Qualcomm

RF360
Europe GmbH

Data sheet

SAW RF filter
Base stations

Series/type:	B4233
Ordering code:	B39421B4233U310
Date:	June 19, 2018
Version:	2.1

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RF360 Europe GmbH

A Qualcomm – TDK Joint Venture

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Table of contents

1 Application

- Low-loss filter for TETRA
- Usable pass band: 20 MHz

2 Features

- Package code QCC8C
- Package size $5.0_{\pm 0.15}$ mm × $5.0_{\pm 0.15}$ mm
- Package height $1.35_{+0.15/-0.1}$ mm
- Approximate weight 0.07 g
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Lead free soldering compatible with J-STD20C
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 1 (MSL1)

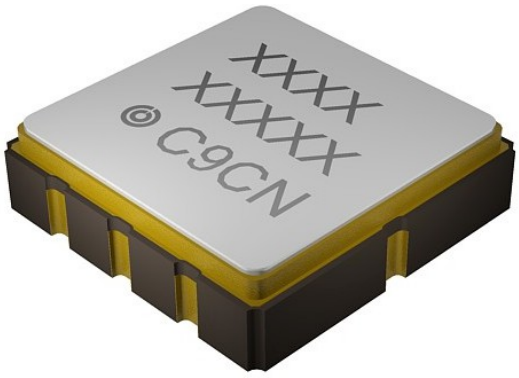

Figure 1: Picture of component with example of product marking.

3 Package

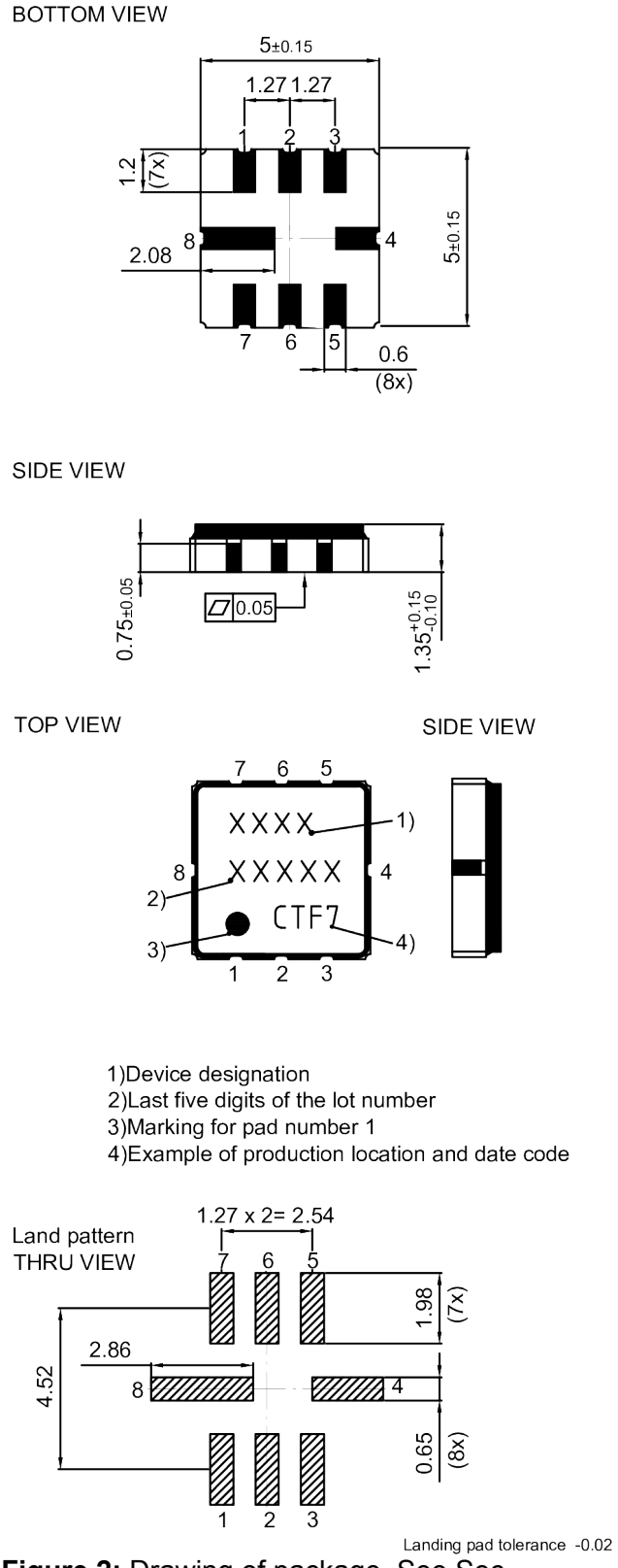

Figure 2: Drawing of package. See Sec. Package information (p. 23).

4 Pin configuration

- 1 Input (filter 1)
- 3 Input (filter 2)
- 5 Output (filter 2)
- 7 Output (filter 1)
- 2, 4, 6, 8 Ground

