SAW Components

SAW Duplexer
LTE Band 13

Series/type:	B8031
Ordering code:	B39781B8031P810
Date:	November 17, 2015
Version:	2.0

Table of contents

1 Application

- Low-loss SAW duplexer for mobile telephone LTE Band 13 systems, also suitable for CDMA applications.
- NS07 rejection, public safety frequency band.
- High isolation.
- Single-ended duplexer.
- Near zero temperature drift.

2 Features

- Package size 2.5±0.1 mm × 2.0±0.1 mm.
- Package height 0.5 mm (max.).
- Approximate weight 0.007 g.
- 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 marking.

3 Package

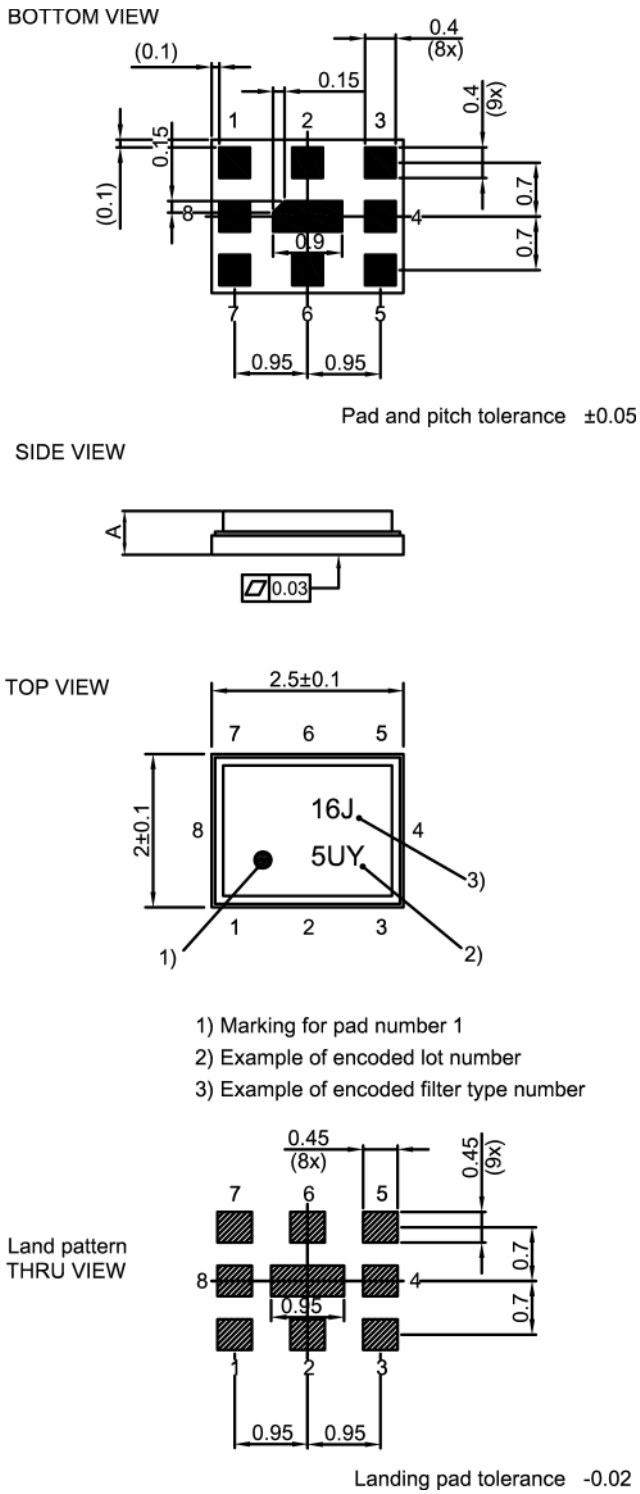

Figure 2: Drawing of package with package height A = 0.5 mm (max.). See Simplified drawings (p. 21).

