

Handling Instructions

■ Soldering

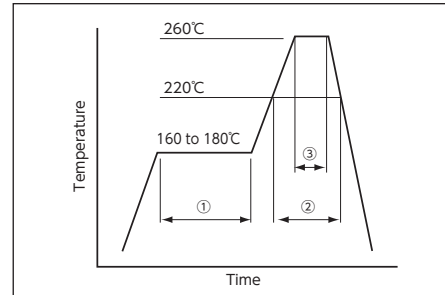
Our products are designed so they may withstand the same standard reflow soldering temperatures as most other electronics components. However, if the reflow temperature is higher than our specification allows, the performance may be affected. Avoid soldering the product at temperatures higher than specified.

For the reflow temperature profile of SMD products, refer to the figure below.

①	Preheat	160 to 180°C	120sec.
②	Primary heat	220°C	60sec
③	Peak	260°C	10sec. max.

※ The reflow temperature profile may vary depending on the product model, specifications and frequency range. Refer to the individual product specifications for details.

Reflow Temperature Profile
(Available for lead free soldering)



■ Cleaning

- General cleaning solutions or ultrasonic cleaning may be used to clean our crystal products, but verification tests are recommended prior to use.
- Tuning fork crystals resonate at frequency bands that are close to the washing frequency of ultrasonic cleaning machines and this may cause resonance deterioration in the crystal. Therefore the use of ultrasonic cleaning machines to clean tuning fork crystals should be avoided. After applying ultrasonic cleaning, the functionality of crystals should be verified by testing the performance of the end product.

■ Shock

Crystal products are designed to resist shock, but if the products receive excessive shocks or are dropped on the ground, be sure to check for any damages before using.

■ Mounting

〈SMD crystal products〉

Surface mount crystals are designed to be compatible with most automatic mounting processes, but some processes may exert excessive shock which may damage the crystal. Therefore test mounting of the crystal prior to mass production is necessary. If there is a possibility that PCB may be warped, make sure the warping is not to such a degree that the crystal products' operating characteristics or soldering conditions will be negatively affected. Avoid mounting and processing by Ultrasonic welding because this method has a possibility of an excessive vibration spreading inside the crystal products and becoming the cause of characteristic deterioration and not oscillating.

〈Lead type〉

When bending, forming, or mounting leaded crystal products be careful not to put too much pressure on the glassed part of the base, as it may crack and negatively affect the crystals' performance.

■ Storage

Storing crystal products at high temperatures or high humidity may deteriorate the soldering condition of pins. Do not store in direct sunlight or damp environments.

■ Others

〈Crystal Resonators〉

- When excessive voltage is applied to crystal resonators, their performance may be affected or the crystal blank may be damaged. When handling the product, use the product within the specifications provided.
- Negative resistance determines the tolerance margin of a circuit that oscillates the resonator. We recommend that the negative resistance be at least five times the standard series resistance for standard applications.

〈Crystal Oscillators〉

- C-MOS is used for internal circuit of crystal oscillators. To prevent latch-up phenomena or static electricity, take careful note.
- Some crystal oscillators do not have internally connected bypass capacitors. When using the product, use a capacitor with a good high frequency characteristic of 0.01μ F between Vcc and GND (e.g. Ceramic chip capacitor) and connect it at the shortest possible distance. For details, refer to the specifications of each individual product.

〈Monolithic Crystal Filters〉

- Take care so that the input pin and the output pin do not close on the PCB.
- If the floating capacity of a PCB (on which a crystal filter is to be mounted) is too large, circuit tuning may be required to cancel out the excess floating capacity.
- When excessive voltage is applied to crystal filters, their performance may be affected or the crystal blank may be damaged. When handling the product, use at its input level equal to or less than -10dBm.

RoHS/ELV Compliant Lead-free and Halogen-free products from KDS.

KDS is fully committed to environmental protection and has been proactively working to comply with the major environmental regulations such as RoHS Directive (Directive of the Restriction of the use of certain Hazardous Substances : 2011/65/EU and (EU) 2015/863), ELV Directive (End-of-Life Vehicles Directive : 2000/53/EC) and Halogen-free activities etc. The below spreadsheet provide the current status of the product compliance in each environmental regulations. Please visit our website for the latest information.(<https://www.kds.info>)

