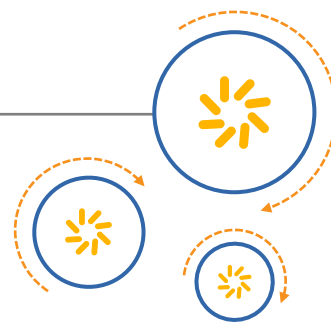




RF360 Europe GmbH

A Qualcomm – TDK Joint Venture



SAW Components

SAW Duplexer

Automotive telematics

Series/type: B4401
Ordering code: B39941B4401P810

Date: June 13, 2014
Version: 2.3

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SAW Components

SAW Duplexer

Automotive telematics

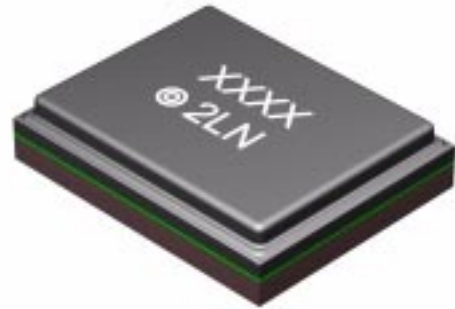
Series/type:	B4401
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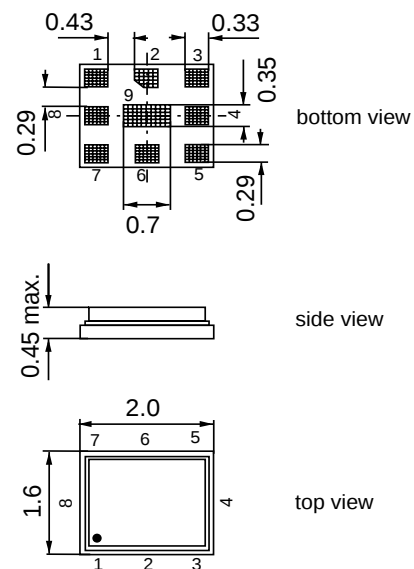
Application

- Low-loss SAW duplexer for W-CDMA Band VIII systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 35 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



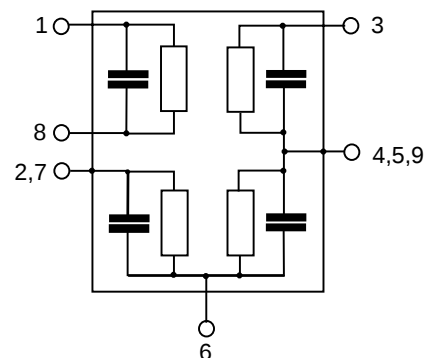
Features

- Package size 2.0 * 1.6 mm²
- Package height max. 0.45mm
- RoHS compatible
- Approximate weight 0.005 g
- Package for **Surface Mount Technology (SMT)**
- Ni terminals, Au-plated
- **Electrostatic Sensitive Device (ESD)**
- AEC-Q200 qualified component family (operable temperature range -40°C to +85°C)



Pin configuration

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



SAW Components
B4401
SAW Duplexer
897.5 / 942.5 MHz
Data sheet

Characteristics

Temperature range for specification:	T = -20 °C to +85 °C
ANT terminating impedance:	Z _{ANT} = 50 Ω 7.8nH
TX terminating impedance:	Z _{TX} = 50 Ω 25nH
RX terminating impedance:	Z _{RX} = 100 Ω 39nH (balanced)

Characteristics Tx - Ant					min.	typ. @ 25 °C	max.	
Center frequency f _C					—	897.5	—	MHz
Maximum insertion attenuation								
@f _{Carrier}	882.4	...	912.6	MHz α _{WCDMA} ¹⁾	—	1.8	2.8	dB
	880.0	...	915.0	MHz	—	2.4	3.9	dB
	880.0	...	915.0	MHz	—	2.4	2.8 ²⁾	dB
Amplitude ripple (p-p)								
@f _{Carrier}	882.4	...	912.6	MHz Δα _{WCDMA} ¹⁾	—	1.0	2.0	dB
	880.0	...	915.0	MHz	—	1.6	3.1	dB
Error Vector Magnitude								
@f _{Carrier}	882.4	...	912.6	MHz EVM ³⁾	—	2.3	6.0	%
@f _{Carrier}	882.4	...	912.6	MHz EVM ³⁾	—	2.3	4.0 ²⁾	%
VSWR								
TX port	880.0	...	915.0	MHz	—	1.8	2.1	
ANT port	880.0	...	915.0	MHz	—	1.7	2.0	
Attenuation α								
	50.0	...	716.0	MHz	30	34	—	dB
	716.0	...	728.0	MHz	30	34	—	dB
	728.0	...	865.0	MHz	30	34	—	dB
	865.0	...	870.0	MHz	10	41	—	dB
@f _{Carrier}	927.4	...	957.6	MHz α _{WCDMA} ¹⁾	38	53	—	dB
@f _{Carrier}	927.4	...	957.6	MHz α _{WCDMA} ¹⁾	45 ⁴⁾	53	—	dB
	1452.0	...	1477.0	MHz	20	42	—	dB
	1565.42	...	1573.374	MHz	40	48	—	dB
	1573.374	...	1577.466	MHz	40	49	—	dB
	1577.466	...	1585.42	MHz	40	49	—	dB
	1597.55	...	1605.89	MHz	40	49	—	dB

1) Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).

