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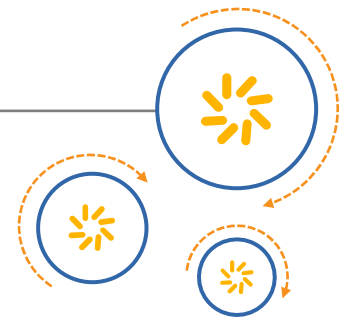
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RF360 Europe GmbH
A Qualcomm – TDK Joint Venture

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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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 \times 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)

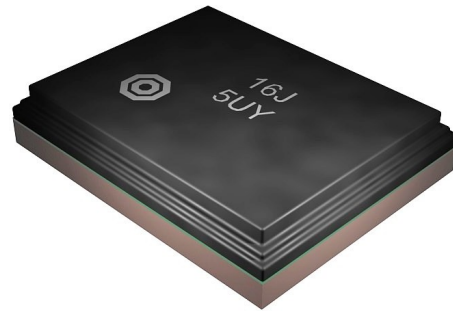


Figure 1: Picture of component with example of product marking.

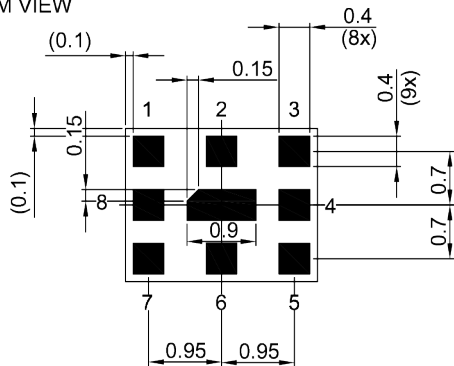
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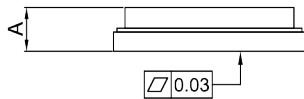
3 Package

BOTTOM VIEW

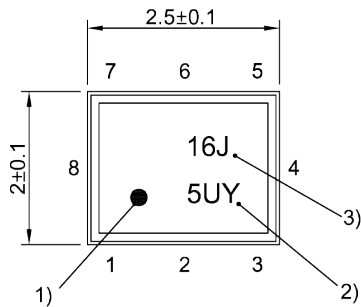


Pad and pitch tolerance ±0.05

SIDE VIEW

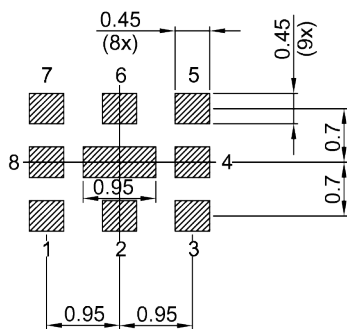


TOP VIEW



- 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 = 0.5 mm (max.). See Sec. Package information (p. 27).

4 Pin configuration

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

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5 Matching circuit

- $L_{p6} = 2.2 \text{ nH}$

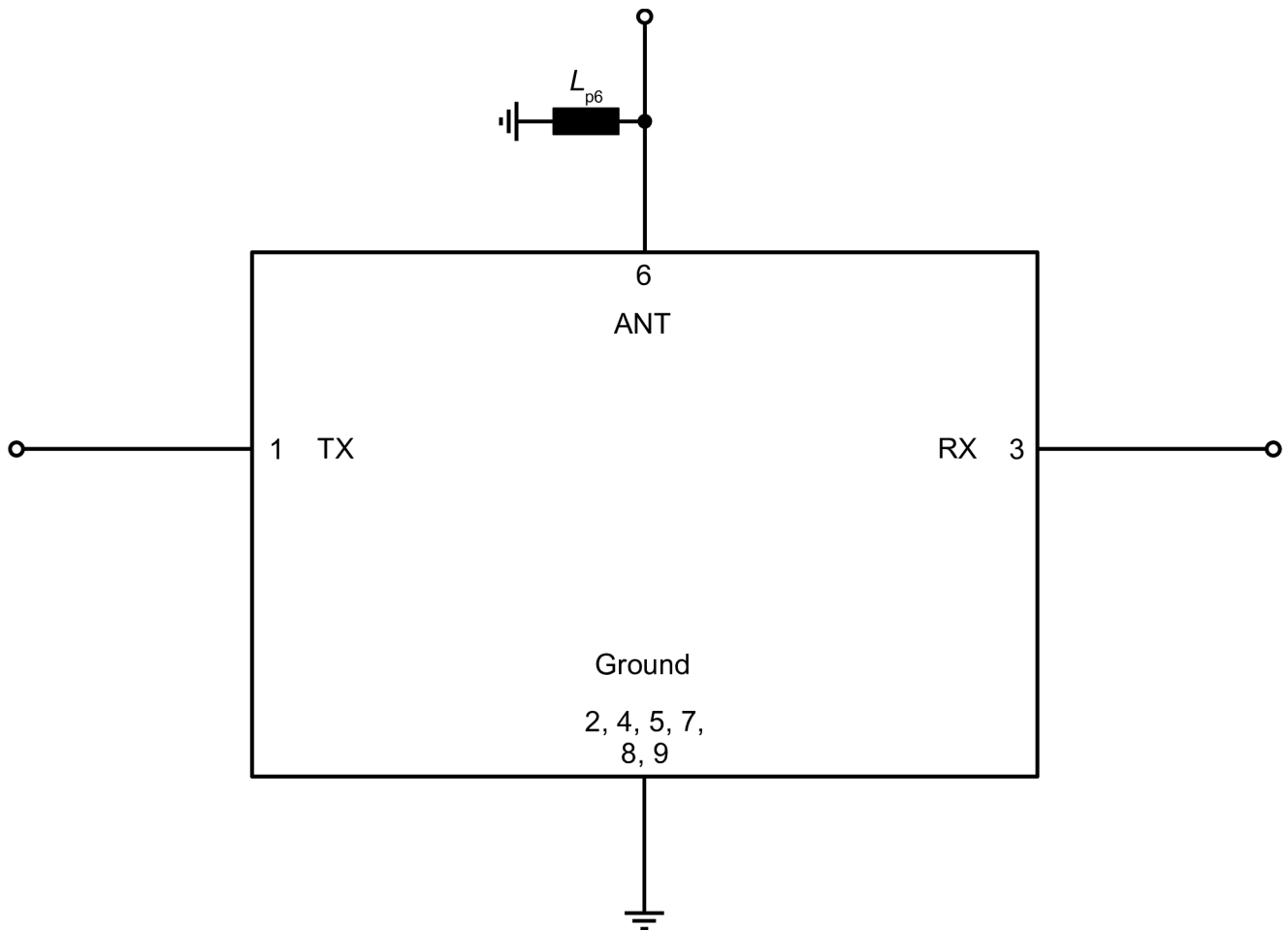


Figure 3: Schematic of matching circuit.

