GEYER
quartz technology

Your Solution for Frequency Control Products

SAW Filter for ISM Band, GPS and RFID applications

QUALITY FOR MORE GEYER THAN 50 YEARS

Edition 1 09/2016

Mit 50 Jahren Erfahrung in der Quarz Branche ist **GEYER electronic** ein weltweit bekannter Hersteller von hochwertigen Schwingquarzen und Oszillatoren.

Der vorliegende Katalog **Ausgabe SAW Filter** bietet einen Überblick über das **GEYER** Filter**-**Sortiment. Weitere Bauformen und Sondertypen sind auf Anfrage lieferbar.

Für Neuentwicklungen und Freigabeprozesse stellt **GEYER electronic** kurzfristig geeignete Musterbauteile zur Verfügung. Darüber hinaus steht ein kompetentes Team von Design- und Entwicklungsingenieuren ganz im Dienste des Kunden und unterstützt bei der Auslegung von Schaltungen. Im **GEYER electronic** Design- und Testzentrum sind verschiedenste Messungen und Analysen, auch in der Klimasimulation, möglich.

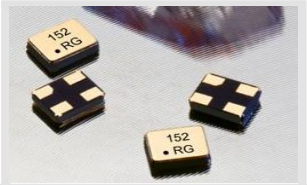
With 50 years' experience in the frequency control marketplace, **GEYER electronic** is a world-renown manufacturer of quality quartz crystals and oscillators.

The catalog in front of you, **Edition SAW Filter**, offers an overview of the **GEYER** component product range of filters. A variety of further packages and special types is available on request.

GEYER is pleased to provide suitable samples at short notice for new developments and approval processes. In addition, a competent team of design and development engineers committed to customers is available to provide support for the design of circuits. In the **GEYER electronic** Design and Test Center, a wide variety of measurements and analyses can be carried out, including in our climactic simulation test chamber.

Be sure with Quartz Crystals from GEYER.

Edition 1 09/2016



GEYER quartz technology

World Class SAW Filter Model KX-SF for ISM Band, GPS and RFID Application

Characteristics

- Low shape factors
- Superior linear phase characteristics
- Rejection qualities
- Stable performance over temperature

Contents

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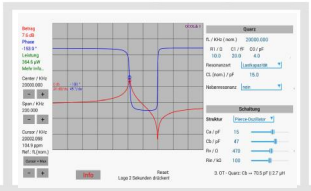


GEYER quartz technology

Design und Testcenter

Auswahl von Bauteilen
Schaltungsbegutachtung
Messungen und Analysen von Baugruppen

Wir bieten einen weltweit außergewöhnlichen Service:
- Ausführliche Beratung
- Validierung Ihrer Schaltung
- Ausgemessene Muster für Vorserien und Prototypen
- Abgestimmte Spezifikationen und Baugrößen
- 3D Modelle unserer Bauteile zur Erleichterung des Design-in
- Kostenlose Simulations - App
- Test der fertigen Baugruppe auf verschiedenste Parameter

Die Vorteile für Sie:
- Vermeidung von Unsicherheiten bei der Bauteileauswahl oder Spezifikation
- Verkürzte Entwicklungsdauer
- Erhöhte Betriebssicherheit in der Serie
- Kostenoptimierte Bauteileauswahl
- Optimale Lebenserwartung in der Serie

Sie erhalten:
- Ausführliche Beratung zum Schaltungsdesign neuer Schaltungen

Unter den Gesichtspunkten von:
- Frequenzgenauigkeit von unterschiedlichen Versorgungsspannungen
- Frequenzgenauigkeit über den Arbeitstemperaturbereich
- Anschwingverhalten bei verschiedenen Temperaturen
- Anschwingsicherheit
- Stromverbrauch
- Layout Optimierung
- Auswahl kostengünstiger Bauteile

Part selection
Evaluation of Circuit Design
Measurements and Analysis of PCBs

We offer your Design Engineers an exceptional worldwide service:
- Comprehensive consulting
- Validation of your design
- Our own Design and Test center
- Selected samples for prototypes and pilot series
- Matched specifications and design sizes
- 3D models of our components for easy design-in
- Free Geyer App-Y-Quartz with analyzing tool
- Testing of boards on selected parameters

As a customer you can expect the following benefits:
- Prevention from incorrect decisions in component selection or specification
- Shorter development time
- Enhanced reliability of operation in production run
- Cost-optimized component selection
- Optimum design life in production run

You get:
- Comprehensive advice in design of new circuits

With regard to:
- Frequency deviation at different supply voltages
- Frequency deviation at different temperatures
- Start-up at different temperatures
- Start allowance
- Current consumption
- Layout optimizing
- Selection of economic components

SERVICE

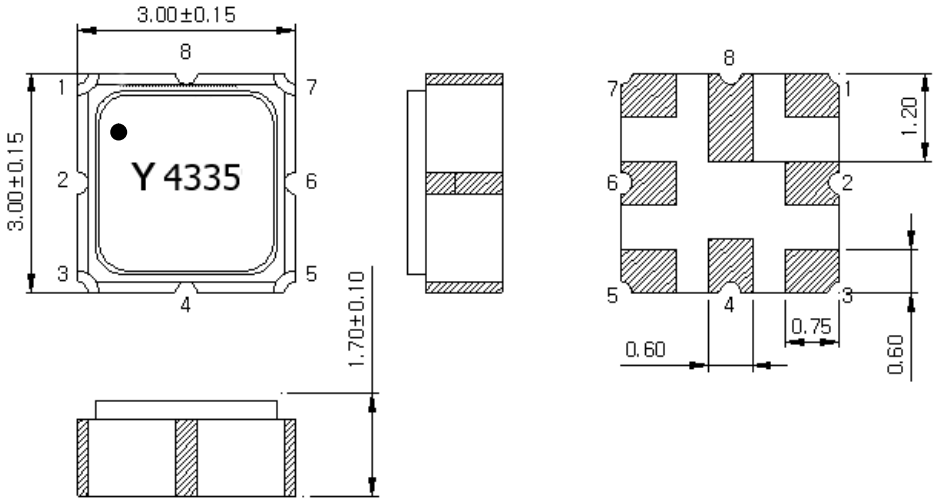
433.92 MHz SAW Bandpass Filter KX-SF

Part no. 12.98xxx

Features

- RF bandpass filter for **R**emote **K**eyless **E**ntry systems.
- Balanced or unbalanced operation
- Ceramic Surface Mounted Device Package (3.0 mm × 3.0 mm)
- **AECQ 200** qualified component family
- **E**lectrostatic **S**ensitive **D**evice (ESD)

Package dimensions



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um Ni Plating

Pin Configuration	
1	Input (recommended) or input ground
2	Input ground (recommended) or input
5	Output (recommended) or output ground
6	Output ground (recommended) or output
3,4,5,6	Ground

Maximum ratings

Parameter	**Unit**	**Minimum**	**Typical**	**Maximum**
Operable temperature range	℃	-45	25	120
Storage temperature range	℃	-45	25	120
DC voltage	V	-	-	6
Power handling capability	dBm	-	-	10

Specifications

Fc = 433.92 MHz
Operating Temperature Range : -45°C to +95°C
Typical Specification at 25°C

