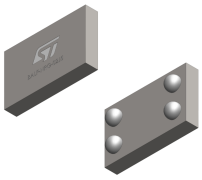
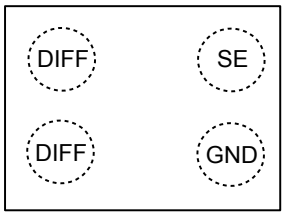
BALF-NRG-02J5

Datasheet

50 Ω ultra thin balun with integrated harmonic filter / conjugate match balun to ST BlueNRG-134 and BlueNRG-234



Flip-Chip (4 bumps) package



Top view

Product status link
BALF-NRG-02J5

Features

- 50 Ω nominal input / conjugate match to STMicroelectronics chips BlueNRG-134 WLCSP and BlueNRG-234 WLCSP
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Ultraminiature footprint: < 1.2 mm^2
- Extra low profile < 350 µm after reflow
- High RF performance
- RF BOM and area reduction

Applications

- 2.45 GHz impedance matched balun filter
- Optimized for STMicroelectronics chip set BlueNRG-134 and BlueNRG-234 WLCSP
- Wearable applications

Description

This device is an ultraminiature extra thin balun that integrates matching network and harmonics filter.

Matching impedance has been customized for the BLUENRG-134 and BlueNRG-234 WLCSP from STMicroelectronics.

Based on IPD technology on high resistivity silicium it optimizes the RF performance.

STMicroelectronics qualified this product intended to be used in system in package module based on standard reliability procedure. For more details, please contact ST representatives.

It is the responsibility of the customer to perform qualification reliability verifications as it is related to customer specific application, mission profile and module design, process.

