SAW Components

SAW Duplexer
W-CDMA Band 1

Series/type:	**B8510**
Ordering code:	**B39212B8510P810**

Date:	September 09, 2013
Version:	2.0

�TDK

Data sheet SMD
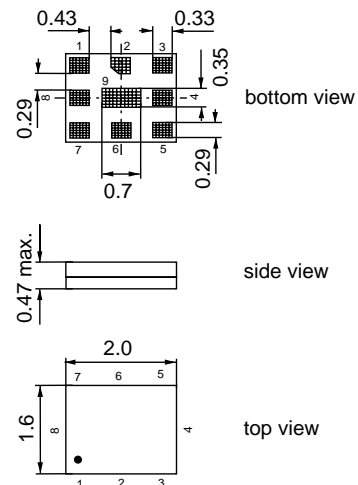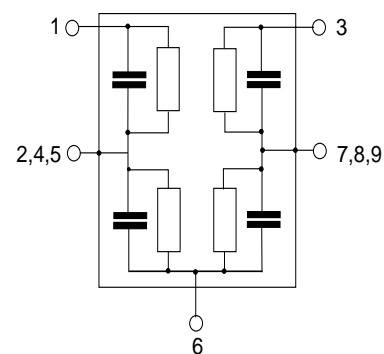
Application

- Low-loss SAW duplexer for mobile telephone W-CDMA Band 1 (UMTS) systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- High isolation between Tx and Rx
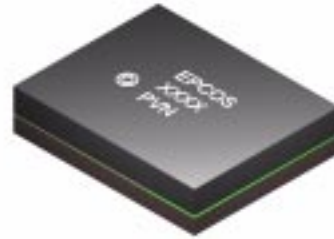
Features

- Package size 2.0 x 1.6 mm^2
- max. Package height 0.47mm
- RoHS compatible
- Approximate weight 0.005 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni terminals, Au-plated
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- Fully matched by integrated matching network
- **M**oisture **S**ensitive **L**evel 3

bottom view

side view

top view

Pin configuration

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

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

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⏣TDK

Data sheet   SMD

Characteristics

Temperature range for specification:	T	=	−30 ˚C to +85 ˚C
TX terminating impedance:	Z_{Tx} =		50 Ω
ANT terminating impedance:	Z_{Ant} =		50 Ω ‖ 2.9nH
RX teminating impedance:	Z_{Rx} =		50 Ω ‖ 11.8nH

Characteristics Tx-Antenna		min.	typ. @ 25 ˚C	max.	
Center frequency	f_c		1950.0		MHz
Maximum insertion attenuation					
@$f_{Carrier}$ 1922.4 ... 1977.6 MHz $\alpha_{W\text{-}CDMA}$[1)	—	1.2	1.7	dB
1920.0 ... 1980.0 MHz α_{CW}	—	1.4	1.8	dB
Amplitude ripple (p-p)					
1920.0 ... 1980.0 MHz $\Delta\alpha$	—	0.5	0.9	dB
1920.0 ... 1980.0 MHz $\Delta\alpha_{5MHZ}$	—	0.3	0.5	dB
Error Vector Magnitude					
@$f_{Carrier}$ 1922.4 ... 1977.6 MHz EVM[2)	—	1.1	2.0	%
TX port VSWR					
1920.0 ... 1980.0 MHz	—	1.7	2.0	
ANT port VSWR					
1920.0 ... 1980.0 MHz	—	1.6	1.9	
Attenuation	α				
10.0 ... 1574.0 MHz		30	40	—	dB
420.0 ... 494.0 MHz		44	51	—	dB
843.0 ... 894.0 MHz		38	43	—	dB
1559.0 ... 1563.0 MHz		39	44	—	dB
1565.42 ... 1573.374 MHz		39	44	—	dB
1573.374... 1577.466 MHz		40	45	—	dB
1577.466... 1585.42 MHz		40	45	—	dB
1597.5515...1605.886 MHz		41	46	—	dB
1605.886... 1805.0 MHz		25	36	—	dB
1805.0 ... 1865.0 MHz		25	33	—	dB
1865.0 ... 1880.0 MHz		15	28	—	dB
2110.0 ... 2170.0 MHz α_{CW}		42	46	—	dB
@$f_{Carrier}$ 2112.4 ... 2167.6 MHz $\alpha_{W\text{-}CDMA}$[1)	42	46	—	dB
2400.0 ... 2500.0 MHz		30	35	—	dB
2620.0 ... 2690.0 MHz		25	32	—	dB
3830.0 ... 3970.0 MHz		20	32	—	dB

