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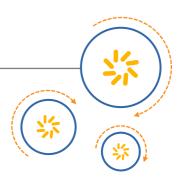
Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832 Email & Skype: info@chipsmall.com Web: www.chipsmall.com Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





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

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SAW components	B9628
BAW filter	2350 MHz

Data sheet

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BAW filter

Data sheet

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)

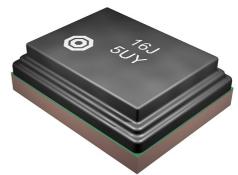


Figure 1: Picture of component with example of product marking.



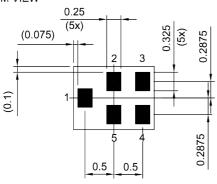
B9628 2350 MHz

BAW filter

Data sheet

3 Package

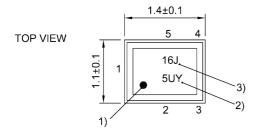
BOTTOM VIEW



Pad and pitch tolerance ±0.05

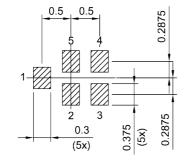
SIDE VIEW

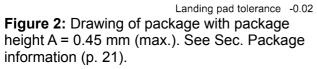




- 1) Marking for pad number 1
- 2) Example of encoded lot number
- 3) Example of encoded filter type number







4 Pin configuration

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



B9628



2350 MHz

SAW components

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5 Matching circuit

■ *L*_{p1} = 3.6 nH

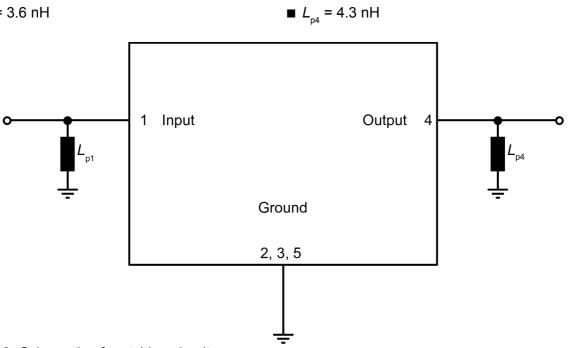


Figure 3: Schematic of matching circuit.

BAW filter

Data sheet

6 Characteristics

Temperature range for specification
Input terminating impedance
Output terminating impedance

$$\begin{split} T_{\rm SPEC} &= -10 \ ^{\circ}{\rm C} \ ... +85 \ ^{\circ}{\rm C} \\ Z_{\rm IN} &= 50 \ \Omega \ {\rm with} \ {\rm par.} \ 3.6 \ {\rm nH}^{\rm 1)} \\ Z_{\rm OUT} &= 50 \ \Omega \ {\rm with} \ {\rm par.} \ 4.3 \ {\rm nH}^{\rm 1)} \end{split}$$

Characteristics				min. for $T_{\rm SPEC}$	typ. @ +25 °C	max. for $T_{_{\rm SPEC}}$	
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)			Δα				
	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			$lpha_{_{WLAN,avg}}^{~~2)}$				
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



BAW filter

Data sheet

Characteristics			min. for $T_{_{\rm SPEC}}$	typ. @ +25 °C	max. for $T_{_{\rm SPEC}}$	
Minimum attenuation		a _{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). Average over each WLAN channel with band width of 17.8 MHz. 2)

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BAW filter

Data sheet

Temperature range for specification Input terminating impedance Output terminating impedance $\begin{array}{ll} T_{\rm SPEC} & = -40 \ ^{\circ}{\rm C} \ ... +95 \ ^{\circ}{\rm C} \\ Z_{\rm IN} & = 50 \ \Omega \ {\rm with} \ {\rm par.} \ 3.6 \ {\rm nH}^{\rm 1}) \\ Z_{\rm OUT} & = 50 \ \Omega \ {\rm with} \ {\rm par.} \ 4.3 \ {\rm nH}^{\rm 1}) \end{array}$

Characteristics				min. for $T_{\rm SPEC}$	typ. @ +25 °C	max. for $T_{_{\rm SPEC}}$	
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			$lpha_{_{WLAN,avg}}^{~~2)}$				
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			$\alpha_{_{min}}$				
	10 880	MHz		35	43	—	dB
	880 960	MHz		35	39	—	dB



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Characteristics			min. for T _{SPEC}	typ. @ +25 °C	max. for $T_{\rm SPEC}$	
	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.

