



## **SAW Components**

### **SAW GPS + GLONASS filter**

|                       |                          |
|-----------------------|--------------------------|
| <b>Series/type:</b>   | <b>B8401</b>             |
| <b>Ordering code:</b> | <b>B39162-B8401-P810</b> |
| <b>Date:</b>          | <b>December 23, 2010</b> |
| <b>Version:</b>       | <b>2.0</b>               |



**SAW Components**

**B8401**

**SAW GPS + GLONASS filter**

**1588.655 MHz**

**Preliminary Data**



**Revision history: Changes compared to previous iteration issue**

| ISSUE      | ORIGINATOR   | DETAIL SPEC CHANGES   | DATE       |
|------------|--------------|---|------------|
| LU46A_v1.0 | M. Schmachtl | initial release   | 29.05.2009 |
| LU46B_v1.1 | M. Schmachtl | initial release of LU46B, only typical values   | 14.10.2009 |
| LU46B_v1.2 | M. Schmachtl | limits defined  | 30.10.2009 |
| LU46B_v1.3 | M. Schmachtl | package height and ESD values defined, attenuation @ 5825-8976 MHz and linearities IIP2, IIP3 added   | 30.11.2009 |
| LU46B_v1.4 | M. Schmachtl | CDM ESD values and IIP2&IIP3 limits added   | 22.12.2009 |
| LU46B_v1.5 | M. Schmachtl | introduction of new frequency ranges 1625-1660 MHz and 1660-1710 MHz, relaxation of attenuation @ 776-824 MHz from 47 dB to 46 dB and @ 915-1427 MHz from 45 dB to 44 dB  | 25.02.2010 |
| B8401_v2.0 | M. Schmachtl | improvement of insertion attenuation @1573.42-1577.42 MHz from 1.5dB to 1.4dB max. and from 1.1dB to 0.9dB typ., @1571.42 - 1605.89 MHz from 1.3dB to 1.0dB typ., relaxation of amplitude ripple @1573.42-1577.42 MHz from 0.6dB to 0.7dB max. and @1571.42 - 1605.89 MHz from 0.8dB to 1.0dB max., relaxation of attenuation @ 1625-1660 MHz from 1.5dB to 1.0dB | 23.12.2010 |



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#### Preliminary Data



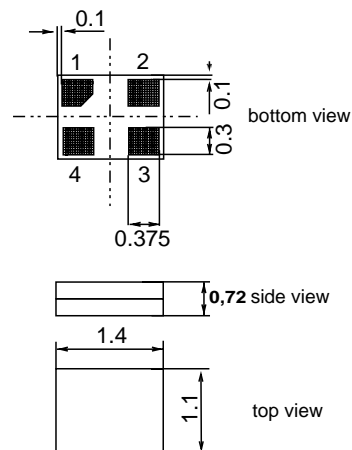
#### Application

- ESD robust low-loss RF GPS + GLONASS filter with ESD protection at the Input
- Usable passbands: up to 8.0 MHz for GPS and 8.34 MHz for GLONASS
- Very low insertion attenuation
- Unbalanced to unbalanced operation
- No matching network required for operation at 50  $\Omega$



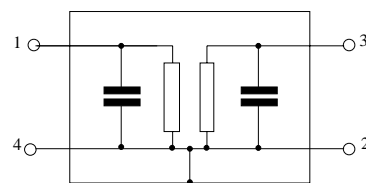
#### Features

- Package size 1.4 x 1.1 x 0.72 mm<sup>3</sup>
- Package code DCS4R
- RoHS compatible
- Approximate weight 0.003 g
- Package for **Surface Mount Technology (SMT)**
- Ni, gold-plated terminals
- **Electrostatic Sensitive Device (ESD)**



#### Pin configuration

- 1 Input
- 3 Output
- 2,4 Case ground



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



|                                 |                     |
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**Preliminary Data**



**Characteristics of Filter**

Temperature range for specification: T = -30 °C to +85 °C  
 Terminating source impedance: Z<sub>S</sub> = 50 Ω  
 Terminating load impedance: Z<sub>L</sub> = 50 Ω

