

RF360 Europe GmbH
A Qualcomm – TDK Joint Venture

SAW components

SAW 2in1 Rx input diplex filter LTE band 7 + TD-LTE band 40

Series/type:	B9946
Ordering code:	B39272B9946P810
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SAW components	B9946
SAW 2in1 Rx input duplex filter	2350 / 2655 MHz

Data sheet

Table of contents

1 Application	4
2 Features	4
3 Package	5
4 Pin configuration	5
5 Matching circuit	6
6 Characteristics LTE B7	7
7 Characteristics TD-LTE B40	8
8 Maximum ratings	9
9 Transmission coefficient LTE B7	10
10 Reflection coefficients LTE B7	11
11 Transmission coefficient TD-LTE B40	12
12 Reflection coefficients TD-LTE B40	13
13 Packing material	14
14 Marking	18
15 Soldering profile	19
16 Annotations	20
17 Cautions and warnings	21
Important notes	22

Data sheet

1 Application

- Low-loss 2in1 RF filter for mobile telephone LTE Band 7 and TD-LTE Band 40 systems, receive path (Rx)
- Usable pass bands:
 - Filter 1 (LTE Band 7): 70 MHz
 - Filter 2 (TD-LTE Band 40): 100 MHz
- Impedance transformation from 50Ω to 50Ω for both filters
- Unbalanced to unbalanced operation for both filters

2 Features

- Package size 1.5±0.1 mm × 1.1±0.1 mm
- Package height 0.45 mm (max.)
- Approximate weight 3 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

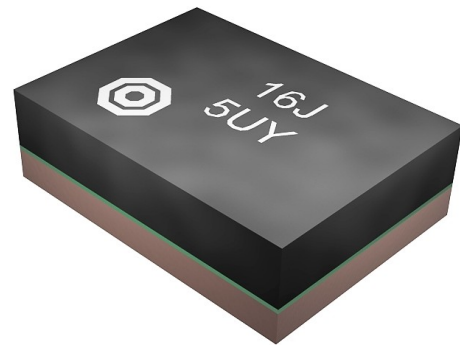


Figure 1: Picture of component with example of product marking.

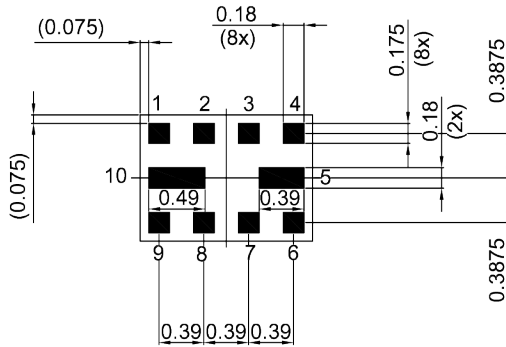
SAW components **B9946**

SAW 2in1 Rx input duplex filter **2350 / 2655 MHz**

Data sheet

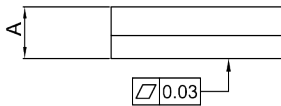
3 Package

BOTTOM VIEW

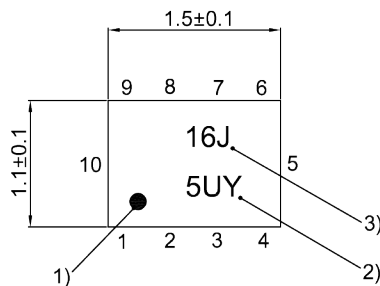


Pad and pitch tolerance ±0.05

SIDE VIEW

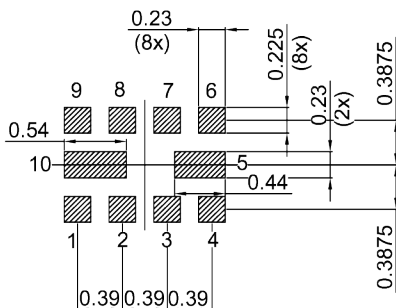


TOP VIEW



- 1) Marking for pad number 1
- 2) Example of encoded lot number
- 3) Example of encoded filter type number

Land pattern THRU VIEW



Landing pad tolerance -0.02

4 Pin configuration

- 1 Input (LTE B7; TD-LTE B40)
- 6 Output (TD-LTE B40)
- 9 Output (LTE B7)
- 2, 3, 4, 5, 7, 8, 10 Ground

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 21).

