



RF360
Europe GmbH

Data sheet

SAW RF uplink filter

Small cell & femtocell
LTE band 28

Series/type: B9644
Ordering code: B39731B9644P810

Date: July 31, 2019

Version: 2.1

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A Qualcomm – TDK Joint Venture

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1 Application

- Low-loss RF filter for smallcell systems (LTE Band 28)
- Usable pass band 45MHz

2 Features

- Package size $1.4_{\pm 0.1}$ mm \times $1.1_{\pm 0.1}$ 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 2a (MSL2a)

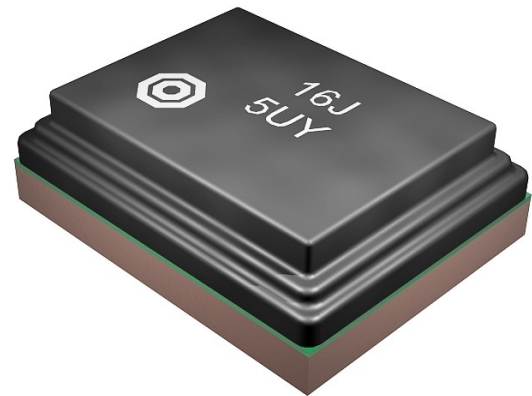
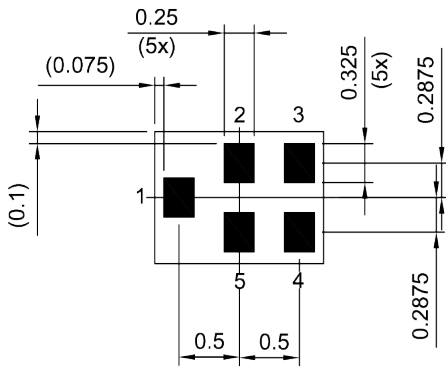


Figure 1: Picture of component with example of product marking.

3 Package

BOTTOM VIEW

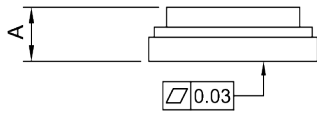


Pad and pitch tolerance ±0.05

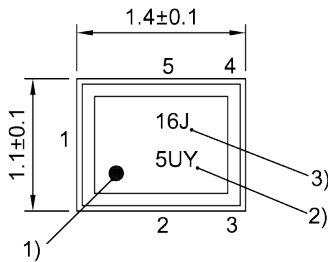
4 Pin configuration

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

SIDE VIEW

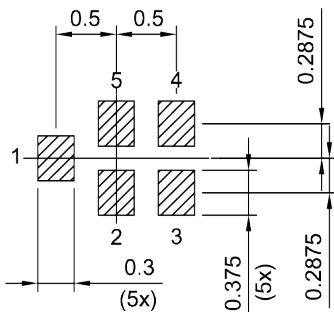


TOP VIEW



- 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

Figure 2: Drawing of package with package height A = 0.45 mm (max.). See Sec. Package information (p. 19).

