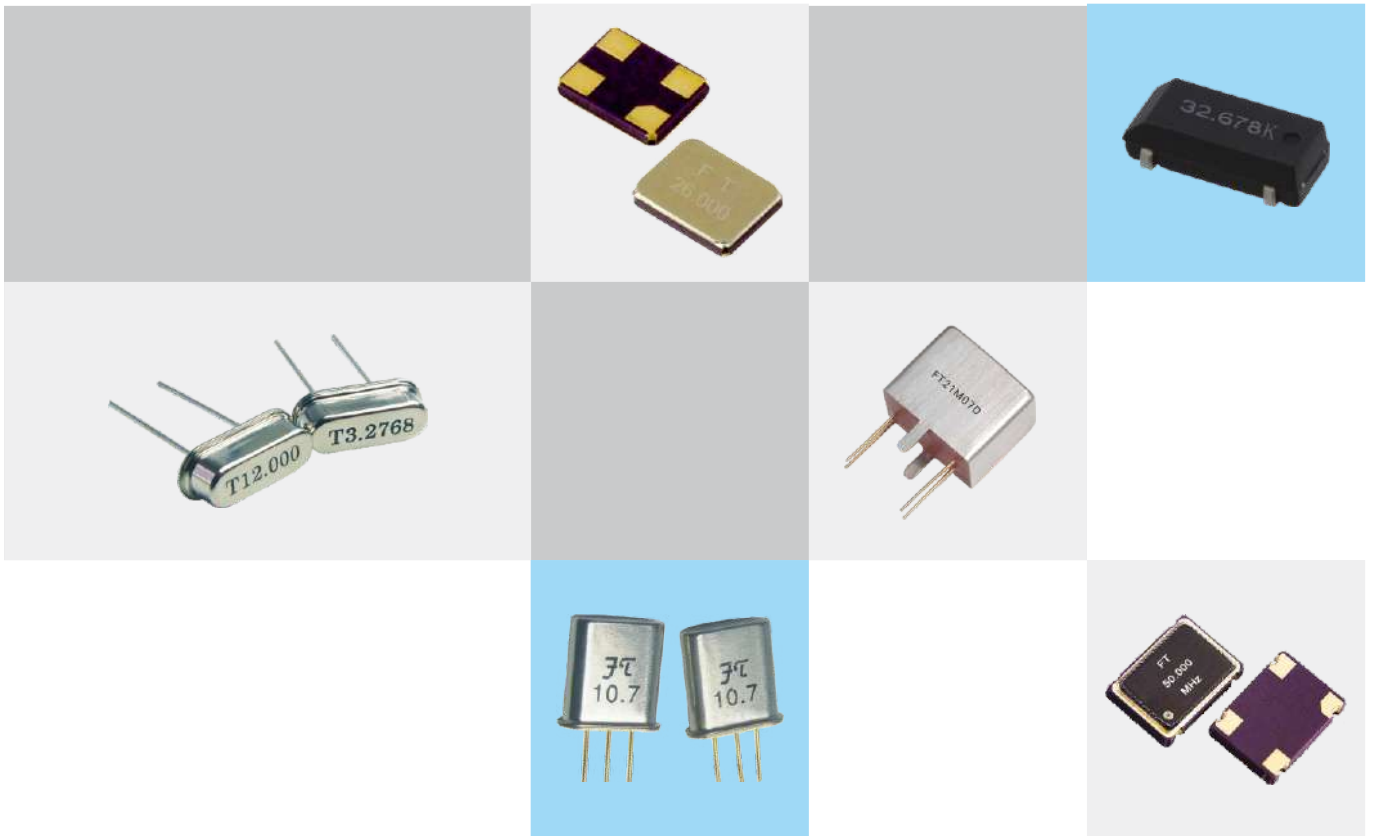




# Chip Sun Technology Co.,Ltd



## Chip Sun Technology Co., Ltd.

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# Part No. Instruction

## FTX13.824M20S-20/20B: 49S 13.824MHz 20pF/±20ppm/±20ppm -20~70C

FT	X	13.824M	20	S	-	20	/	20	B
Brand	Crystal resonator	Frequency	Loading capacitance	Package	Connector	Frequency tolerance	Partition	Frequency stability	Operating temperature range:
FT	X: "quartz crystal resonator".	The unit is M or K. 13.824M is 13.824MHz 32.768K is 32.768KHz	20: 20PF; 0: non-loaded;	Table 1		20 : ±20ppm		20 : ±20ppm	A: -10℃~+60℃ B: -20℃~+70℃ C: -30℃~+85℃ D: -40℃~+85℃ E: Customize
* Table 1:Package									
49S Series	S	HC-49S							
	S1	HC-49S (Pin Length)							
	S22	HC-49S-2.2mm (Shell height)							
	S25	HC-49S-2.5mm (Shell height)							
	S3P	HC-49S 3PIN							
HC-49SMD Series	SM	HC-49SMD							
	SM30	HC-49SMD3.0mm (Shell height)							
	SM35	HC-49SMD3.5mm (Shell height)							
	SM3P	HC-49SMD (3PIN)							
	SM4P	HC-49SMD (4PAD)							
	U	HC-49U							
	T	HC-49T							
UM Series	U1	UM-1							
	U5	UM-5							
AT Series	A6	AT2.0*6.0mm							
	A8	AT3.0*8.0mm							
	A9	AT3.0*9.0mm							
	A10	AT3.0*10.0mm							
KHz Series	D8	DT3.0*8.0mm							
	SM8	SMD8.0*3.8mm							
	FM206	FM206							
	SM3	SMD3.2*1.5 (FC-135)							
	SM7	SMD7*1.4 (MC146)							
	FM206A	DT26 (Bends and ironshell)							
	D5	DT1.0*5.0mm							
D6	DT2.0*6.0mm								
SMD Series	SM12	SMD12.5*4.6mm							
	SM7S	SMD7.0*5.0mm							
	SM6S	SMD6.0*3.5mm							
	SM6SA	SMD6.0*3.5mm Seam Seal 2PAD							
	SM5S	SMD5.0*3.2mm							
	SM5SA	SMD5.0*3.2mm Seam Seal 2PAD							
	SM5G	SMD5.0*3.2mm Glass Seal							
	SM5GA	SMD5.0*3.2mm Glass Seal 2PAD							
	SM4S	SMD4.0*2.5mm							
	SM3S	SMD3.2*2.5mm							
	SM3G	SMD3.2*2.5mm Glass Seal							
	SM2S	SMD2.5*2.0mm							
	SM2A	SMD2.0*1.6mm							
	SM1S	SMD1.6*1.2mm							

## FXO50.000M3.3H-50D:

OSC-DIP8 50.000MHz 3.3V ±50ppm Overall -40~85CFor

## FTO26.000M3.0SM3-1.0/2.0C:

TCXO-SMD3225 26.000MHz 3.0V ±1.0ppm/ ±2.0ppm -30~85C

F	TO	26.000M	3.0	SM3	-	1.0	/	2.5	C
Brand	Crystal oscillator	Frequency	Voltage	Holder type	Connector	Frequency tolerance:	Partition	Frequency stability	Operating temperature range:
F	Table 2	The unit is M or K. For example: 3.579M is 3.579545MHz	1.8V: 1.8; 2.5: 2.5V; 3.0: 3.0V; 3.3: 3.3V;	Table 3		1.0 : ±1.0ppm		2.5: ±2.5ppm	Temperature Range A: -10℃~+60℃ B: -20℃~+70℃ C: -30℃~+85℃ D: -40℃~+85℃ E: Customize
Table 1									
Crystal oscillator									
Oscillator	XO								
VCXO	VO								
TCXO	TO								
VCTCXO	VTO								
Table 3									
H	DIP8								
F	DIP14								
SM7	SMD7.0*5.0mm								
SM5	SMD5.0*3.2mm								
SM3	SMD3.2*2.5mm								
SM2	SMD2.5*2.0mm								
SM2A	SMD2.0*1.6mm								

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DIP Khz Crystal	P22-P25
SMD MHZ Crystal	P26-P53
SMD KHZ Crystal	P54-P65
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SMD Oscillator	P70-P79
TCXO Oscillator	P80-P85
VCTCXO Oscillator	P86-P89
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HC-49U	P4~P5
HC-49S	P6~P7
HC-49S 3PIN	P8~P9
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UM-5	P12~P13
AT2.0*6.0mm	P14~P15
AT3.0*8.0mm	P16~P17
AT3.0*9.0mm	P18~P19
AT3.0*10.0mm	P20~P21
DT2.0*6.0mm	P22~P23
DT3.0*8.0mm	P24~P25
HC-49SMD	P26~P27
HC-49SMD 3PIN	P28~P29
SMD1.6*1.2mm	P30~P31
SMD2.0*1.6mm	P32~P33
SMD2.5*2.0mm	P34~P35
SMD3.2*2.5mm	P36~P37
SMD4.0*2.5mm	P38~P39
SMD5.0*3.2mm	P40~P41
SMD5.0*3.2mm Glass 2PAD	P42~P43
SMD5.0*3.2mm Seam 2PAD	P44~P45
SMD6.0*3.5mm	P46~P47
SMD6.0*3.5mm Seam 2PAD	P48~P49
SMD7.0*5.0mm	P50~P51
SMD12.5*4.6mm	P52~P53
SMD1.6*1.0mm	P54~P55
SMD2.0*1.2mm	P56~P57
SMD3.2*1.5mm	P58~P59
SMD7.0*1.5mm	P60~P61
SMD8.0*3.8mm	P62~P63
FM206	P64~P65
DIP8	P66~P67
DIP14	P68~P69
OSC SMD2.0*1.6mm	P70~P71
OSC SMD2.5*2.0mm	P72~P73
OSC SMD3.2*2.5mm	P74~P75
OSC SMD5.0*3.2mm	P76~P77
OSC SMD7.0*5.0mm	P78~P79
TCXO SMD2.0*1.6mm	P80~P81
TCXO SMD2.5*2.0mm	P82~P83
TCXO SMD3.2*2.5mm	P84~P85
VCTCXO SMD3.2*2.5mm	P86~P87
VCTCXO SMD5.0*3.2mm	P88~P89
2 Poles Crystal filter	P90
4 Poles Crystal filter	P91
Multi Poles Crystal Filter	P92

**DIP QUARTZ CRYSTAL RESONATOR**

**Dip Crystal 11.4×4.8 mm HC-49U**

- Wave Soldering Temperature: 265°C max
- highly stable and reliable crystal unit with a metallic package
- Taped Version Available

 RoHS  
2002/95/

RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	1.8~100MHz
Operation Mode	(1.8~36MHz) Fundamental (27~100MHz) 3rd Overtone
Loading Capacitance	20pF Std. 8 to 33pF, Series available
Drive Level	100 μ W (500 μ W max)
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	±10ppm ~ ±50ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-40 ~ +85°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±10ppm	±20ppm	±30ppm	±50ppm
0°C~+50°C	○	●	○	○
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
1.800-1.999MHz	AT CUT/FUND.	600Ω (max)
2.000-2.399MHz	AT CUT/FUND.	450Ω (max)
2.400-2.999MHz	AT CUT/FUND.	350Ω (max)
3.000-3.499MHz	AT CUT/FUND.	150Ω (max)
3.500-3.999MHz	AT CUT/FUND.	90Ω (max)
4.000-6.999MHz	AT CUT/FUND.	70Ω (max)
7.000-9.999MHz	AT CUT/FUND.	50Ω (max)
10.000-15.999MHz	AT CUT/FUND.	30Ω (max)
16.000-36.000MHz	AT CUT/FUND.	25Ω (max)
27.000-29.000MHz	AT 3rd /OT	30Ω (max)
30.000-100.00MHz	AT 3rd /OT	40Ω (max)

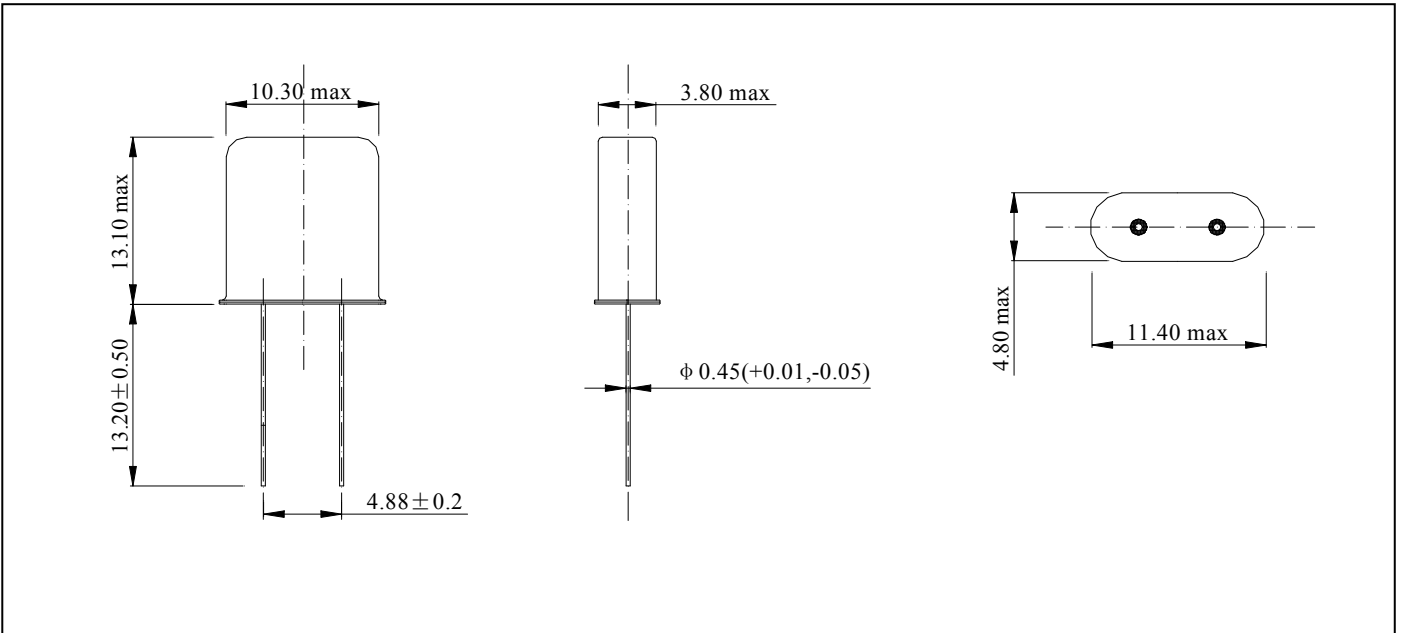
**★ PART NUMBER GUIDE**

e.g. FTX16.000M20U-30/30B (\*U=HC49U TYPE)

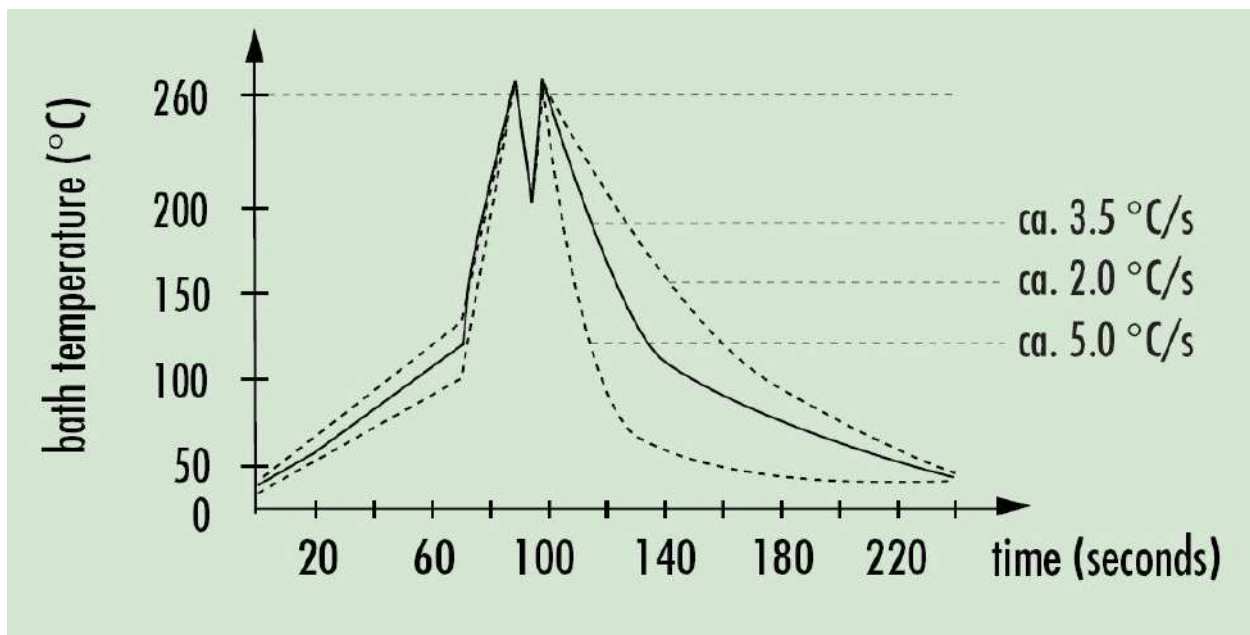
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	U	30	30	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ DIMENSIONS (Unit: mm)



★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**Dip Crystal 11.4×4.8 mm HC-49U/S**

- Package Height 3.5 mm max, 2.5~3.5 mm available
- Wave Soldering Temperature: 265°C max
- highly stable and reliable crystal unit with a metallic package
- Taped Version Available



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	3.5~100MHz
Operation Mode	(3.5 ~ 40MHz) Fundamental (27 ~ 100MHz) 3rd Overtone
Loading Capacitance	20pF Std. 8 to 33pF, Series available
Drive Level	100 μ W (500 μ W max)
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	±2.5ppm ~ ±50ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability					
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm	±50ppm
0°C~+50°C	○	○	○	●	○	○
-10°C~+60°C		○	○	●	○	○
-20°C~+70°C			○	○	●	○
-40°C~+85°C				○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

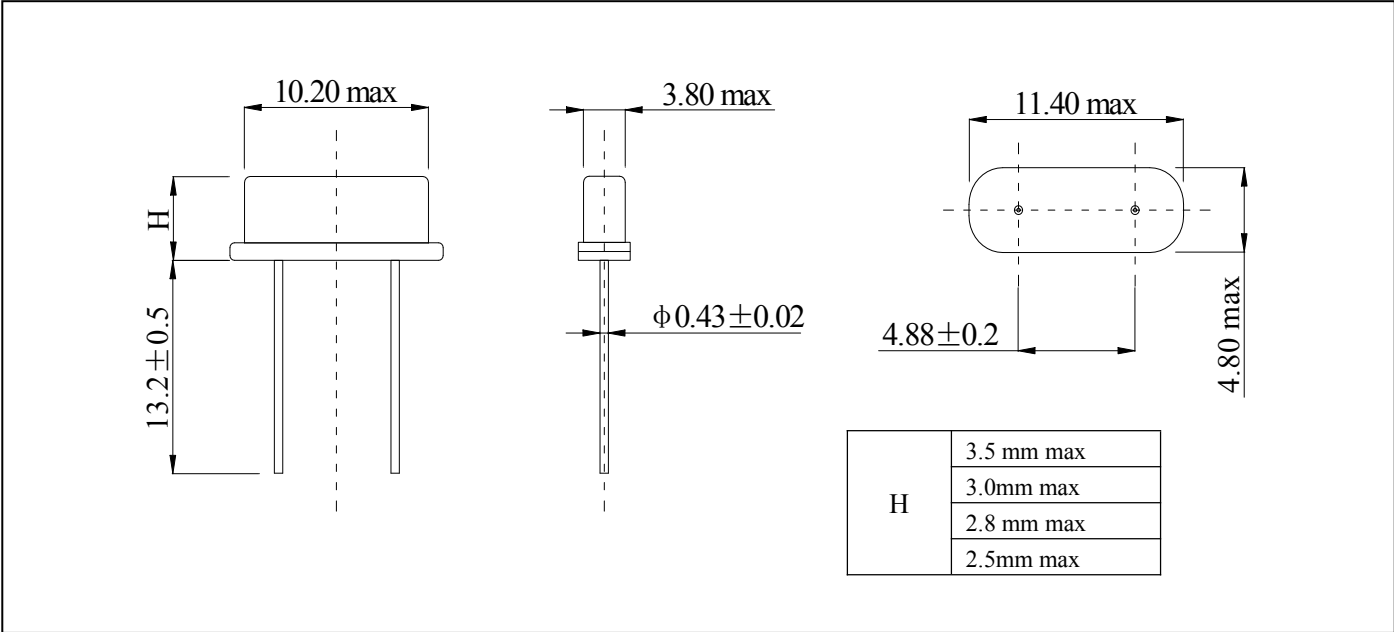
Frequency	Vibration Mode	ESR
3.2-3.999MHz	AT CUT/FUND.	150Ω (max)
4.000-4.499MHz	AT CUT/FUND.	120Ω (max)
4.500-5.999MHz	AT CUT/FUND.	100Ω (max)
6.000-7.999MHz	AT CUT/FUND.	80Ω (max)
8.000-9.999MHz	AT CUT/FUND.	60Ω (max)
10.000-11.999MHz	AT CUT/FUND.	50Ω (max)
12.000-13.999MHz	AT CUT/FUND.	40Ω (max)
14.000-40.000MHz	AT CUT/FUND.	30Ω (max)
27.000-100MHz	AT 3rd /OT	100Ω (max)

**★ PART NUMBER GUIDE** e.g. FTX16.000M20S-30/30B (\*S=HC49/S TYPE)

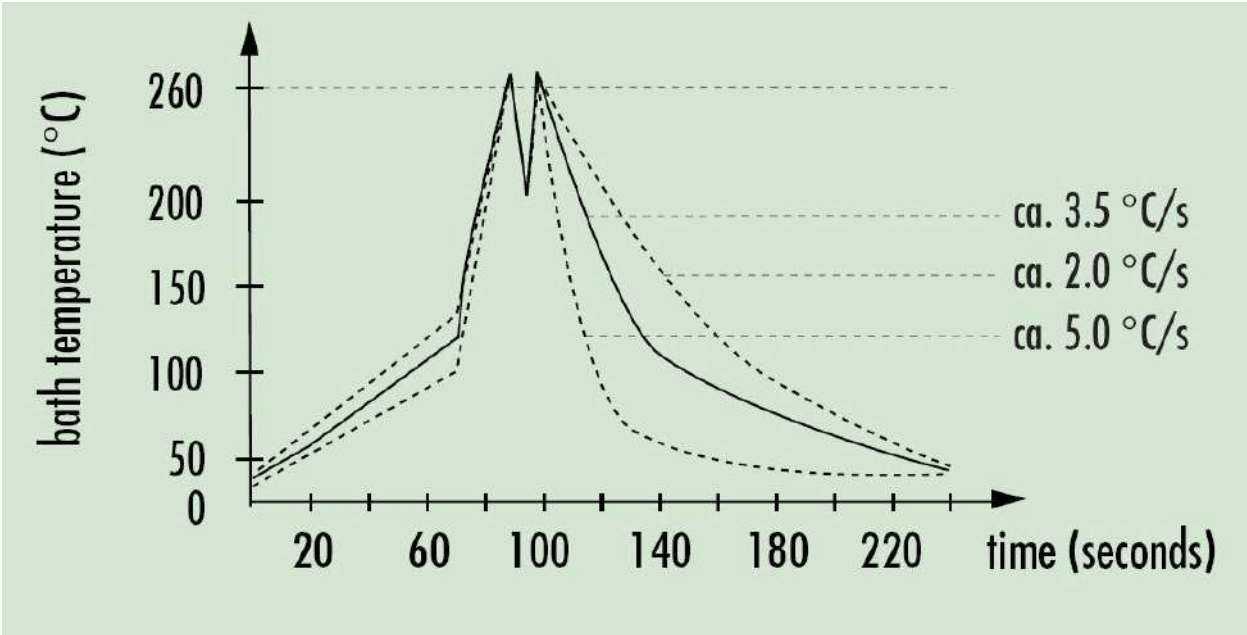
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	S	30	30	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ DIMENSIONS (Unit: mm)



★ WAVE SOLDERING PROFILE



## DIP QUARTZ CRYSTAL RESONATOR



### 3 Pin Dip Crystal 11.4×4.8 mm HC-49U/S-3PIN

- Package Height 3.5 mm max, 2.5~3.5 mm available
- Wave Soldering Temperature: 265°C max
- highly stable and reliable crystal unit with a metallic package
- 3 Pin with ground pin

RoHS  
2002/95/

RoHS compliant

#### ★ PARAMETERS

PARAMETERS	SPECIFICATION
Frequency Range	3.5 ~ 100MHz
Operation Mode	(3.5 ~ 40MHz) Fundamental (27 ~ 100MHz) 3rd/5rdOvertone
Loading Capacitance	20pF Std. 8 to 33pF , Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	±2.5ppm ~ ±50ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

© All specification subject change without notice.

#### ★ FREQUENCY STABILITY VS. TEMPERATURE

Operation Temperature Range	Frequency Stability					
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm	±50ppm
0°C~+50°C	○	○	○	●	○	○
-10°C~+60°C		○	○	●	○	○
-20°C~+70°C			○	○	●	○
-40°C~+85°C				○	○	●

● standard ○ available

#### ★ ESR (SERIES RESISTANCE RS)

Frequency	Vibration Mode	ESR
3.5-3.999MHz	AT CUT/FUND.	150Ω(MAX)
4.000-4.499MHz	AT CUT/FUND.	120Ω(MAX)
4.500-5.999MHz	AT CUT/FUND.	100Ω(MAX)
6.000-7.999MHz	AT CUT/FUND.	80Ω(MAX)
8.000-9.999MHz	AT CUT/FUND.	60Ω(MAX)
10.000-11.999MHz	AT CUT/FUND.	50Ω(MAX)
12.000-13.999MHz	AT CUT/FUND.	40Ω(MAX)
14.000-40.000MHz	AT CUT/FUND.	30Ω(MAX)
27.000-100MHz	AT 3rd /OT	100Ω(MAX)

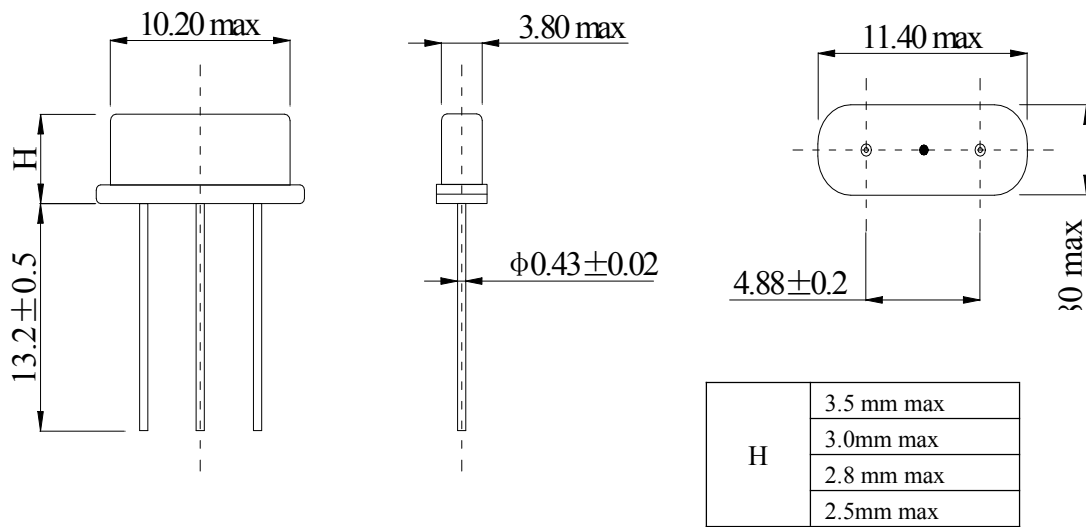
#### ★ PART NUMBER GUIDE e.g. FTX16.000M20S3P-30/30B (\*S3P=HC-49/S-3PIN TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	S3P	30	30	B

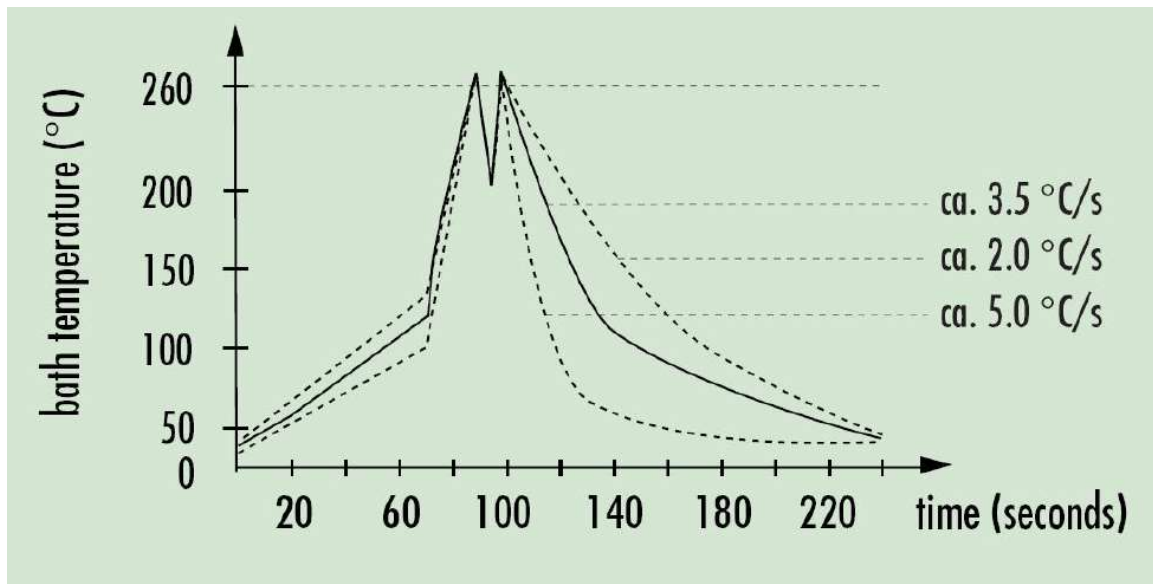


Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+80°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

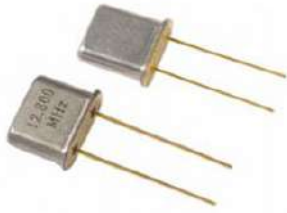
★ DIMENSIONS (Unit: mm)



★ WAVE SOLDERING PROFILE



## DIP QUARTZ CRYSTAL RESONATOR



### 2 Pin Dip Crystal 8.0×3.2 mm UM-1

- Resistance welded
- ±2.5ppm available
- Wide frequency range
- AT Cut



RoHS compliant

### ★ 1. PARAMETERS

PARAMETERS	SPECIFICATION
Frequency Range	8.0 ~ 200MHz
Operation Mode	See Table 3
Loading Capacitance	20pF Std. 8 to 33pF , Series available
Drive Level	100 μ W ( 500 μ W Max )
Frequency Tolerance	±5ppm ~ ±30ppm ( at 25°C )
Equivalent Resistance	See Table 3
Frequency Stability	±2.5ppm ~ ±30ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

◎ All specification subject change without notice.

### ★ 2.FREQUENCY STABILITY VS. TEMPERATURE

Operation Temperature Range	Frequency Stability				
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm
0°C~+50°C	○	○	○	○	○
-10°C~+60°C	○	○	●	○	○
-20°C~+70°C		○	○	●	○
-40°C~+85°C				○	●

● standard ○ available

### ★ 3. ESR (SERIES RESISTANCE RS)

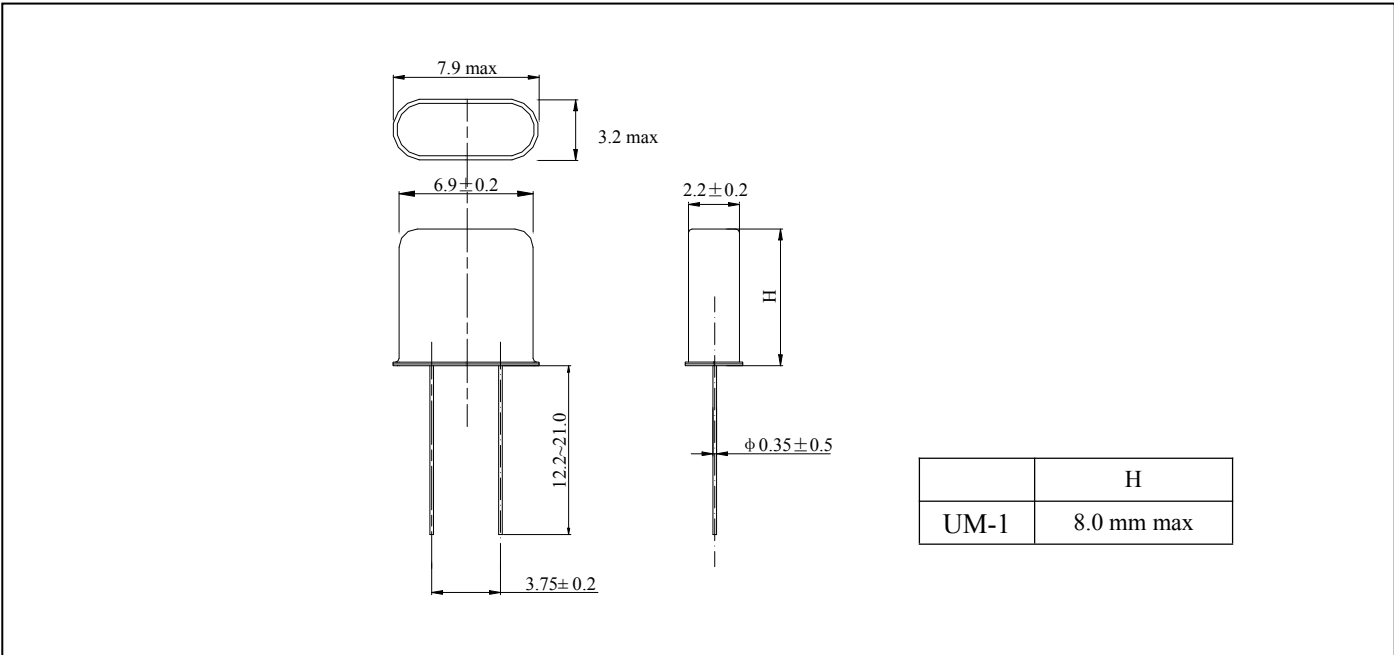
Frequency	Mode	UM-1 ( Ω max )	UM-5 ( Ω max )
8.0-15.0MHz	FUND.	40	
15.1-20.0MHz	FUND.	30	40
20.1-30.0MHz	FUND.	25	35
30.1-105.0MHz	3 <sup>rd</sup> Overtone	45	45
60.0-150.0MHz	5 <sup>th</sup> Overtone	100	100
150.0-200.0MHz	7 <sup>th</sup> Overtone	150	150

### ★ PART NUMBER GUIDE e.g. FTX16.000M20U1-10/10B (\*U1=UM-1)

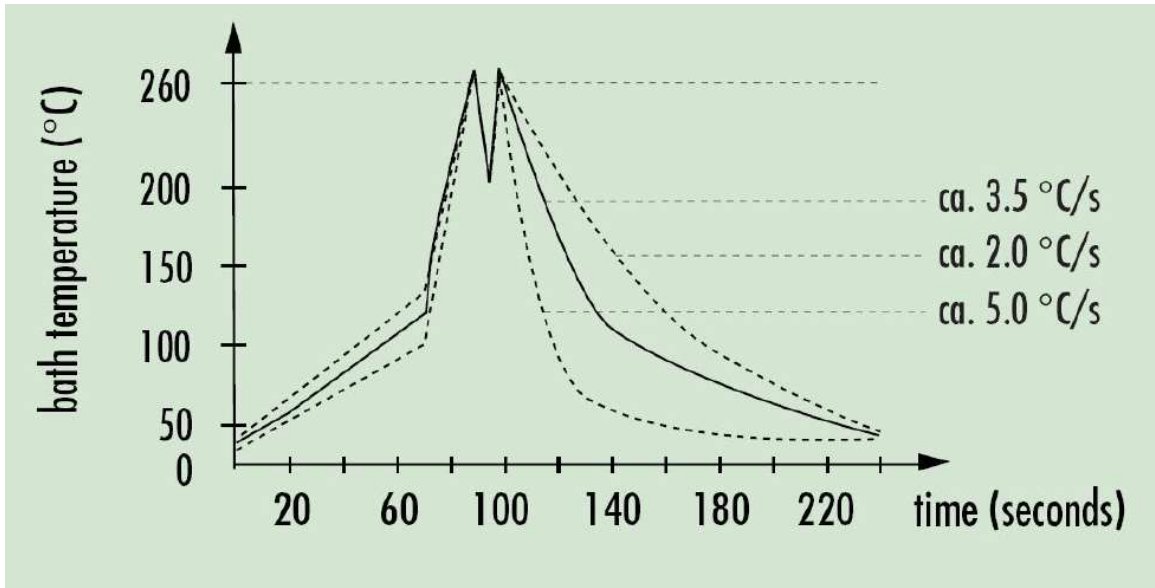
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	U1	10	10	B

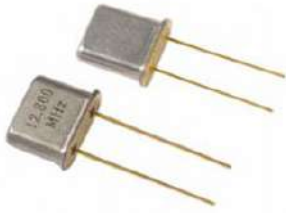
Definition	Description
Operating Temperature Range	A: 0~+50°C
	B: -10~+60°C
	C: -20~+70°C
	D: -40~+85°C
	E: Customer specified

★ DIMENSIONS (Unit: mm)



★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**

**2 Pin Dip Crystal 5.8×3.2 mm UM-5**

- Resistance welded
- ±2.5ppm available
- Wide frequency range
- AT Cut



RoHS compliant

**★ 1. PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	8.0 ~ 200MHz
Operation Mode	See Table 3
Loading Capacitance	20pF Std. 8 to 33pF , Series available
Drive Level	100 μ W ( 500 μ W Max )
Frequency Tolerance	±5ppm ~ ±30ppm ( at 25°C )
Equivalent Resistance	See Table 3
Frequency Stability	±2.5ppm ~ ±30ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

© All specification subject change without notice.

