Qualcomm

RF360
Europe GmbH

SAW components

SAW 2in1 filter
TD-LTE band 34 + TD-LTE band 39

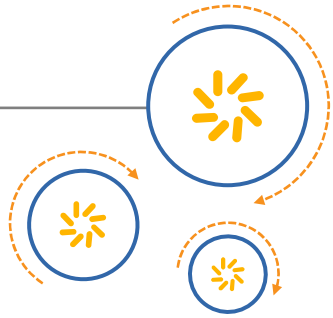
Series/type:	B9923
Ordering code:	B39202B9923P810
Date:	October 04, 2017
Version:	2.3

RF360 products mentioned within this document are products of RF360 Europe GmbH and other subsidiaries of RF360 Holdings Singapore Pte. Ltd. (collectively, the “RF360 Subsidiaries”).

RF360 Europe GmbH, Anzinger Str. 13, München, Germany

RF360 Europe GmbH

A Qualcomm – TDK Joint Venture



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RF360 Europe GmbH, Anzinger Str. 13, München, Germany

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1 Application

- Low-loss 2in1 RF filter for mobile telephone Band 39 and Band 34 systems, receive path (Rx)
- Usable pass band:
  Band 39: 40 MHz
  Band 34: 15 MHz
- Impedance transformation from 50Ω to 50Ω for both filters
- Unbalanced to unbalanced operation for both filters
- Low amplitude ripple

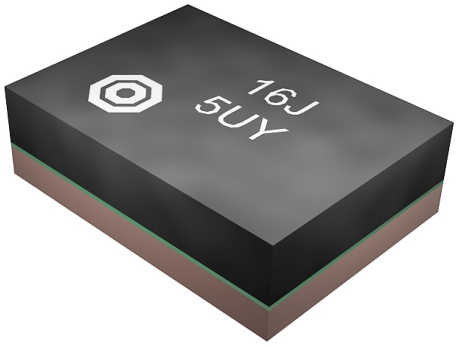

Figure 1: Picture of component with example of product marking.

2 Features

- Package size 1.5±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 3 (MSL3)

3 Package

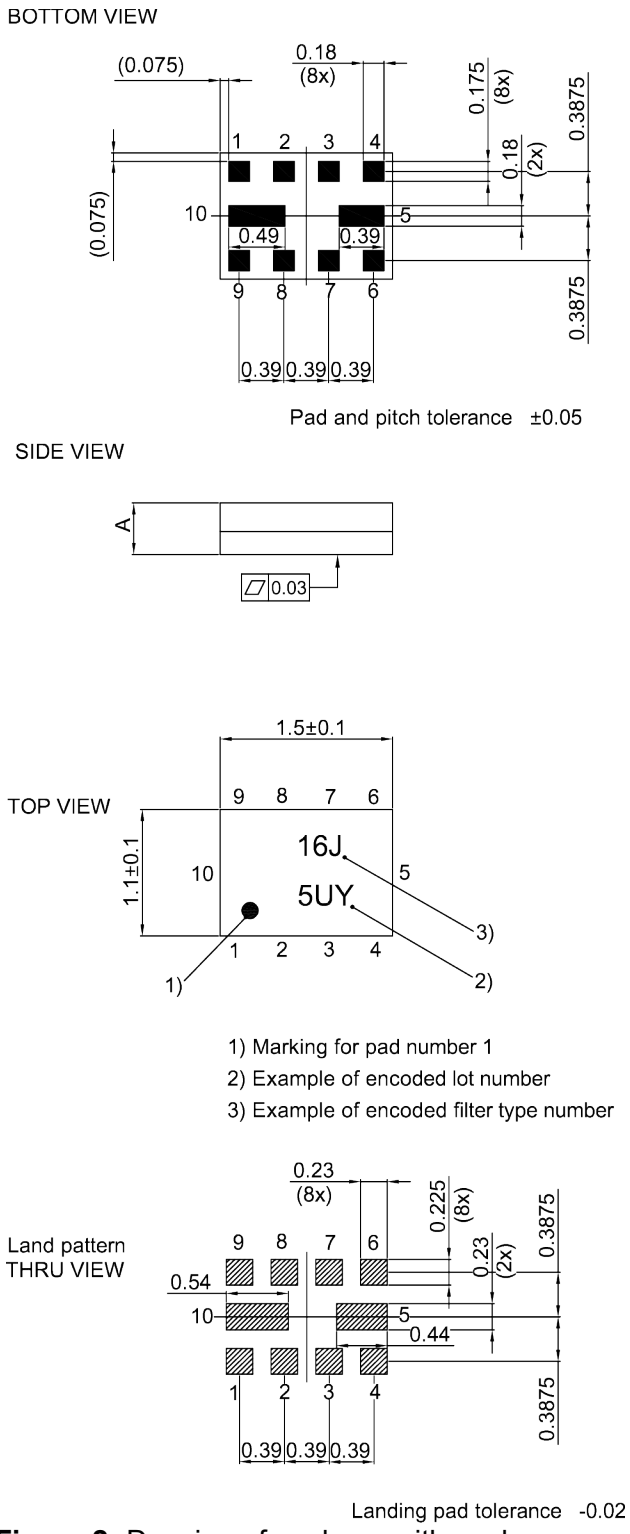

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 21).

4 Pin configuration[1)]

- 1 Output Diplexed (TD-LTE B34 & TD-LTE B39)
- 6 Input (TD-LTE B34)
- 9 Input (TD-LTE B39)
- 2, 3, 4, 5, 7, 8, 10 Ground

1) Note that the component can be used bidirectionally as output(s) can also be used as input(s).

