SAW Components

SAW Duplexer

WCDMA / LTE Band 1 / CDMA 1x

Series/type:	**B8635**
Ordering code:	**B39212B8635P810**
Date:	November 19, 2014
Version:	2.3

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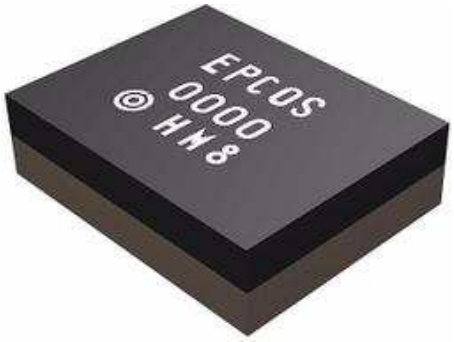
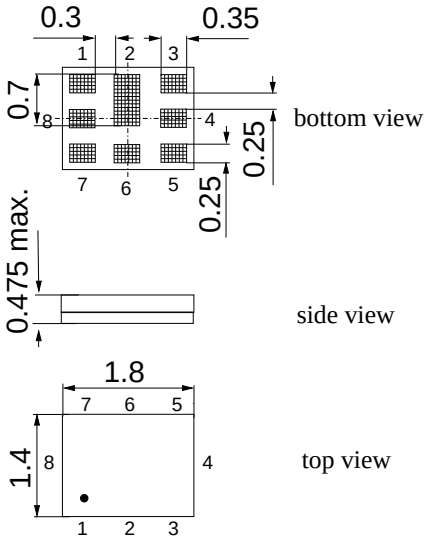
Application

- Low-loss SAW duplexer for mobile telephone WCDMA / LTE Band 1 and CDMA 1x systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- Single-ended to balanced transformation in Antenna-Rx path
- Impedance transformation 50 Ω to 100 Ω in Antenna-Rx path
- High isolation between Tx and Rx



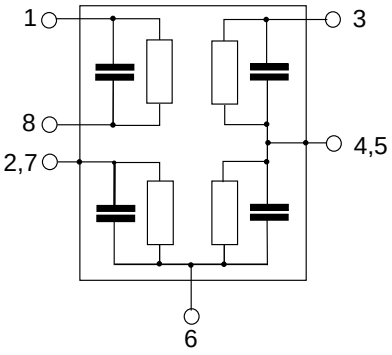
Features

- Package size 1.8 x 1.4 mm²
- Max. package height 0.475mm
- RoHS compatible
- Approximate weight 0.0038g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni terminals, Au-plated
- Balanced Rx port, unbalanced Tx port
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- **M**oisture **S**ensitive **L**evel 3



Pin configuration

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



Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.7 nH
RX teminating impedance: Z_{Rx} = 100 Ω (balanced) || 10.0 nH

Characteristics Tx-Antenna					min.	typ. @ 25 ˚C	max.	
Center frequency				f_c	—	1950.0	—	MHz
Maximum insertion attenuation				α_{max}				
1920.0	...	1980.0	MHz		—	1.5	2.0	dB
1922.4	...	1977.6	MHz	α_{WCDMA} [1)]	—	1.4	1.9	dB
Amplitude ripple (p-p)				$\Delta\alpha$				
1920.0	...	1980.0	MHz		—	0.6	1.1	dB
1922.4	...	1977.6	MHz	α_{WCDMA} [1)]	—	0.5	1.0	dB
Error Vector Magnitude				EVM [2)]				
1922.4	...	1977.6	MHz		—	0.7	2.0	%
TX port VSWR								
1920.0	...	1980.0	MHz		—	1.6	2.0	
ANT port VSWR								
1920.0	...	1980.0	MHz		—	1.4	2.0	

1) Attenuation of WCDMA 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

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.7 nH
RX teminating impedance: Z_{Rx} = 100 Ω (balanced) || 10.0 nH

Characteristics Tx-Antenna					min.	typ. @ 25 ˚C	max.	
Attenuation				α				
10.0	...	420.0	MHz		30	56	—	dB
420.0	...	494.0	MHz		44	54	—	dB
843.0	...	894.0	MHz		38	44	—	dB
1565.42	...	1573.374	MHz		39	42	—	dB
1573.374	...	1577.466	MHz		39	42	—	dB
1577.466	...	1585.42	MHz		39	43	—	dB
1597.5515	...	1605.886	MHz		39	43	—	dB
1605.886	...	1805.0	MHz		25	34	—	dB
1805.0	...	1865.0	MHz		25	31	—	dB
1865.0	...	1880.0	MHz		10	33	—	dB
2010.0	...	2025.0	MHz		19[1)]	24	—	dB
2110.0	...	2170.0	MHz		42	45	—	dB
2112.4	...	2167.6	MHz	α_{WCDMA}[2)]	42	45	—	dB
2400.0	...	2500.0	MHz		30	35	—	dB
2620.0	...	2690.0	MHz		20	32	—	dB
3840.0	...	3960.0	MHz		19	23	—	dB
5150.0	...	5940.0	MHz		12	17	—	dB

1) Temperature range for this specification is +15 to +85 ˚C
2) Attenuation of WCDMA signal (Power Transfer Function). Please refer to page 8 of this document.