4 Pin configuration

- 1 RX
- 3 TX
- 6 ANT
- 2, 4, 5, 7, 8, 9 Ground

5 Matching circuit

■ L_{p6} = 15 nH

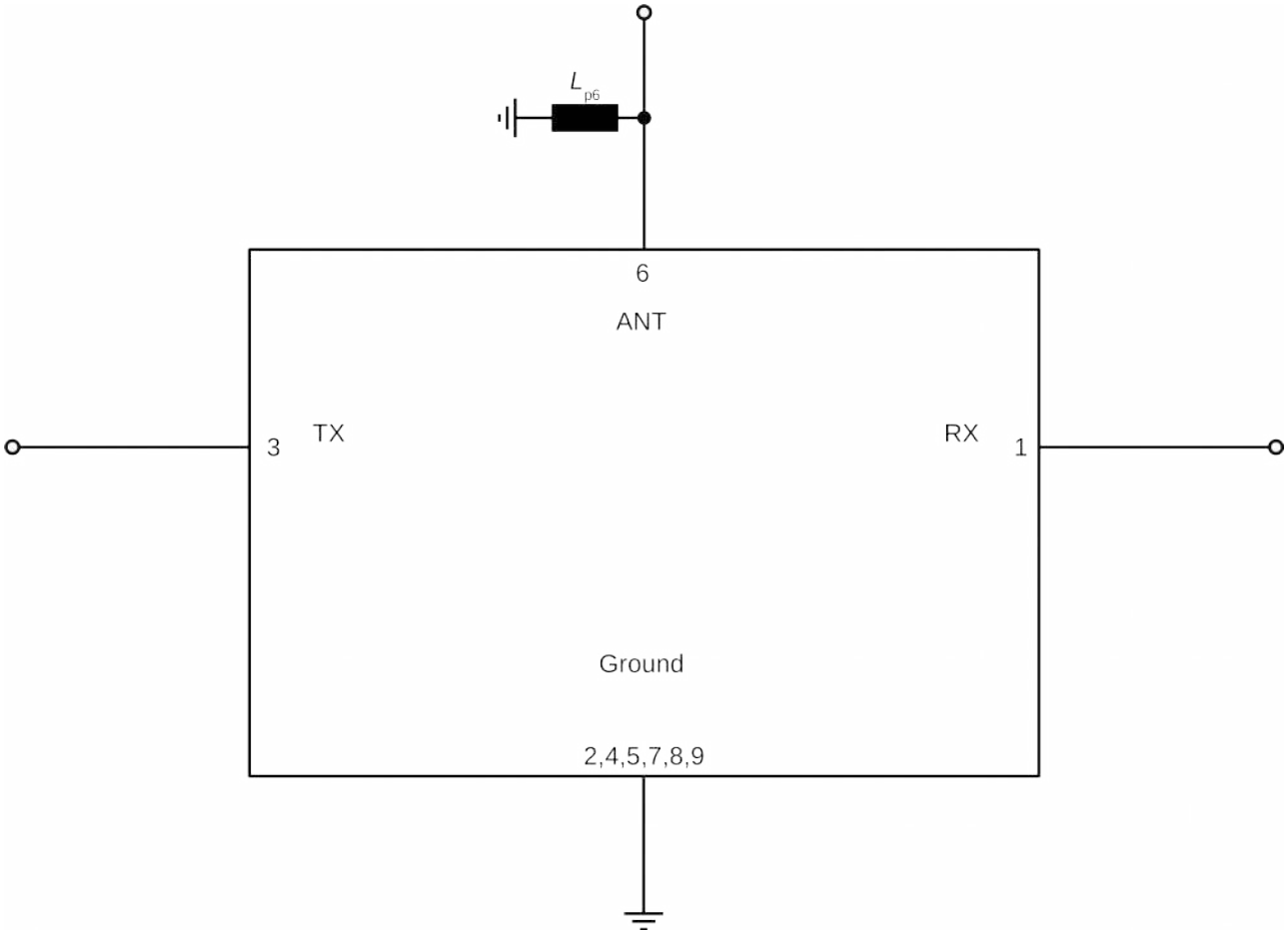

Figure 3: Schematic of matching circuit.

6 Characteristics

6.1 TX – ANT

Temperature range for specification T = −20 °C to +90 °C
TX terminating impedance Z_{TX} = 50 Ω
ANT terminating impedance Z_{ANT} = 50 Ω with par. 15 nH
RX terminating impedance Z_{RX} = 50 Ω

Characteristics TX – ANT				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	782	—	MHz
Maximum insertion attenuation			α_{max}				
	777.34 ... 786.66	MHz		—	2.9	3.6[1]	dB
	777.5 ... 786.5	MHz		—	2.7	3.7[2]	dB
	777.5 ... 786.5	MHz		—	2.7	3.3[1]	dB
Amplitude ripple (p-p)			$\Delta\alpha$[3]				
	777.5 ... 786.5	MHz		—	1.3	2.4	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	777.5 ... 786.5	MHz		—	1.5	2.0	
@ ANT port	777.5 ... 786.5	MHz		—	1.6	2.0	
Minimum attenuation			α_{min}				
	10 ... 716	MHz		30	38	—	dB
	716 ... 728	MHz		35	43	—	dB
	728 ... 746	MHz		40	46	—	dB
	746 ... 756	MHz		45	52	—	dB
	758 ... 768	MHz		33	37	—	dB
NS07	768 ... 775	MHz		10[4]	21[4]	—	dB
	793 ... 805	MHz		10	20	—	dB
	869 ... 894	MHz		30	41	—	dB
	1226 ... 1250	MHz		40	53	—	dB
	1554 ... 1565	MHz		45	50	—	dB
	1565 ... 1607	MHz		45	49	—	dB
	1710 ... 2170	MHz		35	40	—	dB
	2331 ... 2361	MHz		30	38	—	dB
	2400 ... 2484	MHz		30	38	—	dB
	3108 ... 3148	MHz		30	34	—	dB
	4900 ... 5950	MHz		10	15	—	dB

1) Valid for temperature T = +25 °C...+90 °C.
2) Valid for temperature T = −20 °C...+25 °C.

3) Over any channel with band width of 5 MHz.
4) Relative to integrated insertion loss in 777.5 – 786.5MHz over 1RB.

6.2 ANT – RX

Temperature range for specification	T	= −20 °C to +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 15 nH
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics ANT – RX				**min.**	**typ.** @+25 °C	**max.**	
Center frequency			f_C	—	751	—	MHz
Maximum insertion attenuation			α_{max}				
	746 ... 756	MHz		—	1.7	2.3	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	746 ... 756	MHz		—	0.5	1.4	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	746 ... 756	MHz		—	1.4	2.0	
@ RX port	746 ... 756	MHz		—	1.5	2.0	
Minimum attenuation			α_{min}				
	10 ... 550	MHz		40	45	—	dB
	550 ... 686	MHz		20	28	—	dB
	686 ... 728	MHz		30	42	—	dB
	771 ... 772	MHz		30	33	—	dB
	777 ... 787	MHz		50	56	—	dB
	1523 ... 1583	MHz		40	45	—	dB
	1710 ... 1755	MHz		40	44	—	dB
	1850 ... 1910	MHz		40	44	—	dB
	2238 ... 2268	MHz		40	44	—	dB
	2400 ... 2500	MHz		40	44	—	dB
	4900 ... 5950	MHz		10	15	—	dB

6.3 TX – RX

Temperature range for specification	T	= −20 °C to +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 15 nH
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – RX			min.	typ. @+25 °C	max.	
Minimum isolation		α_{min}				
	746 ... 751	MHz	51.5	53.5	—	dB
	751 ... 756	MHz	53	57	—	dB
	777 ... 787	MHz	56	60	—	dB
	1552 ... 1574	MHz	30	60	—	dB
	2328 ... 2361	MHz	30	57	—	dB
	3104 ... 3148	MHz	30	54	—	dB

7 Maximum ratings

Storage temperature	T_{STG} =	−40 °C to +85 °C	
DC voltage	V_{DC} =	5.0 V (max.)	
ESD voltage			
	V_{ESD} [1)]	100 V (max.)	Machine model.
	V_{ESD} [2)]	600 V (max.)	Charged device model.
	V_{ESD} [3)]	325 V (max.)	Human body model.
Input power	P_{IN}		
@ TX port: 777.5 ... 786.5 MHz		29 dBm	Continuous wave for 5000 h @ 50 °C.
@ TX port: other frequency range(s)		10 dBm	Continuous wave for 5000 h @ 50 °C.

1) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
2) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.
3) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

8 Transmission coefficients

8.1 TX – ANT

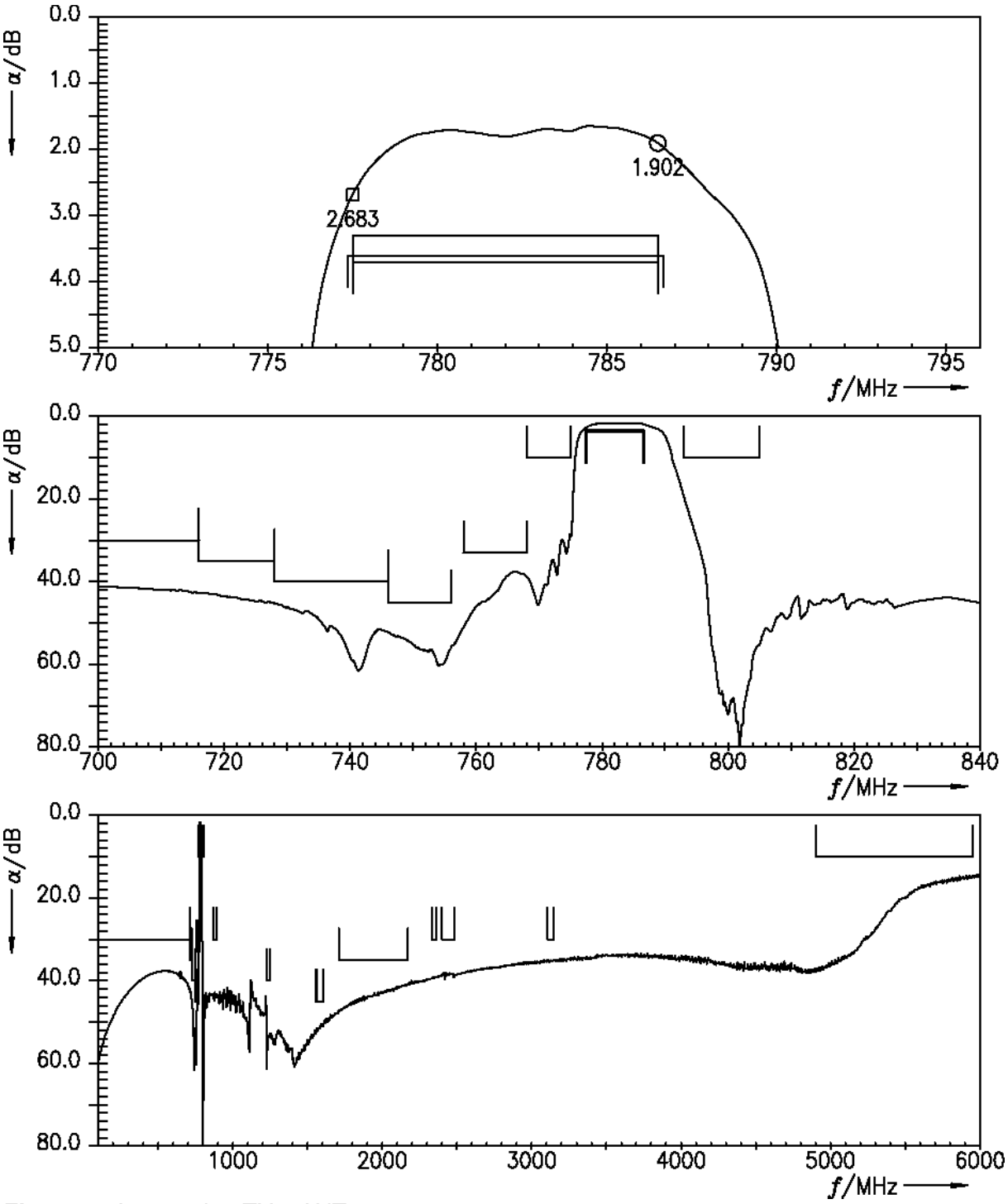

