SAW Components

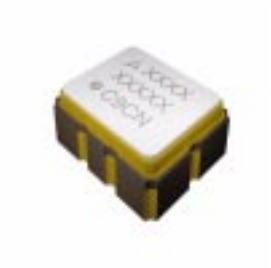
SAW RF filter

Automotive telematics

Series/type:	**B3515**
Ordering code:	**B39202B3515H910**
Date:	January 31, 2013
Version:	2.3

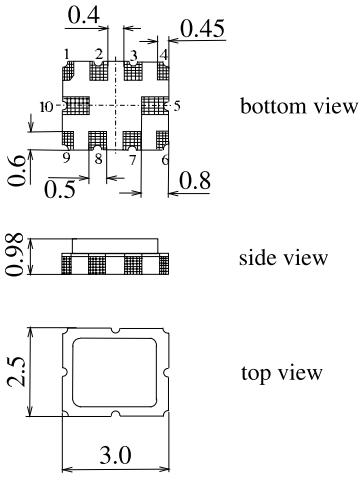
Application

- Low-loss RF filter for GSM 1800/1900 system, receive path
- Usable passband:
  Filter 1 (GSM1800): 75 MHz
  Filter 2 (GSM1900): 60 MHz
- Unbalanced to balanced operation of both filters
- Impedance transformation from 50 Ω to 150 Ω for both filters
- Suitable for GPRS class 1 to 12



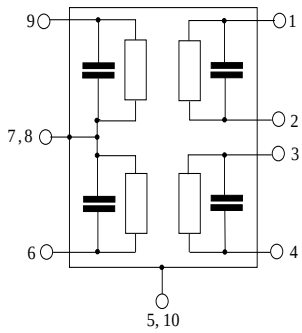
Features

- Package size 3.0 x 2.5 x 0.98 mm³
- Package code QCC10G
- RoHS compatible
- Approximate weight 0.027 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- Lead free soldering compatible with J - STD20C
- AEC-Q200 qualified component family
- **E**lectrostactic **S**ensitive **D**evice (**ESD**)



Pin configuration[1)]

- 1,2 Output, balanced [Filter 1]
- 3,4 Output, balanced [Filter 2]
- 6 Input [Filter 2]
- 9 Input [Filter 1]
- 5,7,8,10 Case grounded



1) The recommended pin configuration usually offers best suppression of electrical crosstalk. The filter characteristics refer to this configuration.

Characteristics Filter 1 (GSM1800)

Temperature range for specification: T = –40 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω (balanced) || 12 nH

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	1842.5	—	MHz
Maximum insertion attenuation	α_{max}				
1805.0 ... 1880.0 MHz		—	2.6	3.0	dB
Amplitude ripple					
1805.0 ... 1880.0 MHz		—	1.2	1.6	dB
VSWR					
1805.0 ... 1880.0 MHz		—	2.2	2.4	
Output amplitude balance ($\lvert S_{31}/S_{21}\rvert$)					
1805.0 ... 1880.0 MHz		–1.5		1.5	dB
Output phase balance ($\phi(S_{31})-\phi(S_{21})+180^\circ$)					
1805.0 ... 1880.0 MHz		–15.0		15.0	degree
Attenuation	α_{abs}				
10.00 ... 1000.00 MHz		40	50	—	dB
1000.00 ... 1700.00 MHz		26	30	—	dB
1700.00 ... 1785.00 MHz		10	17	—	dB
1920.00 ... 1980.00 MHz		15	20	—	dB
1980.00 ... 2030.00 MHz		24	28	—	dB
2030.00 ... 3000.00 MHz		30	32	—	dB

Characteristics Filter 2 (GSM1900)

