



# SAW Components

## SAW Rx 2in1 filter

GSM 1800 / GSM 900

|                       |                        |
|-----------------------|------------------------|
| <b>Series/type:</b>   | <b>B9500</b>           |
| <b>Ordering code:</b> | <b>B39182B9500L310</b> |
| <b>Date:</b>          | <b>May 21, 2008</b>    |
| <b>Version:</b>       | <b>2.0</b>             |

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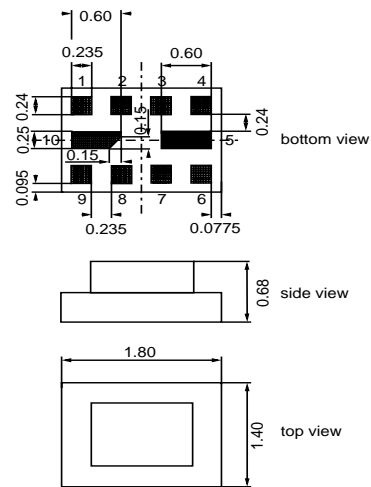
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**Application**

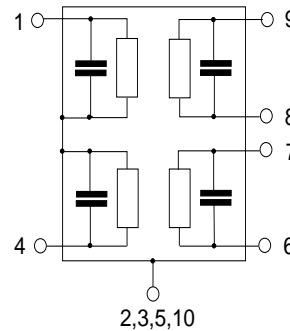
- Low-loss 2in1 RF filter for mobile telephone GSM 900 and GSM 1800 systems, receive path (Rx)
- Usable passband:  
 Filter 1 (GSM 1800): 75 MHz  
 Filter 2 (GSM 900): 35 MHz
- Unbalanced to balanced operation for both filters
- Very low insertion attenuation
- Low amplitude ripple
- Impedance transformation 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 QCS10V
- 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 1800 )**

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

|  |                | B9500            |                   |                   |     |
|--|----------------|------------------|-------------------|-------------------|-----|
|  |                | min.             | typ.<br>@25°C     | max.              |     |
| <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

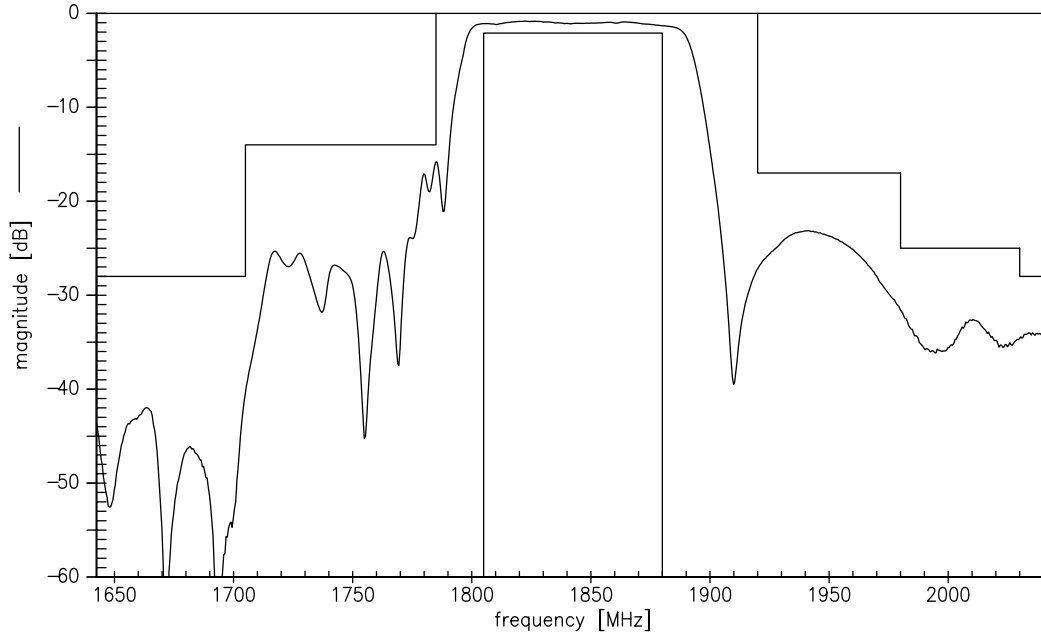

**Maximum ratings of filter 1**

|                            |                  |                  |     |  |
|----------------------------|------------------|------------------|-----|--|
| 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,<br>duty cycle 4:8 |
| GSM 1800, GSM 1900         | P <sub>IN</sub>  | 15               | dBm |  |
| Tx bands                   |                  |                  |     |  |

