



RF360  
Europe GmbH

## Data sheet

### SAW filter

Small cell & femtocell  
Beidou B1; GPS; GLONASS

Series/type: B9621  
Ordering code: B39162B9621P810

Date: June 17, 2019  
Version: 2.3

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A Qualcomm – TDK Joint Venture

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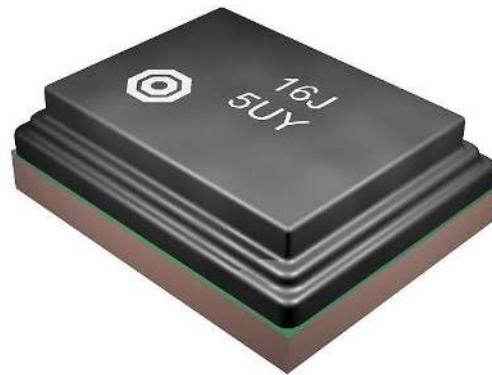
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## 1 Application

- Low-loss RF GPS + Beidou B1 + GLONASS filter for industrial electronics
- Simultaneous usage of GPS, Beidou B1 and GLONASS Bands
- Usable pass band: 2.0 MHz for GPS, 4.092 MHz for Beidou B1 and 8.34 MHz for GLONASS
- Very low insertion attenuation
- No matching network required for operation at 50 Ω

## 2 Features

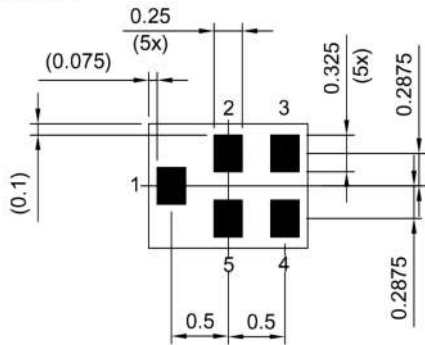
- Industrial grade qualified family
- Package size 1.4±0.1 mm × 1.1±0.1 mm
- Package height 0.45 mm (max.)
- Approximate weight 3 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)



