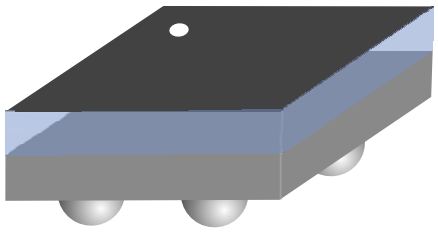
BAL-NRF01D3

50 Ω nominal input / conjugate match balun to nRF51422-QFAA, nRF24LE1, nRF51822-QFAA/AB, with integrated harmonic filter

Datasheet – production data



Lead-free Flip-Chip package
5 bumps

Features

- 50 Ω nominal input / conjugate match to Nordic Semiconductor chips nRF24LE1 QFN32, nRF24AP2-1CH, nRF24AP2-8CH, nRF51422-QFAA (build code CA/C0), nRF51822-QFAA (build code CA/C0) and nRF51822-QFAB (build code AA/A0)
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: < 1.5 mm^2

Benefits

- Very low profile: < 595 µm after reflow
- High RF performance
- RF BOM and area reduction

Applications

- 2.45 GHz impedance matched balun filter
- Optimized for Nordic's chip set nRF24LE1/AP2, nRF51422-QFAA (build code CA/C0), nRF51822-QFAA (build code CA/C0) and nRF51822-QFAB (build code AA/A0).

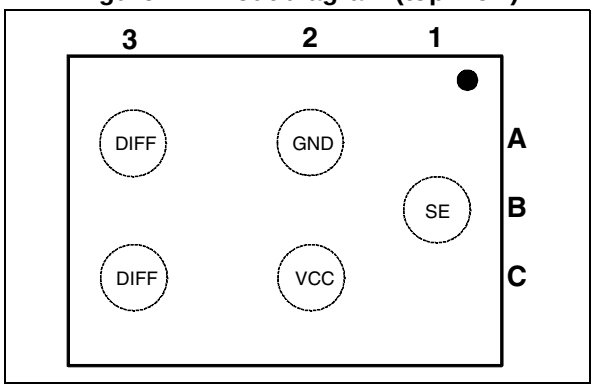
Description

STMicroelectronics BAL-NRF01D3 is an ultraminiature balun. The BAL-NRF01D3 integrates matching network and harmonics filter. Matching impedance has been customized for the following Nordic Semiconductor circuits: nRF24LE1 QFN-32 pins, nRF24AP2-1CH, nRF24AP2-8CH, nRF51422-QFAA (build code CA/C0), nRF51822-QFAA (build code CA/C0) and nRF51822-QFAB (build code AA/A0).

The BAL-NRF01D3 uses STMicroelectronics IPD technology on non-conductive glass substrate which optimize RF performance.

The BAL-NRF01D3 has been tested and approved by Nordic Semiconductor in their nRF2723 and nRF2752 nRFgo modules.

Figure 1. Pinout diagram (top view)



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 k Ω , air discharge)	2000			V
	ESD ratings charge device model (JESD22-C101-C)	500			
	ESD ratings machine model (MM: C = 200 pF, R = 25 Ω , L = 500 nH)	200			
T_{OP}	Operating temperature	-40		+105	°C

Table 2. Impedances (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{OUT}	Nominal differential output impedance		conjugate match to: – nRF24LE1/AP2 – nRF51422-QFAA (build code CA/C0) – nRF51822-QFAA (build code CA/C0) – nRF51822-QFAB (build code AA/A0)		Ω
Z_{IN}	Nominal input impedance		50		Ω

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

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
F	Frequency range (bandwidth)		2400		2540	MHz
I_L	Insertion loss in bandwidth			2.25		dB
R_L	Return loss in bandwidth			10		dB
ϕimb	Phase imbalance			3		°
Aimb	Amplitude imbalance			0.1		dB
2f0	2nd harmonic filtering	4880 MHz		10		dB
3f0	3rd harmonic filtering	7320 MHz		20		dB

1.1 On-board simulations

Figure 2. Transmission (T_{amb} = 25 °C)

