



RF360
Europe GmbH

SAW components

SAW filter

Small cell & femtocell
LTE band 4 downlink

| | |
|----------------|-----------------|
| Series/type: | B9615 |
| Ordering code: | B39212B9615P810 |
| Date: | May 16, 2017 |
| Version: | 2.1 |

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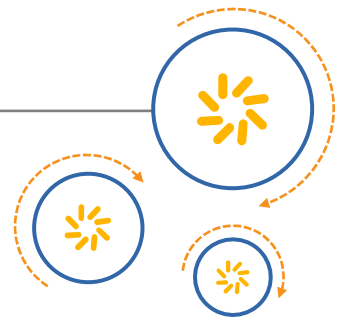
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A Qualcomm – TDK Joint Venture

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SAW components**B9615****SAW filter****2132.50 MHz**

Data sheet

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SAW components

B9615

SAW filter

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1 Application

- Low-loss SAW filter for LTE smallcells & femtocells (Band 4 downlink)
- Low amplitude ripple
- Usable pass band 45MHz
- Unbalanced to unbalanced operation

2 Features

- Industrial grade qualified family
- Package size 1.4 ± 0.1 mm \times 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)

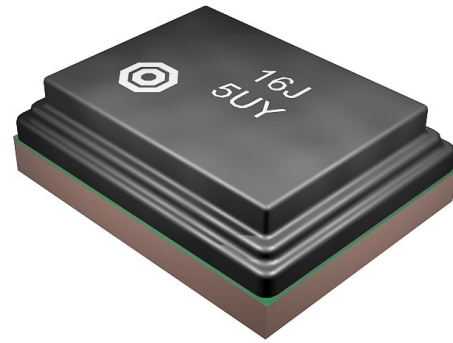


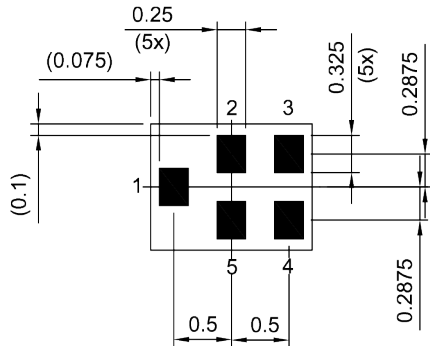
Figure 1: Picture of component with example of product marking.

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SAW filter **2132.50 MHz**

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3 Package

BOTTOM VIEW

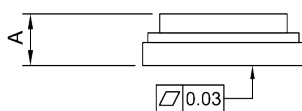


Pad and pitch tolerance ±0.05

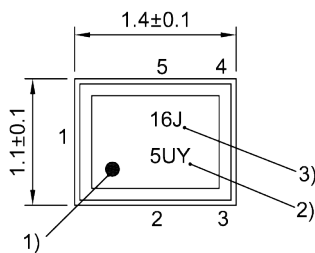
4 Pin configuration

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

SIDE VIEW

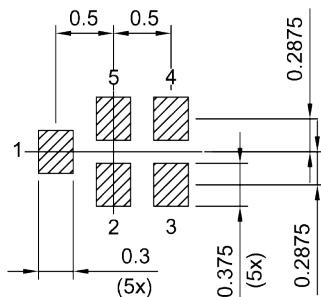


TOP VIEW



- 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. 18).

