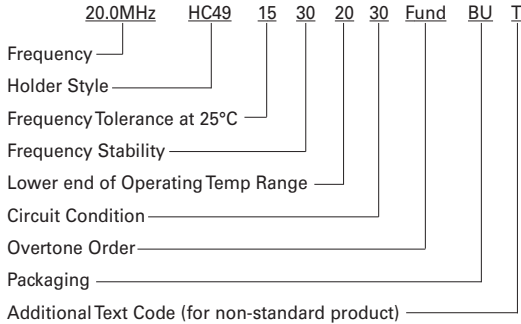


SPECIFYING QUARTZ CRYSTALS

A typical quartz crystal specification reads like this:



The following notes define each element of the specification.

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The frequency should be given to seven significant figures. If seven significant figures are not used, any figure that might follow those given will be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Some specifiers extend the use of kHz to all crystals operating in fundamental mode, reserving MHz for overtones. To minimise the possibility of misunderstanding it is best to use the standard method and specify the mode.

Holder Style

Before manufacture of the crystal can start, the holder style must be defined. If the holder size is not known or it is unimportant, we will supply the holder normally adopted for the frequency specified, such as HC49 for the majority of microprocessor applications. The holder information should also cover any mechanical variant required such as a top wire or cropped leads. The following variants for example are available for most crystals, either singly or in some cases, in combination:

- 3 lead base
- Top wire
- Insulating sleeve
- Taped and reeled
- Fitted insulator
- Cropped leads
- Formed leads

Frequency Tolerance

The cost of manufacture depends partly on the accuracy required at the reference temperature (which in the case of the AT-cut crystal, is usually 25°C).

Where high initial accuracy is important the additional manufacturing cost should be weighed against the cost of including a frequency trimming facility within the oscillator.

Frequency Stability

Frequency stability is normally specified as a frequency tolerance over a defined operating temperature range with respect to the frequency at reference temperature. The temperature ranges are defined for each crystal in the relevant data sheet. However the majority of crystals will continue to operate quite satisfactorily outside the temperature range for which they are specified, but with a possible degradation of their frequency stability.

Generalised frequency vs temperature curves for the AT-cut crystal types are illustrated in the following pages. These indicate that, without compensation, a crystal specified for operation over a wide frequency range will probably have an inferior performance over a narrower range than one whose design was optimised for the narrower range. The angle of cut of the quartz blank from its quartz stone determines which curve will be followed; the chosen angle being subject to its own tolerance. Thus, since manufacturing cost is tolerance-dependent it is wise not to specify a wider operating temperature range than is actually needed unless some sacrifice of stability, or an increase in cost, can be accepted.

Standard Frequency Tolerances and Stabilities

- ±5ppm, ±10ppm, ±15ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C -40 to 90°C
- 10 to 60°C -55 to 105°C
- 20 to 70°C -55 to 125°C
- 30 to 80°C

When the required temperature range is symmetrical about 25°C, it is indicated in the specification by the lower figure, ie: -20 to 70°C would read '20' as shown in the example. If the required temperature range is not symmetrical about 25°C, both figures are used, ie: -55 to 85°C and appear in the additional text code section (T).

Circuit condition

The characters 'SR' are used to denote calibration of the crystal at series resonance. If it is to be calibrated at load resonance the characters represent the circuit load capacitance in pF.

LEADED QUARTZ CRYSTALS

Packaging Codes

Tape & Reel packaging is available as an option on many of the products outlined in the Quartz Crystal chapter.

Unless individual datasheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete Reels are sold.

- BU = Bulk packed
- TR = Tape & Reel packed

Additional Text Code

If the product is non-standard, the letter 'T' will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the special requirements.

Outline Drawings

Dimensions on the crystal outline drawings are shown only as a guide. Precise dimensions of crystal holders are available from our Engineering Department upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Product will be indelibly marked as detailed in the individual data sheets. Where space is limited some or all of the information will be omitted or truncated at C-MAC's discretion. Full product details will be found on the individual batch packaging.

