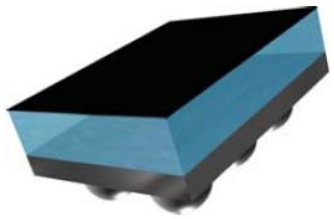
BAL-NRF02D3

50 ohm nominal input / conjugate match balun to nRF51822-CEAA/CDAB/CFAC and nRF51422-CEAA/CDAB/CFAC

Datasheet - production data



Flip-Chip (5 bumps) package

Features

- 50 Ω nominal input / conjugate match to Nordic Semiconductor chips nRF51422-CEAA, nRF51422-CDAB, nRF51422-CFAC and nRF51822-CEAA, nRF51822-CDAB, nRF51822-CFAC
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: < 1.2 mm^2

Benefits

- Very low profile < 570 µm after reflow with pad 260 µm max. or < 585 µm after reflow with pad 220 µm typ.
- High RF performance
- RF BOM and area reduction

Applications

- 2.45 GHz impedance matched balun filter
- Optimized for Nordic's chip set nRF51422-CEAA, nRF51422-CDAB, nRF51422-CFAC and nRF51822-CEAA, nRF51822-CDAB, nRF51822-CFAC

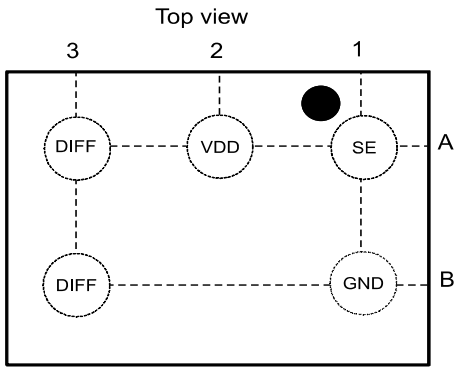
Description

STMicroelectronics BAL-NRF02D3 is an ultraminiature balun. The BAL-NRF02D3 integrates matching network and harmonics filter. Matching impedance has been customized for the following Nordic Semiconductor circuits: nRF51422-CEAA, nRF51422-CDAB, nRF51422-CFAC and nRF51822-CEAA, nRF51822-CDAB, nRF51822-CFAC.

The BAL-NRF02D3 uses STMicroelectronics IPD technology on non-conductive glass substrate which optimizes RF performance.

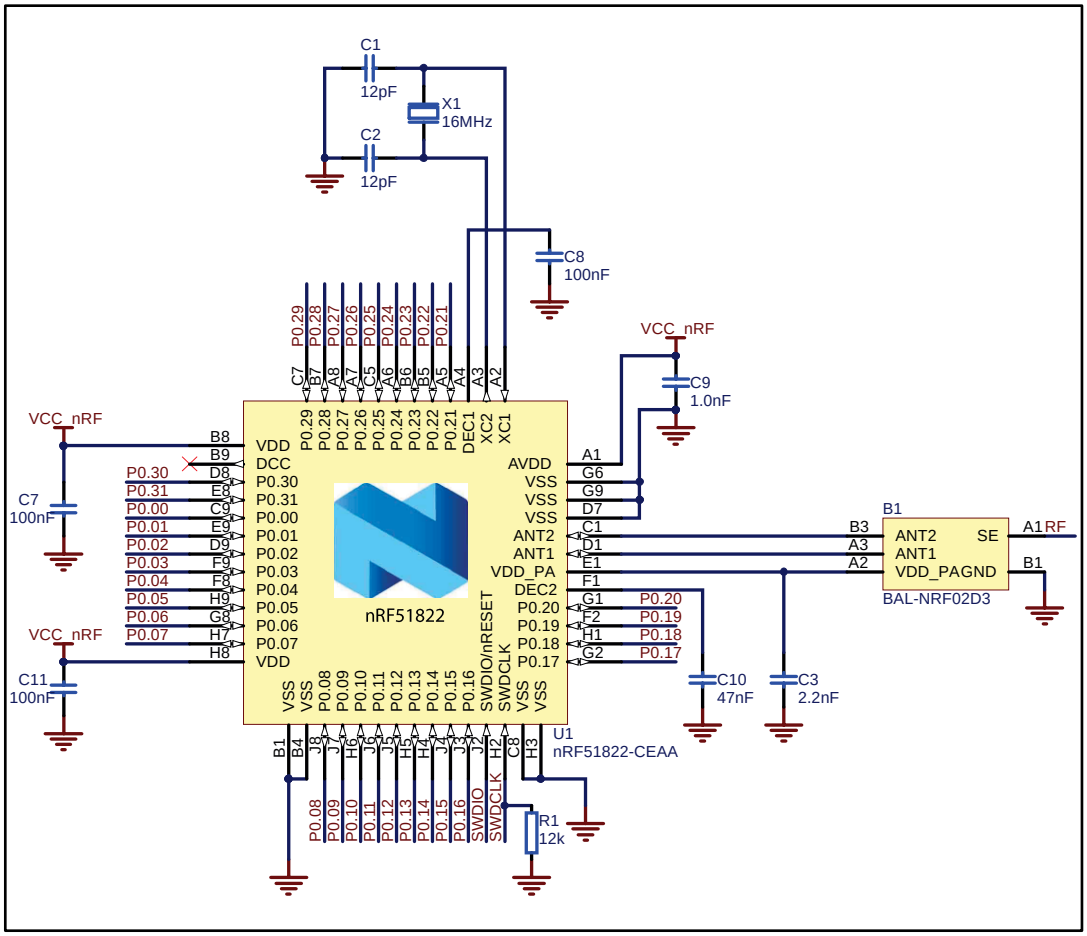
The BAL-NRF02D3 has been tested and approved by Nordic Semiconductor in the nRFgo modules.