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

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SAW Components	B8510
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data sheet   ⧺SMD⧻

			B8510		
Characteristics Tx-Antenna		**min.**	**typ. @ 25 ˚C**	**max.**	
Attenuation (cont.)	α				
4900.0 ... 5150.0 MHz		15	29	—	dB
5150.0 ... 5950.0 MHz		8	12	—	dB
7670.0 ... 7930.0 MHz		—	9	—	dB
9590.0 ... 9910.0 MHz		—	10	—	dB
11510.0 ...11890.0 MHz		—	14	—	dB

[1] Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 8 of this document.

[2] Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141

SAW Components	**B8510**
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data sheet ⩳⧢⧢⧢

Characteristics

Temperature range for specification: T = −30 ˚C to +85 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.9nH
RX teminating impedance: Z_{Rx} = 50 Ω || 11.8nH

					B8510		
Characteristics Antenna-Rx				**min.**	**typ. @ 25 ˚C**	**max.**	
Center frequency		f_c			2140.0		MHz
Maximum insertion attenuation							
@$f_{Carrier}$ 2112.4 ... 2167.6	MHz	$\alpha_{W\text{-}CDMA}$[1]		—	1.8	2.3	dB
2110.0 ... 2170.0	MHz	α_{CW}		—	1.9	2.4	dB
Amplitude ripple (p-p)							
2110.0 ... 2170.0	MHz	$\Delta\alpha$		—	0.4	0.9	dB
2110.0 ... 2170.0	MHz	$\Delta\alpha_{5MHz}$		—	0.3	0.5	dB
Error Vector Magnitude							
@$f_{Carrier}$ 2112.4 ... 2167.6	MHz	EVM[2]		—	1.0	2.0	%
ANT port VSWR							
2110.0 ... 2170.0	MHz			—	1.5	1.8	
RX port VSWR							
2110.0 ... 2170.0	MHz			—	1.5	1.8	
Attenuation		α					
10.0 ... 1920.0	MHz			40	50	—	dB
190.0	MHz			50	>80	—	dB
814.0 ... 849.0	MHz			50	62	—	dB
880.0 ... 915.0	MHz			50	61	—	dB
1730.0 ... 1790.0	MHz			40	52	—	dB
1920.0 ... 1980.0	MHz	α_{CW}		50	57	—	dB
@$f_{Carrier}$ 1922.4 ... 1977.6	MHz	$\alpha_{W\text{-}CDMA}$[1]		50	57	—	dB
1980.0 ... 2015.0	MHz			30	52	—	dB
2015.0 ... 2075.0	MHz			10	23	—	dB
2255.0 ... 2400.0	MHz			40	54	—	dB
2400.0 ... 2500.0	MHz			40	52	—	dB
2500.0 ... 6000.0	MHz			30	40	—	dB
4030.0 ... 4150.0	MHz			38	44	—	dB
4220.0 ... 4340.0	MHz			35	41	—	dB
4900.0 ... 5950.0	MHz			30	47	—	dB
5725.0 ... 5875.0	MHz			30	48	—	dB
5950.0 ... 6130.0	MHz			—	48	—	dB
6130.0 ... 6330.0	MHz			—	48	—	dB

SAW Components	**B8510**
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data sheet   ⊑Mⅅ

Characteristics Antenna-Rx			min.	**B8510** typ. @ 25 ˚C	max.	
Attenuation (cont.)		α				
6330.0	... 6510.0 MHz		—	47	—	dB
6510.0	...13020.0 MHz		—	29	—	dB
8440.0	... 8680.0 MHz		—	42	—	dB
10550.0	...10850.0 MHz		—	48	—	dB
12660.0	...13020.0 MHz		—	29	—	dB
IMD product level limits[3]						
at f_{TX}=1950.0 MHz, f_{RX}=2140.0 MHz						
Blocker 1	190.0 MHz		—	129[4]	115	dBm
Blocker 2	1760.0 MHz		—	108	95	dBm
Blocker 3	4090.0 MHz		—	116	105	dBm
Blocker 4	6040.0 MHz		—	115	105	dBm

[1] Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 8 of this document.

