



RF360 Europe GmbH  
A Qualcomm – TDK Joint Venture

## SAW components

### SAW duplexer LTE band 2

Series/type:	B1229
Ordering code:	B39202-B1229-P810
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RF360 Europe GmbH, Anzinger Str. 13, München, Germany

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<b>SAW components</b>	<b>B1229</b>
<b>SAW duplexer</b>	<b>1880 / 1960 MHz</b>

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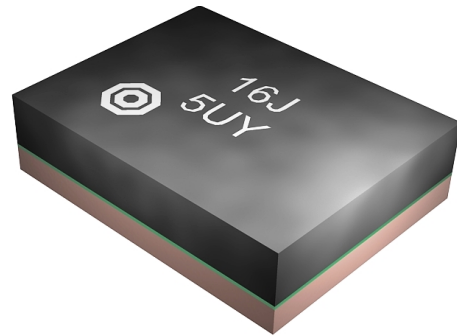
Data sheet

## 1 Application

- Low-loss SAW duplexer for mobile telephone LTE Band 2 (PCS) systems.
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 60 MHz

## 2 Features

- Package size  $1.8\pm 0.1$  mm  $\times$   $1.4\pm 0.1$  mm
- Package height 0.475 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)



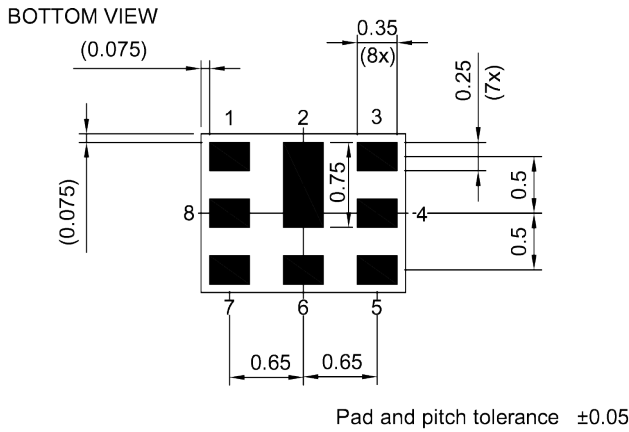
**Figure 1:** Picture of component with example of product marking.

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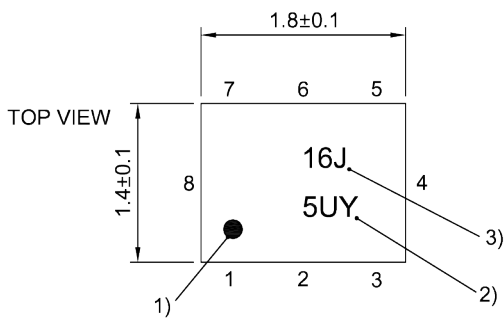
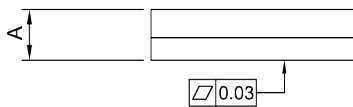
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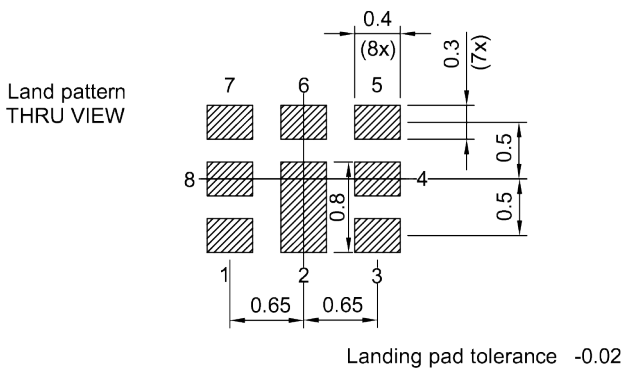
**3 Package**



SIDE VIEW



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



**4 Pin configuration**

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

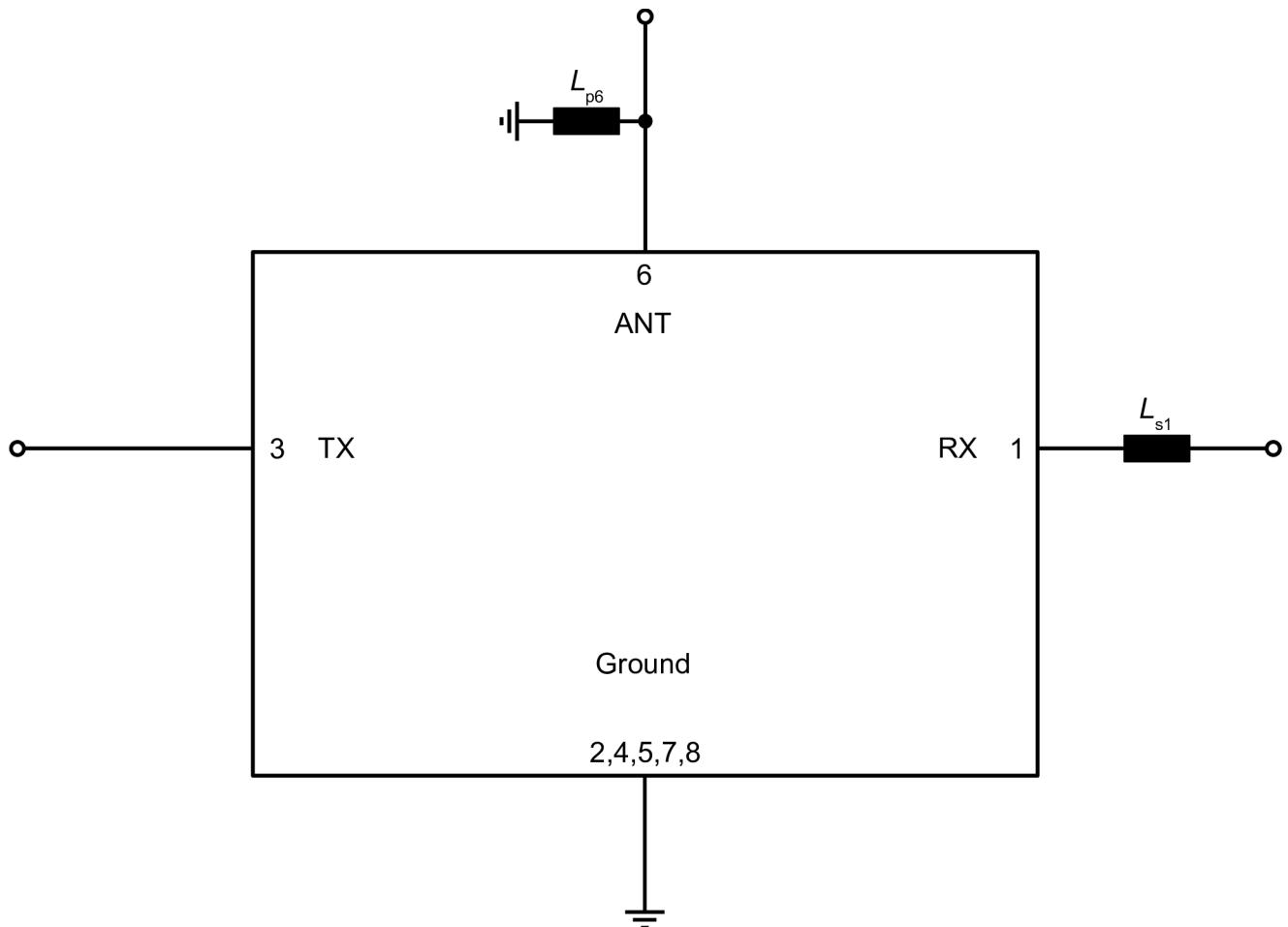
**Figure 2:** Drawing of package with package height A = 0.475 mm (max.). See Sec. Package information (p. 25).

