Qualcomm

RF360
Europe GmbH

Data sheet

Micro-acoustic extractor
GNSS L1

Part number:	B8939
Ordering code:	B39162B8939L210
Date:	August 25, 2022
Version:	2.4

DCN: 80-PA243-482 Rev. E

RF360 Europe GmbH
Anzinger Straße 13
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Table of contents

1 Application

- Premium-performance GNSS L1 Extractor with single ended 50 Ω ports
- Ultra-low-loss acoustic structure
- Advanced fully-integrated multiplexer structure
- Using common antenna for GNSS L1 and Cellular bands
- Placed between antenna and cellular front-end switches and filters
- Usable GNSS L1 pass bands: 1559.05-1563.144 MHz (BeiDou), 1574.42-1576.42 MHz (GPS), 1597.55-1605.89 MHz (Glonass)
- Usable CELL pass bands: 617-1511 MHz, 1695-2690 MHz, 3300-5000 MHz
- No switches and control lines required

2 Features

- Package size 1.5 mm × 1.1 mm
- Package height 0.6 mm
- 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)

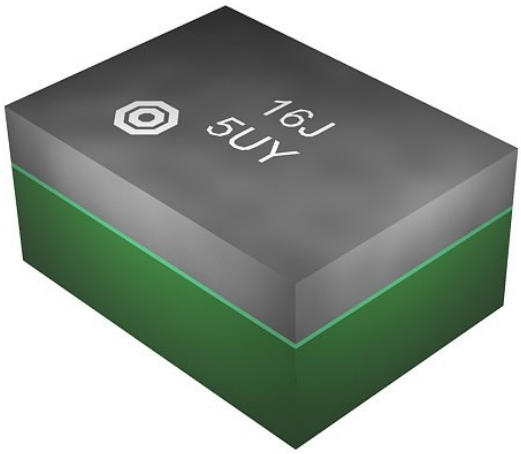

Figure 1: Picture of component with example of product marking.

3 Package

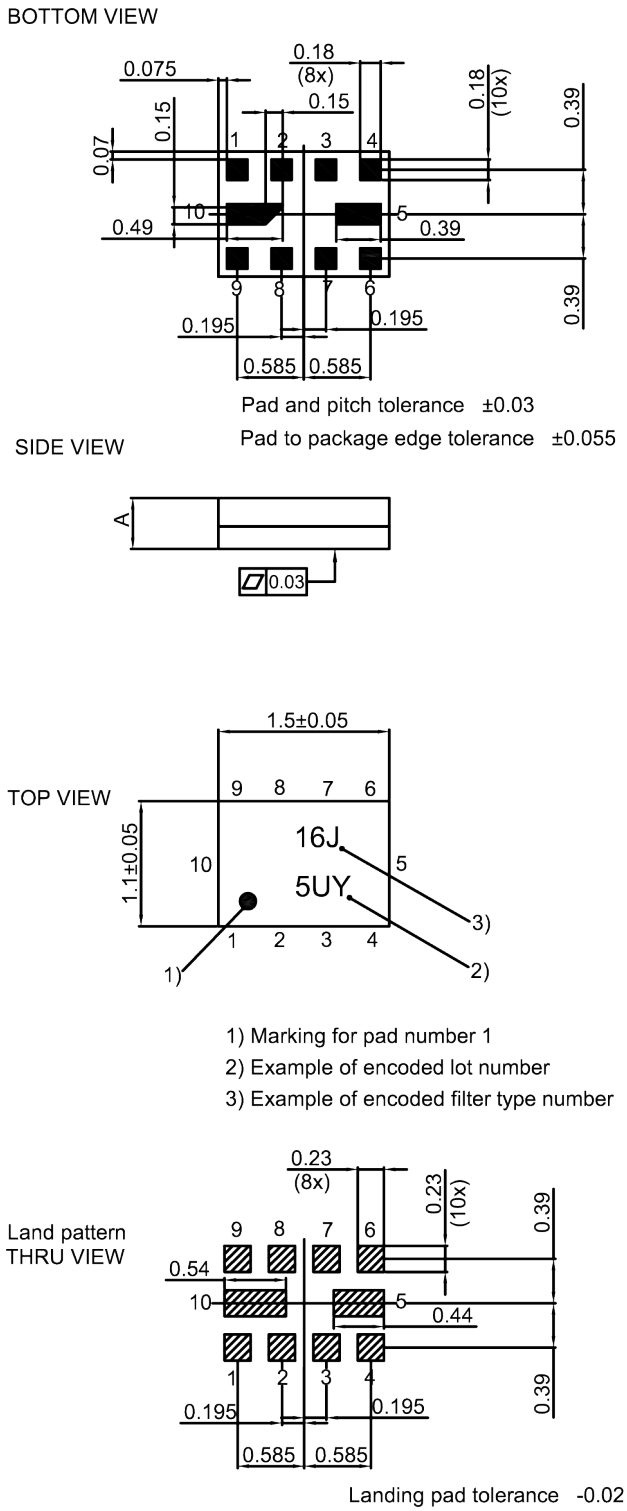

Figure 2: Drawing of package with package height A = 0.7 mm (max.). See Sec. Package information (p. 24).

