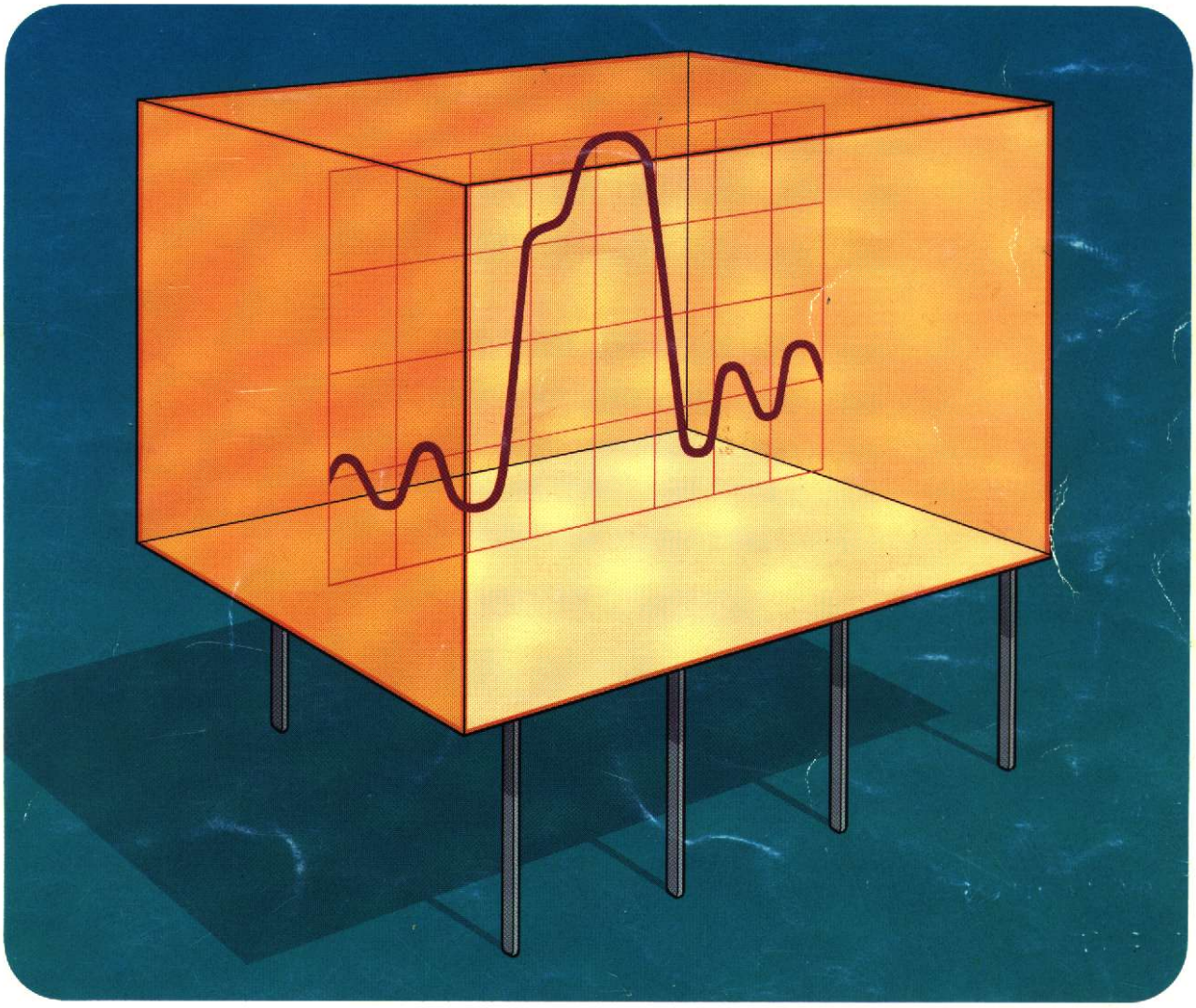
CERAMIC FILTERS

CATALOG NO. P-03-A



murata ERIE®

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MURATA ERIE

The world's foremost manufacturer of ceramic filters with an unparalleled reputation for quality and performance.

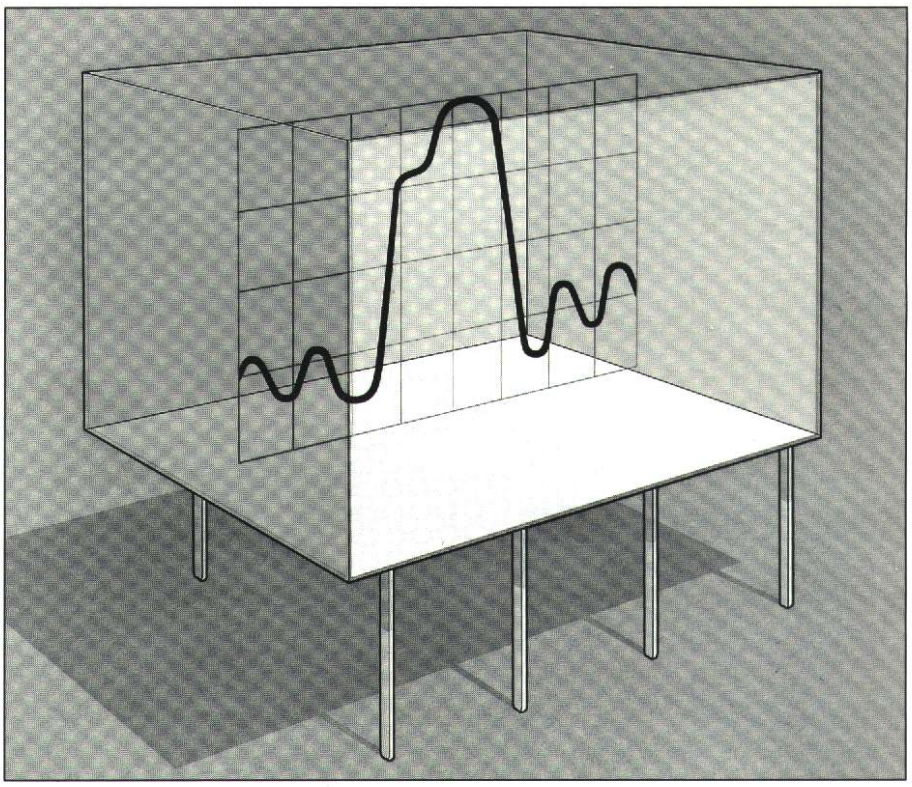
With the rapid growth and increasing sophistication now taking place in all phases of the communications industry, there is a great demand for cost effective band pass filters that offer state-of-the-art performance characteristics such as excellent selectivity, optimum stopband attenuation, a flat band pass characteristic, and high stability.

Calling on over 45 years of experience in the design and manufacture of electronic components, Murata Erie has developed a comprehensive line of ceramic filters that address these demands. Our filters are manufactured from the finest ceramic materials on highly efficient, automated assembly equipment. The end result is a highly consistent product line that has exceptional long-term reliability at the lowest possible cost.

Because Murata Erie's filters are manufactured from readily available quality ceramic materials, they offer the following advantages:

- Small size and lightweight for compact applications
- Excellent temperature characteristics and durability for extreme environments
- Low loss, good waveform symmetry, and high selectivity for solid-state performance devices
- Large volumes and uniformity make these products ideal for mass production designs

For further information on Murata Erie filters or for application assistance, our staff of application engineers in Smyrna, Georgia can provide any technical support that you may require.



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INTRODUCTION TO CERAMIC FILTERS

For more than two decades, ceramic filter technology has been instrumental in the proliferation of solid state electronics. A view of the future reveals that even greater expectations will be placed on piezoelectric material in the area of new applications and for more stringent performance criteria in current products. Traditionally, nearly all low and high-end AM and FM commercial radios use ceramic bandpass filters. However, applications are also found in cordless telephones, cellular systems, 2-way communications, and the television industry.

As a world leader in the development of piezo ceramic filter technology, Murata Erie has been able to develop specialized ceramic materials which when combined with an advanced filter design have resulted in a complete line of practical, inexpensive ceramic filters for entertainment and communications applications. In this catalog, the principle of ceramic filters, the design of representative test circuits and specifications concerning various models are described.

PIEZOELECTRIC THEORY AS APPLIED TO CERAMIC FILTERS

All ceramic filters derive their basic frequency selectivity from a mechanical vibration resulting from a piezoelectric effect. While a total theoretical analysis of piezoelectric technology as applied to ceramic filters is very complex, it can be shown as the equivalent circuit as illustrated in Figure 1. This equivalent circuit represents a typical two-terminal filter, a device which forms the basic building block for more complex filters.

The resonant frequency of this device is calculated by the equation:

$$f_r = \frac{1}{2\pi\sqrt{L_1 C_1}}$$

The anti-resonant frequency is expressed as:

$$f_a = \frac{1}{2\pi\sqrt{L_1 \dfrac{C_1 C_o}{C_1 + C_o}}}$$

This filter exhibits the impedance characteristics shown in Figure 2.

Two-terminal filters are typically used as emitter bypasses and they exhibit the frequency characteristics shown in Figure 3.

Three-terminal ceramic filters can be used as inter-stage coupling devices as shown in Figure 4. By using our filters in this manner, increased selectivity, improved band pass characteristics, reliability and stability can be obtained without increasing circuit complexity or parts count.

By cascading two or more filters as shown in Figures 4, 5 and 6, Murata Erie can greatly enhance selectivity. By controlling the coefficient of electromechanical coupling between the filter elements, bandwidth can be "peaked" or "flattened." Typical 455KHz response curves are shown in Figures 7 and 8.

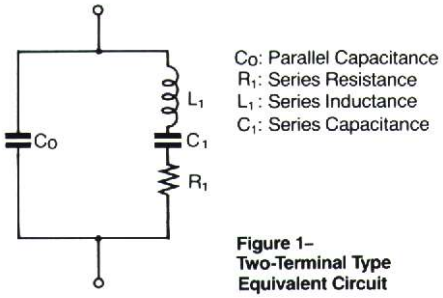


Figure 1–
Two-Terminal Type Equivalent Circuit

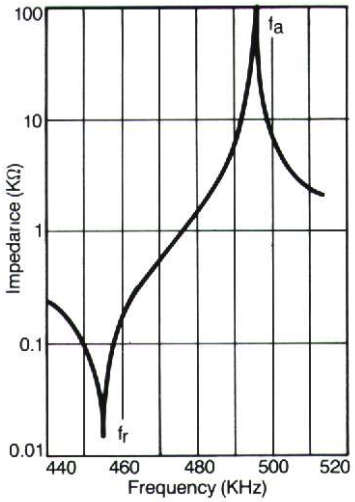


Figure 2–
Typical Impedance vs Frequency Response Curve For A Two-Terminal Device

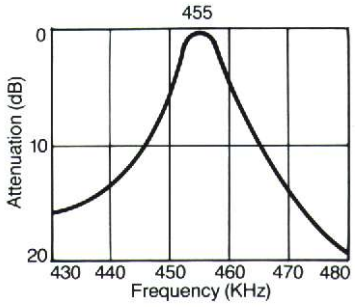


Figure 3–
Typical Attenuation Characteristics For A 455KHz (Two-Terminal) Ceramic Filter

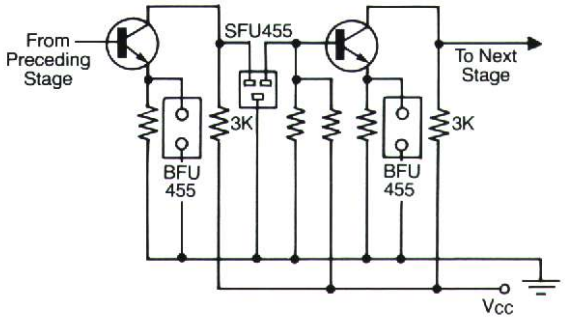


Figure 4–
Three-Terminal Ceramic Filter Used As Inter-Stage Coupling Device

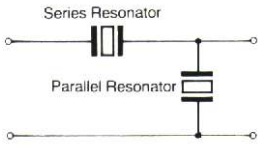


Figure 5–
Ladder Connection

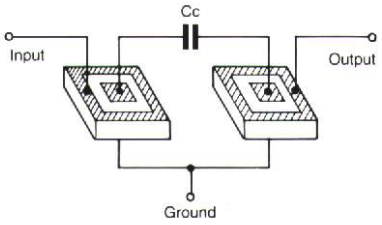


Figure 6–
Cascade Connection

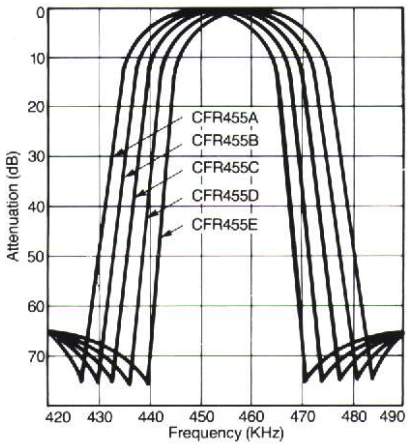


Figure 7–
Typical Response Curves For CFR455 A-E Series Ceramic Filters

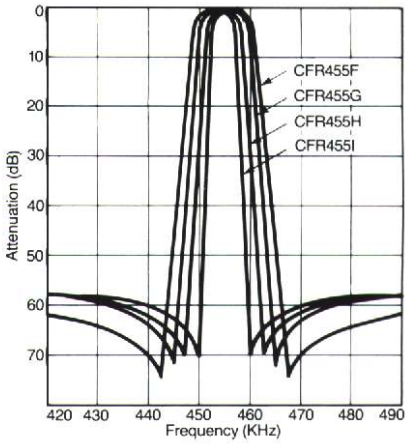


Figure 8–
Typical Response Curves For CFR455 F-I Series Ceramic Filters

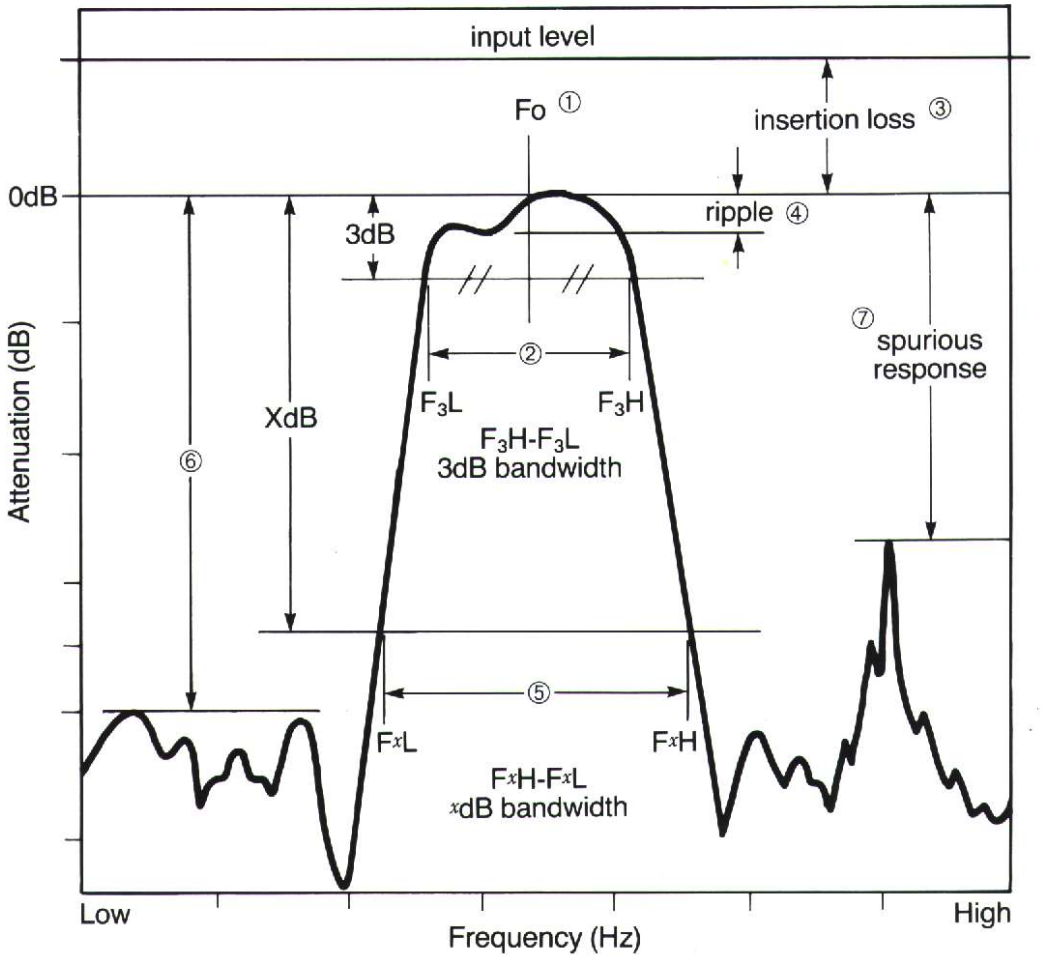


Figure 9–
Graphical Representation of Ceramic Filter Terminology

CERAMIC FILTER TERMINOLOGY

Although the previous section has presented a concise discussion of piezoelectric theory as applied to ceramic filter technology, it is necessary that the respective terminology used in conjunction with ceramic filters be discussed before any further examination of ceramic filter technology is made.