Data sheet

5 Matching circuit

$$\blacksquare L_{p1} = 2.2 \text{ nH}$$

$$\blacksquare L_{s9} = 1.7 \text{ nH}$$

$$\blacksquare L_{s6} = 2.0 \text{ nH}$$

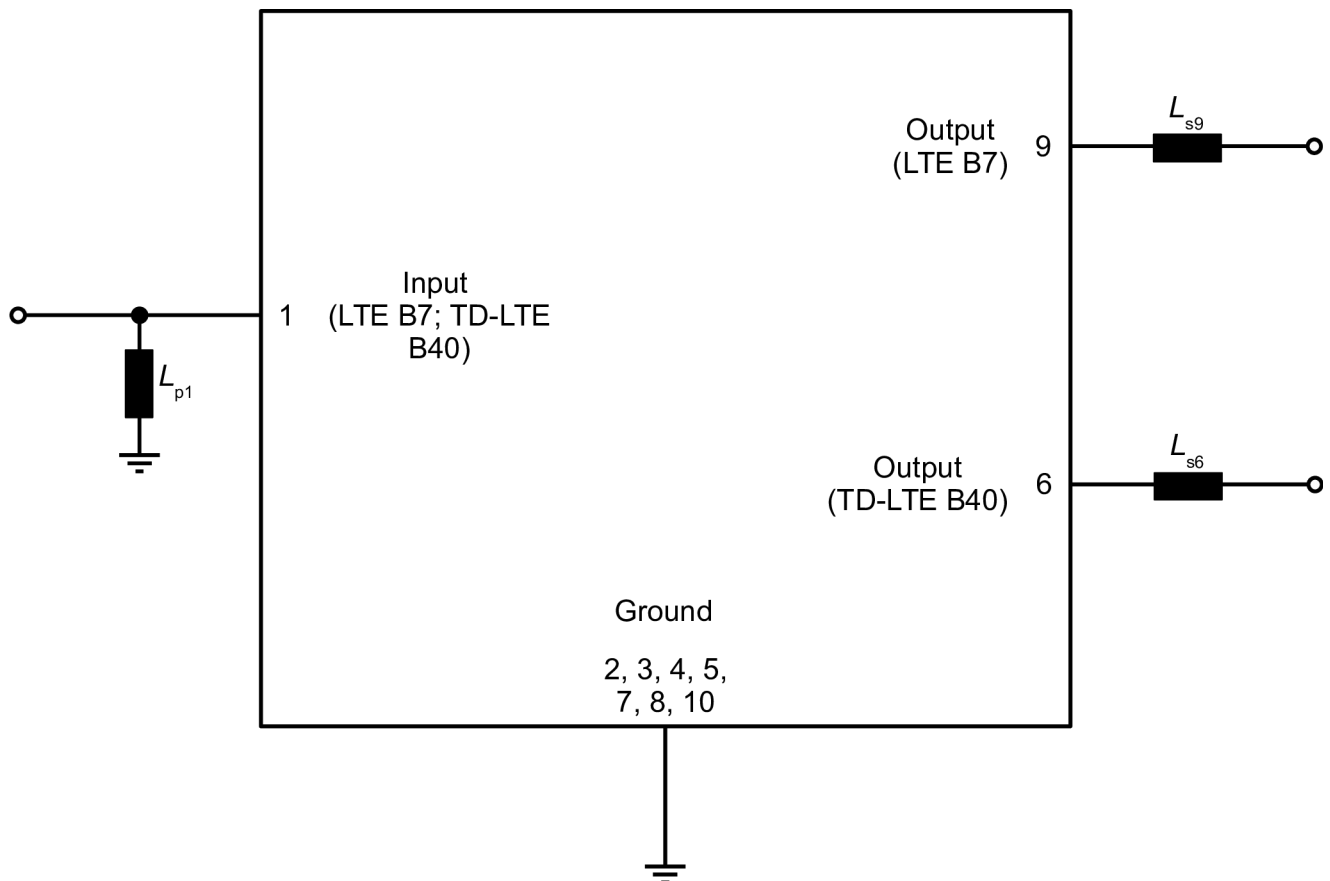


Figure 3: Schematic of matching circuit.

External shunt inductor for ESD protection is recommended at any ports towards antenna.

SAW components

B9946

SAW 2in1 Rx input diplex filter

2350 / 2655 MHz

Data sheet

6 Characteristics LTE B7

Temperature range for specification	T_{SPEC}	= -30 °C ... +85 °C
Input terminating impedance	Z_{IN}	= 50 Ω with par. 2.2 nH ¹⁾
B7 output terminating impedance	$Z_{B7 OUT}$	= 50 Ω with ser. 1.7 nH ¹⁾
B40 output terminating impedance	$Z_{B40 OUT}$	= 50 Ω with ser. 2.0 nH ¹⁾

Characteristics LTE B7			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_C	—	2655	—	MHz
Maximum insertion attenuation	2620... 2690	MHz	—	2.3	3.0	dB
Amplitude ripple (p-p)	2620... 2690	MHz	—	0.7	1.4	dB
Maximum VSWR		VSWR _{max}				
@ input port	2620... 2690	MHz	—	1.4	2.0	
@ B7 output port	2620... 2690	MHz	—	1.6	2.0	
Minimum attenuation		α_{min}				
	10... 2500	MHz	34	41	—	dB
	832... 862	MHz	50	59	—	dB
	1710... 1785	MHz	40	49	—	dB
	2300... 2400	MHz	40	44	—	dB
	2400... 2500	MHz	38	41	—	dB
	2500... 2570	MHz	31	41	—	dB
	2570... 2600	MHz	1	5	—	dB
	2775... 6000	MHz	32	36	—	dB
	4900... 5950	MHz	32	36	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

SAW components

B9946

SAW 2in1 Rx input duplex filter

2350 / 2655 MHz

Data sheet

7 Characteristics TD-LTE B40

Temperature range for specification	T_{SPEC}	= -30 °C ... +85 °C
Input terminating impedance	Z_{IN}	= 50 Ω with par. 2.2 nH ¹⁾
B7 output terminating impedance	$Z_{B7 OUT}$	= 50 Ω with ser. 1.7 nH ¹⁾
B40 output terminating impedance	$Z_{B40 OUT}$	= 50 Ω with ser. 2.0 nH ¹⁾

Characteristics TD-LTE B40			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}		
Center frequency		f_C	—	2350	—	MHz	
Maximum insertion attenuation	2300... 2400	MHz	α_{max}	—	2.9	3.5	dB
Amplitude ripple (p-p)	2300... 2400	MHz	$\Delta\alpha$	—	1.6	2.3	dB
Maximum VSWR			VSWR _{max}				
@ input port	2300... 2400	MHz		—	1.5	2.0	
@ B40 output port	2300... 2400	MHz		—	1.6	2.0	
Minimum attenuation			α_{min}				
	10... 2215	MHz		33	36	—	dB
	2215... 2240	MHz		20	40	—	dB
	2430... 2440	MHz		5	17	—	dB
	2440... 2450	MHz		20	35	—	dB
	2450... 2500	MHz		25	32	—	dB
	2500... 2570	MHz		34	38	—	dB
	2500... 6000	MHz		32	36	—	dB
	4900... 5950	MHz		32	36	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

SAW components

B9946

SAW 2in1 Rx input duplex filter

2350 / 2655 MHz

Data sheet

8 Maximum ratings

Storage temperature	$T_{\text{STG}}^{2)} = -40\text{ °C} \dots +85\text{ °C}^{1)}$	
DC voltage	$ V_{\text{DC}} = 5.0\text{ V (max.)}^{3)}$	
ESD voltage		
	$V_{\text{ESD}}^{4)} = 50\text{ V (max.)}$	Machine model.
	$V_{\text{ESD}}^{5)} = 100\text{ V (max.)}$	Human body model.
	$V_{\text{ESD}}^{6)} = 600\text{ V (max.)}$	Charged device model.
Input power	P_{IN}	
@ input port: 2300 ... 2400 MHz	10 dBm	Continuous wave for 5000 h @ 50 °C.
@ input port: 2500 ... 2570 MHz	15 dBm	Continuous wave for 5000 h @ 50 °C.

