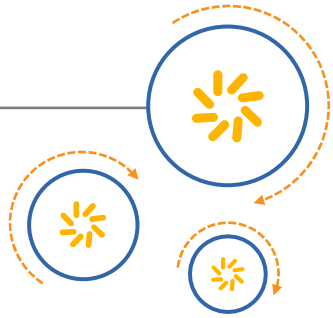
RF360 Europe GmbH

A Qualcomm – TDK Joint Venture



SAW components

SAW duplexer

LTE band 66

Series/type:	B1221
Ordering code:	B39222B1221L210
Date:	March 23, 2017
Version:	2.0

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

Data sheet

Table of contents

1 Application

- Low -loss SAW duplexer for mobile telephone LTE Band 66 system
- Low insertion attenuation
- Low amplitude ripple
- Usable TX pass band: 70 MHz
- Usable RX pass band: 90 MHz

2 Features

- Package size 1.8±0.1 mm × 1.4±0.1 mm
- Package height 0.6 mm (max.)
- Approximate weight 4 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

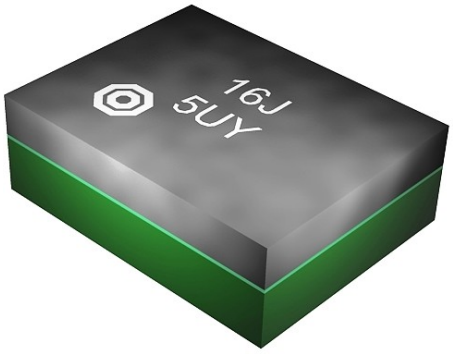

Figure 1: Picture of component with example of product marking.

3 Package

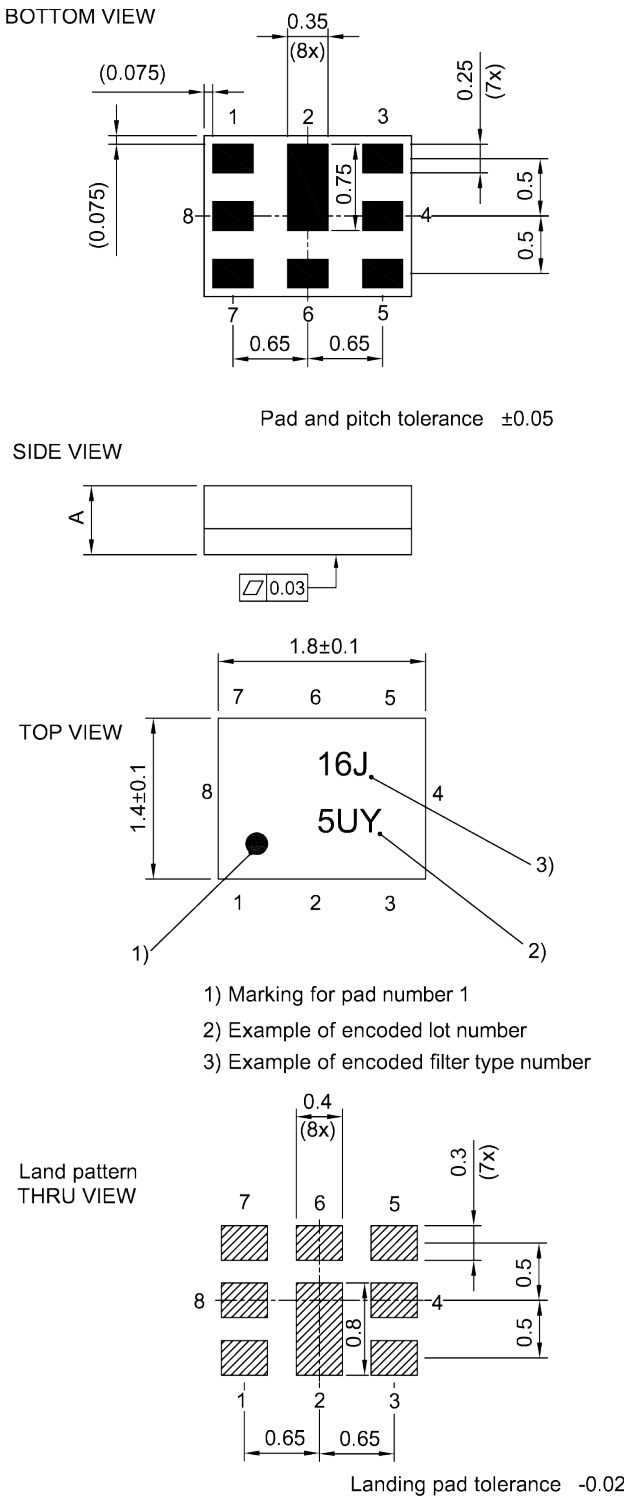

Figure 2: Drawing of package with package height A = 0.6 mm (max.). See Sec. Package information (p. 25).

