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SAW Components

SAW Duplexer
LTE and WCDMA Band I

Series/type: **B8651**
Ordering code: **B39212B8651P810**

Date: January 21, 2015
Version: 2.2

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SAW Components	B8651
SAW Duplexer	1950.0 / 2140.0 MHz

Data Sheet SMD
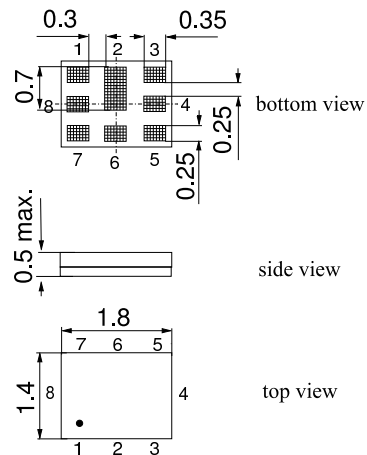
Application

- Low-loss SAW duplexer for mobile telephone LTE and WCDMA Band I systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- High isolation between TX and RX
- External ANT-coil

Features

- Package size 1.8 x 1.4 mm^2, max. height 0.5 mm
- RoHS compatible
- Approx. weight 0.005 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni terminals, Au-plated
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- **M**oisture **S**ensitive **L**evel 3 (**MSL**)

bottom view

side view

top view

Pin configuration

- 3   TX Input
- 1   RX Output
- 6   Antenna
- 7, 8, 9 To be grounded
- 2, 4, 5 To be grounded

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

2 January 21, 2015

⏣TDK

SAW Components	B8651
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data Sheet ⊑Mⅅ

Characteristics

Temperature range for specification: $\quad$ T $\quad$ = −20 ˚C to +90 ˚C
ANT terminating impedance: $\quad$ Z_{ANT} = $\quad$ 50 Ω || 3.1 nH
RX terminating impedance: $\quad$ Z_{RX} = $\quad$ 50 Ω
TX terminating impedance: $\quad$ Z_{TX} = $\quad$ 50 Ω

			B8651		
Characteristics TX - ANT		**min.**	**typ.** **@ 25˚C**	**max.**	
Center frequency	f_C	—	1950.0	—	MHz
Maximum insertion attenuation	α				
$\qquad$ 1920.59 ...1979.41 MHz		—	1.9	2.3	dB
@$f_{Carrier}$ 1922.4 $\quad$...1977.6 MHz α_{WCDMA}[1]		—	1.8	2.3	dB
Amplitude ripple (p-p)					
$\qquad$ 1920.59 ...1979.41 MHz $\Delta\alpha$ [2]		—	0.5	0.8	dB
$\qquad$ 1920.59 ...1979.41 MHz $\Delta\alpha$ [3]		—	1.0	2.0	dB
Error Vector Magnitude					
@$f_{Carrier}$ 1922.4 $\quad$...1977.6 MHz $\quad$ EVM [4]		—	1.5	2.5	%
Input VSWR (TX port)					
$\qquad$ 1920.59 ...1979.41 MHz		—	1.5	2.0	
Output VSWR (ANT port)					
$\qquad$ 1920.59 ...1979.41 MHz		—	1.4	2.0	

[1] Attenuation of a 3.84 Mcps WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).
[2] Over any 5 MHz in-band.
[3] Over any 20 MHz in-band.
[4] Error Vector Magnitude (based on definition given in 3GPP TS 25.141) of a 3.84 Mcps WCDMA signal.

$\boxed{3}$ January 21, 2015

Characteristics

Temperature range for specification:	T	= −20 ˚C to +90 ˚C
ANT terminating impedance:	Z_{ANT} =	50 Ω ‖ 3.1 nH
RX terminating impedance:	Z_{RX} =	50 Ω
TX terminating impedance:	Z_{TX} =	50 Ω

