



RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

## SAW Components

### SAW Rx filter

Automotive telematics

Series/type: B4306  
Ordering code: B39182B4306F210

Date: January 30, 2013  
Version: 2.2

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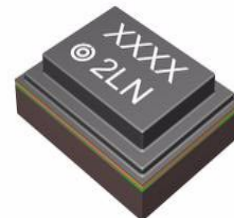
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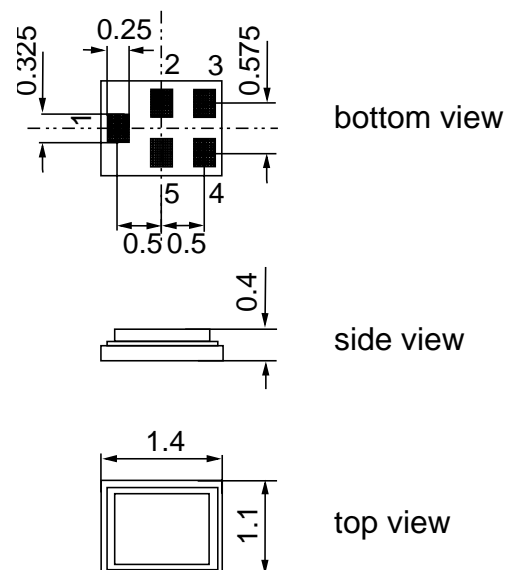
Data sheet


**Application**

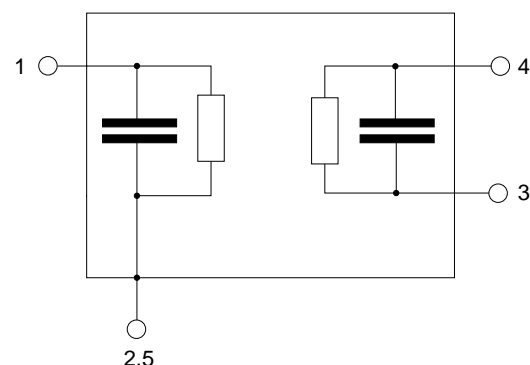
- Low-loss RF filter for GSM 1800 systems, receive path (RX)
- Impedance transform from 50 Ω to 150 Ω
- Unbalanced to balanced operation
- Very low insertion attenuation
- Low amplitude ripple
- Usable passband 75 MHz
- Suitable for GPRS class 1 to 12


**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 **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**)


**Pin configuration**

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




**Characteristics**

Operating temperature range:	$T = -20$ to $+75$ °C
Terminating source impedance:	$Z_S = 50\Omega$
Terminating load impedance:	$Z_L = 150\Omega \parallel 18$ nH (balanced)

				min.	typ. @ 25°C	max.	
<b>Center frequency</b>	$f_C$			—	1842.5	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{max}$	1805.0 ... 1880.0	MHz	—	1.8	2.4	dB
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha$	1805.0 ... 1880.0	MHz	—	0.7	1.5	dB
<b>VSWR</b>							
Input		1805.0 ... 1880.0	MHz	—	1.9	2.5	
Output		1805.0 ... 1880.0	MHz	—	1.9	2.5	
<b>CMRR (<math> S_{21}-S_{31}  /  S_{21}+S_{31} </math>)</b>		1805.0 ... 1880.0	MHz	19 <sup>1)</sup>	24	—	dB
<b>Attenuation</b>	$\alpha$						
		0.0 ... 902.0	MHz	45	50	—	dB
		902.0 ... 940.0	MHz	45	51	—	dB
		940.0 ... 1440.0	MHz	35	41	—	dB
		1440.0 ... 1705.0	MHz	28	36	—	dB
		1705.0 ... 1785.0	MHz	12	18	—	dB
		1920.0 ... 1980.0	MHz	18	23	—	dB
		1980.0 ... 2030.0	MHz	23	26	—	dB
		2030.0 ... 2400.0	MHz	28	31	—	dB
		2400.0 ... 2500.0	MHz	30	37	—	dB
		2500.0 ... 2775.0	MHz	28	32	—	dB
		2775.0 ... 3760.0	MHz	40	47	—	dB
		3760.0 ... 6000.0	MHz	35	40	—	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


