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## **SAW Duplexer**

Automotive telematics

Series/type: B4400

Ordering code: B39212B4400P810

Date: November 07, 2014

Version: 2.3

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B4400

## **SAW Duplexer**

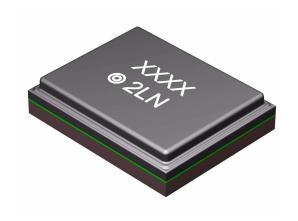
1950.0 / 2140.0 MHz

#### Data sheet



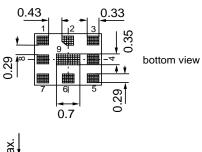
#### **Application**

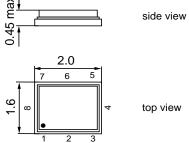
- Low-loss SAW duplexer for W-CDMA Band 1 (UMTS) systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- Single-ended to balanced transformation in Antenna-Rx path
- Impedance transformation 50  $\Omega$  to 100  $\Omega$  in Antenna-Rx path
- High isolation between Tx and Rx



#### **Features**

- Package size 2.0 \* 1.6 mm<sup>2</sup>
- Package height max. 0.45mm
- RoHS compatible
- Approximate weight 0.005 g
- Package for Surface Mount Technology (SMT)
- Ni terminals, Au-plated
- AEC-Q200 qualified component family (operable temperature range -40°C to +85°C)
- Electrostatic Sensitive Device (ESD)





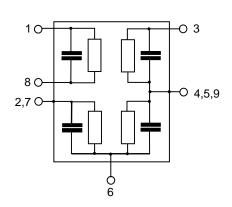
## Pin configuration

■ 3 Tx input

■ 1,8 Rx output (balanced)

■ 6 Antenna

■ 2, 4, 5, 7, 9 To be grounded





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SAW Duplexer

1950.0 / 2140.0 MHz

Data sheet

#### **Characteristics**

Temperature range for specification: T =  $-20\,^{\circ}\text{C}$  to +85  $^{\circ}\text{C}$  TX terminating impedance:  $Z_{\text{Tx}} = 50\,\Omega\,||\,6.0\,\text{nH}$  ANT terminating impedance:  $Z_{\text{Ant}} = 50\,\Omega\,||\,2.2\,\text{nH}$ 

RX teminating impedance:  $Z_{Rx} = 100 \Omega$  (balanced) || 17 nH

SMD

Characteristics Tx-Antenna		min.	typ. @ 25 °C	max.	
Center frequency	f <sub>c</sub>		1950.0		MHz
Maximum insertion attenuation 1922.4 1977.6	$\alpha_{W\text{-CDMA}}{}^{1)}$ MHz	_	1.7	2.3	dB
<b>Amplitude ripple</b> (p-p) 1922.4 1977.6	$\begin{array}{c} \alpha_{W\text{-CDMA}}{}^{1)} \\ \text{MHz} \end{array}$	_	0.5	1.1	dB
Error Vector Magnitude 1922.4 1977.6	EVM <sup>2)</sup> MHz	_	1.4	2.3	%
TX port VSWR  1920.0 1980.0	MHz	_	1.6	2.0	
ANT port VSWR 1920.0 1980.0	MHz	_	1.4	2.0	
Attenuation	α				
10.0 410.0 420.0 494.0 843.0 894.0	MHz MHz MHz	45 43 40	69 64 47	_ _ _	dB dB dB
1565.0 1574.0 1574.0 1577.0 1577.0 1586.0	MHz MHz MHz	41 42 42	45 46 47	_ _ _	dB dB dB
1597.0 1605.0 1605.0 1805.0	MHz MHz	43 34	48 39	_ _	dB dB
1805.0 1865.0 1865.0 1880.0	MHz MHz	30 12	36 33	_ _	dB dB
2112.4 2167.6 2400.0 2500.0 2620.0 2690.0	MHz $\alpha_{W\text{-CDMA}}^{(1)}$ MHz MHz	46 31 30	54 38 36	_ _ _	dB dB dB
3830.0 3970.0 5150.0 5950.0	MHz MHz	28 18	34 22	_ _	dB dB

<sup>1)</sup> Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 7 of this document.

