Qualcomm

RF360
Europe GmbH

Data sheet

SAW duplexer
4G/5G band n25

Part number:	B1310
Ordering code:	B39202B1310P810
Date:	May 02, 2023
Version:	2.0

DCN: 80-PA243-750 Rev. A

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Anzinger Straße 13
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Table of contents

1 Application

- Duplexer for 4G and 5G band25
- 4G/5G band n25 uplink: 1882.5 MHz (pass band 65 MHz)
- 4G/5G band n25 downlink: 1962.5 MHz (pass band 65 MHz)
- Qualcomm® micro-Acoustic Power Management (MAPM)
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 65 MHz

2 Features

- Package size $1.6_{\pm 0.05}$ mm × $1.2_{\pm 0.05}$ mm
- Package height 0.5 mm (max.)
- Approximate weight 2 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

3 Package

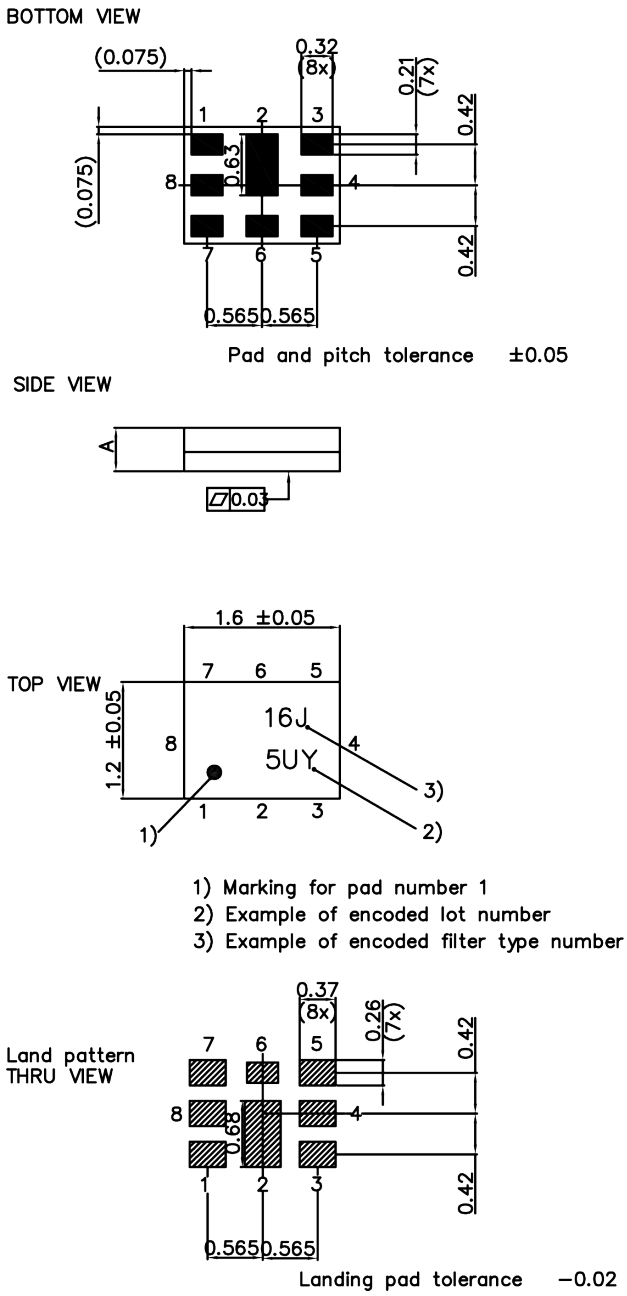

Figure 1: Drawing of package with package height A = 0.5 mm (max.). See Sec. Package information (p. 29).

4 Pin configuration

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

5 Matching circuit

- L_{p6} = 5.4 nH
- L_{s1} = 2.0 nH
- L_{s3} = 3.8 nH

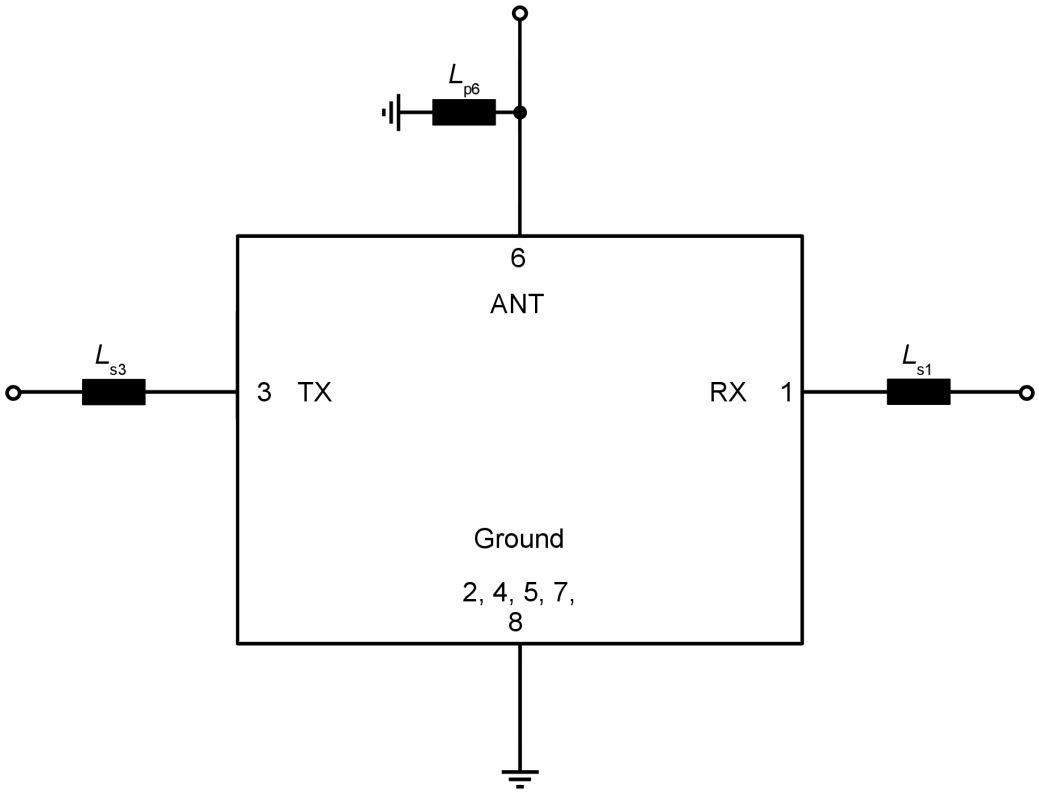

Figure 2: Schematic of matching circuit.

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 ... +85 °C
TX terminating impedance Z_{TX} = 50 Ω + 3.8 nH[1)]
ANT terminating impedance Z_{ANT} = 50 Ω // 5.4 nH[1)]
RX terminating impedance Z_{RX} = 50 Ω + 2.0 nH[1)]

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	1882.5	—	MHz
Maximum insertion attenuation			α_{INT}[2)]				
	1850... 1910	MHz		—	1.1	2.0[3)]	dB
	1850... 1910	MHz		—	1.1	2.0	dB
	1850... 1915	MHz		—	1.3	2.1[3)]	dB
	1850... 1915	MHz		—	1.3	2.1	dB
Maximum insertion attenuation			α_{max}				
	1850.15... 1914.85	MHz		—	1.7	2.6[3)]	dB
	1850.15... 1914.85	MHz		—	1.7	2.7[4)]	dB
Amplitude ripple (p-p)							
	1850... 1910	MHz	$\Delta\alpha$[5)]	—	0.4	1.4	dB
	1850... 1915	MHz	$\Delta\alpha$[5)]	—	0.7	1.6	dB
	1850.15... 1914.85	MHz	$\Delta\alpha$[6)]	—	0.8	1.6[4)]	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	1850... 1915	MHz		—	1.5	2.0	
	1850.15... 1914.85	MHz		—	1.5	2.0[4)]	
@ ANT port	1850... 1915	MHz		—	1.4	2.0	
	1850.15... 1914.85	MHz		—	1.4	2.0[4)]	
Minimum attenuation			α_{min}				
	10... 616	MHz		50	58	—	dB
	10... 960	MHz		40	50	—	dB
	617... 652	MHz		50	57	—	dB
	699... 716	MHz		48	55	—	dB
	728... 768	MHz		47	54	—	dB
	852... 894	MHz		45	51	—	dB
	1166... 1187	MHz		42	46	—	dB
	1225... 1250	MHz		42	46	—	dB
	1559... 1563	MHz		45	49	—	dB
	1559... 1606	MHz		45[4)]	49	—	dB
	1565.42... 1573.37	MHz		45	49	—	dB
	1573.37... 1577.47	MHz		45	49	—	dB
	1577.47... 1585.42	MHz		45	49	—	dB
	1597.55... 1605.89	MHz		45	50	—	dB
	1930.15... 1994.85	MHz		45[4)]	58	—	dB

Characteristics TX – ANT			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
1930.25... 1989.75	MHz		45	59	—	dB
1930.25... 1994.75	MHz		45	59	—	dB
2110... 2200	MHz		45	49	—	dB
2350... 2360	MHz		40	52	—	dB
2400... 2500	MHz		35	51	—	dB
2402... 2483	MHz		35	53	—	dB
2496... 2690	MHz		30	42	—	dB
3300... 3800	MHz		32	38	—	dB
3700... 3830	MHz		32	38	—	dB
4900... 5950	MHz		35	42	—	dB
5550... 5745	MHz		35	42	—	dB
7400... 7660	MHz		30	39	—	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.
3) Valid for typical temperature T = +25 °C.
4) Valid for temperature T = −20 °C...+85 °C.
5) Over any 5 MHz.
6) Over any 20 MHz.

