Qualcomm

RF360
Europe GmbH

Data sheet

BAW filter

5G-NR band n77 + 5G-NR band n79

Project:	M5018
Ordering code:	B39472M5018D310
Date:	February 08, 2022
Version:	2.1

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Table of contents

1 Application

- N77+n79 Diplex Post PA Tx (Full Band) for 5G and High Power User Equipment (HPUE) application.
- 5G-NR band n77: 3750 MHz (pass band 900 MHz)
- 5G-NR band n79: 4700 MHz (pass band 600 MHz)
- Very low insertion loss over full bandwidth with Wifi 5GHz co-existence

2 Features

- Package size $2.0_{\pm 0.1}$ mm × $1.6_{\pm 0.1}$ 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

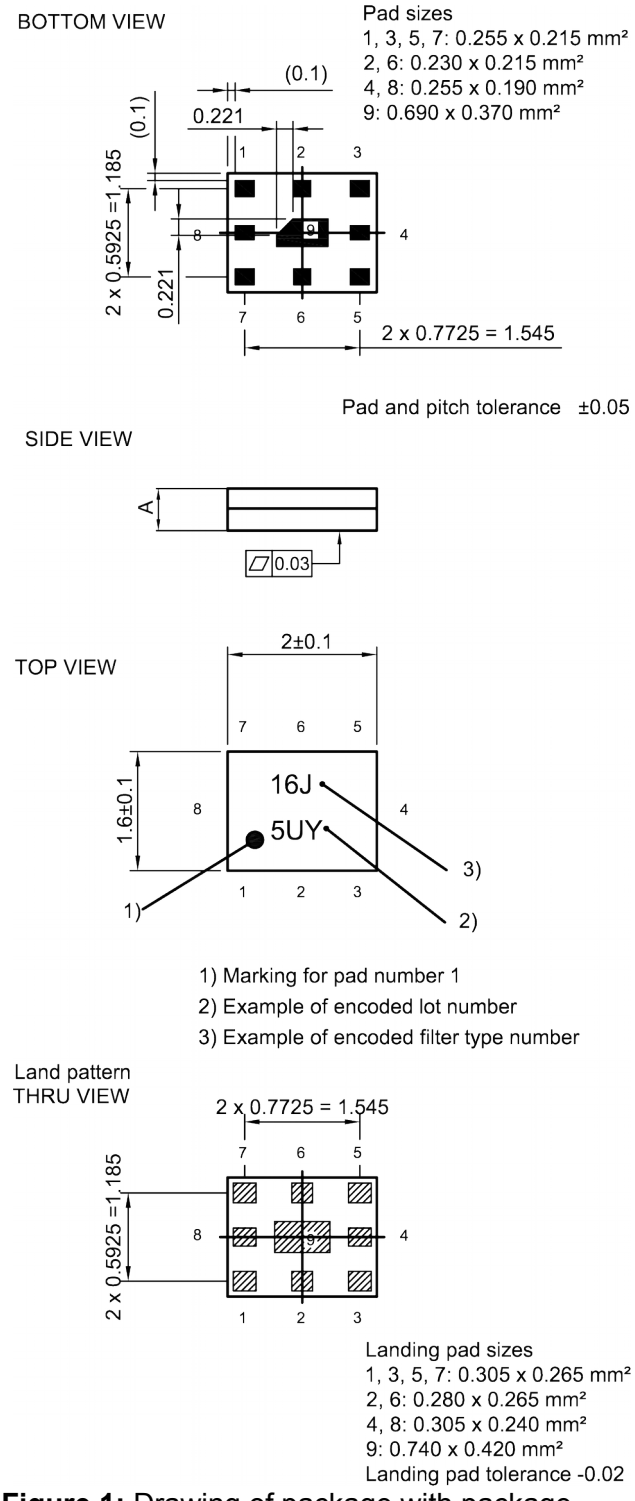

Figure 1: Drawing of package with package height A = 0.6 mm (max.). See Sec. Package information (p. 22).

4 Pin configuration

- 1 TX (n77)
- 3 TX (n79)
- 6 ANT (n77 & n79)
- 2, 4, 5, 7, 8, 9 Ground

5 Matching circuit

- C_{p1b} = 0.8 pF
- C_{p3b} = 0.3 pF
- L_{p6b} = 2.1 nH
- L_{s1a} = 2.1 nH
- L_{s3a} = 2.1 nH
- L_{s6a} = 0.3 nH

