

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

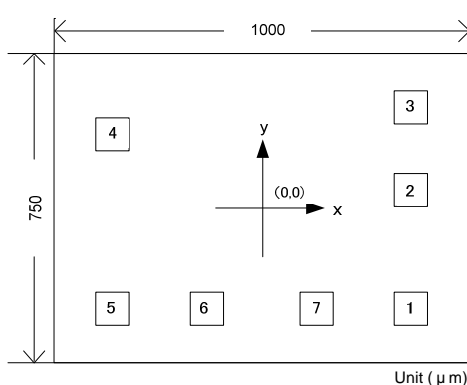
Communication equipment

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
- Environmentally Friendly** : EU RoHS Compliant, Pb Free

* Please refer to the Electrical Characteristics for versions' details.

CHIP PAD LAYOUT



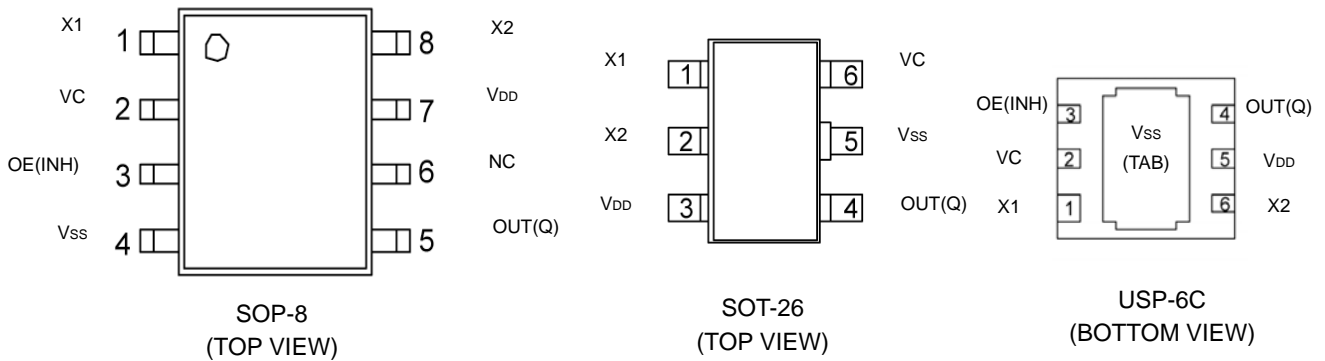
PAD COORDINATE

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

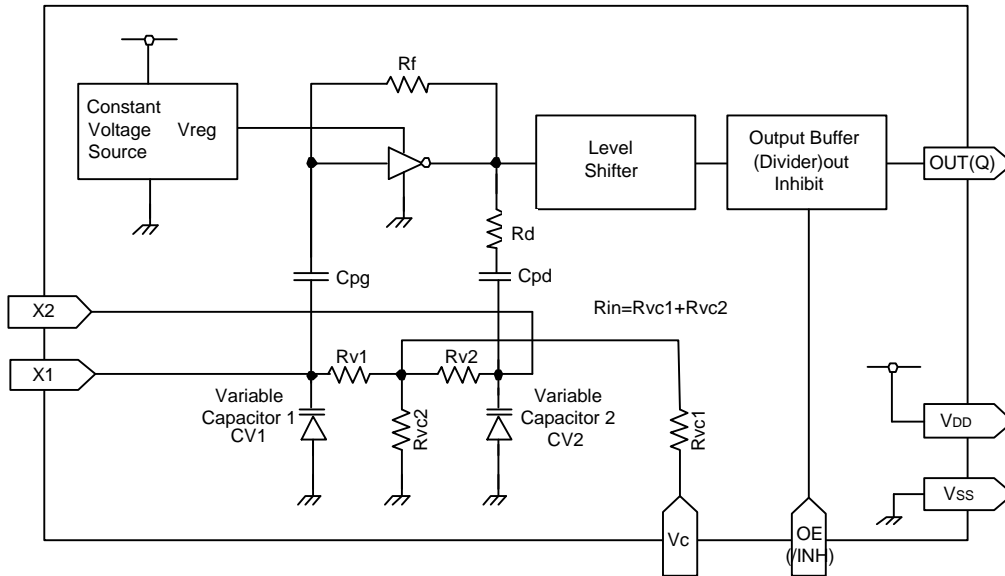
XC2311 _____ - ^(*)

