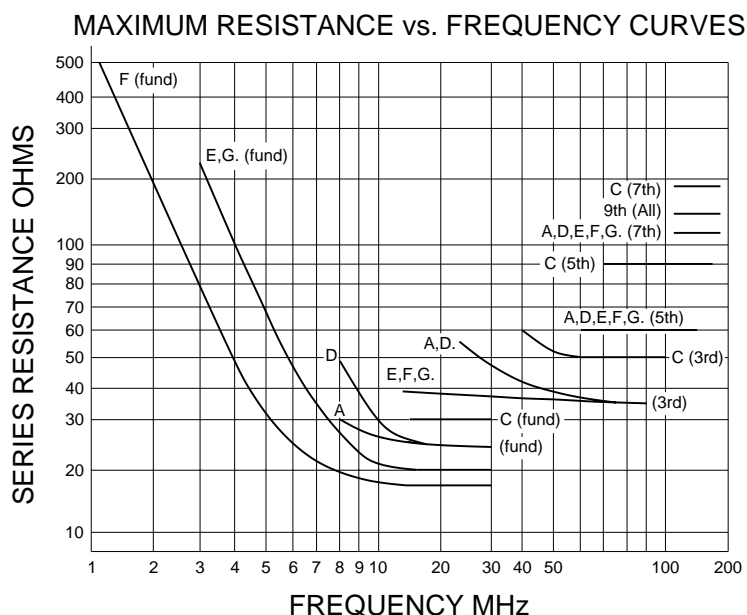


The Hy-Q custom range of AT-cut crystals covers a frequency spectrum from 1 MHz, to 200MHz, with units in resistance weld holders. The resistance weld range of holders includes all common international standard types. Resistance welding is now the preferred type of encapsulation, having in recent years replaced the solder seal technique by virtue of its greater reliability and efficiency in production. Fig. 1 shows the frequency range available for each overtone order within each group of holder styles.

The size of the crystal enclosure determines the maximum size of the resonator that it can accommodate. This limits the lower end of the frequency range for each enclosure type. It may also limit the ruggedness, reproducibility and choice of equivalent circuit parameters.

FREQUENCY RANGES by HOLDER STYLE						
HOLDER		FREQUENCY MHz				
GROUP	STYLE	FUNDAMENTAL	3rd	5th	7th	9th
A	QC61, QC62, QC63	8 - 30	25 - 90	60 - 150	125 - 175	175 - 200
B	This group allocated to cold weld which we no longer offer					
C	QC38, QC68	16 - 30	40 - 90	70 - 150	125 - 175	N/A
D	QC41, QC44, QC45 QC46	8 - 30	25 - 90	60 - 150	125 - 175	175 - 200
E	QC49, QC50, QC53 QC55, QC56, QC59	3 - 30	18 - 90	60 - 150	125 - 175	175 - 200
F	QC48, QC51	1 - 30	15 - 90	60 - 150	125 - 175	175 - 200
G	QC52, QC54, QC57	4 - 30	18 - 90	60 - 150	125 - 175	175 - 200

Fig. 1



FIRST COLUMN			
TEMPERATURE		FREQUENCY	
CODE	RANGE °C	CODE	TOLERANCE ppm
A	-55 to +105	A	±100
B	-40 to +90	B	±50
C	-30 to +80	C	±30
D	-25 to +75	D	±25
E	-20 to +70	E	±20
F	-15 to +65	F	±15
G	-10 to +60	G	±10
H	- 5 to +55	H	±7.5
J	0 to +50	J	±5
K	+ 5 to +45	M	±4
L	+10 to +40	K	±3
		L	±2

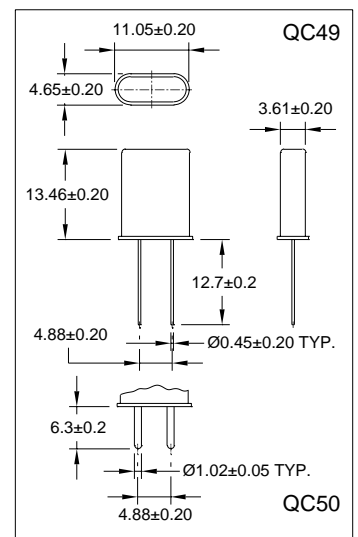
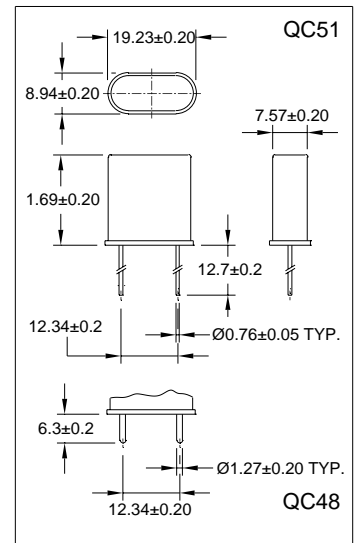
OVENIZED CRYSTAL CODES
STABILITY ±0.5ppm PER °C OVER ±2°C

