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RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

## SAW Components

### SAW Rx filter

Automotive telematics

Series/type:	B4333
Ordering code:	B39741B4333P810
Date:	August 12, 2014
Version:	2.0

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<b>Ordering code:</b>	<b>B39741B4333P810</b>
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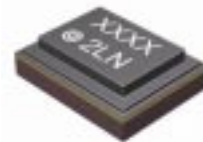
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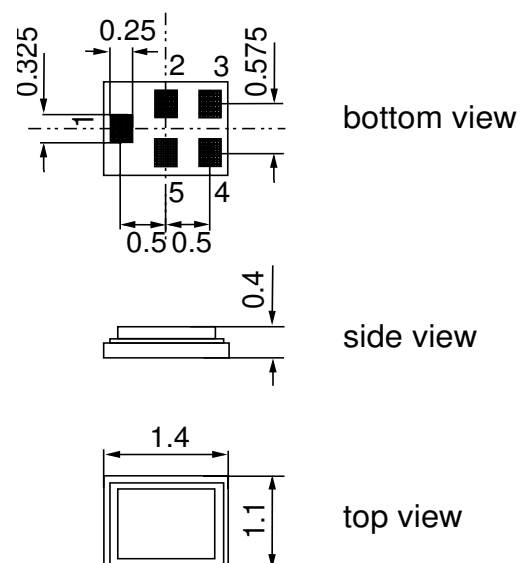
Data sheet


**Application**

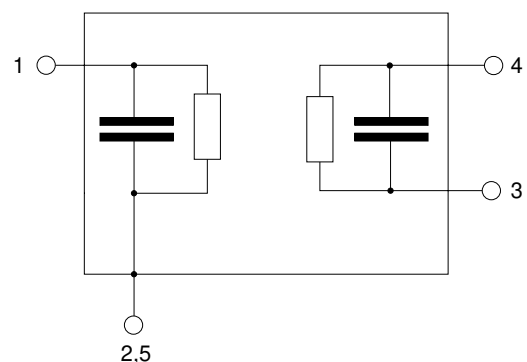
- Low-loss RF filter for LTE Band 17 system
- Usable bandwidth 12 MHz
- Unbalanced to balanced operation


**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
- 3,4 Output, balanced
- 2,5 To be grounded



Data sheet


**Characteristics**

Temperature range for specification:  $T = -30\text{ °C to }+85\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega$   
 Terminating load impedance:  $Z_L = 100\ \Omega$  (balanced)

		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	$f_C$	—	740.0	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{\max}$	—	1.8	2.8	dB
734.0 ... 746.0 MHz					
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha$	—	1.1	1.7	dB
734.0 ... 746.0 MHz					
<b>Input VSWR</b>		—	1.7	2.0	
734.0 ... 746.0 MHz					
<b>Output VSWR</b>		—	1.8	2.1	
734.0 ... 746.0 MHz					
<b>Common mode rejection ratio</b>		25	40	—	dB
734.0 ... 746.0 MHz					
<b>Attenuation</b>	$\alpha$				
50.0 ... 686.0 MHz		50	68	—	dB
704.0 ... 716.0 MHz		40	43	—	dB
716.0 ... 722.0 MHz		35	37	—	dB
722.0 ... 725.0 MHz		29	31	—	dB
725.0 ... 728.0 MHz		9	27	—	dB
777.0 ... 793.0 MHz		26	29	—	dB
793.0 ... 1438.0 MHz		40	48	—	dB
1438.0 ... 1462.0 MHz		40	65	—	dB
1468.0 ... 1492.0 MHz		40	65	—	dB
1570.0 ... 1610.0 MHz		50	65	—	dB
2124.0 ... 2178.0 MHz		40	63	—	dB
2202.0 ... 2238.0 MHz		26	39	—	dB
2400.0 ... 2484.0 MHz		50	64	—	dB
2496.0 ... 2690.0 MHz		45	62	—	dB
2936.0 ... 2984.0 MHz		45	61	—	dB
3400.0 ... 3800.0 MHz		45	60	—	dB
4404.0 ... 4476.0 MHz		40	58	—	dB
4900.0 ... 5850.0 MHz		40	53	—	dB
5872.0 ... 5968.0 MHz		40	57	—	dB

