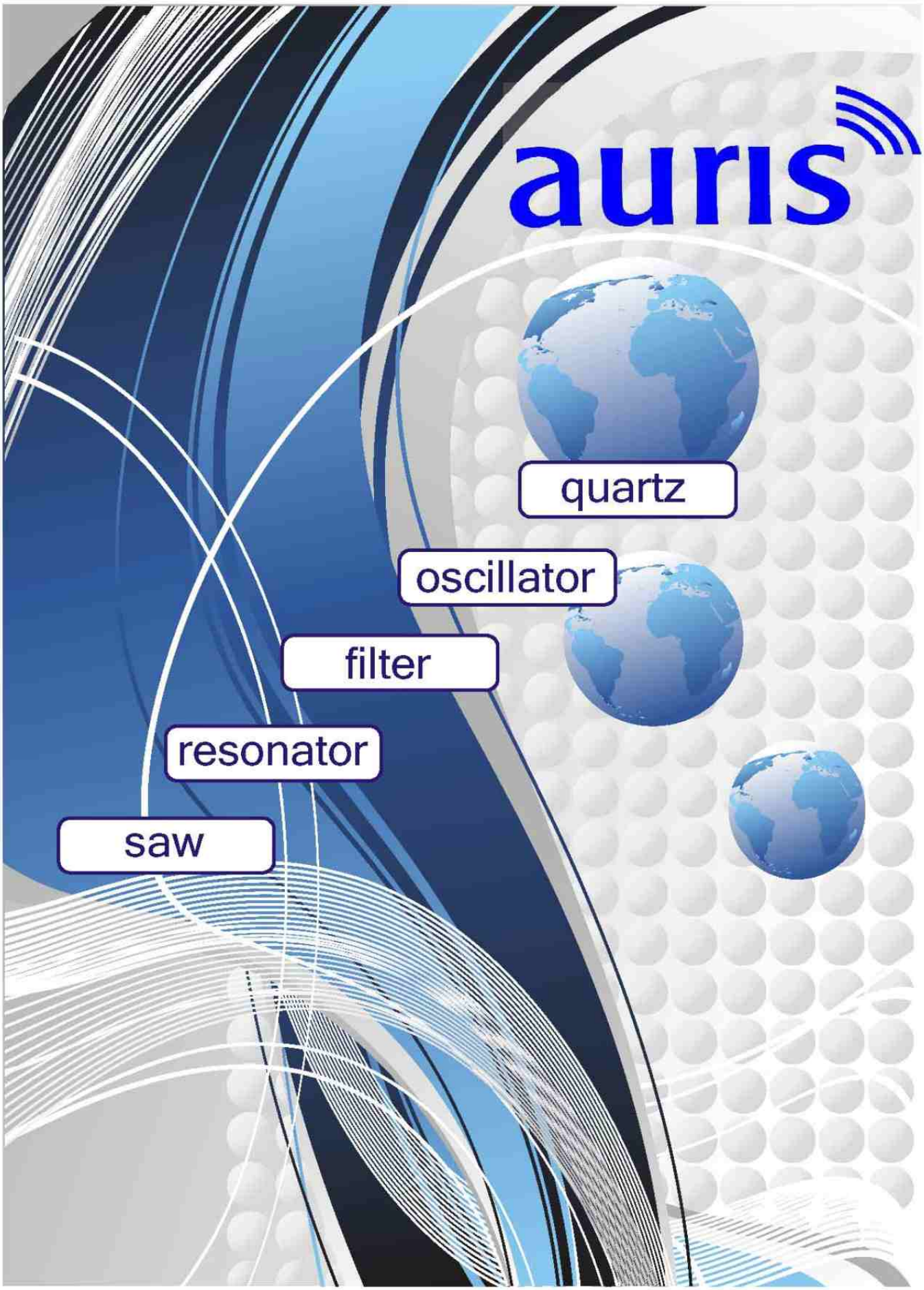


PRODUCTS & COMPONENTS 2010

The World of auris-GmbH - you are hearty welcome

auris-GmbH is a specialist in manufacturing a comprehensive product range of frequency controlled products/devices in conjunction with extensive services at long-time-tested parts, which are doing their reliable work under most extreme conditions.

Without realizing it, you'll meet our products in a variety of applications every day. And so they also seem unspectacular, but they leave their mark in a world dominated by technology a major part of our lives.

For modern electronic products is required an interaction of the different components. From basic applications to highly stable, long term tested components, even under extreme conditions in complex applications reliably meet their requirements.

This wide range and quality of our products are based on more than 10 years of experience. All articles are manufactured in ISO- or TS16949 certified production lines and meet the quality standards in all known areas of application.

The new auris catalog

We are proud to present you our new product catalog.
This catalog shows our wide range of innovative products and technical competence for all industrial applications.

Finding joint solutions

Our Customer Service Center offers you

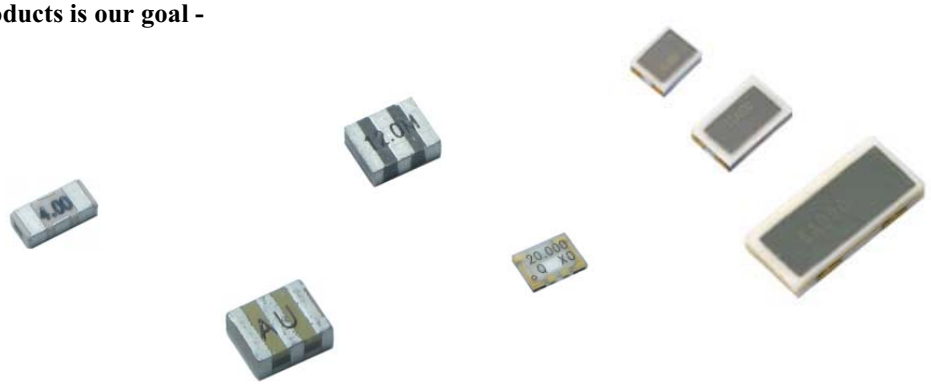
- Design support, with workbench collaboration
- Comprehensive technical advice
- Fast and cost-effective development of customized solutions
- Testing, analysis and optimization of customized circuits
- Project monitoring from initial evaluation to production

Above and beyond that, we are your ideal logistics partner:

- Guaranteed stock
- 24-hour warehouse delivery service
- Just-in time delivery in continuous production
- Logistic concept support

- Your satisfaction with auris products is our goal -

Your team from auris

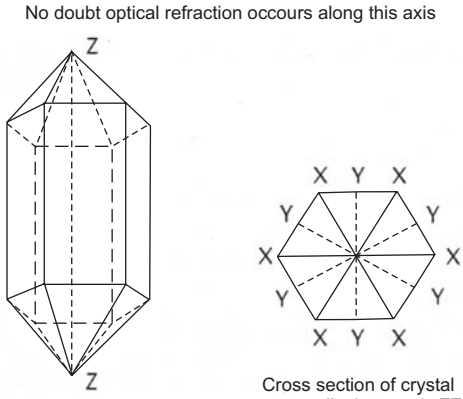


Content

Content

Quartz crystal

Quartz, composed of silicon and oxygen (silicon dioxide),exhibits piezoelectric properties.
This device generates an electrical potential when pressure is applied on the surfaces of the crystal. Inversely, when electrical potential is applied to the surfaces of a crystal, mechanical deformation or vibration is generated. These vibrations occur at a frequency determined by the crystal design and oscillator circuit.

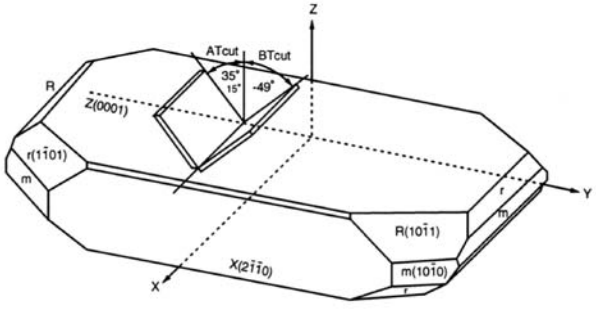


Quatz crystal structure

Cross section of crystal perpendicular to axis ZZ

Cutting angle & vibration mode

Cut angles differ depending upon the applications. (Oscillation frequencies and electrical characteristics). The crystals used in crystal units are normally in the form of plates or elements cut from synthetic crystal. The drawing below shows main cutting angles.
The drawing above shows vibration modes, frequency range and capacity rations (typical values).
Take the most popular AT-cut crystal wafer for example, it is in the plane which makes an angle of 35° 15` to the Z-axis and the wafer thickness is approximately 0,06 mm in the case of 25 MHz fundamental-wave thickness-shear vibration.



Crystal cutting

Frequency tolerance / stability over temperature

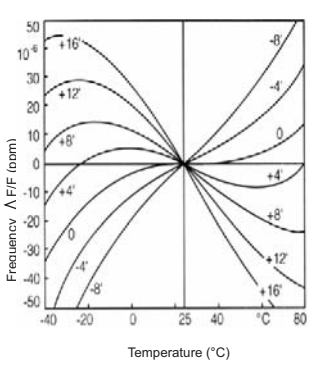
The frequency tolerance of a crystal is defined as the initial deviation of the crystal frequency as compared to the absolute at 25°C. The frequency stability over temperature is defined as the frequency deviation compared to the measured frequency at 25°C OVER the defined operating temperature range (I.E. 0°C to +70°C).
Stability tolerance is sometimes expressed as a percentage of frequency deviation rather than as parts per million (PPM). The conversion is as follows:

.01% = 100 PPM
.005% = 50 PPM
.001% = 10 PPM etc

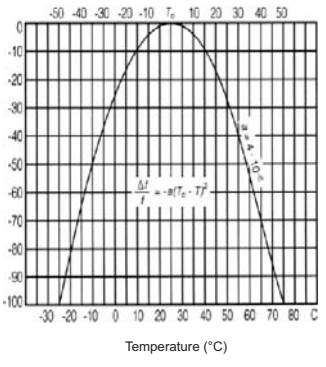
The stability tolerance of a crystal needs to be specified, along with the operating temperature range. For instance, a crystal may be specified as having a frequency stability tolerance of +/- 50 PPM over an operating temperature of -45°C to +85°C, and having a frequency tolerance of +/-50 PPM at +25°C.

Frequency temperature characteristics

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 drawing below). 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.



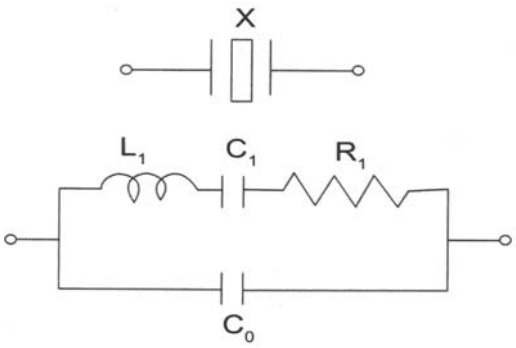
AT-cut frequency-temperature characteristics



Temperature characteristics of popular cuts

Equivalent circuit

The equivalent circuit (shown in the drawing below) depicts electrical activity of a quartz crystal unit operating at its natural resonant frequency.
The shunt capacitance (Co) represents the capacitance of the crystal electrodes plus the capacitance of the holder and leads. R1, C1 and L1 compose the “motional arm” of the crystal, and are referred to as the motional parameters.
The motional inductance (L1) represents the vibrating mass of the crystal unit. The motional capacitance (C1) represents the elasticity of the quartz, and the resistance (R1) represents bulk losses occurring within the quartz.



Equivalent circuit

Equivalent series resistance (ESR)

The equivalent series restistance is the resistive element (R1) of the quartz crystal equivalent circuit (see drawing equivalent circuit above). At frequencies below 100 MHz usually the resonance resistance at zero phase (Rr) is measured instead of R1. The measurement is performed using a Crystal Impedance (CI) meter, or by a network analog analyzer.
ESR values are generally stated as maximum values expressed in ohms. The ESR values vary with frequency, mode of operation, holder type, crystal plate size, electrode size and mounting structure.
It is worth noting that the ESR value at a given frequency for an AT-strip crystal design is generally higher than that of the standard (round blank) design. This becomes more significant at lower frequencies. When transitioning from a series resonant through-hole HC49U type crystal to a smaller surface mount type utilizing an AT-strip crystal, some consideration may be given to the difference in the ESR values produced by different cuts.

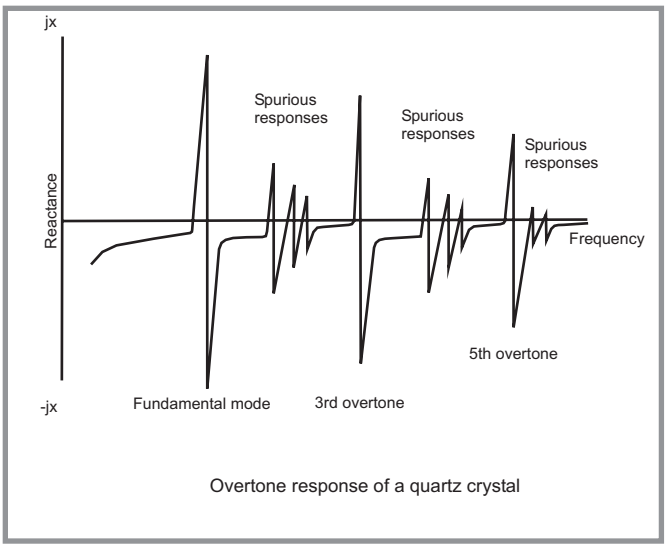
$$\text{fs= (series) frequency} = \frac{1}{2\pi\sqrt{L1C1}}$$

Load capacitance

The load capacitance CL 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 its funktions as an inductive 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 restistance -R and a capacitance CL.
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 variation is large, and when the load capacitance is increased, frequency variation lowers.
If the load capacitance is lessened in the oscillation circuit to secure a large allowance for the oscillation frequcy, 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.

Overtone crystals

Because of the physical properties and geometry of an AT cut quartz blank, a crystal can vibrate at many frequencies. The lowest frequency is called the fundamental frequency and can be supplied up to about 45 MHz.
Higher frequencies (to over 200 MHz) are achived by operating the crystal to odd overtones, 3rd, 5th, 7th and 9th tuning the circuit so that the crystal oscillates at its designed overtone frequency (see drawing below).
Overtone crystals are specially processed for plane parallelism and surface finish in order to enhance their performance at the required overtone frequency. The overtone frequency is higher than the equivalent harmonic multiple of the fundamental by approximately 25 MHz per overtone.



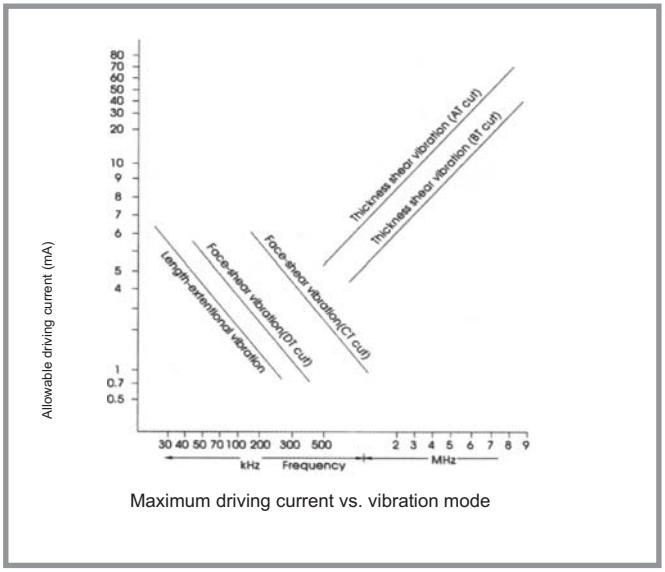
Overtone response of a quartz crystal

Spurious response

It is also possible for a crystal to vibrate at a frequency that is not related to its fundamental or overtone frequencies. Such undesired frequencies are referred to as spurious responses (see drawing page before).
The manufacturing processes are designed to minimize (not eliminate) the spurious responses and maximize the crystal activity at the desired frequency.
The circuit designer should further guard against spurious responses by ensuring that the oscillator feedback circuit achieves its highest gain at the desired operating frequency.

Drive level

The amount of power dissipated by the oscillating crystal unit. Usually expresed in terms of milliwatts (mW), and is usually specified in terms of current through the resonator or power dissipated by the resonator.
The latter is preferable. The drive level of a crystal is a function of the reactance of the input and output capacitance of the inverter or microprocessor and all other external components including the crystal.
To calculate drive level, “ohm`s law” for power is used.
Drive level should be held to a minimum to avoid problems with stability, aging, nonlinear coupled modes and other nonlinear effects.



Maximum driving current vs. vibration mode

Pullability

The Pullability if a crystal refers to a crystal operating with load capacitance and is a measure of the frequency change as a function of load capacitance.
Pullability is important to the circuit designer who wish to achieve several operating frequencies with a single crystal by means of switching various values of load capacitance.

Aging

A change in the frequency and/or the resistance of a quartz crystal unit with the passage of time. Attributable to the relaxation of strain in the resonator and to mass transfer mechanisms within the resonator package due to contamination. Other factors include drive level, ambient temperature, wire fatigue and frictional wear.

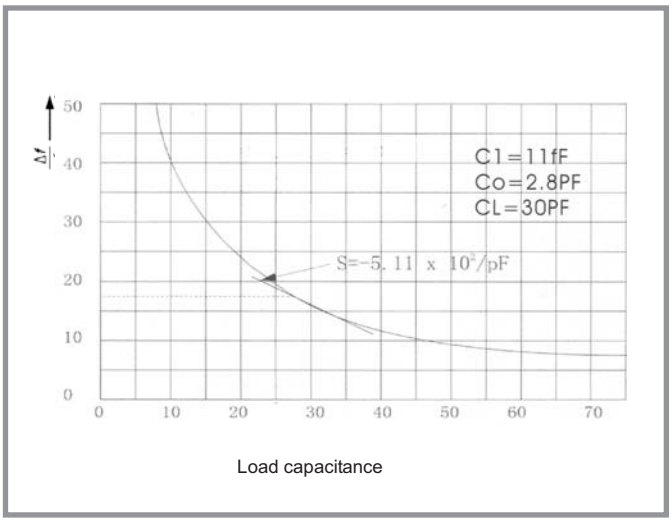
These factors are minimized by design considerations, including the mechanical design of the mounting structure, and by the design and control of certain manufacturing processes. Most of the aging effects of a crystal occur within the first 60 days of operation leading to slower aging characteristics through the first year.
The integrity of the hermetic characteristics of the crystal package is a major factor in determining how well a crystal will age.

Negative resistance

The negative resistance also refer to as degree of oscillation allowance that can be used for judging the quality of the circuit side oscillation motility.
The use of a circuit with an insufficient negative resistance may lead to such an unexpected trouble as the quartz crystal unit falling to initiate oscillation even when the power has been switched on.

Characteristics of frequency vs. load capacitance

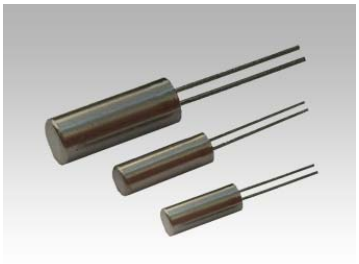
For many applications there are requirements to pull the crystal frequency by using a load reactive element. This may be necessary in order to trim out the manufacturing tolerance or in phase locked loop and frequency modulation applications.
In most applications the load reactive element is capacitive and therefore only this case is now considered.



RoHS 2002/95/EC

Features:

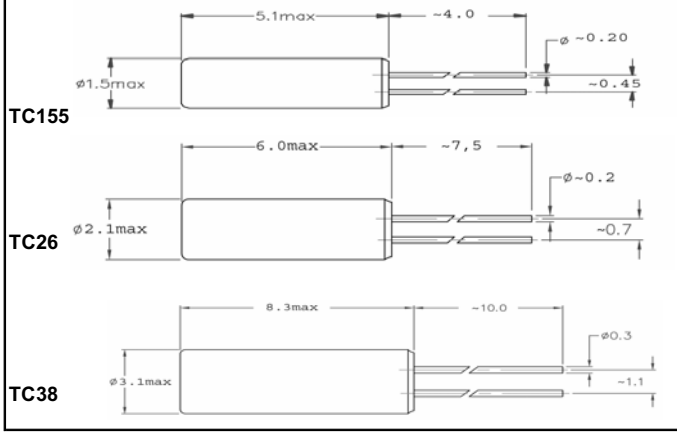
- Small size
- Tuning fork reliability
- Thru-hole package

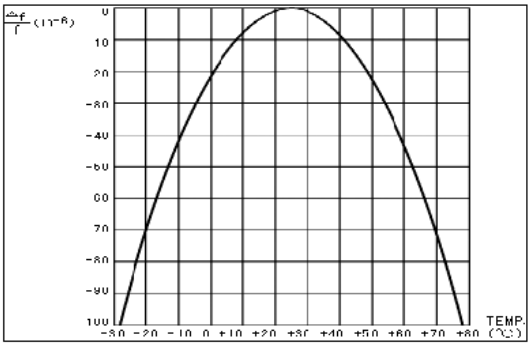


TC38
TC26
TC155

Specifications						
		Symbol	TC155	TC26	TC38	Remarks
Frequency range		f	32.768kHz			Standard
			-	30kHz ~ 200kHz	30kHz ~ 100kHz	Available
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm			Others are offered
Load capacitance		CL	12,5pF	6pF ~ 12.5pF		Please specify
Temp. coefficient		A	-0,04 x 10-6 / °C²			Max
Temperature range	Storage temp.	TSTG	-30°C ~ +85°C			Others are offered
	Operating temp.	TOPR	-10°C ~ +60°C			Standard, others are offered
Drive level	Maximum drive level	MDL	1µW			
	Recommended drive level	RDL	-	-		
Series resistance		R1	65kOhm	40kOhm	35kOhm	Max (25°C ±3°C)
Shunt capacitance		C0	5pF			Max
Insulation resistance		IR	500M Ohm			Min
Aging		ΔfA	±5ppm/Year			Max

Drawing





Dimensions in mm

Order key

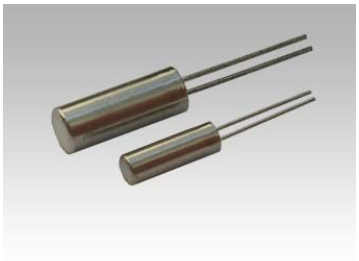
Q	- 32.768000K	- TC38	- 30	- B	- 12.5
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**
Q=Quartz	K=kHz	TC38 TC26 TC155	±ppm (25°C)	A= 0°C ~ +70°C * B= -10°C ~ +60°C * C= -10°C ~ +70°C * D= -20°C ~ +70°C E= -40°C ~ +85°C	pF

* TC155

RoHS 2002/95/EC

Features:

- Wide frequency range
- Low cost to performance
- Very low profile



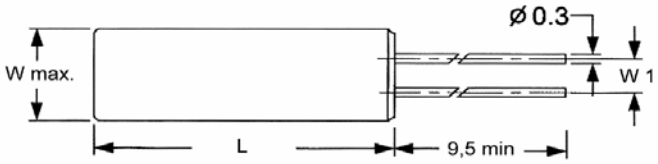
HF26
HF38
HF39
HF310

Specifications					
		Symbol	HF26	HF38/HF39/HF310	*Remarks*
Frequency range		f	4.000MHz ~ 30.000MHz	3.000MHz ~ 30.000MHz	Fundamental mode
			30.001MHz ~ 50.000MHz	30.001MHz ~ 50.000MHz	3rd overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm		Please specify
Load capacitance		CL	10pF ~ 50pF or series		Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm		Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C		
	Operating temperature	T_{OPR}	-20°C ~ +70°C (Std.)		Others are offered
Drive level	Maximum drive level	M_{DL}	-		
	Recommended drive level	R_{DL}	10μW ~ 100μW		
Series resistance		R_1	As per table		25°C ±3°C
Shunt capacitance		C_0	5pF		Max
Insulation resistance		I_R	500M Ohm		Min
Aging		Δf_A	±5ppm/Year		Max

Resistance of series resonance (ESR)					
HF26			HF38, HF39, HF310		
Frequency (MHz)	*Mode*	*Ohm max*	*Frequency (MHz)*	*Mode*	*Ohm max*
4.0 <= f < 6.0	Fundamental	300	3.0 <= f < 4.0	Fundamental	180
6.0 <= f < 10.0	Fundamental	200	4.0 <= f < 6.0	Fundamental	150
10.0 <= f < 31.0	Fundamental	100	6.0 <= f < 10.0	Fundamental	100
31.0 <= f < 50.0	3rd OT	80	10.0 <= f < 31.0	Fundamental	60
			31.0 <= f < 50.0	3rd OT	80

Drawing

HF26 / HF38 / HF39 / HF310



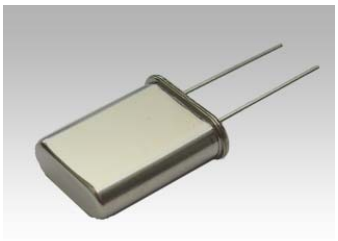
Holder	W	L	W1
HF26	2,1	6,2	0,7
HF38	3,1	8,3	0,8
HF39	3,1	9,3	1,1
HF310	3,1	10,3	1,1

Dimensions in mm

Order key

Q	**- 28.000000M**	**- HF26**	**- F**	**- 30**	**- 50**	**- D**	**- 30**	**- X**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HF26 HF38 HF39 HF310	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	MJ=Metal jacket X=Special options

RoHS 2002/95/EC



HC49U

Features:

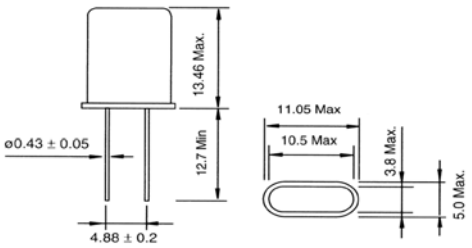
- Industry standard packages
- Wide frequency range
- Low ESR

Specifications				
		Symbol	*HC49U*	*Remarks*
Frequency range		f	1.000MHz ~ 40.000MHz	Fundamental mode
			20.000MHz ~ 180.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±3ppm ~ ±50ppm	Please specify
Load capacitance		C_L	5pF ~ 50pF or series	Please specify
Temperature tolerance		Δf/f	±3ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-55°C ~ +125°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level			0.1mW ~ 1,0mW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year max	Others are offered

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
1.0<f<=1.5	Fundamental	1000		15.0<f<=25.0	Fundamental	30
1.5<f<=1.8	Fundamental	750		20.0<f<=25.0	(3.OT)	70
1.8<f<=2.3	Fundamental	500		25.0<f<=35.0	(3.OT)	50
2.3<f<=3.0	Fundamental	400		35.0<f<=75.0	(3.OT)	40
3.0<f<=3.5	Fundamental	150		75.0<f<=100.0	(3.OT)	35
3.5<f<=4.5	Fundamental	90		100.0<f<=150.0	(5.OT)	100
4.5<f<=7.0	Fundamental	70		125.0<f<=180.0	(7.OT)	150
7.0<f<=15.0	Fundamental	40				

Drawing

HC49U



Dimensions in mm

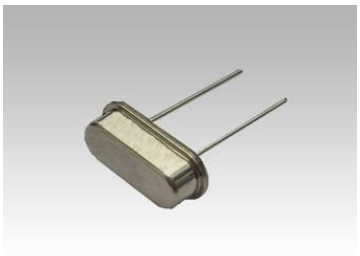
Order key

Q	- 10.000000M	- HC49U	- F	- 30	- 50	- D	- 30	- I
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC49U	F=fund. 3=3.OT 5=5.OT 7=7.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C G= -40°C ~ +125°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	3P=3Pin version MJ=Metal jacket TR=Taped and reeled I=Isolation washers X=Special options

RoHS 2002/95/EC

Features:

- Wide frequency range
- Low cost to performance
- Excellent for clock frequency generation
- Very low profile available



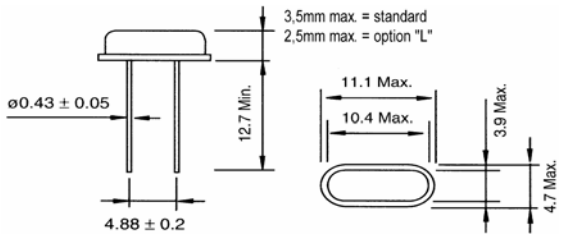
HC49US
Option: 3 Pin

Specifications				
		Symbol	*HC49US*	*Remarks*
Frequency range		f	3.2MHz ~ 40.000MHz	Fundamental mode
			30.000MHz ~ 90.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±3ppm ~ ±50ppm	Please specify
Load capacitance		C_L	5pF ~ 50pF or series	Please specify
Temperature tolerance		Δf/f	±3ppm ~ ±50ppm	Please specify
Temperature range	Storage temp.	T_{STG}	-40°C ~ +105°C	
	Operating temp.	T_{OPR}	0°C ~ +70°C / -40°C ~ +105°C	Others are offered
Drive level	Maximum drive level	M_{DL}	1000µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year max	Others are offered

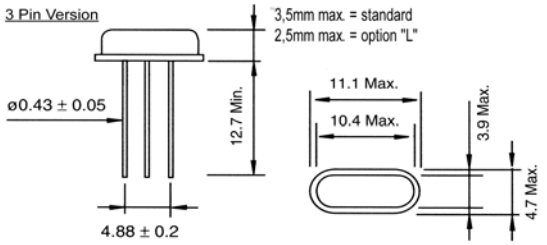
Resistance of series resonance (ESR)						
Frequency (MHz)	Mode	Ohm max		Frequency (MHz)	Mode	Ohm max
3.570 < = f < 3.999	Fundamental	140		8.000 < = f < 9.999	Fundamental	70
4.000 < = f < 4.999	Fundamental	110		10.000 < = f < 14.999	Fundamental	50
5.000 < = f < 5.999	Fundamental	90		15.000 < = f < 35.000	Fundamental	35
6.000 < = f < 7.999	Fundamental	80		30.000 < = f < 90.000	3rd OT	70

