



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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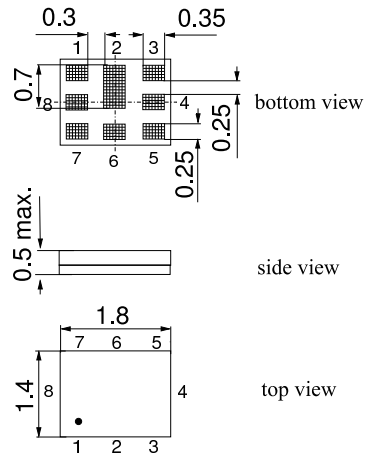
EPCOS AG is a TDK Group Company.

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 mm²,
max. height 0.5 mm
- RoHS compatible
- Approx. weight 0.005 g
- Package for **Surface Mount Technology (SMT)**
- Ni terminals, Au-plated
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- **M**oisture **S**ensitive **L**evel 3 (**MSL**)


Pin configuration

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

SAW Components	B8651
SAW Duplexer	1950.0 / 2140.0 MHz

Data Sheet



Characteristics

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

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

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Characteristics

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

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.

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Characteristics

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

Characteristics ANT - RX		B8651			
		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).

SAW Components	B8651
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Data Sheet **SMD**

Characteristics

Temperature range for specification: $T = -20\text{ °C to }+90\text{ °C}$
 ANT terminating impedance: $Z_{ANT} = 50\ \Omega \parallel 3.1\text{ nH}$
 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 Limits¹⁾ at $f_{TX}=1920 \dots 1980\text{ MHz}$, $f_{RX}=\text{Blocker}$ 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 $P_{TX}=21.5\text{ dBm}$ (antenna port output power) and $P_{Blocker}=-15\text{ dBm}$ (antenna port input power).

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Data Sheet **SMD**

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 - RX	B8651			
	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

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

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:

$$\int_{-\infty}^{\infty} |H_{RRC}(f)|^2 df = 1$$

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Intermodulations

Characteristics simultaneous voice and LTE	B8651			
	min.	typ. @ 25°C	max.	
IM levels referenced at antenna port				
$f_{TX}=1955\text{ MHz}^1$, $f_{ANT}=1765\text{ MHz}^2$				
IM3 2145.0 MHz	—	-75	—	dBm
$f_{TX}=1955\text{ MHz}^1$, $f_{ANT}=1765\text{ MHz}^2$				
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	Machine Model Human Body Model Charged Device Model source and load impedance 50 Ω } continuous wave T = 50°C, >5000 h
DC voltage	V_{DC}	5 ¹⁾	V	
DC impedance to ground		>100	MΩ	
ESD voltage	V_{ESD}	125 ²⁾	V	
		150 ³⁾	V	
		600 ⁴⁾	V	
Input power at 1920.0 ... 1980.0 MHz elsewhere	P_{IN}	29	dBm	
		10	dBm	

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

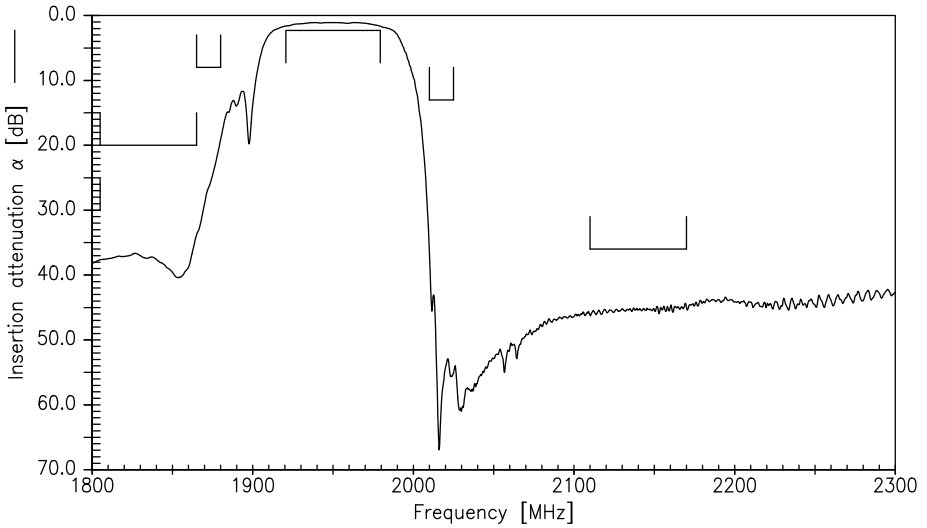
3) acc. to JESD22-A114F (HBM - Human Body Model), 1 negative & 1 positive pulses

