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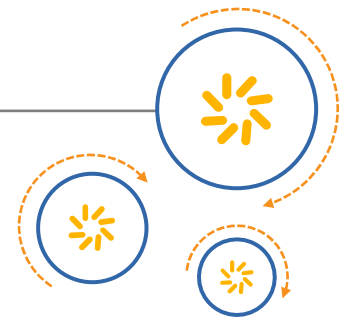
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RF360 Europe GmbH
A Qualcomm – TDK Joint Venture

SAW components

SAW duplexer

Small cell & femtocell
LTE band 28a

Series/type:	B8035
Ordering code:	B39771B8035P810
Date:	May 09, 2018
Version:	2.1

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Data sheet

1 Application

- Low-loss SAW duplexer for 3G/LTE small cell & femtocell systems (Band 28a)
- Usable pass band: 30 MHz
- High power durability in downlink
- Rx = uplink = 703-733 MHz
- Tx = downlink = 758-788 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)

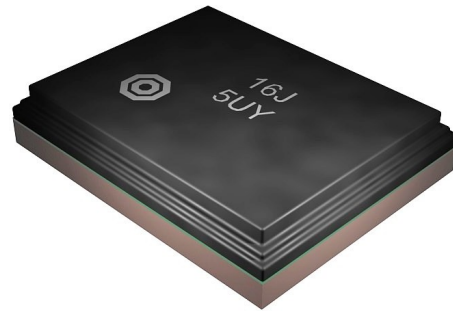


Figure 1: Picture of component with example of product marking.

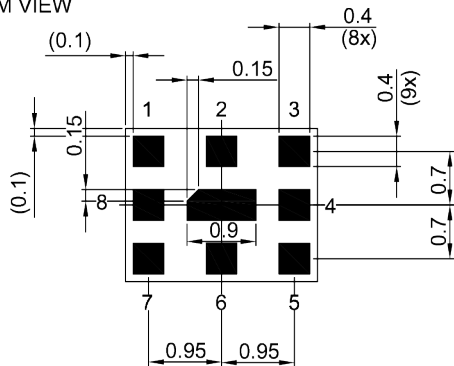
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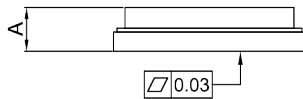
3 Package

BOTTOM VIEW

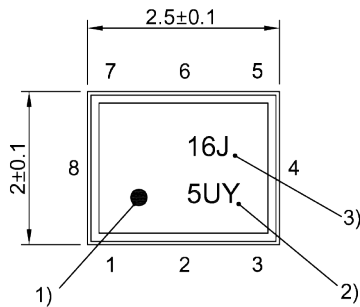


Pad and pitch tolerance ±0.05

SIDE VIEW

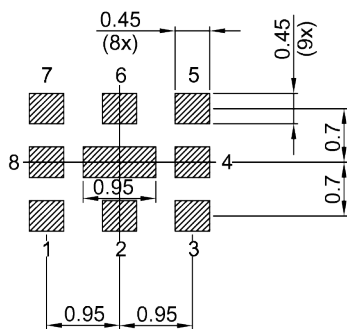


TOP VIEW



- 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. 29).

