SAW Components

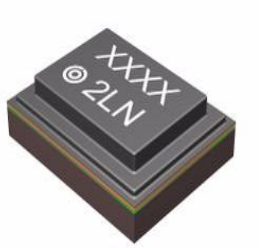
SAW Rx filter

Automotive telematics

Series/type:	**B4302**
Ordering code:	**B39212B4302F210**
Date:	February 01, 2012
Version:	2.3

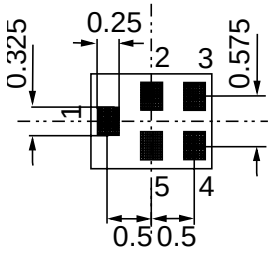
Application

- Low-loss RF filter for mobile telephone WCDMA systems, receive path (RX)
- Impedance transformation from 50 Ω to 150 Ω
- Unbalanced to balanced operation
- Very low insertion attenuation
- Very high Tx-suppression
- Passband with very low error vector magnitude (EVM)
- Low amplitude ripple
- Very low ripple over any 3.84MHz as well as 5.0MHz within the passband
- Usable passband 60 MHz

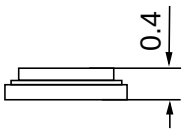


Features

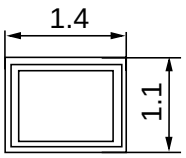
- Package size 1.4 x 1.1 x 0.4 mm³
- Package code QCS5M
- RoHS compatible
- Approximate weight 0.003 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- AEC-Q200 qualified component family (operable temperature range -40˚C to +85˚C)
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)



bottom view



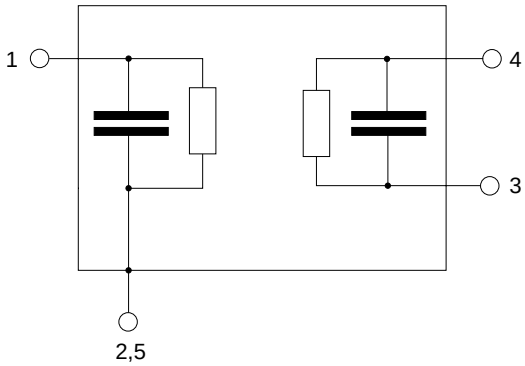
side view



top view

Pin configuration

- 1 Input
- 3,4 Output balanced
- 2,5 To be grounded



Characteristics

Temperature range for specification: T = –10 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω || 18 nH (balanced)

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	2140.0	—	MHz
Maximum insertion attenuation	α_{max}				
2110.0 ... 2170.0 MHz		—	1.9	2.5	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
2110.0 ... 2170.0 MHz		—	0.7	1.4	dB
VSWR					
Input 2110.0 ... 2170.0 MHz		—	2.0	2.4	
Output 2110.0 ... 2170.0 MHz		—	2.0	2.4	
CMRR ($\lvert S_{21}-S_{31}\rvert$ / $\lvert S_{21}+S_{31}\rvert$)					
2110.0 ... 2170.0 MHz		17[1)]	22	—	
Attenuation	α				
10.0 ... 1920.0 MHz		35	41	—	dB
1920.0 ... 1980.0 MHz		44	49	—	dB
1980.0 ... 2025.0 MHz		30	34	—	dB
2025.0 ... 2050.0 MHz		18	32	—	dB
2230.0 ... 2300.0 MHz		18	25	—	dB
2300.0 ... 2360.0 MHz		22	28	—	dB
2360.0 ... 4220.0 MHz		28	33	—	dB
4220.0 ... 4340.0 MHz		35	54	—	dB
4340.0 ... 6000.0 MHz		30	46	—	dB

1) A CMRR of 19.6 dB corresponds to a phase imbalance of +/-10˚ together with an amplitude imbalance of +/- 1.0 dB.

