



Quartz Crystal Devices



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No.	SGS Report No.	Report Date



Attention

Products of Chequers Electronic (China) Limited (hereafter “Chequers”) shall not be used within any critical systems, which require especially high reliability. Critical systems mean, if such systems fail, one can reasonably expect that failure in such systems will result in damage to a third party’s life, body or property. In case products of Chequers must be used in critical systems, please consult with our sales representatives before using products from Chequers.



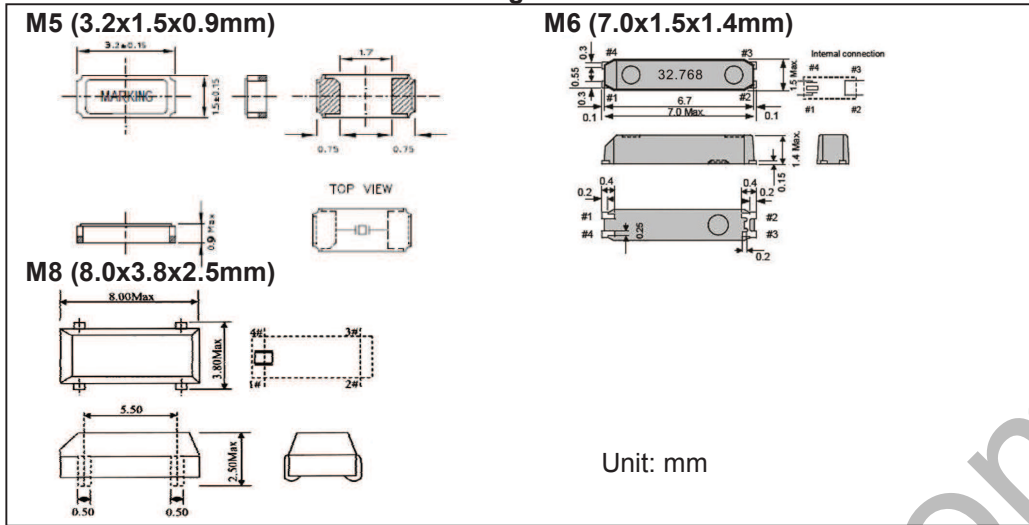
When using CQ products...

1. Do not apply voltage exceeding the rated voltage of components
2. Be certain not to operate outside the recommended operating temperature range of components
3. Be careful of soldering temperature and duration of components when soldering
4. Do not place soldering iron on the body of components
5. Be careful not to subject the terminals or leads of components to excessive force
6. Pay attention to the type of flux cleaning solvents that may damage components
7. Please contact our sales representatives or engineers before using the products specified in this specification sheet for the following equipment, which require high reliability, and if such equipment fails, which might damage to a third party’s life, body or property.
 - (i) Aerospace equipment
 - (ii) Medical equipment
 - (iii) Power plant equipment
 - (iv) Transportation equipment
 - (v) Traffic control equipment
 - (vi) Disaster control / prevention equipment
 - (vii) Undersea navigational equipment
 - (viii) Data-processing equipment
 - (ix) Or equipment that requires similar complexity and / or reliability of above equipment
8. Product specifications in this specification sheet are as of the date that is printed on, and they are for reference only. They are subject to change or discontinue without prior notice. Please check with our sales representative or engineers for details.
9. When using our products, please do not exceed the requirements and conditions specified in this specification sheet.
10. Should there be any doubt when using our products, please consult our sales representative or engineers before using our products.



SMD Tuning Fork Crystal Unit (KHz)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

● Electrical Specifications

Holder type		M5, M6, M8
Nominal frequency	F ₀	32.768KHz
Frequency tolerance (at 25°C)	ΔF	±10ppm, ±20ppm
Temperature coefficient	T _c	-0.034±0.006ppm/°C ²
Operating temperature range	T _o	-40°C ~ +85°C
Storage temperature range	T _S	-55°C ~ +125°C
Turnover temperature	T ₁	+25°C typical
Load capacitance	CL	9pF, 12.5pF

