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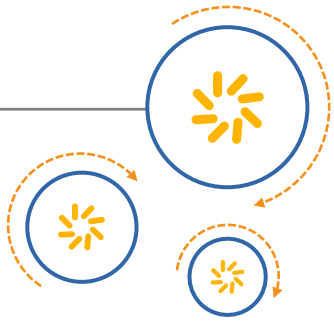

SAW Components

SAW RX filter

Automotive telematics

Series/type:	B4328
Ordering code:	B39182B4328P810
Date:	July 04, 2013
Version:	2.0

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Series/type:	**B4328**
Ordering code:	**B39182B4328P810**
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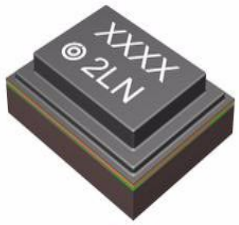
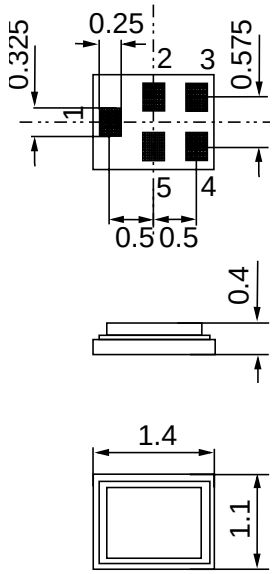
Application

- Low-loss RF filter for LTE and WCDMA Band III receive path (RX)
- Suitable for diversity applications
- High TX suppression
- Useable passband: 75 MHz
- Unbalanced to balanced operation
- Impedance transformation from 50 Ω to 100 Ω



Features

- Package size 1.4 x 1.1 x 0.4 mm³
- Package code QCS5P
- RoHS compatible
- Approximate weight 0.003g
- 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**)



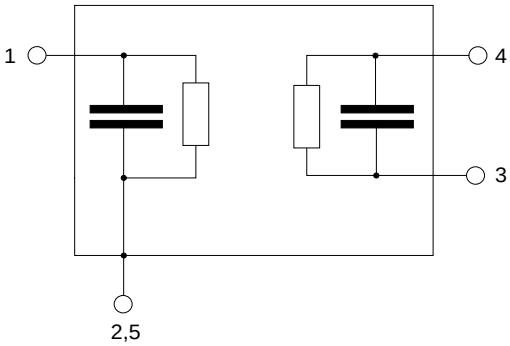
bottom view

side view

top view

Pin configuration

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



Characteristics band III performance

Temperature range for specification: T = -20 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω || 7.0 nH
Terminating load impedance: Z_L = 100 Ω || 9.0 nH + 2x2.2 pF

			min.	typ. @ 25 ˚C	max.	
Center frequency	f_C		—	1842.5	—	MHz
Maximum insertion attenuation						
1805.0 ... 1880.0 MHz	α_{CW}		—	2.2	3.4	dB
@$f_{Carrier\ Bd\ 3\ RX}$ 1807.4 ... 1877.6 MHz	α_{WCDMA} 1)		—	1.9	2.8	dB
Amplitude ripple (p-p)						
1805.0 ... 1880.0 MHz	$\Delta\alpha$		—	1.2	2.3	dB
Error Vector Magnitude 2)						
@$f_{Carrier\ Bd\ 3\ RX}$ 1807.4 ... 1877.6 MHz	EVM		—	1.7	3.0	%
Input VSWR						
1805.0 ... 1880.0 MHz			—	1.6	2.0	
Output VSWR						
1805.0 ... 1880.0 MHz			—	1.6	2.0	
CMRR ($\lvert S_{21}-S_{31}\rvert$ / $\lvert S_{21}+S_{31}\rvert$)						
1805.0 ... 1880.0 MHz			23	28	—	dB
Attenuation	α					
100.0 ... 115.0 MHz			45	130	—	dB
115.0 ... 1615.0 MHz			42	52	—	dB
1615.0 ... 1690.0 MHz			41	47	—	dB
1690.0 ... 1710.0 MHz			36	44	—	dB
1710.0 ... 1785.0 MHz			37	40	—	dB
@$f_{Carrier\ Bd\ 3\ TX}$ 1712.4 ... 1782.6 MHz	α_{WCDMA} 1)		37	41	—	dB
1785.0 ... 1790.0 MHz			8	35	—	dB
1920.0 ... 1965.0 MHz			15	22	—	dB
1965.0 ... 3515.0 MHz			30	35	—	dB
3515.0 ... 3665.0 MHz			40	55	—	dB

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (4).
2) Error Vector Magnitude (EVM) for WCDMA signal based on definition given in 3GPP TS 25.141.