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BAW filter

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2350 MHz

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7 **Maximum ratings**

Operable temperature	<i>T</i> _{OP} = -40 °C +95 °C	
Storage temperature	<i>T</i> _{STG} ¹⁾ = −40 °C +95 °C	
DC voltage	$ V_{\rm DC} ^{2)} = 0 V$	
ESD voltage		
	V _{ESD} ³⁾ = 50 V	Machine model.
	$V_{\rm ESD}^{4)}$ = 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 $50\Omega^{(5)}$
@ input port: other frequency ranges	10 dBm	Source and load impedance 50Ω .
Operating lifetime with output power at antenna @ output port: 2300 2395 MHz	$P_{\rm OUT}^{6}$ = 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. According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

4)

5) Expected lifetime according to accelerated power durability tests, and wear out models.

6) According to accelerated high temperature operating life (HTOL) test.



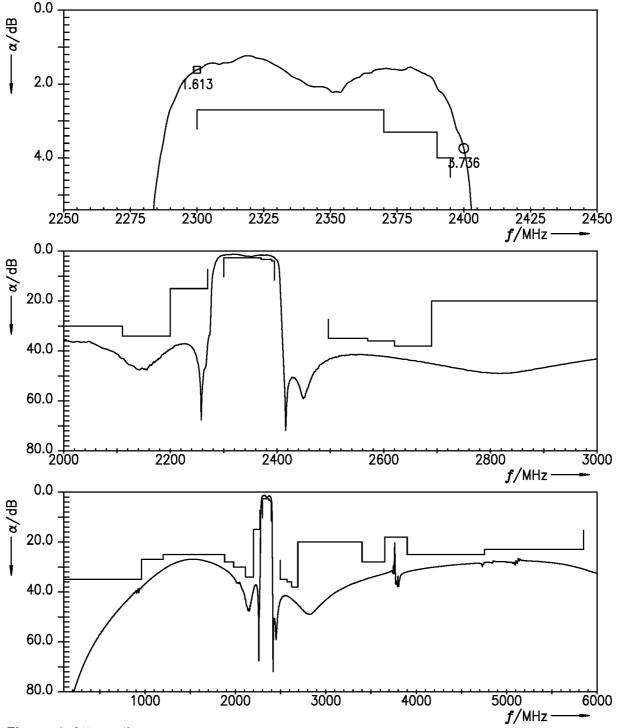
2350 MHz

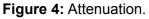
SAW components

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□ = 2300.0 O = 2400.0

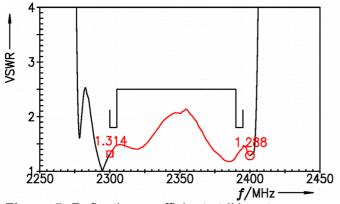
SAW components

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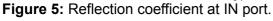
Data sheet

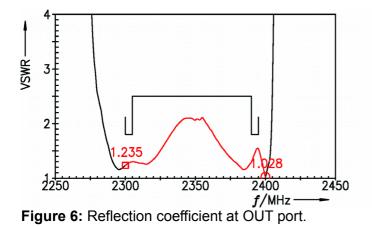
B9628 2350 MHz

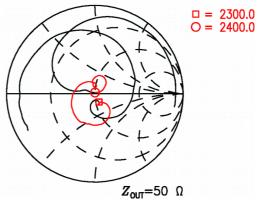
9 Reflection coefficients











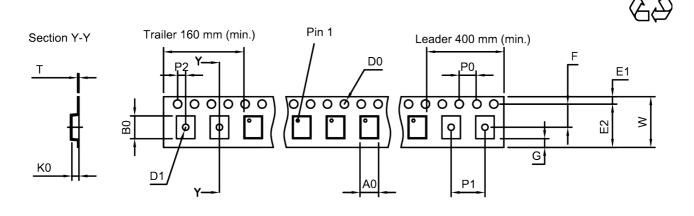
SAW components

BAW filter

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10 Packing material

10.1 Tape



User direction of unreeling

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

A ₀	1.27±0.05 mm
B ₀	1.57±0.05 mm
D ₀	1.5 +0.1/-0 mm
D ₁	0.5±0.1 mm
E1	1.75±0.1 mm

Table 1: Tape dimensions.

