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RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

SAW components

SAW duplexer

Small cell & femtocell
LTE band 1

Series/type:	B8092
Ordering code:	B39212B8092P810
Date:	April 11, 2018
Version:	2.4

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RF360 Europe GmbH, Anzinger Str. 13, München, Germany

SAW components **B8092**

SAW duplexer **1950 / 2140 MHz**

Data sheet

Table of contents

1 Application

- Low-loss SAW duplexer for 3G/LTE small cell & femtocell systems (Band 1)
- Usable pass band 60 MHz
- DECT Europe rejection
- Rx = uplink = 1920 – 1980 MHz
- Tx = downlink = 2110 – 2170 MHz

2 Features

- Industrial grade qualified family
- Package size 2.5±0.1 mm × 2.0±0.1 mm
- Package height 0.5 mm (max.)
- Approximate weight 0.01 g
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)

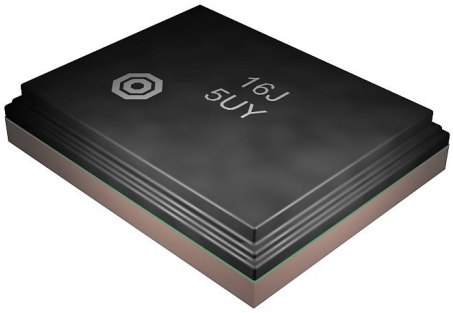

Figure 1: Picture of component with example of product marking.

3 Package

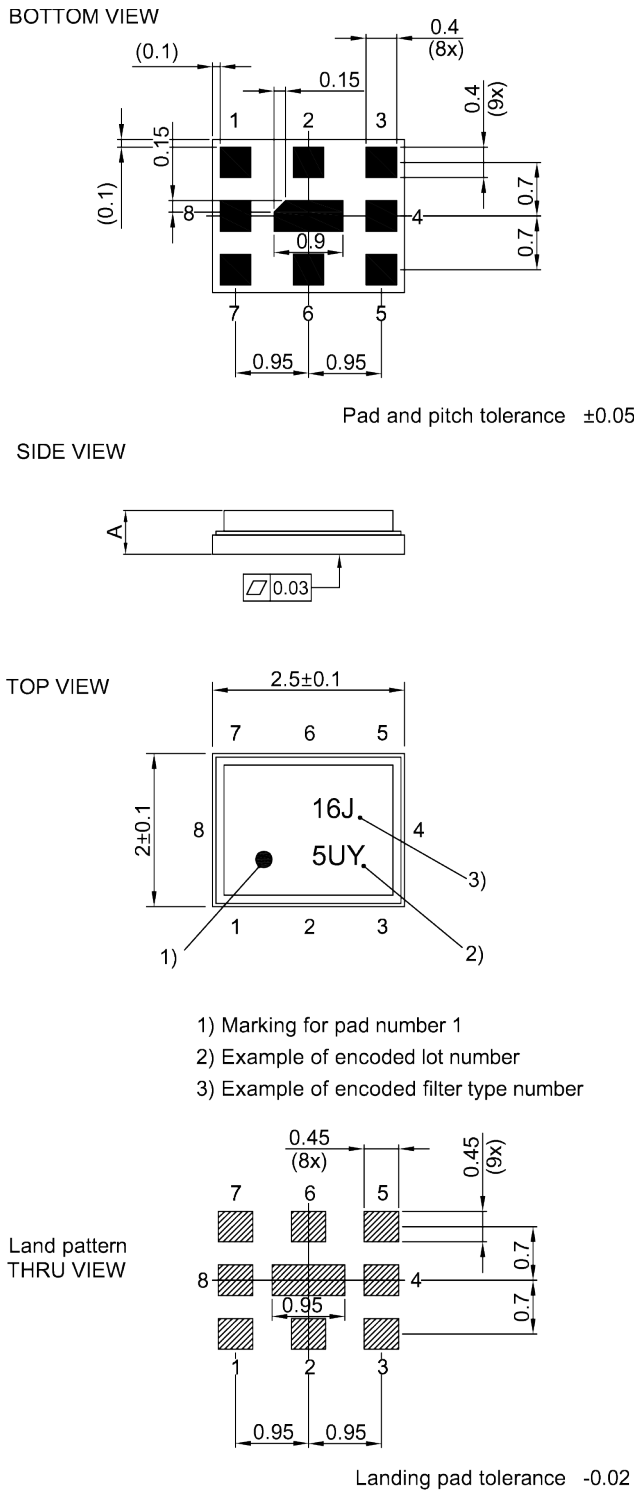

Figure 2: Drawing of package with package height A = 0.5 mm (max.). See Sec. Package information (p. 27).