|  |                  | LU46C <sup>1)</sup> |                 |      | DGL <sup>2)</sup> |     |
|--|------------------|---------------------|-----------------|------|-------------------|-----|
|  |                  | min.                | typ.<br>@ 25 °C | max. | min./<br>max.     |     |
| <b>Center frequency</b>                                  | f <sub>C</sub>   | —                   | 1588.65         |      |                   | MHz |
| <b>Maximum insertion attenuation</b>                     | α <sub>max</sub> |                     |                 |      |                   |     |
| 1573.42 ... 1577.42 MHz                                  |                  | —                   | 0.9             | 1.4  |                   | dB  |
| 1571.42 ... 1605.89 MHz                                  |                  | —                   | 1.0             | 1.7  |                   | dB  |
| <b>Amplitude ripple (p-p)</b>                            | Δα               |                     |                 |      |                   |     |
| 1573.42 ... 1577.42 MHz                                  |                  | —                   | 0.2             | 0.7  |                   | dB  |
| 1571.42 ... 1605.89 MHz                                  |                  | —                   | 0.3             | 1.0  |                   | dB  |
| <b>VSWR Input</b>  |                  |                     |                 |      |                   |     |
| 1573.42 ... 1577.42 MHz                                  |                  | —                   | 1.4             | 1.8  |                   |     |
| 1597.55 ... 1605.89 MHz                                  |                  | —                   | 1.3             | 1.8  |                   |     |
| <b>VSWR Output</b>                                       |                  |                     |                 |      |                   |     |
| 1573.42 ... 1577.42 MHz                                  |                  | —                   | 1.4             | 1.8  |                   |     |
| 1597.55 ... 1605.89 MHz                                  |                  | —                   | 1.2             | 1.8  |                   |     |
| <b>Group delay ripple<sup>3)</sup> (p-p)</b>             | Δτ               |                     |                 |      |                   |     |
| 1573.42 ... 1577.42 MHz                                  |                  | —                   | 2               | 8    |                   | ns  |
| 1597.55 ... 1605.89 MHz                                  |                  | —                   | 3               | 8    |                   | ns  |
| Deviation within GLONASS band relative to L1 1575.42 MHz |                  | -9                  | -3              | 9    |                   | ns  |
| <b>Attenuation</b>                                       | α                |                     |                 |      |                   |     |
| 0.1 ... 698.0 MHz  |                  | 40                  | 51              | —    |                   | dB  |
| 698.0 ... 716.0 MHz                                      |                  | 40                  | 51              | —    |                   | dB  |
| 716.0 ... 776.0 MHz                                      |                  | 45                  | 50              | —    |                   | dB  |
| 776.0 ... 787.0 MHz                                      |                  | 46                  | 50              | —    |                   | dB  |
| 787.0 ... 824.0 MHz                                      |                  | 46                  | 50              | —    |                   | dB  |
| 824.0 ... 849.0 MHz                                      |                  | 45                  | 49              | —    |                   | dB  |
| 849.0 ... 880.0 MHz                                      |                  | 45                  | 49              | —    |                   | dB  |
| 880.0 ... 915.0 MHz                                      |                  | 45                  | 49              | —    |                   | dB  |
| 915.0 ... 1427.0 MHz                                     |                  | 44                  | 48              | —    |                   | dB  |
| 1427.0 ... 1452.0 MHz                                    |                  | 42                  | 47              | —    |                   | dB  |
| 1452.0 ... 1525.0 MHz                                    |                  | 30                  | 38              | —    |                   | dB  |
| 1625.0 ... 1660.0 MHz                                    |                  | 1.0                 | 2.7             | —    |                   | dB  |
| 1660.0 ... 1710.0 MHz                                    |                  | 30                  | 44              | —    |                   | dB  |