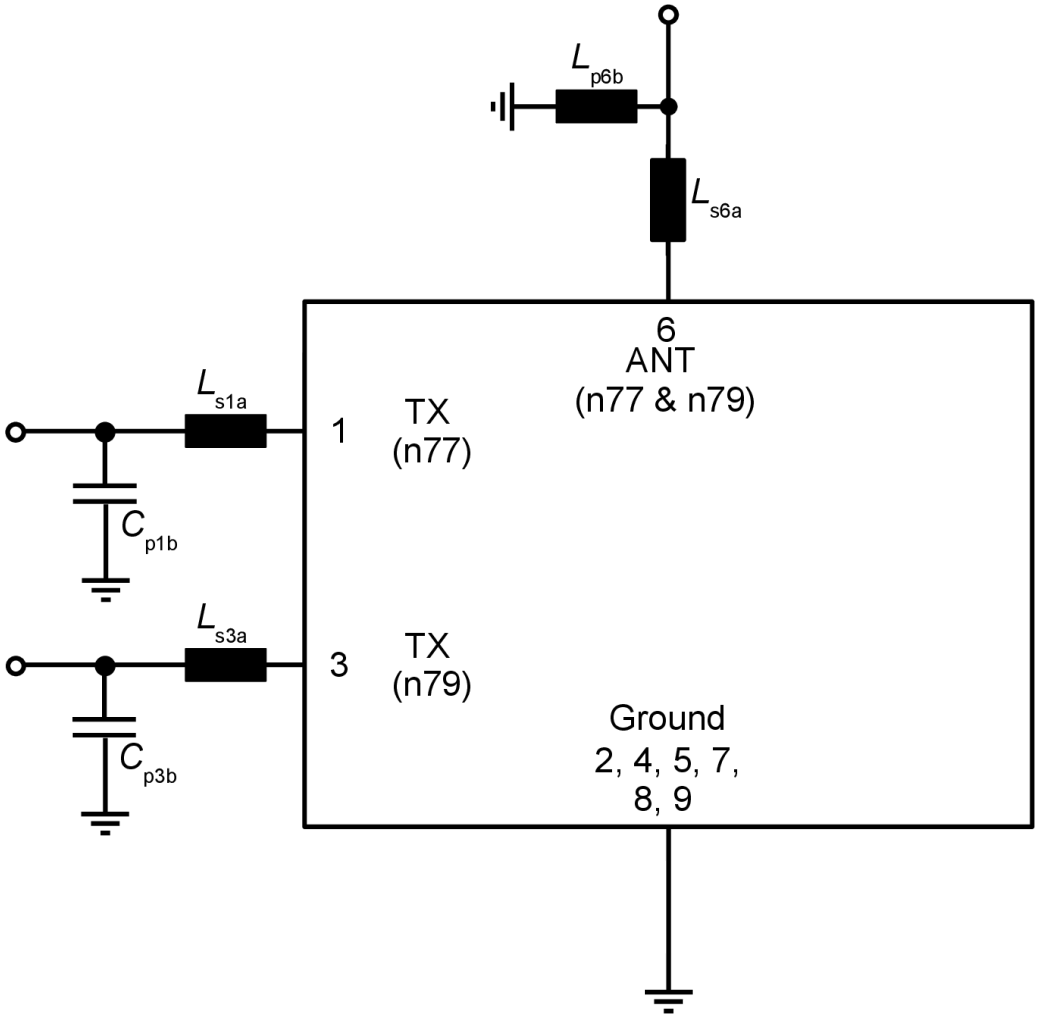

Figure 2: Schematic of matching circuit.

External shunt inductor for ESD protection is recommended at any ports towards antenna.

6 Characteristics 5G-NR n77

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
N77 TX terminating impedance	$Z_{n77\ TX}$	= 50 Ω with ext. circuitry.[1]
N79 TX terminating impedance	$Z_{n79\ TX}$	= 50 Ω with ext. circuitry.[1]
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry.[1]

Characteristics 5G-NR n77 TX – ANT				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	3750	—	MHz
Maximum insertion attenuation			α_{max}				
	3300 ... 4200	MHz		—	1.1	1.5[2]	dB
	3300 ... 4200	MHz		—	1.1	1.5	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	3300 ... 4200	MHz		—	0.1[3]	1.0[3]	dB
Maximum VSWR			$VSWR_{max}$				
@ n77 TX port	3300 ... 4200	MHz		—	1.5	2.3	
@ ANT port	3300 ... 4200	MHz		—	1.5	2.0	
Minimum attenuation			α_{min}				
	500 ... 1606	MHz		20	23	—	dB
	1606 ... 2400	MHz		20	25	—	dB
	2400 ... 2500	MHz		21	27	—	dB
	2500 ... 2690	MHz		17	28	—	dB
	5150 ... 5350	MHz		15	22	—	dB
	5350 ... 5925	MHz		18	22	—	dB
	5925 ... 6600	MHz		23	29	—	dB
	6600 ... 7125	MHz		32	36	—	dB
	7125 ... 8400	MHz		20	25	—	dB
	9900 ... 12600	MHz		—	24[4]	—	dB
	13200 ... 16800	MHz		—	18[4]	—	dB

1) See Sec. Matching circuit (p. 6).
2) Valid for typical temperature T = +25 °C.
3) Over any 10 MHz within pass band.
4) These values are representative of typical Evaluation Board (EVB) measurements as measured in the lab. Parameter is not tested in mass production.

7 Characteristics 5G-NR n79

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
N77 TX terminating impedance	$Z_{n77\ TX}$	= 50 Ω with ext. circuitry.[1]
N79 TX terminating impedance	$Z_{n79\ TX}$	= 50 Ω with ext. circuitry.[1]
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry.[1]

Characteristics 5G-NR n79 TX – ANT				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	4700	—	MHz
Maximum insertion attenuation			α_{max}				
	4400 ... 4960	MHz		—	1.4	2.2[2]	dB
	4400 ... 4960	MHz		—	1.4	2.2	dB
	4400 ... 5000	MHz		—	1.6	2.4[2]	dB
	4400 ... 5000	MHz		—	1.7	2.4	dB
	4960 ... 5000	MHz		—	1.7	2.4[2]	dB
	4960 ... 5000	MHz		—	1.7	2.4	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	4400 ... 5000	MHz		—	0.4[3]	1.0[3]	dB
Maximum VSWR			$VSWR_{max}$				
@ n79 TX port	4400 ... 5000	MHz		—	1.7	2.5	
@ ANT port	4400 ... 5000	MHz		—	1.7	2.5	
Minimum attenuation			α_{min}				
	500 ... 1606	MHz		29	33	—	dB
	1606 ... 2400	MHz		20	25	—	dB
	2400 ... 2500	MHz		20	25	—	dB
	2500 ... 2690	MHz		19	24	—	dB
	5150 ... 5350	MHz		34[2]	40	—	dB
	5150 ... 5350	MHz		34	40	—	dB
	5350 ... 5470	MHz		37[2]	44	—	dB
	5350 ... 5470	MHz		33	44	—	dB
	5470 ... 5850	MHz		33[2]	37	—	dB
	5470 ... 5850	MHz		33	37	—	dB
	5850 ... 5925	MHz		32[2]	38	—	dB
	5850 ... 5925	MHz		32	38	—	dB
	5925 ... 6425	MHz		18	23	—	dB
	6425 ... 7125	MHz		17	24	—	dB
	8800 ... 10000	MHz		—	10[4]	—	dB
	13200 ... 15000	MHz		—	28[4]	—	dB
	17600 ... 20000	MHz		—	34[4]	—	dB

1) See Sec. Matching circuit (p. 6).
2) Valid for typical temperature T = +25 °C.
3) Over any 10 MHz within pass band.
4) These values are representative of typical Evaluation Board (EVB) measurements as measured in the lab. Parameter is not tested in mass production.

