



## **SAW Components**

**SAW Rx 2in1 input duplex filter**  
GSM1900 / GSM1800

<b>Series/type:</b>	<b>B9513</b>
<b>Ordering code:</b>	<b>B39202B9513L310</b>
<b>Date:</b>	<b>May 27, 2010</b>
<b>Version:</b>	<b>2.0</b>



Data sheet



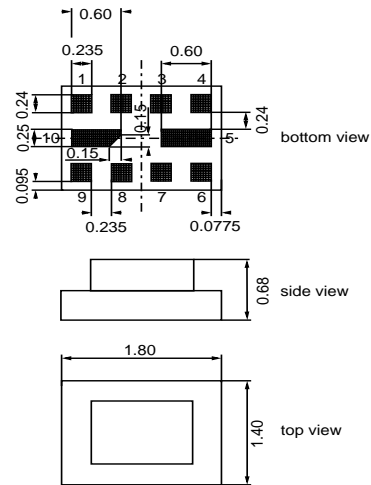
Application

- Low-loss 2in1 RF filter for mobile telephone GSM1900 and GSM1800 systems, receive path (Rx)
- Usable passband:  
 Filter 1 (GSM1900): 60 MHz  
 Filter 2 (GSM1800): 75 MHz
- Unbalanced to balanced operation for both filters
- Impedance transformation from 50 Ω to 150 Ω for both filters
- Low amplitude ripple
- Suitable for GPRS class 1 to 12



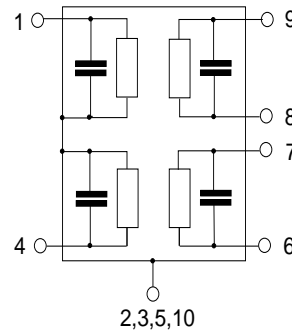
Features

- Package size 1.8 x 1.4 x 0.68 mm<sup>3</sup>
- Moisture Sensitive Level 3
- RoHS compatible
- Approx. weight 0.006g
- Package for Surface Mount Technology (SMT)
- Ni, gold-plated terminals
- **RoHS compatible**
- **Electrostatic Sensitive Device (ESD)**



Pin configuration

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





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**1960.0 / 1842.5 MHz**

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**Characteristics of Filter 1 (GSM1900)**

Temperature range for specification:  $T = -30\text{ °C to }+85\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega \parallel 3.3\text{nH}$   
 Terminating load impedance:  $Z_L = 150\ \Omega \parallel 18\text{nH (balanced)}$

		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	$f_C$	—	1960.0	—	MHz
<b>Maximum insertion attenuation</b> 1930.0 ... 1990.0 MHz	$\alpha_{\max}$	—	2.2	3.0	dB
<b>Amplitude ripple (p-p)</b> 1930.0 ... 1990.0 MHz	$\Delta\alpha$	—	0.9	1.8	dB
<b>Input VSWR</b> 1930.0 ... 1990.0 MHz		—	1.5	2.0	
<b>Output VSWR</b> 1930.0 ... 1990.0 MHz		—	1.6	2.1	
<b>CMRR</b> ( $ S_{21}-S_{31} / S_{21}+S_{31} $ ) 1930.0 ... 1990.0 MHz		22 <sup>1)</sup>	29	—	dB
<b>Attenuation</b>	$\alpha$				
10.0 ... 1510.0 MHz		40	53	—	dB
1510.0 ... 1830.0 MHz		30	35	—	dB
1830.0 ... 1850.0 MHz		23	33	—	dB
1850.0 ... 1890.0 MHz		18	30	—	dB
1890.0 ... 1910.0 MHz		9	14	—	dB
2010.0 ... 2070.0 MHz		4	12	—	dB
2070.0 ... 2400.0 MHz		21	33	—	dB
2400.0 ... 6000.0 MHz		30	43	—	dB

<sup>1)</sup> A CMRR of 21.9dB corresponds to a phase balance of 7° together with an amplitude balance of 0.9dB



