

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)

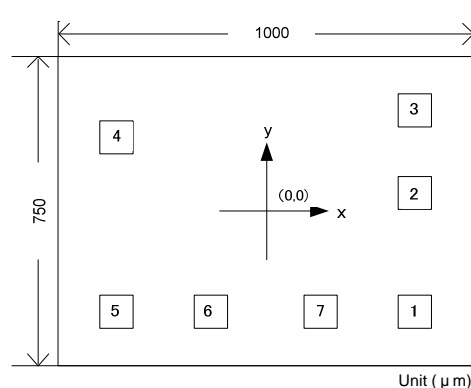
CMOS Output

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



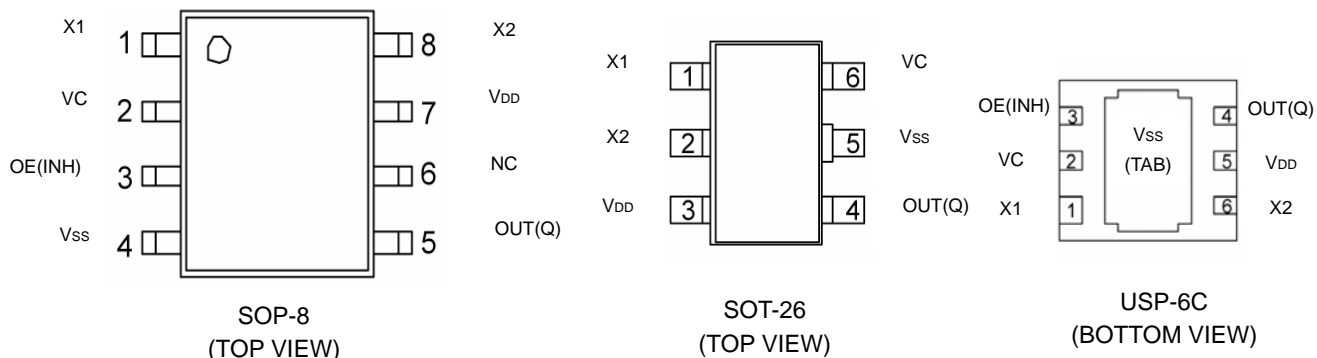
PAD COORDINATE

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

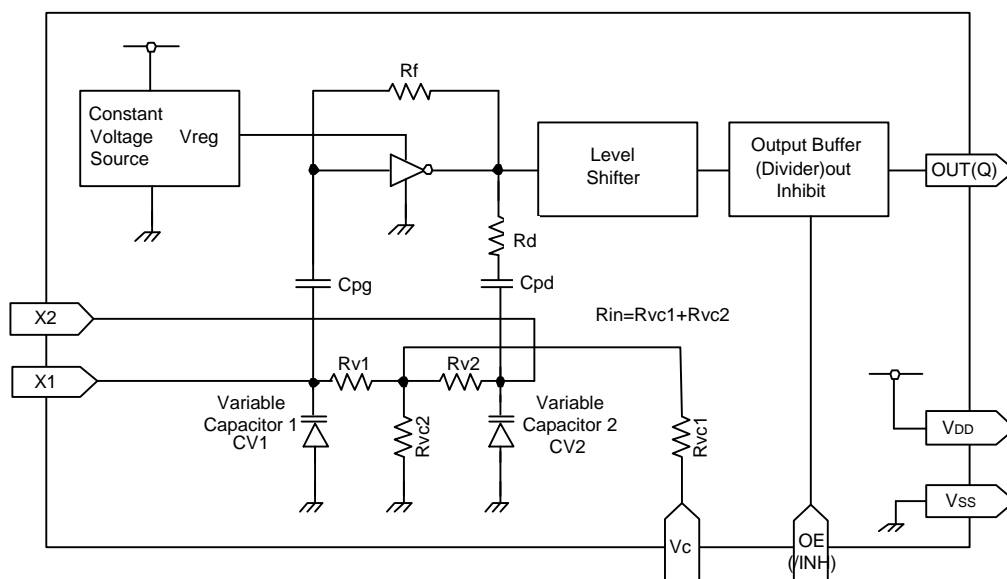
PRODUCT INFORMATION

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

$V_{SS}=0V$, $T_a=25^{\circ}C$

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 : $V_{SS} = 0V$, $T_a = -40 \sim +85$

