SAW Components

SAW Duplexer

Cellular/ WCDMA Band 5

Series/type:	B8576
Ordering code:	B39881B8576P810
Date:	September 23, 2015
Version:	2.2

Table of contents

Data sheet

1 Application

- Multimode SAW duplexer for mobile telephone Cellular / WCDMA Band 5 systems.
- Low insertion attenuation.
- Low amplitude ripple.
- High Tx band isolation.
- Single ended to balanced transformation in Antenna - Rx path.
- Impedance transformation from 50Ω to 100Ω in Antenna - Rx path.

Figure 1: Picture of component with example of marking.

2 Features

- Package size 1.8 mm × 1.4 mm.
- Max. package height 0.475 mm.
- Approximate weight 0.0042 g.
- RoHS compatible.
- Package for Surface Mount Technology (SMT).
- Ni, Au-plated terminals.
- Electrostatic Sensitive Device (ESD).
- Moisture Sensitivity Level 3 (MSL3).

3 Package

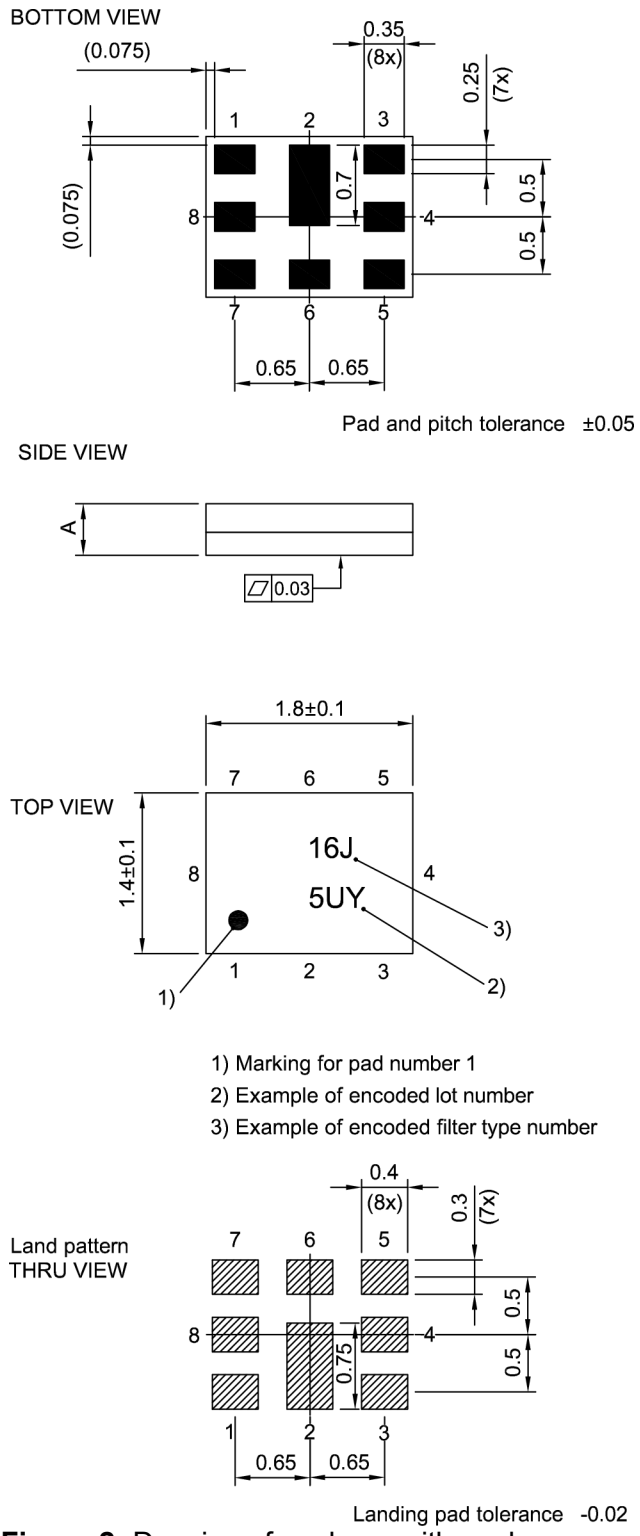

Figure 2: Drawing of package with package height A = 0.475 mm (max.). See Simplified drawings (p. 23).

