SAW Components

SAW Rx 2in1 Input Diplex Filter
WCDMA / LTE Bands 1 & 3

Series/type:	B9926
Ordering code:	B39212B9926P810
Date:	August 06, 2015
Version:	2.0

EPCOS AG is a TDK Group Company.

Table of contents

1 Application

- Low-loss 2in1 RF filter, LTE Band 1 and Band 3 for carrier aggregation, receive path (Rx).
- This is also for WCDMA Band 1 and Band 3.
- Usable pass bands:.
- Filter 1 (LTE / WCDMA Band 1): 60 MHz.
- Filter 2 (LTE / WCDMA Band 3): 75 MHz.
- Impedance transformation from 50Ω to 50Ω for both filters.
- Unbalanced to unbalanced operation for both filters.

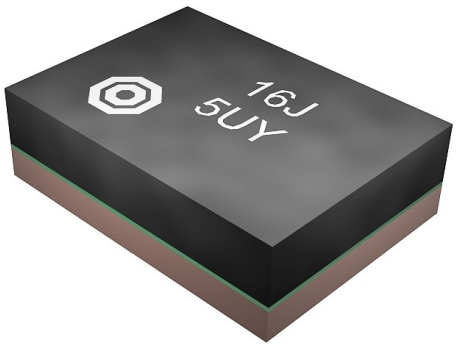

Figure 1: Picture of component with example of marking.

2 Features

- Package size 1.5 mm × 1.1 mm.
- Package height 0.45 mm.
- Approximate weight 0.003 g.
- RoHS compatible.
- Package for Surface Mount Technology (SMT).
- Ni, gold-plated terminals.
- Electrostatic Sensitive Device (ESD).
- Moisture Sensitivity Level 3 (MSL3).

3 Package

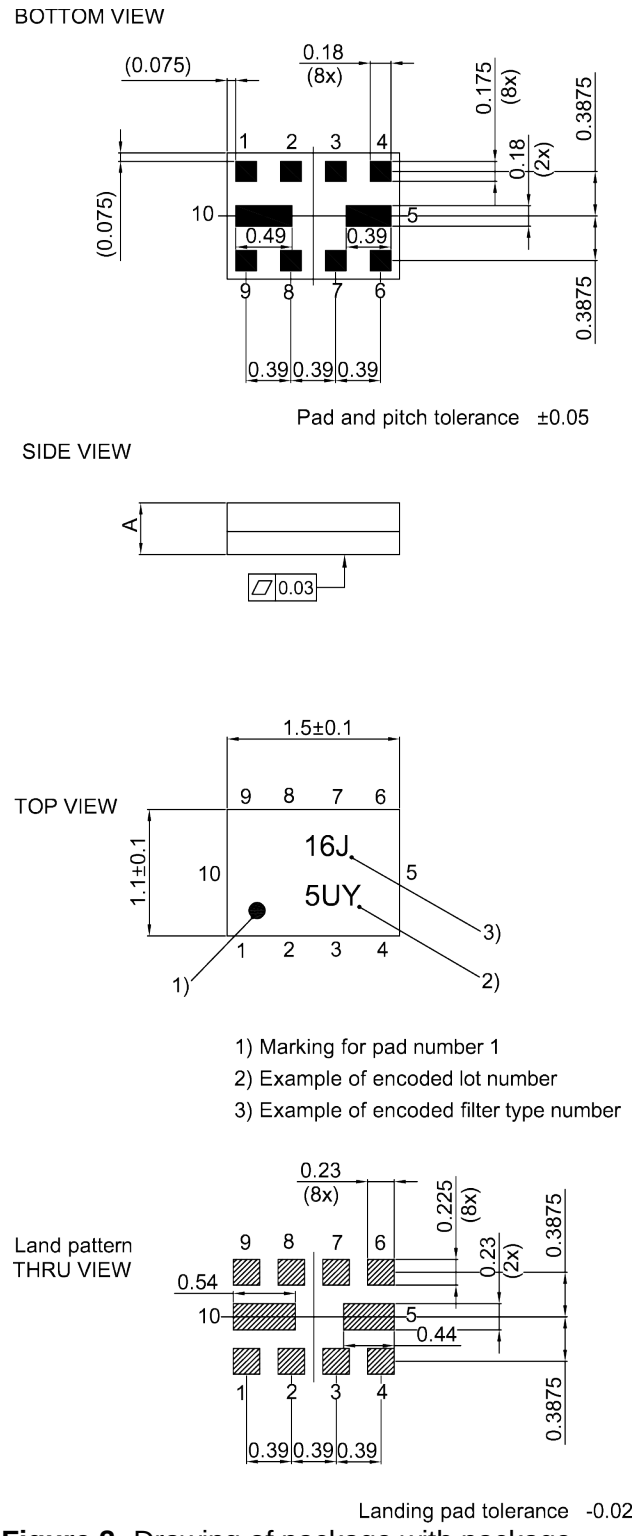

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Simplified drawings (p. 23).

4 Pin configuration

- 1 Input (WCDMA / LTE B1 & B3)
- 6 Output (WCDMA / LTE B1)
- 9 Output (WCDMA / LTE B3)
- 2, 3, 4, 5, 7, 8, 10 Ground