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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	2110... 2170	MHz	α_{max}	—	2.0	2.5	dB
Amplitude ripple (p-p)	2110... 2170	MHz	$\Delta\alpha$	—	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	2112.5... 2167.5	MHz	EVM _{max} ²⁾	—	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.

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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	2110... 2170	MHz	α_{max}	—	2.0	3.0	dB
Amplitude ripple (p-p)	2110... 2170	MHz	$\Delta\alpha$	—	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).

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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	1920... 1980	MHz	α_{max}	—	2.3	3.7	dB
Amplitude ripple (p-p)	1920... 1980	MHz	$\Delta\alpha$	—	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	1922.5... 1977.5	MHz	$EVM_{max}^{2)}$	—	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.

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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}	—	2.3	5.2	dB
	1920... 1980	MHz					
Amplitude ripple (p-p)			$\Delta\alpha$	—	0.9	3.7	dB
	1920... 1980	MHz					
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			$EVM_{max}^{2)}$	—	1.5	6.0	%
	1922.5... 1977.5	MHz					
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.

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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.

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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.

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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	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	$P_{OUT}^{7)} = 24\text{ dBm}$	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.

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8 Transmission coefficients

8.1 TX – ANT

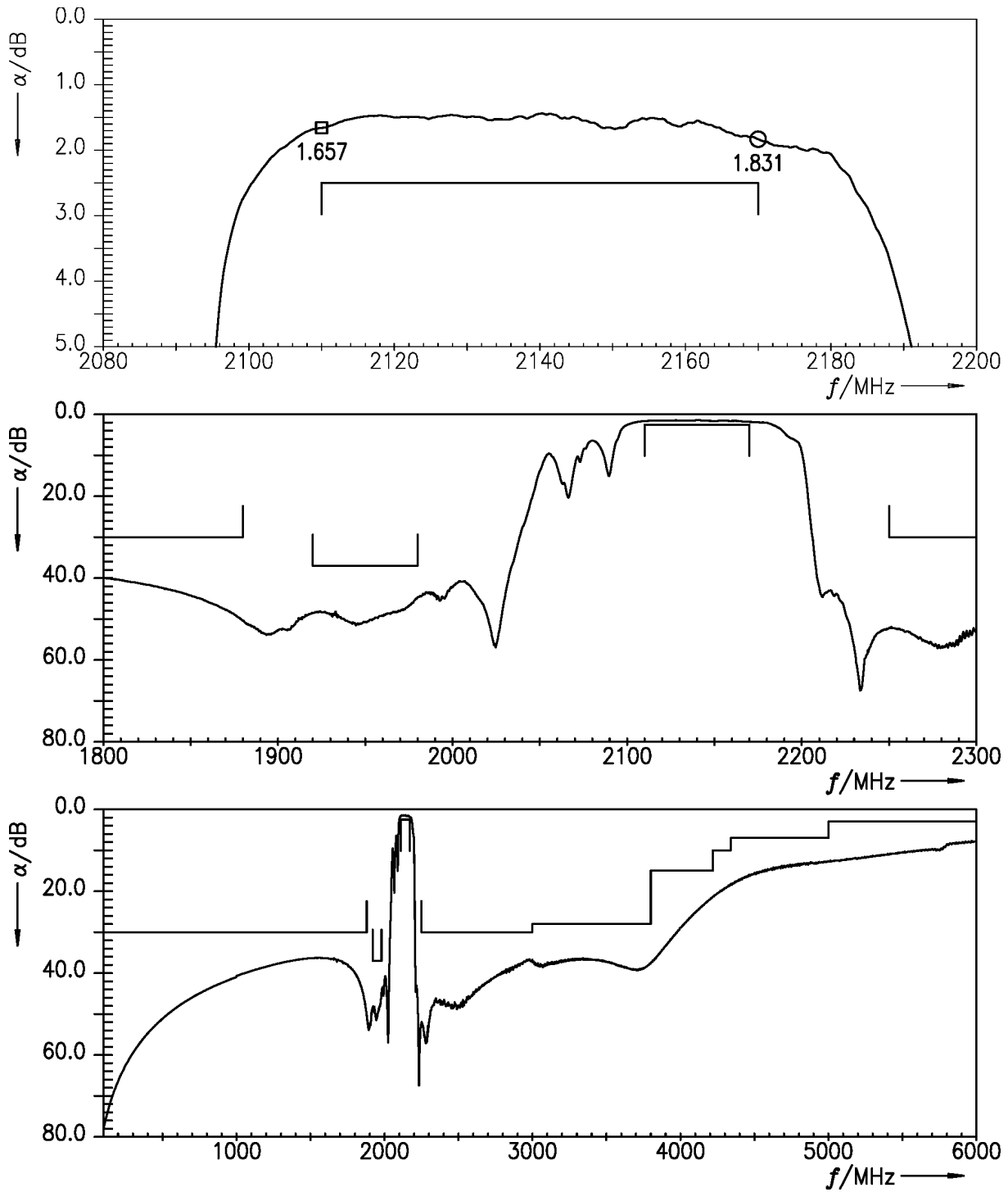


Figure 4: Attenuation TX – ANT.

