



RF360
Europe GmbH

Data sheet

SAW duplexer
LTE band 5

Part number:	B1284
Ordering code:	B39881B1284L210
Date:	July 29, 2021
Version:	2.3

DCN: 80-PA243-522 Rev. D

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1 Application

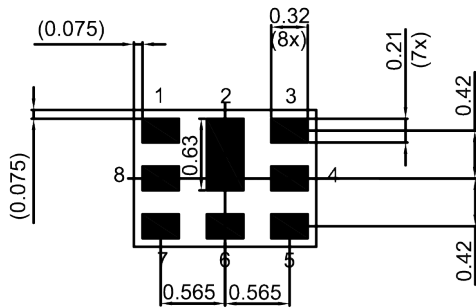
- Multimode SAW duplexer for mobile telephone Cellular / LTE / WCDMA Band 5 systems.
- LTE band 5 uplink: 836.5 MHz (pass band 25 MHz)
- LTE band 5 downlink: 881.5 MHz (pass band 25 MHz)
- Qualcomm® micro-Acoustic Power Management (MAPM)
- Low insertion attenuation
- Low amplitude ripple

2 Features

- Package size $1.6_{\pm 0.05}$ mm \times $1.2_{\pm 0.05}$ 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)

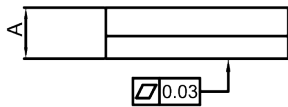
3 Package

BOTTOM VIEW

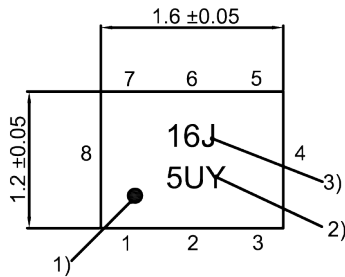


Pad and pitch tolerance ± 0.05

SIDE VIEW

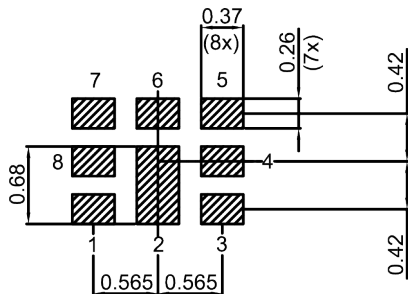


TOP VIEW



- 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 1: Drawing of package with package height A = 0.6 mm (max.). See Sec. Package information (p. 24).

4 Pin configuration

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

5 Matching circuit

■ $C_{p6b} = 3.3 \text{ pF}$

■ $L_{s1} = 3.3 \text{ nH}$

■ $L_{s3} = 8.5 \text{ nH}$

■ $L_{s6a} = 11.5 \text{ nH}$

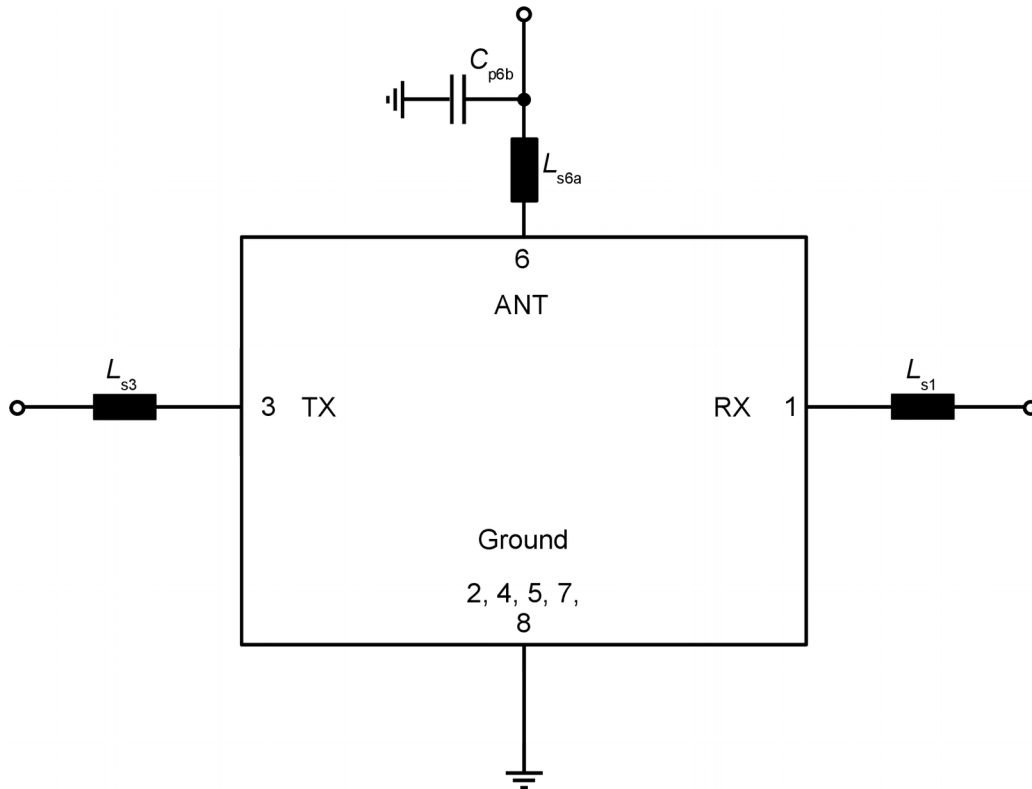


Figure 2: Schematic of matching circuit.

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 + 8.5 nH ¹⁾
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry. ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω + 3.3 nH ¹⁾

