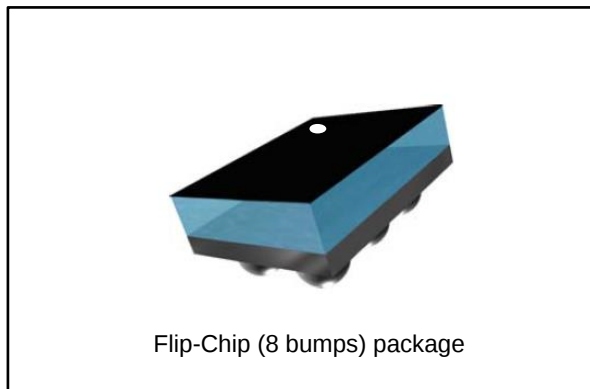


50 ohm nominal input / conjugate match balun CC1120, CC1125, 433 MHz, with integrated harmonic filter

Datasheet - production data



Description

STMicroelectronics' BALF-112X-02D3 is an ultra-miniature balun, integrating both matching network and harmonics filter.

Matching impedance has been customized for the CC1120, CC1125, CC1175 and CC1200 transceivers from Texas Instruments.

The device uses STMicroelectronics' IPD technology on a non-conductive glass substrate, which optimizes RF performance.

Features

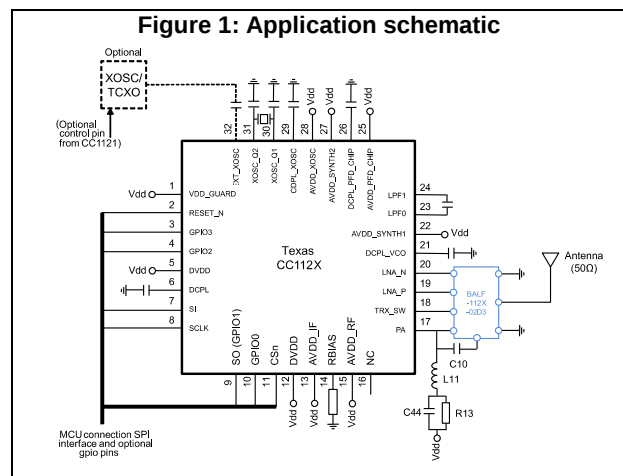
- 50 Ω nominal input / conjugate match to CC1120, CC1125, CC1175, CC1200
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint

Benefits

- Very low profile (< 630 μm thickness)
- High RF performance
- RF BOM and size reduction

Applications

- 433 MHz impedance-matched balun filter optimized for Texas Instruments® CC1120, CC1125, CC1175, CC1200 sub-GHz RFICs



C10 is a DC block capacitor: 0402/100 pF/50 V

1 Characteristics

Table 1: Absolute maximum ratings (limiting values)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P _{IN}	Input power RFIN		-	20	dBm
V _{ESD}	ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5 Ω , air discharge)	1300	-		V
	ESD ratings machine model (MM: C = 200 pF, R = 25 W, L = 500 nH)	250	-		
T _{OP}	Operating temperature	-40	-	+85	°C