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω + 3.8 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω // 5.4 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω + 2.0 nH[1)]

Characteristics ANT – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	1962.5	—	MHz
Maximum insertion attenuation			α_{INT}[2)]				
	1930 ... 1990	MHz		—	1.6	2.7[3)]	dB
	1930 ... 1990	MHz		—	1.6	2.7	dB
	1930 ... 1995	MHz		—	1.6	2.7[3)]	dB
	1930 ... 1995	MHz		—	1.6	2.7	dB
Maximum insertion attenuation			α_{max}				
	1930.15 ... 1994.85	MHz		—	2.0	3.2[3)]	dB
	1930.15 ... 1994.85	MHz		—	2.0	3.7[4)]	dB
Amplitude ripple (p-p)							
	1930 ... 1990	MHz	$\Delta\alpha$[5)]	—	0.7	2.0	dB
	1930 ... 1995	MHz	$\Delta\alpha$[5)]	—	0.7	2.0	dB
	1930.15 ... 1994.85	MHz	$\Delta\alpha$[6)]	—	0.9	2.0[4)]	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	1930 ... 1995	MHz		—	1.5	2.0	
	1930.15 ... 1994.85	MHz		—	1.5	2.0[4)]	
@ RX port	1930 ... 1995	MHz		—	1.6	2.0	
	1930.15 ... 1994.85	MHz		—	1.6	2.0[4)]	
Minimum attenuation			α_{min}				
	10 ... 960	MHz		35	59	—	dB
	10 ... 1850	MHz		35	48	—	dB
	80	MHz		50	95	—	dB
	663 ... 698	MHz		50	63	—	dB
	699 ... 862	MHz		50	59	—	dB
	1710.15 ... 1779.85	MHz		45	58	—	dB
	1770 ... 1835	MHz		40	57	—	dB
	1850.15 ... 1909.85	MHz		43	50	—	dB
	1850.15 ... 1914.85	MHz		40	50	—	dB
	2055 ... 2080	MHz		28	50	—	dB
	2300 ... 2400	MHz		45	58	—	dB
	2305 ... 2315	MHz		45	63	—	dB
	2400 ... 2500	MHz		45	59	—	dB
	2402 ... 2483	MHz		45	60	—	dB
	2496 ... 2690	MHz		40	50	—	dB
	3300 ... 3800	MHz		35	50	—	dB

Characteristics ANT – RX			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	3780... 3910	MHz	35	43	—	dB
	3860... 3990	MHz	35	43	—	dB
	4400... 5950	MHz	42	52	—	dB
	4900... 5950	MHz	42	53	—	dB
	5630... 5810	MHz	42	58	—	dB
	5790... 5985	MHz	42	58	—	dB
	7720... 7980	MHz	35	42	—	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.
3) Valid for typical temperature T = +25 °C.
4) Valid for temperature T = −20 °C...+85 °C.
5) Over any 5 MHz.
6) Over any 20 MHz.

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω + 3.8 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω // 5.4 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω + 2.0 nH[1)]

Characteristics TX – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Minimum isolation							
	1850... 1910	MHz	α_{INT} [2)]	50[3)]	54	—	dB
	1850... 1910	MHz	α_{INT} [2)]	50	54	—	dB
	1850... 1915	MHz	α_{INT} [2)]	50[3)]	54	—	dB
	1850... 1915	MHz	α_{INT} [2)]	50	54	—	dB
	1850.15... 1914.85	MHz	α_{INT} [4)]	48[5)]	53	—	dB
	1850.15... 1914.85	MHz	α_{INT} [6)]	49[5)]	53	—	dB
	1930... 1990	MHz	α_{INT} [2)]	55[3)]	63	—	dB
	1930... 1990	MHz	α_{INT} [2)]	55	63	—	dB
	1930... 1995	MHz	α_{INT} [2)]	55[3)]	63	—	dB
	1930... 1995	MHz	α_{INT} [2)]	55	63	—	dB
	1930.15... 1994.85	MHz	α_{INT} [4)]	51[5)]	62	—	dB
	1930.15... 1994.85	MHz	α_{INT} [6)]	51[5)]	62	—	dB
Minimum isolation			α_{min}				
	1850.15... 1914.85	MHz		47[5)]	53	—	dB
	1930.15... 1994.85	MHz		50[5)]	62	—	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.
3) Valid for typical temperature T = +25 °C.
4) Integrated attenuation α_{INT}: Averaged power $|S_{ij}|^2$ over the center 1.08 MHz of LTE 1.4 MHz (6 RB) channels.
5) Valid for temperature T = −20 °C...+85 °C.
6) Integrated attenuation α_{INT}: Averaged power $|S_{ij}|^2$ over the center 2.7 MHz of LTE 3 MHz (15 RB) channels.

7 Maximum ratings

Storage temperature	T_{STG} [1] = −40 °C ... +90 °C	
DC voltage	$\lvert V_{DC}\rvert$ [3] = 0 V (max.) [2]	
ESD voltage		
	V_{ESD} [4] = 275 V (max.)	Human body model.
	V_{ESD} [5] = 1000 V (max.)	Charged device model.
Input power	P_{IN}	
@ TX port: 1850 ... 1915 MHz	31 dBm	5 MHz 5G-NR (DFT-s-OFDM) (1 RB) for 5000 h @ 50 °C.
@ TX port: 1850 ... 1915 MHz	29 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) In case of applied DC voltage blocking capacitors are mandatory.
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

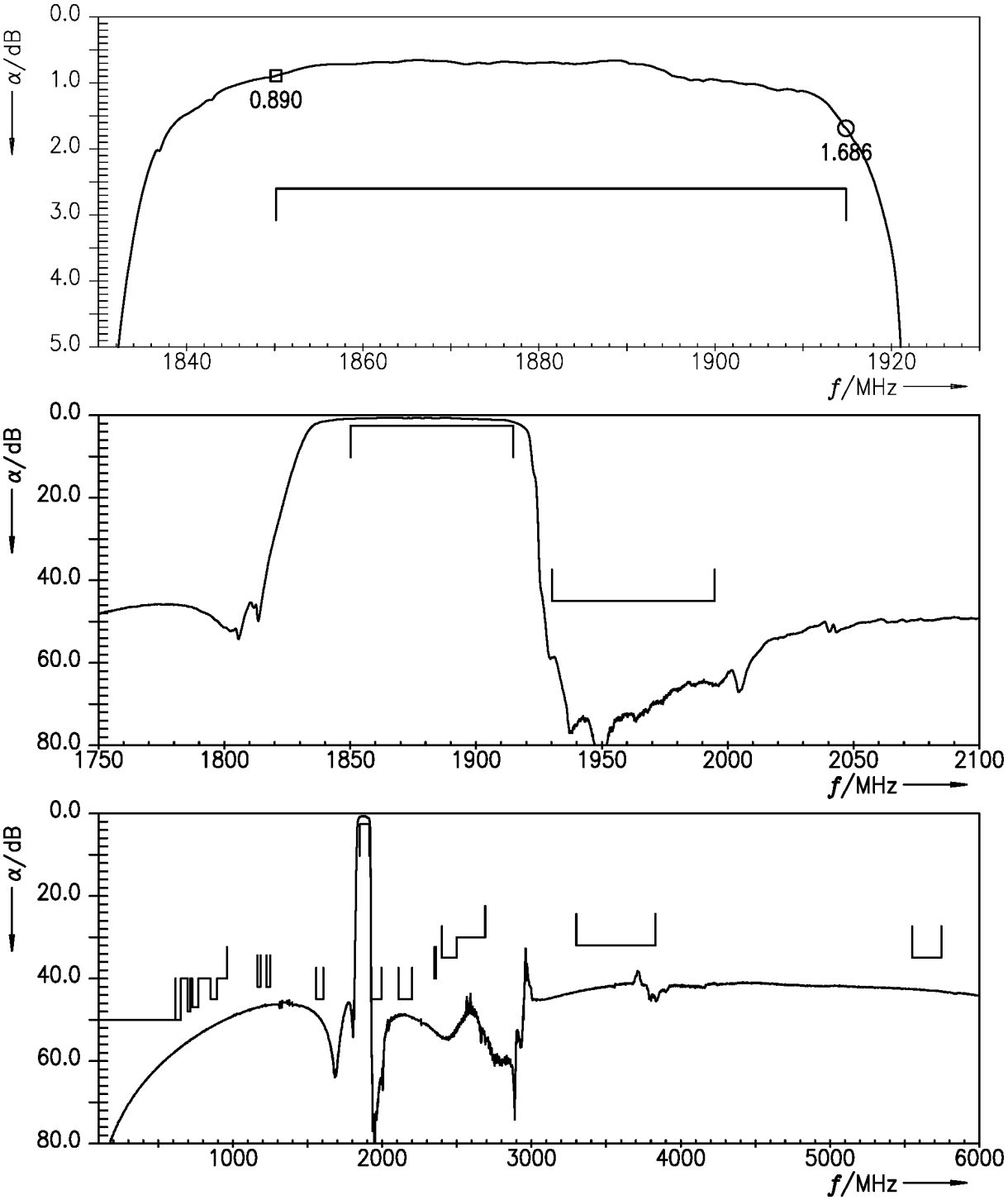

Figure 3: Attenuation TX – ANT.