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.7 nH
RX teminating impedance: Z_{Rx} = 100 Ω (balanced) || 10.0 nH

Characteristics Antenna-Rx					min.	typ. @ 25 ˚C	max.	
Center frequency				f_c	—	2140.0	—	MHz
Maximum insertion attenuation				α_{max}				
2110.0	...	2170.0	MHz		—	1.9	2.2	dB
2112.4	...	2167.6	MHz	α_{WCDMA} [1)]	—	1.9	2.1	dB
Amplitude ripple (p-p)				$\Delta\alpha$				
2110.0	...	2170.0	MHz		—	0.3	0.7	dB
2112.4	...	2167.6	MHz	α_{WCDMA} [1)]	—	0.3	0.7	dB
Error Vector Magnitude				EVM [2)]				
2112.4	...	2167.6	MHz		—	1.0	2.0	%
ANT port VSWR								
2110.0	...	2170.0	MHz		—	1.6	2.0	
RX port VSWR								
2110.0	...	2170.0	MHz		—	1.7	2.0	
Common Mode Rejection Ratio				CMRR				
2110.0	...	2170.0	MHz		19 [3)]	22	—	dB
IMD product level limits [4)]								
at f_{Tx}=1950.0 MHz, f_{Rx}=2140.0 MHz								
Blocker 1		190.0	MHz		—	-130	-110	dBm
Blocker 2		1760.0	MHz		—	-112	-104	dBm
Blocker 3		4090.0	MHz		—	-117	-106	dBm

1) Attenuation of WCDMA 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) A combination of 10˚ phase balance and 1 dB amplitude balance corresponds to 19.6 dB CMRR.
4) IMD product level limits for power levels P_{TX}=21.5 dBm (antenna port output power) and $P_{Blocker}$=-15dBm (antenna port input power).

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.7 nH
RX teminating impedance: Z_{Rx} = 100 Ω (balanced) || 10.0 nH

Characteristics Antenna-Rx					min.	typ. @ 25 ˚C	max.	
Attenuation				α				
10.0	...	1920.0	MHz		35	58	—	dB
1920.0	...	1980.0	MHz		45	57	—	dB
1922.4	...	1977.6	MHz	α_{WCDMA} [1)]	45	57	—	dB
1980.0	...	2025.0	MHz		15	37	—	dB
2255.0	...	2400.0	MHz		15	44	—	dB
2400.0	...	2484.0	MHz		30	44	—	dB
2484.0	...	6000.0	MHz		35	45	—	dB

1) Attenuation of WCDMA signal (Power Transfer Function). Please refer to page 8 of this document.

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
TX terminating impedance: Z_{Tx} = 50 Ω
ANT terminating impedance: Z_{Ant} = 50 Ω || 2.7 nH
RX teminating impedance: Z_{Rx} = 100 Ω (balanced) || 10.0 nH

Characteristics Tx-Rx					min.	typ. @ 25 ˚C	max.	
Differential mode isolation				α				
1922.4	...	1977.6	MHz	α_{WCDMA} [1)]	55	59	—	dB
1920.0	...	1980.0	MHz		55 [2)]	59	—	dB
1920.0	...	1975.0	MHz		55	59	—	dB
1975.0	...	1980.0	MHz		53	59	—	dB
2112.4	...	2167.6	MHz	α_{WCDMA} [1)]	53	59	—	dB
2110.0	...	2170.0	MHz		53	59	—	dB
3830.0	...	3970.0	MHz		20	54	—	dB
5750.0	...	5950.0	MHz		20	49	—	dB
Common mode isolation				α				
1922.4	...	1977.6	MHz	α_{WCDMA} [1)]	47	50	—	dB
1920.0	...	1980.0	MHz		47	50	—	dB

1) Attenuation of WCDMA signal (Power Transfer Function). Please refer to page 8 of this document.
2) Valid for room temperature at 25˚C.