Characteristics TX - ANT			B8651			
			min.	typ. @ 25˚C	max.	
Attenuation		α				
10.0	... 1574.0	MHz	30	41	—	dB
420.0	... 494.0	MHz	44	54	—	dB
843.0	... 894.0	MHz	38	44	—	dB
920.0	... 960.0	MHz	39	44	—	dB
1226.0	... 1250.0	MHz	36	41	—	dB
1470.0	... 1496.0	MHz	35	41	—	dB
1496.0	... 1511.0	MHz	35	41	—	dB
1559.0	... 1563.0	MHz	36	42	—	dB
1565.42	... 1573.374	MHz	36	42	—	dB
1573.374	... 1577.466	MHz	36	43	—	dB
1577.466	... 1585.42	MHz	36	43	—	dB
1597.551	... 1605.886	MHz	36	43	—	dB
1605.886	... 1805.0	MHz	30	38	—	dB
1805.0	... 1865.0	MHz	20	29	—	dB
1865.0	... 1880.0	MHz	10	23	—	dB
2010.0	... 2025.0	MHz	13 [1]	27	—	dB
2110.0	... 2170.0	MHz	36	44	—	dB
2400.0	... 2500.0	MHz	27	37	—	dB
2620.0	... 2690.0	MHz	15	33	—	dB
3830.0	... 3960.0	MHz	14	22	—	dB
4900.0	... 5950.0	MHz	6	12	—	dB
4905.0	... 5840.0	MHz	6	12	—	dB

[1] Valid from + 15 °C to +90 °C.

SAW Components			**B8651**
SAW Duplexer			**1950.0 / 2140.0 MHz**
Data Sheet	SMD		

Characteristics

Temperature range for specification: $T = -20\ ^\circ C$ to $+90\ ^\circ C$
ANT terminating impedance: $Z_{ANT} = 50\ \Omega \parallel 3.1\ nH$
RX terminating impedance: $Z_{RX} = 50\ \Omega$
TX terminating impedance: $Z_{TX} = 50\ \Omega$

			B8651			
Characteristics ANT - RX			**min.**	**typ. @ 25°C**	**max.**	
Center frequency		f_C	—	2140.0	—	MHz
Maximum insertion attenuation		α				
2110.59 ... 2169.41	MHz		—	1.9	2.4	dB
Amplitude ripple (p-p)						
2110.59 ... 2169.41	MHz	$\Delta\alpha$ [1]	—	0.4	0.7	dB
2110.59 ... 2169.41	MHz	$\Delta\alpha$ [2]	—	0.5	1.5	dB
Error Vector Magnitude						
@$f_{Carrier}$ 2112.4 ... 2167.6	MHz	EVM [3]	—	1.2	2.5	%
Input VSWR (ANT port)						
2110.59 ... 2169.41	MHz		—	1.5	2.0	
Output VSWR (RX port)						
2110.59 ... 2169.41	MHz		—	1.7	2.0	
Attenuation		α				
90.0 ... 1920.0	MHz		32	43	—	dB
190.0 ... 190.0	MHz		50	77	—	dB
718.0 ... 748.0	MHz		40	55	—	dB
814.0 ... 849.0	MHz		40	53	—	dB
880.0 ... 910.0	MHz		40	52	—	dB
1427.0 ... 1447.0	MHz		40	46	—	dB
1447.0 ... 1463.0	MHz		39	45	—	dB
1730.0 ... 1790.0	MHz		30	43	—	dB
1710.0 ... 1780.0	MHz		32	43	—	dB
1920.0 ... 1980.0	MHz		36	54	—	dB
1980.0 ... 2010.0	MHz		25	40	—	dB
2010.0 ... 2050.0	MHz		28	34	—	dB
2050.0 ... 2070.0	MHz		18	27	—	dB
2400.0 ... 2500.0	MHz		25	40	—	dB
2500.0 ... 2570.0	MHz		32	42	—	dB
4030.0 ... 4150.0	MHz		34	46	—	dB
4220.0 ... 4340.0	MHz		29	41	—	dB
4900.0 ... 5950.0	MHz		28	38	—	dB

[1] Over any 5 MHz in-band.
[2] Over any 20 MHz in-band.
[3] Attenuation of a 3.84 Mcps WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).