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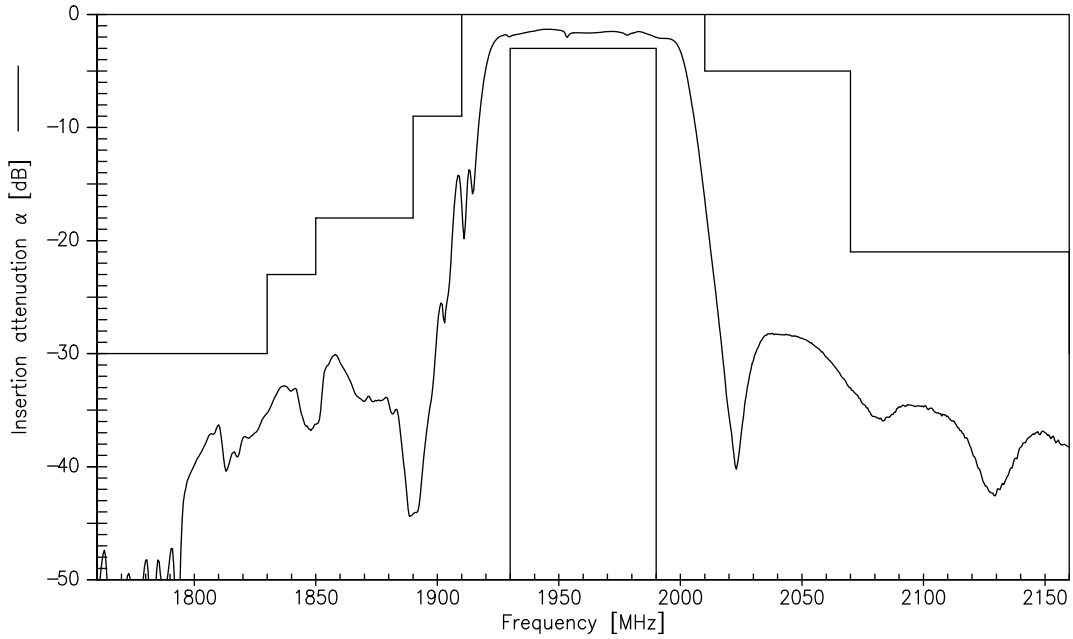
**Maximum ratings of Filter 1**

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T <sub>stg</sub>	-40/+85	°C	
DC voltage	V <sub>DC</sub>	5	V	
ESD voltage	V <sub>ESD</sub>	50 <sup>1)</sup>	V	machine model, 1 pulse
Input Power at				
GSM 850, GSM 900	P <sub>IN</sub>	15	dBm	effective power in the on-state, duty cycle 4:8
GSM 1800, GSM 1900	P <sub>IN</sub>	15	dBm	
Tx bands				

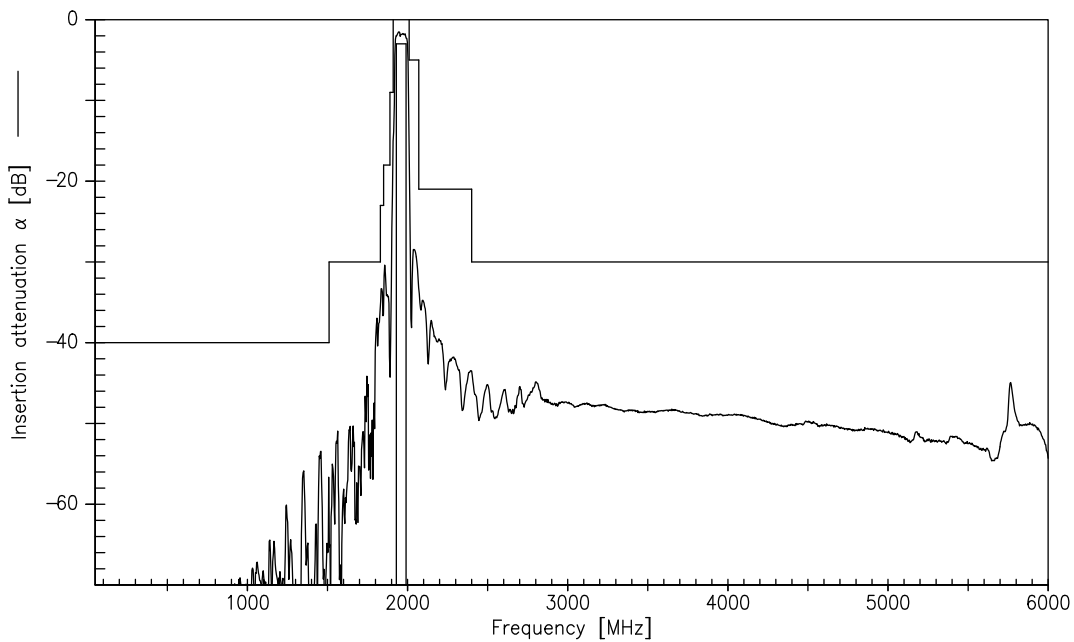
<sup>1)</sup> acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.