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5 Matching circuit

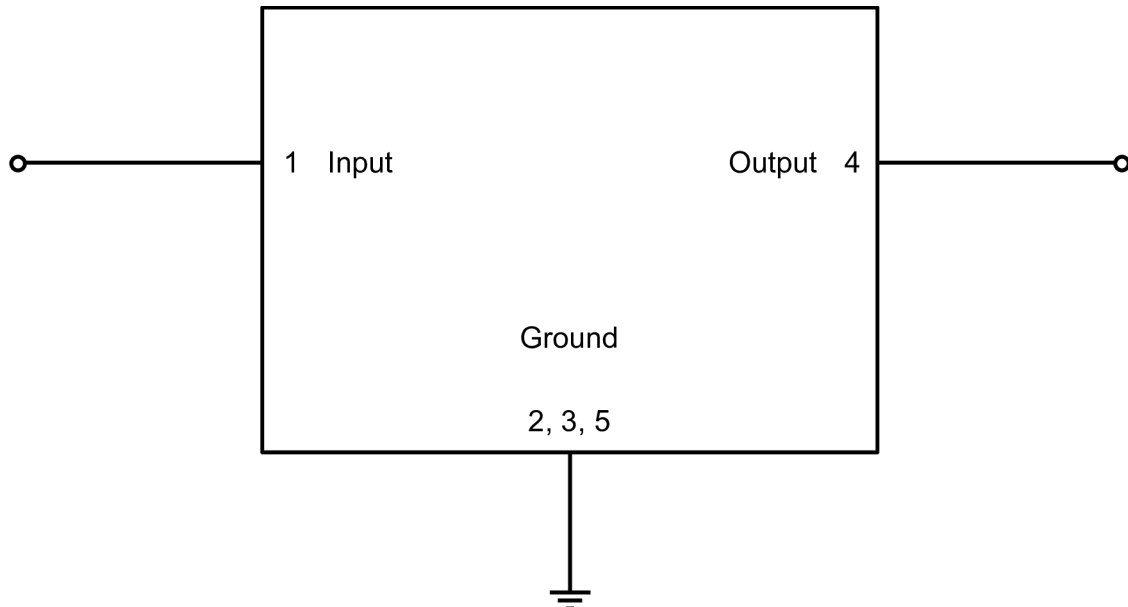


Figure 3: Schematic of matching circuit. No external matching components required.

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6 Characteristics

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

| Characteristics | | min. for T_{SPEC} | typ. @ +25 °C | max. for T_{SPEC} | |
|---------------------------------------|----------------------|------------------------|------------------|------------------------|-----|
| Center frequency | f_C | — | 2132.5 | — | MHz |
| Maximum insertion attenuation | α_{max} | — | 1.9 | 2.3 | dB |
| | 2110... 2155 MHz | | | | |
| Amplitude ripple (p-p) | $\Delta\alpha$ | — | 0.6 | 1.0 | dB |
| | 2110... 2155 MHz | | | | |
| Maximum VSWR | $VSWR_{max}$ | | | | |
| @ input port | | — | 1.6 | 2.0 | |
| @ output port | | — | 1.7 | 2.0 | |
| Maximum error vector magnitude | $EVM_{max}^{1)}$ | — | 1.0 | 3.0 | % |
| | 2112.4... 2152.6 MHz | | | | |
| Minimum attenuation | α_{min} | | | | |
| | 699... 894 MHz | 40 | 50 | — | dB |
| | 1574... 1606 MHz | 45 | 62 | — | |
| | 1710... 1755 MHz | 50 | 54 | — | dB |
| | 1850... 1910 MHz | 40 | 47 | — | |
| | 1930... 1990 MHz | 40 | 43 | — | dB |
| | 2000 MHz | 35 | 44 | — | |
| | 2165 MHz | 1 | 2 | — | dB |
| | 2175 MHz | 1 | 8 | — | |
| | 2400... 2500 MHz | 40 | 44 | — | dB |
| | 3700... 3820 MHz | 30 | 37 | — | |
| | 3860... 3980 MHz | 28 | 37 | — | dB |
| | 5500... 5730 MHz | 18 | 31 | — | |
| | 5790... 5970 MHz | 18 | 30 | — | dB |
| | | | | | |

¹⁾ Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

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SAW filter

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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. |
| | $V_{ESD}^{4)} = 100\text{ V}$ | Human body model. |
| Input power @ input port | $P_{IN} = 10\text{ dBm}^{5)}$ | Continuous wave for 50000 h @ 55 °C. |

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 Life Time according to accelerated power durability simulation and wear out models.

| | |
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| SAW components | B9615 |
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8 Transmission coefficient

