

# Quartz Crystals

<b>X11</b>	<b>X21</b>	<b>X22</b>	<b>X32</b>	<b>Surface Mount</b>	<b>X11, X21, X22, X32</b> <b>Fundamental</b>	<b>X22, X32</b> <b>3rd Overtone</b>
1.65 * 1.25 * 0.30	2.05 * 1.65 * 0.50	2.55 * 2.05 * 0.60	3.20 * 2.50 * 0.70			

## Features

### Specifications

- The entire package can be grounded via the top metal lid and the two bottom pads
- Small footprint. Ideal for space constrained applications
- Exhibits extremely low aging with a high shock & vibration resistance



### General Specifications

Item / Type	X11	X21	X22	X32
Package Dimensions	( 1.65 * 1.25 * 0.30 mm )	( 2.05 * 1.65 * 0.50 mm )	( 2.55 * 2.05 * 0.60 mm )	( 3.20 * 2.50 * 0.70 mm )
Frequency Range	24.0 ~ 96.0 MHz ( Fund. )	16.0 ~ 64.0 MHz ( Fund. )	12.0 ~ 80.0 MHz ( Fund. ) 50 ~ 200 MHz ( 3rd Overtone )	8 ~ 96.0 MHz ( Fund. ) 50 ~ 200 MHz ( 3rd Overtone )
Crystal Cut // Load Capacitance	AT - Cut // Series or Parallel ( 8 to 32 pF ) resonance			
Drive Level	10 $\mu$ W ( typ. ) 100 $\mu$ W ( max. )			
Frequency Tolerance	$\pm$ 10 ppm , $\pm$ 20 ppm or $\pm$ 30 ppm ( max. ) at 25°C			
Aging	$\Delta$ F / F : $\pm$ 3 ppm / year ( max. )			
Storage Temperature Range	- 50°C to 125°C			

### ESR ( Equivalent Series Resistance )

X11		X21		X22			X32		
Frequency Range	E. S. R.	Frequency Range	E. S. R.	Frequency Range	E. S. R.	Oscillator Mode	Frequency Range	E. S. R.	Oscillator Mode
24.0 ~ 29.9 MHz	120 $\Omega$ max.	16.0 ~ 23.9 MHz	120 $\Omega$ max.	12.0 ~ 15.9 MHz	150 $\Omega$ max.	Fund. Mode	8.0 ~ 9.9 MHz	500 $\Omega$ max.	Fund. Mode
30.0 ~ 39.9 MHz	100 $\Omega$ max.	24.0 ~ 29.9 MHz	100 $\Omega$ max.	16.0 ~ 29.9 MHz	80 $\Omega$ max.		10.0 ~ 11.9 MHz	200 $\Omega$ max.	
40.0 ~ 96.0 MHz	80 $\Omega$ max.	30.0 ~ 37.9 MHz	80 $\Omega$ max.	30.0 ~ 80.0 MHz	60 $\Omega$ max.		12.0 ~ 29.9 MHz	80 $\Omega$ max.	
		38.0 ~ 64.0 MHz	60 $\Omega$ max.	50.0 ~ 200.0 MHz	80 $\Omega$ max.	3rd Overtone	30.0 ~ 96.0 MHz	40 $\Omega$ max.	
							50.0 ~ 200.0 MHz	60 $\Omega$ max.	3rd Overtone

### Frequency stability Vs Operating temperature range

Frequency stability Vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	$\pm$ 5	$\pm$ 10	$\pm$ 15	$\pm$ 20	$\pm$ 25	$\pm$ 30
X	-10 to 60°C	▲	○	○	○	○	○
Y	-20 to 70°C		○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available

▲ : contact Mercury

### Outline Dimensions ( Unit : mm )

X11			X21		
<p>Top View</p>	<p>Bottom View</p>	<p>Suggested Layout</p>	<p>Top View</p>	<p>Bottom View</p>	<p>Suggested Layout</p>
<p>Pad Connections : Pad 1 and 3 : Crystal ; Pad 2 and 4 : Ground Chamfered pad is pad No. 4</p>			<p>Pad Connections : Pad 1 and 3 : Crystal ; Pad 2 and 4 : Ground Chamfered pad is pad No. 4</p>		
X22			X32		
<p>Top View</p>	<p>Bottom View</p>	<p>Suggested Layout</p>	<p>Top View</p>	<p>Bottom View</p>	<p>Suggested Layout</p>
<p>Pad Connections : Pad 1 and 3 : Crystal ; Pad 2 and 4 : Ground Chamfered pad is pad No. 1</p>			<p>Pad Connections : Pad 1 and 3 : Crystal ; Pad 2 and 4 : Ground Chamfered pad is pad No. 1 or 4</p>		