[2] Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141

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

[4] Value at noise level of test setup

SAW Components	**B8510**
SAW Duplexer	**1950.0 / 2140.0 MHz**

Data sheet   ⬛SMD⬛

Characteristics

Temperature range for specification:	T =	$-30\,^{\circ}$C to $+85\,^{\circ}$C
TX terminating impedance:	Z_{Tx} =	50 Ω
ANT terminating impedance:	Z_{Ant} =	50 Ω ‖ 2.9nH
RX teminating impedance:	Z_{Rx} =	50 Ω ‖ 11.8nH

					B8510		
Characteristics Tx-Rx				**min.**	**typ. @ 25 $^{\circ}$C**	**max.**	
Isolation			α				
1920.0	...	1980.0	MHz α_{CW}	55	59	—	dB
1922.4	...	1977.6	MHz $\alpha_{W\text{-}CDMA}$[1]	55	59	—	dB
2110.0	...	2170.0	MHz α_{CW}	50	55	—	dB
2112.4	...	2167.6	MHz $\alpha_{W\text{-}CDMA}$[1]	50	55	—	dB
1574.0	...	1577.0	MHz	40	66	—	dB
3830.0	...	3970.0	MHz	20	66	—	dB
5750.0	...	5950.0	MHz	20	51	—	dB

[1] Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 8 of this document.

Annotation for characteristics section

Attenuation of W-CDMA signal (Power Transfer Function, $\alpha_{W\text{-}CDMA}$) is determined by

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

with $f_{Carrier}$ according to 3GPP TS 25.101 (e.g. for UMTS pass band, $f_{Carrier}$ ranges from 1922.4 MHz (lowest Tx channel) to 1967.6 MHz (highest Tx channel)). Here, $H_{RRC}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

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

Maximum Ratings

Storage temperature range	T_{stg}	−40/+85	˚C	
DC voltage	V_{DC}	5[1]	V	
ESD voltage	V_{ESD}	50[2]	V	MM - machine model
		200[3]	V	HBM - human body model
		500[4]	V	CDM - field induced charged device model
Input power at				
1920.0 ... 1980.0 MHz	P_{in}	29	dBm	} continuous wave
elsewhere	P_{in}	10	dBm	50 ˚C, 5000h

