



RF360
Europe GmbH

Data sheet

SAW filter

CBRS (3550-3700MHz)

Series/type:	B9641
Ordering code:	B39362B9641P810
Date:	February 20, 2019
Version:	2.1

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A Qualcomm – TDK Joint Venture

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1 Application

- Low-loss SAW filter for CBRS
- Usable pass band 150MHz

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)

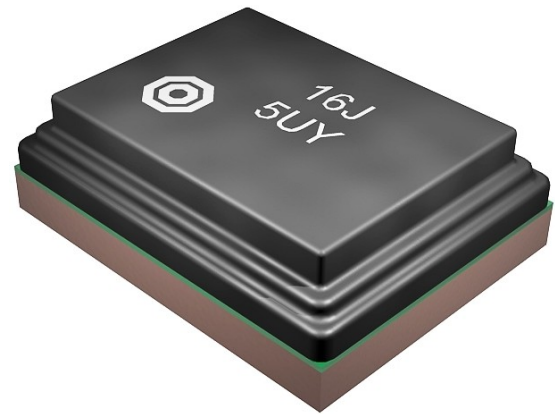
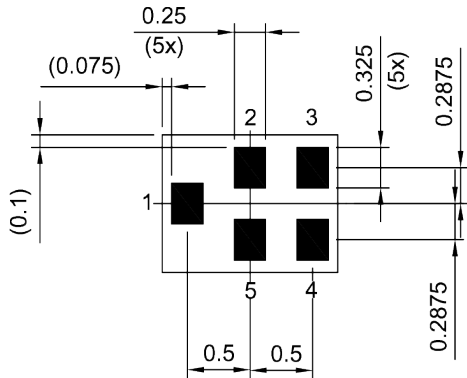


Figure 1: Picture of component with example of product marking.

3 Package

BOTTOM VIEW

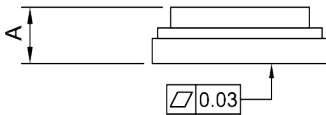


Pad and pitch tolerance ±0.05

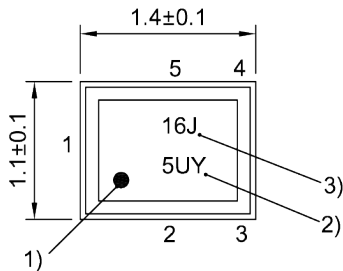
4 Pin configuration

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

SIDE VIEW

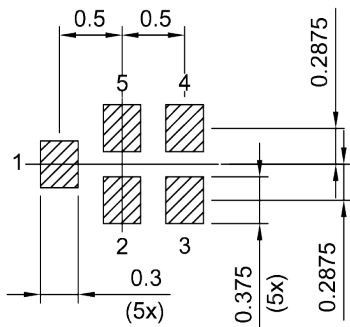


TOP VIEW



- 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

■ $L_{p1} = 1.5 \text{ nH}$

■ $L_{p4} = 1.8 \text{ nH}$

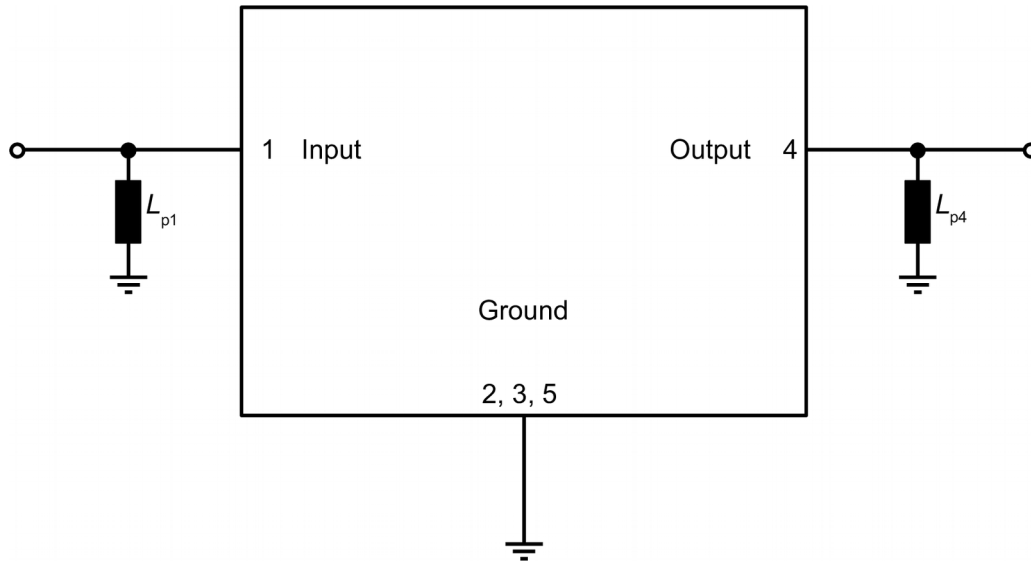


Figure 3: Schematic of matching circuit.

