



SAW Components

SAW Duplexer

WCDMA Band 4/ CDMA 1x AWS Band

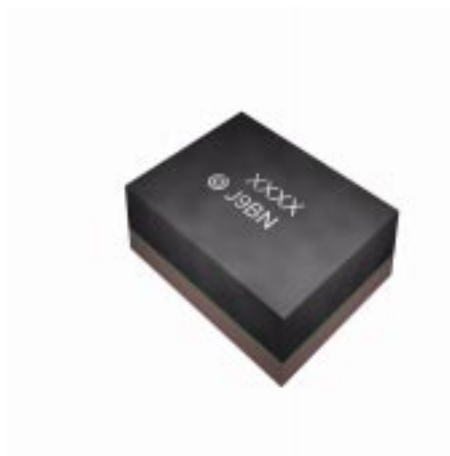
Series/type:	B8524
Ordering Code:	B39212B8524P810
Date:	July 12, 2013
Version:	2.0

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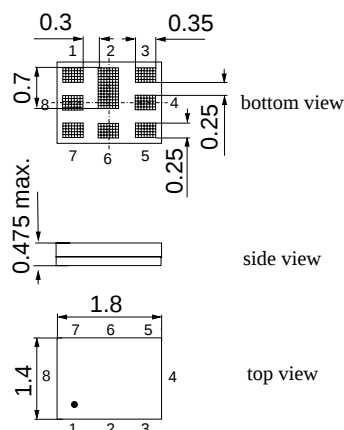
Application

- 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



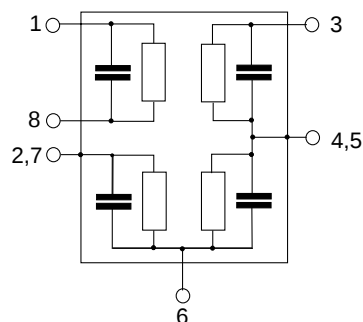
Features

- Package size 1.8 x 1.4 mm², package height 0.475 mm max.
- RoHS compatible
- Approx. weight 0.005g
- Package for **Surface Mount Technology (SMT)**
- Ni, Au-plated terminals
- Balanced Rx port, unbalanced Tx port
- **Electrostatic Sensitive Device (ESD)**
- **Moisture Sensitivity Level 3**



Pin configuration

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



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1732.5 / 2132.5 MHz
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Characteristics for W-CDMA Band 4

Temperature range for specification:

 $T = -15\text{ }^{\circ}\text{C to } +80\text{ }^{\circ}\text{C}$

Antenna terminating impedance:

 $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$

RX terminating impedance:

 $Z_{\text{RX}} = 100\text{ }\Omega \text{ (balanced)} \parallel 18\text{ nH}$

TX terminating impedance:

 $Z_{\text{TX}} = 50\text{ }\Omega$

					B8524			
Characteristics 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	$\alpha_{\text{WCDMA}}^{1)}$					1.1	1.8	dB
Amplitude ripple (p-p)	$\Delta\alpha$							
@ f_{Carrier} 1712.4 ... 1752.6 MHz	$\Delta\alpha_{\text{WCDMA}}^{1)}$					0.4	0.9	dB
Error vector magnitude	EVM ²⁾							
@ f_{Carrier} 1712.4 ... 1752.6 MHz						1.0	2.5	%
Input VSWR (TX port)								
1710.0 ... 1755.0 MHz						1.6	1.9	
Output VSWR (ANT port)								
1710.0 ... 1755.0 MHz						1.5	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	42		dB
1310.0 ... 1355.0 MHz					24	38		dB
1565.42 ... 1573.374MHz					40	48		dB
1573.374 ... 1577.466MHz					45	50		dB
1577.466 ... 1585.42 MHz					40	51		dB
1597.5515... 1605.886MHz					40	47		dB
1805.0 ... 1880.0 MHz					20	46		dB
1930.0 ... 1990.0 MHz					40	46		dB
@ f_{Carrier} 2112.4 ... 2152.6 MHz	$\alpha_{\text{WCDMA}}^{1)}$				42	46		dB
2400.0 ... 2500.0 MHz					30	39		dB
2565.0 ... 2677.0 MHz					5	35		dB
3410.0 ... 3510.0 MHz					25	31		dB
5000.0 ... 5120.0 MHz					10	20		dB
5120.0 ... 5350.0 MHz					12	20		dB
5350.0 ... 5725.0 MHz					10	26		dB
5725.0 ... 5850.0 MHz					18	25		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 (EVM) based on definition given in 3GPP TS 25.141.