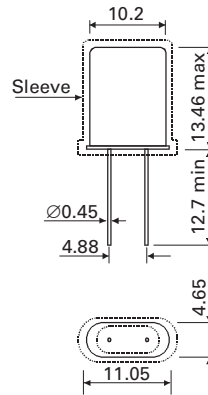
Ordering Information

- See individual datasheet

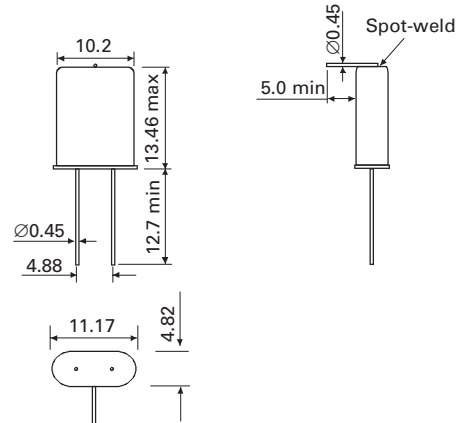
Stability Conversion Chart

10 ^x	PPM	%
10 ⁻³	1000	0.1
10 ⁻⁴	100	0.01
10 ⁻⁵	10	0.001
10 ⁻⁶	1	0.0001
10 ⁻⁷	0.1	0.00001
10 ⁻⁸	0.01	0.000001
10 ⁻⁹	0.001	0.0000001
10 ⁻¹⁰	0.0001	0.00000001

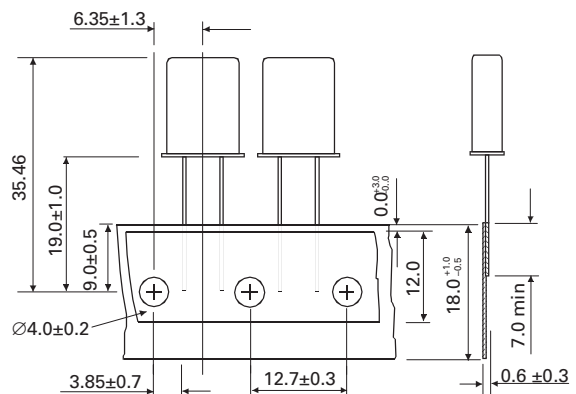
Outline in mm - Insulated Sleeve HC49



Outline in mm - HC49 with Top Wire



Outline in mm - Tape for HC49



LEADED QUARTZ CRYSTALS

STOCK QUARTZ CRYSTALS

WATCH CRYSTALS

Frequency	Holder	Specification	Stock No.	Alpha Code
32.7680kHz	3x8mm	20/-/-/12.5	XTAL002995	A103A
32.7680kHz	3x8mm	15/-/-/12.5	XTAL002996	A103B
32.7680kHz	2x6mm	20/-/-/12.5	XTAL002997	A103C
32.7680kHz	2x6mm	20/-/-/6	XTAL014219	A103V
40.0kHz	3x8mm	100/-/-/12.5	XTAL003018	A109C

Frequency	Specification	Stock No.	Alpha Code	Packaging
18.4320MHz	30/50/20/30	XTAL003176	A146K	Bulk
19.66080MHz	30/50/10/30	XTAL003309	A182K	Bulk
20.0MHz	30/50/10/20	XTAL003186	A147L	Bulk
20.0MHz	30/50/20/12	XTAL003185	A147K	Bulk
24.0MHz	30/50/10/30	XTAL003325	A189K	Bulk
24.5760MHz	30/50/10/20	XTAL003046	A116K	Bulk
32.0MHz	30/50/20/SR 3rd	XTAL003254	A166K	Bulk
35.25120MHz	15/30/20/18 3rd	XTAL003371	A216K	Bulk

