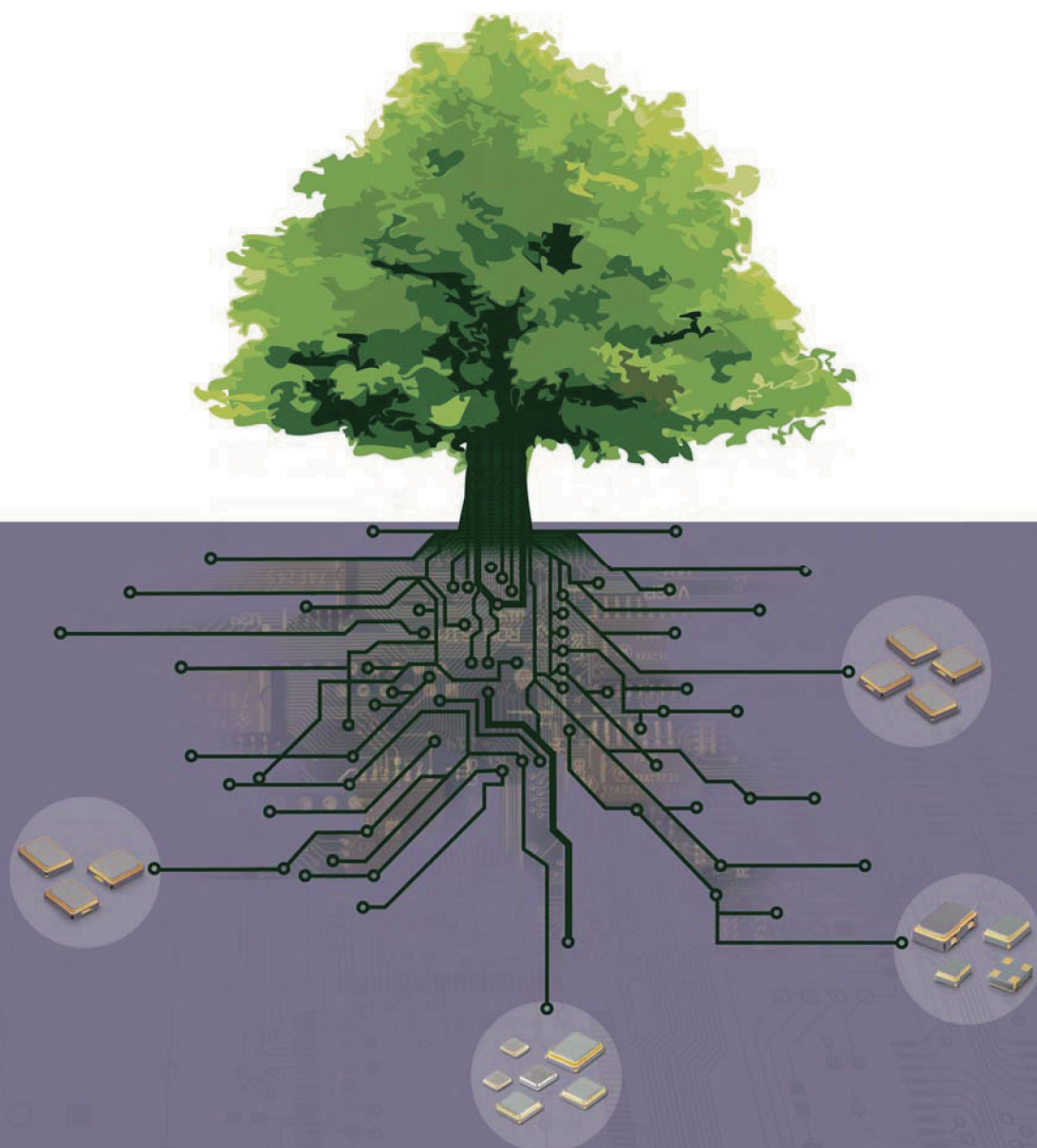


# QUARTZ CRYSTAL UNIT AND OSCILLATOR



SAMSUNG  
ELECTRO-MECHANICS



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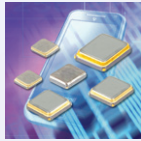


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**Crystal unit** .....

**4** Crystal unit



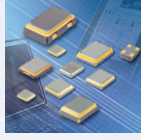
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**11** Crystal Oscillator



**Reliability Test Condition** .....

**15** Reliability Test Condition



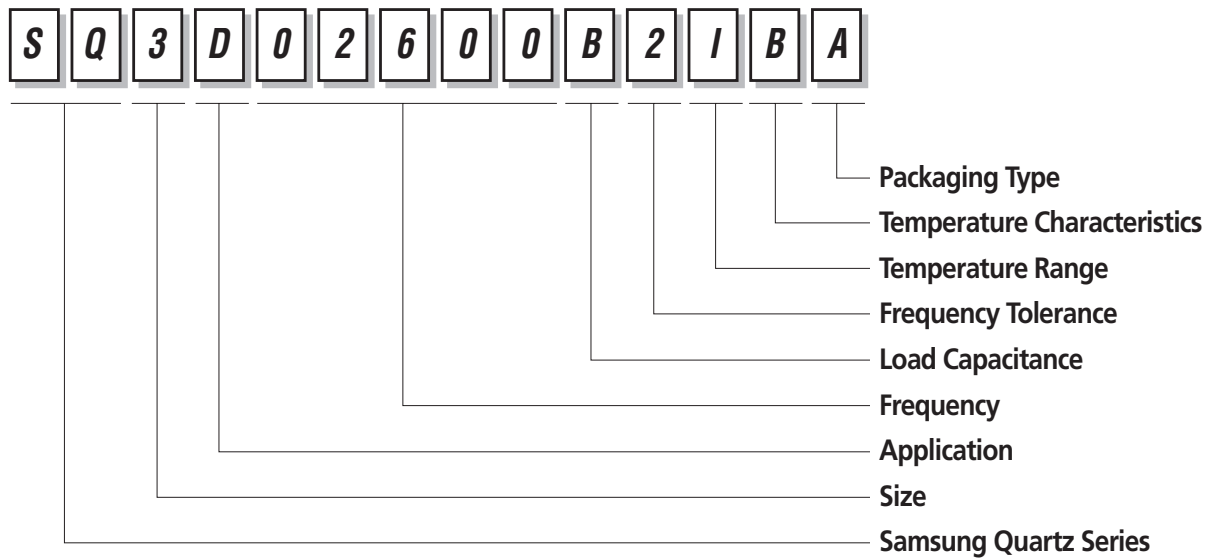
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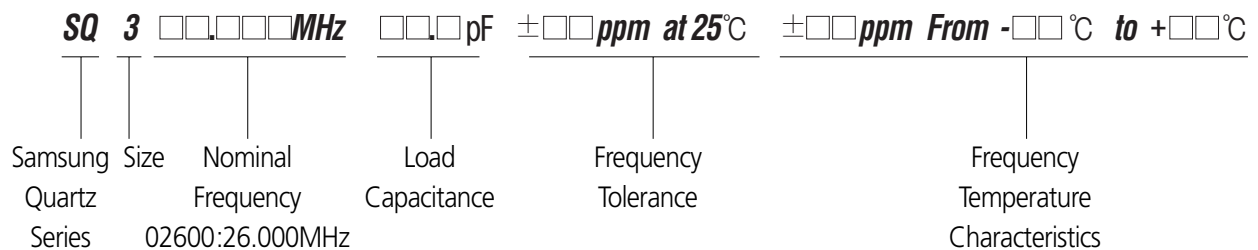
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### Part Numbering System