Using Figure 9 as a typical model of a response curve for a ceramic filter, it can be seen that there are a number of relevant factors to be considered in specifying ceramic filters. These include: center frequency, pass-bandwidth, insertion loss, ripple, attenuation bandwidth, stopband attenuation, spurious response and selectivity. Although not all of these factors will apply to each filter design, these are the key specifications to consider with most filters. From the symbol key shown in Table 1 below, a thorough understanding of this basic terminology should be possible.

IMPEDANCE MATCHING

As it is imperative to properly match the impedances whenever any circuit is connected to another circuit, any component to another component, or any circuit to another component, it is also important that this be taken into account in using ceramic filters. Without proper impedance matching, the operational characteristics of the ceramic filters cannot be met.

Figure 12 illustrates a typical example of this requirement.

This example shows the changes produced in the frequency characteristics of the SFZ455A ceramic filter when the resistance values are altered. For instance, if the input/output impedances R_1 and R_2 are connected to lower values than those specified, the insertion loss increases, the center frequency shifts toward the low side and the ripple increases.

TABLE 1 - CERAMIC FILTER TERMINOLOGY CHART

Numbers In Fig. 9	Terminology	Symbol	Unit	Explanation of Term
1	Center Frequency	f_o	Hz	The frequency in the center of the pass-bandwidth. However, the center frequency for some products is expressed as the point where the loss is at its lowest point.
2	Pass-bandwidth (3dB Bandwidth)	(3dB) B.W.	Hz	Signifies a difference between the two frequencies where the attenuation becomes 3dB from the level of the minimum loss point.
3	Insertion Loss	I.L.	dB	Expressed as the input/output ratio at the point of minimum loss. (The insertion loss for some products is expressed as the input/output ratio at the center frequency.) Insertion loss = 20 LOG (V_2/V_1) in dB.
4	Ripple	—	dB	If there are peaks and valleys in the pass-bandwidth, the ripple expresses the difference between the maximum peak and the minimum valley.
5	Attenuation Bandwidth (dB Bandwidth)	(20dB) B.W.	Hz	The bandwidth at a specified level of attenuation. Attenuation may be expressed as the ratio of the input signal strength to the output signal strength in decibels.
6	Stopband Attenuation	—	dB	The level of signal strength at a specified frequency outside of the passband.
7	Spurious Response	SR	dB	The difference in decibels between the insertion loss and the spurious signal in the stopband.
	Input/Output Impedance	—	Ohm	Internal impedance value of the input and output of the ceramic filter.
	Selectivity	—	dB	The ability of a filter to pass signals of one frequency and reject all others. A highly selective filter has an abrupt transition between a passband region and the stopband region. This is expressed as the shape factor—the attenuation bandwidth divided by the pass-bandwidth. The filter becomes more selective as the resultant value approaches one.

On the other hand, if R_1 and R_2 are connected to higher values other than those specified, the insertion loss will increase, the center frequency will shift toward the high side and the ripple will increase.

DEALING WITH SPURIOUS RESPONSE

Frequently in using 455 KHz filters, spurious will cause problems due to the fact that the resonance occurs under an alien vibrating mode or overtone deviating from the basic vibration characteristics. Among available solutions for dealing with spurious response are:

1. The use of a supplementary IFT together with the ceramic filter for suppression of the spurious.
2. The arrangement of two or more ceramic filters in parallel for the mutual cancellation of spurious.
3. The addition of a low-pass or high-pass LC filter for suppression of spurious.

Perhaps the most commonly used method of dealing with spurious is the use of a supplementary IFT in conjunction with the ceramic filter. The before and after effects of the use of an IFT are shown in Figures 10 and 11. In Figure 10, only a single SFZ455A ceramic filter is employed and spurious is a significant problem. With the addition of an IFT, the spurious problem is reduced as is shown in Figure 11.

Although spurious is a significant problem to contend with when using 455KHz ceramic filters, it is not a problem in 4.5MHz and 10.7 MHz ceramic filters, as their vibration modes are significantly different.

CONSIDERATIONS FOR GAIN DISTRIBUTION

Since the impedance of both the input and output values of the ceramic filters are symmetric and small, it is necessary that the overall gain distribution within the circuit itself be taken into consideration. For instance, in the discussion concerning proper impedance matching, it was illustrated that a certain DC loss occurs if the recommended resistance values are not used. This can cause an overall reduction in the gain which could present a problem if no allowances have been made for the corresponding loss. To compensate for this problem, it is recommended that the following be done:

1. The amplifier stage should be designed to compensate for this loss.
2. The ceramic filter should be used in combination with the IFT for minimizing both matching and DC losses. The IFT should be used strictly as a matching transformer and the ceramic filter only for selectivity.

As the use of IC's has become more prevalent with ceramic filters, these considerations have been taken into account. It should be noted that few of the problems discussed above have been realized when more than three (3) IF stages have been employed.

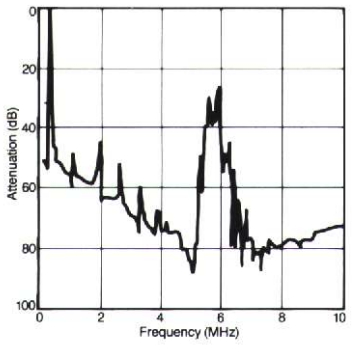


Figure 10–
Spurious Response With Model SFZ455A Ceramic Filter

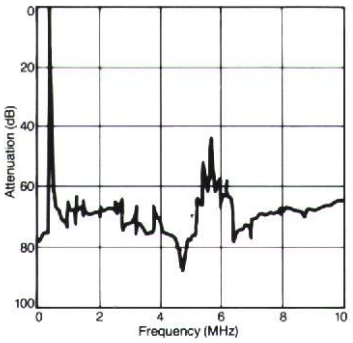


Figure 11–
Spurious Response With Model SFZ455A Ceramic Filter And IFT

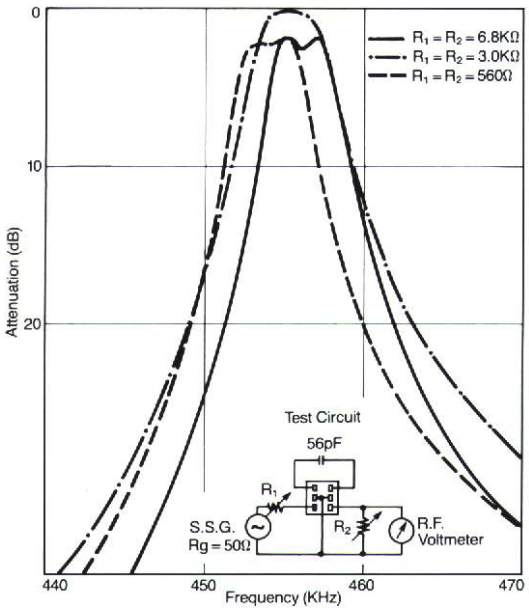


Figure 12–
Model SFZ455A Ceramic Filter Matching Impedance vs. Pass-Band Characteristics

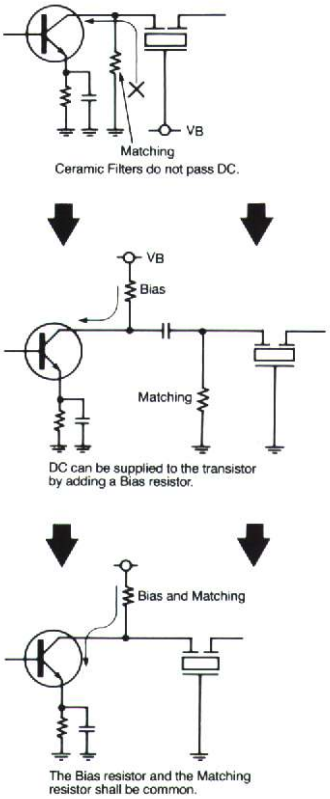


Figure 13–
Coupling With A Transistor

CERAMIC FILTERS DO NOT PASS DC

It is important to note in designing circuits that ceramic filters are incapable of passing DC. As is illustrated in Figure 13, in a typical circuit where a transistor is used, a bias circuit will be required to drive the transistor. Since the ceramic filter requires matching resistance to operate properly, the matching resistor shown in the diagram can play a dual role as both a matching and bias resistor.

If the bias circuit is used, it is important that the parallel circuit of both the bias resistance and the transistor's internal resistance be taken into consideration in meeting the resistance values. This is necessary since the internal resistance of the transistor is changed by the bias resistance. However, when an IC is used, there is no need for an additional bias circuit since the IC has a bias circuit within itself.

Here it is recommended that an IFT be used for impedance matching with the ceramic filter when coupling with a mixer stage, as shown in Figure 14.

COUPLING CAPACITANCE

The SFZ455A is composed of two filter elements which must be connected by a coupling capacitor. Moreover, the frequency characteristic changes according to the coupling capacitance (Cc). As shown in Figure 15, the larger the coupling capacitance (Cc) becomes, the wider the bandwidth and more the ripple increases. Conversely, the smaller the coupling capacitance becomes, the narrower the bandwidth becomes and the more the insertion loss increases. Therefore, the specified value of the coupling capacitance in the catalog is desired in determining the specified passband characteristics.

GROUP DELAY TIME CHARACTERISTICS

Perhaps one of the most important characteristics of a transmitting element is to transmit a signal with the lowest possible distortion level. This distortion occurs when the phase shift of a signal which passes through a certain transmitting path is non-linear with respect to the frequency. For convenience, the group delay time (GDT) characteristic is used for the purpose of expressing non-linearity.

It is important to note the relationship between the amplitude and the GDT characteristics when using group delay time terminology. This relationship differs depending upon the filter characteristics. For example, in the Butterworth type, which has a relatively flat top, the passband is flat while the GDT characteristic is extremely curved, as shown in Figure 16. On the other hand, a Gaussian type, is curved in the passband, while the GDT characteristic is flat. With the flat GDT characteristics, the Gaussian type has excellent distortion characteristics.

Since the amplitude characteristics for the Butterworth type is flat in the passband the bandwidth does not change even at a low input level. With the amplitude characteristic for the Gaussian type being curved in the passband, the bandwidth becomes narrow at a low input level and the sensitivity is poor. Therefore, it should be noted that the Gaussian type has a desirable distortion factor while the Butterworth type has the desirable sensitivity.

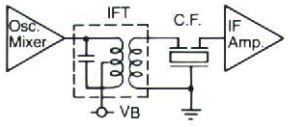


Figure 14–
Coupling From Mixer Stage

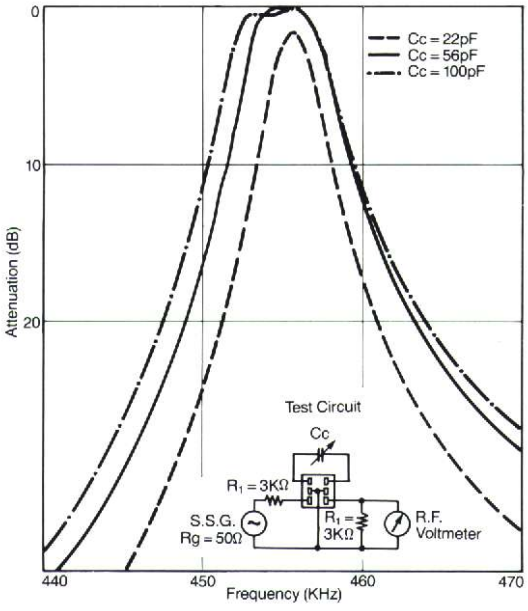
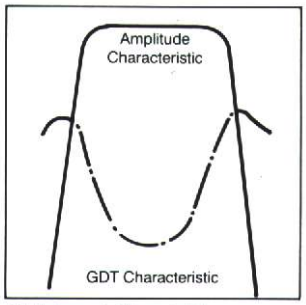
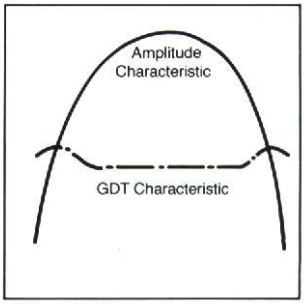


Figure 15–
Model SFZ455A Ceramic Filter
Coupling Capacitance vs. Passband Characteristics



(A) Butterworth Characteristic

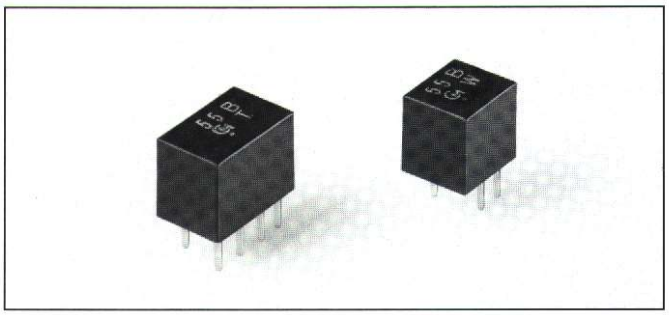


(B) Gaussian Characteristic

Figure 16–
Relationship Between Amplitude And GDT Characteristics

MULTI-ELEMENT, RESIN MOLDED, HIGHLY SELECTIVE CERAMIC FILTERS

CFU/CFW 455 KHz

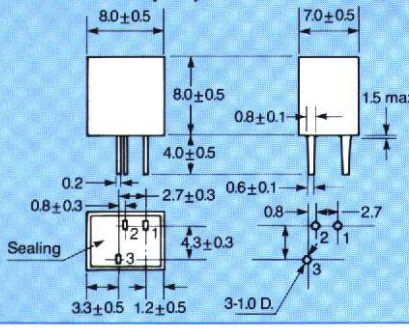


The CFU 455 line of ceramic filters are 4-element devices connected in ladder form while the CFW 455 line of ceramic filters contain 6-elements. These compact, highly selective filters are recommended for use in applications ranging from two-way radio to auxiliary filters in high class transceivers.

