

SAW components

SAW duplexer

Small cell & femtocell
LTE band 28a

Series/type:	B8035
Ordering code:	B39771B8035P810

Date:	June 10, 2016
Version:	2.0

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

Table of contents

1	Application	3
2	Features	3
3	Package	4
4	Pin configuration	4
5	Matching circuit	5
6	Characteristics	6
7	Maximum ratings	9
8	Transmission coefficients	10
9	Reflection coefficients	13
10	EVMS	14
11	Packing material	16
12	Marking	18
13	Soldering profile	19
14	Annotations	20
15	Cautions and warnings	21
	Important notes	22

Data sheet

1 Application

- Low-loss SAW duplexer for 3G/LTE smallcells 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

- Package size $2.5 \pm 0.1 \text{ mm} \times 2.0 \pm 0.1 \text{ mm}$
- Package height 0.5 mm (max.)
- Approximate weight 9 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 2a (MSL2a)

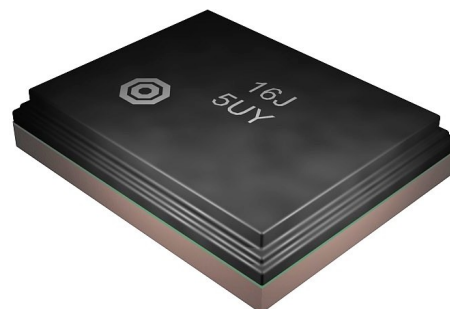
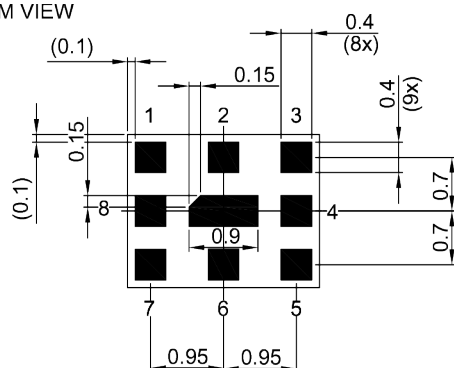
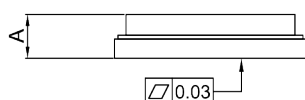
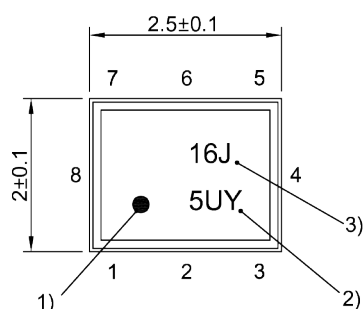


Figure 1: Picture of component with example of product marking.

Data sheet
3 Package
BOTTOM VIEW

 Pad and pitch tolerance ± 0.05
SIDE VIEW

TOP VIEW


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

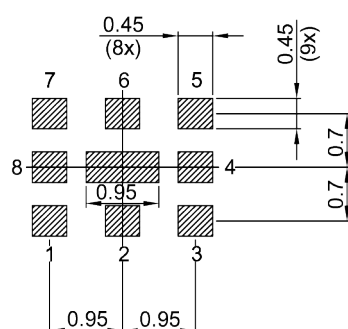
**Land pattern
THRU VIEW**

 Landing pad tolerance -0.02

Figure 2: Drawing of package with package height $A = 0.5$ mm (max.). See Sec. Package information (p. 21).

