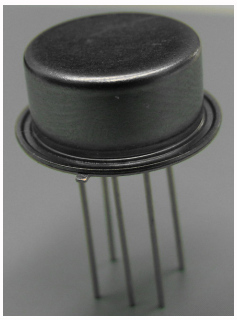
XR-U (HC37 or TO-8) Series Cold Weld
Crystal Resonator

Helping Customers Innovate, Improve & Grow



XR-U (HC37) Series

Description

Vecton International's XR-U (HC37) series cold weld crystals provide a precision, high reliability design in a rugged mount. These precision crystals offer excellent industry leading performance characterisitcs and tight stabilities in a wide range of frequencies. Low phase noise, excellent Aging and low g-sensitivty options make this an ideal choice for Radar (LO Reference), Microwave, Satellite, Telemetry, High Reliability (Space-Aerospace) and Military Communication applications.

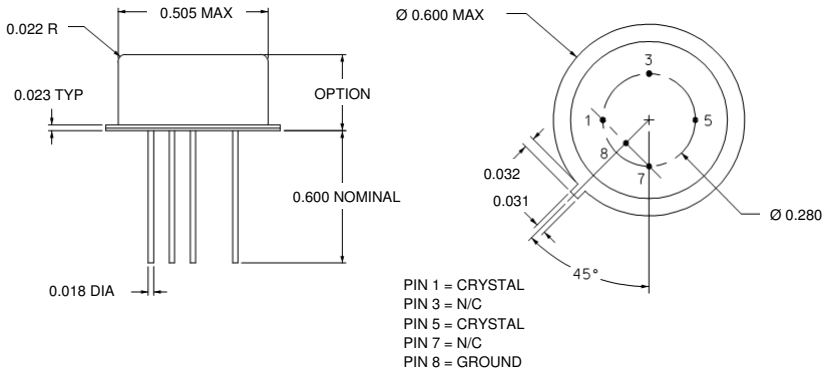
Features

- Industry Standard Base (2 pt, 3 pt, 4 pt blank mounts)
- Variety of package heights available
- AT, SC and IT-Cut Fundamental and OT Modes
- Low Phase Noise, Low G-Sensitivity options
- Tight Stabilities and Tolerances, Excellent Aging
- Robust Rugged Design for demanding environments
- Swept Quartz & Hi-Rel Screening Options Available
- High Temperature Options to +200°C

Applications

- Telecommunications
- Military & Defense
- Microwave
- Telemetry
- Ground and Satellite Communications (Hi-Rel)
- Radar (LO Reference)
- Precision Oscillators (TCXO, VCXO, OCXO)

Standard Physical Specifications



HEIGHT CODE OPTION	PACKAGE EXAMPLES XR-U SERIES	
	inches	mm
1	0.265	6.73
2	0.250	6.35
3	0.230	5.84
4	0.200	5.08
5	0.155	3.93

Reference dimensions specified in inches and millimeters (mm).
Specification subject to change without notice.

Typical Electrical Performance Characteristics

AT-CUT VARIETIES		
Performance Characterisitc	**Symbol**	**Typical Performance Specifications**
Frequency Range	F_O	2.5 MHz to 140 MHz
Operating Temperature Range		-55°C to +125°C (high temperature up to +200°C available)
Frequency Stability over Operating Temp Range	F_T	+/- 5 ppm to +/- 50 ppm (mode, frequency and operating temp range dependent)
Frequency Calibration Tolerance +25°C	F_R-F_L	+/- 10 ppm typical (+/- 1 ppm available)
Equivalent Series Resistance	R (ESR)	10 ohms to 100 ohms (mode and frequency dependent)
Shunt Capacitance	C_0	2.5 pF - 4 pF typical (MIL-PRF-3098 CR101, CR102, CR103 types < 7 pF max.)
Motional Capacitance	C_1	0.1 fF - 30 fF (mode and frequency dependent)
Load Capacitance	C_L	series to 32 pF (customer specified load)
Drive Level	DL	100 uW (50 uW to 5 mW)
Aging per year after first 30 days		< 0.5 ppm (better available)