Drawing

HC49US



HC49US 3Pin

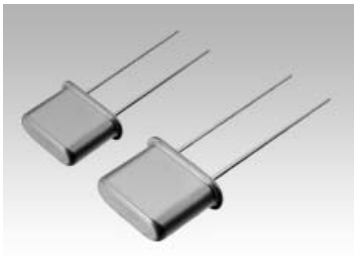


Dimensions in mm

Order key

Q	- 10.000000M	- HC49US	- F	- 30	- 50	- D	- 30	- I
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC49US	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	3P=3Pin version L=Low height TR=Taped reeled I=Isolation washers X=Special options

RoHS 2002/95/EC



UM1
UM5

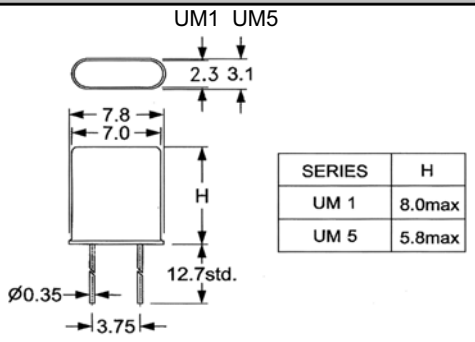
Features:

- Tight tolerance and stability
- Wide frequency range
- Low ESR

Specifications					
		Symbol	*UM1*	*UM5*	*Remarks*
Frequency range		f	6.000MHz ~ 50.000MHz	8.000MHz ~ 50.000MHz	Fundamental
			30.000MHZ ~ 120.000MHz	40.000MHz ~ 120.000MHz	3rd Overtone
			75.000MHz ~ 200.000MHz		5th Overtone
Frequency tolerance,Ta=25°C		Δf/f	±3ppm ~ ±50ppm		Please specify
Load capacitance		C_L	5pF ~ 50pF		Please specify
Temperature tolerance		Δf/f	±3ppm ~ ±50ppm		Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +105°C		
	Operating temperature	T_{OPR}	-20°C ~ +70°C		Others are offered
Drive level	Maximum drive level	M_{DL}	1000μW		
	Recommended drive level	R_{DL}	10μW ~ 100μW		
Series resistance		R_1	As per table		25°C ±3°C
Shunt capacitance		C_0	7pF		Max
Insulation resistance		I_R	500M Ohm		Min
Aging		$Δf_A$	±5ppm/Year max		Others are offered

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
6 <= f < 10	Fundamental	40		30 <= f < 120	3rd OT	40
10 <= f < 50	Fundamental	25		75 <= f < 200	5th OT	60

Drawing



SERIES	H
UM 1	8.0max
UM 5	5.8max

Dimensions in mm

Order key

Q	**- 20.000000M**	**- UM1**	**- F**	**- 30**	**- 50**	**- C**	**- 30**	**- 3P**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	UM1 UM5	F=fund. 3=3.OT 5=5.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C G= -40°C ~ +125°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	3P=3Pin version MJ=Metal jacket TR=Taped and reeled I=Isolation washers X=Special options

RoHS 2002/95/EC

TC206B

Features:

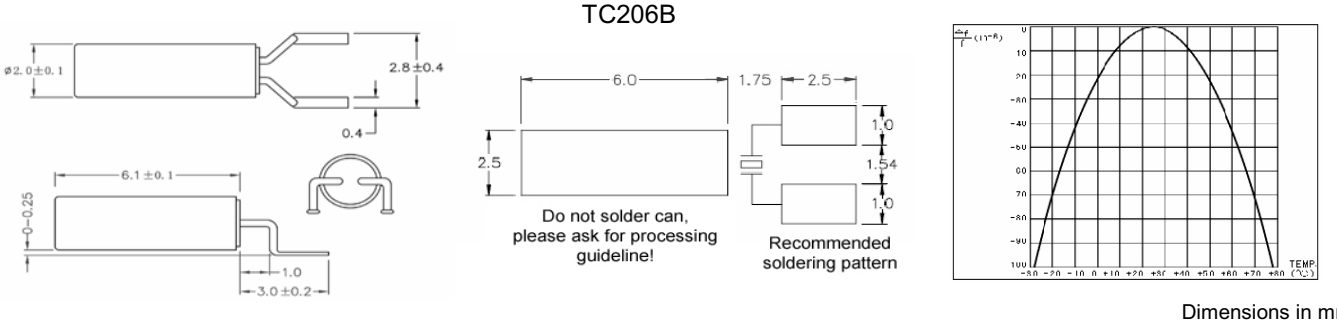
- Surface mount pick & place
- High performance/cost ratio

Specifications					
		Symbol	*TC-206B*		*Remarks*
Frequency range		f	32.768kHz	32kHz ~ 200 kHz	
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±100ppm		Others are offered
Load capacitance		C_L	12.5pF (Std.)	6pF ~ 12.5pF (Std.)	Please specify
Temp. coefficient		A	-0.035 ± 0,01ppm/°C²		Max
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C		Max (25°C±5°C)
	Operating temperature	T_{OPR}	-10°C - +60°C ~ -40°C - +85°C		Others are offered
Drive level	Maximum drive level	M_{DL}	1µW		Max
	Recommended drive level	R_{DL}	-		
Series resistance		R_1	40k Ohm max		As per table (25°C ±3°C)
Shunt capacitance		C_0	1.45pF	1.3pF	Typ
Insulation resistance		I_R	500M Ohm		Min
Aging		Δf_A	±5ppm/Year		Max

Resistance of series resonance (ESR)						
Frequency	Mode	Ohm max		Frequency	Mode	Ohm max
32kHz <= f < 40kHz	Fundamental	40k		60kHz <= f < 70kHz	Fundamental	25k
40kHz <= f < 60kHz	Fundamental	30k		70kHz <= f < 200kHz	Fundamental	22k

Drawing

TC206B



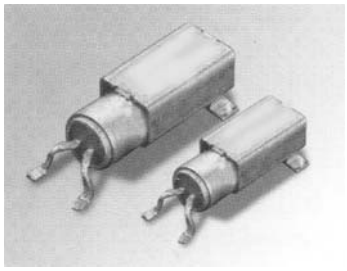
Dimensions in mm

Order key						
Q	**- 32.768000k**	**- TC206B**	**- 50**	**- B**	**- 12.5**	**- X**
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	TC206B	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	X=Special options

RoHS 2002/95/EC

Features:

- Cylindrical enclosures with mounting clips
- Surface mount pick & place
- High performance/cost ratio



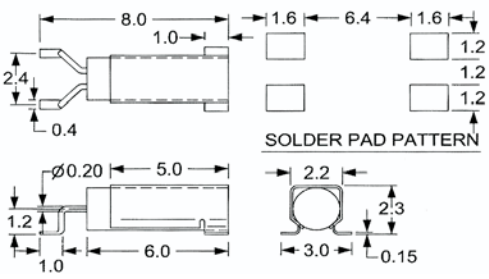
TC308B MJ
TC206B MJ

Specifications					
		Symbol	*TC308B MJ*	*TC206B MJ*	*Remarks*
Frequency range		f	32.768kHz		Standard / Others are offered
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm		Others are offered
Load capacitance		C_L	6pF ~ 12.5pF (Std.)		Please specify
Temp. coefficient		A	-0.04 x 10^{-6} / °C²		Max
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C		
	Operating temperature	T_{OPR}	-10°C ~ +60°C		Others are offered
Drive level	Maximum drive level	M_{DL}	1µW		Max
	Recommended drive level	R_{DL}	-		
Series resistance		R_1	35kOhm max	50kOhm max	As per table (25°C ±3°C)
Shunt capacitance		C_0	0,9pF	0,8pF	
Insulation resistance		IR	100M Ohm		Min
Aging		Δf_A	±5ppm/Year		Max

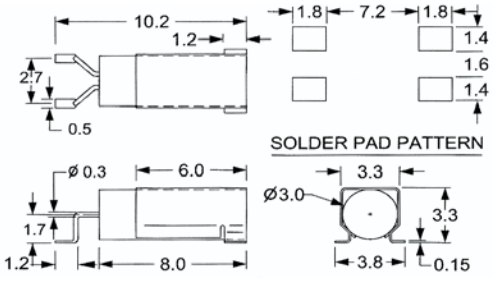
Resistance of series resonance (ESR)		
Frequency	*Mode*	*Ohm max*
32.768kHz	Fundamental	45k max

Drawing

TC206BMJ



TC308BMJ



Dimensions in mm

Order key

Q	**- 32.768000k**	**- TC206B**	**- 50**	**- B**	**- 12.5**	**- MJ**
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	TC206BMJ TC308BMJ	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	MJ=Metal jacket X=Special options

MP03

RoHS 2002/95/EC

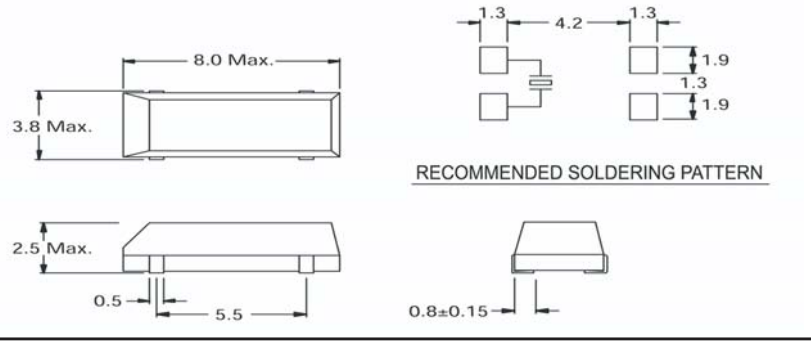
Features:

- Surface mount
- High performance/cost ratio
- Excellent vibration & shock resistance

Specifications				
		Symbol	*MP03*	*Remarks*
Frequency range		f	32.768kHz	Standard
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm	Others are offered
Load capacitance		C_L	6pF, 12.5pF (Std.)	Please specify
Temp. coefficient		A	-0.04 x 10^{-6}/°C²	Max
Temperature range	Storage temp.	T_{STG}	-55°C ~ +125°C	
	Operating temp.	T_{OPR}	-40°C ~ +85°C	Others are offered
Drive level	Maximum drive level	M_{DL}	1µW	Standard
	Recommended drive level	R_{DL}	-	
Series resistance		R_1	50k Ohm	Max (25°C ±3°C)
Shunt capacitance		C_0	1.3pF ~ 2pF	
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year typ	Max
Shock resistance		SR	±10ppm	Max

Drawing

MP03



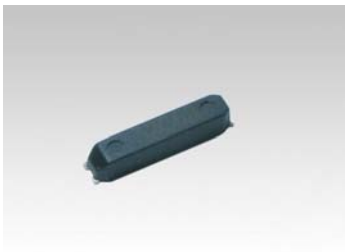
Dimensions in mm

Order key

Q	- 32.768000k	- MP03	- 50	- E	- 12.5	- TR
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	MP03	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

MP6914

RoHS 2002/95/EC



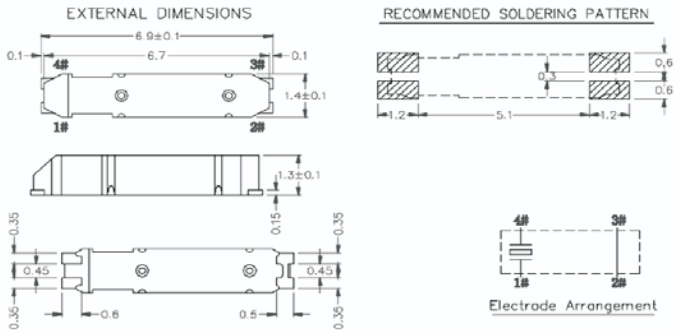
Features:

- Surface mount
- High performance/cost ratio
- Excellent vibration & shock resistance

Specifications				
		Symbol	*MP6914*	*Remarks*
Frequency range		f	32.768kHz	Standard
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm (std.)	Others are offered
Load capacitance		C_L	12.5pF (Std.)	Please specify
Temp.coefficient		A	-0.04 x 10-6/°C²	Max
Temperature range	Storage temp.	T_{STG}	-55°C ~ +125°C	
	Operating temp.	T_{OPR}	-10°C ~ +60°C	Others are offered
Drive level	Maximum drive level	M_{DL}	1µW	
	Recommended drive level	R_{DL}	-	
Series resistance		R_1	70k Ohm	Max (25°C ±3°C)
Shunt capacitance		C_0	1.3pF ~ 2pF	
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year typ	

Drawing

MP6914

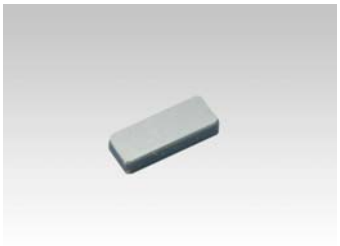


Dimensions in mm

Order key						
Q	**- 32.768000k**	**- MP6914**	**- 50**	**- B**	**- 12.5**	**- TR**
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	MP6914	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC

LC4918



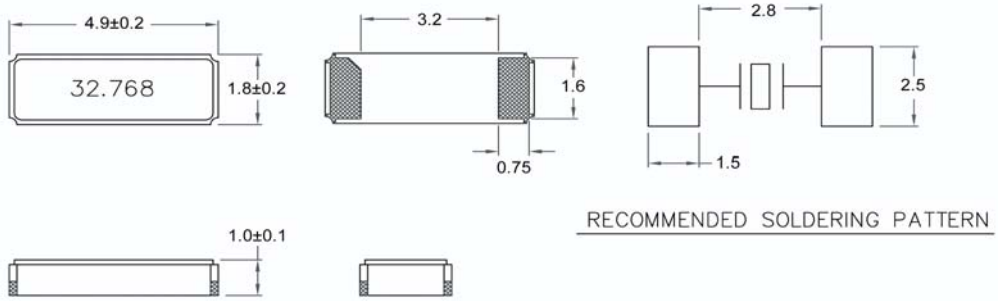
Features:

- Surface mount
- High performance/cost ratio
- Excellent vibration & shock resistance

Specifications				
		Symbol	*LC4918*	*Remarks*
Frequency range		f	32.768kHz	Standard
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm (Std.)	Others are offered
Load capacitance		C_L	12.5pF	Please specify
Temp.coefficient		A	-0.034 ±0,006ppm/°C²	
Temperature range	Storage temp.	T_{STG}	-55°C ~ +125°C	
	Operating temp.	T_{OPR}	-40°C ~ +85°C	Others are offered
Drive level		DL	1µW	Standard
Series resistance		R_1	70k Ohm	Max (25°C ±3°C)
Shunt capacitance		C_0	1.2pF	Typ.
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Max

Drawing

LC4918



Dimensions in mm

Order key

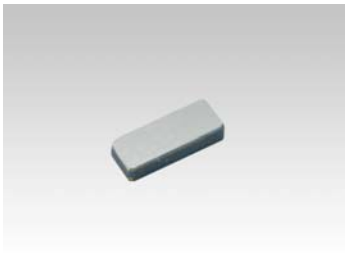
Q	- 32.768000k	- LC4918	- 50	- B	- 12.5	- TR
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	LC4918	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

LC4115

RoHS 2002/95/EC

Features:

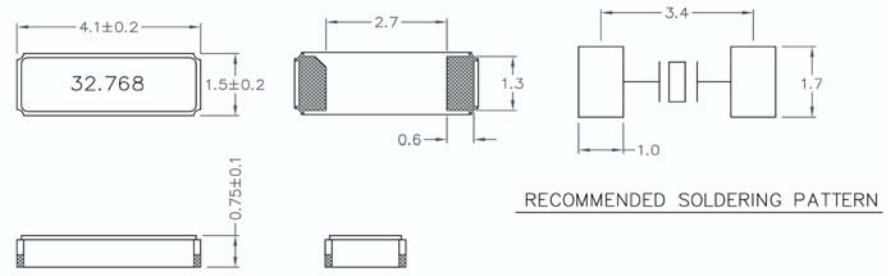
- Surface mount
- High performance/cost ratio
- Excellent vibration & shock resistance



Specifications				
		Symbol	*LC4115*	*Remarks*
Frequency range		f	32.768kHz	Standard
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm (Std.)	Others are offered
Load capacitance		C_L	12.5pF	Please specify
Temp.coefficient		A	-0.034 ±0,006ppm/°C²	
Temperature range	Storage temp.	T_{STG}	-55°C ~ +125°C	
	Operating temp.	T_{OPR}	-40°C ~ +85°C	Others are offered
Drive level		DL	1µW	Standard
Series resistance		R_1	70k Ohm	Max (25°C ±3°C)
Shunt capacitance		C_0	1.2pF	Typ.
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Max

Drawing

LC4115



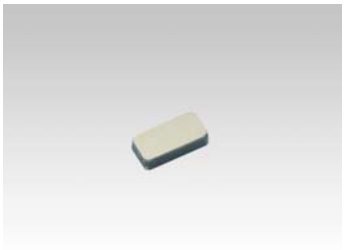
Dimensions in mm

Order key

Q	- 32.768000k	- LC4115	- 50	- B	- 12.5	- TR
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	LC4115	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC

LC3215



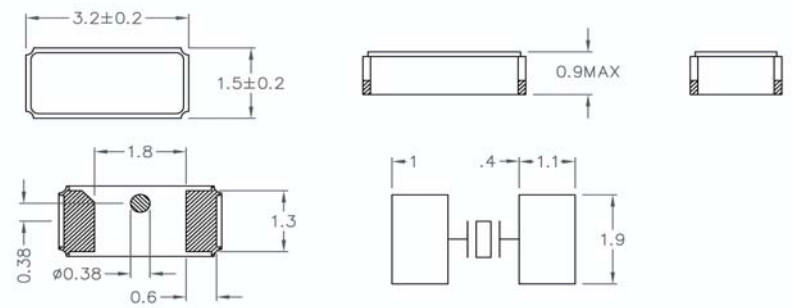
Features:

- Surface mount
- High performance/cost ratio
- Excellent vibration & shock resistance

Specifications				
		Symbol	LC3215	Remarks
Frequency range		f	32.768kHz	Standard
Frequency tolerance,Ta=25°C		Δf/f	±20 ppm	Others are offered
Load capacitance		C_L	12.5 pF	
Temp.coefficient		A	-0.034 ±0,006ppm/°C²	Max
Temperature range	Storage temp.	T_{STG}	-55°C to +125°C	
	Operating temp.	T_{OPR}	-40°C to +85°C	Others are offered
Drive level		DL	1µW	
Series resistance		R_1	70K Ohm	25°C ±3°C
Insulation resistance		I_R	500M Ω	Min
Aging		Δf_A	±5ppm/year	Max

Drawing

LC3215



Dimensions in mm

Order key

Q	- 32.768000k	- LC3215	- 20	- B	- 12.5	- TR
Part	**Frequency**	**Package**	**Frequency tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	k=kHz	LC3215	±ppm (25°C)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

Features:

RoHS 2002/95/EC

-Low profile available
- Wide frequency range
- Tight tolerance and stability over temperature
- Tape & reel packaging
- 3 pin-version available

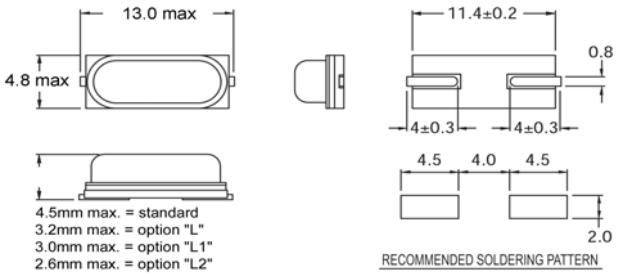
HC49USSMD
Option: 3 Pin

Specifications				
		Symbol	*HC49USSMD*	*Remarks*
Frequency range		f	3.500MHz ~ 40.000MHz	Fund. mode
			30.000MHz ~ 90.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±3ppm ~ ±50ppm	Please specify
Load capacitance		C_L	5pF ~ 50pF	Please specify
Temperature tolerance		Δf/f	±3ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +105°C	
	Operating temperature	T_{OPR}	0°C ~ +70°C / -40°C ~ +105°C	Others are offered
Drive level	Maximum drive level	M_{DL}	1000µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Please specify

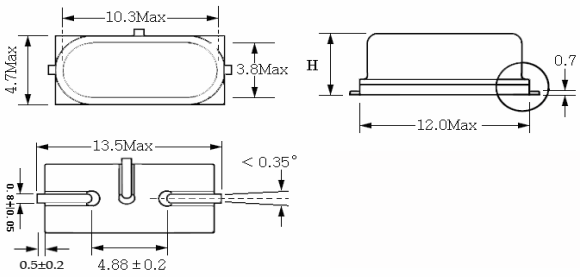
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
3.5 <= f < 4.5	Fundamental	130		12.0 <= f < 15.0	Fundamental	40
4.5 <= f < 6.0	Fundamental	90		15.0 <= f < 18.0	Fundamental	30
6.0 <= f < 8.0	Fundamental	70		18.0 <= f < 33.0	Fundamental	25
8.0 <= f < 10.0	Fundamental	60		30.0 <= f < 40.0	3rd OT	80
10.0 <= f < 12.0	Fundamental	50		40.0 <= f < 90.0	3rd OT	60

Drawing

HC49USSMD



Option 3P



Dimensions in mm

Order key

Q	- 20.000000M	- HC49USSMD	- F	- 30	- 50	- D	- 30	- TR
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC49USSMD	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C G= -40°C ~ +125°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	3P=3 Pin version L =3.2mm height L1=3.0mm height L2=2.6mm height TR=Tape and reel X=Special options

RoHS 2002/95/EC

Features:

- High reliability
- Available in extended temperature range
- Excellent for automotive applications

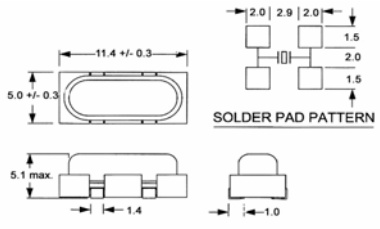
HC49M
HC49J
HC49H

Specifications				
		Symbol	*HC49M / HC49J / HC 49 H*	*Remarks*
Frequency range		f	3.500MHz ~ 40.000MHz	Fundamental mode
			30.000MHz ~ 80.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance		CL	10pF ~ 50pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±100ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +125°C	
	Operating temperature	T_{OPR}	-40°C ~ +125°C	Others are offered
Drive level	Maximum drive level	M_{DL}	1000µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Max

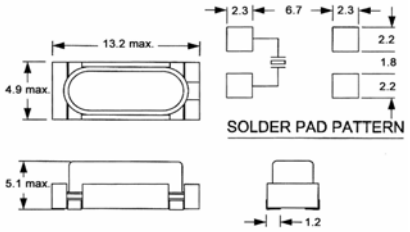
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
3.5 <= f < 4.5	Fundamental	120		15 <= f < 18	Fundamental	30
4.5 <= f < 6.0	Fundamental	90		18 <= f < 33	Fundamental	25
6.0 <= f < 8.0	Fundamental	70		30 <= f < 35	3rdO.T	100
8.0 <= f < 10	Fundamental	60		35 <= f < 40	3rdO.T	80
10 <= f < 12	Fundamental	50		40 <= f < 80	3rdO.T	70
12 <= f < 15	Fundamental	40				

Drawing

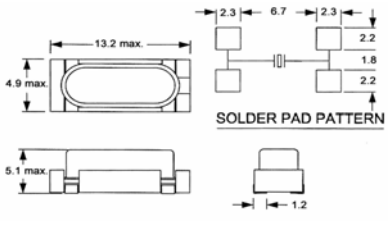
HC49M



HC49J



HC49H



Dimensions in mm

Order key

Q	**- 20.000000M**	**- HC49M**	**- F**	**- 30**	**- 50**	**- D**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC49M HC49J HC49H	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. Range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C G= -40°C ~ +125°C * H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

HE1045/2
HE1045/4

Features:

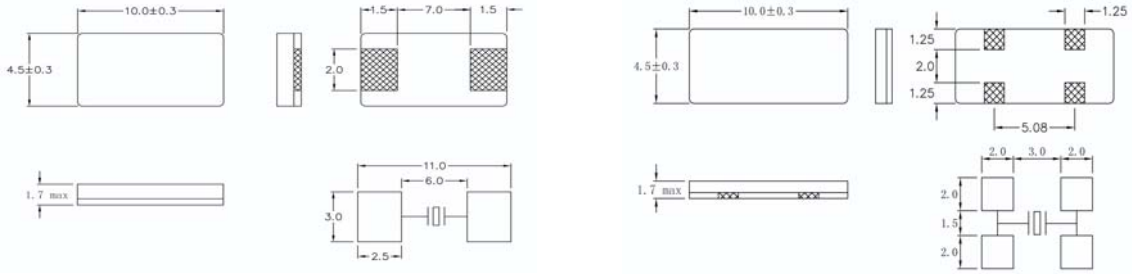
- SMD
- High reliability seam welded seal
- Frequency up to 7 MHz
- Ultra thin profile

Specifications				
		Symbol	*HE1045*	*Remarks*
Frequency range		f	3.2768MHz ~ 7.000MHz	Fundamental mode
Frequency tolerance (std.),Ta=25°C		Δf/f	±30ppm	Others are offered
Load capacitance		C_L	10pF - 30pF	Please specify
Temperature tolerance (std.)		Δf/f	± 30ppm	Others are offered
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	20µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		$Δf_A$	±5ppm/Year	Max

Frequence of series resonance (ESR)						
Frequency (MHz)	Mode	Ohm max		Frequency (MHz)	Mode	Ohm
3.2768<= f <7.0	Fundamental	80-150				

Drawing

HE1045/2 HE1045/4



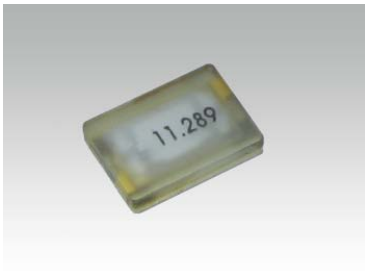
Dimensions in mm

Order key								
Q	**- 4.000000M**	**- HE1045/2**	**- F**	**- 30**	**- 30**	**- A**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HE1045/2 HE1045/4	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +70°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC

Features:

- SMD
- Epoxy resin seal
- Ultra thin profile



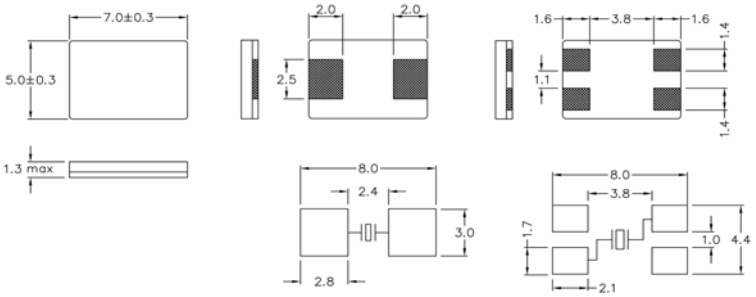
HE7050/2
HE7050/4

Specifications				
		Symbol	*HE7050*	*Remarks*
Frequency range		f	6.000MHz ~ 12.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance		C_L	10pF ~ 30pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	20µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year max	Others are offered

Frequence of series resonance (ESR)						
Frequency (MHz)	Mode	Ohm max		Frequency (MHz)	Mode	Ohm max
6<= f <12.0	Fundamental	80				

Drawing

HE7050/2 HE7050/4



Dimensions in mm

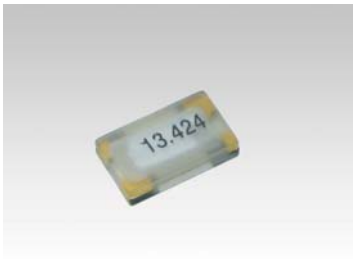
Order key								
Q	**- 40.000000M**	**- HE7050/2**	**- F**	**- 30**	**- 30**	**- A**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HE7050/2 HE7050/4 /2 = 2 pads /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

HE6035/2
HE6035/4

RoHS 2002/95/EC

Features:

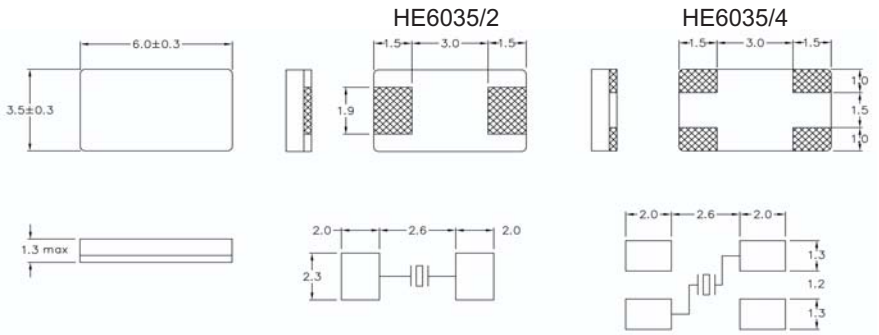
- Application: Bluetooth, wireless LAN
- Ultra-thin and small leadless type
- Automatic mounting is enabled by emboss taping



Specifications				
		Symbol	*HE6035*	*Remarks*
Frequency range		f	11.000MHz ~ 40.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm	Please specify
Load capacitance		CL	10pF ~ 30pF	Please specify
Temperature tolerance		Δf/f	±20ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	20µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Max

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
11 <= f < 16	Fundamental	80		16 <= f < 40	Fundamental	50

Drawing



Dimensions in mm

Order key

Q	- 30.000000M	- HE6035/2	- F	- 50	- 50	- B	- 30	- TR
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HE6035/2 HE6035/4 /2 = 2 pads /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC

HE5032/2
HE5032/4

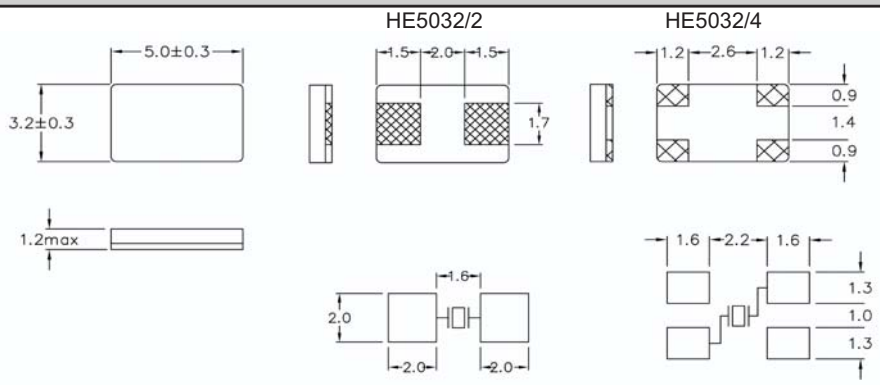
Features:

- Application: Bluetooth, wireless LAN
- Ultra-thin and small leadless type
- Automatic mounting is enabled by emboss taping

Specifications				
		Symbol	*HE5032*	*Remarks*
Frequency range		f	12.000MHz – 40.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±20ppm ~ ±50ppm	Please specify
Load capacitance		C_L	10pF ~ 30pF	Please specify
Temperature tolerance		Δf/f	±20ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	20µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		$Δf_A$	±5ppm/Year	Max

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
12 <= f < 16	Fundamental	80		16 <= f < 40	Fundamental	50

Drawing

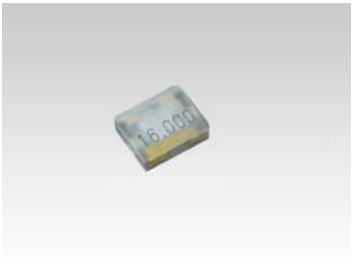


Dimensions in mm

Order key								
Q	**- 40.000000M**	**- HE5032/2**	**- F**	**- 30**	**- 30**	**- A**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HE5032/2 HE5032/4 /2 = 2 pads /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

HE 3225/4

RoHS 2002/95/EC



Features:

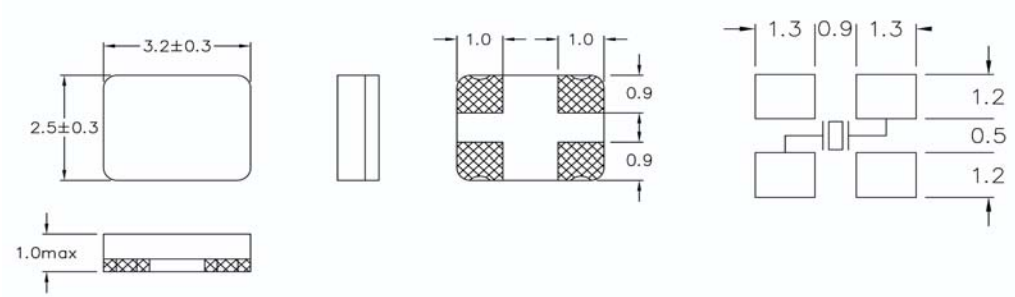
-Epoxy Resin Hermetic Seal
-Ideal for compact size applications
-Wide frequency range
-Ultra miniature size

Specifications				
		Symbol	*HE3225/4*	*Remarks*
Frequency range		f	16.000MHz – 50.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±30ppm ~ ±50ppm	Please specify
Load capacitance		C_L	10pF	Please specify
Temperature tolerance		Δf/f	±30ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-10°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	20µW ~100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±5ppm/Year	Max

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
16 <= f < 20	Fundamental	100		25 <= f < 30	Fundamental	60
20 <= f < 25	Fundamental	80		30 <= f < 50	Fundamental	50

Drawing

HE3225/4



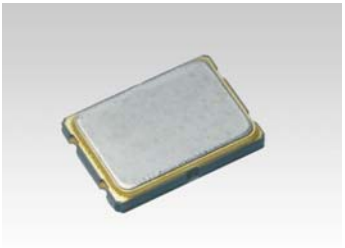
Dimensions in mm

Order key

Q	**- 40.000000M**	**- HE3225/4**	**- F**	**- 30**	**- 30**	**- A**	**- 10**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HE3225/4	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

Quartz SMD, Ceramic

RoHS 2002/95/EC



HC7050/2
HC7050/4

Features:

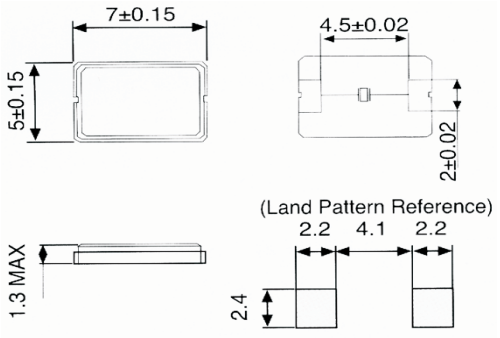
- SMD ceramic enclosures
- High reliability seam welded seal
- Frequency up to 125 MHz
- Ultra thin profile

Specifications				
		Symbol	*HC7050*	*Remarks*
Frequency range		f	6.000MHz ~ 30.000MHz	Fundamental mode
			30.000MHz ~ 125.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Others are offered
Load capacitance		C_L	10pF ~ 32pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm	Others are offered
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		$Δf_A$	±3ppm/Year max	Others are offered

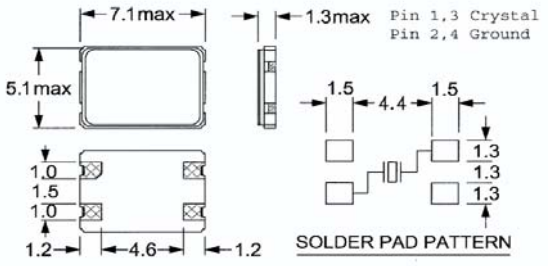
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
6 <= f < 8	Fundamental	100		30 <= f < 40	3rd OT	100
8 <= f < 16	Fundamental	80		40 <= f < 125	3rd OT	80
16 <= f < 30	Fundamental	50				

Drawing

HC7050/2



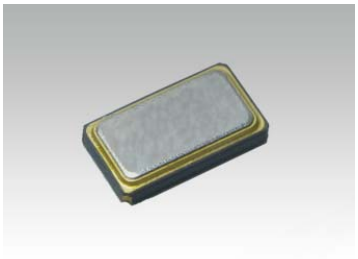
HC7050/4



Dimensions in mm

Order key								
Q	**- 30.000000M**	**- HC7050/2**	**- F**	**- 30**	**- 50**	**- D**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC7050/2 HC7050/4 /2 = 2 pads /4 = 4 pads	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC



HC6035/2
HC6035/4

Features:

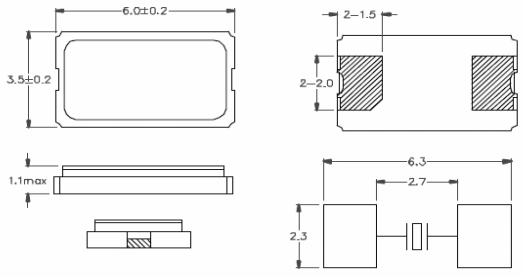
- SMD ceramic enclosures
- High reliability seam welded seal
- Frequency up to 125 MHz
- Ultra thin profile

Specifications				
		Symbol	*HC6035*	*Remarks*
Frequency range		f	8.000MHz ~ 50.000MHz	Fundamental mode
			40.000MHz ~ 125.000MHz	Overtone mode
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance		C_L	10pF ~ 32pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		$Δf_A$	±3ppm/Year max	Others are offered

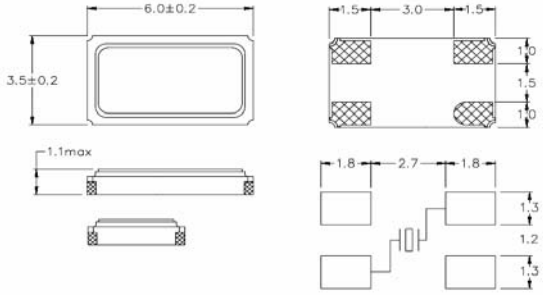
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
8 < f <= 12	Fundamental	80		25 < f <= 30	Fundamental	35
12 < f <= 16	Fundamental	60		30 < f <= 50	Fundamental	25
16 < f <= 25	Fundamental	50		40 < f <= 125	3rd OT	100

Drawing

HC6035/2



HC6035/4



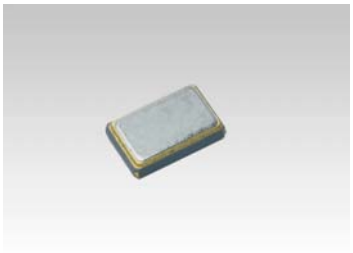
Dimensions in mm

Order key

Q	- 40.000000M	- HC6035/2	- F	- 30	- 50	- D	- 30	- TR
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC6035/2 HC6035/4 /2 = 2 pads /4 = 4 pads	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

Quartz SMD, Ceramic

RoHS 2002/95/EC



HC5032/2
HC5032/4

Features:

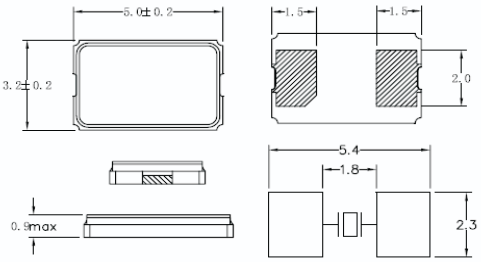
- SMD
- High reliability
- Application: Bluetooth, wireless LAN
- Ultra-thin and small leadless type

Specifications				
		Symbol	*HC5032*	*Remarks*
Frequency range		f	8.000MHz ~ 50.000MHz	Fundamental mode
			50.000MHz ~ 125.000 MHz	3rd. OT
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance		C_L	10pF ~ 32pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°c ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Max
Aging		Δf_A	±3ppm/Year max	Others are offered

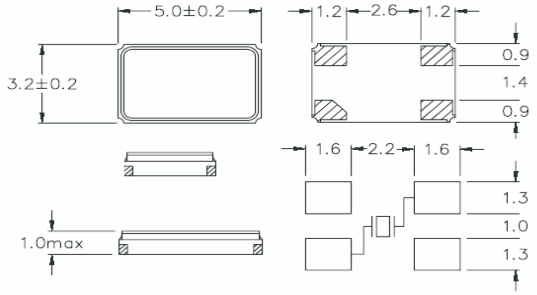
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
8 <= f < 10	Fundamental	*100*		25 <= f < 30	Fundamental	40
10 <= f < 12	Fundamental	90		30 <= f < 50	Fundamental	35
12 <= f < 16	Fundamental	60		50 <= f < 125	3rd OT	100
16 <= f < 25	Fundamental	50				

Drawing

HC5032/2



HC5032/4



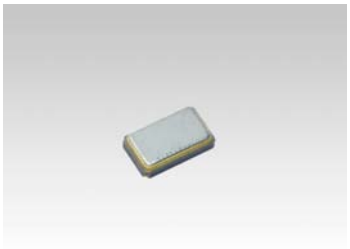
Dimensions in mm

Order key

Q	- 40.000000M	- HC5032/2	- F	- 50	- 50	- D	- 30	- TR
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC5032/2 HC5032/4 /2 = 2 pads /4 = 4 pads	F=fund. 3=3.OT	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C H= -20°C ~ +80°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options

HC4025/4

RoHS 2002/95/EC



Features:

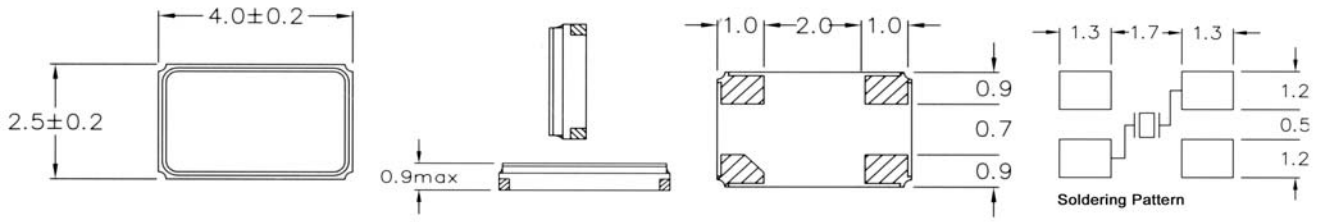
- SMD
- High reliability
- Application: Bluetooth, wireless LAN
- Ultra thin and small leadless type

Specifications				
		Symbol	*HC4025/4*	*Remarks*
Frequency range		f	12.000MHz - 50.000MHz	Fundamental mode
			-	
Frequency tolerance,Ta=25°C		Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance		C_L	7pF ~ 32pF	Please specify
Temperature tolerance		Δf/f	±10ppm ~ ±50ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-40°C ~ +85°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Min
Aging		Δf_A	±3ppm/Year max	Others are offered

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
12 <= f < 16	Fundamental	100		25 <= f < 50	Fundamental	60
16 <= f < 25	Fundamental	80				

Drawing

HC4025/4



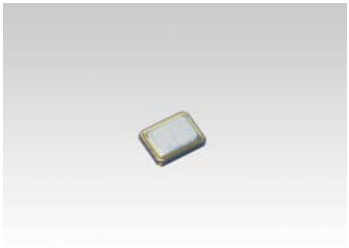
Dimensions in mm

Order key

Q	**- 32.000000M**	**- HC4025/4**	**- F**	**- 30**	**- 30**	**- D**	**- 16**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC4025/4	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C I = -10°C ~ +50°C	pF SR=series	TR=Tape and reel X=Special options
		/4 = 4 pads						

HC3225/4

RoHS 2002/95/EC



Features:

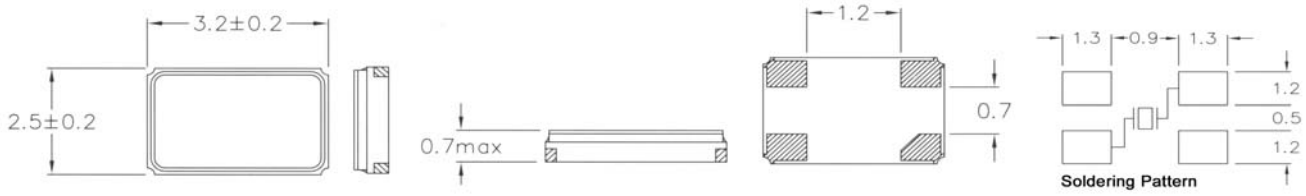
- SMD
- High reliability
- Application: Bluetooth, wireless LAN
- Ultra thin and small leadless type

Specifications			
	Symbol	*HC3225*	*Remarks*
Frequency range	f	12.000MHz ~ 50.000MHz	Fundamental mode
		-	
Frequency tolerance,Ta=25°C	Δf/f	±10ppm ~ ±30ppm	Please specify
Load capacitance	C_L	7pF ~ 32pF	Please specify
Temperature tolerance	Δf/f	±10ppm ~ ±30ppm	Please specify
Storage temperature range	T_{STG}	-40°C ~ +85°C	
Operating temperature range	T_{OPR}	-20°C ~ +70°C	Others are offered
Maximum drive level	M_{DL}	500µW	
Recommended drive level	R_{DL}	100µW	
Series resistance	R_1	As per table	25°C ±3°C
Shunt capacitance	C_0	7pF	Max
Insulation resistance	I_R	500M Ohm	Min
Aging	Δf_A	±3ppm/Year	

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
13 <= f < 25	Fundamental	100		25 <= f < 50	Fundamental	60

Drawing

HC3225/4



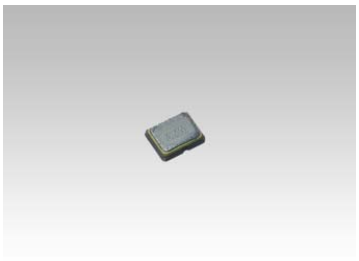
Dimensions in mm

Order key

Q	- 40.000000M	- HC3225/4	- F	- 30	- 30	- D	- 16	- TR
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC3225/4 /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C I = -10°C ~ +50°C S= spezial	pF SR=series	TR=Tape and reel X=Special options

HC 2520/4

RoHS 2002/95/EC



Features:

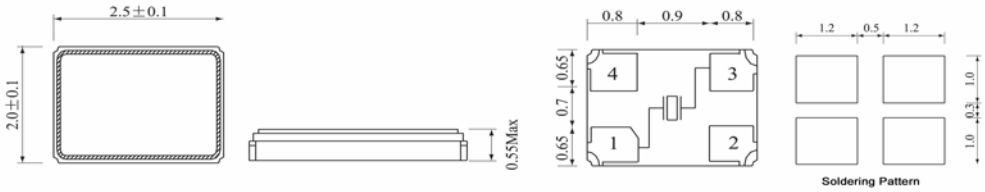
- SMD
- High reliability
- Application: Bluetooth, wireless LAN
- Ultra thin and small leadless type

Specifications			
	Symbol	*HC2520/4*	*Remarks*
Frequency range	f	16.000MHz ~ 50.000MHz	Fundamental mode
		-	
Frequency tolerance,Ta=25°C	Δf/f	±10ppm ~ ±50ppm	Please specify
Load capacitance	C_L	7pf ~ 32pF	Please specify
Temperature tolerance	Δf/f	±10ppm ~ ±50ppm	Please specify
Storage temperature range	T_{STG}	-40°C ~ +85°C	
Operating temperature range	T_{OPR}	-10°C ~ +60°C; -20°C ~ 70°C	Others are offered
Maximum drive level	M_{DL}	100µW	
Recommended drive level	R_{DL}	50µW	
Series resistance	R_1	As per table	25°C ±3°C
Shunt capacitance	C_0	3pF	Max
Insulation resistance	I_R	500M Ohm	Min
Aging	Δf_A	±1 ~ ±3ppm/Year	

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
24.5760 <= f < 30.0	Fundamental	80		30.0 <= f < 50.0	Fundamental	50

Drawing

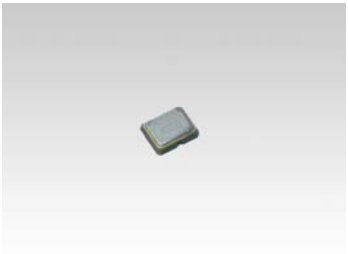
HC2520/4



Dimensions in mm

Order key								
Q	**- 20.000000M**	**- HC2520/4**	**- F**	**- 30**	**- 30**	**- A**	**- 10**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC2520/4	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	pF	TR=Tape and reel X=Special options

RoHS 2002/95/EC



HC 2016/4

Features:

- SMD
- High reliability
- Application: Bluetooth, wireless LAN
- Ultra thin and small leadless type

Preliminary

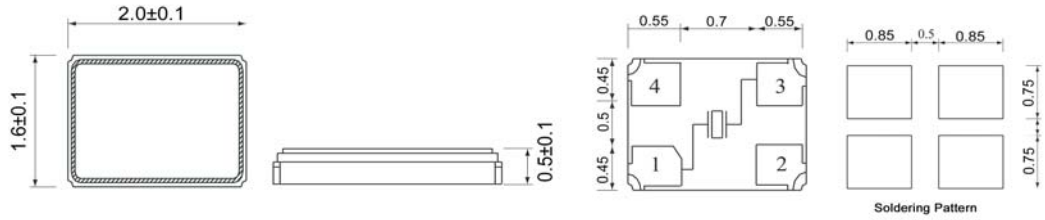
Specifications			
	Symbol	*HC2016/4*	*Remarks*
Frequency range	f	26.000MHz ~ 50.000MHz	Fundamental mode
		-	
Frequency tolerance,Ta=25°C	Δf/f	±10ppm ~ ±30ppm	Please specify
Load capacitance	C_L	12pf	Others are offered
Temperature tolerance	Δf/f	±10ppm ~ ±50ppm	Please specify
Storage temperature range	T_{STG}	-40°C ~ +85°C	
Operating temperature range	T_{OPR}	-20°C ~ 70°C	Others are offered
Maximum drive level	M_{DL}	100µW	
Recommended drive level	R_{DL}	50µW	
Series resistance	R_1	As per table	25°C ±3°C
Shunt capacitance	C_0	3pF	Max
Insulation resistance	I_R	500M Ohm	Min
Aging	Δf_A	±3ppm/Year	

- Please consult with us for other specifications

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
26.0 <= f < 30.0	Fundamental	100		30.0 <= f < 50.0	Fundamental	80

Drawing

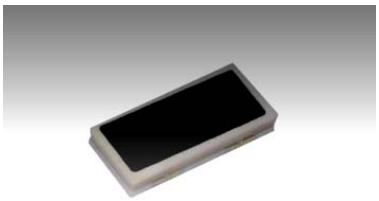
HC2016/4



Dimensions in mm

Order key								
Q	**- 28.000000M**	**- HC2016/4**	**- F**	**- 30**	**- 30**	**- A**	**- 12**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	HC2520/4	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	pF	TR=Tape and reel X=Special options

RoHS 2002/95/EC



AC1045/4

Features:

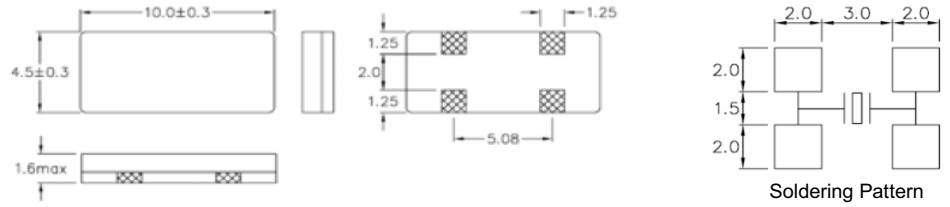
- SMD
- ultra-thin and small leadless type
- for high mechanical demands available

Specifications				
		Symbol	*AC1045*	*Remarks*
Frequency range		f	3.276800MHz ~ 7.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±20ppm	Please specify
Load capacitance		C_L	10pF ~ series	Please specify
Temperature tolerance		Δf/f	±20ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-55°c ~ +125°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	0.1mW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Max
Aging		Δf_A	±5ppm/Year max	Others are offered

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*				
3,276800 <= f < 7.0	Fundamental	*150*				

Drawing

AC1045



Soldering Pattern

Dimensions in mm

Order key								
Q	**- 5.000000M**	**- AC1045/4**	**- F**	**- 30**	**- 30**	**- D**	**- 16**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	AC1045/4 /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC

AC5032/2
AC5032/4

Features:

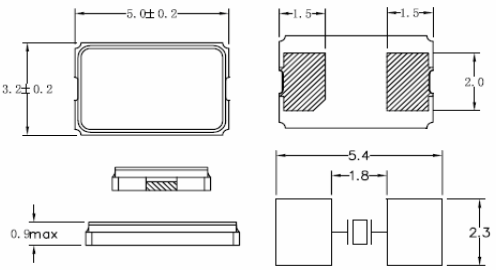
- SMD
- ultra-thin and small leadless type
- for high mechanical demands available

Specifications				
		Symbol	*AC5032*	*Remarks*
Frequency range		f	12.000MHz ~ 30.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±20ppm	Please specify
Load capacitance		C_L	10pF ~ series	Please specify
Temperature tolerance		Δf/f	±20ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-55°C ~ +125°C	
	Operating temperature	T_{OPR}	-20°C ~ +70°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Max
Aging		Δf_A	±5ppm/Year max	Others are offered

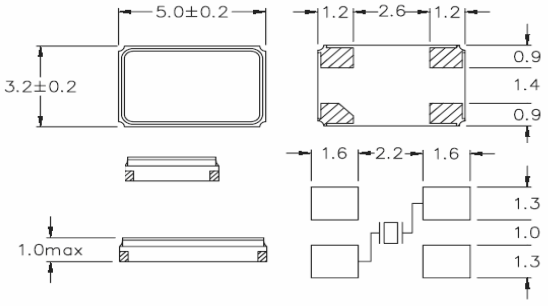
Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
12 <= f < 16	Fundamental	*80*		16 <= f < 30	Fundamental	50

Drawing

AC5032/2



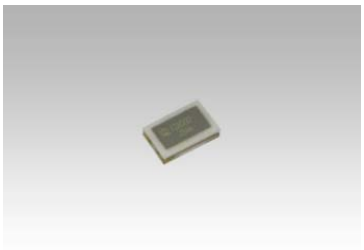
AC5032/4



Dimensions in mm

Order key								
Q	**- 25.000000M**	**- AC5032/2**	**- F**	**- 30**	**- 50**	**- D**	**- 30**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	AC5032/2 AC5032/4 /2 = 2 pads /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

RoHS 2002/95/EC



AC3225/4

Features:

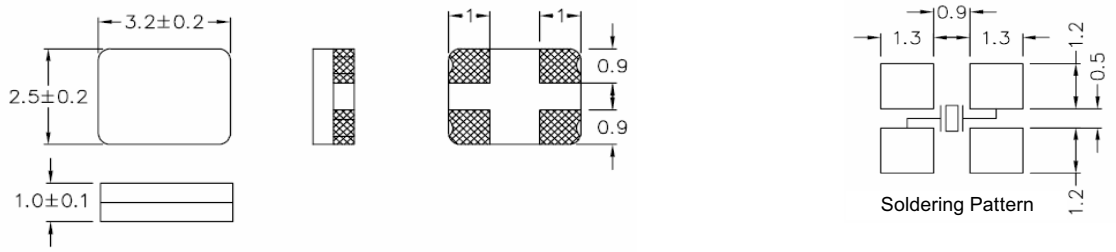
- SMD
- ultra-thin and small leadless type
- for high mechanical demands available

Specifications				
		Symbol	*AC3225*	*Remarks*
Frequency range		f	12.000MHz ~ 40.000MHz	Fundamental mode
Frequency tolerance,Ta=25°C		Δf/f	±20ppm	Please specify
Load capacitance		C_L	10pF ~ series	Please specify
Temperature tolerance		Δf/f	±20ppm ~ ±30ppm	Please specify
Temperature range	Storage temperature	T_{STG}	-55°C ~ +125°C	
	Operating temperature	T_{OPR}	-20°C~+70°C/-40°C~+85°C	Others are offered
Drive level	Maximum drive level	M_{DL}	500µW	
	Recommended drive level	R_{DL}	10µW ~ 100µW	
Series resistance		R_1	As per table	25°C ±3°C
Shunt capacitance		C_0	7pF	Max
Insulation resistance		I_R	500M Ohm	Max
Aging		Δf_A	±5ppm/Year max	Others are offered

Resistance of series resonance (ESR)						
Frequency (MHz)	*Mode*	*Ohm max*		*Frequency (MHz)*	*Mode*	*Ohm max*
12 <= f < 20	Fundamental	*120*		25 <= f < 30	Fundamental	60
20 <= f < 25	Fundamental	80		30 <= f < 40	Fundamental	50

Drawing

AC3225



Dimensions in mm

Order key							
Q	**- 36.000000M**	**- AC3225/2**	**- F**	**- 30**	**- 50**	**- D**	**- 16**	**- TR**
Part	**Frequency**	**Package**	**Mode of oscillation**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**	**Option**
Q=Quartz	M=MHz	AC3225/4 /4 = 4 pads	F=fund.	±ppm (25°C)	±ppm (Temp. range)	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	pF SR=series	TR=Tape and reel X=Special options

Oscillator THT, clock-type

AQO 14

RoHS 2002/95/EC

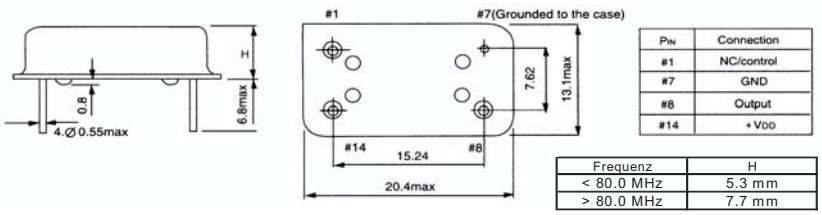
Features:

- Standard DIL14 package
- Low cost to performance
- Tolerance and stability to ±25ppm
- Tristate or power down available

Specifications					
		AQO 14			*Remarks*
Frequency range		1MHz ~ 160MHz			
Frequency stability		±25ppm,±50ppm or ±100ppm			
Operating temperature (std)		0°C ~ +70°C			Others are offered
Storage temperature		-40°C ~ +85°C			
Input	Voltage		3.3Vdc ±10%	5Vdc ±10%	Please specify
	Current	1.0000 ~ 20MHz	15 mA max	20 mA max	
		20.001 ~ 40MHz	25 mA max	30 mA max	
		40.001 ~ 80MHz	35 mA max	40 mA max	
		80.001 ~ 125MHz	45 mA max	50 mA max	
		125.00 ~ 160MHz	75 mA max	80 mA max	
Output Symmetry		40% ~ 60%(1.4Vdc) or 40% ~ 60%(0.5Vdd)			
Output	Rise time	10ns			Max
	Fall time	10ns			Max
	Voltage V_{ol}	0.4Vdc max or 0.1Vdd max			
	Voltage V_{oh}	2.4Vdc min or 0.9Vdd min			
	Current I_{ol}	<25MHz, 16mA max or >25MHz, 8mA max			
	Current I_{oh}	-4mA min or -8mA min			
Start-up time		10ms			Max
Aging		±5ppm			At 25°C per year max
Output waveform		CMOS/TTL compatible			
Shock		Random drop on hard wooden plate 3 times from a height of 50cm			