4 Pin configuration

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

Data sheet

5 Matching circuit

$$\blacksquare L_{p6} = 8.4 \text{ nH}$$

$$\blacksquare L_{s3} = 7.7 \text{ nH}$$

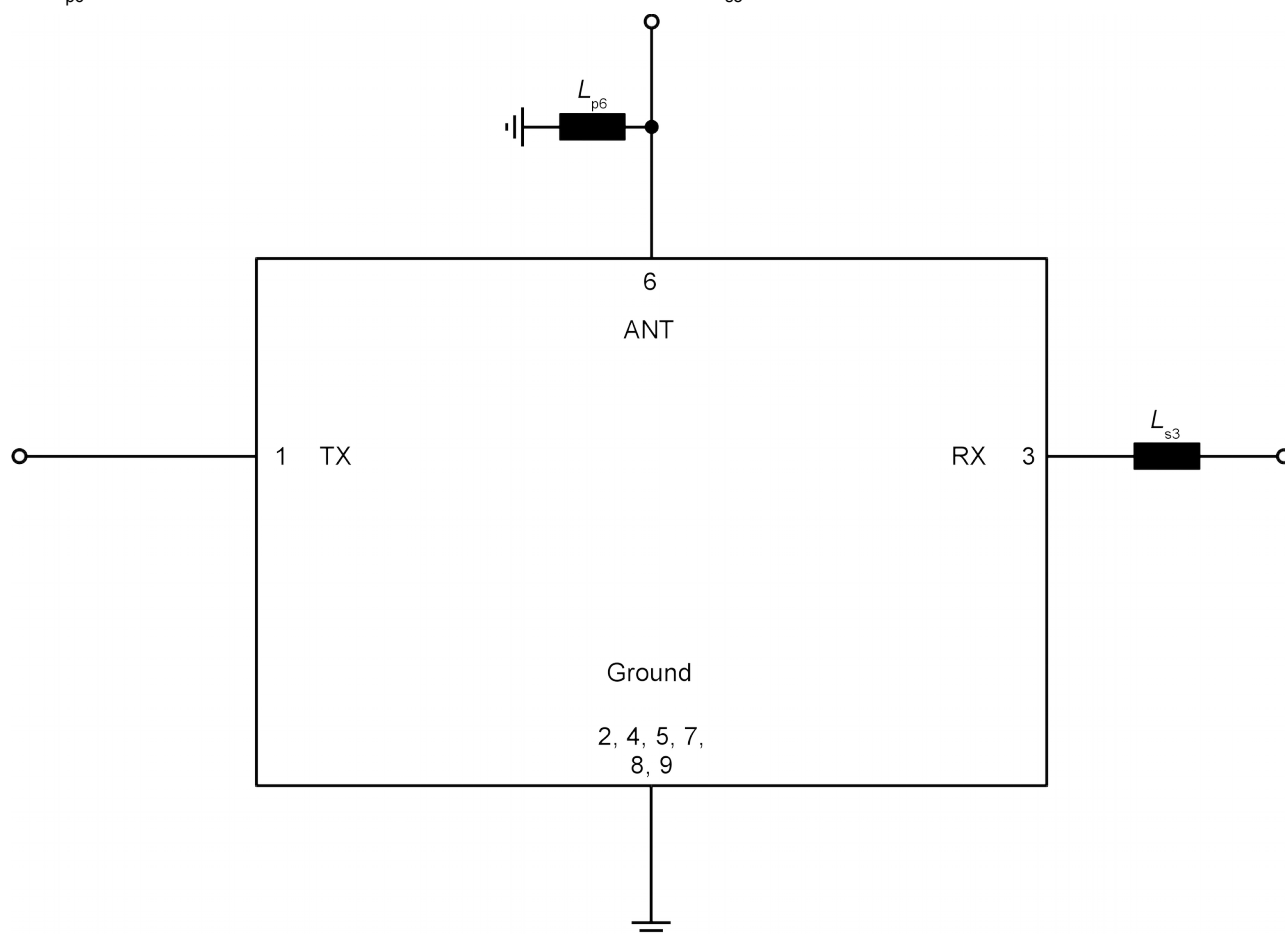


Figure 3: Schematic of matching circuit.

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

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

Characteristics TX – ANT ²⁾			min. for T_{SPEC}	typ. @+25 °C	max. for T_{SPEC}	
Center frequency		f_{C}	—	773	—	MHz
Maximum insertion attenuation		α_{max}				
	758... 788	MHz	—	2.2	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	%
Minimum attenuation		α_{min}				
	50... 699	MHz	30	38	—	dB
	703... 733	MHz	37	48	—	dB
	733... 748	MHz	23	26	—	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

¹⁾ See Sec. Matching circuit (p. 5).

²⁾ T is the ambient temperature of the PCB at component position. Specified min./max values are valid for an input power of up to 17 dBm.

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

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

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
Maximum insertion attenuation		α_{max}	—	2.2	3.5	dB
	703... 733	MHz				
Amplitude ripple (p-p)		$\Delta\alpha$	—	1.2	2.3	dB
	703... 733	MHz				
Maximum VSWR		VSWR _{max}	—	1.6	2.2	
@ ANT port	703... 733	MHz				
@ RX port	703... 733	MHz		1.5	2.3	
Maximum error vector magnitude		EVM _{max} ²⁾	—	2.9	6.0	%
	705.4... 730.6	MHz				
Minimum attenuation		α_{min}				
	50... 694	MHz	28	31	—	dB
	694... 695	MHz	22	33	—	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. 5).

²⁾ Error Vector Magnitude (EVM) based on definition given in 3GPP TS 25.141.

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

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}	
Minimum isolation		α_{min}				
	703... 733	MHz	48	51	—	dB
	758... 788	MHz	49	51	—	dB

¹⁾ See Sec. Matching circuit (p. 5).

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

7 Maximum ratings

Operable temperature	$T_{OP} = -40\text{ °C} \dots +85\text{ °C}$	
Storage temperature	$T_{STG} = -40\text{ °C} \dots +85\text{ °C}$	
DC voltage	$V_{DC} = 0\text{ V}$	
ESD voltage	$V_{ESD}^{1)} = 100\text{ V}$	Machine model.
Input power	P_{IN}	source and load impedance 50 Ω
@ TX port: 758 ... 788 MHz	$P_{IN} \quad 30\text{ dBm}^{2)}$	Pin 30 dBm average – 41dBm peak LTE 5 MHz downlink for 100000 h @ 55 °C.
@ elsewhere	$P_{IN} \quad 10\text{ dBm}$	
@ RX port: 703 ... 733 MHz	$P_{IN} \quad 27\text{ dBm}^{2)}$	LTE 5 MHz uplink for 5000 h @ 55 °C.
Operating lifetime with Output power at antenna		source and load impedance 50 Ω
@ TX port: 758 ... 788 MHz	$P_{OUT} \quad \text{t.b.d. dBm}^{3)}$	Continuous wave for 100000 h @ 55 °C.

¹⁾ According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

²⁾ Time to failure (TTF) according to accelerated power durability test, and wear out models.

³⁾ According to accelerated High Temperating Operating Life (HTOL) test.