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	836.5	—	MHz
Maximum insertion attenuation							
	824... 849	MHz	α_{max}	—	1.0	1.4 ²⁾	dB
	824... 849	MHz	α_{max}	—	1.0	1.8	dB
	824... 849	MHz	$\alpha_{INT,max}$ ³⁾	—	1.0	1.8	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	824... 849	MHz		—	0.4	1.1	dB
Maximum VSWR			VSWR _{max}				
@ TX port	824... 849	MHz		—	1.5	2.0	
@ ANT port	824... 849	MHz		—	1.5	2.0	
Minimum attenuation							
	10... 420	MHz	α_{min}	35	38	—	dB
	420... 494	MHz	α_{min}	34	37	—	dB
	663... 698	MHz	α_{min}	30	34	—	dB
	699... 716	MHz	α_{min}	30	34	—	dB
	728... 764	MHz	α_{min}	30	35	—	dB
	777... 798	MHz	α_{min}	30	37	—	dB
	869... 894	MHz	α_{min}	45	57	—	dB
	869... 894	MHz	$\alpha_{INT,min}$ ³⁾	45	58	—	dB
	1166... 1187	MHz	α_{min}	30	40	—	dB
	1226... 1250	MHz	α_{min}	30	40	—	dB
	1559... 1563	MHz	α_{min}	42	46	—	dB
	1565.42... 1573.37	MHz	α_{min}	42	46	—	dB
	1573.37... 1577.47	MHz	α_{min}	42	46	—	dB
	1577.47... 1585.42	MHz	α_{min}	42	46	—	dB
	1597.55... 1605.89	MHz	α_{min}	42	46	—	dB
	1648... 1698	MHz	α_{min}	39	46	—	dB
	1710... 1785	MHz	α_{min}	39	46	—	dB
	1850... 1915	MHz	α_{min}	38	47	—	dB
	1880... 1920	MHz	α_{min}	40	47	—	dB
	1920... 1980	MHz	α_{min}	40	47	—	dB
	2010... 2025	MHz	α_{min}	40	48	—	dB

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
2110... 2200	MHz	α_{min}	40	48	—	dB	
2300... 2400	MHz	α_{min}	40	50	—	dB	
2305... 2360	MHz	α_{min}	40	50	—	dB	
2400... 2500	MHz	α_{min}	40	50	—	dB	
2472... 2547	MHz	α_{min}	40	50	—	dB	
2496... 2690	MHz	α_{min}	40	50	—	dB	
2620... 2690	MHz	α_{min}	40	51	—	dB	
3300... 3800	MHz	α_{min}	45	54	—	dB	
3300... 4200	MHz	α_{min}	45	54	—	dB	
4110... 4255	MHz	α_{min}	45	58	—	dB	
4400... 5000	MHz	α_{min}	45	59	—	dB	
5150... 5950	MHz	α_{min}	45	59	—	dB	

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

2) Valid for typical temperature $T = +25$ °C.

3) Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= -30 °C ... +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω + 8.5 nH ¹⁾
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry. ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω + 3.3 nH ¹⁾

Characteristics ANT – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	881.5	—	MHz
Maximum insertion attenuation							
	869... 894	MHz	α_{max}	—	1.5	2.0 ²⁾	dB
	869... 894	MHz	α_{max}	—	1.5	2.1	dB
	869... 894	MHz	$\alpha_{INT,max}$ ³⁾	—	1.5	2.0	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	869... 894	MHz		—	0.4	1.0	dB
Maximum VSWR			VSWR _{max}				
@ ANT port	869... 894	MHz		—	1.6	2.0	
@ RX port	869... 894	MHz		—	1.5	2.0	
Minimum attenuation							
	10... 447	MHz	α_{min}	50	55	—	dB
	45	MHz	α_{min}	55	78	—	dB
	447... 824	MHz	α_{min}	48	53	—	dB
	663... 698	MHz	α_{min}	50	54	—	dB
	699... 716	MHz	α_{min}	50	54	—	dB
	777... 798	MHz	α_{min}	50	56	—	dB
	779... 804	MHz	α_{min}	50	56	—	dB
	824... 849	MHz	α_{min}	45	59	—	dB
	824... 849	MHz	$\alpha_{INT,min}$ ³⁾	51	60	—	dB
	849... 854	MHz	α_{min}	30	56	—	dB
	1710... 1785	MHz	α_{min}	55	66	—	dB
	1738... 1788	MHz	α_{min}	55	66	—	dB
	1850... 1915	MHz	α_{min}	50	66	—	dB
	1880... 1920	MHz	α_{min}	50	66	—	dB
	1920... 1980	MHz	α_{min}	50	66	—	dB
	2010... 2025	MHz	α_{min}	50	67	—	dB
	2300... 2400	MHz	α_{min}	55	67	—	dB
	2305... 2315	MHz	α_{min}	55	67	—	dB
	2400... 2500	MHz	α_{min}	55	67	—	dB
	2496... 2690	MHz	α_{min}	55	67	—	dB
	2620... 2690	MHz	α_{min}	55	68	—	dB
	3300... 3800	MHz	α_{min}	55	68	—	dB

Characteristics ANT – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	3300... 4200	MHz	α_{min}	55	68	—	dB
	4400... 5000	MHz	α_{min}	55	74	—	dB
	5150... 5950	MHz	α_{min}	55	79	—	dB

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

2) Valid for typical temperature $T = +25$ °C.

3) Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= -30 °C ... +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω + 8.5 nH ¹⁾
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry. ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω + 3.3 nH ¹⁾

Characteristics TX – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Minimum isolation							
	824... 849	MHz	α_{min}	55 ²⁾	59	—	dB
	824... 849	MHz	α_{min}	52	59	—	dB
	824... 849	MHz	$\alpha_{INT,min}$ ³⁾	55	61	—	dB
	869... 894	MHz	α_{min}	53 ²⁾	57	—	dB
	869... 894	MHz	α_{min}	50	57	—	dB
	869... 894	MHz	$\alpha_{INT,min}$ ³⁾	55	58	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

²⁾ Valid for typical temperature $T = +25$ °C.

³⁾ Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

7 Maximum ratings

Storage temperature	$T_{STG}^{1)} = -40\text{ °C} \dots +85\text{ °C}$	
DC voltage	$ V_{DC} = 5.0\text{ V (max.)}$	
ESD voltage		
	$V_{ESD}^{2)} = 50\text{ V (max.)}$	Machine model.
	$V_{ESD}^{3)} = 150\text{ V (max.)}$	Human body model.
	$V_{ESD}^{4)} = 600\text{ V (max.)}$	Charged device model.
Input power	P_{IN}	
@ TX port: 824 ... 849 MHz	30 dBm	<ul style="list-style-type: none"> ■ 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: 824 ... 849 MHz	28.5 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⁾ According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