5 Matching circuit

■ L_{s1} = 1.5 nH

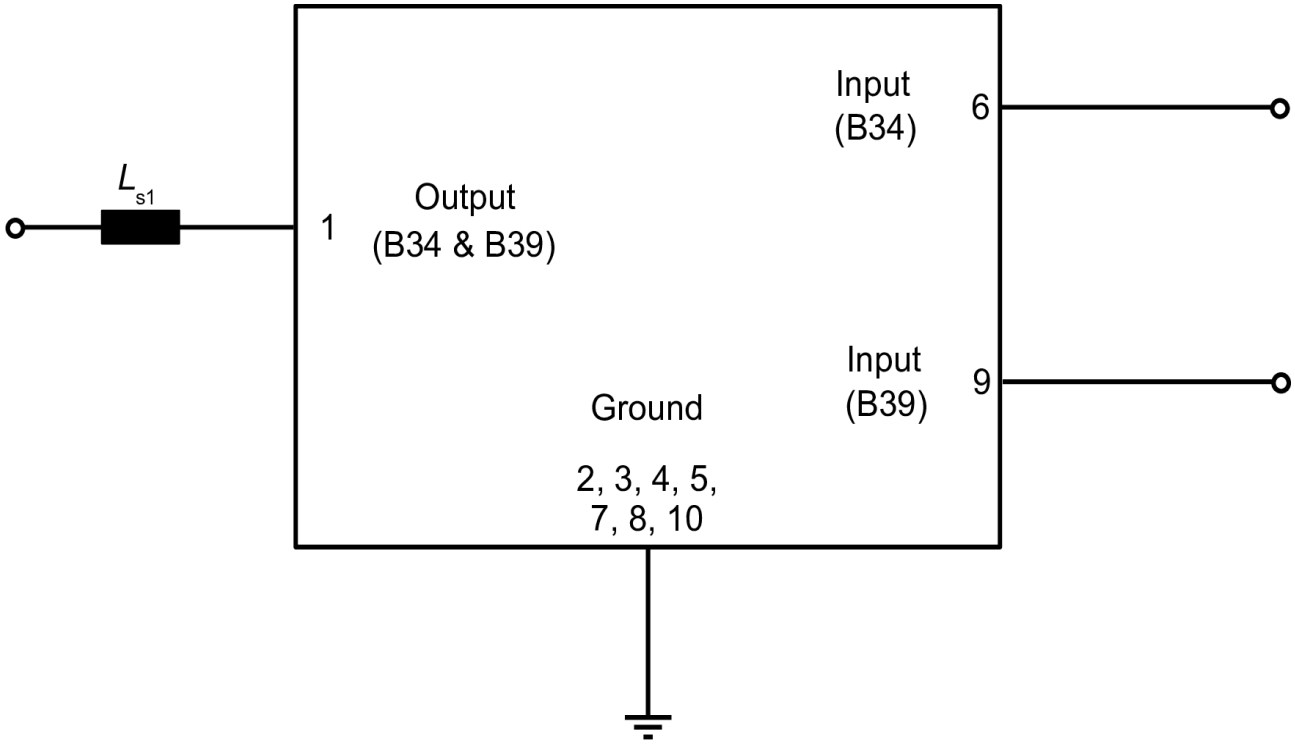

Figure 3: Schematic of matching circuit.

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

6 Characteristics TD-LTE B34

Temperature range for specification T_{SPEC} = −20 °C ... +90 °C
B34 input terminating impedance $Z_{B34\ IN}$ [2)] = 50 Ω
Output terminating impedance Z_{OUT} [2)] = 50 Ω with ser. 1.5 nH[1)]

Characteristics TD-LTE B34				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	2017.5	—	MHz
Maximum insertion attenuation			α_{max}				
	2010 ... 2025	MHz		—	1.7	2.1	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	2010 ... 2025	MHz		—	0.1	0.5	dB
Maximum VSWR			$VSWR_{max}$				
@ B34 input port	2010 ... 2025	MHz		—	1.2	1.7	
@ output port	2010 ... 2025	MHz		—	1.2	1.7	
Minimum attenuation			α_{min}				
	10 ... 1710	MHz		46	50	—	dB
	1710 ... 1785	MHz		50	55	—	dB
	1785 ... 1815	MHz		52	57	—	dB
	1815 ... 1840	MHz		54	60	—	dB
	1840 ... 1895	MHz		38	43	—	dB
	1925 ... 1980	MHz		12	15	—	dB
	2050 ... 2085	MHz		3	7	—	dB
	2085 ... 2110	MHz		35	39	—	dB
	2110 ... 2400	MHz		36	42	—	dB
	2400 ... 2500	MHz		46	51	—	dB
	2500 ... 4900	MHz		42	48	—	dB
	4900 ... 5950	MHz		42	50	—	dB
	5950 ... 6000	MHz		40	56	—	dB

1) See Sec. Matching circuit (p. 6).
2) Note that the component can be used bidirectionally as output(s) can also be used as input(s).

7 Characteristics TD-LTE B39

Temperature range for specification T_{SPEC} = −20 °C ... +90 °C
B39 input terminating impedance $Z_{B39\ IN}$ [2)] = 50 Ω
Output terminating impedance Z_{OUT} [2)] = 50 Ω with ser. 1.5 nH[1)]

Characteristics TD-LTE B39				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	1900	—	MHz
Maximum insertion attenuation			α_{max}				
	1880... 1920	MHz		—	1.7	2.3	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	1880... 1920	MHz		—	0.3	0.9	dB
Maximum VSWR			$VSWR_{max}$				
@ B39 input port	1880... 1920	MHz		—	1.6	2.0	
@ output port	1880... 1920	MHz		—	1.6	2.1	
Minimum attenuation			α_{min}				
	10... 1710	MHz		40	45	—	dB
	1710... 1735	MHz		45	53	—	dB
	1735... 1785	MHz		40	45	—	dB
	1785... 1820	MHz		30	35	—	dB
	1820... 1850	MHz		23	28	—	dB
	1950... 1980	MHz		19	37	—	dB
	1980... 2025	MHz		38	42	—	dB
	2025... 2400	MHz		40	45	—	dB
	2400... 2500	MHz		44	49	—	dB
	2500... 4900	MHz		31	36	—	dB
	4900... 5950	MHz		25	35	—	dB
	5950... 6000	MHz		25	35	—	dB

1) See Sec. Matching circuit (p. 6).
2) Note that the component can be used bidirectionally as output(s) can also be used as input(s).