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

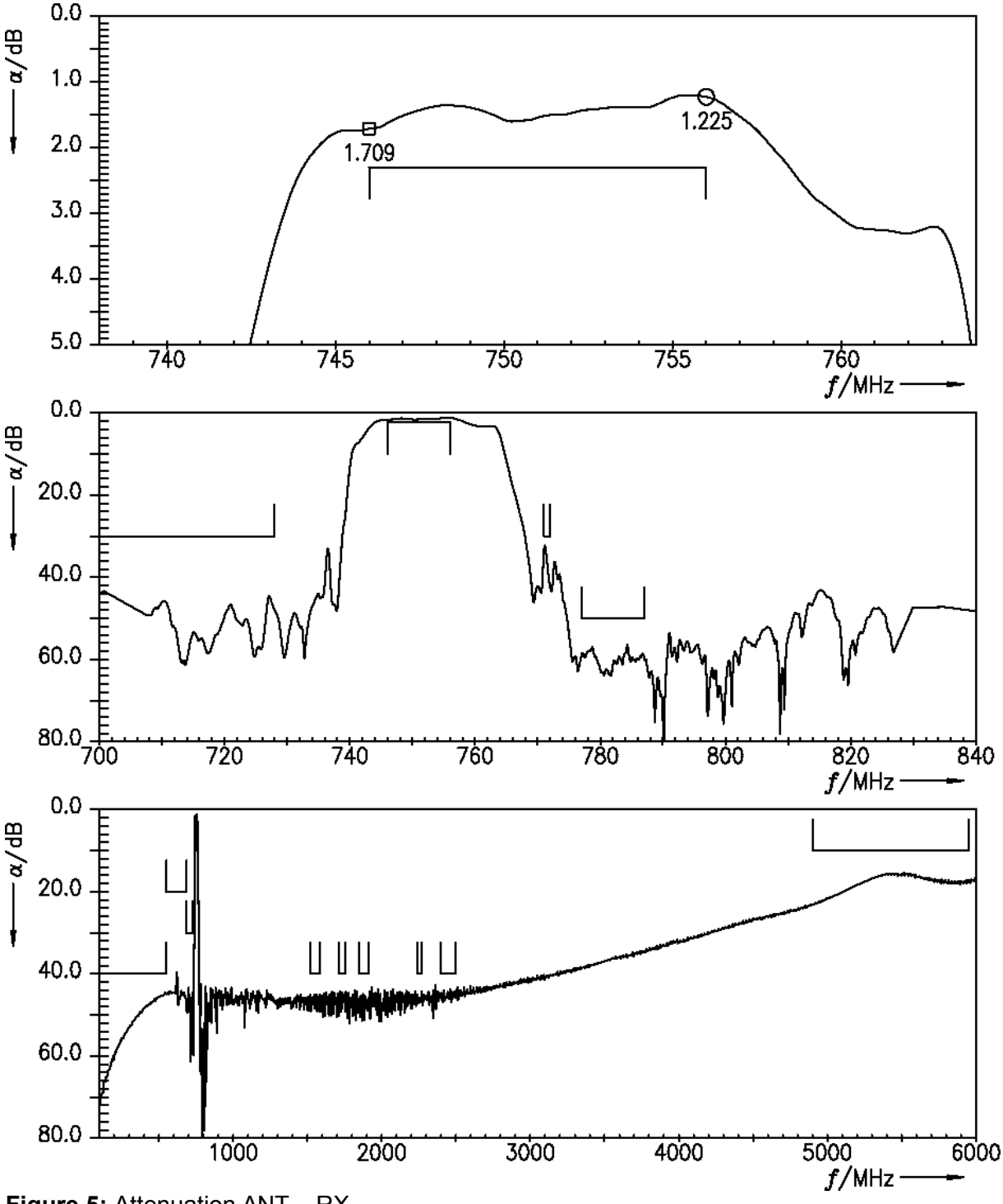

Figure 5: Attenuation ANT – RX.

8.3 TX – RX

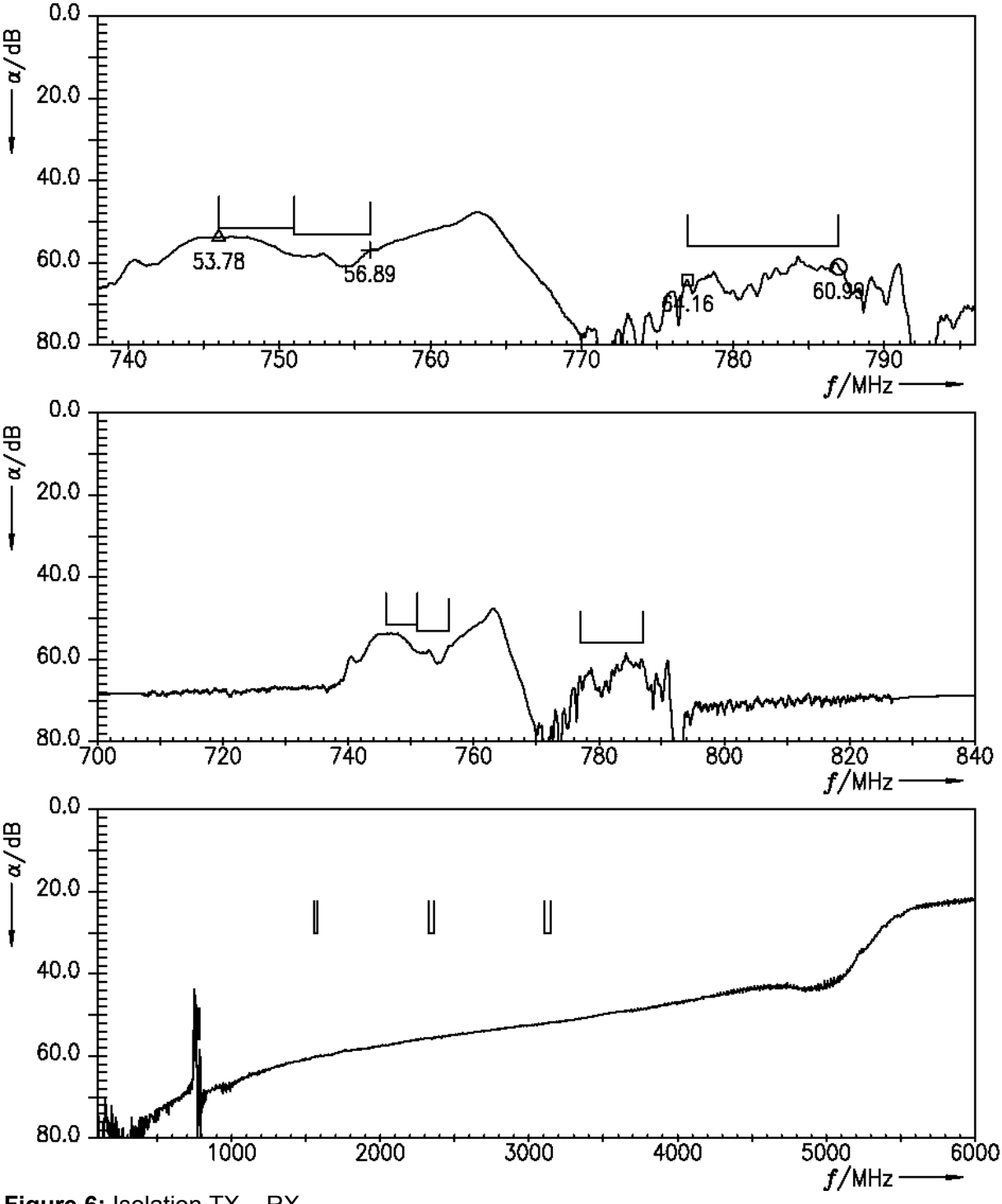

Figure 6: Isolation TX – RX.