<sup>2)</sup> Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141



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**SAW Duplexer** 1950.0 / 2140.0 MHz

**Data sheet** 

#### **Characteristics**

 $T = -20 \,^{\circ}\text{C} \text{ to } +85 \,^{\circ}\text{C}$ Temperature range for specification: TX terminating impedance:  $Z_{Tx} =$  $50 \Omega \parallel 6.0 \text{ nH}$ ANT terminating impedance:

 $Z_{Ant}^{IA} = 50 \Omega \parallel 2.2 \text{ nH}$   $Z_{Rx} = 100 \Omega \text{ (balanced)} \parallel 17 \text{ nH}$ RX teminating impedance:

Characteristics Antenna-Rx		min.	typ. @ 25 °C	max.	
Center frequency	f <sub>c</sub>		2140.0		MHz
Maximum insertion attenuation	$\alpha_{\text{W-CDMA}}^{1)}$				
2112.4 2167.6		_	2.2	2.4	dB
Amplitude ripple (p-p)	$\alpha_{\text{W-CDMA}}^{1)}$				
2112.4 2167.6	MHz	_	0.4	0.8	dB
Error Vector Magnitude	EVM <sup>2)</sup>				
2112.4 2167.6	MHz	_	1.0	2.0	%
ANT port VSWR					
2110.0 2170.0	MHz		1.8	2.2	
RX port VSWR					
2110.0 2170.0	MHz	_	1.6	2.0	

SMD

<sup>1)</sup> Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 7 of this document.

<sup>2)</sup> Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141



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**SAW Duplexer** 

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#### **Characteristics**

Temperature range for specification:  $T = -20 \,^{\circ}\text{C} \text{ to } +85 \,^{\circ}\text{C}$ TX terminating impedance:  $Z_{Tx} =$  $50 \Omega \parallel 6.0 \text{ nH}$  $Z_{Ant} =$ ANT terminating impedance:  $50 \Omega \parallel 2.2 \text{ nH}$ 

 $Z_{Rx} = 100 \Omega$  (balanced) || 17 nH RX teminating impedance:

Characteristics Antenna-Rx		min.	typ. @ 25 °C	max.	
Attenuation	α				
10.0 1920.0 MH	z	45	53	_	dB
1922.4 1977.6 MH	$z \alpha_{W-CDMA}^{(1)}$	50	55	_	dB
1980.0 2025.0 MH	Z	33	49	_	dB
2255.0 2400.0 MH	z	25	45	_	dB
2400.0 2484.0 MH	z	41	44	_	dB
2484.0 5600.0 MH	z	40	45	_	dB
5600.0 6000.0 MH	z	28	32	_	dB

<sup>1)</sup> Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 7 of this document.



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**SAW Duplexer** 

1950.0 / 2140.0 MHz

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SMD

#### **Characteristics**

Temperature range for specification:  $T = -20 \,^{\circ}\text{C} \text{ to } +85 \,^{\circ}\text{C}$ TX terminating impedance:  $Z_{Tx} =$ 50 Ω || 6.0 nH $Z_{Ant} =$ ANT terminating impedance:  $50 \Omega \parallel 2.2 \text{ nH}$ 

 $Z_{Rx} = 100 \Omega$  (balanced) || 17 nH RX teminating impedance:

Characteristics Tx-Rx	min.	typ. @ 25 °C	max.	
Differential Mode Isolation α				
1574.0 1577.0 MHz	40	79	_	dB
1922.4 1977.6 MHz $\alpha_{W-CDMA}^{1}$	) 52	57	_	dB
2112.4 2167.6 MHz $\alpha_{W-CDMA}^{-1}$		59	_	dB
3830.0 3970.0 MHz	30	61	_	dB
5750.0 5950.0 MHz	30	44	_	dB
Common Mode Isolation $\alpha$				
1922.4 1977.6 MHz $\alpha_{W-CDMA}^{1}$	42	45	_	dB

<sup>1)</sup> Attenuation of W-CDMA signal (Power Transfer Function). Please, refer to page 7 of this document.



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**SAW Duplexer** 

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#### 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 2167.6 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:

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



SAW Components				B4400
SAW Duplexer				1950.0 / 2140.0 MHz
Data sheet				
Maximum Ratings				
Operable temperature range	Т	-40/+85	°C	
Storage temperature range	$T_{stg}$	-40/+85	°C	
DC voltage	$V_{DC}$	0	V	
ESD voltage	$V_{ESD}$	50 <sup>1)</sup>	V	machine model, 10 pulses
Input power at				
1920.0 1980.0 MHz	$P_{in}$	29	dBm	continuous wave
elsewhere	$P_{in}$	10	dBm	50 °C, 5000h

<sup>1)</sup> According to JESD22-A115A (machine model), 10 negative and 10 positive pulses.