4 Pin configuration

- 1 TX
- 3 RX
- 6 ANT
- 2, 4, 5, 7, 8, 9 Ground

5 Matching circuit

■ L_{p6} = 2.2 nH

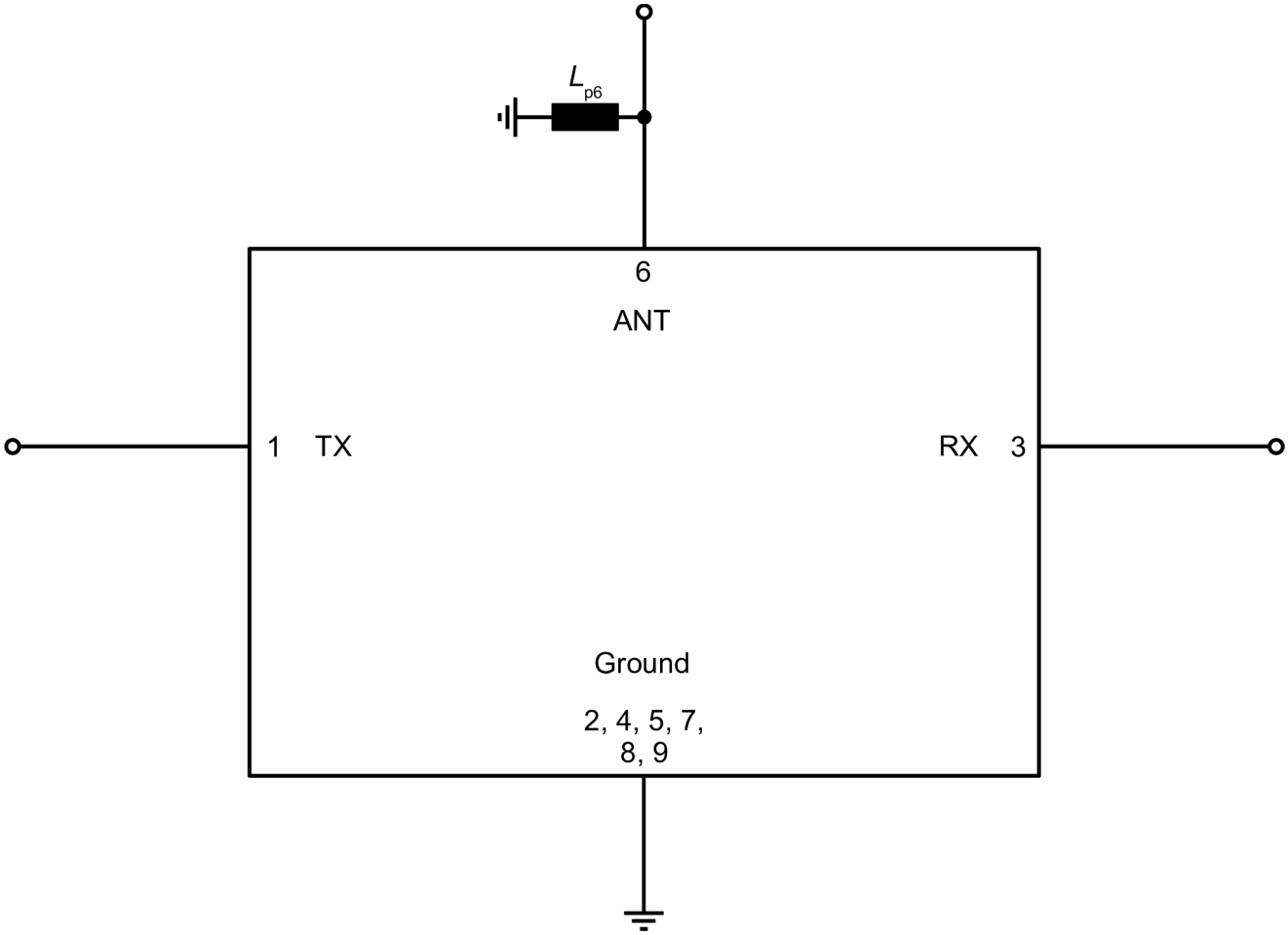

Figure 3: Schematic of matching circuit.

6 Characteristics

6.1 TX – ANT

Temperature range for specification	T_{SPEC}	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.2 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	2140	—	MHz
Maximum insertion attenuation			α_{max}				
	2110... 2170	MHz		—	2.0	2.5	dB
Amplitude ripple (p-p)			Δα				
	2110... 2170	MHz		—	0.8	1.6	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	2110... 2170	MHz		—	1.7	2.0	
@ ANT port	2110... 2170	MHz		—	1.5	2.0	
Maximum error vector magnitude			EVM_{max}[2)]				
	2112.5... 2167.5	MHz		—	0.5	1.5	%
Minimum attenuation			α_{min}				
	10... 1574	MHz		30	34	—	dB
	843... 894	MHz		30	40	—	dB
	1574... 1606	MHz		30	34	—	dB
	1606... 1880	MHz		30	34	—	dB
	1805... 1880	MHz		30	40	—	dB
	1920... 1980	MHz		37	43	—	dB
	2250... 2400	MHz		30	48	—	dB
	2400... 2500	MHz		30	48	—	dB
	2500... 2700	MHz		30	37	—	dB
	2620... 2690	MHz		30	42	—	dB
	2700... 3000	MHz		30	37	—	dB
	3000... 3800	MHz		28	32	—	dB
	3800... 4220	MHz		15	20	—	dB
	4220... 4340	MHz		10	15	—	dB
	4340... 5000	MHz		7	18	—	dB
	5000... 6000	MHz		3	7	—	dB

1) See Sec. Matching circuit (p. 6).
2) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

Temperature range for specification T_{SPEC} = −40 °C ... +95 °C
TX terminating impedance Z_{TX} = 50 Ω
ANT terminating impedance Z_{ANT} = 50 Ω with par. 2.2 nH[1)]
RX terminating impedance Z_{RX} = 50 Ω

Characteristics TX – ANT				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	2140	—	MHz
Maximum insertion attenuation			α_{max}				
	2110... 2170	MHz		—	2.0	3.0	dB
Amplitude ripple (p-p)			Δα				
	2110... 2170	MHz		—	0.8	1.9	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	2110... 2170	MHz		—	1.7	2.2	
@ ANT port	2110... 2170	MHz		—	1.5	2.2	
Minimum attenuation			α_{min}				
	10... 1574	MHz		30	34	—	dB
	843... 894	MHz		30	40	—	dB
	1574... 1606	MHz		30	34	—	dB
	1606... 1880	MHz		30	34	—	dB
	1805... 1880	MHz		30	40	—	dB
	1920... 1980	MHz		37	43	—	dB
	2250... 2400	MHz		30	48	—	dB
	2400... 2500	MHz		30	48	—	dB
	2500... 2700	MHz		30	37	—	dB
	2620... 2690	MHz		30	42	—	dB
	2700... 3000	MHz		30	37	—	dB
	3000... 3800	MHz		28	32	—	dB
	3800... 4220	MHz		15	20	—	dB
	4220... 4340	MHz		10	15	—	dB
	4340... 5000	MHz		7	18	—	dB
	5000... 6000	MHz		3	7	—	dB

1) See Sec. Matching circuit (p. 6).

6.2 ANT – RX

Temperature range for specification	T_{SPEC}	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.2 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics ANT – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	1950	—	MHz
Maximum insertion attenuation			α_{max}				
	1920... 1980	MHz		—	2.3	3.7	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	1920... 1980	MHz		—	0.9	2.2	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	1920... 1980	MHz		—	1.9	2.2	
@ RX port	1920... 1980	MHz		—	2.0	2.3	
Maximum error vector magnitude			EVM_{max} [2)]				
	1922.5... 1977.5	MHz		—	1.5	3.0	%
Minimum attenuation			α_{min}				
	10... 1785	MHz		30	36	—	dB
	1785... 1880	MHz		20	31	—	dB
	1880... 1900	MHz		5	15	—	dB
	2000... 2110	MHz		2.5	12	—	dB
	2110... 2170	MHz		43	48	—	dB
	2255... 2400	MHz		30	33	—	dB
	2400... 2500	MHz		25	30	—	dB
	2500... 3840	MHz		15	20	—	dB
	3840... 3960	MHz		20	24	—	dB
	3960... 5000	MHz		20	25	—	dB
	5000... 5760	MHz		15	30	—	dB
	5760... 5940	MHz		15	30	—	dB

1) See Sec. Matching circuit (p. 6).
2) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

Data sheet

Temperature range for specification	T_{SPEC}	= −40 °C ... +95 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.2 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics ANT – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Maximum insertion attenuation			α_{max}				
	1920... 1980	MHz		—	2.3	5.2	dB
Amplitude ripple (p-p)			Δα				
	1920... 1980	MHz		—	0.9	3.7	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	1920... 1980	MHz		—	1.9	2.3	
@ RX port	1920... 1980	MHz		—	2.0	2.3	
Maximum error vector magnitude			EVM_{max} [2)]				
	1922.5... 1977.5	MHz		—	1.5	6.0	%
Minimum attenuation			α_{min}				
	10... 1785	MHz		30	36	—	dB
	1785... 1880	MHz		20	31	—	dB
	1880... 1900	MHz		3	15	—	dB
	2000... 2110	MHz		2	12	—	dB
	2110... 2170	MHz		43	48	—	dB
	2255... 2400	MHz		30	33	—	dB
	2400... 2500	MHz		25	30	—	dB
	2500... 3840	MHz		15	20	—	dB
	3840... 3960	MHz		20	24	—	dB
	3960... 5000	MHz		20	25	—	dB
	5000... 5760	MHz		15	30	—	dB
	5760... 5940	MHz		15	30	—	dB

1) See Sec. Matching circuit (p. 6).
2) Error Vector Magnitude (EVM) based on definition in 3GPP TS 25.141.