9 Reflection coefficients

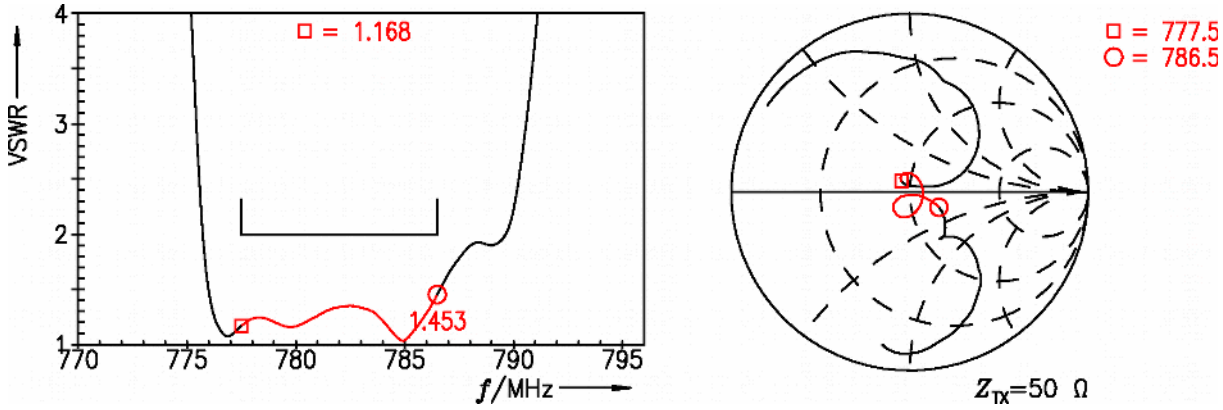

Figure 7: Reflection coefficient at TX port.

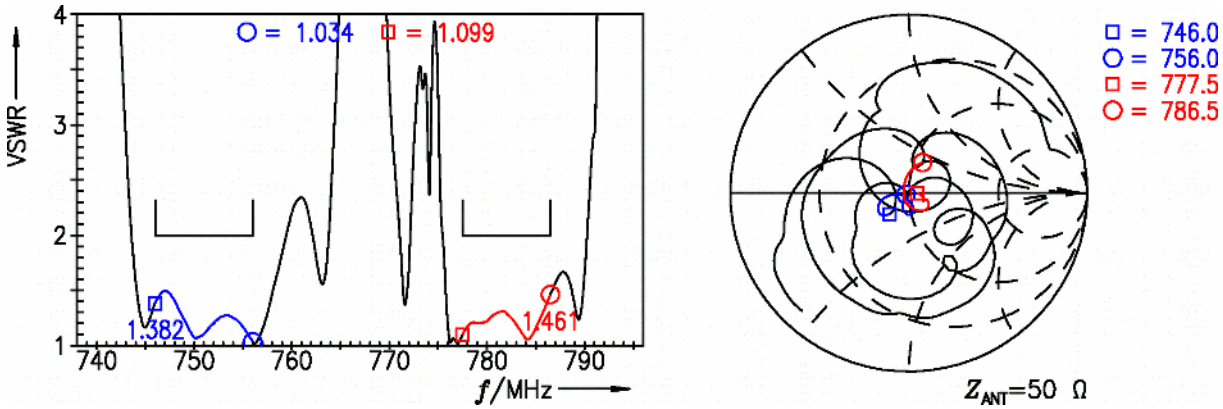

Figure 8: Reflection coefficient at ANT port (TX and RX frequencies).

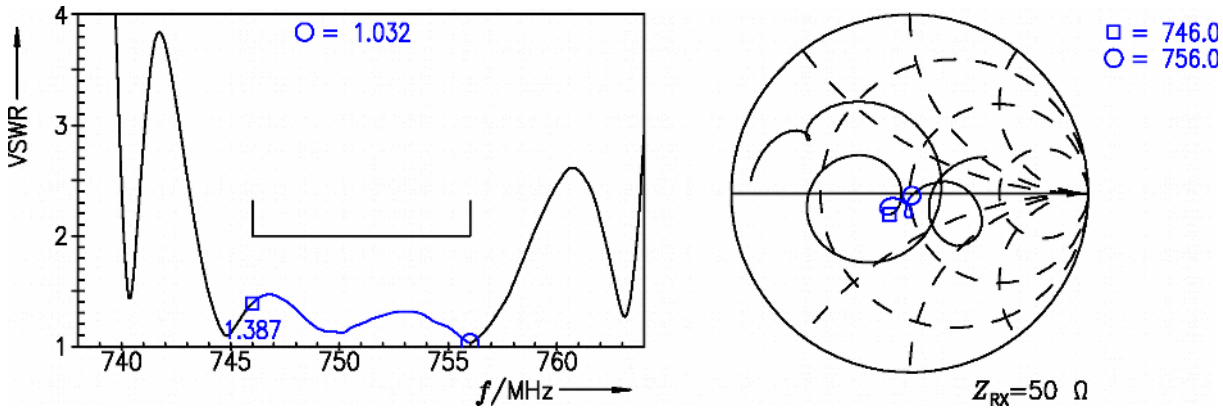

Figure 9: Reflection coefficient at RX port.

10 Packing material

10.1 Tape

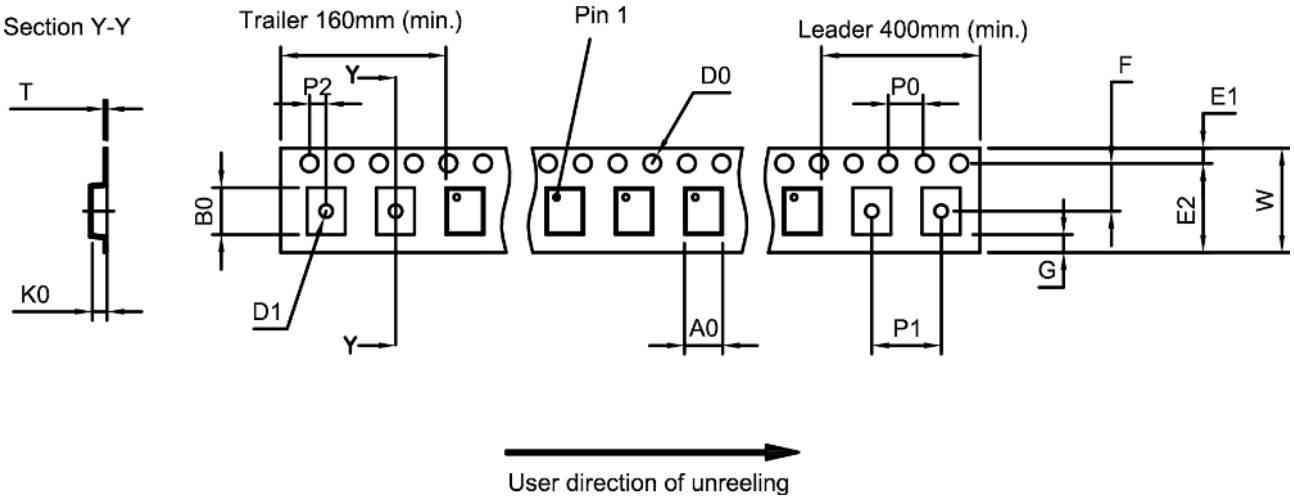

Figure 10: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$2.25_{\pm 0.05}$ mm
B_0	$2.75_{\pm 0.05}$ 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	$0.6_{\pm 0.05}$ 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.