**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	effective power in the on-state, duty cycle 4:8
GSM1800, GSM1900	P <sub>IN</sub>	15	dBm	
Tx bands				

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



### ESD protection of SAW filters

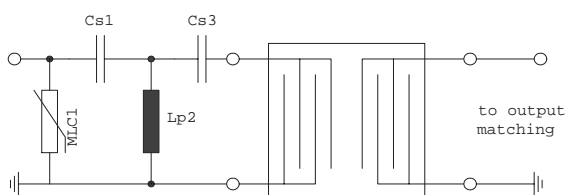
SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

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

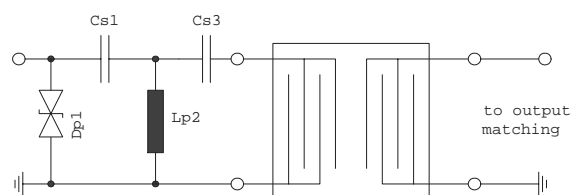
Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

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:

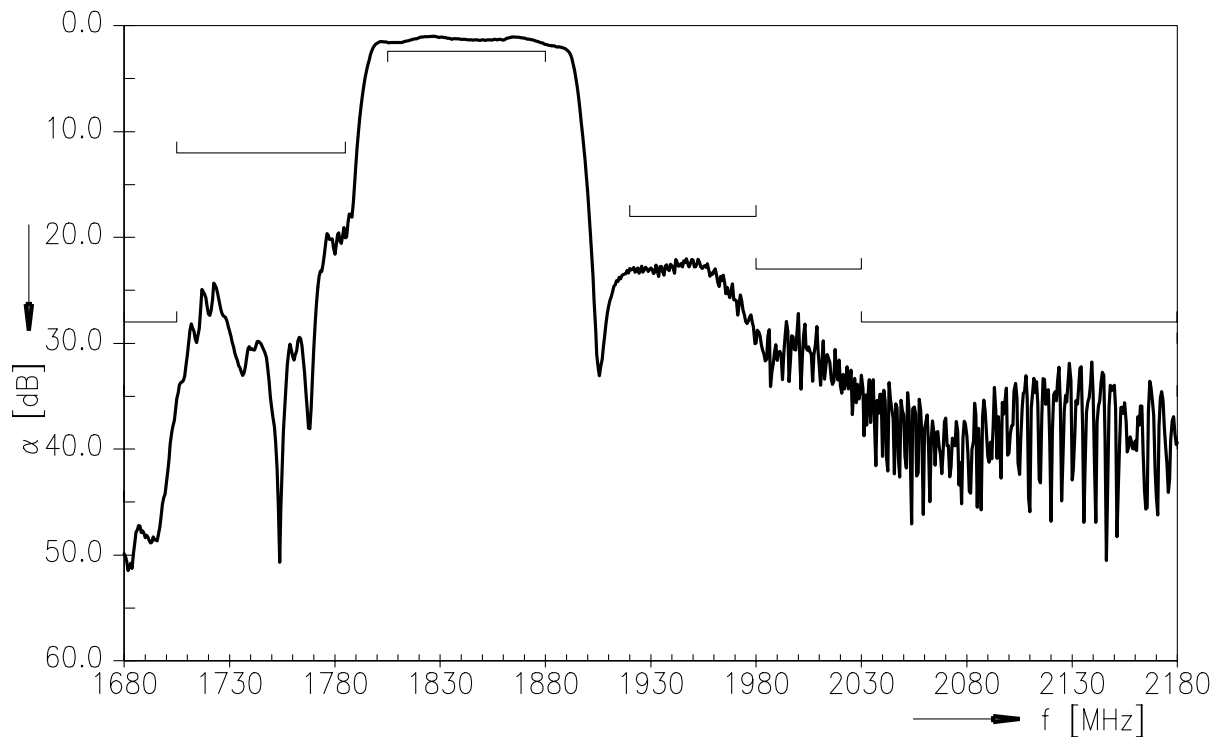
**“ESD protection for SAW filters”.**

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

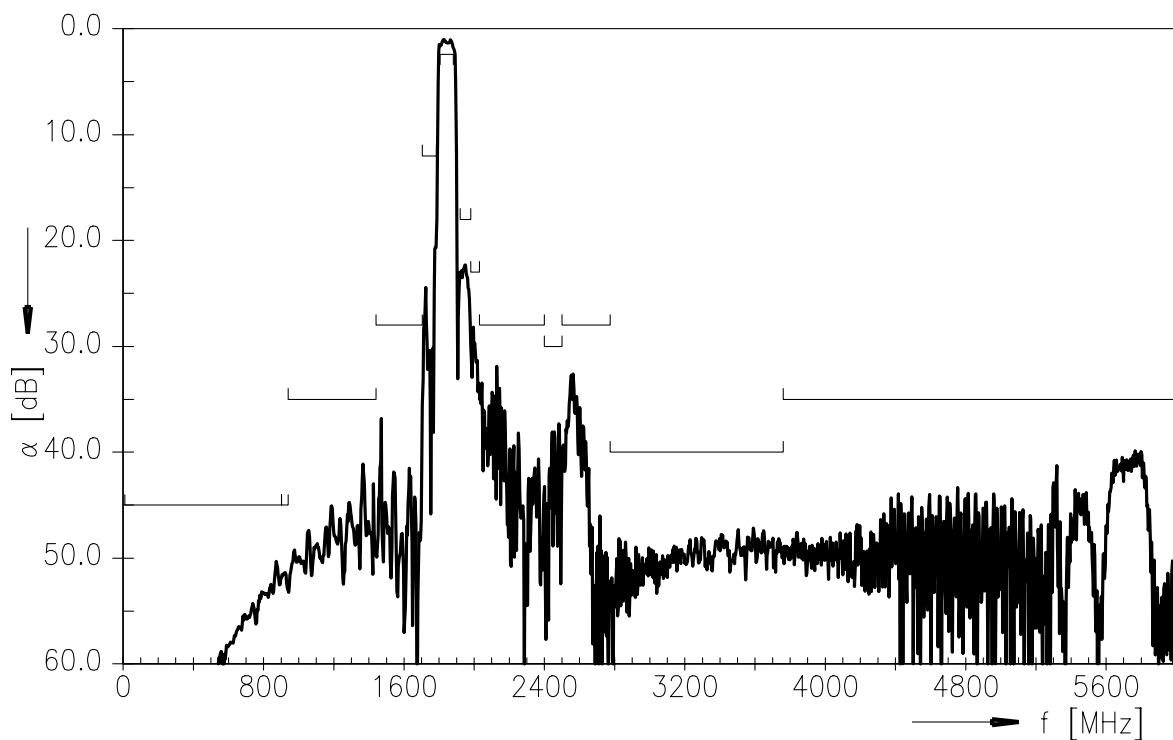
Data sheet



Transfer function



Transfer function (wideband)