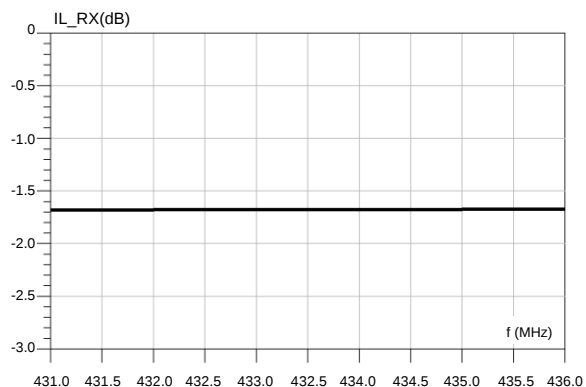
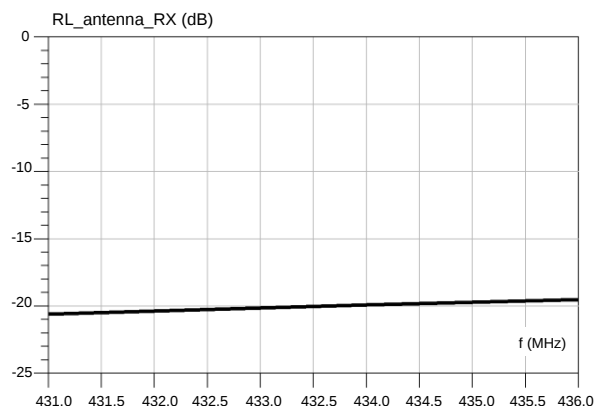
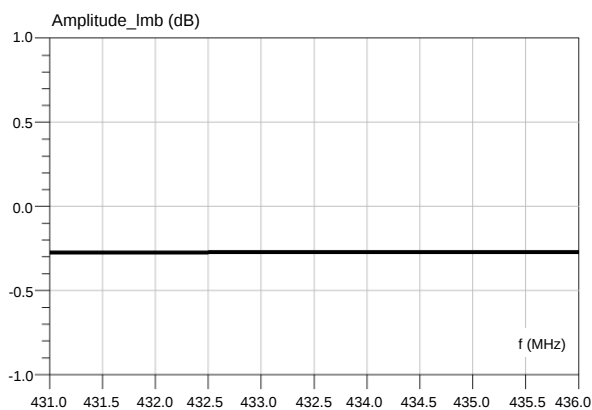
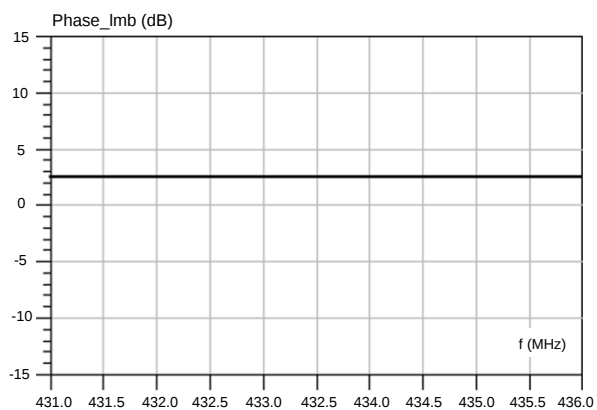
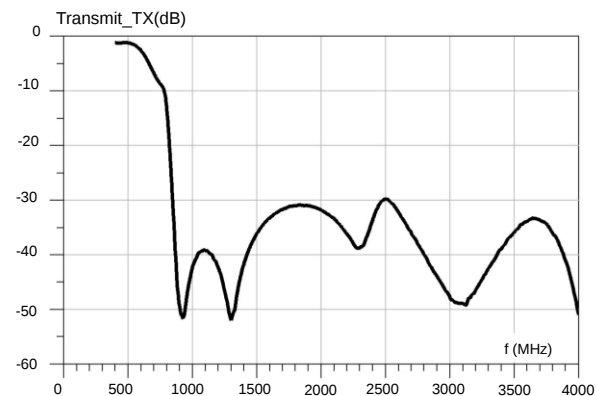
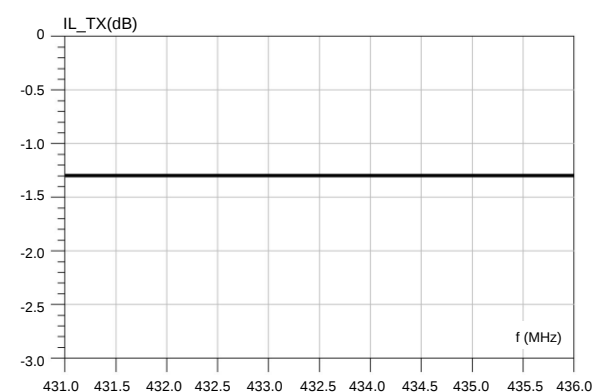
Table 2: Electrical characteristics and RF performance (T_{amb} = 25 °C) RX balun

