



RF360
Europe GmbH

Data sheet

SAW RF filter
Short range devices

Series/type:	B3715
Ordering code:	B39871B3715U410

Date:	March 15, 2019
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Version:	2.3
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A Qualcomm – TDK Joint Venture

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1 Application

- Low-loss RF filter for remote control receivers
- No matching network required for operation at 50 Ω

2 Features

- Package size 3.0 \pm 0.1 mm × 3.0 \pm 0.1 mm
- Package height 1.1 \pm 0.125 mm
- Package code DCC6C
- Approximate weight 0.04 g
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Lead free soldering compatible with J-STD20C
- Filter surface passivated
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 1 (MSL1)
- AEC-Q200 qualified component family (Grade 1: -40 °C to +125 °C)

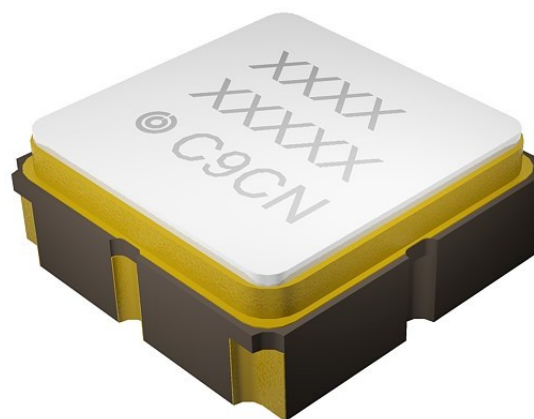
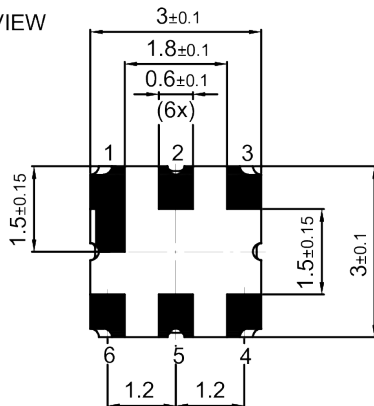


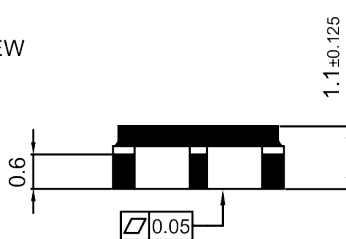
Figure 1: Picture of component with example of product marking.

3 Package

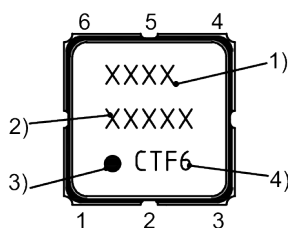
BOTTOM VIEW



SIDE VIEW



TOP VIEW



SIDE VIEW



- 1) Device designation
- 2) Last five digits of the lot number
- 3) Marking for pad number 1
- 4) Example of production location and date code

Land pattern
 THRU VIEW

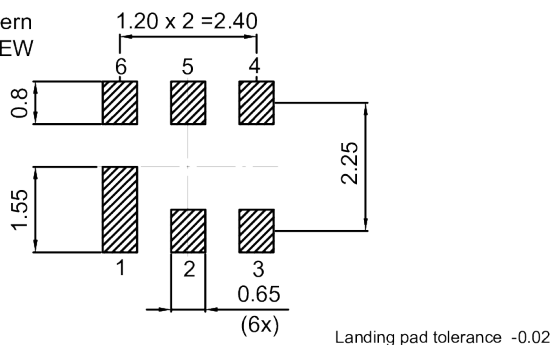


Figure 2: Drawing of package. See Sec. Package information (p. 17).

4 Pin configuration

- 2 Input
- 5 Output
- 1, 3, 4, 6 Ground

5 Matching circuit



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

6 Characteristics

Temperature	T_{SPEC}	= 25 °C
Input terminating impedance	Z_{IN}	= 50 Ω
Output terminating impedance	Z_{OUT}	= 50 Ω

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_c	—	869	—	MHz
Maximum insertion attenuation		α_{max}	—	2.4	3.1	dB
	868... 870	MHz				
Amplitude ripple (p-p)		$\Delta\alpha$	—	0.6	1.2	dB
	868... 870	MHz				
Temperature coefficient of frequency		TC_f	—	-30.0	—	ppm/K
Minimum attenuation		α_{min}				
	10... 845	MHz	37	41	—	dB
	845... 851	MHz	32	36	—	dB
	851... 858	MHz	20	24	—	dB
	883... 892	MHz	35	40	—	dB
	892... 1000	MHz	42	47	—	dB