Drawing

AQO 14



Pin	Connection
#1	NC/control
#7	GND
#8	Output
#14	+VDD

Frequenz	H
< 80.0 MHz	5.3 mm
> 80.0 MHz	7.7 mm

Dimensions in mm

Order key

O	- 10.000000M	- AQO 14	- 50	- 5.0	- A	-	/ T	/
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQO=Quartz oscillator 14=DIL 14	±ppm	5.0=5.0Volt 3.3=3.3Volt 2.5=2.5Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C J= 0°C ~ + 50°C K= -30°C ~ + 75°C	blank = 15pF 3 = 30pF 5 = 50pF	T = Tristate P = Power down	blank = Tray

AQO 08

RoHS 2002/95/EC

Features:

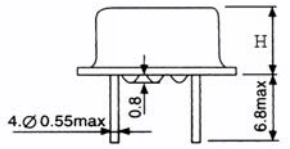
- Standard DIL 8 package
- Low cost to performane
- Tolerance and stability to ±25ppm
-Tristate or power down available

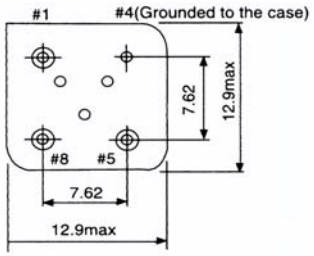
Specifications					
		AQO 08			*Remarks*
Frequency range		1MHz ~ 160MHz			
Frequency stability		±25ppm, ±50ppm or ±100ppm			
Operating temperature (std)		0°C ~ +70°C ~ -40°C - 85°C			Others are offered
Storage temperature		-40°C ~ +85°C			
Input	Voltage		3.3Vdc ±10%	5Vdc ±10%	Please specify
	Current	1.0000 ~ 20MHz	15 mA max	20 mA max	
		20.001 ~ 40MHz	25 mA max	30 mA max	
		40.001 ~ 80MHz	35 mA max	40 mA max	
		80.001 ~ 125MHz	45 mA max	50 mA max	
		125.00 ~ 160MHz	75 mA max	80 mA max	
Output Symmetry		40% ~ 60%(1.4Vdc) or 40% ~ 60%(0.5Vdd)			
Output	Rise time	10ns			Max
	Fall time	10ns			Max
	Voltage V_{ol}	0.4Vdc max or 0.1Vdd max			
	Voltage V_{oh}	2.4Vdc min or 0.9Vdd min			
	Current I_{ol}	<25MHz, 16mA max or >25MHz, 8mA max			
	Current I_{oh}	-4mA min or -8mA min			
Start-up time		10ms			Max
Aging		±5ppm			At 25°C per year max
Output waveform		CMOS/ TTL compatible			
Shock		Random drop on hard wooden plate 3 times from a height of 50cm			

Drawing

AQO 08

Frequenz	H
<80.0 MHz	5.8 mm
>80.0 MHz	7.7 mm





Pin	Connection
1	NC/control
4	GND
5	Output
8	+VDD

Dimensions in mm

Order key

O	- 10.000000M	- AQO 08	- 50	- 5.0	- A	-	/ T	/
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQO=Quartz oscillator 08=DIL 8	±ppm	5.0=5.0Volt 3.3=3.3Volt 2.5=2.5Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	blank = 15pF 3 = 30pF 5 = 50pF	T = Tristate P = Power down	blank = Tray

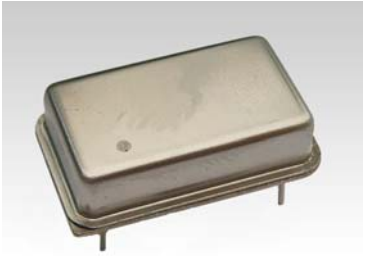
Oscillator THT, programmable

APQO 14

Features:

RoHS 2002/95/EC

- Standard DIL14 package
- Low cost to performance
- 3.0 ~ 5.5 volt available
- Tolerance and stability to ± 25ppm
- Ultra low jitter <11ps
- Tristate or power down available

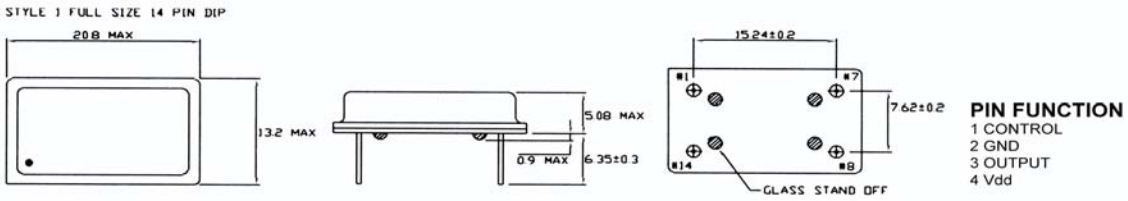


Specifications			
		APQO 14	*Remarks*
Frequency range		1 ~ 133MHz	Please specify
Frequency stability		±25ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -40°C ~ +85°C	Please specify
Storage temperature		-55°C ~ +125°C	
Programmable voltage	1 ~ 133 MHz	4.5V ~ 5.5V	
Programmable voltage	1 ~ 100 MHz	3.0V ~ 3.6V	
Aging (ppm / Year), Ta = 25C, Vdd = 5 / 3.3 V		±5ppm	
Programmable output level		CMOS / TTL	

Operating conditions				
Description		Min	Max	Unit
Vdd	Supply voltage	3.0	5.5	V
CTTL	Max capacitive load on outputs for TTL levels			
	4.5 V ~ 5.5 V Vdd ≤ 40 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 40 ~ 133 MHz		25	pF
CCMOS	Max capacitive load on outputs for CMOS levels			
	4.5 V ~ 5.5 V Vdd ≤ 66 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 66 ~ 133 MHz		25	pF
	3.0 V ~ 3.6 V Vdd ≤ 40 MHz		30	pF
	3.0 V ~ 3.6 V Vdd > 40 ~ 100 MHz		15	pF

Drawing

APQO 14



Dimensions in mm

Order key							
O	**- 50.000000M**	**- APQO 14**	**- 50**	**- 5.0**	**- A**	**/ T**	**/**
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**	**Packaging**
O=Oscillator	M=MHz	APQO=programmable QO 14=DIL 14	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	T = Tristate P = Power down	blank = Tube

APQO 14

Electrical characteristics					
Discription	Test conditions	Min	Typ	Max	Unit
Input characteristics (Pin 1)					
V_{IL}, Low-level input voltage	4.5 ~ 5.5 V Vdd			0.8	V
TO Tri-state or power-down	3.0 ~ 3.6 V Vdd			0.2 Vdd	V
V_{IH}, High-level input voltage	4.5 ~ 5.5 V Vdd	2.0			V
TO Enable output or no connect	3.0 ~ 3.6 V Vdd	0.7 Vdd			V
I_{IL}, Input low current	V_{IN} = 0V			10	µA
I_{IH}, Input high current	V_{IN} = Vdd			5	µA
Output characteristics					
V_{OL}, Low-level output voltage	4.5 V ~ 5.5 V Vdd, 16 mA I_{OL}			0.4	V
	3.0 V ~ 3.6 V Vdd, 8 mA I_{OL}			0.4	V
V_{OHTTL}, High-level output voltage TTL	4.5 V ~ 5.5 V Vdd, -16 mA I_{OL}	2.4			V
V_{OHCMOS}	4.5 ~ 5.5 Vdd, -16 mA I_{OL}	Vdd - 0.4			V
High-level CMOS voltage	3.0 V ~ 3.6 V Vdd, -8 mA I_{OL}	Vdd - 0.4			V
Power supply current	4.5 ~ 5.5 Vdd, Output freq ≤ 133 MHz			45	mA
(unloaded)	3.0 ~ 3.6 Vdd, Output freq ≤ 100 MHz			25	mA
Standby current			10	50	µA
Input pull-up resistor	4.5 ~ 5.5 Vdd, V_{IN} = 0V	1.1	3.0	8.0	MΩ
(P_{IN} 1)	4.5 ~ 5.5 Vdd, V_{IN} = 0.7 V	50	100	200	KΩ
Tri-state leakage current	5.0 Vdd		20		µA
Output enable mode	Output is tri-stated				
Power down mode	Output is tri-stated				

Output clock switching characteristics					
Description	Test conditions	Min	Typ	Max	Unit
Duty cycle					
TTL @ 1.4 V	≤ 50 MHz, C_L = 50 pF	45		55	%
4.5 ~ 5.5 Vdd	50 ~ 66 MHz, C_L = 15 pF	45		55	%
	66 ~ 125 MHz, C_L = 25 pF	40		60	%
	125 ~ 133 MHz, C_L = 15 pF	40		60	%
Duty cycle:					
CMOS @ Vdd / 2	≤ 66 MHz, C_L ≤ 25 pF	45		55	%
4.5 ~ 5.5 Vdd	66 ~ 125 MHz, C_L ≤ 25 pF	40		60	%
3.0 ~ 3.6 Vdd	125 ~ 133 MHz, C_L ≤ 15 pF	40		60	%
	≤ 40 MHz, C_L ≤ 30 pF	45		55	%
	40 ~ 100 MHz, C_L ≤ 15 pF	40		60	%
Output clock rise / fall	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 50			1.8	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 25			1.2	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 15			0.9	ns
	0.2 ~ 0.8 Vdd, 4.5 ~ 5.5 Vdd, C_L = 50			3.4	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, C_L = 30			4.0	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, C_L = 15			2.4	ns
Start up time	From power on			2	ms
Power down delay time					
Synchronous	PWR_DWN pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous			10	15	ns
Output disable time					
Synchronous	OE pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous	T = Frequency oscillator period		10	15	ns
Output enable time				100	ns
Period Jitter: Σ	1 - 133 MHz		8	11	ps
Peak to peak	≤ 33.000 MHz		65	99	ps
	> 33.000 MHz		65	80	ps

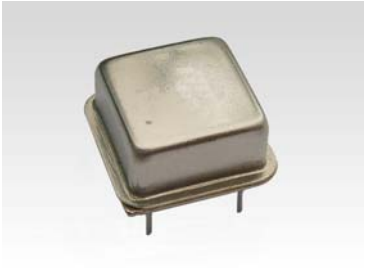
Oscillator THT, programmable

APQO 08

Features:

RoHS 2002/95/EC

- Standard DIL 8 package
- Low cost high performance
- 3.0 ~ 5.5 volt available
- Tolerance and stability up to ± 25ppm
- Ultra low jitter < 11ps
- Tristate or power down available

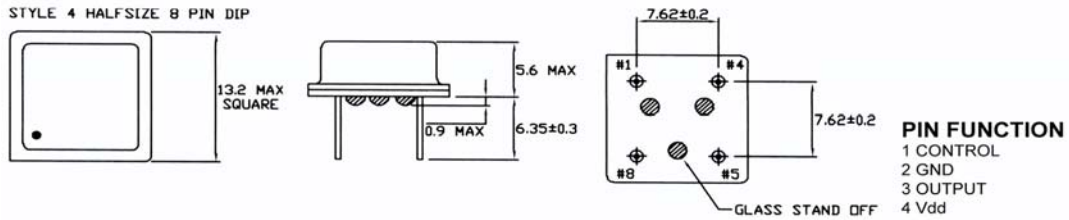


Specifications			
		APQO 08	*Remarks*
Frequency range		1MHz ~ 133MHz	Please specify
Frequency stability		±25ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -40°C ~ +85°C	Please specify
Storage temperature		-55°C ~ +125°C	
Programmable voltage	1 ~ 133 MHz	4.5V ~ 5.5V	
Programmable voltage	1 ~ 100 MHz	3.0V ~ 3.6V	
Aging (ppm / Year), Ta = 25C, Vdd = 5 / 3.3 V		±5ppm	
Programmable output level		CMOS / TTL	

Operating conditions				
Description		Min	Max	Unit
Vdd	Supply voltage	3.0	5.5	V
CTTL	Max capacitive load on outputs for TTL levels			
	4.5 V ~ 5.5 V Vdd ≤ 40 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 40 ~ 133 MHz		25	pF
CCMOS	Max capacitive load on outputs for CMOS levels			
	4.5 V ~ 5.5 V Vdd ≤ 66 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 66 ~ 133 MHz		25	pF
	3.0 V ~ 3.6 V Vdd ≤ 40 MHz		30	pF
	3.0 V ~ 3.6 V Vdd > 40 ~ 100 MHz		15	pF

Drawing

APQO 08



Dimensions in mm

Order key							
O	**- 50.000000M**	**- APQO 08**	**- 50**	**- 5.0**	**- A**	**/ T**	**/**
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**	**Packaging**
O=Oscillator	M=MHz	APQO=programmable QO 08=DIL 8	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	T = Tristate P = Power down	blank = Tube

APQO 08

Electrical characteristics					
Discription	Test conditions	Min	Typ	Max	Unit
Input characteristics (Pin 1)					
VIL, Low-level input voltage	4.5 ~ 5.5 V Vdd			0.8	V
TO Tri-state or power-down	3.0 ~ 3.6 V Vdd			0.2 Vdd	V
VIH, High-level input voltage	4.5 ~ 5.5 V Vdd	2.0			V
TO Enable output or no connect	3.0 ~ 3.6 V Vdd	0.7 Vdd			V
IIL, Input low current	VIN = 0V			10	µA
IIH, Input high current	VIN = Vdd			5	µA
Output characteristics					
VOL, Low-level output voltage	4.5 V ~ 5.5 V Vdd, 16 mA IOL			0.4	V
	3.0 V ~ 3.6 V Vdd, 8 mA IOL			0.4	V
VOHTTL, High-level output voltage TTL	4.5 V ~ 5.5 V Vdd, -16 mA IOL	2.4			V
VOHCMOS	4.5 ~ 5.5 Vdd, -16 mA IOL	Vdd - 0.4			V
High-level CMOS voltage	3.0 V ~ 3.6 V Vdd, -8 mA IOL	Vdd - 0.4			V
Power supply current	4.5 ~ 5.5 Vdd, OUTPUT FREQ ≤ 133 MHz			45	mA
(unloaded)	3.0 ~ 3.6 Vdd, OUTPUT FREQ ≤ 100 MHz			25	mA
Standby current			10	50	µA
Input pull-up resistor	4.5 ~ 5.5 Vdd, VIN = 0V	1.1	3.0	8.0	MΩ
(PIN 1)	4.5 ~ 5.5 Vdd, VIN = 0.7 V	50	100	200	KΩ
Tri-state leakage current	5.0 Vdd		20		µA
Output enable mode	Output is tri-stated				
Power down mode	Output is tri-stated				

Output clock switching characteristics					
Description	Test conditions	Min	Typ	Max	Unit
Duty cycle					
TTL @ 1.4 V	≤ 50 MHz, CL = 50 pF	45		55	%
4.5 ~ 5.5 Vdd	50 ~ 66 MHz, CL = 15 pF	45		55	%
	66 ~ 125 MHz, CL = 25 pF	40		60	%
	125 ~ 133 MHz, CL = 15 pF	40		60	%
Duty cycle:					
CMOS @ Vdd / 2	≤ 66 MHz, CL ≤ 25 pF	45		55	%
4.5 ~ 5.5 Vdd	66 ~ 125 MHz, CL ≤ 25 pF	40		60	%
3.0 ~ 3.6 Vdd	125 ~ 133 MHz, CL ≤ 15 pF	40		60	%
	≤ 40 MHz, CL ≤ 30 pF	45		55	%
	40 ~ 100 MHz, CL ≤ 15 pF	40		60	%
Output clock rise / fall	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 50			1.8	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 25			1.2	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 15			0.9	ns
	0.2 ~ 0.8 Vdd, 4.5 ~ 5.5 Vdd, CL = 50			3.4	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, CL = 30			4.0	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, CL = 15			2.4	ns
Start up time	From power on			2	ms
Power down delay time					
Synchronous	PWR_DWN pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous			10	15	ns
Output disable time					
Synchronous	OE pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous	T = Frequency oscillator period		10	15	ns
Output enable time				100	ns
Period Jitter: Σ	1 - 133 MHz		8	11	ps
Peak to peak	≤ 33.000 MHz		65	99	ps
	> 33.000 MHz		65	80	ps

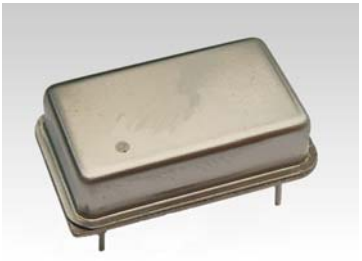
Oscillator THT, voltage-controlled

AVCQO 14

Features:

RoHS 2002/95/EC

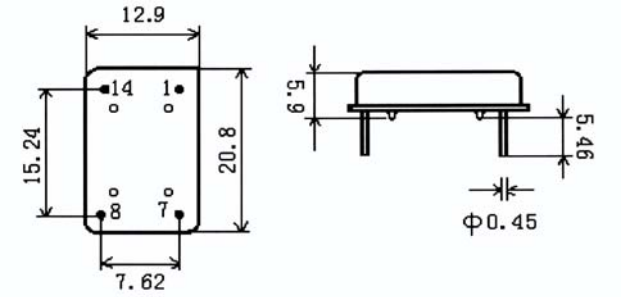
- Standard DIL14 package
- Wide frequency range
- Frequency stability
- High qualified package small dimension
- Clipping sine wave



Specifications		Specifications		
Series		*AVCQO 14*		*Remarks*
Norminal frequency range		1.00MHz ~ 160.00 MHz		Please specify
Frequency stability		±25ppm ~ ±100ppm		Please specify
Absolute pull range		±50ppm min ~ ±100ppm min		Please specify
Operating temp. range		0°C ~ + 70°C ~ -40°C ~ + 85°C		Please specify
Control voltage range		1.65V ±1.65V or 2.5V ±2.0V		
Center frequency		1.65V ±0.05V or 2.5V ±0.05V		
Linearity		±10%		
Input impedance		10k Ohm		Min
Modulation bandwidth		>10 kHz		
Supply voltage		+3.3 V or +5.0 V, ±5%		Please specify
Supply current		50mA		Max
Storage temperature range		- 40°C ~ + 85°C		
Rise & Fall Time		10ns		Max
Output Waveform		CMOS,TTL		
Symmetry		50% ±10%		
Output Voltage	V_{OH}	2.4Vdd or 0.9Vdd		Max
	V_{OL}	0.4Vdd or 0.1Vdd		Min
Output Current		±8mA		Max
Phase Noise	10HZ	-75dbc/Hz (1.0MHz~40.0MHz)	-50dbc/Hz (40.0MHz~160.0MHz)	
	10KHz	-145dbc/Hz (1.0MHz~40.0MHz)	-90dbc/Hz (40.0MHz~160.0MHz)	
Start-up Time		10ms		Max

Drawing

AVCQO 14



Pin	Connection
1	VC
7	GND
8	Output
14	VDC

Dimensions in mm

Order key

O	- 60.000000M	- AVCQO 14	- 50	- 5.0	- A	- T
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	AVCQO=Voltage controlled QO 14=DIL 14	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	T=Tristate 3=Load 30pF 5=Load 50pF X=Special options

Oscillator THT, voltage-controlled

AVCQO 08

RoHS 2002/95/EC

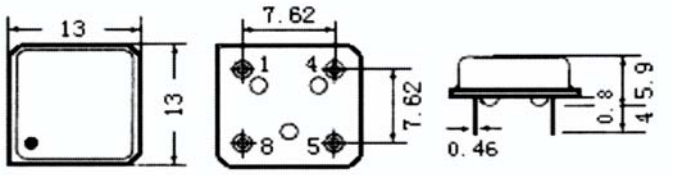
Features:

- Standard DIL 8 package
- Wide frequency range
- Pulling range ±100 ppm
- Clipping sine wave

Specifications		Specifications		
Series		*AVCQO 14*		*Remarks*
Norminal frequency range		1.00MHz ~ 160.00 MHz		Please specify
Frequency stability		±25ppm ~ ±100ppm		Please specify
Absolute pull range		±50ppm min ~ ±100ppm min		Please specify
Operating temp. range		0°C ~ + 70°C ~ -40°C ~ + 85°C		Please specify
Control voltage range		1.65V ±1.65V or 2.5V ±2.0V		
Center frequency		1.65V ±0.05V or 2.5V ±0.05V		
Linearity		±10%		
Input impedance		10k Ohm		Min
Modulation bandwidth		>10 kHz		
Supply voltage		+3.3 V or +5.0 V, ±5%		Please specify
Supply current		50mA		Max
Storage temperature range		-40°C ~ +85°C		
Rise & Fall Time		10ns		Max
Output Waveform		CMOS,TTL		
Symmetry		50% ±10%		
Output Voltage	V_{OH}	2.4Vdd or 0.9Vdd		Max
	V_{OL}	0.4Vdd or 0.1Vdd		Min
Output Current		±8mA		Max
Phase Noise	10HZ	-75dbc/Hz (1.0MHz~40.0MHz)	-50dbc/Hz (40.0MHz~160.0MHz)	
	10KHz	-145dbc/Hz (1.0MHz~40.0MHz)	-90dbc/Hz (40.0MHz~160.0MHz)	
Start-up Time		10ms		Max

Drawing

AVCQO 08



Pin	Connection
1	VC
4	GND
5	OUT
8	VDC

Dimensions in mm

Order key

O	- 40.000000M	- AVCQO 08	- 50	- 5.0	- A	- T
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	AVCQO=Voltage controlled QO 08=DIL 8	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	X=Special options

Oscillator THT, temperature-compensated

ATCQO 1812

RoHS 2002/95/EC

Features:

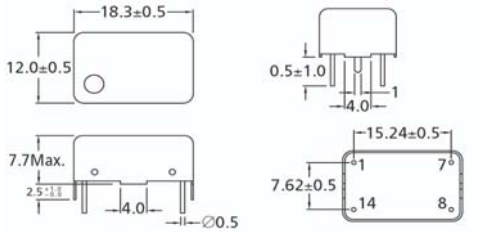
- Wide frequency range
- High Frequency stability
- Clipping sine wave

Specifications	Specifications	
Series	*ATCQO 1812*	*Remarks*
Frequency range	8.00MHz ~ 40.00MHz	Please specify
Frequency accuracy	±1.0 ppm max	Please specify
Frequency stability versus temperature (FST)	J: ±1.0 ppm (0 ~ +50°C)	Please specify
	B: ±1.5 ppm (-10 ~ +60°C)	
	D: ±2.0 ppm (-20 ~ +70°C)	
	K: ±2.5 ppm (-30 ~ +75°C)	
	E: ±5.0 ppm (-40 ~ +85°C)	
Aging	±1ppm/year	Max
Frequency adjustment	±3ppm	Min
Output type and load characteristics	As per table	Please specify
Frequency stability vs load	±0.2 ppm vs ±10% load change	
Supply voltage	5.0Vdc ±5% , 3.3Vdc ±5%	
Supply current	3mA max (Clipped Sine) 20mA max (CMOS/TTL)	
Frequency stability versus voltage	±0.3 ppm vs ±5% voltage change	
Phase noise	100 Hz, -100 dBc/Hz; 1 kHz, -130 dBc/Hz;	
	10 kHz,-140 dBc/Hz; 100 kHz, -145 dBc/Hz	
Storage temperature range	- 40°C ~ +85°C	

Output and load characteristics			
Output waveform	TTL	CMOS	Clipped sine
Output level	TTL	CMOS	1V pk to pk
Duty cycle	50% ±10%	50% ±10%	-
Rise/fall time	5ns	5ns	-
Load	2TTL	15pF	10k Ohm / 10pF

Drawing

ATCQO 1812



PIN	CONNECTION
1	NC
7	GND
8	OUTPUT
14	+Vcc

Dimensions in mm

Order key

O	- 10.000000M	- ATCQO 1812	- 5	- 5.0	- A	-
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	ATCQO=Temperature controlled QO 1812=18x12mm	±ppm	5.0=5.0Volt 3.3=3.3Volt	J= 0°C ~ + 50°C B= -10°C ~ +60°C D= -20°C ~ +70°C K= -30°C ~ + 75°C E= -40°C ~ +85°C	X=Special options

RoHS 2002/95/EC

AOCQO 14

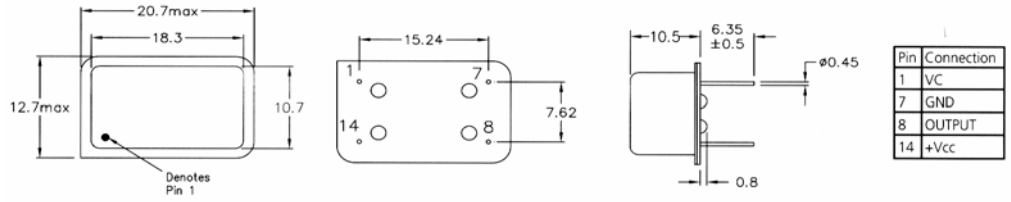
Features:

- Wide frequency range
- Ultra High Frequency stability
- CMOS output

Specification			
Frequency Range		10.0MHz ~ 20.0MHz	Please specify
Initial Stability		±500ppb	
Frequency Stability			
vs Operating Temperature		±500ppb	
vs Load Variation ±10%		±20ppb	
vs Supply Voltage		±20ppb	
Long term stability per year		±0.5ppm	
Operating temperature		-20°C ~ +70°C	
Storage temperature		-40°C ~ +85°C	
Frequency adjustment		±5ppm	
Supply voltage		5.0Vdc ±5%	
Current consumption at 25°C		220mA max.	
Current consumption at warm up		500mA max.	
Output signal		CMOS	
Contol voltage range		2.5V ±2.0V	
Slope		positive	
Warm up time (within $1x10^{-7}$)		5 Min. max.	
Input impedance		10k Ohm min.	
Phase noise	10Hz	-100dBc/Hz	
	100Hz	-125dBc/Hz	
	1kHz	-135dBc/Hz	
	10kHz	-145dBc/Hz	
	100kHz	-150dBc/Hz	

Drawing

AOCQO 14



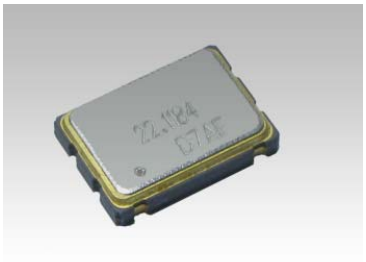
Dimensions in mm

Order key

O	- 10.000000M	- AOCQO 14	- 5	- 5.0	- A	- T
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	AOCQO=Oven controlled QO 14=DIL 14	±ppm	5.0=5.0Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	X=Special options

Oscillator SMD, clock-type

RoHS 2002/95/EC



AQO 7050

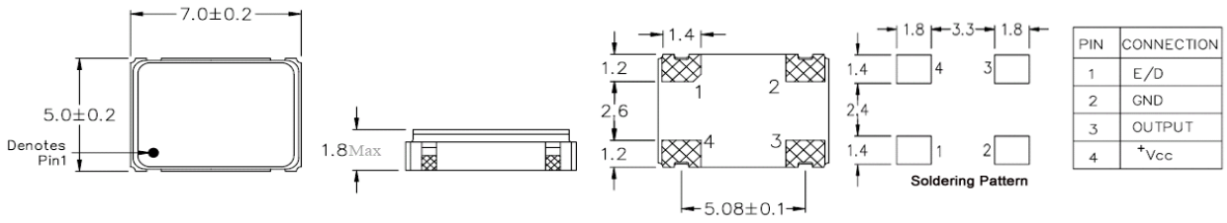
Features:

- Small size 7x5mm
- Low cost to performance
- Excellent for laptop and handheld PDA´s
- Tristate or power down available

Specifications			
		AQO 7050	*Remarks*
Frequency range		1MHz ~160MHz	Please specify
Frequency stability		±25ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C / -40°C ~ +85°C	Please specify
		-40°C ~ +105°C	On enquiry
Storage temperature		-40°C ~ +85°C / -40°C ~ +105°C	Please specify
Input	Voltage	1.8V / 2,5V / 3,3V / 5.0V	Please specify
	Current	20mA 1~3MHz	Max
		35mA 3~32MHz	Max
		60mA 32~125MHz	Max
Output symmetry		40% ~ 60% , 45% ~ 55%	Please specify
Output	Rise and fall time	10ns	Max
		CMOS LSTTL	
	Logic "0" level	+0.5V(10%VDD) +0.4V max	
	Logic "1" level	+4.5V(90%VDD) +2.4V min	
Output load		CMOS/15pF or 10LSTTL (30pF ; 50pF optional)	

Drawing

AQO 7050



Dimensions in mm

Order key								
O	**- 10.000000M**	**- AQO 7050**	**- 50**	**- 5.0**	**- A**	**-**	**/ T**	**/ TR**
Part	**Frequency**	**Type**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQO=Quartz oscillator AQO 7050=SMD 7x5	±ppm	5.0=5.0Volt 3.3=3.3Volt 2.5=2.5Volt 1.8=1.8Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C F= -40°C ~ +105°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P=Power down	TR = tape + reeled

AQO 5032

RoHS 2002/95/EC

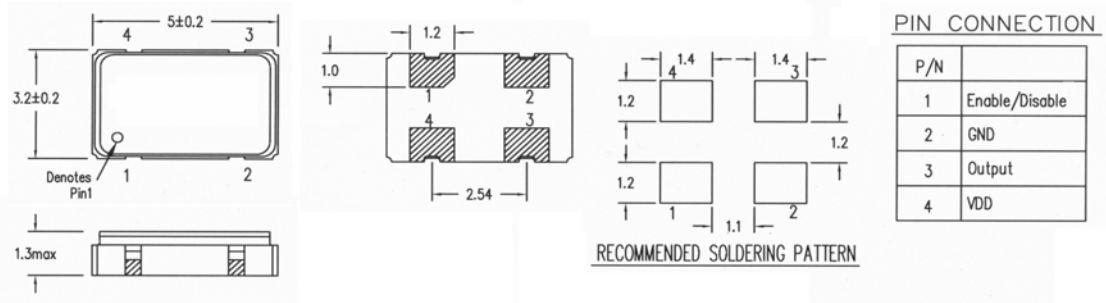
Features:

- Small size 5x3.2mm
- Low cost to performance
- Excellent for laptop and handheld PDA´s
- Tristate or power down available