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 1977.6 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:

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

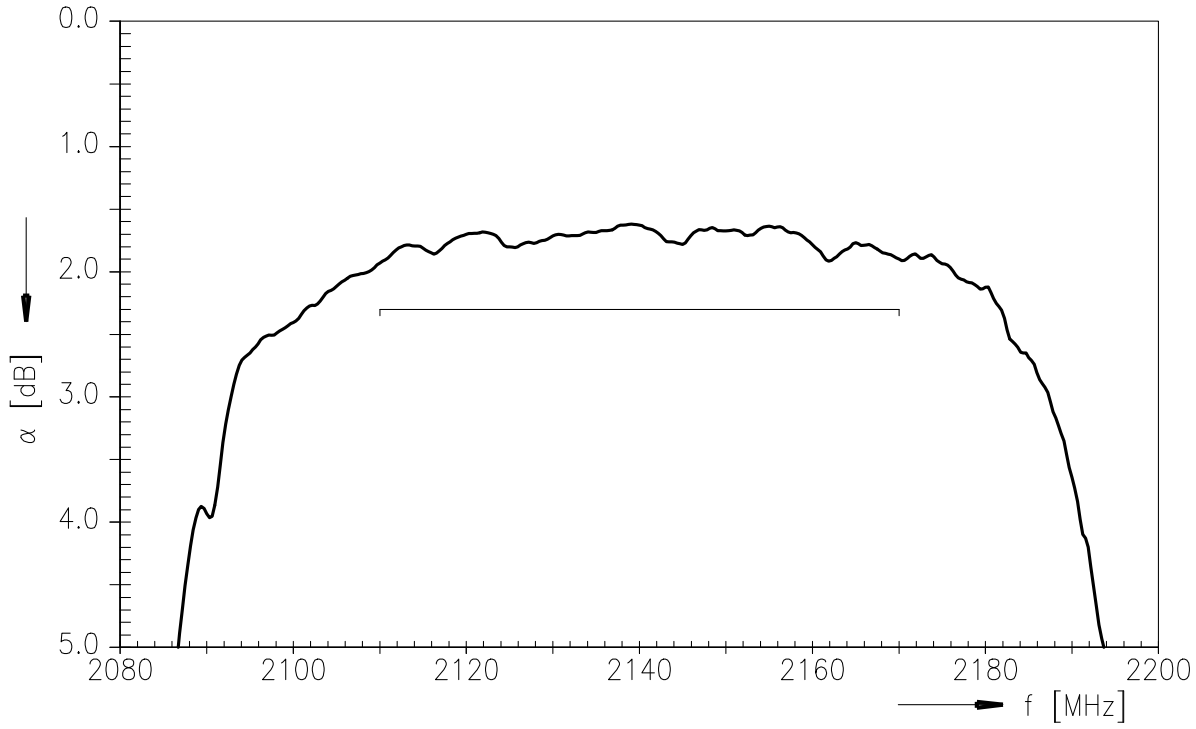
Maximum ratings

Storage temperature range	T_{stg}	–40/+85	˚C	
DC voltage	V_{DC}	5[1)]	V	
ESD voltage	V_{ESD}	50[2)]	V	Machine Model
		250[3)]	V	Human Body Model
		600[4)]	V	Charged Device Model
Input power at				
1920.0 ... 1980.0 MHz	P_{in}	29	dBm	} continuous wave
elsewhere	P_{in}	10	dBm	T = 50 ˚C, 5000 h