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8.2 ANT – RX

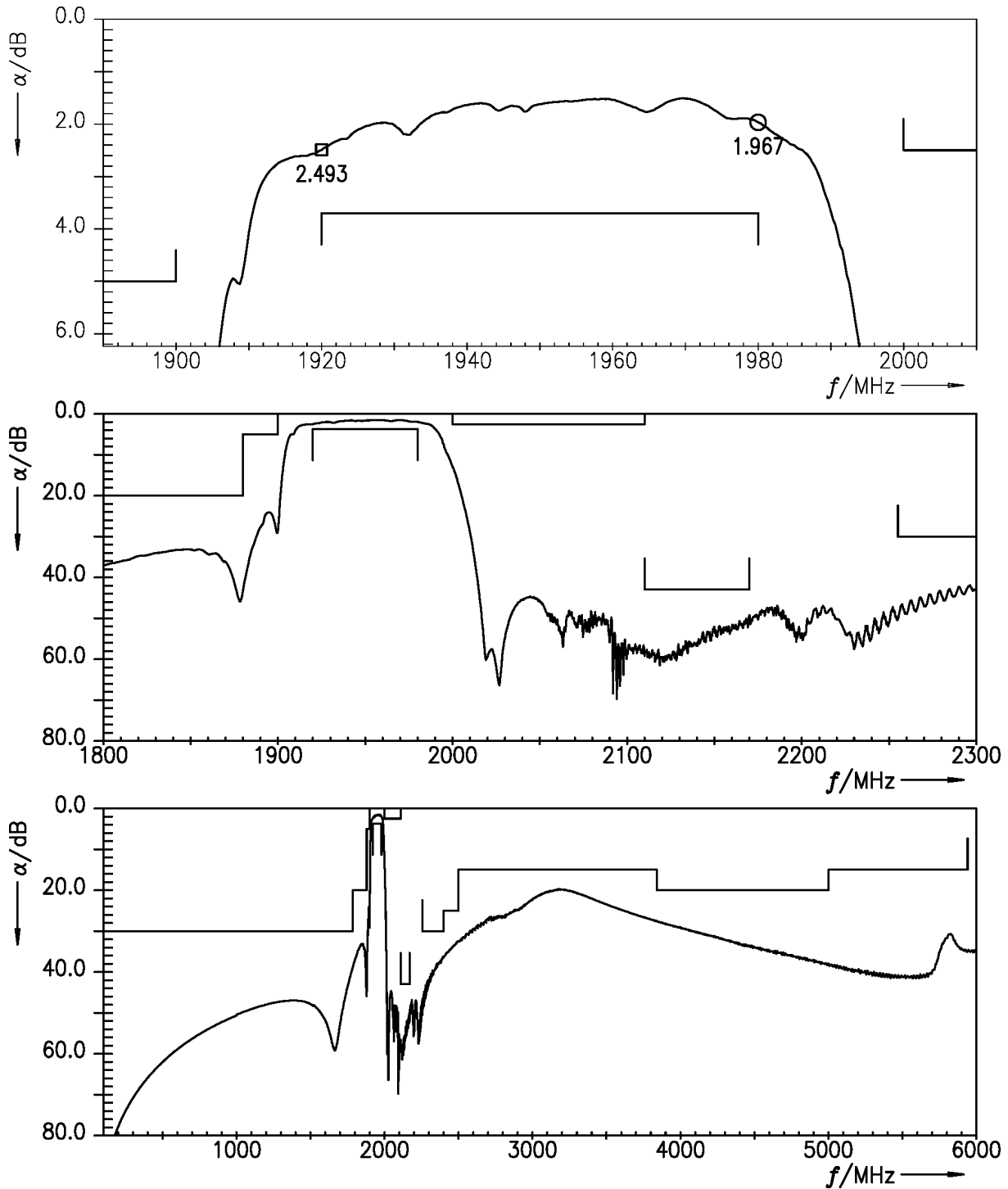


Figure 5: Attenuation ANT – RX.