4 Pin configuration

- 1 RX
- 3 TX
- 6 ANT
- 2, 4, 5, 7, 8 Ground

5 Matching circuit

- L_{p1} = 4.7 nH
- L_{s3} = 1.3 nH
- L_{p6} = 2.7 nH

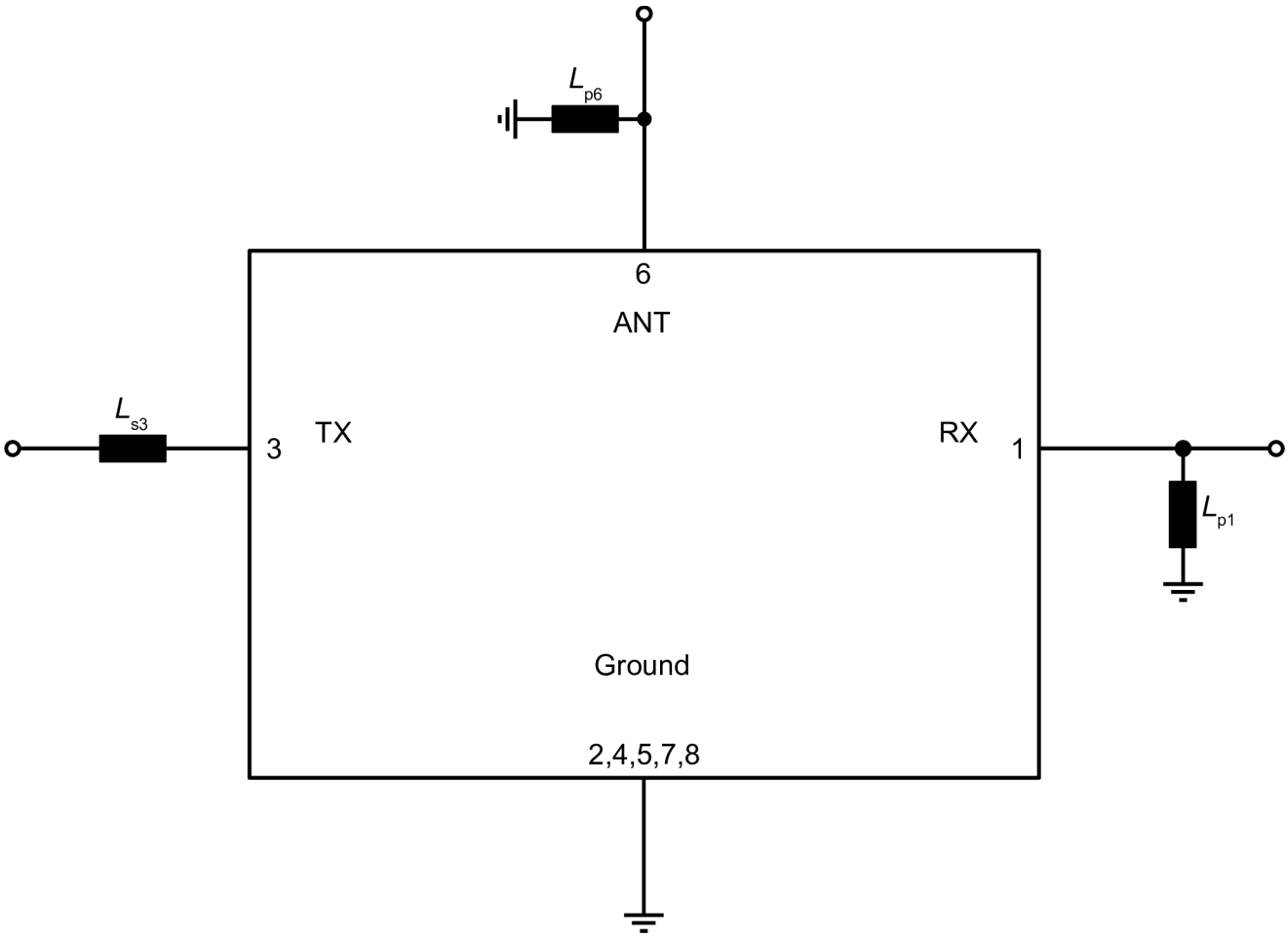

Figure 3: Schematic of matching circuit.

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

6 Characteristics

6.1 TX – ANT

Temperature range for specification	T_{SPEC}	= −30 °C ... +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 1.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.7 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with par. 4.7 nH[1)]

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	1745	—	MHz
Maximum insertion attenuation			α_{max}				
	1710 ... 1780	MHz		—	1.6	2.3	dB
Amplitude ripple (p-p)			Δα				
	1710 ... 1780	MHz		—	0.7	1.3	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	1710 ... 1780	MHz		—	1.6	2.0	
@ ANT port	1710 ... 1780	MHz		—	1.5	2.0	
Maximum error vector magnitude			EVM_{max}[2)]				
	1712.4 ... 1777.6	MHz		—	1.3	2.0	%
Minimum attenuation			α_{min}				
	10 ... 728	MHz		30	44	—	dB
	699 ... 716	MHz		30	44	—	dB
	704 ... 716	MHz		30	44	—	dB
	777 ... 787	MHz		30	42	—	dB
	824 ... 849	MHz		30	41	—	dB
	851 ... 894	MHz		38	40	—	dB
	1226 ... 1250	MHz		33	35	—	dB
	1559 ... 1563	MHz		36	39	—	dB
	1565.42 ... 1573.374	MHz		36	39	—	dB
	1573.374 ... 1577.466	MHz		37	40	—	dB
	1577.466 ... 1585.42	MHz		37	40	—	dB
	1597.5515 ... 1605.886	MHz		35	41	—	dB
	1805 ... 1880	MHz		2.5	6	—	dB
	2110 ... 2200	MHz		36	48	—	dB
	2350 ... 2360	MHz		21	34	—	dB
	2400 ... 2500	MHz		21	30	—	dB
	2440 ... 2494	MHz		21	31	—	dB
	2500 ... 2570	MHz		19	27	—	dB
	3410 ... 3520	MHz		10	14	—	dB
	4900 ... 5950	MHz		8	14	—	dB
	4905 ... 5267	MHz		8	14	—	dB
	6830 ... 7030	MHz		15	30	—	dB

1) See Sec. Matching circuit (p. 6).
2) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 1.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.7 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with par. 4.7 nH[1)]

Characteristics ANT – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	2155	—	MHz
Maximum insertion attenuation			α_{max}				
	2110 ... 2200	MHz		—	2.0	2.9	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	2110 ... 2200	MHz		—	0.8	1.6	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	2110 ... 2200	MHz		—	1.6	2.0	
@ RX port	2110 ... 2200	MHz		—	1.7	2.1	
Minimum attenuation			α_{min}				
	10 ... 1649	MHz		40	54	—	dB
	400	MHz		50	84	—	dB
	699 ... 716	MHz		45	69	—	dB
	777 ... 787	MHz		40	66	—	dB
	824 ... 849	MHz		40	64	—	dB
	1310 ... 1355	MHz		40	55	—	dB
	1649 ... 1672	MHz		30	41	—	dB
	1672 ... 1710	MHz		40	52	—	dB
	1710 ... 1780	MHz		45	52	—	dB
	1755 ... 2025	MHz		15	38	—	dB
	1910 ... 1955	MHz		30	48	—	dB
	2255 ... 6000	MHz		23	33	—	dB
	2305 ... 2315	MHz		40	51	—	dB
	2400 ... 2500	MHz		39	43	—	dB
	2500 ... 3820	MHz		35	39	—	dB
	3820 ... 3910	MHz		35	39	—	dB
	4220 ... 4310	MHz		34	38	—	dB
	4310 ... 8000	MHz		15	21	—	dB
	4900 ... 5950	MHz		25	35	—	dB
	5510 ... 5685	MHz		31	39	—	dB
	5530 ... 5665	MHz		32	39	—	dB
	6330 ... 6465	MHz		17	26	—	dB
IMD product levels							
IMD2[2)]							
Blocker 1	410	MHz		—	−122	−108	dBm

Characteristics ANT – RX			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Blocker 3	3900	MHz	—	−113	−99	dBm
IMD3[2)]						
Blocker 2	1335	MHz	—	−118	−103	dBm
Blocker 4	5645	MHz	—	−131	−116	dBm

1) See Sec. Matching circuit (p. 6).
2) IMD product level limits for power levels P_{TX} = 21 dBm (antenna port output power) and $P_{blocker}$ = −15 dBm (antenna port input power).