5 Matching circuit

■ $L_{s1} = 11 \text{ nH}$

■ $L_{s4} = 25 \text{ nH}$

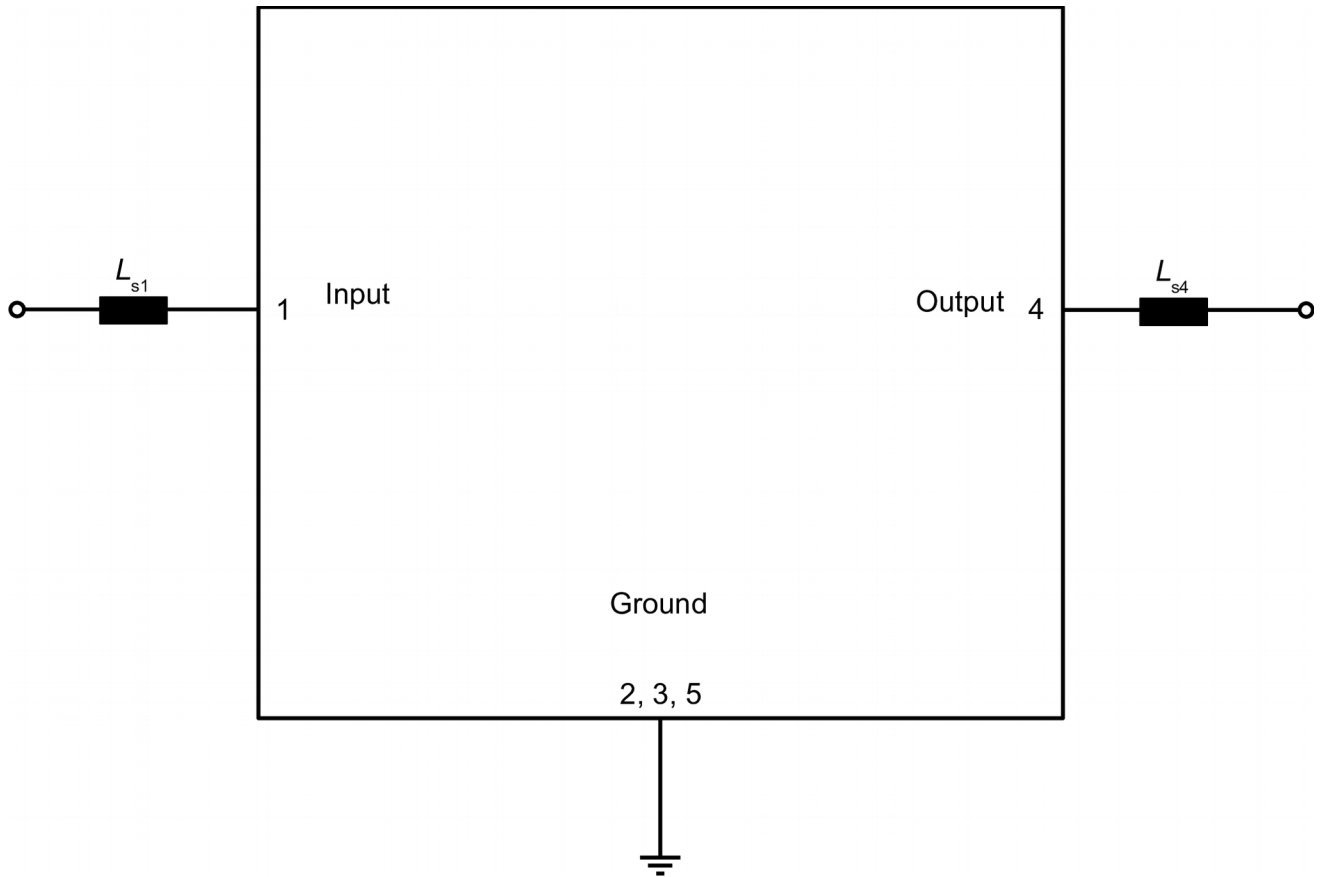


Figure 3: Schematic of matching circuit.

6 Characteristics

Temperature range for specification	T_{SPEC}	= -10 °C ... +85 °C
Input terminating impedance	Z_{IN}	= 50 Ω + 11 nH ¹⁾
Output terminating impedance	Z_{OUT}	= 50 Ω + 25 nH ¹⁾