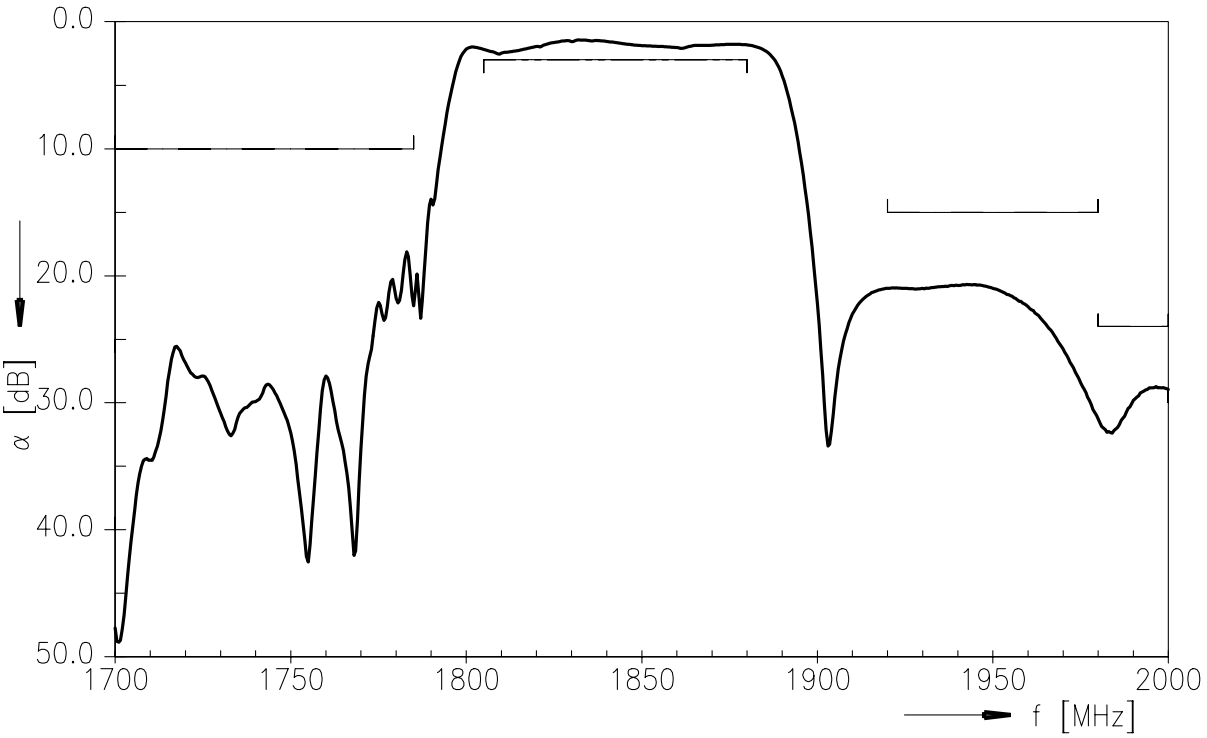
Temperature range for specification: T = –40 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω (balanced) || 12 nH

		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	1960.0	—	MHz
Maximum insertion attenuation	α_{max}				
1930.0 ... 1990.0 MHz		—	2.6	3.1	dB
Amplitude ripple					
1930.0 ... 1990.0 MHz		—	1.0	1.5	dB
VSWR					
1930.0 ... 1990.0 MHz		—	2.2	2.4	
Output amplitude balance ($\lvert S_{31}/S_{21}\rvert$)					
1930.0 ... 1990.0 MHz		–1.5		1.5	dB
Output phase balance ($\phi(S_{31})-\phi(S_{21})+180^\circ$)					
1930.0 ... 1990.0 MHz		–15.0		15.0	degree
Attenuation	α_{abs}				
10.00 ... 1480.00 MHz		38	42	—	dB
1480.00 ... 1820.00 MHz		30	34	—	dB
1820.00 ... 1880.00 MHz		26	30	—	dB
1880.00 ... 1910.00 MHz		10	13	—	dB
2020.00 ... 2100.00 MHz		12	16	—	dB
2100.00 ... 2400.00 MHz		25	31	—	dB
2400.00 ... 3000.00 MHz		30	32	—	dB

