



RF360  
Europe GmbH

## Data sheet

### SAW Rx filter

WCDMA band 1 / band 4 / band 10

Series/type:	B9876
Ordering code:	B39212B9876P810
Date:	June 07, 2019
Version:	2.6

DCN: 80-PA243-1 Rev. B

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RF360 Europe GmbH  
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## 1 Application

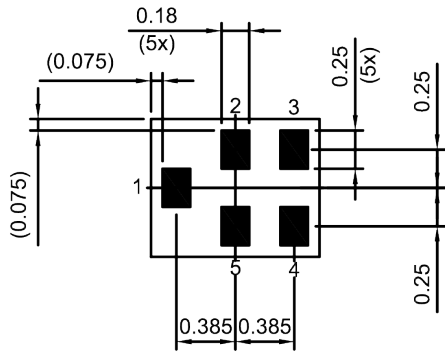
- Low-loss RF filter for mobile telephone WCDMA systems, receive path (RX)
- Usable for antenna diversity systems for WCDMA Band 1,4,10
- Impedance 50Ω
- Unbalanced to unbalanced operation
- Very low insertion attenuation
- Very low amplitude ripple
- Very low Error Vector Magnitude (EVM)
- Very high Tx suppression for WCDMA Band 1, 2,4, 5, 10
- Usable pass band 60 MHz

## 2 Features

- Package size 1.1 $\pm$ 0.05 mm × 0.9 $\pm$ 0.05 mm
- Package height 0.45 mm (max.)
- Approximate weight 1 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

3 Package

BOTTOM VIEW

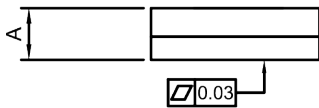


Pad and pitch tolerance ±0.05

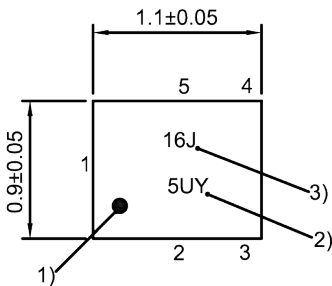
4 Pin configuration

- 1 Input
- 4 Output
- 2, 3, 5 Ground

SIDE VIEW

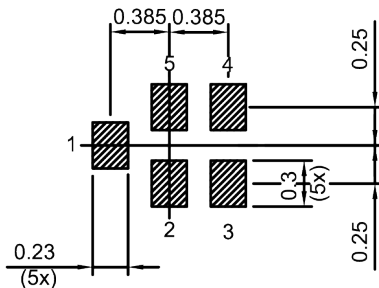


TOP VIEW



- 1) Marking for pad number 1
- 2) Encoded lot number
- 3) Please refer to caption below

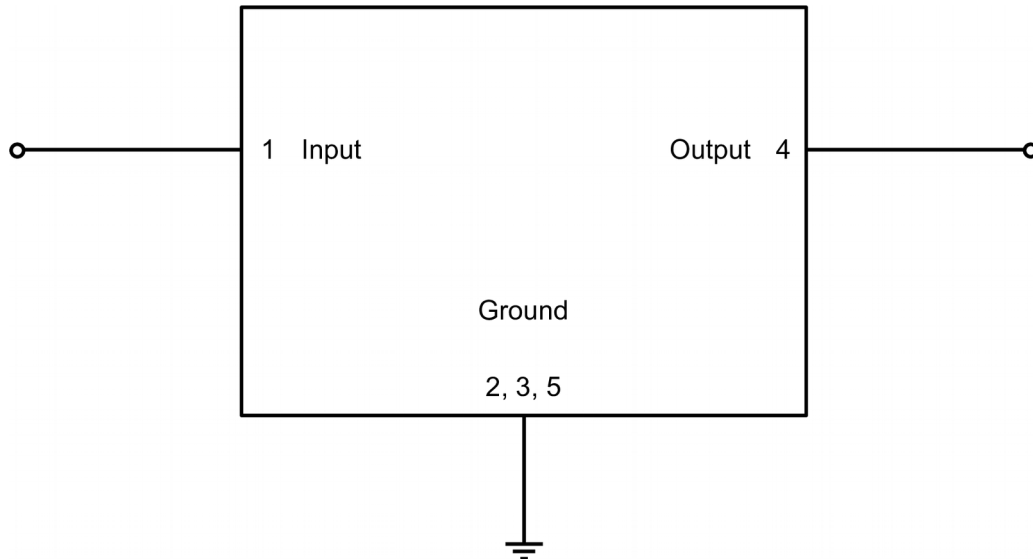
Land pattern THRU VIEW



Landing pad tolerance -0.02

**Figure 1:** Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 19).

5 Matching circuit



**Figure 2:** Schematic of matching circuit. No external matching components required.

External shunt inductor for ESD protection is recommended at any ports towards antenna.