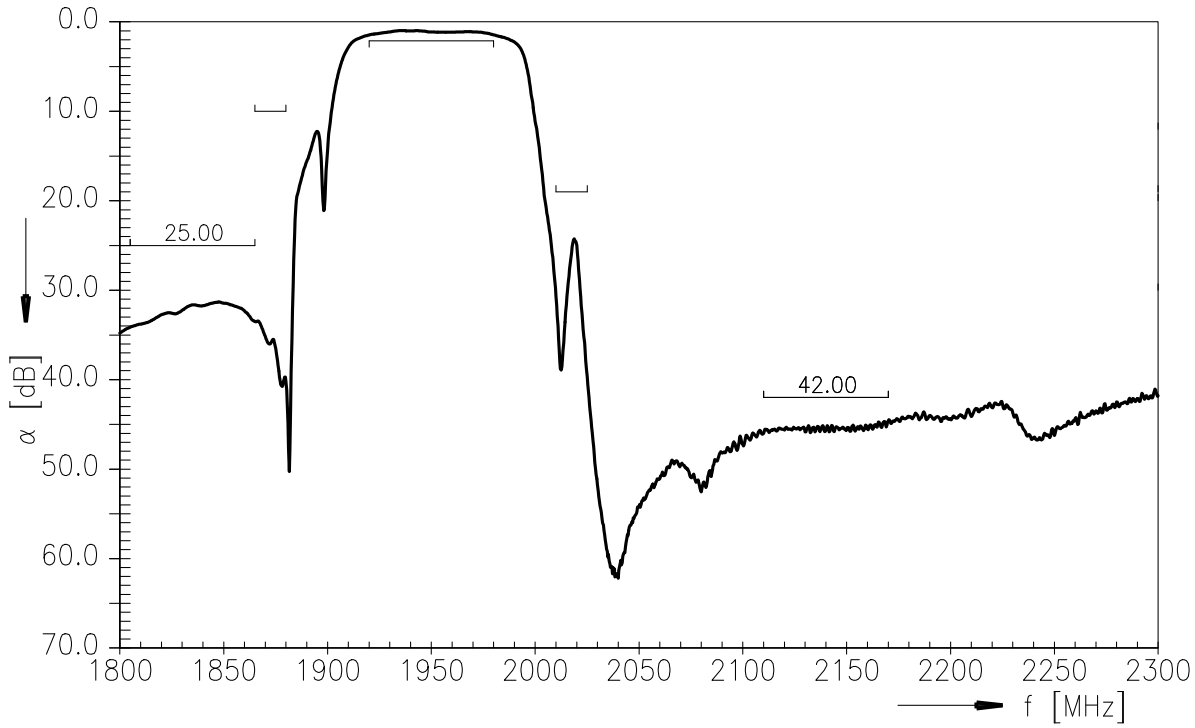
1) 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy
2) acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.
3) acc. to JESD22-A114F (HBM - Human Body Model), 1 negative and 1 positive pulses.
4) acc. to JESD22-C111C (CDM - Charged Device Model), 3 negative and 3 positive pulses.

