RF360 Europe GmbH
A Qualcomm – TDK Joint Venture

SAW components

SAW duplexer
LTE band 3

Series/type:	B1227
Ordering code:	B39182B1227P810
Date:	December 05, 2017
Version:	2.0

Table of contents

1 Application

- Low-loss SAW duplexer for mobile telephone LTE and WCDMA Band 3 systems
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 75 MHz

2 Features

- Package size 1.8±0.1 mm × 1.4±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)

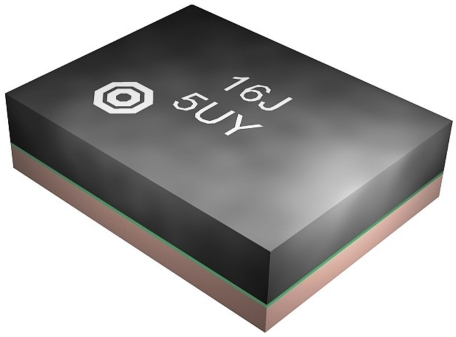

Figure 1: Picture of component with example of product marking.

3 Package

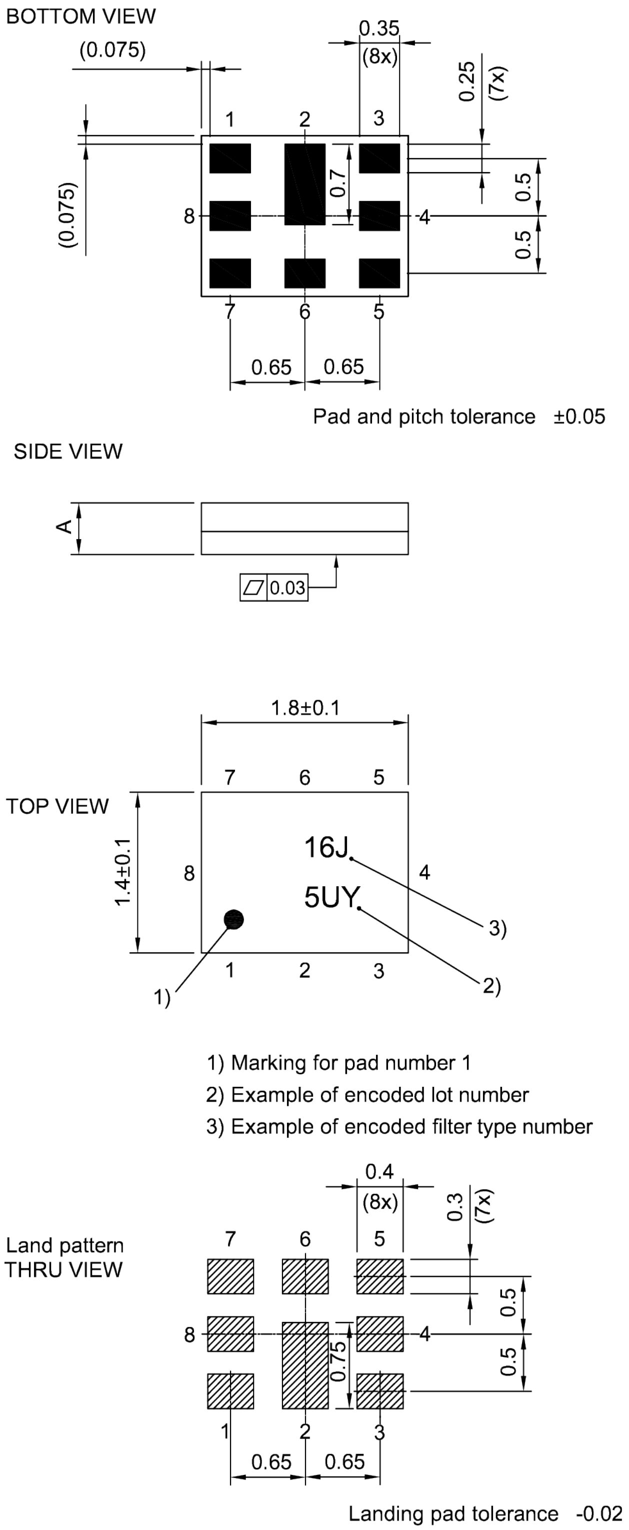

Figure 2: Drawing of package with package height A = 0.475 mm (max.). See Sec. Package information (p. 28).

4 Pin configuration

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

5 Matching circuit

- L_{p6} = 3.3 nH
- L_{s1} = 2.0 nH
- L_{s3} = 1.1 nH

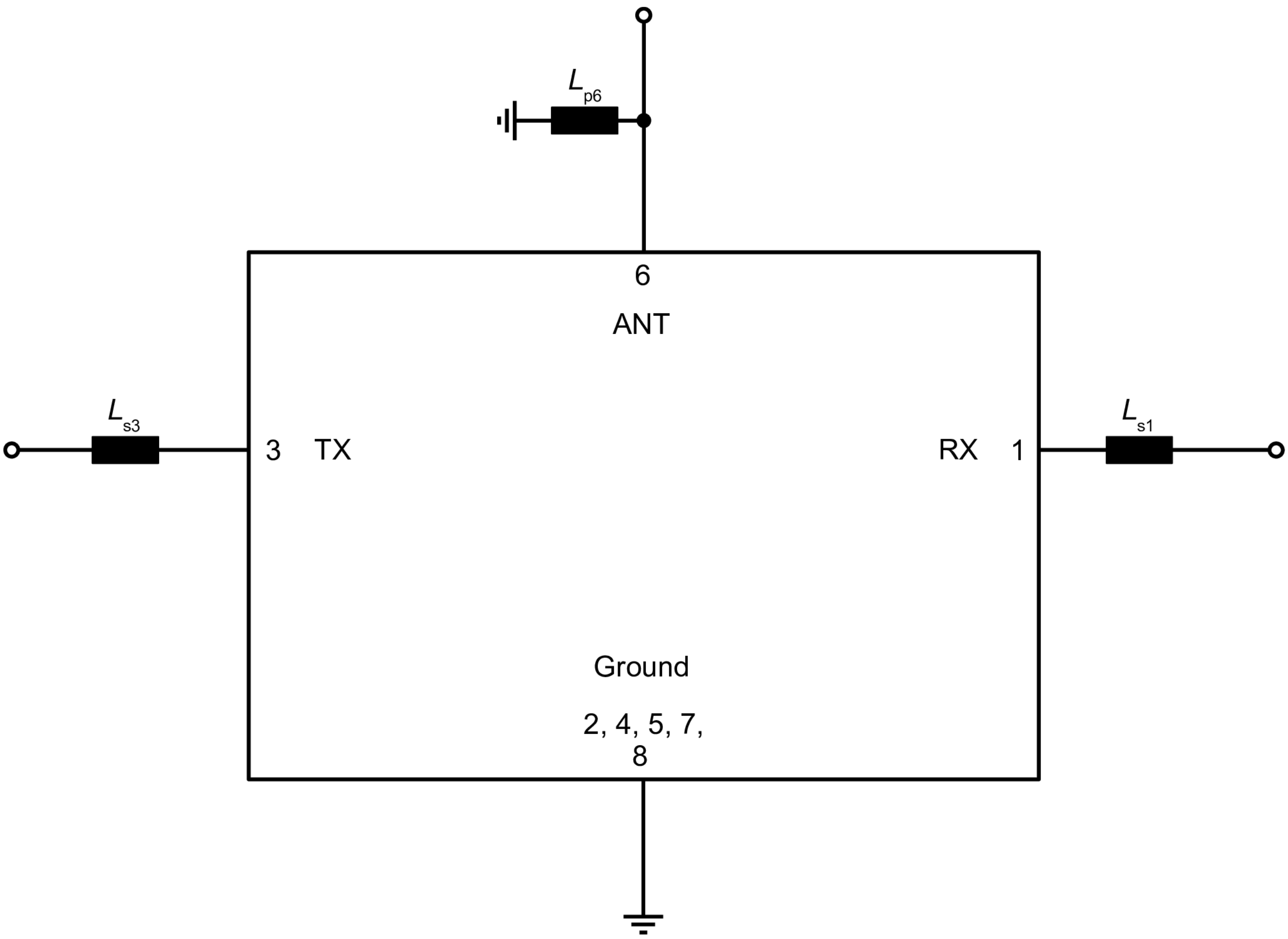

Figure 3: Schematic of matching circuit.

