RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

Data sheet

Micro-acoustic dual extractor

GNSS L1/GPS L5

Series/type:	B8920
Ordering code:	B39162B8920L210
Date:	May 28, 2019
Version:	2.0

DCN: 80-PA243-328 Rev. A

Table of contents

1 Application

- Premium-performance GNSS L1/GPS L5 Dual Extractor with single ended 50 Ω ports.
- Ultra-low-loss acoustic structure.
- Advanced highly-integrated multiplexer structure (no external matching needed)
- Using common antenna for GNSS L1, GPS L5 and Cellular bands.
- Placed between antenna and cellular front-end switches and filters.
- Usable GPS L5 pass band: 1166.22 – 1186.88 MHz.
- Usable GNSS L1 pass bands: 1559.05 – 1563.144 MHz (BeiDou), 1574.42 – 1576.42 MHz (Galileo/GPS), 1597.55 – 1605.89 MHz (Glonass).
- Usable CELL pass band: 699 – 2690 MHz.
- No switches and control lines required.

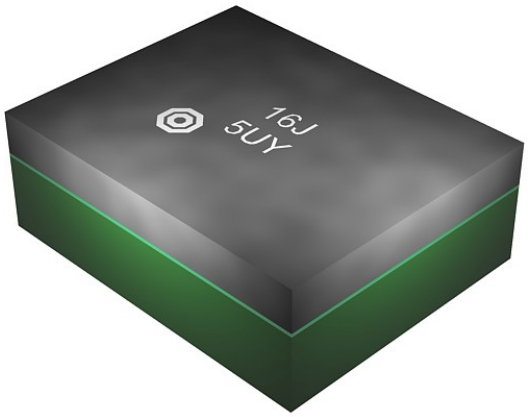

Figure 1: Picture of component with example of product marking.

2 Features

- Package size 2.0 mm × 1.6 mm
- Package height 0.6 mm
- 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

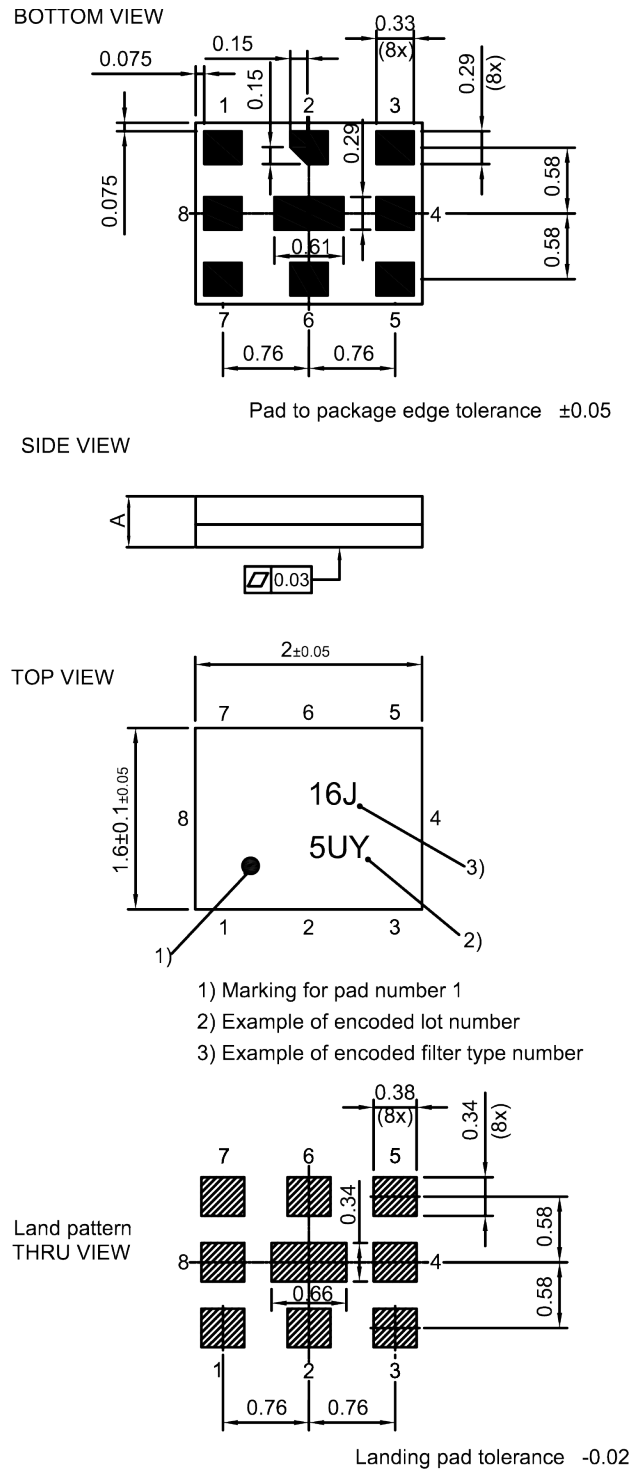

Figure 2: Drawing of package with package height A = 0.7 mm (max.). See Sec. Package information (p. 32).

4 Pin configuration

- 1 BeiDou/GPS L1/Glonass (GNSS L1)
- 3 GPS L5
- 5 CELL
- 7 ANT
- 2, 4, 6, 8, 9 Ground

5 Matching circuit

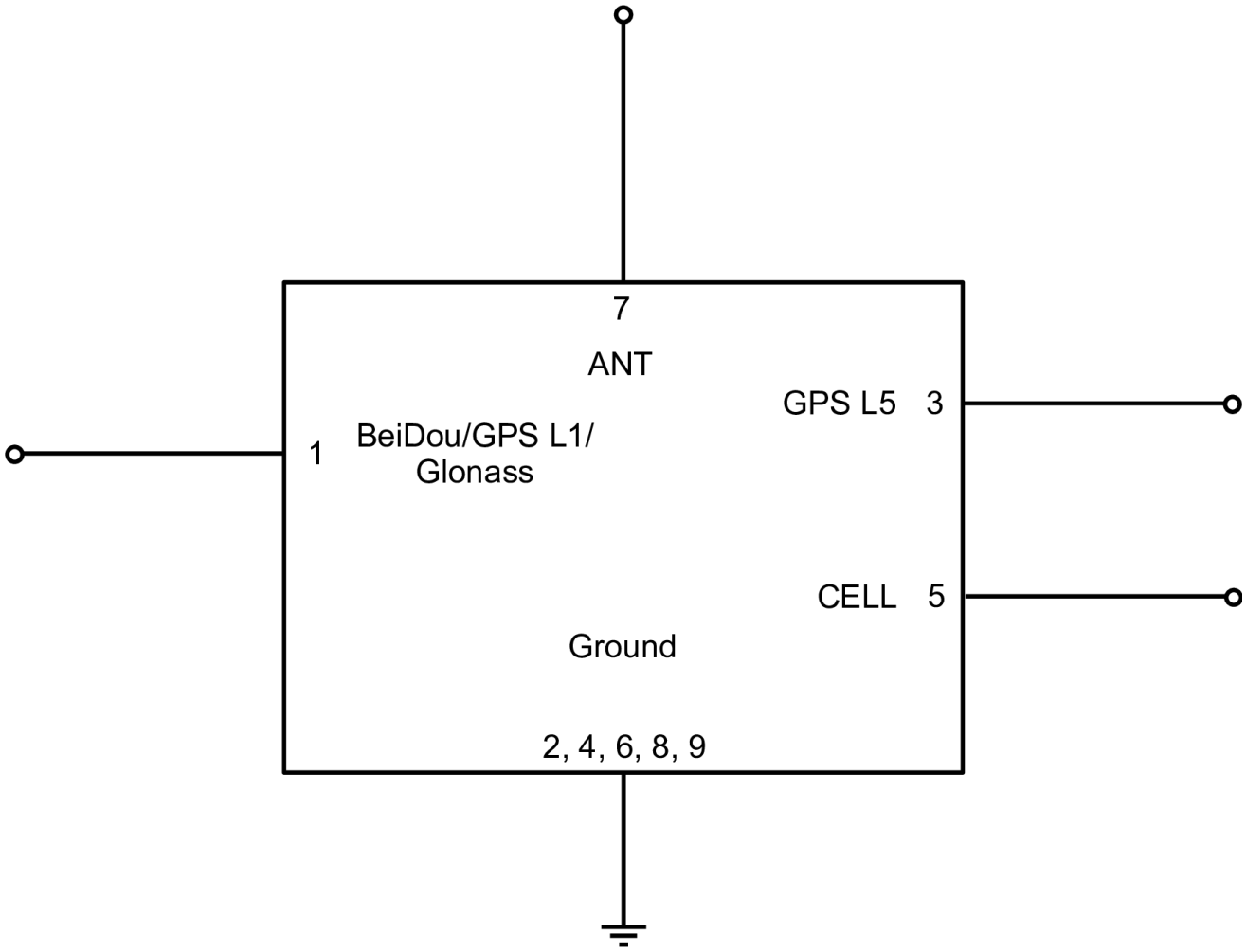

Figure 3: Schematic of matching circuit.