8.2 ANT – RX

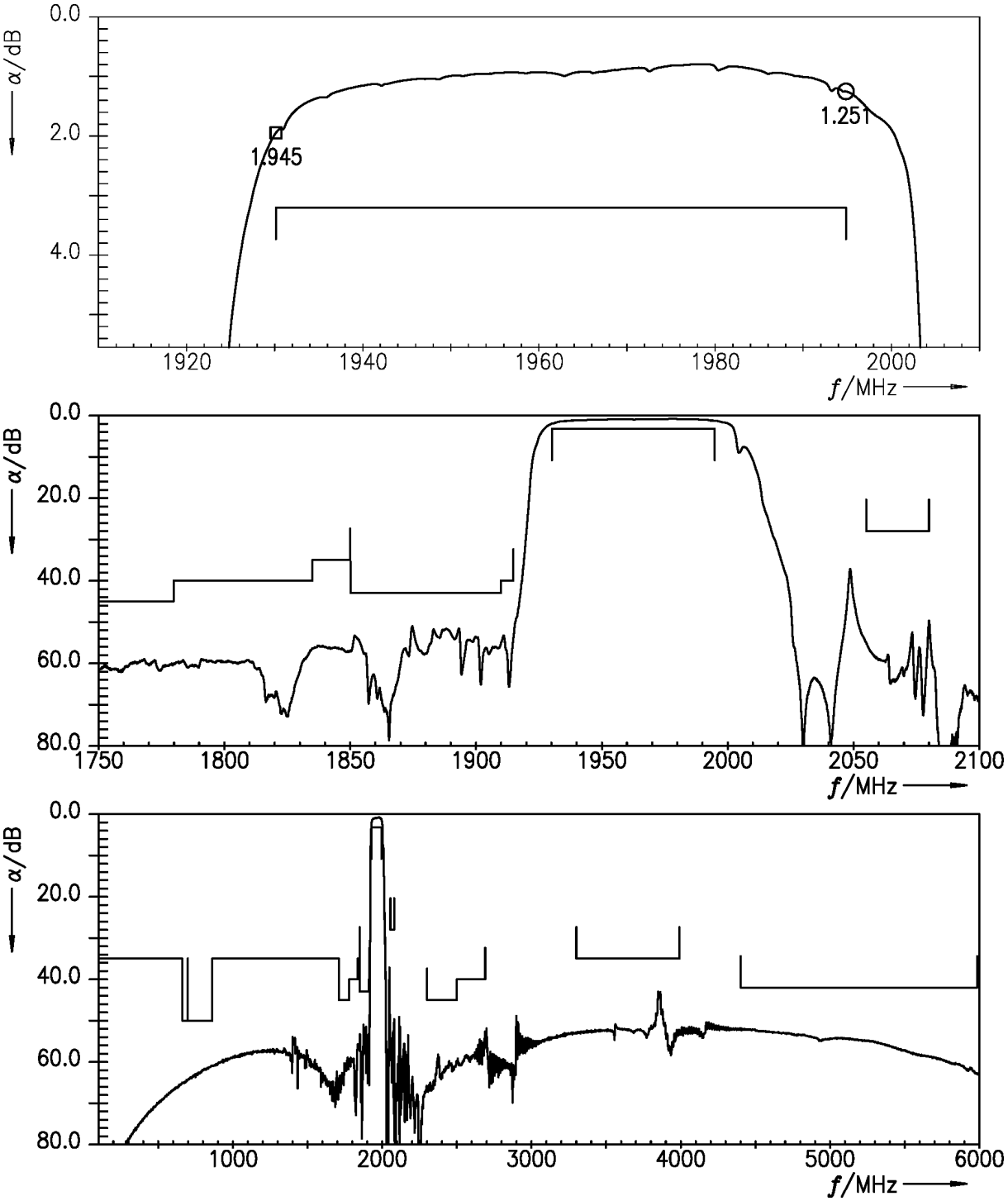

Figure 4: Attenuation ANT – RX.

8.3 TX – RX

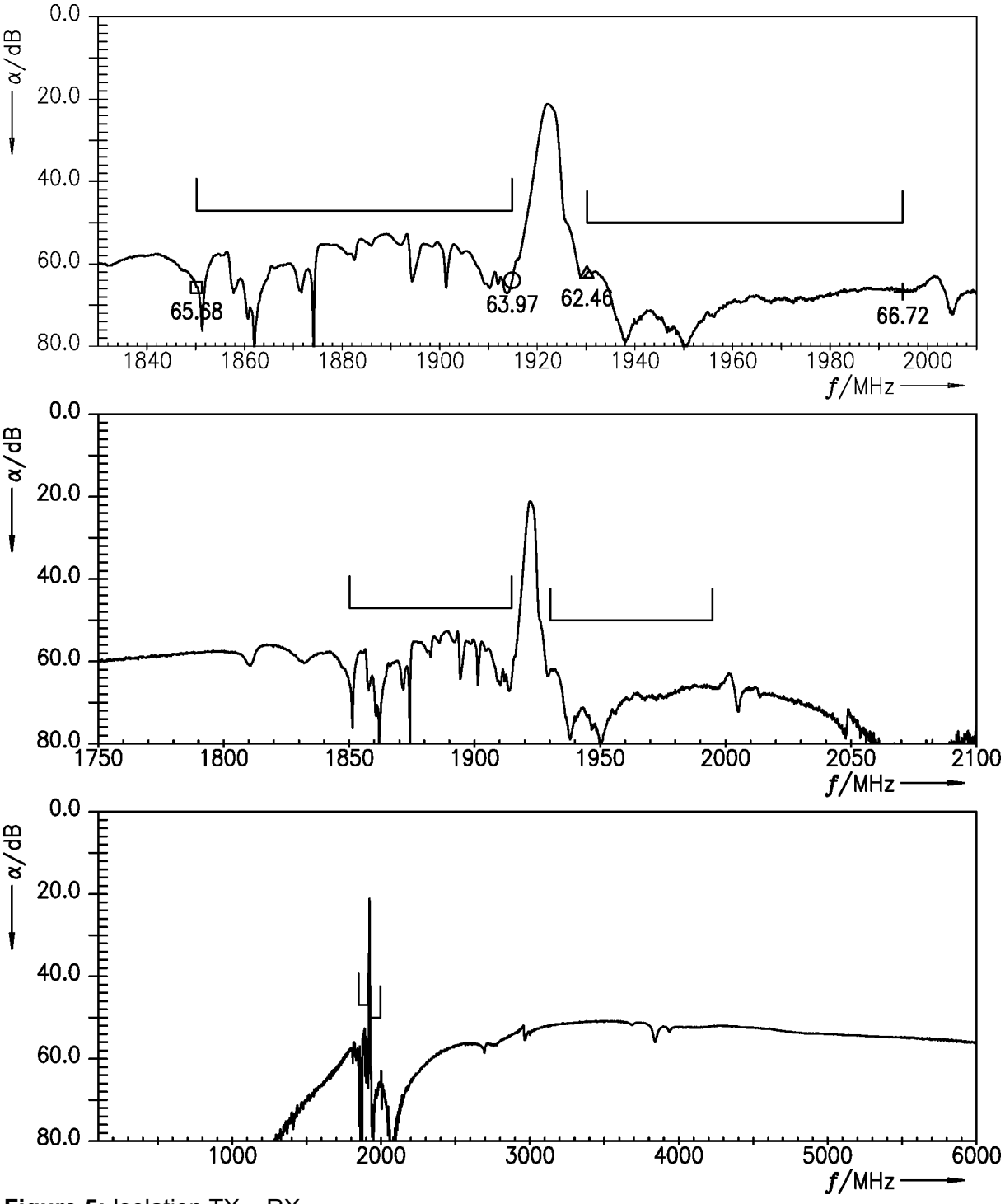

Figure 5: Isolation TX – RX.