¹⁾ Extended upper limit: 96h@125°C acc. to IEC 60068-2-2 Bb.

²⁾ Not valid for packaging material. Storage temperature for packaging material is -25 °C to +40 °C.

³⁾ 168h Damp Heat Steady State acc. to IEC 60068-2-67 Cy.

⁴⁾ According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

⁵⁾ According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

⁶⁾ According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

Data sheet

9 Transmission coefficient LTE B7

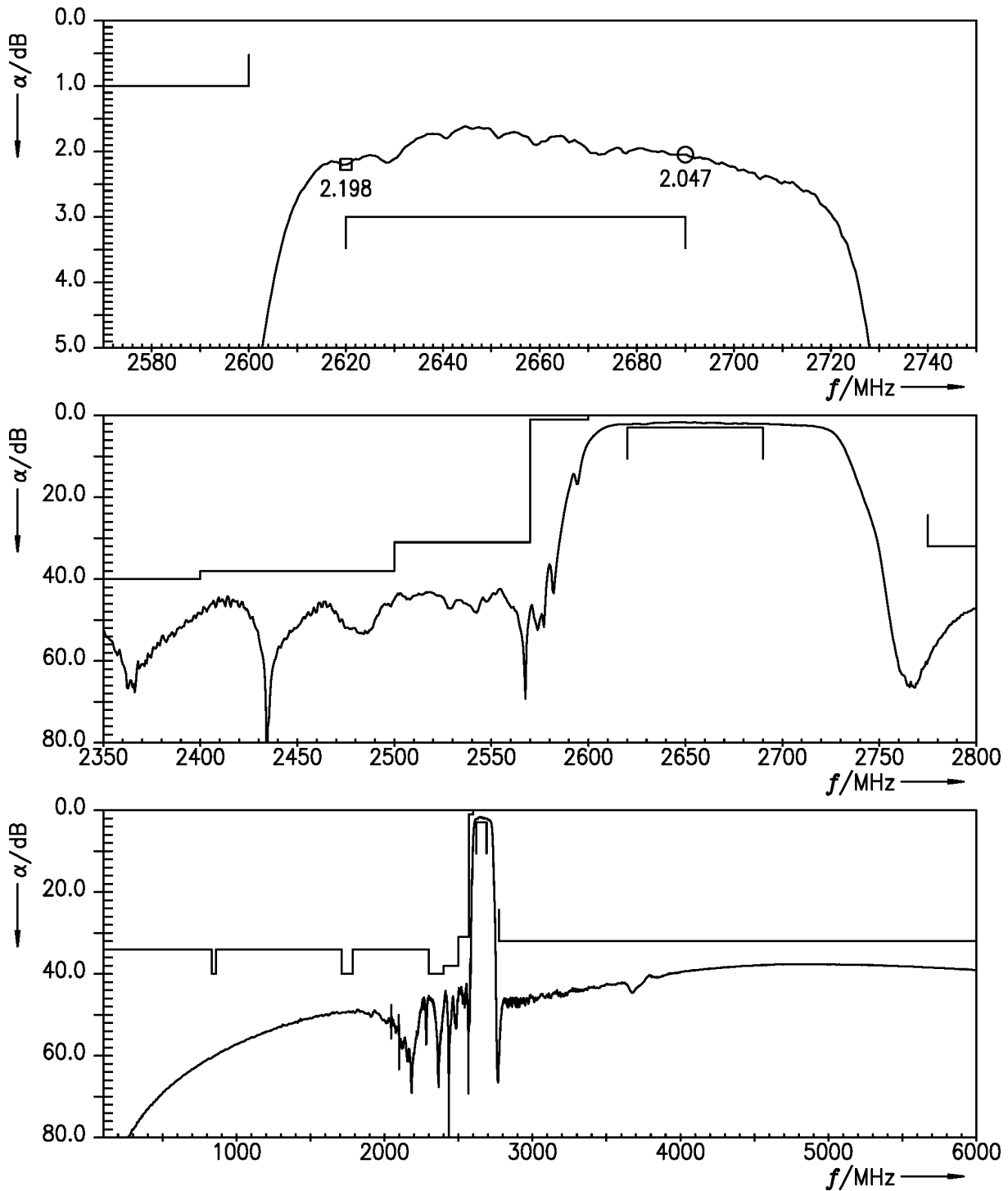


Figure 4: Attenuation LTE B7.

Data sheet

10 Reflection coefficients LTE B7

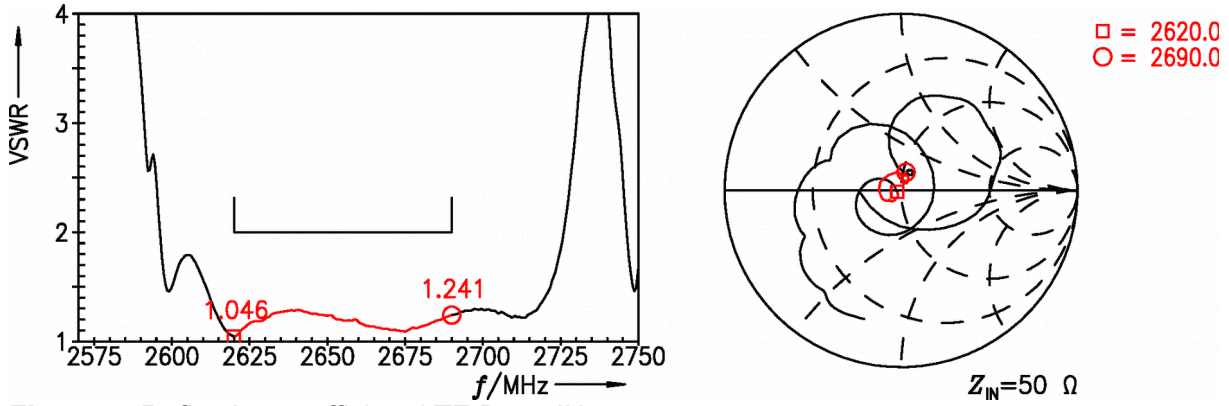


Figure 5: Reflection coefficient LTE B7 at IN port.

