



## **SAW components**

### **BAW Filter**

WLAN 2G; Bluetooth

Series/type:	B9634
Ordering code:	B39242B9634P810
Date:	May 30, 2016
Version:	2.1

© EPCOS AG 2016. Reproduction, publication and dissemination of this data sheet, enclosures hereto and the information contained therein without EPCOS' prior express consent is prohibited.

EPCOS AG is a TDK Group Company.

<b>SAW components</b>	<b>B9634</b>
<b>BAW Filter</b>	<b>2442 MHz</b>

Data sheet

**Table of contents**

1 <a href="#">Application</a> .....	3
2 <a href="#">Features</a> .....	3
3 <a href="#">Package</a> .....	4
4 <a href="#">Pin configuration</a> .....	4
5 <a href="#">Matching circuit</a> .....	5
6 <a href="#">Characteristics</a> .....	6
7 <a href="#">Maximum ratings</a> .....	8
8 <a href="#">Transmission coefficient</a> .....	9
9 <a href="#">Reflection coefficients</a> .....	10
10 <a href="#">Packing material</a> .....	11
11 <a href="#">Marking</a> .....	14
12 <a href="#">Soldering profile</a> .....	16
13 <a href="#">Annotations</a> .....	17
14 <a href="#">Cautions and warnings</a> .....	18
<a href="#">Important notes</a> .....	19

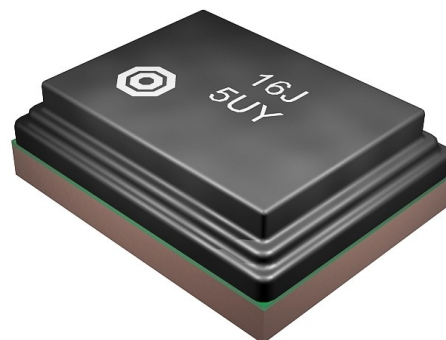
Data sheet

## 1 Application

- Low-loss BAW RF single filter for Bluetooth/WLAN systems
- Low insertion loss
- High power durability
- Usable pass band 79.0 MHz
- Industrial qualification

## 2 Features

- Package size  $1.4 \pm 0.1 \text{ mm} \times 1.1 \pm 0.1 \text{ mm}$
- 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)

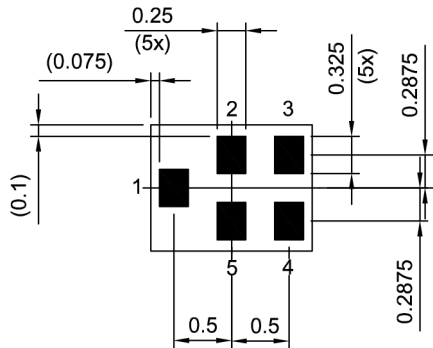


**Figure 1:** Picture of component with example of product marking.

Data sheet

3 Package

BOTTOM VIEW

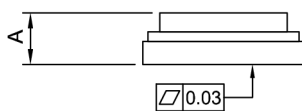


Pad and pitch tolerance ±0.05

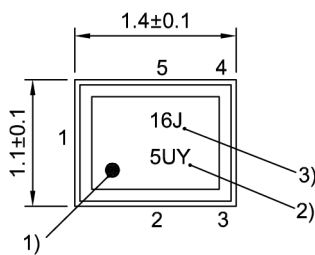
4 Pin configuration

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

SIDE VIEW

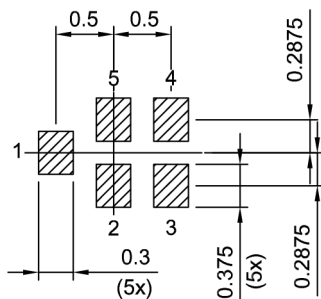


TOP VIEW



- 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).