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

**3 Package**

BOTTOM VIEW



Pad and pitch tolerance  $\pm 0.05$

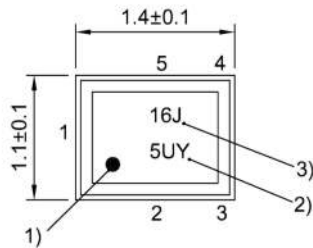
**4 Pin configuration**

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

SIDE VIEW

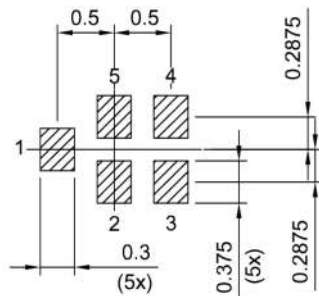


TOP VIEW



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

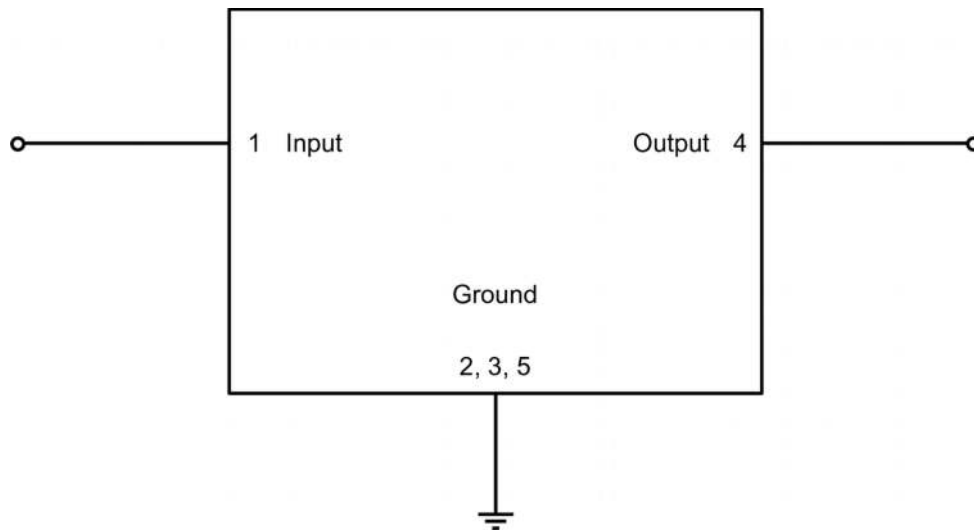
Land pattern  
 THRU VIEW



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



**Figure 3:** Schematic of matching circuit. No external matching components required.



## 6 Characteristics

Temperature range for specification	$T_{SPEC}$	= -10 °C ... +85 °C
Input terminating impedance	$Z_{IN}$	= 50 $\Omega$
Output terminating impedance	$Z_{OUT}$	= 50 $\Omega$

Characteristics		min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$	
<b>Center frequency</b>	$f_C$	—	1582.47	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{max}$				
	1559.052 ... 1563.144 MHz	—	1.4	1.9	dB
	1574.42 ... 1576.42 MHz	—	1.0	1.4	dB
	1597.55 ... 1605.89 MHz	—	1.4	1.9	dB
<b>Group delay ripple</b>	$\Delta\tau_{var}^{1)}$				
	1597.55 ... 1605.89 MHz	—	4.0	16	ns
<b>Maximum VSWR</b>	VSWR <sub>max</sub>				
@ input port	1559.052 ... 1563.144 MHz	—	1.8	2.2	
	1574.42 ... 1576.42 MHz	—	1.2	1.8	
	1597.55 ... 1605.89 MHz	—	1.6	2.0	
@ output port	1559.052 ... 1563.144 MHz	—	1.8	2.2	
	1574.42 ... 1576.42 MHz	—	1.2	1.8	
	1597.55 ... 1605.89 MHz	—	1.5	2.0	
<b>Maximum error vector magnitude</b>	EVM <sub>max</sub> <sup>2)</sup>				
	1561.452 ... 1603.49 MHz	—	1.0	2.0	%
<b>Minimum attenuation</b>	$\alpha_{min}$				
	10 ... 960 MHz	45	49	—	dB
	960 ... 1463 MHz	36	45	—	dB
	1710 ... 1785 MHz	33	42	—	dB
	1785 ... 1990 MHz	32	41	—	dB
	1990 ... 2280 MHz	34	39	—	dB
	2280 ... 2400 MHz	38	51	—	dB
	2400 ... 2500 MHz	40	54	—	dB
	2500 ... 2700 MHz	40	54	—	dB
	2700 ... 3000 MHz	40	58	—	dB
	3000 ... 6000 MHz	25	39	—	dB

<sup>1)</sup> Measured with an aperture of 2 MHz.

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

Temperature range for specification  $T_{SPEC} = -40\text{ °C} \dots +95\text{ °C}$   
 Input terminating impedance  $Z_{IN} = 50\ \Omega$   
 Output terminating impedance  $Z_{OUT} = 50\ \Omega$

