Qualcomm

RF360
Europe GmbH

SAW components

SAW duplexer

Automotive telematics
LTE band 12

Series/type:	B4423
Ordering code:	B39741B4423P810
Date:	January 05, 2017
Version:	2.0

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1 Application

- Low-loss SAW duplexer for LTE Band 12 systems
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 17 MHz

2 Features

- Package size 2.0±0.1 mm × 1.6±0.1 mm
- Package height 0.45 mm (max.)
- Approximate weight 6 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Filter surface passivated
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)
- AEC-Q200 qualified component family (Grade 3: −40 °C to +85 °C)

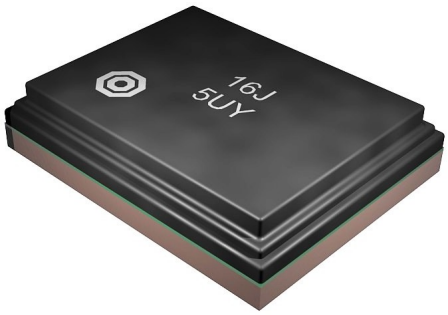

Figure 1: Picture of component with example of product marking.

3 Package

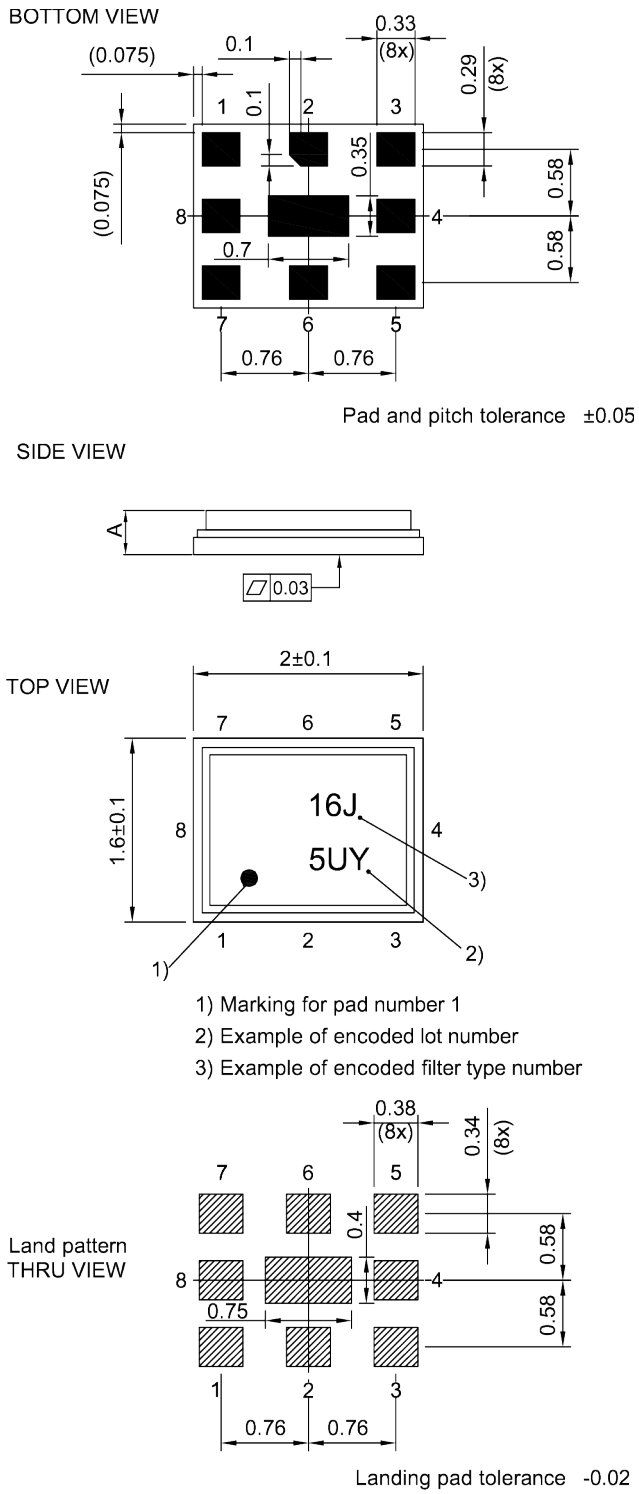

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 20).