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 with ser. 1.1 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 2.0 nH[1)]

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	1747.5	—	MHz
Maximum insertion attenuation			$\alpha_{INT,max}$ [2)]				
	1710 ... 1785	MHz		—	1.6	2.9	dB
Amplitude ripple (p-p)[3)]			$\Delta\alpha_{INT}$ [2)]				
	1710 ... 1785	MHz		—	0.4	1.5	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	1710.24 ... 1784.76	MHz		—	1.6	2.0	
@ ANT port	1710.24 ... 1784.76	MHz		—	1.6	2.0	
Maximum error vector magnitude			EVM_{max} [4)]				
	1712.4 ... 1782.6	MHz		—	1.2	6.0	%
Minimum attenuation							
	10 ... 1565.5	MHz	α_{min}	32	36	—	dB
	703 ... 748	MHz	α_{min}	40	44	—	dB
	716 ... 756	MHz	α_{min}	40	44	—	dB
	814 ... 849	MHz	α_{min}	37	42	—	dB
	824 ... 849	MHz	α_{min}	37	42	—	dB
	830 ... 845	MHz	α_{min}	37	42	—	dB
	832 ... 862	MHz	α_{min}	37	41	—	dB
	880 ... 915	MHz	α_{min}	36	40	—	dB
	925 ... 960	MHz	α_{min}	35	39	—	dB
	1226 ... 1250	MHz	α_{min}	32	36	—	dB
	1496 ... 1511	MHz	α_{min}	33	39	—	dB
	1559 ... 1563	MHz	α_{min}	40	47	—	dB
	1565.42 ... 1573.37	MHz	α_{min}	40	48	—	dB
	1573.37 ... 1577.47	MHz	α_{min}	40	48	—	dB
	1577.47 ... 1585.42	MHz	α_{min}	40	46	—	dB
	1597.55 ... 1605.89	MHz	α_{min}	37	41	—	dB
	1605.89 ... 1680	MHz	α_{min}	18	29	—	dB
	1805 ... 1880	MHz	$\alpha_{INT,min}$ [2)]	44	49	—	dB
	1805.24 ... 1879.76	MHz	α_{min}	38	48	—	dB
	1920 ... 1980	MHz	α_{min}	25	33	—	dB

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	2110 ... 2170	MHz	α_{min}	20	29	—	dB
	2400 ... 2500	MHz	α_{min}	26	31	—	dB
	2440 ... 2494	MHz	α_{min}	26	31	—	dB
	2496 ... 2690	MHz	α_{min}	23	30	—	dB
	2500 ... 2570	MHz	α_{min}	25	31	—	dB
	2620 ... 2690	MHz	α_{min}	23	30	—	dB
	3420 ... 3570	MHz	α_{min}	20	27	—	dB
	4900 ... 5950	MHz	α_{min}	10	18	—	dB
	5100 ... 5385	MHz	α_{min}	10	20	—	dB
	5130 ... 5355	MHz	α_{min}	10	20	—	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) Over any channel with band width of 5MHz.
4) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 1.1 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 2.0 nH[1)]

Characteristics ANT – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	1842.5	—	MHz
Maximum insertion attenuation			$\alpha_{INT,max}$ 2)				
	1805 ... 1880	MHz		—	2.0	2.9[3)]	dB
	1805 ... 1880	MHz		—	2.0	3.4	dB
Amplitude ripple (p-p)[4)]			$\Delta\alpha_{INT}$ 2)				
	1805 ... 1880	MHz		—	0.5	2.0	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	1805.24 ... 1879.76	MHz		—	1.5	2.0	
@ RX port	1805.24 ... 1879.76	MHz		—	1.7	2.1	
Maximum error vector magnitude			EVM_{max} 5)				
	1807.4 ... 1877.6	MHz		—	1.5	6.0	%
Minimum attenuation							
	10 ... 200	MHz	α_{min}	50	79	—	dB
	50 ... 95	MHz	α_{min}	50	91	—	dB
	95 ... 1710	MHz	α_{min}	40	44	—	dB
	200 ... 1615	MHz	α_{min}	40	44	—	dB
	718 ... 748	MHz	α_{min}	40	56	—	dB
	814 ... 849	MHz	α_{min}	40	53	—	dB
	832 ... 862	MHz	α_{min}	40	53	—	dB
	880 ... 915	MHz	α_{min}	40	52	—	dB
	1447 ... 1463	MHz	α_{min}	40	45	—	dB
	1615 ... 1690	MHz	α_{min}	43	47	—	dB
	1710 ... 1785	MHz	$\alpha_{INT,min}$ 2)	45	53	—	dB
	1710.24 ... 1784.76	MHz	α_{min}	38	53	—	dB
	1920 ... 1980	MHz	α_{min}	40	50	—	dB
	1980 ... 2400	MHz	α_{min}	32	38	—	dB
	2400 ... 2500	MHz	α_{min}	37	45	—	dB
	2496 ... 2690	MHz	α_{min}	40	50	—	dB
	2500 ... 2570	MHz	α_{min}	45	50	—	dB
	2570 ... 3515	MHz	α_{min}	40	47	—	dB
	3515 ... 3665	MHz	α_{min}	47	51	—	dB
	3665 ... 3760	MHz	α_{min}	40	51	—	dB

Characteristics ANT – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	3760 ... 6000	MHz	α_{min}	37	42	—	dB
	4900 ... 5950	MHz	α_{min}	37	42	—	dB
	5205 ... 5660	MHz	α_{min}	37	43	—	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 temperature T = +25 °C...+85 °C.
4) Over any channel with band width of 5MHz.
5) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 1.1 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 2.0 nH[1)]

Characteristics TX – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Minimum isolation							
	1710 ... 1785	MHz	$\alpha_{INT,min}$ [2)]	50	53	—	dB
	1710 ... 1785	MHz	$\alpha_{INT,min}$ [3)]	52	55	—	dB
	1805 ... 1880	MHz	$\alpha_{INT,min}$ [2)]	50	58	—	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) Integrated attenuation α_{INT}: Averaged power $|S_{ij}|^2$ over the center 9 MHz of LTE 10 MHz (50 RB) channels.

7 Maximum ratings

Storage temperature	T_{STG}[1] = −40 °C ... +85 °C	
DC voltage	$\lvert V_{DC}\rvert$[3] = 0 V (max.)[2]	
ESD voltage		
	V_{ESD}[4] = 50 V (max.)	Machine model.
	V_{ESD}[5] = 300 V (max.)	Human body model.
	V_{ESD}[6] = 500 V (max.)	Charged device model.
Input power	P_{IN}	
@ TX port: 1710.24 ... 1784.76 MHz	29 dBm	Continuous wave for 5000 h @ 50 °C.
@ TX port: other frequency ranges	10 dBm	Continuous wave 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-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
5) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
6) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

