SAW components

SAW filter for smallcells and femtocell

Band 2 Uplink

Series/type:	B9611
Ordering code:	B39192B9611P810
Date:	December 28, 2015
Version:	2.1

Table of contents

1 Application

- Low-loss RF filter for smallcells
- Usable pass band 58.75MHz
- 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 0.003 g
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

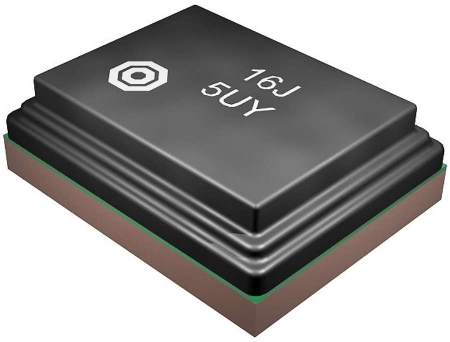
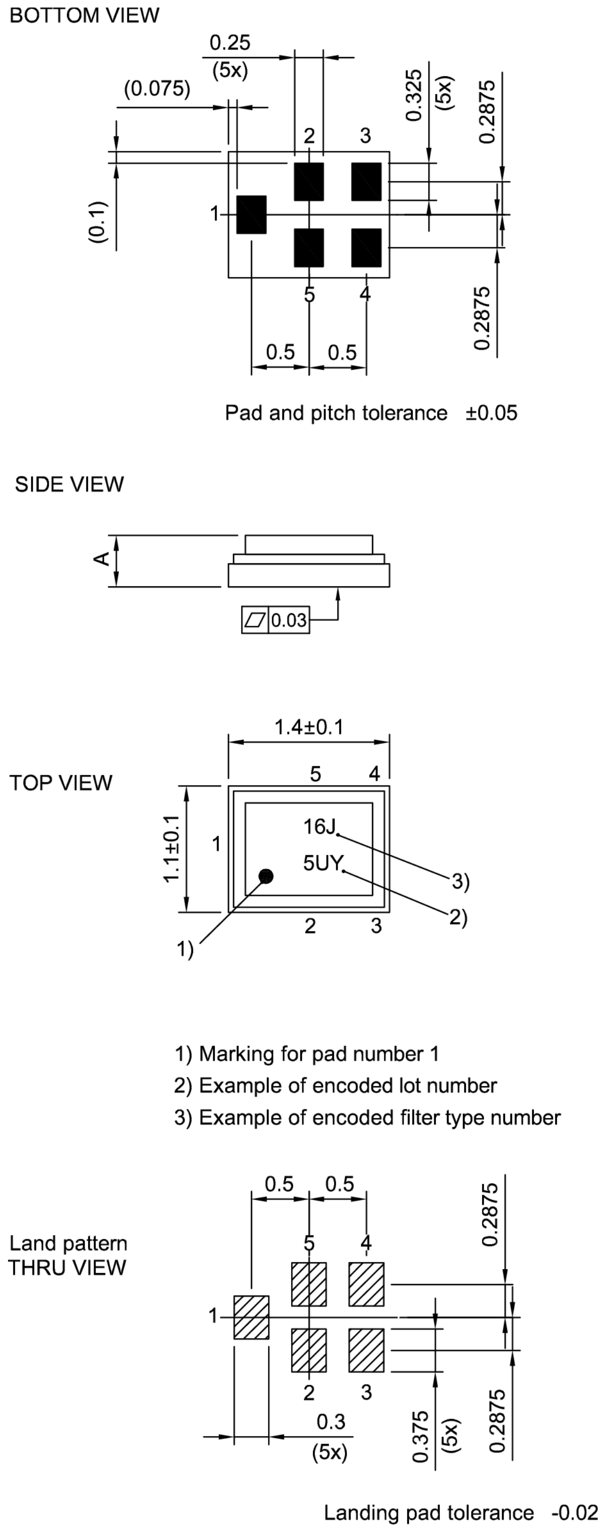


Figure 1: Picture of component with example of product marking.