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Preliminary Data



|  | LU46C <sup>1)</sup> |                 |      | DGL <sup>2)</sup> |     |
|--|---------------------|-----------------|------|-------------------|-----|
|  | min.                | typ.<br>@ 25 °C | max. | min./<br>max.     |     |
| 1710.0 ... 1785.0 MHz                                    | 47                  | 51              | —    |                   | dB  |
| 1785.0 ... 1850.0 MHz                                    | 45                  | 57              | —    |                   | dB  |
| 1850.0 ... 1920.0 MHz                                    | 45                  | 56              | —    |                   | dB  |
| 1920.0 ... 1980.0 MHz                                    | 45                  | 55              | —    |                   | dB  |
| 1980.0 ... 2010.0 MHz                                    | 40                  | 54              | —    |                   | dB  |
| 2010.0 ... 2025.0 MHz                                    | 40                  | 53              | —    |                   | dB  |
| 2025.0 ... 2305.0 MHz                                    | 40                  | 48              | —    |                   | dB  |
| 2305.0 ... 2360.0 MHz                                    | 40                  | 48              | —    |                   | dB  |
| 2360.0 ... 2402.0 MHz                                    | 40                  | 47              | —    |                   | dB  |
| 2402.0 ... 2480.0 MHz                                    | 40                  | 46              | —    |                   | dB  |
| 2480.0 ... 2496.0 MHz                                    | 40                  | 46              | —    |                   | dB  |
| 2496.0 ... 2570.0 MHz                                    | 40                  | 45              | —    |                   | dB  |
| 2570.0 ... 2690.0 MHz                                    | 30                  | 44              | —    |                   | dB  |
| 2690.0 ... 3168.0 MHz                                    | 30                  | 42              | —    |                   | dB  |
| 3168.0 ... 4224.0 MHz                                    | 15                  | 31              | —    |                   | dB  |
| 4224.0 ... 4752.0 MHz                                    | 10                  | 15              | —    |                   | dB  |
| 4752.0 ... 4900.0 MHz                                    | 10                  | 18              | —    |                   | dB  |
| 4900.0 ... 5825.0 MHz                                    | 5                   | 9               | —    |                   | dB  |
| 5825.0 ... 6336.0 MHz                                    | 5 <sup>4)</sup>     | 11              | —    |                   | dB  |
| 6336.0 ... 8976.0 MHz                                    | 7 <sup>4)</sup>     | 12              | —    |                   | dB  |
| <b>IIP2 (2<sup>nd</sup> order Input Intercept Point)</b> |                     |                 |      |                   |     |
| 2 tone (cw) method:                                      |                     |                 |      |                   |     |
| P1 @ 10 ... 14dBm @ F1=824MHz..915MHz                    |                     |                 |      |                   |     |
| P2 @ -4 ... 0dBm @ F2=F1+1575.42MHz                      | 100 <sup>4)</sup>   | 116             | —    |                   | dBm |
| P1 @ 10 ... 14dBm @ F1=824MHz..915MHz                    |                     |                 |      |                   |     |
| P2 @ 6dBm @ F2=F1+1575.42MHz                             | 100 <sup>4)</sup>   | 116             | —    |                   | dBm |
| <b>IIP3 (3<sup>rd</sup> order Input Intercept Point)</b> |                     |                 |      |                   |     |
| 2 tone (cw) method:                                      |                     |                 |      |                   |     |
| P1 @ 10dBm @ F1=1710MHz..1980MHz                         |                     |                 |      |                   |     |
| P2 @ 5dBm @ F2=2*F1+1575.42MHz                           | 105 <sup>4)</sup>   | 120             | —    |                   | dBm |
| P1 @ 14dBm @ F1=1710MHz..1980MHz                         |                     |                 |      |                   |     |
| P2 @ 5dBm @ F2=2*F1+1575.42MHz                           | 105 <sup>4)</sup>   | 120             | —    |                   | dBm |

1) Values in columns min, typ and max indicate the development status of the current version.

2) Values in column DesignGoal (DGL) indicate the target performance.

3) Averaged over 1 MHz

4) Measurement under mass-production conditions not possible.



|                                 |                     |
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**Preliminary Data**

**Maximum ratings of Filter**

|                            |                  |                      |    |                                   |
|----------------------------|------------------|----------------------|----|-----------------------------------|
| Operable temperature range | T                | -30/+85              | °C |                                   |
| Storage temperature range  | T <sub>stg</sub> | -40/+85              | °C |                                   |
| DC voltage                 | V <sub>DC</sub>  | 5                    | V  |                                   |
| ESD voltage @ Input        |                  |                      |    |                                   |
| Contact Discharge          | V <sub>ESD</sub> | ± 8 <sup>1)</sup>    | kV | at input pin 1                    |
| Air Discharge              | V <sub>ESD</sub> | ± 15 <sup>2)</sup>   | kV | at input pin 1                    |
| Machine Model              | V <sub>ESD</sub> | ± 1000 <sup>3)</sup> | V  | at input pin 1                    |
| Machine Model              | V <sub>ESD</sub> | ± 100 <sup>3)</sup>  | V  | at output pin 3                   |
| Charge Device Model        | V <sub>ESD</sub> | ± 750 <sup>4)</sup>  | V  | at input and output (pin 1 and 3) |
| Human Body Model           | V <sub>ESD</sub> | ± 1000 <sup>5)</sup> | V  | at input pin 1                    |
| Human Body Model           | V <sub>ESD</sub> | ± 400 <sup>5)</sup>  | V  | at output pin 3                   |

1) acc. to IEC61000-4-2 (Contact discharge, R<sub>s</sub> = 330 R, C<sub>s</sub> = 150 pF), 10 negative & 10 positive pulses

2) acc. to IEC61000-4-2 (Air discharge, R<sub>s</sub> = 330 R, C<sub>s</sub> = 150 pF), 10 negative & 10 positive pulses.