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Characteristics for W-CDMA Band 4

Temperature range for specification:

 $T = -15\text{ }^{\circ}\text{C to } +80\text{ }^{\circ}\text{C}$

Antenna terminating impedance:

 $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$

RX terminating impedance:

 $Z_{\text{RX}} = 100\text{ }\Omega \text{ (balanced)} \parallel 18\text{ nH}$

TX terminating impedance:

 $Z_{\text{TX}} = 50\text{ }\Omega$

				B8524		
Characteristics 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	$\alpha_{\text{WCDMA}}^{1)}$				1.6	2.3 dB
Amplitude ripple (p-p)	$\Delta\alpha$					
@ f_{Carrier} 2112.4 ... 2152.6 MHz	$\Delta\alpha_{\text{WCDMA}}^{1)}$				0.4	1.0 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					1.5	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 ³⁾	29	dB

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

²⁾ Error Vector Magnitude (EVM) 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.

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Characteristics for W-CDMA Band 4

Temperature range for specification:

 $T = -15\text{ }^{\circ}\text{C to } +80\text{ }^{\circ}\text{C}$

Antenna terminating impedance:

 $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$

RX terminating impedance:

 $Z_{\text{RX}} = 100\text{ }\Omega \text{ (balanced)} \parallel 18\text{ nH}$

TX terminating impedance:

 $Z_{\text{TX}} = 50\text{ }\Omega$

				B8524			
Characteristics Antenna - Rx				min.	typ. @ 25 °C	max.	
Attenuation							
			α				
	1.0	...	400.0 MHz	57	> 70		dB
	400.0	...	1310.0 MHz	40	67		dB
	1310.0	...	1355.0 MHz	43	65		dB
	1355.0	...	1710.0 MHz	35	49		dB
@f _{Carrier}	1712.4	...	1752.6 MHz $\alpha_{\text{WCDMA}}^{1)}$	45	60		dB
	1755.0	...	1910.0 MHz	15	53		dB
	1910.0	...	1955.0 MHz	35	58		dB
	1955.0	...	2025.0 MHz	15	37		dB
	2240.0	...	2300.0 MHz	15	36		dB
	2300.0	...	2400.0 MHz	30	46		dB
	2400.0	...	2496.0 MHz	40	47		dB
	2496.0	...	2690.0 MHz	40	52		dB
	2690.0	...	3300.0 MHz	35	45		dB
	3300.0	...	3800.0 MHz	45	51		dB
	3820.0	...	3910.0 MHz	40	50		dB
	3910.0	...	4220.0 MHz	35	50		dB
	4220.0	...	4310.0 MHz	40	49		dB
	4310.0	...	5150.0 MHz	35	47		dB
	5150.0	...	5850.0 MHz	37	46		dB
	5850.0	...	6000.0 MHz	35	42		dB

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

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Characteristics for W-CDMA Band 4

Temperature range for specification:

 $T = -15\text{ }^{\circ}\text{C to } +80\text{ }^{\circ}\text{C}$

Antenna terminating impedance:

 $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$

RX terminating impedance:

 $Z_{\text{RX}} = 100\text{ }\Omega \text{ (balanced)} \parallel 18\text{ nH}$

TX terminating impedance:

 $Z_{\text{TX}} = 50\text{ }\Omega$

				B8524			
Characteristics Tx - Rx				min.	typ. @ 25 °C	max.	
Differential Mode Isolation							
			α				
	1574.0 ... 1577.0	MHz		40	68		dB
@f _{Carrier}	1712.4 ... 1752.6	MHz	$\alpha_{\text{WCDMA}}^{1)}$	55	59		dB
@f _{Carrier}	2112.4 ... 2152.6	MHz	$\alpha_{\text{WCDMA}}^{1)}$	50	57		dB
	3410.0 ... 3520.0	MHz		20	60		dB
	5120.0 ... 5275.0	MHz		20	55		dB
Common Mode Isolation							
			α				
@f _{Carrier}	1712.4 ... 1752.6	MHz	$\alpha_{\text{WCDMA}}^{1)}$	46	51		dB

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

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Characteristics for CDMA 1x AWS Band

Temperature range for specification: $T = -30\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
 Antenna terminating impedance: $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$
 RX terminating impedance: $Z_{\text{RX}} = 100\text{ }\Omega$ (balanced) $\parallel 18\text{ nH}$
 TX terminating impedance: $Z_{\text{TX}} = 50\text{ }\Omega$