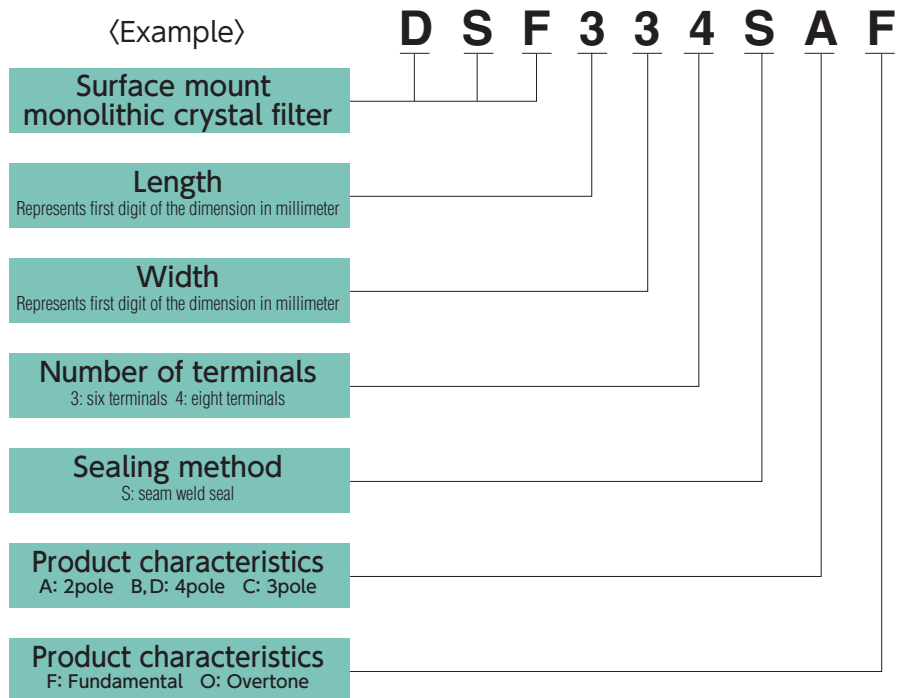
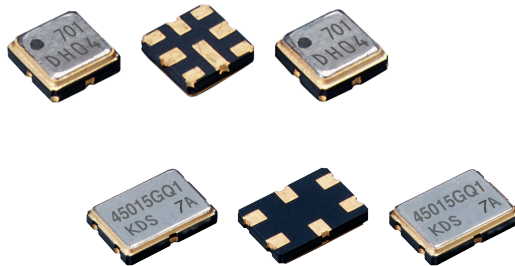
As of sept.30.2023

	Type	RoHS/ELV Compliant	Halogen-free	Pb-free	Materials of pin	Note
Crystal Resonators/ MHz Band Crystal Resonators	DX1008J SERIES	○	○	○	Ni/Au	
	DSX1210A	○	○	○	Ni/Au	
	DSX1612S	○	○	○	Ni/Au	
	DSX211S, DSX211SH	○	○	○	Ni/Au	
	DSX221SH	○	○	○	Ni/Au	
	DSX321SH	○	○	○	Ni/Au	
	DSX210GE	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX320GE	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX211G	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX321G, DSX321GK	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
Tuning Fork Crystal Resonators/ kHz Band Crystal Resonators	DSX530GA	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DT-26, DT-261	○	○	○	Sn	
	DT-38, DT-381	○	○	○	Sn	
	DMX-26S	○	○	High temperature solder	Sn	High temperature solder used inside the product is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DST1210A	○	○	○	Ni/Au	
	DST1610A	○	○	○	Ni/Au	
	DST210AC	○	○	○	Ni/Au	
Crystal Resonators with dedicated temperature sensor/ MHz Band Crystal Resonators	DST310S	○	○	○	Ni/Au	
	DSR1210ATH	○	○	○	Ni/Au	
	DSR1612ATH	○	○	○	Ni/Au	
	DSR2115TH	○	○	○	Ni/Au	
Temperature Compensated Crystal Oscillators (TCXO)	DSR2215TH	○	○	○	Ni/Au	
	DSA/DSB1612 SERIES	○	○	○	Ni/Au	
	DSA/DSB211 SERIES	○	○	○	Ni/Au	
	DSA/DSB221 SERIES	○	○	○	Ni/Au	
	DSA/DSB321 SERIES	○	○	○	Ni/Au	
	DSA/DSB535 SERIES	○	○	○	Ni/Au	
	DSK1612ATD	○	○	○	Ni/Au	
Real Time Clock Module (RTC)	DSK321STD	○	○	○	Ni/Au	
	DD3225TS, DD3225TR	○	○	○	Ni/Au	
Simple Packaged Crystal Oscillators (SPXO)	DD3225TS, DD3225TR	○	○	○	Ni/Au	
	DS1008J SERIES	○	○	○	Ni/Au	
	DSO1612AR	○	○	○	Ni/Au	
	DSO211S SERIES	○	○	○	Ni/Au	
	DSO221S SERIES	○	○	○	Ni/Au	
	DSO223S SERIES	○	○	○	Ni/Au	
	DSO321S SERIES	○	○	○	Ni/Au	
	DSO323S SERIES	○	○	○	Ni/Au	
	DSO531S SERIES	○	○	○	Ni/Au	
	DSO533 SERIES	○	○	○	Ni/Au	
Voltage Controlled Crystal Oscillators (VCXO)	DLO555MBA	○	○	○	Sn	
	DSO751S SERIES	○	○	○	Ni/Au	
	DSO753S SERIES	○	○	○	Ni/Au	
	DSV221SV	○	○	○	Ni/Au	
Monolithic Crystal Filters	DSV321S	○	○	○	Ni/Au	
	DSF334 SERIES	○	○	○	Ni/Au	
	DSF444 SERIES	○	○	○	Ni/Au	
	DSF633 SERIES	○	○	○	Ni/Au	
	DSF753 SERIES	○	○	○	Ni/Au	