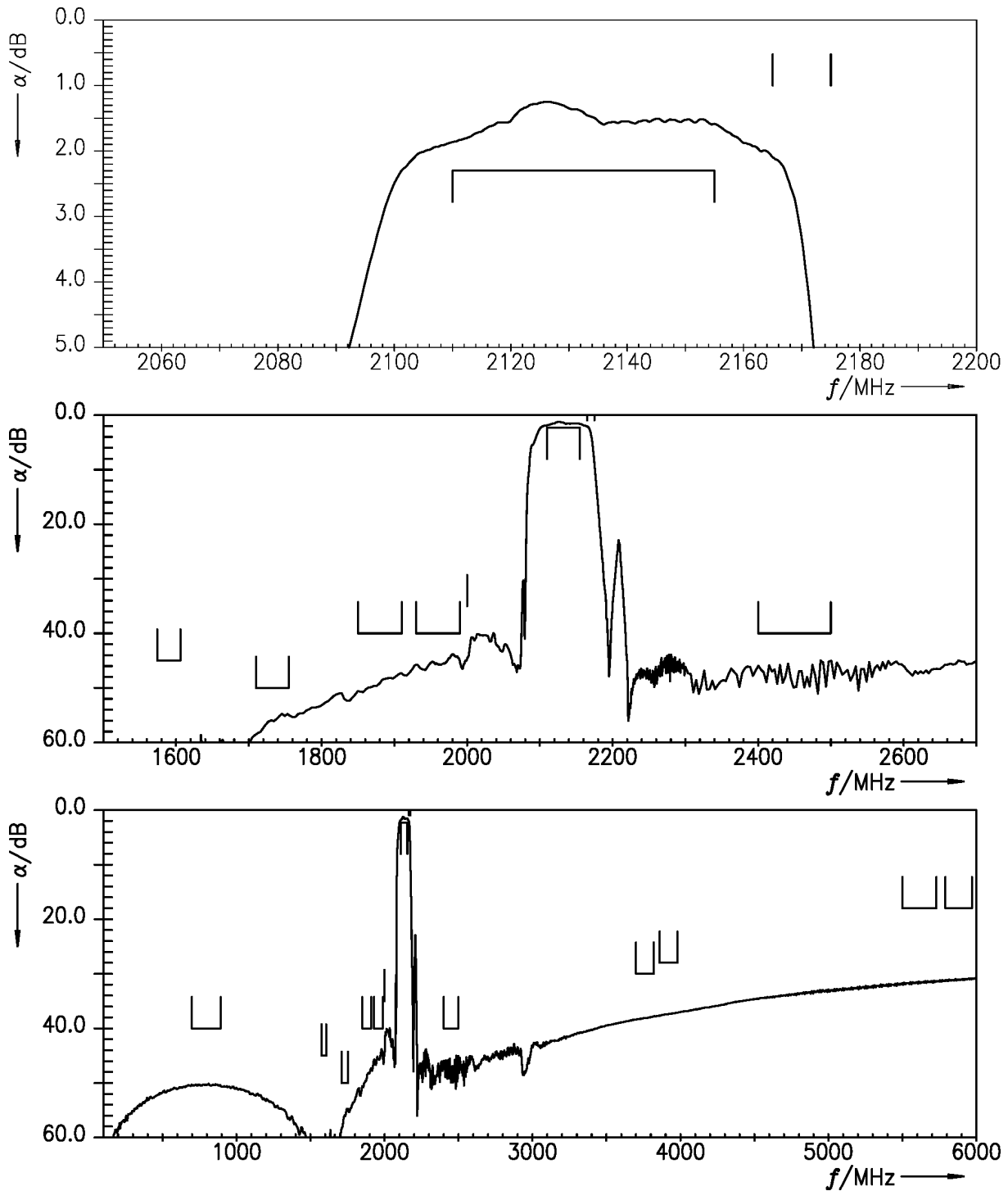


Figure 4: Attenuation.

| | |
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9 Reflection coefficients