2) T = +25 °C

3) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

4) T = +5 °C to +85 °C

SAW Components
B4401
SAW Duplexer
897.5 / 942.5 MHz
Data sheet

Characteristics

Temperature range for specification:	T = -20 °C to +85 °C
ANT terminating impedance:	Z _{ANT} = 50 Ω 7.8nH
TX terminating impedance:	Z _{TX} = 50 Ω 25nH
RX terminating impedance:	Z _{RX} = 100 Ω 39nH (balanced)

Characteristics Tx - Ant				min.	typ. @ 25 °C	max.	
1670.0	...	1675.0	MHz	25	51	—	dB
1760.0	...	1830.0	MHz	38	46	—	dB
1830.0	...	1880.0	MHz	27	45	—	dB
2110.0	...	2170.0	MHz	27	40	—	dB
2400.0	...	2500.0	MHz	30	36	—	dB
2620.0	...	2650.0	MHz	27	31	—	dB
2650.0	...	2745.0	MHz	30	35	—	dB
3520.0	...	3660.0	MHz	20	32	—	dB
4400.0	...	4575.0	MHz	20	32	—	dB
5100.0	...	5490.0	MHz	15	24	—	dB
5490.0	...	5850.0	MHz	10	17	—	dB
Characteristics Tx - Rx				min.	typ. @ 25 °C	max.	
Differential Mode Isolation							
@f _{Carrier}	882.4	...	912.6 MHz α _{WCDMA} ¹⁾	56	60	—	dB
@f _{Carrier}	927.4	...	957.6 MHz α _{WCDMA} ¹⁾	43	57	—	dB
@f _{Carrier}	927.4	...	957.6 MHz α _{WCDMA} ¹⁾	50 ²⁾	57	—	dB
Common Mode Isolation							
@f _{Carrier}	882.4	...	912.6 MHz α _{WCDMA} ¹⁾	55	65	—	dB

¹⁾ Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).

²⁾ T= +5°C to +85°C

SAW Components
B4401
SAW Duplexer
897.5 / 942.5 MHz
Data sheet

Characteristics

Temperature range for specification:	T = -20 °C to +85 °C
ANT terminating impedance:	Z _{ANT} = 50 Ω 7.8nH
TX terminating impedance:	Z _{TX} = 50 Ω 25nH
RX terminating impedance:	Z _{RX} = 100 Ω 39nH (balanced)

Characteristics Rx - Ant					min.	typ. @ 25 °C	max.	
Center frequency f_C					—	942.5	—	MHz
Maximum insertion attenuation								
@f _{Carrier}	927.4	...	957.6	MHz $\alpha_{\text{WCDMA}}^{1)}$	—	1.8	2.5	dB
	925.0	...	960.0	MHz	—	2.4	4.7	dB
	925.0	...	960.0	MHz	—	2.4	3.2 ²⁾	dB
	925.0	...	960.0	MHz	—	2.4	3.7 ³⁾	dB
Amplitude ripple (p-p)								
@f _{Carrier}	927.4	...	957.6	MHz $\Delta\alpha_{\text{WCDMA}}^{1)}$	—	0.6	1.3	dB
	925.0	...	960.0	MHz	—	1.0	3.5	dB
Error Vector Magnitude								
@f _{Carrier}	927.4	...	957.6	MHz EVM ⁴⁾	—	3.3	8.5	%
@f _{Carrier}	927.4	...	957.6	MHz EVM ⁴⁾	—	3.3	4.5 ²⁾	%
VSWR								
RX port	925.0	...	960.0	MHz	—	1.8	2.1	
ANT port	925.0	...	960.0	MHz	—	1.7	2.0	
Common Mode Rejection Ratio α								
	925.0	...	960.0	MHz	23	30		dB
Attenuation α								
	50.0	...	462.0	MHz	35	90	—	dB
	462.0	...	480.0	MHz	45	86	—	dB
	480.0	...	835.0	MHz	38	68	—	dB
	835.0	...	870.0	MHz	49	65	—	dB
	870.0	...	880.0	MHz	38	67	—	dB
@f _{Carrier}	882.4	...	912.6	MHz $\alpha_{\text{WCDMA}}^{1)}$	50	57	—	dB
	980.0	...	1045.0	MHz	16	20	—	dB
	1045.0	...	2400.0	MHz	35	57	—	dB

¹⁾ Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).

