HOW TO SPECIFY A QUARTZ CRYSTAL

Most crystals may be fully specified with the following information:

1) **Crystal Frequency**   (i.e. 1.000 to 360 MHz).

2) **Mode of Operation**   (i.e. - Fund, 3rd, 5th etc) (see page 1).

3) **Holder Style**   The holder style depends on your individual application and crystal frequency. (see pages 10 - 12).

4) **Calibration Tolerance at Reference Temperature**
The allowable frequency deviation from the nominal frequency at the fixed calibration temperature (i.e. ± 20 ppm @ 25°C, ± 5 ppm @ 75°C, etc.).

5a) **Temperature Stability**   The allowable frequency deviation over a specified temperature range, with reference to the actual frequency measured at the calibration temperature (i.e. ± 15 ppm, 2 ppm, etc.)   or . . .

5b) **Total Tolerance**   The allowable deviation over a specified temperature range, with reference to the nominal frequency (i.e. calibration tolerance and temperature stability combined).

6) **Operating Temperature Range**
This is the specified temperature range over which the temperature stability or the total tolerance is to be effective.

7) **Circuit Condition**   The circuit condition will be either parallel or series resonance. If parallel resonance, please state the load capacitance (see page 2).

Optional information may include any other parameters that are important to you and which are not covered by, or differ from, MIL-PRF-3098, (such as shunt capacitance C_o, motional capacitance C_1, equivalent resistance R_1, spurious mode suppression, aging characteristics, drive level, etc.)

THE CROVEN CRYSTALS CODE

We have reduced items 2 through 7 to a nine digit alpha-numeric code that can be used to describe the crystal required. A typical code would be **A357DFE-32 @ 20.000000 MHz** and is translated as follows:

A	fundamental mode of operation
35	HC-35/U holder
7	four point mount for improved g-sensitivity
D	calibration tolerance of ± 10 ppm at the reference temperature
F	temperature stability of ± 20 ppm, with respect to the frequency measured at the reference temperature
E	temperature range of -15°C to +65°C, over which the temperature stability is effective
-32	when present, these two digits specify parallel resonance operation and the load capacitance in pF (i.e. 32 pF)

Nominal frequency of 20.000000 MHz

The table below lists the many values of these six essential parameters that can be covered by the **CRYSTAL CODE**. Note that the nine digit **CRYSTAL CODE** addresses only the six parameters outlined above. Unless otherwise specified by the customer, the values of any additional parameters will be per the latest revision of MIL-PRF-3098.

If the crystal requirements cannot be fully described by the nine digit code, a unique deviation number will be assigned by the factory.

MODE		HOLDER				CALIBRATION TOLERANCE AT REFERENCE TEMPERATURE		TEMPERATURE STABILITY OR TOTAL TOLERANCE		OPERATING TEMPERATURE RANGE (ºC)		CIRCUIT CONDITION	
CODE	DESC	CODE	DESC	CODE	DESC	CODE	DESC	CODE	DESC	CODE	DESC	CODE	DESC
A	Fund	35	HC-35/U (TO-5)	0	Standard			X	± 2 ppm stability	X	+15 to +35		
B	3rd OT	36	HC-36/U	1	Surface Mount	X	± 1.5 ppm	Y	± 3 ppm stability	Y	+10 to +40		
C	5th OT	37	HC-37/U (TO-8)	2	Surface Mount	A	± 2 ppm	Z	± 4 ppm stability	Z	+5 to +45		
D[1]	7th OT	40	HC-40/U (EO-7)	3	Slimline	B	± 5 ppm	B	± 5 ppm stability	A	0 to +50	00	Series resonance.
E[1]	9th OT	42	HC-42/U	4	Modifed can height	C	± 7 ppm	C	± 7 ppm stability	B	-5 to +55		
F[1]	11th OT	43	HC-43/U	5	Modifed can height	D	± 10 ppm	D	± 10 ppm stability	D	-10 to +60		
		45	HC-45/U	6	Modifed can height	E	± 15 ppm	E	± 15 ppm stability	E	-15 to +65	01	Parallel resonance
		47	HC-47/U	7	Four point mount	F	± 20 ppm	F	± 20 ppm stability	F	-20 to +70		load capacity of
		48	HC-48/U	8	Modifed can height	G	± 25 ppm	G	± 25 ppm stability	G	-25 to +75		100 pF or more.
		49	HC-49/U	9	Modifed can height	H	± 30 ppm	H	± 30 ppm stability	H	-30 to +80		Advise actual
		50	HC-50/U			J	± 40 ppm	J	± 40 ppm stability	J	-40 t0 +90		value.
		51	HC-51/U			M	± 50 ppm	M	± 50 ppm stability	M	-55 to +105		
		52	HC-52/U					L	± 75 ppm stability	U	+50 to +60 Oven	10 to 90	Parallel resonance
		90	SM1			K	± 100 ppm	K	± 100 ppm stability	L	+55 to +65 Oven		load capacity in pF.
								N	± 150 ppm stability	T	+60 to +70 Oven		
								S	Specific curve	N	+65 to +75 Oven		
								T	± 20 ppm(4) (B)†	P	+70 to +80 Oven		
								U	± 25 ppm(4) (C)†	R	+75 to +85 Oven	99	Calibration at
								V	± 30 ppm(4) (D)†	S	+80 to +90 Oven		reference
								W	± 50 ppm(4) (F)†	V	+85 to +95 Oven		temperature in
								P	± 100 ppm(4) (H)†	W	+90 to +100 Oven		customer's
								R	± 200 ppm(4) (M)†	X	+95 to +105 Oven		oscillator.
										0	Not specified		
								0	Turn Over Point in Oven Range		Calibration frequency is at the mid-point of the above ranges.		
									† - Corresponding calibration codes				

NOTES:

(1) 7th, 9th and 11th overtone modes are available at series resonance only.

(2) Standard holder types for all codes are as per MIL-H-10056.

(3) Not all holders are available with all modifications.

(4) These codes indicate the total tolerance (i.e. calibration and temperature stability) measured from the nominal frequency. They are to be used with the calibration code indicated.

(5) For RoHS compliant parts add 'R' to the end of the part number.

For your specific requirements, please contact our engineering staff.