SAW Components

BAW/SAW Duplexer
WCDMA Band II (PCS)

Series/type: B7686
Ordering code: B39202B7686L313

Date: June 23, 2008
Version: 2.0
SAW Components

BAW/SAW Duplexer

Application

- Low-loss BAW/SAW duplexer for mobile telephone
  WCDMA Band II (PCS) systems
- Low insertion attenuation
- Low amplitude ripple
- Usable passband 60 MHz
- Single ended to balanced transformation
  in Antenna - Rx path
- Impedance transformation 50Ω to 100Ω
  in Antenna - Rx path

Features

- Package size 3.0 x 2.5 mm², max. height 1.2 mm
- RoHS compatible
- Approx. weight 0.03 g
- Package for Surface Mount Technology (SMT)
- Ni, gold-plated terminals
- Fully matched by integrated matching network
- Electrostatic Sensitive Device (ESD)

Pin configuration

- 3 TX Input
- 1, 8 RX Output (balanced)
- 6 Antenna
- 4, 5, 9 To be grounded
- 2, 7 To be grounded

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

BAW/SAW Duplexer

1880.0 / 1960.0 MHz

Data Sheet

Characteristics

Temperature range for specification: $T = -15 \, ^\circ C \text{ to } +80 \, ^\circ C$

ANT terminating impedance: $Z_{ANT} = 50 \, \Omega$

RX terminating impedance: $Z_{RX} = 100 \, \Omega$ (balanced) || $15 \, nH$

TX terminating impedance: $Z_{TX} = 50 \, \Omega$

Characteristics TX-ANT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>min. @ 25°C</th>
<th>typ. @ 25°C</th>
<th>max. @ 25°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center frequency $f_C$</td>
<td>1880 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum insertion attenuation $\alpha_{WCDMA}$</td>
<td></td>
<td>2.4 dB</td>
<td>3.2 dB</td>
</tr>
<tr>
<td>Amplitude ripple (p-p) $\alpha_{WCDMA}$</td>
<td></td>
<td>0.9 dB</td>
<td>1.6 dB</td>
</tr>
<tr>
<td>Error Vector Magnitude $\alpha_{EVM}$</td>
<td></td>
<td>2.0 %</td>
<td>4.0 %</td>
</tr>
<tr>
<td>Input VSWR (TX port)</td>
<td></td>
<td>1.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Output VSWR (ANT port)</td>
<td></td>
<td>1.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Attenuation $\alpha$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>470.0 ... 750.0 MHz</td>
<td>30 dB</td>
<td>43 dB</td>
<td></td>
</tr>
<tr>
<td>1450.0 ... 1480.0 MHz</td>
<td>30 dB</td>
<td>37 dB</td>
<td></td>
</tr>
<tr>
<td>1570.0 ... 1580.0 MHz</td>
<td>35 dB</td>
<td>41 dB</td>
<td></td>
</tr>
<tr>
<td>1670.0 ... 1675.0 MHz</td>
<td>30 dB</td>
<td>44 dB</td>
<td></td>
</tr>
<tr>
<td>1770.0 ... 1824.0 MHz</td>
<td>20 dB</td>
<td>23 dB</td>
<td></td>
</tr>
<tr>
<td>1824.0 ... 1830.0 MHz</td>
<td>10 dB</td>
<td>23 dB</td>
<td></td>
</tr>
<tr>
<td>$\alpha_{WCDMA}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932.4 ... 1987.6 MHz</td>
<td>45 dB</td>
<td>52 dB</td>
<td></td>
</tr>
<tr>
<td>2400.0 ... 2500.0 MHz</td>
<td>25 dB</td>
<td>31 dB</td>
<td></td>
</tr>
<tr>
<td>3700.0 ... 3820.0 MHz</td>
<td>18 dB</td>
<td>21 dB</td>
<td></td>
</tr>
<tr>
<td>3820.0 ... 5150.0 MHz</td>
<td>10 dB</td>
<td>16 dB</td>
<td></td>
</tr>
<tr>
<td>5150.0 ... 5550.0 MHz</td>
<td>10 dB</td>
<td>14 dB</td>
<td></td>
</tr>
<tr>
<td>5550.0 ... 5730.0 MHz</td>
<td>10 dB</td>
<td>13 dB</td>
<td></td>
</tr>
</tbody>
</table>