Frequency Response TX-ANT

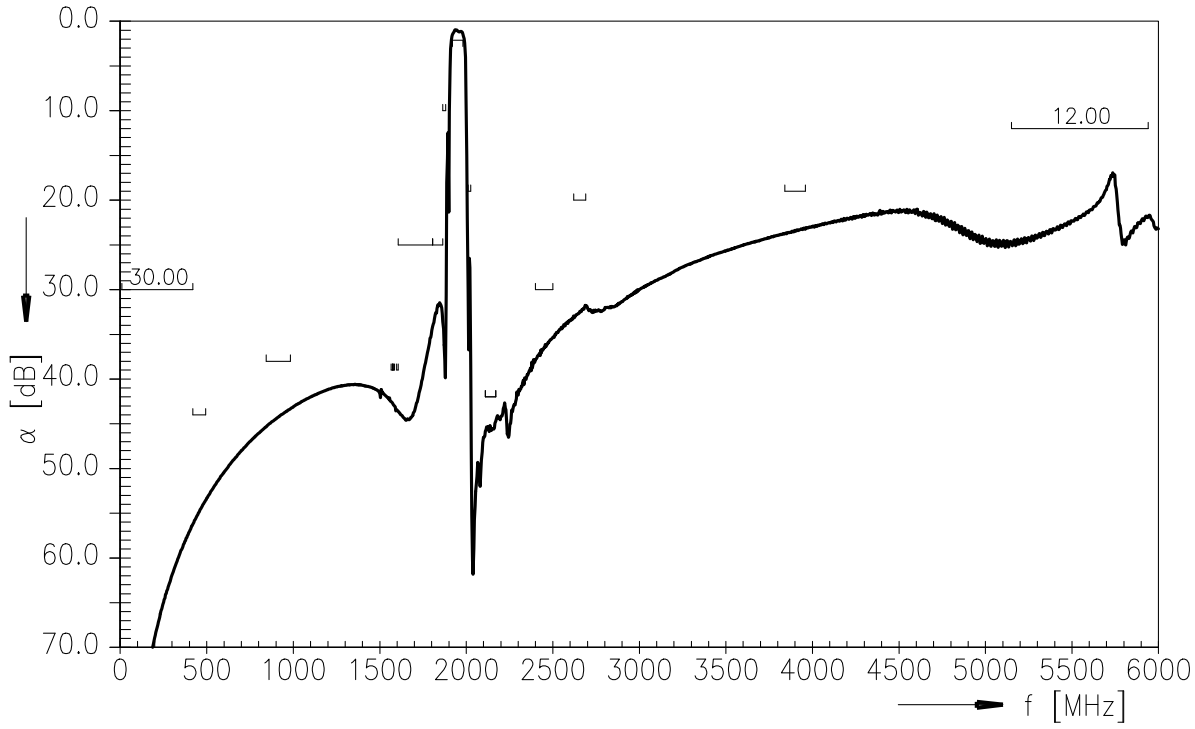
Frequency Response RX-ANT



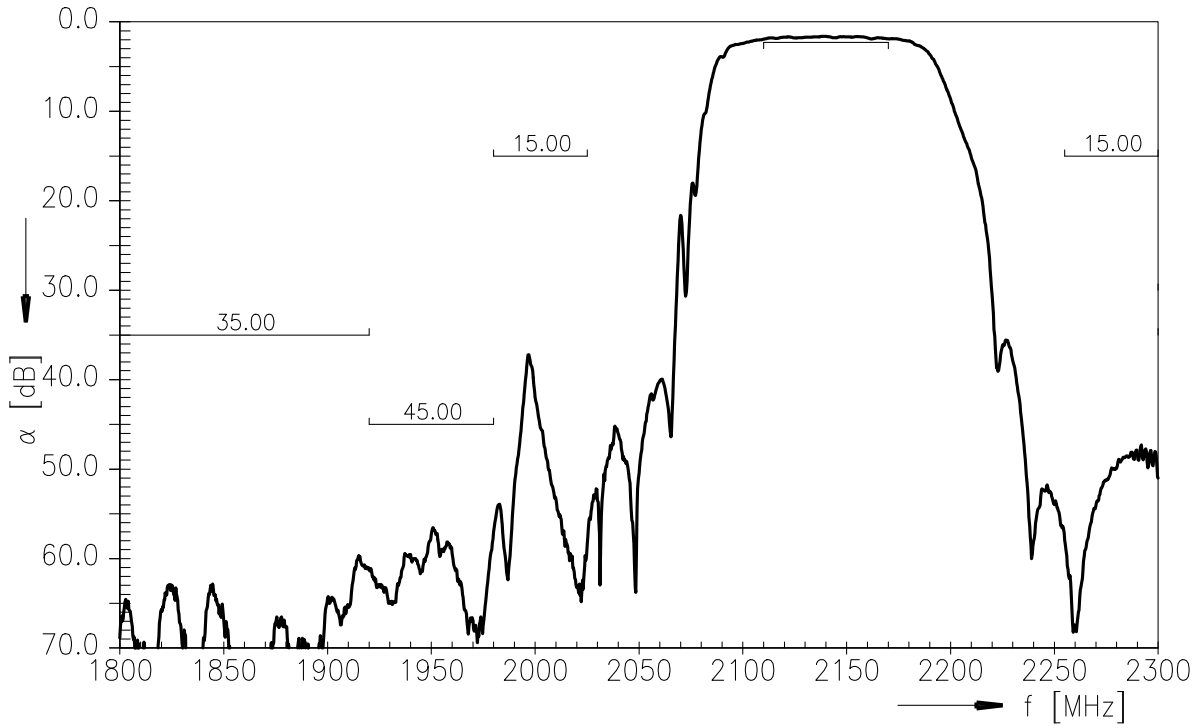