3 Package



Pad and pitch tolerance ±0.05

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

Landing pad tolerance -0.02

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Simplified drawings (p. 16).

4 Pin configuration

■ 1	Input
■ 4	Output
■ 2, 3, 5	Ground

5 Matching circuit

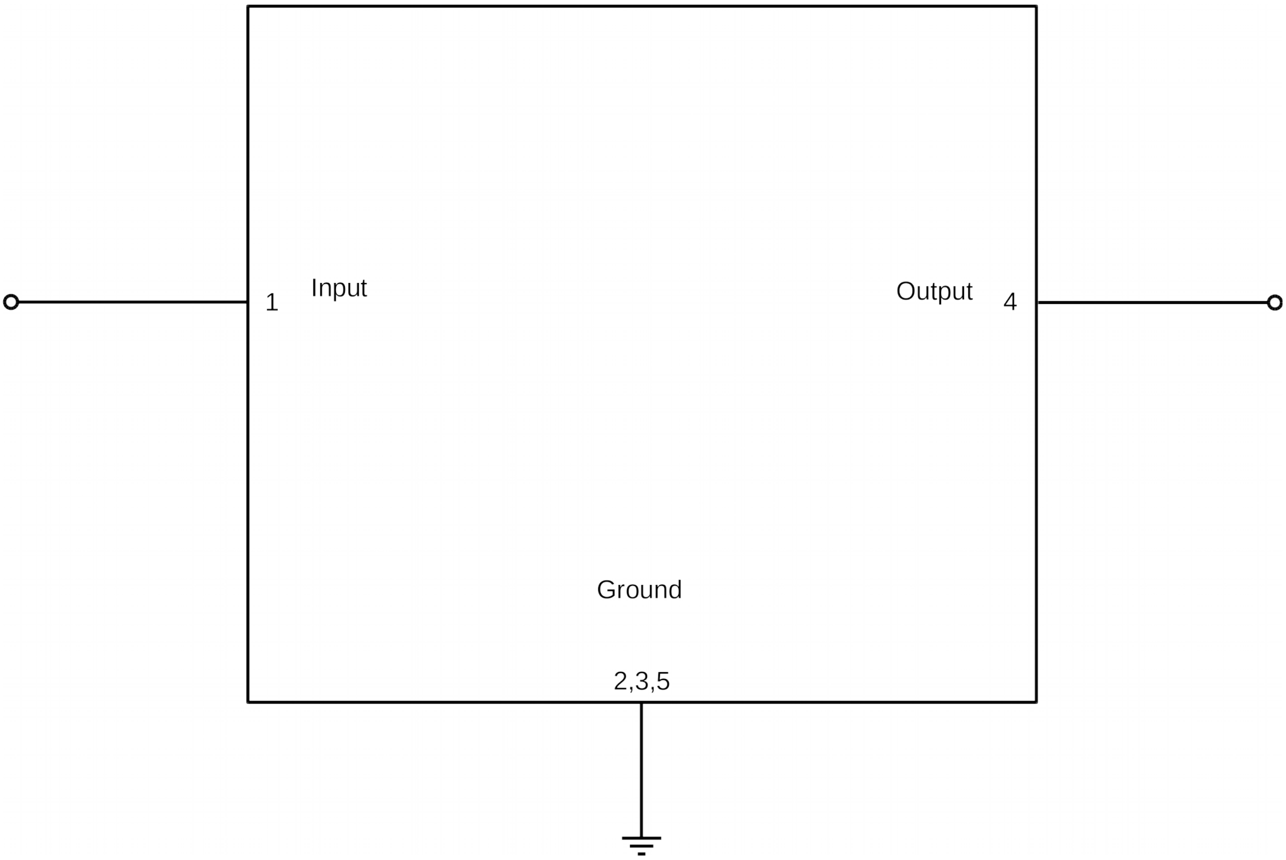


Figure 3: Schematic of matching circuit. No external matching components required.

