SAW components

SAW duplexer for smallcell
LTE band 4

Series/type:	B8033
Ordering code:	B39212B8033P810
Date:	February 17, 2016
Version:	2.0

Table of contents

1 Application

- Low-loss SAW duplexer for LTE smallcell system (Band 4)
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 45MHz
- High power durability in downlink
- TX=DOWNLINK=2110-2155MHz
- RX=UPLINK=1710-1755MHz

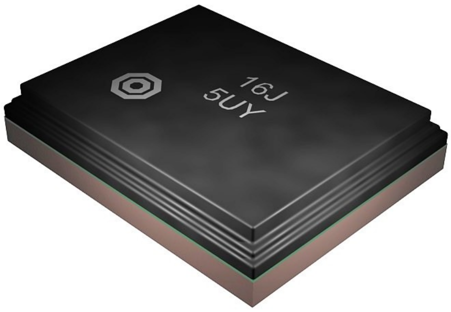

Figure 1: Picture of component with example of product marking.

2 Features

- Package size 2.5±0.1 mm × 2.0±0.1 mm
- Package height 0.5 mm (max.)
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)

3 Package

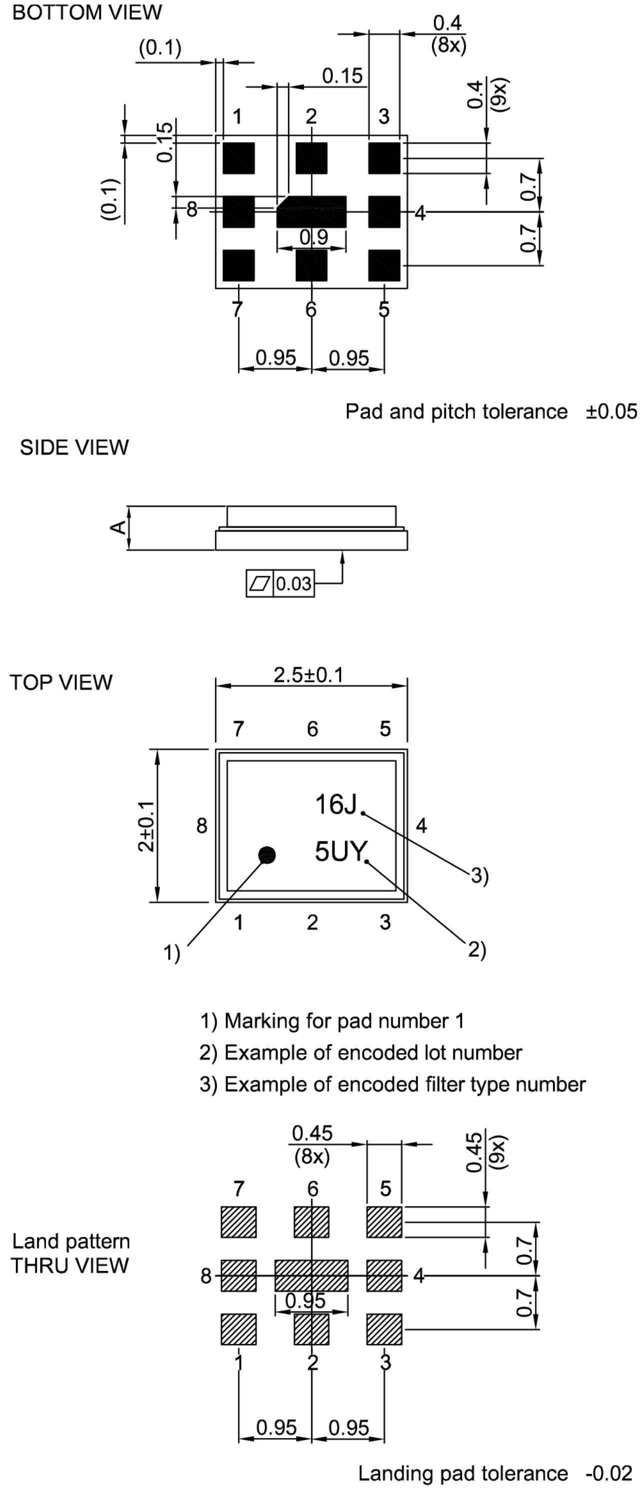

Figure 2: Drawing of package with package height A = 0.5 mm (max.). See Simplified drawings (p. 21).