CODE	TEMPERATURE
TR	45
TS	50
TT	55
TU	60
TV	65
TW	70
TX	75
TY	80
TZ	85

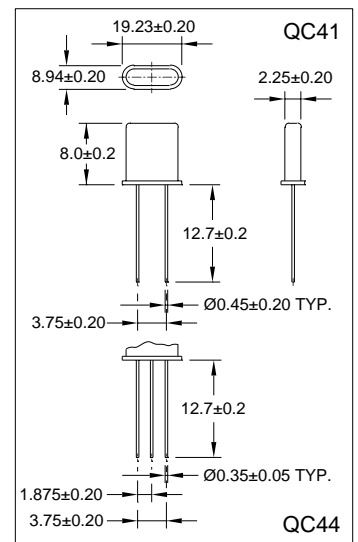
SECOND COLUMN	
CODE	CALIBRATION TOLERANCE ppm
01	±50
02	±30
03	±20
04	±15
05	±10
06	±7.5
07	±5
08	+45 to +65
09	+35 to +55
10	+25 to +45
11	+20 to +40
12	+15 to +35
13	+10 to +30
14	+ 5 to +25
15	0 to +20
16	- 5 to +15
17	- 15 to + 5
18	- 20 to 0
19	- 25 to - 5
20	- 30 to -10
21	- 35 to -15
22	- 40 to -20
23	- 45 to -25
24	- 50 to -30
25	- 55 to -35
26	- 60 to -40
27	- 65 to -45
28	- 70 to -50
29	- 75 to -55

THIRD COLUMN	
CODE	CCT CONDITION pF
A	10
B	15
C	20 Refer Note 1
D	25
E	30 Refer Note 1
F	32
G	40
H	45
I	—
J	50
K	60
L	70
M	80
N	90
O	—
P	100
Q	18
R	150
S	Series Refer Note 1
T	35
U	55
V	65
W	75
X	85
Y	95
Z	12

Note 1.
These are preferred values



AVAILABLE FIRST COLUMN CODE COMBINATIONS												
TEMPERATURE °C	A ±100	B ±50	C ±30	D ±25	E ±20	F ±15	G ±10	H ±7.5	J ±5	M ±4	K ±3	L ±2
A - 55 to + 105	1	1	2	2	4	☎	☎	☎	☎	☎	☎	☎
B - 40 to + 90	1	1	2	2	2	3	4	☎	☎	☎	☎	☎
C - 30 to + 80	1	1	1	2	2	2	3	4	☎	☎	☎	☎
D - 25 to + 75	1	1	1	1	2	2	2	3	4	☎	☎	☎
E - 20 to + 70	1	1	1	1	2	2	2	3	4	☎	☎	☎
F - 15 to + 65	1	1	1	1	2	2	2	3	3	4	☎	☎
G - 10 to + 60	1	1	1	1	1	2	2	2	3	3	4	☎
H - 5 to + 55	1	1	1	1	1	1	2	2	2	3	3	4
J 0 to + 50	1	1	1	1	1	1	2	2	2	2	3	4
K + 5 to + 45	1	1	1	1	1	1	1	1	2	2	2	2
L + 10 to + 40	1	1	1	1	1	1	1	1	1	1	2	2



Degree of manufacturing difficulty

1	2	3	4	☎
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☎ Consult our technical department

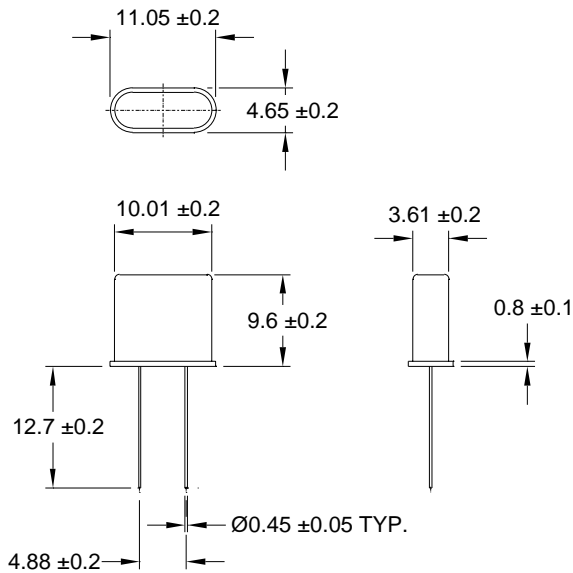
Minimum Order Information

- ◆ Nominal Frequency
- ◆ Overtone order - Fundamental 3rd, 5th or 7th.
- ◆ Holder Style
- ◆ Three Column Code
- ◆ Quantity Required