6 Characteristics

Temperature range for specification	T_{SPEC}	= -10 °C ... +85 °C
Input terminating impedance	Z_{IN}	= 50 Ω // 1.5 nH ¹⁾
Output terminating impedance	Z_{OUT}	= 50 Ω // 1.8 nH ¹⁾

Characteristics				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	3625	—	MHz
Average insertion attenuation			$\alpha_{INT,avg}$ ²⁾				
	3550... 3555	MHz		—	2.0	3.0	dB
	3555... 3695	MHz		—	1.9	2.9	dB
	3695... 3700	MHz		—	2.1	3.1	dB
Maximum insertion attenuation			α_{max}				
	3550... 3700	MHz		—	2.1	3.2	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	3550... 3700	MHz		—	0.9	2.0	dB
Maximum VSWR			VSWR _{max}				
@ input port	3550... 3700	MHz		—	1.5	2.1	
@ output port	3550... 3700	MHz		—	1.6	2.1	
Maximum error vector magnitude			EVM _{max} ³⁾				
	3552.4... 3697.6	MHz		—	0.7	3.0	%
Minimum attenuation			α_{min}				
	450... 2200	MHz		34	40	—	dB
	2200... 2700	MHz		31	36	—	dB
	2700... 2900	MHz		25	36	—	dB
	4900... 5850	MHz		25	29	—	dB
	5850... 6000	MHz		20	29	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

²⁾ Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

³⁾ 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 // 1.5 nH ¹⁾
Output terminating impedance	Z_{OUT}	= 50 Ω // 1.8 nH ¹⁾

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_C	—	3625	—	MHz
Average insertion attenuation		$\alpha_{INT,avg}$ ²⁾				
	3550... 3555	MHz	—	2.0	3.2	dB
	3555... 3695	MHz	—	1.9	3.0	dB
	3695... 3700	MHz	—	2.1	3.3	dB
Maximum insertion attenuation		α_{max}				
	3550... 3700	MHz	—	2.1	3.5 ³⁾	dB
Amplitude ripple (p-p)		$\Delta\alpha$				
	3550... 3700	MHz	—	0.9	2.3 ⁴⁾	dB
Maximum VSWR		VSWR _{max}				
@ input port	3550... 3700	MHz	—	1.5	2.3 ⁵⁾	
@ output port	3550... 3700	MHz	—	1.6	2.3 ⁵⁾	
Maximum error vector magnitude		EVM _{max} ⁶⁾				
	3552.4... 3697.6	MHz	—	0.7	3.0 ⁷⁾	%
Minimum attenuation		α_{min}				
	450... 2200	MHz	34	40	—	dB
	2200... 2700	MHz	31	36	—	dB
	2700... 2900	MHz	25	36	—	dB
	4900... 5850	MHz	25	29	—	dB
	5850... 6000	MHz	20	29	—	dB

¹⁾ See Sec. Matching circuit (p. 6).

²⁾ Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

³⁾ 3.4dB for T= -5°C to +95°C.

⁴⁾ 2.2dB for T= -5°C to +95°C.

⁵⁾ 2.1 for T= -5°C to +95°C.

⁶⁾ Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

⁷⁾ 3.0dB for T= -5°C to +95°C.

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		
	$V_{ESD}^{3)} = 50\text{ V}$	Machine model.
	$V_{ESD}^{4)} = 425\text{ V}$	Human body model.
Input power @ input port	$P_{IN} = 22\text{ dBm}^{5), 6)}$	5 MHz LTE downlink (25 RB), ON-state power 70% DC for 27000 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⁾ T_{SPEC} is the ambient temperature of the PCB at component position. Specified min./max values from section 6 "characteristics" for maximum input power 22dBm are valid for temperature up to 80°C.

