

RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

SAW Components

SAW Rx filter

Automotive Telematics

Series/type:	B4323
Ordering code:	B39941B4323P810
Date:	August 13, 2013
Version:	2.1

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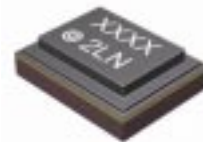
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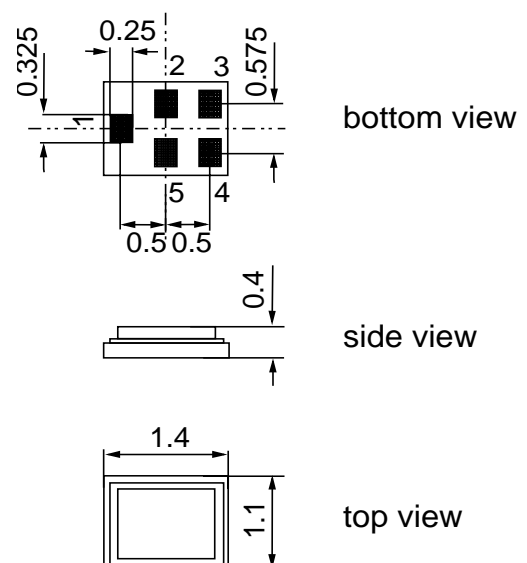
Data sheet


Application

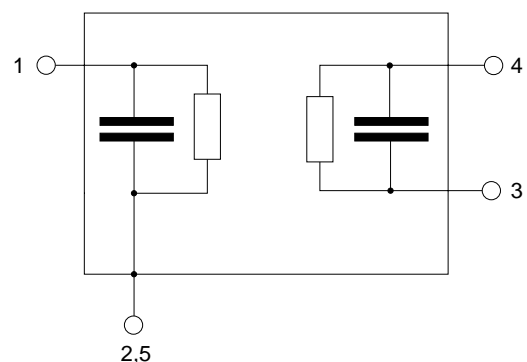
- Low-loss RF filter for WCDMA Band VIII and GSM 900 systems, receive path (RX)
- Very high TX suppression - suitable for diversity applications
- Usable passband: 35 MHz
- Unbalanced to balanced operation
- Impedance transformation from 50 Ω to 100 Ω
- Suitable for GPRS class 1 to 12


Features

- Package size 1.4 x 1.1 x 0.4 mm³
- 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 = -20 °C to +85 °C
Terminating source impedance:	Z _S = 50 Ω
Terminating load impedance:	Z _L = 100 Ω

	min.	typ. @ 25 °C	max.	
Center frequency f_C	—	942.5	—	MHz
Maximum insertion attenuation				
@f _{Carrier Bd 8 RX} 927.4 ... 957.6 MHz $\alpha_{\text{WCDMA}}^{1)}$	—	2.1	2.8	dB
@f _{Carrier Bd 8 RX} 925.7 ... 959.3 MHz $\alpha_{\text{LTE}}^{2)}$	—	2.3	3.6	dB
925.0 ... 960.0 MHz α_{GSM}	—	2.5	4.0	dB
Amplitude ripple (p-p)				
925.0 ... 960.0 MHz $\Delta\alpha$	—	1.5	2.8	dB
Error Vector Magnitude³⁾				
@f _{Carrier Bd 8 RX} 927.4 ... 957.6 MHz EVM	—	3.2	6.2	%
Input VSWR				
925.0 ... 960.0 MHz	—	1.8	2.3	
Output VSWR				
925.0 ... 960.0 MHz	—	1.9	2.4	
CMRR ($S_{21}-S_{31} / S_{21}+S_{31}$)				
925.0 ... 960.0 MHz	18	23 ⁴⁾	—	dB
Attenuation α				
50.0 ... 880.0 MHz	42	55	—	dB
@f _{Carrier Bd 8 TX} 882.4 ... 912.6 MHz $\alpha_{\text{WCDMA}}^{2)}$	42	47	—	dB
@f _{Carrier Bd 8 TX} 880.7 ... 914.3 MHz $\alpha_{\text{LTE}}^{3)}$	39	44	—	dB
880.0 ... 915.0 MHz α_{GSM}	35	44	—	dB
980.0 ... 1045.0 MHz	21	25	—	dB
1045.0 ... 1700.0 MHz	35	50	—	dB
1700.0 ... 2600.0 MHz	45	62	—	dB
2600.0 ... 2682.0 MHz	50	60	—	dB
2682.0 ... 4345.0 MHz	44	56	—	dB
4345.0 ... 4470.0 MHz	45	58	—	dB
4470.0 ... 6000.0 MHz	48	55	—	dB

1) Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (4).

2) Attenuation of LTE signal ("Powertransferfunction"). Please refer to annotation on page (4).

3) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

4) A CMRR of 22.8 dB corresponds to a phase balance of 5° together an amplitude balance of 1.0 dB


Annotation for characteristics section

Attenuation of WCDMA and LTE signal (“Powertransferfunction”, α_{WCDMA} , α_{LTE}) are determined by

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

$H_{\text{RRC}}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

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

f_{Carrier} of WCDMA signal according to 3GPP TS 25.101 (e.g. for band VIII RX passband, f_{Carrier} ranges from 927.4 MHz (f_{C} of lowest Rx channel) to 957.6 MHz (f_{C} of highest Rx channel)).

f_{Carrier} of LTE signal according to 3GPP TS 36.101 with a channel band width of 1.08 MHz (equals 6 Resource Blocks) and a guard band of 0.16 MHz (e.g. for band VIII RX passband, f_{Carrier} ranges from 925.7 MHz (f_{C} of lowest Rx channel) to 959.3 MHz (f_{C} of highest Rx channel)).

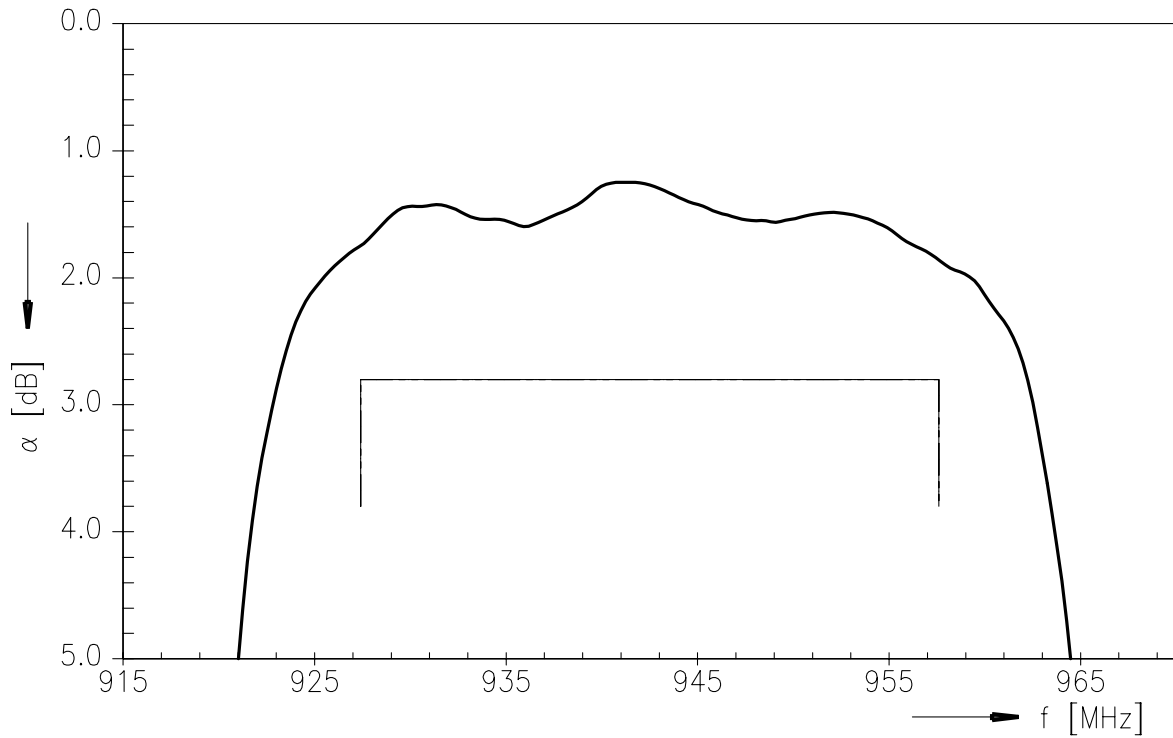
Maximum ratings

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T _{stg}	-40/+85	°C	
DC voltage	V _{DC}	0	V	
Input power at	P _{IN}	17	dBm	10000h @ 55°C

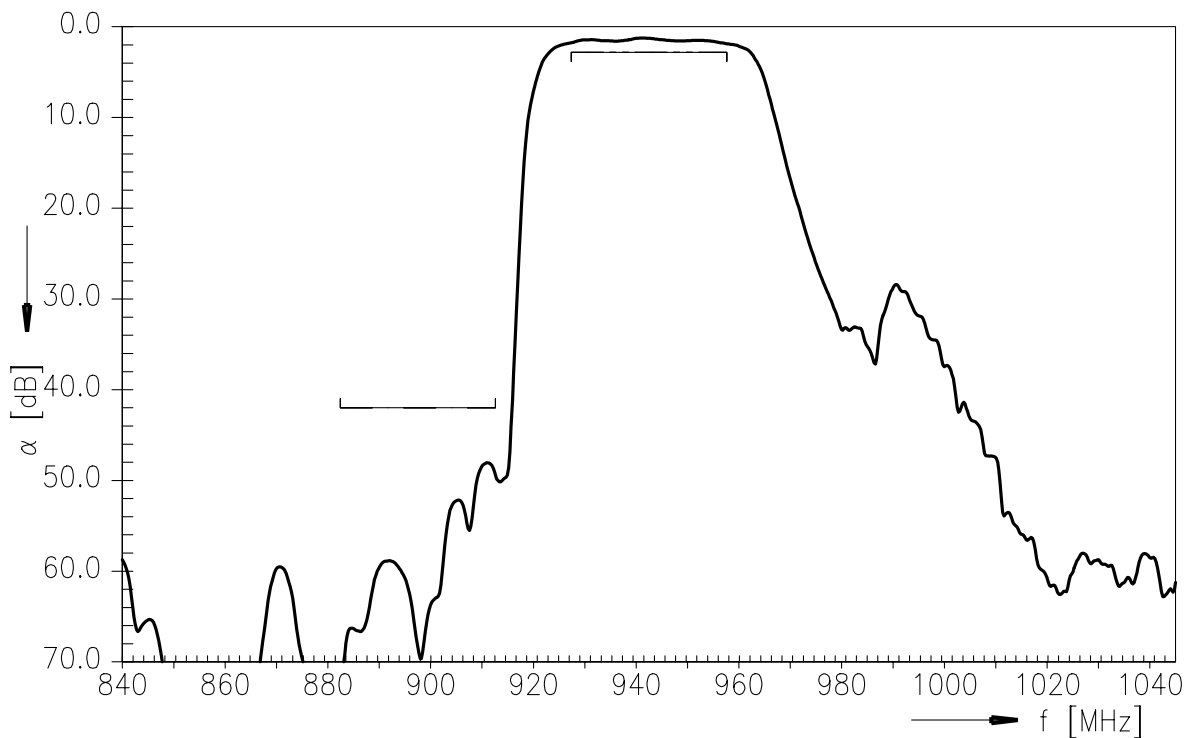
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Transfer function for WCDMA signals (Powertransferfunction vs. carrier frequency)



