

# MONOLITHIC CRYSTAL FILTERS

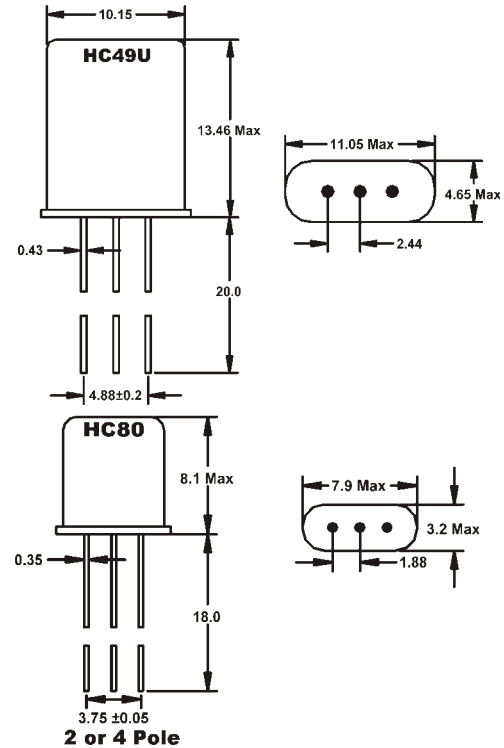
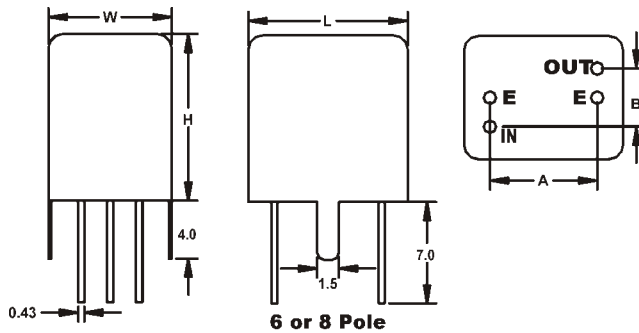
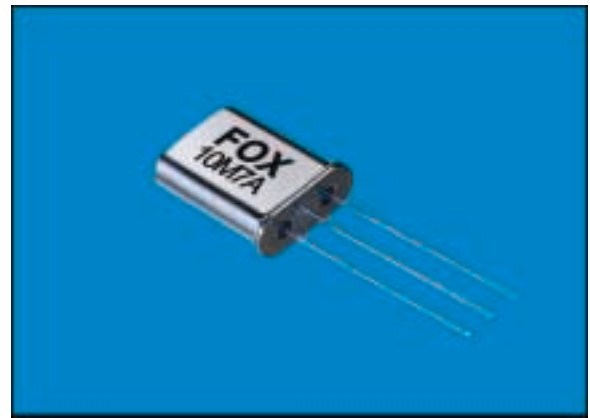
Fox filters offer excellent features such as sharp cut off characteristics, low loss and high stability over a wide temperature range which are superior to LC Filters and Ceramic Filters.

The basic building block for all custom built Fox filters is the two-pole monolithic filter available in standard package as shown. Two-pole monolithic filters are cascaded to produce four, six and eight pole filter responses with the addition of coupling capacitors between two-pole sections. Standard Fox filters are available with center frequencies from 10.7 MHz to 90 MHz, and from two to eight poles.

For custom made filters, please specify the following:

- Holder Size
- Insertion Loss
- Ripple
- Nominal Frequency
- Attenuation
- Terminating Impedance
- Pass Bandwidth
- Spurious Response
- Operating Temp. Range

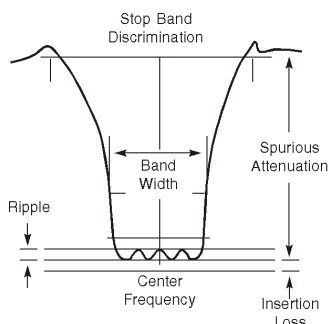
*Note: 45F Series 45.000 MHz fundamental is a special filter designed for mobile radio and cellular phone applications.*



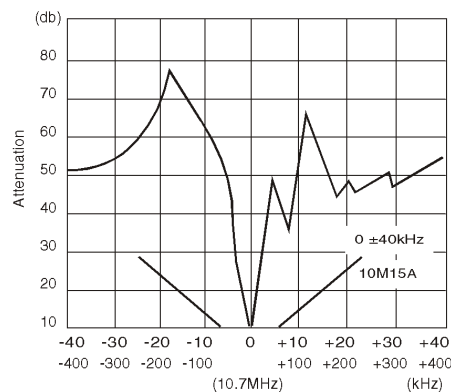
## • MULTI-POLE PACKAGE DIMENSIONS

| CASE TYPE | L     |        | W     |        | H     |        | A     |        | B     |       |
|-----------|-------|--------|-------|--------|-------|--------|-------|--------|-------|-------|
| C         | 0.590 | (15.0) | 0.472 | (12.0) | 0.591 | (15.0) | 0.354 | (9.0)  | 0.197 | (5.0) |
| D         | 0.728 | (18.5) | 0.472 | (12.0) | 0.591 | (15.0) | 0.531 | (13.5) | 0.197 | (5.0) |
| CN        | 0.433 | (11.0) | 0.335 | (8.5)  | 0.453 | (11.5) | 0.291 | (7.4)  | 0.157 | (4.0) |