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

PARAMETER	SYMBOL	CONDITIONS	RATINGS			UNITS
			MIN.	TYP.	MAX.	
Operating Supply Voltage	V_{DD}	-	2.6	3.3	3.6	V
"H" Level Input Voltage	V_{IH}	OE (/INH) Pin	$0.7 \times V_{DD}$	-	-	V
"L" Level Input Voltage	V_{IL}	OE (/INH) Pin	-	-	$0.3 \times V_{DD}$	V
Input Voltage	V_{IN}	OE (/INH) Pin	V_{SS}	-	V_{DD}	V
Control Voltage	V_C	$2.6V \leq V_{DD} \leq 3.6V$	0	-	$V_{DD} + 1.0$	V
Oscillation Frequency Range	f_0	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	IDD1	XC2311V2B0, VDD=3.6V, fosc=27MHz, CL=15pF	-	3.0	5.0	mA
		XC2311V3B0, VDD=3.6V, fosc=47MHz, CL=15pF	-	6.0	12.0	
Supply Current Disable (*3)	IDD2	fosc=27MHz, CL=15pF, OE(/INH)= "L"	-	1.0	2.0	mA
		fosc=47MHz, CL=15pF, OE(/INH)= "L"	-	1.5	3.0	
"H" Level Output Voltage	VOH	I _{OH} = -5mA	V _{DD} -0.4	-	-	V
"L" Level Output Voltage	VOL	I _{OL} = 5mA	-	-	0.4	V
Input Pull-up Resistance	Rup	OE(/INH) = 0V	1.0	2.5	5.0	MΩ
Output Off Leak Current (*3)	Ioz	VDD = 3.6V, OE(/INH) = "L"	-	-	10	μA
Output Waveform Symmetry	DUTY	CL = 15pF	45	50	55	%
Input Resistance (*2)	Rin	Between the V _C and the Ground pins	100	-	-	kΩ
Pull Range Linearity (*2)	Lin	V _C = 1.65 ± 1.35V (*1)	-	-	10	%
Cut-off Frequency at Modulation (*2)	fc	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)	tpe	-	-	-	100	ns
Output Disable Delay Time (*2), (*3)	tpd	-	-	-	100	ns
Oscillation Start-up Time (*2)	tstart	-	-	1.5	-	ms
Feedback Resistance (*2)	Rf	-	-	100	-	kΩ
DC Block Capacity (*2)	Cpg	-	13	16	19	pF
DC Block Capacity (*2)	Cpd	-	40	50	60	pF
Output Load Capacity (*2)	CL	XC2311V2B0, CMOS level	-	15	30	pF
		XC2311V3B0, CMOS level	-	-	15	

NOTE:

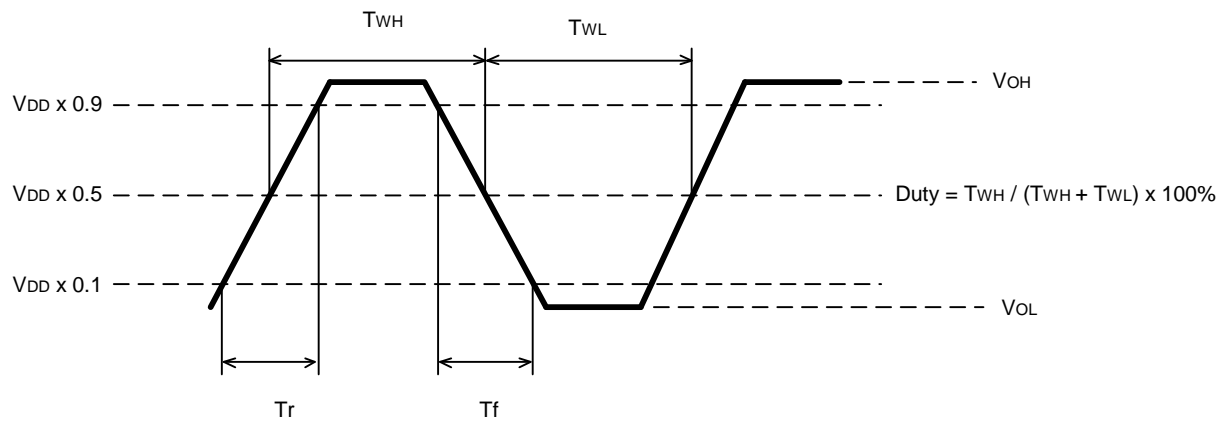
*1: Crystal Oscillator Equivalent Parameter, $\omega = CO/C1 < 300$