Specifications			
		AQO 5032	*Remarks*
Frequency range		1MHz ~ 160MHz	Please specify
Frequency stability		±25ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -40°C ~ +85°C	Please specify
		-40°C ~ +105°C	On enquiry
Storage temperature		-40°C ~ +85°C	Others are offered
Input	Voltage	1.8V / 2,5V / 3.3V / 5.0V	Please specify
	Current	20mA 1~3MHz	Max
		35mA 3~32MHz	Max
		60mA >32MHz	Max
Output symmetry		40% ~ 60%, 45% ~ 55%	Please specify
Output	Rise and fall time	10 ns	Max
		CMOS LSTTL	
	Logic "0" level	+0.5V(10%VDD) +0.4V max	
	Logic "1" level	+4.5V(90%VDD) +2.4V min	
Output load		1~10 LSTTL or CMOS 15~50pF	Please spezify

Drawing

AQO 5032



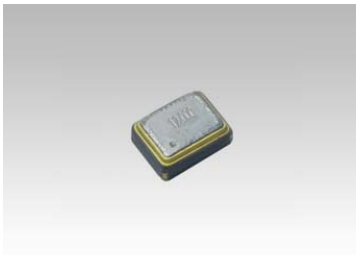
Dimensions in mm

Order key

O	- 10.000000M	- AQO 5032	- 50	- 5.0	- A	-	/ T	/ TR
Part	**Frequency**	**Type**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQO=Quartz oscillator AQO 5032=SMD 5x3,2	±ppm	5.0=5.0Volt 3.3=3.3Volt 2.5=2.5Volt 1.8=1.8Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P=Power down	TR = tape + reeled

Oscillator SMD, clock-type

RoHS 2002/95/EC



AQO 3225

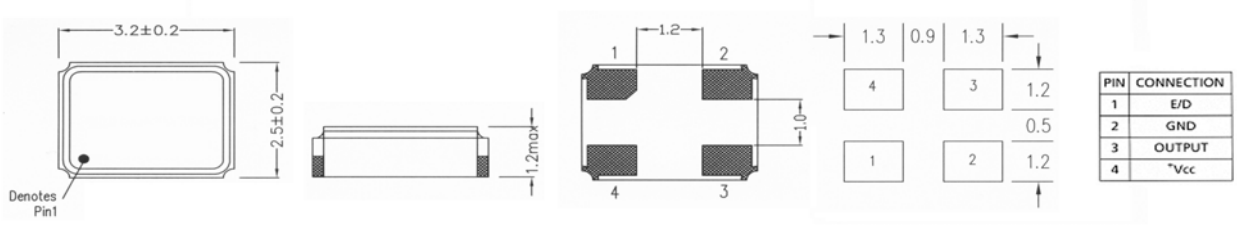
Features:

- Small size 3.2x2.5 mm
- Low cost to performance
- Excellent for laptop and handheld PDA´s
- Tristate or power down available

Specifications			
		AQO 3225	*Remarks*
Frequency range		1.000000MHz ~ 48MHz	Please specify
Frequency stability		±50ppm ~ ±100ppm	Please specify
Operating temperature		-40°C ~ +85°C	Please specify
Storage temperature		-40°C ~ +85°C	Others are offered
Input	Voltage	1.8V ~ 2.8V ~ 3.3V	Please specify
	Current	30mA	Max
Output symmetry		40% ~ 60%	Please specify
Output	Rise and fall time	8 ns	Max
		CMOS / TTL compatible	
	Logic "0" level	(10%VDD)	Max
	Logic "1" level	(90%VDD)	Min
Output load		15pF / 10 LSTTL	

Drawing

AQO 3225



Dimensions in mm

Order key

O	- 10.000000M	- AQO 3225	- 50	- 3.3	- A	-	/ T	/ TR
Part	**Frequency**	**Type**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQO=Quartz oscillator AQO 3225=SMD 3.2x2.5	±ppm	3.3=3.3Volt 2.8=2.8Volt 1.8=1.8Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P=Power down	TR = tape + reeled

AQOE3225

Features:

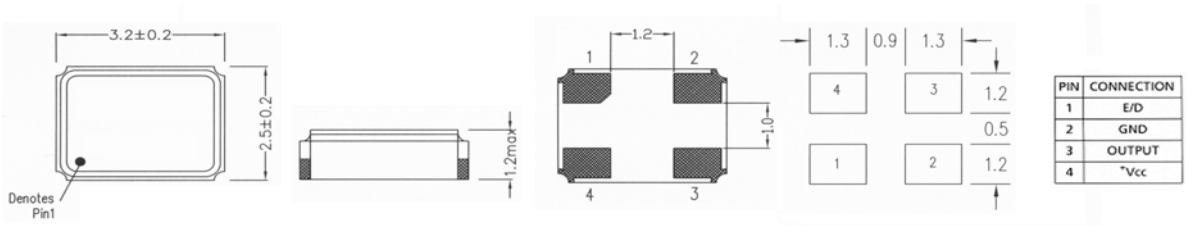
RoHS 2002/95/EC

- all Quartz
- Small size 3.2x2.5mm
- Low cost to performance
- Excellent in portable PC and telecommunication
- Tristate or power down available

Specifications			
		AQOE3225	Remarks
Frequency range		2MHz ~ 48MHz	Please specify
Frequency stability		±50ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -20°C ~ +70°C	Please specify
Storage temperature		-40°C ~ +85°C	
Input	Voltage	3.3V (+/-10%), 5.0V (+/-10%)	Please specify
	Current	8mA 2~10MHz	Max
		15mA 10~35MHz	Max
		30mA >35MHz	Max
Output symmetry		40% ~ 60%	Please specify
Output	Rise and fall time	8 ns	Max
		CMOS	
	Logic "0" level	10%VDD	Max
	Logic "1" level	90%VDD	Min
Output load		CMOS, 15pF	Please specify

Drawing

AQOE3225



Dimensions in mm

Order key

O	- 10.000000M	- AQOE3225	- 50	- 3.3	- D	-	/ T	/ TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQOE=Quartz Oscillator all Quartz AQOE3225=SMD 3,2x2,5	±ppm	3.3=3.3Volt 5.0=5.0Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P = Power down	TR = tape + reeled

Oscillator SMD, clock-type

AQOE5032

Features:

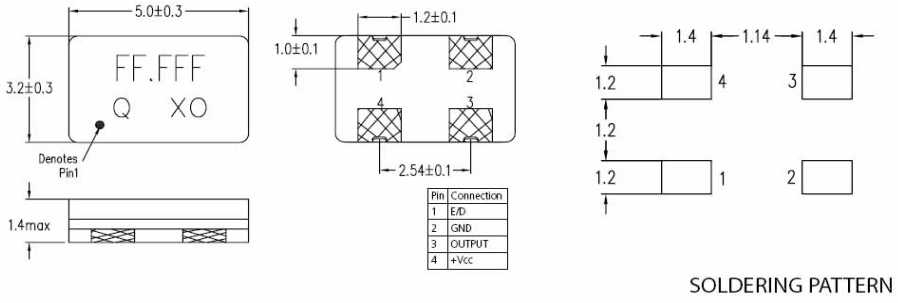
RoHS 2002/95/EC

- all Quartz
- Small size 5.0x3.2mm
- Low cost to performance
- Excellent in portable PC and telecommunication
- Tristate or power down available

Specifications			
		AQOE5032	Remarks
Frequency range		2MHz ~ 48MHz	Please specify
Frequency stability		±50ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -20°C ~ +70°C	Please specify
Storage temperature		-40°C ~ +85°C	
Input	Voltage	3.3V (+/-10%), 5.0V (+/-10%)	Please specify
	Current	25mA Typ.	Max
Output symmetry		40% ~ 60%	Please specify
Output	Rise and fall time	8 ns	Max
		CMOS, HCMOS, TTL,CMOS/TTL compatable	
	Logic "0" level	10%VDD	Max
	Logic "1" level	90%VDD	Min
Output load		CMOS, 15 pF	Please specify

Drawing

AQOE5032



Dimensions in mm

Order key

O	- 10.000000M	- AQOE5032	- 50	- 3.3	- D	-	/ T	/ TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQOE=Quartz Oscillator all Quartz AQOE5032=SMD 5,0x3,2	±ppm	3.3=3.3Volt 5.0=5.0Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P = Power down	TR = tape + reeled

AQOE7050

RoHS 2002/95/EC

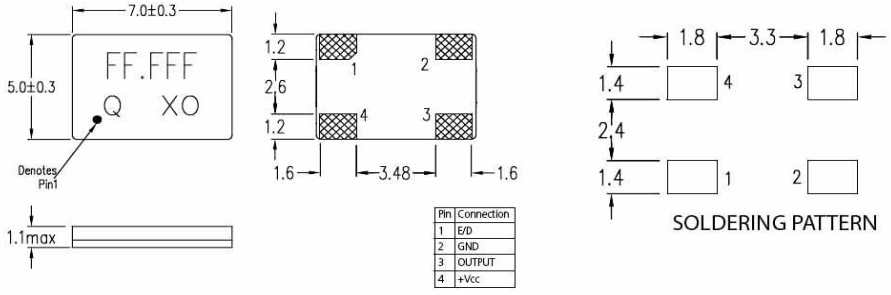
Features:

- all Quartz
- Low cost to performance
- Excellent in portable PC and telecommunication
- Tristate or power down available

Specifications			
		AQOE7050	Remarks
Frequency range		2MHz ~ 48MHz	Please specify
Frequency stability		±50ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -20°C ~ +70°C	Please specify
Storage temperature		-40°C ~ +85°C	
Input	Voltage	3.3V (+/-10%), 5.0V (+/-10%)	Please specify
	Current	25mA Typ.	Max
Output symmetry		40% ~ 60%	Please specify
Output	Rise and fall time	8 ns	Max
		CMOS, HCMOS, TTL,CMOS/TTL compatable	
	Logic "0" level	10%VDD	Max
	Logic "1" level	90%VDD	Min
Output load		CMOS, 15 pF	Please specify

Drawing

AQOE7050



Dimensions in mm

Order key

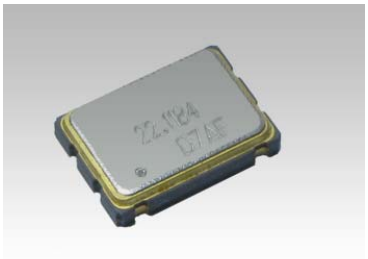
O	- 10.000000M	- AQOE7050	- 50	- 3.3	- D	-	/ T	/ TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	AQOE=Quartz Oscillator all Quartz AQOE5032=SMD 7,0x5,0	±ppm	3.3=3.3Volt 5.0=5.0Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C	blank = 15pF 3 = 30pF 5 = 50pF	T=Tristate P = Power down	TR = tape + reeled

Oscillator SMD, programmable

Features:

RoHS 2002/95/EC

- Small size 7x5mm
- Low cost to performance
- 3.0 ~ 5.5 volt available
- Tolerance and stability to ±25ppm
- Ultra low jitter <11ps
- Tristate or power down available



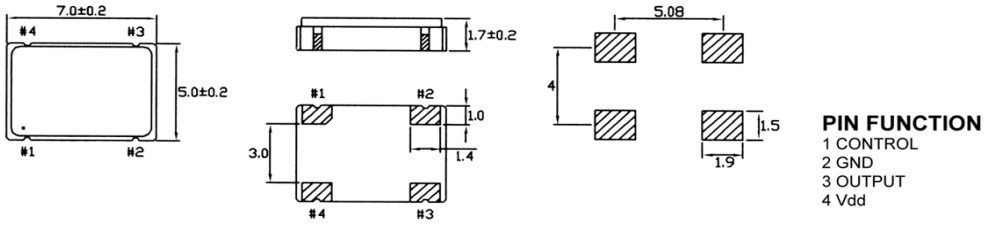
APQO 7050

Specifications			
		APQO 7050	*Remarks*
Frequency range		1MHz ~ 133MHz	Please specify
Frequency stability		±25ppm ~ ±100ppm	Please specify
Operating temperature		0°C ~ +70°C - -40°C ~ +85°C	Please specify
Storage temperature		-55°C ~ +125°C	
Programmable voltage	1 ~ 133 MHz	5.0V ±10%	
Programmable voltage	1 ~ 100 MHz	3.3V ±10%	
Aging (ppm / Year), Ta = 25C, Vdd = 5 / 3.3 V		±5ppm	
Programmable output level		CMOS / TTL	

Operating conditions				
		Min	Max	Unit
Vdd	Supply voltage	3.0	5.5	V
CTTL	Max capacitive load on outputs for TTL levels			25
	4.5 V ~ 5.5 V Vdd ≤ 40 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 40 ~ 133 MHz		25	pF
CCMOS	Max capacitive load on outputs for CMOS levels			
	4.5 V ~ 5.5 V Vdd ≤ 66 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 66 ~ 133 MHz		25	pF
	3.0 V ~ 3.6 V Vdd ≤ 40 MHz		30	pF
	3.0 V ~ 3.6 V Vdd > 40 ~ 100 MHz		15	pF

Drawing

APQO 7050



PIN FUNCTION
1 CONTROL
2 GND
3 OUTPUT
4 Vdd

Dimensions in mm

Order key							
O	**- 10.000000M**	**- APQO 7050**	**- 50**	**- 5.0**	**- A**	**/ T**	**/**
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**	**Packaging**
O=Oscillator	M=MHz	APQO= programmable QO 7050=SMD 7x5	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	T= Tristate P = Power down	blank = tube

APQO 7050

Electrical characteristics					
	Test conditions	Min	Typ	Max	Unit
Input characteristics (Pin 1):					
V_{IL}, Low-level input voltage	4.5 ~ 5.5 V Vdd			0.8	V
TO Tri-state or power down	3.0 ~ 3.6 V Vdd			0.2 Vdd	V
V_{IH}, High-level iInput voltage	4.5 ~ 5.5 V Vdd	2.0			V
TO Enable output or no connect	3.0 ~ 3.6 V Vdd	0.7 Vdd			V
I_{IL}, Input low current	V_{IN} = 0V			10	µA
I_{IH}, Input high current	V_{IN} = Vdd			5	µA
Input characteristics	4.5 V ~ 5.5 V Vdd, 16 mA I_{OL}			0.4	V
V_{OL}, Low-level output voltage	3.0 V ~ 3.6 V Vdd, 8 mA I_{OL}			0.4	V
V_{OHTTL}, High-level output voltage TTL	4.5 V ~ 5.5 V Vdd, -16 mA I_{OL}	2.4			V
V_{OHCMOS}, High-level CMOS voltage	4.5 ~ 5.5 Vdd, -16 mA I_{OL}	Vdd - 0.4			V
	3.0 V ~ 3.6 V Vdd, -8 mA I_{OL}	Vdd - 0.4			V
Power supply current	4.5 ~ 5.5 Vdd, Output-freq ≤ 133 MHz			45	mA
(unloaded)	3.0 ~ 3.6 Vdd, Output-freq ≤ 100 MHz			25	mA
Standby current			10	50	µA
Input pull-up resistor	4.5 ~ 5.5 Vdd, V_{IN} = 0V	1.1	3.0	8.0	MΩ
(P_{IN} 1)	4.5 ~ 5.5 Vdd, V_{IN} = 0.7 V	50	100	200	KΩ
Tri-state leakage current	5.0 Vdd		20		µA
Output enable mode	Output is Tri-stated				
Power down mode	Output is Tri-stated				

Output clock switching characteristics					
Description	Test conditions	Min	Typ	Max	Unit
Duty cycle					
TTL @ 1.4 V	≤ 50 MHz, C_L = 50 pF	45		55	%
4.5 ~ 5.5 Vdd	50 ~ 66 MHz, C_L = 15 pF	45		55	%
	66 ~ 125 MHz, C_L = 25 pF	40		60	%
	125 ~ 133 MHz, C_L = 15 pF	40		60	%
Duty cycle:					
CMOS @ Vdd / 2	≤ 66 MHz, C_L ≤ 25 pF	45		55	%
4.5 ~ 5.5 Vdd	66 ~ 125 MHz, C_L ≤ 25 pF	40		60	%
3.0 ~ 3.6 Vdd	125 ~ 133 MHz, C_L ≤ 15 pF	40		60	%
	≤ 40 MHz, C_L ≤ 30 pF	45		55	%
	40 ~ 100 MHz, C_L ≤ 15 pF	40		60	%
Output clock rise / fall	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 50			1.8	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 25			1.2	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, C_L = 15			0.9	ns
	0.2 ~ 0.8 Vdd, 4.5 ~ 5.5 Vdd, C_L = 50			3.4	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, C_L = 30			4.0	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, C_L = 15			2.4	ns
Start up time	From power on			2	ms
Power down delay time					
Synchronous	PWR_DWN pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous			10	15	ns
Output disable time					
Synchronous	OE pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous	T = Frequency oscillator period		10	15	ns
Output enable time				100	ns
Period Jitter: J	1 - 133MHz		8	11	ps
Peak to peak	≤ 33.000 MHz		65	99	ps
	> 33.000 MHz		65	80	ps

Oscillator SMD, programmable

Features:

RoHS 2002/95/EC

- Small size 5x3.2
- Low cost to performance
- 3.0 ~ 5.5 volt available
- Tolerance and stability to ±25ppm
- Ultra low jitter <11ps
- Tristate or power down available

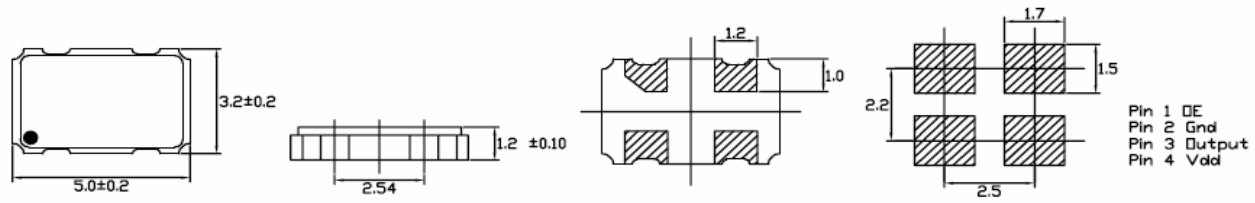
APQO 5032

Specifications		
	APQO 5032	*Remarks*
Frequency range	1MHz ~ 133MHz	Please specify
Frequency stability	±25ppm ~ ±100ppm	Please specify
Operating temperature	0°C ~ +70°C - -40°C ~ +85°C	Please specify
Storage temperature	-55°C ~ +125°C	
Programmable voltage 1 ~ 133 MHz	4.5V ~ 5.5V	
Programmable voltage 1 ~ 100 MHz	3.0V ~ 3.6V	
Aging (ppm / Year), Ta = 25C, Vdd = 5 / 3.3 V	±5ppm	
Programmable output level	CMOS / TTL	

Operating conditions				
Description		Min	Max	Unit
Vdd	Supply voltage	3.0	5.5	V
CTTL	Max capacitive load on outputs for TTL levels			
	4.5 V ~ 5.5 V Vdd ≤ 40 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 40 ~ 133 MHz		25	pF
CCMOS	Max capacitive load on outputs for CMOS levels			
	4.5 V ~ 5.5 V Vdd ≤ 66 MHz		50	pF
	4.5 V ~ 5.5 V Vdd > 66 ~ 133 MHz		25	pF
	3.0 V ~ 3.6 V Vdd ≤ 40 MHz		30	pF
	3.0 V ~ 3.6 V Vdd > 40 ~ 100 MHz		15	pF

Drawing

APQO 5032



Dimensions in mm

Order key

O	- 10.000000M	- APQO 5032	- 50	- 5.0	- A	/ T	/
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**	**Packaging**
O=Oscillator	M=MHz	APQO= programmable QO 5032=SMD 5x3.2	±ppm	5.0=5.0Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	T= Tristate P = Power down	blank = tube

APQO 5032

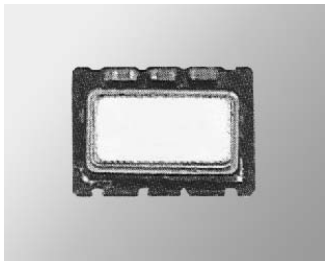
Electrical characteristics					
Discription	Test conditions	Min	Typ	Max	Unit
Input characteristics (Pin 1)					
VIL, Low-level input voltage	4.5 ~ 5.5 V Vdd			0.8	V
TO Tri-state or power-down	3.0 ~ 3.6 V Vdd			0.2 Vdd	V
VIH, High-level input voltage	4.5 ~ 5.5 V Vdd	2.0			V
TO Enable output or no connect	3.0 ~ 3.6 V Vdd	0.7 Vdd			V
IIL, Input low current	VIN = 0V			10	µA
IIH, Input high current	VIN = Vdd			5	µA
Output characteristics					
VOL, Low-level output voltage	4.5 V ~ 5.5 V Vdd, 16 mA IOL			0.4	V
	3.0 V ~ 3.6 V Vdd, 8 mA IOL			0.4	V
VOHTTL, High-level output voltage TTL	4.5 V ~ 5.5 V Vdd, -16 mA IOL	2.4			V
VOHCMOS	4.5 ~ 5.5 Vdd, -16 mA IOL	Vdd - 0.4			V
High-level CMOS voltage	3.0 V ~ 3.6 V Vdd, -8 mA IOL	Vdd - 0.4			V
Power supply current	4.5 ~ 5.5 Vdd, OUTPUT FREQ ≤ 133 MHz			45	mA
(unloaded)	3.0 ~ 3.6 Vdd, OUTPUT FREQ ≤ 100 MHz			25	mA
Standby current			10	50	µA
Input pull-up resistor	4.5 ~ 5.5 Vdd, VIN = 0V	1.1	3.0	8.0	M÷
(PIN 1)	4.5 ~ 5.5 Vdd, VIN = 0.7 V	50	100	200	K♦
Tri-state leakage current	5.0 Vdd		20		µA
Output enable mode	Output is tri-stated				
Power down mode	Output is tri-stated				

Output clock switching characteristics					
Description	Test conditions	Min	Typ	Max	Unit
Duty cycle					
TTL @ 1.4 V	≤ 50 MHz, CL = 50 pF	45		55	%
4.5 ~ 5.5 Vdd	50 ~ 66 MHz, CL = 15 pF	45		55	%
	66 ~ 125 MHz, CL = 25 pF	40		60	%
	125 ~ 133 MHz, CL = 15 pF	40		60	%
Duty cycle:					
CMOS @ Vdd / 2	≤ 66 MHz, CL ≤ 25 pF	45		55	%
4.5 ~ 5.5 Vdd	66 ~ 125 MHz, CL ≤ 25 pF	40		60	%
3.0 ~ 3.6 Vdd	125 ~ 133 MHz, CL ≤ 15 pF	40		60	%
	≤ 40 MHz, CL ≤ 30 pF	45		55	%
	40 ~ 100 MHz, CL ≤ 15 pF	40		60	%
Output clock rise / fall	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 50			1.8	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 25			1.2	ns
	0.8 V ~ 2.0 V, 4.5 ~ 5.5 Vdd, CL = 15			0.9	ns
	0.2 ~ 0.8 Vdd, 4.5 ~ 5.5 Vdd, CL = 50			3.4	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, CL = 30			4.0	ns
	0.2 ~ 0.8 Vdd, 3.0 ~ 3.6 Vdd, CL = 15			2.4	ns
Start up time	From power on			2	ms
Power down delay time					
Synchronous	PWR_DWN pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous			10	15	ns
Output disable time					
Synchronous	OE pin LOW to output Hi-Z		T / 2	T+10	ns
Asynchronous	T = Frequency oscillator period		10	15	ns
Output enable time				100	ns
Period Jitter: °	1 - 133MHz		8	11	ps
Peak to peak	≤ 33.000 MHz		65	99	ps
	> 33.000 MHz		65	80	ps

Oscillator SMD, voltage-controlled, temperature-compensated

RoHS 2002/95/EC

AVCTCQO 7050



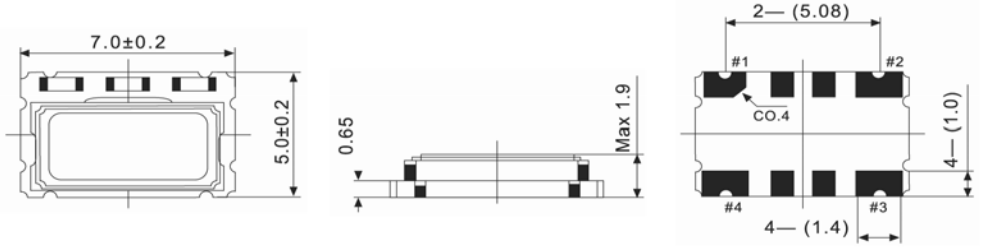
Features:

- Small Size 7x5mm
- For cellular phones and GPS
- High accuracy

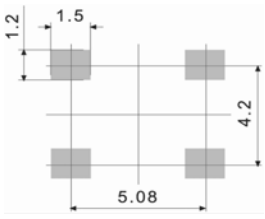
Specifications		
	AVCTCQO 7050	*Remarks*
Frequency range	12MHz ~ 20MHz	Please specify
Nominal frequency	12.8 / 13.0 / 14.4 / 15.36 / 19.2 / 19.68 MHz	
Frequency tolerance	±0.5 ppm	
Frequency vs temperature	± 2.5 ppm (-30°C ~ +75°C)	
Frequency vs aging	± 1.0 ppm / year (25°C)	
Frequency vs supply voltage	± 0.3 ppm / (+3.0V ±5%)	
External control voltage Vc =	+1.5V ± 1.0Vdc	
Frequency tuning range	±4.0 x10-6 ppm min (positive)	
Operating temperature	-30°C ~ +75°C	
Storage temperature	-40°C ~ +85°C	
Supply voltage	+2.8V ~ +5.0V	
Current Consumption	2mA	Max
Output load	10K Ohm / 10pF	
Output voltage	0.8Vp-p	Min
Waveform	Clipped Sine Wave	

Drawing

AVCTCQO 7050



Soldering Pattern



Dimensions in mm

Order key

O	- 20.000000M	- AVCTCQO 7050	- 0.5	- 5.0	- D	- TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	AVCTCQO=Voltage compensated, Temperature controlled QO 7050=7x5mm	+/-ppm	5,0=5,0Volt 2,7=2,7Volt 3,0=3,0Volt	D= -20°C ~ +70°C E= -40°C ~ +85°C K= -30°C ~ + 75°C S= special	TR=Tape and reeled X=Special options

Oscillator SMD, voltage-controlled, temperature-compensated

AVCTCQO 5032

RoHS 2002/95/EC

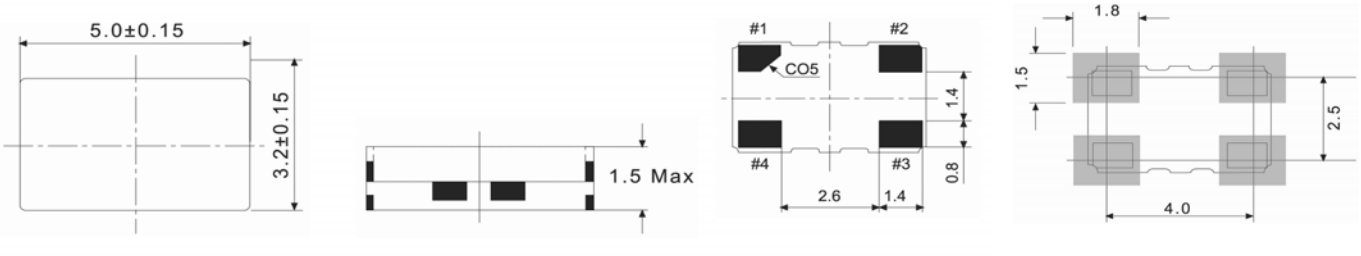
Features:

- Small Size 5x3.2m
- High accuracy

Specifications		
	AVCTCQO 5032	*Remarks*
Frequency range	12MHz ~ 20MHz	Please specify
Nominal frequency	13.0 / 14.4 / 19.2 / 19.68 MHz	
Frequency tolerance	±0.5 ppm	
Frequency vs temperature	±2.5 ppm (-30°C ~ +75°C)	
Frequency vs aging	±1.0 ppm / year (25°C)	
Frequency vs supply voltage	±0.2 ppm / (+3.0V ±5%)	
External control voltage Vc =	+1.5V ±1.0Vdc	
Frequency tuning range	±8.0 ppm min (positive)	
Operating temperature	-30°C ~ +75°C	
Storage temperature	-40°C ~ +85°C	
Supply voltage	+2.7V ~ +5.0V	
Current Consumption	2mA	Max
Output load	10K Ohm / 10pF	
Output voltage	0.8Vp-p	Min
Waveform	Clipped Sine Wave	

Drawing

AVCTCQO 7050



Soldering Pattern

Dimensions in mm

Order key

O	- 20.000000M	- AVCTCQO 5032	- 0,5	- 5.0	- E	- TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	AVCTCQO=Voltage compensated, Temperature controlled QO 5032=5x3,2mm	±ppm	5,0=5,0Volt 2,7=2,7Volt 3,0=3,0Volt	D= -20°C ~ +70°C E= -40°C ~ +85°C K= -30°C ~ + 75°C S= special	TR=Tape and reeled X=Special options

Oscillator SMD, spread spectrum, programmable

RoHS 2002/95/EC

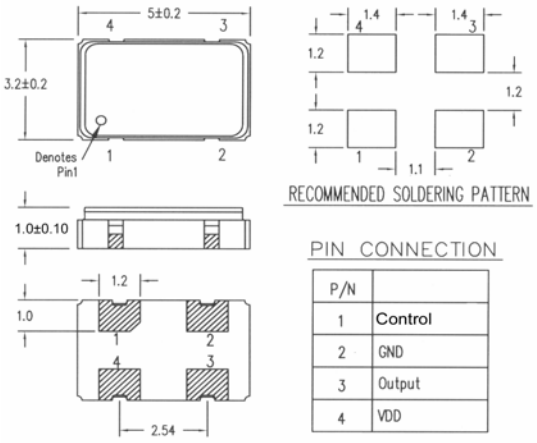
APSSO 7050
APSSO 5032

Features:
Supply voltage 2,5V + 3,3V
Different spread widths available
Short delivery time