6.3 TX – RX

Temperature range for specification	T_{SPEC}	= −10 °C ... +85 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.2 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Average isolation			$\alpha_{INT,avg}$ [2)]				
	1920... 1960	MHz		45	48	—	dB
	1960... 1980	MHz		42	48	—	dB
	2110... 2155	MHz		50	52	—	dB
	2155... 2170	MHz		48	52	—	dB
Minimum isolation			α_{min}				
	1920... 1980	MHz		42	48	—	dB
	2110... 2170	MHz		47	52	—	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.

Temperature range for specification	T_{SPEC}	= −40 °C ... +95 °C
TX terminating impedance	Z_{TX}	= 50 Ω
ANT terminating impedance	Z_{ANT}	= 50 Ω with par. 2.2 nH[1)]
RX terminating impedance	Z_{RX}	= 50 Ω

Characteristics TX – RX				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Average isolation			$\alpha_{INT,avg}$ [2)]				
	1920... 1960	MHz		45	48	—	dB
	1960... 1980	MHz		42	48	—	dB
	2110... 2155	MHz		50	52	—	dB
	2155... 2170	MHz		48	52	—	dB
Minimum isolation			α_{min}				
	1920... 1980	MHz		42	48	—	dB
	2110... 2170	MHz		47	52	—	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.

7 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +95 °C	
Storage temperature	T_{STG} [1)] = −40 °C ... +95 °C	
DC voltage	$\|V_{DC}\|$ [2)] = 0 V	
ESD voltage		
	V_{ESD} [3)] = 50 V	Machine model.
	V_{ESD} [4)] = 100 V	Human body model.
Input power	P_{IN}	
@ TX port: 2110 ... 2170 MHz	28 dBm [5), 6)]	5 MHz LTE downlink signal (25 RB) for 100000 h @ 55 °C. P_{IN} average – 39 dBm peak. Source and load impedance 50Ω.
@ TX port: other frequency ranges	10 dBm	Source and load impedance 50Ω.
Operating lifetime with output power at antenna 2110 ... 2170 MHz	P_{OUT} [7)] = 24 dBm	Continuous wave for 100000 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 28dBm are valid for temperature up to 57°C.
7) According to accelerated high temperature operating life (HTOL) test.

8 Transmission coefficients

8.1 TX – ANT

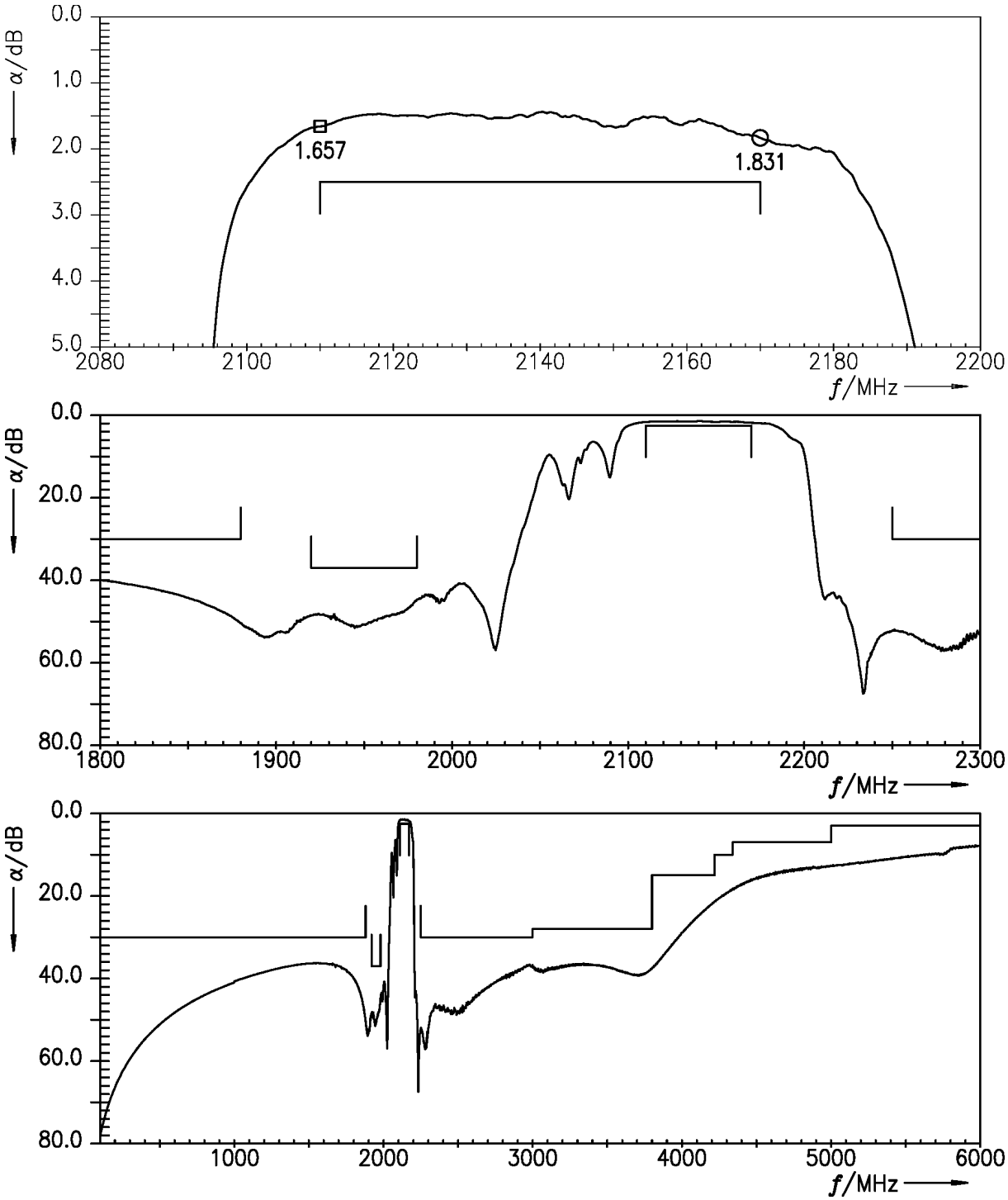

Figure 4: Attenuation TX – ANT.

