SAW filters for automotive electronics

Series/Type: B4380

The following products presented in this data sheet are being withdrawn.

Ordering Code	Substitute Product	Date of Withdrawal	Deadline Last Orders	Last Shipments
B39941B4380P810		2016-01-08	2016-04-15	2016-07-15

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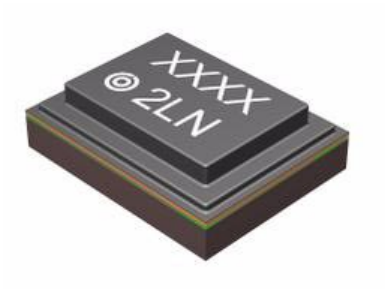
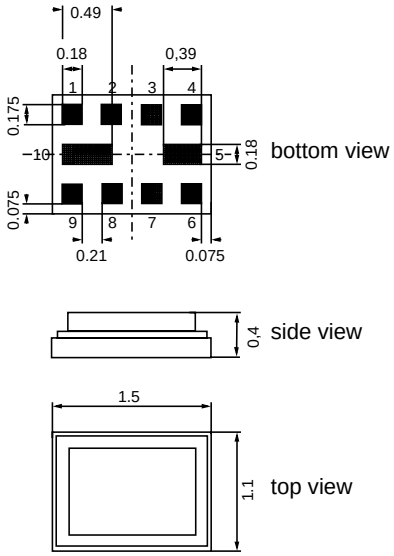
Application

- Low-loss 2in1 RF filter for mobile telephone GSM 900 and GSM 850 systems, receive path (Rx)
- Usable passband:
  Filter 1 (GSM 900): 35 MHz
  Filter 2 (GSM 850): 25 MHz
- Unbalanced to balanced operation for all filters
- Impedance transformation from 50 Ω to 150 Ω for both filters
- Low amplitude ripple
- Suitable for GPRS class 1 to 12



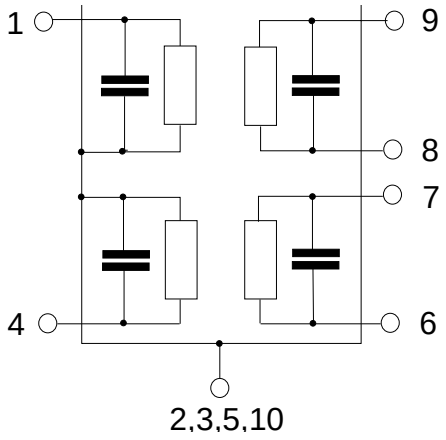
Features

- Package size 1.5 x1.1 x 0.40 mm³
- Package code QCS10W
- RoHS compatible
- Approx. 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**)



Pin configuration

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



Characteristics of Filter 1 (GSM 900)

Temperature range for specification: T = -20 ˚C to +75 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω || 72 nH (balanced)

		min.	typ. @25˚C	max.	
Center frequency	f_C	—	942.5	—	MHz
Maximum insertion attenuation	α_{max}				
925.0 ... 960.0 MHz		—	1.3	2.3 [1]	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
925.0 ... 960.0 MHz		—	0.8	1.5 [2]	dB
VSWR					
925.0 ... 960.0 MHz		—	1.9	2.3	
Common mode rejection ratio					
925.0 ... 960.0 MHz		19	25	—	dB
Attenuation	α				
100.0 ... 480.0 MHz		45	55	—	dB
480.0 ... 900.0 MHz		30	35	—	dB
900.0 ... 905.0 MHz		27	31	—	dB
905.0 ... 915.0 MHz		20 [3]	30	—	dB
980.0 ... 1000.0 MHz		25	29	—	dB
1000.0 ... 1850.0 MHz		28	31	—	dB
1850.0 ... 1920.0 MHz		40	44	—	dB
1920.0 ... 3700.0 MHz		35	39	—	dB
3700.0 ... 6000.0 MHz		30	36	—	dB