HC49/4H CRYSTALS

Frequency	Specification	Stock No.	Alpha Code	Packaging
3.27680MHz	30/50/10/12	XTAL024985	A118D	Bulk
3.579545MHz	30/50/20/20	XTAL003063	A119K	Bulk
3.68640MHz	30/50/20/30	XTAL003263	A169K	Bulk
4.0MHz	20/50/10/30	XTAL003074	A120K	Bulk
4.0320MHz	30/50/20/30	XTAL003081	A121K	Bulk
4.0960MHz	30/50/10/30	XTAL003084	A122K	Bulk
4.194304MHz	30/50/10/12	XTAL003093	A123K	Bulk
4.194304MHz	30/50/10/30	XTAL003092	A123J	Bulk
4.433619MHz	30/50/10/20	XTAL003102	A124K	Bulk
4.91520MHz	30/50/20/30	XTAL003115	A127K	Bulk
5.0MHz	30/50/10/30	XTAL003119	A128K	Bulk
6.0MHz	30/50/10/30	XTAL003132	A132K	Bulk
6.1440MHz	30/50/10/30	XTAL003137	A133K	Bulk
7.37280MHz	15/30/10/18	XTAL003336	A194L	Bulk
7.37280MHz	30/50/10/30	XTAL003335	A194K	Bulk
8.0MHz	30/50/20/30	XTAL003156	A140K	Bulk
8.1920MHz	30/50/10/30	XTAL003271	A170K	Bulk
9.83040MHz	30/50/10/30	XTAL003279	A173K	Bulk
10.0MHz	30/50/20/30	XTAL003169	A143K	Bulk
10.7520MHz	30/50/10/30	XTAL003365	A212K	Bulk
11.05920MHz	30/50/20/30	XTAL003523	L108K	Bulk
12.0MHz	30/50/20/30	XTAL003215	A158K	Bulk
12.2880MHz	30/50/10/30	XTAL003286	A175K	Bulk
14.318180MHz	30/50/20/30	XTAL003200	A153L	Bulk
14.74560MHz	30/50/10/30	XTAL003224	A159K	Bulk
15.0MHz	30/50/10/30	XTAL003230	A160K	Bulk
15.360MHz	20/30/10/30	XTAL003554	M451K	Bulk
16.0MHz	30/50/20/30	XTAL003240	A161K	Bulk
16.93440MHz	30/50/10/30	XTAL003366	A213K	Bulk

HC49 CRYSTALS

Frequency	Specification	Stock No.	Alpha Code	Packaging
1.84320MHz	20/50/10/30	XTAL003033	A113B	Bulk
2.0MHz	50/100/0/20	XTAL003037	A114E	Bulk
2.45760MHz	20/50/10/30	XTAL003044	A116C	Bulk
3.27680MHz	20/30/10/12	XTAL003051	A118B	Bulk
3.579545MHz	20/50/10/20	XTAL003056	A119C	Bulk
3.68640MHz	20/50/10/30	XTAL003257	A169A	Bulk
4.0MHz	20/10/20/30	XTAL003067	A120A	Bulk
4.0MHz	20/50/10/30	XTAL003068	A120B	Bulk
4.0MHz	30/50/20/20	XTAL011512	A120U	Bulk
4.0320MHz	20/10/20/30	XTAL003079	A121A	Bulk
4.0960MHz	20/10/20/30	XTAL003082	A122A	Bulk
4.0960MHz	20/50/10/30	XTAL003083	A122B	Bulk
4.194304MHz	20/30/10/12	XTAL003086	A123A	Bulk
4.433619MHz	20/30/10/20	XTAL003099	A124D	Bulk
4.6080MHz	20/50/10/30	XTAL003107	A125C	Bulk
4.91520MHz	20/50/10/30	XTAL003110	A127A	Bulk
5.00MHz	20/50/10/30	XTAL003118	A128B	Bulk
5.06880MHz	20/50/10/SR	XTAL003121	A129A	Bulk
5.242880MHz	20/30/10/12	XTAL003316	A186A	Bulk
6.0MHz	20/50/10/30	XTAL003127	A132A	Bulk
6.1440MHz	20/50/10/30	XTAL003134	A133A	Bulk
6.55360MHz	20/30/10/12	XTAL003141	A135A	Bulk
7.37280MHz	20/50/10/30	XTAL003329	A194A	Bulk
7.680MHz	20/50/10/30	XTAL003144	A138A	Bulk
8.0MHz	20/50/10/30	XTAL003147	A140A	Bulk
8.1920MHz	20/50/10/30	XTAL003268	A170A	Bulk

