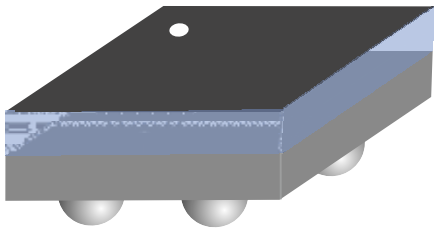
# BALF-NRF01D3

## 50 Ω nominal input / conjugate match balun to nRF51822-QFAA /QFAB and nRF51422-QFAA/QFAB with integrated harmonic filter

**Datasheet – production data**



**Lead-free Flip-Chip package**
**5 bumps**

## Features

- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated Flip-Chip on Glass
- Small footprint: < 1.5 $mm^2$

### Benefits

- Very low profile: < 560 µm after reflow
- High RF performance
- PCB space saving versus discrete solution
- BOM count reduction
- Efficient manufacturability

## Applications

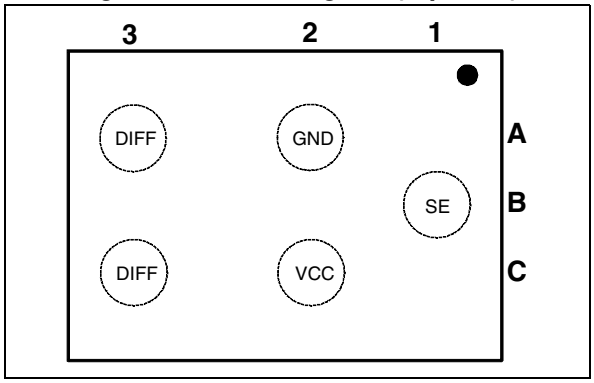
- 2.45 GHz balun with integrated matching network
- Matching optimized for following chipsets: nRF51822-QFAA/QFAB, and nRF51422-QFAA/QFAB

## Description

STMicroelectronics BALF-NRF01D3 is an ultraminiature balun. The BALF-NRF01D3 integrates matching network in a monolithic glass substrate. Matching impedance has been customized for the nRF51822-QFAA/QFAB, and nRF51422-QFAA/QFAB RF transceivers.

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

**Figure 1. Pinout diagram (top view)**






This is information on a product in full production. www.st.com

# 1 Characteristics

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

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $P_{IN}$ | Input Power $RF_{IN}$ | | | 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) | 500 | | | |
| $T_{OP}$ | Operating temperature | -40 | | +105 | °C |

**Table 2. Electrical characteristics ($T_{amb}$ = 25 °C)**

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $Z_{OUT}$ | Nominal differential output impedance | | conjugate match to:<br>– nRF51822-QFAA/QFAB<br>– nRF51422-QFAA/QFAB | | Ω |
| $Z_{IN}$ | Nominal input impedance | | 50 | | Ω |
| F | Frequency range (bandwidth) | 2400 | | 2540 | |
| $I_L$ | Insertion loss in bandwidth | | 1.35 | 1.46 | dB |
| $R_L$ | Return loss in bandwidth | 16.5 | 17 | 17.5 | dB |
| ϕimb | Phase imbalance | 4.5 | 5 | 5.5 | ° |
| Aimb | Amplitude imbalance | 0.15 | 0.2 | 0.25 | dB |
| 2f0 | 2nd harmonic filtering | | -15 | -14 | dB |
| 3f0 | 3rd harmonic filtering | | -42 | -41 | dB |

