

Hy-Q

International

Quartz Crystal Filter Product Guide

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Application

Quartz crystal filters are the optimum choice where the application requires selective narrow band filtering at HF and VHF frequencies. Because of the extremely high Q of quartz resonators, crystal filters with a fractional bandwidth of the order of 0.01% to 0.5% can be realised with low insertion loss and high selectivity. Hy-Q International employs modern computer aided design techniques covering conventional crystal filter realisations and polyolithic realisations. The conventional approach, utilising discrete crystal resonators, is employed at low frequencies and where the selectivity or bandwidth requirements are such that complex realisations are necessary, as in HF SSB filters. The polyolithic approach, using cascaded monolithic dual filter elements, is used at higher frequencies where the selectivity and bandwidth requirements allow.

Terms and Definitions

Reference Frequency: a frequency defined by specification to which other frequencies may be referred. Normally, the reference frequency indicates the centre frequency (f_0), the carrier frequency (f_c) in SSB filters.

Relative Attenuation: the difference between the attenuation at a given frequency and the minimum attenuation in the pass band or the attenuation at the reference frequency.

Pass Band: bands of frequencies B_1 (kHz) in which the relative attenuation is equal or less than a specific value A_1 (dB).

Pass Bandwidth: the separation of frequencies between which the relative attenuation is equal to or less than a specific value A_1 (dB).

Pass Band Ripple: R(dB) the greatest difference between the maximum and the minimum attenuation within a pass band.

Insertion Loss: L(dB) for a specified frequency, the attenuation resulting from the insertion of a filter into a transmission system, i.e. the logarithmic ratio of the power delivered to the load before insertion of the filter to the power delivered to the load after insertion of the filter. The term 'Insertion Loss' is often loosely used to refer to the minimum value of the attenuation in the pass band.

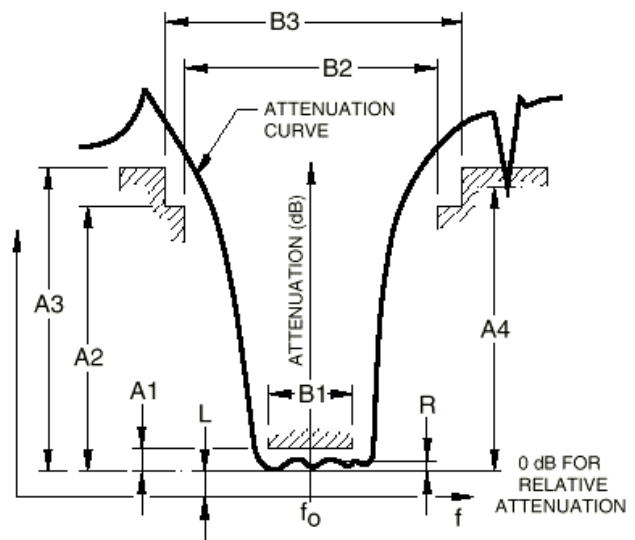
Stop Band: band(s) of frequencies in which the relative attenuation is equal or greater than the specified minimum values.

Stop Bandwidth: the separation of frequencies B_2 and B_3 kHz at which the relative attenuation first exceeds the specified minimum values A_2 and A_3 (dB) respectively.

Spurious Response Attenuation: the minimum attenuation A_4 (dB) guaranteed for spurious response in the stop band. Spurious responses usually occur at frequencies higher than the centre frequency.

Attenuation Guaranteed: the minimum attenuation A_2 or A_3 (dB) guaranteed in specific frequency ranges.

Terminating Impedances: the impedance presented to the filter by the source and load, usually expressed in terms of a parallel combination of resistance and capacitance.



Ordering Information

Where possible, filters for a given application should be selected from the Standard Range, and ordered by quoting the appropriate filter type. If the application is such that a custom filter is required, then our engineers are available to discuss the specification and to obtain the best compromise between performance and the unavoidable cost of design and development.

Standard Filters:

Hy-Q International offer a range of standard filters which cover the most common applications. These all fall into the following groups:

- Channel Filters
- Filters for HF applications
- Filters for VHF applications
- LC Filters

Full details of these are given in the individual data sheets.