4 Pin configuration

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

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5 Matching circuit

■ $L_{p6} = 8.4 \text{ nH}$

■ $L_{s3} = 7.7 \text{ nH}$

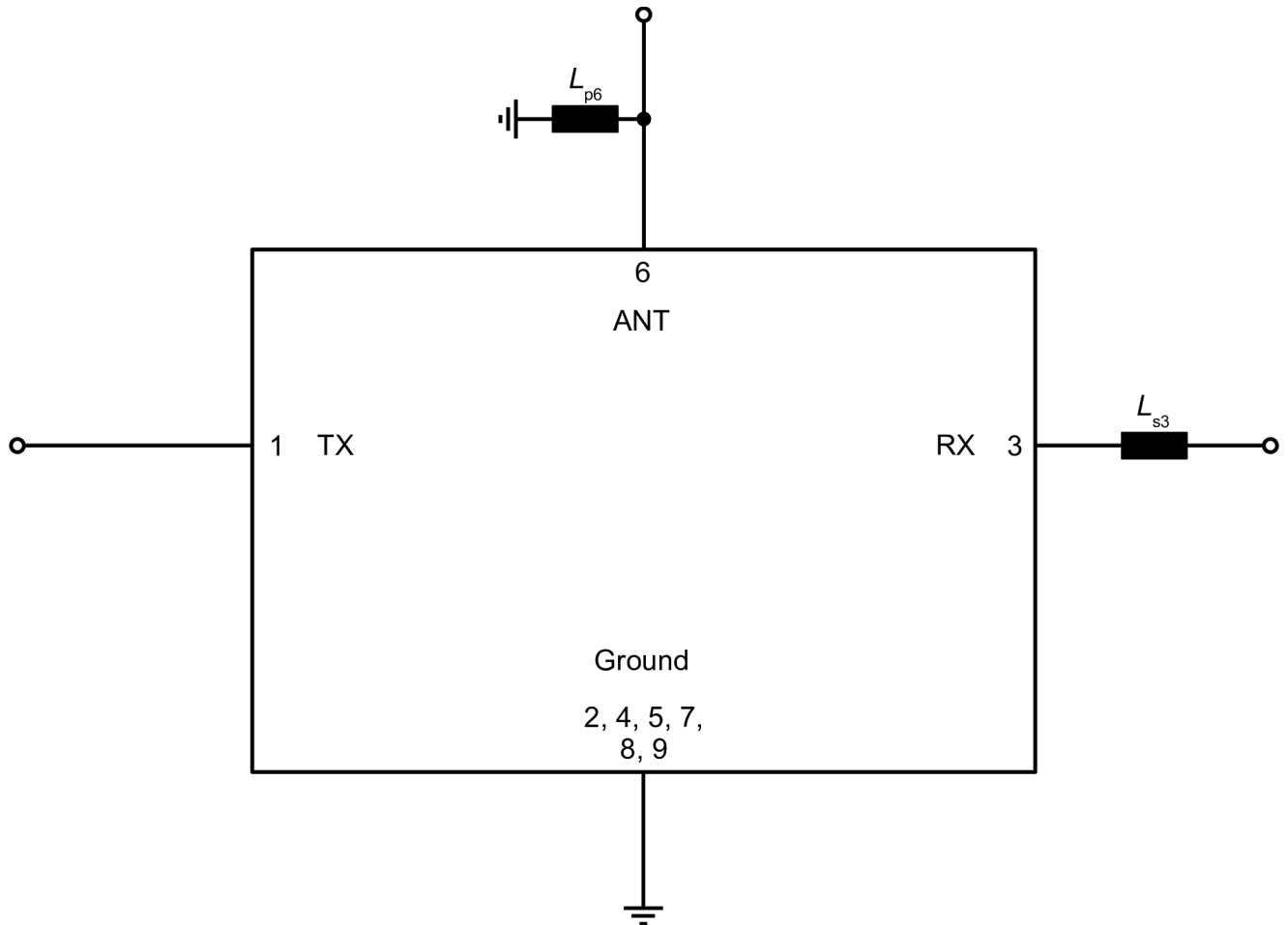


Figure 3: Schematic of matching circuit.

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6 Characteristics

6.1 TX – ANT

Temperature range for specification
 TX terminating impedance
 ANT terminating impedance
 RX terminating impedance

T_{SPEC} = -10 °C ... +85 °C
 Z_{TX} = 50 Ω
 Z_{ANT} = 50 Ω with par. 8.4 nH¹⁾
 Z_{RX} = 50 Ω with ser. 7.7 nH¹⁾

Characteristics TX – ANT				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	773	—	MHz
Average insertion attenuation			$\alpha_{INT,avg}$ ²⁾				
	758 ... 763	MHz		—	1.6	2.5	dB
	763 ... 783	MHz		—	1.5	2.1	dB
	783 ... 788	MHz		—	1.7	2.5	dB
Maximum insertion attenuation			α_{max}				
	758 ... 788	MHz		—	2.0	3.2	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	758 ... 788	MHz		—	1.0	2.1	dB
Maximum VSWR			$VSWR_{max}$				
@ TX port	758 ... 788	MHz		—	1.8	2.2	
@ ANT port	758 ... 788	MHz		—	1.9	2.2	
Maximum error vector magnitude			EVM_{max} ³⁾				
	760.4 ... 785.6	MHz		—	2.0	4.0	%
Average attenuation			$\alpha_{INT,avg}$ ²⁾				
	703 ... 733	MHz		46	50	—	dB
Minimum attenuation			α_{min}				
	50 ... 699	MHz		30	38	—	dB
	703 ... 733	MHz		45	48	—	dB
	733 ... 748	MHz		23	27	—	dB
	803 ... 814	MHz		30	48	—	dB
	880 ... 915	MHz		36	42	—	dB
	925 ... 960	MHz		36	42	—	dB
	1710 ... 1785	MHz		34	36	—	dB
	1805 ... 1880	MHz		33	36	—	dB
	1920 ... 1980	MHz		33	36	—	dB
	2110 ... 2170	MHz		27	34	—	dB
	2400 ... 2500	MHz		27	35	—	dB
	2500 ... 2570	MHz		24	35	—	dB
	2620 ... 2690	MHz		24	31	—	dB
	3000 ... 5150	MHz		10	12	—	dB

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5150... 5850	MHz	8	10	—	dB
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- 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.
- ³⁾ 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. 8.4 nH ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 7.7 nH ¹⁾

Characteristics TX – ANT			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_C	—	773	—	MHz
Average insertion attenuation		$\alpha_{INT,avg}^{2)}$				
	758... 763	MHz	—	1.6	2.6	dB
	763... 783	MHz	—	1.5	2.1	dB
	783... 788	MHz	—	1.7	2.6	dB
Maximum insertion attenuation		α_{max}				
	758... 788	MHz	—	2.0	3.4	dB
Amplitude ripple (p-p)		$\Delta\alpha$				
	758... 788	MHz	—	1.0	2.3	dB
Maximum VSWR		$VSWR_{max}$				
@ TX port	758... 788	MHz	—	1.8	2.2	
@ ANT port	758... 788	MHz	—	1.9	2.2	
Maximum error vector magnitude		$EVM_{max}^{3)}$				
	760.4... 785.6	MHz	—	2.0	5.0	%
Average attenuation		$\alpha_{INT,avg}^{2)}$				
	703... 733	MHz	46	50	—	dB
Minimum attenuation		α_{min}				
	50... 699	MHz	30	38	—	dB
	703... 733	MHz	45	48	—	dB
	733... 748	MHz	23	27	—	dB
	803... 814	MHz	30	48	—	dB
	880... 915	MHz	36	42	—	dB
	925... 960	MHz	36	42	—	dB
	1710... 1785	MHz	34	36	—	dB
	1805... 1880	MHz	33	36	—	dB
	1920... 1980	MHz	33	36	—	dB
	2110... 2170	MHz	27	34	—	dB
	2400... 2500	MHz	27	35	—	dB
	2500... 2570	MHz	24	35	—	dB
	2620... 2690	MHz	24	31	—	dB
	3000... 5150	MHz	10	12	—	dB
	5150... 5850	MHz	8	10	—	dB

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

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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. 8.4 nH ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 7.7 nH ¹⁾