Figure 1: Pin coordinates



Application

Figure 2: Application schematic



1 Characteristics

Table 1: Absolute ratings (limiting values)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P_{IN}	Input power RF_{IN}		-	20	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 (JESD22-A115-C), all I/O	-40	-	+105	°C
T_{stg}	Storage temperature range	-55°C		+150	°C

Table 2: Impedances (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{OUT}	Nominal differential output impedance	-	matched	-	Ω
Z_{IN}	Nominal input impedance	-	50	-	Ω

Table 3: RF performances (T_{amb} = 25 °C)

Symbol	Parameter		Value			Unit
			Min.	Typ.	Max.	
f	Frequency range (bandwidth)		2400		2540	MHz
I_L	Insertion loss in bandwidth			1.9		dB
RL	Return loss in bandwidth			12		dB
φimb	Phase imbalance			6		°
Aimb	Amplitude imbalance			0.15		dB
2f0	2nd harmonic S21 attenuation	4880 MHz	44	10		dB
3f0	3rd harmonic S21 attenuation	7320 MHz		20		dB

1.1 On-board measurements

Figure 3: Transmission (T_{amb} = 25 °C)

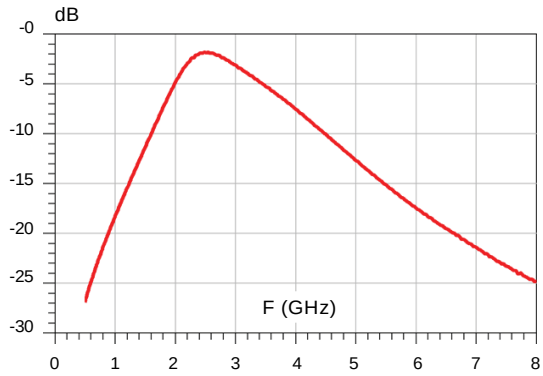


Figure 4: Insertion loss (T_{amb} = 25 °C)

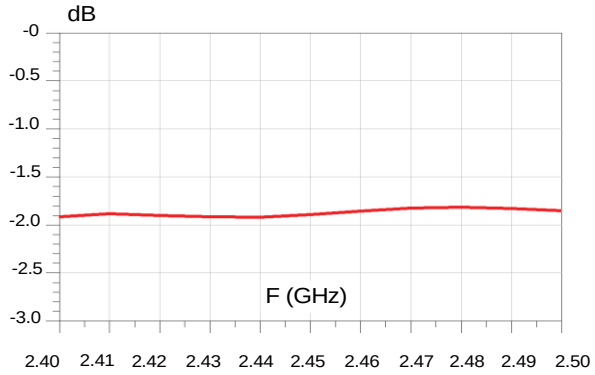


Figure 5: Return loss on SE port (T_{amb} = 25 °C)

