



## **SAW Components**

### **SAW Rx 2in1 input diplex filter**

GSM 850 / GSM 900

|                       |                          |
|-----------------------|--------------------------|
| <b>Series/Type:</b>   | <b>B9515</b>             |
| <b>Ordering code:</b> | <b>B39941B9515P810</b>   |
| <b>Date:</b>          | <b>February 18, 2011</b> |
| <b>Version:</b>       | <b>2.0</b>               |



## SAW Components

B9515

### SAW Rx 2in1 input duplex filter

881.5 / 942.5

#### Data sheet



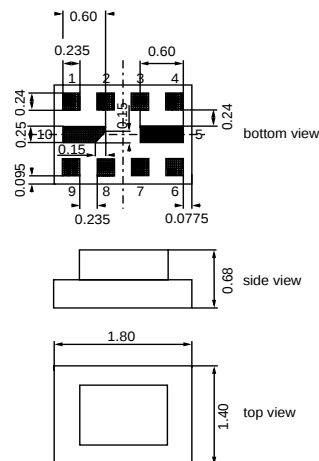
#### Application

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



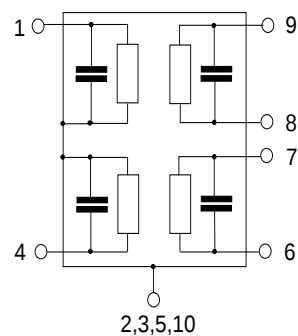
#### Features

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



#### Pin configuration

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



Please read *cautions and warnings and important notes* at the end of this document.



## SAW Components

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#### Data sheet



#### Characteristics of filter 1 ( GSM 850 )

Temperature range for specification:

$$T = -30\text{ °C to }+85\text{ °C}$$

Terminating source impedance:

$$Z_S = 50\ \Omega \parallel 10\text{ nH (unbalanced)}$$

Terminating load impedance:

$$Z_L = 150\ \Omega \parallel 56\text{ nH (balanced)}$$

|                                      |                 | min. | typ.<br>@ 25 °C | max. |     |
|--------------------------------------|-----------------|------|-----------------|------|-----|
| <b>Center frequency</b>              | $f_C$           | —    | 881.5           | —    | MHz |
| <b>Maximum insertion attenuation</b> | $\alpha_{\max}$ | —    | 1.7             | 2.3  | dB  |
| 869.0 ... 894.0 MHz                  |                 |      |                 |      |     |
| <b>Amplitude ripple (p-p)</b>        | $\Delta\alpha$  | —    | 0.7             | 1.4  | dB  |
| 869.0 ... 894.0 MHz                  |                 |      |                 |      |     |
| <b>Input VSWR</b>                    |                 | —    | 1.6             | 2.0  |     |
| 869.0 ... 894.0 MHz                  |                 |      |                 |      |     |
| <b>Output VSWR</b>                   |                 | —    | 1.8             | 2.2  |     |
| 869.0 ... 894.0 MHz                  |                 |      |                 |      |     |
| <b>Common mode rejection ratio</b>   |                 | 20   | 25              | —    | dB  |
| 869.0 ... 894.0 MHz                  |                 |      |                 |      |     |
| <b>Attenuation</b>                   | $\alpha$        |      |                 |      |     |
| 10.0 ... 447.0 MHz                   |                 | 45   | 52              | —    | dB  |
| 447.0 ... 849.0 MHz                  |                 | 30   | 34              | —    | dB  |
| 914.0 ... 1000.0 MHz                 |                 | 24   | 28              | —    | dB  |
| 1000.0 ... 1850.0 MHz                |                 | 28   | 32              | —    | dB  |
| 1850.0 ... 1920.0 MHz                |                 | 37   | 55              | —    | dB  |
| 1920.0 ... 5000.0 MHz                |                 | 33   | 38              | —    | dB  |
| 5000.0 ... 6000.0 MHz                |                 | 30   | 38              | —    | dB  |