5 Matching circuit

- L_{p1} = 3.7 nH
- L_{s9} = 2.8 nH
- L_{s6} = 1.5 nH

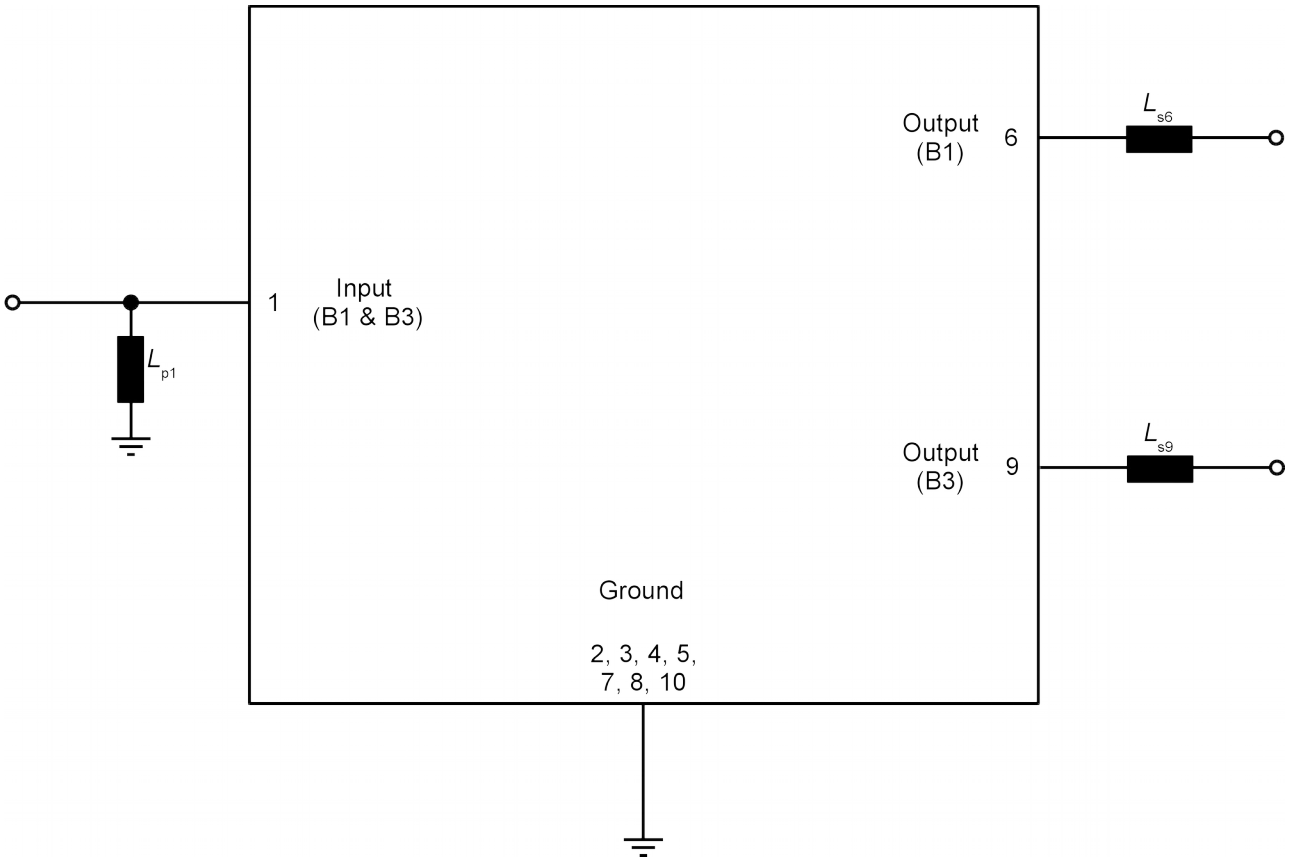

Figure 3: Schematic of matching circuit.

6 Characteristics WCDMA / LTE B1

Temperature range for specification T = −30 °C to +85 °C
INPUT terminating impedance Z_{INPUT} = 50 Ω with par. 3.7 nH
B1 Rx terminating impedance $Z_{B1\ Rx}$ = 50 Ω with ser. 1.5 nH
B3 Rx terminating impedance $Z_{B3\ Rx}$ = 50 Ω with ser. 2.8 nH

Characteristics WCDMA / LTE B1				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	2140	—	MHz
Maximum insertion attenuation			α_{max}				
	2110... 2170	MHz		—	2.00[1)]	2.40[1)]	dB
	2110... 2170	MHz		—	2.00[2)]	2.40[2)]	dB
	2110... 2170	MHz		—	2.00	2.40	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	2110... 2170	MHz		—	0.50[2)]	1.00[2)]	dB
	2110... 2170	MHz		—	0.50	1.00	dB
Maximum VSWR			$VSWR_{max}$				
	2110... 2170	MHz		—	1.4	2.0	
Maximum error vector magnitude			EVM_{max} [3)]				
	2112.74... 2167.26	MHz		—	1.7	4.0	%
Minimum attenuation							
	10... 1710	MHz	α_{min}	40.0	48.0	—	dB
	188... 192	MHz	α_{min}	50.0	70.0	—	dB
	398... 402	MHz	α_{min}	50.0	70.0	—	dB
	699... 716	MHz	α_{min}	40.0	60.0	—	dB
	777... 787	MHz	α_{min}	40.0	58.0	—	dB
	814... 849	MHz	α_{min}	40.0	58.0	—	dB
	880... 915	MHz	α_{min}	40.0	57.0	—	dB
	1710... 1785	MHz	α_{min}	43.0	51.0	—	dB
@$f_{carrier}$	1712.64... 1782.36	MHz	$\alpha_{WCDMA,min}$ [4)]	43.0	51.0	—	dB
	1785... 1920	MHz	α_{min}	40.0	46.0	—	dB
	1920... 1980	MHz	α_{min}	42.0	49.0	—	dB
@$f_{carrier}$	1922.74... 1977.26	MHz	$\alpha_{WCDMA,min}$ [4)]	42.0	49.0	—	dB
	2015... 2075	MHz	α_{min}	11.0	31.0	—	dB
	2255... 2400	MHz	α_{min}	38.0	41.0	—	dB

Characteristics WCDMA / LTE B1				min.	typ. @+25 °C	max.	
2400... 2500	MHz	α_{min}		38.0	43.0	—	dB
4900... 5950	MHz	α_{min}		40.0	47.0	—	dB

1) Valid for temperature T = −20 °C...+85 °C.
2) Valid for temperature T = +23 °C...+27 °C.
3) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.
4) Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 23).

7 Characteristics WCDMA / LTE B3

Temperature range for specification T = −30 °C to +85 °C
INPUT terminating impedance Z_{INPUT} = 50 Ω with par. 3.7 nH
B1 Rx terminating impedance $Z_{B1\ Rx}$ = 50 Ω with ser. 1.5 nH
B3 Rx terminating impedance $Z_{B3\ Rx}$ = 50 Ω with ser. 2.8 nH

Characteristics WCDMA / LTE B3				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	1842.5	—	MHz
Maximum insertion attenuation			α_{max}				
	1805 ... 1880	MHz		—	2.00[1]	3.50[1]	dB
	1805 ... 1880	MHz		—	2.00[2]	2.70[2]	dB
	1805 ... 1880	MHz		—	2.00	3.50	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	1805 ... 1880	MHz		—	1.20[2]	1.50[2]	dB
	1805 ... 1880	MHz		—	1.20	2.30	dB
Maximum VSWR			$VSWR_{max}$				
@ input port	1805 ... 1880	MHz		—	1.7	2.0	
@ output port	1805 ... 1880	MHz		—	1.7	2.1	
Maximum error vector magnitude			EVM_{max} [3]				
	1807.44 ... 1877.36	MHz		—	2.0	10	%
Minimum attenuation							
	10 ... 1710	MHz	α_{min}	35.0	39.0	—	dB
	93 ... 97	MHz	α_{min}	50.0	70.0	—	dB
	824 ... 849	MHz	α_{min}	40.0	47.0	—	dB
	832 ... 862	MHz	α_{min}	40.0	47.0	—	dB
	880 ... 915	MHz	α_{min}	40.0	46.0	—	dB
	1710.24 ... 1784.76	MHz	α_{min}	35.0	37.0	—	dB
@$f_{carrier}$	1712.64 ... 1782.36	MHz	$\alpha_{WCDMA,min}$ [4]	35.0	37.0	—	dB
	1785 ... 1790	MHz	α_{min}	7.00	39.0	—	dB
	1920 ... 5950	MHz	α_{min}	30.0	35.0	—	dB
	1920.34 ... 1979.66	MHz	α_{min}	39.0	48.0	—	dB
@$f_{carrier}$	1922.74 ... 1977.26	MHz	$\alpha_{WCDMA,min}$ [4]	40.0	48.0	—	dB
	2400 ... 2500	MHz	α_{min}	37.0	41.0	—	dB
	2500 ... 2570	MHz	α_{min}	37.0	40.0	—	dB

Characteristics WCDMA / LTE B3				min.	typ. @+25 °C	max.	
	4900... 5950	MHz	α_{min}	30.0	35.0	—	dB
	5415... 5640	MHz	α_{min}	30.0	35.0	—	dB

1) Valid for temperature T = −20 °C...+85 °C.
2) Valid for temperature T = +23 °C...+27 °C.
3) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.
4) Attenuation of WCDMA signal ("power transfer function"). Please refer to definition of Power Transfer Function (PTF) of WCDMA signal (p. 23).