10.2 Reel with diameter of 180 mm

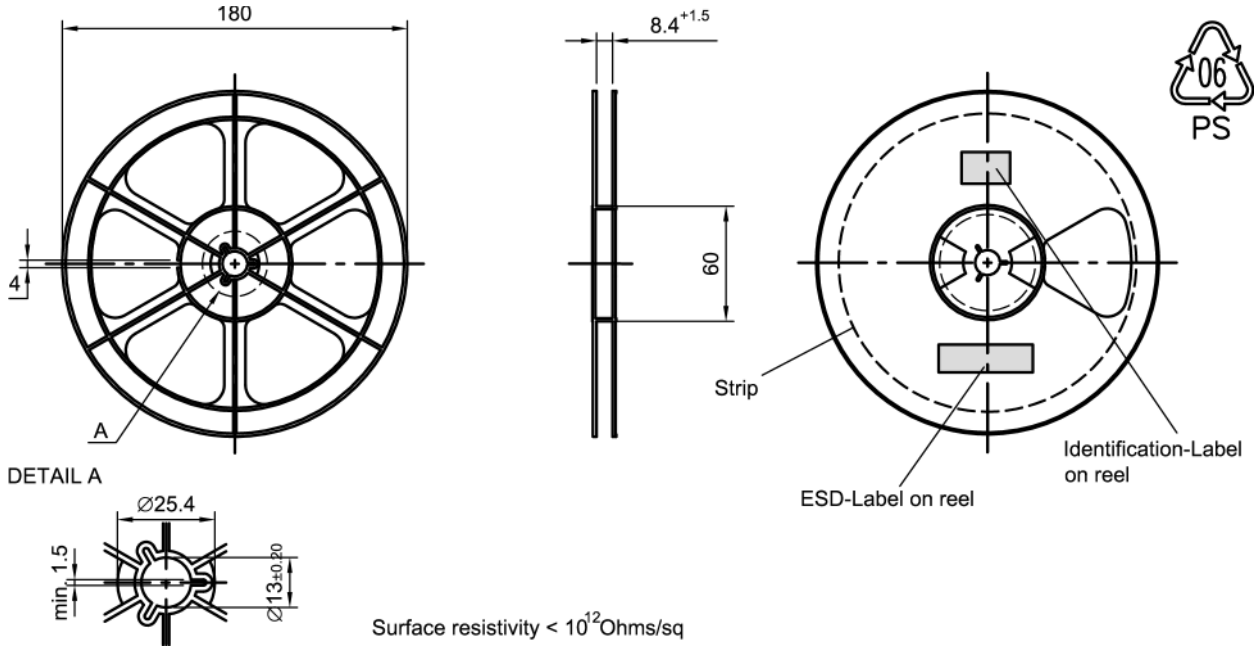

Figure 11: Drawing of reel (first-angle projection) with diameter of 180 mm.

