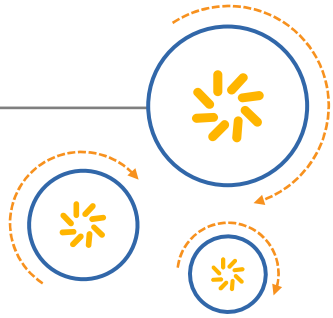
RF360 Europe GmbH

A Qualcomm – TDK Joint Venture



SAW components

BAW filter

Small cell & femtocell
TD-LTE band 40

Series/type:	B9628
Ordering code:	B39232B9628P810
Date:	July 28, 2017
Version:	2.3

RF360 products mentioned within this document are offered by RF360 Europe GmbH and other subsidiaries of RF360 Holdings Singapore Pte. Ltd. (collectively, the “RF360 Subsidiaries”).

RF360 Holdings Singapore Pte. Ltd. is a joint venture of Qualcomm Global Trading Pte. Ltd. and EPCOS AG.

RF360 Europe GmbH, Anzinger Str. 13, München, Germany

SAW components **B9628**

BAW filter **2350 MHz**

Data sheet

Table of contents

1 Application

- Low-loss BAW single filter for LTE small cell and femtocell systems (Band 40)
- Low insertion loss
- High WLAN attenuation
- Usable pass band 100 MHz

2 Features

- Industrial grade qualified family
- Package size 1.4±0.1 mm × 1.1±0.1 mm
- Package height 0.45 mm (max.)
- Approximate weight 5 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)

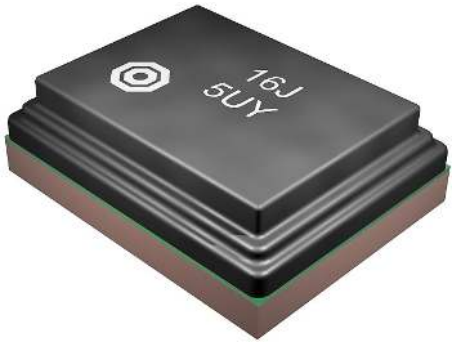


Figure 1: Picture of component with example of product marking.

3 Package

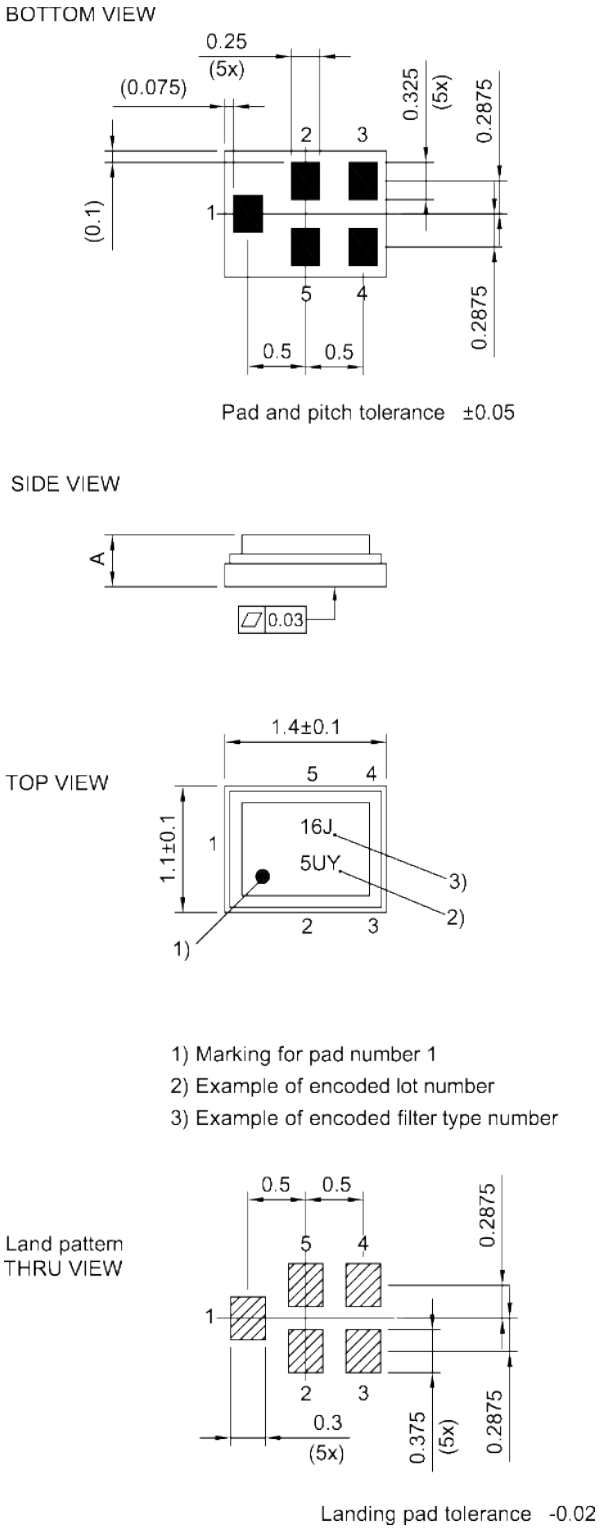


Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 21).

