RF360 Europe GmbH

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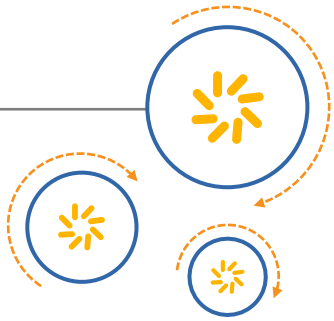

SAW Components

SAW Rx filter

Automotive telematics

Series/type:	B4303
Ordering code:	B39881B4303F210
Date:	December 19, 2013
Version:	2.2

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RF360 Europe GmbH, Anzinger Str. 13, München, Germany

SAW Components

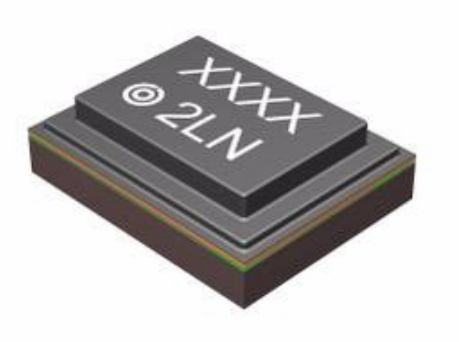
SAW Rx filter

Automotive telematics

Series/type:	**B4303**
Ordering code:	**B39881B4303F210**
Date:	December 19, 2013
Version:	2.2

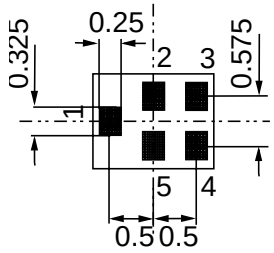
Application

- Low-loss RF filter for mobile telephone GSM850 systems, receive path (RX)
- Impedance transformation from 50 Ω to 150 Ω
- Unbalanced to balanced operation
- Very low insertion attenuation
- Low amplitude ripple
- Usable passband 25 MHz
- Suitable for GPRS class 1 to 12

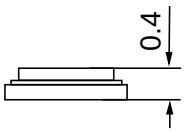


Features

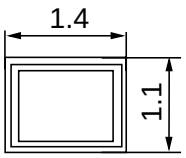
- Package size 1.4 x1.1 x 0.4 mm³
- Package code QCS5M
- RoHS compatible
- Approximate weight 0.003 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- AEC-Q200 qualified component family (operable temperature range -40˚C to +85˚C)
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)



bottom view



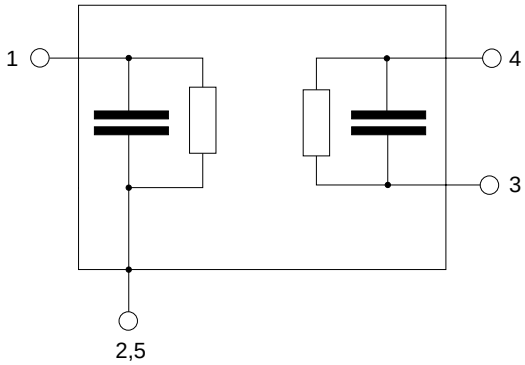
side view



top view

Pin configuration

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



Data sheet SMD

Characteristics

Temperature range for specification: T = –20 ˚C to +75 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω || 82 nH (balanced)

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	881.5	—	MHz
Maximum insertion attenuation	α_{max}				
869.0 ... 894.0 MHz		—	1.4	1.7	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
869.0 ... 894.0 MHz		—	0.6	1.1	dB
Input VSWR					
869.0 ... 894.0 MHz		—	1.9	2.3	
Output VSWR					
869.0 ... 894.0 MHz		—	1.8	2.3	
CMRR ($\lvert S_{21}-S_{31}\rvert$ / $\lvert S_{21}+S_{31}\rvert$)					
869.0 ... 894.0 MHz		20[1)]	29	—	dB
Attenuation	α				
0.0 ... 434.0 MHz		45	53	—	dB
434.0 ... 447.0 MHz		45	54	—	dB
447.0 ... 849.0 MHz		28	33	—	dB
914.0 ... 1000.0 MHz		24	31	—	dB
1000.0 ... 1738.0 MHz		26	31	—	dB
1738.0 ... 2500.0 MHz		32	40	—	dB
2500.0 ... 2565.0 MHz		26	33	—	dB
2565.0 ... 6000.0 MHz		32	40	—	dB