8 Maximum ratings

Storage temperature	T_{STG} = −40 °C ... +85 °C[1)]	
DC voltage	$\|V_{DC}\|$ = 5.0 V[2)]	
ESD voltage	V_{ESD} = 50 V[3)]	Machine model.
Input power	P_{IN}	
@ input port: 1710 ... 1785 MHz for Band 39	32 dBm[4)]	GSM 1:8 signal for 2000 h @ 50 °C.
@ input port: 1710 ... 1785 MHz for Band 34	32 dBm[4)]	GSM 1:8 signal for 2000 h @ 50 °C.
@ input port: 1880 ... 1920 MHz for Band 39	18 dBm[5)]	Continuous wave for 2000 h @ 55 °C.
@ input port: 2010 ... 2025 MHz for Band 34	17 dBm[6)]	Continuous wave for 2000 h @ 55 °C.

1) Extended upperlimit: 96h@125°C acc. to IEC 60068-2-2 Bb.
2) 168h Damp Heat Steady State acc. IEC 60068-2-67 Cy.
3) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
4) ON-state power, same power handling capability when input power is applied at Pin 1.
5) 2dB better power handling capability when input power is applied at Pin 1.
6) 1dB better power handling capability when input power is applied at Pin 1.

9 Transmission coefficient TD-LTE B34

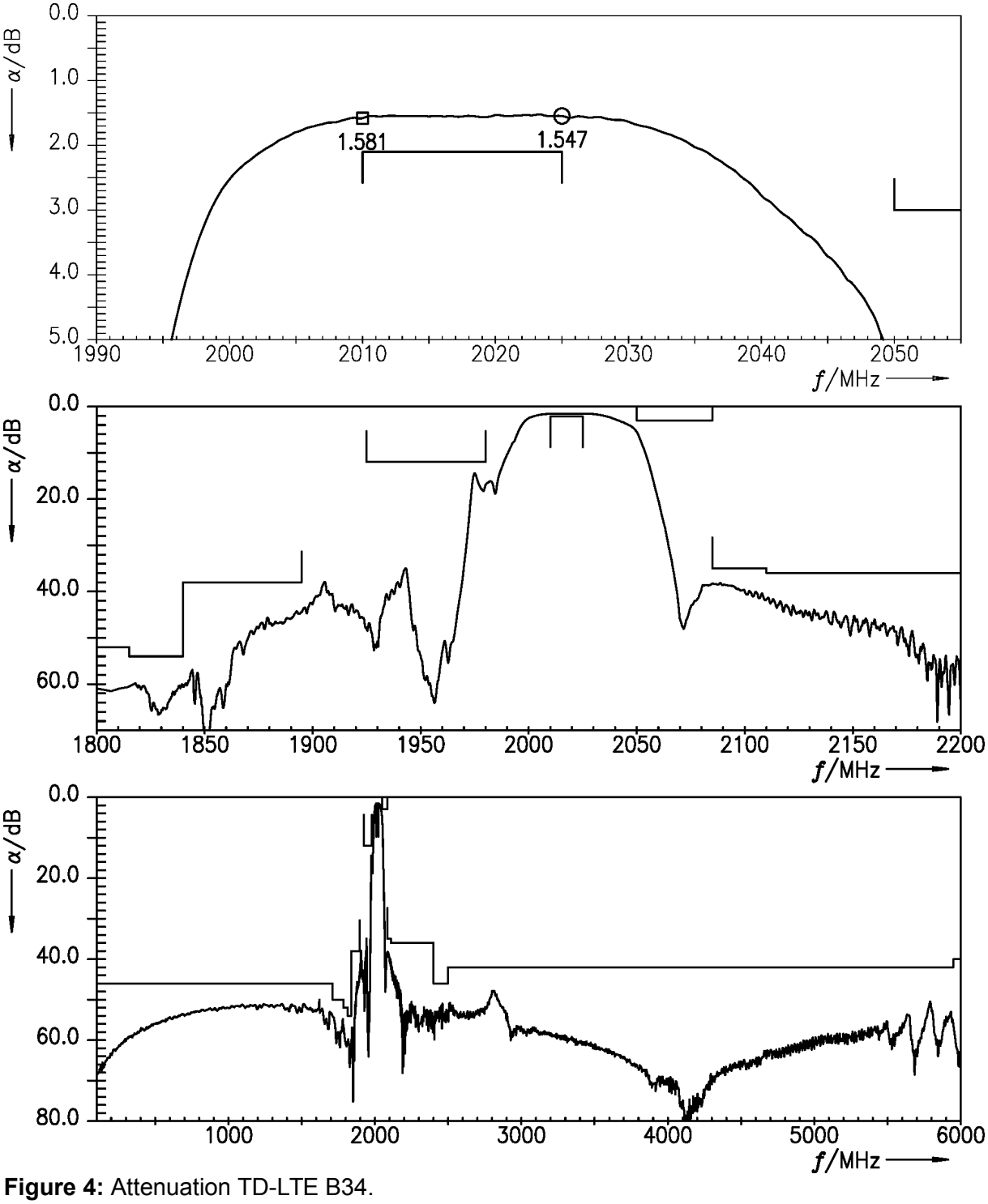

Figure 4: Attenuation TD-LTE B34.

10 Reflection coefficients TD-LTE B34

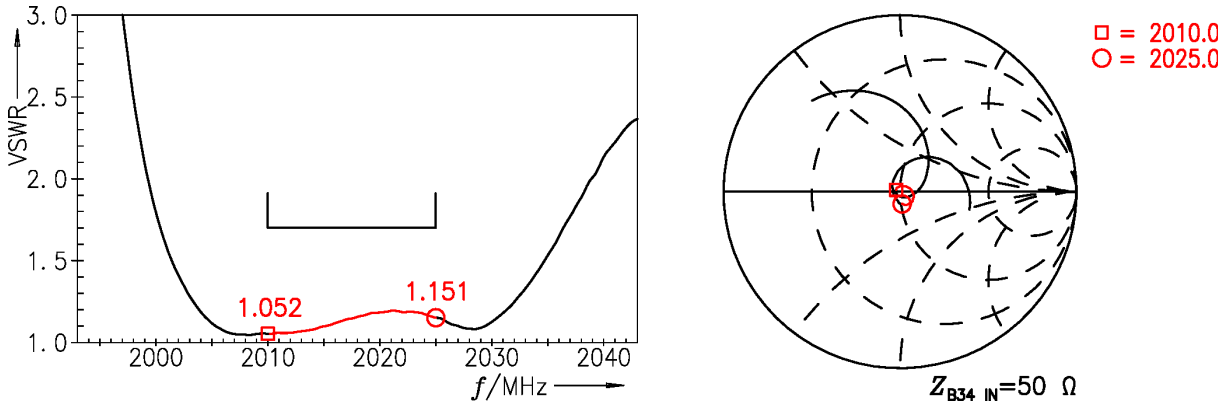

Figure 5: Reflection coefficient TD-LTE B34 at IN port.

