# SAW Components

## SAW duplexer
LTE & WCDMA band VIII

| | |
|---|---|
| **Series/type:** | **B8631** |
| **Ordering code:** | **B39941-B8631-P810** |

| | |
|---|---|
| Date: | November 13, 2014 |
| Version: | 2.0 |

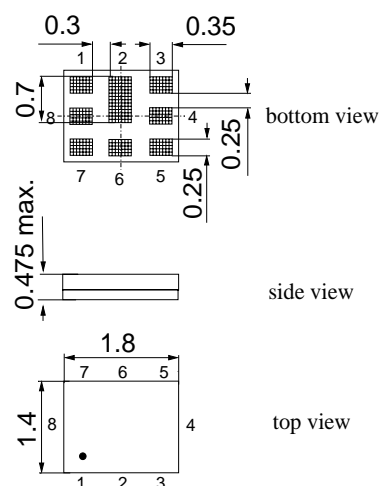| SAW Components | **B8631** |
|---|---|
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**

## Application

■ Low-loss SAW duplexer for mobile telephone LTE and WCDMA Band VIII systems
■ Low insertion attenuation
■ Low amplitude ripple
■ Usable passband 35 MHz
■ Single ended to balanced transformation in Antenna - Rx path

## Features

■ Package size  1.8 x 1.4mm$^2$,
■ RoHS compatible
■ Approx. weight 0.0035g
■ Package for **S**urface **M**ount **T**echnology (**SMT**)
■ Ni, gold-plated terminals
■ **E**lectrostatic **S**ensitive **D**evice (**ESD**)
■ **M**oisture **S**ensitive **L**evel 3

## Pin configuration

■ 1,8        RX output, balanced
■ 3          TX input, single ended
■ 6          Antenna
■ 2,4,5,7    Ground

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

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**SAW Components** **B8631**

**SAW duplexer** **897.5 / 942.5 MHz**

**Data sheet** SMD

### Characteristics

| | | |
|---|---|---|
| Temperature range for specification: | $T$ = | −20 ˚C to +90 ˚C |
| ANT terminating impedance: | $Z_{ANT}$= | 50 Ω ‖ 8.5 nH |
| TX terminating impedance: | $Z_{TX}$ = | 50 Ω + 2.0 nH |
| RX terminating impedance: | $Z_{RX}$ = | 100 Ω ‖ 0.62pF + 6.2 nH (balanced)[1] |

| | | | B8631 | | | |
|---|---|---|---|---|---|---|
| **Characteristics Tx - Ant[2]** | | **min.** | **typ. @ 25 ˚C** | **max.** | |
| **Center frequency** | $f_C$ | — | 897.5 | — | MHz |
| **Maximum insertion attenuation** | | | | | |
| 880.24 ... 914.76 MHz | $\alpha$ | | 1.6 | 3.0 | dB |
| @$f_{Carrier}$ 882.4 ... 912.6 MHz | $\alpha_{WCDMA}$[3] | | 1.3 | 2.5 | dB |
| **Amplitude ripple** (p-p) | | | | | |
| 880.24 ... 914.76 MHz | $\Delta\alpha$ | | 0.7 | 2.0 | dB |
| **VSWR** | | | | | |
| TX port 880.0 ... 915.0 MHz | | | 1.5 | 2.0 | |
| ANT port 880.0 ... 915.0 MHz | | | 1.4 | 2.0 | |
| **Attenuation** | $\alpha$ | | | | |
| 10.0 ... 716.0 MHz | | 30 | 40 | | dB |
| 716.0 ... 728.0 MHz | | 35 | 41 | | dB |
| 728.0 ... 821.0 MHz | | 30 | 41 | | dB |
| 925.24 ... 959.76 MHz | | 40 | 53 | | dB |
| @$f_{Carrier}$ 927.4 ... 957.6 MHz | $\alpha_{WCDMA}$[3] | 44 | 54 | | dB |
| 1565.42 ... 1585.42 MHz | | 30 | 33 | | dB |
| 1597.55 ... 1605.89 MHz | | 30 | 33 | | dB |
| 1760.0 ... 1830.0 MHz | | 27 | 32 | | dB |
| 1830.0 ... 1880.0 MHz | | 25 | 31 | | dB |
| 2110.0 ... 2170.0 MHz | | 25 | 30 | | dB |
| 2400.0 ... 2500.0 MHz | | 25 | 30 | | dB |
| 2620.0 ... 2745.0 MHz | | 22 | 28 | | dB |
| 3520.0 ... 3660.0 MHz | | 20 | 28 | | dB |
| 4400.0 ... 4575.0 MHz | | 10 | 28 | | dB |
| 5150.0 ... 5490.0 MHz | | 10 | 14 | | dB |
| 5725.0 ... 5850.0 MHz | | 10 | 13 | | dB |