Specifications		
	APSO 7050 / APSO 5032	*Remarks*
Frequency range	1.5MHz ~ 200MHz	Please specify
Frequency stability	±25ppm ~ ±100ppm	Please specify
Operating temperature	-40°C ~ +85°C	Please specify
Storage temperature	-55°C ~ +125°C	
Programmable voltage 1 ~ 166 MHz	2.5V ±10%	
Programmable voltage 1 ~ 200 MHz	3.3V ±10%	
Aging (ppm / Year), Ta = 25C, Vdd = 5 / 3.3 V	±5ppm	
Programmable output level	HCMOS	

Drawing

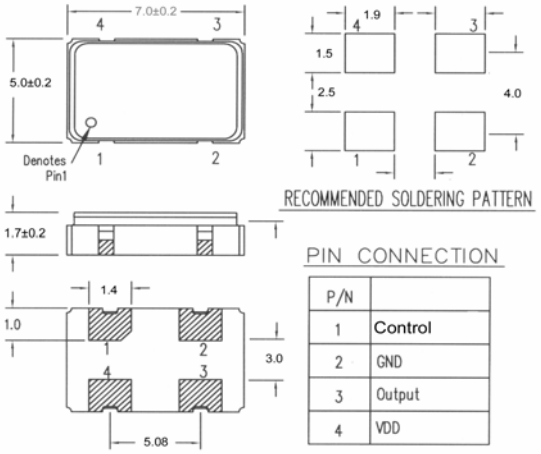
APSO 5032



PIN CONNECTION

P/N	
1	Control
2	GND
3	Output
4	VDD

APSO 7050



PIN CONNECTION

P/N	
1	Control
2	GND
3	Output
4	VDD

Dimensions in mm

Operating conditions				
Description		Min	Max	Unit
Vdd	Supply voltage	2.25	3.6	V
Vdd	Rise Time	100		µS
HCMOS	max capacitive load on outputs for CMOS levels			
	Frequency: <40MHz		30	pF
	Frequency: <40-200MHz		15	pF

Order key

O	**- 10.000000M**	**- APSO 7050**	**- 50**	**- 2.5**	**- A**	**/ T**	**/ C**	**/**
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**	**Spread**	**Packaging**
O=Oscillator	M=MHz	APQO= programmable QO 7050=SMD 7x5	±ppm	2.5=2.5Volt 3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C E= -40°C ~ +85°C	T= Tristate P= Power down	please see table 1	blank = tube

APSSO 7050
APSSO 5032

Output clock switching characteristics					
Description	Test conditions	Min	Typ	Max	Unit
Duty cycle HCMOS @ Vdd/2	2.25V~3.6V Vdd	45		55	%
Output clock rise / fall	0.2-0.8Vdd, 2.25-3.6 Vdd, Cl=30 0.2-0.8Vdd, 2.25-3.6Vdd, Cl=15			4.0 2.4	ns ns
Start up time	From power on		3	10	ms

Electrical characteristics					
Discription	Test conditions	Min	Typ	Max	Unit
Input characteristics (Pin 1) VIL, Low-level input voltage TO Tri-state or power-down	3.0 ~ 3.6 V Vdd			0.2 Vdd	V
VIH, High-level input voltage TO Enable output or no connect	3.0 ~ 3.6 V Vdd	0.7 Vdd			V
IIL, Input low current IIH, Input high current	VIN = 0V VIN = Vdd			80 10	µA µA
Output characteristics VOL, Low-level output voltage	3.0 V ~ 3.6 V Vdd, 8 mA IOL			0.4	V
VOHCMOS, High-level CMOS voltage	2.25 V ~ 3.6 V Vdd, -8 mA IOL	Vdd - 0.4			V
Power supply current (unloaded)	2.25 ~ 3.6 Vdd, OUTPUT FREQ ≤ 200 MHz			35	mA
Input pull-up resistor	2.25 ~ 3.6V Vdd, VIN = 0.7V	50	70	90	⌋
Tri-state leakage current	3.6V Vdd		20		µA
Output enable mode	Output is tri-stated Output is power down				

spread		spread	
A	± 0.125%	I	± 1.125%
B	± 0.250%	K	± 1.250%
C	± 0.375%	M	± 1.375%
D	± 0.500%	O	± 1.500%
E	± 0.625%	P	± 1.625%
F	± 0.750%	R	± 1.750%
G	± 0.875%	S	± 1.875%
H	± 1.000%	T	± 2.000%

Table 1

RoHS 2002/95/EC

APTCQO 7050

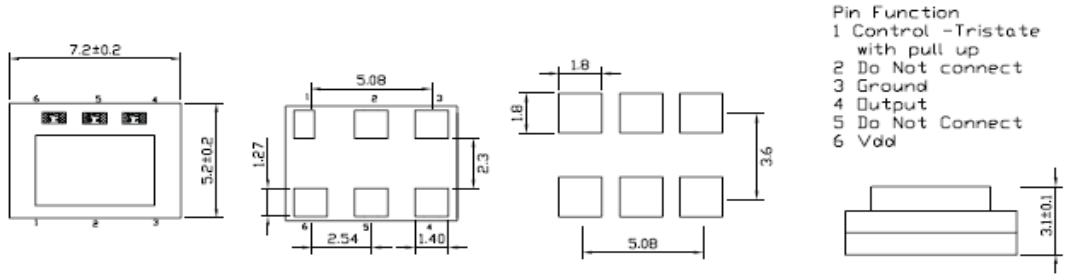
Features:

- tristate available
- short delivery time
- very low tolerance

Specifications			
		APTCQO 7050	*Remarks*
Frequency range		1.5MHz ~200MHz	Please specify
Frequency stability		±2.5ppm	Please specify
Operating temperature		-30°C ~ +75°C	Please specify
Aging		1ppm / 1st year	
Storage temperature		-40°C ~ +85°C	Please specify
Input	Voltage	3,3V ±5%	Please specify
	Current	35mA 1.5~200MHz	Max
Vdd Rise time		100 uS	Min
Start-up time		3 mS typ, 10mS max.	
Phase noise @ 10 kHz		-100 dBc/Hz	Max
Output symmetry		45% ~ 55%	Please specify
Output	Rise and fall time	2.4ns	Max
	Logic "0" level	+0.4V	
	Logic "1" level	vdd -0.4V	
Output load		CMOS / 15pF	

Drawing

APTCQO 7050



Dimensions in mm

Order key

O	- 10.000000M	- APTCQO 7050	- 2,5	- 3,3	- A	-	/ T	/ TR
Part	**Frequency**	**Type**	**Tolerance**	**Voltage**	**Temperature**	**Load**	**Option**	**Packaging**
O=Oscillator	M=MHz	APTCQO=Quartz oscillator 7050=SMD 7x5	±ppm	3.3=3.3Volt	A= 0°C ~ +70°C B= -10°C ~ +60°C C= -10°C ~ +70°C D= -20°C ~ +70°C K= -30°C ~ +75°C	blank = 15pF	T=Tristate	blank=tube

Oscillator SMD, temperature-compensated

ATCQO 5032

RoHS 2002/95/EC

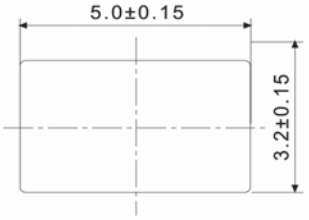
Features:

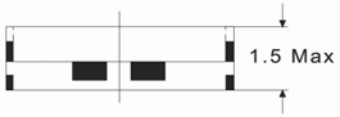
- Small Size 5x3.2m
- High accuracy

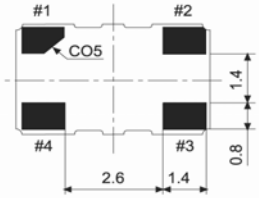
Specifications		
	ATCQO 5032	*Remarks*
Frequency range	10MHz ~ 26MHz	Please specify
Frequency tolerance	±0.5ppm	at 0°C to 50°C
	±1.0ppm	at -10°C to 60°C
	±2.0ppm	at -20°C to 70°C
	±2.5ppm	at -30°C to 75°C
	±3.5ppm	at -40°C to 85°C
Frequency vs aging	±1.0 ppm / year	
Frequency vs supply voltage	±0.3 ppm VDD ±5%	
Frequency vs output load	±0.2ppm (standard load ±10%)	
Operating temperature	0°C ~ +50°C ~ -40°C ~ +85°C	
Storage temperature	-55°C ~ +125°C	
Supply voltage	2.8V, 3.3V	
supply current	3mA max. (clipped sine)	
Output load	10K Ohm / 10pF	
Phase Noise	100Hz -115dBc/Hz	
	1kHz -135dBc/Hz	
	10kHz -148dBc/Hz	
Jitter	3pS RMS	

Drawing

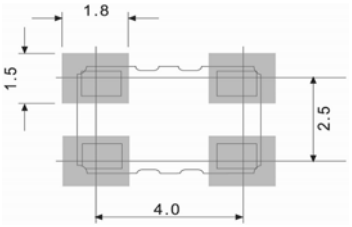
ATCQO 5032







Soldering Pattern



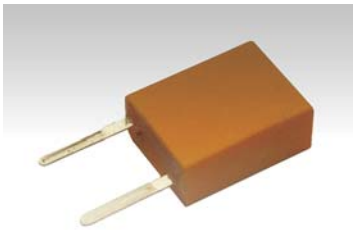
Dimensions in mm

Order key

O	- 20.000000M	- ATCQO 5032	- 0,5	- 3.3	- E	- TR
Part	**Frequency**	**Type/Package**	**Tolerance**	**Voltage**	**Temperature**	**Option**
O=Oscillator	M=MHz	ATCQO= Temperature controlled QO 5032=5x3,2mm	±ppm	3,3=3,3Volt 2,8=2,8Volt	B= -10°C ~ +60°C D= -20°C ~ +70°C E= -40°C ~ +85°C S= 0°C ~ +50°C S= 30°C ~ +75°C	TR=Tape and reeled X=Special options

Resonator THT Ceramic, 2 Pin

RoHS 2002/95/EC



ZTB/E

Features:

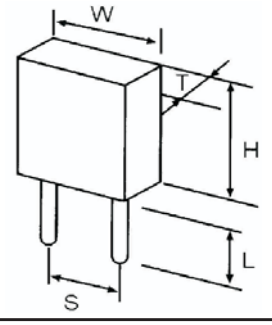
- Low cost
- Consumer electronics
- Microprocessor systems
- Automotive applications

Specifications

		ZTB/E						
Frequency range (kHz)		190 – 249	250 – 374	375 – 429	430 – 509	510 – 699	700 – 999	1000 – 1250
Frequency accuracy (25°C)		±1kHz	±1kHz	±1kHz	±2kHz	±2kHz	±0.5%	±0.5%
Temp. stability (-20°C - +80°C)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Aging (over 10 years)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Load capacitance (pF)	C1	330	220	120	100	100	100	100
	C2	470	470	470	100	100	100	100
Resonant Impedance (Ω) max.		20	20	20	20	30	70	100

Drawing

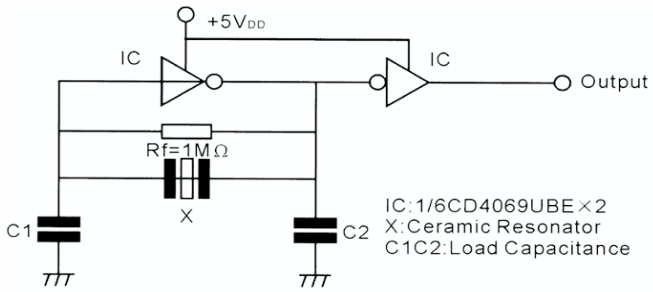
ZTB/E

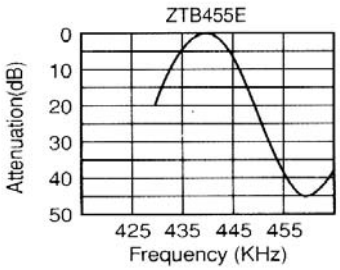


Dimensions in mm

Frequency Range(kHz)	Width W	Thickness T	Height H	Lead Space S	Lead Lenght L
190 – 249	13.5	3.6	14.7	10.0	8.0
250 – 374	11.0	3.6	12.2	7.7	7.0
375 – 400	7.9	3.6	9.3	5.0	7.7
401 – 699	7.0	3.5	9.0	5.0	4.0 (6.0)
700 – 1250	5.1	2.3	6.3	2.5	4.0

Test circuit





Order key

R	- 250.00K	- ZTB/E	- 1.0	- 0.3	- H	- 220/470
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**
R=Resonator	K=KHz	ZTB/E series	±KHz or % (25°C)	±% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

Resonator THT Ceramic, 2 Pin

RoHS 2002/95/EC

Features:

- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications

ZTA/MG

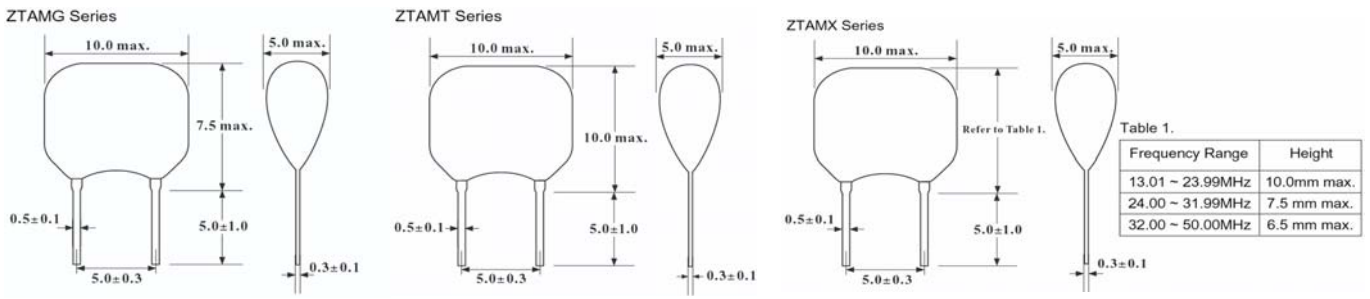
ZTA/MT

ZTA/MX

Specifications

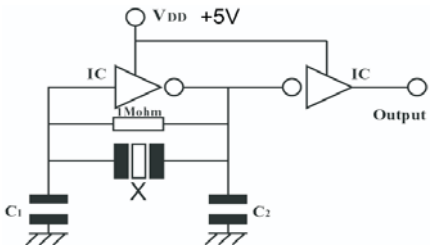
		ZTA						
Type		ZTA/MG	ZTA/MG	ZTA/MG	ZTA/MT	ZTA/MX	ZTA/MX	ZTA/MX
Frequency range (MHz)		1.79 ~ 2.99	3.00 ~ 3.49	3.50 ~ 8.00	8.00 ~ 13.00	13.01 ~ 20.0	20.01 ~ 25.99	26.00 ~ 50.00
Frequency accuracy (25°C)		±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
Temp. stability (-20°C - +80°C)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Aging (over 10 years)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Load capacitance (pF)	C1	30	30	30	30	30	15	5
	C2	30	30	30	30	30	15	5
Resonant Impedance (Ω) max.		80	50	30	25	30	30	30

Drawing



Dimensions in mm

Test circuit



C1 C2 : as listed

IC: 1/6 74HCU04 x 2 (MG; MX))

1/6 4069UBP x 2 (MT)

X : Ceramic Resonator

Order key

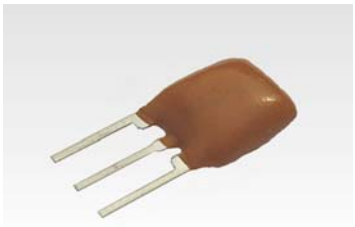
R	- 20.000000M	- ZTA/MX	- 0.5	- 0.3	- H	- 30/30
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**
R=Resonator	M=MHz	ZTA/MG ZTA/MT ZTA/MX	±% (25°C)	±% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

Resonator THT Ceramic, 3 Pin

RoHS 2002/95/EC

Features:

- Built-in capacitors
- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications



ZTT/MG

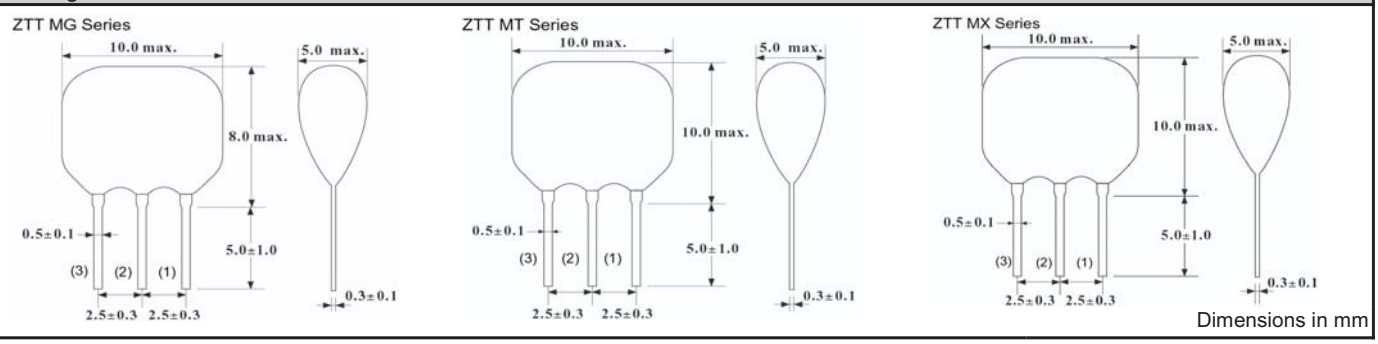
ZTT/MT

ZTT/MX

Specifications

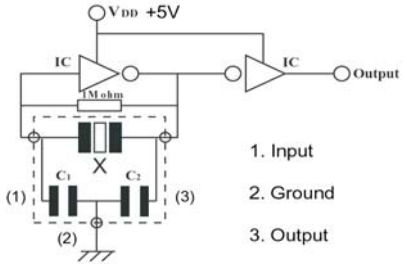
		ZTT						
Part		***ZTT/MG***	***ZTT/MG***	***ZTT/MG***	***ZTT/MT***	***ZTT/MX***	***ZTT/MX***	***ZTT/MX***
Frequency range (MHz)		1.84 ~ 2.99	3.00 ~ 3.49	3.50 ~ 8.00	8.00 ~ 13.00	13.01 ~ 20.00	20.01 ~ 25.99	26.00 ~ 50.00
Frequency accuracy (25°C)		±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %
Temperature stability (-20°C ~ +80°C)		±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %
Aging (over 10 years)		±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %
Build-in load capacistance (pF)	C1	30 ±20%	30 ±20%	30 ±20%	22 ±20%	30 ±20%	15 ±20%	5 ±20%
	C2	30 ±20%	30 ±20%	30 ±20%	22 ±20%	30 ±20%	15 ±20%	5 ±20%
Resonant impedance (Ω) max.		80	50	30	25	30	30	30

Drawing



Dimensions in mm

Test circuit



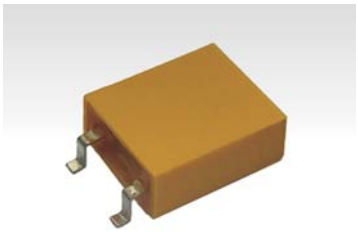
C1 C2 : as listed above
MG/MT IC : 1/6TC4069UBPx2
MX IC : 1/6TC74HCU04x2
X : Ceramic Resonator
VDD : +5V

Order key

R	**- 13.000000M**	**- ZTT/MT**	**- 0.5**	**- 0.3**	**- H**	**- 22/22**
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Internal load capacitance**
R=Resonator	M=MHz	ZTT/MG ZTT/MT ZTT/MX	±% (25°C)	±% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

Resonator SMD Ceramic, 2 Pin

RoHS 2002/95/EC



ZTB/Y

Features:

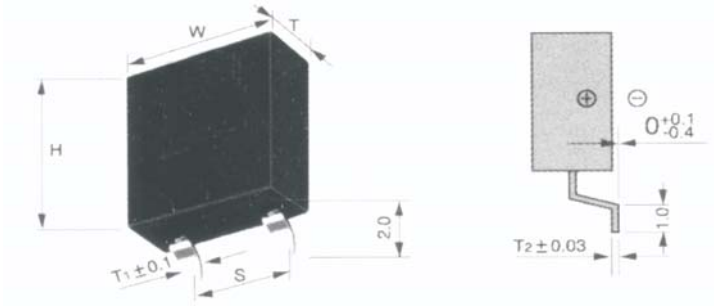
- Low cost
- Consumer electronics
- Microprocessor systems
- Automotive applications

Specifications

		ZTB/Y				
Frequency range (kHz)		375 ~ 429	430 ~ 509	510 ~ 699	700 ~ 999	1000 ~ 1250
Frequency accuracy (25°C)		±2kHz	±2kHz	±2kHz	±0.5%	±0.5%
Temp. stability (-20°C ~ +80°C)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Aging (over 10 years)		±0.3%	±0.3%	±0.3%	±0.3%	±0.3%
Load capacitance (pF)	C1	120	100	100	100	100
	C2	470	100	100	100	100
Resonant Impedance (Ω) max.		20	20	30	70	100

Drawing

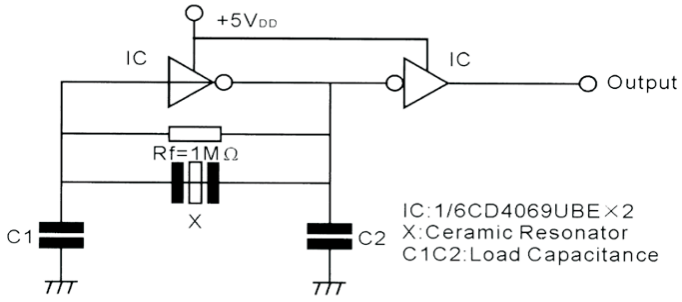
ZTB/Y



Frequency Range	Width (mm)	Thickness (mm)	Height (mm)	Lead Space (mm)	T1	T2
375~429	8.0	3.5	9.0	5.0	1.1	0.15
430~509	7.5	3.3	8.5	5.0	1.1	0.15
510~699	7.0	3.0	8.5	5.0	1.1	0.15
700~1250	5.0	2.2	6.0	2.5	0.8	0.12

Dimensions in mm

Test circuit



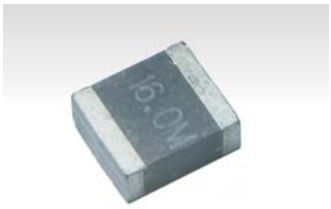
Order key

R	- 375.00K	- ZTB/Y	- 2.0	- 0.3	- H	- 120/470
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**
R=Resonator	K=KHz	ZTB/Y series	±KHz or % (25°C)	±% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

Resonator SMD Ceramic, 2 Pin

Features:

RoHS 2002/95/EC



ZTACC/MG

ZTACS/MT

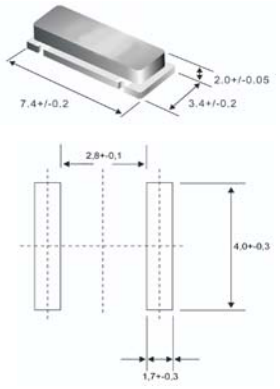
ZTACS/MX

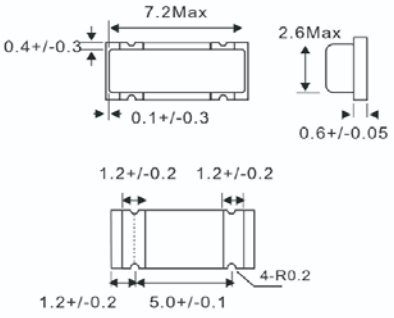
- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications

Specifications								
Part		*ZTACC/MG*	*ZTACC/MG*	*ZTACC/MG*	*ZTACS/MT*	*ZTACS/MX*	*ZTACS/MX*	*ZTACS/MX*
Frequency range (MHz)		1.84 ~ 2.99	3.00 ~ 3.49	3.50 ~ 8.00	8.00 ~ 13.00	13.01 ~ 20.00	20.01 ~ 25.99	26.00 ~ 50.00
Frequency accuracy (25°C)		+/- 0.5 %			+/- 0.5 %	+/- 0.5 %		
Temp. stability (-20°C ~ +80°C)		+/- 0.3 %			+/- 0.4 %	+/- 0.3 %		
Aging (over 10 years)		+/- 0.3 %			+/- 0.3 %	+/- 0.3 %		
Load capacitance (pF)	C1	30	30	30	30	30	15	5
	C2	30	30	30	30	30	15	5
Resonant impedance (Ω) max.		100	50	30	25	40	40	40

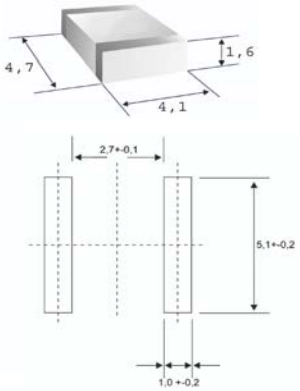
Drawing

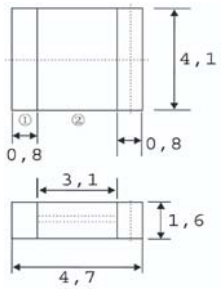
ZTACC





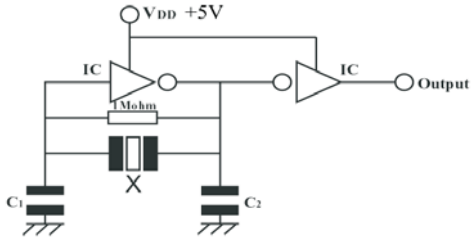
ZTACS





Dimensions in mm

Test circuit



C1 C2 : as listed
IC : 1/6 4069UBP x 2 (MG ; MT)
1/6 74HCU04 x 2 (MX)
X : Ceramic Resonator

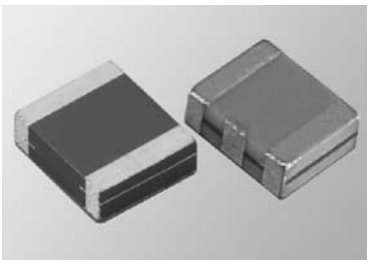
Order key

R	**- 5.000000M**	**- ZTACC/MG**	**- 0.5**	**- 0.3**	**- H**	**- 30/30**
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**
R=Resonator	M=MHz	ZTACC/MG ZTACS/MT ZTACS/MX	+/-KHz or % (25°C)	+/-% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

RoHS 2002/95/EC

Features:

- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications

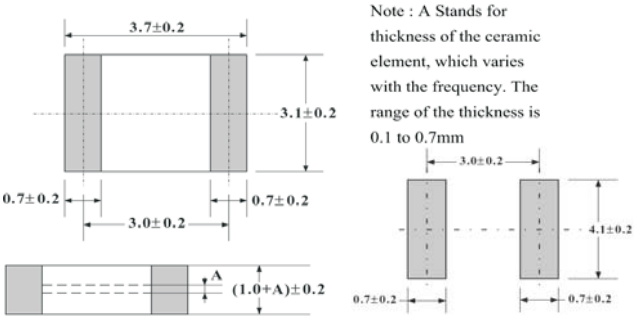


ZTACR/MG
ZTACV/MT
ZTACV/MX
ZTACW/MX

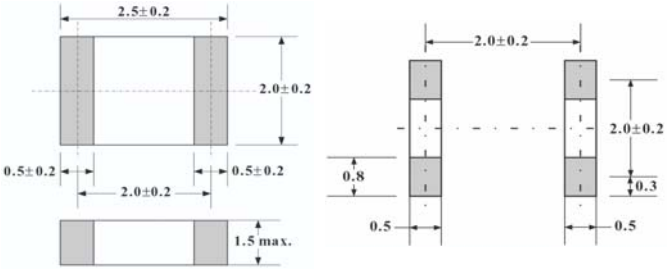
Specifications										
Part		ZTACR/MG	ZTACV/MT	ZTACV/MX			ZTACW/MX			
Frequency range (MHz)		4.00 ~ 8.00	8.0 ~ 13.0	13.01 ~ 20.0	20.01 ~ 25.99	26.0 ~ 50.0	20.01 ~ 25.99	26.00 ~ 35.00	35.01 ~ 48.00	
Frequency accuracy (25°C)		±0.5%	±0.5%	±0.5%			±0.5%			
Temp. stability (-20°C ~ +80°C)		±0.3%	±0.4%	±0.3%			±0.3%			
Aging (over 10 years)		±0.3%	±0.3%	±0.3%			±0.3%			
Load capacitance (pF)	C1	30	30	30	15	5	15	5	5	
	C2	30	30	30	15	5	15	5	5	
Resonant impedance (Ω) max.		40	25	40	40	40	60	50	50	

Drawing

ZTACV

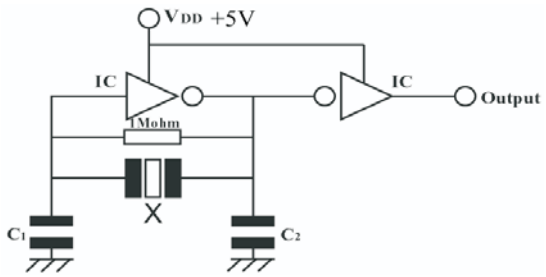


ZTACW



Dimensions in mm

Test circuit



C1 C2: as listed
IC: 1/6 4069UBP x 2 (MT,MG)
1/6 74HCU04 x 2 (MX)
X: Ceramic Resonator

