Qualcomm

RF360
Europe GmbH

Data sheet

SAW duplexer
LTE / 5G band 66

Part number:	B1285
Ordering code:	B39222B1285L210
Date:	March 07, 2022
Version:	2.2

DCN: 80-PA243-562 Rev. C

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1 Application

- Duplexer for 4G and 5G Band 66/4
- LTE band 66 uplink: 1745 MHz (pass band 70 MHz)
- LTE band 66 downlink: 2155 MHz (pass band 90 MHz)
- Qualcomm® micro-Acoustic Power Management (MAPM)
- Low insertion attenuation
- Low amplitude ripple

2 Features

- Package size $1.6_{\pm 0.05}$ mm × $1.2_{\pm 0.05}$ mm
- Package height 0.6 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)

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3 Package

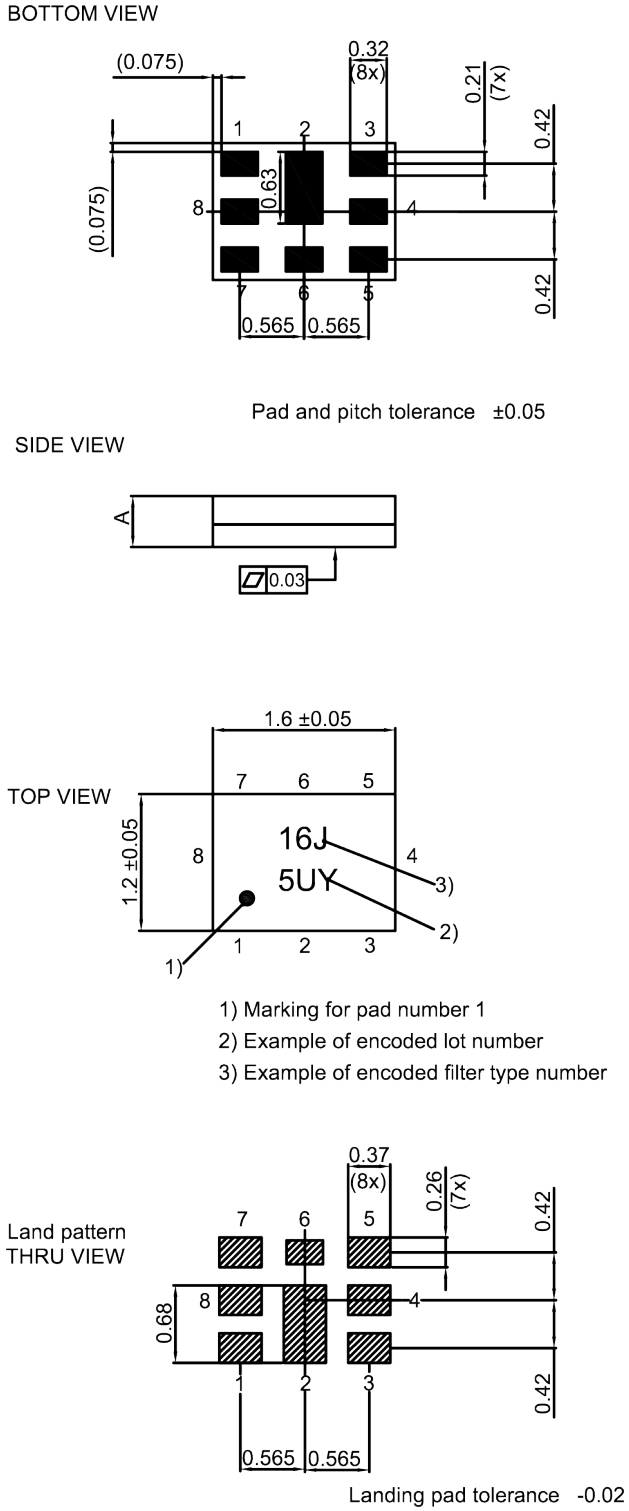

Figure 1: Drawing of package with package height A = 0.6 mm (max.). See Sec. Package information (p. 23).