8 Characteristics 5G-NR n79 – 5G-NR n77

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
N77 TX terminating impedance	$Z_{n77\ TX}$	= 50 Ω with ext. circuitry.[1)]
N79 TX terminating impedance	$Z_{n79\ TX}$	= 50 Ω with ext. circuitry.[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with ext. circuitry.[1)]

Characteristics 5G-NR n79 – 5G-NR n77 TX – TX			**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Minimum attenuation	α_{min}					
	3300... 4200	MHz	19	22	—	dB
	4400... 5000	MHz	17	24	—	dB

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

9 Maximum ratings

Storage temperature	T_{STG} [1] = −40 °C ... +85 °C	
DC voltage	$\lvert V_{DC} \rvert$ = 5.0 V (max.)	
ESD voltage		
	V_{ESD} [2] = 225 V	Human body model.
	V_{ESD} [3] = 1000 V	Charged device model.
Input power	P_{IN}	
@ n77 TX port: 3300 ... 4200 MHz	32 dBm	10 MHz 5G-NR (CP-OFDM) 1 RB signal 50% duty cycle for 5000 h @ 50 °C.
@ n79 TX port: 4400 ... 5000 MHz	32 dBm	40 MHz 5G-NR (CP-OFDM) 1 RB signal 50% duty cycle 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-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
[3] According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

10 Transmission coefficient 5G-NR n77

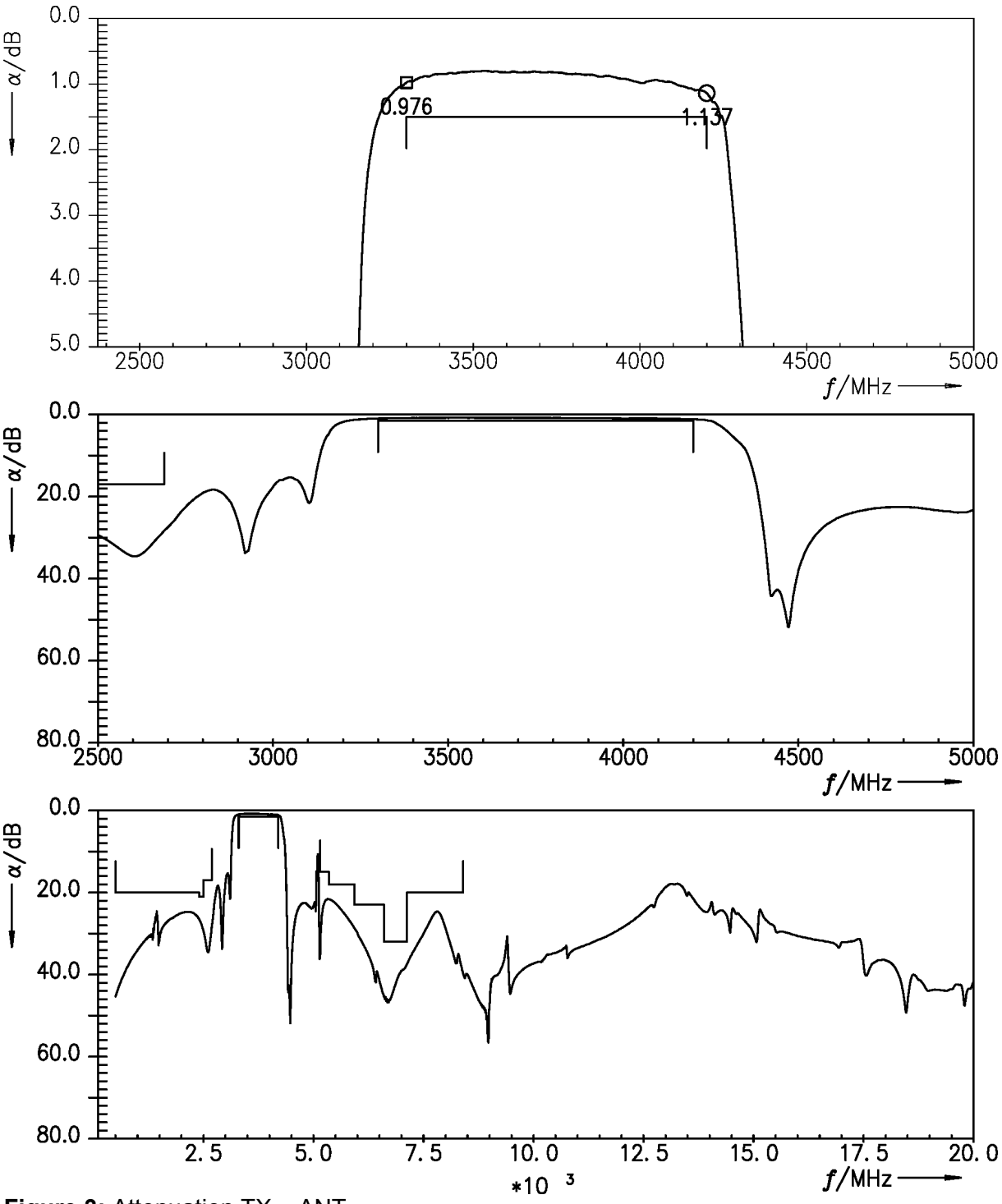

Figure 3: Attenuation TX – ANT.