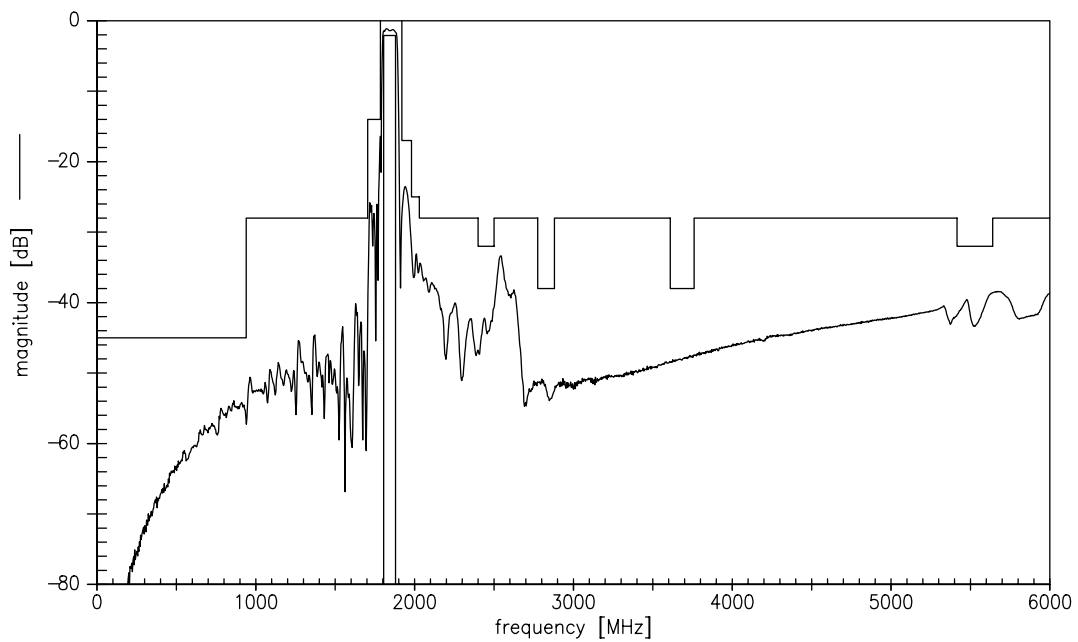
<sup>1)</sup> acc. to JEESD22-A115A (machine model), 1 negative & 1 positive pulse.



