



RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

## SAW Components

### SAW Duplexer

LTE Band 2

Series/type:	B8618
Ordering code:	B39202B8618P810
Date:	October 13, 2015
Version:	2.1

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Data sheet

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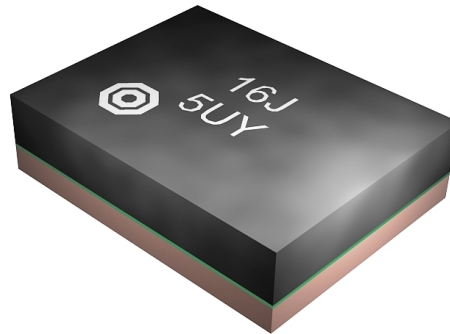
Data sheet

## 1 Application

- Low-loss SAW duplexer for mobile telephone LTE Band 2 (PCS) systems.
- Low insertion attenuation.
- Low amplitude ripple.
- Usable pass band 60 MHz.
- Single ended to balanced transformation in Antenna – Rx path.
- Impedance transformation 50Ω to 100Ω in Antenna – Rx path.

## 2 Features

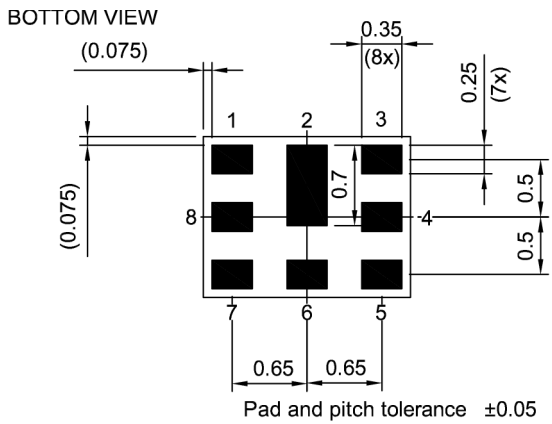
- Package size 1.8 mm × 1.4 mm.
- Package height (max.) 0.475 mm.
- Approximate weight 0.0035 g.
- RoHS compatible.
- Package for Surface Mount Technology (SMT).
- Ni, gold-plated terminals.
- Electrostatic Sensitive Device (ESD).
- Moisture Sensitivity Level 3 (MSL3).



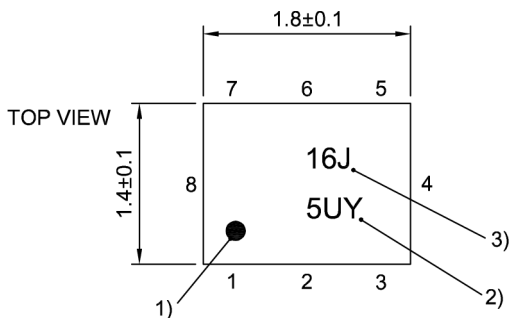
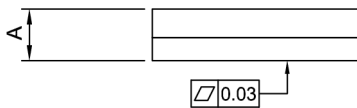
**Figure 1:** Picture of component with example of marking.