4 Pin configuration

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

5 Matching circuit

■ L_{p6} = 8.2 nH

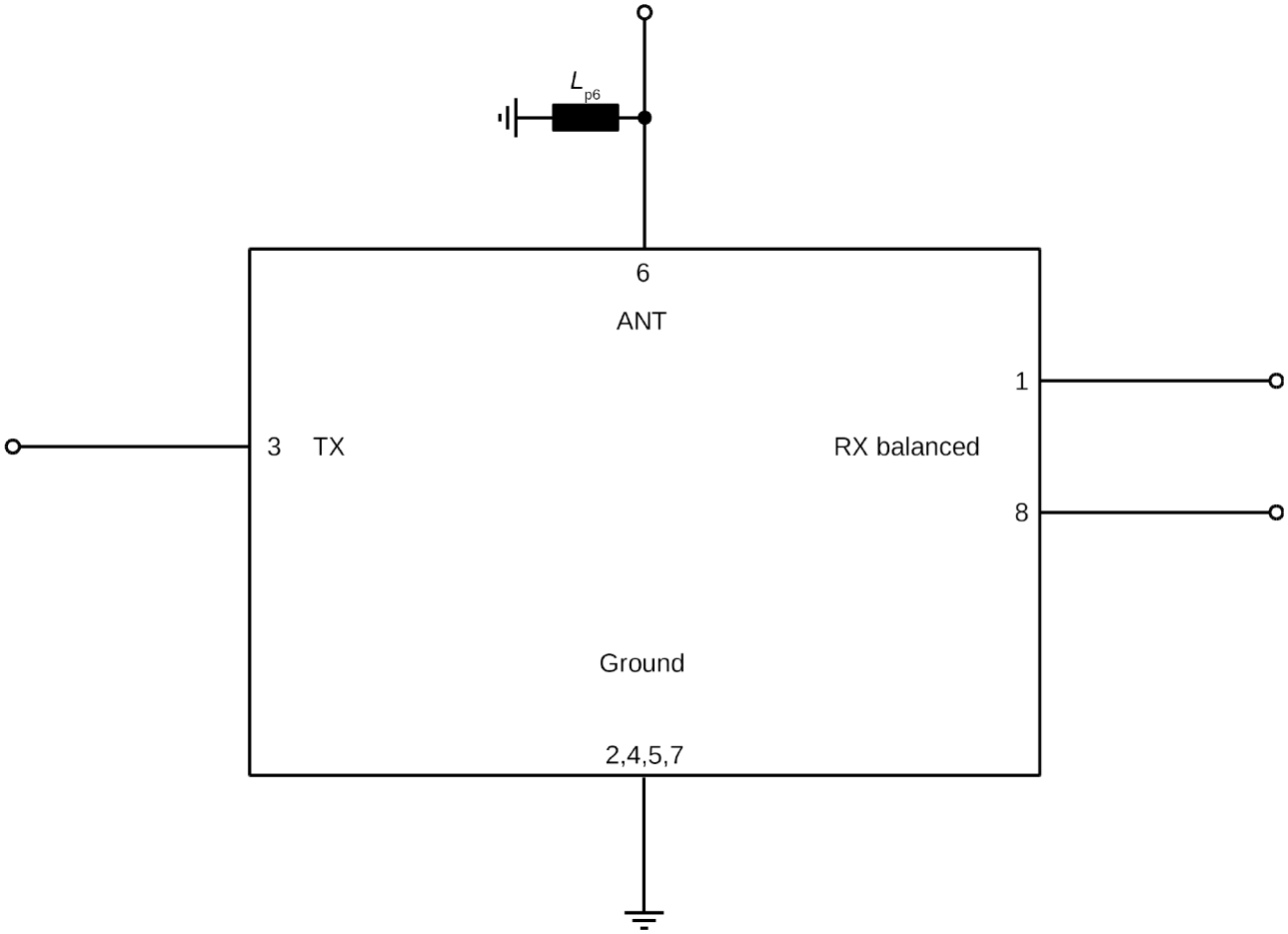

Figure 3: Schematic of matching circuit.

6 Characteristics

6.1 TX – ANT

Temperature range for specification T = −30 °C to +90 °C
TX terminating impedance Z_{TX} = 50 Ω
ANT terminating impedance Z_{ANT} = 50 Ω with par. 8.2 nH
RX terminating impedance Z_{RX} = 100 Ω (balanced)

Characteristics TX – ANT				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	836.5	—	MHz
Maximum insertion attenuation							
	824 ... 849	MHz	α_{max}	—	1.5	2.3	dB
@$f_{carrier}$	826.4 ... 846.6	MHz	$\alpha_{WCDMA,max}$ [1]	—	1.3	2.1	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	824 ... 849	MHz		—	0.6	1.4	dB
Maximum error vector magnitude			EVM_{max} [2]				
	826.4 ... 846.6	MHz		—	2.1	4.0	%
Maximum VSWR			$VSWR_{max}$				
@ TX port	824 ... 849	MHz		—	1.5	2.0	
@ ANT port	824 ... 849	MHz		—	1.4	2.0	
Minimum attenuation			α_{min}				
	10 ... 420	MHz		40	45	—	dB
	420 ... 494	MHz		38	42	—	dB
	494 ... 701	MHz		35	39	—	dB
	701 ... 728	MHz		35	40	—	dB
	728 ... 764	MHz		35	41	—	dB
	764 ... 804	MHz		30	37	—	dB
	860 ... 869	MHz		3	10	—	dB
	869 ... 894	MHz		45	52	—	dB
@$f_{carrier}$	871.4 ... 891.6	MHz	$\alpha_{WCDMA,min}$ [1]	48	53	—	dB
	1236 ... 1341	MHz		40	47	—	dB
	1574 ... 1577	MHz		35	39	—	dB
	1638 ... 1708	MHz		33	36	—	dB
	1844.9 ... 1879.9	MHz		30	34	—	dB
	1884.5 ... 1919.6	MHz		30	34	—	dB

Characteristics TX – ANT				min.	typ. @+25 °C	max.	
1930 ... 1990	MHz	α_{min}		30	33	—	dB
2110 ... 2170	MHz			28	31	—	dB
2400 ... 2557	MHz			25	28	—	dB
3286 ... 3406	MHz			20	25	—	dB
4110 ... 4255	MHz			20	24	—	dB
4934 ... 5350	MHz			10	14	—	dB
5725 ... 5953	MHz			5	10	—	dB

1) Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 22).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

6.2 ANT – RX

Temperature range for specification T = −30 °C to +90 °C
TX terminating impedance Z_{TX} = 50 Ω
ANT terminating impedance Z_{ANT} = 50 Ω with par. 8.2 nH
RX terminating impedance Z_{RX} = 100 Ω (balanced)

Characteristics ANT – RX				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	881.5	—	MHz
Maximum balanced insertion attenuation							
	869 ... 894	MHz	α_{max}	—	1.7	2.4	dB
@$f_{carrier}$	871.4 ... 891.6	MHz	$\alpha_{WCDMA,max}$ [3]	—	1.5	2.2	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	869 ... 894	MHz		—	0.5	1.2	dB
Maximum error vector magnitude			EVM_{max} [1]				
	871.4 ... 891.6	MHz		—	1.7	3.5	%
Maximum VSWR			$VSWR_{max}$				
@ ANT port	869 ... 894	MHz		—	1.7	2.0	
@ RX port	869 ... 894	MHz		—	1.6	2.0	
Minimum common-mode rejection ratio			$CMRR_{min}$ [4]				
	869 ... 894	MHz		23	27	—	dB
Minimum balanced attenuation			α_{min}				
	10 ... 447	MHz		45	75	—	dB
	447 ... 824	MHz		45	61	—	dB
	824 ... 849	MHz		50	60	—	dB
@$f_{carrier}$	826.4 ... 846.6	MHz	$\alpha_{WCDMA,min}$ [3]	55	61	—	dB
	849 ... 854	MHz		10	56	—	dB
	854 ... 871.5	MHz		0.9	1.3	—	dB
	909 ... 914	MHz		10	20	—	dB
	914 ... 940	MHz		20	27	—	dB
	940 ... 1000	MHz		40	49	—	dB
	1000 ... 1693	MHz		40	53	—	dB
	1693 ... 1850	MHz		45	54	—	dB
	1850 ... 1920	MHz		40	54	—	dB
	1920 ... 5000	MHz		40	46	—	dB

Characteristics ANT – RX				min.	typ. @+25 °C	max.	
	5000 ... 6000	MHz	α_{min}	30	41	—	dB
IMD product levels[2]							
IMD2							
Blocker 1	45	MHz		—	−125	−109	dBm
Blocker 3	1718	MHz		—	−106	−96	dBm
IMD3							
Blocker 2	791.5	MHz		—	−106	−96	dBm
Blocker 4	2554.5	MHz		—	−115	−105	dBm

1) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.
2) Power levels: 21.5 dBm Tx signal, -15dBm blocker at antenna port.
3) Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 22).
4) A combination of 10` phase balance and 1 dB amplitude balance corresponds to 19.6 dB CMRR.