8 Maximum ratings

Storage temperature	T_{STG} =	−40 °C to +85 °C[1)]	
DC voltage	V_{DC} =	5.0 V (max.)[2)]	
ESD voltage			
	V_{ESD} [3)]	50 V (max.)	Machine model.
	V_{ESD} [4)]	100 V (max.)	Human body model.
	V_{ESD} [5)]	600 V (max.)	Charged device model.
Input power	P_{IN}		
@ input port: 1710.24 ... 1784.76 MHz		15 dBm	Continuous wave for 2000 h @ 50 °C.
@ input port: 1920.34 ... 1979.66 MHz		15 dBm	Continuous wave for 2000 h @ 50 °C.

1) Extended upperlimit: 96@125°C acc. To IEC 60068-2-2 Bb.
2) 168h Damp Heat Steady State acc. IEC 60068-2-67 Cy.
3) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
4) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
5) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

9 Transmission coefficient WCDMA / LTE B1

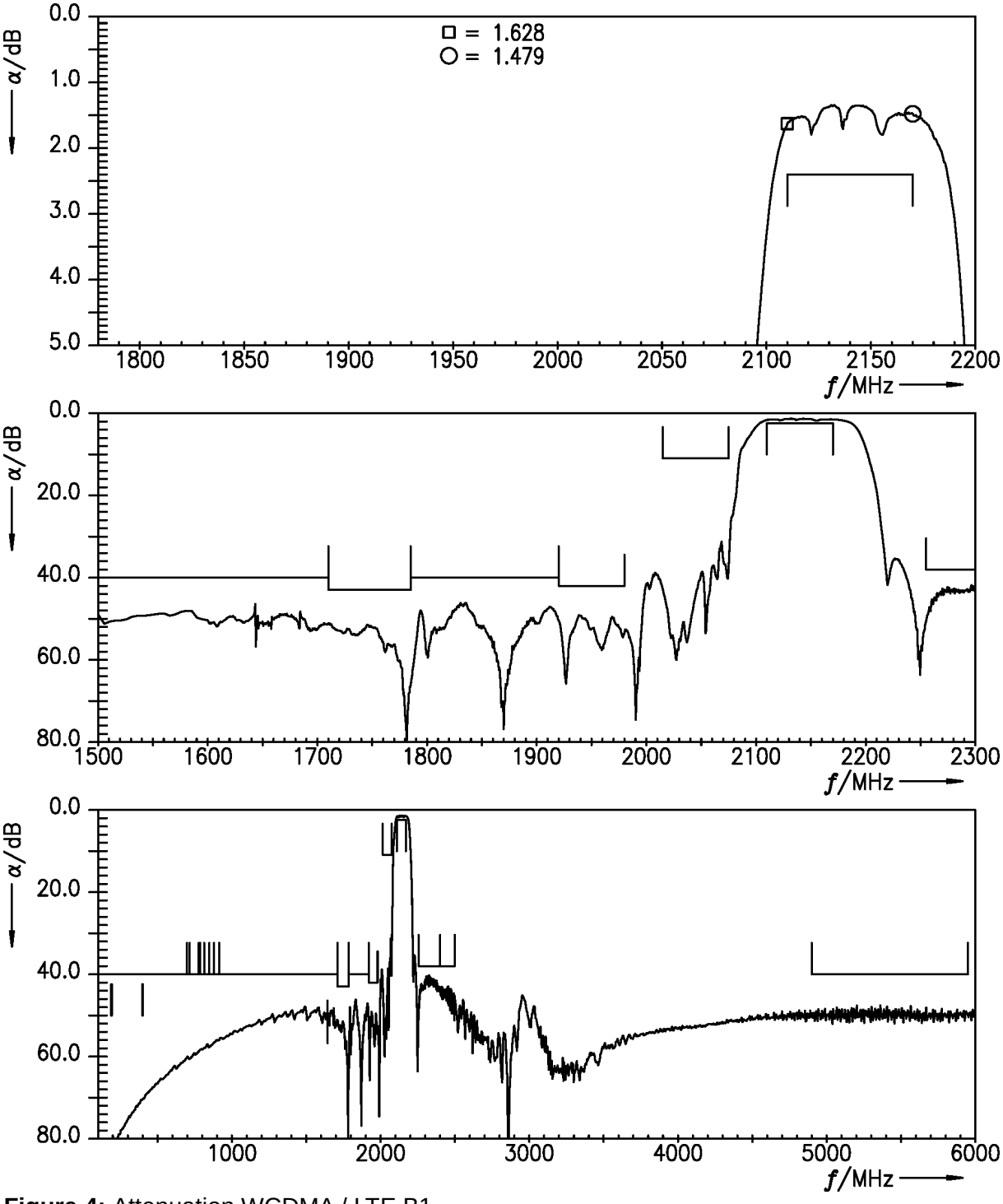

Figure 4: Attenuation WCDMA / LTE B1.

10 Reflection coefficients WCDMA / LTE B1

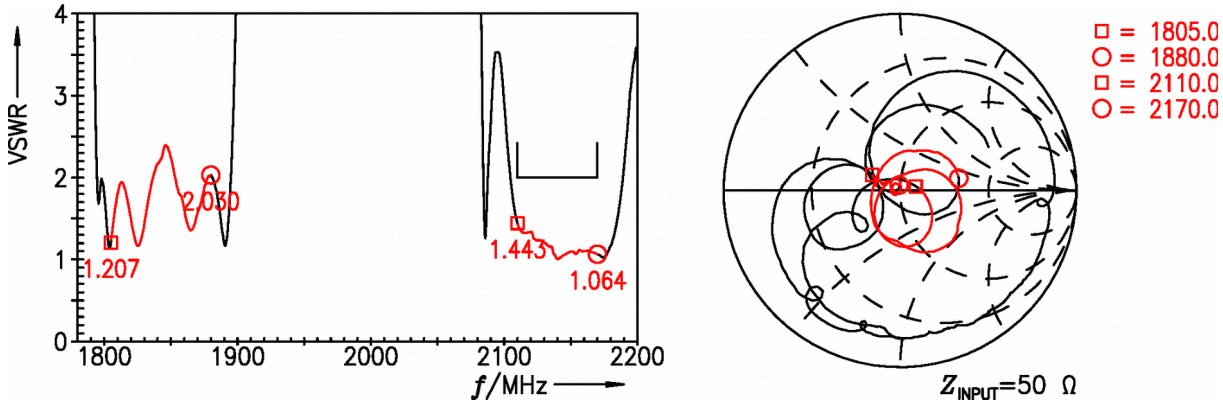

Figure 5: Reflection coefficient WCDMA / LTE B1 at IN port.