Data sheet

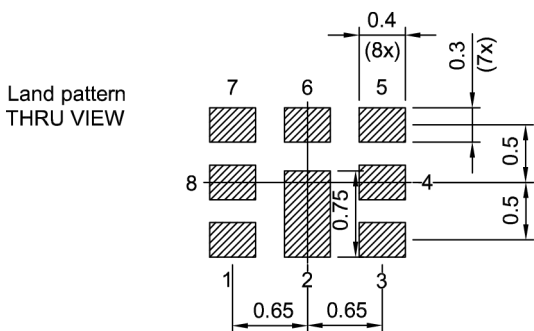
3 Package



SIDE VIEW



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



Landing pad tolerance -0.02

**Figure 2:** Drawing of package with package height A = 0.475 mm (max.). See Simplified drawings (p. 21).

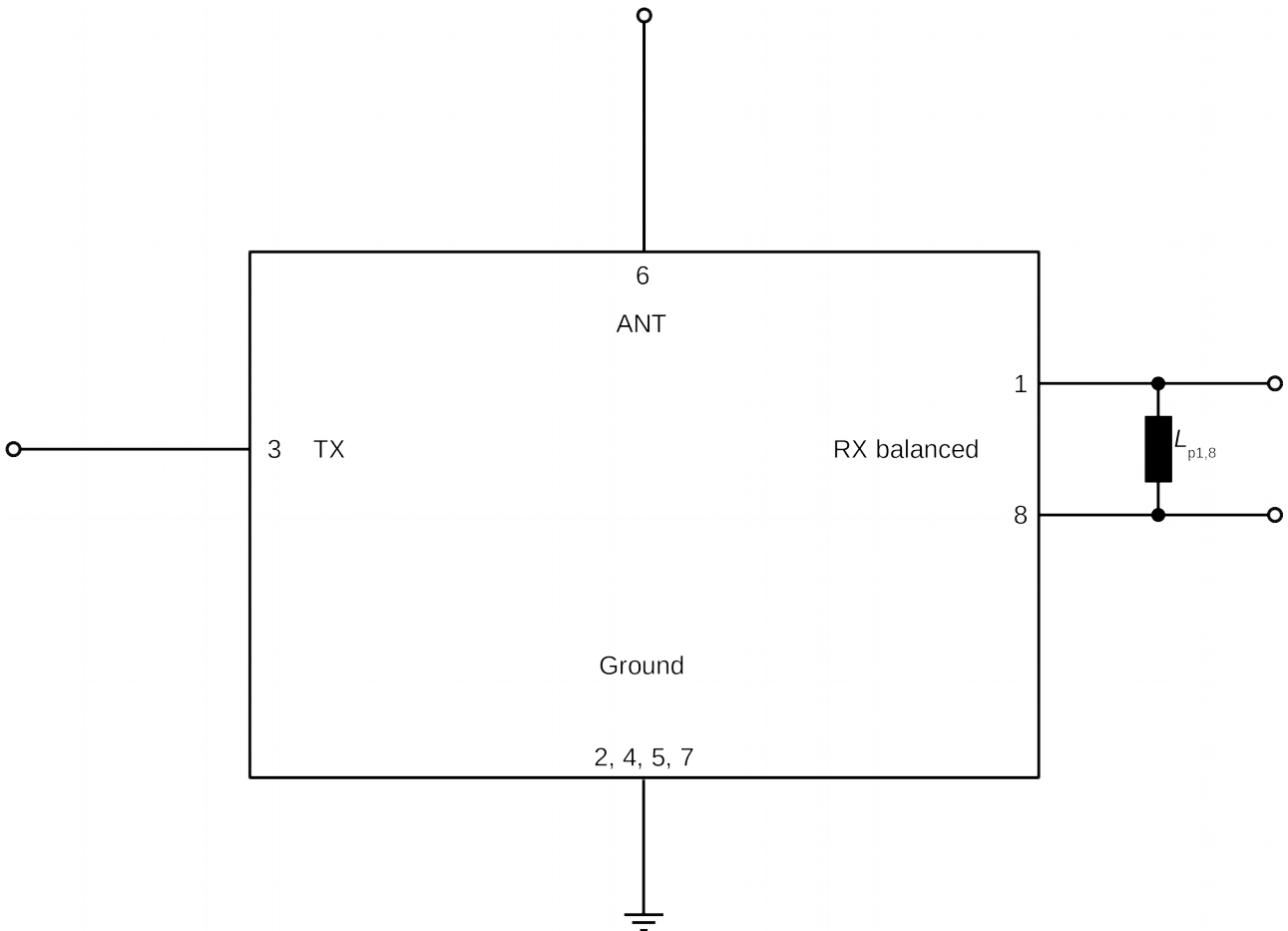
4 Pin configuration

- 1, 8 RX balanced
- 3 TX
- 6 ANT
- 2, 4, 5, 7 Ground

Data sheet

**5 Matching circuit**

■  $L_{p1,8} = 9.5 \text{ nH}$



**Figure 3:** Schematic of matching circuit.

Data sheet

## 6 Characteristics

### 6.1 TX – ANT

Temperature range for specification	$T$	= -30 °C to +85 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$
RX terminating impedance	$Z_{RX}$	= 100 $\Omega$ with par. 9.5 nH (differential mode)
RX terminating impedance	$Z_{RX}$	= 25 $\Omega$ (common mode)

Characteristics TX – ANT <sup>1)</sup>	min.	typ. @+25 °C	max.				
<b>Center frequency</b>	$f_C$	—	1880	—	MHz		
<b>Maximum insertion attenuation</b>	$\alpha_{max}$	1850.24... 1909.76 MHz		—	1.9	2.5	dB
<b>Amplitude ripple (p-p)</b>	$\Delta\alpha^{2)}$	1850.24... 1909.76 MHz		—	0.3	1.5	dB
<b>Maximum VSWR</b>	VSWR <sub>max</sub>	1850.24... 1909.76 MHz		—	1.4	2.0	
@ TX port		1850.24... 1909.76 MHz		—	1.4	2.0	
@ ANT port		1850.24... 1909.76 MHz		—	1.4	2.0	
<b>Maximum error vector magnitude</b>	EVM <sub>max</sub> <sup>3)</sup>	1852.4... 1907.6 MHz		—	0.5	3.0	%
<b>Minimum attenuation</b>	$\alpha_{min}$	50... 787 MHz		30	42	—	dB
		728... 764 MHz		40	43	—	dB
		869... 894 MHz		40	43	—	dB
		1226... 1250 MHz		43	50	—	dB
		1559... 1606 MHz		43	54	—	dB
		1605.9... 1680 MHz		30	54	—	dB
		1930.24... 1989.76 MHz		44	57	—	dB
		2010... 2025 MHz		20	52	—	dB
		2110... 2155 MHz		44	49	—	dB
		2400... 2500 MHz		25	35	—	dB
		3700... 3820 MHz		26	29	—	dB
		4900... 5950 MHz		21	29	—	dB
		5550... 5730 MHz		23	27	—	dB

<sup>1)</sup> Specified min/max values are valid for a testing power of +10 dBm.

<sup>2)</sup> Over any channel with band width of 5 MHz.

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



Data sheet

## 6.2 ANT – RX

Temperature range for specification	$T$	= -30 °C to +85 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$
RX terminating impedance	$Z_{RX}$	= 100 $\Omega$ with par. 9.5 nH (differential mode)
RX terminating impedance	$Z_{RX}$	= 25 $\Omega$ (common mode)

Characteristics ANT – RX <sup>1)</sup>		min.	typ. @+25 °C	max.	
<b>Center frequency</b>	$f_C$	—	1960	—	MHz
<b>Maximum insertion attenuation</b>	$\alpha_{max}$				
1930.24... 1989.76 MHz		—	2.7	3.5	dB
<b>Maximum VSWR</b>	VSWR <sub>max</sub>				
@ ANT port		—	1.6	2.0	
@ RX port		—	1.6	2.0	
<b>Minimum attenuation</b>	$\alpha_{min}$				
50... 1850 MHz		45	49	—	dB
80 MHz		50	>60	—	dB
1850.24... 1909.76 MHz		45	52	—	dB
2050... 2075 MHz		25	39	—	dB
2075... 2350 MHz		30	37	—	dB
2350... 2550 MHz		20	31	—	dB
2550... 6000 MHz		40	51	—	dB
5610... 5845 MHz		48	52	—	dB

<sup>1)</sup> Specified min/max values are valid for a testing power of +10 dBm.

Data sheet

### 6.3 TX – RX

Temperature range for specification	$T$	= -30 °C to +85 °C
TX terminating impedance	$Z_{TX}$	= 50 $\Omega$
ANT terminating impedance	$Z_{ANT}$	= 50 $\Omega$
RX terminating impedance	$Z_{RX}$	= 100 $\Omega$ with par. 9.5 nH (differential mode)
RX terminating impedance	$Z_{RX}$	= 25 $\Omega$ (common mode)

Characteristics TX – RX <sup>1)</sup>	min.	typ. @+25 °C	max.	
<b>Minimum differential-mode isolation</b>				
$\alpha_{min}$				
1574... 1577 MHz	40	67	—	dB
1850.24... 1909.76 MHz	54	57	—	dB
1930.24... 1989.76 MHz	55	61	—	dB
3700... 3820 MHz	20	58	—	dB
5550... 5850 MHz	20	49	—	dB
<b>Minimum common-mode isolation</b>				
$\alpha_{min}$				
1850.24... 1909.76 MHz	43	48	—	dB

<sup>1)</sup> Specified min/max values are valid for a testing power of +10 dBm.