## 6 Characteristics

Temperature range for specification	$T_{SPEC}$	= -30 °C ... +90 °C
Input terminating impedance	$Z_{IN}$	= 50 $\Omega$
Output terminating impedance	$Z_{OUT}$	= 50 $\Omega$

Characteristics				min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$	
<b>Center frequency</b>			$f_C$	—	2140	—	MHz
<b>Maximum insertion attenuation</b>							
	2110... 2155	MHz	$\alpha_{max}$	—	1.7	2.0	dB
	2110... 2170	MHz	$\alpha_{max}$	—	1.7	2.0	dB
	@ $f_{carrier}$ 2112.4... 2167.6	MHz	$\alpha_{WCDMA,max}^{1)}$	—	1.7	2.0	dB
<b>Amplitude ripple (p-p)</b>			$\Delta\alpha$				
	2110... 2155	MHz		—	0.6	1.0	dB
	2110... 2170	MHz		—	0.6	1.0	dB
<b>Maximum VSWR</b>			$VSWR_{max}$				
@ input port	2110... 2155	MHz		—	1.8	2.1	
	2110... 2170	MHz		—	1.8	2.1	
@ output port	2110... 2155	MHz		—	1.7	2.0	
	2110... 2170	MHz		—	1.7	2.0	
<b>Maximum error vector magnitude</b>			$EVM_{max}^{2)}$				
	2112.4... 2167.6	MHz		—	1.7	1.9	%
<b>Minimum attenuation</b>			$\alpha_{min}$				
	10... 1710	MHz		40	45	—	dB
	1710... 1755	MHz		46	51	—	dB
	1755... 1770	MHz		45	55	—	dB
	1755... 1920	MHz		45	50	—	dB
	1920... 1980	MHz		46	49	—	dB
	2015... 2075	MHz		11	25	—	dB
	2255... 2400	MHz		27	30	—	dB
	2400... 2500	MHz		34	40	—	dB
	2500... 4240	MHz		30	35	—	dB
	4240... 4340	MHz		29	34	—	dB
	4340... 6000	MHz		25	30	—	dB

<sup>1)</sup> Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 18).

<sup>2)</sup> Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

## 7 Maximum ratings

Storage temperature	$T_{STG}^{1)} = -40\text{ °C} \dots +85\text{ °C}$	
DC voltage	$ V_{DC}  = 5.0\text{ V (max.)}^{2)}$	
ESD voltage		
	$V_{ESD}^{3)} = 50\text{ V (max.)}$	Machine model.
	$V_{ESD}^{4)} = 100\text{ V (max.)}$	Human body model.
	$V_{ESD}^{5)} = 500\text{ V (max.)}$	Charged device model.
Input power	$P_{IN}$	
@ input port: 1710 ... 1755 MHz	15 dBm	Continuous wave for 2000 h @ 55 °C.
@ input port: 1710 ... 1770 MHz	15 dBm	Continuous wave for 2000 h @ 55 °C.
@ input port: 1920 ... 1980 MHz	15 dBm	Continuous wave for 2000 h @ 55 °C.

<sup>1)</sup> Not valid for packaging material. Storage temperature for packaging material is -25 °C to +40 °C.