4 Pin configuration

- 1 ANT
- 4 GNSS
- 9 CELL
- 2, 3, 5, 6, 7, 8, 10 Ground

5 Matching circuit

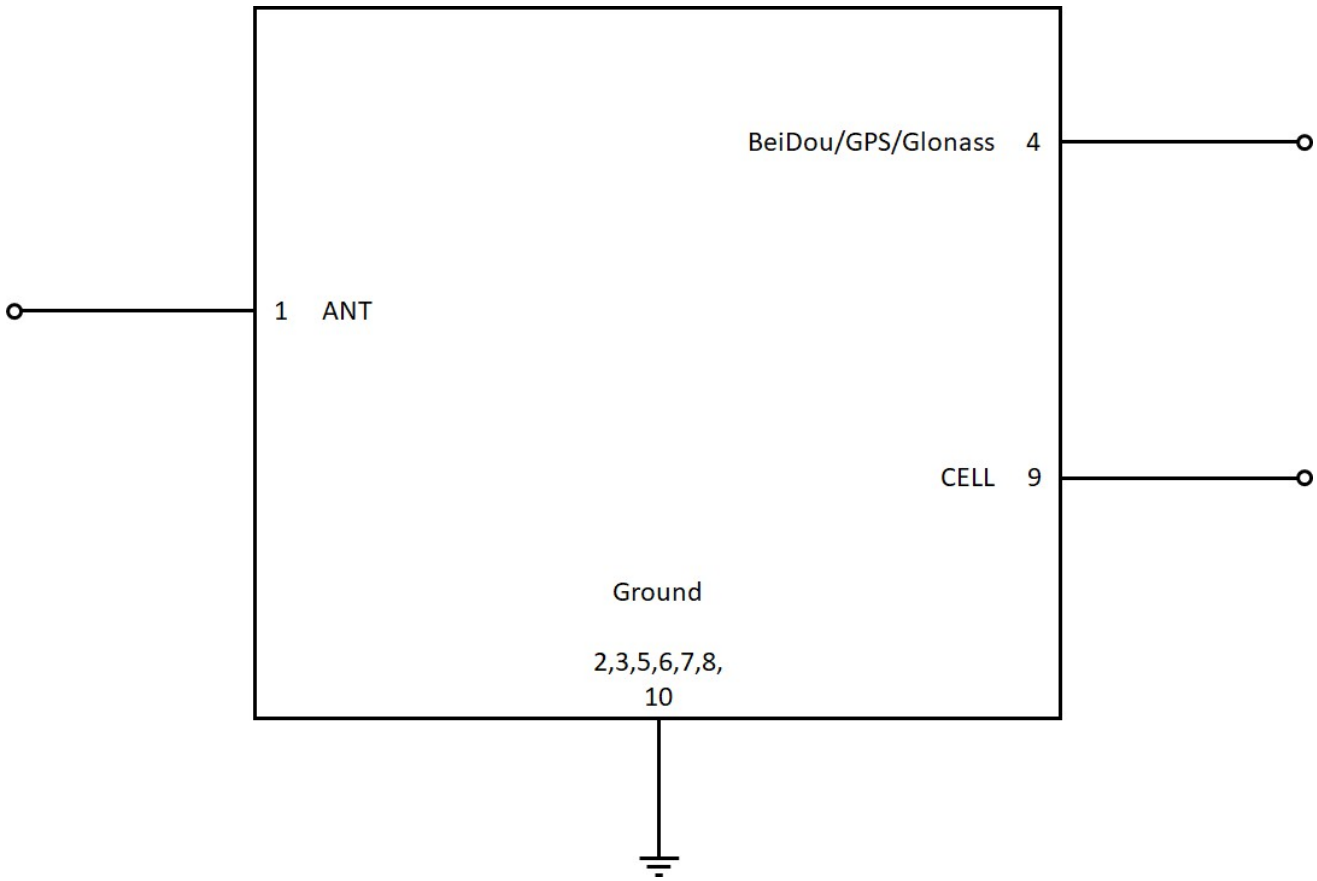

Figure 3: Schematic of matching circuit. No external matching components required.

6 Characteristics ANT – GNSS

Temperature range for specification T_{SPEC} = −30 °C ... +85 °C
ANT terminating impedance Z_{ANT} = 50 Ω
GNSS terminating impedance Z_{GNSS} = 50 Ω
CELL terminating impedance Z_{CELL} = 50 Ω

Characteristics ANT – GNSS			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Insertion loss		α				
	1559.052... 1563.144	MHz	—	1.6	4.1	dB
	1574.42... 1576.42	MHz	—	0.8	1.5	dB
	1597.55... 1605.89	MHz	—	1.4	3.5	dB
VSWR		VSWR				
@ ANT port	1559.052... 1563.144	MHz	—	1.1	1.8	
	1574.42... 1576.42	MHz	—	1.1	1.8	
	1597.55... 1605.89	MHz	—	1.3	1.8	
@ GNSS port	1559.052... 1563.144	MHz	—	1.3	2.5	
	1574.42... 1576.42	MHz	—	1.1	1.8	
	1597.55... 1605.89	MHz	—	1.2	2.0	
Attenuation		α				
	100... 617	MHz	34	40	—	dB
	617... 698	MHz	37	41	—	dB
	699... 960	MHz	33	38	—	dB
	1427... 1511	MHz	34	41	—	dB
	1695... 1910	MHz	34	39	—	dB
	1910... 2025	MHz	35	40	—	dB
	2110... 2200	MHz	32	38	—	dB
	2300... 2500	MHz	36	43	—	dB
	2500... 2690	MHz	37	44	—	dB
	3300... 3800	MHz	26	32	—	dB
	3800... 4200	MHz	23	30	—	dB
	4400... 5000	MHz	19	25	—	dB
	5150... 5950	MHz	17	24	—	dB

7 Characteristics ANT – CELL

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
ANT terminating impedance	Z_{ANT}	= 50 Ω
GNSS terminating impedance	Z_{GNSS}	= 50 Ω
CELL terminating impedance	Z_{CELL}	= 50 Ω

Characteristics ANT – CELL				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Insertion loss			α				
	617 ... 652	MHz		—	1.2	2.1	dB
	663 ... 698	MHz		—	0.8	1.7	dB
	699 ... 824	MHz		—	0.7	1.4	dB
	824 ... 960	MHz		—	0.4	1.0	dB
	1427 ... 1511	MHz		—	0.3	1.0	dB
	1452 ... 1496	MHz		—	0.3	0.9	dB
	1695 ... 1785	MHz		—	1.0	1.7	dB
	1805 ... 1880	MHz		—	0.8	1.6	dB
	1920 ... 1990	MHz		—	0.7	1.5	dB
	2010 ... 2025	MHz		—	0.8	1.5	dB
	2110 ... 2200	MHz		—	1.1	1.8	dB
	2300 ... 2496	MHz		—	0.7	1.6	dB
	2496 ... 2690	MHz		—	0.6	1.2	dB
	3300 ... 3800	MHz		—	0.6	1.2	dB
	3800 ... 4200	MHz		—	0.8	1.4	dB
	4400 ... 5000	MHz		—	1.3	2.0	dB
VSWR			VSWR				
@ ANT port	617 ... 652	MHz		—	2.0	2.7	
	663 ... 698	MHz		—	1.6	2.5	
	699 ... 960	MHz		—	1.4	1.9	
	1427 ... 1511	MHz		—	1.2	1.9	
	1695 ... 1785	MHz		—	1.4	1.9	
	1805 ... 2200	MHz		—	1.3	1.9	
	2300 ... 2690	MHz		—	1.1	1.9	
	3300 ... 4200	MHz		—	1.2	1.9	
	4400 ... 5000	MHz		—	1.4	2.0	
@ CELL port	617 ... 652	MHz		—	2.1	2.8	
	663 ... 698	MHz		—	1.7	2.6	
	699 ... 960	MHz		—	1.4	1.9	
	1427 ... 1511	MHz		—	1.2	1.9	
	1695 ... 1785	MHz		—	1.4	1.9	
	1805 ... 2200	MHz		—	1.3	1.9	
	2300 ... 2690	MHz		—	1.1	1.9	
	3300 ... 4200	MHz		—	1.2	1.9	

Characteristics ANT – CELL				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	4400... 5000	MHz		—	1.6	2.0	
Attenuation			α				
	1559.052... 1563.144	MHz		5.0	8.0	—	dB
	1574.42... 1576.42	MHz		9.0	19	—	dB
	1597.55... 1605.89	MHz		6.0	10	—	dB

8 Characteristics GNSS – CELL

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
ANT terminating impedance	Z_{ANT}	= 50 Ω
GNSS terminating impedance	Z_{GNSS}	= 50 Ω
CELL terminating impedance	Z_{CELL}	= 50 Ω

Characteristics GNSS – CELL			**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Isolation	α					
	617 ... 698	MHz	36	41	—	dB
	699 ... 960	MHz	34	39	—	dB
	1427 ... 1511	MHz	35	41	—	dB
	1559.052 ... 1563.144	MHz	5	10	—	dB
	1574.42 ... 1576.42	MHz	9	19	—	dB
	1597.55 ... 1605.89	MHz	6	11	—	dB
	1695 ... 2025	MHz	36	40	—	dB
	2110 ... 2200	MHz	36	42	—	dB
	2300 ... 2400	MHz	37	45	—	dB
	2496 ... 2690	MHz	43	50	—	dB
	3300 ... 3800	MHz	26	32	—	dB
	3800 ... 4200	MHz	23	30	—	dB
	4400 ... 5000	MHz	20	28	—	dB