8.2 ANT – RX

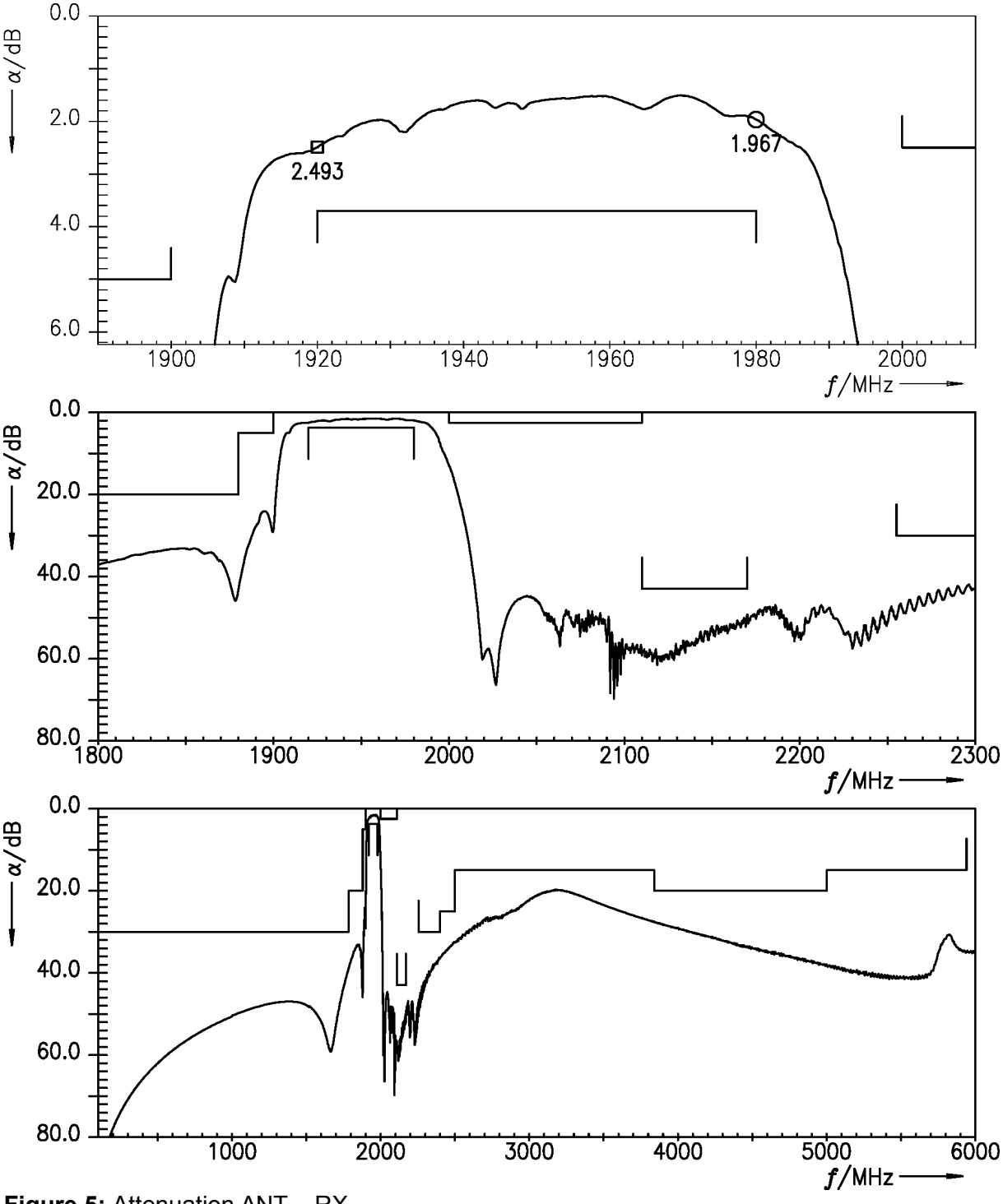

Figure 5: Attenuation ANT – RX.

8.3 TX – RX

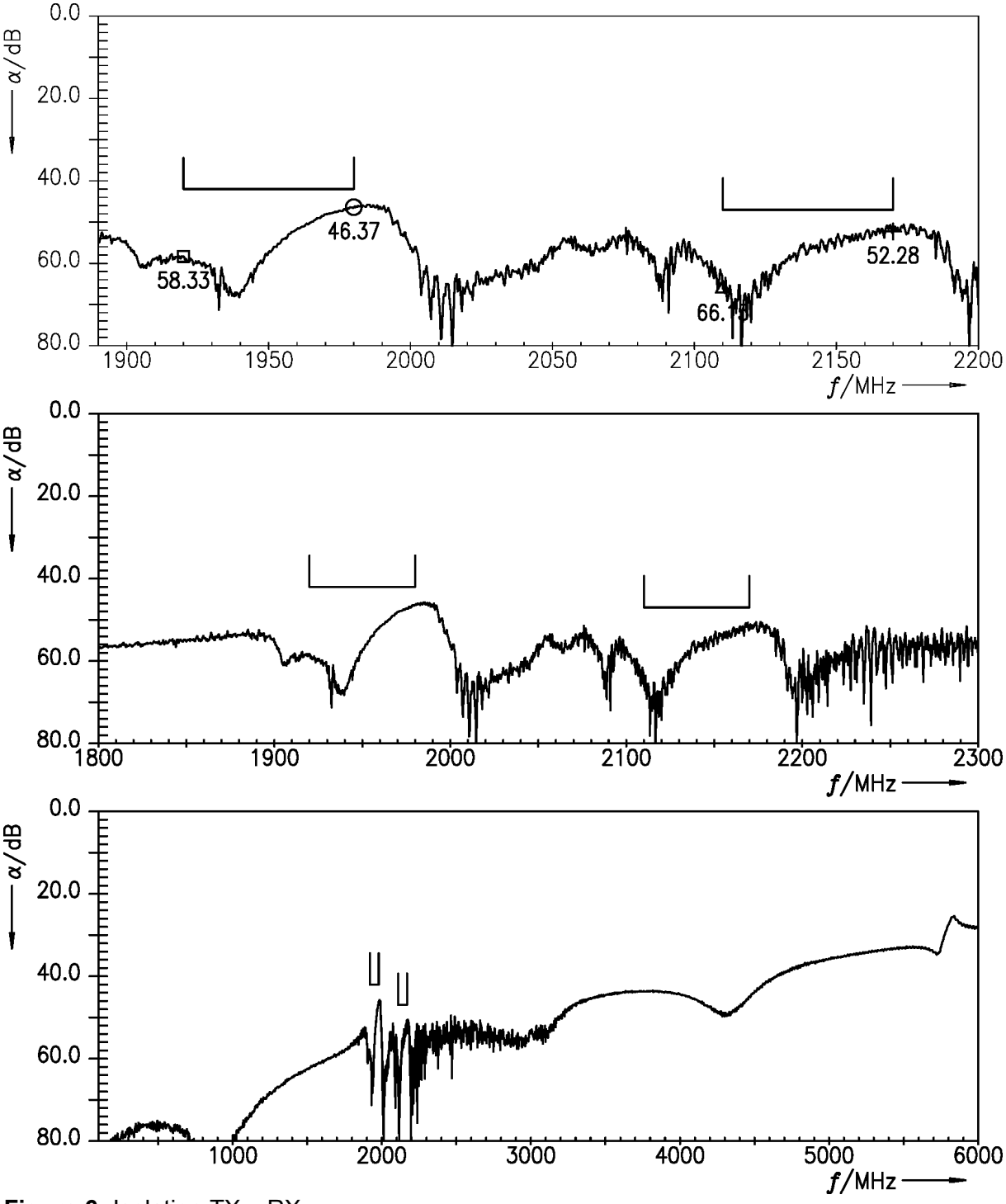

Figure 6: Isolation TX – RX.