Temperature range for specification T_{SPEC} = -40 °C ... +85 °C
 Input terminating impedance Z_{IN} = 50 Ω
 Output terminating impedance Z_{OUT} = 50 Ω

Characteristics			min. for T_{SPEC}	typ. @ +25 °C	max. for T_{SPEC}	
Center frequency		f_c	—	869	—	MHz
Maximum insertion attenuation		α_{max}	—	2.6	3.3	dB
	868... 870	MHz				
Amplitude ripple (p-p)		$\Delta\alpha$	—	0.6	1.2	dB
	868... 870	MHz				
Temperature coefficient of frequency		TC_f	—	-30.0	—	ppm/K
Minimum attenuation		α_{min}				
	10... 845	MHz	37	41	—	dB
	845... 851	MHz	32	36	—	dB
	851... 856.8	MHz	20	24	—	dB
	883... 892	MHz	20	35	—	dB
	892... 1000	MHz	42	47	—	dB

7 Maximum ratings

Operable temperature	$T_{OP} = -45\text{ °C} \dots +125\text{ °C}$	
Storage temperature	$T_{STG}^{1)} = -45\text{ °C} \dots +125\text{ °C}$	
DC voltage	$ V_{DC} = 5.0\text{ V}$	
Source power	P_S	
	13 dBm	Source impedance 50 Ω.
868 ... 870 MHz	18 dBm	1000 hours, duty cycle 1:10, -40 °C to +85 °C.

¹⁾ Not valid for packaging material. Please refer to definition of Shelf life (p. 16).