5 Matching circuit

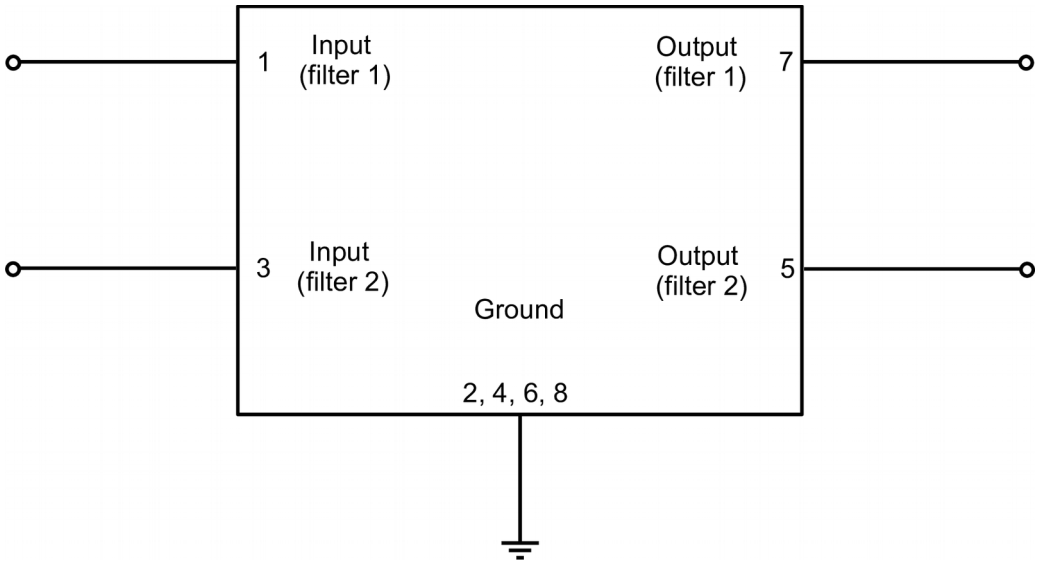

Figure 3: Schematic of matching circuit. No external matching components required.

6 Characteristics TETRA filter 1

Temperature T_{SPEC} = +25 °C
Filter 1 input terminating impedance $Z_{filter\ 1\ IN}$ = 50 Ω
Filter 1 output terminating impedance $Z_{filter\ 1\ OUT}$ = 50 Ω

Characteristics TETRA filter 1				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	390	—	MHz
Maximum insertion attenuation			α_{max}				
	380 ... 400	MHz		—	1.9	2.2	dB
Amplitude ripple (p-p)			Δα				
	380 ... 400	MHz		—	0.7	1.1	dB
Minimum return loss			α				
@ filter 1 input port	380 ... 400	MHz		10	11	—	dB
@ filter 1 output port	380 ... 400	MHz		10	12	—	dB
Minimum attenuation			α_{min}				
	0.1 ... 150	MHz		35	42	—	dB
	190 ... 200	MHz		30	41	—	dB
	228 ... 250	MHz		30	41	—	dB
	252 ... 275	MHz		30	39	—	dB
	275 ... 287	MHz		33	37	—	dB
	304 ... 320	MHz		30	34	—	dB
	320 ... 335	MHz		30	33	—	dB
	342 ... 360	MHz		20	25	—	dB
	418 ... 440	MHz		20	22	—	dB
	442 ... 455	MHz		25	31	—	dB
	456 ... 480	MHz		30	39	—	dB
	492 ... 531	MHz		30	42	—	dB
	532 ... 560	MHz		33	39	—	dB
	570 ... 600	MHz		25	35	—	dB
	632 ... 668	MHz		35	46	—	dB
	684 ... 1000	MHz		27	34	—	dB

Temperature range for specification	T_{SPEC}	= −30 °C ... +60 °C
Filter 1 input terminating impedance	$Z_{filter\ 1\ IN}$	= 50 Ω
Filter 1 output terminating impedance	$Z_{filter\ 1\ OUT}$	= 50 Ω

Characteristics TETRA filter 1				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	390	—	MHz
Maximum insertion attenuation			α_{max}				
	380 ... 400	MHz		—	2.6	3.3	dB
Amplitude ripple (p-p)			Δα				
	380 ... 400	MHz		—	1.4	2.3	dB
Minimum return loss			α				
@ filter 1 input port	380 ... 400	MHz		10	11	—	dB
@ filter 1 output port	380 ... 400	MHz		10	12	—	dB
Minimum attenuation			α_{min}				
	0.1 ... 150	MHz		35	42	—	dB
	190 ... 200	MHz		30	41	—	dB
	228 ... 250	MHz		30	41	—	dB
	252 ... 275	MHz		30	39	—	dB
	275 ... 287	MHz		33	37	—	dB
	304 ... 320	MHz		30	33	—	dB
	320 ... 335	MHz		30	33	—	dB
	342 ... 360	MHz		20	25	—	dB
	418 ... 440	MHz		20	21	—	dB
	442 ... 455	MHz		25	31	—	dB
	456 ... 480	MHz		30	39	—	dB
	492 ... 531	MHz		30	42	—	dB
	532 ... 560	MHz		33	39	—	dB
	570 ... 600	MHz		25	35	—	dB
	632 ... 668	MHz		35	46	—	dB
	684 ... 1000	MHz		27	34	—	dB

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
Filter 1 input terminating impedance	$Z_{filter\ 1\ IN}$	= 50 Ω
Filter 1 output terminating impedance	$Z_{filter\ 1\ OUT}$	= 50 Ω

Characteristics TETRA filter 1				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	390	—	MHz
Maximum insertion attenuation			α_{max}				
	380 ... 400	MHz		—	2.7	3.3	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	380 ... 400	MHz		—	1.5	2.3	dB
Minimum return loss			α				
@ filter 1 input port	380 ... 400	MHz		10	11	—	dB
@ filter 1 output port	380 ... 400	MHz		10	12	—	dB
Minimum attenuation			α_{min}				
	0.1 ... 150	MHz		35	42	—	dB
	190 ... 200	MHz		30	41	—	dB
	228 ... 250	MHz		30	41	—	dB
	252 ... 275	MHz		30	39	—	dB
	275 ... 287	MHz		33	37	—	dB
	304 ... 320	MHz		30	33	—	dB
	320 ... 335	MHz		30	33	—	dB
	342 ... 360	MHz		20	25	—	dB
	418 ... 440	MHz		20	21	—	dB
	442 ... 455	MHz		25	31	—	dB
	456 ... 480	MHz		30	39	—	dB
	492 ... 531	MHz		30	42	—	dB
	532 ... 560	MHz		33	39	—	dB
	570 ... 600	MHz		25	35	—	dB
	632 ... 668	MHz		35	46	—	dB
	684 ... 1000	MHz		27	34	—	dB