9 Reflection coefficients

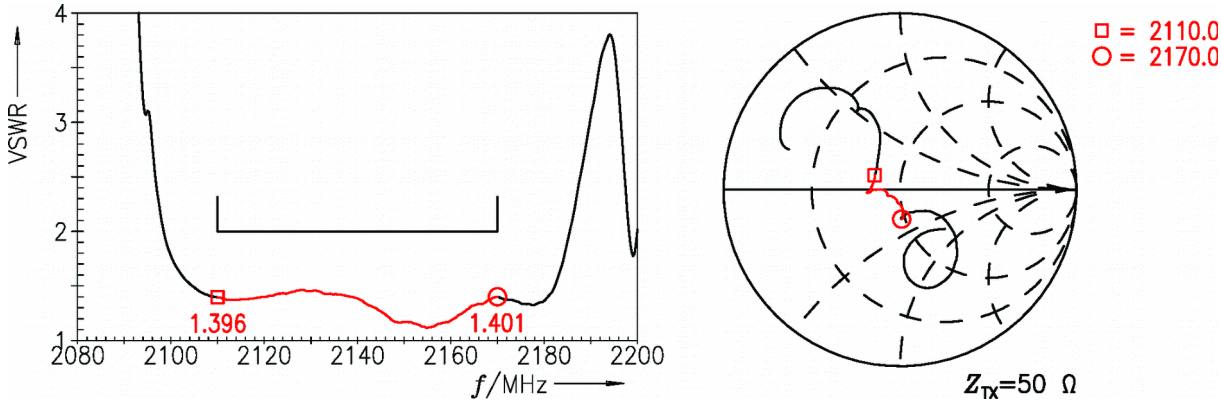

Figure 7: Reflection coefficient at TX port.

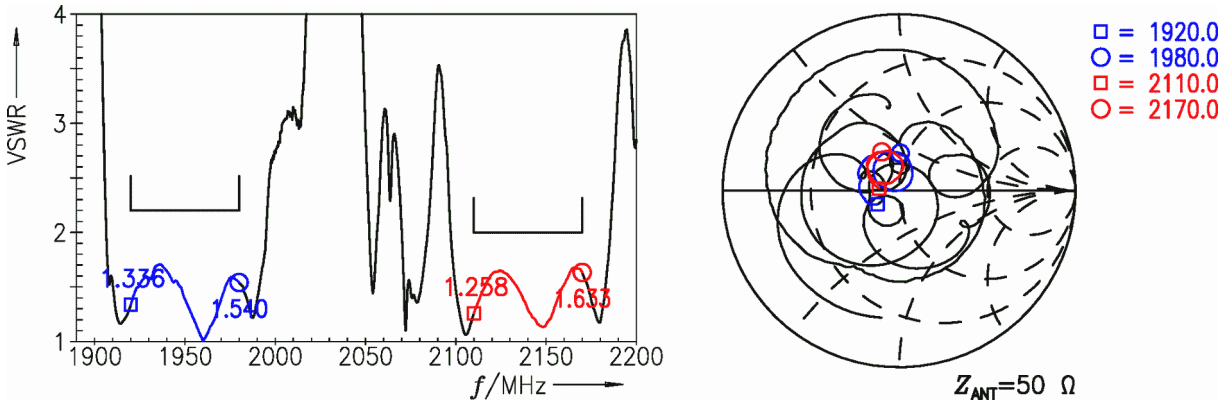

Figure 8: Reflection coefficient at ANT port.

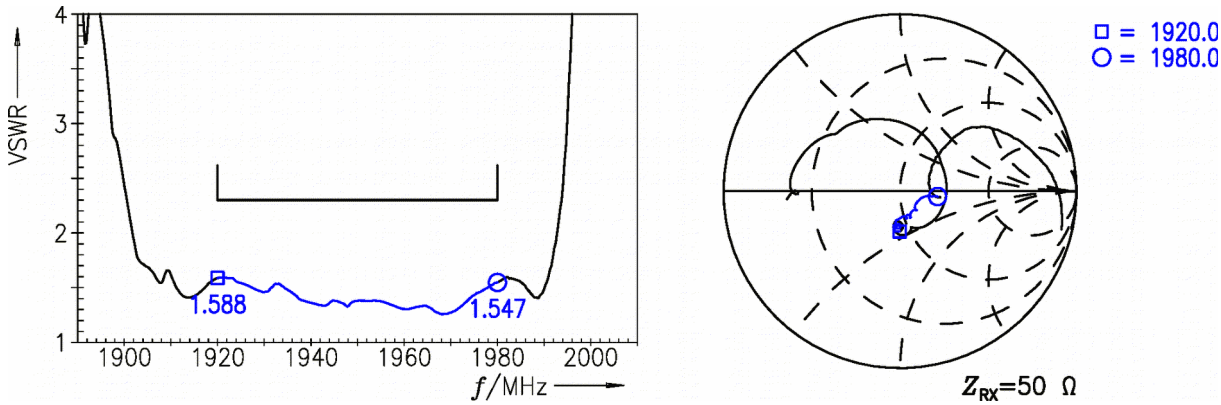

Figure 9: Reflection coefficient at RX port.

10 EVMs

10.1 TX – ANT

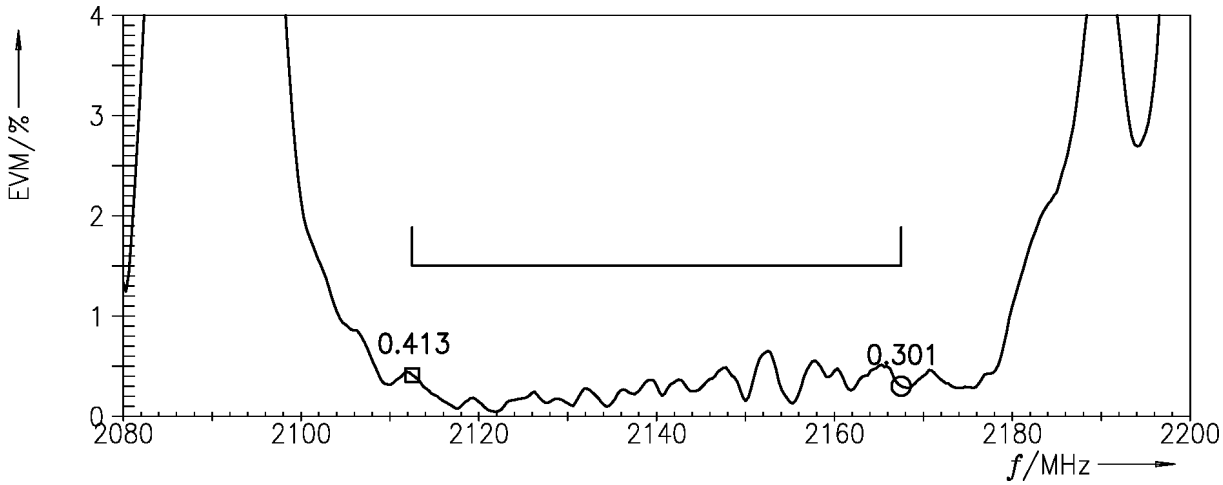

Figure 10: Error vector magnitude TX – ANT.