4 Pin configuration

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

5 Matching circuit

■ L_{p6} = 12 nH ■ L_{s3} = 4.3 nH

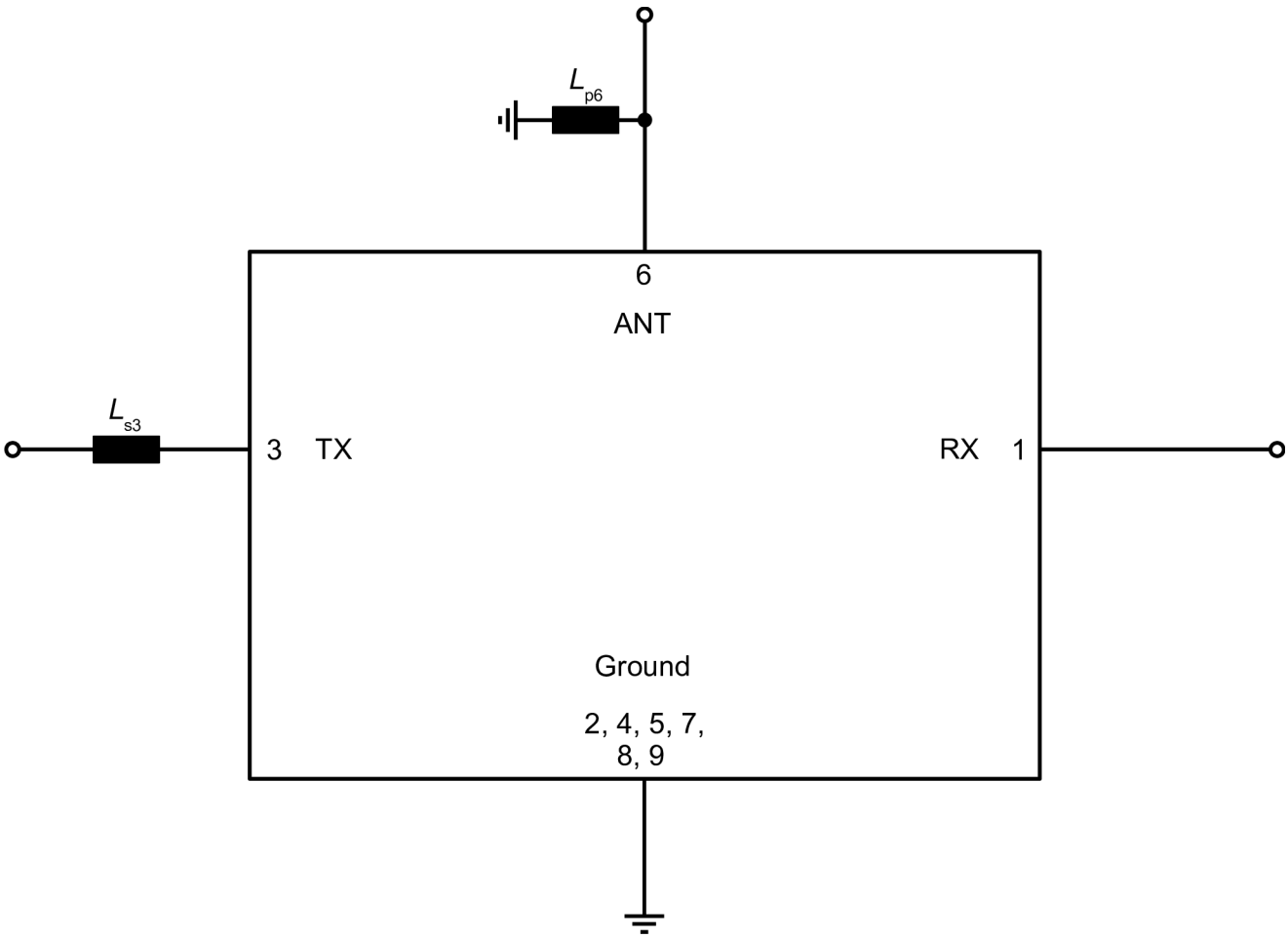

Figure 3: Schematic of matching circuit.

6 Characteristics

6.1 TX – ANT

Temperature range for specification	T_{SPEC}	= −20 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 4.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 12 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C				
	699.24 ... 715.76	MHz		—	707.5	—	MHz
Maximum insertion attenuation			α_{max}				
	699.24 ... 715.76	MHz		—	1.9	2.8	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	699.24 ... 715.76	MHz		—	0.7	1.7	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	699 ... 716	MHz		—	1.4	2.0	
@ ANT port	699 ... 716	MHz		—	1.4	2.0	
Minimum attenuation							
	50 ... 650	MHz	α_{min}	33	36	—	dB
	650 ... 686	MHz	α_{min}	34	38	—	dB
	722 ... 728	MHz	$\alpha_{INT,min}$ [2)]	8	21	—	dB
	729 ... 746	MHz	α_{min}	45	60	—	dB
	746 ... 768	MHz	α_{min}	35	40	—	dB
	768 ... 805	MHz	α_{min}	35	39	—	dB
	824 ... 849	MHz	α_{min}	35	37	—	dB
	869 ... 894	MHz	α_{min}	35	37	—	dB
	1398 ... 1432	MHz	α_{min}	40	44	—	dB
	1559 ... 1607	MHz	α_{min}	42	48	—	dB
	1710 ... 1755	MHz	α_{min}	45	52	—	dB
	1805 ... 1880	MHz	α_{min}	47	54	—	dB
	1930 ... 1990	MHz	α_{min}	48	53	—	dB
	2097 ... 2155	MHz	α_{min}	45	51	—	dB
	2155 ... 2170	MHz	α_{min}	45	51	—	dB
	2400 ... 2484	MHz	α_{min}	44	48	—	dB
	2816 ... 2864	MHz	α_{min}	42	46	—	dB
	4900 ... 5300	MHz	α_{min}	28	33	—	dB
	5300 ... 5950	MHz	α_{min}	20	31	—	dB

1) See Sec. Matching circuit (p. 5).
2) Please refer to definition of α_{INT} in section Integrated rejection (p. 19).