7 Characteristics TETRA filter 2

Temperature T_{SPEC} = +25 °C
Filter 2 input terminating impedance $Z_{filter\ 2\ IN}$ = 50 Ω
Filter 2 output terminating impedance $Z_{filter\ 2\ OUT}$ = 50 Ω

Characteristics TETRA filter 2				min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency			f_C	—	420	—	MHz
Maximum insertion attenuation			α_{max}				
	410 ... 430	MHz		—	1.9	2.2	dB
Amplitude ripple (p-p)			Δα				
	410 ... 430	MHz		—	0.6	1.0	dB
Minimum return loss			α				
@ filter 2 input port	410 ... 430	MHz		10	11.5	—	dB
@ filter 2 output port	410 ... 430	MHz		10	13.5	—	dB
Minimum attenuation			α_{min}				
	0.1 ... 150	MHz		35	42	—	dB
	204 ... 216	MHz		30	41	—	dB
	246 ... 270	MHz		30	41	—	dB
	272 ... 301	MHz		35	41	—	dB
	328 ... 344	MHz		30	42	—	dB
	345 ... 360	MHz		25	31	—	dB
	369 ... 387	MHz		18	23	—	dB
	451 ... 473	MHz		20	23	—	dB
	477 ... 491	MHz		25	35	—	dB
	492 ... 516	MHz		30	39	—	dB
	532 ... 573	MHz		30	38	—	dB
	574 ... 602	MHz		33	39	—	dB
	602 ... 1000	MHz		27	34	—	dB

Temperature range for specification	T_{SPEC}	= −30 °C ... +60 °C
Filter 2 input terminating impedance	$Z_{filter\ 2\ IN}$	= 50 Ω
Filter 2 output terminating impedance	$Z_{filter\ 2\ OUT}$	= 50 Ω

Characteristics TETRA filter 2				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	420	—	MHz
Maximum insertion attenuation			α_{max}				
	410 ... 430	MHz		—	2.4	3.3	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	410 ... 430	MHz		—	1.1	2.2	dB
Minimum return loss			α				
@ filter 2 input port	410 ... 430	MHz		10	11.5	—	dB
@ filter 2 output port	410 ... 430	MHz		10	13.5	—	dB
Minimum attenuation			α_{min}				
	0.1 ... 150	MHz		35	42	—	dB
	204 ... 216	MHz		30	41	—	dB
	246 ... 270	MHz		30	41	—	dB
	272 ... 301	MHz		35	41	—	dB
	328 ... 344	MHz		30	35	—	dB
	345 ... 360	MHz		25	31	—	dB
	369 ... 387	MHz		18	23	—	dB
	451 ... 473	MHz		20	21	—	dB
	477 ... 491	MHz		25	35	—	dB
	492 ... 516	MHz		30	39	—	dB
	532 ... 573	MHz		30	38	—	dB
	574 ... 602	MHz		33	39	—	dB
	602 ... 1000	MHz		27	34	—	dB

Temperature range for specification	T_{SPEC}	= −30 °C ... +85 °C
Filter 2 input terminating impedance	$Z_{filter\ 2\ IN}$	= 50 Ω
Filter 2 output terminating impedance	$Z_{filter\ 2\ OUT}$	= 50 Ω

Characteristics TETRA filter 2				**min.** for T_{SPEC}	**typ.** @ +25 °C	**max.** for T_{SPEC}	
Center frequency			f_C	—	420	—	MHz
Maximum insertion attenuation			α_{max}				
	410... 430	MHz		—	2.5	3.3	dB
Amplitude ripple (p-p)			$\Delta\alpha$				
	410... 430	MHz		—	1.2	2.2	dB
Minimum return loss			α				
@ filter 2 input port	410... 430	MHz		10	11.5	—	dB
@ filter 2 output port	410... 430	MHz		10	13.5	—	dB
Minimum attenuation			α_{min}				
	0.1... 150	MHz		35	42	—	dB
	204... 216	MHz		30	41	—	dB
	246... 270	MHz		30	41	—	dB
	272... 301	MHz		35	41	—	dB
	328... 344	MHz		30	35	—	dB
	345... 360	MHz		25	31	—	dB
	369... 387	MHz		18	23	—	dB
	451... 473	MHz		20	21	—	dB
	477... 491	MHz		25	35	—	dB
	492... 516	MHz		30	39	—	dB
	532... 573	MHz		30	38	—	dB
	574... 602	MHz		33	39	—	dB
	602... 1000	MHz		27	34	—	dB

8 Maximum ratings

Operable temperature	T_{OP} = −40 °C ... +125 °C	
Storage temperature	T_{STG} [1)] = −40 °C ... +125 °C	
DC voltage	$\lvert V_{DC} \rvert$ = 3.0 V	
ESD voltage	V_{ESD} [2)] = 100 V	Machine model.
Input power	P_{IN}	
@ filter 1 input port	12 dBm	Continuous wave
@ filter 2 input port	12 dBm	Continuous wave

1) Not valid for packaging material. Please refer to definition of Shelf life (p. 22).
2) According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