[1] Alternative matching 150Ω + 2.2nH (balanced)
[2] Specified min./max. values are valid for a testing power of +10 dBm.
[3] Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (9).

| **SAW Components** | **B8631** |
| --- | --- |
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**    ⧉SMD

## Characteristics

Temperature range for specification:     T    = −20 ˚C to +90 ˚C
ANT terminating impedance:     $Z_{ANT}$ =    50 Ω || 8.5 nH
TX terminating impedance:     $Z_{TX}$ =    50 Ω + 2.0 nH
RX terminating impedance:     $Z_{RX}$ =    100 Ω || 0.62 pF + 6.2 nH (balanced)[1]

| | | | | | **B8631** | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Charcteristics Rx - Ant[2]** | | | | **min.** | **typ. @ 25 ˚C** | **max.** | |
| **Center frequency** | | | $f_C$ | — | 942.5 | — | MHz |
| **Maximum insertion attenuation** | | | | | | | |
| @$f_{Carrier}$ 927.4 | ... | 957.6 | MHz $\alpha_{WCDMA}$[3] | | 1.9 | 3.0 | dB |
| 925.24 | ... | 959.76 | MHz | | 2.0 | 3.0 | dB |
| **Amplitude ripple** (p-p) | | | | | | | |
| 925.24 | ... | 959.76 | MHz $\Delta\alpha$ | | 0.9 | 2.0 | dB |
| **VSWR** | | | | | | | |
| RX port 925.0 | ... | 960.0 | MHz | | 1.6 | 2.0 | |
| ANT port 925.0 | ... | 960.0 | MHz | | 1.6 | 2.0 | |
| **Common Mode Suppression** | | | $\alpha$ | | | | |
| 925.24 | ... | 959.76 | MHz | 20 | 26 | | dB |
| **Attenuation** | | | $\alpha$ | | | | |
| 10.0 | ... | 880.0 | MHz | 35 | 59 | | dB |
| 880.24 | ... | 914.76 | MHz | 45 | 58 | | dB |
| @$f_{Carrier}$ 882.4 | ... | 912.6 | MHz $\alpha_{WCDMA}$[3] | 50 | 61 | | dB |
| 1045.0 | ... | 1750.0 | MHz | 15 | 54 | | dB |
| 1750.0 | ... | 4810.0 | MHz | 35 | 56 | | dB |

[1] Alternative matching 150 Ω + 2.2 nH (balanced)
[2] Specified min./max. values are valid for a testing power of +10 dBm.
[3] Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (9).

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

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| SAW Components | **B8631** |
|---|---|
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**　　　　　　　　　　SMD

## Characteristics

Temperature range for specification:　　T　= −20 ˚C to +90 ˚C
ANT terminating impedance:　　　　　$Z_{ANT}$= 50 Ω || 8.5 nH
TX terminating impedance:　　　　　　$Z_{TX}$ = 50 Ω + 2.0 nH
RX terminating impedance:　　　　　　$Z_{RX}$ = 100 Ω || 0.62pF + 6.2 nH (balanced)[1]

| | | | | B8631 | | |
|---|---|---|---|---|---|---|
| **Charcteristics Tx - Rx[2]** | | | **min.** | **typ. @ 25 ˚C** | **max.** | |
| **Differential Mode Isolation** | | | | | | |
| 880.24 ... | 914.76 | MHz $\alpha$ | 55 | 61 | | dB |
| @$f_{Carrier}$ 882.4 ... | 912.6 | MHz $\alpha_{WCDMA}$[3] | 55 | 63 | | dB |
| 925.24 ... | 959.76 | MHz $\alpha$ | 50 | 59 | | dB |
| @$f_{Carrier}$ 927.4 ... | 957.6 | MHz $\alpha_{WCDMA}$[3] | 50 | 59 | | dB |
| **Common Mode Isolation** | | | | | | |
| 880.24 ... | 914.76 | MHz $\alpha$ | 50 | 53 | | dB |
| @$f_{Carrier}$ 882.4 ... | 912.6 | MHz $\alpha_{WCDMA}$[3] | 50 | 54 | | dB |

[1] Alternative matching 150Ω + 2.2nH (balanced)
[2] Specified min./max. values are valid for a testing power of +10 dBm.
[3] Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (6).

| SAW Components | B8631 |
|---|---|
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**   SMD