4) acc. to JESD22-C101C (CDM - Field Induced Charged Device Model), 3 negative & 3 positive pulses

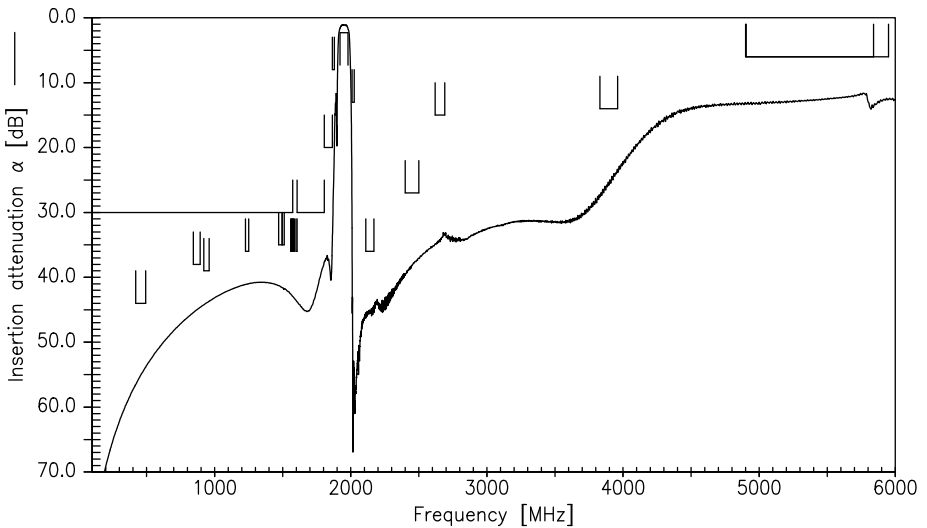
Data Sheet



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



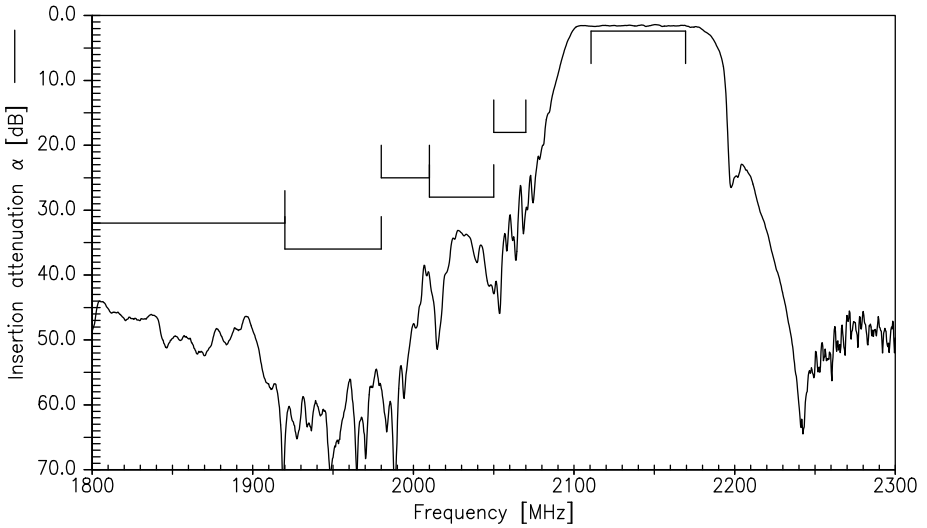
Frequency Response TX - ANT (CW Signal - wideband)