8 Transmission coefficient

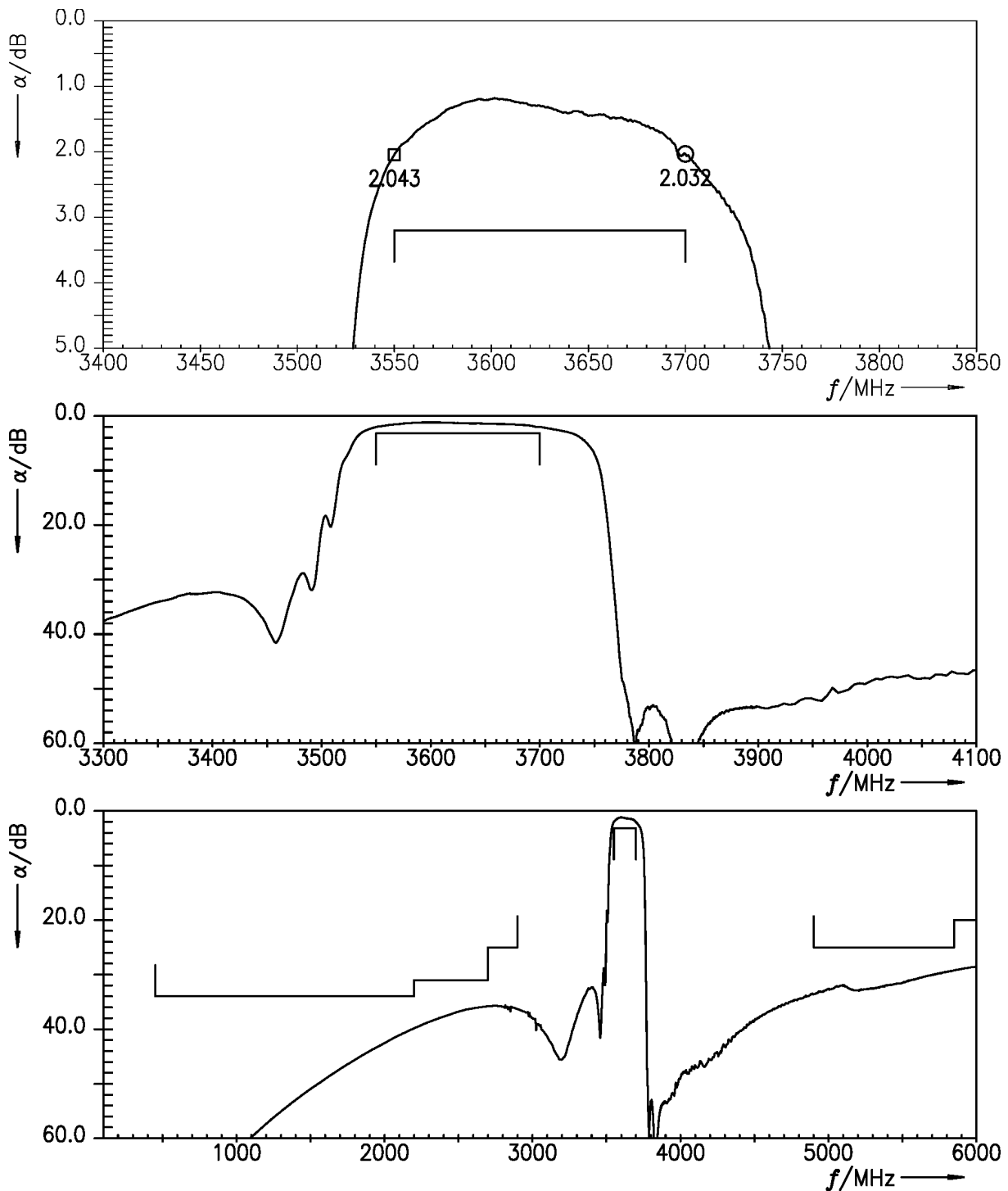


Figure 4: Attenuation .

9 Reflection coefficients

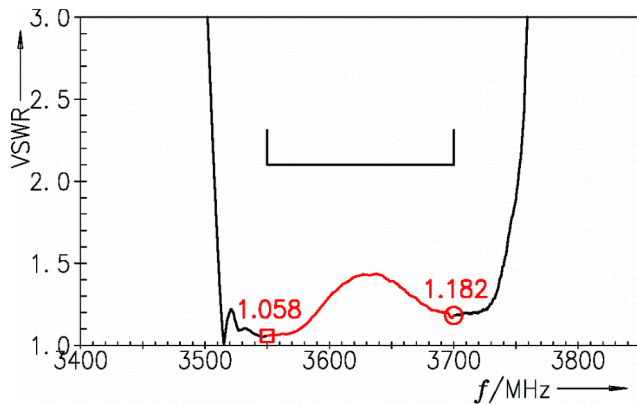


Figure 5: Reflection coefficient at input port.