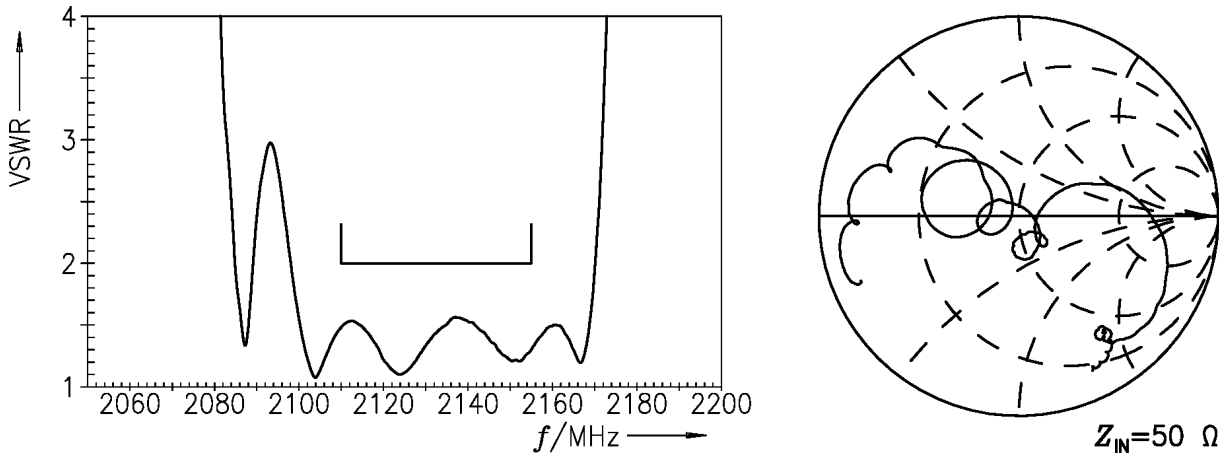


Figure 5: Reflection coefficient at IN port.

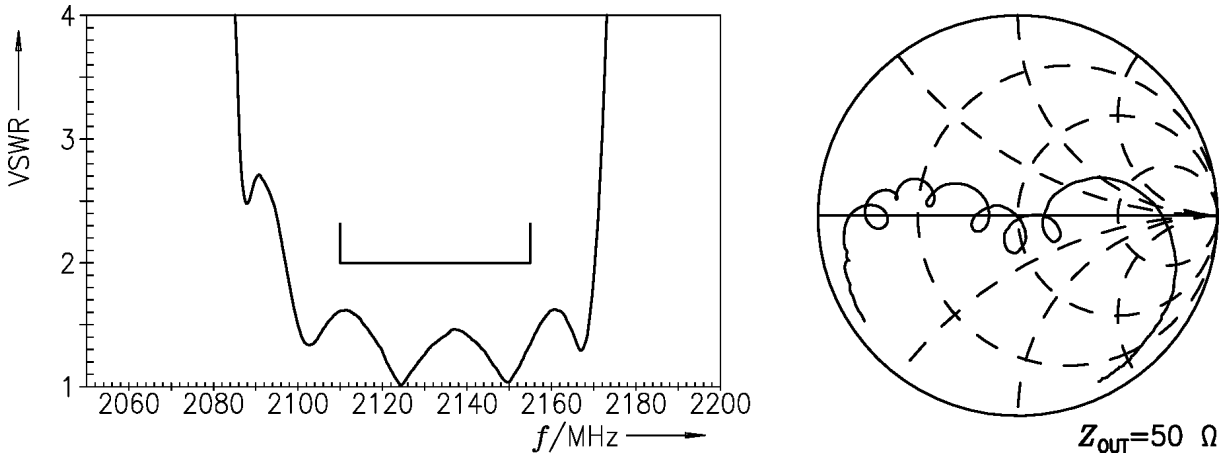


Figure 6: Reflection coefficient at OUT port.

