

RF360 Europe GmbH
A Qualcomm – TDK Joint Venture

SAW components

SAW filter

Small cell & femtocell
Band 2 uplink

Series/type:	B9611
Ordering code:	B39192B9611P810
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SAW components**B9611****SAW filter****1880 MHz**

Data sheet

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1 Application

- Low-loss RF filter for smallcells
- Usable pass band 58.75 MHz
- No matching network required for operation at 50Ω
- Unbalanced to unbalanced operation

2 Features

- Package size 1.4±0.1 mm × 1.1±0.1 mm
- Package height 0.45 mm (max.)
- Approximate weight 3 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)

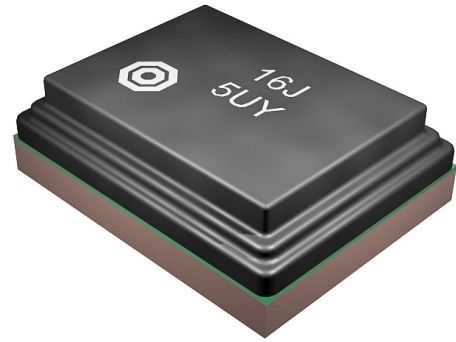


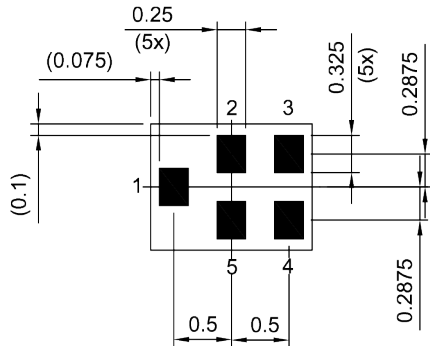
Figure 1: Picture of component with example of product marking.

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3 Package

BOTTOM VIEW

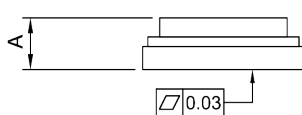


Pad and pitch tolerance ±0.05

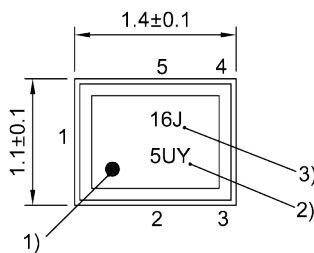
4 Pin configuration

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

SIDE VIEW

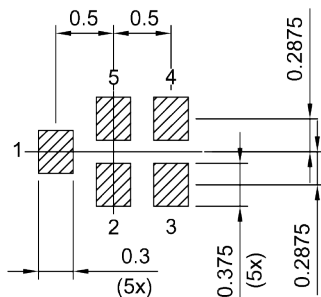


TOP VIEW



- 1) Marking for pad number 1
- 2) Example of encoded lot number
- 3) Example of encoded filter type number

Land pattern THRU VIEW



Landing pad tolerance -0.02

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 18).