Characteristics		min. for $T_{SPEC}$	typ. @ +25 °C	max. for $T_{SPEC}$		
<b>Maximum insertion attenuation</b>	$\alpha_{max}$					
	1559.052... 1563.144 MHz	—	1.4	2.4	dB	
	1574.42... 1576.42 MHz	—	1.0	1.4	dB	
	1597.55... 1605.89 MHz	—	1.4	1.9	dB	
<b>Group delay ripple</b>	$\Delta\tau_{var}^{1)}$					
	1597.55... 1605.89 MHz	—	4.0	20	ns	
<b>Maximum VSWR</b>	@ input port	$VSWR_{max}$				
		1559.052... 1563.144 MHz	—	1.8	2.3	
		1574.42... 1576.42 MHz	—	1.2	1.8	
		1597.55... 1605.89 MHz	—	1.6	2.0	
	@ output port	1559.052... 1563.144 MHz	—	1.8	2.3	
		1574.42... 1576.42 MHz	—	1.2	1.8	
		1597.55... 1605.89 MHz	—	1.5	2.0	
	<b>Maximum error vector magnitude</b>	$EVM_{max}^{2)}$				
		1561.452... 1603.49 MHz	—	1.0	3.0	%
<b>Minimum attenuation</b>	$\alpha_{min}$					
	10... 960 MHz	45	49	—	dB	
	960... 1463 MHz	36	45	—	dB	
	1710... 1785 MHz	33	42	—	dB	
	1785... 1990 MHz	32	41	—	dB	
	1990... 2280 MHz	34	39	—	dB	
	2280... 2400 MHz	38	51	—	dB	
	2400... 2500 MHz	40	54	—	dB	
	2500... 2700 MHz	40	54	—	dB	
	2700... 3000 MHz	40	58	—	dB	
3000... 6000 MHz	25	39	—	dB		

<sup>1)</sup> Measured with an aperture of 2 MHz.

<sup>2)</sup> 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 (max.)}$	
ESD voltage		
	$V_{ESD}^{3)} = 50\text{ V (max.)}$	Machine model.
	$V_{ESD}^{4)} = 225\text{ V (max.)}$	Human body model.
Input power	$P_{IN}$	
@ input port: 777 ... 915 MHz	28 dBm <sup>5)</sup>	GSM signal duty cycle 1:8 for 10000 h @ 55 °C.
@ input port: 1710 ... 2200 MHz	28 dBm <sup>5)</sup>	GSM signal duty cycle 1:8 for 10000 h @ 55 °C.

<sup>1)</sup> Not valid for packaging material. Storage temperature for packaging material is -25 °C to +40 °C.

<sup>2)</sup> In case of applied DC voltage blocking capacitors are mandatory.

<sup>3)</sup> According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

<sup>4)</sup> According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

<sup>5)</sup> Expected Lifetime according to accelerated power durability simulation and wear out models.