1 Characteristics

Figure 1. **Application schematic**

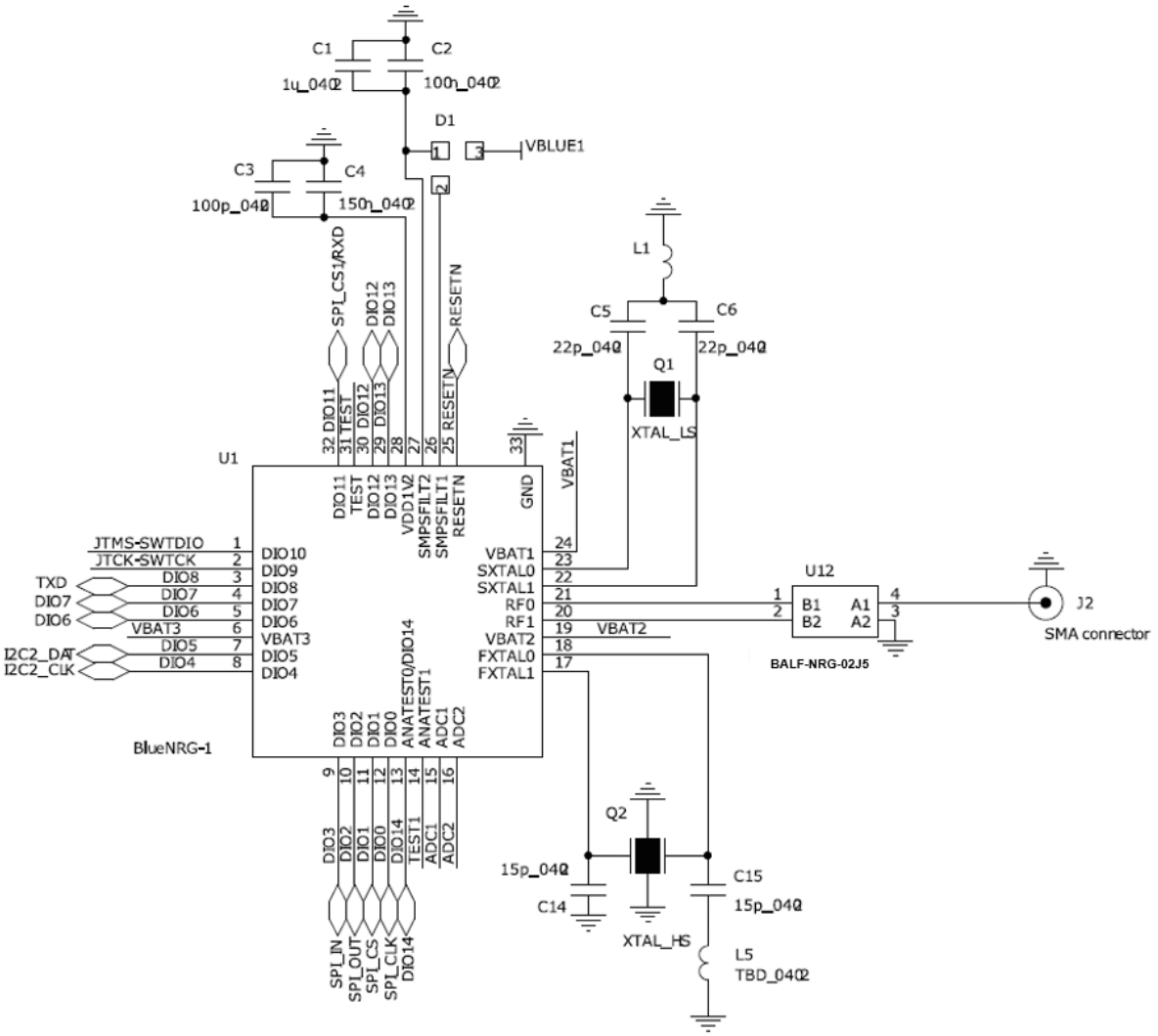


Table 1. **Absolute ratings (limiting values)**

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P_{IN}	Input power RF_{IN}		-	10	dBm
V_{ESD}	ESD ratings human body model (JESD22-A114-C), all I/O one at a time while others connected to GND	2000	-		V
	ESD ratings charge device model (JESD22-C101-C)	500	-		
	ESD ratings machine model, all I/O	200	-		
T_{OP}	Operating temperature	-40	-	+105	°C

Table 2. Impedances (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{DIFF}	Nominal differential impedance	-	matched	-	Ω
Z_{SE}	Nominal single ended impedance	-	50	-	Ω

Table 3. RF performance (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
f	Frequency range (bandwidth)	2400		2500	MHz
I_L	Insertion loss in bandwidth (differential mode)		1.35	1.65	dB
RL_{SE}	Single ended return loss in bandwidth (differential mode)	26	34		dB
RL_{DIFF}	Differential return loss in bandwidth	18	24		dB
H2	Second harmonic attenuation (differential mode)	37	47		dB
H3	Third harmonic attenuation (differential mode)	50	56		dB
H4	Fourth harmonic attenuation (differential mode)	45	50		dB
H5	Fifth harmonic attenuation (differential mode)	39	60		dB
H6	Sixth harmonic attenuation (differential mode)	37	46		dB
H7	Seventh harmonic attenuation (differential mode)	38	58		dB
φ_{imb}	Phase imbalance	-4.5		4.5	°
A_{imb}	Amplitude imbalance	-1.1		+1.1	dB

1.1 On-board measurements

Figure 2. Return loss on SE port (T_{amb} = 25 °C)

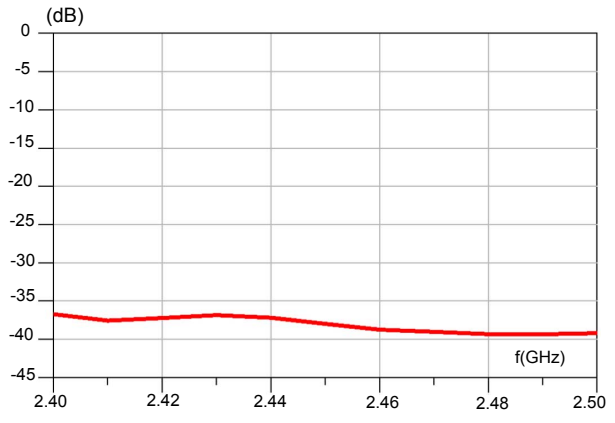


Figure 3. Return loss on DIFF port (T_{amb} = 25 °C)