Data sheet

### 5 Matching circuit

■  $L_{p1} = 10 \text{ nH}$

■  $L_{s4} = 1.2 \text{ nH}$

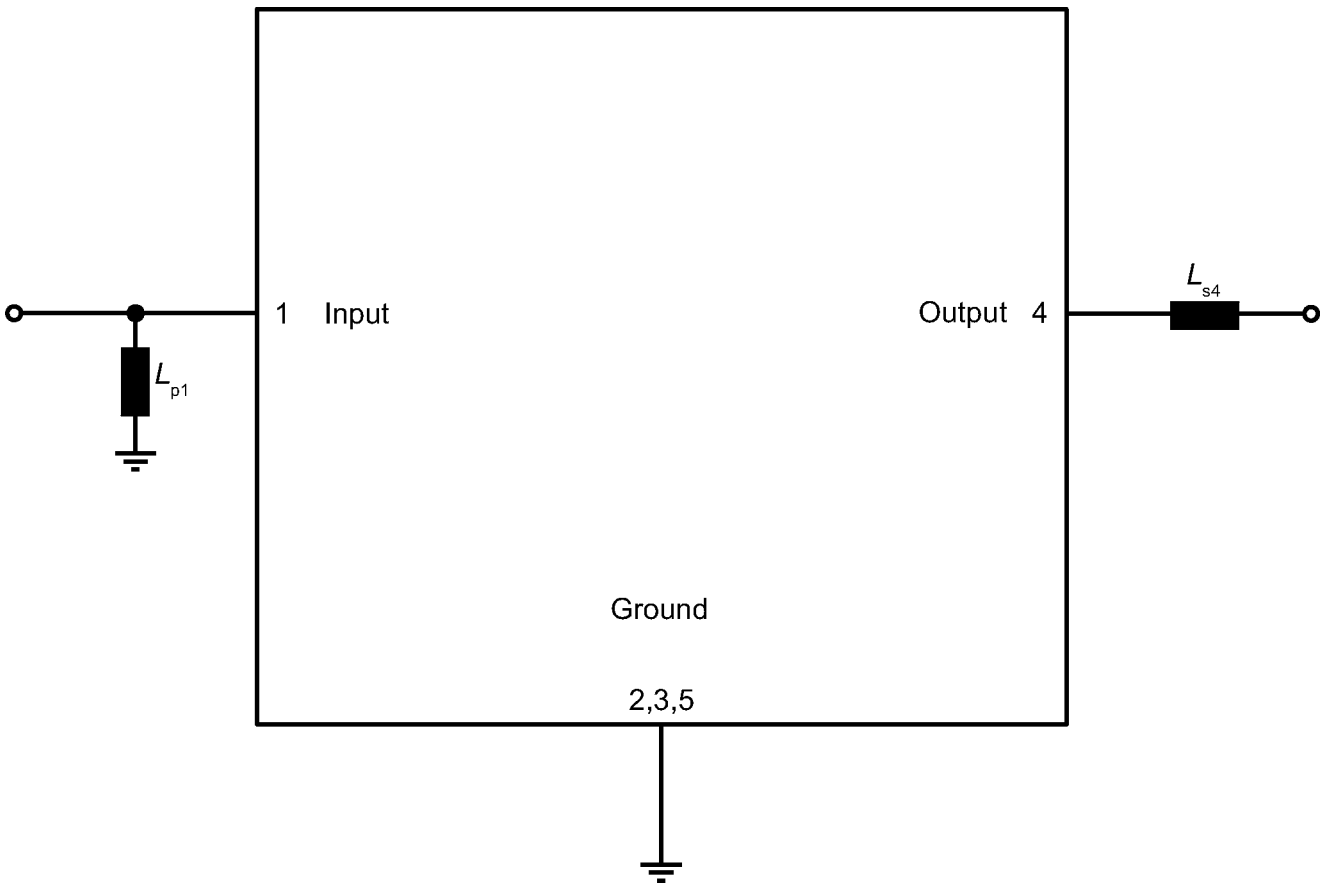


Figure 3: Schematic of matching circuit.

Data sheet

## 6 Characteristics

Temperature range for specification

$$T_{\text{SPEC}} = -10\text{ °C} \dots +85\text{ °C}$$

Input terminating impedance

$$Z_{\text{IN}} = 50\ \Omega \text{ with par. } 10\ \text{nH}^{(1)}$$

Output terminating impedance

$$Z_{\text{OUT}} = 50\ \Omega \text{ with ser. } 1.2\ \text{nH}^{(1)}$$

Characteristics				min. for $T_{\text{SPEC}}$	typ. @+25 °C	max. for $T_{\text{SPEC}}$		
<b>Center frequency</b>				$f_{\text{C}}$	—	2442	—	MHz
<b>Maximum insertion attenuation</b>				$\alpha_{\text{max}}$				
Bluetooth	2401.5... 2480.5	MHz		—	1.5 <sup>(2)</sup>	2.1 <sup>(2)</sup>		dB
Channel 1	2403.1... 2420.9	MHz		—	1.9 <sup>(3)</sup>	2.5 <sup>(3)</sup>		dB
Channel 2	2408.1... 2425.9	MHz		—	1.6 <sup>(3)</sup>	2.0 <sup>(3)</sup>		dB
Channel 3-11	2413.1... 2470.9	MHz		—	1.4 <sup>(3)</sup>	1.8 <sup>(3)</sup>		dB
Channel 12	2458.1... 2475.9	MHz		—	1.5 <sup>(3)</sup>	2.2 <sup>(3)</sup>		dB
Channel 13	2463.1... 2480.9	MHz		—	1.8 <sup>(3)</sup>	2.7 <sup>(3)</sup>		dB
<b>Amplitude ripple (p-p)</b>				$\Delta\alpha$				
Channel 1	2403.1... 2420.9	MHz		—	1.2	3.6		dB
Channel 2	2408.1... 2425.9	MHz		—	0.7	2.0		dB
Channel 3-11	2413.1... 2470.9	MHz		—	0.6	1.6		dB
Channel 12	2458.1... 2475.9	MHz		—	0.6	2.0		dB
Channel 13	2463.1... 2480.9	MHz		—	1.4	5.7		dB
<b>Maximum VSWR</b>				VSWR <sub>max</sub>				
@ input port	2403.1... 2475.9	MHz		—	1.5	2.3		
	2403.1... 2480.9	MHz		—	1.8	2.5		
@ output port	2403.1... 2480.9	MHz		—	1.6	2.3		
<b>Minimum attenuation</b>				$\alpha_{\text{min}}$				
	10... 800	MHz		40	44	—		dB
	800... 1805	MHz		32	37	—		dB
	1805... 2170	MHz		35	38	—		dB
	2170... 2300	MHz		35	45	—		dB
	2300... 2360	MHz		38	41	—		dB
	2360... 2365	MHz		38 <sup>(4)</sup>	43 <sup>(4)</sup>	—		dB
	2365... 2370	MHz		40 <sup>(4)</sup>	45 <sup>(4)</sup>	—		dB
	2370... 2375	MHz		35 <sup>(4)</sup>	48 <sup>(4)</sup>	—		dB
	2375... 2380	MHz		15 <sup>(4)</sup>	50 <sup>(4)</sup>	—		dB
	2377.5... 2382.5	MHz		10 <sup>(4)</sup>	48 <sup>(4)</sup>	—		dB
	2496... 2501	MHz		13 <sup>(4)</sup>	54 <sup>(4)</sup>	—		dB
	2500... 2505	MHz		34 <sup>(4),5)</sup>	65 <sup>(4)</sup>	—		dB
	2500... 2505	MHz		43 <sup>(4),6)</sup>	65 <sup>(4)</sup>	—		dB
	2505... 2570	MHz		45	52	—		dB
	2570... 2620	MHz		42	48	—		dB
	2620... 2690	MHz		40	47	—		dB