## Characteristics

| | | |
|---|---|---|
| Temperature range for specification: | $T$ = | −30 ˚C to +85 ˚C |
| ANT terminating impedance: | $Z_{ANT}$ = | 50 Ω ‖ 8.5 nH |
| TX terminating impedance: | $Z_{TX}$ = | 50 Ω + 2.0 nH |
| RX terminating impedance: | $Z_{RX}$ = | 100 Ω ‖ 0.62pF + 6.2 nH (balanced)[1] |

| Characteristics Tx - Ant[2] | | min. | typ. @ 25 ˚C | max. | |
|---|---|---|---|---|---|
| **Center frequency** | $f_C$ | — | 897.5 | — | MHz |
| **Maximum insertion attenuation** | | | | | |
| 880.24 ... 914.76 MHz | $\alpha$ | | 1.6 | 3.0 | dB |
| @f$_{Carrier}$ 882.4 ... 912.6 MHz | $\alpha_{WCDMA}$[3] | | 1.3 | 2.5 | dB |
| **Amplitude ripple** (p-p) | | | | | |
| 880.24 ... 914.76 MHz | $\Delta\alpha$ | | 0.7 | 2.0 | dB |
| **VSWR** | | | | | |
| TX port 880.0 ... 915.0 MHz | | | 1.5 | 2.0 | |
| ANT port 880.0 ... 915.0 MHz | | | 1.4 | 2.0 | |
| **Attenuation** | $\alpha$ | | | | |
| 10.0 ... 716.0 MHz | | 30 | 40 | | dB |
| 716.0 ... 728.0 MHz | | 35 | 41 | | dB |
| 728.0 ... 821.0 MHz | | 30 | 41 | | dB |
| 925.24 ... 959.76 MHz | | 40 | 53 | | dB |
| @f$_{Carrier}$ 927.4 ... 957.6 MHz | $\alpha_{WCDMA}$[4] | 44 | 54 | | dB |
| 1565.42 ... 1585.42 MHz | | 30 | 33 | | dB |
| 1597.55 ... 1605.89 MHz | | 30 | 33 | | dB |
| 1760.0 ... 1830.0 MHz | | 27 | 32 | | dB |
| 1830.0 ... 1880.0 MHz | | 25 | 31 | | dB |
| 2110.0 ... 2170.0 MHz | | 25 | 30 | | dB |
| 2400.0 ... 2500.0 MHz | | 25 | 30 | | dB |
| 2620.0 ... 2745.0 MHz | | 22 | 28 | | dB |
| 3520.0 ... 3660.0 MHz | | 20 | 28 | | dB |
| 4400.0 ... 4575.0 MHz | | 10 | 28 | | dB |
| 5150.0 ... 5490.0 MHz | | 10 | 14 | | dB |
| 5725.0 ... 5850.0 MHz | | 10 | 13 | | dB |

[1] Alternative matching 150Ω + 2.2nH (balanced)
[2] Specified min./max. values are valid for a testing power of +10 dBm.
[3] Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (9).

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

| **SAW Components** | **B8631** |
| --- | --- |
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**          ЅМＤ

**Characteristics**

Temperature range for specification:  $T$  = −30 ˚C to +85 ˚C
ANT terminating impedance:  $Z_{ANT}$ =  50 Ω || 8.5 nH
TX terminating impedance:  $Z_{TX}$ =  50 Ω + 2.0 nH
RX terminating impedance:  $Z_{RX}$ =  100 Ω || 0.62pF + 6.2 nH (balanced)[1]

| | | | **B8631** | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Charcteristics Rx - Ant[2]** | | | **min.** | **typ. @ 25 ˚C** | **max.** | |
| **Center frequency** | | $f_C$ | — | 942.5 | — | MHz |
| **Maximum insertion attenuation** | | | | | | |
| @$f_{Carrier}$ 927.4 ... 957.6 MHz | | $\alpha_{WCDMA}$[3] | | 1.9 | 3.0 | dB |
| 925.24 ... 959.76 MHz | | $\alpha$ | | 2.0 | 3.2 | dB |
| 925.24 ... 959.76 MHz | | $\alpha$[4] | | 2.0 | 3.0 | dB |
| **Amplitude ripple** (p-p) | | | | | | |
| 925.24 ... 959.76 MHz | | $\Delta\alpha$ | | 0.9 | 2.2 | dB |
| 925.24 ... 959.76 MHz | | $\Delta\alpha$[4] | | 0.9 | 2.0 | dB |
| **VSWR** | | | | | | |
| RX port | 925.0 ... 960.0 | MHz | | 1.6 | 2.0 | |
| ANT port | 925.0 ... 960.0 | MHz | | 1.6 | 2.0 | |
| **Common Mode Suppression** | | $\alpha$ | | | | |
| 925.24 ... 959.76 MHz | | | 20 | 26 | | dB |
| **Attenuation** | | $\alpha$ | | | | |
| 10.0 ... 880.0 | MHz | | 35 | 59 | | dB |
| 880.24 ... 914.76 | MHz | | 45 | 58 | | dB |
| @$f_{Carrier}$ 882.4 ... 912.6 | MHz | $\alpha_{WCDMA}$[3] | 50 | 61 | | dB |
| 1045.0 ... 1750.0 | MHz | | 15 | 54 | | dB |
| 1750.0 ... 4810.0 | MHz | | 35 | 56 | | dB |