Non-Standard Requirements:

The following is the minimum information required for the specification for a non-standard filter.

FILTER APPLICATION: Low Pass _____ High Pass _____ Band Pass _____ SSB _____ Other _____

REFERENCE FREQUENCY (f_0): _____ kHz

PASS BANDWIDTH: _____ dB @ \pm _____ kHz

Ripple _____ dB Max. Insertion Loss _____ dB Max.

STOP BANDWIDTH(S): _____ dB @ \pm _____ kHz

_____ dB @ \pm _____ kHz

GUARANTEED ATTENUATION: _____ dB @ \pm _____ kHz

SOURCE IMPEDANCE: _____ ohm // _____ pF

LOAD IMPEDANCE: _____ ohm // _____ pF

OPERATING TEMPERATURE RANGE: _____ °C _____ °C

PACKAGE STYLE: _____ or SIZE L _____ W _____ H _____

10.7 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz		RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
12.5 kHz CHANNEL SPACING										
QMF 10741	2	3±3.75	18±12.5		1.0	2.0	35+300 ~ +1000 35-300 ~ -1000	3.3k / 2.5	-40 - +80	QC53
QMF 10743	2	3±3.75	20±18.0		0.5	1.5	35+300 ~ +1000 35-300 ~ -1000	1.8k / 6.0	-20 - +70	QC59
QMF 10744	4	3±3.75	40±14.0		1.0	2.5	50+300 ~ +1000 70-200 ~ -1000	1.8k / 5.0	-20 - +70	QC59 x2
QMF 10750	4	3±3.75	40±14.0		1.0	2.5	50+300 ~ +1000 70-200 ~ -1000	3.0k / 2.0	-20 - +70	QC59 x2
QMF 10745	6	3±3.75	45±8.75	65±12.5	2.0	3.5	65±12.5 ~ ±300	1.8k / 5.0	-20 - +70	QFP10
QMF 10742	6	3±3.75	50±8.75	65±12.5	2.0	3.0	65±12.5 ~ ±300	3.3k / 2.5	-40 - +80	QFP10
QMF 10749	8	3±3.75	65±8.75	90±12.5	2.0	4.0	90±12.5 ~ ±300	1.8k / 5.0	-20 - +70	QFP11
QMF 10718	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	910 / 25	-40 - +80	QFP7
QMF 10725	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	910 / 25	-20 - +70	QFP9
QMF 10726	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	3.3k / 2.5	-20 - +70	QFP11
QMF 10732	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	470 / 25	-40 - +80	QFP7
QMF 10758	8	3±3.75	65±8.75	90±12.5	1.0	2.0	90±12.5 ~ ±300	3.3k / 2.5	-20 - +70	QFP11
QMF 10762	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	820 / 10	-20 - +70	QFP9
QMF 10767	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	910 / 25	-20 - +70	QFP9
QMF 10770	8	3±3.75	70±8.75	90±12.5	2.0	4.5	90±12.5 ~ ±300	3.3k / 2.5	-20 - +70	QFP11
QMF 10739	10	3±3.75	90±8.75		2.0	4.5	90±8.75 ~ ±300	3.3k / 2.5	-20 - +70	QFP12
20 kHz CHANNEL SPACING										
QMF 10746	2	3±6.0	18±20.0		1.0	2.0	35+300 ~ +1000 40-200 ~ -1000	3.3k / 2.0	-40 - +80	QC53