ım (min.)
5 mm
ım (min.)
.05 mm
mm

P ₁	4.0±0.1 mm
P ₂	2.0±0.05 mm
Т	0.25±0.03 mm
W	8.0+0.3/-0.1 mm

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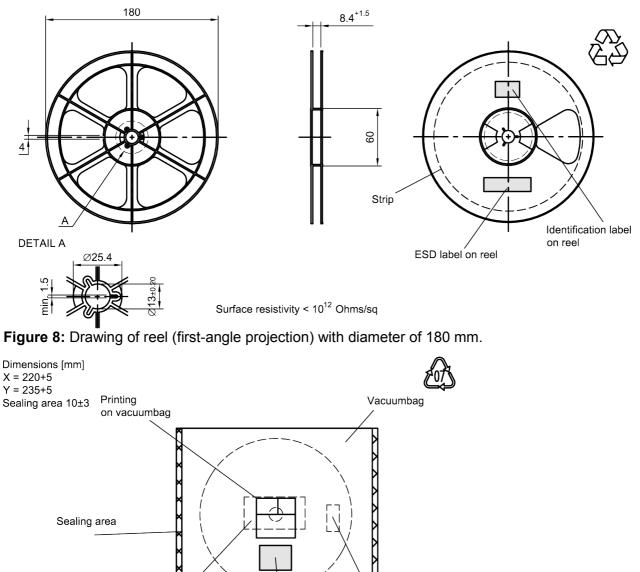
2350 MHz

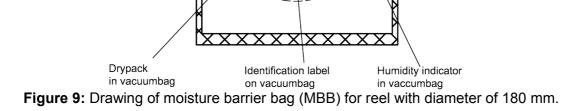
SAW components

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10.2 Reel with diameter of 180 mm





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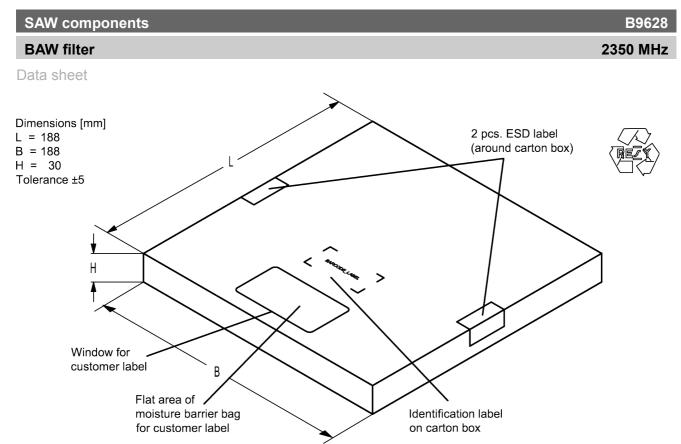
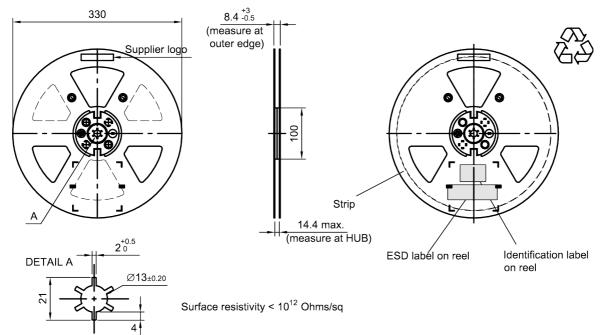
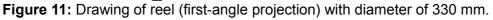


Figure 10: Drawing of folding box for reel with diameter of 180 mm.