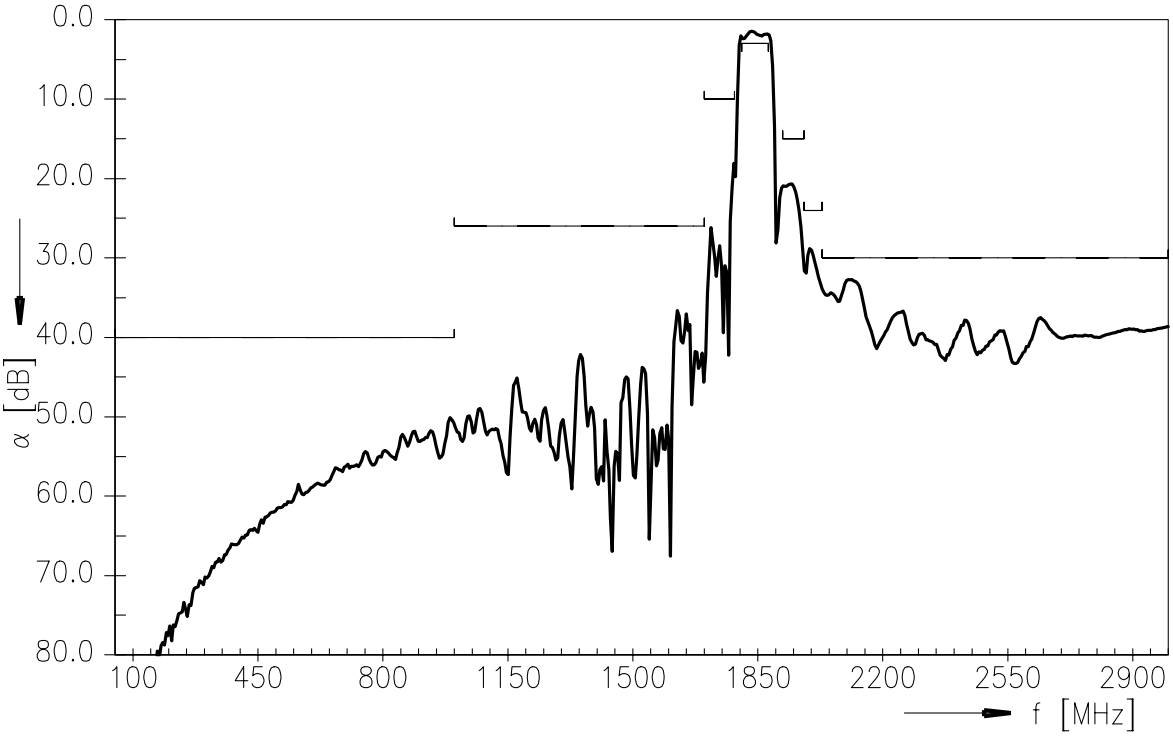
Maximum ratings

Operable temperature range	T	–45/+125	˚C	
Storage temperature range	T_{stg}	–45/+125	˚C	
DC voltage	V_{DC}	6	V	
ESD voltage	V_{ESD}	50	V	
Input power at Tx bands:				
GSM1800, GSM1900	P_{IN}	15	dBm	peak power of GSM signal duty cycle 4:8