²⁾ T= +25°C

³⁾ T= +5°C to +85°C

⁴⁾ Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

SAW Components
B4401
SAW Duplexer
897.5 / 942.5 MHz
Data sheet

Characteristics

Temperature range for specification:	$T = -20\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$
ANT terminating impedance:	$Z_{\text{ANT}} = 50\text{ }\Omega \parallel 7.8\text{ nH}$
TX terminating impedance:	$Z_{\text{TX}} = 50\text{ }\Omega \parallel 25\text{ nH}$
RX terminating impedance:	$Z_{\text{RX}} = 100\text{ }\Omega \parallel 39\text{ nH (balanced)}$

Characteristics Rx - Ant				min.	typ. @ 25 °C	max.	
Center frequency		f_c		—	942.5	—	MHz
Attenuation		α					
	2400.0 ... 2500.0 MHz			45	60	—	dB
	2500.0 ... 4810.0 MHz			35	55	—	dB
	5100.0 ... 5825.0 MHz			35	52	—	dB

SAW Components
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Maximum ratings

Operable temperature range ¹⁾	T	−40/+85	°C	
Storage temperature range	T _{stg}	−40/+85	°C	
DC voltage	V _{DC}	0	V	
Input power at 880.0 ... 915.0 MHz	P _{IN}	30	dBm	} WCDMA signal 55 °C, 10000 h
elsewhere		10	dBm	

¹⁾ Defines the temperature range in which the SAW device keeps its typical characteristics, however the specification values are not guaranteed.

Annotation for characteristics section

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

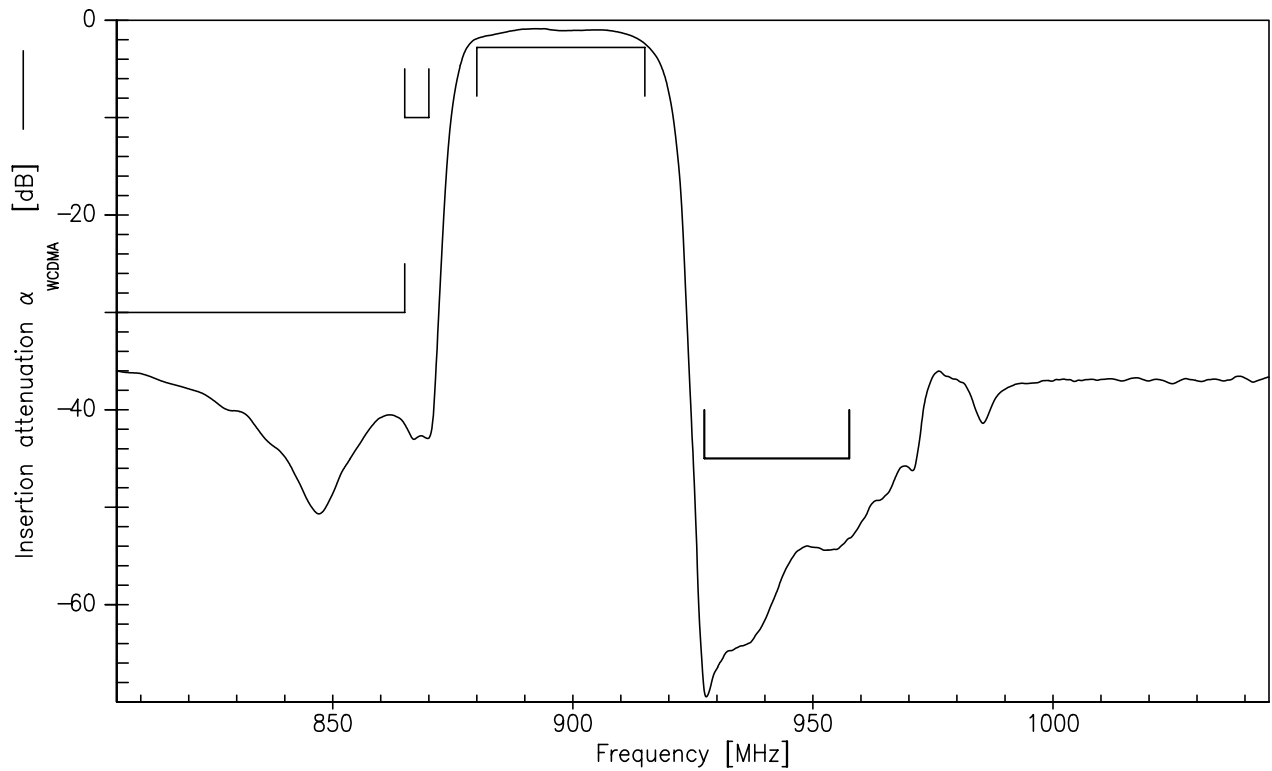
$$\int_{-\infty}^{\infty} |S_{\text{ds21}}(f) H_{\text{RRC}}(f - f_{\text{Carrier}})|^2 df$$

f_{Carrier} according to 3GPP TS 25.101 (e.g. for UMTS-Passband, f_{Carrier} ranges from 2112.4 MHz (lowest Rx channel) to 2167.6 MHz (highest Rx 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:

