

# Quartz Crystals

**X11**

[1.6 \* 1.2 \* 0.4 mm]

**X21**

[2.0 \* 1.6 \* 0.5 mm]

**X22**

[2.5 \* 2.0 \* 0.6 mm]

**X32**

[3.2 \* 2.5 \* 0.7 mm]

Surface Mount

X11, X21, X22, X32

Fundamental

X32

3rd Overtone

**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 ( 1.6 * 1.2 * 0.4 mm )	X21 ( 2.0 * 1.6 * 0.5 mm )	X22 ( 2.5 * 2.0 * 0.6 mm )	X32 ( 3.2 * 2.5 * 0.7 mm )
Frequency Range	24.0 ~ 48.0 MHz ( Fund. )	20.0 ~ 54.0 MHz ( Fund. )	12.0 ~ 60.0 MHz ( Fund. )	8 ~ 54.0 MHz ( Fund. ) 40 ~ 200 MHz ( 3rd Overtone )
Crystal Cut // Load Capacitance	AT - Cut // Series or Parallel ( 8 to 32 pF ) resonance			
Drive Level	10 µW ( typ.) 100 µW ( max.)			
Frequency Tolerance	± 10 ppm, ± 20 ppm or ± 30 ppm ( max.) at 25°C			
Aging	ΔF / F : ± 3 ppm / year ( max.)			
Storage Temperature Range	- 50°C to 105°C			

**ESR ( Equivalent Series Resistance )**

X11		X21		X22		X32		
Frequency Range	E. S. R.	Frequency Range	E. S. R.	Frequency Range	E. S. R.	Frequency Range	E. S. R.	Oscillator Mode
24.0 ~ 29.9 MHz	120 Ω max.	20.0 ~ 23.9 MHz	120 Ω max.	12.0 ~ 15.9 MHz	300 Ω max.	8.0 ~ 9.9 MHz	600 Ω max.	Fund. Mode
30.0 ~ 39.9 MHz	100 Ω max.	24.0 ~ 29.9 MHz	100 Ω max.	16.0 ~ 29.9 MHz	100 Ω max.	10.0 ~ 11.9 MHz	200 Ω max.	
40.0 ~ 48.0 MHz	80 Ω max.	30.0 ~ 37.9 MHz	80 Ω max.	30.0 ~ 60.0 MHz	70 Ω max.	12.0 ~ 29.9 MHz	100 Ω max.	
		38.0 ~ 54.0 MHz	60 Ω max.			30.0 ~ 54.0 MHz	60 Ω max.	3rd Overtone
						40.0 ~ 200 MHz	80 Ω max.	

**Frequency stability Vs Operating temperature range**

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

○ : available

▲ : contact MATEL

**Outline Dimensions ( Unit : mm )**

X11				X21			
<p>Pad Connections : Pad 1 and 3 : Crystal Chamfered pad is pad No. 4</p>				<p>Pad Connections : Pad 1 and 3 : Crystal Chamfered pad is pad No. 2</p>			
X22				X32			
<p>Pad Connections : Pad 1 and 3 : Crystal Chamfered pad is pad No. 1 or 3</p>				<p>Pad Connections : Pad 1 and 3 : Crystal Chamfered pad is pad No. 1 or 4</p>			



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# Part Number Formats and Product Marking Rules

## Quartz Crystals

### Holder Type

SMD type :	X11	X21	X22	X32	X42	MJ	MF	MQ	M49	ML49	MP5	MP4	MP25	MP24
Dip type :	H49	HUS	HUSL	U1	U5	T38	T26							
Jacket type :	H49MJ	49TMJ	U1MJ	U5MJ	T26MJ									
Gull wing :	H49SM	49TSM	U1SM	U5SM	T26SM									

### 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

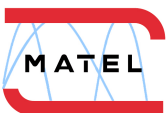
- Ex (1) : H49 - 40.000A3 - 12 - 30 / 30 X [ 49/U type , 40.000MHz , AT-cut 3rd overtone , 12pF , ±30ppm ( 25°C ) , ±30ppm ( -10°C to 60°C ) ]  
 Ex (2) : X32 - 26.000 - 16 - 30 / 30 X / 20R [ X32 type , 26.000MHz , 16pF , ±30ppm ( 25°C ) , ±30ppm ( -10°C to 60°C ) , 20 Ω ]  
 Ex (3) : MJ - 12.000 - 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
[ 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
[ 7 ]	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, MF, MJ, X42 marking rules	X22, X32 marking rules
<p>( Cutting method ) :  <b>A</b> : AT-cut ( fundamental )  <b>B</b> : BT-cut ( fundamental )  <b>3</b> : AT-cut ( 3rd overtone )  <b>5</b> : AT-cut ( 5th overtone )</p>	<p>( Cutting method ) :  <b>A</b> : AT-cut , fundamental  <b>B</b> : BT-cut , fundamental  <b>3</b> : AT-cut , 3rd overtone  <b>5</b> : AT-cut , 5th overtone</p>	
<h4>X11 marking rules</h4>		<h4>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																