³⁾ According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

⁴⁾ According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

8 Transmission coefficients

8.1 TX – ANT

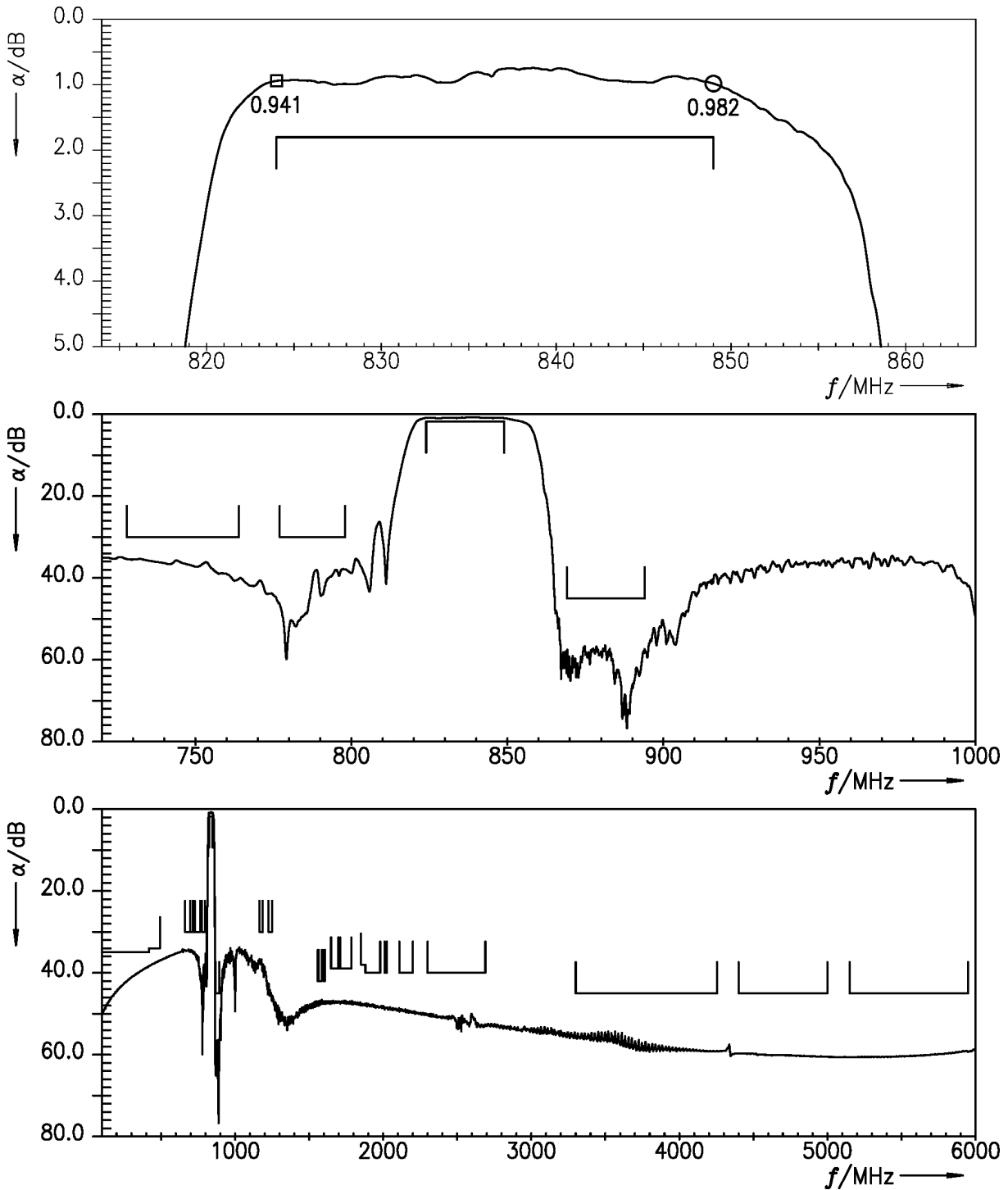


Figure 3: Attenuation TX – ANT.