9 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] = 100 V (max.)	Machine model.
	V_{ESD} [4] = 200 V (max.)	Human body model.
	V_{ESD} [5] = 700 V (max.)	Charged device model.
Input power	P_{IN}	
@ ANT port: 824 ... 849 MHz	35 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 880 ... 915 MHz	35 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 1574.42 ... 1576.42 MHz	15 dBm	Continuous wave for 5000 h @ -30...+85 °C.
@ ANT port: 1710 ... 1785 MHz	33 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 1850 ... 1910 MHz	33 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 617 ... 960 MHz	30 dBm	5 MHz LTE uplink signal (25 RB) for 5000 h @ -30...+85 °C.
@ CELL port: 824 ... 849 MHz	35 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 880 ... 915 MHz	35 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 1427 ... 1463 MHz	30 dBm	5 MHz LTE uplink signal (25 RB) for 5000 h @ -30...+85 °C.
@ CELL port: 1710 ... 2690 MHz	30 dBm	5 MHz LTE uplink signal (25 RB) for 5000 h @ -30...+85 °C.
@ CELL port: 1710 ... 1785 MHz	33 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 1850 ... 1910 MHz	33 dBm	GSM signal duty cycle 1:8 for 50 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 2402 ... 2482 MHz	26 dBm	20 MHz WLAN signal for 5000 h @ -30...+85 °C.
@ CELL port: 3300 ... 5000 MHz	27 dBm	5G NR CP-OFDM signal for 5000 h @ -30...+85 °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. to IEC60068-2-67 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.

10 Transmission coefficient ANT – GNSS

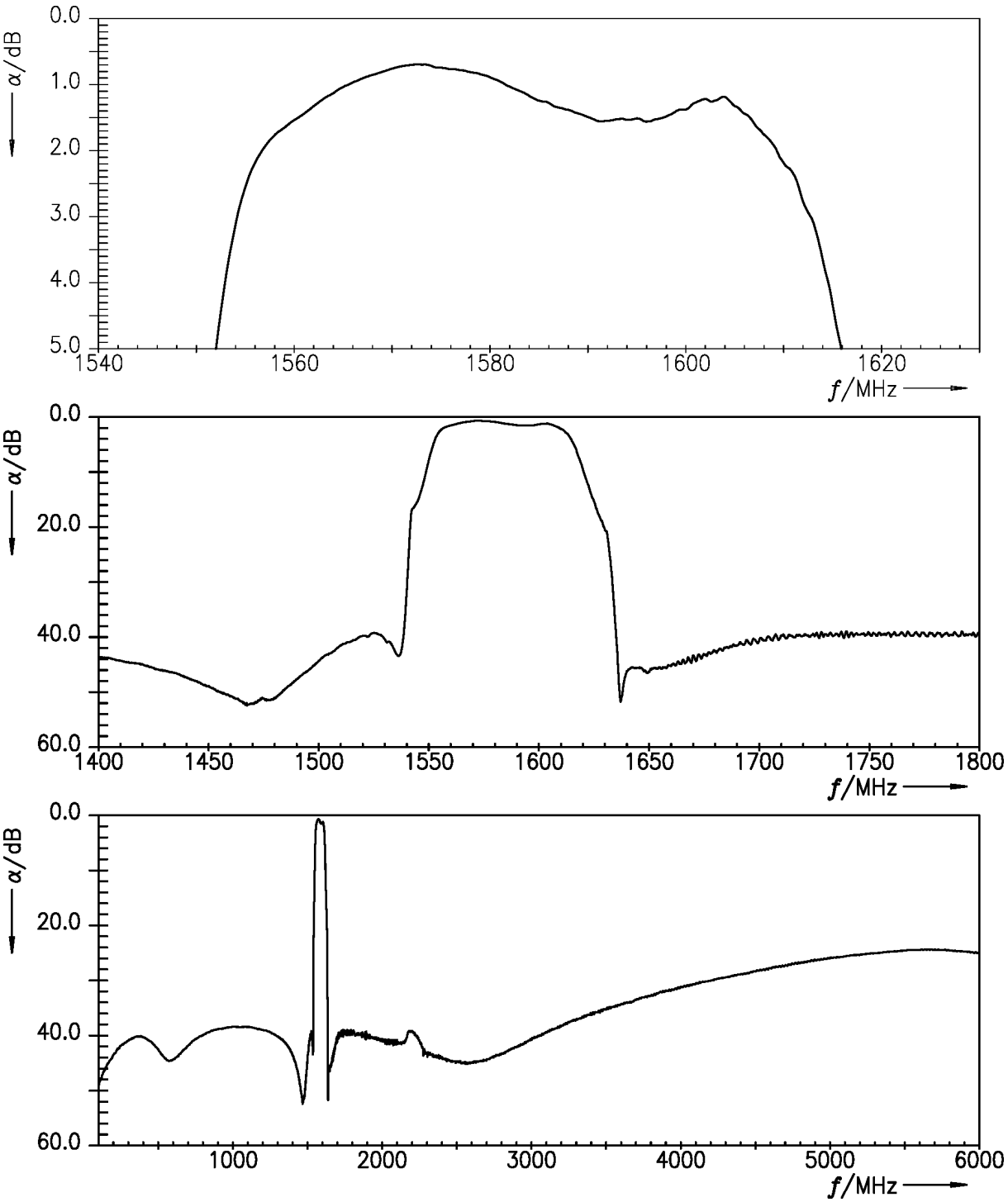

Figure 4: Attenuation ANT – GNSS.

11 Reflection coefficients ANT – GNSS

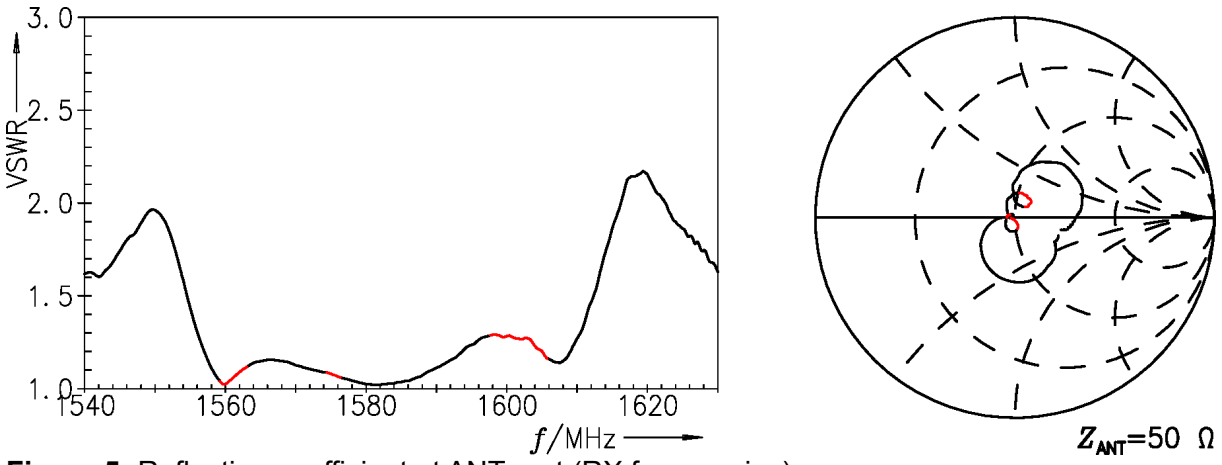

Figure 5: Reflection coefficient at ANT port (RX frequencies).

