

# Quartz Crystals

Surface Mount		Thru - Hole type		32.768 KHz	Frequency Tolerance options		
X2012	X3215	T26	T38		± 5 ppm	± 10 ppm	± 20 ppm
[ 2.05 * 1.2 * 0.55 mm ]	[ 3.2 * 1.5 * 0.8 mm ]	[ 2.0ø * 6.0 mm ]	[ 3.0ø * 8.0 mm ]				

## Features

### Specifications

Ultra compact, thin, and light weight tuning fork crystal unit

- Excellent heat resistance and environmental characteristics
- Excellent electrical performance optimum for mobile communications, OA ( office automation ) and AV ( audiovisual ) applications
- RoHS Compliant. Meets the re-flow profiling requirements using lead-free solder



## General Specifications

Frequency Range	32.768 KHz			
Hold type	Surface Mount Type		Thru - Hole Type	
Item / Type	X2012	X3215	T26	T38
Package sizes	[ 2.05 * 1.2 * 0.55 mm ]	[ 3.2 * 1.5 * 0.8 mm ]	[ 2.0ø * 6.0 mm ]	[ 3.0ø * 8.0 mm ]
Shunt Capacitance	1.3 pF ( typ. ) / 1.5 pF ( max. )	1.0 pF ( typ. ) / 1.6 pF ( max. )	1.5 pF ( max. )	0.9 pF ( max. )
Equivalent series resistance	80 KΩ ( max. )		40 KΩ ( max. )	35 KΩ ( max. )
Temperature coefficient	$-0.04 \times 10^{-6} / ^\circ\text{C}^2$ ( max. )		$-0.035 \times 10^{-6} / ^\circ\text{C}^2$ ( max. )	
Drive Level	0.1 μW ( typ. ) 0.5 μW ( max. )		1.0 μW ( typ. )	
Operating Temperature Range	- 40 °C to 85 °C		- 10 °C to 60 °C	
Storage Temperature Range	- 40 °C to 125 °C		- 40 °C to 85 °C	
Crystal Cut	XT - Cut			
Load Capacitance	7 pF , 9 pF or 12.5 pF			
Frequency Tolerance	± 5 ppm , ± 10 ppm , ± 20 ppm ( max. ) at 25°C			
Turning POINT	+ 25 °C ± 5 °C			
Insulation resistance	500 MΩ min.			

## Outline Dimensions ( Unit : mm )

X2012	X3215
T26	T38

# Part Number Formats and Product Marking Rules

## Quartz Crystals

### Holder Type

SMD type : X11 X21 X22 X32 MJ MQ M49 ML49 MP5 MP4 MP25 MP24  
X2012 X3215  
 Dip type : H49 HUS HUSL U1 U5 T38 T26

### Part Number Format

	[ 1 ] Holder Type	-	[ 2 ] Center Freq.	-	[ 3 ] CL	-	[ 4 ] Freq. Tolerance	/	[ 5 ] Freq. Stability	[ 6 ] Operating Temp. Range Code	/	[ 7 ] Special ESR
Example	(1)	H49	-	40.000A3	-	12	-	30	/	30	X	
	(2)	X32	-	26.000	-	16	-	30	/	30	X	/ 20R
	(3)	MJ	-	12.000	-	20	-	10	/	10	W	
	(4)	M49	-	24.000	-	18	-	20	/	30	H	/ 15R

Ex (1) : H49 - 40.000A3 - 12 - 30 / 30 X [ 49/U type , 40.000MHz , AT-cut 3rd overtone , 12pF , ±30ppm ( 25°C ) , ±30ppm ( -10°C to 60°C ) ]  
 Ex (2) : X32 - 26.000 - 16 - 30 / 30 X / 20R [ X32 type , 26.000MHz , 16pF , ±30ppm ( 25°C ) , ±30ppm ( -10°C to 60°C ) , 20 Ω ]  
 Ex (3) : MJ - 12.000 - 20 - 10 / 10 W [ MJ type , 12.000MHz , 20pF , ±10ppm ( 25°C ) , ±10ppm ( 0°C to 50°C ) ]  
 Ex (4) : M49 - 24.000 - 18 - 20 / 30 H / 15R [ M49 type , 24.000MHz , 18pF , ±20ppm ( 25°C ) , ±30ppm ( -30°C to 85°C ) , 15 Ω ]