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −20 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 4.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 12 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics ANT – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C				
	729.24... 745.76	MHz		—	737.5	—	MHz
Maximum insertion attenuation			α_{max}				
	729.24... 745.76	MHz		—	2.0	2.8	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	729.24... 745.76	MHz		—	0.6	1.5	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	729... 746	MHz		—	1.6	2.0	
@ RX port	729... 746	MHz		—	1.5	2.0	
Minimum attenuation			α_{min}				
	50... 699	MHz		40	57	—	dB
	699... 716	MHz		45	58	—	dB
	716... 722	MHz		12	22	—	dB
	777... 798	MHz		35	45	—	dB
	798... 805	MHz		35	53	—	dB
	1710... 1755	MHz		50	62	—	dB
	1850... 1910	MHz		50	60	—	dB
	2202... 2238	MHz		48	57	—	dB
	2400... 2500	MHz		48	55	—	dB
	4900... 6000	MHz		25	43	—	dB

1) See Sec. Matching circuit (p. 5).

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −20 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω with ser. 4.3 nH[1)]
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 12 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – RX			**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Minimum isolation	α_{min}					
	699.24 ... 715.76	MHz	50	61	—	dB
	715.76 ... 729.24	MHz	25	36	—	dB
	729.24 ... 745.76	MHz	50	63	—	dB
	1398 ... 1432	MHz	30	62	—	dB
	2097 ... 2148	MHz	30	60	—	dB
	2796 ... 2864	MHz	30	59	—	dB

1) See Sec. Matching circuit (p. 5).

7 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +85 °C	
Storage temperature	T_{STG} [1] = −40 °C ... +85 °C	
DC voltage	$\lvert V_{DC} \rvert$ [2] = 0 V	
Input power @ TX port: 699 ... 716 MHz	P_{IN} = 28 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) In case of applied DC voltage blocking capacitors are mandatory.