11 Reflection coefficients 5G-NR n77

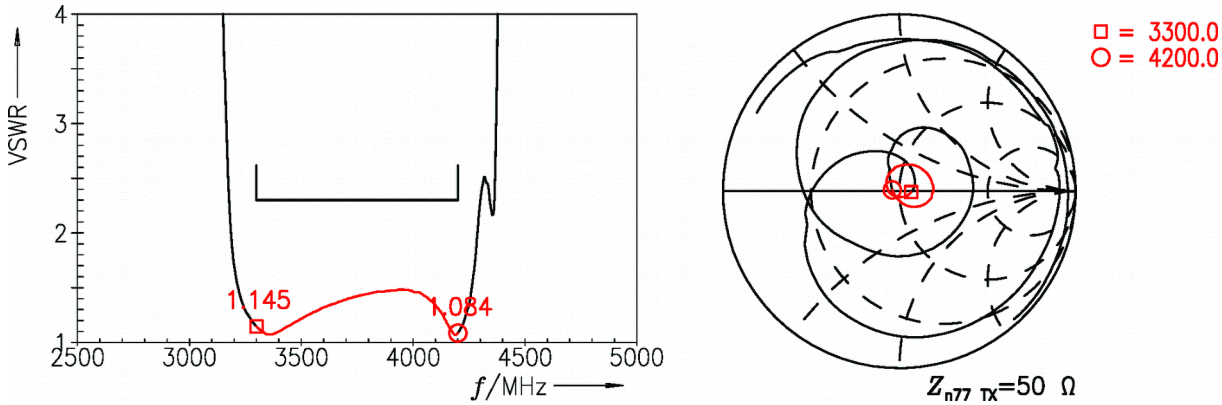

Figure 4: Reflection coefficient at n77 TX port.

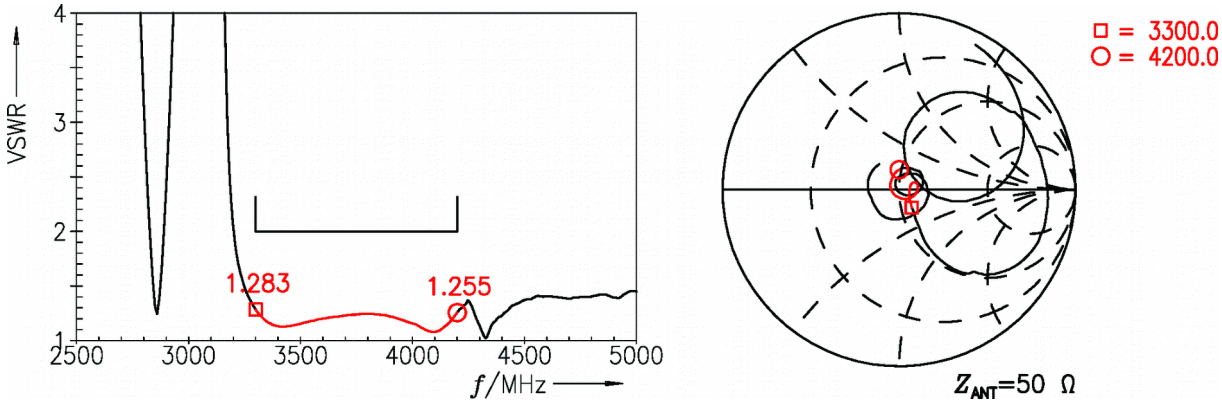

Figure 5: Reflection coefficient at ANT port (TX frequencies).

