SAW Components

SAW Duplexer

Cellular Band / WCDMA Band 5

Series/type:	**B8594**
Ordering code:	**B39881B8594P810**
Date:	June 27, 2013
Version:	2.3

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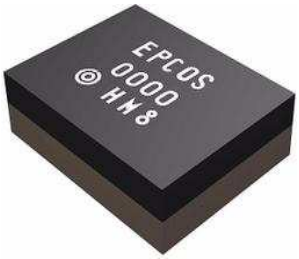
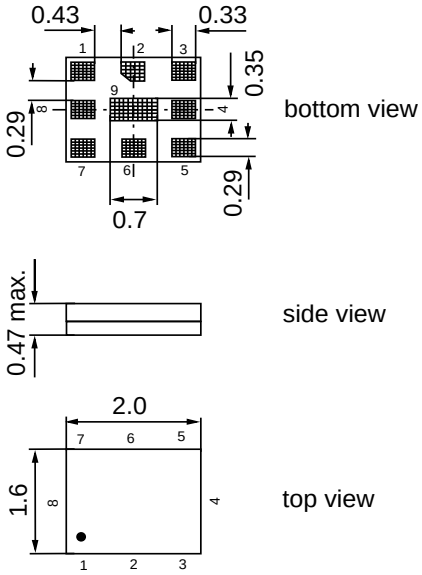
Application

- Low-loss SAW duplexer for mobile telephone Cellular Band / WCDMA Band 5, 6 and 19 systems
- Low insertion attenuation
- Low amplitude ripple



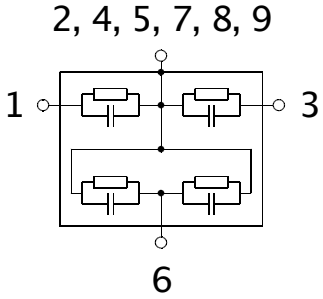
Features

- Package size 2.0 x 1.6 mm²
- Max. package height 0.47 mm
- RoHS compatible
- Approx. weight 0.006g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)
- **M**oisture **S**ensitive **L**evel 3



Pin configuration

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



Data sheet SMD

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
Antenna terminating impedance: Z_{ANT} = 50 Ω || 8.2 nH
RX terminating impedance: Z_{RX} = 50 Ω
TX terminating impedance: Z_{TX} = 50 Ω

Characterisitcs TX - ANT					min.	typ. @ 25 ˚C	max.	
Center frequency				f_C	—	836.5	—	MHz
Maximum insertion attenuation								
824.0	...	849.0	MHz	α_{max}	—	1.4	2.1	dB
@$f_{Carrier}$ 826.4	...	846.6	MHz	α_{WCDMA} [1)]	—	1.2	1.7	dB
Amplitude ripple (p-p)								
824.0	...	849.0	MHz	$\Delta\alpha$	—	0.6	1.2	dB
@$f_{Carrier}$ 826.4	...	846.6	MHz	$\Delta\alpha_{WCDMA}$ [3)]	—	0.4	0.8	dB
Amplitude ripple over any 5MHz channel				$\Delta\alpha$				
824.0	...	849.0	MHz	$\Delta\alpha$	—	0.5	0.8	dB
Error Vector Magnitude								
@$f_{Carrier}$ 826.4	...	846.6	MHz	EVM [2)]	—	2.8	4.0	%
Input VSWR (TX port)								
824.0	...	849.0	MHz		—	1.8	2.1	
Output VSWR (ANT port)								
824.0	...	849.0	MHz		—	1.6	2.0	

[1)] Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page(8).
[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
Antenna terminating impedance: Z_{ANT} = 50 Ω || 8.2 nH
RX terminating impedance: Z_{RX} = 50 Ω
TX terminating impedance: Z_{TX} = 50 Ω