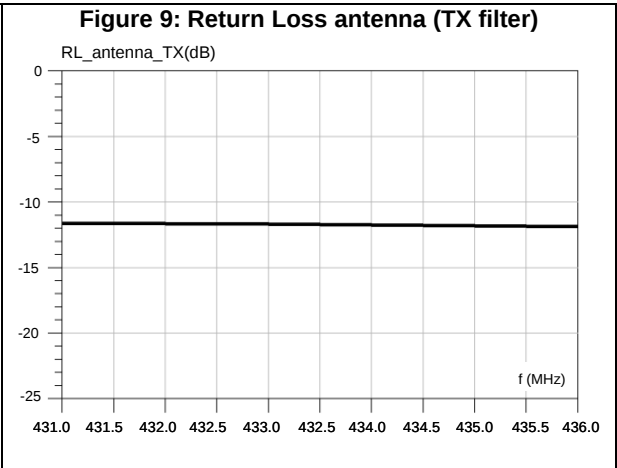
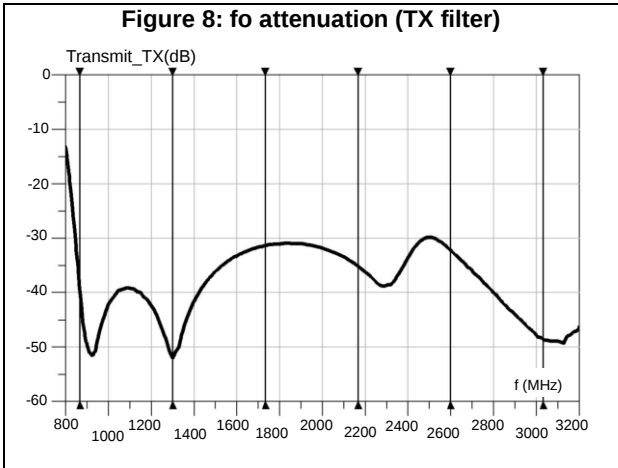
Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z _{RX}	Nominal differential impedance		Match to CC112X		Ω
Z _{ANT}	Antenna impedance		50		Ω
f	Frequency range (bandwidth)	431		436	MHz
S _{21RX-ANT}	Insertion loss in bandwidth	-1.9	-1.7		dB
S _{11ANT}	Input return loss in bandwidth		-20	-18	dB
Phase_imbal	Output phase imbalance	0	1.7	10	°
Ampl_imbal	Output amplitude imbalance		0.3	1	dB

Table 3: Electrical characteristics and RF performance ($T_{amb} = 25\text{ °C}$) TX filter

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
Z_{TX}	Nominal TX impedance			Match to CC112X		Ω
Z_{ANT}	Antenna impedance			50		Ω
f	Frequency range (bandwidth)		431		436	MHz
$S_{21_{TX-ANT}}$	Insertion loss in bandwidth		-1.5	-1.3		dB
$S_{11_{ANT}}$	Input return loss in bandwidth			-12	-10	dB
Att	Harmonic levels	Attenuation at 2 fo		-40	-26	dBm
		Attenuation at 3 fo		-52	-46	
		Attenuation at 4 fo		-31	-30	
		Attenuation at 5 fo		-35	-32	
		Attenuation at 6 fo		-32	-28	
		Attenuation at 7 fo		-48	-44	

1.1 RF measurement

Figure 2: Insertion loss (RX balun)**Figure 3: Return loss antenna (RX balun)****Figure 4: Amplitude imbalance (RX balun)****Figure 5: Phase imbalance (RX balun)****Figure 6: TX filter transmission****Figure 7: Insertion loss (TX filter)**