3) acc. to JESD22-A115A (machine model, R<sub>s</sub> = 0 R, C<sub>s</sub> = 200 pF), 1 negative & 1 positive pulse.

4) acc. to JESD22-C101 (charge device model), 3 negative & 3 positive pulses.

5) acc. to JESD22-A114 (Human body model, R<sub>s</sub> = 1500 R, C<sub>s</sub> = 100 pF), 1 negative & 1 positive pulse.



SAW Components

B8401

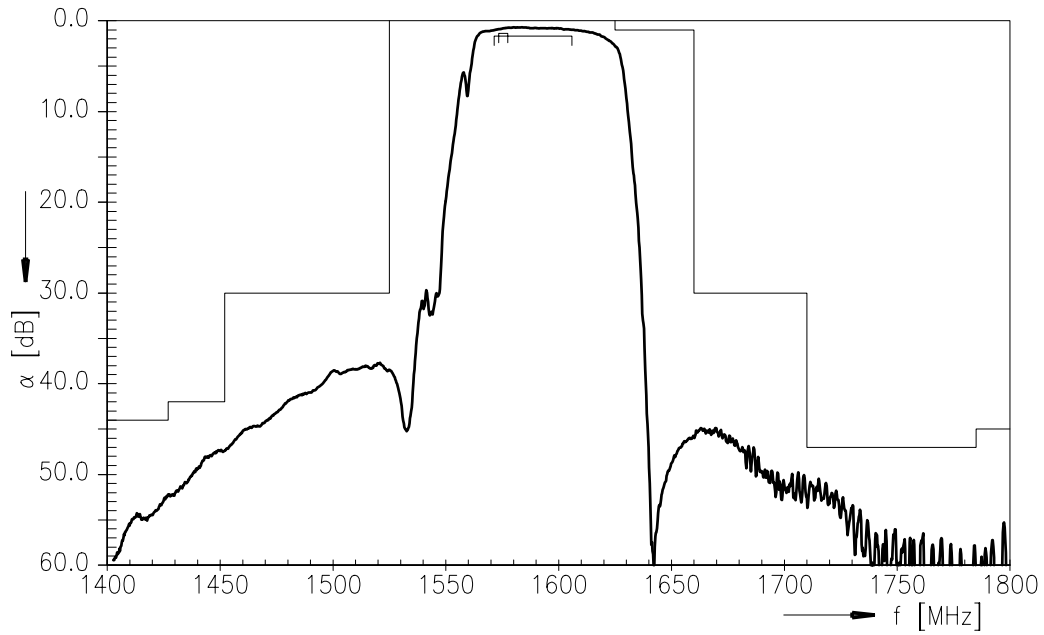
SAW GPS + GLONASS filter

1588.655 MHz

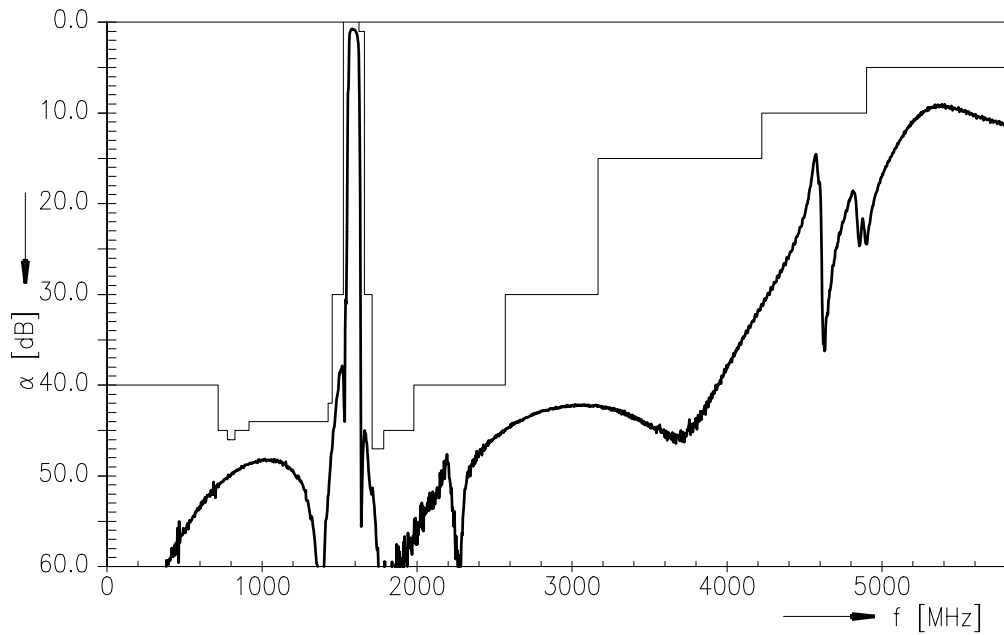
Preliminary Data



Transfer function (passband)