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5 Matching circuit

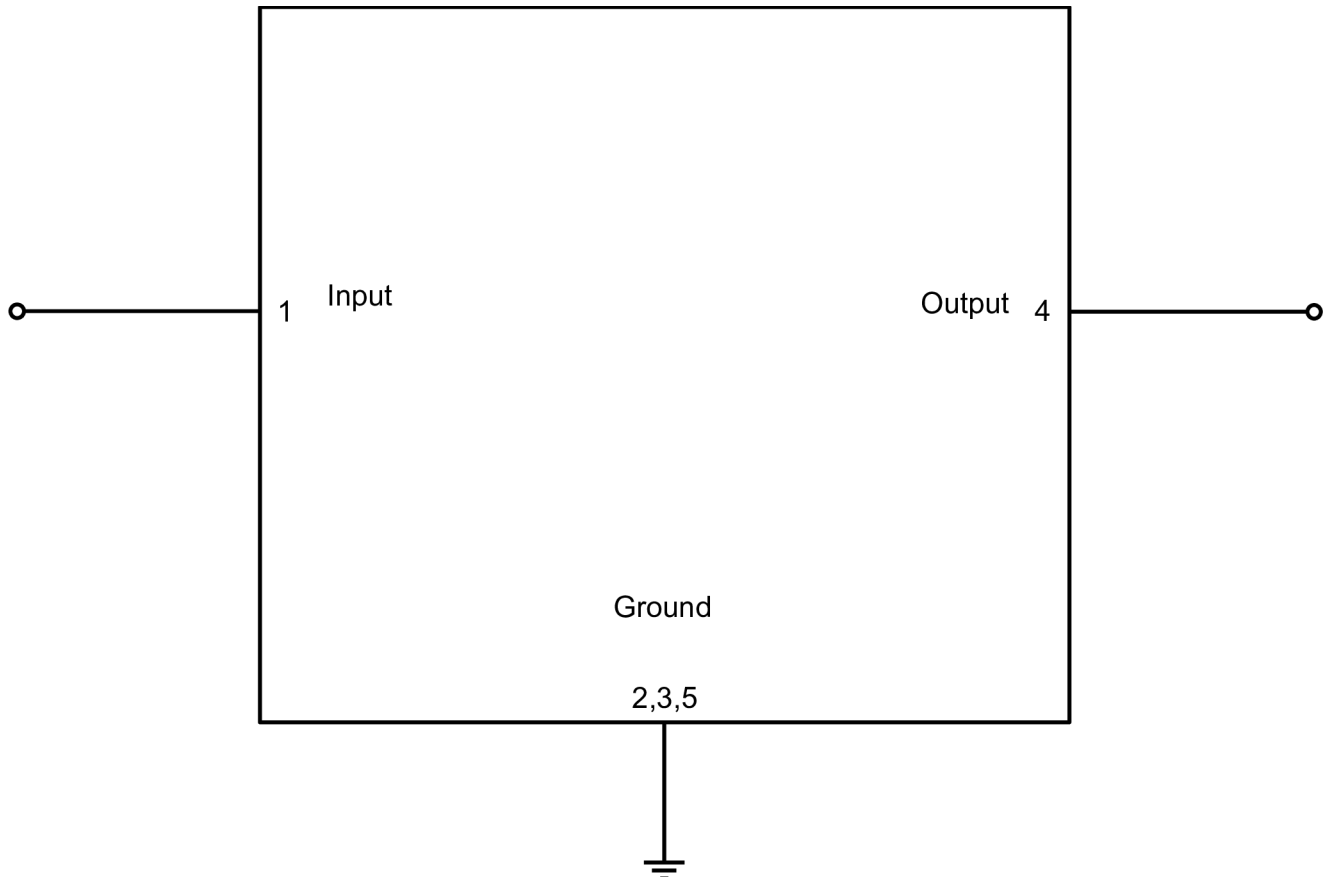


Figure 3: Schematic of matching circuit. No external matching components required.

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6 Characteristics

Temperature range for specification	T_{SPEC}	= -10 °C ... +85 °C
Input terminating impedance	Z_{IN}	= 50 Ω
Output terminating impedance	Z_{OUT}	= 50 Ω

Characteristics		min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}		
Center frequency	f_C	—	1880	—	MHz	
Maximum insertion attenuation						
	1850.625... 1909.375 MHz	α_{max}	—	2.5	3.8	dB
	@ $f_{carrier}$ 1853.025... 1906.975 MHz	$\alpha_{WCDMA,max}^{1)}$	—	2.5	3.8	dB
Amplitude ripple (p-p)		$\Delta\alpha$				
	1850.625... 1909.375 MHz		—	1.3	3.3	dB
Maximum VSWR		VSWR _{max}				
@ input port	1850.625... 1909.375 MHz		—	2.0	2.5	
@ output port	1850.625... 1909.375 MHz		—	2.1	2.5	
Maximum error vector magnitude		EVM _{max} ²⁾				
	1853.025... 1906.975 MHz		—	2.3	4.5	%
Minimum attenuation						
	10... 1550 MHz	α_{min}	32	38	—	dB
	1550... 1580 MHz	α_{min}	35	40	—	dB
	1580... 1770 MHz	α_{min}	30	40	—	dB
	1770... 1830 MHz	α_{min}	14	26	—	dB
	1930.625... 1990 MHz	α_{min}	25	35	—	dB
	@ $f_{carrier}$ 1933.025... 1987.6 MHz	$\alpha_{WCDMA,min}^{1)}$	25	35	—	dB
	1990... 2032 MHz	α_{min}	35	39	—	dB
	2032... 2500 MHz	α_{min}	35	39	—	dB
	2500... 3700 MHz	α_{min}	30	37	—	dB
	3700... 3820 MHz	α_{min}	35	55	—	dB
	3820... 6000 MHz	α_{min}	25	37	—	dB

