SAW Components

SAW Duplexer

WCDMA Band 4/ CDMA 1x AWS Band

Series/type:	**B8563**
Ordering Code:	**B39212B8563P810**
Date:	January 27, 2012
Version:	2.0

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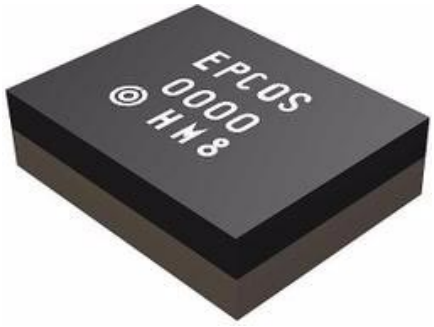
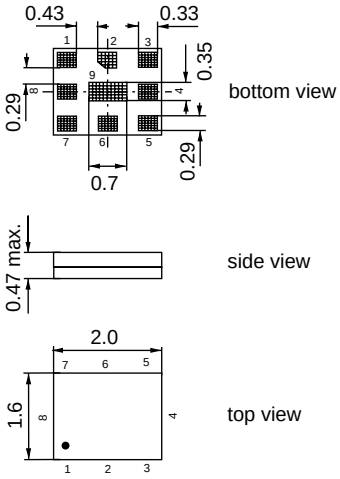
Application

- Low-loss SAW duplexer for mobile telephone WCDMA Band 4 / CDMA 1x AWS systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 45 MHz
- Single-ended to balanced transformation in Antenna-Rx path
- Impedance transformation 50Ω to 100Ω in Antenna-Rx path
- High isolation between Tx and Rx



Features

- Package size 2.0 x 1.6 mm², package height 0.47 mm max.
- RoHS compatible
- Approx. weight 0.005 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, Au-plated terminals
- Balanced Rx port, unbalanced Tx port
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- **M**oisture **S**ensitivity **L**evel 3



Pin configuration

3	Tx input, unbalanced
1,8	Rx output, balanced
6	Antenna
2, 4, 5, 7, 9	To be grounded

Characteristics for W-CDMA Band 4

Temperature range for specification: T = –15 ˚C to +80 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

		B8563			
Characterisitcs TX - Antenna		**min.**	**typ. @ 25 ˚C**	**max.**	
Center frequency	f_C		1732.5		MHz
Maximum insertion attenuation	α				
@$f_{Carrier}$ 1712.4 ... 1752.6 MHz	α_{WCDMA} [1]		1.3	1.8	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
@$f_{Carrier}$ 1712.4 ... 1752.6 MHz	$\Delta\alpha_{WCDMA}$ [1]		0.3	0.8	dB
Error vector magnitude	EVM [2]				
@$f_{Carrier}$ 1712.4 ... 1752.6 MHz			1.1	2.5	%
Input VSWR (TX port)					
1710.0 ... 1755.0 MHz			1.4	1.9	
Output VSWR (ANT port)					
1710.0 ... 1755.0 MHz			1.4	1.9	
Attenuation	α				
1.0 ... 728.0 MHz		30	45		dB
728.0 ... 764.0 MHz		35	45		dB
851.0 ... 894.0 MHz		35	43		dB
1310.0 ... 1355.0 MHz		24	38		dB
1565.42 ... 1573.374MHz		40	50		dB
1573.374 ... 1577.466MHz		45	52		dB
1577.466 ... 1585.42 MHz		40	52		dB
1597.5515... 1605.886MHz		40	45		dB
1805.0 ... 1880.0 MHz		20	47		dB
1930.0 ... 1990.0 MHz		40	49		dB
@$f_{Carrier}$ 2112.4 ... 2152.6 MHz	α_{WCDMA} [1]	42	46		dB
2400.0 ... 2500.0 MHz		30	38		dB
2565.0 ... 2677.0 MHz		5	33		dB
3410.0 ... 3510.0 MHz		25	32		dB
5000.0 ... 5120.0 MHz		10	21		dB
5120.0 ... 5350.0 MHz		15	25		dB
5350.0 ... 5725.0 MHz		10	28		dB
5725.0 ... 5850.0 MHz		20	28		dB
5850.0 ... 6000.0 MHz		10	25		dB

[1] Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (10).
[2] Error Vector Magnitude (EMV) based on definition given in 3GPP TS 25.141.