Data sheet

8 Transmission coefficients

8.1 TX – ANT

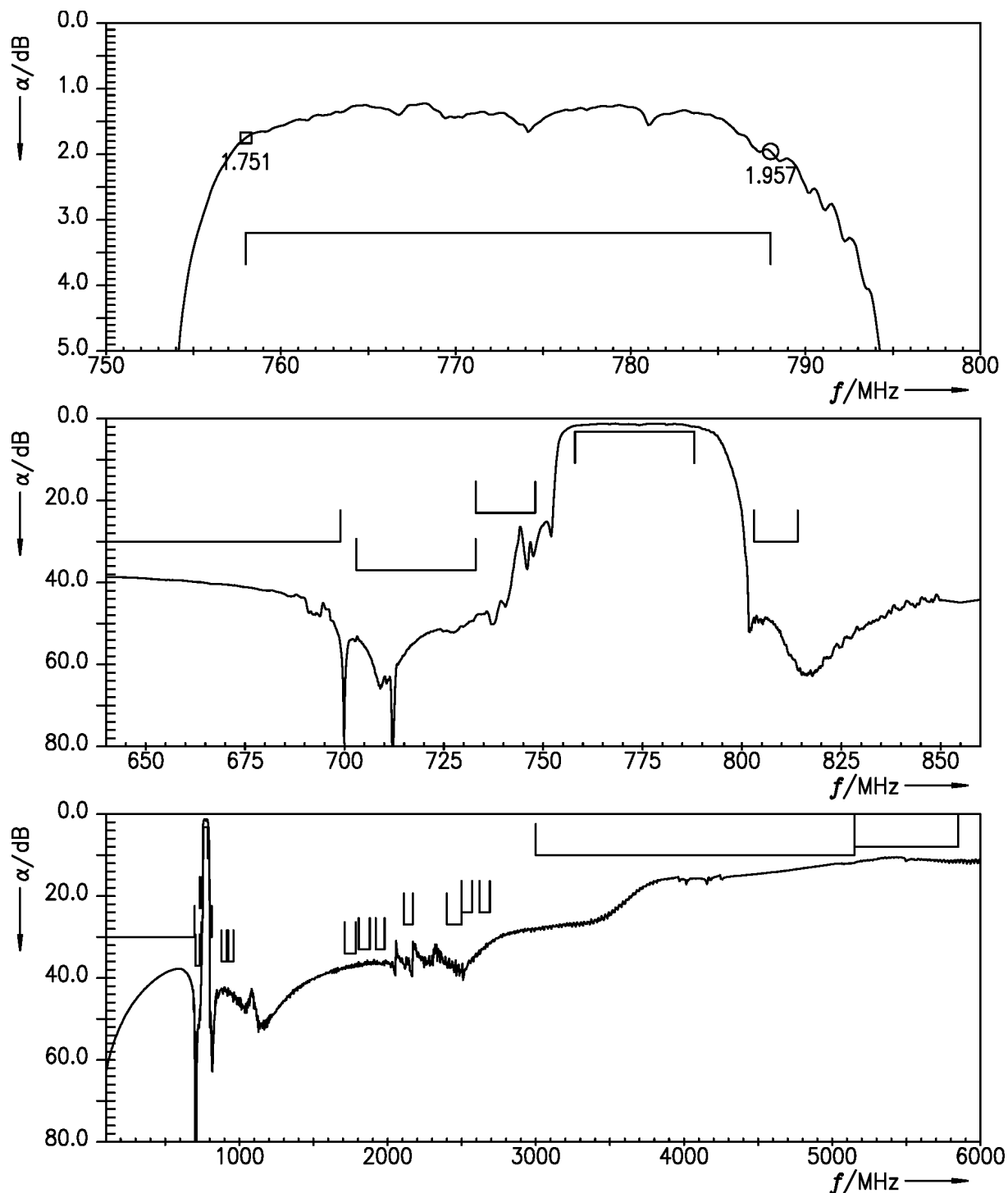


Figure 4: Attenuation TX – ANT.