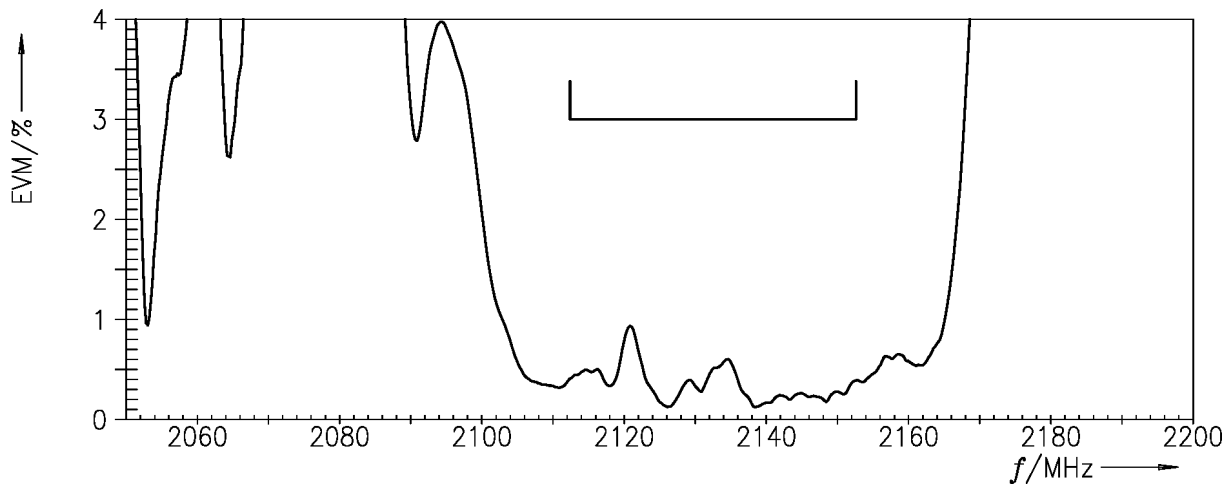
SAW components

B9615

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10 EVM**Figure 7:** Error vector magnitude.

Data sheet

11 Packing material

11.1 Tape

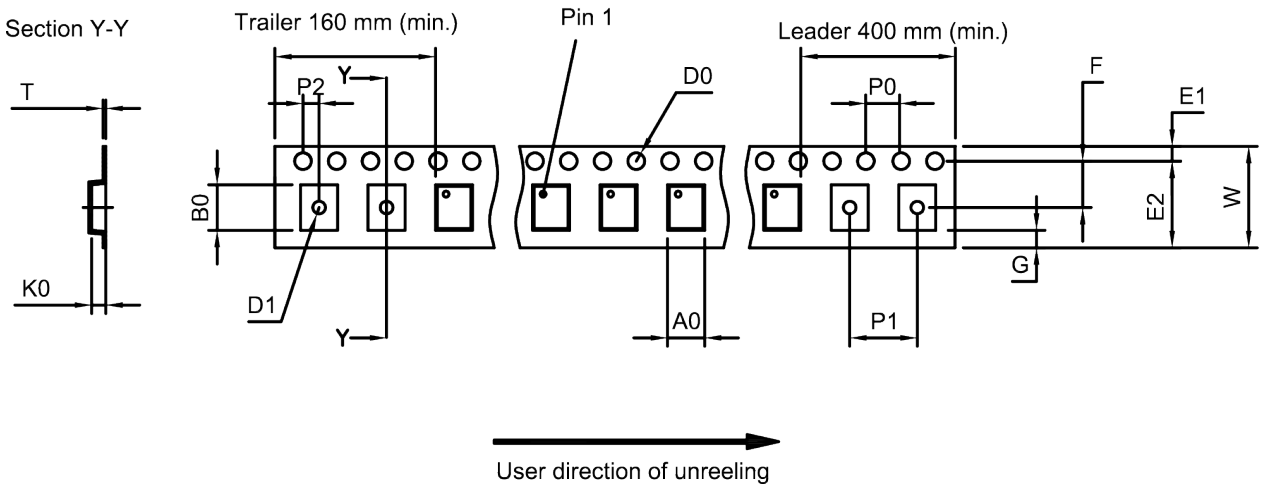


Figure 8: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

| | | |
|------------------------------|-------------------------------|----------------------------|
| 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.

| | |
|----------------|-------------|
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11.2 Reel with diameter of 180 mm