Frequency Response TX-ANT



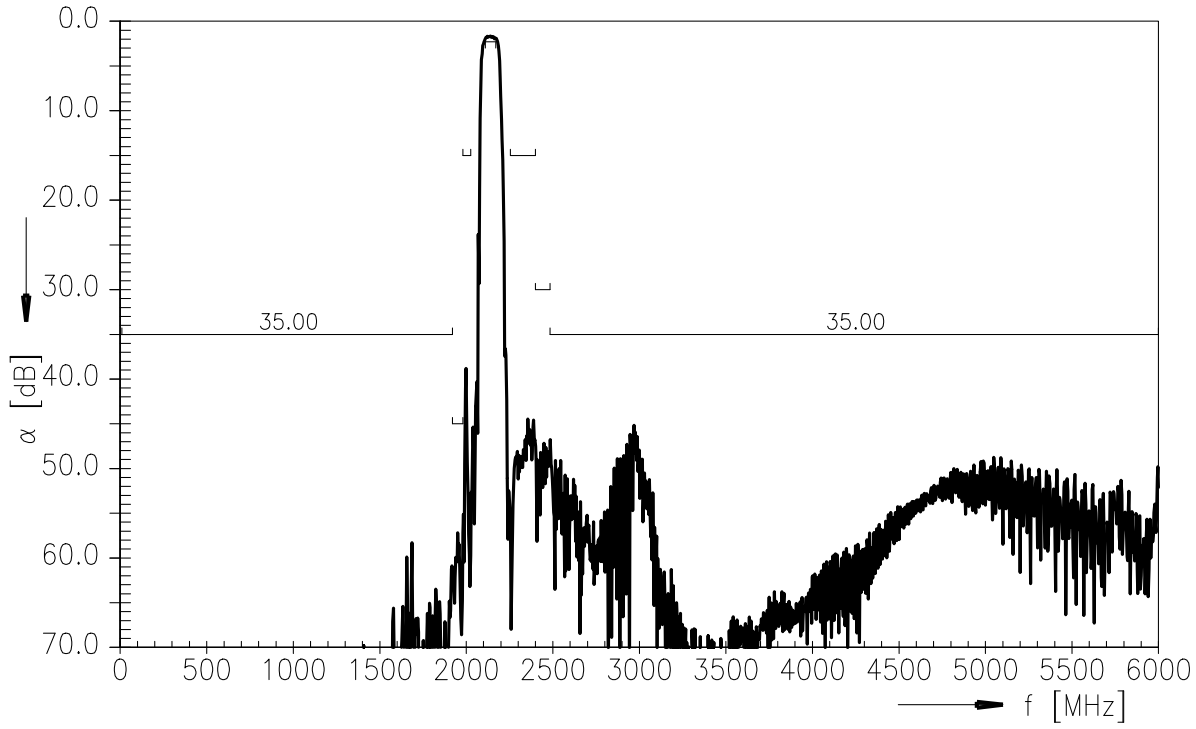
Frequency Response TX-ANT (wideband)