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

● Equivalent Series Resistance and Mode of Operation

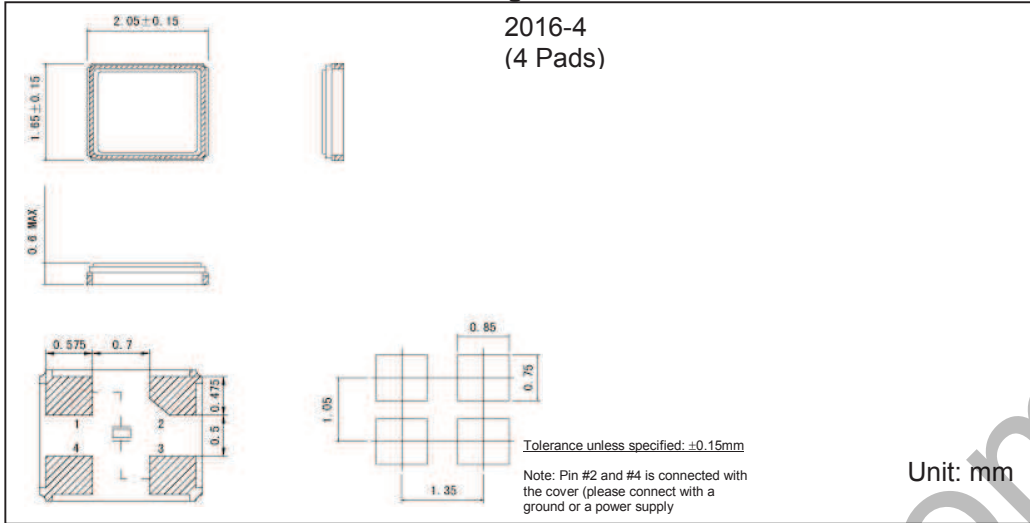
Holder type	Equivalent series resistance
M5	70KΩ max.
M6	65KΩ max.
M8	60KΩ max.

- The above information is for reference only. For other frequencies or specifications, please



Quartz Crystal Unit (2.0 x 1.6 x 0.6mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		2016-4 (2.0 x 1.6 x 0.6mm, surface-mounted, four pads)
Frequency range	Fo	24.000MHz to 60.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	10μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

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● Equivalent Series Resistance and Mode of Operation

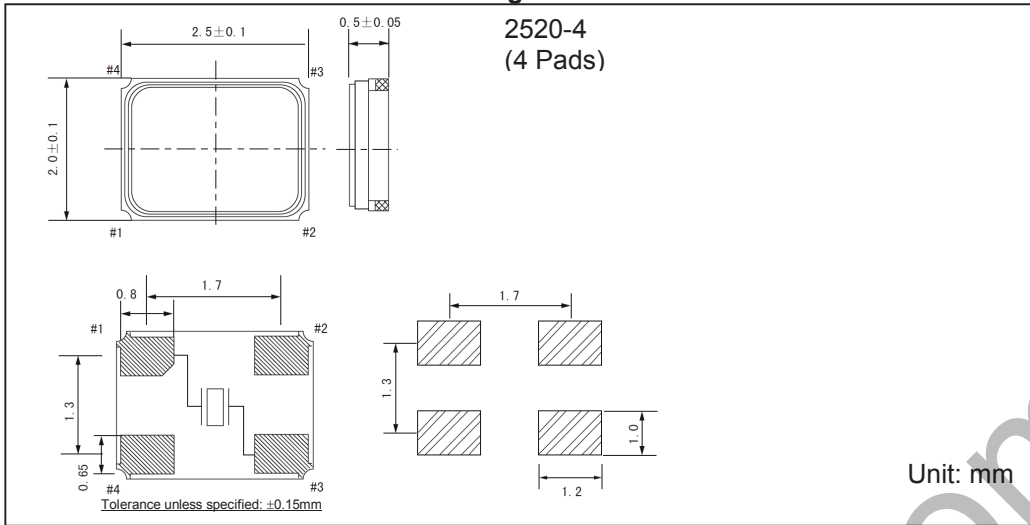
Frequency range	Equivalent series resistance	Mode of operation
24.000MHz to 25.999MHz	80Ω max.	Fundamental
26.000MHz to 39.999MHz	60Ω max.	Fundamental
40.000MHz to 60.000MHz	50Ω max.	Fundamental

- The above information is for reference only. For other frequencies or specifications, please



Quartz Crystal Unit (2.5 x 2.0 x 0.5mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		2520-4 (2.5 x 2.0 x 0.5mm, surface-mounted, four pads)
Frequency range	Fo	20.000MHz to 50.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