6 Characteristics ANT – GNSS L1

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
ANT terminating impedance	Z_{ANT}	= 50 Ω
GNSS L1 terminating impedance	$Z_{GNSS\ L1}$	= 50 Ω
GPS L5 terminating impedance	$Z_{GPS\ L5}$	= 50 Ω
CELL terminating impedance	Z_{CELL}	= 50 Ω

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Insertion loss			α				
ANT-BeiDou	1559.052	... 1563.144	MHz	—	1.4[1)]	2.8	dB
ANT-GPS L1	1574.42	... 1576.42	MHz	—	0.6[1)]	1.5	dB
ANT-Glonass	1597.55	... 1605.89	MHz	—	1.1[1)]	2.5	dB
Attenuation			α				
	100	... 617	MHz	37	40	—	dB
	617	... 960	MHz	35	39	—	dB
	1164	... 1189	MHz	35	38	—	dB
	1427.9	... 1510.9	MHz	33	38	—	dB
	1710	... 1805	MHz	37	42	—	dB
	1805	... 1990	MHz	37	40	—	dB
	1990	... 2025	MHz	37	40	—	dB
	2110	... 2200	MHz	37	42	—	dB
	2300	... 2500	MHz	38	42	—	dB
	2500	... 2690	MHz	32	39	—	dB
	3300	... 4200	MHz	25	29	—	dB
VSWR (ANT port)			VSWR				
	1559.052	... 1563.144	MHz	—	1.3	1.9	
	1574.42	... 1576.42	MHz	—	1.3	1.9	
	1597.55	... 1605.89	MHz	—	1.7	2.2	
VSWR (GNSS L1 port)			VSWR				
	1559.052	... 1563.144	MHz	—	1.5	1.9	
	1574.42	... 1576.42	MHz	—	1.3	1.9	
	1597.55	... 1605.89	MHz	—	1.7	2.2	

1) Typical value averaged over indicated frequency range.

7 Characteristics ANT – GPS L5

Temperature range for specification T_{SPEC} = −30 °C ... +85 °C
ANT terminating impedance Z_{ANT} = 50 Ω
GNSS L1 terminating impedance $Z_{GNSS\ L1}$ = 50 Ω
GPS L5 terminating impedance $Z_{GPS\ L5}$ = 50 Ω
CELL terminating impedance Z_{CELL} = 50 Ω

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Insertion loss			α				
	1166.22... 1186.68	MHz		—	1.3[1)]	1.9	dB
Attenuation			α				
	617... 699	MHz		35	39	—	dB
	699... 960	MHz		33	38	—	dB
	1427.9... 1510.9	MHz		33	37	—	dB
	1559.052... 1605.89	MHz		34	46	—	dB
	1710... 1990	MHz		33	37	—	dB
	1990... 2025	MHz		33	38	—	dB
	2110... 2200	MHz		33	38	—	dB
	2300... 2500	MHz		33	40	—	dB
	2500... 2690	MHz		33	40	—	dB
	3300... 4200	MHz		25	33	—	dB
VSWR (ANT port)			VSWR				
	1166.22... 1186.68	MHz		—	1.2	1.8	
VSWR (GPS L5 port)			VSWR				
	1166.22... 1186.68	MHz		—	1.3	1.8	

[1)] Typical value averaged over indicated frequency range.

8 Characteristics ANT – CELL

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
ANT terminating impedance	Z_{ANT}	= 50 Ω
GNSS L1 terminating impedance	$Z_{GNSS\ L1}$	= 50 Ω
GPS L5 terminating impedance	$Z_{GPS\ L5}$	= 50 Ω
CELL terminating impedance	Z_{CELL}	= 50 Ω

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Insertion loss			α				
	699 ... 960	MHz		—	1.2	1.7	dB
	1427.9 ... 1447.9	MHz		—	1.4	1.8	dB
	1447.9 ... 1510.9	MHz		—	1.6	2.1	dB
	1710 ... 1785	MHz		—	1.6	2.2	dB
	1805 ... 1880	MHz		—	1.2	1.7	dB
	1920 ... 2025	MHz		—	1.2	1.6	dB
	2110 ... 2200	MHz		—	1.1	1.6	dB
	2300 ... 2500	MHz		—	1.5	2.1	dB
	2500 ... 2690	MHz		—	1.7	2.4	dB
Attenuation			α				
	1166.22 ... 1186.68	MHz		9.0	14	—	dB
	1559.052 ... 1563.144	MHz		7.0	10	—	dB
	1574.42 ... 1576.42	MHz		13	29	—	dB
	1597.55 ... 1605.89	MHz		8.0	12	—	dB
VSWR (ANT port)			VSWR				
	699 ... 960	MHz		—	1.4	1.7	
	1427.9 ... 1447.9	MHz		—	1.4	1.8	
	1447.9 ... 1510.9	MHz		—	1.5	1.9	
	1710 ... 1785	MHz		—	1.6	2.0	
	1805 ... 1880	MHz		—	1.4	1.8	
	1920 ... 2025	MHz		—	1.3	1.7	
	2110 ... 2200	MHz		—	1.4	1.7	
	2300 ... 2500	MHz		—	1.5	1.9	
	2500 ... 2690	MHz		—	1.5	1.9	

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
VSWR (CELL port)			VSWR				
	699 ... 960	MHz		—	1.4	1.7	
	1427.9 ... 1447.9	MHz		—	1.3	1.7	
	1447.9 ... 1510.9	MHz		—	1.3	1.7	
	1710 ... 1785	MHz		—	1.5	2.0	
	1805 ... 1880	MHz		—	1.3	1.7	
	1920 ... 2025	MHz		—	1.1	1.7	
	2110 ... 2200	MHz		—	1.3	1.7	
	2300 ... 2500	MHz		—	1.6	1.9	
	2500 ... 2690	MHz		—	1.7	2.0	

9 Characteristics GNSS L1 – CELL

Temperature range for specification T_{SPEC} = −30 °C ... +85 °C
ANT terminating impedance Z_{ANT} = 50 Ω
GNSS L1 terminating impedance $Z_{GNSS\ L1}$ = 50 Ω
GPS L5 terminating impedance $Z_{GPS\ L5}$ = 50 Ω
CELL terminating impedance Z_{CELL} = 50 Ω

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Isolation	α					
	617 ... 960	MHz	38	41	—	dB
	1427.9 ... 1447.9	MHz	40	47	—	dB
	1447.9 ... 1510.9	MHz	37	41	—	dB
	1559.052 ... 1563.144	MHz	8	12	—	dB
	1574.42 ... 1576.42	MHz	15	32	—	dB
	1597.55 ... 1605.89	MHz	9	13	—	dB
	1710 ... 2025	MHz	37	42	—	dB
	2300 ... 2500	MHz	39	45	—	dB
	2500 ... 2690	MHz	35	42	—	dB

10 Characteristics GPS L5 – CELL

Temperature range for specification T_{SPEC} = −30 °C ... +85 °C
ANT terminating impedance Z_{ANT} = 50 Ω
GNSS L1 terminating impedance $Z_{GNSS\ L1}$ = 50 Ω
GPS L5 terminating impedance $Z_{GPS\ L5}$ = 50 Ω
CELL terminating impedance Z_{CELL} = 50 Ω

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Isolation	α					
	617... 960	MHz	32	38	—	dB
	1164... 1189	MHz	9	15	—	dB
	1427.9... 1447.9	MHz	33	38	—	dB
	1447.9... 1510.9	MHz	32	37	—	dB
	1710... 2025	MHz	32	36	—	dB
	2300... 2500	MHz	30	36	—	dB
	2500... 2690	MHz	30	35	—	dB

11 Characteristics GPS L5 – GNSS L1

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
ANT terminating impedance	Z_{ANT}	= 50 Ω
GNSS L1 terminating impedance	$Z_{GNSS\ L1}$	= 50 Ω
GPS L5 terminating impedance	$Z_{GPS\ L5}$	= 50 Ω
CELL terminating impedance	Z_{CELL}	= 50 Ω

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Isolation	α					
	1166.22... 1186.68	MHz	36	40	—	dB
	1559.052... 1605.89	MHz	39	44	—	dB

12 Maximum ratings

Storage temperature	T_{STG} [2] = −40 °C ... +85 °C [1]	
DC voltage	$\|V_{DC}\|$ [3), 4)] = 5.0 V (max.)	Holds when no RF power is applied to the four signal ports: ANT, CELL, GNSS L1, GPS L5.
ESD voltage		
	V_{ESD} [5)] = 275 V (max.)	Machine model.
	V_{ESD} [6)] = 425 V (max.)	Human body model.
	V_{ESD} [7)] = 2000 V (max.)	Charged device model.
Input power	P_{IN}	
@ ANT port: 824 ... 849 MHz	33 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 880 ... 915 MHz	33 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 1176 MHz	15 dBm	Continuous wave for 5000 h @ -30...+85 °C.
@ ANT port: 1575 MHz	15 dBm	Continuous wave for 5000 h @ -30...+85 °C.
@ ANT port: 1710 ... 1785 MHz	30 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ ANT port: 1850 ... 1910 MHz	30 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 663 ... 960 MHz	30 dBm	10 MHz LTE uplink signal (50 RB) for 5000 h @ -30...+85 °C.
@ CELL port: 824 ... 849 MHz	33 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 880 ... 915 MHz	33 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 1427 ... 2690 MHz	30 dBm	10 MHz LTE uplink signal (50 RB) for 5000 h @ -30...+85 °C.
@ CELL port: 1710 ... 1785 MHz	32 dBm	GSM signal duty cycle 1:8 for 5000 h @ -30...+85 °C. Effective power in On-state.
@ CELL port: 1850 ... 1910 MHz	32 dBm	GSM signal duty cycle 1:8 for 5000 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: 2496 ... 2690 MHz	30.5 dBm	5G NR CP-OFDM signal for 5000 h @ -30...+85°C.

1) Applicable only for components without tape and reel (unpacked).
2) Not valid for packaging material. Storage temperature for packaging material is −25 °C to +40 °C.