4 Pin configuration

- 1 Input
- 4 Output
- 2, 3, 5 Ground

5 Matching circuit

- L_{p1} = 3.6 nH
- L_{p4} = 4.3 nH

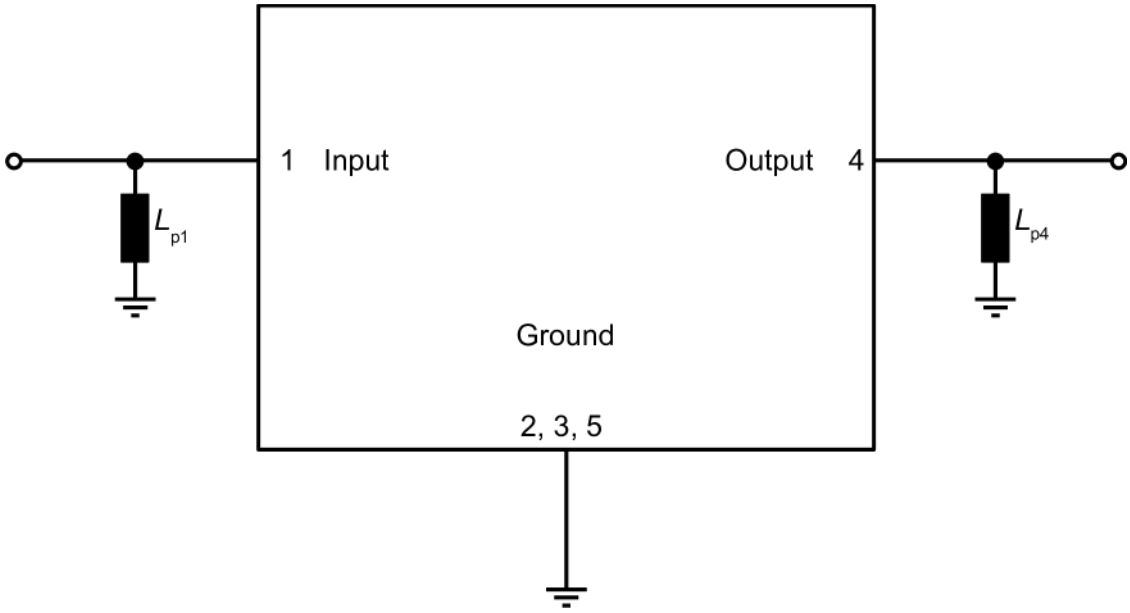


Figure 3: Schematic of matching circuit.

6 Characteristics

Temperature range for specification T_{SPEC} = −10 °C ... +85 °C
Input terminating impedance Z_{IN} = 50 Ω with par. 3.6 nH[1)]
Output terminating impedance Z_{OUT} = 50 Ω with par. 4.3 nH[1)]

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	2350	—	MHz
Maximum insertion attenuation			α_{max}				
	2300 ... 2370	MHz		—	2.1	2.7	dB
	2370 ... 2390	MHz		—	2.2	3.3	dB
	2370 ... 2395	MHz		—	2.7	4.0	dB
	2395 ... 2400	MHz		—	3.6	—	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	2300 ... 2370	MHz		—	0.8	1.5	dB
	2370 ... 2395	MHz		—	1.4	2.5	dB
	2395 ... 2400	MHz		—	2.4	—	dB
Maximum VSWR			$VSWR_{max}$				
@ input port	2300 ... 2305	MHz		—	1.5	1.8	
	2305 ... 2390	MHz		—	1.9	2.5	
	2390 ... 2395	MHz		—	1.5	1.8	
	2395 ... 2400	MHz		—	1.5	—	
@ output port	2300 ... 2305	MHz		—	1.3	1.8	
	2305 ... 2390	MHz		—	1.9	2.5	
	2390 ... 2395	MHz		—	1.7	1.8	
	2395 ... 2400	MHz		—	1.6	—	
Average attenuation			$\alpha_{WLAN,avg}$[2)]				
Channel 1	2403.1 ... 2420.9	MHz		5	16	—	dB
Channel 2	2408.1 ... 2425.9	MHz		9	38	—	dB
Channel 3	2413.1 ... 2430.9	MHz		18	54	—	dB
Channel 4	2418.1 ... 2435.9	MHz		40	52	—	dB
Channel 5	2423.1 ... 2440.9	MHz		45	52	—	dB
Channel 6	2428.1 ... 2445.9	MHz		46	53	—	dB
Channel 7	2433.1 ... 2450.9	MHz		46	54	—	dB
Channel 8	2438.1 ... 2455.9	MHz		48	56	—	dB
Channel 9	2443.1 ... 2460.9	MHz		48	56	—	dB
Channel 10	2448.1 ... 2465.9	MHz		45	54	—	dB
Channel 11	2453.1 ... 2470.9	MHz		45	51	—	dB
Channel 12	2458.1 ... 2475.9	MHz		42	49	—	dB
Channel 13	2463.1 ... 2480.9	MHz		40	48	—	dB
Channel 14	2475.1 ... 2492.9	MHz		40	45	—	dB

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Minimum attenuation			α_{min}				
	10 ... 880	MHz		35	43	—	dB
	880 ... 960	MHz		35	39	—	dB
	960 ... 1150	MHz		27	33	—	dB
	1150 ... 1200	MHz		27	32	—	dB
	1200 ... 1559	MHz		25	27	—	dB
	1559 ... 1606	MHz		25	27	—	dB
	1606 ... 1680	MHz		25	27	—	dB
	1680 ... 1710	MHz		25	28	—	dB
	1710 ... 1785	MHz		25	28	—	dB
	1785 ... 1805	MHz		25	29	—	dB
	1805 ... 1880	MHz		25	29	—	dB
	1880 ... 1920	MHz		28	31	—	dB
	1920 ... 1980	MHz		28	32	—	dB
	1980 ... 2010	MHz		30	34	—	dB
	2010 ... 2025	MHz		30	36	—	dB
	2025 ... 2110	MHz		30	36	—	dB
	2110 ... 2170	MHz		34	43	—	dB
	2170 ... 2200	MHz		34	39	—	dB
	2200 ... 2270	MHz		15	37	—	dB
	2496 ... 2500	MHz		35	43	—	dB
	2500 ... 2570	MHz		35	41	—	dB
	2570 ... 2620	MHz		36	41	—	dB
	2620 ... 2690	MHz		38	42	—	dB
	2690 ... 3400	MHz		20	35	—	dB
	3400 ... 3650	MHz		28	32	—	dB
	3650 ... 3900	MHz		18	24	—	dB
	3900 ... 4600	MHz		25	28	—	dB
	4600 ... 4755	MHz		25	28	—	dB
	4755 ... 5150	MHz		23	26	—	dB
	5150 ... 5850	MHz		23	26	—	dB

1) See Sec. Matching circuit (p. 6).
2) Average over each WLAN channel with band width of 17.8 MHz.