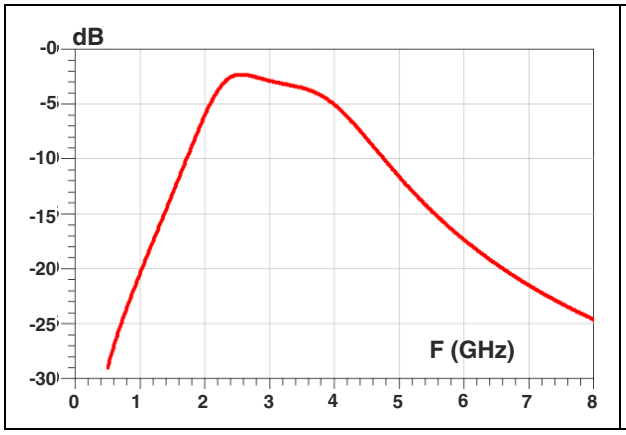


Figure 3. Return loss on SE port (T_{amb} = 25 °C)

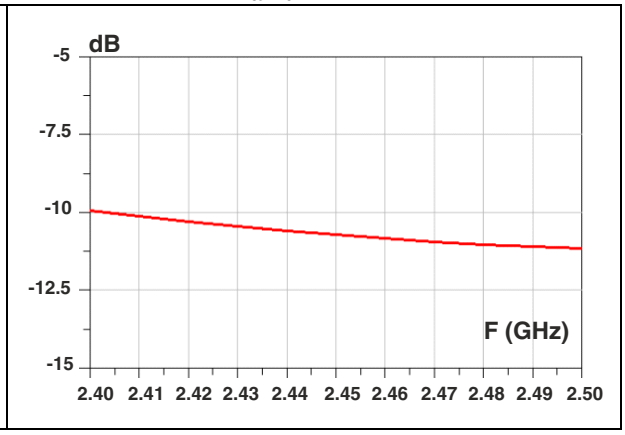


Figure 4. Return loss on DIFF port (T_{amb} = 25 °C)

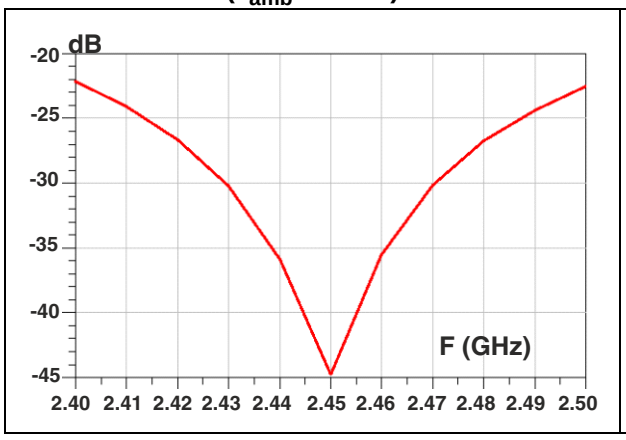


Figure 5. Amplitude imbalance (T_{amb} = 25 °C)

