



## **SAW Components**

**SAW Rx 2in1 filter**

GSM 900 / GSM 1800

<b>Series/type:</b>	<b>B9501</b>
<b>Ordering code:</b>	<b>B39182B9501L310</b>
<b>Date:</b>	<b>May 21, 2008</b>
<b>Version:</b>	<b>2.0</b>



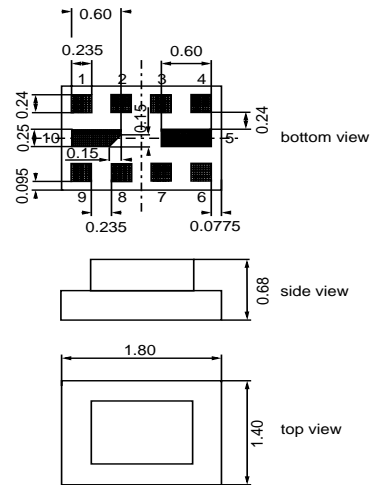
**Application**

- Low-loss 2in1 RF filter for mobile telephone GSM 900 and GSM 1800 systems, receive path (Rx)
- Usable passband:  
 Filter 1 (GSM 900): 35 MHz  
 Filter 2 (GSM 1800): 75 MHz
- Unbalanced to balanced operation for both filters
- Very low insertion attenuation
- Low amplitude ripple
- Impedance transformation from 50 Ω to 150 Ω for both filters
- Suitable for GPRS class 1 to 12



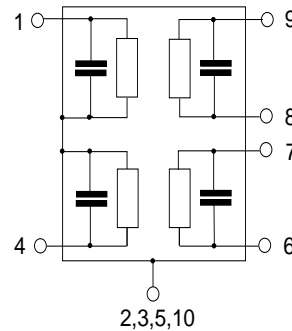
**Features**

- Package size 1.8 x 1.4 x 0.68 mm<sup>3</sup>
- Package code QCS10U
- RoHS compatible
- Approx. weight 0.006 g
- Package for Surface Mount Technology (SMT)
- Ni, gold-plated terminals
- Electrostatic Sensitive Device (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





Data sheet



Characteristics of filter 1 ( GSM 900 )

Temperature range for specification:  $T = -20\text{ °C to }+75\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega$   
 Terminating load impedance:  $Z_L = 150\ \Omega \parallel 56\text{ nH (balanced)}$

		B9501			
		min.	typ. @25°C	max.	
<b>Center frequency</b>	$f_C$	—	942.5	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{max}$	—	1.3 <sup>1)</sup>	2.1 <sup>2)</sup>	dB
925.0 ... 960.0 MHz					
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha$	—	0.5	1.3 <sup>3)</sup>	dB
925.0 ... 960.0 MHz					
<b>Input VSWR</b>		—	1.7	2.0	
925.0 ... 960.0 MHz					
<b>Output VSWR</b>		—	1.7	2.0	
925.0 ... 960.0 MHz					
<b>Output amplitude balance (<math> S_{31}/S_{21} </math>)</b>		-1.0	-0.6/0.6	1.0	dB
925.0 ... 960.0 MHz					
<b>Output phase balance (<math>\phi(S_{31})-\phi(S_{21})+180^\circ</math>)</b>		-10	-3/+3	10	°
925.0 ... 960.0 MHz					
<b>Attenuation</b>	$\alpha$				
10.0 ... 480.0 MHz		45	55	—	dB
480.0 ... 900.0 MHz		30	34	—	dB
900.0 ... 905.0 MHz		26	30	—	dB
905.0 ... 915.0 MHz		20	30	—	dB
980.0 ... 1000.0 MHz		25	29	—	dB
1000.0 ... 1850.0 MHz		28	36	—	dB
1850.0 ... 1920.0 MHz		40	49	—	dB
1920.0 ... 3700.0 MHz		35	43	—	dB
3700.0 ... 6000.0 MHz		32	37	—	dB

1) Typical value excluding PCB losses of 0.16 dB.