8 Transmission coefficient

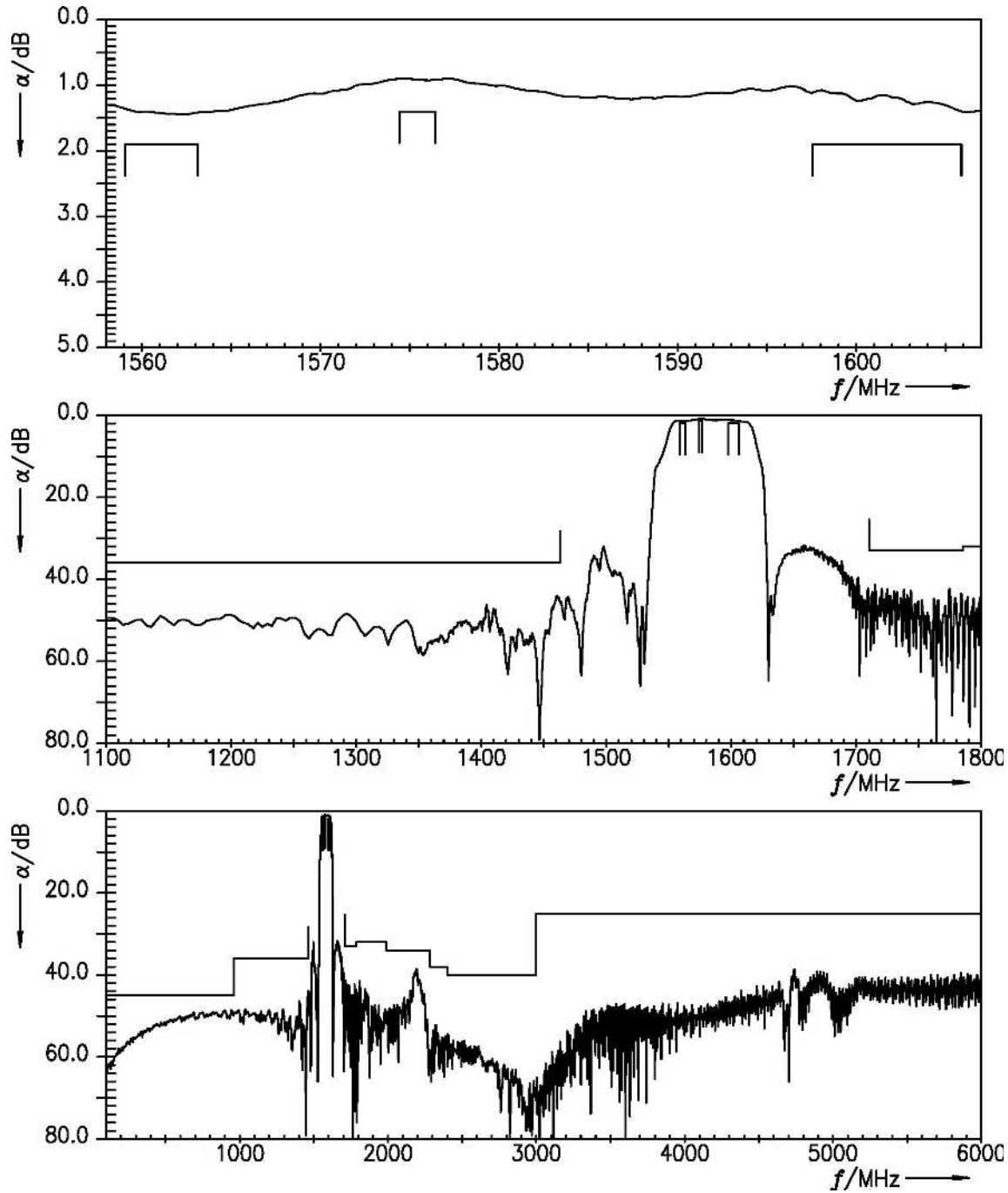


Figure 4: Attenuation.

9 Reflection coefficients

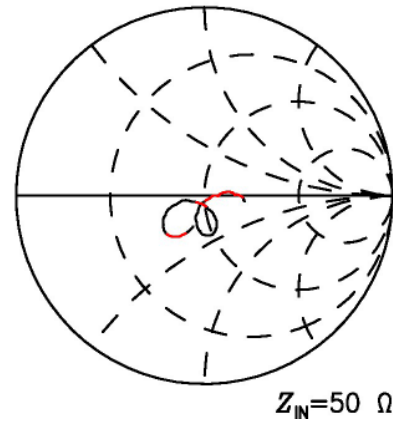
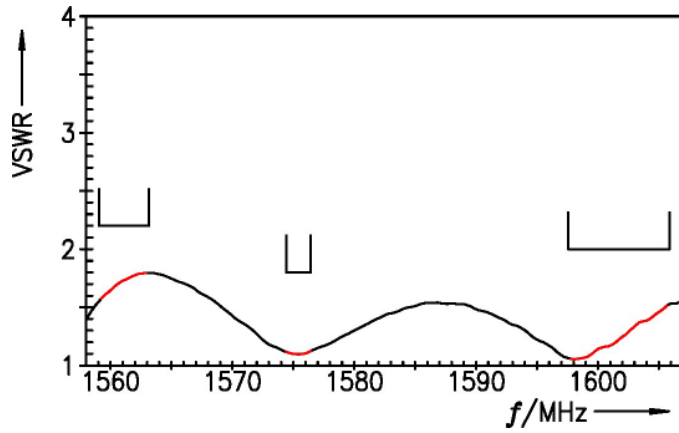


Figure 5: Reflection coefficient at input port.

