SAW Components

SAW Tx filter

Automotive Telematics

Series/type: B4331
Ordering code: B39172B4331P810
Date: December 18, 2013
Version: 2.0
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SAW Components B4331

SAW Tx filter 1747.5 MHz

Data sheet

Application

- Low-loss filter for WCDMA Band III, Transmit path (Tx)
- Low amplitude ripple
- Usable passband 75MHz

Features

- Package size 1.4 x 1.1 x 0.4 mm³
- Package code QCS5P
- RoHS compatible
- Approximate weight 0.003 g
- Package for Surface Mount Technology (SMT)
- Ni, gold-plated terminals
- AEC-Q200 qualified component family (operable temperature range -40°C to +85°C)
- Electrostatic Sensitive Device (ESD)

Pin configuration

- 1  Input
- 4  Output
- 2,3,5  To be grounded

Please read cautions and warnings and important notes at the end of this document.
### Characteristics

Temperature range for specification: \( T = -30 \, ^\circ\text{C} \) to \(+85 \, ^\circ\text{C}\)

Terminating source impedance: \( Z_S = 50 \, \Omega + 3.0 \, \text{nH}\)

Terminating load impedance: \( Z_L = 50 \, \Omega + 3.0 \, \text{nH}\)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>min.</th>
<th>typ. @ 25 °C</th>
<th>max.</th>
<th>MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center frequency ( f_C )</td>
<td>—</td>
<td>1747.5</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Maximum insertion attenuation ( \alpha_{\text{max}} ) 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1710.0 ... 1785.0 MHz</td>
<td>—</td>
<td>2.6</td>
<td>3.8</td>
<td>dB</td>
</tr>
<tr>
<td>1712.4 ... 1782.6 MHz</td>
<td>—</td>
<td>2.4</td>
<td>3.3</td>
<td>dB</td>
</tr>
<tr>
<td>Maximum Amplitude ripple (p-p) ( \Delta \alpha ) 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1710.0 ... 1785.0 MHz</td>
<td>—</td>
<td>1.9</td>
<td>3.1</td>
<td>dB</td>
</tr>
<tr>
<td>1712.4 ... 1782.6 MHz</td>
<td>—</td>
<td>1.7</td>
<td>2.6</td>
<td>dB</td>
</tr>
<tr>
<td>VSWR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1710.0 ... 1785.0 MHz</td>
<td>—</td>
<td>1.9</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Attenuation ( \alpha )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.0 ... 1574.0 MHz</td>
<td>18</td>
<td>22</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>1574.0 ... 1577.0 MHz</td>
<td>28</td>
<td>33</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>1577.0 ... 1690.0 MHz</td>
<td>26</td>
<td>30</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>1805.0 ... 1880.0 MHz</td>
<td>8</td>
<td>30</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>1920.0 ... 1980.0 MHz</td>
<td>24</td>
<td>28</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>2110.0 ... 2170.0 MHz</td>
<td>24</td>
<td>30</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>2400.0 ... 2500.0 MHz</td>
<td>25</td>
<td>32</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>3420.0 ... 3570.0 MHz</td>
<td>24</td>
<td>32</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>5130.0 ... 5355.0 MHz</td>
<td>21</td>
<td>30</td>
<td>—</td>
<td>dB</td>
</tr>
</tbody>
</table>

1\) Attenuation of WCDMA signal (“Powertransferfuntion”). Please refer to annotation on the next page.

2\) Ripple determined within any 5 MHz channel.
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**SAW Tx filter**

1747.5 MHz

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**Annotation for characteristics section**

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

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

$f_{\text{Carrier}}$ according to 3GPP TS 25.101 (e.g. for Passband, $f_{\text{Carrier}}$ ranges from 1712.4 MHz (lowest Tx channel) to 1782.6 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:

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

**Maximum ratings**

<table>
<thead>
<tr>
<th>Operable temperature range</th>
<th>$T$</th>
<th>$-40/+85$ °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature range</td>
<td>$T_{stg}$</td>
<td>$-40/+85$ °C</td>
</tr>
<tr>
<td>DC voltage</td>
<td>$V_{DC}$</td>
<td>0 V</td>
</tr>
<tr>
<td>Input Power</td>
<td>$P_{IN}$</td>
<td>15 dBm cw signal</td>
</tr>
</tbody>
</table>
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SAW Tx filter

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Transfer function

Please read cautions and warnings and important notes at the end of this document.
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SAW Tx filter
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Data sheet
Smith chart

$S_{11}$ function

$S_{22}$ function
ESD protection of SAW filters

SAW filters are Electro Static Discharge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied. In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 3rd order to ensure a proper matching for any impedance value of antenna and SAW filter input. The required component values have to be determined from case to case.

**Fig. 1 MLC varistor plus ESD matching**

**Fig. 2 Suppressor diode plus ESD matching**

In cases where minor ESD occur, following simplified “ESD matching” topologies can be used alternatively.

**Fig. 3 3rd order high-pass structure for basic ESD protection**

In all three figures the shunt inductor Lp2 could be replaced by a shorted microstrip with proper length and width. If this configuration is possible depends on the operating frequency and available pcb space.

Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements.

For further information, please refer to EPCOS Application report: “ESD protection for SAW filters”. This report can be found under [www.epcos.com](http://www.epcos.com), Click on “Applications Notes”.

Please read cautions and warnings and important notes at the end of this document.
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<table>
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<th>B4331</th>
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</table>

### SAW Tx filter

**1747.5 MHz**

Data sheet

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### References

**Type**

| B4331 |

**Ordering code**

| B39172B4331P810 |

**Marking and package**

| C61157-A8-A9 |

**Packaging**

| F61074-V8237-Z000 |

**Date codes**

| L_1126 |

**S-parameters**

| B4331_NB.s2p, B4331_WB.s2p  
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](http://www.tdk.co.jp/tefe02/coil.htm#aname1)

and Data Library for circuit simulation

[http://www.tdk.co.jp/etvcl/index.htm](http://www.tdk.co.jp/etvcl/index.htm)

for a large variety of matching coils.

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For further information please contact your local EPCOS sales office or visit our webpage at [www.epcos.com](http://www.epcos.com).

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