2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

2.1 Flip-Chip CSPG 0.4 package information

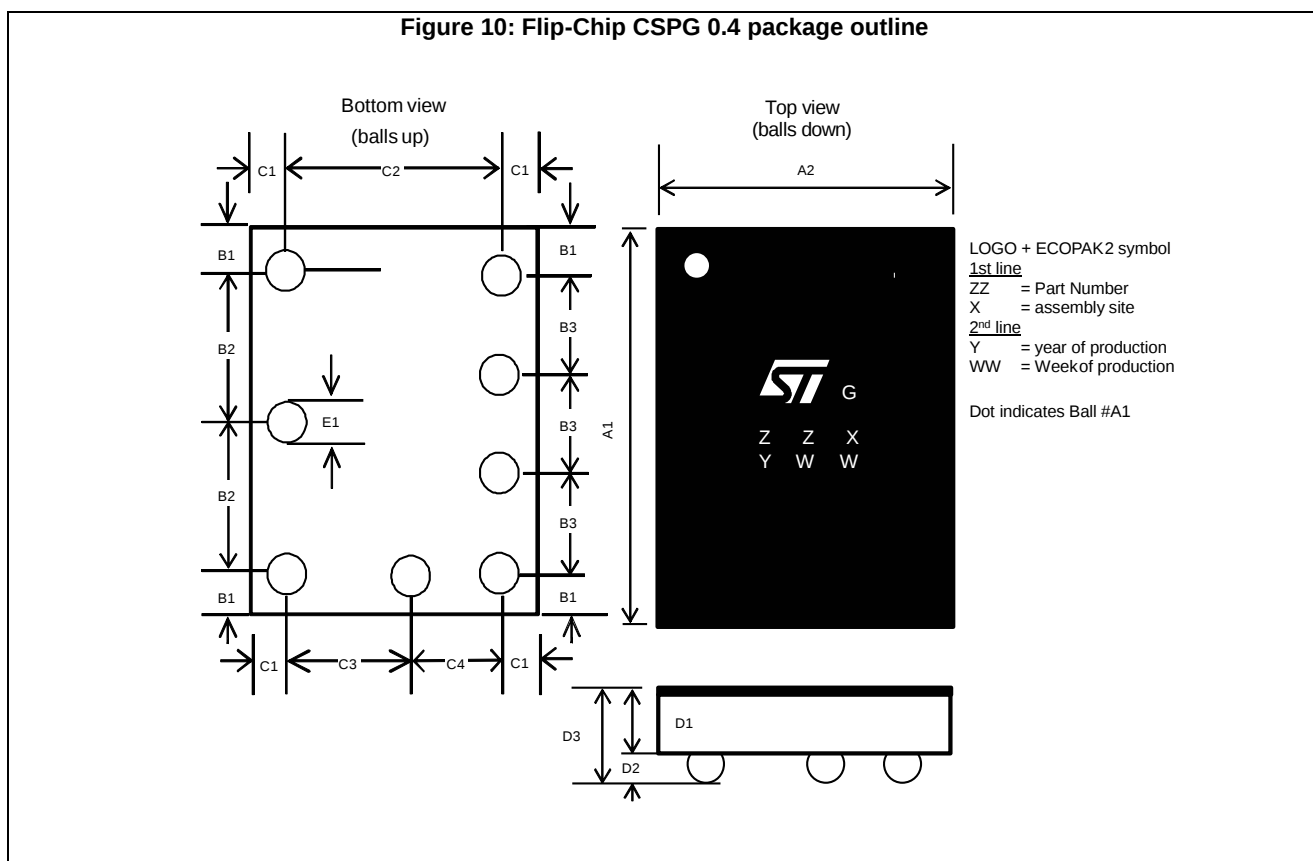


Table 4: Flip-Chip CSPG 0.4 mechanical data

Dimensions	Frequency	A1	A2	B1	B2	B3	C1	C2	C3	C4	D1	D2	D3	E1
BAL-112X-02D3	433 MHz	1950	1870	225	750	500	223	1424	820	604	425	205	630	255

Figure 11: Footprint - non solder mask defined

Copper pad diameter:
220µm recommended
180µm minimum
260µm maximum

Solder mask opening:
320µm recommended
300µm minimum
340µm maximum

Solder stencil opening:
220µm recommended

Line to connect copper pad on solder mask opening
should be smaller than copper pad diameter