¹⁾ Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 17).

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

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7 Maximum ratings

Operable temperature	$T_{OP} = -40\text{ °C} \dots +95\text{ °C}$	
Storage temperature	$T_{STG}^{1)} = -40\text{ °C} \dots +95\text{ °C}$	
DC voltage	$ V_{DC} ^{2)} = 0\text{ V}$	
ESD voltage		
	$V_{ESD}^{3)} = 50\text{ V}$	Machine model.
	$V_{ESD}^{4)} = 100\text{ V}$	Human body model.
Input power @ input port: 1850.625 ... 1909.375 MHz	$P_{IN} = 8\text{ dBm}^{5)}$	Continuous wave for 50000 h @ 55 °C.

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

²⁾ In case of applied DC voltage blocking capacitors are mandatory.

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

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

⁵⁾ Expected Life Time according to accelerated power durability simulation and wear out models.

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8 Transmission coefficient

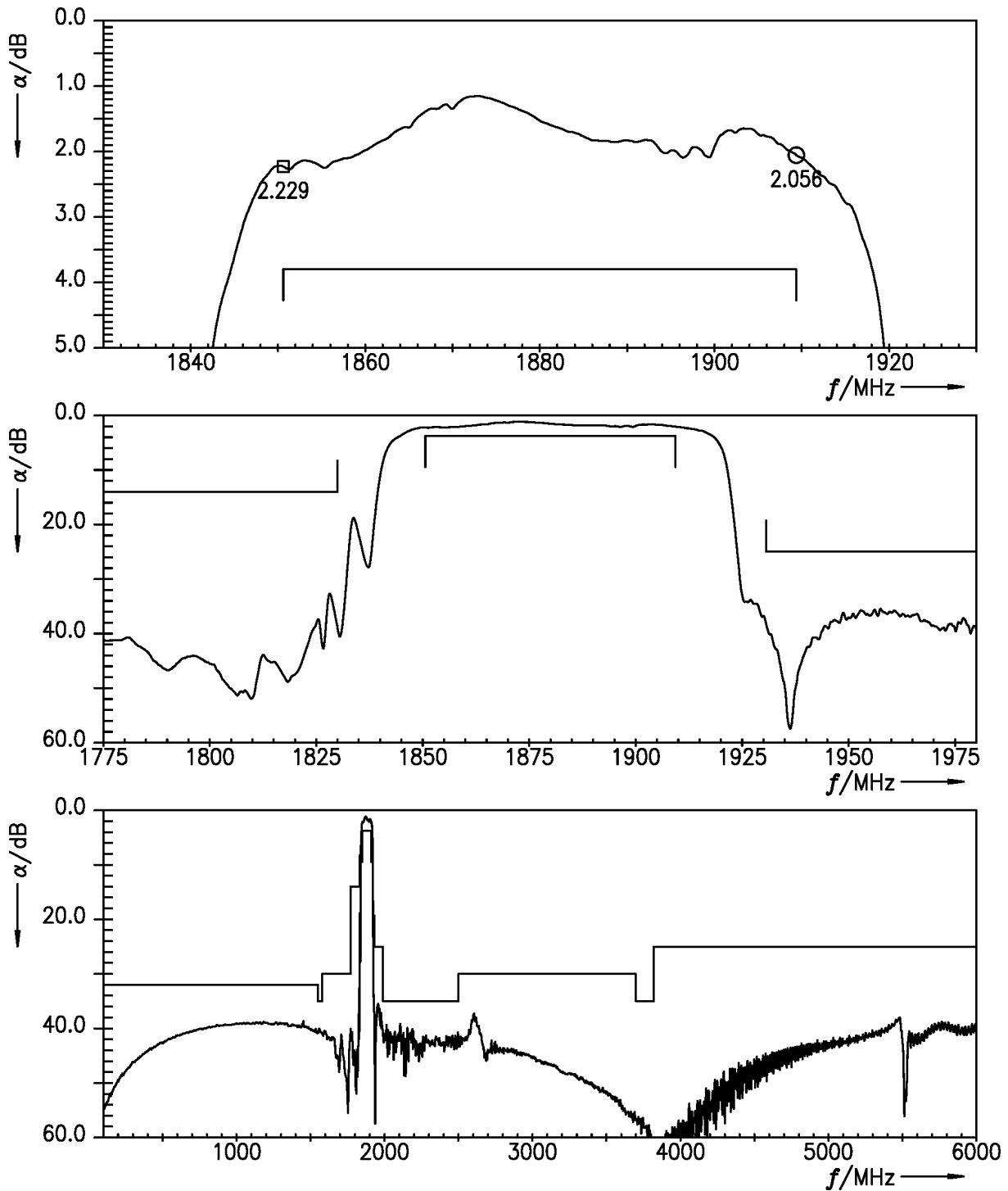


Figure 4: Attenuation.

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9 Reflection coefficients

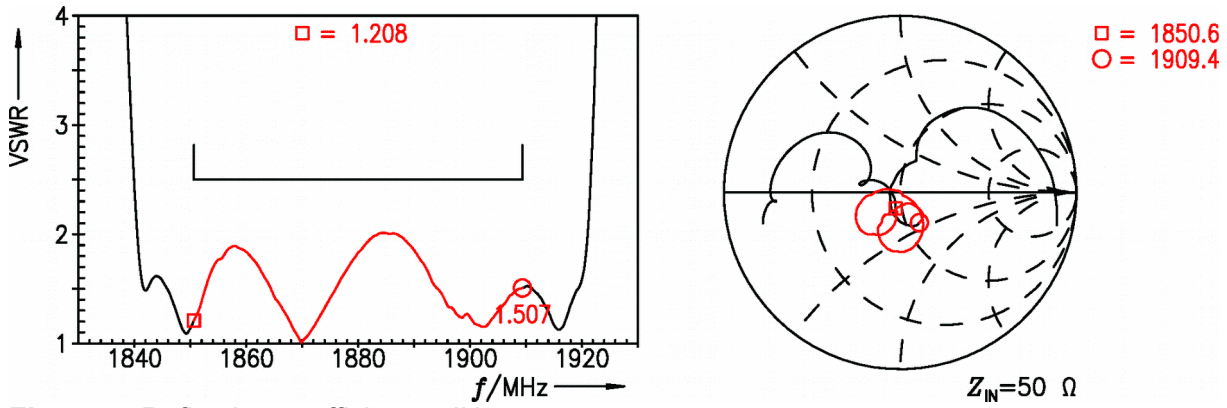


Figure 5: Reflection coefficient at IN port.

