



RF360 Europe GmbH

A Qualcomm – TDK Joint Venture



## SAW Components

### SAW Rx filter

Automotive telematics

Series/type: B4305  
Ordering code: B39202B4305F210

Date: January 30, 2013  
Version: 2.1

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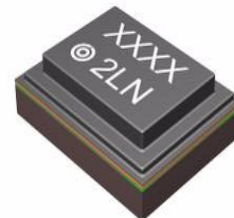
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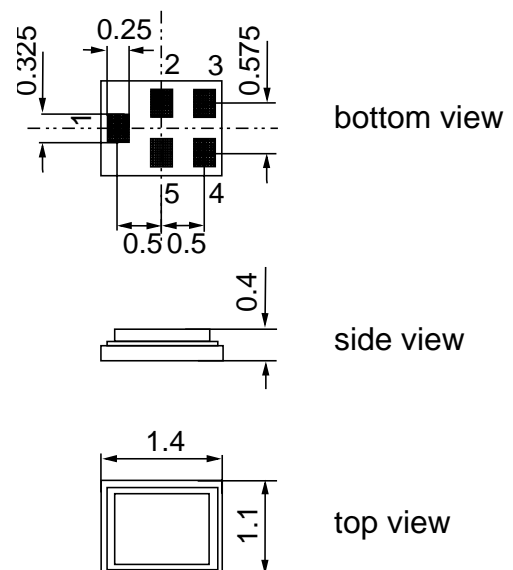
**Data sheet**

**Application**

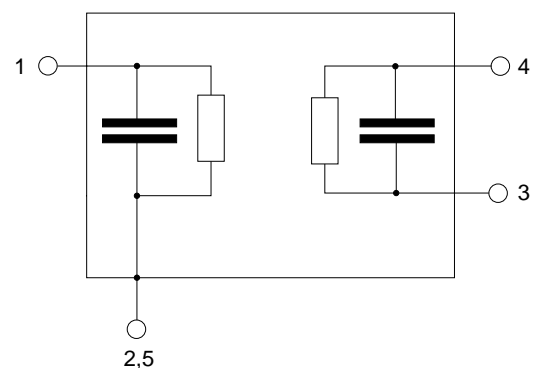
- Low-loss RF filter for PCS systems, receive path (RX)
- Impedance transform from 50  $\Omega$  to 150  $\Omega$
- Unbalanced to balanced operation
- Very low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- Suitable for GPRS class 1 to 12


**Features**

- Package size 1.4 x 1.1 x 0.4 mm<sup>3</sup>
- Package code QCS5M
- RoHS compatible
- Approximate weight 0.003 g
- Package for **Surface Mount Technology (SMT)**
- Ni, gold-plated terminals
- AEC-Q200 qualified component family (operable temperature range -40°C to +85°C)
- **Electrostatic Sensitive Device (ESD)**


**Pin configuration**

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



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**SAW Rx filter**
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**Characteristics**

Operating temperature range:  $T = -20 \text{ to } +75 \text{ }^{\circ}\text{C}$   
 Terminating source impedance:  $Z_S = 50 \Omega$   
 Terminating load impedance:  $Z_L = 150 \Omega \parallel 15 \text{ nH (balanced)}$

		min.	typ. @ 25°C	max.	
<b>Center frequency</b>	$f_C$	—	1960	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{\max}$	—	1.7	2.6	dB
1930.0 ... 1990.0 MHz					
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha$	—	0.7	1.7	dB
1930.0 ... 1990.0 MHz					
<b>VSWR</b>		—	1.7	2.4	
1930.0 ... 1990.0 MHz					
<b>CMRR (<math> S_{21}-S_{31}  /  S_{21}+S_{31} </math>)</b>		19 <sup>1)</sup>	26	—	dB
1930.0 ... 1990.0 MHz					
<b>Attenuation</b>	$\alpha$				
0.0 ... 1500.0 MHz		40	44	—	dB
1500.0 ... 1830.0 MHz		30	37	—	dB
1830.0 ... 1850.0 MHz		26	32	—	dB
1850.0 ... 1890.0 MHz		23	28	—	dB
1890.0 ... 1910.0 MHz		11	18	—	dB
2010.0 ... 2070.0 MHz		4 <sup>2)</sup>	14	—	dB
2070.0 ... 2400.0 MHz		26	30	—	dB
2400.0 ... 2500.0 MHz		34	40	—	dB
2500.0 ... 3860.0 MHz		28	33	—	dB
3860.0 ... 3980.0 MHz		40	49	—	dB
3980.0 ... 5790.0 MHz		28	41	—	dB
5790.0 ... 6000.0 MHz		34	42	—	dB

1) A CMRR of 19.6 dB corresponds to a phase imbalance of  $\pm 10^{\circ}$  together with an amplitude imbalance of  $\pm 1.0$  dB.