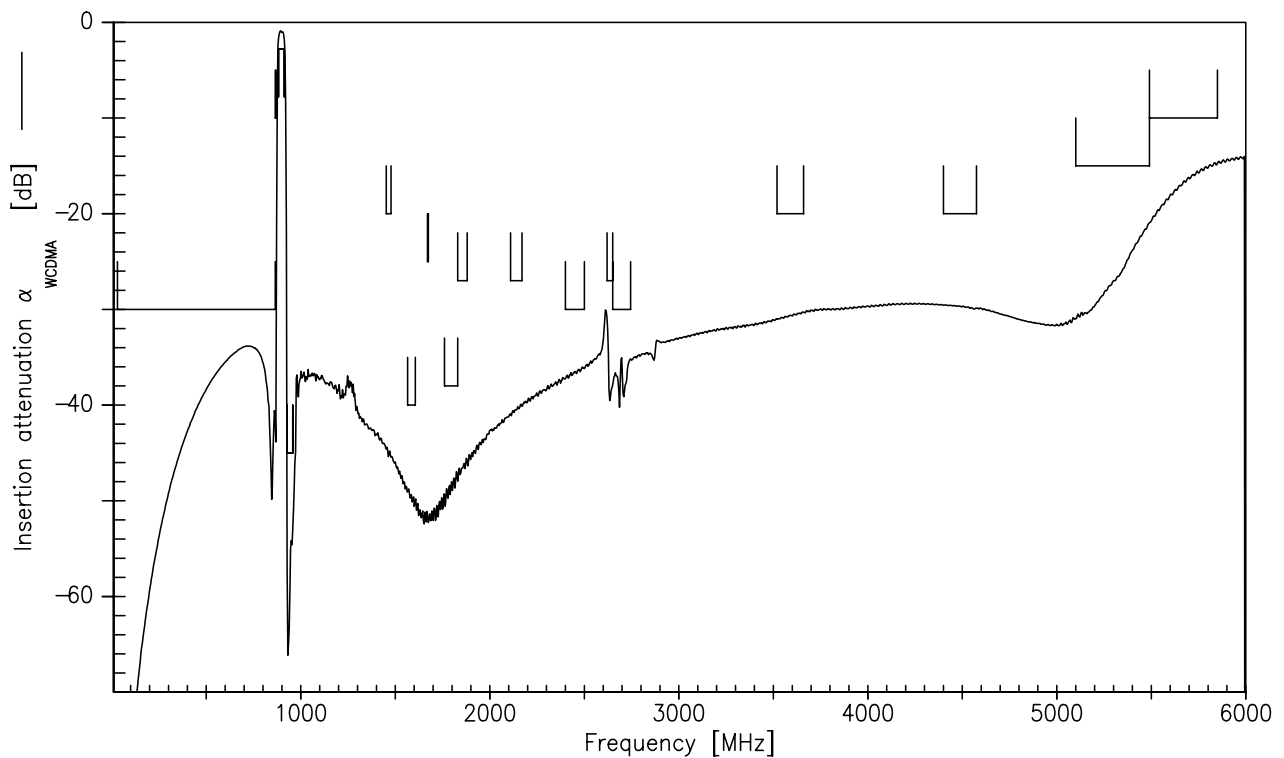
$$\int_{-\infty}^{\infty} |H_{\text{RRC}}(f)|^2 df = 1$$