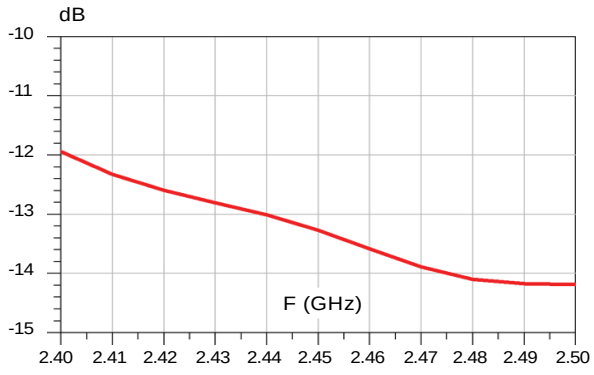


Figure 6: Return loss on DIFF port (T_{amb} = 25 °C)

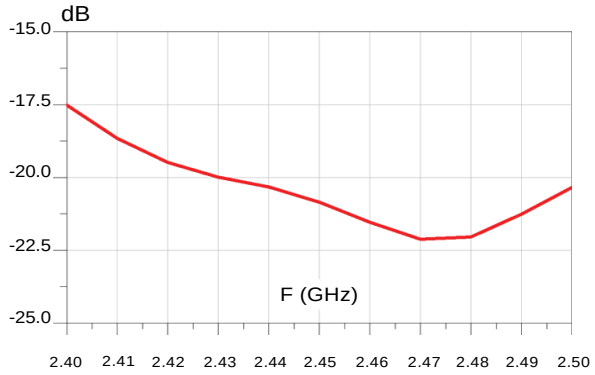


Figure 7: Amplitude imbalance (T_{amb} = 25 °C)

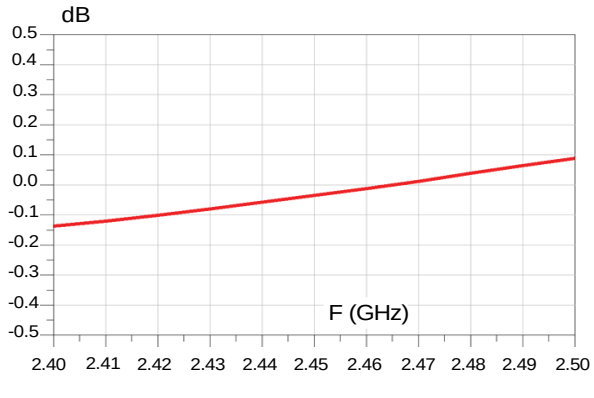


Figure 8: Phase imbalance (T_{amb} = 25 °C)

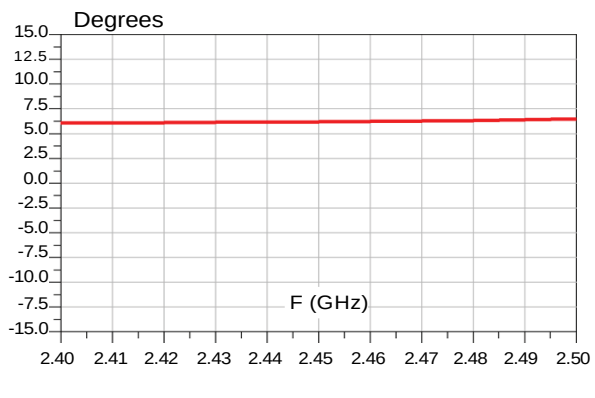


Table 4: Compatibility matrix (nRF51422)

nRF51422 IC revision	Packet/variant	Build code
1	CEAA	A0A
2	CEAA	Bx0
3	CDAB	Ax0
	CEAA	Cx0
	CFAC	Ax0

Table 5: Compatibility matrix (nRF51822)

nRF51822 IC revision	Packet/variant	Build code
1	CEAA	BA
	CEAA	B0
2	CEAA	CA0
	CEAA	DA0
	CEAA	Dx0
3	CDAB	Ax0
	CEAA	Ex0
	CFAC	Ax0

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.