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## 5 Matching circuit

■  $L_{p6} = 3.4 \text{ nH}$

■  $L_{s1} = 1.7 \text{ nH}$



**Figure 3:** 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	$T_{SPEC}$	= -20 °C ... +90 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$ with par. 3.4 nH <sup>1)</sup>
RX terminating impedance	$Z_{RX}$	= 50 $\Omega$ with ser. 1.7 nH <sup>1)</sup>

Characteristics TX – ANT				min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$	
<b>Center frequency</b>			$f_C$	—	1880	—	MHz
<b>Maximum insertion attenuation</b>	1850... 1910	MHz	$\alpha_{INT,max}^{2)}$	—	1.7	2.5	dB
	1850.24... 1909.76	MHz	$\alpha_{max}$	—	1.9	2.7	dB
<b>Maximum VSWR</b>			VSWR <sub>max</sub>				
@ TX port	1850.24... 1909.76	MHz		—	1.4	2.0	
@ ANT port	1850.24... 1909.76	MHz		—	1.4	2.0	
<b>Minimum attenuation</b>			$\alpha_{min}$				
	10... 894	MHz		44	47	—	dB
	1226... 1250	MHz		40	43	—	dB
	1559... 1605.9	MHz		43	47	—	dB
	1605.8... 1680	MHz		30	50	—	dB
	1930.24... 1989.76	MHz		45	57	—	dB
	2010... 2025	MHz		20	52	—	dB
	2110... 2155	MHz		40	45	—	dB
	2400... 2500	MHz		20	35	—	dB
	3700... 3820	MHz		32	35	—	dB
	4900... 5850	MHz		19	24	—	dB
	5254... 5455	MHz		22	26	—	dB
	5540... 5950	MHz		17	22	—	dB

<sup>1)</sup> See Sec. Matching circuit (p. 6).

<sup>2)</sup> Integrated attenuation  $\alpha_{INT}$ : Averaged power  $|S_{ij}|^2$  over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

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## 6.2 ANT – RX

Temperature range for specification	$T_{SPEC}$	= -20 °C ... +90 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$ with par. 3.4 nH <sup>1)</sup>
RX terminating impedance	$Z_{RX}$	= 50 $\Omega$ with ser. 1.7 nH <sup>1)</sup>

Characteristics ANT – RX				min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$	
<b>Center frequency</b>			$f_C$	—	1960	—	MHz
<b>Maximum insertion attenuation</b>							
	1930... 1990	MHz	$\alpha_{INT,max}^{2)}$	—	2.1	3.0	dB
	1930.24... 1989.76	MHz	$\alpha_{max}$	—	2.4	3.0	dB
<b>Maximum VSWR</b>			VSWR <sub>max</sub>				
@ ANT port	1930.24... 1989.76	MHz		—	1.5	2.0	
@ RX port	1930.24... 1989.76	MHz		—	1.4	2.0	
<b>Minimum attenuation</b>			$\alpha_{min}$				
	10... 1100	MHz		45	50	—	dB
	79.9... 80.1	MHz		50	95	—	dB
	1100... 1850	MHz		41	45	—	dB
	1850.24... 1909.76	MHz		45	50	—	dB
	2050... 2075	MHz		25	43	—	dB
	2075... 2305	MHz		30	37	—	dB
	2305... 2315	MHz		40	50	—	dB
	2315... 2550	MHz		15	23	—	dB
	2550... 6000	MHz		40	48	—	dB

<sup>1)</sup> See Sec. Matching circuit (p. 6).

<sup>2)</sup> Integrated attenuation  $\alpha_{INT}$ : Averaged power  $|S_{ij}|^2$  over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.



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## 6.3 TX – RX

Temperature range for specification	$T_{SPEC}$	= -20 °C ... +90 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$ with par. 3.4 nH <sup>1)</sup>
RX terminating impedance	$Z_{RX}$	= 50 $\Omega$ with ser. 1.7 nH <sup>1)</sup>

Characteristics TX – RX				min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$	
<b>Minimum isolation</b>							
	1574... 1577	MHz	$\alpha_{min}$	40	64	—	dB
	1850... 1910	MHz	$\alpha_{INT,min}^{2)}$	54	57	—	dB
	1850.24... 1909.76	MHz	$\alpha_{min}$	53	56	—	dB
	1930... 1990	MHz	$\alpha_{INT,min}^{2)}$	55	63	—	dB
	1930.24... 1989.76	MHz	$\alpha_{min}$	55 <sup>3)</sup>	62	—	dB
	1930.24... 1989.76	MHz	$\alpha_{min}$	50	62	—	dB
	3700... 3820	MHz	$\alpha_{min}$	20	53	—	dB
	5550... 5850	MHz	$\alpha_{min}$	20	55	—	dB

<sup>1)</sup> See Sec. Matching circuit (p. 6).

<sup>2)</sup> Integrated attenuation  $\alpha_{INT}$ : Averaged power  $|S_{ij}|^2$  over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

<sup>3)</sup> Valid for temperature  $T = +25$  °C...+90 °C.

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## 7 Maximum ratings

Storage temperature	$T_{STG}^{1)} = -40\text{ °C} \dots +90\text{ °C}$	
DC voltage	$ V_{DC} ^{3)} = 0\text{ V (max.)}^{2)}$	
ESD voltage		
	$V_{ESD}^{4)} = 50\text{ V (max.)}$	Machine model.
	$V_{ESD}^{5)} = 300\text{ V (max.)}$	Human body model.
	$V_{ESD}^{6)} = 600\text{ V (max.)}$	Charged device model.
Input power @ TX port: 1850.24 ... 1909.76 MHz	$P_{IN} = 29\text{ dBm}$	Continuous wave for 5000 h @ 50 °C.

<sup>1)</sup> Not valid for packaging material. Storage temperature for packaging material is -25 °C to +40 °C.

<sup>2)</sup> 168h Damp Heat Steady State acc. IEC 60068-2-67 Cy.

<sup>3)</sup> In case of applied DC voltage blocking capacitors are mandatory.