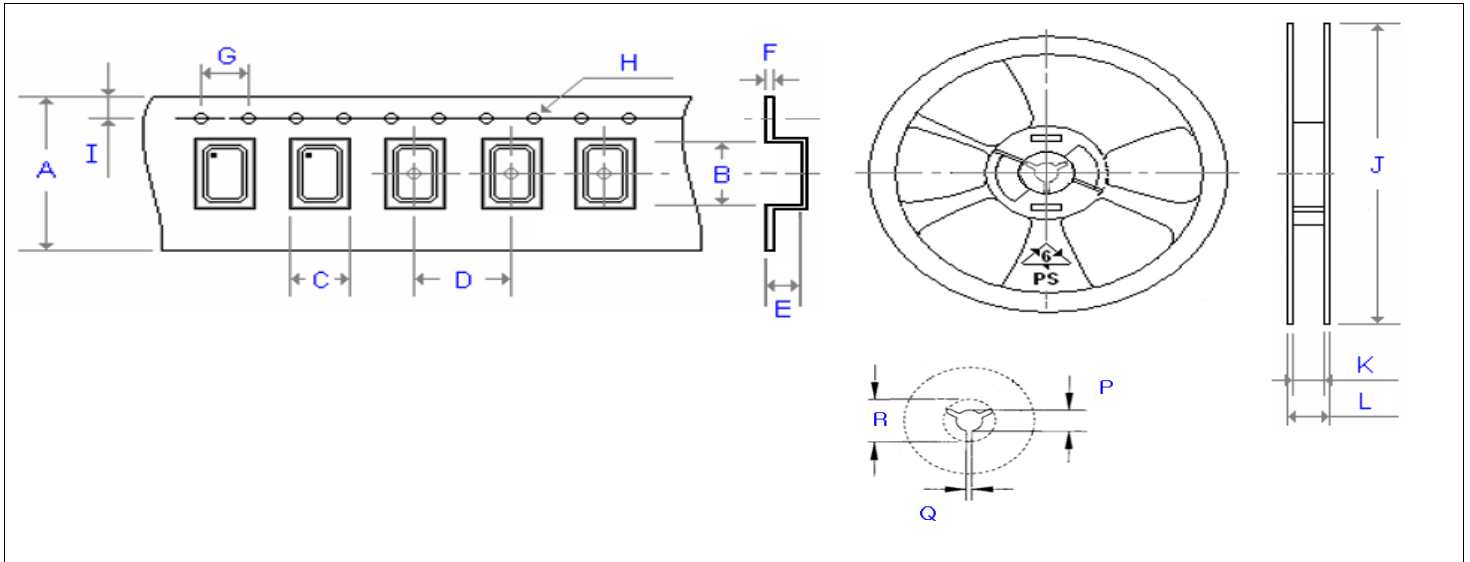
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## Emboss Taping and Reel Specifications

[ Crystal Units ]

[ M . C . F . Units ]

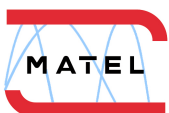


Carrier Type Dimensions ( unit : mm ) ±0.3mm

	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
X42	12.00	4.30	2.80	8.00	1.00	0.30	4.00	Ø 1.50	1.75	1000
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	1.75	4.00	0.87	0.32	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
MF	16.00	6.30	4.00	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 ) ±2mm

	J	K	L	P	Q	R	pcs / reel
X11	180.0	8.4	11.4	13.0	2.5	20.2	3000
X21	180.0	8.4	11.4	13.0	2.5	20.2	3000
X22	180.0	8.4	11.4	13.0	2.5	20.2	3000
X32	180.0	9.0	12.0	13.0	2.5	20.2	3000
X42	180.0	13.0	16.0	13.0	2.5	20.2	1000
X2012	180.0	9.0	11.4	13.0	2.5	20.2	3000
X3215	180.0	13.0	15.4	13.0	2.5	20.2	3000
MJ	180.0	13.0	16.0	13.0	2.5	20.2	1000
MF	180.0	17.2	19.3	13.0	2.5	20.2	1000
MQ	180.0	17.2	19.3	13.0	2.5	20.2	1000
M49	330.0	24.5	29.1	13.0	2.5	20.2	1000
ML49	330.0	24.5	29.1	13.0	2.5	20.2	1000
MP4 ( 24 )	330.0	24.5	29.1	13.0	2.5	20.2	1000
MP5 ( 25 )	330.0	24.5	29.1	13.0	2.5	20.2	1000



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