4 Pin configuration

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

5 Matching circuit

- L_{p6} = 3.3 nH

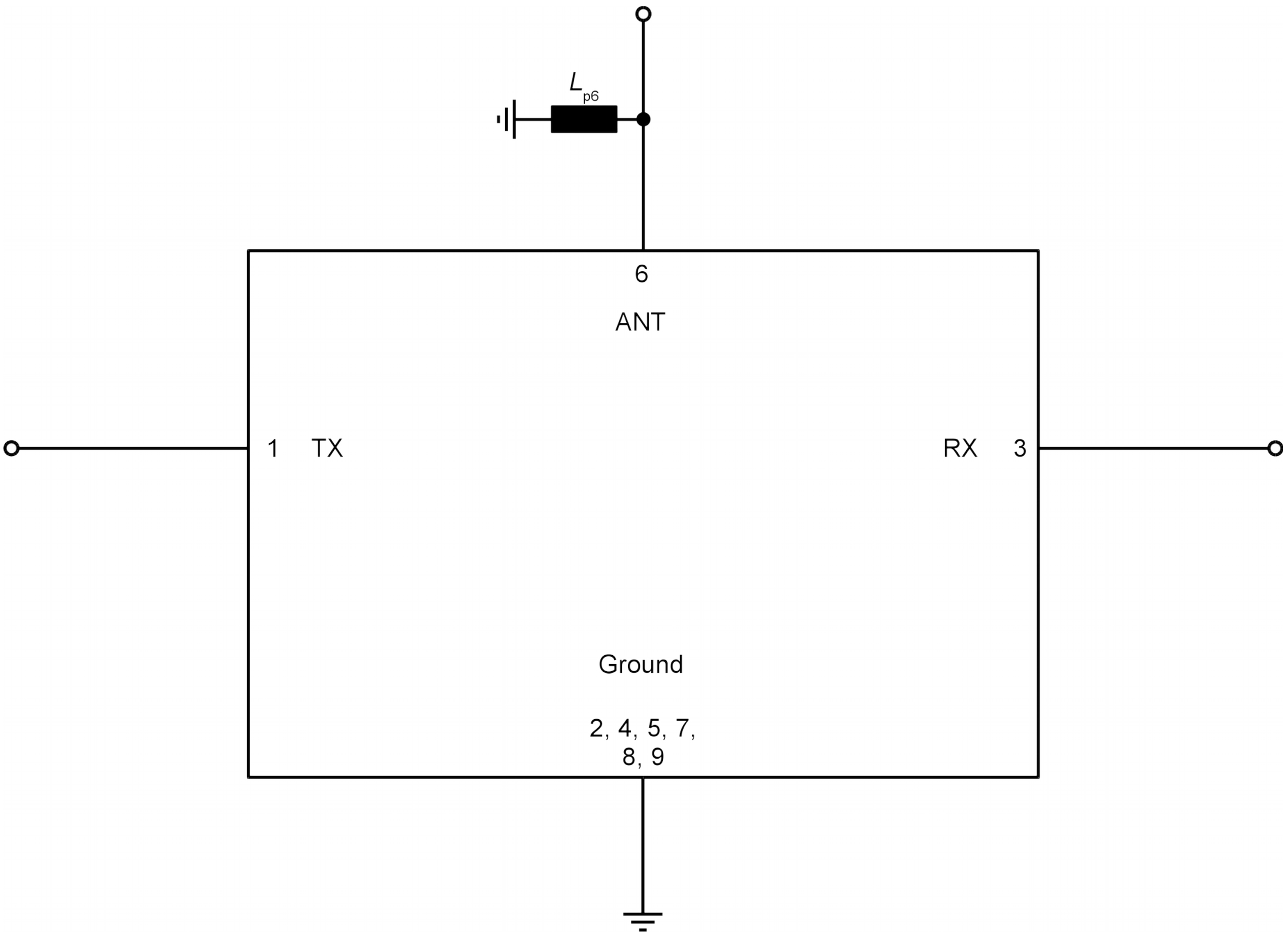

Figure 3: Schematic of matching circuit.

6 Characteristics

6.1 TX – ANT

Temperature range for specification	T	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – ANT				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	2132.5	—	MHz
Maximum insertion attenuation			α_{max}				
	2110 ... 2155	MHz		—	1.7	2.4	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	2110 ... 2155	MHz		—	0.3	1.0	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	2110 ... 2155	MHz		—	1.3	2.0	
@ ANT port	2110 ... 2155	MHz		—	1.3	2.1	
Maximum error vector magnitude			EVM_{max} [2)]				
	2112.4 ... 2152.6	MHz		—	1.2	3.0	%
Minimum attenuation			α_{min}				
	50 ... 1574	MHz		30	38	—	dB
	1574 ... 1606	MHz		35	44	—	dB
	1606 ... 1710	MHz		35	47	—	dB
	1710 ... 1755	MHz		38	47	—	dB
	1830 ... 1875	MHz		28	33	—	dB
	1875 ... 1910	MHz		20	31	—	dB
	1920 ... 2050	MHz		17	27	—	dB
	2180 ... 2200	MHz		2	7	—	dB
	2200 ... 2300	MHz		15	39	—	dB
	2300 ... 2400	MHz		30	33	—	dB
	2400 ... 2500	MHz		28	31	—	dB
	2500 ... 2690	MHz		23	27	—	dB
	2690 ... 3400	MHz		19	22	—	dB
	3400 ... 3800	MHz		10	22	—	dB
	3800 ... 5150	MHz		10	20	—	dB
	5150 ... 5180	MHz		5	20	—	dB

1) See Matching circuit (p. 5).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

6.2 ANT – RX

Temperature range for specification	T	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics ANT – RX				min.	typ. @+25 °C	max.	
Center frequency			f_C	—	1732.5	—	MHz
Maximum insertion attenuation			α_{max}				
	1710 ... 1755	MHz		—	2.1	3.1	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	1710 ... 1755	MHz		—	0.6	1.6	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	1710 ... 1755	MHz		—	1.5	2.0	
@ RX port	1710 ... 1755	MHz		—	1.7	2.1	
Maximum error vector magnitude			EVM_{max} [2)]				
	1712.4 ... 1752.6	MHz		—	1.2	3.0	%
Minimum attenuation			α_{min}				
	50 ... 1500	MHz		40	53	—	dB
	1500 ... 1560	MHz		45	51	—	dB
	1560 ... 1675	MHz		21	37	—	dB
	1675 ... 1680	MHz		15	35	—	dB
	1775 ... 1805	MHz		3	11	—	dB
	1805 ... 1830	MHz		20	42	—	dB
	1830 ... 1880	MHz		34	44	—	dB
	1880 ... 1910	MHz		34	44	—	dB
	1920 ... 1980	MHz		38	44	—	dB
	1980 ... 2110	MHz		20	48	—	dB
	2110 ... 2155	MHz		49	52	—	dB
	2155 ... 2300	MHz		45	50	—	dB
	2300 ... 2500	MHz		38	50	—	dB
	2500 ... 3800	MHz		40	53	—	dB
	3800 ... 4310	MHz		32	42	—	dB
	4310 ... 5265	MHz		29	42	—	dB

1) See Matching circuit (p. 5).
2) Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

6.3 TX – RX

Temperature range for specification	T	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 3.3 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – RX				**min.**	**typ.** @+25 °C	**max.**	
Minimum isolation			α_{min}				
	1710 ... 1755	MHz		45	49	—	dB
	2110 ... 2155	MHz		48	52	—	dB

1) See Matching circuit (p. 5).