Transfer function of filter 1



Transfer function of filter 1 - wideband

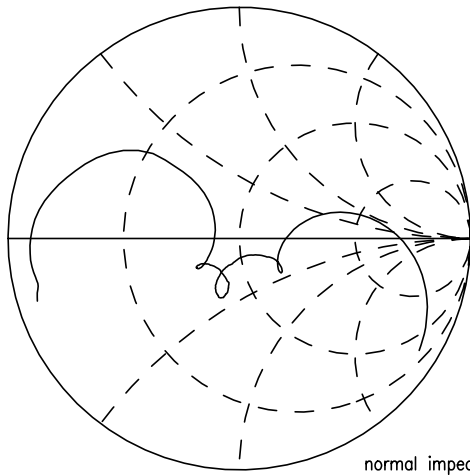


Data sheet

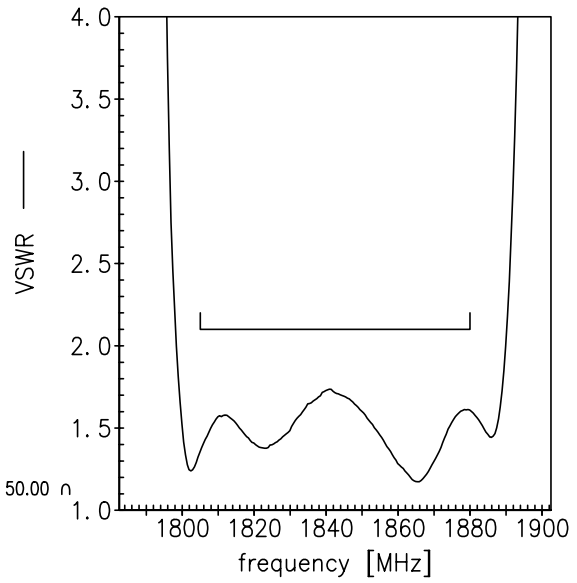


Smith charts filter 1

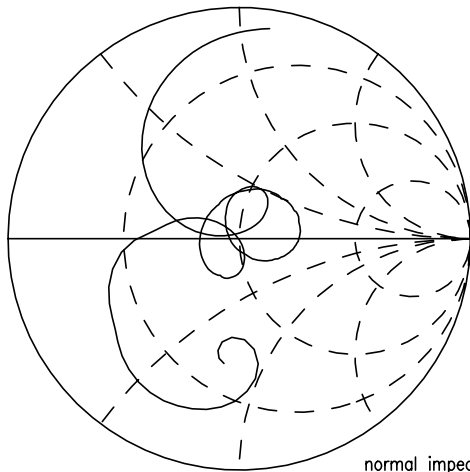
$S_{11}$  function



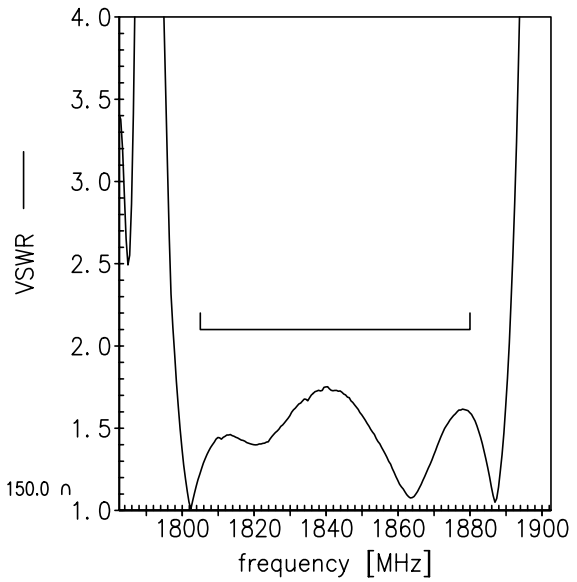
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 150.0  $\Omega$



**Data sheet**

**Characteristics of filter 2 ( GSM 900 )**

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

|  |                 | <b>B9500</b> |                   |                   |            |
|--|-----------------|--------------|-------------------|-------------------|------------|
|  |                 | <b>min.</b>  | <b>typ.</b>       | <b>max.</b>       |            |
|  |                 |              | <b>@ 25 °C</b>    |                   |            |
| <b>Center frequency</b>  | $f_C$           | —            | 942.5             | —                 | MHz        |
| <b>Maximum insertion attenuation</b>   | $\alpha_{\max}$ |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | —            | 1.3 <sup>1)</sup> | 2.1 <sup>2)</sup> | dB         |
| <b>Amplitude ripple (p-p)</b>  | $\Delta\alpha$  |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | —            | 0.5               | 1.3 <sup>3)</sup> | dB         |
| <b>Input VSWR</b>  |                 |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | —            | 1.7               | 2.0               |            |
| <b>Output VSWR</b>   |                 |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | —            | 1.7               | 2.0               |            |
| <b>Output amplitude balance (<math> S_{31}/S_{21} </math>)</b>                   |                 |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | -1.0         | -0.6/0.6          | 1.0               | dB         |
| <b>Output phase balance (<math>\phi(S_{31})-\phi(S_{21})+180^{\circ}</math>)</b> |                 |              |                   |                   |            |
| 925.0 ... 960.0 MHz  |                 | -10          | -3/+3             | 10                | $^{\circ}$ |
| <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