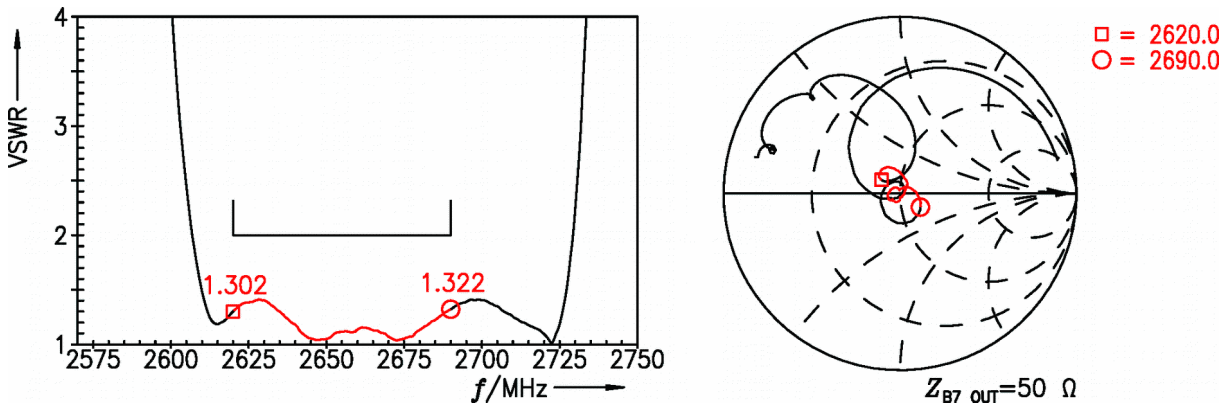


Figure 6: Reflection coefficient LTE B7 at OUT port.

SAW components	B9946
SAW 2in1 Rx input duplex filter	2350 / 2655 MHz

Data sheet

11 Transmission coefficient TD-LTE B40

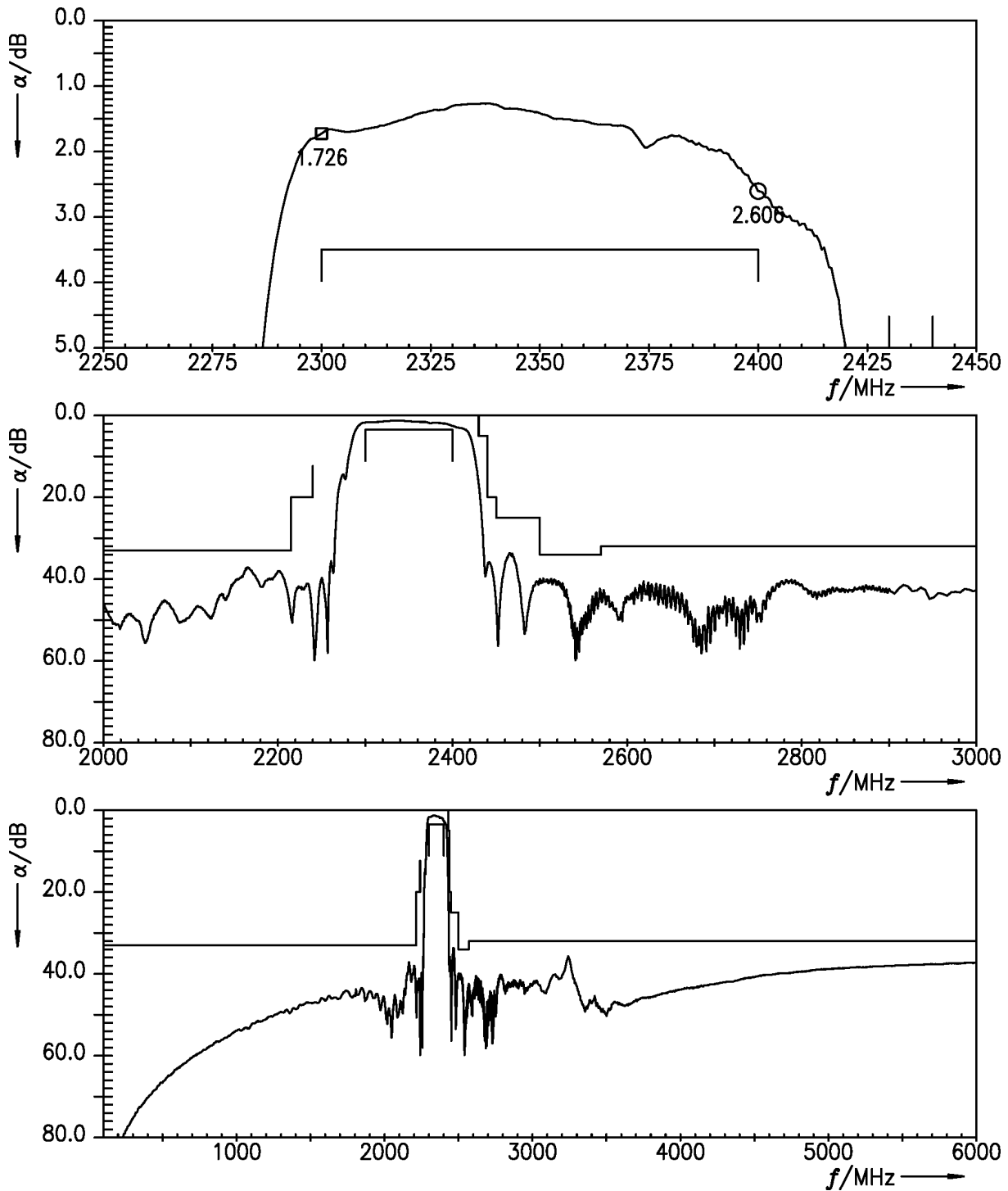


Figure 7: Attenuation TD-LTE B40.