8.2 ANT – RX

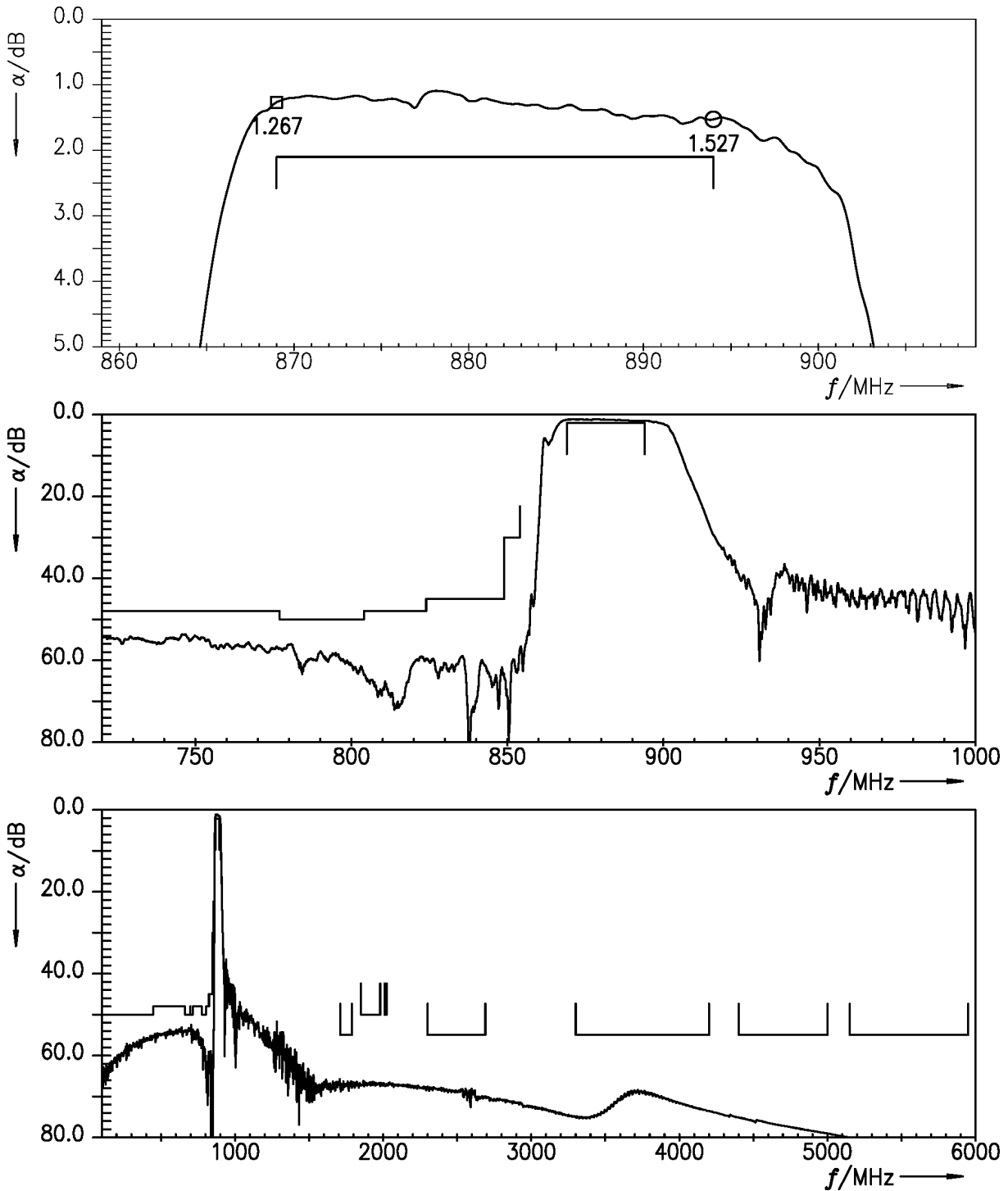


Figure 4: Attenuation ANT – RX.

8.3 TX – RX

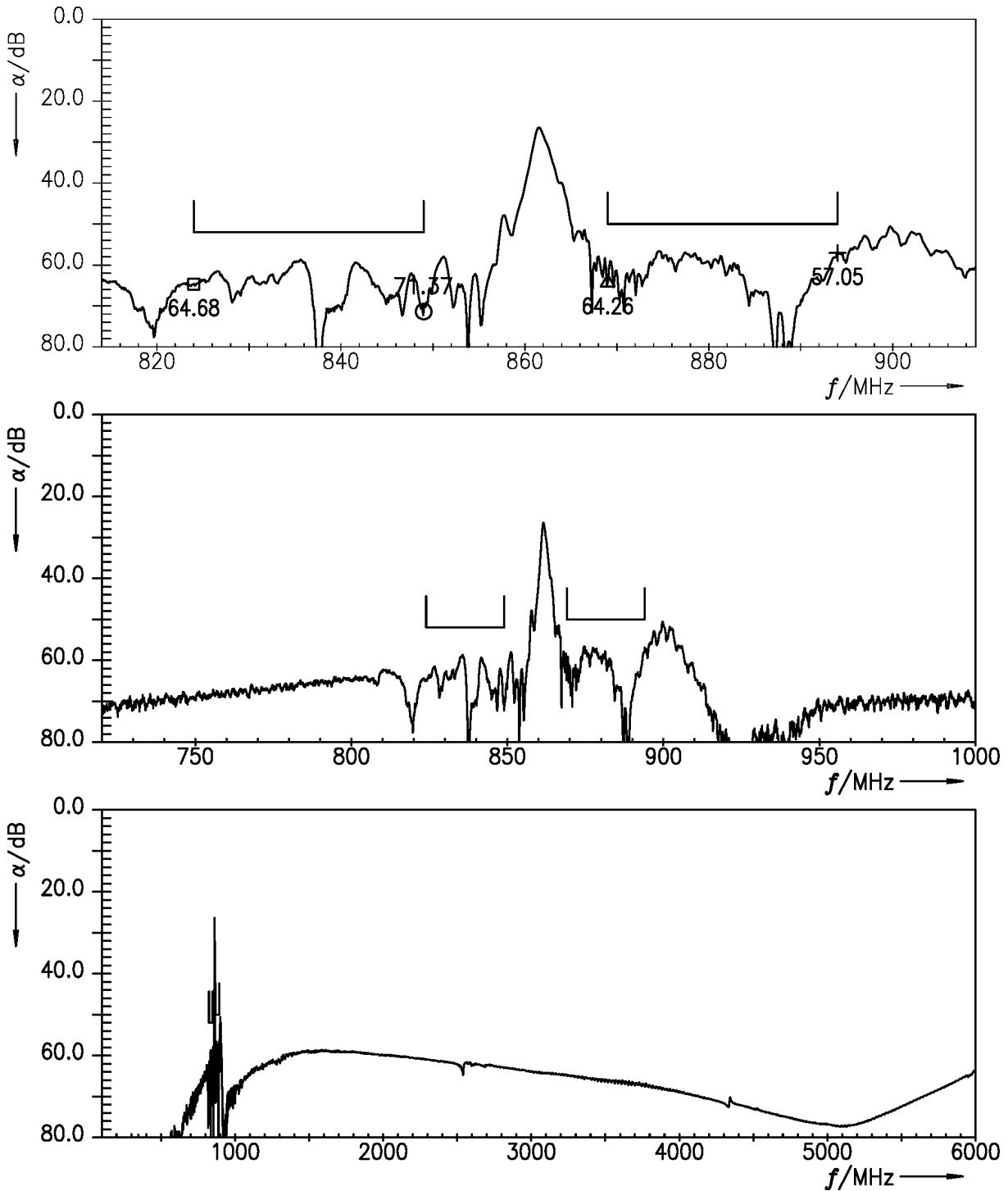


Figure 5: Isolation TX – RX.

9 Reflection coefficients

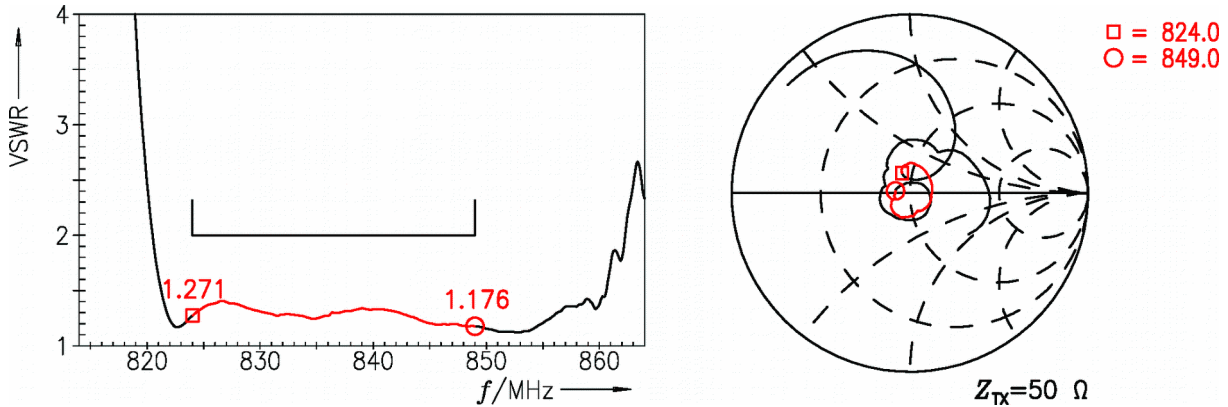


Figure 6: Reflection coefficient at TX port.