QMF 10751	4	3±6.0	40±20.0		1.0	2.5	50+300 ~ +1000 70-200 ~ -1000	3.3k / 1.5	-20 - +70	QC59 x2
QMF 10747	6	3±6.0	50±14.0	65±20.0	2.0	3.0	65±20.0 ~ ±300	3.3k / 2.0	-20 - +70	QFP10
QMF 10738	8	3±6.0	70±14.0	90±20.0	2.0	3.5	90±20.0 ~ ±300	910 / 25	-20 - +70	QFP9
QMF 10740	8	3±6.0	70±14.0	90±20.0	2.0	3.5	90±20.0 ~ ±300	910 / 25	-20 - +70	QFP7
QMF 10748	8	3±6.0	70±14.0	90±20.0	2.0	3.5	90±20.0 ~ ±300	3.3k / 2.0	-40 - +80	QFP11
25 kHz CHANNEL SPACING										
QMF 10752A	2	3±7.5	18±25.0		0.5	1.5	35+300 ~ +1000 40-200 ~ -1000	3.0k / 2.0	-20 - +70	QC59
QMF 10752	2	3±7.5	18±25.0		1.0	2.0	35+300 ~ +1000 40-200 ~ -1000	3.3k / 1.5	-40 - +80	QC53
QMF 10771	4	3±7.5	40±25.0		1.0	2.5	40±25.0 ~ ±300	3.0k / 0	-40 - +80	QC53 x2
QMF 10772	4	3±7.5	40±25.0		1.0	2.5	65+300 ~ +1000 85-200 ~ -1000	3.0k / 1.5	-40 - +80	QC53 x2
QMF 10766	4	3±10.0	30±25.0	45±35.0	0.5	3.0	45±35.0 ~ ±300	910 / 25	-40 - +80	QFP9
QMF 10765	6	3±11.5	45±25.0	60±35.0	1.0	3.5	60±35.0 ~ ±300	910 / 25	-40 - +80	QFP9
QMF 10753	6	3±7.5	50±17.5	65±25.0	2.0	3.0	65±25.0 ~ ±300	3.3k / 1.5	-40 - +80	QFP10
QMF 10712	8	3±7.5	65±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	3.3k / 1.5	-40 - +80	QFP11
QMF10712A	8	6±7.5	60±15.0	90±25.0	2.0	4.0	90±25.0 ~ ±300	3.0k / 0	-20 - +70	QFP11
QMF 10713	8	3±7.5	80±22.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-20 - +70	QFP9
QMF 10716	8	6±7.5	80±25.0		2.0	3.5	80±25.0 ~ ±300	820 / 0(1) 820 / 25(0)	-20 - +70	QFP9
QMF 10719	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-40 - +80	QFP7
QMF 10729	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-40 - +80	QFP9
QMF 10730	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	470 / 25	-40 - +80	QFP7
QMF 10735	8	3±7.5	80±22.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-20 - +70	QFP9
QMF 10737	8	3±7.5	75±18.0	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-40 - +80	QFP7
QMF 10757	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 25	-40 - +80	QFP7
QMF 10761	8	3±7.5	80±22.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	820 / 10	-20 - +70	QFP9
QMF 10736	10	3±7.5	90±17.5		2.0	4.0	90±17.5 ~ ±300	3.0k / 0	-20 - +70	QFP12
34 kHz CHANNEL SPACING										
QMF 10M20A	2	3±10.0	18±34.0		0.5	1.5	35+300 ~ +1000 40-200 ~ -1000	3.9k / 2.0	-20 - +70	QC59
QMF 10M20B	4	3±10.0	40±34.0		1.0	2.5	50+300 ~ +1000 70-200 ~ -1000	3.9k / 2.0	-20 - +70	QC59 x2