Temperature range for specification T_{SPEC} = −40 °C ... +95 °C
Input terminating impedance Z_{IN} = 50 Ω with par. 3.6 nH[1)]
Output terminating impedance Z_{OUT} = 50 Ω with par. 4.3 nH[1)]

Characteristics				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Maximum insertion attenuation			α_{max}				
	2300 ... 2370	MHz		—	2.1	3.2	dB
	2370 ... 2390	MHz		—	2.2	3.4	dB
	2370 ... 2395	MHz		—	2.7	4.5	dB
	2395 ... 2400	MHz		—	3.6	—	dB
Amplitude ripple (p-p)			Δα				
	2300 ... 2370	MHz		—	0.8	2.0	dB
	2370 ... 2395	MHz		—	1.4	3.0	dB
	2395 ... 2400	MHz		—	2.4	—	dB
Maximum VSWR			$VSWR_{max}$				
@ input port	2300 ... 2305	MHz		—	1.5	1.9	
	2305 ... 2390	MHz		—	1.9	2.5	
	2390 ... 2395	MHz		—	1.5	1.8	
	2395 ... 2400	MHz		—	1.5	—	
@ output port	2300 ... 2305	MHz		—	1.3	1.9	
	2305 ... 2390	MHz		—	1.9	2.5	
	2390 ... 2395	MHz		—	1.7	1.8	
	2395 ... 2400	MHz		—	1.6	—	
Average attenuation			$\alpha_{WLAN,avg}$ [2)]				
Channel 1	2403.1 ... 2420.9	MHz		5	16	—	dB
Channel 2	2408.1 ... 2425.9	MHz		7	38	—	dB
Channel 3	2413.1 ... 2430.9	MHz		13	54	—	dB
Channel 4	2418.1 ... 2435.9	MHz		32	52	—	dB
Channel 5	2423.1 ... 2440.9	MHz		45	52	—	dB
Channel 6	2428.1 ... 2445.9	MHz		46	53	—	dB
Channel 7	2433.1 ... 2450.9	MHz		46	54	—	dB
Channel 8	2438.1 ... 2455.9	MHz		48	56	—	dB
Channel 9	2443.1 ... 2460.9	MHz		48	56	—	dB
Channel 10	2448.1 ... 2465.9	MHz		45	54	—	dB
Channel 11	2453.1 ... 2470.9	MHz		45	51	—	dB
Channel 12	2458.1 ... 2475.9	MHz		42	49	—	dB
Channel 13	2463.1 ... 2480.9	MHz		40	48	—	dB
Channel 14	2475.1 ... 2492.9	MHz		40	45	—	dB
Minimum attenuation			α_{min}				
	10 ... 880	MHz		35	43	—	dB
	880 ... 960	MHz		35	39	—	dB

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
	960 ... 1150	MHz	27	33	—	dB
	1150 ... 1200	MHz	27	32	—	dB
	1200 ... 1559	MHz	25	27	—	dB
	1559 ... 1606	MHz	25	27	—	dB
	1606 ... 1680	MHz	25	27	—	dB
	1680 ... 1710	MHz	25	28	—	dB
	1710 ... 1785	MHz	25	28	—	dB
	1785 ... 1805	MHz	25	29	—	dB
	1805 ... 1880	MHz	25	29	—	dB
	1880 ... 1920	MHz	28	31	—	dB
	1920 ... 1980	MHz	28	32	—	dB
	1980 ... 2010	MHz	30	34	—	dB
	2010 ... 2025	MHz	30	36	—	dB
	2025 ... 2110	MHz	30	36	—	dB
	2110 ... 2170	MHz	34	43	—	dB
	2170 ... 2200	MHz	34	39	—	dB
	2200 ... 2270	MHz	12	37	—	dB
	2496 ... 2500	MHz	35	43	—	dB
	2500 ... 2570	MHz	35	41	—	dB
	2570 ... 2620	MHz	36	41	—	dB
	2620 ... 2690	MHz	38	42	—	dB
	2690 ... 3400	MHz	20	35	—	dB
	3400 ... 3650	MHz	28	32	—	dB
	3650 ... 3900	MHz	18	24	—	dB
	3900 ... 4600	MHz	25	28	—	dB
	4600 ... 4755	MHz	25	28	—	dB
	4755 ... 5150	MHz	23	26	—	dB
	5150 ... 5850	MHz	23	26	—	dB

1) See Sec. Matching circuit (p. 6).
2) Average over each WLAN channel with band width of 17.8 MHz.

7 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +95 °C	
Storage temperature	T_{STG} [1] = −40 °C ... +95 °C	
DC voltage	$\|V_{DC}\|$ [2] = 0 V	
ESD voltage		
	V_{ESD} [3] = 50 V	Machine model.
	V_{ESD} [4] = 100 V	Human body model.
Input power	P_{IN}	
@ input port: 2300 ... 2395 MHz	27 dBm	5 MHz LTE downlink signal for 100000 h @ 55 °C. P_{IN} average – 38 dBm peak. Source and load impedance 50Ω. [5]
@ input port: other frequency ranges	10 dBm	Source and load impedance 50Ω.
Operating lifetime with output power at antenna @ output port: 2300 ... 2395 MHz	P_{OUT} [6] = 23 dBm	Continuous wave for 100000 h @ 55 °C. Source and load impedance 50Ω.

