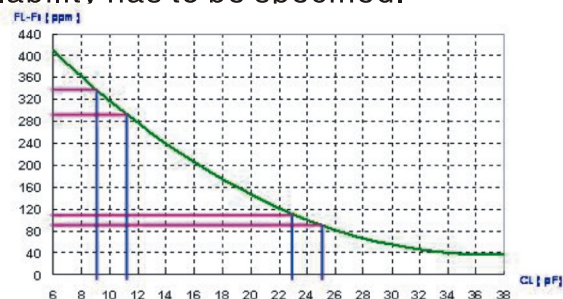


$$Q = \frac{2\pi f_s L_1}{R_1} = \frac{1}{2\pi f_s C_1 R_1} \text{-----(6)}$$

where, R1 is the resistance appearing in the series branch.
The loaded Q value depends on the loaded circuit.

10. Pullability

In a parallel-load capacitance oscillator, the oscillation frequency depends on the load capacitance, CL as shown in (Fig.8) and (Fig. 12). The frequency change (in ppm) as a function of the load capacitance change (in pF) is a specification. In certain applications where the variation of loaded resonance frequency is mandatory (VCXO, for example), pullability has to be specified.



(Fig.12) Frequency variation vs. load capacitance

11. AGING

Aging is the relative change of operating frequency over a specified time period and is expressed in parts per million (ppm) within a specified period. This rate of frequency change is normally exponential in character. The highest aging rate occurs within the first week of aging and decreases slowly afterwards. Typically, aging is computed within first 30 days and is calculated over a long-term period (one year or ten years). Aging rate depends on many factors: seal method, integrity, manufacturing processes, material type, operating temperature, and frequency.

12. STORAGE TEMPERATURE RANGE

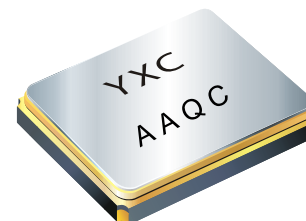
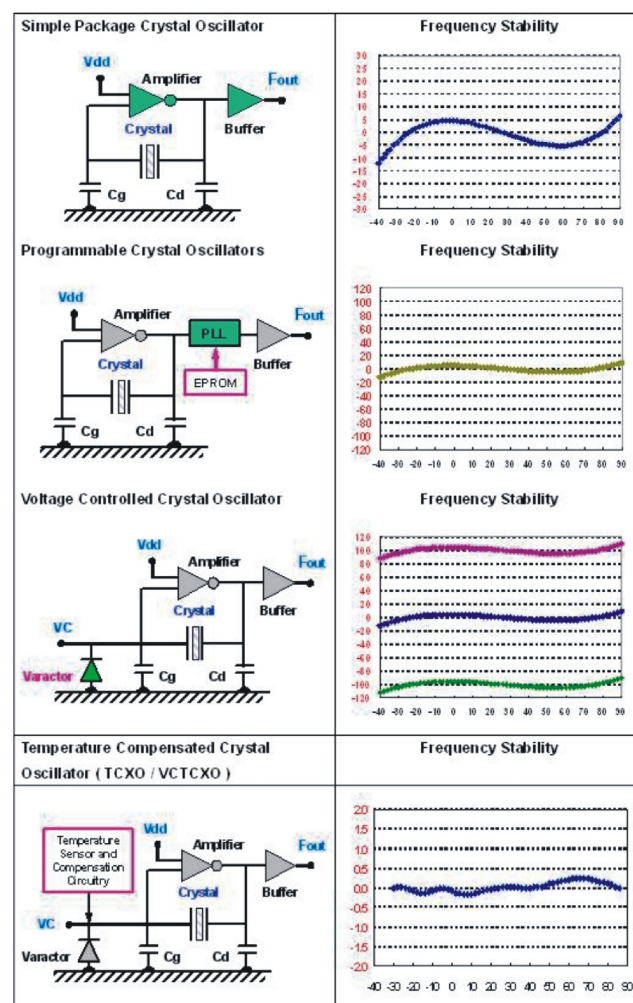
The specification indicates the minimum and maximum temperatures in which the devices can be stored or exposed in a non-operating state. After storing or exposing the devices at the specified temperature

range for a long time, all of the specifications are guaranteed over the specified operating temperature range.

