



RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

## SAW Components

### SAW Tx filter

Automotive Telematics

Series/type:	B4331
Ordering code:	B39172B4331P810
Date:	December 18, 2013
Version:	2.0

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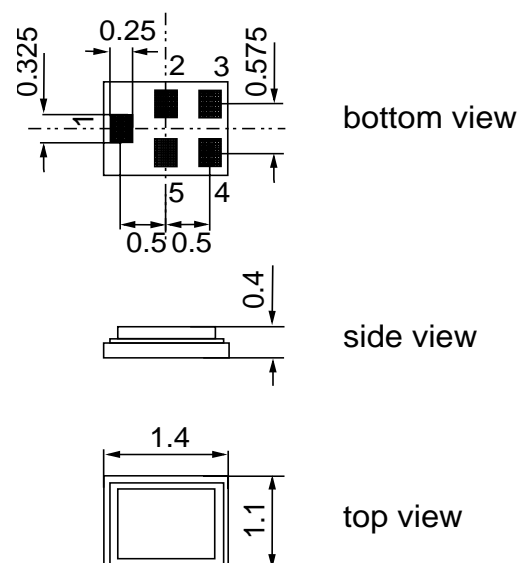
Data sheet


**Application**

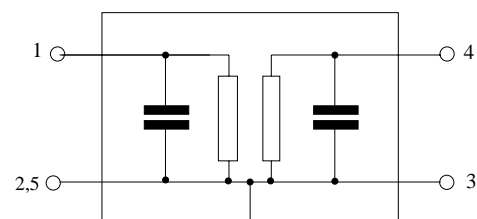
- Low-loss filter for WCDMA Band III, Transmit path (Tx)
- Low amplitude ripple
- Usable passband 75MHz


**Features**

- Package size 1.4 x 1.1 x 0.4 mm<sup>3</sup>
- Package code QCS5P
- 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
- 4 Output
- 2,3,5 To be grounded



Data sheet


**Characteristics**

Temperature range for specification:	T = -30 °C to +85 °C
Terminating source impedance:	Z <sub>S</sub> = 50 Ω + 3.0nH
Terminating load impedance:	Z <sub>L</sub> = 50 Ω + 3.0nH

		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	f <sub>C</sub>	—	1747.5	—	MHz
<b>Maximum insertion attenuation</b>	α <sub>max</sub>				
1710.0 ... 1785.0 MHz		—	2.6	3.8	dB
1712.4 ... 1782.6 MHz	α <sub>WCDMA</sub> <sup>1)</sup>	—	2.4	3.3	dB
<b>Maximum Amplitude ripple (p-p)</b>	Δα				
1710.0 ... 1785.0 MHz		—	1.9	3.1	dB
1712.4 ... 1782.6 MHz	Δα <sub>5MHz</sub> <sup>2)</sup>	—	1.7	2.6	dB
<b>VSWR</b>					
1710.0 ... 1785.0 MHz		—	1.9	2.2	
<b>Attenuation</b>	α				
50.0 ... 1574.0 MHz		18	22	—	dB
1574.0 ... 1577.0 MHz		28	33	—	dB
1577.0 ... 1690.0 MHz		26	30	—	dB
1805.0 ... 1880.0 MHz		8	30	—	dB
1920.0 ... 1980.0 MHz		24	28	—	dB
2110.0 ... 2170.0 MHz		24	30	—	dB
2400.0 ... 2500.0 MHz		25	32	—	dB
3420.0 ... 3570.0 MHz		24	32	—	dB
5130.0 ... 5355.0 MHz		21	30	—	dB

1) Attenuation of WCDMA signal ("Powertransferfunktion"). Please refer to annotation on the next page.

2) Ripple determined within any 5 MHz channel.