● Equivalent Series Resistance and Mode of Operation

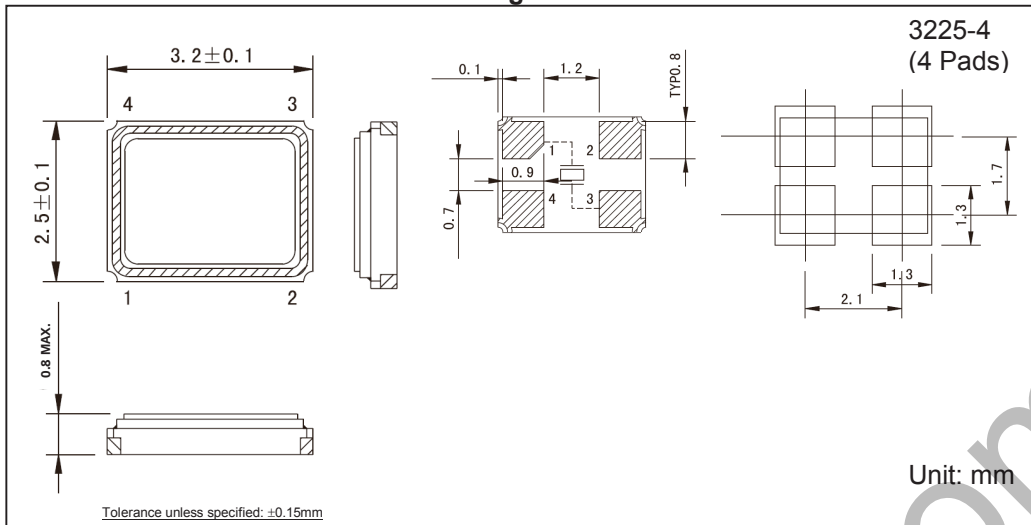
Frequency range	Equivalent series resistance	Mode of operation
20.000MHz to 29.999MHz	80Ω max.	Fundamental
30.000MHz to 39.999MHz	60Ω max.	Fundamental
40.000MHz to 50.000MHz	40Ω max.	Fundamental

- The above information is for reference only. For other frequencies or specifications, please



Quartz Crystal Unit (3.2 x 2.5 x 0.8mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		3225-4 (3.2 x 2.5 x 0.8mm, surface-mounted, four pads)
Frequency range	Fo	12MHz to 50MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	10μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

● Equivalent Series Resistance and Mode of Operation

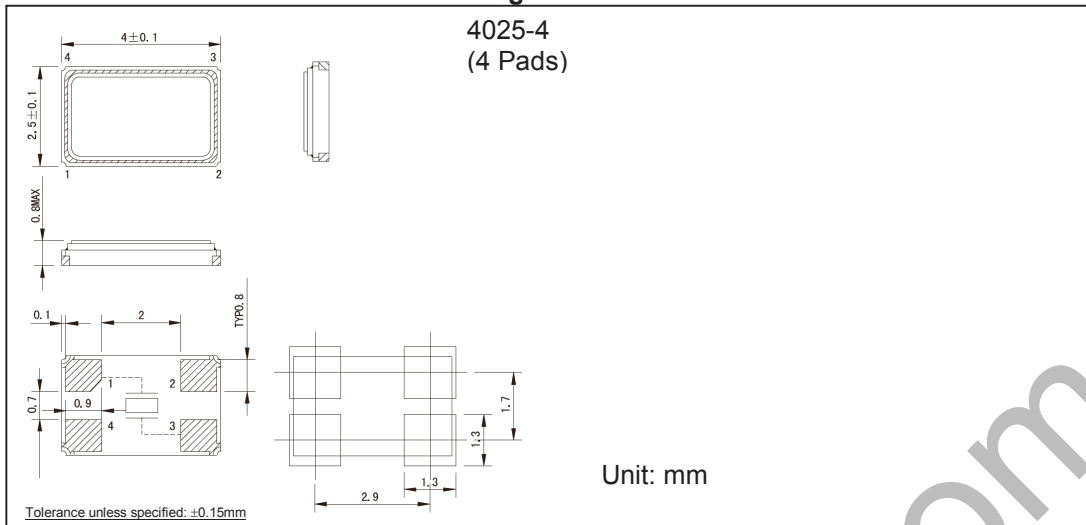
Frequency range	Equivalent series resistance	Mode of operation
12.000MHz to 15.999MHz	100Ω max.	Fundamental
16.000MHz to 19.999MHz	80Ω max.	Fundamental
20.000MHz to 23.999MHz	60Ω max.	Fundamental
24.000MHz to 50.000MHz	40Ω max.	Fundamental

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Quartz Crystal Unit (4.0 x 2.5 x 0.8mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

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(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		4025-4 (4.0 x 2.5 x 0.8mm, surface-mounted, four pads)
Frequency range	Fo	12.000MHz to 50.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

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● Equivalent Series Resistance and Mode of Operation