21.4 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz		RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
12.5 kHz CHANNEL SPACING										
QMF 21407	2	3±3.75	20±18.0		0.5	1.5	35+350 ~ +1000 50-200 ~ -1000	850 / 8.0	-20 - +70	QC44
QMF 21406	4	3±3.75	40±14.0		1.0	2.5	65+350 ~ +1000 80-200 ~ -1000	850 / 6.5	-20 - +70	QC44 x2
QMF 21404	6	3±3.75	45±8.75	65±12.5	2.0	3.0	65±12.5 ~ ±300	850 / 6.0	-20 - +70	QFP22
QMF 21405	8	3±3.75	65±9.0	90±12.5	2.0	4.0	90±12.5 ~ ±300	850 / 6.0	-20 - +70	QFP23
QMF 21408	6	3±3.75	45±8.75	65±12.5	2.0	3.0	65±12.5 ~ ±300	850 / 6.0	-20 - +70	QFP10
QMF 21409	8	3±3.75	65±9.0	90±12.5	2.0	4.0	90±12.5 ~ ±300	850 / 6.0	-20 - +70	QFP11
QMF 21410	8	3±3.75	65±9.0	90±12.5	2.0	4.0	90±12.5 ~ ±300	910 / 3.0	-20 - +70	QFP11
QMF 21411	2	3±3.75	20±18.0		0.5	1.5	35+350 ~ +1000 50-200 ~ -1000	1.6k / 2.0	-20 - +70	QC44
QMF 21412	4	3±3.75	40±14.0		1.0	2.5	65+350 ~ +1000 80-200 ~ -1000	1.6k / 2.0	-20 - +70	QC44 x2
QMF 21413	6	3±3.75	45±8.75	65±12.5	2.0	3.0	65±12.5 ~ ±300	1.6k / 3.0	-20 - +70	QFP22
QMF 21414	8	3±3.75	65±9.0	90±12.5	2.0	4.0	90±12.5 ~ ±300	1.6k / 2.0	-20 - +70	QFP23
QMF 21415	6	3±3.75	45±8.75	65±12.5	2.0	3.0	65±12.5 ~ ±300	1.6k / 3.0	-20 - +70	QFP10
QMF 21416	8	3±3.75	65±9.0	90±12.5	2.0	4.0	90±12.5 ~ ±300	1.6k / 2.0	-20 - +70	QFP11
20 kHz CHANNEL SPACING										
QMF 21430	2	3±6.0	20±25.0		0.5	1.5	35+350 ~ +1000 50-200 ~ -1000	1.2k / 2.5	-20 - +70	QC44
QMF 21431	4	3±6.0	40±20.0		1.0	2.5	65+350 ~ +1000 80-200 ~ -1000	1.2k / 2.5	-20 - +70	QC44 x2
QMF 21436	6	3±6.0	45±14.0	65±20.0	2.0	2.5	65±20.0 ~ ±300	1.2k / 2.5	-20 - +70	QFP22
QMF 21434	8	3±6.0	65±14.0	90±20.0	2.0	3.0	90±20.0 ~ ±300	1.2k / 2.5	-20 - +70	QFP23
QMF 21432	6	3±6.0	45±14.0	65±20.0	2.0	2.5	65±20.0 ~ ±300	1.6k / 1.0	-20 - +70	QFP22
QMF 21433	6	3±6.0	45±14.0	65±20.0	2.0	2.5	65±20.0 ~ ±300	1.6k / 1.0	-20 - +70	QFP10
QMF 21435	8	3±6.0	65±14.0	90±20.0	2.0	3.0	90±20.0 ~ ±300	1.2k / 2.5	-20 - +70	QFP11
25 kHz CHANNEL SPACING										
QMF 21446	2	3±7.5	18±25.0		1.0	2.0	35+350 ~ +1000 50-200 ~ -1000	1.6k / 2.0	-40 - +80	QC44
QMF 21446A	2	3±7.5	18±25.0		0.5	1.5	35+350 ~ +1000 50-200 ~ -1000	1.5k / 2.0	-20 - +70	QC44
QMF 21447	4	3±7.5	40±25.0		1.0	2.0	65+350 ~ +1000 80-200 ~ -1000	1.5k / 2.0	-40 - +80	QC44 x2
QMF 21448	4	3±7.5	40±25.0		1.0	2.0	65+300 ~ +1000 85-200 ~ -1000	1.5k / 2.0	-40 - +80	QC44 x2
QMF 21444A	6	3±7.5	45±17.5	65±25.0	2.0	2.5	65±25.0 ~ ±300	1.5k / 2.0	-20 - +70	QFP22
QMF 21443	6	3±7.5	50±17.5	65±25.0	2.0	3.0	65±25.0 ~ ±300	1.6k / 2.0	-40 - +80	QFP10
QMF 21444	6	3±7.5	50±17.5	65±25.0	2.0	3.0	65±25.0 ~ ±300	1.6k / 2.0	-40 - +80	QFP22
QMF 21445A	8	3±7.5	65±17.5	90±25.0	2.0	3.0	90±25.0 ~ ±300	1.5k / 2.0	-20 - +70	QFP23
QMF 21441	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	910 / 15	-40 - +80	QFP9
QMF 21442	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	1.6k / 2.0	-40 - +80	QFP11
QMF 21445	8	3±7.5	70±17.5	90±25.0	2.0	3.5	90±25.0 ~ ±300	1.6k / 2.0	-40 - +80	QFP23
QMF 21449	8	3±7.5	60±15.5	80±20.0	2.0	4.0	80±20.0 ~ ±300	1.0k / 1.0	-20 - +70	QFP11
34 kHz CHANNEL SPACING										
QMF 21M20A	2	3±10.0	18±34.0		0.5	2.0	35+350 ~ +1000 50-200 ~ -1000	1.8k / 1.5	-20 - +70	QC44
QMF 21M20B	4	3±10.0	40±34.0		1.0	2.5	65+350 ~ +1000 80-200 ~ -1000	1.8k / 1.5	-20 - +70	QC44 x2
QMF 21450	8	3±11.0	70±25.0	80±35.0	2.0	3.5	80±35.0 ~ ±300	1.6k / 2.0	-20 - +70	QFP11
50 kHz CHANNEL SPACING										
QMF 21M30A	2	3±15.0	15±45.0		0.5	1.5	35+350 ~ +1000 45-200 ~ -1000	3.0k / 0.5	-20 - +70	QC44
QMF 21M30B	4	3±15.0	40±50.0		1.0	2.5	65+350 ~ +1000 80-200 ~ -1000	3.0k / 0.5	-20 - +70	QC44 x2