2) 1.9 dB at 25 °c

3) 1.2 dB at 25 °c



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942.5 / 1842.5 MHz

Data sheet



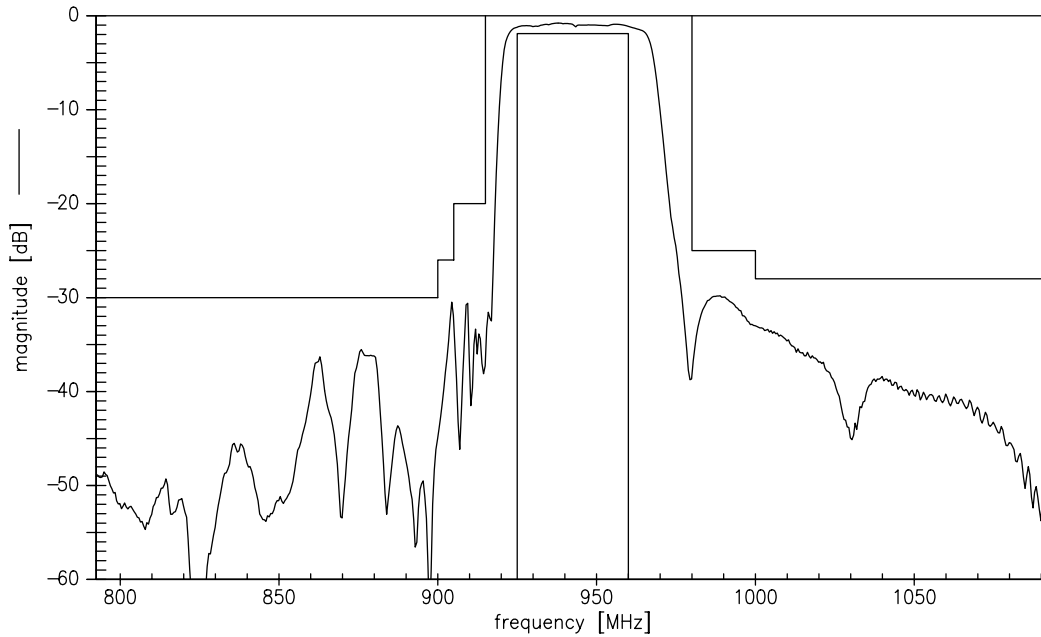
**Maximum ratings of filter 1**

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>	100 <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				

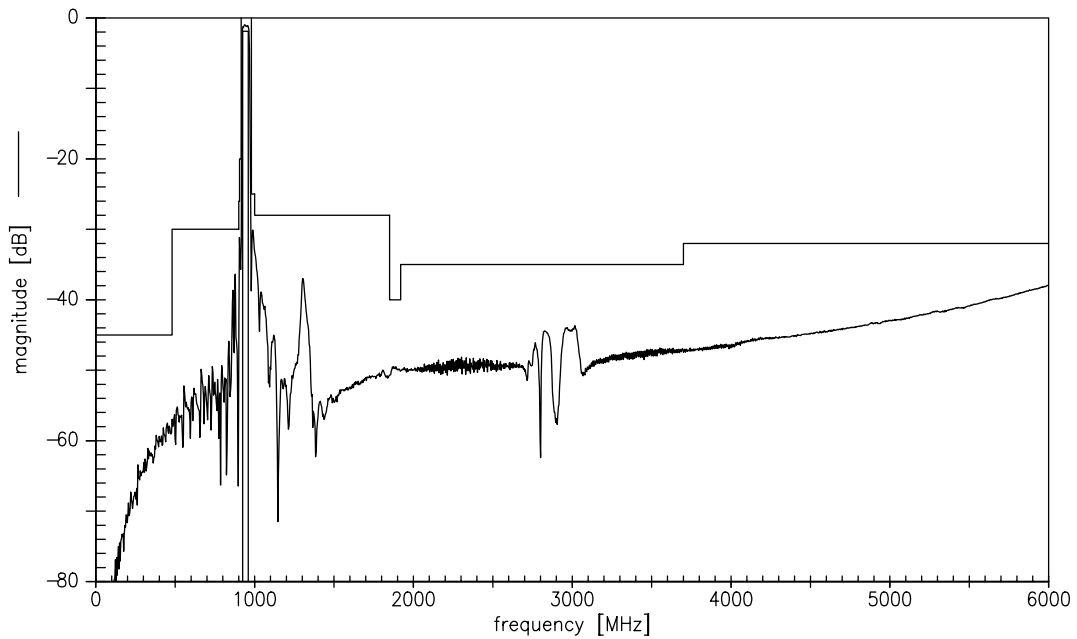
<sup>1)</sup> acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.