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

5 January 21, 2015

SAW Components			**B8651**
SAW Duplexer			**1950.0 / 2140.0 MHz**

Data Sheet   SMD

Characteristics

Temperature range for specification: $T = -20\,°C$ to $+90\,°C$
ANT terminating impedance: $Z_{ANT} = 50\,\Omega \parallel 3.1\,nH$
RX terminating impedance: $Z_{RX} = 50\,\Omega$
TX terminating impedance: $Z_{TX} = 50\,\Omega$

Characteristics ANT - RX			**B8651**		
		min.	**typ. @ 25°C**	**max.**	
IMD Product Level Limits[1] **at f_{TX}=1920 ... 1980 MHz, f_{RX}= Blocker 1... 4**					
Blocker 1	190.0 MHz	—	-117	—	dBm
Blocker 2	1730.0 ... 1790.0 MHz	—	-113	—	dBm
Blocker 3	4030.0 ... 4150.0 MHz	—	-102	—	dBm
Blocker 4	5950.0 ... 6130.0 MHz	—	-118	—	dBm

[1] IMD product level limits for power levels P_{TX}=21.5dBm (antenna port output power) an $P_{Blocker}$=-15dBm (antenna port input power).

SAW Components	**B8651**
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data Sheet SMD

Characteristics

Temperature range for specification:	T	$= -20\ °C$ to $+90\ °C$
ANT terminating impedance:	$Z_{ANT} =$	$50\ \Omega\ \|\|\ 3.1\ nH$
RX terminating impedance:	$Z_{RX} =$	$50\ \Omega$
TX terminating impedance:	$Z_{TX} =$	$50\ \Omega$

				B8651		
Characteristics TX - RX			**min.**	**typ. @ 25°C**	**max.**	
Isolation	α					
1574.0 ... 1577.0	MHz		40	74	—	dB
1920.59 ... 1979.41	MHz		55	60	—	dB
@$f_{Carrier}$ 2112.4 ... 2167.6	MHz	α_{WCDMA}	55[1]	61	—	dB
3830.0 ... 3970.0	MHz		20	60	—	dB
5750.0 ... 5950.0	MHz		20	42	—	dB

[1] Attenuation of a 3.84 Mcps WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).

Annotation for characteristics section

Attenuation of WCDMA signal ("Powertransferfunction", α_{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 WCDMA Band 2 Passband, $f_{Carrier}$ ranges from 1852.4 MHz (lowest Tx channel) to 1907.6 MHz (highest Tx 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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7 January 21, 2015

Intermodulations

Characteristics simultaneous voice and LTE		B8651		
	min.	typ. @ 25˚C	max.	
IM levels referenced at antenna port f_{TX}=1955 MHz [1], f_{ANT}=1765 MHz [2]				
IM3 2145.0 MHz	—	-75	—	dBm
f_{TX}=1955 MHz [1], f_{ANT}=1765 MHz [2]				
IM3 1575.0 MHz	—	-85	—	dBm

[1] P=+24dBm at antenna port.
[2] P=+14dBm.

Maximum ratings

Storage temperature range	T_{stg}	−40/+90	˚C	
DC voltage	V_{DC}	5 [1]	V	
DC impedance to ground		>100	MΩ	
ESD voltage	V_{ESD}			
		125 [2]	V	Machine Model
		150 [3]	V	Human Body Model
		600 [4]	V	Charged Device Model
Input power at	P_{IN}			source and load impedance 50 Ω
1920.0 ... 1980.0 MHz		29	dBm	} continuous wave
elsewhere		10	dBm	T = 50˚C, >5000 h

[1] 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.
[2] acc. to JESD22-A115B (MM - Machine Model), 10 negative & 10 positive pulses
[3] acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses
[4] acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses

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8   January 21, 2015

Frequency Response TX - ANT (CW Signal - narrow band)