16.9 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz	RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
25 kHz CHANNEL SPACING									
QMF 16M15A	2	3±7.5	18±25.0	0.5	1.5	35+300 ~ +1000 40-200 ~ -1000	1.8k / 2.0	-20 - +70	QC59
QMF 16M15B	4	3±7.5	40±25.0	1.0	2.5	50+300 ~ +1000 70-200 ~ -1000	1.8k / 2.0	-20 - +70	QC59 x2

45.0 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz	RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
FUNDAMENTAL MODE									
QMF 45F15A	2	3±7.5	15±25.0	1.0	2.0	40+500 ~ +1000 40-200 ~ -1000	650 / 4.5	-20 - +70	QC44
QMF 45F20A	2	3±10.0	15±30.0	1.0	2.0	40+500 ~ +1000 40-200 ~ -1000	700 / 1.5	-20 - +70	QC44
QMF 45F30A	2	3±15.0	15±50.0	1.0	2.0	35+500 ~ +1000 35-200 ~ -1000	800 / 3.0	-20 - +70	QC44
QMF 45F15B	4	3±7.5	30±25.0	1.0	2.0	70+500 ~ +1000 70-200 ~ -1000	650 / 1.5	-20 - +70	QC44 x2
QMF 45F20B	4	3±10.0	40±48.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	700 / 1.0	-20 - +70	QC44 x2
QMF 45F30B	4	3±15.0	40±60.0	1.0	3.0	70+500 ~ ±1000 70-200 ~ -1000	800 / 3.0	-20 - +70	QC44 x2
THIRD OVERTONE									
QMF 45M15A	2	3±7.5	15±30.0	1.0	2.0	40+500 ~ +1000 40-200 ~ -1000	3.3k / 1.0	-20 - +70	QC44
QMF 45M20A	2	3±10.0	15±35.0	1.0	2.0	40+500 ~ +1000 40-200 ~ -1000	5.5k / 1.0	-20 - +70	QC44
QMF 45M15B	4	3±7.5	25±25.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	3.3k / 1.0	-20 - +70	QC44 x2
QMF 45M20B	4	3±10.0	35±40.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	5.5k / 1.0	-20 - +70	QC44 x2

70.0 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz	RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
QMF 70M15A	2	3±7.5	15±30.0	1.0	3.0	35+500 ~ +1000 35-200 ~ -1000	2.5k / 1.0	-20 - +70	QC44
QMF 70M20A	2	3±10.0	15±30.0	1.0	2.0	35+500 ~ +1000 35-200 ~ -1000	2.5k / 1.0	-20 - +70	QC44
QMF 70M15B	4	3±7.5	25±25.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	2.5k / 1.0	-20 - +70	QC44 x2
QMF 70M20B	4	3±10.0	35±40.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	2.5k / 1.0	-20+70	QC44 x2