Transfer function of filter 1



Transfer function of filter 1 - wideband

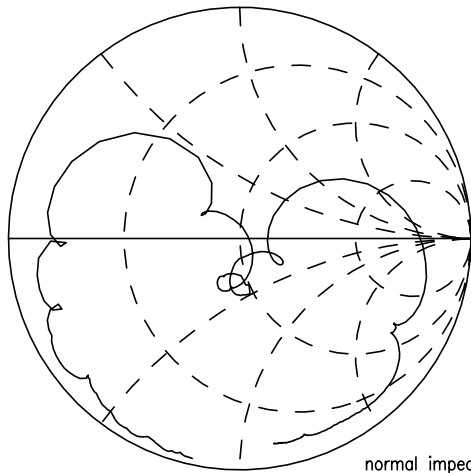


Data sheet

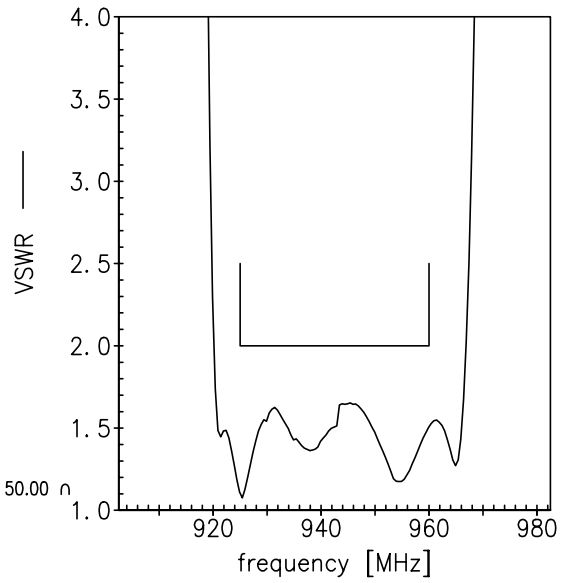


Smith charts filter 1

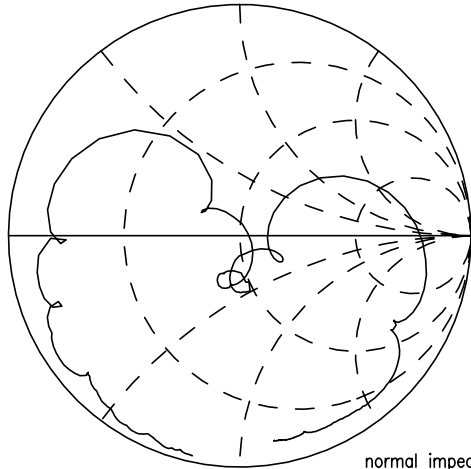
$S_{11}$  function



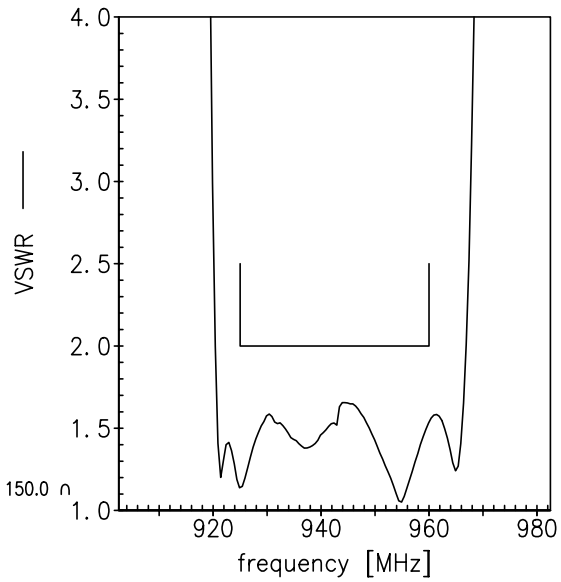
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 150.0  $\Omega$