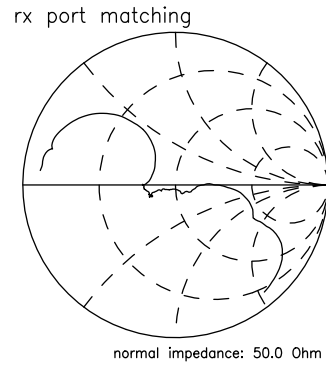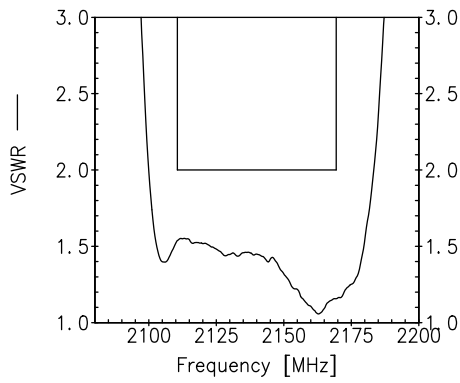

Frequency Response TX - ANT (CW Signal - wideband)

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9   January 21, 2015
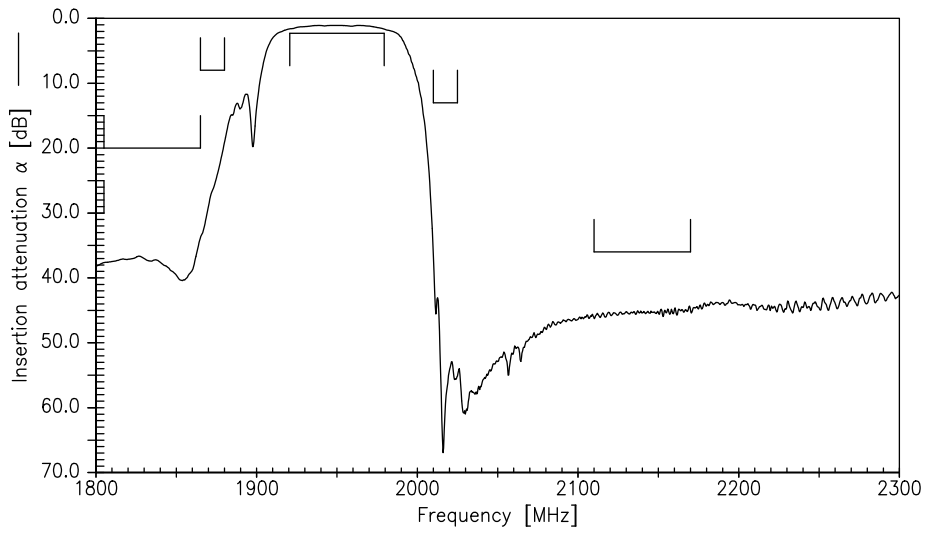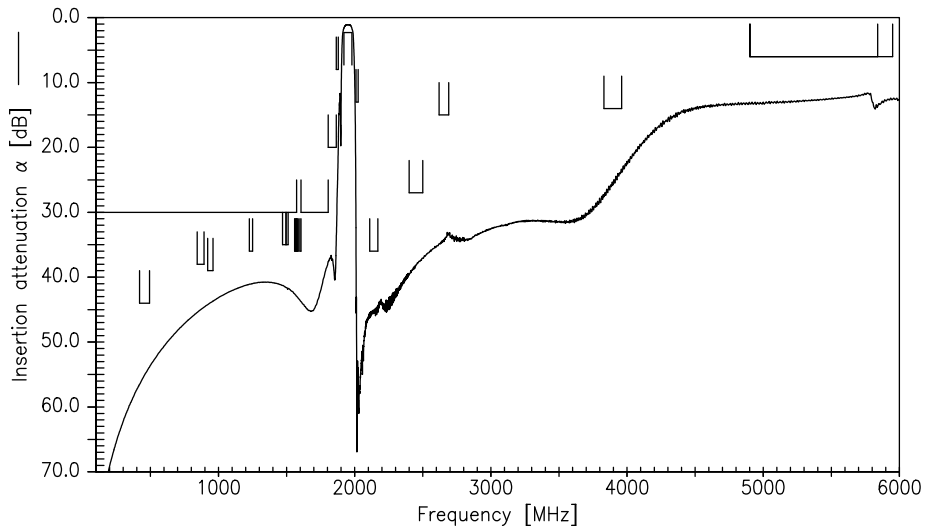
Frequency Response RX - ANT (CW Signal - narrow band)

Frequency Response RX - ANT (CW Signal - wideband)