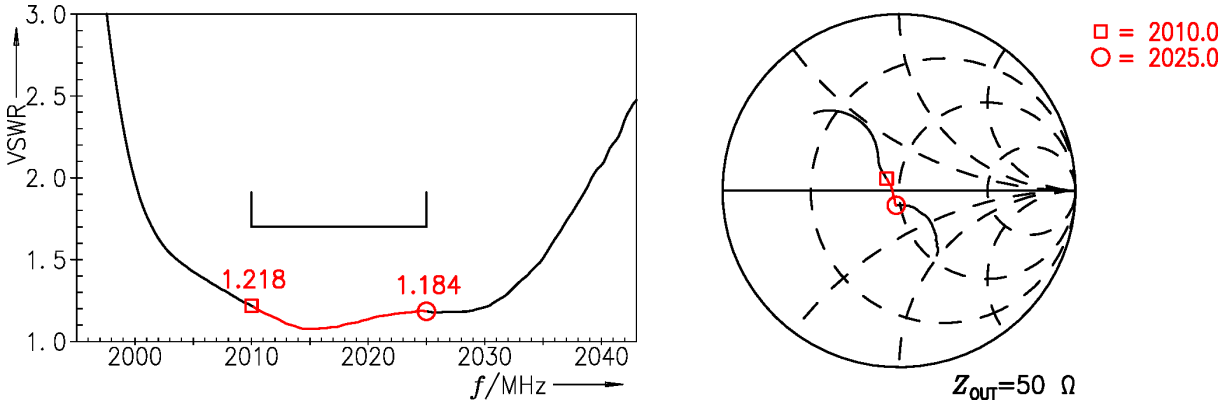

Figure 6: Reflection coefficient TD-LTE B34 at OUT port.

11 Transmission coefficient TD-LTE B39

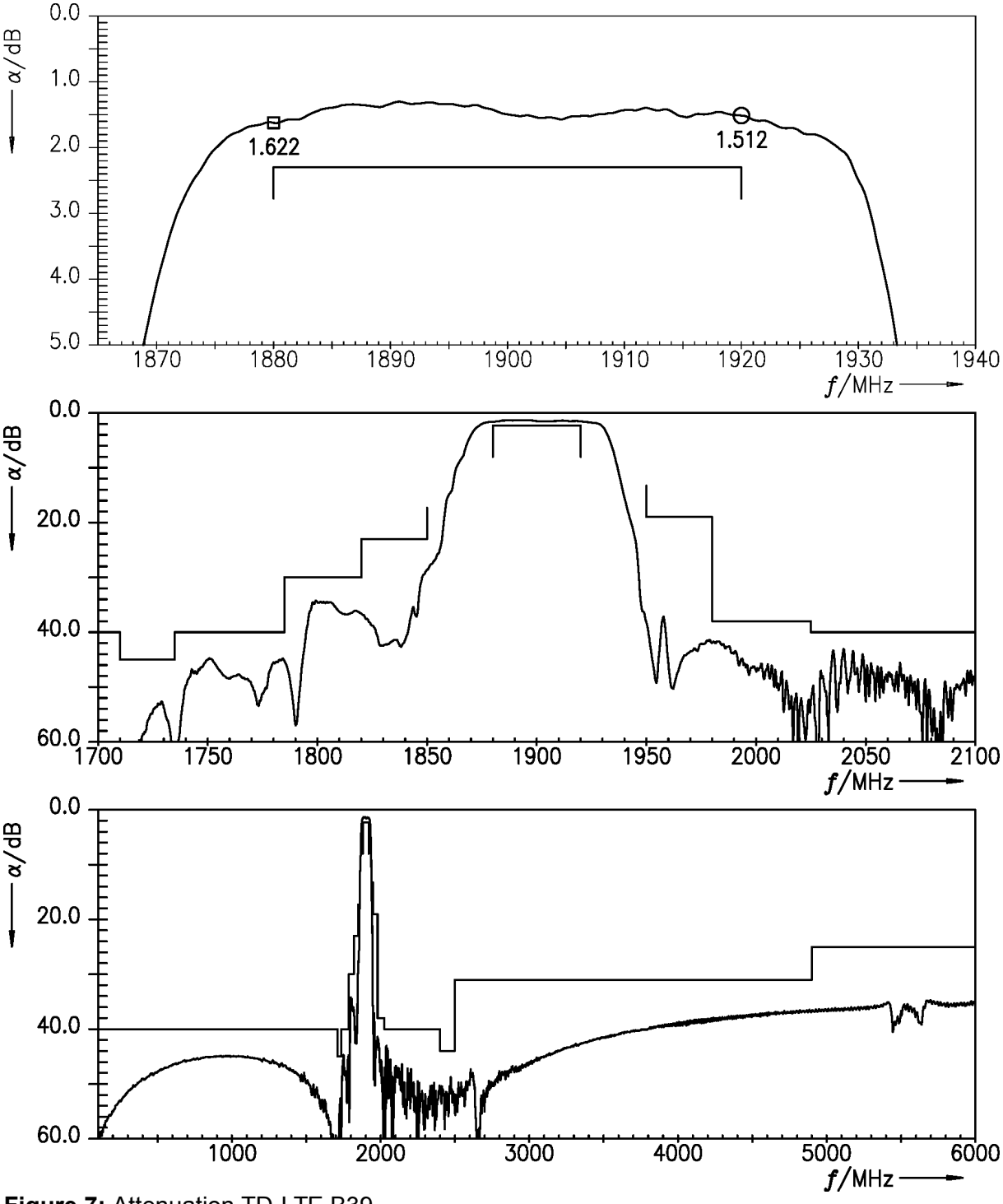

Figure 7: Attenuation TD-LTE B39.