<sup>2)</sup> 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

<sup>3)</sup> According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

<sup>4)</sup> According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

<sup>5)</sup> According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

8 Transmission coefficient

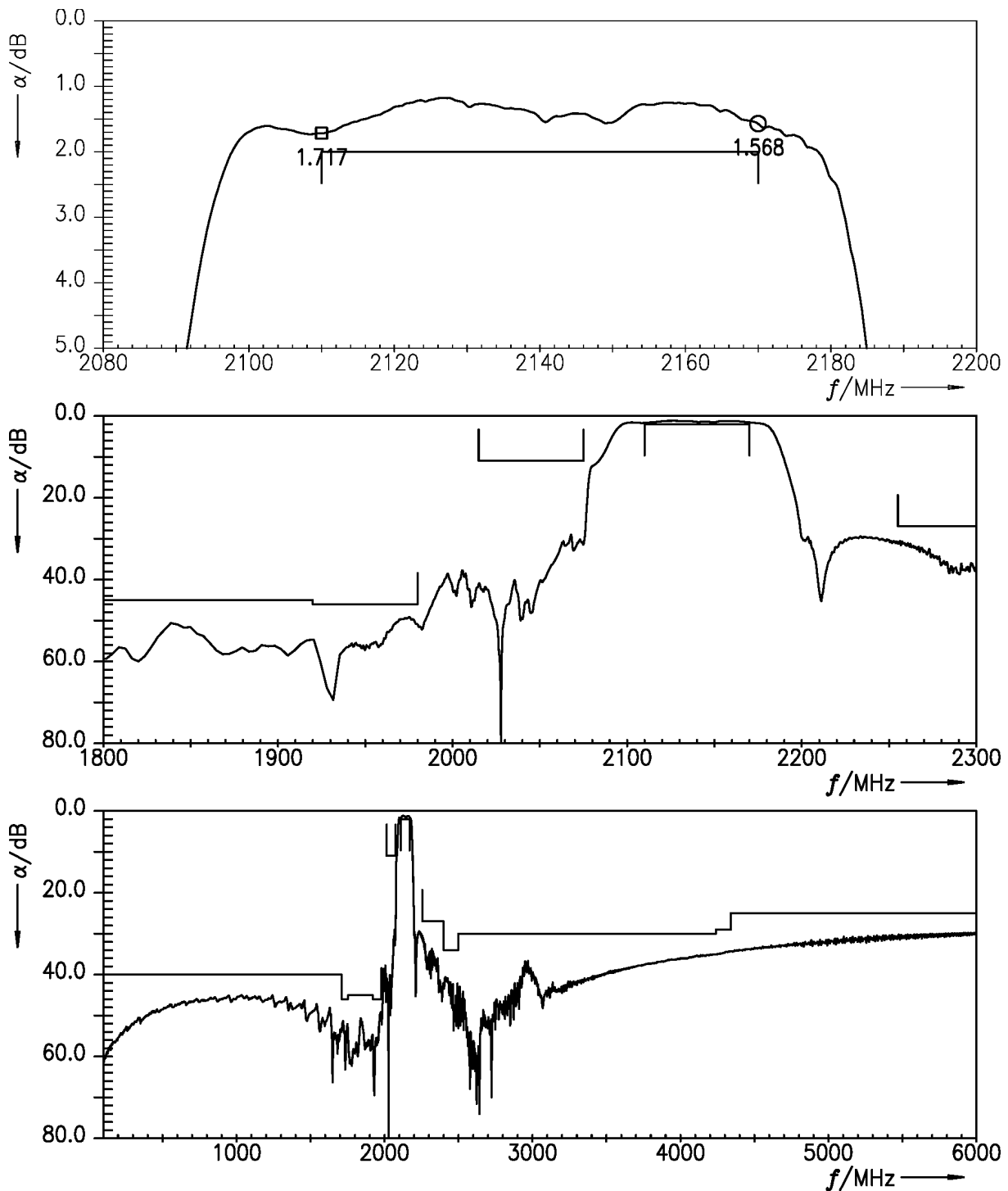


Figure 3: Attenuation.

9 Reflection coefficients

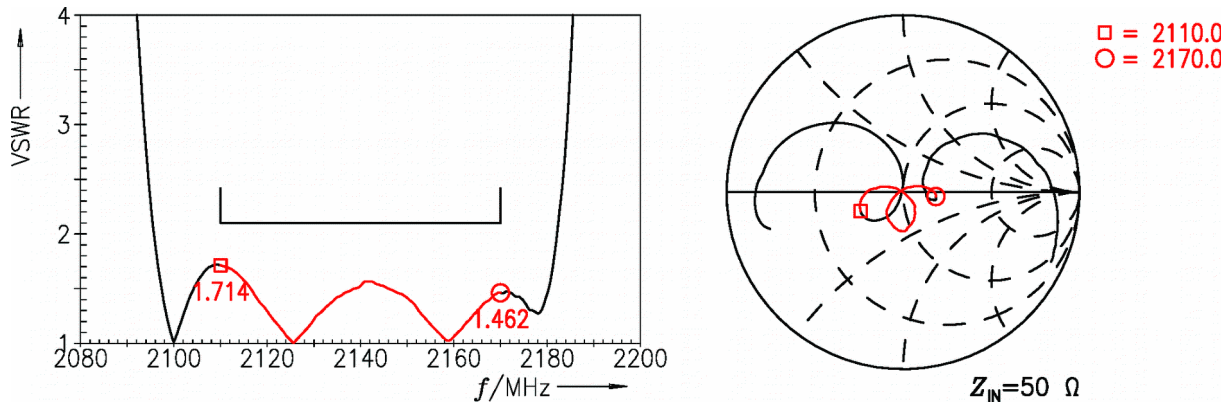


Figure 4: Reflection coefficient at input port.

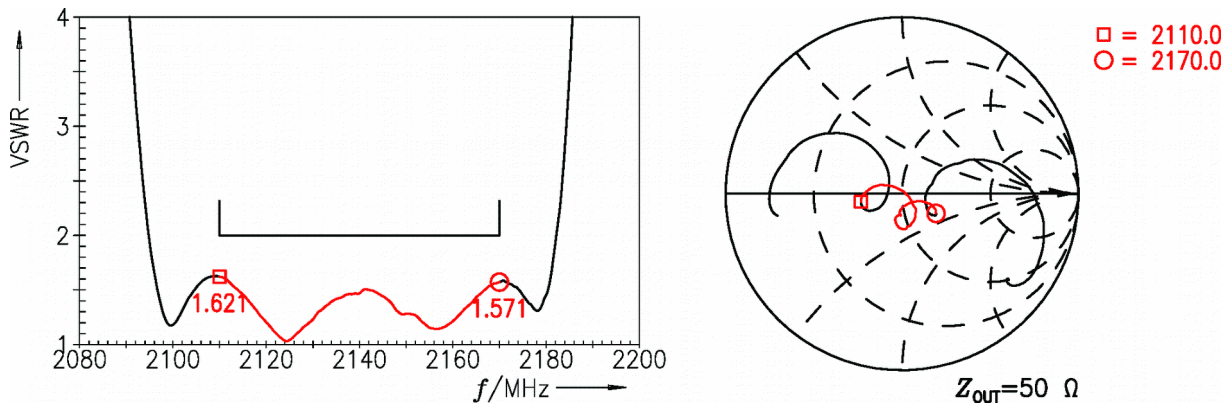


Figure 5: Reflection coefficient at output port.