**★ 2.FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability				
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm
0°C~+50°C	○	○	○	○	○
-10°C~+60°C	○	○	●	○	○
-20°C~+70°C		○	○	●	○
-40°C~+85°C				○	●

● standard ○ available

**★ 3. ESR (SERIES RESISTANCE RS)**

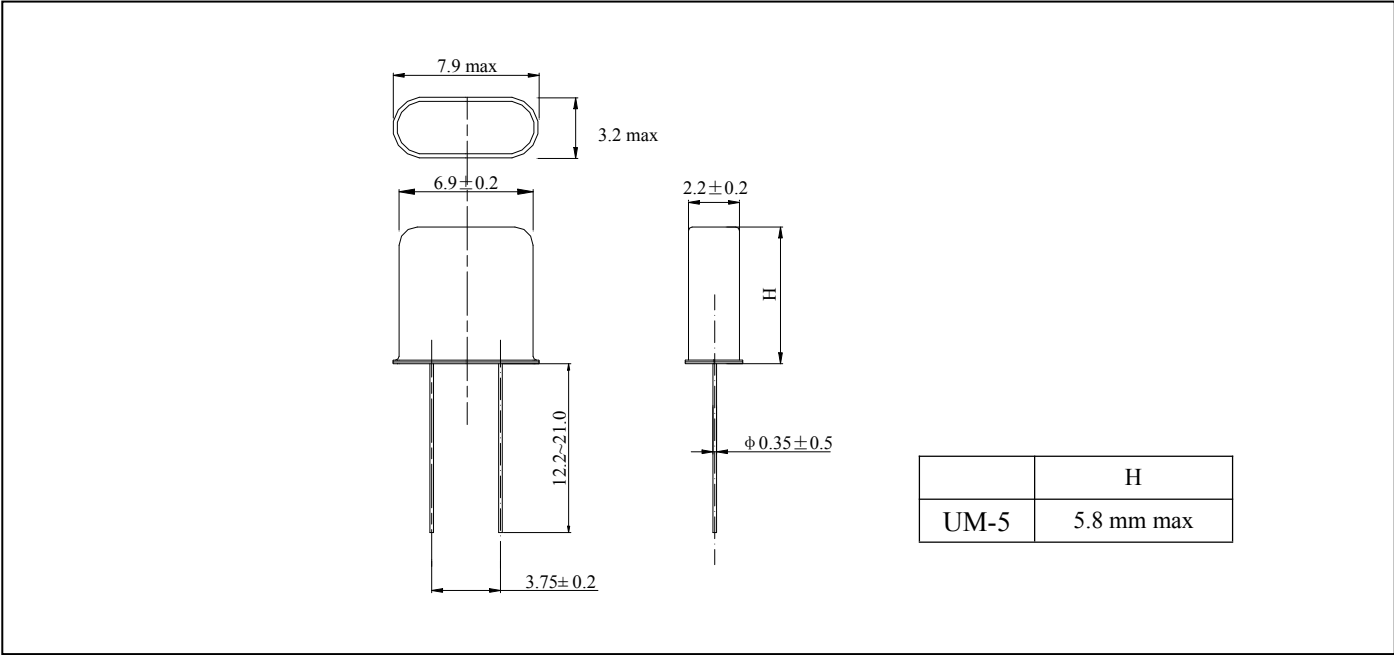
Frequency	Mode	UM-5 ( Ω max )
8.0-15.0MHz	FUND.	
15.1-20.0MHz	FUND.	40
20.1-30.0MHz	FUND.	35
30.1-105.0MHz	3 <sup>rd</sup> Overtone	45
60.0-150.0MHz	5 <sup>th</sup> Overtone	100
150.0-200.0MHz	7 <sup>th</sup> Overtone	150

**★ PART NUMBER GUIDE** e.g.FTX16.000M20U5-10/10B (\* U5=UM-5)

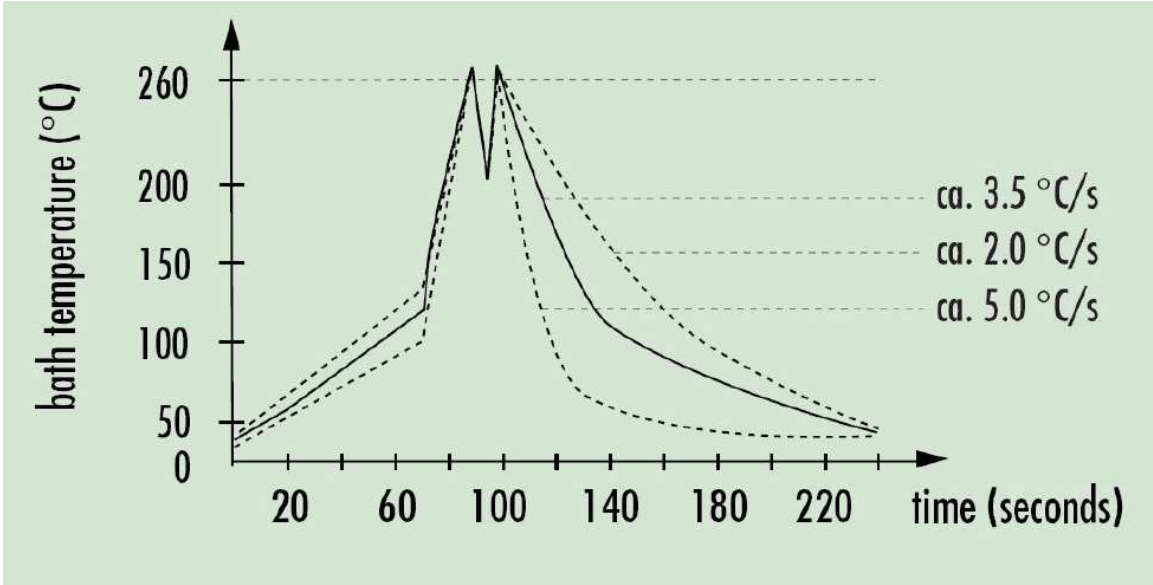
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	U5	10	10	B

Definition	Description
Operating Temperature Range	A: 0~+50°C
	B: -10~+60°C
	C: -20~+70°C
	D: -40~+85°C
	E: Customer specified

★ DIMENSIONS (Unit: mm)



★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**DIP Cylindrical Crystal MHz  $\phi$  2×6 mm**

- 2 x 6 mm cylinder type
- Small size
- $\pm 20$  ppm Standard
- With Insulation Sleeve Available



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	6.000~50.000MHz
Loading Capacitance	20pF Std. 7pF~33pF available
Drive Level	10 $\mu$ W (300 $\mu$ W Max)
Frequency Tolerance	$\pm 10$ ppm / $\pm 20$ ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	$\pm 10$ ppm~ $\pm 30$ ppm
Operating Temp. Range:	0~+50°C to -40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	$\pm 5$ ppm max

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

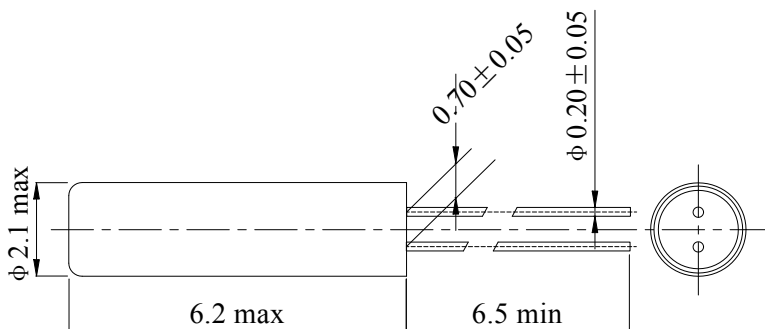
Operation Temperature Range	Frequency Stability			
	$\pm 10$ ppm	$\pm 20$ ppm	$\pm 30$ ppm	$\pm 50$ ppm
0°C~+50°C	○	●	○	○
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
6.000-7.999MHz	AT CUT/FUND.	150 $\Omega$ (MAX)
8.000-9.999MHz	AT CUT/FUND.	100 $\Omega$ (MAX)
10.000-11.999MHz	AT CUT/FUND.	80 $\Omega$ (MAX)
12.000-15.999MHz	AT CUT/FUND.	60 $\Omega$ (MAX)
16.000-19.999MHz	AT CUT/FUND.	50 $\Omega$ (MAX)
20.000-33.000MHz	AT CUT/FUND.	40 $\Omega$ (MAX)
30.000-50.000MHz	AT 3rd /OT	100 $\Omega$ (MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.

● Soldering

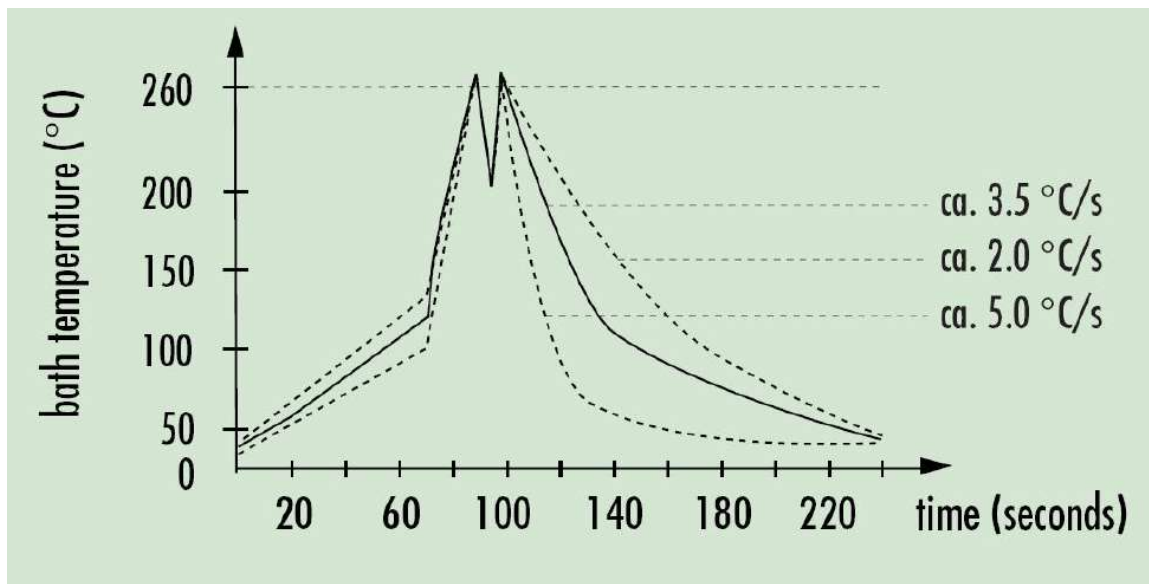
Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300°C

★ PART NUMBER GUIDE e.g. FTX20.000M20A6-20/30B (\*A6=AT 2.0×6.0mm)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	20.000M	20	A6	20	30	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**DIP Cylindrical Crystal MHz  $\phi$  3×8 mm**

- 3 x 8 mm cylinder type
- Small size
- $\pm 20$  ppm Standard
- With Insulation Sleeve Available



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	6.000~50.000MHz
Loading Capacitance	20pF Std. 7pF~33pF available
Drive Level	10 $\mu$ W (300 $\mu$ W Max)
Frequency Tolerance	$\pm 10$ ppm / $\pm 20$ ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	$\pm 10$ ppm~ $\pm 30$ ppm
Operating Temp. Range:	0~+50°C to -40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	$\pm 5$ ppm max

⊙ All specification subject change without notice.

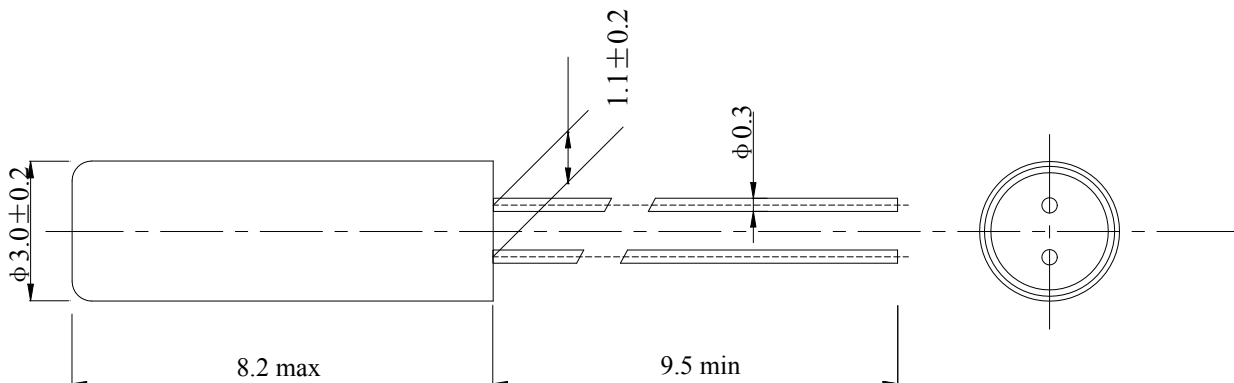
**★ FREQUENCY STABILITY VS. TEMPERATURE      ★ ESR (SERIES RESISTANCE RS)**

Operation Temperature Range	Frequency Stability			
	$\pm 10$ ppm	$\pm 20$ ppm	$\pm 30$ ppm	$\pm 50$ ppm
0°C~+50°C	○	●	○	○
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

Frequency	Vibration Mode	ESR
6.000-7.999MHz	AT CUT/FUND.	100 $\Omega$ (MAX)
8.000-9.999MHz	AT CUT/FUND.	80 $\Omega$ (MAX)
10.000-11.999MHz	AT CUT/FUND.	60 $\Omega$ (MAX)
12.000-15.999MHz	AT CUT/FUND.	50 $\Omega$ (MAX)
16.000-19.999MHz	AT CUT/FUND.	40 $\Omega$ (MAX)
20.000-33.000MHz	AT CUT/FUND.	30 $\Omega$ (MAX)
30.000-50.000MHz	AT 3rd /OT	100 $\Omega$ (MAX)

● standard ○ available

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**





● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.

● Soldering

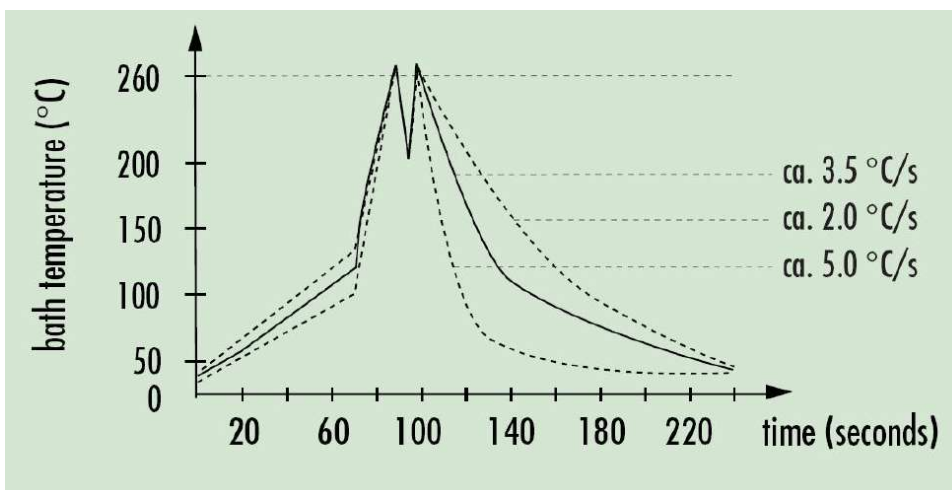
Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300°C

★ PART NUMBER GUIDE e.g. FTX20.000M20A8-20/30B (\*A8=AT 3.0×8.0mm)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	20.000M	20	A8	20	30	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**DIP Cylindrical Crystal MHz  $\phi$  3×9 mm**

- 3 x 9 mm cylinder type
- Small size
- $\pm 20$  ppm Standard
- With Insulation Sleeve Available



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	4.000~50.000MHz
Loading Capacitance	20pF Std. 7pF~33pF available
Drive Level	10 $\mu$ W (300 $\mu$ W Max)
Frequency Tolerance	$\pm 10$ ppm / $\pm 20$ ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	$\pm 10$ ppm~ $\pm 30$ ppm
Operating Temp. Range:	0~+50°C to -40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	$\pm 5$ ppm max

⊙ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

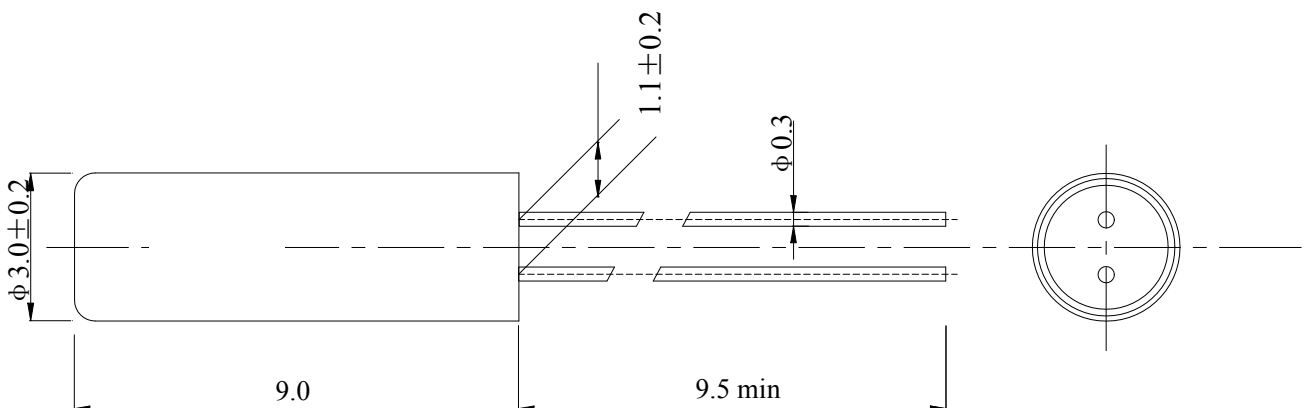
Operation Temperature Range	Frequency Stability			
	$\pm 10$ ppm	$\pm 20$ ppm	$\pm 30$ ppm	$\pm 50$ ppm
0°C~+50°C	○	●	○	○
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
4.000-5.999MHz	AT CUT/FUND.	120 $\Omega$ (MAX)
6.000-7.999MHz	AT CUT/FUND.	100 $\Omega$ (MAX)
8.000-9.999MHz	AT CUT/FUND.	80 $\Omega$ (MAX)
10.000-11.999MHz	AT CUT/FUND.	60 $\Omega$ (MAX)
12.000-15.999MHz	AT CUT/FUND.	50 $\Omega$ (MAX)
16.000-19.999MHz	AT CUT/FUND.	40 $\Omega$ (MAX)
20.000-33.000MHz	AT CUT/FUND.	30 $\Omega$ (MAX)
30.000-50.000MHz	AT 3rd /OT	100 $\Omega$ (MAX)

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**



● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.

● Soldering

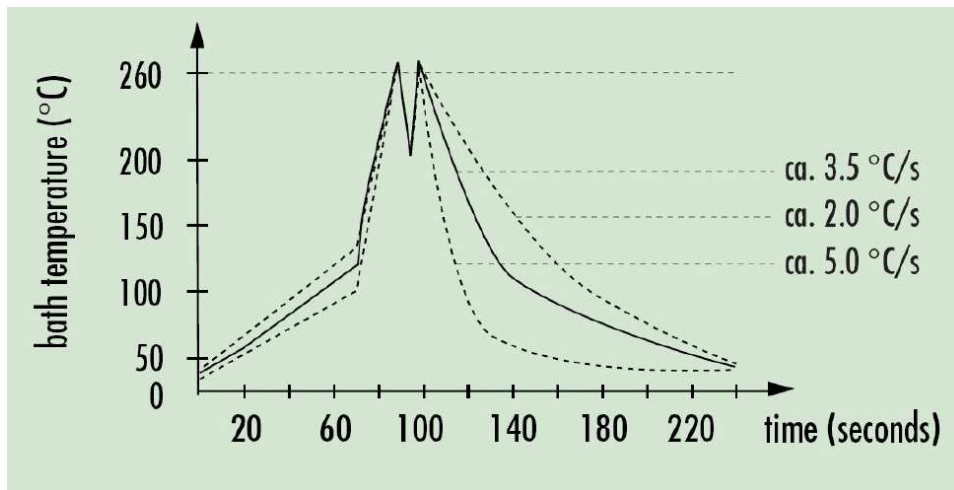
Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300°C

★ PART NUMBER GUIDE *e.g. FTX20.000M20A9-20/30B (\*A9=AT 3.0×9.0mm)*

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	20.000M	20	A9	20	30	B

Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+80°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**DIP Cylindrical Crystal MHz  $\phi$  3×10 mm**

- 3 x 10 mm cylinder type
- Small size
- $\pm 20$  ppm Standard
- With Insulation Sleeve Available



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION 规格
Frequency Range	3.579~50.000MHz
Loading Capacitance	20pF Std. 7pF~33pF available
Drive Level	10 $\mu$ W (300 $\mu$ W Max)
Frequency Tolerance	$\pm 10$ ppm / $\pm 20$ ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	$\pm 10$ ppm~ $\pm 30$ ppm
Operating Temp. Range:	0~+50°C to -40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	$\pm 5$ ppm max

⊙ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

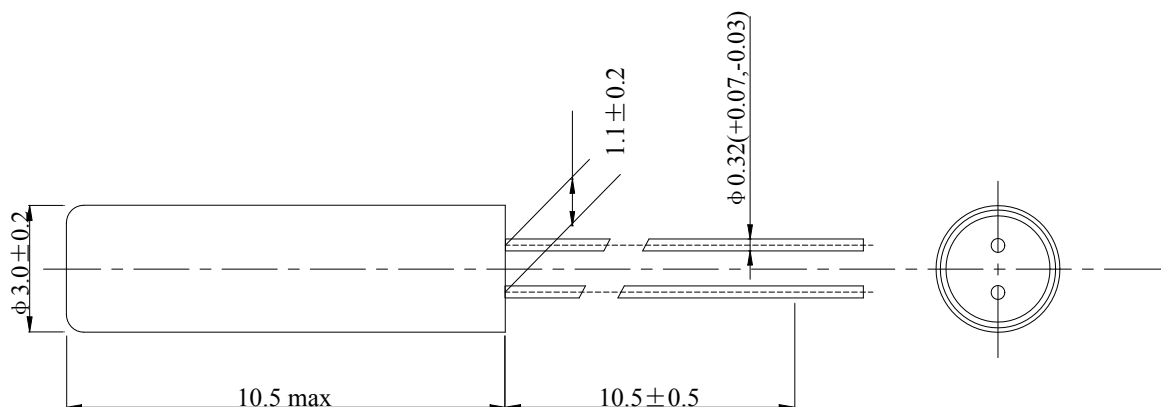
Operation Temperature Range	Frequency Stability			
	$\pm 10$ ppm	$\pm 20$ ppm	$\pm 30$ ppm	$\pm 50$ ppm
0°C~+50°C	○	●	○	○
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
3.579-5.999MHz	AT CUT/FUND.	150 $\Omega$ (MAX)
6.000-7.999MHz	AT CUT/FUND.	100 $\Omega$ (MAX)
8.000-9.999MHz	AT CUT/FUND.	80 $\Omega$ (MAX)
10.000-11.999MHz	AT CUT/FUND.	60 $\Omega$ (MAX)
12.000-15.999MHz	AT CUT/FUND.	50 $\Omega$ (MAX)
16.000-19.999MHz	AT CUT/FUND.	40 $\Omega$ (MAX)
20.000-33.000MHz	AT CUT/FUND.	30 $\Omega$ (MAX)
30.000-50.000MHz	AT 3rd /OT	100 $\Omega$ (MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.

● Soldering

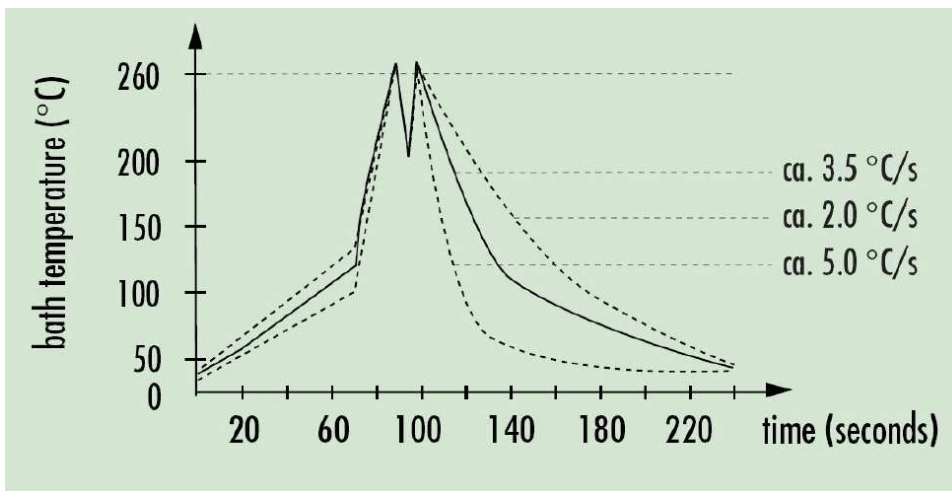
Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300°C

★ PART NUMBER GUIDE *e.g. FTX20.000M20A10-20/30B (\*A10=AT 3.0×10.0mm)*

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	20.000M	20	A10	20	30	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ WAVE SOLDERING PROFILE



## DIP QUARTZ CRYSTAL RESONATOR



### DIP Tuning Fork 2.0×6.0 mm

- Tuning fork crystal in 2 x 6 mm cylinder type
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance



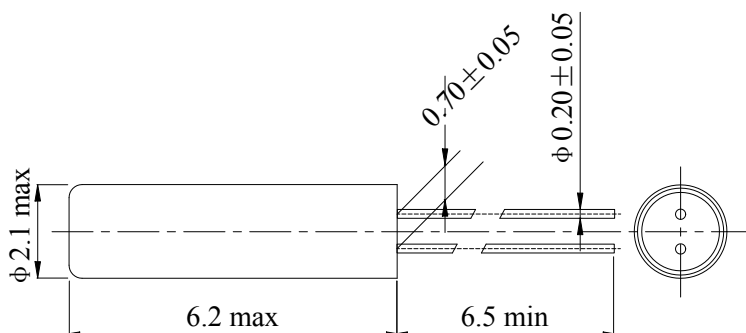
RoHS compliant

#### ★ PARAMETERS

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz (30.00~ 200.00 KHz available)
Loading Capacitance	12.5pF Std. 6 pF~20pF available
Drive Level	1.0 μ W Max
Frequency Tolerance	±5ppm / ±10ppm / ±20ppm ( at 25℃ )
Equivalent Resistance	40K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max, -0.034×10 <sup>-6</sup> /°C <sup>2</sup> typical
Operating Temp. Range:	-20~+70℃ / -40~+85℃
Storage Temp. Range:	-40~+85℃
Aging (25℃, First Year)	±5ppm max

○ All specification subject change without notice.

#### ★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)



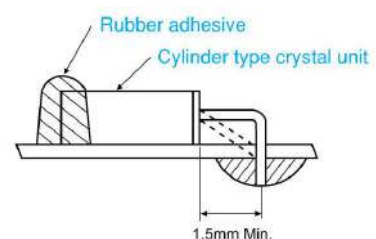
#### ★ Frequency Stability vs. Temperature

Operating Temperature Range	Frequency Stability		
	-80ppm	-160ppm	
-10℃~+60℃	●		
-20℃~+70℃		●	

● standard ○ available

#### ● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.



#### ● Soldering

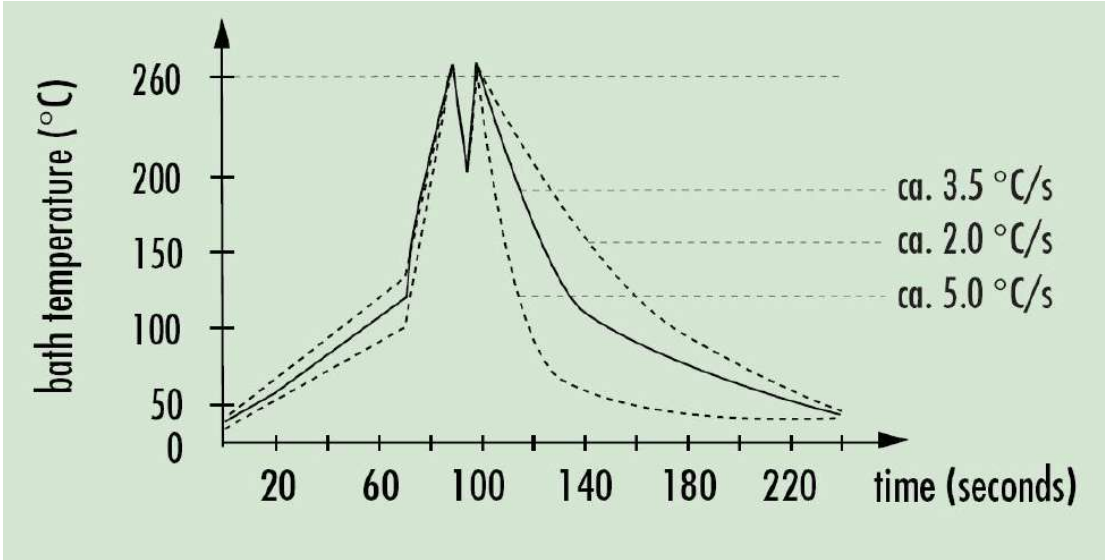
Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300℃

★ PART NUMBER GUIDE *e.g. FTX32.768K12.5D6-20B(\*D6=2.0×6.0mm)*

	Quartz Crystal Resonator	Frequency	Load Capacitance	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	D6	20	B

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ WAVE SOLDERING PROFILE



**DIP QUARTZ CRYSTAL RESONATOR**



**DIP Tuning Fork 3.0x8.0 mm**

- Tuning fork crystal in 3 x 8 mm cylinder type
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance



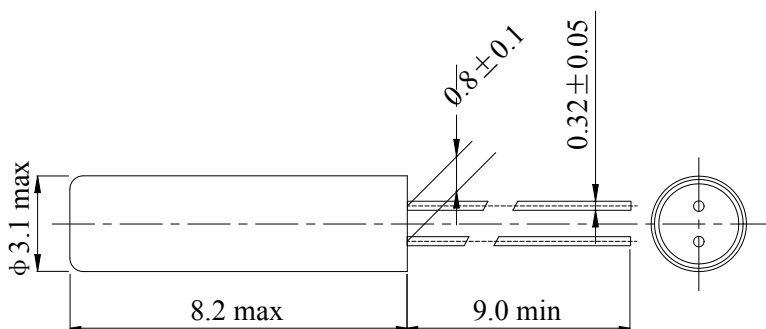
RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz (30.00~ 200.00 KHz available)
Loading Capacitance	12.5pF Std. 6 pF~20pF available
Drive Level	1.0 μ W Max
Frequency Tolerance	±5ppm / ±10ppm / ±20ppm (at 25°C)
Equivalent Resistance	30K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max, -0.034×10 <sup>-6</sup> /°C <sup>2</sup> typical
Operating Temp. Range:	-20~+70°C / -40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	±5ppm max

○ All specification subject change without notice.

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



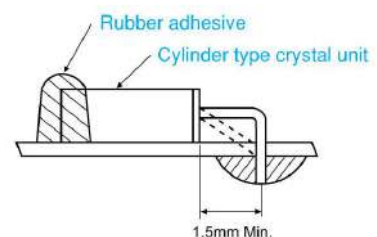
**★ Frequency Stability vs. Temperature**

Operating Temperature Range	Frequency Stability		
	-80ppm	-160ppm	
-10°C~+60°C	●		
-20°C~+70°C		●	

● standard ○ available

● Mounting of cylinder type products:

Soldering the body of the cylinder type crystal units with PCB must be avoided due to deteriorate the characteristics or damage the products. Rubber adhesive is recommended.