- Epoxy meets UL94, V0
- Lead-free package

2.1 Flip-Chip 5 bumps package information

Figure 9: Flip-Chip 5 bumps package outline

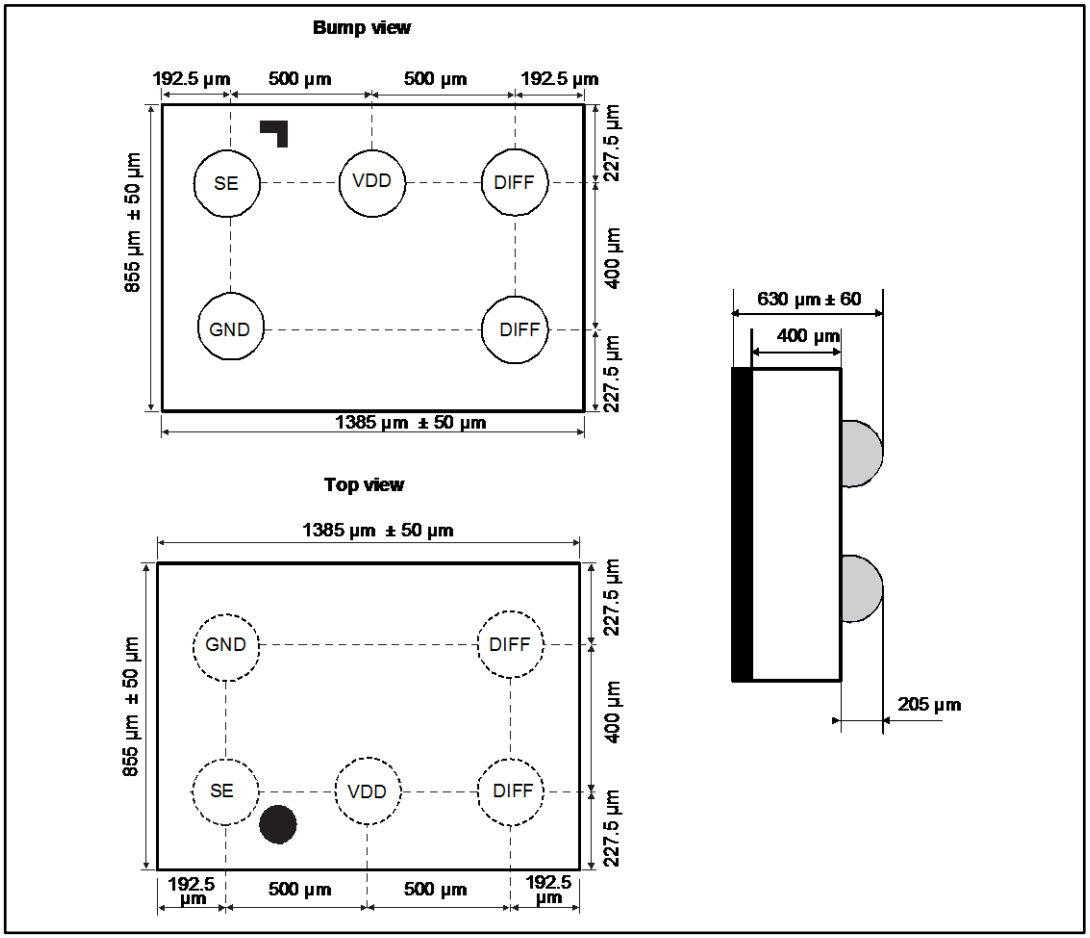


Figure 10: Recommended land pattern

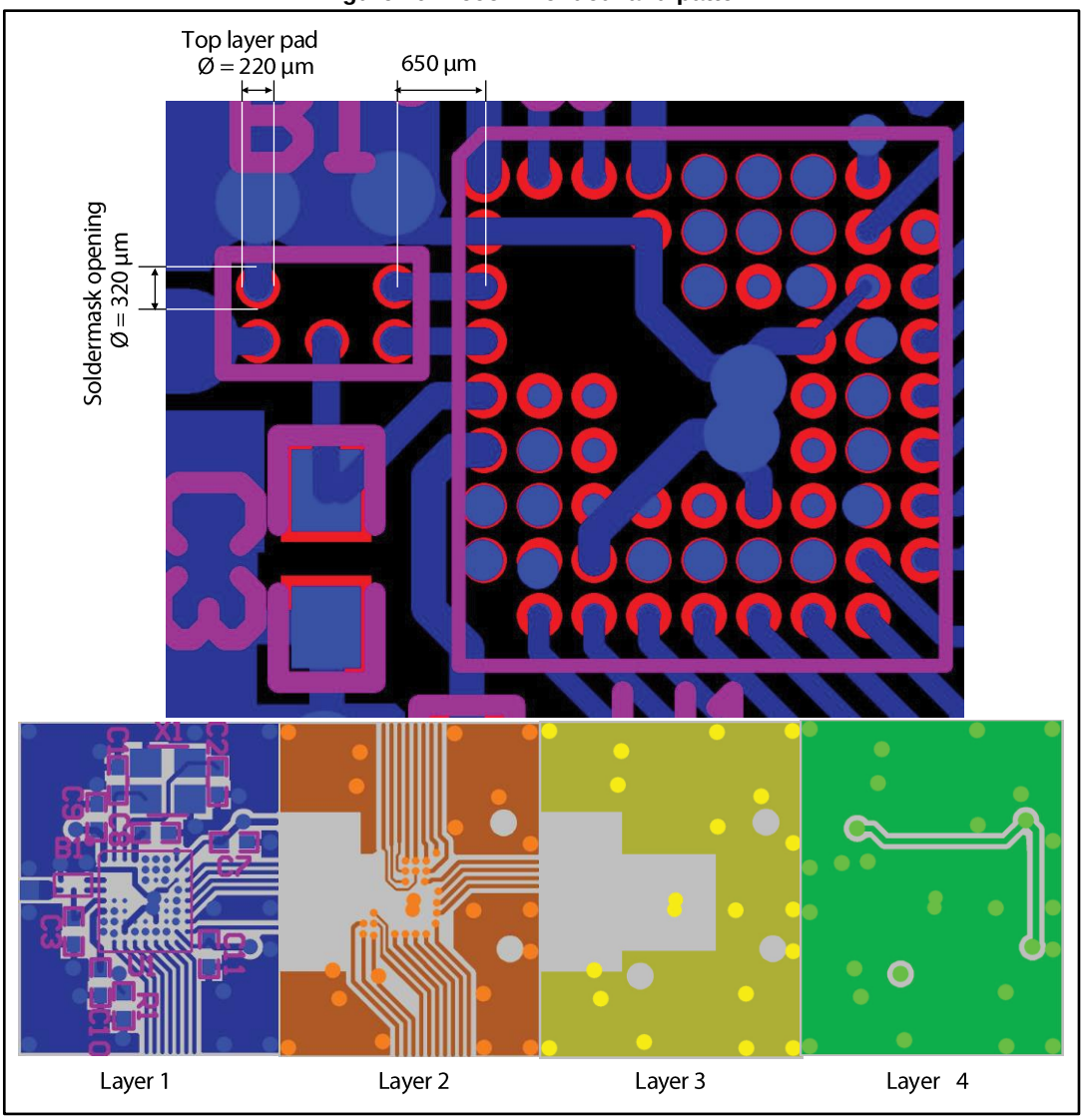
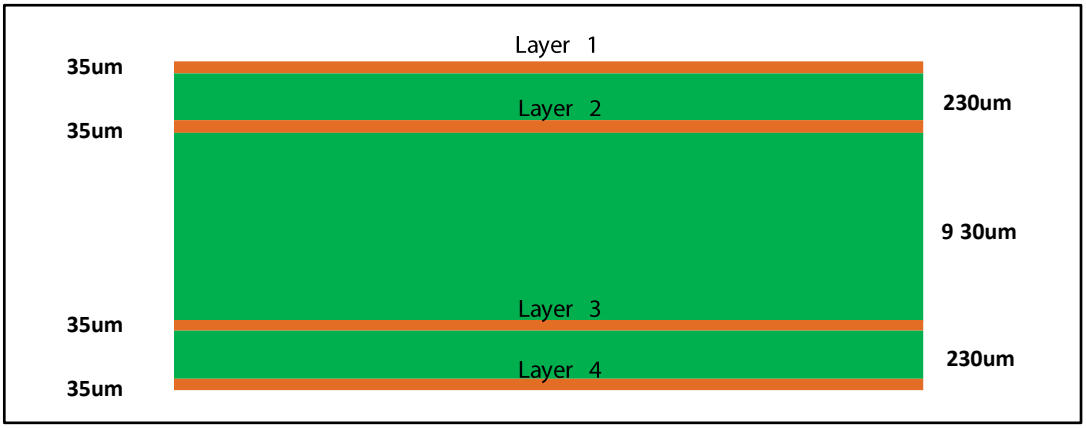