**SAW Components**

**B9501**

**SAW Rx 2in1 filter**

**942.5 / 1842.5 MHz**

Data sheet



**Characteristics of filter 2 ( GSM 1800 )**

Temperature range for specification:  $T = -20\text{ °C to }+75\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega$   
 Terminating load impedance:  $Z_L = 150\ \Omega \parallel 13\text{ nH (balanced)}$

		<b>B9501</b>			
		<b>min.</b>	<b>typ.</b>	<b>max.</b>	
			<b>@25°C</b>		
<b>Center frequency</b>	$f_C$	—	1842.5	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{max}$	—	1.3 <sup>1)</sup>	2.2 <sup>2)</sup>	dB
1805.0 ... 1880.0 MHz					
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha$	—	0.5	1.4 <sup>3)</sup>	dB
1805.0 ... 1880.0 MHz					
<b>Input VSWR</b>		—	1.8	2.1	
1805.0 ... 1880.0 MHz					
<b>Output VSWR</b>		—	1.8	2.1	
1805.0 ... 1880.0 MHz					
<b>Output amplitude balance (<math> S_{31}/S_{21} </math>)</b>		-1.0	-0.7/0.7	1.0	dB
1805.0 ... 1880.0 MHz					
<b>Output phase balance (<math>\phi(S_{31})-\phi(S_{21})+180^\circ</math>)</b>		-10	-7/+7	10	°
1805.0 ... 1880.0 MHz					
<b>Attenuation</b>	$\alpha$				
10.0 ... 902.0 MHz		45	53	—	dB
902.0 ... 940.0 MHz		45	53	—	
940.0 ... 1705.0 MHz		28	39	—	dB
1705.0 ... 1785.0 MHz		12 <sup>4)</sup>	16	—	
1920.0 ... 1980.0 MHz		17	22	—	dB
1980.0 ... 2030.0 MHz		25	32	—	
2030.0 ... 2400.0 MHz		28	34	—	dB
2400.0 ... 2500.0 MHz		32	40	—	
2500.0 ... 2775.0 MHz		28	33	—	dB
2775.0 ... 2880.0 MHz		38	50	—	
2880.0 ... 3610.0 MHz		28	47	—	dB
3610.0 ... 3760.0 MHz		38	46	—	
3760.0 ... 5415.0 MHz		28	37	—	dB
5415.0 ... 5640.0 MHz		32	37	—	
5640.0 ... 6000.0 MHz		28	37	—	dB

1) Typical value excluding PCB losses of 0.27 dB.