Transfer function



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B8401

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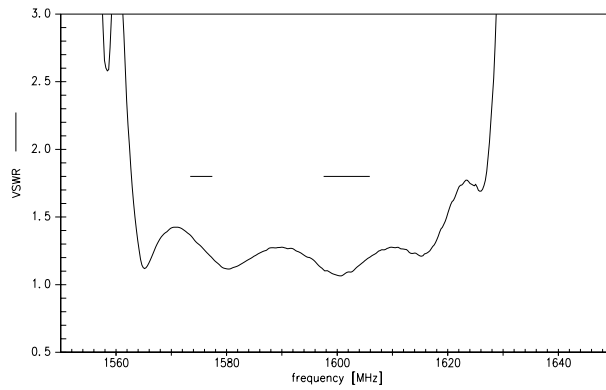
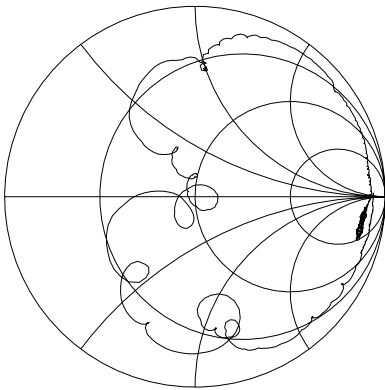
1588.655 MHz

Preliminary Data

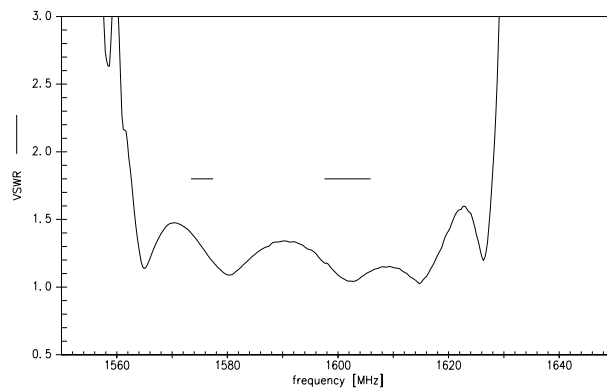
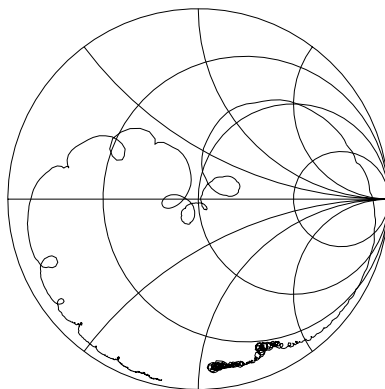


Smith chart / VSWR

$S_{11}$  function



$S_{22}$  function



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|                            |  |
|----------------------------|--|
| <b>Type</b>                | B8401  |
| <b>Ordering code</b>       | B39162-B8401-P810  |
| <b>Marking and package</b> | C61157-A8-A31  |
| <b>Packaging</b>           | F61074-V8249-Z000  |
| <b>Date codes</b>          | L_1126   |
| <b>S-parameters</b>        | B8401_NB.s3p, B8401_WB.s3p<br>see file header for port/pin assignment table  |
| <b>Soldering profile</b>   | S_6001   |
| <b>RoHS compatible</b>     | defined as compatible with the following documents:<br>"DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. 2005/618/EC from April 18th, 2005, amending Directive 2002/95/EC of the European Parliament and of the Council for the purposes of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment." |
| <b>Moldability</b>         | Before using in overmolding environment, please contact your EPCOS sales office.   |
| <b>Matching coils</b>      | See Inductor pdf-catalog<br><a href="http://www.tdk.co.jp/tefe02/coil.htm#aname1">http://www.tdk.co.jp/tefe02/coil.htm#aname1</a><br>and Data Library for circuit simulation<br><a href="http://www.tdk.co.jp/etvcl/index.htm">http://www.tdk.co.jp/etvcl/index.htm</a>  |

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**Published by EPCOS AG**  
**Surface Acoustic Wave Components Division**  
**P.O. Box 80 17 09, 81617 Munich, GERMANY**

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