Annotation for characteristics section

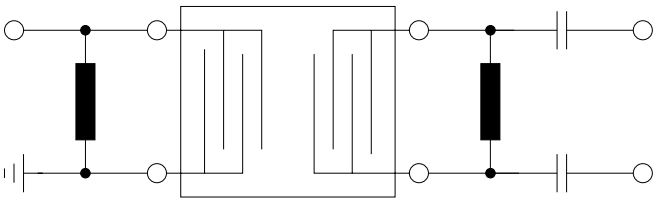
Attenuation of WCDMA signal ("Powertransferfunction", α_{WCDMA}) is determined by

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

$f_{Carrier}$ according to 3GPP TS 25.101 (e.g. for band III RX passband, $f_{Carrier}$ ranges from 1807.4 MHz (lowest RX channel) to 1877.6 MHz (highest RX 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:

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

Matching topology proposal for improved VSWR in 50/100Ω environment



Input: L_P=7.0 nH

Output (balanced): L_P=9.0 nH, C_S=2.2 pF

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	$P_{IN(TX)}$	15	dBm	CW@55˚C, 10000h, Bd III TX band
	P_{IN}	12	dBm	CW@55˚C, 10000h, all other bands

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.

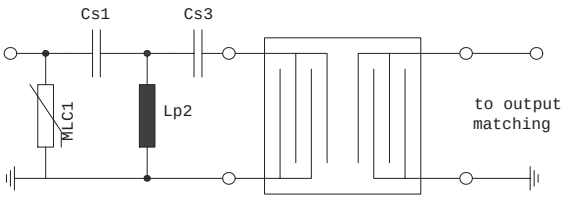


Fig. 1 MLC varistor plus ESD matching

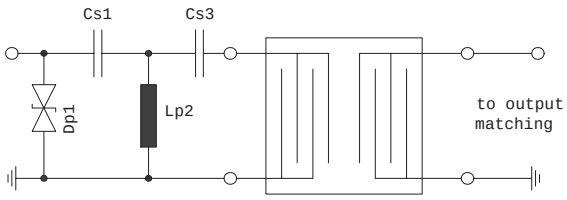


Fig. 2 Suppressor diode plus ESD matching

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

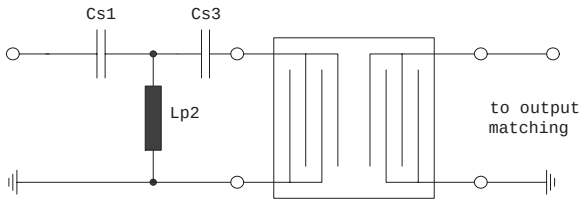


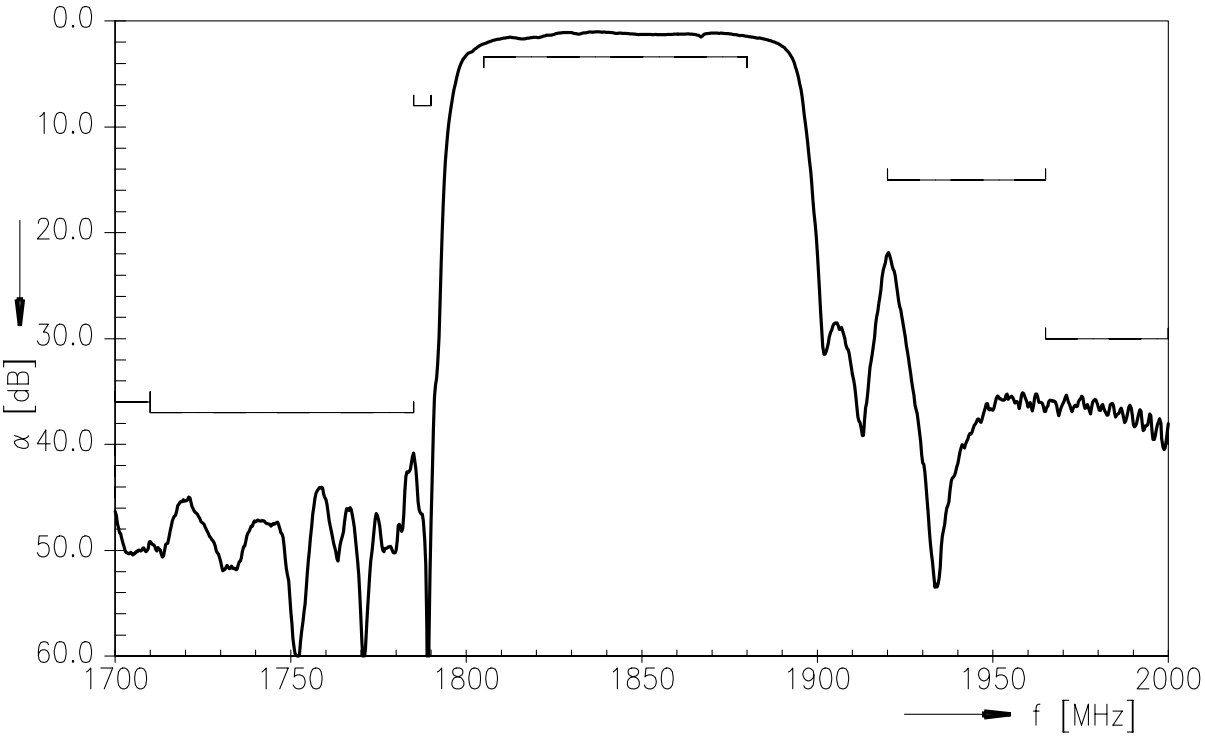
Fig. 3 3rd order high-pass structure for basic ESD protection