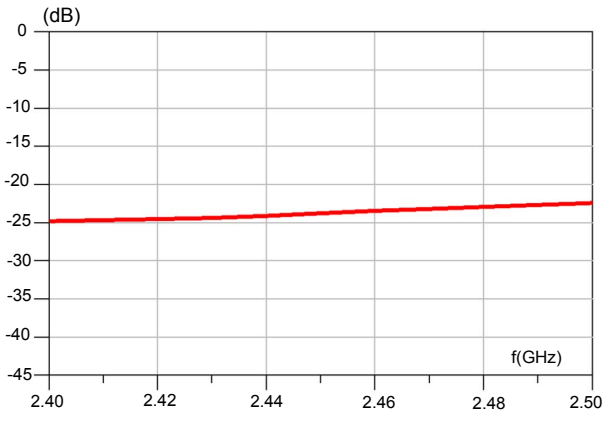


Figure 4. Transmission (T_{amb} = 25 °C)

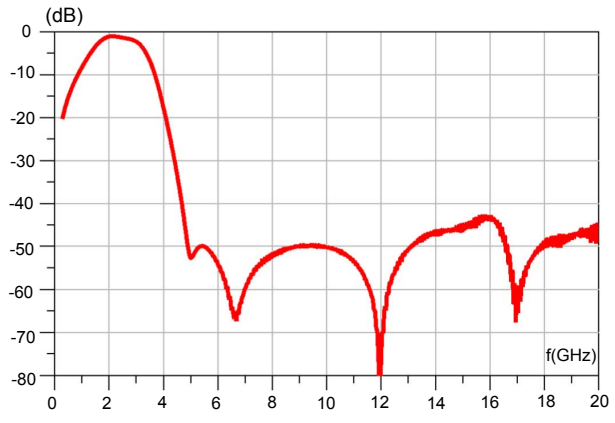


Figure 5. Insertion loss (T_{amb} = 25 °C)

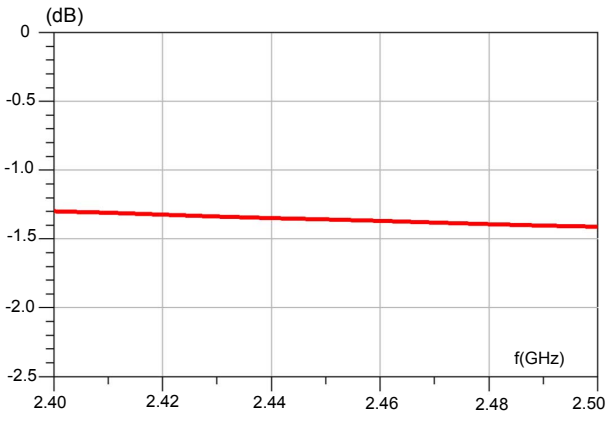


Figure 6. H2 attenuation (T_{amb} = 25 °C)

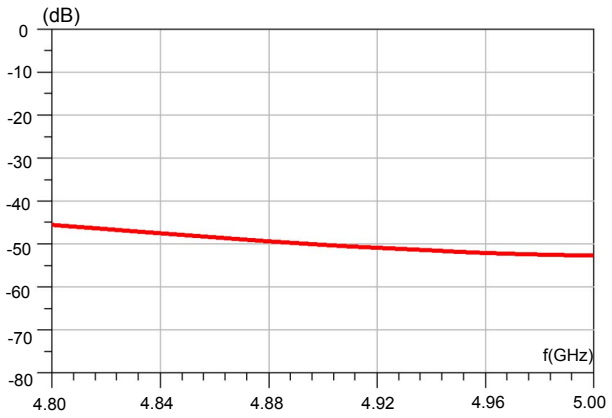


Figure 7. H3 attenuation (T_{amb} = 25 °C)

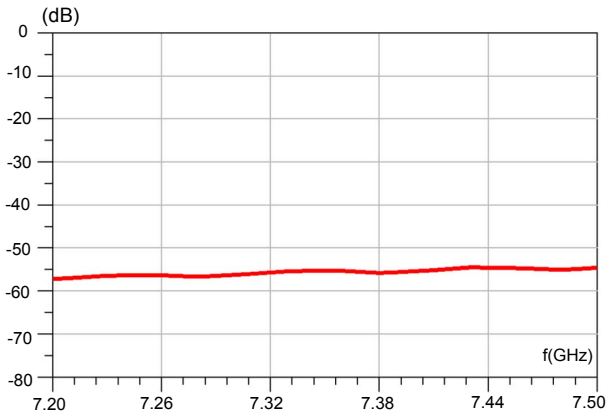


Figure 8. H4 attenuation (T_{amb} = 25 °C)