<sup>4)</sup> According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

<sup>5)</sup> According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

<sup>6)</sup> 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

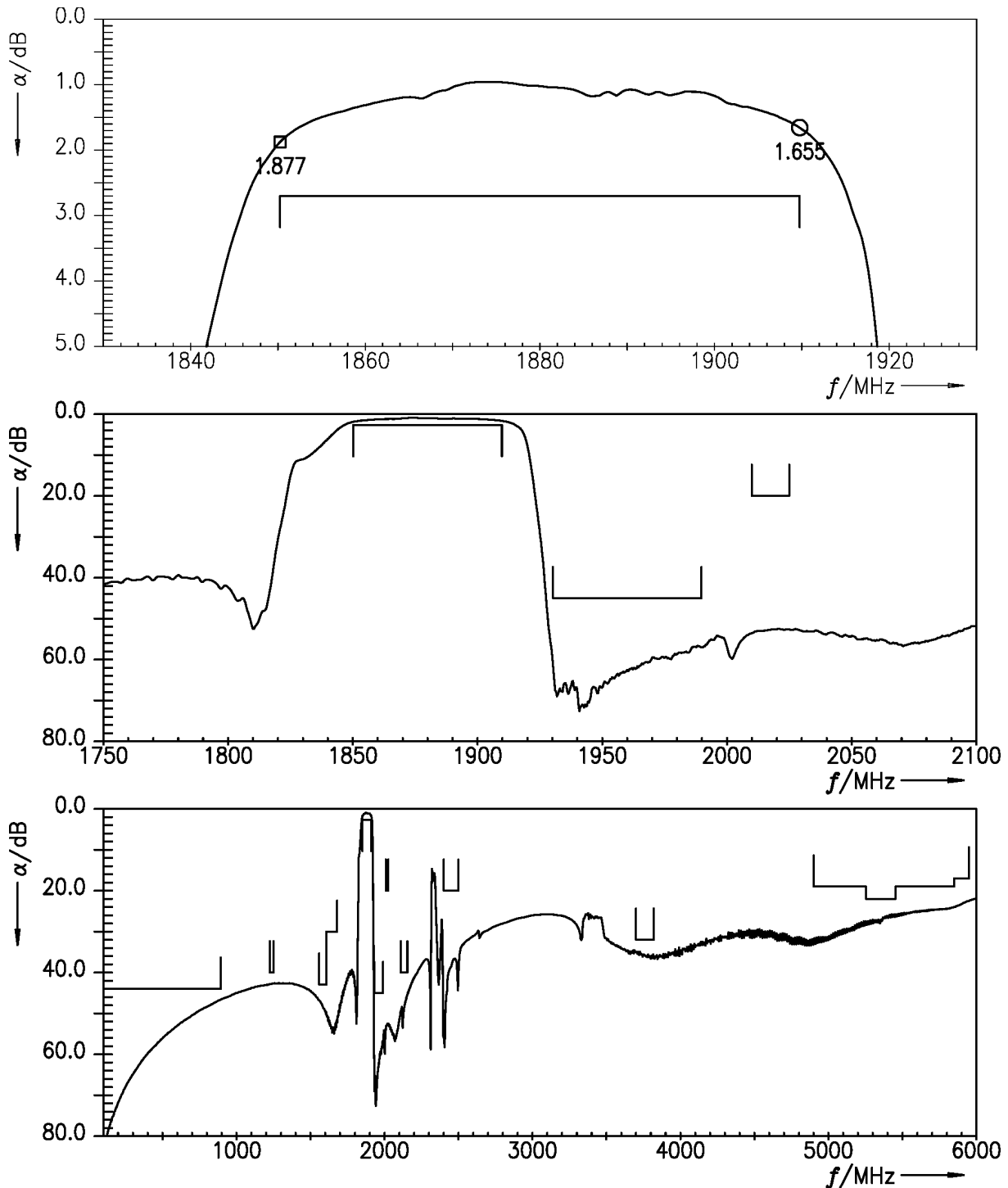
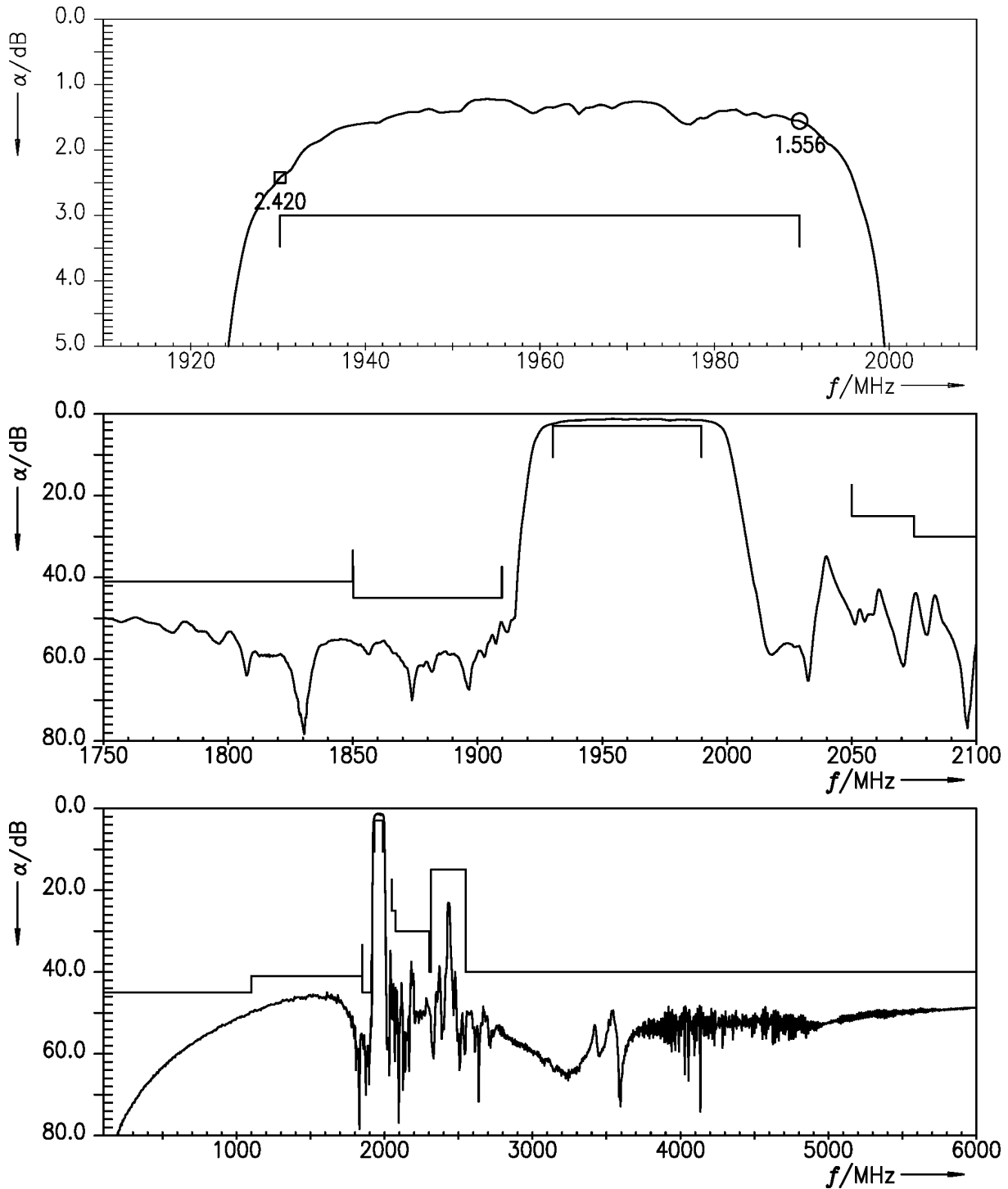


Figure 4: Attenuation TX – ANT.