3) 168h Damp Heat Steady State acc. to IEC60068-2-67 Cy.
4) In case of applied RF power DC voltage blocking capacitors are mandatory.
5) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
6) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
7) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

13 Transmission coefficient ANT – GNSS L1

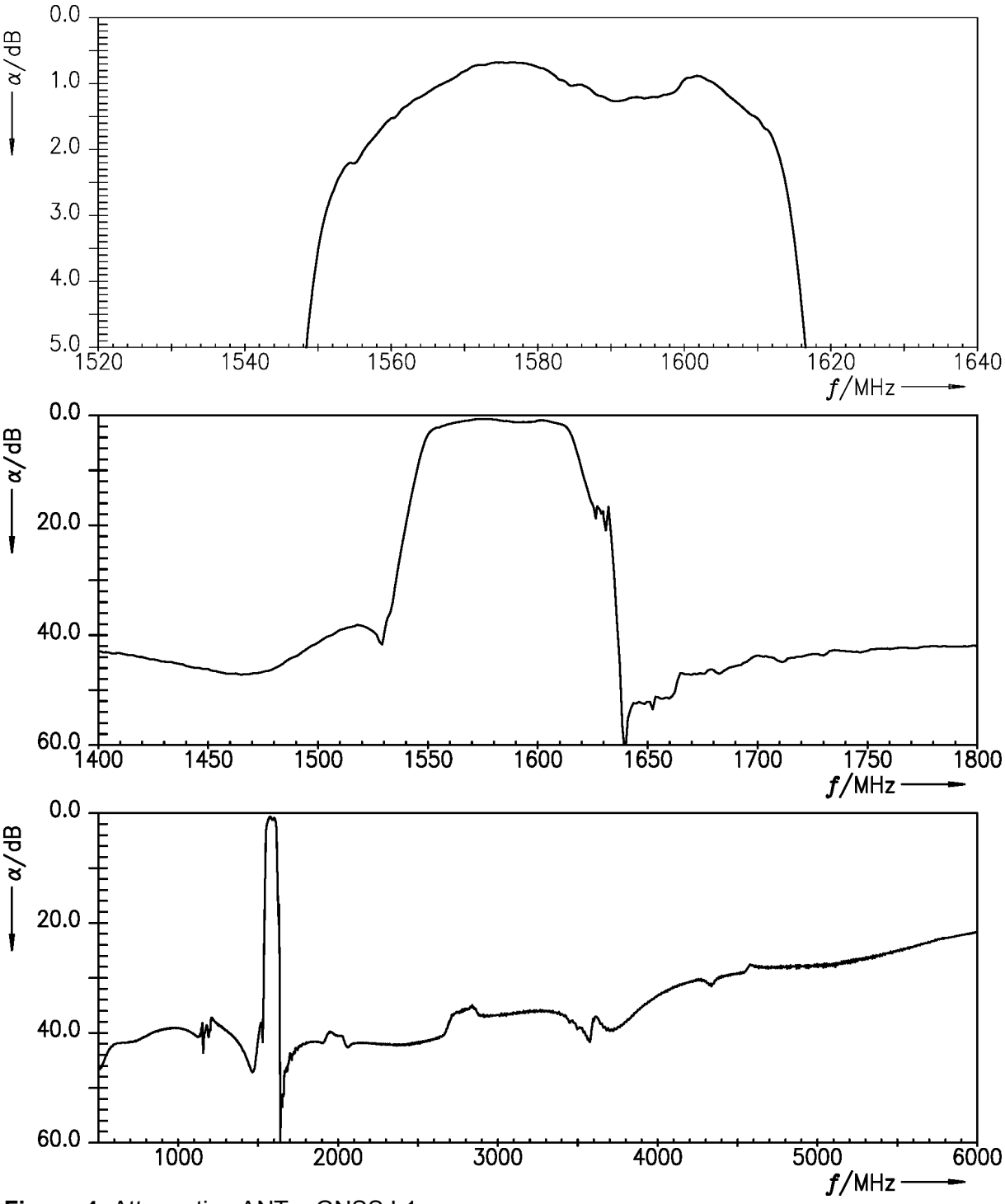

Figure 4: Attenuation ANT – GNSS L1.

14 Reflection coefficients ANT – GNSS L1

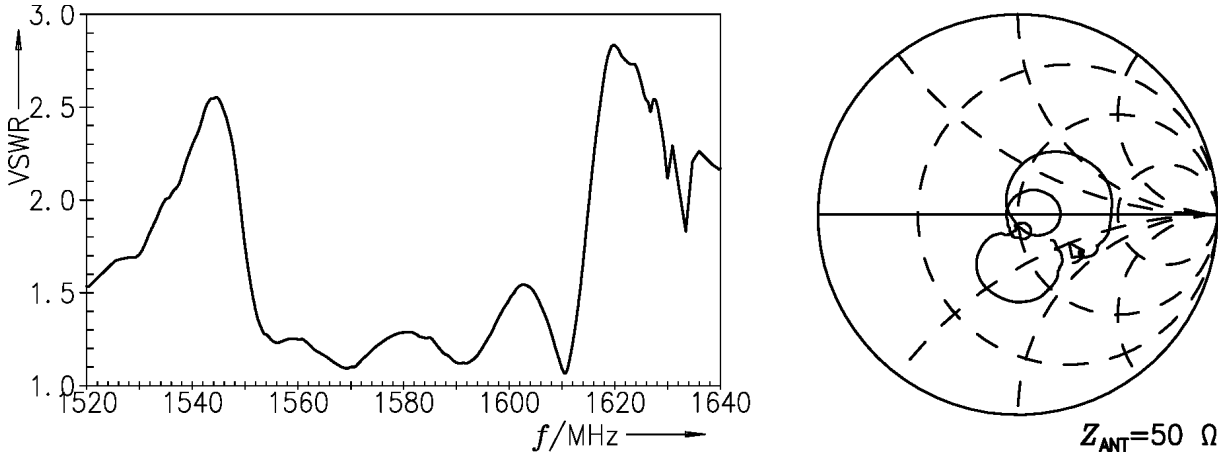

Figure 5: Reflection coefficient at ANT port.

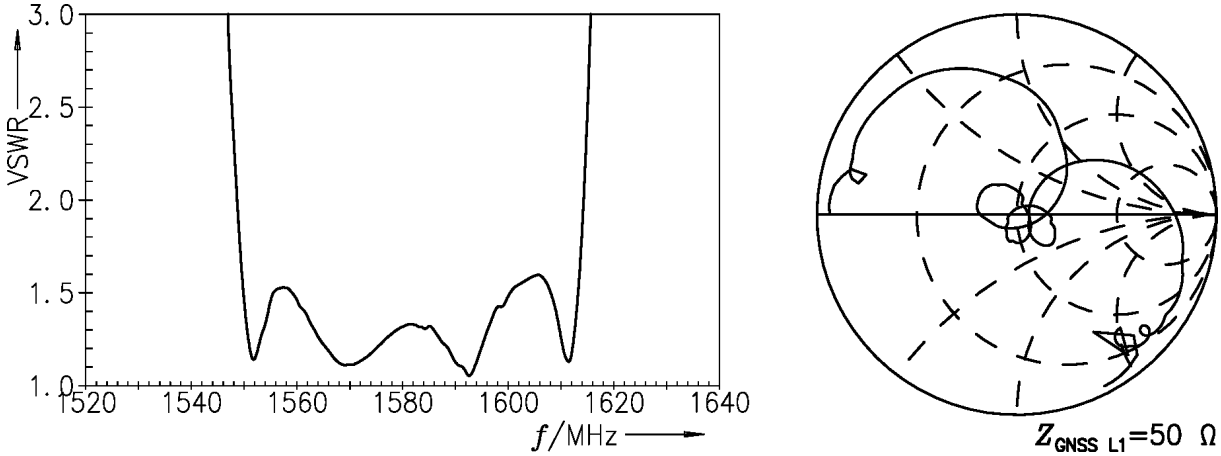

Figure 6: Reflection coefficient at GNSS L1 port.