2) 2.1 dB at 25 °c

3) 1.3 dB at 25 °c

4) 14 dB at 25 °c



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942.5 / 1842.5 MHz

Data sheet



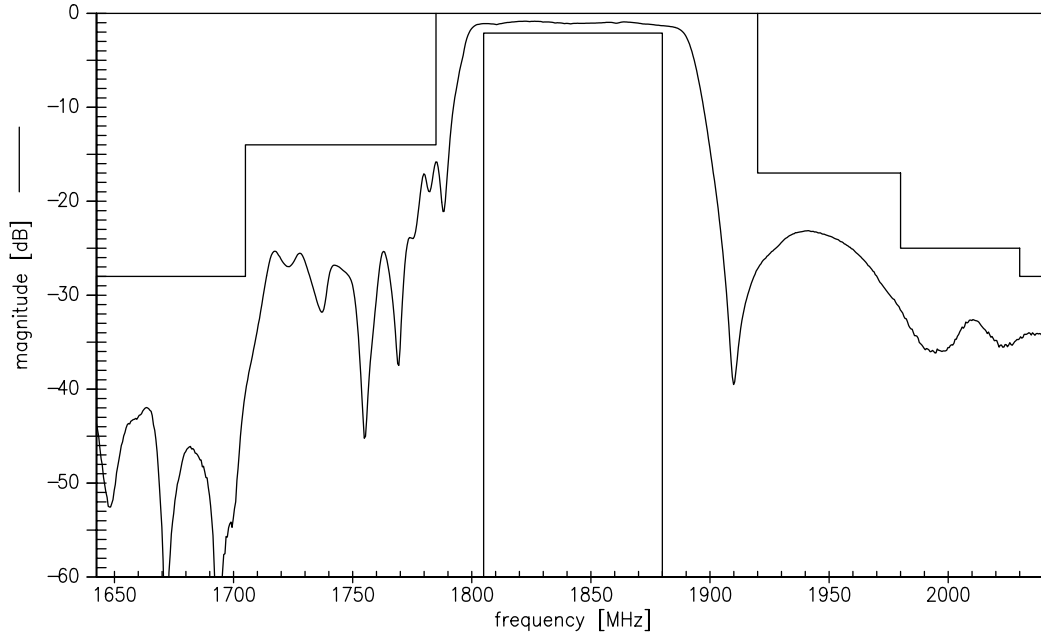
**Maximum ratings of filter 2**

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				

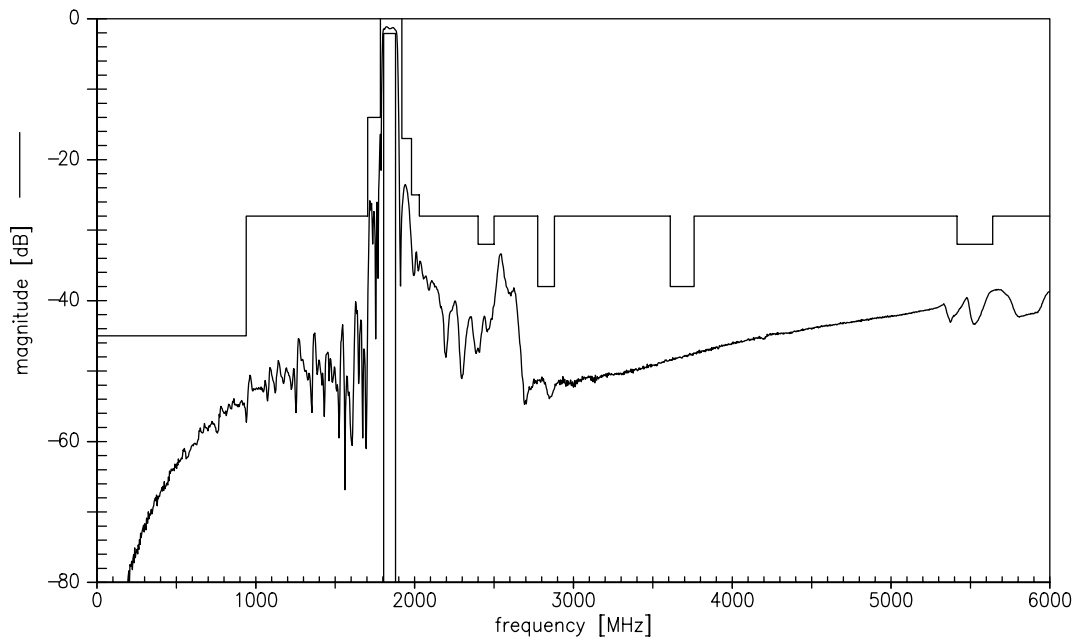
<sup>1)</sup> acc. to JEDEC22-A115A (machine model), 1 negative & 1 positive pulse.