8 Transmission coefficients

8.1 TX – ANT

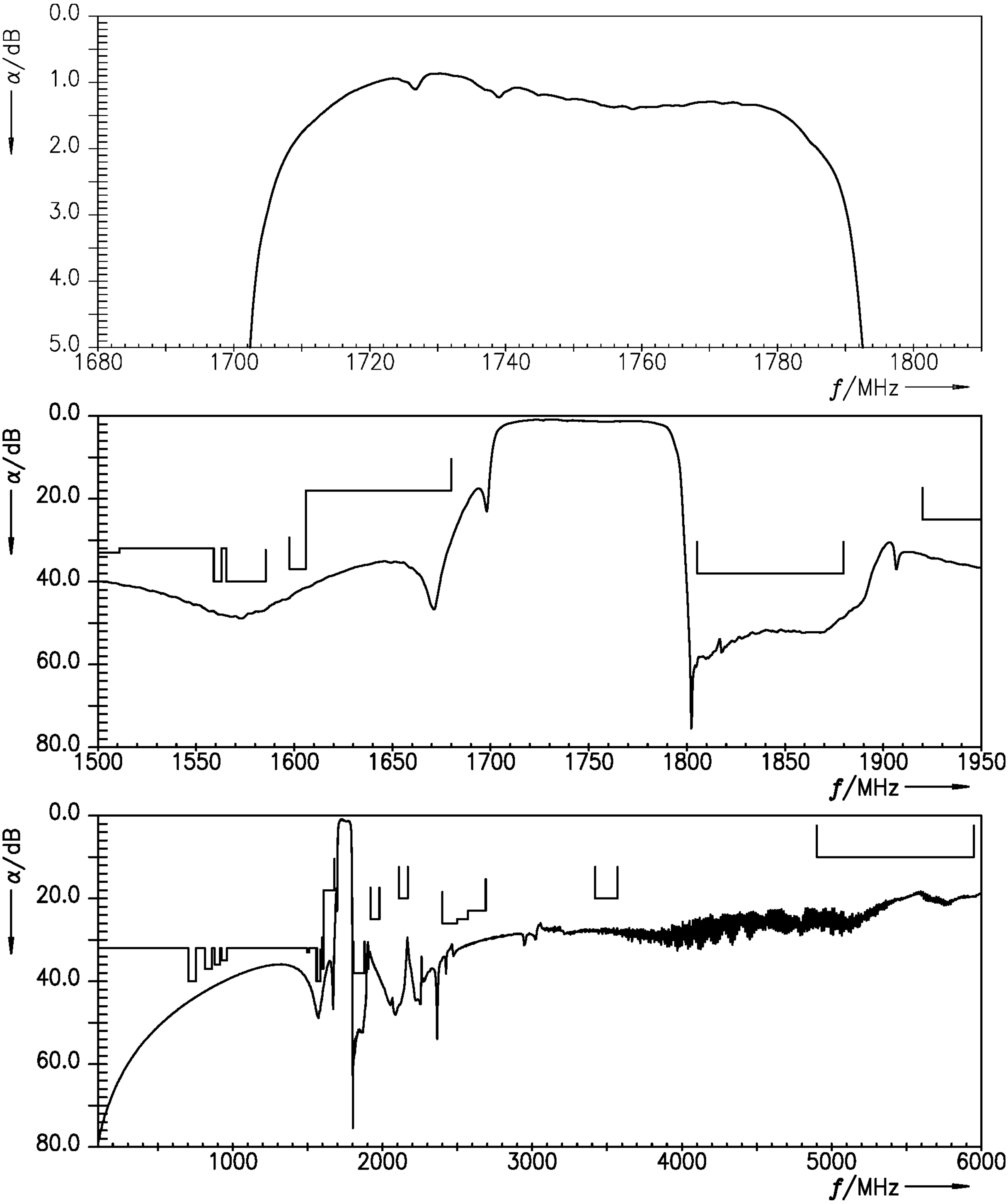

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

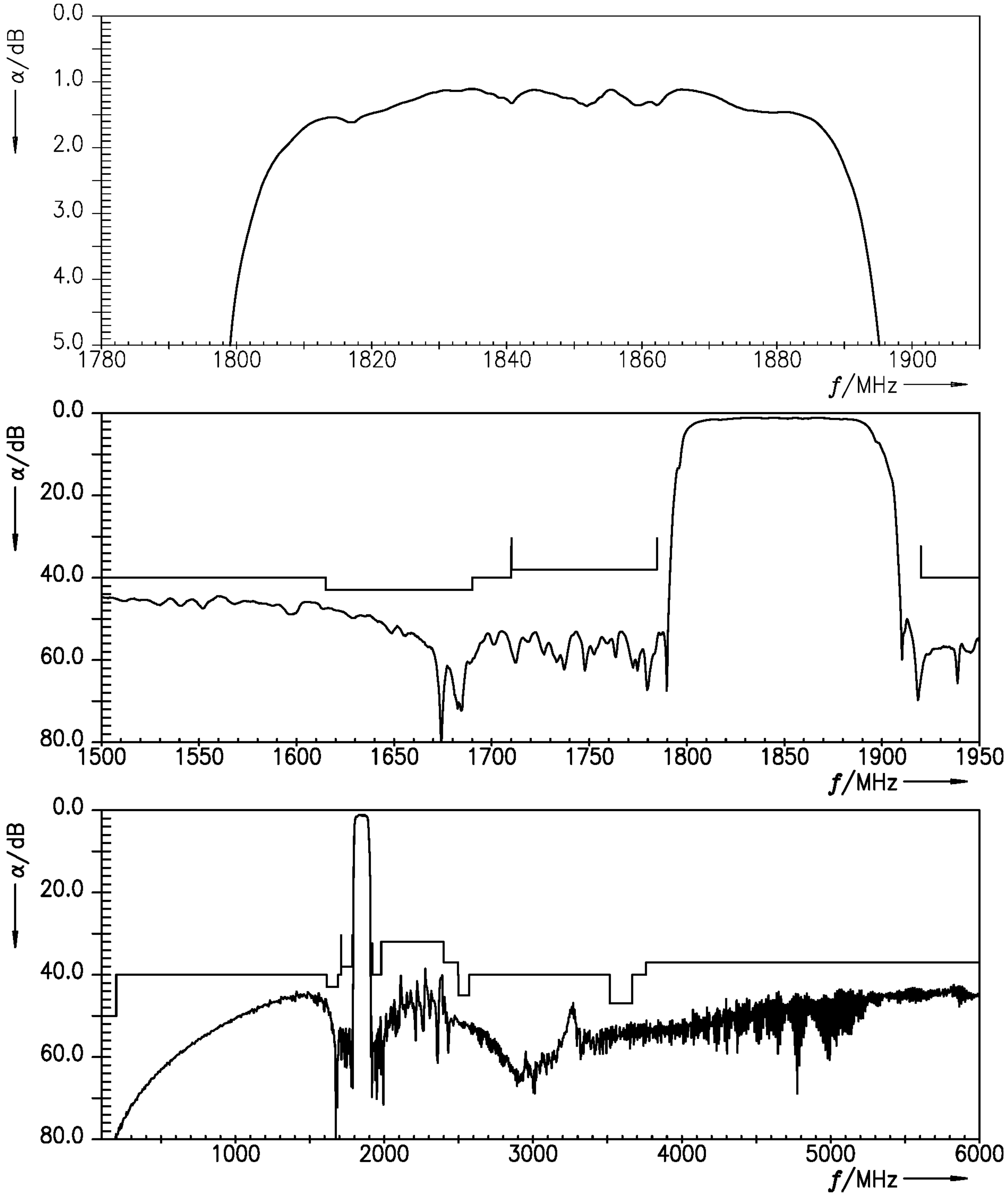

Figure 5: Attenuation ANT – RX.