12 Transmission coefficient 5G-NR n79

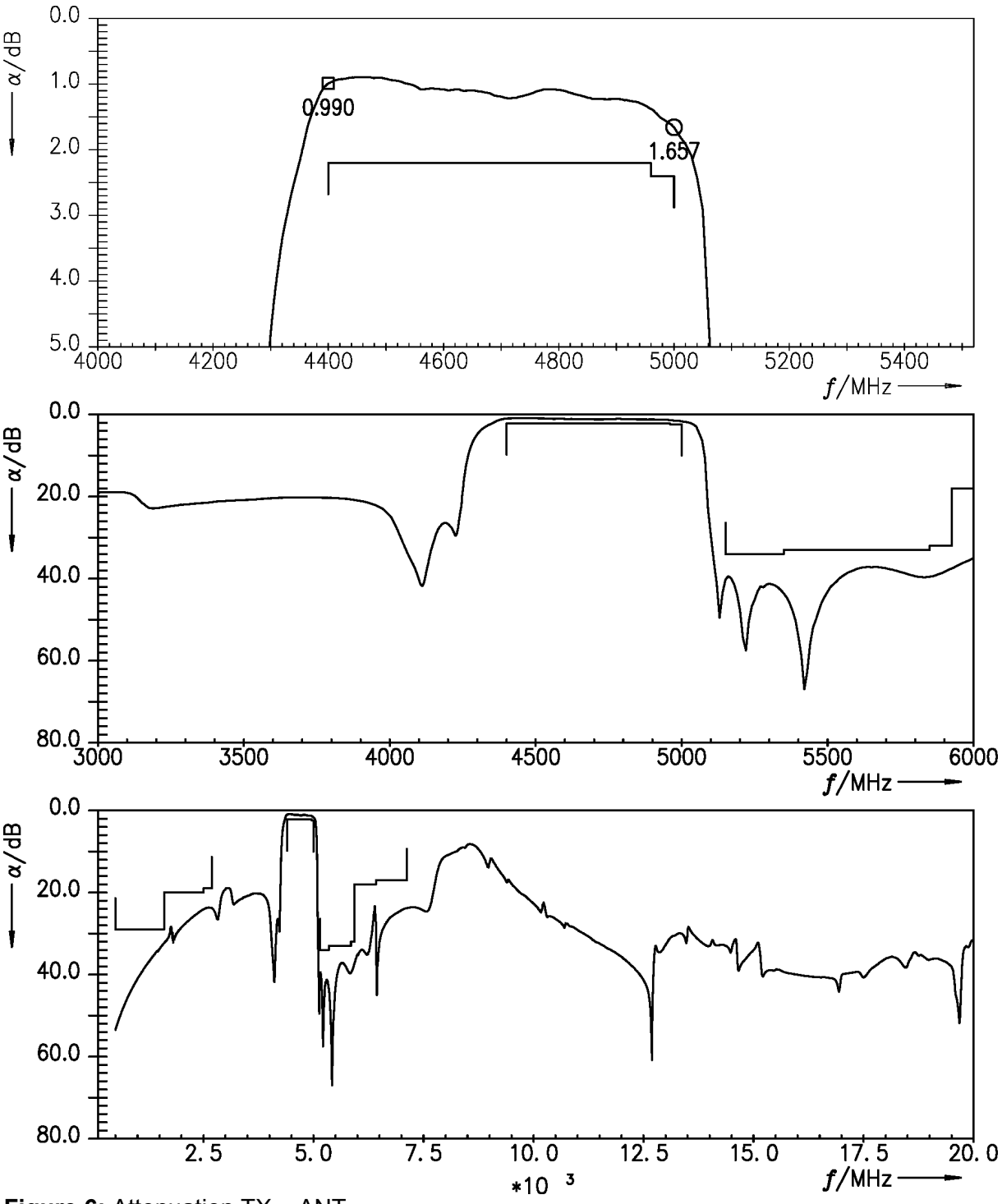

Figure 6: Attenuation TX – ANT.

13 Reflection coefficients 5G-NR n79

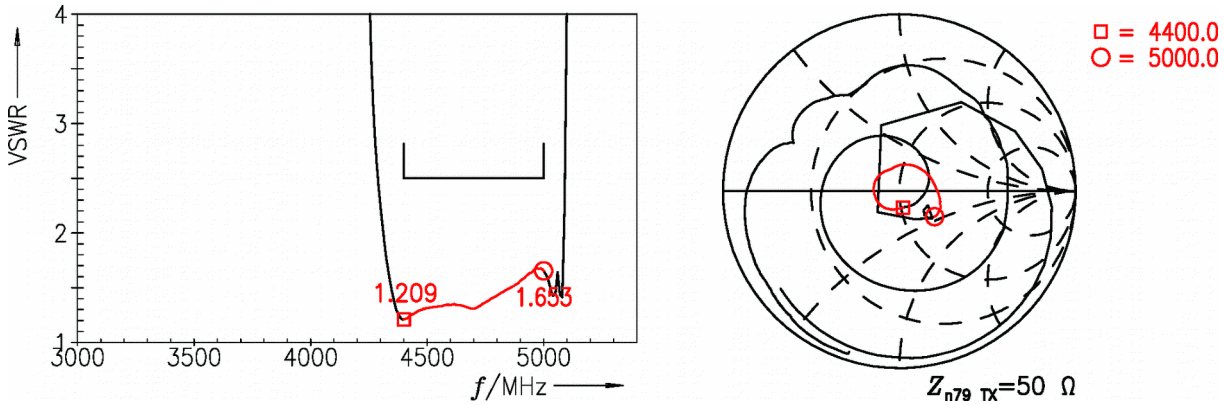

Figure 7: Reflection coefficient at n79 TX port.

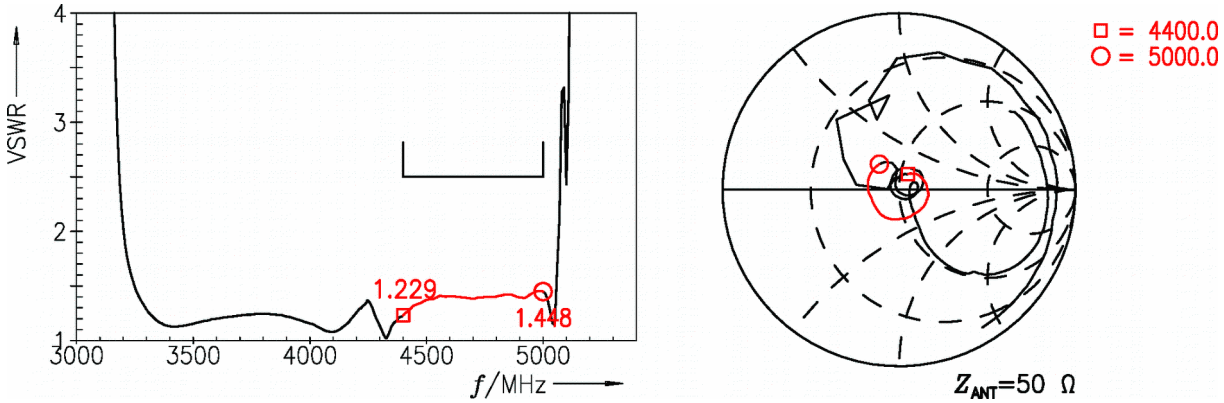

Figure 8: Reflection coefficient at ANT port (TX frequencies).