13. Negative Resistance "-R"

Negative resistance is introduced to describe the electric property of an oscillator circuit. This is the amount of resistance that the oscillator circuit exhibits when looking into the circuit through the terminals of the resonator. One of the basic oscillation conditions demands the amplifier have to supply enough gain to compensate the loss in the resonator. From resonator point of view, the load has to exhibit enough "negative resistance" to compensate the resistance of the resonator. This is an important parameter in designing oscillators.

(9) oscillators



Features

- External dimensions: 2.55 x 2.05 x 0.55 mm.
- Frequency range: 12MHz ~ 48MHz.
- High precision and high frequency stability.
- Excellent heat resistance and environmental characteristics.
- Applications: mobile phone, Bluetooth, Bluetooth, W-LAN ISM band radio, clock for MPU GPS, smart phone.

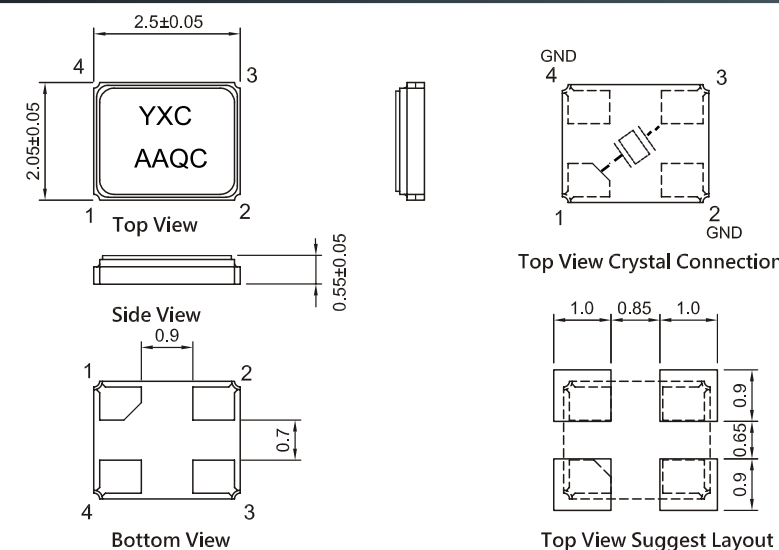
Electrical Specifications

Item / Type	YSX221SL
Nominal Frequency Range	12 ~ 48 MHz
Vibration Mode	AT Fundamental
Load Capacitance	12pF, 20pF, or specify
Frequency Tolerance (at 25 °C)	± 10 ppm, ± 20 ppm, or specify
Frequency Versus Temperature Characteristics	±20 ppm, or specify
Operating Temperature	- 20 ~ + 70 °C , - 40 ~ + 85 °C , or specify
Storage Temperature	- 40 ~ + 85 °C , or specify
Shunt Capacitance	3 pF Max.
Level Of Drive	1~200 μW Max. (100uW typical)
Frequency Aging (at 25 °C)	± 3 ppm / year Max.

Equivalent Series Resistance(ESR)

Fundamental	
12 ~ 13 MHz	150 Ω Max.
14 ~ 30 MHz	100 Ω Max.
30 ~ 48 MHz	60 Ω Max.

Dimensions



Units: mm



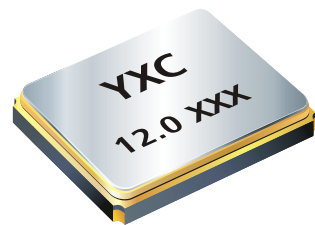
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贴片金属表面石英晶体谐振器
SMD Metal Surface Quartz Crystal Resonator



Features

- External dimensions: 3.2 x 2.5 x 0.8 mm.
- Frequency range: 11.0592MHz ~ 54MHz.
- High precision and high frequency stability.
- Extremely good for reducing EMI effect.
- RoHS Compliant / Pb Free.
- The best choice of Bluetooth, wireless communication set, DSC, PDA and mobile phone.

