# SAW Components

## SAW Rx 2in1 input diplex filter

GSM1900 / GSM1800

| | |
|---|---|
| **Series/type:** | **B9513** |
| **Ordering code:** | **B39202B9513L310** |
| Date: | May 27, 2010 |
| Version: | 2.0 |

## SAW Rx 2in1 input diplex filter 1960.0 / 1842.5 MHz

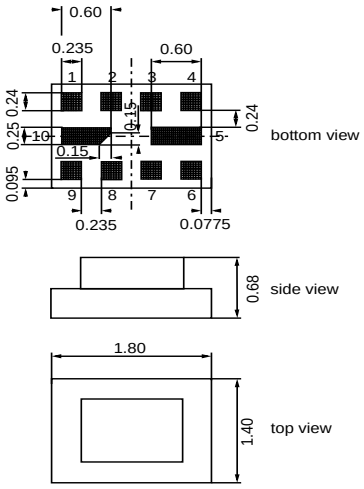
**Data sheet** SMD

### Application

- Low-loss 2in1 RF filter for mobile telephone GSM1900 and GSM1800 systems, receive path (Rx)
- Usable passband:
  Filter 1 (GSM1900): 60 MHz
  Filter 2 (GSM1800): 75 MHz
- Unbalanced to balanced operation for both filters
- Impedance transformation from 50 Ω to 150 Ω for both filters
- Low amplitude ripple
- Suitable for GPRS class 1 to 12

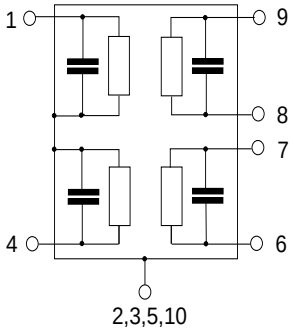

### Features

- Package size 1.8 x 1.4 x 0.68 mm³
- Moisture Sensitive Level 3
- RoHS compatible
- Approx. weight 0.006g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- **RoHS compatible**
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)




### Pin configuration

| | | |
|---|---|---|
| ■ | 1 | Input [Diplex] |
| ■ | 8,9 | Output balanced [Filter 1] |
| ■ | 6,7 | Output balanced [Filter 2] |
| ■ | 2,3,4,5,10 | Case-ground |



**Characteristics of Filter 1 (GSM1900)**

Temperature range for specification: $T$ = -30 ˚C to +85 ˚C
Terminating source impedance: $Z_S$ = 50 Ω || 3.3nH
Terminating load impedance: $Z_L$ = 150 Ω || 18nH (balanced)

| | | min. | typ. @ 25 ˚C | max. | |
|---|---|---|---|---|---|
| **Center frequency** | $f_C$ | — | 1960.0 | — | MHz |
| **Maximum insertion attenuation** | $\alpha_{max}$ | | | | |
| 1930.0 ... 1990.0 MHz | | — | 2.2 | 3.0 | dB |
| **Amplitude ripple** (p-p) | $\Delta\alpha$ | | | | |
| 1930.0 ... 1990.0 MHz | | — | 0.9 | 1.8 | dB |
| **Input VSWR** | | | | | |
| 1930.0 ... 1990.0 MHz | | — | 1.5 | 2.0 | |
| **Output VSWR** | | | | | |
| 1930.0 ... 1990.0 MHz | | — | 1.6 | 2.1 | |
| **CMRR** ($\lvert S_{21}-S_{31}\rvert/\lvert S_{21}+S_{31}\rvert$) | | | | | |
| 1930.0 ... 1990.0 MHz | | 22[1)] | 29 | — | dB |
| **Attenuation** | $\alpha$ | | | | |
| 10.0 ... 1510.0 MHz | | 40 | 53 | — | dB |
| 1510.0 ... 1830.0 MHz | | 30 | 35 | — | dB |
| 1830.0 ... 1850.0 MHz | | 23 | 33 | — | dB |
| 1850.0 ... 1890.0 MHz | | 18 | 30 | — | dB |
| 1890.0 ... 1910.0 MHz | | 9 | 14 | — | dB |
| 2010.0 ... 2070.0 MHz | | 4 | 12 | — | dB |
| 2070.0 ... 2400.0 MHz | | 21 | 33 | — | dB |
| 2400.0 ... 6000.0 MHz | | 30 | 43 | — | dB |

