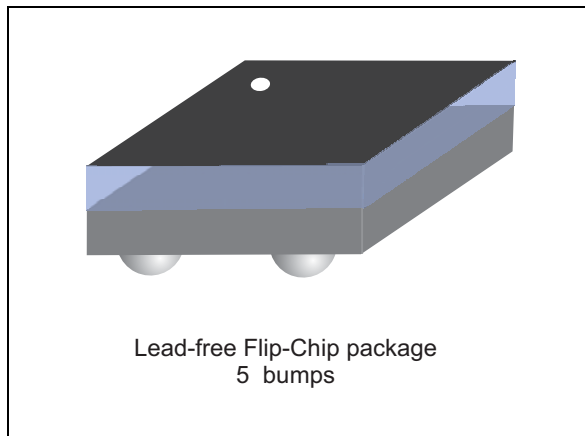
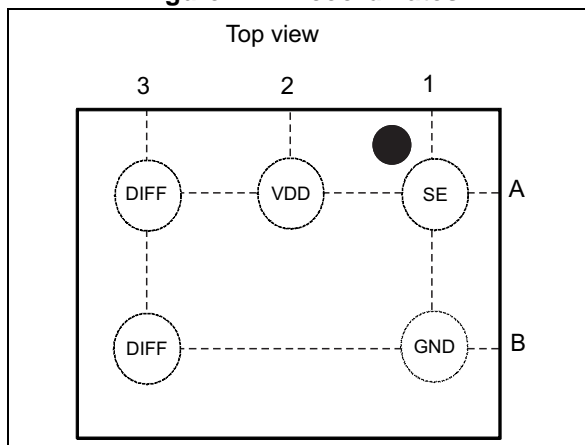


50 ohm nominal input / conjugate match balun to nRF51822-CEAA/CDAB/CFAC and nRF51422-CEAA/CDAB/CFAC

Datasheet – production data


Figure 1. Pin coordinates

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 mm²

Benefits

- Very low profile: < 560 μ m after reflow
- 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 optimize RF performances.

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

2 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 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

Table 2. Impedances ($T_{amb} = 25\text{ °C}$)

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 performance ($T_{amb} = 25\text{ °C}$)

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
F	Frequency range (bandwidth)		2400		2540	MHz
I_L	Insertion loss in bandwidth			1.9		dB
R_L	Return loss in bandwidth			12		dB
ϕ_{imb}	Phase imbalance			6		°
Aimb	Amplitude imbalance			0.15		dB
2f0	2nd harmonic S21 attenuation	4880 MHz		10		dB
3f0	3rd harmonic S21 attenuation	7320 MHz		20		dB