2) 11.5dB at 25°C

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**Maximum ratings**

Operable temperature range	T	−40/+85	°C	
Storage temperature range	T <sub>stg</sub>	−40/+85	°C	
DC voltage	V <sub>DC</sub>	0	V	
ESD voltage	V <sub>ESD</sub>	50 <sup>1)</sup>	V	machine model, 10 pulses
Input Power at				
GSM850, GSM900	P <sub>IN</sub>	15	dBm	peak power of GSM signal,
GSM1800, GSM1900	P <sub>IN</sub>	15	dBm	duty cycle 4:8
Tx bands				

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



### ESD protection of SAW filters

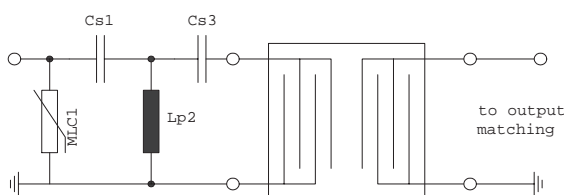
SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

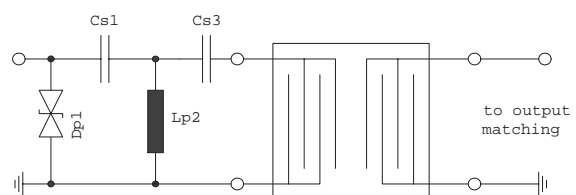
Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 3<sup>rd</sup> 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.