* RoHS Directive and ELV Directive exemptions are granted for high temperature solder, lead content in low-melting glass of DSX-G Series.

Quartz Devices

Monolithic crystal filters



Monolithic Crystal Filters

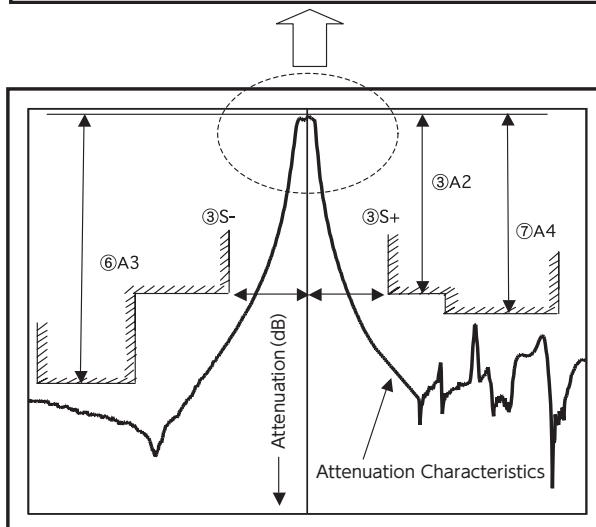
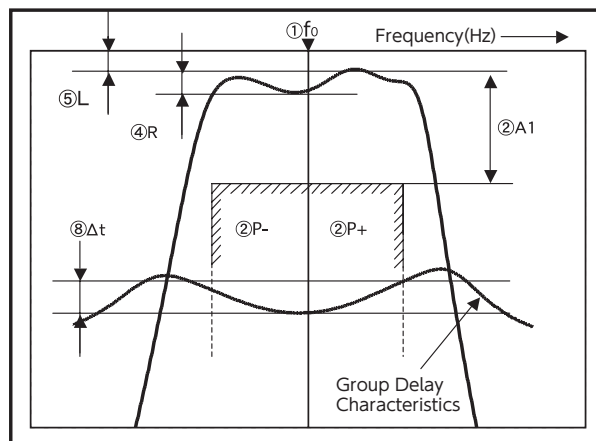
Description

A monolithic crystal filter is a device that has a frequency screening function. From a wide frequency range, it passes a specific frequency and attenuates unnecessary ones. It plays the role of extracting desired frequency in radio communication equipment.

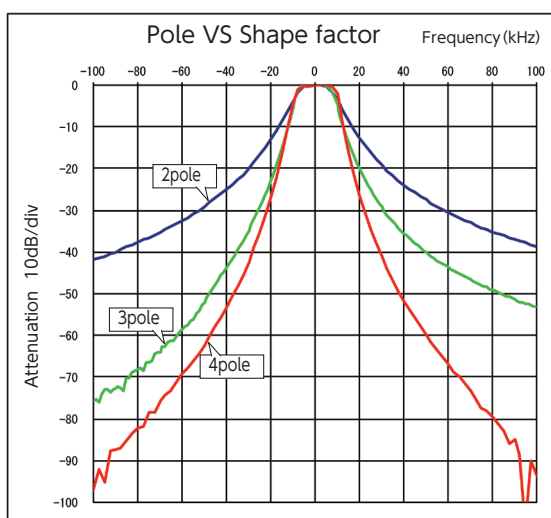
With the high Q factor of the crystal, these filters feature low loss, steep attenuation characteristics and high stability, as well as good temperature drifting characteristics.