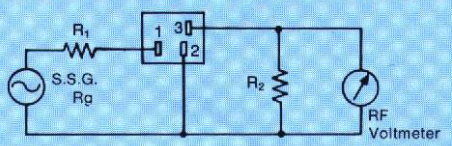
SPECIFICATIONS — CFU 455 KHz

Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFU455B2	455±2	±15	±30	27	4	1500
CFU455C2	455±2	±12.5	±24	27	4	1500
CFU455D2	455±1.5	±10	±20	27	4	1500
CFU455E2	455±1.5	±7.5	±15	27	6	1500
CFU455F2	455±1.5	±6	±12.5	27	6	2000
CFU455G2	455±1	±4.5	±10	25	6	2000
CFU455H2	455±1	±3	±9	25	6	2000
CFU455I2	455±1	±2	±7.5	25	6	2000
CFU455HT	455±1	±3	±9	35	6	2000
CFU455IT	455±1	±2	±7.5	35	6	2000

DIMENSIONS (mm)



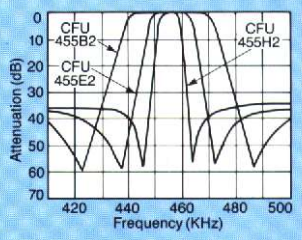
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
2=GND
3=OUTPUT

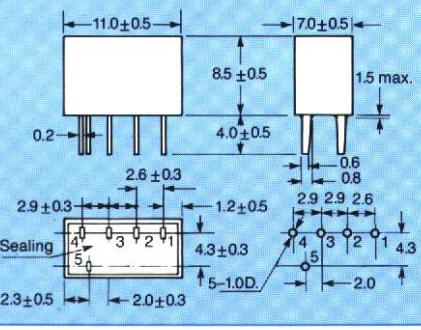
CHARACTERISTICS



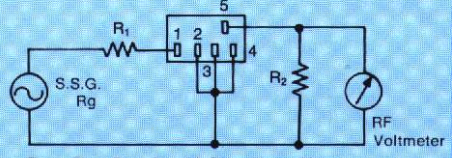
SPECIFICATIONS — CFW 455 KHz

Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFW455B	455±2	±15	±30	35	4	1500
CFW455C	455±2	±12.5	±24	35	4	1500
CFW455D	455±2	±10	±20	35	4	1500
CFW455E	455±2	±7.5	±15	35	6	1500
CFW455F	455±2	±6	±12.5	35	6	2000
CFW455G	455±2	±4.5	±10	35	6	2000
CFW455H	455±2	±3	±9	35	6	2000
CFW455I	455±2	±2	±7.5	35	7	2000
CFW455HT	455±2	±3	±9	60	6	2000
CFW455IT	455±2	±2	±7.5	60	7	2000

DIMENSIONS (mm)



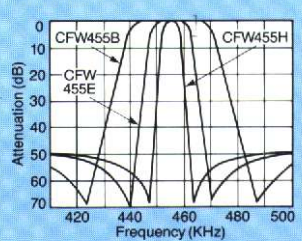
CIRCUIT



Rg + R1 = R2 = Input & Output Impedance

1=INPUT
2,3,4=GND
5=OUTPUT

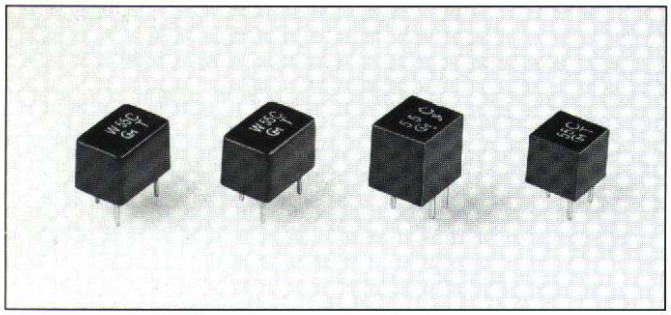
CHARACTERISTICS



MULTI-ELEMENT ULTRA-MINIATURE CERAMIC FILTERS

muRata ERIE

CFUM/CFWM 455 KHz



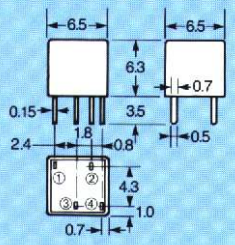
The CFUM 455 and CFWM 455 lines of ceramic filters are miniaturized versions of the CFU/CFW lines. These ultra-miniature versions consume approximately 40% less volume while still offering the same high performance filter characteristics available with the CFU/CFW lines.

SPECIFICATIONS — CFUM 455 KHz

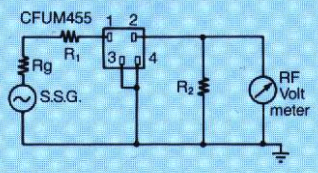
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFUM455B	455±2	±15	±30	27	4	1500
CFUM455C	455±2	±12.5	±24	27	4	1500
CFUM455D	455±1.5	±10	±20	27	4	1500
CFUM455E	455±1.5	±7.5	±15	27	6	1500
CFUM455F	455±1.5	±6	±12.5	27	6	2000
CFUM455G	455±1	±4.5	±10	25	6	2000
CFUM455H	455±1	±3	±9	35	6	2000
CFUM455I	455±1	±2	±7.5	35	7	2000

• CFUM455 series filters are 4-element ceramic filters and ultraminiature versions of CFU455 series.

DIMENSIONS (mm)



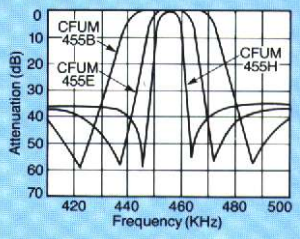
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
3,4=GND
2=OUTPUT

CHARACTERISTICS

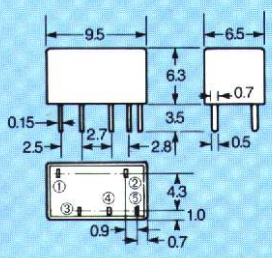


SPECIFICATIONS — CFWM 455 KHz

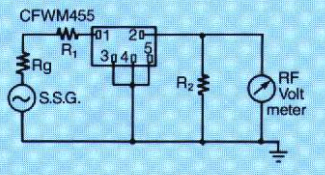
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	50dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFWM455B	455±2	±15	±30	35	4	1500
CFWM455C	455±2	±12.5	±24	35	4	1500
CFWM455D	455±2	±10	±20	35	4	1500
CFWM455E	455±2	±7.5	±15	35	6	1500
CFWM455F	455±2	±6	±12.5	35	6	2000
CFWM455G	455±2	±4.5	±10	35	6	2000
CFWM455H	455±2	±3	±9	55	6	2000
CFWM455I	455±2	±2	±7.5	55	7	2000

• CFWM455 series filters are 6-element ceramic filters and ultraminiature versions of CFW455 series.

DIMENSIONS (mm)



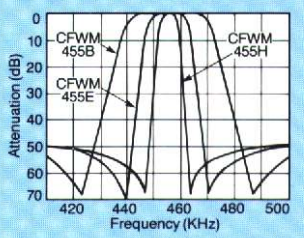
CIRCUIT



Rg+R1=R2=Input/Output Impedance

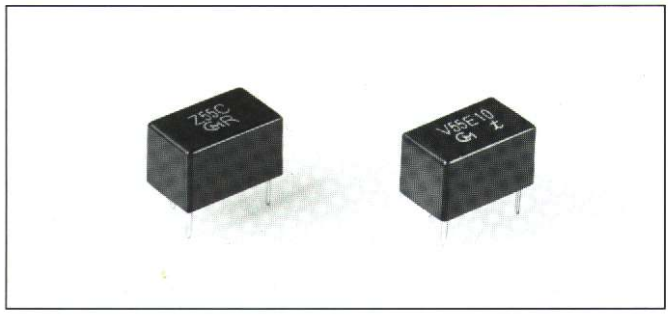
1=INPUT
3,4,5=GND
2=OUTPUT

CHARACTERISTICS



MULTI-ELEMENT, ULTRA-MINIATURE, RESIN MOLDED, HIGHLY SELECTIVE CERAMIC FILTERS

CFVM/CFZM 455 KHz

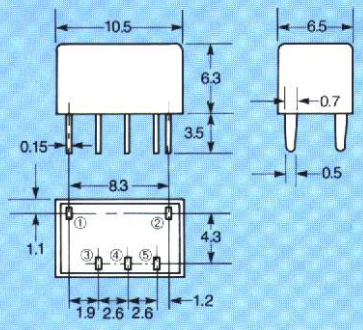


The CFVM 455 line of ceramic filters are 7-element devices connected in ladder form while the CFZM 455 line of filters contain 9-elements. These highly selective filters offer improved stopband attenuation and are recommended for use in a variety of applications.

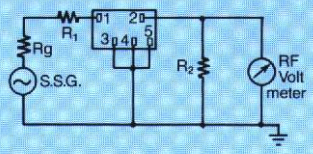
SPECIFICATIONS — CFVM 455 KHz

Part Number	Nominal Center Frequency (KHz)	3dB Bandwidth (KHz) min.	6dB Bandwidth (KHz) min.	Ripple (dB) max.	60dB Bandwidth (KHz) max.	Attenuation (dB) min.	Spurious Response (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFVM455B	455	±10	±15	3	±25	50	25	4	1000
CFVM455C	455	±9	±13	3	±23	50	25	4	1000
CFVM455D	455	±7	±10	3	±20	50	25	4	1500
CFVM455E	455	±5.5	±8	3	±16	50	25	6	1500
CFVM455E10	455	±5.0	±7.0	3	±12.5	50	25	6	1500
CFVM455F	455	±4.2	±6	3	±12	50	25	6	1500
CFVM455G	455	-	±4	3	±10	50	25	6	1500
CFVM455H	455	-	±3	3	±7.5	50	25	6	1500

DIMENSIONS (mm)



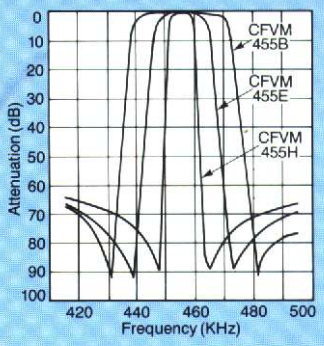
CIRCUIT



Rg+R1=Input/Output Impedance

1=INPUT
3,4,5=GND
2=OUTPUT

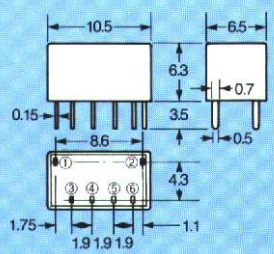
CHARACTERISTICS



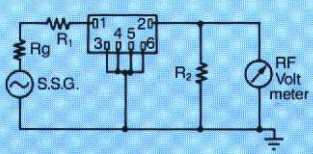
SPECIFICATIONS — CFZM 455 KHz

Part Number	Nominal Center Frequency (KHz)	3dB Bandwidth (KHz) min.	6dB Bandwidth (KHz) min.	Ripple (dB) max.	70dB Bandwidth (KHz) max.	Attenuation (dB) min.	Spurious Response (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFZM455B	455	±10	±15	3	±25	70	40	4	1000
CFZM455C	455	± 9	±13	3	±23	70	40	4	1000
CFZM455D	455	± 7	±10	3	±20	70	40	4	1500
CFZM455E	455	±5.5	±8	3	±16	70	40	6	1500
CFZM455E10	455	±5.0	±7.5	3	±12.5	70	40	6	1500
CFZM455F	455	±4.2	±6	3	±12	70	50	6	1500
CFZM455G	455	-	±4	3	±10	70	50	6	1500
CFZM455H	455	-	±3	3	±7.5	70	50	7	1500

DIMENSIONS (mm)



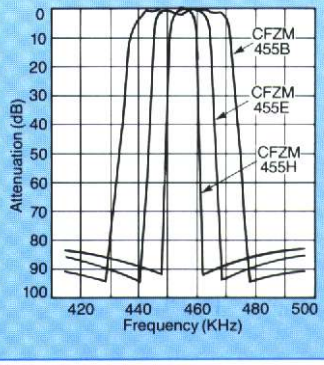
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
2,3,4,5=GND
6=OUTPUT

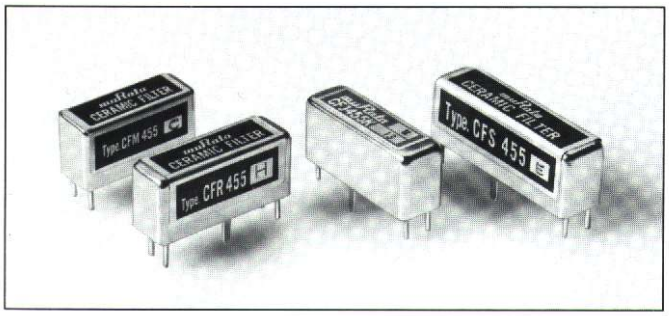
CHARACTERISTICS



HIGH PERFORMANCE, MULTI-ELEMENT CERAMIC FILTERS

murata ERIE

CFM/CFJ/CFR/CFS 455 KHz



The following lines of filters are high performance devices that achieve ultimate stopband attenuation through the use of multiple piezoelectric elements connected in ladder form. A few of the recommended applications for these filters include high class receivers. SSB communications equipment, pocket pagers, and mobile radios.