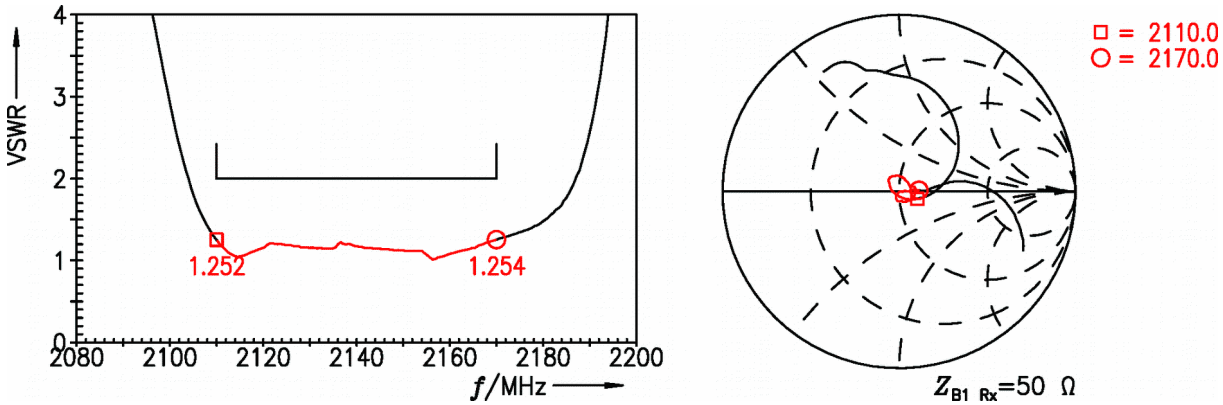

Figure 6: Reflection coefficient WCDMA / LTE B1 at OUT port.

11 EVM WCDMA / LTE B1

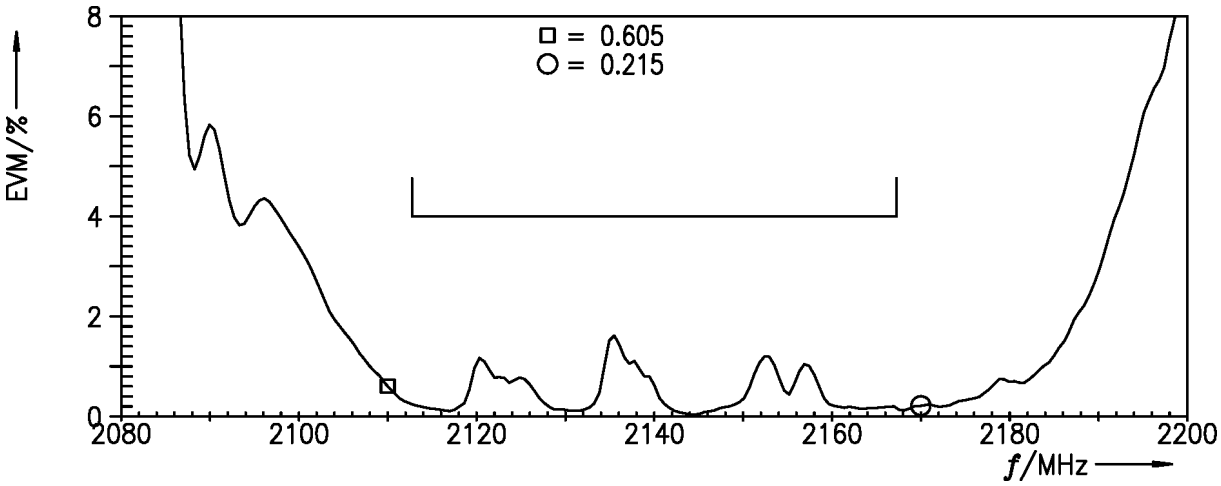

Figure 7: Error vector magnitude WCDMA / LTE B1.