Data sheet


**Annotation for characteristics section**

Attenuation of WCDMA signal (“Powertransferfunction”,  $\alpha_{\text{WCDMA}}$ ) is determined by

$$\int_{-\infty}^{\infty} |S_{\text{ds21}}(f)H_{\text{RRC}}(f - f_{\text{Carrier}})|^2 df$$

$f_{\text{Carrier}}$  according to 3GPP TS 25.101 (e.g. for Passband,  $f_{\text{Carrier}}$  ranges from 1712.4 MHz (lowest Tx channel) to 1782.6 MHz (highest Tx channel)).  $H_{\text{RRC}}(f)$  is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

$$\int_{-\infty}^{\infty} |H_{\text{RRC}}(f)|^2 df = 1$$

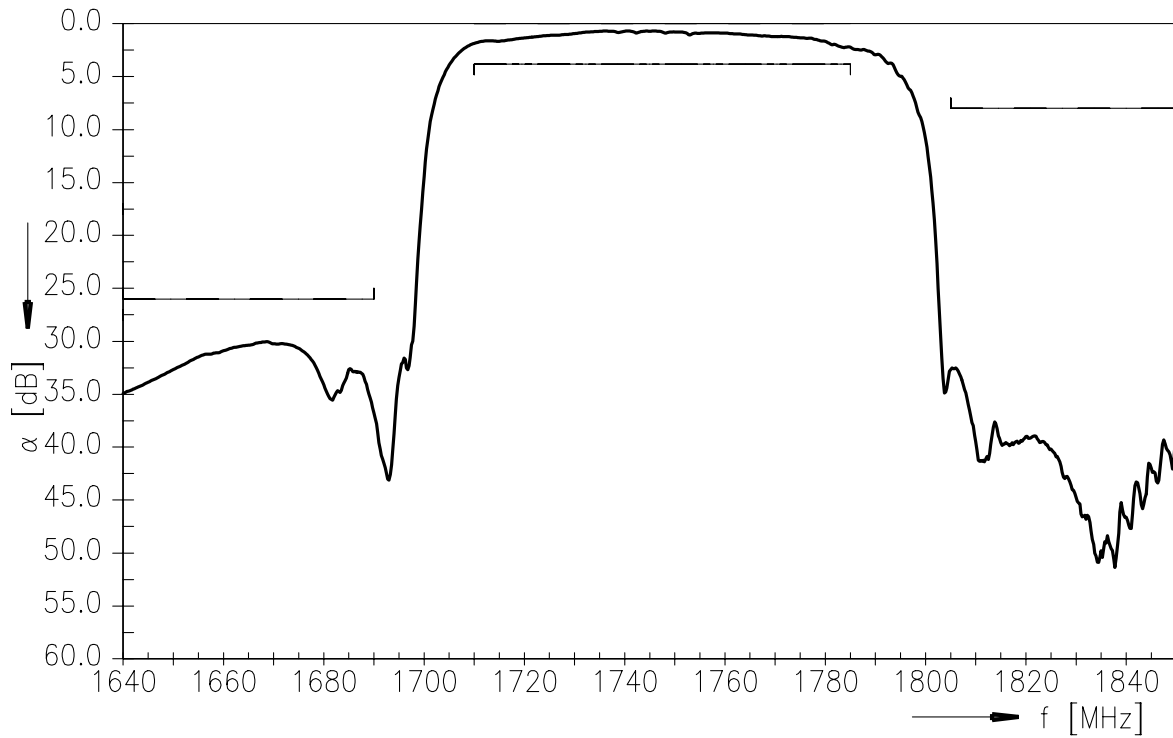
**Maximum ratings**

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	
Input Power	P <sub>IN</sub>	15	dBm	cw signal