Data sheet

## 7 Maximum ratings

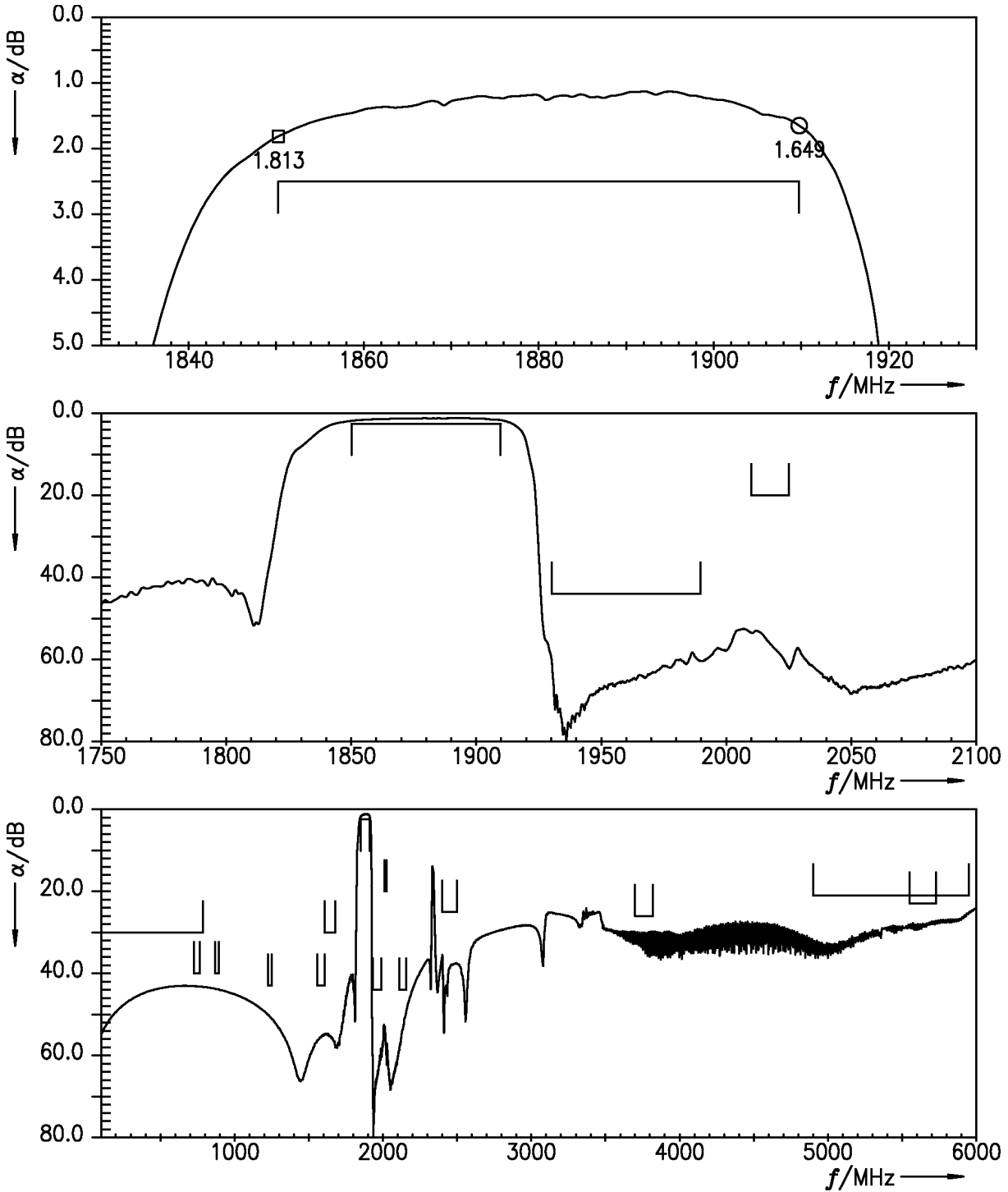
Storage temperature	$T_{STG} = -40\text{ °C to }+90\text{ °C}$	
DC voltage	$V_{DC} = 0\text{ V (max.)}^{1)}$	
ESD voltage		
	$V_{ESD}^{2)}$ 300 V (max.)	Human body model.
	$V_{ESD}^{3)}$ 600 V (max.)	Charged device model.
Input power @ TX port: 1850.24 ... 1909.76 MHz elsewhere	$P_{IN} = 29\text{ dBm}$  $= 10\text{ dBm}$	Continuous wave for 5000 h @ 50 °C.

- 1) DC resistance at RX output might be less than 100 MΩ at elevated temperatures. Hence, using blocking capacitors is recommended.
- 2) According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.
- 3) According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.