9 Transmission coefficients (LTE)

9.1 TX – ANT

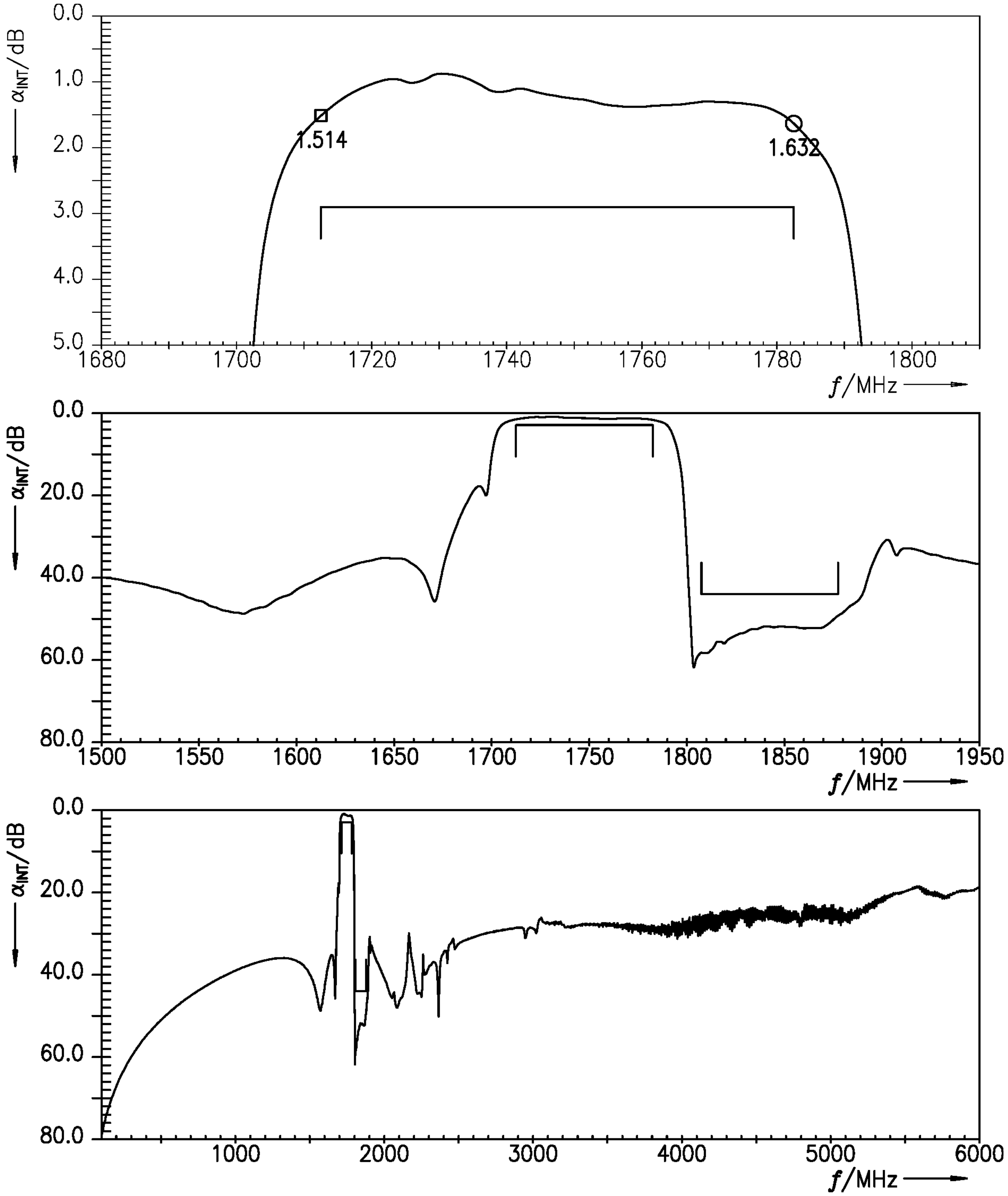

Figure 6: Attenuation (LTE) (integration window = 5 MHz) TX – ANT.

9.2 ANT – RX

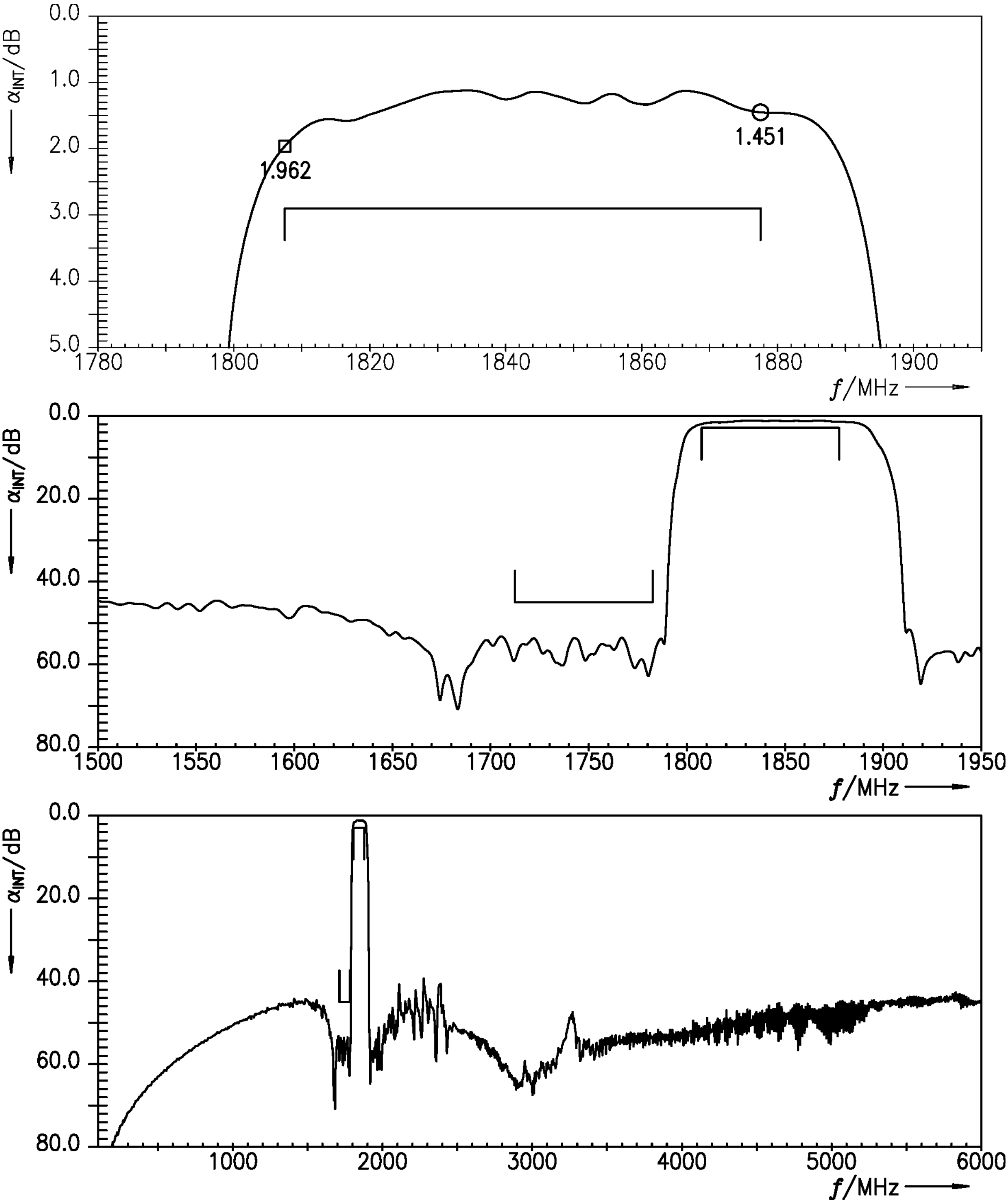

Figure 7: Attenuation (LTE) (integration window = 5 MHz) ANT – RX.