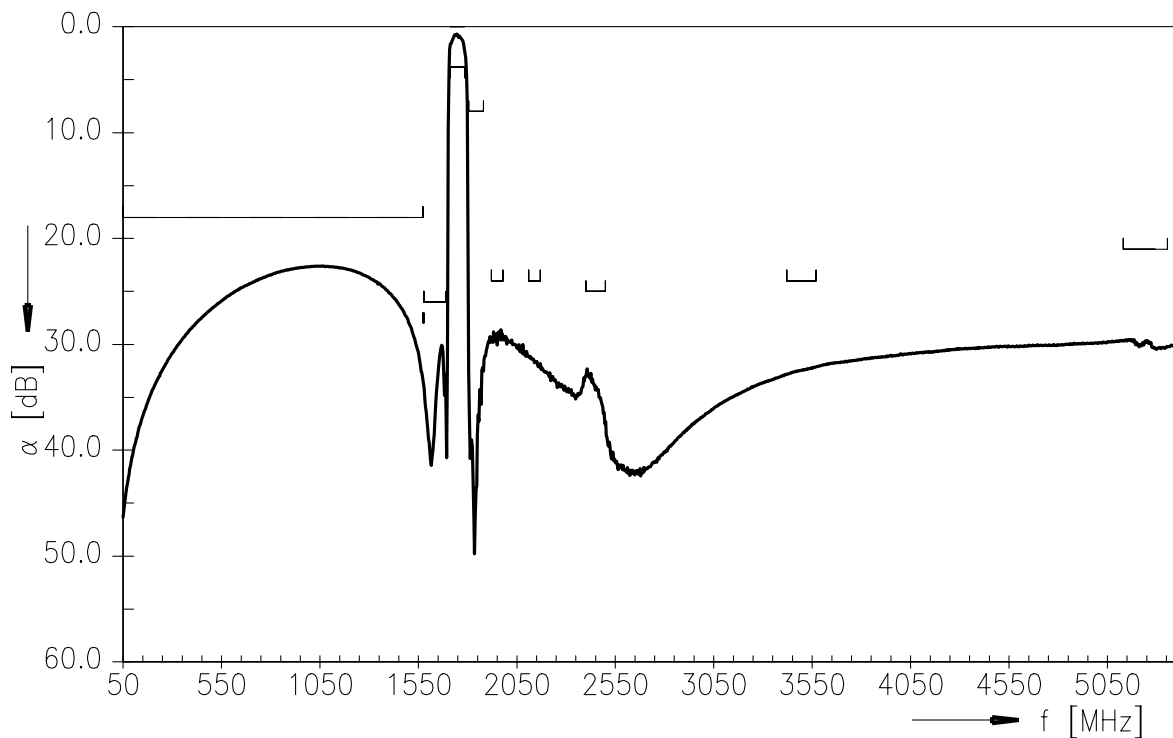
Data sheet



**Transfer function**



**Transfer function (wideband)**

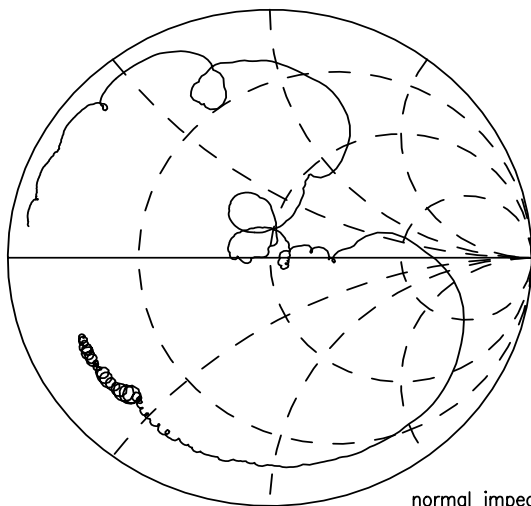


Data sheet

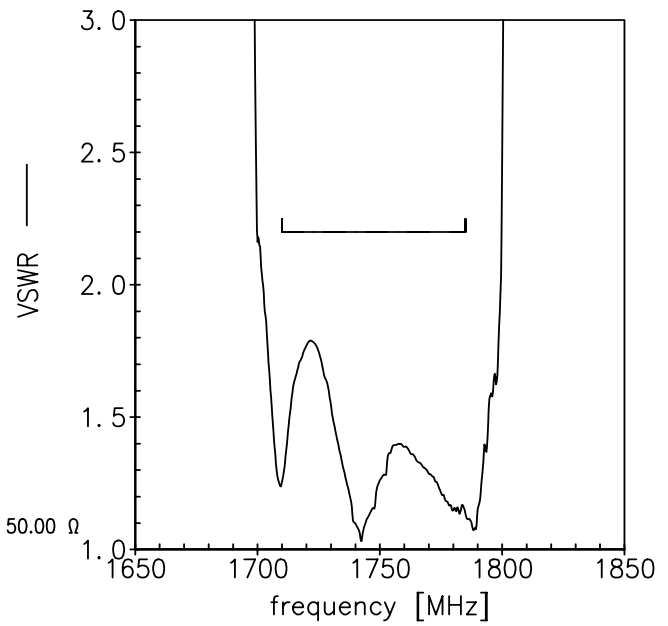


Smith chart

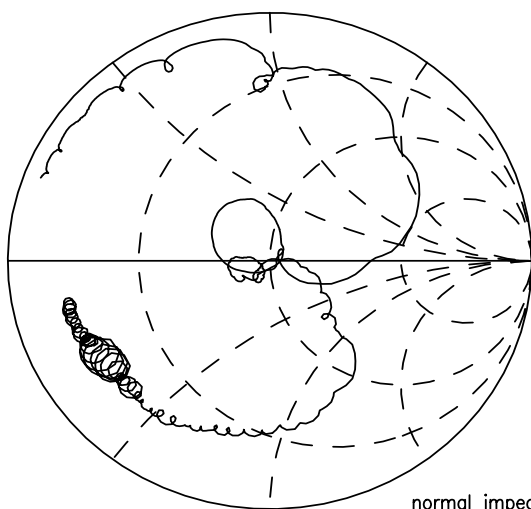
$S_{11}$  function



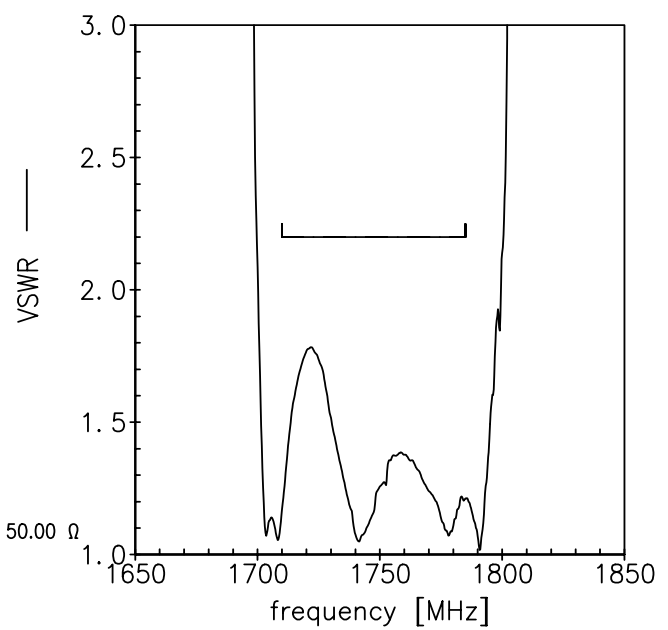
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 50.00  $\Omega$







### ESD protection of SAW filters

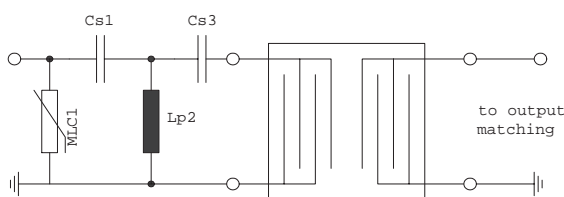
SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

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

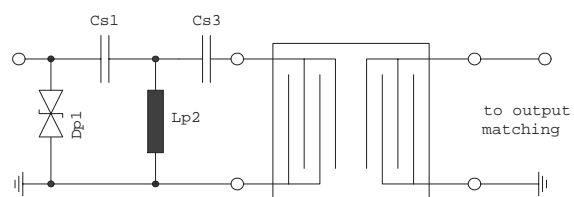
Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

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.

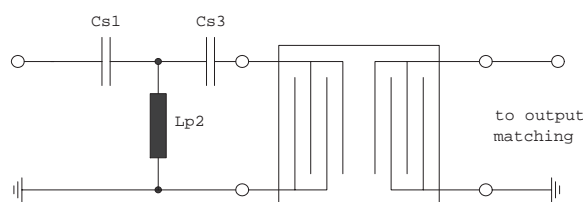


**Fig. 1 MLC varistor plus ESD matching**



**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


**References**

<b>Type</b>	B4331
<b>Ordering code</b>	B39172B4331P810
<b>Marking and package</b>	C61157-A8-A9
<b>Packaging</b>	F61074-V8237-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B4331_NB.s2p, B4331_WB.s2p 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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