9 Transmission coefficient TETRA filter 1

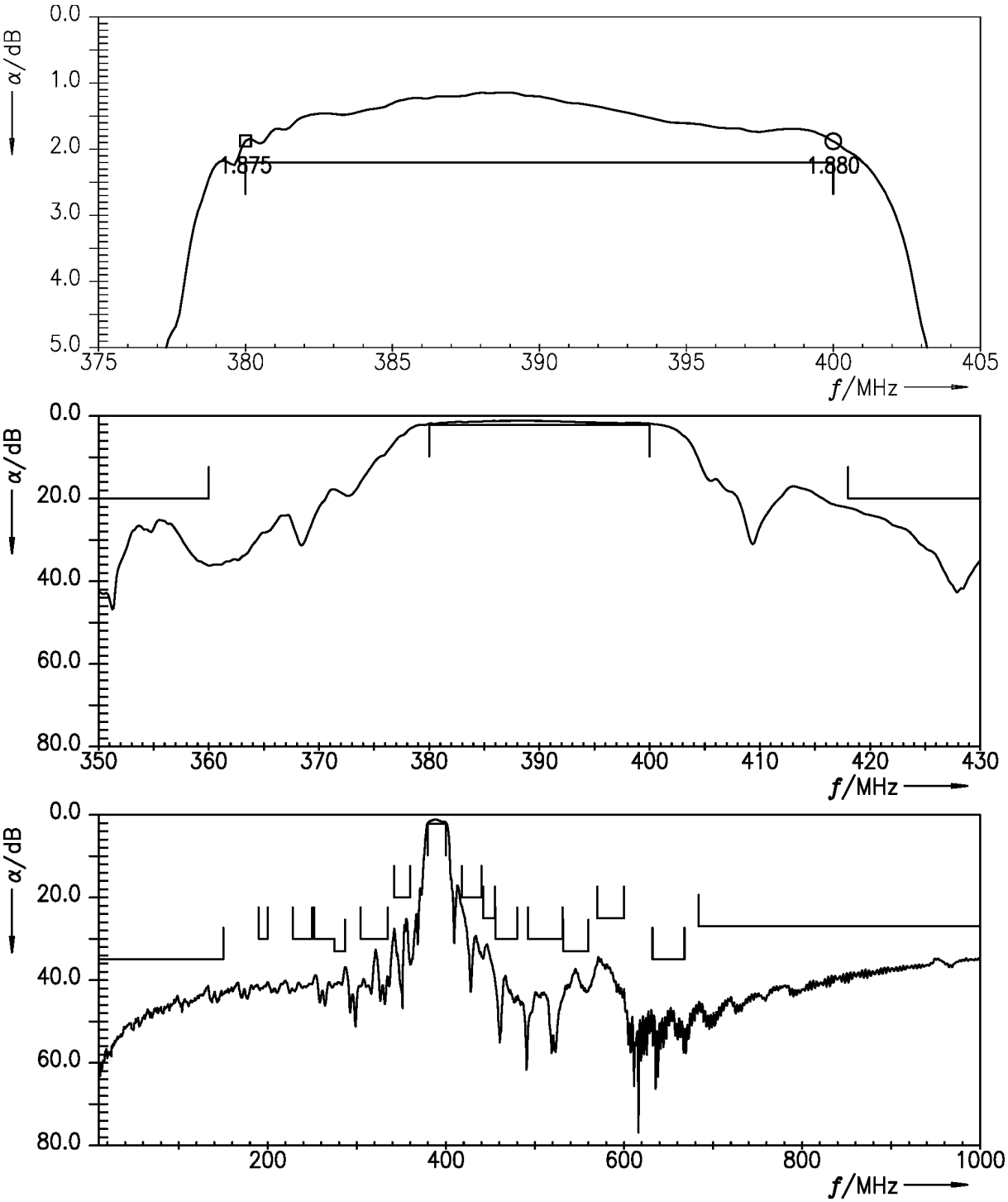

Figure 4: Attenuation TETRA filter 1.

10 Return loss TETRA filter 1

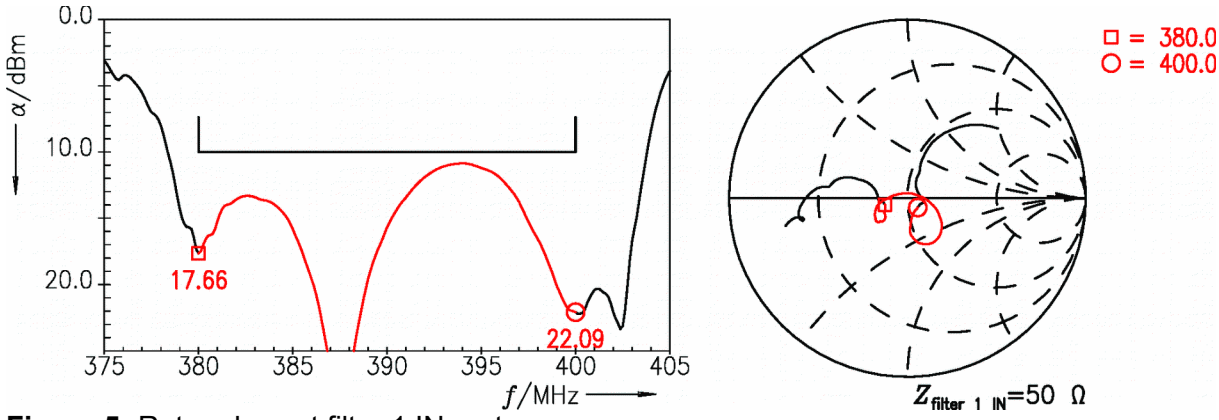

Figure 5: Return loss at filter 1 IN port.