● Soldering

Lead wires should be soldered within 3 seconds with the soldering iron heated to a temperature no higher than 300°C

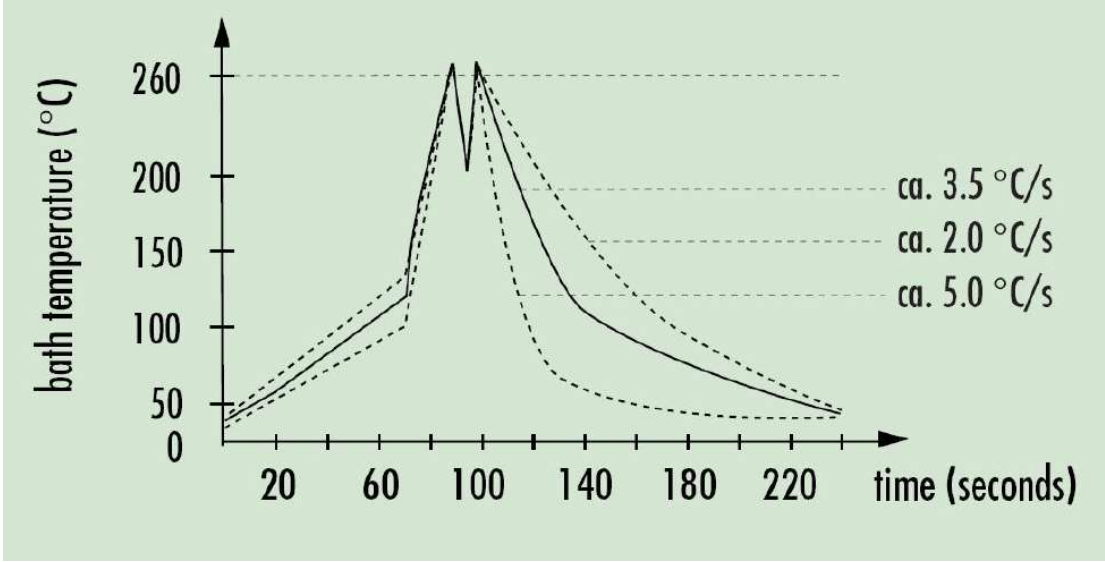


★ PART NUMBER GUIDE *e.g. FTX32.768K12.5D8-20D (\*D8=3.0×8.0mm)*

	Quartz Crystal Resonator	Frequency	Load Capacitance	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	D8	20	D

Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ WAVE SOLDERING PROFILE



**SMD QUARTZ CRYSTAL RESONATOR**

**2 Pad SMD Crystal 11.5×4.8 mm HC-49SMD**

- Package Height 4.2 mm max, 2.8~4.2 mm available
- Reflow soldering temperature: 260°C max
- highly stable and reliable crystal unit with a metallic package
- Taped Version Standard



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	3.5 ~ 100MHz
Operation Mode	(3.5 ~ 40MHz) Fundamental (27 ~ 100MHz) 3rd /5rd Overtone
Loading Capacitance	20pF Std. 8 to 33pF, Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	±2.5ppm ~ ±50ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability					
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm	±50ppm
0°C~+50°C	○	○	○	●	○	○
-10°C~+60°C		○	○	●	○	○
-20°C~+70°C			○	○	●	○
-40°C~+85°C				○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

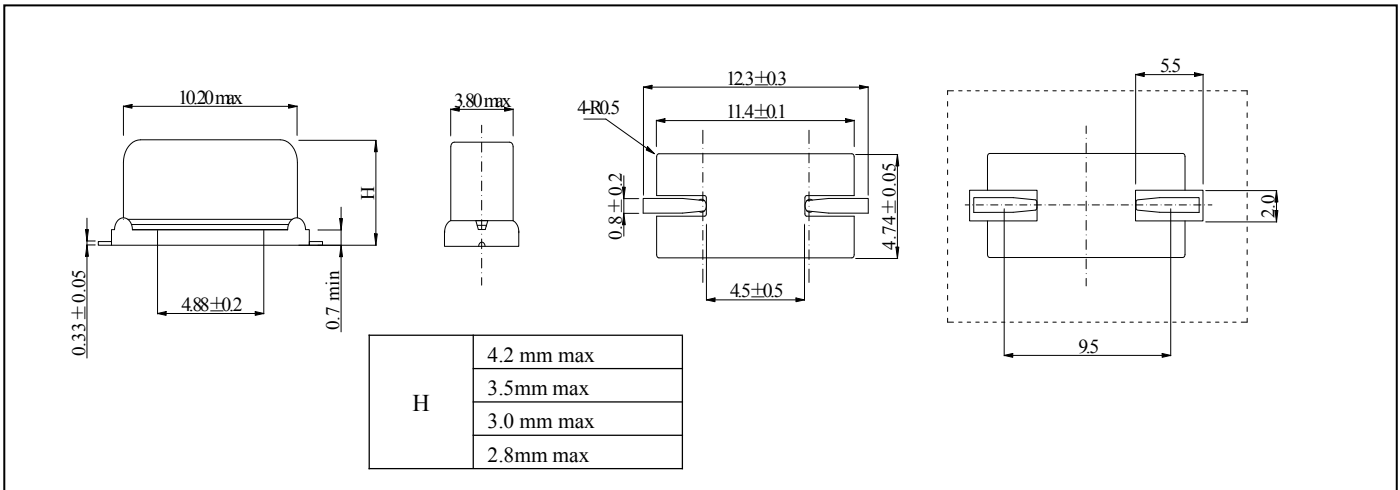
Frequency	Vibration Mode	ESR
3.5-3.999MHz	AT CUT/FUND.	150Ω(MAX)
4.000-4.499MHz	AT CUT/FUND.	120Ω(MAX)
4.500-5.999MHz	AT CUT/FUND.	100Ω(MAX)
6.000-7.999MHz	AT CUT/FUND.	80Ω(MAX)
8.000-9.999MHz	AT CUT/FUND.	60Ω(MAX)
10.000-11.999MHz	AT CUT/FUND.	50Ω(MAX)
12.000-13.999MHz	AT CUT/FUND.	40Ω(MAX)
14.000-40.000MHz	AT CUT/FUND.	30Ω(MAX)
27.000-100MHz	AT 3rd /OT	100Ω(MAX)

**★ PART NUMBER GUIDE** e.g. FTX16.000M20SM-30/30B (\*SM=HC-49/SMD TYPE)

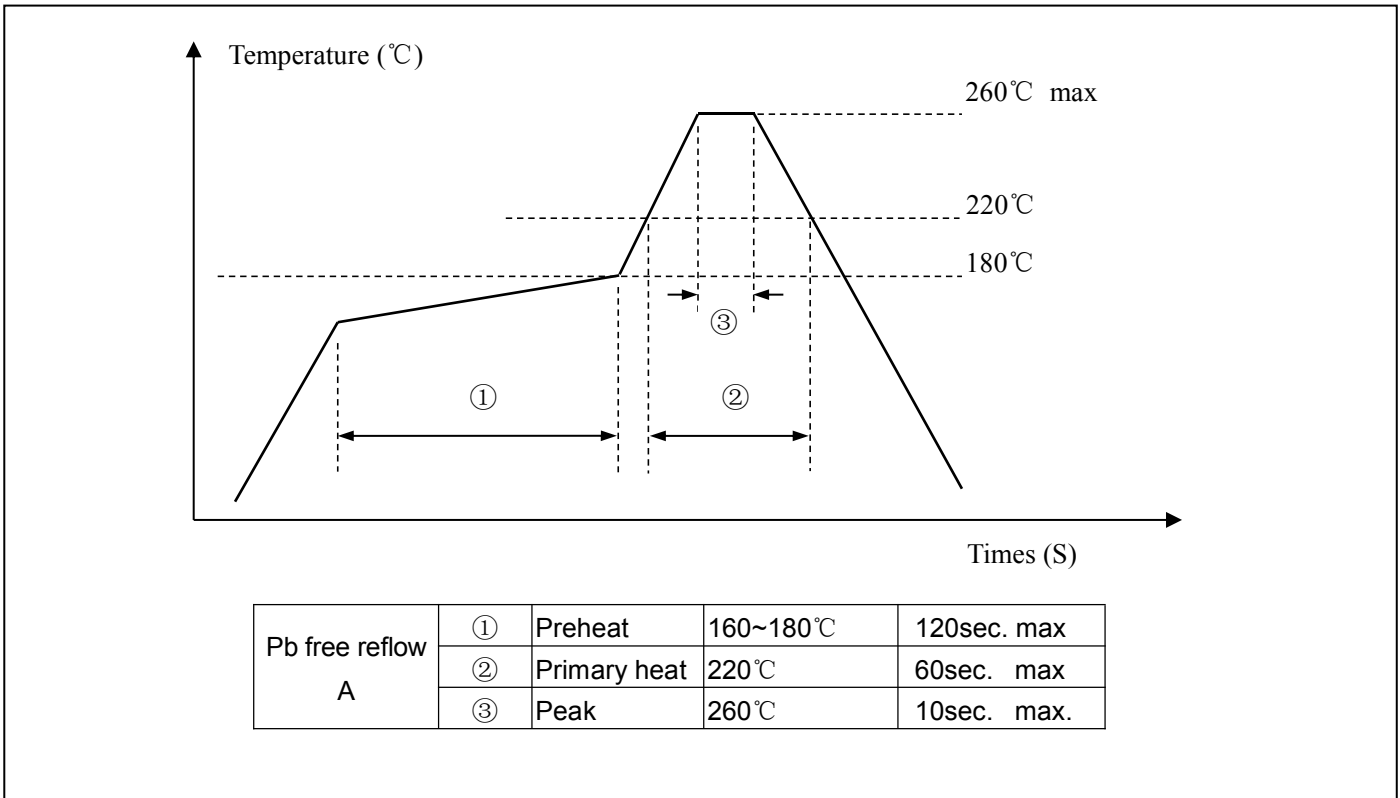
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	SM	30	30	B

Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)



★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL RESONATOR**



**3 Pad SMD Crystal 11.5×4.8 mm HC-49SMD-3PIN**

- Package Height 4.2 mm max, 2.8~4.2 mm available
- Reflow soldering temperature: 260°C max
- highly stable and reliable crystal unit with a metallic package
- Taped Version Standard
- 3 Pin with ground pin



RoHS compliant

★ **PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	3.5 ~ 100MHz
Operation Mode	(3.5 ~ 40MHz) Fundamental (27 ~ 100MHz) 3rd /5rd Overtone
Loading Capacitance	20pF Std. 8 to 33pF , Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	See Below
Frequency Stability	±2.5ppm ~ ±50ppm
Operating Temp. Range:	0 ~ +50°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C

◎ All specification subject change without notice.

★ **FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability					
	±2.5ppm	±5ppm	±10ppm	±20ppm	±30ppm	±50ppm
0°C~+50°C	○	○	○	●	○	○
-10°C~+60°C		○	○	●	○	○
-20°C~+70°C			○	○	●	○
-40°C~+85°C				○	○	●

● standard ○ available

★ **ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
3.5-3.999MHz	AT CUT/FUND.	150Ω(MAX)
4.000-4.499MHz	AT CUT/FUND.	120Ω(MAX)
4.500-5.999MHz	AT CUT/FUND.	100Ω(MAX)
6.000-7.999MHz	AT CUT/FUND.	80Ω(MAX)
8.000-9.999MHz	AT CUT/FUND.	60Ω(MAX)
10.000-11.999MHz	AT CUT/FUND.	50Ω(MAX)
12.000-13.999MHz	AT CUT/FUND.	40Ω(MAX)
14.000-40.000MHz	AT CUT/FUND.	30Ω(MAX)
27.000-100MHz	AT 3rd /OT	100Ω(MAX)

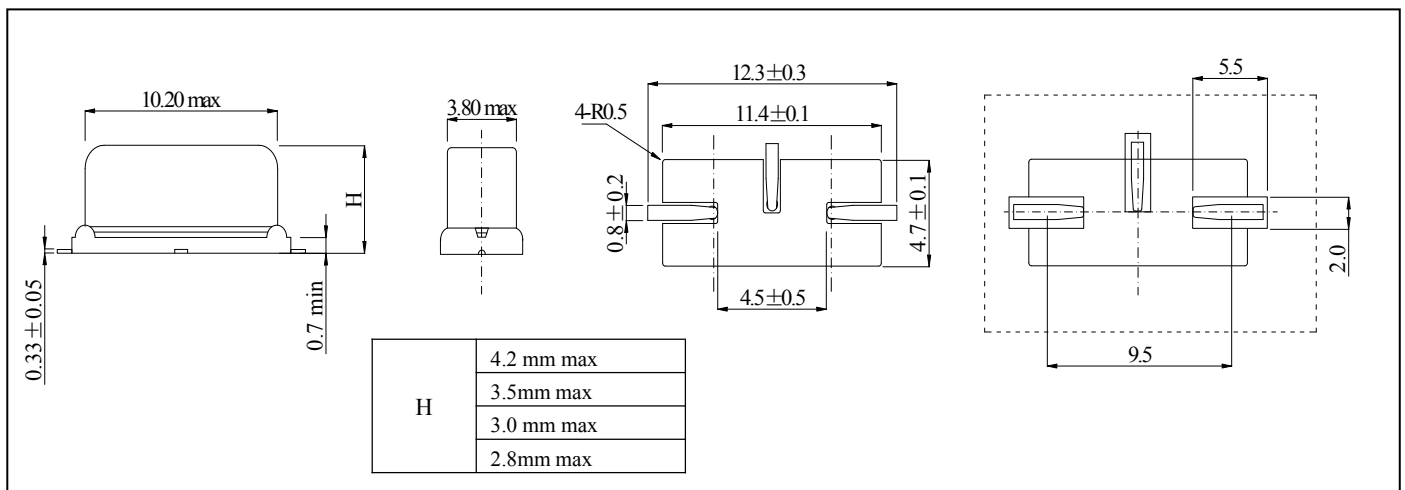
★ **PART NUMBER GUIDE**

e.g. JXX16.000M20SM3P-30/30B (\*SM3P=HC-49/SMD TYPE)

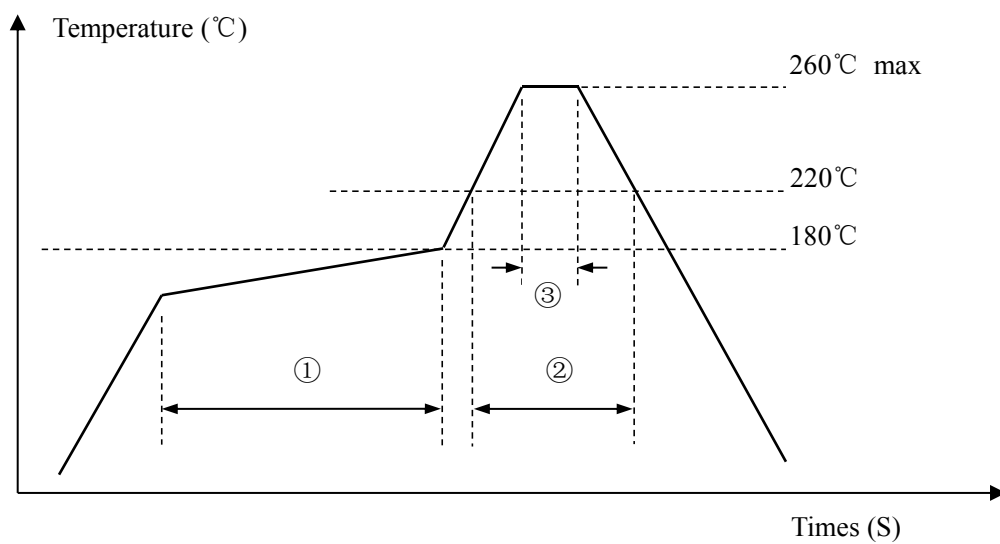
Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	SM3P	30	30	B

Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

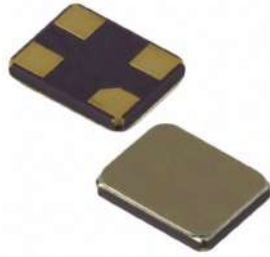
★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)



★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 1.6×1.2 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ultra-small package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	24~54MHz
Operation Mode	Fundamental
Loading Capacitance	9pF Std. 8 to 32pF / Series available
Drive Level	10 μ W ( 100 μ W Max )
Frequency Tolerance	±10ppm~±30ppm ( at 25°C )
Equivalent Resistance	150 Ω Max
Frequency Stability	±10ppm~±30ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

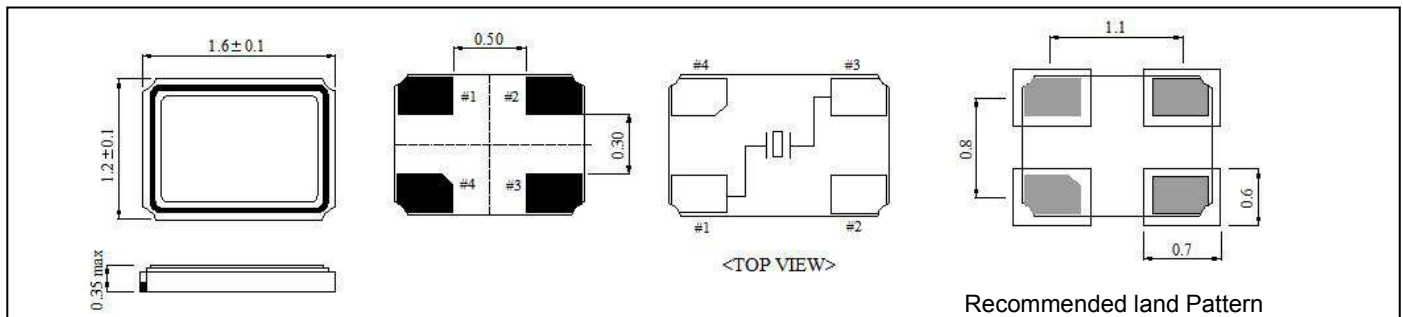
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±10ppm	±15ppm	±20ppm	±30ppm
-10°C~+60°C	●	○	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C		○	○	●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
24-25.999MHz	AT CUT/FUND.	150Ω(MAX)
26-39.999MHz	AT CUT/FUND.	120Ω(MAX)
40-54.000MHz	AT CUT/FUND.	100Ω(MAX)

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**


Recommended land Pattern

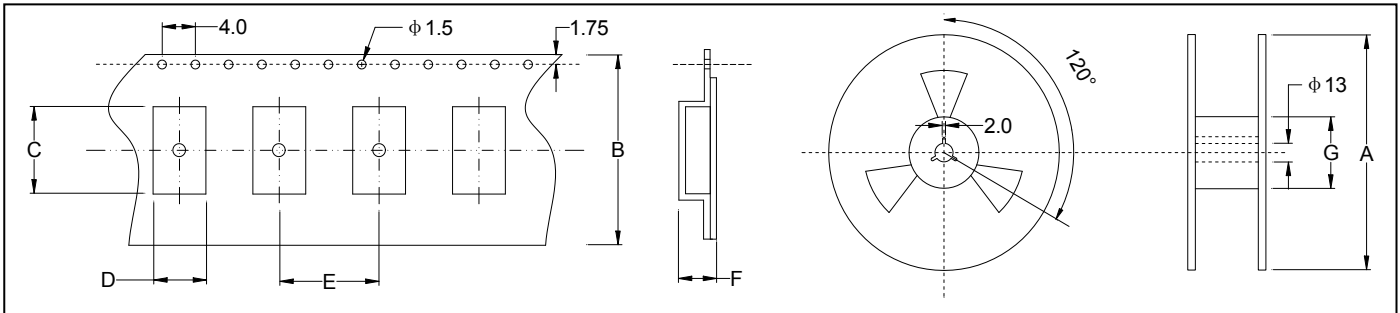
**★ PART NUMBER GUIDE**

e.g. FTX26.000M9SM1S-10/10B (\*SM1S=1.6×1.2 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	26.000M	9	SM1S	10	10	B

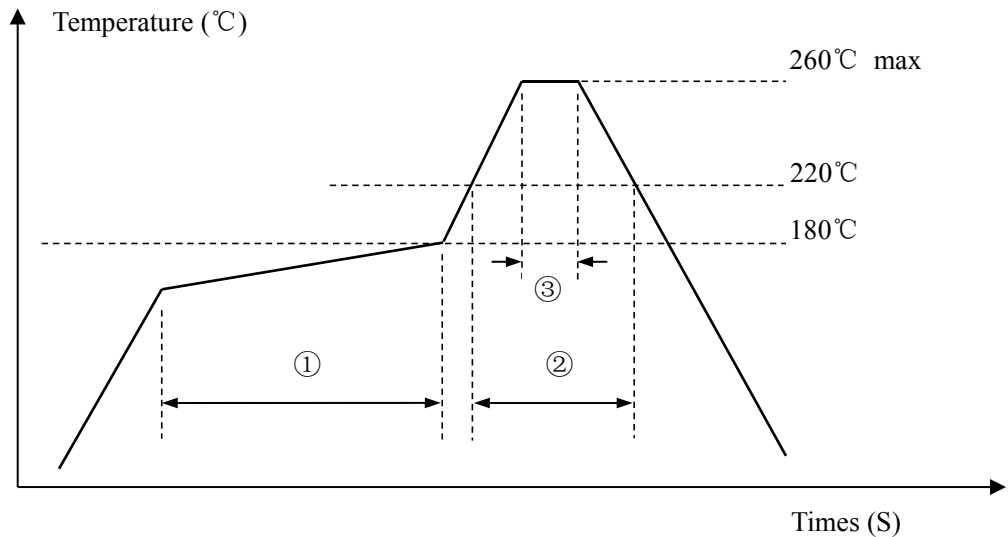
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



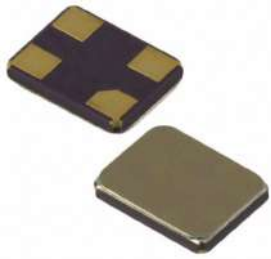
	A	B	C	D	E	F	G
SMD1612	178±2.0	8.0±0.3	1.85±0.05	1.45±0.05	4.0±0.1	0.6±0.1	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**



**4 Pad Version 2.0×1.6 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	24~50MHz
Operation Mode	Fundamental
Loading Capacitance	9pF Std. 8 to 32pF / Series available
Drive Level	10 μ W (100 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	80 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

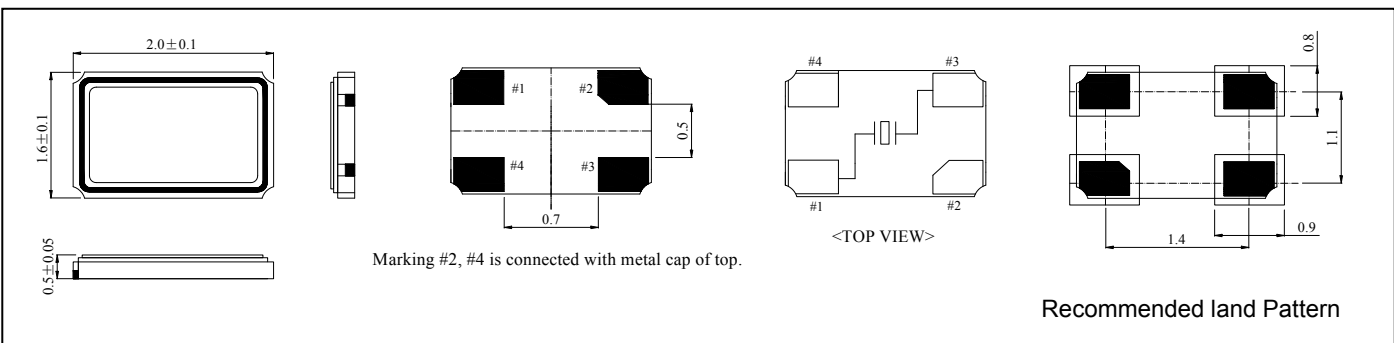
Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
24-25.999MHz	AT CUT/FUND.	80Ω(MAX)
26-39.999MHz	AT CUT/FUND.	60Ω(MAX)
40-50.999MHz	AT CUT/FUND.	50Ω(MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



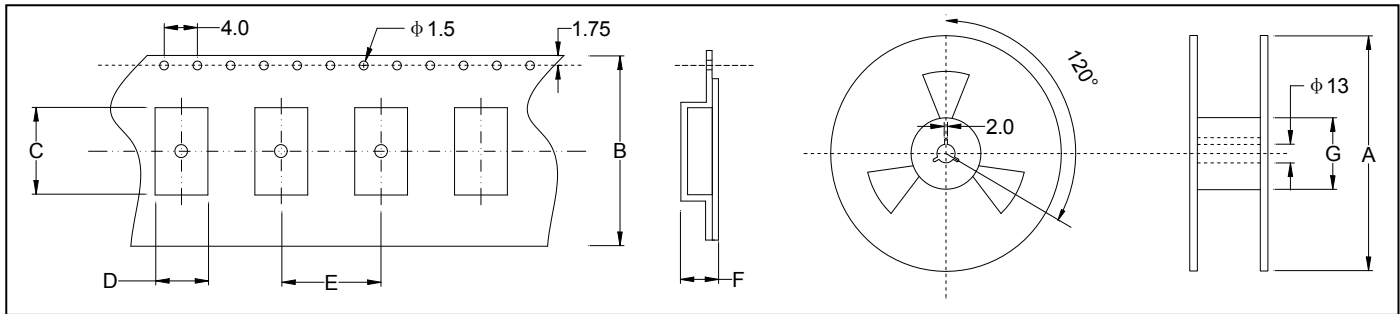
**★ PART NUMBER GUIDE** e.g. FTX16.000M10SM2A-10/10B (\*SM2A=2.0×1.6 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	10	SM2A	10	10	B



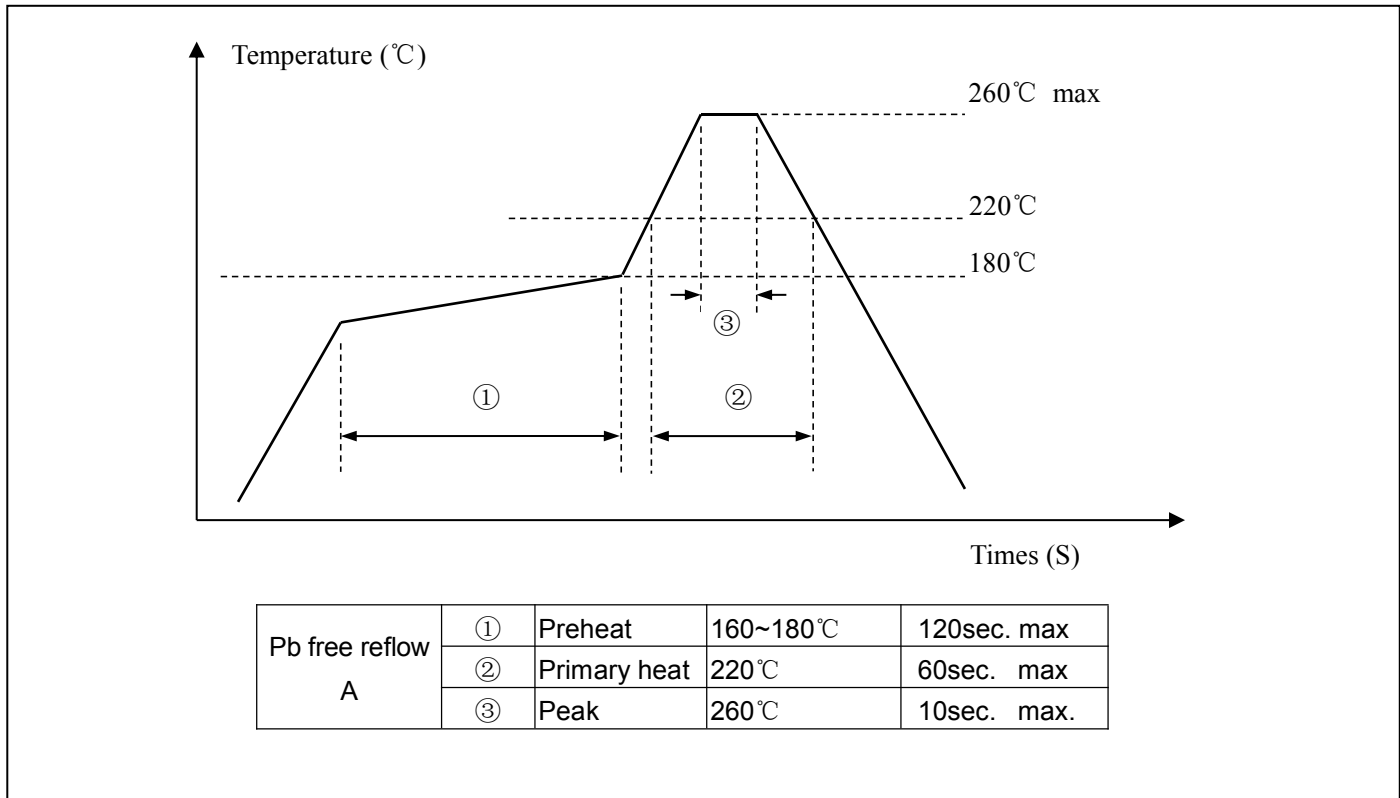
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)

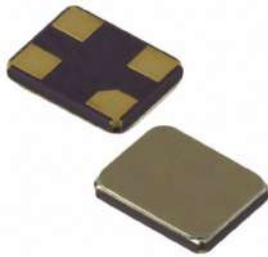


	A	B	C	D	E	F	G
SMD2016	178±2.0	8.0±0.3	2.25±0.05	1.85±0.05	4.0±0.1	0.65±0.05	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL RESONATOR**



**4 Pad Version 2.5×2.0 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

★ **PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	16~60MHz
Operation Mode	Fundamental
Loading Capacitance	9pF Std. 8 to 32pF / Series available
Drive Level	10 μ W ( 100 μ W Max )
Frequency Tolerance	±10ppm~±30ppm ( at 25°C )
Equivalent Resistance	80 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C

○ All specification subject change without notice.

★ **FREQUENCY STABILITY VS. TEMPERATURE**

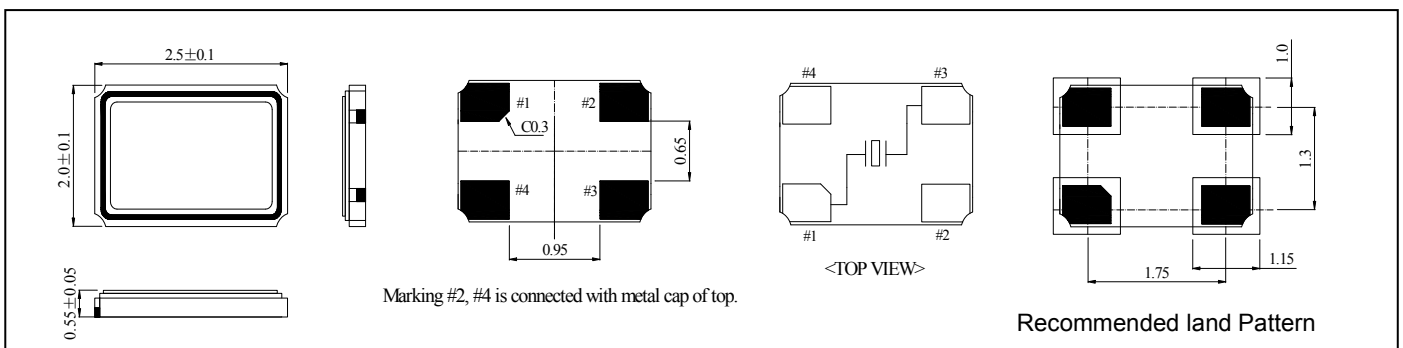
Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

★ **ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
16-21.999MHz	AT CUT/FUND.	80Ω(MAX)
22-24.999MHz	AT CUT/FUND.	70Ω(MAX)
25-29.999MHz	AT CUT/FUND.	60Ω(MAX)
30-60.000MHz	AT CUT/FUND.	50Ω(MAX)

★ **DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

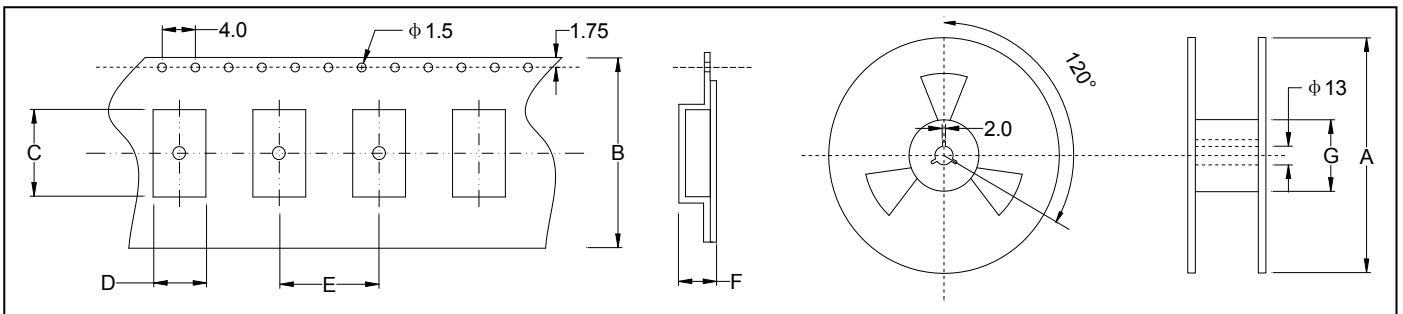


★ **PART NUMBER GUIDE** e.g. *FTX16.000M10SM2S-10/10B* (\*SM2S=2.5×2.0 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	10	SM2S	10	10	B

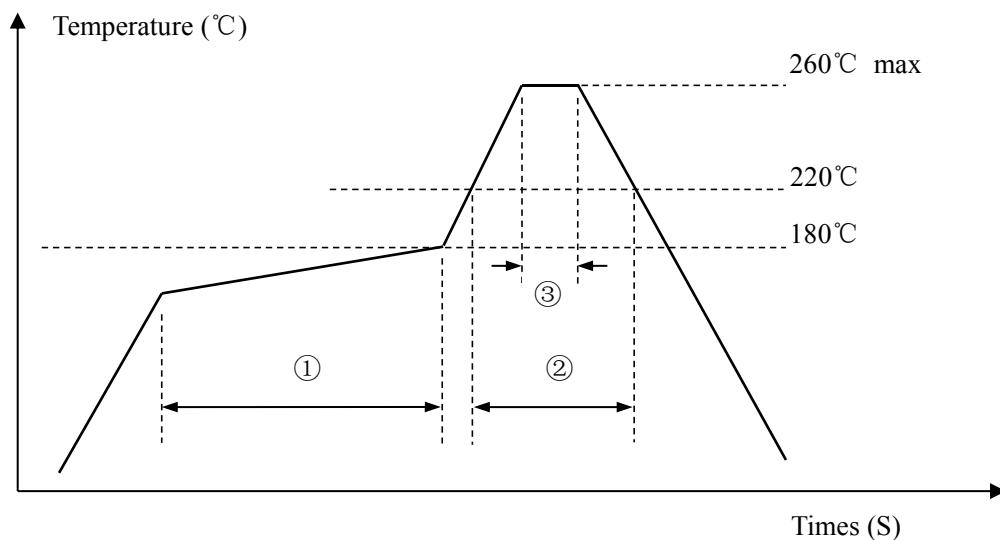
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



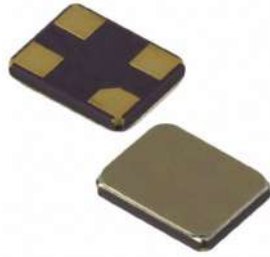
	A	B	C	D	E	F	G
SMD2520	178±2.0	8.0±0.3	2.70±0.05	2.25±0.05	4.0±0.1	0.65±0.05	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**



**4 Pad Version 3.2×2.5 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	12~60MHz
Operation Mode	Fundamental
Loading Capacitance	9pF Std. 8 to 32pF / Series available
Drive Level	10 μ W (200 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	80 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

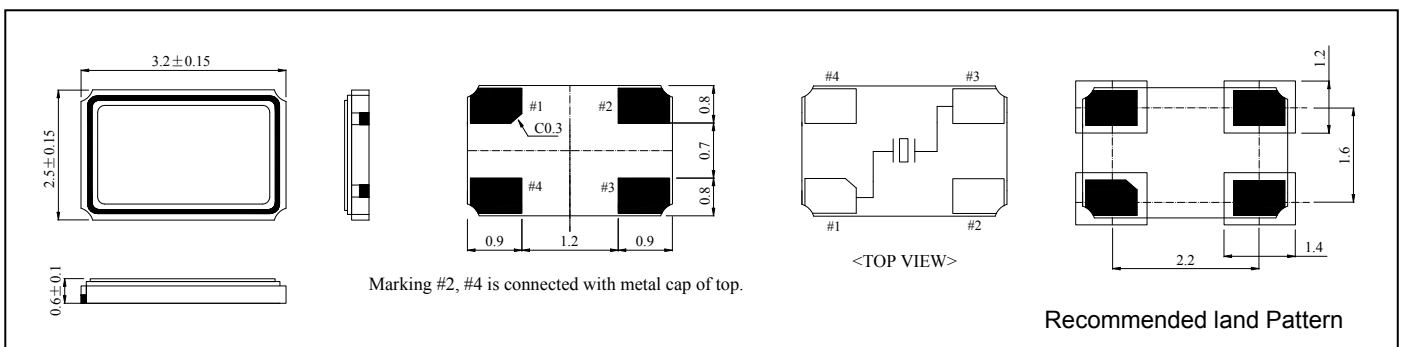
Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
12-15.999MHz	AT CUT/FUND.	80Ω(MAX)
16-19.999MHz	AT CUT/FUND.	60Ω(MAX)
20-25.999MHz	AT CUT/FUND.	50Ω(MAX)
26-60.000MHz	AT CUT/FUND.	40Ω(MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



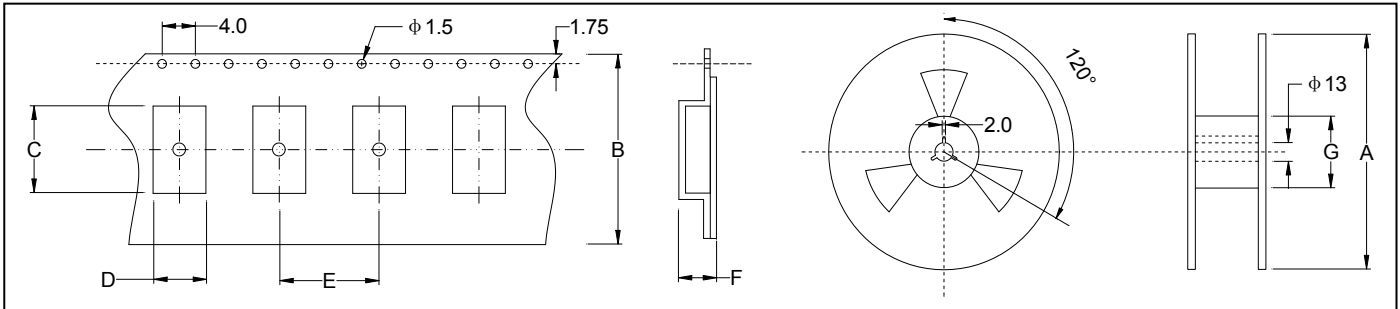
**★ PART NUMBER GUIDE**

e.g. FTX16.000M10SM3S-10/10B (\*SM3S=3.2×2.5 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	10	SM3S	10	10	B

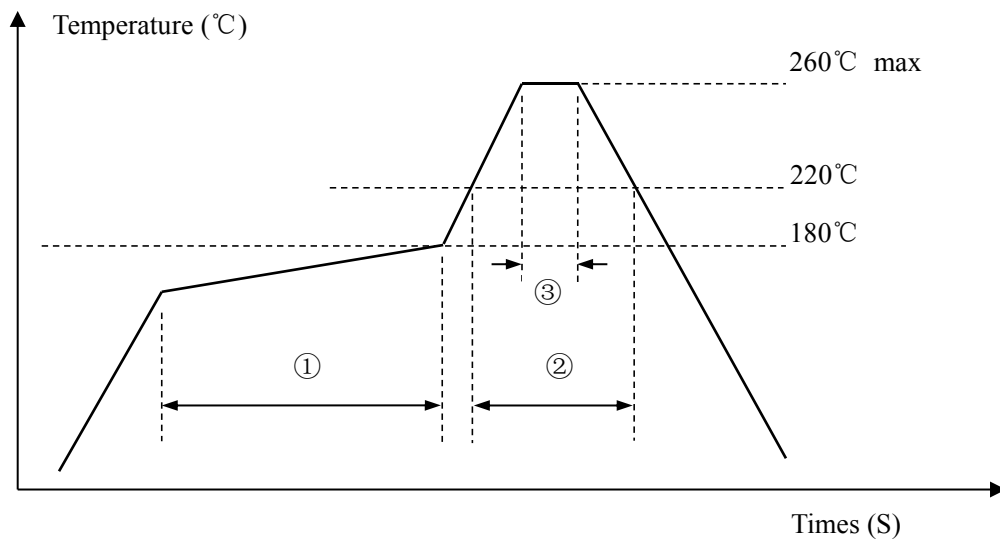
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)