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
	VCXO product	V	Fixed number
	Oscillation Frequency	2	16MHz ~ 36MHz
		3	30MHz ~ 50MHz
	-	B	Fixed number
	-	0	Fixed number
-	Packages Taping Type ^(**)	SR	SOP-8
		MR	SOT-26
		MR-G	SOT-26
		ER	USP-6C
		ER-G	USP-6C
		CT	Bare chip (on chip tray)

^(*) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

^(**) The device orientation is fixed in its embossed tape pocket. For reverse orientation, please contact your local Torex sales office or representative. (Standard orientation: R- , Reverse orientation: L-)

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	$V_C = 1.65 \pm 1.35V$ (*1), XC2311V2B0, 27MHz	± 110	-	-	ppm
		$V_C = 1.65 \pm 1.35V$ (*1), XC2311V3B0, 47MHz	± 100	-	-	
Operating Supply Current	IDD1	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)	IDD2	$f_{osc}=27MHz$, $CL=15pF$, OE(/INH) = "L"	-	1.0	2.0	mA
		$f_{osc}=47MHz$, $CL=15pF$, OE(/INH) = "L"	-	1.5	3.0	
"H" Level Output Voltage	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	$V_{DD} = 3.6V$, 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	$V_C = 1.65 \pm 1.35V$ (*1)	-	-	10	%
Cut-off Frequency at Modulation ^(*2)	fc	$V_C = 1.65 \pm 1.35V$ (*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:

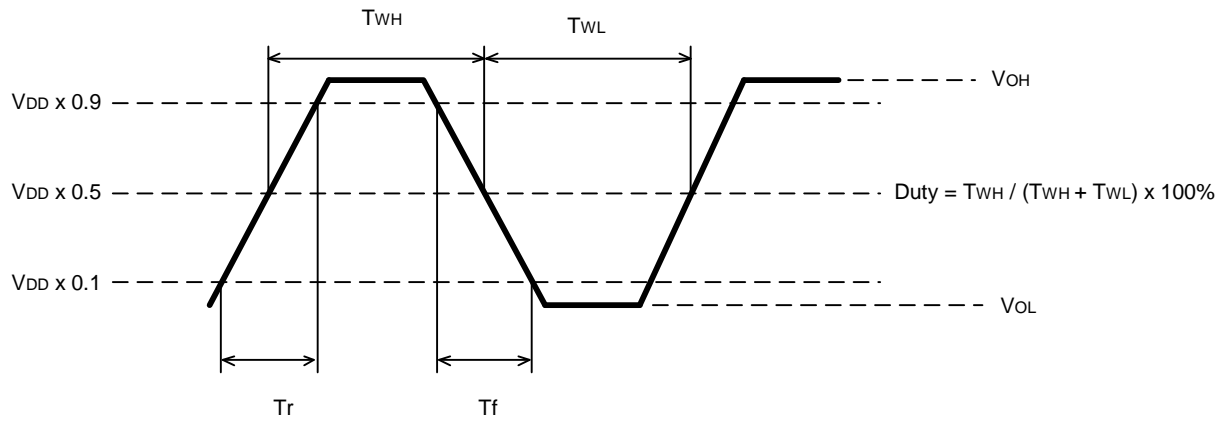
 *1: Crystal Oscillator Equivalent Parameter, $CO/C1 < 300$

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

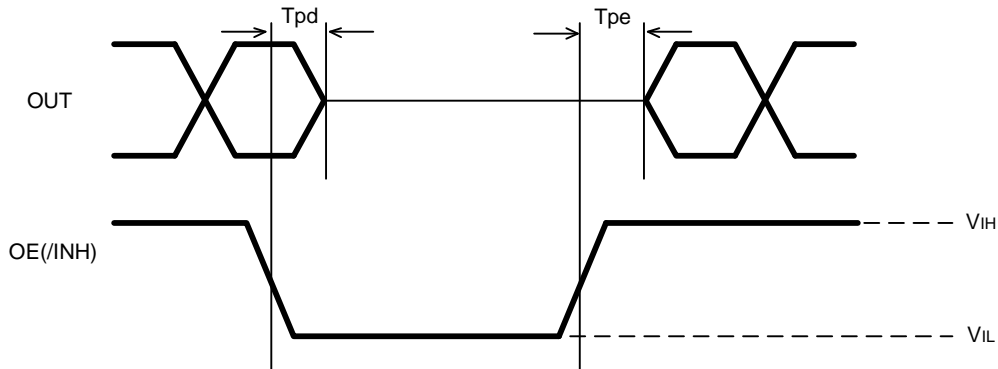
*3: For the SOT-26 package products, the OE (/INH) pin is fixed by an internal pull-up. No OE (/INH) function available.