10.2 ANT – RX

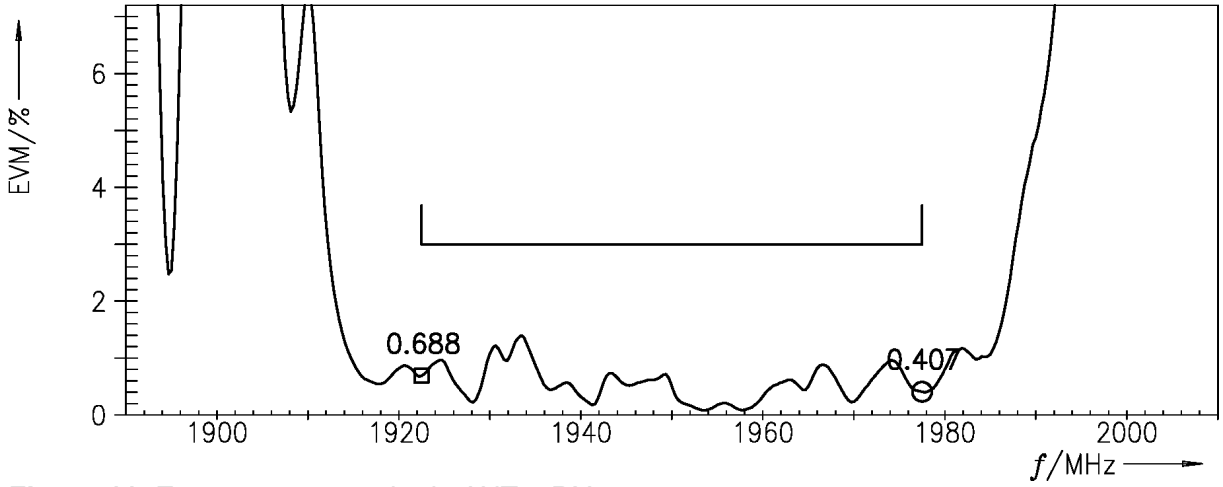

Figure 11: Error vector magnitude ANT – RX.

11 Packing material

11.1 Tape

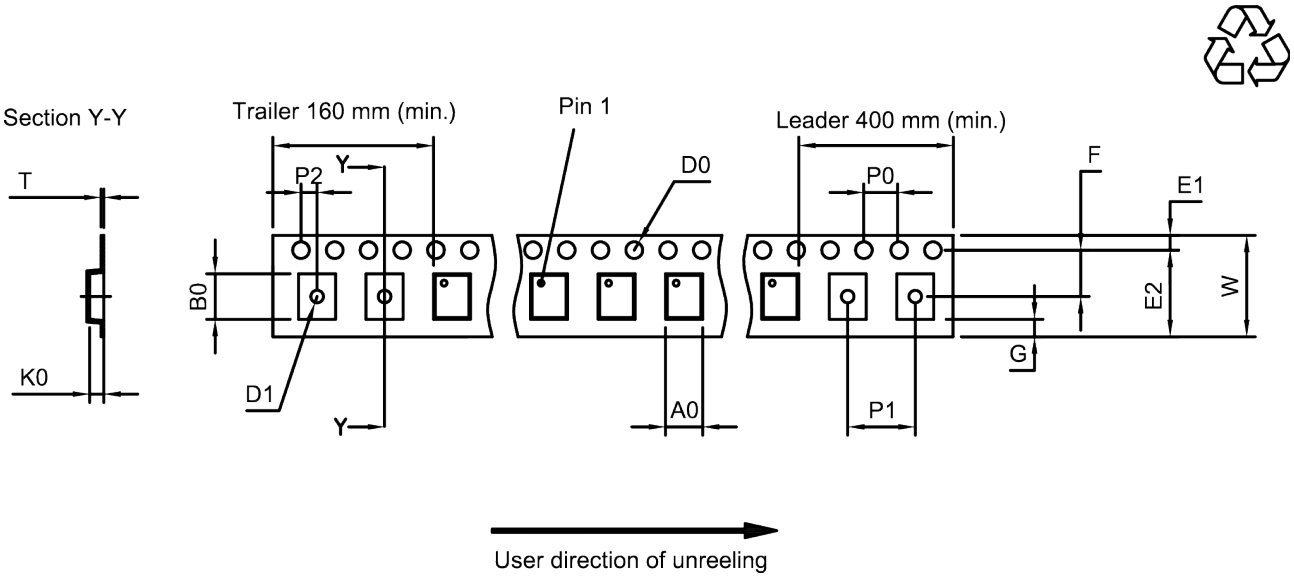

Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0	2.25±0.05 mm
B_0	2.75±0.05 mm
D_0	1.5+0.1/−0 mm
D_1	1.0 mm (min.)
E_1	1.75±0.1 mm

E_2	6.25 mm (min.)
F	3.5±0.05 mm
G	0.75 mm (min.)
K_0	0.6±0.05 mm
P_0	4.0±0.1 mm

P_1	4.0±0.1 mm
P_2	2.0±0.05 mm
T	0.25±0.03 mm
W	8.0+0.3/−0.1 mm

Table 1: Tape dimensions.