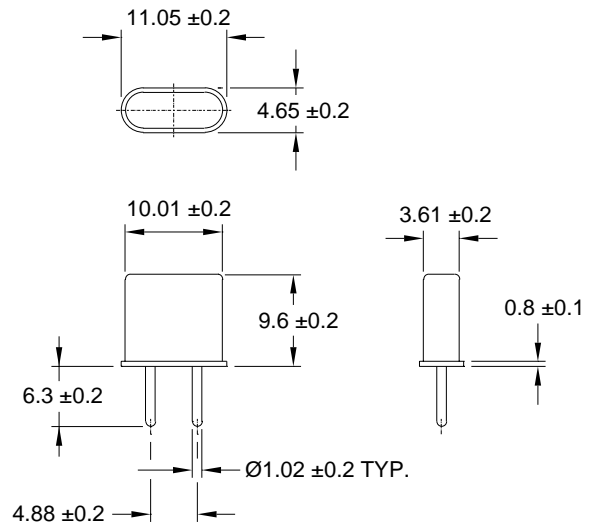
Examples:-

1. Temperature range and frequency tolerance: -10°C to +60°C and ±15ppm. Calibration tolerance: ±20ppm. Circuit condition: 32pF input capacity. Code = GF 03 F
2. Temperature and frequency tolerance: +70°C (±2°C) and ±1ppm. Calibration tolerance: ±10ppm. Circuit condition: Series resonance. Code = TW 05 S

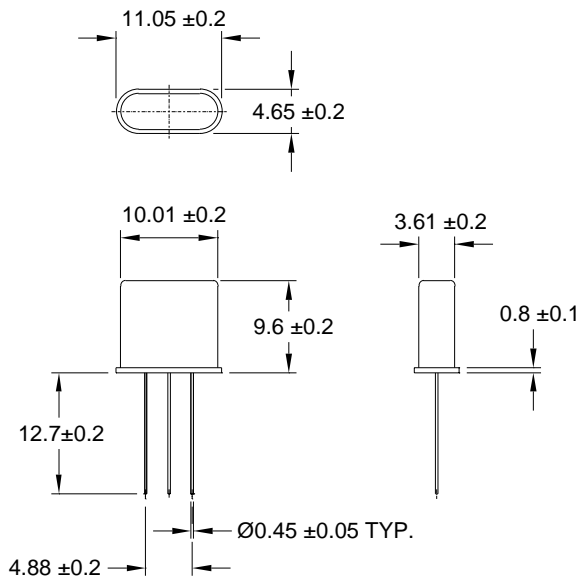
QC61



QC62



QC63



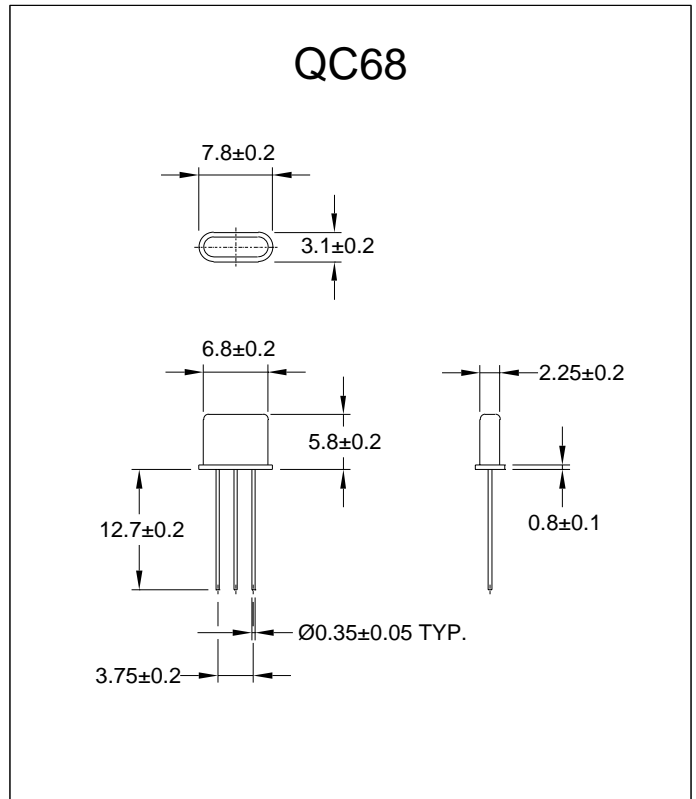
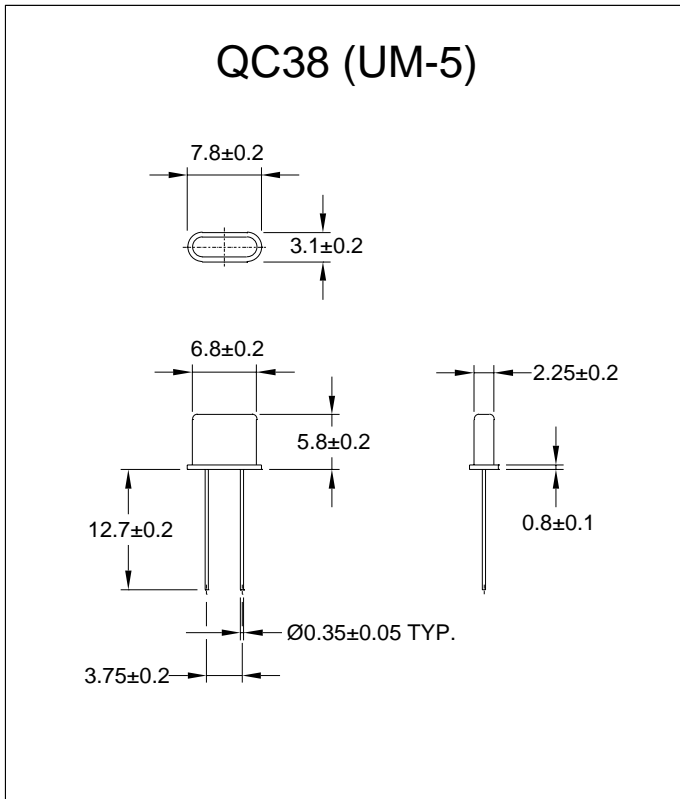
STANDARD PERFORMANCE REPRESENTATION

- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	8 to 45	25	13 to 35
3rd	25 to 90	35 to 50	1 to 3.8
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

Note:

Above parameters are for standard crystal units.
 Hy-Q sales office should be contacted for special requirements
 * Value dependent upon frequency

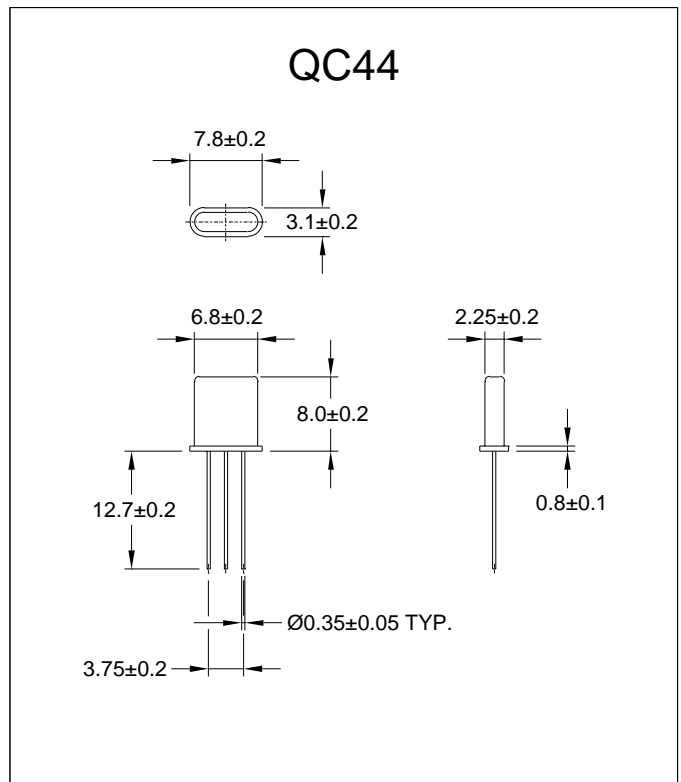
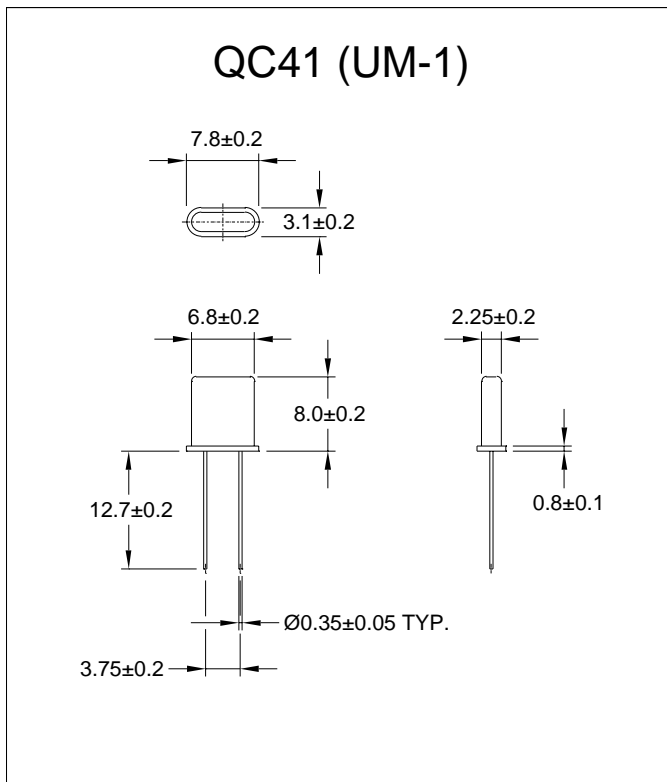


STANDARD PERFORMANCE REPRESENTATION

- Temperature Range -10°C to 60°C
- Stability (ppm) ±3 to ±100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ±5 to ±50 (±10ppm typical)
- ESR R₁ Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C₁) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C ₁ Typ. (fF)*
Fund.	16 to 45	30	9 to 26
3rd	40 to 90	50 to 60	0.5 to 1.5
5th	70 to 150	90	0.70
7th	125 to 175	180	0.20

Note:
 Above parameters are for standard crystal units.
 Hy-Q sales office should be contacted for special requirements.
 * Value dependent upon frequency.