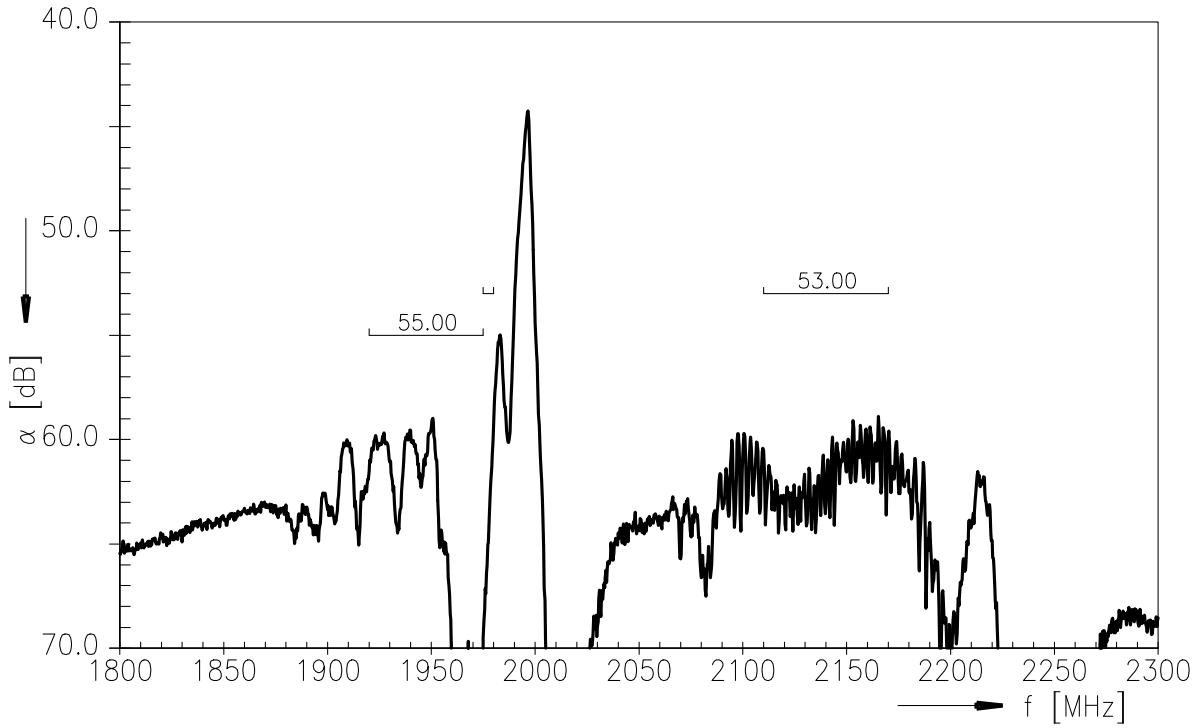
Frequency Response RX-ANT



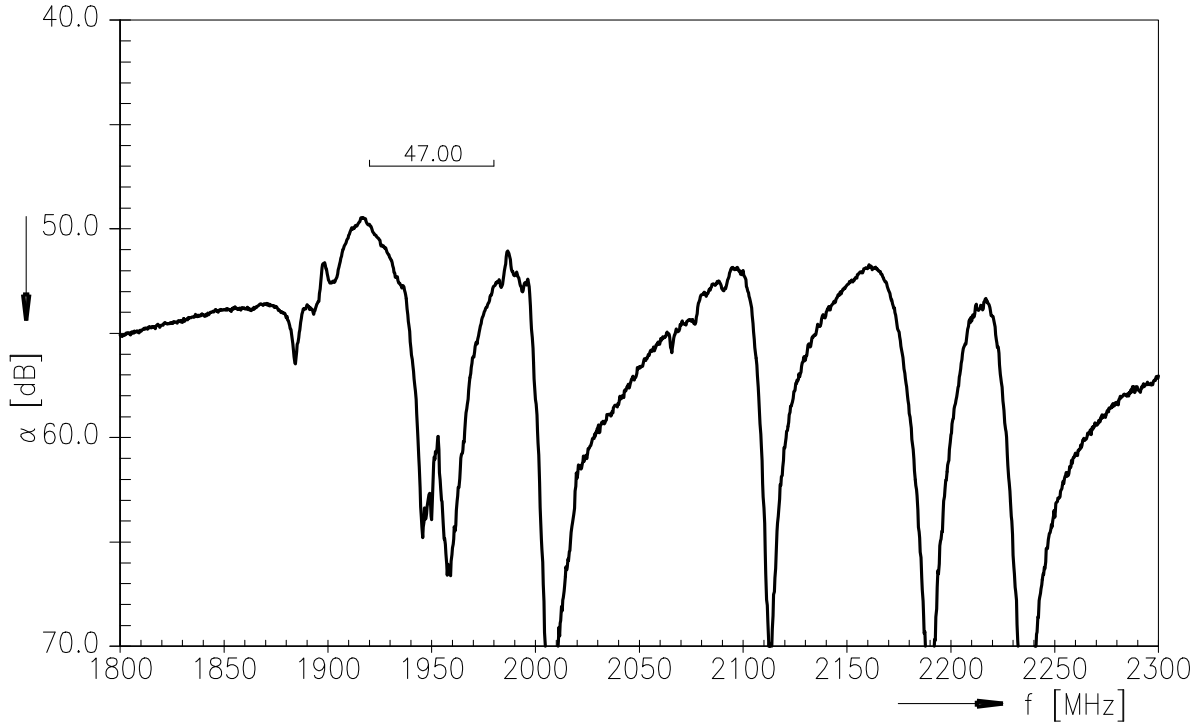
Frequency Response RX-ANT (wideband)



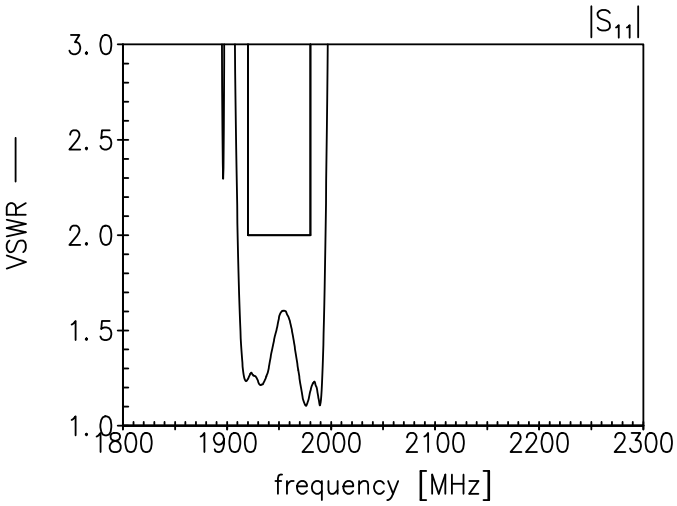
Frequency Response TX-RX (Differential mode)