# Quartz Crystals

**MJ**

5.0 \* 3.2 \* 0.9

**MQ**

7.0 \* 5.0 \* 1.0

Surface Mount

MJ, MQ

Fundamental

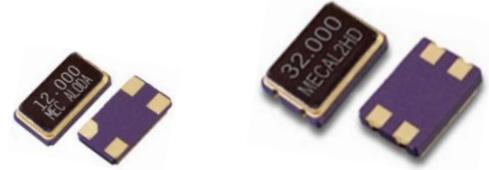
MJ, MQ

3rd Overtone

## Features

### Specifications

- Exhibits extremely low aging with a high shock and vibration resistance
- The entire package can be grounded via the top metal lid and the two bottom pads



## General Specifications

Item / Type	MJ series	MQ series
Package Dimensions	( 5.0 * 3.2 * 0.9 mm )	( 7.0 * 5.0 * 1.0 mm )
Frequency Range	8.0 ~ 52.0 MHz ( Fund. )	6.0 ~ 50.0 MHz ( Fund. )
	50.0 ~ 200.0 MHz ( 3rd )	45.0 ~ 200.0 MHz ( 3rd )
Crystal Cut	AT - Cut ; 3rd overtone	
Load Capacitance	Series or Parallel ( 8 to 32 pF ) resonance	
Drive Level	10 $\mu$ W ( typ. ) 100 $\mu$ W ( max. )	
Frequency Tolerance	$\pm$ 10 ppm , $\pm$ 20 ppm or $\pm$ 30 ppm ( max. ) at 25°C	
Aging	$\Delta$ F / F : $\pm$ 3 ppm / year ( max. )	
Storage Temp. Range	- 50°C to 125°C	

## ESR ( Equivalent Series Resistance )

MJ			MQ		
Freq. ( MHz )	E.S.R.	Mode	Freq. ( MHz )	E.S.R.	Mode
8.0 ~ 9.9	100 $\Omega$	Fund.	6.0 ~ 8.0	80 $\Omega$	Fund.
10.0 ~ 14.9	60 $\Omega$		8.1 ~ 11.0	60 $\Omega$	
15.0 ~ 19.9	50 $\Omega$		11.1 ~ 14.0	50 $\Omega$	
20.0 ~ 52.0	40 $\Omega$		14.1 ~ 50.0	40 $\Omega$	
50.0 ~ 200.0	80 $\Omega$	3rd	40.1 ~ 45.0	60 $\Omega$	3rd
			45.1 ~ 200.0	80 $\Omega$	

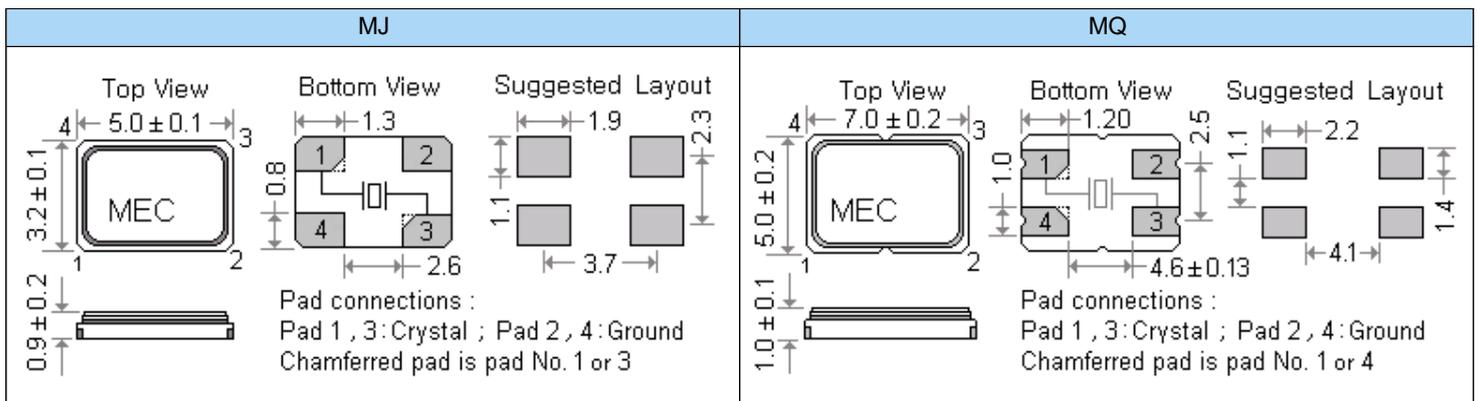
## Frequency stability Vs Operating temperature range