Data sheet

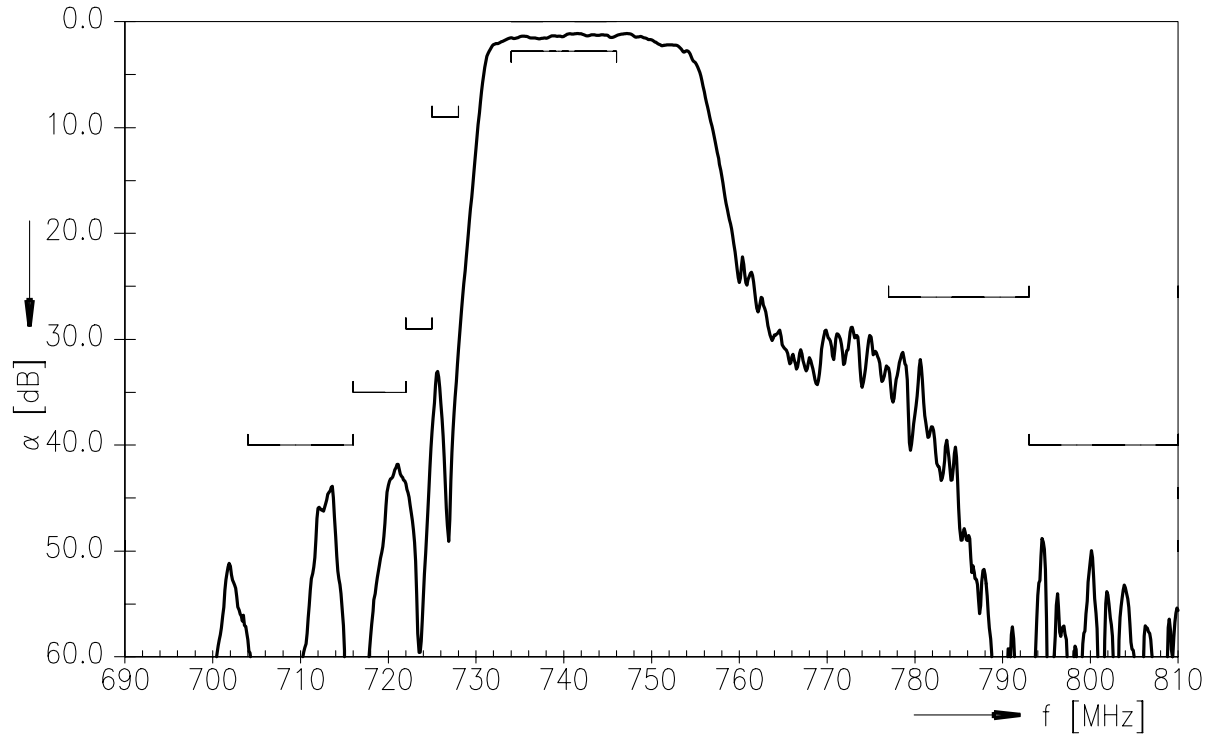

**Maximum ratings**

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 at 704.0 ... 716.0 MHz	P <sub>IN</sub>	15	dBm	