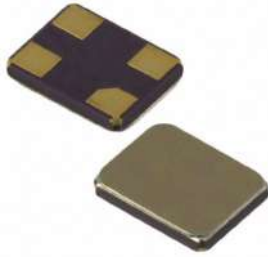


	A	B	C	D	E	F	G
SMD3225	178±2.0	12.0±0.3	3.55±0.10	2.80±0.10	4.0±0.1	0.85±0.10	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 4.0×2.5 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	12~60MHz
Operation Mode	Fundamental
Loading Capacitance	9pF Std. 8 to 32pF Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	80 Ω Max
Frequency Stability	±5ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

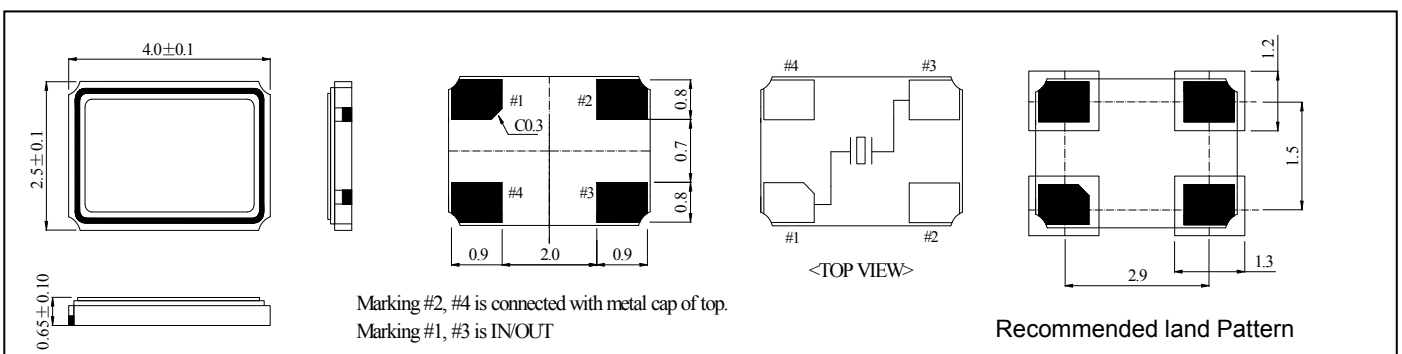
**★ FREQUENCY STABILITY VS. TEMPERATURE**

peration Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
12-15.999MHz	AT CUT/FUND.	80Ω(MAX)
16-19.999MHz	AT CUT/FUND.	60Ω(MAX)
20-25.999MHz	AT CUT/FUND.	50Ω(MAX)
26-60.000MHz	AT CUT/FUND.	40Ω(MAX)

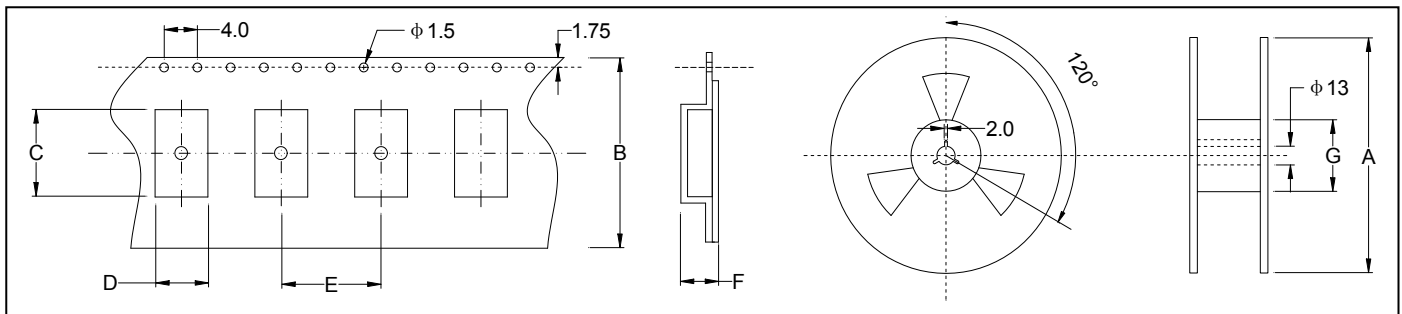
**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FTX16.000M10SM4S-10/10B (\*SM4S=4.0×2.5 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	10	SM4S	10	10	B

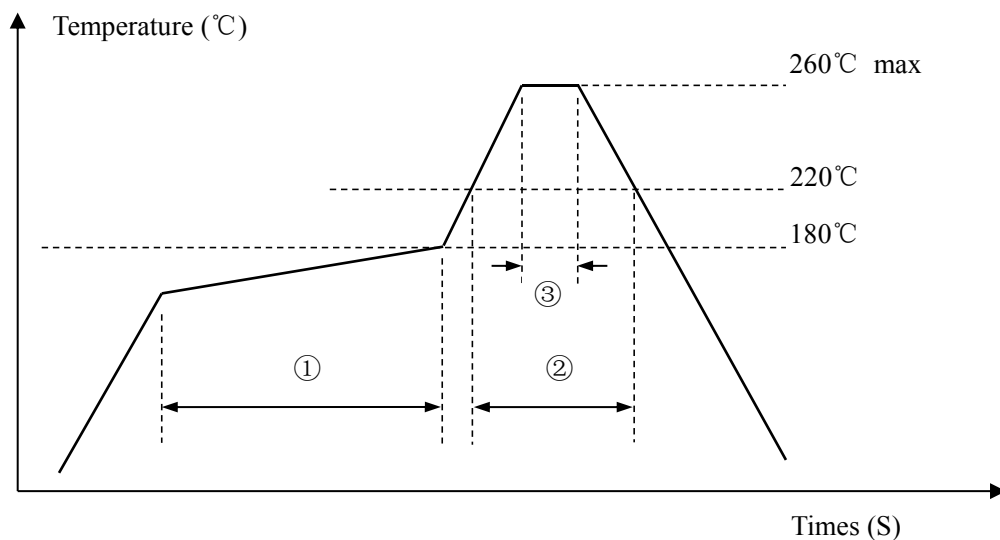
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



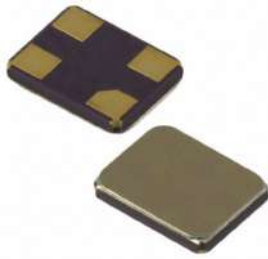
	A	B	C	D	E	F	G
SMD4025	178±2.0	12.0±0.3	4.30±0.10	2.80±0.10	8.0±0.1	0.9±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**



**4 Pad Version 5.0×3.2 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	8~54MHz
Operation Mode	Fundamental
Loading Capacitance	18pF Std. 8 to 32pF Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	100 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
8-9.999MHz	AT CUT/FUND.	100Ω(MAX)
10-11.999MHz	AT CUT/FUND.	60Ω(MAX)
12-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-54.000MHz	AT CUT/FUND.	30Ω(MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

Marking #2, #4 is connected with metal cap of top.  
Marking #1, #3 is IN/OUT

<TOP VIEW>

Recommended land Pattern

**★ PART NUMBER GUIDE**

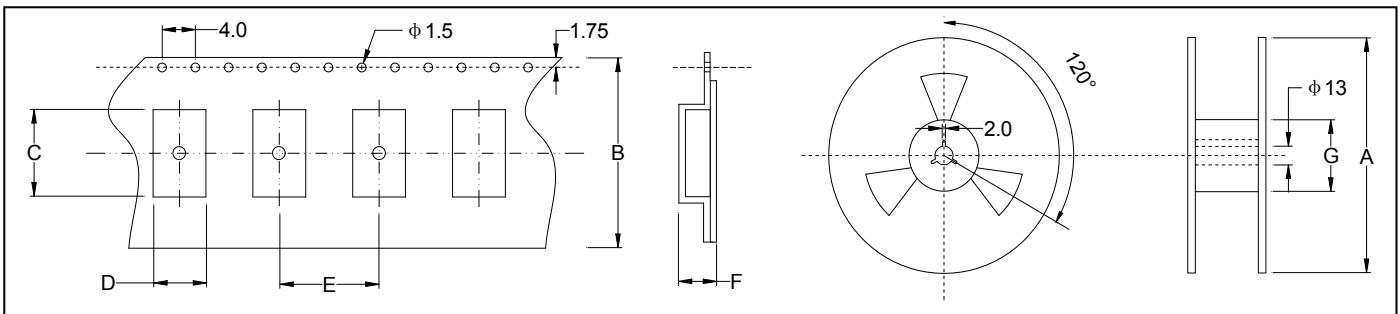
e.g. FTX12.000M18SM5S-20/20B (\*SM5S=5.0×3.2 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	18	SM5S	20	20	B



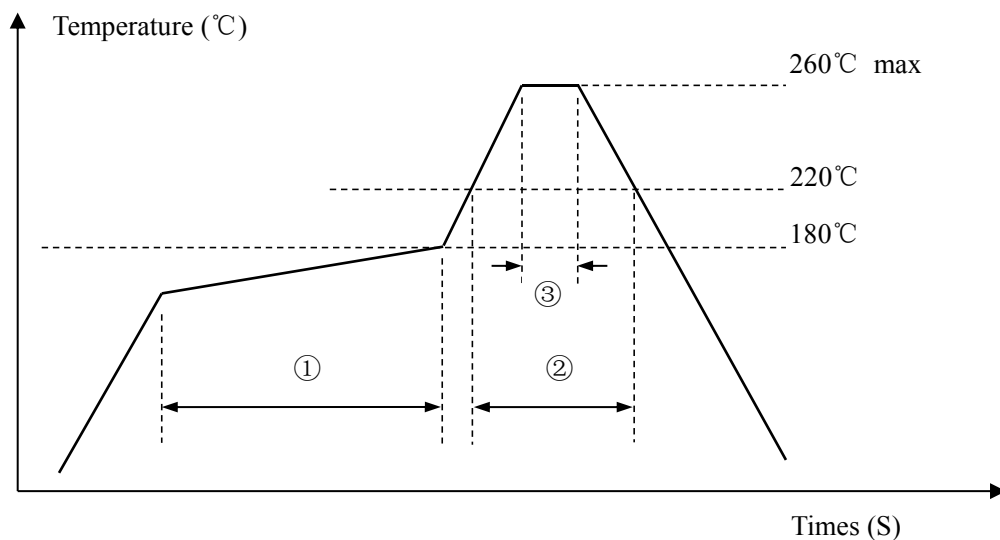
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD5032	178±2.0	12.0±0.3	5.40±0.10	3.60±0.10	8.0±0.1	1.1±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**



**2 Pad Version 5.0×3.2 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max
- Ceramic Glass sealed



RoHS compliant

★ **PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	8~50MHz
Operation Mode	Fundamental
Loading Capacitance	20pF Std. 8 to 32pF Series available
Drive Level	10 μ W (300 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	100 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

★ **FREQUENCY STABILITY VS. TEMPERATURE**

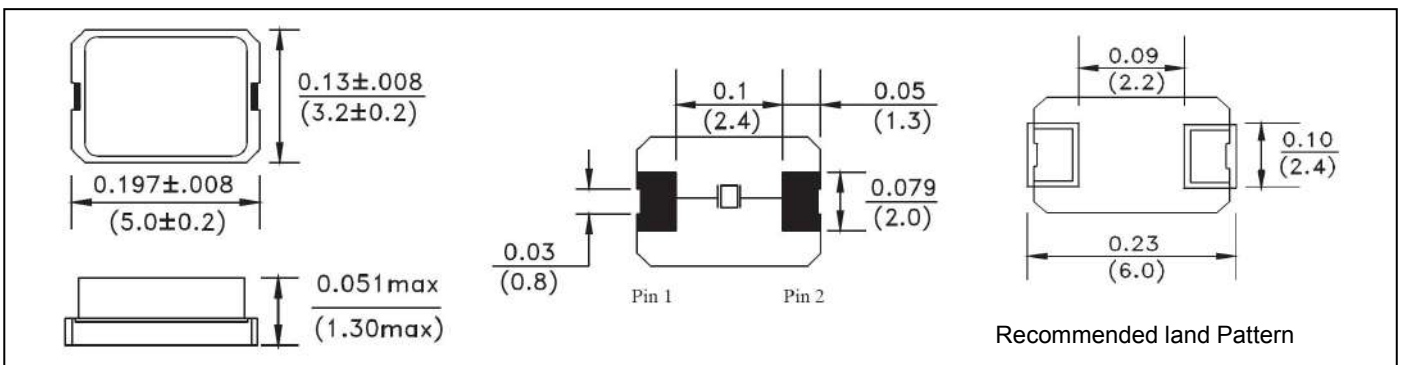
Operation Temperature Range	Frequency Stability					
	±5ppm	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C		●	○	●	○	○
-20°C~+70°C		○	○	●	○	○
-40°C~+85°C				○	●	○

● standard ○ available

★ **ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
8-9.999MHz	AT CUT/FUND.	100Ω(MAX)
10-11.999MHz	AT CUT/FUND.	60Ω(MAX)
12-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-50.000MHz	AT CUT/FUND.	30Ω(MAX)

★ **DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



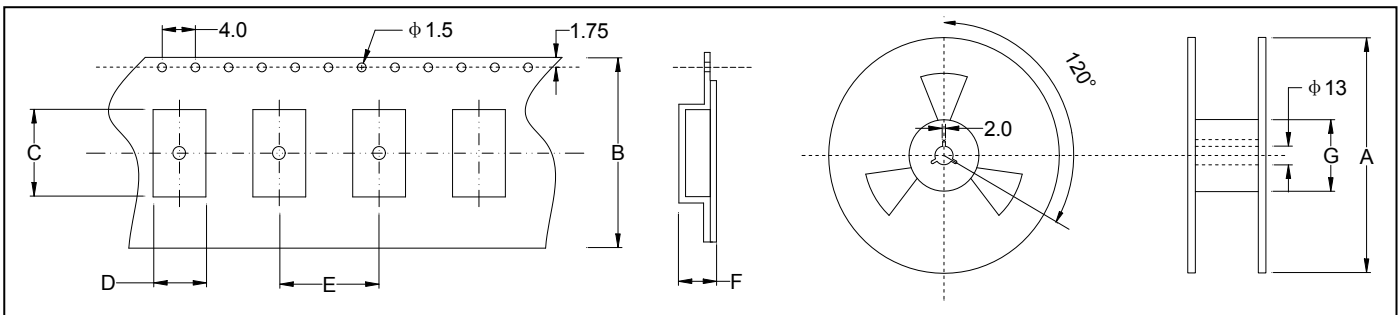
★ **PART NUMBER GUIDE**

e.g. FTX12.000M20SM5GA-30/30B (\*SM5G=5.0×3.2 SMD GLASS 2PAD TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	20	SM5GA	30	30	B

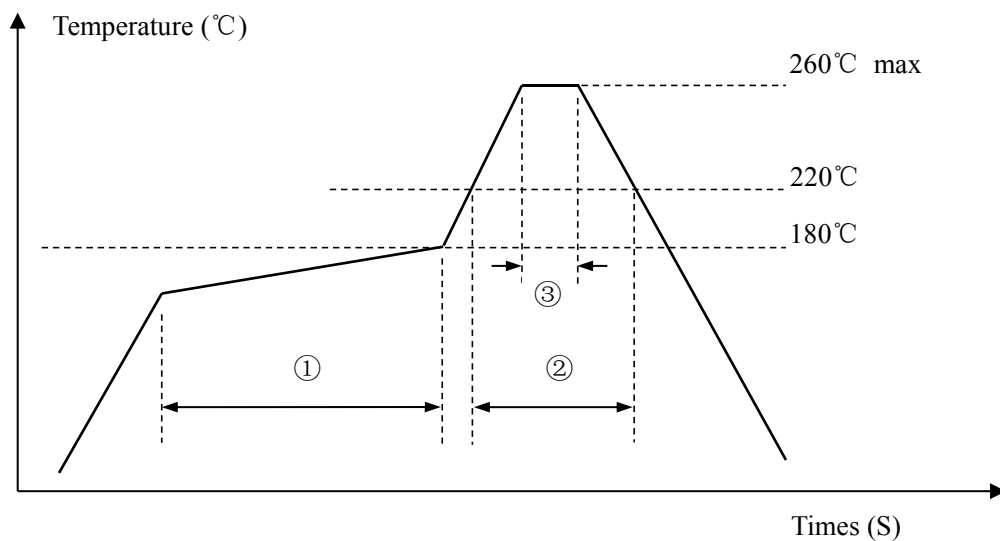
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD5032G	178±2.0	12.0±0.3	5.40±0.10	3.60±0.10	8.0±0.1	1.1±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**

**2 Pad Version 5.0×3.2 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	8~50MHz
Operation Mode	Fundamental
Loading Capacitance	20pF Std. 8 to 32pF Series available
Drive Level	100 μ W (300 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	100 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

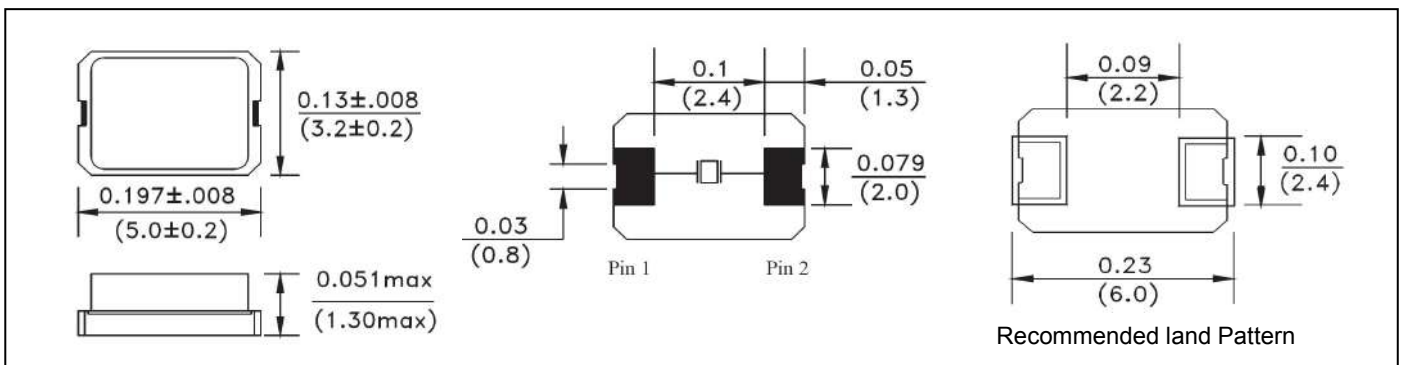
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability					
	±5ppm	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C		●	○	●	○	○
-20°C~+70°C		○	○	●	○	○
-40°C~+85°C				○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
8-9.999MHz	AT CUT/FUND.	100Ω(MAX)
10-11.999MHz	AT CUT/FUND.	60Ω(MAX)
12-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-50.000MHz	AT CUT/FUND.	30Ω(MAX)

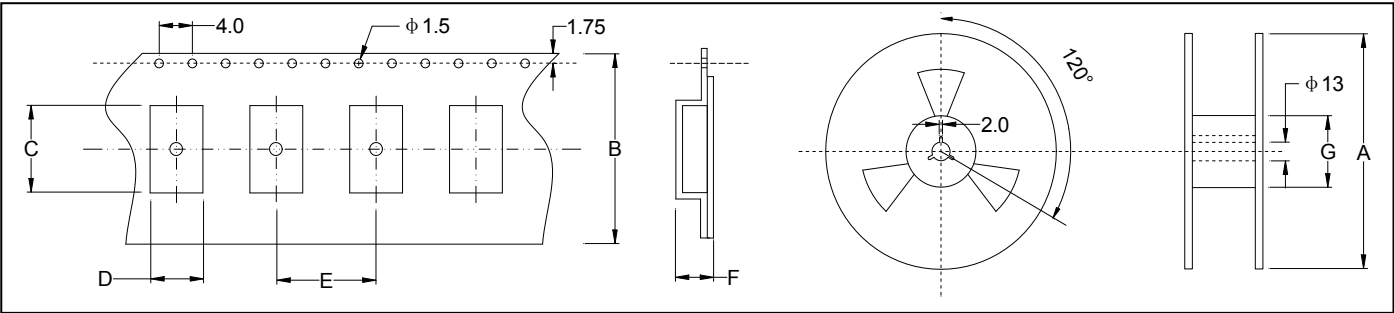
**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FTX12.000M20SM5A-30/30B (\*SM5A=5.0×3.2 SMD SEAM 2PAD TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	20	SM5A	30	30	B

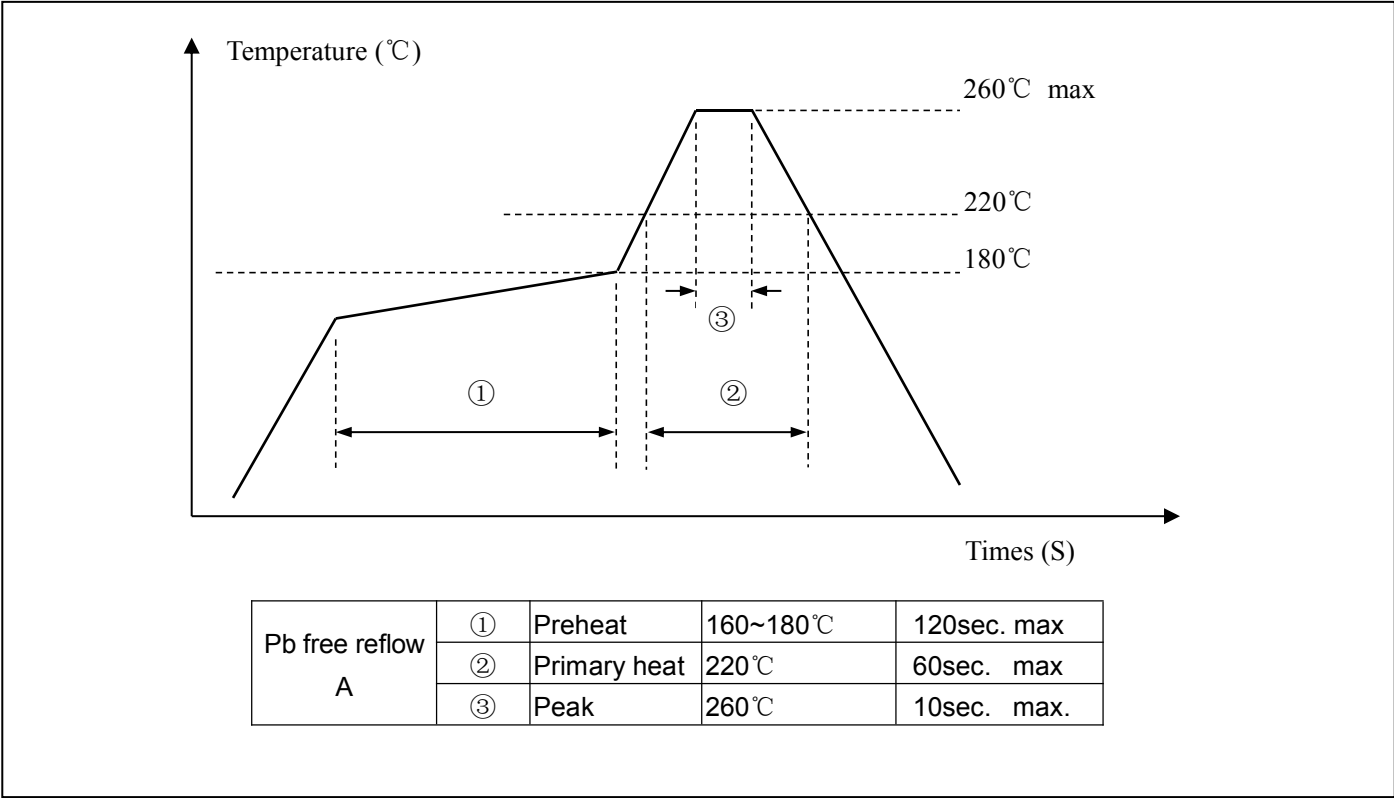
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD5032-2pad	178±2.0	12.0±0.3	5.40±0.10	3.60±0.10	8.0±0.1	1.1±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 6.0×3.5 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	7.3~50MHz
Operation Mode	Fundamental
Loading Capacitance	12pF Std. 8 to 32pF Series available
Drive Level	10 μ W (500 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	60 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

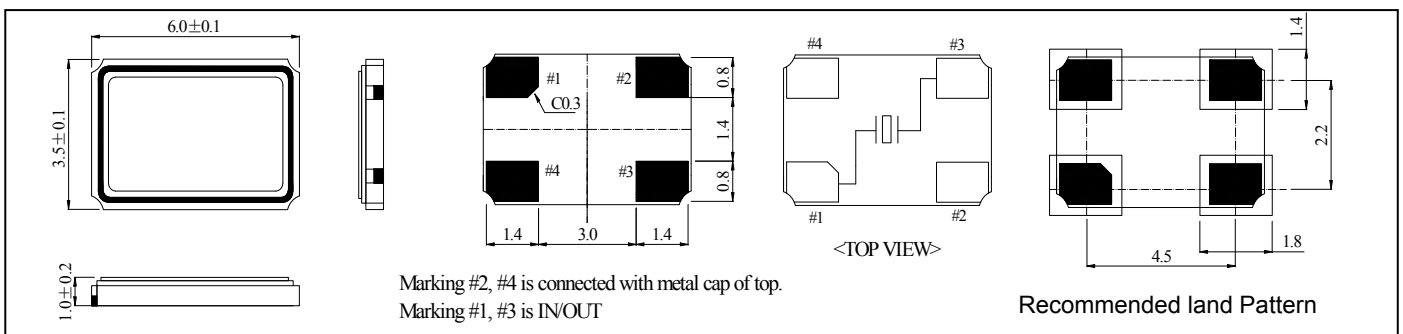
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
7.3-11.999MHz	AT CUT/FUND.	60Ω(MAX)
12-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-50.000MHz	AT CUT/FUND.	30Ω(MAX)

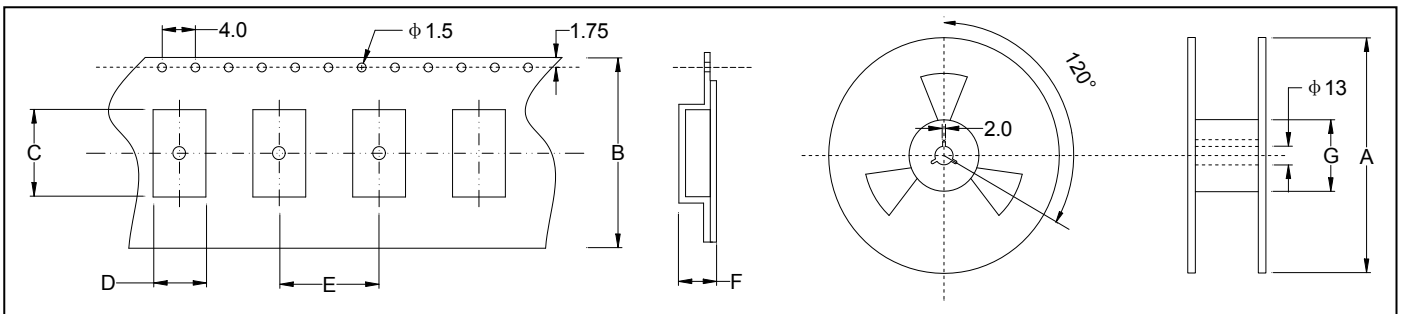
**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FTX12.000M18SM6S-20/20B (\*SM6S=6.0×3.5 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	18	SM6S	20	20	B

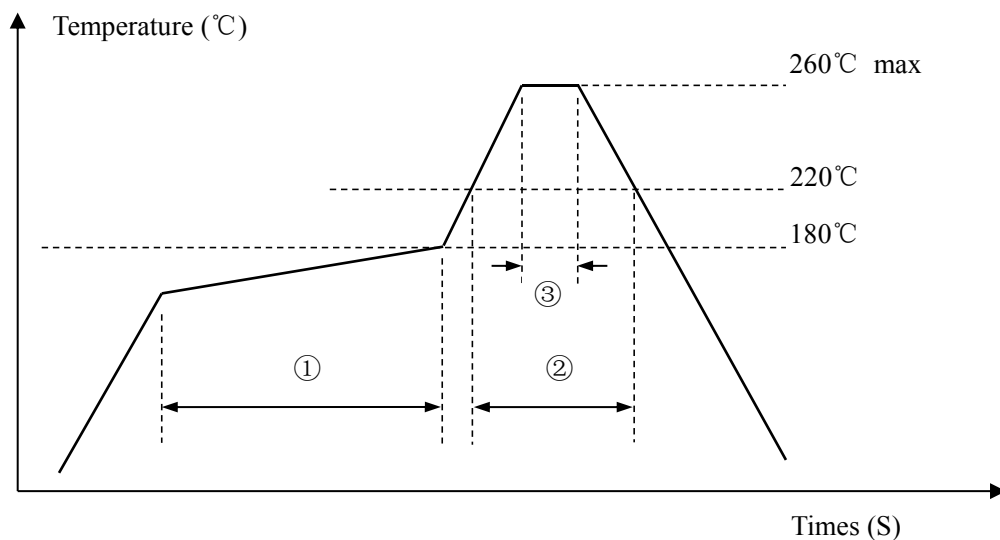
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD6035	178±2.0	16.0±0.3	6.40±0.10	3.90±0.10	8.0±0.1	1.5±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**



**2 Pad Version 6.0×3.5 mm**

- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	7.3~50MHz
Operation Mode	Fundamental
Loading Capacitance	18pF Std. 8 to 32pF Series available
Drive Level	10 μ W (500 μ W Max)
Frequency Tolerance	±10ppm~±30ppm (at 25°C)
Equivalent Resistance	60 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

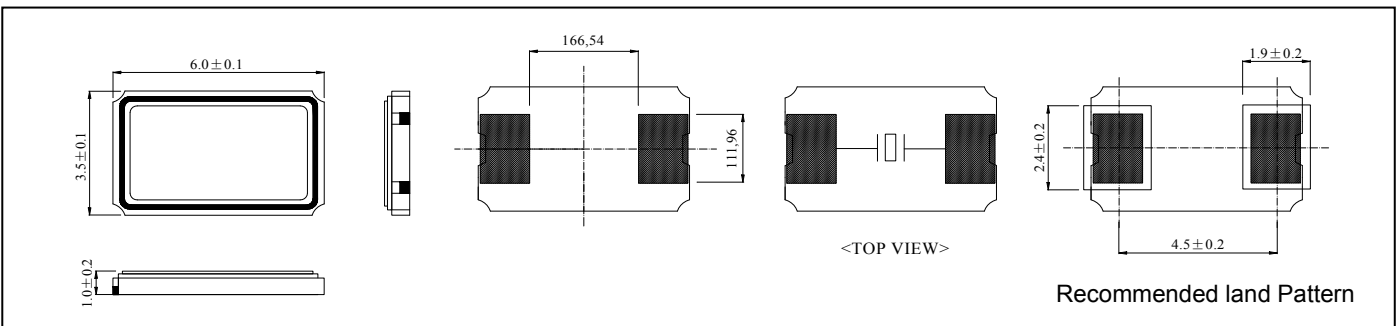
Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
7.3-11.999MHz	AT CUT/FUND.	60Ω(MAX)
12-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-50.000MHz	AT CUT/FUND.	30Ω(MAX)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



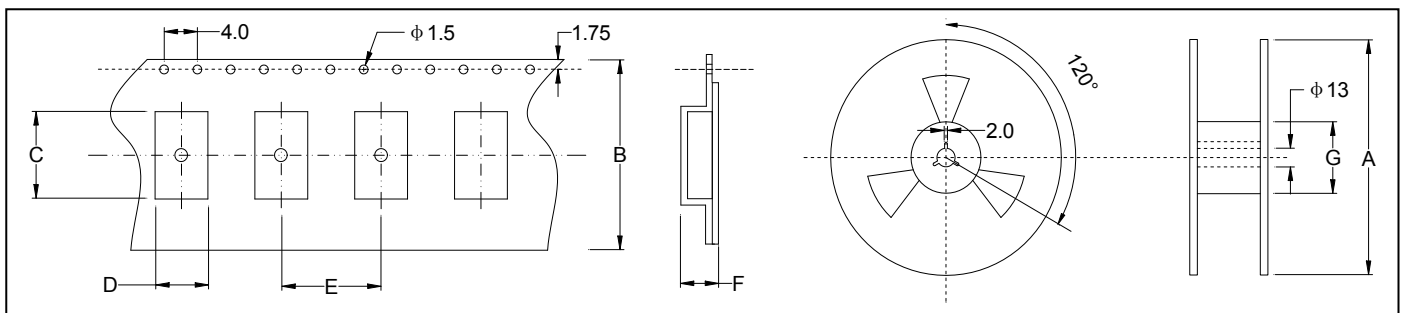
**★ PART NUMBER GUIDE** e.g. FTX12.000M18SM6A-20/20B (\*SM6A=6.0×3.5 SMD SEAM 2PAD TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	18	SM6A	20	20	B



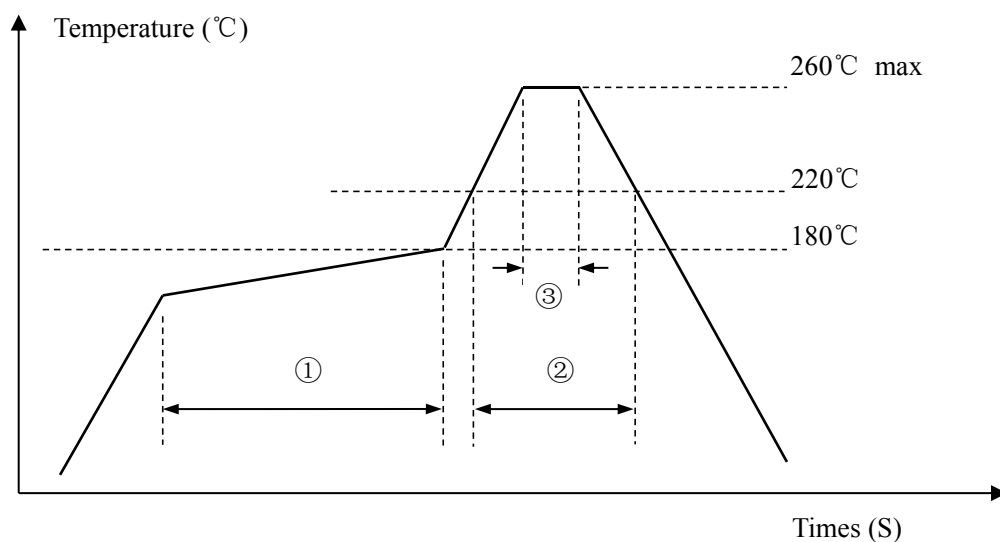
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60℃
	<b>B:</b> -20~+70℃
	<b>C:</b> -30~+80℃
	<b>D:</b> -40~+85℃
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD6035	178±2.0	16.0±0.3	6.40±0.10	3.90±0.10	8.0±0.1	1.5±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 7.0×5.0 mm**



- ±10 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	6~80MHz
Operation Mode	Fundamental, Overtone
Loading Capacitance	20pF Std. 8 to 32pF Series available
Drive Level	10 μ W ( 500 μ W Max )
Frequency Tolerance	±10ppm~±30ppm ( at 25°C )
Equivalent Resistance	80 Ω Max
Frequency Stability	±10ppm~±50ppm
Operating Temp. Range:	-10~+60°C to -40~+85°C
Storage Temp. Range:	-55~+125°C

○ All specification subject change without notice

**★ FREQUENCY STABILITY VS. TEMPERATURE**

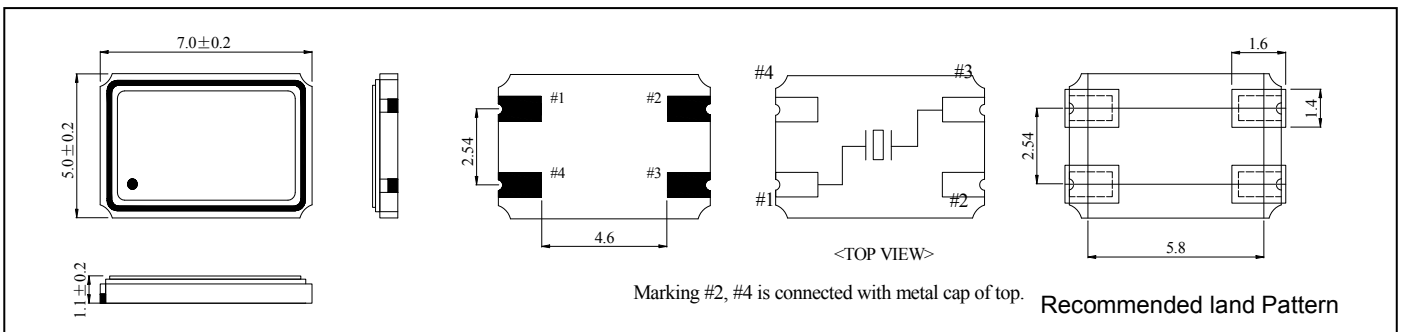
Operation Temperature Range	Frequency Stability				
	±10ppm	±15ppm	±20ppm	±30ppm	±50ppm
-10°C~+60°C	●	○	○	○	○
-20°C~+70°C	○	○	●	○	○
-40°C~+85°C		○	○	●	○

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	Vibration Mode	ESR
6-9.999MHz	AT CUT/FUND.	80Ω(MAX)
10-15.999MHz	AT CUT/FUND.	50Ω(MAX)
16-24.999MHz	AT CUT/FUND.	40Ω(MAX)
25-50.000MHz	AT CUT/FUND.	30Ω(MAX)
40-80.000MHz	AT 3 <sup>rd</sup> OT	on request

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

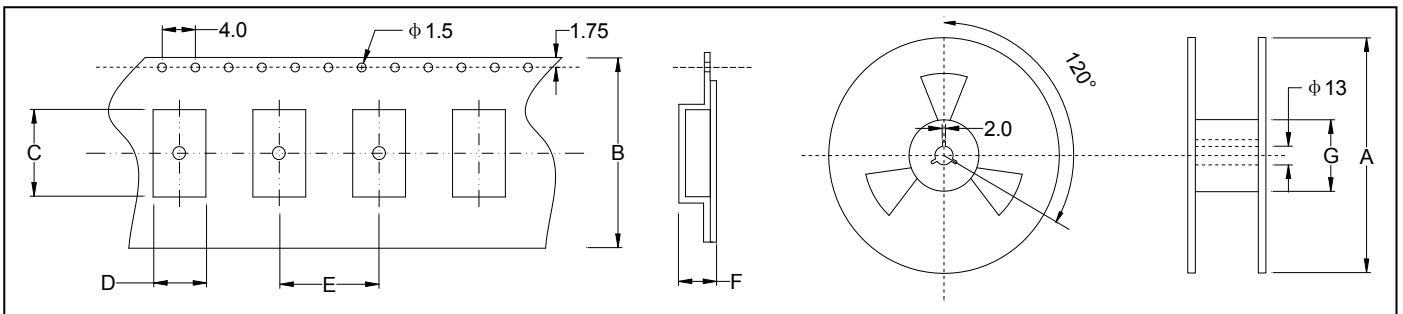


**★ PART NUMBER GUIDE** e.g. FTX12.000M18SM7S-20/20B (\*SM7S=7.0×5.0 SMD SEAM TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	12.000M	18	SM7S	20	20	B

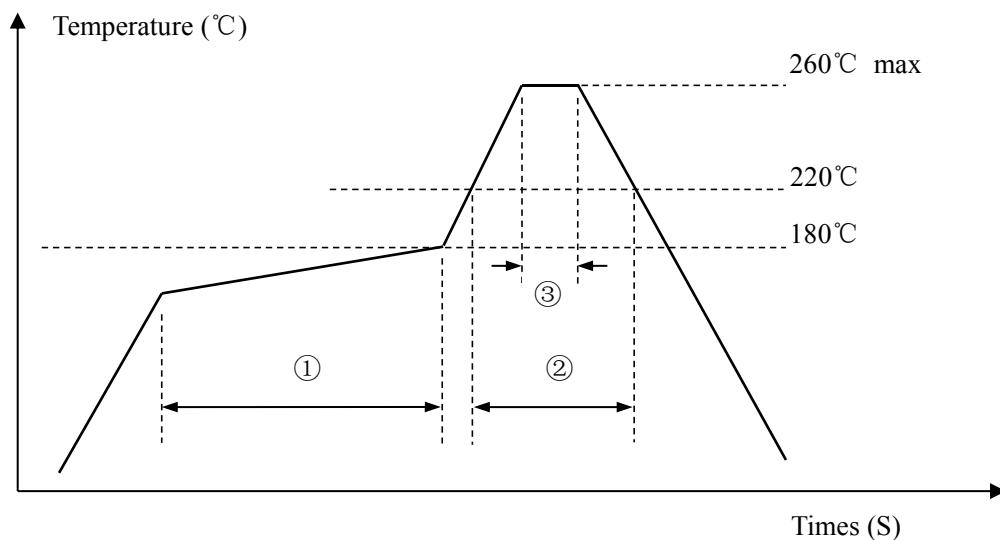
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD7050	178±2.0	16.0±0.3	7.40±0.10	5.40±0.10	8.0±0.1	1.8±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	120sec. max
	②	Primary heat	220℃	60sec. max
	③	Peak	260℃	10sec. max.