Frequency Response TX-ANT

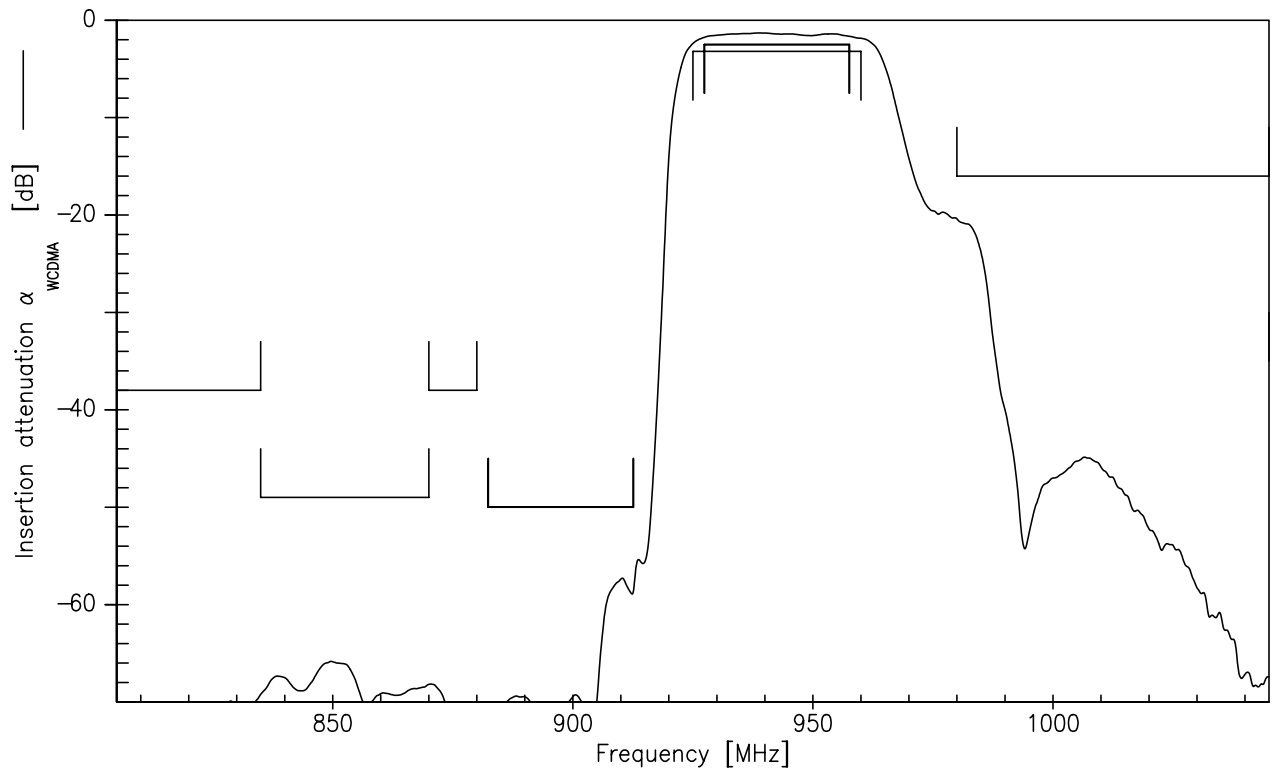


Frequency Response TX-ANT (wideband)