7 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +85 °C	
Storage temperature	T_{STG} = −40 °C ... +85 °C	
DC voltage	V_{DC} = 0 V	
ESD voltage	V_{ESD} [1)] = 50 V	Machine model.
	V_{ESD} [2)] = 175 V	Human body model.
Input power @ TX port: 2110 ... 2155 MHz	P_{IN} = 27.4 dBm [3)]	LTE 5MHz downlink for 100000 h @ 55 °C.
elsewhere	P_{IN} = 10 dBm	
Operating lifetime with Output power at antenna		
@ 2110 ... 2155 MHz	Tbd [4)]	Continuous wave for 100000 h @ 55 °C.

1) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.
2) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
3) Time to failure (TTF) according to accelerated power durability test, and wear out models.
4) Values to be determine according to accelerated High Temperating Operating Life (HTOL) models.

8 Transmission coefficients

8.1 TX – ANT

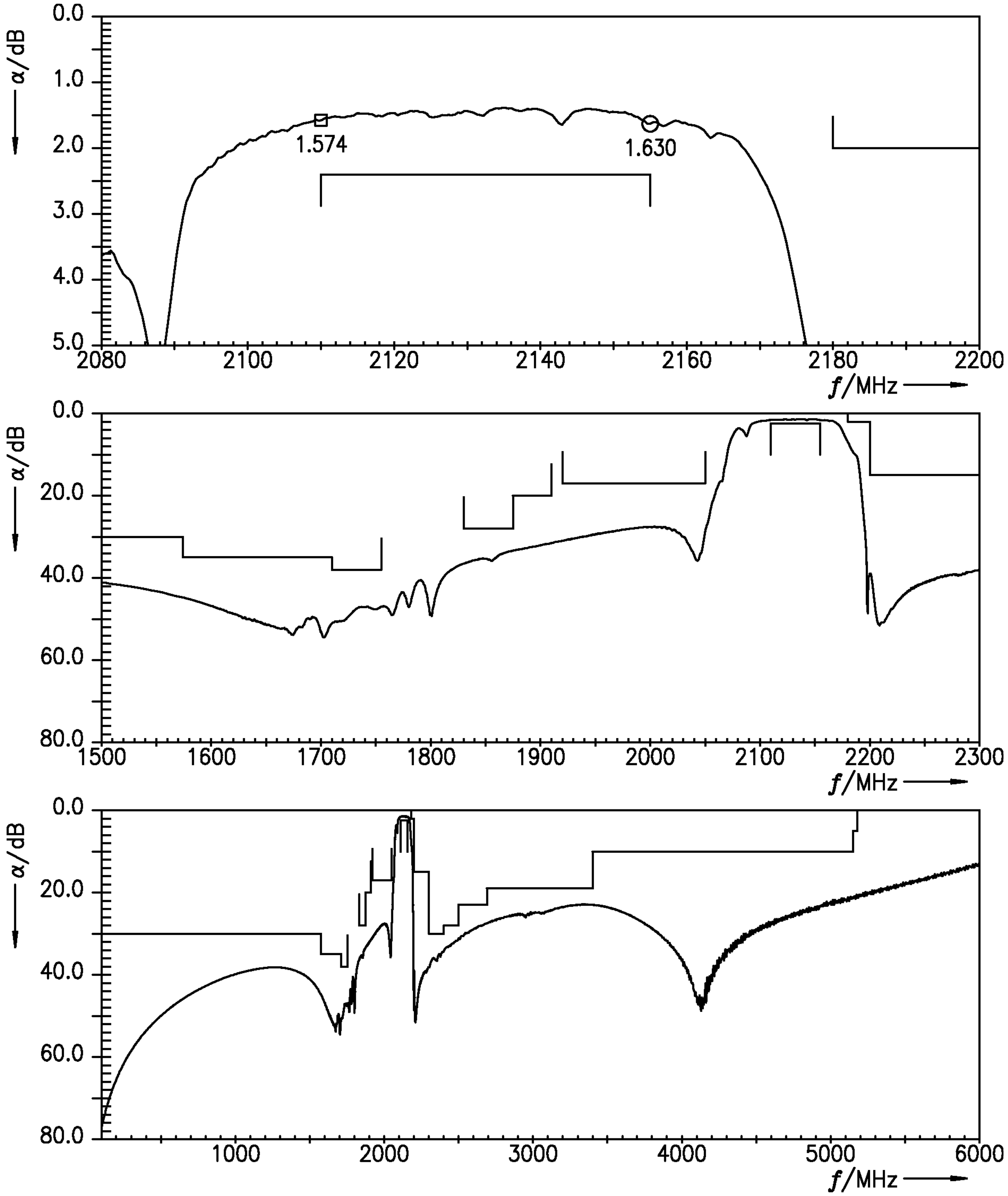

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

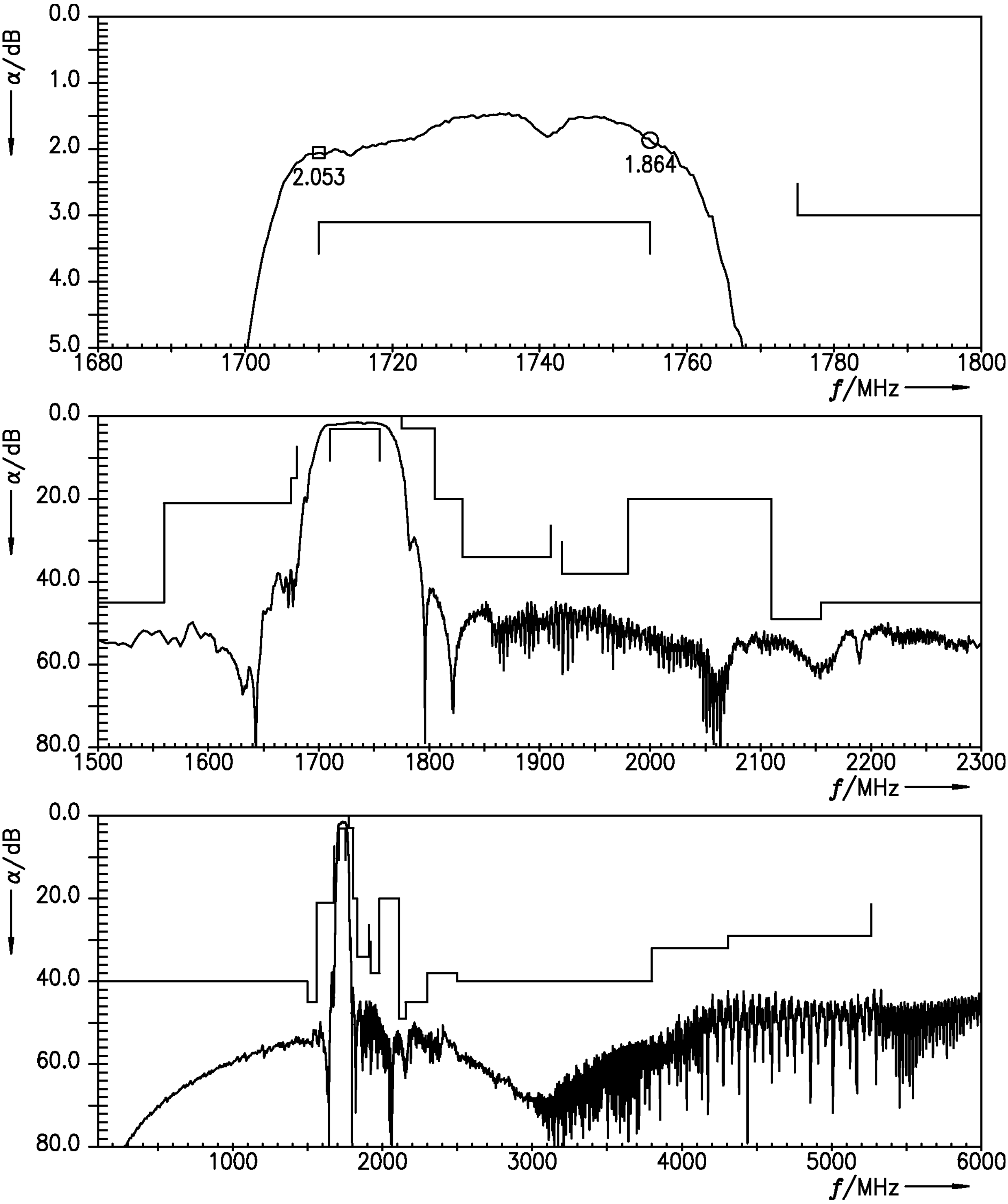

Figure 5: Attenuation ANT – RX.