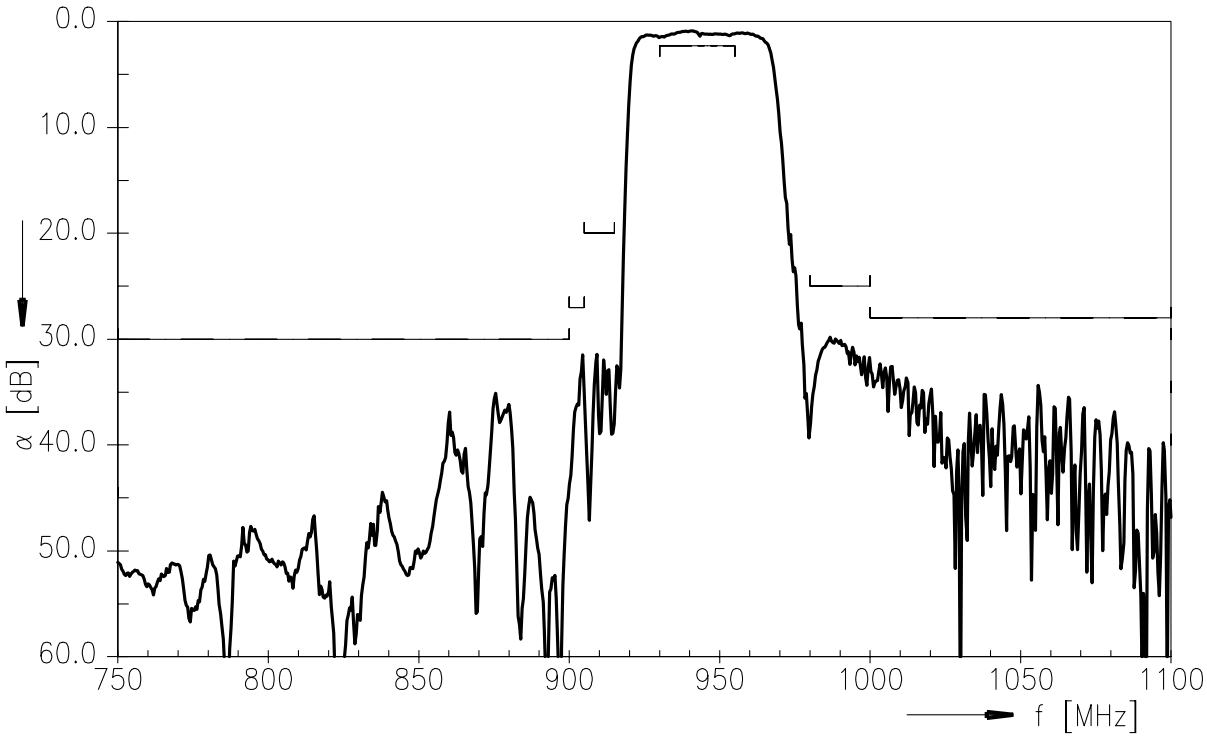
[1] 1.9 dB at 25˚C
[2] 1.2 dB at 25˚C
[3] 23 dB at 25˚C