Frequency stability vs Operating temperature range							
Stability code	Temp. (°C) \ ppm	$\pm$ 5	$\pm$ 10	$\pm$ 15	$\pm$ 20	$\pm$ 25	$\pm$ 30
X	-10 to 60°C	○	○	○	○	○	○
Y	-20 to 70°C	▲	○	○	○	○	○
I	-40 to 85°C			○	○	○	○

○ : available

▲ : contact Mercury

## Outline Dimensions ( Unit : mm )



# 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 and Example

	[ 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> </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>Lot code                      ( month ) : Table 2                      ( Year ) :                      ex: 2024 - 4                      Load capacitance ( CL ) : Table 1</p>	<p>( Cutting method ) :                      A : AT-cut , fundamental                      B : BT-cut , fundamental                      3 : AT-cut , 3rd overtone                      5 : AT-cut , 5rd overtone</p>	<p>X21 marking rules</p>

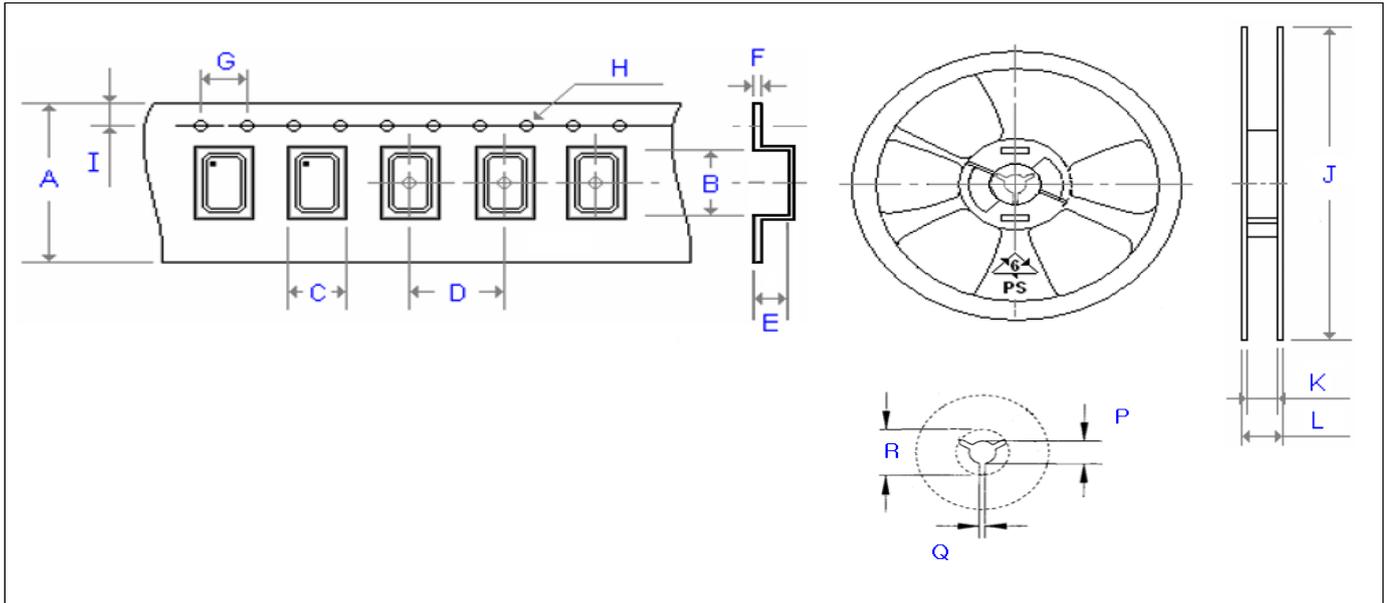
Table 1	CL	< 10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	>34	Series
	Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b

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