



RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

## SAW Components

### SAW RF filter

Satellite radio

|                |                   |
|----------------|-------------------|
| Series/type:   | B1647             |
| Ordering code: | B39152B1647U510   |
| Date:          | December 20, 2012 |
| Version:       | 2.2               |

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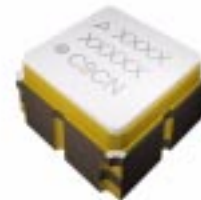
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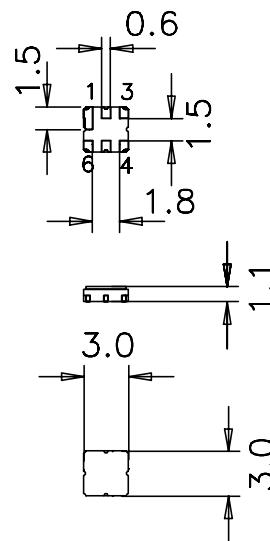
Data sheet


**Application**

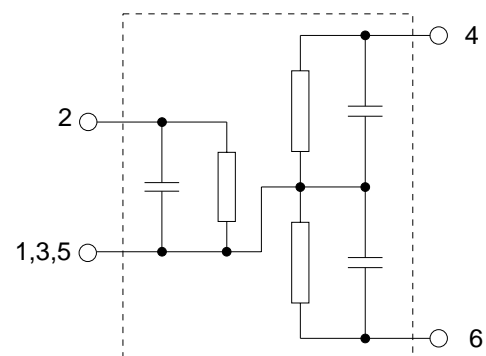
- Low-loss RF filter for satellite radio
- Impedance transformation from 50 Ω to 100 Ω
- Unbalanced to balanced operation
- Usable passband 40 MHz


**Features**

- Package size 3.0 x 3.0 x 1.1 mm<sup>3</sup>
- Package code DCC6D
- Maximum package height of 1.225 mm
- RoHS compatible
- Approximate weight 0.037 g
- Package for **Surface Mount Technology (SMT)**
- Ni, gold-plated terminals
- Lead free soldering compatible with J - STD20C
- AEC-Q200 qualified component family (operable temperature range -40°C to +85°C)
- **Electrostatic Sensitive Device (ESD)**


**Pin configuration**

- 2 Input, unbalanced
- 4,6 Output, balanced
- 1,3,5 To be grounded



Data sheet


**Characteristics**

Temperature range for specification:  $T = -40\text{ °C to }+85\text{ °C}$   
 Terminating source impedance:  $Z_S = 50\ \Omega$   
 Terminating load impedance:  $Z_L = 100\ \Omega$  (balanced)