Terminology

①	Nominal Frequency f_0 (MHz)	Nominal value of center frequency.
②	Pass Bandwidth $P \pm$ (kHz), A_1 (dB)	Frequency interval at which relative attenuation is guaranteed to be equal to or less than a given value, A_1 .
③	Stop Bandwidth $S \pm$ (kHz), A_2 (dB)	Frequency interval at which relative attenuation is guaranteed to be equal to or more than a given value, A_2 .
④	Ripple R (dB)	The maximum difference between the minimum attenuation and the minimum loss within the pass band.
⑤	Insertion Loss L (dB)	Difference in attenuation when filter is inserted and not inserted. Can be either of the following. Minimum loss: Minimum value of insertion loss. Insertion loss at f_0 : Insertion loss at nominal frequency.
⑥	Guaranteed Attenuation A_3 (dB)	Relative attenuation guaranteed in a specific range within the stop band.
⑦	Spurious A_4 (dB)	Relative attenuation produced as a result of spurious frequencies in a specific range within the stop band.
⑧	Tolerance in Group Delay Time Δt (μs)	Difference between the maximum value and minimum value of the group delay time within the pass band.
Terminating Impedance $R_t // C_t$ ($\Omega // pF$)		Signal-source impedance or loading impedance as viewed from the filter side. Expressed as resistance and parallel capacitance including floating capacitance.
Coupling Capacitance C_c (pF)		Capacitance of the connection between elements for 4pole filter.
Operating Temperature Range		Temperature range over which the monolithic crystal filter can be operated within allowable deviation range.

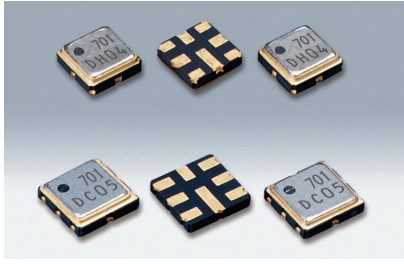


Pole VS Shape factor



SMD Monolithic Crystal Filters

DSF334S 2POLE/DSF334S 3POLE/DSF444S 2POLE/DSF444S 3POLE



Actual size DSF334S DSF444S

■ Features

- DSF334S 2POLE, 3POLE: 3030 size, 0.9mm height, miniature SMD crystal filter and lightweight(0.03g)
- DSF444S 2POLE, 3POLE: 3838 size, 0.9mm height, miniature SMD crystal filter and lightweight(0.05g)
- Excellent shock and vibration resistance.
- Low spurious

■ Applications

- Radio communications



■ Standard Specification

Type	DSF334SAF	DSF334SAF	DSF334SCF	DSF444SAF	DSF444SCF
Model	D50003AM	D50015AM	DA6115FM	D50003AL	D73313FL
Pole	2	2	3	2	3
Overtone Order	Fundamental	Fundamental	Fundamental	Fundamental	Fundamental
Nominal Frequency	50.000 MHz	50.000 MHz	161.950 MHz	50.000 MHz	73.350 MHz
Pass Bandwidth	±1.5kHz min./3dB	±7.5kHz min./3dB	±7.5kHz min./3dB	±1.75kHz min./3dB	±6.5kHz min./3dB
Stop Bandwidth	±18kHz max./15dB	±25kHz max./13dB	±20dB min./50kHz	±16kHz max./15dB	±20kHz max./18dB
Ripple	1dB max.	1dB max.	1dB max.	1dB max.	1dB max.
Insertion Loss	40dB max.	3.5dB max.	5dB max.	4dB max.	3.5dB max.
Guaranteed Attenuation	60dB min.	60dB min.	70dB min.	50dB min.	70dB min.
Terminating Impedance	400Ω//9pF	750Ω//3pF	120Ω// -0.8pF	380Ω//9.0pF	380Ω// -1pF
Operating Temperature Range	-20 to +70°C				
Packing Unit (1)	2000pcs./reel(φ180)			1000pcs./reel(φ180)	

1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level: LEVEL 1 (IPC/JEDEC J-STD-03)

Consult our sales representative for other specifications.

■ DSF334S [mm]

■ Dimensions

Pin No.	Connection
#1	Input
#2	GND.
#3	GND.
#4	GND.
#5	Output
#6	GND.
#7	GND.
#8	GND.

■ Recommended Land Pattern (Top View)

■ Measurement Circuit

■ DSF444S [mm]

■ Dimensions

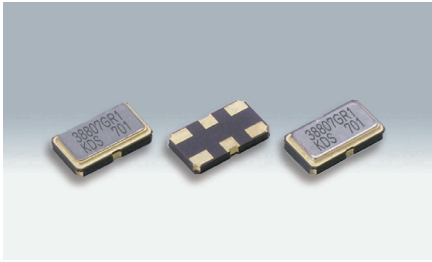
Pin No.	Connection
#1	Input
#2	GND.
#3	GND.
#4	GND.
#5	Output
#6	GND.
#7	GND.
#8	GND.

