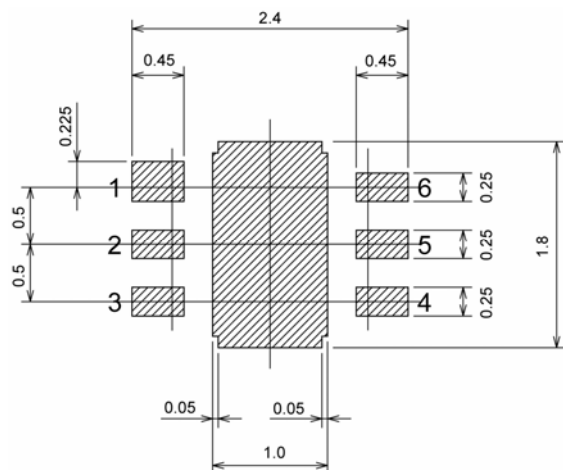
● USP-6C



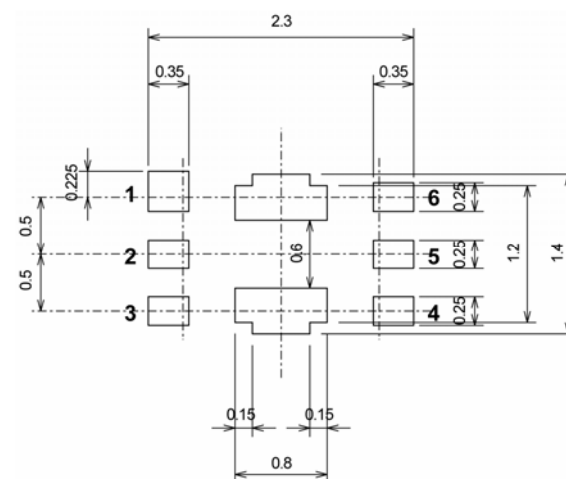
Note: The side of pins are not gilded, but nickel is used.

■ PACKAGING INFORMATION (Continued)

● USP-6C Recommended Pattern Layout



● USP-6C Recommended Metal Mask Design



■ MARKING RULE

● SOP-8

Represents product series

MARK		PRODUCT SERIES
2	1	XC2311xxxxxx

Represents VCXO product

MARK	PRODUCT SERIES
V	XC2311Vxxxxx

Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
2	16MHz ~ 36MHz	XC2311x2xxxx
3	30MHz ~ 50MHz	XC2311x3xxxx

Represents operating voltage range

MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

Represents last digit of production year

ex)

MARK	YEAR
5	2005
6	2006

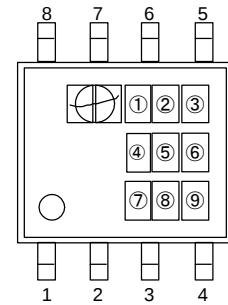
Represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excepted. No high-order zero marked.)

Note: No character inversion used.

ex)

MARK		PRODUCTION LOT NUMBER
-	3	03
1	A	A



SOP-8
(TOP VIEW)

■ MARKING RULE (Continued)

● SOT-26

Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
L	16MHz ~ 36MHz	XC2311x2xxxx
M	30MHz ~ 50MHz	XC2311x3xxxx

Represents operating voltage range

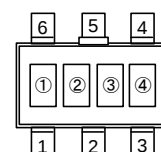
MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

Represents production lot number

0 to 9, A to Z, reverse character 0 to 9, A to Z repeated (G, I, J, O, Q, W excepted.)



SOT-26
(TOP VIEW)

● USP-6C

Represents product series

MARK		PRODUCT SERIES
2	1	XC2311xxxxxx

Represents oscillation frequency range

MARK	FREQUENCY RANGE	PRODUCT SERIES
2	16MHz~36MHz	XC2311x2xxxx
3	30MHz~50MHz	XC2311x3xxxx

Represents operating voltage range

MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V~3.6V	XC2311xxBxxx

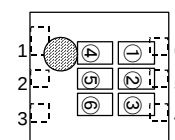
Represents divider circuit

MARK	DIVIDER CIRCUIT	PRODUCT SERIES
0	No Divider	XC2311xxx0xx

Represents production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excepted.)

Note: No character inversion used.



USP-6C
(TOP VIEW)

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