[1]  Alternative matching 150Ω + 2.2nH (balanced)
[2]  Specified min./max. values are valid for a testing power of +10 dBm.
[3]  Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (9).
[4]  T = -20˚C to +85˚C

| SAW Components | **B8631** |
| --- | --- |
| **SAW duplexer** | **897.5 / 942.5 MHz** |

**Data sheet**   ⬚SMD⬚

## Characteristics

Temperature range for specification:   $T = -30\,^{\circ}C$ to $+85\,^{\circ}C$
ANT terminating impedance:   $Z_{ANT} = 50\,\Omega \,\|\, 8.5\,\text{nH}$
TX terminating impedance:   $Z_{TX} = 50\,\Omega + 2.0\,\text{nH}$
RX terminating impedance:   $Z_{RX} = 100\,\Omega \,\|\, 0.62\text{pF} + 6.2\,\text{nH}$ (balanced)[1]

| | | B8631 | | | |
| --- | --- | --- | --- | --- | --- |
| **Charcteristics Tx - Rx**[2] | | **min.** | **typ. @ 25 °C** | **max.** | |
| **Differential Mode Isolation** | | | | | |
| 880.24 ... 914.76 MHz | $\alpha$ | 55 | 61 | | dB |
| @f$_{Carrier}$ 882.4 ... 912.6 MHz | $\alpha_{WCDMA}$[3] | 55 | 63 | | dB |
| 925.24 ... 959.76 MHz | $\alpha$ | 48 | 59 | | dB |
| 925.24 ... 959.76 MHz | $\alpha$[4] | 50 | 59 | | dB |
| @f$_{Carrier}$ 927.4 ... 957.6 MHz | $\alpha_{WCDMA}$[3] | 50 | 59 | | dB |
| **Common Mode Isolation** | | | | | |
| 880.24 ... 914.76 MHz | $\alpha$ | 50 | 53 | | dB |
| @f$_{Carrier}$ 882.4 ... 912.6 MHz | $\alpha_{WCDMA}$[3] | 50 | 54 | | dB |

[1] Alternative matching $150\Omega + 2.2\text{nH}$ (balanced)
[2] Specified min./max. values are valid for a testing power of +10 dBm.
[3] Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (6).
[4] $T = -20\,^{\circ}C$ to $+85\,^{\circ}C$

## Maximum ratings

| Storage temperature range | $T_{stg}$ | –40/+85 | ˚C | |
|---|---|---|---|---|
| DC voltage | $V_{DC}$ | 0[1] | V | |
| ESD voltage | $V_{ESD}$ | 100[2] | V | machine model, +/- 10 pulses |
| ESD voltage | $V_{ESD}$ | 100[3] | V | HBM, +/- 1 pulse |
| ESD voltage | $V_{ESD}$ | 500[4] | V | CDM, +/- 3 pulses |
| Input power at | $P_{IN}$ | | | |
|     882.5 ... 912.5 MHz | | 29 | dBm | 5MHz LTE uplink signal, 50 ˚C, 5000 h |

[1] DC resistance at RX output might be less than 100MΩ at elevated temperatures. Hence, we recommend usage of blocking capacitors.

[2] acc. to JESD22-A115B (machine model), 10 negative & 10 positive pulses.

[3] target, acc. to JESD22-A114F (human body model), 1 negative & 1 positive pulses.

[4] target, acc. to JESD22-C101C (charge device model), 3 negative & 3 positive pulses.

## Annotation for characteristics section

Attenuation of WCDMA signal ("Powertransferfunction", $\alpha_{WCDMA}$) is determined by

$$\int_{\infty}^{\infty} \left| S_{ds21}(f) H_{RRC}(f - f_{Carrier}) \right|^2 df$$