|                                        |                      |
|----------------------------------------|----------------------|
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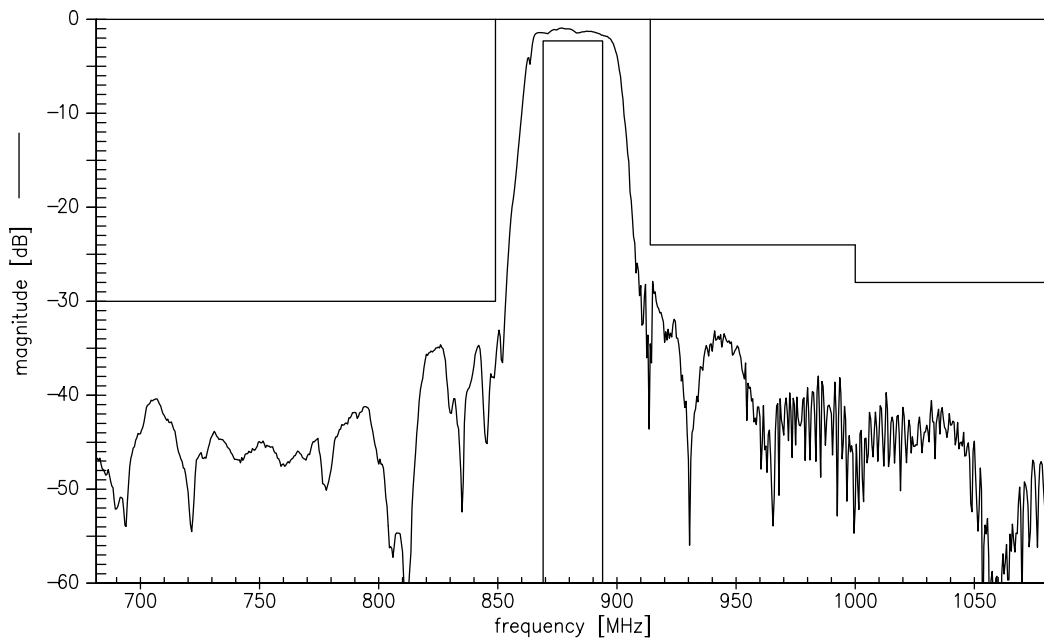
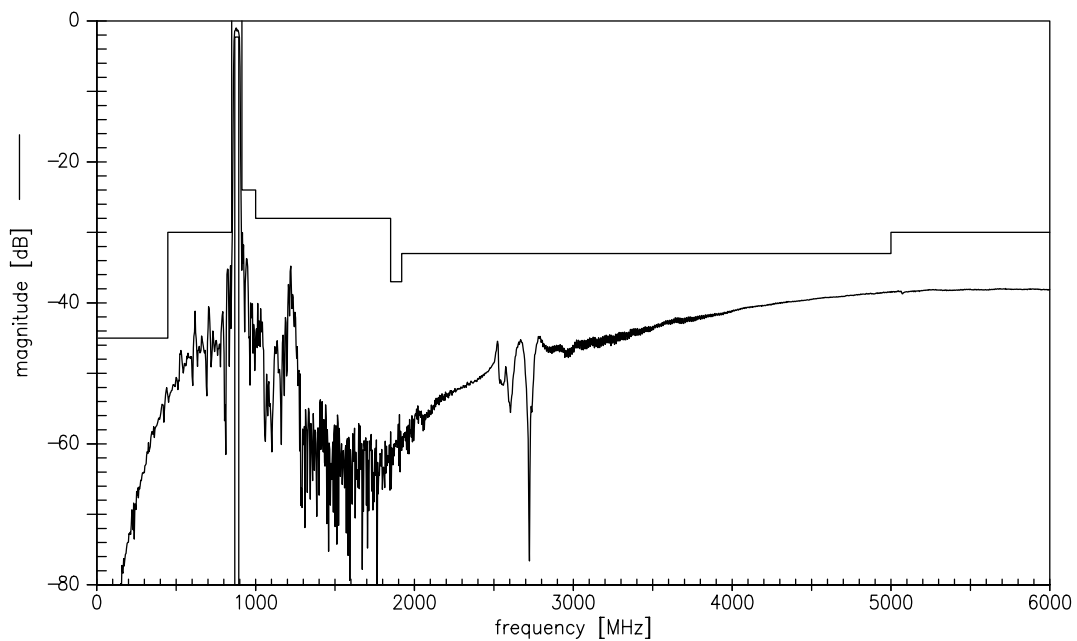
Data sheet