Data sheet

8.2 ANT – RX

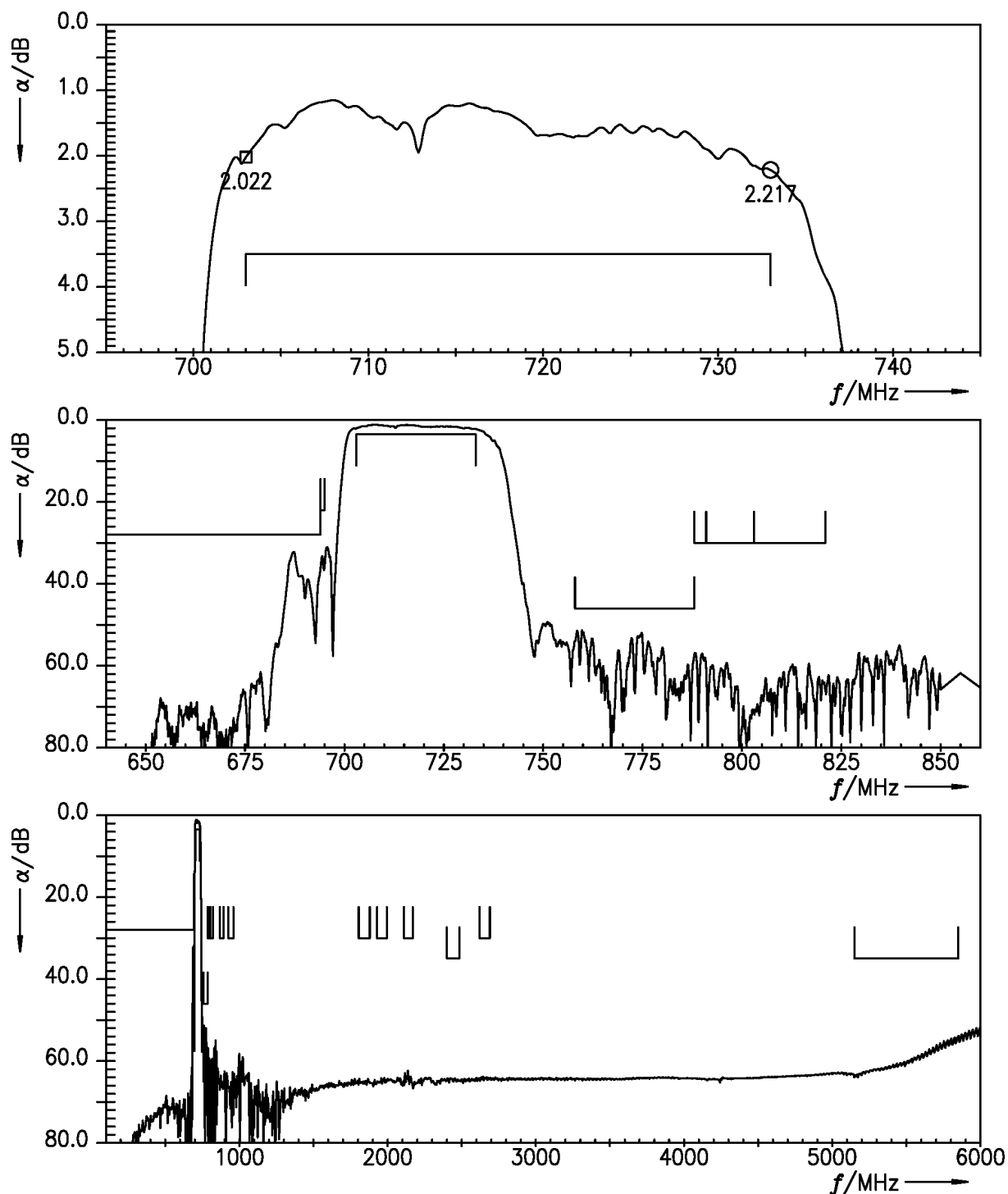


Figure 5: Attenuation ANT – RX.

Data sheet

8.3 TX – RX

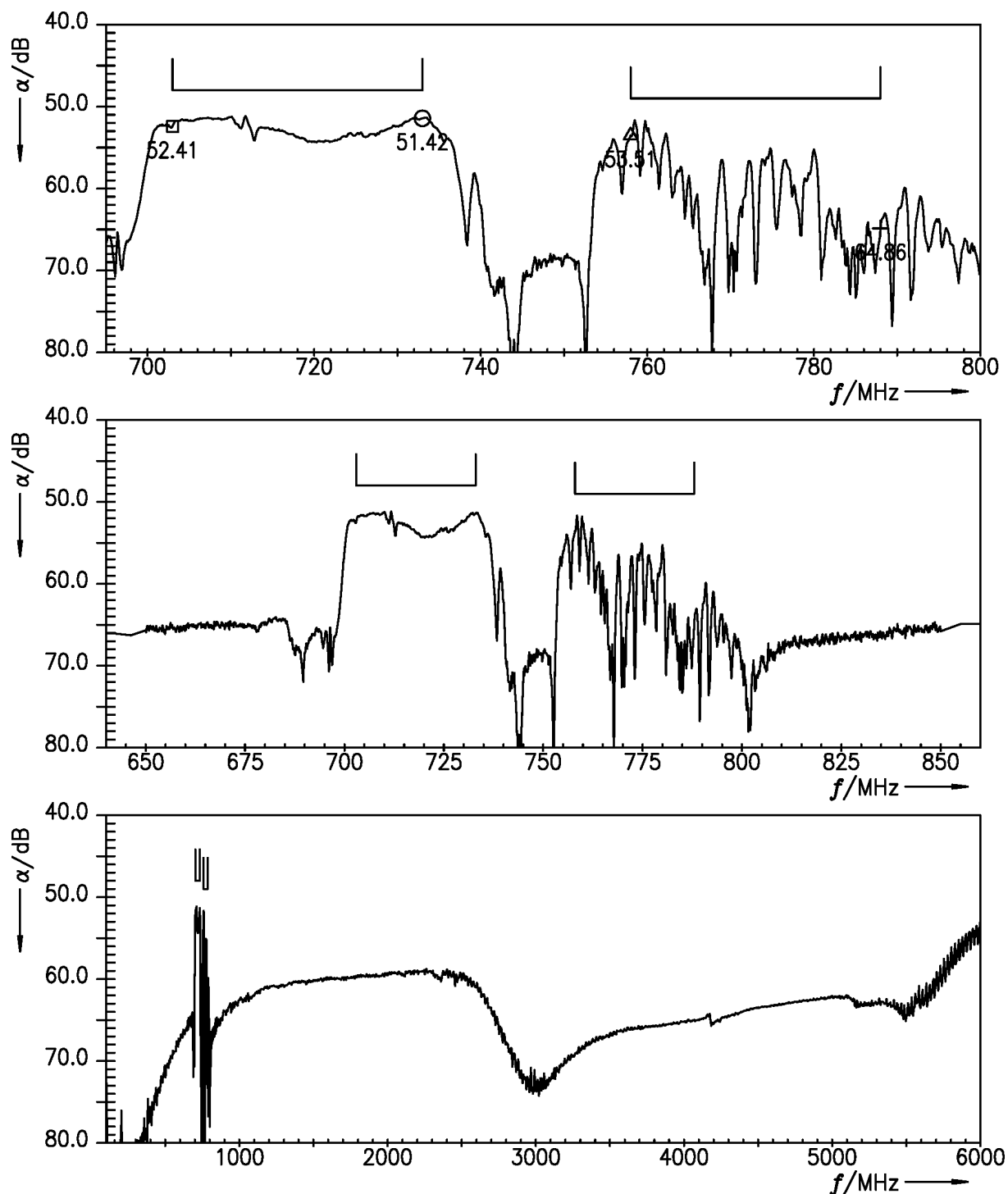


Figure 6: Isolation TX – RX.