Data sheet

12 Reflection coefficients TD-LTE B40

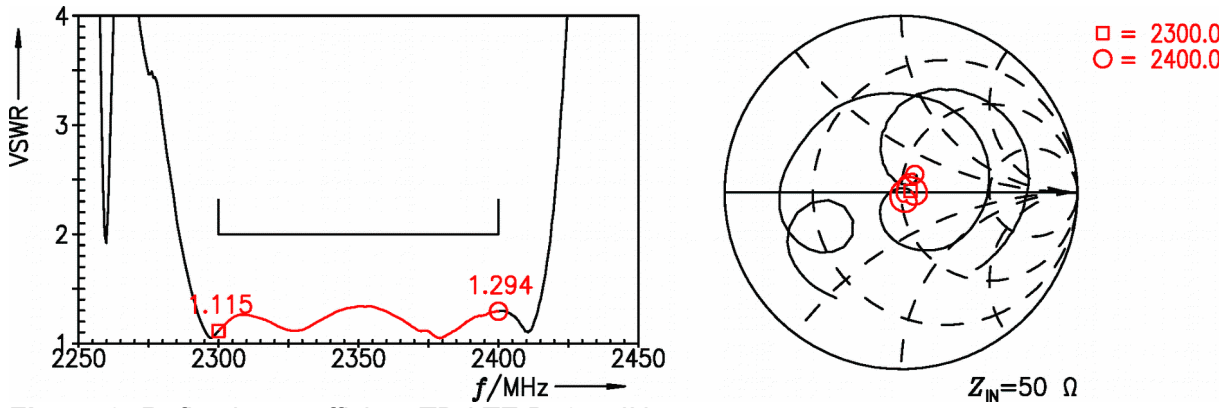


Figure 8: Reflection coefficient TD-LTE B40 at IN port.

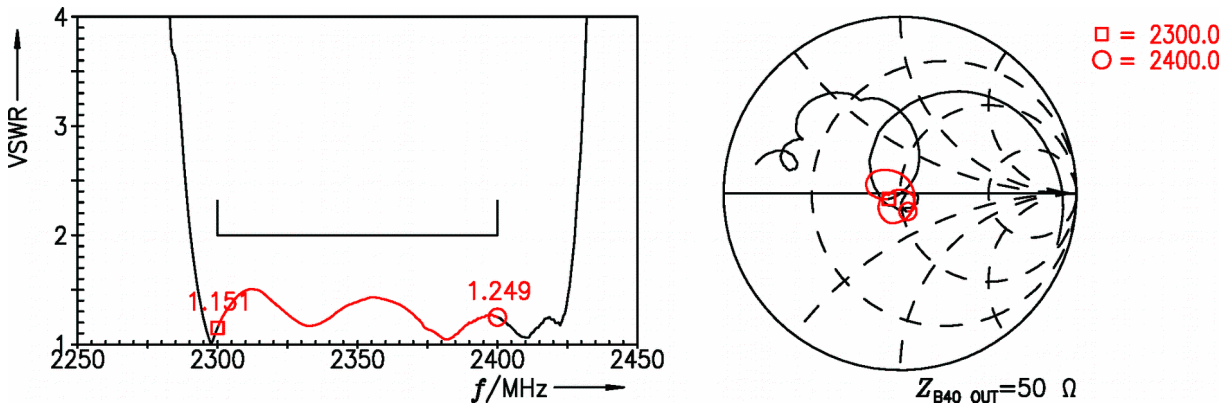


Figure 9: Reflection coefficient TD-LTE B40 at OUT port.

Data sheet

13 Packing material

13.1 Tape

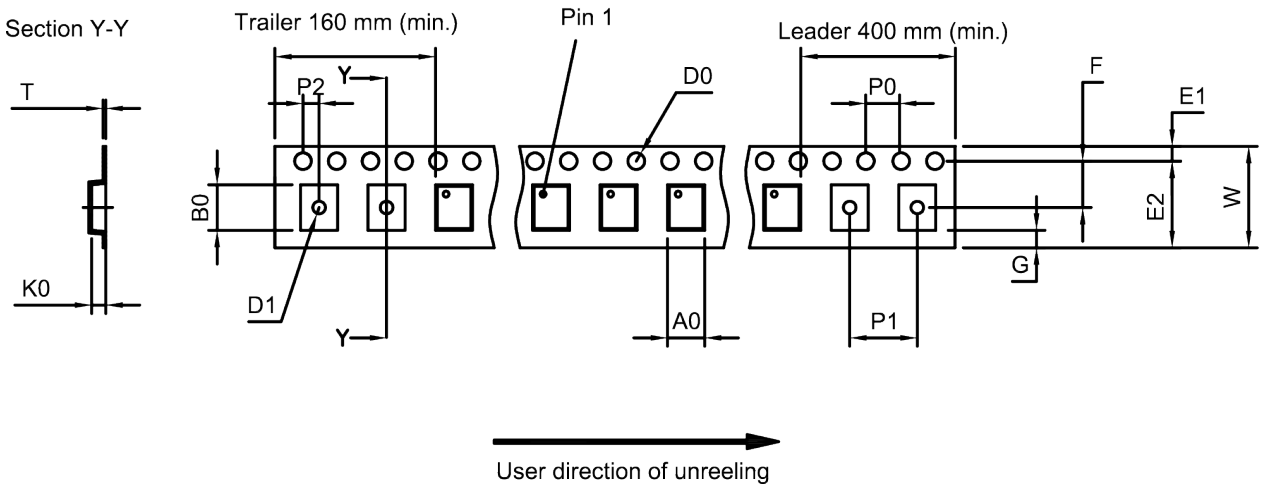


Figure 10: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A ₀	1.27±0.05 mm	E ₂	6.25 mm (min.)	P ₁	4.0±0.1 mm
B ₀	1.67±0.05 mm	F	3.5±0.05 mm	P ₂	2.0±0.05 mm
D ₀	1.5+0.1/-0 mm	G	0.75 mm (min.)	T	0.25±0.03 mm
D ₁	0.5+0.1/-0 mm	K ₀	0.55±0.05 mm	W	8.0+0.3/-0.1 mm
E ₁	1.75±0.1 mm	P ₀	4.0±0.1 mm		

Table 1: Tape dimensions.