8 Transmission coefficients

8.1 TX – ANT

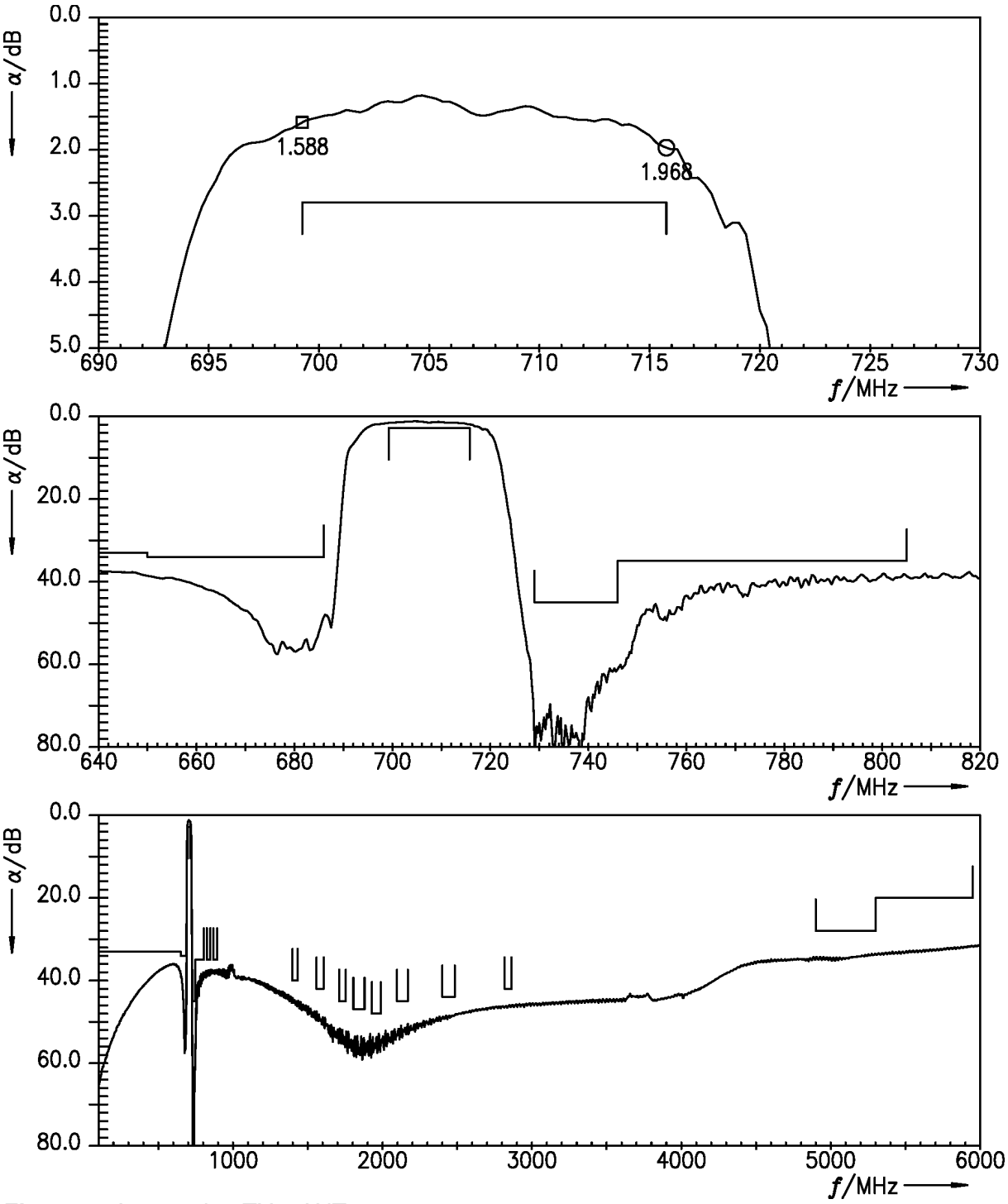

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

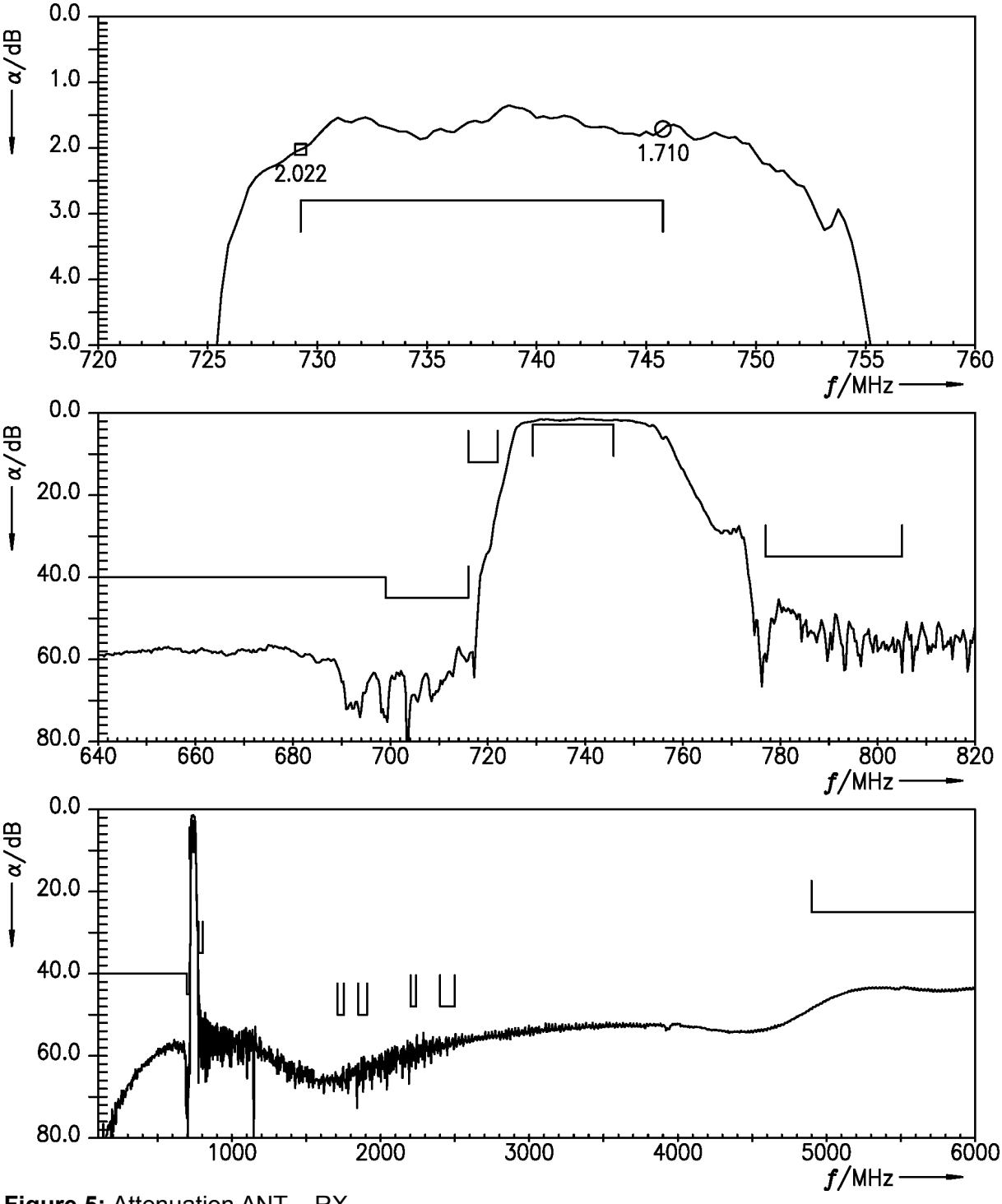

Figure 5: Attenuation ANT – RX.