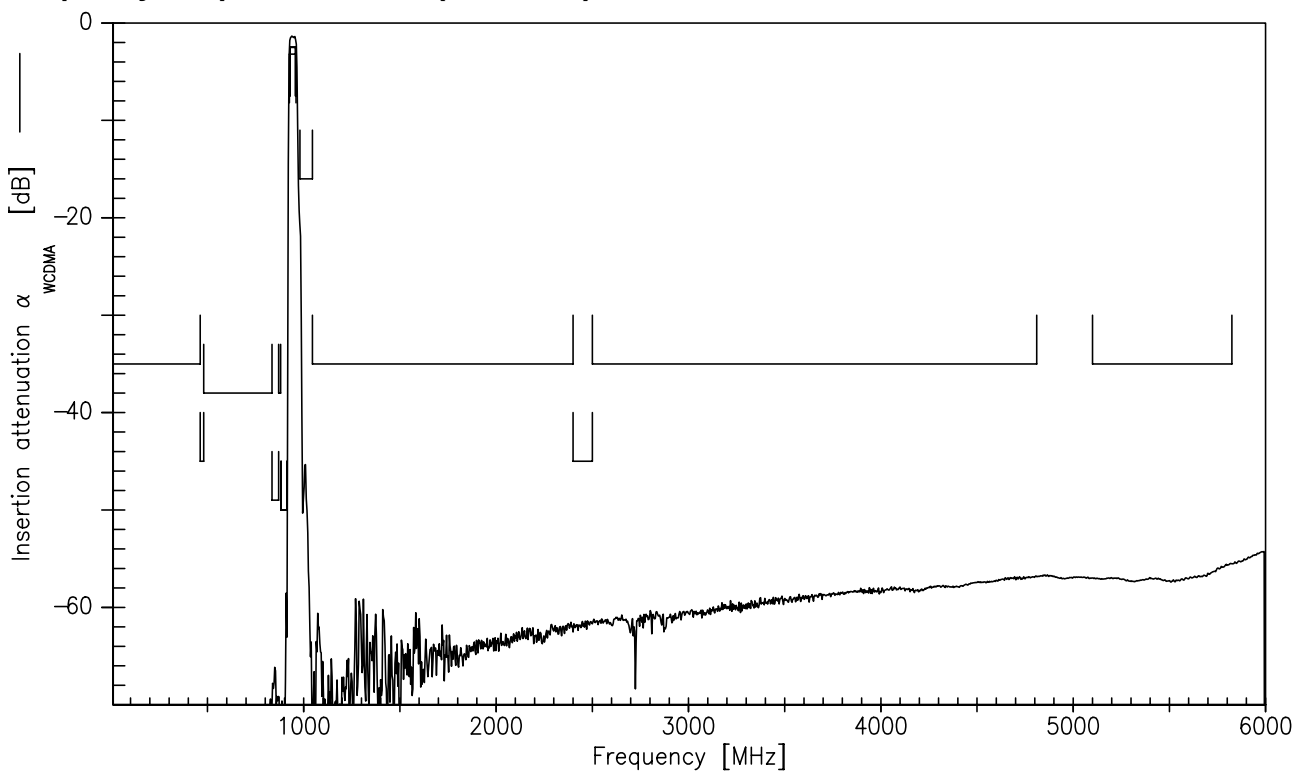


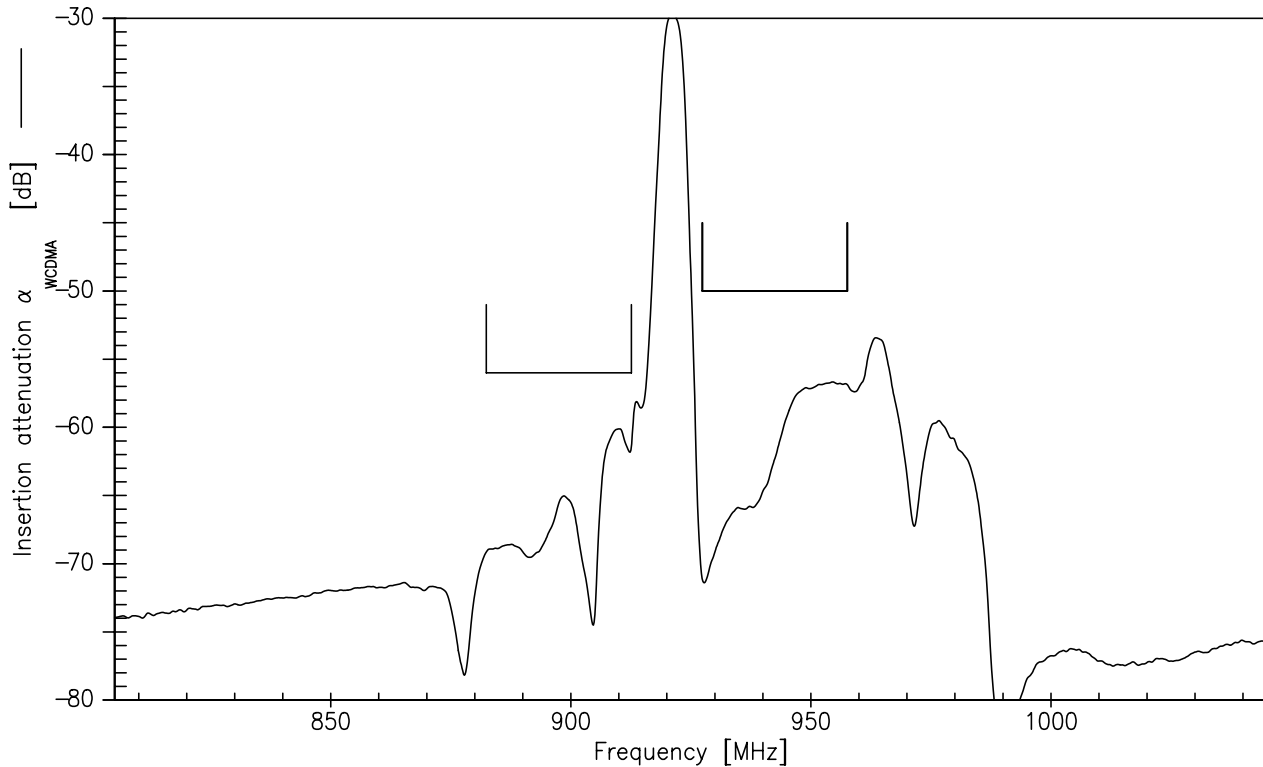