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	433.92	-
Minimum insertion loss (Matching elements Q = 47)	dB	-	2.4	3.0
Pass band (relative to α_{min}) 433.78 ~ 434.06 MHz 433.74 ~ 434.10 MHz 433.70 ~ 434.14 MHz	dB	 - - -	 0.6 0.8 1.2	 2.0 3.0 6.0
3dB Bandwidth	MHz	-	0.72	0.79
Relative attenuation 10.00 ~ 423.50 MHz 423.50 ~ 431.52 MHz 431.52 ~ 432.90 MHz 432.90 ~ 433.10 MHz 434.92 ~ 444.00 MHz 444.00 ~ 500.00 MHz 500.00 ~ 810.00 MHz 810.00 ~ 1200.00 MHz 1200.00 ~ 2500.00 MHz	dBc	 48 28 20 17 16 45 42 50 58	 60 40 30 24 25 54 47 54 63	 - - - - - - - -
Impedance for pass band matching Input : $Z_{IN} = R_{IN} \parallel C_{IN}$ Output : $Z_{OUT} = R_{OUT} \parallel C_{OUT}$	 Ω || pF Ω || pF	 - -	 290 || 1.8 290 || 1.8	 - -

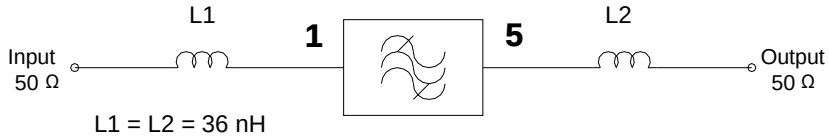
Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

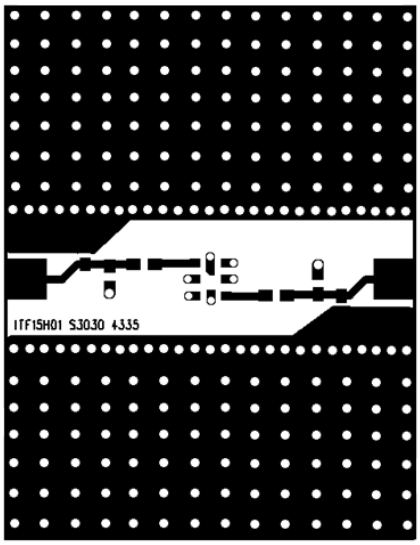
(Actual matching values may vary due to PCB layout and parasitic)



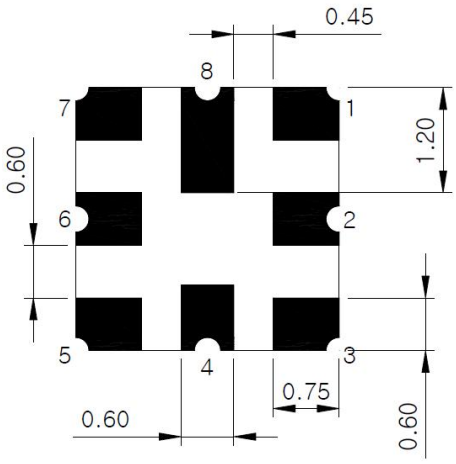
L1 = L2 = 36 nH
(* Note : 0805 Coilcraft CS series used for inductor)

PCB Layout recommended

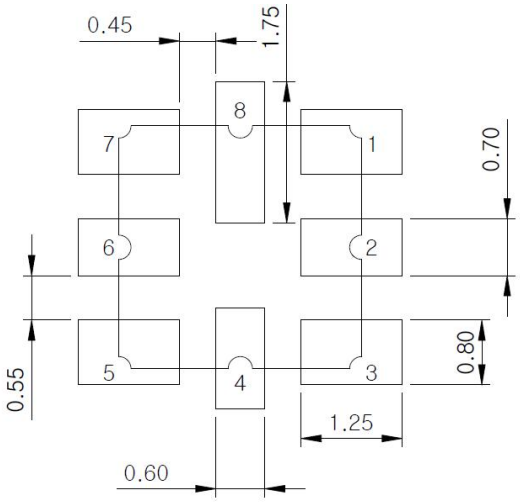
1. ITF PCB Layout for F4335 package. (pin number 1, 5)
2. For ultimate rejection is necessary to place enough via holes.



Recommended Land Pattern



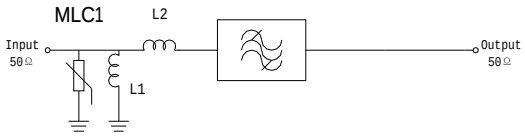
Bottom view



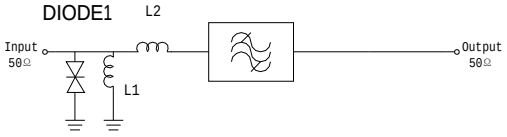
Suggested soldering pad

ESD protection of SAW filters

1. SAW filers are weak to Electric Static Discharge
2. Generally, to overcome damages of ESD, recommend suitable matching structure. (Depending input impedance)

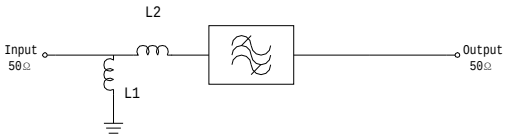


(Case A : MLC varistor used ESD matching structure)

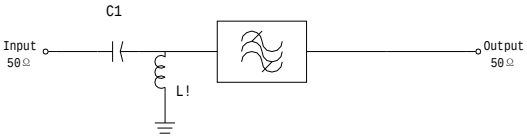


(Case B : Diode used ESD matching structure)

3. In case weak ESD used simple L-C component matching structure. (Depending input impedance)

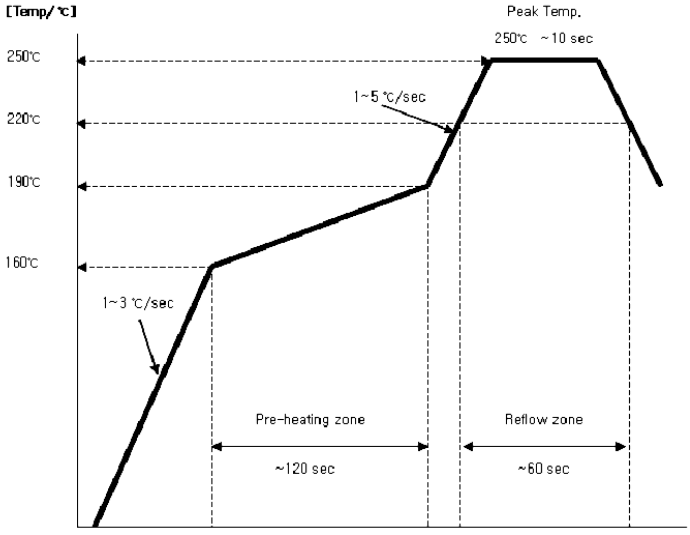


(Case C : Shunt L // Series L matching structure)



(Case D : Series C // Shunt L matching structure)

Reflow condition



Comment: The quality is guaranteed under this temperature conditions on 2 times solder reflows

Cautions

1. This is a hermetic device.
   MSL (Moisture Sensitive Level) is the 1st level
2. This is an electrostatic sensitive device. Please avoid static voltage during operation and storage.
   ESD (Electrostatic Discharge) Rating is class 0. (Test : HBM-Human Body Model)
3. Ultrasonic cleaning shall be avoided.
4. This device should not be used in any type of fluid such as water, oil, organic solvent, etc.