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_C	—	725.5	—	MHz
Maximum insertion attenuation	703... 748	MHz	α_{max}	1.9	2.9	dB
Amplitude ripple (p-p)	703... 748	MHz	$\Delta\alpha$	1.2	2.2	dB
Maximum VSWR			VSWR _{max}			
@ input port	703... 748	MHz		1.8	2.1	
@ output port	703... 748	MHz		1.8	2.1	
Maximum error vector magnitude	705.4... 745.6	MHz	EVM _{max} ²⁾	2.7	4.0	%
Minimum attenuation			α_{min}			
	758... 763	MHz		2	5	dB
	763... 765	MHz		11	19	dB
	765... 803	MHz		18	23	dB
	791... 821	MHz		18	29	dB
	832... 863	MHz		20	27	dB
	869... 894	MHz		20	28	dB
	880... 915	MHz		22	29	dB
	925... 960	MHz		24	29	dB
	1710... 1785	MHz		35	58	dB
	1805... 1880	MHz		30	58	dB
	1920... 1995	MHz		30	58	dB
	2110... 2200	MHz		30	58	dB
	2300... 2400	MHz		30	60	dB
	2400... 2500	MHz		40	61	dB
	2620... 2690	MHz		30	62	dB
	5150... 5850	MHz		40	65	dB

¹⁾ See Sec. Matching circuit (p. 6).

²⁾ Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

Temperature range for specification	T_{SPEC}	= -40 °C ... +95 °C
Input terminating impedance	Z_{IN}	= 50 Ω + 11 nH ¹⁾
Output terminating impedance	Z_{OUT}	= 50 Ω + 25 nH ¹⁾

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}		
Center frequency		f_C	—	725.5	—	MHz	
Maximum insertion attenuation	703... 748	MHz	α_{max}	—	1.9	3.0	dB
Amplitude ripple (p-p)	703... 748	MHz	$\Delta\alpha$	—	1.2	2.6	dB
Maximum VSWR			VSWR _{max}				
@ input port	703... 748	MHz		—	1.8	2.2	
@ output port	703... 748	MHz		—	1.8	2.2	
Maximum error vector magnitude	705.4... 745.6	MHz	EVM _{max} ²⁾	—	2.7	5.5	%
Minimum attenuation			α_{min}				
	758... 763	MHz		2	5	—	dB
	763... 765	MHz		8	19	—	dB
	765... 803	MHz		14	23	—	dB
	791... 821	MHz		18	29	—	dB
	832... 863	MHz		20	27	—	dB
	869... 894	MHz		20	28	—	dB
	880... 915	MHz		22	29	—	dB
	925... 960	MHz		24	29	—	dB
	1710... 1785	MHz		35	58	—	dB
	1805... 1880	MHz		30	58	—	dB
	1920... 1995	MHz		30	58	—	dB
	2110... 2200	MHz		30	58	—	dB
	2300... 2400	MHz		30	60	—	dB
	2400... 2500	MHz		40	61	—	dB
	2620... 2690	MHz		30	62	—	dB
	5150... 5850	MHz		40	65	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

²⁾ Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

7 Maximum ratings

Operable temperature	$T_{OP} = -40\text{ °C} \dots +95\text{ °C}$	
Storage temperature	$T_{STG}^{1)} = -40\text{ °C} \dots +95\text{ °C}$	
DC voltage	$ V_{DC} ^{2)} = 0\text{ V}$	
ESD voltage		
	$V_{ESD}^{3)} = 150\text{ V}$	Machine model.
	$V_{ESD}^{4)} = 250\text{ V}$	Human body model.
Input power	P_{IN}	
@ input port: 703 ... 748 MHz	25 dBm ^{5),6)}	Continuous wave for 24 h @ 85 °C. Source and load impedance 50Ω.
@ input port: 703 ... 748 MHz	18 dBm ⁵⁾	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 simulations and wear out models.

⁶⁾ T_{spec} is the ambient temperature of the PCB at component position. Specified min./max values from Section 6 “Characteristics” for maximum input power of 25dBm are valid for temperature up to 72°C.