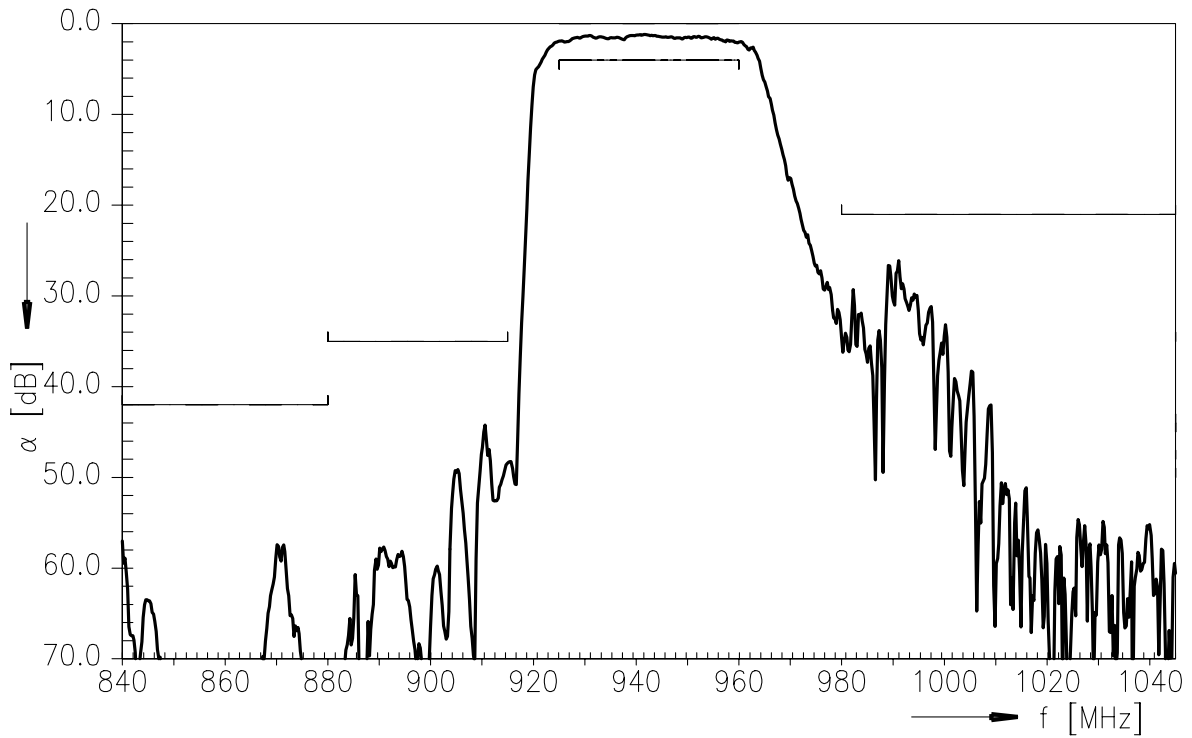
Transfer function for WCDMA signals (Powertransferfunction vs. carrier frequency)



