



SAW Components

SAW Rx 4in1 input/output duplex filter

GSM850 / GSM900 / GSM1800 / GSM1900

Series/type:	B9838
Ordering code:	B39202B9838P810
Date:	December 18,2014
Version:	2.1

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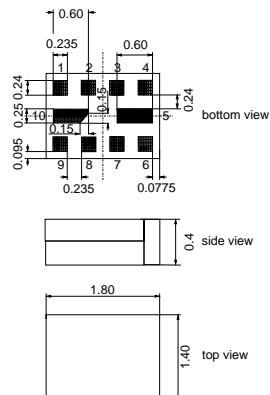
Data sheet


Application

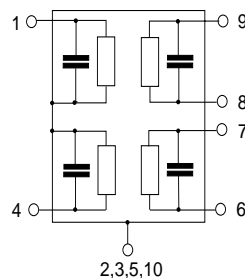
- Low-loss 4in1 RF filter for mobile telephone GSM 1900, GSM 1800, GSM 900 and GSM 850 systems, receive path (Rx)
- Usable passband:
 - Filter 1 (GSM 1900): 60 MHz
 - Filter 2 (GSM 1800): 75 MHz
 - Filter 3 (GSM 900): 35 MHz
 - Filter 4 (GSM 850): 25 MHz
- Unbalanced to balanced operation for all filters
- Impedance transformation from 50 Ω to 150 Ω for all filters
- Low amplitude ripple
- Suitable for GPRS class 1 to 12


Features

- Package size 1.8 x 1.4 x 0.4 mm³
- RoHS compatible
- Approx. weight 0.004g
- Package for **Surface Mount Technology (SMT)**
- Ni, gold-plated terminals
- **Electrostatic Sensitive Device (ESD)**
- **Moisture Sensitive Level 3**


Pin configuration

- 1 Input [Diplex Filter 1 & 3]
- 4 Input [Diplex Filter 2 & 4]
- 6,7 Output, balanced [Diplex Filter 3 & 4]
- 8,9 Output, balanced [Diplex Filter 1 & 2]
- 2,3,5,10 To be grounded



Data sheet


Characteristics of Filter 1 (GSM1900)

Temperature range for specification: $T = -20\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$
 Terminating source impedance: $Z_S = 50\ \Omega \parallel 6.3\ \text{nH}$
 Terminating load impedance: $Z_L = 150\ \Omega \parallel 9.0\ \text{nH}$

		min.	typ. @ 25 °C	max.	
Center frequency	f_C	—	1960.0	—	MHz
Maximum insertion attenuation	α_{\max}	—	2.3	3.4	dB
1930.0 ... 1990.0 MHz					
Amplitude ripple (p-p)	$\Delta\alpha$	—	0.6	1.7	dB
1930.0 ... 1990.0 MHz					
Input VSWR		—	1.8	2.4	
1930.0 ... 1990.0 MHz					
Output VSWR		—	2.0	2.5	
1930.0 ... 1990.0 MHz					
CMRR ($S_{21}-S_{31} / S_{21}+S_{31}$)		16	21	—	dB
1930.0 ... 1990.0 MHz					
Attenuation	α				
0.2 ... 1000.0 MHz		45	50	—	dB
1000.0 ... 1510.0 MHz		35	45	—	dB
1510.0 ... 1805.0 MHz		30	39	—	dB
1805.0 ... 1850.0 MHz		26	32	—	dB
1850.0 ... 1890.0 MHz		23	37	—	dB
1890.0 ... 1910.0 MHz		8	16	—	dB
2010.2 ... 2070.0 MHz		6	19	—	dB
2070.0 ... 2400.0 MHz		22	27	—	dB
2400.0 ... 3000.0 MHz		30	36	—	dB
3000.0 ... 6000.0 MHz		30	38	—	dB


Maximum ratings of Filter 1

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T _{stg}	-40/+85	°C	
DC voltage	V _{DC}	5 ¹⁾	V	
ESD voltage	V _{ESD}	50 ²⁾	V	Machine Model
		325 ³⁾	V	Human Body Model
		600 ⁴⁾	V	Charged Device Model
Input power at				
GSM850, GSM900	P _{IN}	13	dBm	effective power in the on-state, duty cycle 4:8
GSM1800, GSM1900	P _{IN}	13	dBm	
Tx bands				

1) 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

2) acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.