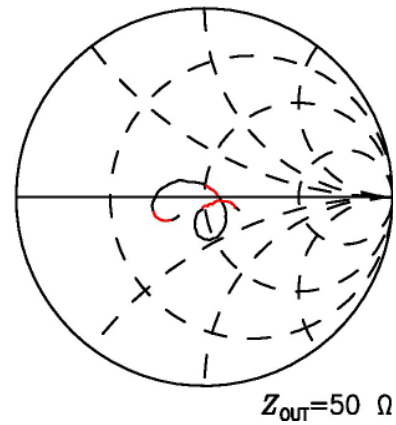
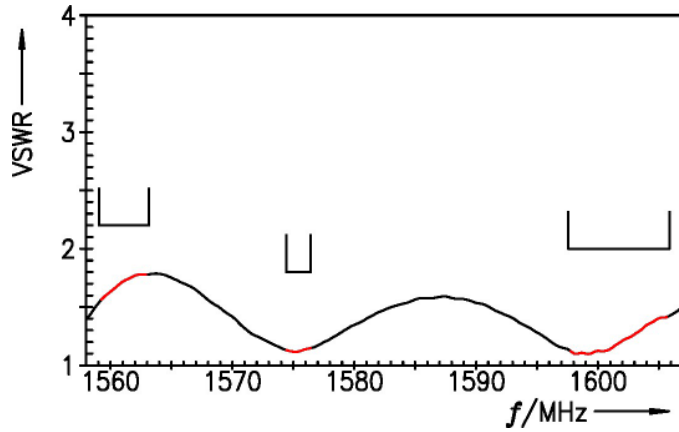


Figure 6: Reflection coefficient at output port.

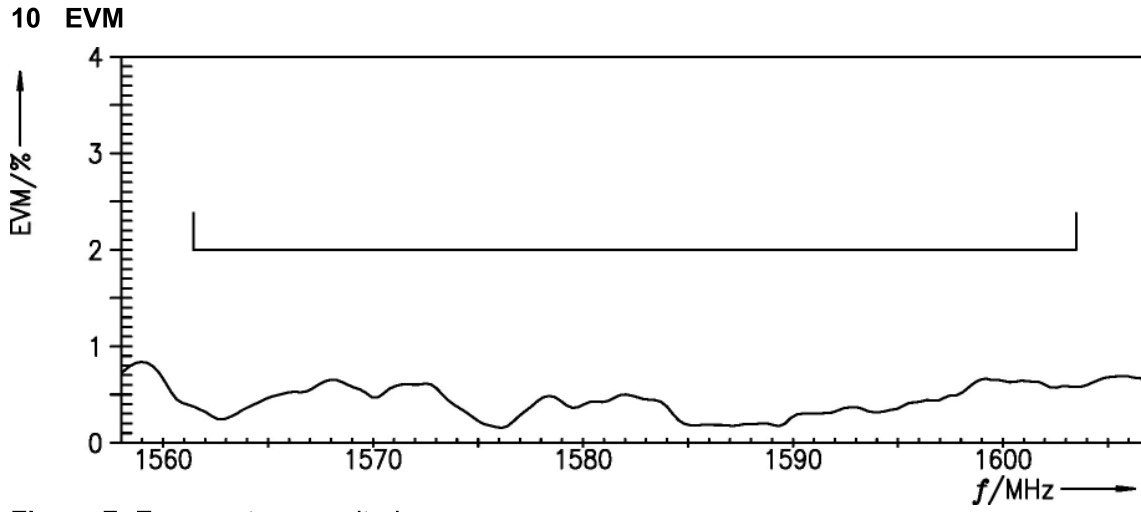
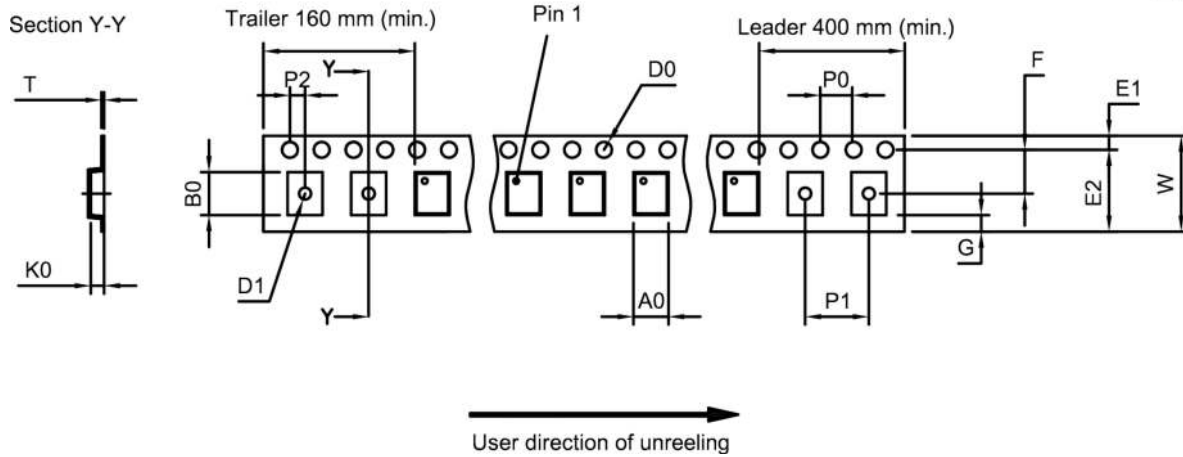