■ Recommended Land Pattern (Top View)

■ Measurement Circuit

SMD Monolithic Crystal Filters

DSF633S 2POLE/DSF633S 4POLE



Actual size

■ Features

- 6035 size, lightweight (0.072g) and miniature SMD crystal filter. Just 1.1mm height.
- 4 pole function in a single package.
- Excellent guaranteed attenuation.
- Excellent shock and vibration resistance.

■ Applications

- Radio communications



■ Standard Specification

Type	DSF633SDF				
Model	D38807GR	D49903GR	D58010GR	D73312GR	DA3050GR
Pole	4	4	4	4	4
Overtone Order	Fundamental	Fundamental	Fundamental	Fundamental	Fundamental
Nominal Frequency	38.850 MHz	49.950 MHz	58.050 MHz	73.350MHz	130.000MHz
Pass Bandwidth	±3.75kHz min./3dB	±1.75kHz min./3dB	±5.0kHz min./3dB	±6.0kHz min./3dB	±25.0kHz min./3dB
Stop Bandwidth	±15.0kHz min./35dB	±6.25kHz max./20dB	±12.5kHz max./25dB	±25kHz max./40dB	±100kHz max./35dB
Ripple	1dB max.	1dB max.	1dB max.	1dB max.	1dB max.
Insertion Loss	6dB max.	6dB max.	5dB max.	5dB max.	5dB max.
Guaranteed Attenuation	76dB min.	76dB min.	80dB min.	80dB min.	70dB min.
Terminating Impedance	710Ω//4pF Cc=12.5pF	150Ω//11pF Cc=33pF	450Ω//4.5pF Cc=9.5pF	380Ω//5pF Cc=11pF	560Ω//0.2pF Cc=3.5pF
Operating Temperature Range	-20 to +70°C				
Packing Unit (1)	1000pcs./reel(φ180)				

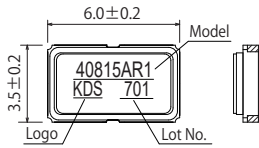
(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level: LEVEL 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

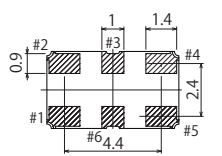
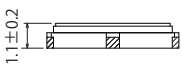
■ DSF633SA

[mm]

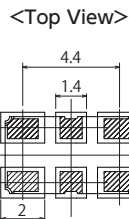
■ Dimensions



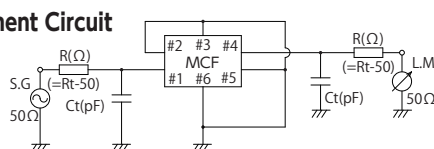
Pin No.	Connection
#1	INPUT
#2	GND.
#3	GND.
#4	OUTPUT
#5	GND.
#6	GND.



■ Recommended Land Pattern



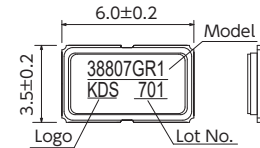
■ Measurement Circuit



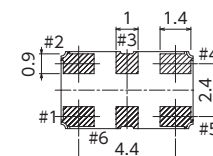
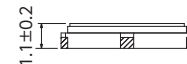
■ DSF633SD

[mm]

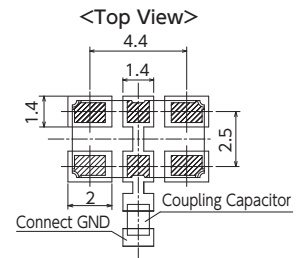
■ Dimensions



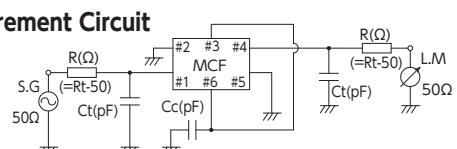
Pin No.	Connection
#1	INPUT
#2	GND.
#3	Connect with #6
#4	OUTPUT
#5	GND.
#6	Connect with #3