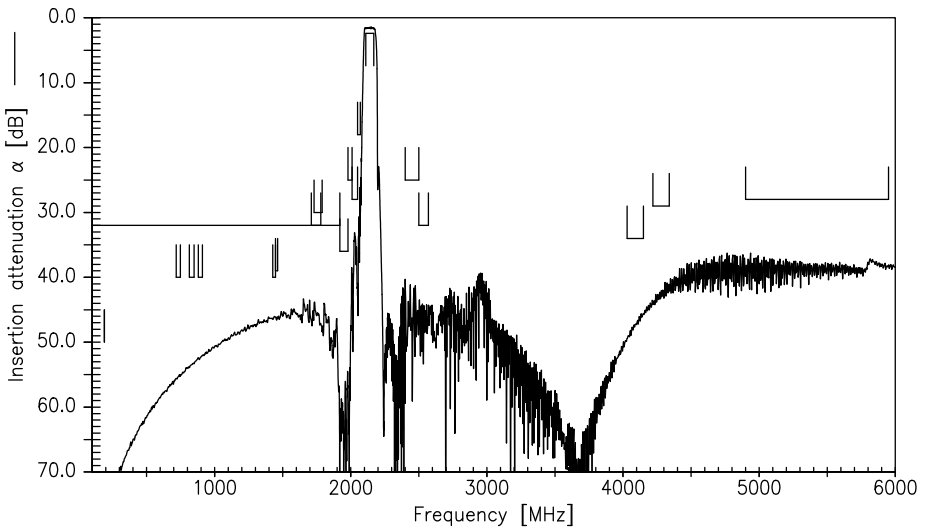
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Frequency Response RX - ANT (CW Signal - narrow band)



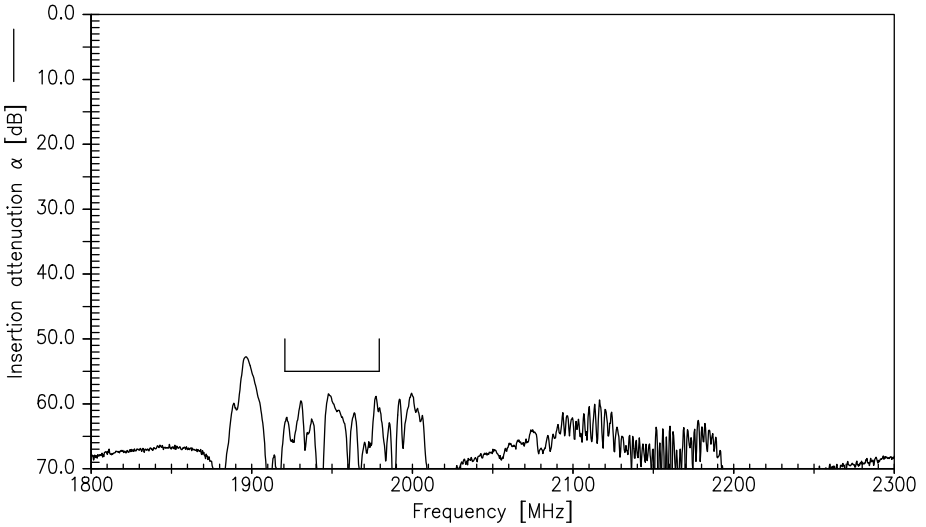
Frequency Response RX - ANT (CW Signal - wideband)