14 Transmission coefficient 5G-NR n79 – 5G-NR n77

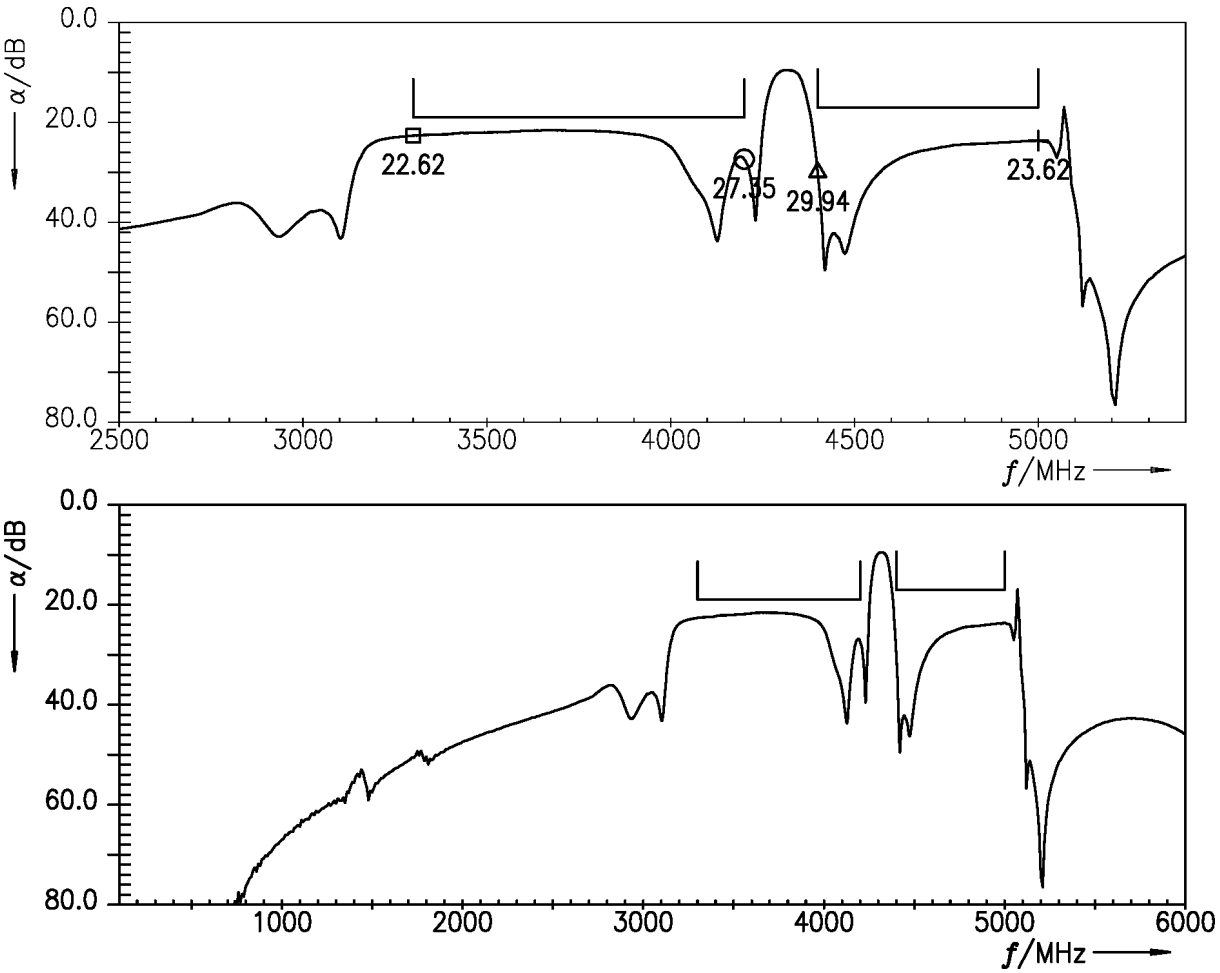

Figure 9: Attenuation TX – TX.

15 Packing material

15.1 Tape

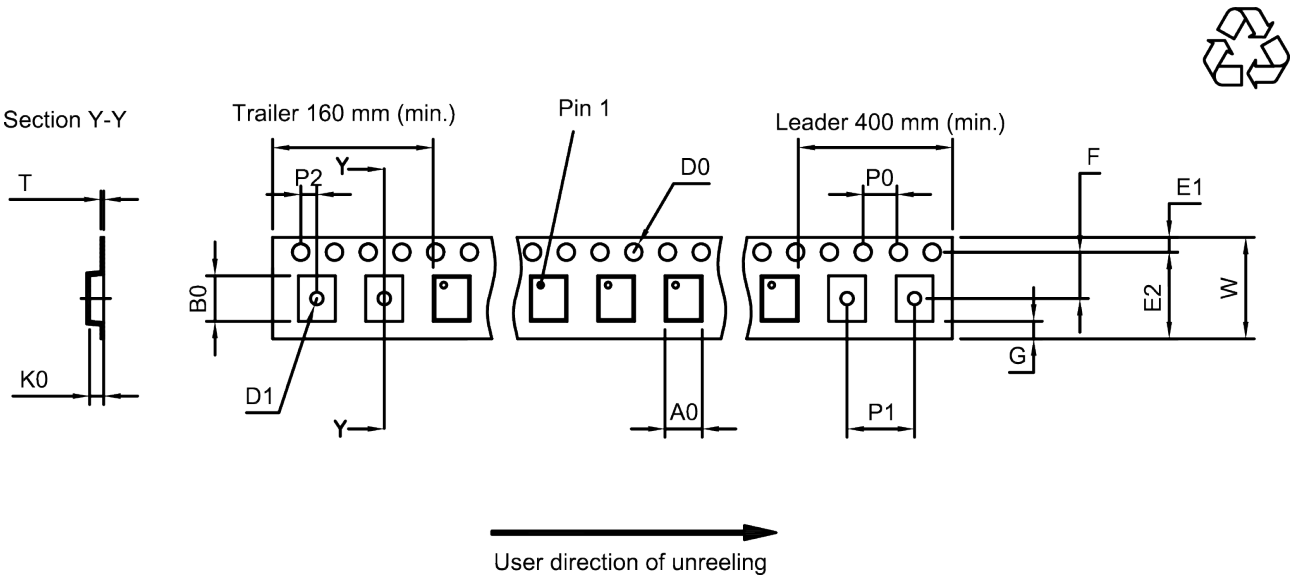

Figure 10: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A_0	$1.8_{\pm 0.05}$ mm
B_0	$2.2_{\pm 0.05}$ 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	$10.25^{+0.2/-0}$ mm
F	$5.5_{\pm 0.05}$ mm
G	0.75 mm (min.)
K_0	$0.8_{\pm 0.1}$ 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	$0.3_{\pm 0.03}$ mm
W	$12.0^{+0.3/-0.1}$ mm

Table 1: Tape dimensions.