8.3 TX – RX

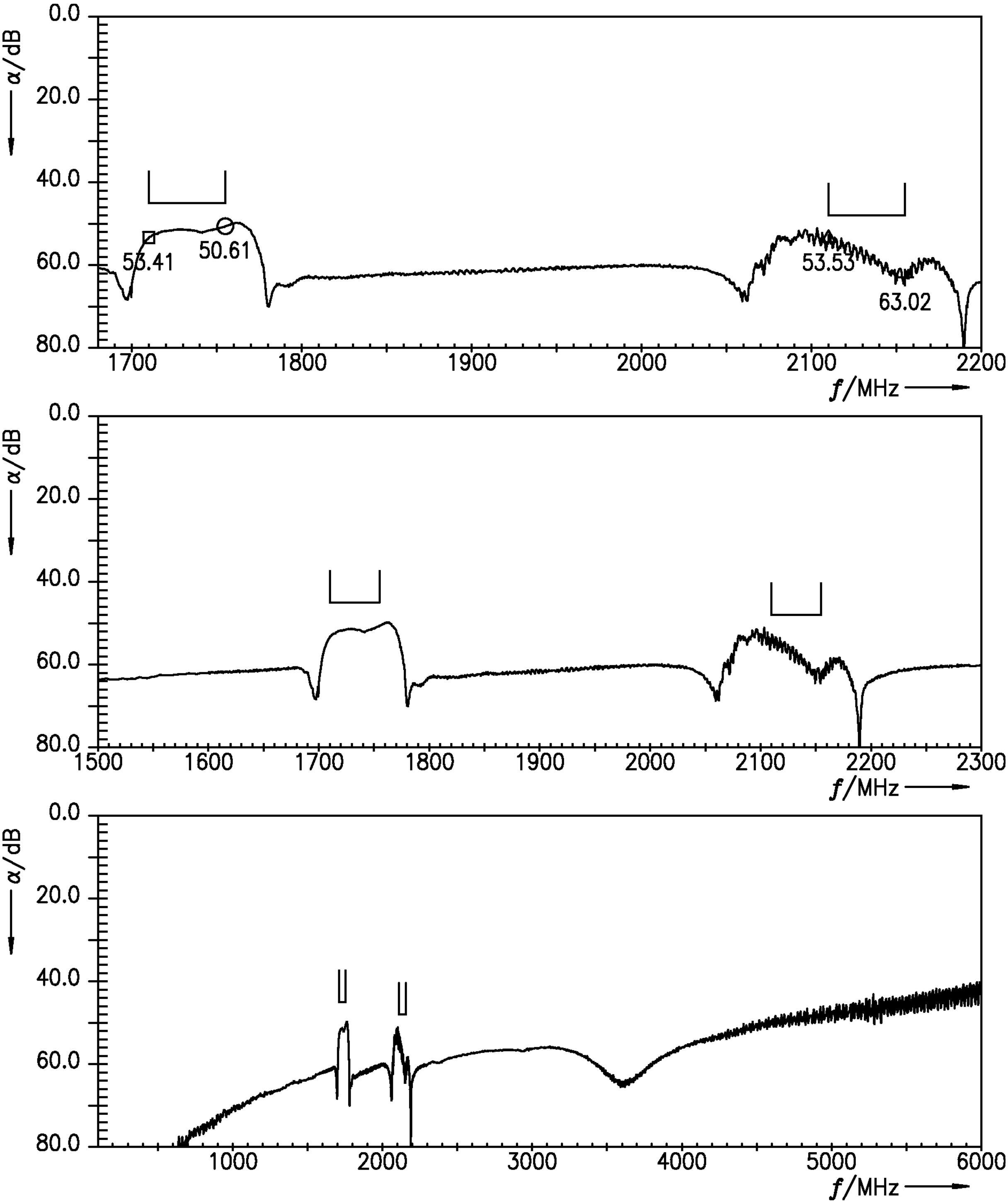

Figure 6: Isolation TX – RX.

9 Reflection coefficients

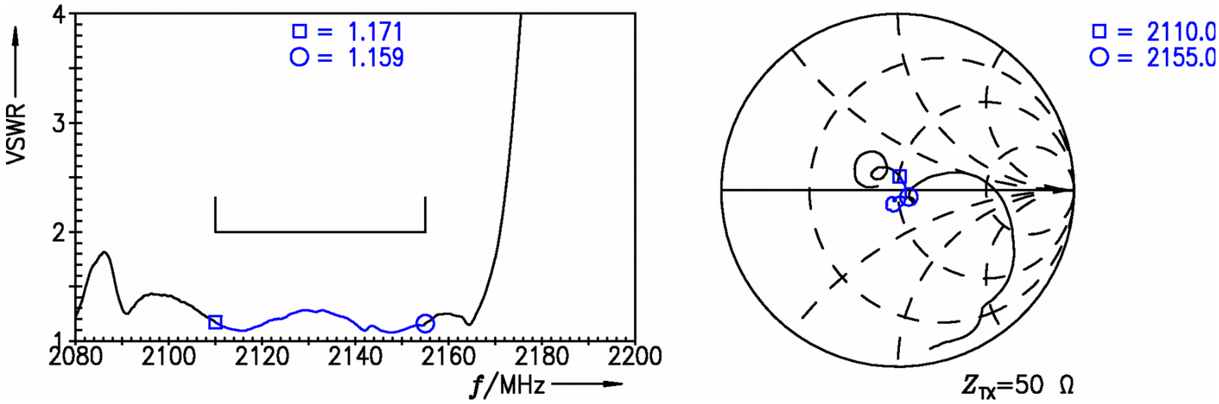

Figure 7: Reflection coefficient at TX port.

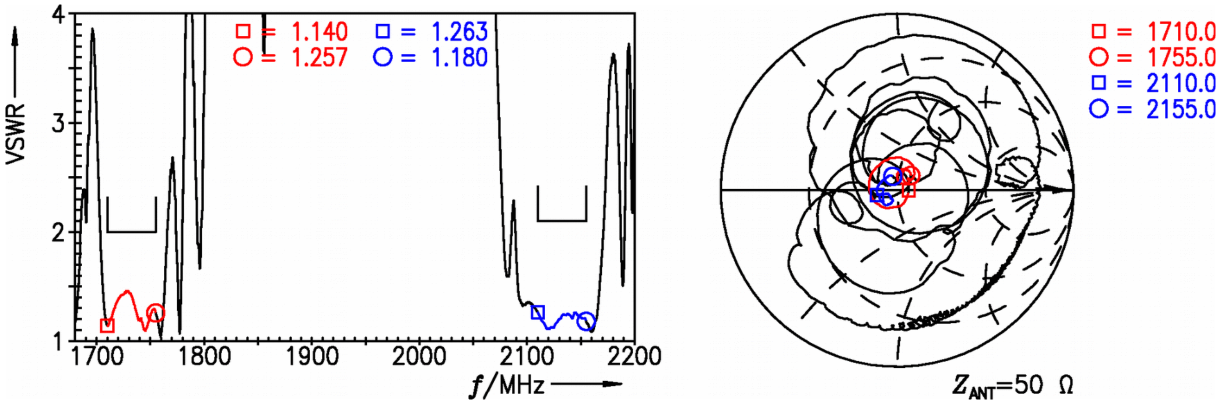

Figure 8: Reflection coefficient at ANT port (TX and RX frequencies).

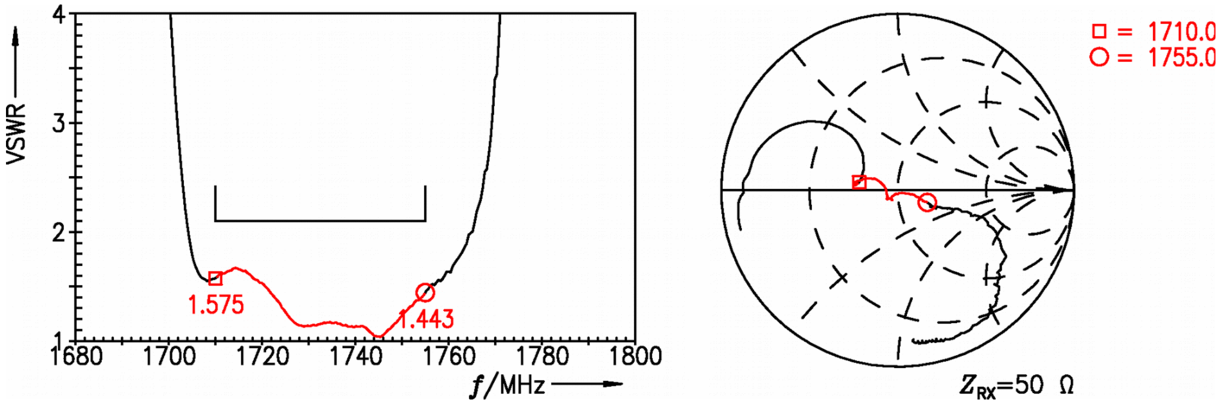

Figure 9: Reflection coefficient at RX port.