8 Transmission coefficient

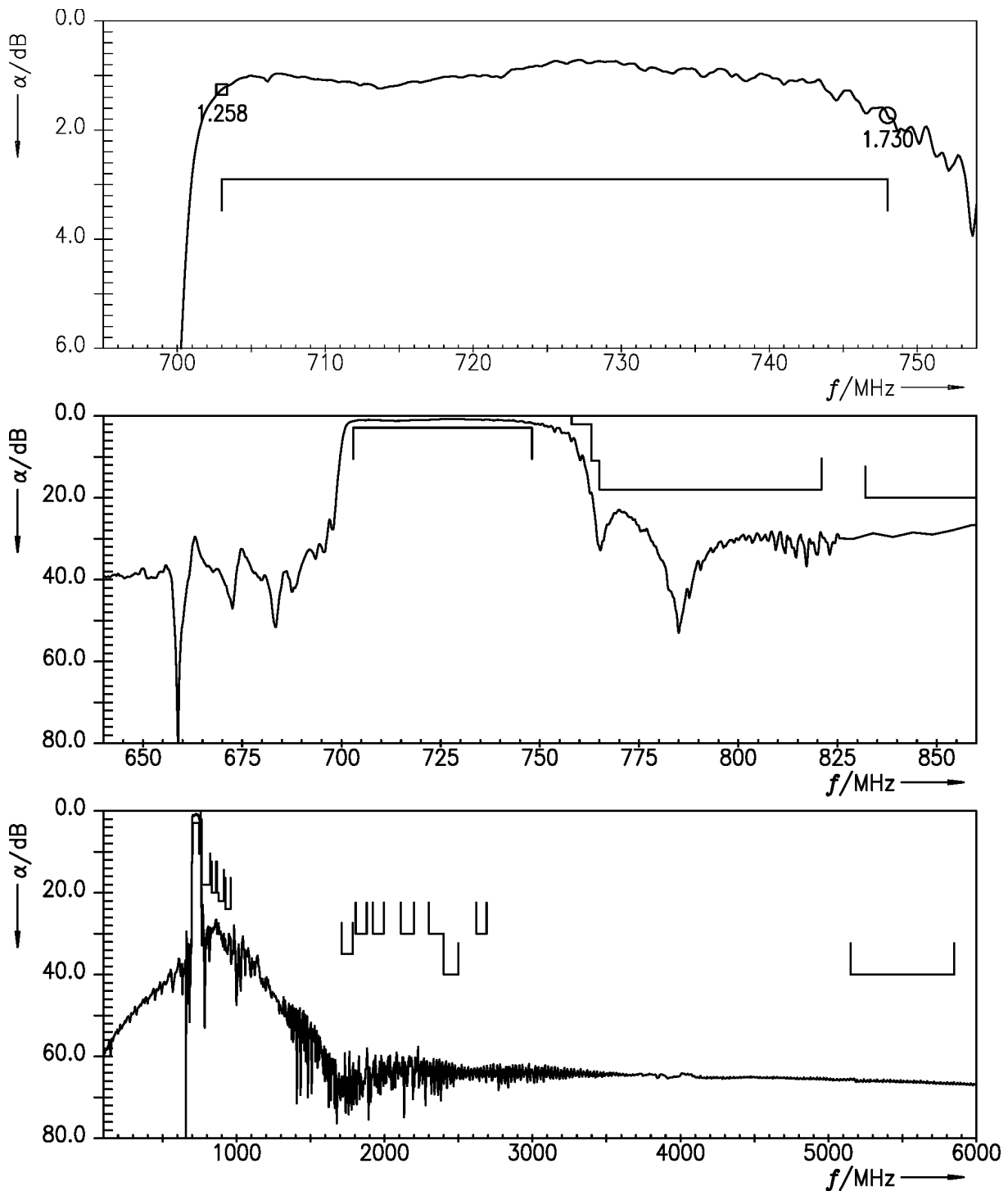


Figure 4: Attenuation.