Characterisitcs TX - ANT					min.	typ. @ 25 ˚C	max.	
Attenuation				α				
10.0	...	420.0	MHz		30	43	—	dB
420.0	...	494.0	MHz		32	41	—	dB
494.0	...	701.0	MHz		30	37	—	dB
701.0	...	728.0	MHz		30	37	—	dB
728.0	...	764.0	MHz		33	37	—	dB
764.0	...	804.0	MHz		30	40	—	dB
860.0	...	864.0	MHz		2	10	—	dB
864.0	...	869.0	MHz		10	36	—	dB
869.0	...	894.0	MHz		43	51	—	dB
@$f_{Carrier}$ 871.4	...	891.6	MHz	α_{WCDMA} [1)]	44	51	—	dB
1565.42	...	1573.374	MHz		45	48	—	dB
1573.374	...	1577.466	MHz		45	49	—	dB
1577.466	...	1585.42	MHz		45	49	—	dB
1597.5515	...	1605.866	MHz		45	50	—	dB
1648.0	...	1698.0	MHz		45	51	—	dB
1844.9	...	1879.9	MHz		38	45	—	dB
1884.5	...	1919.6	MHz		38	45	—	dB
1930.0	...	1990.0	MHz		37	43	—	dB
2110.0	...	2170.0	MHz		34	40	—	dB
2400.0	...	2547.0	MHz		32	36	—	dB
3296.0	...	3396.0	MHz		23	30	—	dB
4120.0	...	4245.0	MHz		22	28	—	dB
4900.0	...	5943.0	MHz		12	18	—	dB

[1)] Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page(8).

Data sheet SMD

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 8.2 nH
RX terminating impedance: Z_{RX} = 50 Ω
TX terminating impedance: Z_{TX} = 50 Ω

Characterisitcs ANT - RX		min.	typ. @ 25 ˚C	max.	
Center frequency	f_C	—	881.5	—	MHz
Maximum insertion attenuation					
869.0 ... 894.0MHz	α_{max}	—	1.7	2.1	dB
@$f_{Carrier}$ 871.4 ... 891.6MHz	α_{WCDMA} 1)	—	1.6	2.0	dB
Amplitude ripple (p-p)					
869.0 ... 894.0MHz	$\Delta\alpha$	—	0.6	1.0	dB
@$f_{Carrier}$ 871.4 ... 891.6MHz	$\Delta\alpha_{WCDMA}$ 3)	—	0.4	0.8	dB
Amplitude ripple over any 5MHz channel					
869.0 ... 894.0MHz	$\Delta\alpha$	—	0.5	0.8	dB
Error Vector Magnitude					
@$f_{Carrier}$ 871.4 ... 891.6MHz	EVM 2)	—	2.0	3.5	%
Input VSWR (ANT port)					
869.0 ... 894.0MHz		—	1.6	2.0	
Output VSWR (RX port)					
869.0 ... 894.0MHz		—	1.7	2.0	

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page(8).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141

Data sheet SMD

Characteristics

Temperature range for specification: T = –30 ˚C to +90 ˚C
Antenna terminating impedance: Z_{ANT}= 50 Ω || 8.2 nH
RX terminating impedance: Z_{RX} = 50 Ω
TX terminating impedance: Z_{TX} = 50 Ω

Characterisitcs ANT - RX						min.	typ. @ 25 ˚C	max.	
Attenuation					α				
	10.0	...	824.0	MHz		40	59	—	dB
			45.0	MHz		50	95	—	dB
	824.0	...	849.0	MHz		51	59	—	dB
@$f_{Carrier}$	826.4	...	846.6	MHz	α_{WCDMA}[1)]	55	61	—	dB
	849.0	...	854.0	MHz		26	36	—	dB
	909.0	...	920.0	MHz		10	18	—	dB
	920.0	...	979.0	MHz		25	30	—	dB
	979.0	...	1710.0	MHz		40	56	—	dB
	1710.0	...	1785.0	MHz		50	61	—	dB
	1785.0	...	4100.0	MHz		40	48	—	dB
	4100.0	...	4500.0	MHz		35	42	—	dB
	4500.0	...	5000.0	MHz		31	39	—	dB
	5000.0	...	6000.0	MHz		28	34	—	dB
IMD product level limits[2)] at f_{TX}=836.5MHz, f_{RX}=881.5MHz									
Blocker 1			45.0	MHz		—	-126	-109	dBm
Blocker 2			791.5	MHz		—	-113	-100	dBm
Blocker 3			1718.0	MHz		—	-106	-94	dBm
Blocker 4			2554.5	MHz		—	-122	-102	dBm