8 Transmission coefficient

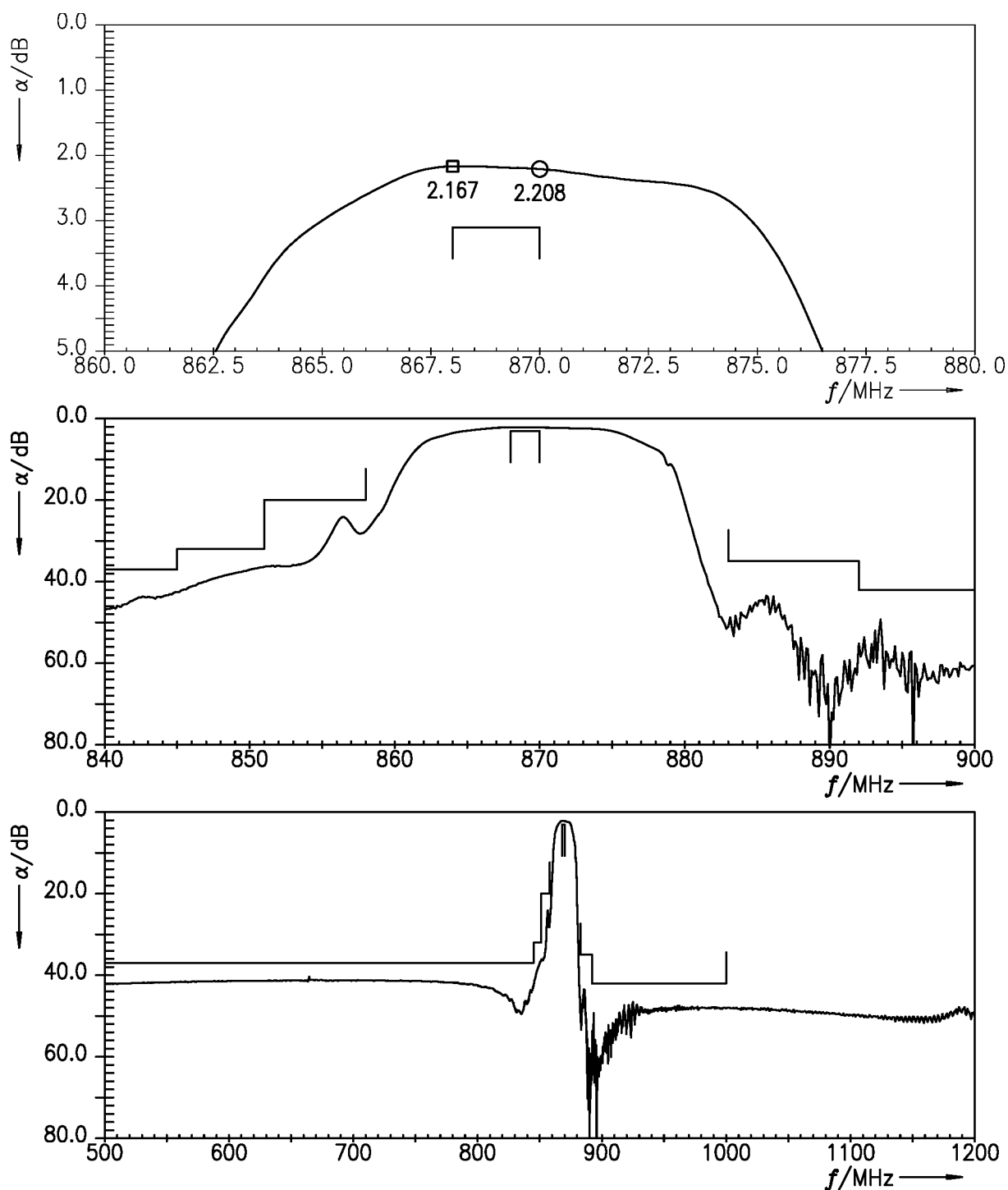


Figure 4: Attenuation .

9 Packing material

9.1 Tape

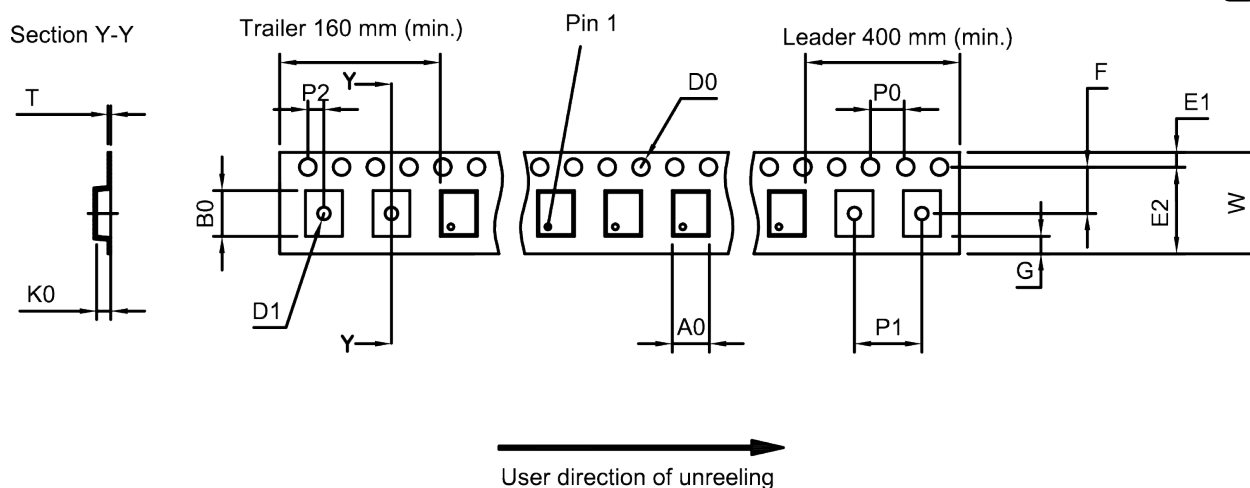


Figure 5: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

A ₀	3.25±0.1 mm
B ₀	3.3±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	1.5±0.1 mm
P ₀	4.0±0.1 mm

P ₁	4.0±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.

10 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: B3xxxxB1234xxxx

- 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.

1 st digit (day)						2 nd digit (year)				3 rd digit (month)			
Day	Code	Day	Code	Day	Code	Year	Code	Year	Code	Month	Code	Month	Code
1	1	11	A	21	M	2010	A	2022	P	Jan	1	Jul	7
2	2	12	B	22	N	2011	B	2023	R	Feb	2	Aug	8
3	3	13	C	23	P	2012	C	2024	S	Mar	3	Sep	9
4	4	14	D	24	R	2013	D	2025	T	Apr	4	Oct	0
5	5	15	E	25	S	2014	E	2026	U	May	5	Nov	N
6	6	16	F	26	T	2015	F	2027	V	Jun	6	Dec	D
7	7	17	H	27	U	2016	H	2028	W				
8	8	18	J	28	V	2017	J	2029	X				
9	9	19	K	29	W	2018	K	2030	Z				
10	0	20	L	30	X	2019	L	2031	A				
				31	Z	2020	M	2032	B				
						2021	N	and so on					

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

11 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).