Characteristics for W-CDMA Band 4

Temperature range for specification: T = –15 ˚C to +80 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH.
TX terminating impedance: Z_{TX} = 50 Ω

		B8563			
Characterisitcs Antenna - Rx		**min.**	**typ. @ 25 ˚C**	**max.**	
Center frequency	f_C		2132.5		MHz
Maximum insertion attenuation	α				
@$f_{Carrier}$ 2112.4 ... 2152.6 MHz	α_{WCDMA} [1]		1.8	2.2	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
@$f_{Carrier}$ 2112.4 ... 2152.6 MHz	$\Delta\alpha_{WCDMA}$ [1]		0.3	0.7	dB
Error vector magnitude	EVM [2]				
@$f_{Carrier}$ 2112.4 ... 2152.6 MHz			1.1	2.5	%
Input VSWR (RX port)					
2110.0 ... 2155.0 MHz			1.4	2.0	
Output VSWR (ANT port)					
2110.0 ... 2155.0 MHz			1.7	2.0	
CMRR ($\lvert S_{32}-S_{42}\rvert/\lvert S_{32}+S_{42}\rvert$)					
2110.0 ... 2155.0 MHz		20 [3]	26		dB

[1] Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (10).
[2] Error Vector Magnitude (EMV) based on definition given in 3GPP TS 25.141.
[3] A combination of 10 ˚ phase balance and 1 dB amplitude balance corresponds to 19.6 dB CMRR.

Characteristics for W-CDMA Band 4

Temperature range for specification: T = –15 ˚C to +80 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

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Characterisitcs Antenna - Rx					**min.**	**typ. @ 25 ˚C**	**max.**	
Attenuation				α				
1.0	...	400.0	MHz		57	70		dB
400.0	...	1310.0	MHz		40	70		dB
1310.0	...	1355.0	MHz		43	68		dB
1355.0	...	1710.0	MHz		35	51		dB
@$f_{Carrier}$ 1712.4	...	1752.6	MHz	α_{WCDMA}[1)]	45	63		dB
1755.0	...	1910.0	MHz		15	52		dB
1910.0	...	1955.0	MHz		35	57		dB
1955.0	...	2025.0	MHz		15	39		dB
2240.0	...	2300.0	MHz		15	38		dB
2300.0	...	2400.0	MHz		30	46		dB
2400.0	...	2496.0	MHz		40	45		dB
2496.0	...	2690.0	MHz		40	54		dB
2690.0	...	3300.0	MHz		35	48		dB
3300.0	...	3800.0	MHz		45	56		dB
3820.0	...	3910.0	MHz		40	56		dB
3910.0	...	4220.0	MHz		35	55		dB
4220.0	...	4310.0	MHz		40	54		dB
4310.0	...	5150.0	MHz		35	50		dB
5150.0	...	5850.0	MHz		40	44		dB
5850.0	...	6475.0	MHz		35	43		dB

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (10).

Characteristics for W-CDMA Band 4

Temperature range for specification: T = –15 ˚C to +80 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

				B8563			
Characterisitcs Tx - Rx				**min.**	**typ. @ 25 ˚C**	**max.**	
Differential Mode Isolation			α				
1574.0	... 1577.0	MHz		40	70		dB
@$f_{Carrier}$ 1712.4	... 1752.6	MHz	α_{WCDMA}[1)]	55	60		dB
@$f_{Carrier}$ 2112.4	... 2152.6	MHz	α_{WCDMA}[1)]	50	62		dB
3410.0	... 3520.0	MHz		20	70		dB
5120.0	... 5275.0	MHz		20	59		dB
Common Mode Isolation			α				
@$f_{Carrier}$ 1712.4	... 1752.6	MHz	α_{WCDMA}[1)]	48	51		dB

[1)] Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (10).