DOUBLY ROTATED (DR)-CUT VARIETIES (SC, MODIFIED SC, IT, ETC...)		
Performance Characterisitc	**Symbol**	**Typical Performance Specifications**
Frequency Range	F_O	2.5 MHz to 140 MHz
Turn Point	TP	+75°C to +105°C (mode, cut, frequency dependent, other turn points available)
Frequency Calibration Tolerance	F_R-F_L	+/- 1 ppm to +/- 5 ppm typical
Equivalent Series Resistance	R (ESR)	15 ohms to 180 ohms (mode and frequency dependent)
Shunt Capacitance	C_0	2.5 pF - 4 pF typical
Motional Capacitance	C_1	0.1 fF - 30 fF (mode and frequency dependent)
Load Capacitance	C_L	series to 32 pF (customer specified load)
Drive Level	DL	100 uW (50 uW to 5 mW)
Aging per year after first 30 days		< 0.5 ppb/day (mode-cut and frequency dependent, consult factory)

PHASE NOISE @ 100 Hz OFFSET (dBc/Hz)		
Mode - Cut	**Frequency Range**	**Phase Noise**
Fundamental-AT	2.5 MHz - 20 MHz	-80 to -120
Fundamental-DR		
3rd OT - AT	5 MHz - 60 MHz	-80 to -135
3rd OT - DR		-120 to -150
5th OT - AT	15 MHz - 100 MHz	-115 to -140
5th OT - DR		-115 to -140
7th OT - AT	25 MHz - 140 MHz	-80 to -110

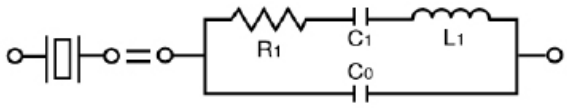
Phase Noise performance is mode and frequency dependent

NOMINAL G-SENSITIVITY (4 pt. blank mount)	
Cut	G-SENSITIVITY
AT	1 X 10^{-9}/g (average attainable when specified)
DR (SC-IT)	5 x 10^{-10}/g (average attainable when specified)
Results assume same frequency and mode when specified. Better results are available.	

TYPICAL ESR & C_1 BY MODE AND FREQUENCY RANGE			
Mode	Frequency Range (MHz)	*ESR Typical (ohms)	*C_1 Typical (fF)
Fund.	2.5 - 20 MHz	25-360	5 - 25
3rd	5 - 60 MHz	50-140	1 -2.5
5th	15 - 100 MHz	50-120	0.70
7th	25 - 140 MHz	<120	0.35

**ESR and C1 values are dependent upon the specified frequency and mode of vibration.*

EQUIVALENT CIRCUIT OF A CRYSTAL RESONATOR

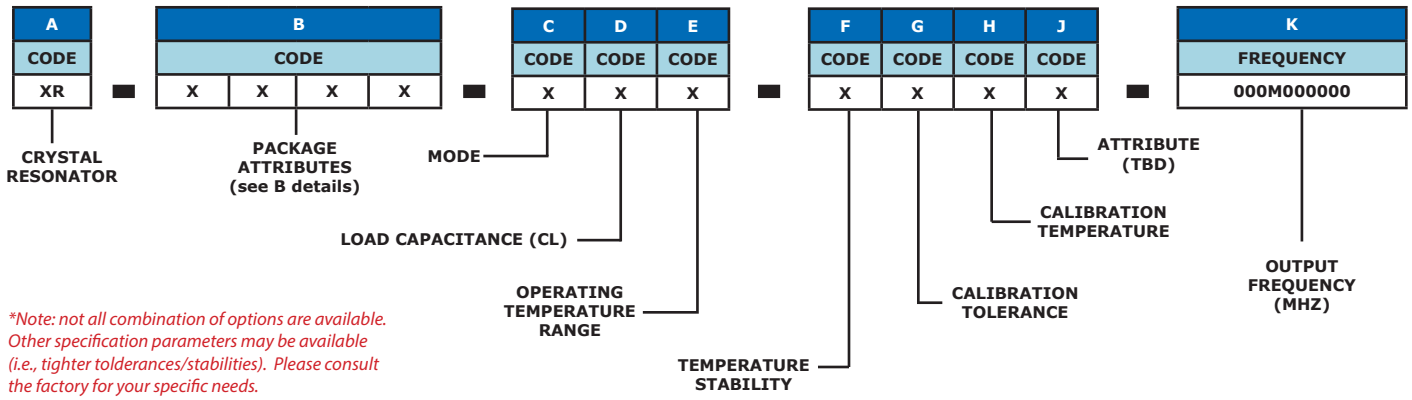


Vectron International designs and manufactures HC37 series crystals for a wide variety of commercial and high reliabilty applications. *Our proven cleanroom finish processes and fully integrated environmental vacuum bake cold weld systems yield excellent aging and low perturbations.*

We have tight controls over series resistance, motional capacitance, temperature characteristics and other parameters critical to your application. We primarily build to customer specifications but we've optimized designs on all frequencies that are commonly used in telecommunications.