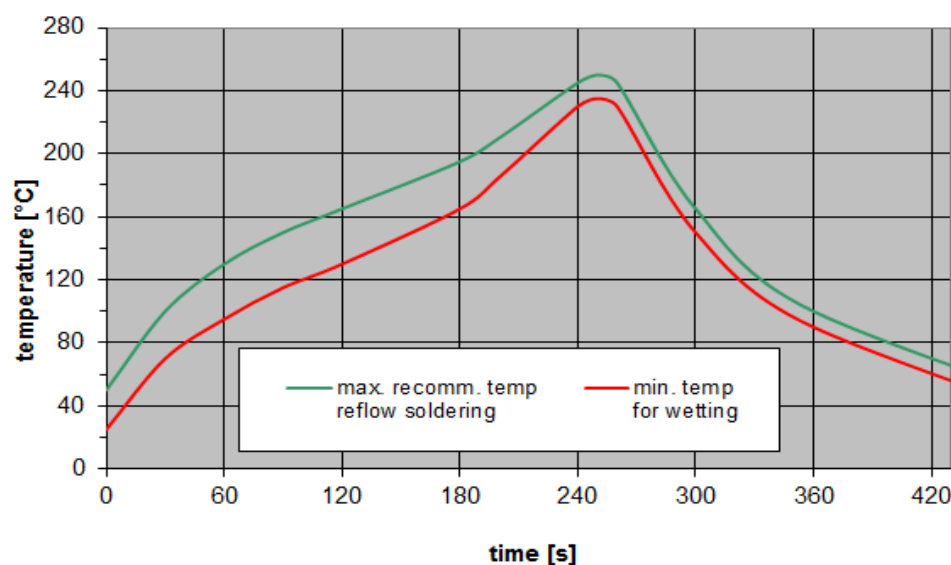


Figure 8: Recommended reflow profile for convection and infrared soldering – lead-free solder.

12 ESD protection of SAW filters

SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.

In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore, only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wide band filters the high-pass ESD matching structure needs to be at least of 3rd order to ensure a proper matching for any impedance value of antenna and SAW filter input. The required component values have to be determined from case to case.

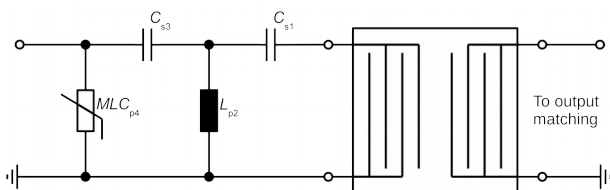


Figure 9: MLC varistor plus ESD matching.



Figure 10: Suppressor diode plus ESD matching.

In cases where minor ESD occur, following simplified “ESD matching” topologies can be used alternatively.

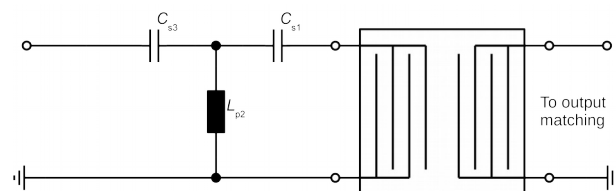


Figure 11: 3rd order high-pass structure for basic ESD protection.

In all three figures the shunt inductor L_{p2} could be replaced by a shorted microstrip with proper length and width. If this configuration is possible depends on the operating frequency and available PCB space.

Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements.

For further information, please refer to RF360 Application report: “**ESD protection for SAW filters**”. This report can be found under www.rf360jv.com/rke. Click on “Applications Notes”.

13 Annotations

13.1 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.

13.2 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.

13.3 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 $-25\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$, and
- storage humidity with $\leq 75\text{ \% r.h.}$ mean annual humidity, $\leq 95\text{ \% r.h.}$ for max. 30 days / year, and no dew condensation.

14 Cautions and warnings

14.1 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.

14.2 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.

14.3 Moldability

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

14.4 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.

15 Important notes

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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.
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