8.3 TX – RX

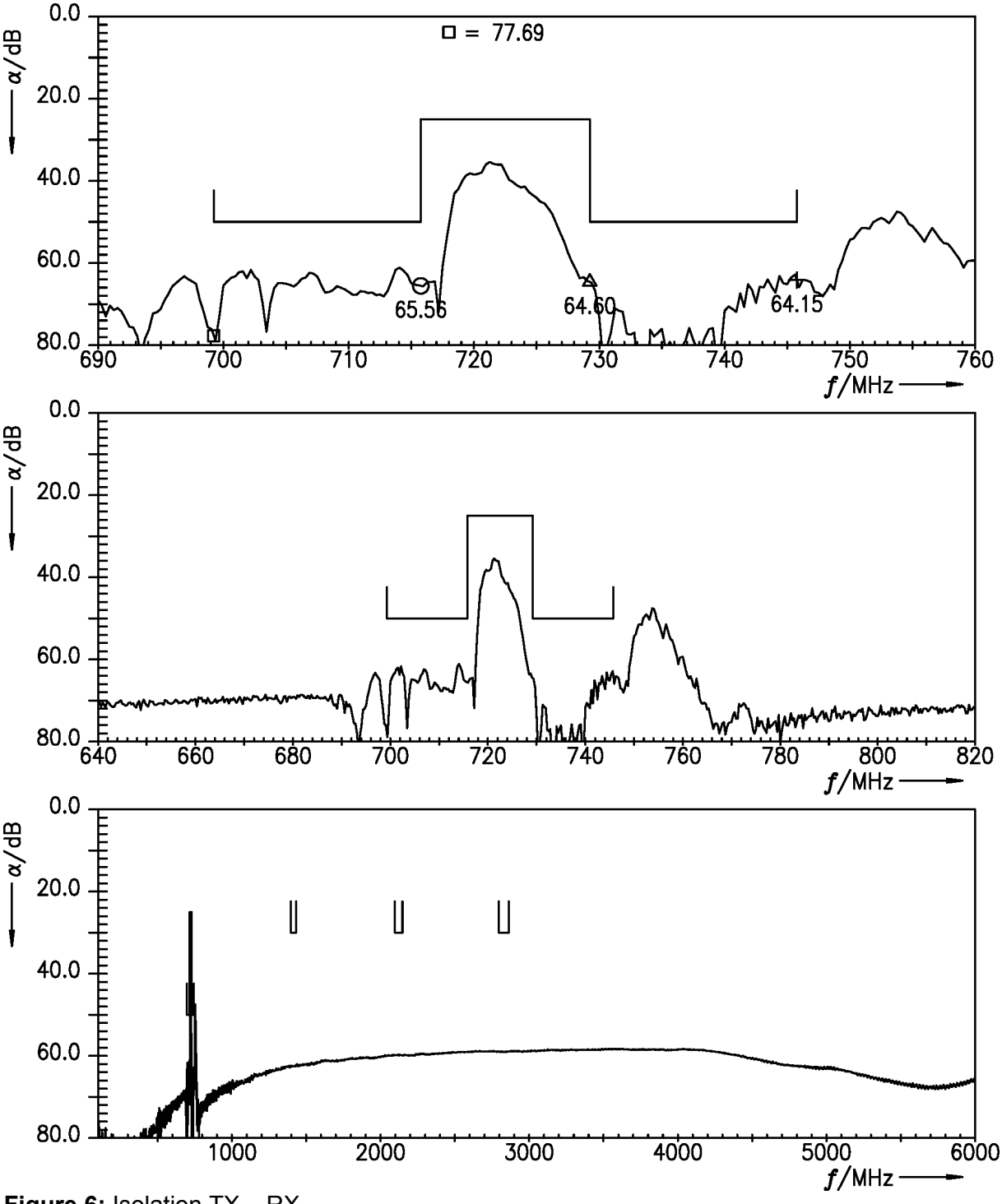

Figure 6: Isolation TX – RX.

9 Reflection coefficients

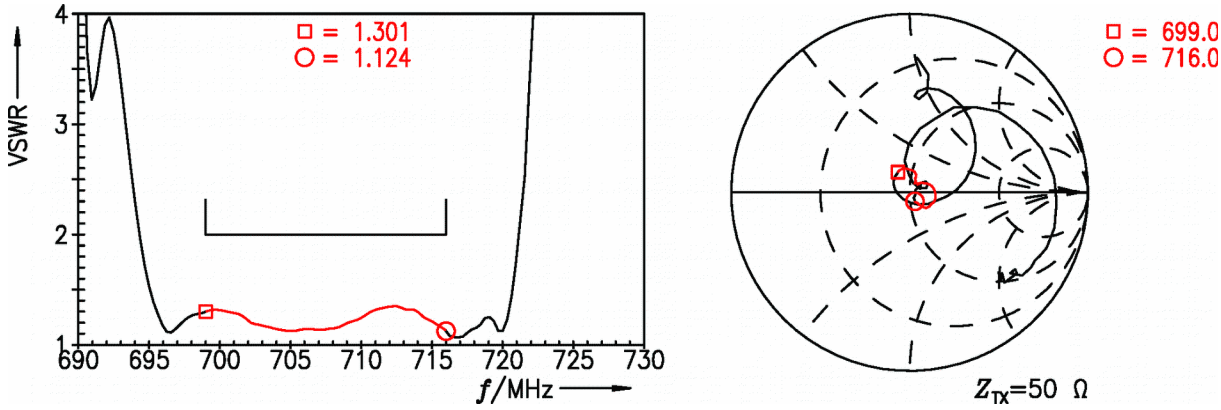

Figure 7: Reflection coefficient at TX port.