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

Data sheet SMD

Characteristics

Temperature range for specification: T = –40 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω || 82 nH (balanced)

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	881.5	—	MHz
Maximum insertion attenuation	α_{max}				
869.0 ... 894.0 MHz		—	1.4	1.9	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
869.0 ... 894.0 MHz		—	0.6	1.3	dB
Input VSWR					
869.0 ... 894.0 MHz		—	1.9	2.4	
Output VSWR					
869.0 ... 894.0 MHz		—	1.8	2.4	
CMRR ($\|S_{21}-S_{31}\| / \|S_{21}+S_{31}\|$)					
869.0 ... 894.0 MHz		20[1)]	29	—	dB
Attenuation	α				
0.0 ... 434.0 MHz		45	53	—	dB
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447.0 ... 849.0 MHz		28	33	—	dB
914.0 ... 1000.0 MHz		20	31	—	dB
1000.0 ... 1738.0 MHz		26	31	—	dB
1738.0 ... 2500.0 MHz		32	40	—	dB
2500.0 ... 2565.0 MHz		26	33	—	dB
2565.0 ... 6000.0 MHz		32	40	—	dB

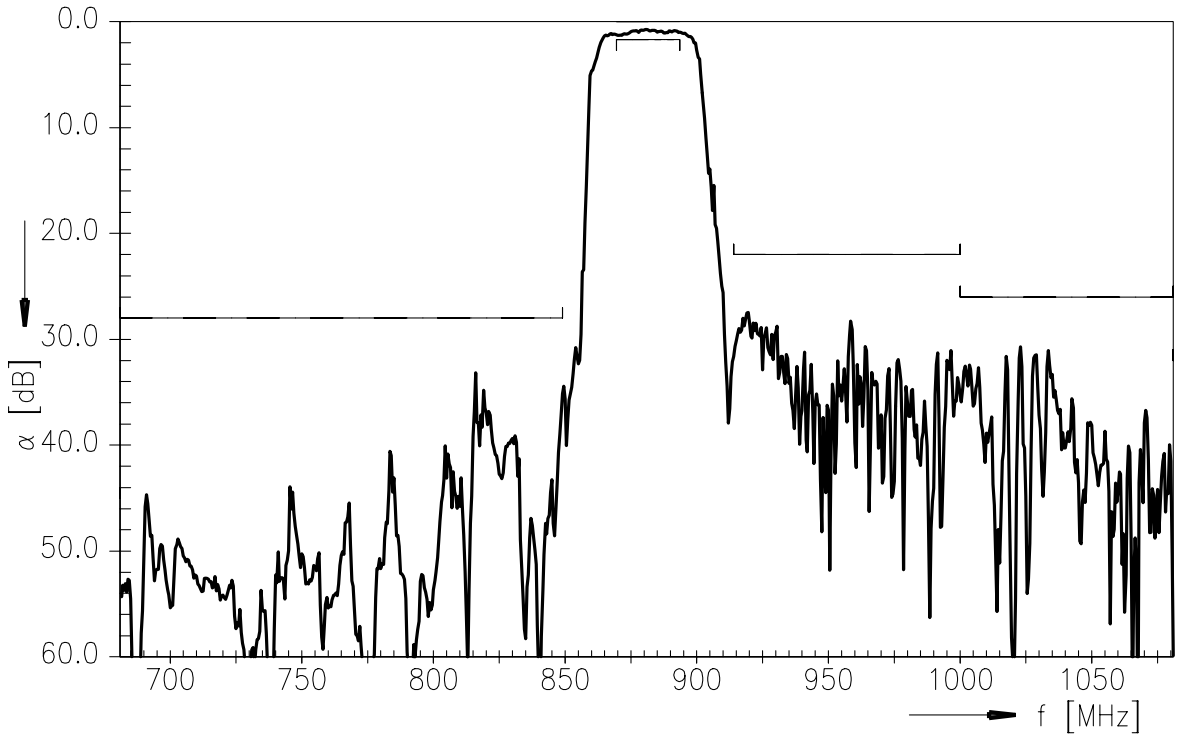
1) A CMRR of 19.6 dB corresponds to a phase imbalance of +/-10˚ together with an amplitude imbalance of +/- 1.0 dB.