9.3 TX – RX

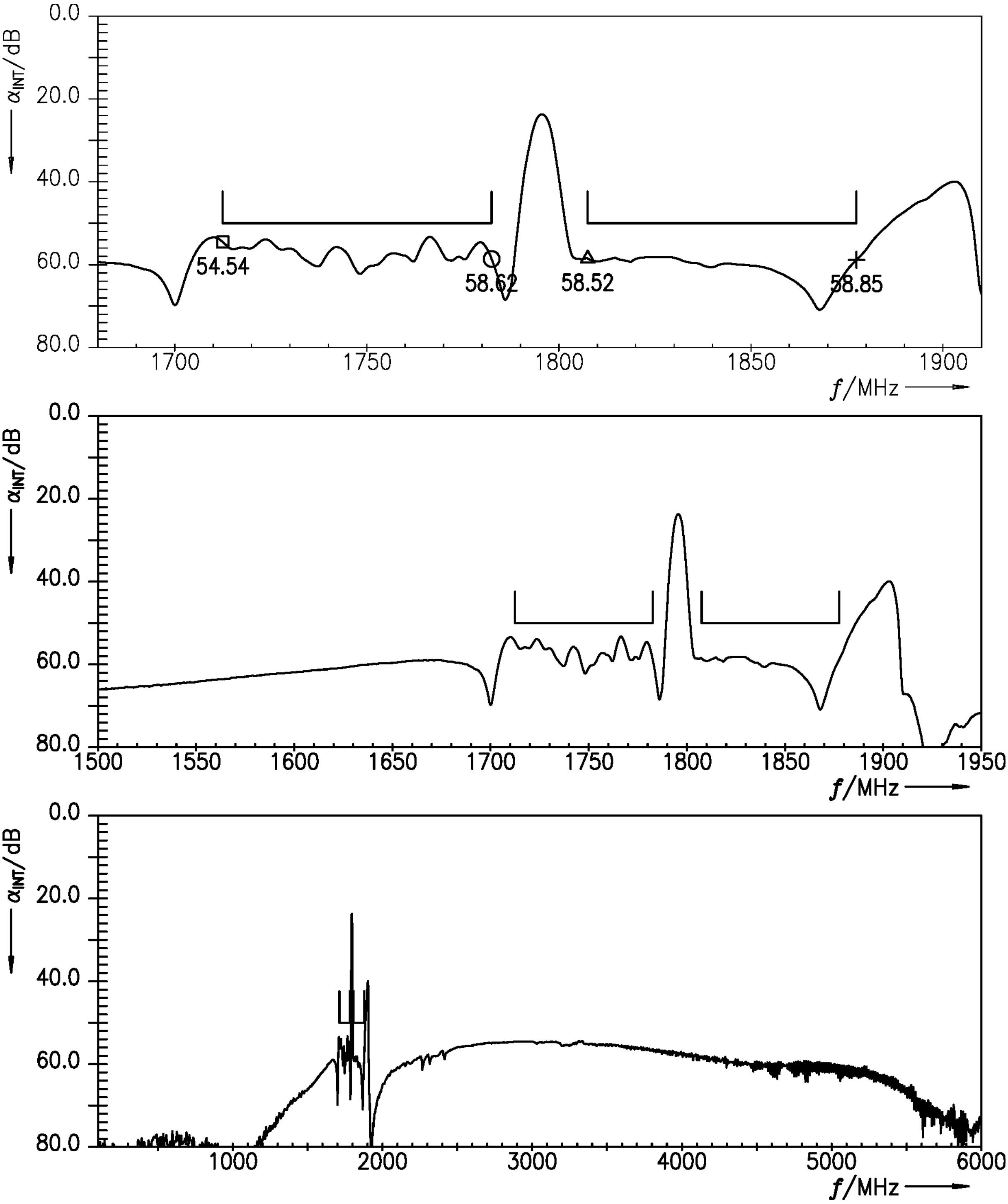

Figure 8: Isolation (LTE) (integration window = 5 MHz) TX – RX.

10 Reflection coefficients

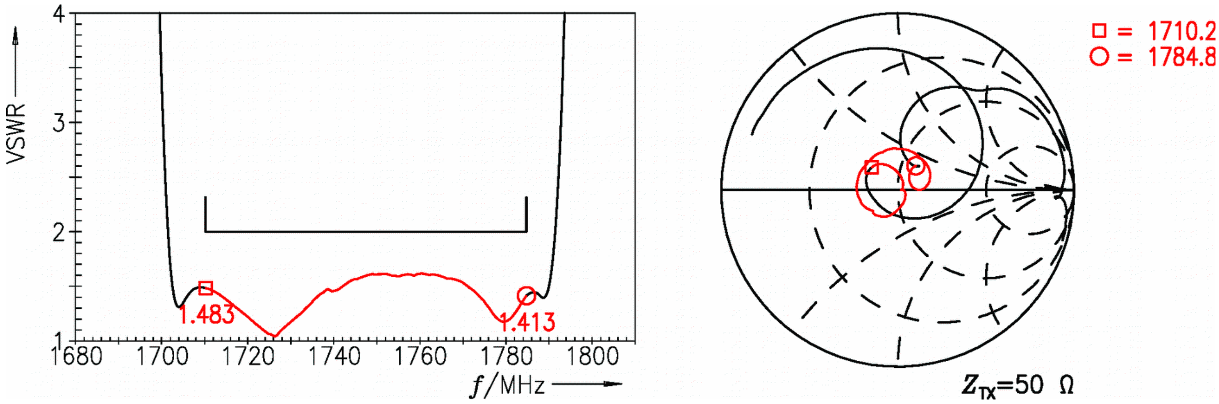

Figure 9: Reflection coefficient at TX port.

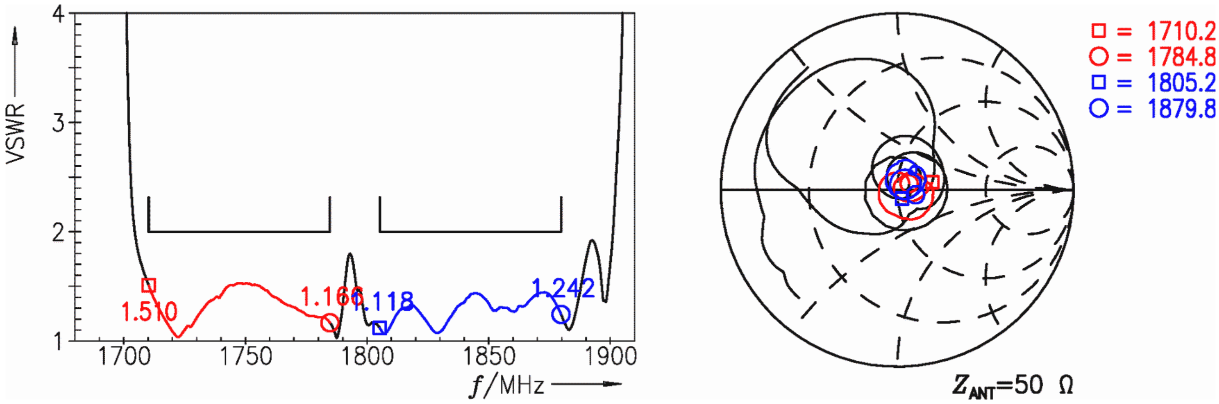

Figure 10: Reflection coefficient at ANT port.

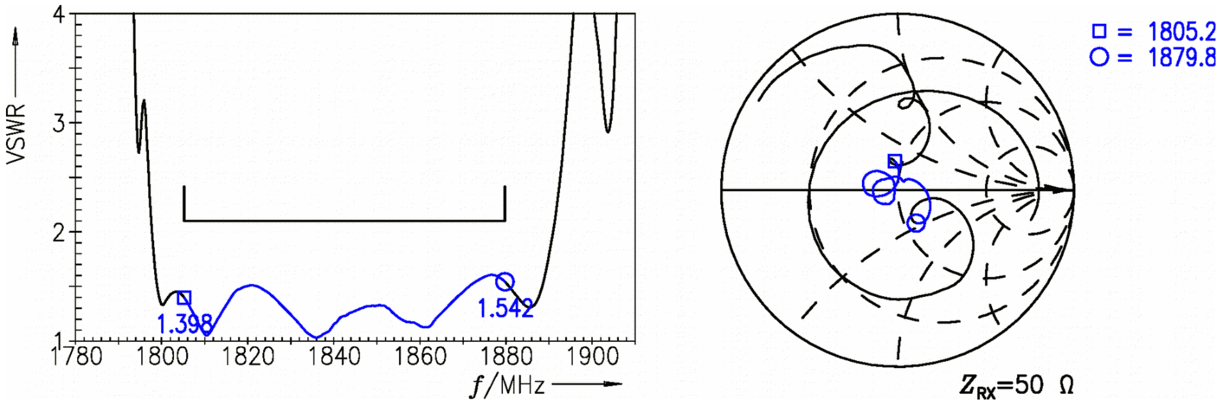

Figure 11: Reflection coefficient at RX port.