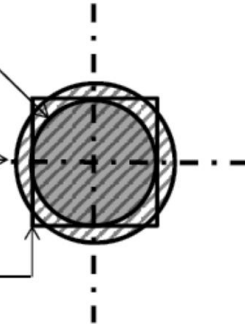


Figure 12: Footprint - solder mask defined

Solder mask opening:
220µm recommended
180µm minimum
260µm maximum

Copper pad diameter:
320µm recommended
300µm minimum

Solder stencil opening :
220µm recommended

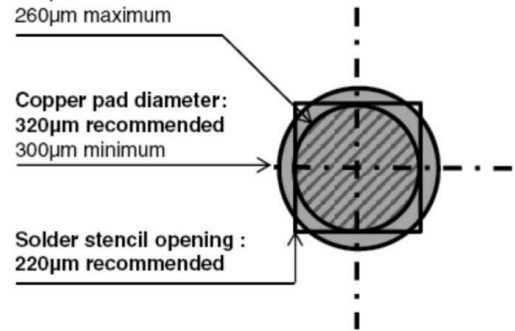


Figure 13: Ball assignment

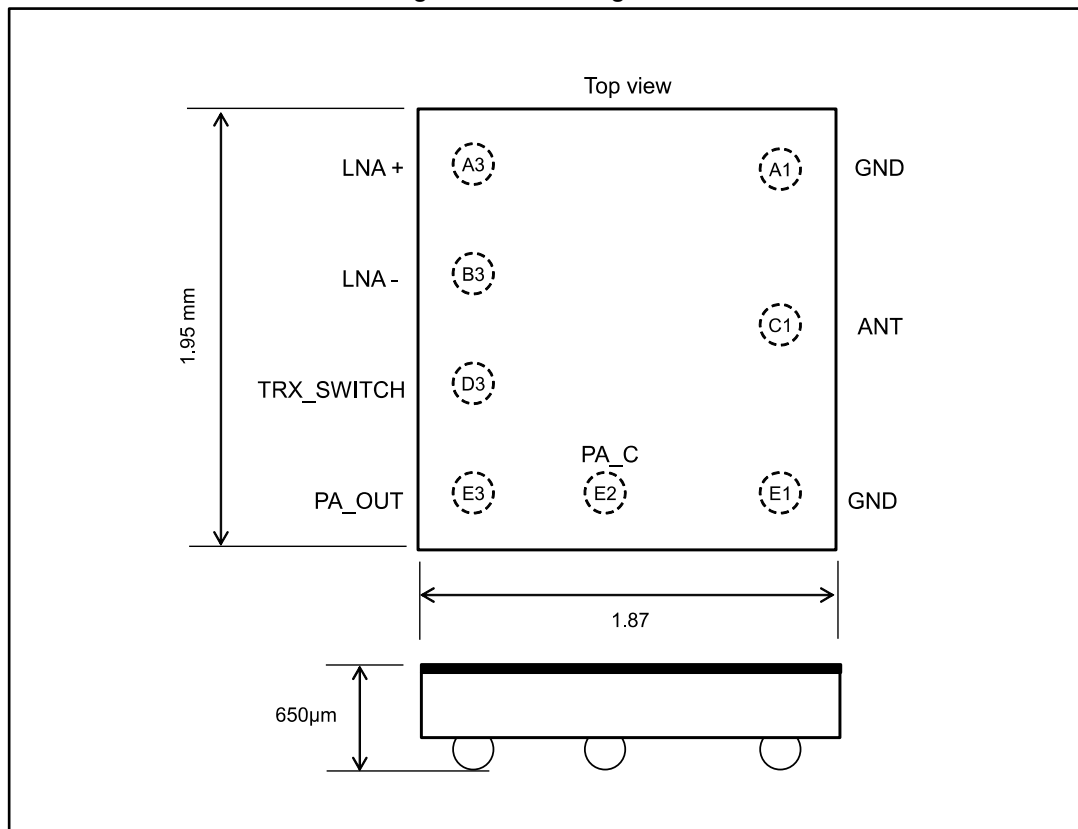


Table 5: Flip-Chip CSPG 0.4 ball description

Ball	Name	Designation
A1	GND	Ground
A3	LNA-	Connect to LNA_N
B3	LNA+	Connect to LNA_P
C1	ANT	Connect to antenna
D3	TRX_SW	Connect to TRX switch
E1	GND	Ground
E2	PA_C	Connect to PA output thru C10
E3	PA_OUT	Connect to PA

Figure 14: Application board EVB (4 layers)