Characteristics for CDMA 1x AWS Band

Temperature range for specification: T = –30 ˚C to +85 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

		B8563			
Characterisitcs TX - Antenna		**min.**	**typ. @ 25 ˚C**	**max.**	
Center frequency	f_C		1732.5		MHz
Maximum insertion attenuation	α				
1710.0 ... 1755.0 MHz			1.4	2.0	dB
Amplitude ripple (p-p)	Δα				
1710.0 ... 1755.0 MHz			0.4	1.2	dB
Input VSWR (TX port)					
1710.0 ... 1755.0 MHz			1.4	1.9	
Output VSWR (ANT port)					
1710.0 ... 1755.0 MHz			1.4	1.9	
Attenuation	α				
1.0 ... 728.0 MHz		30	45		dB
728.0 ... 764.0 MHz		35	45		dB
851.0 ... 894.0 MHz		35	43		dB
1310.0 ... 1355.0 MHz		24	38		dB
1565.42 ... 1573.374MHz		40	50		dB
1573.374 ... 1577.466MHz		45	52		dB
1577.466 ... 1585.42 MHz		40	52		dB
1597.5515... 1605.886MHz		40	45		dB
1805.0 ... 1880.0 MHz		20	47		dB
1930.0 ... 1990.0 MHz		40	49		dB
2110.0 ... 2155.0 MHz		42	46		dB
2400.0 ... 2500.0 MHz		30	38		dB
2565.0 ... 2677.0 MHz		5	33		dB
3410.0 ... 3510.0 MHz		25	32		dB
5000.0 ... 5120.0 MHz		10	21		dB
5120.0 ... 5350.0 MHz		15	25		dB
5350.0 ... 5725.0 MHz		10	28		dB
5725.0 ... 5850.0 MHz		20	28		dB
5850.0 ... 6000.0 MHz		10	25		dB

Characteristics for CDMA 1x AWS Band

Temperature range for specification: T = –30 ˚C to +85 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

		B8563			
Characterisitcs Antenna - Rx		**min.**	**typ. @ 25 ˚C**	**max.**	
Center frequency	f_C		2132.5		MHz
Maximum insertion attenuation	α				
2110.0 ... 2155.0 MHz			1.8	2.3	dB
Amplitude ripple (p-p)	Δα				
2110.0 ... 2155.0 MHz			0.4	0.8	dB
Input VSWR (RX port)					
2110.0 ... 2155.0 MHz			1.4	2.0	
Output VSWR (ANT port)					
2110.0 ... 2155.0 MHz			1.7	2.0	
CMRR ($\|S_{32}-S_{42}\|/\|S_{32}+S_{42}\|$)					
2110.0 ... 2155.0 MHz		20[1)]	26		dB
Attenuation	α				
1.0 ... 400.0 MHz		57	70		dB
400.0 ... 1310.0 MHz		40	70		dB
1310.0 ... 1355.0 MHz		43	68		dB
1355.0 ... 1710.0 MHz		35	51		dB
1710.0 ... 1755.0 MHz		45	63		dB
1755.0 ... 1910.0 MHz		15	52		dB
1910.0 ... 1955.0 MHz		35	57		dB
1955.0 ... 2025.0 MHz		15	39		dB
2240.0 ... 2300.0 MHz		15	38		dB
2300.0 ... 2400.0 MHz		30	46		dB
2400.0 ... 2496.0 MHz		40	45		dB
2496.0 ... 2690.0 MHz		40	54		dB
2690.0 ... 3300.0 MHz		35	48		dB
3300.0 ... 3800.0 MHz		45	56		dB
3820.0 ... 3910.0 MHz		40	56		dB
3910.0 ... 4220.0 MHz		35	55		dB
4220.0 ... 4310.0 MHz		40	54		dB
4310.0 ... 5150.0 MHz		35	50		dB
5150.0 ... 5850.0 MHz		40	44		dB
5850.0 ... 6475.0 MHz		35	43		dB

1) A combination of 10 ˚ phase balance and 1 dB amplitude balance corresponds to 19.6 dB CMRR.