Figure 11: PCB stack-up recommendation



2.2 Flip-chip 5 bumps packing information

Figure 12: Marking

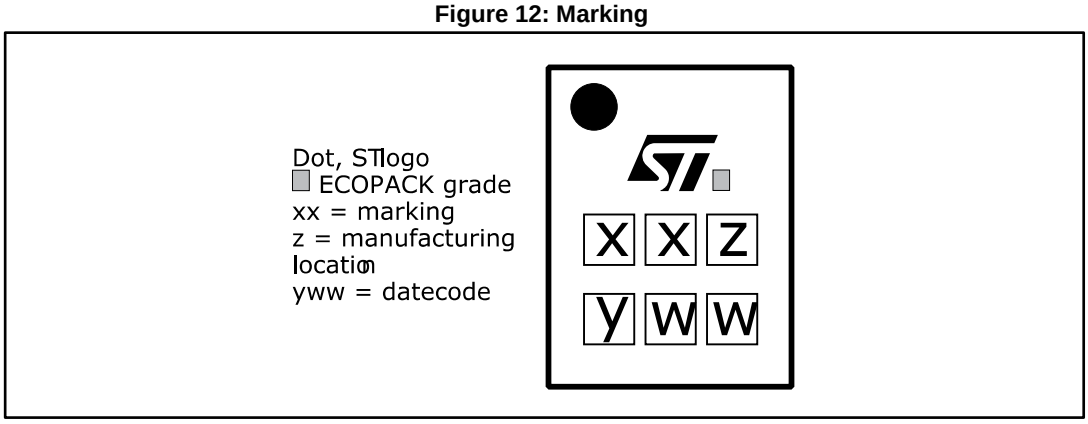
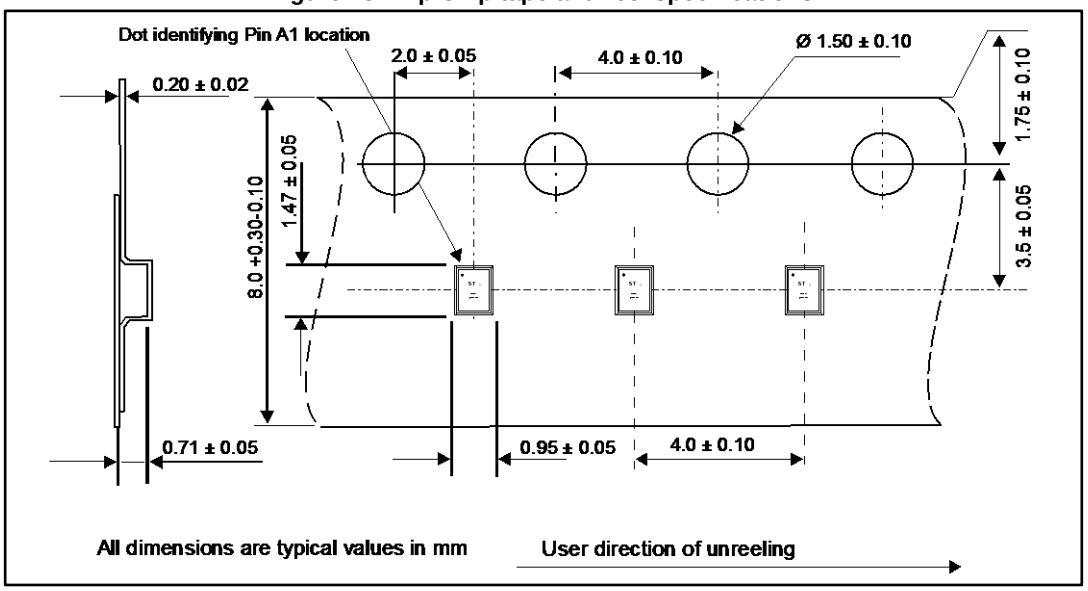