6 Characteristics

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

Characteristics			**min.**	**typ.** @+25 °C	**max.**	
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. 15).

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

7 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +85 °C	
Storage temperature	T_{STG} = −40 °C ... +85 °C	
DC voltage	V_{DC} = 0 V	
ESD voltage	V_{ESD} [1] = 50 V	Machine model.
Input power @ input port: 1850.625 ... 1909.375 MHz	P_{IN} = 8.0 dBm	Continuous wave for 50000 h @ 55 °C.

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

[2] Time to failure (TTF) according to accelerated power durability test, and wear out models.

8 Transmission coefficient

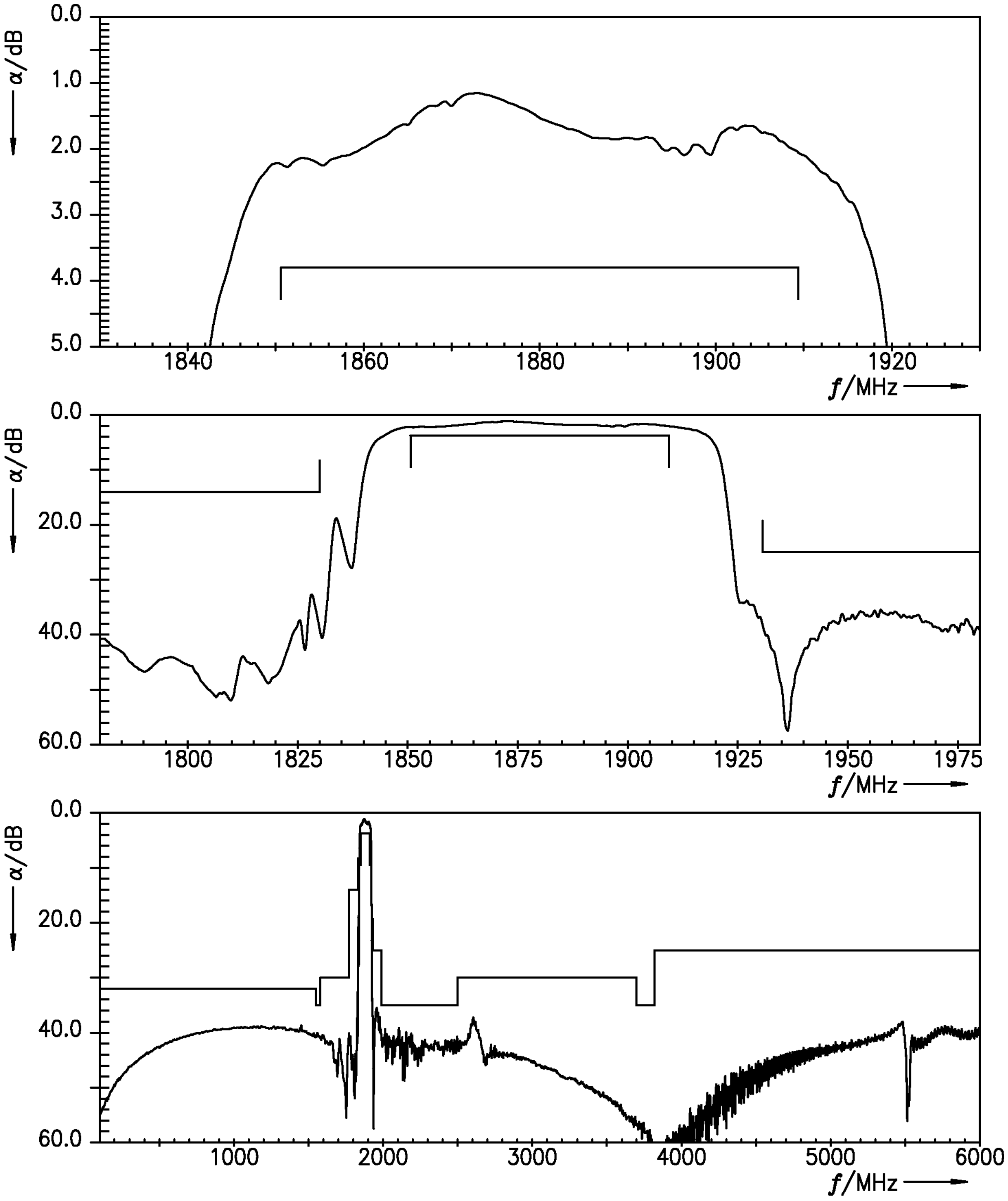


Figure 4: Attenuation.

9 Reflection coefficients

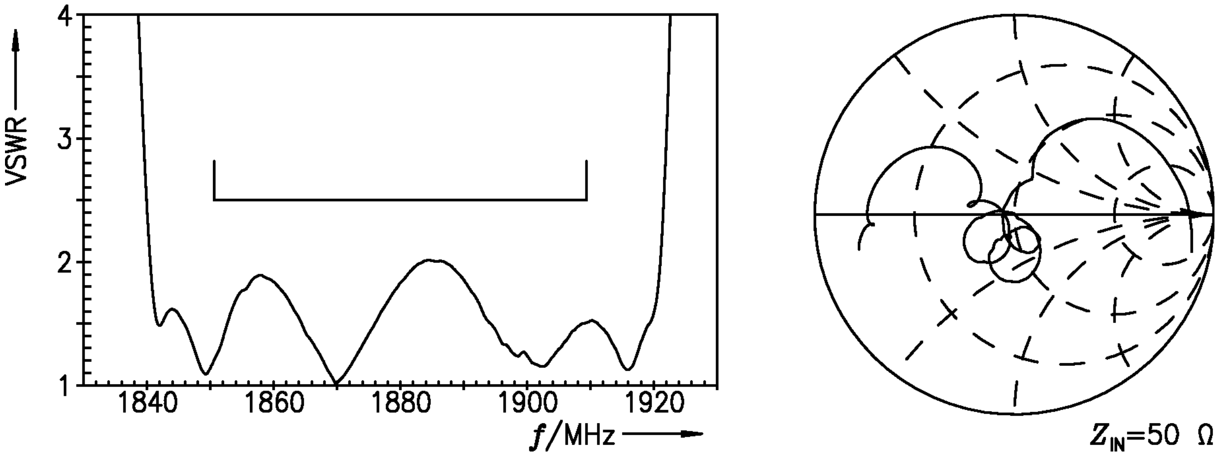


Figure 5: Reflection coefficient at IN port.