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VSWR					
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Output 2110.0 ... 2170.0 MHz		—	2.0	2.6	
CMRR ($\lvert S_{21}-S_{31}\rvert$ / $\lvert S_{21}+S_{31}\rvert$)					
2110.0 ... 2170.0 MHz		17[1)]	22	—	
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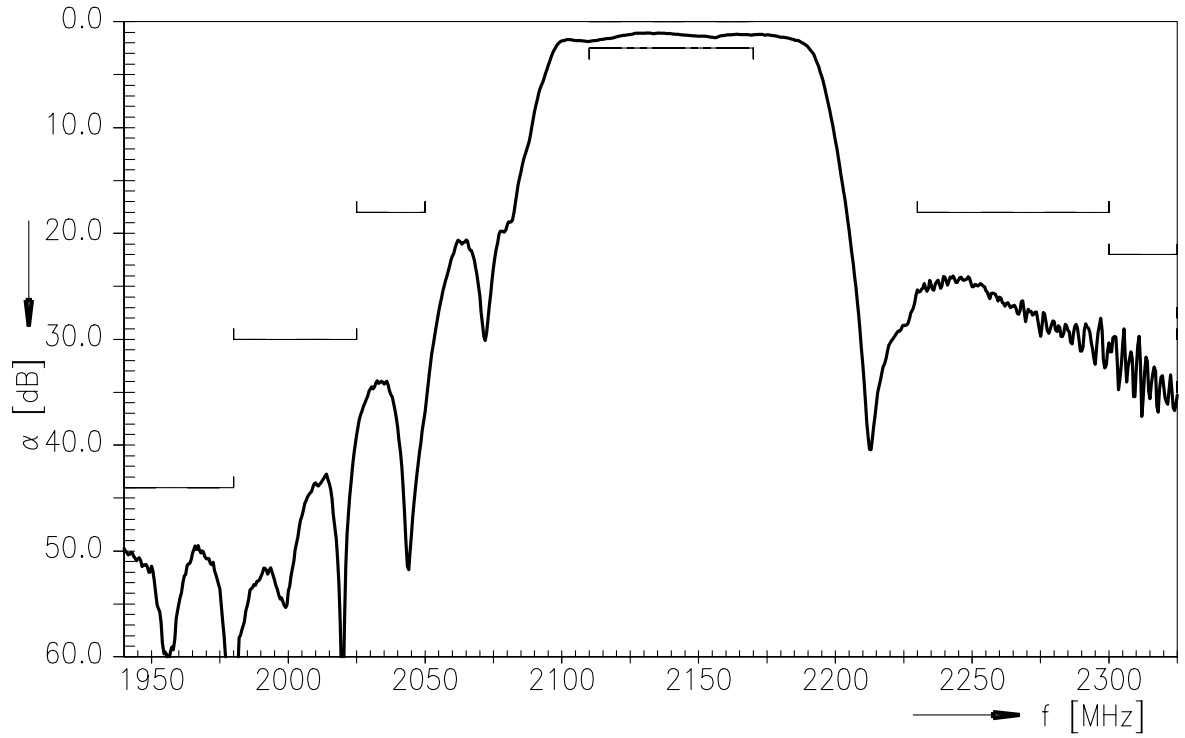
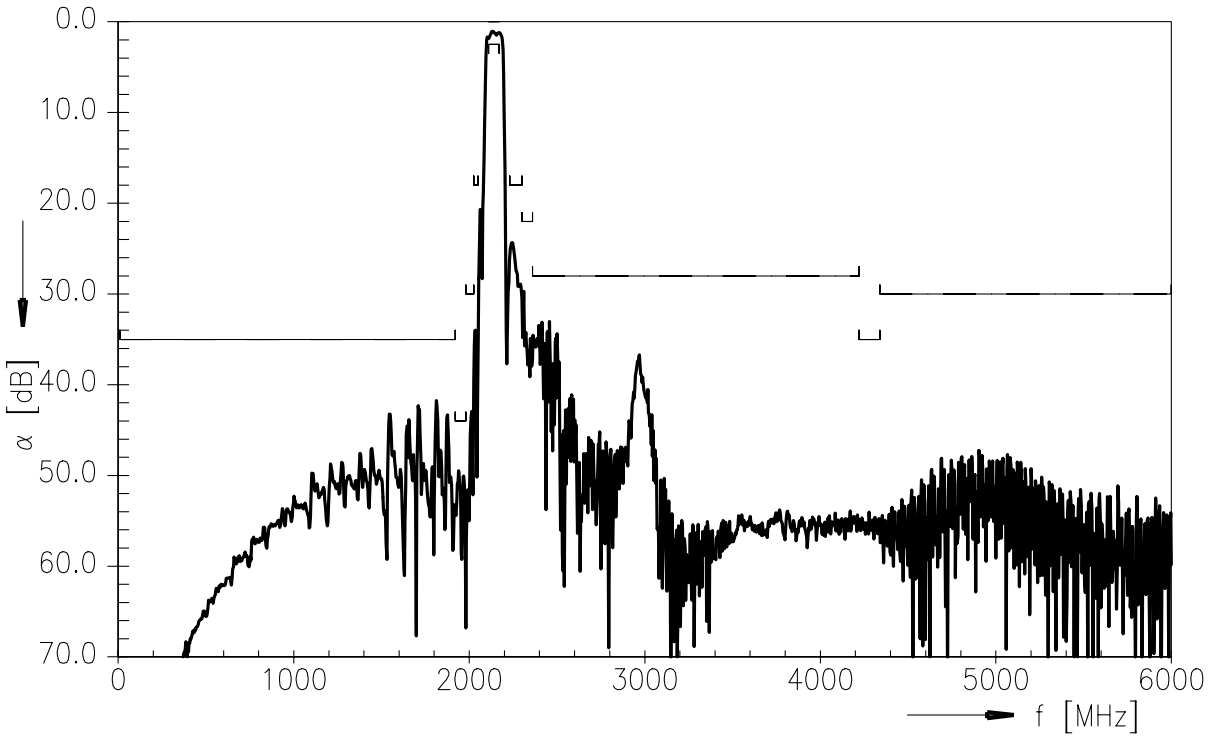
Operable temperature range	T	–40/+85	˚C	
Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	0	V	
ESD voltage	V_{ESD}	50[1)]	V	machine model, 10 pulses
Source Power	P_s	10	dBm	