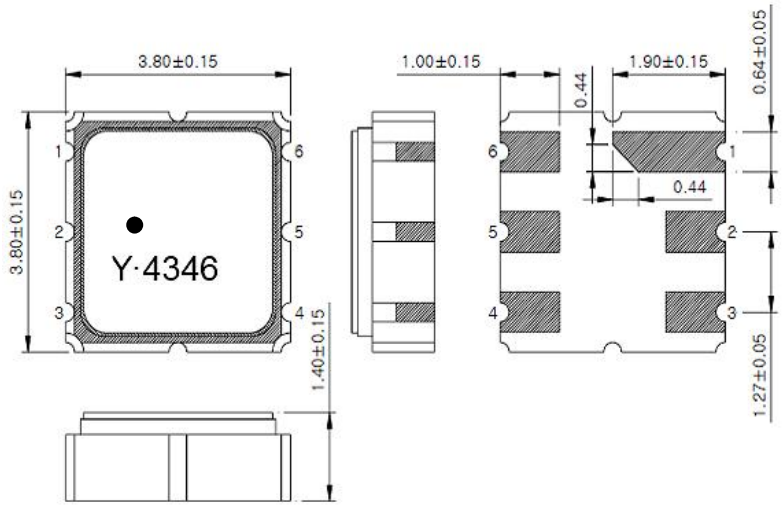
RoHS 2011/65/EU REACH compliant Conflict minerals free

GEYER quartz technology

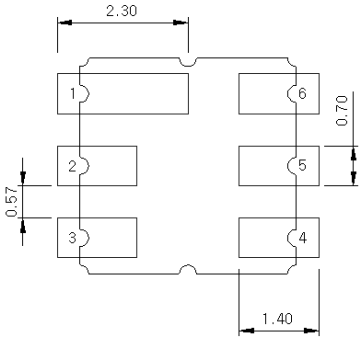
434.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98758

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-10	25	60
Storage temperature range	℃	-40	-	85
Power handling capability	dBm	-	-	-

Electrostatics Sensitive Devise (ESD)

Specifications

Fc = 434.0 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fe)	MHz	-	434.0	-
Insertion loss /Fc ± 2.0 MHz)	dB	-	2.5	4.0
Amplitude Ripple (Fc ± 2.0 MHz)	dB	-	1.0	1.5
Absolute Group Delay at Fc	nsec	-	50	-
Group Delay Variation (Fc ± 2.0 MHz)	nsec	-	50	-
VSWR (Fc ±2.0 MHz)			1.5	2.0
Relative Attenuation … ~ Fc – 15 MHz Fc +25 MHz ~ …	dB	 45 45	 50 50	-
Temperature Coefficient of Frequency	ppm/°C	-	-32	-

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

3) All attenuation measurements are measured relative to insertion loss

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

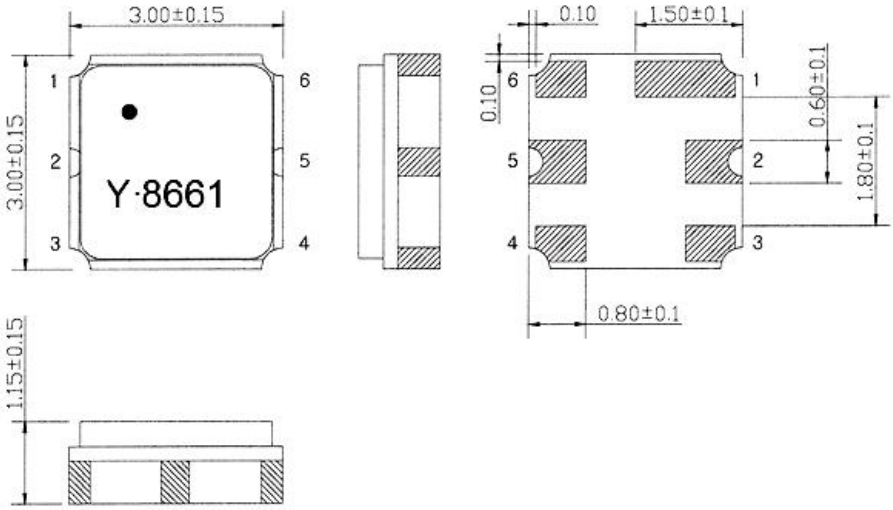
866.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98760

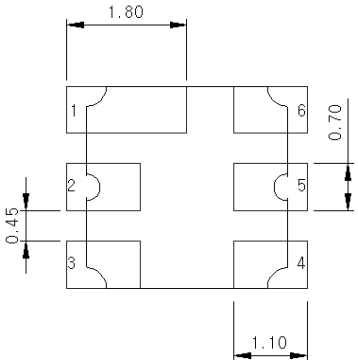
Features

- RF bandpass filter
- High attenuation
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (3.0 mm × 3.0 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-25	25	70
Storage temperature range	℃	-30	25	85
DC voltage	V	-	-	6
Power handling capability	dBm	-	-	18

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 866.0 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fe)	MHz	-	866	-
Insertion loss (863 ~ 870 MHz)	dB	-	2.3	3.0
Amplitude Ripple (863 ~ 870 MHz)	dBp-p	-	0.3	1.3
VSWR (863 ~ 870 MHz)		-	1.2	2.0
Relative Attenuation: 10 ~ 830 MHz 830 ~ 850 MHz 885 ~ 905 MHz 905 ~ 950 MHz 950 ~ 1500 MHz	dB	 45 22 27 45 40	 49 35 35 49 47	 - - - - -
Temperature range (Optional)	°C	-25	25	70
Input RF Power (863 ~ 870 MHz)	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

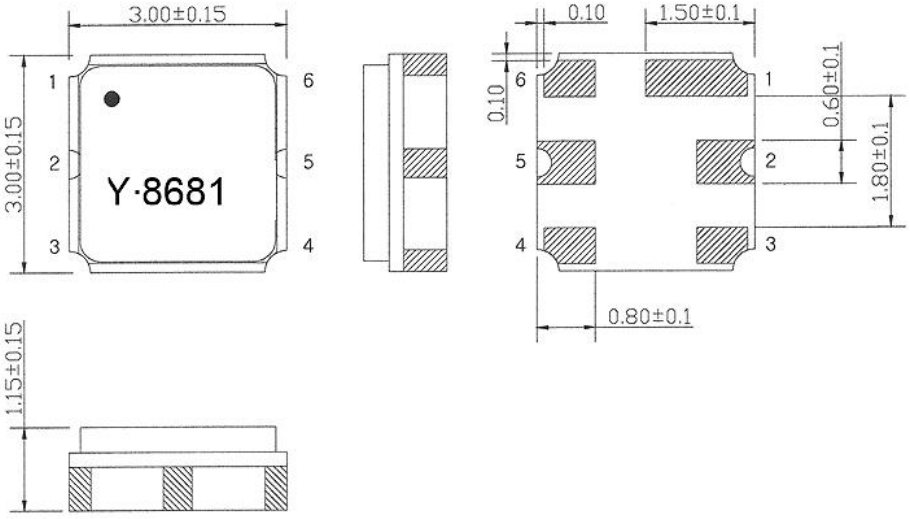
868.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98756

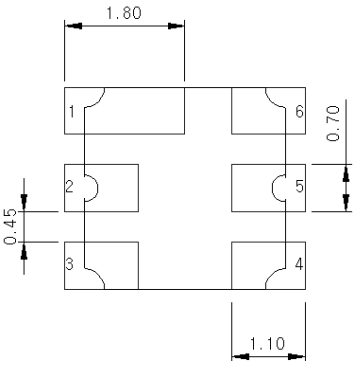
Features

- RF bandpass filter
- High attenuation
- Usable bandwidth 4 MHz
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (3.0 x 3.0 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-20	25	50
Storage temperature range	℃	-40	-	85
Power handling capability	dBm	-	-	22

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 868.0 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	868	-
Insertion loss (Fc ± 2.0 MHz)	dB	-	4.0	4.5
Amplitude Ripple (Fc ± 2.0 MHz)	dB	-	0.5	1.0
VSWR (Fc ± 2.0 MHz)		-	1.5	2.0
Relative Attenuation: 468.0 ~ 827.0 MHz 918.0 ~ 1268.0 MHz	dB	 40 40	 50 50	 - -