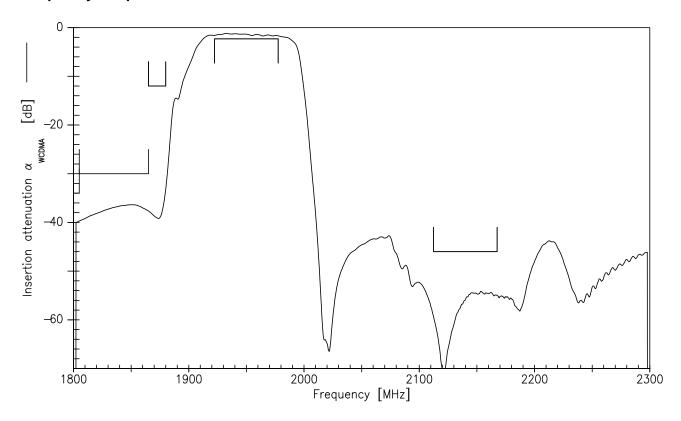


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SAW Duplexer 1950.0 / 2140.0 MHz

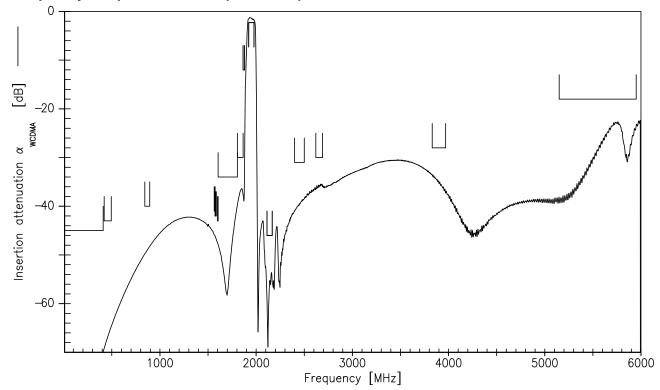
**Data sheet** 



## **Frequency Response TX-ANT**



## Frequency Response TX-ANT (wideband)





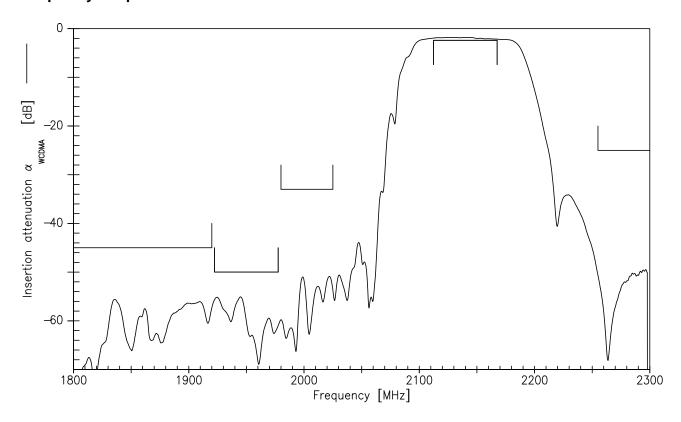
SAW Components

SAW Duplexer

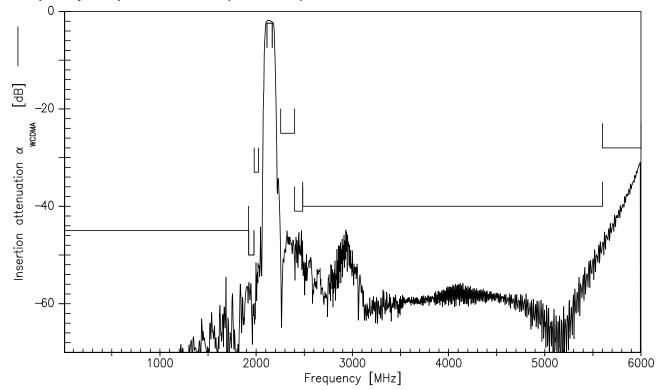
1950.0 / 2140.0 MHz

Data sheet

## Frequency Response RX-ANT



## Frequency Response RX-ANT (wideband)

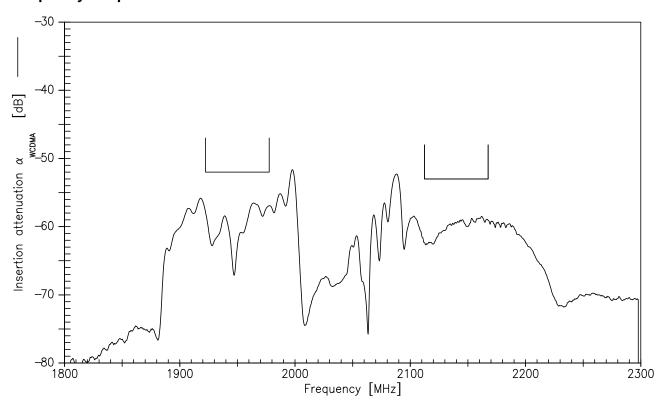




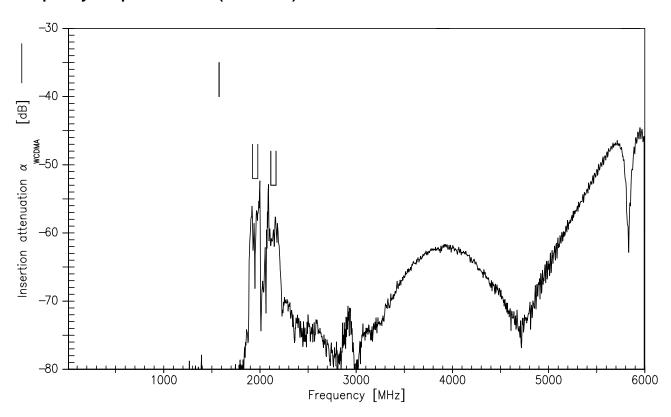
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SAW Duplexer 1950.0 / 2140.0 MHz