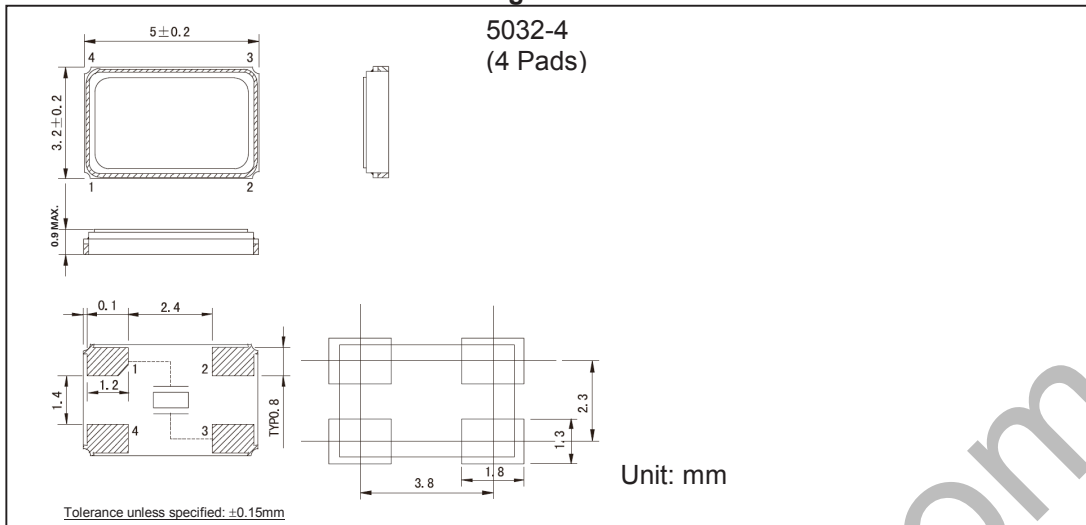
Frequency range	Equivalent series resistance	Mode of Operation
12.000MHz to 15.999MHz	80Ω max.	Fundamental
16.000MHz to 19.999MHz	60Ω max.	Fundamental
20.000MHz to 23.999MHz	50Ω max.	Fundamental
24.000MHz to 50.000MHz	40Ω max.	Fundamental

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Quartz Crystal Unit (5.0 x 3.2 x 0.9mm)

● Dimension and Recommended Soldering Pattern



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REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		5032-4 (5.0 x 3.2 x 0.9mm, surface-mounted, four pads)
Frequency range	Fo	8.000MHz to 150.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

● Equivalent Series Resistance and Mode of Operation

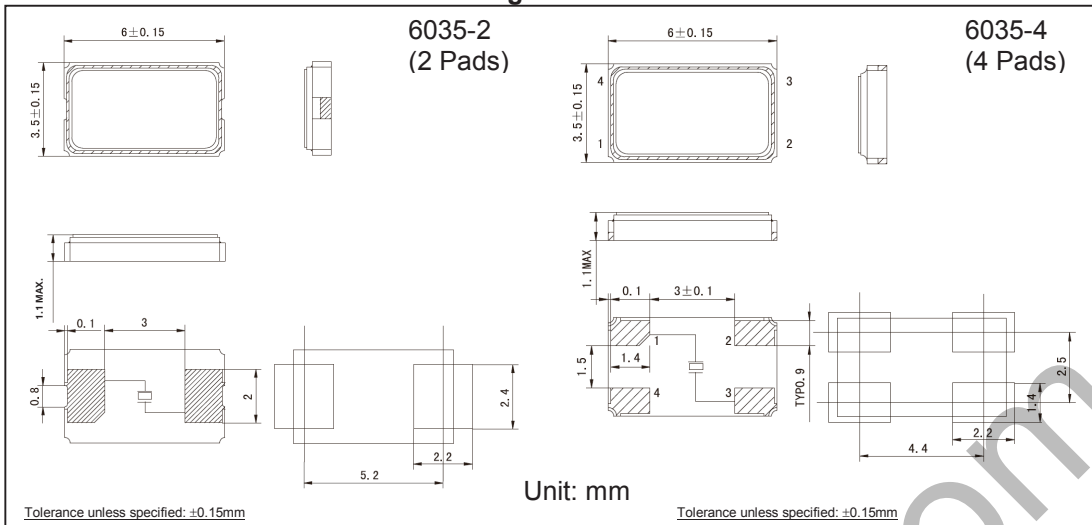
Frequency range	Equivalent series resistance	Mode of Operation
8.000MHz to 9.999MHz	100Ω max.	Fundamental
10.000MHz to 11.999MHz	80Ω max.	Fundamental
12.000MHz to 15.999MHz	60Ω max.	Fundamental
16.000MHz to 19.999MHz	50Ω max.	Fundamental
20.000MHz to 23.999MHz	40Ω max.	Fundamental
24.000MHz to 50.000MHz	30Ω max.	Fundamental
40.000MHz to 150.000MHz	80Ω max.	3 rd Overtone

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Quartz Crystal Unit (6.0 x 3.5 x 1.1mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		6035-2 (6.0 x 3.5 x 1.1mm, surface-mounted, two pads) 6035-4 (6.0 x 3.5 x 1.1mm, surface-mounted, four pads)
Frequency range	Fo	8.000MHz to 150.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

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● Equivalent Series Resistance and Mode of Operation