Data sheet

9 Reflection coefficients

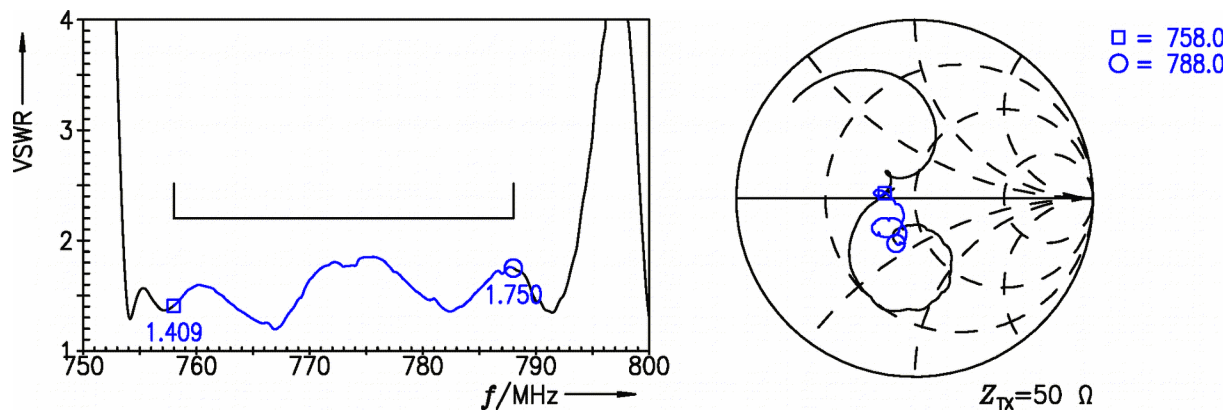


Figure 7: Reflection coefficient at TX port.

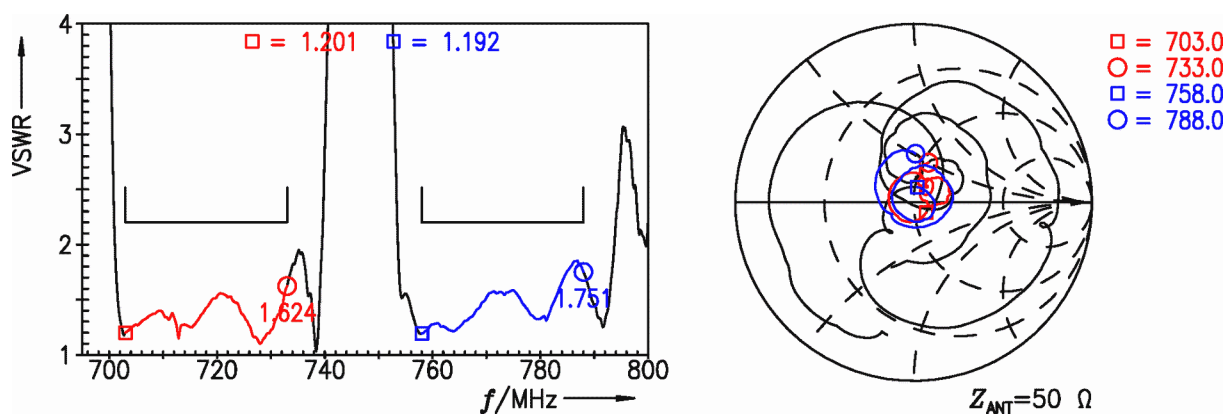


Figure 8: Reflection coefficient at ANT port (TX and RX frequencies).

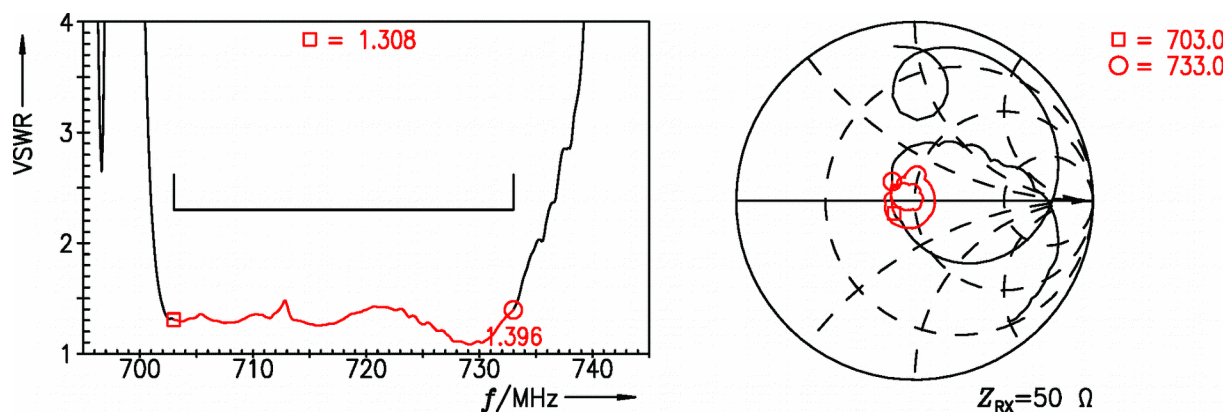


Figure 9: Reflection coefficient at RX port.