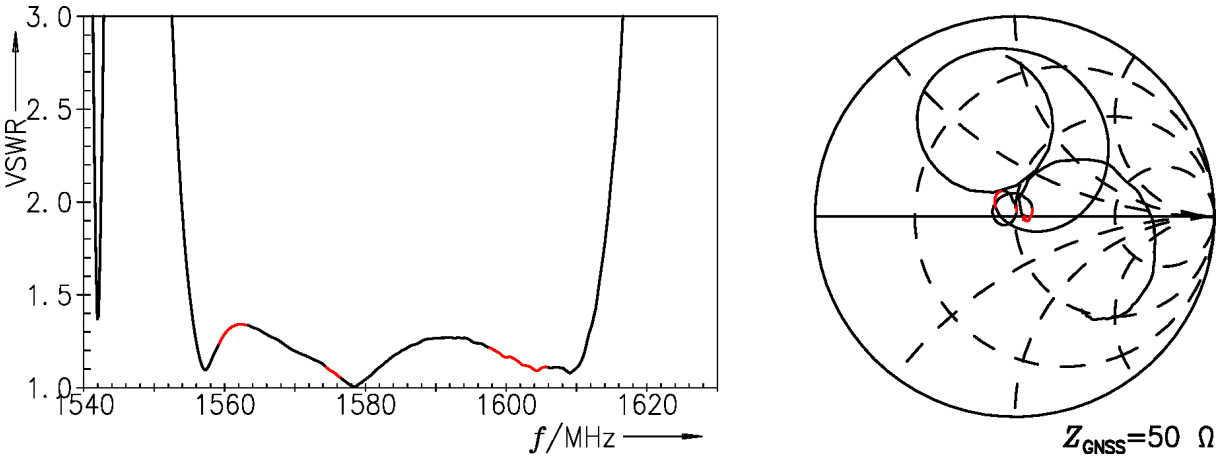

Figure 6: Reflection coefficient at GNSS port.

12 Transmission coefficient ANT – CELL

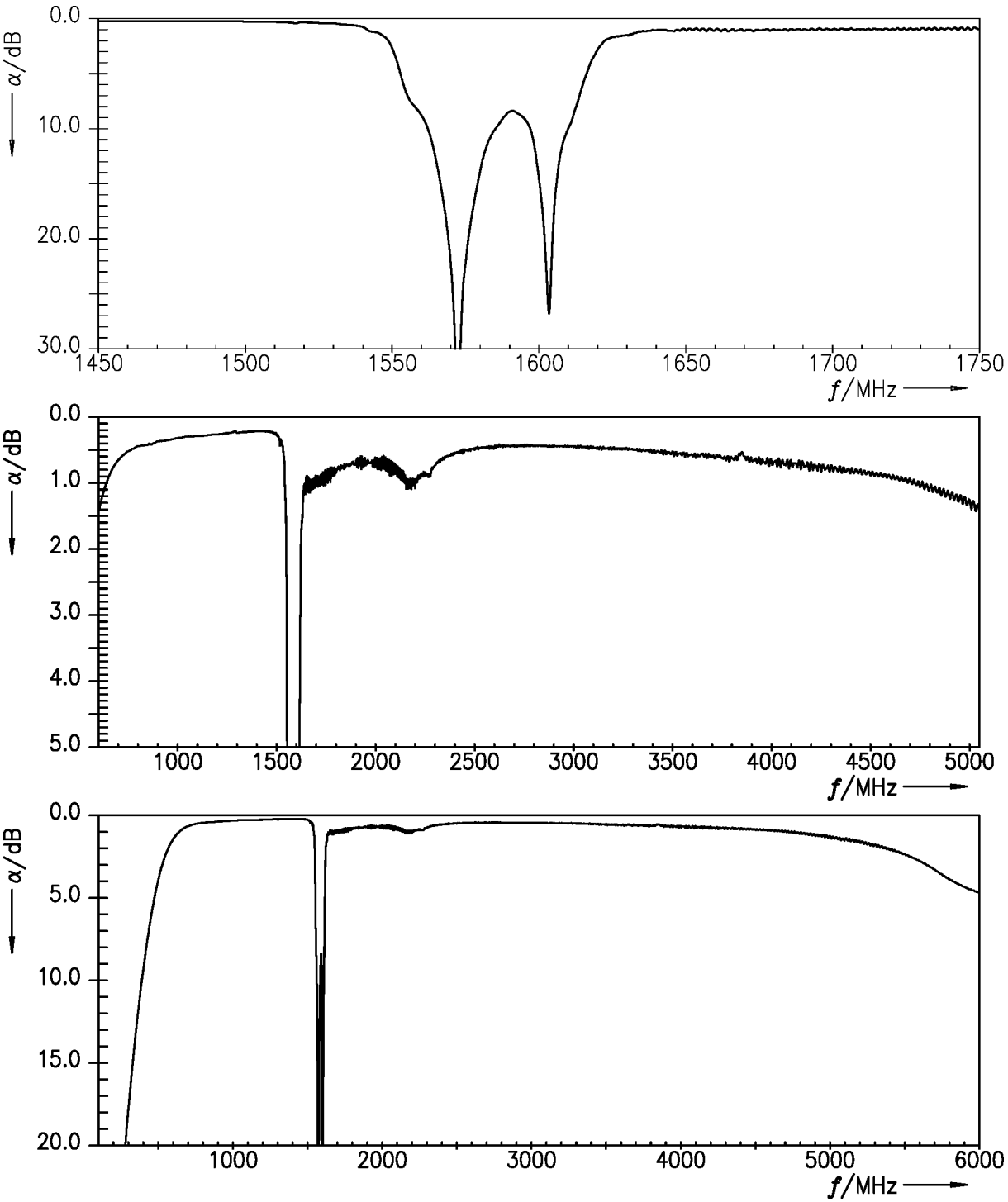

Figure 7: Attenuation ANT – CELL.

13 Reflection coefficients ANT – CELL

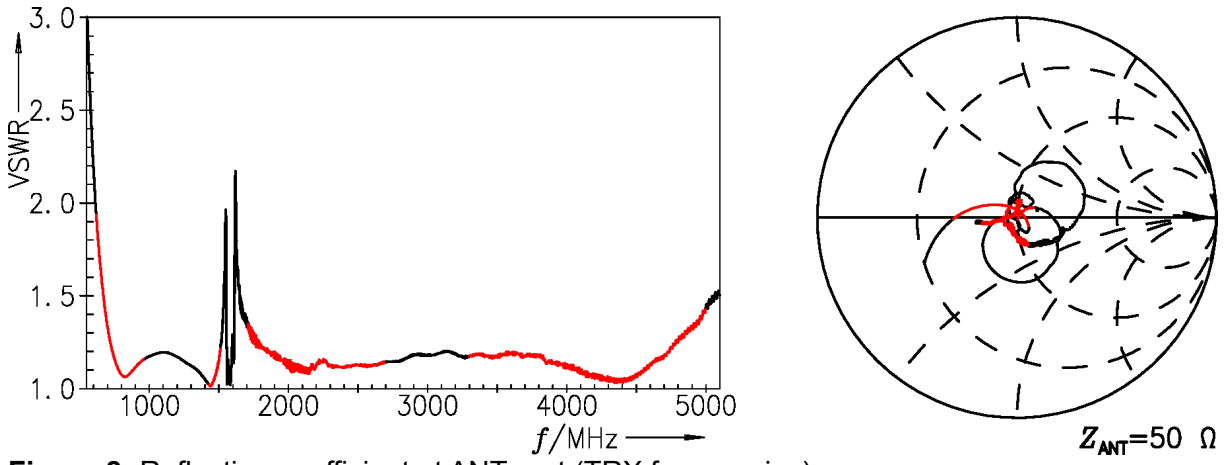

Figure 8: Reflection coefficient at ANT port (TRX frequencies).