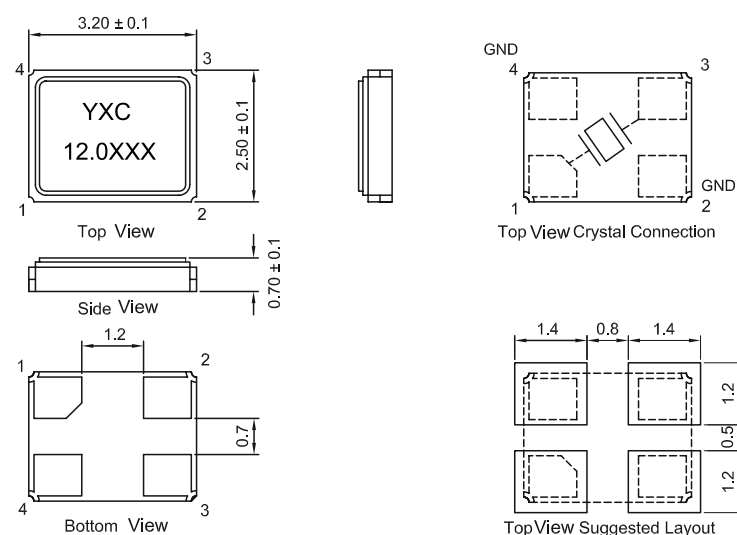
Electrical Specifications

Item / Type	YSX321SL
Nominal Frequency Range	11.0592~ 54 MHz
Vibration Mode	AT Fundamental
Load Capacitance	12pF, 20pF, or specify
Frequency Tolerance (at 25 °C)	± 10 ppm, ± 20 ppm, or specify
Frequency Versus Temperature Characteristics	±20 ppm, or specify
Operating Temperature	- 20 ~ + 70 °C , - 40 ~ + 85 °C , or specify
Storage Temperature	- 40 ~ + 85 °C , or specify
Shunt Capacitance	7 pF Max.
Level Of Drive	1~100 μW Max. (10 uW typical)
Frequency Aging (at 25 °C)	± 3 ppm / year Max.
Insulation Resistance	More Than 500MΩ at DC 100V

Equivalent Series Resistance(ESR)

Fundamental	
11.0592 ~ 16 MHz	80 Ω Max.
16 ~ 20 MHz	60 Ω Max.
20 ~ 54 MHz	40 Ω Max.

Dimensions



Units: mm

行为准则：耐心对事情、信心对自己、诚心对客户。



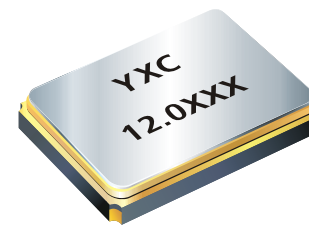
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贴片金属表面石英晶体谐振器
SMD Metal Surface Quartz Crystal Resonator



Features

- External dimensions: 5.0 x 3.2 x 0.9 mm.
- Frequency range: 8MHz ~ 54MHz.
- High precision characteristics covering up to wide frequency range.
- Higher frequency stability and reliability.
- Excellent for reducing EMI effect.
- The best choice of Bluetooth, wireless communication set, DSC, PDA, mobile phone and USB interface card.