12 Reflection coefficients TD-LTE B39

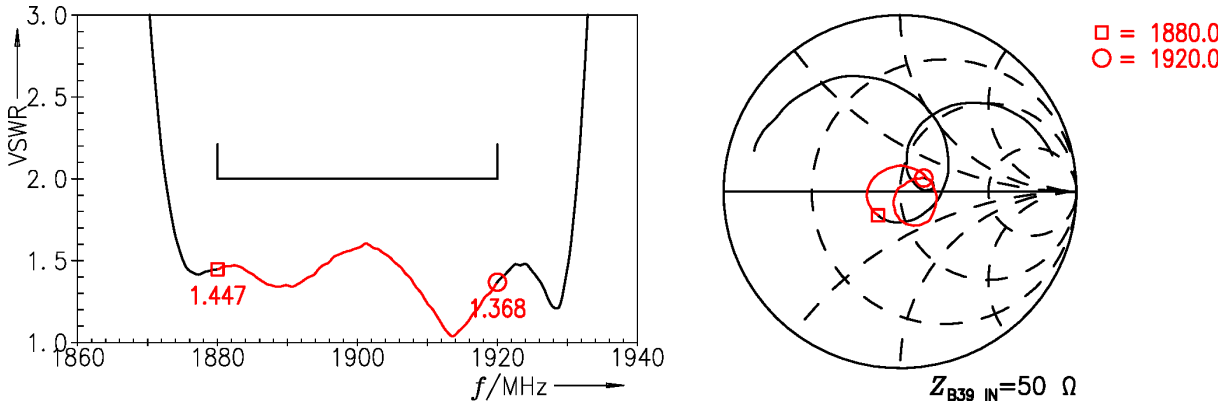

Figure 8: Reflection coefficient TD-LTE B39 at IN port.

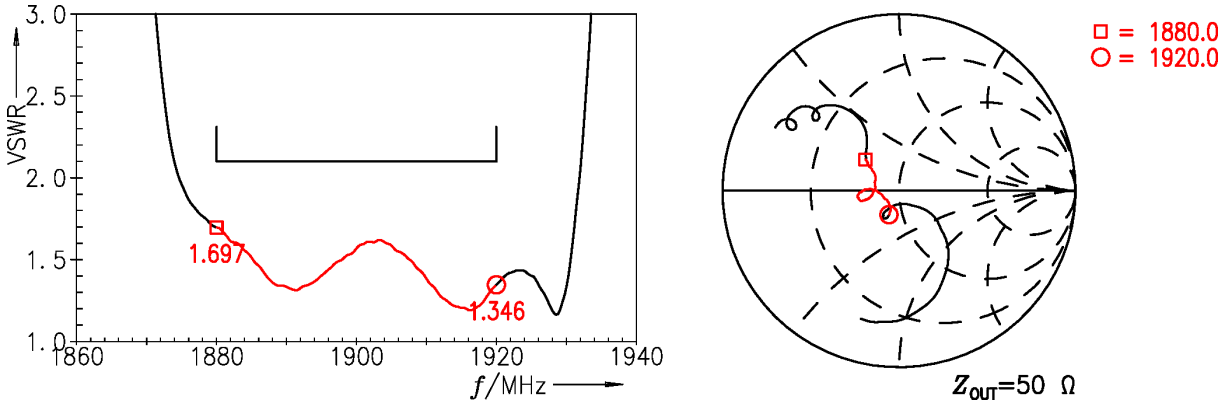

Figure 9: Reflection coefficient TD-LTE B39 at OUT port.

13 Packing material

13.1 Tape

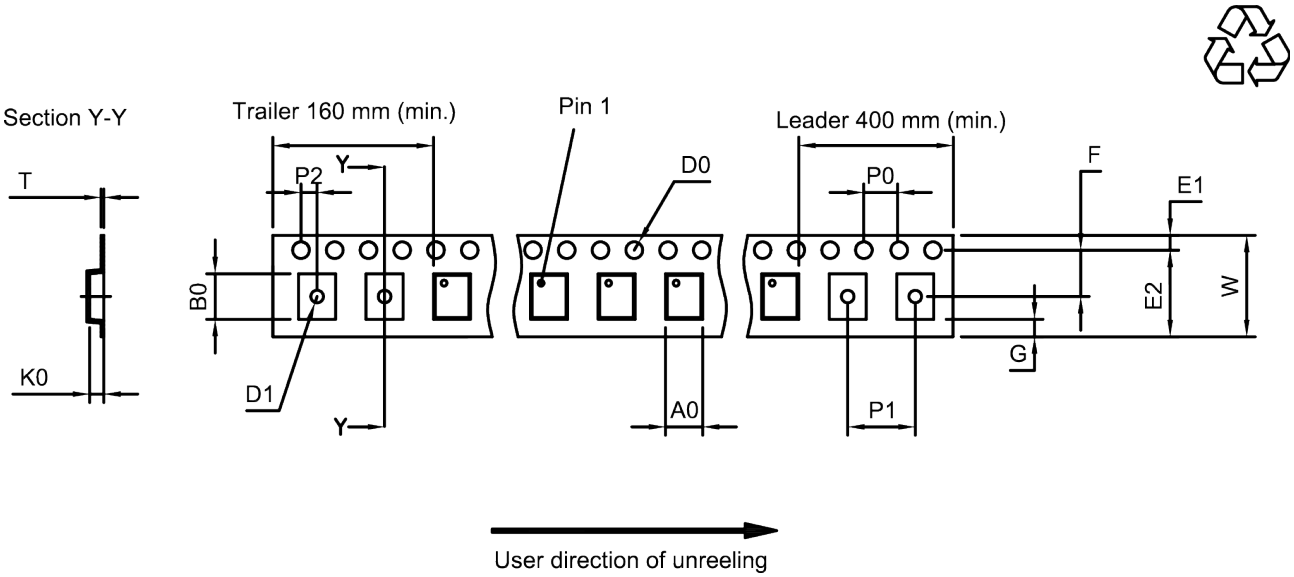

Figure 10: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$1.27_{\pm 0.05}$ mm
B_0	$1.67_{\pm 0.05}$ mm
D_0	$1.5^{+0.1/-0}$ mm
D_1	$0.5^{+0.1/-0}$ mm
E_1	$1.75_{\pm 0.1}$ mm

E_2	6.25 mm (min.)
F	$3.5_{\pm 0.05}$ mm
G	0.75 mm (min.)
K_0	$0.55_{\pm 0.05}$ mm
P_0	$4.0_{\pm 0.1}$ mm

P_1	$4.0_{\pm 0.1}$ mm
P_2	$2.0_{\pm 0.05}$ mm
T	$0.25_{\pm 0.03}$ mm
W	$8.0^{+0.3/-0.1}$ mm

Table 1: Tape dimensions.