9 Transmission coefficient (LTE)

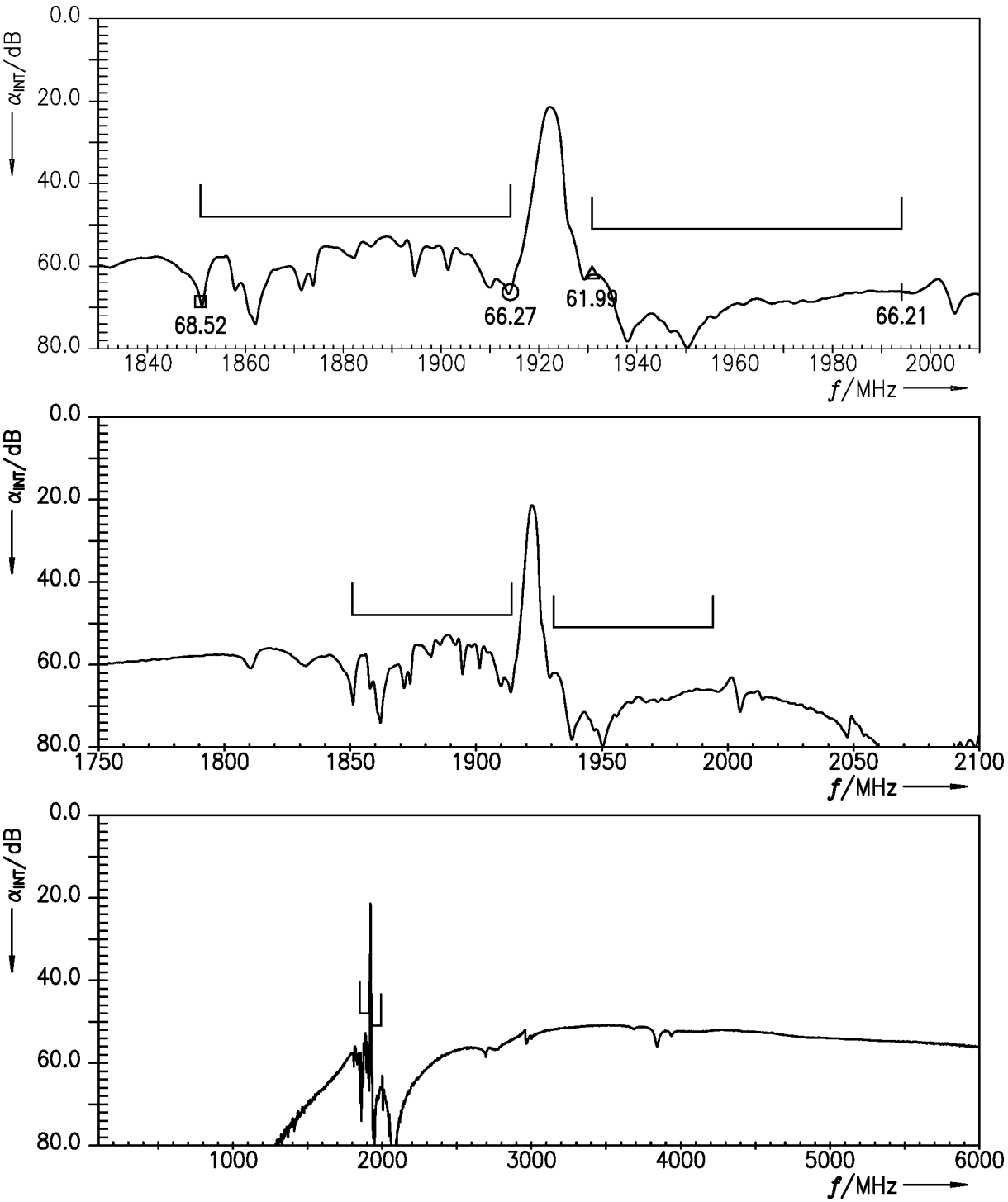

Figure 6: Isolation (LTE) (integration window = 1.4 MHz) TX – RX.

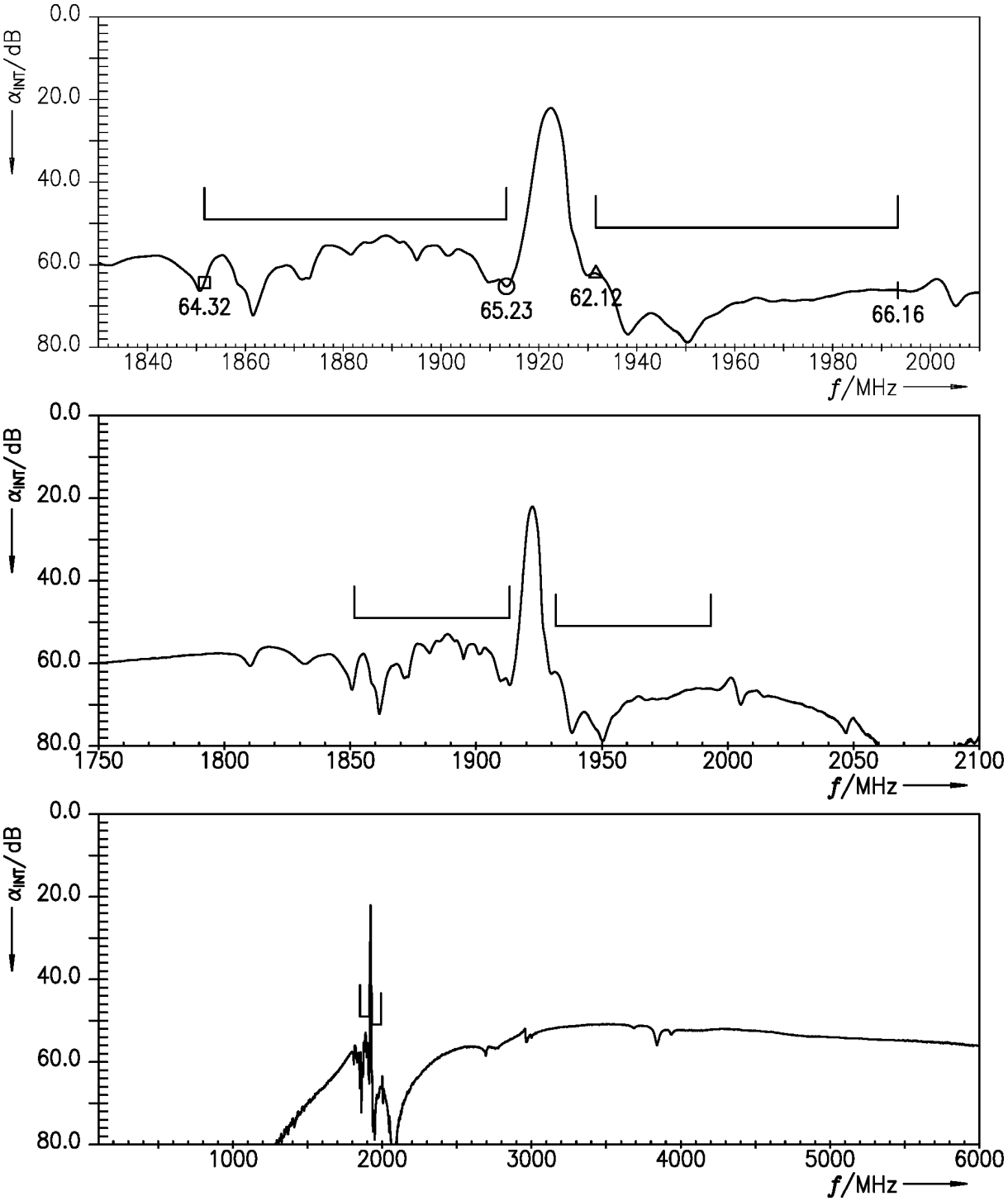

Figure 7: Isolation (LTE) (integration window = 3 MHz) TX – RX.