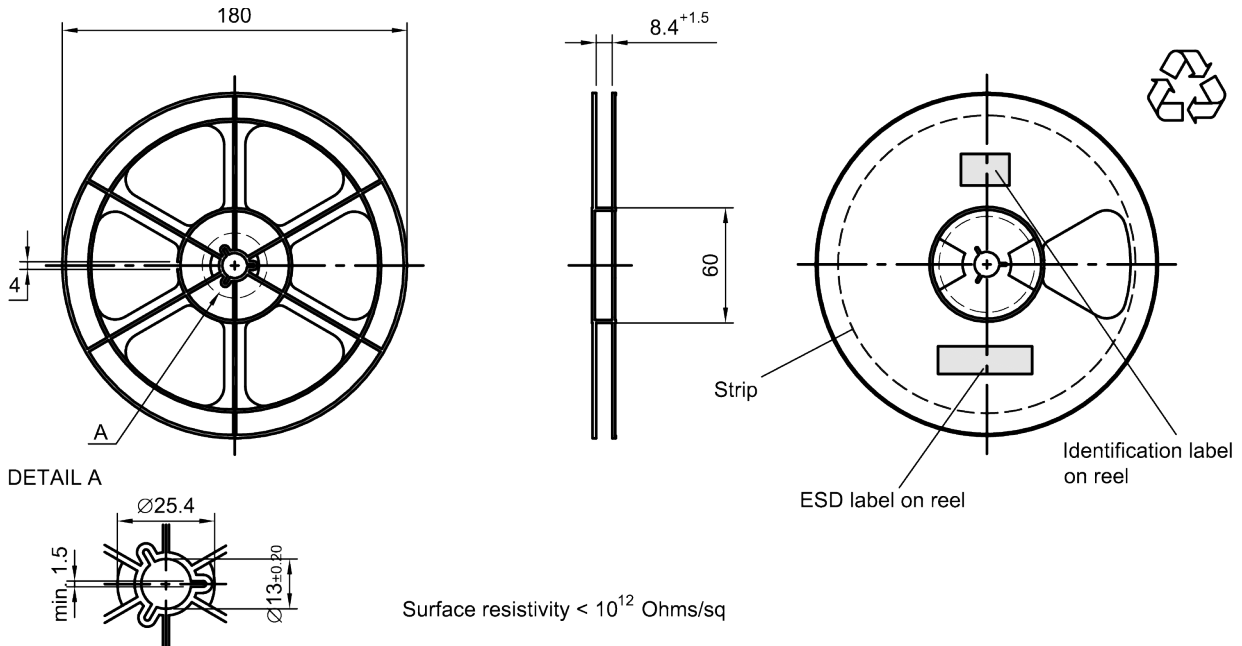


Figure 9: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

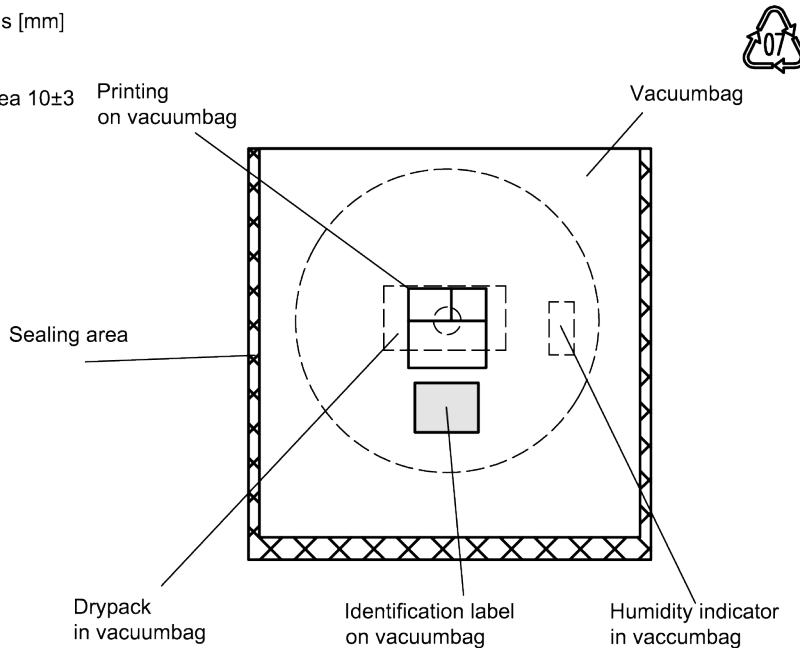


Figure 10: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

| | |
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Dimensions [mm]
 L = 188
 B = 188
 H = 30
 Tolerance ±5