15 Transmission coefficient ANT – GPS L5

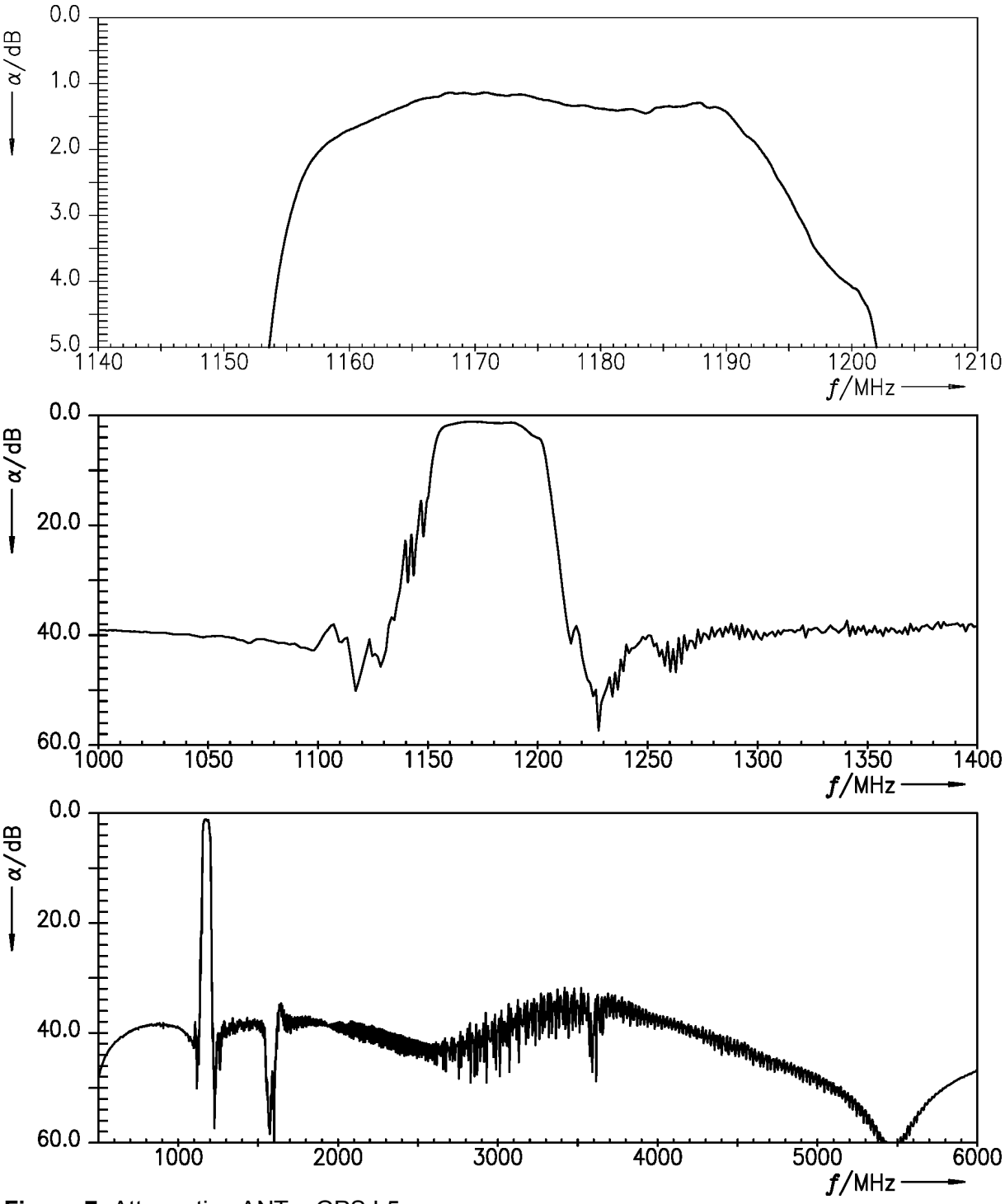

Figure 7: Attenuation ANT – GPS L5.

16 Reflection coefficients ANT – GPS L5

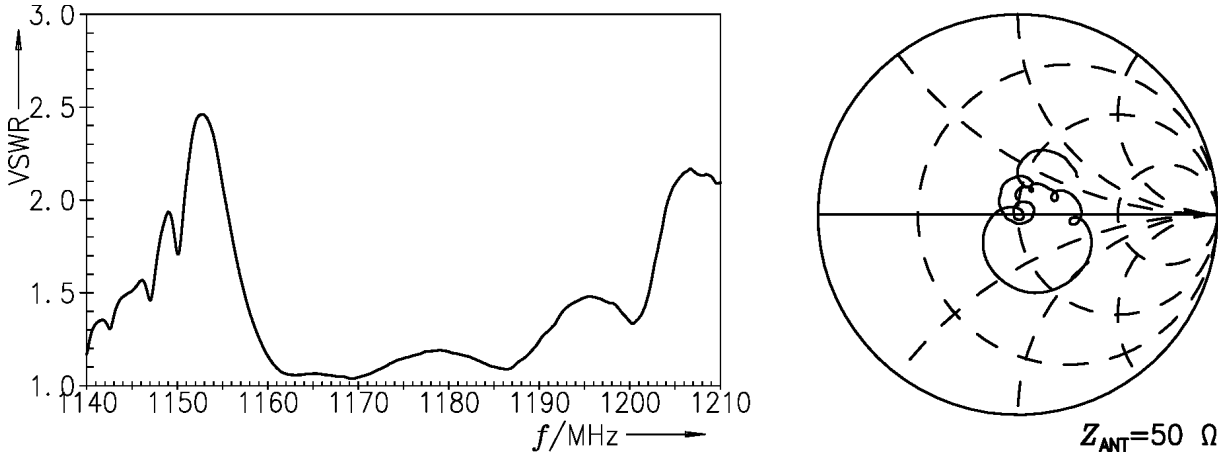

Figure 8: Reflection coefficient at ANT port.

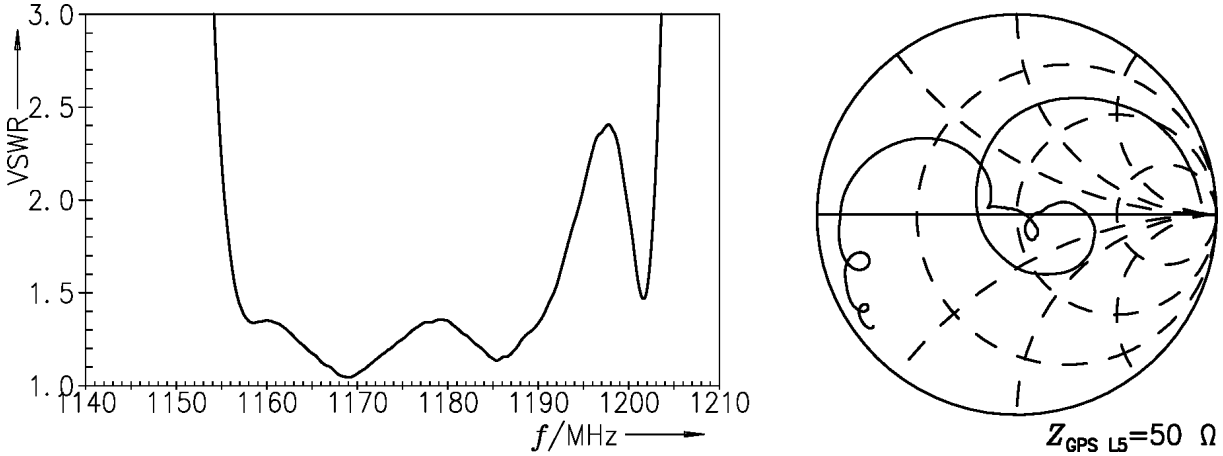

Figure 9: Reflection coefficient at GPS L5 port.

17 Transmission coefficient ANT – CELL

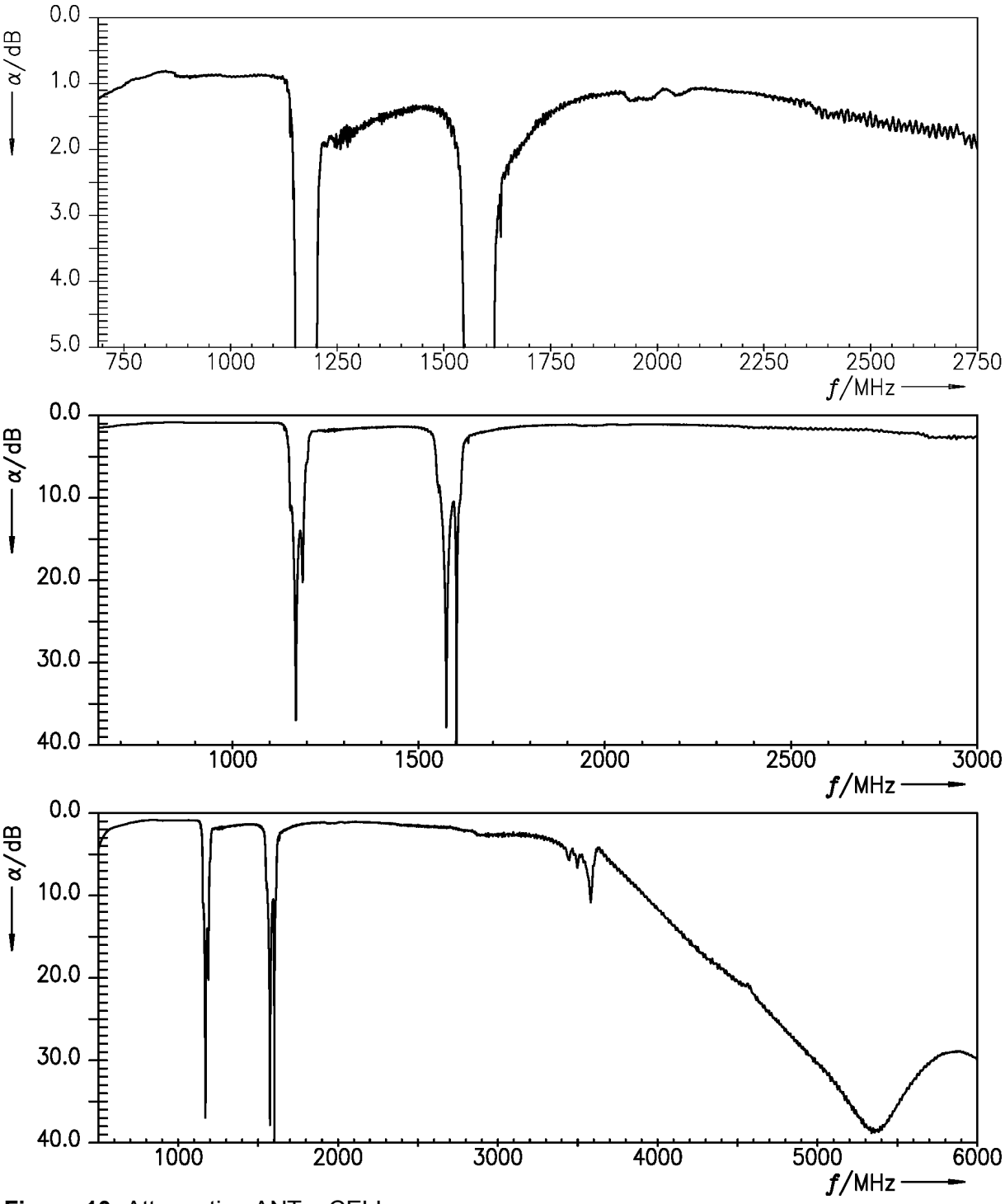

Figure 10: Attenuation ANT – CELL.