[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   SMD
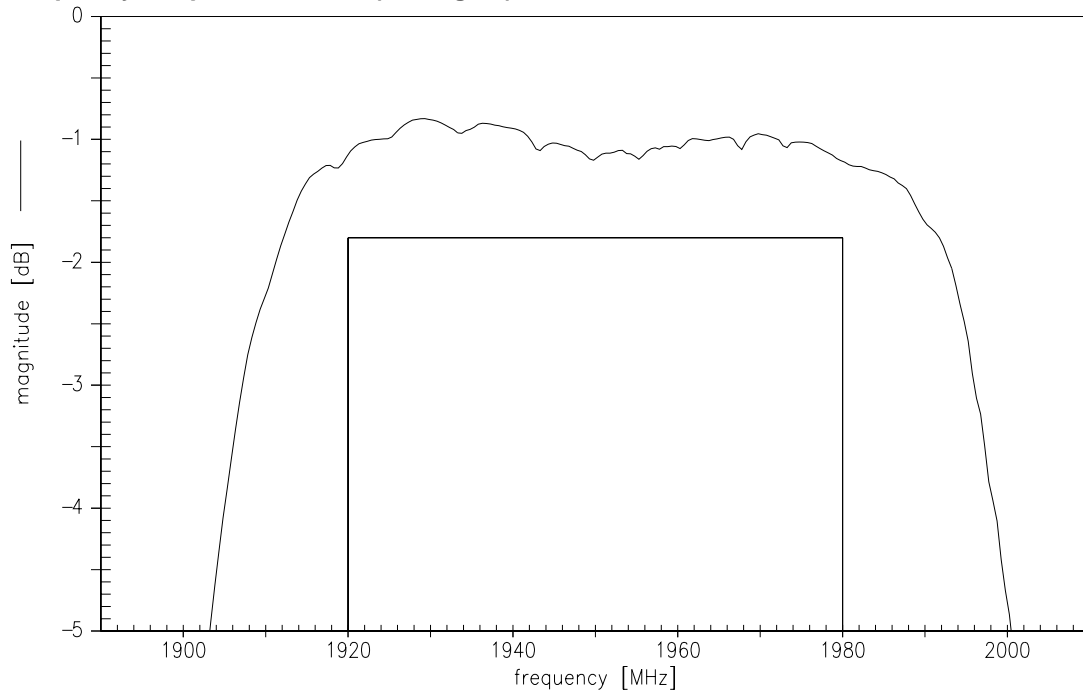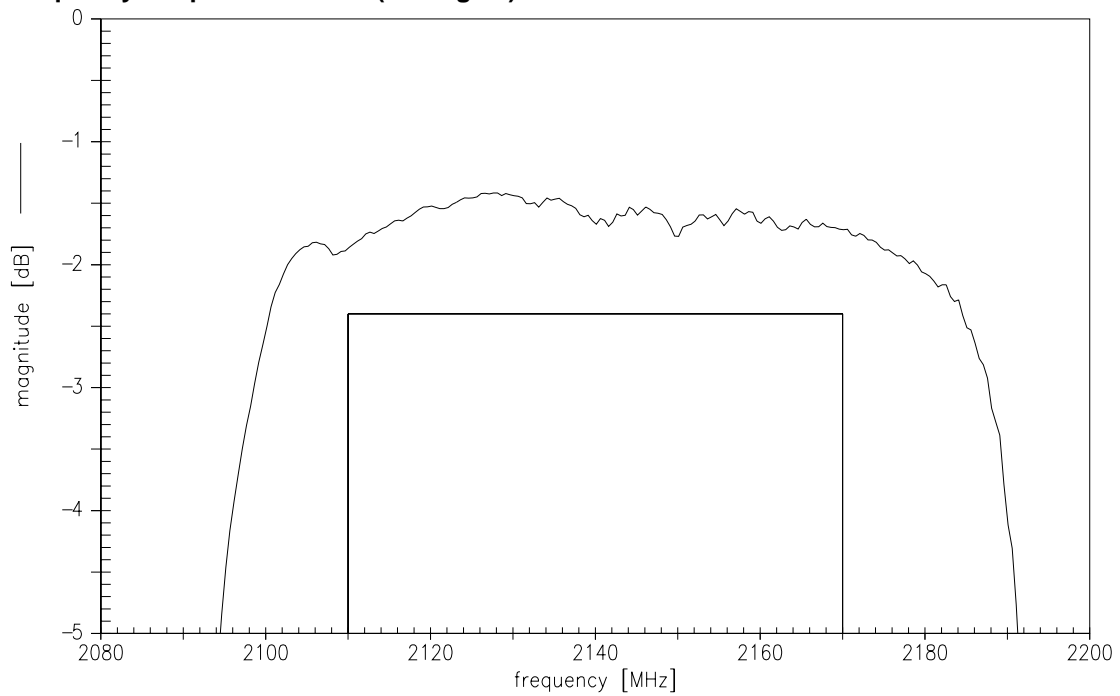
Frequency Response TX-ANT (CW signal)

Frequency Response RX-ANT (CW signal)

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Frequency Response TX-ANT (CW signal)

Frequency Response RX-ANT (CW signal)