**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 12.5×4.6 mm**



- Plastic Encapsulated
- ±10 ppm available
- Temperatures to -40°C ~ +85°C
- Reflow soldering temperature: 260°C max
- Tape and Reel (1,000 pcs STD)



RoHS compliant

★ **PARAMETERS**

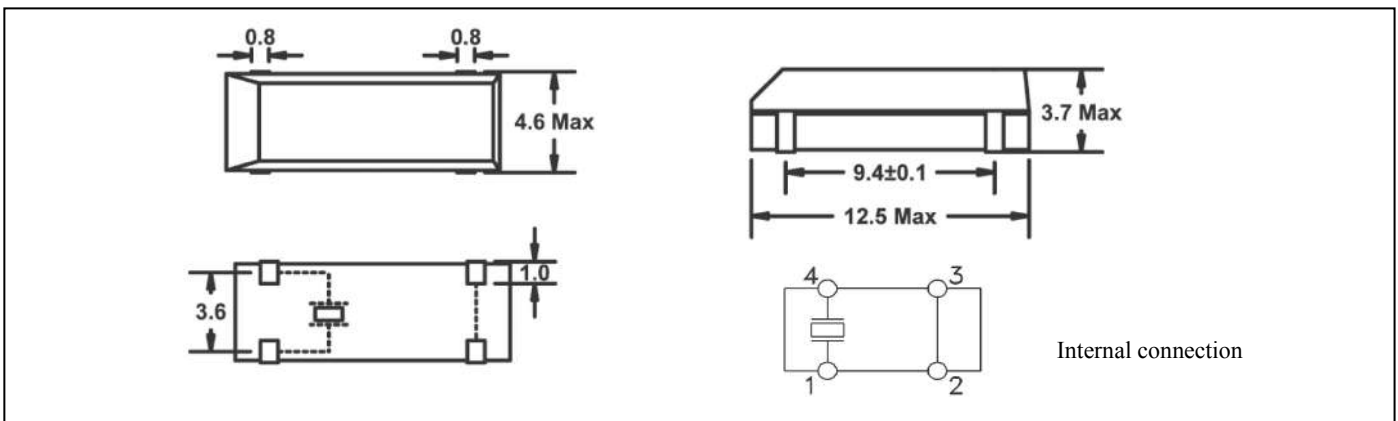
PARAMETERS	SPECIFICATION
Frequency Range	3.579~27.000MHz
Loading Capacitance	20pF Std. 8 to 33pF Series available
Drive Level	100 μ W Max
Frequency Tolerance	±10ppm ~ ±50ppm (at 25°C)
Frequency Stability	±20ppm ~ ±50ppm
Equivalent Resistance	50 Ω ~ 200 Ω
Operating Temp. Range:	-10 ~ +60°C to -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C
Aging (25°C, First Year)	±5ppm max

⊙ All specification subject change without notice.

★ **ESR (SERIES RESISTANCE RS)**

Frequency (MHz)	3.579≤f<4.000	4.000≤f<6.000	6.000≤f<10.000	10.000≤f<27.000
Equivalent Resistance (MHz)	200Ω (MAX)	150Ω (MAX)	100Ω (MAX)	50Ω (MAX)

★ **DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

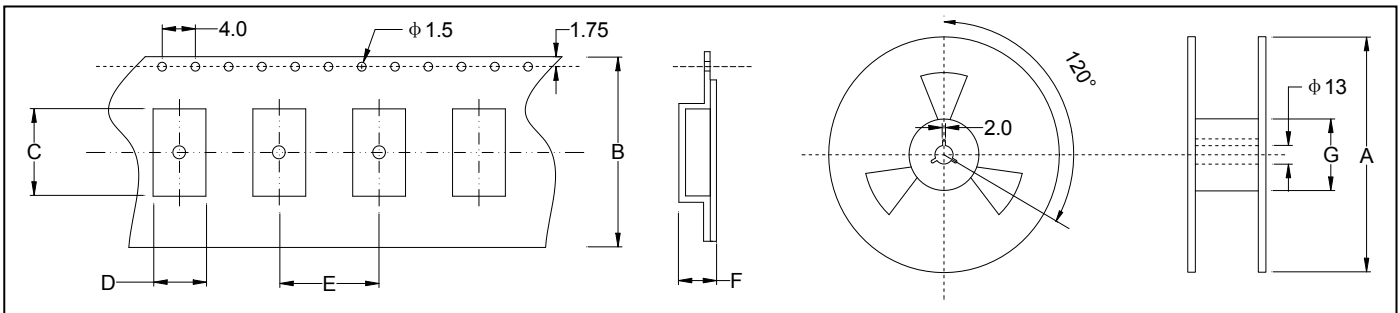


★ **PART NUMBER GUIDE** e.g. FTX16.000M20SM12-30/50D (\*S=HC49/S TYPE)

Logo	Quartz Crystal Resonator	Frequency Hz	Load Capacitance pF	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. Range
FT	X	16.000M	20	SM12	30	50	D

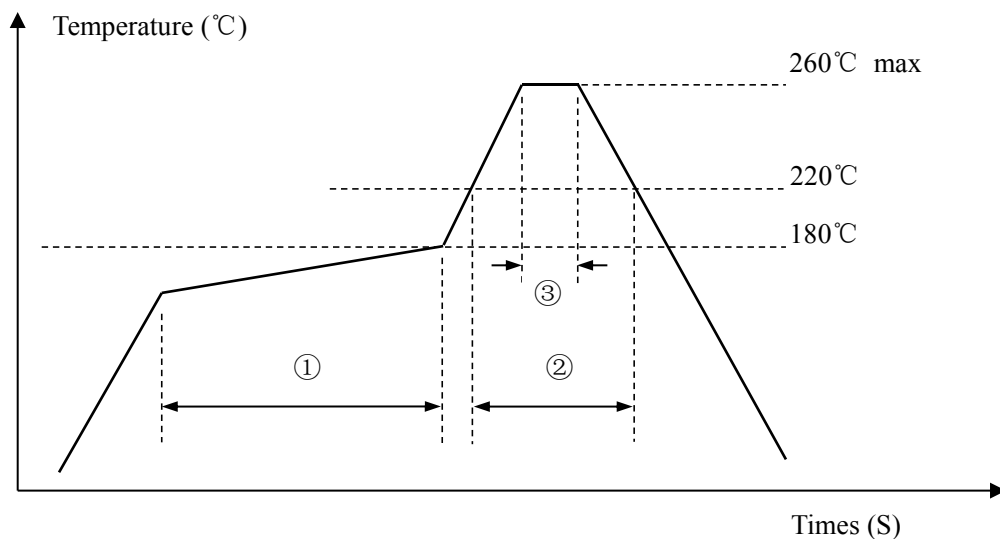
Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD12.5×4.6	330	24.0±0.3	12.8	5.8	12.0	4.3	100
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	100sec. max
	②	Primary heat	220°C	35sec. max
	③	Peak	260°C	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**

**2 Pad Version 1.6×1.0 mm**

- Ultra miniature SMD tuning fork crystal resonator
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max

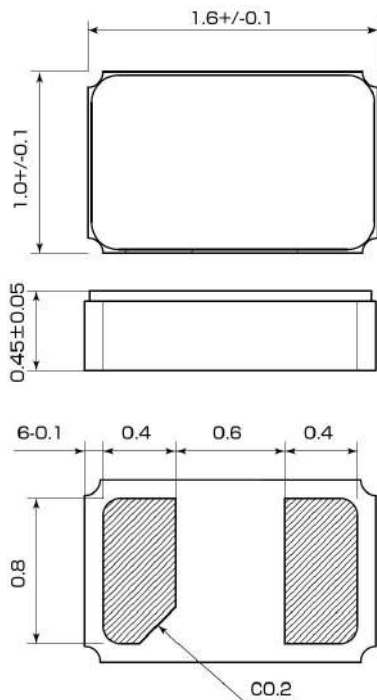


RoHS compliant

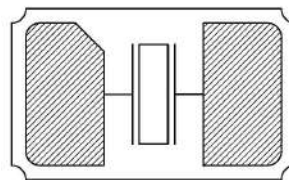
**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz
Loading Capacitance	12.5pF Std. 9 pF available
Drive Level	0.1μW (1.0μW Max)
Frequency Tolerance	±20ppm ( at 25°C )
Equivalent Resistance	90KΩ Max
Turn-over temperature	+25°C±5°C
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	±3ppm max

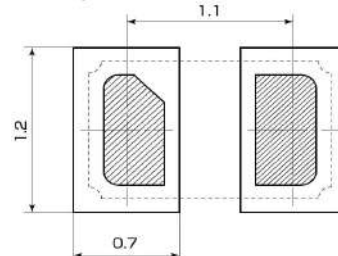
○ All specification subject change without notice.

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**


&lt;Top View&gt;


**■ Recommended Land Pattern [mm]**

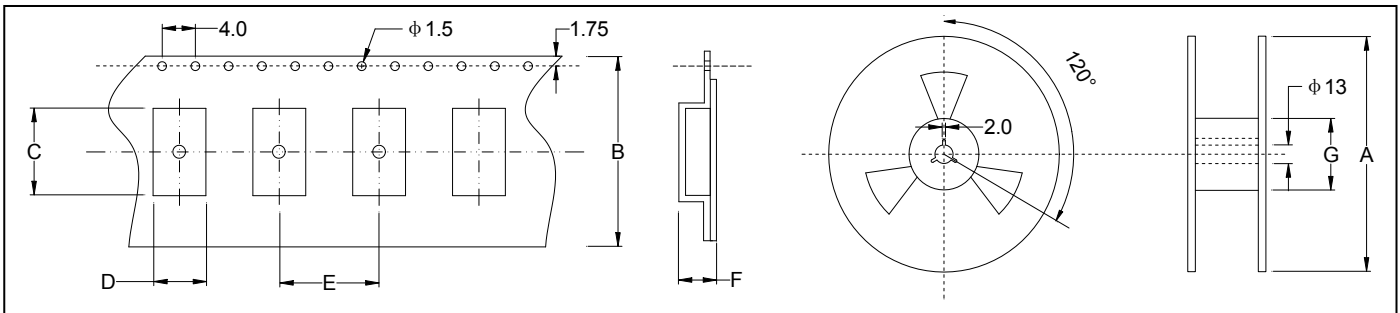
&lt;Top View&gt;


**★ PART NUMBER GUIDE** e.g. FTX32.768K12.5SM1-20D (\*SM1=1.6×1.0 SMD)

	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	SM1	20	D

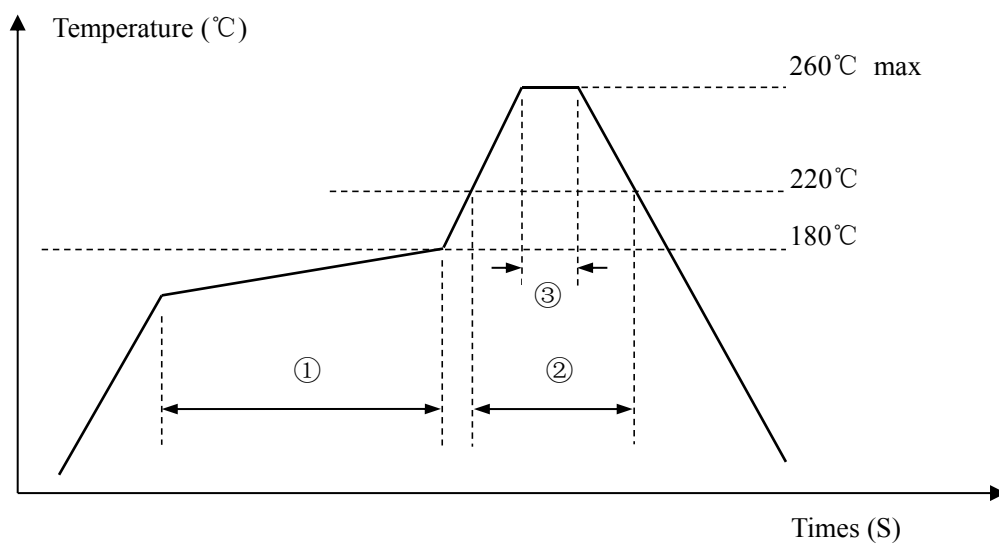
Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD1.6×1.0	180	8.0	1.79	1.28	4.0	0.65	60
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	100sec. max
	②	Primary heat	220°C	35sec. max
	③	Peak	260°C	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**
**2 Pad Version 2.0×1.2 mm**


- Ultra miniature SMD tuning fork crystal resonator
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max

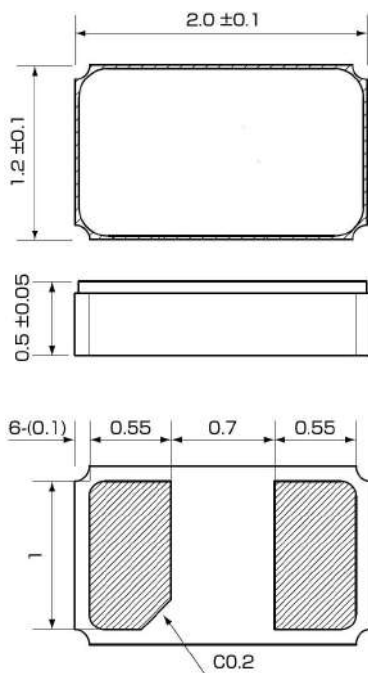


RoHS compliant

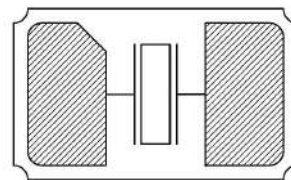
**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz
Loading Capacitance	12.5pF Std. 9 pF available
Drive Level	0.2μW (1.0μW Max)
Frequency Tolerance	±20ppm (at 25°C)
Equivalent Resistance	80KΩ Max
Turn-over temperature	+25°C±5°C
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-40~+85°C
Storage Temp. Range:	-40~+85°C
Aging (25°C, First Year)	±3ppm max

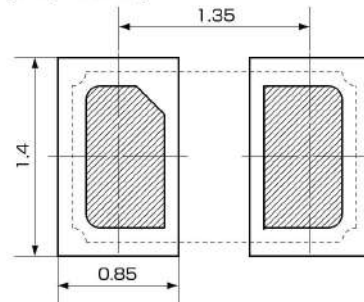
○ All specification subject change without notice.

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**


&lt;Top View&gt;


**■ Recommended Land Pattern [mm]**

&lt;Top View&gt;

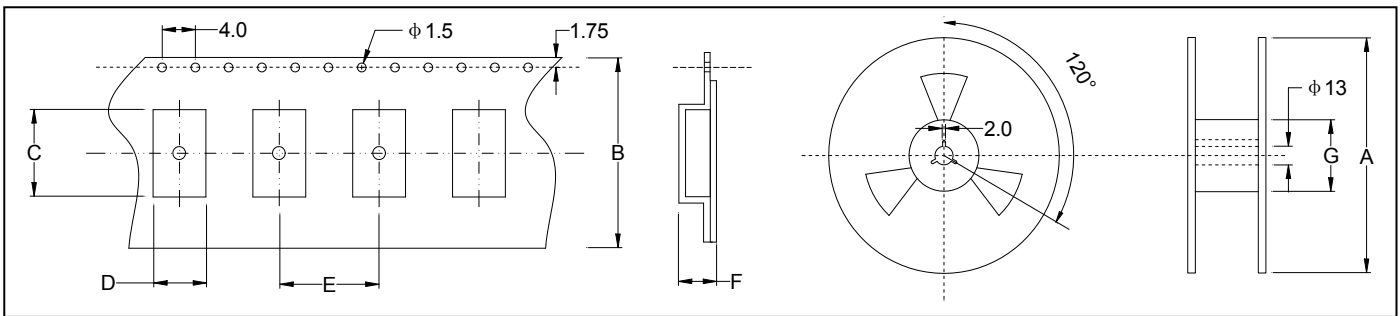

**★ PART NUMBER GUIDE** e.g. FTX32.768K12.5SM2-20D (\*SM2=2.0×1.2 SMD)

	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	SM2	20	D



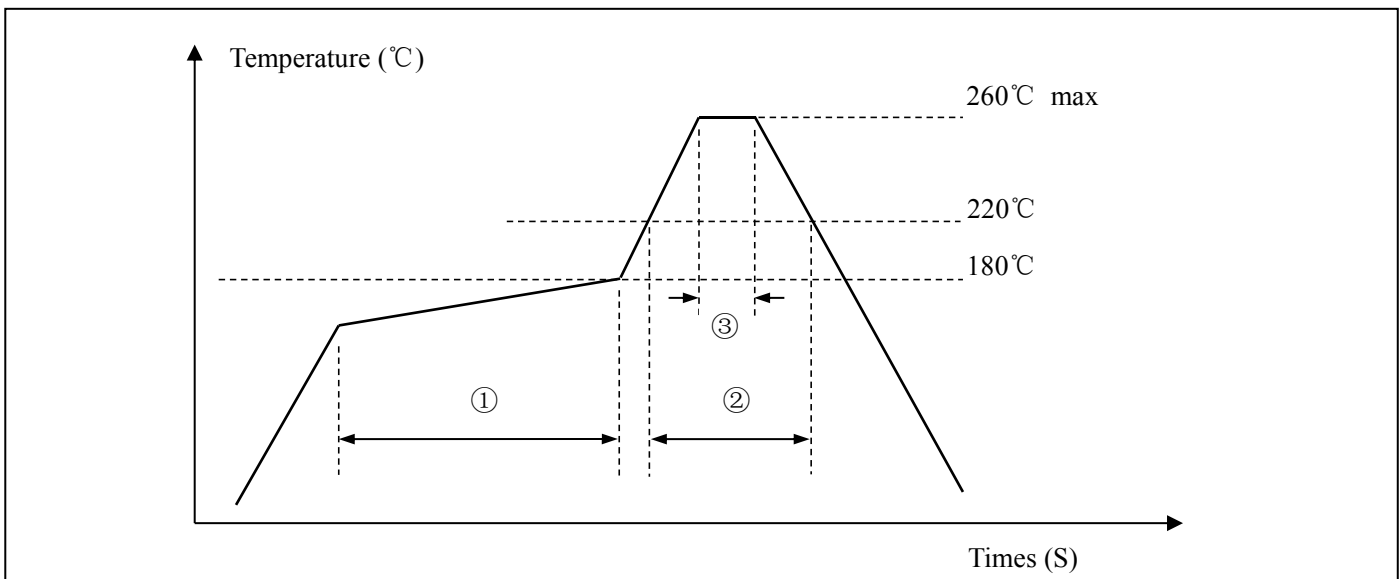
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD2.0×1.2	180	8.0	2.3	1.45	4.0	0.65	60
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	100sec. max
	②	Primary heat	220℃	35sec. max
	③	Peak	260℃	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**



**2 Pad Version 3.2×1.5 mm**

- Tuning fork crystal in standard package
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max



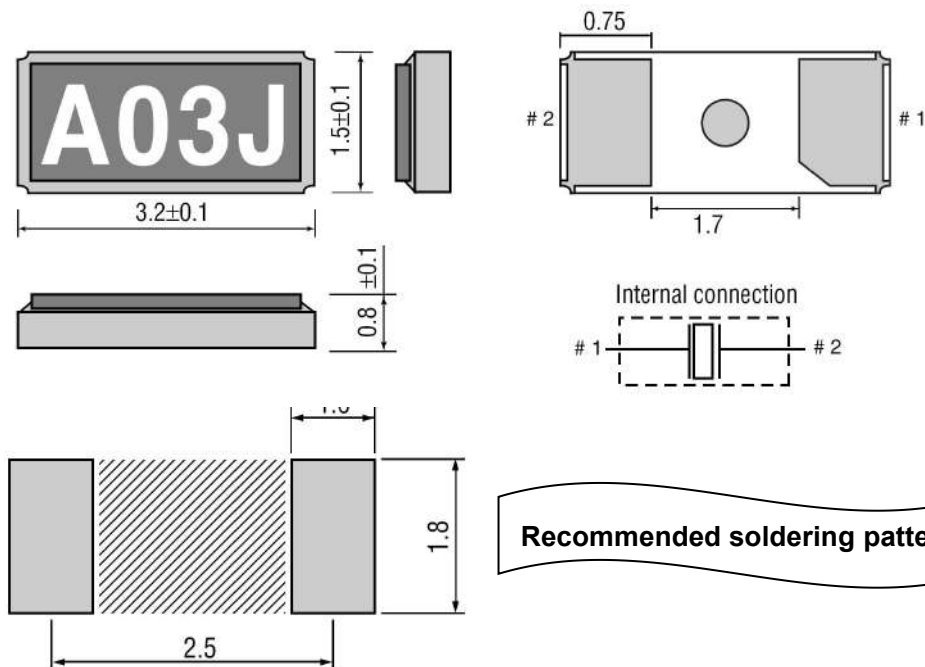
RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz
Loading Capacitance	12.5pF Std. 7 pF available
Drive Level	1.0 μ W Max
Frequency Tolerance	±20ppm ( at 25℃ )
Equivalent Resistance	70K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-40~+85℃
Storage Temp. Range:	-55~+125℃
Aging (25℃, First Year)	±3ppm max

© All specification subject change without notice.

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



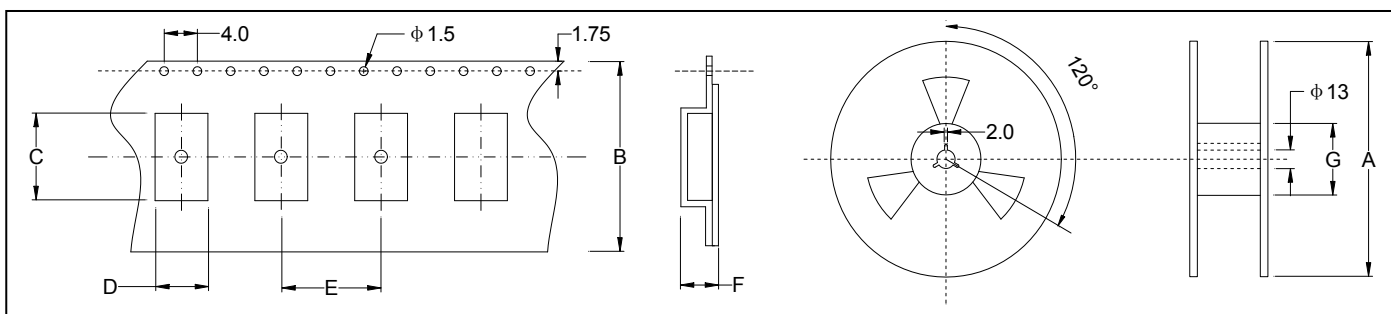
**Recommended soldering pattern**

**★ PART NUMBER GUIDE** e.g. FTX32.768K12.5SM3-20D (\*SM3=3.2×1.5 SMD)

	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	SM3	20	D

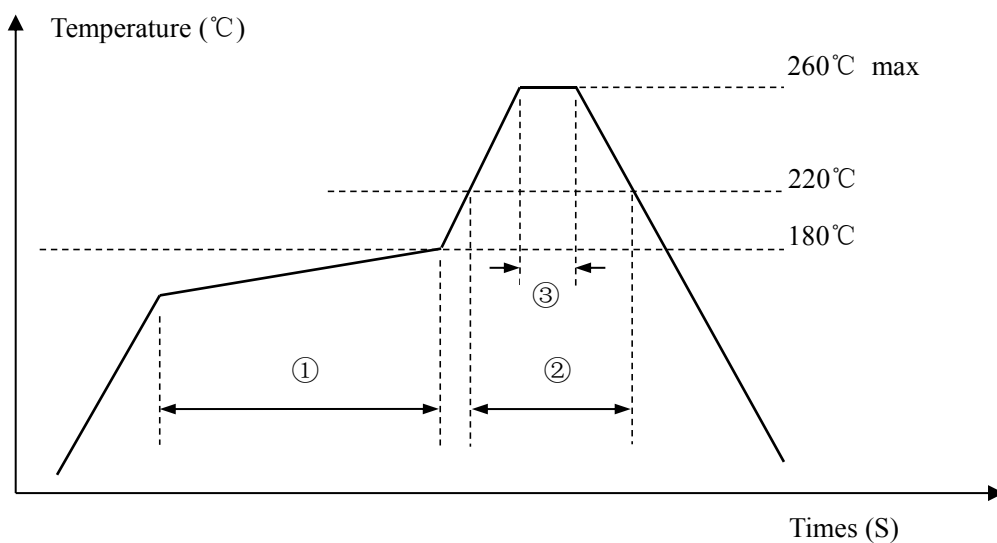
Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD3.2×1.5	180	12	3.45	1.75	4.0	1.0	60
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	100sec. max
	②	Primary heat	220°C	35sec. max
	③	Peak	260°C	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**
**4 Pad Version 7.0×1.5 mm**


- Tuning fork crystal in standard package
- 32.768 KHz standard
- ±20 ppm Standard
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max

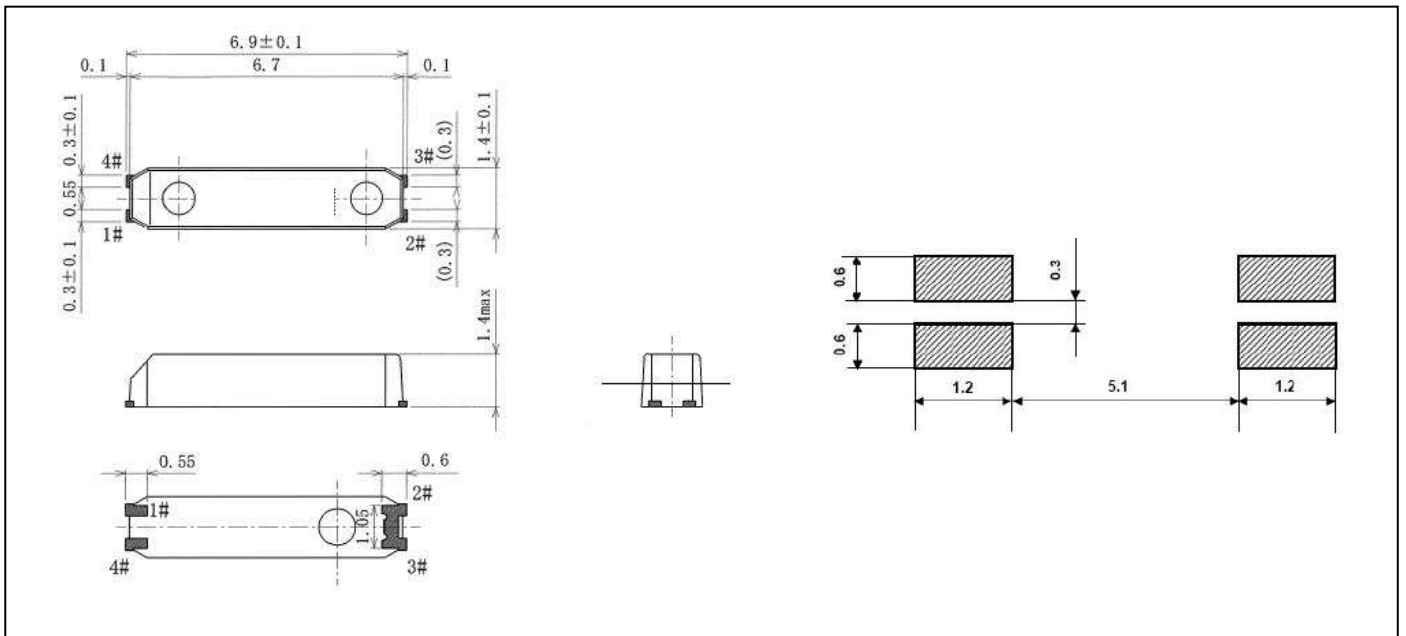


RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz
Loading Capacitance	12.5pF Std. 7 pF available
Drive Level	1.0 μ W Max
Frequency Tolerance	±20ppm (at 25°C)
Equivalent Resistance	65K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-40~+85°C
Storage Temp. Range:	-55~+125°C
Aging (25°C, First Year)	±3ppm max

© All specification subject change without notice.

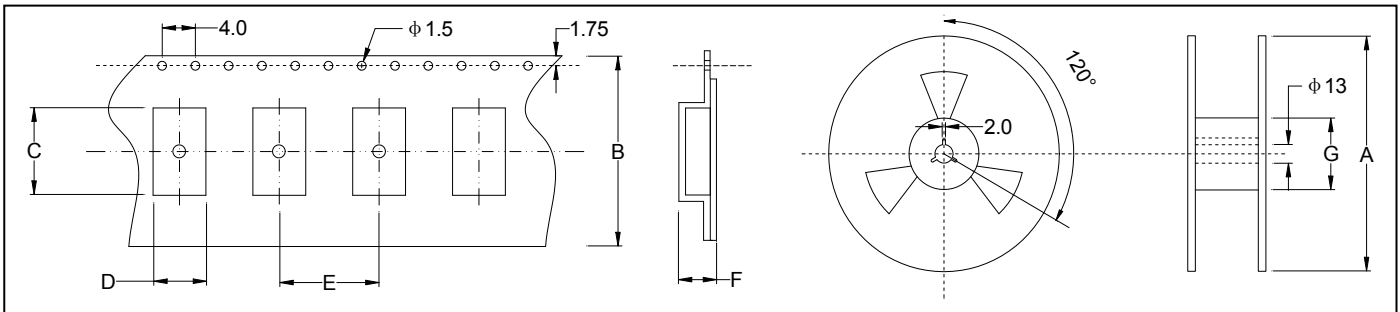
**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FTX32.768K12.5SM7-20D (\*SM7=7.0×1.5 SMD)

Logo	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	SM7	20	D

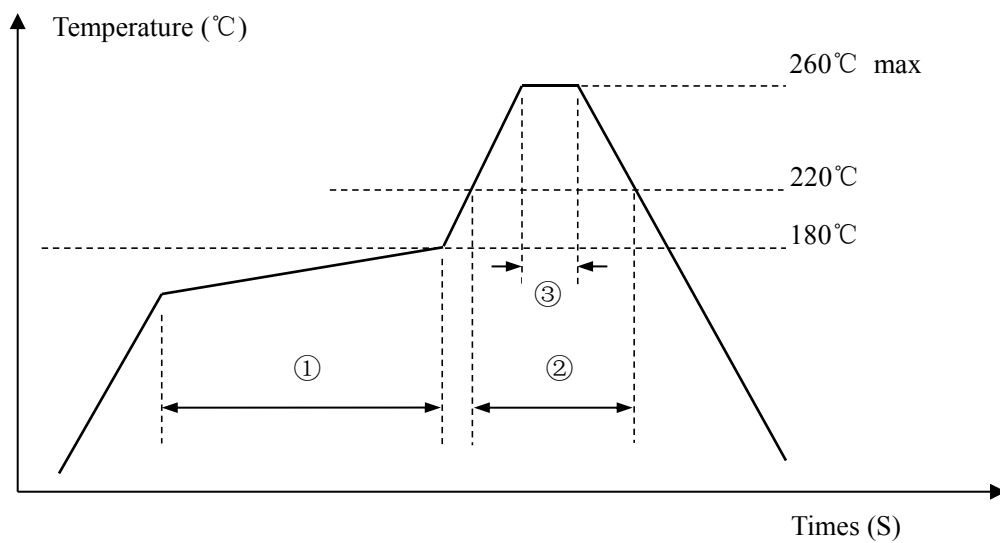
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+80°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD7×1.5	330	16	7.2	1.55	8.0	1.5	100
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	100sec. max
	②	Primary heat	220°C	35sec. max
	③	Peak	260°C	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**

**4 Pad Version 8.0×3.8 mm**

- Tuning fork crystal in standard package
- 32.768 KHz standard
- ±10 ppm available
- Excellent Reliability Performance
- Reflow soldering temperature: 260°C max



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz standard, 20.000~165.000KHz
Loading Capacitance	12.5pF Std. 6 to 20pF Series available
Drive Level	1.0 μ W Max
Frequency Tolerance	±10ppm ~ ±30ppm (at 25°C)
Equivalent Resistance	50K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-20 ~ +70°C / -40 ~ +85°C
Storage Temp. Range:	-55 ~ +125°C
Aging (25°C, First Year)	±3ppm max

○ All specification subject change without notice.