2.1 On-board measurements

Figure 3. Transmission ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

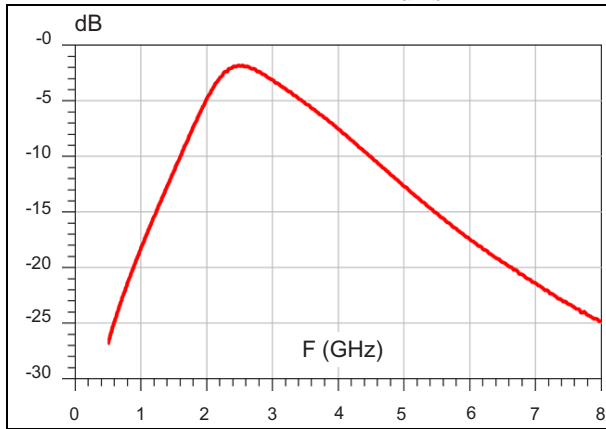


Figure 4. Insertion loss ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

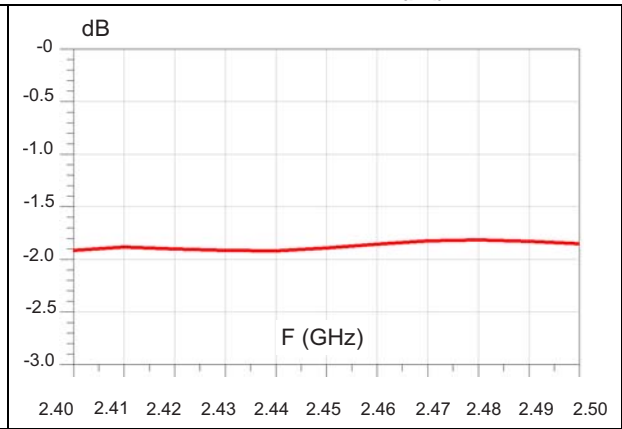


Figure 5. Return loss on SE port ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

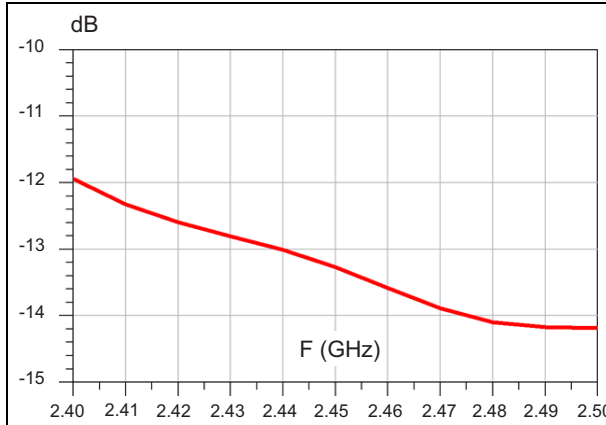


Figure 6. Return loss on DIFF port ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