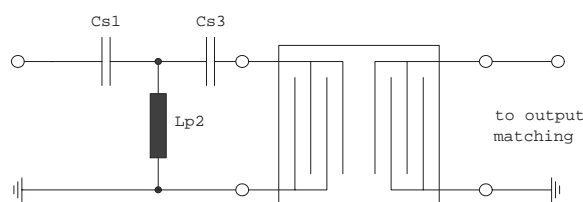


**Fig. 1 MLC varistor plus ESD matching**



**Fig. 2 Suppressor diode plus ESD matching**

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



**Fig. 3 3<sup>rd</sup> 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.

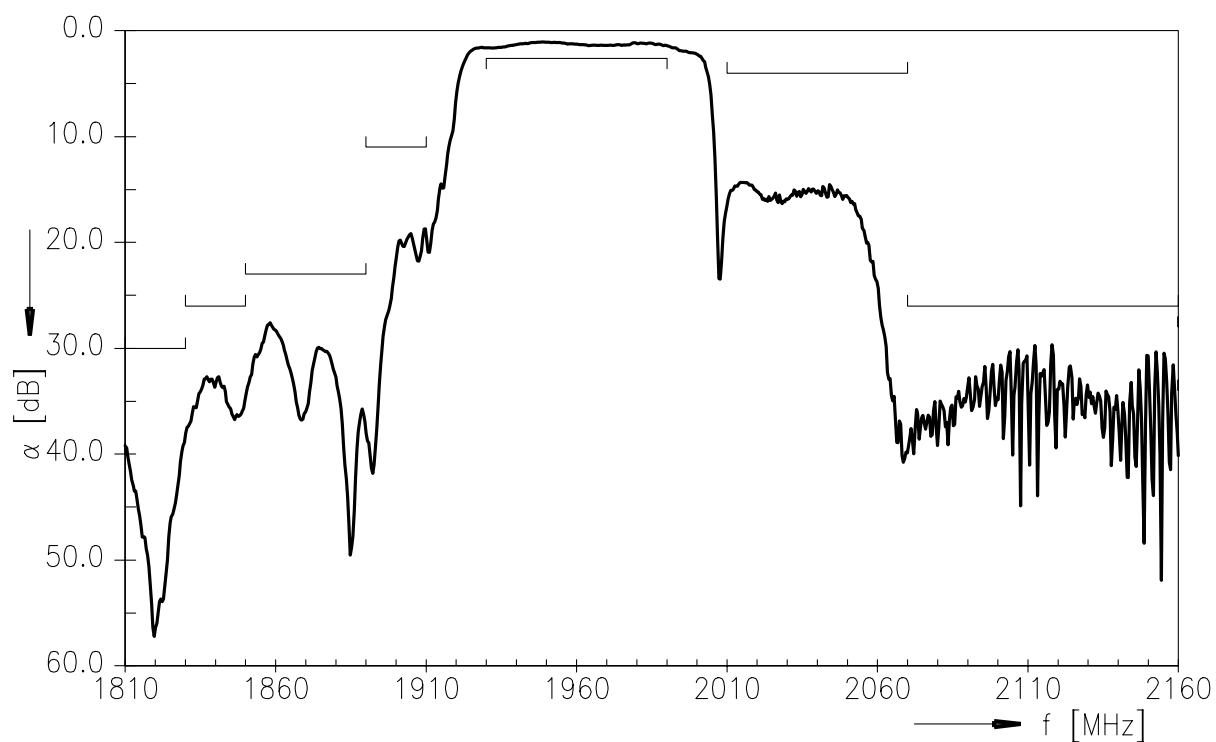
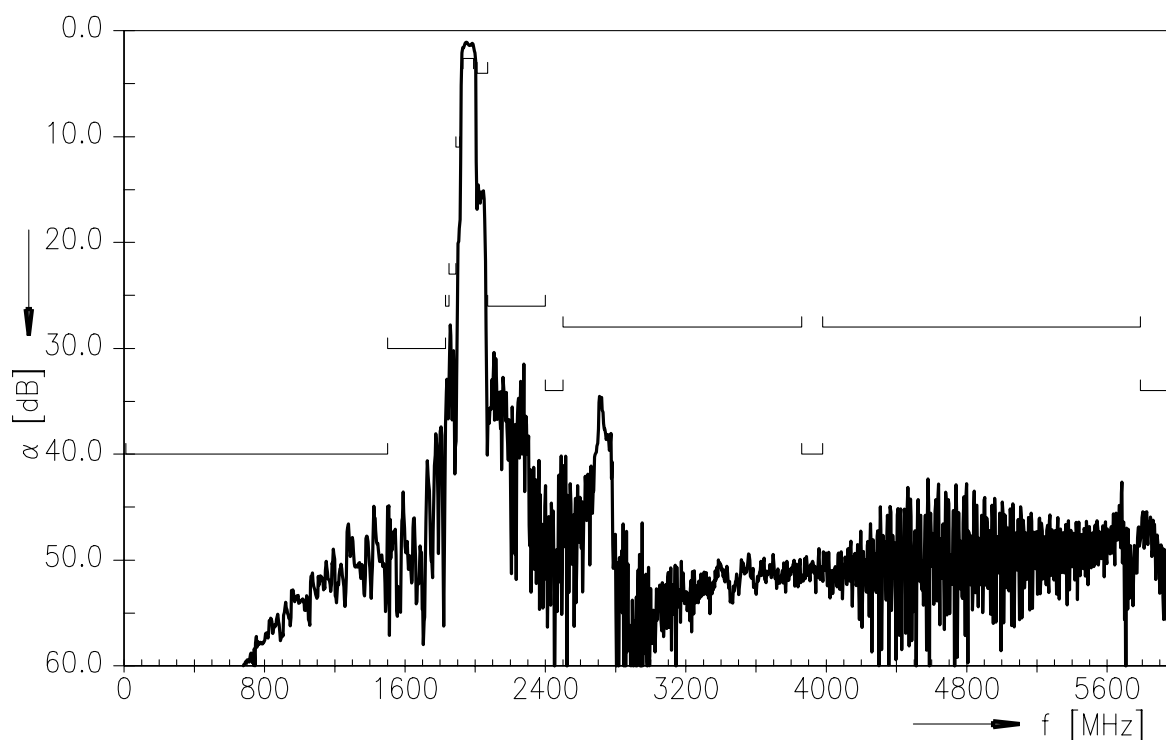
Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements

For further information, please refer to EPCOS Application report:

**“ESD protection for SAW filters”.**

This report can be found under [www.epcos.com/rke](http://www.epcos.com/rke). Click on “Applications Notes”.