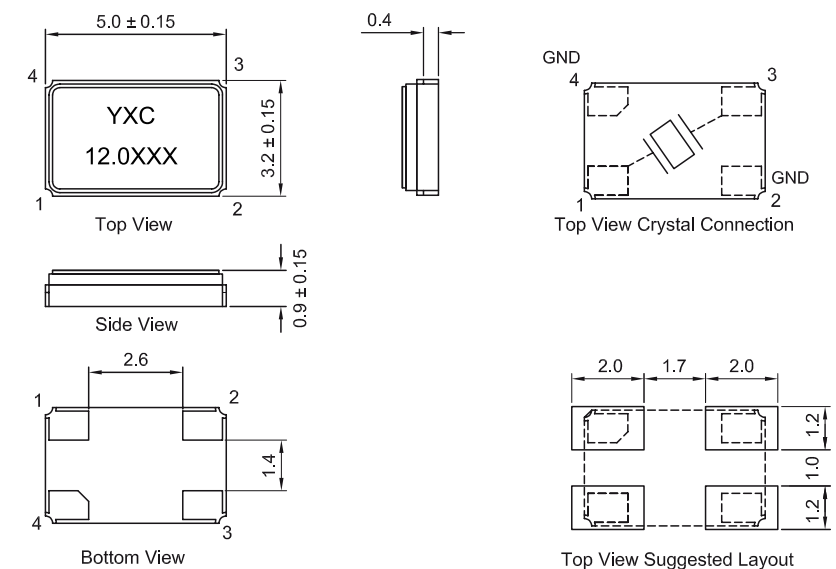
Electrical Specifications

Item / Type	YSX531SL
Nominal Frequency Range	8 ~ 54 MHz
Vibration Mode	AT Fundamental
Load Capacitance	12pF, 20pF, or specify
Frequency Tolerance (at 25 °C)	± 10 ppm, ± 20 ppm, or specify
Frequency Versus Temperature Characteristics	±20 ppm, or specify
Operating Temperature	- 20 ~ + 70 °C , - 40 ~ + 85 °C , or specify
Storage Temperature	- 40 ~ + 85 °C , or specify
Shunt Capacitance	7 pF Max.
Level Of Drive	1~100 μW Max. (10 uW typical)
Frequency Aging (at 25 °C)	± 3 ppm / year Max.
Insulation Resistance	More Than 500MΩ at DC 100V

Equivalent Series Resistance(ESR)

Fundamental	
8 ~ 12 MHz	60 Ω ~ 80 Ω
12 ~ 25 MHz	40 Ω ~ 60 Ω
25 ~ 54 MHz	30 Ω ~ 40 Ω

Dimensions



Units: mm

三大习惯：学习习惯、计划习惯、行为习惯。



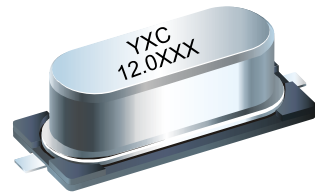
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贴片金属表面石英晶体谐振器
SMD Metal Surface Quartz Crystal Resonator



Features

- External dimensions: 11.4 x 4.8 x 3.8 mm.
- Frequency range: 3.579545MHz ~ 64MHz.
- Surface mount type crystal units.
- A great number of standard frequencies.
- High frequency pullability and low equivalent series resistance.
- Highly mass production capability.
- Applications: PC, STB, LCDM and Cable Modem.