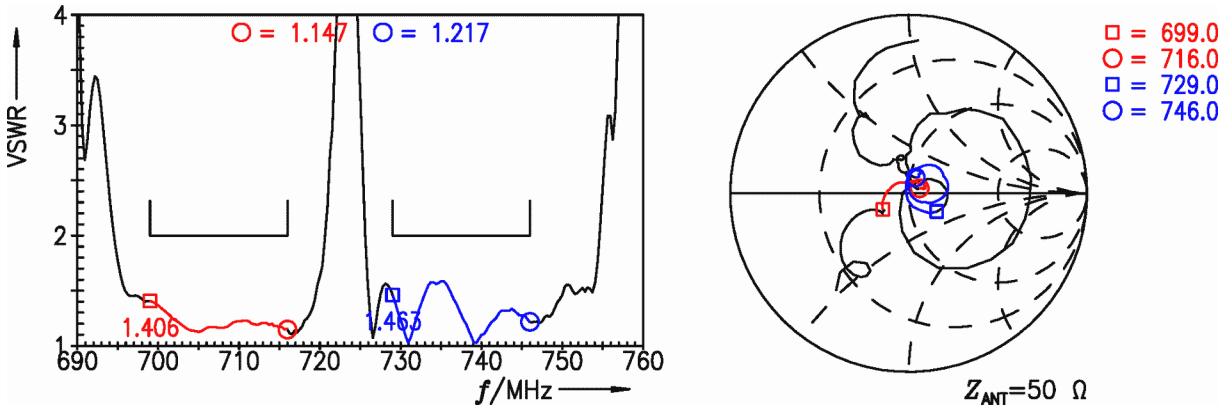

Figure 8: Reflection coefficient at ANT port.

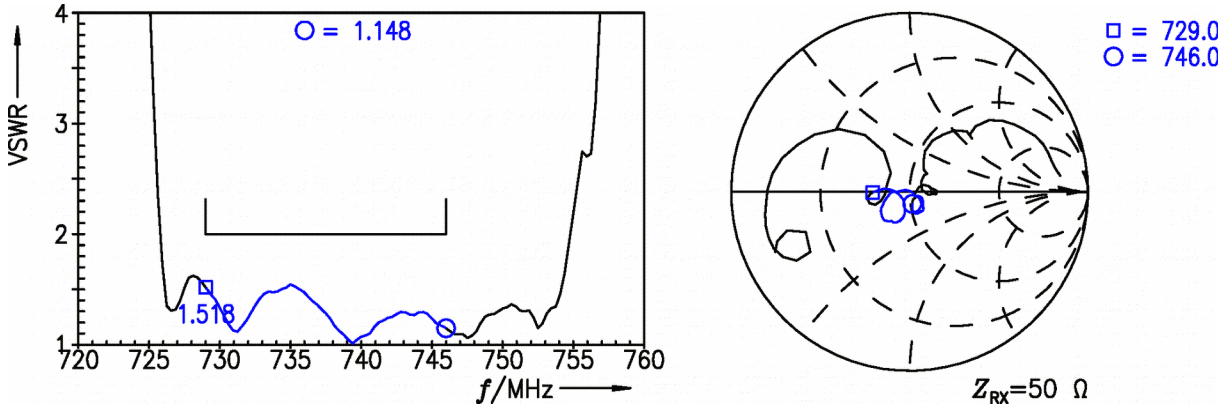

Figure 9: Reflection coefficient at RX port.

10 Packing material

10.1 Tape

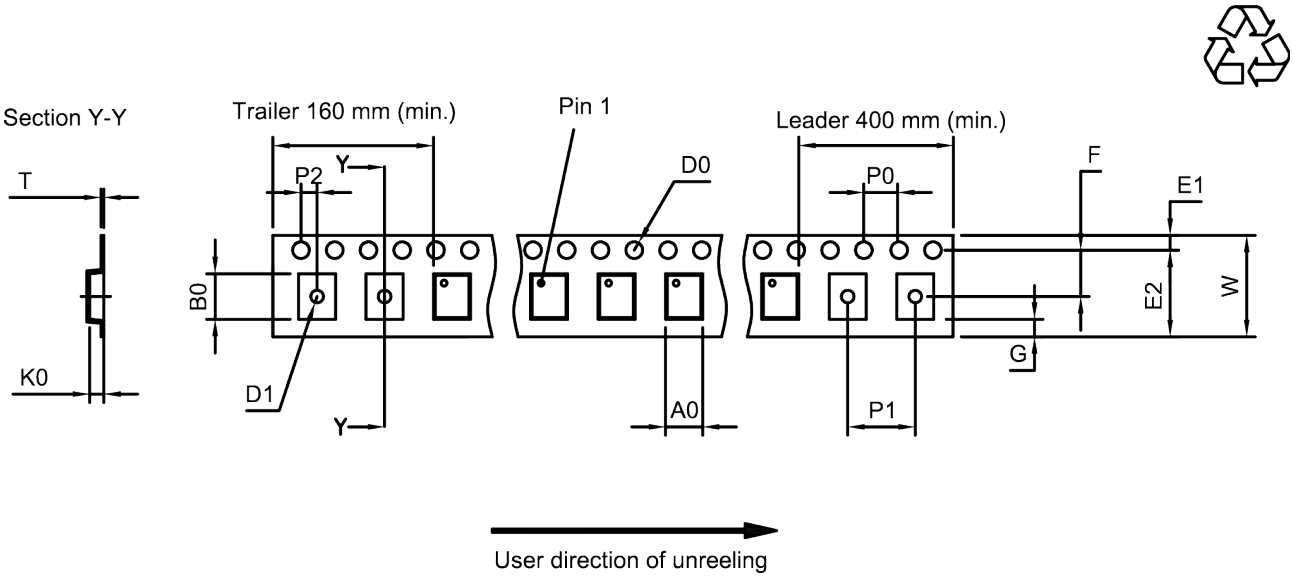

Figure 10: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$1.8_{\pm 0.05}$ mm
B_0	$2.25_{\pm 0.05}$ 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