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8.3 TX – RX

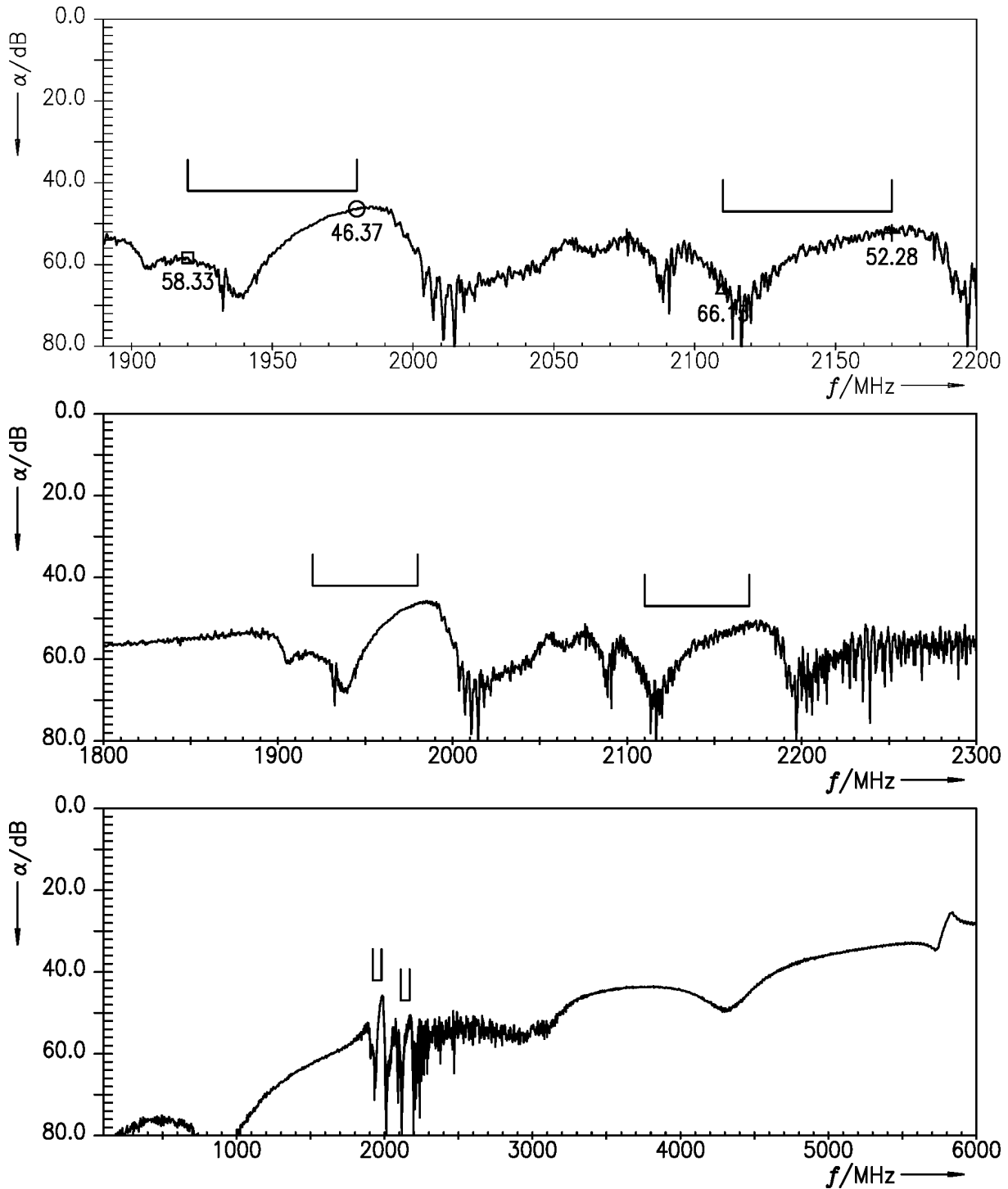


Figure 6: Isolation TX – RX.

Data sheet

9 Reflection coefficients

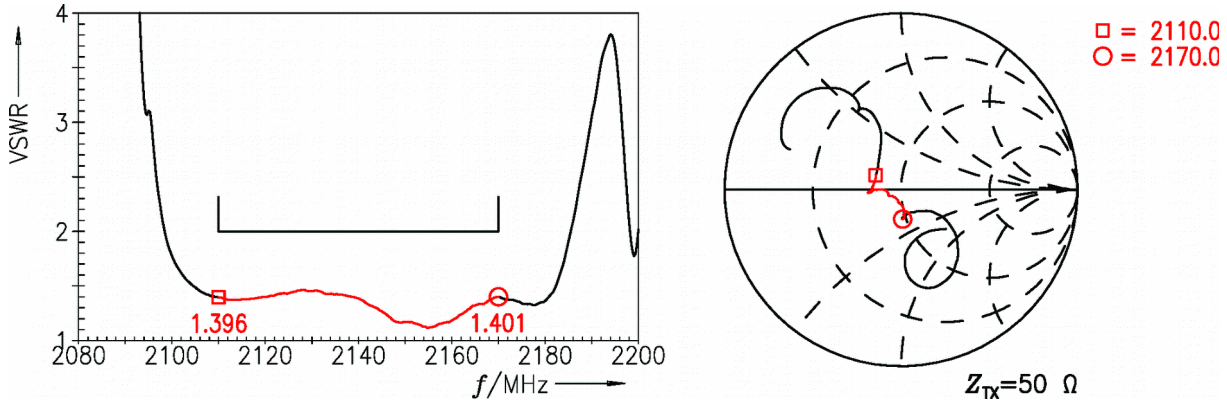


Figure 7: Reflection coefficient at TX port.

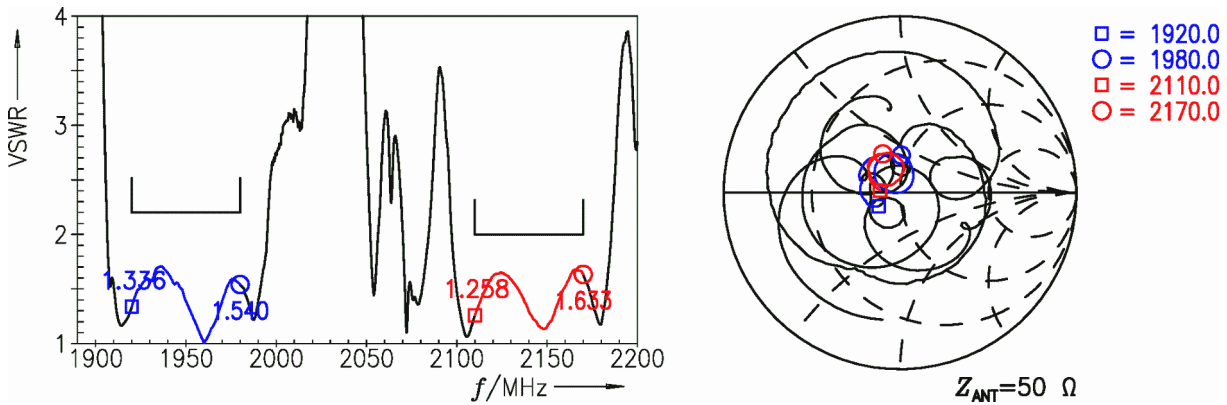


Figure 8: Reflection coefficient at ANT port.