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**8.2 ANT – RX**

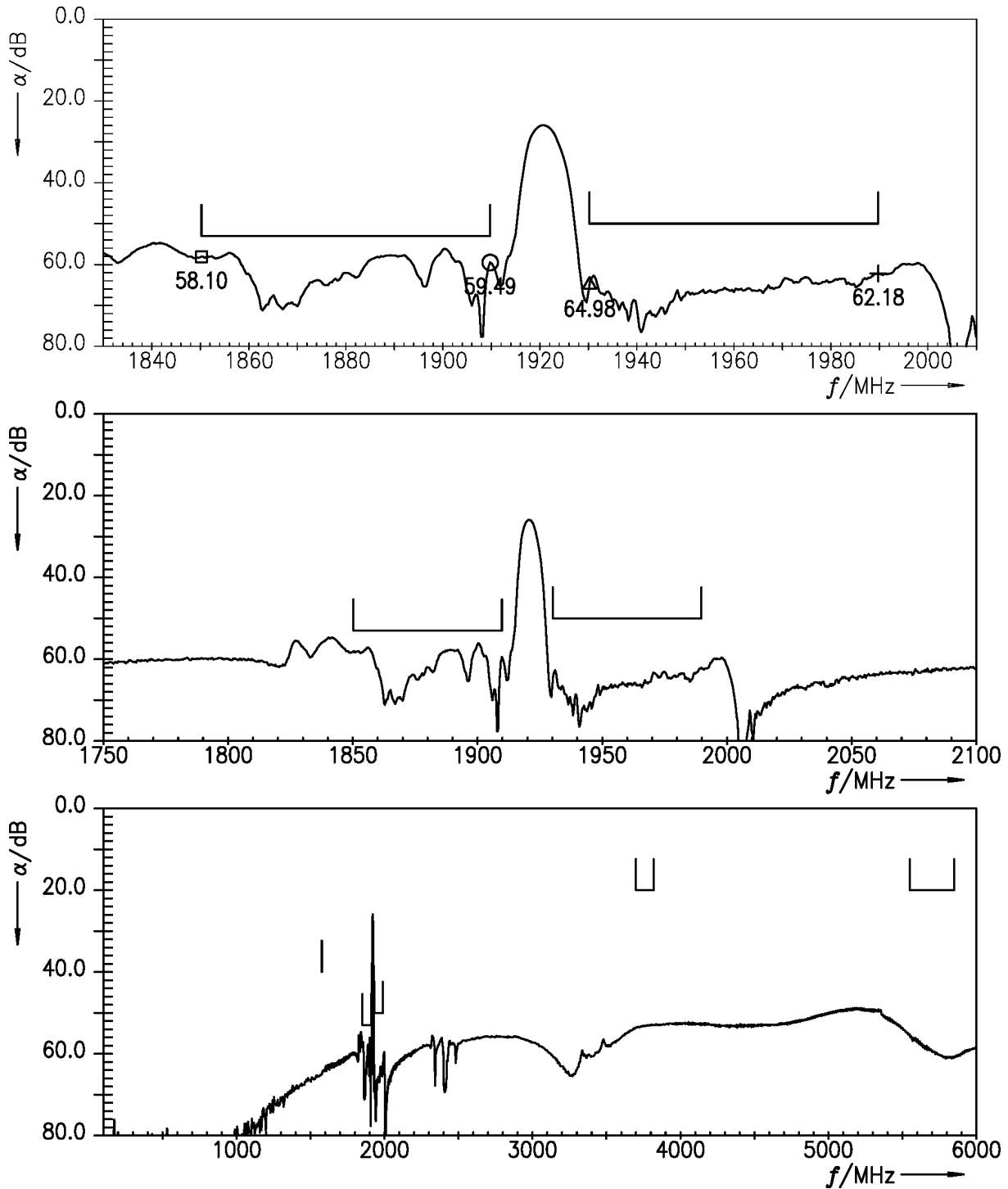


**Figure 5:** Attenuation ANT – RX.

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**8.3 TX – RX**



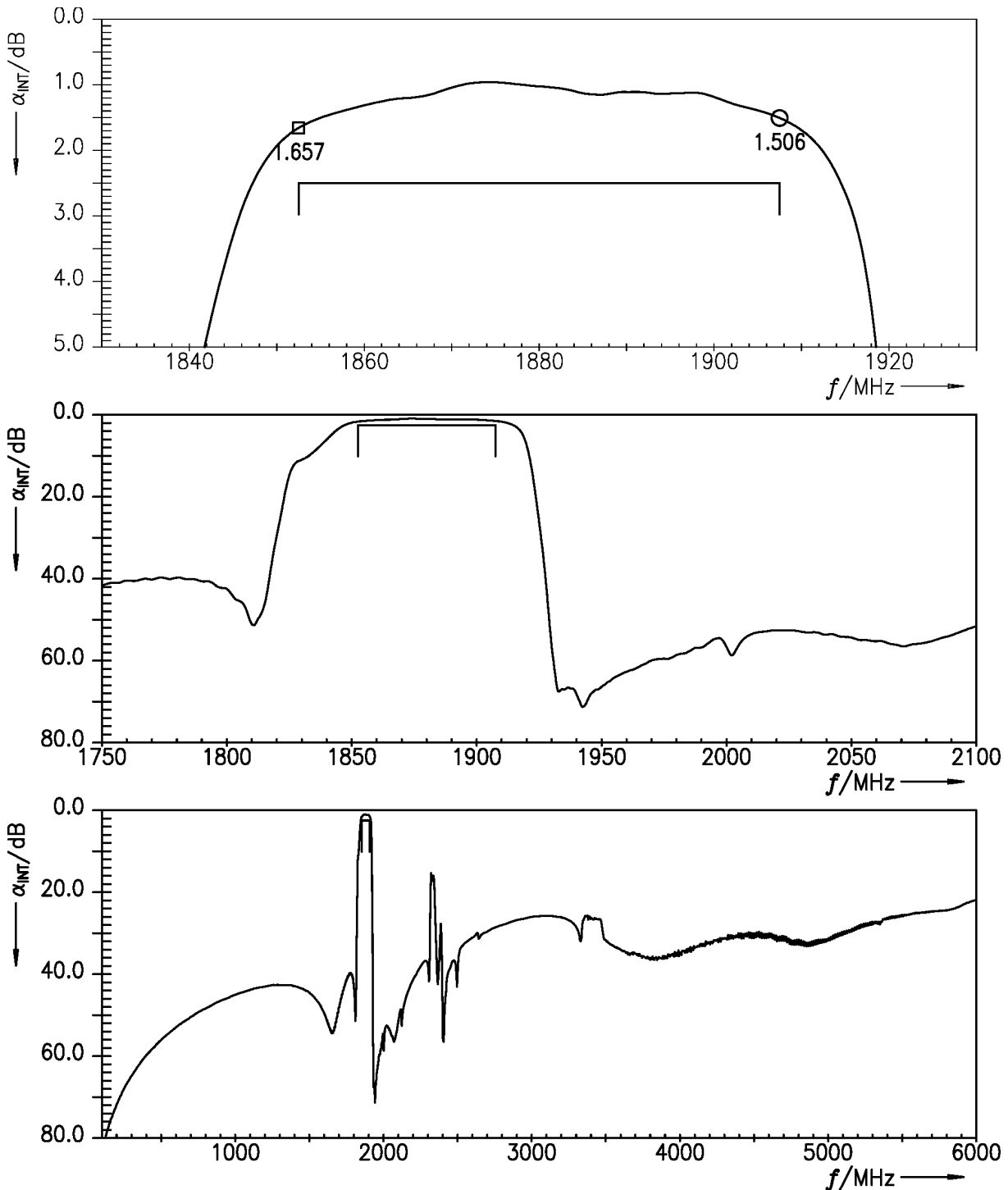
**Figure 6:** Isolation TX – RX.

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**9 Transmission coefficients (LTE)**