12 Transmission coefficient WCDMA / LTE B3

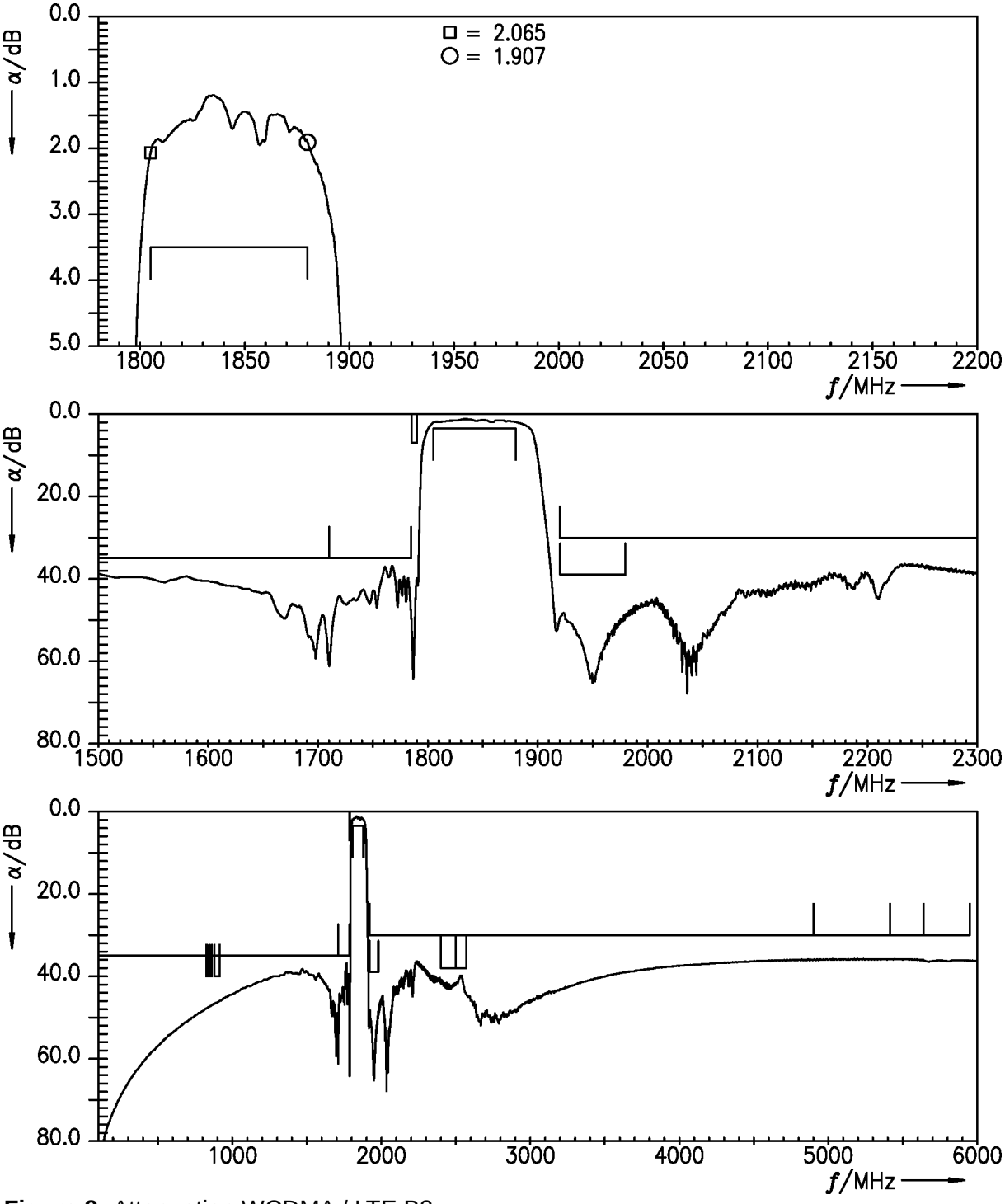

Figure 8: Attenuation WCDMA / LTE B3.

13 Reflection coefficients WCDMA / LTE B3

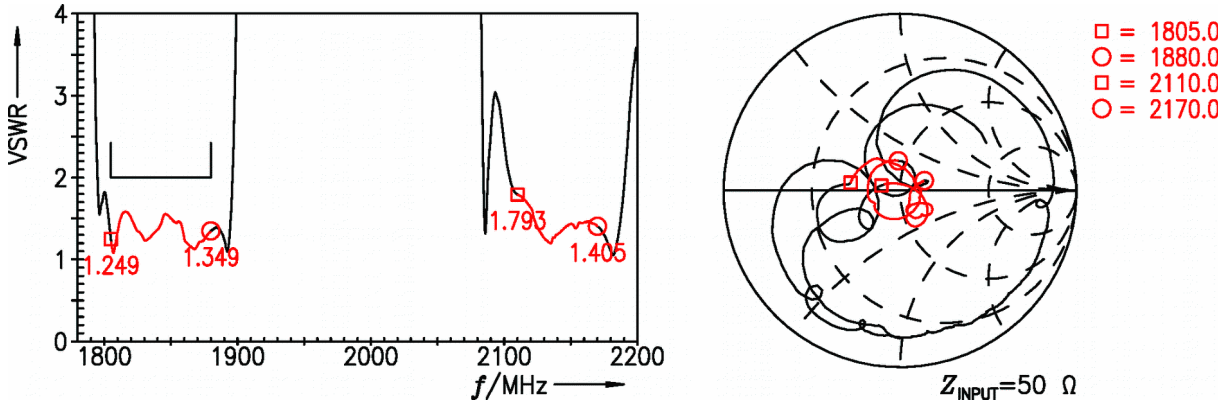

Figure 9: Reflection coefficient WCDMA / LTE B3 at IN port.

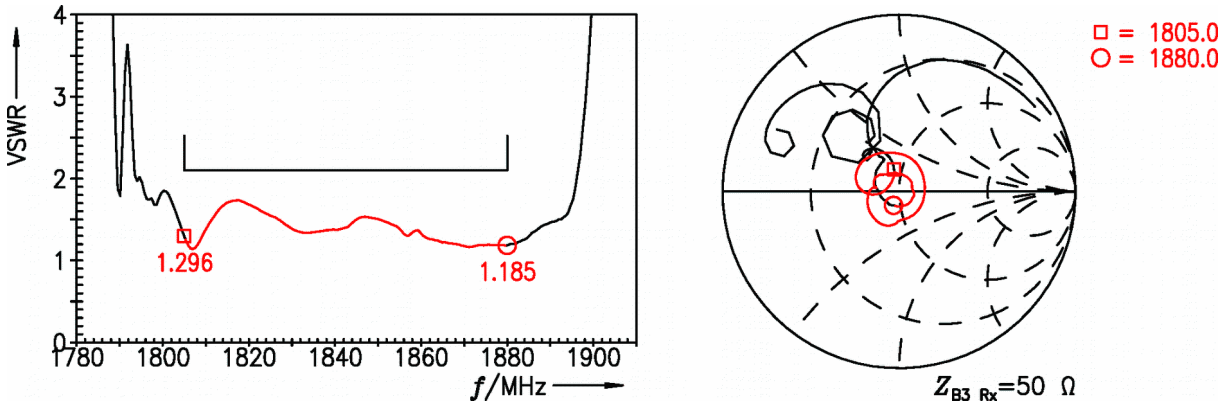

Figure 10: Reflection coefficient WCDMA / LTE B3 at OUT port.

14 EVM WCDMA / LTE B3

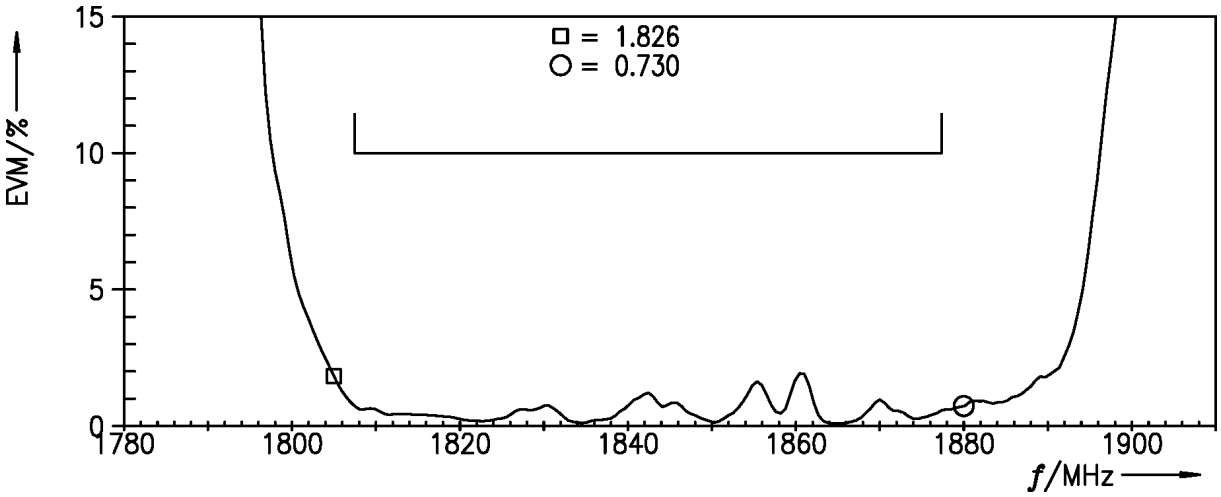

Figure 11: Error vector magnitude WCDMA / LTE B3.