4 Pin configuration

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

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5 Matching circuit

- L_{p1} = 5.4 nH
- L_{p3} = 4.7 nH
- L_{p6} = 2.6 nH

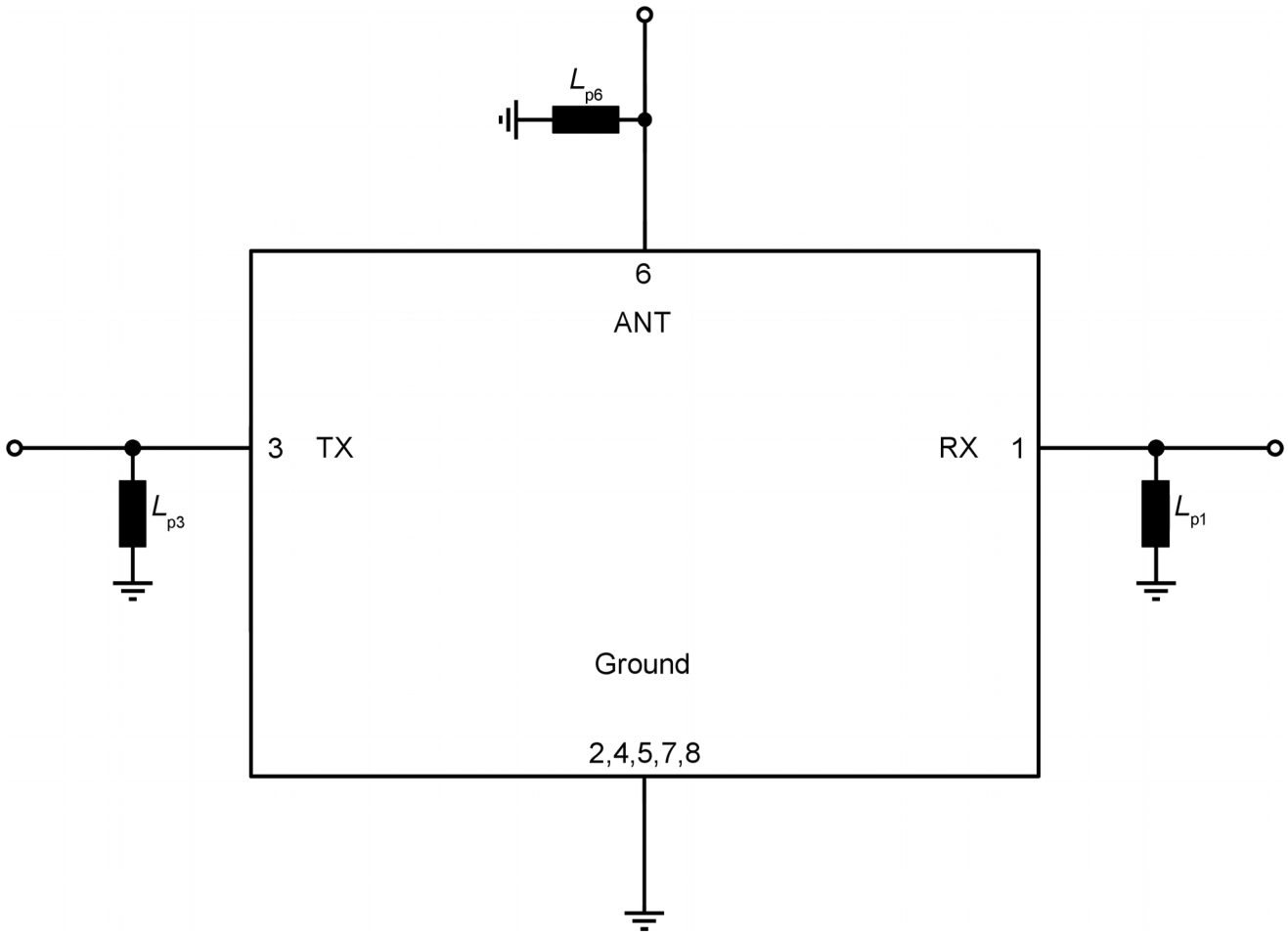

Figure 2: Schematic of matching circuit.

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

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6 Characteristics

6.1 TX – ANT

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω // 4.7 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω // 2.6 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω // 5.4 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}				
	1710.24 ... 1754.76	MHz		—	1.4	2.0	dB
	1710.24 ... 1779.76	MHz		—	1.4	2.0	dB
Amplitude ripple (p-p)			$\Delta\alpha$[2)]				
	1710 ... 1755	MHz		—	0.8	1.4	dB
	1710 ... 1780	MHz		—	0.8	1.4	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	1710 ... 1755	MHz		—	1.4	2.0	
	1710 ... 1780	MHz		—	1.5	2.0	
@ ANT port	1710 ... 1755	MHz		—	1.3	2.0	
	1710 ... 1780	MHz		—	1.3	2.0	
Minimum attenuation			α_{min}				
	10 ... 699	MHz		30	46	—	dB
	10 ... 728	MHz		30	45	—	dB
	663 ... 698	MHz		30	46	—	dB
	699 ... 716	MHz		30	45	—	dB
	699 ... 960	MHz		30	36	—	dB
	717 ... 728	MHz		30	45	—	dB
	777 ... 798	MHz		30	42	—	dB
	814 ... 849	MHz		30	40	—	dB
	851 ... 894	MHz		33	38	—	dB
	1166 ... 1187	MHz		30	32	—	dB
	1226 ... 1250	MHz		30	32	—	dB
	1559 ... 1563	MHz		35	47	—	dB
	1559 ... 1606	MHz		35	42	—	dB
	1565.42 ... 1573.37	MHz		35	49	—	dB
	1573.37 ... 1577.47	MHz		37	52	—	dB
	1577.47 ... 1585.42	MHz		35	50	—	dB
	1597.55 ... 1605.89	MHz		35	42	—	dB
	1805 ... 1880	MHz		3	5.5	—	dB
	1850 ... 1915	MHz		33	44	—	dB
	1930 ... 1990	MHz		33	43	—	dB
	2110 ... 2200	MHz		36	43	—	dB

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Characteristics TX – ANT			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	2300... 2690	MHz	25	35	—	dB
	2305... 2315	MHz	25	43	—	dB
	2350... 2360	MHz	25	38	—	dB
	2400... 2500	MHz	30	38	—	dB
	2496... 2690	MHz	30	35	—	dB
	2500... 2570	MHz	30	37	—	dB
	2620... 2690	MHz	30	35	—	dB
	3300... 4200	MHz	16	20	—	dB
	3420... 3520	MHz	30	34	—	dB
	4900... 5950	MHz	12	19	—	dB
	5130... 5340	MHz	12	19	—	dB

1) See Sec. Matching circuit (p. 6).
2) Over any 20 MHz.

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6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω // 4.7 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω // 2.6 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω // 5.4 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}				
	2110.24 ... 2154.76	MHz		—	1.7	2.5	dB
	2110.24 ... 2199.76	MHz		—	1.8	2.7	dB
Amplitude ripple (p-p)			$\Delta\alpha$[2)]				
	2110 ... 2155	MHz		—	0.4	1.3	dB
	2110 ... 2200	MHz		—	0.7	1.6	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	2110 ... 2155	MHz		—	1.6	2.1	
	2110 ... 2200	MHz		—	1.6	2.1	
@ RX port	2110 ... 2155	MHz		—	1.5	2.0	
	2110 ... 2200	MHz		—	1.5	2.0	
Minimum attenuation			α_{min}				
	10 ... 663	MHz		40	73	—	dB
	10 ... 699	MHz		40	72	—	dB
	400	MHz		50	100	—	dB
	663 ... 698	MHz		40	72	—	dB
	699 ... 716	MHz		45	71	—	dB
	699 ... 849	MHz		40	67	—	dB
	777 ... 798	MHz		40	68	—	dB
	814 ... 849	MHz		40	67	—	dB
	1310 ... 1355	MHz		40	58	—	dB
	1710 ... 1780	MHz		45	52	—	dB
	1850 ... 1915	MHz		39	45	—	dB
	1910 ... 1955	MHz		30	43	—	dB
	2300 ... 2690	MHz		35	41	—	dB
	2305 ... 2315	MHz		35	52	—	dB
	2400 ... 2500	MHz		36	41	—	dB
	2496 ... 2690	MHz		37	42	—	dB
	2500 ... 2570	MHz		37	42	—	dB
	3300 ... 4200	MHz		33	37	—	dB
	3820 ... 3910	MHz		33	37	—	dB
	4900 ... 5950	MHz		30	33	—	dB
	5530 ... 5665	MHz		30	33	—	dB

1) See Sec. Matching circuit (p. 6).
2) Over any 20 MHz.

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6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω // 4.7 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω // 2.6 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω // 5.4 nH[1)]

Characteristics TX – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Minimum isolation							
1710.24... 1754.76	MHz	α_{min}		52	55	—	dB
1710.24... 1779.76	MHz	α_{min}		52	55	—	dB
2110... 2155	MHz	$\alpha_{INT,min}$	2)	50	55	—	dB
2110... 2200	MHz	$\alpha_{INT,min}$	2)	50	55	—	dB

1) See Sec. Matching circuit (p. 6).
2) Integrated attenuation α_{INT}: Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

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7 Maximum ratings

Storage temperature	T_{STG} [1] = −40 °C ... +85 °C	
DC voltage	$\|V_{DC}\|$ = 5.0 V (max.)[2]	
ESD voltage		
	V_{ESD} [3] = 150 V (max.)	Machine model.
	V_{ESD} [4] = 250 V (max.)	Human body model.
	V_{ESD} [5] = 700 V (max.)	Charged device model.
Input power	P_{IN}	
@ TX port: 1710 ... 1780 MHz	31 dBm	■ 5 MHz LTE uplink signal (1 RB) for 5000 h @ 50 °C. ■ 5 MHz 5G-NR (DFT-s-OFDM) (1 RB) for 5000 h @ 50 °C.
@ TX port: 1710 ... 1780 MHz	29.5 dBm	5 MHz 5G-NR (CP-OFDM) (1 RB) 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.