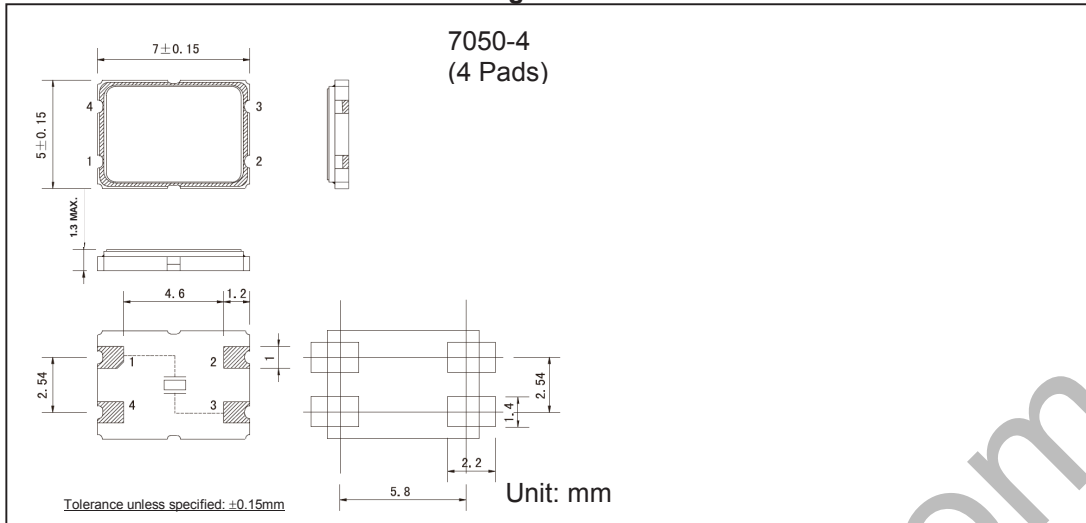
Frequency range	Equivalent series resistance	Mode of operation
8.000MHz to 9.999MHz	60Ω max.	Fundamental
10.000MHz to 13.999MHz	50Ω max.	Fundamental
14.000MHz to 19.999MHz	40Ω max.	Fundamental
≥ 20.000MHz	30Ω max.	Fundamental
40.000MHz to 150.000MHz	80Ω max.	3 rd Overtone

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Quartz Crystal Unit (7.0 x 5.0 x 1.3mm)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications

Holder type		7050-4 (7.0 x 5.0 x 1.3mm, surface-mounted, four pads)
Frequency range	Fo	5.500MHz to 150.000MHz
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

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● Equivalent Series Resistance and Mode of Operation

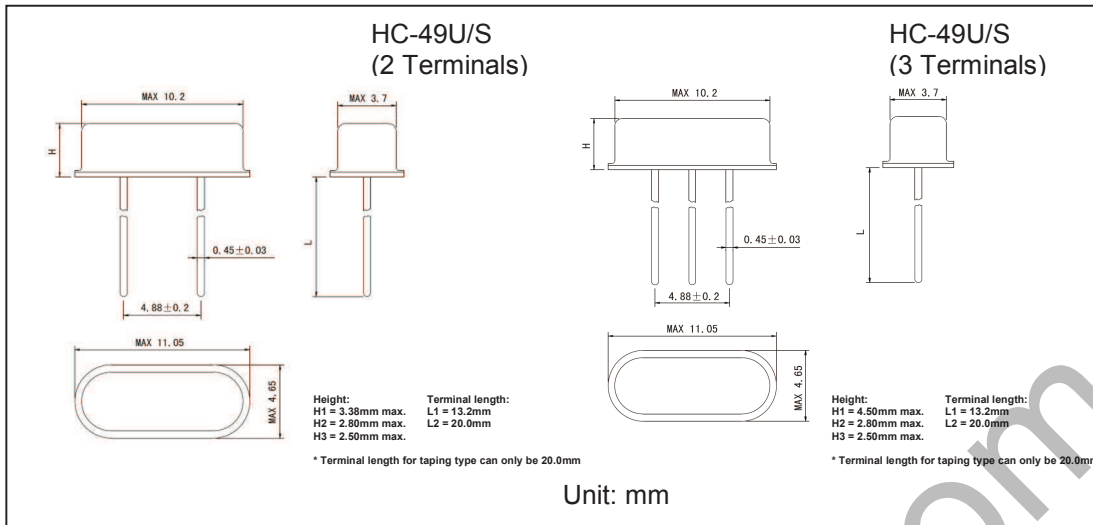
Frequency range	Equivalent series resistance	Mode of operation
5.500MHz to 7.999MHz	100Ω max.	Fundamental
8.000MHz to 9.999MHz	60Ω max.	Fundamental
10.000MHz to 13.999MHz	50Ω max.	Fundamental
14.000MHz to 19.999MHz	40Ω max.	Fundamental
≥ 20.000MHz	30Ω max.	Fundamental
35.000MHz to 150.000MHz	80Ω max.	3 rd Overtone