15 Packing material

15.1 Tape

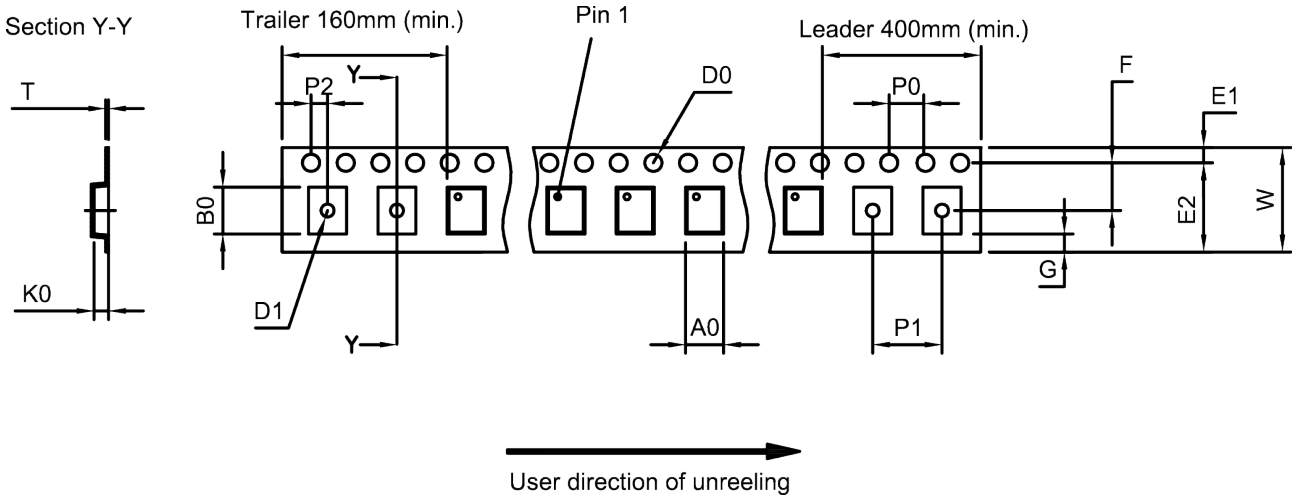

Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$1.27_{\pm 0.05}$ mm
B_0	$1.67_{\pm 0.05}$ mm
D_0	$1.5_{+0.1/-0}$ mm
D_1	$0.5_{\pm 0.1}$ 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	$0.55_{\pm 0.05}$ 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.