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

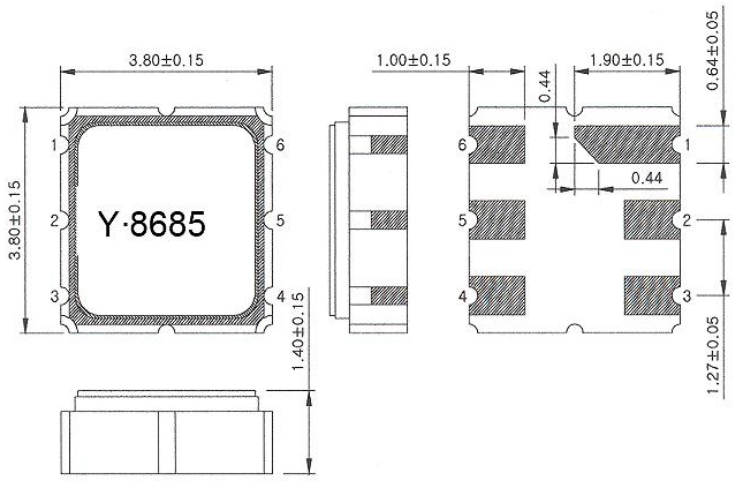
868.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98757

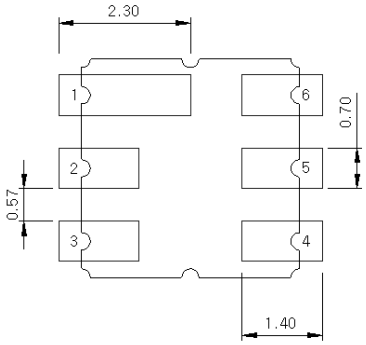
Features

- RF bandpass filter
- High attenuation
- Usable bandwidth 4 MHz
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (3.8 x 3.8 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-10	25	60
Storage temperature range	℃	-40	-	85
Power handling capability	dBm	-	-	-

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 868.0 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	868	-
Insertion loss (Fc ± 2.0 MHz)	dB	-	3.5	4.5
Amplitude Ripple (Fc ± 2.0 MHz)	dB	-	1.0	2.0
Absolute Group Delay at Fc	nsec	-	100	-
Group Delay Variation (Fc ± 2.0 MHz)	nsec	-	50	-
VSWR (Fc ± 2.0 MHz)		-	1.5	2.0
Relative Attenuation: 0.3 ~ 800 MHz 810 ~ 848 MHz 898 ~ 930 MHz 935 ~ 1200 MHz 1300 ~ 2000 MHz	dB	 50 40 35 45 25	 55 45 42 50 30	 - - - - -
Temperature Coefficient of Frequency	ppm/°C	-	-32	-

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

3. All attenuation measurements are measured relative to insertion loss.

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

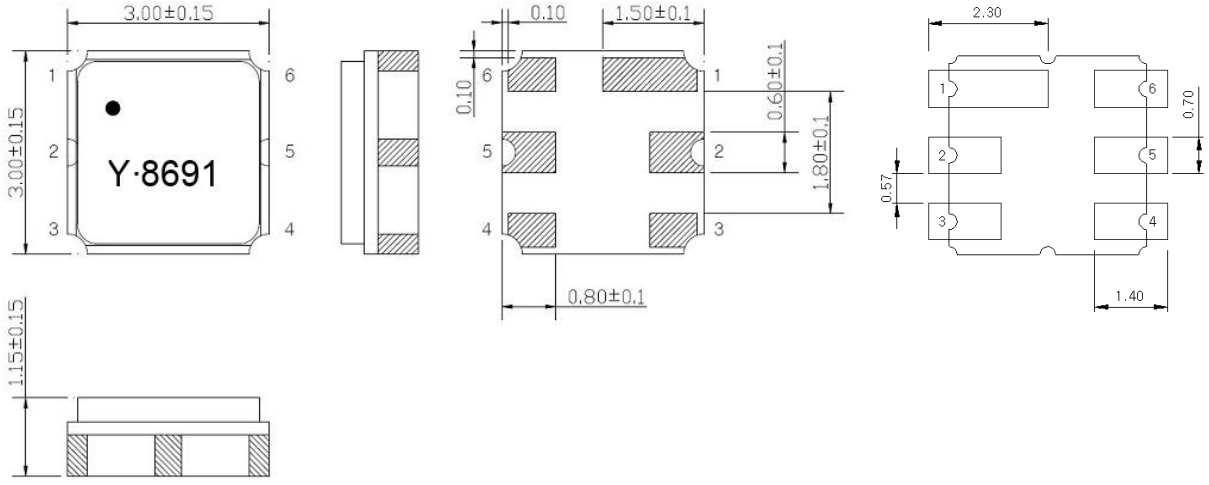
869.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98759

Features

- RF bandpass filter for Remote Control
- Usable bandwidth of 2 MHz
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (3.0 x 3.0 mm)

Package dimensions



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-10	25	60
Storage temperature range	℃	-40	-	85
Power handling capability	dBm	-	-	17

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 868.0 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	869	-
Insertion loss (Fc ± 1.0 MHz)	dB	-	2.8	4.0
Amplitude Ripple (Fc ± 1.0 MHz)	dBp-p	-	0.2	1.5
VSWR (Fc ± 1.0 MHz)		-	1.5	2.3
Relative Attenuation: 825 ~ 828 MHz 835 ~ 842 MHz 891 ~ 894 MHz 910 ~ 913 MHz	dB	 40 30 30 40	 47 39 42 47	 - - - -
Temperature Range optional	°C	-10	25	60
Input RF Power (Fc ± 1.0 MHz)	dBm			17
Input / Output Impedance	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

3. All attenuation measurements are measured relative to insertion loss.

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

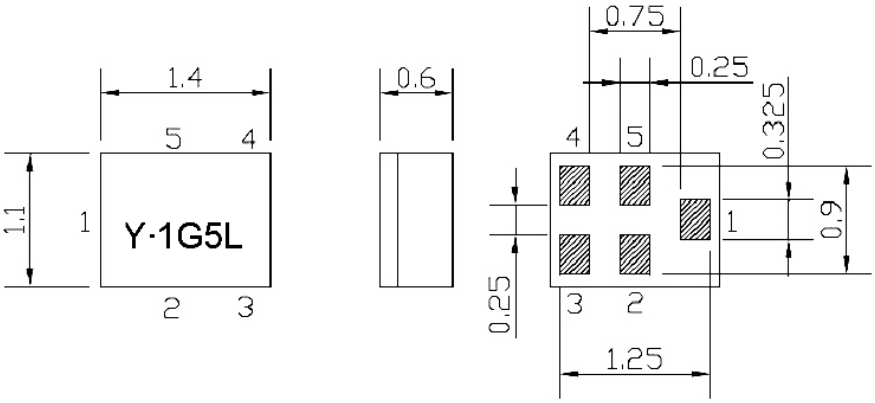
1575.42 MHz SAW Bandpass Filter KX-SF

Part no. 12.98762

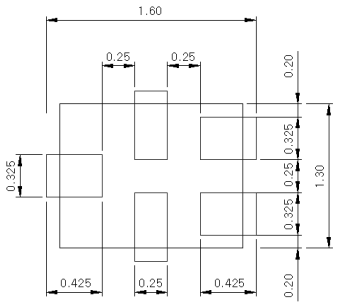
Features

- RF bandpass filter for Remote Control
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (1.4 x 1.1 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
1	Input
4	Output
2,3,5	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-40	25	85
Storage temperature range	℃	-40	25	85
Power handling capability	dBm	-	-	15