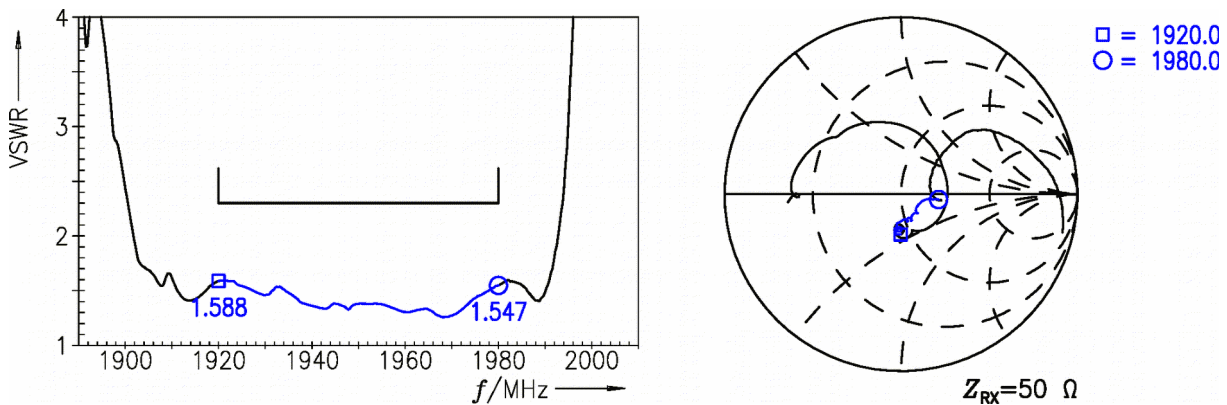


Figure 9: Reflection coefficient at RX port.

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10 EVMs

10.1 TX – ANT

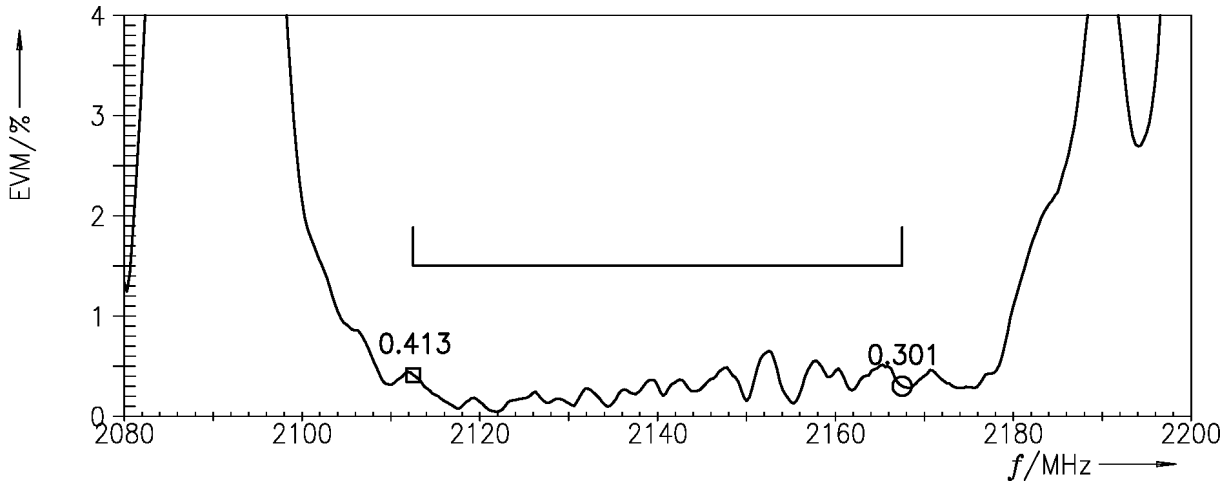


Figure 10: Error vector magnitude TX – ANT.

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10.2 ANT – RX

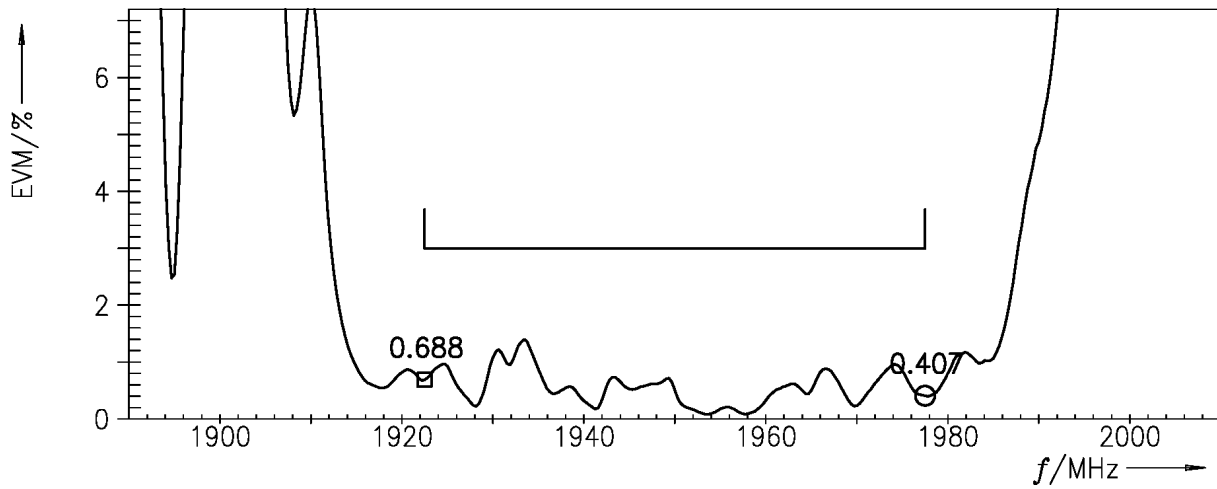


Figure 11: Error vector magnitude ANT – RX.