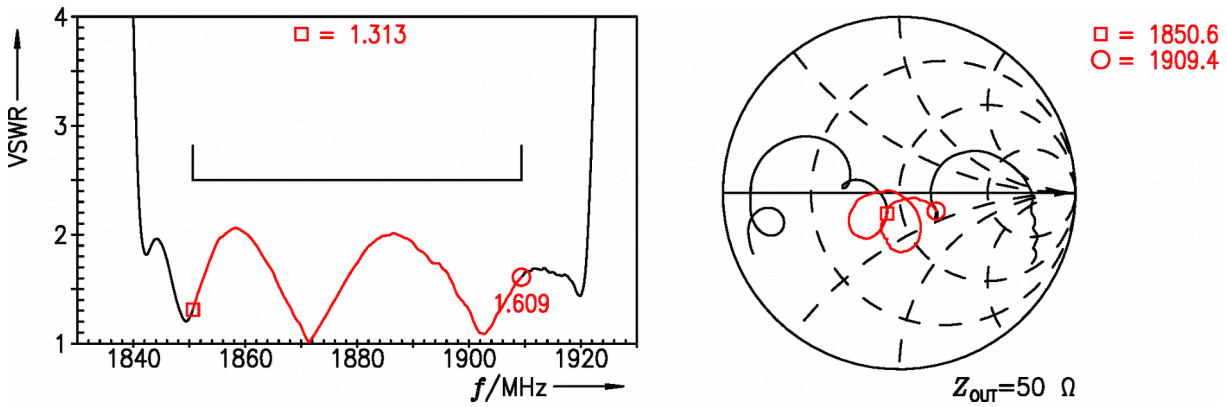


Figure 6: Reflection coefficient at OUT port.

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10 EVM

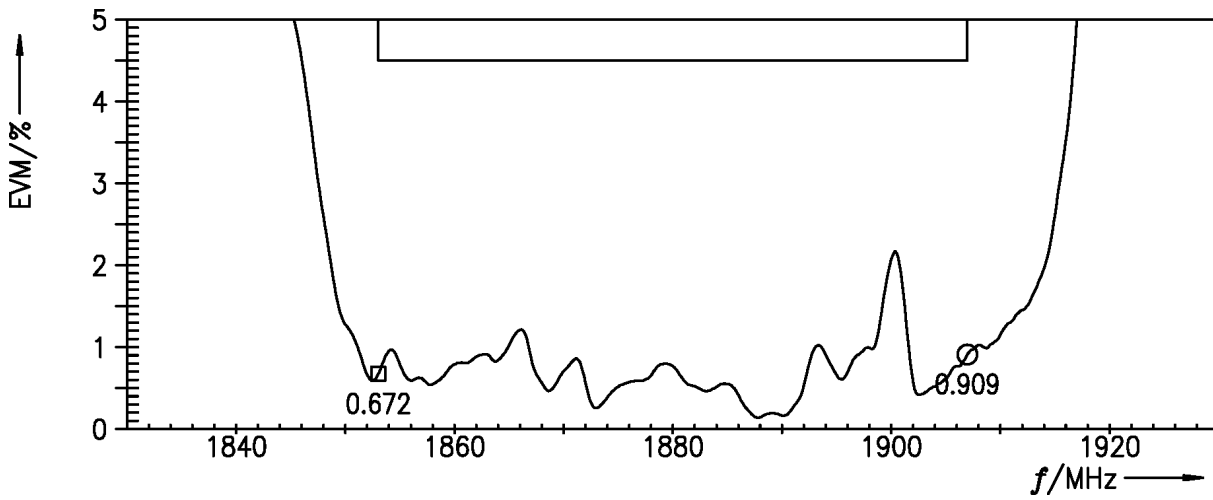


Figure 7: Error vector magnitude.