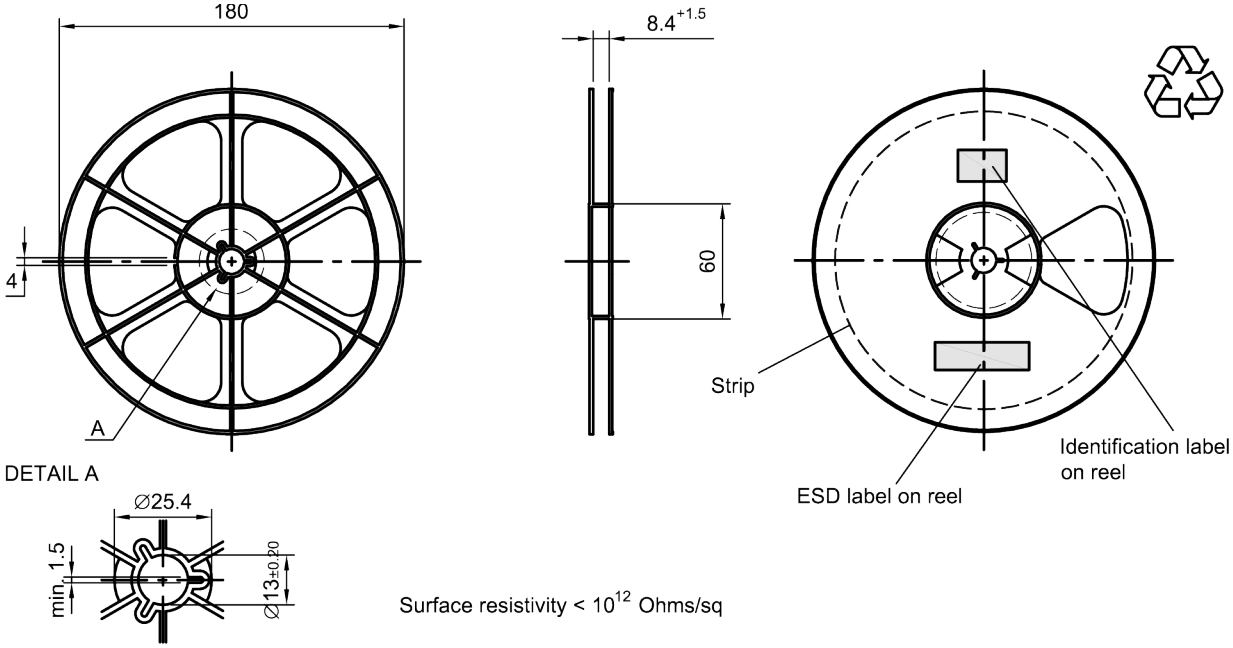

Figure 11: Drawing of reel (first-angle projection) with diameter of 180 mm.