Data sheet

**8 Transmission coefficients**

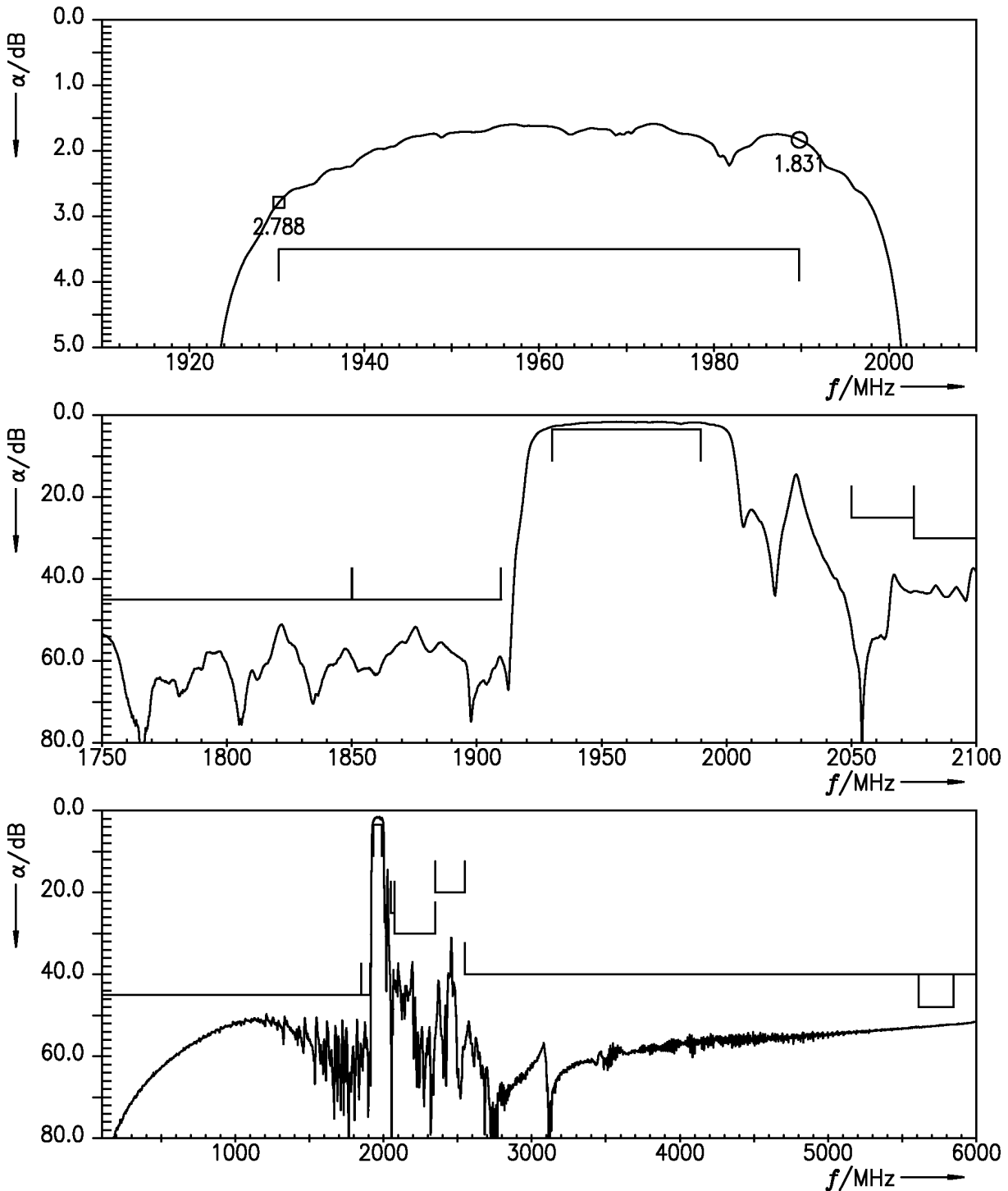
**8.1 TX – ANT**



**Figure 4:** Attenuation TX – ANT.

Data sheet

**8.2 ANT – RX**



**Figure 5:** Attenuation ANT – RX.

Data sheet

8.3 TX – RX

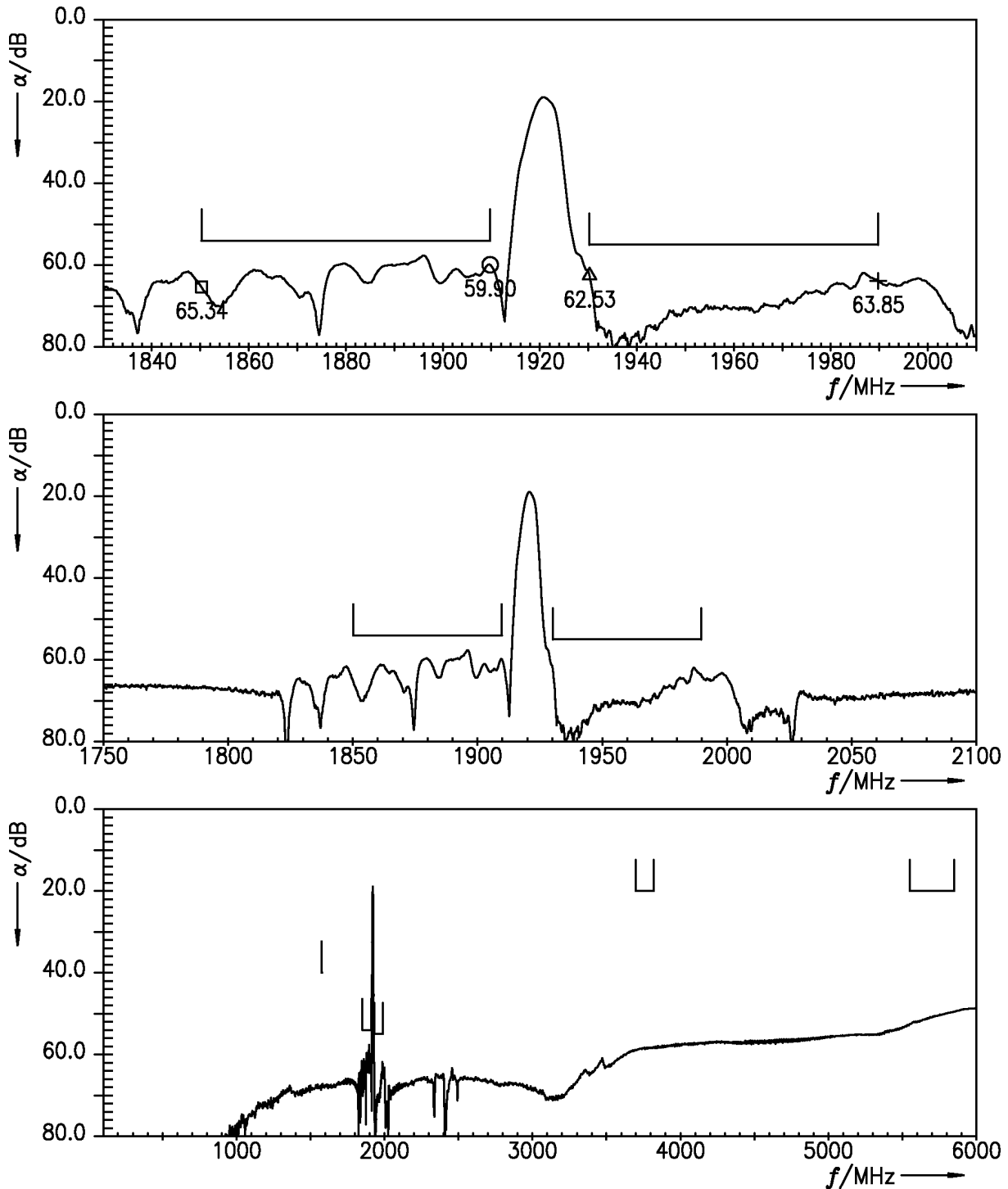
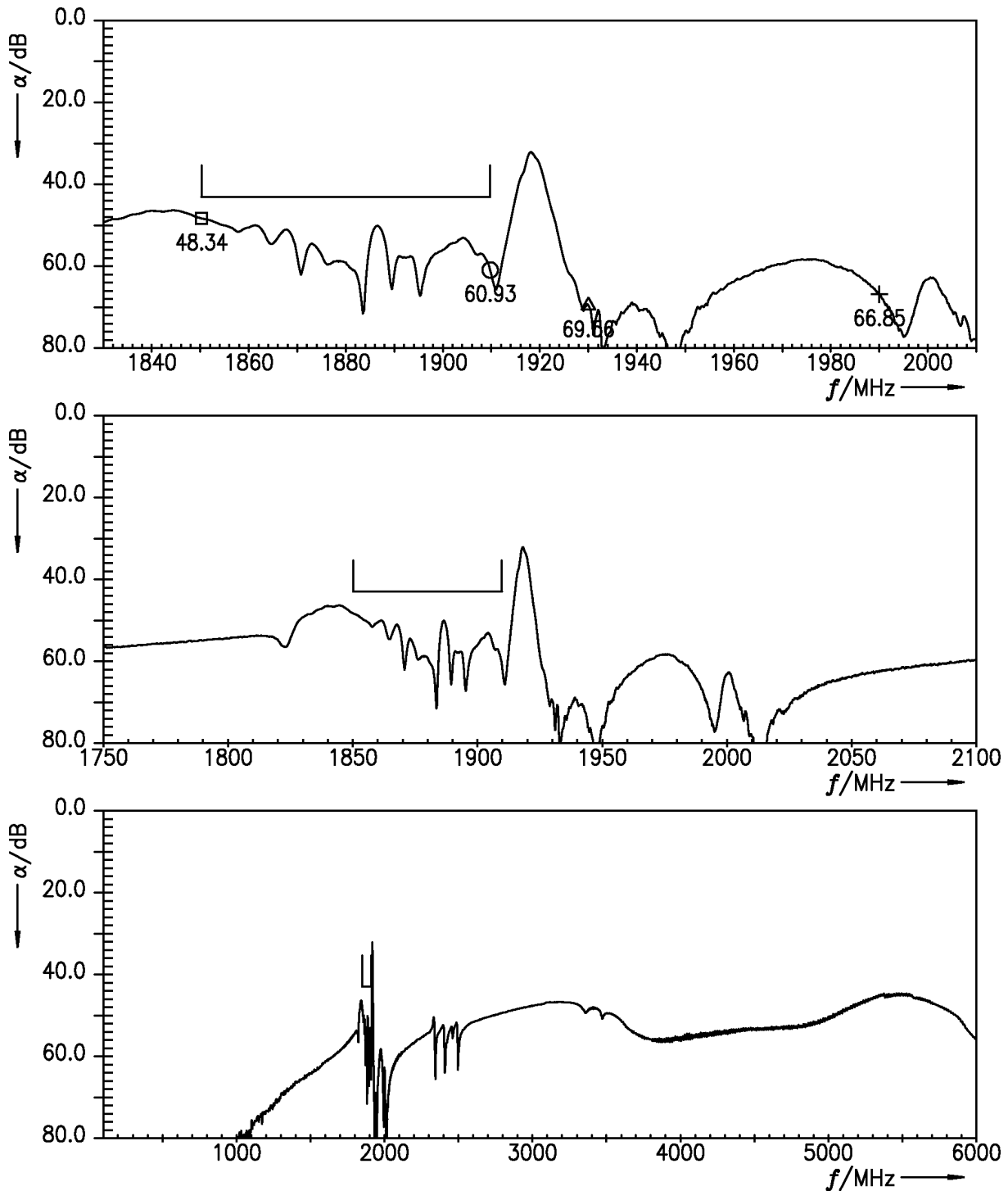