Order key

R	- 15.000000M	- ZTACV/MX	- 0.5	- 0.3	- H	- 30/30
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Load capacitance**
R=Resonator	M=MHz	ZTACR/MG ZTACV/MT ZTACV/MX ZTACW/MX	+/-% (25°C)	+/-% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

Resonator SMD Ceramic, 3 Pin

Features:

RoHS 2002/95/EC

- Built-in capacitor
- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications

ZTTCC/MG

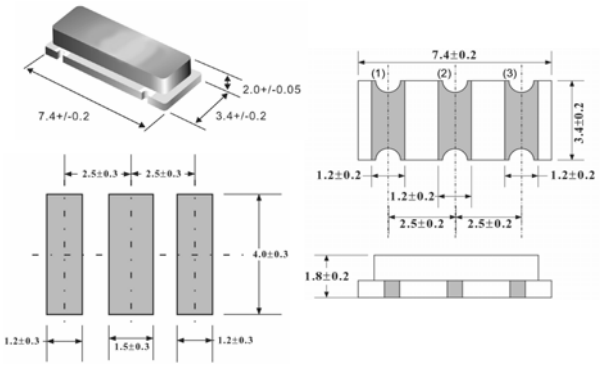
ZTTCS/MT

ZTTCS/MX

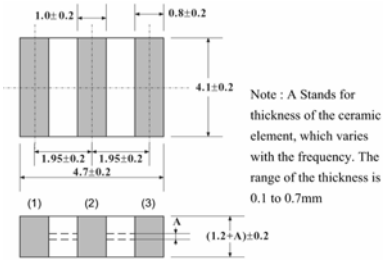
Specifications									
Part		*ZTTCC/MG*				*ZTTCS/MT*	*ZTTCS/MX*		
Frequency range (MHz)		1.84 ~ 2.40	2.41 ~ 2.99	3.00 ~ 3.49	3.50 ~ 8.00	8.0 ~ 13.0	13.01 ~ 16.0	16.01 ~ 40.00	40.01 ~ 50.00
Frequency accuracy (25°C)		+/-0.5%				+/-0.5%	+/-0.5%		
Temp. stability(-20°C~+80°C standard)		+/-0.3%				+/-0.4%	+/-0.3%		
Please ask for other specifications									
Aging (over 10 years)		+/-0.3%				+/-0.3%	+/-0.3%		
Build-in load capacitance (pf)	C1	33 ±20%	22 ±20%	22 ±20%	22 ±20%	22 ±20%	22 ±20%	15 ±20%	5 ±20%
Please ask for other specifications	C2	33 ±20%	22 ±20%	22 ±20%	22 ±20%	22 ±20%	22 ±20%	15 ±20%	5 ±20%
Resonant impedance (Ω) max.		100	100	50	30	25	40	40	40

Drawing

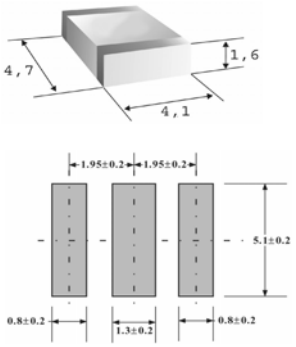
ZTTCC



ZTTCS

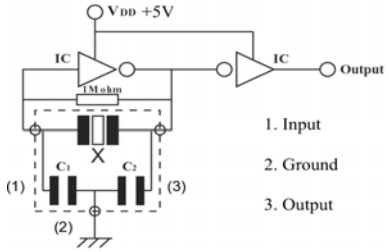


Note : A Stands for thickness of the ceramic element, which varies with the frequency. The range of the thickness is 0.1 to 0.7mm



Dimensions in mm

Test circuit



C1 C2 : as listed

IC : 1/6 4069UBP x 2 (MG ; MT)
1/6 74HCU04 x 2 (MX)

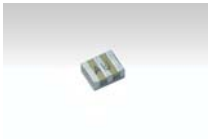
X : Ceramic resonator

Order key

R	**- 8.000000M**	**- ZTTCC/MG**	**- 0.5**	**- 0.3**	**- H**	**- 22/22**
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Internal load capacitance**
R=Resonator	M=MHz	ZTTCC/MG ZTTCS/MT ZTTCS/MX	+/-% (25°C)	+/-% (Temp. range)	H=-20°C ~ +80°C E=-40°C ~ +80°C	pF C1/C2
					Please ask for other specifications	

RoHS 2002/95/EC





ZTTCR/MG
ZTTCV/MT
ZTTCV/MX
ZTTCW/MX

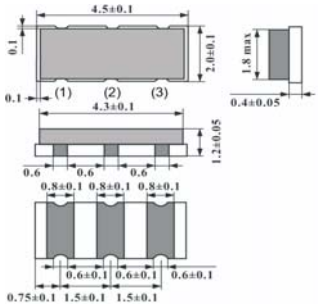
Features:

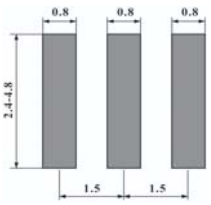
- Built-in capacitor
- Low cost
- Consumer electronics
- Microprocessor systems
- Excellent for automotive applications

Specifications									
Part		ZTTCR/MG	ZTTCV/MT	ZTTCV/MX	ZTTCV/MX	ZTTCV/MX	ZTTCW/MX	ZTTCW/MX	ZTTCW/MX
Frequency range (MHz)		4.00 ~ 8.00	8.00 ~ 13.00	13.01 ~ 16.00	16.01 ~ 40.00	40.01 ~ 50.00	20.00 ~ 25.99	26.00 ~ 35.00	35.01 ~ 48.00
Frequency accuracy (25°C)		±0.5%	±0.5%	±0.5%			±0.5%		
Temp. stability (-20°C ~ +80°C)		±0.3%	±0.3%	±0.3%			±0.3%		
Build in load capacitance (pF)	C1	15 ±20%	20 ±20%	20 ±20%	10 ±20%	5 ±20%	5 ±20%	5 ±20%	5 ±20%
	C2	15 ±20%	20 ±20%	20 ±20%	10 ±20%	5 ±20%	5 ±20%	5 ±20%	5 ±20%
Aging (over 10 years) %		±0.3%	±0.3%	±0.3%			±0.3%		
Resonant impedance (Ω) max.		40	25	60	40	40	60	50	50

Drawing

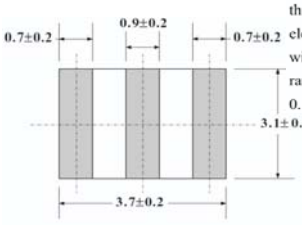
ZTTCR



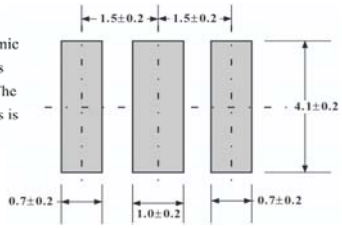


Recommended land pattern

ZTTCV



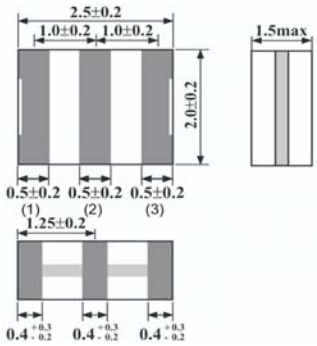
Note : A Stands for thickness of the ceramic element, which varies with the frequency. The range of the thickness is 0.1 to 0.7mm

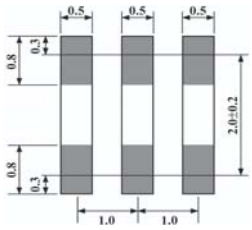


Recommended land pattern

Dimensions in mm

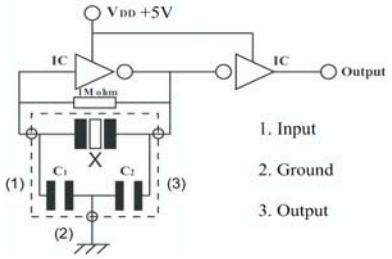
ZTTCW





Recommended land pattern

Test circuit



C1 C2 : as listed
IC : 1/6 4069UBP x 2 (MG ; MT)
1/6 74HCU04 x 2 (MX)
X : Ceramic resonator

Order key

R	- 30.000000M	- ZTTCW/MX	- 0.5	- 0.3	- H	- 5/5
Part	**Frequency**	**Type/Package**	**Frequency tolerance**	**Temperature tolerance**	**Temperature range**	**Internal load capacitance**
R=Resonator	M=MHz	ZTTCR/MG ZTTCV/MT ZTTCV/MX ZTTCW/MX	±% (25°C)	±% (Temp. range)	H=-20°C ~ +80°C	pF C1/C2

RoHS 2002/95/EC

Features:

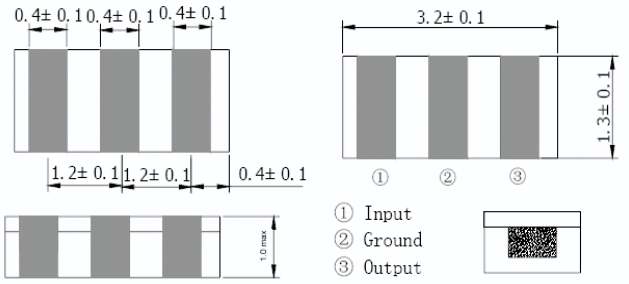
- Built-in capacitors
- Low cost
- Consumer electronics
- Microprocessor systems

ZTTCE/MG

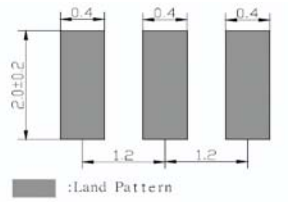
Specifications		
Part		*ZTTCE*
Frequency range (MHz)		8.00 ~ 12.00
Frequency accuracy (25°C)		±0.5 %
Temp. stability (-20°C ~ +80°C)		±0.3 %
Aging (over 10 years)		±0.2 %
Build-in load capacitance (pf)	C1	15 ±20 %
	C2	15 ±20 %
Resonant impedance (Ω) max.		40

Drawing

ZTTCE/MG

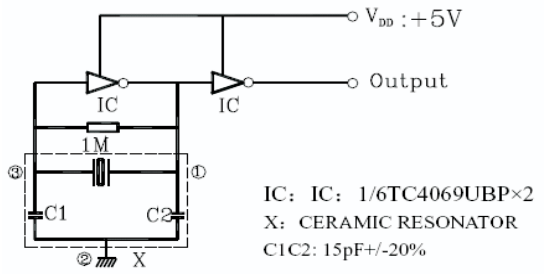


Recommended land pattern



Dimensions in mm

Test circuit



Order key

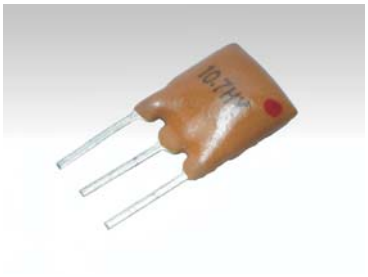
R	-	8.000000M	-	ZTTCE /MG	-	0.5	-	0.3	-	H	-	15/15
Part		**Frequency**		**Type/Package**		**Frequency tolerance**		**Temperature tolerance**		**Temperature range**		**Internal load capacitance**
R=Resonator		M=MHz		ZTTCE		±% (25°C)		±% (Temp. range)		H=-20°C ~ +80°C		pF C1/C2

Filter THT, Ceramic

RoHS 2002/95/EC

Features:

- Series LT or LT A10
- Consumer electronics
- Individual specification: A5, S2, S3 or J



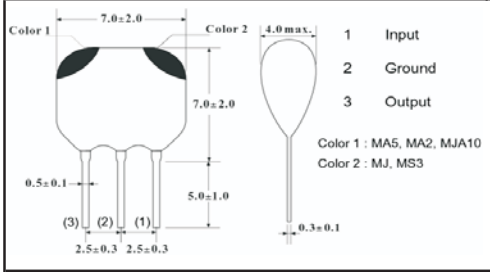
LT

LT/A10

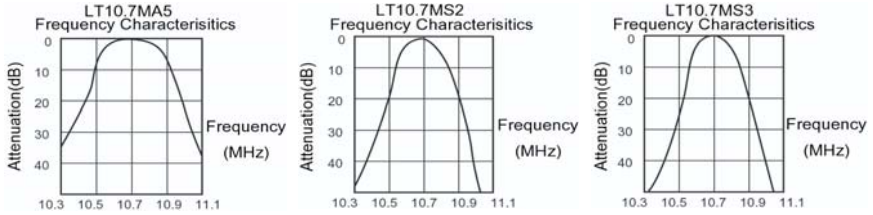
Specifications				
Part	*LT*			
	A5-	**S2-**	**S3-**	**J-**
3db band width (kHz)	280 ±50	230 ±50	180 ±40	150 ±40
20db band width (kHz) max	650	600	520	400
Insertion loss (dB) max	6	6	7	10
Spurious attenuation (9 ~ 12MHz) (dB) min	30	40	40	38
Input/output impedance (Ohm)	330	330	330	330

Specifications				
Part	*LT/A10*			
	A10-A5	**A10-S2**	**A10-S3**	**A10-J**
3db band width (kHz)	280 ±50	230 ±50	180 ±40	150 ±40
20db band width (kHz) max	590	520	470	360
Insertion loss (dB) max	2.5 ±2.0	3.0 ±2.0	3.5 ±1.5	4.5 ±2.0
Spurious attenuation (9 ~ 12MHz) (dB) min	30	35	35	35
Input/output impedance (Ohm)	330	330	330	330

Drawing

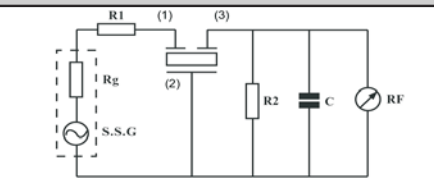


Characteristics



Dimensions in mm

Test circuit



Rg+R1=R2= Input / Output Impedance
C = 10pF
(Including Stray capacitance and input Capacitance of RF voltmeter)

Color code

Center Frequency	Code	Color
10.700MHz±30KHz	A	Red
10.670MHz±30KHz	B	Blue
10.730MHz±30KHz	C	Orange
10.640MHz±30KHz	D	Black
10.760MHz±30KHz	E	White

Order key

F	**- LT**	**- A5**	**- 10.700 M**	**-**
Part	**Package**	**Individual specification**	**Center frequency** **M = MHz. K = KHz**	**Option**
F= Ceramic filter	LT	A5	10.700 MHz (= A = Red)	blank = standard
	LT/A10	S2	10.670 MHz (= B = Blue)	
		S3	10.730 MHz (= C = Orange)	
		J	10.640 MHz (= D = Black)	
			10.760 MHz (= E = White)	
			450 ~ XXX ~ 470 KHz	X=Special options

RoHS 2002/95/EC

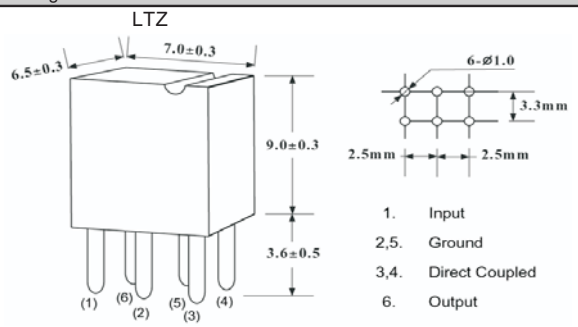
LTZ-series

Features:

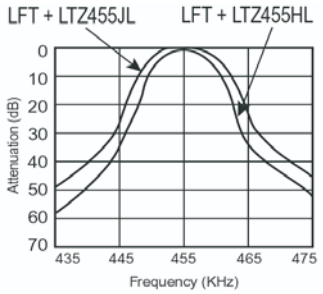
- Six pins filter
- For AM
- 450 ~ 470 KHz

Specifications			
Part		*LTZ*	
		HL	**JL**
3db band width (kHz) min		4.0	5.5
Selectivity (dB) min	±9KHz off	23	18
Insertion loss (dB) max		7.0	7.0
Composition		2 elements direct coupling type	2 elements direct coupling type

Drawing

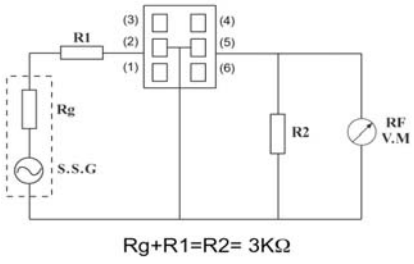


Characteristics



Dimensions in mm

Test circuit



Rg+R1=R2= 3KΩ

Recommended IFT (7mm square)

Item \ Type	LTZ455HL/JL		
Winding Specification (From bottom)	①~②	②~③	④~⑥
	68T	84T	14T
Unloaded Qu	90		
Tuning Capacity	180PF		

Order key

F	**- LTZ**	**- HL**	**- 465 K**	**-**
Part	**Package**	**Individual specification**	**Center frequency** **K** = KHz	**Option**
F= Ceramic filter	LTZ	HL JL	450 ~ XXX ~ 470 KHz	blank = standard X=Special options

RoHS 2002/95/EC

LTP-series

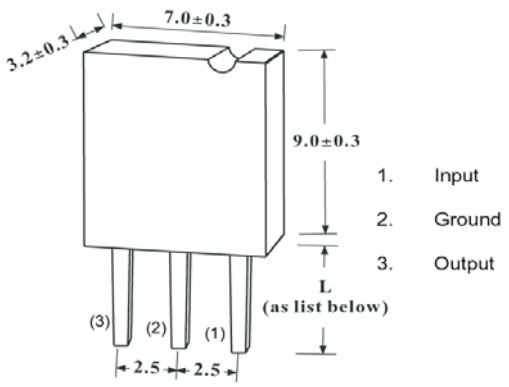
Features:

- Three pins filter
- For AM
- 450 ~ 470 KHz

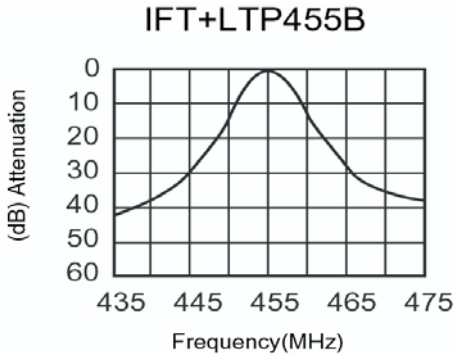
Specifications					
Part		*LTP*			
		A	**B**	**BY**	**BY1**
3db band width (kHz) min		9.5 ±3	9.5 ±3	7 ±2	4.5 ±1.5
Selectivity (dB) min	-9KHz off	5.0	5.0	6.0	9.0
	+9KHz off	3,0	3,0	5,0	8,0
Insertion loss (dB) max		5,0	5,0	5,0	5,0
Composition		one element	one element with IFT	one element with IFT	one element with IFT
Lead length L (mm) +/-0.5	L1	3.6	3.6	3.6	3.6
	L2	5.0	5.0	5.0	5.0

Drawing

LTP

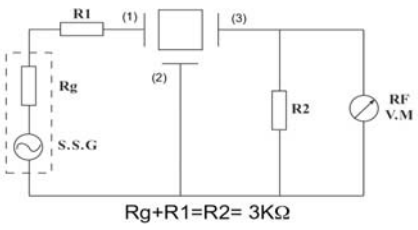


Characteristics



Dimensions in mm

Test circuit



Rg+R1=R2= 3KΩ

Recommended IFT (7mm square)

Item \ Type	LTP455B		
Winding Specification	①~②	②~③	④~⑥
From bottom	70T	115T	7T
Unloaded Qu	105		
Tuning Capacity	180PF		

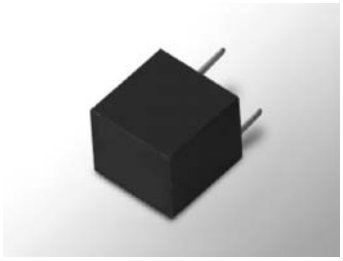
Order key

F	**- LTP**	**- BY**	**- 455 K**	**-**
Part	**Package**	**Individual specification**	**Center frequency** **K** = KHz	**Option**
F= Ceramic filter	LTP	A	450 ~ XXX ~ 470 KHz	blank = standard
		B		L1= 3.6
		BY		L2= 5.0
		BY1		X=Special options

RoHS 2002/95/EC

Features:

- For communication
- 4 elements
- 450/455 KHz



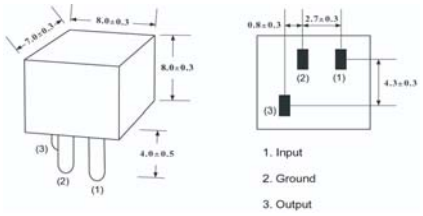
LT 450/455 U series

Specifications	LT450									
Part number	**LT450AU**	**LT450BU**	**LT450CU**	**LT450DU**	**LT450EU**	**LT450FU**	**LT450GU**	**LT450HU**	**LT450IU**	**LT450HTU**
Center frequency (kHz)	450±2.0	450±2.0	450±2.0	450±1.5	450±1.5	450±1.5	450±1.5	450±1.0	450±1.0	450±1.0
Insertion loss (dB) max	4	4	4	4	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LT450/U f_o±100kHz (dB) min	28	28	28	28	28	28	28	28	28	35
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

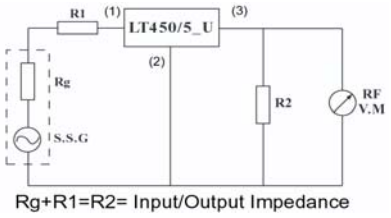
Specifications	LT455									
Part number	**LT455AU**	**LT455BU**	**LT455CU**	**LT455DU**	**LT455EU**	**LT455FU**	**LT455GU**	**LT455HU**	**LT455IU**	**LT455HTU**
Center frequency (kHz)	455±2.0	455±2.0	455±2.0	455±1.5	455±1.5	455±1.5	455±1.5	455±1.0	455±1.0	455±1.0
Insertion loss (dB) max	4	4	4	4	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LT455/U f_o±100kHz (dB) min	28	28	28	28	28	28	28	28	28	35
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

Drawing

LT 450/455 U



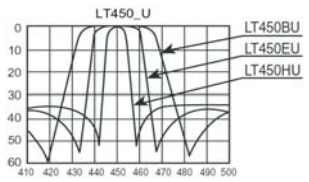
Test circuit

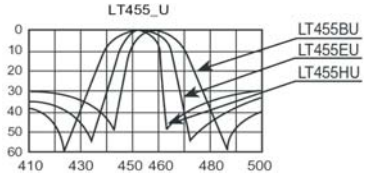


Rg+R1=R2= Input/Output Impedance

Dimensions in mm

Characteristics





Order key

F	**- LT 450**	**- AU**		**-**
Part	**Package**	**Individual specification**		**Option**
F= Ceramic filter	LT 450	AU	FU	blank = standard
	LT 455	BU	GU	
		CU	HU	
		DU	IU	
		EU	HTU	X=Special options

RoHS 2002/95/EC

LTM 450/455 U series

Features:

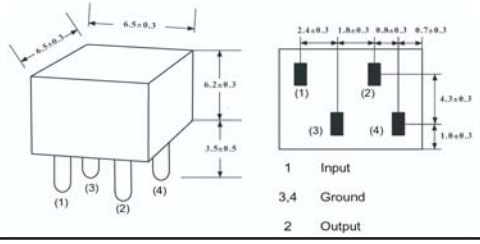
- For communication
- 4 elements
- 450/455 KHz

Specifications	LTM 450									
Part number	**AU**	**BU**	**CU**	**DU**	**EU**	**FU**	**GU**	**HU**	**IU**	**HTU**
Center frequency (kHz)	450±2.0	450±2.0	450±2.0	450±1.5	450±1.5	450±1.5	450±1.5	450±1.0	450±1.0	450±1.0
Insertion loss (dB) max	4	4	4	6	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LTM450U f_o±100kHz (dB) min	28	28	28	28	28	28	28	28	28	35
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

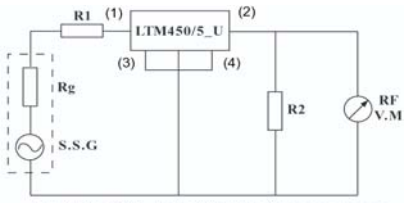
Specifications	LTM 455									
Part number	**AU**	**BU**	**CU**	**DU**	**EU**	**FU**	**GU**	**HU**	**IU**	**HTU**
Center frequency (kHz)	455±2.0	455±2.0	455±2.0	455±1.5	455±1.5	455±1.5	455±1.5	455±1.0	455±1.0	455±1.0
Insertion loss (dB) max	4	4	4	6	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LTM455U f_o±100kHz (dB) min	28	28	28	28	28	28	28	28	28	35
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

Drawing

LTM 450/455 U



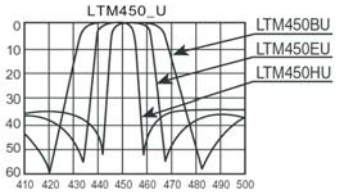
Test circuit

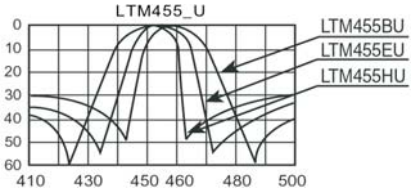


Rg+R1=R2= Input/Output Impedance

Dimensions in mm

Characteristics





Order key

F	**- LTM 450**	**- AU**		**-**
Part	**Package**	**Individual specification**		**Option**
F= Ceramic filter	LTM 450	AU	FU	blank = standard
	LTM 455	BU	GU	
		CU	HU	
		DU	IU	
		EU	HTU	X=Special options

RoHS 2002/95/EC

LT 450/455 W series

Features:

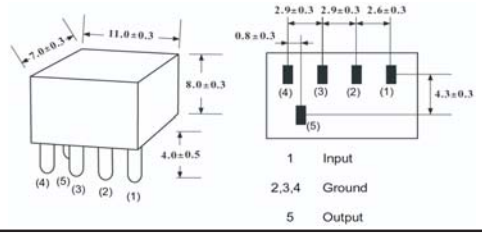
- For communication
- 6 elements
- 450/455 KHz

Specifications	LT 450									
Part number	**LT450AW**	**LT450BW**	**LT450CW**	**LT450DW**	**LT450EW**	**LT450FW**	**LT450GW**	**LT450HW**	**LT450IW**	**LT450HTW**
Center frequency (kHz)	450±2.0	450±2.0	450±2.0	450±1.5	450±1.5	450±1.5	450±1.5	450±1.0	450±1.0	450±1.0
Insertion loss (dB) max	4	4	4	4	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LT450/W f_o±100kHz (dB) min	40	40	40	40	40	40	40	40	40	60
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

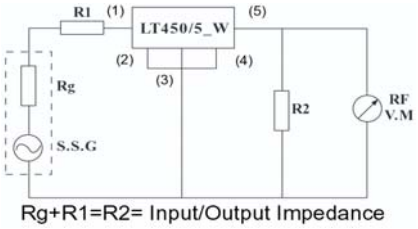
Specifications	LT 455									
Part number	**LT455AW**	**LT455BW**	**LT455CW**	**LT455DW**	**LT455EW**	**LT455FW**	**LT455GW**	**LT455HW**	**LT455IW**	**LT455HTW**
Center frequency (kHz)	455±2.0	455±2.0	455±2.0	455±1.5	455±1.5	455±1.5	455±1.5	455±1.0	455±1.0	455±1.0
Insertion loss (dB) max	4	4	4	4	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LT455/W f_o±100kHz (dB) min	40	40	40	40	40	40	40	40	40	60
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

Drawing

LT 450/455 W



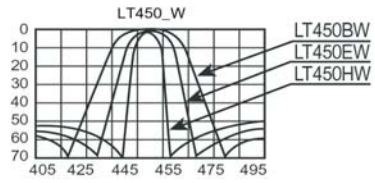
Test circuit

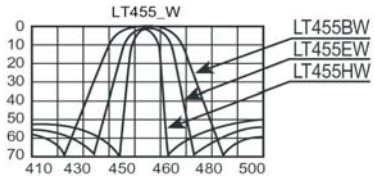


Rg+R1=R2= Input/Output Impedance

Dimensions in mm

Characteristics





Order key

F	**- LT 450**	**- AW**		**-**
Part	**Package**	**Individual specification**		**Option**
F= Ceramic filter	LT 450	AW	FW	blank = standard
	LT 455	BW	GW	
		CW	HW	
		DW	IW	
		EW	HTW	X=Special options

Filter THT, Ceramic

RoHS 2002/95/EC

LTM 450/455 W series

Features:

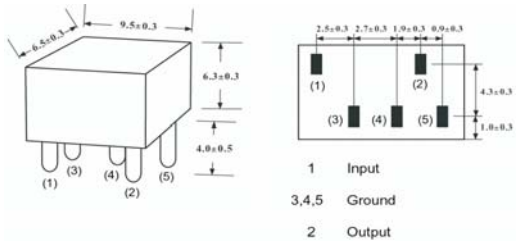
- For communication
- 6 elements
- 450/455 KHz

Specifications	LTM 450									
Part number	**AW**	**BW**	**CW**	**DW**	**EW**	**FW**	**GW**	**HW**	**IW**	**HTW**
Center frequency (kHz)	450±2.0	450±2.0	450±2.0	450±1.5	450±1.5	450±1.5	450±1.5	450±1.0	450±1.0	450±1.0
Insertion loss (dB) max	4	4	4	6	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LTM450W f_o±100kHz (dB) min	40	40	40	40	40	40	40	40	40	60
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