Characteristics ANT – RX			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_C	—	718	—	MHz
Average insertion attenuation		$\alpha_{INT,avg}$ ²⁾				
	703... 708	MHz	—	1.6	2.8	dB
	708... 728	MHz	—	1.8	2.4	dB
	728... 733	MHz	—	2.0	2.8	dB
Maximum insertion attenuation		α_{max}				
	703... 733	MHz	—	2.2	3.5	dB
Amplitude ripple (p-p)		$\Delta\alpha$				
	703... 733	MHz	—	1.2	2.3	dB
Maximum VSWR		VSWR _{max}				
@ ANT port	703... 733	MHz	—	1.6	2.2	
@ RX port	703... 733	MHz	—	1.5	2.3	
Maximum error vector magnitude		EVM _{max} ³⁾				
	705.4... 730.6	MHz	—	2.9	6.0	%
Average attenuation		$\alpha_{INT,avg}$ ²⁾				
	758... 788	MHz	51	55	—	dB
Minimum attenuation		α_{min}				
	50... 694	MHz	28	32	—	dB
	694... 695	MHz	22	35	—	dB
	758... 788	MHz	46	50	—	dB
	788... 803	MHz	30	58	—	dB
	791... 821	MHz	30	58	—	dB
	869... 894	MHz	30	62	—	dB
	925... 960	MHz	30	62	—	dB
	1805... 1880	MHz	30	64	—	dB
	1930... 1995	MHz	30	64	—	dB
	2110... 2170	MHz	30	62	—	dB
	2400... 2484	MHz	35	63	—	dB
	2620... 2690	MHz	30	63	—	dB
	5150... 5850	MHz	35	53	—	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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³⁾ 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. 8.4 nH ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 7.7 nH ¹⁾

Characteristics ANT – RX				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	718	—	MHz
Average insertion attenuation			$\alpha_{INT,avg}$ ²⁾				
	703... 708	MHz		—	1.6	3.6	dB
	708... 728	MHz		—	1.8	2.4	dB
	728... 733	MHz		—	2.0	3.6	dB
Maximum insertion attenuation			α_{max}				
	703... 733	MHz		—	2.2	4.5	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	703... 733	MHz		—	1.2	3.2	dB
Maximum VSWR			$VSWR_{max}$				
@ ANT port	703... 733	MHz		—	1.6	4.0	
@ RX port	703... 733	MHz		—	1.5	4.0	
Maximum error vector magnitude			EVM_{max} ³⁾				
	705.4... 730.6	MHz		—	2.9	8.0	%
Average attenuation			$\alpha_{INT,avg}$ ²⁾				
	758... 788	MHz		51	55	—	dB
Minimum attenuation			α_{min}				
	50... 694	MHz		28	32	—	dB
	694... 695	MHz		22	35	—	dB
	758... 788	MHz		46	50	—	dB
	788... 803	MHz		30	58	—	dB
	791... 821	MHz		30	58	—	dB
	869... 894	MHz		30	62	—	dB
	925... 960	MHz		30	62	—	dB
	1805... 1880	MHz		30	64	—	dB
	1930... 1995	MHz		30	64	—	dB
	2110... 2170	MHz		30	62	—	dB
	2400... 2484	MHz		35	63	—	dB
	2620... 2690	MHz		30	63	—	dB
	5150... 5850	MHz		35	53	—	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.

³⁾ 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. 8.4 nH ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 7.7 nH ¹⁾

Characteristics TX – RX			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Average isolation	$\alpha_{INT,avg}$ ²⁾	703... 733 MHz	49	51	—	dB
		758... 788 MHz	51	53	—	dB
Minimum isolation	α_{min}	703... 733 MHz	48	51	—	dB
		758... 788 MHz	49	51	—	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. 8.4 nH ¹⁾
RX terminating impedance	Z_{RX}	= 50 Ω with ser. 7.7 nH ¹⁾

Characteristics TX – RX			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Average isolation		$\alpha_{INT,avg}$ ²⁾				
		703... 733 MHz	49	51	—	dB
		758... 788 MHz	51	53	—	dB
Minimum isolation		α_{min}				
		703... 733 MHz	48	51	—	dB
		758... 788 MHz	49	51	—	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 (max.)}$	
ESD voltage		
	$V_{ESD}^{3)} = 100\text{ V (max.)}$	Machine model.
	$V_{ESD}^{4)} = 225\text{ V (max.)}$	Human body model.
Input power	P_{IN}	
@ TX port: 758 ... 788 MHz	30 dBm ^{5), 6)}	5 MHz LTE downlink signal (25 RB) for 100000 h @ 55 °C. P_{IN} average – 41 dBm peak. Source and load impedance 50Ω.
@ RX port: 703 ... 733 MHz	27 dBm ⁵⁾	5 MHz LTE uplink signal (25 RB) for 5000 h @ 55 °C. P_{IN} average – 38 dBm peak. Source and load impedance 50Ω.
Operating lifetime with output power at antenna 758 ... 788 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 test 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 30dBm are valid for temperature up to 56.5°C.

⁷⁾ According to accelerated high temperature operating life (HTOL) test.