Figure 7: Error vector magnitude.

**11 Packing material**

**11.1 Tape**

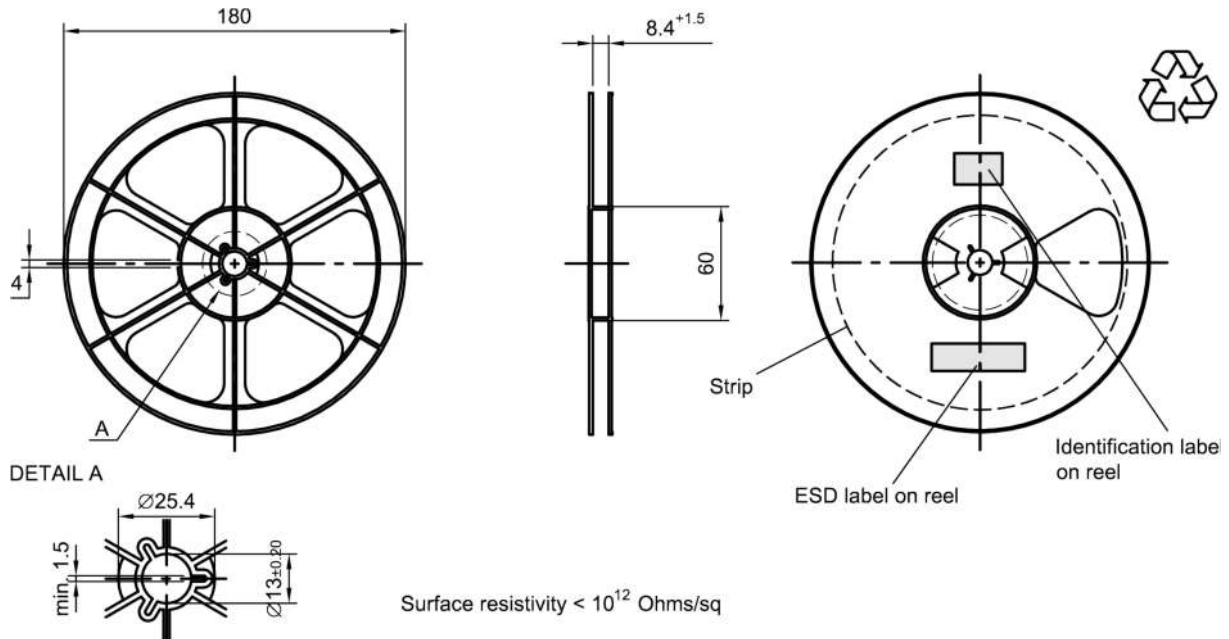


**Figure 8:** Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A <sub>0</sub>	1.27±0.05 mm	E <sub>2</sub>	6.25 mm (min.)	P <sub>1</sub>	4.0±0.1 mm
B <sub>0</sub>	1.57±0.05 mm	F	3.5±0.05 mm	P <sub>2</sub>	2.0±0.05 mm