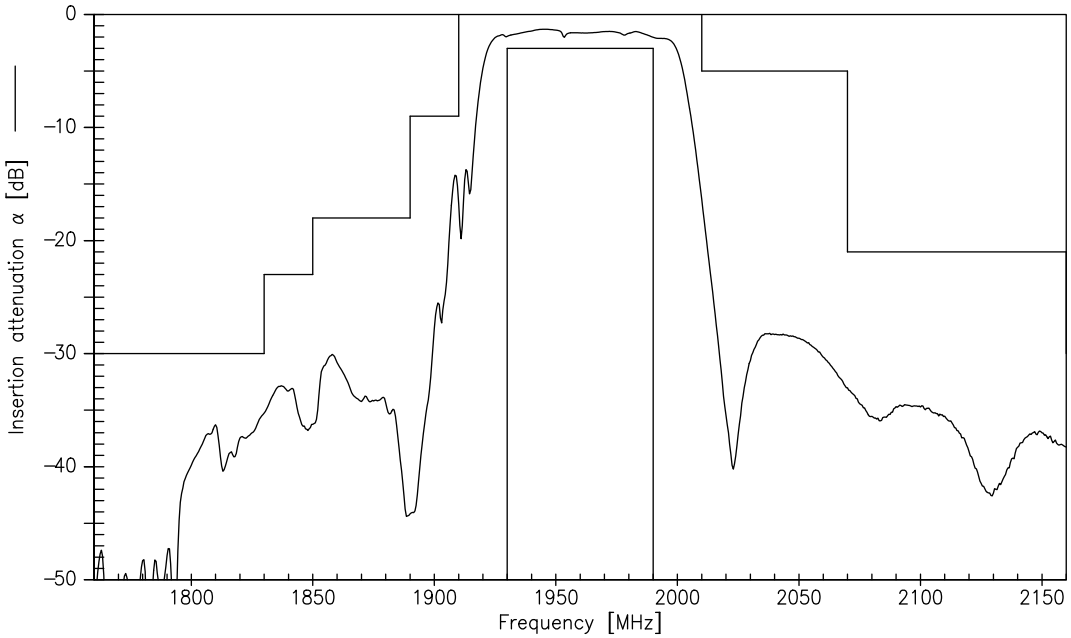
1) A CMRR of 21.9dB corresponds to a phase balance of 7˚ together with an amplitude balance of 0.9dB

**Maximum ratings of Filter 1**

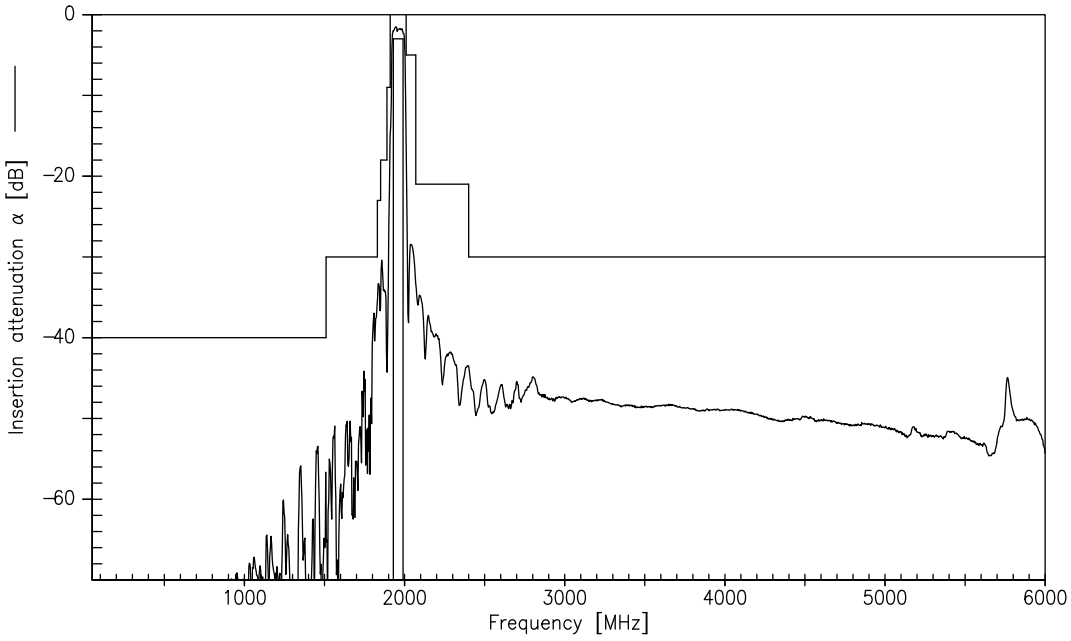
| | | | | |
|---|---|---|---|---|
| Operable temperature range | T | –40/+85 | ˚C | |
| Storage temperature range | $T_{stg}$ | –40/+85 | ˚C | |
| DC voltage | $V_{DC}$ | 5 | V | |
| ESD voltage | $V_{ESD}$ | 50[1)] | V | machine model, 1 pulse |
| Input Power at | | | | |
| GSM 850, GSM 900 | $P_{IN}$ | 15 | dBm | effective power in the on-state, |
| GSM 1800, GSM 1900 | $P_{IN}$ | 15 | dBm | duty cycle 4:8 |
| Tx bands | | | | |

1) acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.

**Transfer function Filter 1 (GSM1900)**

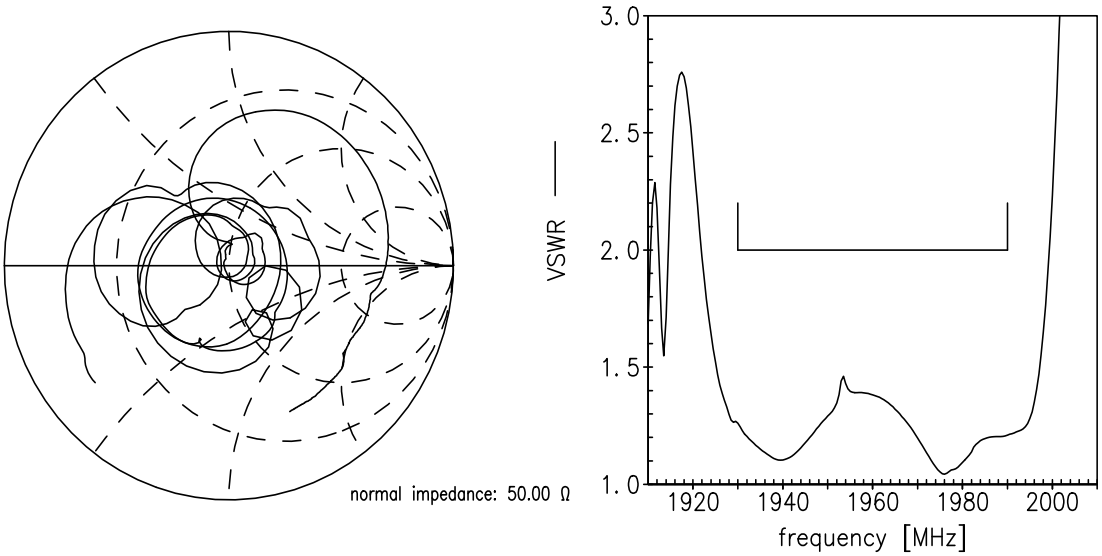



**Transfer function Filter 1 (GSM1900)** - Wideband

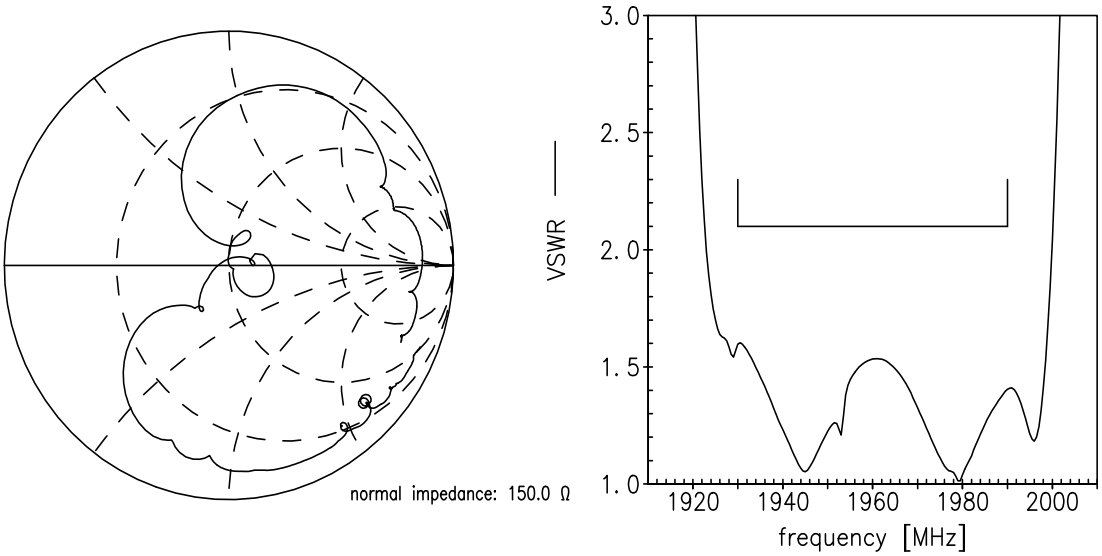


**Smith charts Filter 1 (GSM1900)**

**$S_{11}$ function**




**$S_{22}$ function**



**Characteristics of Filter 2 (GSM1800)**

Temperature range for specification: $T$ = -30 ˚C to +85 ˚C
Terminating source impedance: $Z_S$ = 50 Ω || 3.3nH
Terminating load impedance: $Z_L$ = 150 Ω || 15nH (balanced)

| | | min. | typ. @ 25 ˚C | max. | |
|---|---|---|---|---|---|
| **Center frequency** | $f_C$ | — | 1842.5 | — | MHz |
| **Maximum insertion attenuation** | $\alpha_{max}$ | | | | |
| 1805.0 ... 1880.0 MHz | | — | 2.2 | 2.8 | dB |
| **Amplitude ripple** (p-p) | $\Delta\alpha$ | | | | |