<b>SAW components</b>	<b>B9634</b>
<b>BAW Filter</b>	<b>2442 MHz</b>

Data sheet

Characteristics	min. for $T_{SPEC}$	typ. @+25 °C	max. for $T_{SPEC}$	
2690... 3400 MHz	28	38	—	dB
3400... 3800 MHz	28	33	—	dB
3800... 4800 MHz	20	25	—	dB
4800... 5150 MHz	20	29	—	dB
5150... 5850 MHz	25	29	—	dB

- 1) See Sec. Matching circuit (p. 5).
- 2) Averaged values over whole pass band due to frequency hopping in Bluetooth mode.
- 3) Averaged value within each Wifi channel width of 17.8 MHz.
- 4) Averaged values of linear S-parameter over any 5MHz.
- 5) Valid for temperature  $T_{SPEC} = -10\text{ °C}...+25\text{ °C}$ .
- 6) Valid for temperature  $T_{SPEC} = +25\text{ °C}...+85\text{ °C}$ .

<b>SAW components</b>	<b>B9634</b>
<b>BAW Filter</b>	<b>2442 MHz</b>

Data sheet

## 7 Maximum ratings

Storage temperature	$T_{STG} = -40\text{ °C} \dots +90\text{ °C}$	
DC voltage	$V_{DC} = 0\text{ V (max.)}$	
ESD voltage	$V_{ESD} = 50\text{ V (max.)}^{1)}$	
Input power	$P_{IN}$	
@ input port: 2401.5 ... 2480.5 MHz	29.5 dBm	Source and load impedance 50Ω. LTE 5MHz downlink. T=55°C, 100.000h. <sup>2)</sup>
@ input port: other frequency range(s)	10 dBm	Source and load impedance 50Ω.
Operating lifetime with output power at antenna	$P_{OUT}$	
@ output port: 2401.5 ... 2480.5 MHz	t.b.d. dBm <sup>3)</sup>	Continuous wave T= 55 °C, 100khrs. <sup>4)</sup>

<sup>1)</sup> According to JESD22-A115A (machine model), 1 negative and 1 positive pulses.

<sup>2)</sup> Time to failure (TTF) according to accelerated power durability tests, and wear out models.