18 Reflection coefficients ANT – CELL

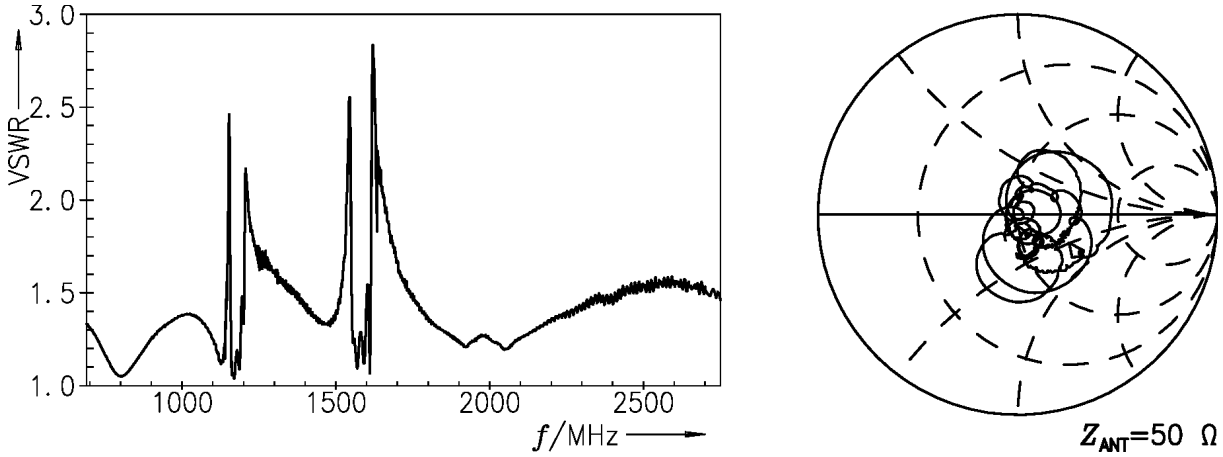

Figure 11: Reflection coefficient at ANT port.

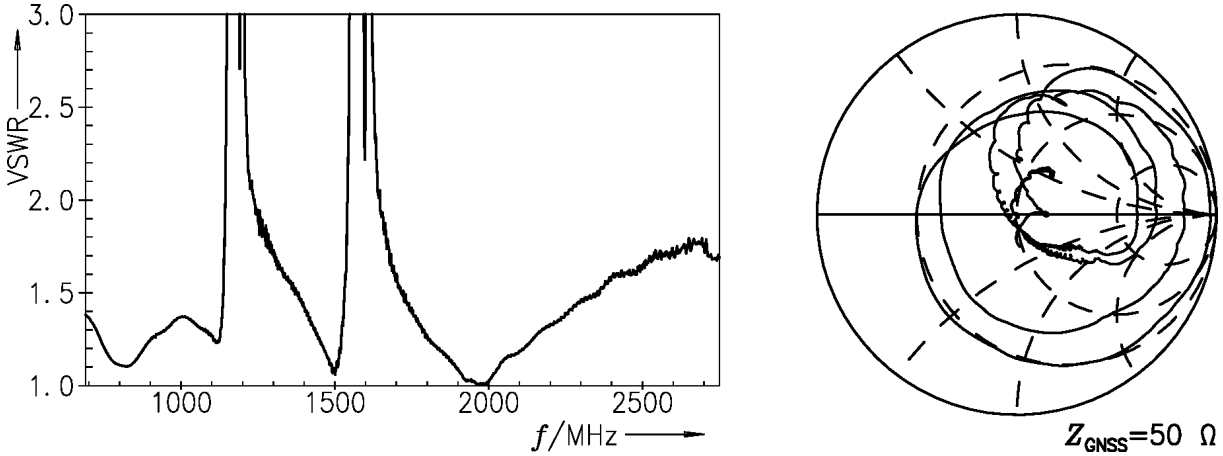

Figure 12: Reflection coefficient at CELL port.

19 Transmission coefficient GNSS L1 – CELL

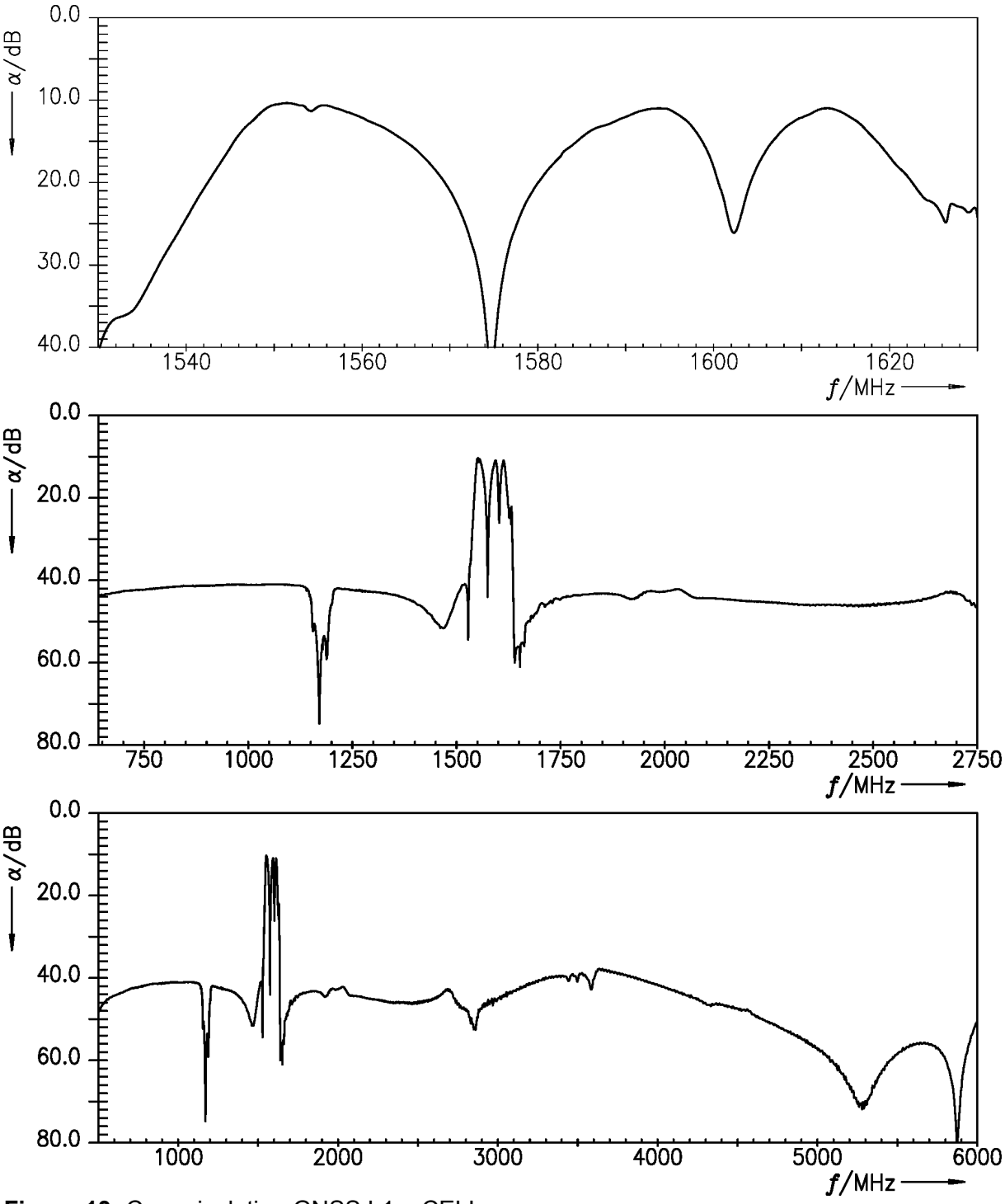

Figure 13: Cross-isolation GNSS L1 – CELL.