[ 1 ]	Holder Type																														
[ 2 ]	Center frequency . Please add " A3 , A5 or B " after the " Freq. in MHz " for the quartz cut other options . Blank : AT-cut fund. mode ; A3 : AT-cut 3rd overtone ; A5 : AT-cut 5th overtone ; B : BT-cut fund. mode ; SL : SL-cut fund. mode																														
[ 3 ]	Load Capacitance ( CL ) : series ( spec. code is " S " ) or Parallel ( If parallel , please specify CL value , typical CL ranges from 8 to 32 pF ) Available Options " V " = Vinyl sleeve around holder , " K " = 3rd lead at bottom center , " R " = On reel " G " = 3rd lead at top center , " I " = Teflon insulator at bottom																														
[ 4 ]	Calibration tolerance value : freq. tolerance value ( at 25°C ) , industrial temp. range																														
[ 5 ]	Frequency Stability , industrial temp. range																														
[ 6 ]	Temp. Range Options																														
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>W</td><td>0°C ~ +50°C</td><td>X</td><td>-10°C ~ +60°C</td><td>Y</td><td>-20°C ~ +70°C</td><td>F</td><td>-30°C ~ +70°C</td><td>G</td><td>-10°C ~ +80°C</td> </tr> <tr> <td>H</td><td>-30°C ~ +85°C</td><td>I</td><td>-40°C ~ +85°C</td><td>J</td><td>-40°C ~ +90°C</td><td>K</td><td>-40°C ~ +105°C</td><td>M</td><td>-55°C ~ +105°C</td> </tr> <tr> <td>N</td><td>-55°C ~ +125°C</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table> Temp. Range is -10°C to 60°C , for example " X "	W	0°C ~ +50°C	X	-10°C ~ +60°C	Y	-20°C ~ +70°C	F	-30°C ~ +70°C	G	-10°C ~ +80°C	H	-30°C ~ +85°C	I	-40°C ~ +85°C	J	-40°C ~ +90°C	K	-40°C ~ +105°C	M	-55°C ~ +105°C	N	-55°C ~ +125°C								
W	0°C ~ +50°C	X	-10°C ~ +60°C	Y	-20°C ~ +70°C	F	-30°C ~ +70°C	G	-10°C ~ +80°C																						
H	-30°C ~ +85°C	I	-40°C ~ +85°C	J	-40°C ~ +90°C	K	-40°C ~ +105°C	M	-55°C ~ +105°C																						
N	-55°C ~ +125°C																														
[ 7 ]	If non-standard please enter the desired Temp. Range after " / " , for example " -20 + 60 " : -20°C to 60°C If non-standard please enter the desired ESR ( Equivalent Series Resistance ) after " / " , for example " 20R " : 20Ω																														

### Production Marking Rules

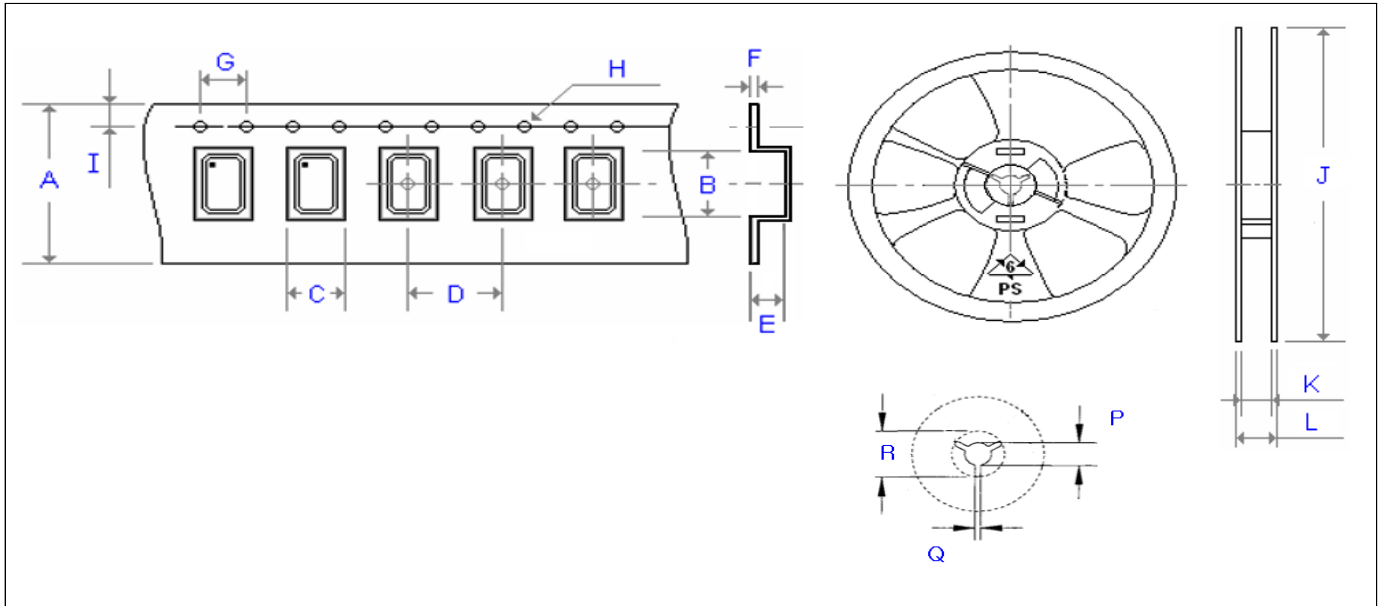
General X'tal package type marking rules	MQ, MJ marking rules	X22, X32 marking rules
<p>( Cutting method ) :                      A : AT-cut ( fundamental )                      B : BT-cut ( fundamental )                      3 : AT-cut ( 3rd overtone )                      5 : AT-cut ( 5th overtone )                      SL : SL-cut ( fundamental )</p>	<p>( Cutting method ) :                      A : AT-cut , fundamental                      B : BT-cut , fundamental                      3 : AT-cut , 3rd overtone                      5 : AT-cut , 5rd overtone</p>	
<h4 style="text-align: center;">X11 marking rules</h4>		<h4 style="text-align: center;">X21 marking rules</h4>