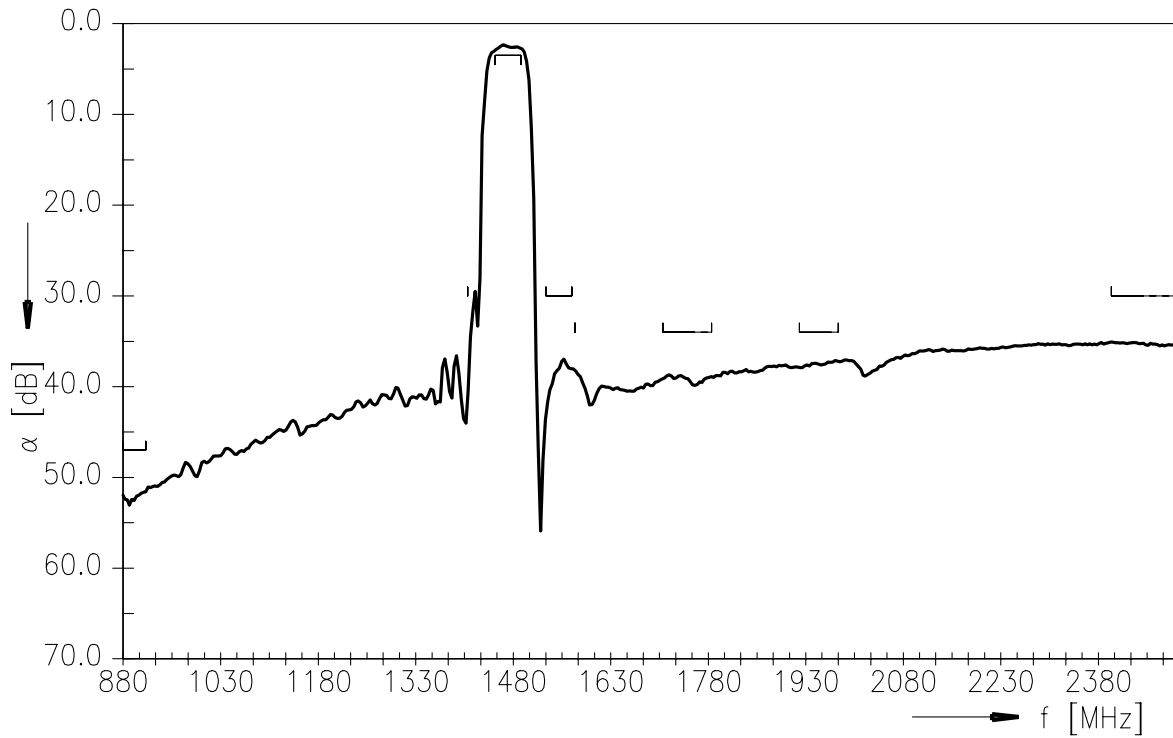
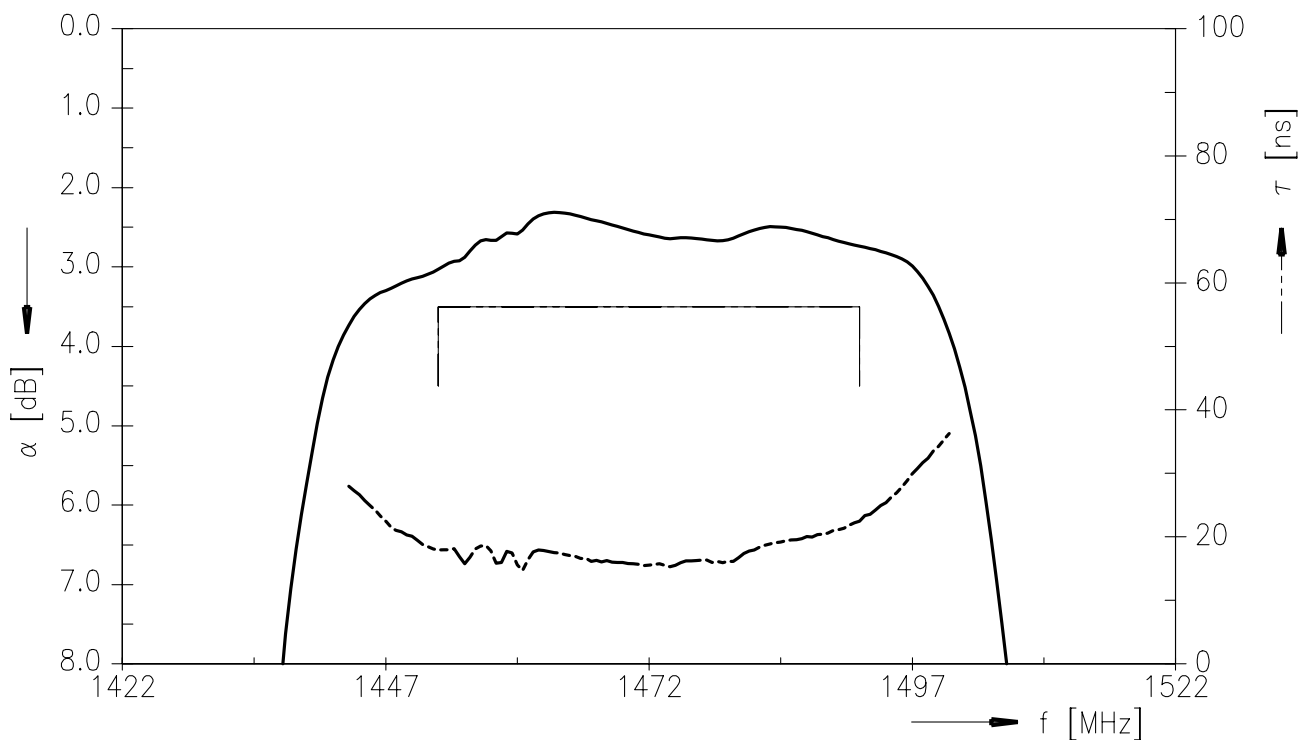
|                                      |                 | min. | typ.<br>@ 25 °C | max.             |     |
|--------------------------------------|-----------------|------|-----------------|------------------|-----|
| <b>Nominal frequency</b>             | $f_N$           | —    | 1472.00         | —                | MHz |
| <b>Maximum insertion attenuation</b> | $\alpha_{\max}$ |      |                 |                  |     |
| 1452.0 ... 1492.0 MHz                |                 | —    | 3.0             | 3.5              | dB  |
| <b>Amplitude ripple (p-p)</b>        | $\Delta\alpha$  |      |                 |                  |     |
| 1452.0 ... 1492.0 MHz                |                 | —    | 0.7             | 1.8              | dB  |
| <b>Input return loss</b>             |                 | 10   | 13              | —                | dB  |
| <b>Output return loss</b>            |                 | 9    | 12              | —                | dB  |
| <b>Attenuation</b>                   | $\alpha$        |      |                 |                  |     |
| 880.0 ... 915.0 MHz                  |                 | 47   | 51              | —                | dB  |
| 1410.0 MHz                           |                 | 30   | 38              | —                | dB  |
| 1530.0 ... 1570.0 MHz                |                 | 30   | 36              | —                | dB  |
| 1575.0 MHz                           |                 | 34   | 38              | —                | dB  |
| 1710.0 ... 1785.0 MHz                |                 | 34   | 38              | —                | dB  |
| 1920.0 ... 1980.0 MHz                |                 | 34   | 38              | —                | dB  |
| 2400.0 ... 2500.0 MHz                |                 | 30   | 34              | —                | dB  |
| <b>Group delay ripple (p-p)</b>      |                 |      |                 |                  |     |
| 1452.0 ... 1492.0 MHz                |                 | —    | 12              | 30 <sup>1)</sup> | ns  |