20 Transmission coefficient GPS L5 – CELL

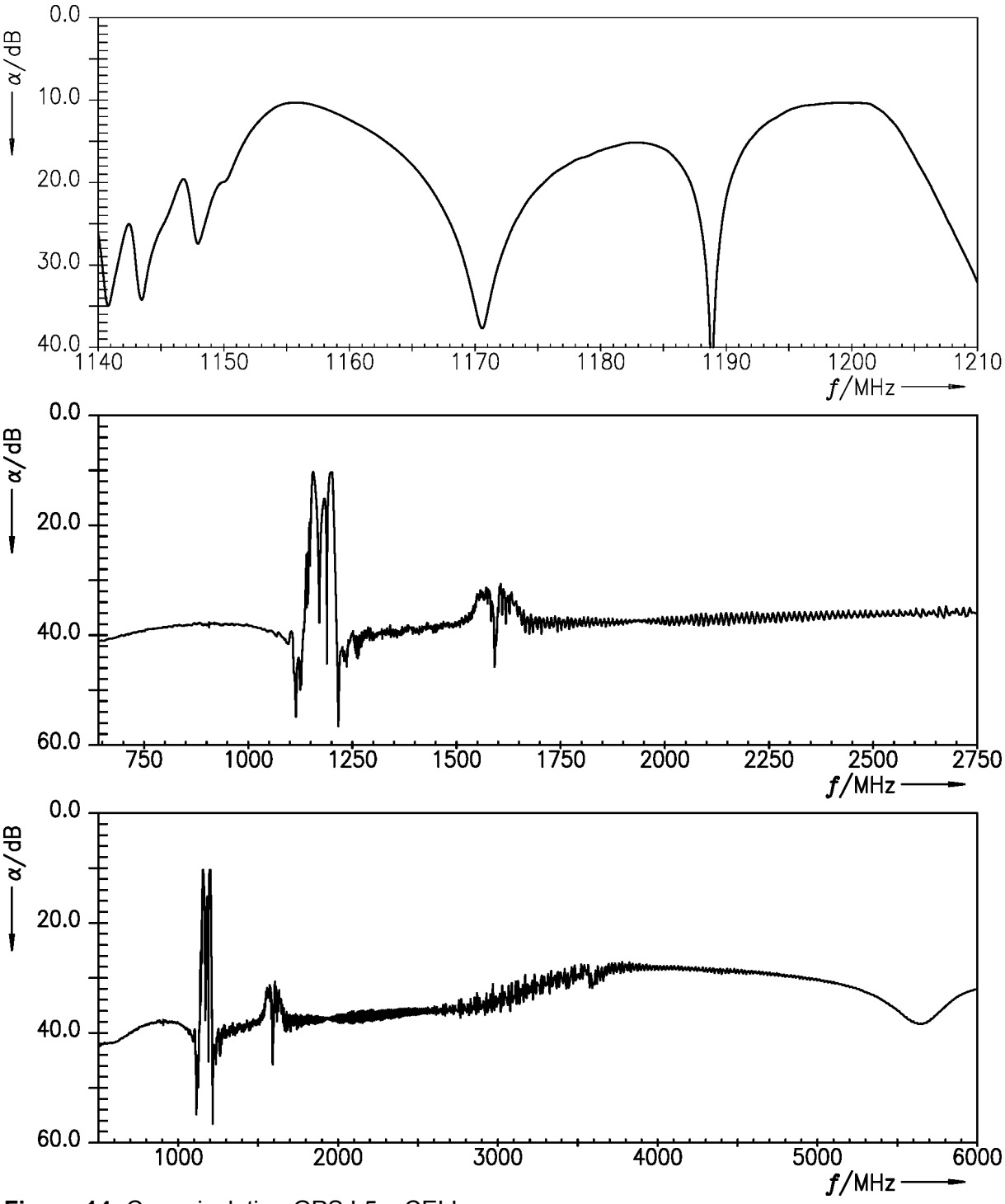

Figure 14: Cross-isolation GPS L5 – CELL.

21 Transmission coefficient GPS L5 – GNSS L1

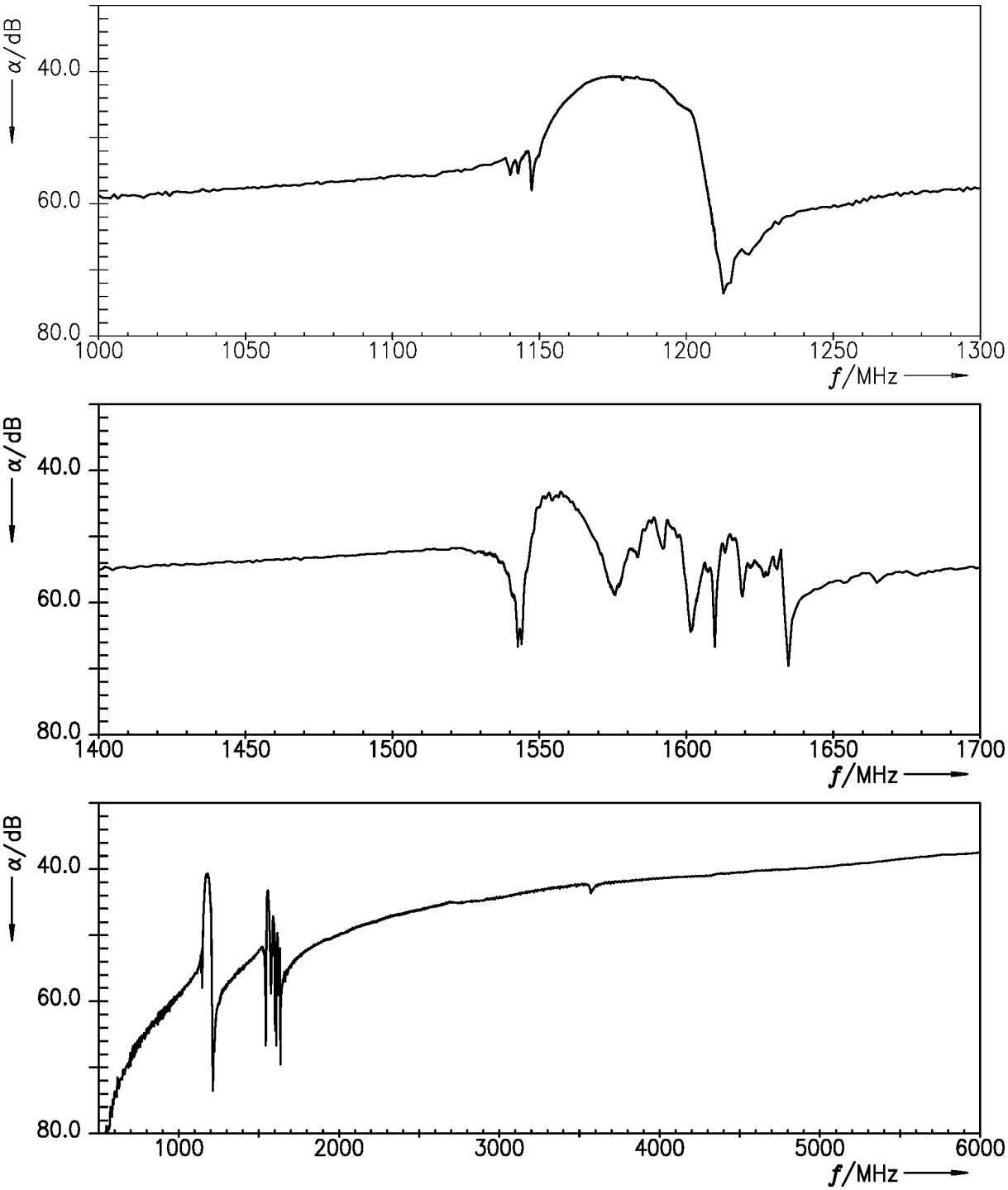

Figure 15: Cross-isolation GPS L5 – GNSS L1.

22 Packing material

22.1 Tape

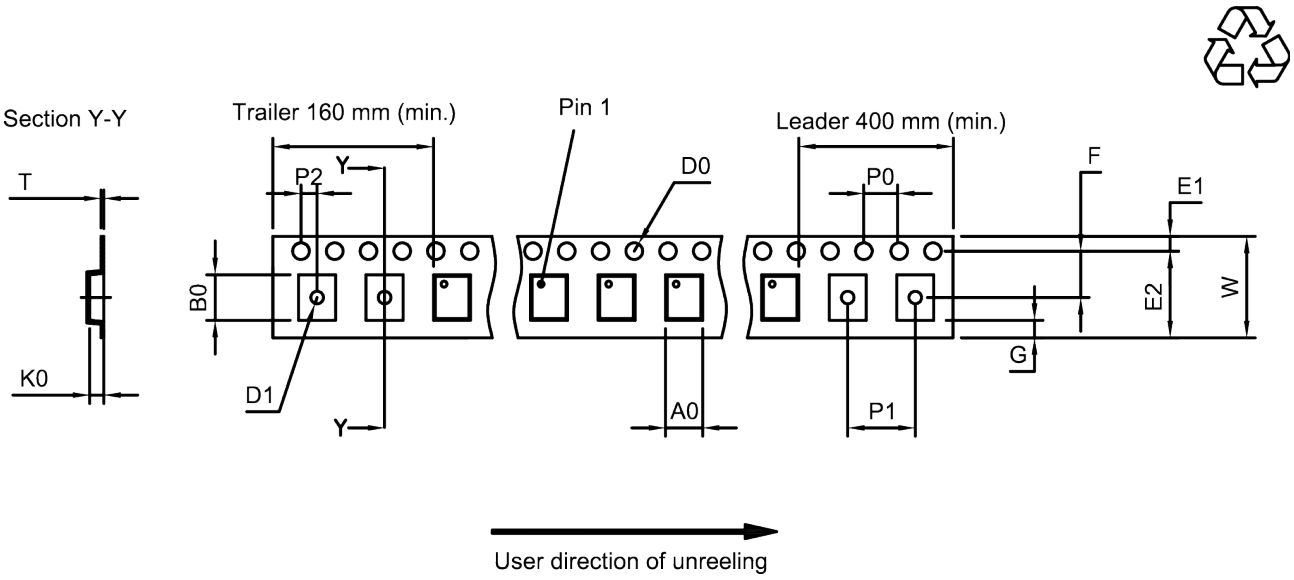

Figure 16: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A_0	$1.8_{\pm 0.05}$ mm
B_0	$2.25_{\pm 0.05}$ mm
D_0	$1.5^{+0.1/-0}$ mm
D_1	1.0 mm (min.)
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	$0.9_{\pm 0.05}$ 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	$0.3_{\pm 0.05}$ mm
W	$8.0^{+0.3/-0.1}$ mm

Table 1: Tape dimensions.