D <sub>0</sub>	1.5+0.1/-0 mm	G	0.75 mm (min.)	T	0.25±0.03 mm
D <sub>1</sub>	0.5±0.1 mm	K <sub>0</sub>	0.62±0.05 mm	W	8.0+0.3/-0.1 mm
E <sub>1</sub>	1.75±0.1 mm	P <sub>0</sub>	4.0±0.1 mm		

**Table 1:** Tape dimensions.

**11.2 Reel with diameter of 180 mm**



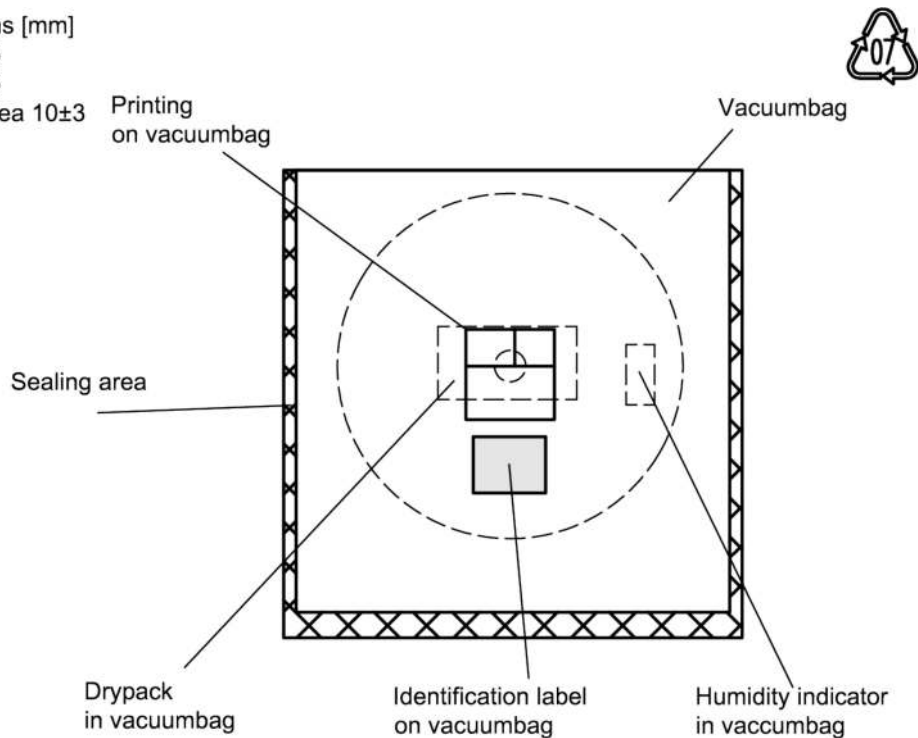
**Figure 9:** Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