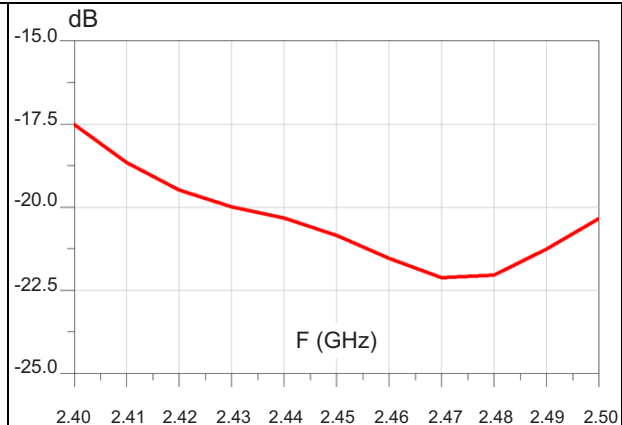


Figure 7. Amplitude imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

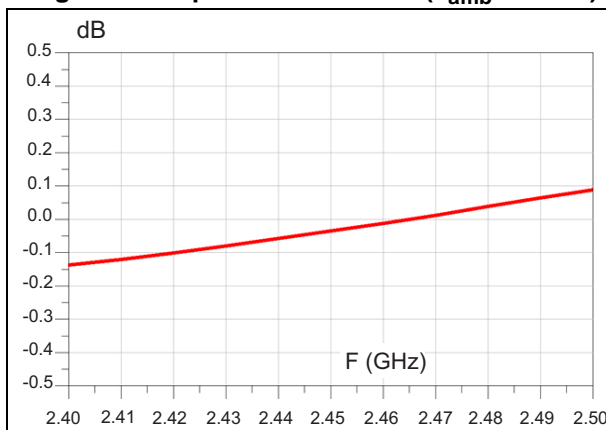


Figure 8. Phase imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

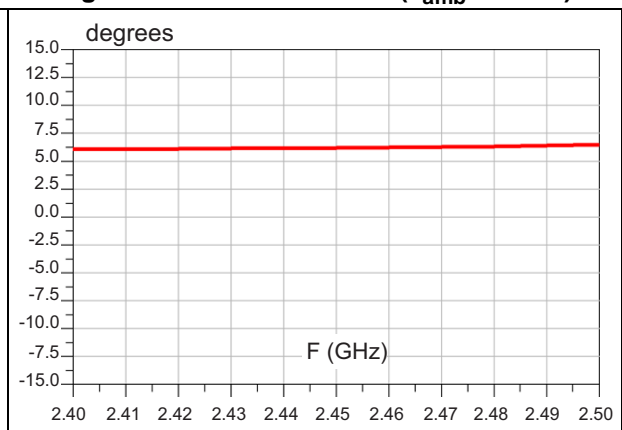


Table 4. Compatibility matrix (nRF51422)