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.

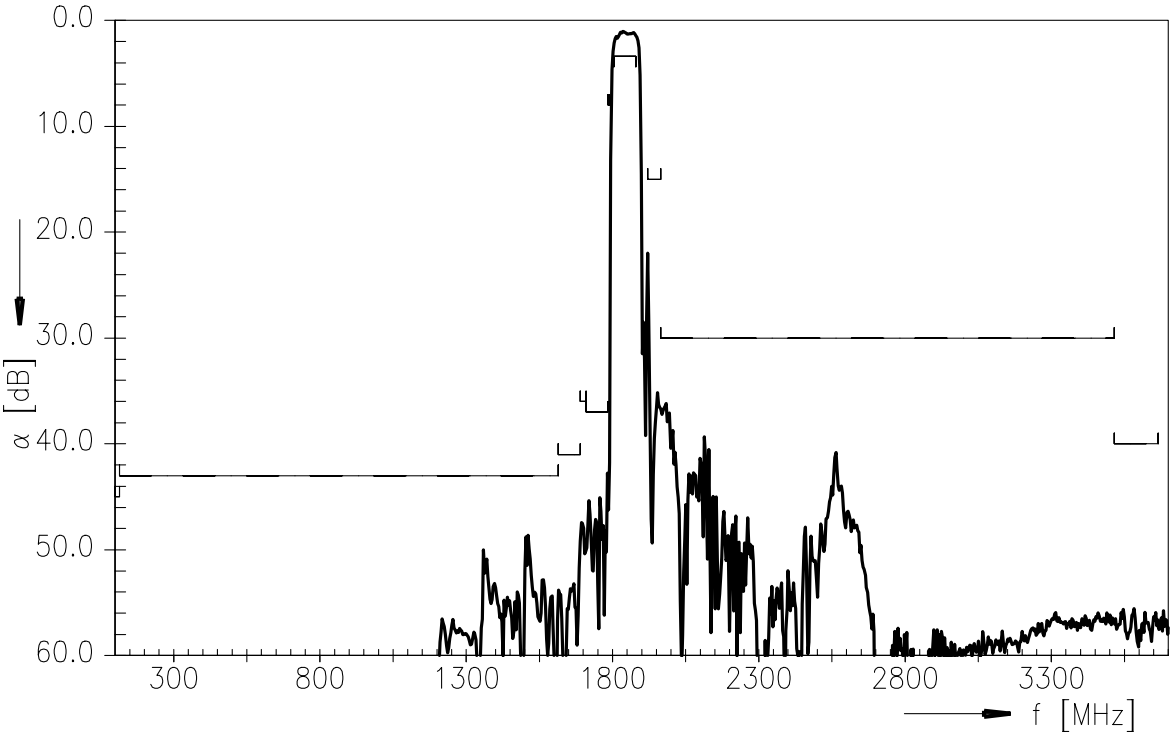
Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements.

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 “Application Notes”.

Transfer function



Transfer function (wideband)



References

Type	B4328
Ordering code	B39182B4328P810
Marking and package	C61157-A8-A9
Packaging	F61074-V8212-Z000
Date codes	L_1126
S-parameters	B4328_NB_UN.s3p, B4328_WB_UN.s3p
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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