Data sheet

10 EVMs

10.1 TX – ANT

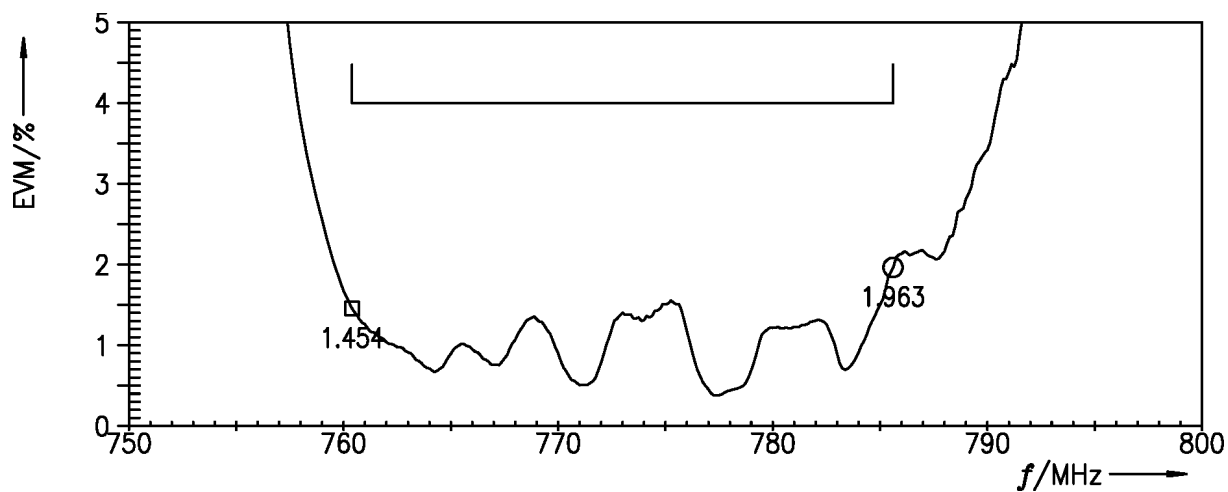


Figure 10: Error vector magnitude TX – ANT.

Data sheet

10.2 ANT – RX

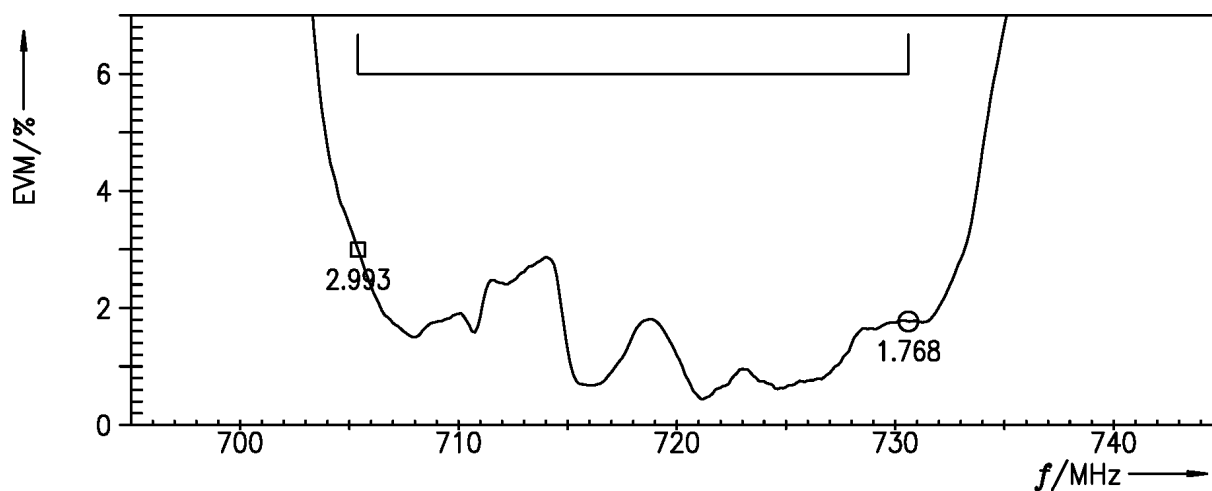


Figure 11: Error vector magnitude ANT – RX.

Data sheet

11 Packing material

11.1 Tape

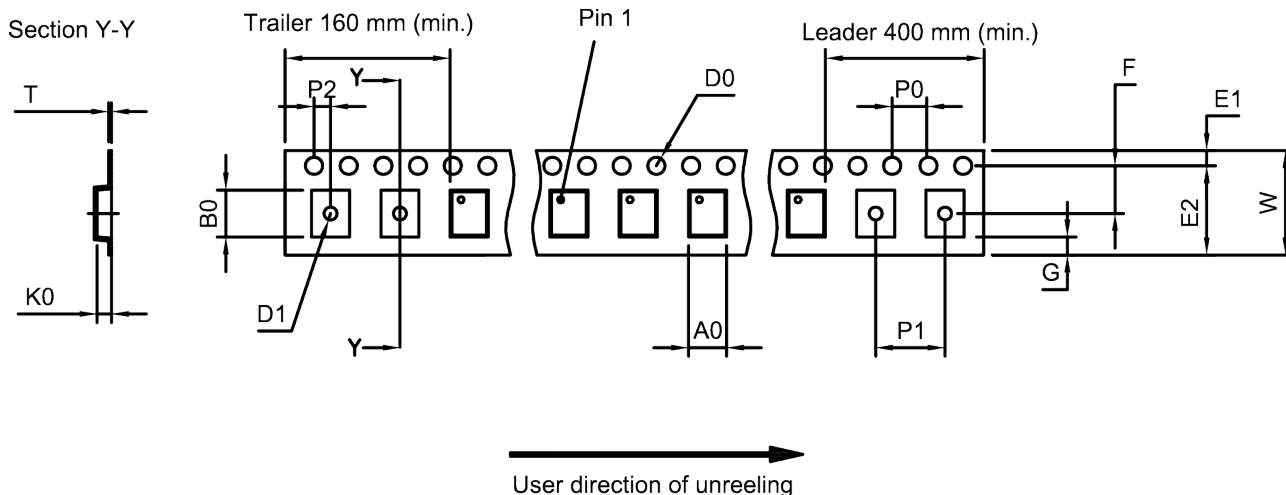


Figure 12: Drawing of tape (first-angle projection) with tape dimensions according to Table 1.