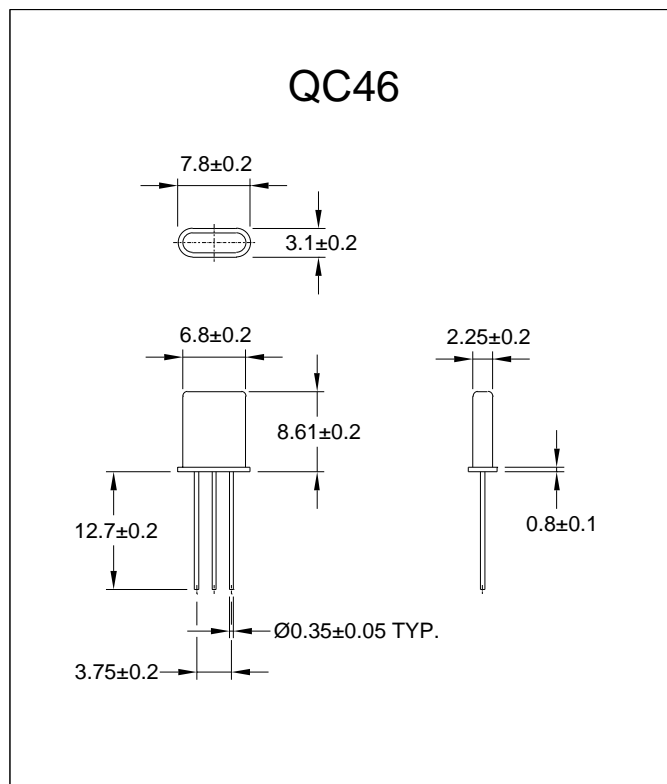
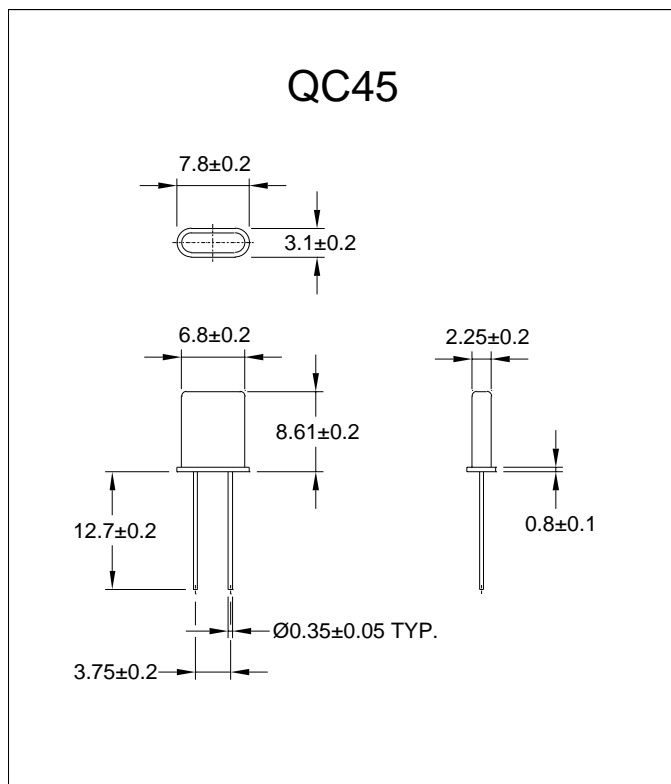
STANDARD PERFORMANCE REPRESENTATION

- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 ($\pm 10\text{ppm}$ typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	8 to 45	25 to 90	6 to 25
3rd	25 to 90	35 to 50	0.5 to 1.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

Note:

Above parameters are for standard crystal units.
 Hy-Q sales office should be contacted for special requirements.
 * Value dependent upon frequency.



STANDARD PERFORMANCE REPRESENTATION

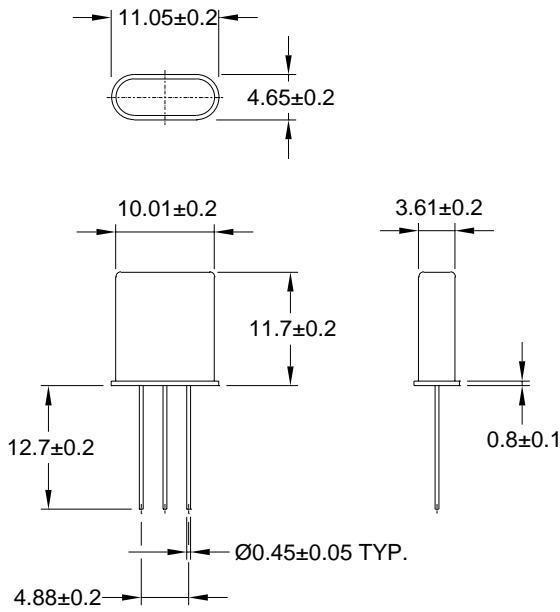
- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	8 to 45	25 to 90	6 to 25
3rd	25 to 90	35 to 50	0.5 to 1.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