15.2 Reel with diameter of 180 mm

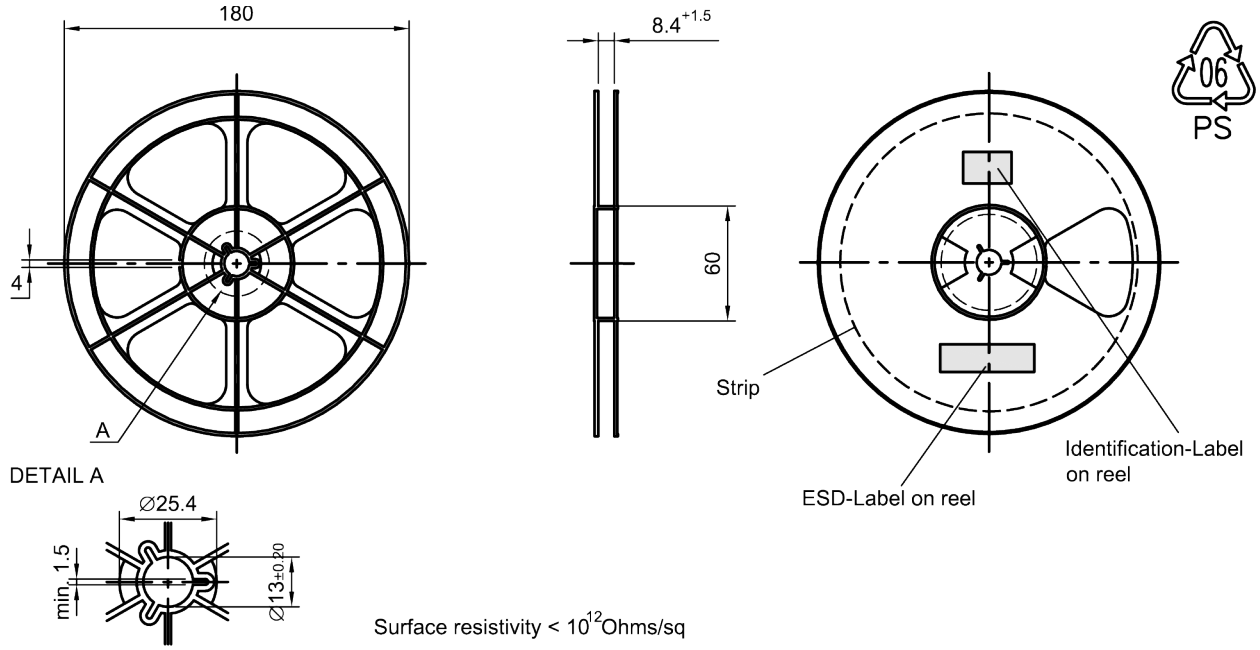

Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

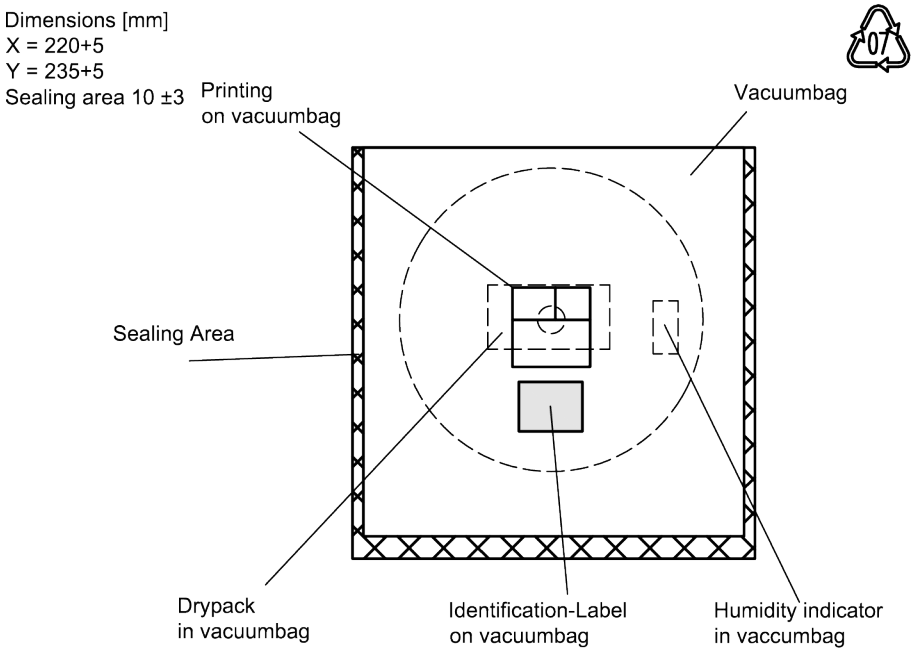

Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

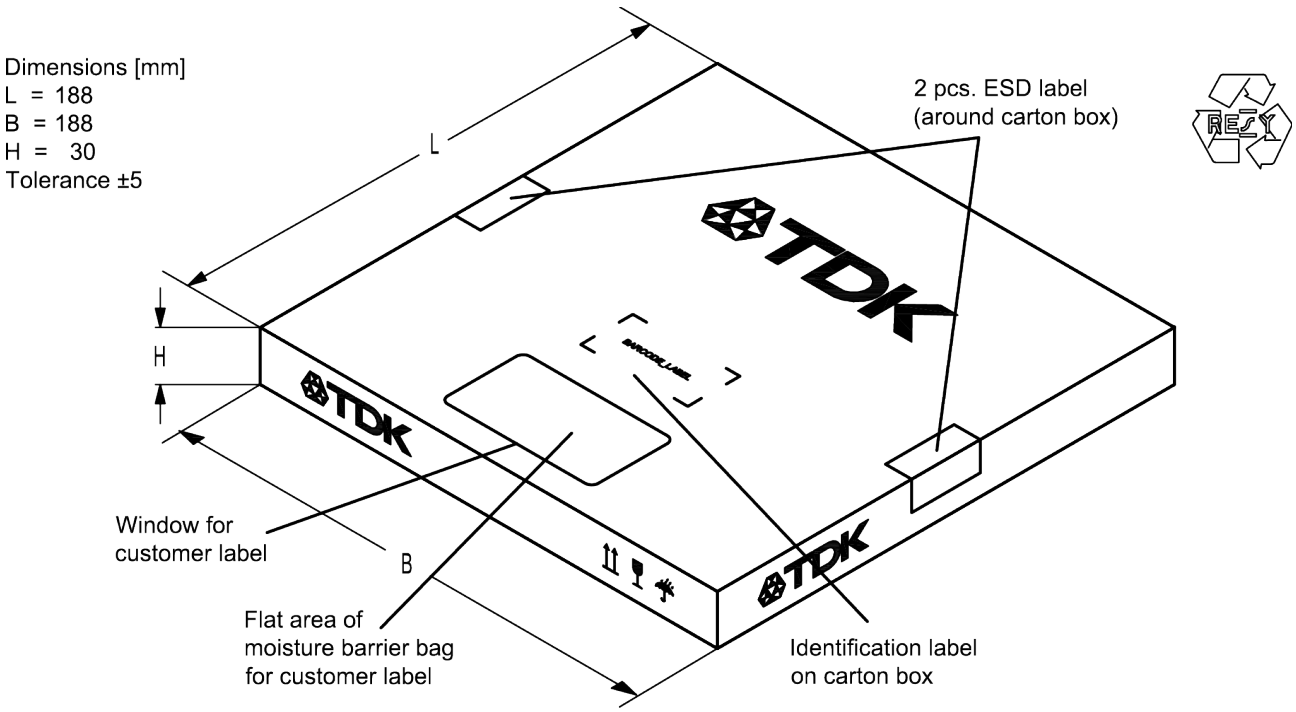

Figure 15: Drawing of folding box for reel with diameter of 180 mm.

15.3 Reel with diameter of 330 mm

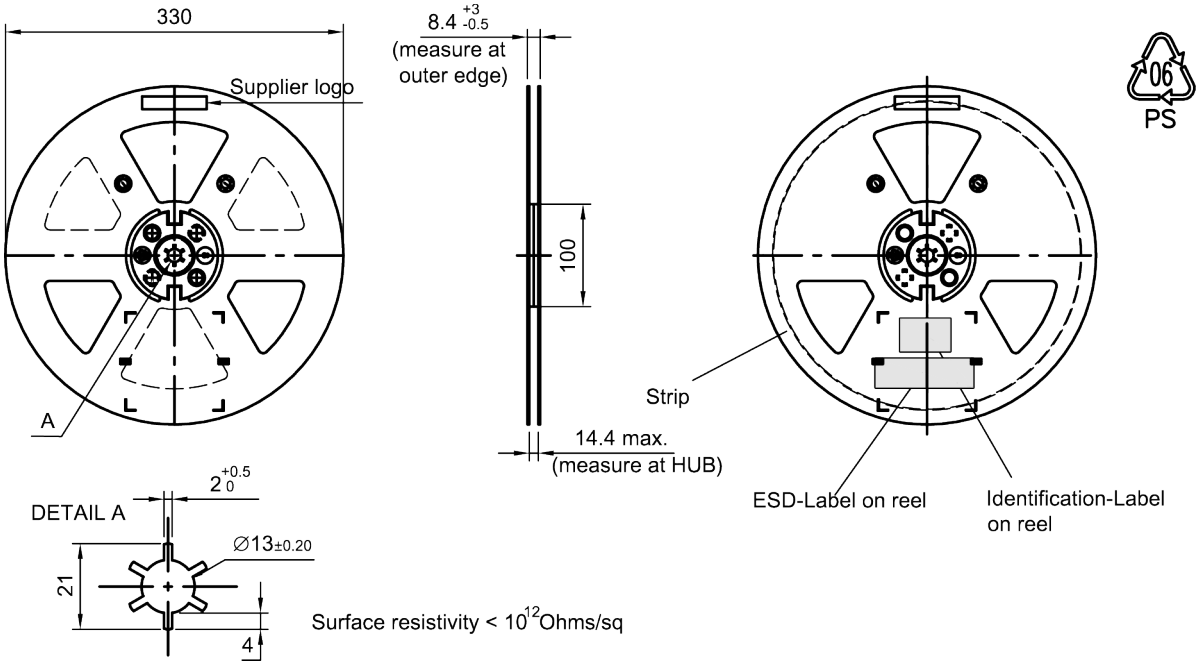

Figure 16: Drawing of reel (first-angle projection) with diameter of 330 mm.