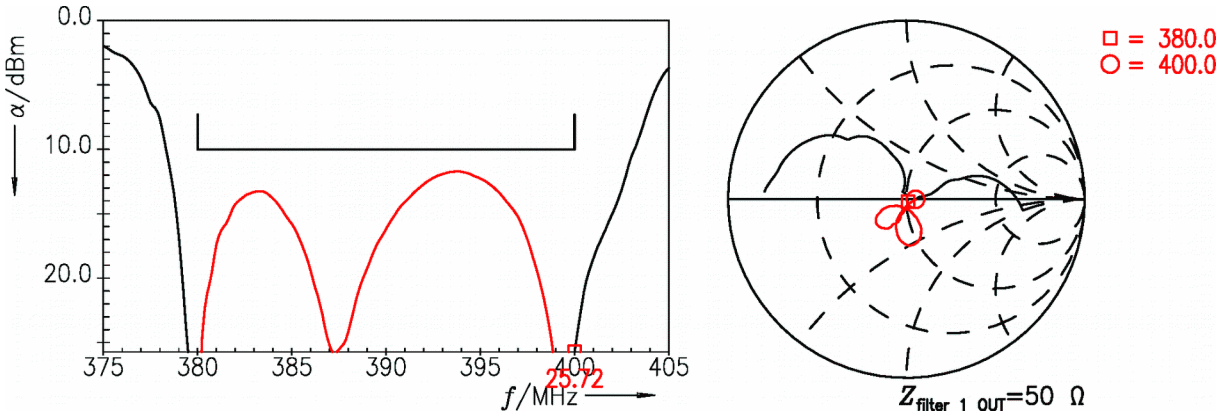

Figure 6: Return loss at filter 1 OUT port.

11 Transmission coefficient TETRA filter 2

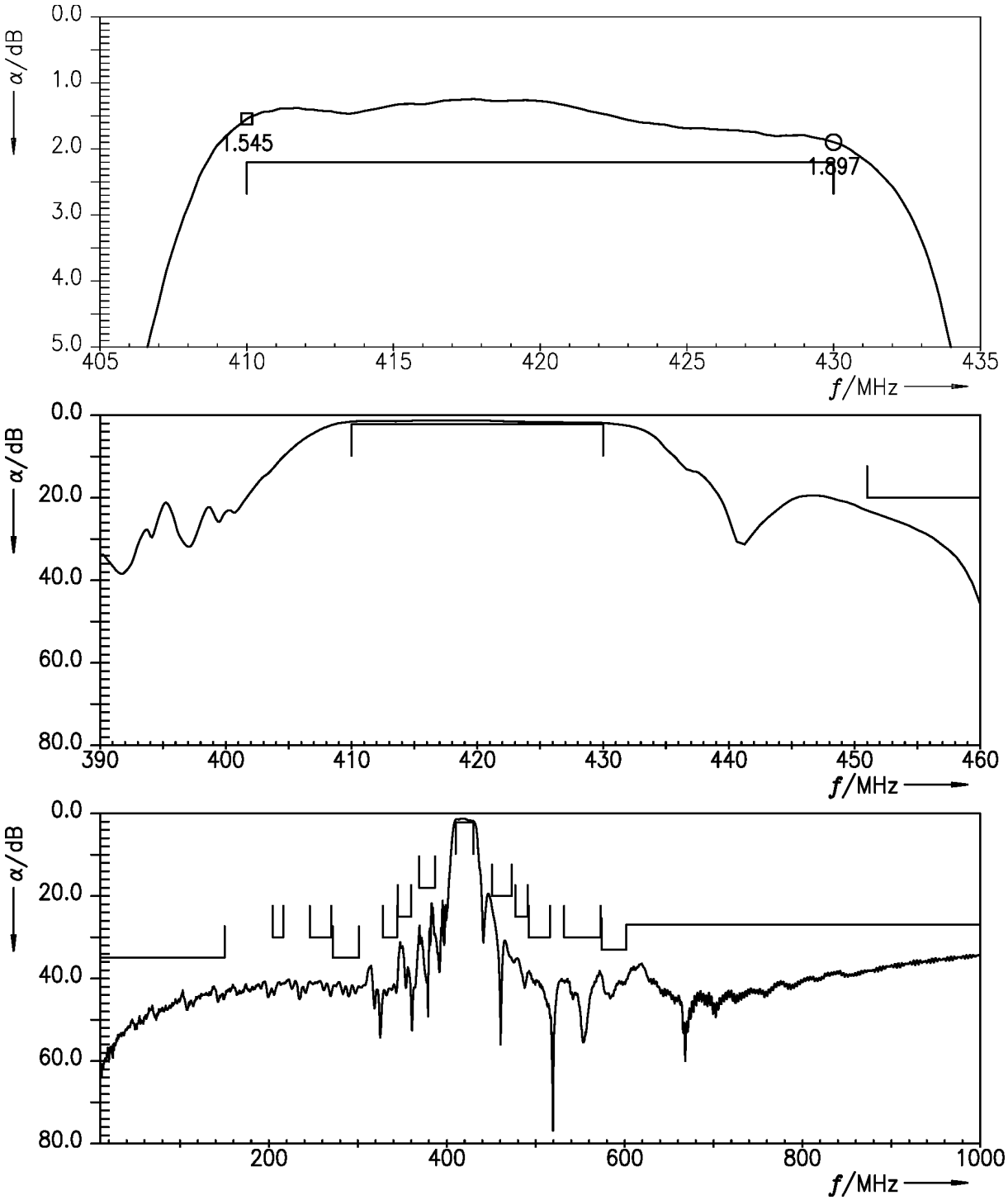

Figure 7: Attenuation TETRA filter 2.