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8 Transmission coefficients

8.1 TX – ANT

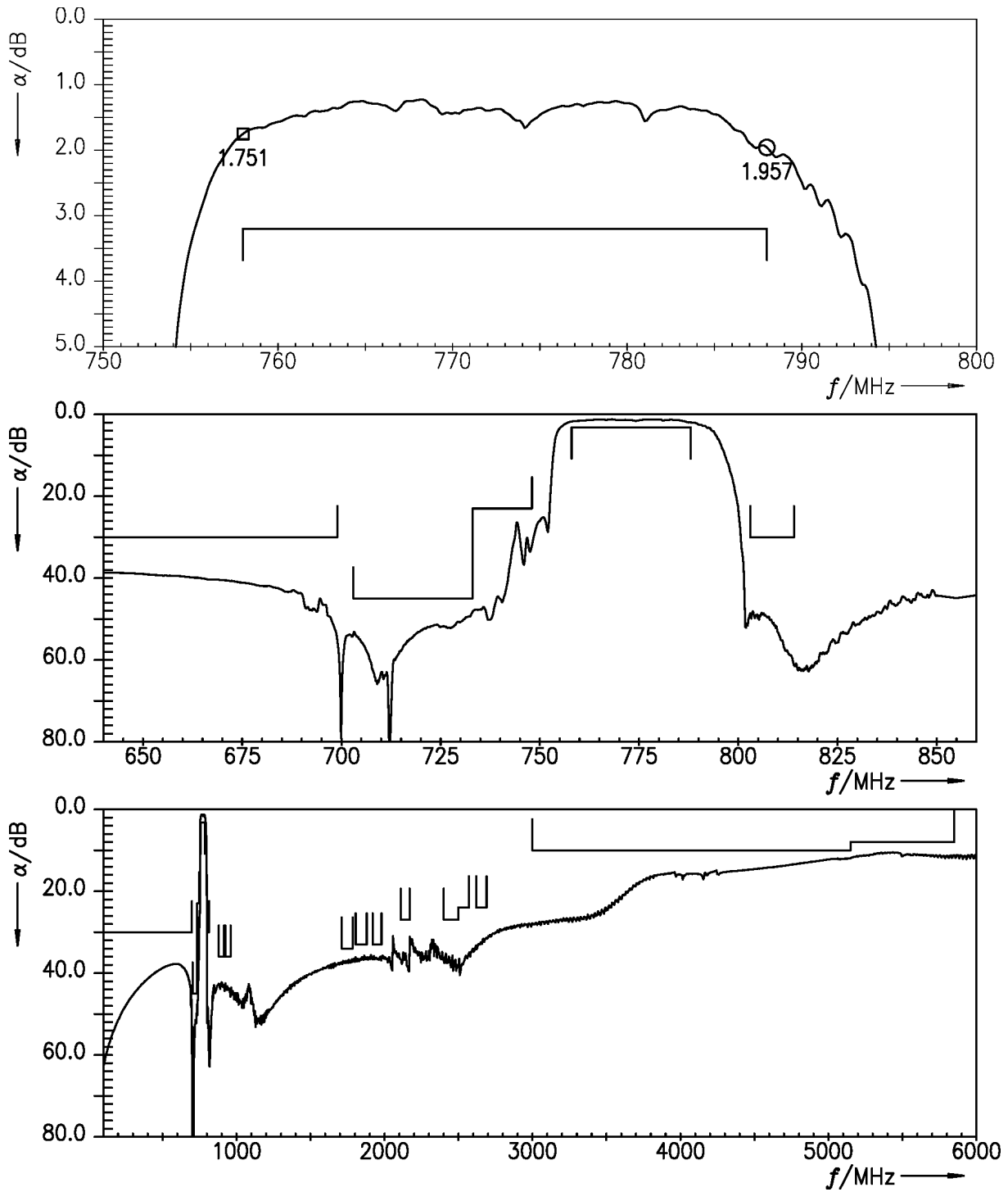


Figure 4: Attenuation TX – ANT.

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8.2 ANT – RX

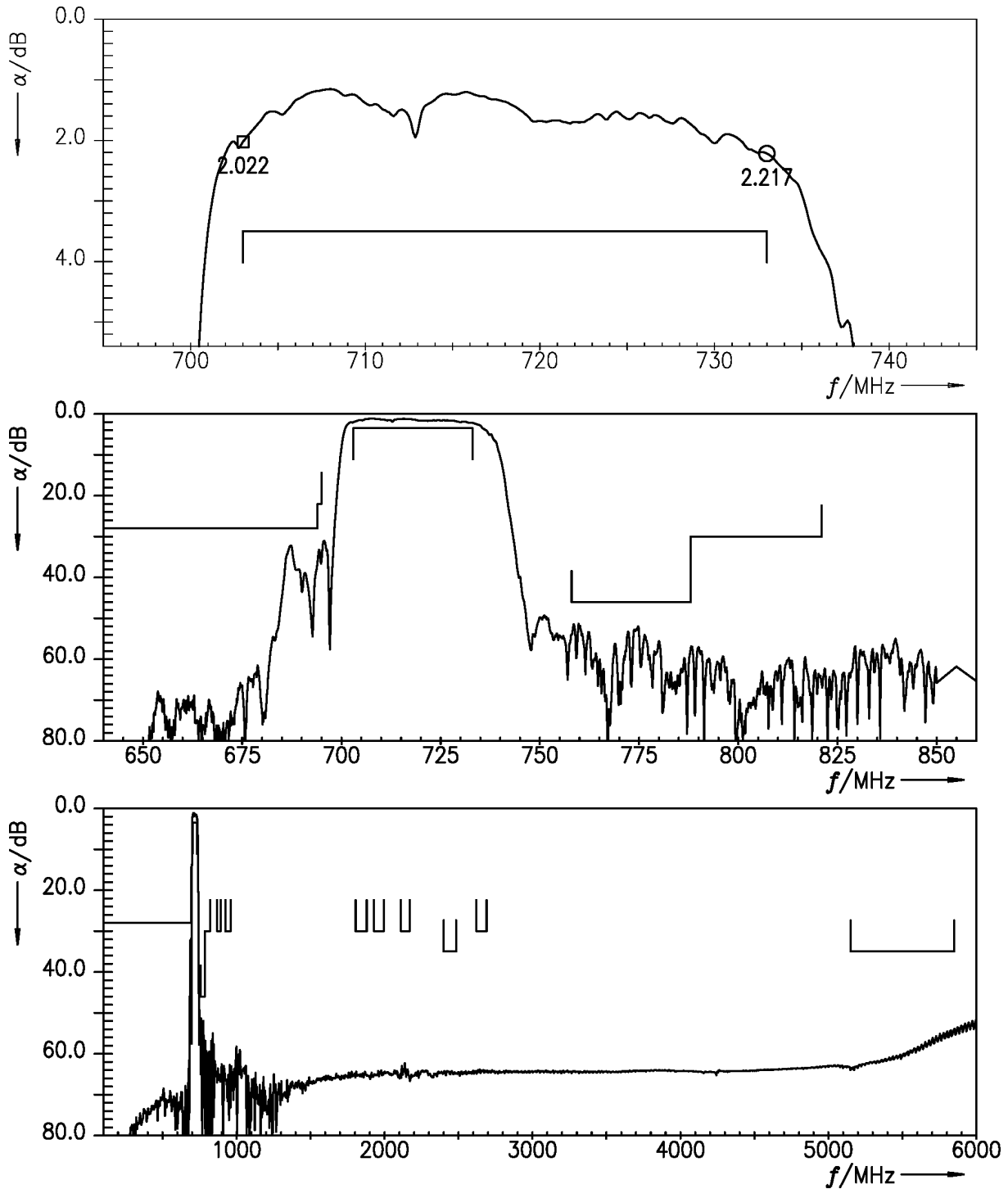


Figure 5: Attenuation ANT – RX.