#### Maximum ratings

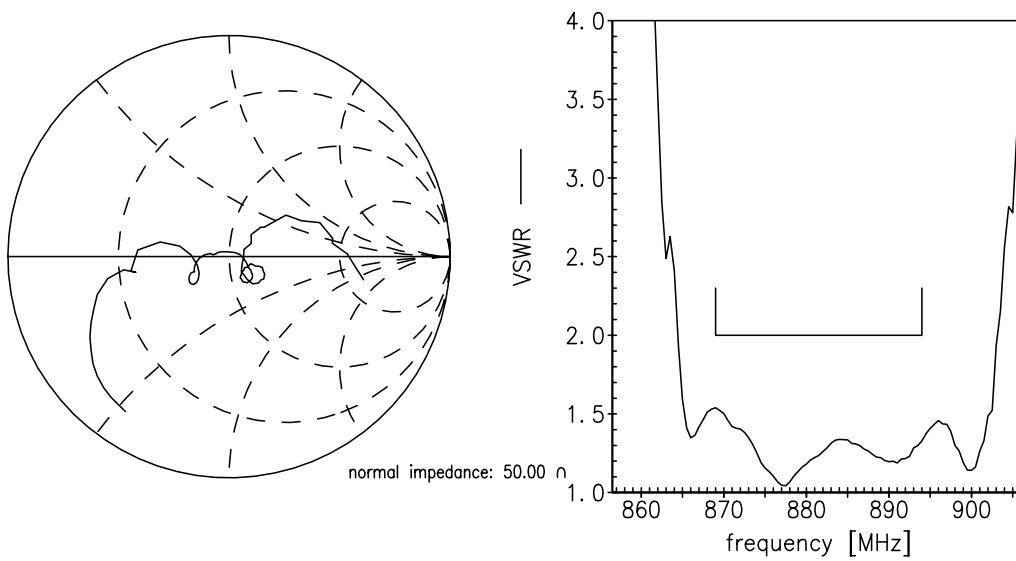
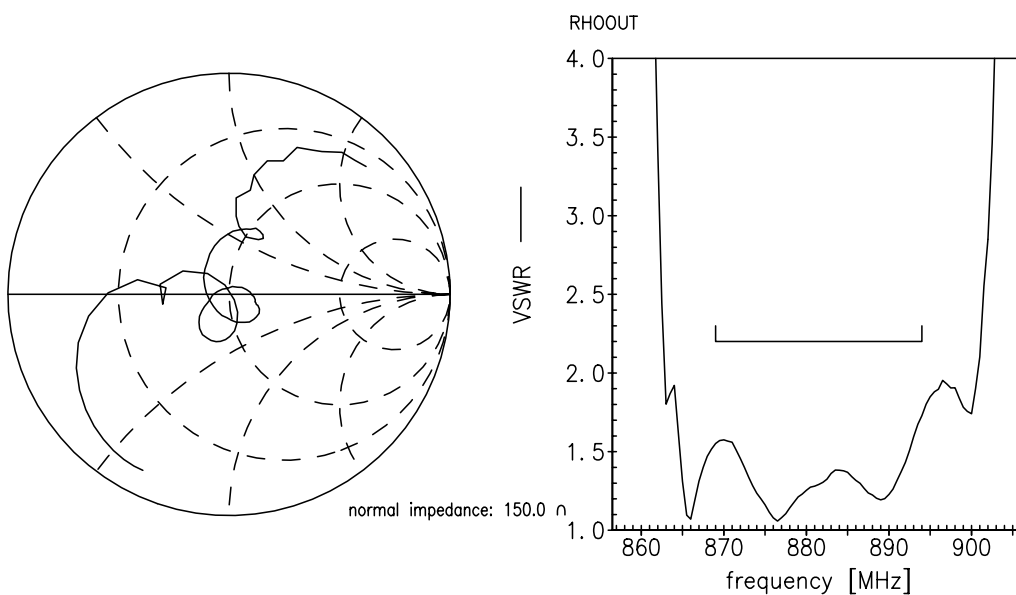
|                            |                  |                   |     |                                                    |
|----------------------------|------------------|-------------------|-----|----------------------------------------------------|
| Operable temperature range | T                | −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 pulses.