12 Return loss TETRA filter 2

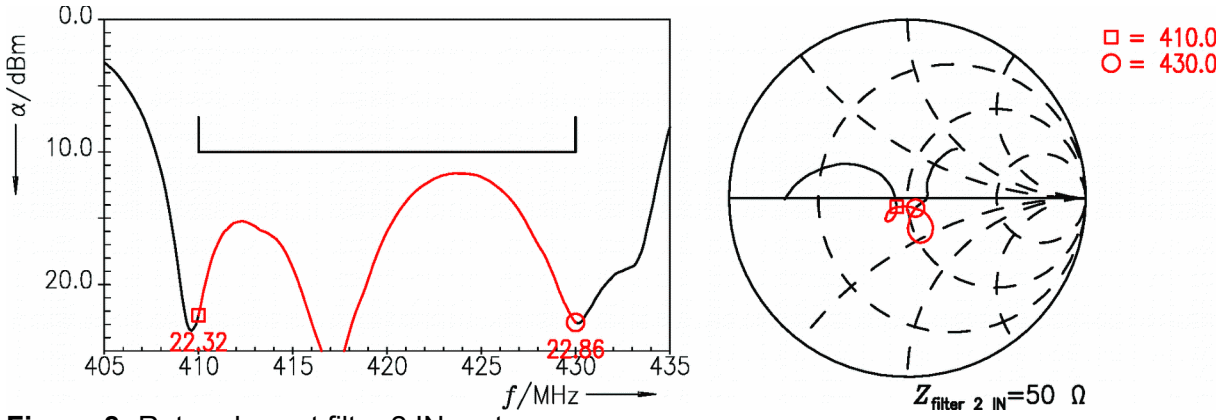

Figure 8: Return loss at filter 2 IN port.

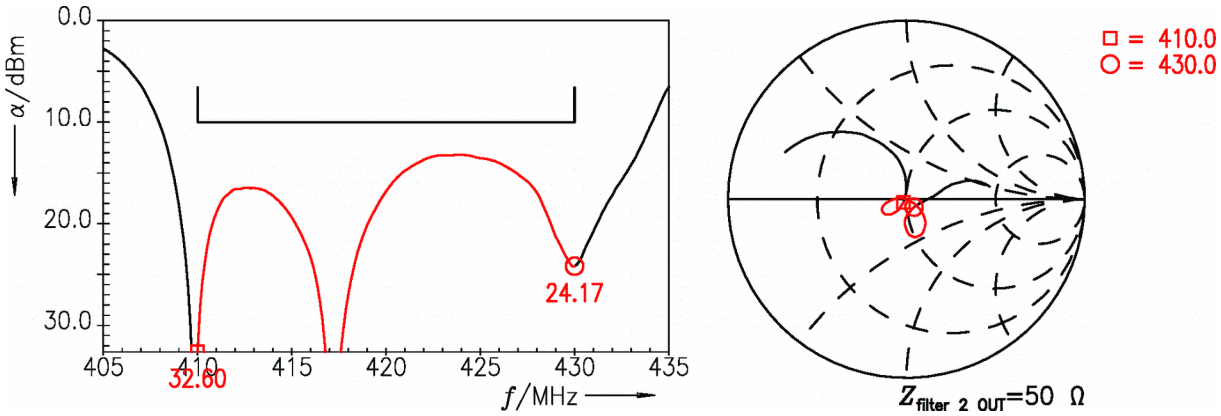

Figure 9: Return loss at filter 2 OUT port.

13 Packing material

13.1 Tape

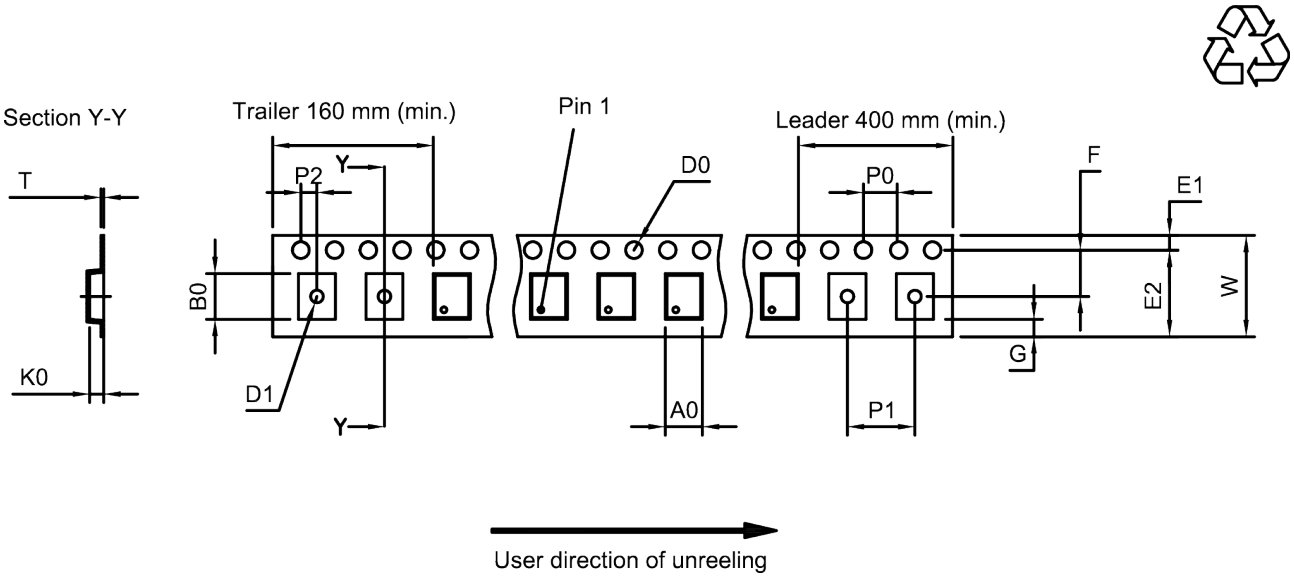

Figure 10: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A_0	5.3±0.1 mm
B_0	5.3±0.1 mm
D_0	1.5+0.1/−0 mm
D_1	1.5 mm (min.)
E_1	1.75±0.1 mm

E_2	10.25 mm (min.)
F	5.5±0.05 mm
G	0.75 mm (min.)
K_0	2.1±0.1 mm
P_0	4.0±0.1 mm

P_1	8.0±0.1 mm
P_2	2.0±0.1 mm
T	0.3±0.05 mm
W	12.0+0.3/−0.1 mm

Table 1: Tape dimensions.