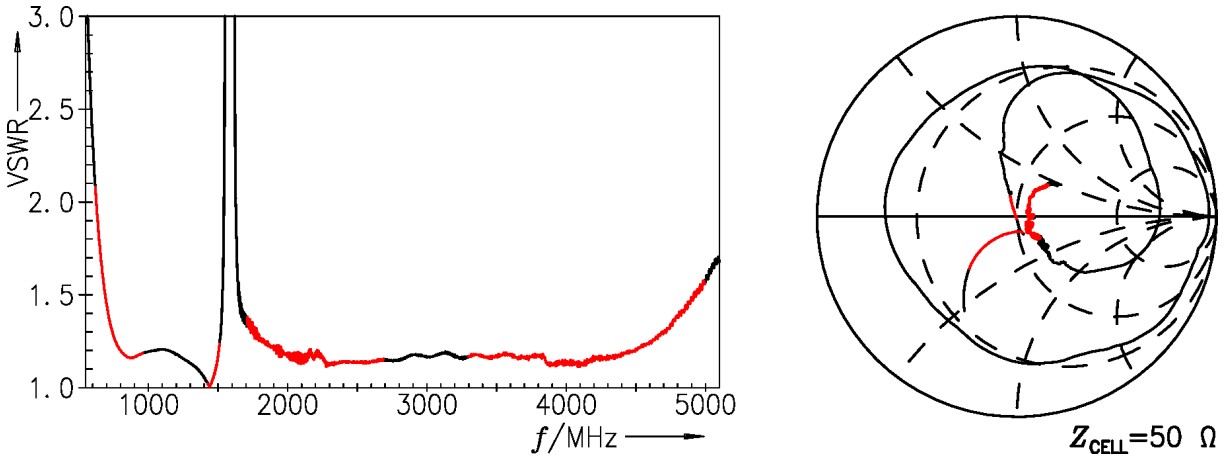

Figure 9: Reflection coefficient at CELL port.

14 Transmission coefficient GNSS – CELL

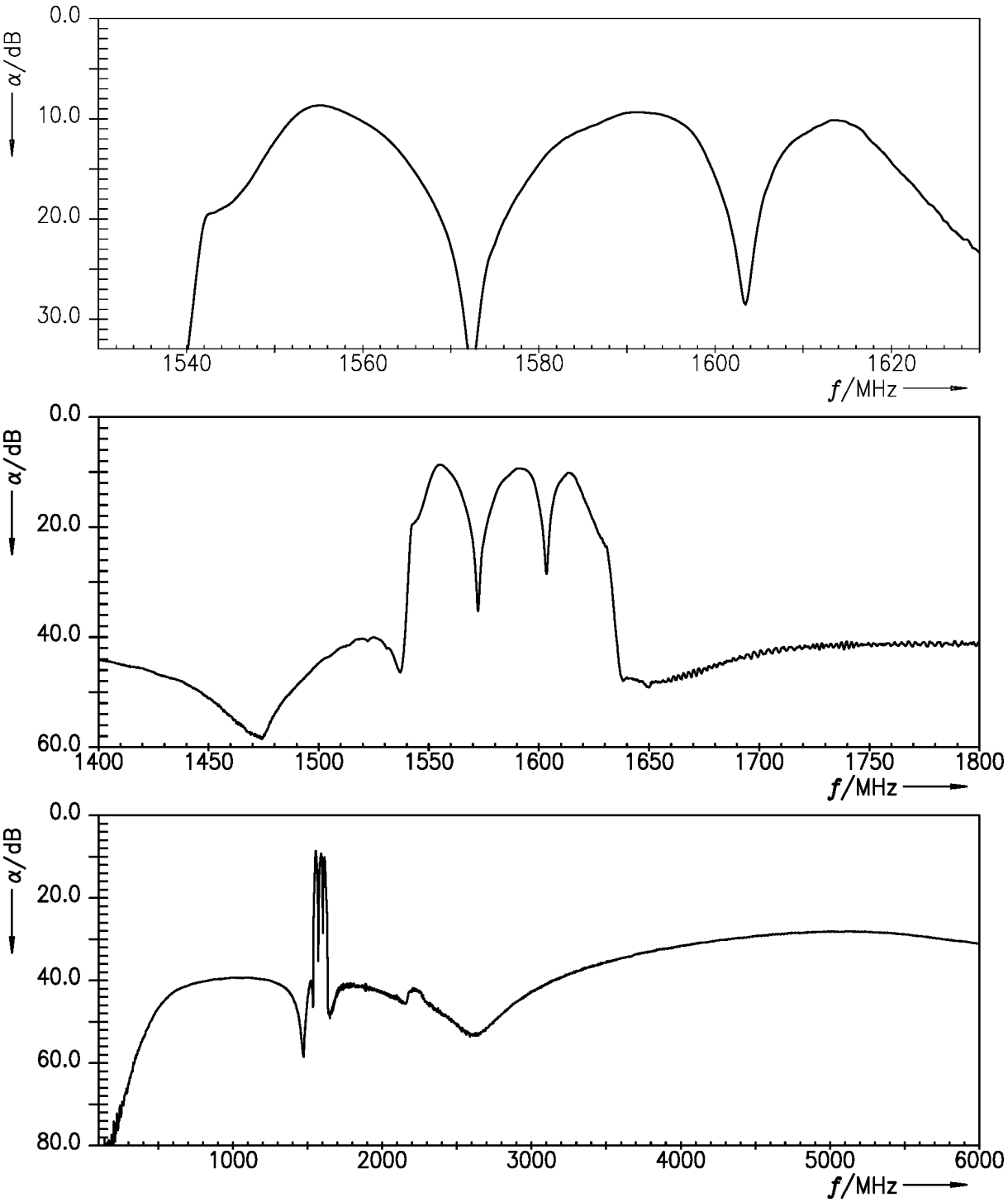

Figure 10: Cross-isolation GNSS – CELL.