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

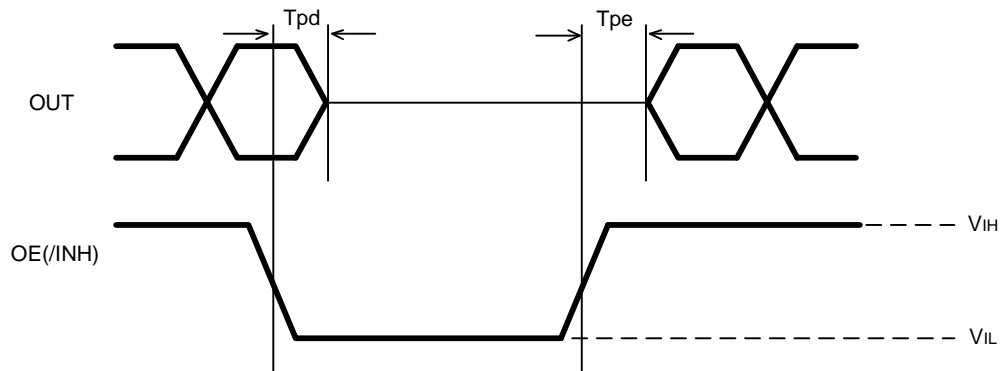
*3: For the SOT-26 package products, the OE (/INH) pin is fixed by an internal pull-up. No OE (/INH) function available.

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

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

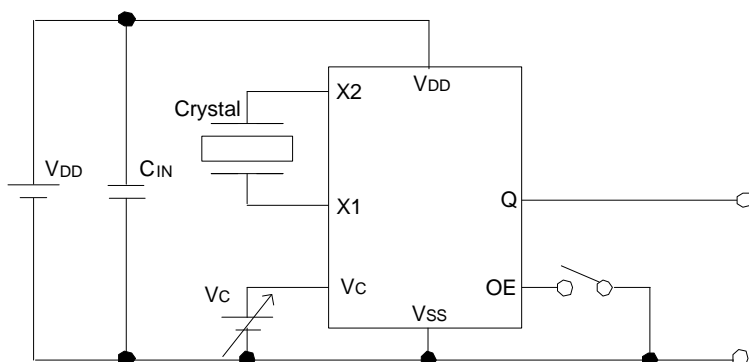


Tpe / Tpd: Output Enable / Disable Time



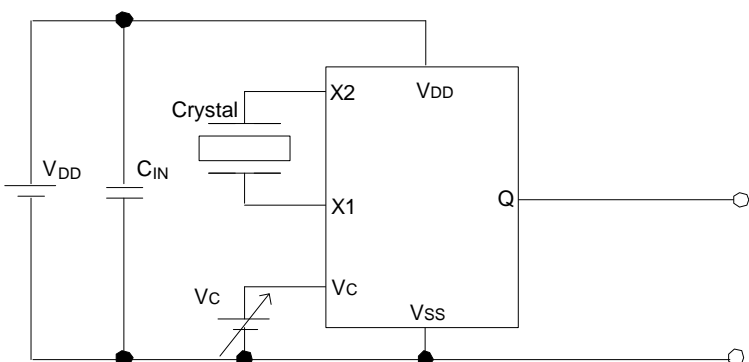
TYPICAL APPLICATION CIRCUITS

1) SOP-8 and USP-6C



*) Please mount the CIN in a near position from both the VDD and the VSS pins as much as possible.

2) SOT-26



*) Please mount the CIN in a near position from both the VDD and the VSS pins as much as possible.