Maximum ratings of Filter 1

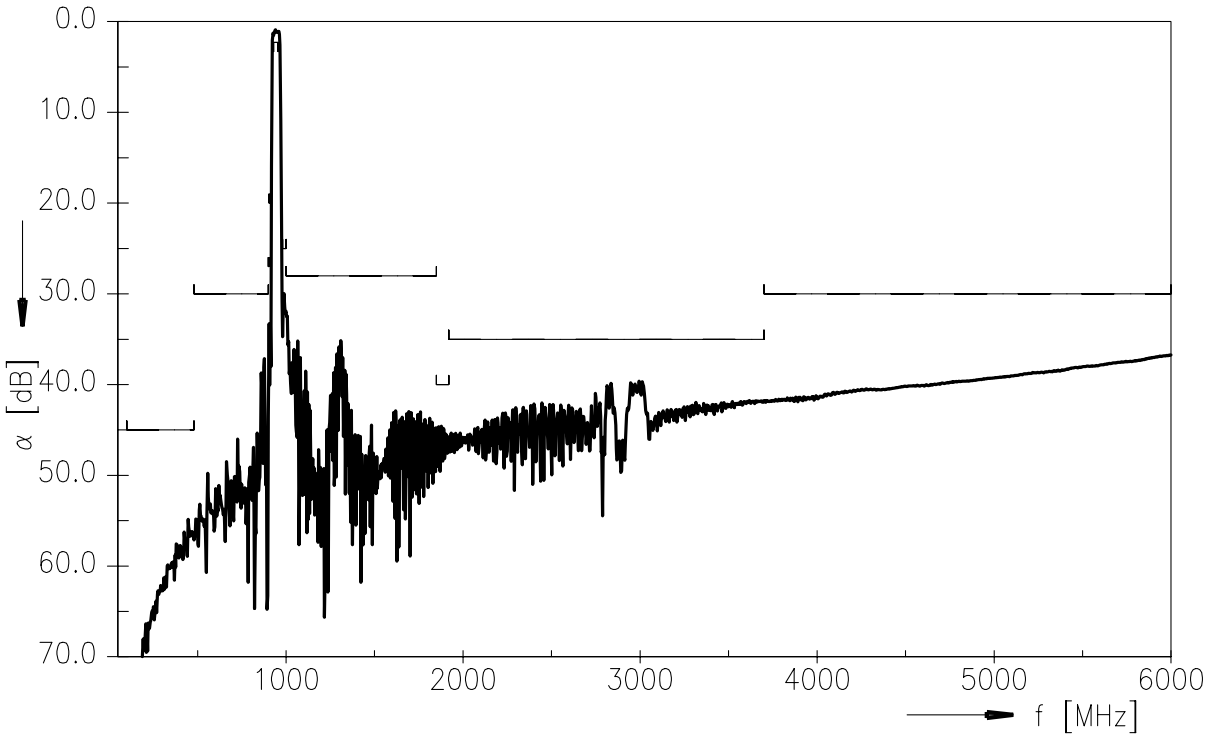
Operable temperature range	T	–40/+85	˚C	
Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	0	V	
ESD voltage	V_{ESD}	100[1)]	V	machine model, 1 pulse
Input power at				
GSM 850, GSM 900	P_{IN}	15	dBm	effective power in the on-state,
GSM 1800, GSM 1900	P_{IN}	15	dBm	duty cycle 4:8
Tx bands				

1) acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.

Transfer function of Filter 1



Transfer function of Filter 1 - wideband



Characteristics of Filter 2 (GSM 850)

Temperature range for specification: T = -20 ˚C to +75 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 150 Ω || 82 nH (balanced)

		min.	typ. @25˚C	max.	
Center frequency	f_C	—	881.5	—	MHz
Maximum insertion attenuation	α_{max}				
869.0 ... 894.0 MHz		—	1.4	2.2 [1]	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
869.0 ... 894.0 MHz		—	0.7	1.4 [2]	dB
VSWR					
869.0 ... 894.0 MHz		—	1.7	2.2	
Commom mode rejection ratio					
869.0 ... 894.0 MHz		17	20	—	dB
Attenuation	α				
100.0 ... 447.0 MHz		45	48	—	dB
447.0 ... 849.0 MHz		30	34	—	dB
914.0 ... 954.0 MHz		21	25	—	dB
954.0 ... 1738.0 MHz		28	33	—	dB
1738.0 ... 1788.0 MHz		40	55	—	dB
1788.0 ... 3476.0 MHz		35	40	—	dB
3476.0 ... 6000.0 MHz		26	31	—	dB