15 Packing material

15.1 Tape

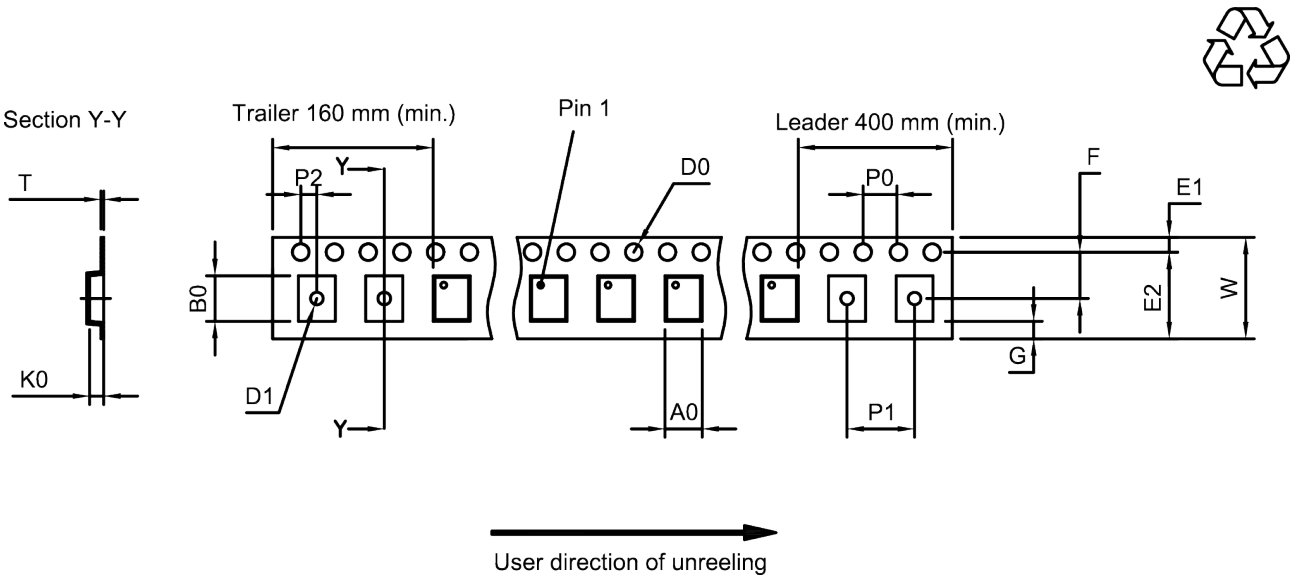

Figure 11: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A_0	$1.3_{\pm 0.05}$ mm
B_0	$1.7_{\pm 0.05}$ 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	$0.73_{\pm 0.05}$ 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.

15.2 Reel with diameter of 180 mm

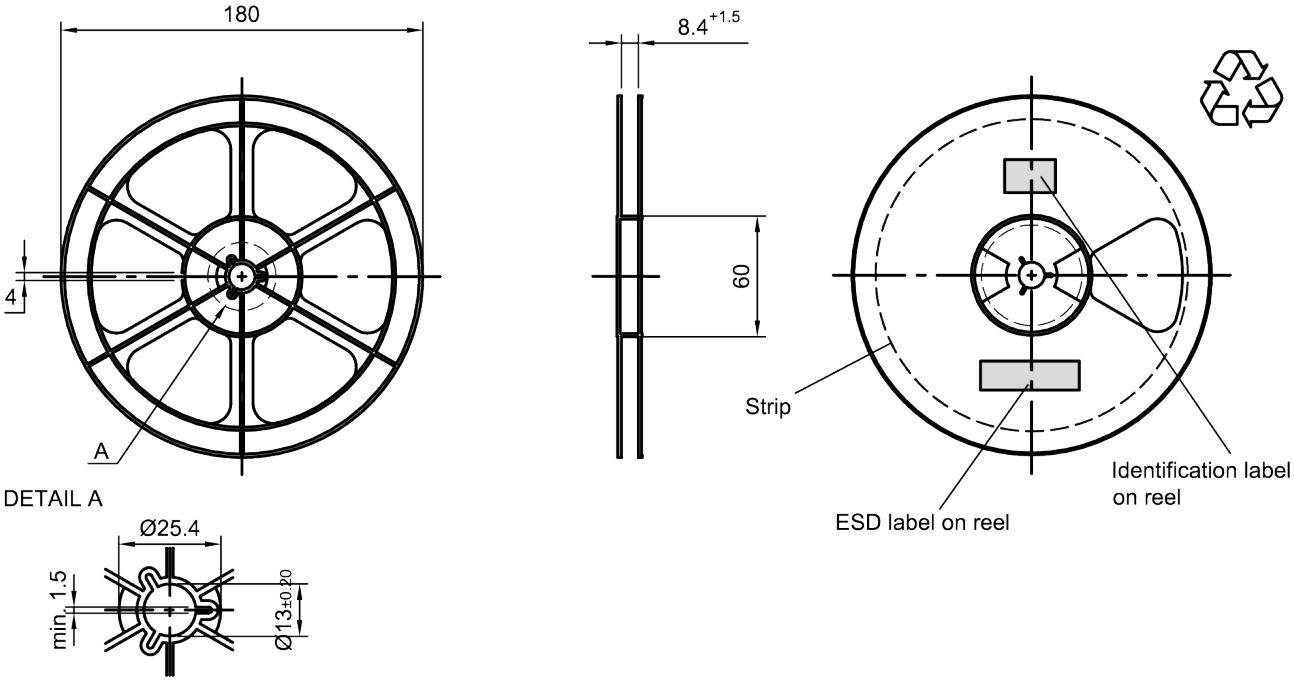

Figure 12: Drawing of reel (first-angle projection) with diameter of 180 mm.