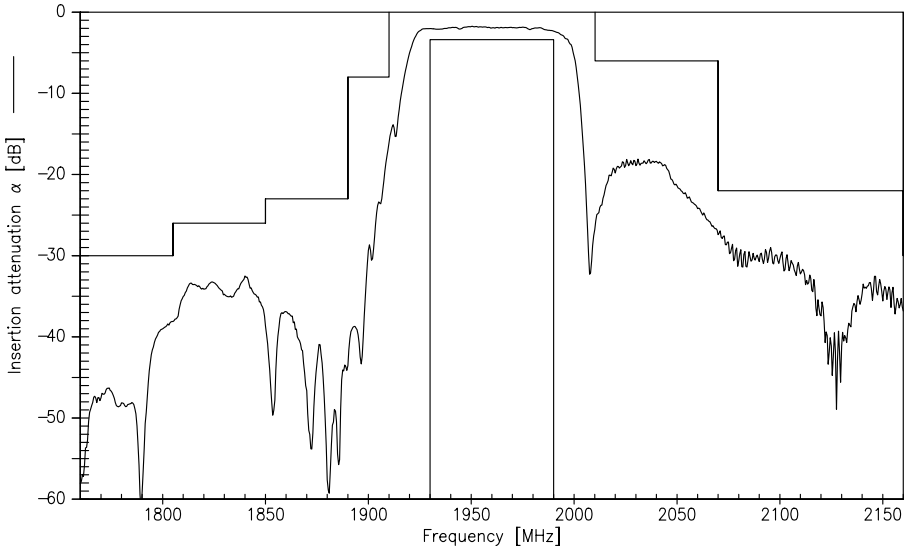
3) acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses.

4) acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses.

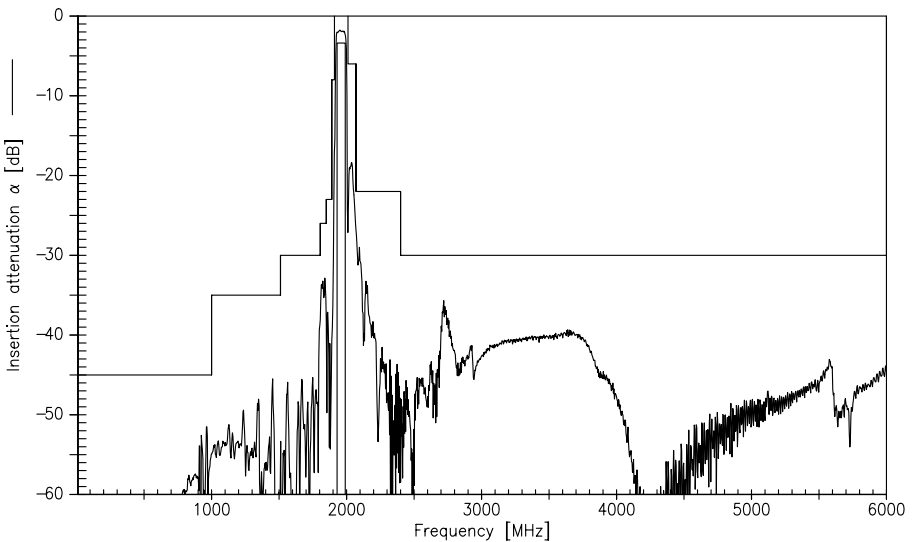
Data sheet



Transfer function of filter 1 - narrowband



Transfer function of filter 1 - wideband

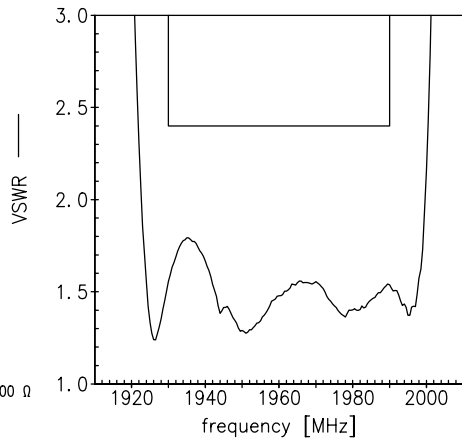
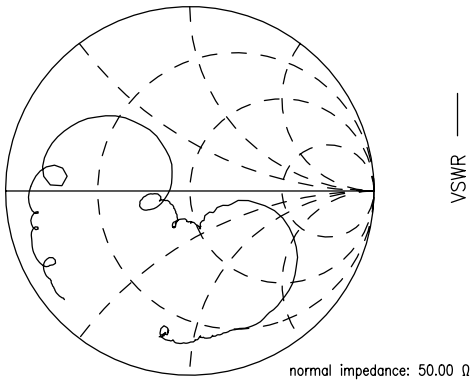