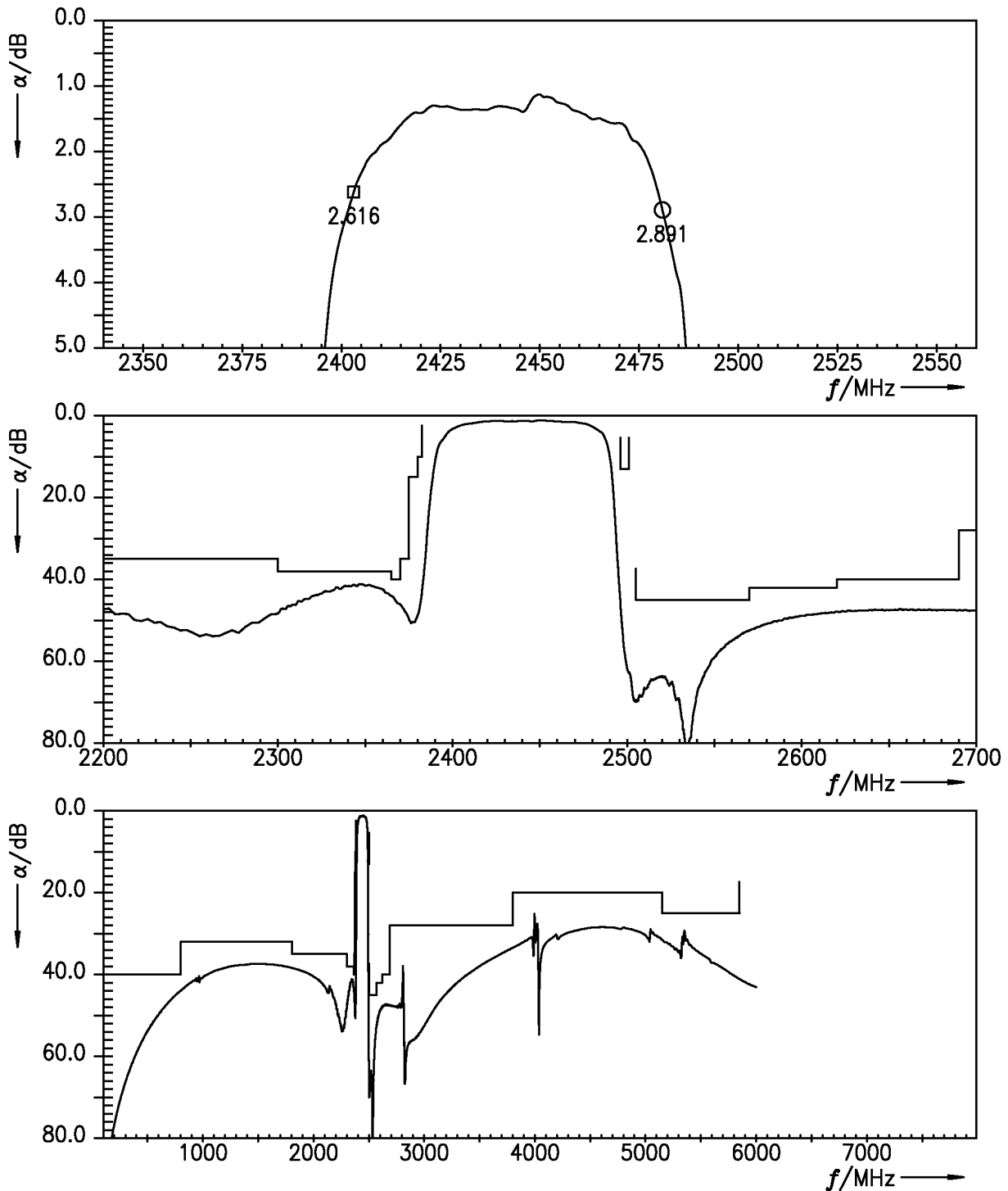
<sup>3)</sup> Target is 24 dBm.

<sup>4)</sup> According to accelerated high temperature operating life (HOTL) test.



Data sheet

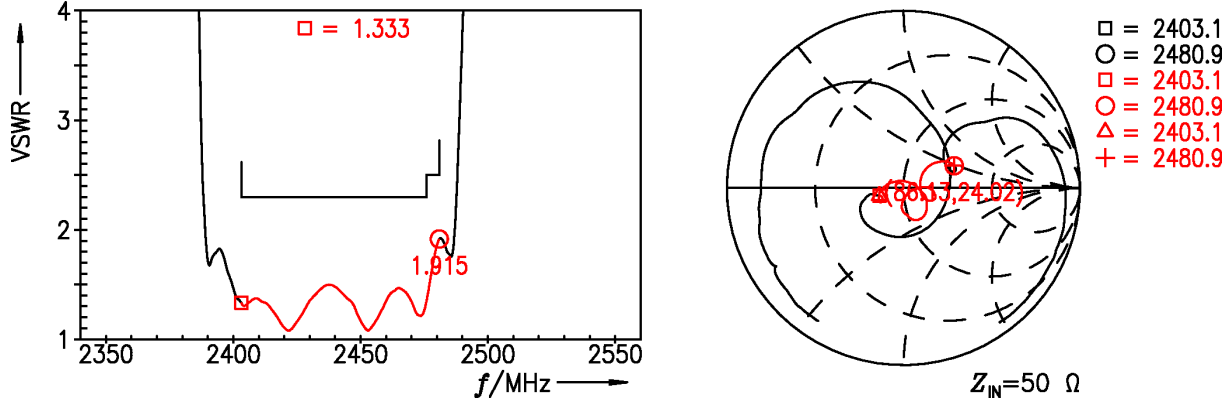
**8 Transmission coefficient**



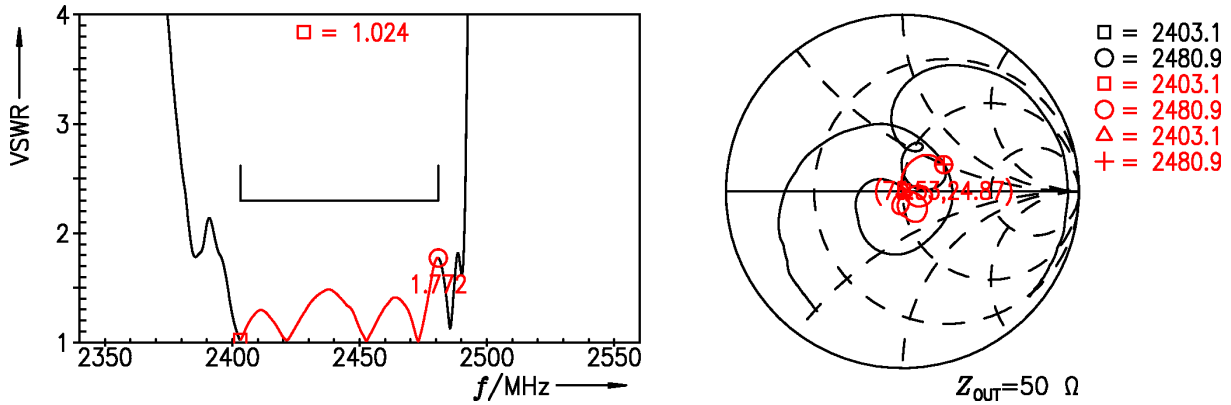
**Figure 4:** Attenuation.