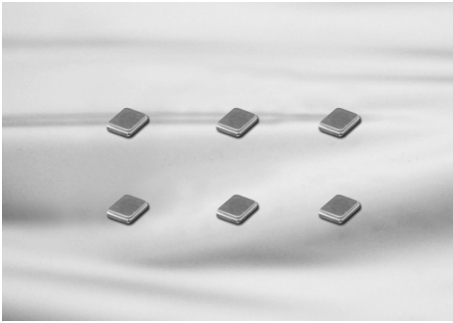


### How to order



3 Size code	
Index	Size(mm)
C	1612
B	2016
2	2520
3	3225
5	5032
A	5032

※ For the more details, Please contact sales department



### Feature

- High density surface mounting type with ultra small & thin size.
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

### Application

- Bluetooth/W-LAN
- MP3
- Mobile TV
- GPS(Global Positioning System)

### Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental
Frequency Range	MHz	24.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	60 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

### Dimensions

**Top View**

(Unit : mm)

<b>A</b>	1.6
<b>B</b>	1.2
<b>C</b>	0.35
<b>D</b>	0.5
<b>E</b>	0.55
<b>F</b>	0.45
<b>G</b>	0.3
<b>H</b>	0.3
<b>I</b>	0.75
<b>J</b>	0.65
<b>K</b>	0.1

**Reference Land Pattern**

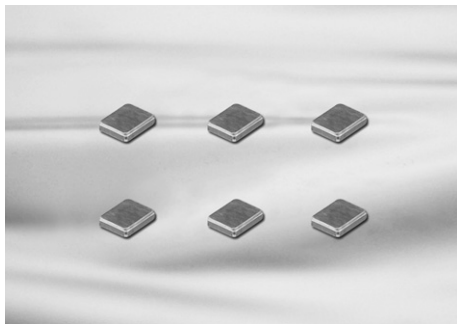
Crystal unit

Crystal Oscillator

Reliability Test Condition

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Application Guide



## Feature

- High density surface mounting type with ultra small & thin size.
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

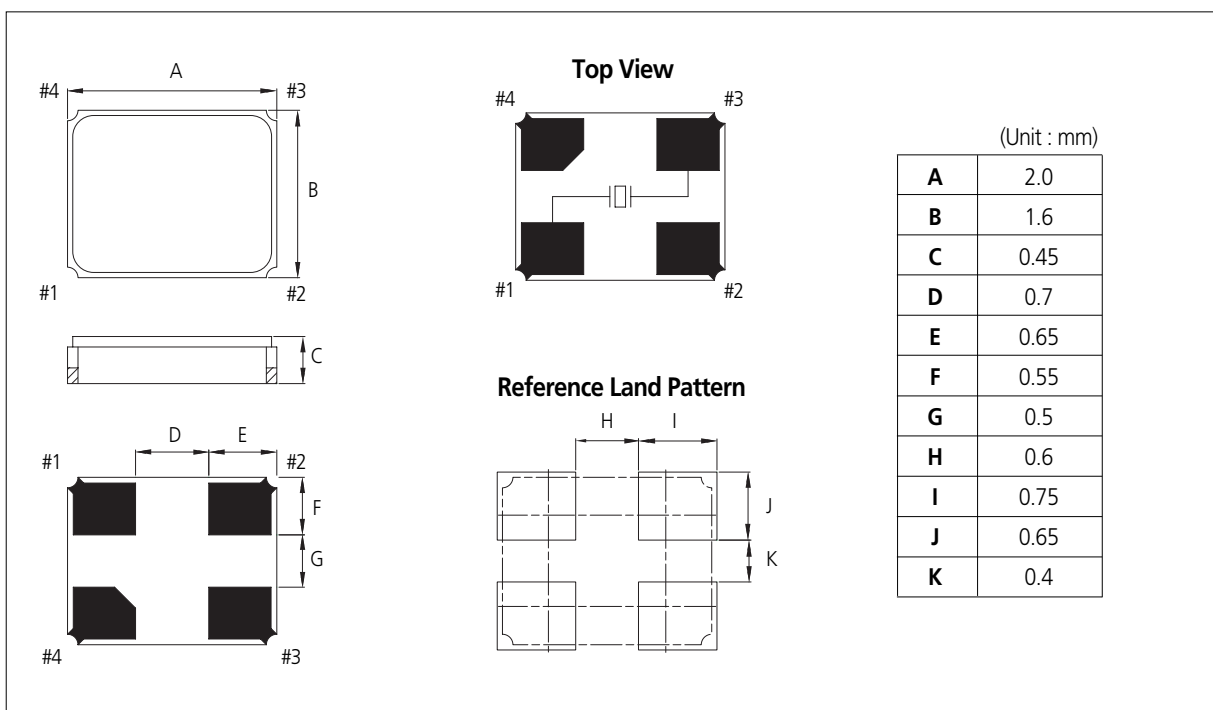
## Application

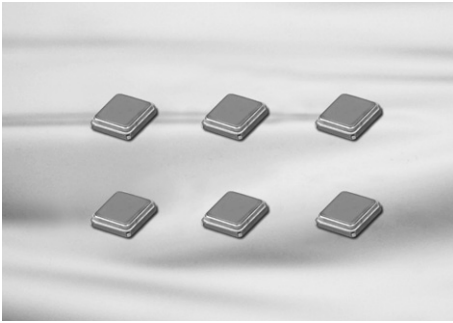
- Bluetooth/W-LAN
- MP3
- Mobile TV
- GPS(Global Positioning System)

## Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental
Frequency Range	MHz	20.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	60 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

## Dimensions





### Feature

- High density surface mounting type with small & thin size.
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

### Application

- Mobile Communication (TDMA, PCS/CDMA, GSM)
- Bluetooth/W-LAN
- MP3
- GPS(Global Positioning System)

### Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental
Frequency Range	MHz	16.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	60 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

### Dimensions

**Top View**

(Unit : mm)

<b>A</b>	2.5
<b>B</b>	2.0
<b>C</b>	0.5
<b>D</b>	0.9
<b>E</b>	0.8
<b>F</b>	0.65
<b>G</b>	0.7
<b>H</b>	0.8
<b>I</b>	1.0
<b>J</b>	0.8
<b>K</b>	0.6

**Reference Land Pattern**

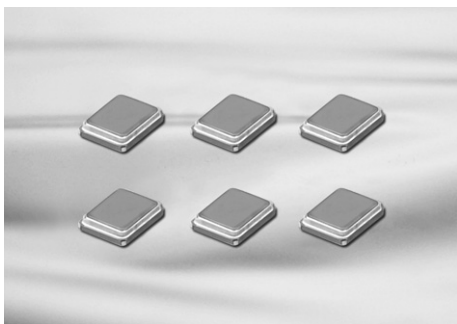
Crystal unit

Crystal Oscillator

Reliability Test Condition

Packaging Specification

Application Guide



### Feature

- High density surface mounting type
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

### Application

- Mobile Communication (TDMA, PCS/CDMA, GSM)
- MP3
- Bluetooth/W-LAN
- GPS(Global Positioning System)

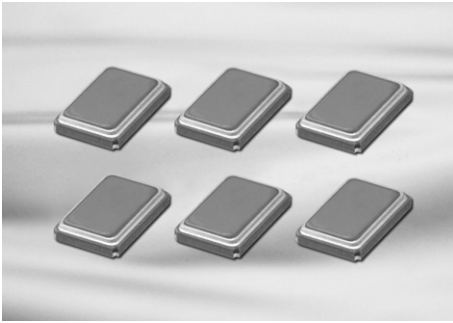
### Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental
Frequency Range	MHz	12.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	30 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