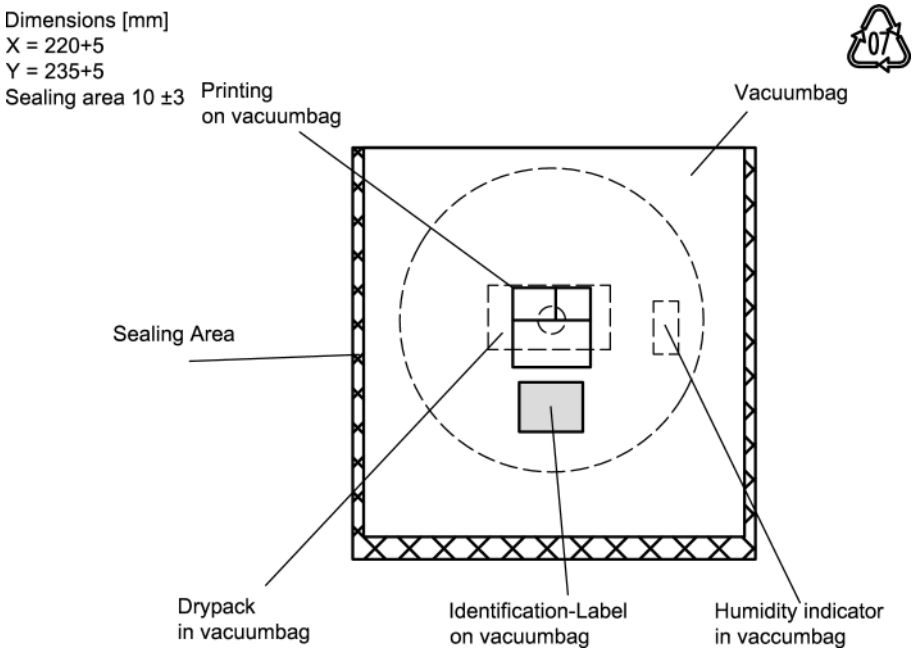

Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

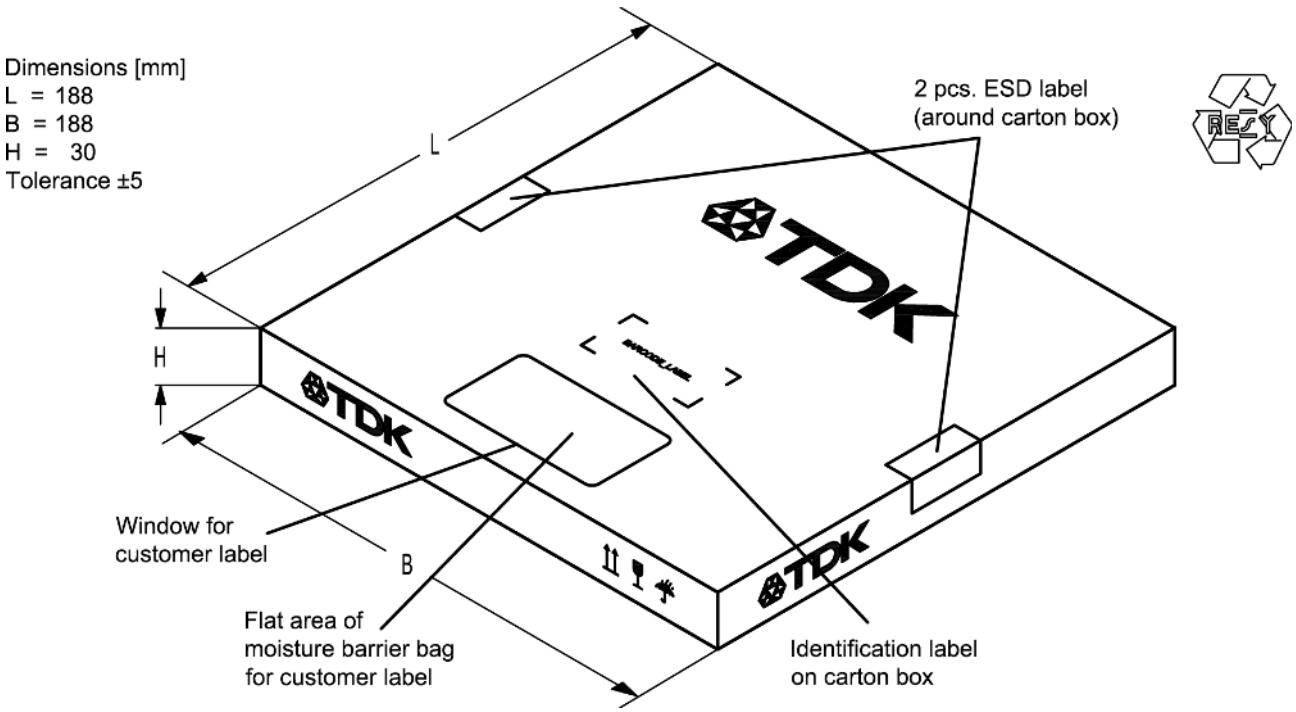

Figure 13: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm

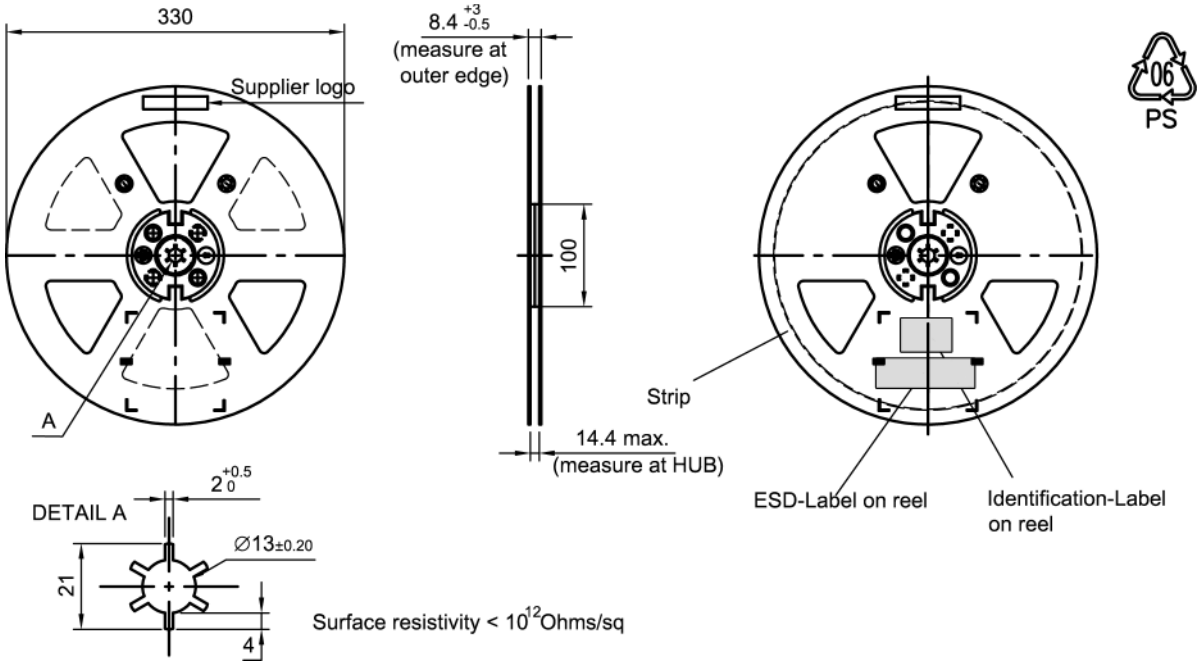

Figure 14: Drawing of reel (first-angle projection) with diameter of 330 mm.