CFM 455 9 Ceramic Elements
CFJ 455K 11 Ceramic Elements
CFR 455 11 Element Filters
CFS 455 15 Element Filters

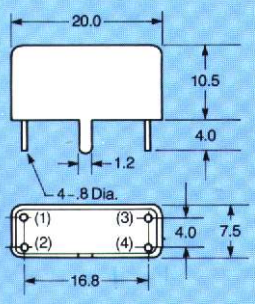
SPECIFICATIONS

CFM/CFJ/CFR/CFS 455 KHz

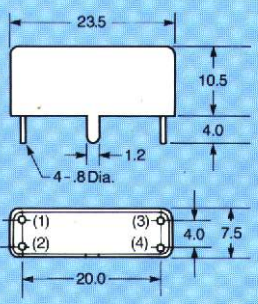
Part Number	Nominal Center Frequency (KHz)	3dB Bandwidth (KHz) min.	6dB Bankwidth (KHz) min.	Ripple (dB) max.	Bandwidth (KHz) max.	Bandwidth At (dB)	Attenuation 455±100KHz (dB) min.	Spurious 0.1 ~ 1MHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
CFM455A	455	±13	±17.5	3	±30		50	30	3	1000
CFM455B	455	±10	±15	3	±25		50	30	3	1000
CFM455C	455	±9	±13	3	±23		50	30	3	1000
CFM455D	455	±7	±10	3	±20		50	30	3	1500
CFM455E	455	±5.5	±8	3	±16	60	45	30	5	1500
CFM455F	455	±4.2	±6	3	±12		45	30	6	2000
CFM455G	455	-	±4	3	±10		45	30	6	2000
CFM455H	455	-	±3	3	±7.5		45	30	6	2000
CFM455I	455	-	±2	3	±5		45	30	7	2000
CFR455A	455	±13	±17.5	3	±30		60	40	4	1000
CFR455B	455	±10	±15	3	±25		60	40	4	1000
CFR455C	455	±9	±13	3	±23		60	40	4	1000
CFR455D	455	±7	±10	3	±20		60	40	4	1500
CFR455E	455	±5.5	±8	3	±16	70	55	40	6	1500
CFR455F	455	±4.2	±6	3	±12		55	40	6	2000
CFR455G	455	-	±4	3	±10		55	40	6	2000
CFR455H	455	-	±3	3	±7.5		55	40	7	2000
CFR455I	455	-	±2	3	±5		55	40	8	2000
CFR455J	455	-	±1.5	3	±4.5		55	40	8	2000
CFJ455K5	455	-	2.4 (Total)	2	4.5 (Total)		-	60 (40 at 600 ~ 700KHz)	6	2000
CFJ455K14	455	-	±1.1~±1.3	2	4.5 (Total)	60	-	60 (40 at 600 ~ 700KHz)	7	2000
CFJ455K8	455	-	1.0 (Total)	1.5	3.0 (Total)		60	-	8	2000
CFS455A	455	±13	±17.5	3	±30		70	50	4	1500
CFS455B	455	±10	±15	3	±25		70	50	4	1500
CFS455C	455	±9	±13	3	±23		70	50	4	1500
CFS455D	455	±7	±10	3	±20		70	50	4	1500
CFS455E	455	±5.5	±8	3	±15		70	50	6	1500
CFS455F	455	±4.2	±6	3	±12	80	70	50	6	2000
CFS455G	455	-	±4	3	±9		70	50	6	2000
CFS455H	455	-	±3	3	±7.5		70	50	7	2000
CFS455I	455	-	±2	3	±5		70	50	8	2000
CFS455J	455	-	±1.5	3	±4.5		60	50	8	2000

DIMENSIONS (mm)

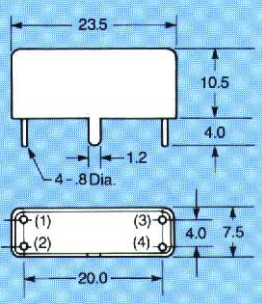
CFM 455



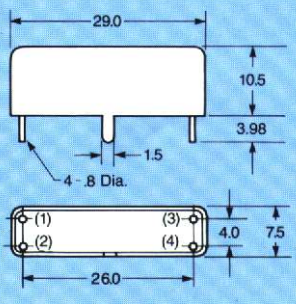
CFR 455



CFJ 455K

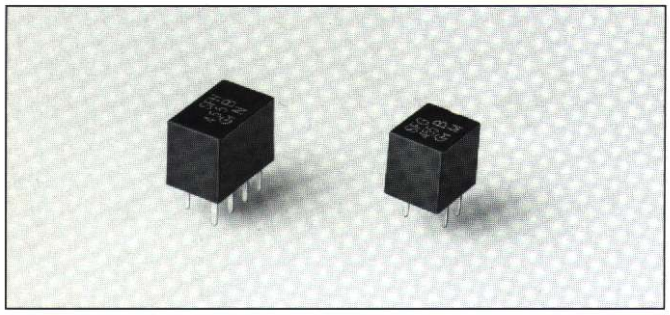


CFS 455



MULTI-ELEMENT, RESIN MOLDED, G.D.T. FLAT TYPE CERAMIC FILTERS

SFG/SFH 455 KHz



The SFG line of ceramic filters are 4-element devices connected in ladder form while the SFH 455 filters contain 6-elements. These highly selective filters are designed to address the G.D.T. characteristics required in digital communications. The excellent G.D.T. characteristics allow these filters to be utilized in areas such as the mobile cellular markets as well as a variety of stereo applications.

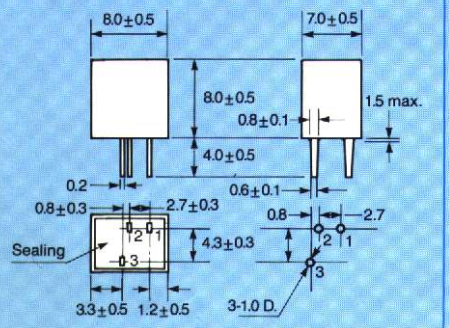
SPECIFICATIONS

SFG 455 KHz

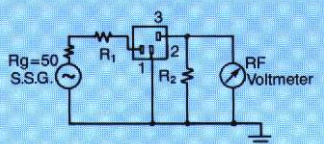
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)	G.D.T. Tolerance Typ. (μsec.)*
SFG455B	455±1.5	±15	±35	25(455± 80KHz)	5	1500	30(±15KHz)
SFG455C	455±1.5	±12.5	±30	25(455±80KHz)	6	1500	30(±12.5KHz)
SFG455D	455±1.0	±10	±25	23	7	1500	30(±10KHz)
SFG455E	455±1.0	±7.5	±20	23	8	1500	30(±7.5KHz)
SFG455F	455±1.0	±6	±17.5	23	9	2000	20(±6KHz)
SFG455G	455±1.0	±4.5	±15	20	10	2000	20(±4.5KHz)

*Typical value.
Also available at 450 KHz

DIMENSIONS (mm)



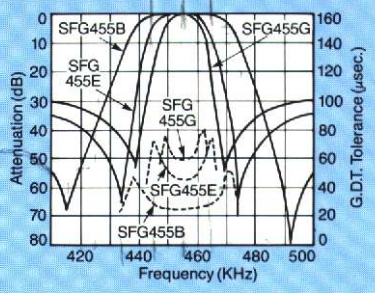
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
2=GND
3=OUTPUT

CHARACTERISTICS



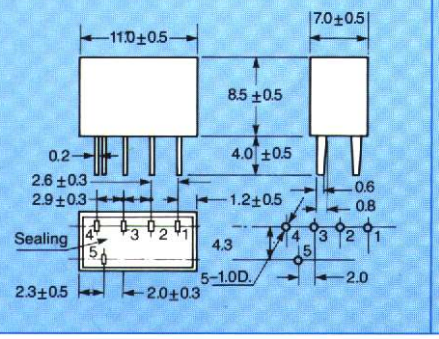
SPECIFICATIONS

SFH 455 KHz

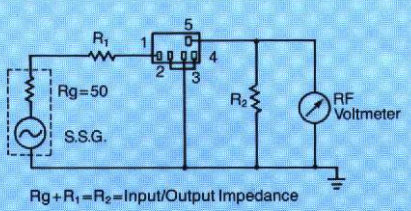
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	50dB Bandwidth (KHz) max.	Attenuation 455±100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)	G.D.T. Tolerance Typ. (μsec.)*
SFH455B	455±1.5	±15	±35	35	6	1500	40(±15KHz)
SFH455C	455±1.5	±12.5	±30	35	7	1500	40(±12.5KHz)
SFH455D	455±1.0	±10	±25	35	8	1500	40(±10KHz)
SFH455E	455±1.0	±7.5	±15	35	9	1500	40(±7.5KHz)
SFH455F	455±1.0	±6	±17.5	35	10	2000	40(±6KHz)
SFH455G	455±1.0	±4.5	±15	35	13	2000	40(±4.5KHz)

*Typical value
Also available at 450 KHz

DIMENSIONS (mm)



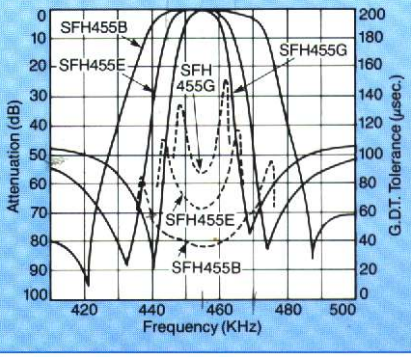
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
2,3,4=GND
5=OUTPUT

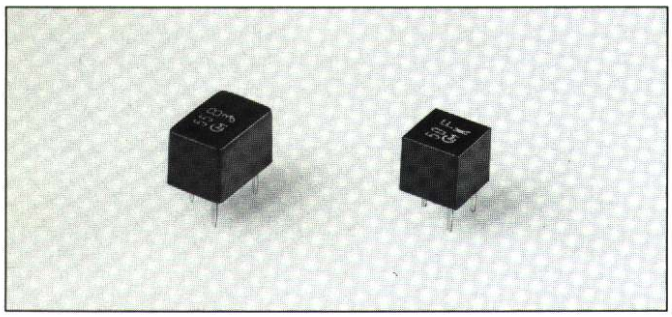
CHARACTERISTICS



MULTI-ELEMENT, ULTRA-MINIATURE G.D.T. FLAT TYPE CERAMIC FILTERS

muRata ERIE

SFGM/SFHM 455 KHz



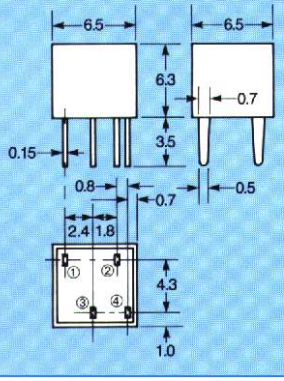
The SFGM/SFHM lines of ceramic filters are miniaturized versions of the SFG/SFH lines. These ultra-miniature versions consume approximately 40% less volume while still offering the same excellent G.D.T. characteristics as the SFG/SFH lines. This reduction in size makes these devices ideal for compact communication applications such as mobile telephones.

SPECIFICATIONS — SFGM 455 KHz

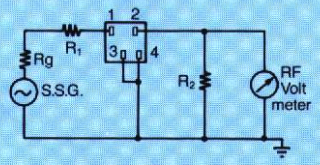
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	40dB Bandwidth (KHz) max.	Attenuation 455 ± 100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
SFGM455B	455	±15	±35	25	5	1500
SFGM455C	455	±12.5	±30	25	6	1500
SFGM455D	455	±10	±25	23	7	1500
SFGM455E	455	±7.5	±20	23	8	1500
SFGM455F	455	±6	±17.5	23	9	2000
SFGM455G	455	±4.5	±15	20	10	2000

• SFGM455 series filters are 4-element ceramic filters and ultra-miniature type of SFG455 series.
Also available at 450 KHz

DIMENSIONS (mm)



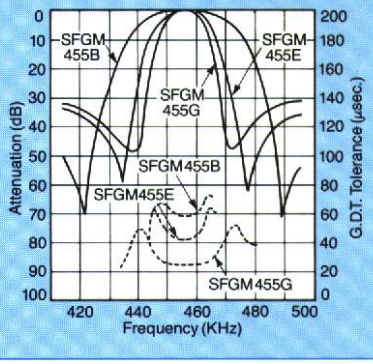
CIRCUIT



Rg+R1=R2=Input/Output Impedance

1=INPUT
3,4=GND
2=OUTPUT

CHARACTERISTICS

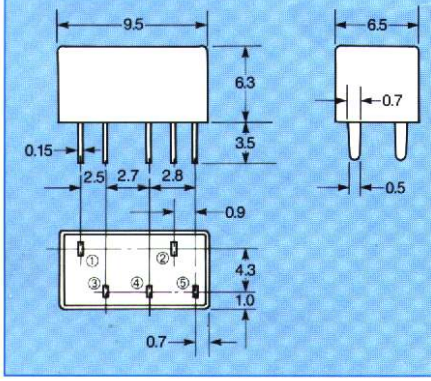


SPECIFICATIONS — SFHM 455 KHz

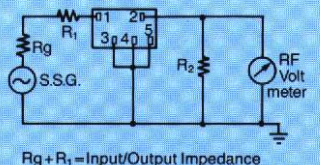
Part Number	Nominal Center Frequency (KHz)	6dB Bandwidth (KHz) min.	50dB Bandwidth (KHz) max.	Attenuation 455 ± 100 KHz (dB) min.	Insertion Loss (dB) max.	Input/Output Impedance (Ω)
SFHM455B	455	±15	±35	35	6	1500
SFHM455C	455	±12.5	±30	35	7	1500
SFHM455D	455	±10	±25	35	8	1500
SFHM455E	455	±7.5	±20	35	9	1500
SFHM455F	455	±6	±17.5	35	10	2000
SFHM455G	455	±4.5	±15	35	13	2000

• SFHM455 series filters are 6-element ceramic filters and ultra-miniature type of SFH455 series.
Also available at 450 KHz

DIMENSIONS (mm)



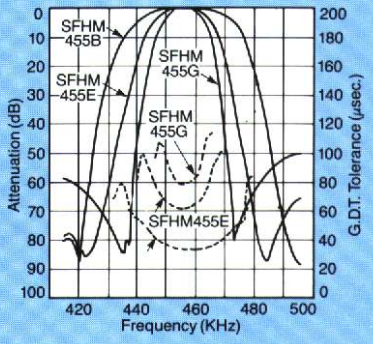
CIRCUIT



Rg+R1=Input/Output Impedance

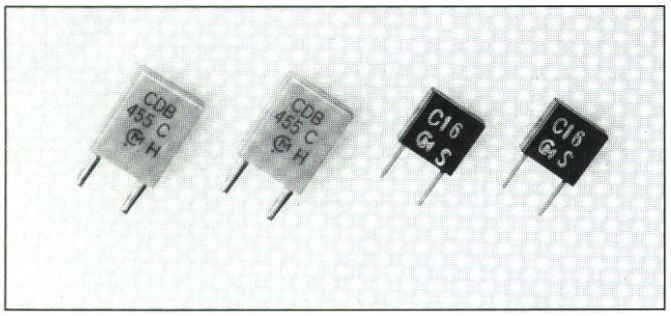
1=INPUT
3,4,5=GND
2=OUTPUT

CHARACTERISTICS



CERAMIC DISCRIMINATORS FOR COMMUNICATIONS EQUIPMENT

CDB 455 KHz



The CDB 455 ceramic discriminators are constructed of wide-band piezoelectric elements that allow for adjustment free audio detection. These IC specific devices are utilized in various communications equipment for wide band use.