## 10 EVM

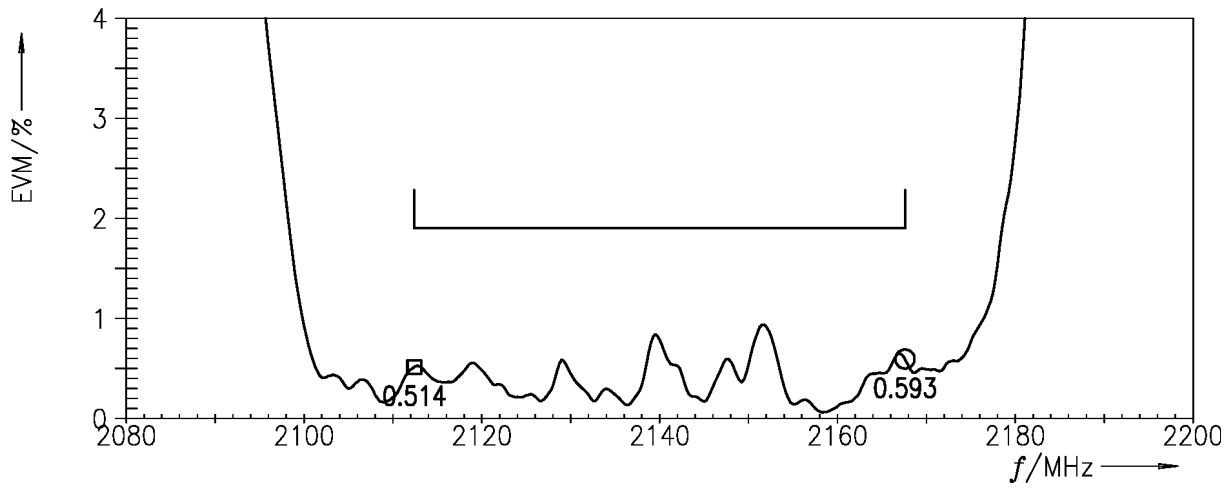
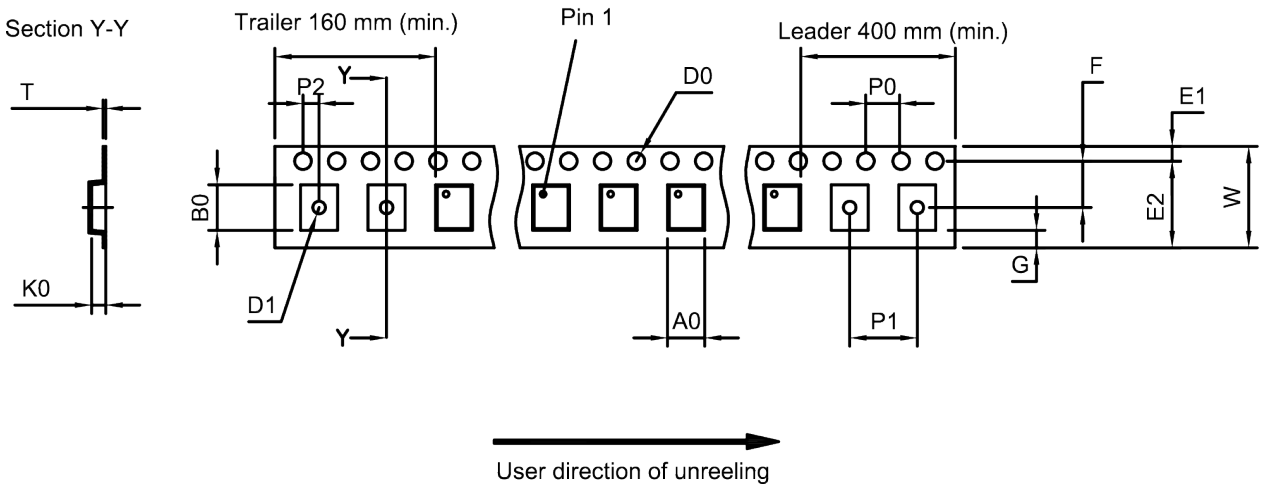


Figure 6: Error vector magnitude.



**11 Packing material**

**11.1 Tape**



**Figure 7:** Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A <sub>0</sub>	1.02±0.05 mm	E <sub>2</sub>	6.25 mm (min.)	P <sub>1</sub>	2.0±0.1 mm
B <sub>0</sub>	1.22±0.05 mm	F	3.5±0.05 mm	P <sub>2</sub>	2.0±0.05 mm
D <sub>0</sub>	1.55±0.05 mm	G	–	T	0.25±0.03 mm
D <sub>1</sub>	0.55±0.1 mm	K <sub>0</sub>	0.6±0.05 mm	W	8.0+0.3/-0.1 mm
E <sub>1</sub>	1.75±0.1 mm	P <sub>0</sub>	4.0±0.1 mm		