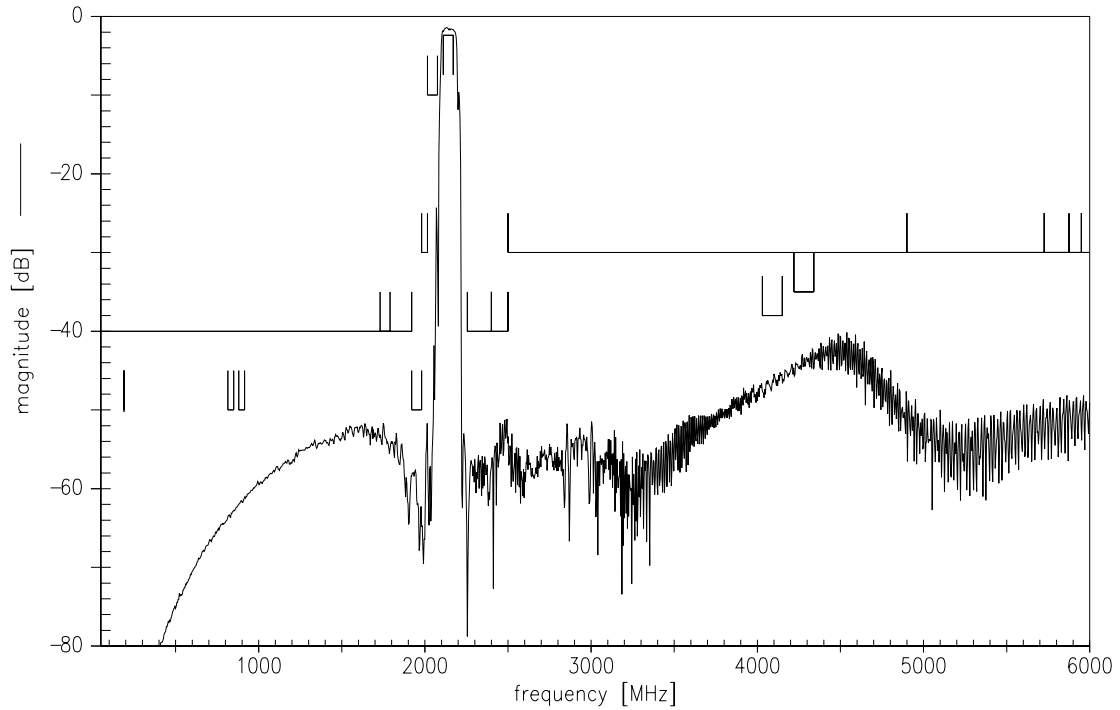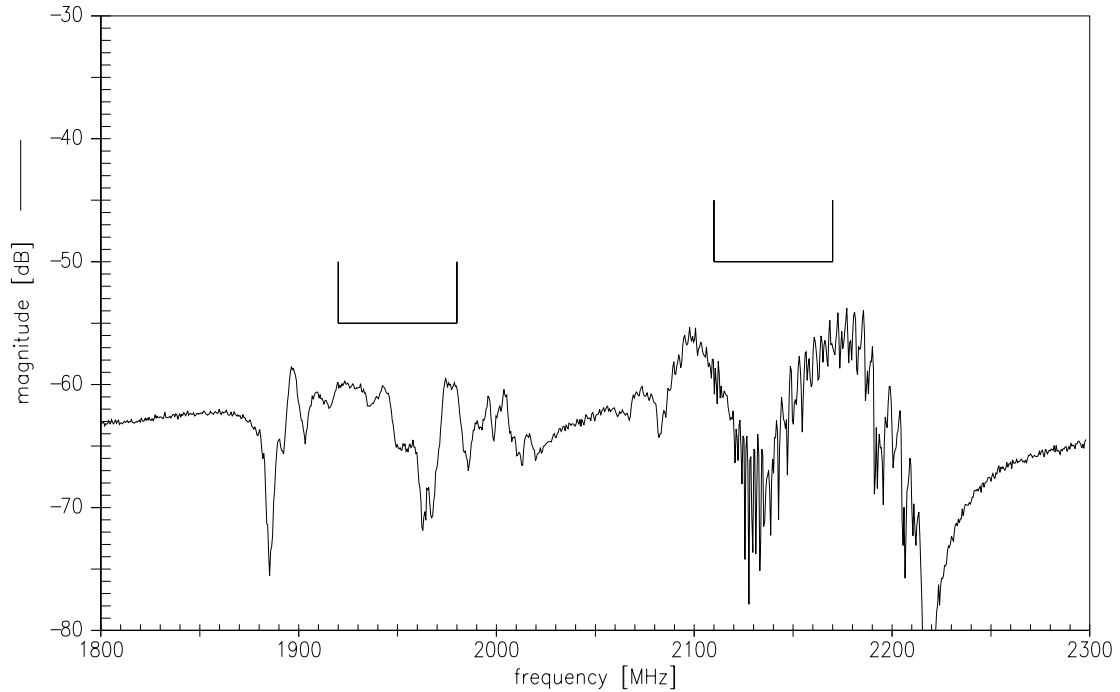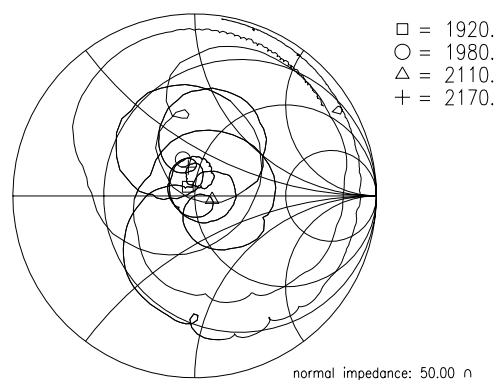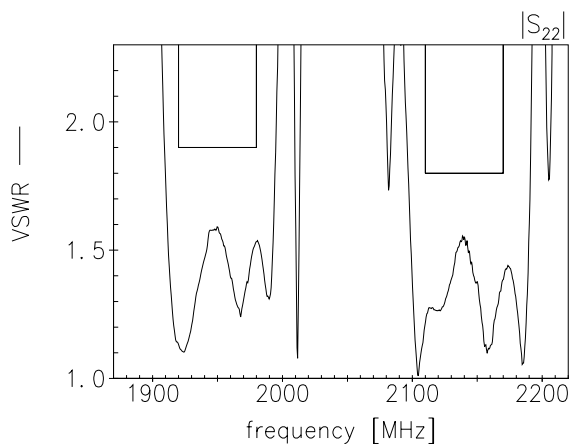Please read *cautions and warnings and important notes* at the end of this document.