13.2 Reel with diameter of 330 mm

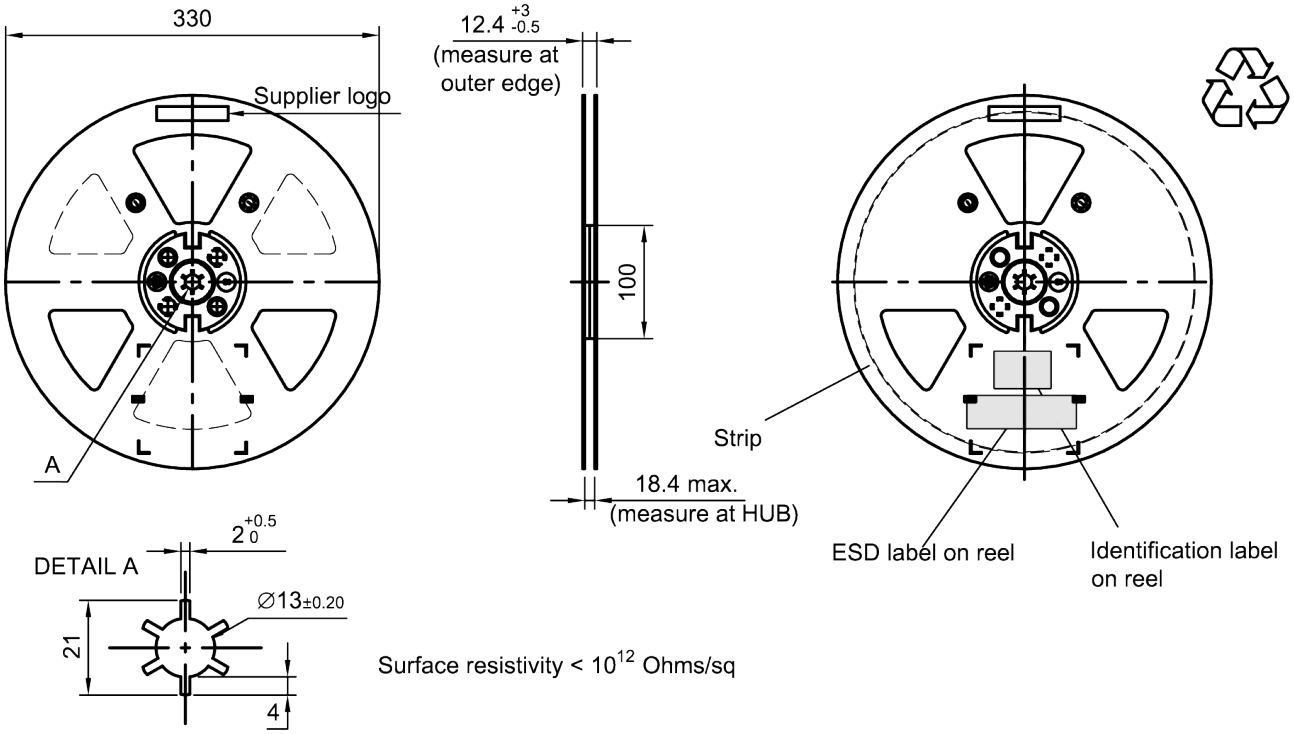

Figure 11: Drawing of reel (first-angle projection) with diameter of 330 mm.