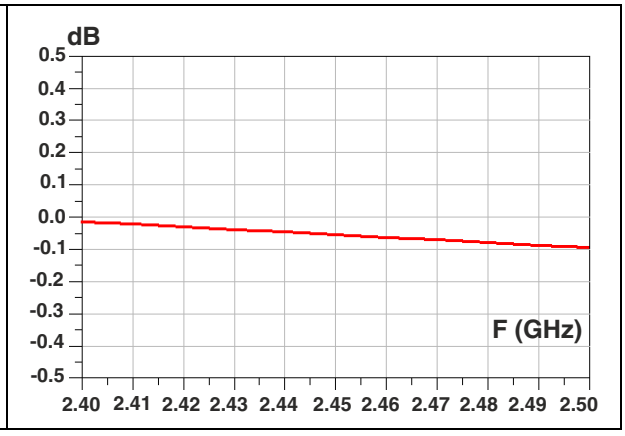
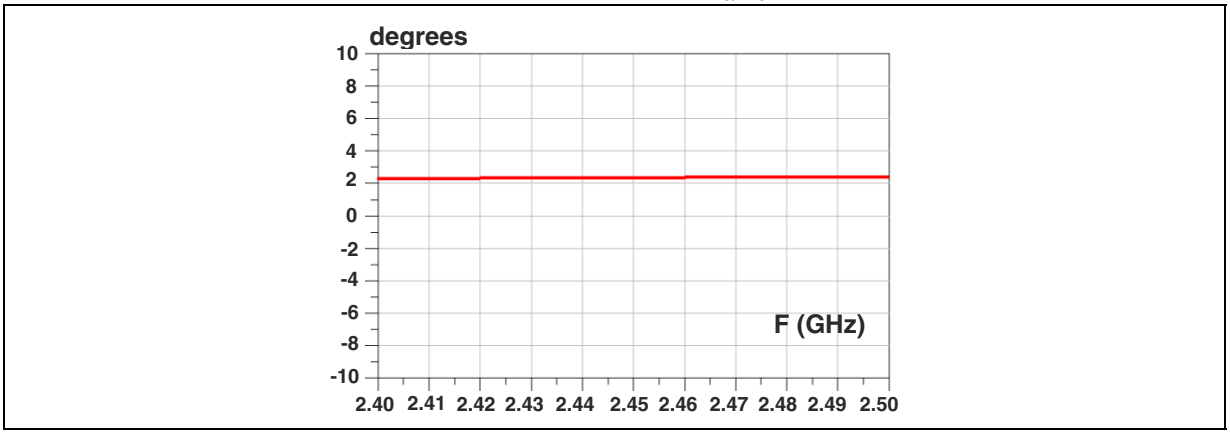


Figure 6. Phase imbalance (T_{amb} = 25 °C)



2 Application information

Figure 7. Application schematic (courtesy of Nordic Semiconductor)

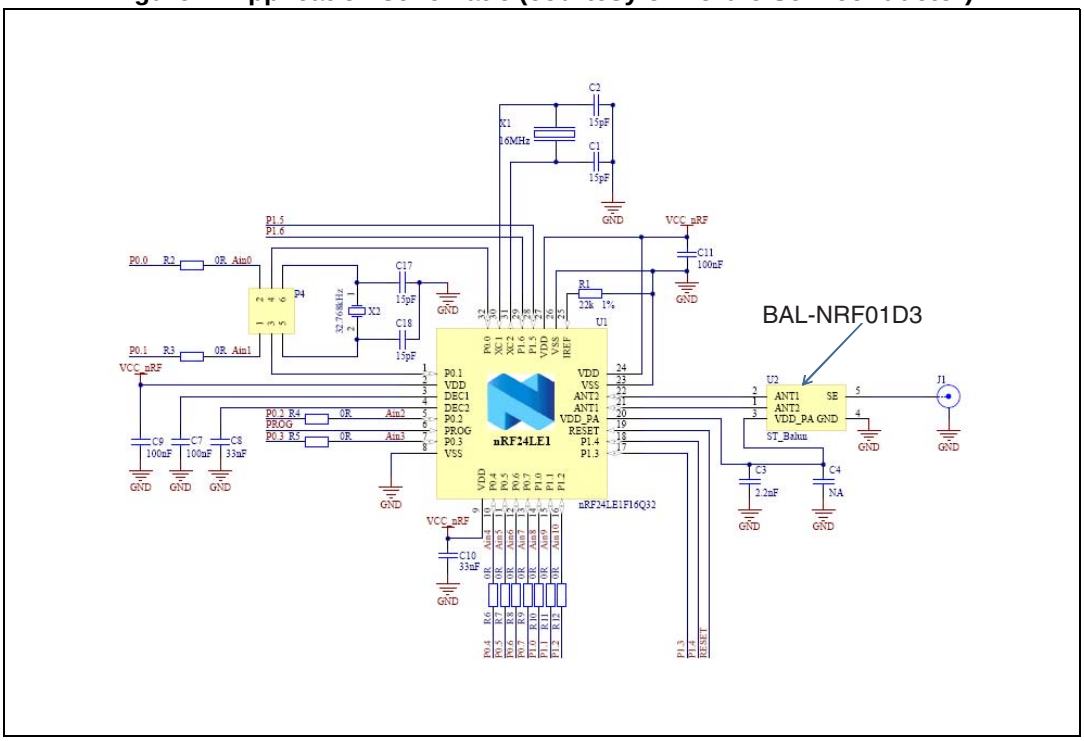


Figure 8. nRF2723 application board (courtesy of Nordic Semiconductor)