Table 1	CL	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	>34	Series
	Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b
Table 2	Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.																
	Code	A	B	C	D	E	F	G	H	I	J	K	L																

# Emboss Taping and Reel Specifications

[ Crystal Units ]

[ M . C . F . Units ]



**Carrier Type Dimensions ( unit : mm ) ±0.3mm**

	A	B	C	D	E	F	G	H	I	pcs / reel
X11	8.00	1.79	1.39	4.00	0.45	0.25	4.00	Ø 1.50	1.75	3000
X21	8.00	2.30	1.90	4.00	0.60	0.20	4.00	Ø 1.50	1.75	3000
X22	8.00	2.80	2.25	4.00	1.10	0.30	4.00	Ø 1.50	1.75	3000
X32	8.00	3.40	2.70	4.00	1.40	0.25	4.00	Ø 1.50	1.75	3000
X2012	8.00	2.25	1.45	4.00	0.75	0.25	4.00	Ø 1.50	1.75	3000
X3215	12.00	3.40	1.70	4.00	1.00	0.30	4.00	Ø 1.50	1.75	3000
MJ	12.00	5.30	3.60	8.00	1.40	0.30	4.00	Ø 1.50	1.75	1000
MQ	16.00	7.20	5.40	8.00	1.80	0.30	4.00	Ø 1.50	1.75	1000
M49	24.00	15.00	5.00	12.00	4.25	0.40	4.00	Ø 1.50	1.75	1000
ML49	24.00	14.80	5.00	12.00	3.50	0.40	4.00	Ø 1.50	1.75	1000
MP4 ( 24 )	24.00	13.30	5.10	12.00	4.20	0.40	4.00	Ø 1.50	1.75	1000
MP5 ( 25 )	24.00	13.40	5.10	12.00	5.20	0.40	4.00	Ø 1.50	1.75	1000

**Reel Dimensions ( unit : mm ) +2.0 / -0.0mm**

	J	K	L	P	Q	R	pcs / reel
X11	180.00	9.00	12.00	13.20	2.10	-	3000
X21	180.00	9.00	12.00	13.20	2.10	-	3000
X22	180.00	9.00	12.00	13.20	2.10	-	3000
X32	180.00	9.00	12.00	13.20	2.10	-	3000
X2012	180.00	9.00	12.00	13.20	2.10	-	3000
X3215	180.00	13.00	16.00	13.20	2.50	-	3000
MJ	180.00	13.00	16.00	13.20	2.50	-	1000
MQ	180.00	17.20	19.30	13.30	2.20	22.00	1000
M49	330.00	24.50	29.10	13.00	2.20	17.30	1000
ML49	330.00	24.50	29.10	13.00	2.20	17.30	1000
MP4 ( 24 )	330.00	24.50	29.10	13.00	2.20	17.30	1000
MP5 ( 25 )	330.00	24.50	29.10	13.00	2.20	17.30	1000