SAW components	B9946
SAW 2in1 Rx input duplex filter	2350 / 2655 MHz

Data sheet

13.2 Reel with diameter of 180 mm

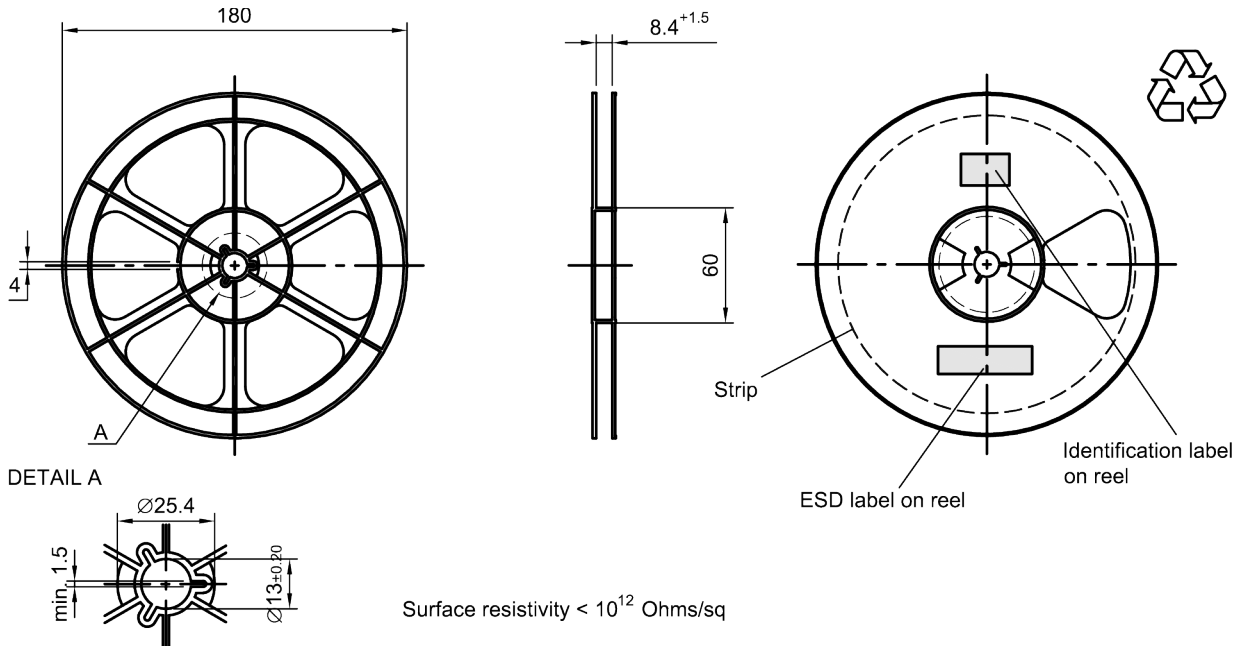


Figure 11: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

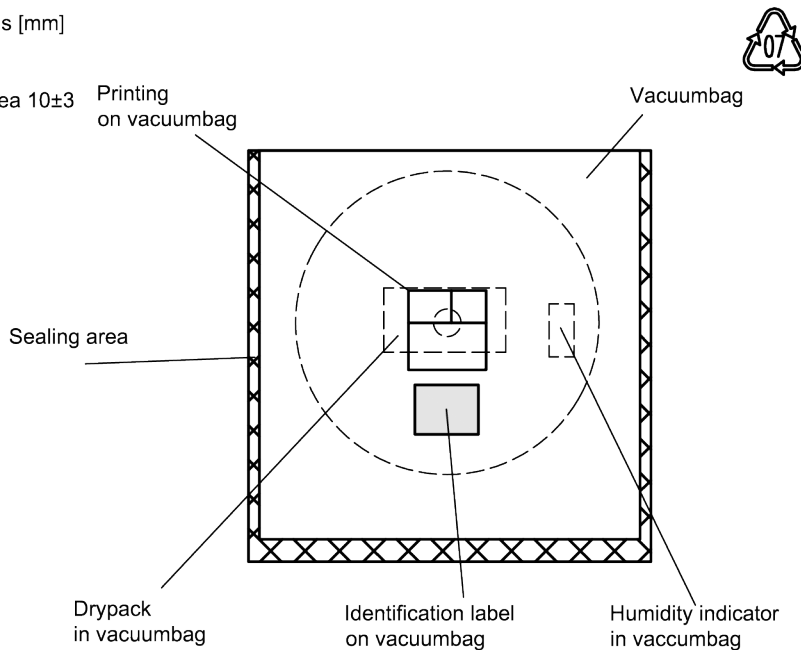


Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

SAW components **B9946**
SAW 2in1 Rx input duplex filter **2350 / 2655 MHz**

Data sheet

Dimensions [mm]
 L = 188
 B = 188
 H = 30
 Tolerance ±5

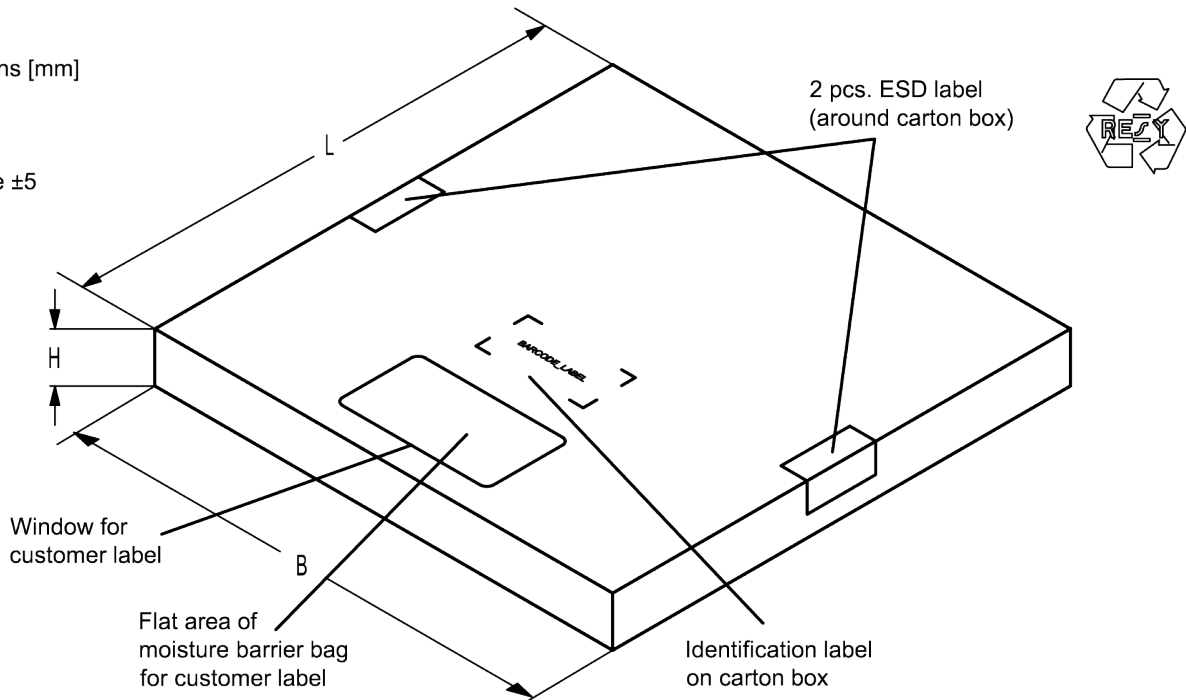


Figure 13: Drawing of folding box for reel with diameter of 180 mm.