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.

11.2 Reel with diameter of 180 mm

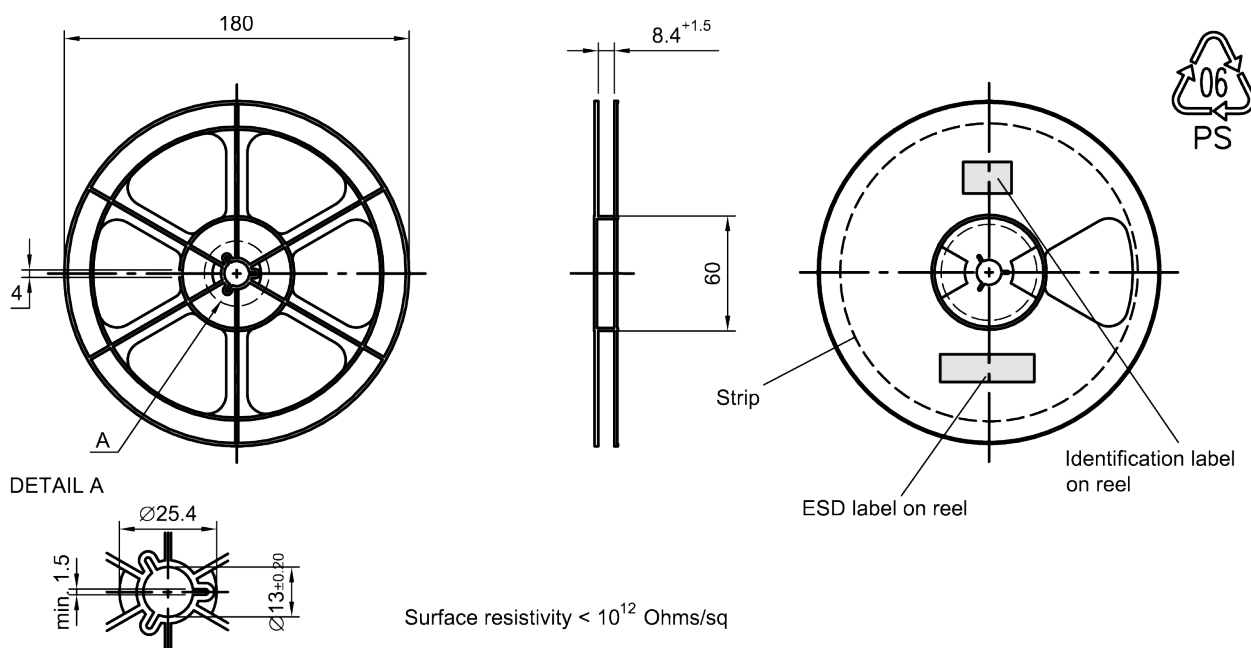


Figure 13: Drawing of reel (first-angle projection) with diameter of 180 mm.

Data sheet

Dimensions [mm]

X = 220±5

Y = 235±5

Sealing area 10±3

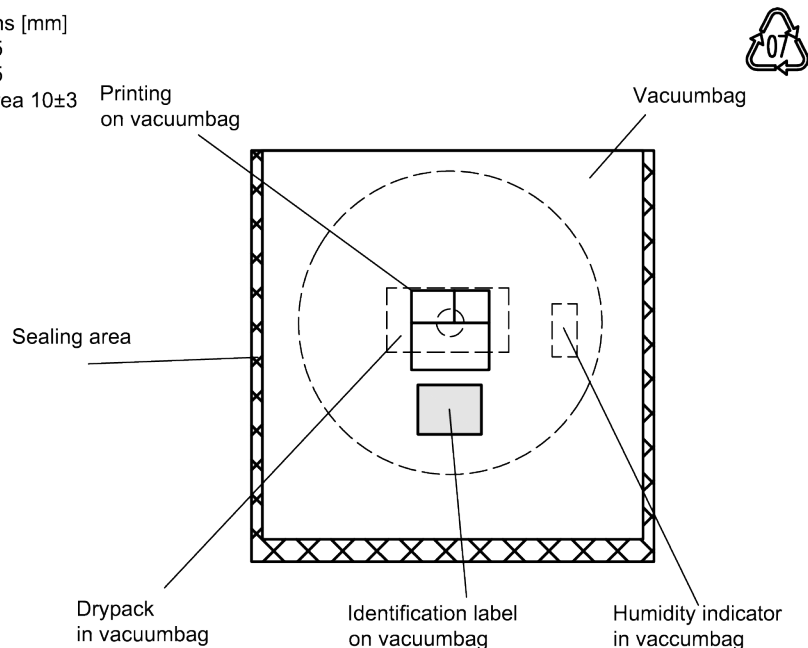


Figure 14: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

Dimensions [mm]