1) acc. to JESD22-A115A (machine model), 10 negative & 10 positive pulses.

Frequency response (narrowband)

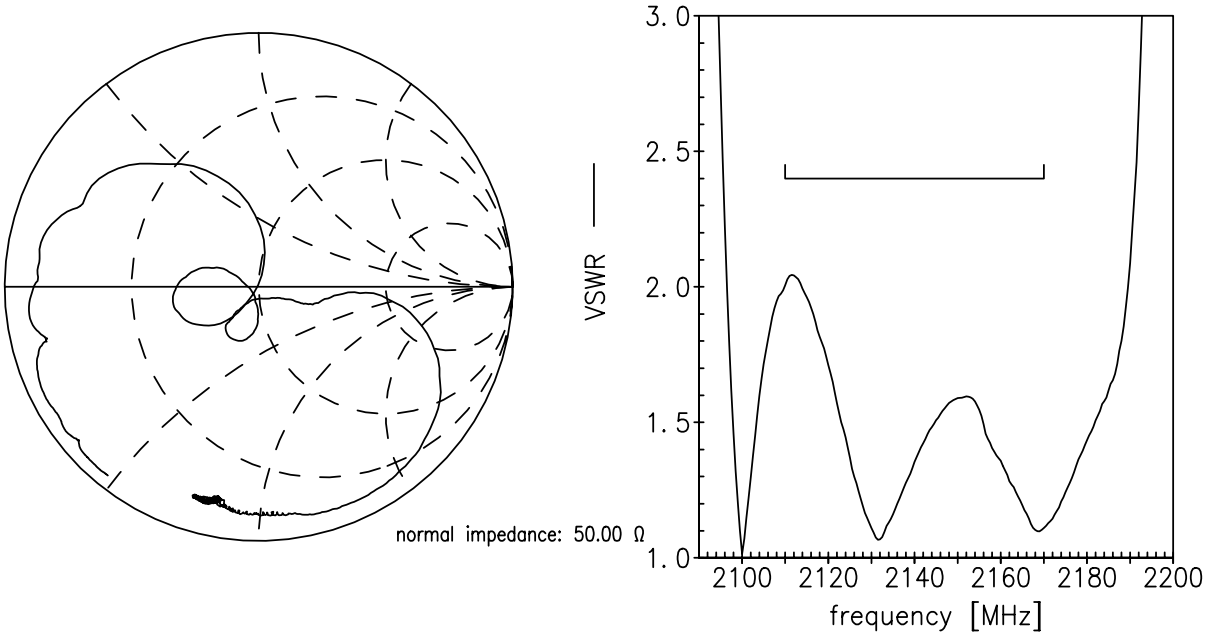


Frequency response (wideband)