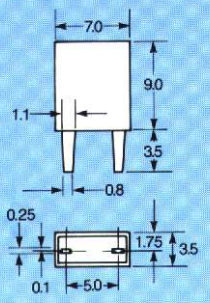
SPECIFICATIONS

CDB 455 SERIES

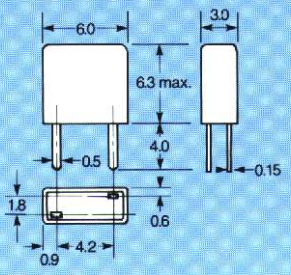
Part Number	Demodulation 3dB Bandwidth	Demodulation Output (455KHz)	Distorsion Factor (455KHz)	Impedance Char.				
				Resonant Freq. Fr	Antiresonant Freq. Fa	△F (Fa-Fr)	Resonant Resistance R1	Capacitance C
CDB455C3	—	—	—	—	455±1.5KHz	48±5KHz	70Ωmax.	600pF±20%
CDB455C7	±4.0KHz min.	340±60mV	2.5% max.	—	—	—	—	—
CDB455C9	±5.0KHz min.	100mV min.	1.5% max.	—	—	—	—	—
CDB455C10	—	—	—	429±2.0KHz	—	46KHz min.	70Ωmax.	580pF±20%
CDBM455C4	—	—	—	—	470±1.0KHz	43±2.0KHz	300Ωmax.	140pF±20%
CDBM455C16	±4.0KHz min.	190±50mV	2.0% max.	—	—	—	—	—
CDBM455C3	—	—	—	—	455±1.5KHz	46±5.0KHz	70Ωmax.	550pF±20%
CDBM455C7	±4.0KHz min.	340±60mV	3.0% max.	—	—	—	—	—
CDBM455C18	±3KHz	180±40mV	2%	—	—	—	—	—

DIMENSIONS (mm)

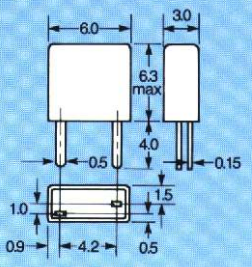
CDB455C3/7/9/10



CDBM455C4/16



CDBM455C3/7



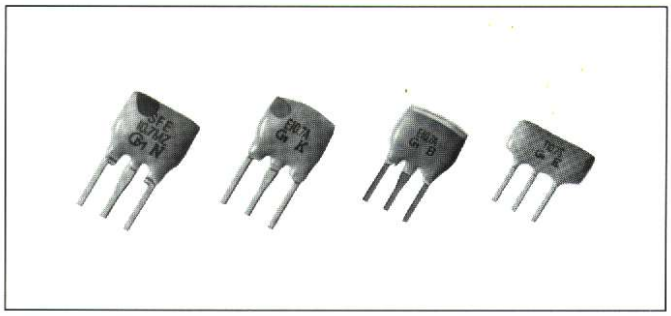
IC COMPATIBILITY

Part Number	IC Maker	IC Number	Note 1	Note 2	Part Number	IC Maker	IC Number	Note 1	Note 2
CDB455C3	SONY	CXA 1183	*		**CDB455C10**	TOSHIBA	TA81035		
CDB455C4	SANYO	LA 8610	*		**CDB455C11**	SIEMENS	S1469		
CDB455C5	NEC	UPC1167C		*	**CDB455C12**	PLESSY	SL6652		
CDB455C7	MOTOROLA	MC3357	*	*	**CDB455C13**	SONY	CXP1003	*	
CDB455C8	PHILLIPS	TDA1576		*	**CDB455C16**	MOTOROLA	MC3372	*	
CDB455C9	SIGNETICS	NE604/5	*	*					

* NOTE 1 ALSO AVAILABLE IN MINIATURE SIZE
* NOTE 2 ALSO AVAILABLE IN 450 KHZ

• CDB455 Series/CDBM455 Series (for quadrature detection)

MHz SERIES CERAMIC FILTERS



Murata Erie's MHz series of ceramic filters are monolithic devices which utilize the energy-trapped thickness vibration-mode. This principle of operation is based upon the fact that an excellent resonating element with low spurious vibration can be obtained by adhering to certain theoretical parameters of design. These parameters include the physical dimensions of the ceramic element, the electrode pattern, and the associated mass loading effect of the electrodes.

In addition to employing the principle of energy-trapped thickness shear vibration-mode, Murata also utilizes the theory of the multicoupling mode. In short, this theory utilizes divided electrodes to "trap" different frequencies simultaneously.

The advantages of Murata Erie's multicoupling mode technology is a highly selective, integrated ceramic filter that allows a single ceramic substrate to contain a number of coupled resonators.

Murata Erie categorizes the SFE 10.7 family of ceramic filters according to rank of center frequency. This ranking indicates that a given SFE 10.7 filter will be marked with one of the colors listed in the following chart and will exhibit the center frequency characteristics specified below.

CENTER FREQUENCY DEFINITIONS

Color Code	Category	Center Frequency (MHz) ±30KHz (Tolerance)
BLACK	D	10.64
BLUE	B	10.67
RED	A	10.70
ORANGE	C	10.73
WHITE	E	10.76
RED, BLUE, ORANGE, BLACK OR WHITE	Z	Combination A. B. C. D. E.
RED, BLUE OR ORANGE	M	Combination A. B. C.

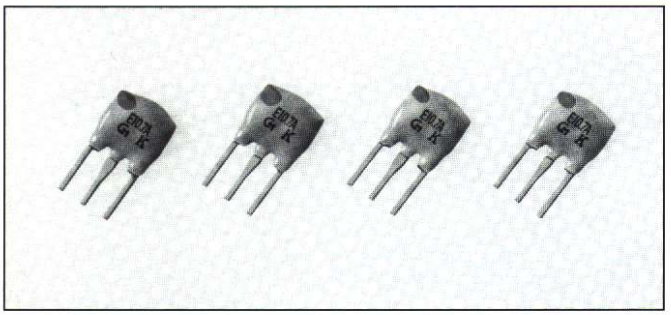
Example–An application calls for a band pass filter centered at 10.7 MHz with a ±30 KHz center frequency tolerance. If a 180 ±40 KHz 3 dB bandwidth is suitable, then the Murata Erie part number would be: SFE 10.7MS3-A

Note–This method of categorizing center frequency only applies to the 10.7 MHz filters that are followed by the -Z designation on the following pages. Part numbers that are not followed by the -Z designation are available only at 10.7MHz center frequency.

Note–The above chart should be used only as a guide for identifying the color code marking on Murata Erie filters. Murata Erie recommends that engineers incorporate either the -A (center of distribution) or -Z (total distribution) designation into their designs. This recommendation is based on product availability.

LOW LOSS, HIGHLY SELECTIVE, MINIATURE CERAMIC FILTERS

SFE MA/MS/MJ 10.7 MHz



The standard SFE 10.7 line of ceramic filters are extremely reliable devices that exhibit excellent waveform symmetry. These filters have traditionally found wide application in FM receiver technology.

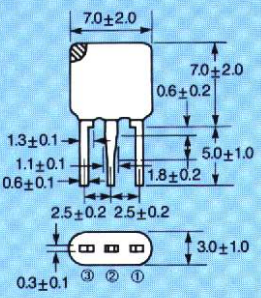
SPECIFICATIONS

SFE MA/MS/MJ 10.7 MHz

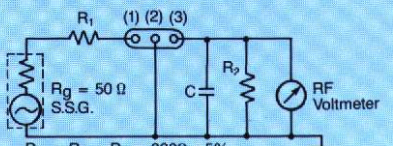
Part Number	3dB Bandwidth (KHz)	20dB Bandwidth (KHz) max.	Insertion Loss (dB)	Spurious Attenuation (9 to 12MHz) (dB) min.
SFE10.7MA5-Z	280±50	650 (520)	6 (4)	30 (43)
SFE10.7MS2-Z	230±50	570 (420)	6 (4)	40 (5)
SFE10.7MS3-Z	180±40	520 (380)	7 (4.5)	40 (5)
SFE10.7MJ-Z	150±40	400 (300)	10 (5)	40 (5)

Input/output matching impedance: 330 Ω ( ) Typ. value

DIMENSIONS (mm)



CIRCUIT

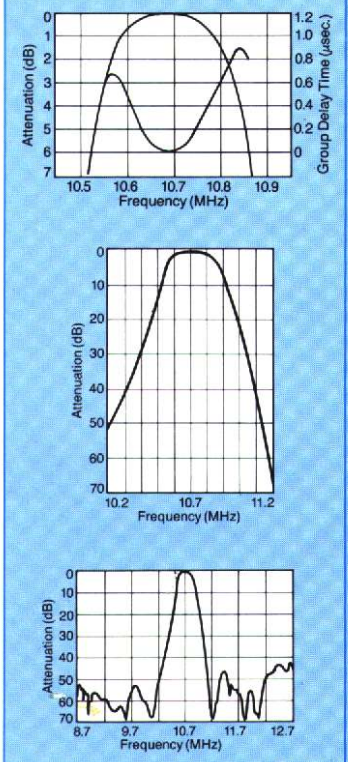


$R_g + R_1 = R_2 = 330\Omega \pm 5\%$
C = 10 pF
(including stray capacitance and input capacitance of RF Voltmeter)

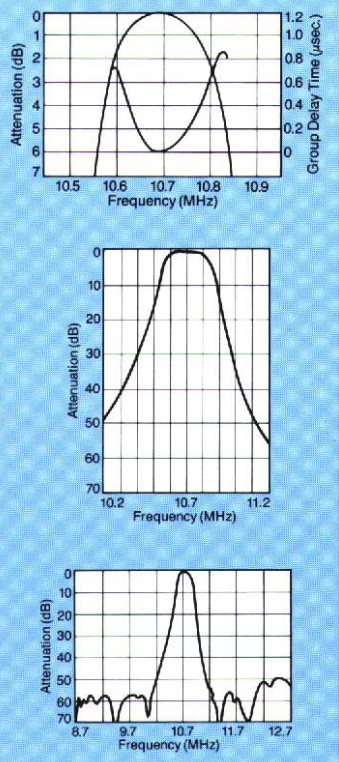
1 = INPUT
2 = GND
3 = OUTPUT

FREQUENCY CHARACTERISTICS

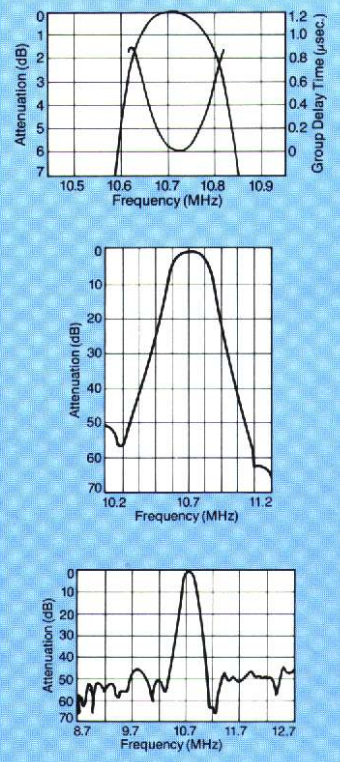
SFE10.7MA5



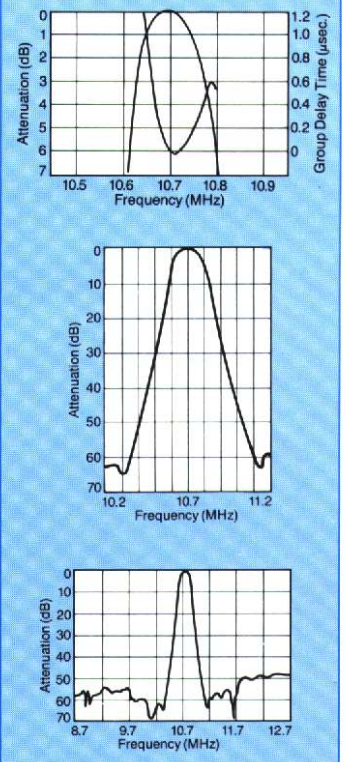
SFE10.7MS2



SFE10.7MS3



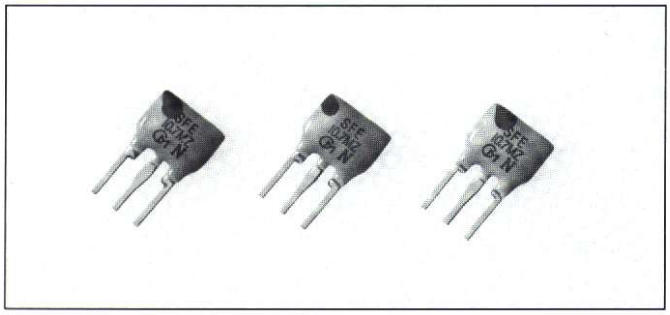
SFE10.7MJ



HIGHLY SELECTIVE, G.D.T. FLAT TYPE CERAMIC FILTERS

muRata ERIE

SFE MX/MA8 10.7 MHz



The SFE 10.7MX/MA8 lines of ceramic filters were designed to minimize the dispersion of amplitude and phase characteristics within the pass band. Because the excellent G.D.T. characteristics of these filters insure signal integrity, they are recommended for use in applications ranging from high grade stereo receivers to digital transmission systems.

SPECIFICATIONS

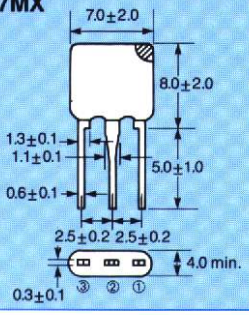
SFE MX/MA8 10.7 MHz

	Part Number	3db Band Width (KHz)	20dB Band Width (KHz) max.	Insertion Loss (dB) max.	Spurious Attenuation min.	G.D.T. Band Width (KHz) min.
MX series	SFE10.7MX-Z	250±40	670(620)	12(10)	25(33)	0.2μ sec. max. Within ± 110KHz
	SFE10.7MX2-Z	220±40	610(560)	12.5(10.5)	30(37)	0.15μ sec. max. Within ± 80KHz
	SFE10.7MZ1-Z	180±30	530(460)	14(12.3)	33(38)	0.15μ sec. max. Within ± 60KHz
	SFE10.7MZ2-Z	150±30	500(420)	14(12.6)	35(41)	0.15μ sec. max. Within ± 50KHz
MA8 series	SFE 10.7MA8-Z	280±50	650(520)	6(4)	30(43)	0.5μ sec. max. Within ± 80(100)KHz
	SFE10.7MS2G-Z	230±50	600(420)	7(4.5)	40(45)	0.5μ sec. max. Within ± 60(75)KHz
	SFE10.7MS3G-Z	180±40	520(380)	9(5)	40(45)	0.5μ sec. max. Within ± 45(60)KHz

• Input/output matching impedance: 330 ( ) Typ. value

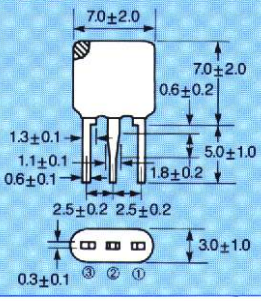
DIMENSIONS (mm)

SFE10.7MX

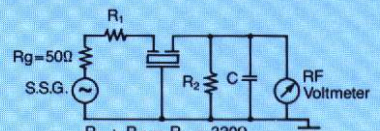


DIMENSIONS (mm)

SFE10.7MA8



CIRCUIT



$R_1 + R_g = R_2 = 330\Omega$
$C = 10pF$

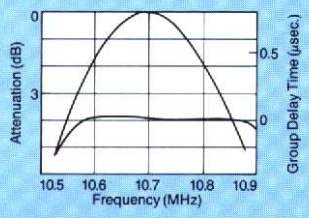
(Includes stray capacitance and input capacitance of RF Voltmeter.)