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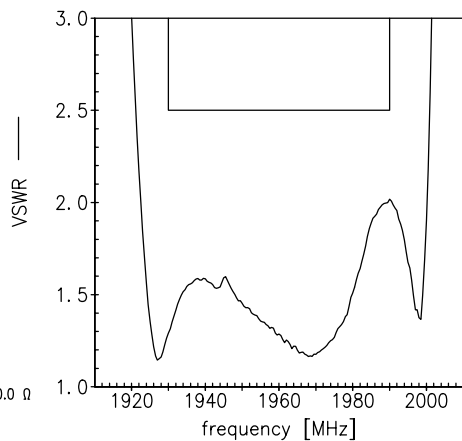
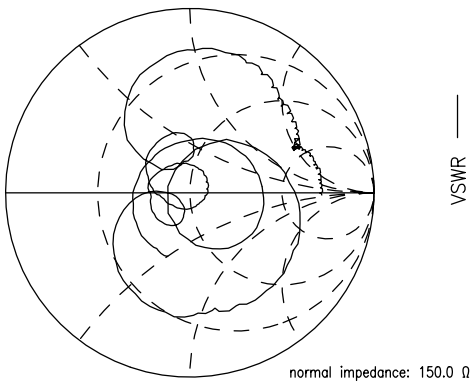


Smith Charts filter 1

S₁₁ function



S₂₂ function



Data sheet


Characteristics of Filter 2 (GSM1800)

Temperature range for specification: $T = -20\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
 Terminating source impedance: $Z_S = 50\ \Omega \parallel 6.3\ \text{nH}$
 Terminating load impedance: $Z_L = 150\ \Omega \parallel 9.0\ \text{nH}$

		min.	typ. @ 25 °C	max.	
Center frequency	f_C	—	1842.5	—	MHz
Maximum insertion attenuation	α_{\max}	—	2.3	3.4	dB
1805.0 ... 1880.0 MHz					
Amplitude ripple (p-p)	$\Delta\alpha$	—	0.9	2.0	dB
1805.0 ... 1880.0 MHz					
Input VSWR		—	2.0	2.5	
1805.0 ... 1880.0 MHz					
Output VSWR		—	1.9	2.4	
1805.0 ... 1880.0 MHz					
CMRR ($ S_{21}-S_{31} / S_{21}+S_{31} $)		17	21	—	dB
1805.0 ... 1880.0 MHz					
Attenuation	α				
10.0 ... 824.0 MHz		45	58	—	dB
824.0 ... 940.0 MHz		41	52	—	
940.0 ... 1690.0 MHz		27	40	—	dB
1690.0 ... 1705.0 MHz		27	40	—	
1705.0 ... 1785.0 MHz		10	16	—	dB
1920.0 ... 1980.2 MHz		20	27	—	
1980.2 ... 2030.0 MHz		24	36	—	dB
2030.0 ... 2650.0 MHz		28	36	—	
2650.0 ... 6000.0 MHz		30	42	—	dB


Maximum ratings of filter 2

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T _{stg}	-40/+85	°C	
DC voltage	V _{DC}	5 ¹⁾	V	
ESD voltage	V _{ESD}	50 ²⁾	V	Machine Model
		325 ³⁾	V	Human Body Model
		600 ⁴⁾	V	Charged Device Model
Input power at				
GSM850, GSM900	P _{IN}	13	dBm	effective power in the on-state, duty cycle 4:8
GSM1800, GSM1900	P _{IN}	13	dBm	
Tx bands				

1) 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

2) acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.