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Quartz Crystal Unit (HC-49U/S)

● Dimension



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications ¹

Holder type		HC-49U/S (two terminals, height: H1, H2, H3) HC-49U/S (three terminals, height: H1, H2, H3)
Frequency range	Fo	3.200 to 100.000MHz ²
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	Tc	±10ppm to ±100ppm
Operating temperature range	T0	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	TS	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C0	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	Ri	500MΩ min. at DC100V
Load capacitance	CL	Suggested by customer

¹ Above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.
² For HC-49U/S (two terminals / three terminals, height: H2 = 2.8mm max.), the lowest frequency that can be manufactured is 10.000MHz.
For HC-49U/S (two terminals / three terminals, height: H3 = 2.5mm max.), the lowest frequency that can be manufactured is 6.000MHz.

● Equivalent Series Resistance and Mode of Operation

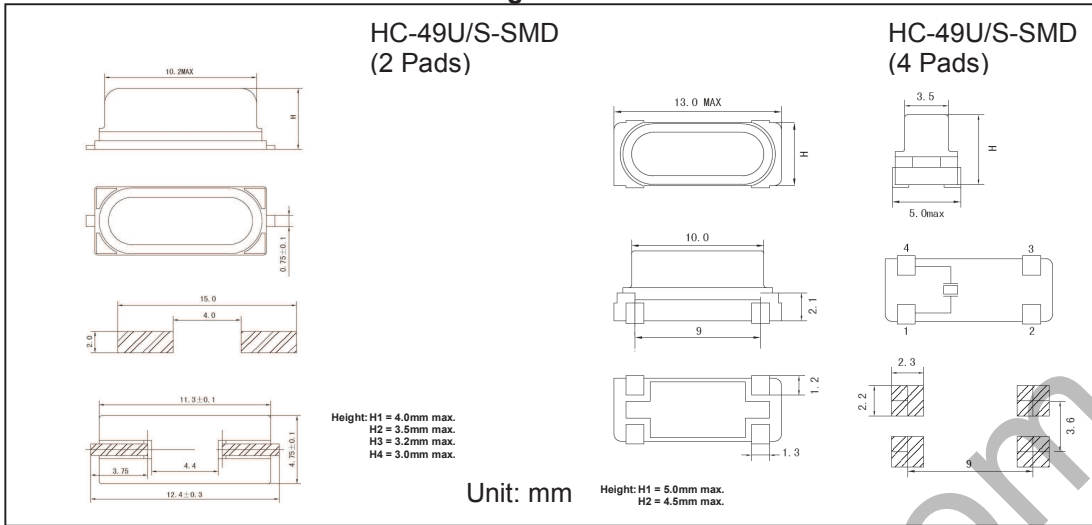
Frequency range	Equivalent series resistance	Mode of operation
3.200MHz to 3.578MHz	250Ω max.	Fundamental
3.579MHz to 3.999MHz	150Ω max.	Fundamental
4.000MHz to 4.999MHz	120Ω max.	Fundamental
5.000MHz to 5.999MHz	100Ω max.	Fundamental
6.000MHz to 6.999MHz	80Ω max.	Fundamental
7.000MHz to 9.999MHz	60Ω max.	Fundamental
10.000MHz to 13.999MHz	50Ω max.	Fundamental
14.000MHz to 19.999MHz	40Ω max.	Fundamental
≥ 20.000MHz	30Ω max. (AT cut) 40Ω max. (BT cut)	Fundamental
24.000MHz to 34.999MHz	100Ω max.	3 rd overtone
≥ 35.000MHz	80Ω max.	3 rd overtone

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Quartz Crystal Unit (HC-49U/S-SMD)

● Dimension and Recommended Soldering Pattern



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

TS16949:2002
Certified

● Electrical Specifications ¹

Holder type		HC-49U/S-SMD (two pads, height: H1, H2, H3, H4) HC-49U/S-SMD (four pads, height: H1, H2)
Frequency range	F ₀	3.200 to 100.000MHz ²
Frequency tolerance (at 25°C)	ΔF	±10ppm to ±100ppm
Frequency drift	T _c	±10ppm to ±100ppm
Operating temperature range	T ₀	-10°C ~ +60°C to -40°C ~ +85°C
Storage temperature range	T _S	-40°C ~ +85°C to -55°C ~ +125°C
Aging (at 25°C)		±5ppm / year max.
Shunt capacitance	C ₀	7pF max.
Drive level	DL	100μW (typical)
Insulation resistance	R _i	500MΩ min. at DC100V
Load capacitance	C _L	Suggested by customer

¹ Above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

² For HC-49U/S-SMD (two pads, height: H4 = 3.0mm max.), the lowest frequency that can be manufactured is 10.000MHz.