9 Reflection coefficients

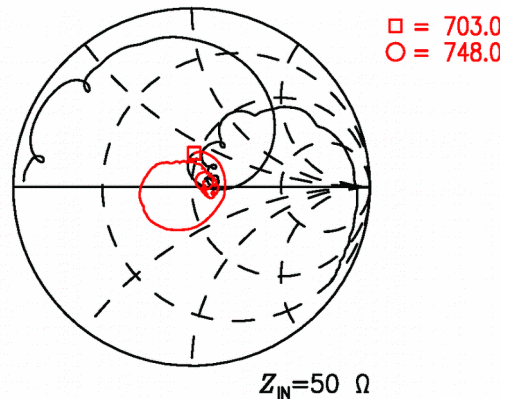
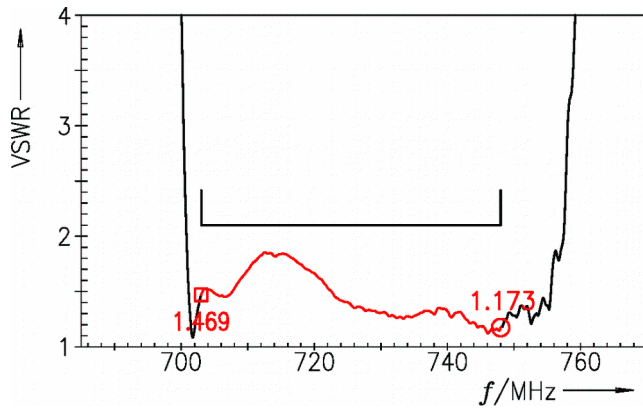


Figure 5: Reflection coefficient at input port.

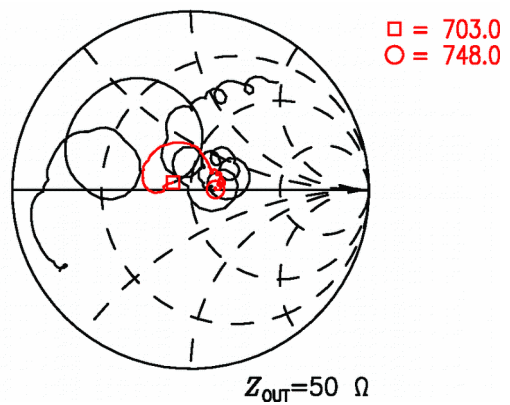
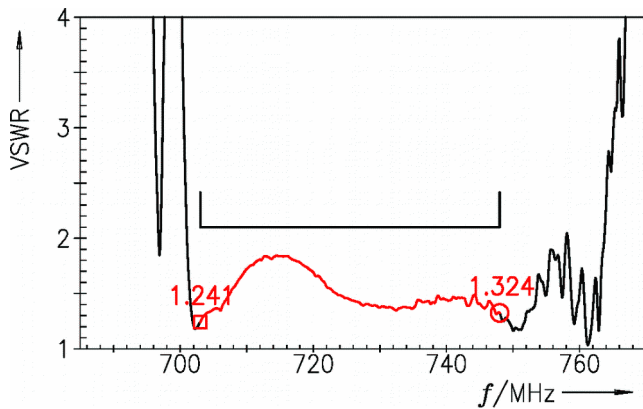


Figure 6: Reflection coefficient at output port.