				B8524			
Characteristics TX - Antenna				min.	typ. @ 25 °C	max.	
Center frequency	f_c				1732.5		MHz
Maximum insertion attenuation	α						
1710.0 ... 1755.0	MHz				1.3	2.0	dB
Amplitude ripple (p-p)	$\Delta\alpha$						
1710.0 ... 1755.0	MHz				0.5	1.2	dB
Input VSWR (TX port)							
1710.0 ... 1755.0	MHz				1.6	1.9	
Output VSWR (ANT port)							
1710.0 ... 1755.0	MHz				1.5	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	42		dB
1310.0 ... 1355.0	MHz			24	38		dB
1565.42 ... 1573.374	MHz			40	48		dB
1573.374 ... 1577.466	MHz			45	50		dB
1577.466 ... 1585.42	MHz			40	51		dB
1597.5515 ... 1605.886	MHz			40	47		dB
1805.0 ... 1880.0	MHz			20	46		dB
1930.0 ... 1990.0	MHz			40	46		dB
2110.0 ... 2155.0	MHz			42	46		dB
2400.0 ... 2500.0	MHz			30	39		dB
2565.0 ... 2677.0	MHz			5	35		dB
3410.0 ... 3510.0	MHz			25	31		dB
5000.0 ... 5120.0	MHz			10	20		dB
5120.0 ... 5350.0	MHz			12	20		dB
5350.0 ... 5725.0	MHz			10	26		dB
5725.0 ... 5850.0	MHz			18	25		dB
5850.0 ... 6000.0	MHz			10	25		dB

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Characteristics for CDMA 1x AWS Band

Temperature range for specification: $T = -30\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$
 Antenna terminating impedance: $Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$
 RX terminating impedance: $Z_{\text{RX}} = 100\text{ }\Omega$ (balanced) $\parallel 18\text{ nH}$
 TX terminating impedance: $Z_{\text{TX}} = 50\text{ }\Omega$

				B8524			
Characteristics Antenna - Rx				min.	typ. @ 25 °C	max.	
Center frequency	f_C				2132.5		MHz
Maximum insertion attenuation	α						
2110.0 ... 2155.0	MHz				1.7	2.3	dB
Amplitude ripple (p-p)	$\Delta\alpha$						
2110.0 ... 2155.0	MHz				0.4	1.0	dB
Input VSWR (RX port)							
2110.0 ... 2155.0	MHz				1.5	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⁾	29		dB
Attenuation	α						
1.0 ... 400.0	MHz			57	> 70		dB
400.0 ... 1310.0	MHz			40	67		dB
1310.0 ... 1355.0	MHz			43	65		dB
1355.0 ... 1710.0	MHz			35	49		dB
1710.0 ... 1755.0	MHz			45	60		dB
1755.0 ... 1910.0	MHz			15	53		dB
1910.0 ... 1955.0	MHz			35	58		dB
1955.0 ... 2025.0	MHz			15	37		dB
2240.0 ... 2300.0	MHz			15	36		dB
2300.0 ... 2400.0	MHz			30	46		dB
2400.0 ... 2496.0	MHz			40	47		dB
2496.0 ... 2690.0	MHz			40	52		dB
2690.0 ... 3300.0	MHz			35	45		dB
3300.0 ... 3800.0	MHz			45	51		dB
3820.0 ... 3910.0	MHz			40	50		dB
3910.0 ... 4220.0	MHz			35	50		dB
4220.0 ... 4310.0	MHz			40	49		dB
4310.0 ... 5150.0	MHz			35	47		dB
5150.0 ... 5850.0	MHz			37	46		dB
5850.0 ... 6475.0	MHz			35	42		dB

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

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Characteristics for CDMA 1x AWS Band

Temperature range for specification:	$T = -30\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$
Antenna terminating impedance:	$Z_{\text{ANT}} = 50\text{ }\Omega \parallel 2.6\text{ nH}$
RX terminating impedance:	$Z_{\text{RX}} = 100\text{ }\Omega \text{ (balanced)} \parallel 18\text{ nH}$
TX terminating impedance:	$Z_{\text{TX}} = 50\text{ }\Omega$

				B8524			
Characteristics Tx - Rx				min.	typ. @ 25 °C	max.	
Differential Mode Isolation α							
1574.0	...	1577.0	MHz	40	68		dB
1710.0	...	1755.0	MHz	55	58		dB
2110.0	...	2155.0	MHz	50	56		dB
3410.0	...	3520.0	MHz	20	60		dB
5120.0	...	5275.0	MHz	20	55		dB
Common Mode Isolation α							
1710.0	...	1755.0	MHz	46	51		dB


Annotation for characteristics section

Attenuation of WCDMA signal ("Powertransferfunction", α_{WCDMA}) is determined by

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

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)). $H_{\text{RRC}}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