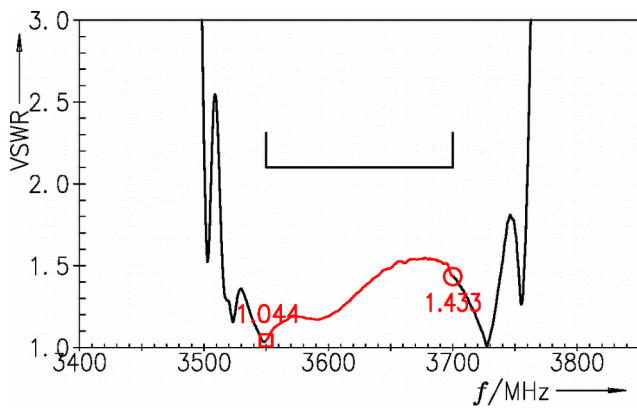
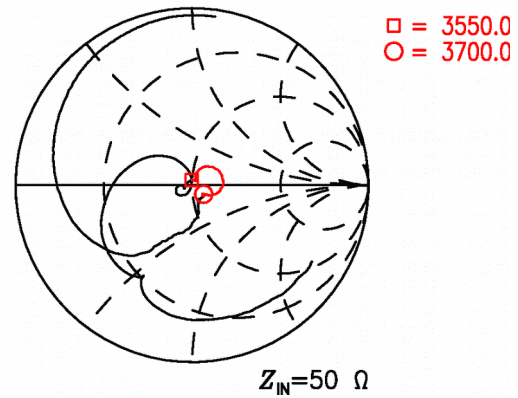
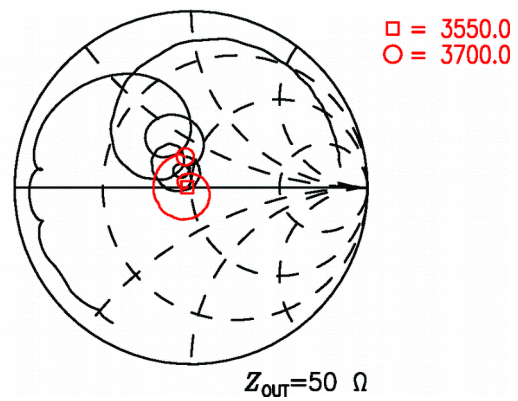


Figure 6: Reflection coefficient at output port.



10 EVM

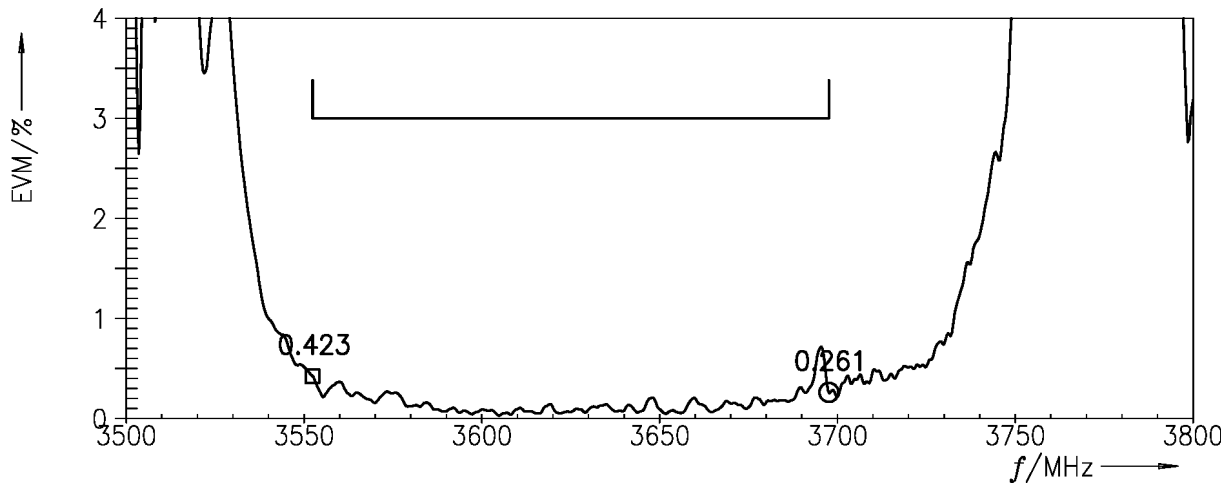


Figure 7: Error vector magnitude .