10 EVMs

10.1 TX – ANT

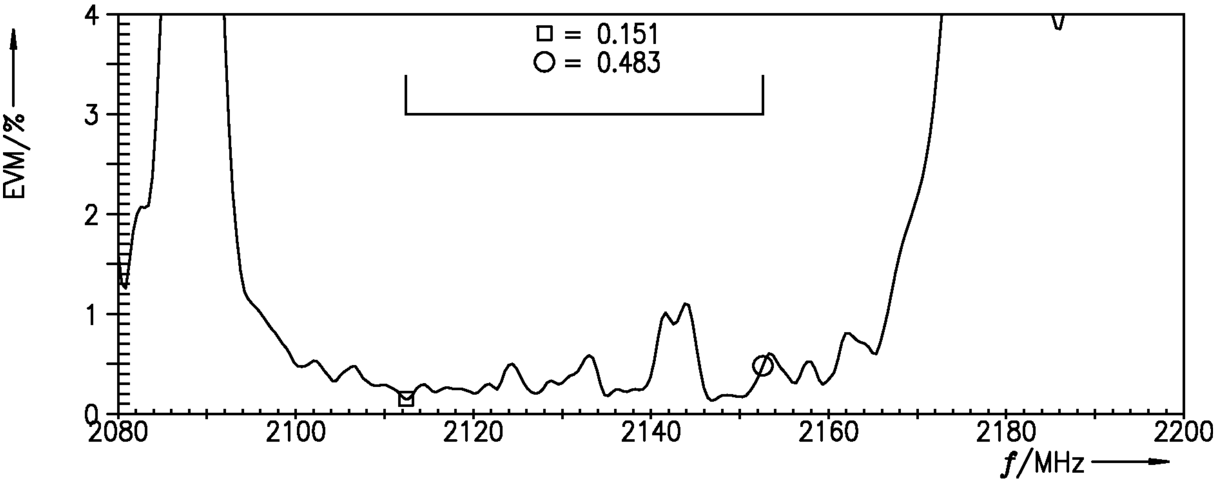

Figure 10: Error vector magnitude TX – ANT.

10.2 ANT – RX

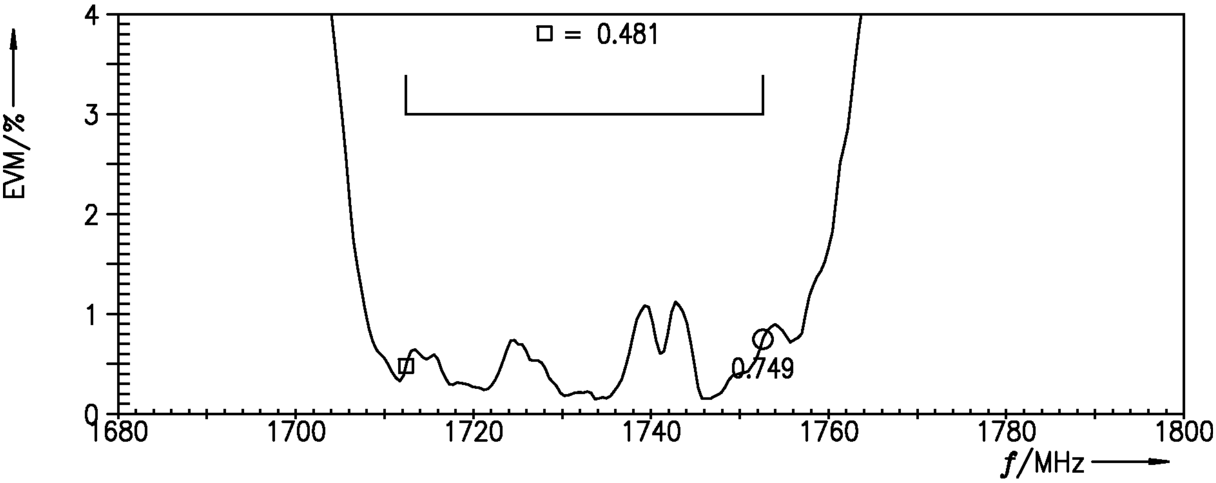

Figure 11: Error vector magnitude ANT – RX.