■ Recommended Land Pattern



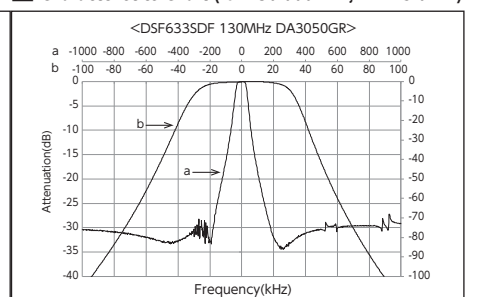
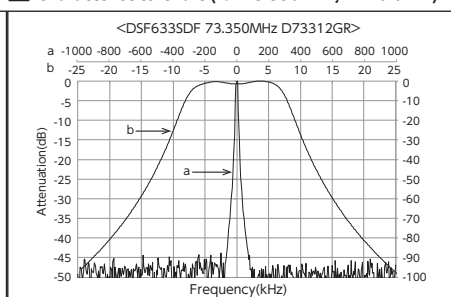
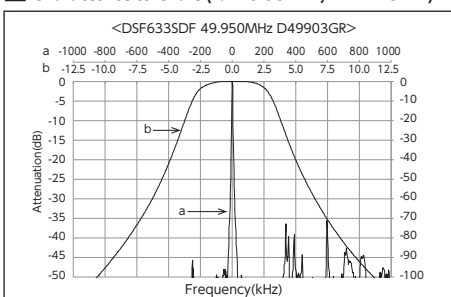
■ Measurement Circuit



■ Characteristics Chart (fo=49.95MHz, P=±1.75kHz)

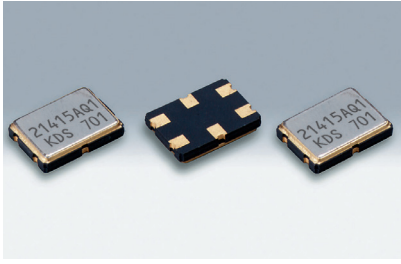
■ Characteristics Chart (fo=73.350MHz, P=±6.0kHz)

■ Characteristics Chart (fo=130.000MHz, P=±25.0kHz)



SMD Monolithic Crystal Filters

DSF753S 2POLE/DSF753S 3POLE/DSF753S 4POLE



Actual size

Features

- 7050 size, lightweight (0.15g) and miniature SMD crystal filter. Just 1.3mm height.
- Excellent shock and vibration resistance

Applications

- Radio communications



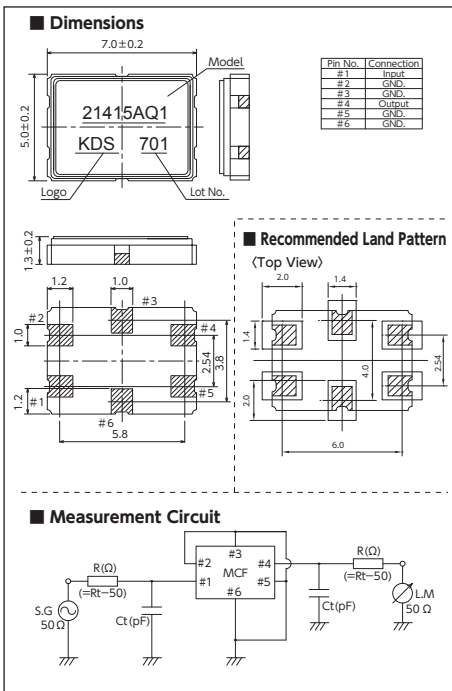
Standard Specification

Type	DSF753SAF	DSF753SCF	DSF753SBF/DSF753SDF		DSF753SDO	
Model	D21415AQ	D45015FQ	D46307GQ	D50810GQ	D73312GQ	DA4917GQ
Pole	2	3	4	4	4	4
Overtone Order	Fundamental	Fundamental	Fundamental	Fundamental	Fundamental	3rd overtone
Nominal Frequency	21.400 MHz	45.000 MHz	46.350MHz	50.850MHz	73.350MHz	149.9725 MHz
Pass Bandwidth	±7.5kHz min./3dB	±7.5kHz min./3dB	±3.5kHz min./3dB	±5.0kHz min./3dB	±6.0kHz min./3dB	±8.68kHz min./3dB
Stop Bandwidth	±25kHz max./18dB	±50kHz max./30dB	±18kHz max./40dB	±20kHz max./40dB	±25kHz max./40dB	±15dB min./30kHz
Ripple	1dB max.	1dB max.	1dB max.	1dB max.	1dB max.	1dB max.
Insertion Loss	2dB max.	3dB max.	5dB max.	5dB max.	5dB max.	6dB max.
Guaranteed Attenuation	70dB min.	70dB min.	80dB min.	80dB min.	80dB min.	60dB min.
Terminating Impedance	1500Ω//2.5pF	700Ω//−1pF	400Ω//4pF Cc=17.5pF	560Ω//4pF Cc=9.7pF	450Ω//4pF Cc=9.2pF	800Ω//−0.2pF Cc=0.6pF
Operating Temperature Range	−20 to +70°C					
Packing Unit (1)	1000pcs./reel(φ 180)					