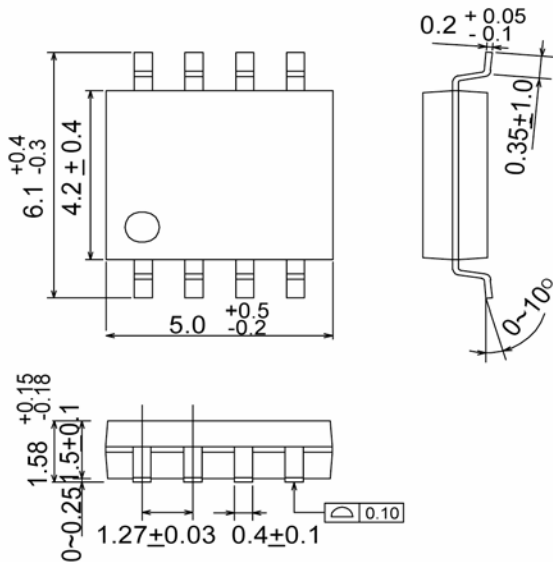
NOTE ON USE

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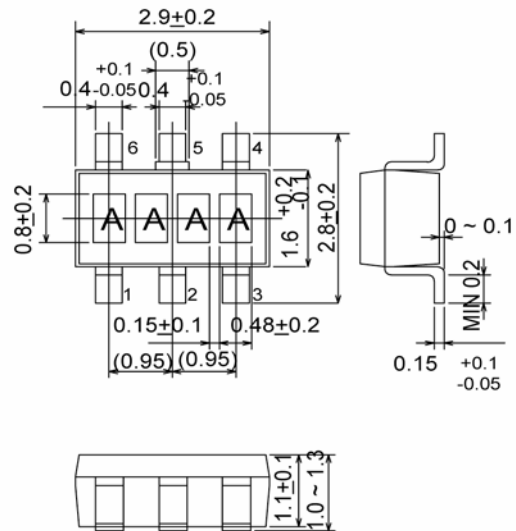
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PACKAGING INFORMATION

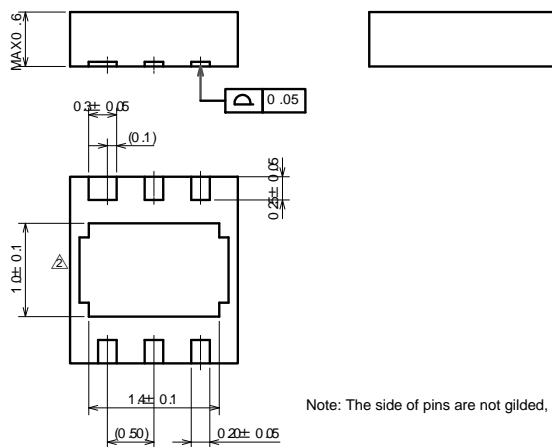
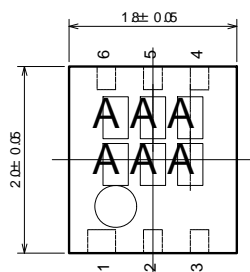
SOP-8



SOT-26



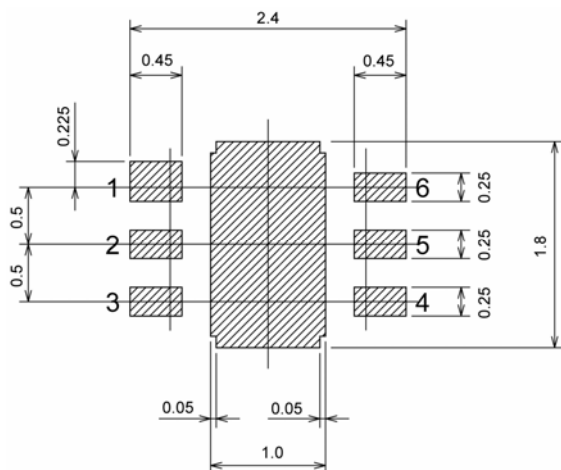
USP-6C



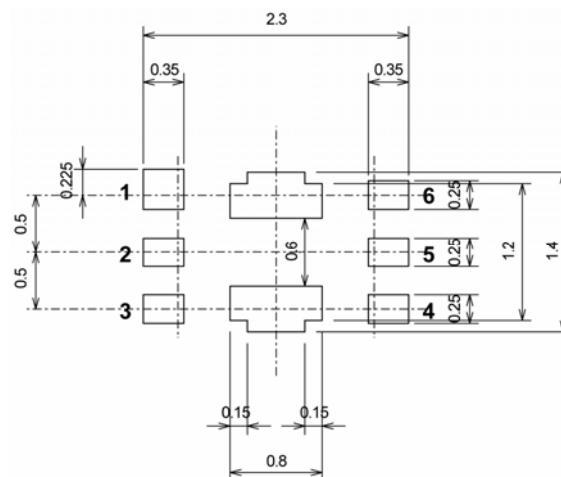
Note: The side of pins are not gilded, but nickel is used.

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

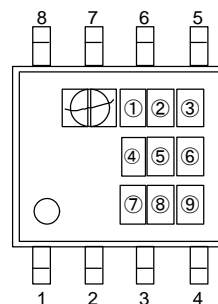
Represents production lot number

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

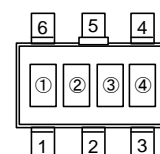
MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

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

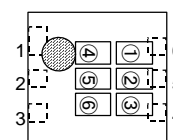
Represents divider circuit

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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