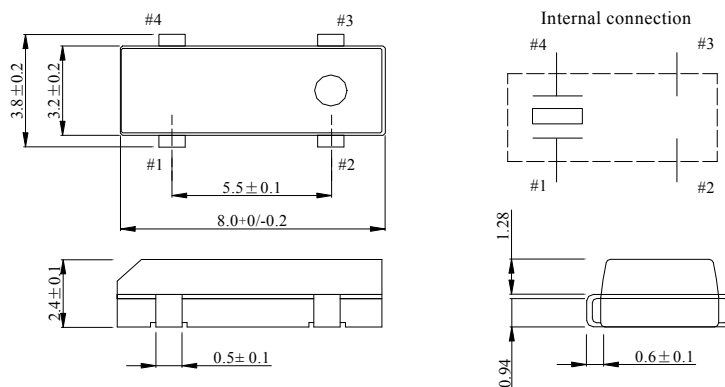
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability	
	-80ppm	-160ppm
-20°C~+70°C	●	
-40°C~+85°C		●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

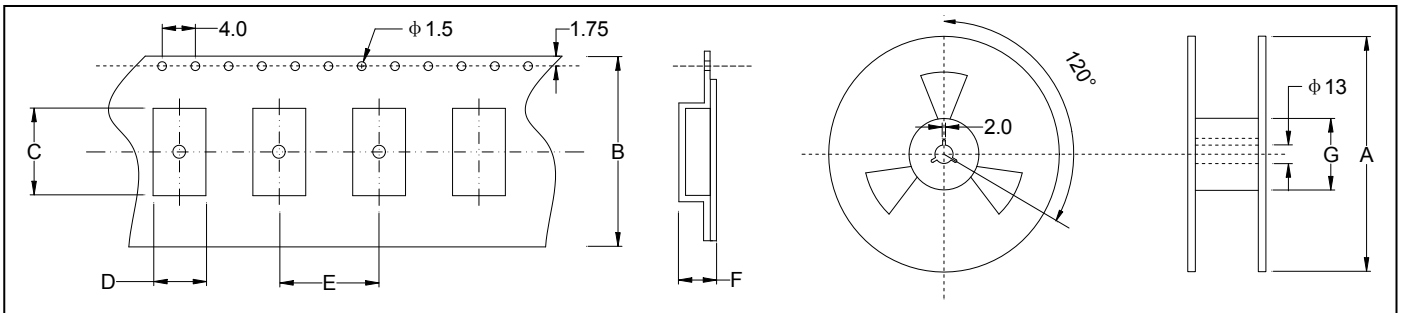
Frequency	20-30KHz	30-40KHz	40-70KHz	70-165KHz
ESR	50KΩ (MAX)	45KΩ (MAX)	20KΩ (MAX)	12KΩ (MAX)

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE** e.g. FTX32.768K12.5SM8-20D (\*SM8=8.0×3.8 SMD)

FT	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	SM8	20	D

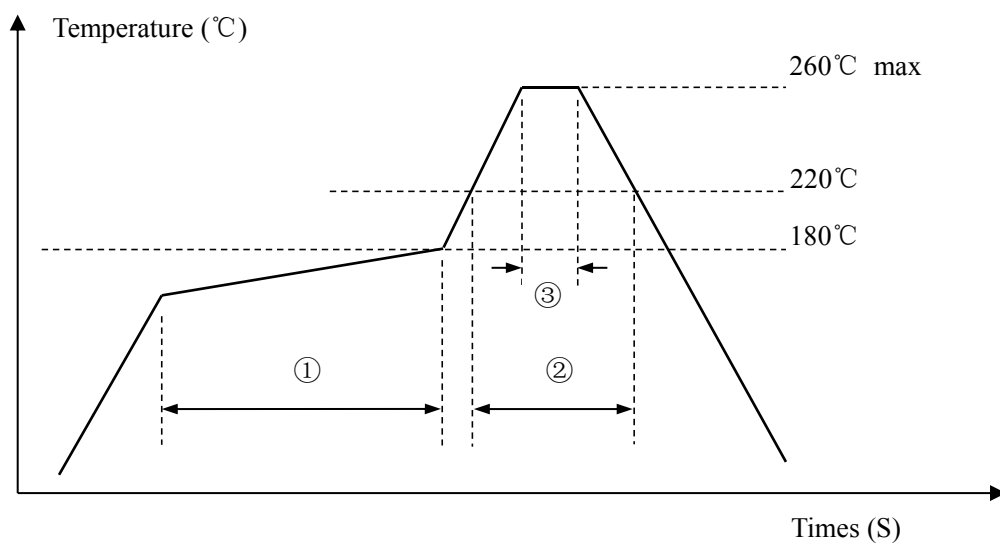
Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+80°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
SMD8×3.8	330	16	8.4	4.0	8.0	2.8	100
2000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	100sec. max
	②	Primary heat	220°C	35sec. max
	③	Peak	260°C	10sec. max

**SMD QUARTZ CRYSTAL RESONATOR**



**SMD Tuning Fork Crystal 2.0×6.0 mm**

- Tuning fork crystal in standard package
- 32.768 KHz standard
- ±10 ppm available
- Excellent Reliability Performance
- Reflow soldering temperature: 250°C max



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	32.768KHz standard, 20.000~160.000KHz
Loading Capacitance	12.5pF Std. 6 to 20pF Series available
Drive Level	1.0 μ W Max
Frequency Tolerance	±10ppm~±30ppm ( at 25°C )
Equivalent Resistance	50K Ω Max
Temperature coefficient	-0.04×10 <sup>-6</sup> /°C <sup>2</sup> max
Operating Temp. Range:	-20~+70°C / -40~+85°C
Storage Temp. Range:	-55~+125°C
Aging (25°C, First Year)	±3ppm max

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATUR**

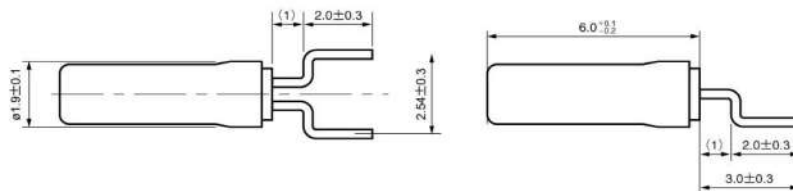
Operation Temperature Range	Frequency Stability	
	-80ppm	-160ppm
-20°C~+70°C	●	
-40°C~+85°C		●

● standard ○ available

**★ ESR (SERIES RESISTANCE RS)**

Frequency	20-30KHz	30-40KHz	40-70KHz	70-160KH
				z
ESR	50KΩ(MA X)	45KΩ(MA X)	20KΩ(MA X)	12KΩ(MA X)

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



**★ PART NUMBER GUIDE** e.g. FTX32.768K12.5FM206-20 (\*FM206=2.0×6.0mm SMD)

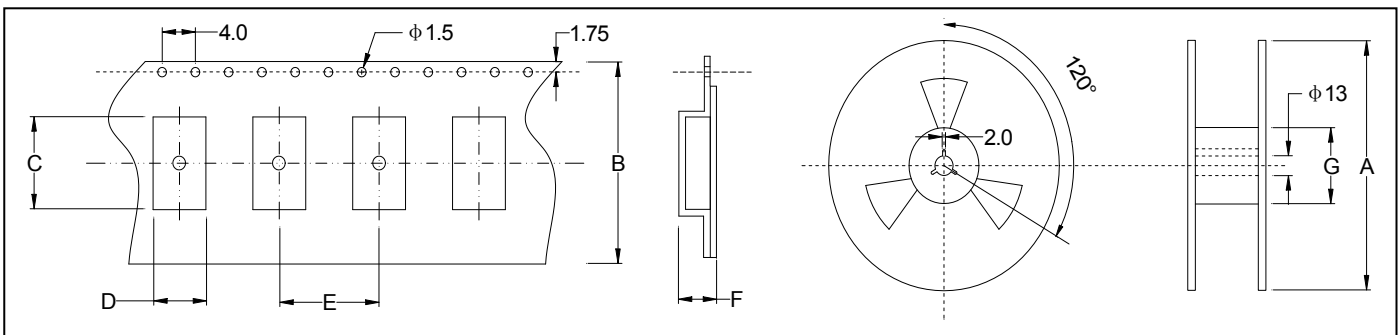
	Quartz Crystal Resonator	Frequency	Load Capacitance pf	Package	Frequency Tolerance ppm	Operating Temp. Range
FT	X	32.768KHz	12.5	FM206	20	D





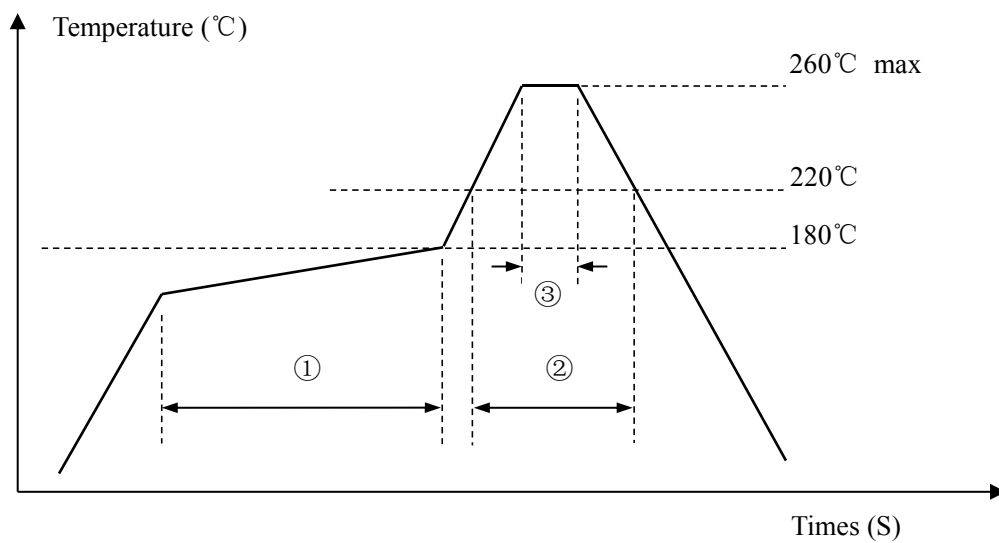
Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
FM206	178±2.0	16.0±0.3	8.4±0.1	4.0±0.1	8.0±0.1	2.8±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180℃	100sec. max
	②	Primary heat	220℃	35sec. max
	③	Peak	260℃	10sec. max

**DIP QUARTZ CRYSTAL OSCILLATOR**
**4 Pin Version 13.08×13.08 mm**


- ±20 ppm type available
- Excellent Reliability Performance



RoHS compliant

**★ PARAMETERS**

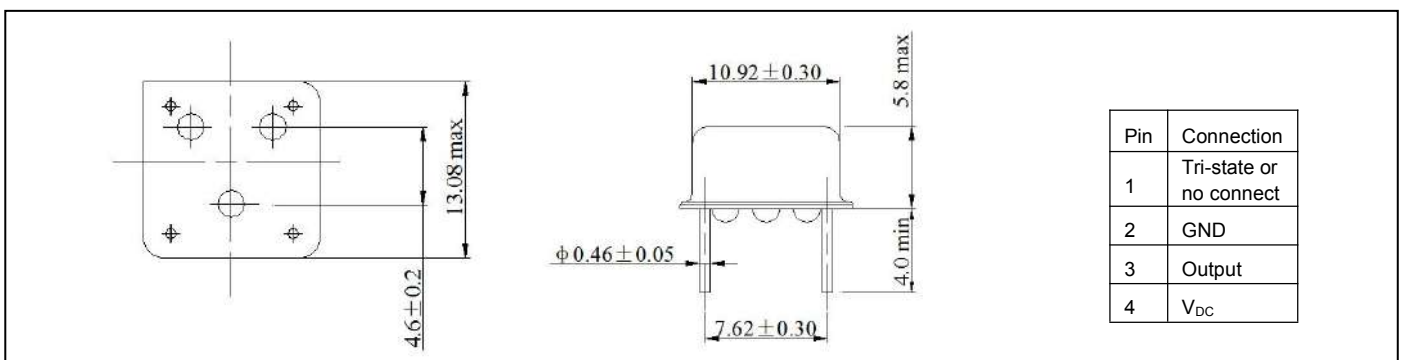
PARAMETERS	SPECIFICATION		
Frequency Range	0.4~200MHz		
Supply voltage	1.8V、3.3V、5.0V		
Input Current		TTL	CMOS
	0.5MHz ~ 24.999MHz	25mA max	20mA max
	25MHz ~ 99.999MHz	40mA max	40mA max
	100MHz ~ 200MHz	60mA max	60mA max
Frequency Stability Overall	±20ppm~±100ppm		
Operating Temp. Range	-10~+60°C to -40~+85°C		
Storage Temp. Range	-55~+125°C		
Output Load	CMOS or TTL (15pF/1-10TTL)		
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×Vdc		
Start-up time	10mS max		
Rise & Fall Time	10nS max		
Aging	±5ppm max/Year		

◎ All specification subject change without notice

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C				●

● standard ○ available

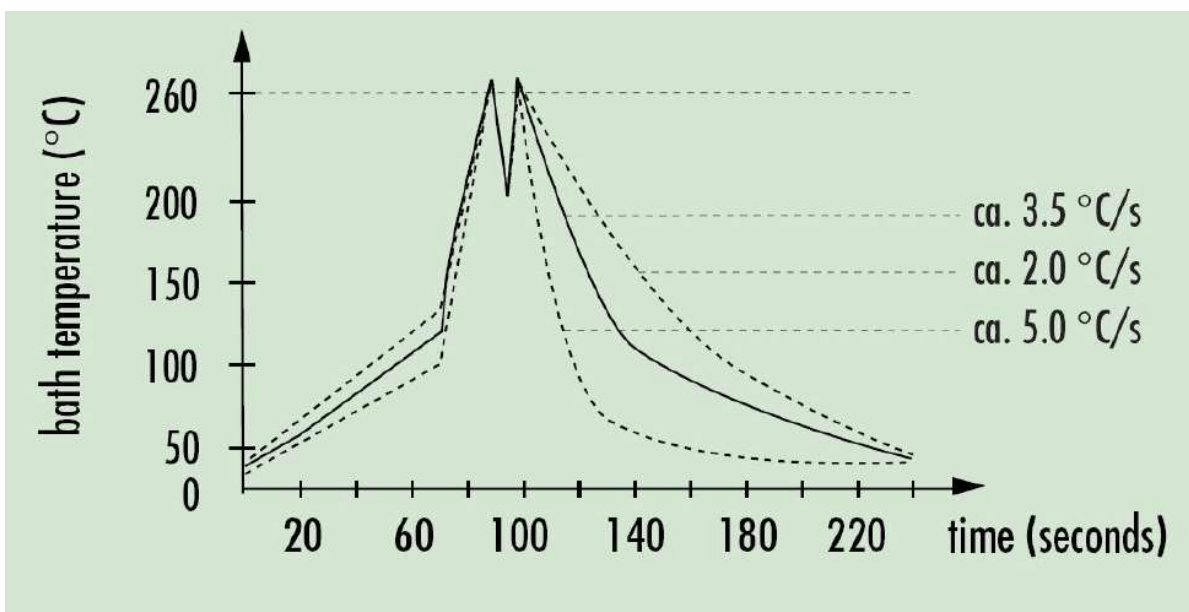
**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**


★ PART NUMBER GUIDE *e.g. FXO12.000M3.3H-50D (\*H=Half Size, DIP8)*

Logo	Quartz Crystal Oscillator	Frequency Hz	Supply voltage V	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000M	3.3	H	50	D

Definition	Description
Operating Temperature Range	<b>A:</b> -10~+60°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+80°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ WAVE SOLDERING PROFILE



## DIP QUARTZ CRYSTAL OSCILLATOR



### 4 Pin Version 20.7×13.2 mm

- ±20 ppm type available
- Excellent Reliability Performance



RoHS compliant

### ★ PARAMETERS

PARAMETERS	SPECIFICATION		
=Frequency Range	0.4~200MHz		
Supply voltage	1.8V、3.3V、5.0V		
Input Current		TTL	CMOS
	0.5MHz ~ 24.999MHz	25mA max	20mA max
	25MHz ~ 99.999MHz	40mA max	40mA max
	100MHz ~ 200MHz	60mA max	60mA max
Frequency Stability Overall	±20ppm~±100ppm		
Operating Temp. Range	-10~+60°C to -40~+85°C		
Storage Temp. Range	-55~+125°C		
Output Load	CMOS or TTL (15pF/1-10TTL)		
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×Vdc		
Start-up time	10mS max		
Rise & Fall Time	10nS max		
Aging	±5ppm max/Year		

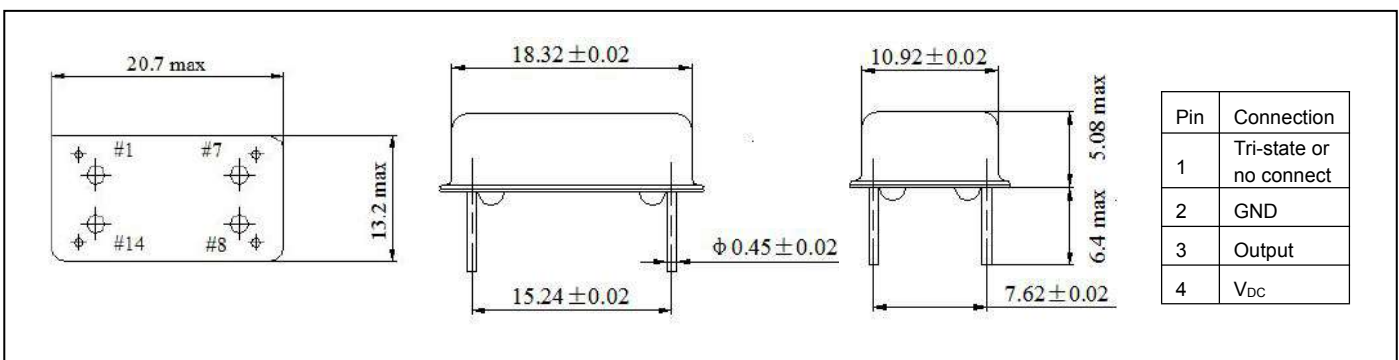
⊙ All specification subject change without notice.

### ★ FREQUENCY STABILITY VS. TEMPERATURE

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C				●

● standard ○ available

### ★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)

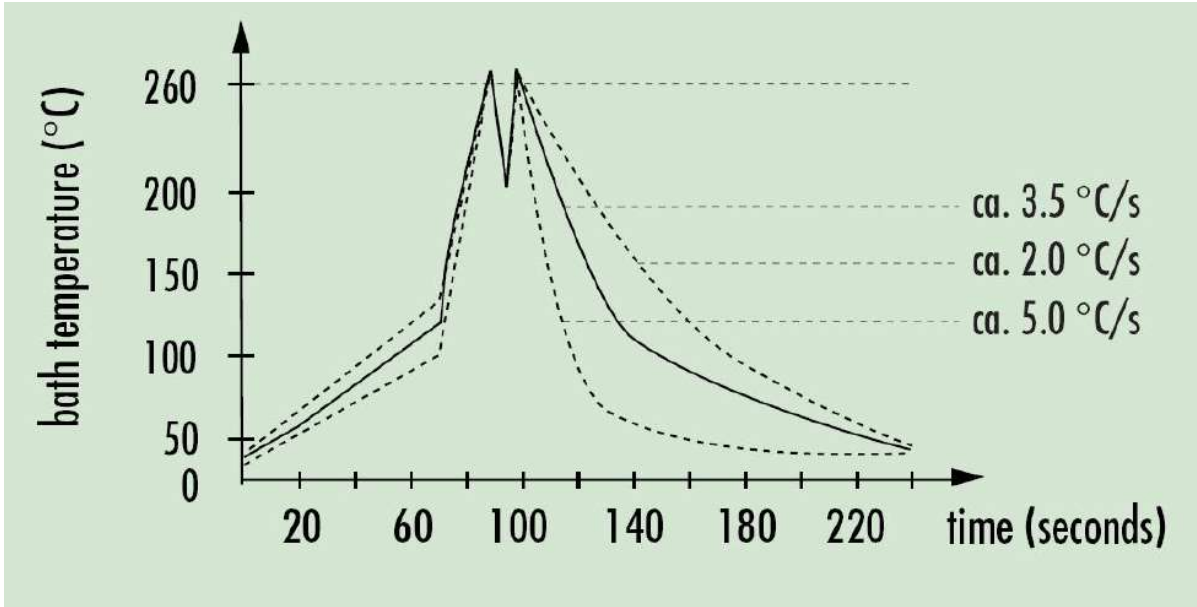


★ PART NUMBER GUIDE *e.g. FXO12.000M3.3F-50D (\*F=Full Size, DIP14)*

Logo	Quartz Crystal Oscillator	Frequency Hz	Supply voltage V	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000M	3.3	F	50	D

Definition	Description
Operating Temperature Range	A: -10~+60°C
	B: -20~+70°C
	C: -30~+80°C
	D: -40~+85°C
	E: Customer specified

★ WAVE SOLDERING PROFILE



**SMD QUARTZ CRYSTAL OSCILLATOR**

**4 Pad Version 2.0×1.6 mm**

- ±20 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	1.5~50MHz
Supply voltage	1.8V、2.5V、2.8V、3.3V
Input Current	See Below
Frequency Stability Overall	±20ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C
Output Load	HCMOS/TTL (15pF~30pF/10TTL)
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×Vdc
Start-up time	10mS max
Enable/ Disable Function	O/E or E/D

○ All specification subject change without notice.

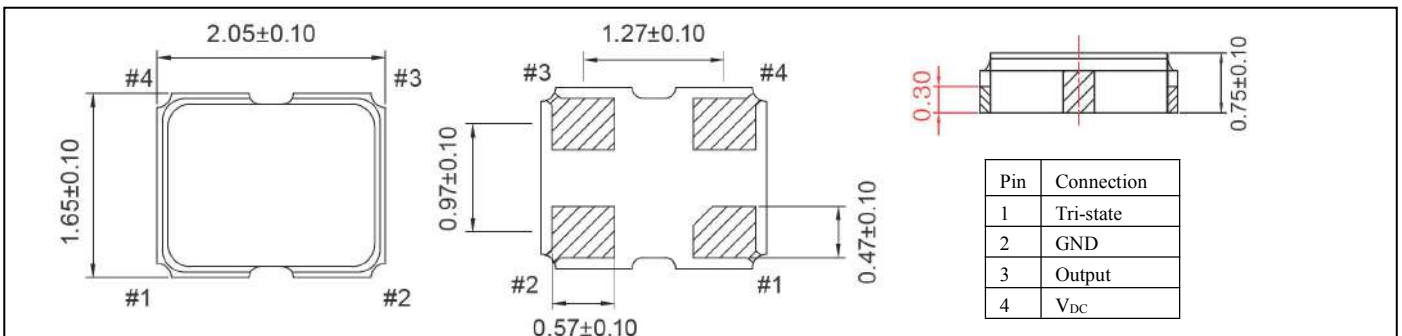
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C				●

● standard ○ available

**★ Rise & Fall TIME MAX.**

Frequency	Rise & Fall Time	V <sub>DC</sub>	Rise & Fall Time	V <sub>DC</sub>
1.5~9.9 MHz	4nS max	3.3V	5nS max	1.8V
10.0~19.9 MHz	4nS max		5nS max	
20.0~31.9 MHz	3nS max		4nS max	
32.0~50 MHz	3nS max		4nS max	

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FXO12.000M3.3SM2A-50D (\*SM2A=2.0×1.6 SMD TYPE)

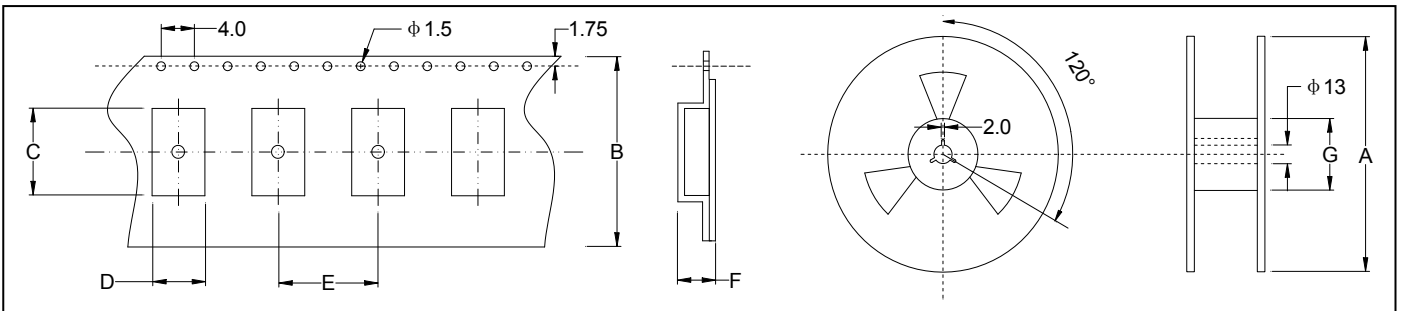
Logo	Quartz Crystal Oscillator	Frequency Hz	Supply voltage V	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000M	3.3	SM2A	50	D

Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+85℃
	D: -40~+85℃
	E: Customer specified

★ INPUT CURRENT

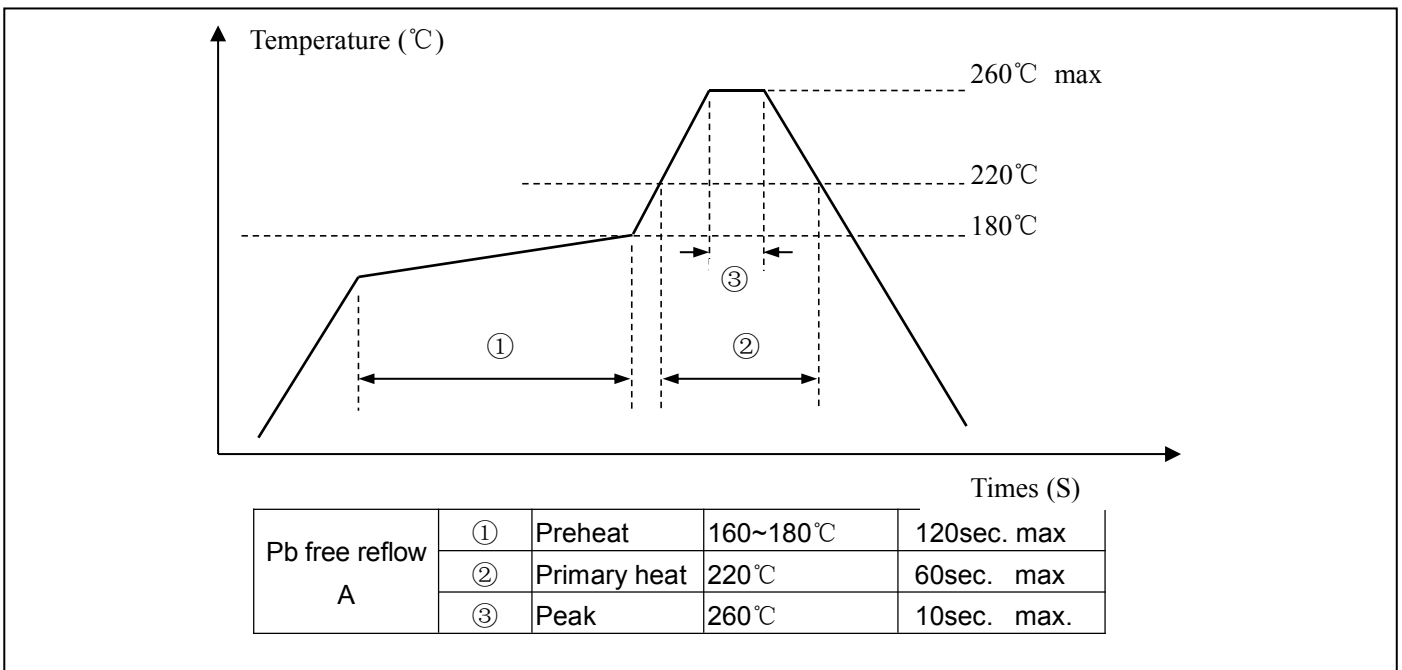
Vdc=3.3V		Vdc=2.5V		Vdc=1.8V	
1.5 ~ 9.9 MHz	7 mA	1.5 ~ 9.9 MHz	6 mA	1.5 ~ 9.9 MHz	4 mA
10.0 ~ 19.9 MHz	7 mA	10.0 ~ 19.9 MHz	6 mA	10.0 ~ 19.9 MHz	4 mA
20.0 ~ 31.9 MHz	10 mA	20.0 ~ 31.9 MHz	8 mA	20.0 ~ 31.9 MHz	5 mA
32.0 ~ 50.0 MHz	15 mA	32.0 ~ 50.0 MHz	10 mA	32.0 ~ 50.0 MHz	7 mA

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD2016	180±2.0	8.0±0.3	2.25±0.10	1.85±0.10	4.0±0.1	0.95±0.1	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL OSCILLATOR**
**4 Pad Version 2.5×2.0 mm**


- ±20 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	2~50MHz
Supply voltage	1.8V、2.5V、2.8V、3.3V
Input Current	See Below
Frequency Stability Overall	±20ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C
Output Load	HCMOS/TTL (15pF~30pF/10TTL)
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×Vdc
Start-up time	10mS max
Enable/ Disable Function	O/E or E/D

◎ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C		○	●	○
-40°C~+85°C				●

● standard ○ available

**★ Rise & Fall TIME MAX.**

Frequency	Rise & Fall Time	V <sub>DC</sub>	Rise & Fall Time	V <sub>DC</sub>
2.0~9.9 MHz	5nS max	3.3V	6nS max	1.8V
10.0~19.9 MHz	5nS max		5nS max	
20.0~31.9 MHz	5nS max		4nS max	
32.0~50 MHz	5nS max		4nS max	

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

Pin	Connection
1	Tri-state or no connect
2	GND
3	Output
4	V <sub>DC</sub>

Recommended land Pattern

**★ PART NUMBER GUIDE**

e.g. FXO12.000M3.3SM2-50D (\*SM2=2.5×2.0 SMD TYPE)

Logo	Quartz Crystal Oscillator	Frequency Hz	Supply voltage V	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000M	3.3	SM2	50	D

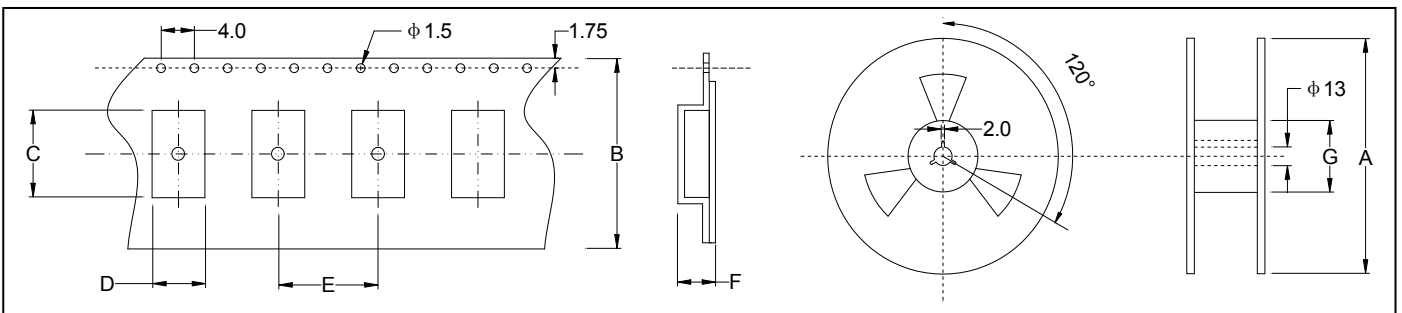


Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

### ★ INPUT CURRENT

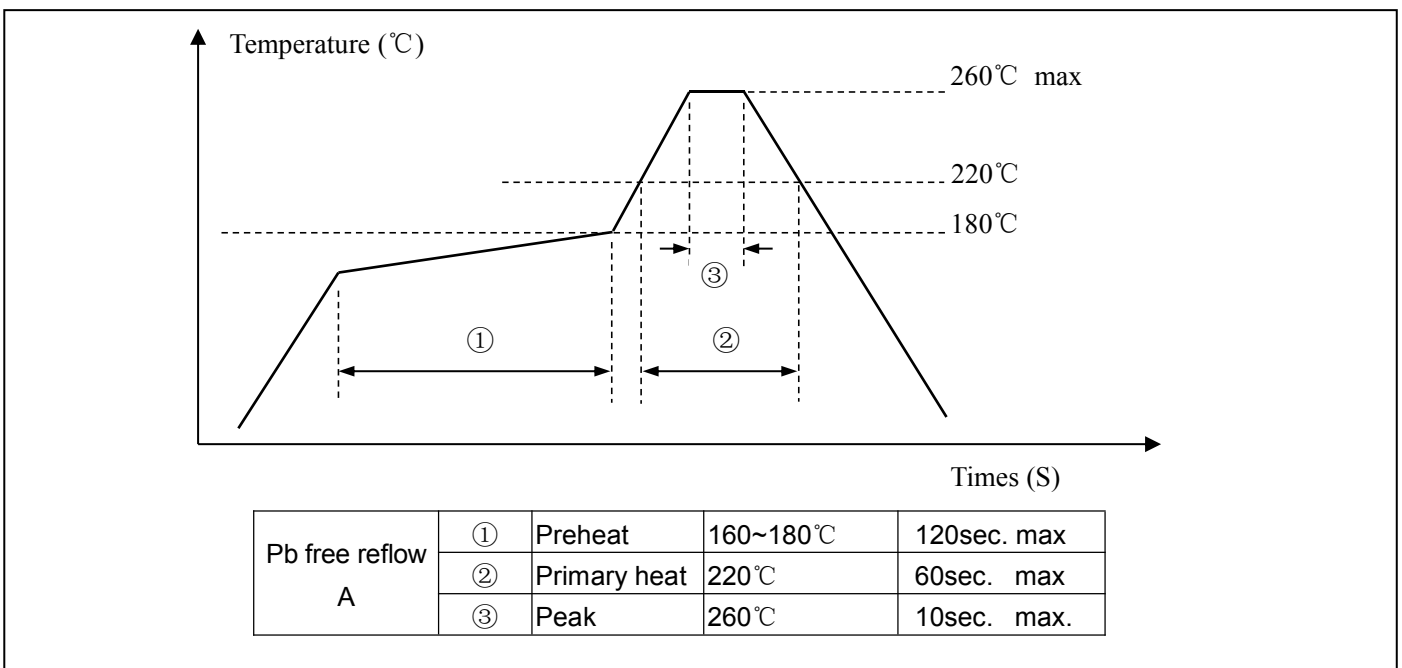
Vdc=3.3V		Vdc=2.5V		Vdc=1.8V	
2.0 ~ 9.9 MHz	7 mA	2.0 ~ 9.9 MHz	6 mA	2.0 ~ 9.9 MHz	3 mA
10.0 ~ 19.9 MHz	7 mA	10.0 ~ 19.9 MHz	8 mA	10.0 ~ 19.9 MHz	5 mA
20.0 ~ 31.9 MHz	12 mA	20.0 ~ 31.9 MHz	8 mA	20.0 ~ 31.9 MHz	5 mA
32.0 ~ 50.0 MHz	20 mA	32.0 ~ 50.0 MHz	20 mA	32.0 ~ 50.0 MHz	10 mA

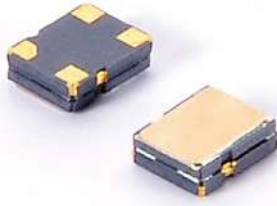
### ★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD2520	$178 \pm 2.0$	$8.0 \pm 0.2$	$2.80 \pm 0.10$	$2.30 \pm 0.10$	$4.0 \pm 0.1$	$1.15 \pm 0.1$	$60.5 \pm 1.0$
3000 pcs per reel							

### ★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL OSCILLATOR**
**4 Pad Version 3.2×2.5 mm**


- ±20 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	2~80MHz, 32.768KHz
Supply voltage	1.8V、2.5V、2.8V、3.3V、5.0V
Input Current	See Below
Frequency Stability Overall	±20ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C
Output Load	HCMOS/TTL (15pF~30pF/10TTL)
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×Vdc
Start-up time	10mS max
Enable/ Disable Function	O/E or E/D

○ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C		○	●	○
-40°C~+85°C				●

● standard ○ available

**★ Rise & Fall TIME MAX.**

Frequency	Rise & Fall Time	Note
2.0~9.9 MHz	6nS max	rise time: 0.1 V <sub>DC</sub> ~ 0.9 V <sub>DC</sub> fall time: 0.9 V <sub>DC</sub> ~ 0.1 V <sub>DC</sub>
10.0~39.9 MHz	5nS max	
40.0~79.9 MHz	4nS max	