11 Packing material

11.1 Tape

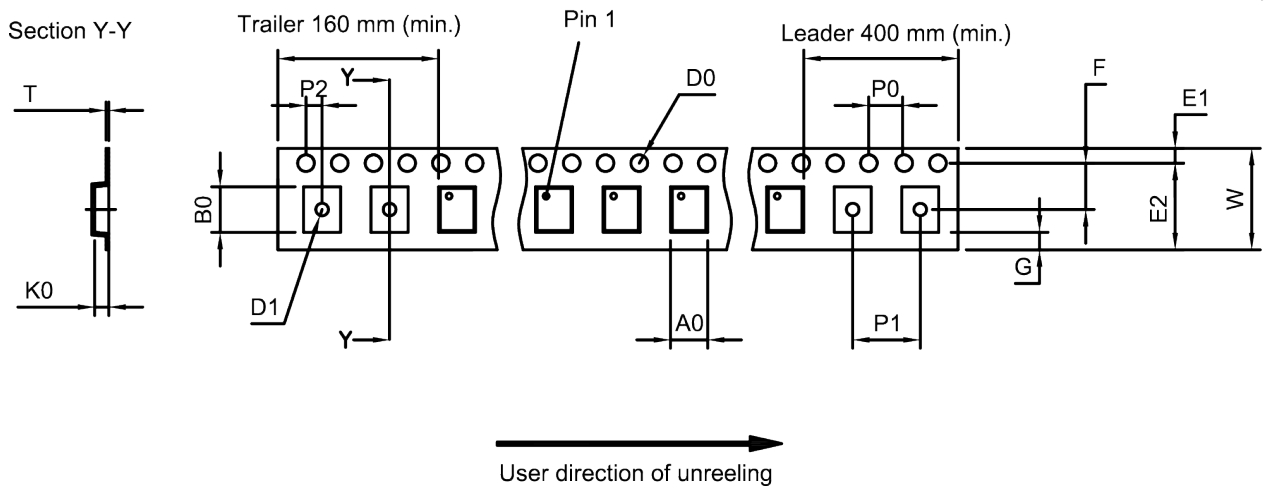


Figure 8: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

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

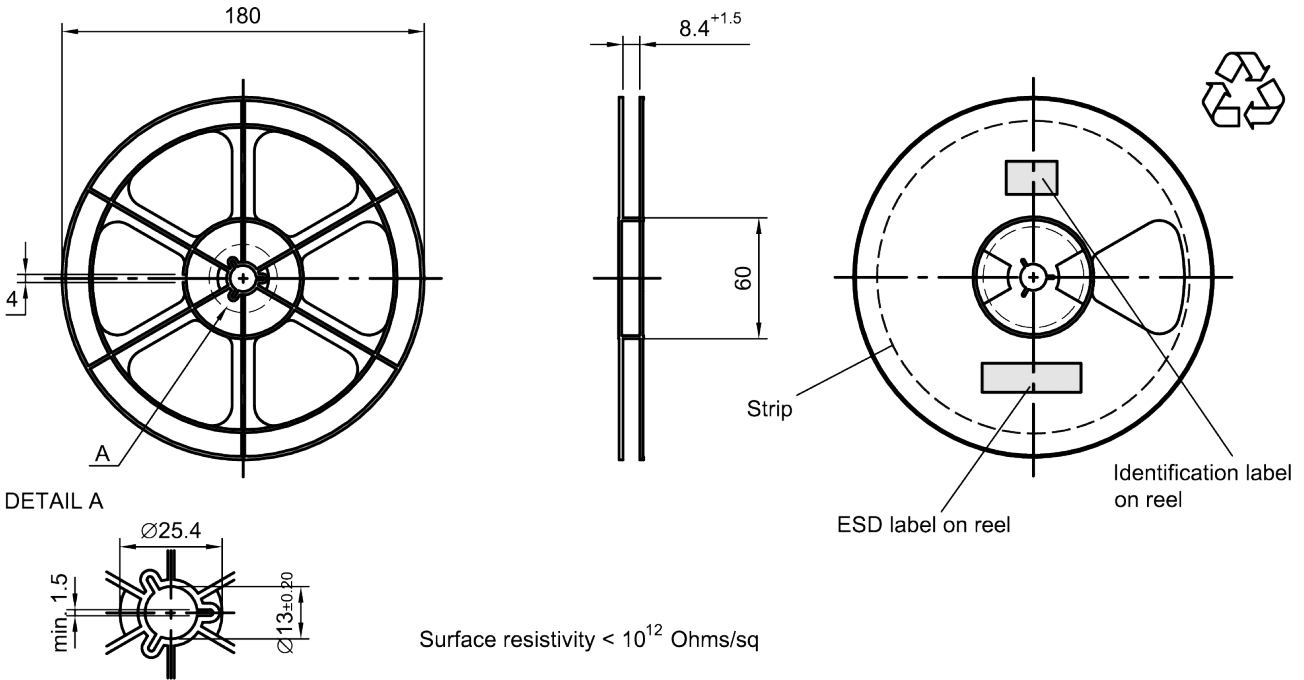


Figure 9: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

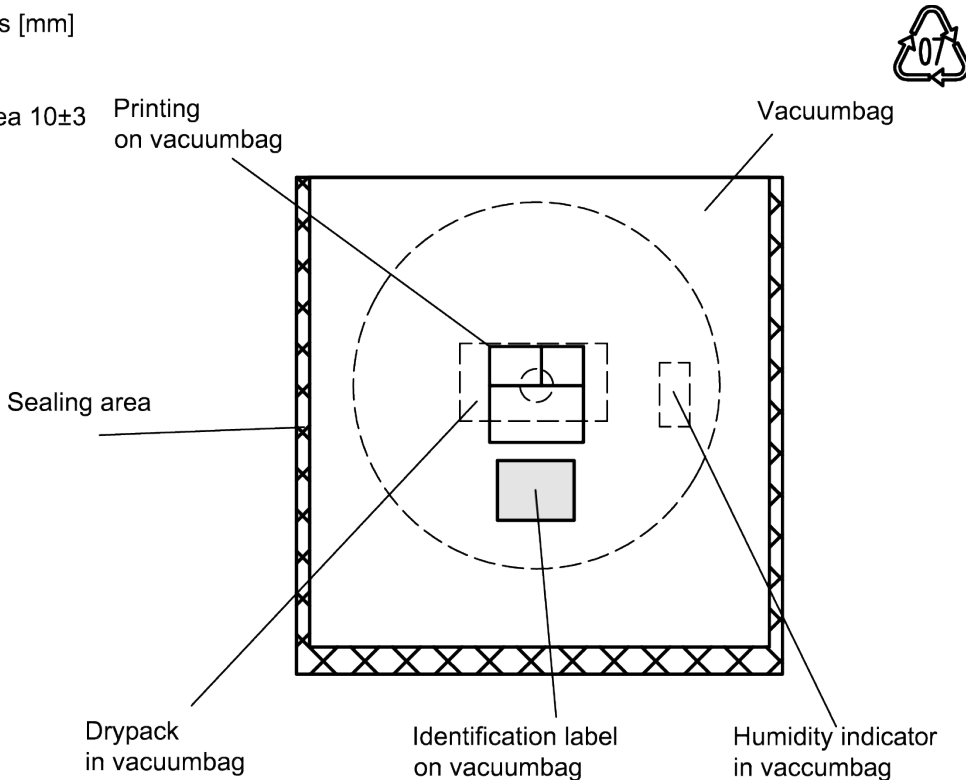