### Dimensions

(Unit : mm)

<b>A</b>	3.2
<b>B</b>	2.5
<b>C</b>	0.7
<b>D</b>	1.2
<b>E</b>	1.0
<b>F</b>	0.9
<b>G</b>	0.7
<b>H</b>	0.8
<b>I</b>	1.4
<b>J</b>	1.2
<b>K</b>	0.4



### Feature

- Surface mounting type
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

### Application

- MP3
- Bluetooth/W-LAN
- Mobile Communication (TDMA, PCS/CDMA, GSM)
- GPS(Global Positioning System)

### Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental / 3rd overtone
Frequency Range	MHz	10.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	30 / 60 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

### Dimensions

**Top View**

(Unit : mm)

<b>A</b>	5.0
<b>B</b>	3.2
<b>C</b>	0.9
<b>D</b>	2.6
<b>E</b>	1.2
<b>F</b>	0.9
<b>G</b>	1.4
<b>H</b>	2.1
<b>I</b>	1.7
<b>J</b>	1.4
<b>K</b>	0.9

**Reference Land Pattern**

Crystal unit

Crystal Oscillator

Reliability Test Condition

Packaging Specification

Application Guide





## Feature

- High density surface mounting type.
- Excellent heat resistance and environmental characteristics.
- Excellent electric performance.
- Suitable product for lead free soldering.

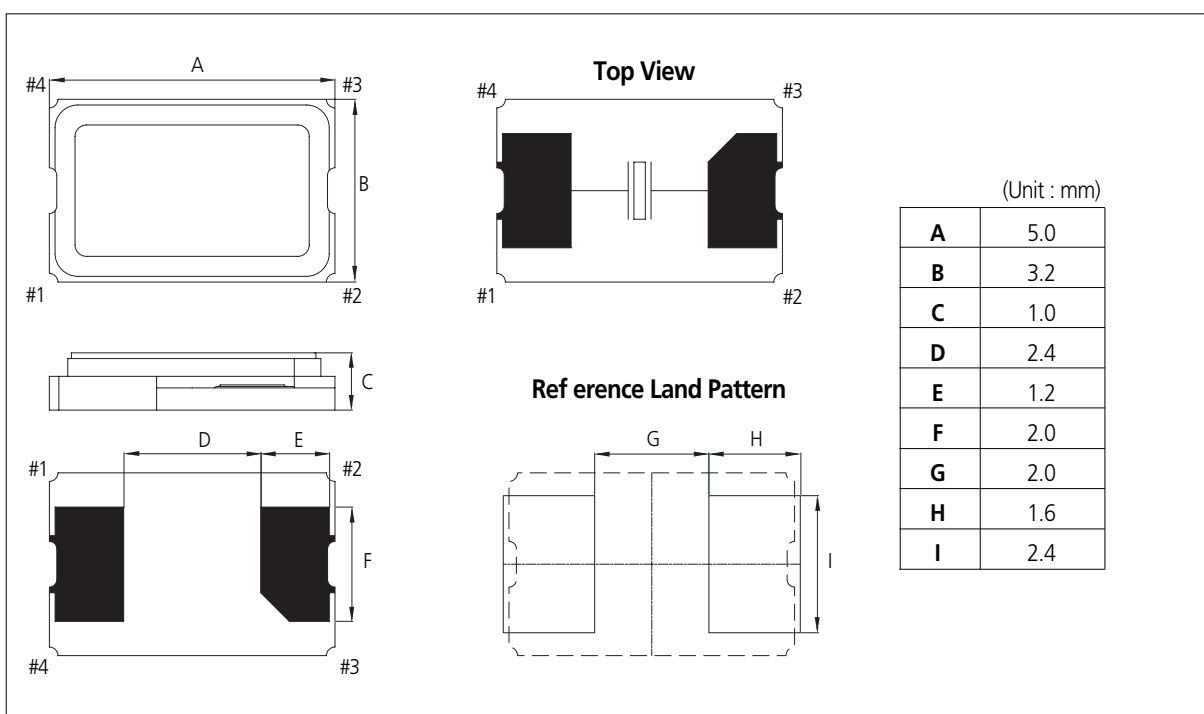
## Application

- MP3
- Note P.C
- HDD/SSD
- OA ,AV etc.

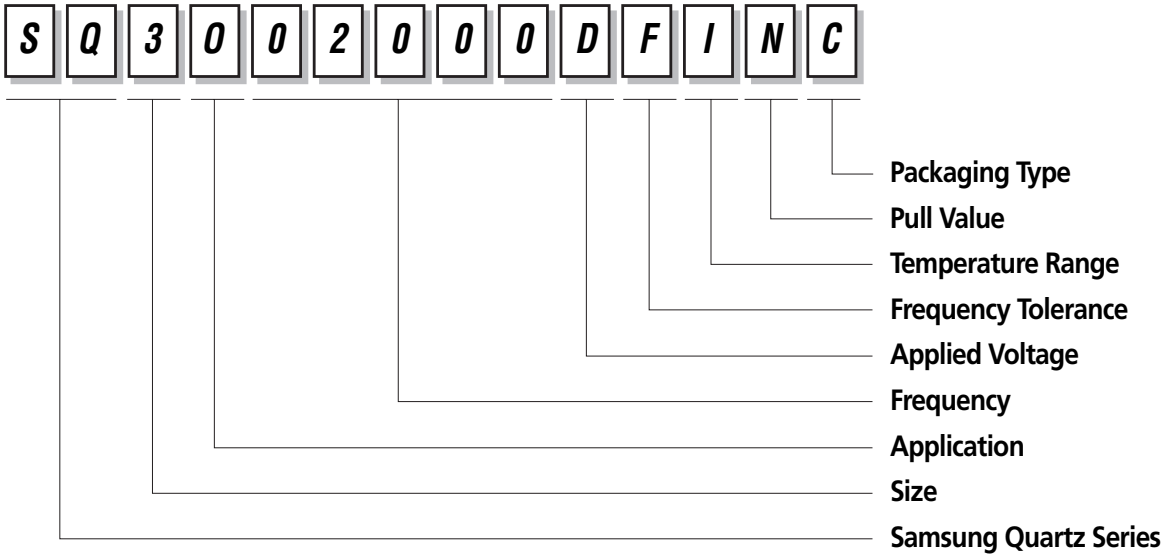
## Specifications

Item	Type	Specifications
Mode of Oscillation		Fundamental
Frequency Range	MHz	10.0 ~ 50.0
Frequency Tolerance (25±2℃)	ppm	±10.0 ~ ±50.0
Temperature Characteristics (in reference to+25℃)	ppm	±10.0 ~ ±50.0
Equivalent Series Resistance (ESR)	Ω	30 / 60 / 80 max
Drive Level	μW	Typ. 50 (Max. 100)
Standard Load Capacitance	pF	8.0, 10.0, 12.0 etc(specified by customer)
Operating Temperature Range	℃	-20 ~ +75 / -30 ~ +85
Storage Temperature Range	℃	-40 ~ +85