$f_{Carrier}$ according to 3GPP TS 25.101 (e.g. for UMTS-Passband, $f_{Carrier}$ ranges from 2112.4 MHz (lowest Rx channel) to 2167.6 MHz (highest Rx channel)). $H_{RRC}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:
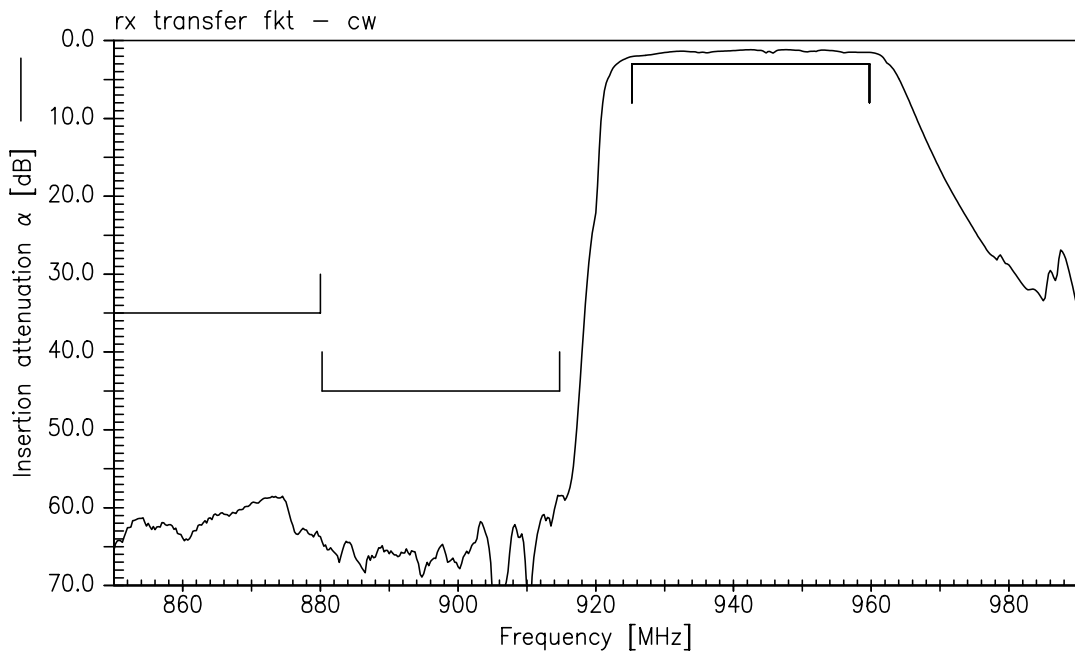
$$\int_{\infty}^{\infty} \left| H_{RRC}(f) \right|^2 df = 1$$

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**Frequency response TX - ANT**



tx transfer fkt — cw



Tx wide band

**Frequency response RX - ANT**

rx transfer fkt — cw
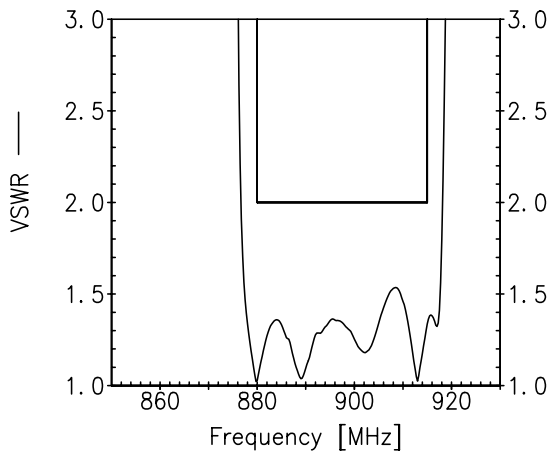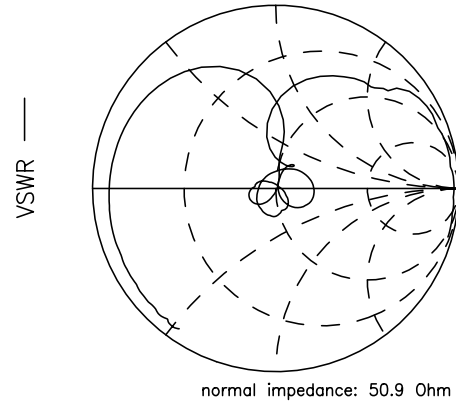