9.1 TX – ANT

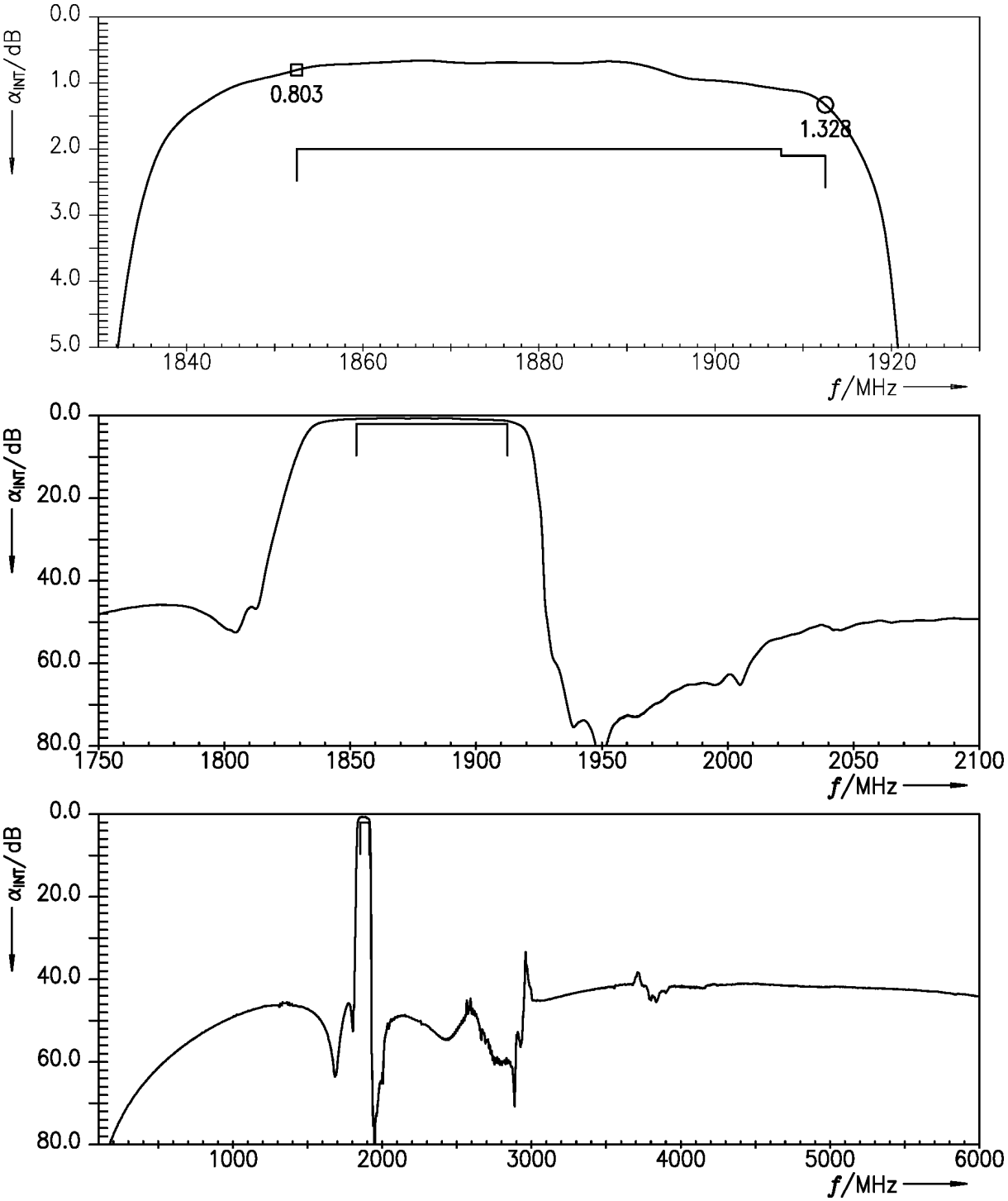

Figure 8: Attenuation (LTE) (integration window = 5 MHz) TX – ANT.

9.2 ANT – RX

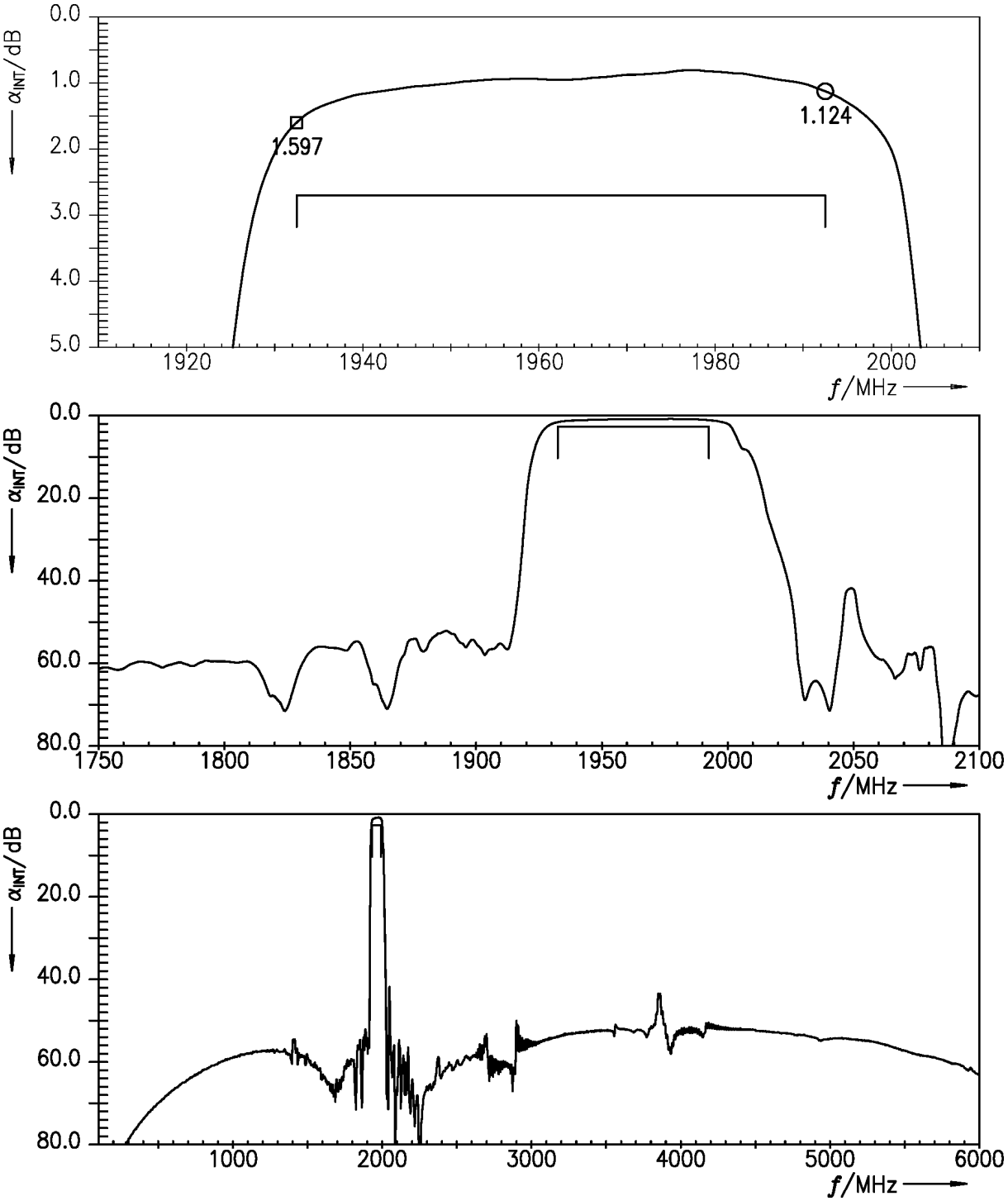

Figure 9: Attenuation (LTE) (integration window = 5 MHz) ANT – RX.

9.3 TX – RX

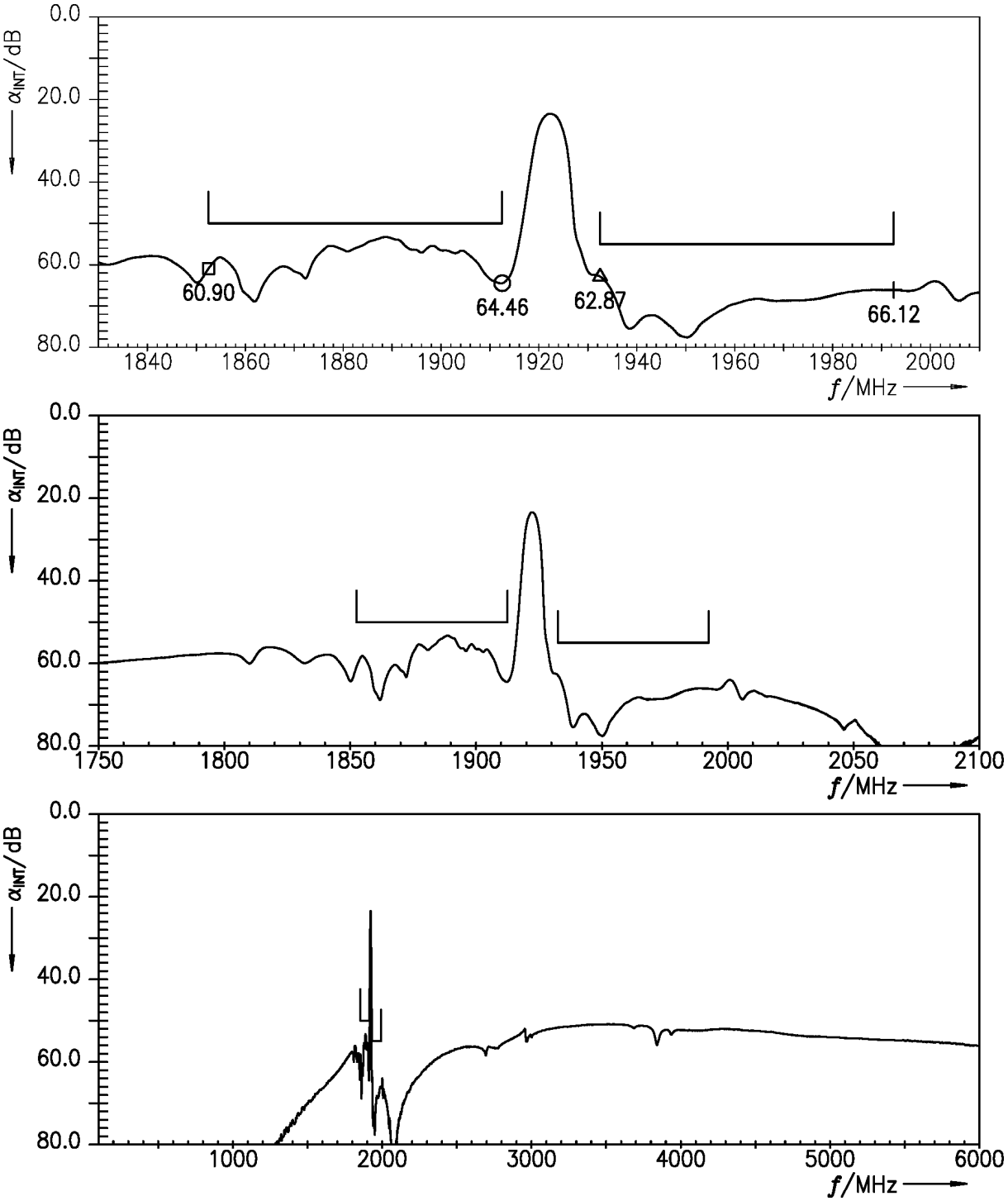

Figure 10: Isolation (LTE) (integration window = 5 MHz) TX – RX.