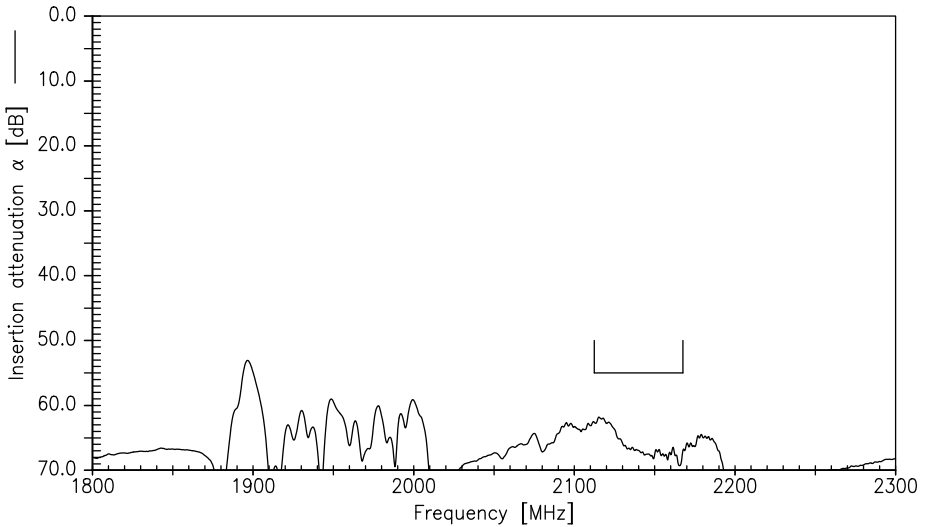
Data Sheet



Frequency Response TX - RX isolation (CW Signal - narrow band)



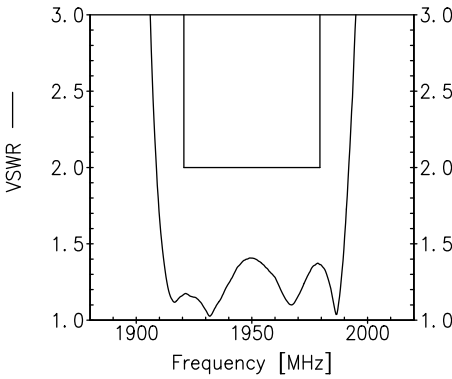
Frequency Response TX - RX isolation (WCDMA Signal - narrow band)



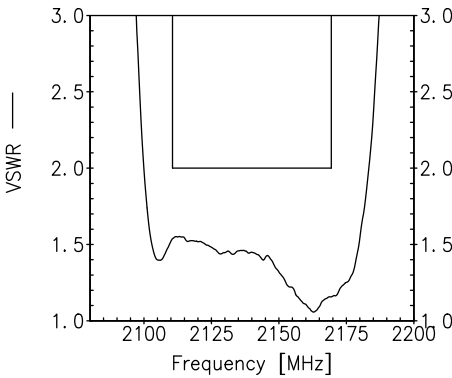
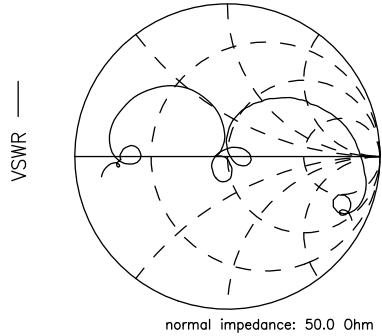
Data Sheet



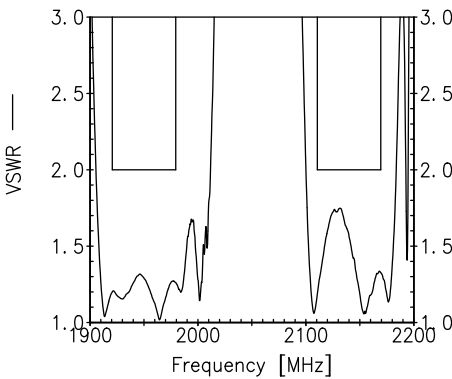
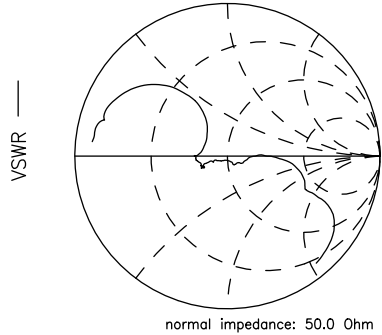
VSWR at TX, RX and ANT (CW Signal - narrow band)