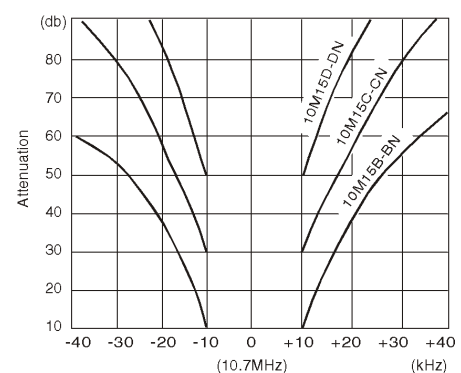
FILTER PARAMETERS



10.7MHz TWO POLE CHARACTERISTICS



MULTI-POLE CHARACTERISTICS



# • STANDARD MONOLITHIC CRYSTAL FILTERS

| Type   | Frequency<br>MHz | Pole | Case   | Pass Band<br>dB kHz | Stop Band<br>dB kHz | Stop Band<br>dB kHz | Ripple<br>Max dB | Loss<br>Max dB | Attenuation<br>Guaranteed<br>to $\pm$ kHz | Terminating<br>Impedance<br>ohms/pF |
|--------|------------------|------|--------|---------------------|---------------------|---------------------|------------------|----------------|-------------------------------------------|-------------------------------------|
| 10M7A  | 10.700           | 2    | 49U    | 3 $\pm$ 3.75        | 20 $\pm$ 18         |                     | 0.5              | 1.5            | 35 +300 ~ +1000<br>40 -200 ~ -1000        | 1.8K//6.0                           |
| 10M7B  | 10.700           | 4    | 49Ux2  | 3 $\pm$ 3.75        | 40 $\pm$ 14         |                     | 1.0              | 2.5            | 50 +300 ~ +1000<br>70 -200 ~ -1000        | 1.8K//5.0<br>Cc = 11pF              |
| 10M7C  | 10.700           | 6    | C      | 3 $\pm$ 3.75        | 45 $\pm$ 8.75       | 65 $\pm$ 12.5       | 2.0              | 3.5            | 65 $\pm$ 12.5 ~ $\pm$ 300                 | 1.8K//5.0                           |
| 10M7D  | 10.700           | 8    | D      | 3 $\pm$ 3.75        | 65 $\pm$ 8.75       | 90 $\pm$ 12.5       | 2.0              | 4.0            | 90 $\pm$ 12.5 ~ $\pm$ 300                 | 1.8K//5.0                           |
| 10M12A | 10.700           | 2    | 49U    | 3 $\pm$ 6.0         | 20 $\pm$ 25         |                     | 0.5              | 1.5            | 35 +300 ~ +1000<br>40 -200 ~ -1000        | 3.3K//1.5                           |
| 10M12B | 10.700           | 4    | 49Ux2  | 3 $\pm$ 6.0         | 40 $\pm$ 20         |                     | 1.0              | 2.5            | 50 +300 ~ +1000<br>70 -200 ~ -1000        | 3.3K//1.5<br>Cc = 6pF               |
| 10M12C | 10.700           | 6    | C      | 3 $\pm$ 6.0         | 50 $\pm$ 14         | 65 $\pm$ 20         | 2.0              | 3.0            | 65 $\pm$ 20 ~ $\pm$ 300                   | 3.3K//2.0                           |
| 10M12D | 10.700           | 8    | D      | 6 $\pm$ 6.0         | 65 $\pm$ 14         | 90 $\pm$ 20         | 2.0              | 3.5            | 90 $\pm$ 20 ~ $\pm$ 300                   | 3.3K//2.0                           |
| 10M15A | 10.700           | 2    | 49U    | 3 $\pm$ 7.5         | 18 $\pm$ 25         |                     | 0.5              | 1.5            | 35 +300 ~ +1000<br>40 -200 ~ -1000        | 3.0K//2.0                           |
| 10M15B | 10.700           | 4    | 49Ux2  | 3 $\pm$ 7.5         | 40 $\pm$ 25         |                     | 1.0              | 2.5            | 50 +300 ~ +1000<br>70 -200 ~ -1000        | 3.0K//2.0<br>Cc = 5pF               |
| 10M15C | 10.700           | 6    | C      | 3 $\pm$ 7.5         | 50 $\pm$ 17.5       | 65 $\pm$ 25         | 2.0              | 3.0            | 65 $\pm$ 25 ~ $\pm$ 300                   | 3.3K//1.5                           |
| 10M15D | 10.700           | 8    | D      | 6 $\pm$ 7.5         | 65 $\pm$ 17.5       | 90 $\pm$ 25         | 2.0              | 3.5            | 90 $\pm$ 25 ~ $\pm$ 300                   | 3.3K//1.5                           |
| 10M20A | 10.700           | 2    | 49U    | 3 $\pm$ 10.0        | 18 $\pm$ 34         |                     | 0.5              | 1.5            | 35 +300 ~ +1000<br>40 -200 ~ -1000        | 3.9K//1.0                           |
| 10M20B | 10.700           | 4    | 49Ux2  | 3 $\pm$ 10.0        | 40 $\pm$ 34         |                     | 1.0              | 2.5            | 50 +300 ~ +1000<br>70 -200 ~ -1000        | 3.9K//1.0<br>Cc = 3pF               |