**Table 1:** Tape dimensions.

11.2 Reel with diameter of 180 mm

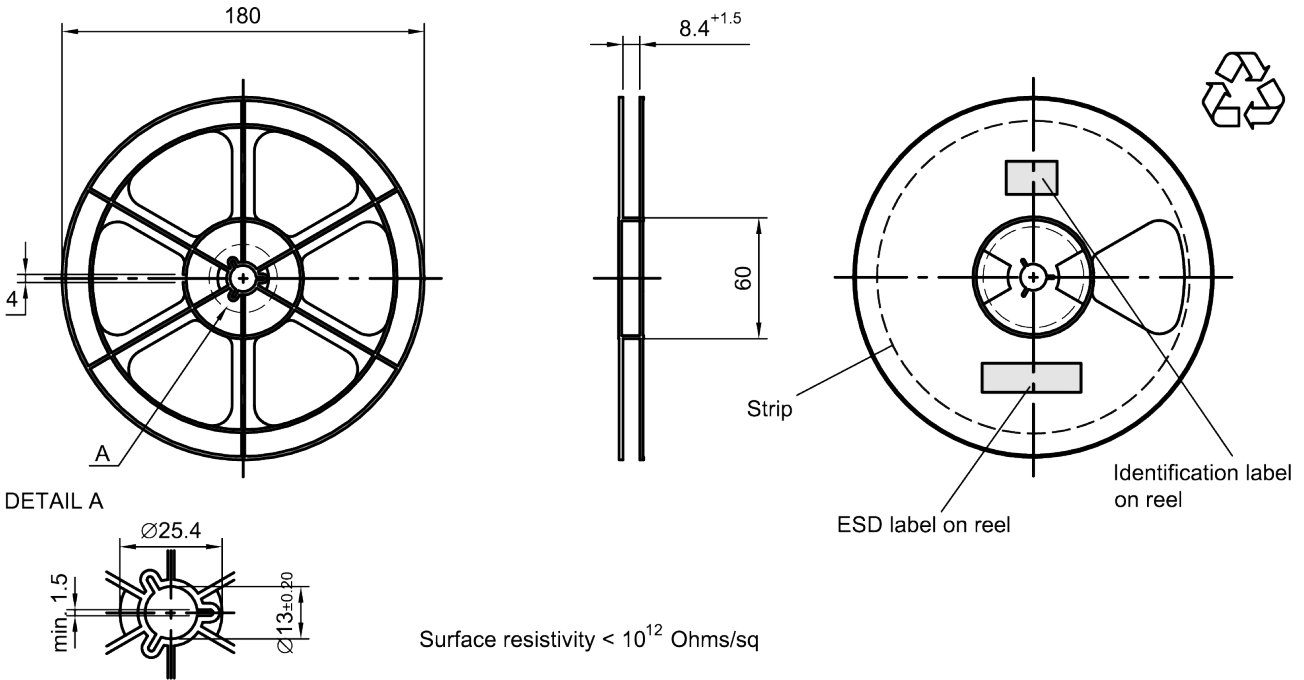


Figure 8: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

Printing on vacuumbag

Vacuumbag

Sealing area

Drypack in vacuumbag

Identification label on vacuumbag

Humidity indicator in vacuumbag

Figure 9: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

Dimensions [mm]

L = 188

B = 188

H = 30

Tolerance  $\pm 5$

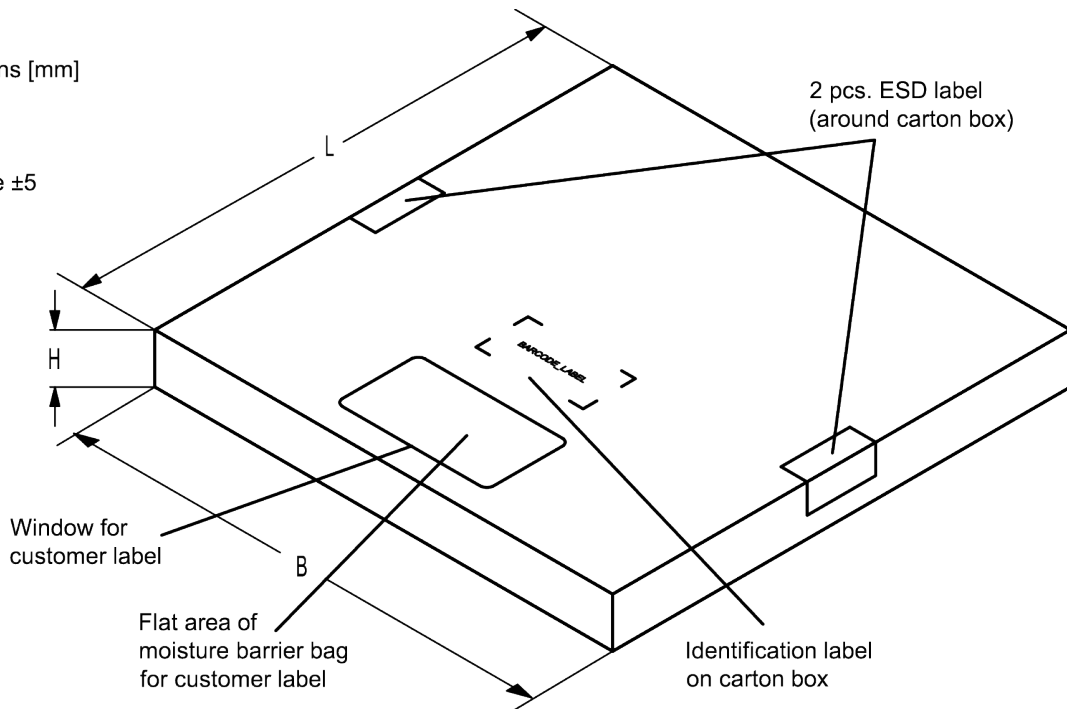


Figure 10: Drawing of folding box for reel with diameter of 180 mm.