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page(8).
2) 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
Antenna terminating impedance: Z_{ANT}= 50 Ω || 8.2 nH
RX terminating impedance: Z_{RX} = 50 Ω
TX terminating impedance: Z_{TX} = 50 Ω

Characterisitcs TX - RX					min.	typ. @ 25 ˚C	max.	
Isolation				α				
824.0	...	849.0	MHz	α	55	61	—	dB
@$f_{Carrier}$ 826.4	...	846.6	MHz	α_{WCDMA} 1)	57	64	—	dB
869.0	...	894.0	MHz	α	48	53	—	dB
@$f_{Carrier}$ 871.4	...	891.6	MHz	α_{WCDMA} 3)	50	54	—	dB
1574.0	...	1577.0	MHz	α	40	63	—	dB
1638.0	...	1708.0	MHz	α	40	62	—	dB
2462.0	...	2557.0	MHz	α	40	57	—	dB

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page(8).

Maximum ratings

Storage temperature range	T_{stg}	–40/+90[1)]	˚C	
DC voltage	V_{DC}	5[2)]	V	
DC impedance to ground		>100	MΩ	
ESD voltage	V_{ESD}	100[3)]	V	Machine Model
Input power at	P_{IN}			source and load impedance 50 Ω
824.0 ... 849.0 MHz		28	dBm	} continuous wave
elsewhere		10	dBm	T = 50˚C, 3000 h

1) extended upperlimit: 168h@125˚C acc. to IEC 60068-2-2 Bb
2) 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy
3) acc. to JESD22-A115B (MM - Machine Model), 10 negative and 10 positive pulses.

Annotation for characteristics section

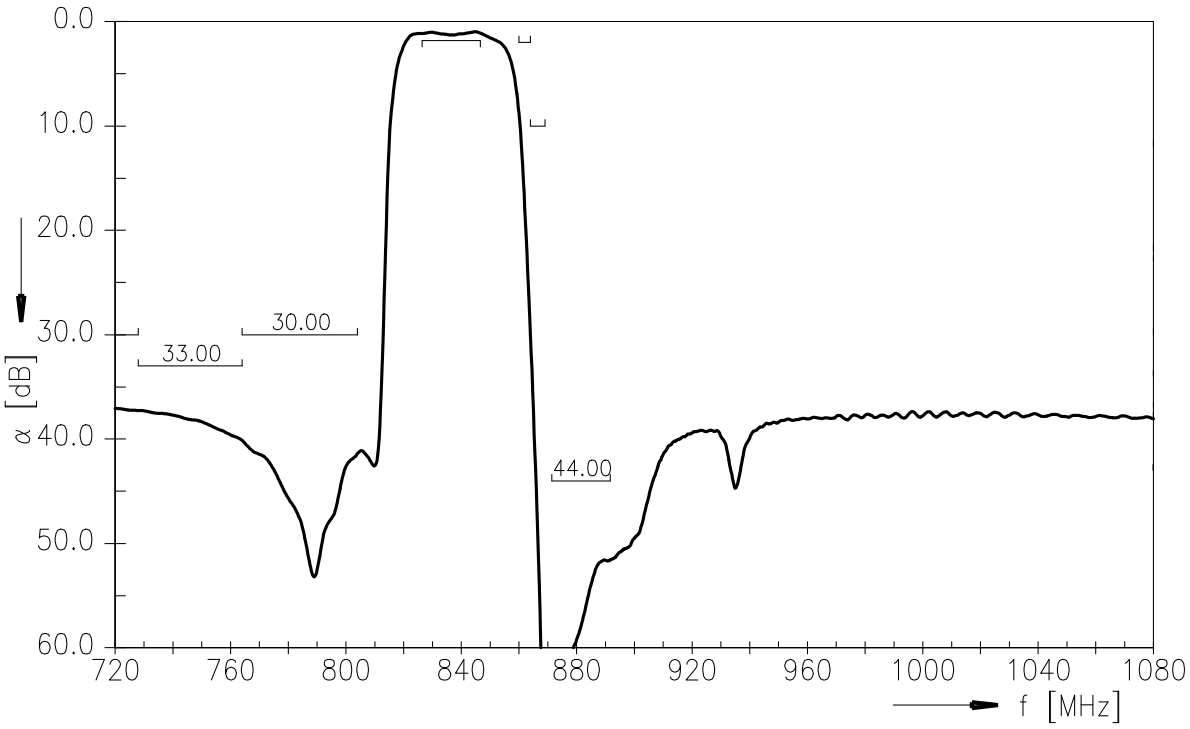
Attenuation of WCDMA signal ("Powertransferfunction", α_{WCDMA}) is determined by