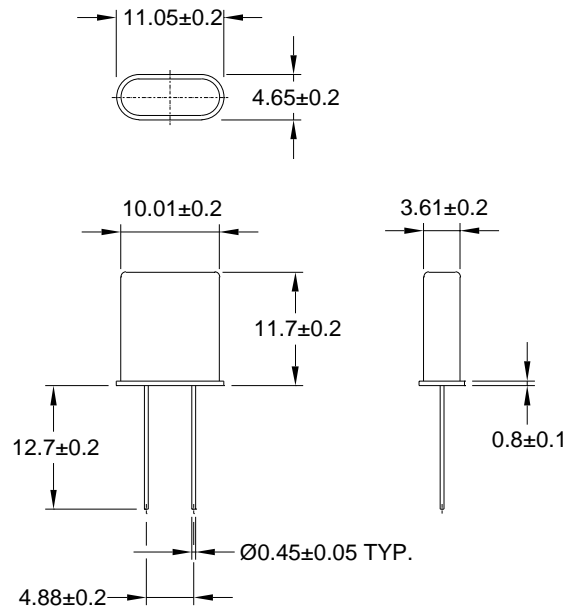
Note:

Above parameters are for standard crystal units.
 Hy-Q sales office should be contacted for special requirements.
 * Value dependent upon frequency.

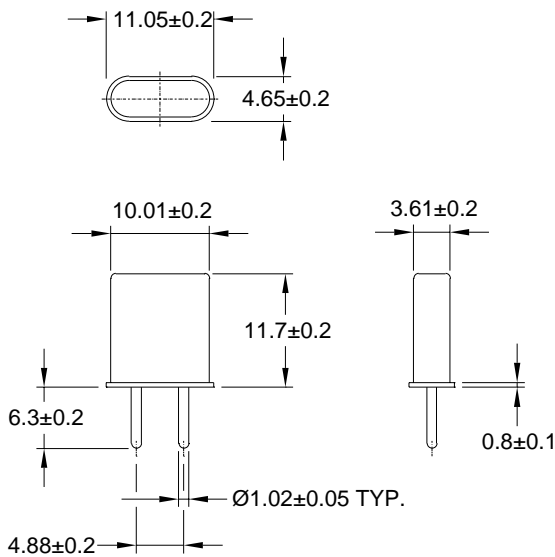
QC53



QC55



QC56



STANDARD PERFORMANCE REPRESENTATION

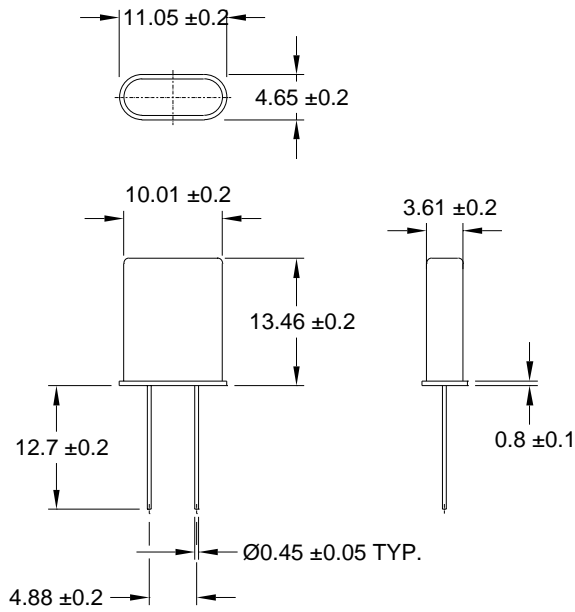
- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	3 to 45	20 to 180	5 to 30
3rd	18 to 90	40	1 to 2.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

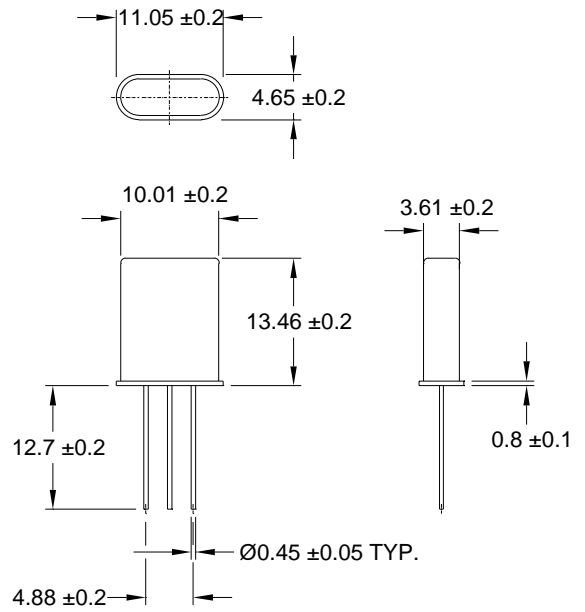
Note:

Above parameters are for standard crystal units.
Hy-Q sales office should be contacted for special requirements.
* Value dependent upon frequency.