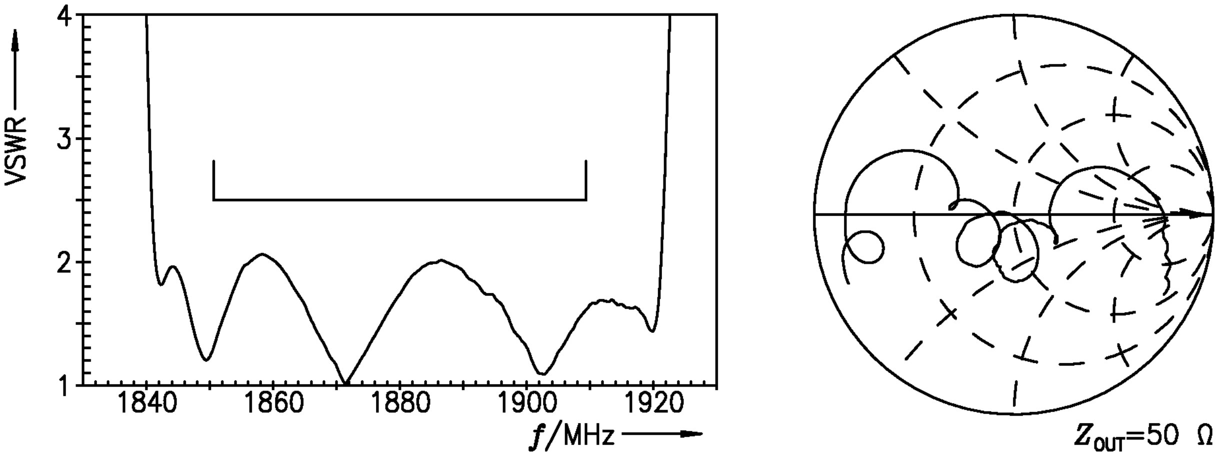


Figure 6: Reflection coefficient at OUT port.

10 EVM

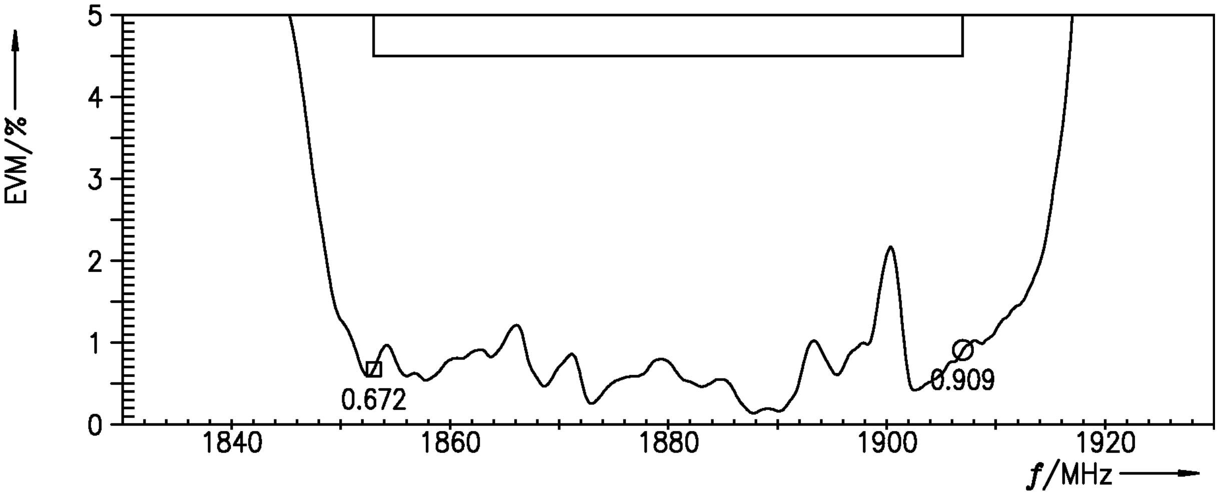


Figure 7: Error vector magnitude.