Characteristics for CDMA 1x AWS Band

Temperature range for specification: T = –30 ˚C to +85 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 2.4nH
RX terminating impedance: Z_{RX} = 100 Ω (balanced) || 11nH
TX terminating impedance: Z_{TX} = 50 Ω

	B8563			
Characterisitcs Tx - Rx	**min.**	**typ. @ 25 ˚C**	**max.**	
Differential Mode Isolation α				
1574.0 ... 1577.0 MHz	40	70		dB
1710.0 ... 1755.0 MHz	55	58		dB
2110.0 ... 2155.0 MHz	50	60		dB
3410.0 ... 3520.0 MHz	20	70		dB
5120.0 ... 5275.0 MHz	20	59		dB
Common Mode Isolation α				
1710.0 ... 1755.0 MHz	48	51		dB

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 UMTS-Passband, $f_{Carrier}$ ranges from 882.4 MHz (lowest Tx channel) to 912.6 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:

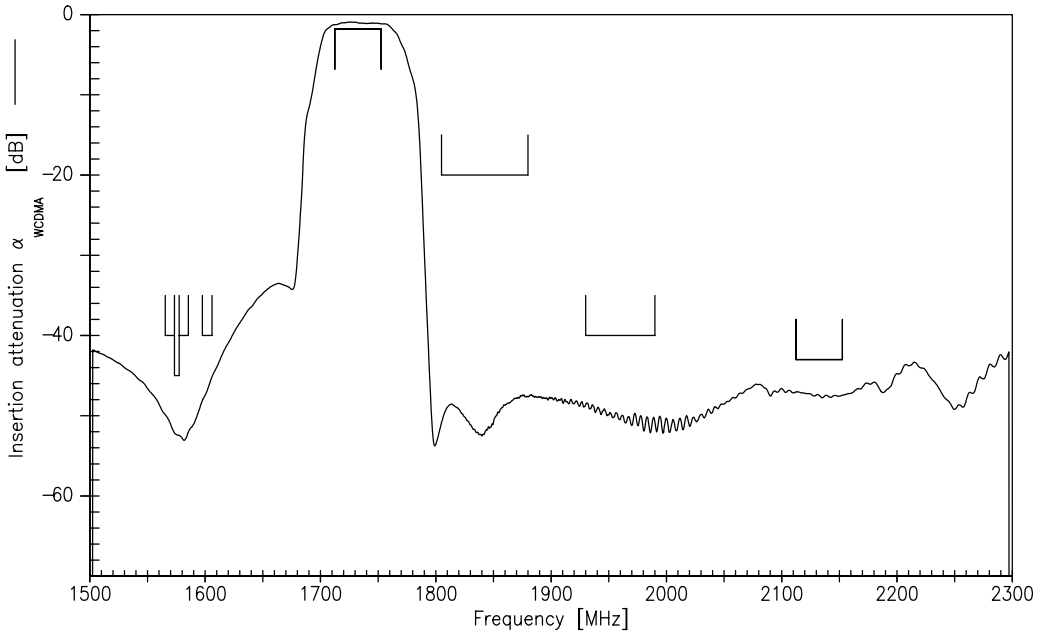
$$\int_{\infty}^{\infty} |H_{RRC}(f)|^2 df = 1$$