22.2 Reel with diameter of 180 mm

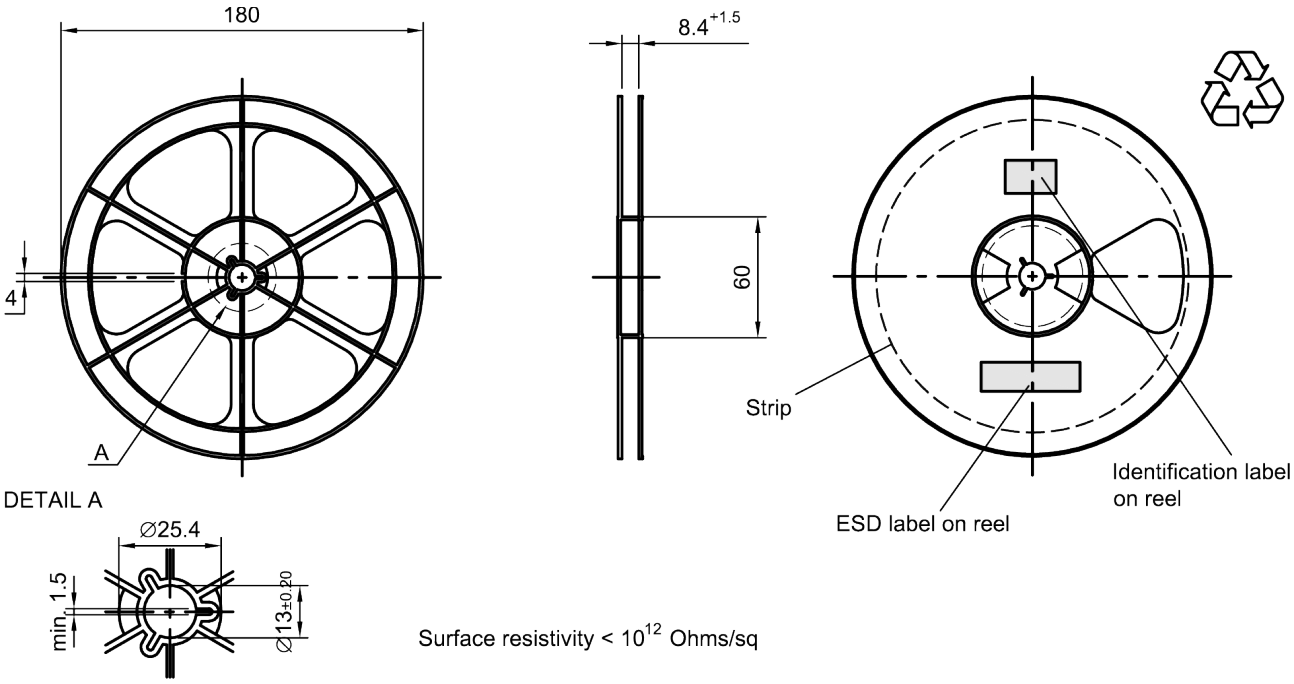

Figure 17: Drawing of reel (first-angle projection) with diameter of 180 mm.

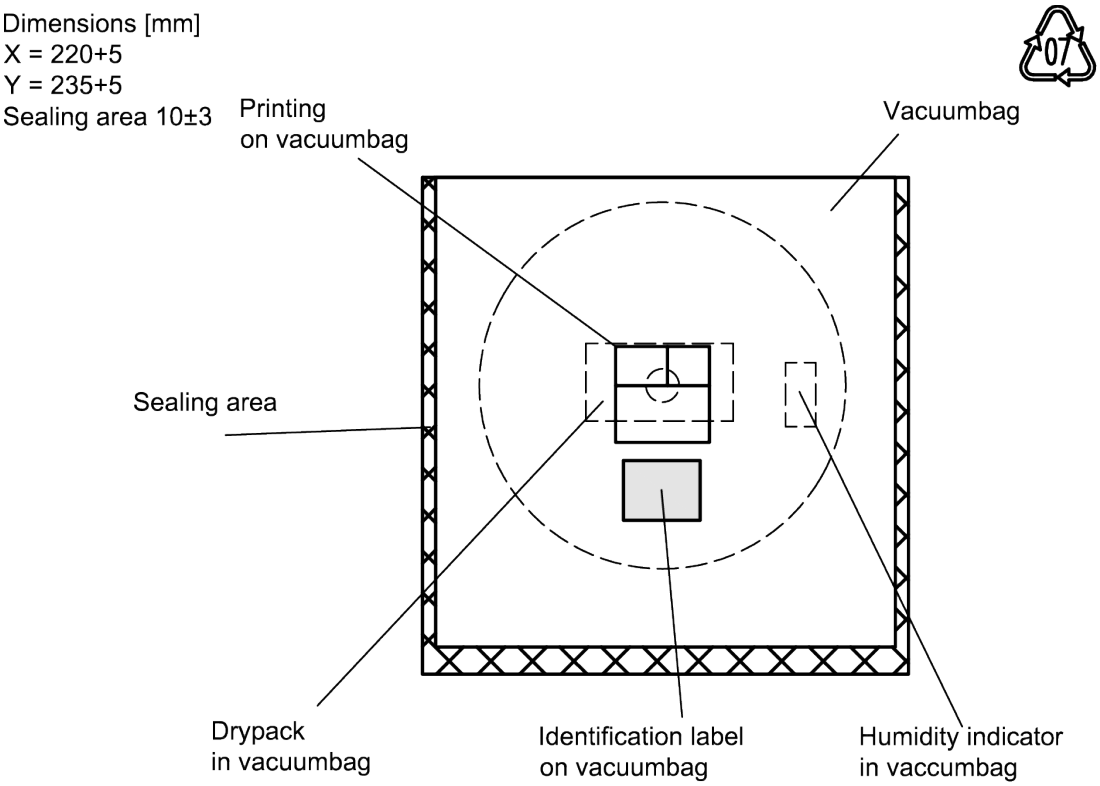

Figure 18: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

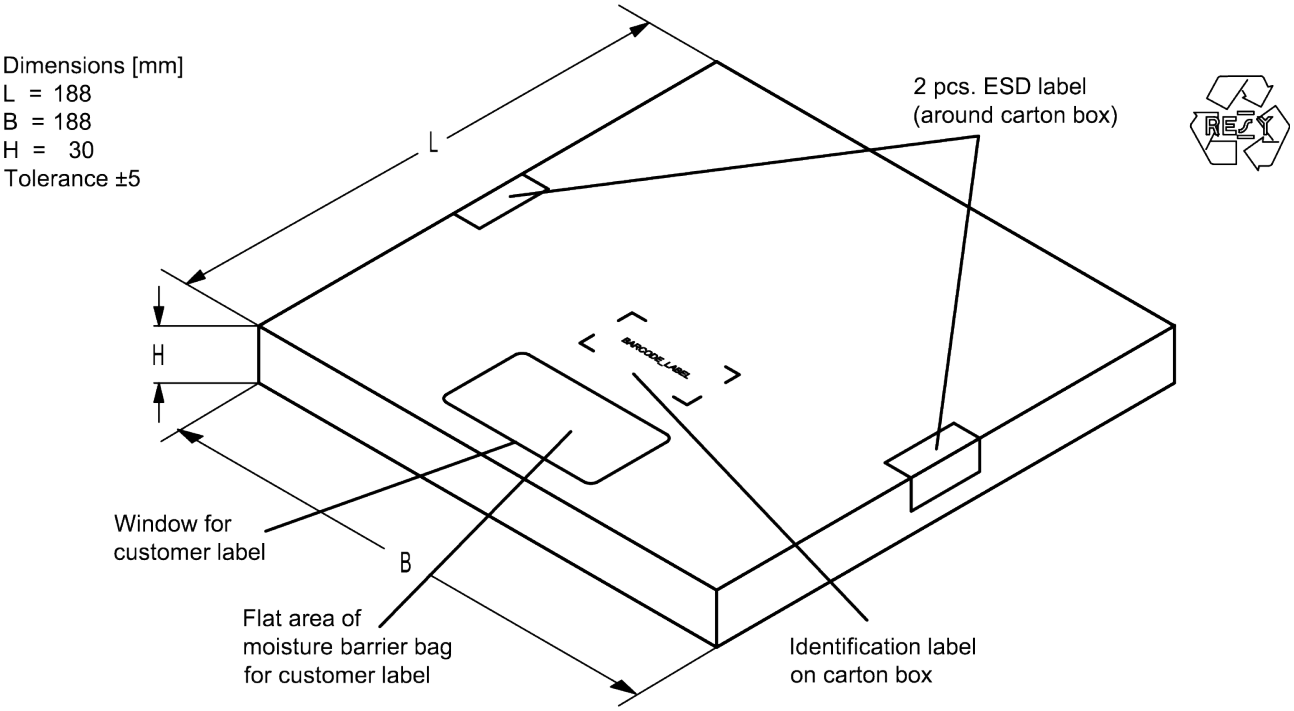

Figure 19: Drawing of folding box for reel with diameter of 180 mm.