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

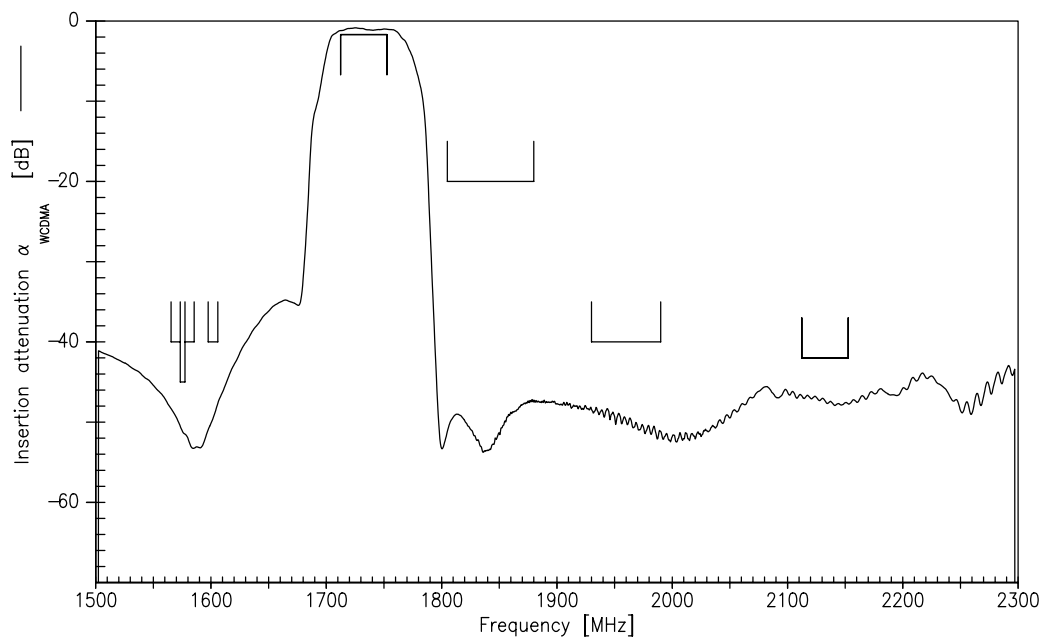
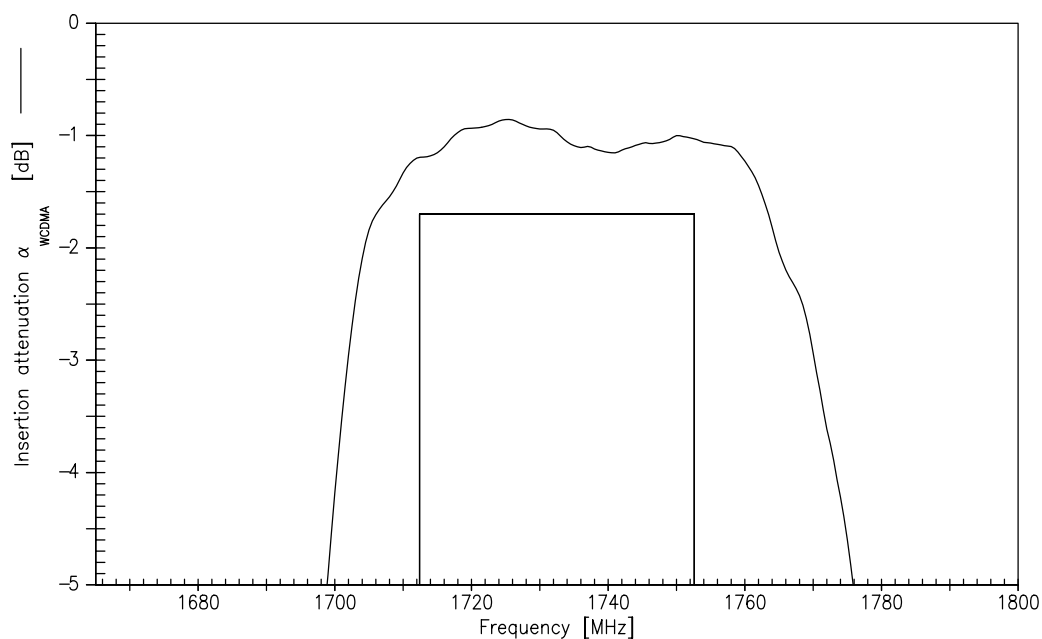