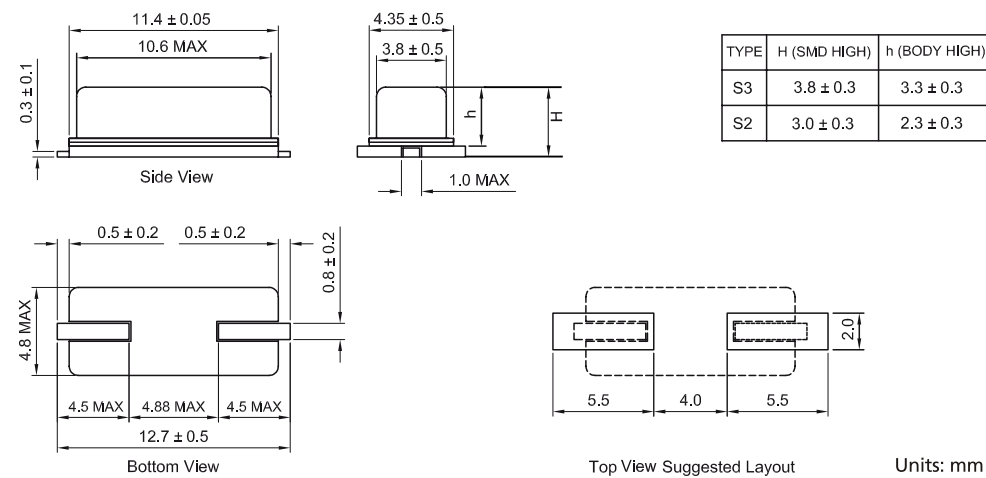
Electrical Specifications

Item / Type	HC-49SMD
Nominal Frequency Range	3.579545 ~ 64MHz
Vibration Mode	AT Fundamental
Load Capacitance	12pF, 20pF, or specify
Frequency Tolerance (at 25 °C)	±10 ppm, ± 20 ppm, or specify
Frequency Versus Temperature Characteristics	± 20 ppm, or specify
Operating Temperature	- 20 ~ + 70 °C , - 40 ~ + 85 °C , or specify
Storage Temperature	-40 ~ +85 °C , or specify
Shunt Capacitance	7 pF Max.
Level Of Drive	1 ~ 500 μW (100μW typical)
Frequency Aging (at 25 °C)	± 3 ppm / year Max.

Equivalent Series Resistance(ESR)

Fundamental		3rd Overtone	
3.579545 ~ 4 MHz	150 Ω Max.	20 ~ 25 MHz	100 Ω Max.
4 ~ 5 MHz	120 Ω Max.	25 ~ 64 MHz	80 Ω Max.
5 ~ 6 MHz	100 Ω Max.		
6 ~ 7 MHz	80 Ω Max.		
7 ~10MHz	60 Ω Max.		
10 ~ 27MHz	40 Ω Max.		

Dimensions



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直插金属表面石英晶体谐振器
DIP Metal Surface Quartz Crystal Resonator



Features

- External dimensions: 11.5 x 4.5 x 3.68mm.
- Frequency range: 3.579545MHz ~ 64MHz.
- Surface mount type crystal units.
- A great number of standard frequencies.
- High frequency pullability and low equivalent series resistance.
- Highly mass production capability.
- Applications: PC, STB, LCDM and Cable Modem.

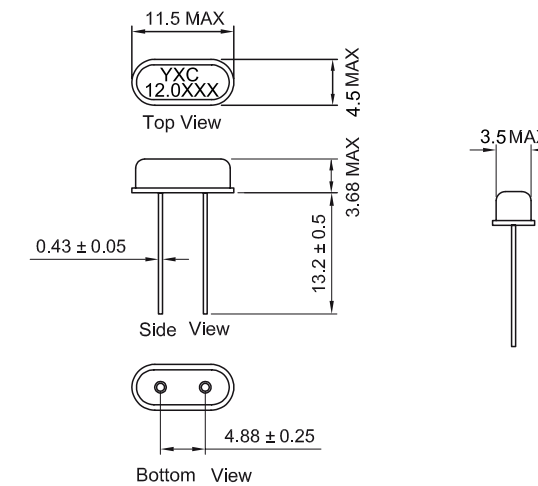
Electrical Specifications

Item / Type	HC-49US
Nominal Frequency Range	3.579545 ~ 64MHz
Vibration Mode	AT Fundamental
Load Capacitance	12pF, 20pF, or specify
Frequency Tolerance (at 25 °C)	±10 ppm, ± 20 ppm, or specify
Frequency Versus Temperature Characteristics	± 20 ppm, or specify
Operating Temperature	- 20 ~ + 70 °C , - 40 ~ + 85 °C , or specify
Storage Temperature	-40 ~ +85 °C , or specify
Shunt Capacitance	7 pF Max.
Level Of Drive	1 ~ 500 μW (100μW typical)
Frequency Aging (at 25 °C)	± 3 ppm / year Max.

Equivalent Series Resistance(ESR)

Fundamental		3rd Overtone	
3.579545 ~ 4 MHz	150 Ω Max.	20 ~ 25 MHz	100 Ω Max.
4 ~ 5 MHz	120 Ω Max.	25 ~ 64 MHz	80 Ω Max.
5 ~ 6 MHz	100 Ω Max.		
6 ~ 7 MHz	80 Ω Max.		
7 ~10MHz	60 Ω Max.		
10 ~ 27MHz	40 Ω Max.		

Dimensions



Units: mm