Please feel free to contact us with your questions. We are here to assist you with selecting the best performing and most cost effective crystal for your application.

PART NUMBER ORDERING INFORMATION



**Note: not all combination of options are available. Other specification parameters may be available (i.e., tighter tolderances/stabilities). Please consult the factory for your specific needs.*

PART NUMBER CODES (attribute details)

B							
X		X		X		X	
CODE	PACKAGE TYPE	CODE	PACKAGE HEIGHT (A)	CODE	SEAL METHOD	CODE	LEAD STYLE
U	HC37	1	.265 (6.73)	1	CW	1	STANDARD
		2	.250 (6.35)			2	SOLDER DIP
		3	.230 (5.84)				
		4	.200 (5.08)				
		5	.155 (3.93)				

C	
CODE	MODE
1	Fund
3	3rd OT
5	5th OT
7	7th OT

D	
CODE	LOAD CAPACITANCE
S	Series
A	8 pF
B	10 pF
C	12 pF
D	15 pF
E	18 pF
F	20 pF
G	25 pF
H	30 pF
J	32 pF
K	35 pF
M	40 pF
N	45 pF
P	50 pF
R	55 pF
S	60 pF
T	65 pF
U	70 pF
V	75 pF
W	80 pF
Y	90 pF
Z	Custom

E	
CODE	OPERATING TEMPERATURE RANGE
A	-55°C to +85°C
B	-55°C to +105°C
C	-55°C to +125°C
D	-40°C to +70°C
E	-40°C to +85°C
F	-40°C to +105°C
G	-30°C to +80°C
H	-30°C to +85°C
J	-20°C to +70°C
K	-10°C to +60°C
M	-10°C to +75°C
N	-5°C to +70°C
P	0°C to +50°C
R	0°C to +55°C
S	0°C to +60°C
T	0°C to +70°C
U	0°C to +85°C
V	+10°C to +40°C
W	-10°C to +70°C
Y	-55°C to +185°C
Z	-20°C to +180°C
1	0°C to +150°C
2	0°C to +200°C
9	Custom

F	
CODE	FREQUENCY STABILITY OVER TEMPERATURE
A	+/- 5 ppm
B	+/- 10 ppm
C	+/- 12 ppm
D	+/- 15 ppm
E	+/- 20 ppm
F	+/- 25 ppm
G	+/- 30 ppm
H	+/- 32 ppm
J	+/- 40 ppm
K	+/- 50 ppm
M	+/- 60 ppm
N	+/- 75 ppm
P	+/- 80 ppm
R	+/- 90 ppm
S	+/- 100 ppm
T	+/- 130 ppm
U	+/- 150 ppm
V	+/- 200 ppm
W	+/- 250 ppm
Y	+/- 300 ppm
Z	Custom

G	
CODE	FREQUENCY CALIBRATION TOLERANCE
A	+/- 5 ppm
B	+/- 10 ppm
C	+/- 12 ppm
D	+/- 15 ppm
E	+/- 20 ppm
F	+/- 25 ppm
G	+/- 30 ppm
H	+/- 32 ppm
J	+/- 40 ppm
K	+/- 50 ppm
M	+/- 60 ppm
N	+/- 75 ppm
P	+/- 80 ppm
R	+/- 90 ppm
S	+/- 100 ppm
T	+/- 130 ppm
U	+/- 150 ppm
V	+/- 200 ppm
W	+/- 250 ppm
Y	+/- 300 ppm
Z	Custom