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10 January 21, 2015

SAW Components	B8651
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data Sheet   SMD
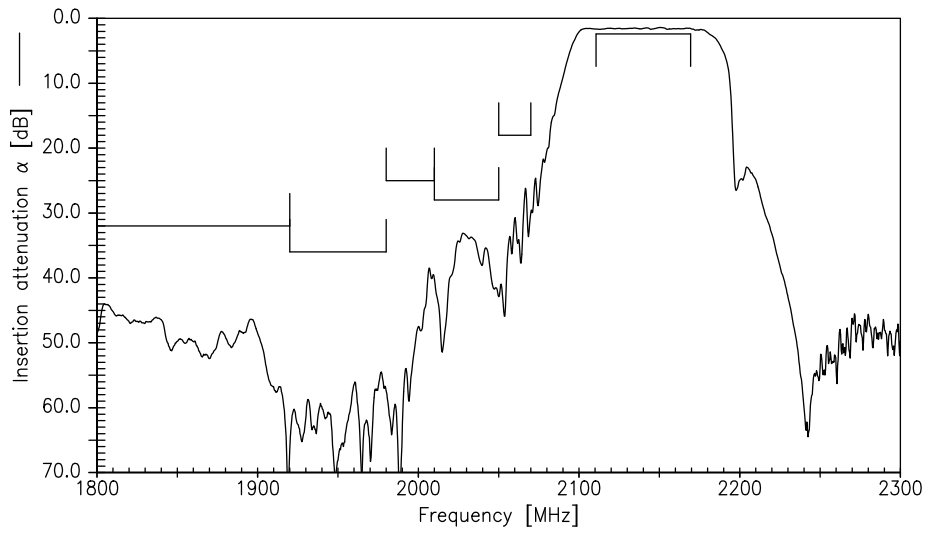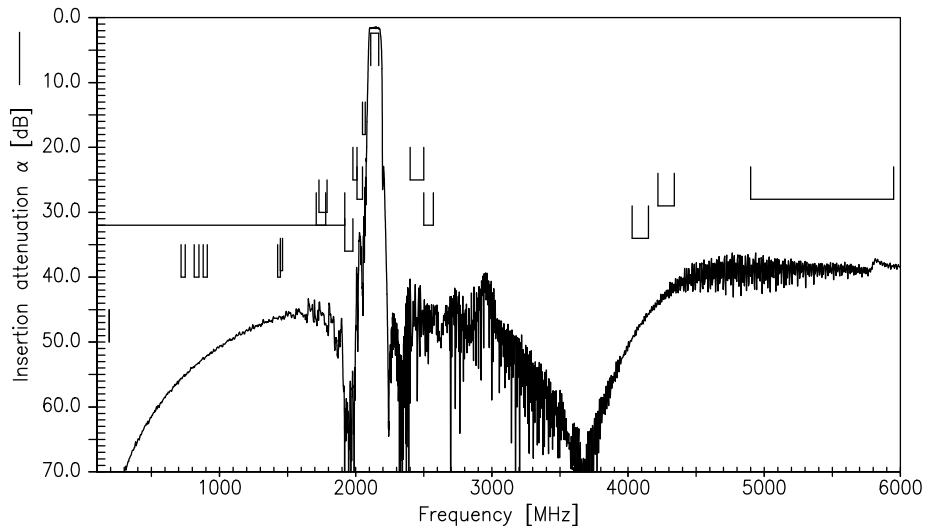
Frequency Response TX - RX isolation (CW Signal - narrow band)
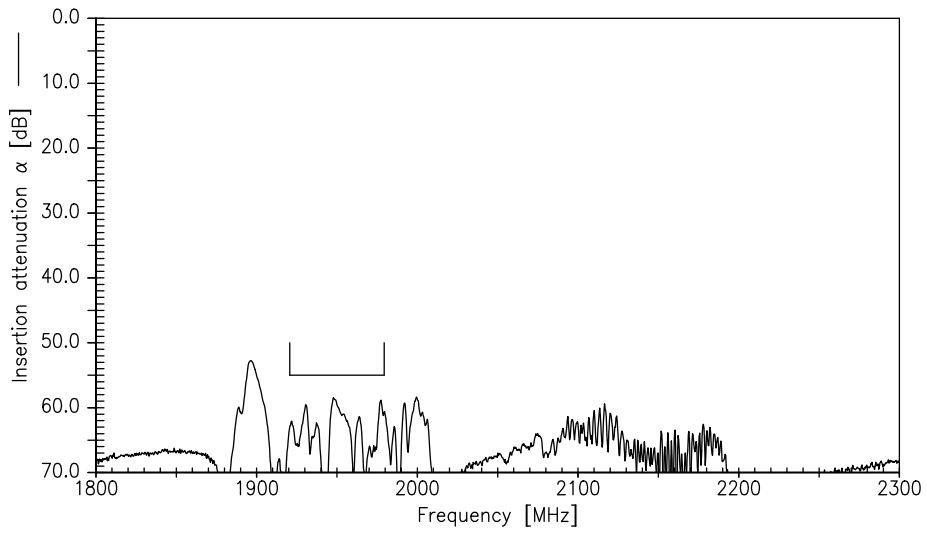