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8.3 TX – RX

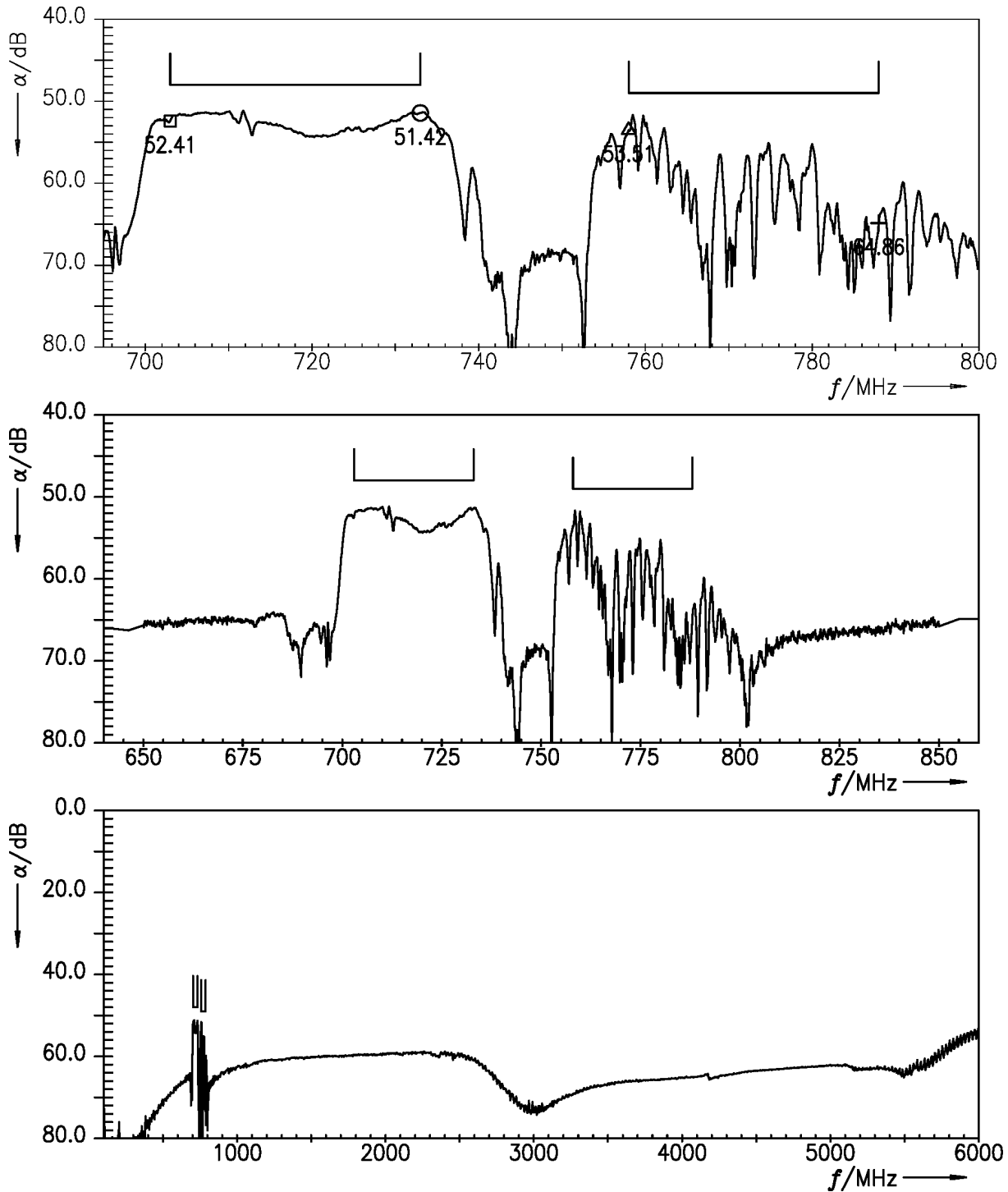


Figure 6: Isolation TX – RX.

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9 Reflection coefficients

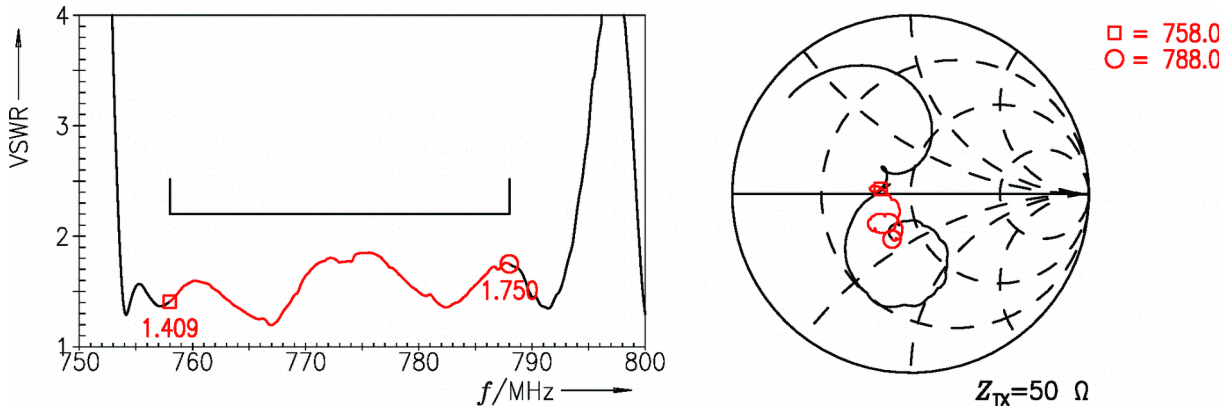


Figure 7: Reflection coefficient at TX port.