Figure 6: Differential-mode isolation TX – RX.

Data sheet



**Figure 7:** Common-mode isolation TX – RX.

Data sheet

9 Reflection coefficients

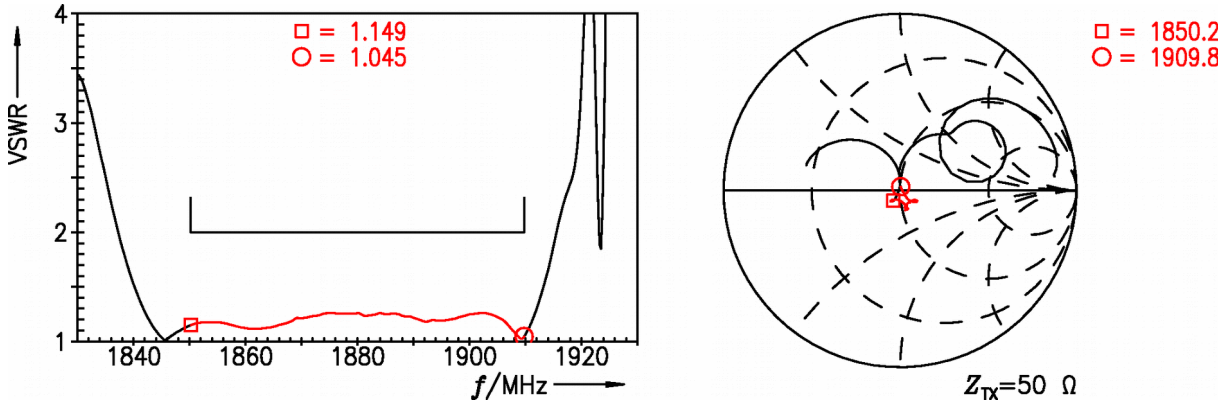


Figure 8: Reflection coefficient at TX port.

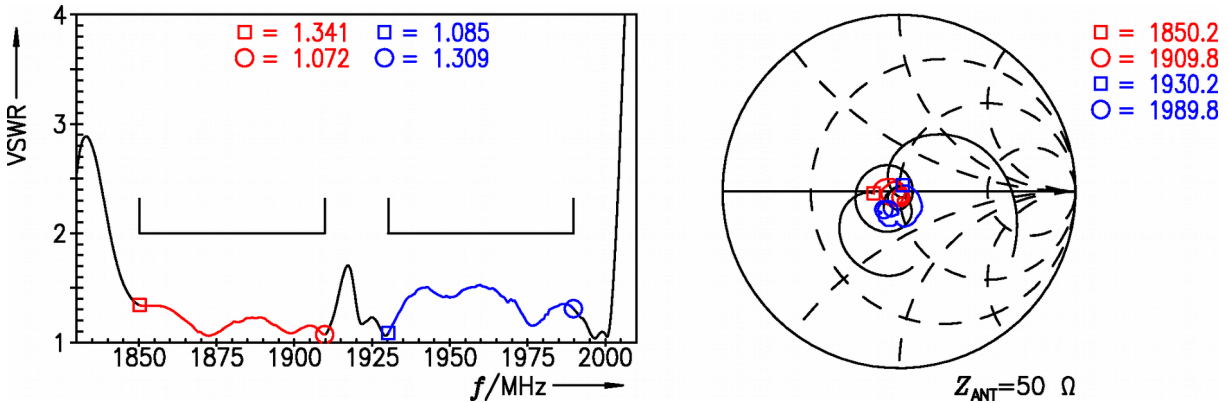


Figure 9: Reflection coefficient at ANT port (TX and RX frequencies).