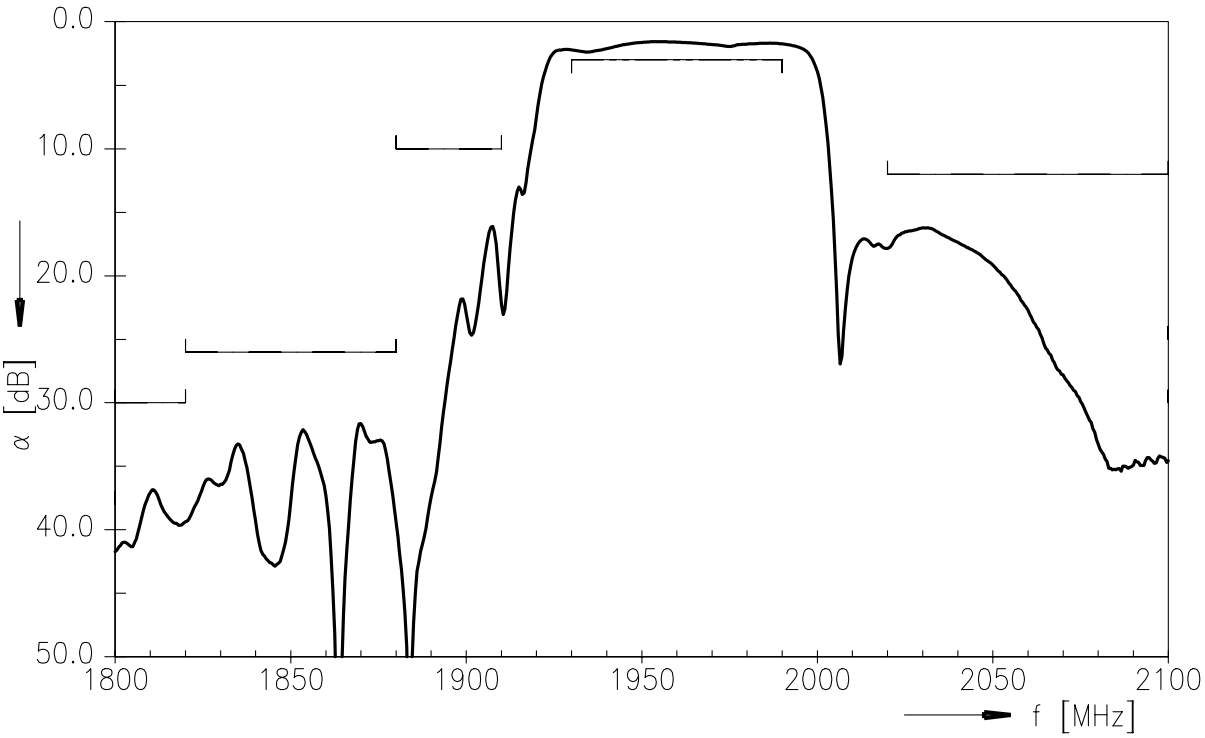
Transfer function Filter 1



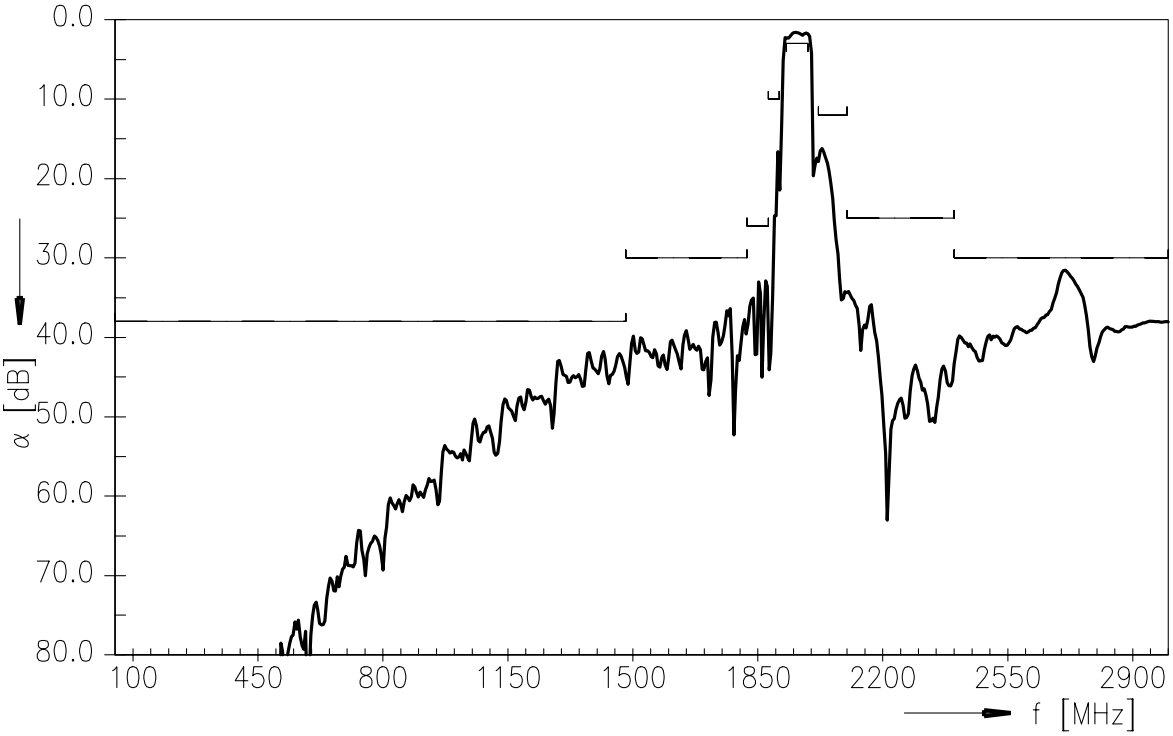
Transfer function Filter 1 (wideband)



Transfer function Filter 2



Transfer function Filter 2 (wideband)



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.

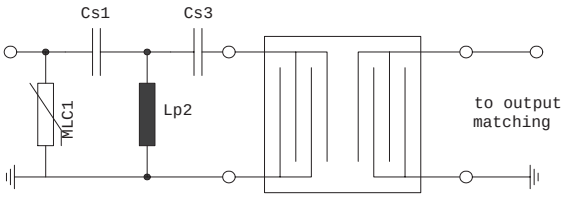


Fig. 1 MLC varistor plus ESD matching

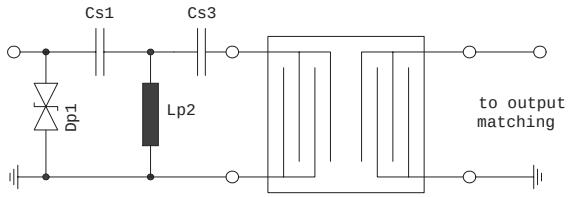


Fig. 2 Suppressor diode plus ESD matching

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

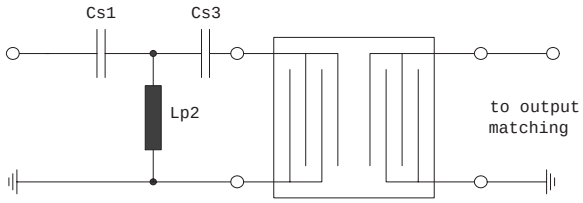


Fig. 3 3rd order high-pass structure for basic ESD protection

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	B3515
Ordering code	B39202B3515H910
Marking and package	C61157-A7-A142
Packaging	F61074-V8174-Z000
Date codes	L_1126
S-parameters	B3515_LB_NB.s3p, B3515_LB_WB.s3p B3515_UB_NB.s3p, B3515_UB_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 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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