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11 Packing material

11.1 Tape

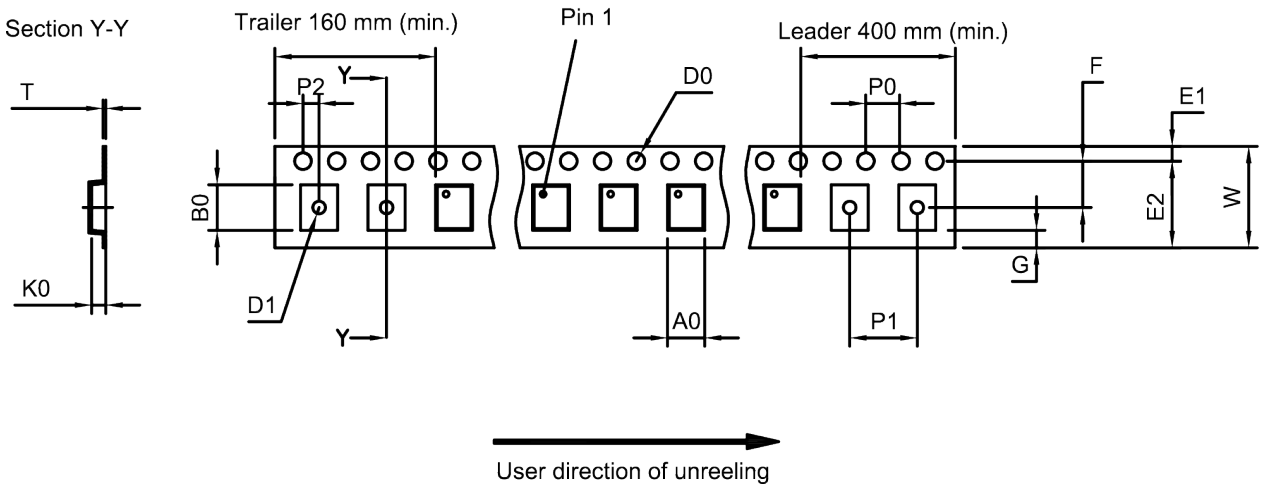


Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

A_0 2.25±0.05 mm	E_2 6.25 mm (min.)	P_1 4.0±0.1 mm
B_0 2.75±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 1.0 mm (min.)	K_0 0.6±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