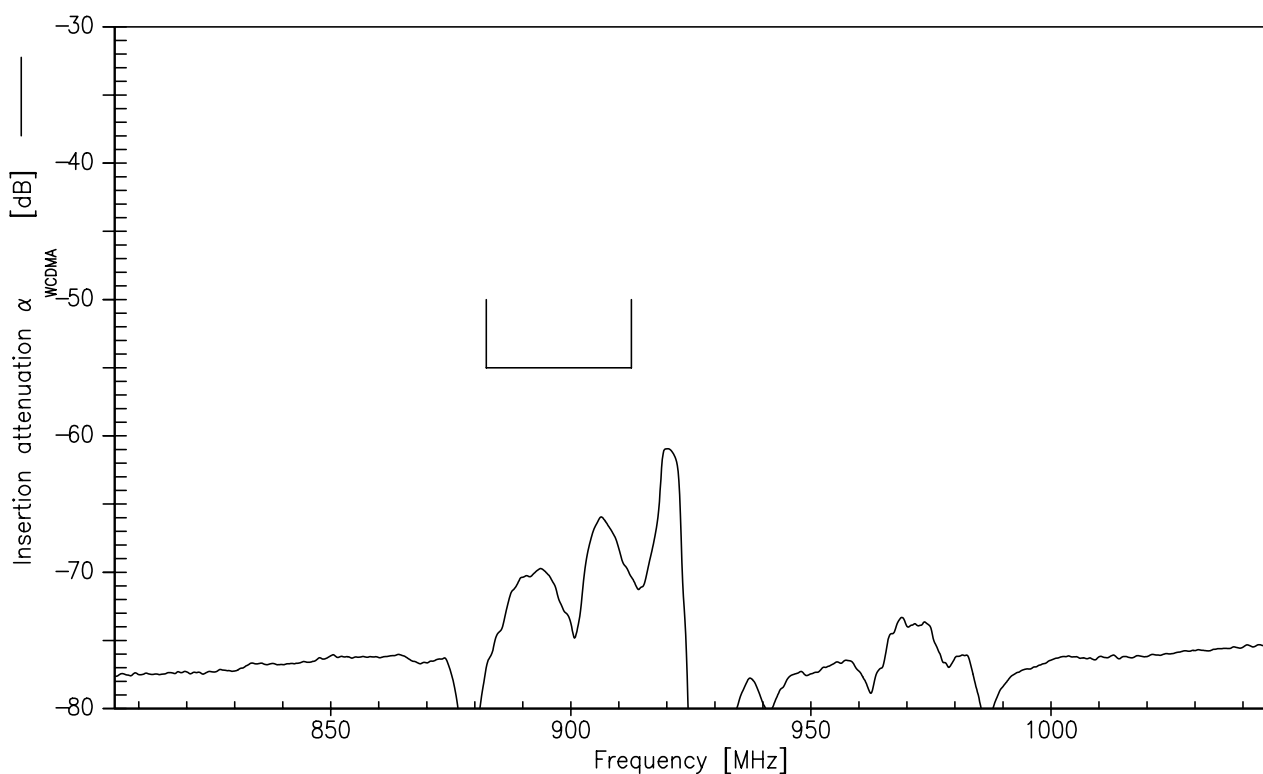