6.3 TX – RX

Temperature range for specification	T	= −30 °C to +90 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 8.2 nH
RX terminating impedance	Z_{RX}	= 100 Ω (balanced)

Characteristics TX – RX					min.	typ. @+25 °C	max.	
Differential Mode Isolation				α_{min}				
		824 ... 849	MHz		54	63	—	dB
	@$f_{carrier}$	826.4 ... 846.6	MHz	$\alpha_{WCDMA,min}$ [1)]	57	63	—	dB
		869 ... 894	MHz		50	55	—	dB
	@$f_{carrier}$	871.4 ... 891.6	MHz	$\alpha_{WCDMA,min}$ [1)]	52	56	—	dB
		1574 ... 1577	MHz		40	64	—	dB
		1638 ... 1708	MHz		40	62	—	dB
		2462 ... 2557	MHz		40	56	—	dB
Common Mode Isolation								
		824 ... 849	MHz		42	47	—	dB
	@$f_{carrier}$	826.4 ... 846.6	MHz	$\alpha_{WCDMA,min}$ [1)]	42	48	—	dB

1) Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 22).

7 Maximum ratings

Storage temperature	T_{STG} =	−40 °C to +85 °C	
DC voltage	V_{DC} =	5.0 V (max.)[1)]	
ESD voltage	V_{ESD}[2)] =	100 V (max.)	Machine model.
Input power	P_{IN}		
@ TX port: elsewhere MHz (min.)		10 dBm	Continuous wave for 5000 h @ 50 °C.
@ TX port: 824 ... 849 MHz		29 dBm	Continuous wave for 5000 h @ 50 °C.

1) 168h Damp Heat Steady State acc. IEC 60068-2-67 Cy.
2) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