L = 188

B = 188

H = 30

Tolerance ±5

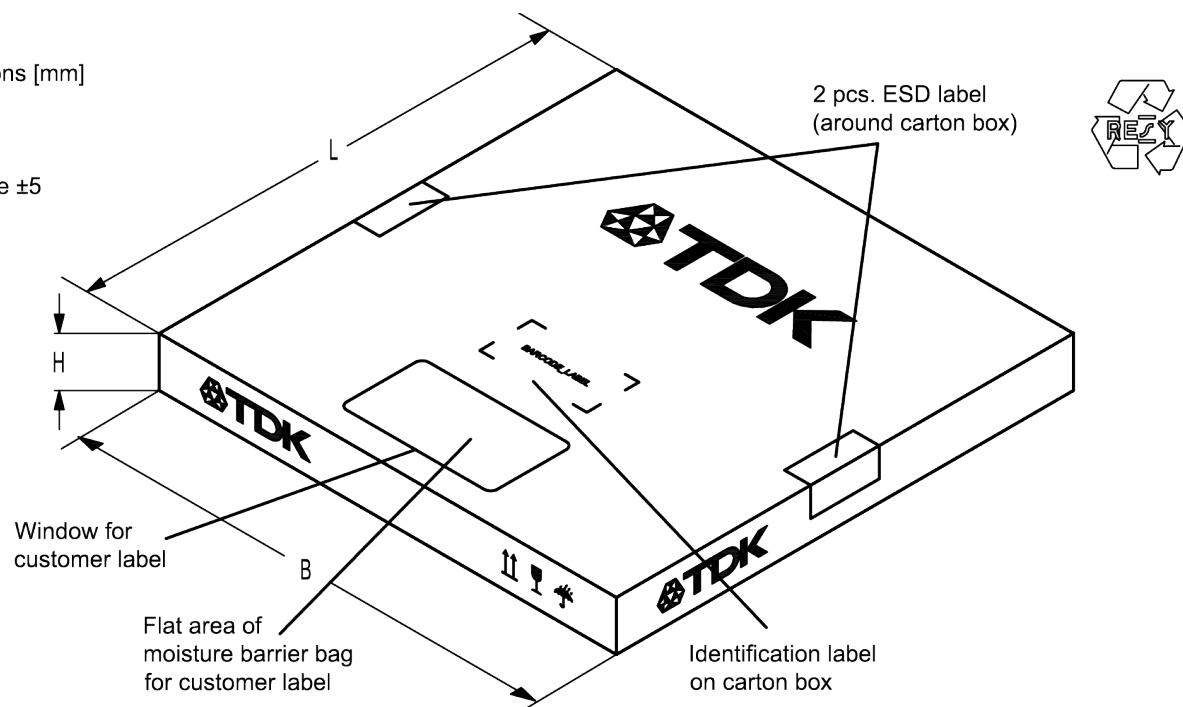


Figure 15: Drawing of folding box for reel with diameter of 180 mm.

Data sheet

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.

$$\begin{array}{rcl} \mathbf{16J} & \Rightarrow & \mathbf{1234} \\ \mathbf{1 \times 32^2 + 6 \times 32^1 + 18 (=J) \times 32^0} & = & \mathbf{1234} \end{array}$$

The BASE32 code for product type B8035 is 7V3.

■ 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.

$$\begin{array}{rcl} \mathbf{5UY} & \Rightarrow & \mathbf{12345} \\ \mathbf{5 \times 47^2 + 27 (=U) \times 47^1 + 31 (=Y) \times 47^0} & = & \mathbf{12345} \end{array}$$

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.

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

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
$T > 220\text{ °C}$	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).

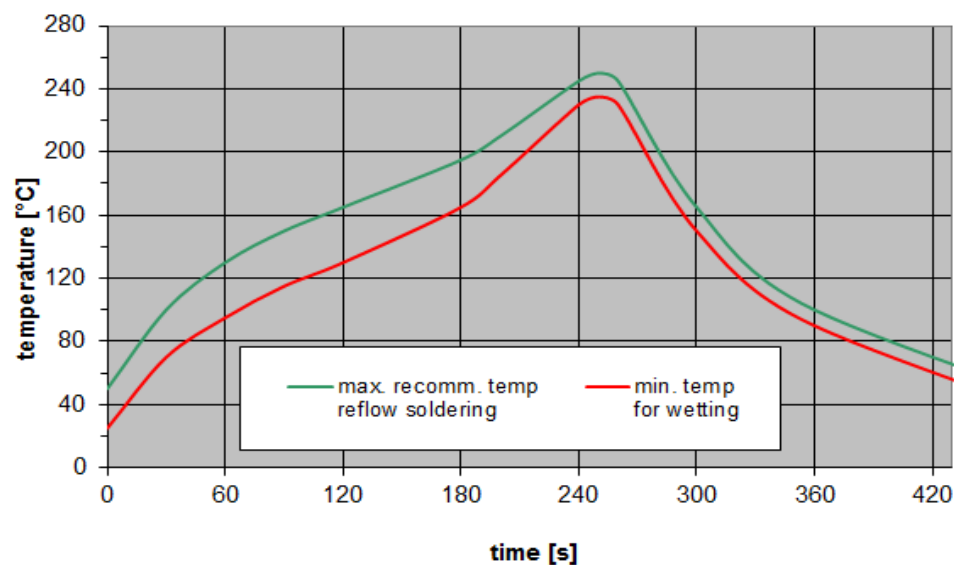


Figure 16: Recommended reflow profile for convection and infrared soldering – lead-free solder.

SAW components	B8035
SAW duplexer	718.0 / 773.0 MHz

Data sheet

14 Annotations

14.1 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>.

14.2 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.

14.3 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.

14.4 Ordering codes and packing units

Ordering code	Packing unit
B39771B8035P810	5000 pcs

Table 4: Ordering codes and packing units.

Data sheet

15 Cautions and warnings

15.1 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.

15.2 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.

15.3 Moldability

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

15.4 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.

Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified**. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.epcos.com/material). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available.
The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, Alu-X, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CSSP, CTVS, DeltaCap, DigiSiMic, DSSP, ExoCore, FilterCap, FormFit, LeaXield, MiniBlue, MiniCell, MKD, MKK, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PQSine, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SIP5D, SIP5K, TFAP, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at www.epcos.com/trademarks.