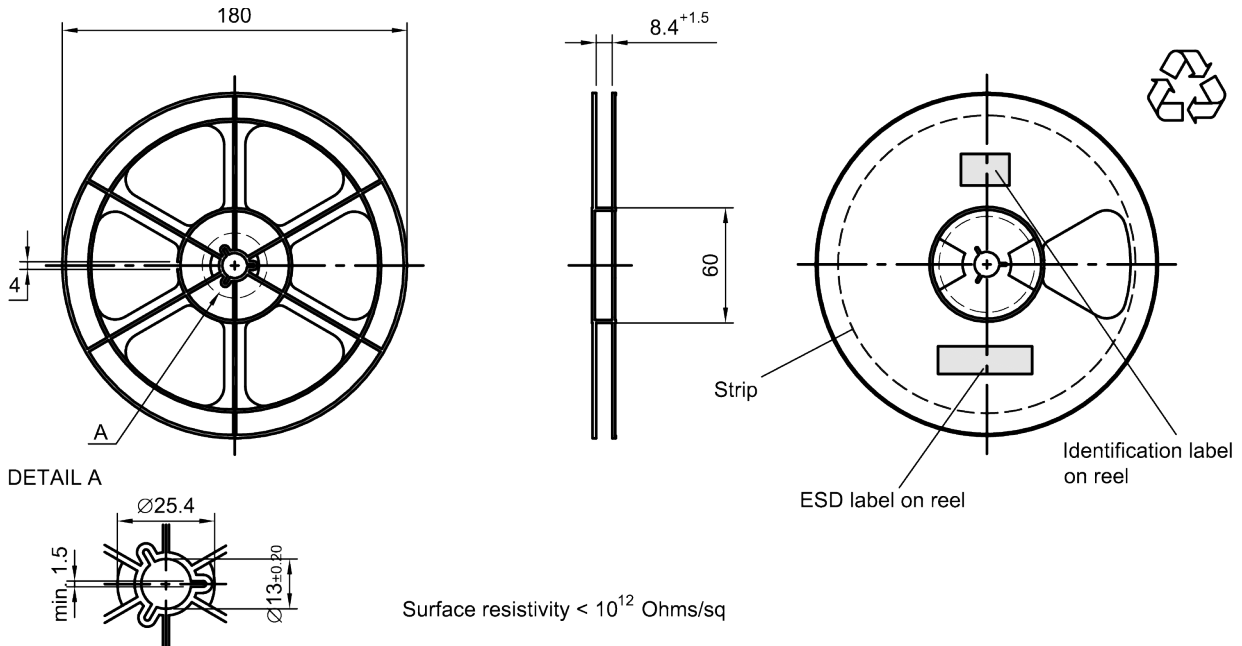


Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

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

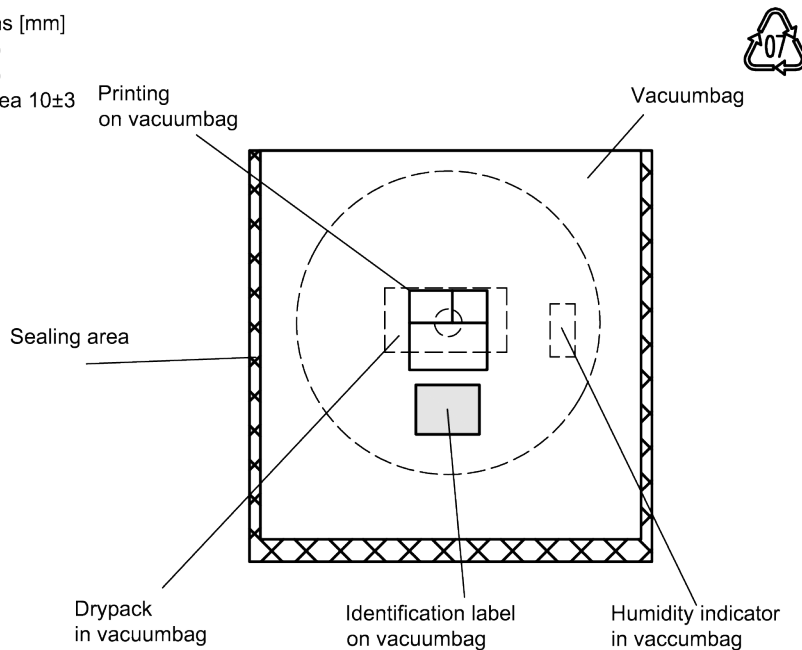


Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

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

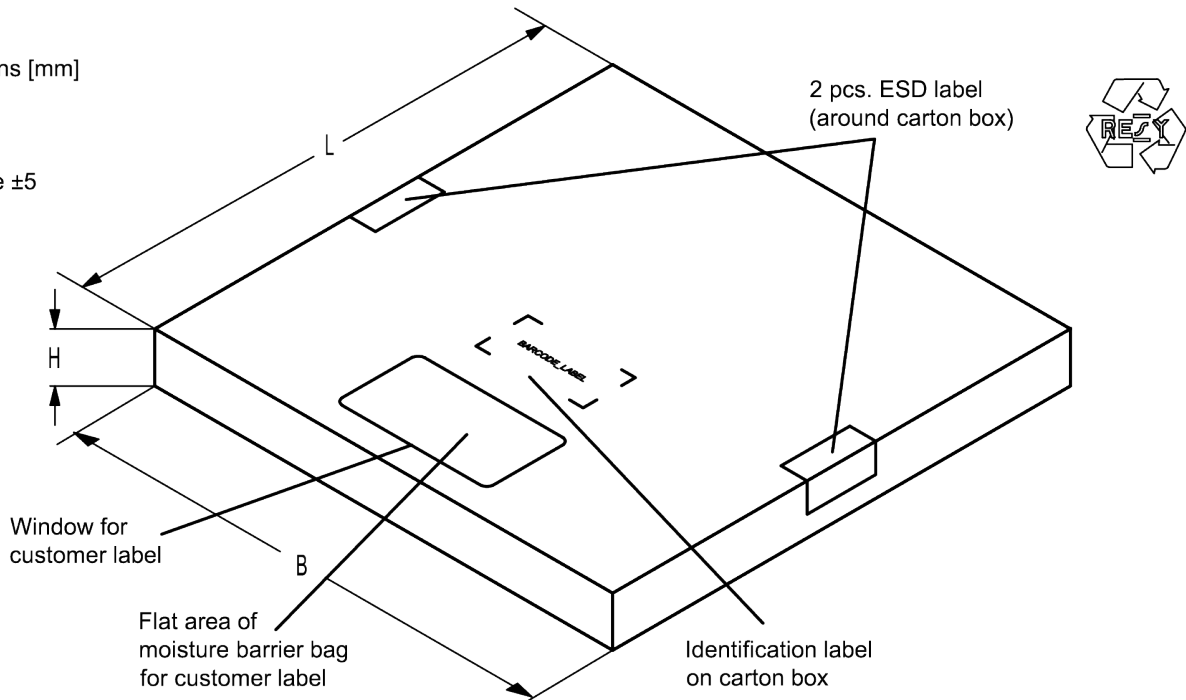


Figure 15: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

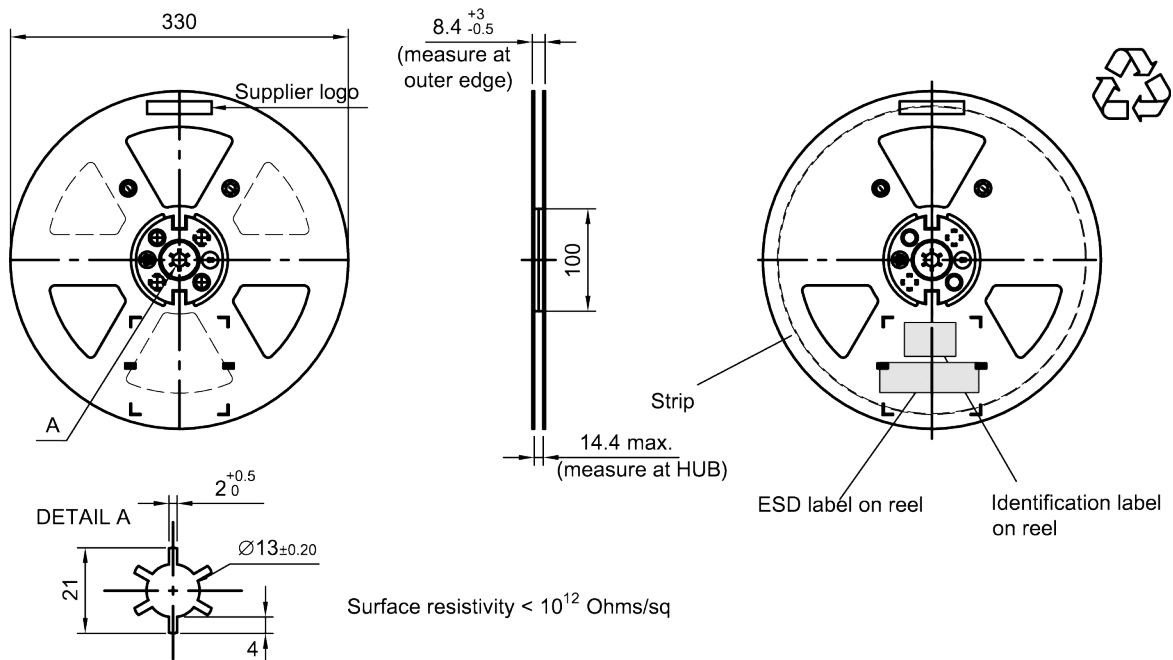


Figure 16: Drawing of reel (first-angle projection) with diameter of 330 mm.