Data sheet

**9 Reflection coefficients**



**Figure 5:** Reflection coefficient at IN port.

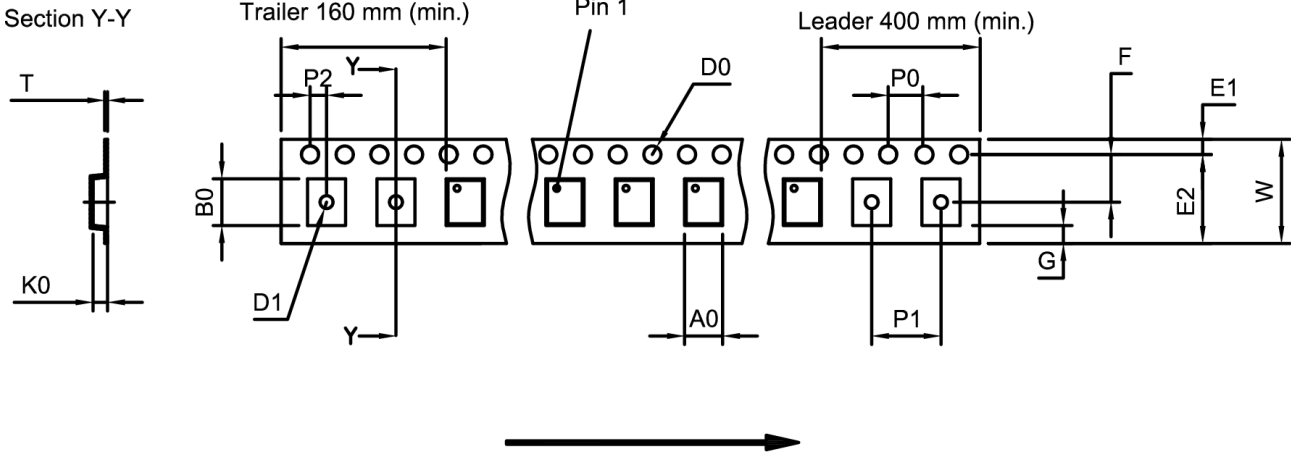


**Figure 6:** Reflection coefficient at OUT port.

Data sheet

**10 Packing material**

**10.1 Tape**

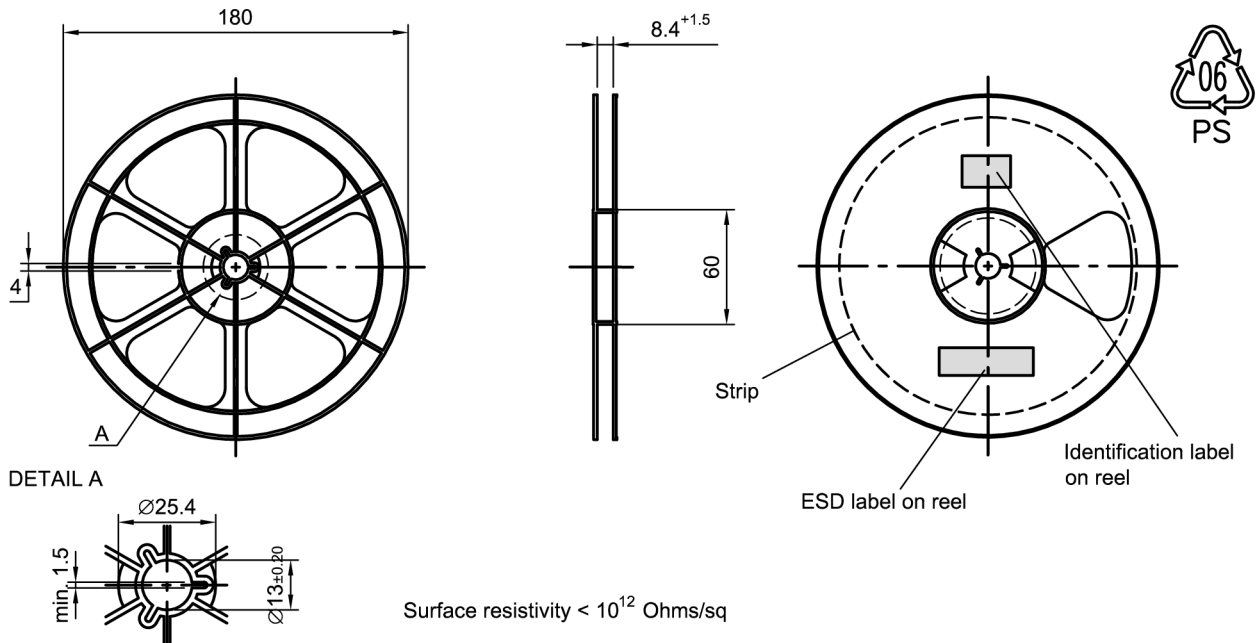


**Figure 7:** Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

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.