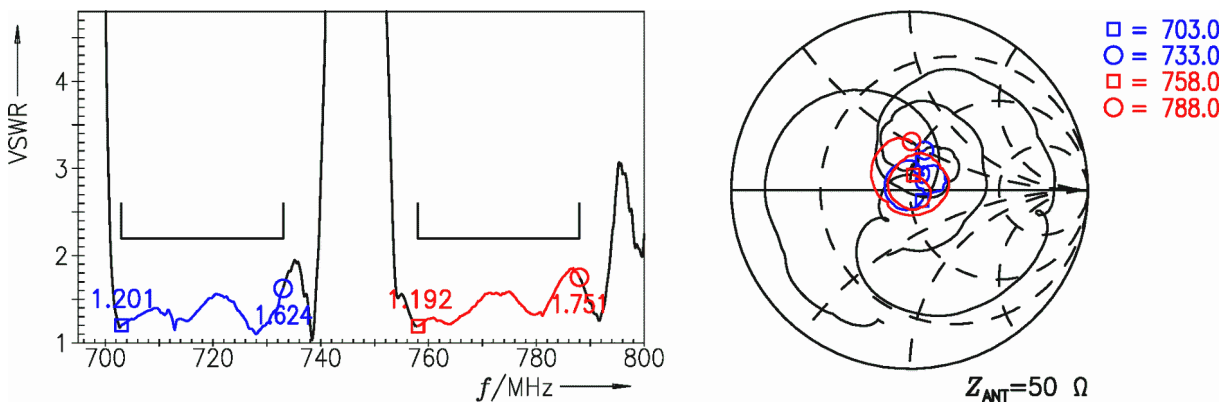


Figure 8: Reflection coefficient at ANT port.

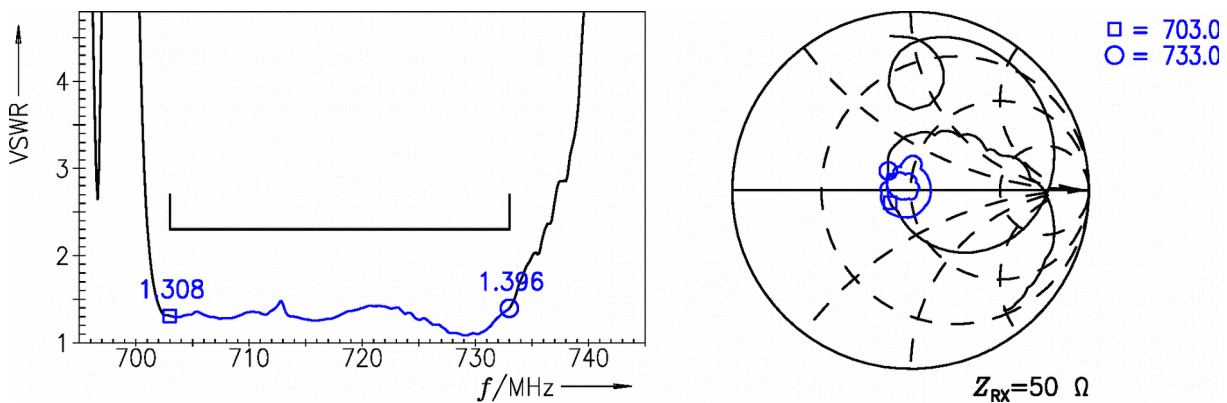


Figure 9: Reflection coefficient at RX port.

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10 EVMs

10.1 TX – ANT

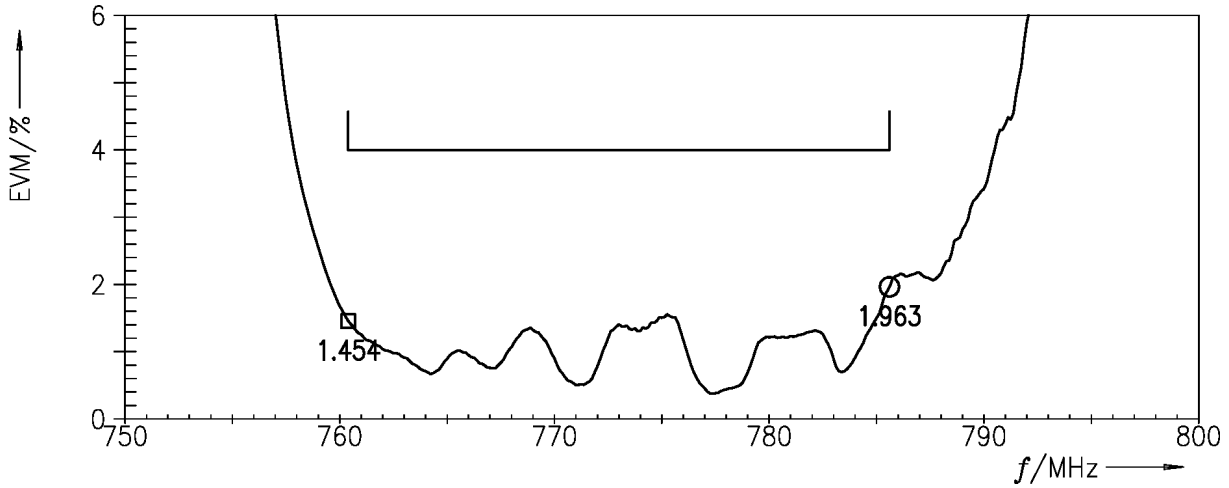


Figure 10: Error vector magnitude TX – ANT.

