Qualcomm

RF360
Europe GmbH

SAW Components

SAW Tx filter

Automotive Telematics

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

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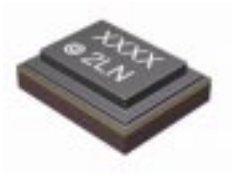
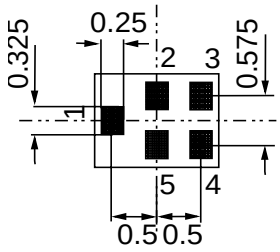
Application

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

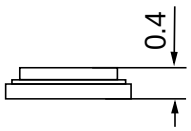


Features

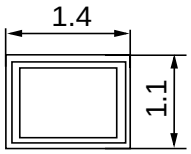
- Package size 1.4 x1.1 x 0.4 mm³
- Package code QCS5P
- RoHS compatible
- Approximate weight 0.003 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- AEC-Q200 qualified component family (operable temperature range -40˚C to +85˚C)
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)



bottom view



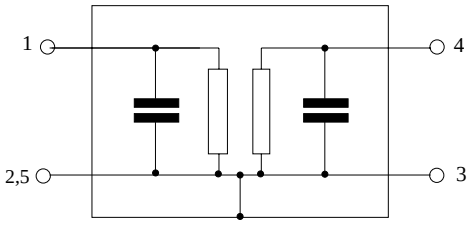
side view



top view

Pin configuration

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



Data sheet SMD

Characteristics

Temperature range for specification: T = –30 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω + 3.0nH
Terminating load impedance: Z_L = 50 Ω + 3.0nH

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	1747.5	—	MHz
Maximum insertion attenuation	α_{max}				
1710.0 ... 1785.0 MHz		—	2.6	3.8	dB
1712.4 ... 1782.6 MHz	α_{WCDMA} 1)	—	2.4	3.3	dB
Maximum Amplitude ripple (p-p)	$\Delta\alpha$				
1710.0 ... 1785.0 MHz		—	1.9	3.1	dB
1712.4 ... 1782.6 MHz	$\Delta\alpha_{5MHz}$ 2)	—	1.7	2.6	dB
VSWR					
1710.0 ... 1785.0 MHz		—	1.9	2.2	
Attenuation	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 (“Powertransferfuntion”). Please refer to annotation on the next page.
2) Ripple determined within any 5 MHz channel.

Annotation for characteristics section

Attenuation of WCDMA signal ("Powertransferfunction", α_{WCDMA}) is determined by