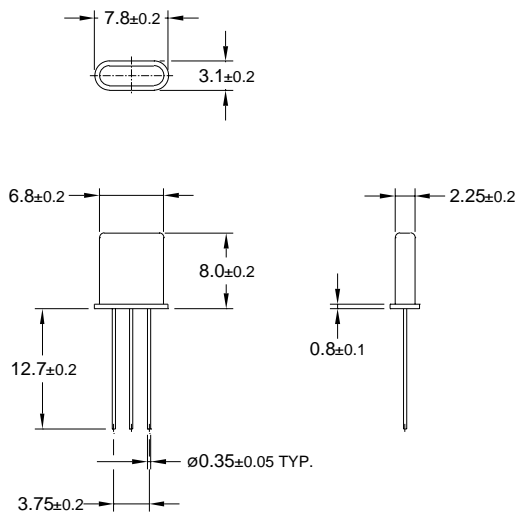
90.0 MHz Channel Filters

TYPE	POLE	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz	RIPPLE MAX dB	LOSS MAX dB	ATTENUATION GUARANTEED dB @ (fo±kHz)	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
QMF 90M15A	2	3±7.5	15±30.0	1.0	2.0	35+500 ~ +1000 35-200 ~ -1000	1.5k / 1.0	-20 - +70	QC44
QMF 90M20A	2	3±10.0	15±30.0	1.0	2.0	35+500 ~ +1000 35-200 ~ -1000	1.5k / 1.0	-20 - +70	QC44
QMF 90M15B	4	3±7.5	35±38.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	1.5k / 1.0	-20 - +70	QC44 x2
QMF 90M20B	4	3±10.0	35±40.0	1.0	3.0	70+500 ~ +1000 70-200 ~ -1000	1.5k / 1.0	-20 - +70	QC44 x2