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8 Transmission coefficients

8.1 TX – ANT

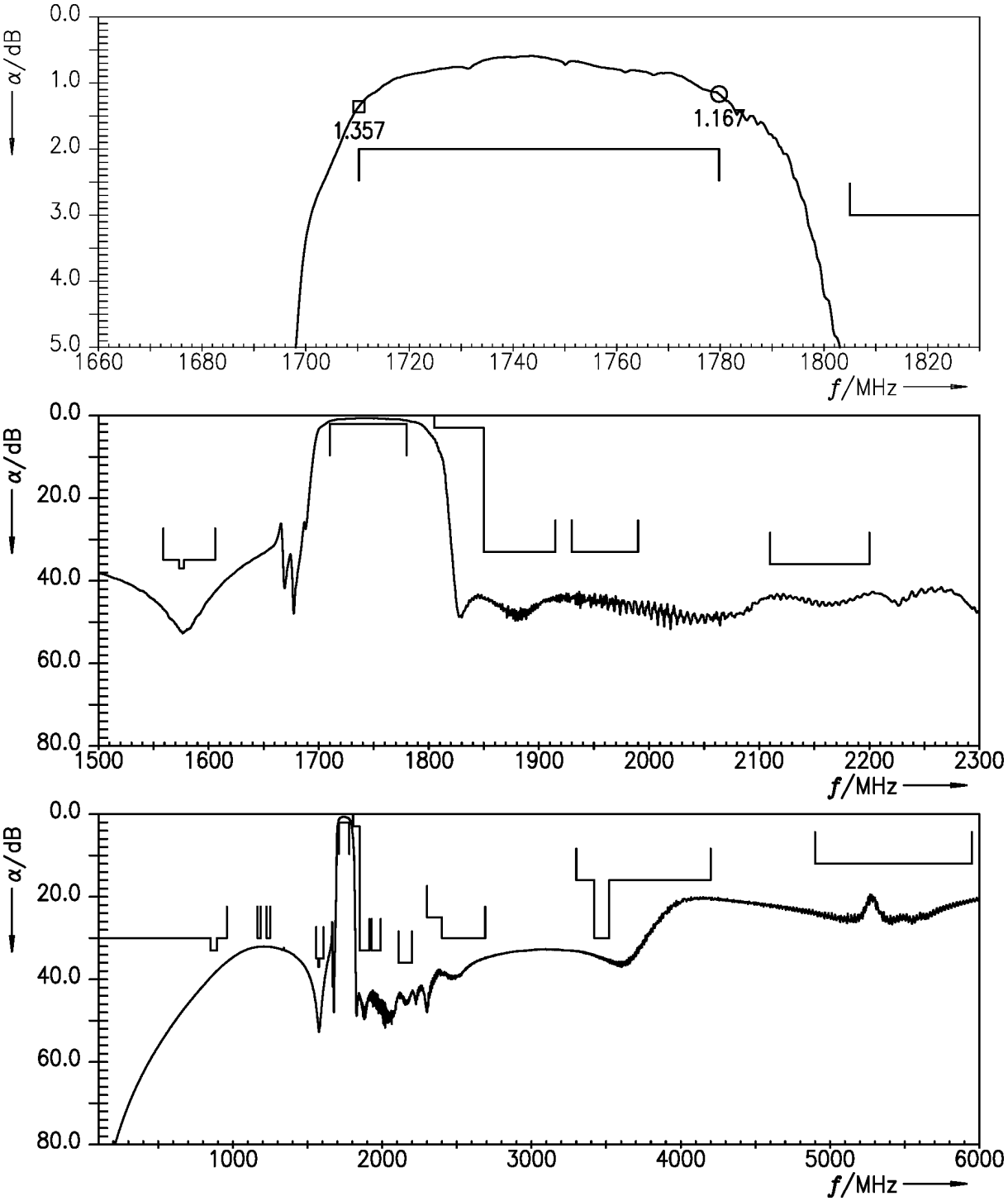

Figure 3: Attenuation TX – ANT.