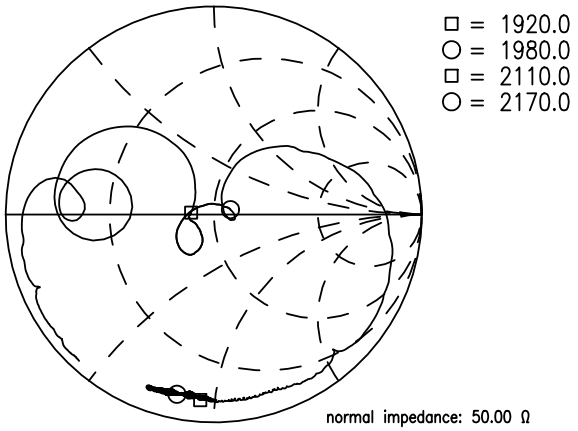


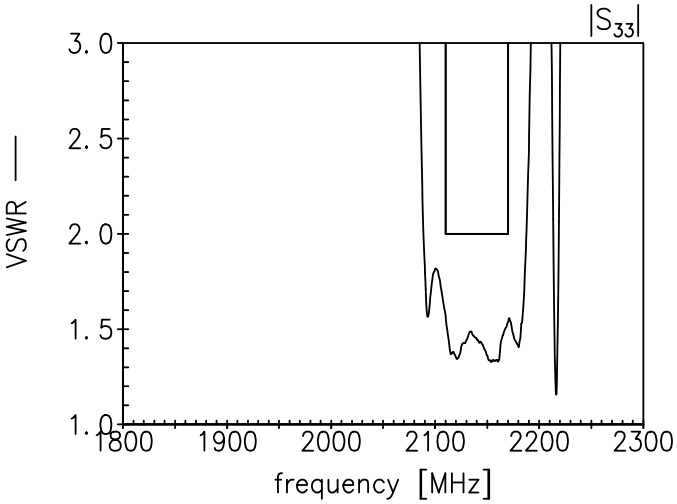
Frequency Response TX-RX (Common mode)

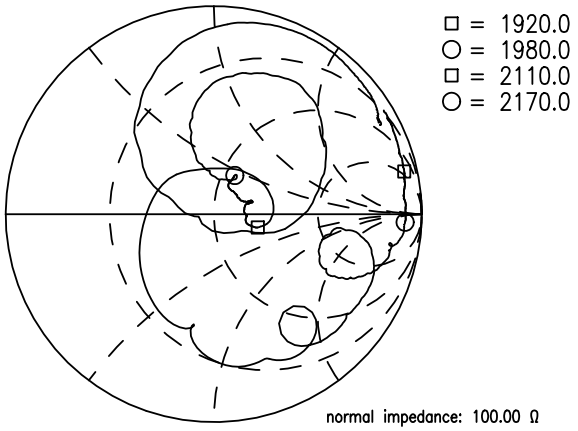


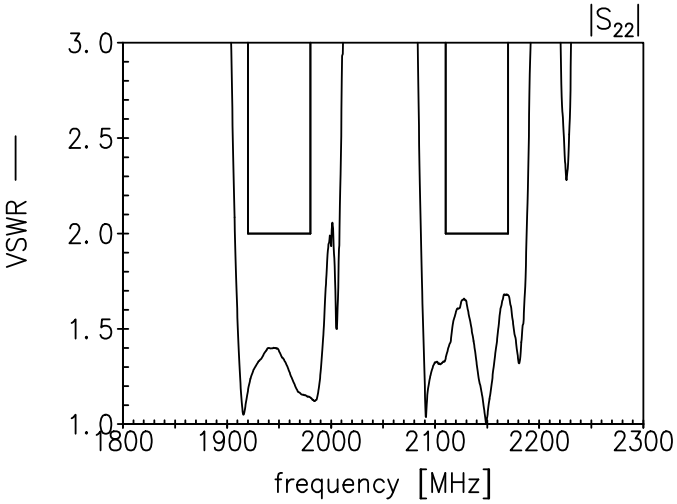
VSWR **S_{11} TX- port** **S_{22} ANT-port** **S_{33} RX-port**

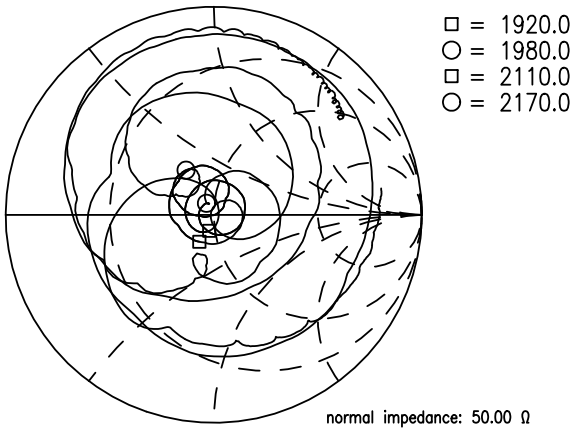












References

Type	B8635
Ordering code	B39212B8635P810
Marking and package	C61157-A8-A149
Packaging	F61074-V8259-Z000
Date codes	L_1126
S-parameters	B8635_NB_UN.s4p, B8635_WB_UN.s4p 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

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