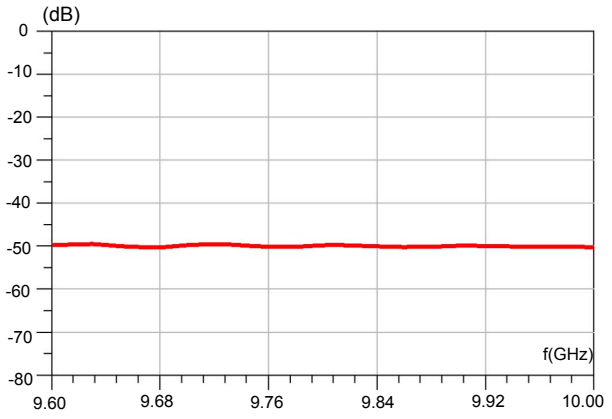


Figure 9. H5 attenuation (T_{amb} = 25 °C)

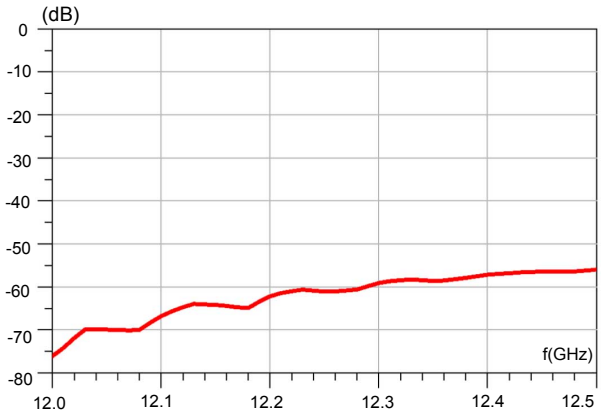


Figure 10. H6 attenuation (T_{amb} = 25 °C)

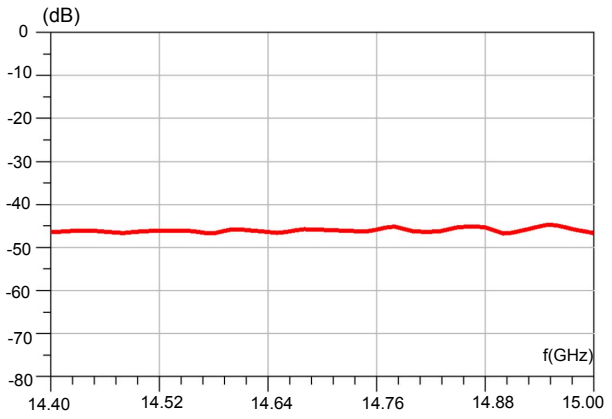


Figure 11. H7 attenuation (T_{amb} = 25 °C)