**Transfer function of filter 1 - narrowband****Transfer function of filter 1 - wideband**



## Smith charts of filter 1

 $S_{11}$  function $S_{22}$  function



## SAW Components

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### SAW Rx 2in1 input duplex filter

881.5 / 942.5

#### Data sheet



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

Temperature range for specification:

$$T = -30\text{ °C to }+85\text{ °C}$$

Terminating source impedance:

$$Z_S = 50\ \Omega \parallel 10\text{ nH (unbalanced)}$$

Terminating load impedance:

$$Z_L = 150\ \Omega \parallel 40\text{ nH (balanced)}$$

|                                      |                 | min. | typ.<br>@ 25 °C | max. |     |
|--------------------------------------|-----------------|------|-----------------|------|-----|
| <b>Center frequency</b>              | $f_C$           | —    | 942.5           | —    | MHz |
| <b>Maximum insertion attenuation</b> | $\alpha_{\max}$ | —    | 1.8             | 3.2  | dB  |
| 925.0 ... 960.0 MHz                  |                 |      |                 |      |     |
| <b>Amplitude ripple (p-p)</b>        | $\Delta\alpha$  | —    | 0.7             | 2.0  | dB  |
| 925.0 ... 960.0 MHz                  |                 |      |                 |      |     |
| <b>Input VSWR</b>                    |                 | —    | 1.8             | 2.2  |     |
| 925.0 ... 960.0 MHz                  |                 |      |                 |      |     |
| <b>Output VSWR</b>                   |                 | —    | 1.9             | 2.2  |     |
| 925.0 ... 960.0 MHz                  |                 |      |                 |      |     |
| <b>Common mode rejection ratio</b>   |                 | 23   | 28              | —    | dB  |
| 925.0 ... 960.0 MHz                  |                 |      |                 |      |     |
| <b>Attenuation</b>                   | $\alpha$        |      |                 |      |     |
| 10.0 ... 480.0 MHz                   |                 | 45   | 56              | —    | dB  |
| 480.0 ... 825.0 MHz                  |                 | 40   | 44              | —    | dB  |
| 825.0 ... 905.0 MHz                  |                 | 25   | 28              | —    | dB  |
| 905.0 ... 915.0 MHz                  |                 | 15   | 22              | —    | dB  |
| 980.0 ... 1000.0 MHz                 |                 | 23   | 26              | —    | dB  |
| 1000.0 ... 1850.0 MHz                |                 | 25   | 29              | —    | dB  |
| 1850.0 ... 1920.0 MHz                |                 | 40   | 55              | —    | dB  |
| 1920.0 ... 5000.0 MHz                |                 | 35   | 40              | —    | dB  |
| 5000.0 ... 6000.0 MHz                |                 | 30   | 40              | —    | dB  |



|                                        |                      |
|----------------------------------------|----------------------|
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| <b>SAW Rx 2in1 input duplex filter</b> | <b>881.5 / 942.5</b> |

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,<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 pulses.



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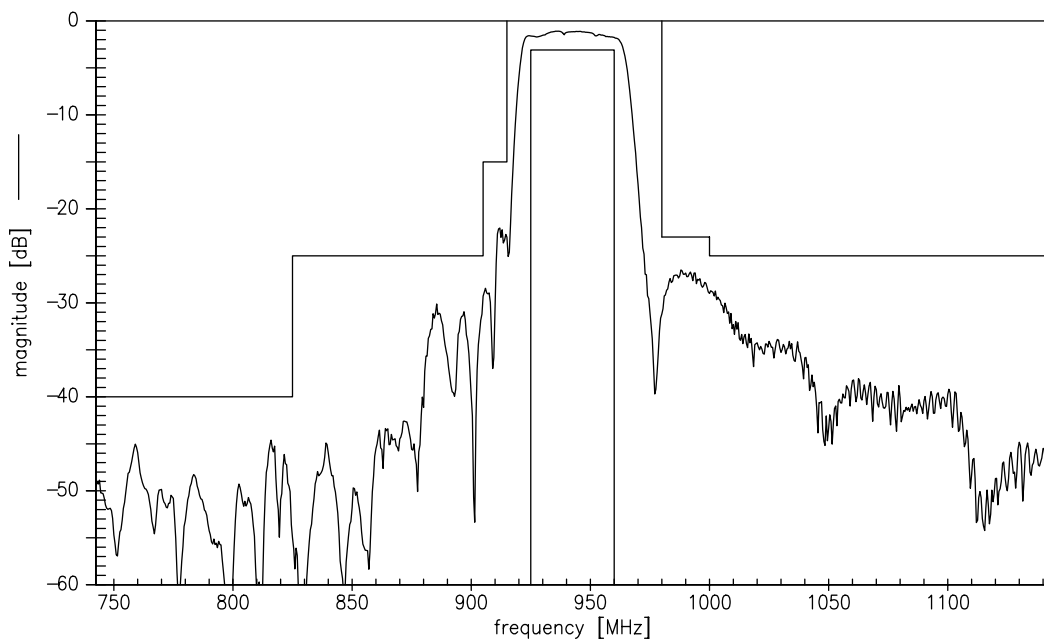
### SAW Rx 2in1 input duplex filter