1) Attenuation of WCDMA signal (“Powertransferfunction”). Please refer to annotation on page (7).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.
3) Valid only for room temperature 25 °C

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SAW Components

BAW/SAW Duplexer

Data Sheet

Characteristics

Temperature range for specification: \( T = -15 \degree C \text{ to } +80 \degree C \)

ANT terminating impedance: \( Z_{\text{ANT}} = 50 \Omega \)

RX terminating impedance: \( Z_{\text{RX}} = 100 \Omega \) (balanced) || 15nH

TX terminating impedance: \( Z_{\text{TX}} = 50 \Omega \)

### Characteristics ANT-RX

<table>
<thead>
<tr>
<th>Characteristics ANT-RX</th>
<th>min.</th>
<th>typ. @ 25°C</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center frequency ( f_C )</td>
<td>—</td>
<td>1960</td>
<td>— MHz</td>
</tr>
<tr>
<td>Maximum insertion attenuation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( @f_{\text{Carrier}} )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932.4 ... 1987.6 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \alpha_{\text{WCDMA}} )</td>
<td>3.0</td>
<td>3.7 dB</td>
<td></td>
</tr>
<tr>
<td>1930.0 ... 1935.0 MHz</td>
<td>—</td>
<td>3.3</td>
<td>4.6 dB</td>
</tr>
<tr>
<td>1935.0 ... 1990.0 MHz</td>
<td>—</td>
<td>2.9</td>
<td>3.5 dB</td>
</tr>
<tr>
<td>Amplitude ripple (p-p)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( @f_{\text{Carrier}} )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932.4 ... 1987.6 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \alpha_{\text{WCDMA}} )</td>
<td>1.1</td>
<td>2.0 dB</td>
<td></td>
</tr>
<tr>
<td>Error Vector Magnitude</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( @f_{\text{Carrier}} )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932.4 ... 1987.6 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVM</td>
<td>2.0</td>
<td>4.0 %</td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input VSWR (ANT port)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930.0 ... 1990.0 MHz</td>
<td>—</td>
<td>1.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Output VSWR (RX port)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930.0 ... 1990.0 MHz</td>
<td>—</td>
<td>2.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Attenuation ( \alpha )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3 ... 1770.0 MHz</td>
<td>35</td>
<td>57</td>
<td>— dB</td>
</tr>
<tr>
<td>1770.0 ... 1850.0 MHz</td>
<td>38</td>
<td>58</td>
<td>— dB</td>
</tr>
<tr>
<td>( @f_{\text{Carrier}} ) 1852.4 ... 1907.6 MHz</td>
<td>50</td>
<td>54</td>
<td>— dB</td>
</tr>
<tr>
<td>1910.0 ... 1915.0 MHz</td>
<td>9</td>
<td>35</td>
<td>— dB</td>
</tr>
<tr>
<td>2010.0 ... 2070.0 MHz</td>
<td>5</td>
<td>8</td>
<td>— dB</td>
</tr>
<tr>
<td>2070.0 ... 2500.0 MHz</td>
<td>30</td>
<td>55</td>
<td>— dB</td>
</tr>
<tr>
<td>2500.0 ... 3780.0 MHz</td>
<td>35</td>
<td>58</td>
<td>— dB</td>
</tr>
<tr>
<td>3780.0 ... 3980.0 MHz</td>
<td>35</td>
<td>57</td>
<td>— dB</td>
</tr>
<tr>
<td>3980.0 ... 6000.0 MHz</td>
<td>35</td>
<td>52</td>
<td>— dB</td>
</tr>
</tbody>
</table>

1) Attenuation of WCDMA signal ("Powertransferfunction"). Please refer to annotation on page (7).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.
3) Valid for reduced temperature range 0 °C to 80 °C

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1880.0 / 1960.0 MHz

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Characteristics

Temperature range for specification: \( T = -15 \, ^\circ C \to +80 \, ^\circ C \)

ANT terminating impedance: \( Z_{ANT} = 50 \Omega \)