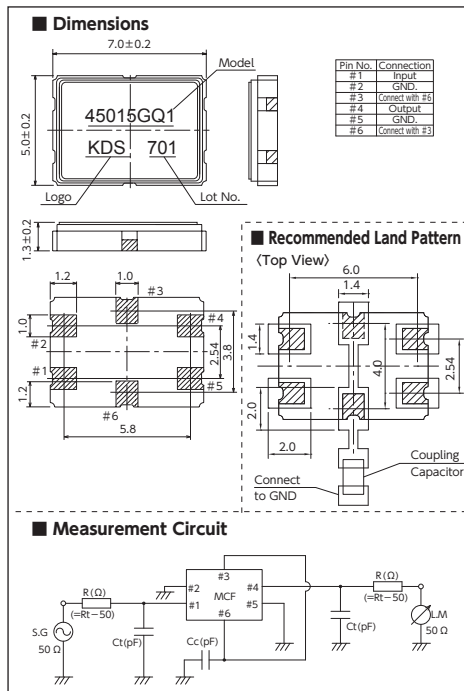
(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level: LEVEL 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

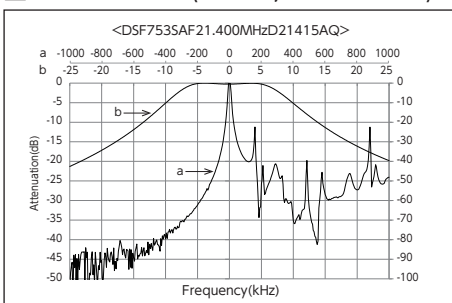
DSF753SA/DSF753SC [mm]



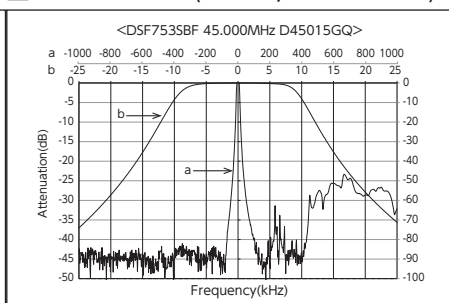
DSF753SB/DSF753SD [mm]



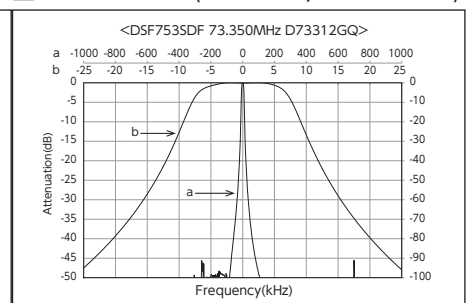
Characteristics Chart (fo=45MHz, P=±7.5kHz 2POLE)



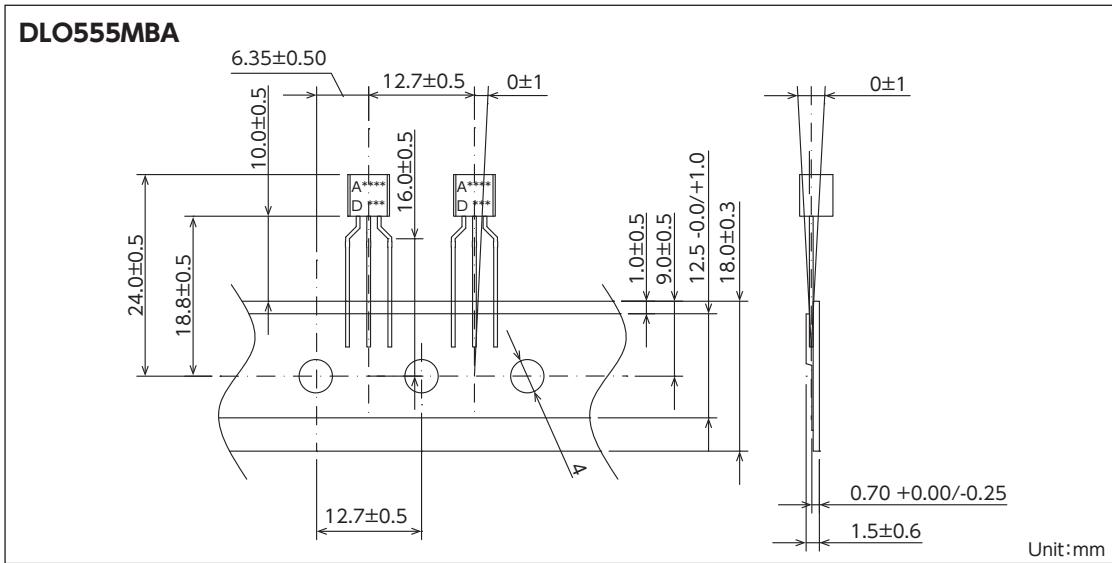
Characteristics Chart (fo=45MHz, P=±7.5kHz 4POLE)