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 1.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.7 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with par. 4.7 nH[1)]

Characteristics TX – RX			**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Minimum isolation		α_{min}				
	1574... 1577 MHz		40	59	—	dB
	1710... 1780 MHz		50	53	—	dB
	2110... 2200 MHz		45	51	—	dB
	3410... 3570 MHz		20	50	—	dB
	5120... 5350 MHz		20	40	—	dB

[1)] See Sec. Matching circuit (p. 6).

7 Maximum ratings

Storage temperature	T_{STG} [1] = −40 °C ... +85 °C	
DC voltage	$\lvert V_{DC} \rvert$ = 5.0 V (max.)[2]	
ESD voltage		
	V_{ESD} [3] = 50 V (max.)	Machine model.
	V_{ESD} [4] = 250 V (max.)	Human body model.
	V_{ESD} [5] = 600 V (max.)	Charged device model.
Input power	P_{IN}	
@ TX port: 1710 ... 1780 MHz	29 dBm	Continuous wave for 5000 h @ 50 °C.
@ TX port: other frequency ranges	10 dBm	Continuous wave for 5000 h @ 50 °C.

1) Not valid for packaging material. Storage temperature for packaging material is −25 °C to +40 °C.
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) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
5) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

8 Transmission coefficients

8.1 TX – ANT

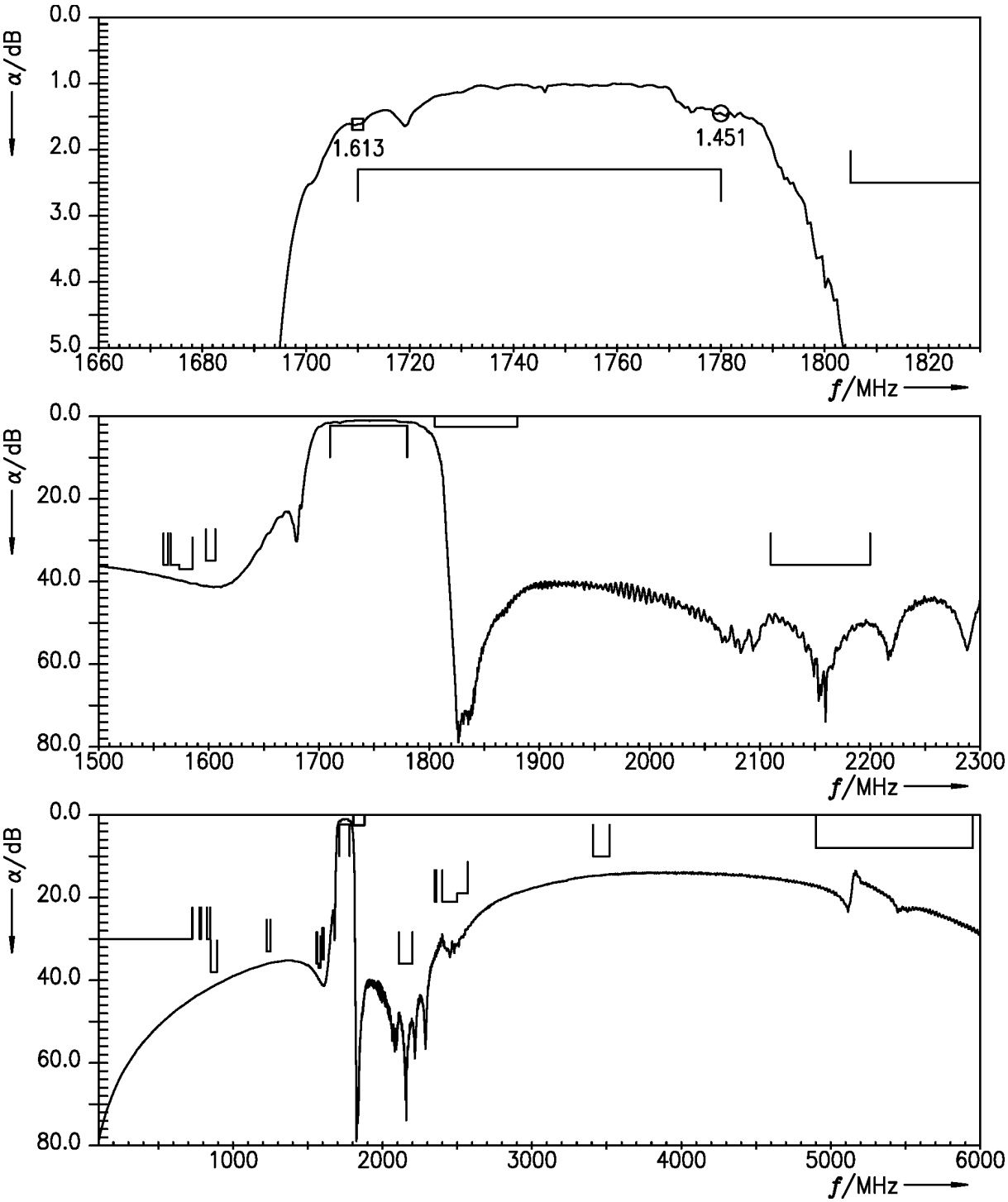

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

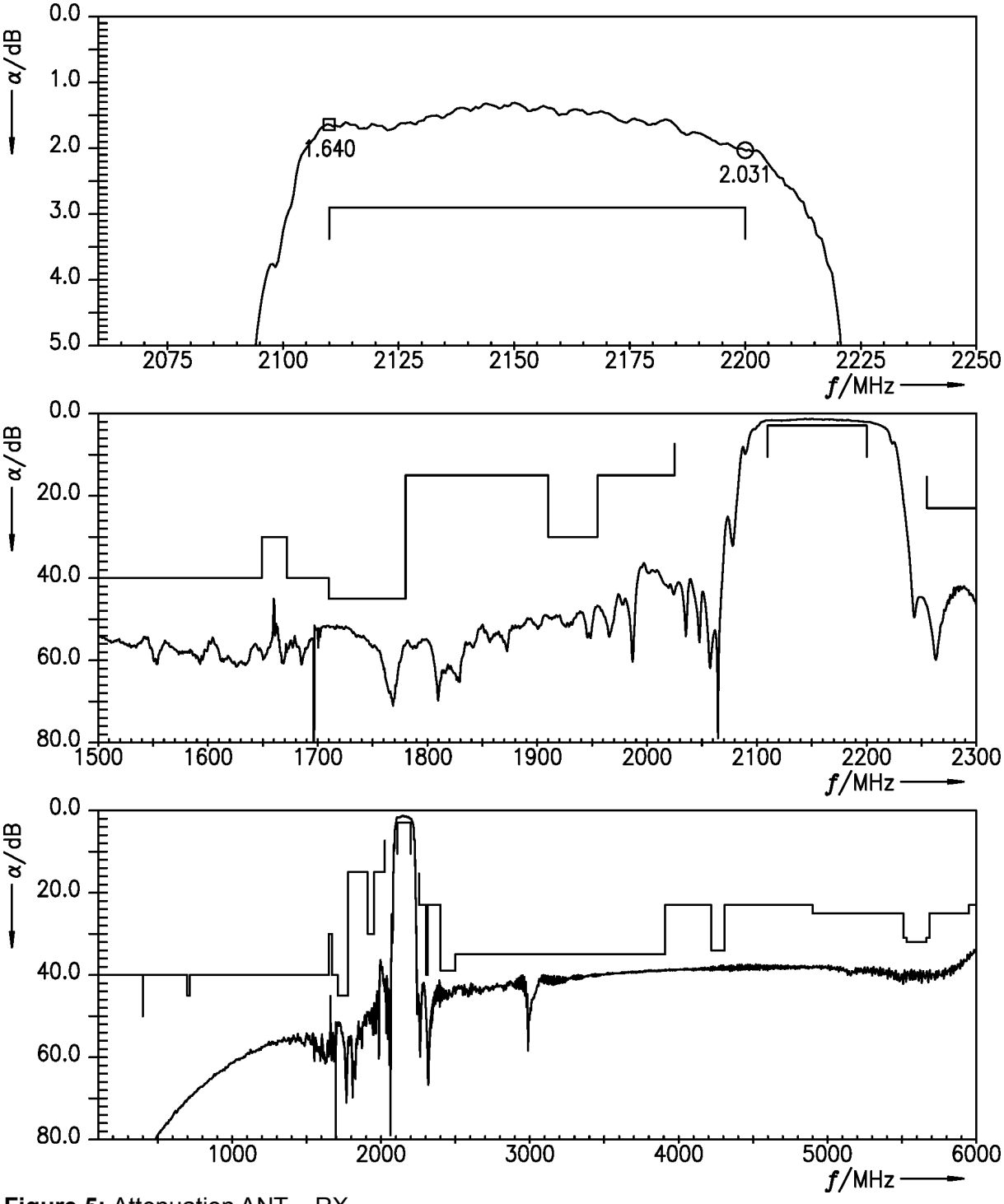

Figure 5: Attenuation ANT – RX.

8.3 TX – RX

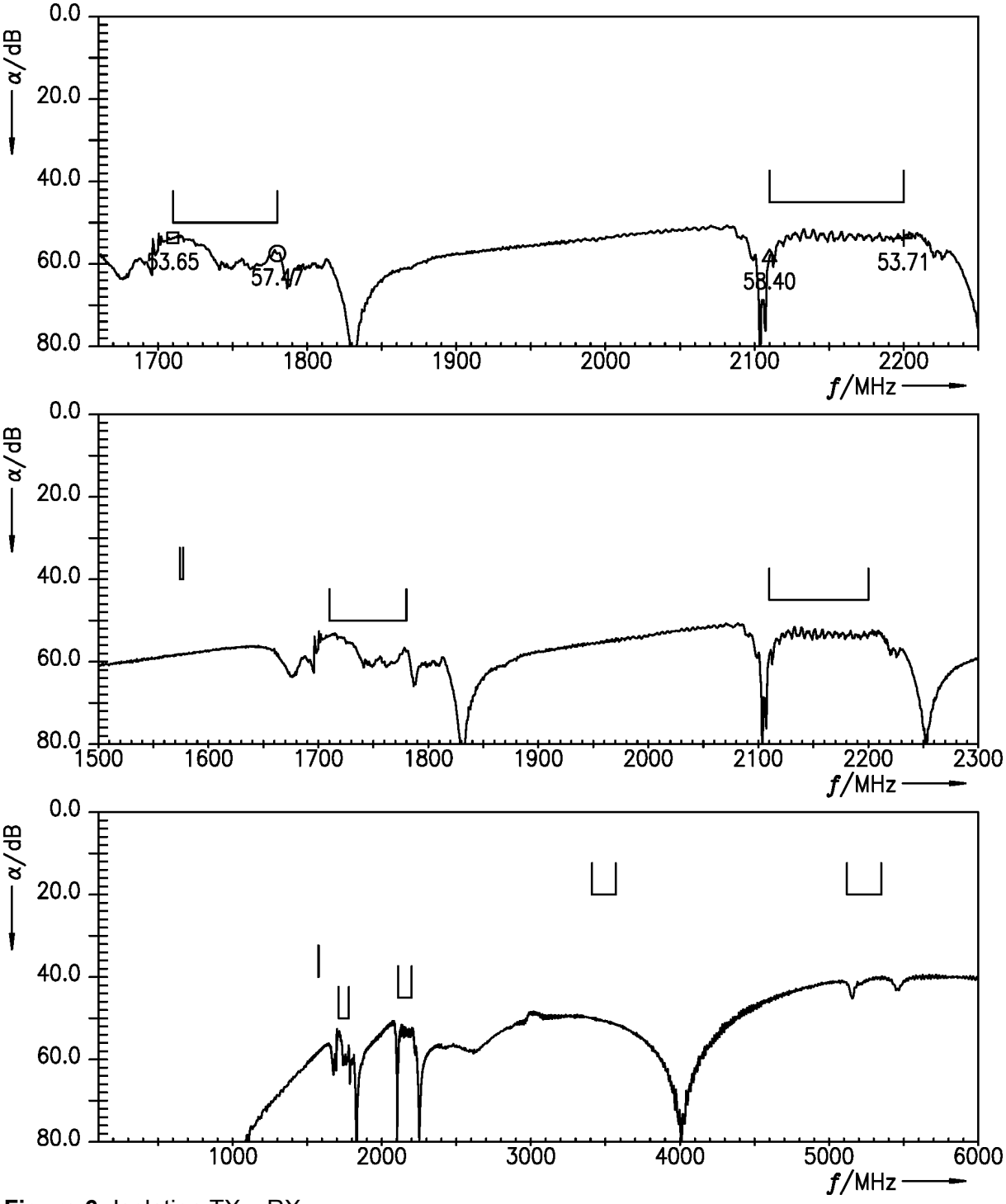

Figure 6: Isolation TX – RX.