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.
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) Expected lifetime according to accelerated power durability tests, and wear out models.
6) According to accelerated high temperature operating life (HTOL) test.

8 Transmission coefficient

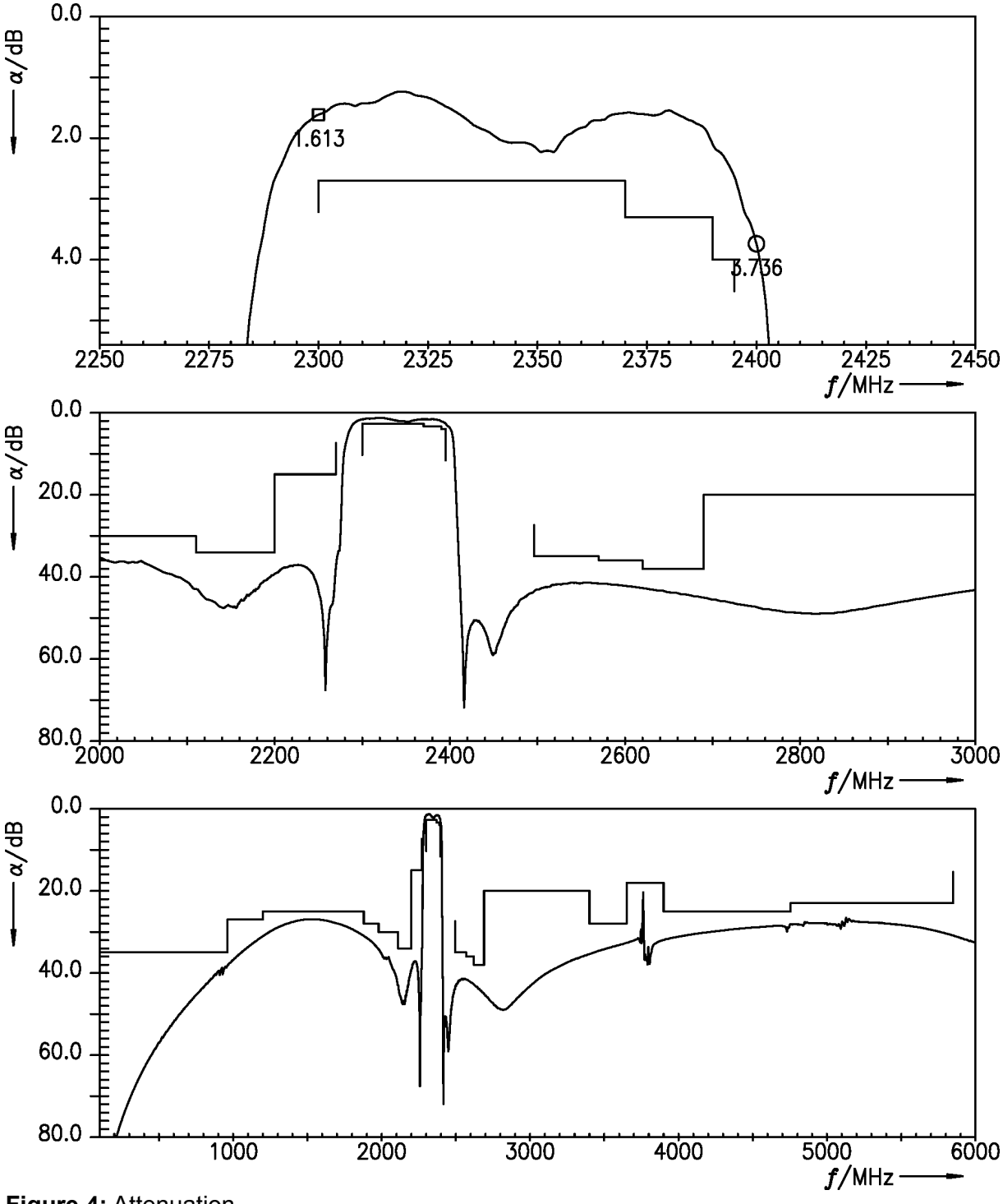


Figure 4: Attenuation.

9 Reflection coefficients

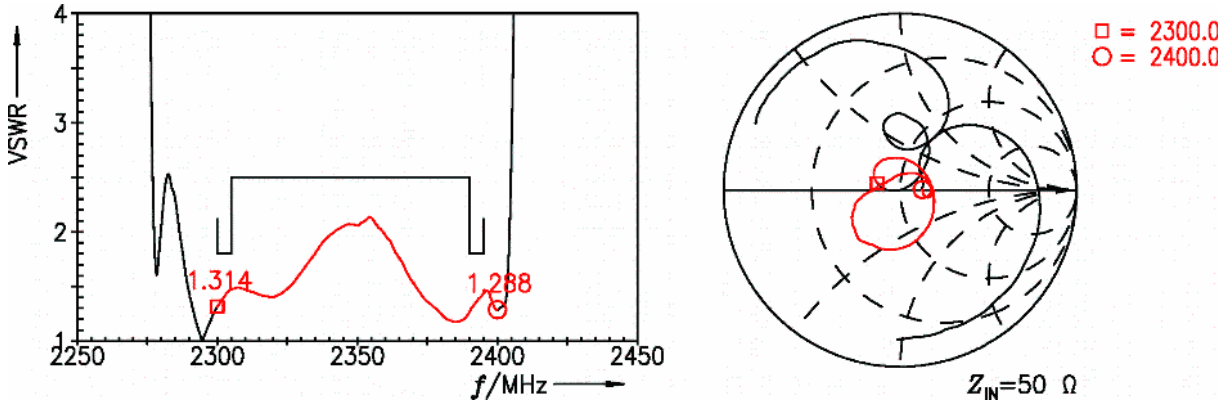


Figure 5: Reflection coefficient at IN port.