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

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

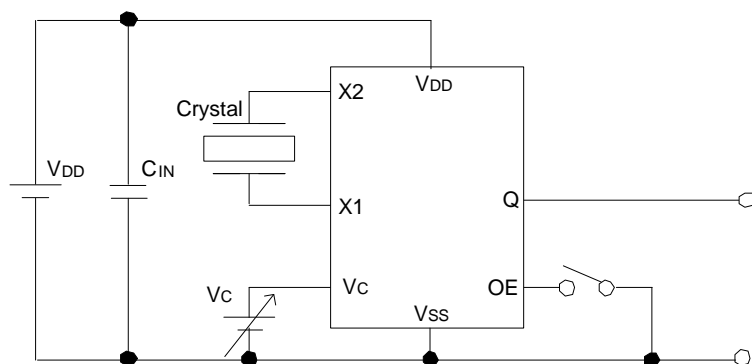


Tpe / Tpd: Output Enable / Disable Time



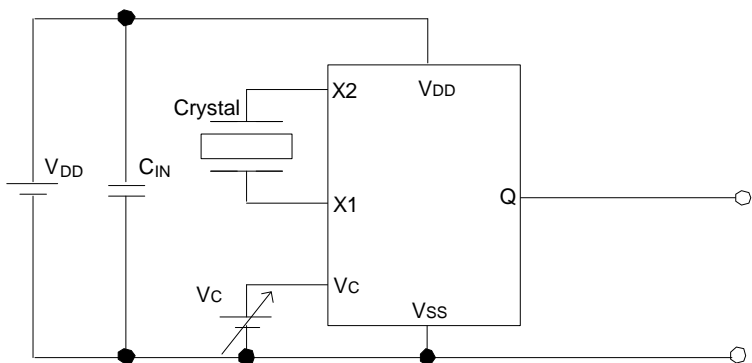
TYPICAL APPLICATION CIRCUITS

1) SOP-8 and USP-6C



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

2) SOT-26



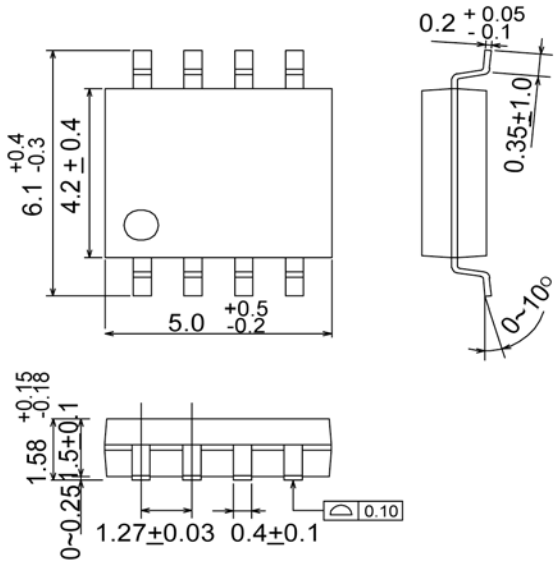
*) Please mount the C_{IN} in a near position from both the V_{DD} and the V_{SS} pins as much as possible.

NOTE ON USE

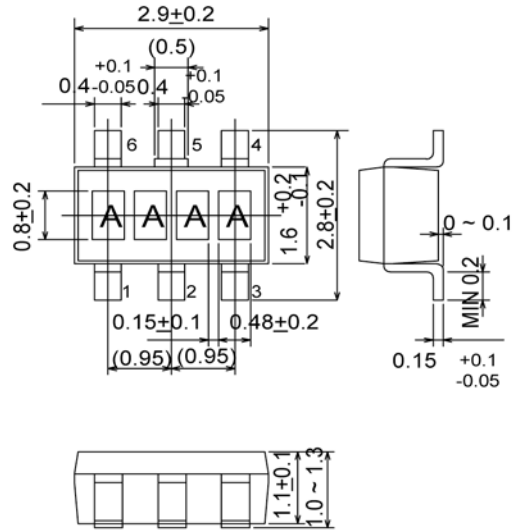
The content described in this data sheet might be changed without an advance notice.
Please contact Torex, sales offices, or representatives to make the inquiry of latest information.