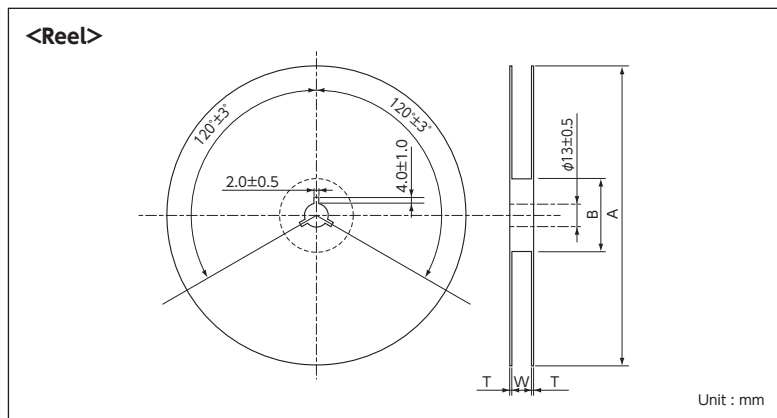
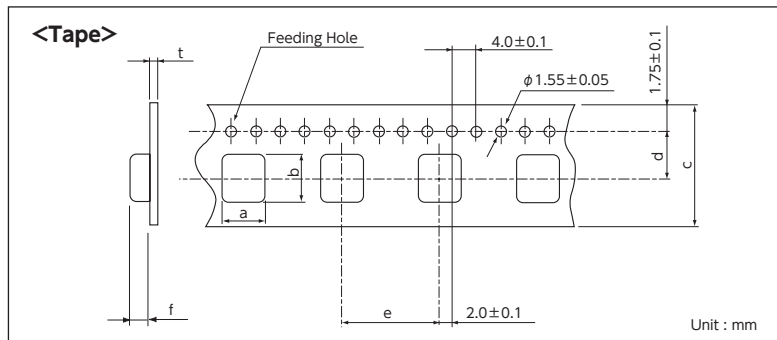
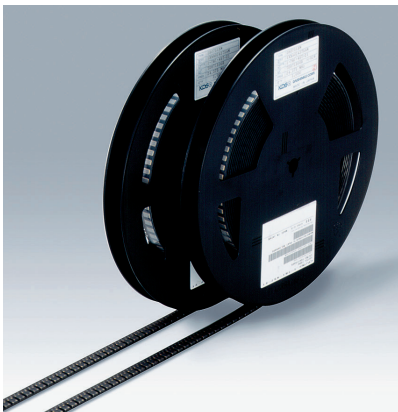
Characteristics Chart (fo=73.350MHz, P=±6.0kHz 4POLE)



Radial Tape (Crystal Oscillators)



Emboss Carrier Tape (SMD Monolithic Crystal Filters)



Standard Specification

TYPE	a	b	c	d	e	f	t	A	B	T	W
DSF753S SERIES	5.6 ±0.1	7.6 ±0.1	16.0 ±0.3	7.5 ±0.1	8.0 ±0.1	1.7 ±0.1	0.30 ±0.05	φ178 ±2	φ60 +1/-0	1.2 ±0.5	17.0 ±0.3
DSF633S SERIES	4.0 ±0.1	6.5 ±0.1	12.0 ±0.2	5.5 ±0.05	8.0 ±0.1	1.7 ±0.1	0.30 ±0.05	φ178 ±2	φ60 ±1/-0	1.2 ±0.5	13.0 ±0.3
DSF444S SERIES	4.0 ±0.1	4.0 ±0.1	12.0 ±0.3	5.5 ±0.1	8.0 ±0.1	1.5 ±0.1	0.30 ±0.05	φ178 ±2	φ60 ±1/-0	1.2 ±0.5	13.0 ±0.3
DSF334S SERIES	3.2 ±0.1	3.2 ±0.1	8.0 ±0.2	3.5 ±0.05	4.0 ±0.1	1.5 ±0.1	0.25 ±0.05	φ178 ±2	φ60 +1/-0	1.2 ±0.5	9.0 ±0.3

※ 1: To indicate product name and other information, place those information on a label, and affix the label on one side of the flange.
 2: The taping dimensions should be as per JIS C 0806. 1,000 units should be packaged per reel.
 3: The standard packaged quantity per reel is 2,000 units for DSF334S.