11 Packing material

11.1 Tape

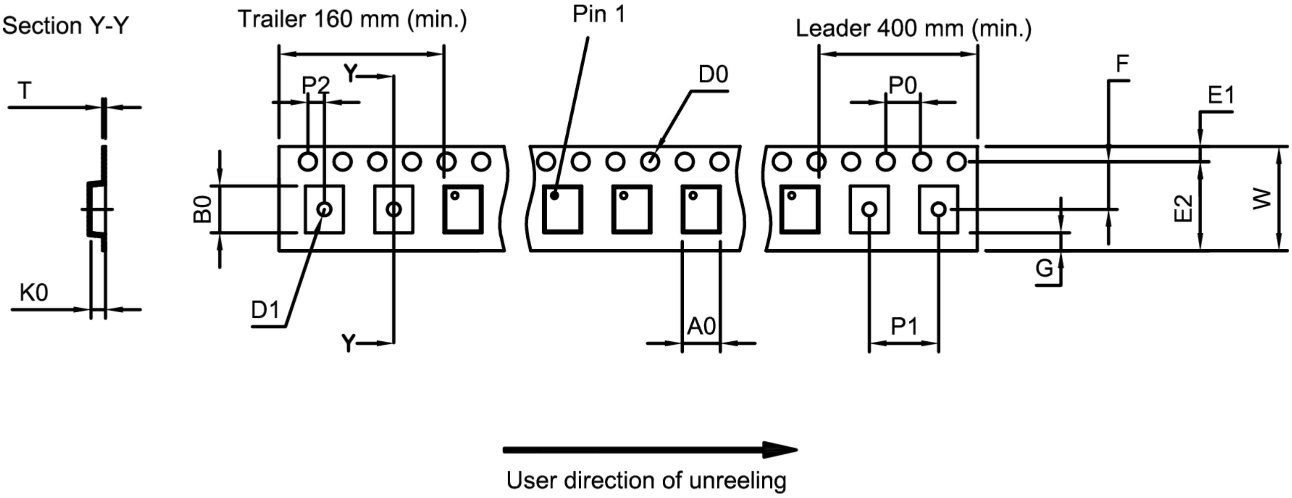
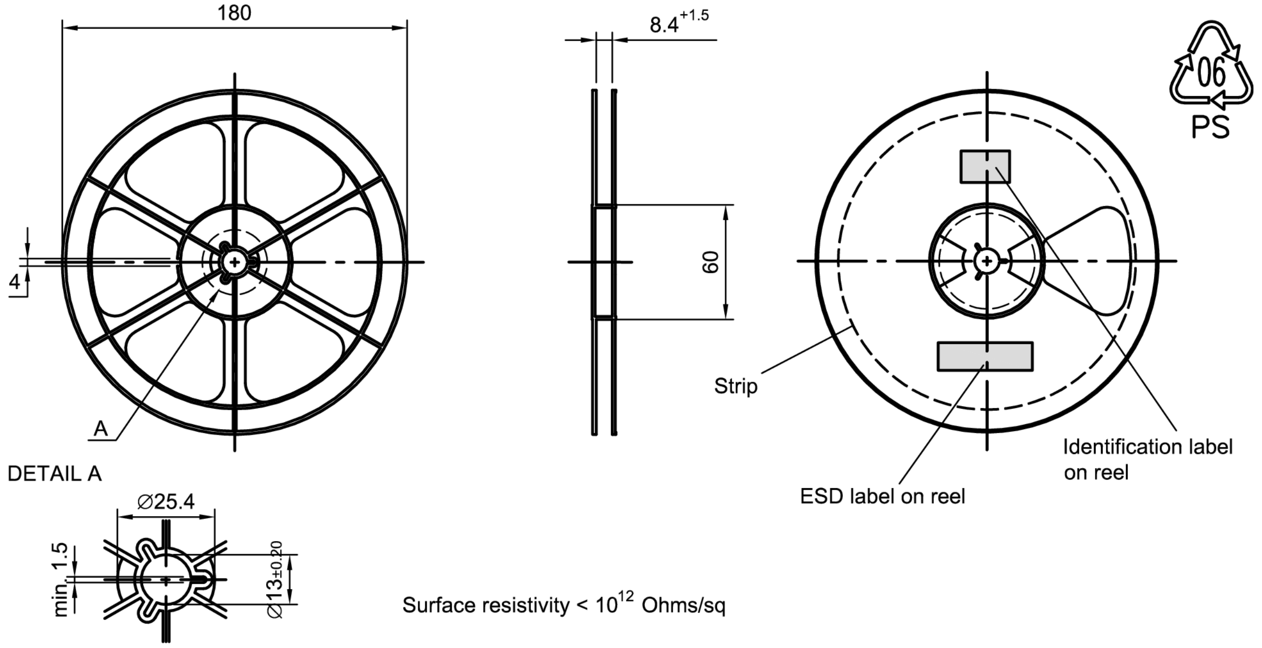


Figure 8: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

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.