10.3 Reel with diameter of 330 mm







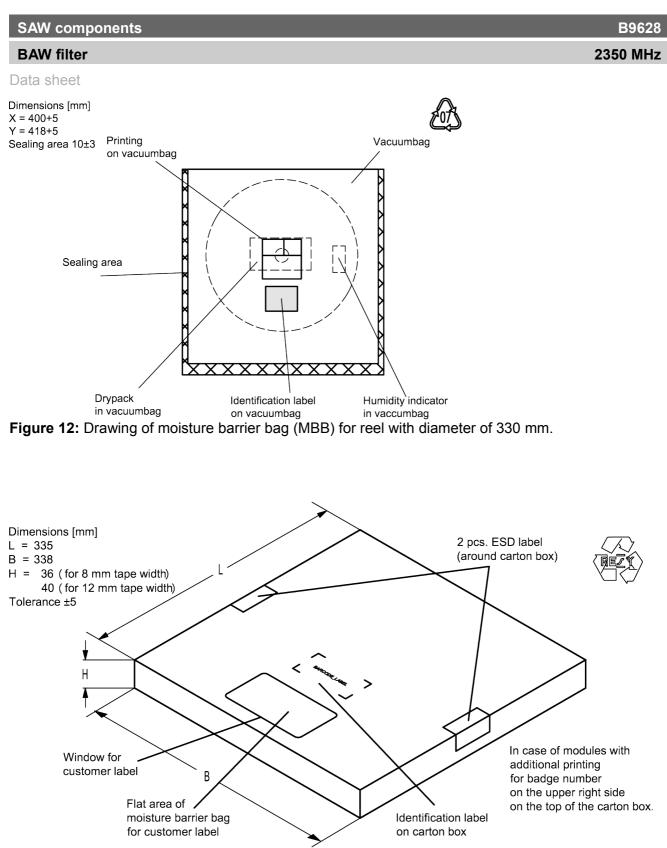


Figure 13: Drawing of folding box for reel with diameter of 330 mm.

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SAW components	B9628
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11 Marking	
Products are marked with product type number and lot nu	mber encoded according to 2:
■ Type number:	
The 4 digit type number of the ordering code, is encoded by a special BASE32 code into a 3 digit mark	e.g., B3xxxxB <u>1234</u> xxxx, king.
Example of decoding type number marking on devi	
	=> 1234 = 1234
The BASE32 code for product type B9628 is 9CW.	- 1254
■ Lot number:	
The last 5 digits of the lot number, are encoded based on a special BASE47 code into a 3 c	e.g., 12345 , digit marking.
	in decimal code. => 12345 = 12345

Adopted BASE32 code for type number			
Decimal	Base32	Decimal	Base32
value	code	value	code
0	0	16	G
1	1	17	Н
2	2	18	J
3	3	19	K
4	4	20	М
5	5	21	N
6	6	22	Р
7	7	23	Q
8	8	24	R
9	9	25	S
10	А	26	Т
11	В	27	V
12	С	28	W
13	D	29	X
14	E	30	Y
15	F	31	Z

Adopt	Adopted BASE47 code for lot number			
Decimal	Base47	Decimal	Base47	
value	code	value	code	
0	0	24	R	
1	1	25	S	
2	2	26	Т	
3	3	27	U	
4	4	28	V	
5	5	29	W	
6	6	30	Х	
7	7	31	Y	
8	8	32	Z	
9	9	33	b	
10	A	34	d	
11	В	35	f	
12	С	36	h	
13	D	37	n	
14	E	38	r	
15	F	39	t	
16	G	40	v	
17	Н	41	١	
18	J	42	?	
19	K	43	{	
20	L	44	}	
21	М	45	<	
22	N	46	>	
23	Р			

Table 2: Lists for encoding and decoding of marking.



2350 MHz

SAW components

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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
<i>T</i> > 220 °C	30 s to 70 s
<i>T</i> > 230 °C	min. 10 s
<i>T</i> > 245 °C	max. 20 s
<i>T</i> ≥ 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).

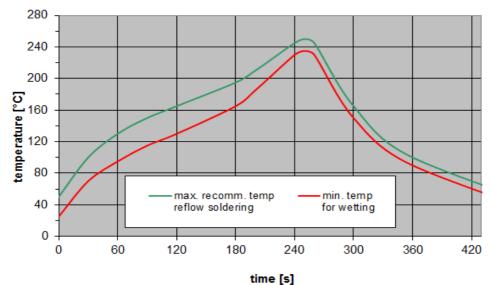


Figure 14: Recommended reflow profile for convection and infrared soldering – lead-free solder.



2350 MHz

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13 Annotations

13.1 Matching coils

See TDK inductor pdf-catalog <u>http://www.tdk.co.jp/tefe02/coil.htm#aname1</u> and Data Library for circuit simulation <u>http://www.tdk.co.jp/etvcl/index.htm</u>.

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.



BAW filter

Data sheet

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 <u>www.rf360jv.com/orderingcodes</u>.

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.

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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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The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.