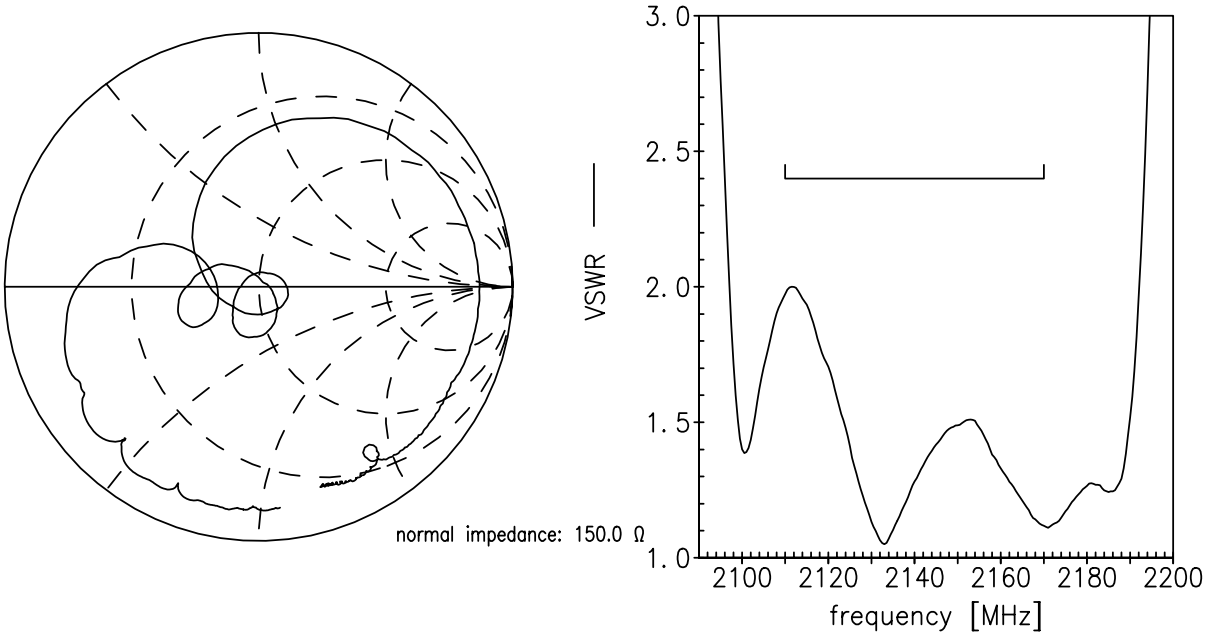


Smith chart

S_{11} function



S_{22} function



ESD protection of SAW filters

SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.
In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 3rd order to ensure a proper matching for any impedance value of antenna and SAW filter input. The required component values have to be determined from case to case.

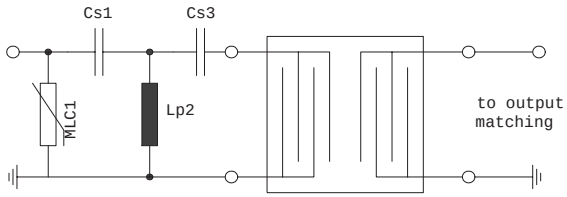


Fig. 1 MLC varistor plus ESD matching

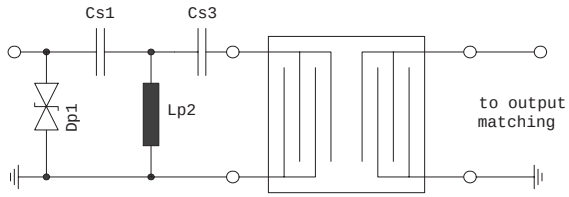


Fig. 2 Suppressor diode plus ESD matching

In cases where minor ESD occur, following simplified “ESD matching” topologies can be used alternatively.

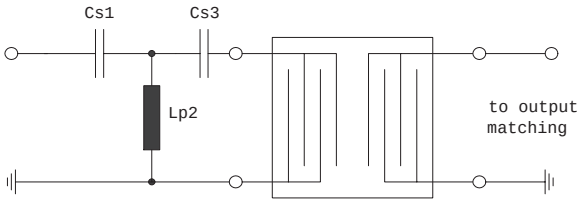


Fig. 3 3rd order high-pass structure for basic ESD protection

In all three figures the shunt inductor Lp2 could be replaced by a shorted microstrip with proper length and width. If this configuration is possible depends on the operating frequency and available pcb space.

Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements

For further information, please refer to EPCOS Application report:
“**ESD protection for SAW filters**”.
This report can be found under www.epcos.com/rke.Click on “Applications Notes”.

References

Type	B4302
Ordering code	B39212B4302F210
Marking and package	C61157-A8-A8
Packaging	F61074-V8212-Z000
Date codes	L_1126
S-parameters	B4302_NB.s3p, B4302_WB.s3p see file header for port/pin assignment table
Soldering profile	S_6001
RoHS compatible	defined as compatible with the following documents: "DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. 2005/618/EC from April 18th, 2005, amending Directive 2002/95/EC of the European Parliament and of the Council for the purposes of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment."
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