8 Transmission coefficients

8.1 TX – ANT

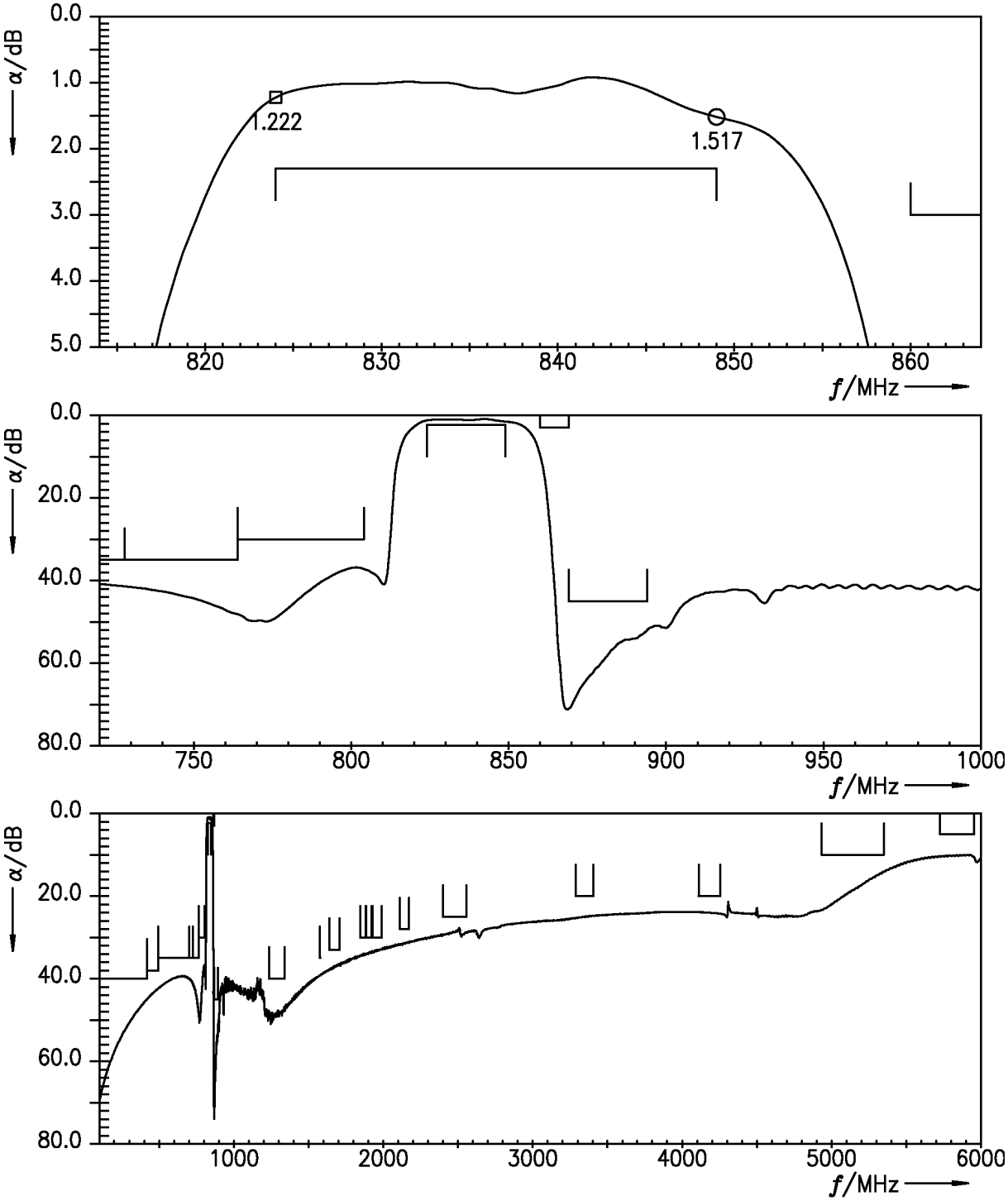

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

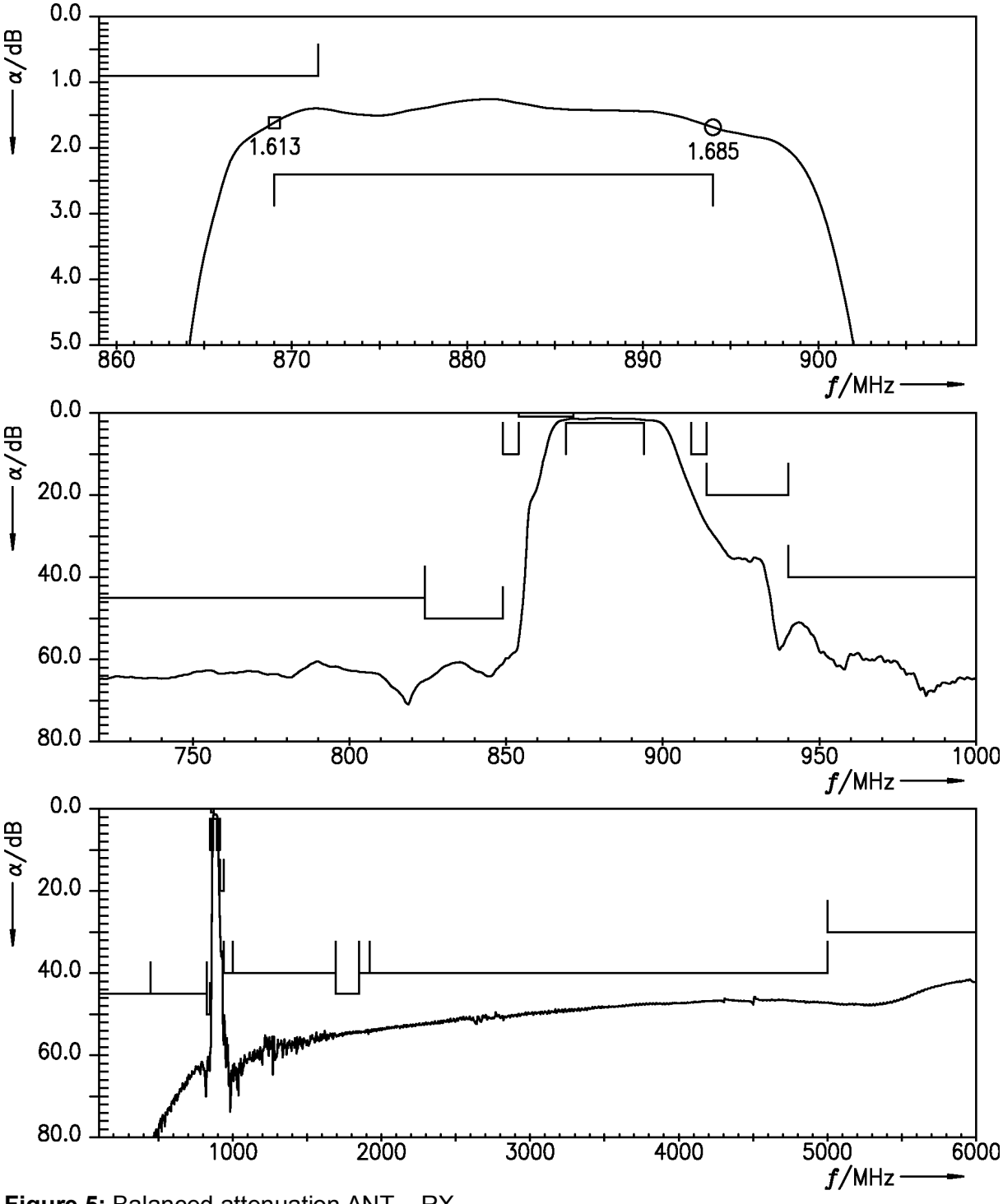

Figure 5: Balanced attenuation ANT – RX.

8.3 TX – RX

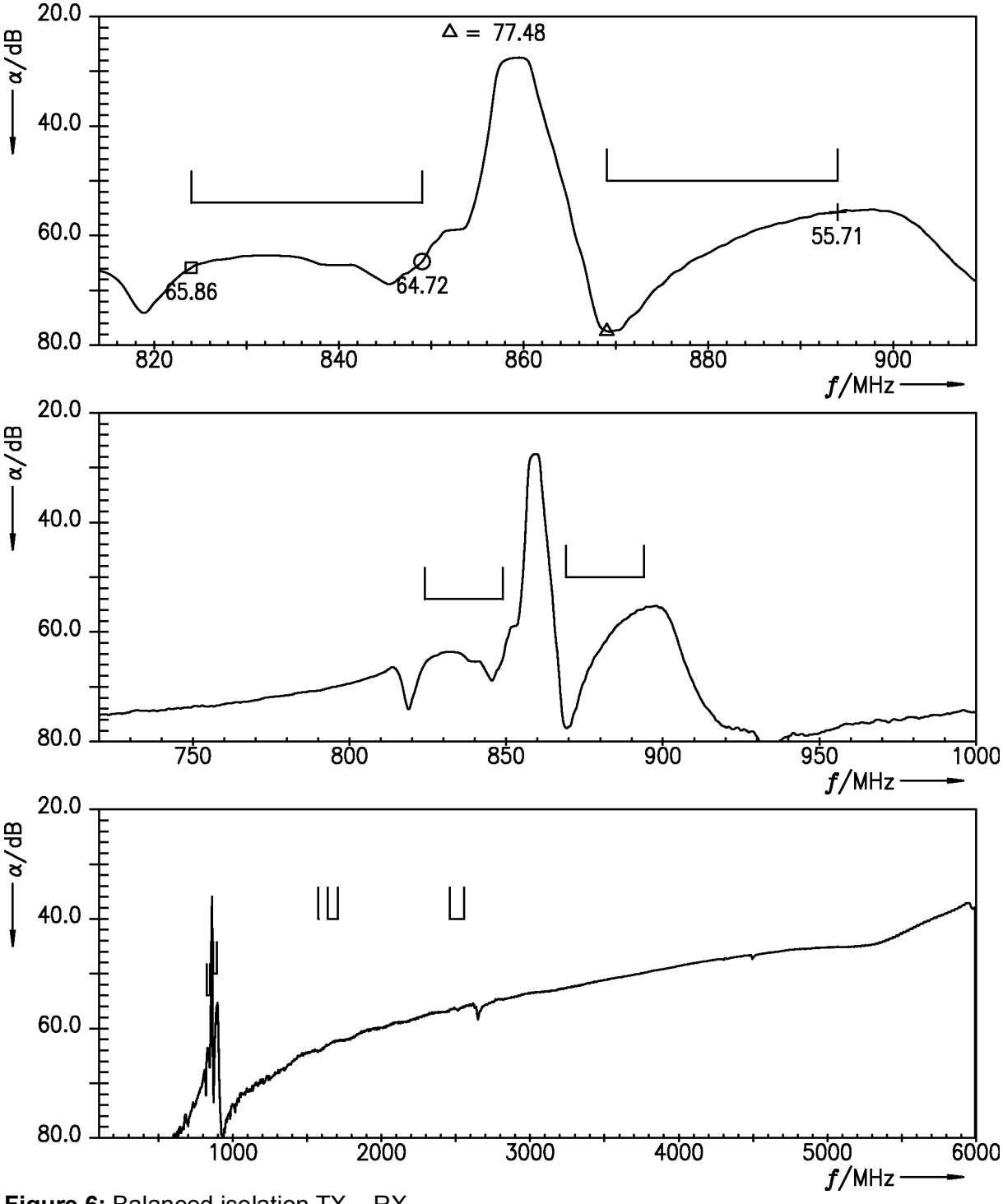

Figure 6: Balanced isolation TX – RX.