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11 Packing material

11.1 Tape

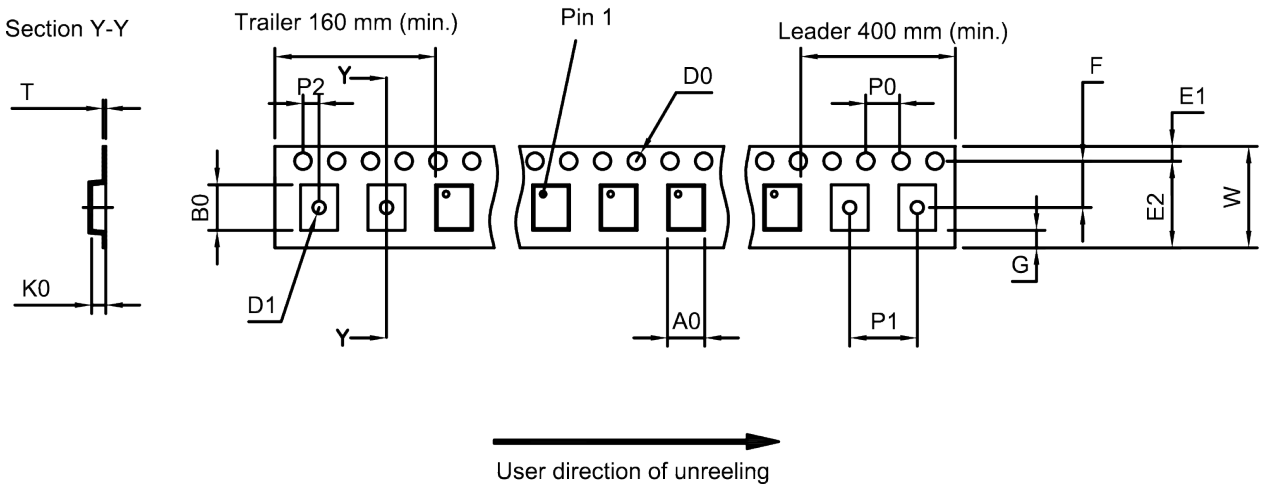


Figure 8: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A ₀	1.27±0.05 mm	E ₂	6.25 mm (min.)	P ₁	4.0±0.1 mm
B ₀	1.57±0.05 mm	F	3.5±0.05 mm	P ₂	2.0±0.05 mm
D ₀	1.5+0.1/-0 mm	G	0.75 mm (min.)	T	0.25±0.03 mm
D ₁	0.5±0.1 mm	K ₀	0.62±0.05 mm	W	8.0+0.3/-0.1 mm
E ₁	1.75±0.1 mm	P ₀	4.0±0.1 mm		

Table 1: Tape dimensions.

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11.2 Reel with diameter of 180 mm