1 = INPUT
2 = GND
3 = OUTPUT

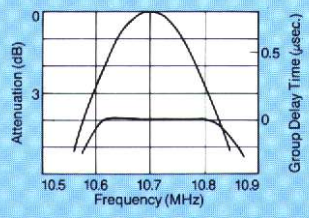
FREQUENCY CHARACTERISTICS

MX Series

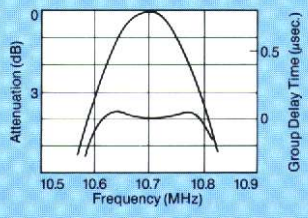
SFE10.7MX



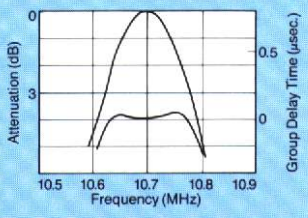
SFE10.7MX2



SFE10.7MZ1

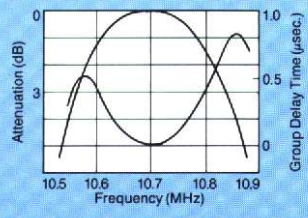


SFE10.7MZ2

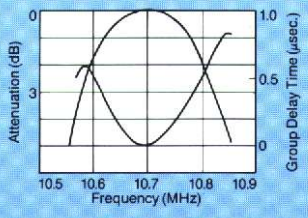


MA8 Series

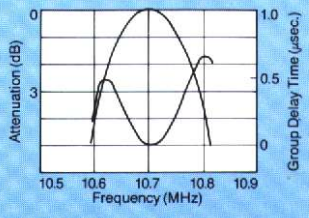
SFE10.7MA8



SFE10.7MS2G

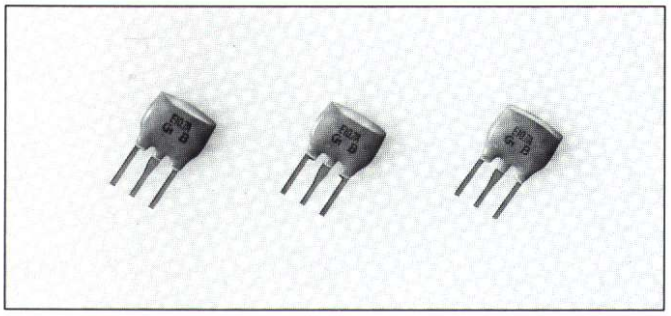


SFE10.7MS3G



LOW LOSS, WIDE OR NARROW BAND, MINIATURE CERAMIC FILTERS

SFE MA/MH 10.7 MHz



The following filters were developed to offer both narrower and wider band width characteristics for use in products such as DBS receivers. These filters also retain the same reliability that is available with our standard filters. The various band widths allow these filters to be utilized in a multitude of new communication applications.

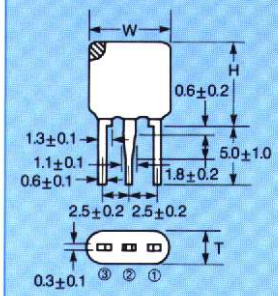
SPECIFICATIONS

SFE MA/MH 10.7 MHz

Part Number	3dB Bandwidth (KHz)	20dB Bandwidth (KHz) max.	Insertion Loss (dB)	Spurious Attenuation (9 to 12MHz) (dB) min.	Input/Output Matching Imp.
SFE10.7MA19	350min. (450)	950 (750)	3±2	20 (30)	470 Ω
SFE10.7MA20-A	330±50	680 (615)	4±2	30 (40)	330 Ω
SFE10.7MA21	400 (500)	950 (750)	3±2	20 (30)	470 Ω
SFE10.7MHY-A	110±30	350 (260)	7±2	30 (42)	330 Ω

NOTE: These filters are not classified according to center frequency. ( ) Typ. value

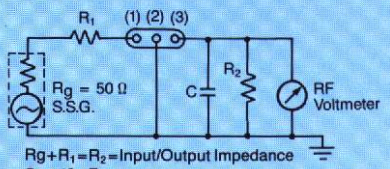
DIMENSIONS (mm)



P/N	W	H	T
MA19 MA20-A MA21	9.0 Max.	9.0 Max.	4.0 Max.
MHY-A	7.0 ±2.0	7.0 ±2.0	3.0 ±1.0

Rg+R1=R2=Input/Output Impedance

CIRCUIT

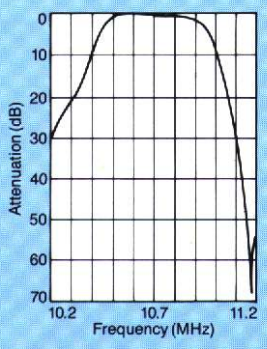


Rg+R1=R2=Input/Output Impedance
C = 10 pF
(including stray capacitance and input capacitance of RF Voltmeter)

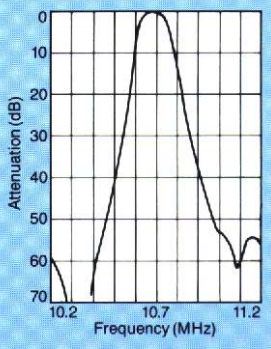
1=INPUT
2=GND
3=OUTPUT

FREQUENCY CHARACTERISTICS

SFE10.7MA19

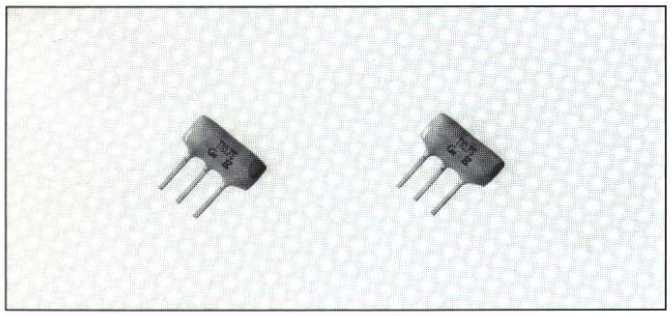


SFE10.7MH



HIGHLY SELECTIVE, 3 STAGE TYPE CERAMIC FILTERS

SFT MA/MS 10.7 MHz



The SFT 10.7 ceramic filters are single substrate, 3 element devices that offer 1.5 times more selectivity than the conventional SFE series of filters. The improved spurious suppression of these filters eliminates the need for cascading multiple filtering devices; therefore, it is possible to design a more compact circuit board configuration.

SPECIFICATIONS

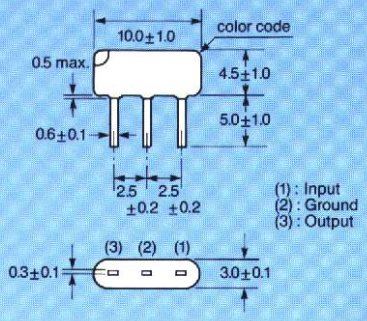
SFT MA/MS 10.7 MHz

Part Number	3dB Bandwidth (KHz)	20dB Bandwidth (KHz) max.	Insertion Loss (dB)	Spurious Attenuation (9 to 12MHz) (dB) min.
SFT10.7MA5-Z	280±50	700 (630)	6±2	50 (60)
SFT10.7MS2-Z	230±40	650 (580)	6±2	50 (60)
SFT10.7MS3-Z	180±40	550 (500)	8±2	50 (60)

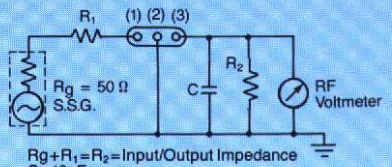
*Input/Output impedance: 330Ω

( ) Typ. value

DIMENSIONS (mm)



CIRCUIT

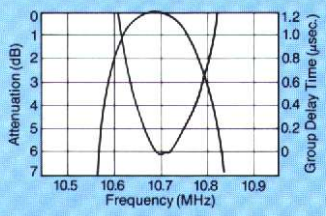


Rg+R1=R2=Input/Output Impedance
C=10pF
(Including stray capacitance and input capacitance of RF Voltmeter.)

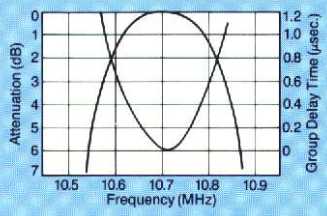
1=INPUT
2=GND
3=OUTPUT

FREQUENCY CHARACTERISTICS

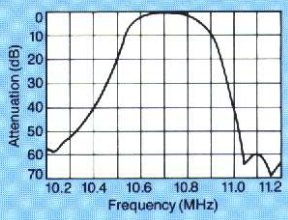
SFT10.7MS2



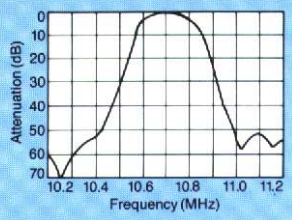
SFT10.7MS3



SFT10.7MS3

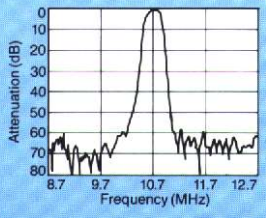


SFT10.7MS3

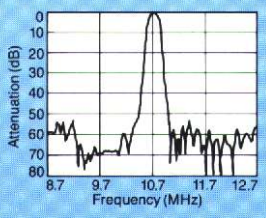


TYPICAL SPURIOUS RESPONSE CHARACTERISTICS

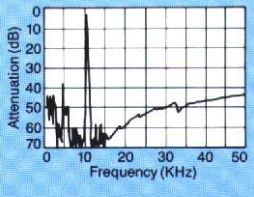
SFT10.7MS2



SFT10.7MS3

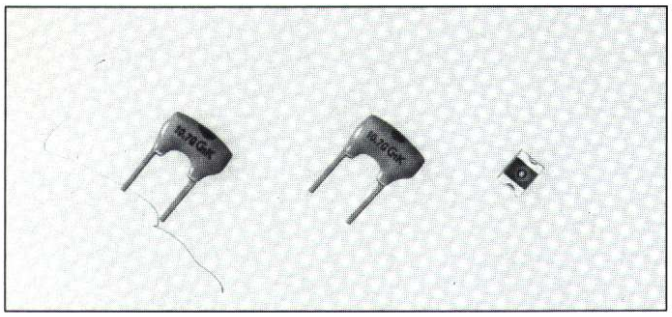


SFT10.7MS2



CERAMIC DISCRIMINATORS FOR FM DEMODULATION

CDA 10.7 MHz



The CDA 10.7 line of ceramic discriminators are resonate devices that offer adjustment free audio detection in both wide and narrow bandwidths. These IC dependent devices utilize FM specific detection methods to convert changes in frequency into an intelligible audio signal.

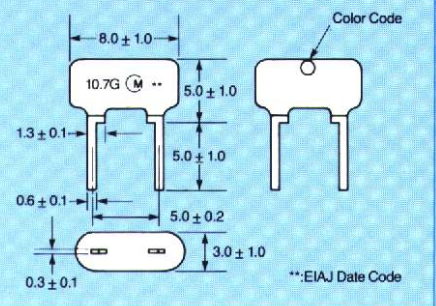
Part Number	IC Mfg.	IC Number	Part Number	IC Mfg.	IC Number
CDA10.7MC2-A	Toshiba	TA7687P/F	**CDA10.7MG17-A**	Phillips	TEA5591
CDA10.7MC3-A	National	AN7220A	**CDA10.7MG18-A**	Toshiba	TA8132N
CDA10.7MC4A-A	Motorola	MC3356P	**CDA10.7MG19-A**	Rohm	BA1440
CDA10.7MC5A-A	Sanyo	LA7770	**CDA10.7MG20-A**	Signetics	NE604
CDA10.7MC6-A	Phillips	TEA5591	**CDA10.7MG21-A**	Siemans	TBA229-2
CDA10.7MC7-A	Sanyo	LA1811	**CDA10.7MG22-A**	Sanyo	LA1810
CDA10.7MC19-A	Rohm	BA1440	**CDA10.7MG23-A**	Sanyo	LA7770
CDA10.7MC30-A	Phillips	TEA5592	**CDA10.7MG24-A**	Phillips	TDA2557
CDA10.7MF1A-A	National	AN7223	**CDA10.7MG26-A**	Sanyo	LA1805
CDA10.7MF2A-A	National	AN7222	**CDA10.7MG28-A**	Telefunken	U2510B
CDA10.7MF3-A	Hitachi	HA12413	**CDA10.7MG30-A**	Phillips	TEA5392
CDA10.7MF4-A	National	AN7221	**CDA10.7MA4-A**	Sanyo	LA1235
CDA10.7MF5-A	Hitachi	HA12430	**CDA10.7MA5A-A**	RCA	CA3089E
CDA10.7MF6-A	Toshiba	TA7747P	**CDA10.7MA12-A**	NEC	uPC1167C
CDA10.7MF7-A	Toshiba	TA7704P	**CDA10.7MA14-A**	Mitsubishi	M51173AP
CDA10.7MG1-A	Sony	CXA-1238/-20111	**CDA10.7MA15-A**	Sanyo	LA1231N
CDA10.7MG2-A	Sony	CX-831	**CDA10.7MA16-A**	Hitachi	HA12411
CDA10.7MG4-A	Rohm	BA4234L	**CDA10.7MA17-A**	N.S.	LM3189N
CDA10.7MG6-A	Toshiba	TA7640AP	**CDA10.7MA18K-A**	Sanyo	LA1265
CDA10.7MG7-A	Sanyo	LA1260	**CDA10.7MA19-A**	Hitachi	HA1137W
CDA10.7MG8-A	Toshiba	TA7303P	**CDA10.7MA19A-A**	Hitachi	HA1137W
CDA10.7MG9-A	Toshiba	TA7130P	**CDA10.7MA20-A**	Siemans	TBA120T
CDA10.7MG12-A	Sony	CXA1030P	**CDA10.7MA21-A**	Siemans	TDA4282T
CDA10.7MG13-A	National	AN7007SU	**CDA10.7MA22-A**	RCA	CA3209
CDA10.7MG14A-A	National	AN7006S	**CDA10.7MA23-A**	Sanyo	LA1140
CDA10.7MG15-A	Sanyo	LA1816	**CDA10.7MA25-A**	Hitachi	HA11225
CDA10.7MG16-A	Toshiba	TA8122AN	**CDA10.7MA27-A**	NEC	uPC1382C

NOTE: The CDA 10.7 line of ceramic discriminators is categorized according to center frequency in the same manner as 10.7MHz Filters (refer to pg. 15.)

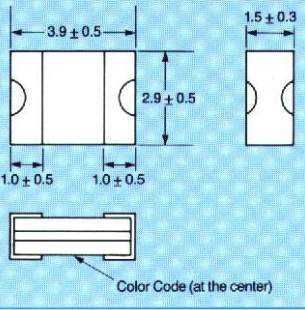
SURFACE MOUNT CERAMIC DISCRIMINATORS

Part Number	IC Mfg.	IC Number
CDAC10.7MG1-A	Sony	CX-20029
CDAC10.7MG2-A	Sony	CX-20076
CDAC10.7MG18-A	Toshiba	TA8132F
CDAC10.7MG20-A	Signetics	NE-604

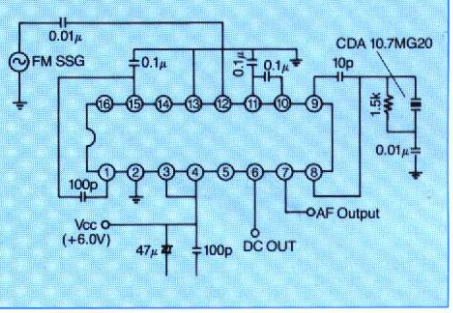
LEADED DIMENSIONS



SURFACE MOUNT DIMENSIONS

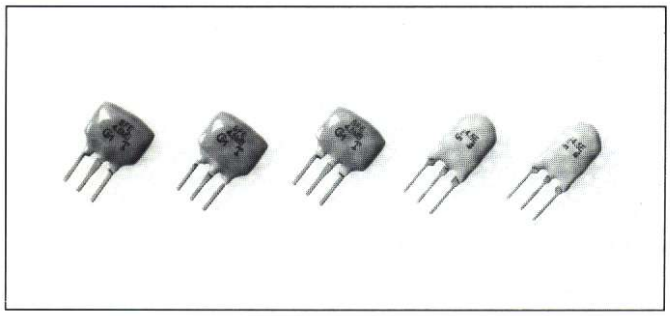


TYPICAL CIRCUIT



HIGHLY ACCURATE, TV/VCR TYPE CERAMIC FILTERS

SFE/SFS 3.58-6.5 MHz



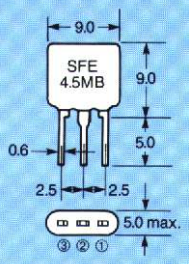
The SFE/SFS lines of ceramic filters are high quality devices designed to address the TV/VCR/CATV/DBS markets. The SFE/SFS lines are utilized as IF filters in virtually every type of technology currently used in the television industry.