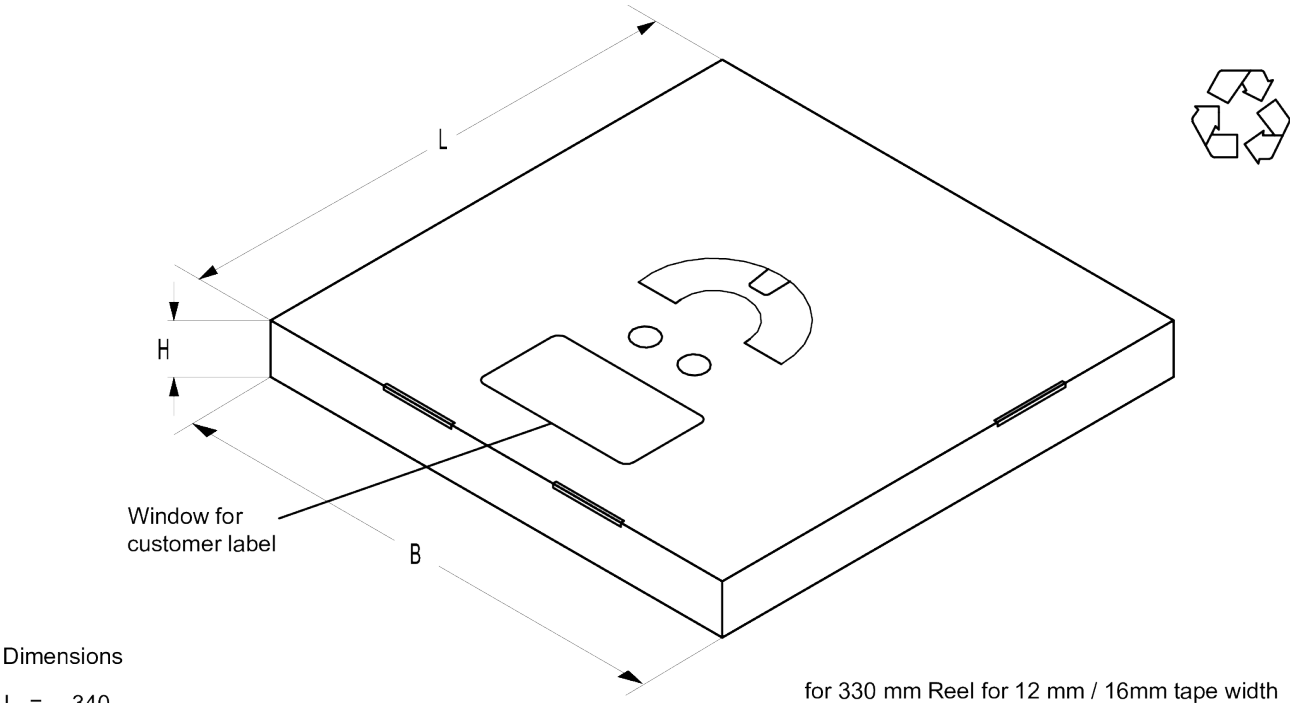

Figure 12: Drawing of folding box for reel with diameter of 330 mm.

14 Marking

Products are marked with device designation, lot number, as well as production location and date code.

- Device designation: The 4-character device designation of the ordering code is used for the marking.

  Example for 4-character device designation: B3xxxxB**1234**xxxx

- Lot number: The last 5 digits of the lot number are used for the marking.

  Example: **12345**

- Production location and date code: The production location is Wuxi (encoded in the first character 'C'). The production date code is encoded in the last three characters according to Table 2.

1st digit (day)					
Day	Code	Day	Code	Day	Code
1	1	11	A	21	M
2	2	12	B	22	N
3	3	13	C	23	P
4	4	14	D	24	R
5	5	15	E	25	S
6	6	16	F	26	T
7	7	17	H	27	U
8	8	18	J	28	V
9	9	19	K	29	W
10	0	20	L	30	X
				31	Z

2nd digit (year)			
Year	Code	Year	Code
2010	A	2022	P
2011	B	2023	R
2012	C	2024	S
2013	D	2025	T
2014	E	2026	U
2015	F	2027	V
2016	H	2028	W
2017	J	2029	X
2018	K	2030	Z
2019	L	2031	A
2020	M	2032	B
2021	N	and so on	

3rd digit (month)			
Month	Code	Month	Code
Jan	1	Jul	7
Feb	2	Aug	8
Mar	3	Sep	9
Apr	4	Oct	0
May	5	Nov	N
Jun	6	Dec	D

Table 2: Production date code.

Example of how to decode production location and date code:

Code: **C T F 6**

Location: C → Wuxi
Day: T → 26th
Year: F → 2015
Month: 6 → June

15 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).

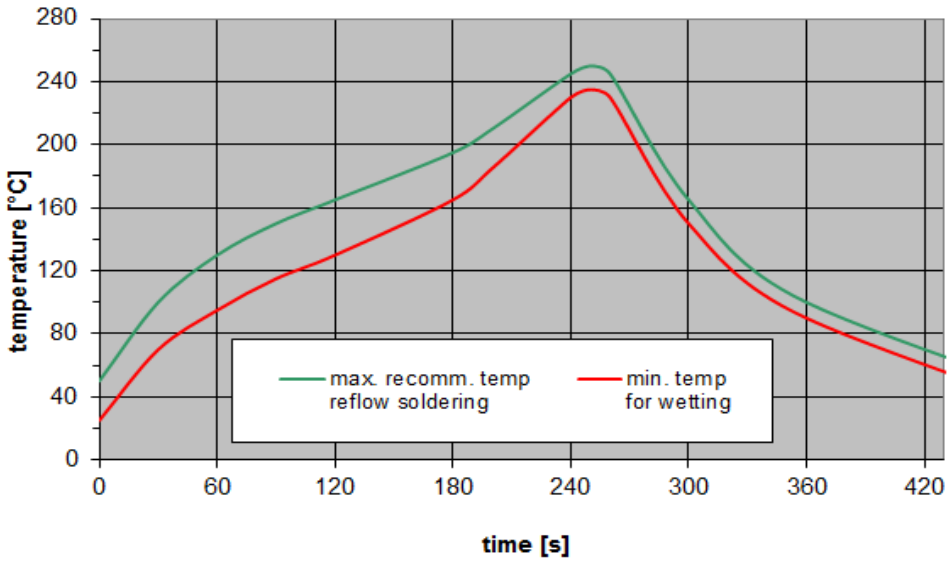

Figure 13: Recommended reflow profile for convection and infrared soldering – lead-free solder.

16 Annotations

16.1 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.

16.2 Scattering parameters (S-parameters)

The pin/port assignment is available in the headers of the S-parameter files. Please contact your local RF360 sales office.

16.3 Shelf life

The shelf life of components is determined by solderability of the package terminals. It is specified as 2 years from manufacturing date assuming the following conditions:

- storage in original packaging and non-aggressive atmosphere,
- storage temperature ranging from −25 °C to +40 °C, and
- storage humidity with ≤ 75 % r.h. mean annual humidity, ≤ 95 % r.h. for max. 30 days / year, and no dew condensation.

17 Cautions and warnings

17.1 Display of ordering codes for RF360 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 RF360, 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.rf360jv.com/orderingcodes.

17.2 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.

For information on recycling of tapes and reels please contact one of our sales offices.

17.3 Moldability

Before using in overmolding environment, please contact your local RF360 sales office.

17.4 Package information

Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on RF360 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 RF360, 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.

18 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, RF360 Europe GmbH and its affiliates are 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 RF360 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.rf360jv.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.