11.2 Reel with diameter of 180 mm

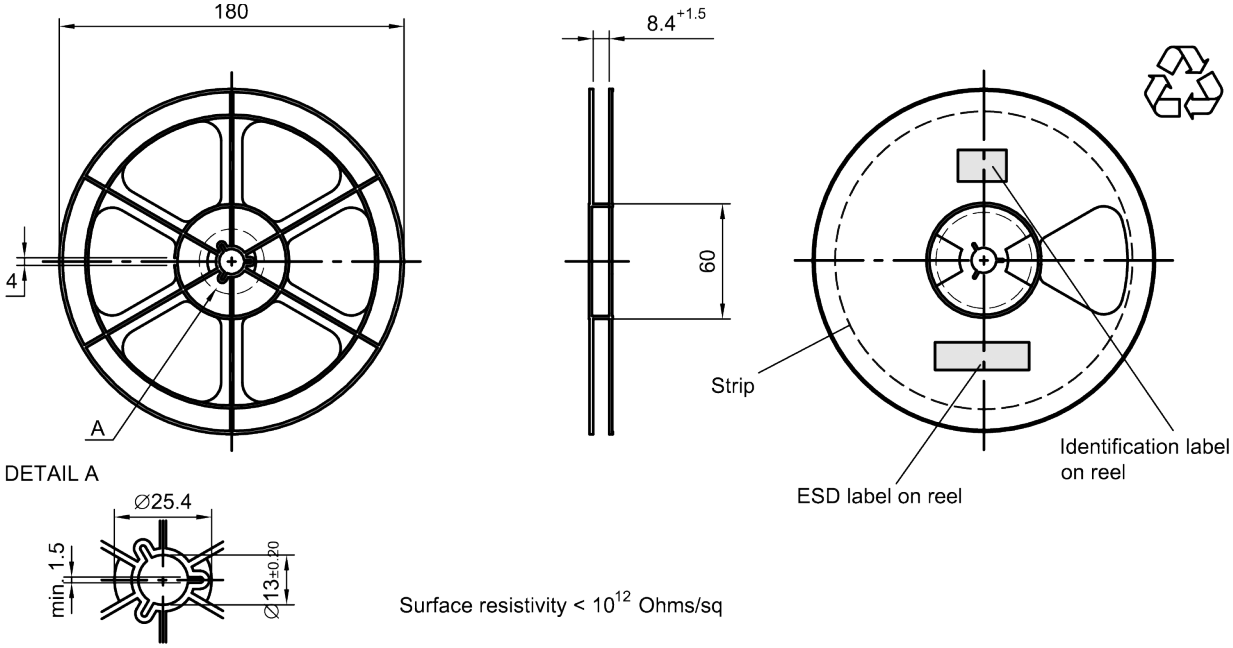

Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

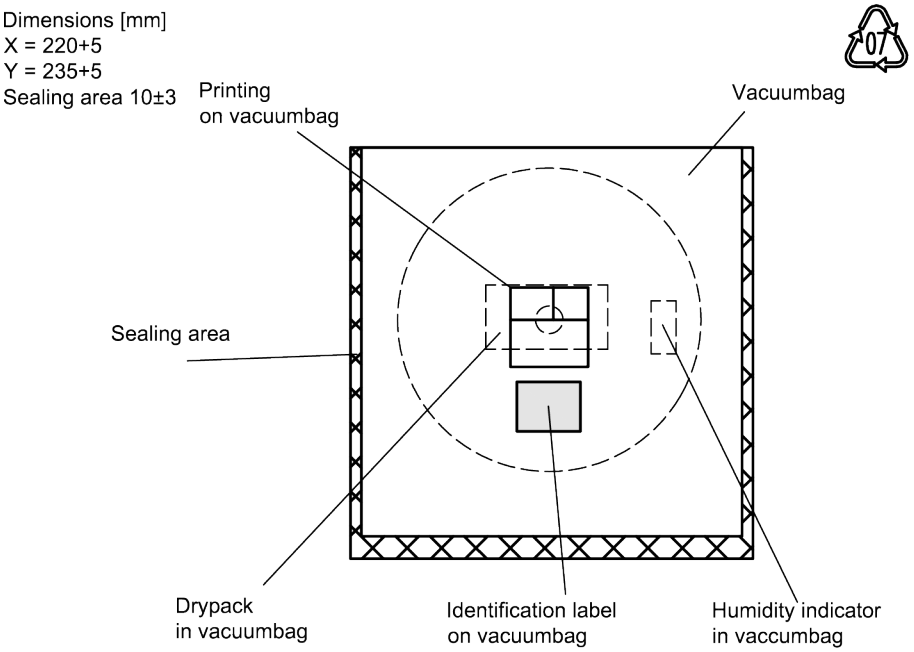

Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

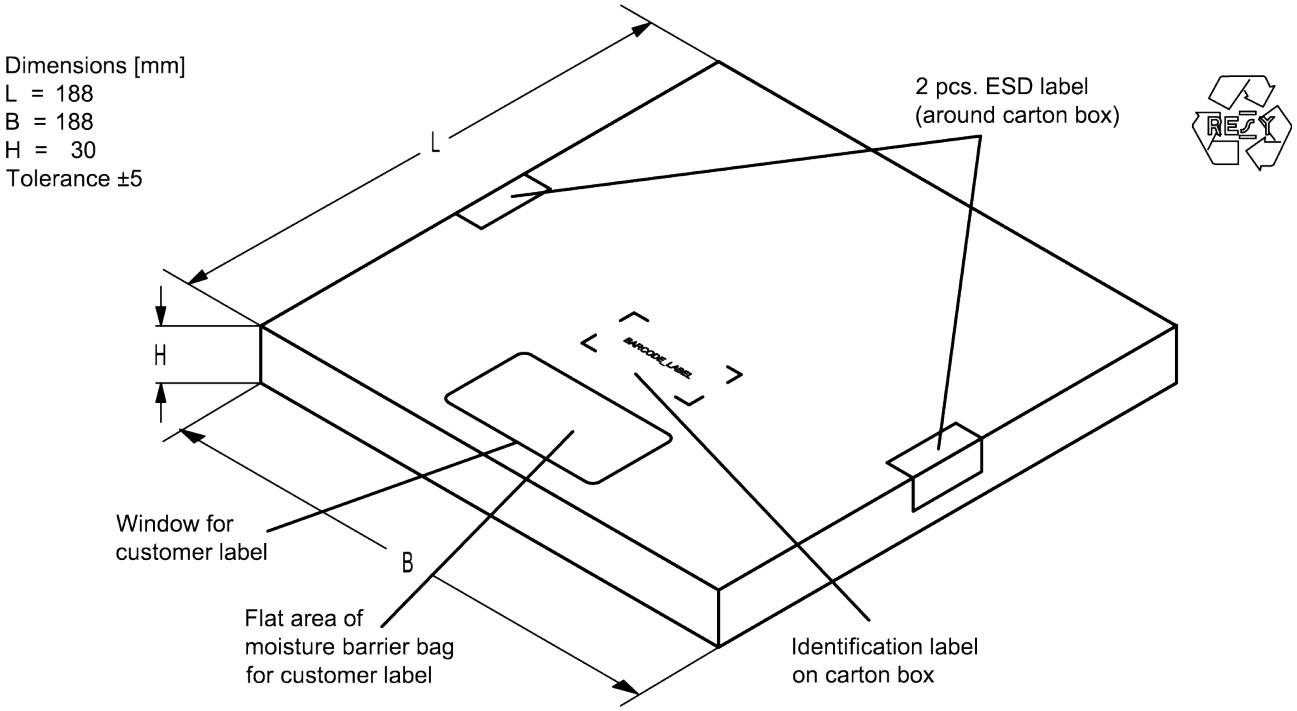

Figure 15: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

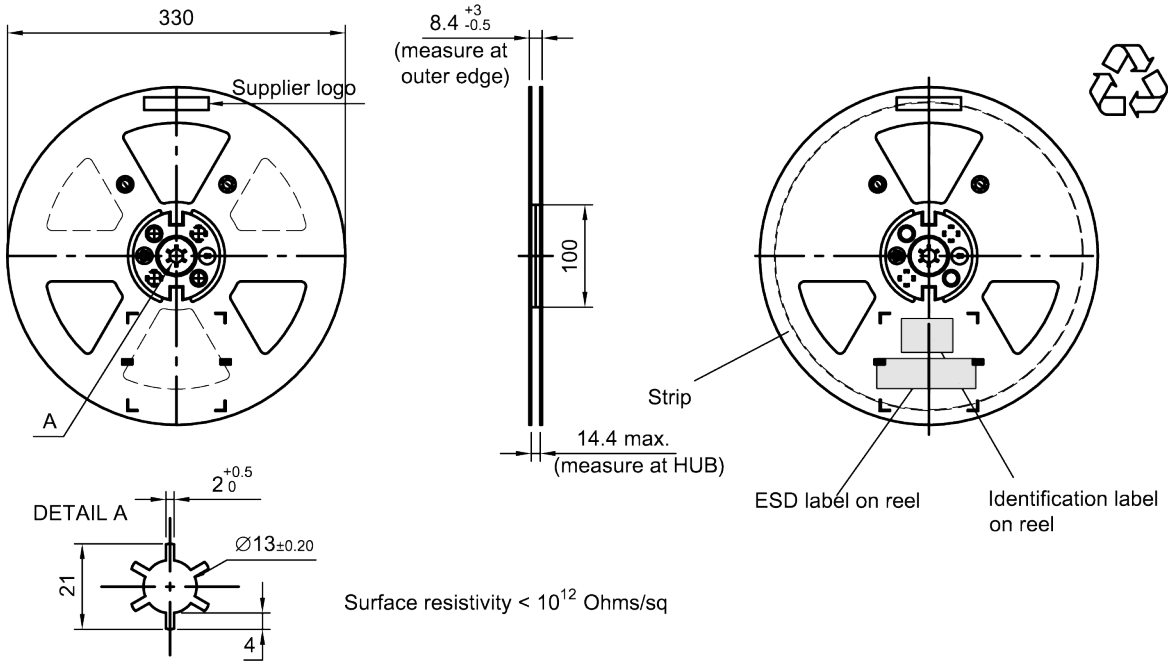

Figure 16: Drawing of reel (first-angle projection) with diameter of 330 mm.