11 EVMs

11.1 TX – ANT

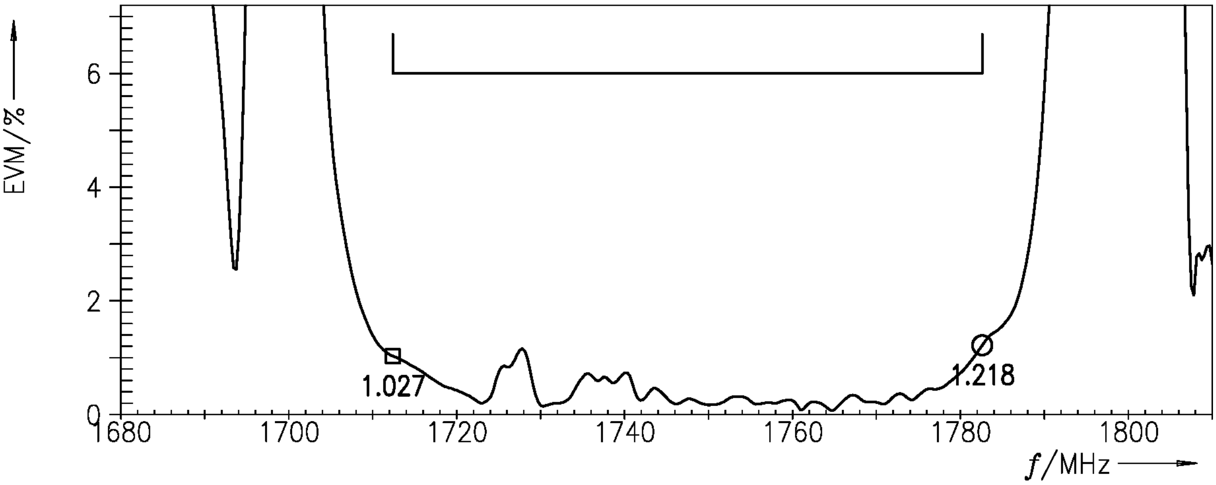

Figure 12: Error vector magnitude TX – ANT.

11.2 ANT – RX

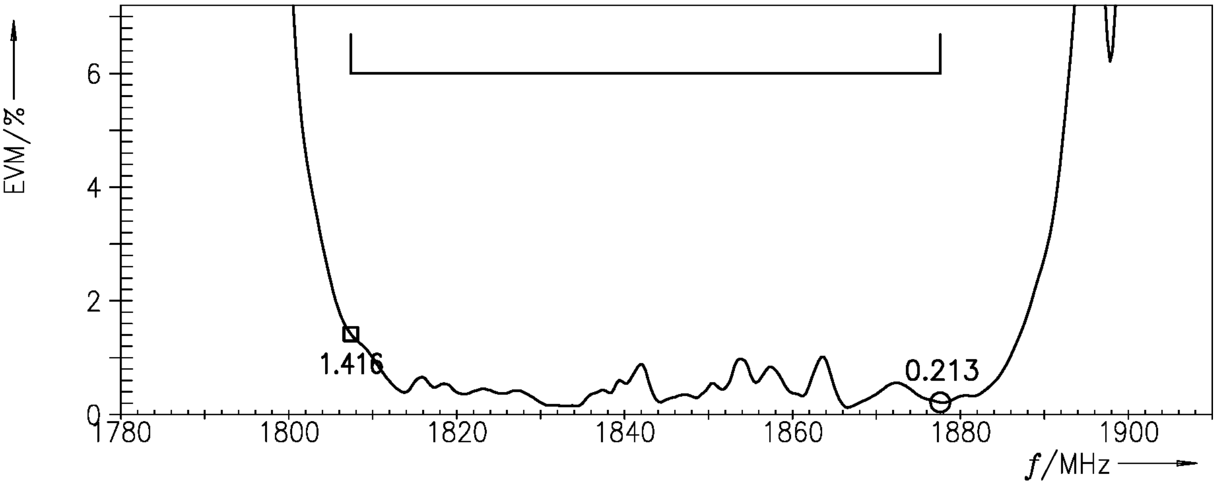

Figure 13: Error vector magnitude ANT – RX.

12 Packing material

12.1 Tape

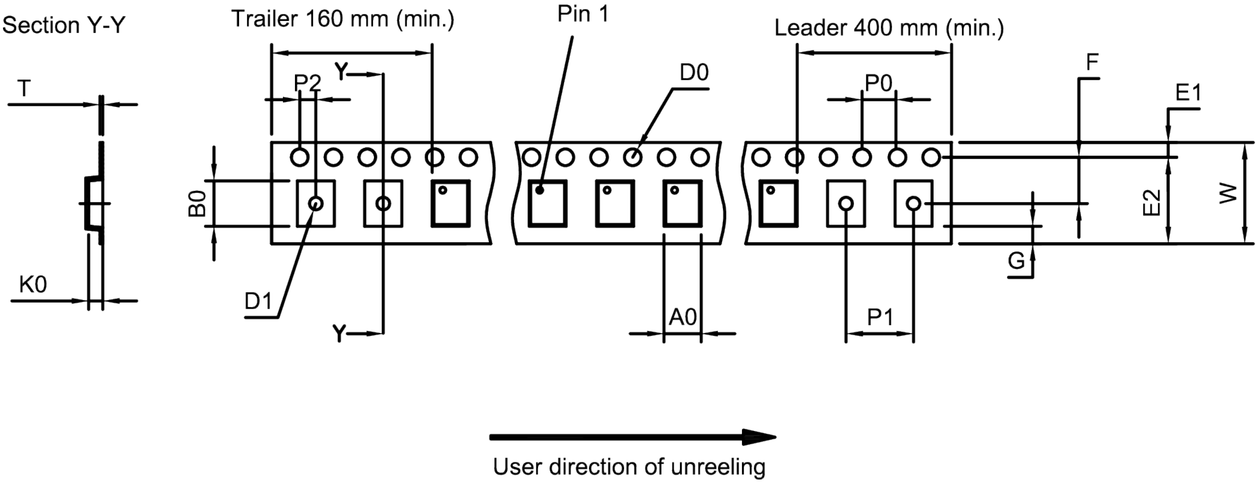

Figure 14: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	1.62$_{\pm0.05}$ mm	E_2	6.25 mm (min.)	P_1	4.0$_{\pm0.1}$ mm
B_0	2.04$_{\pm0.05}$ mm	F	3.5$_{\pm0.05}$ mm	P_2	2.0$_{\pm0.05}$ mm
D_0	1.5$_{+0.1/-0}$ mm	G	0.75 mm (min.)	T	0.25$_{\pm0.05}$ mm
D_1	0.8$_{\pm0.05}$ mm	K_0	0.62$_{\pm0.05}$ mm	W	8.0$_{\pm0.1}$ mm
E_1	1.75$_{\pm0.1}$ mm	P_0	4.0$_{\pm0.1}$ mm		

Table 1: Tape dimensions.

12.2 Reel with diameter of 180 mm

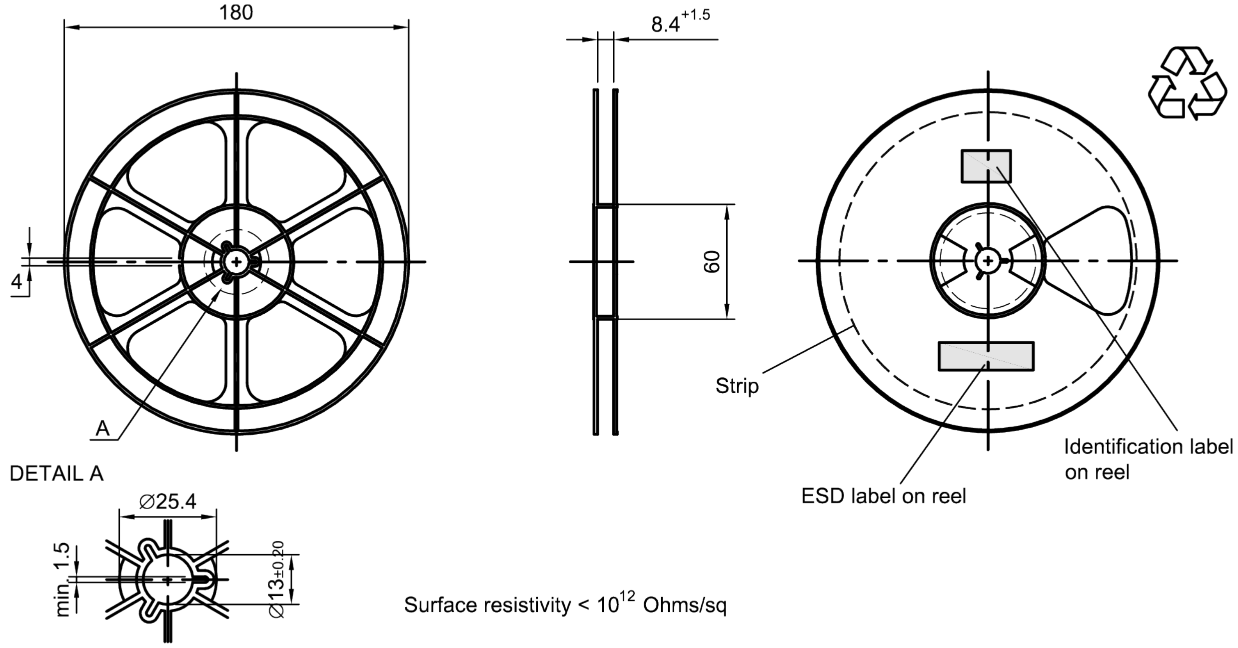

Figure 15: Drawing of reel (first-angle projection) with diameter of 180 mm.