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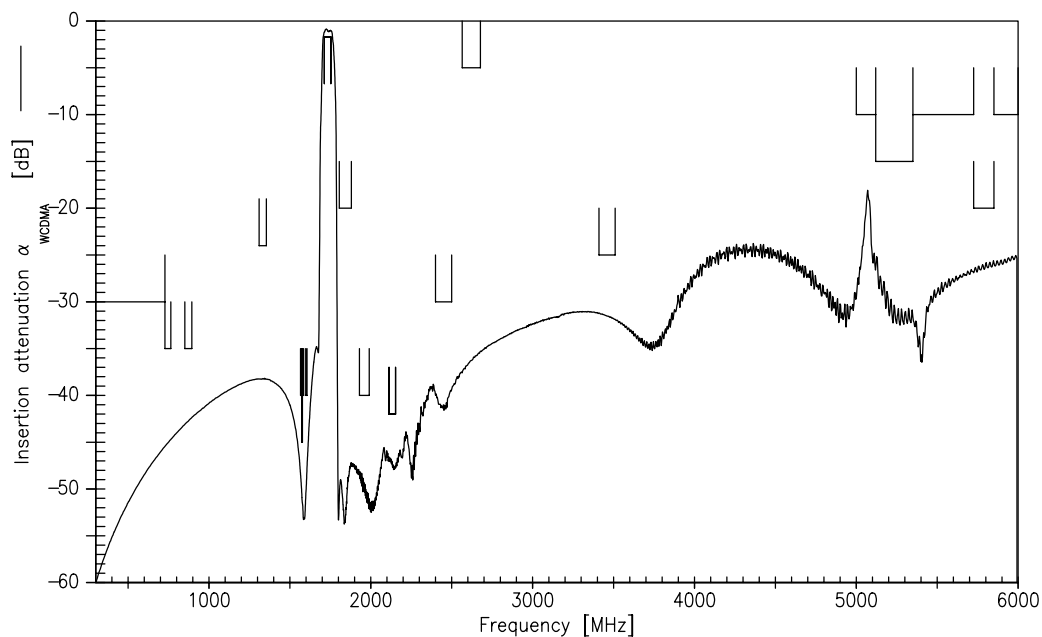
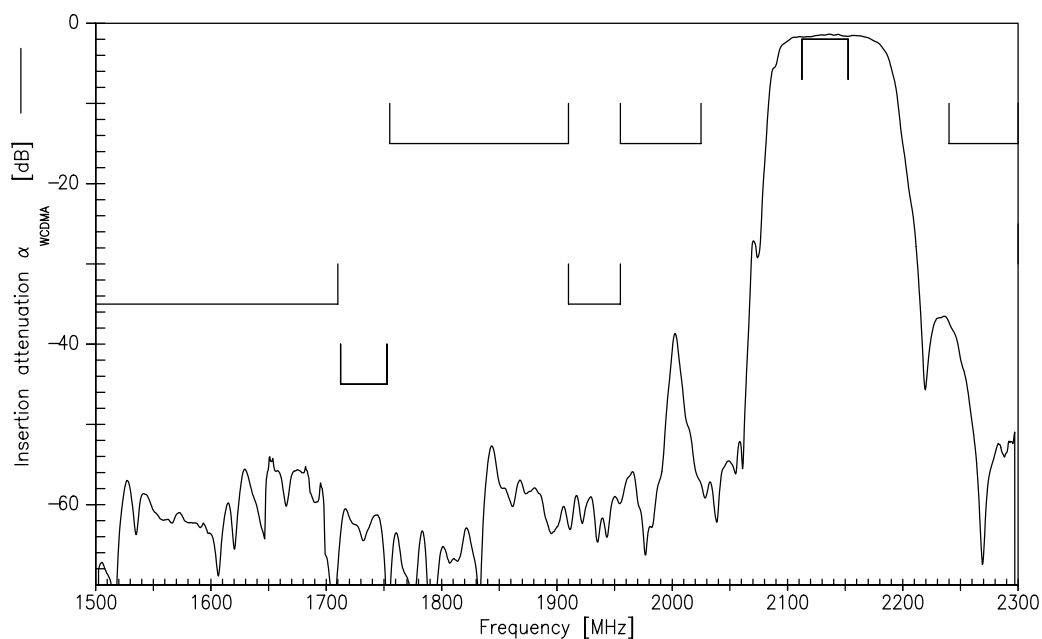
Maximum Ratings