Transfer function Filter 1 (GSM1900)



Transfer function Filter 1 (GSM1900) - Wideband

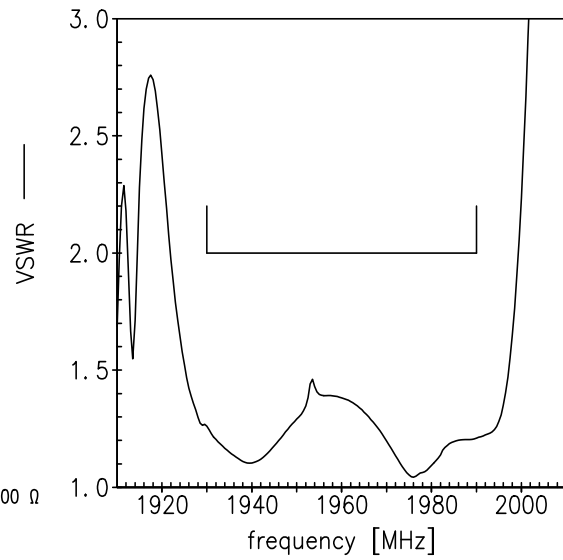
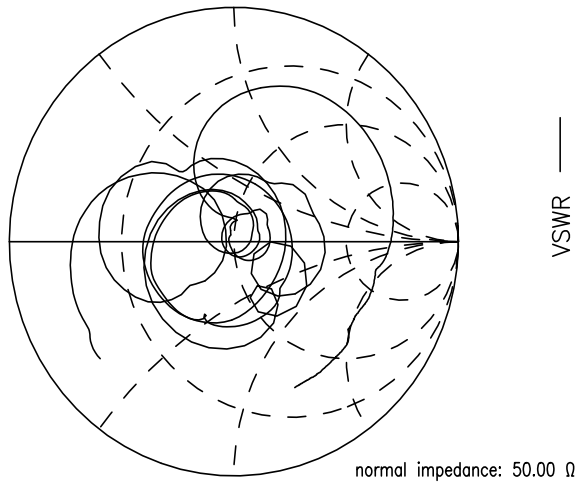


Data sheet

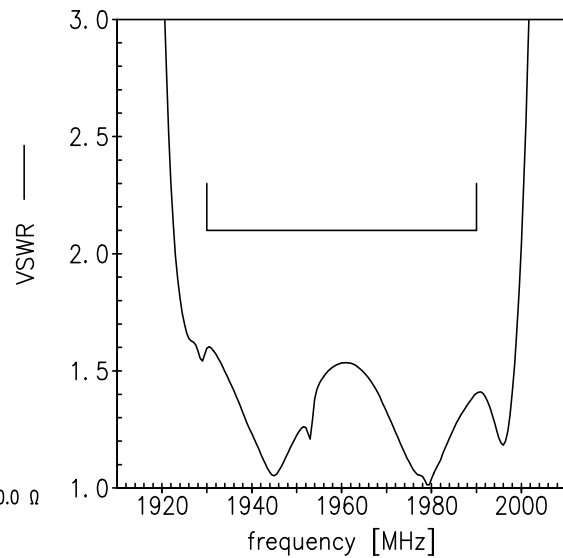
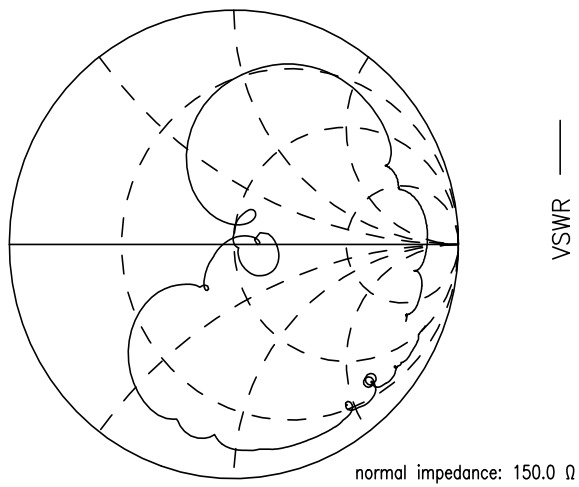
**SMD**