Transfer function of filter 2



Transfer function of filter 2 - wideband

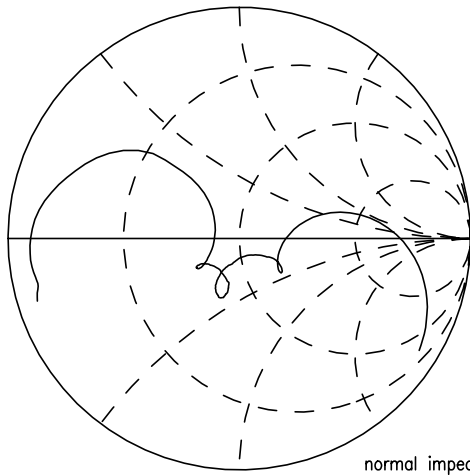


Data sheet

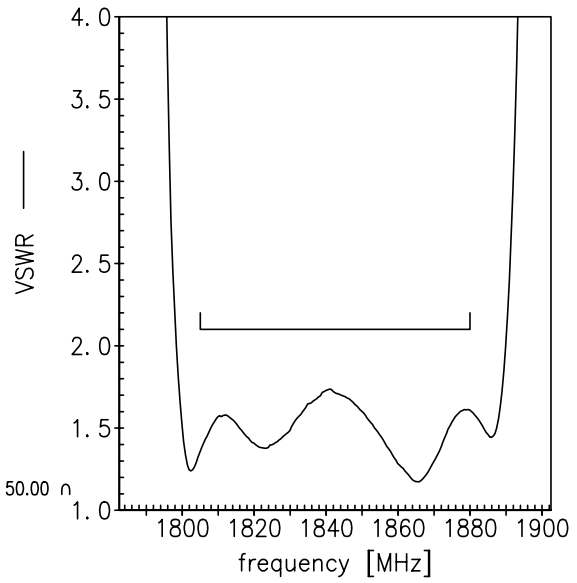


Smith charts filter 2

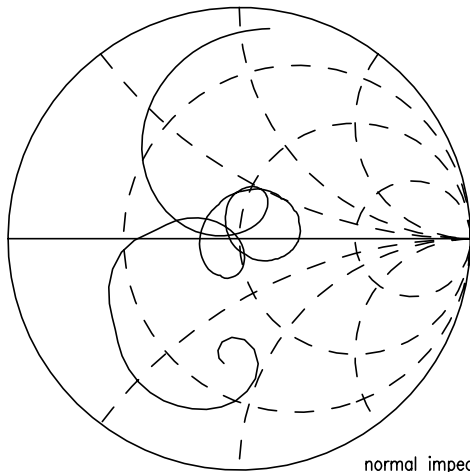
$S_{11}$  function



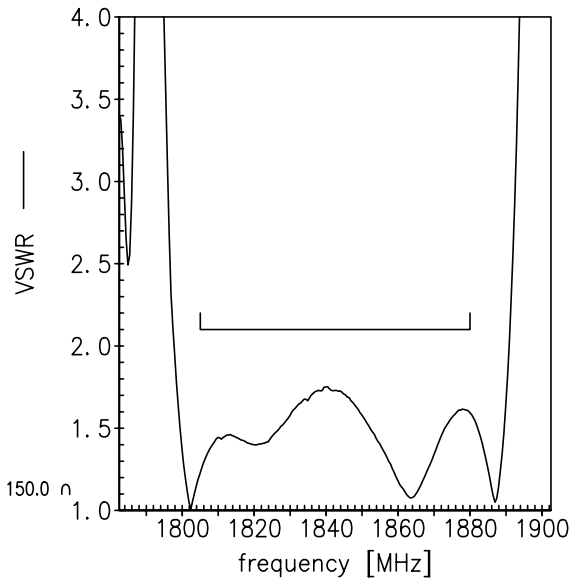
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 150.0  $\Omega$





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942.5 / 1842.5 MHz

Data sheet



## References

Type	B9501
Ordering code	B39182B9501L310
Marking and package	C61157-A6-A152
Packaging	F61074-V8226-Z000
Date code	L_1126
S-parameters	B9501_LB_NB.s3p B9501_LB_WB.s3p B9501_UB_NB.s3p B9501_UB_WB.s3p
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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