13.2 Reel with diameter of 180 mm

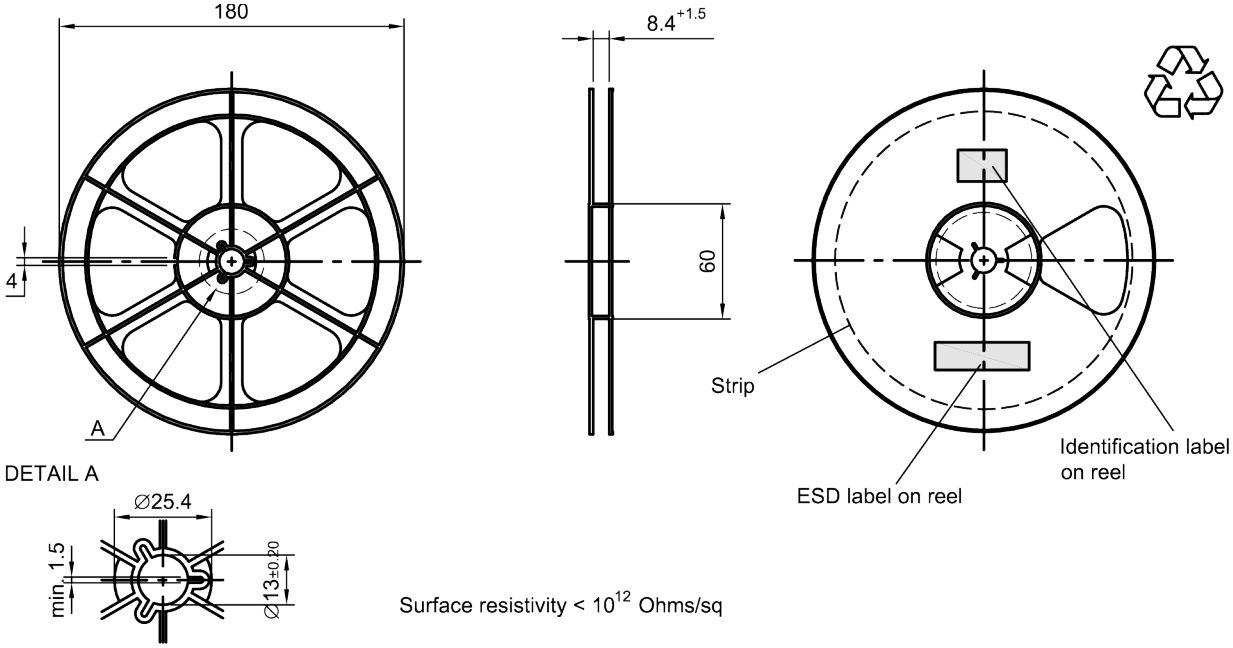

Figure 11: Drawing of reel (first-angle projection) with diameter of 180 mm.