10 EVM

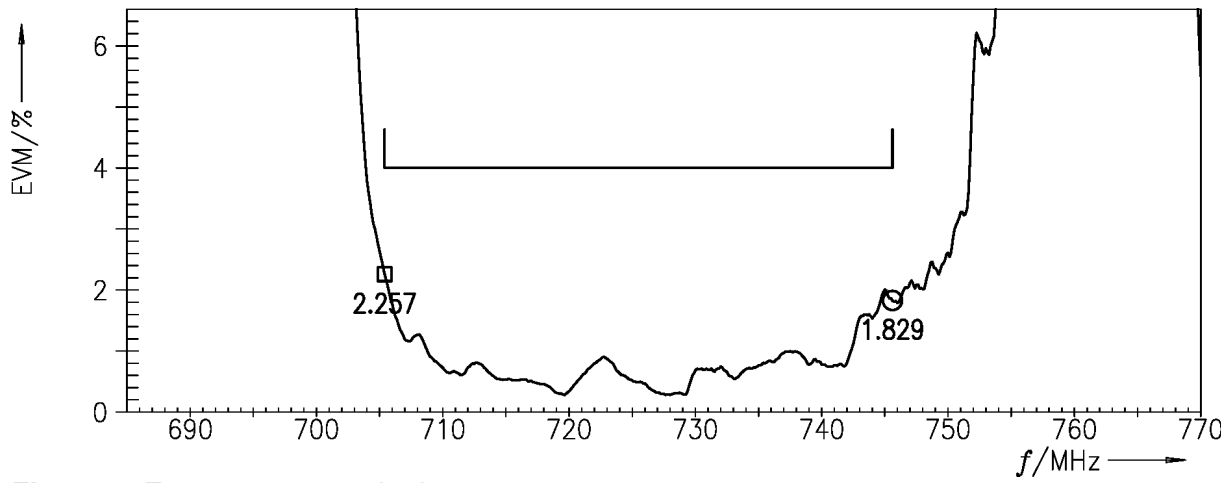


Figure 7: Error vector magnitude.



11 Packing material
11.1 Tape

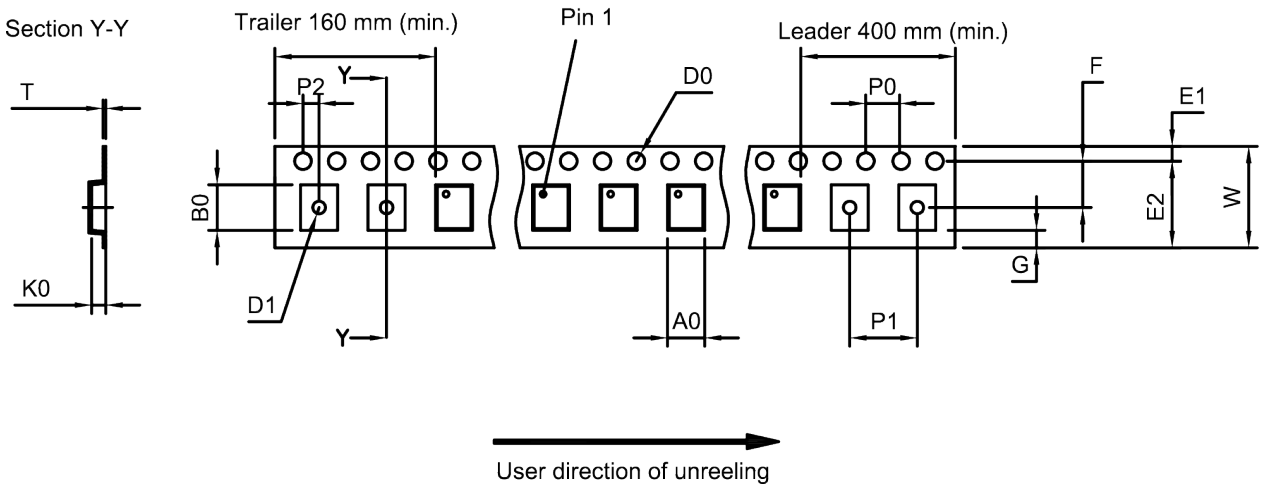


Figure 8: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A ₀	1.27±0.05 mm	E ₂	6.25 mm (min.)	P ₁	4.0±0.1 mm
B ₀	1.57±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 mm	K ₀	0.62±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.