Data sheet SMD

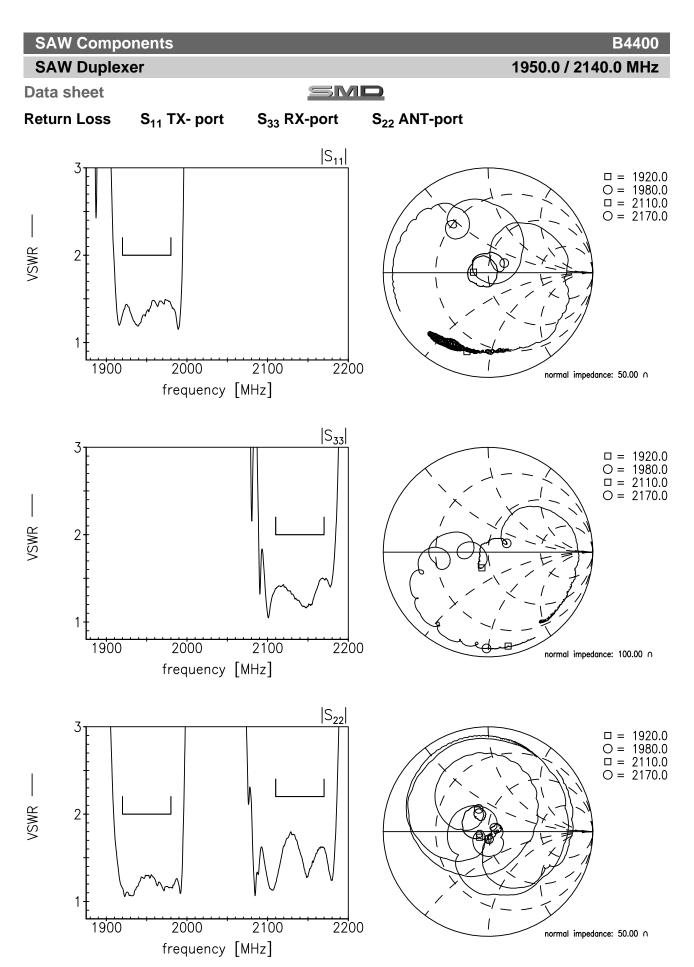
## Frequency Response TX-RX



## Frequency Response TX-RX (wideband)









SAW Components	B4400
SAW Duplexer	1950.0 / 2140.0 MHz

SMD

**Data sheet** 

#### References

Туре	B4400
Ordering code	B39212B4400P810
Marking and package	C61157-A8-A50
Packaging	F61074-V8247-Z000
Date codes	L_1126
S-parameters	B4400_NB_UN.s4p, B4400_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 <sup>th</sup> , 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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SAW Duplexer 1950.0 / 2140.0 MHz

Data sheet



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