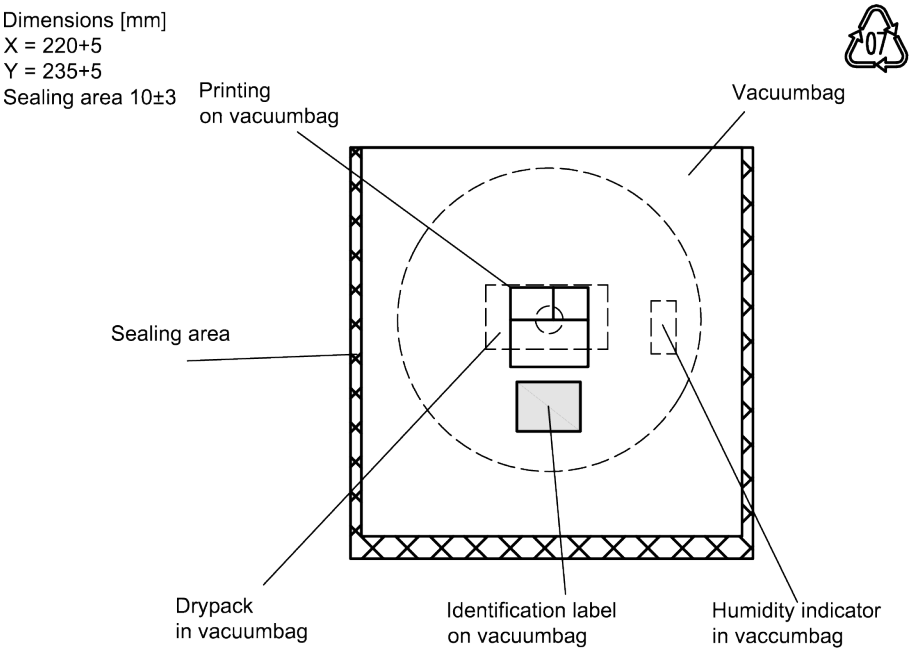

Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

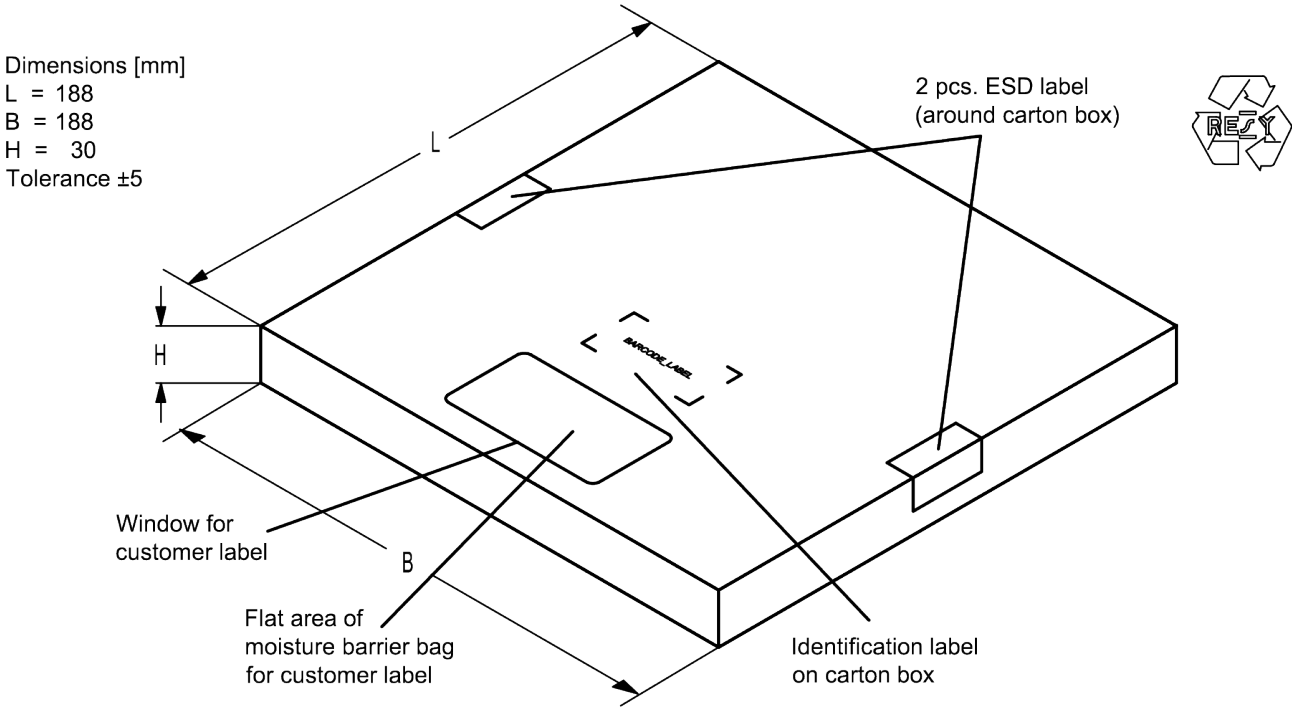

Figure 13: Drawing of folding box for reel with diameter of 180 mm.

13.3 Reel with diameter of 330 mm

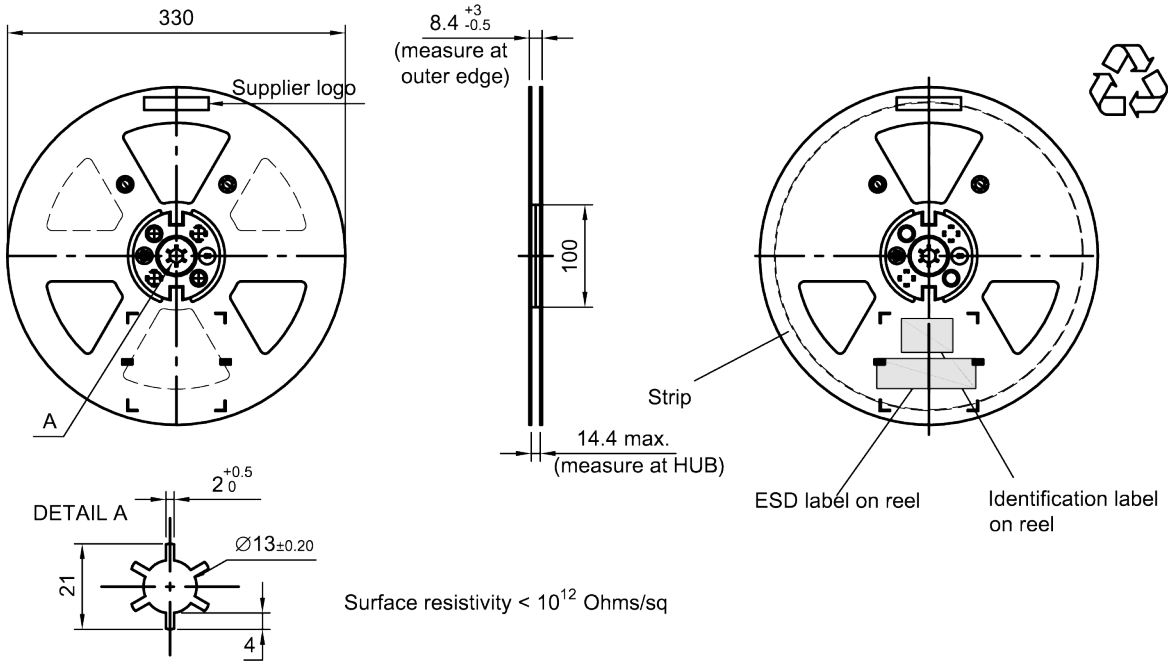

Figure 14: Drawing of reel (first-angle projection) with diameter of 330 mm.