Figure 10: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

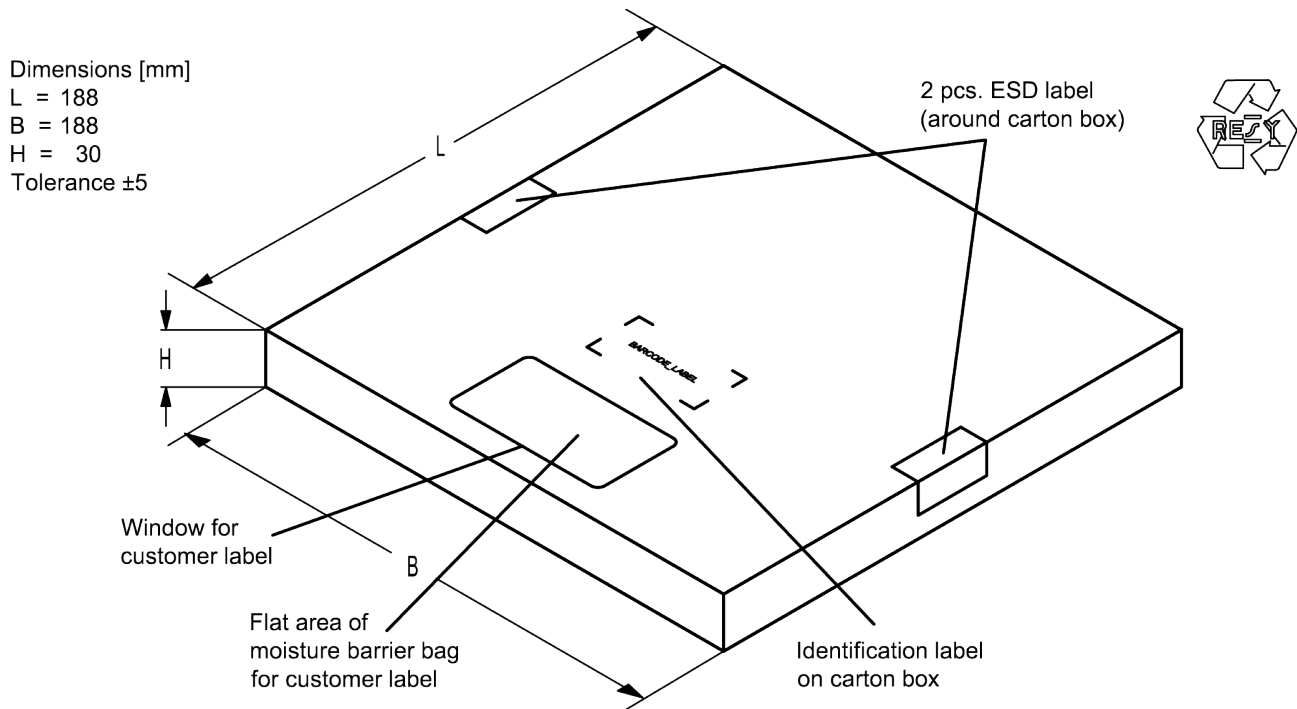


Figure 11: Drawing of folding box for reel with diameter of 180 mm.

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 B9641 is 9D9.

■ 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).

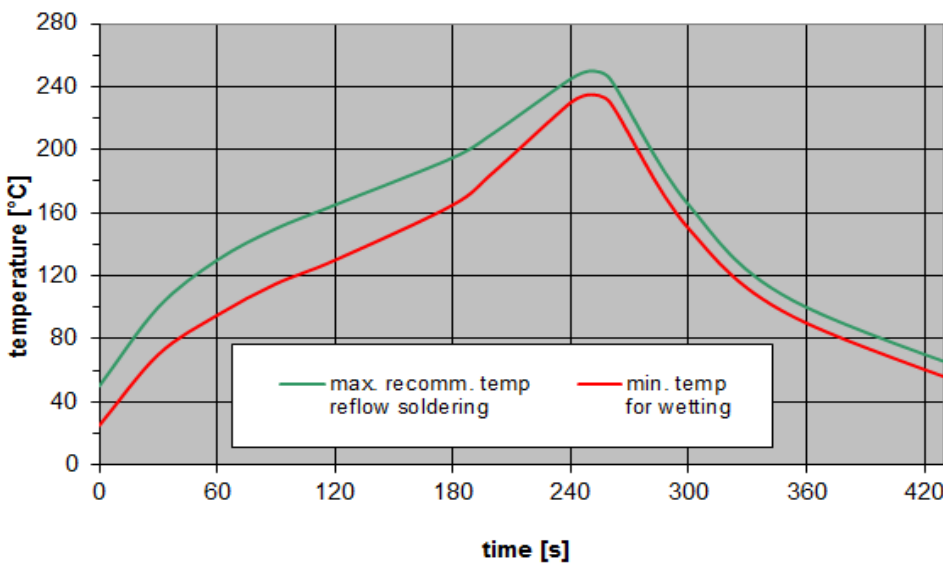


Figure 12: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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
B39362B9641P810	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.
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3. **The warnings, cautions and product-specific notes must be observed.**
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