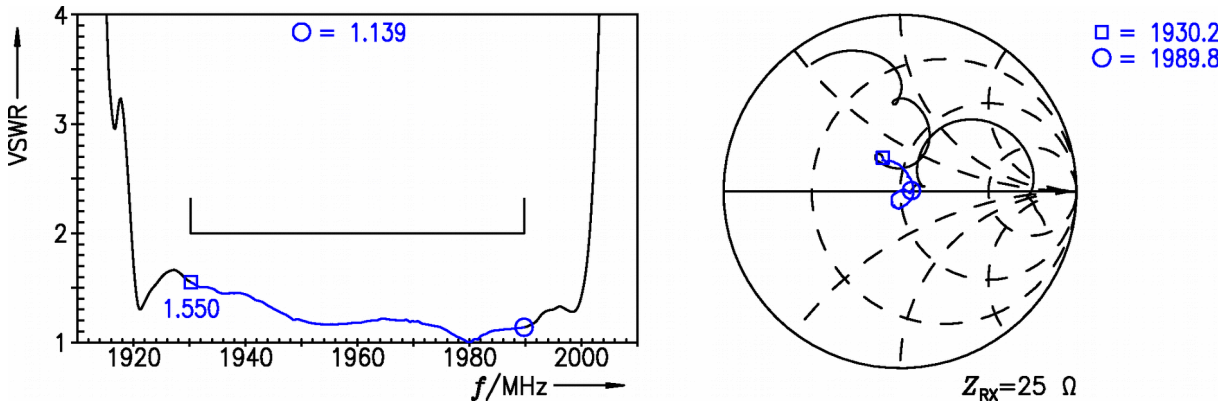


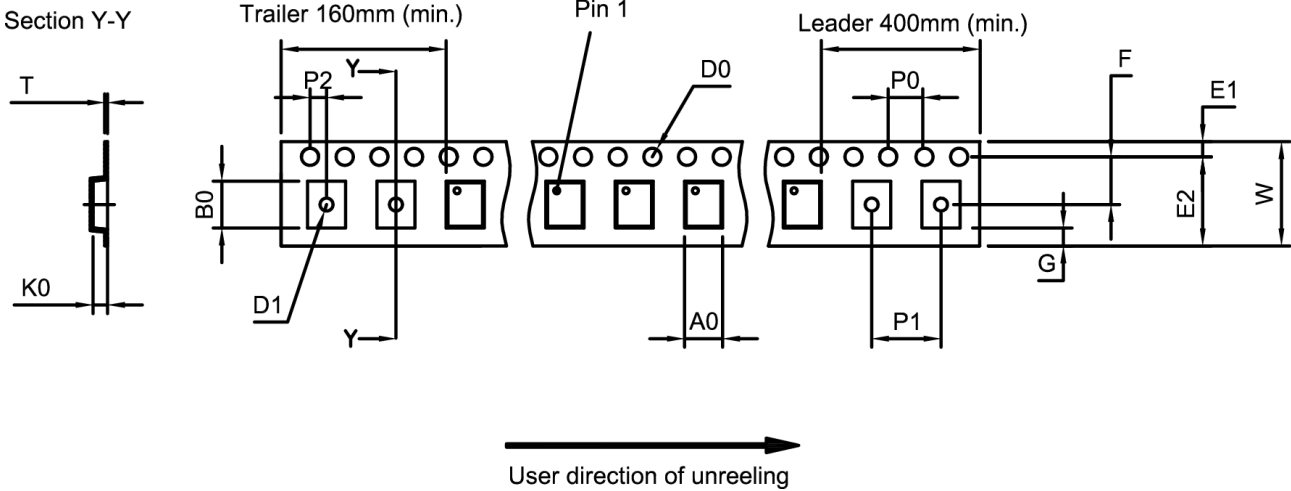
Figure 10: Reflection coefficient at RX port.



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**10 Packing material**

**10.1 Tape**



**Figure 11:** Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

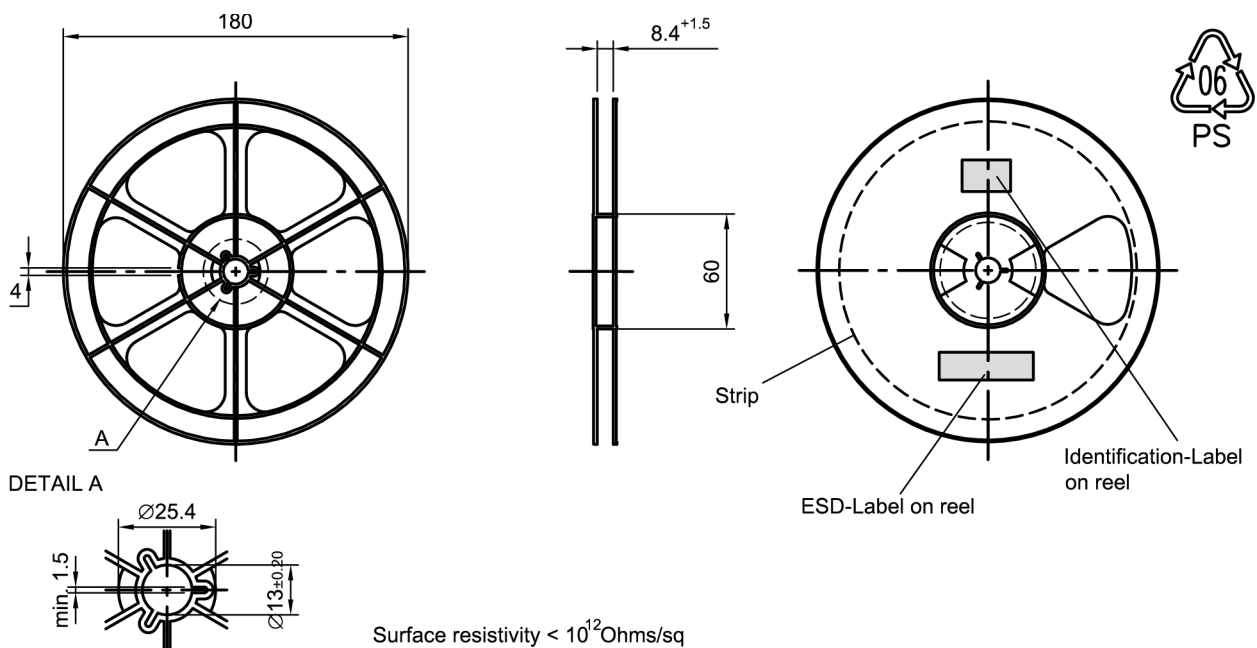
A <sub>0</sub>	1.62±0.05 mm
B <sub>0</sub>	2.04±0.05 mm
D <sub>0</sub>	1.5±0.05 mm
D <sub>1</sub>	0.8±0.05 mm
E <sub>1</sub>	1.75±0.1 mm

E <sub>2</sub>	6.25 mm (min.)
F	3.5±0.05 mm
G	0.75 mm (min.)
K <sub>0</sub>	0.62±0.05 mm
P <sub>0</sub>	4.0±0.1 mm

P <sub>1</sub>	4.0±0.1 mm
P <sub>2</sub>	2.0±0.05 mm
T	0.25±0.02 mm
W	8.0±0.1 mm

**Table 1:** Tape dimensions.

**10.2 Reel with diameter of 180 mm**



**Figure 12:** Drawing of reel (first-angle projection) with diameter of 180 mm.

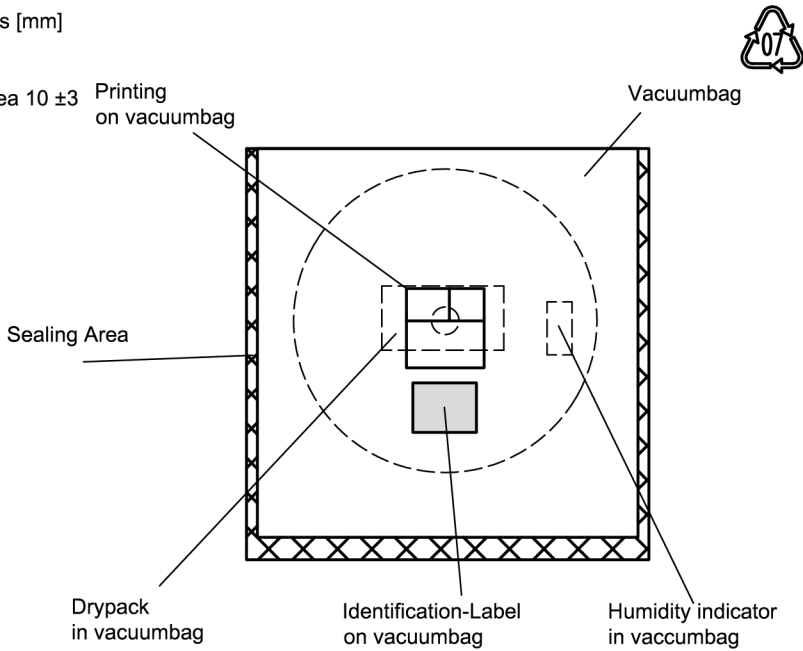
Data sheet

Dimensions [mm]