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 1575.42 MHz

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	1575.42	-
Insertion loss (1574.42 ~ 1576.42MHz)	dB	-	1.0	1.5
Amplitude Ripple (1574.42 ~ 1576.42MHz)	dBp-p	-	0.1	0.6
VSWR (1574.42 ~ 1576.42MHz)		-	1.4	1.8
Relative Attenuation: 0.3 ~ 1450 MHz 1450 ~ 1520 MHz 1625 ~ 1640 MHz 1640 ~ 2000 MHz 2000 ~ 3000 MHz	dB	 40 30 40 40 30	 45 38 45 45 35	 - - - - -
Input / Output Impedance	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

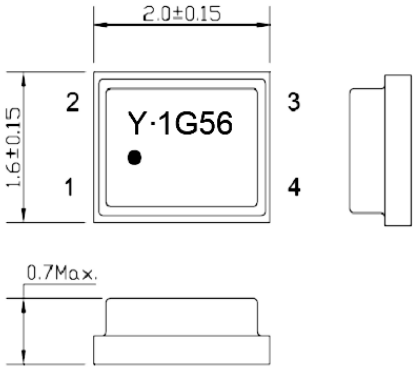
1575.42 MHz SAW Bandpass Filter KX-SF

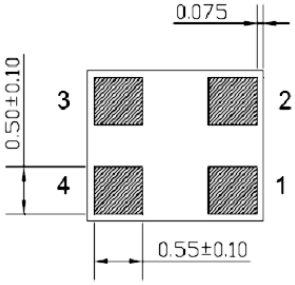
Part no. 12.98752

Features

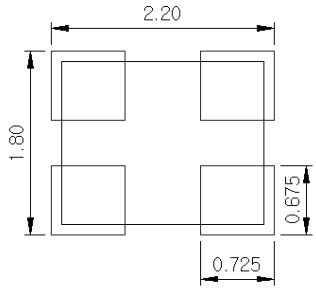
- GPS application
- No matching 50Ω single-ended operation
- SMD Package (2.0 x 1.6 x 0.7 mm)

Package dimensions





Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
1	Input
2	Case Ground
3	Output
4	Case Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-40	25	85
Storage temperature range	℃	-40	-	95
Power handling capability	dBm	-	-	10

Electrostatics Sensitive Device (ESD)

Specifications

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	1575.42	-
Insertion loss (Fo ± 1 MHz)	dB	-	1.1	1.6
Amplitude Ripple (Fo ± 1 MHz)	dBp-p	-	0.1	0.8
VSWR (Fo ± 1 MHz)		-	1.2	1.8
Relative Attenuation: D.C. ~ 1400 MHz 1400 ~ 1490 MHz 1490 ~ 1520 MHz (1500 MHz) 1625 ~ 1635 MHz 1800 ~ 3000 MHz	dB	 20 25 30 (35.0) 30 25	 23 30 35 (44.0) 42 30	 - - - - - -
Temperature Range optional	°C	-40	25	85
Input RF Power (Fo ± 1 MHz)	dBm			10
Input / Output Impedance	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

3. All attenuation measurements are measured relative to insertion loss.

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

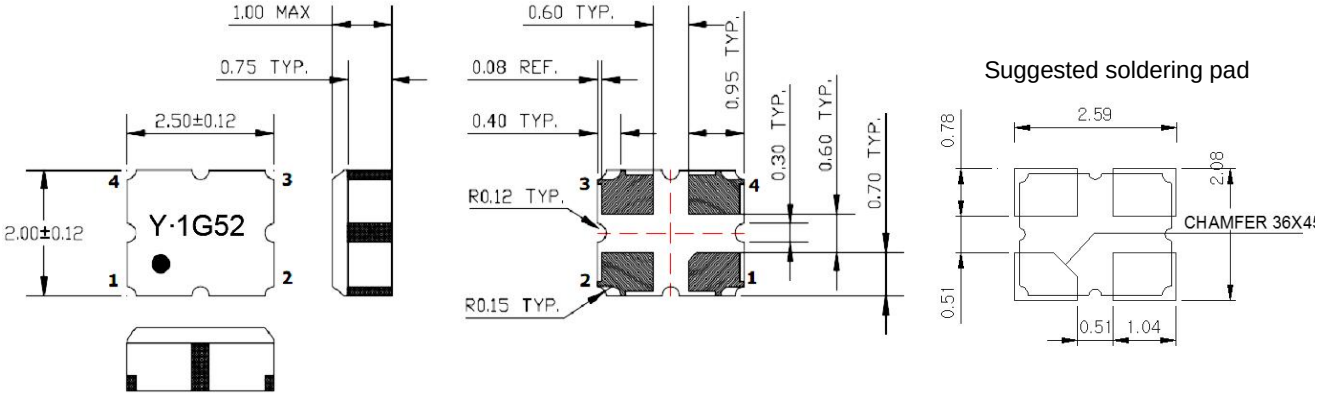
1575.42 MHz SAW Bandpass Filter KX-SF

Part no. 12.98600

Features

- GPS application
- Usable bandwidth of 2 MHz
- No matching 50Ω single-ended operation
- SMD Package (2.5 x 2.0 x 1.0 mm)

Package dimensions



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 2.0 ~ 6.0 um
Ni Plating

Pin Configuration	
1	Input
3	Output
2, 4	Output

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-40	25	95
Storage temperature range	℃	-40	-	105
Power handling capability	dBm	-	-	-

Electrostatics Sensitive Device (ESD)

Specifications

Fc = 1575.42 MHz
Terminating source impedance: 50Ω
Terminating load impedance: 50Ω

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	1575.42	-
Insertion loss (Fo ± 1 MHz)	dB	-	1.5	2.2
Amplitude Ripple (Fo ± 1 MHz)	dBp-p	-	0.1	1.0
Relative Attenuation: D.C. ~ 1400 MHz 1400 ~ 1475 MHz 1475 ~ 1525 MHz 1625 ~ 1640 MHz 1640 ~ 2000 MHz 2000 ~ 3000 MHz	dB	 35 30 25 30 32 20	 37 34 37 45 34 28	 - - - - - -
VSWR (1574.42 ~ 1576.42 MHz)	-	-	1.2	2.0

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

3. All attenuation measurements are measured relative to insertion loss.

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

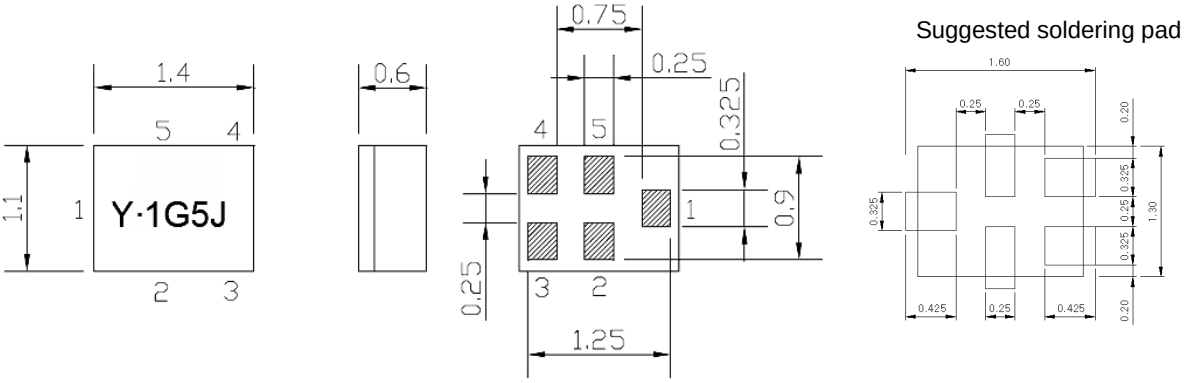
1588.655 MHz SAW Bandpass Filter KX-SF

Part no. 12.98764

Features

- RF bandpass filter
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device (SMD) Package (1.4 x 1.1 mm)