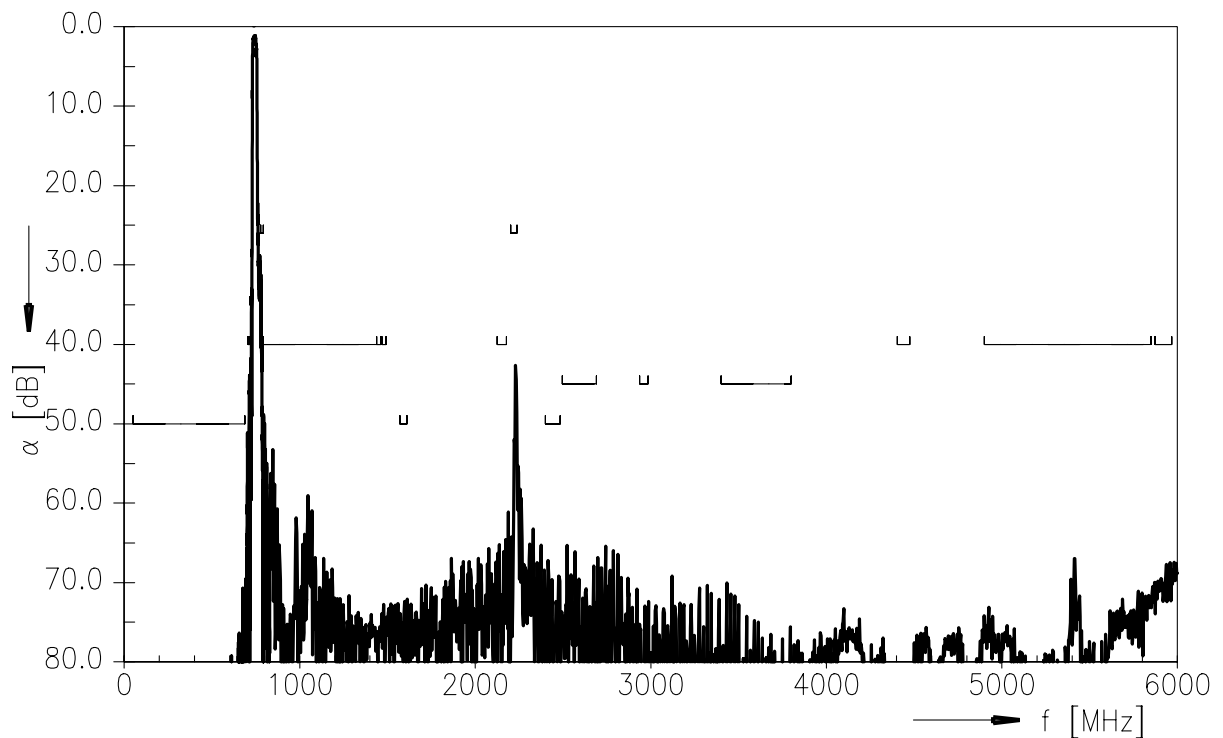
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**Transfer function**



**Transfer function (wideband)**



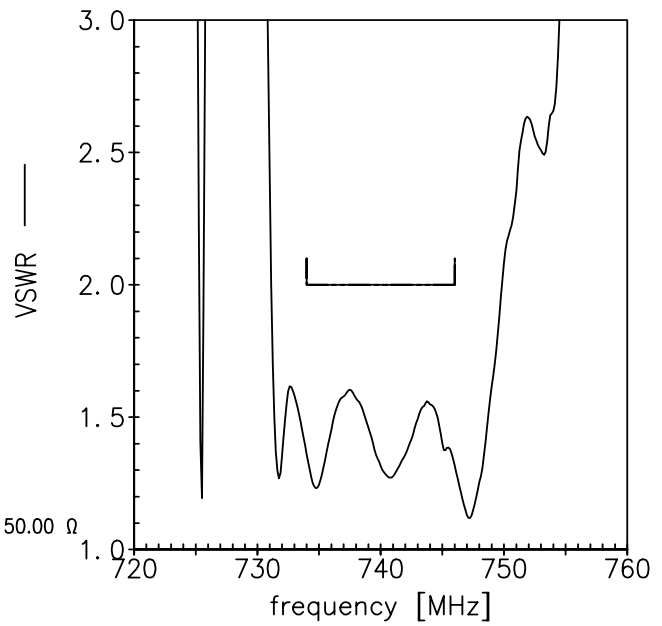
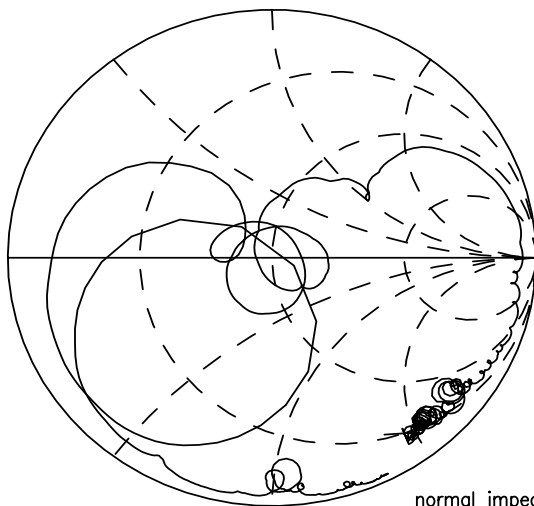