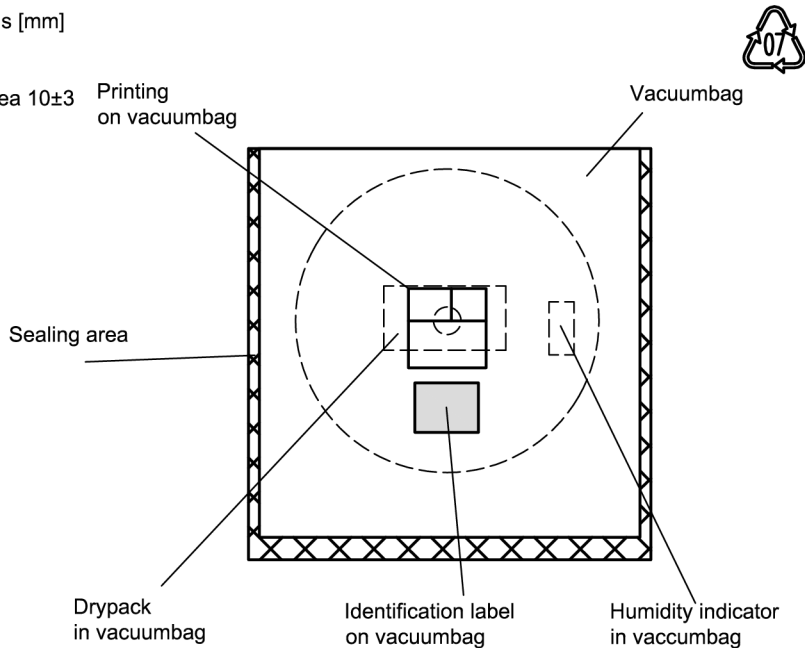
**10.2 Reel with diameter of 180 mm**



**Figure 8:** Drawing of reel (first-angle projection) with diameter of 180 mm.

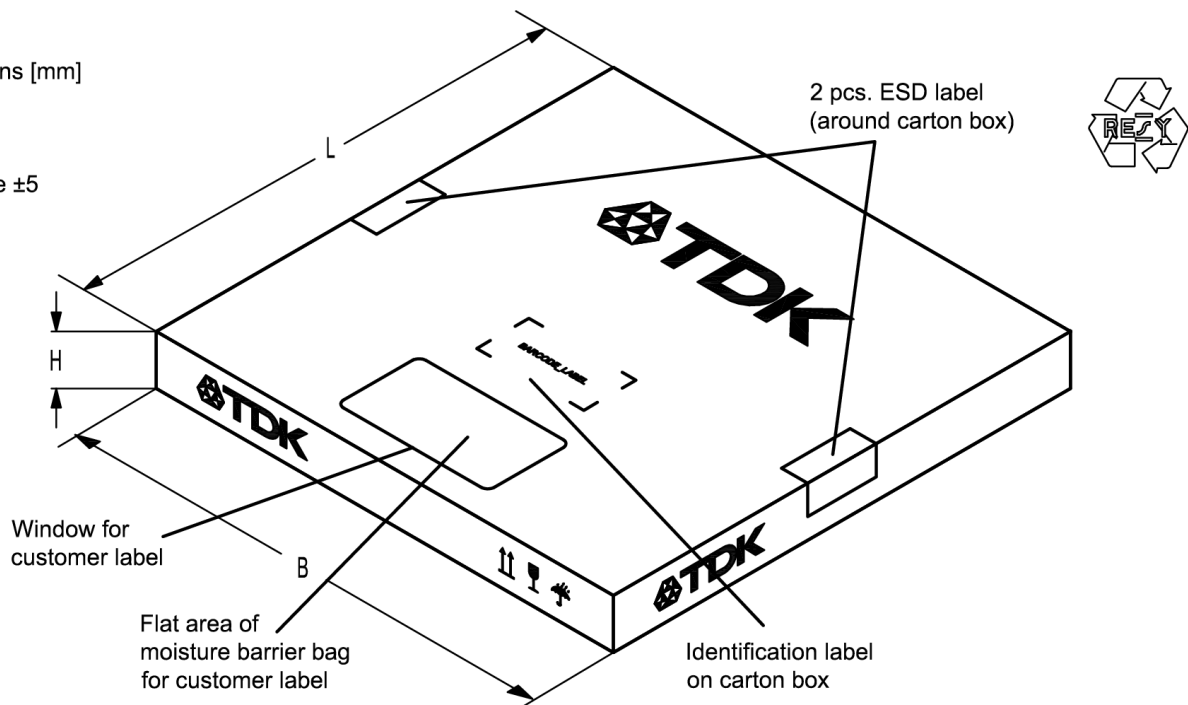
Data sheet

Dimensions [mm]  
 X = 220+5  
 Y = 235+5  
 Sealing area 10±3



**Figure 9:** Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

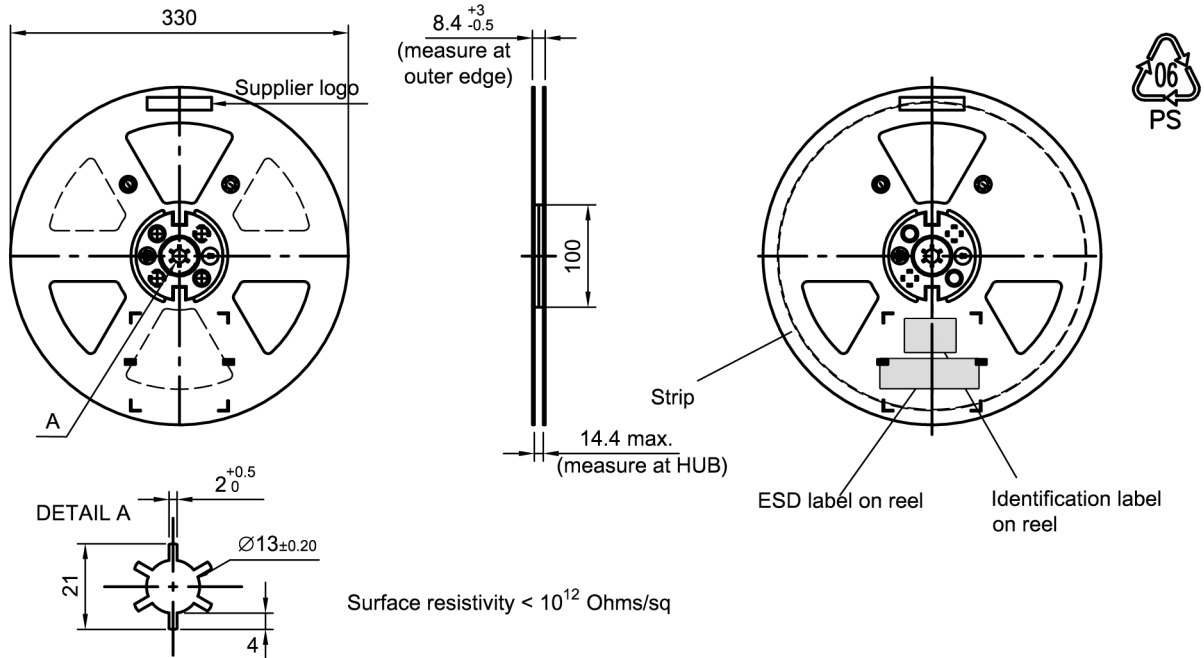
Dimensions [mm]  
 L = 188  
 B = 188  
 H = 30  
 Tolerance ±5