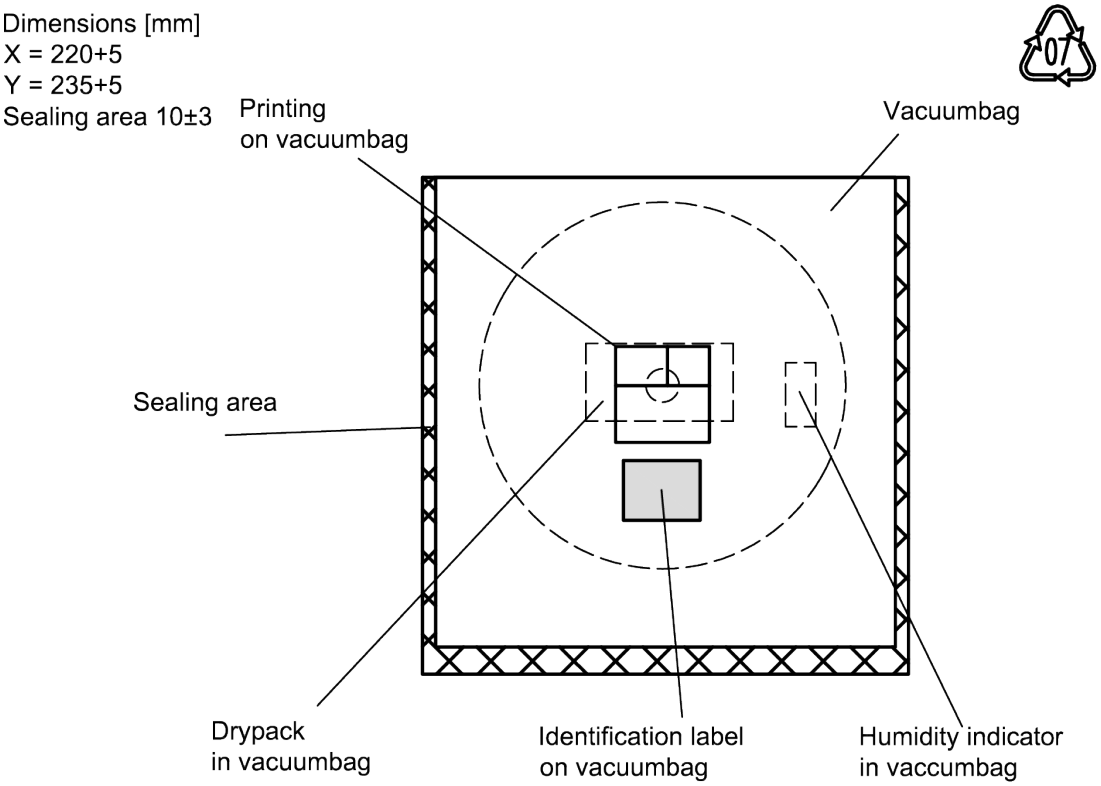

Figure 13: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

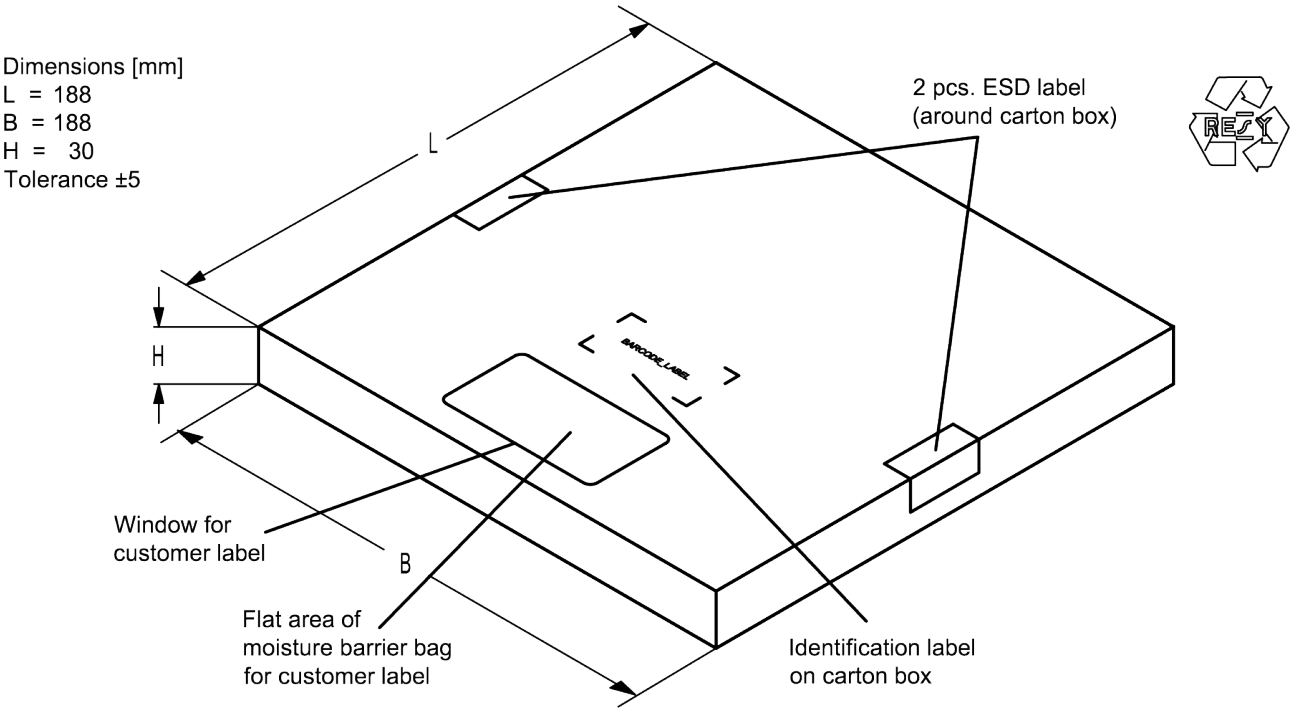

Figure 14: Drawing of folding box for reel with diameter of 180 mm.

15.3 Reel with diameter of 330 mm

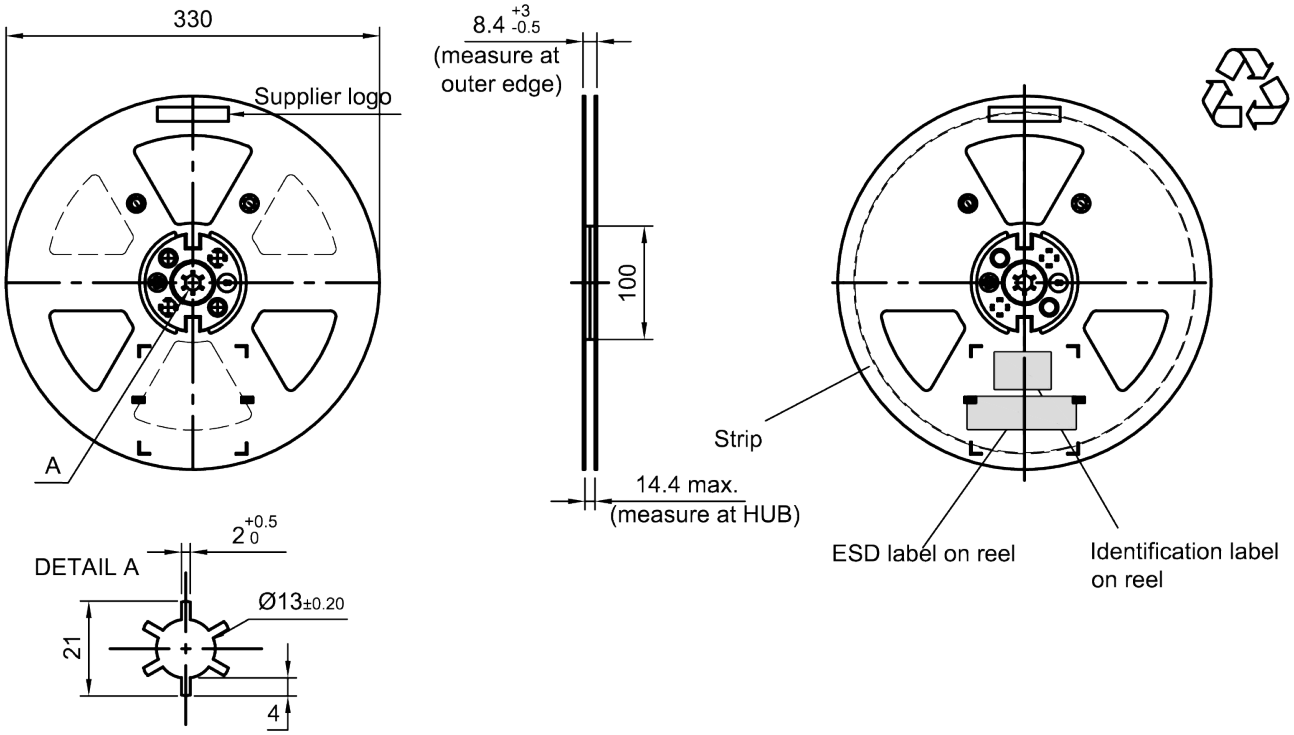

Figure 15: Drawing of reel (first-angle projection) with diameter of 330 mm.