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8.2 ANT – RX

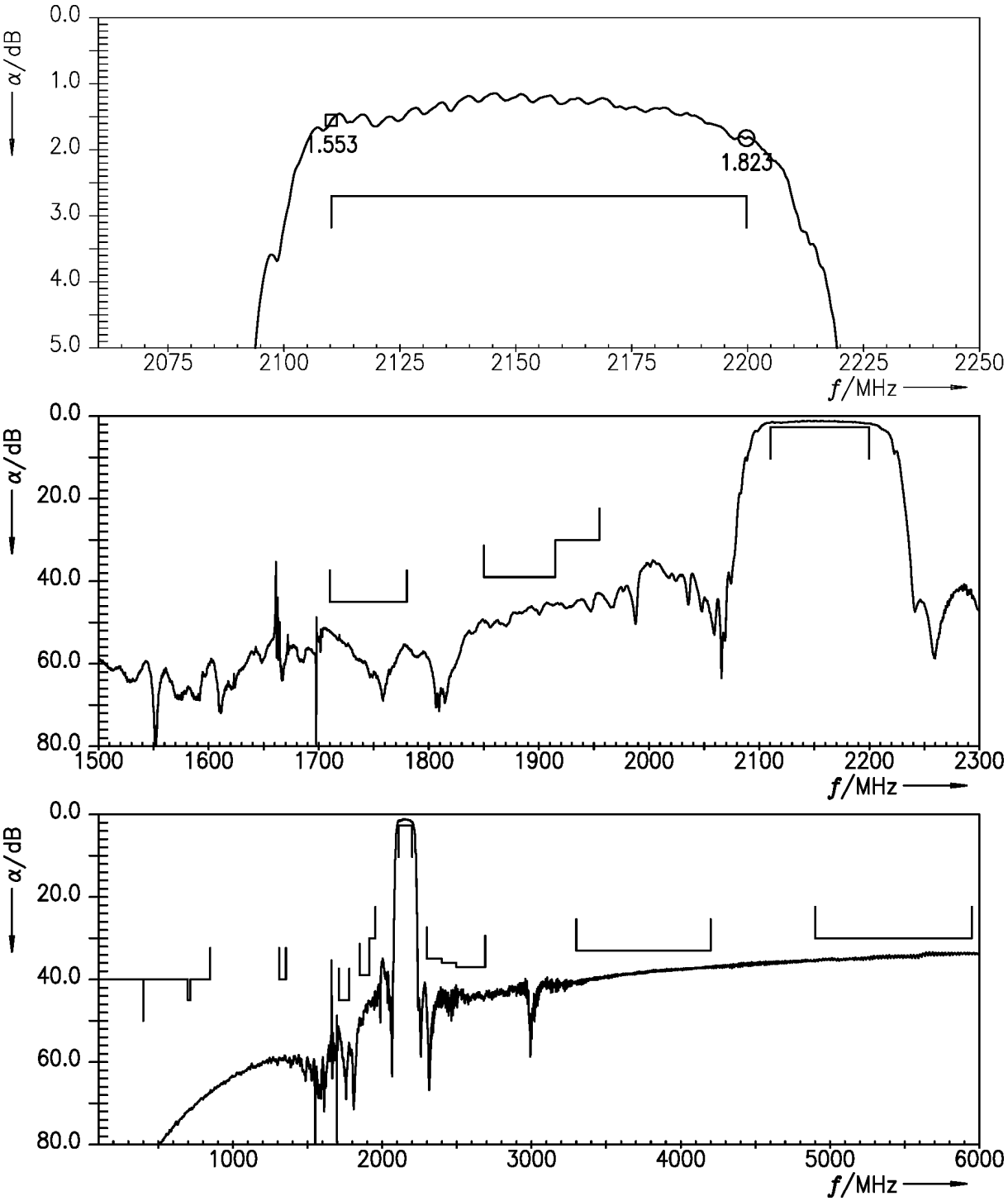

Figure 4: Attenuation ANT – RX.

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8.3 TX – RX

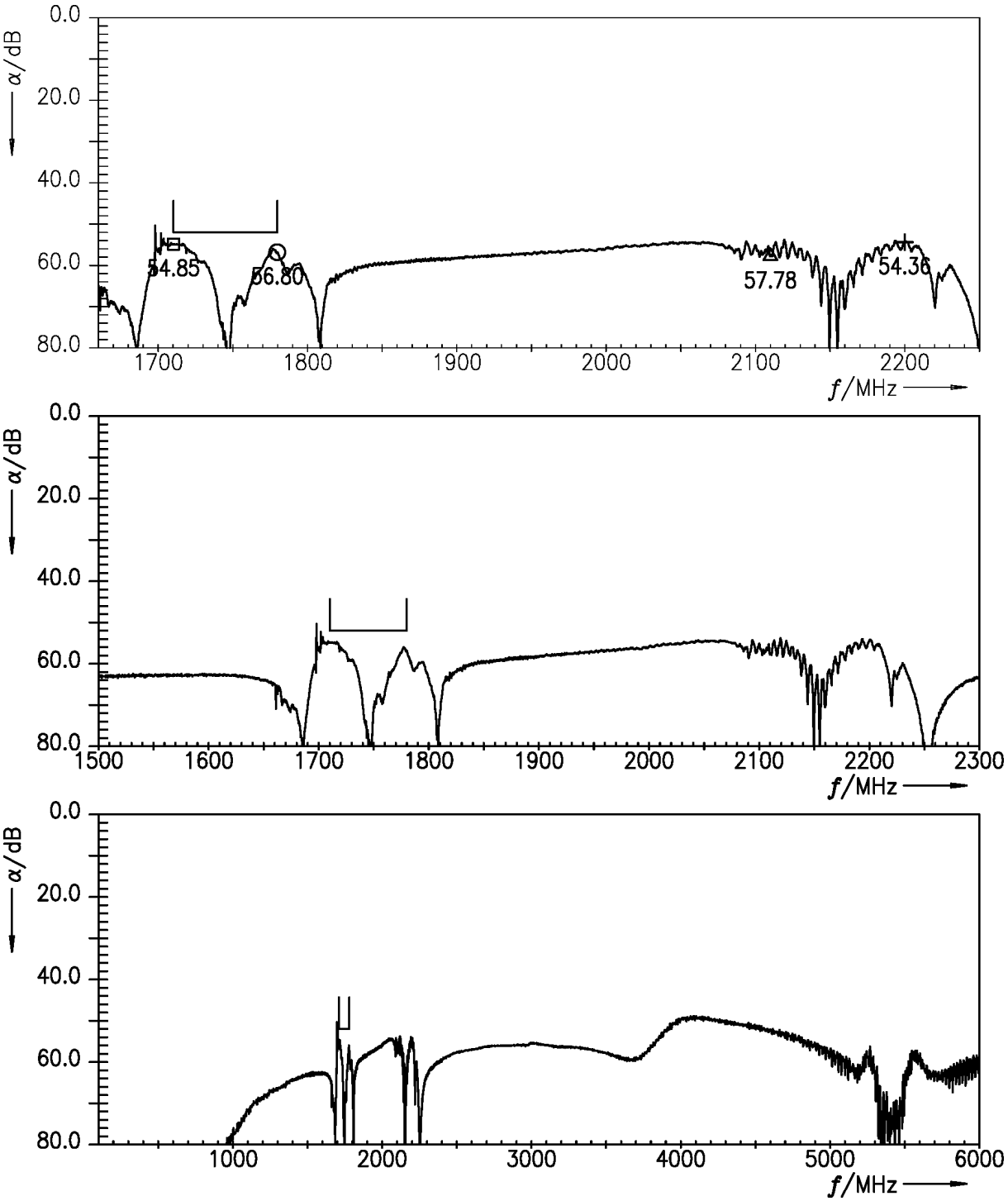

Figure 5: Isolation TX – RX.

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9 Reflection coefficients

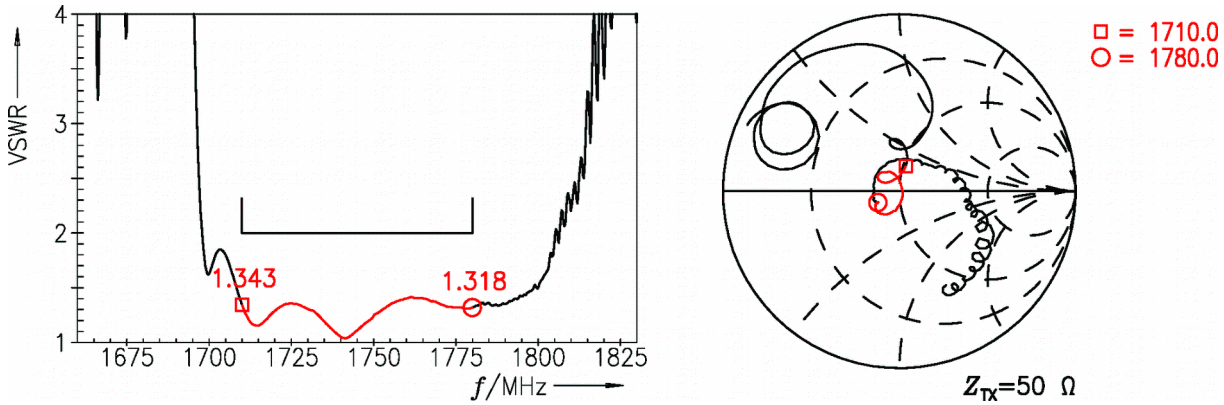

Figure 6: Reflection coefficient at TX port.