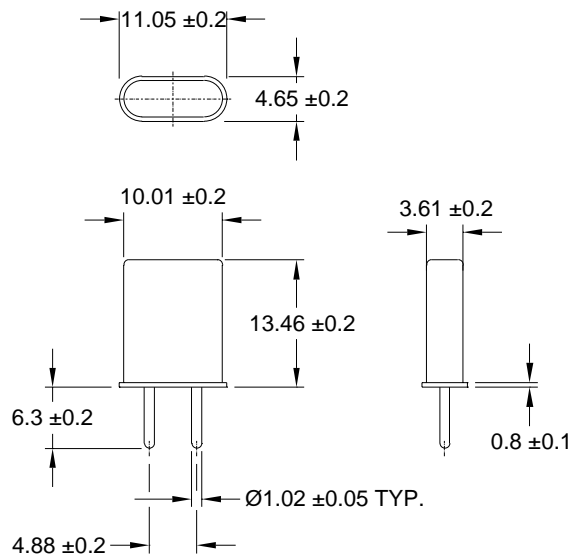
QC49



QC59



QC50



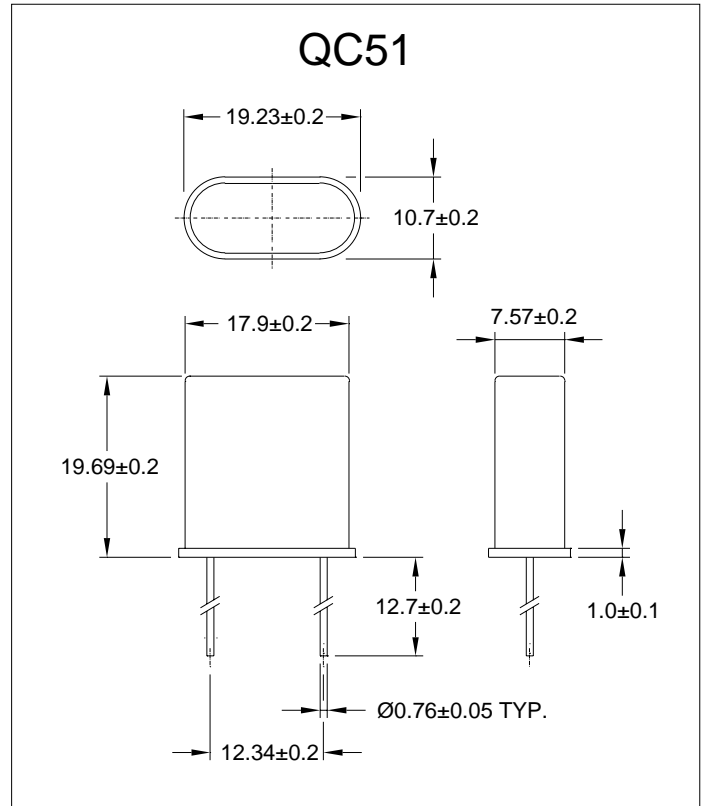
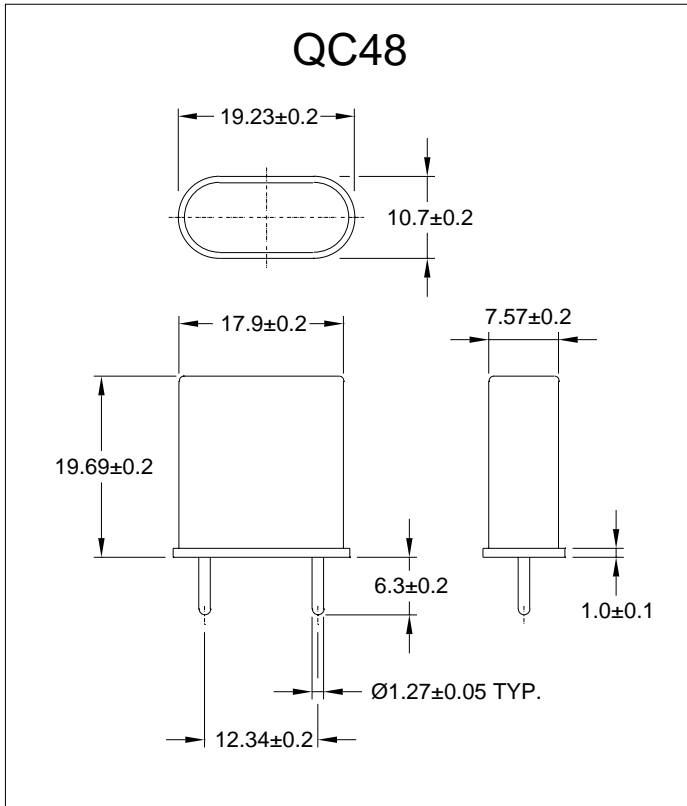
STANDARD PERFORMANCE REPRESENTATION

- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	3 to 45	20 to 180	5 to 30
3rd	18 to 90	40	1 to 2.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

Note:

Above parameters are for standard crystal units.
Hy-Q sales office should be contacted for special requirements.
* Value dependent upon frequency.