11 Packing material

11.1 Tape

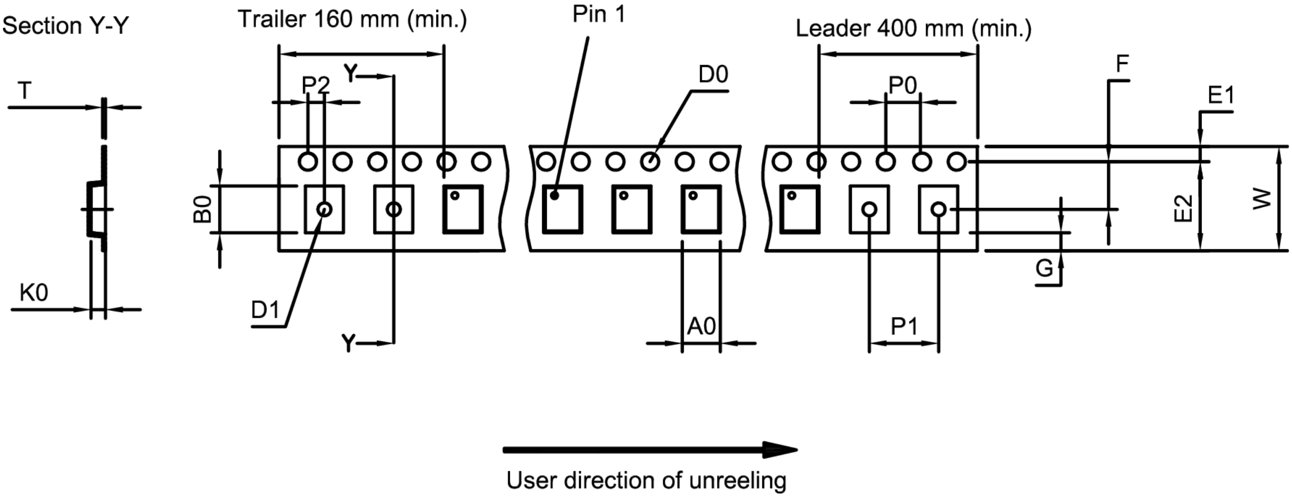

Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$2.25_{\pm0.05}$ mm	E_2	6.25 mm (min.)	P_1	$4.0_{\pm0.1}$ mm
B_0	$2.75_{\pm0.05}$ 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	$0.25_{\pm0.03}$ mm
D_1	1.0 mm (min.)	K_0	$0.6_{\pm0.05}$ mm	W	$8.0_{+0.3/-0.1}$ mm
E_1	$1.75_{\pm0.1}$ mm	P_0	$4.0_{\pm0.1}$ mm		

Table 1: Tape dimensions.