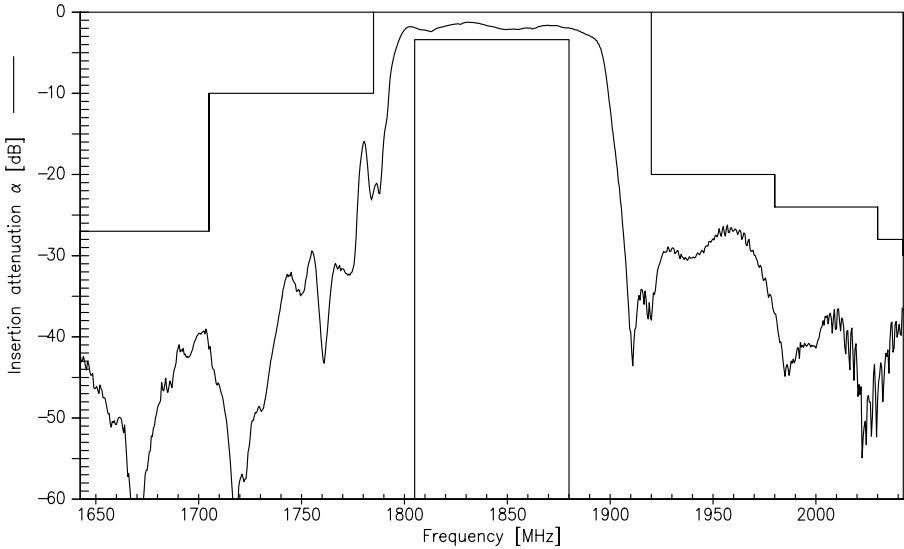
3) acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses.

4) acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses.

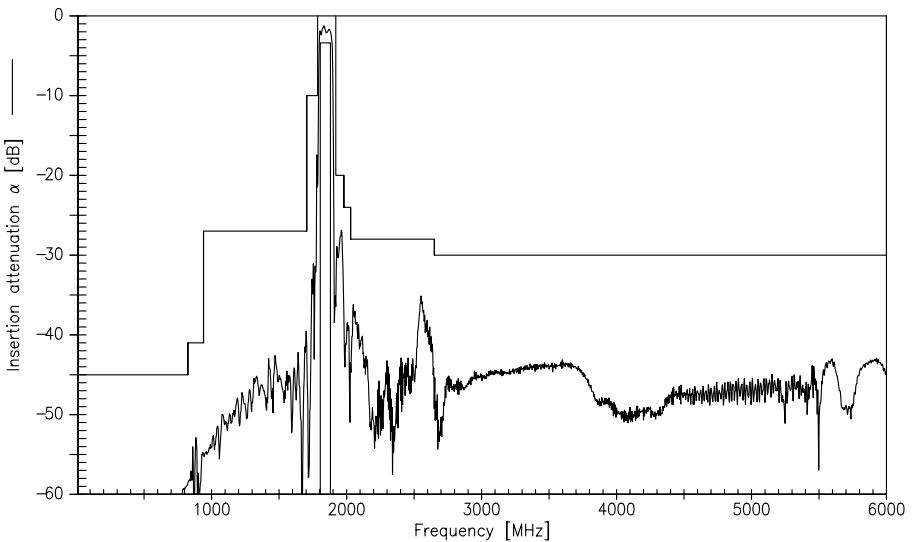
Data sheet



Transfer function of filter 2 - narrowband



Transfer function of filter 2 - wideband

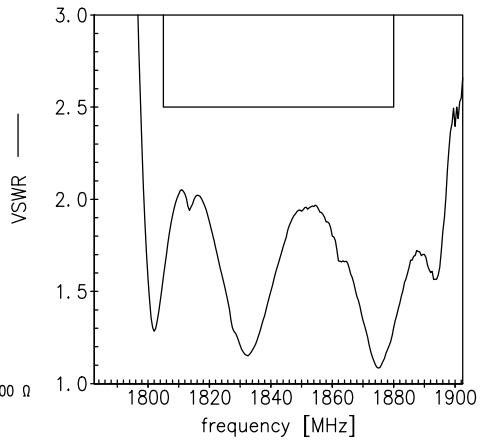
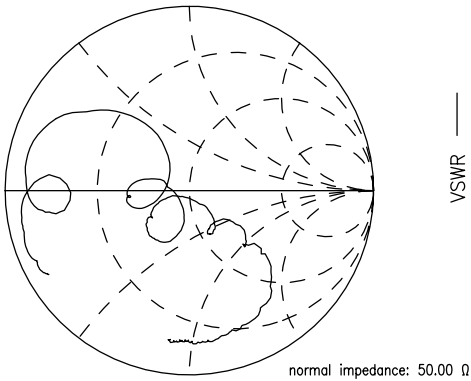