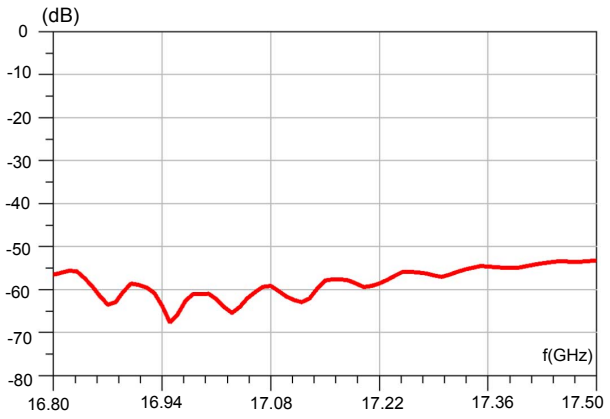


Figure 12. **Amplitude imbalance (T_{amb} = 25 °C)**

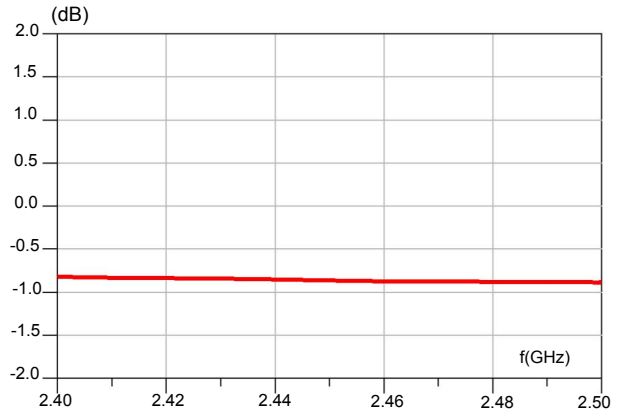
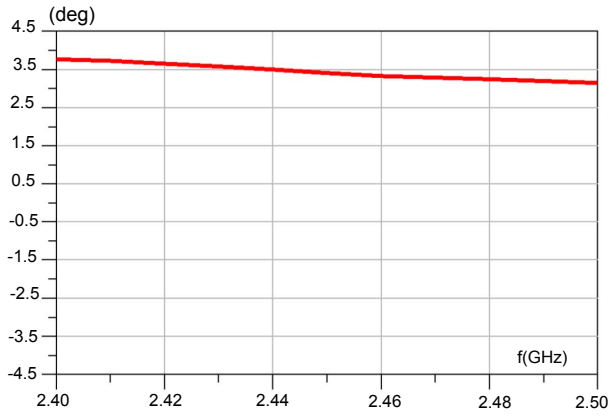


Figure 13. **Phase imbalance (T_{amb} = 25 °C)**



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 Ultra thin Flip-Chip 4 bumps package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 14. Ultra thin Flip-Chip 4 bumps package outline

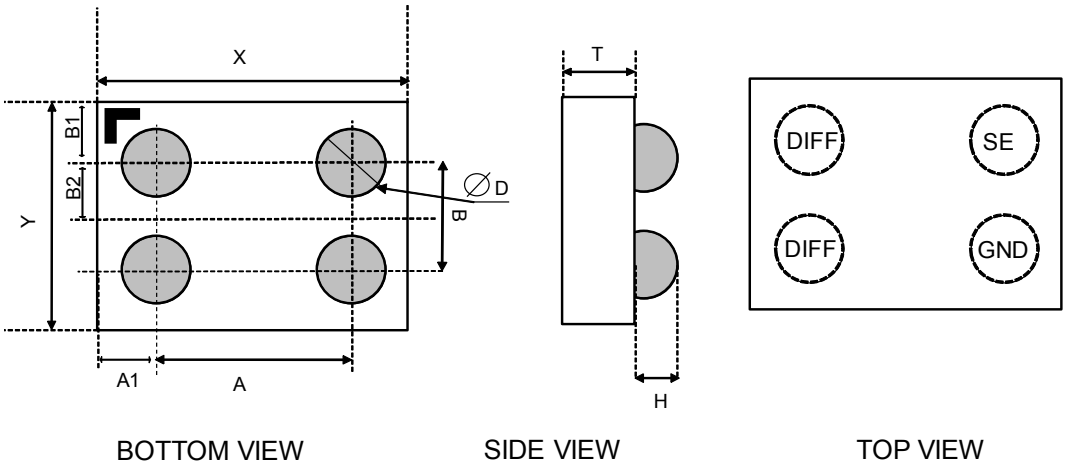
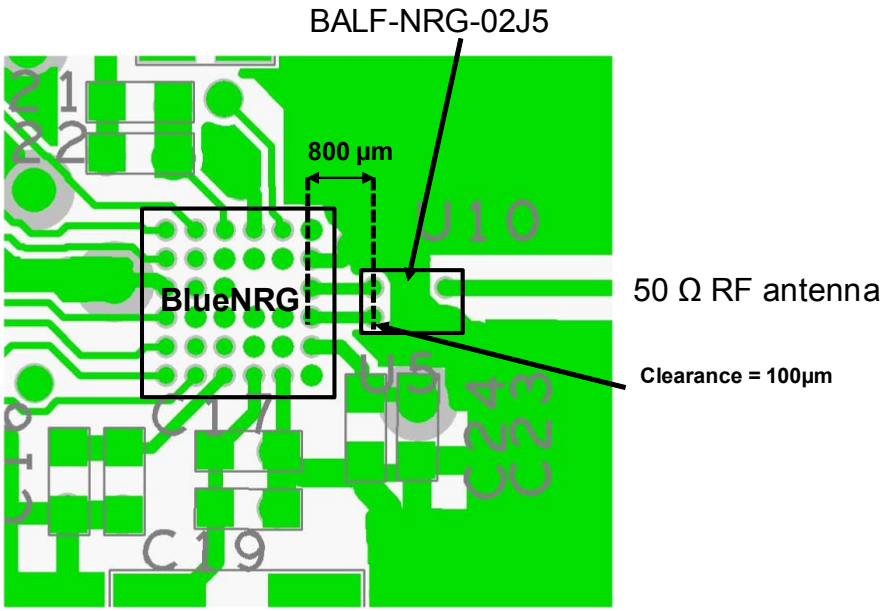