10 Reflection coefficients

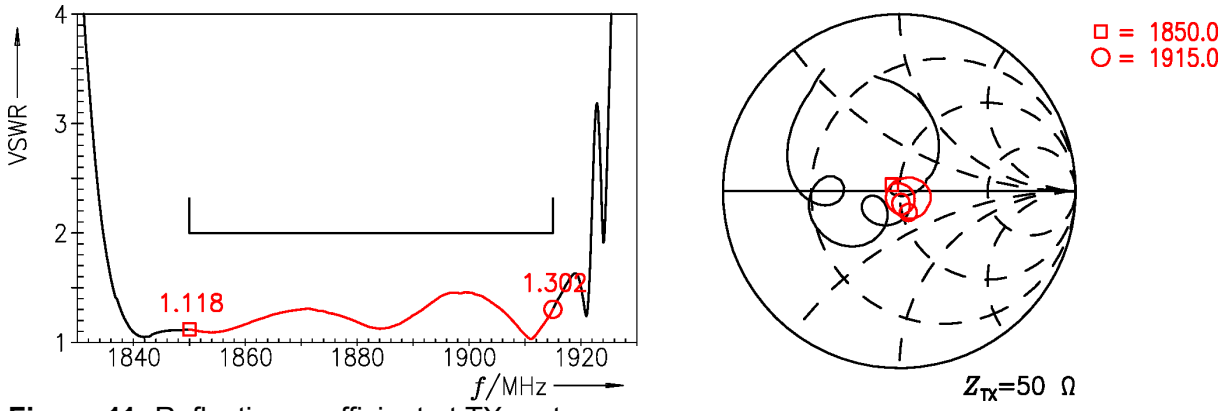

Figure 11: Reflection coefficient at TX port.

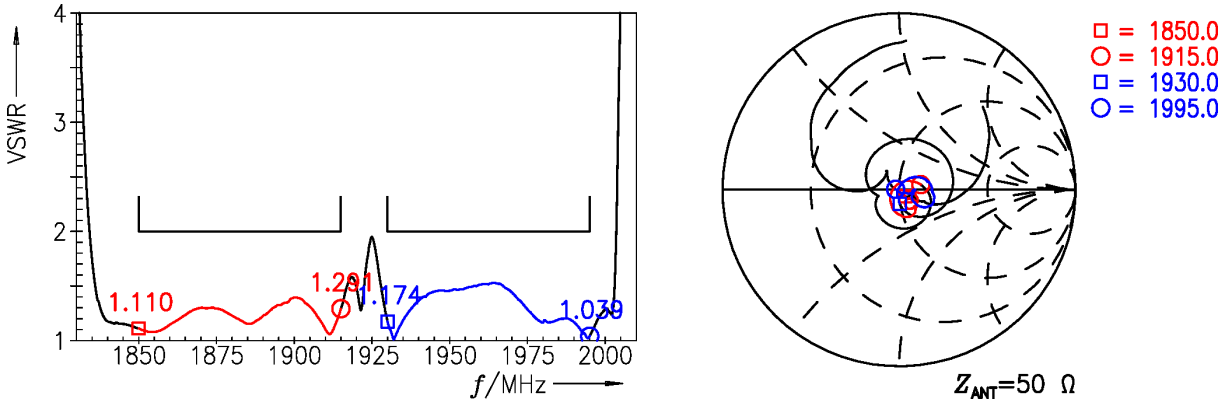

Figure 12: Reflection coefficient at ANT port (TX and RX frequencies).

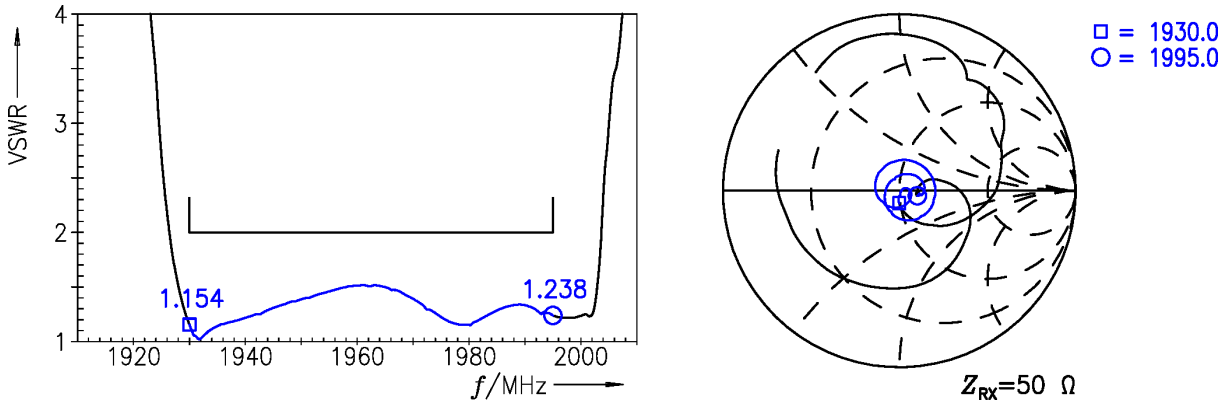

Figure 13: Reflection coefficient at RX port.

11 Packing material

11.1 Tape

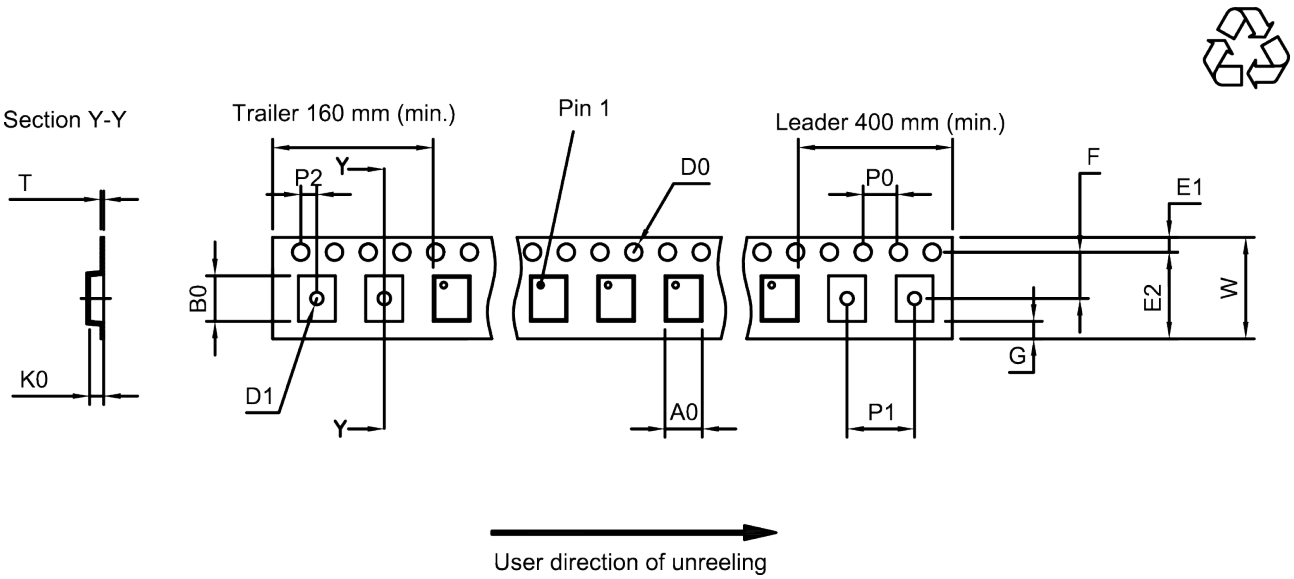

Figure 14: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

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.