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10.2 ANT – RX

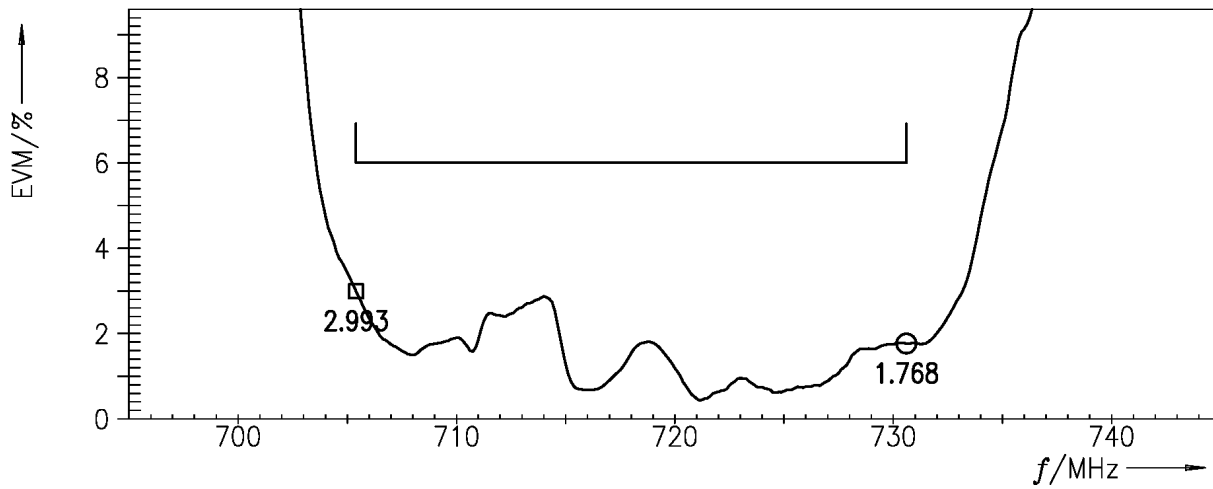


Figure 11: Error vector magnitude ANT – RX.