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

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 9. Package dimensions

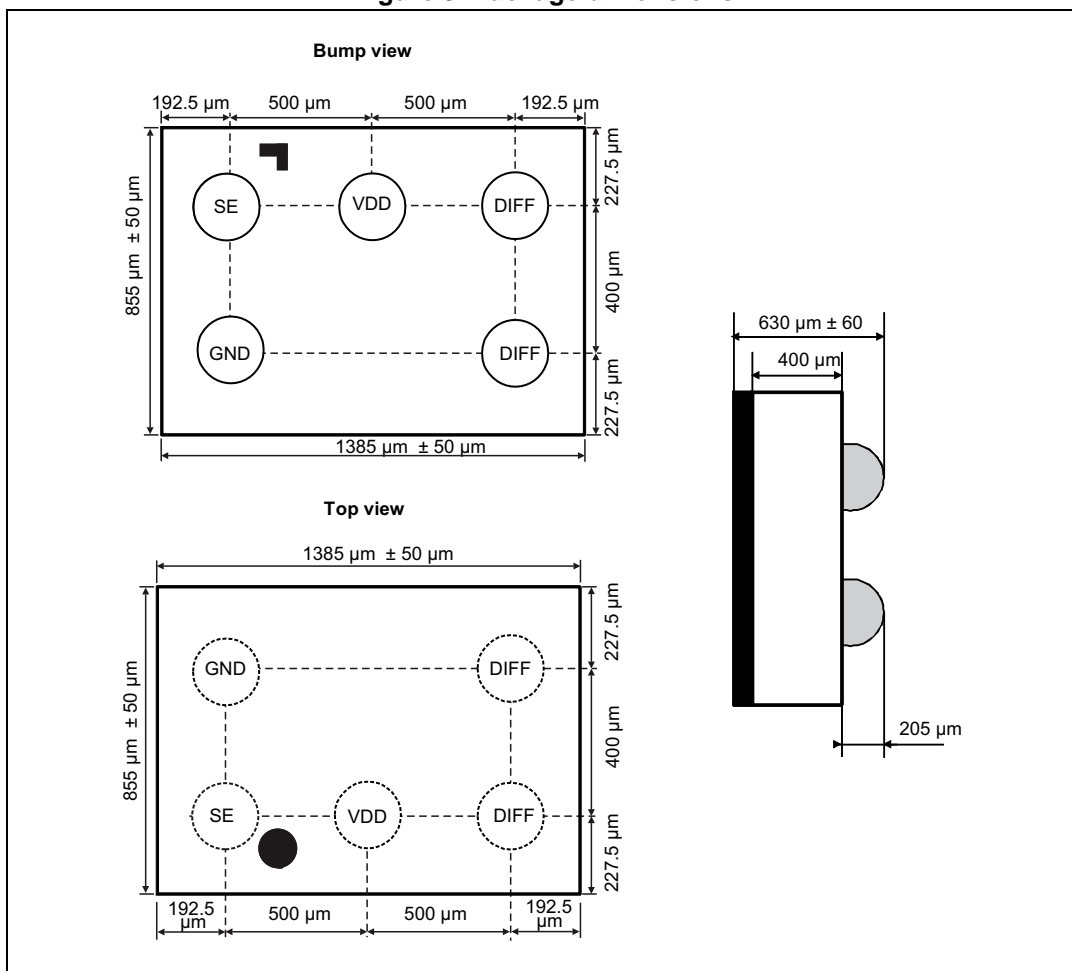


Figure 10. Recommended land pattern

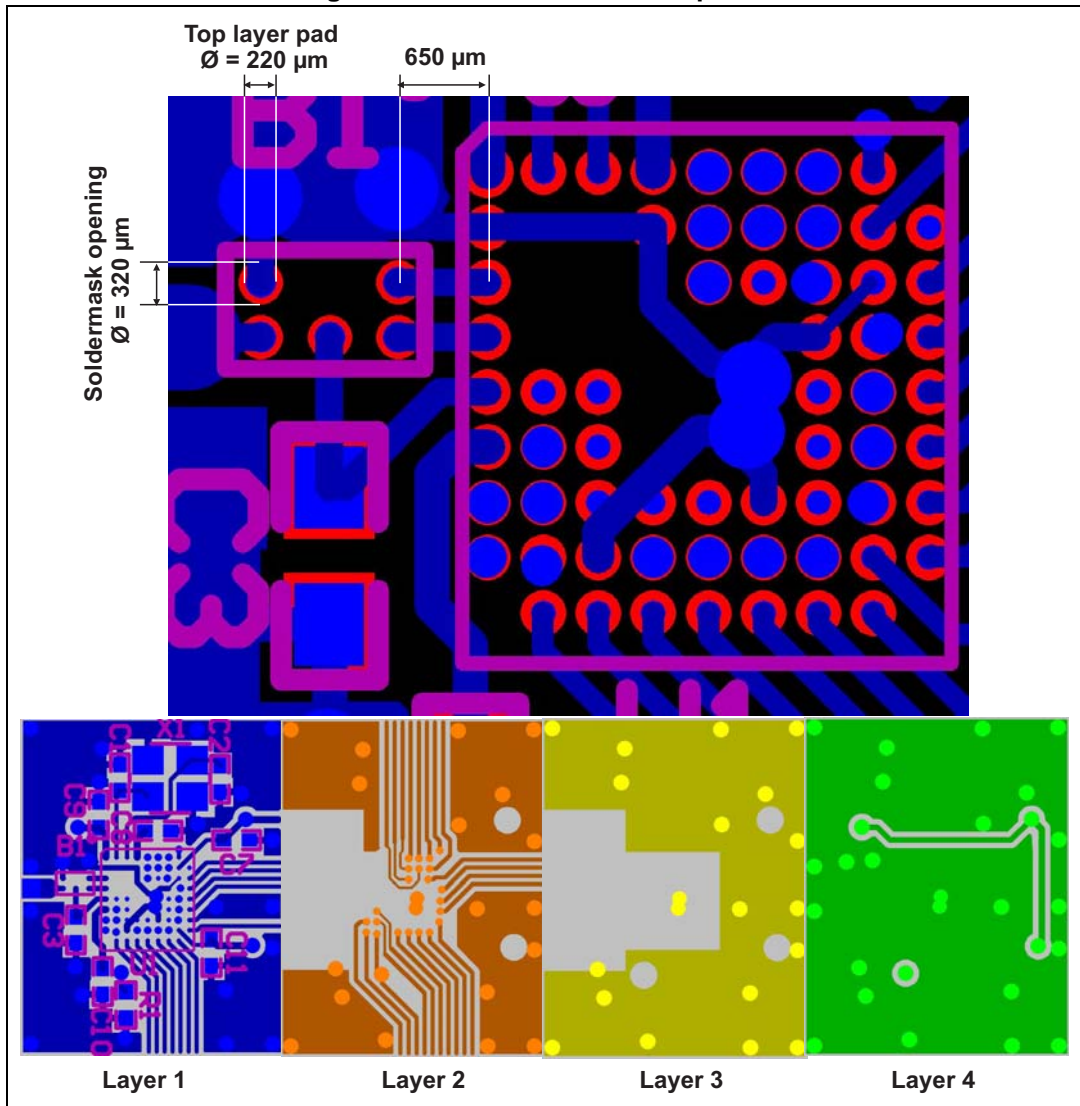


Figure 11. PCB stack-up recommendation

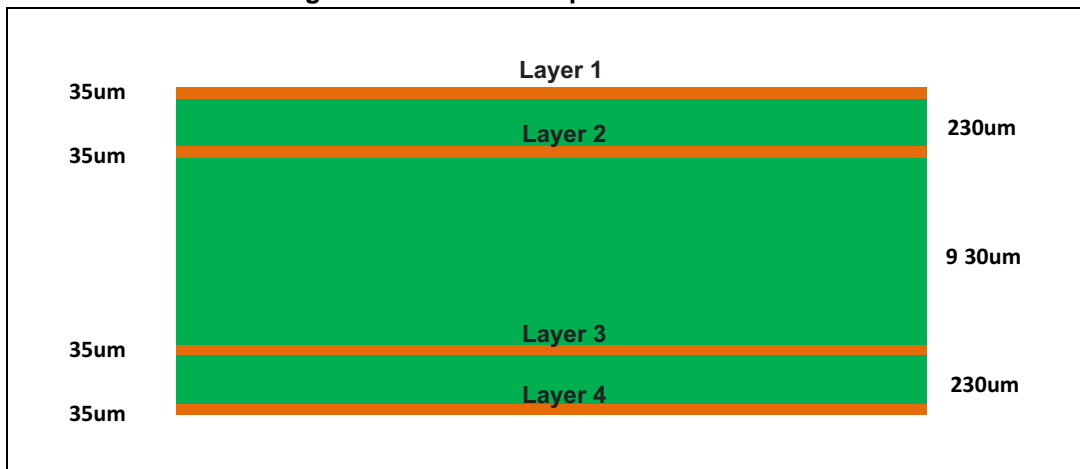


Figure 12. Marking

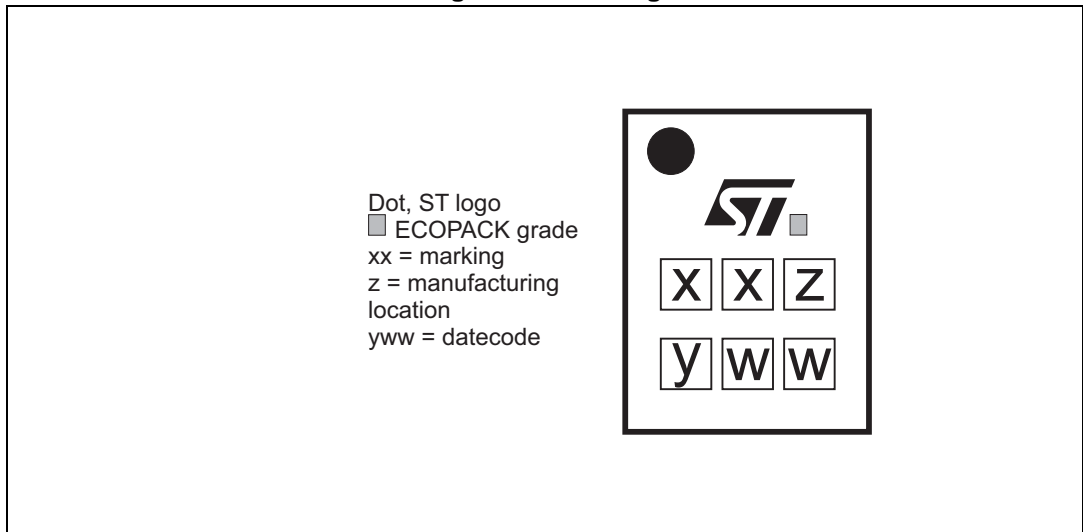
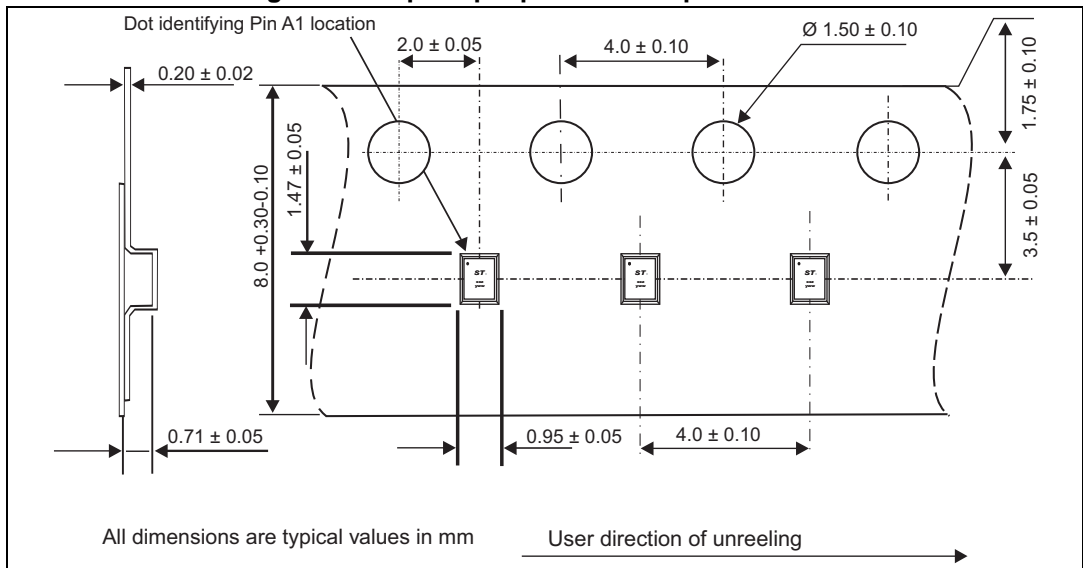


Figure 13. Flip Chip tape and reel specifications



Note: More information is available in the STMicroelectronics Application notes:
 AN2348 Flip-Chip: "Package description and recommendations for use"
 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