**Maximum ratings of filter 2**

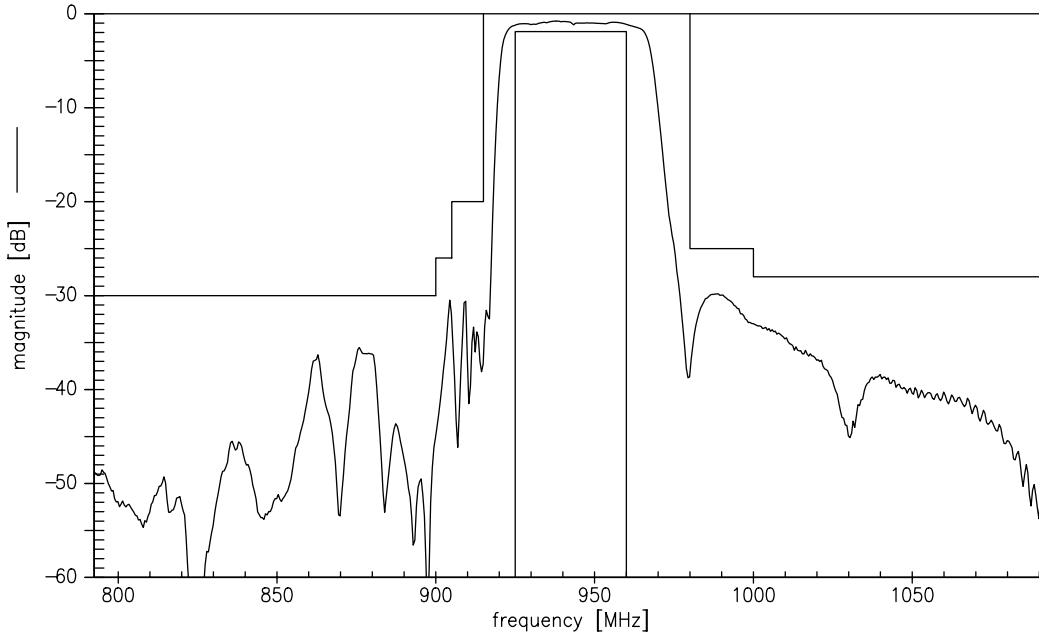
|                            |                  |                   |     |  |
|----------------------------|------------------|-------------------|-----|--|
| Operable temperature range | T                | -40/+85           | °C  |  |
| Storage temperature range  | T <sub>stg</sub> | -40/+85           | °C  |  |
| DC voltage                 | V <sub>DC</sub>  | 5                 | V   |  |
| ESD voltage                | V <sub>ESD</sub> | 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,<br>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.