### 11.3 Reel with diameter of 330 mm

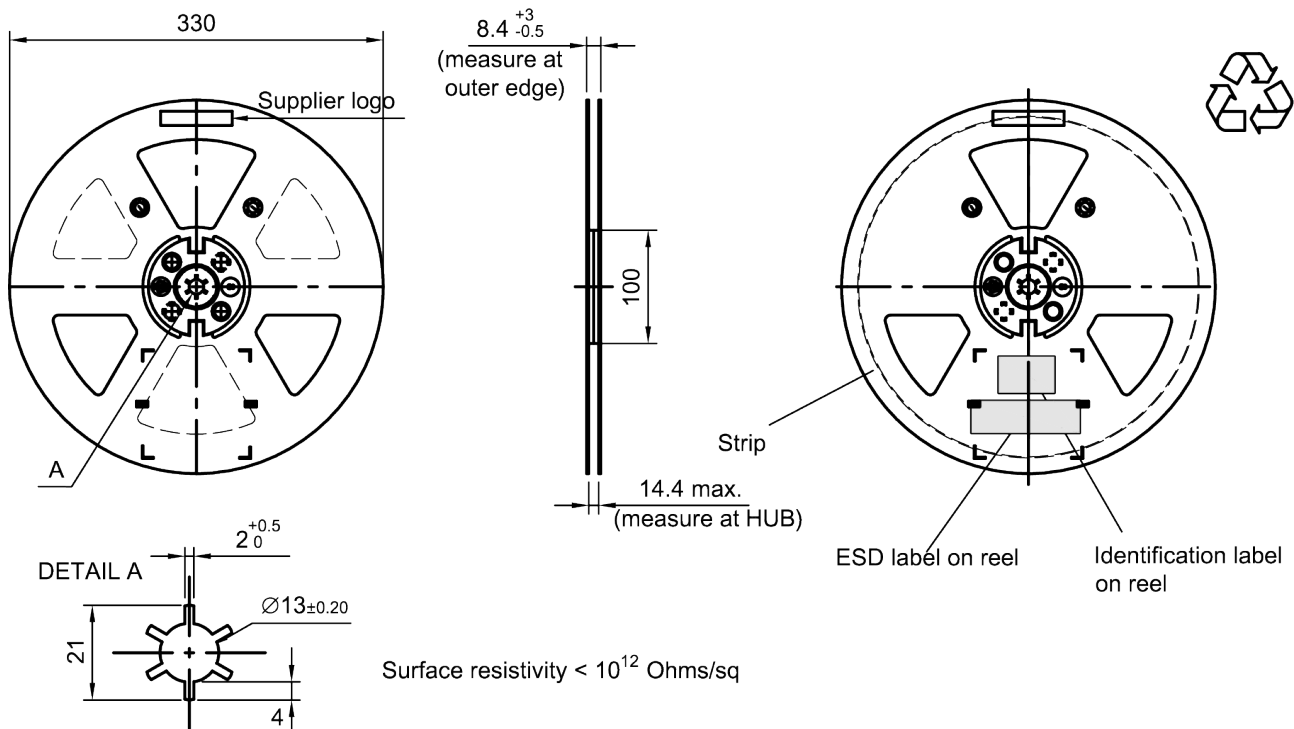
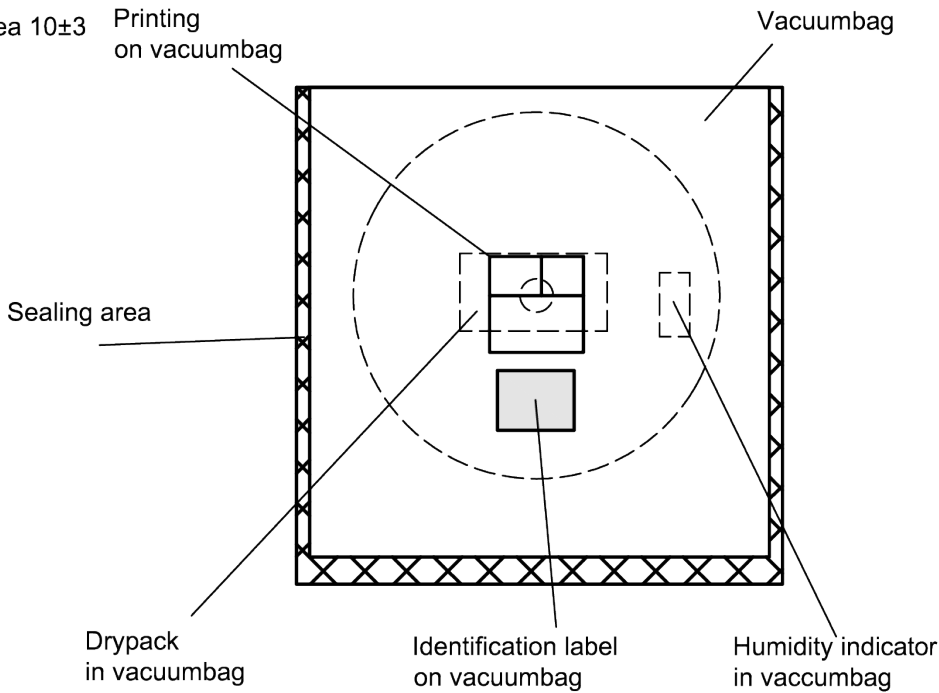


Figure 11: Drawing of reel (first-angle projection) with diameter of 330 mm.