Figure 13: Flip Chip tape and reel specifications



More packing information is available in the application note:

- AN2348 Flip-Chip: “Package description and recommendations for use”
- AN4315: “BAL-NRF02D3 matched balun with integrated harmonics filter for Nordic Semiconductor ultralow power transceivers”

Figure 14: Footprint - 3 mils stencil -non solder mask defined

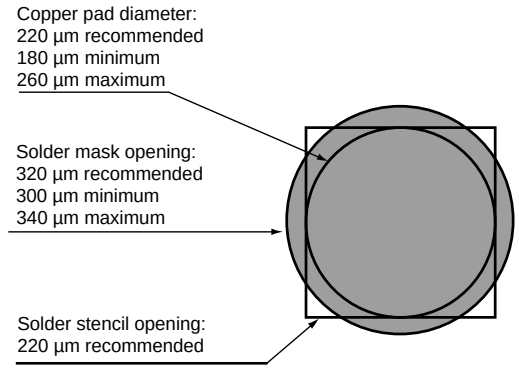


Figure 15: Footprint - 3 mils stencil - solder mask defined

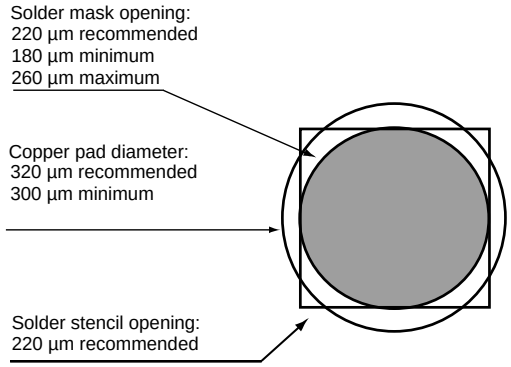


Figure 16: Footprint - 5 mils stencil -non solder mask defined

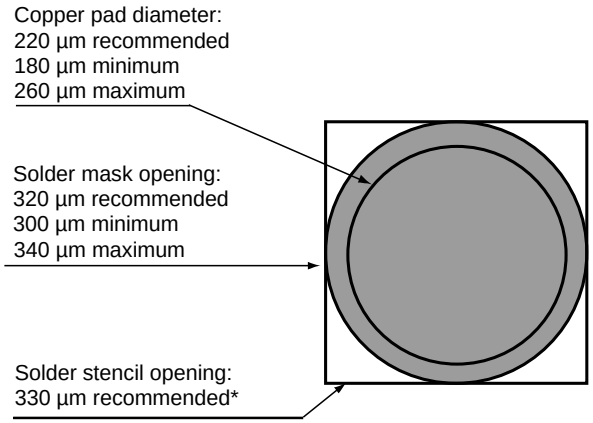
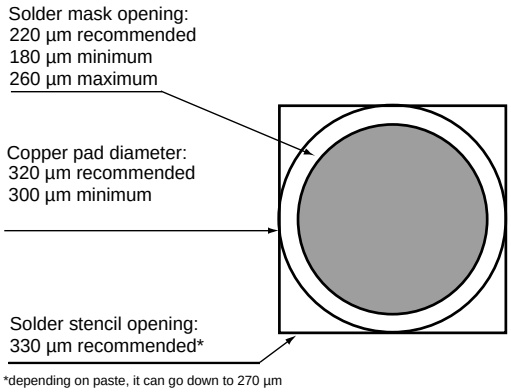


Figure 17: Footprint - 5 mils stencil - solder mask defined



3 Ordering information

Table 6: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BAL-NRF02D3	SK	Flip-Chip 5 bumps	1.44 mg	5000	Tape and reel

4 Revision history

Table 7: Document revision history

Date	Revision	Changes
02-Jul-2013	1	Initial release.
30-Aug-2013	2	Updated *Table 1*.
13-Oct-2014	3	Updated *Figure 9*.
25-Mar-2015	4	Updated cover page, added *Table 4* and *Table 5*.
15-Jun-2015	5	Updated *Table 1*.
07-Dec-2016	6	Updated *Table 1: "Absolute ratings (limiting values)"*.
02-Aug-2017	7	Updated Section 3: "Ordering information".
14-Nov-2017	8	Updated *Section "Benefits"*.

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