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11 Packing material

11.1 Tape

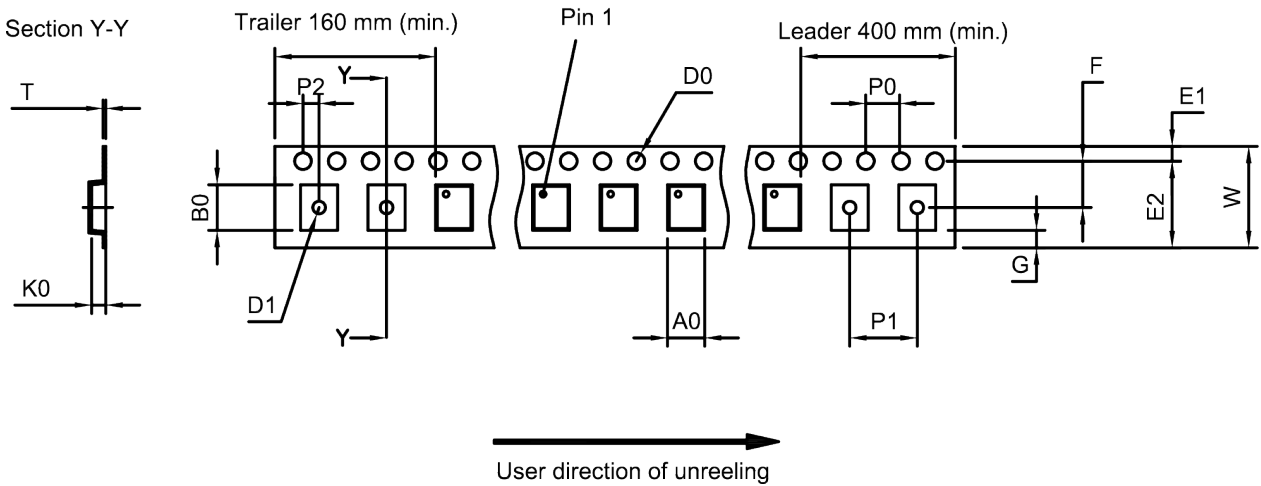


Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

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

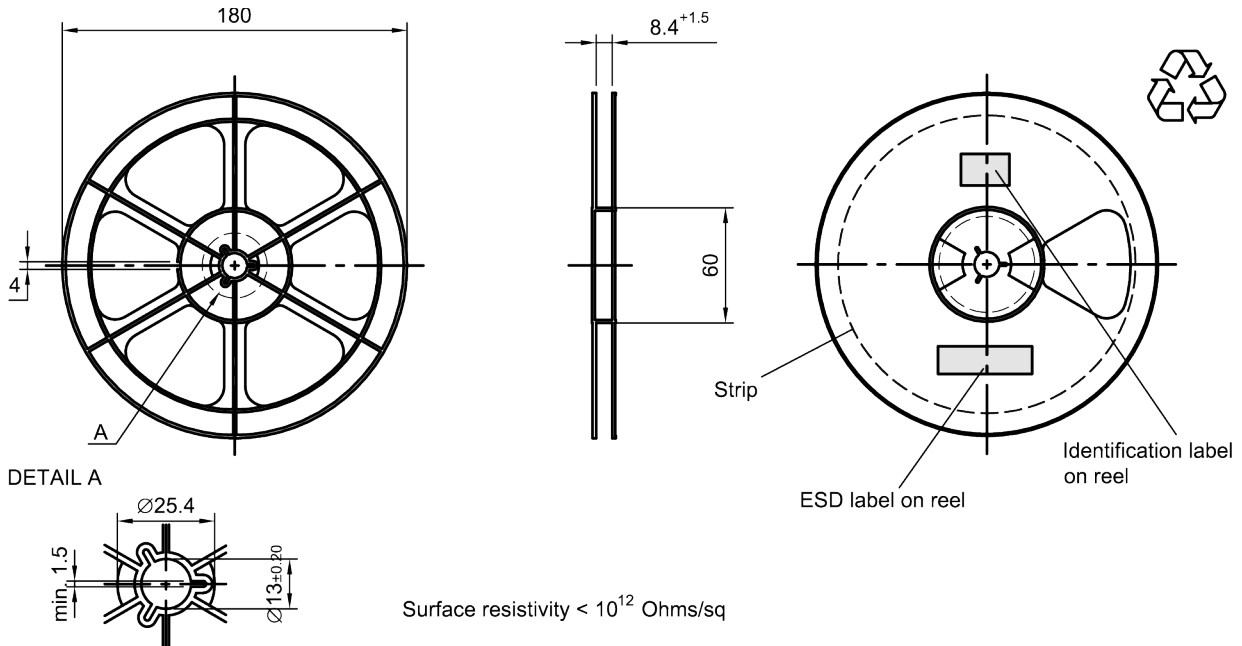


Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

Dimensions [mm]

X = 220+5

Y = 235+5

Sealing area 10±3

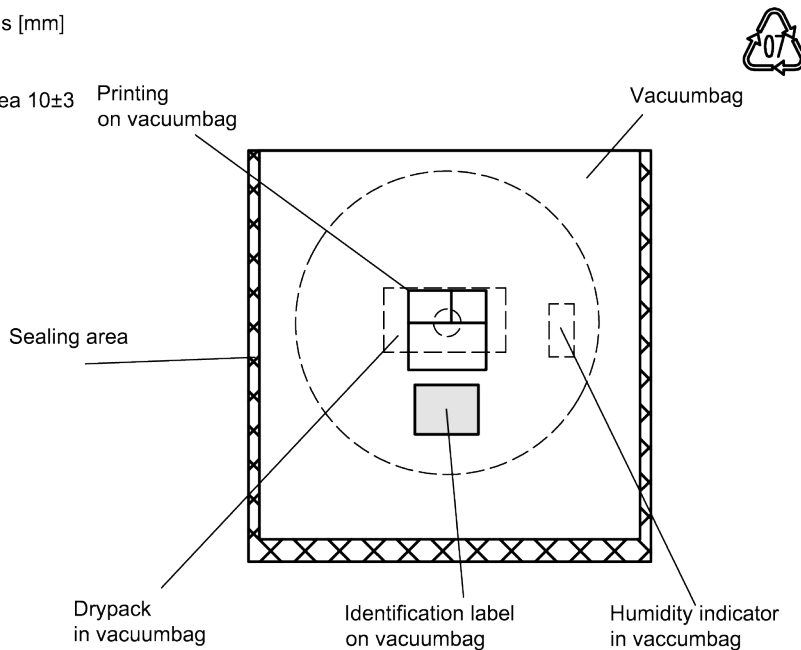


Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

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Dimensions [mm]

L = 188

B = 188

H = 30

Tolerance ±5

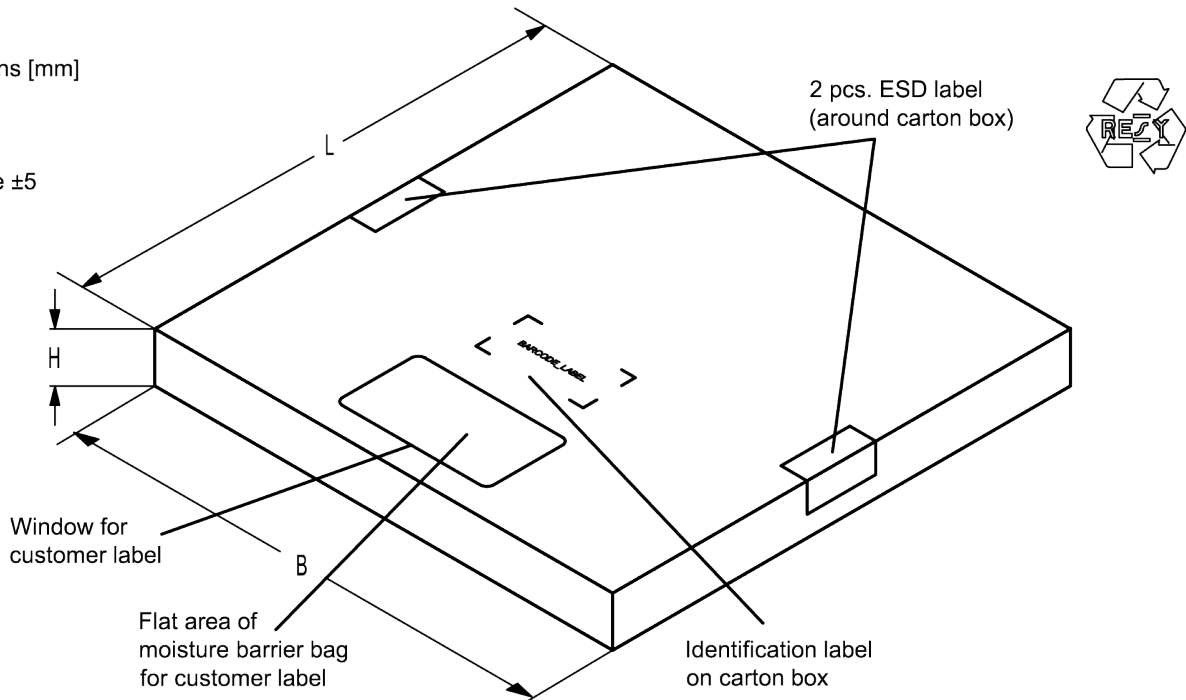


Figure 15: Drawing of folding box for reel with diameter of 180 mm.