Frequency Response TX - RX isolation (WCDMA Signal - narrow band)
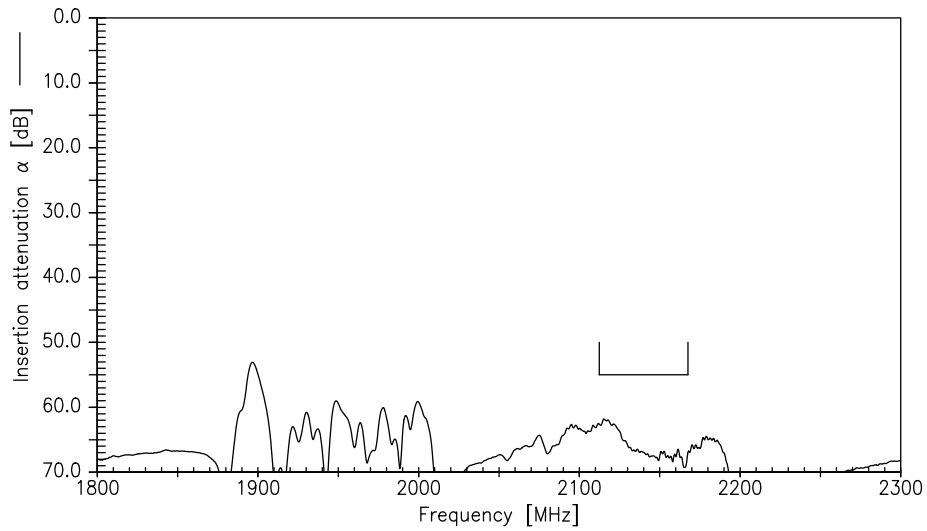
VSWR at TX, RX and ANT (CW Signal - narrow band)
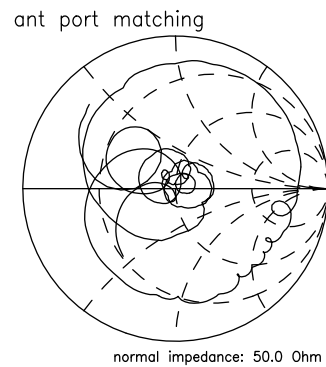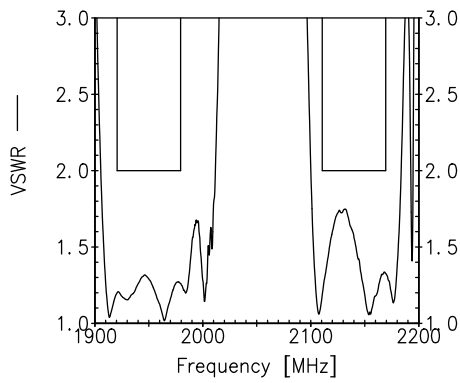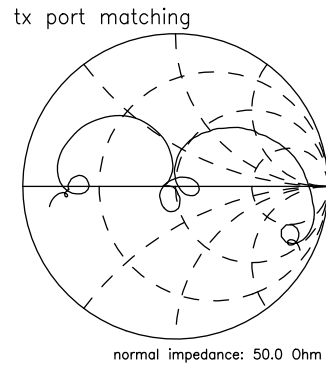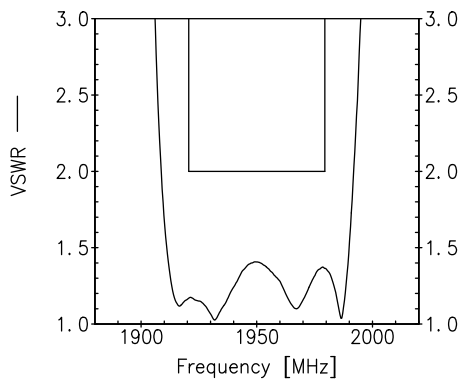
tx port matching