11.2 Reel with diameter of 180 mm



Surface resistivity < 10^{12} Ohms/sq

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

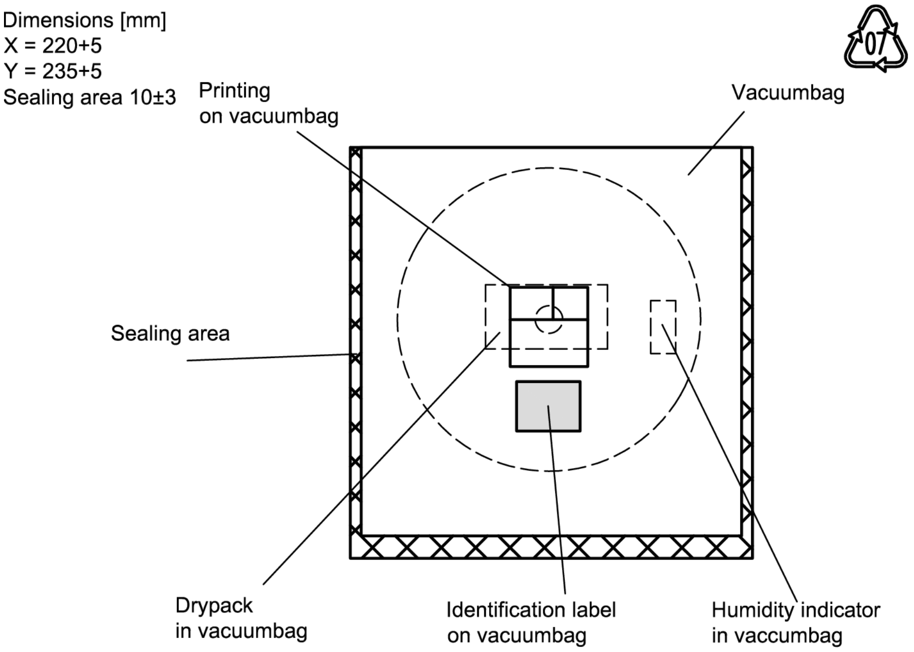


Figure 10: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

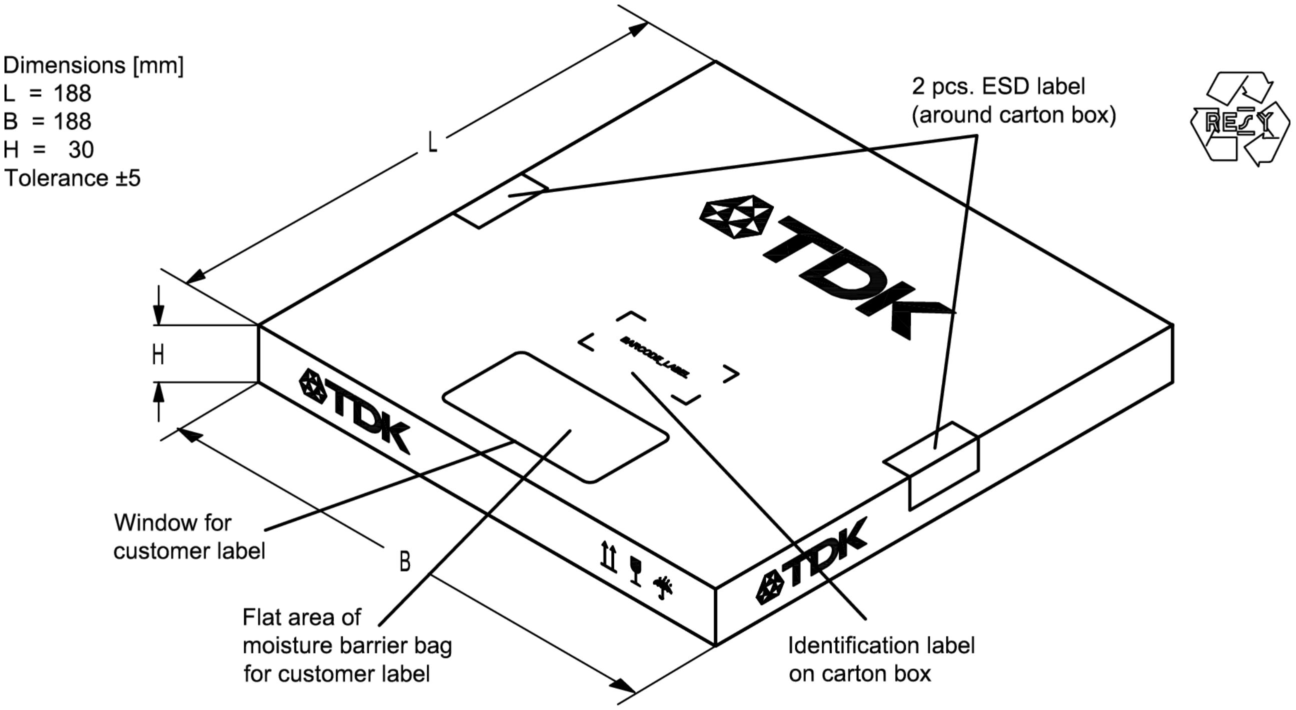


Figure 11: Drawing of folding box for reel with diameter of 180 mm.

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**
  $\mathbf{1} \times 32^2 + \mathbf{6} \times 32^1 + \mathbf{18\ (=J)} \times 32^0$ **=** **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 in decimal code.
  5UY **=>** **12345**
  $\mathbf{5} \times 47^2 + \mathbf{27\ (=U)} \times 47^1 + \mathbf{31\ (=Y)} \times 47^0$ **=** **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 – 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 +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).

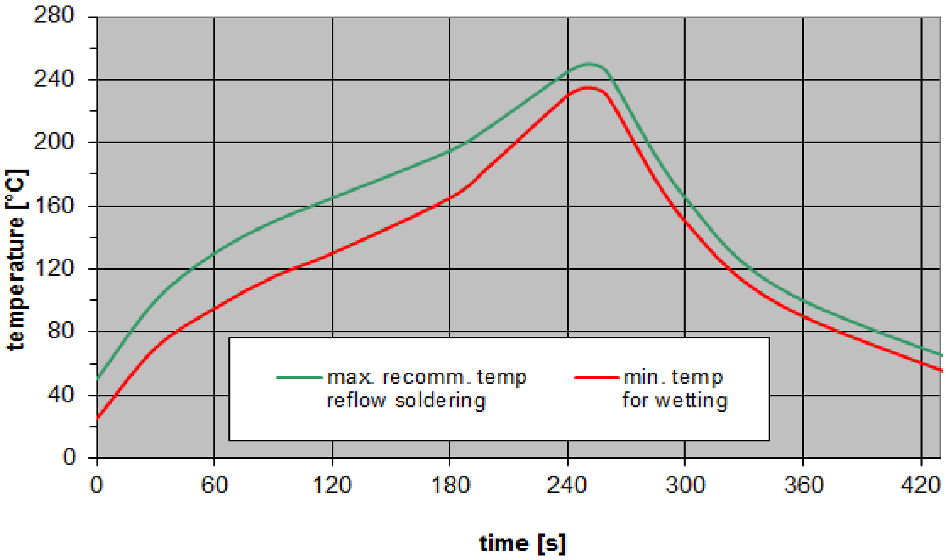


Figure 12: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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

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

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

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

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 EPCOS sales office.

14.5 Ordering codes and packing units

Ordering code	Packing unit
B39192B9611P810	5000 pcs

Table 4: Ordering codes and packing units.

15 Cautions and warnings

15.1 Display of ordering codes for EPCOS 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 EPCOS, 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.epcos.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.

15.3 Moldability

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

15.4 Simplified drawings

Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on EPCOS 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 EPCOS, 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:

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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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