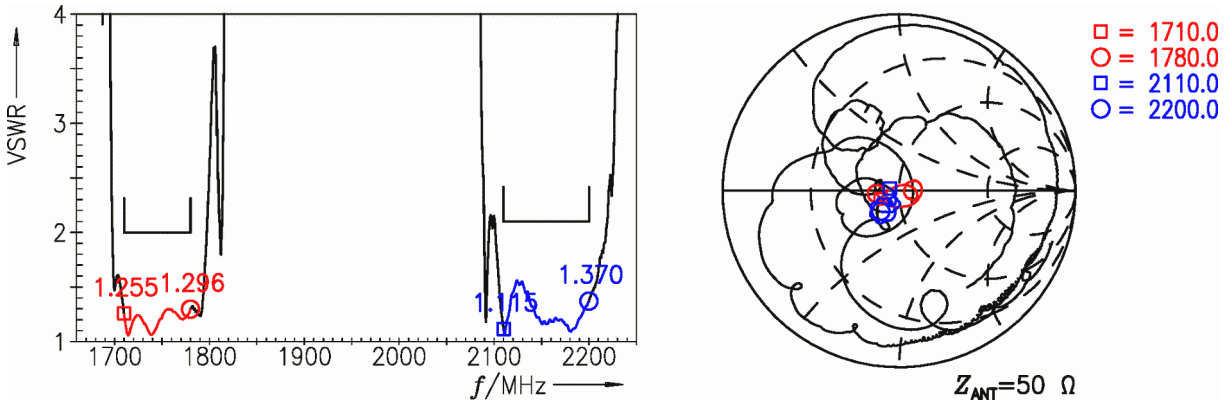

Figure 7: Reflection coefficient at ANT port (TX and RX frequencies).

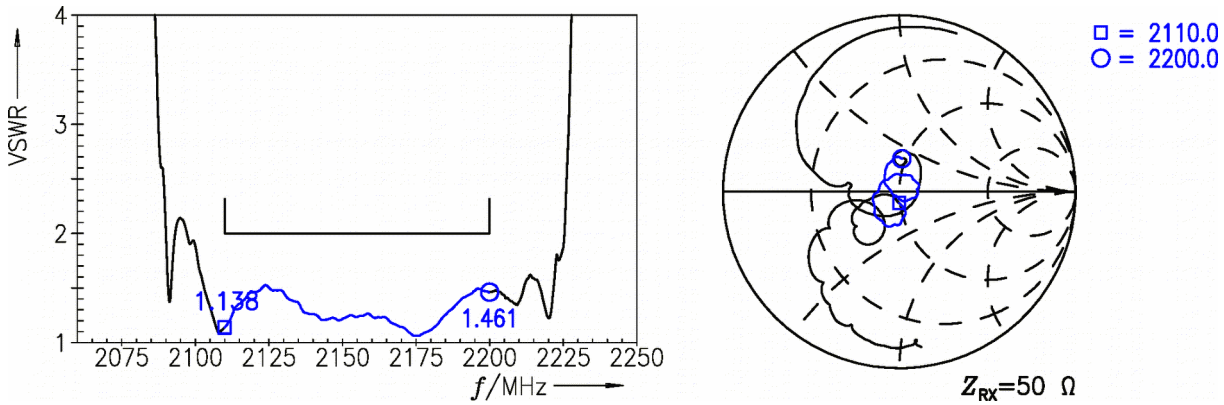

Figure 8: Reflection coefficient at RX port.

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10 Packing material

10.1 Tape

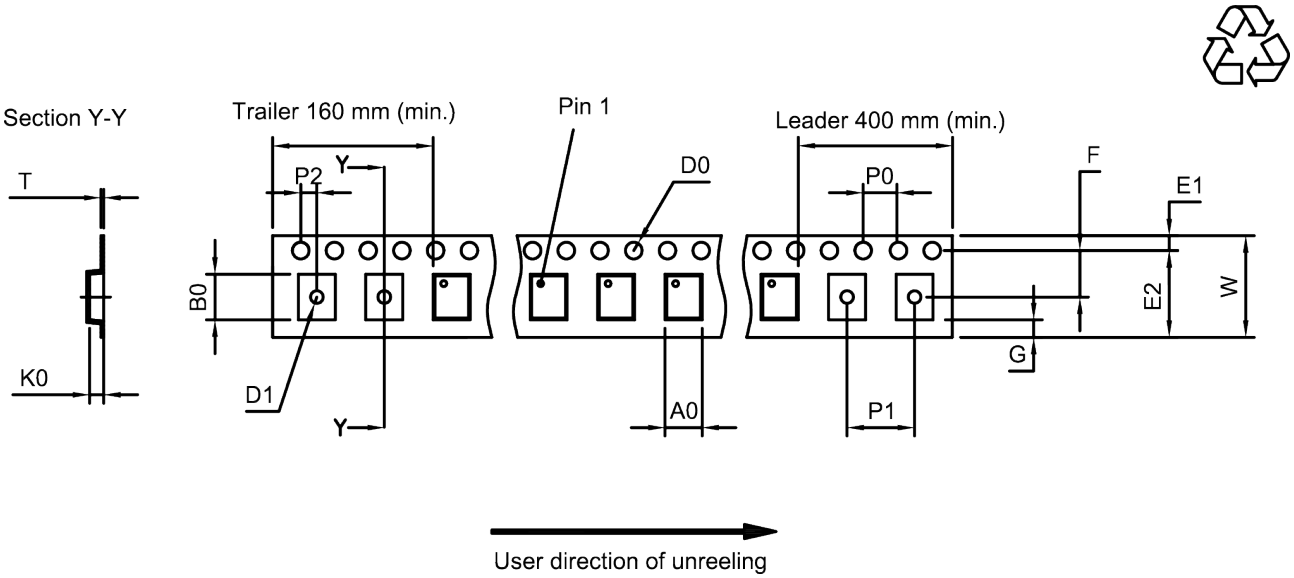

Figure 9: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A_0	$1.4_{\pm 0.05}$ mm
B_0	$1.8_{\pm 0.05}$ mm
D_0	$1.5^{+0.1/-0}$ mm
D_1	$0.6^{+0.1/-0}$ 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	$0.7_{\pm 0.05}$ 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.