For HC-49U/S-SMD (two pads, height: H3 = 3.2mm max. and height: H2 = 3.5mm max.), the lowest frequency that can be manufactured is 6.000MHz.

For HC-49U/S-SMD (four pads, height: H2 = 4.5mm max.), the lowest frequency that can be manufactured is 10.000MHz.

● Equivalent Series Resistance and Mode of Operation

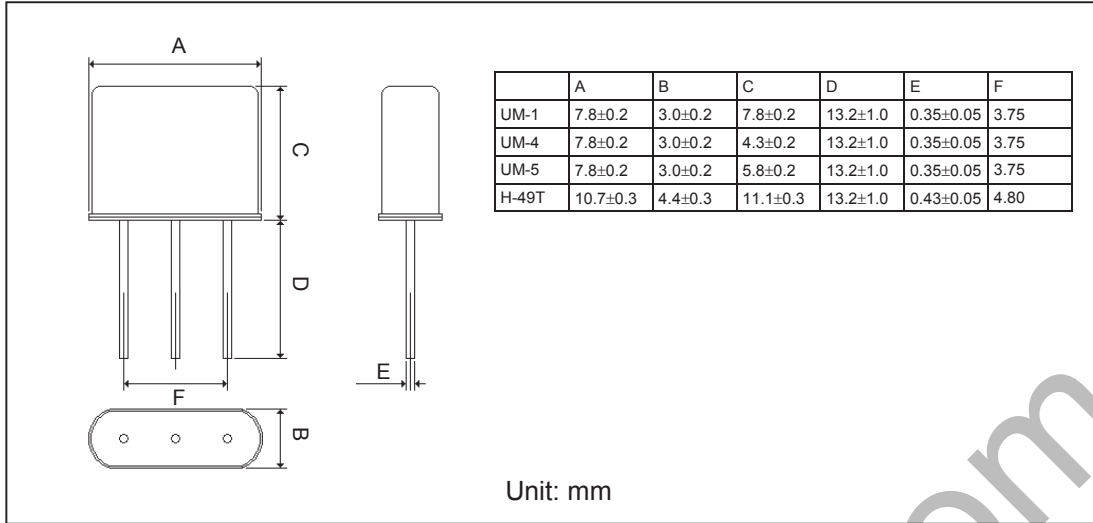
Frequency range	Equivalent series resistance	Mode of operation
3.200MHz to 3.579MHz	250Ω max.	Fundamental
3.580MHz to 3.999MHz	150Ω max.	Fundamental
4.000MHz to 4.999MHz	120Ω max.	Fundamental
5.000MHz to 5.999MHz	100Ω max.	Fundamental
6.000MHz to 6.999MHz	80Ω max.	Fundamental
7.000MHz to 9.999MHz	60Ω max.	Fundamental
10.000MHz to 13.999MHz	50Ω max.	Fundamental
14.000MHz to 19.999MHz	40Ω max.	Fundamental
≥ 20.000MHz	30Ω max. (AT cut) 40Ω max. (BT cut)	Fundamental
24.000MHz to 34.999MHz	100Ω max.	3 rd overtone
≥ 35.000MHz	80Ω max.	3 rd overtone

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.



Quartz Crystal Filter

● Dimension *



RoHS Compliant
Directive 2002/95/EC

REACH Compliant
(15 SVHCs)
Regulation (EC) No.
1907/2006

* Quartz crystal filters in surface-mounted UM-5 package are also available, contact our sales representatives for more details.

● Electrical Specifications of 2-Pole Crystal Filter

(Operating Temperature Range: -20 to +70°C)