11.2 Reel with diameter of 180 mm

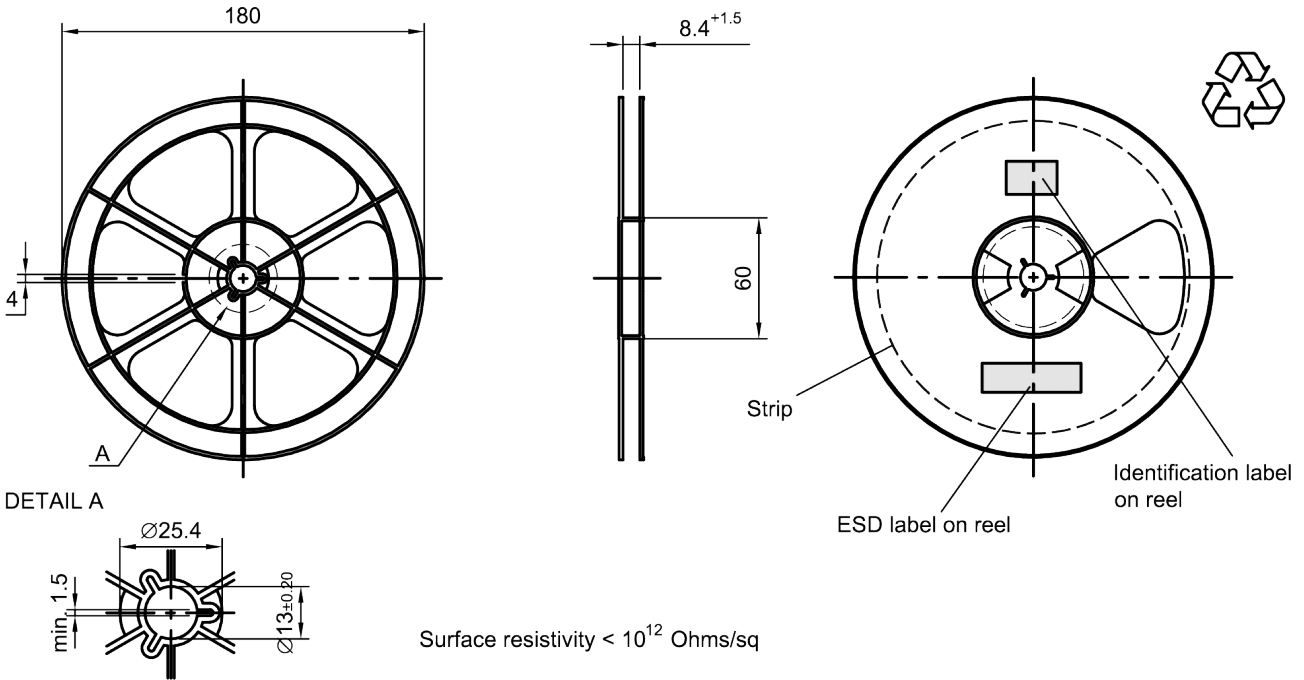


Figure 9: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

Printing on vacuumbag

Vacuumbag

Sealing area

Drypack in vacuumbag

Identification label on vacuumbag

Humidity indicator in vacuumbag

Figure 10: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

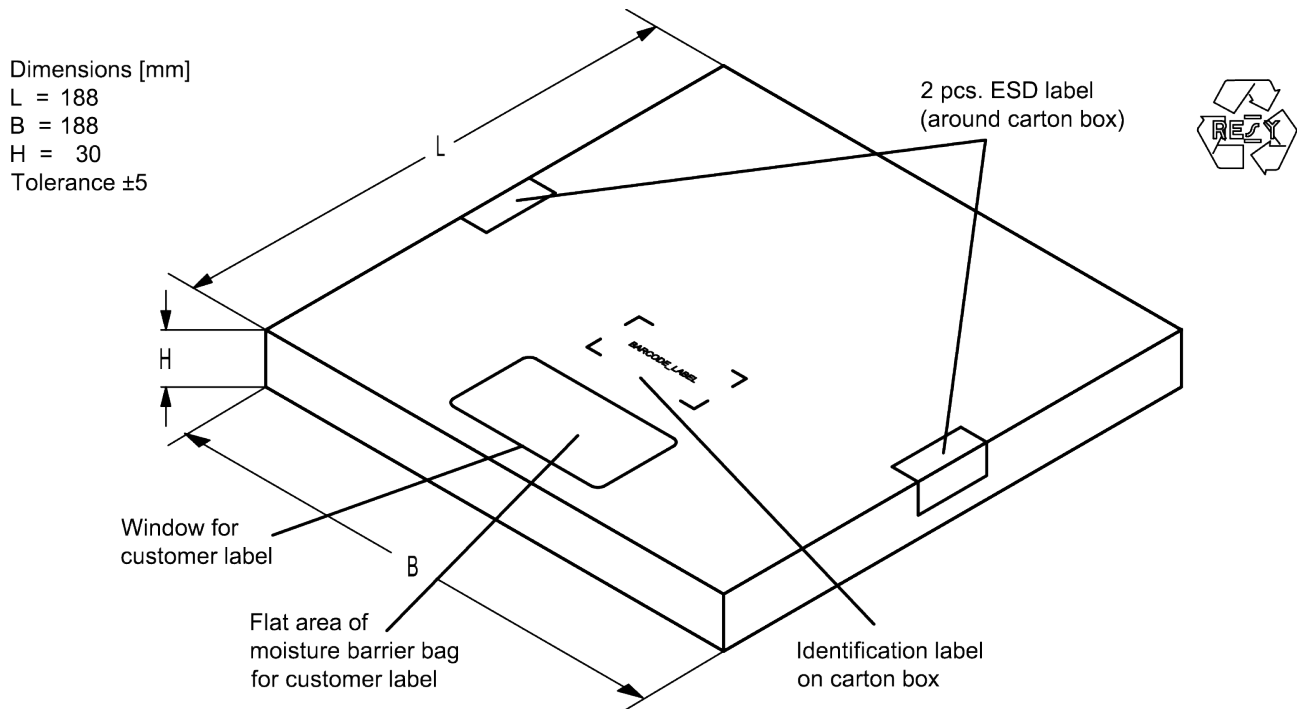


Figure 11: Drawing of folding box for reel with diameter of 180 mm.

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**
 $1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0 =$ **1234**
 The BASE32 code for product type B9644 is 9DC.

■ 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.

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).

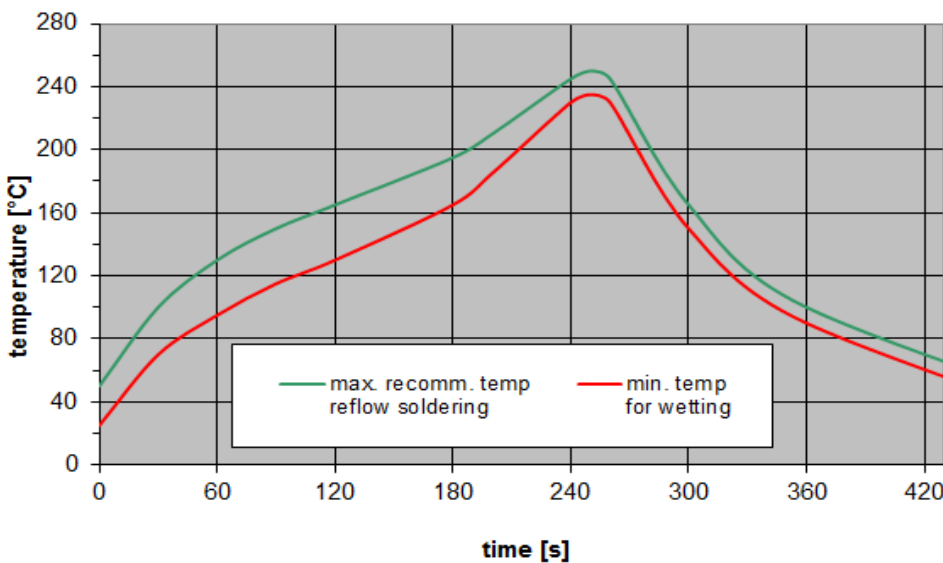


Figure 12: Recommended reflow profile for convection and infrared soldering – lead-free solder.

14 Annotations

14.1 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.

14.2 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.

14.3 Ordering codes and packing units

Ordering code	Packing unit
B39731B9644P810	5000 pcs

Table 4: Ordering codes and packing units.

15 Cautions and warnings

15.1 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.

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.

For information on recycling of tapes and reels please contact one of our sales offices.

15.3 Moldability

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

15.4 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.

16 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.**
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