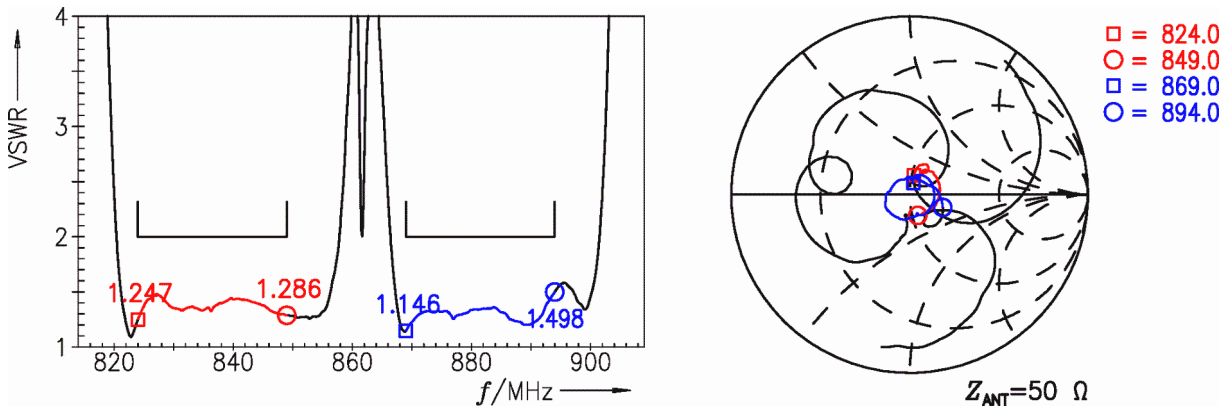


Figure 7: Reflection coefficient at ANT port (TX and RX frequencies).

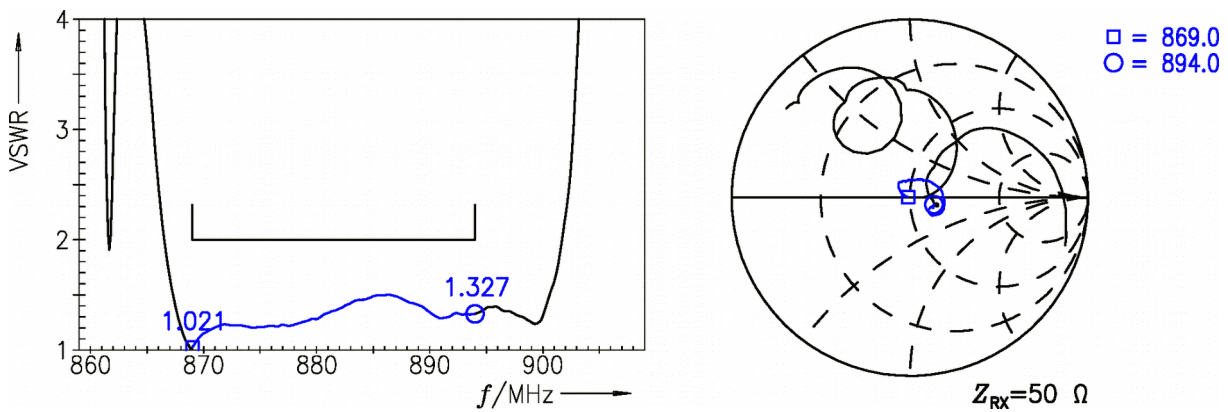


Figure 8: Reflection coefficient at RX port.

10 Packing material

10.1 Tape

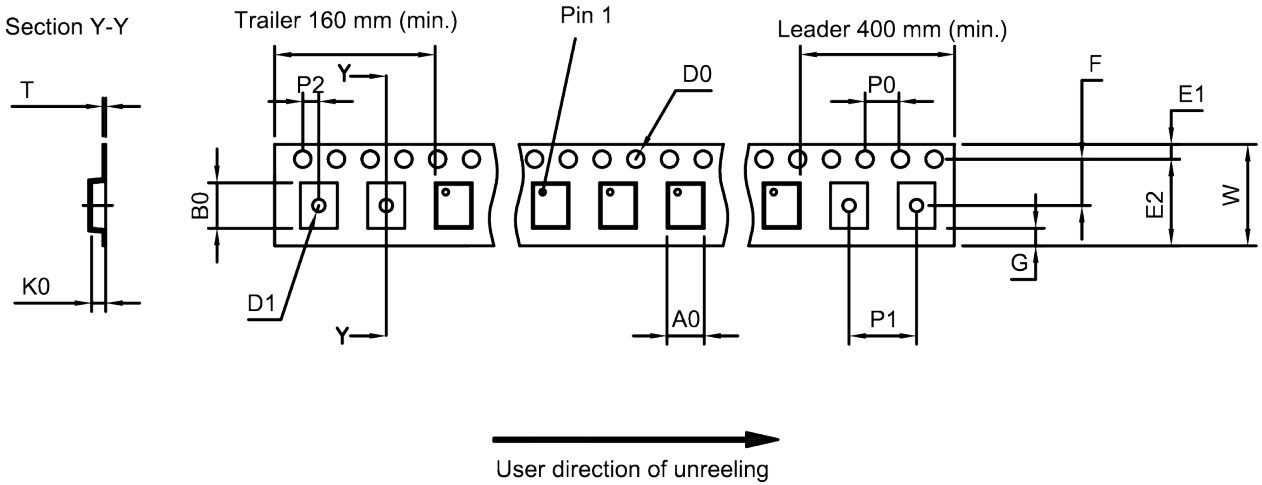


Figure 9: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A ₀	1.4±0.05 mm	E ₂	6.25 mm (min.)	P ₁	4.0±0.1 mm
B ₀	1.8±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	0.6+0.1/-0 mm	K ₀	0.7±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.