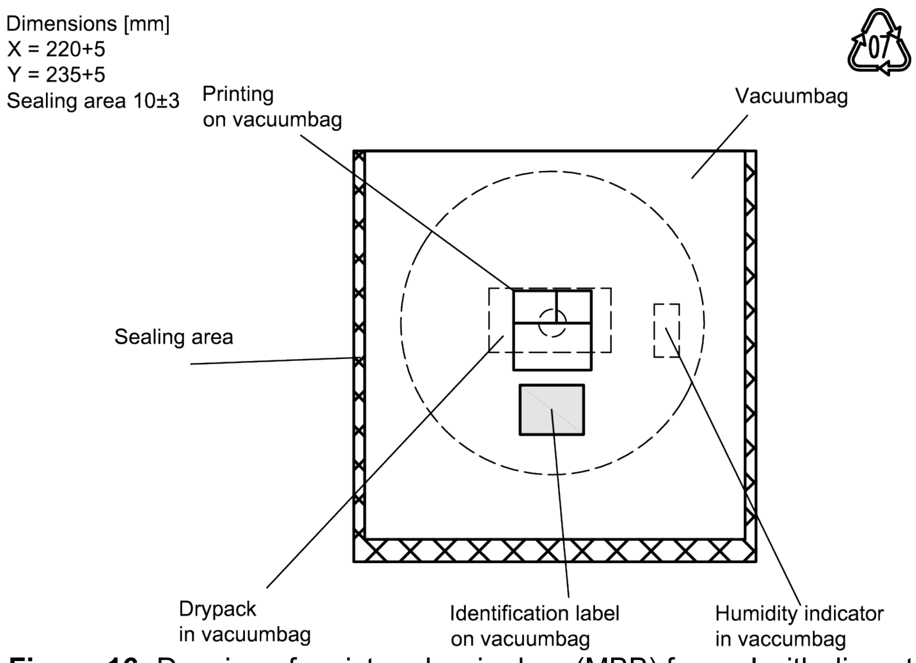

Figure 16: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

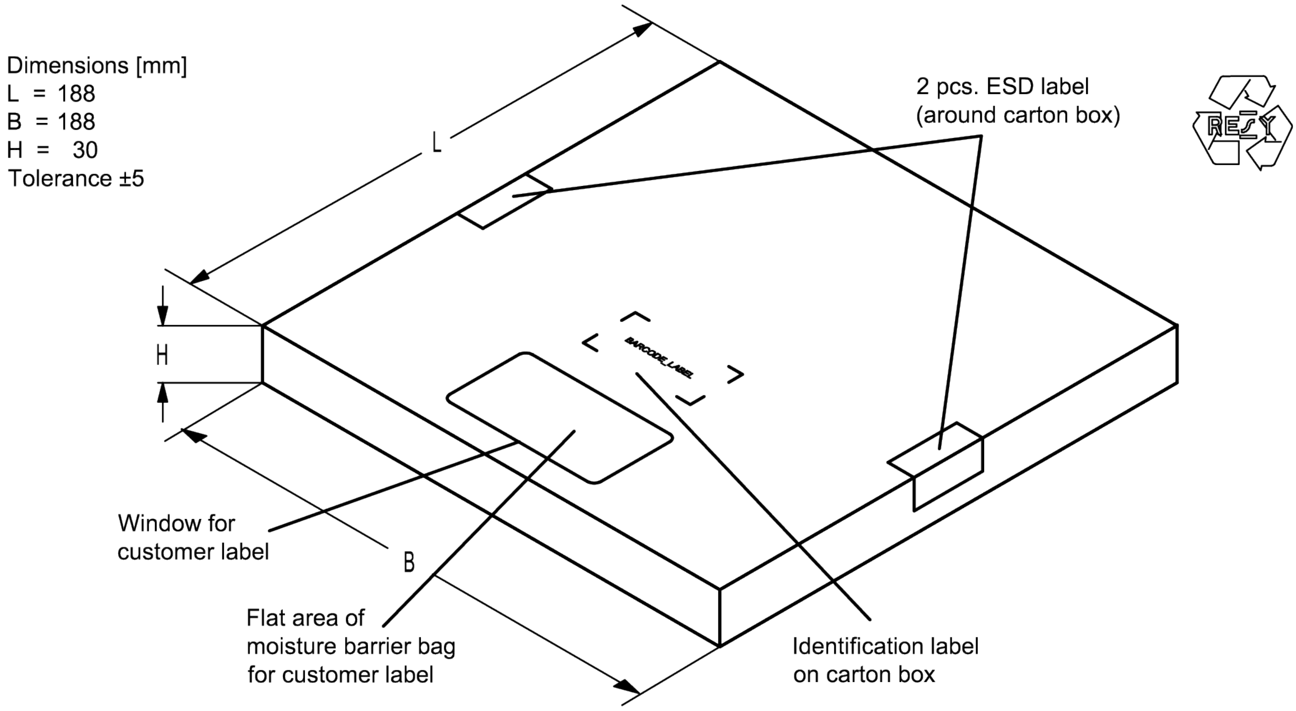

Figure 17: Drawing of folding box for reel with diameter of 180 mm.

12.3 Reel with diameter of 330 mm

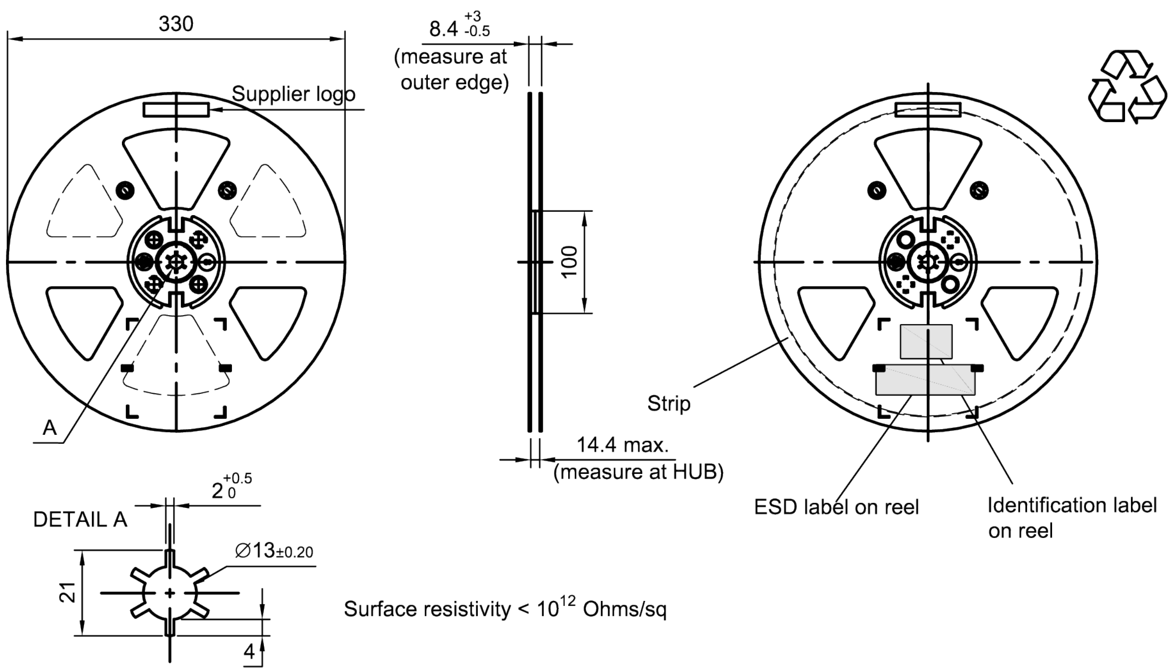

Figure 18: Drawing of reel (first-angle projection) with diameter of 330 mm.