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10.2 Reel with diameter of 180 mm

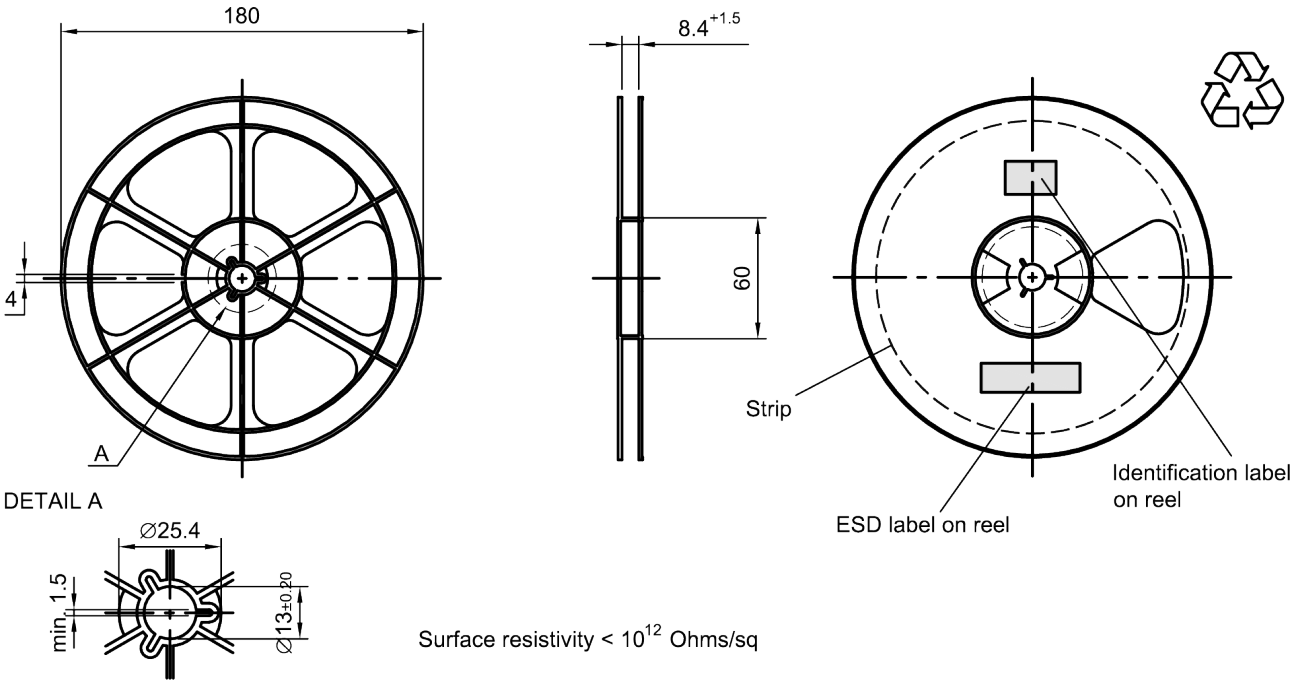

Figure 10: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]
X = 220+5
Y = 235+5
Sealing area 10±3