Package dimensions



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
1	Input
4	Output
2,3,5	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-30	25	85
Storage temperature range	℃	-40	25	85
Power handling capability	dBm	-	-	10

Electrostatics Sensitive Device (ESD)

Specifications

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	1588.655	-
Insertion loss (1573.42 ~ 1577.42 MHz)	dB	-	1.25	1.7
Insertion loss (1571.42 ~ 1605.89 MHz)	dB	-	1.7	2.5
Amplitude Ripple (1573.42 ~ 1577.42 MHz)	dBp-p	-	0.25	0.8
Amplitude Ripple (1571.42 ~ 1605.89 MHz)	dBp-p	-	0.7	1.5
VSWR (1573.42 ~ 1577.42 MHz)		-	1.2	2.0
VSWR (1571.42 ~ 1605.89 MHz)		-	1.6	2.0
Relative Attenuation: . 0.3 ~ 824 MHz 824 ~ 849 MHz 849 ~ 880 MHz 880 ~ 915 MHz 915 ~ 1452 MHz 1452 ~ 1525 MHz 1710 ~ 1785 MHz 1785 ~ 1850 MHz 1850 ~ 3000 MHz	dB	 32 32 32 32 30 32 32 32 25	 35 35 34.5 34.5 34 37 36 36 36	 - - - - - - - - -
Input / Output Impedance	Ohm		50	

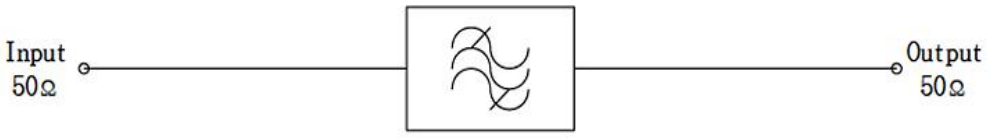
Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)



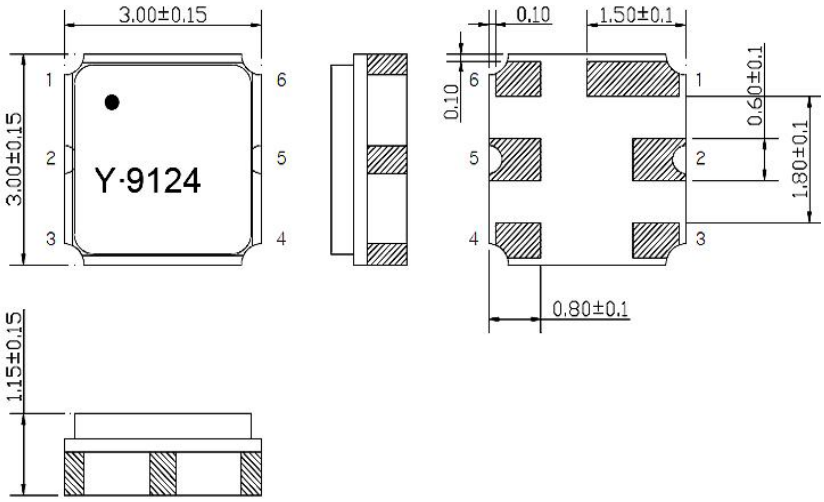
912.0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98755

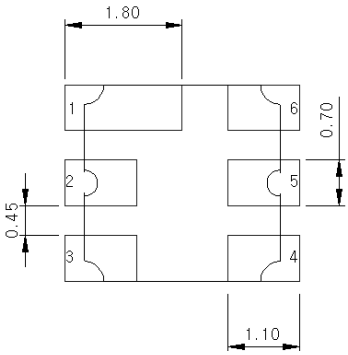
Features

- RF bandpass filter for RFID
- Usable bandwidth 7 MHz (908 ~915 MHz)
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device Package (3.0 x 3.0 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-30	25	85
Storage temperature range	℃	-40	-	85
Power handling capability	dBm	-	-	30

Electrostatics Sensitive Device (ESD)

Specifications

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	912.0	-
Insertion loss (908.0 ~ 915.0 MHz)	dB	-	2.0	3.0
Amplitude Ripple (908.0 ~ 915.0 MHz)	dB	-	0.2	0.8
VSWR (908.0 ~ 915.0 MHz)		-	1.5	2.0
Relative Attenuation: . 0.3 ~ 863 MHz 863 ~ 894 MHz 942 ~ 962 MHz 962 ~ 3000 MHz	dB	 - 30 30 -	 45 40 35 40	 - - - -
Temperature Range optional	°C	-30	25	85
Input / Output Impedance	Ohm		50	

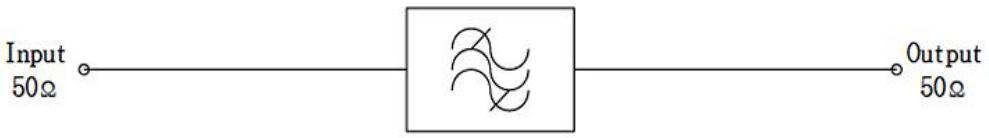
Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)



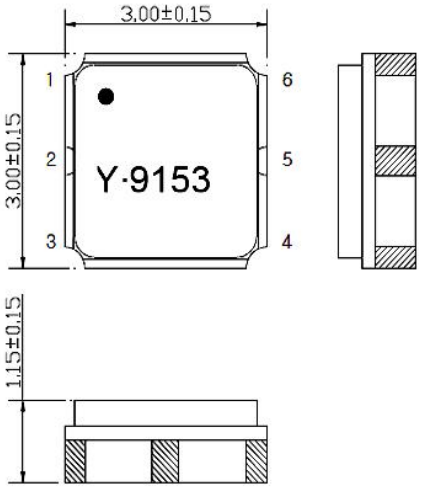
915,0 MHz SAW Bandpass Filter KX-SF

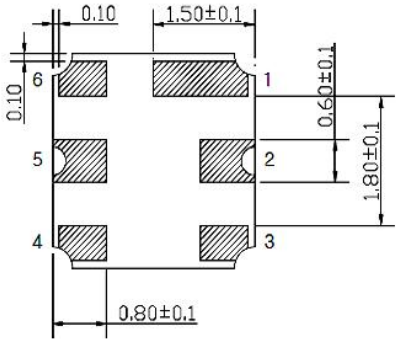
Part no. 12.98753

Features

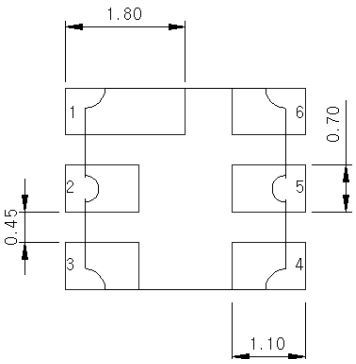
- RF bandpass filter
- Usable bandwidth 5 MHz
- High attenuation
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device Package (3.0 x 3.0 mm)

Package dimensions





Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-40	25	85
Storage temperature range	℃	-45	25	85
Power handling capability	dBm	-	-	15

Specifications

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	915	-
Insertion loss (In Fc ± 2.5 MHz)	dB	-	2.5	3.5
Amplitude Ripple (In Fc ± 2.5 MHz)	dB	-	0.5	1.0
VSWR (In Fc ± 2.5 MHz)		-	1.5	2.0
Relative Attenuation: . 0.3 ~ 840 MHz 869 ~ 894 MHz 970 ~ 1500 MHz 1500 ~ 3000 MHz	dB	 40 30 35 25	 50 40 40 30	 - - - -
Input / Output Impedance	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