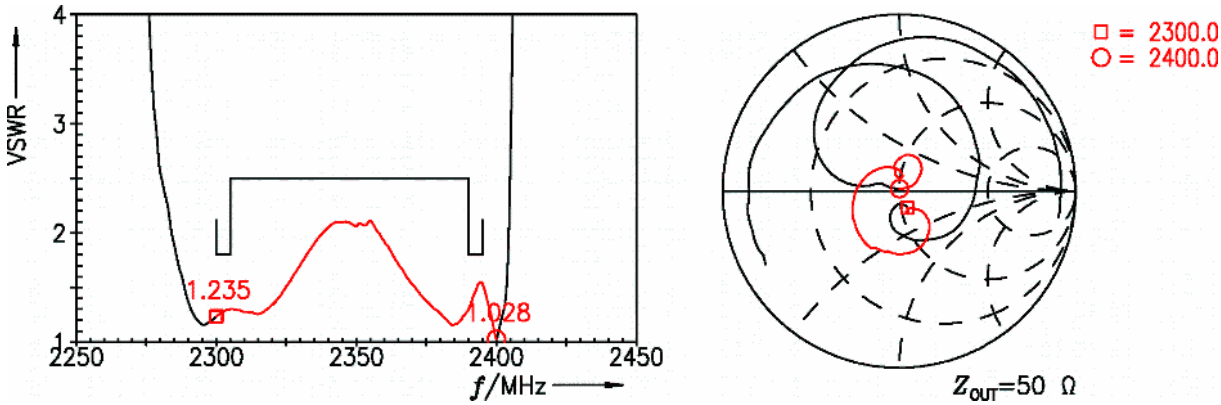


Figure 6: Reflection coefficient at OUT port.

10 Packing material

10.1 Tape

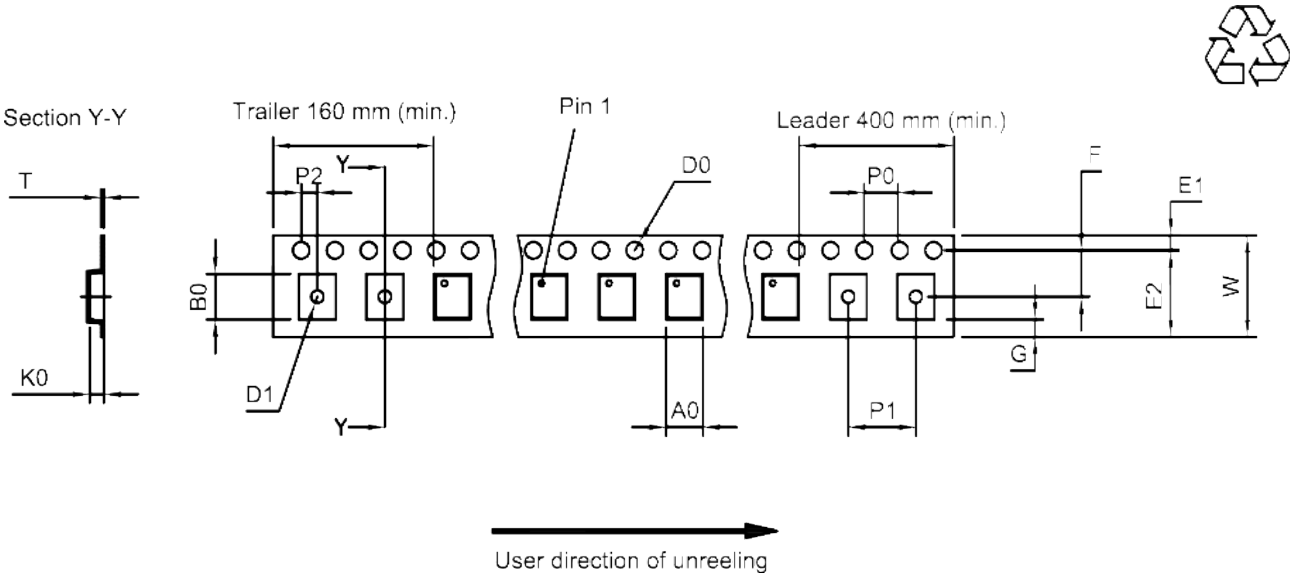


Figure 7: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	$1.27_{\pm 0.05}$ mm
B_0	$1.57_{\pm 0.05}$ 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	$0.62_{\pm 0.05}$ 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	$0.25_{\pm 0.03}$ mm
W	$8.0^{+0.3/-0.1}$ mm

Table 1: Tape dimensions.