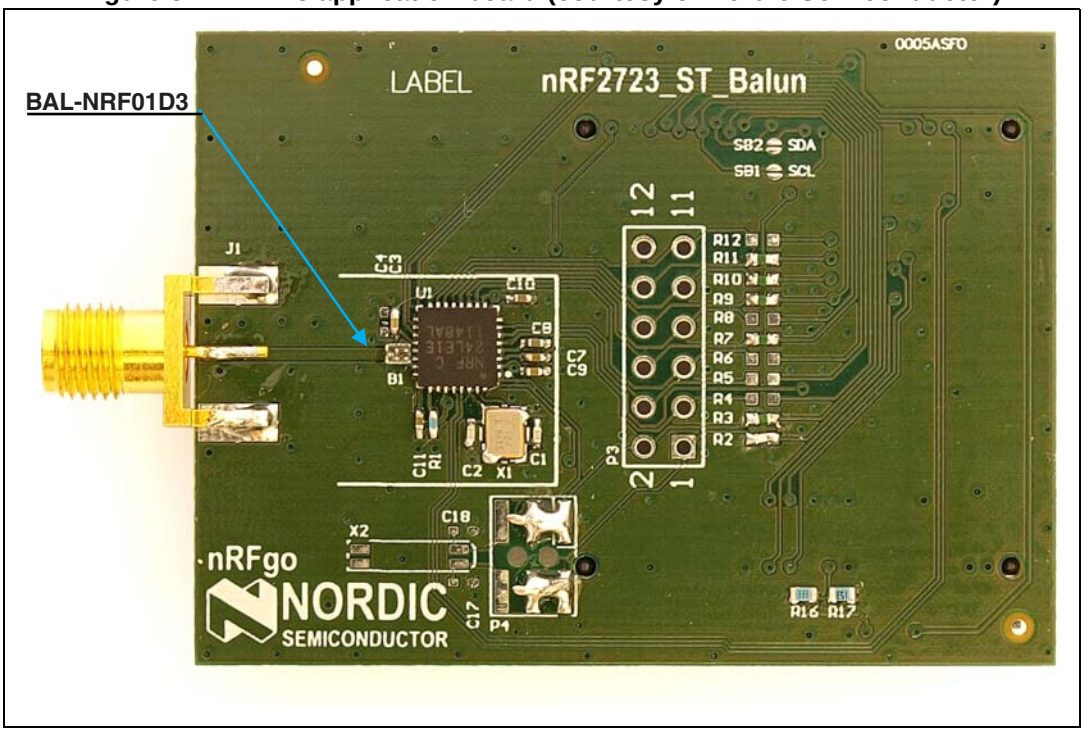
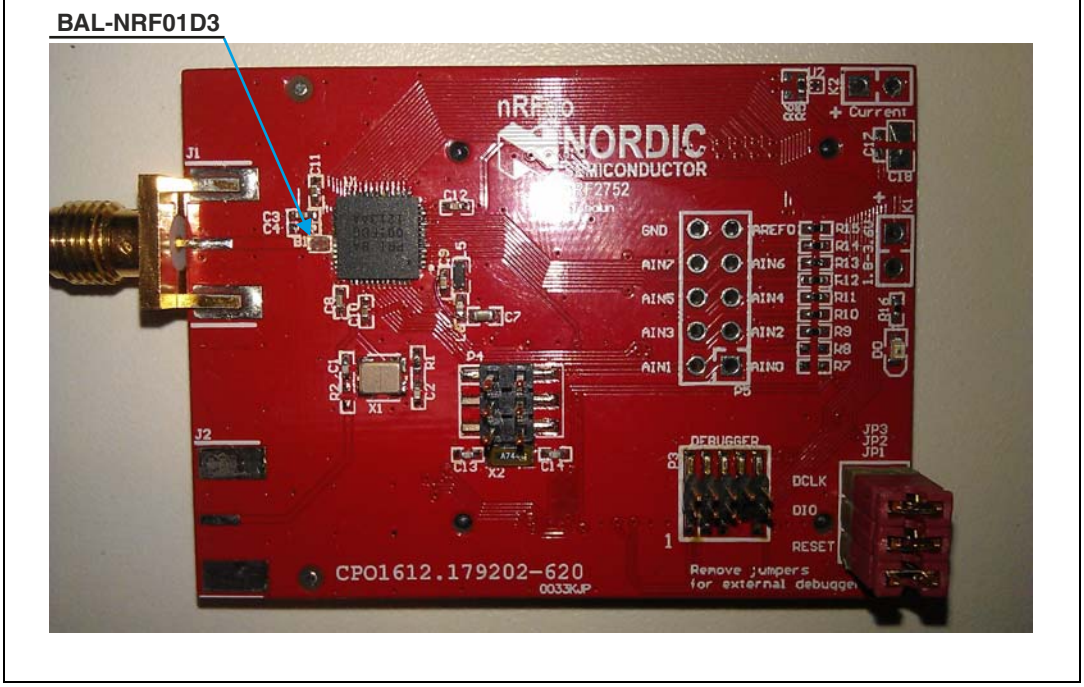