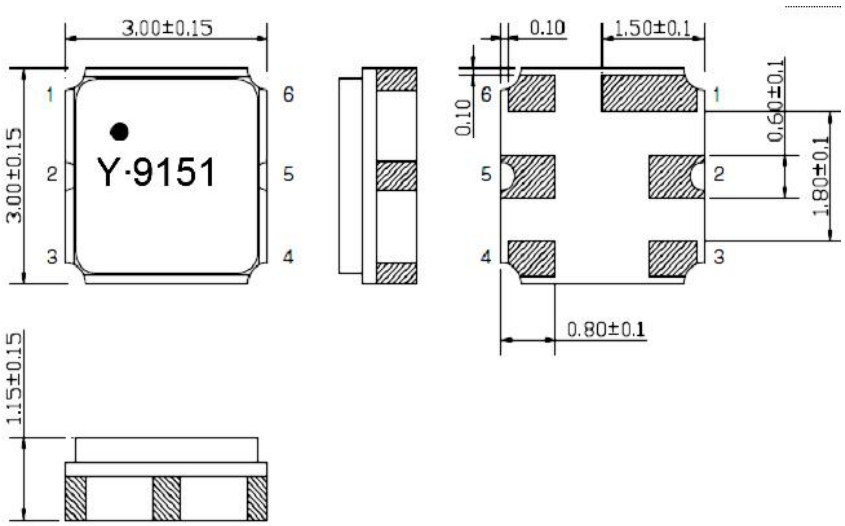
915,0 MHz SAW Bandpass Filter KX-SF

Part no. 12.98754

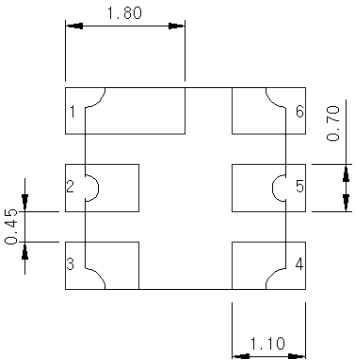
Features

- RF bandpass filter
- Usable bandwidth 26 MHz
- High attenuation
- No matching 50Ω single-ended operation
- Ceramic Surface Mounted Device Package (3.0 x 3.0 mm)

Package dimensions



Suggested soldering pad



Dimensions shown are nominal in millimeters
Body : Al_2O_3 Ceramic
Lid: Kovar, Ni Plated
Terminations : Au Plating 0.3 ~ 1.0 um,
Over a 1.27 ~ 8.89 um
Ni Plating

Pin Configuration	
2	Input
5	Output
1,3,4,6	Ground

Maximum ratings

Parameter	Unit	Minimum	Typical	Maximum
Operating temperature range	℃	-30	25	85
Storage temperature range	℃	-45	25	85
Power handling capability	dBm	-	-	15

Electrostatics Sensitive Device (ESD)

Specifications

	Unit	Minimum	Typical	Maximum
Center frequency (Fc)	MHz	-	915	-
Insertion loss (In Fc ± 13.0 MHz)	dB	-	2.8	3.5
Amplitude Ripple (In Fc ± 13.0 MHz)	dB	-	0.8	1.5
VSWR (In Fc ± 13.0 MHz)		-	1.5	-
Relative Attenuation: . 0.3 ~ 715 MHz 715 ~ 875 MHz 950 ~ 1030 MHz 1030 ~ 1900 MHz	dB	 45 40 25 -	 50 47 30 45	 - - - -
Input / Output Impedance	Ohm		50	

Notes:

1) All specifications are based on the matching schematic shown below, measured by Agilent Network analyzer and full-2 port calibration.

2) Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances

Matching schematic

(Actual matching values may vary due to PCB layout and parasitic)

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I.Scope of Validity

1.These Conditions shall apply exclusively to all our offers, supplies and services to our Customer. These Conditions shall also apply for future orders, supplies and services without the need of any express agreement thereon at the conclusion of such transaction.
2.Any conditions of the Customer, which differ from our Conditions shall not be recognized, whether or not we have objected to such conditions. Our Conditions shall also apply, if we, knowing of any contradictory or dissenting conditions of our Customer, unconditionally execute the supply.
3.Our Conditions shall apply only to contractors as defined by § 310, Section 1 BGB (German Civil Code).

II.Offer and Acceptance

1.Our quotations are subject to change without notice and are not binding unless they are expressly described as being binding.
2.Any describing data of our products, such as illustrations, drawings, specifications, weights, dimensions, performance-, operational- and consumption data, loading capacities, tolerances, and information relating to the use or suitability for a particular application, contained in our offer, in prospectus, catalogues or similar documents, constitute an approximate guide and shall not be binding unless expressly described as binding. Any such data relate to serial products which have been tested under central European operation conditions and describe their standard functions. They are not to be deemed guaranteed properties but are descriptions or definitions of the goods or services.
3.Customary changes in quantities, quality or specifications of the goods, changes as a result of a change of law and technical improvements shall be allowed. We may also replace parts of the goods with other equal parts provided such parts do not impair their suitability for the purpose provided for by the contract.
4.We reserve the right of ownership and copyright of all quotation documents; they may not be made available to third parties unless upon our approval.
5.Offers made by the Customer shall be in writing (letter, telefax, e-mail).
6.We may accept an order made by a Customer within 4 weeks after its receipt, which shall be confirmed in writing.

III.Prices and Terms of Payment

1.The prices quoted by us are in EURO and are given on the basis ex works (EXW as per Incoterms 2000) for deliveries within and outside Germany, subject to the provisions under Section IV.1 hereunder. Value added tax shall be added at the rate applicable at the time of invoicing.
2.Unless otherwise agreed, the price shall be paid within 30 calendar days (without discount).
3.If the Customer is in delay in making payment, we are entitled to charge interest for late payment at the rate of 9 % p.a. above the relevant base rate of the Deutsche Bundesbank. The creditor of a remuneration has in case of default also the right to get a flat payment of 40 Euro. If we are able to demonstrate a greater loss as a result of late payment, then we are entitled to claim for this loss.
4.Any offsetting or retaining of payment by the Customer is only permitted if Customer`s counterclaims are not contested or have been finally decided by the court.

IV.Delivery

1.Deliveries within Germany and outside Germany shall be made Ex Works (EXW according to Incoterms 2000). The means of shipment shall be at our sole discretion. We will deliver in customary packaging. Unless otherwise agreed upon, we will charge the Customer for all shipment and packaging costs as accrued. At the request of the Customer, the deliveries will be insured by us at his expense.
2.We are entitled to make partial deliveries.
3.We are entitled to charge the Customer for costs incurred by us due to Customer`s failure to accept the goods or because of false information given by him.
4.The minimum order value for shipments shall be EURO 25,- (without VAT).

V.Transfer of Risk

1.The risk of accidental loss and accidental deterioration of the goods passes to the Customer when the goods are ready for shipment.
2.If the delivery is delayed due to circumstances for which the Customer is responsible for, the risk passes over to him from the date of readiness for shipment.

VI.Transportation Damages

1.The Customer shall give notice in writing without delay to us as well as to the carrier or such other party in charge of the transport of any transport damage within the following time-limits :

In case of damaged packaging :

a) Mail :The damage needs to be confirmed upon handing over and to be notified at the post office within 24 hours (!). The damage needs to be notified to us within 48 hours.
b) Parcel Post :The damaged goods need to be unpacked in the presence of the driver and the damage needs to be confirmed by him. The damage is to be notified to us within 48 hours.
c) Transport: The damaged goods need to be unpacked in the presence of the driver and the damage needs to be confirmed on the bill of lading. The damage is to be notified to us within 48 hours.