SPECIFICATIONS — SFE 3.58-6.5 MHz

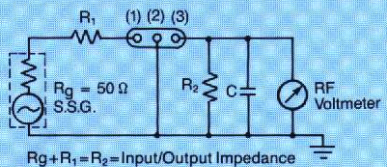
Part Number	Nominal Frequency	3dB Bandwidth (KHz) min.	20dB Bandwidth (KHz) max.	Insertion Loss (dB) max.	Stop Band Attenuation (dB) min.	Input/Output Matching Imp.
SFE3.58MBF	3.58MHz	±40 (±80)	530 (370)	10 (5)	17 (Within 3.58 $^{+0.5}_{-1.0}$MHz)	1 KΩ
SFE4.5MBF	4.5MHz	±60 (±105)	530 (420)	6 (4)	20 (Within 4.5 $^{+0.8}_{-1.0}$MHz)	1 KΩ
SFE5.5MBF	5.5MHz	±75 (±120)	550 (470)	6 (3)	25 (Within 5.5±1.0 MHz)	600 Ω
SFE6.0MBF	6.0MHz	±80 (±130)	600 (500)	6 (2.5)	25 (Within 6.0±1.0 MHz)	470 Ω
SFE6.5MBF	6.5MHz	±80 (±130)	630 (530)	6 (2.5)	25 (Within 6.5±1.0 MHz)	470 Ω

( ) Typ. value

DIMENSIONS (mm)



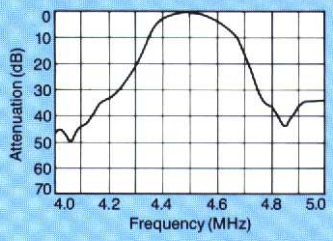
CIRCUIT



Rg+R1=R2=Input/Output Impedance
C = 10 pF
(including stray capacitance and input capacitance of RF Voltmeter)

1=INPUT
2=GND
3=OUTPUT

CHARACTERISTICS



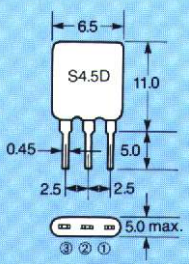
SPECIFICATIONS — SFS 4.5 MHz

Part Number	Nominal Center Frequency	3dB Bandwidth (KHz) min.	20dB Bandwidth (KHz) max.	Insertion Loss (dB) max.	Stop Band Attenuation (dB) min.	Input/Output Matching Imp.
SFS4.5MC	4.5MHz	±60 (±110)	600 (420)	6 (3.5)	30 (0 to 4.5MHz)	1 KΩ
SFS4.5MD	4.5MHz	±70 (±140)	750 (530)	6 (2.8)	30 (0 to 4.5MHz)	1 KΩ
SFS4.5ME2	4.5MHz	±110 (±160)	750 (700)	6 (3.5)	30 (0 to 4.5MHz)	600 Ω

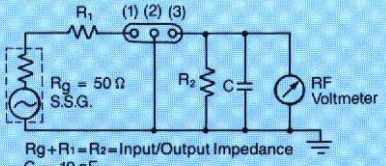
5.5, 6.0 6.5KHz types are also available.

( ) Typ. value

DIMENSIONS (mm)



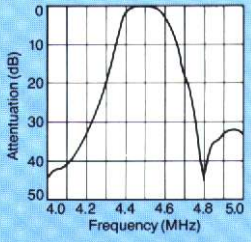
CIRCUIT



Rg+R1=R2=Input/Output Impedance
C = 10 pF
(including stray capacitance and input capacitance of RF Voltmeter)

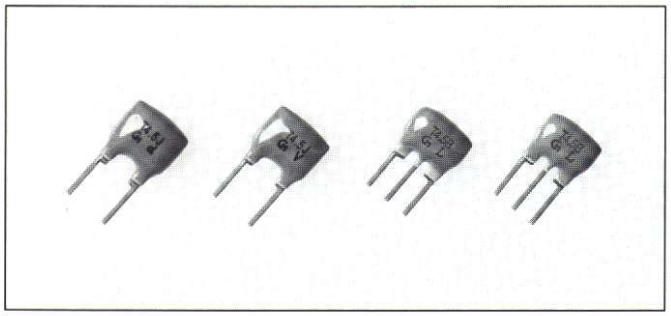
1=INPUT
2=GND
3=OUTPUT

CHARACTERISTICS



HIGH ATTENUATION CERAMIC TRAPS

TPS MJ/MB 4.5-6.5 MHz



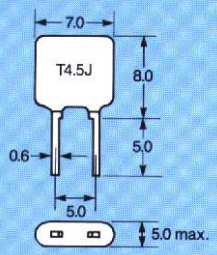
The TPS MJ/MB lines of ceramic traps are band reject filters used for video and sound IF attenuation. The 2 terminal TPS MJ series can be used to attenuate either the sound signal in B/W receivers or the chroma signal in video. The 3 terminal TPS MB series contains 2 trap elements on one substrate for additional attenuation. This line of traps can be used in the sound IF of CATV/VCR receivers.

SPECIFICATIONS — TPS MJ 4.5-6.5 MHz

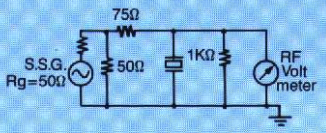
Part Number	Nominal Center Frequency (fn)	Attenuation at fn (dB) min.	20dB Attenuation Bandwidth (KHz) min.	Spurious Response (0 to fn) (dB) max.
TPS4.5MJ	4.5MHz	20 (30)	30 (50)	0.5 (0)
TPS5.5MJ	5.5MHz	20 (30)	30 (60)	0.5 (0)
TPS6.0MJ	6.0MHz	20 (30)	30 (70)	0.5 (0)
TPS6.5MJ	6.5MHz	20 (30)	30 (70)	0.5 (0)
TPS3.58MJ	3.58MHz	20 (27)	20 (30)	0.5 (0)
TPS4.43MJ	4.43MHz	20 (30)	20 (50)	0.5 (0)

( ) Typ. value

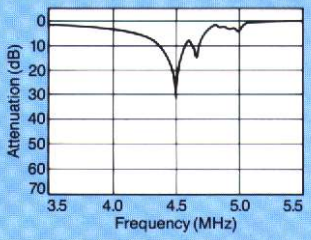
DIMENSIONS (mm)



CIRCUIT



CHARACTERISTICS



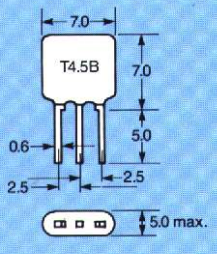
SPECIFICATIONS — TPS MB 4.5-6.5 MHz

Part Number	Nominal Center Frequency (fn)	Attenuation at fn (dB) min.	30dB Attenuation Bandwidth (KHz) min.	Spurious Response (0 to fn) (dB) max.
TPS4.5MB2	4.5MHz	35 (45)	50 (80)	0.5 (0)
TPS5.5MB	5.5MHz	35 (45)	70 (120)	0.5 (0)
TPS6.0MB	6.0MHz	35 (45)	70 (120)	0.5 (0)
TPS6.5MB	6.5MHz	35 (45)	70 (120)	0.5 (0)

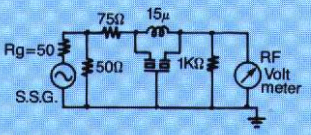
The level at 1 MHz shall be made for a reference (OdB)
Other frequencies (3.58, 4.43 MHz) are also available.

( ) Typ. value

DIMENSIONS (mm)

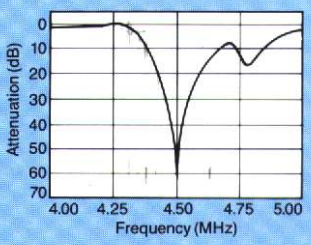


CIRCUIT



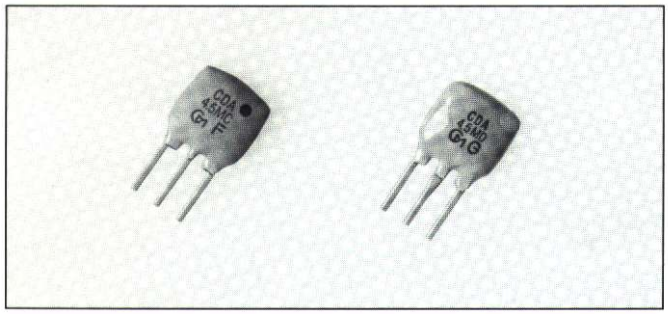
CHARACTERISTICS

TPS4.5 (4.5±0.5MHz.)



CERAMIC DISCRIMINATORS FOR QUADRATURE DETECTION

CDA MC/ME 4.5-6.5 MHz



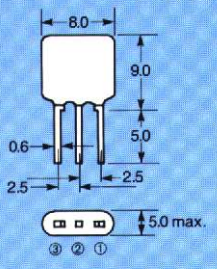
The CDA MC/ME lines of ceramic discriminators are IC dependent devices used in the recovery of audio signals. The CDA MC discriminators have three terminals while the CDA ME discriminators are 2 terminal devices.

MATCHING IC — CDA MC 4.5-6.5 MHz

Part Number	IC	Part Number	IC	Part Number	IC
CDA□MC10	TBA120T	**CDA□MC22**	M51354AP	**CDA□MC30**	M51348FP
CDA□MC15	TA7146P	**CDA□MC23**	M51316P	**CDA□MC31**	TDA4282T
CDA□MC16	TDA4940	**CDA□MC24**	LA7520	**CDA□MC32**	LA7522
CDA□MC17	TDA4280	**CDA□MC25**	LA7521	**CDA□MC33**	μPC1416G
CDA□MC18	HA11229	**CDA□MC26**	LA7530 (N)	**CDA□MC34**	TBA130-2
CDA□MC19	μPC1391H	**CDA□MC27**	μPC1411CA	**CDA□MC35**	M51345FP
CDA□MC20	μPC1382C	**CDA□MC28**	M51316BP		
CDA□MC21	μPC1383C	**CDA□MC29**	M51365SP		

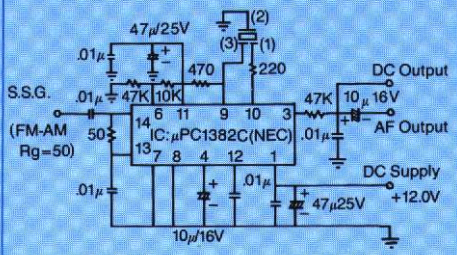
□ Indicates frequency 4.5/5.5/5.74/6.0/6.5 MHz are available. Note that part numbers, circuit and ratings vary according to the IC used at detector process.

DIMENSIONS (mm)



CIRCUIT

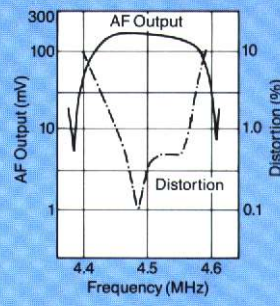
CDA 4.5 MC20



(1) =INPUT
(2) =GND
(3) =OUTPUT

RECOVERED AUDIO CHARACTERISTICS

CDA 4.5 MC20



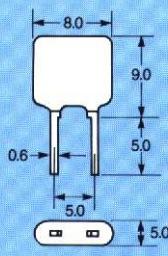
Test Conditions = 100 dBV
400 H_z, ±7.5 KH_z Dev.

MATCHING IC — CDA ME 4.5-6.5 MHz

Part Number	IC	Part Number	IC	Part Number	IC
CDA□ME1	CX-20014	**CDA□ME8**	TBA129	**CDA□ME23**	M51496P
CDA□ME2	AN5135	**CDA□ME10**	TDA2546A	**CDA□ME27**	LA7650
CDA□ME3	TA7678AP	**CDA□ME19**	M51346BP	**CDA□ME30**	CXA1110AS
CDA□ME5	AN5135NK	**CDA□ME20**	LA7550	**CDA□ME34**	TA8680N
CDA□ME6	M51346AP	**CDA□ME21**	LA7545	**CDA□ME35**	LA7680
CDA□ME7	TDA4503	**CDA□ME22**	TDA2556	**CDA□ME37**	TA8691N

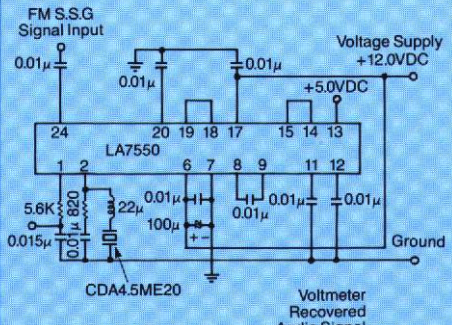
□ Indicates frequency 4.5/5.5/5.74/6.0/6.5MHz are available. Note that part numbers, circuits and ratings vary according to the IC used at detector process.

DIMENSIONS (mm)



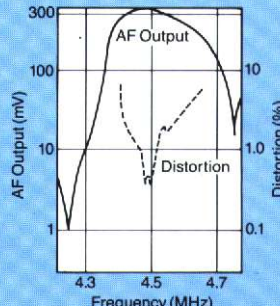
CIRCUIT

CDA 4.5 ME20



RECOVERED AUDIO CHARACTERISTICS

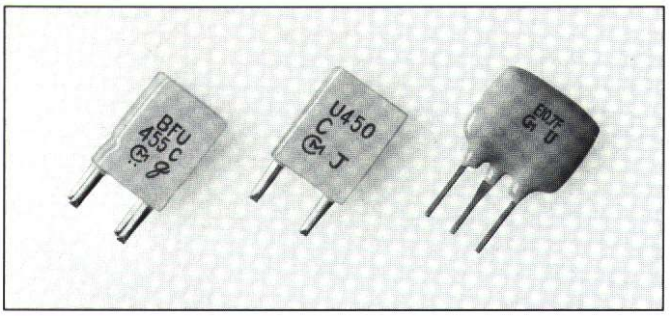
CDA 4.5 ME20



Test Conditions = 100 dBV
400 H_z, ±7.5 KH_z Dev.

CERAMIC FILTERS FOR SIGNAL DETECTION

SFE & BFU Series

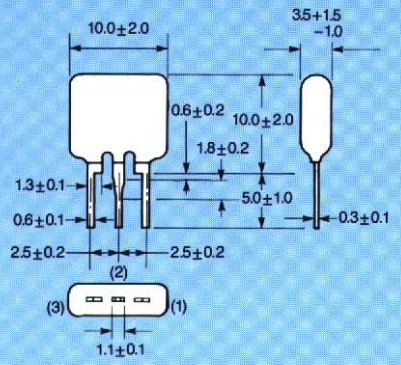


The following filters were specifically designed for signal detection circuitry used in applications such as that found in the search–stop functions of electronically tuned radios.