Figure 9. nRF2752 application board (courtesy of Nordic Semiconductor)



3 Package information

- Epoxy meets UL94, V0
- Lead-free package

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.

Figure 10. Package dimensions (top and side view)

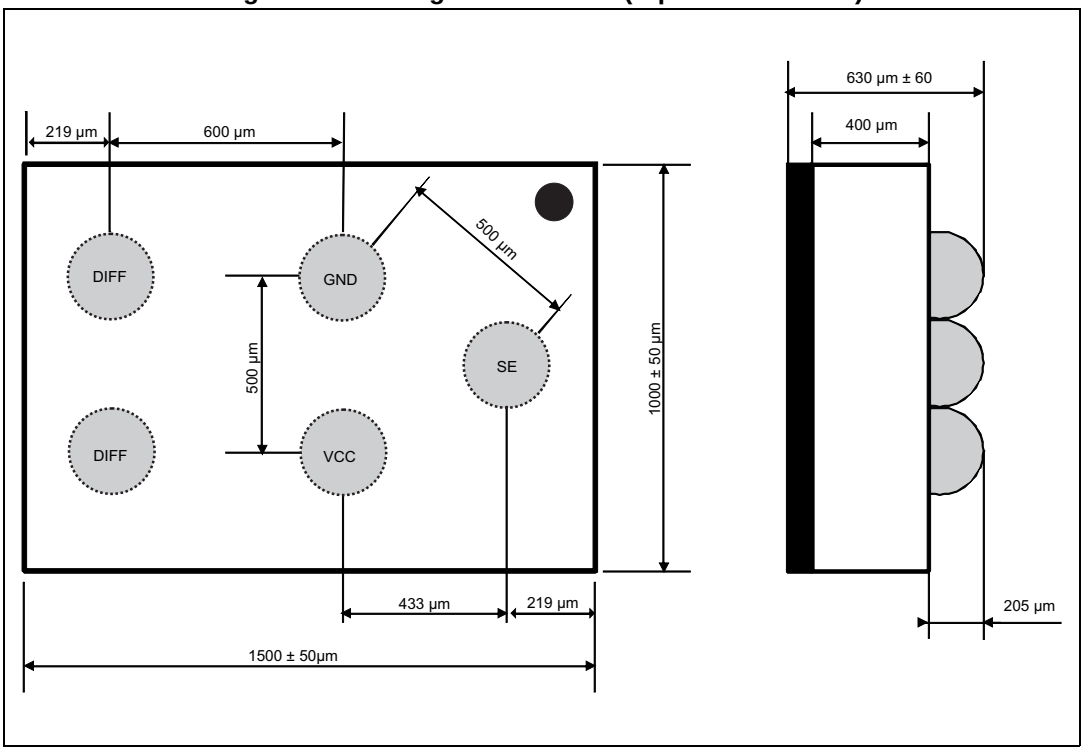


Figure 11. Marking

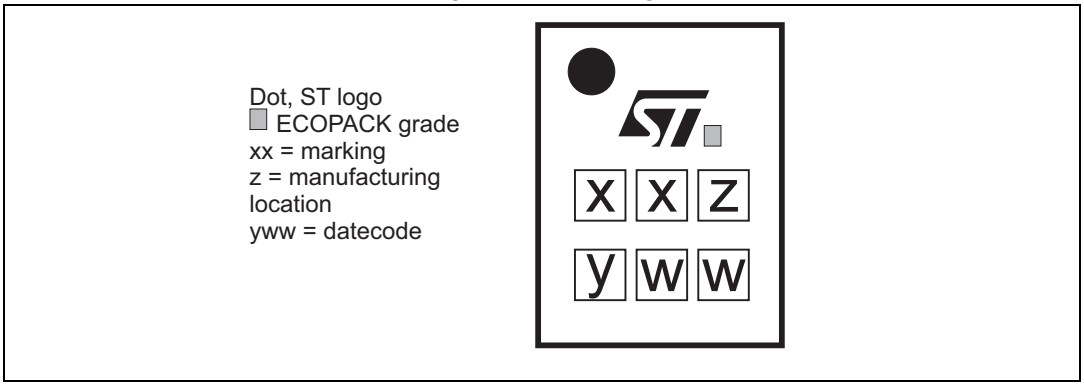
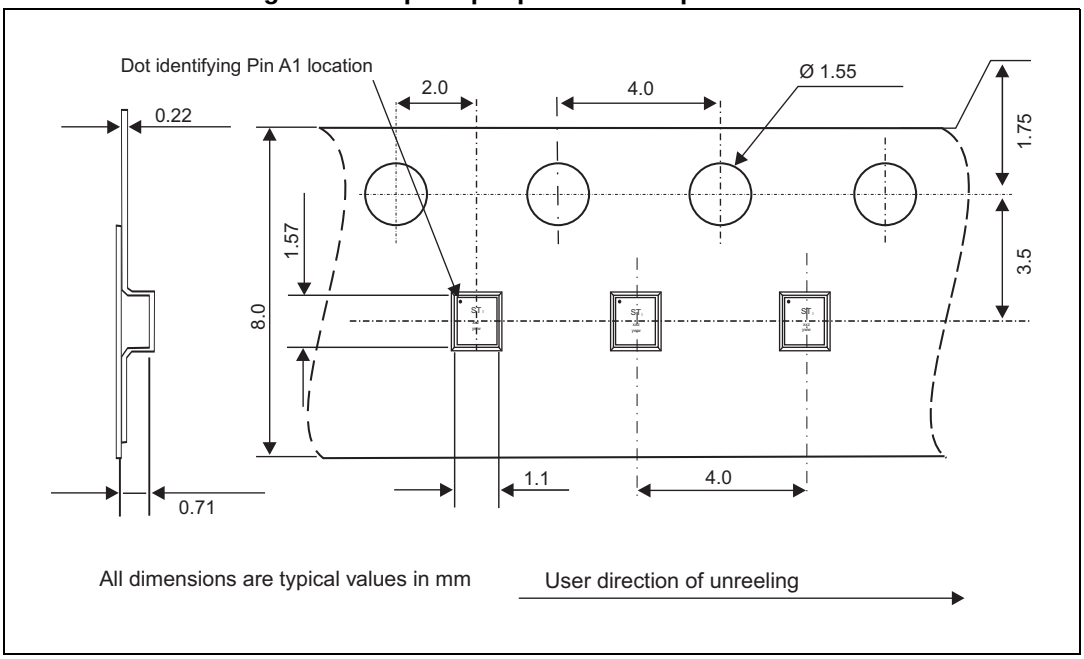