15.2 Reel with diameter of 330 mm

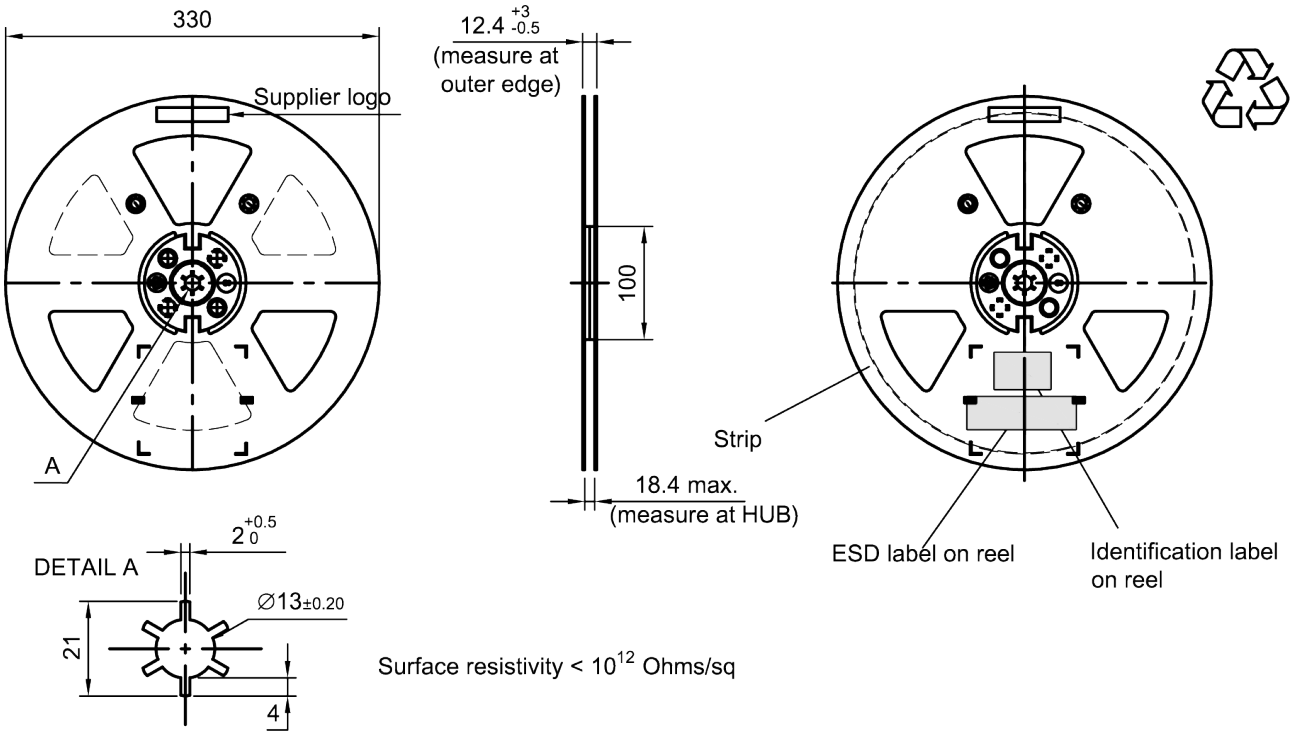

Figure 11: Drawing of reel (first-angle projection) with diameter of 330 mm.