11.2 Reel with diameter of 180 mm

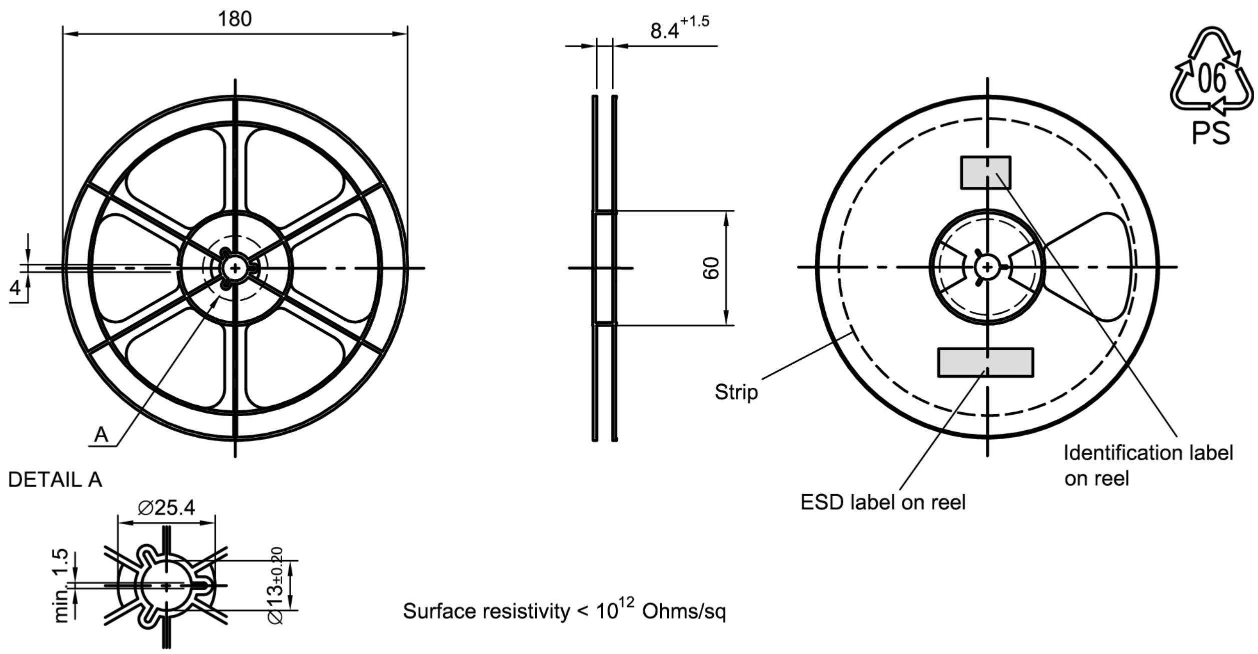

Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

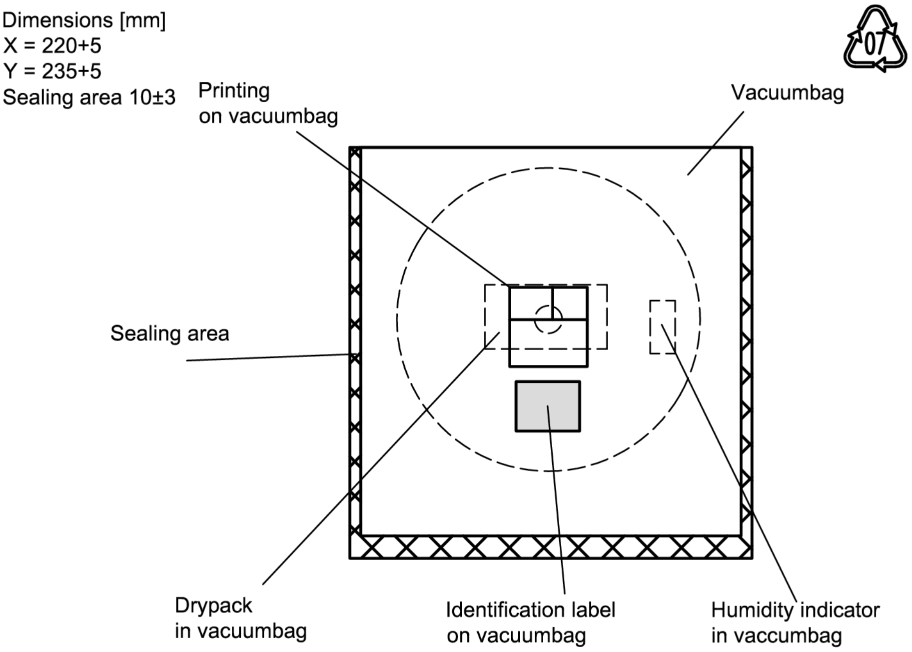

Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

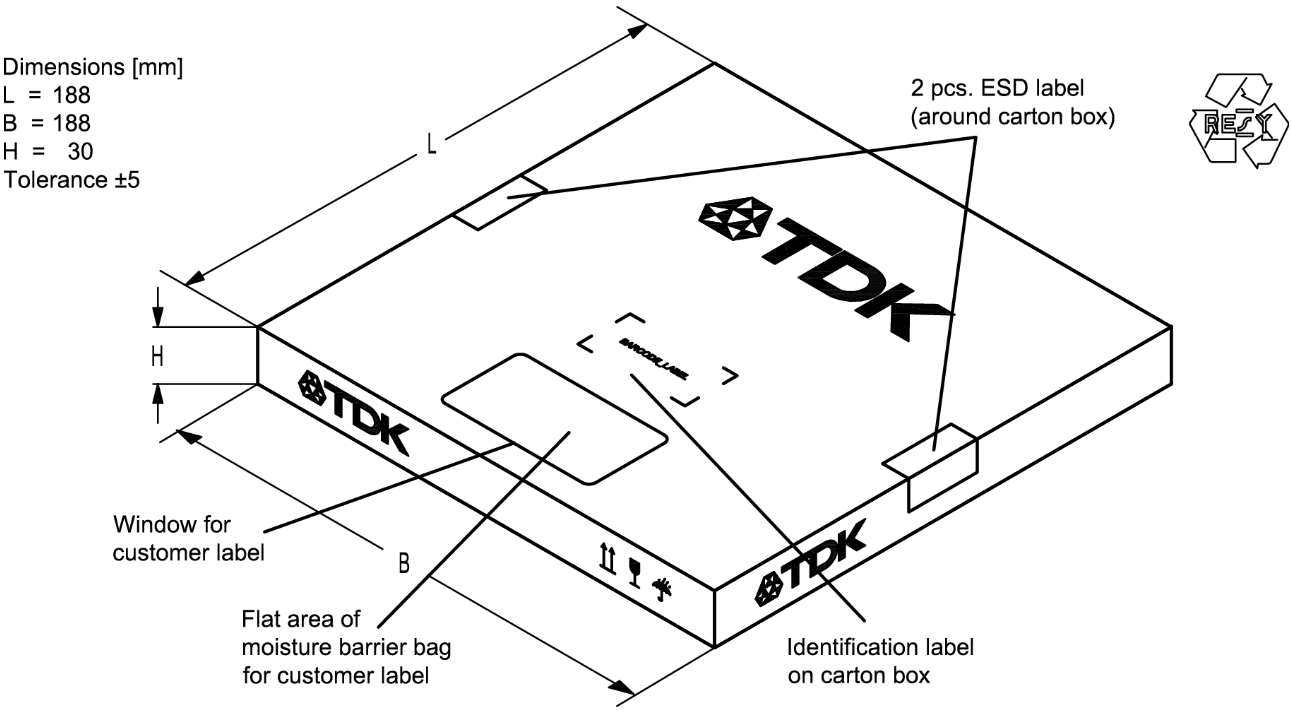

Figure 15: Drawing of folding box for reel with diameter of 180 mm.

12 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**

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

  The BASE32 code for product type B8033 is 7V1.

- 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.

13 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).

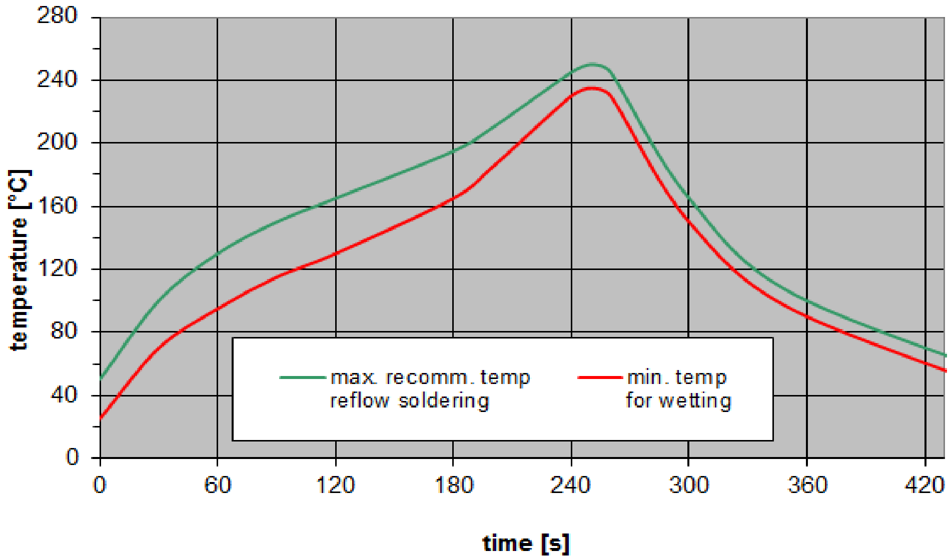

Figure 16: Recommended reflow profile for convection and infrared soldering – lead-free solder.

14 Annotations

14.1 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.

14.2 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.

14.3 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.

14.4 Ordering codes and packing units

Ordering code	Packing unit
B39212B8033P810	5000 pcs

Table 4: Ordering codes and packing units.

15 Cautions and warnings

15.1 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.

15.2 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.

15.3 Moldability

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

15.4 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.

Important notes

The following applies to all products named in this publication:

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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.**
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