11.2 Reel with diameter of 180 mm

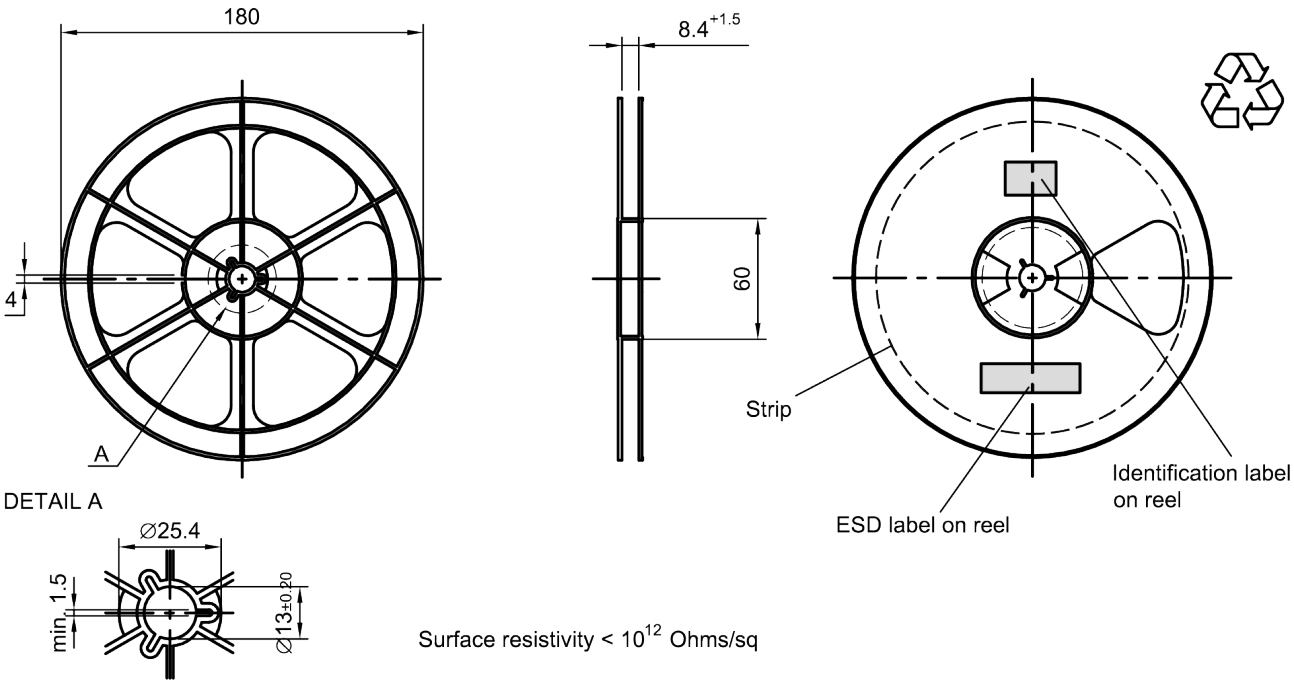

Figure 15: Drawing of reel (first-angle projection) with diameter of 180 mm.

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

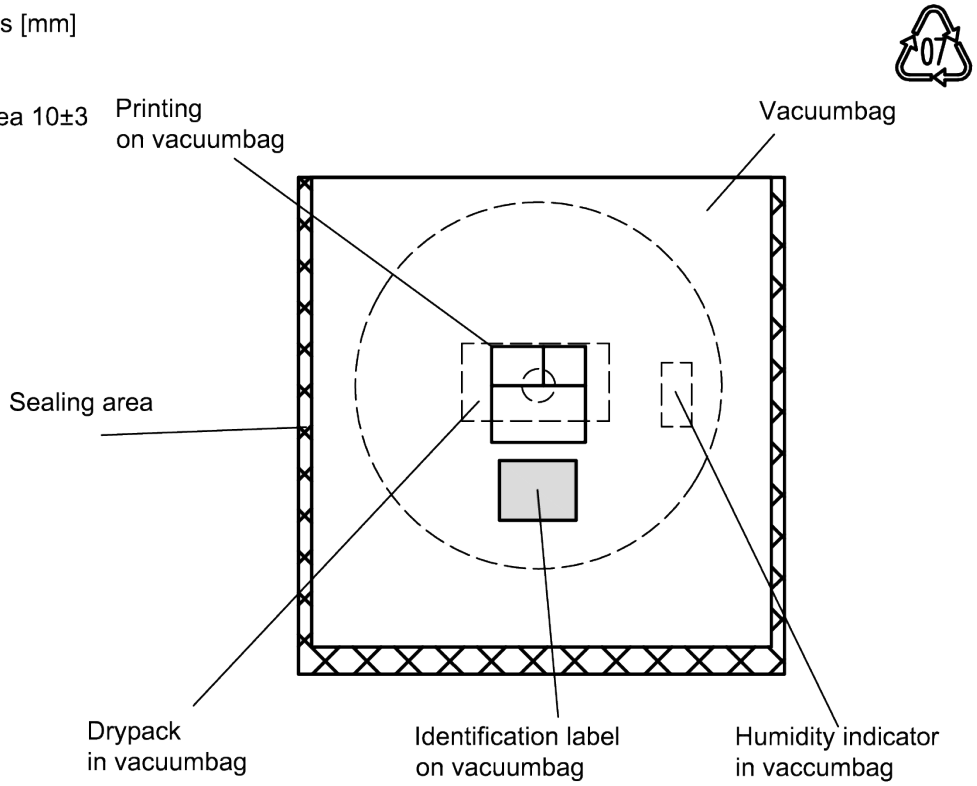

Figure 16: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

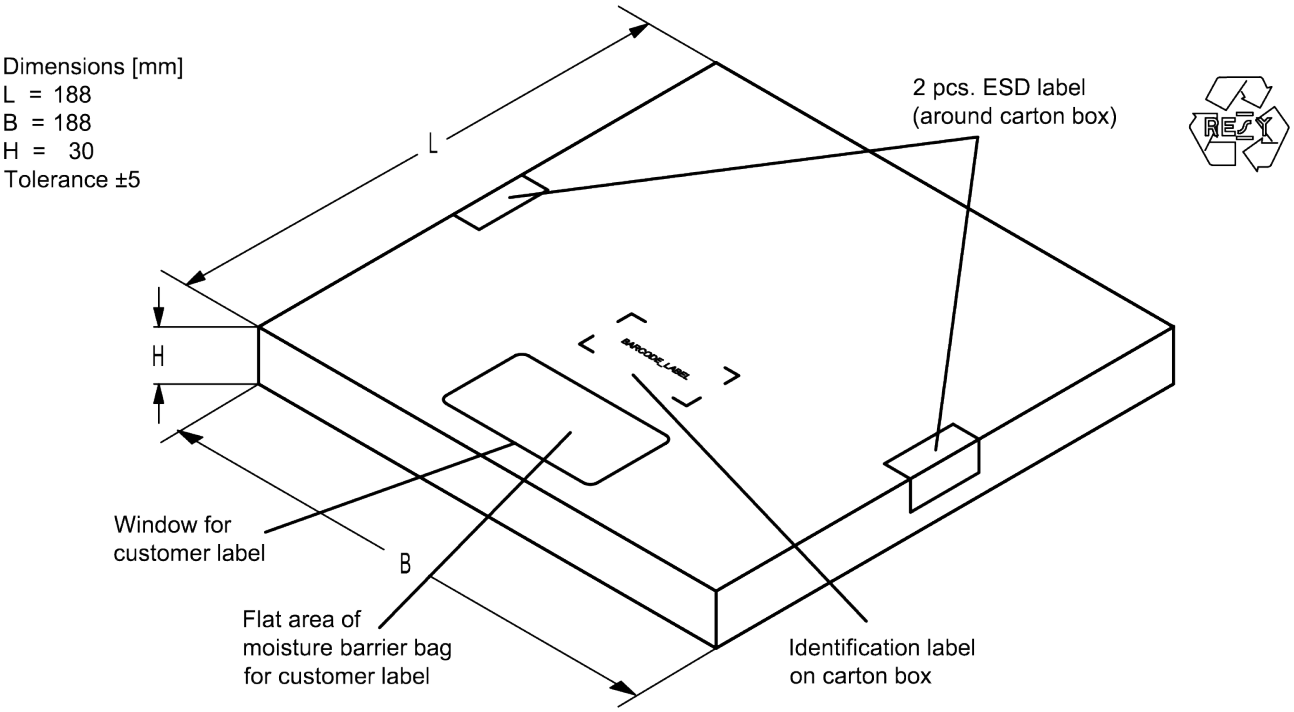

Figure 17: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

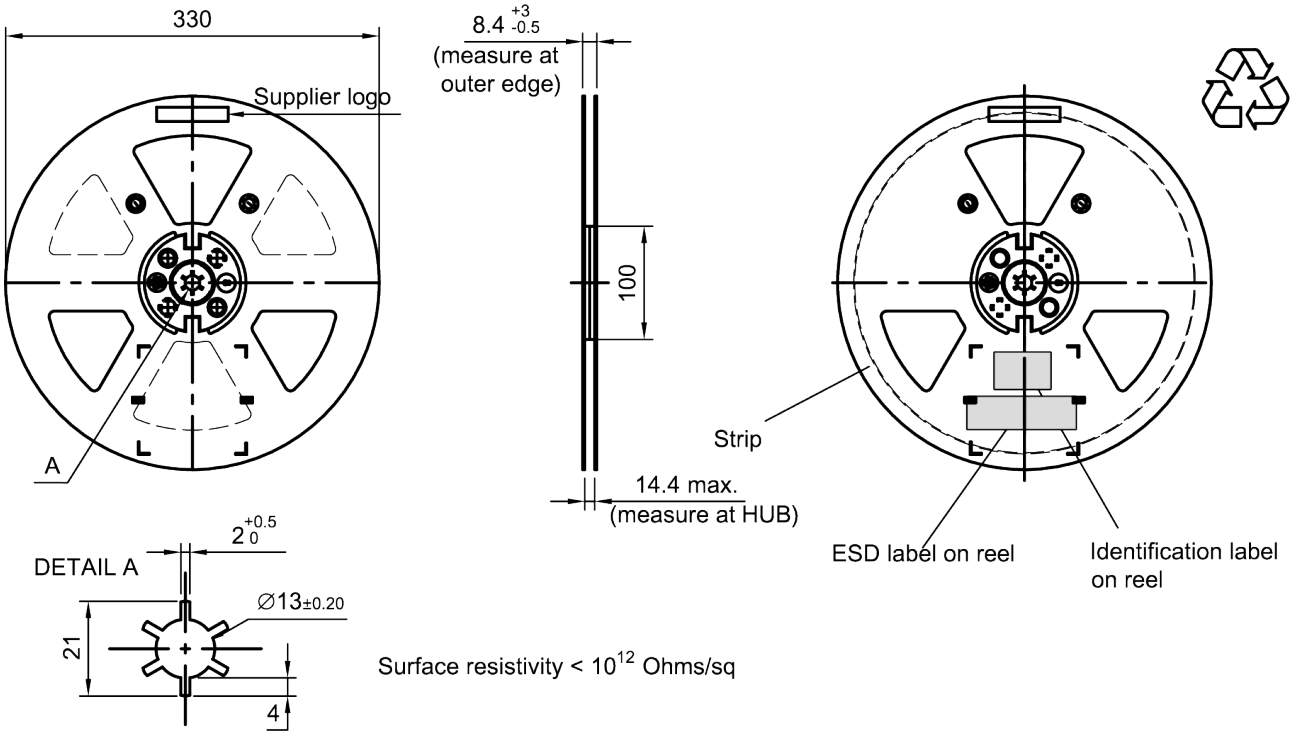

Figure 18: Drawing of reel (first-angle projection) with diameter of 330 mm.