Maximum ratings

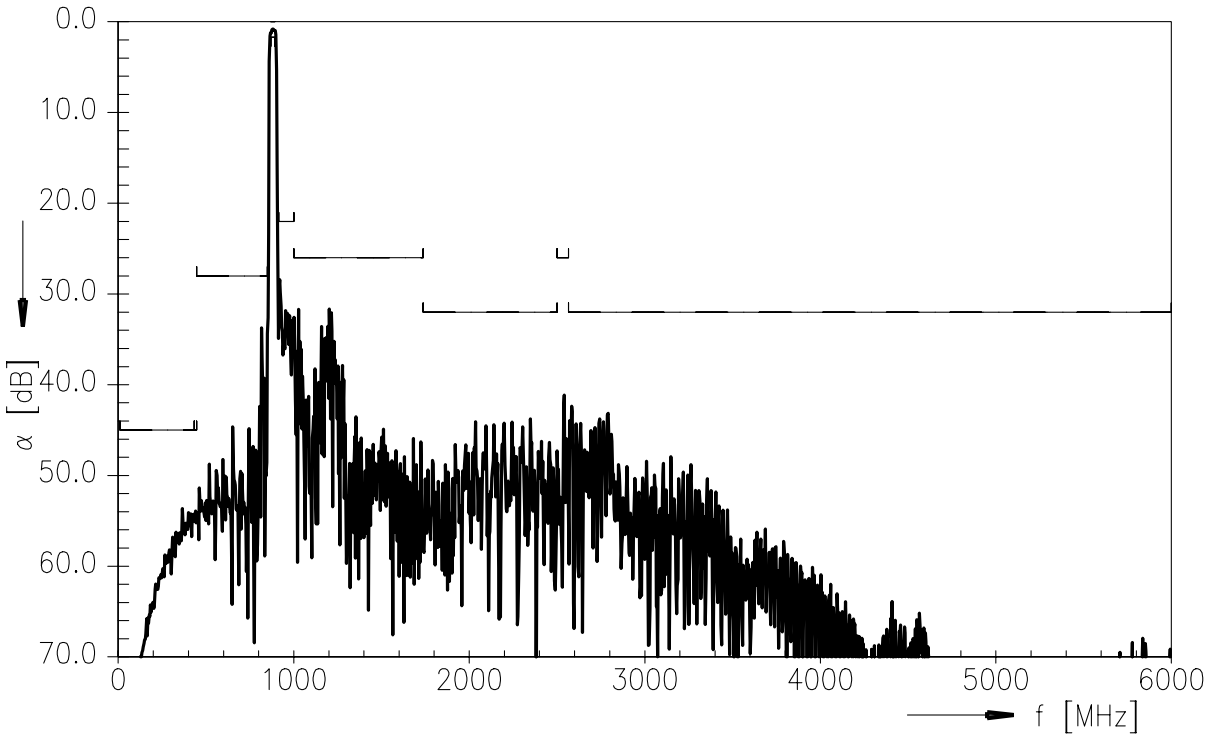
Operable temperature range	T	–40/+85	˚C	
Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	0	V	
ESD voltage	V_{ESD}	100[1)]	V	machine model, 10 pulses
Input power at				
GSM850, GSM900	P_{IN}	18	dBm	effective power in the on-state,
GSM1800, GSM1900	P_{IN}	20	dBm	duty cycle 4:8
Tx bands				