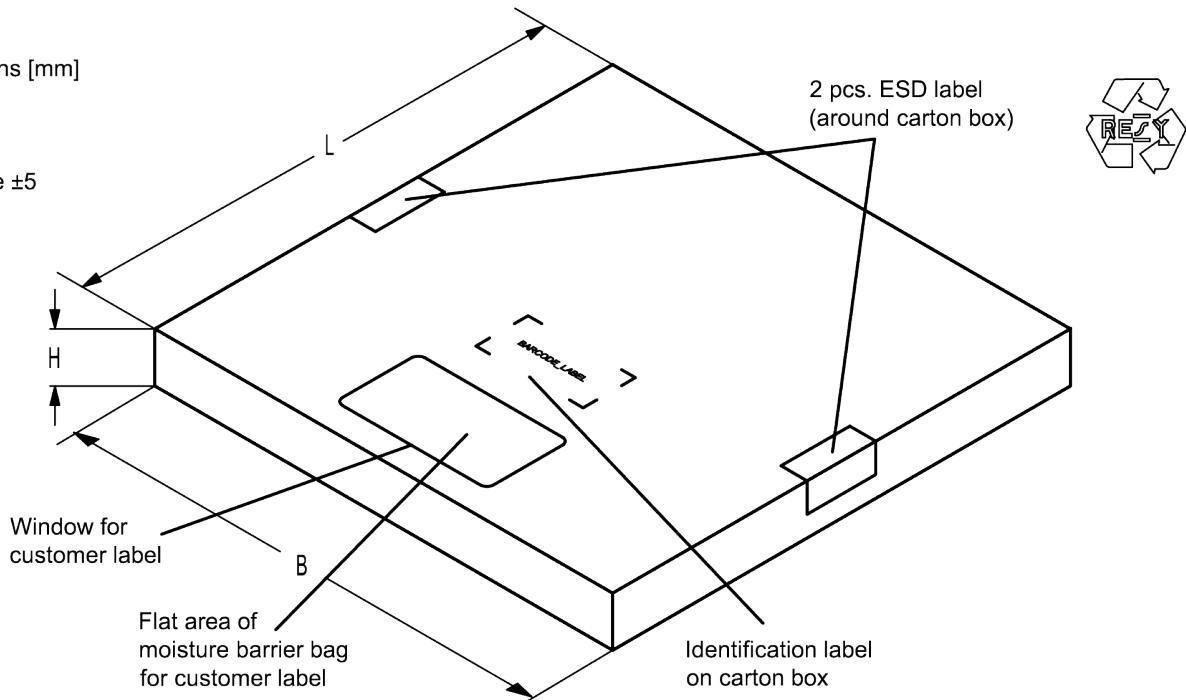


Figure 11: Drawing of folding box for reel with diameter of 180 mm.

| | |
|-----------------------|--------------------|
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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 B9615 is 9CF.

■ 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.

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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 |
| $T \geq 255$ °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).

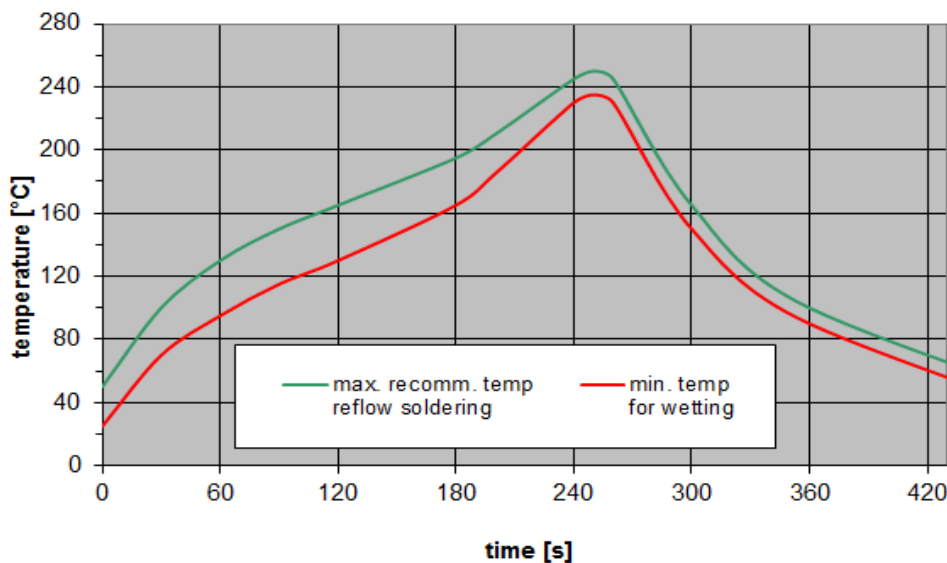


Figure 12: Recommended reflow profile for convection and infrared soldering – lead-free solder.

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14 Annotations

14.1 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>.

14.2 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.

14.3 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.

14.4 Ordering codes and packing units

| Ordering code | Packing unit |
|-----------------|--------------|
| B39212B9615P810 | 5000 pcs |

Table 4: Ordering codes and packing units.

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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.

Important notes

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