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

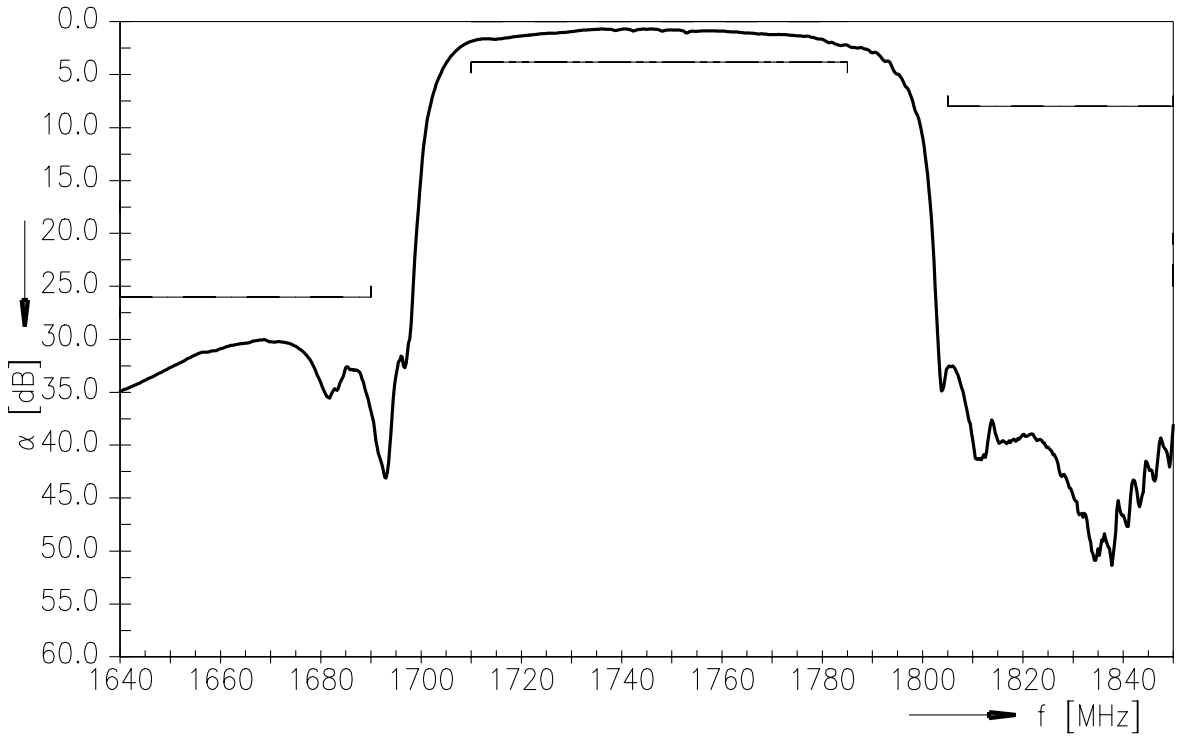
$f_{Carrier}$ according to 3GPP TS 25.101 (e.g. for Passband, $f_{Carrier}$ ranges from 1712.4 MHz (lowest Tx channel) to 1782.6 MHz (highest Tx channel)). $H_{RRC}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