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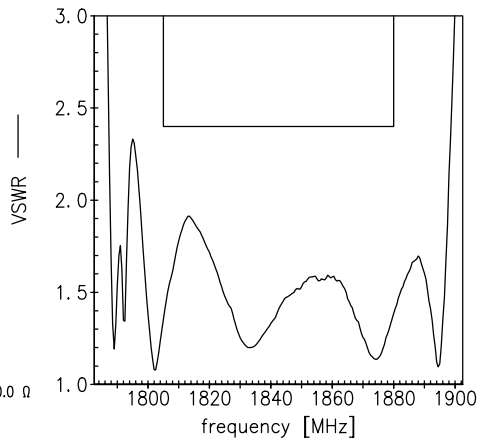
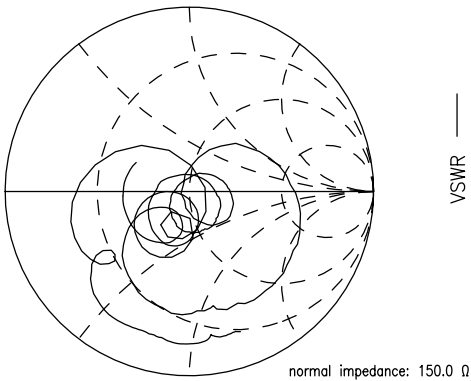


Smith Charts filter 2

S₁₁ function



S₂₂ function



Data sheet


Characteristics of Filter 3 (GSM 900)

Temperature range for specification: $T = -20\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$
 Terminating source impedance: $Z_S = 50\Omega \parallel 6.3\text{nH}$
 Terminating load impedance: $Z_L = 150\Omega \parallel 21\text{nH}$

		min.	typ. @ 25°C	max.	
Center frequency	f_C	—	942.5	—	MHz
Maximum insertion attenuation	α_{\max}	—	2.2	3.1	dB
925.0 ... 960.0 MHz					
Amplitude ripple (p-p)	$\Delta\alpha$	—	0.9	1.8	dB
925.0 ... 960.0 MHz					
Input VSWR		—	1.8	2.4	
925.0 ... 960.0 MHz					
Output VSWR		—	1.6	2.3	
925.0 ... 960.0 MHz					
CMRR ($S_{21}-S_{31} / S_{21}+S_{31}$)		17	21	—	dB
925.0 ... 960.0 MHz					
Attenuation	α				
10.0 ... 480.0 MHz		45	73	—	dB
480.0 ... 850.0 MHz		30	47	—	
850.0 ... 905.0 MHz		21	31	—	dB
905.0 ... 915.0 MHz		10	17	—	
980.2 ... 1000.0 MHz		18	24	—	dB
1000.0 ... 1850.0 MHz		28	36	—	
1850.0 ... 1920.0 MHz		35	45	—	dB
1920.0 ... 3300.0 MHz		28	42	—	
3300.0 ... 6000.0 MHz		28	38	—	dB


Maximum ratings of Filter 3

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T _{stg}	-40/+85	°C	
DC voltage	V _{DC}	5 ¹⁾	V	
ESD voltage	V _{ESD}	50 ²⁾	V	Machine Model
		325 ³⁾	V	Human Bodel Model
		600 ⁴⁾	V	Charged Device Model
Input power at				
	GSM 850, GSM 900	P _{IN}	13	dBm
GSM 1800, GSM 1900	P _{IN}	13	dBm	
Tx bands				

¹⁾ 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

²⁾ acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.

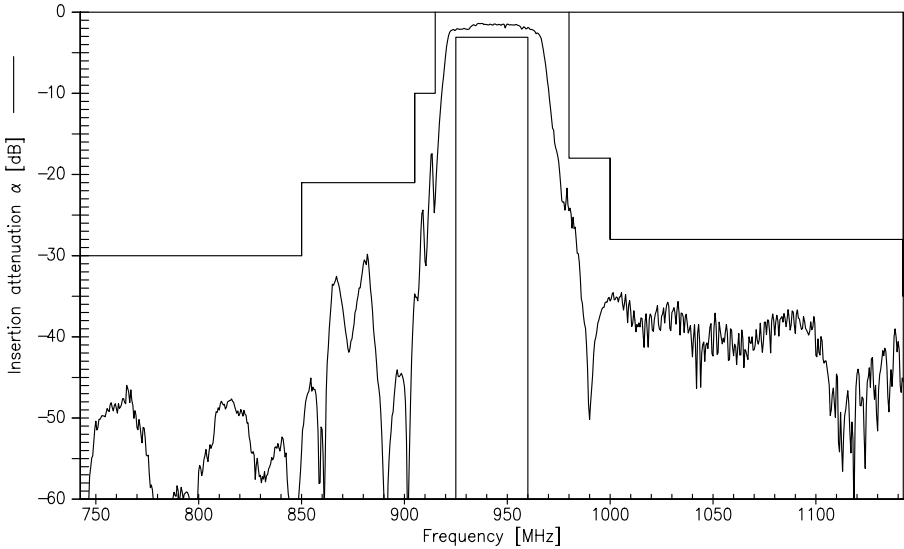
³⁾ acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses.