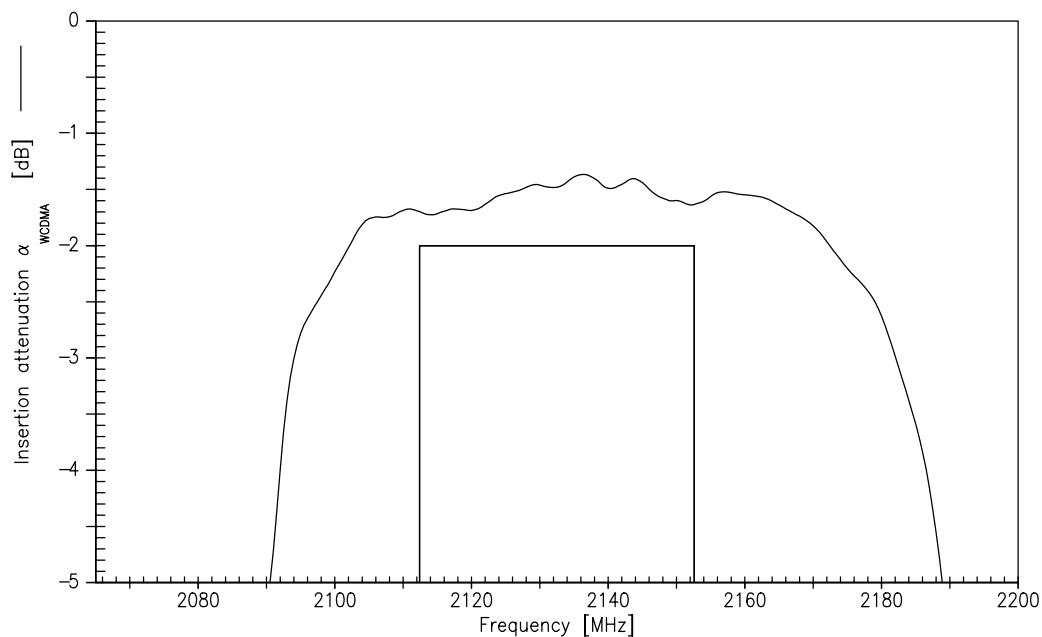
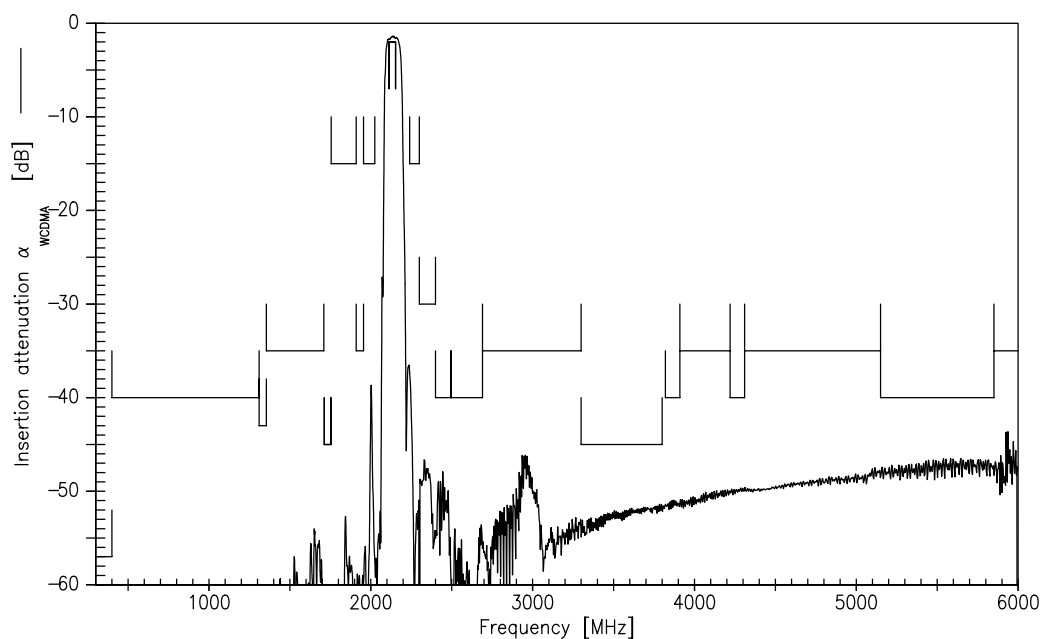
Storage temperature range	T_{stg}	-40/+85	°C	machine model, 10 pulses source and load impedance 50 Ω } continuous wave 50°C, 5.000 h
DC voltage	V_{DC}	5 ¹⁾	V	
ESD voltage	V_{ESD}	50 ²⁾	V	
Input power at 1710.0 ... 1755.0 MHz	P_{IN}	29	dBm	
elsewhere		10	dBm	