9 Reflection coefficients

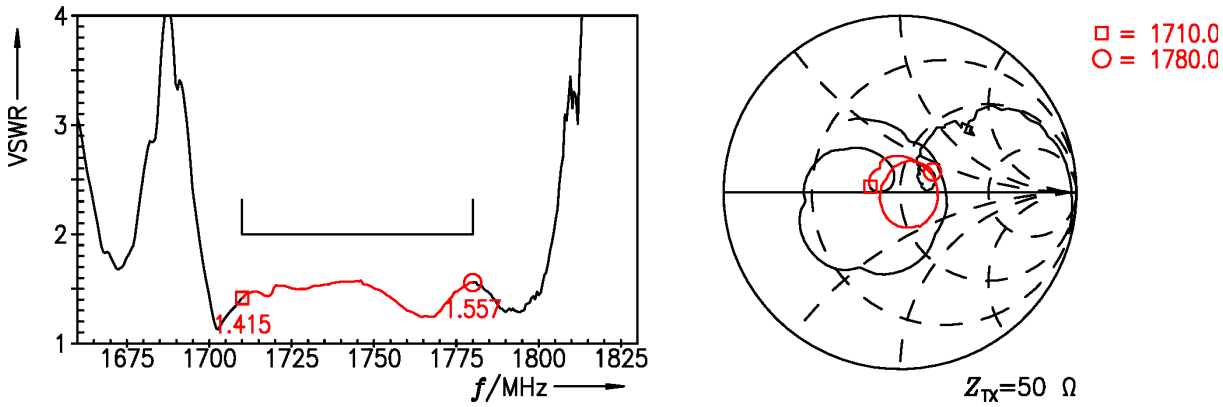

Figure 7: Reflection coefficient at TX port.

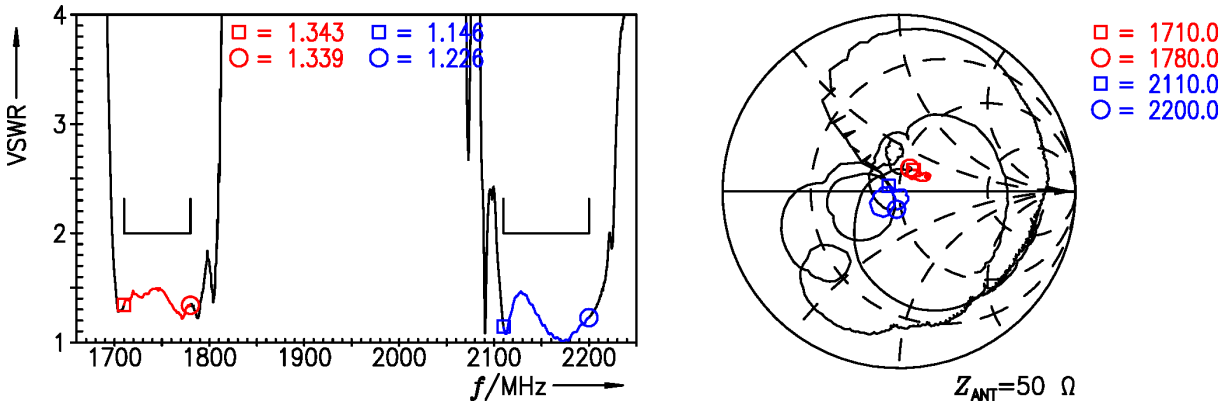

Figure 8: Reflection coefficient at ANT port.

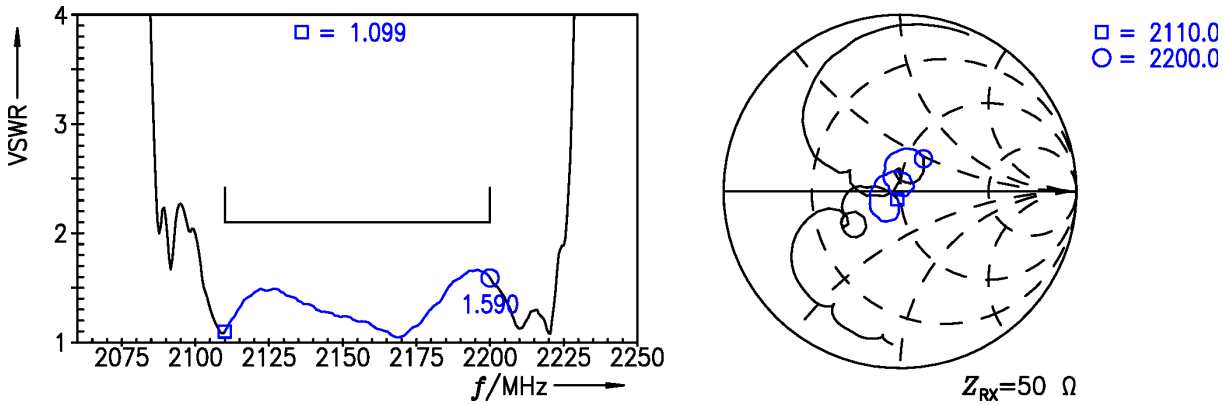

Figure 9: Reflection coefficient at RX port.

10 EVM

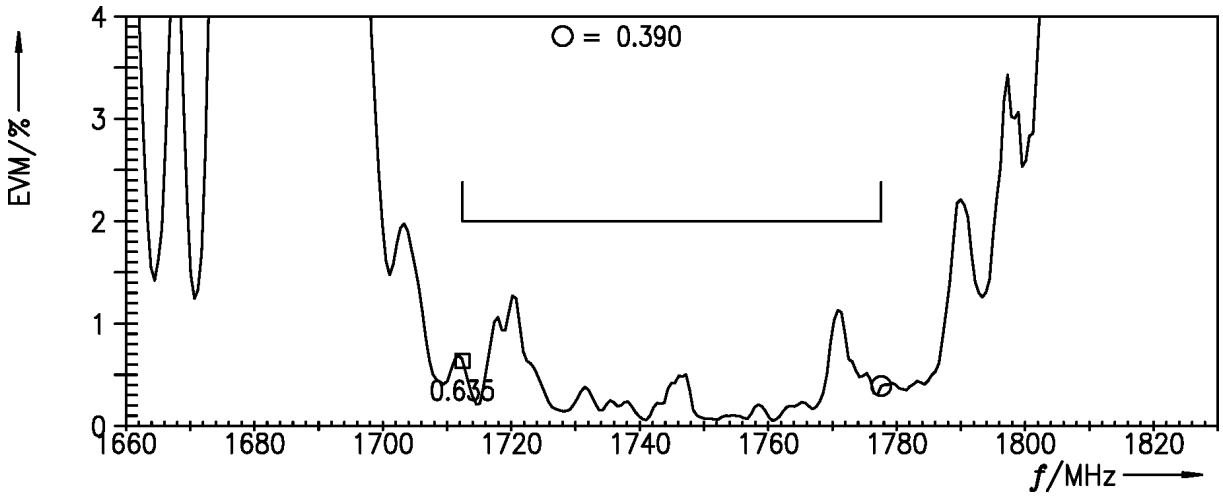

Figure 10: Error vector magnitude.