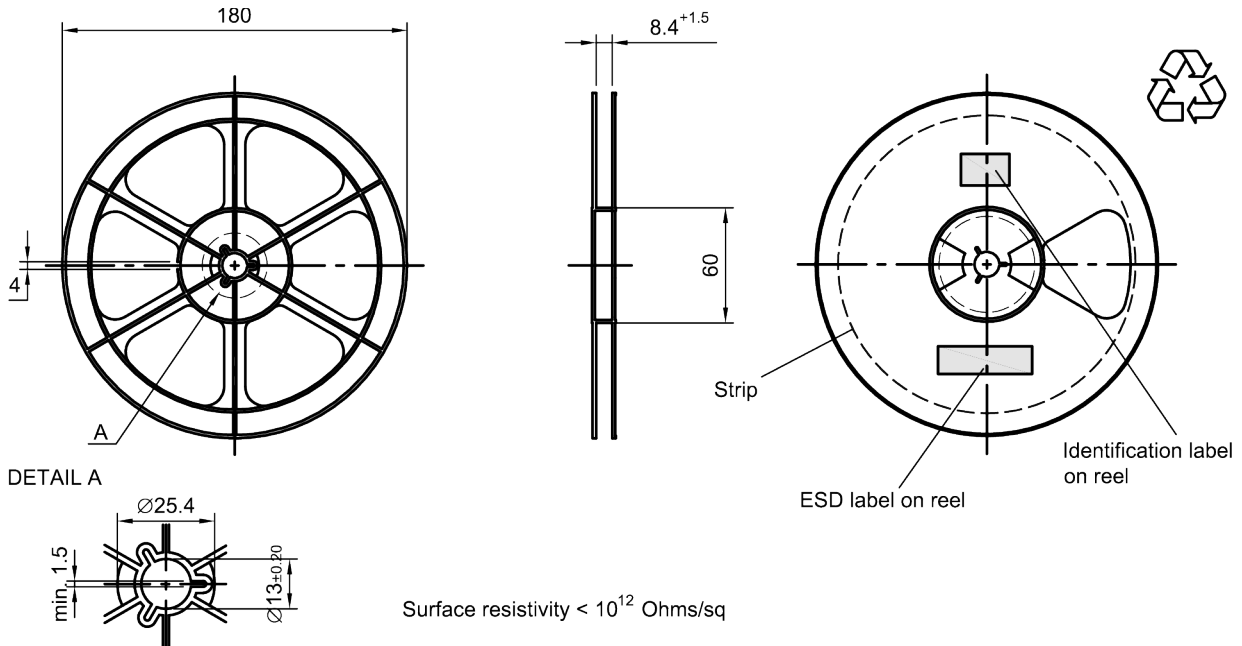


Figure 9: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

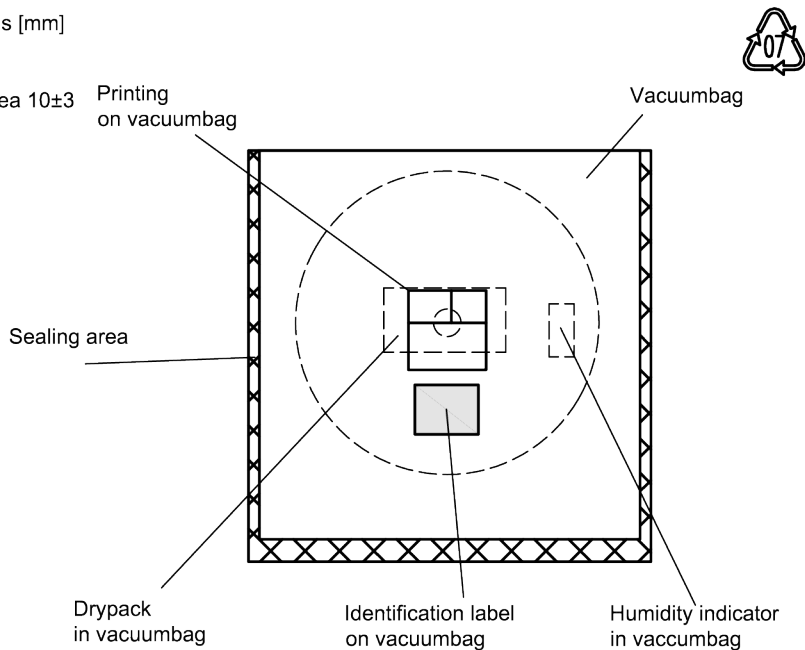


Figure 10: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

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Dimensions [mm]
 L = 188
 B = 188
 H = 30
 Tolerance ±5