Maximum Ratings

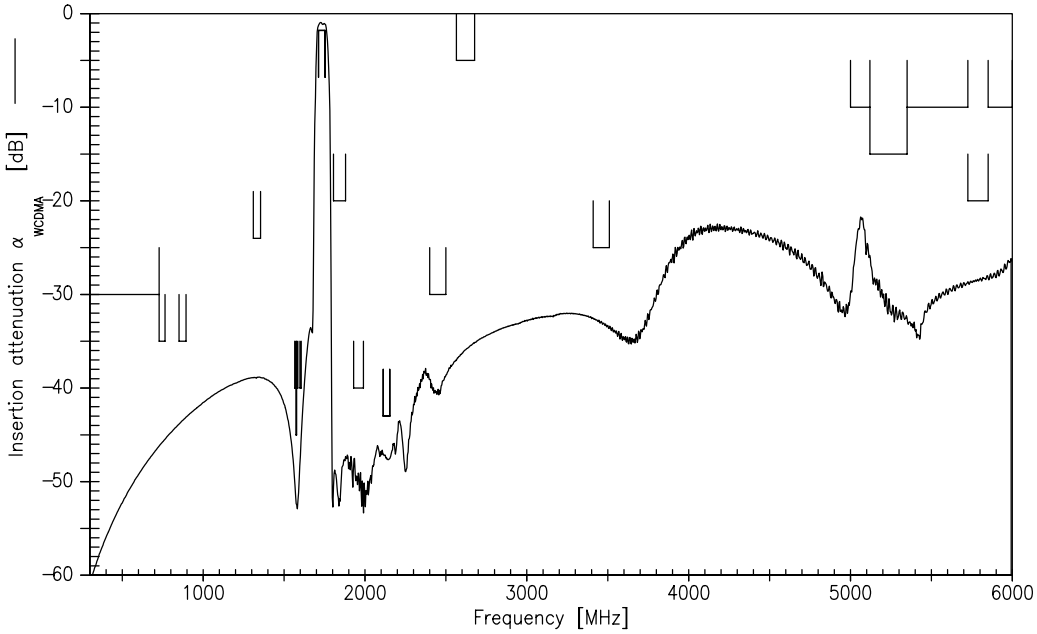
Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	5	V	
ESD voltage	V_{ESD}	50[1)]	V	machine model, 10 pulses
Input power at	P_{IN}			source and load impedance 50 Ω
1710.0 ... 1755.0 MHz		29	dBm	} continuous wave 50˚C, 5.000 h
elsewhere		10	dBm	

1) acc. to JESD22-A115A (machine model), 10 negative & 10 positive pulses.

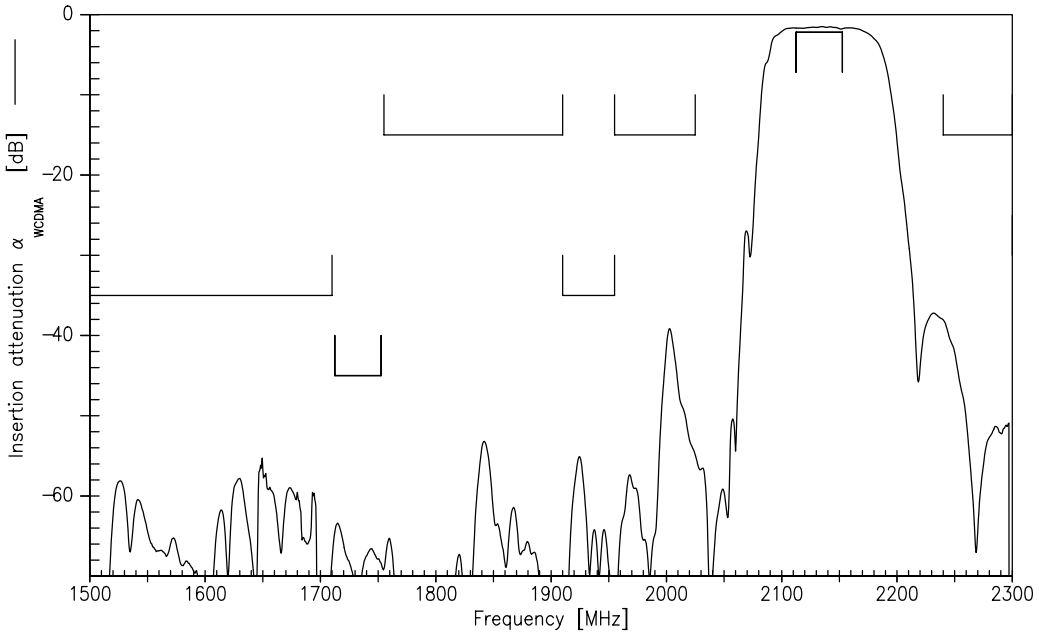
Power Transfer Function Tx-Ant:



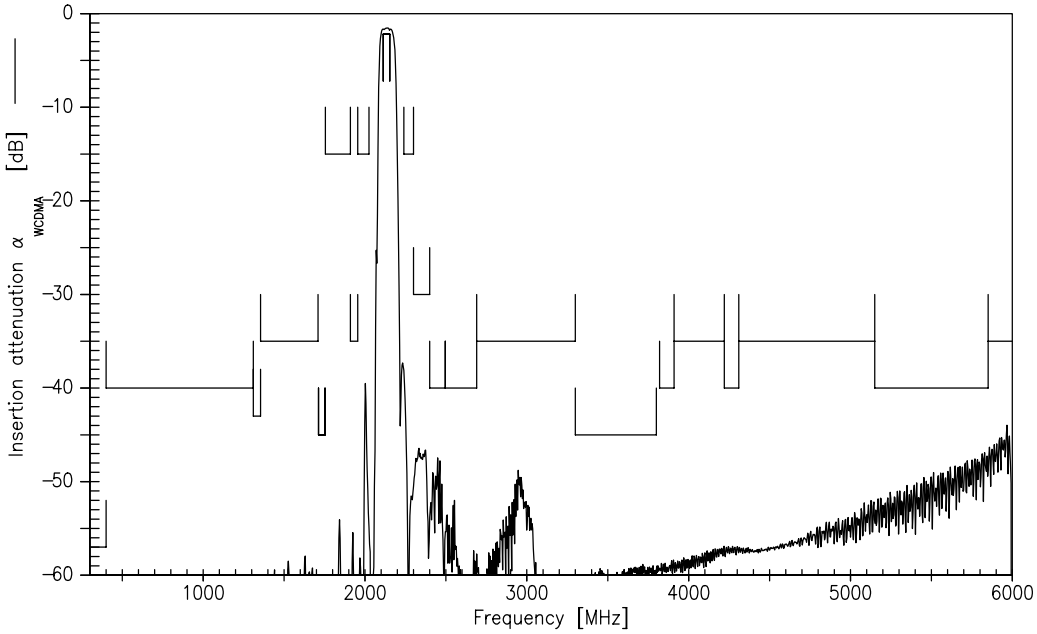
Power Transfer Function Tx-Ant (Wideband):



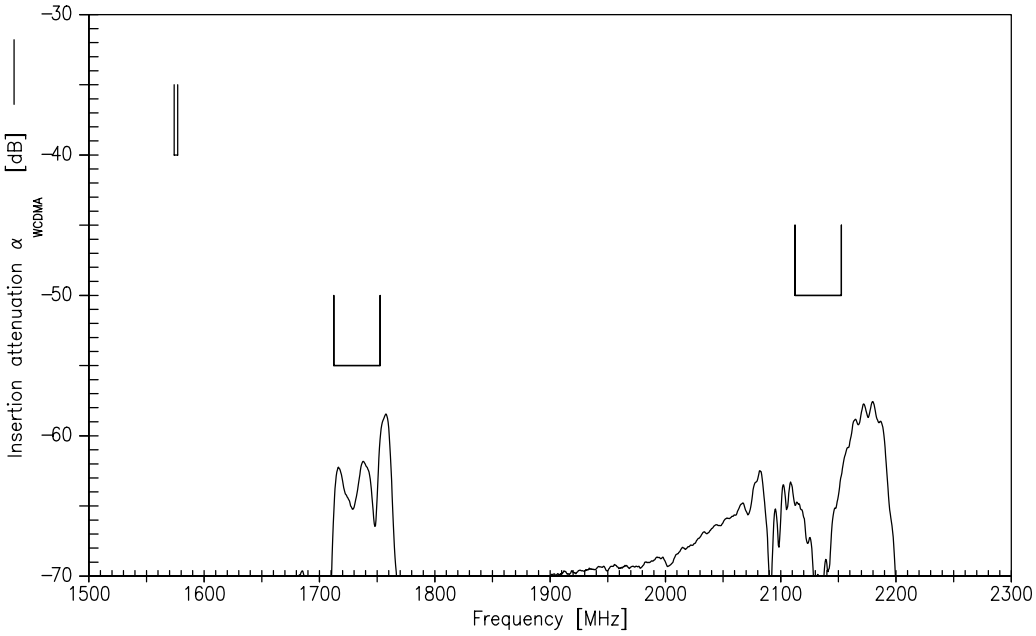
Power Transfer Function Ant-Rx:



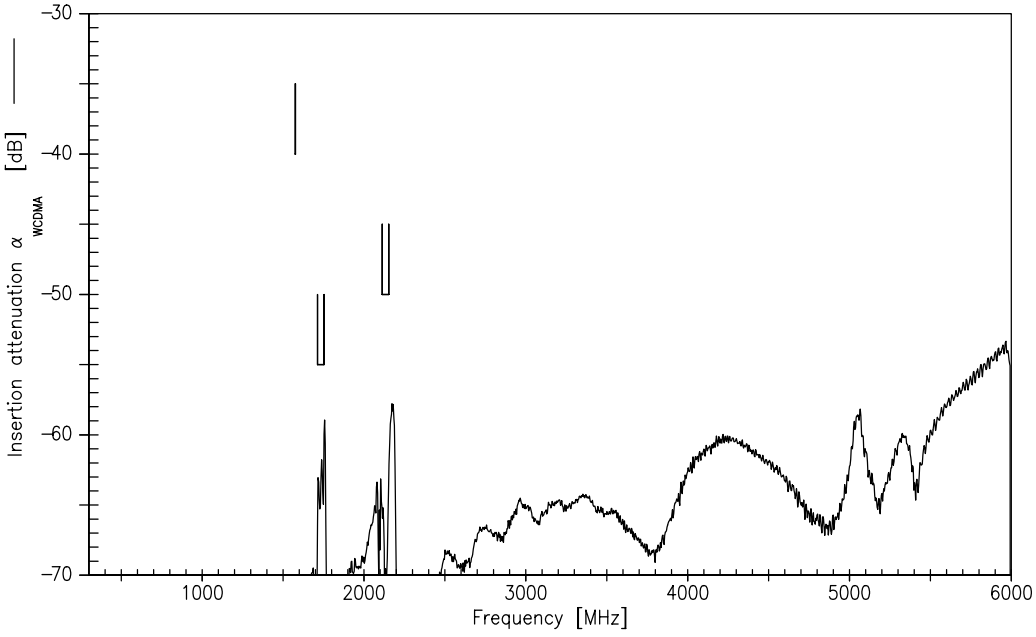
Power Transfer Function Ant-Rx (Wideband):



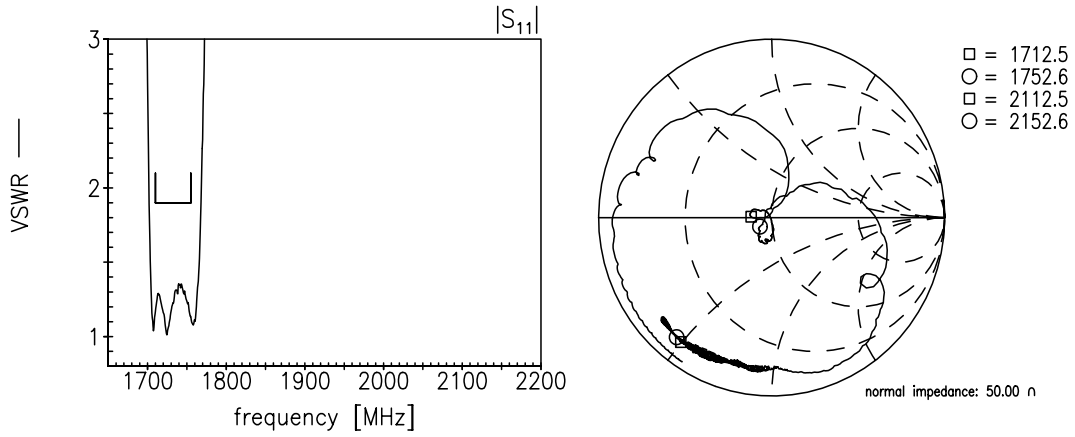
Power Transfer Function Tx-Rx isolation:

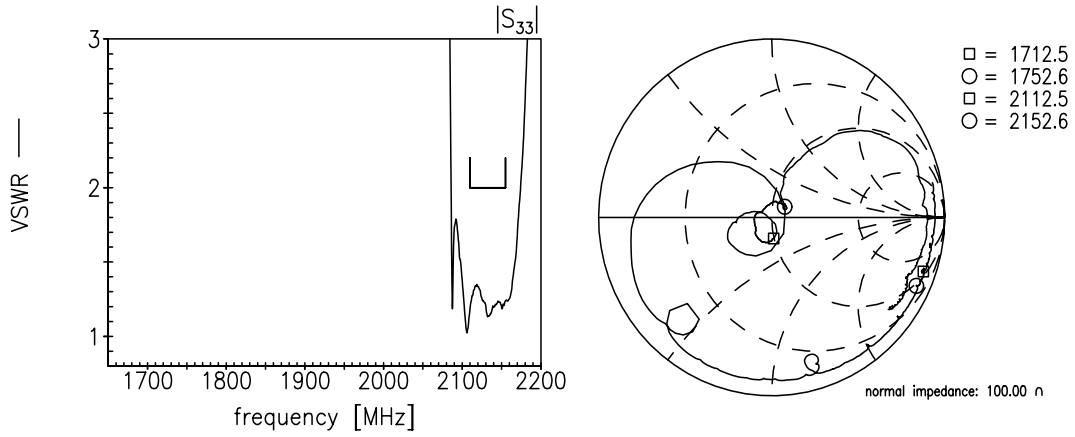


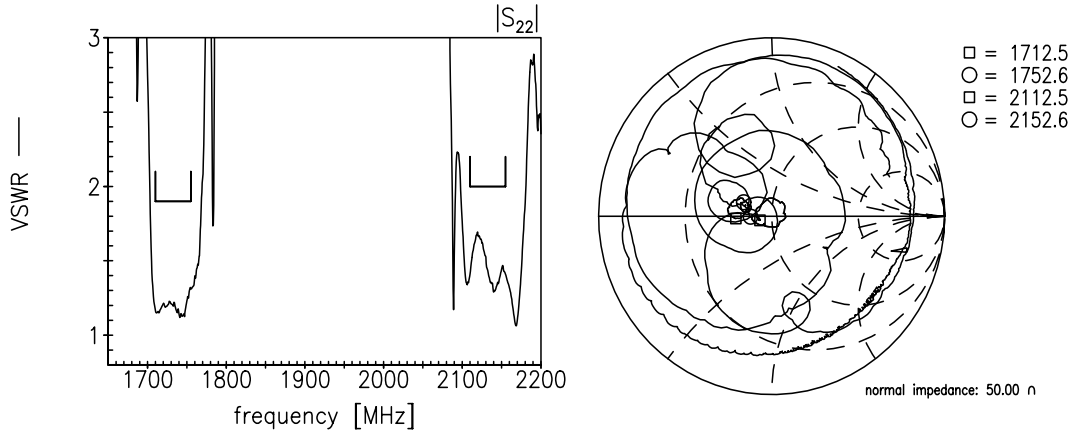
Power Transfer Function Tx-Rx isolation (Wideband):



VSWRs at Tx, Rx and Ant:







References

Type	B8563
Ordering code	B39212B8563P810
Marking and package	C61157-A8-A45-51-27
Packaging	F61074-V8247-Z000-3-27
Date codes	L_1126
S-parameters	B8563_NB_UN.s4p, B8563_WB_UN.s4p See file header for pin/port assignement.
Soldering profile	S_6001
RoHS compatible	defined as compatible with the following documents: "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 http://www.tdk.co.jp/tefe02/coil.htm#aname1 and Data Library for circuit simulation http://www.tdk.co.jp/etvcl/index.htm

For further information please contact your local EPCOS sales office or visit our webpage at www.epcos.com .

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