11 Packing material

11.1 Tape

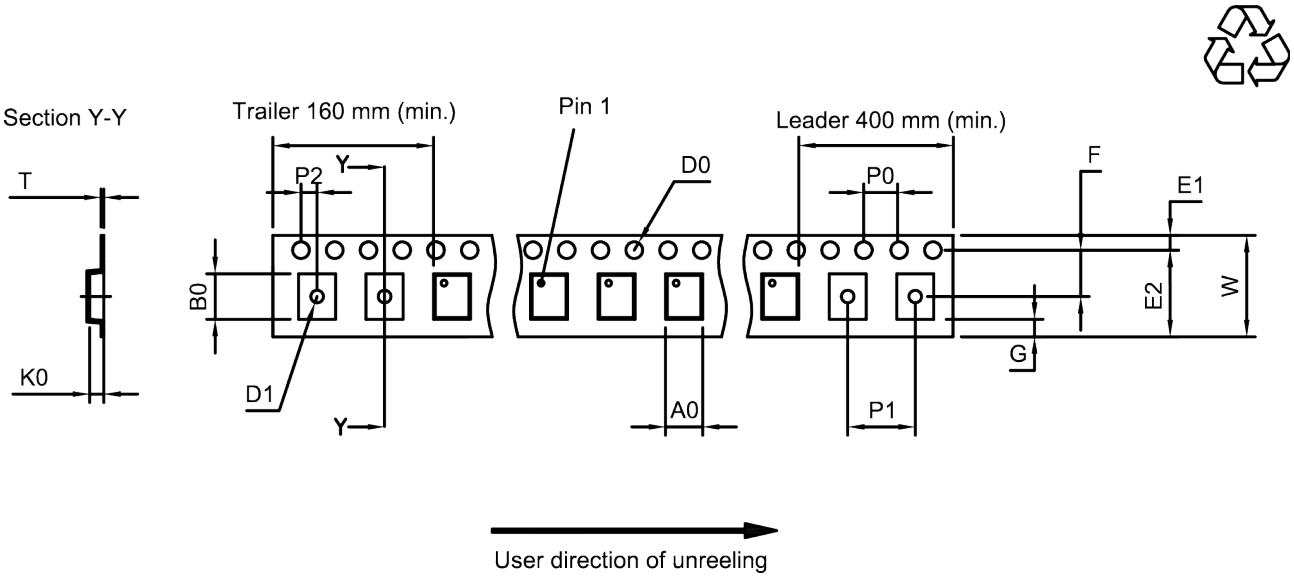

Figure 11: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	1.65±0.05 mm
B_0	2.05±0.05 mm
D_0	1.5+0.1/−0 mm
D_1	1.0 mm (min.)
E_1	1.75±0.1 mm

E_2	6.25 mm (min.)
F	3.5±0.05 mm
G	0.75 mm (min.)
K_0	0.7±0.05 mm
P_0	4.0±0.1 mm

P_1	4.0±0.1 mm
P_2	2.0±0.05 mm
T	0.25±0.03 mm
W	8.0+0.3/−0.1 mm

Table 1: Tape dimensions.

11.2 Reel with diameter of 180 mm

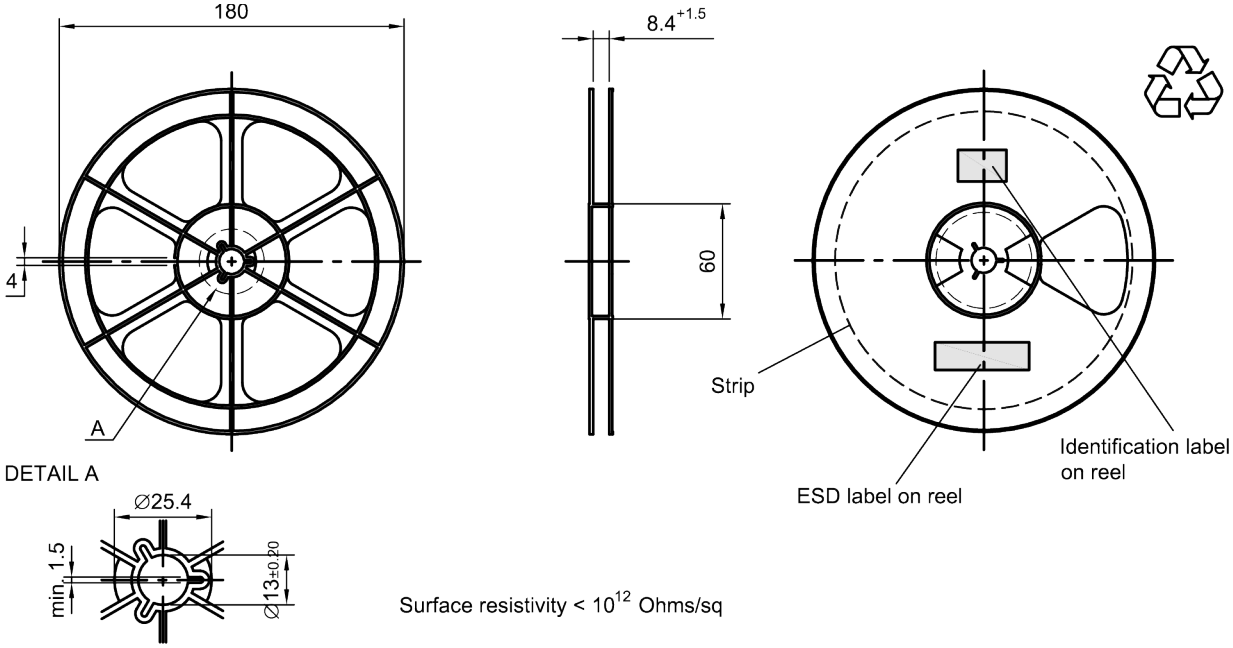

Figure 12: Drawing of reel (first-angle projection) with diameter of 180 mm.