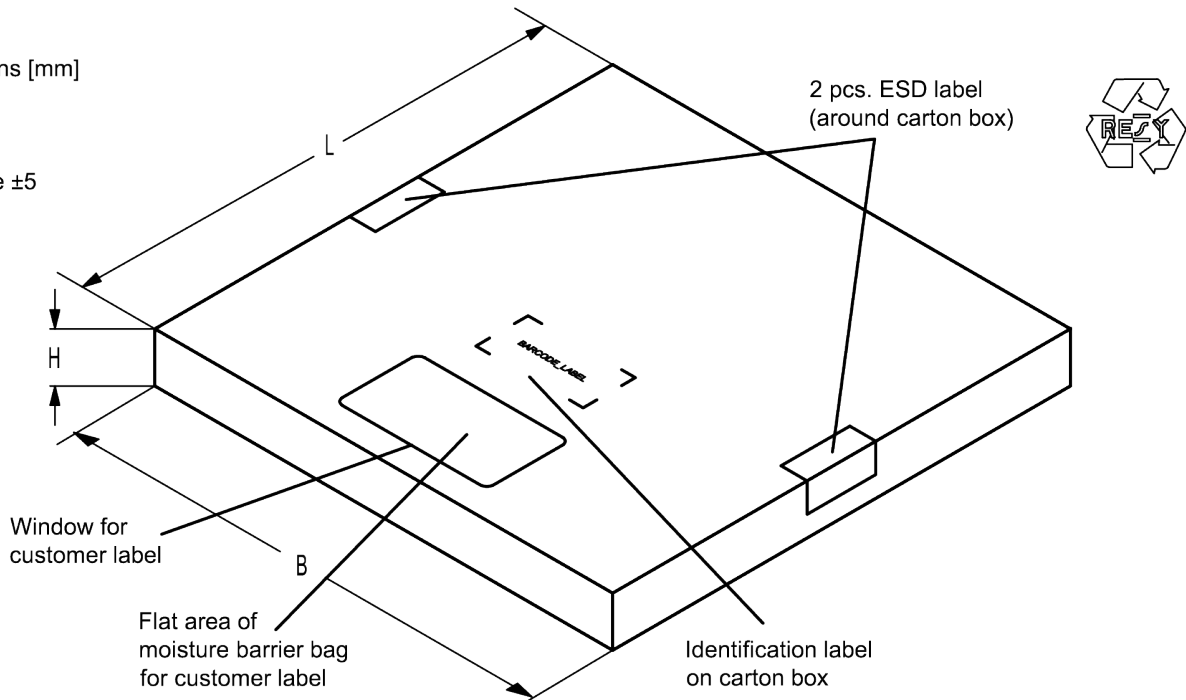


Figure 11: Drawing of folding box for reel with diameter of 180 mm.

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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 B9611 is 9CB.

■ 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	type 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.

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13 Soldering profile

The recommended soldering process is in accordance with IEC 60068-2-58 – 3rd 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
$T \geq 255$ °C	–
peak temperature T_{peak}	250 °C ± 5 °C
wetting temperature T_{min}	230 °C ± 5 °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).

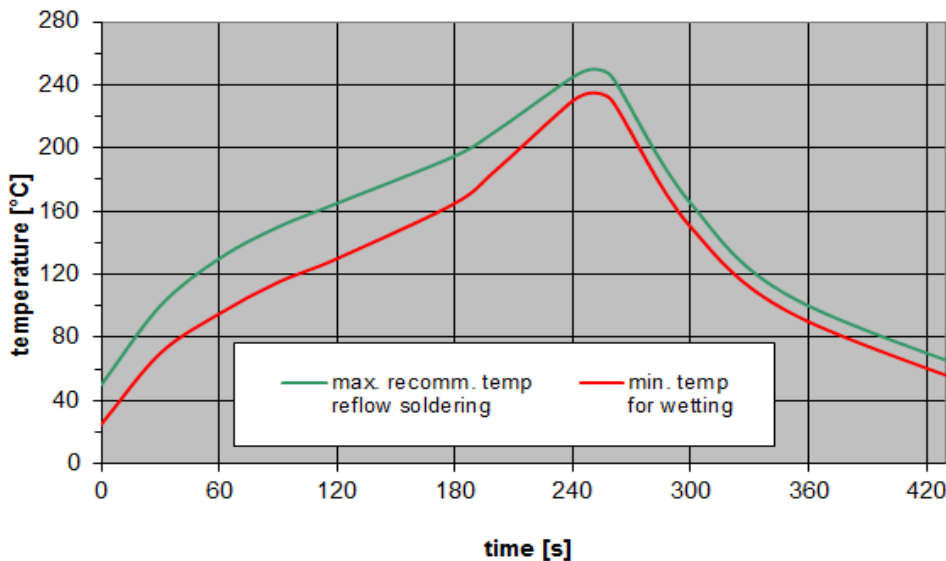


Figure 12: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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14 Annotations

14.1 Matching coils

See TDK inductor pdf-catalog <http://www.tdk.co.jp/tefe02/coil.htm#aname1> and Data Library for circuit simulation <http://www.tdk.co.jp/etvcl/index.htm>.

14.2 Power Transfer Function (PTF) of WCDMA signal

Attenuation of WCDMA signal, α_{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_{carrier} according to 3GPP TS 25.101 (e.g., for the WCDMA B8 pass band, f_{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

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

14.3 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.

14.4 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.

14.5 Ordering codes and packing units

Ordering code	Packing unit
B39192B9611P810	5000 pcs

Table 4: Ordering codes and packing units.

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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.

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).

Dimensions do not include burrs.

Projection method

Unless otherwise specified first-angle projection is applied.

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.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
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