In case of undamaged packaging :

a) Mail: Immediately (within 24 hours) the post office in charge needs to be notified and an inspection and a finding of facts is to be applied for. The damage is to be notified to us within 48 hours.
b) Parcel Post: The damage is to be notified to us within 48 hours.
c) Transport :The damaged goods need to be unpacked in the presence of the driver and the damage needs to be confirmed on the bill of lading, indicating that the packaging has been undamaged prior to the ascertainment of the damage. The damage is to be notified to us within 48 hours.

VII.Delivery Time

1.Compliance with the agreed due dates for delivery requires that the Customer has fulfilled all his obligations in good time and in the appropriate way.
2.The delivery time has been complied with if by the end of the delivery period, the ordered goods have been handed over to the Customer, or the carrier or the other party in charge of the transport, or is ready for shipment and this has been notified to the Customer.
3.If non-compliance with an agreed delivery period is due to force majeure or other circumstances for which we are not responsible, the delivery period will be extended by the duration of such events.
4.If a delivery is in delay due to circumstances for which we are responsible for, or becomes impossible, our liability for damages shall be limited in accordance with the provisions of Section X hereunder.

VIII.Retention of Title

1.The property of all goods supplied shall remain with us until all amounts outstanding to us under the business relationship with the Customer are fully paid. In the event of a breach of contract by the Customer, especially in case of default of payment or in case of enforcement measures by third parties, we are entitled to demand return of the goods. Return of the goods or their seizure shall not be deemed termination or cancellation of the contract, unless we have expressly declared so. We are entitled to the sale or any other use or exploitation of such returned goods.
2.The Customer may neither pledge nor assign the goods by way of security. The Customer shall notify us immediately in the event of seizures of or other enforcement measures by third parties to the goods.
3.The Customer is entitled to resell the goods in the ordinary course of business.
Once the goods are resold, payment claims by the customer against his own buyer as a result of the resale are deemed to have been assigned to us, whether or not such goods have been incorporated into, processed or mixed with other goods. We herewith accept such assignment. Upon assignment the Customer shall be entitled to collect any receivables arising from the resale of the goods. We reserve our right to collect such receivables by ourselves in case the Customer fails to fulfil his payment obligations.
4.Any processing of the goods shall always be made in our name and for our behalf. In case the goods are incorporated into or mixed with other goods not belonging to us, we will become the co-owner of such other goods in relation of the value of our goods to the value of the other goods.
5.We undertake to release the securities due to us at the request of the Customer in so far as their value exceed the secured debts by more than 20 %, in so far as these have not yet been settled.

IX.Liability for Defects

1.We accept liability for defects of the goods or services supplied only if the Customer has complied with his legal inspection and notification duties. The Customer shall inspect the goods without delay upon delivery and shall give notice to us of any defect without delay. If the Customer fails to give such notice, the goods shall be conclusively accepted, except for a defect which has not been detectable during inspection.
2.In case of a defect, we shall make good such defect at our option by repair or by the supply of a replacement. In case of repair we will bear all expenses necessary for such repair, except those expenses which are the result of the goods being transferred to another location than the place of performance agreed upon.
3.If repair or replacement is unsuccessful, the Customer is entitled, at his option, to demand a corresponding reduction in the purchase price or cancellation of the contract.
4.No claims for defects can be made in case of minor deviations from the properties agreed upon or in case of a minor impairment of the suitability, in case of normal wear and tear, in case of damages resulting from misuse, use of unsuitable operating materials, in case of external influences, which have not been agreed upon or have not been a condition of the contract, or in case of defects of the software which cannot be reproduced.
5.This liability for defects does also not apply if the Customer modifies the goods without our consent or has them modified by third parties and such modification makes the remedy more difficult or impossible. In either case the Customer shall be liable for the additional expenses incurred due to such modification.
6.In case of defects in goods as are not of our manufacture, we are entitled at our option to pursue our warranty claims against the manufacturer or supplier of such goods or to assign such claims to our Customer. The Customer may claim against us in case of such defects only, if Customers claim against the supplier or manufacturer has been unsuccessful or, for instance due to insolvency, is unpromissing.
7.Claims for defects hereunder are always subject to the return of defective parts by the Customer to us.
8.The defects liability period is one (1) year from delivery of the goods.
9.Used goods are sold without any liability for defects.
10.We are not giving the Customer any guarantees within the legal meaning of the word, unless we expressly grant such a guarantee in a given case.
11.The provisions under Section X – Liability apply to any claims for damages by the Customer.

X.Liability

1.Our liability for damages or compensation, irrespective of the legal ground, in particular with respect to impossibility of performance, delays, defective of false supply, breach of contract, defective or non performed consulting or information, breach of duties in negotiations and wrongful acts, in so far as negligence is legally required, shall be limited to the extent set forth in this Section X.
2.We shall not be liable in case of ordinary negligence on the part of our managing director, legal representatives, executives or other agents.
3.We are liable under the legal provisions, if the damage was caused by negligent breach of a major contractual obligation (cardinal obligation); in such a case our liability for compensation shall be limited to the foreseeable damage that may typically occur. Cardinal obligations are understood to be obligations, which are mandatory for the proper performance of the contract and upon which the Customer could rely upon on a regular basis.
4.The foregoing limitations and exclusions of liability shall not apply in case of guaranteed properties, not in case of physical injuries or damage to health or loss of life for which we are responsible for and shall also not apply for claims made by the Customer under product liability.

XI.Waste Disposal under the German Electrical and Electronic Appliances Act

1.If the goods are subject to the German Electrical and Electronic Appliances Act, we offer to our Customer the option to carry out for him the waste disposal as stipulated by law. This service is provided against reimbursement of the actual cost that have been incurred and on condition that it has been requested in writing at the time of the purchase contract. Otherwise the Customer himself shall be liable for the correct legally stipulated waste disposal of the delivered goods at his own expense upon the termination of use of the goods.
2.In such a case the Customer shall indemnify us and our suppliers against any duties arising from section 10 II of the German Electrical and Electronic Appliances Act (Reacceptance Duty of the Manufacturer) and thus also against any associated third-party claims.
3.The Customer shall impose a contractual commitment on any third-party contractor to which he passes on the delivered good, specifying that the third party shall, at its own expense, ensure the correct legally stipulated waste disposal of the delivered good upon termination of use and that the third party shall furthermore impose the same commitment on further third parties in case that the relevant goods are passed on further. If the customer fails to impose a waste disposal commitment and a passing-on duty in respect of this commitment in his relationship with third-party contractors to which he passes on the delivered goods, then the Customer shall be liable to reaccept the delivered goods upon termination of use at his own expense and to ensure correct legally stipulated waste disposal of the same. If the Customer passes on the goods to non contractors, then the provisions of Section XI.2 here above shall apply.
4.Our claim towards Customer for take-over/indemnification shall not become subject to statute-barring until the expiration of two years following the final termination of use of the goods. This period shall start no earlier than our receipt of written notification from the Customer and/or from the Customer`s customer concerning termination of use.

XII.Final Provisions

1.In the case of disputes arising out of the business relationship with contractors, München is agreed as the legal venue, or, at our option, the principal place of business of our Customer.
2.Unless otherwise agreed, the place of performance is München.
3.The laws of the Federal Republic of Germany shall apply. The provisions of the United Nations Convention on Contracts for the International Sale of Goods do not apply.

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