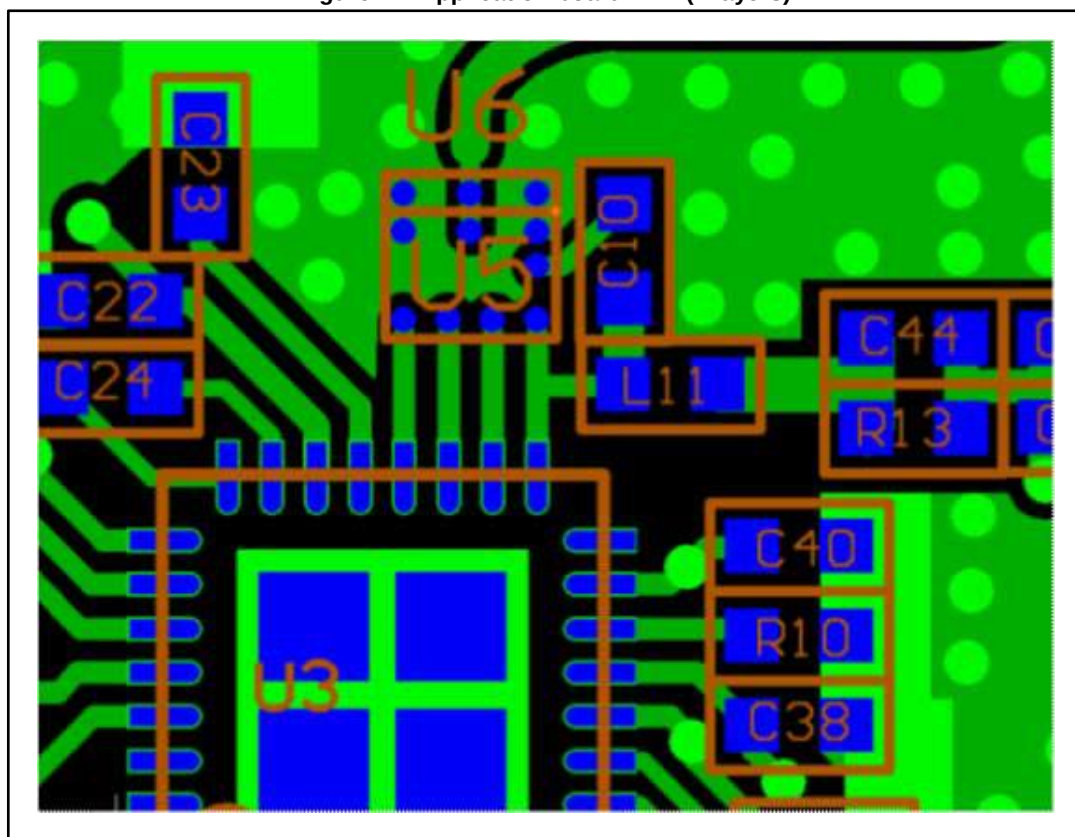


Figure 15: Recommended balun land pattern

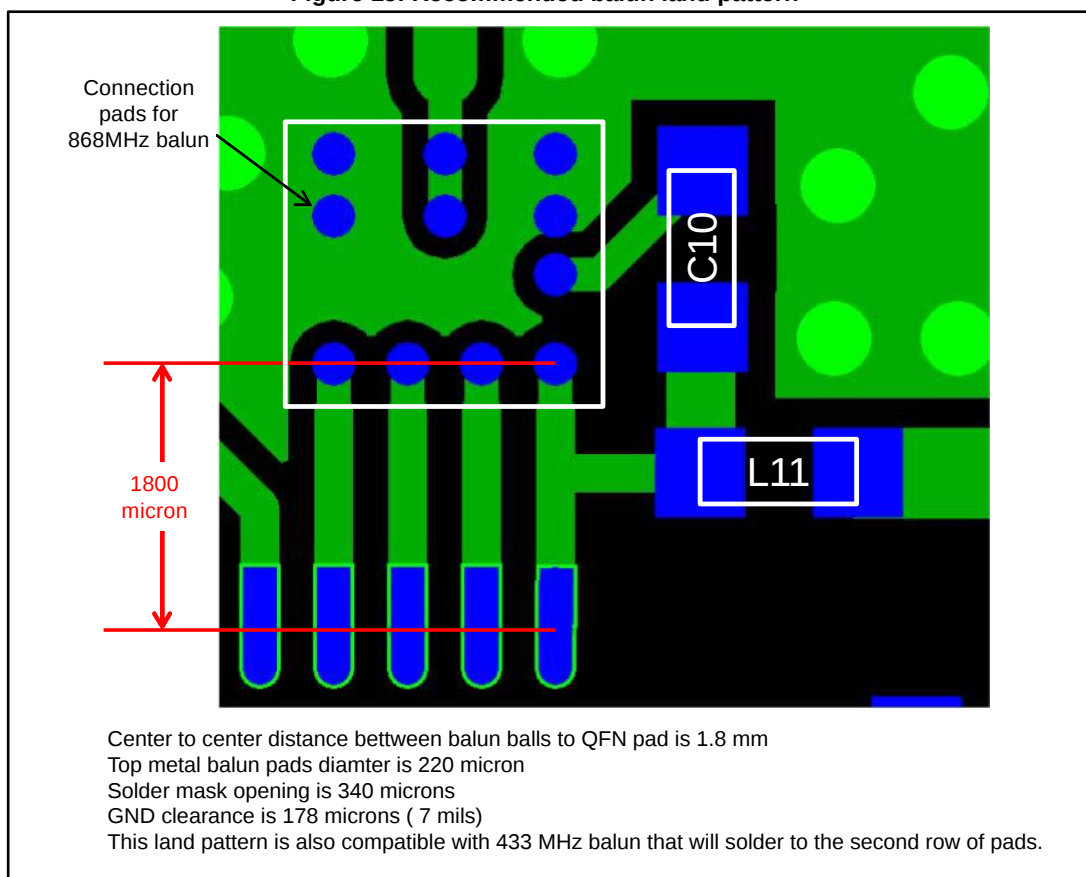
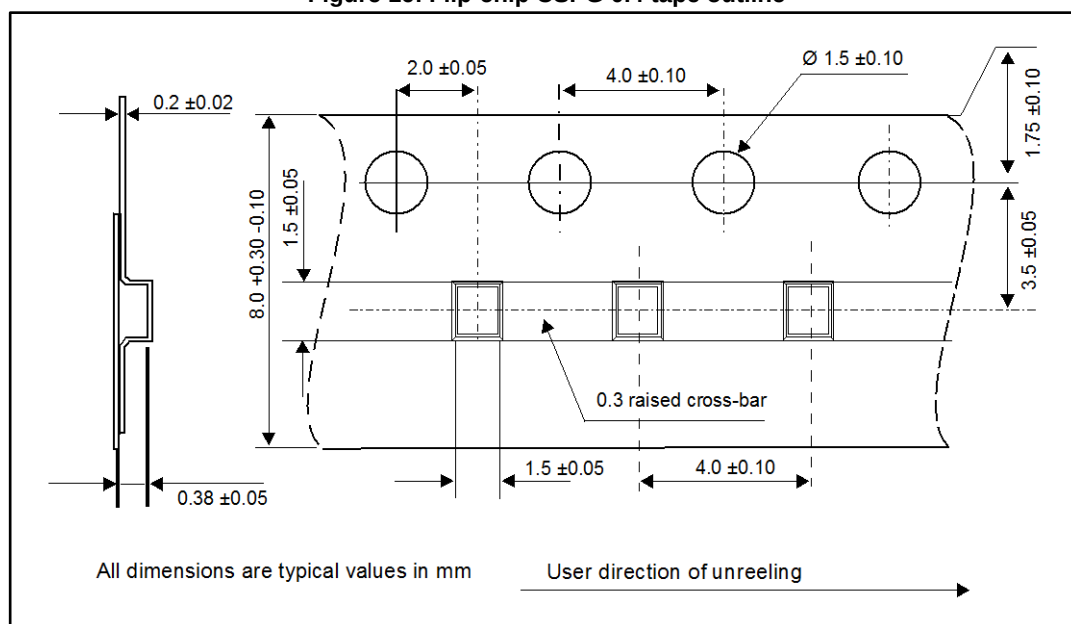


Table 6: Bill of material

Designation	Reference	Value	Package	Comments
L11	LQW15AN10NJ00D	56 nH	0402	Wire wounded
C10		39 pF	0402	50 V
R13		18 Ohms	0402	
C44		56 pF	0402	50 V
U3	CC1121		DFN 5X5	
U6	BALF-112X-02D3		FC 2 X 1.5	433 MHz

2.2 Flip-chip CSPG 0.4 packing information

Figure 16: Flip-chip CSPG 0.4 tape outline



3 Ordering information

Table 7: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BALF-112X-02D3	TG	Flip-Chip CSPG 0.4	3.94 mg	5000	Tape and reel

4 Revision history

Table 8: Document revision history

Date	Revision	Changes
07-Jul-2016	1	First issue.
24-Feb-2017	2	Updated front page.

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