Table 4. Ultra thin Flip-Chip 4 bumps package mechanical data

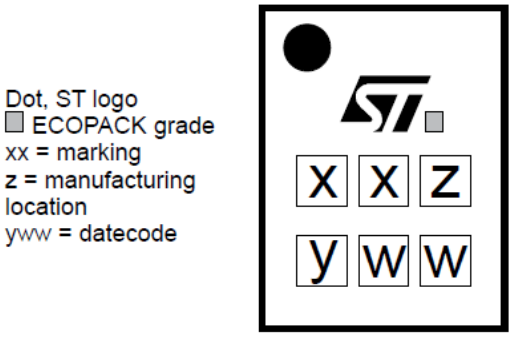
Parameter	Description	Min.	Typ.	Max.	Unit
X	X dimension of the die	1355	1385	1415	µm
Y	Y dimension of the die	825	855	885	
A	X pitch		1000		
B	Y pitch		400		
A1	Distance from bump to edge of die on X axis		192.5		
B1	Distance from bump to edge of die on Y axis		227.5		
B2	Distance from bump to center of die on Y axis		200		
D	Bump diameter	202	227	252	
T	Substrate thickness	190	200	210	
H	Bump height	117	142	167	

Figure 15. **Recommended land pattern**



2.2 Ultra thin Flip-chip 4 bumps packing information

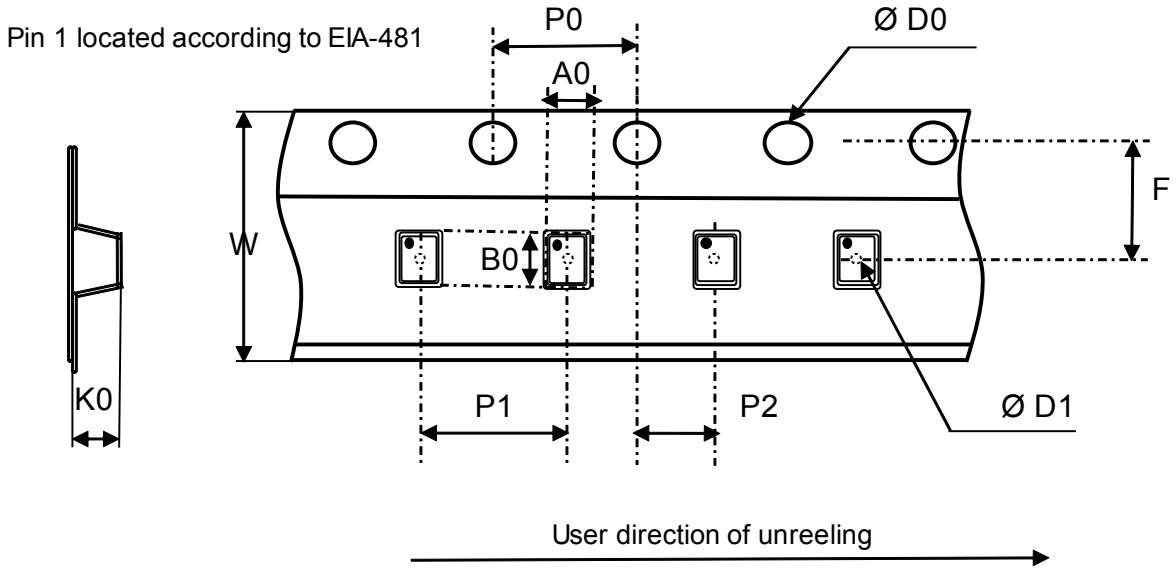
Figure 16. Marking



Note: More packing information is available in the application note:

- *AN2348 Flip-Chip: "Package description and recommendations for use"*

Figure 17. Flip Chip tape and reel specification



Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Table 5. Ultra thin Flip-Chip 4 bumps package mechanical data