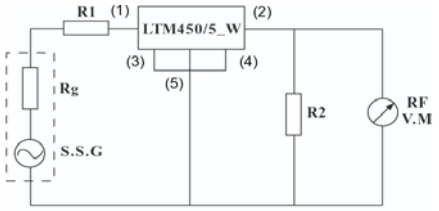
Specifications	LTM 455									
Part number	**AW**	**BW**	**CW**	**DW**	**EW**	**FW**	**GW**	**HW**	**IW**	**HTW**
Center frequency (kHz)	455±2.0	455±2.0	455±2.0	455±1.5	455±1.5	455±1.5	455±1.5	455±1.0	455±1.0	455±1.0
Insertion loss (dB) max	4	4	4	6	6	6	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±17.5	±15	±12.5	±10	±7.5	±6	±4.5	±3	±2	±3
40dB bandwidth (kHz) max	±40	±30	±24	±20	±15	±12.5	±10	±9	±7.5	±9
Spurious Attenuation LTM455W f_o±100kHz (dB) min	40	40	40	40	40	40	40	40	40	60
Input/output impedance (Ohm)	1000	1500	1500	1500	1500	2000	2000	2000	2000	2000

Drawing

LTM 450/455 W

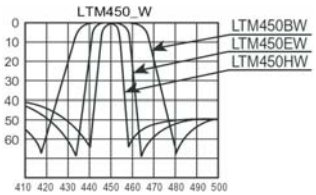


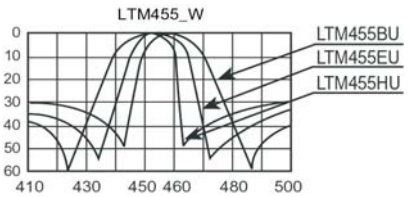
Test circuit



Dimensions in mm

Characteristics





Order key

F	**- LTM 450**	**- AW**		**-**
Part	**Package**	**Individual specification**		**Option**
F= Ceramic filter	LTM 450	AW	FW	blank = standard
	LTM 455	BW	GW	
		CW	HW	
		DW	IW	
		EW	HTW	X=Special options

RoHS 2002/95/EC

LTCA
LTCV

Features:

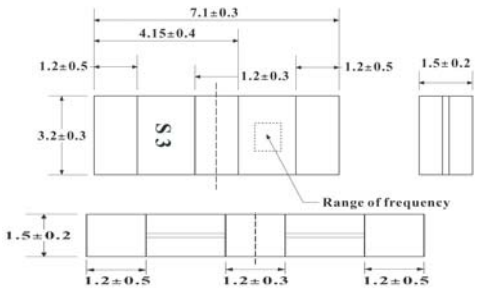
- Series CA or CV
- Consumer electronics
- Individual specification: A5, S2, S3 or J

Specifications					
Part	*LTCA*				
	A5-	S2-	S3-	J-	HY
3db band width (kHz)	280 ±50	230 ±50	180 ±40	150 ±40	110 ±30
20db band width (kHz) max	650	570	520	430	350
Insertion loss (dB) max	6	6	6	10	9
Spurious attenuation (9 ~ 12MHz) (dB) min	30	30	30	30	30

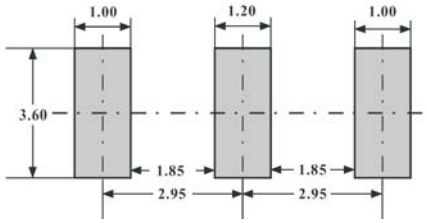
Specifications					
Part	*LTCV*				
	A5-	S2-	S3-	J-	HY
3db band width (kHz)	280 ±50	230 ±50	180 ±40	150 ±40	110 ±30
20db band width (kHz) max	590	510	470	380	320
Insertion loss (dB) max	3.0 ±2.0	3.5 ±2.0	4.0 ±2.0	5.5 ±2.0	6.0 ±2.0
Spurious attenuation (9 ~ 12MHz) (dB) min	35	35	35	35	35

Drawing

LTCA / LTCV

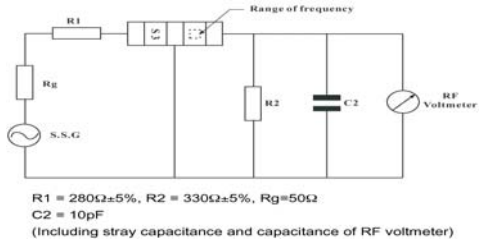


Recommended land pattern



Dimensions in mm

Test circuit



R1 = 280Ω±5%, R2 = 330Ω±5%, Rg=50Ω
C2 = 10pF
(Including stray capacitance and capacitance of RF voltmeter)

Color code

Center Frequency	Code	Color
10.700MHz±30KHz	A	Red
10.670MHz±30KHz	B	Blue
10.730MHz±30KHz	C	Orange
10.640MHz±30KHz	D	Black
10.760MHz±30KHz	E	White

Order key

F	- LTCA	- A5	- 10.700 M	-
Part	**Package**	**Individual specification**	**Center frequency** **M = MHz.**	**Option**
F= Ceramic filter	LTCA	A5	10.700 MHz (= A = red)	blank = standard
	LTCV	S2	10.670 MHz (= B = blue)	
		S3	10.730 MHz (= C = orange)	
		J	10.640 MHz (= D = black)	
			10.760 MHz (= E = white)	
				X=Special options

RoHS 2002/95/EC

LTCS

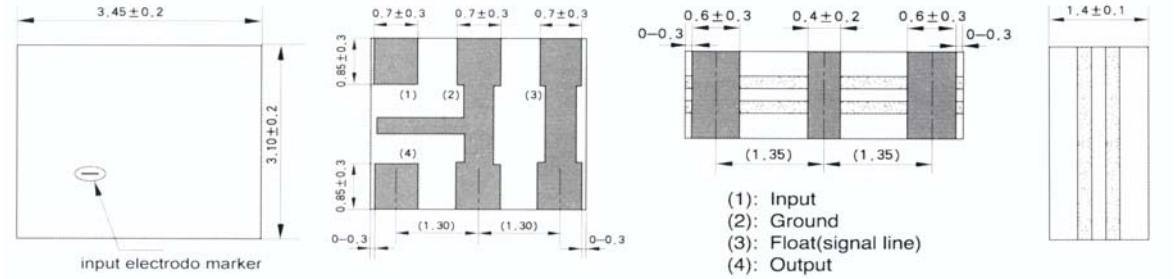
Features:

- 10.7 MHz
- Low cost
- Cosumer electronics

Specifications				
Part	S3	S2	A5	A20
3 db band width (kHz)	180 ±40	230 ±50	280 ±50	330 ±50
20 db band width (kHz) max	470	510	590	700
Insert loss (dB)	4.5 ±2.0	3.5 ±2.0	3.0 ±2.0	3.0 ±2.0
Spurious attenuation (9-12MHz)(dB)min	30	30	30	30

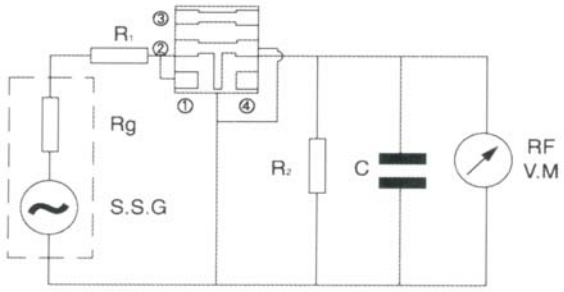
Drawing

LTCS



Dimensions in mm

Test circuit



① Input
② Ground
③ Float
④ Output

Rg+R1=R2=330Ω
C=10PF
(Including stray capacitance and input capacitance of RF voltmeter)

Order Key			
F	**-LTCS**	**-A**	**-10.700 M**
Part	Package	Individual specification	Center frequency
F= Ceramic Filter	LTCS	S3	M=MHz
		S2	
		A5	
		A20	

RoHS 2002/95/EC

LTC 450/455 U
LTC 450/455 W
series

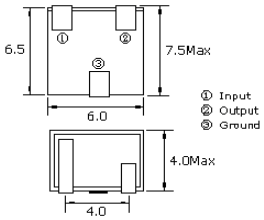
Features:

- 450 / 455 kHz
- For communications
- Can be reflow soldered
- Mountable by automatic placers
- Slim and small mounting area

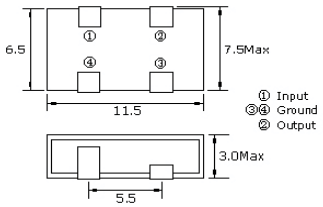
Spezifications	LTC455U/W							
Part number	LTC455BU/BW	LTC455CU/CW	LTC455DU/DW	LTC455EU/EW	LTC455FU/FW	LTC455GU/GW	LTC455HU/HW	LTC455IU/IW
Center frequency (kHz)	455±1.5	455±1.5	455±1.5	455±1.5	455±1.5	455±1.5	455±1.5	455±1.5
Insertion loss (dB) max LTC/U	4	4	4	6	6	6	6	6
Insertion loss (dB) max LTC/W	4	4	4	4	6	6	6	6
Pass band ripple (dB) max	2	2	2	2	2	2	2	2
6dB bandwidth (kHz) min	±15.0	±12.5	±10.0	±7.5	±6.0	±4.5	±3.0	±2.0
40dB bandwidth (kHz) min	±30.0	±25.0	±20.0	±15.0	±12.0	±10.0	±9.0	±7.5
50dB bandwidth (kHz) min	±30.0	±25.0	±20.0	±15.0	±12.0	±10.0	±9.0	±7.5
Spurious Attenuation LTC/U 455±100kHz (dB) min	27	27	27	27	27	25	25	25
Spurious Attenuation LTC/W 455±100kHz (dB) min	50	50	50	50	47	47	47	47
Input/Output impedance (Ohm)	1000	1000	1500	1500	1500	1500	1500	1500

Drawing

LTC455/U

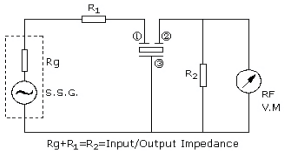


LTC455/W

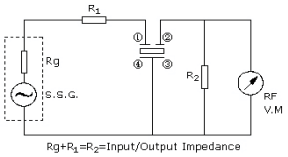


Test circuit

LTC455/U

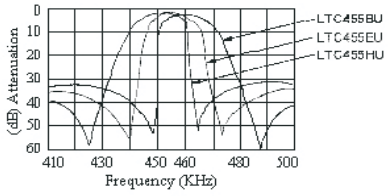


LTC455/W

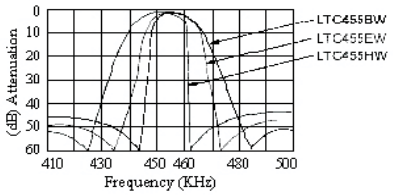


Characteristics

LTC455/U



LTC455/W



Order key

F	-LTC455	-BU	-
Part	Package	Individual specification	Option
F=Ceramic Filter	LT450	BU / BW	blanc = standard
	LT455	CU / CW	
		DU / DW	
		EU / EW	
		FU / FW	
		GU / GW	
		HU / HW	
		IU / IW	X = Spezial options

One-port resonator

Specifications		
		Remarks
Center frequency (MHz)	260 / 300 / 303.825 / 303.875 / 304.3 310 / 311 / 314.5 / 315 / 316.8 / 318 330 / 340 / 345 / 350 / 351 / 360 / 390 395 / 395.5 / 396 / 403.55 / 407.3 418 / 420 / 441 / 423.22 / 430.5 430.65 / 433.42 / 433.92 / 435.72 479.5 / 674 / 790 / 852 / 902.3 / 907 912 / 915 / 916.5 / 925 / 980...	Others are offered
Frequency tolerance	±75/±150/±250 KHz	
Insertion loss	<= 2dB	
Unloaded Q	12.000	Typ
50 Ohm loaded Q	2.000	Typ
Operating temperature	-10°C ~ +60°C	
Storage temperature	-45°C ~ +85°C	
Packages available	ST9133, ST9133/2, ST1145, ST1272 SS1145, SS5030, SS5050, SS3838, SS3030/6	Please see page 9.6 *Different packages* !

Two-port resonator

Specifications		
		Remarks
Center frequency (MHz)	Phase-shift 180°: 300 / 384.05 / 387 / 403.55 / 418 / 423.22 433.92 / 824.25 / 913.5 / 674 / 790 / 852 / 868 902.3 / 907 / 912 / 915 / 916.5 / 925 / 950 / 1030	Others are offered
	Phase-shift 0°: 669.5 / 800 / 915.....	
Frequency tolerance	±75/±150/±250 KHz	
Insertion loss	<= 6dB	Typ
Unloaded Q	13.000	Typ
50 Ohm loaded Q	6.000	Typ
Operating temperature	-10°C ~ +60°C	
Storage temperature	-45°C ~ +85°C	
Packages available	ST9133, ST9133/2, ST1145, ST1272 SS1145, SS5030, SS5050, SS3838, SS3030/6	Please see page 9.6 *Different packages* !

Front-end filter

Specifications		
		Remarks
Center frequency (MHz)	315 / 345 / 418 / 424.825 / 433.92 824.25 / 868.35 / 902.3 / 913.5 / 916.5...	Others are offered
Insertion loss	5,5dB	Max
3dB bandwidth	600/1200 KHz	Typ
Ultimate rejection	60dB	Min
Packages available	ST9133, ST9133/2, ST1145, ST1272 SS1145, SS5030, SS5050, SS3838, SS3030/6	Please see page 9.6 *Different packages* !

Bandpass-filter for DVB, DAB and VOD

Specifications				
Center frequency (MHz)	Bandwidth (MHz)	Standard	Package	Remarks
23.40	1.8	DAB	ST1428	
36.00	8.1	DVB-T	ST1428	
	8.0	Dig. CATV	*	
36.125	8.0	Dig. CATV	ST1428	
	8.0	Dig. CATV	*	
37.00	6.0	Dig. CATV	*	
37.70	1.4	DAB	*	
38.912	1.5	DAB	*	
41.25	0.9	DAB	*	
42.00	6.0	Dig. CATV	*	
43.00	6.0	Dig. CATV	*	
43.75	6.2	Dig. CATV	ST1428	Please see page 9.6
	6.0	Dig. CATV	*	Different packages!
	6.0	Dig. CATV	ST1428	
43.80	6.0	Dig. CATV	*	
	6.0	Dig. CATV	*	
	6.0	Dig. CATV	*	
44.00	6.0	Dig. CATV	ST1428	
	6.0	Dig. CATV	*	
	6.2	Dig. CATV	ST1428	
	1.8 / 1.1	DVB-DAVIC	*	
	1.7	Interactive TV	*	
	8.0	Dig. CATV	*	
46.59	6.0	Dig. CATV	*	
49.125	0.72	DAB	*	
54.00	6.0	Dig. CATV	*	
70.00	1.0	Dig. CATV	*	
	10.4	DVB-S	*	
1090	±6	Digital TV	SS3838	
1220	±4	Digital TV	SS3838	

* = For detailed informations concerning packages and drawing of measurement please contact us!

SAW filter for satellite-receiver

Specifications				
				Remarks
Center frequency (MHz)	**480**	**479.5**	**480**	
Insertion Loss (dB)	21 22.5 22.5 22.5	21.8 / 22 22 / 22.5 24.5 / 23.6	22 / 27.5	
-3dB bandwidth (MHz)	18 27.5 36 27.5	15 / 27 18 / 27 27 / 36	26.8 / 53.6	
Application: One channel satellite receiver DSB Two channel satellite receiver DSB	X	X	X	
Packages available	ST9133, ST9133/2, ST1145, SS5050			Please see page 9.6 *Different packages!*

SAW resonator for RF-modulator

Specifications				
Center frequency (MHz)	Frequency (KHz)	Insertion loss (dB)	Package	*Remarks*
49.74/57.74	±80	5.0 max	ST1272/2	
65.74/77.24		4.0 max		
77.24/85.24				
55.24/61.24		5.0 max (55.24 MHz)		
		4.0 max (61.24 MHz)		
61.24/67.24		4.0 max		
55.24/62.24				
46.24/57.24		6.0 max (46.24 MHz)		
		4.0 max (57.24 MHz)		
91.24/97.24		3.2 max		
211.24	±120	2.5 max		
535.25	±250	1.5 max		
607.25				
615.25		2.5 max	ST9133	Please see page 9.6
687.25				*Different packages!*

SAW filter for pager

Specifications							
Center frequency (MHz)	139.0	147.0	155.0	163.0	171.0	281.0	930.5
-3dB bandwidth (MHz)	±4.0	±4.0	±4.0	±4.0	±4.0	±3.0	±2.0
Insertion loss (dB)							
fc - 100 MHz to fc - 38.8 MHz	50 min	50 min	50 min	50 min	50 min	50 min	50 min
fc ±4.0 MHz	6.5 max	6.5 max	6.5 max	6.5 max	6.5 max		
fc ±3.0 MHz						4.5 max	
fc ±2.0 MHz							4.5 max
fc +38.8 MHz to fc +100 MHz	50 min	50 min	50 min	50 min	50 min	50 min	50 min
fc ±38.8 MHz to fc X2.5	42 min	42 min	42 min	42 min	42 min	42 min	42 min
Input/output impedance (Ohm/pF)	210/-13.3	210/-12.12	210/-12.3	210/-11.0	210/-10.9	150/0.0	50/5.0
Package	*	*	*	*	*	*	*

* = For detailed informations concerning packages and drawing of measurement please contact us!

SAW filter for wireless LAN and bluetooth

Specifications									
Center frequency (MHz)	110	240	260	280	325	352	371	374	1240
-1,5 dB bandwidth (MHz)	4.0	10.0	1.1	19.8	2.0	5.6	2.0	22.0	20.0
Insertion loss (dB)	6.8	14.0	8.5	7.0	13.0	2.0	10.5	9.0	2.9
Package	ST1145, ST1272, SS5050								
Remarks	Please see page 9.6: *Different packages* !								

SAW filter for cordless telephone

Specifications									
Center frequency (MHz)	422.18	433.91	465.14	886	914.5	915	926.25	931	959.5
1,5dB bandwidth (MHz)	12	12.3	10.9	10.2	10.3	32	11.3	9.4	10.2
Insertion loss (dB)	2.5	2.5	2.5	3.0	2.7	2.5	3.5	3.0	2.8
Package	ST1145, SS5050, SS3030/6								
Remarks	Please see page 9.6: *Different packages* !								

SAW duplexer for cordless telephone

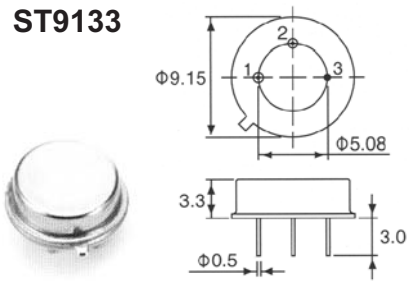
Specifications				
Center frequency (MHz)	26.40/41.40	31.175/40.075	40.68/49.86	45.24/48.24
Insertion loss (dB)	8.5/5.0	6.0/5.0	4.5/4.5	6.0/6.0
Attenuation (dB)	40	40	40	40
Package	*	*	*	*
Remarks	Please see page 9.6: *Different packages* !			

* = For detailed informations concerning packages and drawing of measurement please contact us!

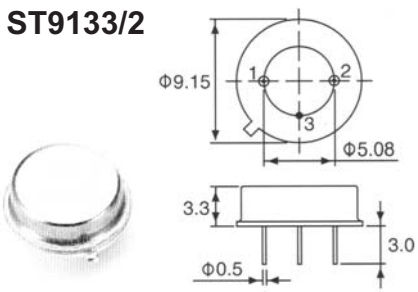
Specifications				
Center frequency (MHz)	46.75/49.83	886/931	903.75/926.25	914.5/959.5
Insertion loss (dB)	4.0/4.0	3.6/3.6	3.5/3.5	3.0/3.0
Attenuation (dB)	40	40	40	40
Package	ST9133/2	ST9133/2	SS5050	SS3838
Remarks	Please see page 9.6: *Different packages* !			

SAW different packages

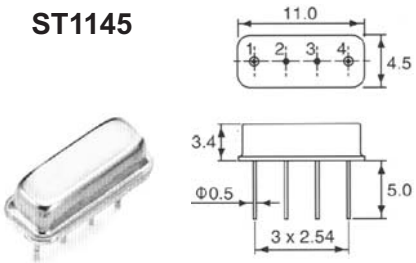
ST9133



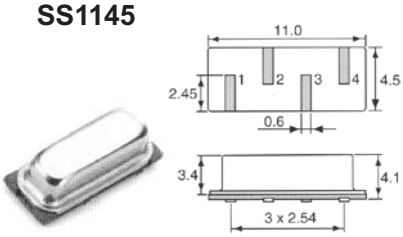
ST9133/2



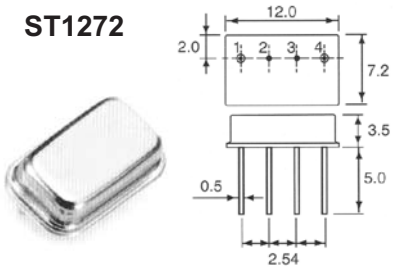
ST1145



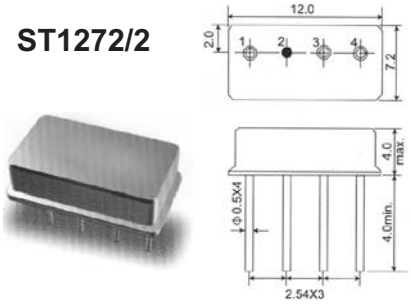
SS1145



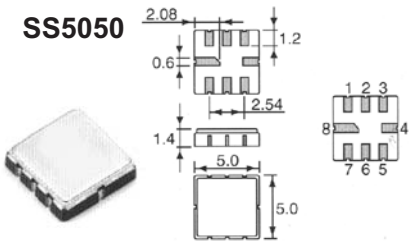
ST1272



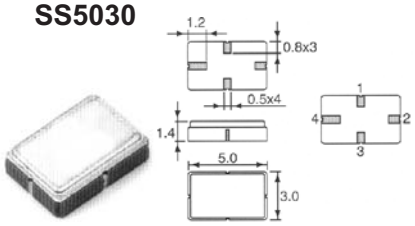
ST1272/2



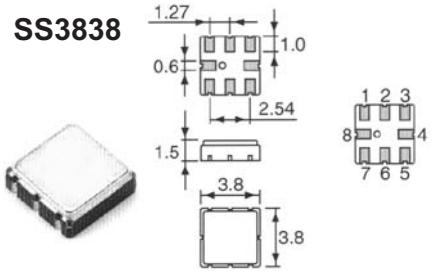
SS5050



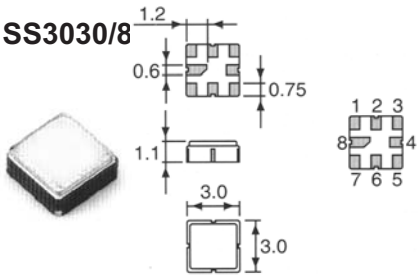
SS5030



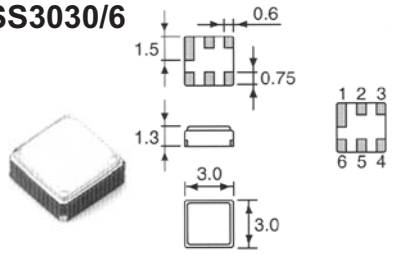
SS3838



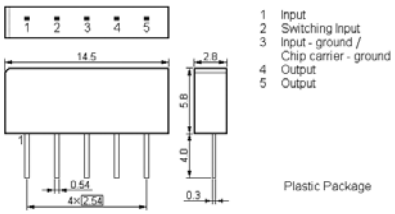
SS3030/8



SS3030/6



ST1428



Dimensions in mm

Remarks: All specifications subject to change without notice!

Please note:
For detailed informations concerning other SAW-packages
And drawings of measurement please contact us!

Quartz crystal specification form

Please fill in all needed specifications and send this form to:

auris-GmbH
electronic components & logistic
Walthausenstraße 11
31789 Hameln
Tel.: +49/5151/809600
Fax: +49/5151/809881
Email: office@auris-gmbh.de
http://www.auris-gmbh.de

Name	Telephone
Company	Fax
Address	eMail
	Date

Application	
Quantity required	

Holder type (series)	
Frequency	MHz / kHz
Mode of vibration	Fundamental, 3rd OT, 5th OT
Frequency tolerance at 25°C ±3°C	ppm
Operating temperature range	°C
Frequency tolerance over operating temp. Range	ppm
Storage temperature range	°C
Load capacitance	pF
Shunt capacitance(Co)	pF max
Motional capacitance (C1)	fF max
Equivalent series resistance	Ohm max
Drive level	µW
Aging	ppm/Year

Optional requirements

Quartz clock oscillator specification form

Please fill in all needed specifications and send this form to:

auris-GmbH
electronic components & logistic
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31789 Hameln
Tel.: +49/5151/809600
Fax: +49/5151/809881
Email: office@auris-gmbh.de
http://www.auris-gmbh.de

Name	Telephone
Company	Fax
Address	eMail
	Date

Application	
Quantity required	

Holder type (series)	
Frequency	MHz / kHz
Frequency stability	ppm
Frequency vs. aging	ppm/Year
Frequency vs. temperature	ppm
Frequency vs. supply voltage	ppm
Frequency vs. load	ppm
Operating temperature range	°C
Storage temperature range	°C
Supply voltage	V
Current consumption	mA max
Output waveform	
Output symmetry	%
Output voltage Vol	VDD
Output voltage VoH	VDD
Output load	pF
Rise / fall time	ns max
Duty cycle	
Frequency control range	ppm min
Control voltage range	V
Start-up time	ms

Optional requirements

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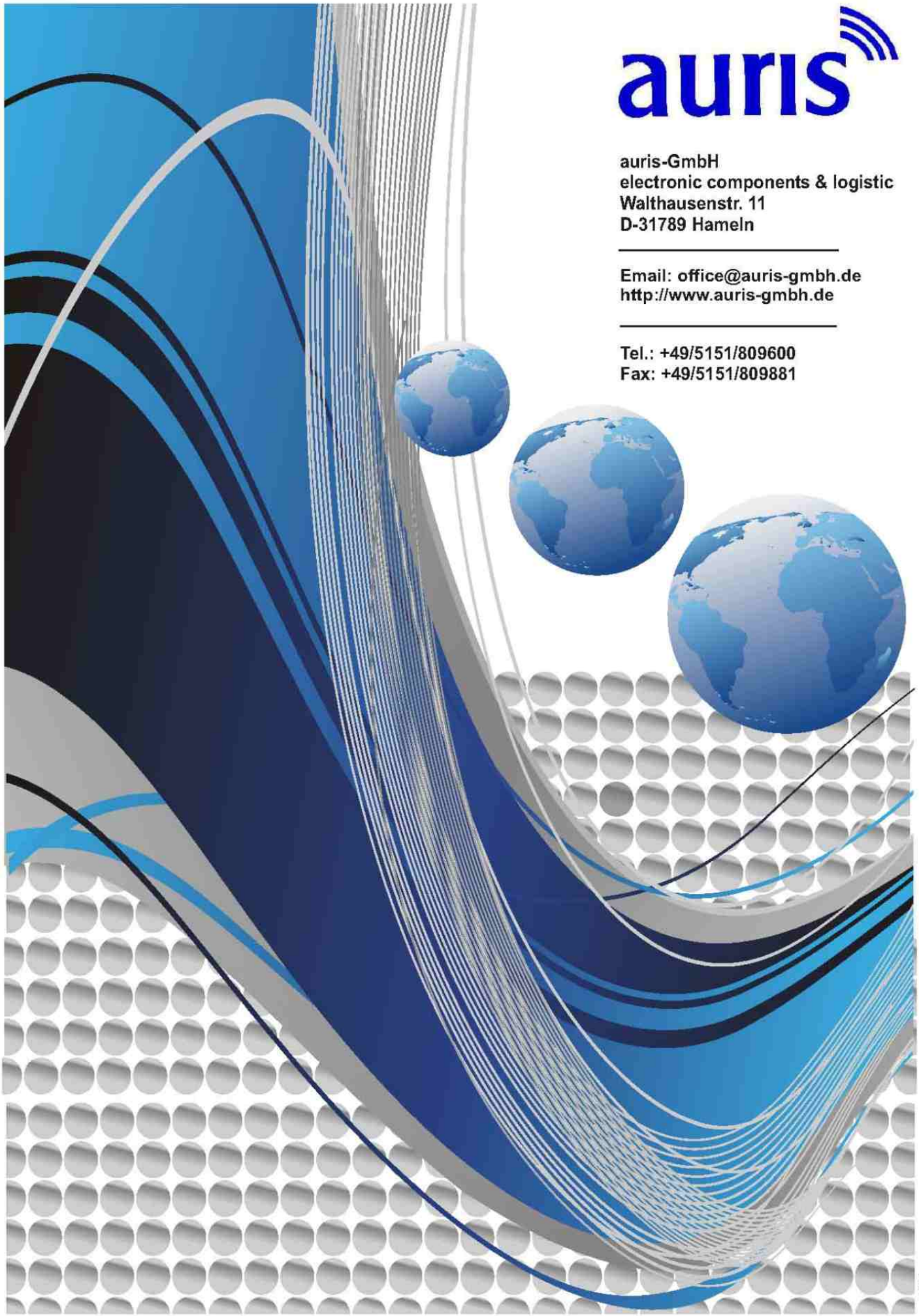
Allgemeine Geschäftsbedingungen

Unsere AGB können Sie unter *www.auris-gmbh.de/home/AGB.pdf* Einsehen und ausdrucken. Zum Öffnen der Datei benötigen Sie den kostenlosen „Acrobat Reader“, den Link finden Sie auf unserer Homepage, oder unter *www.adobe.com* . Auf Wunsch senden wir Ihnen unsere AGB gerne in dem von Ihnen gewünschten Format zu.

General Terms and Conditions

Our General Terms and Conditions can be viewed here *www.auris-gmbh.de/home/AGB.pdf*.Adobe Acrobat Reader is required to open this link. If you do not have Acrobat Reader you can download it here *www.adobe.com*. Should you require our Terms and Conditions in another format please contact us.



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