10.2 Reel with diameter of 180 mm

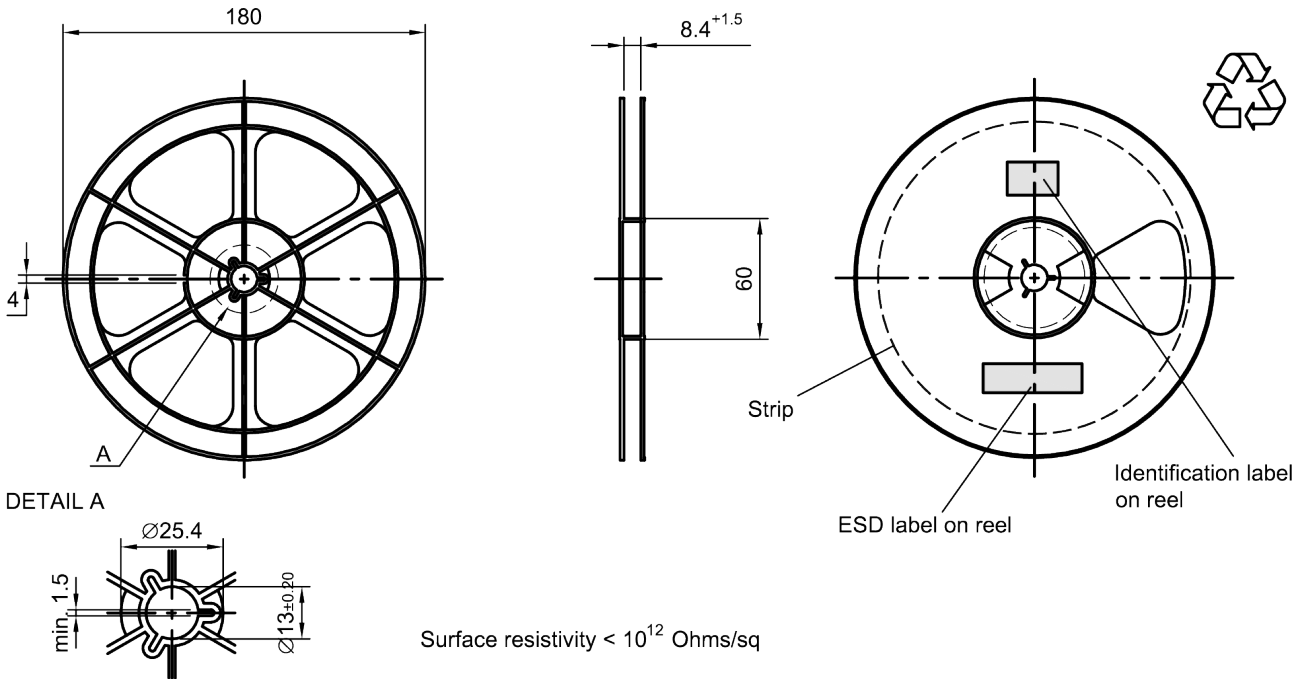


Figure 10: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

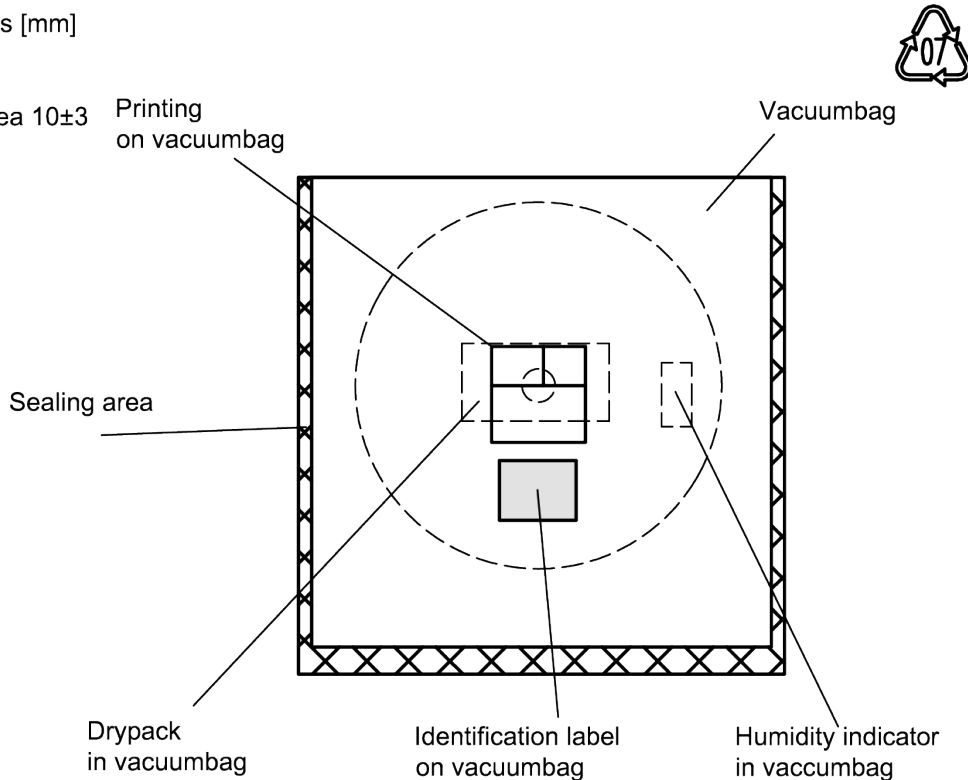


Figure 11: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