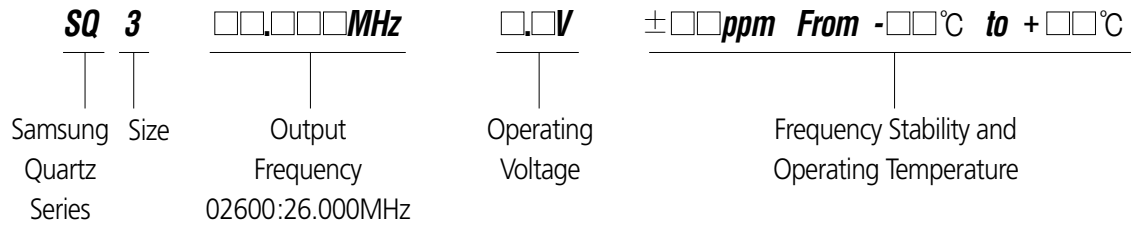
## Dimensions



### Part Numbering System



### How to order

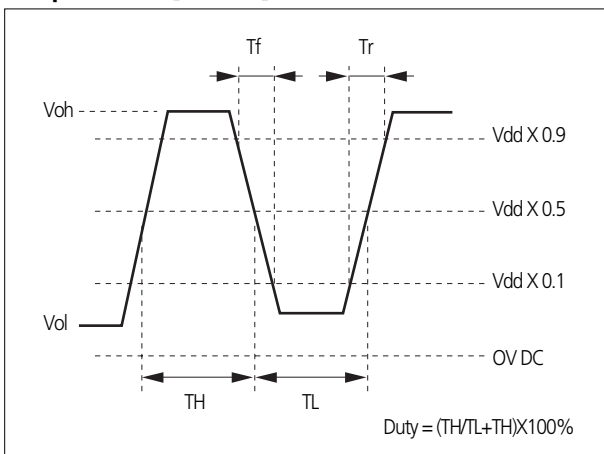


3 Size code	
Index	Size(mm)
C	1612
B	2016
2	2520
3	3225
5	5032
A	5032

※ For the more details, Please contact sales department

### Wave Form and Pin Description

#### Output Wave [C-MOS]



#### Stand-by Function [Tri-state]

# 1 pin input	# 3 pin input
H level or open	oscillation
L level	High Impedance

#### Oscillator Pin Description

Pad No.	Connection	Pad No.	Connection
#1	stand-By	#3	Output
#2	GND	#4	VDD

Crystal unit

Crystal Oscillator

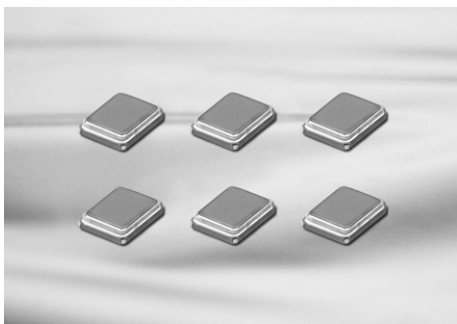
Reliability Test Condition

Packaging Specification

Application Guide

# Crystal Oscillator

## SQ20 SERIES



### Feature

- Height compatible with slim IC package.
- Small size and volume. Also Ultra light weight.
- The best choice for portable PC, PDA and PC card.
- Directly drives C-MOS IC.
- Embossed carrier tape and IR reflow are possible.

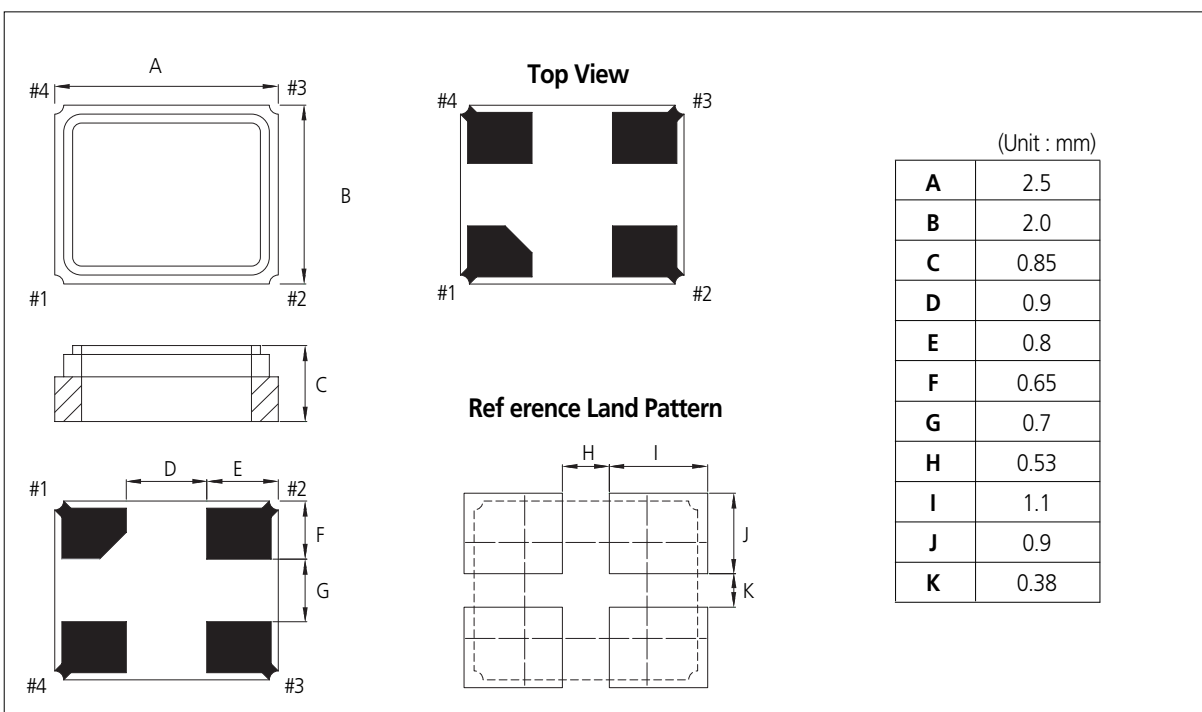
### Application

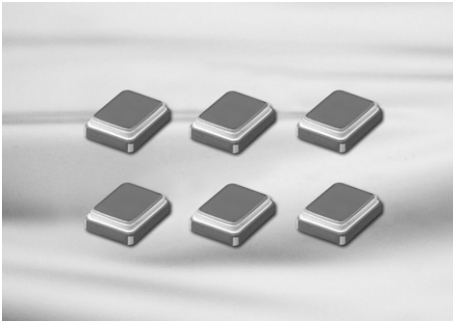
- PC / PDA / MP3 / WiFi / Modem etc

### Specifications

Item	Type	Specifications
Output Level		C-MOS
Frequency Range	MHz	4.0 ~ 125.0
Frequency Stability	ppm	$\pm 20.0 \sim \pm 100.0$
Operating Temperature Range	°C	-20 ~ +75 / -30 ~ +85
Supply Voltage	V	1.6 ~ 2.0, 2.7 ~ 5.5
Current Consumption	mA	7max
Output Rise/Fall Time	nS	10max
Duty Cycle	%	40 ~ 60 / 45 ~ 55(at 1/2 VDD)
CL	CL(pF)	15 (standard)
Stand-by Function	Tri-sate	Yes

### Dimensions





### Feature

- Height compatible with slim IC package.
- Small size and volume. Also Ultra light weight.
- The best choice for portable PC, PDA and PC card.
- Directly drives C-MOS IC.
- Embossed carrier tape and IR reflow are possible.