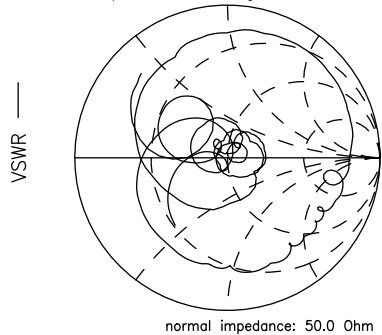
tx port matching



rx port matching



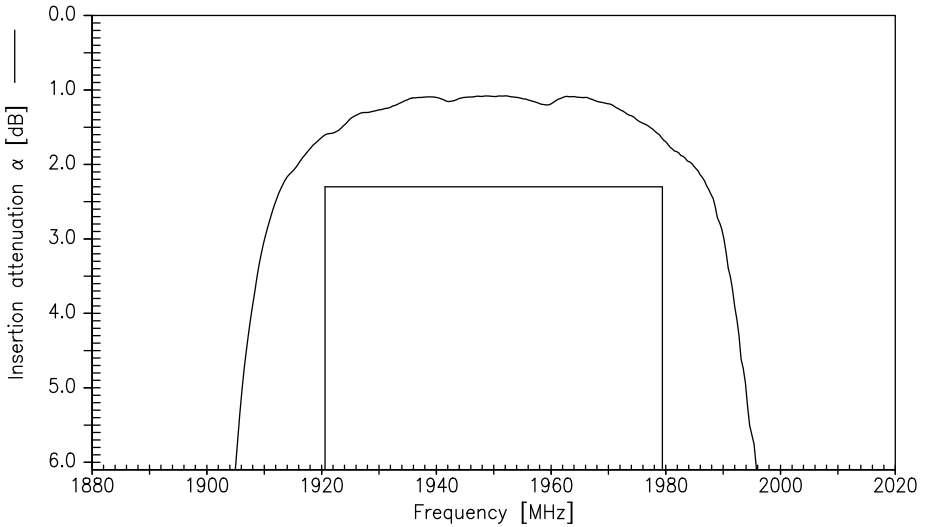
ant port matching



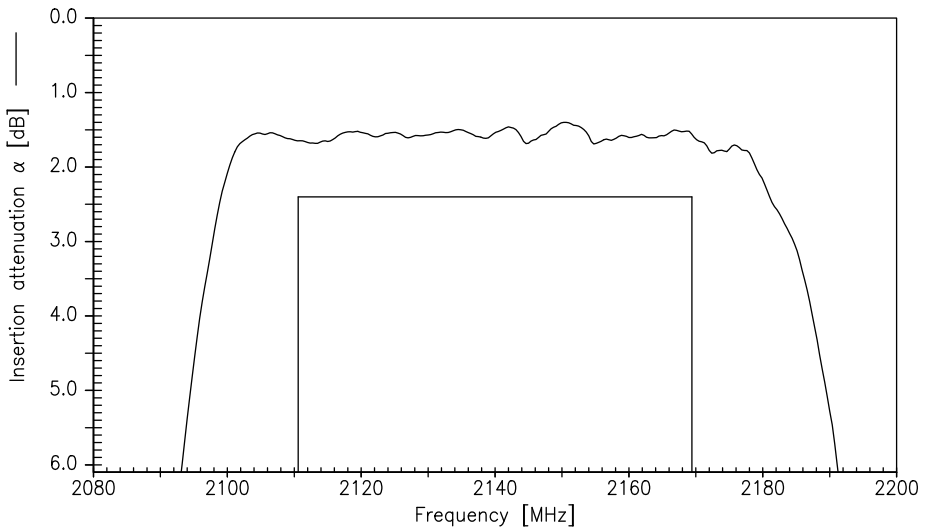
Data Sheet



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



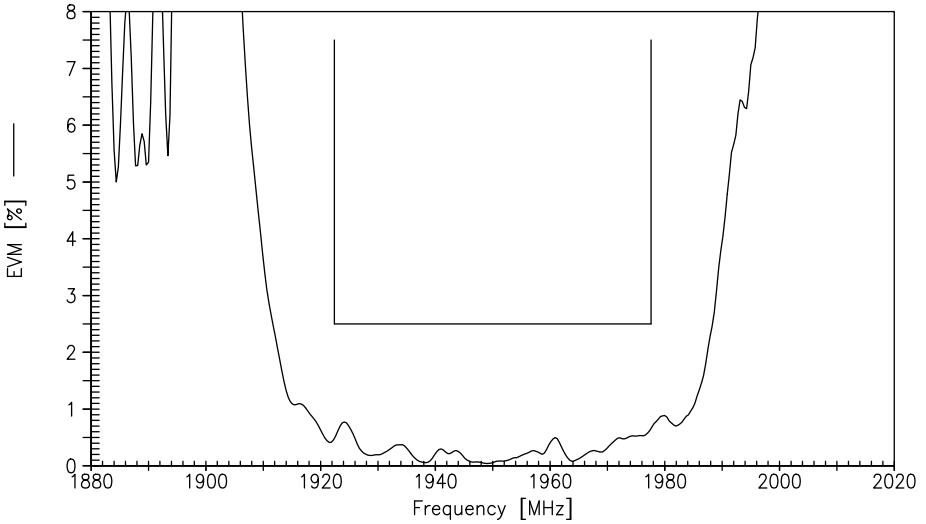
Frequency Response RX - ANT (WCDMA Signal - narrow band zoom)