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

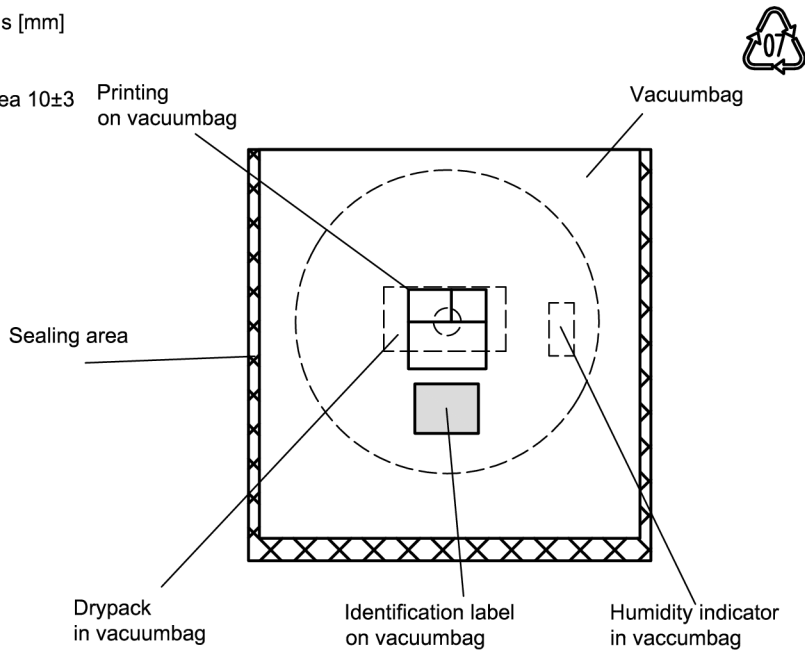
Data sheet

**10.3 Reel with diameter of 330 mm**



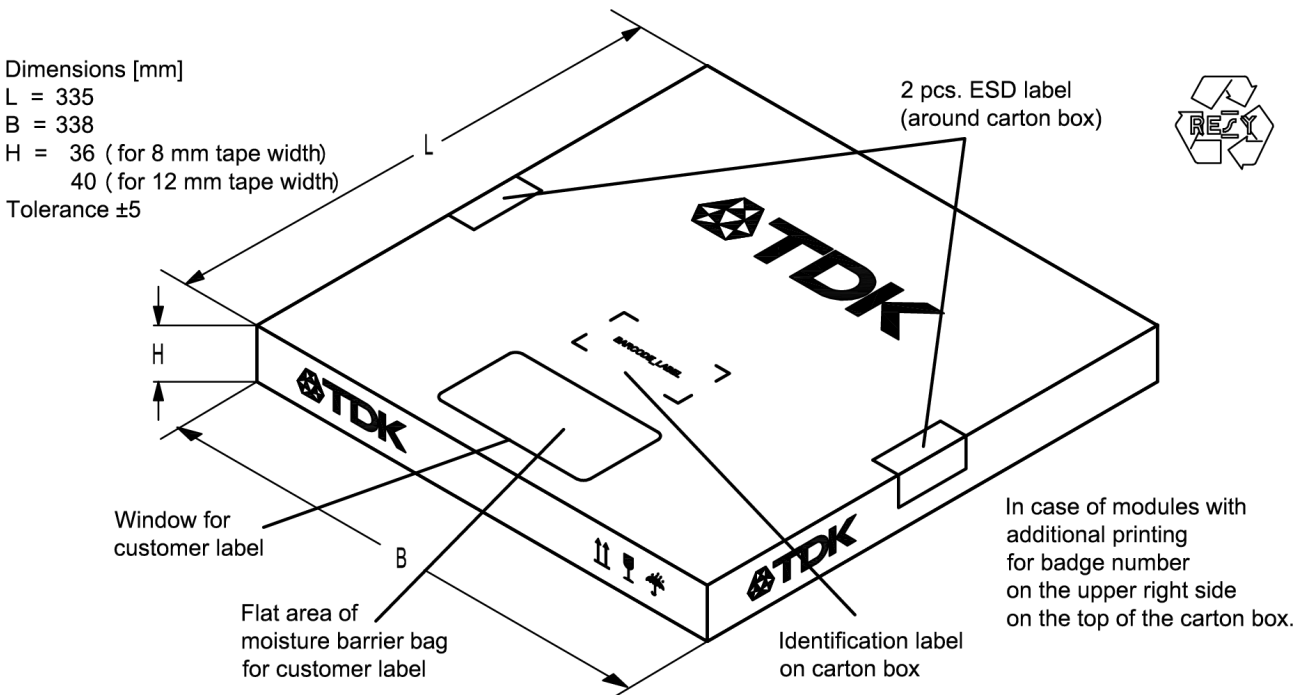
**Figure 11:** Drawing of reel (first-angle projection) with diameter of 330 mm.

Dimensions [mm]  
 X = 400±5  
 Y = 418±5  
 Sealing area 10±3



**Figure 12:** Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

## Data sheet


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

**11 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.
<b>16J</b>	=>	<b>1234</b>
$1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0$	=	<b>1234</b>

The BASE32 code for product type B9634 is 9D2.

**■ 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.
<b>5UY</b>	=>	<b>12345</b>
$5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0$	=	<b>12345</b>

Data sheet

<b>Adopted BASE32 code for type number</b>			
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

<b>Adopted BASE47 code for lot number</b>			
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.

SAW components	B9634
BAW Filter	2442 MHz

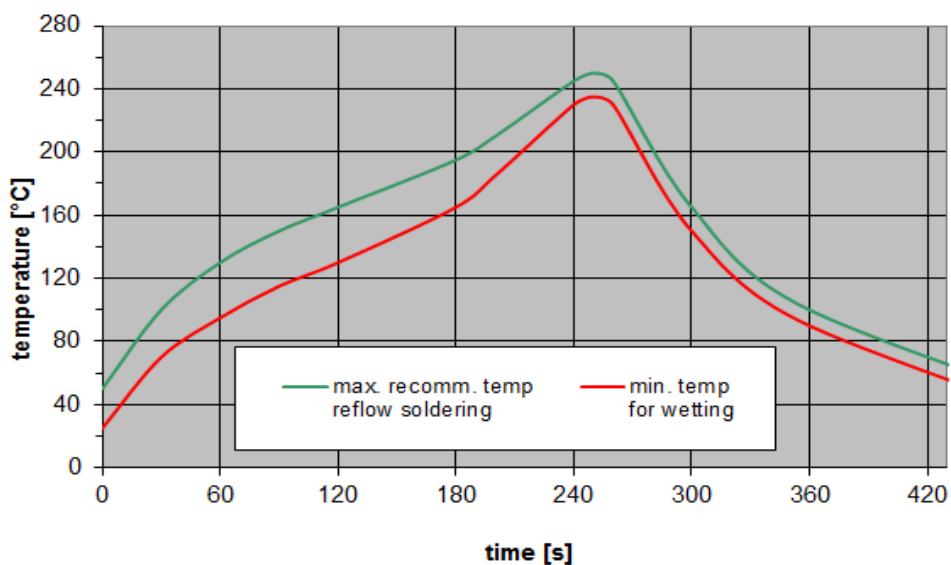
Data sheet

## 12 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
$T > 220\text{ °C}$	30 s to 70 s
$T > 230\text{ °C}$	min. 10 s
$T > 245\text{ °C}$	max. 20 s
$T \geq 255\text{ °C}$	–
peak temperature $T_{\text{peak}}$	250 °C +0/-5 °C
wetting temperature $T_{\text{min}}$	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.



<b>SAW components</b>	<b>B9634</b>
<b>BAW Filter</b>	<b>2442 MHz</b>

Data sheet

### 13 Annotations

#### 13.1 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>.

#### 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 EPCOS sales office.

#### 13.4 Ordering codes and packing units

Ordering code	Packing unit
B39242B9634P810	5000 pcs

**Table 4:** Ordering codes and packing units.

Data sheet

## 14 Cautions and warnings

### 14.1 Display of ordering codes for EPCOS 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 EPCOS, 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.epcos.com/orderingcodes](http://www.epcos.com/orderingcodes).

### 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.

### 14.3 Moldability

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

### 14.4 Package information

#### Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on EPCOS 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 EPCOS, 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.