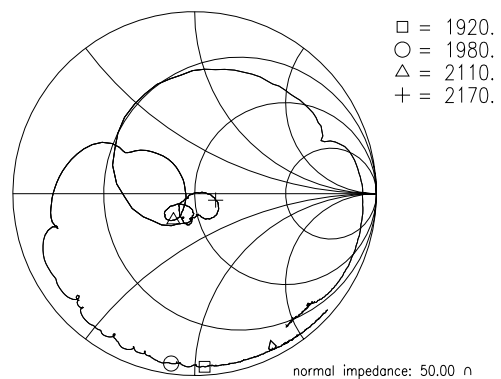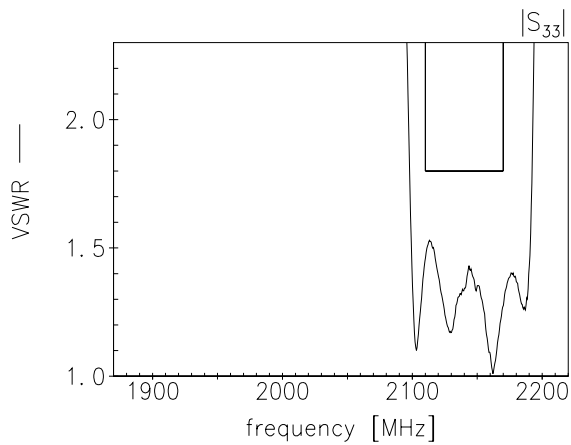**10** September 09, 2013

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SAW Duplexer	**1950.0 / 2140.0 MHz**