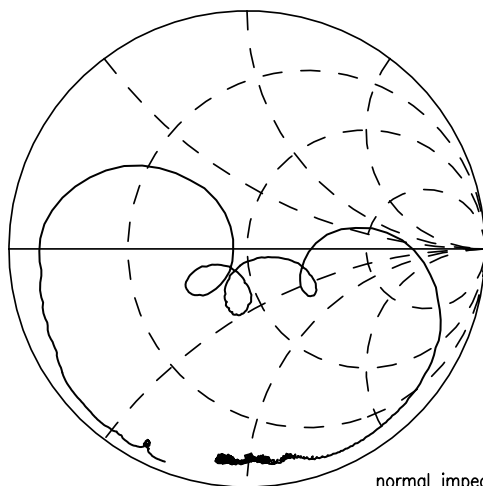


Data sheet

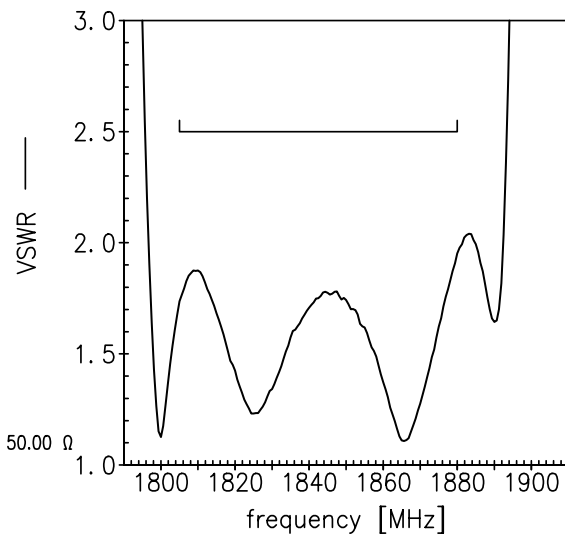


Smith chart

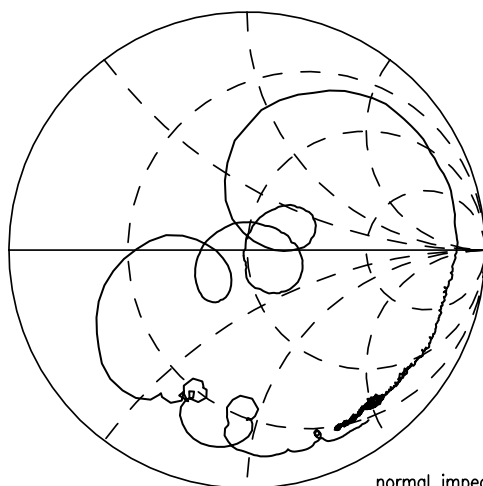
$S_{11}$  function



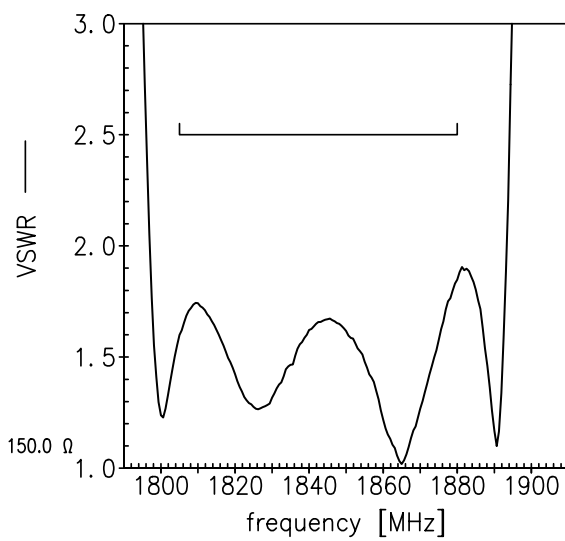
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 150.0  $\Omega$



Data sheet


**References**

<b>Type</b>	B4306
<b>Ordering code</b>	B39182B4306F210
<b>Marking and package</b>	C61157-A8-A8
<b>Packaging</b>	F61074-V8212-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B4306_NB.s3p, B4306_WB.s3p see file header for port/pin assignment table
<b>Soldering profile</b>	S_6001
<b>RoHS compatible</b>	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 8 <sup>th</sup> , 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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<b>Matching coils</b>	See Inductor pdf-catalog <a href="http://www.tdk.co.jp/tefe02/coil.htm#aname1">http://www.tdk.co.jp/tefe02/coil.htm#aname1</a> and Data Library for circuit simulation <a href="http://www.tdk.co.jp/etvcl/index.htm">http://www.tdk.co.jp/etvcl/index.htm</a>

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