1) 25ns for reduced temperature range -10°C to +70 °C


**Maximum ratings**

|                                         |                  |          |     |                        |
|-----------------------------------------|------------------|----------|-----|------------------------|
| Operable temperature range              | T                | -40/+125 | °C  |                        |
| Storage temperature range               | T <sub>stg</sub> | -40/+125 | °C  |                        |
| DC voltage                              | V <sub>DC</sub>  | 6        | V   |                        |
| ESD voltage                             | V <sub>ESD</sub> | 50       | V   | machine model, 1 pulse |
| Input power at<br>1452 MHz ... 1492 MHz | P <sub>IN</sub>  | 0        | dBm | source impedance 50 Ω  |

Data sheet


**Transfer function (wideband)**

**Transfer function (narrowband)**




### ESD protection of SAW filters

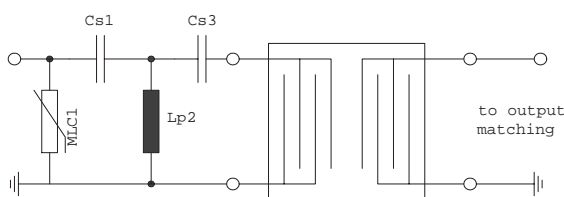
SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

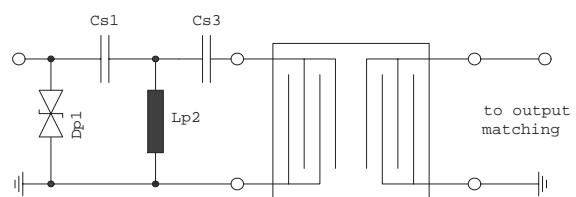
Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 3<sup>rd</sup> 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 3<sup>rd</sup> 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/rke](http://www.epcos.com/rke). Click on “Applications Notes”.




**References**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type</b>                | B1647                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Ordering code</b>       | B39152B1647U510                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Marking and package</b> | C61157-A7-A68                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Packaging</b>           | F61074-V8168-Z000                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Date codes</b>          | L_1126                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>S-parameters</b>        | B1647_NB.s3p<br>B1647_WB.s3p<br>See file header for port/pin assignment table.                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Soldering profile</b>   | S_6001                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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