STANDARD PERFORMANCE REPRESENTATION

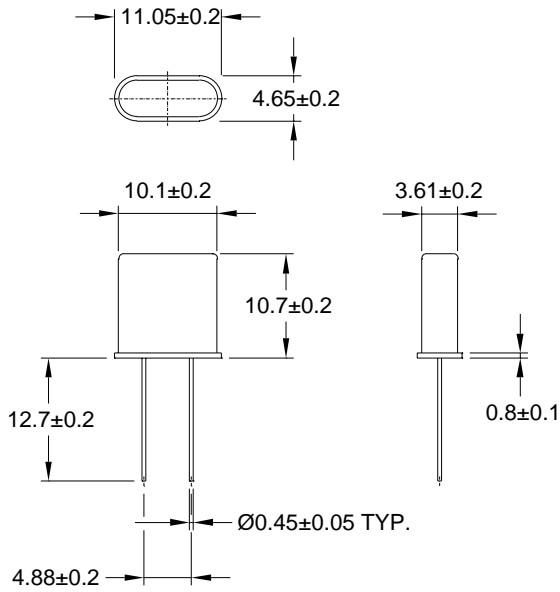
- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	1 to 45	15 to 500	8 to 35
3rd	15 to 90	35	1.5 to 3.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

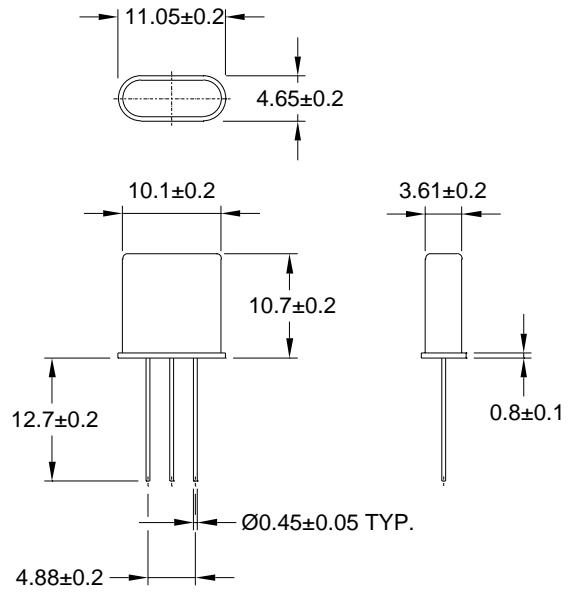
Note:

Above parameters are for standard crystal units.
 Hy-Q sales office should be contacted for special requirements.
 * Value dependent upon frequency.

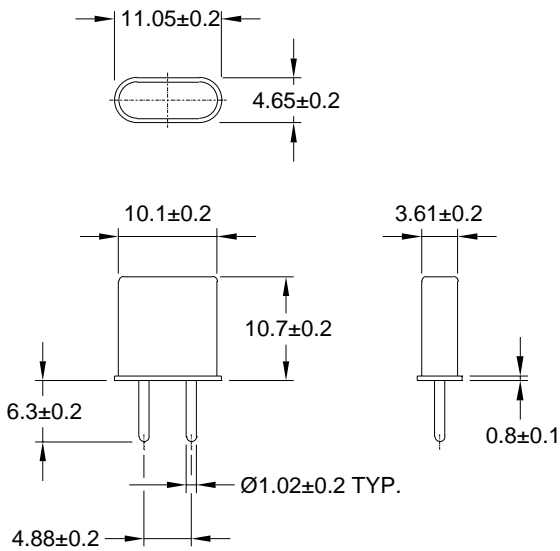
QC52



QC54



QC57



STANDARD PERFORMANCE REPRESENTATION

- Temperature Range -10°C to 60°C
- Stability (ppm) ± 3 to ± 100
- Load Capacitance (C_L) Series to 150pF
- Calibration ppm at 25°C ± 5 to ± 50 (± 10 ppm typical)
- ESR R_1 Refer table
- Shunt (C_O) 7pF Maximum
- Motional Capacitance (C_1) Refer table
- Drive Level 0.5mW Typical

Mode	Frequency Range (MHz)	Max. ESR (Ohms)*	C_1 Typ. (fF)*
Fund.	4 to 45	20 to 110	8 to 30
3rd	18 to 90	40	1 to 2.5
5th	60 to 150	60	0.70
7th	125 to 175	120	0.35
9th	175 to 200	120	0.20

Note:

Above parameters are for standard crystal units.
Hy-Q sales office should be contacted for special requirements.
* Value dependent upon frequency.