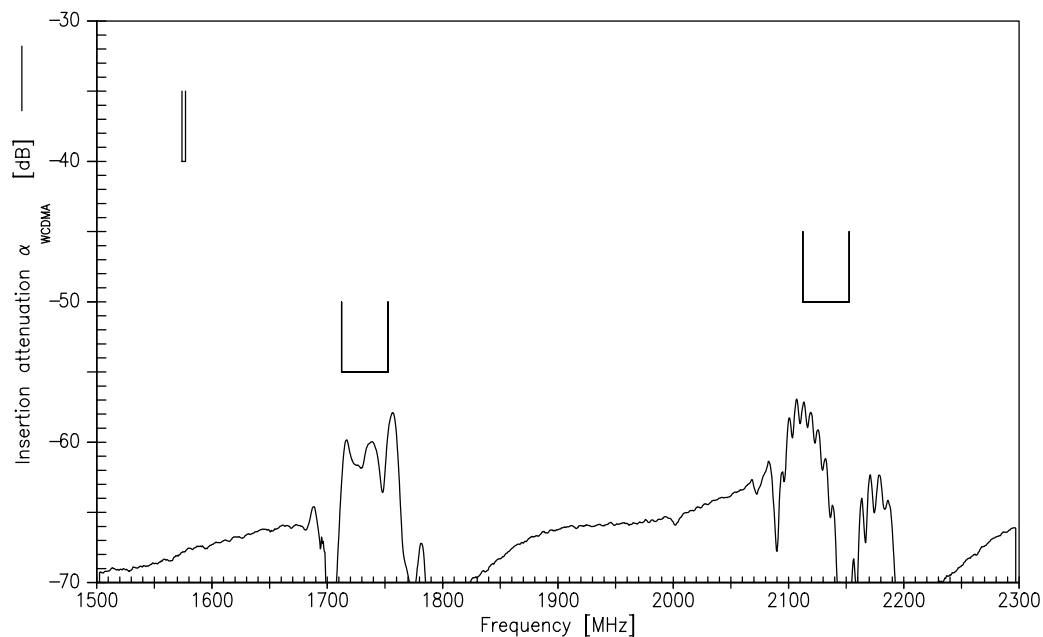
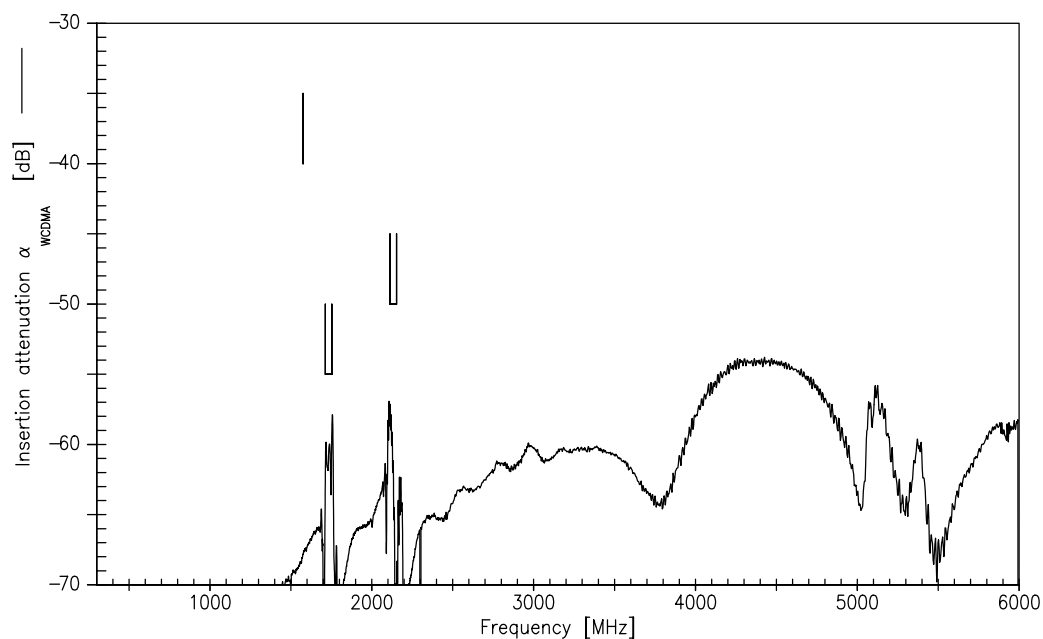
¹⁾ 168h Damp Heat Steady State according to IEC 60068-2-67Cy