Data sheet   ☰MD
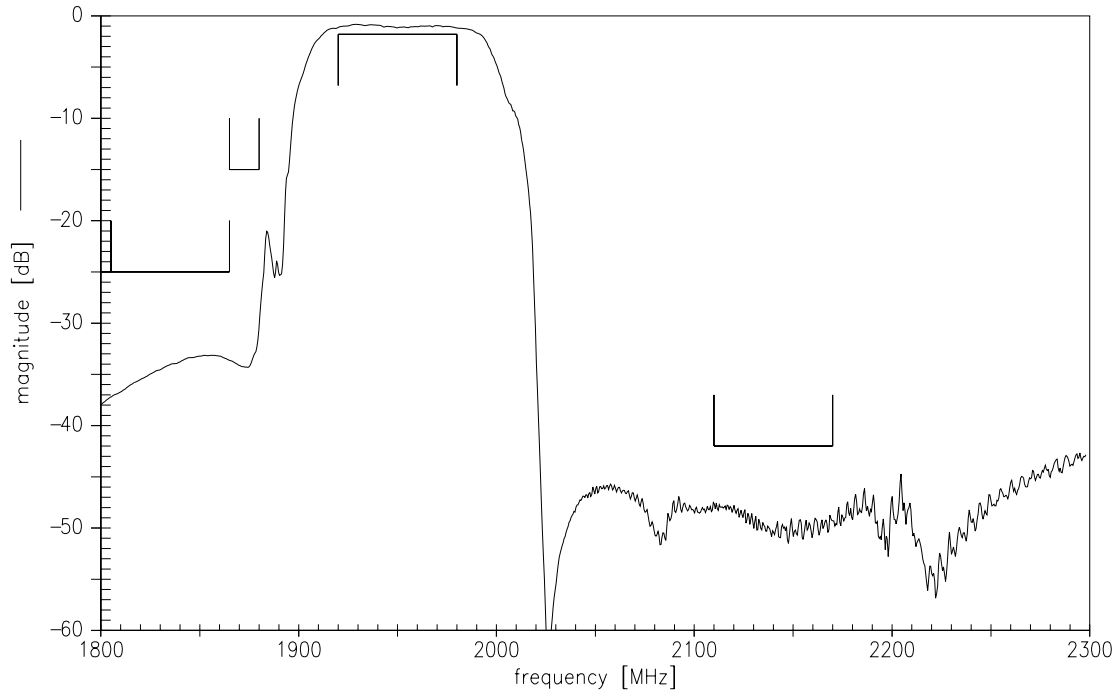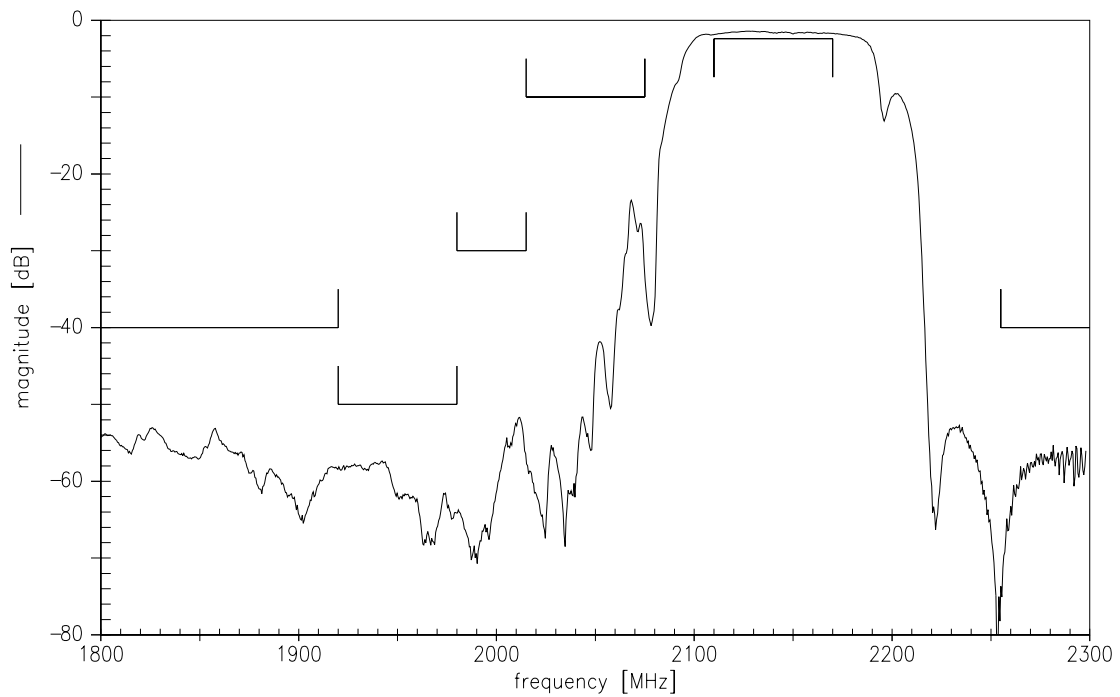
Frequency Response TX-ANT (wideband)
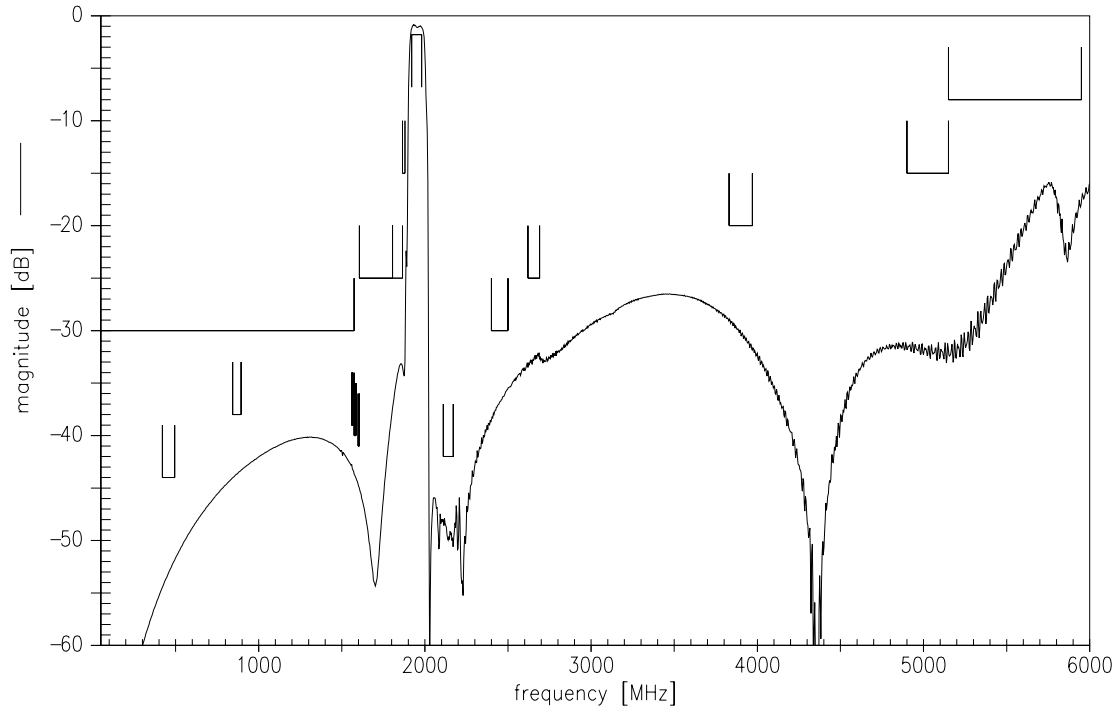
Frequency Response RX-ANT (wideband)