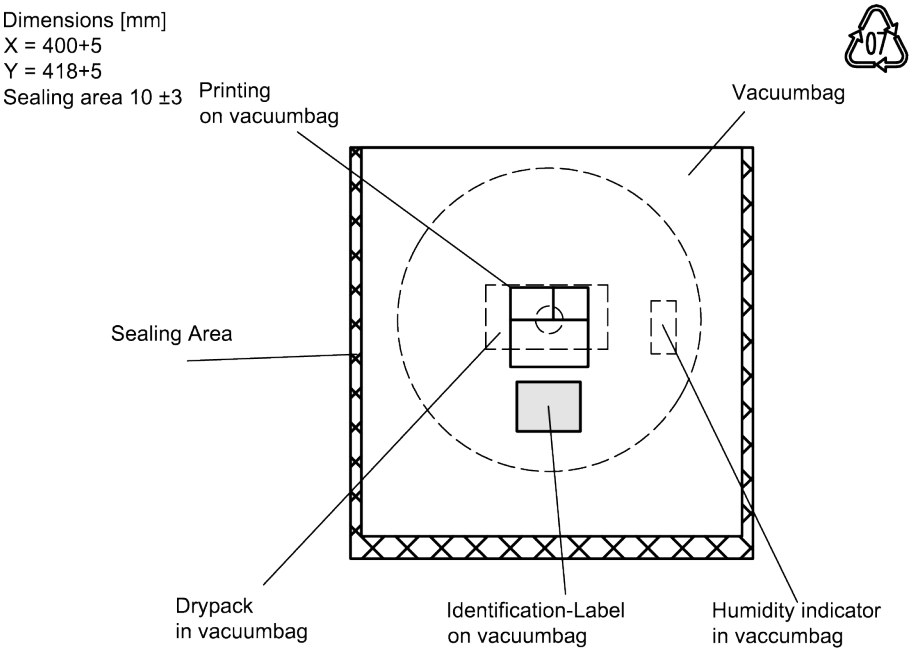

Figure 17: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

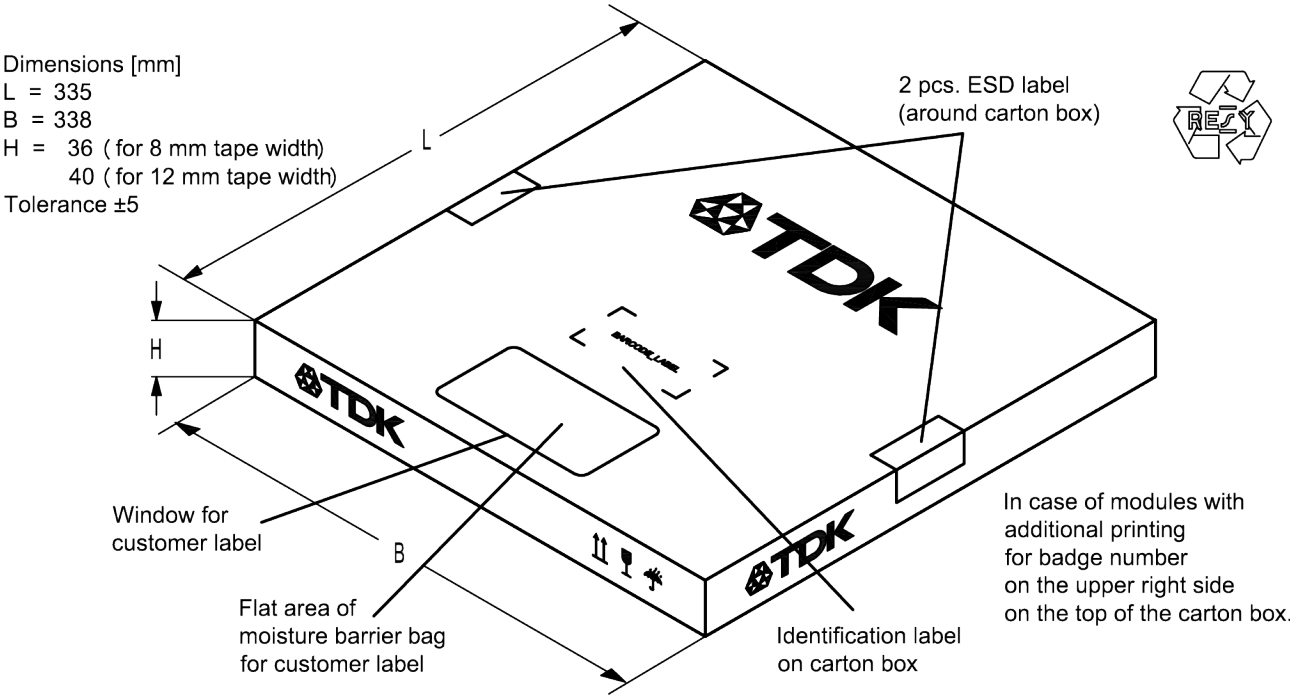

Figure 18: Drawing of folding box for reel with diameter of 330 mm.

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 B9926 is 9P6.

- 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).

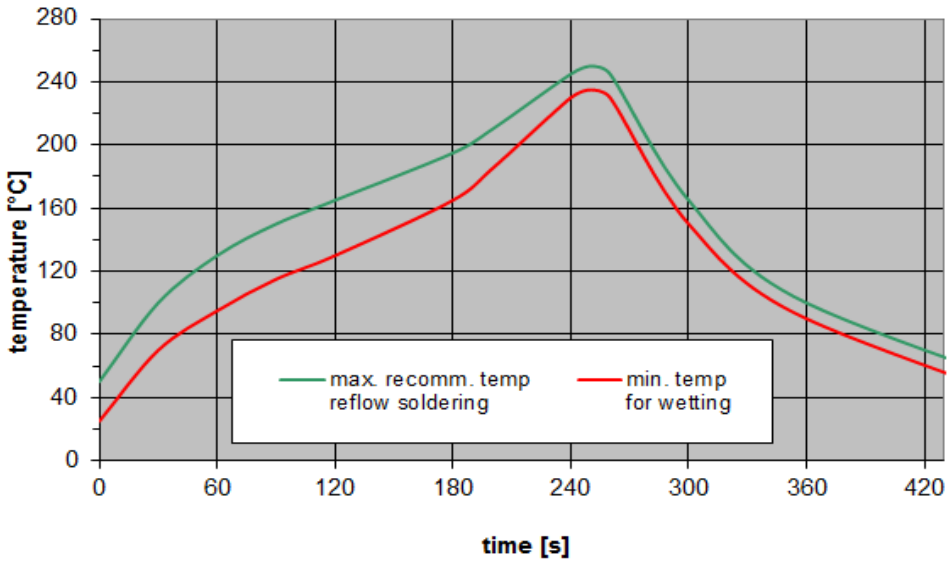

Figure 19: Recommended reflow profile for convection and infrared soldering – lead-free solder.

18 Annotations

18.1 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.

18.2 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

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

18.3 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.

18.4 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.

18.5 Ordering code and packing units

Ordering code	Packing units
B39212B9926P810	15000 pcs
B39212B9926P810S 5	5000 pcs

Table 4: Ordering codes and packing units.

19 Cautions and warnings

19.1 Moldability

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

19.2 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.

Published by EPCOS AG
Systems, Acoustics, Waves Business Group
P.O. Box 80 17 09, 81617 Munich, GERMANY

For questions on technology, prices and delivery please contact the sales offices of EPCOS AG or the international representatives.

Due to technical requirements components may contain dangerous substances. For information on the type in question please also contact one of our sales offices.

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, EPCOS is 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 EPCOS 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.epcos.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.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, Alu-X, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PQSine, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, TFAP, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.

单击下面可查看定价，库存，交付和生命周期等信息

>>Qualcomm-RF360