| 16M15A | 16.900           | 2    | 49U    | 3 $\pm$ 7.5         | 18 $\pm$ 25         |                     | 0.5              | 1.5            | 35 +300 ~ +1000<br>40 -200 ~ -1000        | 1.8K//2.0                           |
| 16M15B | 16.900           | 4    | 49Ux2  | 3 $\pm$ 7.5         | 40 $\pm$ 25         |                     | 1.0              | 2.5            | 50 +300 ~ +1000<br>70 -200 ~ -1000        | 1.8K//1.5<br>Cc = 7.5pF             |
| 16M15C | 16.900           | 6    | C      | 3 $\pm$ 7.5         | 45 $\pm$ 17.5       | 65 $\pm$ 25         | 2.0              | 3.0            | 65 $\pm$ 25 ~ $\pm$ 300                   | 1.8K//1.5                           |
| 16M15D | 16.900           | 8    | D      | 3 $\pm$ 7.5         | 65 $\pm$ 17.5       | 90 $\pm$ 25         | 2.0              | 3.5            | 90 $\pm$ 25 ~ $\pm$ 300                   | 1.8K//1.5                           |
| 21M7A  | 21.400           | 2    | HC80   | 3 $\pm$ 3.75        | 20 $\pm$ 18         |                     | 0.5              | 1.5            | 35 +350 ~ +1000<br>50 -200 ~ -1000        | 850//6.0                            |
| 21M7B  | 21.400           | 4    | HC80x2 | 3 $\pm$ 3.75        | 40 $\pm$ 14         |                     | 1.0              | 2.5            | 65 +350 ~ +1000<br>80 -200 ~ -1000        | 850//5.0<br>Cc = 16pF               |
| 21M7C  | 21.400           | 6    | CN     | 3 $\pm$ 3.75        | 45 $\pm$ 8.75       | 65 $\pm$ 12.5       | 2.0              | 3.0            | 65 $\pm$ 12.5 ~ $\pm$ 300                 | 850//5.0                            |
| 21M7D  | 21.400           | 8    | CN     | 3 $\pm$ 3.75        | 65 $\pm$ 9.0        | 90 $\pm$ 12.5       | 2.0              | 4.0            | 90 $\pm$ 12.5 ~ $\pm$ 300                 | 850//5.0                            |
| 21M12A | 21.400           | 2    | HC80   | 3 $\pm$ 6.0         | 20 $\pm$ 25         |                     | 0.5              | 1.5            | 35 +350 ~ +1000<br>50 -200 ~ -1000        | 1.2K//3.0                           |
| 21M12B | 21.400           | 4    | HC80x2 | 3 $\pm$ 6.0         | 40 $\pm$ 20         |                     | 1.0              | 2.5            | 65 +350 ~ +1000<br>80 -200 ~ -1000        | 1.2K//2.5<br>Cc = 10.5pF            |
| 21M12C | 21.400           | 6    | CN     | 3 $\pm$ 6.0         | 45 $\pm$ 14         | 65 $\pm$ 20         | 2.0              | 2.5            | 65 $\pm$ 20 ~ $\pm$ 300                   | 1.2K//2.5                           |
| 21M12D | 21.400           | 8    | CN     | 3 $\pm$ 6.0         | 65 $\pm$ 14         | 90 $\pm$ 20         | 2.0              | 3.0            | 90 $\pm$ 20 ~ $\pm$ 300                   | 1.2K//2.5                           |
| 21M15A | 21.400           | 2    | HC80   | 3 $\pm$ 7.5         | 18 $\pm$ 25         |                     | 0.5              | 1.5            | 35 +350 ~ +1000<br>50 -200 ~ -1000        | 1.5K//2.0                           |
| 21M15B | 21.400           | 4    | HC80x2 | 3 $\pm$ 7.5         | 40 $\pm$ 25         |                     | 1.0              | 2.5            | 65 +350 ~ +1000<br>80 -200 ~ -1000        | 1.5K//2.0<br>Cc = 8pF               |
| 21M15C | 21.400           | 6    | CN     | 3 $\pm$ 7.5         | 45 $\pm$ 17.5       | 65 $\pm$ 25         | 2.0              | 2.5            | 65 $\pm$ 25 ~ $\pm$ 300                   | 1.5K//2.0                           |
| 21M15D | 21.400           | 8    | CN     | 3 $\pm$ 7.5         | 65 $\pm$ 17.5       | 90 $\pm$ 25         | 2.0              | 3.0            | 90 $\pm$ 25 ~ $\pm$ 300                   | 1.5K//2.0                           |