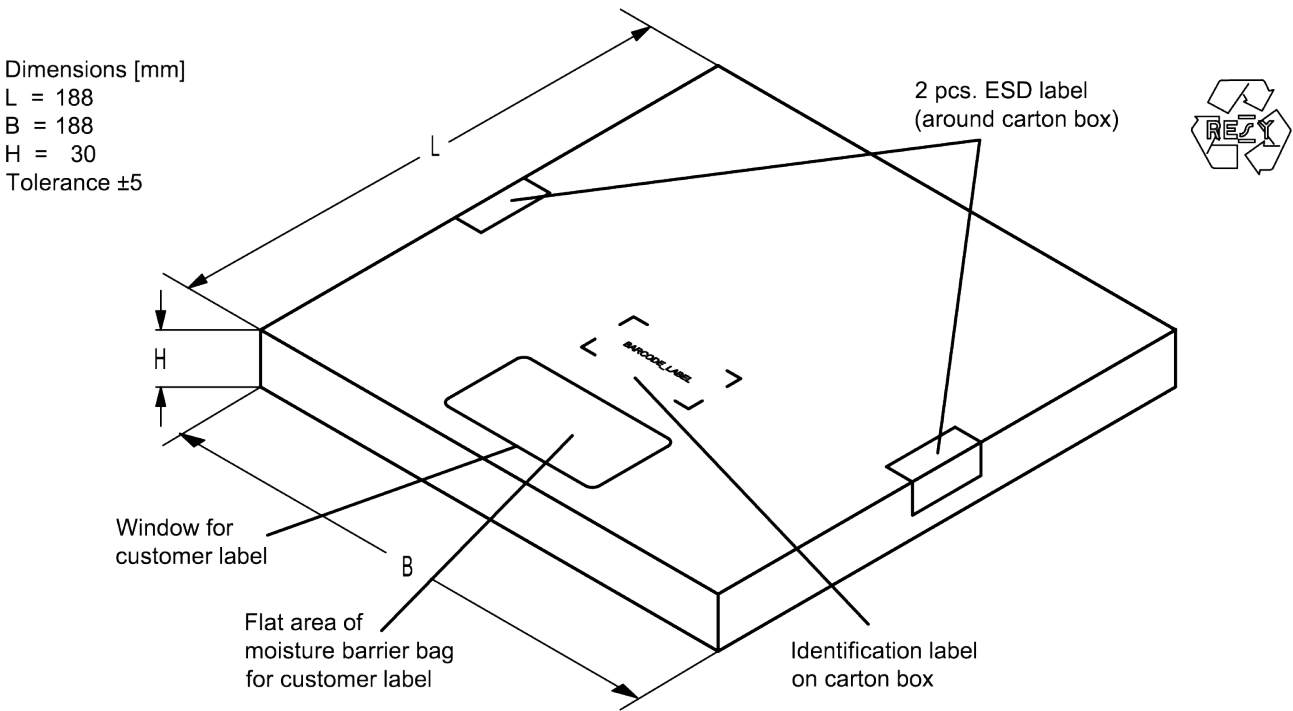


Figure 12: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm

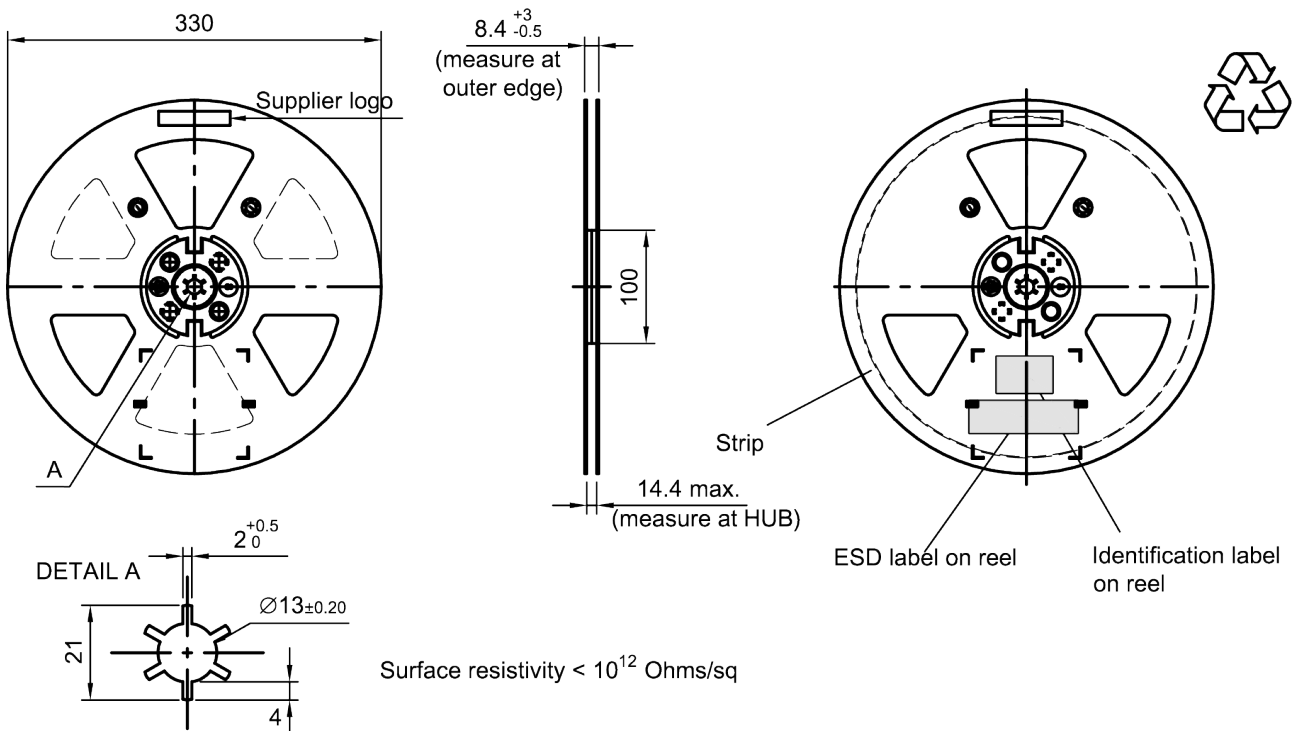


Figure 13: Drawing of reel (first-angle projection) with diameter of 330 mm.

Dimensions [mm]