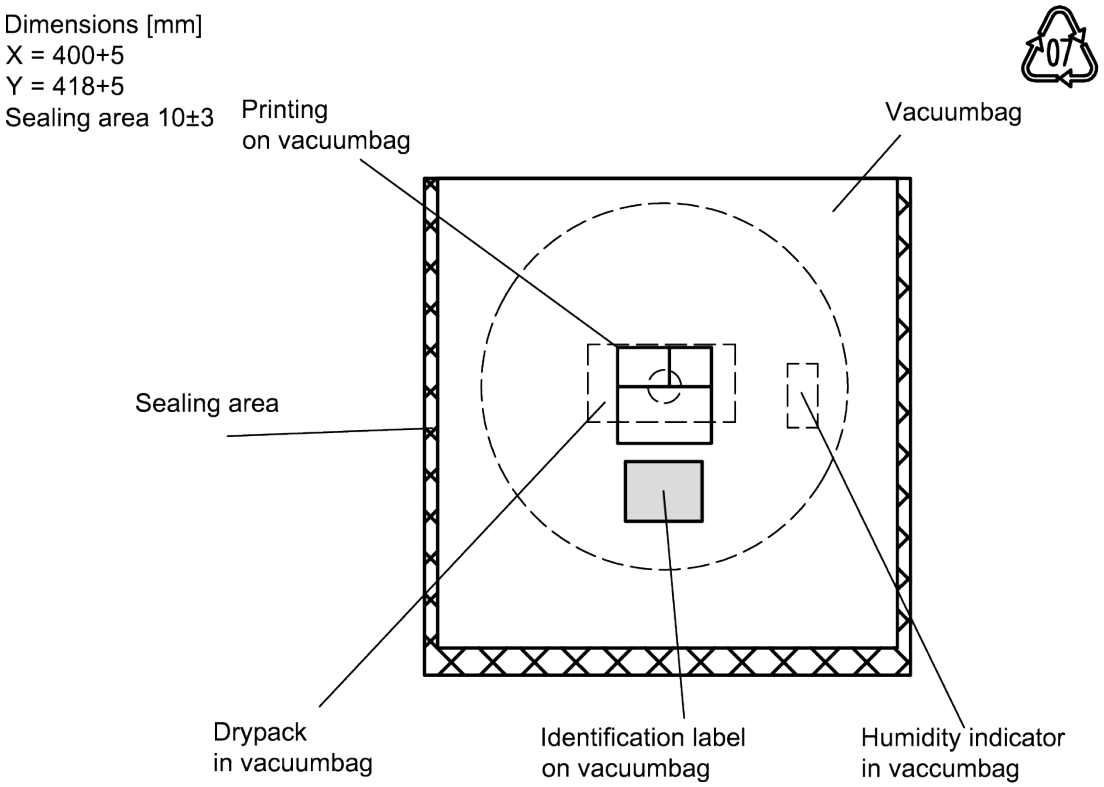

Figure 16: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

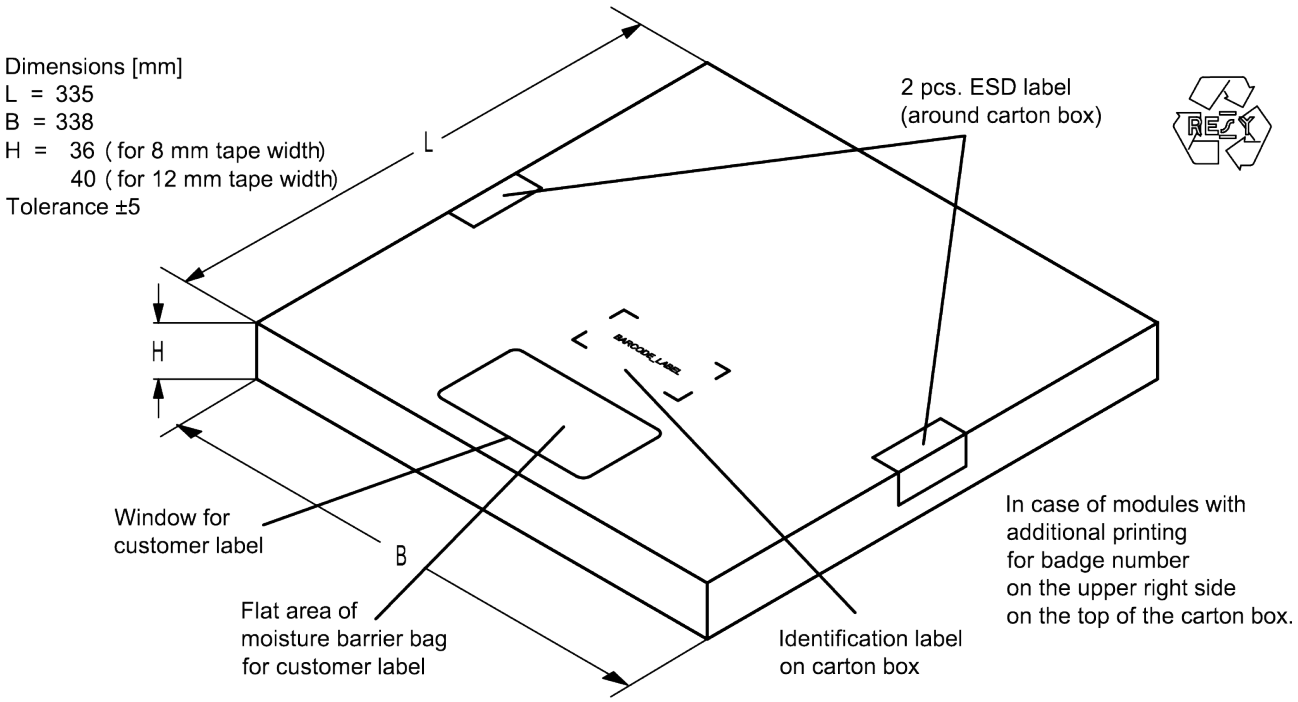

Figure 17: Drawing of folding box for reel with diameter of 330 mm.

16 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 B8939 is 8QB.

- 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.

17 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).

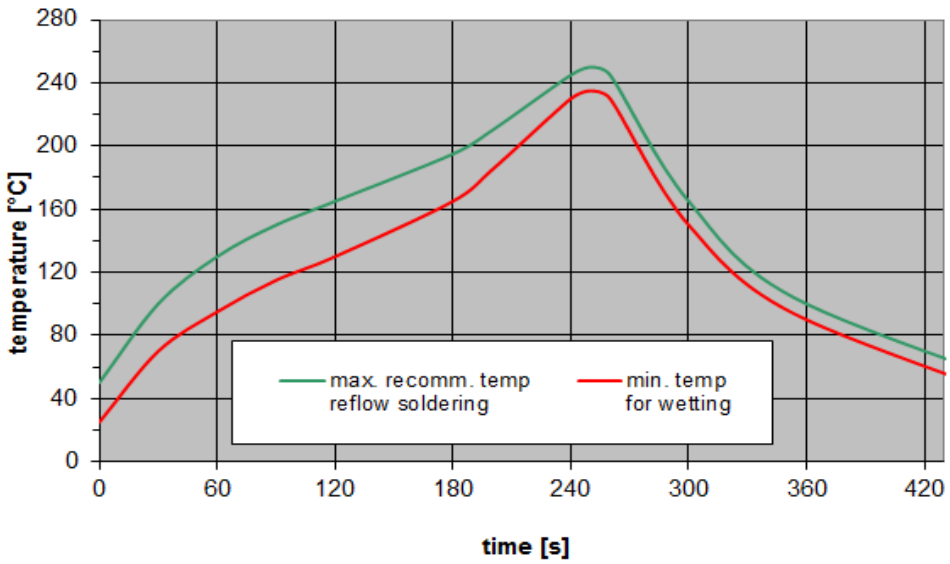

Figure 18: Recommended reflow profile for convection and infrared soldering – lead-free solder.

18 Annotations

18.1 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.

18.2 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.

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

Ordering code	Product ID	RF360 label	Packing unit
B39162B8939L210	B39162-B8939-L210-S05	B39162B8939L210S 5	5000 pcs
	B39162-B8939-L210-W05	B39162B8939L210W 5	5000 pcs

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

19 Cautions and warnings

19.1 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/.

19.2 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.

19.3 Moldability

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

19.4 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.

20 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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