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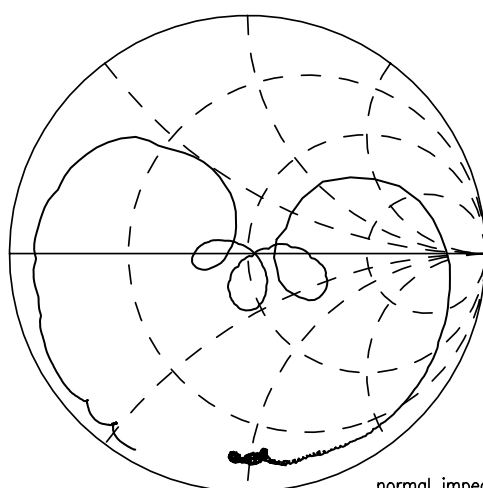
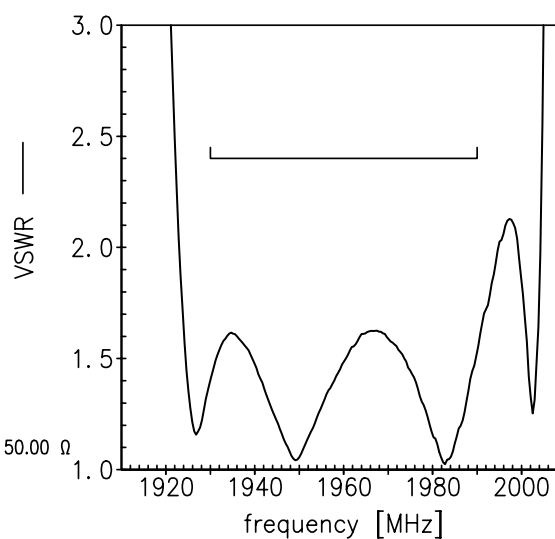
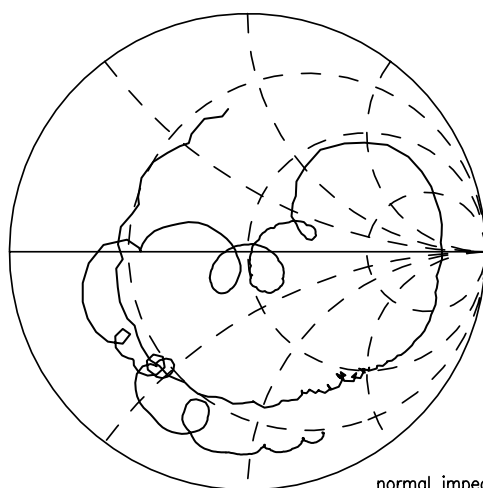
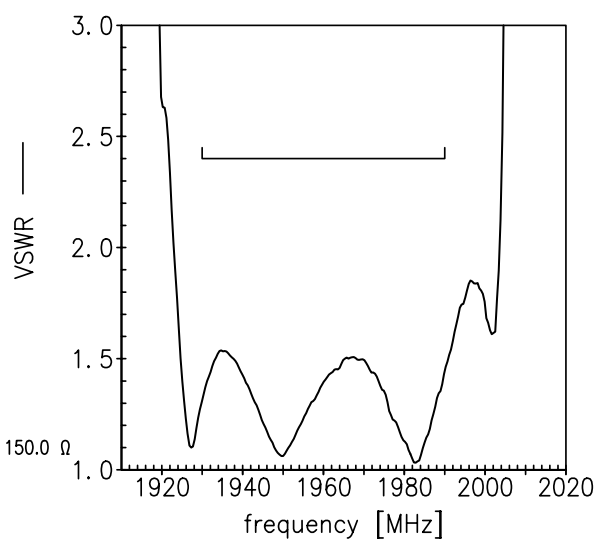
**Transfer function**

**Transfer function (wideband)**




Data sheet



Smith chart

 $S_{11}$  function

normal impedance: 50.00  $\Omega$ 

 $S_{22}$  function

normal impedance: 150.0  $\Omega$ 


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**1960.00 MHz**

Data sheet


**References**

<b>Type</b>	B4305
<b>Ordering code</b>	B39202B4305F210
<b>Marking and package</b>	C61157-A8-A8
<b>Packaging</b>	F61074-V8212-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B4305_NB.s3p, B4305_WB.s3p see file header for port/pin assignment table
<b>Soldering profile</b>	S_6001
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**Published by EPCOS AG**

**Systems, Acoustics, Waves Business Group**

**P.O. Box 80 17 09, 81617 Munich, GERMANY**

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