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

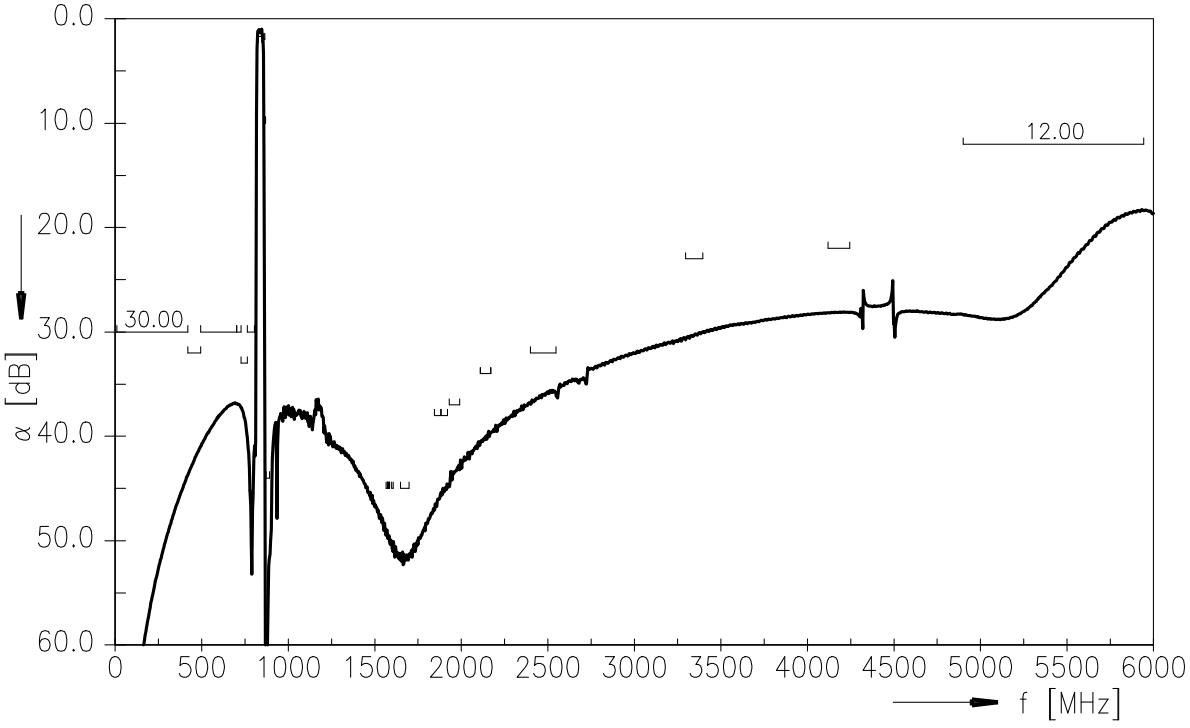
$f_{Carrier}$ according to 3GPP TS 25.101 (e.g. for WCDMA Band 5-Passband, $f_{Carrier}$ ranges from 826.4 MHz (lowest Tx channel) to 846.6 MHz (highest Tx channel)). $H_{RRC}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 with the following normalization:

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

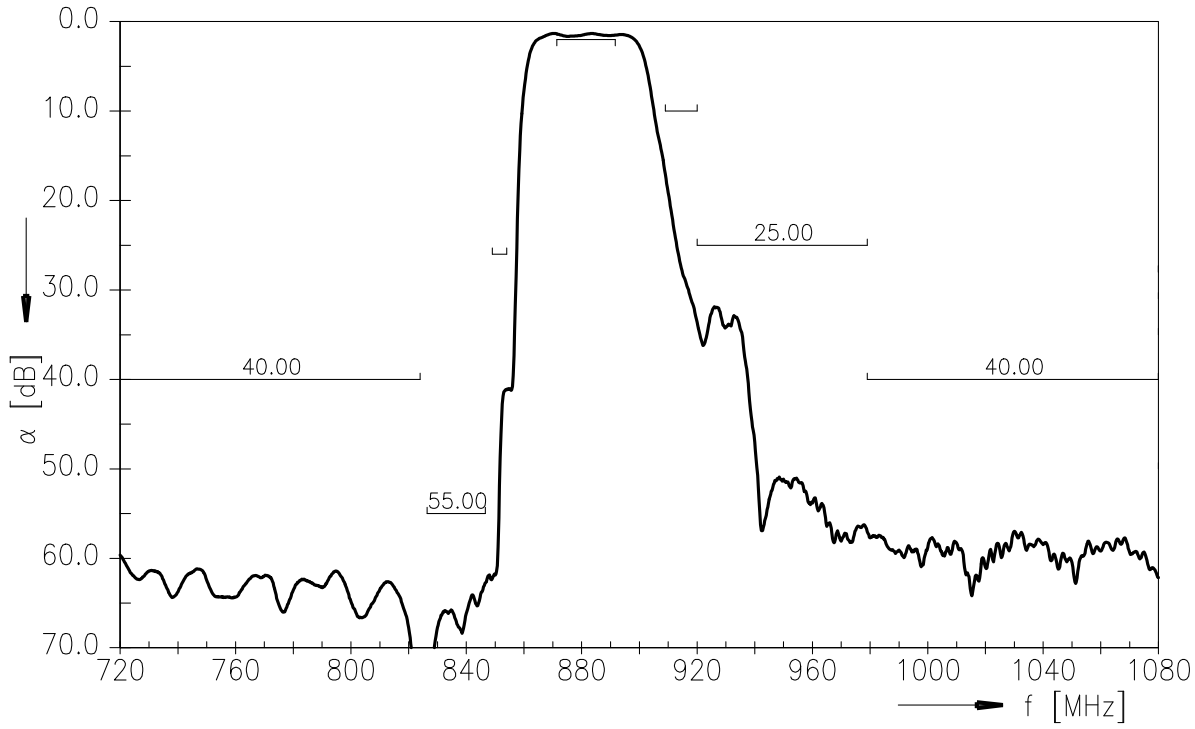
Frequency Response TX-ANT (Power transfer function)



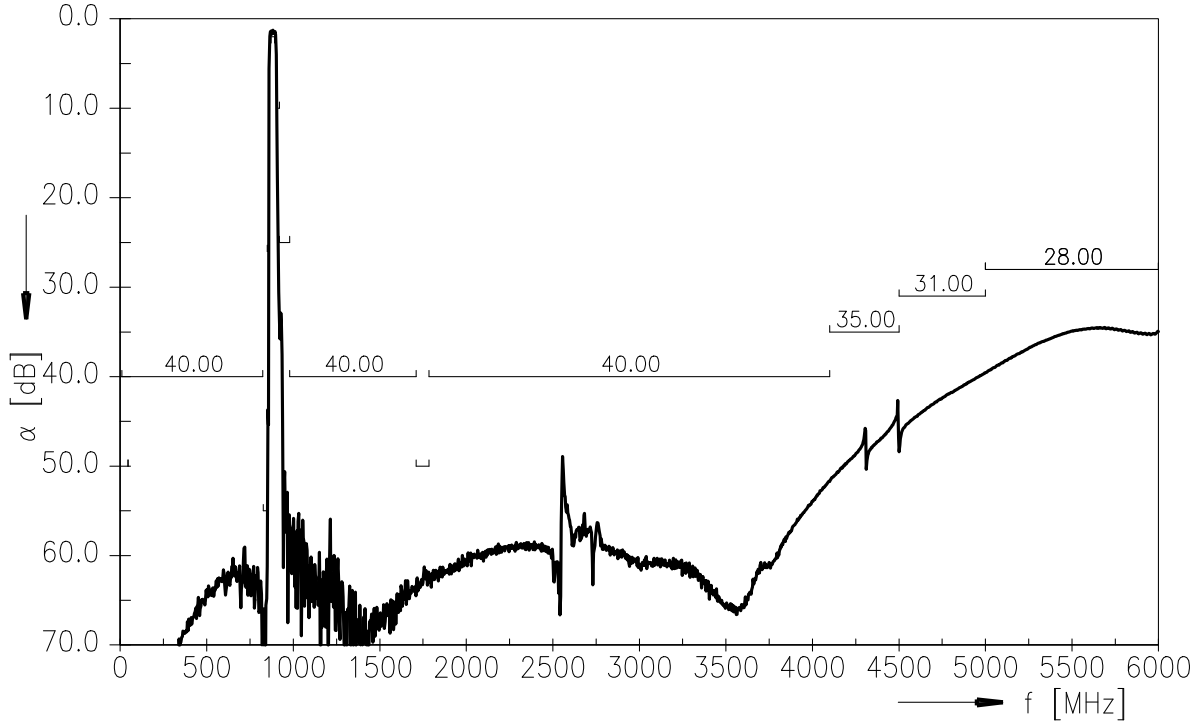
Frequency Response TX-ANT (wideband)