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

Pin	Connection
1	Tri-state or no connect
2	GND
3	Output
4	V <sub>DC</sub>

Recommended land Pattern

**★ PART NUMBER GUIDE** e.g. FXO12.000M3.3SM3-50D (\*SM2=3.2×2.5 SMD TYPE)

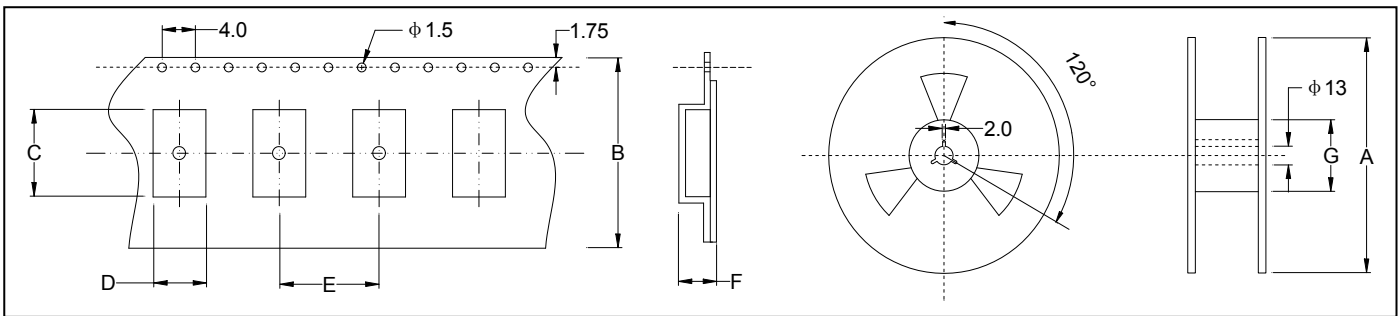
Logo	Quartz Crystal Oscillator	Frequency Hz	Supply voltage V	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000M	3.3	SM3	50	D

Definition	Description
Operating Temperature Range	A: -10~+60℃
	B: -20~+70℃
	C: -30~+80℃
	D: -40~+85℃
	E: Customer specified

★ INPUT CURRENT

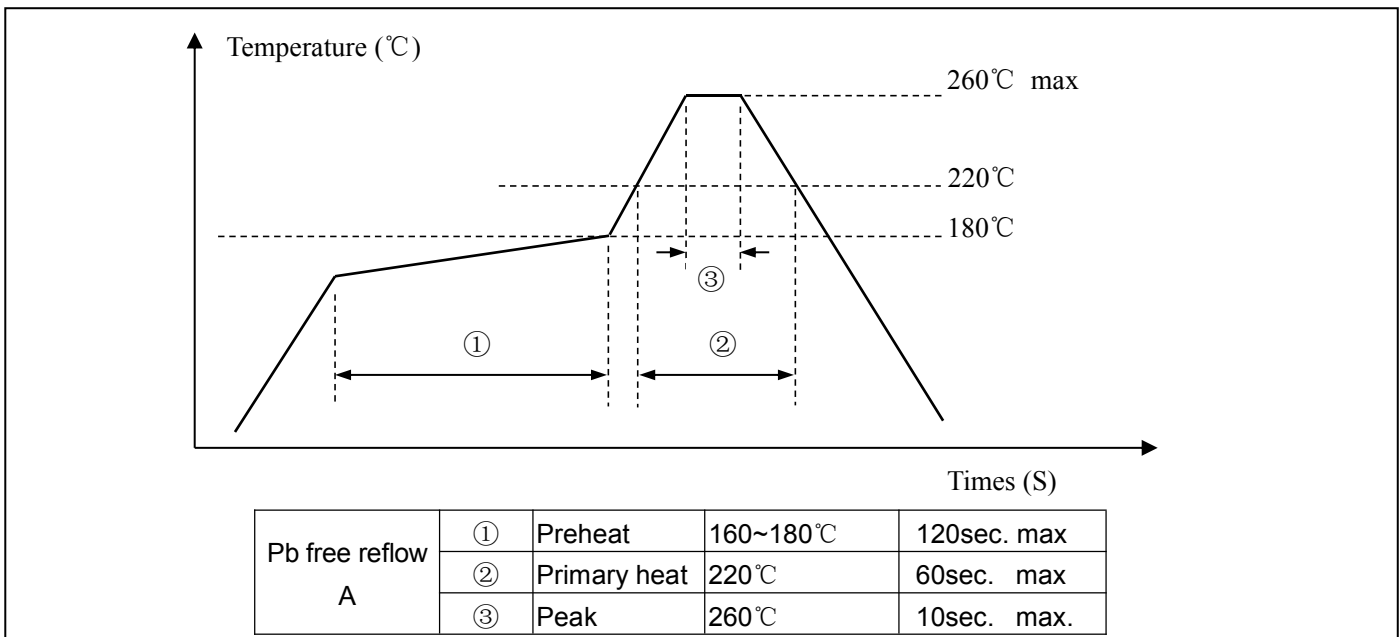
Vdc=3.3V				Vdc=1.8V			
15pF load		30pF load		15pF load		30pF load	
1.0 ~ 19.9 MHz	4 mA	1.0 ~ 19.9 MHz	6 mA	1.0 ~ 19.9 MHz	2 mA	1.0 ~ 19.9 MHz	6 mA
20.0 ~ 39.9 MHz	7 mA	20.0 ~ 39.9 MHz	13 mA	20.0 ~ 39.9 MHz	3 mA	20.0 ~ 29.9 MHz	10 mA
40.0 ~ 59.9 MHz	19 mA	40.0 ~ 49.9 MHz	24 mA	40.0 ~ 59.9 MHz	10 mA	30.0 ~ 40.0 MHz	12 mA
60.0 ~ 79.9 MHz	24 mA	50.0 ~ 60.0 MHz	35 mA	60.0 ~ 80.0 MHz	12 mA		

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD3225	178±2.0	8.0±0.3	3.55±0.10	2.80±0.10	4.0±0.1	1.4±0.1	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



**SMD QUARTZ CRYSTAL OSCILLATOR**

**4 Pad Version 5.0×3.2 mm**

- ±20 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	1 ~ 125MHz
Supply voltage	1.8V、2.5V、2.8V、3.3V、5.0V
Input Current	See Below
Frequency Stability Overall	±20ppm ~ ±50ppm
Operating Temp. Range	-10 ~ +60°C to -40 ~ +85°C
Storage Temp. Range	-55 ~ +125°C
Output Load	HCMOS/TTL (15pF~30pF/10TTL)
Symmetry	45% ~ 55% typ. (40% ~ 60% max.) at 0.5×V <sub>dc</sub>
Start-up time	10mS max
Enable/ Disable Function	O/E or E/D

◎ All specification subject change without notice.

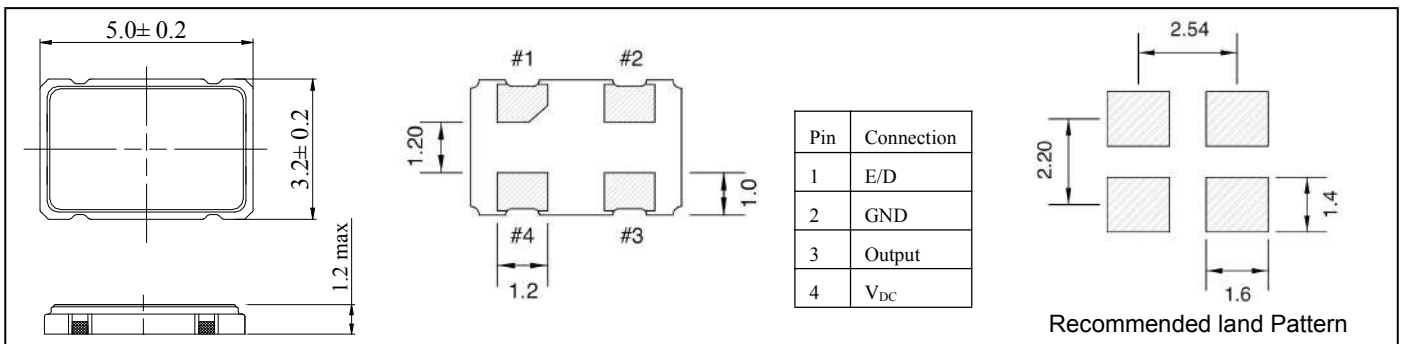
**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C				●

● standard ○ available

**★ Rise & Fall TIME MAX.**

Frequency	Rise & Fall Time	Note
1.0~9.9 MHz	6nS max	rise time: 0.1 V <sub>dc</sub> ~ 0.9 V <sub>dc</sub> fall time: 0.9 V <sub>dc</sub> ~ 0.1 V <sub>dc</sub>
10.0~39.9 MHz	5nS max	
40.0~80.9 MHz	4nS max	

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FXO12.000MAA3SM5-50D (\*SM5=5.0×3.2 SMD TYPE)

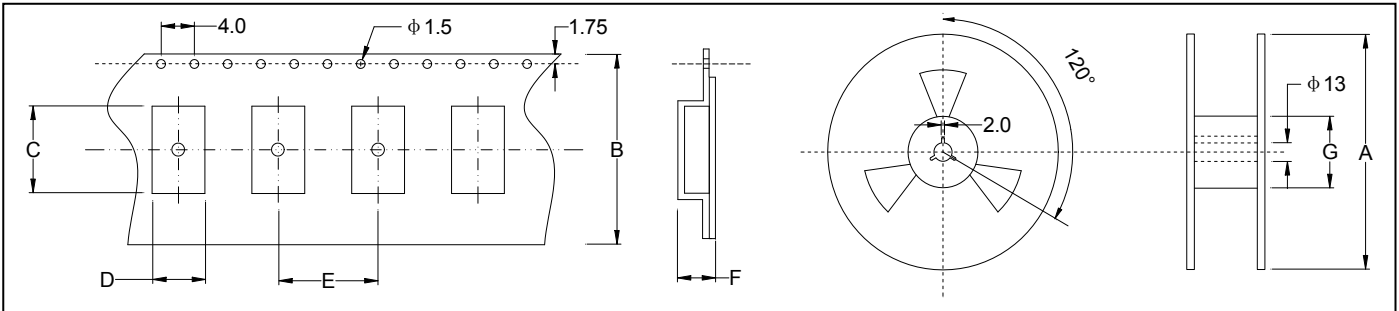
	Quartz Crystal Oscillator	Frequency	Supply voltage	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000	3.3	SM5	50	D

Definition	Description	Definition	Description
Frequency Stability	A: $\pm 25\text{ppm}$	Operating Temp.	A: $0\sim+70^{\circ}\text{C}$
	B: $\pm 50\text{ppm}$		B: $-20\sim+70^{\circ}\text{C}$
	C: $\pm 100\text{ppm}$		C: $-30\sim+85^{\circ}\text{C}$
	D: Customer specified		D: $-40\sim+85^{\circ}\text{C}$
			E: Customer specified

★ INPUT CURRENT

Vdc=5.0V				Vdc=3.5V			
15pF load		30pF load		15pF load		30pF load	
1.0 ~ 19.9 MHz	4 mA	1.0 ~ 19.9 MHz	6 mA	1.0 ~ 19.9 MHz	2 mA	1.0 ~ 19.9 MHz	6 mA
20.0 ~ 39.9 MHz	7 mA	20.0 ~ 39.9 MHz	13 mA	20.0 ~ 39.9 MHz	3 mA	20.0 ~ 29.9 MHz	10 mA
40.0 ~ 59.9 MHz	19 mA	40.0 ~ 49.9 MHz	24 mA	40.0 ~ 59.9 MHz	10 mA	30.0 ~ 40.0 MHz	12 mA
60.0 ~ 79.9 MHz	24 mA	50.0 ~ 60.0 MHz	35 mA	60.0 ~ 80.0 MHz	12 mA		

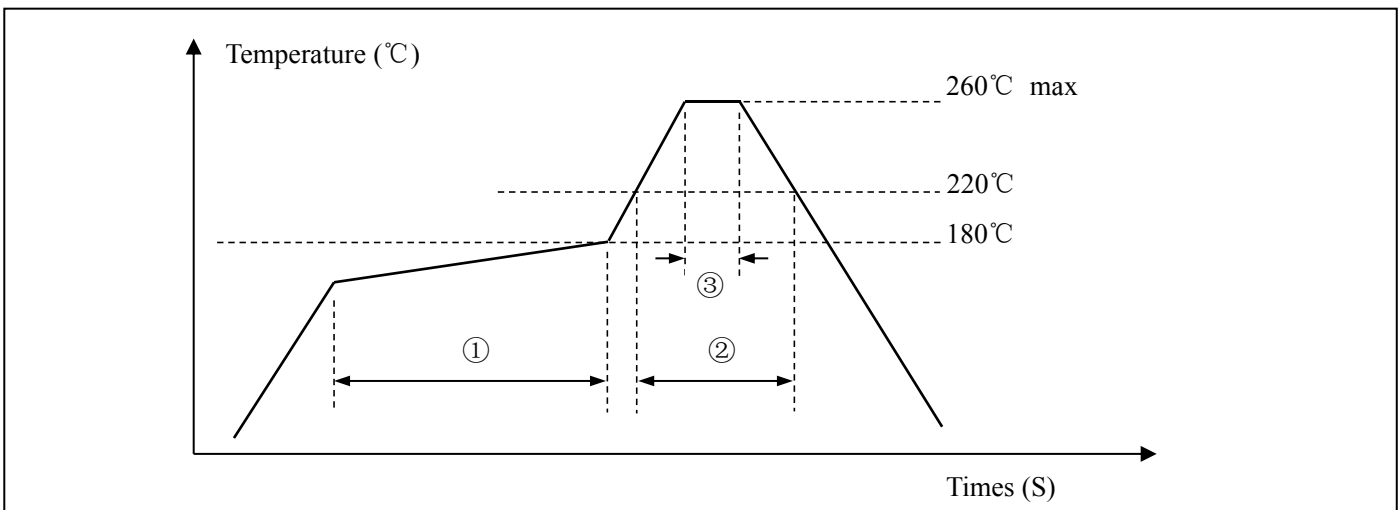
★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD5032	$178\pm 2.0$	$12.0\pm 0.3$	$3.55\pm 0.10$	$2.80\pm 0.10$	$4.0\pm 0.1$	$1.4\pm 0.1$	$60.5\pm 1.0$

1000 pcs per reel

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**SMD QUARTZ CRYSTAL OSCILLATOR**



**4 Pad Version 7.0×5.0 mm**

- ±20 ppm type available
- Excellent Reliability Performance
- EMI shielding possible by grounded lid
- Reflow soldering temperature: 260°C max
- Ceramic Seam Weld package



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION
Frequency Range	1~125MHz
Supply voltage	1.8V、2.5V、2.8V、3.3V、5.0V
Input Current	See Below
Frequency Stability Overall	±20ppm~±50ppm
Operating Temp. Range	-10~+60°C to -40~+85°C
Storage Temp. Range	-55~+125°C
Output Load	HCMOS/TTL (15pF~30pF/10TTL)
Symmetry	45%~55% typ. (40%~60% max.) at 0.5×Vdc
Start-up time	10mS max
Enable/ Disable Function	O/E or E/D

⊙ All specification subject change without notice.

**★ FREQUENCY STABILITY VS. TEMPERATURE**

Operation Temperature Range	Frequency Stability			
	±20ppm	±25ppm	±30ppm	±50ppm
-10°C~+60°C	○	●	○	○
-20°C~+70°C	○	○	●	○
-40°C~+85°C	○	○	○	●

● standard ○ available

**★ Rise & Fall TIME MAX.**

Frequency	Rise & Fall Time	Note
1.0~9.9 MHz	6nS max	rise time: 0.1 V <sub>DC</sub> ~ 0.9 V <sub>DC</sub>
10.0~39.9 MHz	5nS max	
40.0~69.9 MHz	4nS max	fall time: 0.9 V <sub>DC</sub> ~ 0.1 V <sub>DC</sub>
70.0~125.0 MHz	3nS max	

**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

Pin	Connection
1	E/D
2	GND
3	Output
4	V <sub>DC</sub>

Recommended land Pattern

**★ PART NUMBER GUIDE** e.g. FXO12.000M3.3SM7-50D(\*SM7=7.0×5.0SMD TYPE)

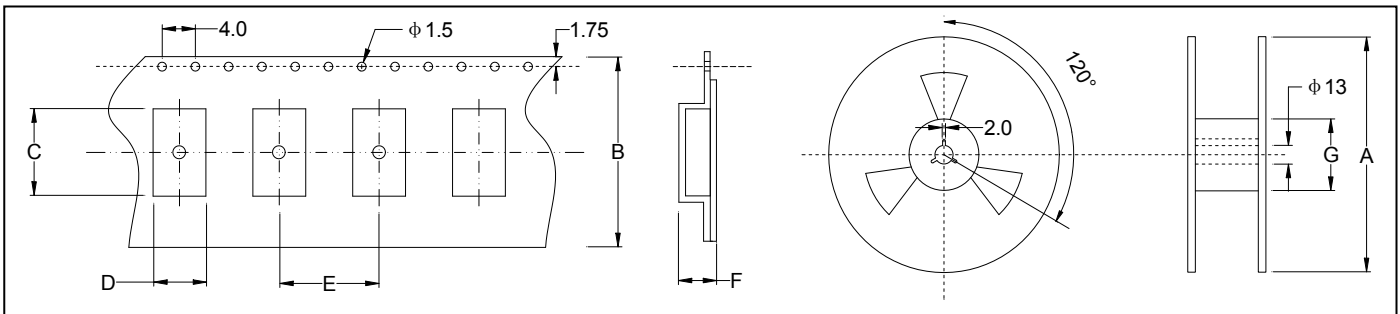
	Quartz Crystal Oscillator	Frequency	Supply voltage	Package	Frequency Stability ppm	Operating Temp. Range
F	XO	12.000	3.3	SM7	50	D

Definition	Description	Definition	Description
Frequency Stability	A: $\pm 25\text{ppm}$	Operating Temp.	A: $0\sim+70^{\circ}\text{C}$
	B: $\pm 50\text{ppm}$		B: $-20\sim+70^{\circ}\text{C}$
	C: $\pm 100\text{ppm}$		C: $-30\sim+85^{\circ}\text{C}$
	D: Customer specified		D: $-40\sim+85^{\circ}\text{C}$
			E: Customer specified

★ INPUT CURRENT

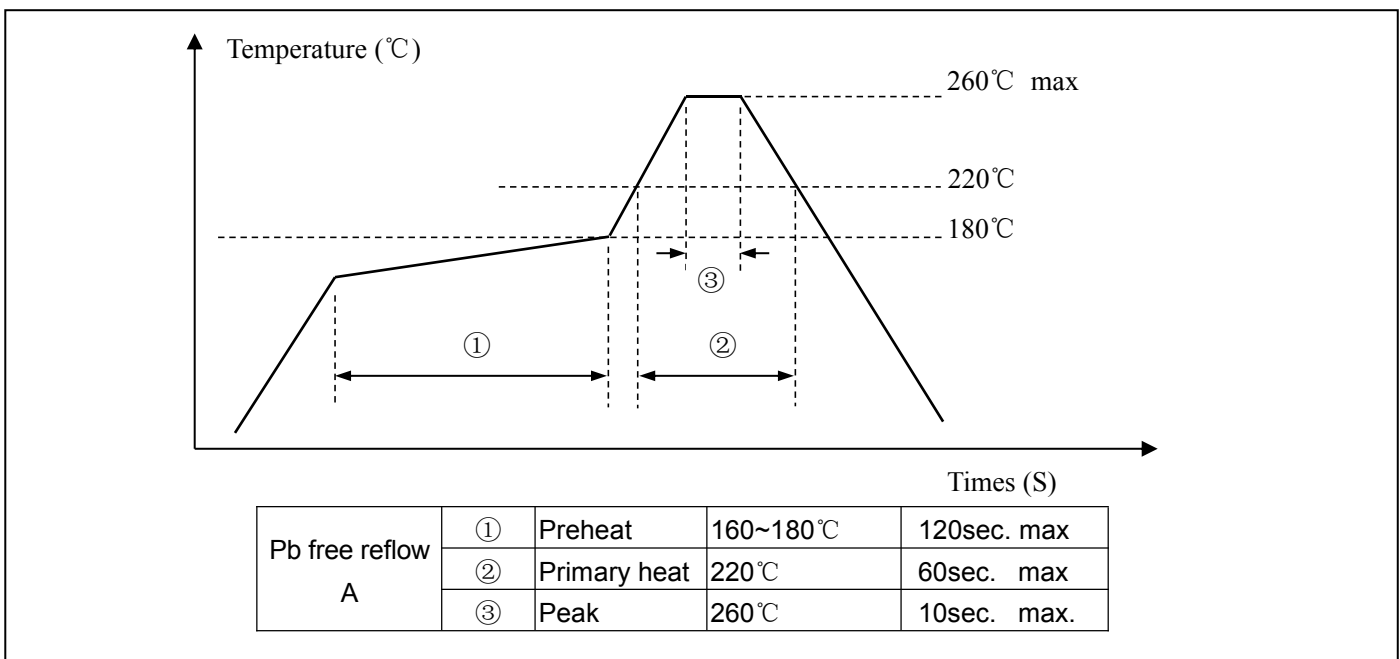
Vdc=5.0V				Vdc=3.3V			
15pF load		30pF load		15pF load		30pF load	
1.0 ~ 19.9 MHz	12 mA	1.0 ~ 19.9 MHz	15 mA	1.0 ~ 19.9 MHz	8 mA	1.0 ~ 19.9 MHz	15 mA
20.0 ~ 39.9 MHz	20 mA	20.0 ~ 39.9 MHz	30 mA	20.0 ~ 39.9 MHz	15 mA	20.0 ~ 39.9 MHz	25 mA
40.0 ~ 59.9 MHz	30 mA	40.0 ~ 59.9 MHz	35 mA	40.0 ~ 59.9 MHz	25 mA	40.0 ~ 59.9 MHz	30 mA
60.0 ~ 79.9 MHz	45 mA	50.0 ~ 80.0 MHz	55 mA	60.0 ~ 79.9 MHz	35 mA	60.0 ~ 79.9 MHz	35 mA
80.0 ~ 125.0MHz	60 mA			80.0 ~ 125.0MHz	45 mA		

★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD7050	$178\pm 2.0$	$16.0\pm 0.3$	$7.40\pm 0.15$	$5.40\pm 0.15$	$8.0\pm 0.1$	$2.2\pm 0.1$	$60.5\pm 1.0$
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



**TCXO**



**4 Pad Version 2.0×1.6 mm**

- ±0.5~±2.5 ppm stability
- Ultra-miniature package
- Clipped sine wave
- Low power consumption
- Reflow soldering temperature: 260°C max



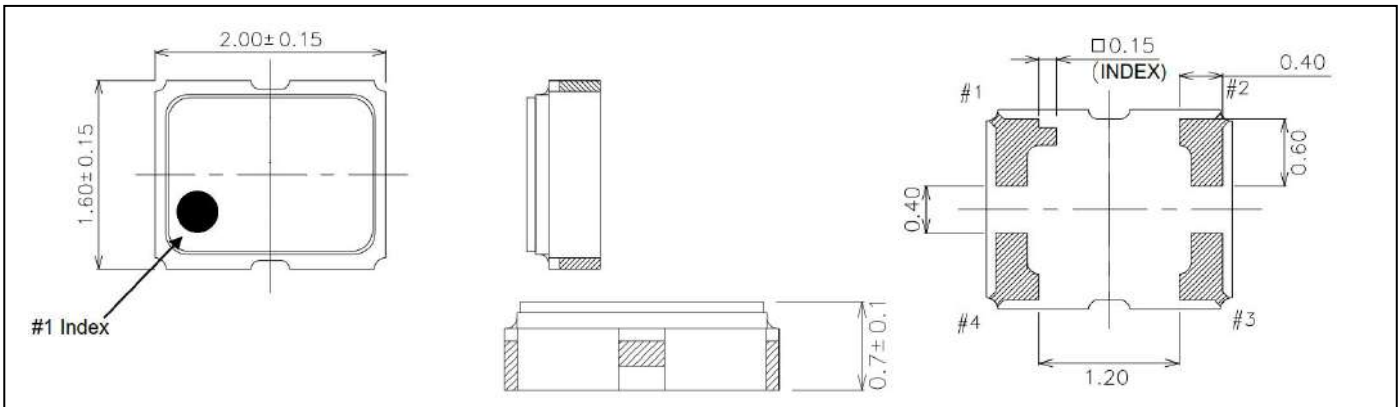
RoHS compliant

★ **PARAMETERS**

PARAMETERS	SPECIFICATION	
Frequency Range	13.0~50.0MHz	
Supply Voltage	1.8V、2.5V、2.8V、3.3V	
Supply Current	13MHz≤F0≤26MHz: 1.5mA max 26MHz<F0≤50MHz: 2.0mA max	
Frequency Tolerance	±1.0ppm、±1.5ppm、±2.0ppm	
Frequency Stability	Vs Temperature (ref. to +25°C)	±0.5~±2.5ppm
	Vs Supply voltage change (±5%)	±0.2ppm
	Vs Load change (±10%)	±0.2ppm
	Vs Aging (1 <sup>st</sup> Year ,25±2°C)	±1.0ppm
Operating Temp. Range	-30~+85°C、-40~+85°C	
Storage Temp. Range	-55~+125°C	
Output Waveform:	Clipped Sine Wave	
Output Level:	0.8 Vp-p Min (Clipped Sine Wave)	
Output Load	10K Ω //10pF	
Symmetry	45% ~ 55% typ. at 0.5×Vdc	
Start-up Time	2.0mS max	
Phase Noise	-115 dBc/Hz max @100Hz offset	
	-135 dBc/Hz max @1KHz offset	
	-148 dBc/Hz max @10KHz offset	

© All specification subject change without notice.

★ **DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**



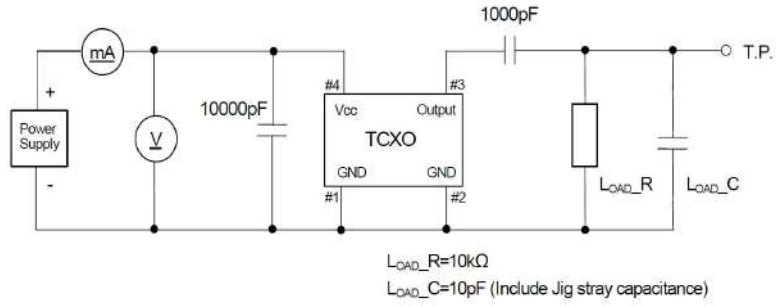
★ **PART NUMBER GUIDE** e.g. FTO26.000M3.0SM2A-1.0/2.5C (\*SM2=2.0×1.6 SMD TYPE)

Logo	TCXO	Frequency	Supply voltage v	Package	Frequency Tolerance ppm	Frequency Stability ppm	Operating Temp. C
F	TO	26.000M	3.0	SM2A	1.0	2.5	C

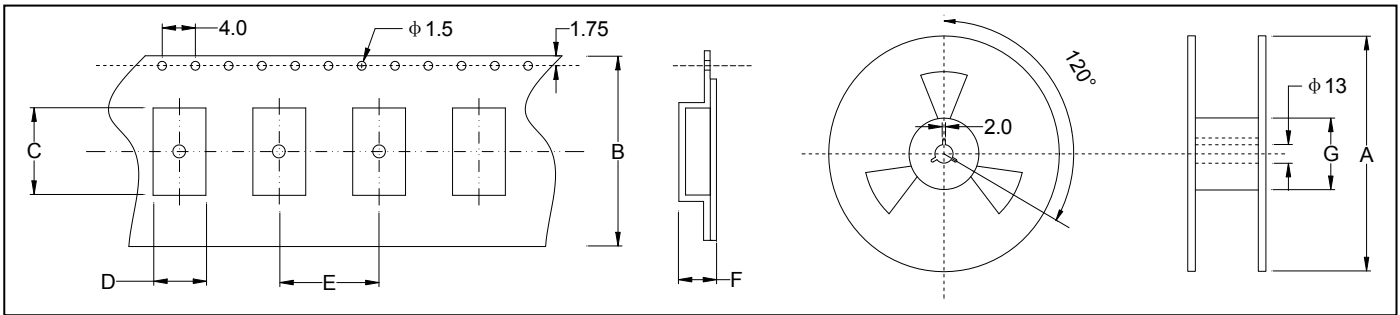


Definition	Description
Operating Temp.	<b>A:</b> -10~+70°C
	<b>B:</b> -20~+80°C
	<b>C:</b> -30~+85°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TEST CIRCUIT

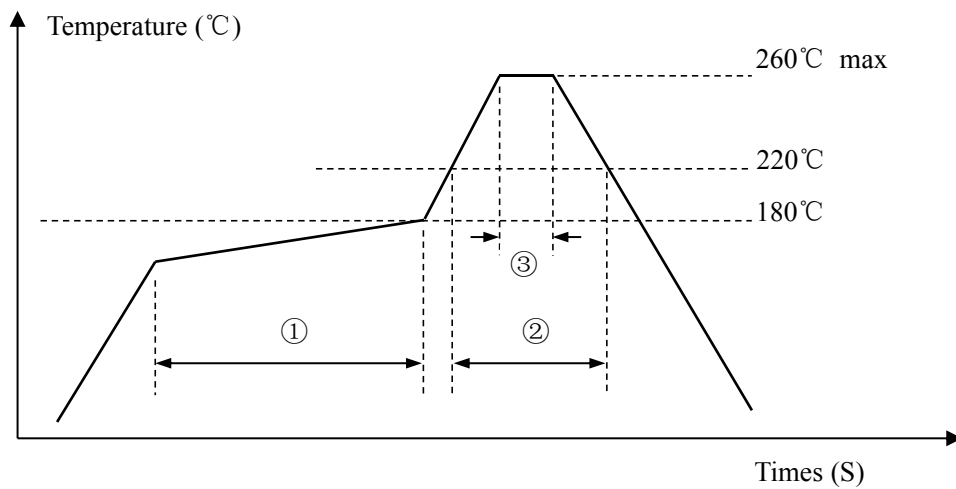


★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD2016	180±2.0	8.0±0.3	2.25±0.10	1.85±0.10	4.0±0.1	0.95±0.1	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**TCXO**

**4 Pad Version 2.5×2.0 mm**

- ±0.5~±2.5 ppm stability
- Ultra-miniature package
- Clipped sine wave
- Low power consumption
- Reflow soldering temperature: 260°C max

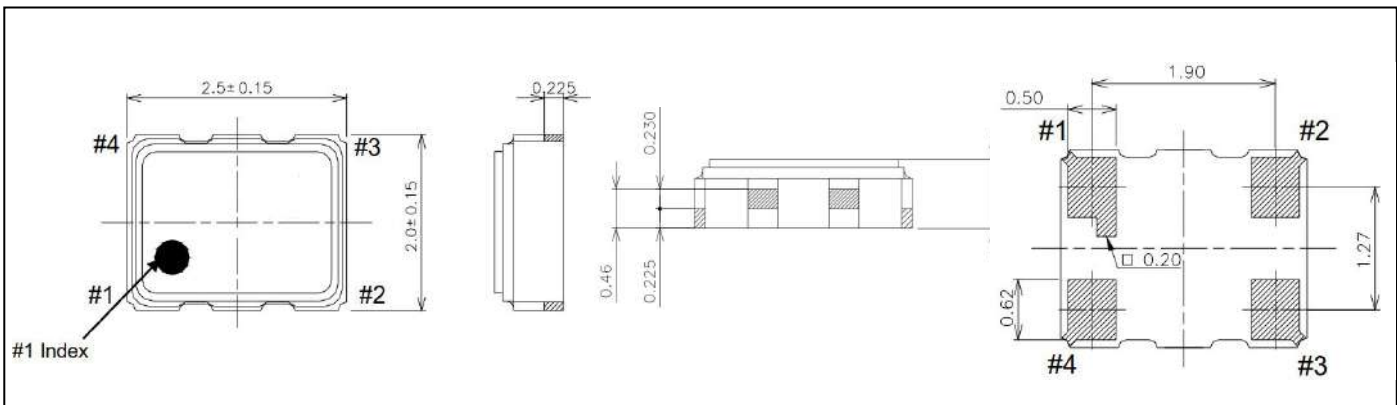


RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION	
Frequency Range	13.0~50.0MHz	
Supply Voltage	1.8V、2.5V、2.8V、3.3V	
Supply Current	13MHz≤F0≤26MHz: 1.5mA max 26MHz<F0≤50MHz: 2.0mA max	
Frequency Tolerance	±1.0ppm、±1.5ppm、±2.0ppm	
Frequency Stability	Vs Temperature (ref. to +25°C)	±0.5~±2.5ppm
	Vs Supply voltage change (±5%)	±0.2ppm
	Vs Load change (±10%)	±0.2ppm
	Vs Aging (1 <sup>st</sup> Year ,25±2°C)	±1.0ppm
Operating Temp. Range	-30~+85°C、-40~+85°C	
Storage Temp. Range	-55~+125°C	
Output Waveform:	Clipped Sine Wave	
Output Level:	0.8 Vp-p Min (Clipped Sine Wave)	
Output Load	10K Ω //10pF	
Symmetry	45% ~ 55% typ. at 0.5×Vdc	
Start-up Time	2.0mS max	
Phase Noise	-115 dBc/Hz max @100Hz offset	
	-135 dBc/Hz max @1KHz offset	
	-148 dBc/Hz max @10KHz offset	

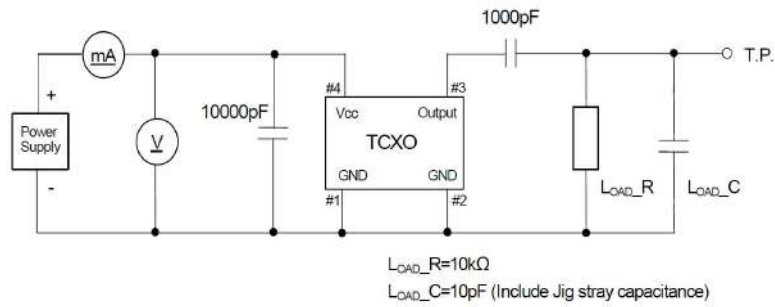
© All specification subject change without notice.