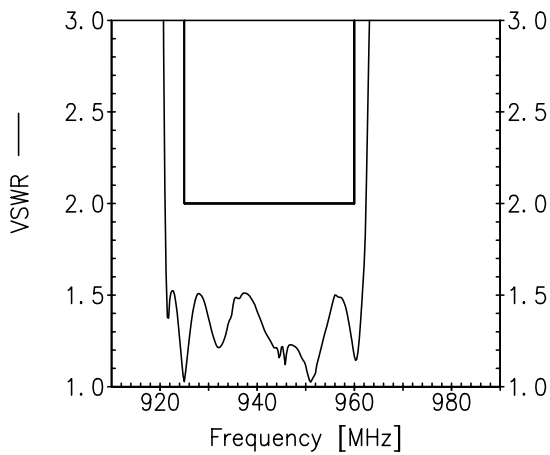Rx wide band
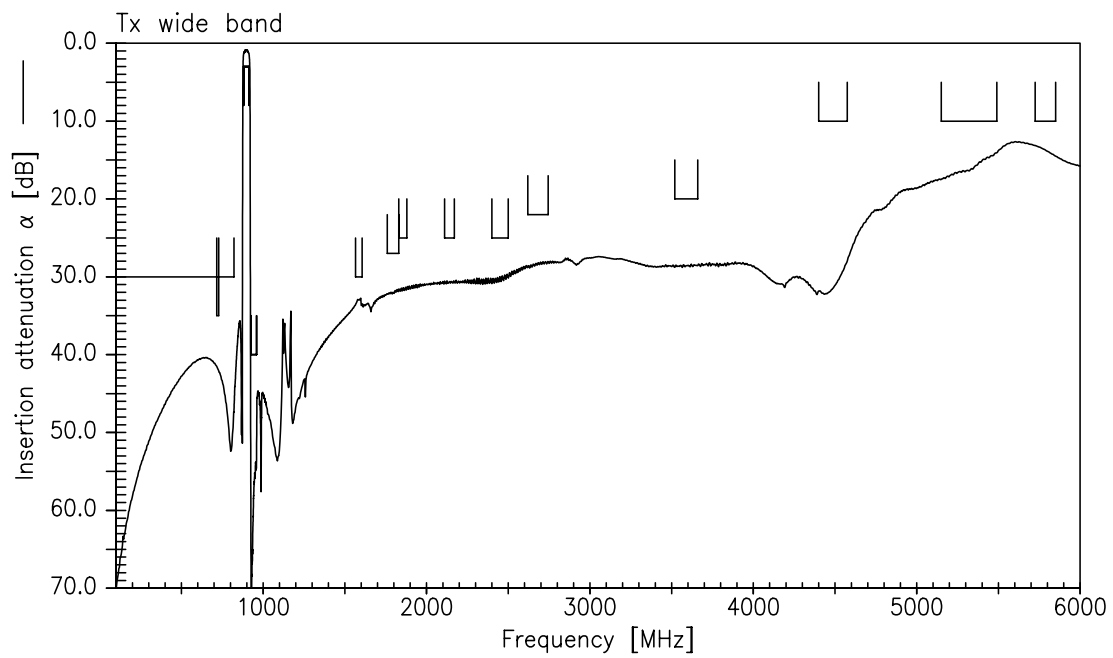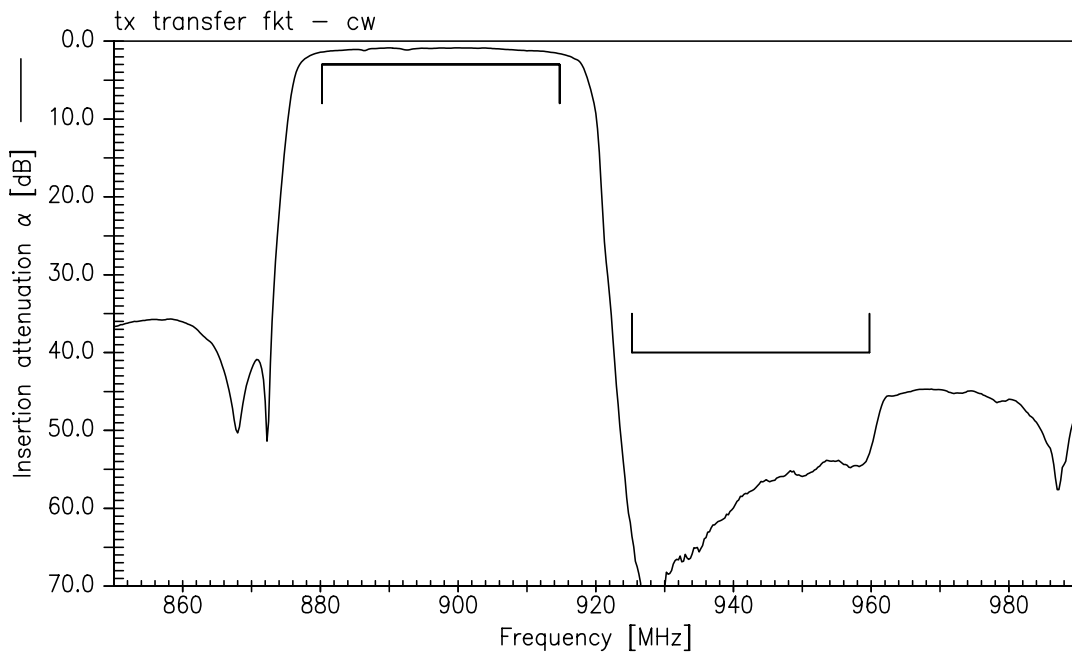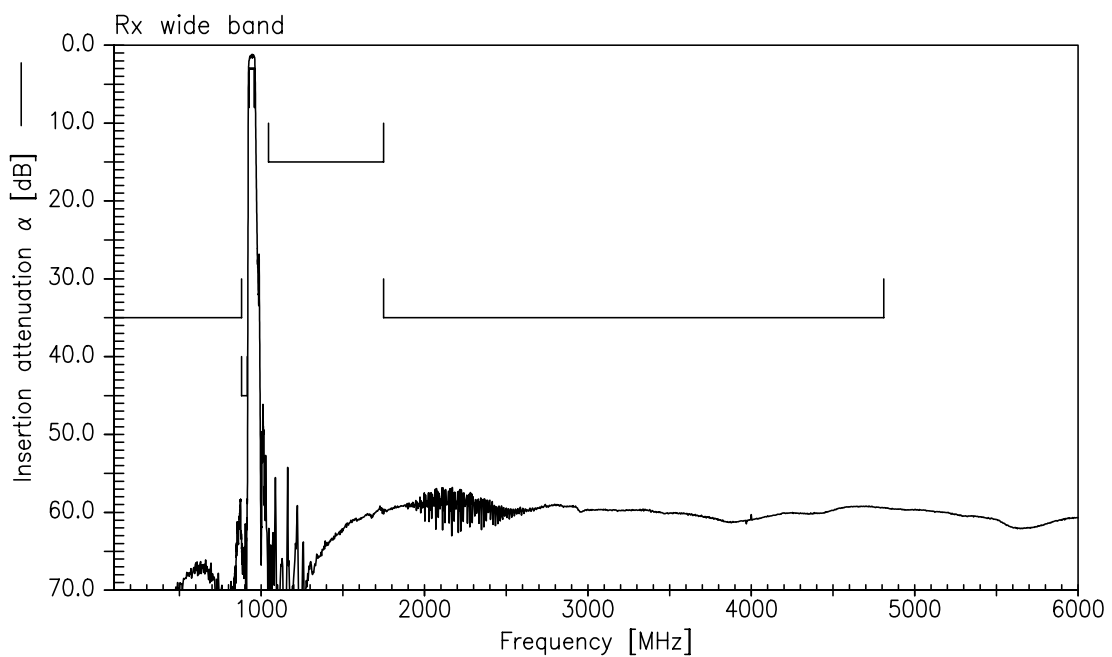
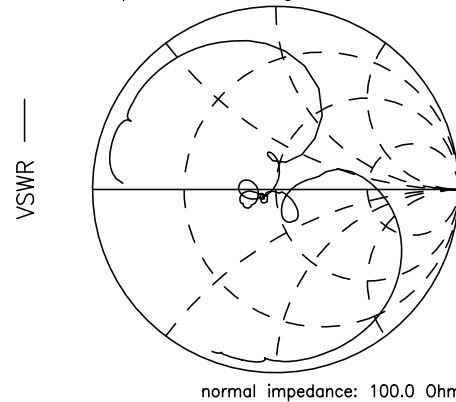**Frequency response TX - RX isolation**
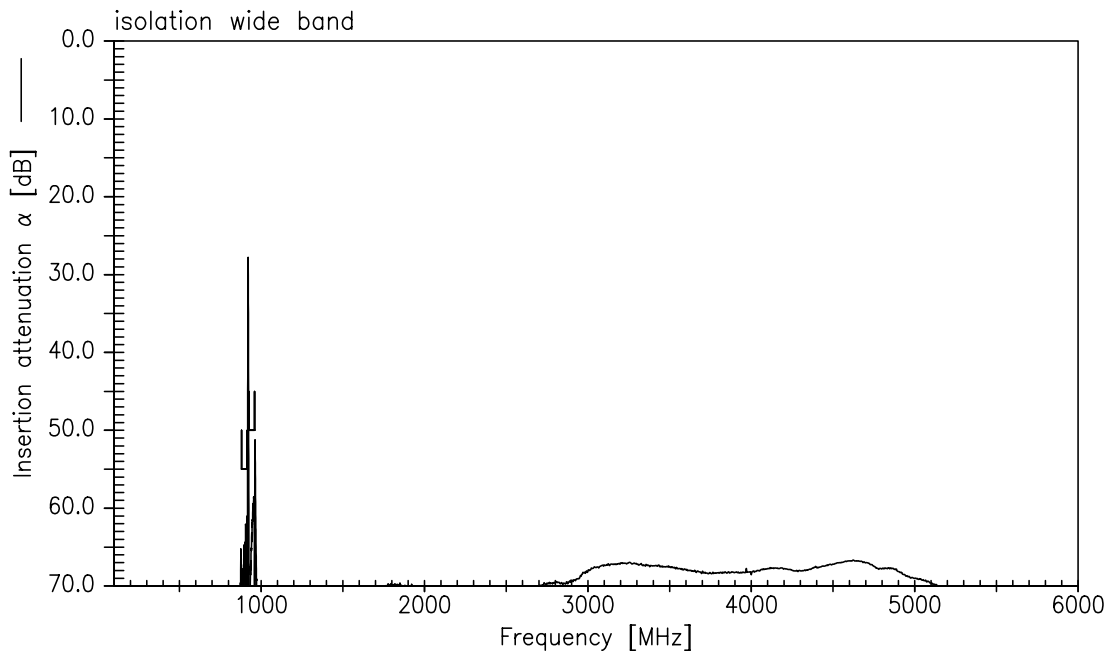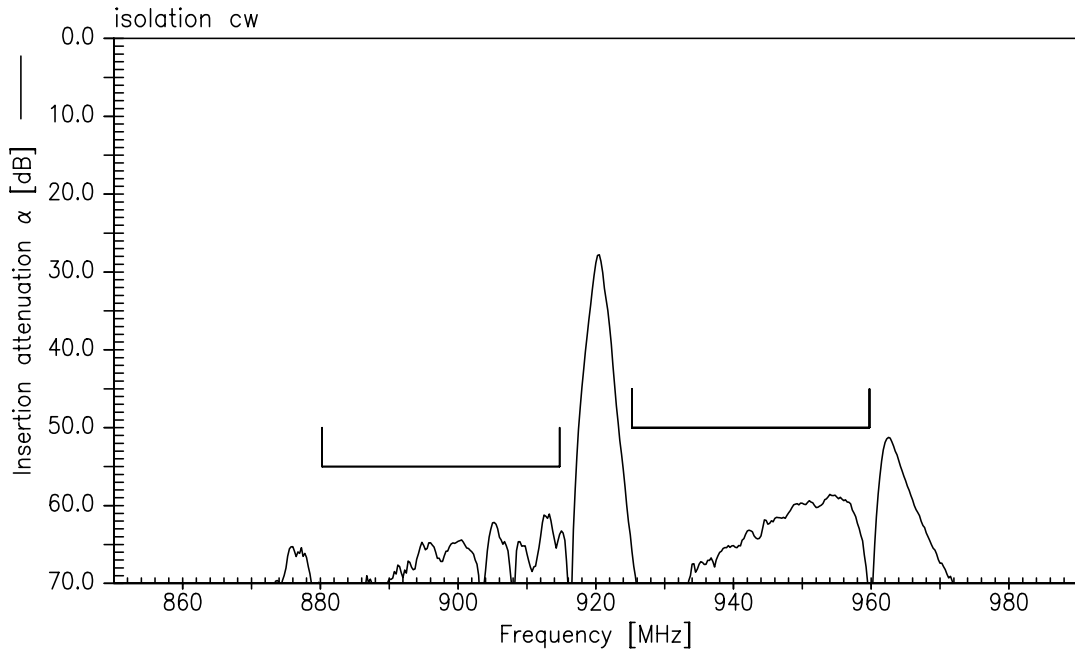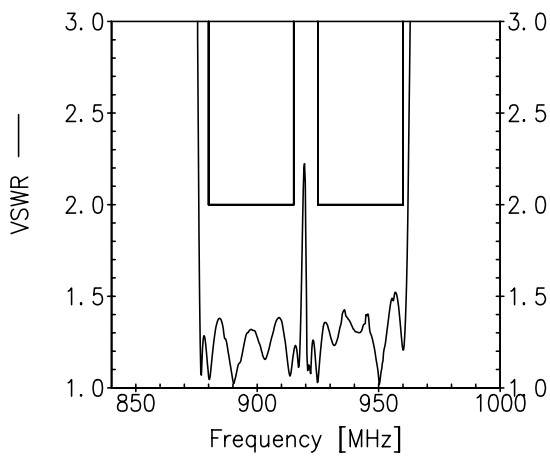
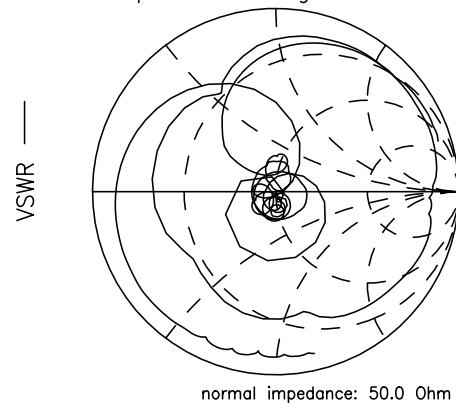### VSWRs at TX, RX and Antenna



tx port matching

normal impedance: 50.9 Ohm



rx port matching

normal impedance: 100.0 Ohm



ant port matching

normal impedance: 50.0 Ohm

Please read *cautions and warnings and
important notes* at the end of this document.
   **13**   November 13, 2014

**References**

| | |
|---|---|
| **Type** | B8631 |
| **Ordering code** | B39941-B8631-P810 |
| **Marking and package** | C61157-A8-A95 |
| **Packaging** | F61074-V8259-Z000 |
| **Date codes** | L_1126 |
| **S-parameters** | B8631_NB_UN.s4p (unmatched, narrow band)<br>B8631_WB_UN.s4p (unmatched, wide band) |
| **Soldering profile** | S_6001 |
| **RoHS compatible** | defined as compatible with the following documents:<br><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." |
| **Moldability** | Before using in overmolding environment, please contact your EPCOS sales office. |
| **Matching coils** | See Inductor pdf-catalog<br>   http://www.tdk.co.jp/tefe02/coil.htm#aname1<br>and Data Library for circuit simulation<br>   http://www.tdk.co.jp/etvcl/index.htm |

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