RX terminating impedance: \( Z_{RX} = 100 \Omega \) (balanced) \| 15nH

TX terminating impedance: \( Z_{TX} = 50 \Omega \)

<table>
<thead>
<tr>
<th>Characteristics ANI-RX</th>
<th>min.</th>
<th>typ. @ 25°C</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common mode suppression</td>
<td>( S_{CS21} )</td>
<td>1930.0 ... 1990.0 MHz</td>
<td>23</td>
</tr>
</tbody>
</table>

IMD Product Level Limits¹)

at \( f_{TX}=1880MHz, f_{RX}=1960MHz \)

<table>
<thead>
<tr>
<th>Blocker</th>
<th>Frequency</th>
<th>IMD Product Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80.0 MHz</td>
<td>-117 dBm</td>
</tr>
<tr>
<td>2</td>
<td>1800.0 MHz</td>
<td>-101 dBm</td>
</tr>
<tr>
<td>3</td>
<td>3840.0 MHz</td>
<td>-87 dBm</td>
</tr>
</tbody>
</table>

¹) IMD product level limits for power levels \( P_{TX}=21\text{dBm} \) (antenna port output power) and \( P_{Blocker}=-15\text{dBm} \) (antenna port input power)

<table>
<thead>
<tr>
<th>Characteristics TX-RX</th>
<th>min.</th>
<th>typ. @ 25°C</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation</td>
<td>( \alpha )</td>
<td>( \alpha_{WCDMA} )^¹</td>
<td>53</td>
</tr>
</tbody>
</table>

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

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Maximum ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification 1)</th>
<th>Specification 2)</th>
<th>Temperature range for specification 1)</th>
<th>Operable temperature range 2)</th>
<th>DC voltage</th>
<th>ESD voltage</th>
<th>Input power at</th>
<th>Source and load impedance 50 Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>T</td>
<td>T</td>
<td>−15/+80 °C</td>
<td>−25/+85 °C</td>
<td>3 V</td>
<td>50 V</td>
<td>30 dBm</td>
<td>10 negative &amp; 10 positive pulses</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T_stg</td>
<td></td>
<td>−40/+85 °C</td>
<td></td>
<td></td>
<td></td>
<td>10 dBm</td>
<td></td>
</tr>
<tr>
<td>DC voltage</td>
<td>V_DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD voltage</td>
<td>V_ESD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input power at</td>
<td>P_IN</td>
<td>1850.0 ... 1910.0 MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>else where</td>
<td></td>
<td>30 dBm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Defines the temperature range in which the specification values are warranted.

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

3) acc. to JESD22-A115A (machine model), 10 negative & 10 positive pulses.

Annotation for characteristics section

Attenuation of WCDMA signal ("Powertransferfunction", \(\alpha_{\text{WCDMA}}\)) is determined by

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

\(f_{\text{Carrier}}\) according to 3GPP TS 25.101 (e.g. for UMTS-Passband, \(f_{\text{Carrier}}\) ranges from 882.4 MHz (lowest Tx channel) to 912.6 MHz (highest Tx 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:

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

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1880.0 / 1960.0 MHz  
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Frequency Response TX-ANT (PTF)

Frequency Response TX-ANT (wideband)

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Frequency Response ANT-RX (PTF)

Frequency Response ANT-RX (wideband)

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Frequency Response TX-RX (PTF)

Frequency Response RX-ANT Common Mode Suppression

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BAW/SAW Duplexer

B7686

1880.0 / 1960.0 MHz

Data Sheet

References

<table>
<thead>
<tr>
<th>Type</th>
<th>B7686</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering code</td>
<td>B39202B7686L313</td>
</tr>
<tr>
<td>Marking and package</td>
<td>C61157-A3-A40</td>
</tr>
<tr>
<td>Packaging</td>
<td>F61074-V8211-Z000</td>
</tr>
<tr>
<td>Date codes</td>
<td>L_1126</td>
</tr>
</tbody>
</table>
| S-parameters  | B7686_NB_UN.s4p
                B7686_WB_UN.s4p
                See file header for pin/port assignment. |
| Soldering profile | S_6001 |

RoHS compatible defined as compatible with the following documents:

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

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