13.3 Reel with diameter of 330 mm

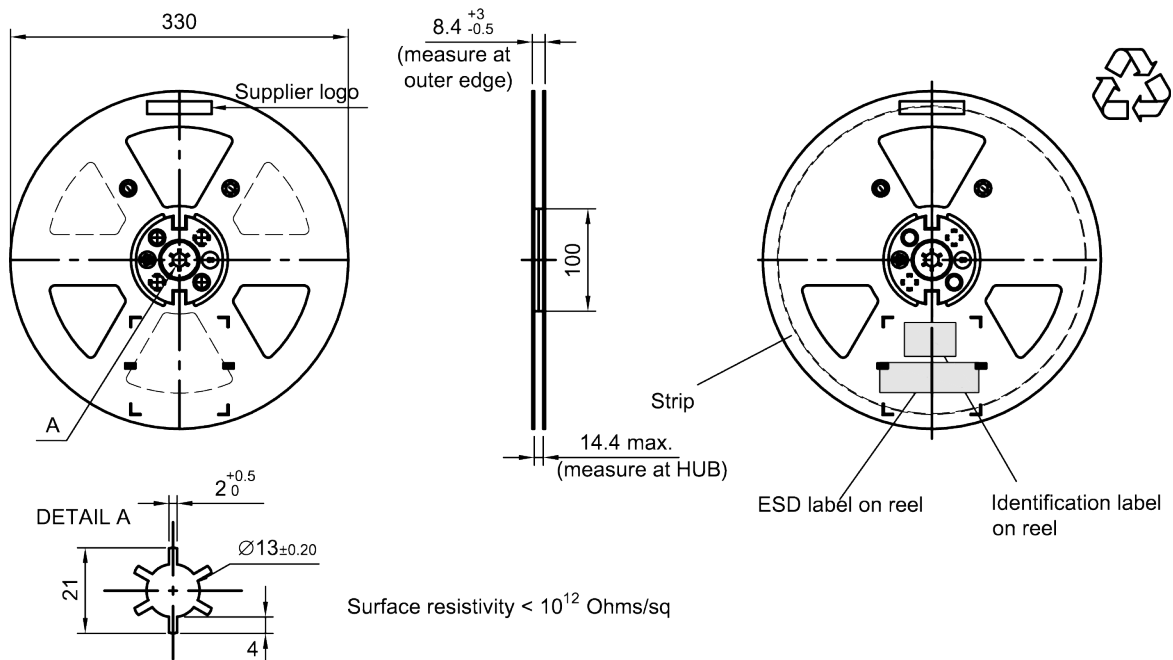


Figure 14: Drawing of reel (first-angle projection) with diameter of 330 mm.

SAW components **B9946**
SAW 2in1 Rx input duplex filter **2350 / 2655 MHz**

Data sheet

Dimensions [mm]
 X = 400+5
 Y = 418+5
 Sealing area 10±3

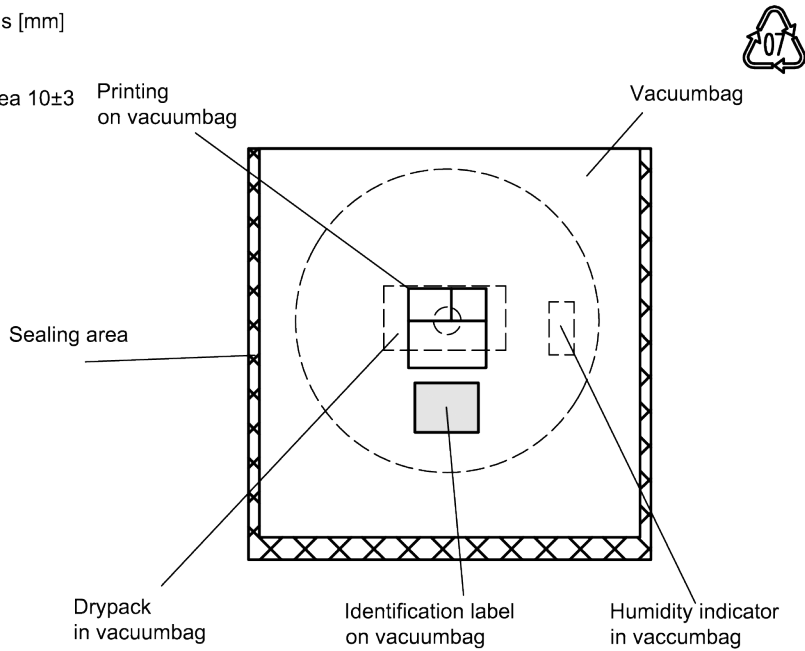


Figure 15: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

Dimensions [mm]
 L = 335
 B = 338
 H = 36 (for 8 mm tape width)
 40 (for 12 mm tape width)
 Tolerance ±5