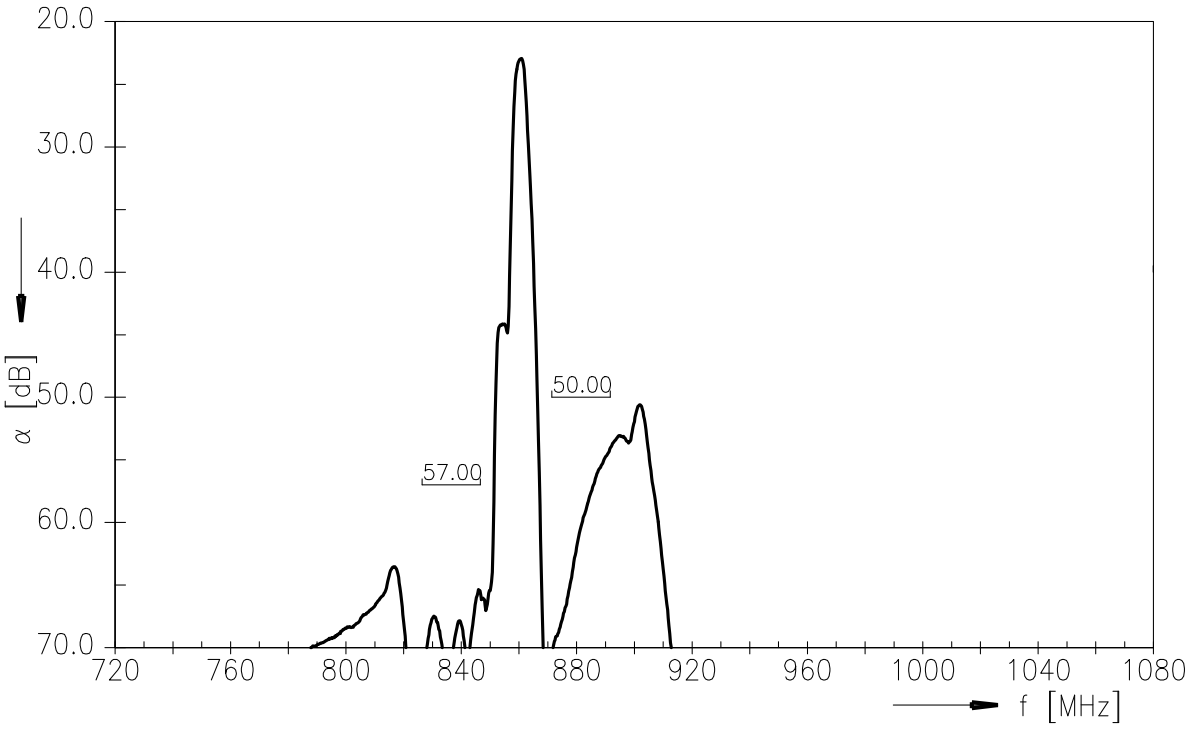
Frequency Response RX-ANT (Power transfer function)