**9.1 TX – ANT**

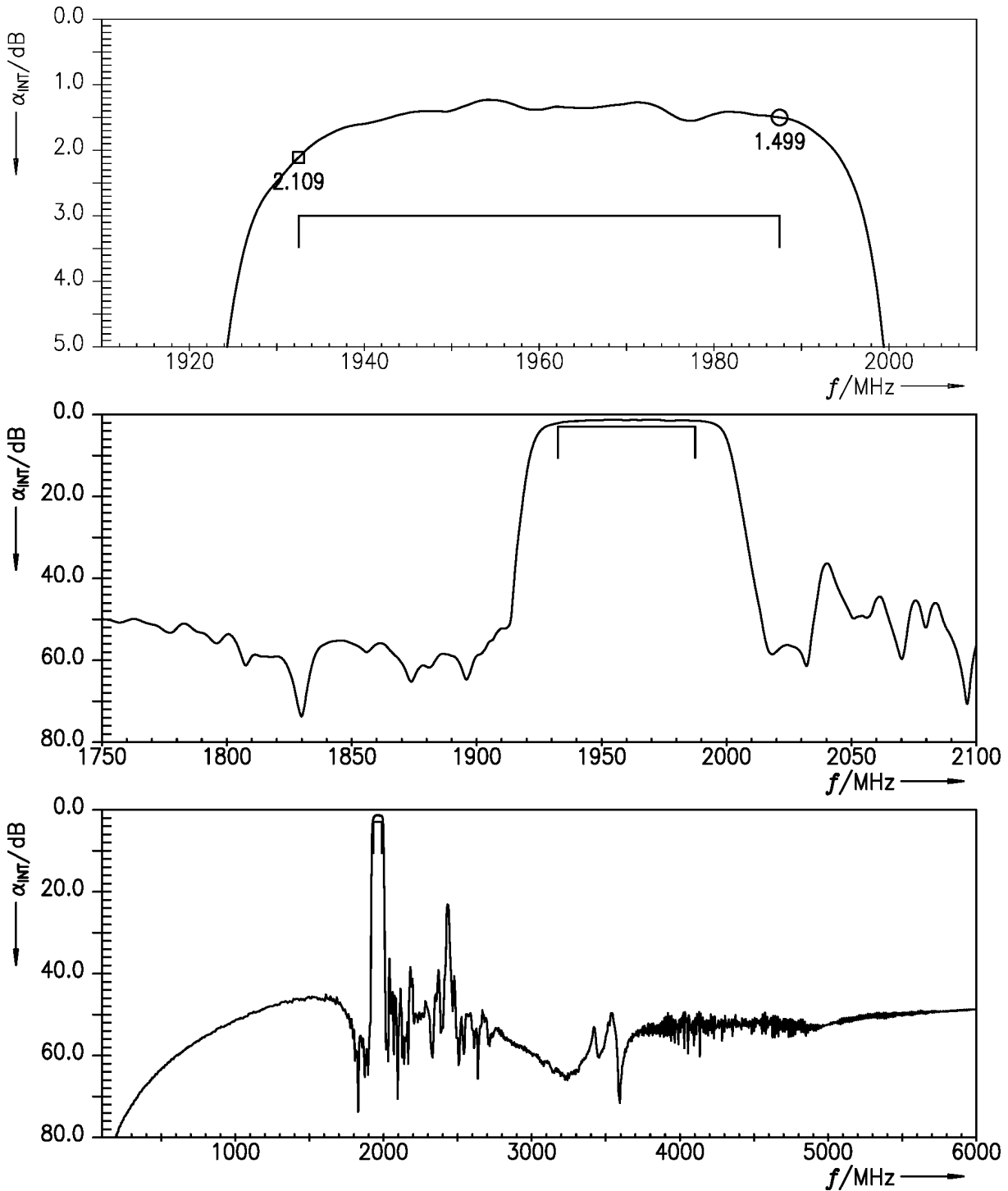


**Figure 7:** Attenuation (LTE) (integration window = 5 MHz) TX – ANT.

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**9.2 ANT – RX**

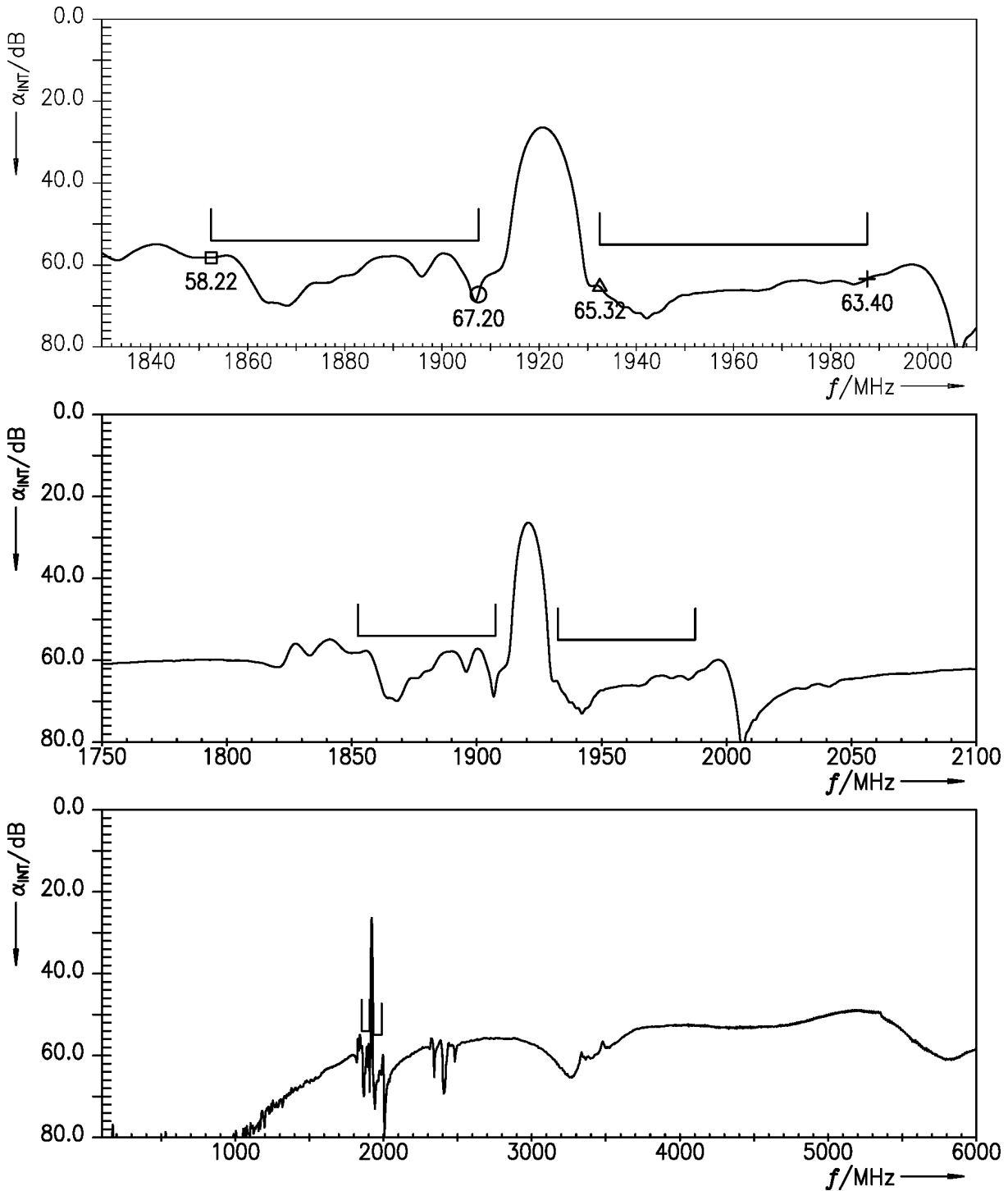


**Figure 8:** Attenuation (LTE) (integration window = 5 MHz) ANT – RX.

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**9.3 TX – RX**



**Figure 9:** Isolation (LTE) (integration window = 5 MHz) TX – RX.



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10 Reflection coefficients

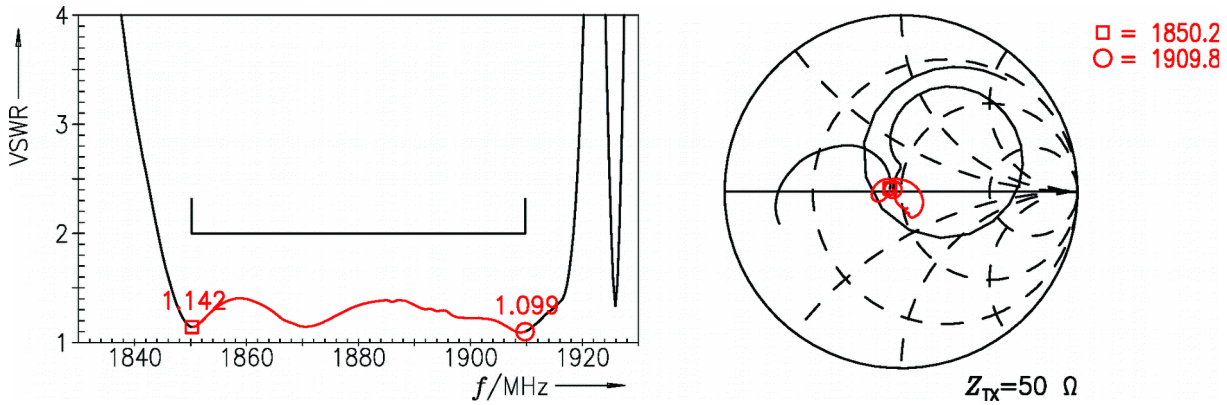


Figure 10: Reflection coefficient at TX port.