X = 220±5

Y = 235±5

Sealing area 10 ±3



**Figure 13:** Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

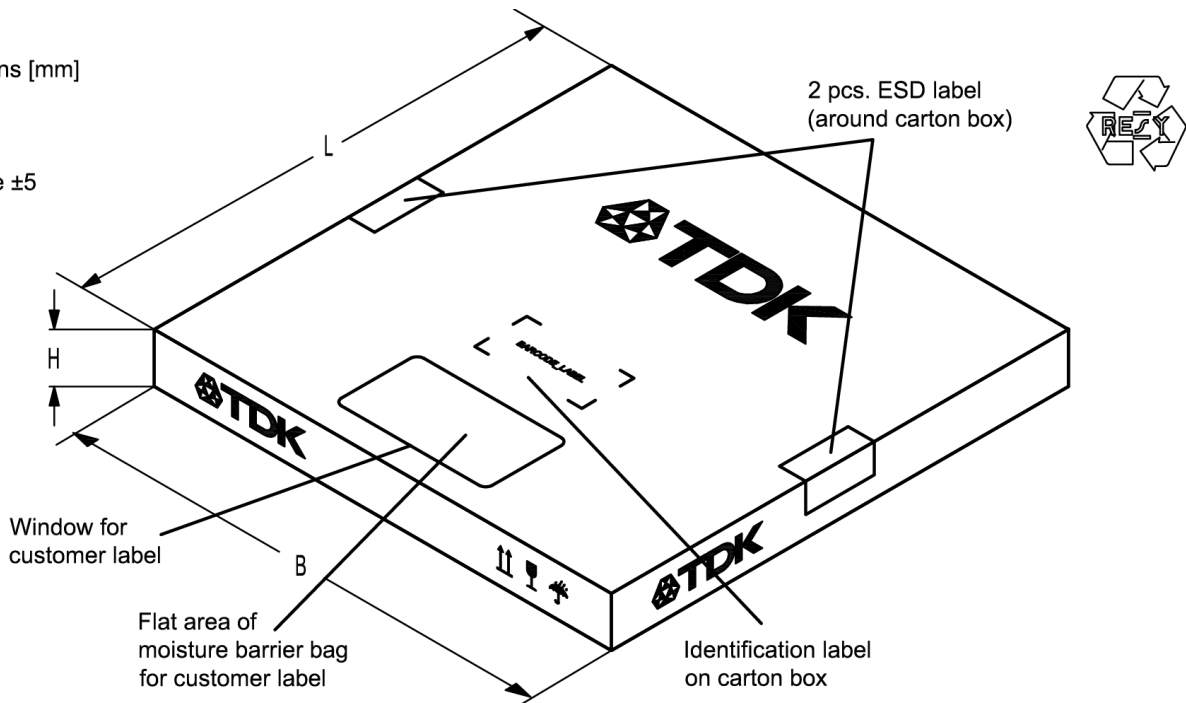
Dimensions [mm]