Figure 12. Flip Chip tape and reel specifications



Note: More information is available in the STMicroelectronics Application notes:
AN2348 Flip-Chip: "Package description and recommendations for use"
AN4111: "BAL-NRF01D3 matched balun with integrated harmonics filter for Nordic Semiconductor chips with ultralow power transceivers"

Figure 13. Footprint - 3 mils stencil -non solder mask defined

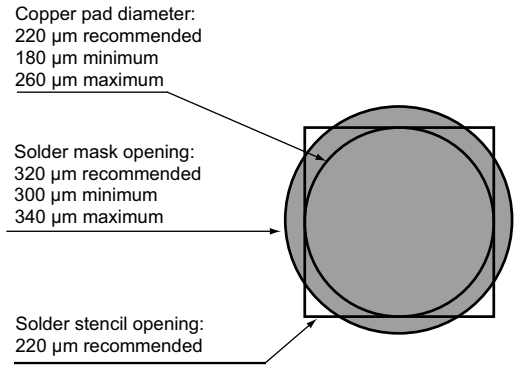


Figure 14. Footprint - 3 mils stencil - solder mask defined

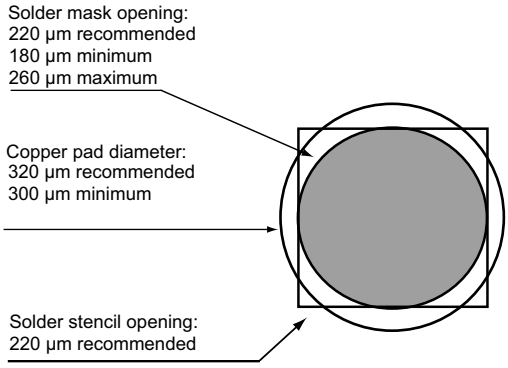


Figure 15. Footprint - 5 mils stencil -non solder mask defined

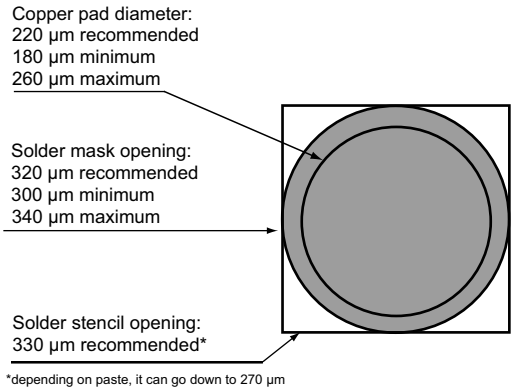
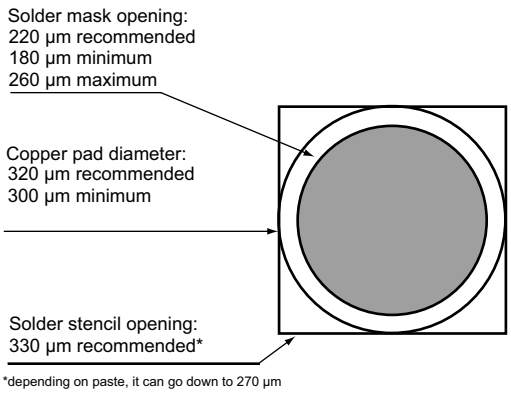


Figure 16. Footprint - 5 mils stencil - solder mask defined



4 Ordering information

Table 4. Ordering information

Order code	Marking	Weight	Base Qty	Delivery mode
BAL-NRF01D3	SC	1.82 mg	5000	Tape and Reel

5 Revision history

Table 5. Document revision history

Date	Revision	Changes
15-Oct-2012	1	Initial release
13-Nov-2012	2	Added references to nRF51 series. Added *Figure 9*. Updated y-axis labels in *Figure 2*.
04-Mar-2013	3	Updated footprint illustrations in *Figure 13*, and *Figure 14*.
06-Aug-2013	4	Added dimensions in *Figure 10*. Updated marking orientation in *Figure 11* and *Figure 12*.
13-Jan-2014	5	Updated document title and product references.
07-Jul-2015	6	Updated *Table 1*.