Frequency Response RX-ANT



Frequency Response RX-ANT (wideband)




Frequency Response TX-RX

Frequency Response TX-RX (Common Mode)


SAW Components

B4401

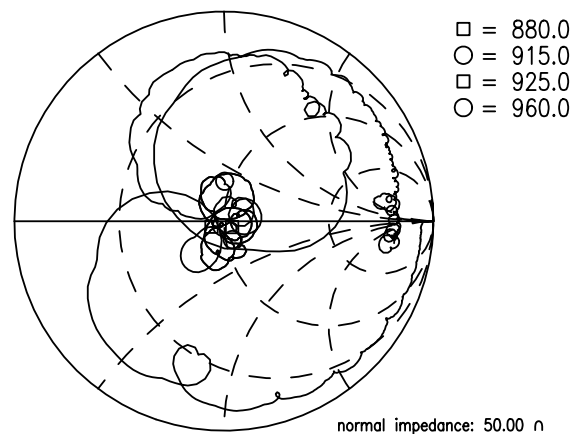
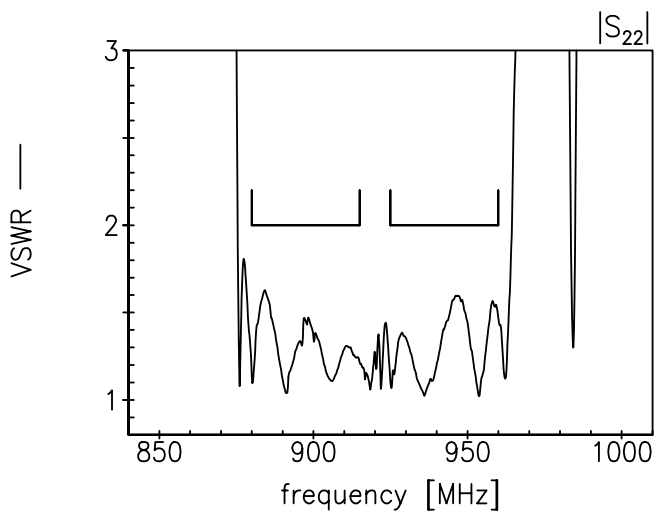
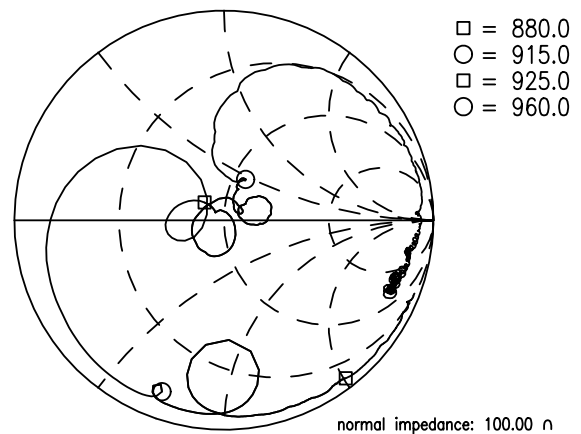
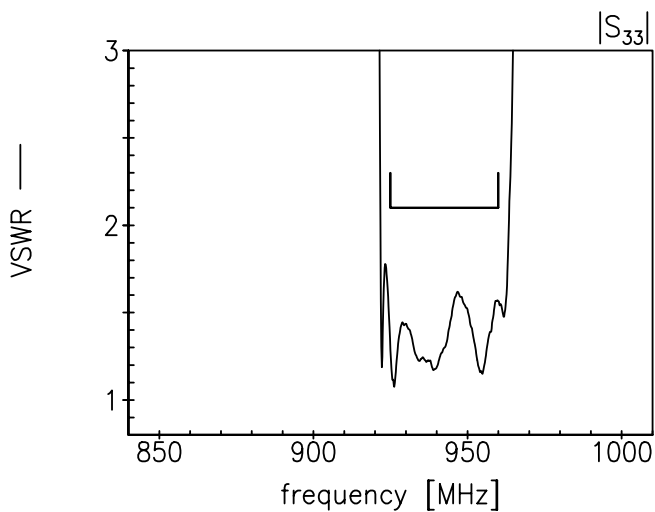
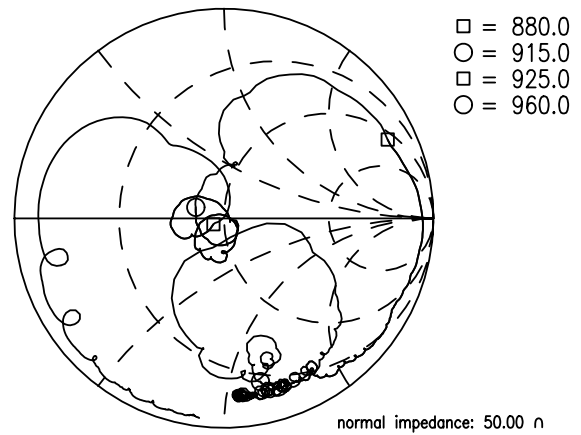
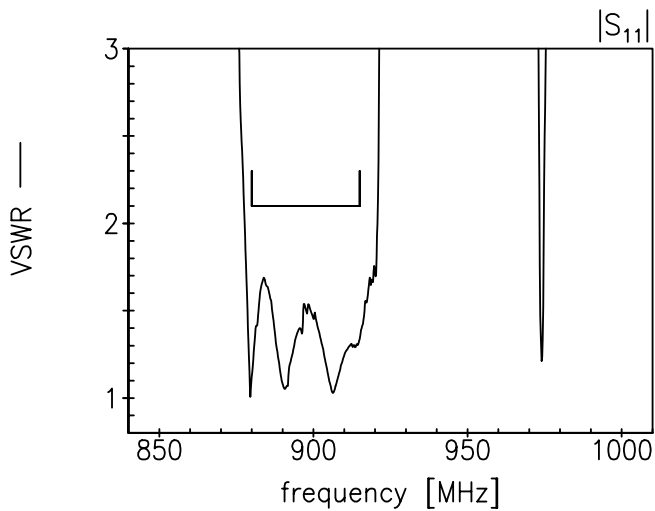
SAW Duplexer

897.5 / 942.5 MHz

Data sheet



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



SAW Components
B4401
SAW Duplexer
897.5 / 942.5 MHz

Data sheet



References

Type	B4401
Ordering code	B39941B4401P810
Marking and package	C61157-A8-A37
Packaging	F61074-V8247-Z000
Date codes	L_1126
S-parameters	B4401_NB_UN.s4p, B4401_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 8 th , 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.
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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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