normal impedance: 50.0 Ohm

rx port matching

normal impedance: 50.0 Ohm

ant port matching

normal impedance: 50.0 Ohm

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12   January 21, 2015

Frequency Response TX - ANT (CW Signal - narrow band zoom)
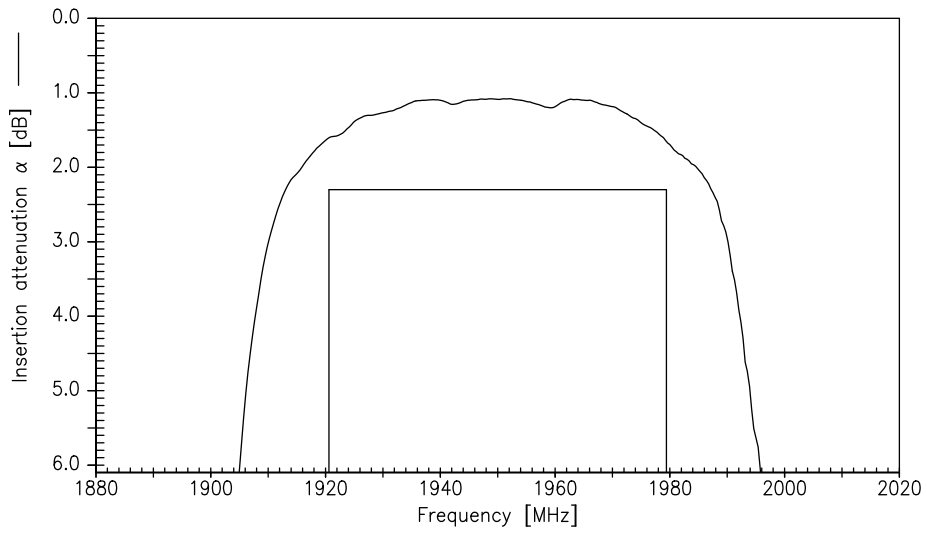
Frequency Response RX - ANT (WCDMA Signal - narrow band zoom)

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13   January 21, 2015

SAW Components	B8651
SAW Duplexer	1950.0 / 2140.0 MHz
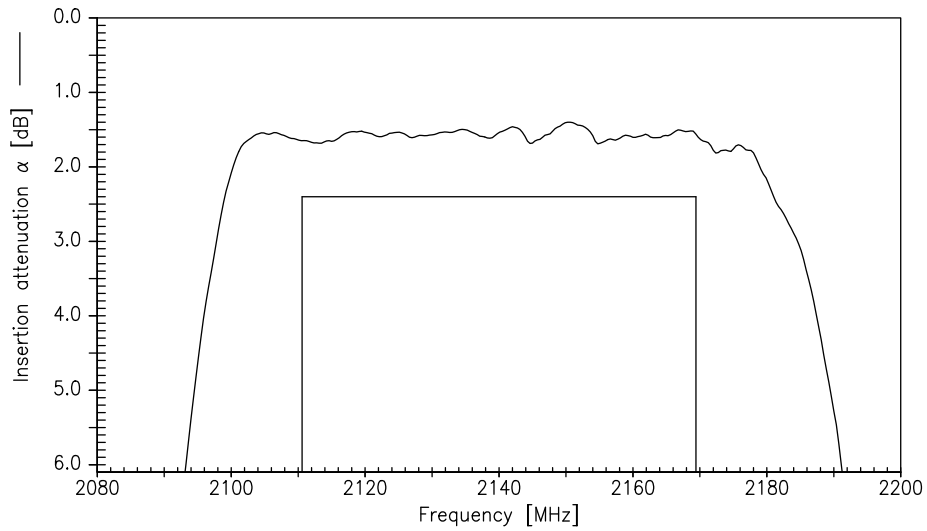
Data Sheet SMD