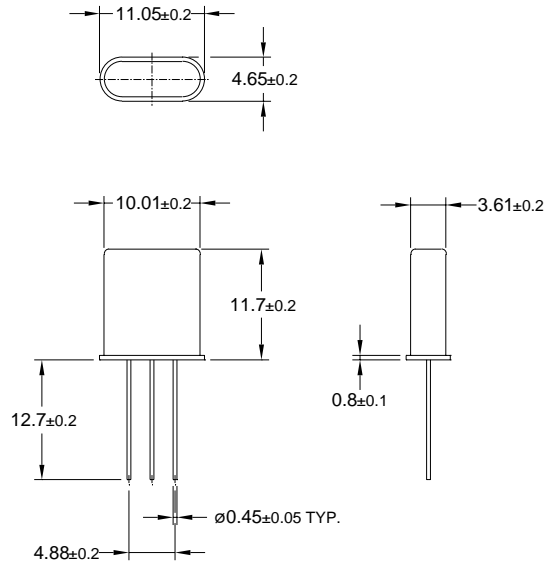
Filters For HF, SSB & VHF Applications

TYPE	APPLIC- ATION	PASS BANDWIDTH dB @ kHz	STOP BANDWIDTH dB @ kHz		RIPPLE MAX dB	LOSS MAX dB	CARRIER REJECTION dB MIN	TERMINATING IMPEDANCE ohms / pF	TEMP RANGE °C	PACKAGE
1.4 MHz										
HF FILTERS										
QF 01401	LSB	4-2.7 ~ -.35	20 0.0 40+0.15	60-3.4 ~ +.4	2.0	4.0	20	1k / 15	-15 to +55	QFP16
QF 01403	CW	3±0.5	60±3.50		2.0	4.0		1k / 15	-15 to +55	QFP16
QF 01405	LSB	4+2.7 ~ -.35	20 0.0 40-3.5 ~ +0.15	60-3.7 ~ +.4	2.0	4.0	20	1k / 15	-15 to +55	QFP16
QF 01406	USB	4+.35 ~ +2.7	60+3.7 ~ -0.4		2.0	4.0	20	1k / 15	-15 to +55	QFP16
QF 01408	BP	4±1.5	30±3.5	60±6.0	2.0	6.0		1k / 15	-15 to +55	QFP16
QF 01409	AM	4±0.5	60±2.0		2.0	6.0		1k / 15	-15 to +55	QFP16
QF 01410	CW	3±0.1	16±0.2 30±1.0	60±2.0	2.0	4.0		1k / 15	-15 to +55	QFP16
QF 01411	AM	3±0.15	60±0.4		2.0	5.0		50 / 0	-15 to +55	QFP16
QF 01412	AM	3±0.3	60±0.75		2.0	5.0		50 / 0	-15 to +55	QFP16
QF 01413	AM	3±0.75	60±1.9		2.0	5.0		50 / 0	-15 to +55	QFP16
QF 01414	AM	3±0.2	60±0.5		2.0	6.0		1k / 15	-15 to +55	QFP16
QF 01417	TELEX	3±.125	6±0.2 30±0.5	60±1.2	2.0	4.0		1k / 15	-15 to +55	QFP16
QF 01418	TELEX	3±.085 5±.125	6±0.17 30±0.38	60±0.5 66±0.55	1.0	5.0		1k / 15	-15 to +55	QFP16
QF 01419	TELEX	4±0.25	30±1.0	60±2.0	3.0	4.0		1k / 15	-15 to +55	QFP16
QF 01420	LSB	3-3.4 ~ -0.3	50-5.0 ~ +0.3	60-7.0 ~ +0.45	1.5	6.0		50 / 0	-15 to +55	QFP16
QF 01421	USB	3+0.3 ~ +3.4	50-0.3 ~ +5.0	60-0.45 ~ +7.0	1.5	6.0		50 / 0	-15 to +55	QFP16
QF 01422	DSB	3±3.0	60±14.0		2.0	6.0		50 / 0	-15 to +55	QFP16
QF 01423	DSB	5±2.7	20±6.0	60±12.0	2.0	6.0		1k / 15	-15 to +70	QFP16
QF 01425	LSB	3-2.3 ~ -1.1	60-3.4 ~ +0.05	30-2.9 ~ -0.5	2.0	6.0		1k / 15	-10 to +55	QFP16
QF 01426	USB	3+0.3 ~ +3.0	60-0.4 ~ +4.1		2.0	6.0		1k / 15	-10 to +55	QFP16
QF 01427	LSB	3-3.0 ~ -0.3	60-4.1 ~ +0.4		2.0	6.0		1k / 15	-10 to +55	QFP16
QF 01428	LSB	3-1.95 ~ -1.45	30-2.3 ~ -1.1	60-2.7 ~ -0.7	2.0	6.0		1k / 15	-10 to +55	QFP16
QF 01429	LSB	3-1.9 ~ -1.1	60-2.3 ~ -0.65		2.0	4.0		1k / 15	-15 to +55	QFP16
QF 01430	CW	3±0.1	60±0.3		3.0	5.0		50 / 0	-10 to +80	QFP16
QF 01431	CW	3±0.4	60±1.0		3.0	5.0		50 / 0	-10 to +80	QFP16
QF 01436	LSB	2-3.4 ~ -0.3	60-4.0 ~ +0.3		2.0	5.0		50 / 0	-10 to +60	QFP16