Smith charts Filter 1 (GSM1900)

**S<sub>11</sub> function**



**S<sub>22</sub> function**





**SAW Components**

**B9513**

**SAW Rx 2in1 input diplex filter**

**1960.0 / 1842.5 MHz**

Data sheet



**Characteristics of Filter 2 (GSM1800)**

Temperature range for specification:  $T = -30\text{ °C to }+85\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega \parallel 3.3\text{nH}$   
 Terminating load impedance:  $Z_L = 150\ \Omega \parallel 15\text{nH (balanced)}$

		min.	typ. @ 25 °C	max.	
<b>Center frequency</b>	$f_C$	—	1842.5	—	MHz
<b>Maximum insertion attenuation</b> 1805.0 ... 1880.0 MHz	$\alpha_{\max}$	—	2.2	2.8	dB
<b>Amplitude ripple (p-p)</b> 1805.0 ... 1880.0 MHz	$\Delta\alpha$	—	1.0	1.8	dB
<b>Input VSWR</b> 1805.0 ... 1880.0 MHz		—	1.5	2.0	
<b>Output VSWR</b> 1805.0 ... 1880.0 MHz		—	1.7	2.1	
<b>CMRR</b> ( $ S_{21}-S_{31} / S_{21}+S_{31} $ ) 1805.0 ... 1880.0 MHz		20 <sup>1)</sup>	24	—	dB
<b>Attenuation</b>	$\alpha$				
10.0 ... 940.0 MHz		45	62	—	dB
940.0 ... 1705.0 MHz		20	34	—	dB
1705.0 ... 1785.0 MHz		12	18	—	dB
1920.0 ... 1980.0 MHz		17	26	—	dB
1980.0 ... 2030.0 MHz		25	30	—	dB
2030.0 ... 2700.0 MHz		28	35	—	dB
2700.0 ... 6000.0 MHz		30	37	—	dB

<sup>1)</sup> A CMRR of 19.6dB corresponds to a phase balance of 10° together with an amplitude balance of 1.0dB



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SAW Rx 2in1 input duplex filter

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### Maximum ratings of Filter 2

Operable temperature range	T	-40/+85	°C	
Storage temperature range	T <sub>stg</sub>	-40/+85	°C	
DC voltage	V <sub>DC</sub>	5	V	
ESD voltage	V <sub>ESD</sub>	50 <sup>1)</sup>	V	machine model, 1 pulse
Input Power at				
GSM 850, GSM 900	P <sub>IN</sub>	15	dBm	effective power in the on-state, duty cycle 4:8
GSM 1800, GSM 1900	P <sub>IN</sub>	15	dBm	
Tx bands				

<sup>1)</sup> acc. to JEDEC22-A115A (machine model), 1 negative & 1 positive pulse.