| 21M20A | 21.400           | 2    | HC80   | 3 $\pm$ 10.0        | 18 $\pm$ 34         |                     | 0.5              | 2.0            | 35 +350 ~ +1000<br>50 -200 ~ -1000        | 1.8K//1.5                           |
| 21M20B | 21.400           | 4    | HC80x2 | 3 $\pm$ 10.0        | 40 $\pm$ 34         |                     | 1.0              | 2.5            | 65 +350 ~ +1000<br>80 -200 ~ -1000        | 1.8K//1.5<br>Cc = 5pF               |
| 21M30A | 21.400           | 2    | HC80   | 3 $\pm$ 15.0        | 15 $\pm$ 45         |                     | 0.5              | 1.5            | 35 +350 ~ +1000<br>50 -300 ~ -1000        | 3.0K//0.5                           |
| 21M30B | 21.400           | 4    | HC80x2 | 3 $\pm$ 15.0        | 40 $\pm$ 50         |                     | 1.0              | 2.5            | 65 +350 ~ +1000<br>80 -300 ~ -1000        | 3.0K//0.5<br>Cc = 3pF               |
| 45F15A | 45.000           | 2    | HC80   | 3 $\pm$ 7.5         | 15 $\pm$ 25         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>40 -200 ~ -1000        | 650//4.5                            |
| 45F15B | 45.000           | 4    | HC80x2 | 3 $\pm$ 7.5         | 30 $\pm$ 25         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 650//1.5<br>Cc = 9pF                |
| 45F20A | 45.000           | 2    | HC80   | 3 $\pm$ 10.0        | 15 $\pm$ 34         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>40 -200 ~ -1000        | 700//2.5                            |
| 45F20B | 45.000           | 4    | HC80x2 | 3 $\pm$ 10.0        | 40 $\pm$ 48         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 700//1.5<br>Cc = 6.5pF              |
| 45F30A | 45.000           | 2    | HC80   | 3 $\pm$ 15.0        | 15 $\pm$ 50         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>-300 ~ -1000           | 800//1.5                            |
| 45F30B | 45.000           | 4    | HC80x2 | 3 $\pm$ 15.0        | 40 $\pm$ 60         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-300 ~ -1000           | 800//1.0<br>Cc = 5pF                |
| 45M15A | 45.000           | 2    | HC80   | 3 $\pm$ 7.5         | 18 $\pm$ 28         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>-200 ~ -1000           | 4K//1.0                             |
| 45M15B | 45.000           | 4    | HC80x2 | 3 $\pm$ 7.5         | 40 $\pm$ 30         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 4K//1.0<br>Cc = -1pF                |
| 45M20A | 45.000           | 2    | HC80   | 3 $\pm$ 10.0        | 15 $\pm$ 30         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>-200 ~ -1000           | 5K//1.0                             |
| 45M20B | 45.000           | 4    | HC80x2 | 3 $\pm$ 10.0        | 35 $\pm$ 40         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 5K//1.0<br>Cc = -1.5pF              |
| 70M15A | 70.000           | 2    | HC80   | 3 $\pm$ 7.5         | 15 $\pm$ 30         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>-200 ~ -1000           | 2.0K//1.0                           |
| 70M15B | 70.000           | 4    | HC80x2 | 3 $\pm$ 7.5         | 25 $\pm$ 25         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 2.0K//1.0<br>Cc = -1pF              |
| 70M20A | 70.000           | 2    | HC80   | 3 $\pm$ 10.0        | 15 $\pm$ 40         |                     | 1.0              | 2.0            | 35 +500 ~ +1000<br>-200 ~ -1000           | 2.5K//1.0                           |
| 70M20B | 70.000           | 4    | HC80x2 | 3 $\pm$ 10.0        | 35 $\pm$ 40         |                     | 1.0              | 3.0            | 70 +500 ~ +1000<br>-200 ~ -1000           | 2.5K//1.0<br>Cc = -1pF              |

All specifications subject to change without notice. Rev. 05/01/02

Note: Operating Temperature -20°C to +70°C