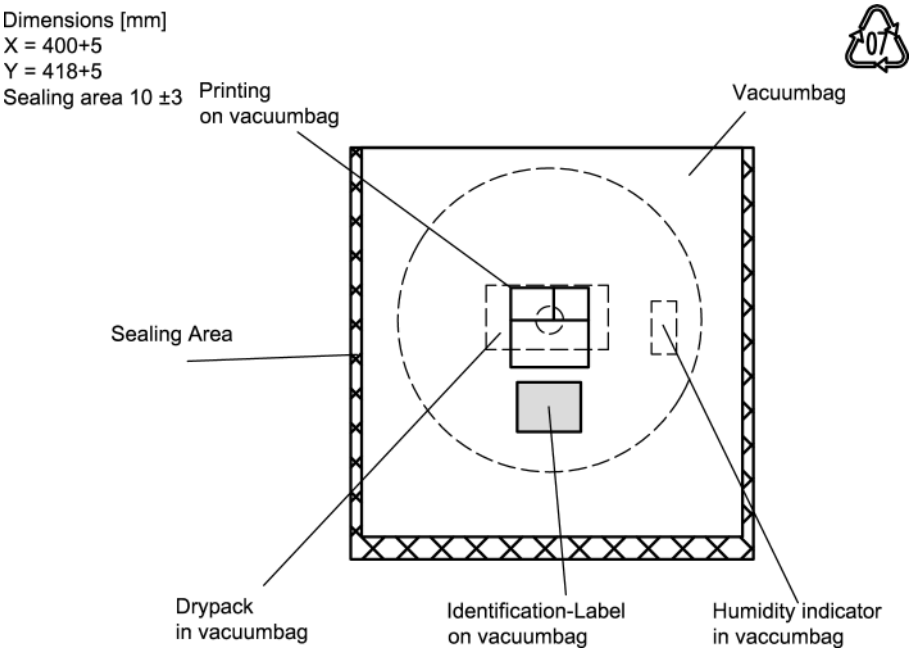

Figure 15: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

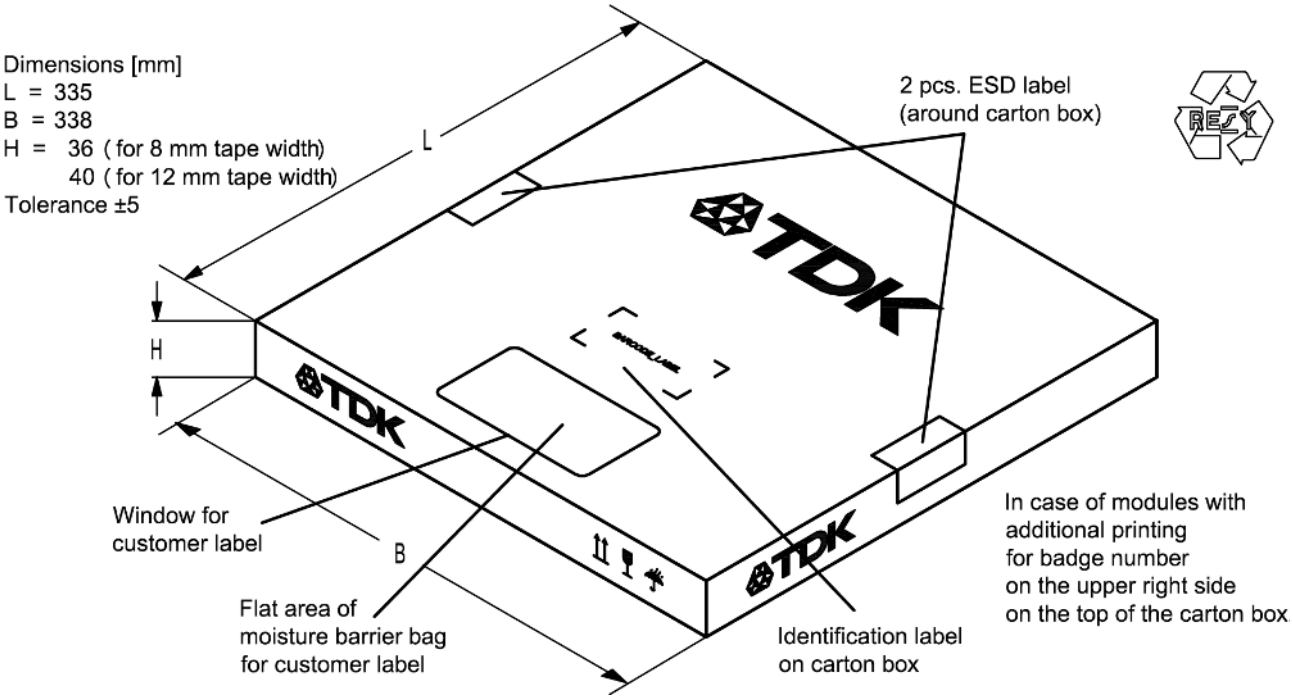

Figure 16: Drawing of folding box for reel with diameter of 330 mm.

11 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 B8031 is 7TZ.

- 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.

12 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).

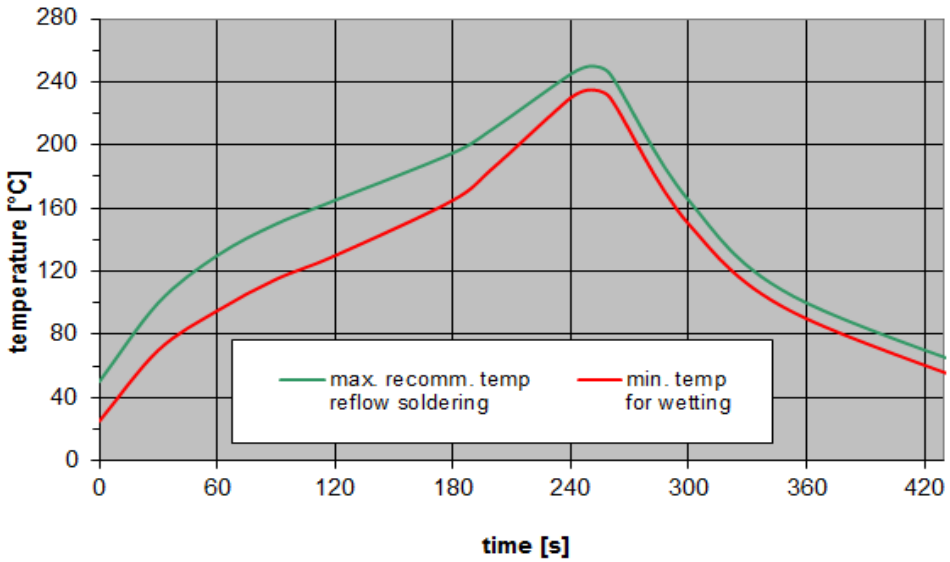

Figure 17: Recommended reflow profile for convection and infrared soldering – lead-free solder.

13 Annotations

13.1 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.

13.2 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.

13.3 Scattering parameters (S-parameters)

The pin/port assignment is available in the headers of the S-parameter files. Please contact your local EPCOS sales office.

13.4 Ordering codes and packing units

Ordering code	Packing unit
B39781B8031P810	15.000 pcs
B39781B8031P810S 5	5.000 pcs

Table 4: Ordering codes and packing units.

14 Cautions and warnings

14.1 Display of ordering codes for EPCOS 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 EPCOS, 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.epcos.com/orderingcodes**.

14.2 Moldability

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

14.3 Simplified drawings

Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on EPCOS 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 EPCOS, 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).

Dimensions do not include burrs.

Projection method

Unless otherwise specified first-angle projection is applied.

Contact and Important notes

For further information please contact your local EPCOS sales office or visit our web page at www.epcos.com.

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