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
A0	0.91	0.96	1.01
B0	1.44	1.49	1.54

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
P1	3.90	4.00	4.10
P0	3.90	4.00	4.10
Ø D0	1.40	1.50	1.60
Ø D1	0.15	0.20	0.25
F	3.45	3.50	3.55
K0	0.38	0.43	0.48
P2	1.95	2.00	2.05
W	7.90	8.00	8.30

Figure 18. Footprint - non solder mask defined

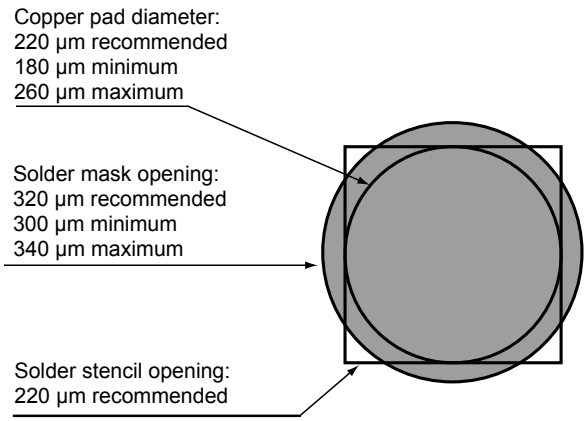
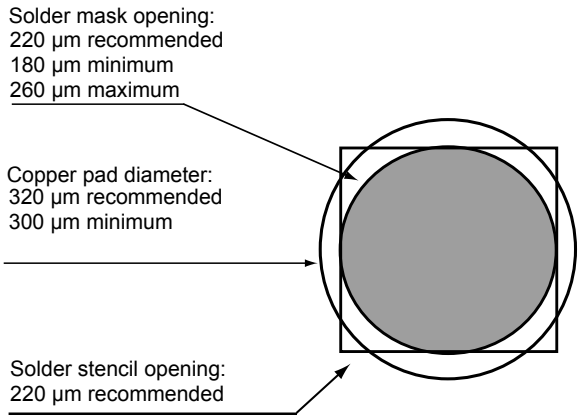


Figure 19. Footprint - solder mask defined



3 Ordering information

Figure 20. **Ordering information scheme**

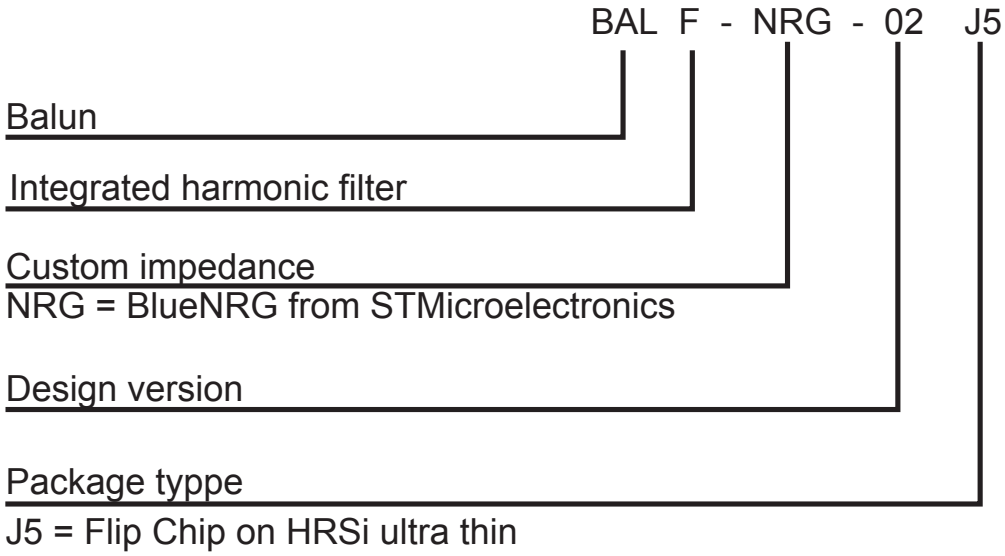


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BALF-NRG-02J5	TP	Flip-Chip 4 bumps	0.645 mg	5000	Tape and reel

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
12-Jul-2018	1	Initial release.

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