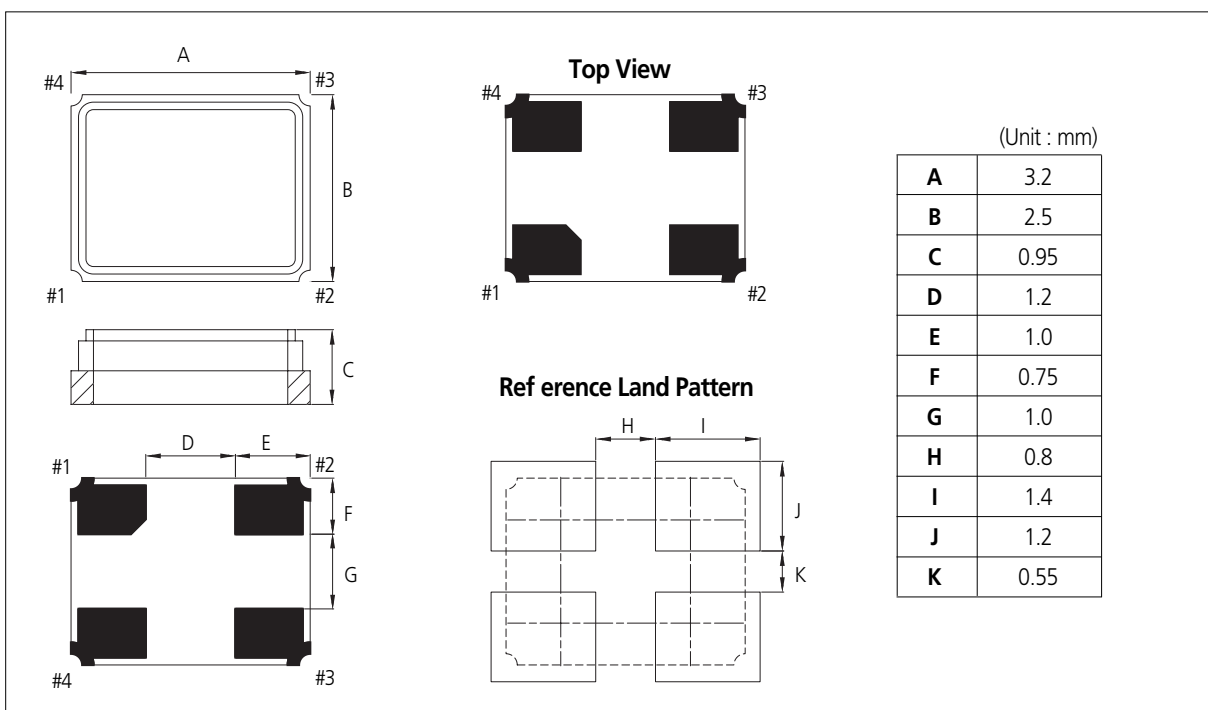
### Application

- PC / PDA / MP3 / WiFi / Modem etc

### Specifications

Item	Type	Specifications
Output Level		C-MOS
Frequency Range	MHz	4.0 ~ 125.0
Frequency Stability	ppm	±20.0 ~ ±100.0
Operating Temperature Range	°C	-20 ~ +75 / -30 ~ +85
Supply Voltage	V	1.6 ~ 2.0, 2.7 ~ 5.5
Current Consumption	mA	7max
Output Rise/Fall Time	nS	10max
Duty Cycle	%	40 ~ 60 / 45 ~ 55(at 1/2 VDD)
CL	CL(pF)	15 (standard)
Stand-by Function	Tri-sate	Yes

### Dimensions



Crystal unit

Crystal Oscillator

Reliability Test Condition

Packaging Specification

Application Guide

# Crystal Oscillator

## SQ50 SERIES



### Feature

- Height compatible with slim IC package.
- The best choice for portable PC, PDA and PC card.
- Directly drives C-MOS IC.
- Embossed carrier tape and IR reflow are possible.

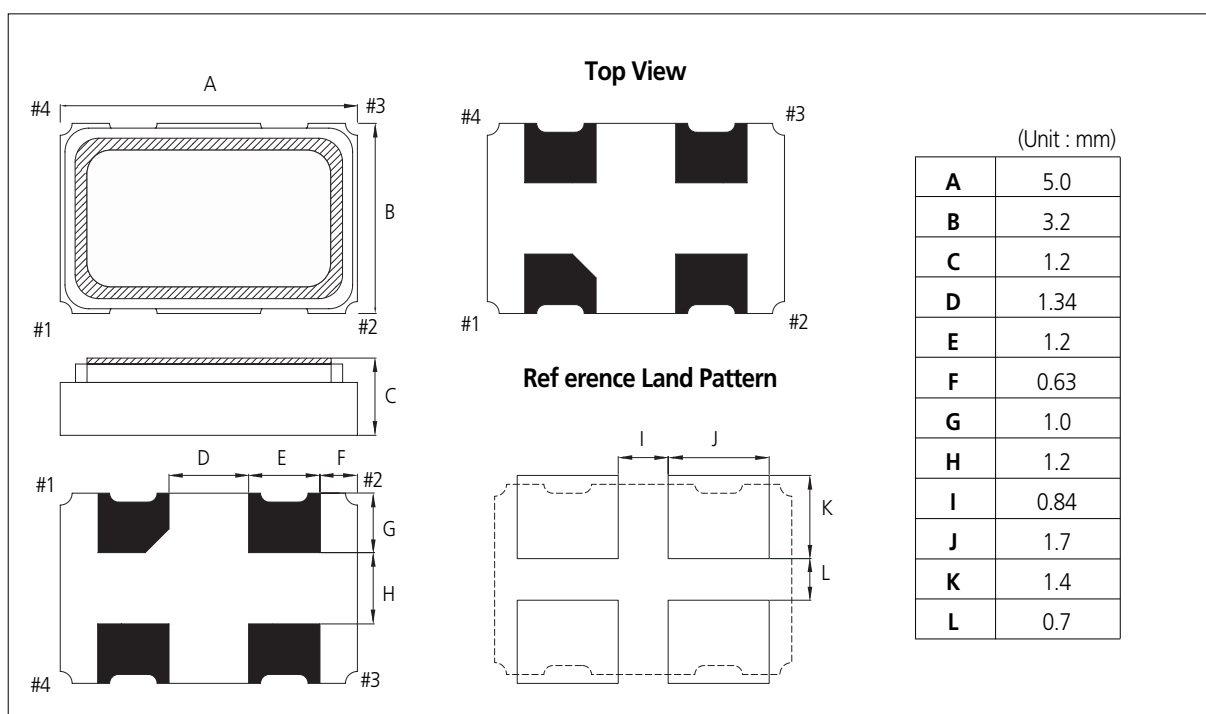
### Application

- PC / PDA / MP3 / WiFi / Modem etc

### Specifications

Item	Type	Specifications
Output Level		C-MOS
Frequency Range	MHz	4.0 ~ 125.0
Frequency Stability	ppm	±20.0 ~ ±100.0
Operating Temperature Range	°C	-20 ~ +75 / -30 ~ +85
Supply Voltage	V	2.7 ~ 5.5
Current Consumption	mA	25max
Output Rise/Fall Time	nS	10max
Duty Cycle	%	40 ~ 60 / 45 ~ 55(at 1/2 VDD)
CL	CL(pF)	15 (standard)
Stand-by Function	Tri-sate	Yes