9 Reflection coefficients

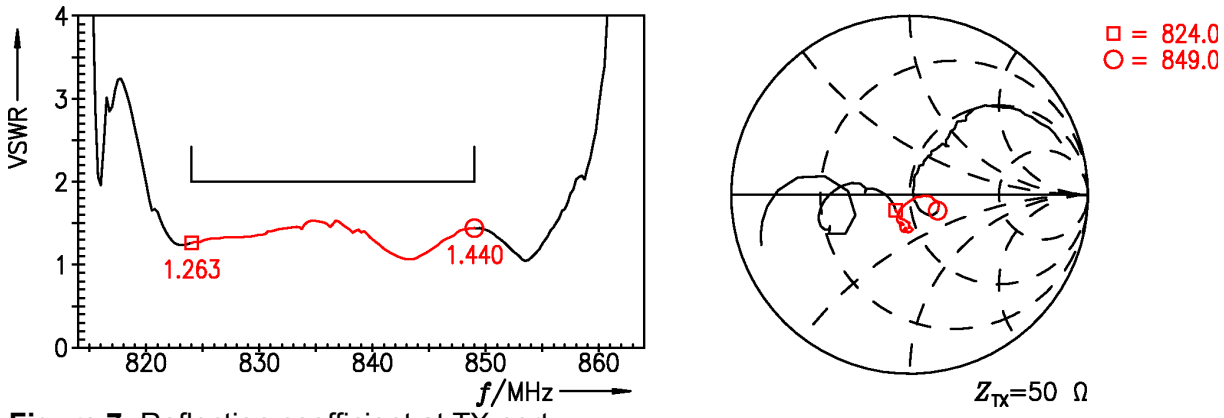

Figure 7: Reflection coefficient at TX port.

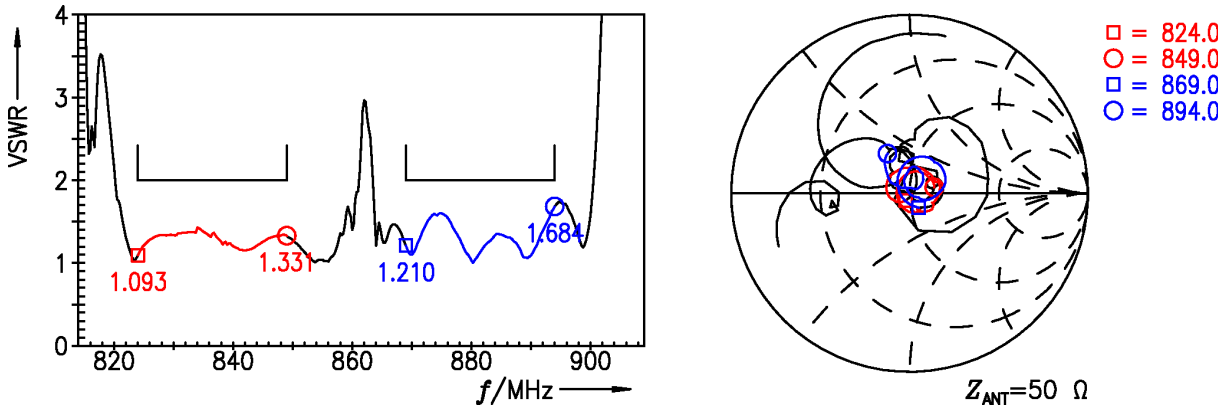

Figure 8: Reflection coefficient at ANT port (TX and RX frequencies).

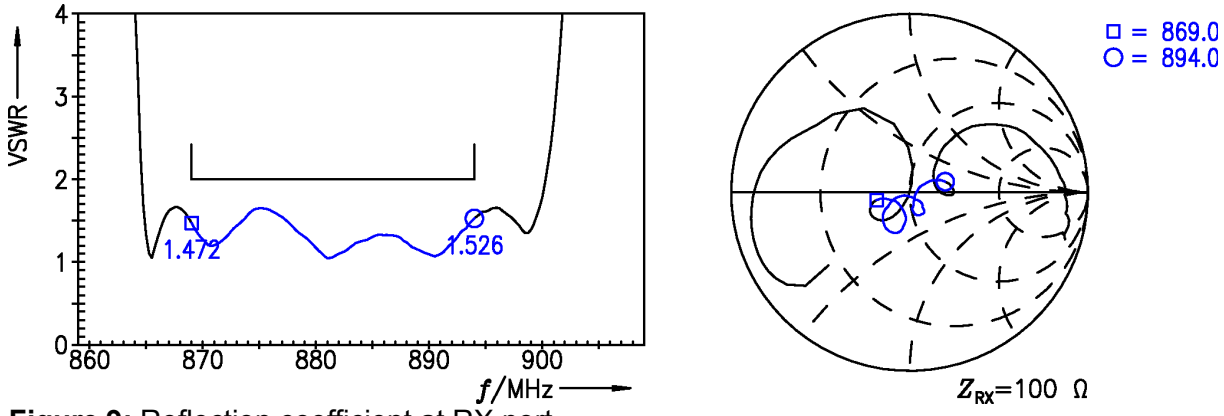

Figure 9: Reflection coefficient at RX port.