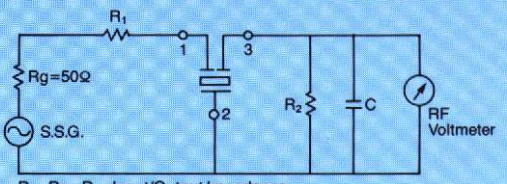
SPECIFICATIONS — SFE 10.7

Part Number	Center Freq. (MHz)	3dB Bandwidth (KHz)	Insertion Loss (dB max)	Terminal Impedance (Ω)
SFE10.7MFP1	10.7 (Nominal)	Fn ±5 min. Fn ±35 max.	6	600

DIMENSIONS (mm)



CIRCUIT



$R_1+Rg=R_2=$Input/Output Impedance
C=10pF±2pF (Including stray capacitance and input capacitance of RF Voltmeter.)

1 = INPUT
2 = GND
3 = OUTPUT

SPECIFICATIONS — BFU 450/455

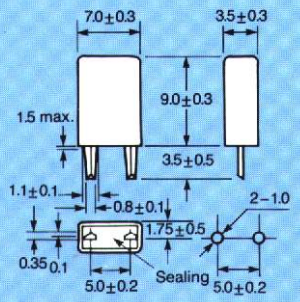
Part Number	Resonant Frequency (KHz)	Resonant Resistance (Ω)	△f(fa-fr) (KHz)
BFU450K3	450±1	30	27.5±4
BFU450C	450±1	20	14±2
BFU450C4N	450±0.8	30	9±2

• Temperature Coefficient is typically 10ppm/°C

Part Number	Center Frequency (KHz)	3dB Bandwidth (KHz)	Selectivity
BFU455K	455±2	8±2	8db @ f_0=−9, 12dB @ f_0=+9

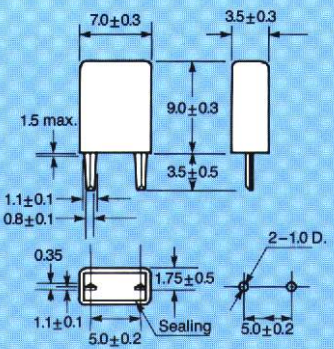
DIMENSIONS (mm)

BFU450K3/C/C4N



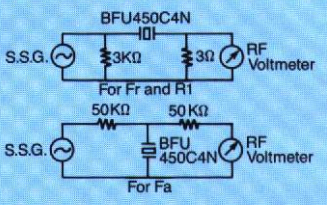
DIMENSIONS (mm)

BFU455K

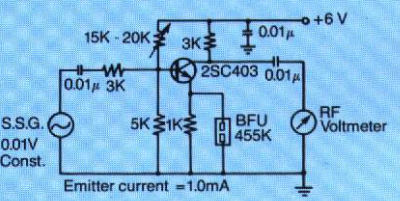


CIRCUITS

BFU450K3/C/C4N



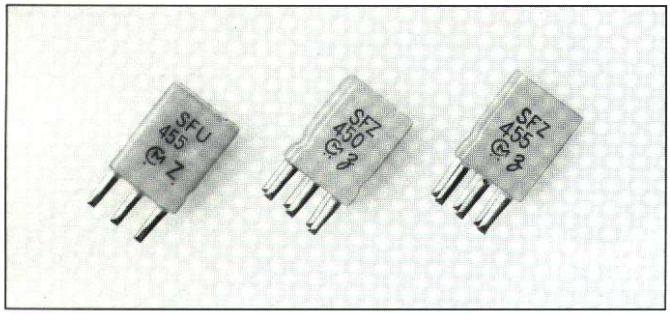
BFU455K



CERAMIC FILTERS FOR AM APPLICATIONS

muRata ERIE

SFU & SFZ Series



The following filters were designed to address the needs of standard AM filtering requirements. These filters are recommended for use in low cost products where economically, efficient designs are critical.

SPECIFICATIONS

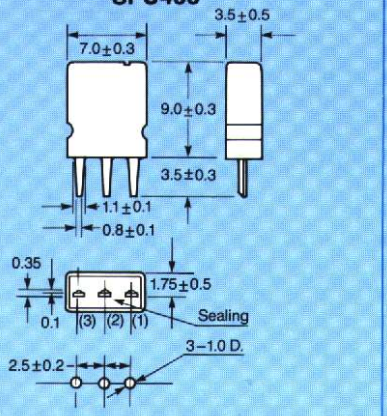
SFU/SFZ/450/455

Part Number	Center Freq. (KHz)	3dB Bandwidth (KHz)	Ripple (dB) max.	Selectivity (dB) min.	Termination Impedance (ohms) max.	Spurious Response (dB) min.	Insertion Loss (dB) max.	Operating Temperature Range	Withstanding Voltage
SFU455A	455±2	10 (±3)	0	6@−10KHz 4@+10KHz	3K	10 (1–3MHz)	5	−10°C to +80°C	50V DC
SFU455B (connected to an IFT)	462±2	10 (±3)	-	4@+10KHz 6@−10KHz	3K	10 (1–3MHz)	5	−10°C to +80°C	
SFZ455A	455±2	4.5 (±1)	1.5	26@−10KHz 20@+10KHz	3K	20 (1–3MHz)	6	−20°C to +80°C	
SFZ455B	455±2	6.5 (±1)	1.5	14@+9KHz 18@+9KHz	3K	20 (0–3MHz) 10 (3–15MHz)	6	−20°C to +80°C	
SFZ450C3N	450±1	2.5 (±1)	-	30@−9KHz 24@+9KHz	3K	Fo 20 (1−3MHz)	6.5	−10°C to +80°C	

( ) Typ. value

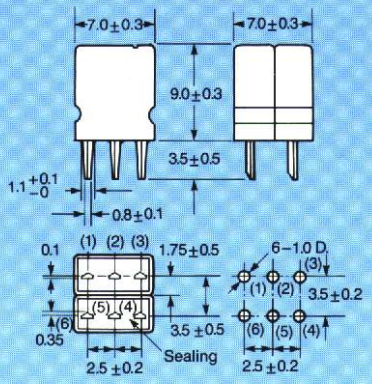
DIMENSIONS (mm)

SFU455



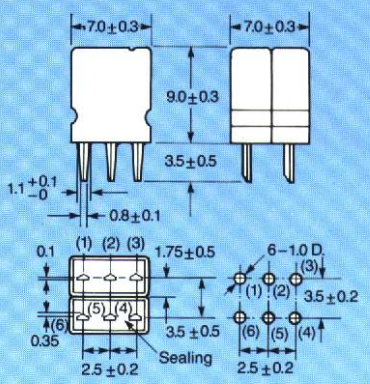
DIMENSIONS (mm)

SFZ455

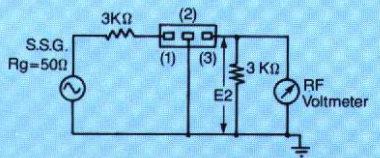


DIMENSIONS (mm)

SFZ450C3N

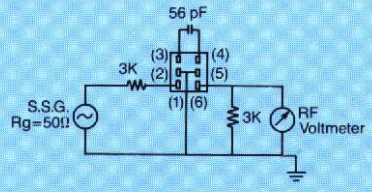


CIRCUIT

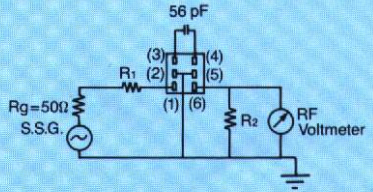


SFU455B is designed to be connected with an I.F.T.

CIRCUIT



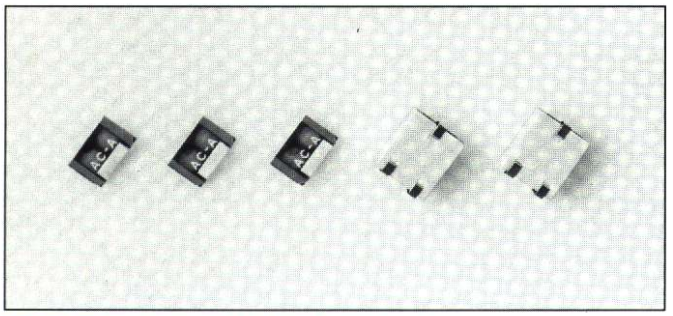
CIRCUIT



$Rg+R_1=R_2=$ Input/Output Impedance

SURFACE MOUNTED CHIP PIEZOELECTRIC CERAMIC FILTERS FOR AM AND FM APPLICATIONS

SFGCC 455KHz/SFEC10.7 MA



Along with the development of the AM chip filter, IF filters for AM/FM radios have also been made smaller, thinner and in a chip configuration for surface mounting. This is one more example of Murata Erie's leadership in converting conventional electronic components to chip technology.

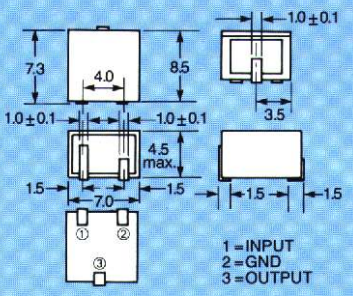
PRELIMINARY SPECIFICATIONS

SFGCC 455 KHz

Part Number	Center Frequency		Bandwidth			Ripple (max)		*Insertion Loss (max) dB	Stop Band Atten. (min) at ±100KHz dB	Group Delay (max)		Source And Load Impedance KΩ
	Nom. (KHz)	Tol. (KHz)	3dB (min) (KHz)	6dB (min) (KHz)	40dB (min) (KHz)	dB	Point of Measure			μs	Point of Measure	
SFGCC455AX2	455	-	28	-	70	1.0	±10 KHz	5.0	25	15	±10 KHz	1.0
SFGCC455BX	455	1.5	-	30	70	1.0	±10 KHz	5.0	25	15	±10 KHz	1.0
SFGCC455CX	455	1.5	-	25	60	1.0	±8 KHz	6.0	25	15	±8 KHz	1.0
SFGCC455DX	455	1.0	-	20	50	1.0	±7 KHz	7.0	23	20	±7 KHz	1.5
SFGCC455EX	455	1.0	-	15	40	1.0	±5 KHz	8.0	23	20	±5 KHz	1.5
SFGCC455FX	455	1.0	-	12	35	1.0	±4 KHz	9.0	23	25	±4 KHz	1.5
SFGCC455GX	455	1.0	-	9	30	1.0	±3 KHz	10.0	20	25	±3 KHz	1.5

Note: Also available as CFU equivalent

DIMENSIONS (mm)



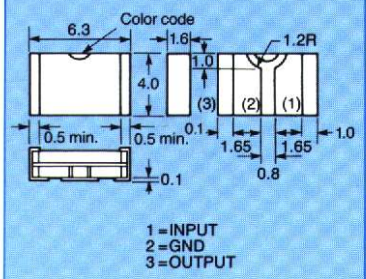
SPECIFICATIONS

SFEC10.7MA5P/MS2/MS3

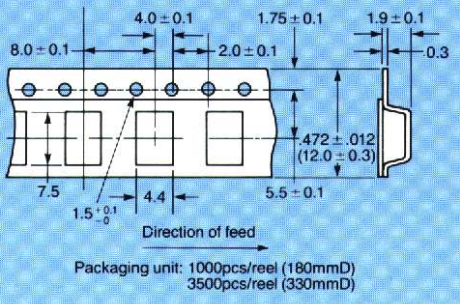
Center frequency (f_o)	**A: 10.70MHz±30KHz (red)** **B: 10.67MHz±30KHz (blue)** **C: 10.73MHz±30KHz (orange)** **D: 10.64MHz±30KHz (black)** **E: 10.76MHz±30KHz (white)**	**The center point of 3dB bandwidth around the center frequency and identified by the colors as shown**

	SFEC10.7MA5P-Z	SFEC10.7MS2-Z	SFEC10.7MS3-Z
3dB bandwidth	280 KHz±50KHz	230 KHz±50 KHz	180 KHz+40 KHz
Insertion loss	5dB max.	6.5dB max.	4.5dB max.
Spurious attenuation	25dB min. (9 to 12MHz)	30dB min. (8 to 13MHz)	30dB min. (8 to 13MHz)
I/O match impedence	330Ω	330Ω	330Ω

DIMENSIONS (mm)

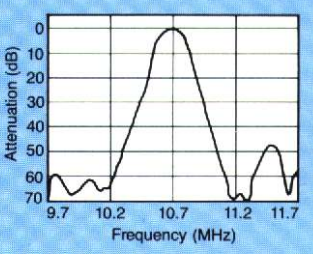


DIMENSIONS (mm) TAPE



Packaging unit: 1000pcs/reel (180mmD)
3500pcs/reel (330mmD)

CHARACTERISTICS



SPECIFICATIONS

MECHANICAL

TEST ITEM	TEST CONDITIONS	TEST METHOD
Terminal Strength	Axial direction: 1Kg load for 5-10 seconds.	MIL-STD-202E Method 211A
Solderability	Parts are immersed for 5±1 seconds at 230±5°C.	MIL-STD-202E Method 208C
Random Drop	Drop 3 times on concrete floor from 1.0 meter, (30cm for some products).	
Vibration	Vibration amplitude of 1.5mm at 10–55 Hz in each of three mutually perpendicular directions for 1 hour.	MIL-STD-202E Method 201A

ENVIRONMENTAL

TEST ITEM	TEST CONDITIONS	TEST METHOD
Salt Spray	Hold in chamber with 5% salt density at 35°C+1.1°C/–1.7°C for 48 hrs. Measure after exposure to room conditions for 1 hour.	MIL-STD-202E Method 101D
Temperature Cycling	Expose to 5 cycles of –55°C (30 minutes), → +25°C (15 minutes), → +85°C (30 minutes), → +25°C (15 minutes). Test after 1 hour exposure to room conditions.	MIL-STD-202E Method 102A
Humidity	Hold in chamber with 90 to 95% R.H. at 40±2°C for 100 hours. Test after exposure to room conditions for 1 hour.	MIL-STD-202E Method 103B
Operating Humidity	Hold in chamber with 90 to 95% R.H. at 40±2°C for 100 hours at 6VDC. Test after exposure to room conditions for 1 hour.	
Thermal Shock	Expose to 5 cycles of –55°C (30 minutes), → +85°C (30 minutes). Test after 1 hour exposure to room conditions.	MIL-STD-202E Method 107D
Life Test	Hold in chamber at 85±2°C for 100 hours. Test after exposure to room conditions for 1 hour.	MIL-STD-202E Method 108A
Operating Life Test	Hold in chamber at 85±2°C for 100 hours at 6VDC. Test after exposure to room conditions for 1 hour.	
Sulfuration	Hold in chamber with 1000 ppm sulfer density for 24 hours. Test after exposure to room conditions for 1 hour.	
Resistance to Soldering Heat	Immerse leads completely in solder bath at 350±5°C for 3 seconds. Test after exposure to room conditions for 1 hour.	MIL-STD-202E Method 210A

ELECTRICAL

TEST ITEM	TEST CONDITIONS	TEST METHOD
Dielectric Withstanding Voltage	Apply 100VDC between I/O terminals and ground terminal, for 1 minute.	MIL-STD-202E Method 301
Insulation Resistance	Apply 100VDC between I/O terminals and ground terminal, for 1 minute.	MIL-STD-202E Method 302
Temperature Characteristic	Hold part for 20 minutes at each of the following temperatures and then measure. –20°C, 0°C, 20°C, 40°C, 60°C, 80°C.	

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