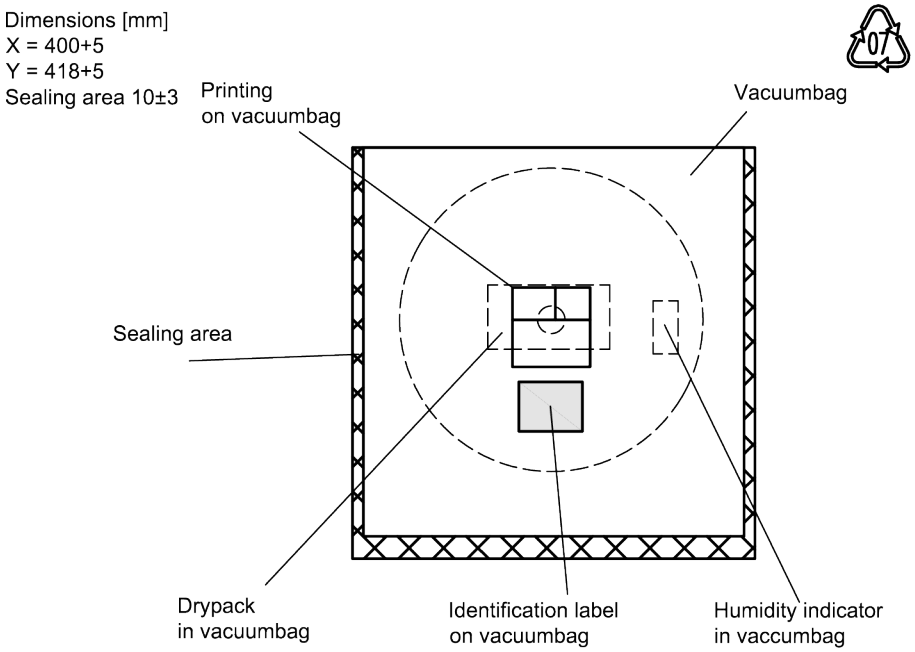

Figure 15: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

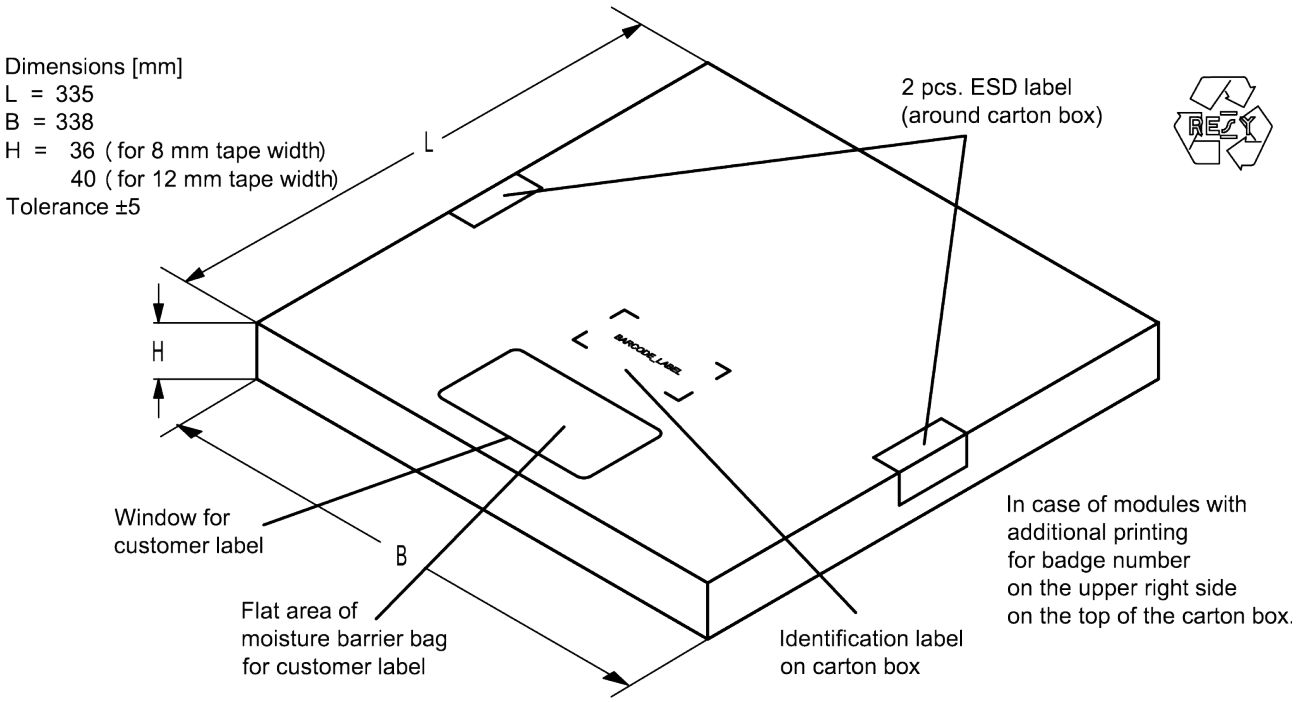

Figure 16: Drawing of folding box for reel with diameter of 330 mm.

14 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 x 32^2 + **6** x 32^1 + **18 (=J)** x 32^0 **=** **1234**
  The BASE32 code for product type B9923 is 9P3.

- 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 x 47^2 + **27 (=U)** x 47^1 + **31 (=Y)** x 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.

15 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 ≥ 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).

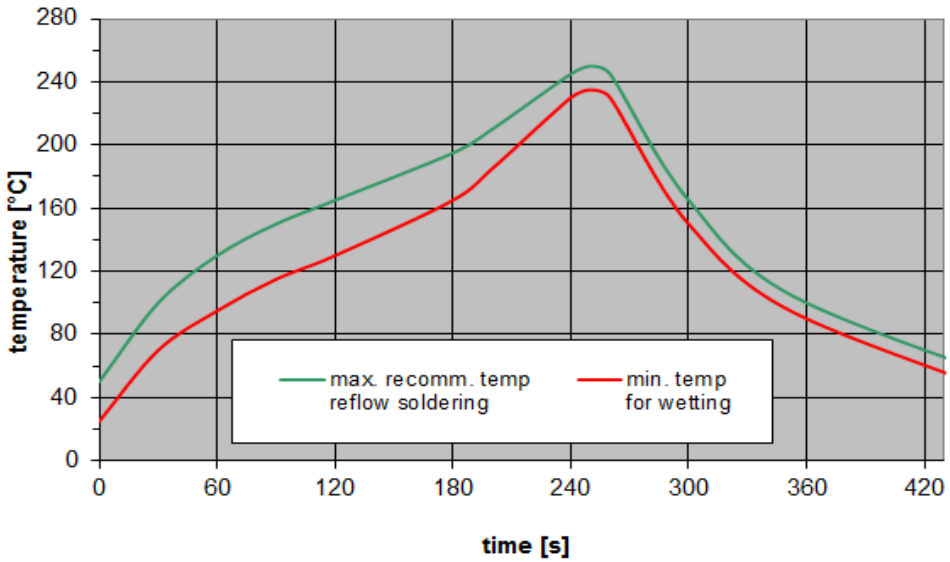

Figure 17: Recommended reflow profile for convection and infrared soldering – lead-free solder.

16 Annotations

16.1 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.

16.2 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.

16.3 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.

16.4 Ordering codes and packing units

Ordering code	Packing unit
B39202B9923P810	15000 pcs
B39202B9923P810S 5	5000 pcs

Table 4: Ordering codes and packing units.

17 Cautions and warnings

17.1 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.

17.2 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.

17.3 Moldability

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

17.4 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.

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.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.rf360jv.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.
   The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.