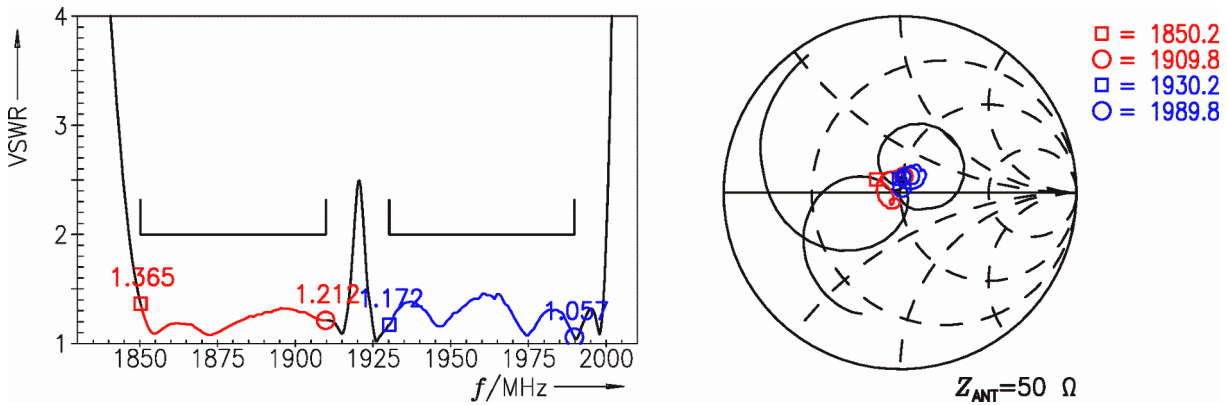


Figure 11: Reflection coefficient at ANT port.

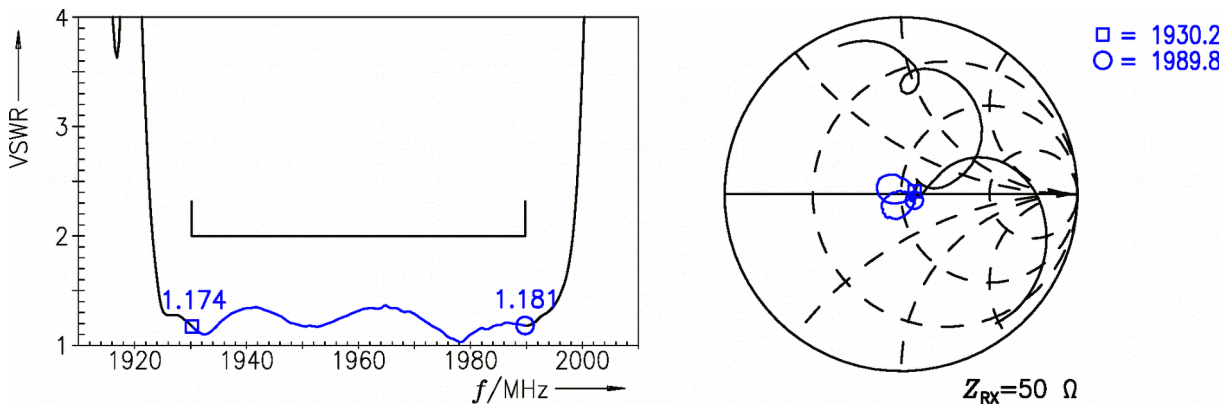
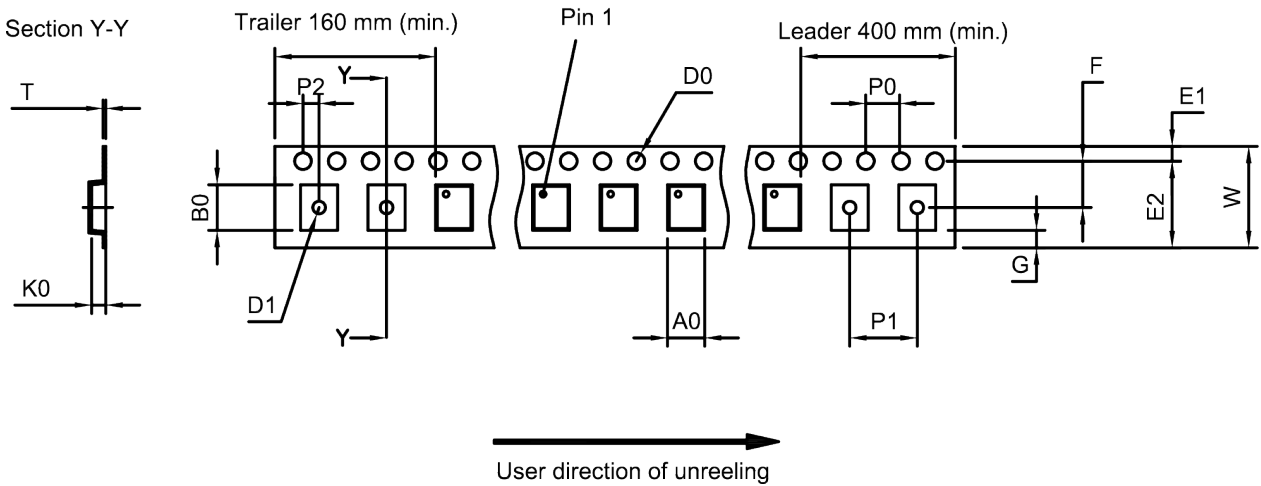


Figure 12: Reflection coefficient at RX port.

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**11 Packing material**

**11.1 Tape**



**Figure 13:** Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A <sub>0</sub>	1.62±0.05 mm	E <sub>2</sub>	6.25 mm (min.)	P <sub>1</sub>	4.0±0.1 mm
B <sub>0</sub>	2.04±0.05 mm	F	3.5±0.05 mm	P <sub>2</sub>	2.0±0.05 mm
D <sub>0</sub>	1.5+0.1/-0 mm	G	0.75 mm (min.)	T	0.25±0.05 mm
D <sub>1</sub>	0.8±0.05 mm	K <sub>0</sub>	0.62±0.05 mm	W	8.0±0.1 mm
E <sub>1</sub>	1.75±0.1 mm	P <sub>0</sub>	4.0±0.1 mm		

**Table 1:** Tape dimensions.

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11.2 Reel with diameter of 180 mm