10.2 Reel with diameter of 180 mm

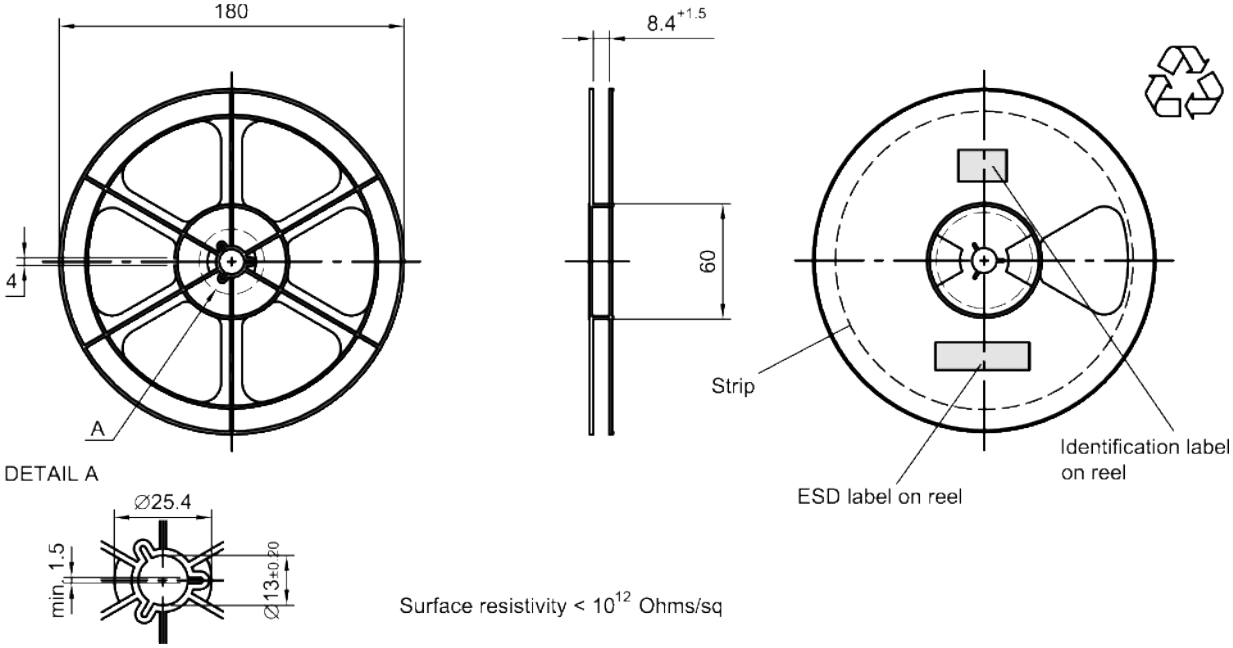


Figure 8: Drawing of reel (first-angle projection) with diameter of 180 mm.