### Dimensions



## Crystal Unit

NO.	Item	Test Condition
1	SHOCK RESISTANC (RANDOM DROP)	2 cycle drop it onto a concrete for six directions(x, y, z) and one corner. The height is 152cm. Dummy is 120g weight.
2	VIBRATION RESISTANCE	Frequency : 10 ~ 55Hz Amplitude : 1.5 m Period : 1 min Test time : x,y,z each direction 2h According to IEC 1178-1.4.8.7
3	SOLDER ABILITY	Temperature of bath : $235 \pm 5^{\circ}\text{C}$ solder bath Dipping time : $5 \pm 1.0$ sec According to IEC 1178-1.4.8.3
4	HIGH TEMPERATURE STORAGE	Temperature : $85 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours According to IEC 1178-1.4.8.11
5	LOW TEMPERATURE STORAGE	Temperature : $-40 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours According to IEC 1178-1.4.8.13
6	HUMIDITY	Temperature : $40 \pm 2^{\circ}\text{C}$ Humidity : 90 ~ 95% Time : For 240 hours According to IEC 1178-1.4.8.15
7	THERMAL SHOCK	100 cycles of temperature $-40^{\circ}\text{C}$ and $85^{\circ}\text{C}$ , Keeping time is 30 min. at each temperature. According to IEC 1178-1.4.8.4
8	REFLOW	Peak Temperature : $+260^{\circ}\text{C}$ According to JEDEC J-STD-020C
9	LEAKAGE	AIR LEAK TEST Helium leak detector According to IEC 1178-1.4.8.2

Crystal unit

Crystal Oscillator

Reliability Test Condition

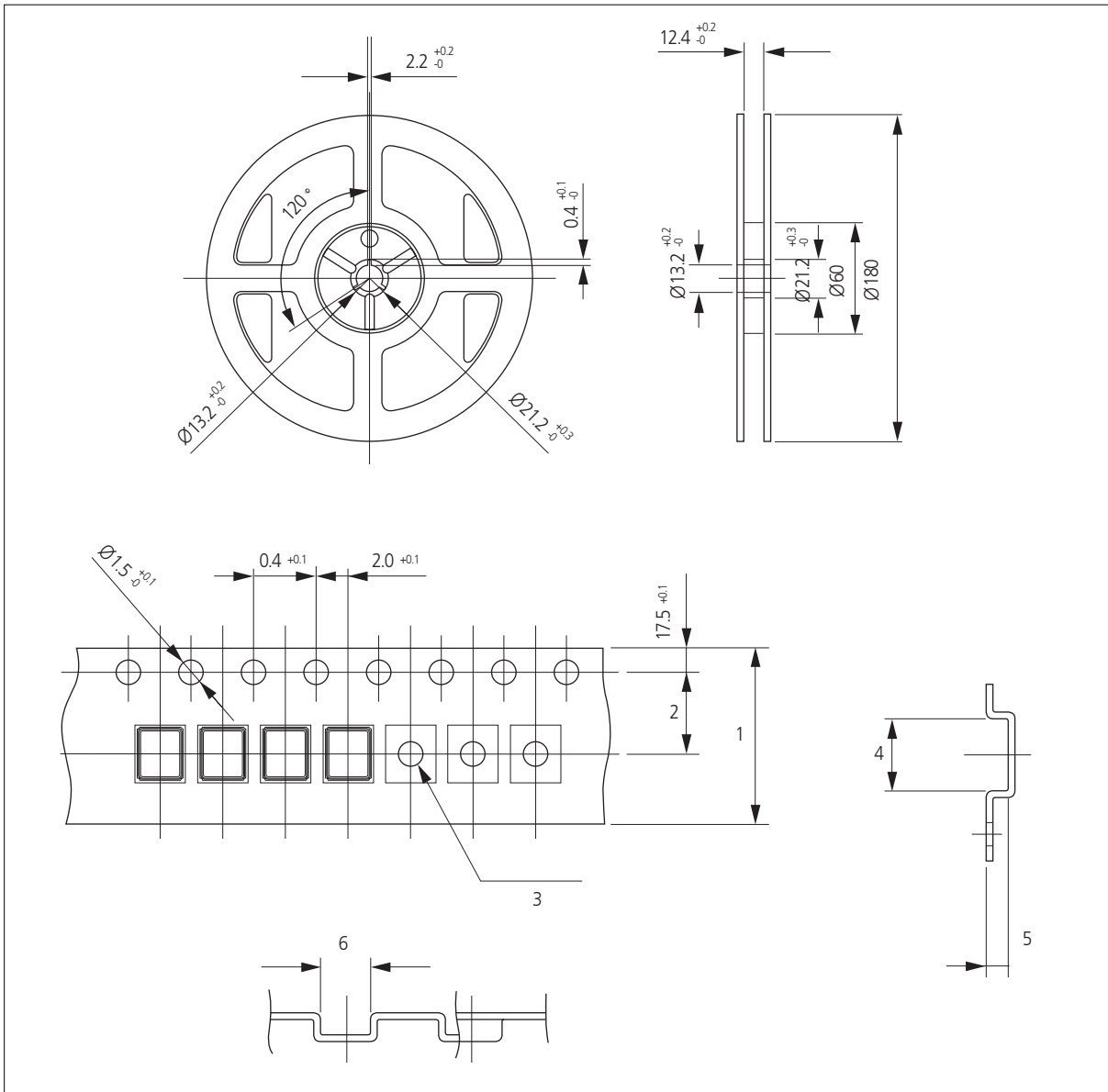
Packaging Specification

Application Guide

## Crystal Oscillator

NO.	Item	Test Condition
1	SHOCK RESISTANC (RANDOM DROP)	2 cycle drop it onto a concrete for six directions(x, y, z) and one corner. The height is 152cm. Dummy is 120g weight.
2	VIBRATION RESISTANCE	Frequency : 10 ~ 55Hz Amplitude : 1.5 m Period : 1 min Test time : x,y,z each direction 2h According to IEC 1178-1.4.8.7
3	SOLDER ABILITY	Temperature of bath : $235 \pm 5^{\circ}\text{C}$ solder bath Dipping time : $5 \pm 1.0$ sec According to IEC 1178-1.4.8.3
4	HIGH TEMPERATURE STORAGE	Temperature : $85 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours According to IEC 1178-1.4.8.11
5	HIGH TEMPERATURE OPERATING	Temperature : $85 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours Rated Voltage : Applied
6	LOW TEMPERATURE STORAGE	Temperature : $40 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours
7	LOW TEMPERATURE OPERATING	Temperature : $40 \pm 3^{\circ}\text{C}$ in atmosphere. Time : For 240 hours Rated Voltage : Applied
8	HUMIDITY	Temperature : $40 \pm 3^{\circ}\text{C}$ in atmosphere. Humidity : 90 ~ 95% Time : For 240 hours Rated Voltage : Applied
9	THERMAL SHOCK	100 cycles of temperature $-40^{\circ}\text{C}$ and $85^{\circ}\text{C}$ , Keeping time is 30 min. at each temperature. According to IEC 1178-1.4.8.4
10	REFLOW	Peak Temperature : $+260^{\circ}\text{C}$ According to JEDEC J-STD-020C
11	LEAKAGE	AIR LEAK TEST Helium leak detector According to IEC 1178-1.4.8.2

## Reel Dimensions



Crystal unit

Crystal Oscillator

Reliability Test Condition

Packaging Specification

Application Guide

Class	Size	1	2	3	4	5	6	Packing Quantity		
								Reel	Inner Box	Outer Box
Crystal	5032	12	5.5	Ø1.5	5.35	1.2	3.5	1,500psc	7,500psc	30,000psc
	3225	12	5.5	Ø1.5	3.5	1.0	2.8	3,000psc	15,000psc	60,000psc
	2520	8	3.5	Ø1.0	2.8	0.75	2.3	3,000psc	15,000psc	60,000psc
	2016	8	3.5	Ø1.0	2.3	0.75	1.95	3,000psc	15,000psc	60,000psc
	1612	8	3.5	Ø0.8	1.9	0.6	1.5	3,000psc	15,000psc	60,000psc
OSC	5032	12	5.5	Ø1.5	5.35	1.2	3.5	1,500psc	7,500psc	30,000psc
	3225	12	5.5	Ø1.5	3.6	1.5	2.9	3,000psc	15,000psc	60,000psc
	2520	8	3.5	Ø1.0	2.77	1.05	2.19	3,000psc	15,000psc	60,000psc



## Application Guide

### 1. Equivalent Circuit

Vibration of a crystal unit is actually mechanical vibration. However, the crystal unit can be expressed by a two-terminal network if its behavior is electrically converted. The series circuit consisting of L1, C1, and R1 is related to elastic vibration, while the element C0 connected in parallel to the series arm as a capacitance attributable to the dielectric body of a quartz crystal plate. The resistance R1 is a resonance resistance of the crystal unit at the series resonance frequency. (See Fig. 1.)