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

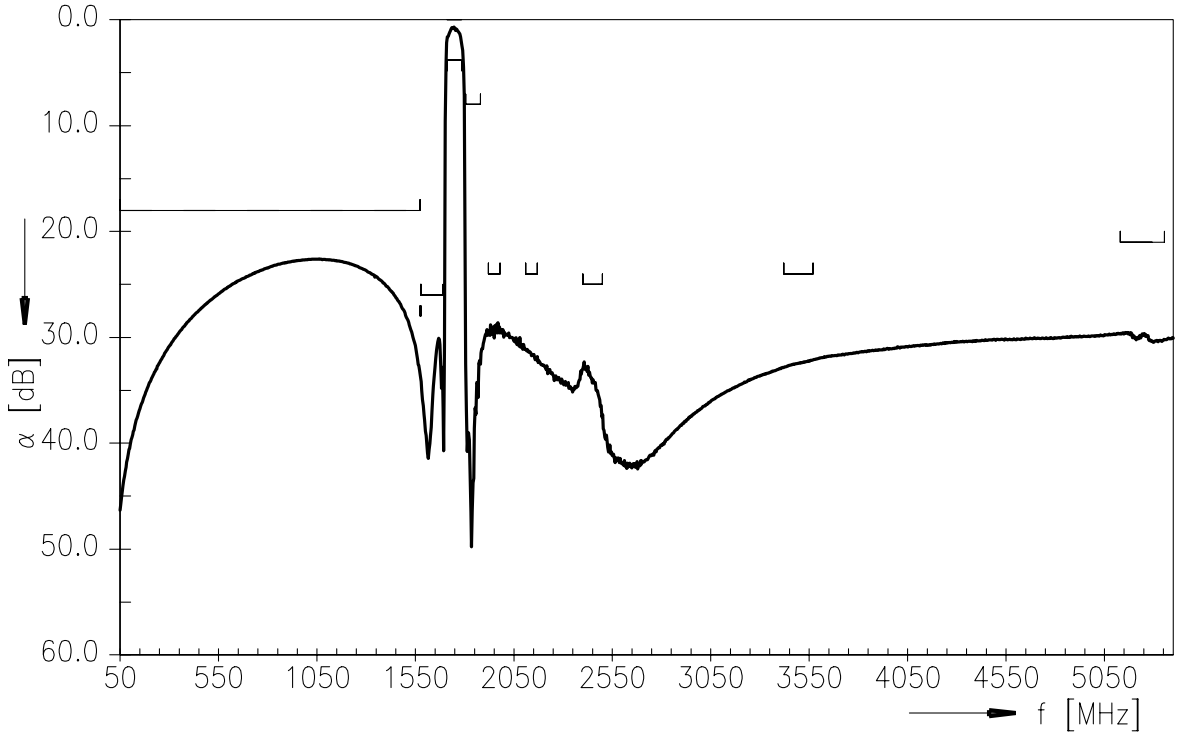
Maximum ratings

Operable temperature range	T	–40/+85	°C	
Storage temperature range	T_{stg}	–40/+85	°C	
DC voltage	V_{DC}	0	V	
Input Power	P_{IN}	15	dBm	cw signal

Transfer function

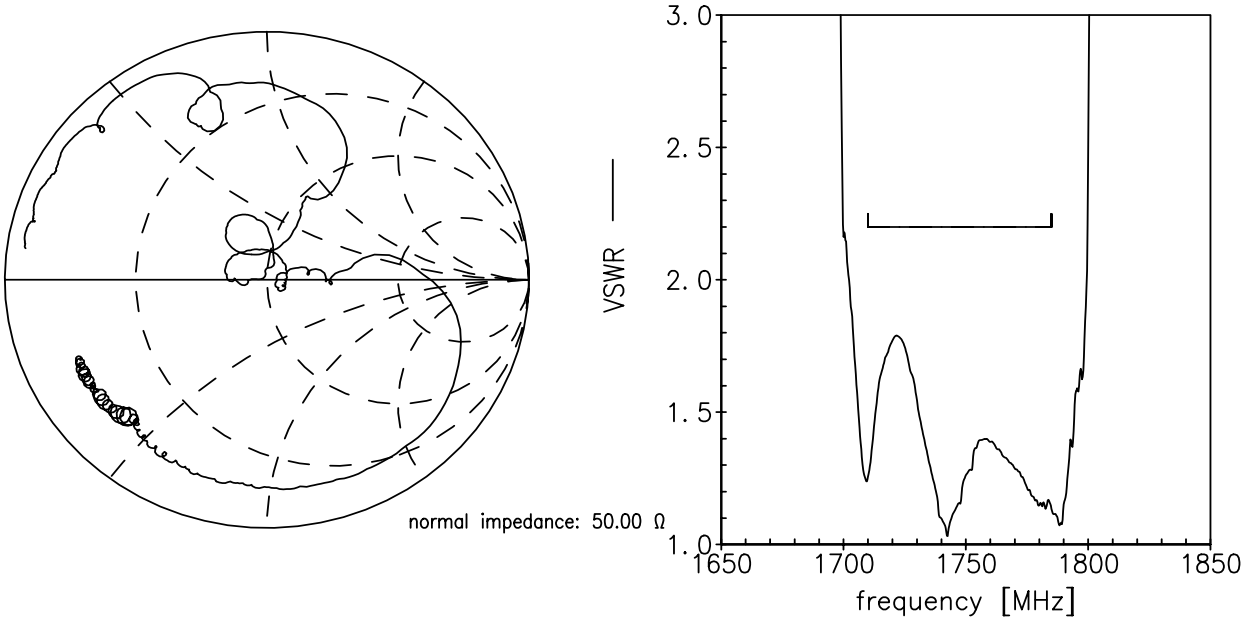


Transfer function (wideband)