Frequency Response TX Error Vector Magnitude (narrow band)
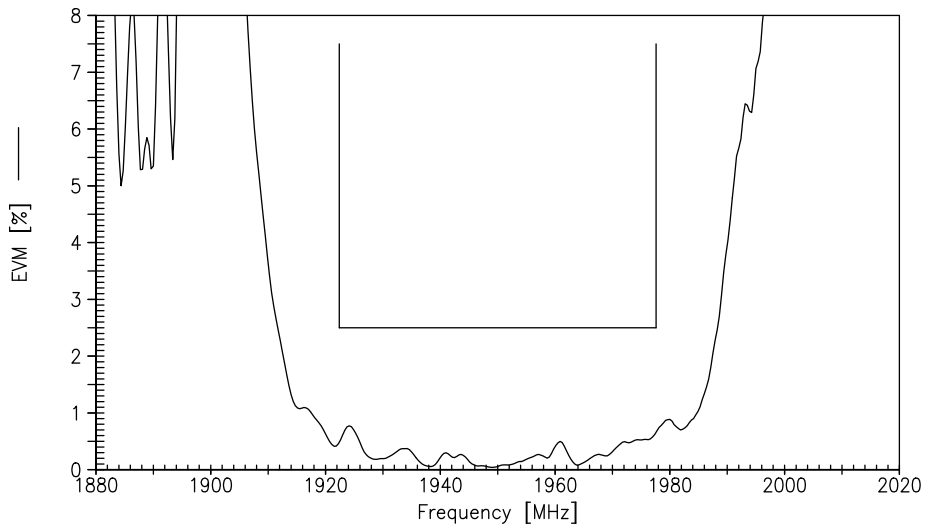
Frequency Response RX Error Vector Magnitude (narrow band)
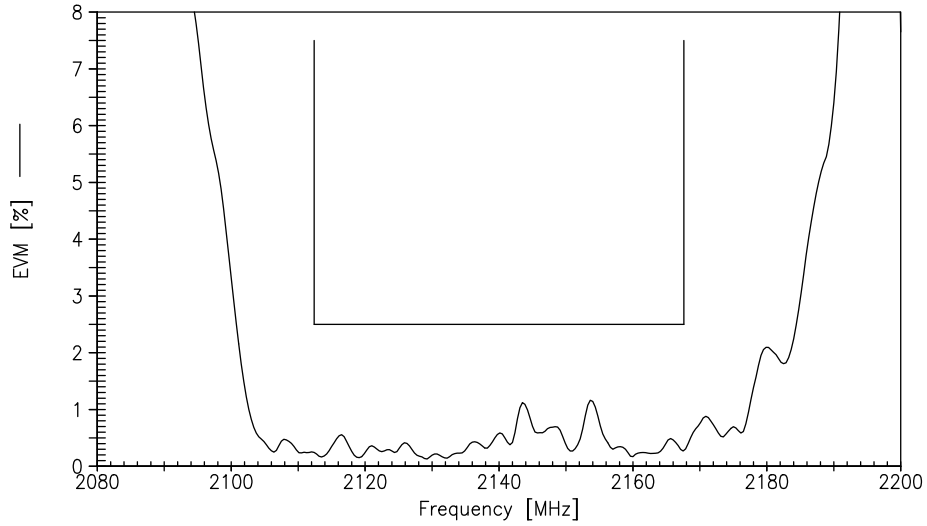
Frequency Response TX - RX isolation (CW Signal - wide band)

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15 January 21, 2015

References

Type	B8651
Ordering code	B39212B8651P810
Marking and package	C61157-A8-A169-1-27
Packaging	F61074-V8259-Z000-2-27
Date codes	L_1126
S-parameters	B8651_PCB.s3p
Soldering profile	S_6001
RoHS compatible	RoHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.

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