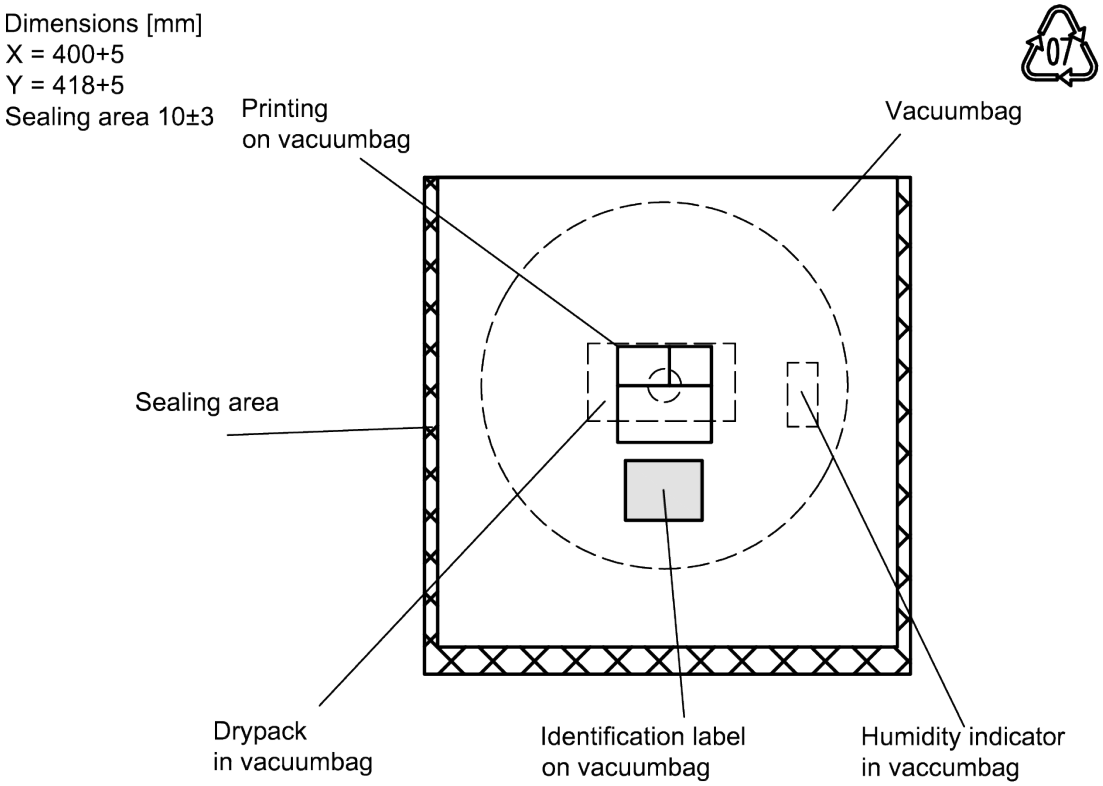

Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

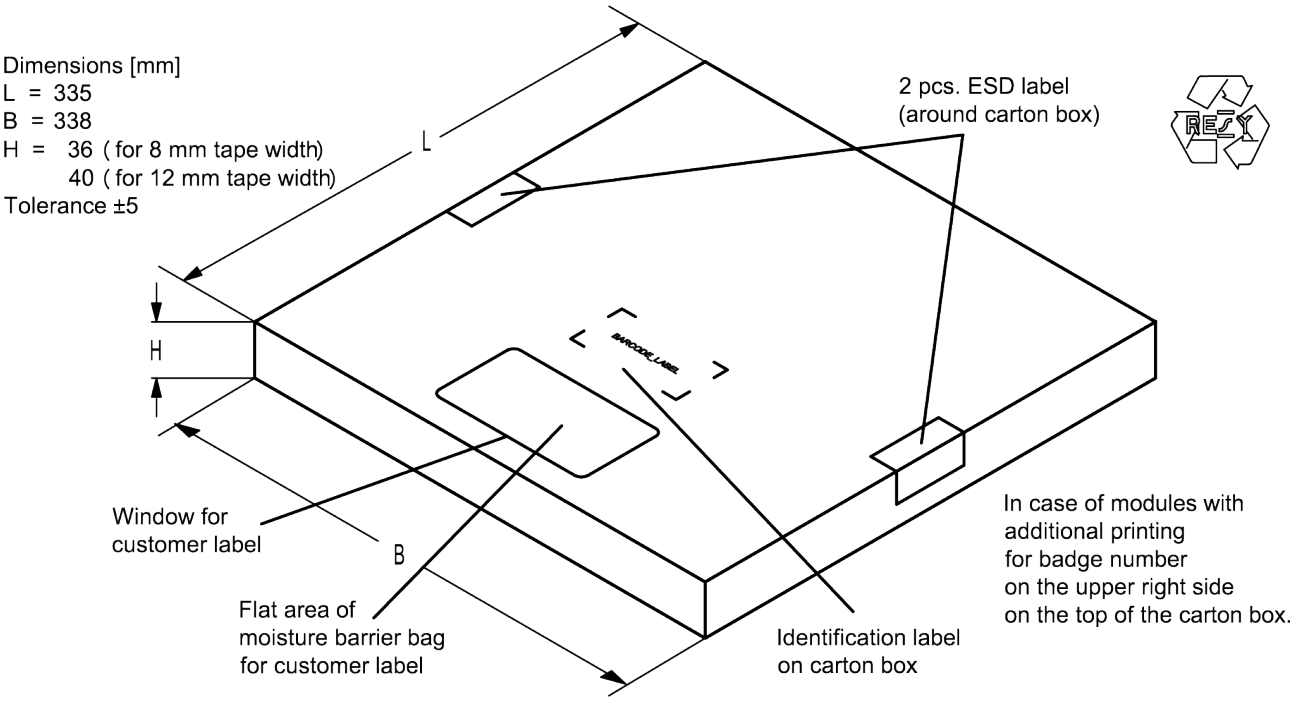

Figure 13: Drawing of folding box for reel with diameter of 330 mm.

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 M5018 is 4WT.

- 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).

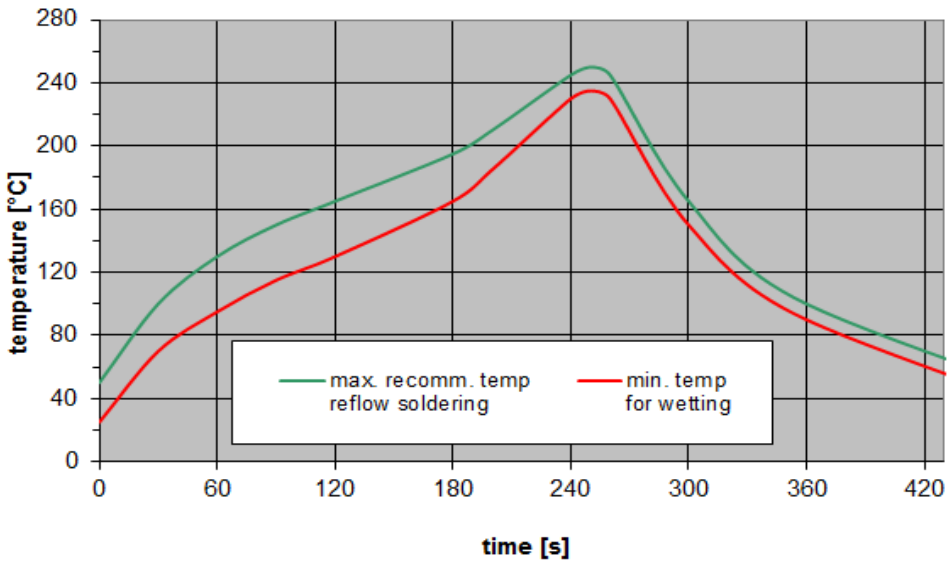

Figure 14: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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 and packing units

Ordering code / product ID	RF360 label	Packing unit
B39472M5018D310	B39472-M5018-D310-W01	10000 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.
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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