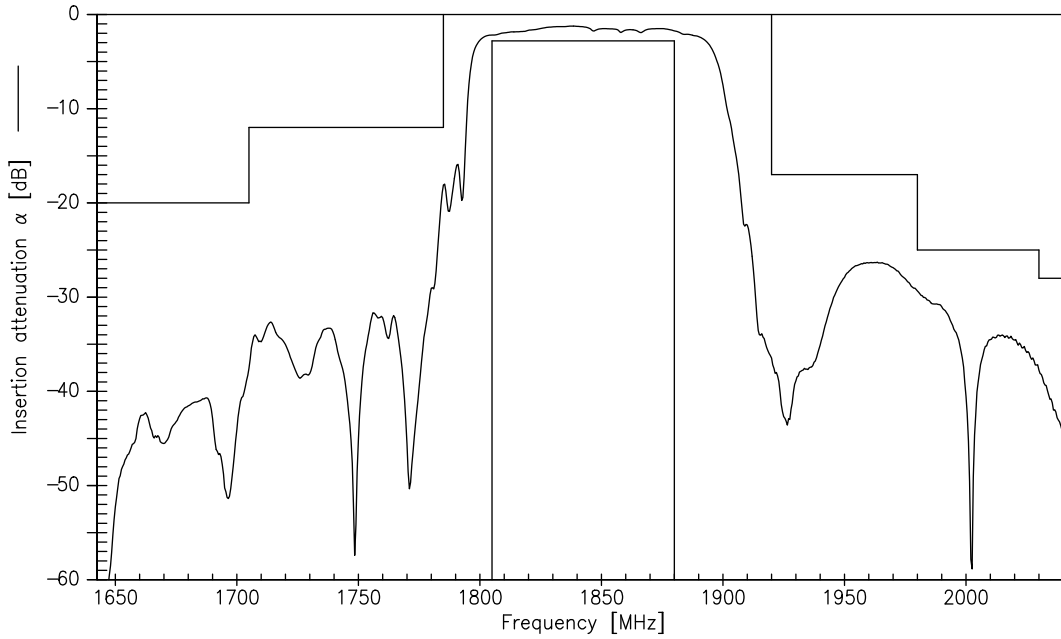




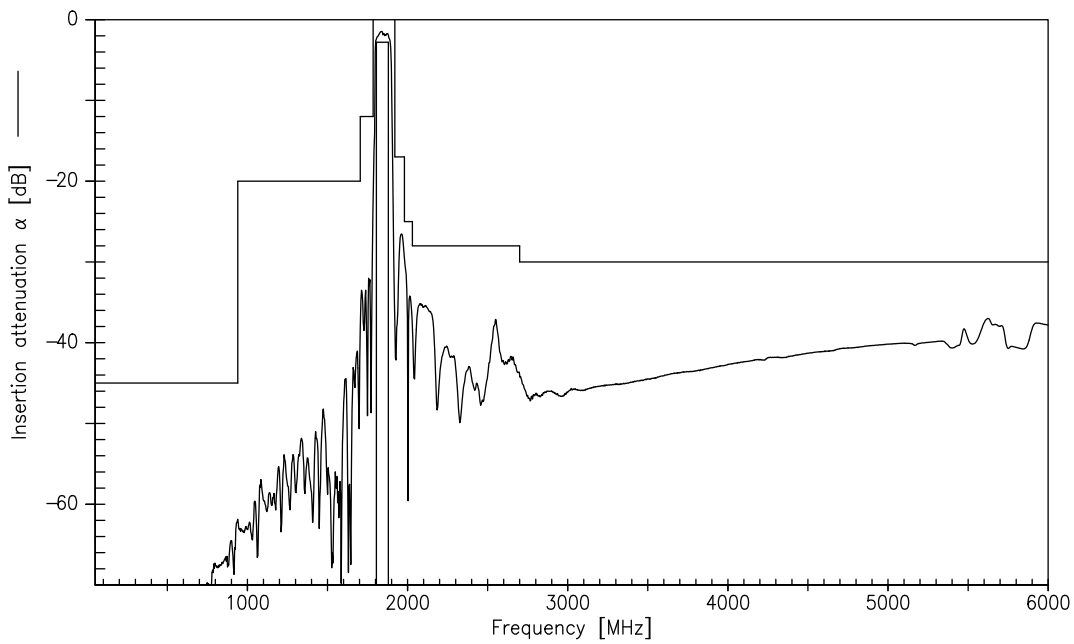
Data sheet



Transfer function Filter 2 (GSM1800)