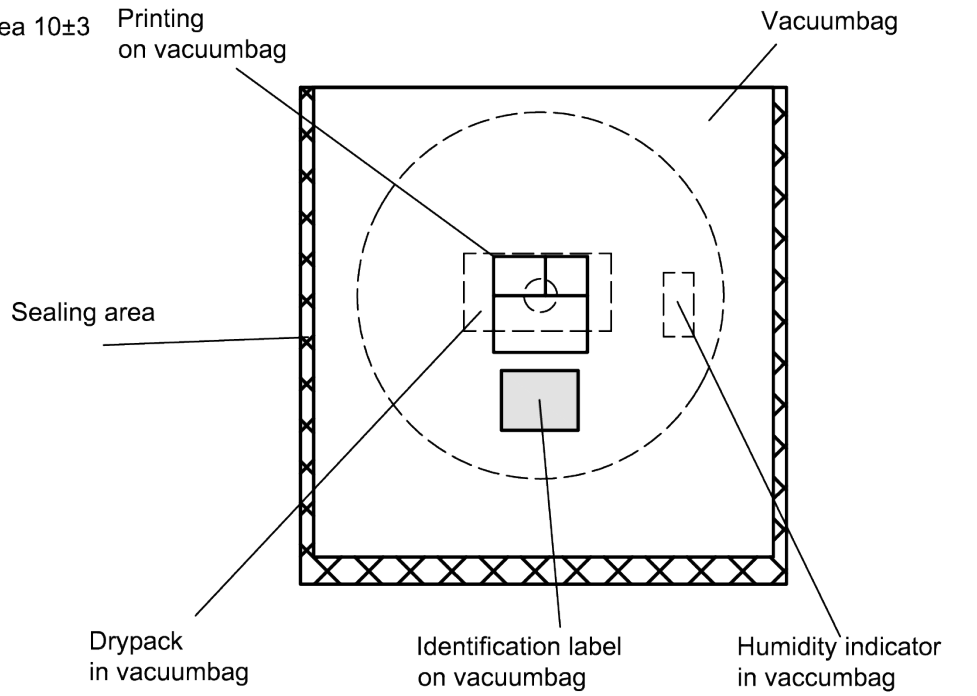

Figure 11: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

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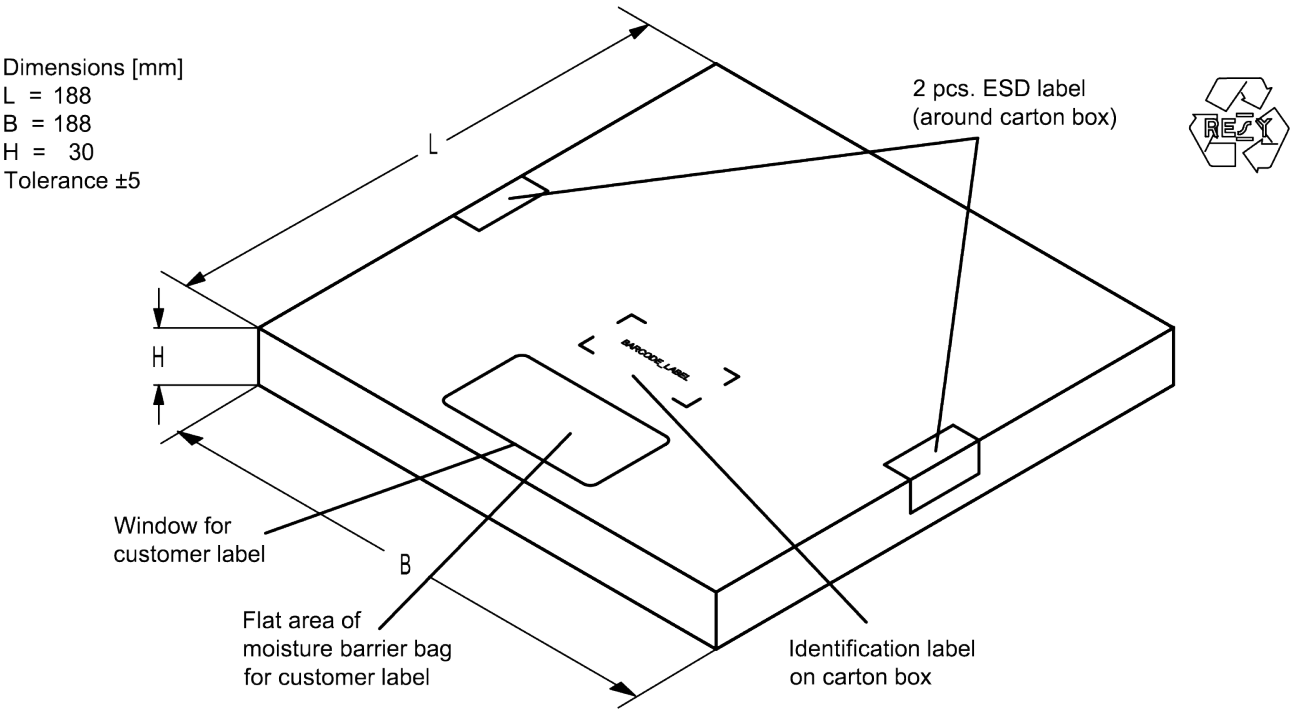

Figure 12: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm

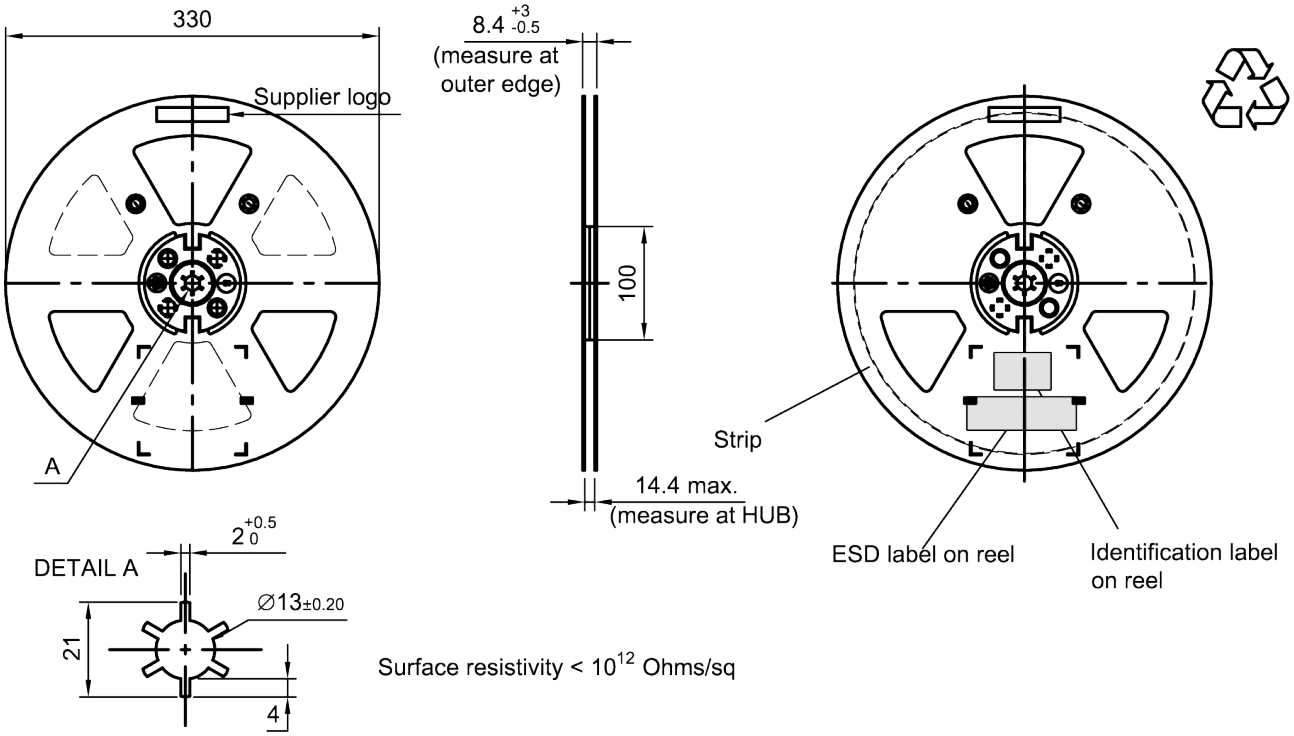

Figure 13: Drawing of reel (first-angle projection) with diameter of 330 mm.

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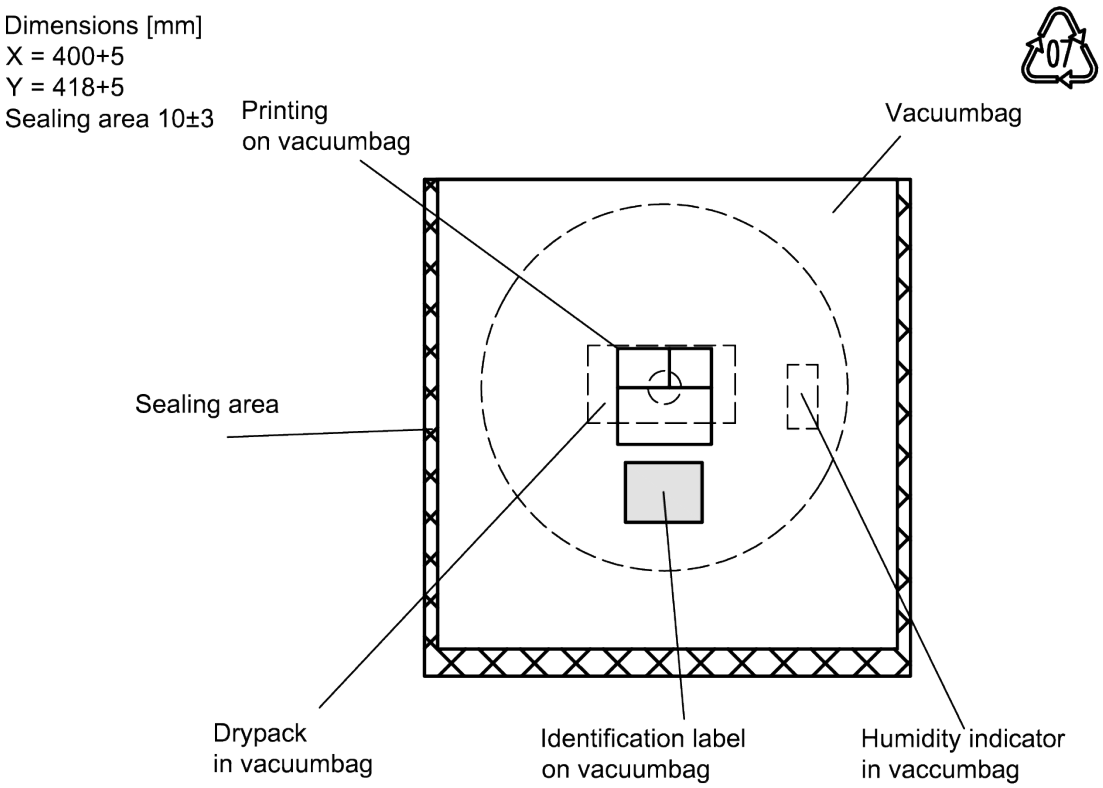

Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

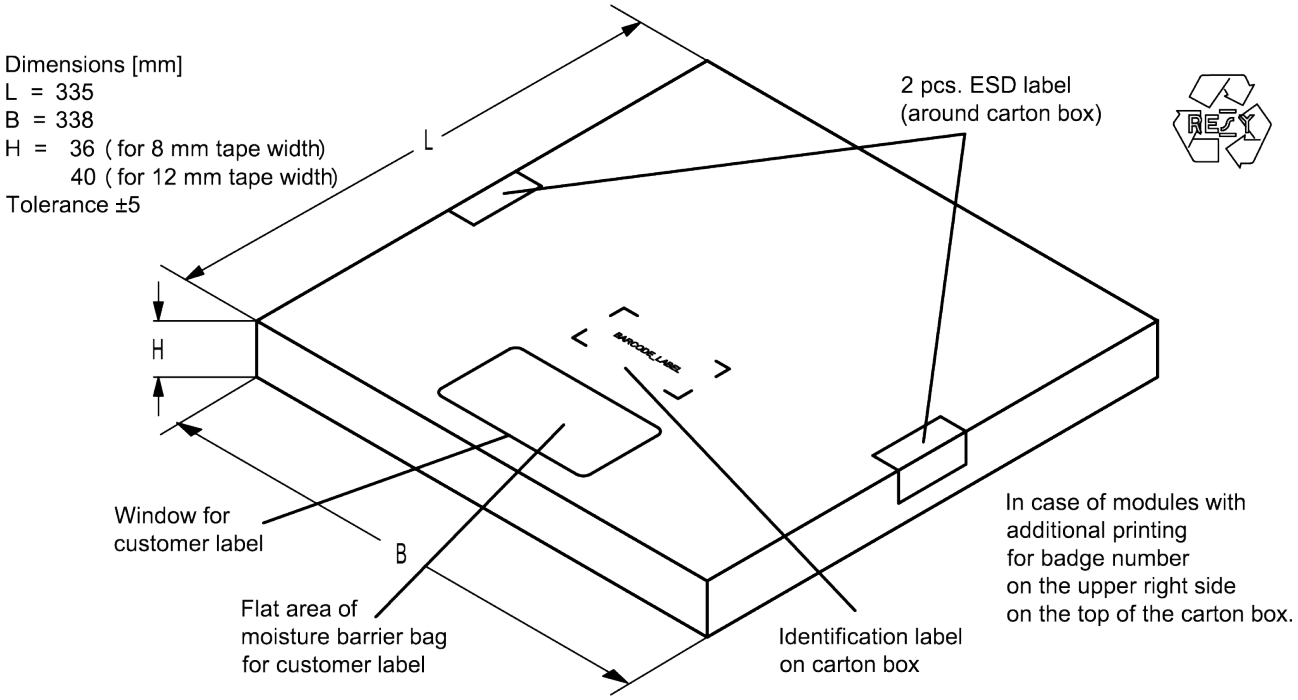

Figure 15: Drawing of folding box for reel with diameter of 330 mm.

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11 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 B1285 is 185.

- 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.

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12 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).

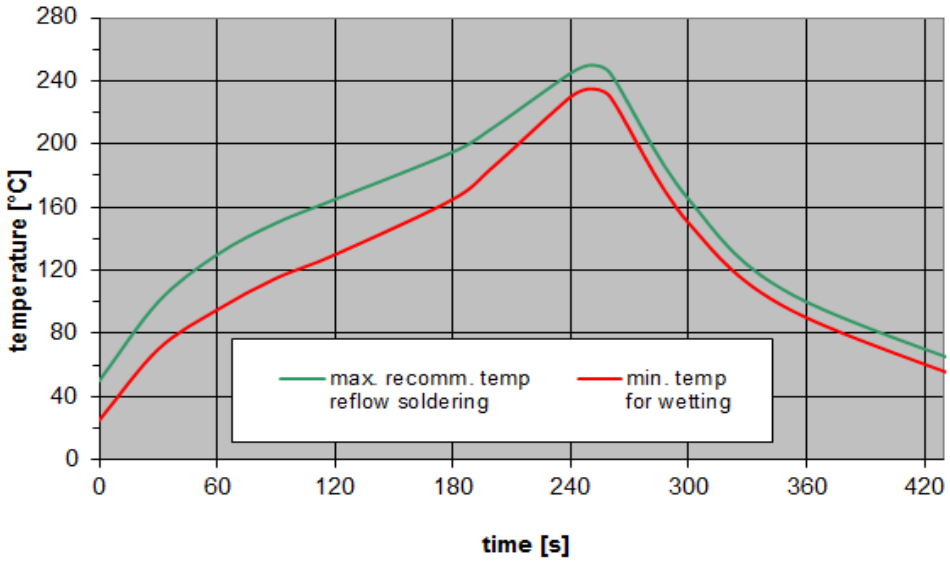

Figure 16: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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13 Annotations

13.1 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.

13.2 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.

13.3 Ordering codes / product IDs and packing units

Ordering code / product ID	RF360 label	Packing unit
B39222B1285L210	B39222-B1285-L210-S05	5000 pcs
	B39222-B1285-L210-W05	5000 pcs

Table 4: Ordering codes / product IDs and packing units. Shipment will come from either Singapore or Wuxi location.

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14 Cautions and warnings

14.1 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 https://rffe.qualcomm.com/.

14.2 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.

14.3 Moldability

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

14.4 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.

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15 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 (https://rffe.qualcomm.com). Should you have any more detailed questions, please contact our sales offices.
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