⁴⁾ acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses.

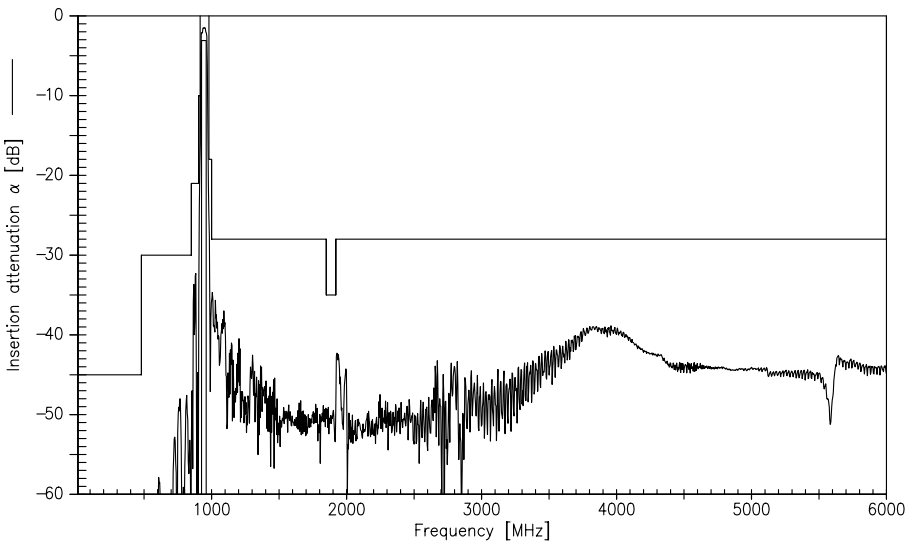
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Transfer function of filter 3 - narrowband



Transfer function of filter 3 - wideband

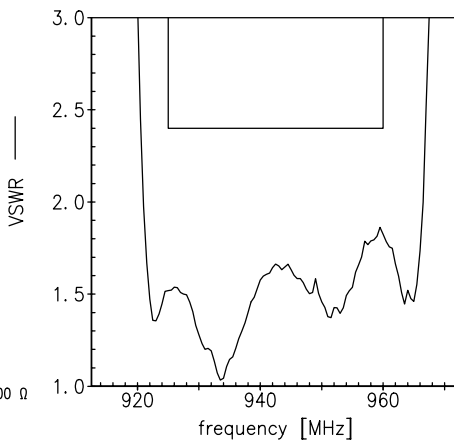
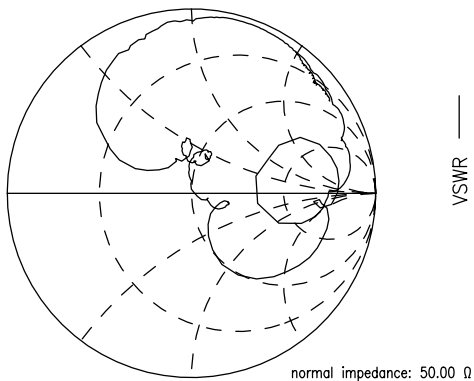


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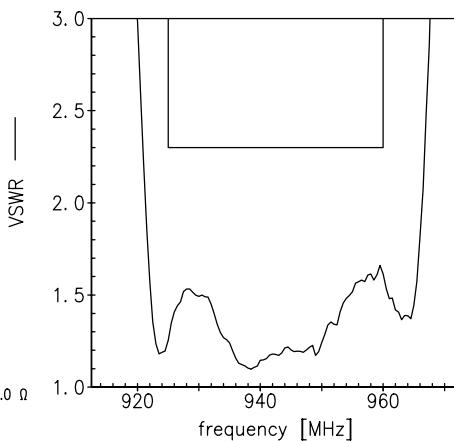
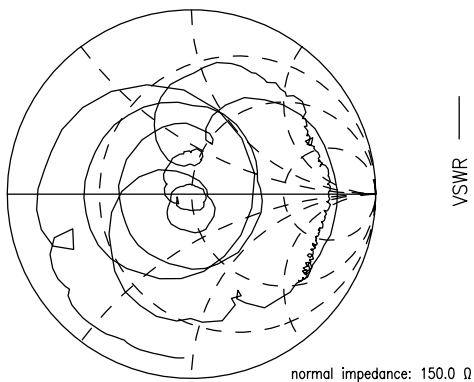