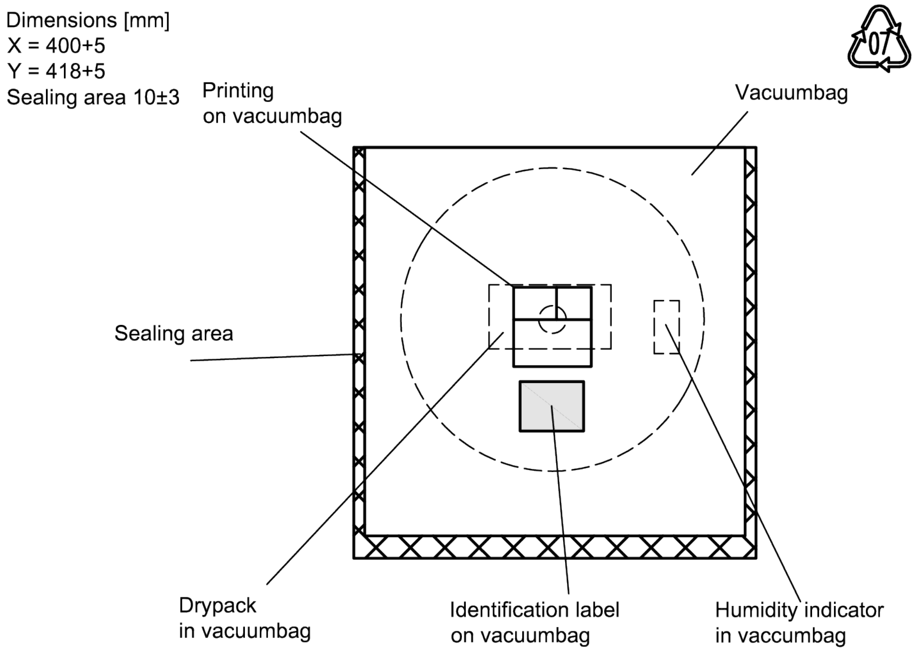

Figure 19: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

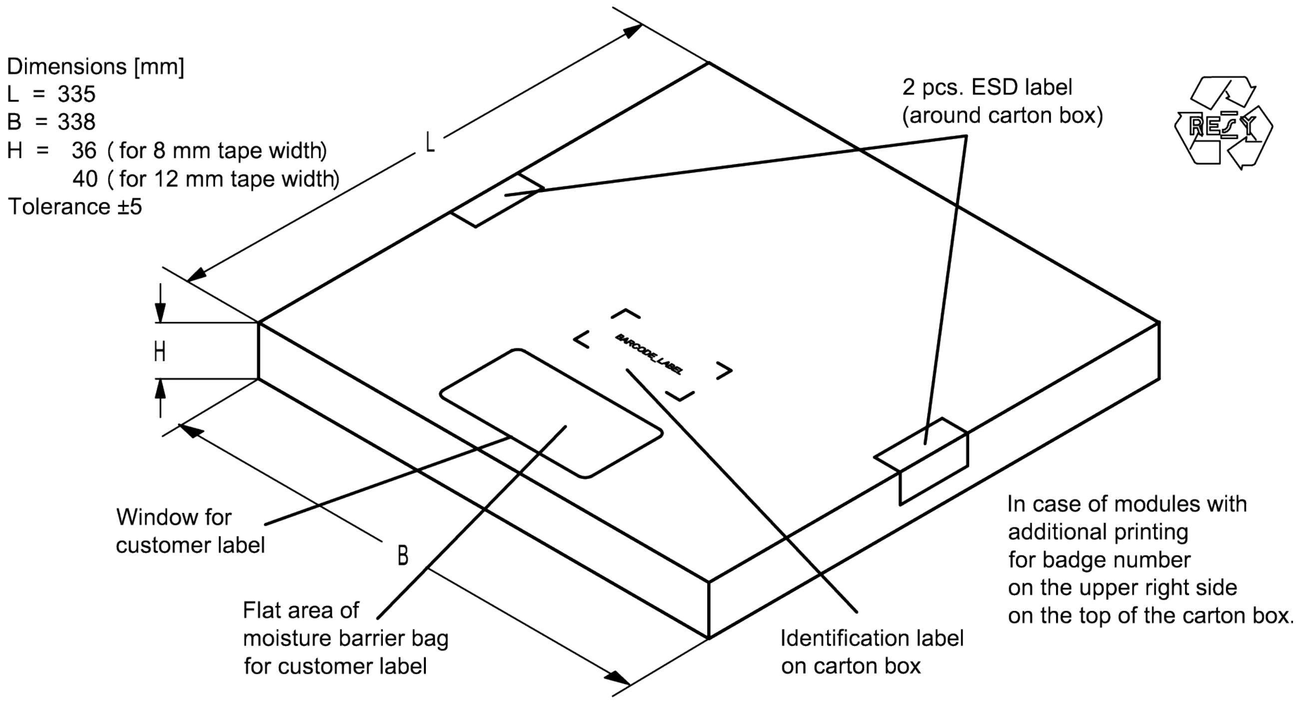

Figure 20: Drawing of folding box for reel with diameter of 330 mm.

13 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<u>1234</u>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**

$\mathbf{1} \times 32^2 + \mathbf{6} \times 32^1 + \mathbf{18\ (=J)} \times 32^0$ **=** **1234**

The BASE32 code for product type B1227 is 16B.

- 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**

$\mathbf{5} \times 47^2 + \mathbf{27\ (=U)} \times 47^1 + \mathbf{31\ (=Y)} \times 47^0$ **=** **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.

14 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).

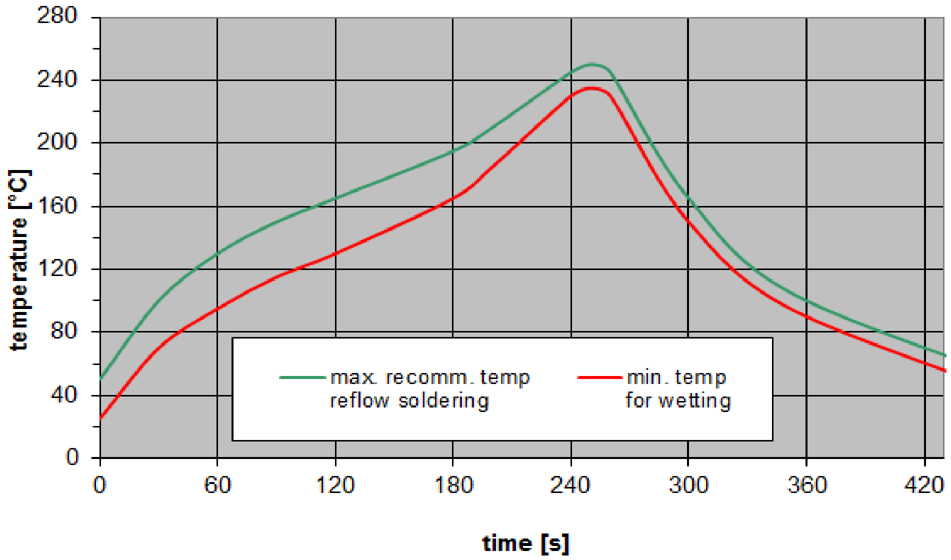

Figure 21: Recommended reflow profile for convection and infrared soldering – lead-free solder.

15 Annotations

15.1 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.

15.2 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.

15.3 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.

15.4 Ordering codes and packing units

Ordering code	Packing unit
B39182B1227P810	15000 pcs
B39182B1227P810S 5	5000 pcs

Table 4: Ordering codes and packing units.

16 Cautions and warnings

16.1 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.

16.2 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.

16.3 Moldability

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

16.4 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.
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.
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