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

Frequency response (narrowband)

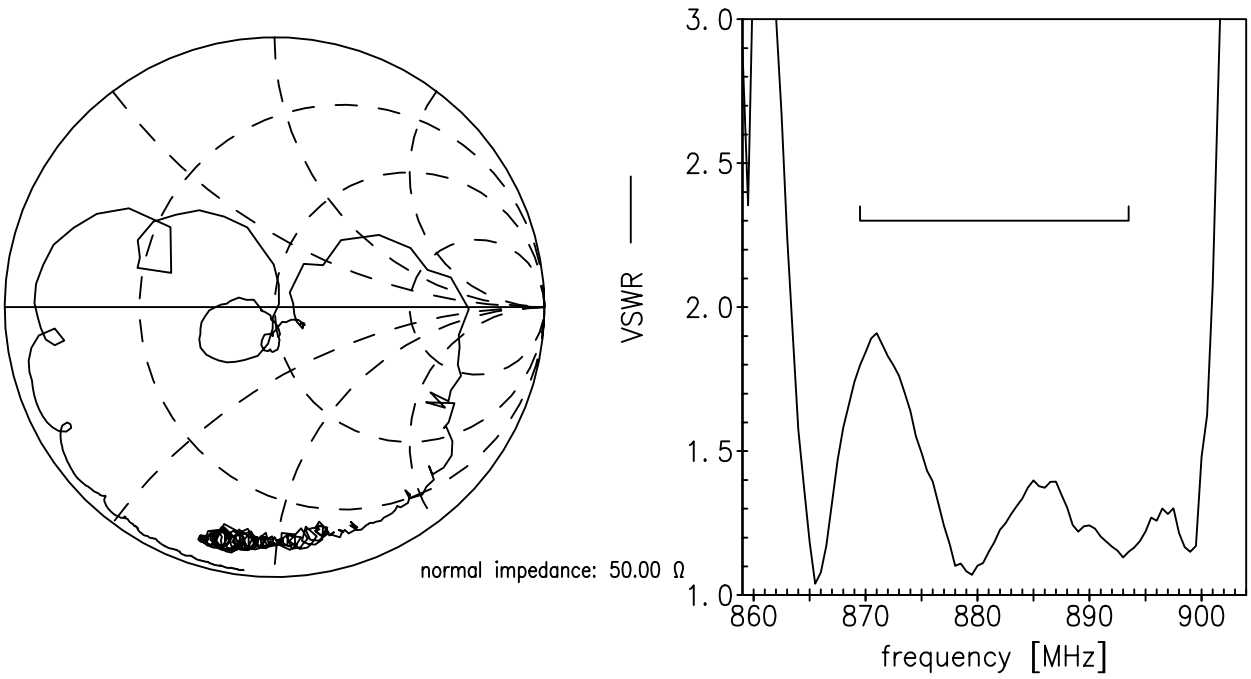


Frequency response (wideband)