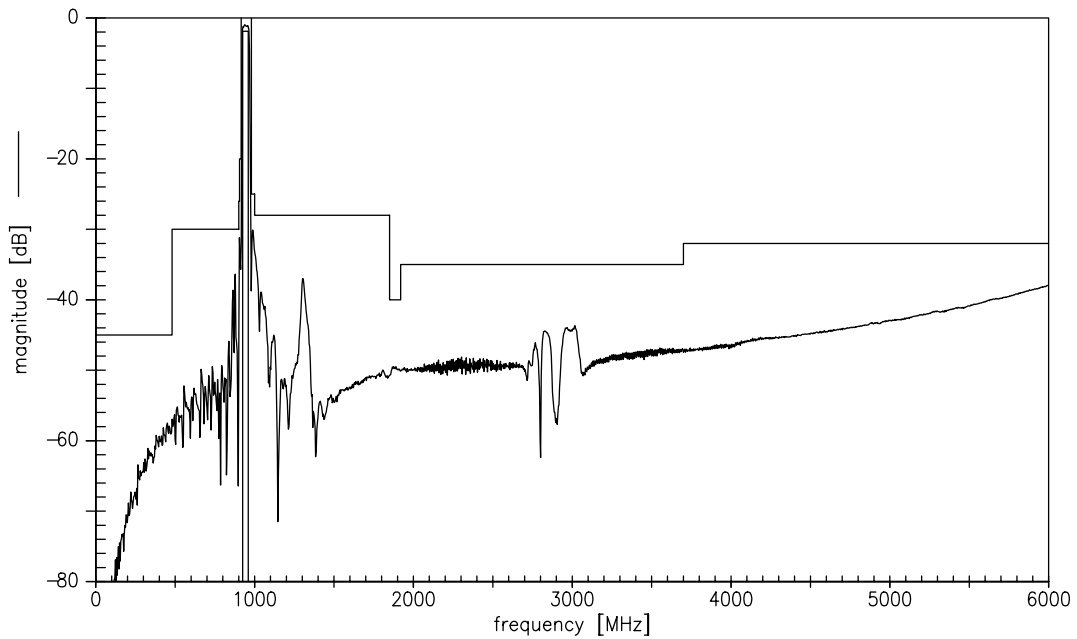




Transfer function of filter 2



Transfer function of filter 2 - wideband

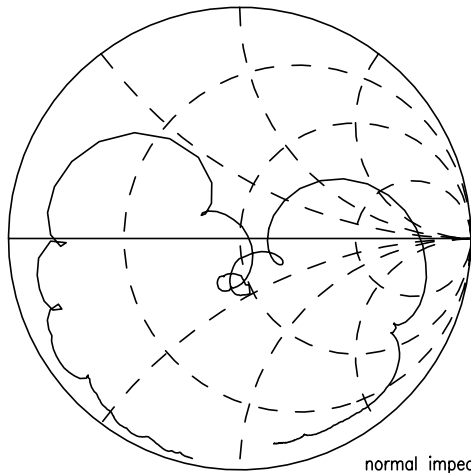


Data sheet

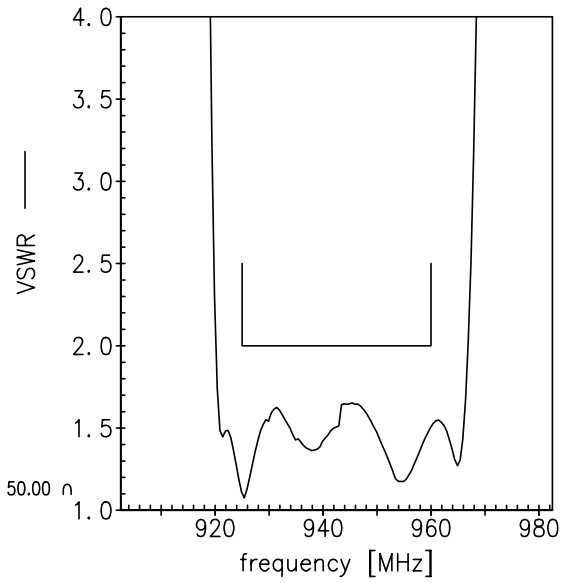


Smith charts filter 2

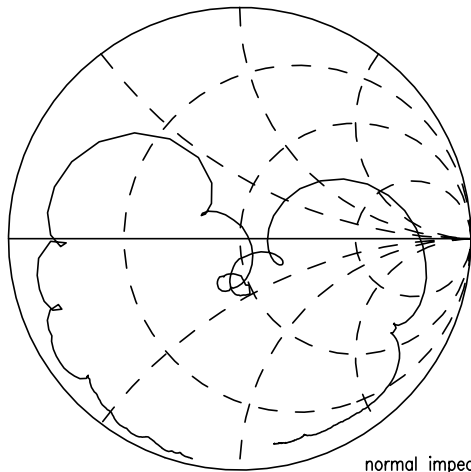
$S_{11}$  function



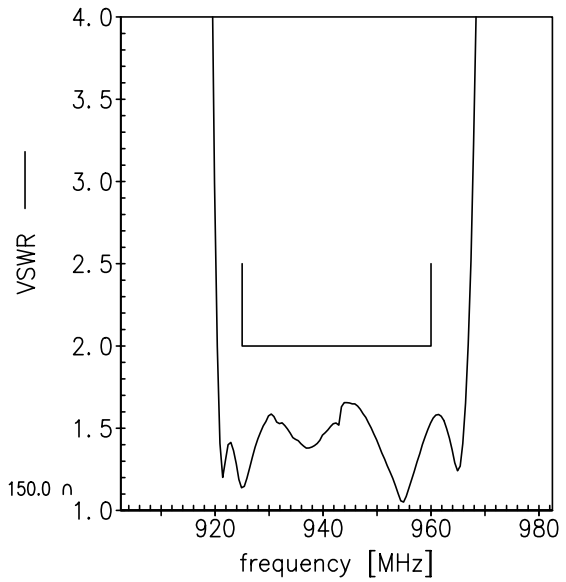
normal impedance: 50.00  $\Omega$



$S_{22}$  function



normal impedance: 150.0  $\Omega$



|                           |                           |
|---------------------------|---------------------------|
| <b>SAW Components</b>     | <b>B9500</b>              |
| <b>SAW Rx 2in1 filter</b> | <b>1842.5 / 942.5 MHz</b> |

Data sheet



## References

|                            |  |
|----------------------------|--|
| <b>Type</b>                | B9500  |
| <b>Ordering code</b>       | B39182B9500L310  |
| <b>Marking and package</b> | C61157-A7-A153   |
| <b>Packaging</b>           | F61074-V8226-Z000  |
| <b>Date code</b>           | L_1126   |
| <b>S-parameters</b>        | B9500_LB_NB.s3p<br>B9500_LB_WB.s3p<br>B9500_UB_NB.s3p<br>B9500_UB_WB.s3p   |
| <b>Soldering profile</b>   | S_6001   |
| <b>RoHS compatible</b>     | defined as compatible with the following documents:<br>"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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