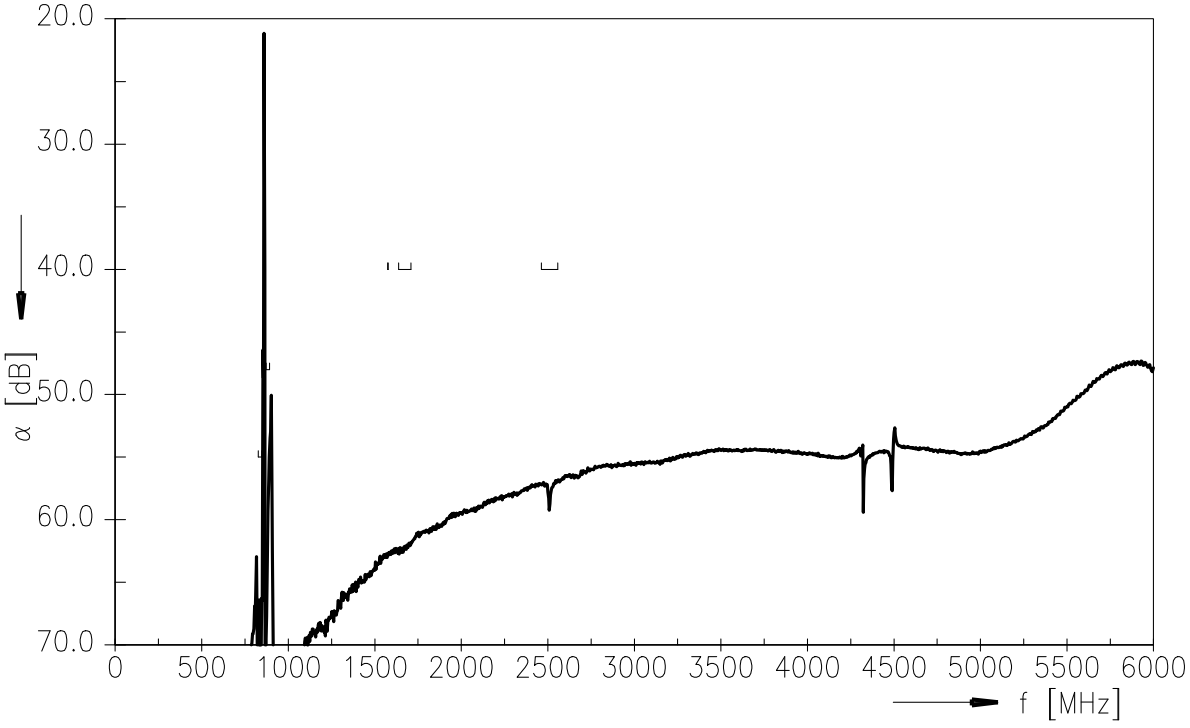
Frequency Response RX-ANT (wideband)



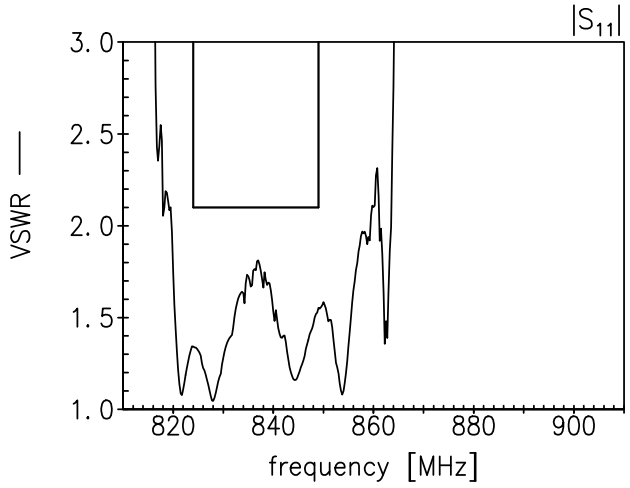
Frequency Response TX-RX (Power transfer function)