Smith Charts filter 3

S_{11} function



S_{22} function



Data sheet


Characteristics of Filter 4 (GSM 850)

Temperature range for specification: $T = -20\text{ °C to }+85\text{ °C}$
 Terminating source impedance: $Z_S = 50\Omega \parallel 6.3\text{ nH}$
 Terminating load impedance: $Z_L = 150\Omega \parallel 21\text{ nH}$

		min.	typ. @ 25 °C	max.	
Center frequency	f_C	—	881.5	—	MHz
Maximum insertion attenuation	α_{\max}	—	1.8	2.8	dB
869.0 ... 894.0 MHz					
Amplitude ripple (p-p)	$\Delta\alpha$	—	0.5	1.5	dB
869.0 ... 894.0 MHz					
Input VSWR		—	1.8	2.4	
869.0 ... 894.0 MHz					
Output VSWR		—	1.7	2.3	
869.0 ... 894.0 MHz					
Common mode rejection ratio		17	23	—	dB
869.0 ... 894.0 MHz					
Attenuation	α				
10.0 ... 447.0 MHz		45	68	—	dB
447.0 ... 800.0 MHz		30	46	—	dB
800.0 ... 849.0 MHz		26	32	—	dB
914.2 ... 940.0 MHz		20	25	—	dB
940.0 ... 1000.0 MHz		24	41	—	dB
1000.0 ... 1850.0 MHz		28	41	—	dB
1850.0 ... 1920.0 MHz		35	42	—	dB
1920.0 ... 6000.0 MHz		28	35	—	dB


Maximum ratings of Filter 4

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T _{stg}	-40/+85	°C	
DC voltage	V _{DC}	5 ¹⁾	V	
ESD voltage	V _{ESD}	50 ²⁾	V	Machine Model
		325 ³⁾	V	Human Body Model
		600 ⁴⁾	V	Charged Device Model
Input power at				
	GSM 850, GSM 900	P _{IN}	13	dBm
GSM 1800, GSM 1900	P _{IN}	13	dBm	
Tx bands				

¹⁾ 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

²⁾ acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.

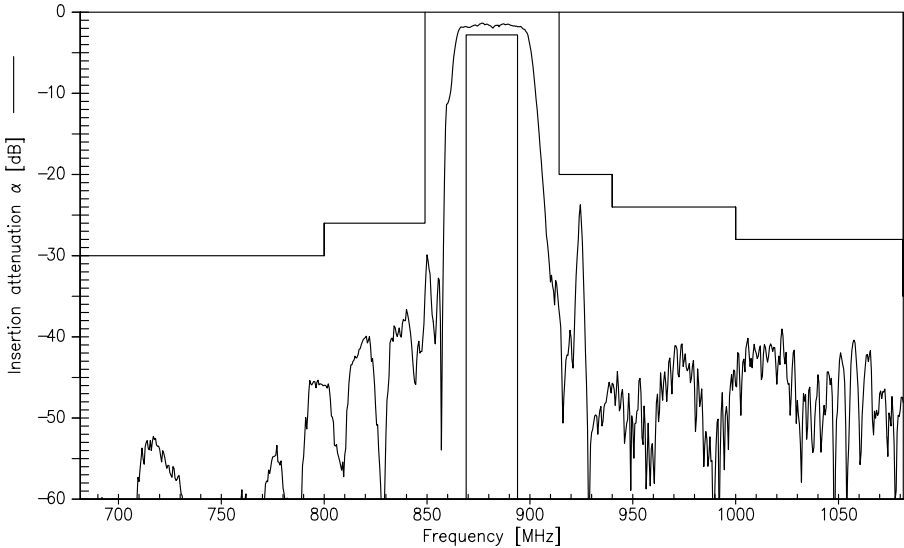
³⁾ acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses.

⁴⁾ acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses.