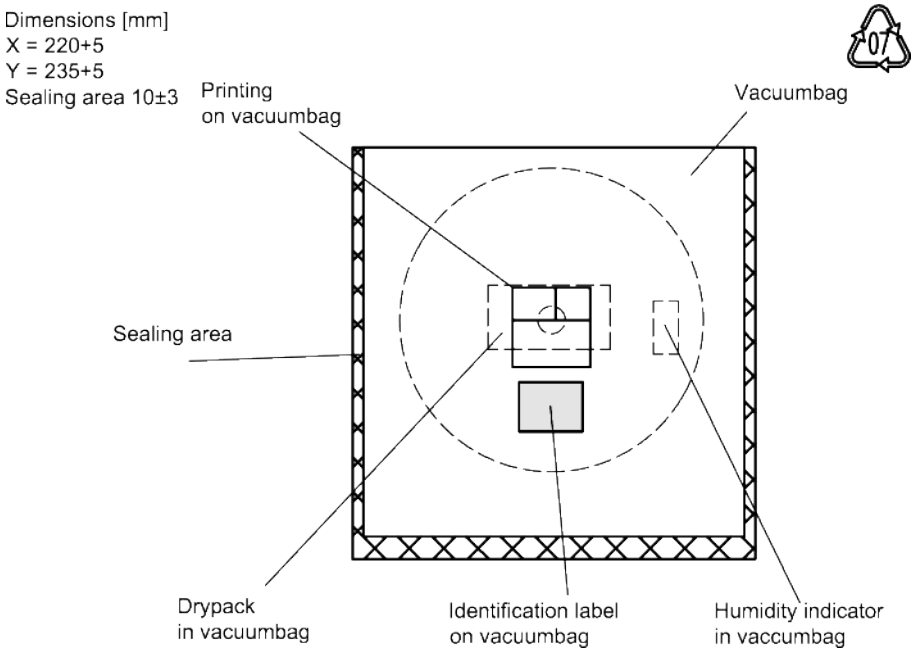


Figure 9: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

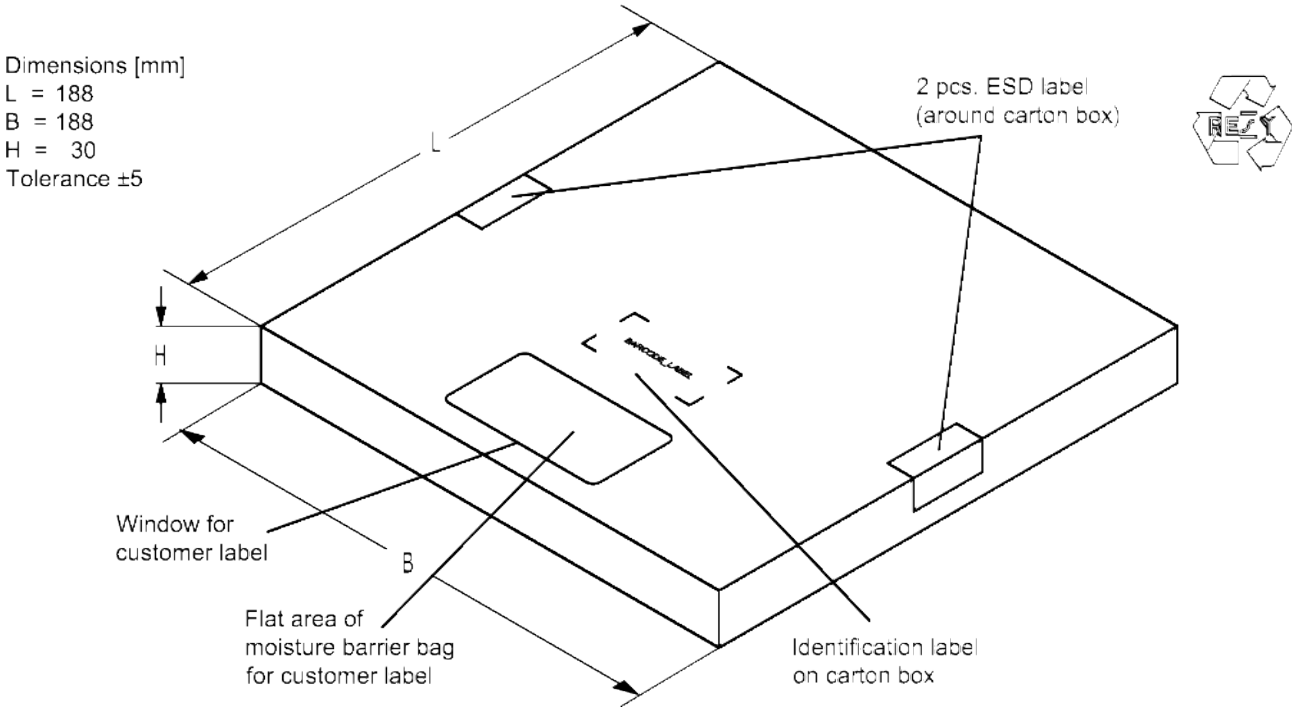


Figure 10: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm

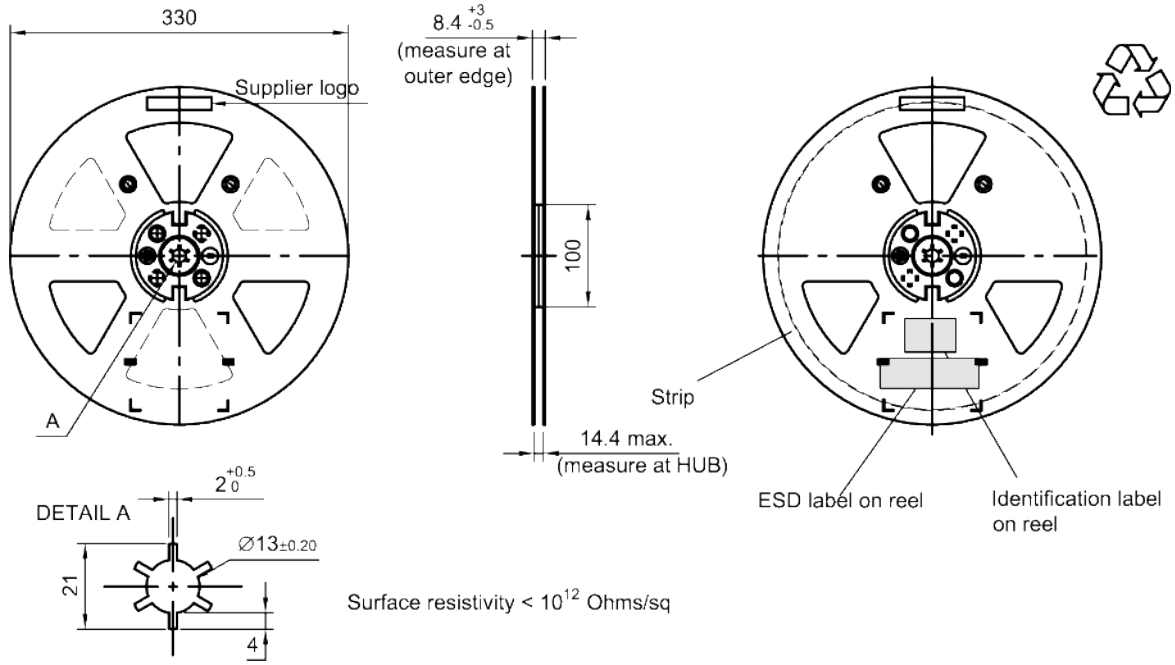


Figure 11: Drawing of reel (first-angle projection) with diameter of 330 mm.