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE** e.g. FTO26.000M3.0SM2-1.0/2.5C (\*SM2=2.5×2.0 SMD TYPE)

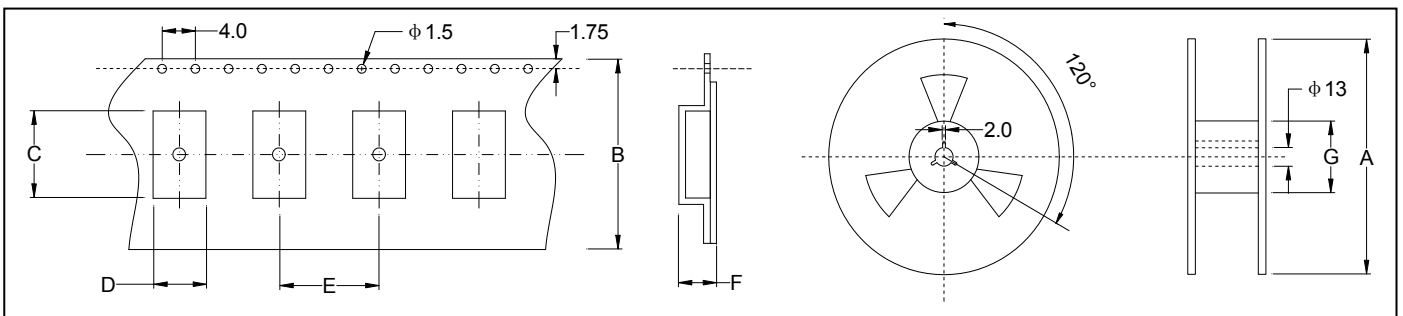
Logo	TCXO	Frequency	Supply voltage V	Package	Frequency Tolerance PPM	Frequency Stability PPM	Operating Temp.
F	TO	26.000M	3.0	SM2	1.0	2.5	C

Definition	Description
Operating Temp.	<b>A:</b> -10~+70°C
	<b>B:</b> -20~+80°C
	<b>C:</b> -30~+85°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TEST CIRCUIT

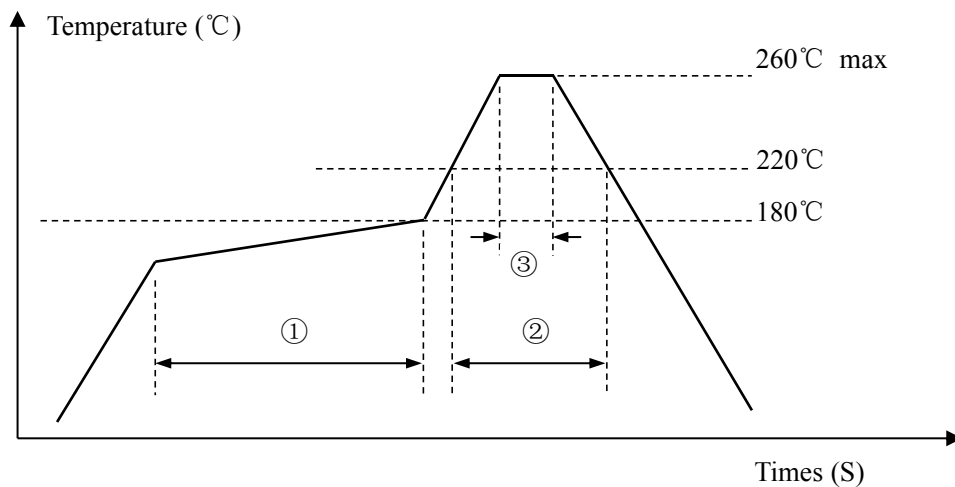


★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD2520	180±2.0	8.0±0.3	2.80±0.10	2.30±0.10	4.0±0.1	1.1±0.1	60.5±1.0
2000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**TCXO**

**4 Pad Version 3.2×2.5 mm**

- ±0.5~±2.5 ppm stability
- Ultra-miniature package
- Clipped sine wave
- Low power consumption
- Reflow soldering temperature: 260°C max

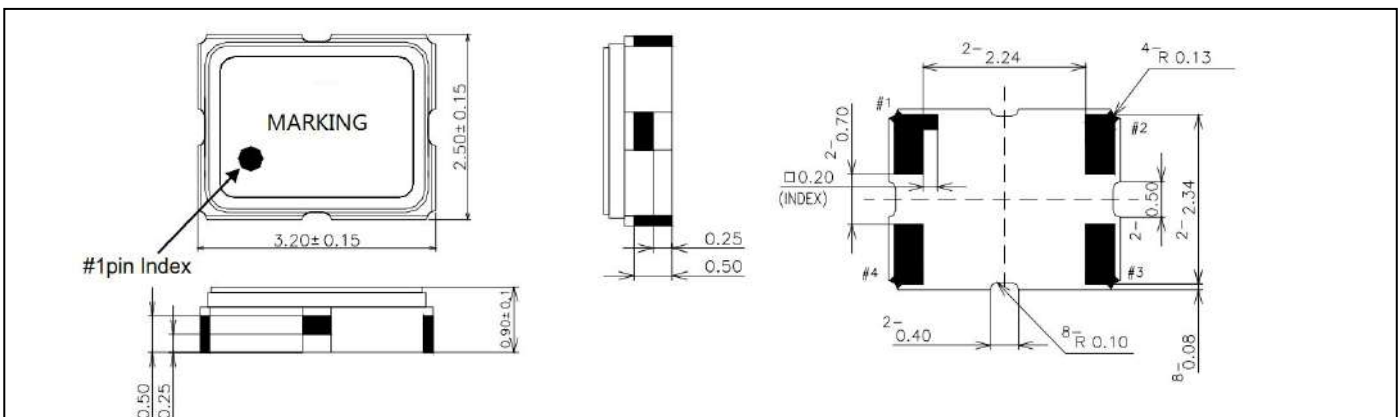


RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION	
Frequency Range	13.0~50.0MHz	
Supply Voltage	1.8V、2.5V、2.8V、3.3V	
Supply Current	13MHz≤F0≤26MHz: 1.5mA max 26MHz<F0≤50MHz: 2.0mA max	
Frequency Tolerance	±1.0ppm、±1.5ppm、±2.0ppm	
Frequency Stability	Vs Temperature (ref. to +25°C)	±0.5~±2.5ppm
	Vs Supply voltage change (±5%)	±0.2ppm
	Vs Load change (±10%)	±0.2ppm
	Vs Aging (1 <sup>st</sup> Year ,25±2°C)	±1.0ppm
Operating Temp. Range	-30~+85°C、-40~+85°C	
Storage Temp. Range	-55~+125°C	
Output Waveform:	Clipped Sine Wave	
Output Level:	0.8 Vp-p Min (Clipped Sine Wave)	
Output Load	10K Ω //10pF	
Symmetry	45% ~ 55% typ. at 0.5×Vdc	
Start-up Time	2.0mS max	
Phase Noise	-115 dBc/Hz max @100Hz offset	
	-135 dBc/Hz max @1KHz offset	
	-148 dBc/Hz max @10KHz offset	

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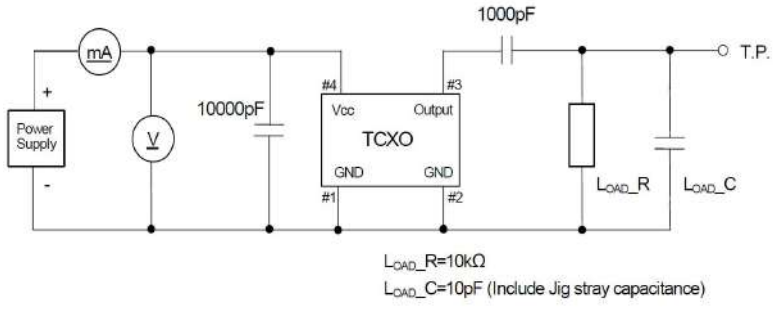
**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE**

e.g. FTO26.000M3.0SM3-1.0/2.5C (\*SM3=3.2×2.5 SMD TYPE)

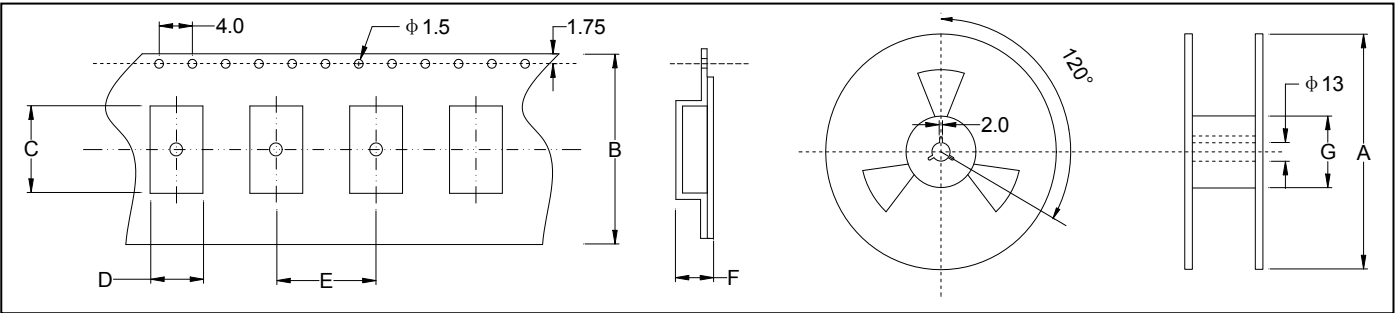
Logo	TCXO	Frequency	Supply voltage V	Package	Frequency Tolerance PPM	Frequency Stability PPM	Operating Temp.
F	TO	26.000M	3.0	SM3	1.0	2.5	C

Definition	Description
Operating Temp.	<b>A:</b> -10~+70°C
	<b>B:</b> -20~+80°C
	<b>C:</b> -30~+85°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TEST CIRCUIT

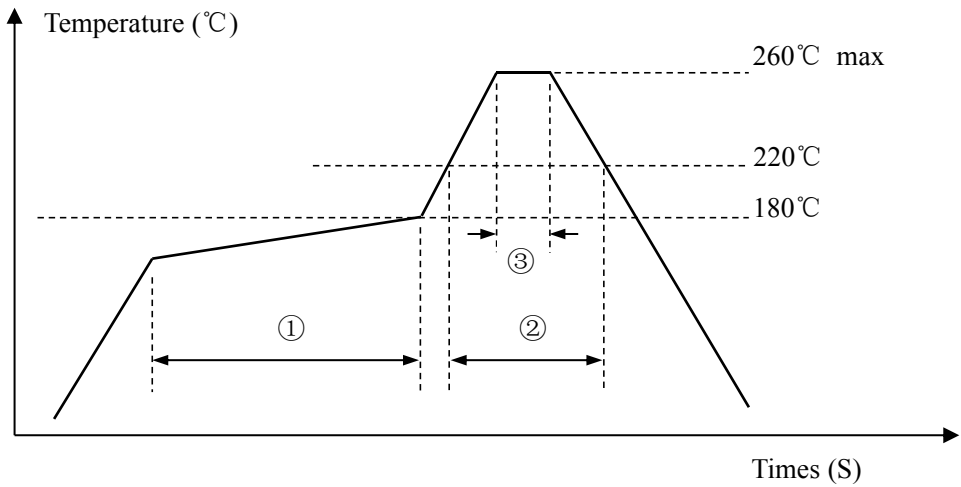


★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
OSC-SMD3225	178±2.0	8.0±0.3	3.55±0.10	2.80±0.10	4.0±0.1	1.4±0.1	60.5±1.0
2000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**VCTCXO**

**4 Pad Version 3.2×2.5 mm**

- ±2.5 ppm stability
- Ultra-miniature package
- Clipped sine wave
- Low power consumption
- Reflow soldering temperature: 260°C max



RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION	
Frequency Range	10.0~40.0MHz	
Supply Voltage	1.8V、2.5V、2.8V、3.3V	
Supply Current	10MHz≤F0≤26MHz: 2.0mA max 26MHz<F0≤40MHz: 2.5mA max	
Frequency Tolerance	±0.5ppm、±1.0ppm、±2.0ppm	
Frequency Stability	Vs Temperature (ref. to +25°C)	±1.5~±2.5ppm
	Vs Supply voltage change (±5%)	±0.2ppm
	Vs Load change (±10%)	±0.2ppm
	Vs Aging (1 <sup>st</sup> Year ,25±2°C)	±1.0ppm
Operating Temp. Range	-30~+85°C (-40~+85°C)	
Storage Temp. Range	-55~+125°C	
Voltage Control Range	±5.0ppm min	
Output Waveform:	Clipped Sine Wave	
Output Level:	0.8 Vp-p Min (Clipped Sine Wave)	
Output Load	10K Ω //10pF	
Symmetry	45% ~ 55% typ. at 0.5×Vdc	
Start-up Time	2.0mS max	
Phase Noise	-115 dBc/Hz max @100Hz offset	
	-135 dBc/Hz max @1KHz offset	
	-148 dBc/Hz max @10KHz offset	

© All specification subject change without notice.

**★ DIMENSIONS& LAND PATTERN LAYOUT (Unit: mm)**

Pin	Connection
1	Vcon
2	GND
3	Output
4	Vdc

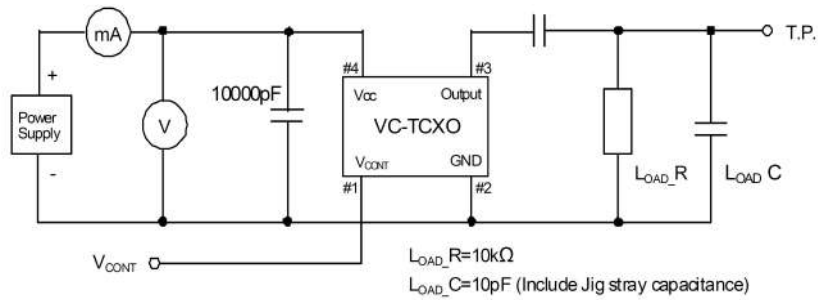
Recommended land Pattern

**★ PART NUMBER GUIDE** e.g. FVTO26.000M2.8SM3-1.0/2.5C(\*SM3=3.2×2.5 SMD TYPE)

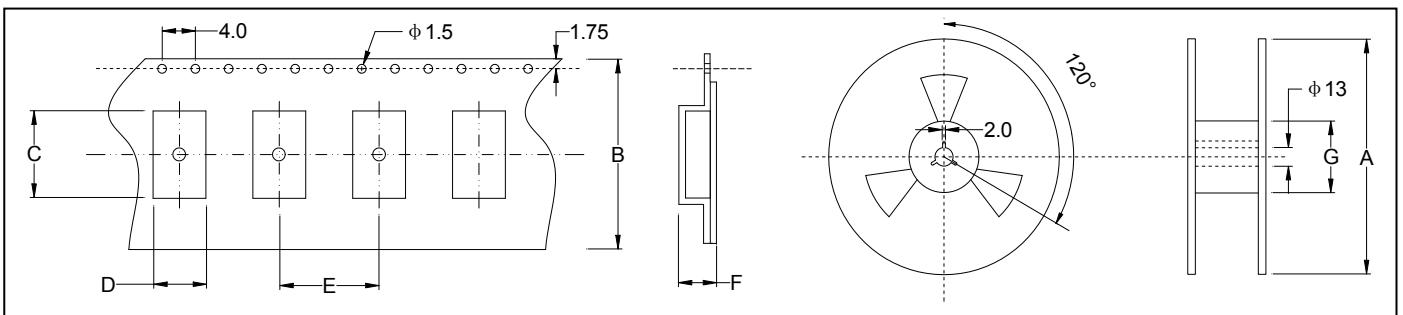
	VCTCXO	Frequency	Supply voltage V	Package	Frequency Tolerance PPM	Frequency Stability PPM	Operating Temp.
F	VTO	26.000	3.0	SM3	1.0	2.5	C

Definition	Description
Operating Temp.	<b>A:</b> 0~+70°C
	<b>B:</b> -20~+70°C
	<b>C:</b> -30~+85°C
	<b>D:</b> -40~+85°C
	<b>E:</b> Customer specified

★ TEST CIRCUIT

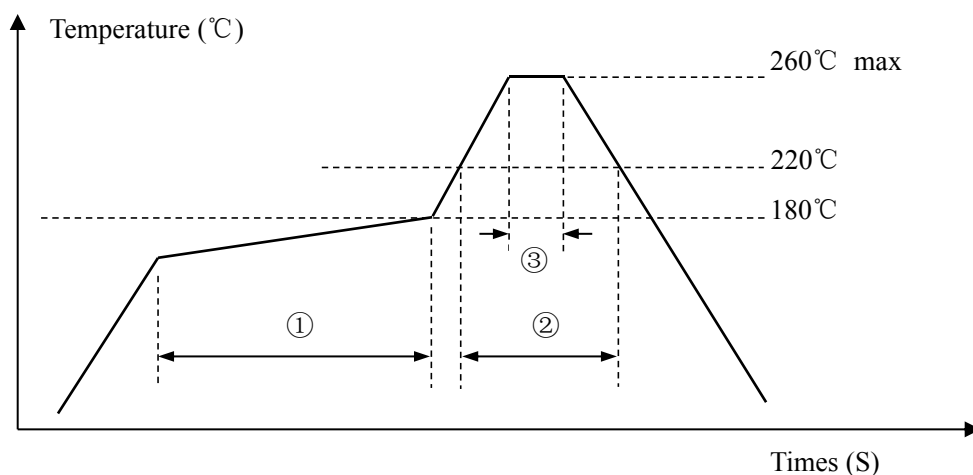


★ TAPING SPECIFICATION (Unit: mm)

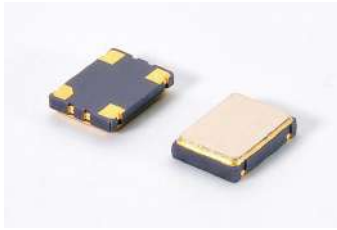


	A	B	C	D	E	F	G
VCTCXO-SMD3225	178±2.0	8.0±0.3	3.55±0.10	2.80±0.10	4.0±0.1	1.4±0.1	60.5±1.0
3000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**VCTCXO**

**4 Pad Version 5.0×3.2 mm**

- ±2.5 ppm stability
- Clipped sine wave
- Low power consumption
- Reflow soldering temperature: 260°C max

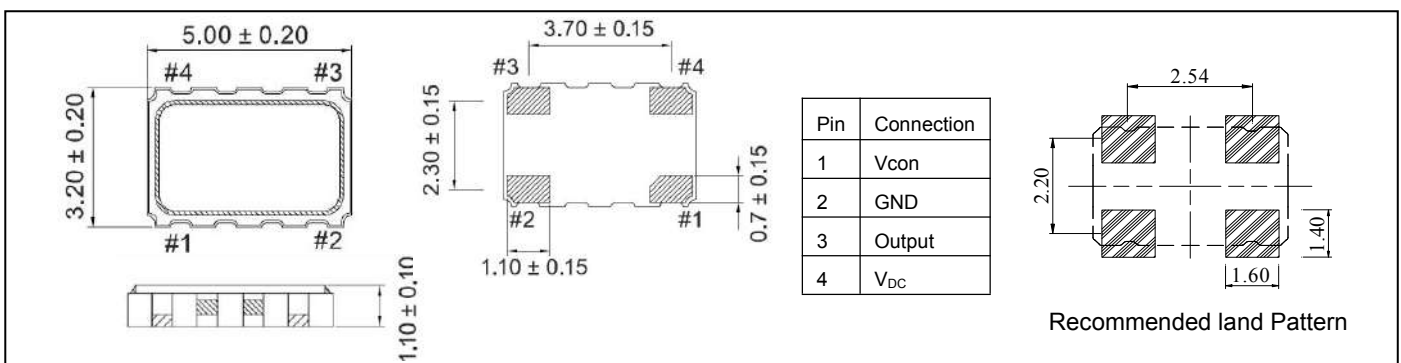


RoHS compliant

**★ PARAMETERS**

PARAMETERS	SPECIFICATION	
Frequency Range	10.0~40.0MHz	
Supply Voltage	1.8V、2.5V、2.8V、3.3V	
Supply Current	10MHz≤F0<15MHz: 1.5mA max 15MHz≤F0<26MHz: 2.0mA max 26MHz≤F0≤40MHz: 2.5mA max	
Frequency Tolerance	±0.5ppm、±1.0ppm、±2.0ppm	
Frequency Stability	Vs Temperature (ref. to +25°C)	±1.5~±2.5ppm
	Vs Supply voltage change (±5%)	±0.2ppm
	Vs Load change (±10%)	±0.2ppm
	Vs Aging (1 <sup>st</sup> Year ,25±2°C)	±1.0ppm
Operating Temp. Range	-30~+85°C	
Storage Temp. Range	-55~+125°C	
Voltage Control Range	±5.0ppm min	
Output Waveform:	Clipped Sine Wave	
Output Level:	0.8 Vp-p Min (Clipped Sine Wave)	
Output Load	10K Ω //10pF	
Symmetry	45% ~ 55% typ. at 0.5×Vdc	
Start-up Time	2.0mS max	
Phase Noise	-115 dBc/Hz max @100Hz offset	
	-135 dBc/Hz max @1KHz offset	
	-148 dBc/Hz max @10KHz offset	

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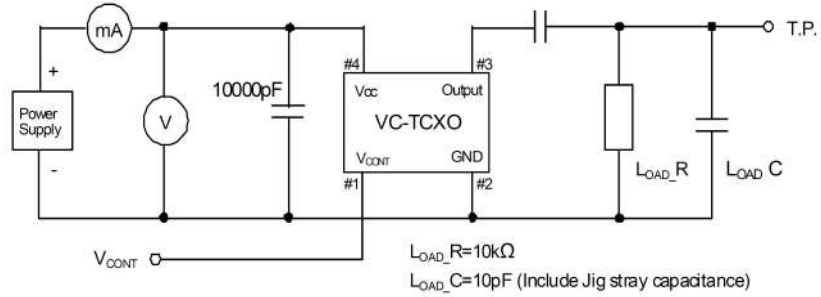
**★ DIMENSIONS & LAND PATTERN LAYOUT (Unit: mm)**

**★ PART NUMBER GUIDE** e.g. FVTO26.000M2.8SM5-1.0/2.5C (\*SM5=5.0×3.2 SMD TYPE)

	VCTCXO	Frequency	Supply voltage V	Package	Frequency Tolerance PPM	Frequency Stability PPM	Operating Temp.
F	VTO	26.000	2.8A	SM5	1.0	2.5	C

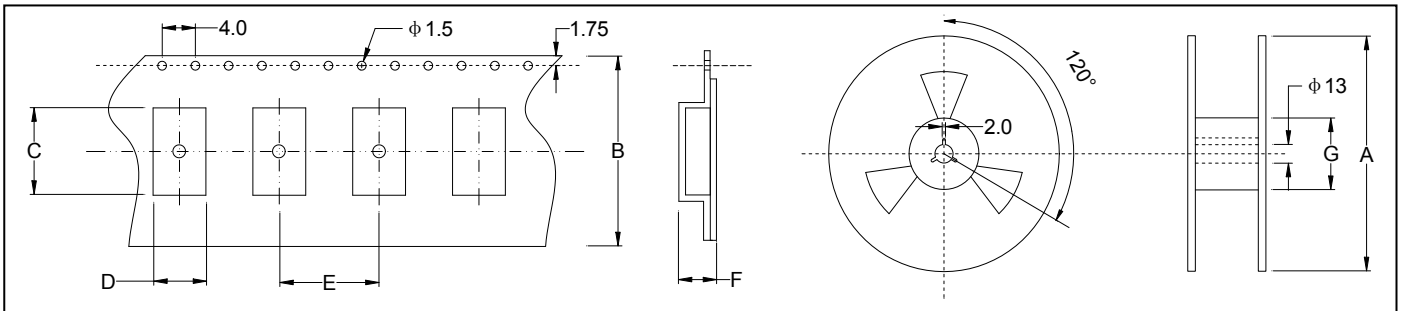


Definition	Description
Operating Temp.	<b>A:</b> -10~+70°C
	<b>B:</b> -20~+80°C
	<b>C:</b> -30~+85°C
	<b>D:</b> Customer specified

★ TEST CIRCUIT

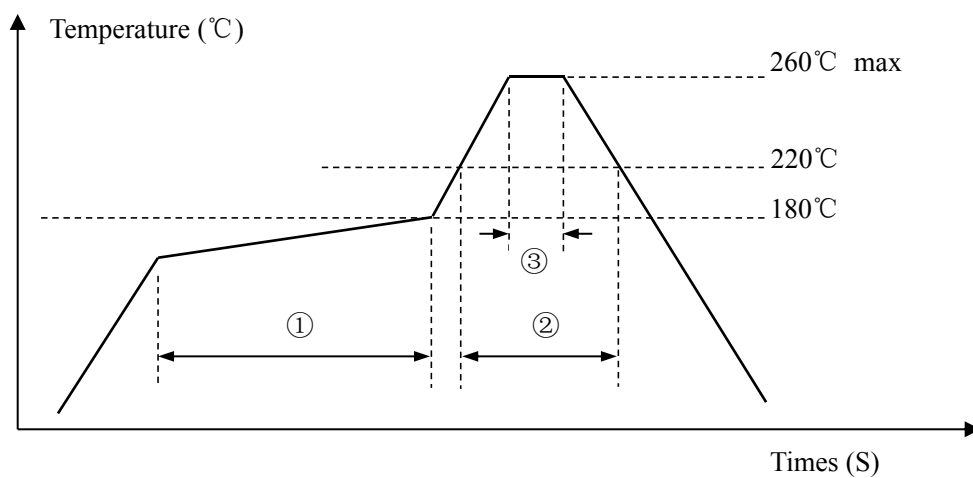


★ TAPING SPECIFICATION (Unit: mm)



	A	B	C	D	E	F	G
VCTCXO-SMD5032	178±2.0	12.0±0.3	5.40±0.10	3.60±0.10	8.0±0.1	1.4±0.1	60.5±1.0
1000 pcs per reel							

★ REFLOW SOLDERING PROFILE



Pb free reflow A	①	Preheat	160~180°C	120sec. max
	②	Primary heat	220°C	60sec. max
	③	Peak	260°C	10sec. max.

**MONOLITHIC CRYSTAL FILTER**

**UM-1、UM-5 DIP TYPE**

- High stability for wide temperature ranges
- Wide frequency ranges
- RoHS Compliant (Pb Free)

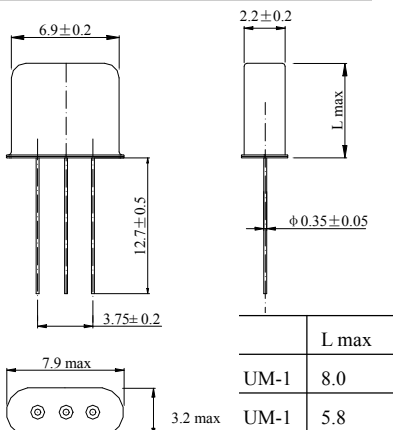
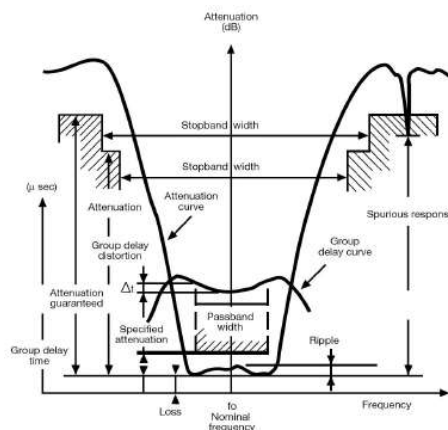
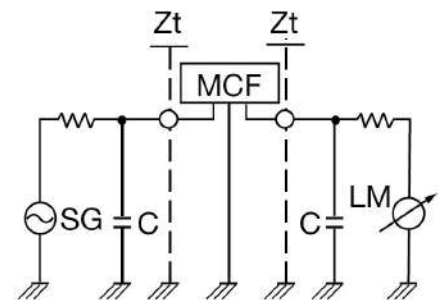


RoHS compliant

**★ PARAMETERS**

Model	Centre Frequency Fc (MHz)	Pass Band Width (KHz/dB)	Stop Band Width (KHz/dB)	Pass Band Ripple (dB) max	Insertion Loss (dB) max	Terminal Impedance Zt/C(Ω//pF)	Operating Temperature Range	Mode of oscillator	Pole
FT21M07A	21.400	±3.75/3	±14.0/18	0.5	1.5	850//7	-20~+70°C	Fund	2
FT21M09A	21.400	±4.50/3	±12.5/14	0.5	1.5	850//7	-20~+70°C	Fund	2
FT21M12A	21.400	±6.00/3	±20.0/15	0.5	1.5	1200//2.5	-20~+70°C	Fund	2
FT21M15A1	21.400	±7.50/3	±25.0/18	0.5	1.5	1500//3	-20~+70°C	Fund	2
FT21M15A2	21.400	±7.50/3	±30.0/18	0.5	2.0	1500//3	-20~+70°C	Fund	2
FT21M15A3	21.400	±7.50/3	±30.0/18	1.0	2.0	1500//2	-20~+70°C	Fund	2
FT21M20A	21.400	±10.0/3	±25.0/10	0.5	1.5	1800//1.5	-20~+70°C	Fund	2
FT21M30A	21.400	±15.0/3	±45.0/15	0.5	1.5	3000//0.5	-20~+70°C	Fund	2
FT21P07A	21.600	±3.75/3	±14.0/18	0.5	1.5	850//5	-20~+70°C	Fund	2
FT21P12A	21.600	±6.00/3	±20.0/15	0.5	1.5	1200//2.5	-20~+70°C	Fund	2
FT21P15A	21.600	±7.50/3	±25.0/18	0.5	1.5	1500//3	-20~+70°C	Fund	2
FT21T07A1	21.700	±3.75/3	±14.0/18	0.5	1.5	850//5	-20~+70°C	Fund	2
FT21T07A2	21.700	±3.75/3	±15.0/18	0.5	1.5	850//6	-20~+70°C	Fund	2
FT21T09A	21.700	±4.50/3	±12.5/14	0.5	1.5	1500//4	-20~+70°C	Fund	2
FT21T12A	21.700	±6.00/3	±20.0/15	0.5	1.5	1200//2.5	-20~+70°C	Fund	2
FT21T15A	21.700	±7.50/3	±25.0/18	0.5	1.5	1500//3	-20~+70°C	Fund	2
FT21T20A	21.700	±10.0/3	±25.0/10	0.5	1.5	1800//1.5	-20~+70°C	Fund	2
FT21T30A	21.700	±15.0/3	±45.0/15	0.5	1.5	3000//0.5	-20~+70°C	Fund	2
FT21S07A	21.750	±3.75/3	±25.0/18	0.5	1.5	1500//3	-20~+70°C	Fund	2
FT23M07A	23.050	±3.75/3	±12.5/16	0.5	1.5	1600//5	-20~+70°C	Fund	2
FT23M15A	23.050	±7.50/3	±25.0/18	0.5	1.5	1500//3	-20~+70°C	Fund	2
FT30M15A	30.875	±7.50/3	±25.0/15	0.5	1.5	800//6	-20~+70°C	Fund	2
FT45M07A	45.000	±3.75/3	±12.5/10	0.5	1.5	510//5.5	-20~+70°C	Fund	2
FT45M15A	45.000	±7.50/3	±25.0/14	0.5	1.5	550//3	-20~+70°C	Fund	2
FT45M30A	45.000	±15.0/3	±50.0/10	0.5	1.5	510//5.5	-20~+70°C	Fund	2

⊙ All specification subject change without notice. 规格变化, 恕不另行通知。

**★ DIMENSIONS**

**★ PASS BAND FILTER SPEC-DRAWING**

**★ TEST CIRCUIT**


**MONOLITHIC CRYSTAL FILTER**

**UM-1、UM-5 DIP TYPE 4POLES**

- High stability for wide temperature ranges
- Wide frequency ranges
- RoHS Compliant (Pb Free)

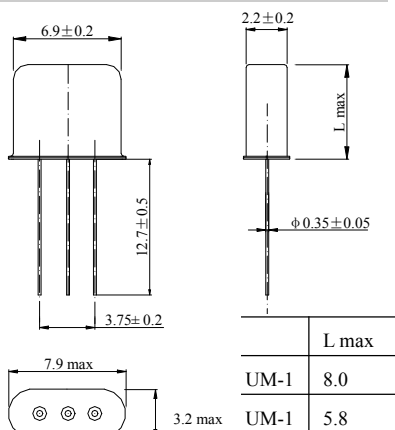
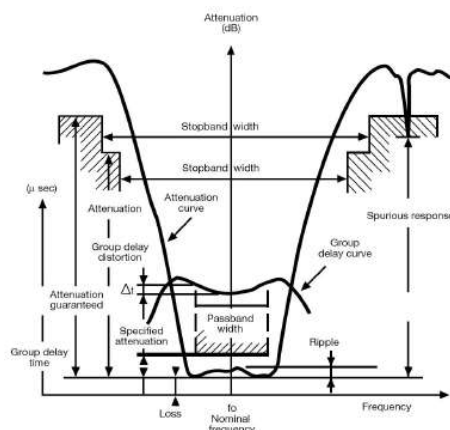
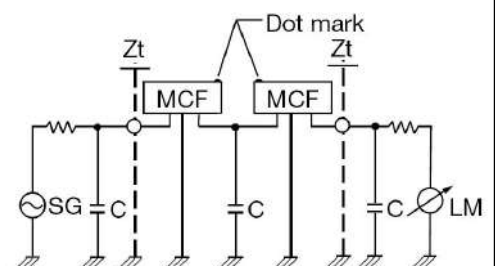


RoHS compliant

**★ PARAMETERS**

Model	Centre Frequency Fc (MHz)	Pass Band Width (KHz/dB)	Stop Band Width (KHz/dB)	Pass Band Ripple (dB) max	Insertion Loss (dB) max	Terminal Impedance Zt/C(Ω//pF)	Operating Temperature Range	Mode of oscillator	Pole
FT21M07B	21.400	±3.75/3	±14.0/40	1.0	2.0	850//5	-20~+70°C	Fund	4
FT21M08B	21.400	±4.00/3	±16.0/40	1.0	2.0	1000//4	-20~+70°C	Fund	4
FT21M12B	21.400	±6.00/3	±20.0/40	1.0	2.0	1200//2.5	-20~+70°C	Fund	4
FT21M15B	21.400	±7.50/3	±25.0/40	1.0	2.0	1500//2	-20~+70°C	Fund	4
FT21M15B2	21.400	±7.50/3	±30.0/40	1.0	2.0	1500//2	-20~+70°C	Fund	4
FT21M15B3	21.400	±7.50/3	±30.0/40	1.5	3.0	1500//1	-20~+70°C	Fund	4
FT21M30B	21.400	±15.0/3	±50.0/40	1.0	2.0	3000//0.5	-20~+70°C	Fund	4
FT21P07B	21.600	±3.75/3	±14.0/40	1.0	2.0	850//5	-20~+70°C	Fund	4
FT21P12B	21.600	±6.00/3	±20.0/40	1.0	2.0	1200//2.5	-20~+70°C	Fund	4
FT21P15B	21.600	±7.50/3	±25.0/40	1.0	2.0	1500//2	-20~+70°C	Fund	4
FT21T07B	21.700	±3.75/3	±14.0/40	1.0	2.0	850//5	-20~+70°C	Fund	4
FT21T12B	21.700	±6.00/3	±20.0/40	1.0	2.0	1200//2.5	-20~+70°C	Fund	4
FT21T15B	21.700	±7.50/3	±25.0/40	1.0	2.0	1500//2	-20~+70°C	Fund	4
FT21T30B	21.700	±15.0/3	±50.0/40	1.0	2.0	3000//0.5	-20~+70°C	Fund	4
FT30M15B	30.875	±7.5/3	±25.0/40	1.0	2.5	800//4	-20~+70°C	Fund	4
FT38M15B	38.850	±7.5/3	±30.0/40	1.0	3.0	800//3	-20~+70°C	Fund	4
FT45M07B	45.000	±3.75/3	±12.5/30	1.0	2.5	350//6.5	-20~+70°C	Fund	4
FT45M15B	45.000	±7.50/3	±25.0/40	1.0	2.5	550//3	-20~+70°C	Fund	4
FT45M30B	45.000	±15.0/3	±40.0/30	1.0	2.5	800//1.5	-20~+70°C	Fund	4

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**★ DIMENSIONS**

**★ PASS BAND FILTER SPEC-DRAWING**

**★ TEST CIRCUIT**


**MULTI-POLES CRYSTAL FILTER**



**S-1/S-2、L-1/L-2/L-3/L-4 DIP TYPE**

- High stability for wide temperature ranges
- Wide frequency ranges
- RoHS Compliant (Pb Free)



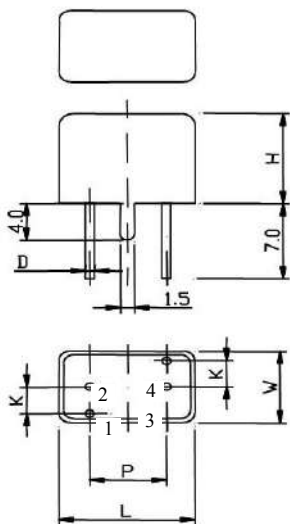
RoHS compliant

★ **PARAMETERS**

Model	Centre Frequency (MHz)	Pole	Pass Band Width (KHz/dB)	Stop Band Width (KHz/dB)		Pass Band Ripple (dB) max	Insertion Loss (dB) max	Guaranteed Attenuation KHz/dB	Terminal Impedance Zt/C(Ω/pF)	Type
FT21M07C	21.400	6	±3.75/3	±8.75/45	±12.5/65	2.0	3.0	(+12.5~+300)/65	850//5	S-1
FT21M07D	21.400	8	±3.75/3	±9.0/65	±12.5/90	2.0	4.0	(+12.5~+300)/65	850//5	S-2
FT21M07E	21.400	10	±3.75/3	±8.75/75	±10.5/90	2.0	4.5	(+12.5~+300)/65	850//5	S-2
FT21M12C	21.400	6	±6.0/3	±14.0/45	±20.0/65	2.0	3.0	(+20~+300)/65	1200//2.5	S-1
FT21M12D	21.400	8	±6.0/3	±14.0/65	±20.0/90	2.0	4.0	(+20~+300)/90	1200//2.5	S-2
FT21M15C	21.400	6	±7.50/3	±17.5/45	±25.0/65	2.0	2.5	(+25~+300)/65	1500//2.0	S-1
FT21M15D	21.400	8	±7.50/3	±17.5/65	±25.0/90	2.0	3.0	(+25~+300)/90	1500//2.0	S-2
FT21M15E	21.400	10	±7.50/3	±17.5/75	±20.0/90	2.0	4.0	(+18~+300)/90	1500//2.0	S-2
FT21M30C	21.400	6	±15.0/3	±3.75/45	±50.0/65	2.0	2.5	(+50~+300)/65	2200//0.5	S-1
FT21M20D	21.400	8	±10.0/3	±25.0/80	±30.0/90	2.0	4.0	(+30~+300)/90	1800//0.5	S-2
FT10M07C	10.700	6	±3.75/3	±8.75/45	±12.5/65	2.0	3.5	(+12.5~+300)/65	1800//3.5	L-1
FT10M07D	10.700	8	±3.75/3	±8.75/65	±12.5/90	2.0	4.0	(+12.5~+300)/90	1800//3.5	L-2
FT10M15C	10.700	6	±7.50/3	±17.5/45	±25.0/65	2.0	3.0	(+25~+300)/65	3000//1.5	L-1
FT10M15D	10.700	8	±7.50/3	±17.5/70	±25.0/90	2.0	4.0	(+25~+300)/90	3000//1.5	L-2
FT10M15E	10.700	10	±7.50/3	±15.0/75	±20.0/90	2.0	4.5	(+20~+300)/90	3000//1.5	L-3
FT10M30C	10.700	6	±15.0/3	±45.0/65		2.0	3.0	(+45~+300)/60	5500//1.0	L-1

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★ **DIMENSIONS Unit: mm**



Type	L	W	H	P	K	D
S-1	11.0	8.5	11.5	7.4	2.0	0.3
S-2	13.4	8.5	11.5	9.8	2.0	0.3
L-1	15.0	12.0	15.0	9.0	2.5	0.43
L-2	18.5	12.0	15.0	13.4	2.5	0.43
L-3	23.0	12.0	15.0	17.8	2.5	0.43
L-4	12.0	9.5	16.5			0.43

★ **PASS BAND FILTER SPEC-DRAWING**