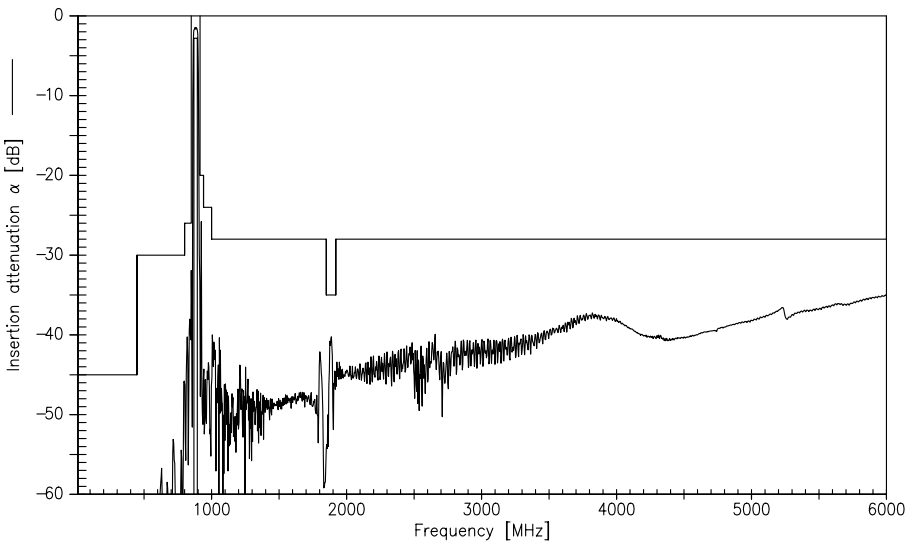
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Transfer function of filter 4 - narrowband



Transfer function of filter 4 - wideband

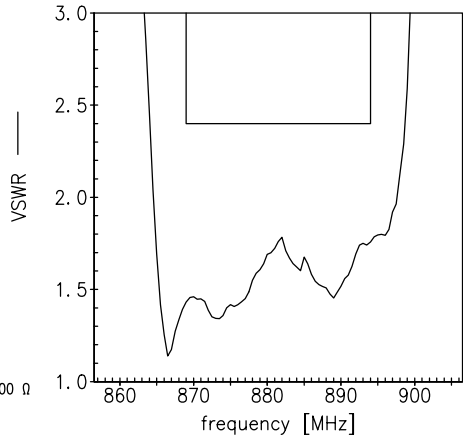
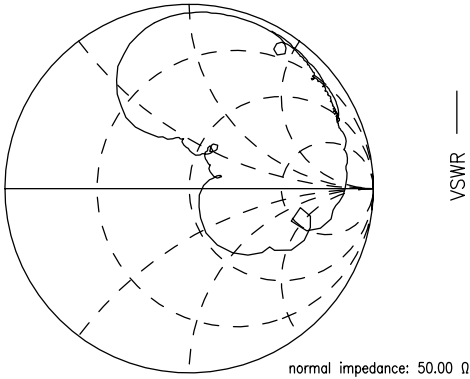


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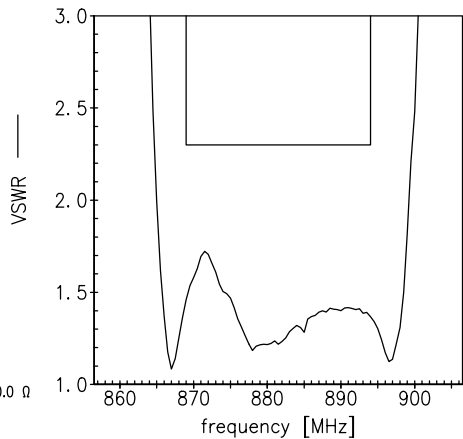
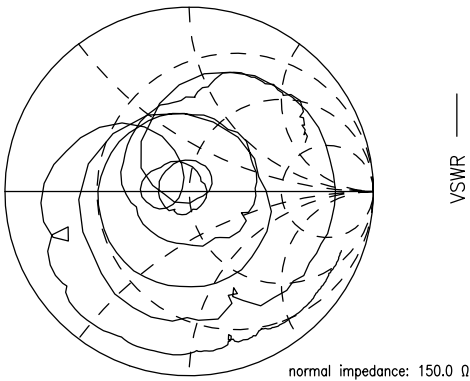


Smith Charts filter 4

S₁₁ function



S₂₂ function



SAW Components	B9838
SAW Rx 4in1 input/output duplex filter	881.5 / 942.5 / 1842.5 /

Data sheet



References

Type	B9838
Ordering code	B39202B9838P810
Marking and package	C61157-A8-A43
Packaging	F61074-V8259-Z000
Date codes	L_1126
S-parameters	B9838_LB_NB.s4p, B9838_LB_WB.s4p B9838_UB_NB.s4p, B9838_UB_WB.s4p 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.
Moldability	Before using in overmolding environment, please contact your EPCOS sales office.
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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