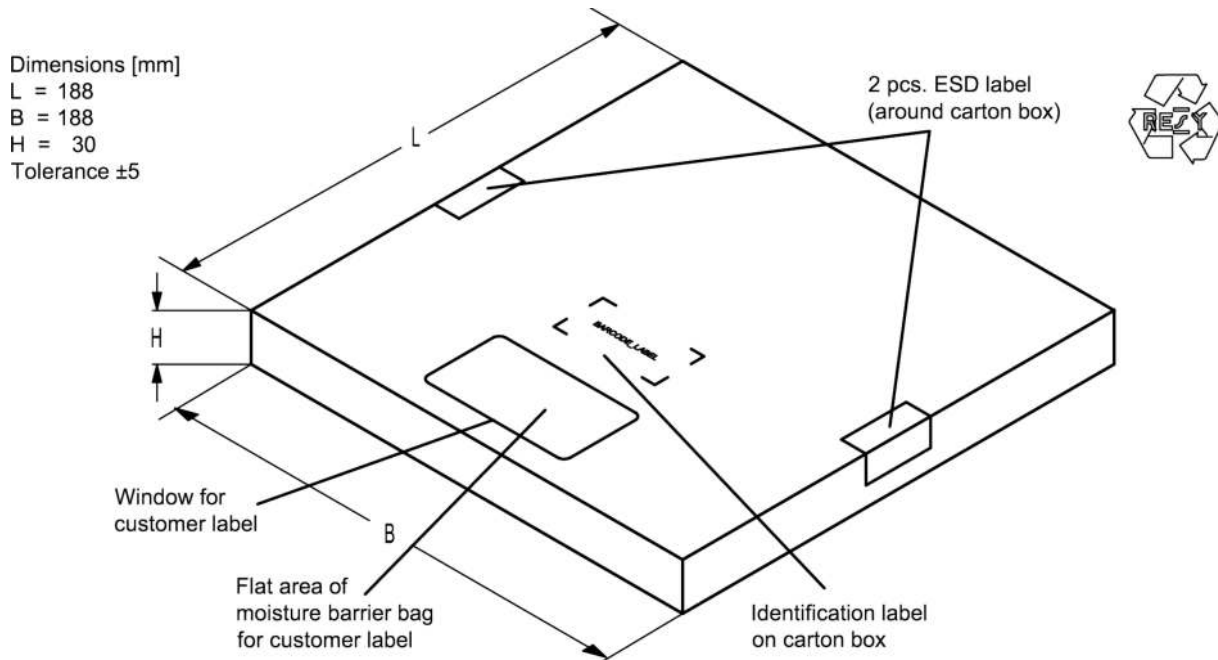
Y = 235+5

Sealing area  $10 \pm 3$



**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 B9621 is 9CN.

### ■ 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		

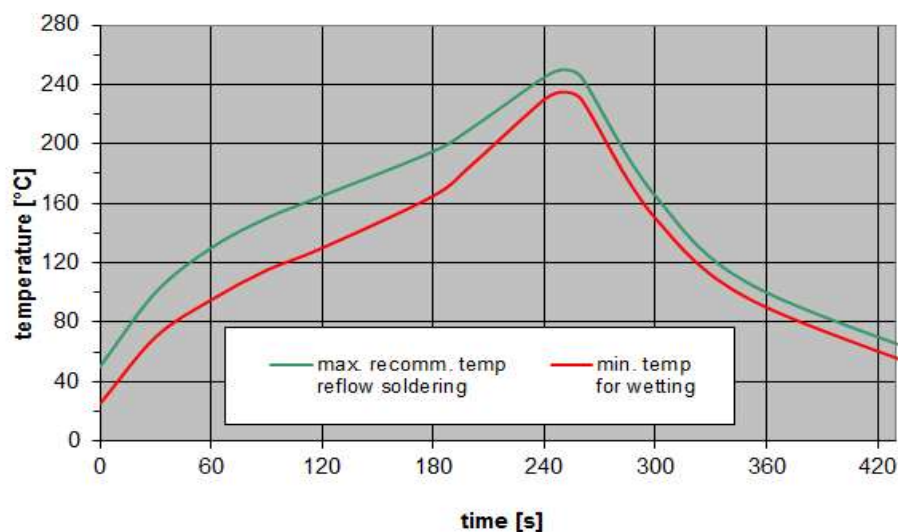
**Table 2:** Lists for encoding and decoding of marking.

### 13 Soldering profile

The recommended soldering process is in accordance with IEC 60068-2-58 – 3<sup>rd</sup> 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
B39162B9621P810	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](http://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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