10 Packing material

10.1 Tape

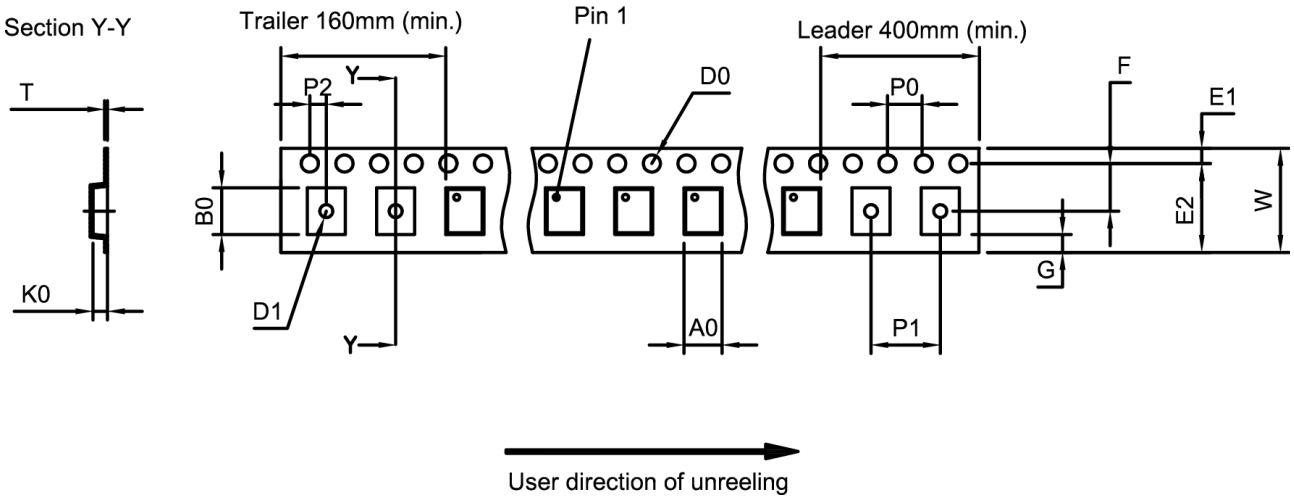

Figure 10: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$1.62_{\pm 0.05}$ mm
B_0	$2.04_{\pm 0.05}$ mm
D_0	$1.5_{\pm 0.05}$ mm
D_1	$0.8_{\pm 0.05}$ 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	$0.62_{\pm 0.05}$ 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	$0.25_{\pm 0.02}$ mm
W	$8.0_{\pm 0.1}$ mm

Table 1: Tape dimensions.

10.2 Reel with diameter of 180 mm

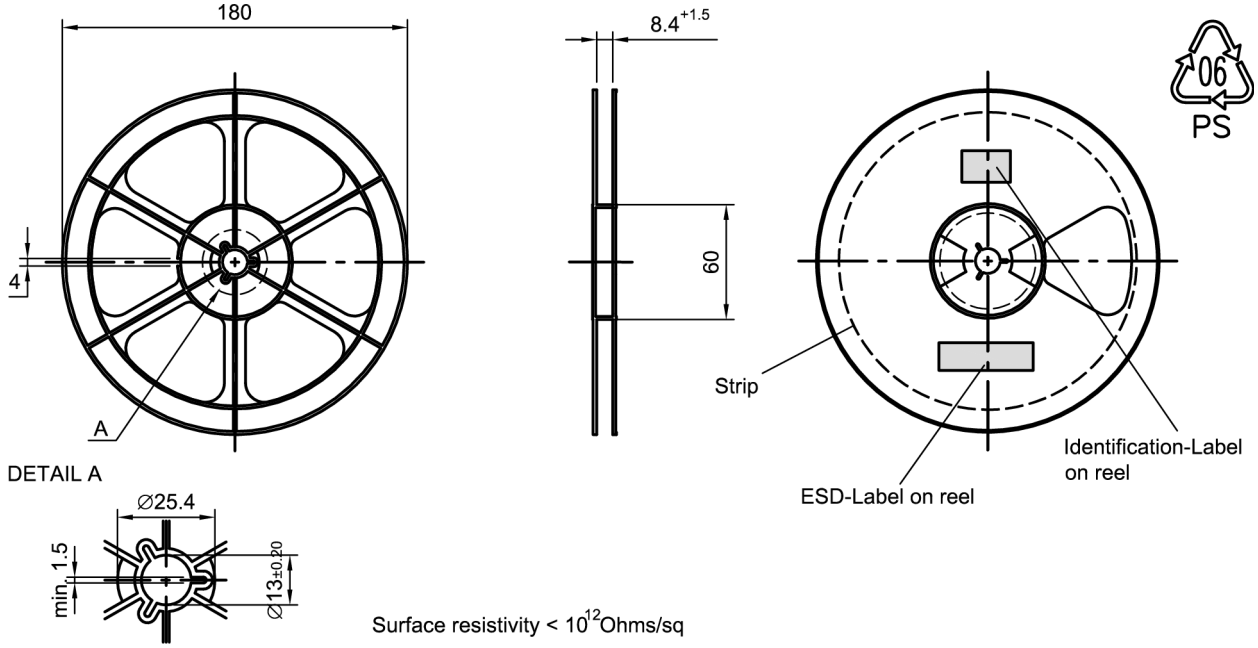

Figure 11: Drawing of reel (first-angle projection) with diameter of 180 mm.