L = 188

B = 188

H = 30

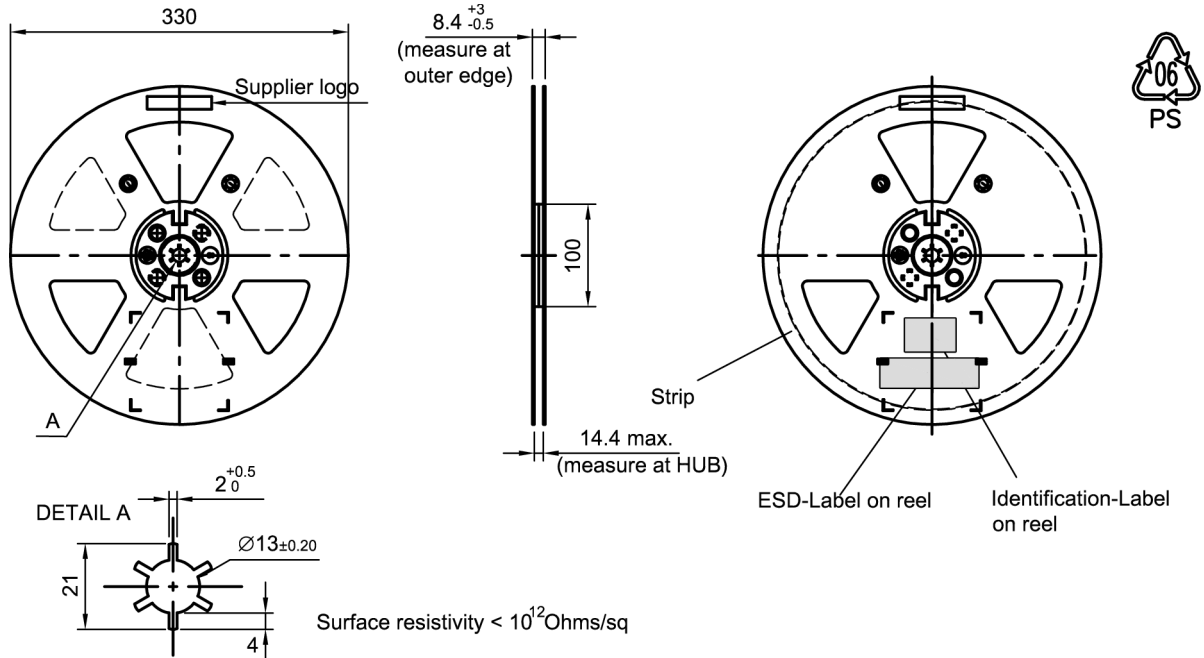
Tolerance ±5



**Figure 14:** Drawing of folding box for reel with diameter of 180 mm.

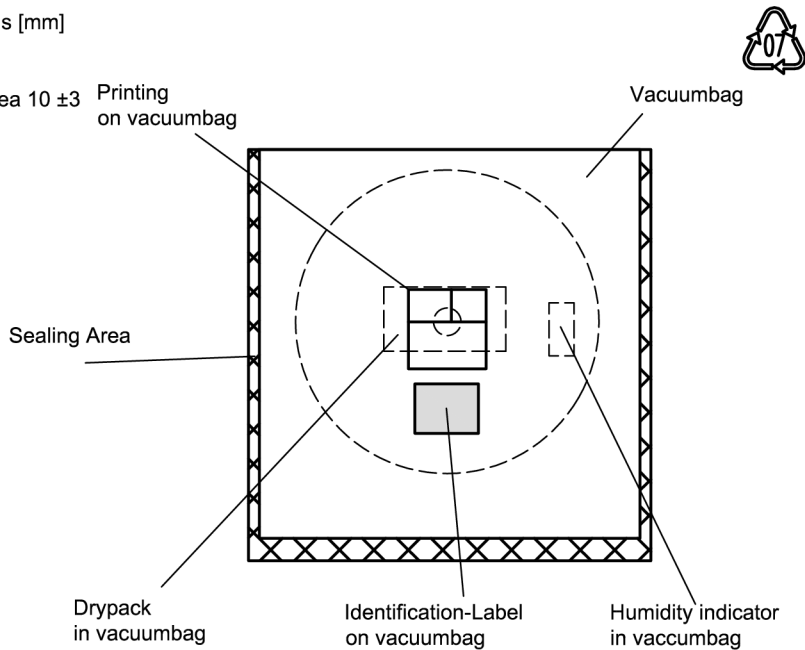
Data sheet

**10.3 Reel with diameter of 330 mm**



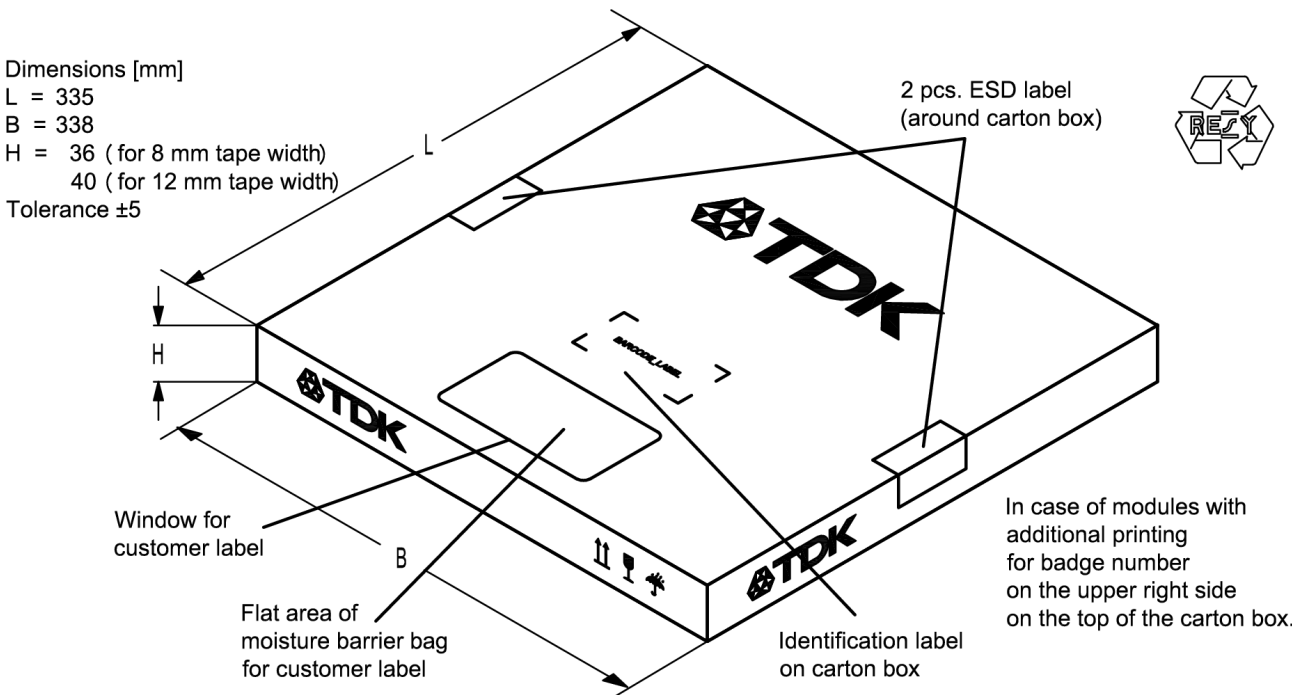
**Figure 15:** Drawing of reel (first-angle projection) with diameter of 330 mm.

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



**Figure 16:** Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

## Data sheet


**Figure 17:** 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 B8618 is 8DA.

**■ 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>

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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.

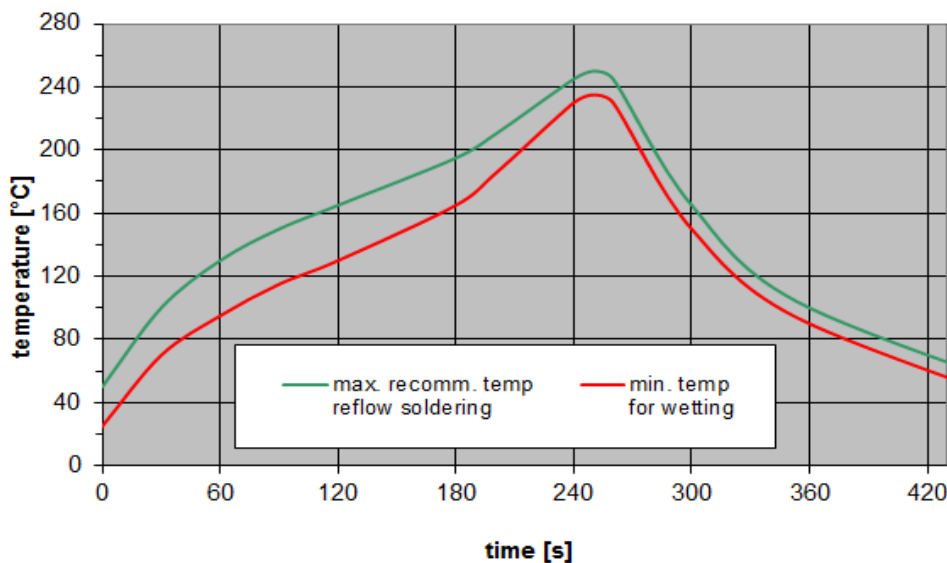
Data sheet

## 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 $T_{peak}$	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 18:** Recommended reflow profile for convection and infrared soldering – lead-free solder.

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 code and packing units

Ordering code	Packing units
B39202B8618P810	15000 pcs
B39202B8618P810S 5	5000 pcs

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

### 14 Cautions and warnings

#### 14.1 Moldability

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

#### 14.2 Simplified drawings

##### 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).

##### Projection method

Unless otherwise specified first-angle projection is applied.

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### Contact and Important notes

For further information please contact your local EPCOS sales office or visit our web page at [www.epcos.com](http://www.epcos.com).

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