Transfer function Filter 2 (GSM1800) - Wideband

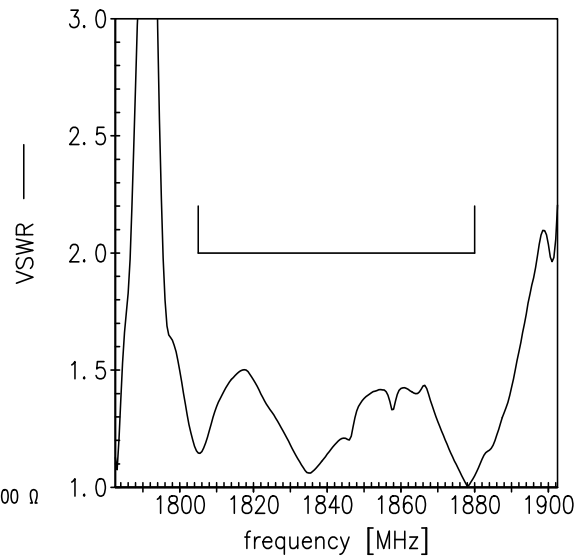
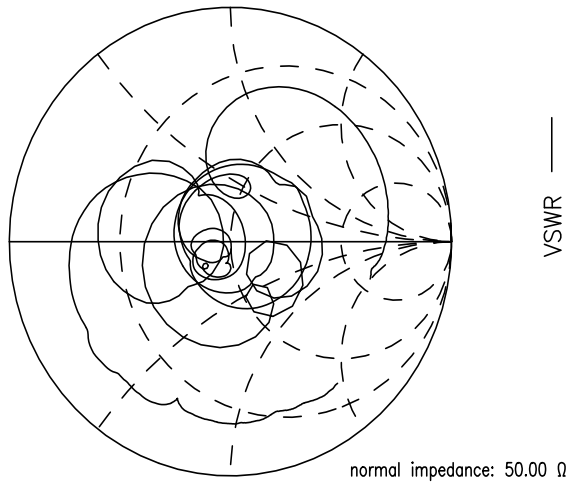


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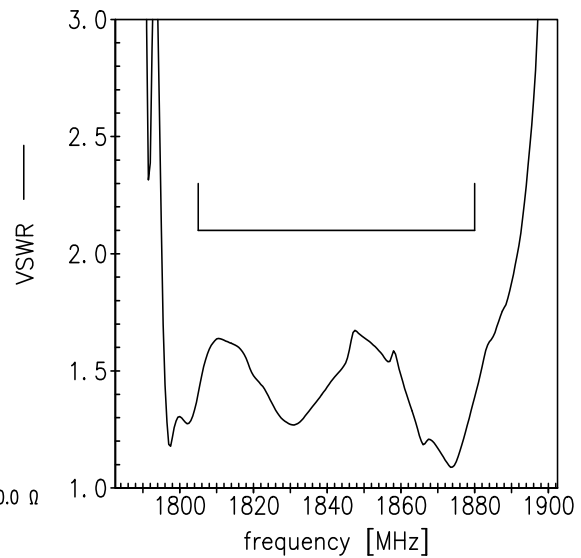
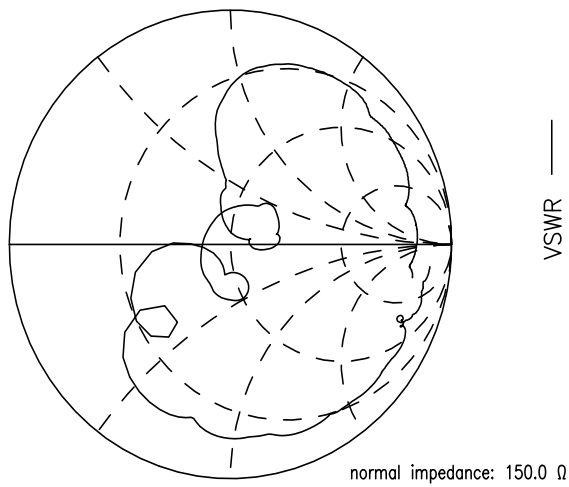


Smith charts Filter 2 (GSM1800)

$S_{11}$  function



$S_{22}$  function





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## References

<b>Type</b>	B9513
<b>Ordering code</b>	B39202B9513L310
<b>Marking and package</b>	C61157-A7-A153
<b>Packaging</b>	F61074-V8226-Z000
<b>Date codes</b>	L_1126
<b>S-parameters</b>	B9513_LB_NB.s3p B9513_LB_WB.s3p B9513_UB_NB.s3p B9513_UB_WB.s3p See file header for port/pin assignment table.
<b>Soldering profile</b>	S_6001
<b>RoHS compatible</b>	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."
<b>Moldability</b>	Before using in overmolding environment, please contact your EPCOS sales office.

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