QF 01447	USB	4+0.35 ~ +2.7	60-0.4 ~ +3.7		2.0	4.0		50 / 0	-15 to +55	QFP16
QF 01448	LSB	4-2.7 ~ -0.35	20 0.0 35+3.1	40±0.15 60-3.4 ~ +0.4	2.0	4.0	20	50 / 0	-15 to +55	QFP16
QF 01449	DSB	3±2.7	30±8.0	60±10.0	2.0	6.0		50 / 0	-15 to +55	QFP16
QF 01453	USB	6+0.35 ~ +2.7	20+3.2 40+0.15 ~ +3.3	60+0.5 ~ +3.4	2.0	6.0		1k / 15	-15 to +55	QFP16
QF 01456	LSB	4-2.7 ~ -0.35	20-3.2	60-3.4 ~ +0.4	2.0	6.0		1k / 15	-15 to +55	QFP16
1.65 MHz										
HF FILTERS										
QF 01601	DSB	6±3.0	60±14.0		2.0	3.5		1k / 100	0 to +60	QFP3
QF 01602	LSB	6-2.8 ~ -0.3	70-5.0 ~ +1.0		2.0	3.5	20	1k / 100	0 to +60	QFP3
QF 01606	USB	6+0.3 ~ +2.8	70-5.0 ~ +5.0		2.0	3.5	20	1k / 100	0 to +60	QFP3
QF 01607	LSB	6-3.1 ~ -0.3	70-5.0 ~ +1.0		2.0	3.5	20	1k / 100	0 to +60	QFP3
QF 01608	USB	6+0.3 ~ +3.0	70+5.0 ~ +1.0		2.0	3.5	20	10k / 7.0	0 to +60	QFP3
QF 01609	LSB	6-3.0 ~ -0.3	70+5.0 ~ +1.0		2.0	3.5	20	10k / 7.0	0 to +60	QFP3
QF 01610	USB	6+0.3 ~ +3.1	70-1.0 ~ +5.0		2.0	3.5	20	1k / 100	0 to +60	QFP3
QF 01612	LSB	6-2.6 ~ -0.3	70-5.0 ~ +1.0		2.0	3.5	20	1k / 100	0 to +60	QFP3
5.0 MHz										
SSB FILTERS										
							Ref Freq MHz			
QF 05051	SSB	6 0 ~ -3.0	60-4.6 ~ +1.6		1.0	3.0	5.050	50 / 0	0 to +50	QFP7
QF 05052	SSB	6 0 ~ +3.0	60-1.6 ~ +4.6		1.0	3.0	5.050	50 / 0	0 to +50	QFP7
9.0 MHz										
SSB FILTERS										
							Ref Freq MHz			
QF 09002	SSB	6±1.2	80±2.15	80±2.65	2.0	3.5	9.000	500 / 30	0 to +50	QFP7
QF 09006	SSB	6±7.5	80±16.5		2.0	3.5	9.000	1.2k / 30	0 to +50	QFP7
12.7 MHz										
SSB FILTERS										
							Ref Freq MHz			
QMF 12701	LSB	6-3.0 ~ -0.5	26-3.75 60-4.75 ~ +1.3		2.0	5.0	12.700	200 / 7(1) 3k / 7(0)	-30 to +60	QFP27
QMF 12702	USB	6+0.5 ~ +3.0	26+3.75 60-1.3 ~ +4.75		2.0	5.0	12.700	200 / 7(1) 3k / 7(1)	-30 to +60	QFP27
35.0 MHz										
VHF FILTERS										
							Ref Freq MHz			
QF 35401	AM/FM 25 kHz	3±3.5	25±12.0		1.0	3.0	35.3965	50 / 0	0 to +50	QFP9
45.0 MHz										
VHF FILTERS										
							Ref Freq MHz			
QF 45001	AM/FM 25 kHz	3±2.7	20±6.0 60±10.0	66±11.0	2.0	4.0	45.000	50 / 0	-15 to +55	QFP25
QF 45002	AM/FM 50 kHz	3±4.0	30±10.0	60±17.5	2.0	4.0	45.000	50 / 0	-15 to +55	QFP25

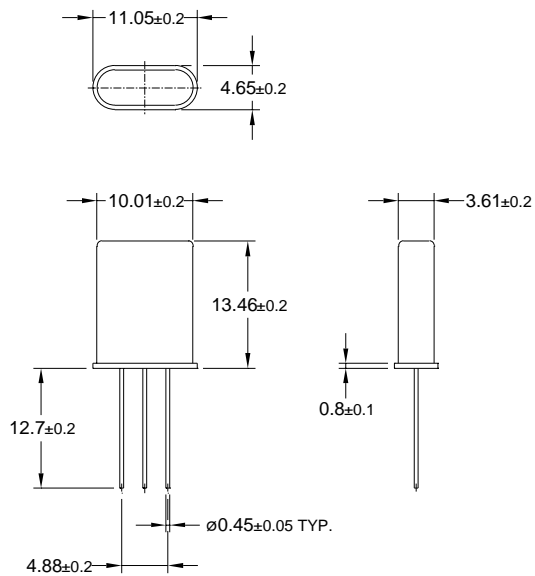
QC44



QC53



QC59



TYPICAL 4 POLE CONNECTION