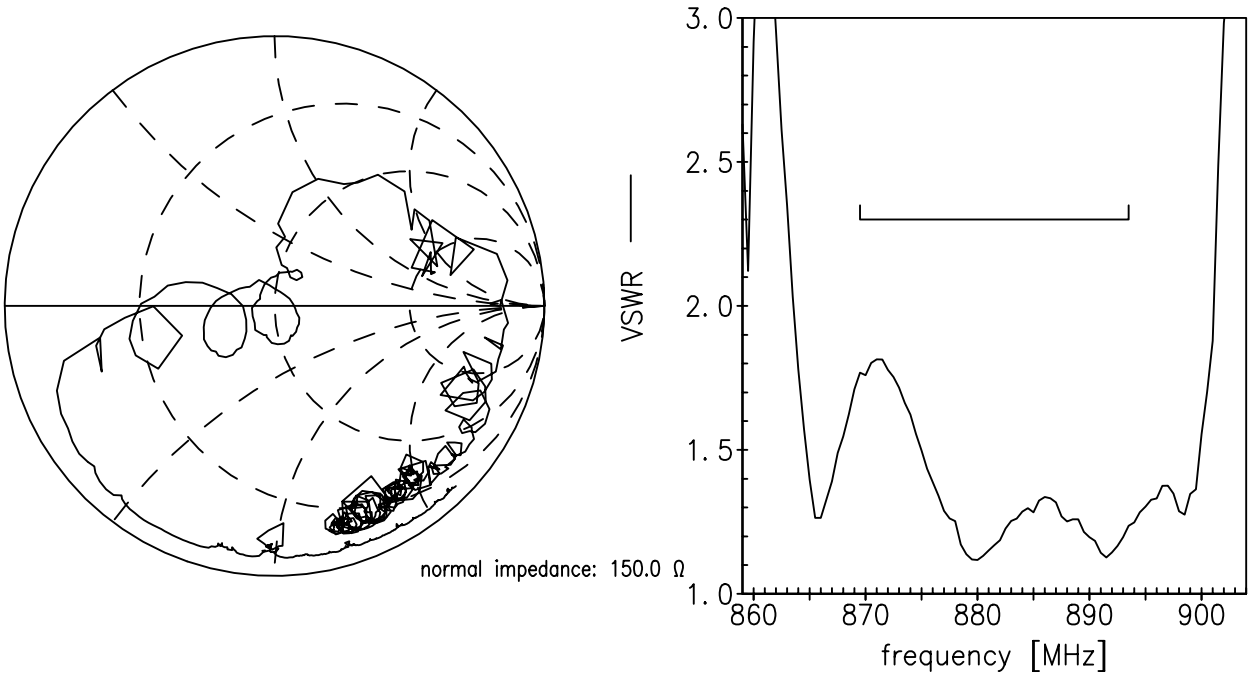


Smith chart

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.

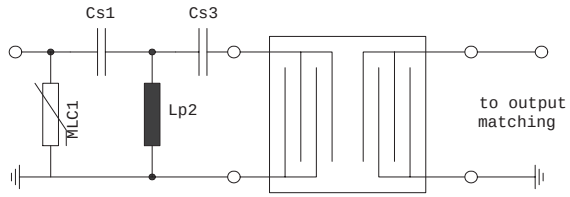


Fig. 1 MLC varistor plus ESD matching

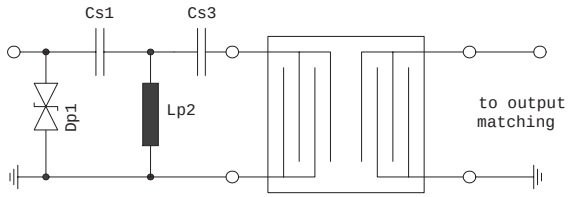


Fig. 2 Suppressor diode plus ESD matching

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

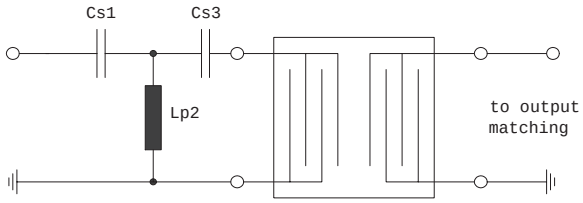


Fig. 3 3rd order high-pass structure for basic ESD protection

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	B4303
Ordering code	B39881B4303F210
Marking and package	C61157-A8-A8
Packaging	F61074-V8212-Z000
Date codes	L_1126
S-parameters	B4303_NB.s3p, B4303_WB.s3p See file header for port/pin assignment table.
Soldering profile	S_6001
RoHS compatible	RoHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.
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Matching coils	See Inductor pdf-catalog http://www.tdk.co.jp/tefe02/coil.htm#aname1 and Data Library for circuit simulation http://www.tdk.co.jp/etvcl/index.htm

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