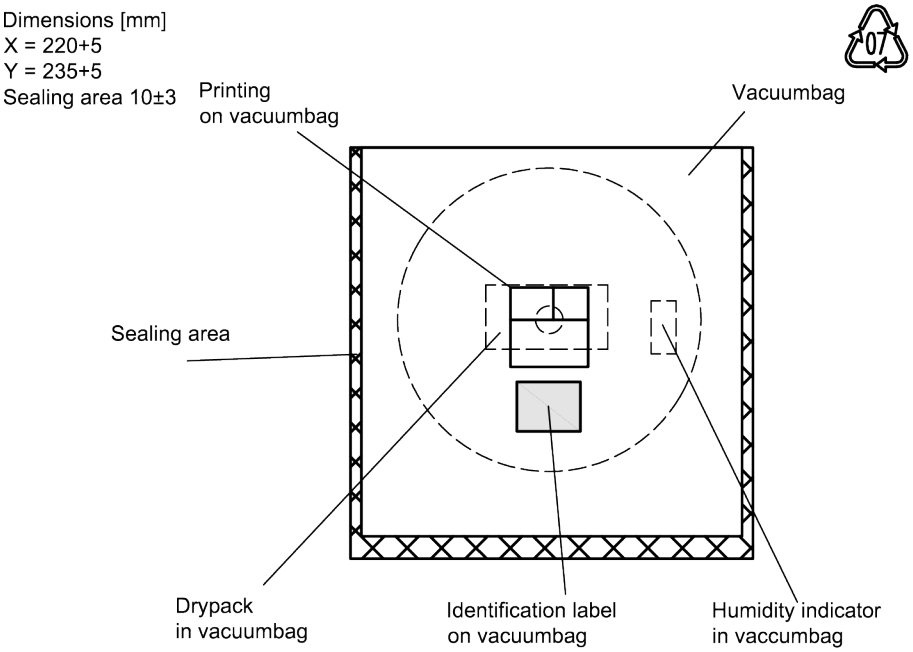

Figure 13: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

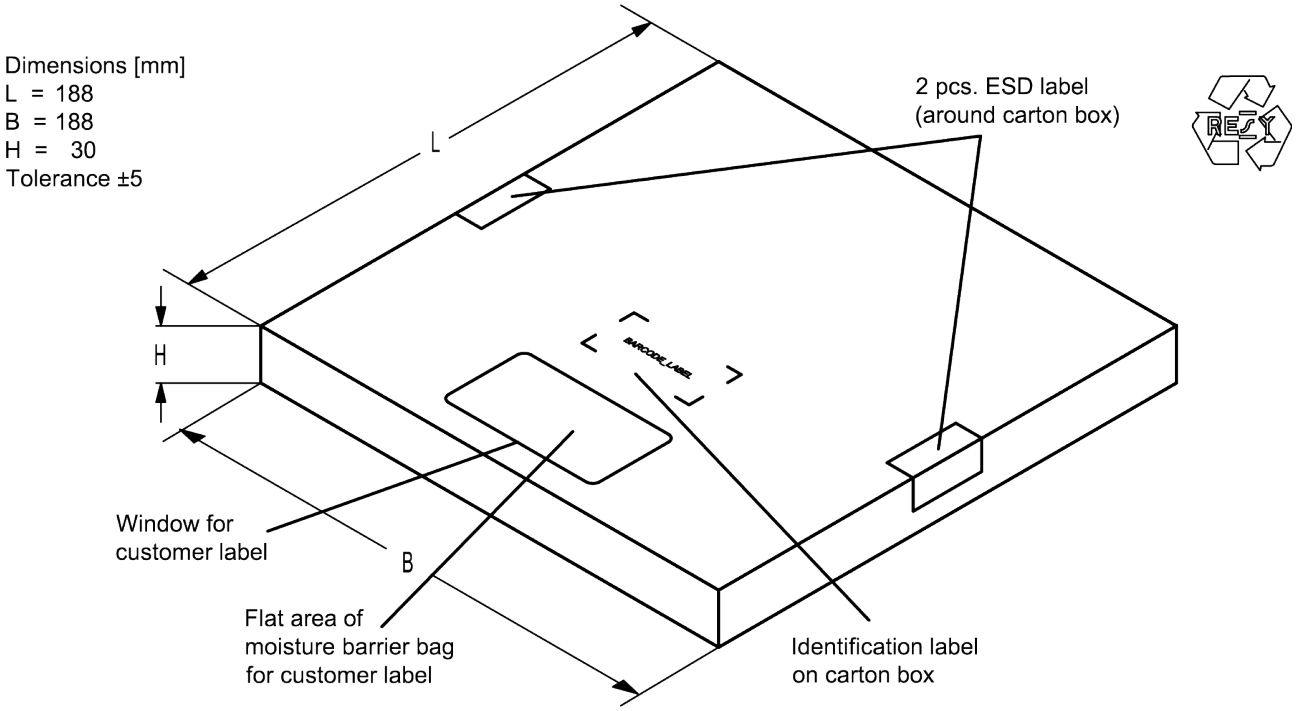

Figure 14: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

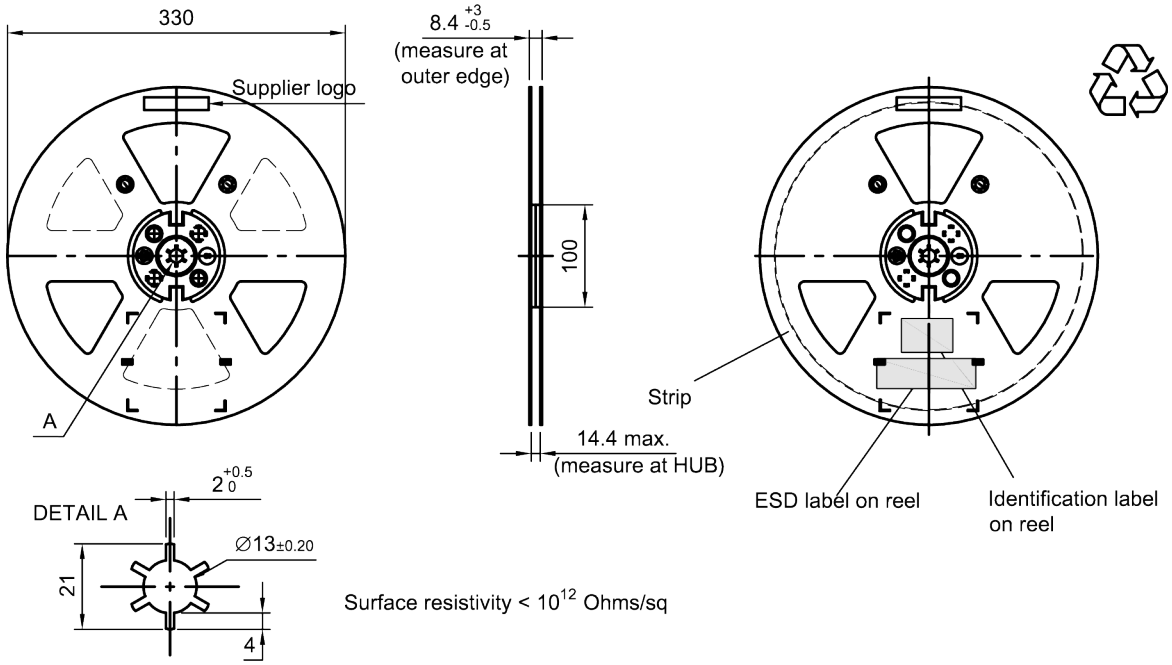

Figure 15: Drawing of reel (first-angle projection) with diameter of 330 mm.