| 1805.0 ... 1880.0 MHz | | — | 1.0 | 1.8 | dB |
| **Input VSWR** | | | | | |
| 1805.0 ... 1880.0 MHz | | — | 1.5 | 2.0 | |
| **Output VSWR** | | | | | |
| 1805.0 ... 1880.0 MHz | | — | 1.7 | 2.1 | |
| **CMRR** ($\lvert S_{21}-S_{31}\rvert/\lvert S_{21}+S_{31}\rvert$) | | | | | |
| 1805.0 ... 1880.0 MHz | | 20[1)] | 24 | — | dB |
| **Attenuation** | $\alpha$ | | | | |
| 10.0 ... 940.0 MHz | | 45 | 62 | — | dB |
| 940.0 ... 1705.0 MHz | | 20 | 34 | — | dB |
| 1705.0 ... 1785.0 MHz | | 12 | 18 | — | dB |
| 1920.0 ... 1980.0 MHz | | 17 | 26 | — | dB |
| 1980.0 ... 2030.0 MHz | | 25 | 30 | — | dB |
| 2030.0 ... 2700.0 MHz | | 28 | 35 | — | dB |
| 2700.0 ... 6000.0 MHz | | 30 | 37 | — | dB |

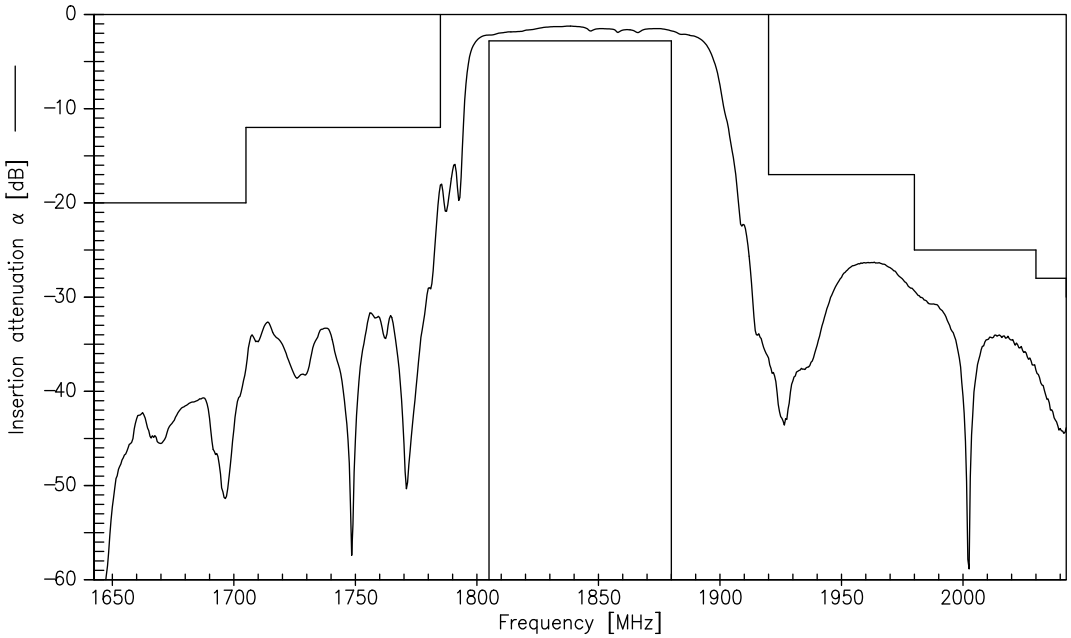
[1)] A CMRR of 19.6dB corresponds to a phase balance of 10˚ together with an amplitude balance of 1.0dB