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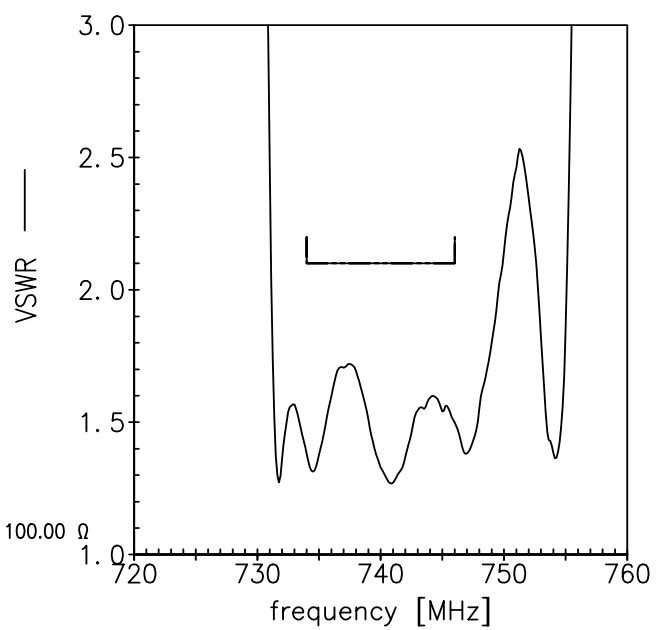
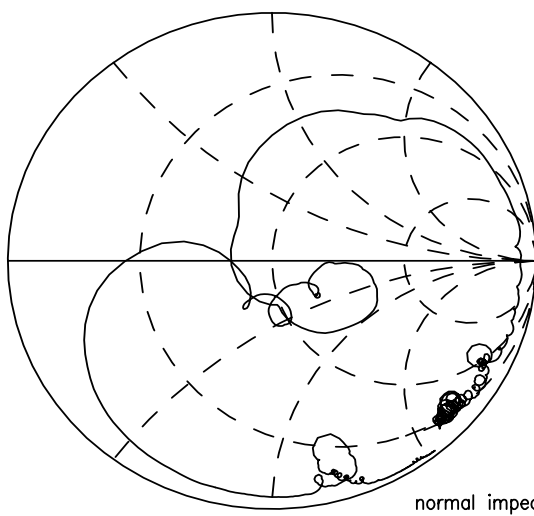


Smith chart

S<sub>11</sub> function



S<sub>22</sub> function





### ESD protection of SAW filters

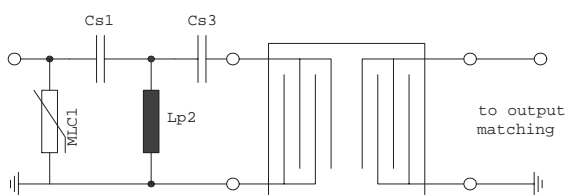
SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

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

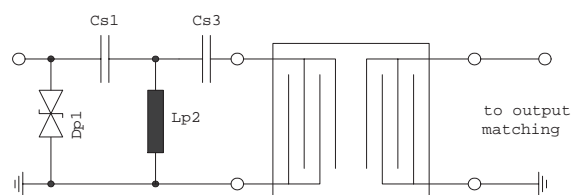
Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 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.

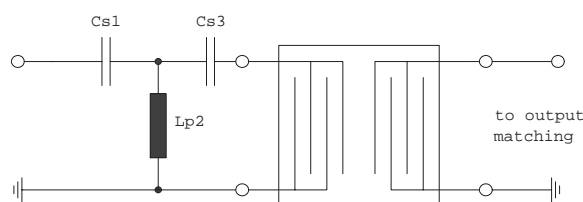


**Fig. 1 MLC varistor plus ESD matching**



**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”.


**References**

<b>Type</b>	B4333
<b>Ordering code</b>	B39741B4333P810
<b>Marking and package</b>	C61157-A8-A9
<b>Packaging</b>	F61074-V8237-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B4333_NB.s3p, B4333_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> for a large variety of matching coils.

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