Part No.	Nominal Frequency	Pass Band Bandwidth		Stop Band Bandwidth		Ripple	Insertion Loss	Terminal Impedance	Package
	MHz	dB	KHz	dB	KHz	dB	dB	Rt // Ct (Ω // pF)	
XF10M08A2T1A00	10.700	3	±3.75	20	±18.00	0.5	2.0	1800 // 5	HC-49T
XF10M12A2T1A00	10.700	3	±6.00	18	±20.00	0.5	2.0	3000 // 3	
XF10M15A2T1A00	10.700	3	±7.50	18	±25.00	0.5	2.0	3000 // 2	
XF10M30A2T1A00	10.700	3	±15.00	18	±50.00	0.5	2.0	5000 // 1	
XF21M08A2T1A00	21.400	3	±3.75	18	±14.00	0.5	1.5	850 // 6	UM-1 UM-4 UM-5
XF21M09A2T1A00	21.400	3	±4.50	14	±12.00	0.5	1.5	850 // 7	
XF21M12A2T1A00	21.400	3	±6.00	15	±20.00	0.5	1.5	1200 // 2.5	
XF21M15A2T1A00	21.400	3	±7.50	18	±25.00	0.5	1.5	1500 // 3	
XF21M20A2T1A00	21.400	3	±10.00	10	±25.00	0.5	1.5	1800 // 1.5	
XF21M30A2T1A00	21.400	3	±15.00	15	±45.00	0.5	1.5	3000 // 0.5	
XF21P08A2T1A00	21.600	3	±3.75	18	±14.00	0.5	1.5	850 // 5	
XF21P12A2T1A00	21.600	3	±6.00	15	±20.00	0.5	1.5	1200 // 2.5	
XF21P15A2T1A00	21.600	3	±7.50	18	±25.00	0.5	1.5	1500 // 3	
XF21T07A2T1A00	21.700	3	±3.75	18	±14.00	0.5	1.5	850 // 5	
XF21T09A2T1A00	21.700	3	±4.50	14	±12.50	0.5	1.5	850 // 7	
XF21T12A2T1A00	21.700	3	±6.00	15	±20.00	0.5	1.5	1200 // 2.5	
XF21T15A2T1A00	21.700	3	±7.50	18	±25.00	0.5	1.5	1500 // 3	
XF21T20A2T1A00	21.700	3	±10.00	10	±25.00	0.5	1.5	1800 // 1.5	
XF21T30A2T1A00	21.700	3	±15.00	15	±45.00	0.5	1.5	3000 // 0.5	

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.



● **Electrical Specifications of 4-Pole Crystal Filter**
(Operating Temperature Range: -20 to +70°C)

Part No.	Nominal Frequency	Pass Band Bandwidth		Stop Band Bandwidth		Ripple	Insertion Loss	Terminal Impedance	Package
	MHz	dB	KHz	dB	KHz	dB	dB	Rt // C // Ct (Ω // pF // pF)	
XF10M08B4T1A00	10.700	3	±3.75	40	±14.00	1.0	2.5	1800 // 4 // 12	HC-49T x 2
XF10M12B4T1A00	10.700	3	±6.00	40	±20.00	1.0	2.5	2800 // 1.5 // 7	
XF10M15B4T1A00	10.700	3	±7.50	40	±25.00	1.0	2.5	3000 // 1 // 7	
XF10M30B4T1A00	10.700	3	±15.00	40	±50.00	1.0	2.5	5500 // -1 // 0	
XF21M07B4T1A00	21.400	3	±3.75	40	±14.00	1.0	2.0	850 // 5 // 16	UM-1 x 2 UM-4 x 2 UM-5 x 2
XF21M08B4T1A00	21.400	3	±4.00	40	±16.00	1.0	2.0	1000 // 4 // 13.5	
XF21M12B4T1A00	21.400	3	±6.00	40	±20.00	1.0	2.0	1200 // 2.5 // 10.5	
XF21M15B4T1A00	21.400	3	±7.50	40	±25.00	1.0	2.0	1500 // 2 // 8	
XF21M30B4T1A00	21.400	3	±15.00	40	±50.00	1.0	2.0	3300 // 0.5 // 3	
XF21M07B4T1A00	21.400	3	±3.75	40	±14.00	1.0	2.0	850 // 5 // 16	
XF21M08B4T1A00	21.400	3	±4.00	40	±16.00	1.0	2.0	1000 // 4 // 13.5	
XF21M12B4T1A00	21.400	3	±6.00	40	±20.00	1.0	2.0	1200 // 2.5 // 10.5	
XF21M15B4T1A00	21.400	3	±7.50	40	±25.00	1.0	2.0	1500 // 2 // 8	
XF21M30B4T1A00	21.400	3	±15.00	40	±50.00	1.0	2.0	3300 // 0.5 // 3	
XF21P07B4T1A00	21.600	3	±3.75	40	±14.00	1.0	2.0	850 // 5 // 16	
XF21P12B4T1A00	21.600	3	±6.00	40	±20.00	1.0	2.0	1200 // 2.5 // 10.5	
XF21P15B4T1A00	21.600	3	±7.50	40	±25.00	1.0	2.0	1500 // 2 // 8	
XF21T07B4T1A00	21.700	3	±3.75	40	±14.00	1.0	2.0	850 // 5 // 16	
XF21T12B4T1A00	21.700	3	±6.00	40	±20.00	1.0	2.0	1200 // 2.5 // 10.5	
XF21T15B4T1A00	21.700	3	±7.50	40	±25.00	1.0	2.0	1500 // 2 // 8	
XF21T30B4T1A00	21.700	3	±15.00	40	±50.00	1.0	2.0	3300 // 0.5 // 3	

- The above information is for reference only. For other frequencies or specifications, please consult with our sales representatives for details.

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