**Maximum ratings of Filter 2**

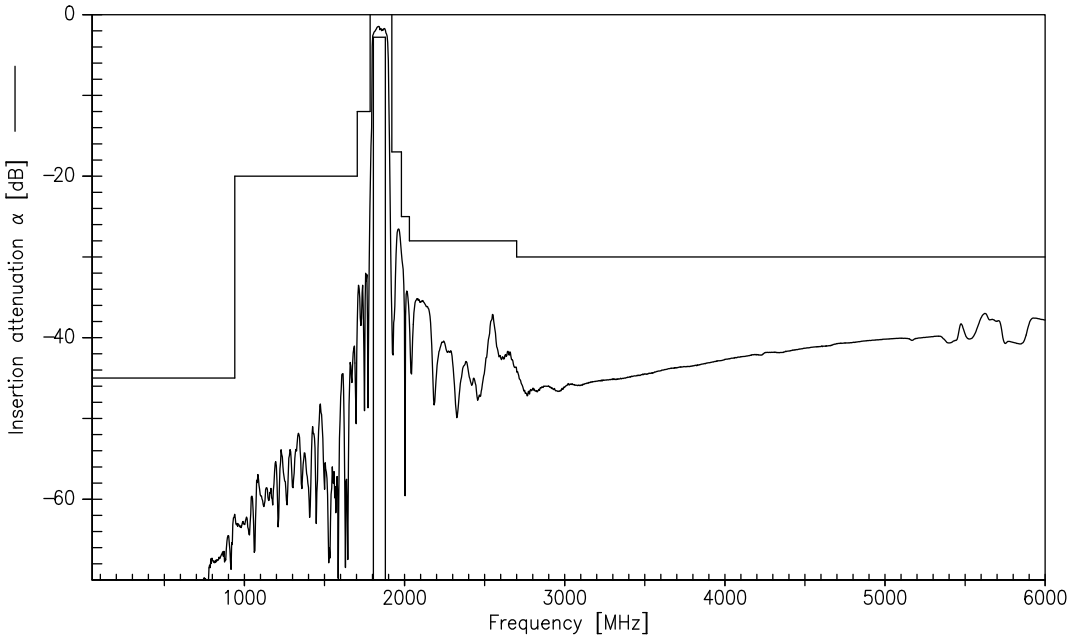
| | | | | |
|---|---|---|---|---|
| Operable temperature range | T | –40/+85 | ˚C | |
| Storage temperature range | $T_{stg}$ | –40/+85 | ˚C | |
| DC voltage | $V_{DC}$ | 5 | V | |
| ESD voltage | $V_{ESD}$ | 50[1)] | V | machine model, 1 pulse |
| Input Power at | | | | |
| GSM 850, GSM 900 | $P_{IN}$ | 15 | dBm | effective power in the on-state, |
| GSM 1800, GSM 1900 | $P_{IN}$ | 15 | dBm | duty cycle 4:8 |
| Tx bands | | | | |

1) acc. to JESD22-A115A (machine model), 1 negative & 1 positive pulse.