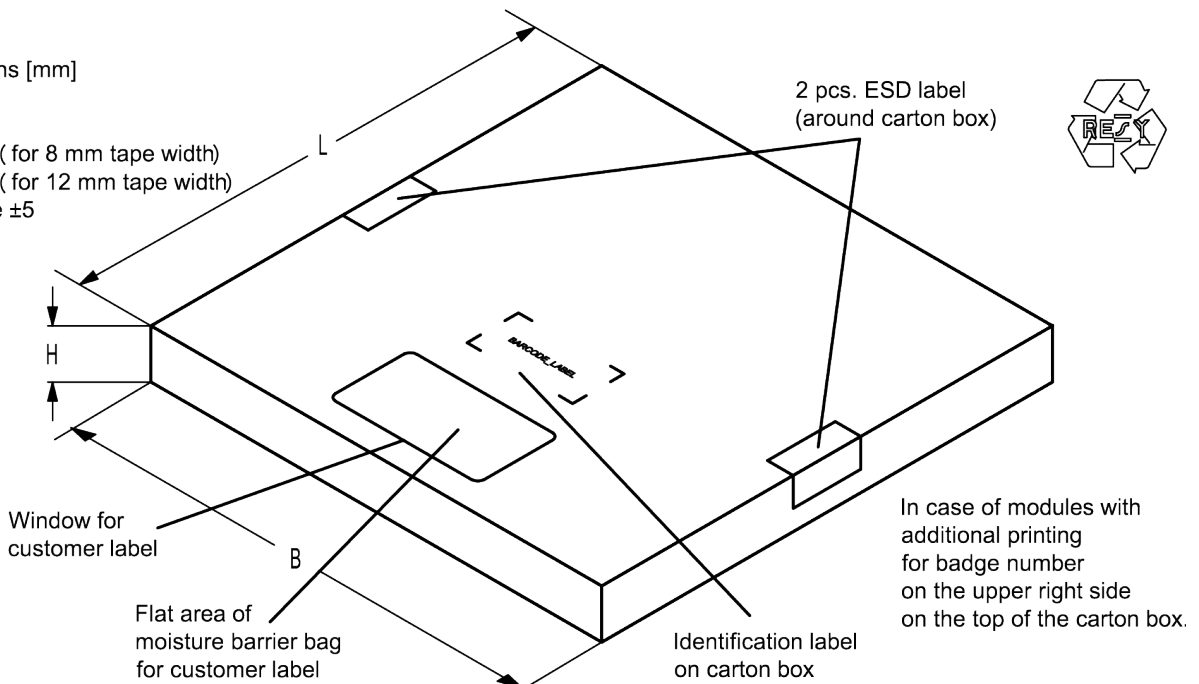


Dimensions [mm]  
 X = 400+5  
 Y = 418+5  
 Sealing area 10±3



**Figure 12:** Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

Dimensions [mm]  
 L = 335  
 B = 338  
 H = 36 ( for 8 mm tape width)  
 40 ( for 12 mm tape width)  
 Tolerance ±5



**Figure 13:** Drawing of folding box for reel with diameter of 330 mm.

**12 Marking**

Products are marked with product type number and lot number encoded according to Table 2:

■ Type number:

The 4 digit type number of the ordering code, e.g., B3xxxxB**1234**xxxx,  
is encoded by a special BASE32 code into a 3 digit marking.

Example of decoding type number marking on device in decimal code.  
**16J** => **1234**  
 $1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0 =$  **1234**

The BASE32 code for product type B9876 is 9MM.

■ Lot number:

The last 5 digits of the lot number, e.g., **12345**,  
are encoded based on a special BASE47 code into a 3 digit marking.

Example of decoding lot number marking on device in decimal code.  
**5UY** => **12345**  
 $5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0 =$  **12345**

Adopted BASE32 code for type number			
Decimal value	Base32 code	Decimal value	Base32 code
0	0	16	G
1	1	17	H
2	2	18	J
3	3	19	K
4	4	20	M
5	5	21	N
6	6	22	P
7	7	23	Q
8	8	24	R
9	9	25	S
10	A	26	T
11	B	27	V
12	C	28	W
13	D	29	X
14	E	30	Y
15	F	31	Z

Adopted BASE47 code for lot number			
Decimal value	Base47 code	Decimal value	Base47 code
0	0	24	R
1	1	25	S
2	2	26	T
3	3	27	U
4	4	28	V
5	5	29	W
6	6	30	X
7	7	31	Y
8	8	32	Z
9	9	33	b
10	A	34	d
11	B	35	f
12	C	36	h
13	D	37	n
14	E	38	r
15	F	39	t
16	G	40	v
17	H	41	\
18	J	42	?
19	K	43	{
20	L	44	}
21	M	45	<
22	N	46	>
23	P		