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

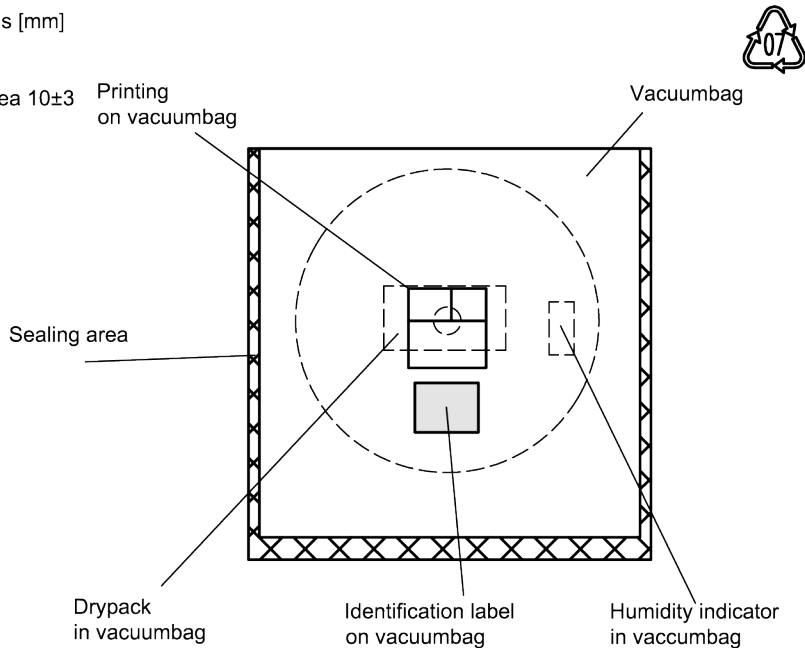


Figure 17: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

Dimensions [mm]
 L = 335
 B = 338
 H = 36 (for 8 mm tape width)
 40 (for 12 mm tape width)
 Tolerance ±5

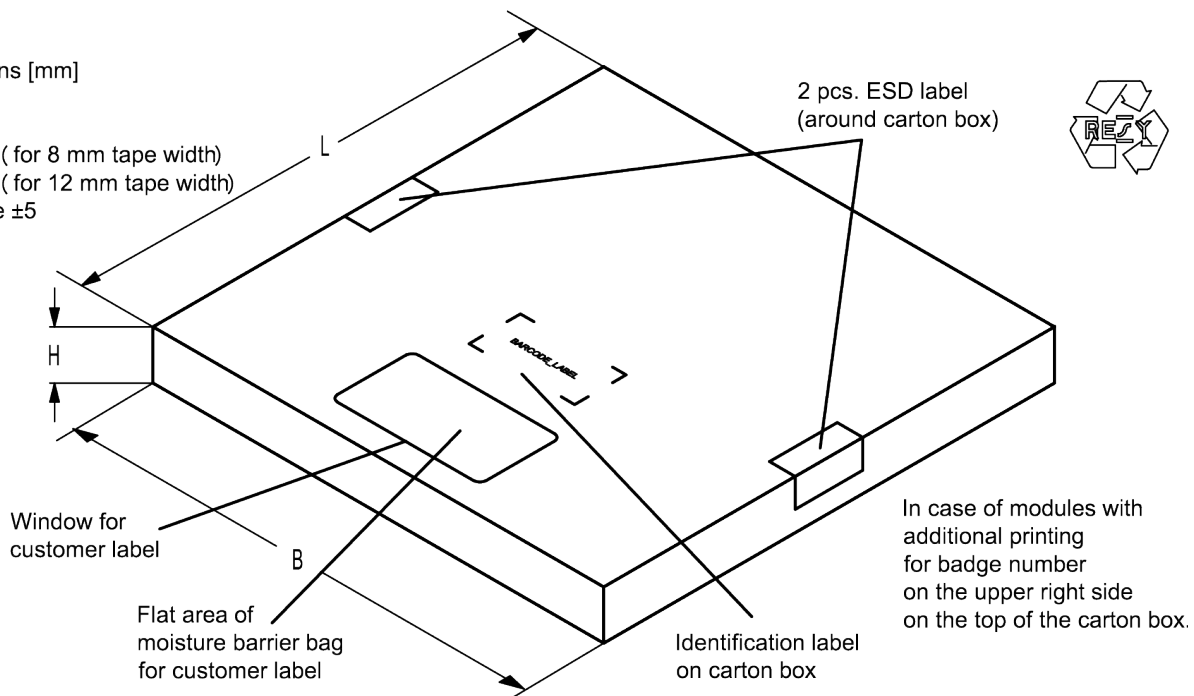


Figure 18: Drawing of folding box for reel with diameter of 330 mm.

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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 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
	$5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0$	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.

Data sheet

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).

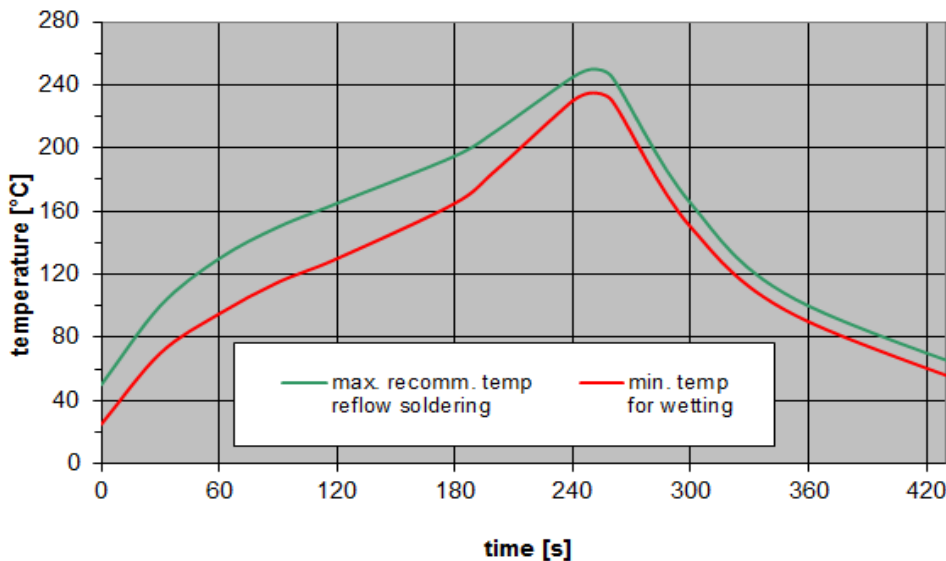


Figure 19: Recommended reflow profile for convection and infrared soldering – lead-free solder.