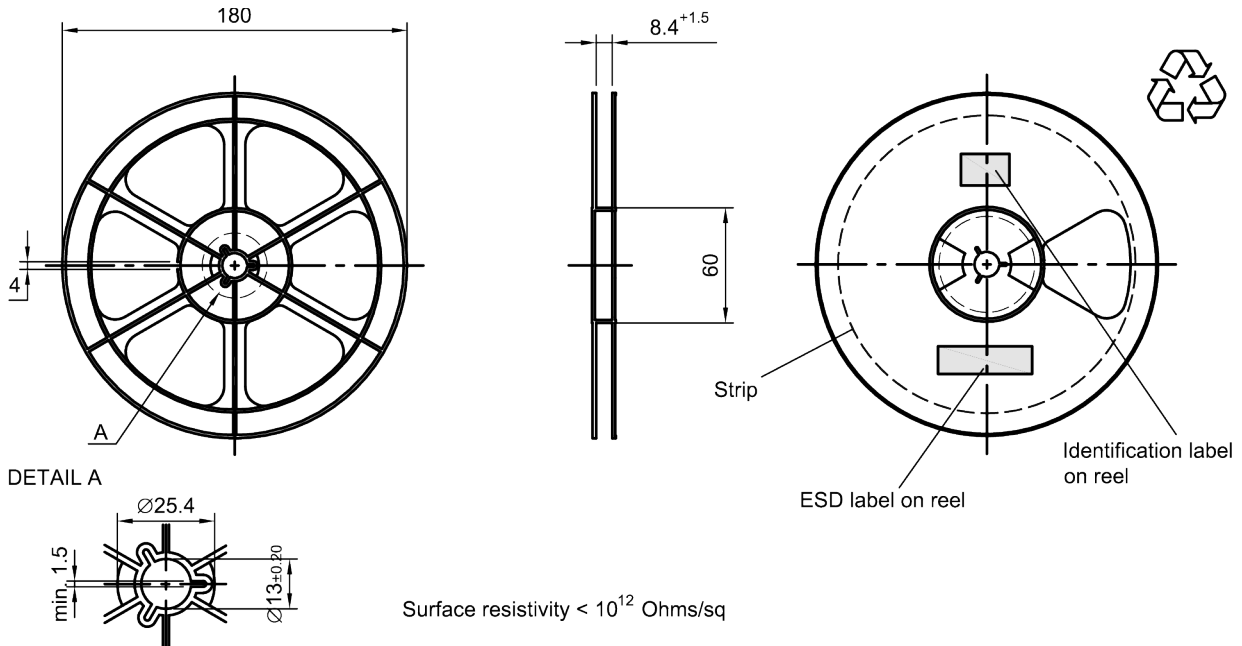


Figure 14: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

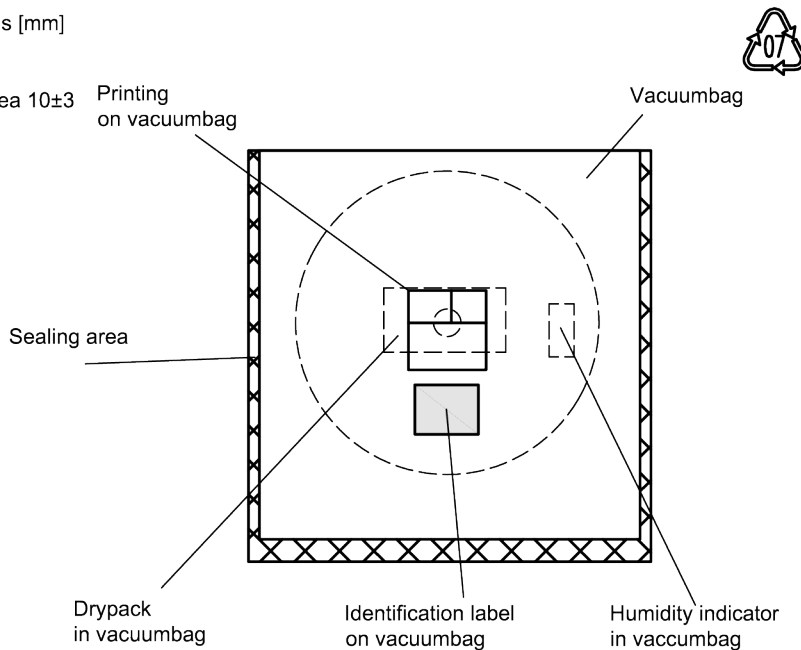


Figure 15: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

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Dimensions [mm]  
 L = 188  
 B = 188  
 H = 30  
 Tolerance ±5