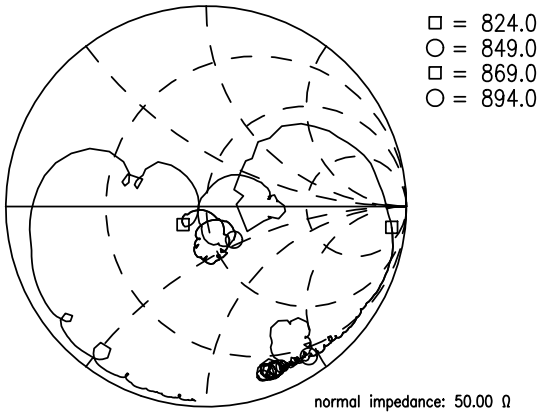


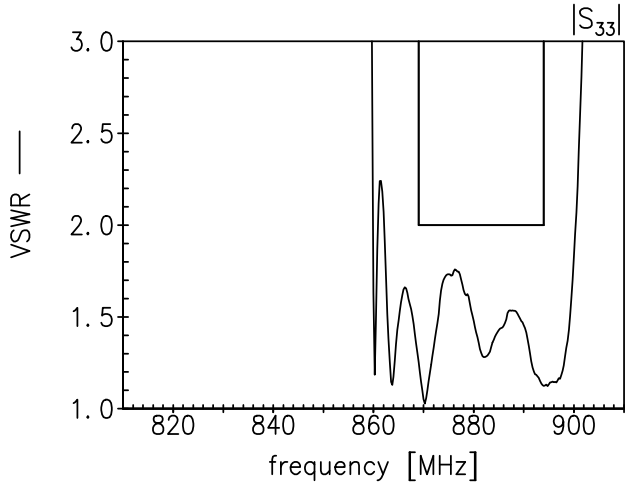
Frequency Response TX-RX (wideband)

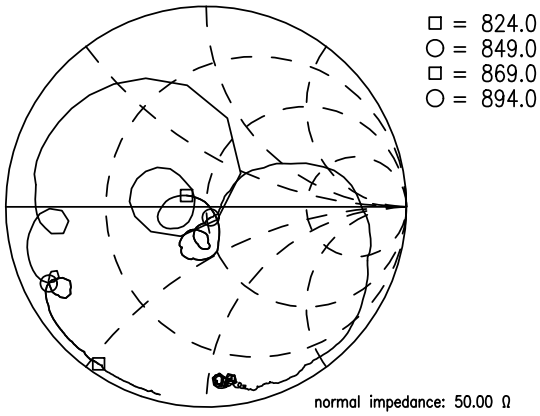


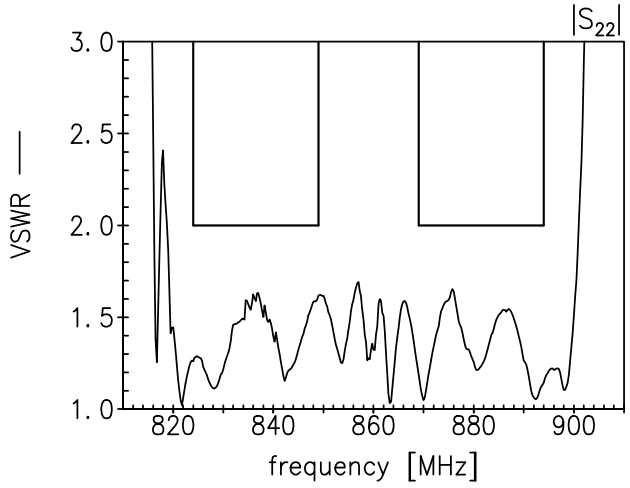
Return Loss **S_{11} TX- port** **S_{22} ANT-port** **S_{33} RX-port**

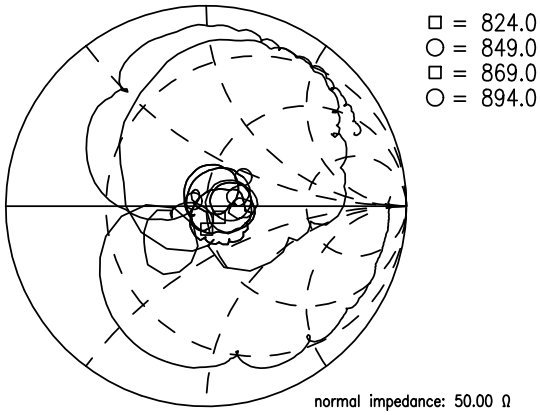












References

Type	B8594
Ordering code	B39881B8594P810
Marking and package	C61157-A8-A38
Packaging	F61074-V8247-Z000
Date codes	L_1126
S-parameters	B8594_NB_UN.s3p, B8594_WB_UN.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

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