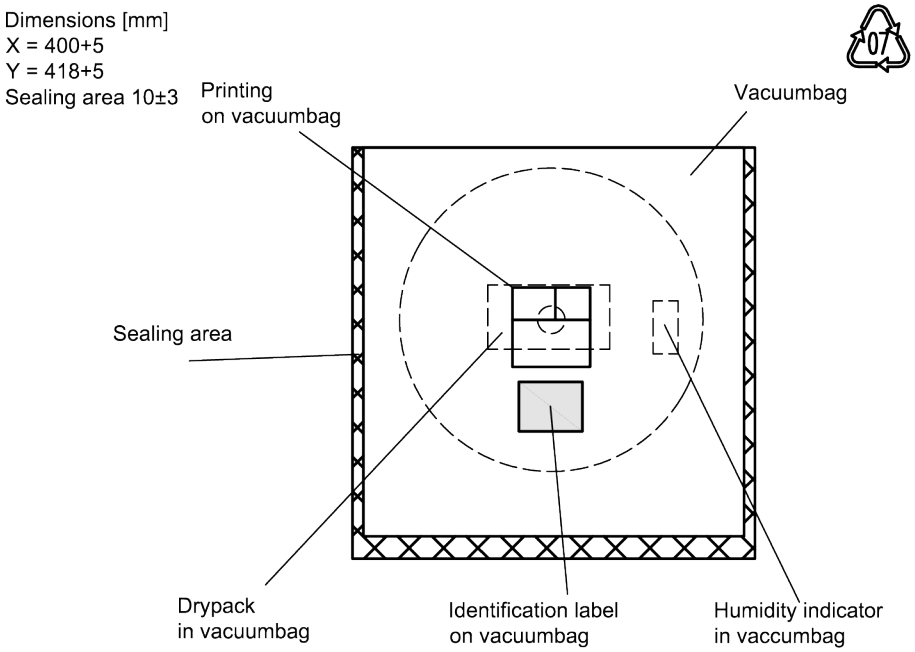

Figure 16: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

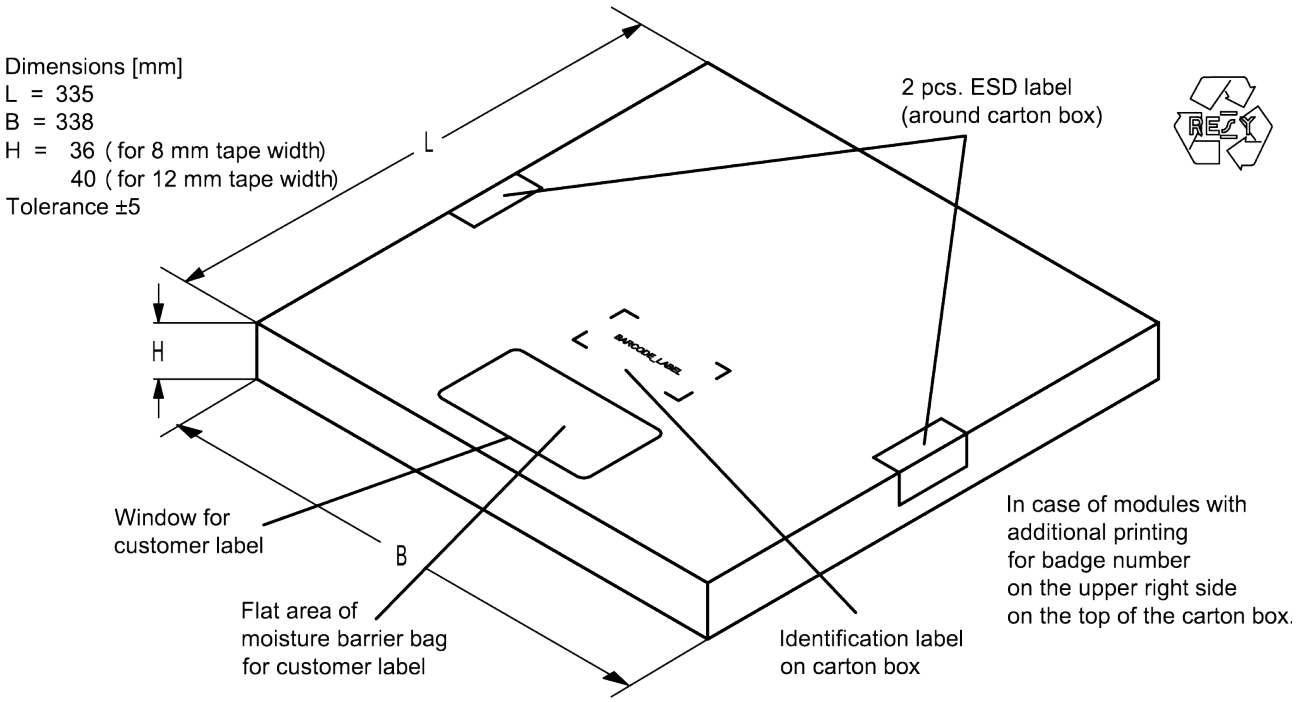

Figure 17: Drawing of folding box for reel with diameter of 330 mm.

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 x 32^2 + **6** x 32^1 + **18 (=J)** x 32^0 **=** **1234**
  The BASE32 code for product type B1221 is 165.

- 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.

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 ≥ 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).

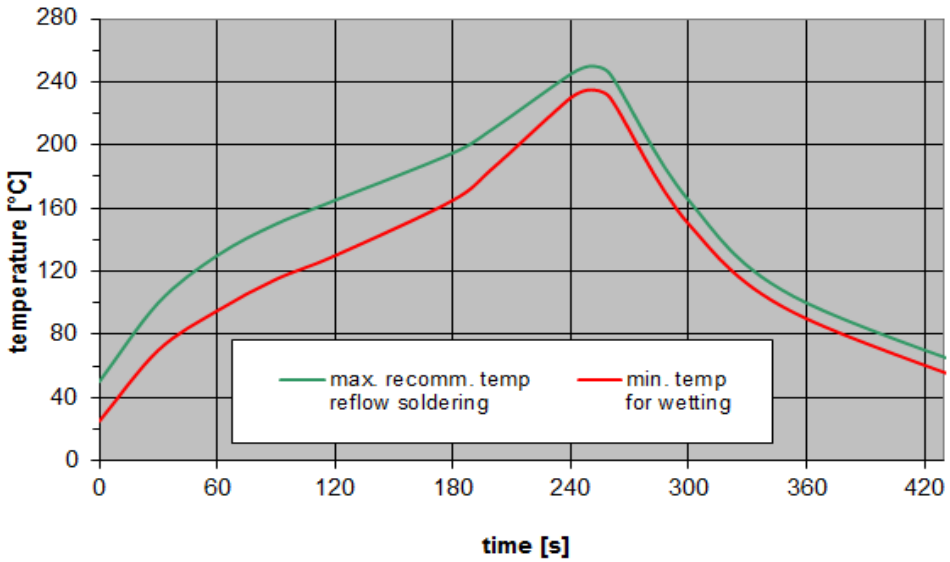

Figure 18: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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 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
B39222B1221L210	15000 pcs
B39222B1221L210S 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.

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.

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.