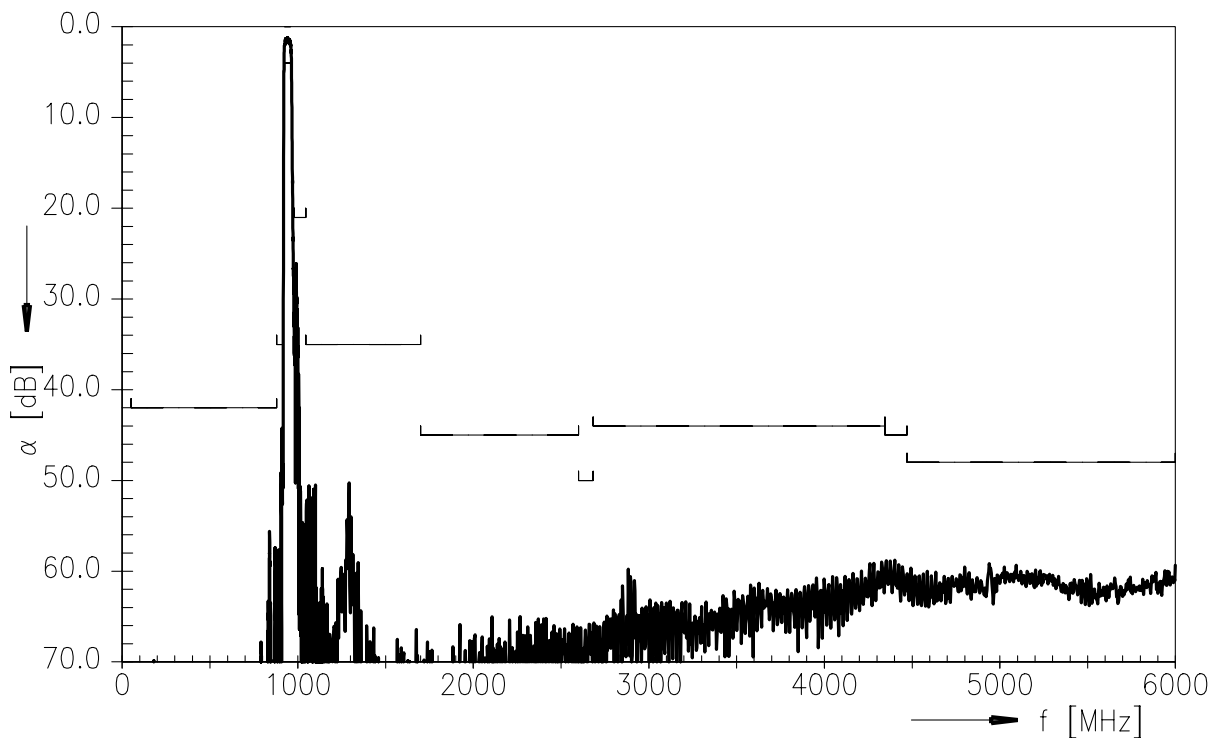
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Transfer function for CW signals (narrowband)



Transfer function for CW signals (wideband)

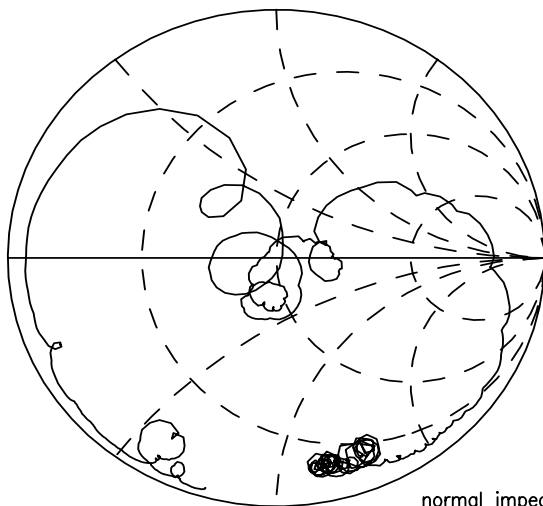


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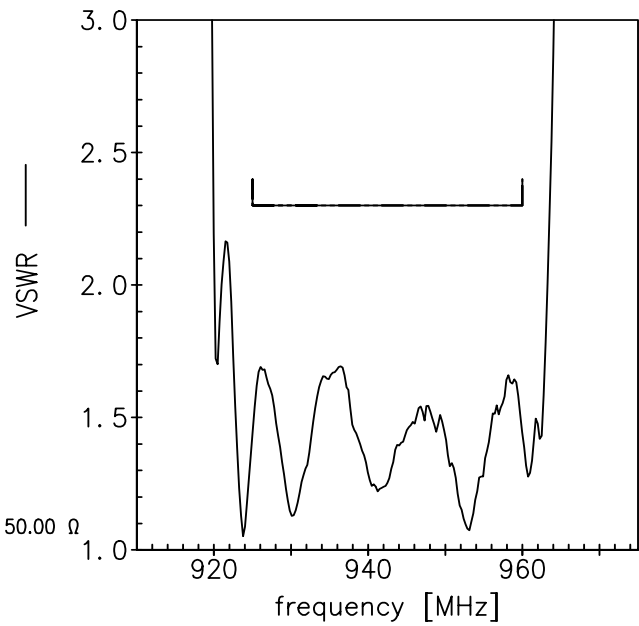