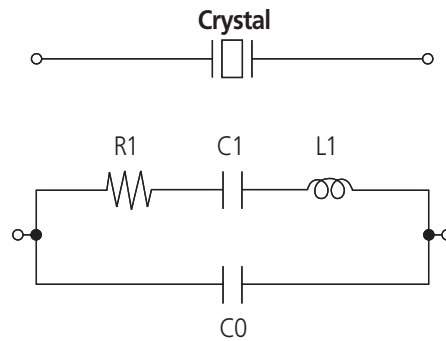


Fig.1 Equivalent Circuit of Crystal Unit

### 2. Frequency-Temperature Characteristics of an AT-cut

The frequency-temperature characteristics of an AT-cut crystal unit most generally used at present are expressed by cubic curves. (See Fig.2.) A crystal plate is cut at an angle at which a required frequency tolerance is obtained in the given operating temperature range. Actually, however there can be some dispersion in apparent cutting angle due to the result of cutting and polishing accuracy in the successive processes. Therefore, it is necessary to raise processing accuracy.

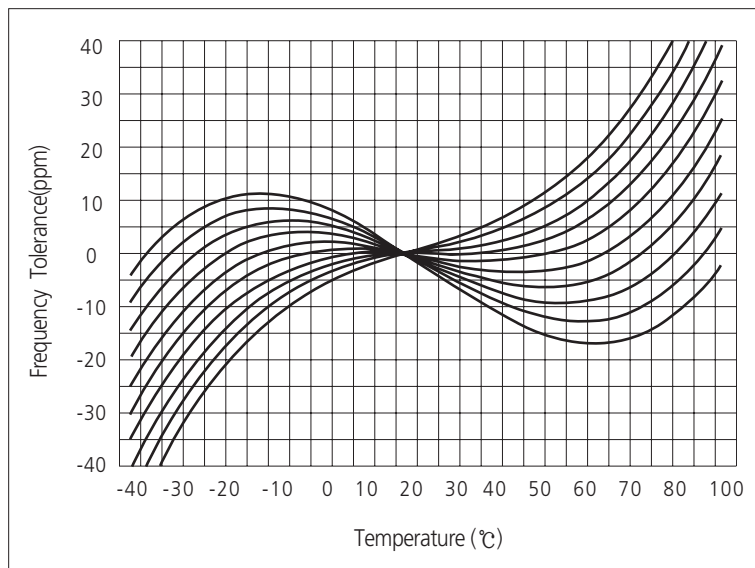


Fig.2 Frequency vs. Temperature Characteristics of AT-cut Crystal Unit

### 3. Level of Drive

Since a crystal unit performs mechanical vibration, too much vibration may lead to unstable oscillation frequency, and finally to destruction in the worst case. When designing an oscillation circuit, the level of drive should be examined so as to use an oscillator below the level specified by our company. Fig.3 shows an example method of confirming a level of drive. The method employs a current probe to measure the crystal oscillator current. In this case the level of drive is as follows :

$$\text{Level of drive(P)} = I_q^2 R_e$$

$$R_e = R_1(1 + C_0/C_L)^2$$

here,  $R_1$  is series resonance resistance,  $C_0$  is shunt capacitance,  $C_L$  is load capacitance.  
If level of drive exceed the specified level, oscillation frequency will shift or crystal unit will malfunction.

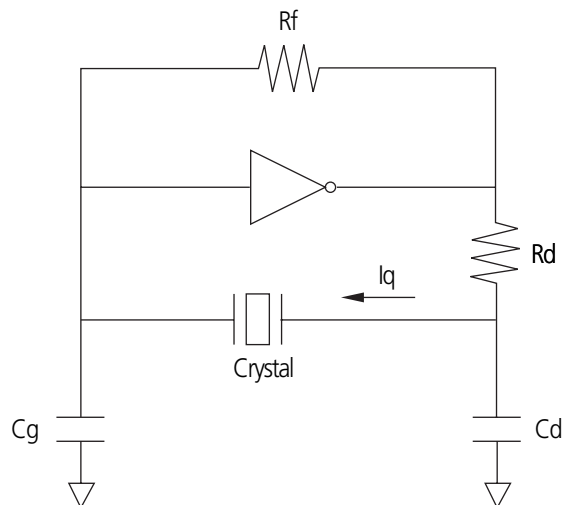


Fig.3 Example Method of Confirming a Drive Level

### 4. Load Capacitance

The load capacitance  $C_L$  is a factor for determining the "conditions" of a crystal unit when used in the oscillation circuit. In an ordinary oscillation circuit, the crystal unit is used in a range where it function as an inductive reactance. In such usage, the oscillation circuit operates as a capacitive reactance. In other words, when the oscillation circuit is seen from both terminals of the crystal unit, the oscillation circuit can be expressed as a series circuit of a negative resistance  $-R$  and a capacitance  $C_L$ . At that time this capacitance is called the load capacitance. The relationship between load capacitance and oscillation frequency is not linear. When the load capacitance is small, the amount of frequency vibration is large, and when the load capacitance is lessened in the oscillation circuit to secure a large allowance for the oscillation frequency, the frequency stability will be greatly influenced even by a small change in the circuit. The load capacitance can be chosen from standard values specified in the catalog.

Crystal unit

Crystal  
OscillatorReliability Test  
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## 5. Equivalent Circuit of Crystal Oscillation Circuit

When a crystal unit is actuated as an inductive reactance in an oscillation circuit, the relationship between crystal unit and oscillation circuit is shown in Fig. 4. To improve the starting conditions of the oscillation circuit, it is preferable to increase the circuit. The starting conditions will become worse if a circuit without much allowance in negative resistance (less negative resistance) is combined with a crystal unit having a larger resonance resistance. The oscillation circuit should be designed to a goal such that the value of negative resistance is 5 to 10 times the resonance resistance. It is also necessary that the center value of load capacitance (to determine the absolute value of oscillation frequency) and the variable range (fine adjustment range of oscillation frequency) are maintained at the optimum values in the oscillation circuit.

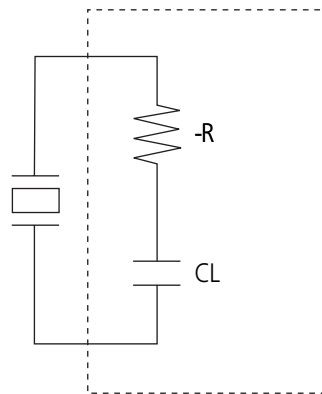


Fig.4 Equivalent Circuit of Crystal Oscillation Circuit

## 6. Oscillation Circuit

A typical oscillation circuit composed of a crystal unit is introduced below. Element constants used are for example.