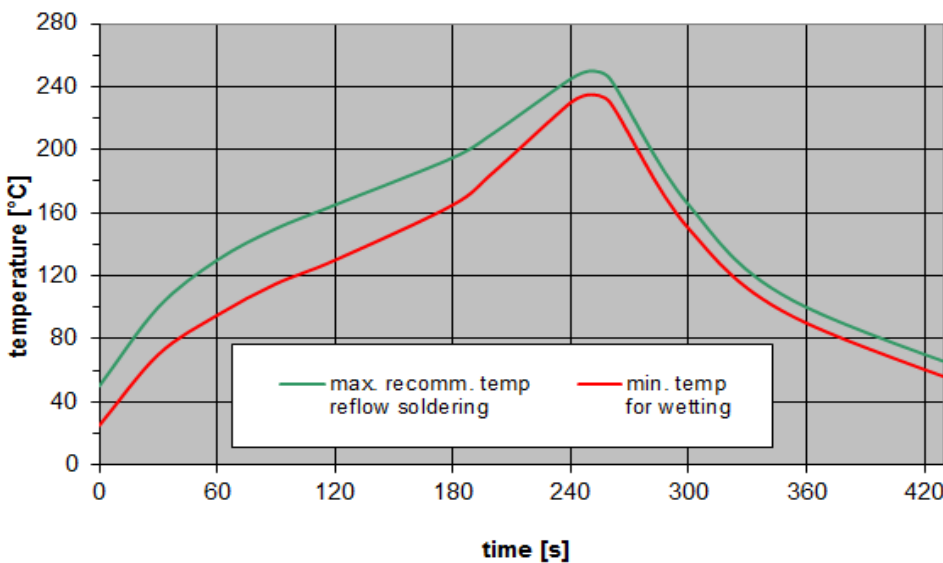
**Table 2:** Lists for encoding and decoding of marking.

### 13 Soldering profile

The recommended soldering process is in accordance with IEC 60068-2-58 – 3<sup>rd</sup> edit and IPC/JEDEC J-STD-020B.

ramp rate	≤ 3 K/s
preheat	125 °C to 220 °C, 150 s to 210 s, 0.4 K/s to 1.0 K/s
T > 220 °C	30 s to 70 s
T > 230 °C	min. 10 s
T > 245 °C	max. 20 s
T ≥ 255 °C	–
peak temperature $T_{peak}$	250 °C +0/-5 °C
wetting temperature $T_{min}$	230 °C +5/-0 °C for 10 s ± 1 s
cooling rate	≤ 3 K/s
soldering temperature T	measured at solder pads

**Table 3:** Characteristics of recommended soldering profile for lead-free solder (Sn95.5Ag3.8Cu0.7).



**Figure 14:** Recommended reflow profile for convection and infrared soldering – lead-free solder.

**14 Annotations**

**14.1 Power Transfer Function (PTF) of WCDMA signal**

Attenuation of WCDMA signal,  $\alpha_{\text{WCDMA}}$ , is defined by

$$\alpha_{\text{WCDMA}}(f_{\text{carrier}}) = 10 \log_{10} \left| \frac{1}{\text{PTF}(f_{\text{carrier}})} \right| \text{dB}$$

and

$$\text{PTF}(f_{\text{carrier}}) = \int_{-\infty}^{+\infty} |S_{21}(f) H_{\text{RRC}}(f - f_{\text{carrier}})|^2 df$$

with  $f_{\text{carrier}}$  according to 3GPP TS 25.101 (e.g., for the WCDMA B8 pass band,  $f_{\text{carrier}}$  ranges from 882.4 MHz to 912.6 MHz which correspond to the lowest and highest TX channels, respectively).  $H_{\text{RRC}}(f)$  is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 using the normalization

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

**14.2 RoHS compatibility**

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.

**14.3 Scattering parameters (S-parameters)**

The pin/port assignment is available in the headers of the S-parameter files. Please contact your local RF360 sales office.

**14.4 Ordering codes and packing units**

Ordering code	Packing unit
B39212B9876P810	15000 pcs
B39212B9876P810S 5	5000 pcs

**Table 4:** Ordering codes and packing units.

## 15 Cautions and warnings

### 15.1 Display of ordering codes for RF360 products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications and the website of RF360, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products. Detailed information can be found on the Internet under [www.rf360jv.com/orderingcodes](http://www.rf360jv.com/orderingcodes).

### 15.2 Material information

Due to technical requirements components may contain dangerous substances. For information on the type in question please also contact one of our sales offices.

For information on recycling of tapes and reels please contact one of our sales offices.

### 15.3 Moldability

Before using in overmolding environment, please contact your local RF360 sales office.

### 15.4 Package information

#### Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on RF360 internal development and empirical data and illustrated for example purposes, only. As customers' SMD assembly processes may have a plenty of variants and influence factors which are not under control or knowledge of RF360, additional careful process development on customer side is necessary and strongly recommended in order to achieve best soldering results tailored to the particular customer needs.

#### Dimensions

Unless otherwise specified all dimensions are understood using unit millimeter (mm).

#### Projection method

Unless otherwise specified first-angle projection is applied.

## 16 Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, RF360 Europe GmbH and its affiliates are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an RF360 product with the properties described in the product specification is suitable for use in a particular customer application.
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