Frequency Response TX-RX (CW signal)

Frequency Response TX-RX (wideband)
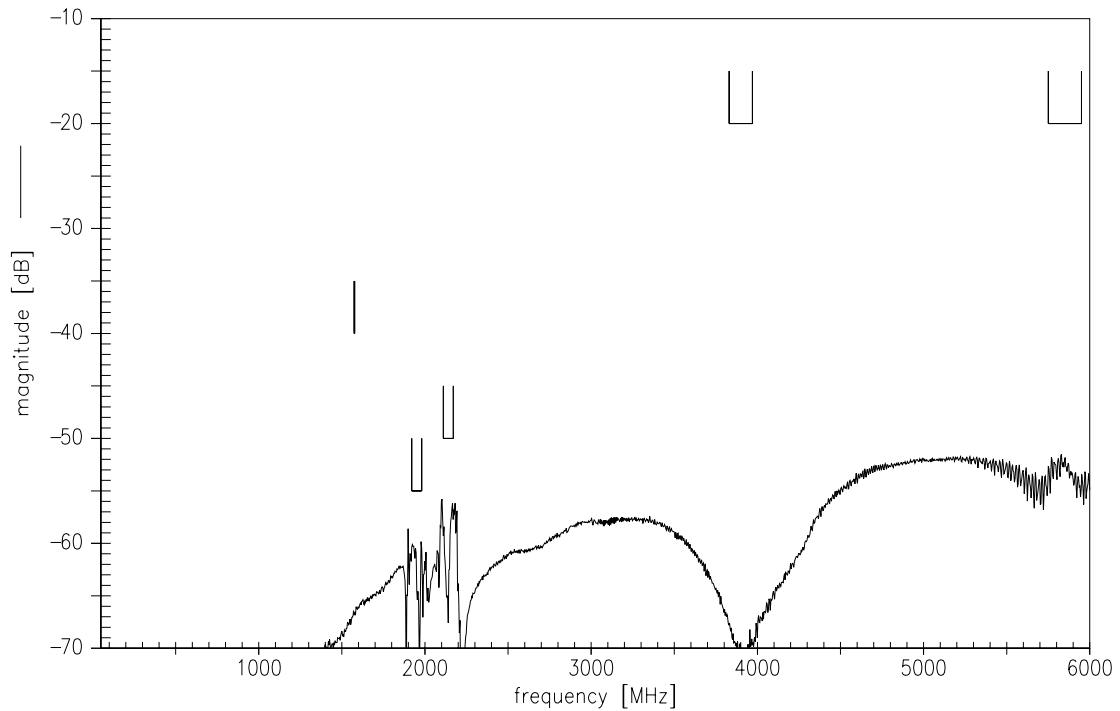
Data sheet   SMD

Return Loss   S$_{11}$ TX- port   S$_{33}$ RX-port   S$_{22}$ ANT-port

$|S_{11}|$

□ = 1920.
○ = 1980.
△ = 2110.
+ = 2170.

normal impedance: 50.00 Ω

$|S_{33}|$

□ = 1920.
○ = 1980.
△ = 2110.
+ = 2170.

normal impedance: 50.00 Ω

$|S_{22}|$

□ = 1920.
○ = 1980.
△ = 2110.
+ = 2170.

normal impedance: 50.00 Ω

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

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References

Type	B8510
Ordering code	B39212B8510P810
Marking and package	C61157-A8-A76
Packaging	F61074-V8247-Z000
Date codes	L_1126
S-parameters	B8510_NB.s3p B8510_WB.s3p See file header for port/pin assignment table.
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.
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 a large variety of matching coils.

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

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