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

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

Solder stencil opening:
220 μm recommended

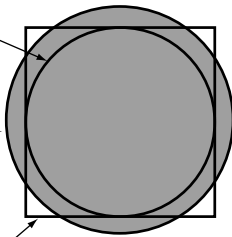


Figure 15. Footprint - 3 mils stencil - solder mask defined

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

Copper pad diameter:
320 μm recommended
300 μm minimum

Solder stencil opening:
220 μm recommended

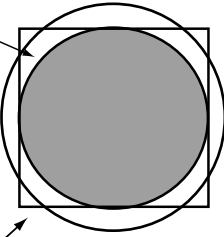


Figure 16. Footprint - 5 mils stencil - non solder mask defined

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

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

Solder stencil opening:
330 μm recommended*

*depending on paste, it can go down to 270 μm

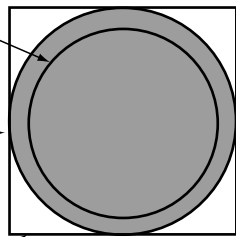


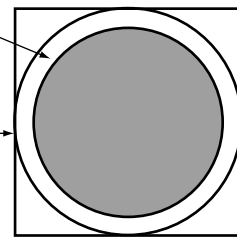
Figure 17. Footprint - 5 mils stencil - solder mask defined

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

Copper pad diameter:
320 μm recommended
300 μm minimum

Solder stencil opening:
330 μm recommended*

*depending on paste, it can go down to 270 μm



4 Ordering information

Table 6. Ordering information

Order code	Marking	Weight	Base Qty	Delivery mode
BAL-NRF02D3	SK	1.58 mg	5000	Tape and Reel

5 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 .

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