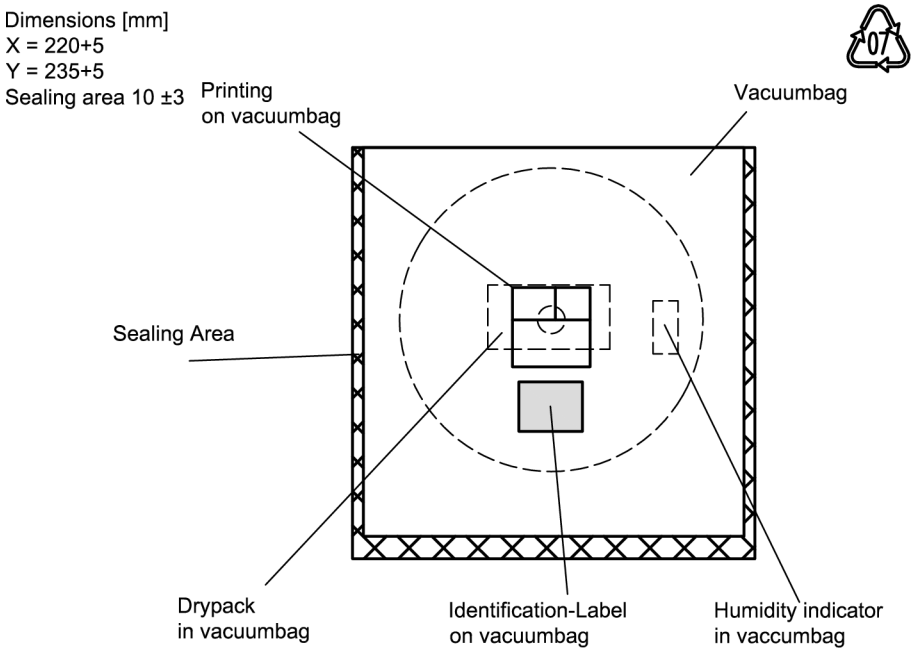

Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

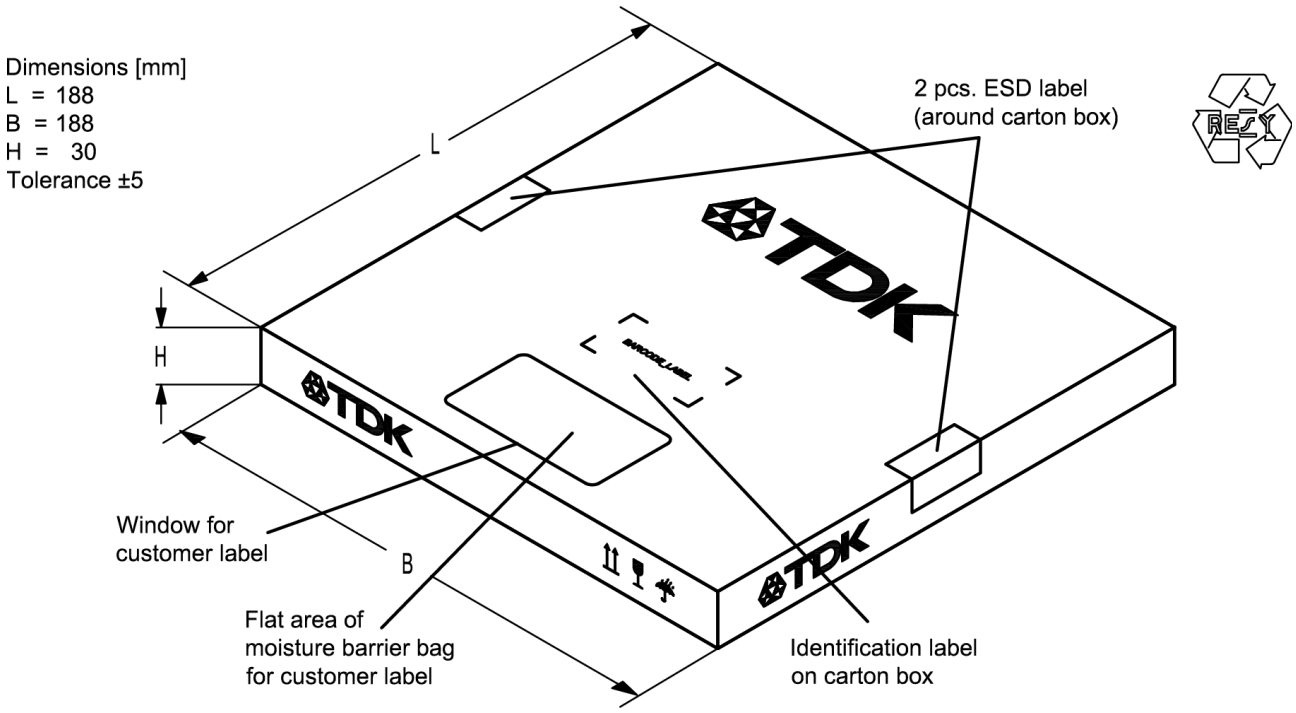

Figure 13: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm

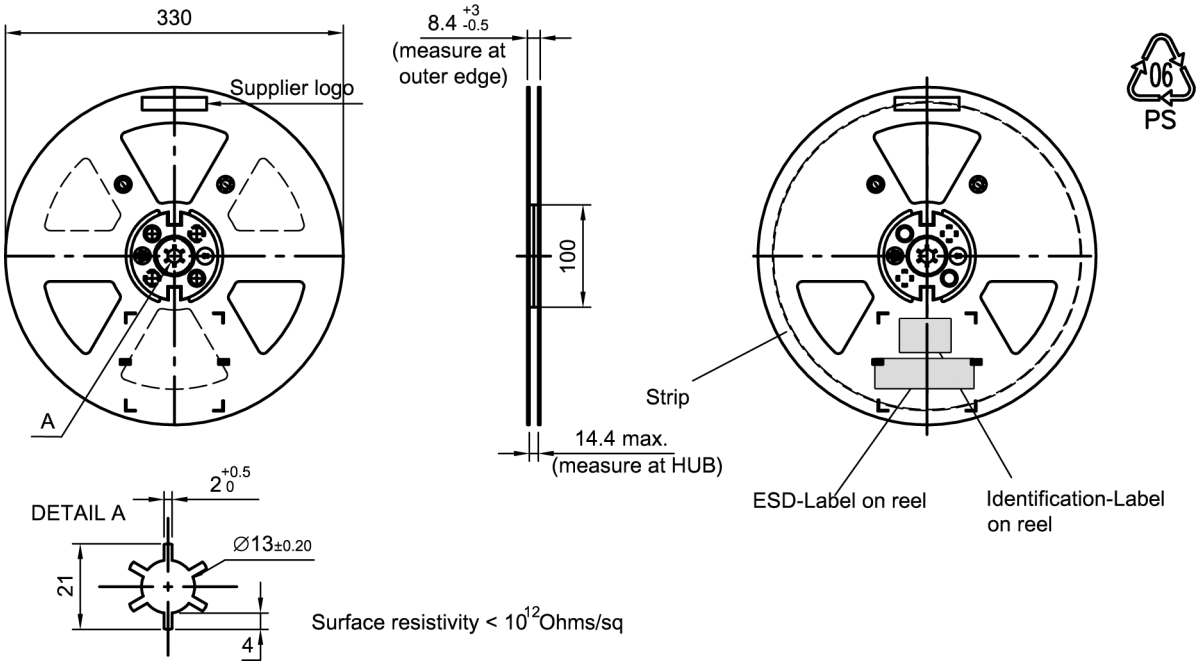

Figure 14: Drawing of reel (first-angle projection) with diameter of 330 mm.