Smith chart

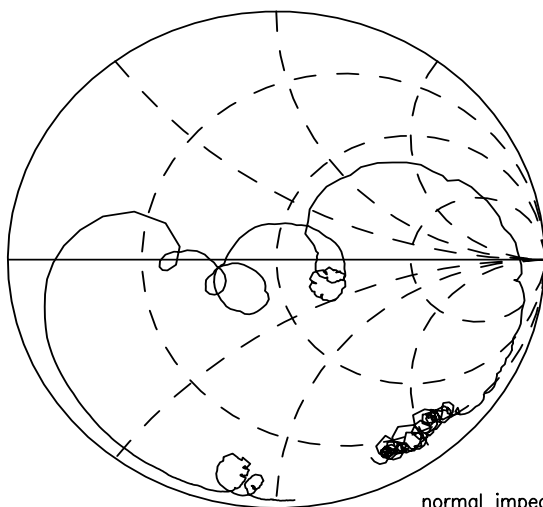
S_{11} function



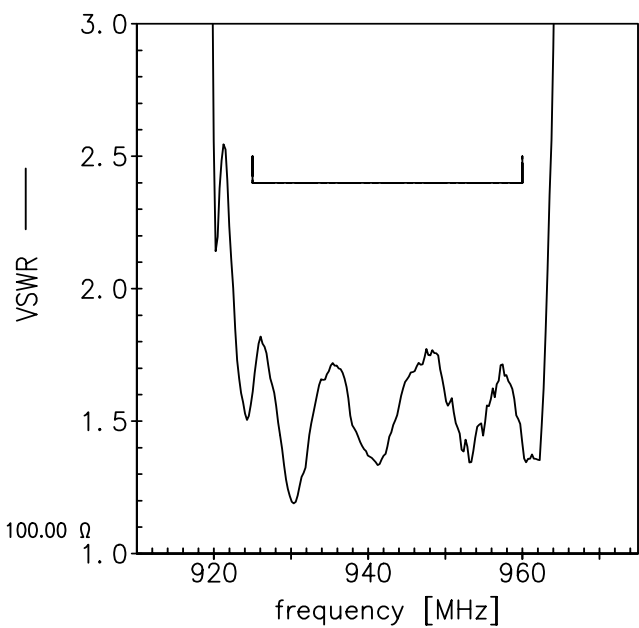
normal impedance: 50.00 Ω



S_{22} function



normal impedance: 100.00 Ω





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.

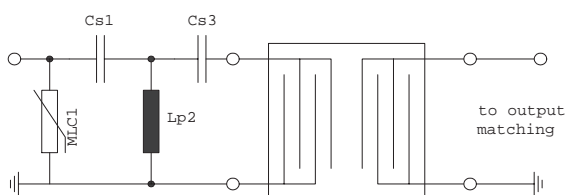


Fig. 1 MLC varistor plus ESD matching

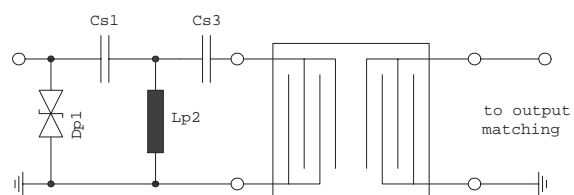


Fig. 2 Suppressor diode plus ESD matching

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

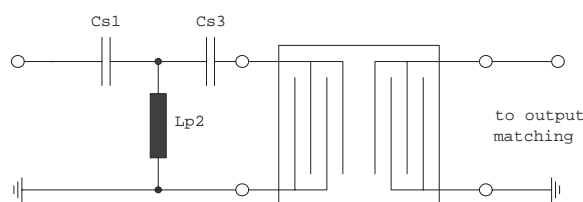


Fig. 3 3rd order high-pass structure for basic ESD protection

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”.

Data sheet


References

Type	B4323
Ordering code	B39941B4323P810
Marking and package	C61157-A8-A9
Packaging	F61074-V8212-Z000
Date codes	L_1126
S-parameters	B4323_NB.s3p, B4323_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 8 th , 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 for a large variety of matching coils.

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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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