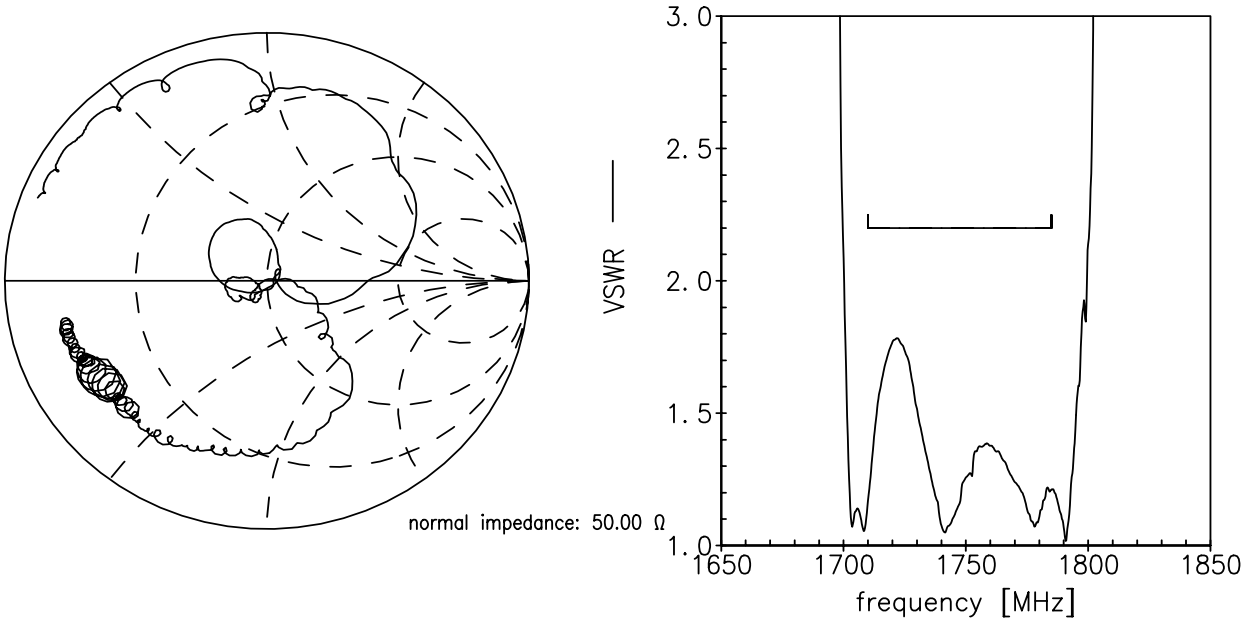


Smith chart

S_{11} function



S_{22} 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 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.

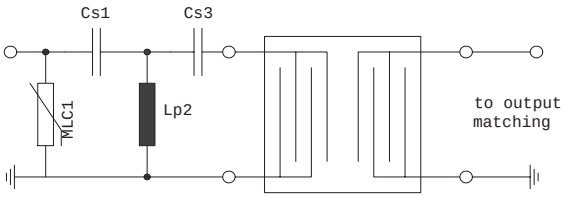


Fig. 1 MLC varistor plus ESD matching

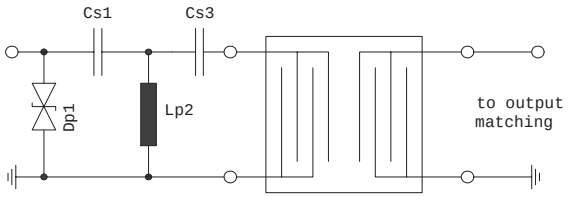


Fig. 2 Suppressor diode plus ESD matching

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

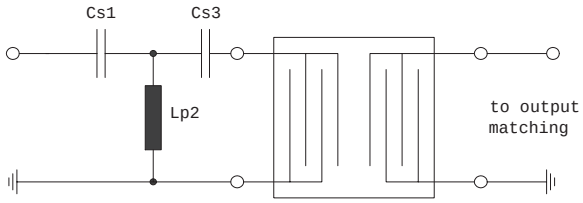


Fig. 3 3rd order high-pass structure for basic ESD protection

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”.

References

Type	B4331
Ordering code	B39172B4331P810
Marking and package	C61157-A8-A9
Packaging	F61074-V8237-Z000
Date codes	L_1126
S-parameters	B4331_NB.s2p, B4331_WB.s2p 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 8th, 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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