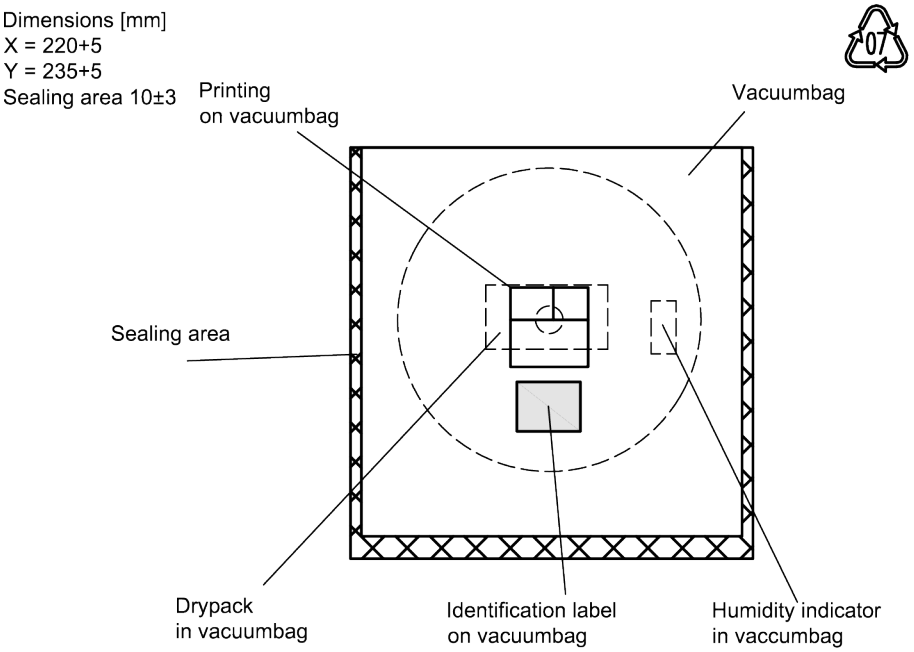

Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

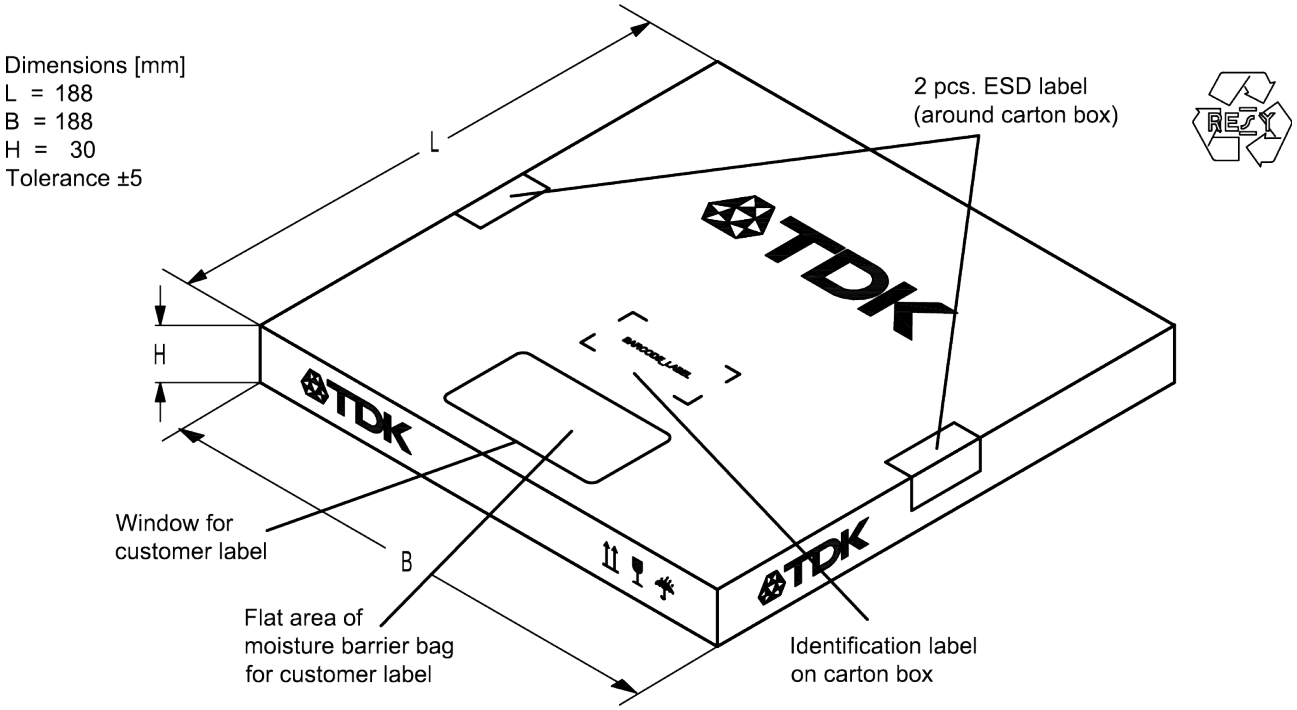

Figure 13: Drawing of folding box for reel with diameter of 180 mm.

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 B4423 is 4A7.

- 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).

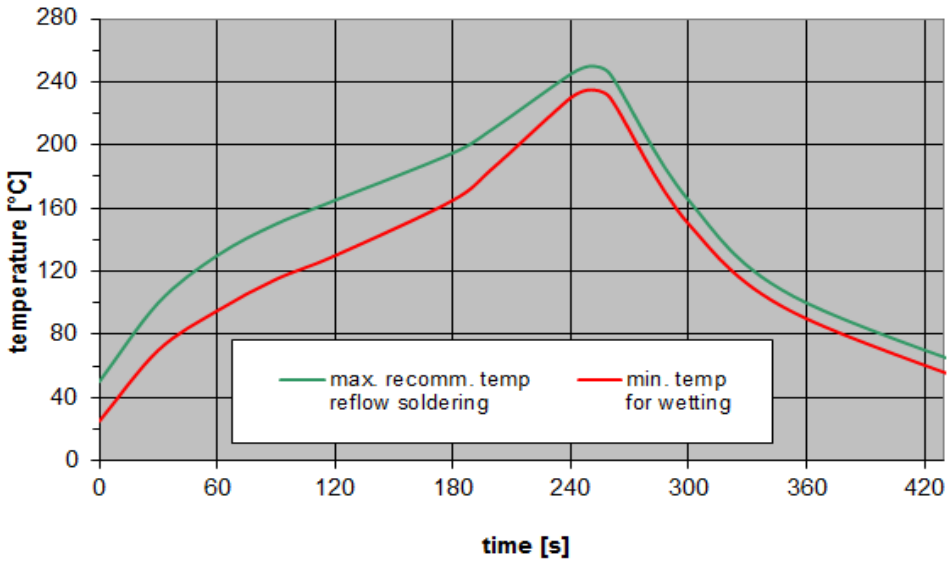

Figure 14: Recommended reflow profile for convection and infrared soldering – lead-free solder.

13 Annotations

13.1 Integrated rejection

Integrated rejection, α_{INT}, is defined by

$$\alpha_{INT} = 20 \log_{10} \left(\frac{\sum_{n=2}^{N} \frac{\mathrm{Loss}(F_{n-1}) + \mathrm{Loss}(F_n)}{2} \times (F_n - F_{n-1})}{F_N - F_1} \right)$$

where

$$\mathrm{H}(f_n) = 1/|S_{21}|$$

and

$$N = \text{Number of frequency sampling points, insertion loss pairs in channel.}$$

13.2 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.

13.3 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.

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 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.

14.3 Moldability

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

14.4 Package information

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.
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