- (1) Crystal units are designed to have lower limitable level of drive, of 100uW and below. Prior to use, the crystal current should be examined in an actually mounting circuit. (See Fig.3)
- (2) The negative resistance of a circuit must be checked. Confirmation of negative resistance is possible according to Fig. 5. A goal of negative resistance is designed to 5 or more times of the resonance resistance.
- (3) The  $R_d$  in the circuit diagram is indispensable when used in a C-MOS oscillation circuit. (See Fig. 5.) If this  $R_d$  is attached, the level of drive is kept within the specified value and stable oscillation frequency can be obtained.
- (4)  $C_g$  and  $C_d$  should be used within the range of 10 ~ 30pF. If  $C_g$  and  $C_d$  are used below 10pF or above 30pF, oscillation may be easily affected by circuit performance, level of drive may increase, of negative resistance may decrease, thus failing in maintaining stable oscillation.
- (5) The layout for crystal oscillation circuits should be arranged as short as possible. The stray capacitance between circuits and ground patterns should be reduced. Crossing of crystal oscillation circuits patterns over other circuit patterns should be avoided.
- (6) If the circuits used, IC types, and IC manufactures are different, frequency, level of drive, and negative resistance should be confirmed.

\* Overtone oscillation circuits need additional consultation.

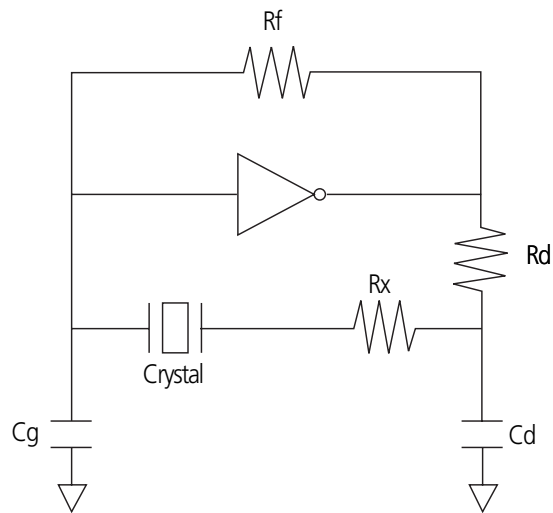


Fig.5 Example Method of Negative Resistance Measurement

#### \*\*\* Procedures of Negative Resistance Measurement

1. Open either end of the crystal unit in the main circuit used, and insert a variable resistor in series to the crystal unit, as shown in Fig. 6. Change the resistance value to examine the limits of oscillation and resistance in ohms observed at that time. In this case the power circuit must be turned on and off, without fail.
2. Negative resistance (-R) in the circuit is the sum of the value obtained by 1 above and the resonance resistance R1 of the crystal.  
 \*\*\* This measurement should be carried out at both the upper and lower limits of the operating temperature range.

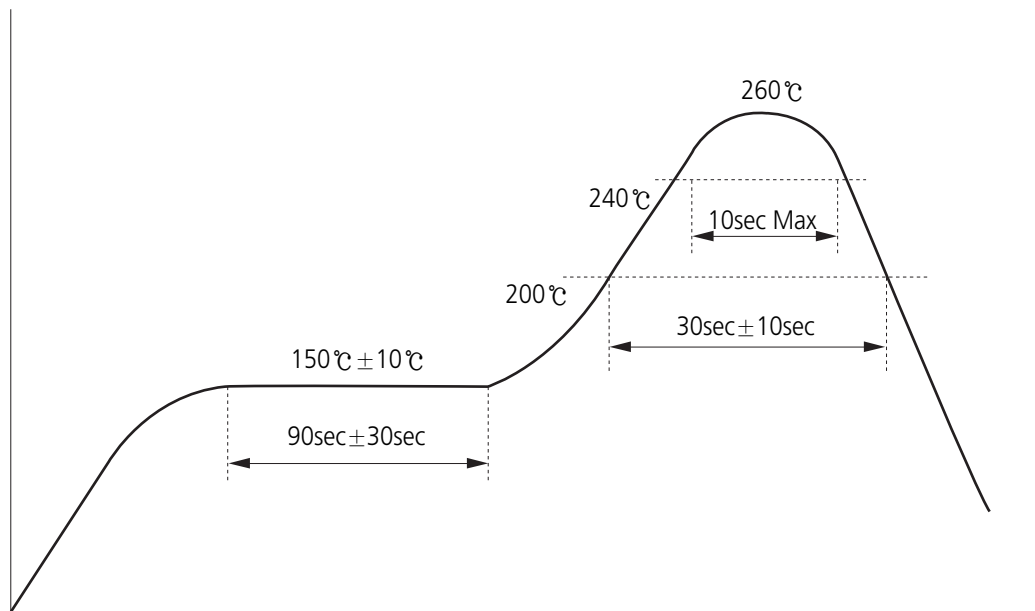
### Notes for Crystal Unit Applications

- (1) It has the possibility that a crystal element fractures when an excessive shock and a vibration more than the regulation are added at the time of the conveyance or circuit board mounting. Be sure to do characteristic confirmation when a shock more than the regulation, a vibration are added.
- (2) Ultrasonic-wave cleaning may cause deterioration of crystal units, which printed in the catalog.
- (3) The deformation of the extreme circuit board sometimes brings about a pattern comes off, a terminal and electrode comes off, a crack in the solder. Be careful when you install it in the position where the curve of the circuit board appears greatly when you divide a circuit board appears greatly when you divide a circuit board after you mount it specially.
- (4) Select the model whose shock is small as much as possible, and use it after confirmation in advance when you use an automatic loading machine.

Crystal unit

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## Reflow Profile(Reference)



- Pre heating temperature :  $150^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- Pre heating time :  $90\text{sec} \pm 30\text{sec}$
- Heating temperature :  $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- Heating time : 10sec Max.
- Peak temperature must not exceed  $+265^{\circ}\text{C}$  and the duration of over  $+200^{\circ}\text{C}$  should be  $30\text{sec} \pm 10\text{sec}$

## Storage environment

- 1)Recommended storage condition :  $+15^{\circ}\text{C} \sim +35^{\circ}\text{C}$ , RH 85%  
(MSL : LEVEL 1,  $+30^{\circ}\text{C}/85\%\text{RH}$  Unlimited)
- 2)Please open the package just before using.
- 3)Please keep the products out of the direct rays of the sun.
- 4)Please keep the products away from any corrosive chemicals.
- 5)Please do not put other materials but the product in the reel or package box.  
(Otherwise, the products might be affected by other materials.)

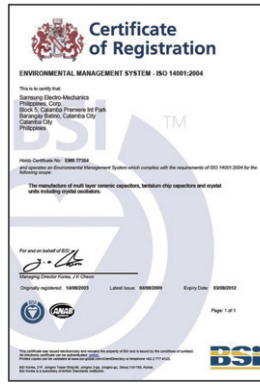
<Caution>

Please keep the products not to be shocked directly.

ISO/TS 16949



ISO 14001



OHSAS 18001



QC080000



Quality System Certification List

Table 1: Certification list of Samsung Factory

Certification	Section	PHILIPPINES
ISO / TS 16949	Authority	BSI
	Number	TS 91430-005
	Date	2009 - 08 - 14
	Validity	2012 - 08 - 13
ISO 14001	Authority	BSI
	Number	EMS 77354
	Date	2009 - 08 - 04
	Validity	2012 - 08 - 03
OSHAS18001	Authority	BSI
	Number	OHS 568723
	Date	2010 - 12 - 21
	Validity	2013 - 12 - 20
QC080000	Authority	UL
	Number	PI-HSPM-1001
	Date	2010 - 07 - 05
	Validity	2013 - 07 - 04

Crystal unit

Crystal Oscillator

Reliability Test Condition

Packaging Specification

Application Guide