X = 400+5

Y = 418+5

Sealing area 10±3

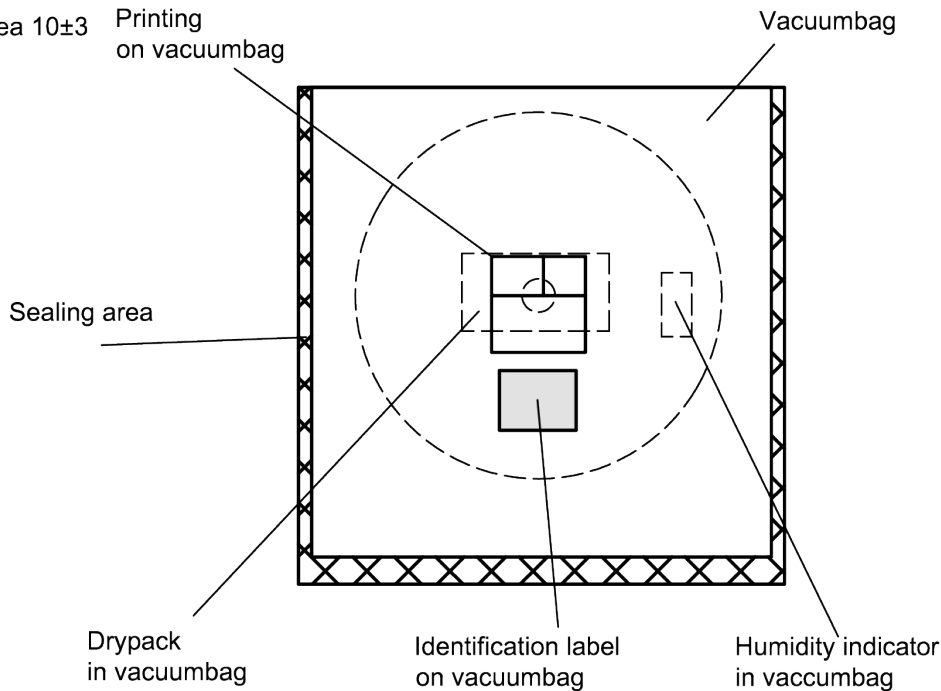


Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

Dimensions [mm]

L = 335

B = 338

H = 36 (for 8 mm tape width)

40 (for 12 mm tape width)

Tolerance ±5

2 pcs. ESD label
(around carton box)

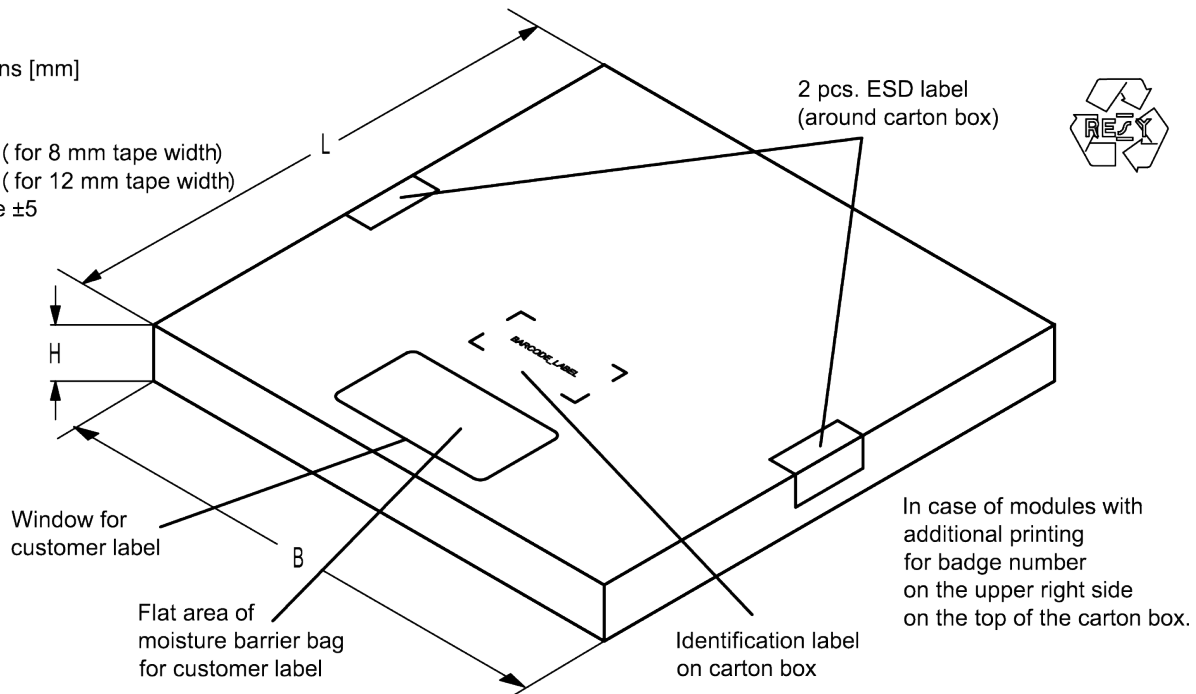


Figure 15: Drawing of folding box for reel with diameter of 330 mm.

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**
 $1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0 =$ **1234**
 The BASE32 code for product type B1284 is 184.

■ 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**
 $5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0 =$ **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.

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
$T > 220\text{ °C}$	30 s to 70 s
$T > 230\text{ °C}$	min. 10 s
$T > 245\text{ °C}$	max. 20 s
$T \geq 255\text{ °C}$	–
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).

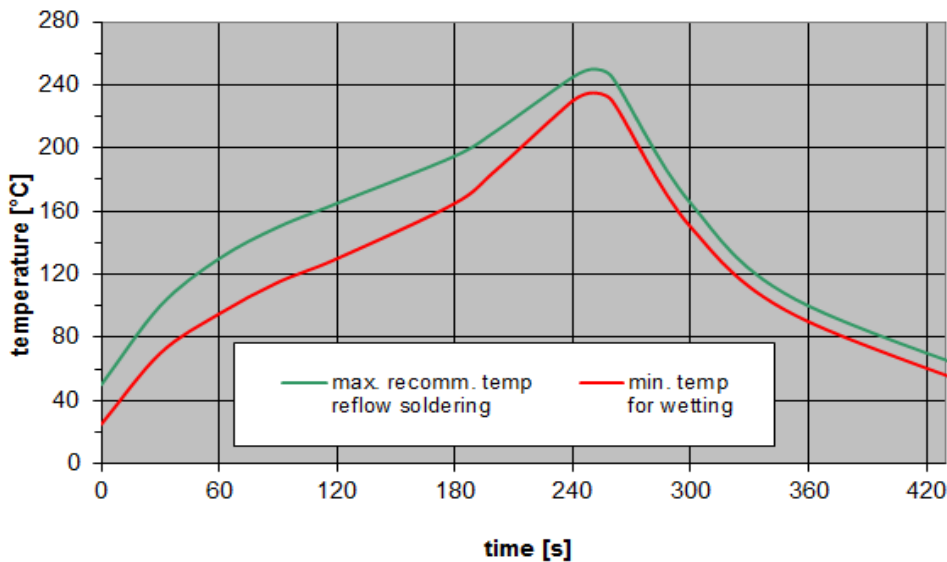


Figure 16: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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
B39881B1284L210S 5	B39881-B1284-L210-S05	5000 pcs
B39881B1284L210W 5	B39881-B1284-L210-W05	5000 pcs

Table 4: Ordering codes / product IDs and packing units.

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://rfe.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.

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.
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