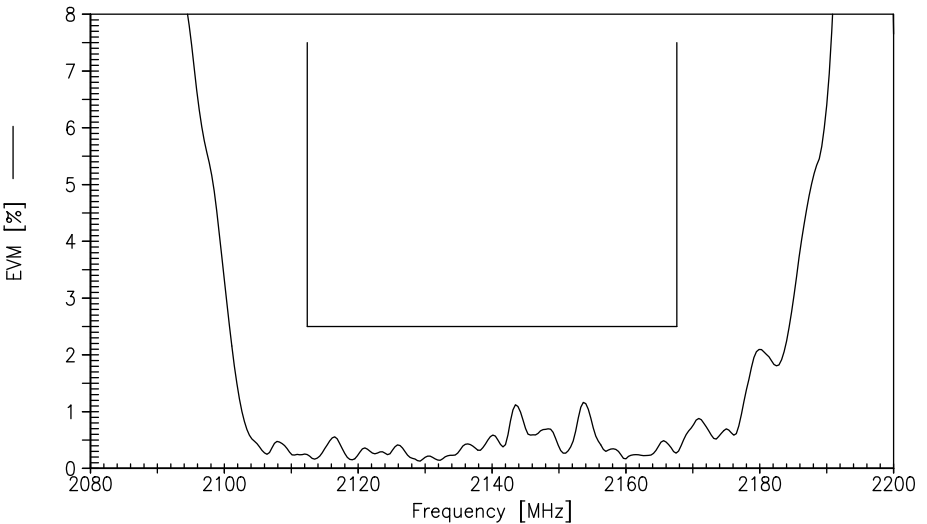
Data Sheet



Frequency Response TX Error Vector Magnitude (narrow band)



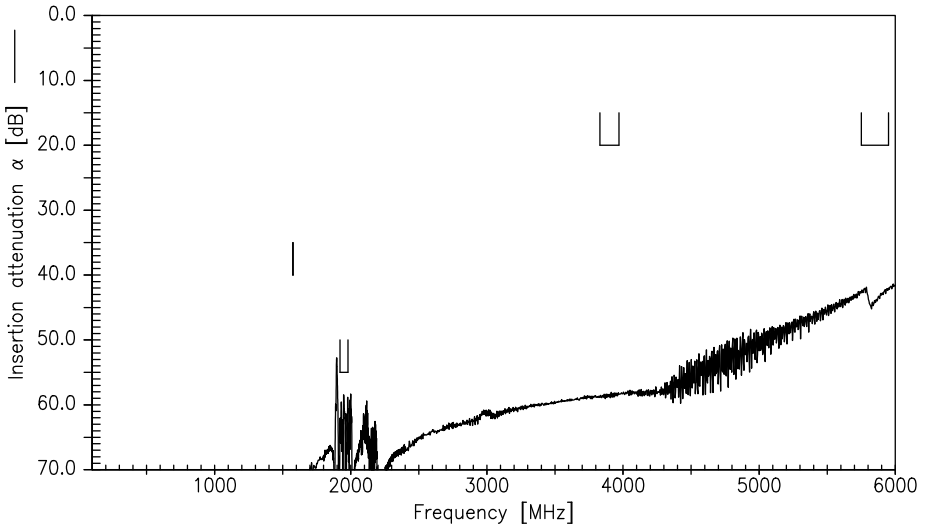
Frequency Response RX Error Vector Magnitude (narrow band)



Data Sheet



Frequency Response TX - RX isolation (CW Signal - wide band)



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Data Sheet



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 8 th , 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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