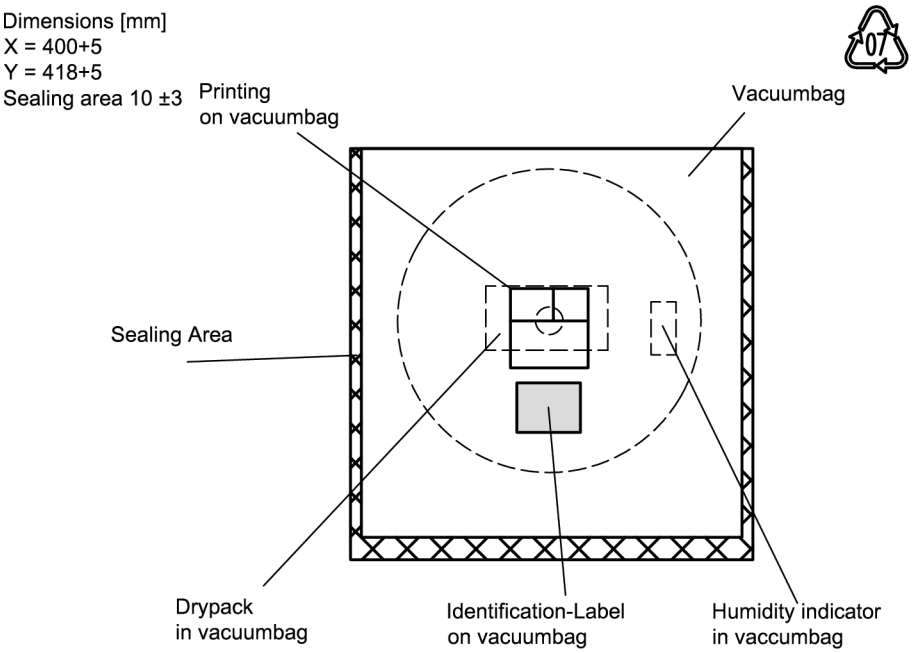

Figure 15: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

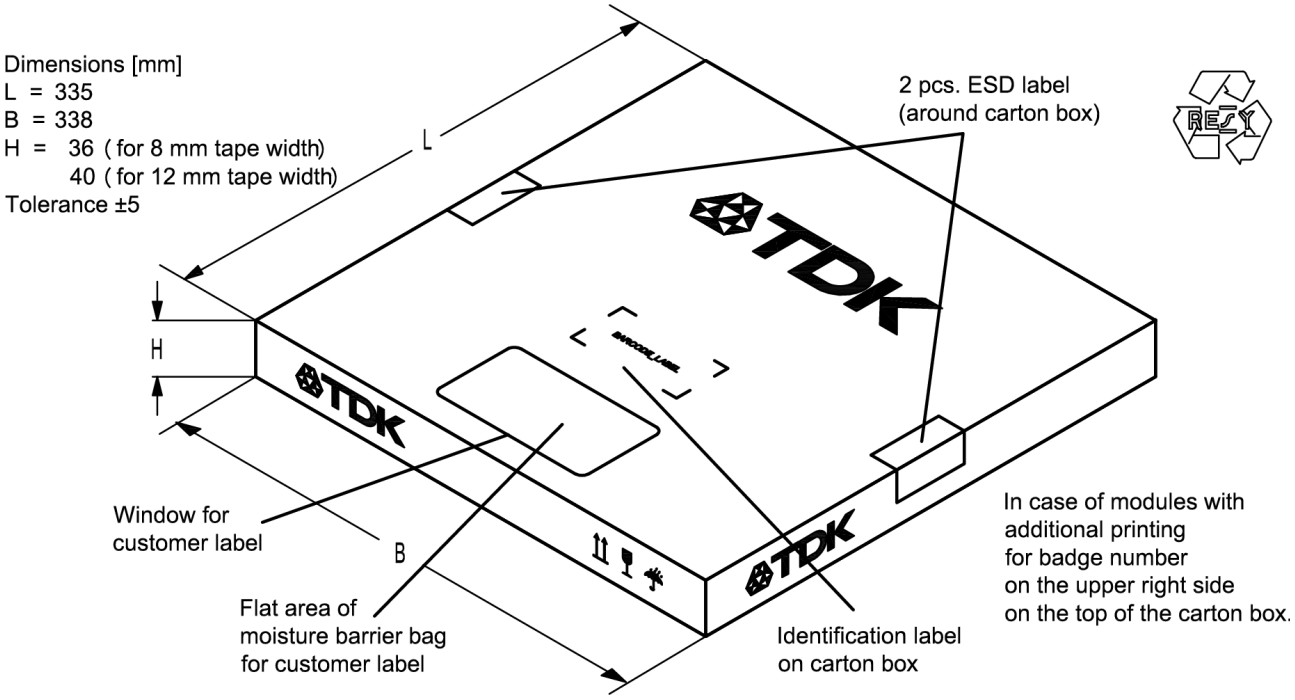

Figure 16: Drawing of folding box for reel with diameter of 330 mm.

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 B8576 is 8C0.

■ 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).

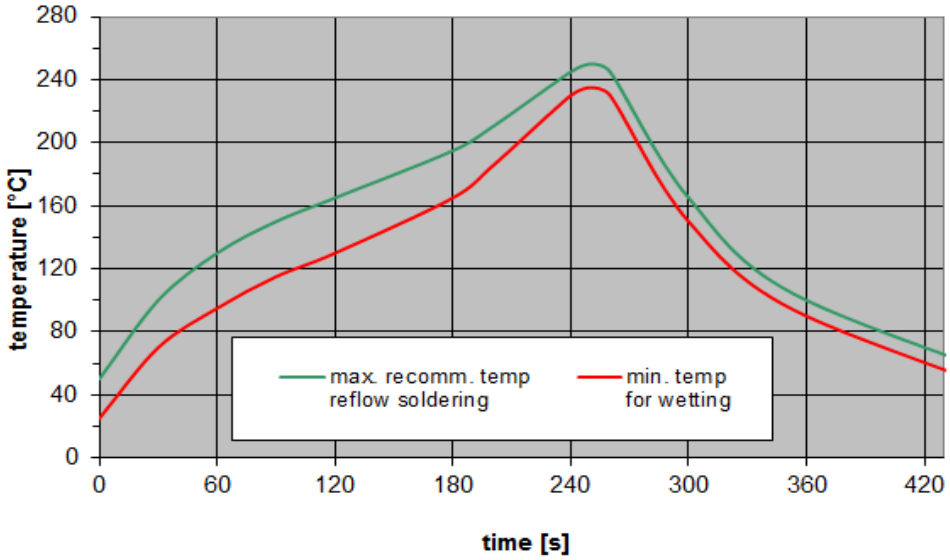

Figure 17: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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 Power Transfer Function (PTF) of WCDMA signal

Attenuation of WCDMA signal, α_{WCDMA}, is defined by

$$\alpha_{\mathrm{WCDMA}}(f_{\mathrm{carrier}}) = 10\log_{10}\left|\frac{1}{\mathrm{PTF}(f_{\mathrm{carrier}})}\right| \mathrm{dB}$$

and

$$\mathrm{PTF}(f_{\mathrm{carrier}}) = \int_{-\infty}^{+\infty} \left|S_{21}(f)\, H_{\mathrm{RRC}}(f - f_{\mathrm{carrier}})\right|^2 \mathrm{d}\, f$$

with $f_{carrier}$ according to 3GPP TS 25.101 (e.g., for the WCDMA B8 pass band, $f_{carrier}$ ranges from 882.4 MHz to 912.6 MHz which correspond to the lowest and highest TX channels, respectively). $H_{RRC}(f)$ is the transfer function of the root-raised cosine transmit pulse shaping filter according to 3GPP TS 25.101 using the normalization

$$\int_{-\infty}^{+\infty} \left|H_{\mathrm{RRC}}(f)\right|^2 \mathrm{d}\, f = 1 \quad .$$

13.3 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.

13.4 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.

13.5 Ordering code and packing units

Ordering code	Packing units
B39881B8576P810	15000 pcs
B39881B8576P810S 5	5000 pcs

Table 4: Ordering codes and packing units.

14 Cautions and warnings

14.1 Moldability

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

14.2 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).

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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P.O. Box 80 17 09, 81617 Munich, GERMANY

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