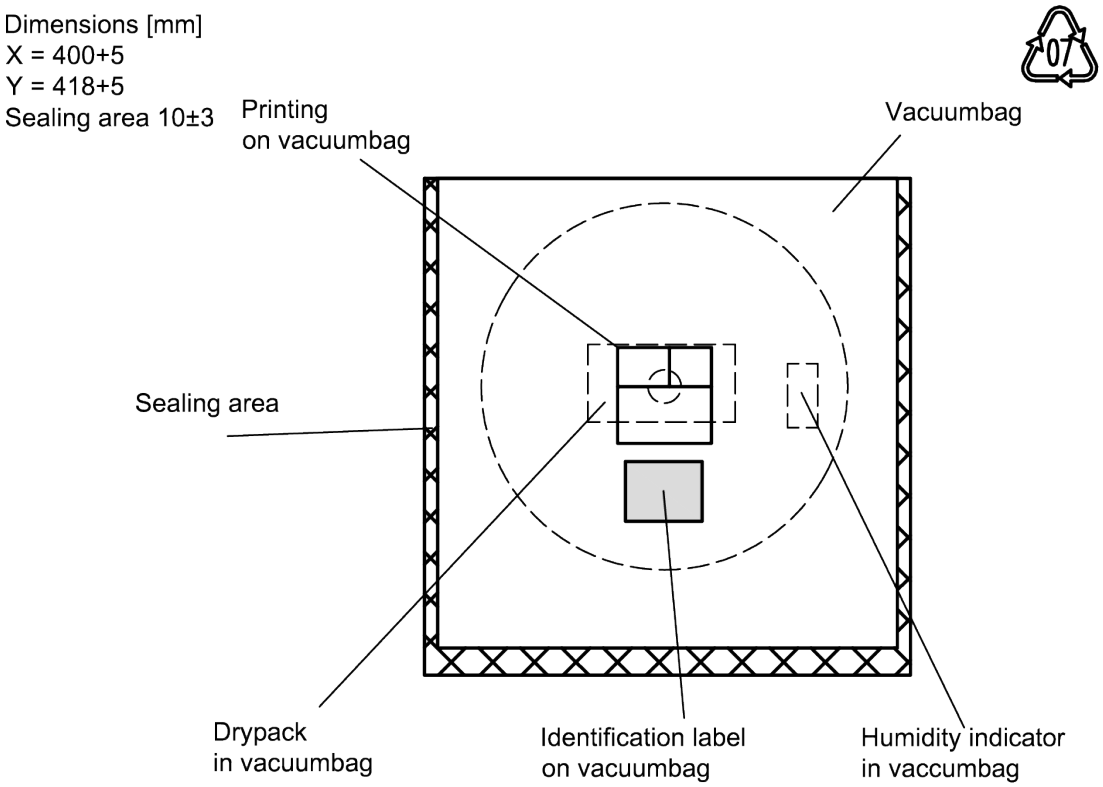

Figure 19: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

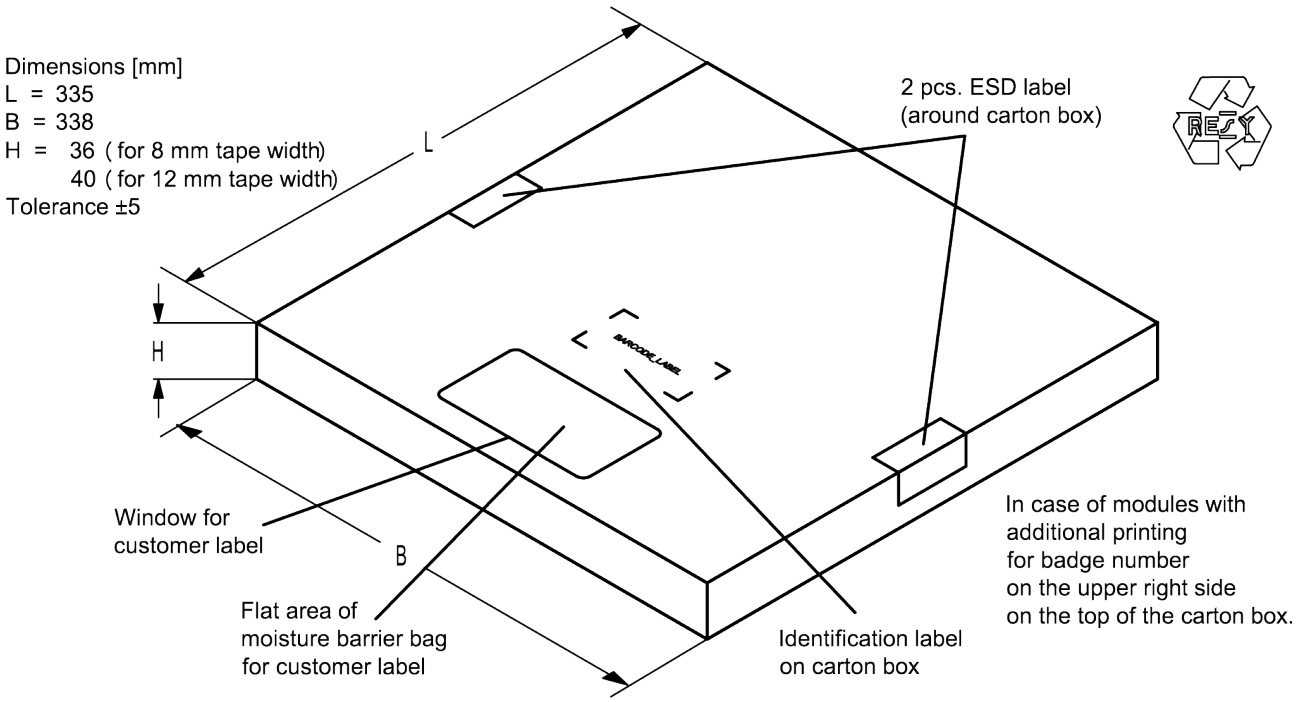

Figure 20: Drawing of folding box for reel with diameter of 330 mm.

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 B1310 is 18Y.

- 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).

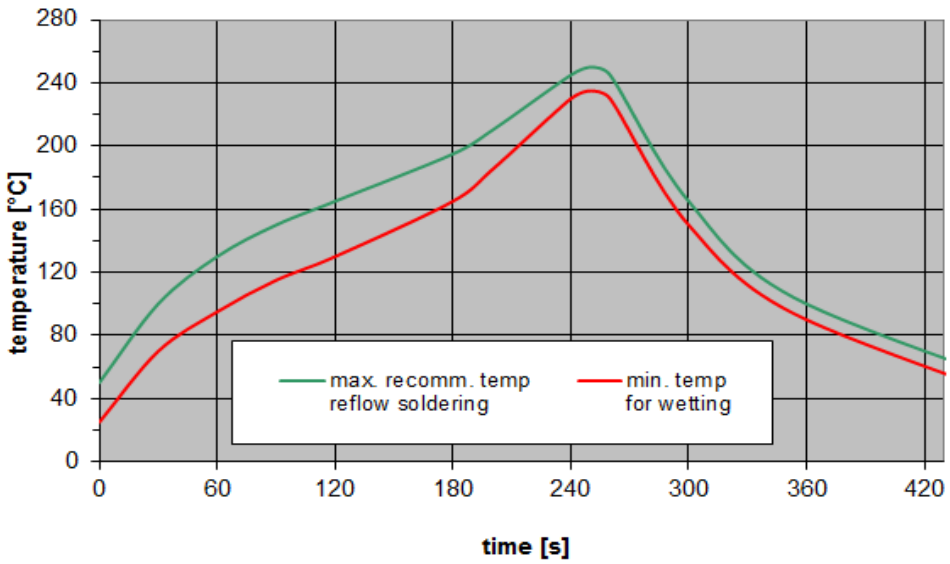

Figure 21: Recommended reflow profile for convection and infrared soldering – lead-free solder.

14 Annotations

14.1 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.

14.2 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.

14.3 Ordering codes, product IDs, labels, and packing units

Ordering code	Product ID	RF360 label	Packing unit
B39202B1310P810	B39202-B1310-P810-W05	B39202B1310P810W 5	5000 pcs

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

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 https://rffe.qualcomm.com/.

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.

16 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.
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.

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