**Transfer function Filter 2 (GSM1800)**

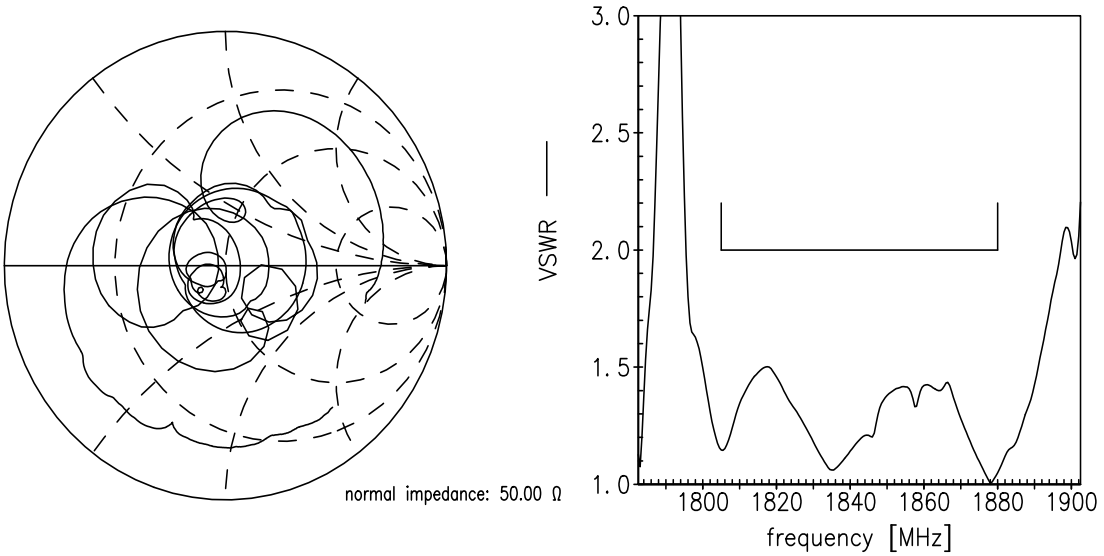



**Transfer function Filter 2 (GSM1800)** - Wideband

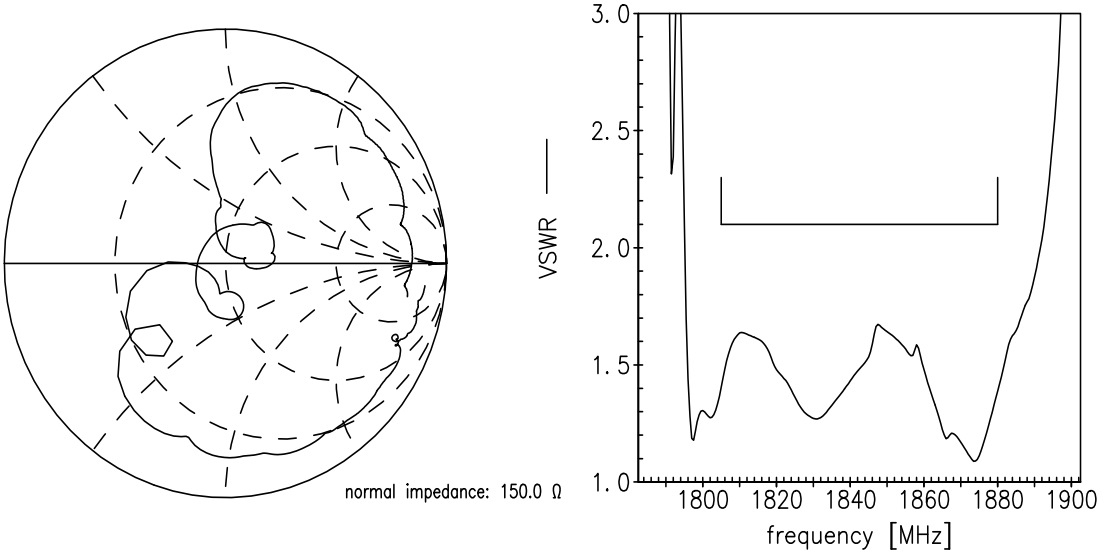


**Smith charts Filter 2 (GSM1800)**

**$S_{11}$ function**




**$S_{22}$ function**



**References**

| | |
|---|---|
| **Type** | B9513 |
| **Ordering code** | B39202B9513L310 |
| **Marking and package** | C61157-A7-A153 |
| **Packaging** | F61074-V8226-Z000 |
| **Date codes** | L_1126 |
| **S-parameters** | B9513_LB_NB.s3p<br>B9513_LB_WB.s3p<br>B9513_UB_NB.s3p<br>B9513_UB_WB.s3p<br>See file header for port/pin assignment table. |
| **Soldering profile** | S_6001 |
| **RoHS compatible** | 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." |
| **Moldability** | Before using in overmolding environment, please contact your EPCOS sales office. |

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