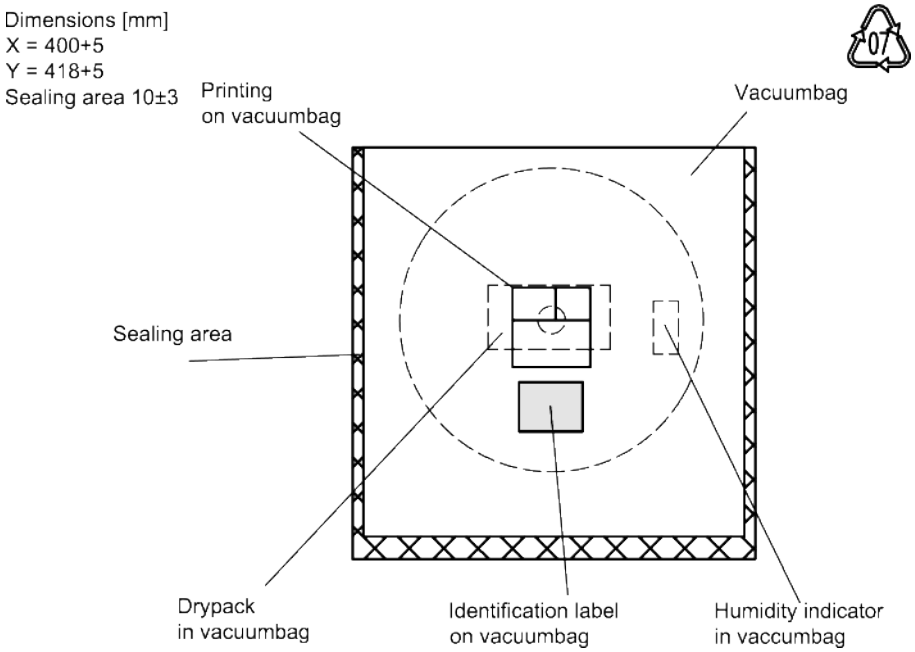


Figure 12: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

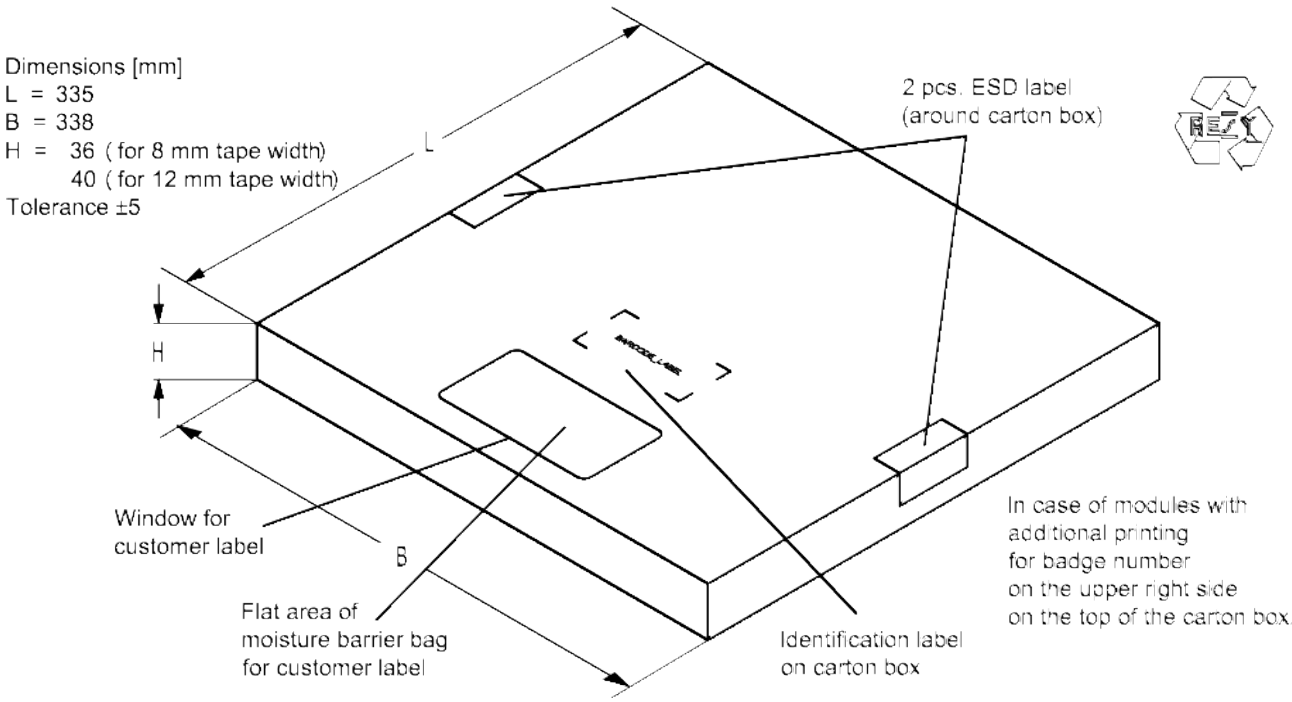


Figure 13: Drawing of folding box for reel with diameter of 330 mm.

11 Marking

Products are marked with product type number and lot number encoded according to 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 B9628 is 9CW.

- 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).

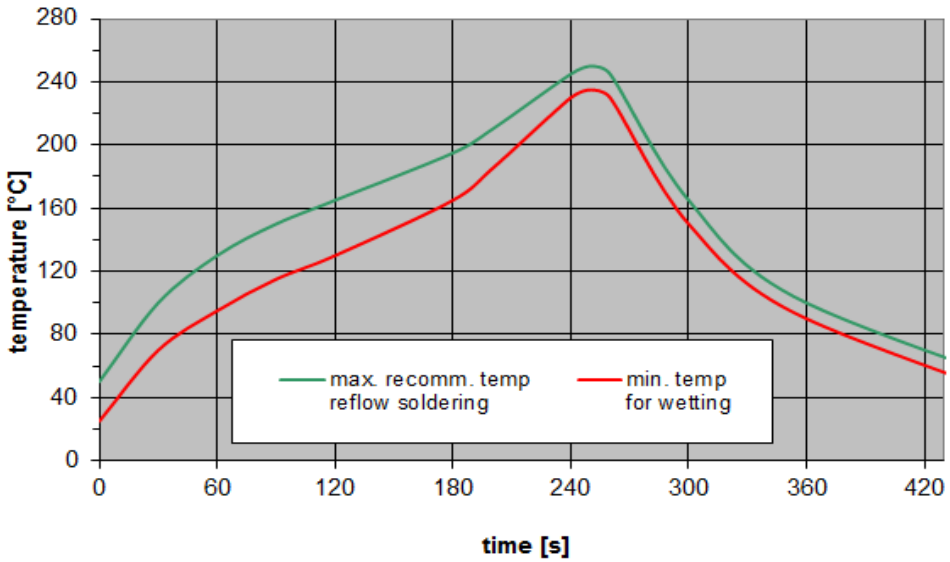


Figure 14: Recommended reflow profile for convection and infrared soldering – lead-free solder.

13 Annotations

13.1 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 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.

13.3 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.

13.4 Ordering codes and packing units

Ordering code	Packing unit
B39232B9628P810	5000 pcs

Table 4: Ordering codes and packing units.

14 Cautions and warnings

14.1 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.

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 RF360 sales office.

14.4 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).

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:

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.
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.