881.5 / 942.5

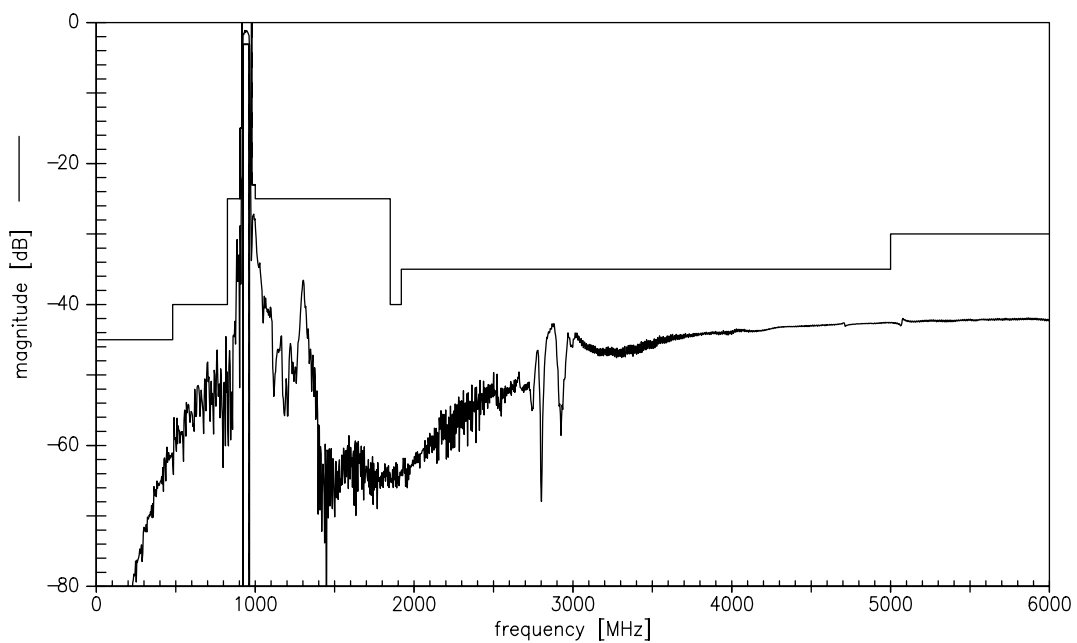
Data sheet



#### Transfer function of filter 2 - narrowband



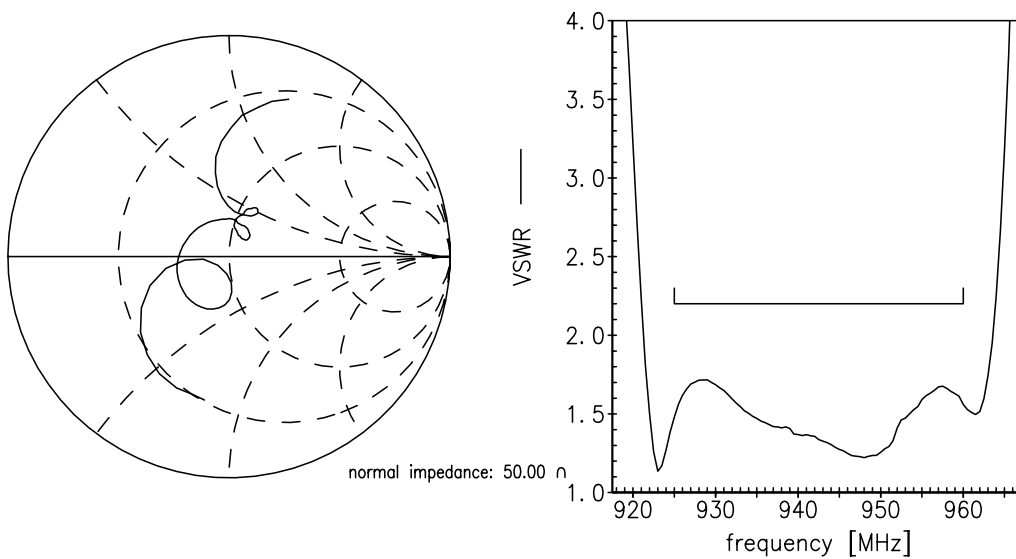
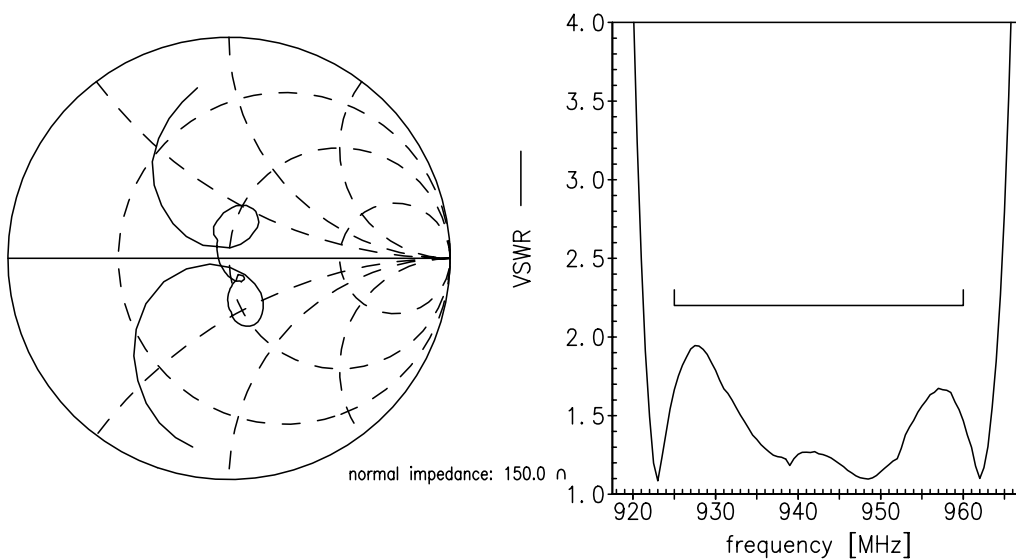
#### Transfer function of filter 2 -wideband



Please read *cautions and warnings* and *important notes* at the end of this document.



## Smith charts of filter 2

 $S_{11}$  function $S_{22}$  function

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Data sheet

**References**

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                | B9515                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Ordering code       | B39941B9515P810                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Marking and package | C61157-A7-A512                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Packaging           | F61074-V8226-Z000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Date codes          | L_1126                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| S-parameters        | B9515_LB_NB.s3p, B9515_LB_WB.s3p<br>B9515_UB_NB.s3p, B9515_UB_WB.s3p<br>see file header for port/pin assignment table                                                                                                                                                                                                                                                                                                                                                                                                              |
| Soldering profile   | S_6001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| RoHS compatible     | defined as compatible with the following documents:<br>"DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT<br>AND OF THE COUNCIL of 27 January 2003 on the restriction of the<br>use of certain hazardous substances in electrical and electronic<br>equipment. 2005/618/EC from April 18th, 2005, amending Directive<br>2002/95/EC of the European Parliament and of the Council for the<br>purposes of establishing the maximum concentration values for cer-<br>tain hazardous substances in electrical and electronic equipment." |
| Moldability         | Before using in overmolding environment, please contact your<br>EPCOS sales office.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Matching coilss     | See Inductor pdf-catalog<br><a href="http://www.tdk.co.jp/tefe02/coil.htm#aname1">http://www.tdk.co.jp/tefe02/coil.htm#aname1</a><br>and Data Library for circuit simulation<br><a href="http://www.tdk.co.jp/etvcl/index.htm">http://www.tdk.co.jp/etvcl/index.htm</a>                                                                                                                                                                                                                                                            |

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