LEADED QUARTZ CRYSTALS



CRYSTAL ACCESSORIES

Frequency	Specification	Stock No.	Alpha Code	Packaging
8.388608MHz	20/50/10/30	XTAL003157	A141A	Bulk
8.867237MHz	30/30/10/20	XTAL003201	A154A	Bulk
9.83040MHz	20/50/10/30	XTAL003277	A173A	Bulk
10.0MHz	20/10/20/30	XTAL003162	A143A	Bulk
10.0MHz	20/50/10/30	XTAL003164	A143E	Bulk
11.0MHz	20/30/10/30	XTAL003327	A193A	Bulk
11.05920MHz	20/30/10/20	XTAL003515	L108A	Bulk
11.05920MHz	20/30/10/30	XTAL003517	L108C	Bulk
11.28960MHz	20/30/10/30	XTAL003367	A214A	Bulk
12.0MHz	20/30/10/30	XTAL003206	A158A	Bulk
12.2880MHz	20/30/10/30	XTAL003280	A175A	Bulk
14.318180MHz	20/50/10/SR	XTAL003194	A153A	Bulk
14.74560MHz	20/30/10/30	XTAL003218	A159A	Bulk
14.74560MHz	20/50/10/SR	XTAL003219	A159B	Bulk
15.0MHz	20/50/10/SR	XTAL003228	A160C	Bulk
15.360MHz	20/30/10/30	XTAL003552	M451A	Bulk
16.0MHz	20/30/10/30	XTAL003231	A161A	Bulk
16.0MHz	30/50/20/20	XTAL012898	A161U	Bulk
17.734470MHz	20/30/10/30	XTAL003298	A180A	Bulk
18.4320MHz	20/50/10/SR	XTAL003174	A146B	Bulk
18.4320MHz	30/50/20/20	XTAL011515	A146U	Bulk
19.66080MHz	20/50/10/SR	XTAL003304	A182A	Bulk
20.0MHz	20/30/10/SR	XTAL003179	A147C	Bulk
20.0MHz	20/50/10/30	XTAL003177	A147A	Bulk
22.11840MHz	20/50/10/SR	XTAL003312	A183A	Bulk
22.57920MHz	10/20/10/15	XTAL003407	A315A	Bulk
24.0MHz	20/50/10/SR	XTAL003320	A189A	Bulk
24.000140MHz	15/30/10/18	XTAL003360	A210A	Bulk
24.5760MHz	20/50/10/30	XTAL003386	A223A	Bulk
25.0MHz	20/50/10/SR	XTAL003317	A187B	Bulk
30.0MHz	20/50/10/SR	XTAL003342	A197B	Bulk
32.0MHz	20/30/10/SR 3rd	XTAL003248	A166A	Bulk

Frequency	For Holder	Stock No.	Alpha Code	Packaging
Insulators (Mylar, 3 holes)	UM1 (HC45)	INSL000003	M153C	Bulk
Insulators (Mylar, 3 holes)	HC49	INSL000002	M153B	Bulk
Insulator (PTFE, 2 holes)	HC49	INSL000004	M153D	Bulk
Clips	HC49	CLPS000001	M156A	Bulk

LEADED QUARTZ CRYSTALS

CX-1V-SM1 CRYSTALS

Frequency	Specification	Stock No.	Alpha Code	Packaging
32.768000kHz	30/-/40/9	XTAL003426	C113G	Tray

Europe Tel: +44 (0)1460 270200 Fax: +44 (0)1460 72578
 Americas Tel: +1 919 941 9333 Fax: +1 919 941 9371
 Asia Tel: +86 755 8826 5991 Fax: +86 755 8826 5990

Website: www.cmac.com