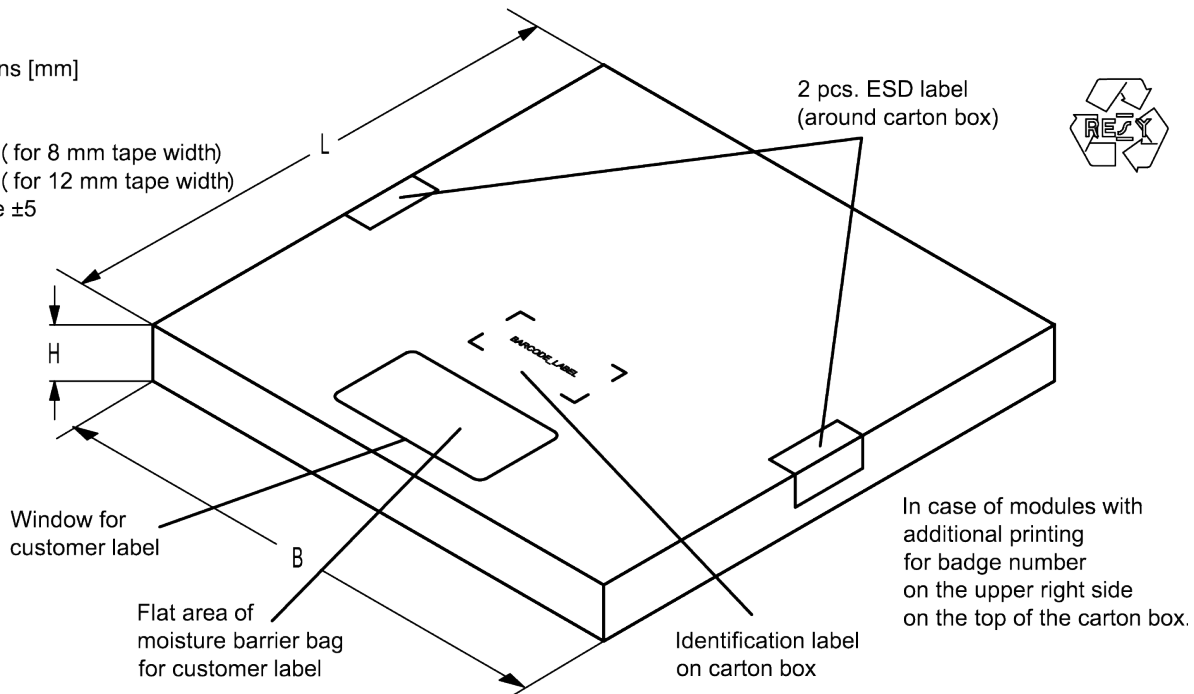


Figure 16: Drawing of folding box for reel with diameter of 330 mm.

Data sheet

14 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
	$1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0$	1234

The BASE32 code for product type B9946 is 9PT.

■ 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
	$5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0$	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.

Data sheet

15 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
$T \geq 255$ °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).

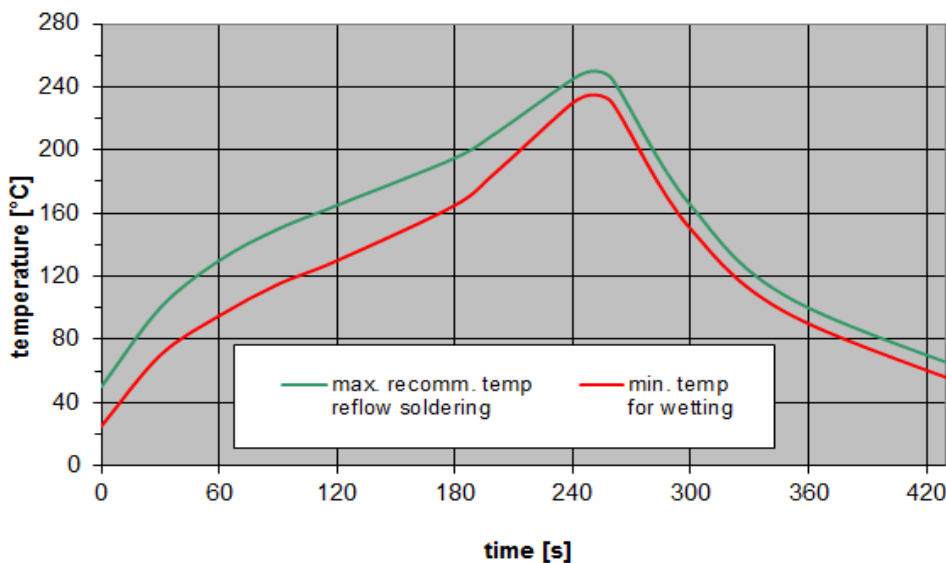


Figure 17: Recommended reflow profile for convection and infrared soldering – lead-free solder.

Data sheet

16 Annotations

16.1 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>.

16.2 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.

16.3 Scattering parameters (S-parameters)

The pin/port assignment is available in the headers of the S-parameter files. Please contact your local RF360 sales office.

16.4 Ordering codes and packing units

Ordering code	Packing unit
B39272B9946P810	15000 pcs
B39272B9946P810S 5	5000 pcs

Table 4: Ordering codes and packing units.

Data sheet

17 Cautions and warnings

17.1 Display of ordering codes for RF360 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 RF360, 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.rf360jv.com/orderingcodes.

17.2 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.

17.3 Moldability

Before using in overmolding environment, please contact your local RF360 sales office.

17.4 Package information

Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on RF360 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 RF360, 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.

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, RF360 Europe GmbH and its affiliates are 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 RF360 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.rf360jv.com/material). Should you have any more detailed questions, please contact our sales offices.
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