PACKAGING INFORMATION

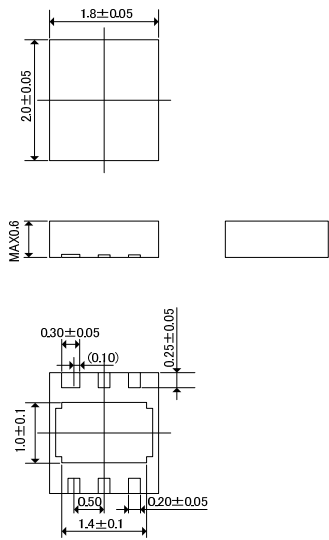
SOP-8



SOT-26



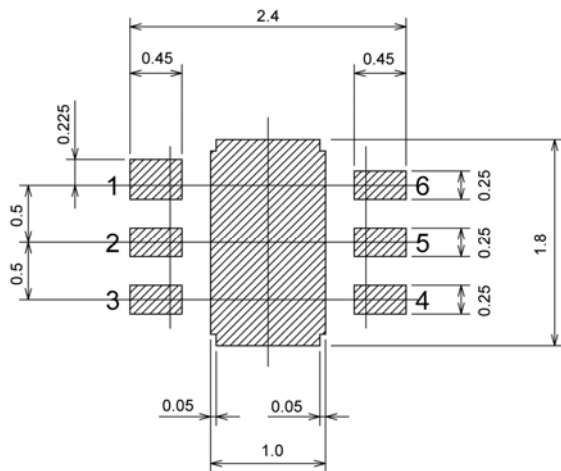
USP-6C



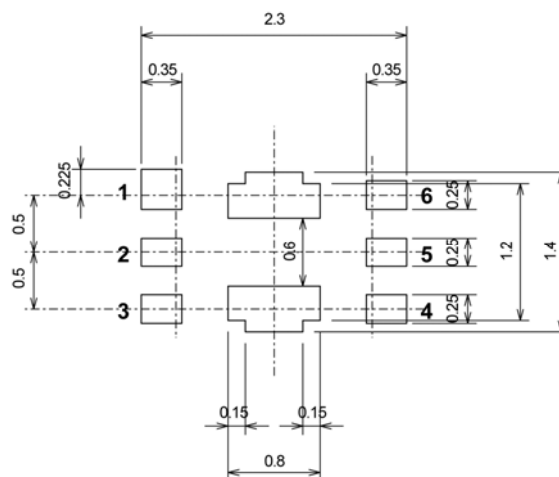
USP-6C Package

PACKAGING INFORMATION (Continued)

USP-6C Reference Pattern Layout



USP-6C Reference Metal Mask Design



MARKING RULE

SOP-8

Represents product series

MARK		PRODUCT SERIES
2	1	

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

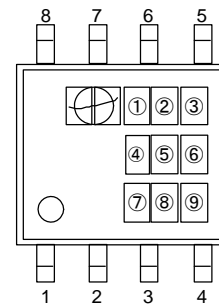
Represents production lot number

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	
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

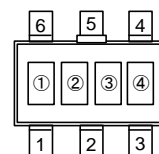
MARK	OPERATING VOLTAGE RANGE	PRODUCT SERIES
B	2.6V ~ 3.6V	XC2311xxBxxx

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

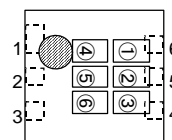
Represents divider circuit

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)

1. The products and product specifications contained herein are subject to change without notice to improve performance characteristics. Consult us, or our representatives before use, to confirm that the information in this datasheet is up to date.
2. We assume no responsibility for any infringement of patents, patent rights, or other rights arising from the use of any information and circuitry in this datasheet.
3. Please ensure suitable shipping controls (including fail-safe designs and aging protection) are in force for equipment employing products listed in this datasheet.
4. The products in this datasheet are not developed, designed, or approved for use with such equipment whose failure or malfunction can be reasonably expected to directly endanger the life of, or cause significant injury to, the user.
(e.g. Atomic energy; aerospace; transport; combustion and associated safety equipment thereof.)
5. Please use the products listed in this datasheet within the specified ranges.
Should you wish to use the products under conditions exceeding the specifications, please consult us or our representatives.
6. We assume no responsibility for damage or loss due to abnormal use.
7. All rights reserved. No part of this datasheet may be copied or reproduced without the prior permission of TOREX SEMICONDUCTOR LTD.

TOREX SEMICONDUCTOR LTD.