22.3 Reel with diameter of 330 mm

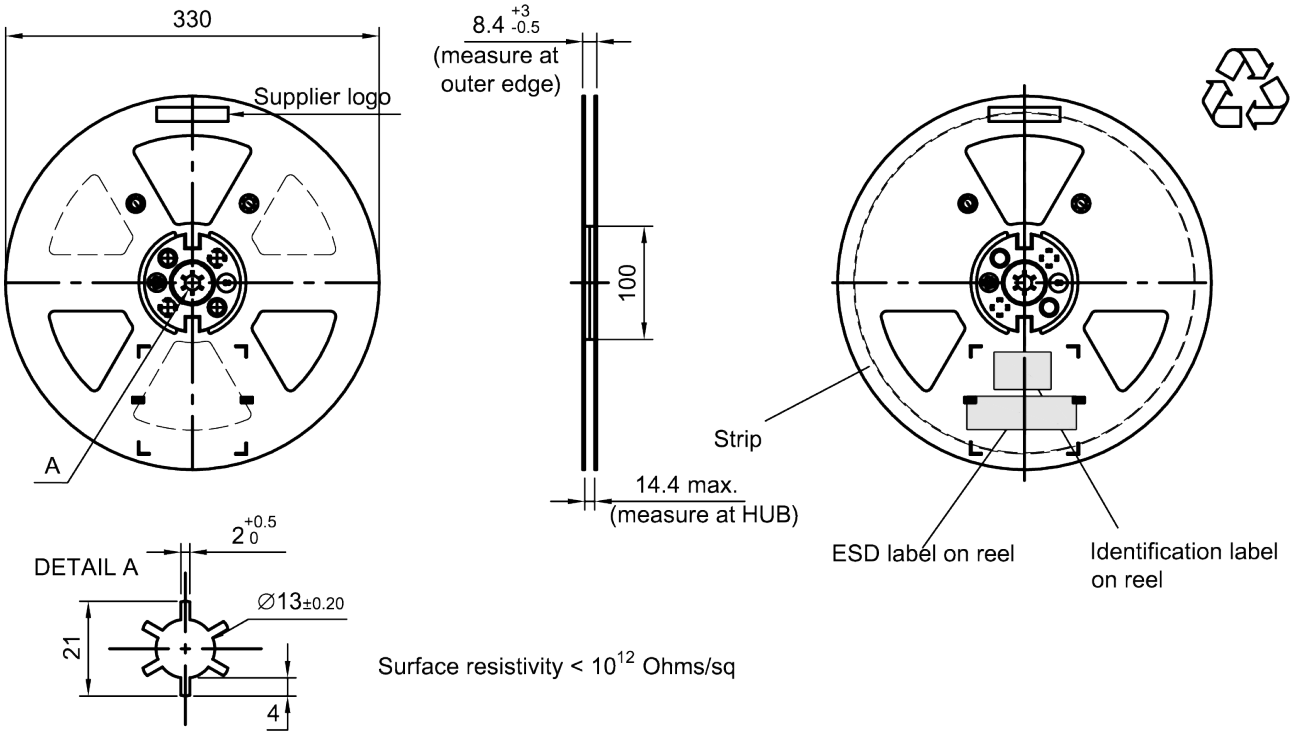

Figure 20: Drawing of reel (first-angle projection) with diameter of 330 mm.

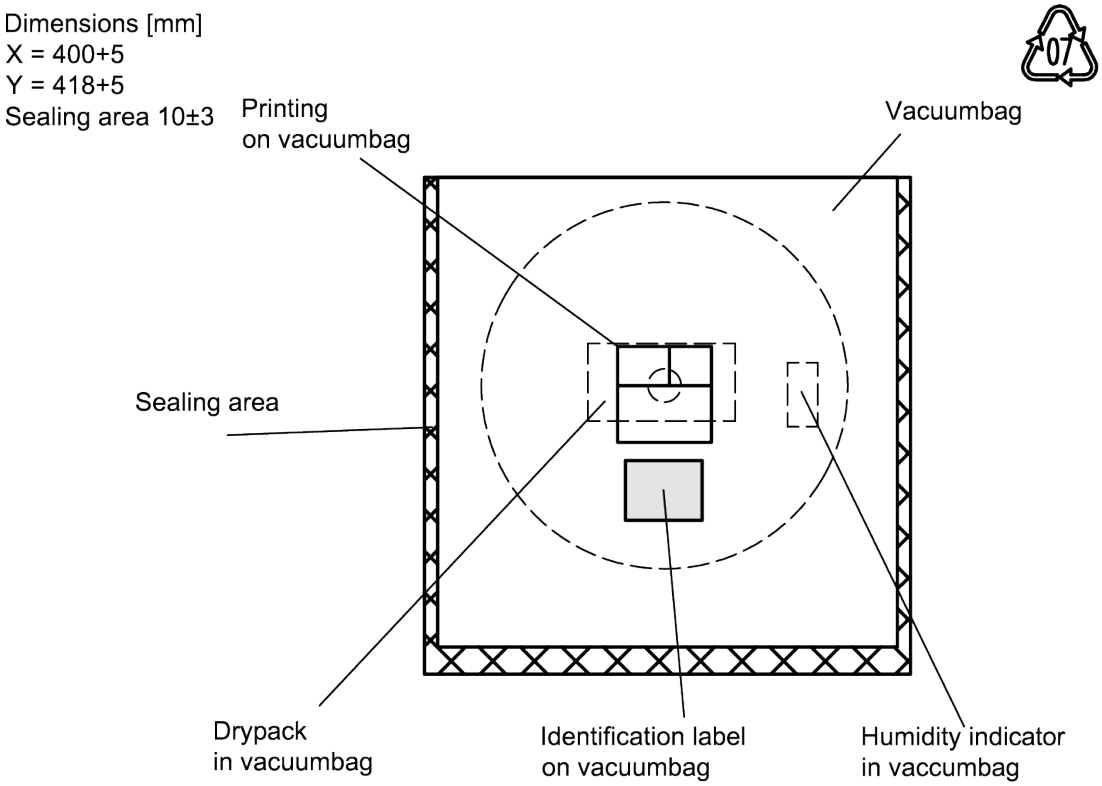

Figure 21: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

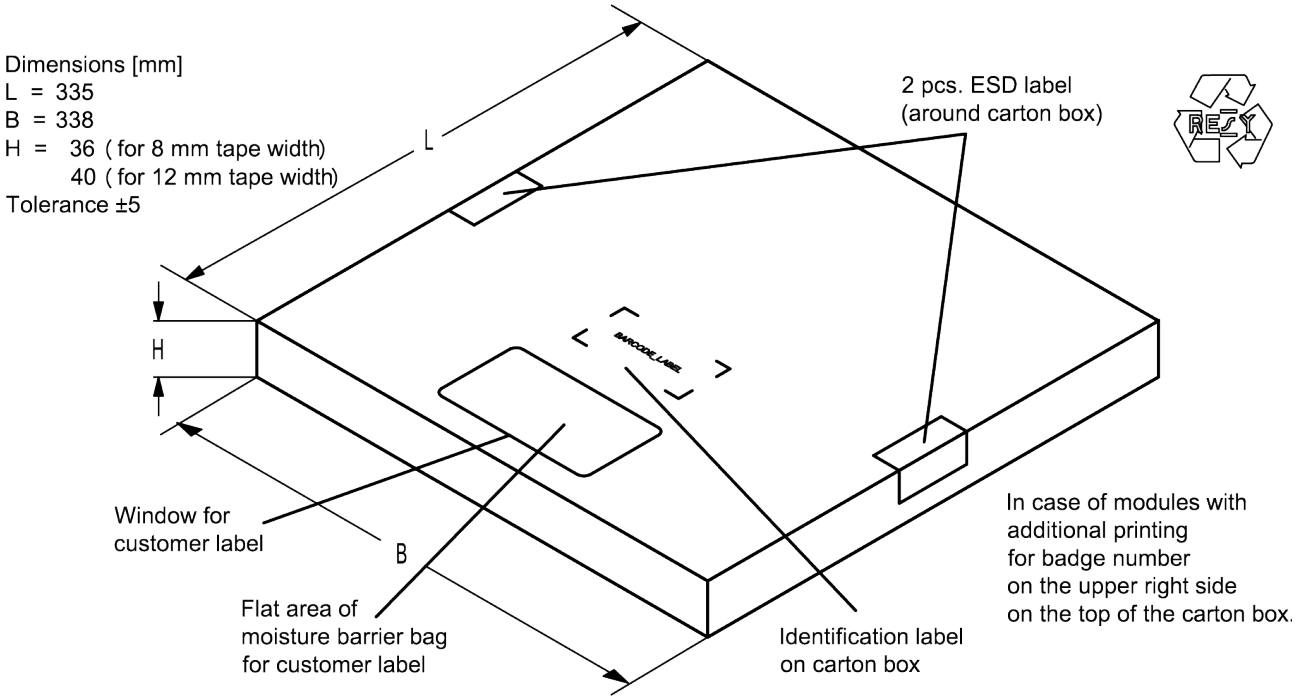

Figure 22: Drawing of folding box for reel with diameter of 330 mm.

23 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 B8920 is 8PR.

- 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.

24 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).

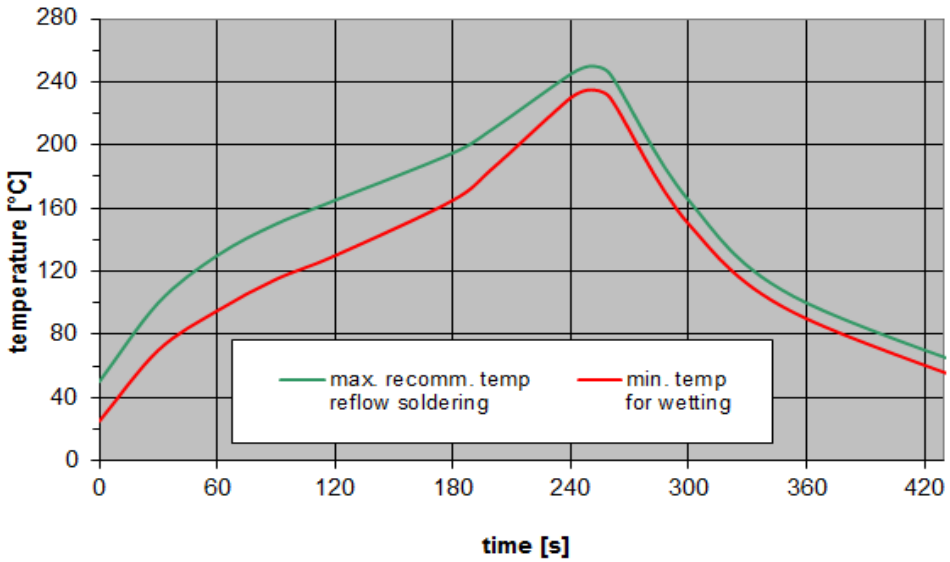

Figure 23: Recommended reflow profile for convection and infrared soldering – lead-free solder.

25 Annotations

25.1 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.

25.2 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.

25.3 Ordering codes and packing units

Ordering code	Packing unit
B39162B8920L210	15000 pcs
B39162B8920L210S 5	5000 pcs

Table 4: Ordering codes and packing units.

26 Cautions and warnings

26.1 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.

26.2 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.

26.3 Moldability

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

26.4 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.

27 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 (www.rf360jv.com/material). 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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