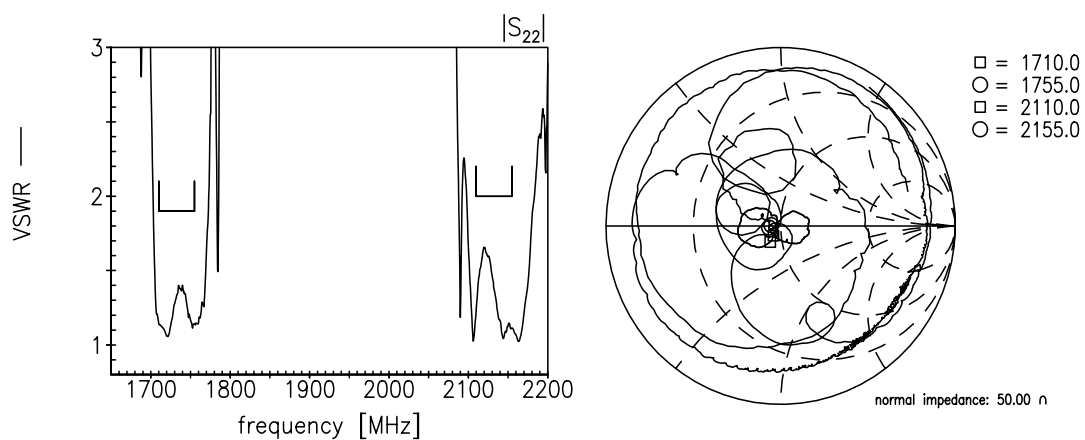
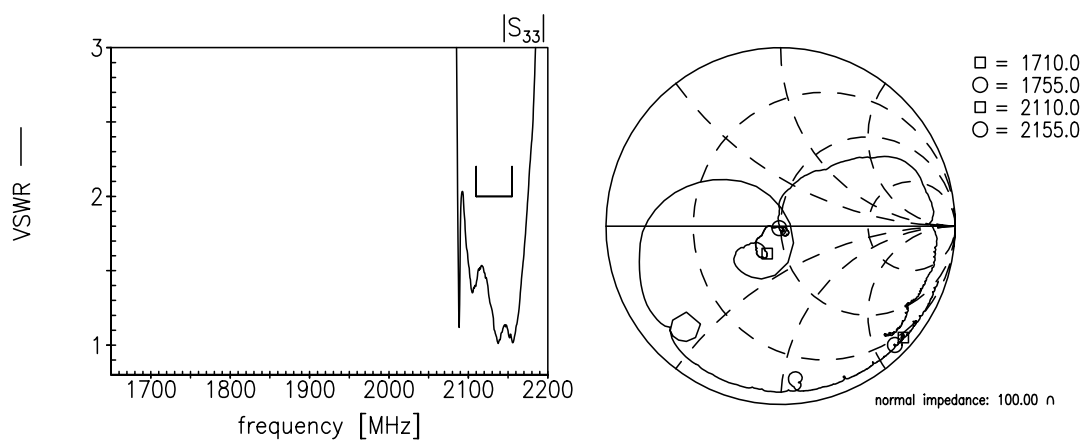
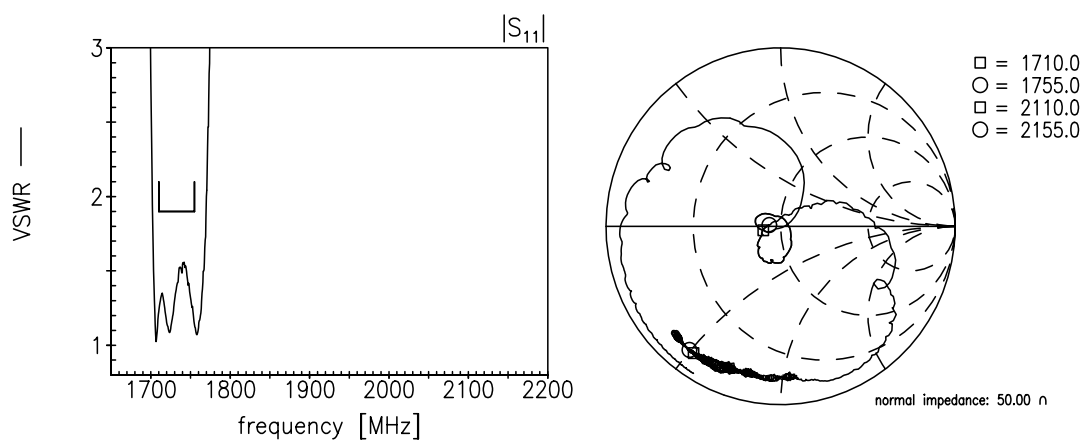
²⁾ acc. to JESD22-A115A (machine model), 10 negative & 10 positive pulses.

Power Transfer Function Tx-Ant:

Power Transfer Function Tx-Ant (Passband):


Power Transfer Function Tx-Ant (Wideband):

Power Transfer Function Ant-Rx:


Power Transfer Function Ant-Rx (Passband):

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:


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References

Type	B8524
Ordering code	B39212B8524P810
Marking and package	C61157-A8-A72-1-27
Packaging	F61074-V8259-Z000-2-27
Date codes	L_1126
S-parameters	B8524_NB_UN.s4p, B8524_WB_UN.s4p See file header for pin/port assignment.
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

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