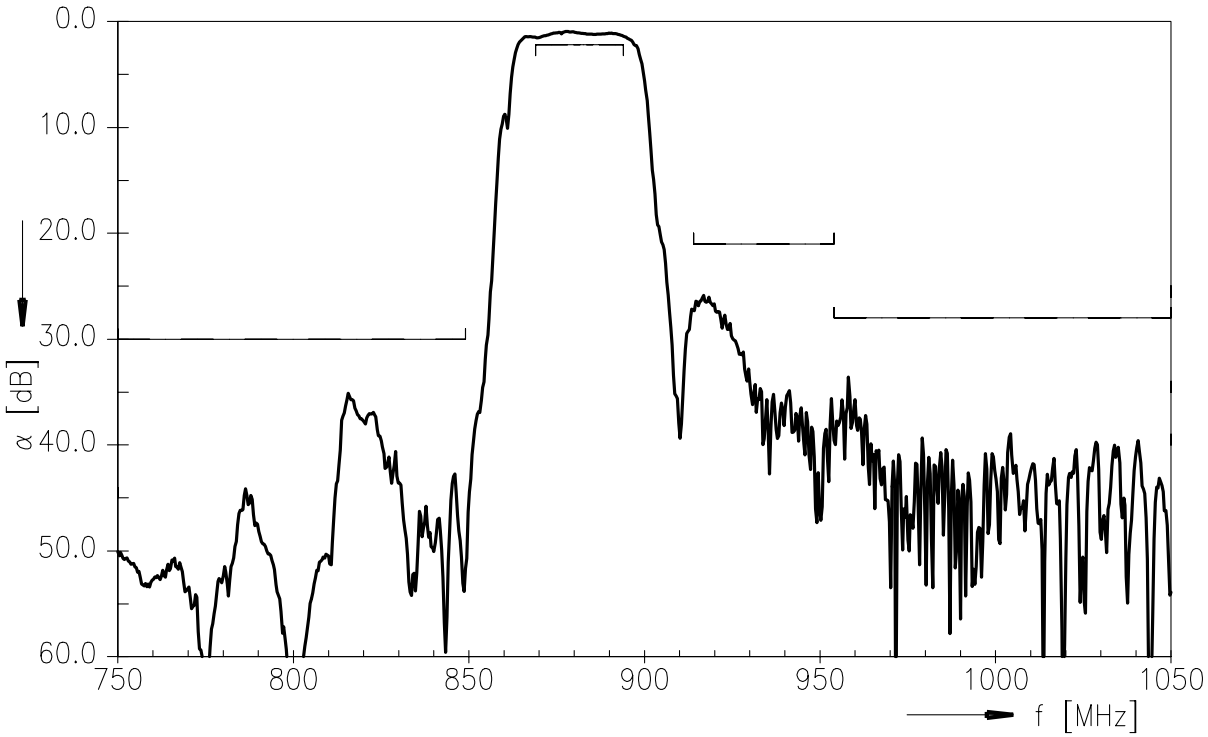
[1] 1.9 dB at 25˚C
[2] 1.1 dB at 25˚C

Maximum ratings of Filter 2

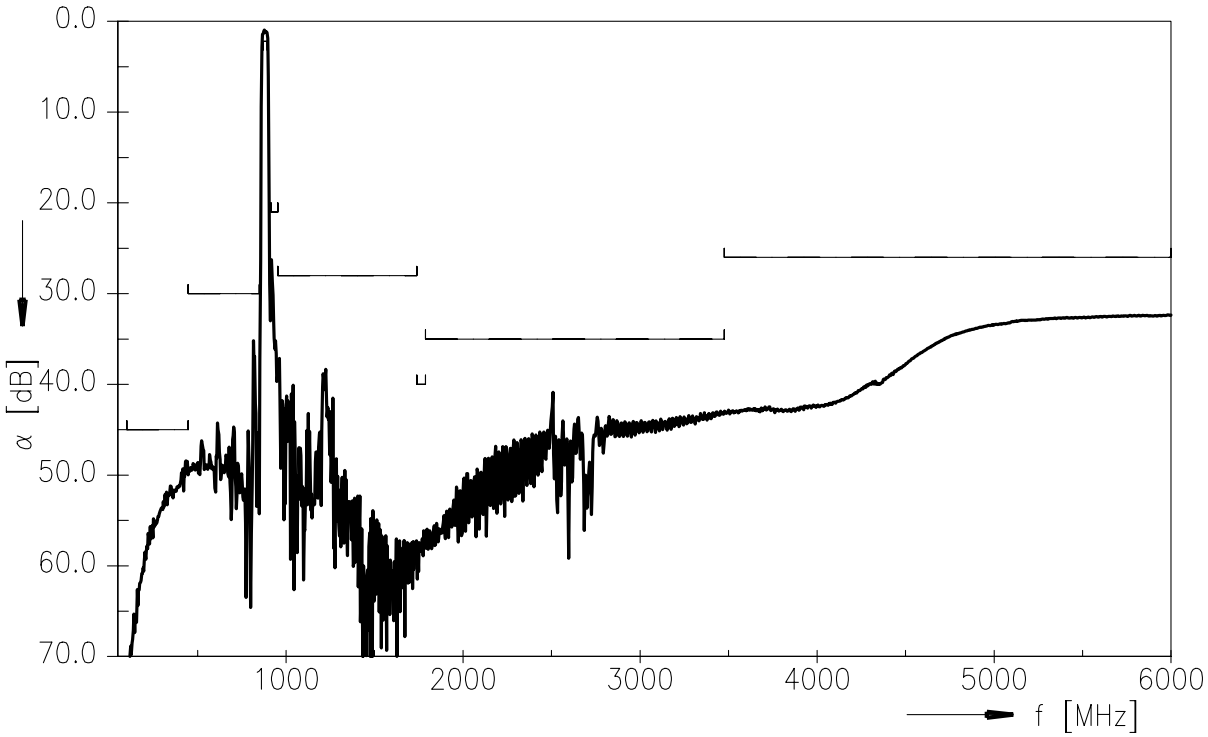
Operable temperature range	T	–40/+85	˚C	
Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	0	V	
ESD voltage	V_{ESD}	100[1)]	V	machine model, 1 pulse
Input power at				
GSM 850, GSM 900	P_{IN}	15	dBm	effective power in the on-state,
GSM 1800, GSM 1900	P_{IN}	15	dBm	duty cycle 4:8

1) acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.

Transfer function of Filter 2



Transfer function of 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.

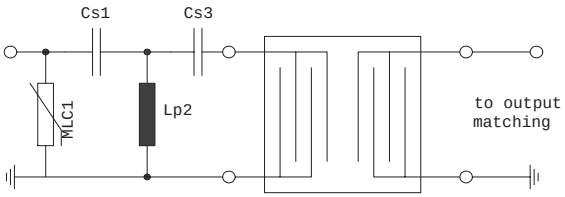


Fig. 1 MLC varistor plus ESD matching

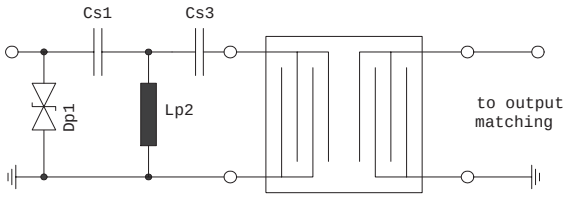


Fig. 2 Suppressor diode plus ESD matching

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

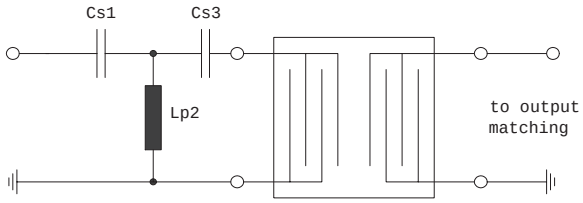


Fig. 3 3rd order high-pass structure for basic ESD protection

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	B4380
Ordering code	B39941B4380P810
Marking and package	C61157-A8-A10
Packaging	F61074-V8227-Z000
Date code	L_1126
S-parameters	B4380_LB_NB.s3p, B4380_LB_WB.s3p B4380_UB_NB.s3p, B4380_UB_WB.s3p See file header for port/pin assignment table.
Soldering profile	S_6001
RoHS compatible	defined as compatible with the following documents: "DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. 2005/618/EC from April 18th, 2005, amending Directive 2002/95/EC of the European Parliament and of the Council for the purposes of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment."
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