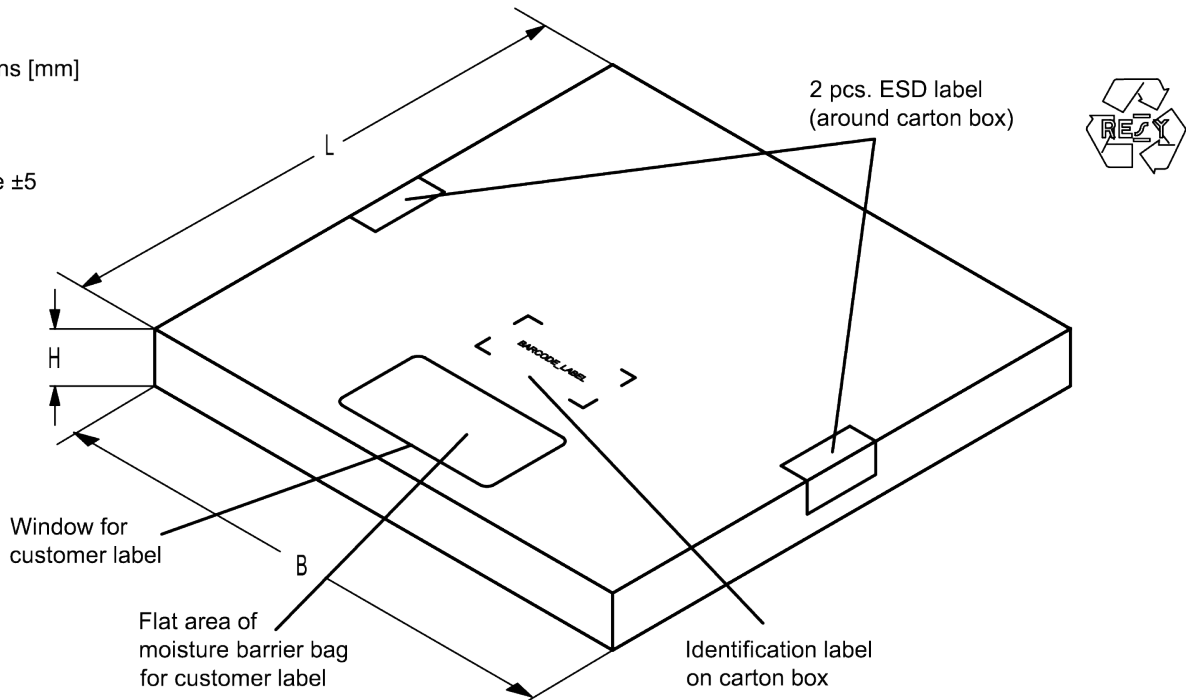


Figure 16: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

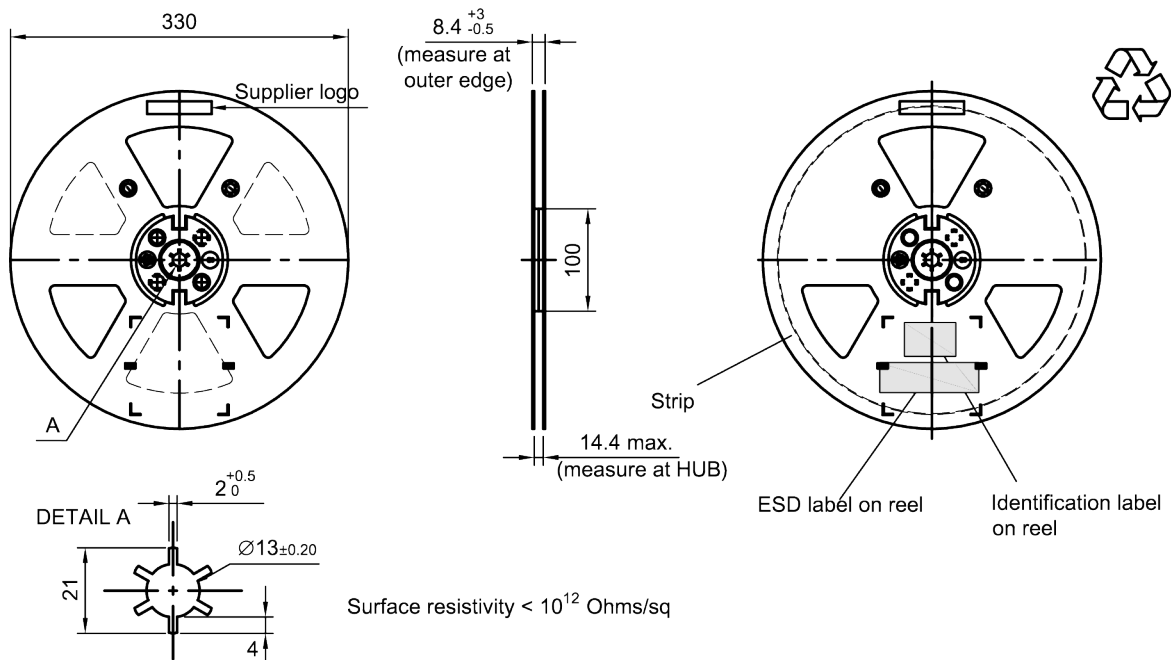
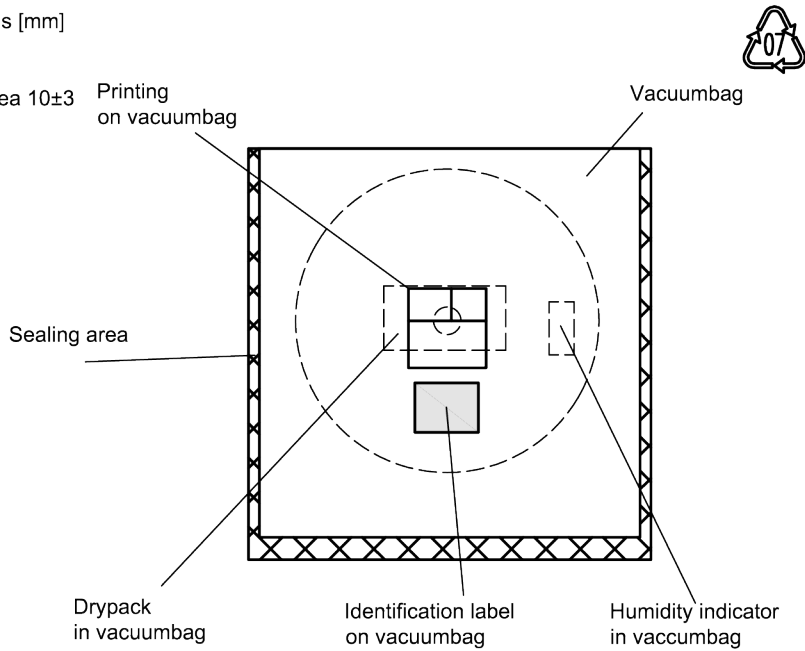


Figure 17: Drawing of reel (first-angle projection) with diameter of 330 mm.

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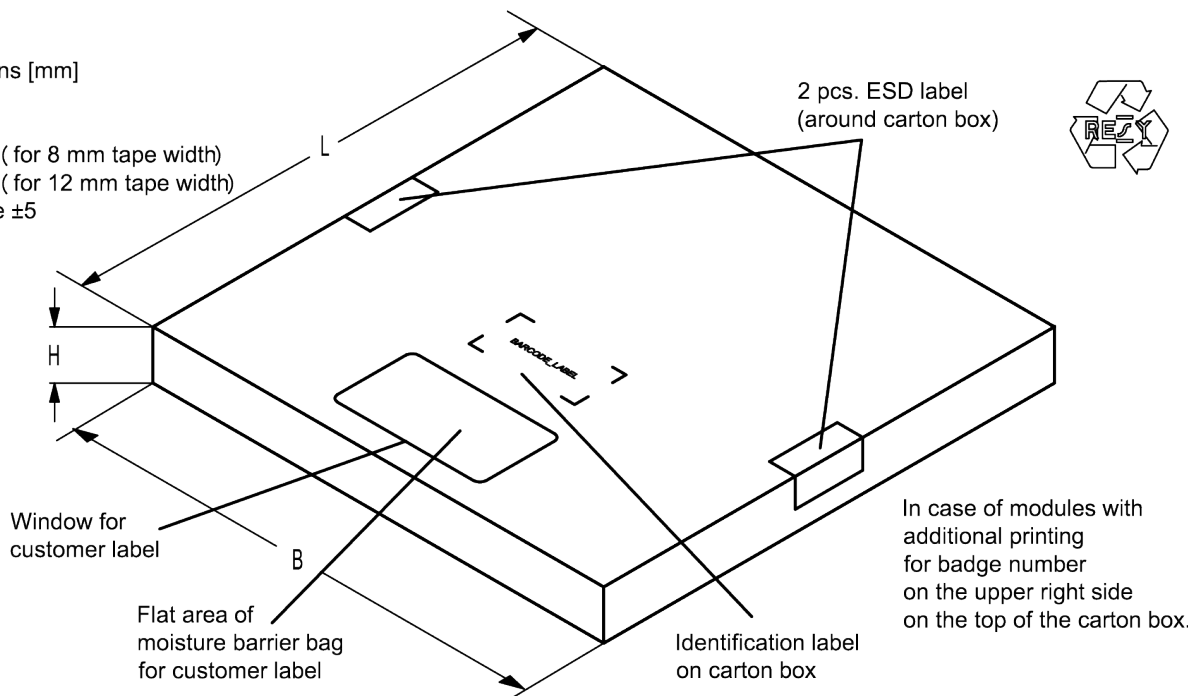
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Dimensions [mm]  
 X = 400+5  
 Y = 418+5  
 Sealing area 10±3



**Figure 18:** 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



**Figure 19:** Drawing of folding box for reel with diameter of 330 mm.

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## 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.
	<b>16J</b>	<b>1234</b>
	$1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0$	<b>1234</b>

The BASE32 code for product type B1229 is 16D.

## ■ 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.
	<b>5UY</b>	<b>12345</b>
	$5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0$	<b>12345</b>

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.

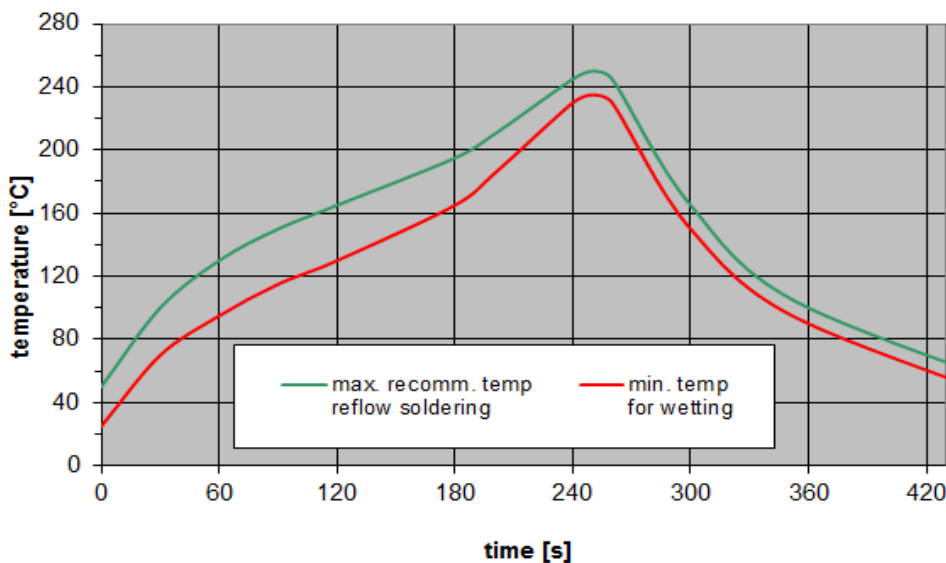
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### 13 Soldering profile

The recommended soldering process is in accordance with IEC 60068-2-58 – 3<sup>rd</sup> 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 $T_{\text{peak}}$	250 °C +0/-5 °C
wetting temperature $T_{\text{min}}$	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 20:** Recommended reflow profile for convection and infrared soldering – lead-free solder.

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## 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
B39202-B1229-P810	15000 pcs
B39202-B1229-P810S 5	5000 pcs

**Table 4:** Ordering codes and packing units.



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## 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](http://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.
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