H	
CODE	FREQUENCY CALIBRATION TEMPERATURE
A	+25°C
B	+50°C
C	+55°C
D	+60°C
E	+65°C
F	+70°C
G	+75°C
H	+80°C
J	+85°C
K	+90°C
M	+95°C
N	+100°C
P	+105°C
R	+110°C
S	+115C
T	+120°C
U	+125°C
Z	Custom

CALIBRATION TEMPERATURE IS ALWAYS +25°C UNLESS OTHERWISE SPECIFIED

J	
CODE	TBD
A	TBD
B	TBD
C	TBD
D	TBD
E	TBD
F	TBD
G	TBD
H	TBD
J	TBD
K	TBD
M	TBD
N	TBD
P	TBD
R	TBD
S	TBD
T	TBD
U	TBD
Z	Custom

Typical Environmental Specifications

TEST DESCRIPTION	SPECIFICATION REFERENCE
SHOCK	MIL-STD-202, Method 213, Cond. C (100g, 6ms, Half-Sine)
VIBRATION	MIL-STD-202, Method 201/204 (Random-Sine, 20g)
TEMPERATURE CYCLE	MIL-STD-883, Method 1010 (-55°C/+125°C), 10 cycles
THERMAL SHOCK	MIL-STD-202, Method 107
MOISTURE RESISTANCE	MIL-STD-202, Method 106
SALT ATMOSPHERE	MIL-STD-202, Method 101
ACCELERATION	MIL-STD-883, Method 2001, Condition A (5,000g)
SOLDERABILITY	MIL-STD-202, Method 208 (ANSI-EIA-J-STD-002)
TERMINAL STRENGTH	MIL-STD-202, Method 211 (2lbs)
PIND	MIL-STD-883, Method 2020, Condition A or B (20g, 10g)
FINE LEAK	MIL-STD-202, Method 112, Condition C-IIIc ($1x10^{-8}$ atm/cc^2)
GROSS LEAK	MIL-STD-202, Method 112, Condition D
RESISTANCE TO SOLVENTS	MIL-STD-202, Method 215
RESISTANCE TO SOLDERING HEAT	MIL-STD-202, Method 210, Condition K
HIGH TEMPERATURE STORAGE	MIL-STD-883, Method 1008, Condition C (+125°C, 168 hours)
LOW TEMPERATURE STORAGE	MIL-PRF-3098

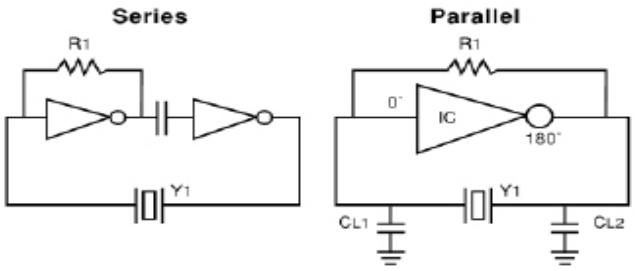
Vectron is uniquely equipped to handle all of your special test requirements. All environmental and qualification related tests are performed in house. We've demonstrated compliance and the ability to test to the requirements of all governing industry and military crystal specifications (past and present).

Some of which include;

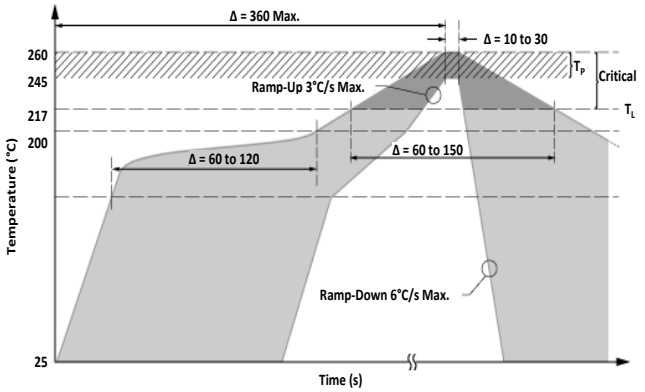
- MIL-PRF-3098
- MIL-C-49468
- MIL-C-3098
- TOR-2006 (8583)-5236
- EEE-INST-002
- MIL-PRF-55310
- MIL-STD-202
- MIL-STD-883
- 0THERS

Additional Technical Information

Diagrams of Series and Parallel Resonant Circuits



Typical Wave Solder Reflow Profile (Sn-Pb)



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