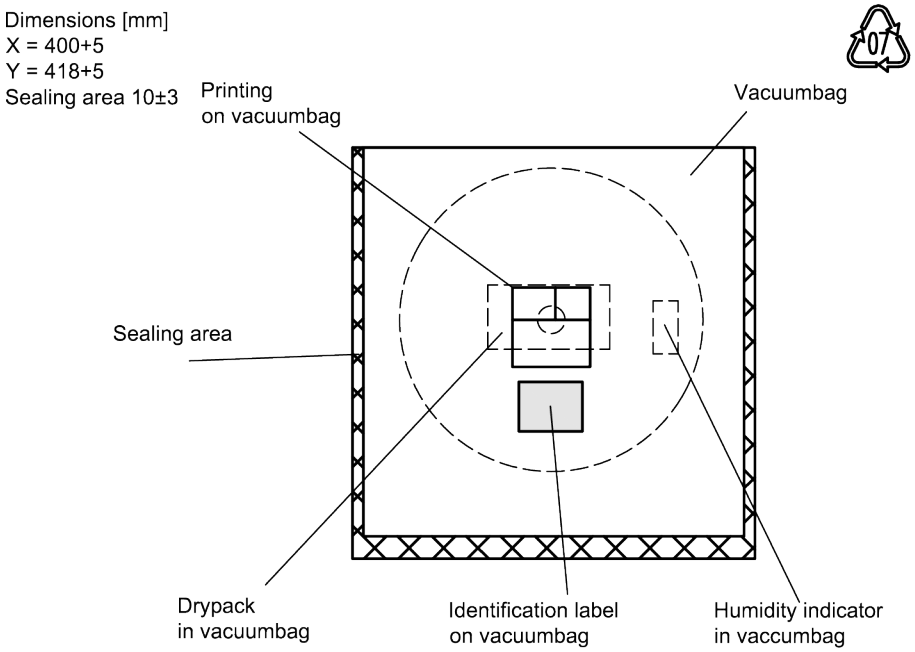

Figure 17: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

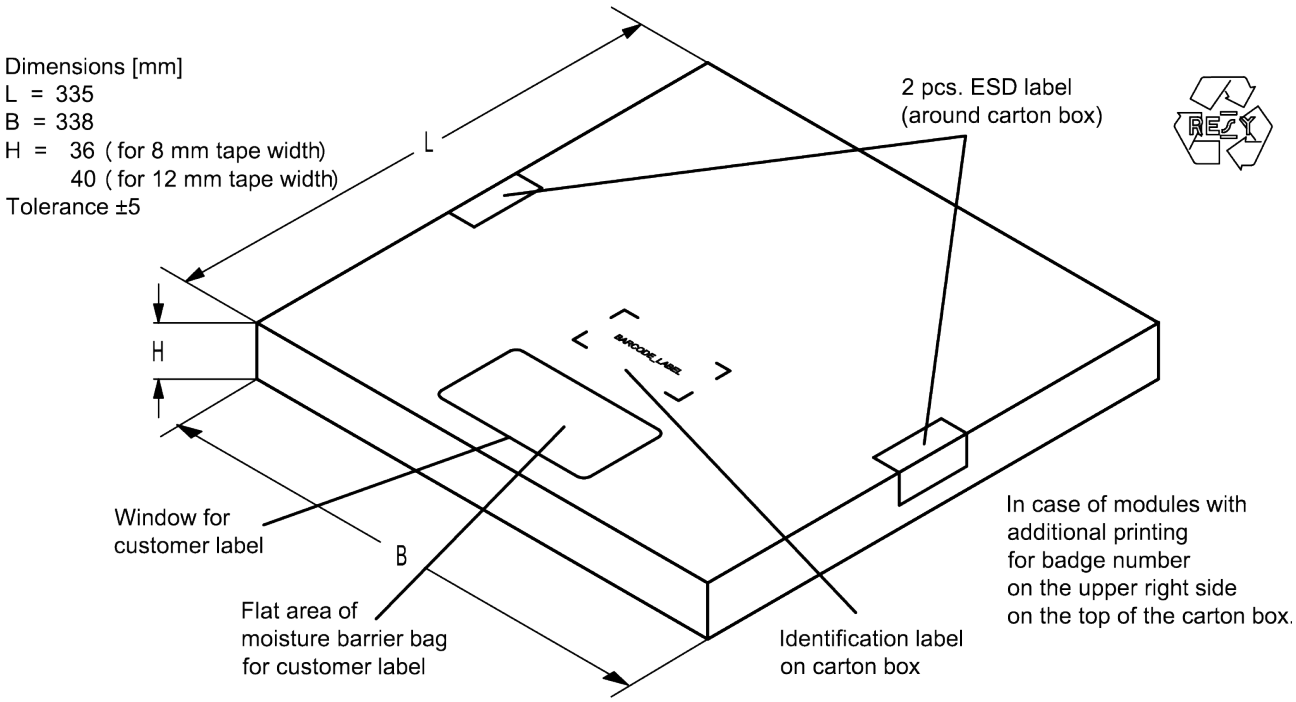

Figure 18: Drawing of folding box for reel with diameter of 330 mm.

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 x 32^2 + **6** x 32^1 + **18 (=J)** x 32^0 **=** **1234**
  The BASE32 code for product type B8092 is 7WW.

- 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 x 47^2 + **27 (=U)** x 47^1 + **31 (=Y)** x 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).

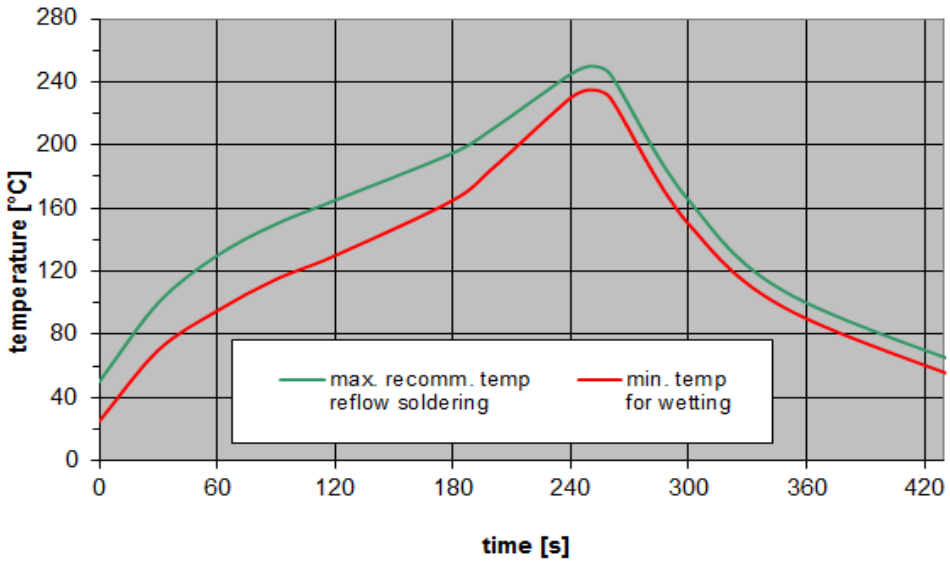

Figure 19: Recommended reflow profile for convection and infrared soldering – lead-free solder.