## 1.1 Simulations results ($T_{amb}$ = 25 °C)

**Figure 2. Insertion loss in band**

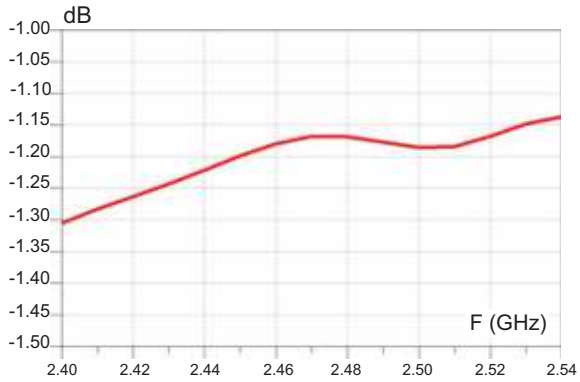



**Figure 3. Differential transmission**




**Figure 4. Return loss on SE port**

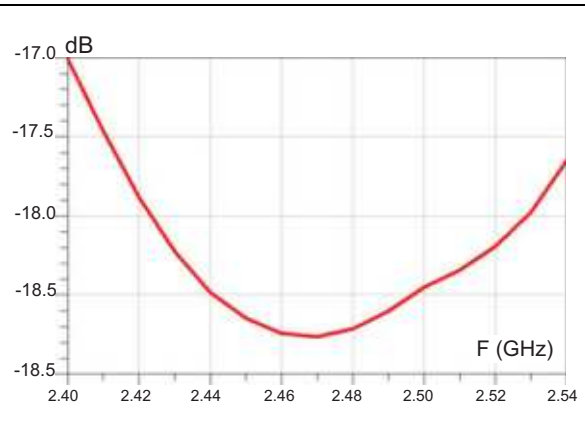



**Figure 5. Amplitude imbalance**

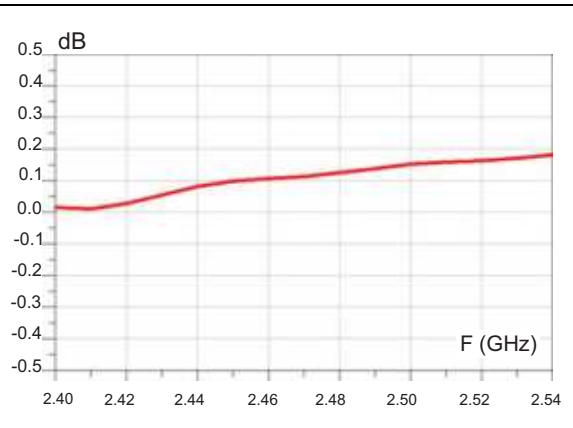



**Figure 6. Phase imbalance**

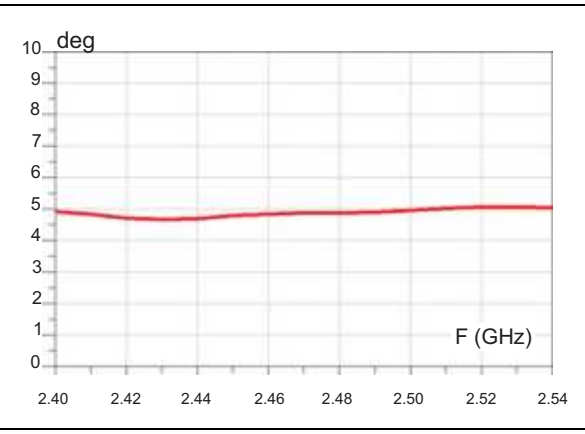



**Figure 7. H2 attenuation**

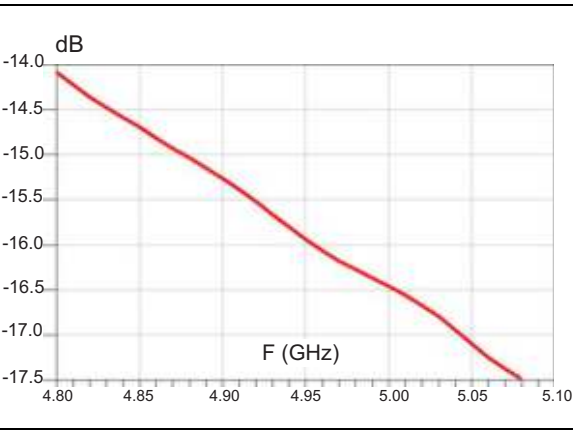


**Figure 8. Attenuation in H3**

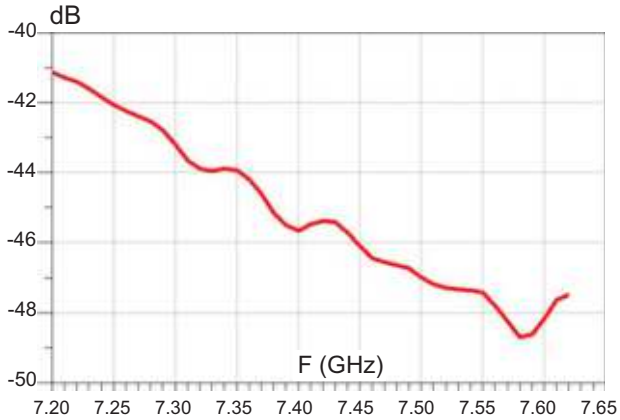


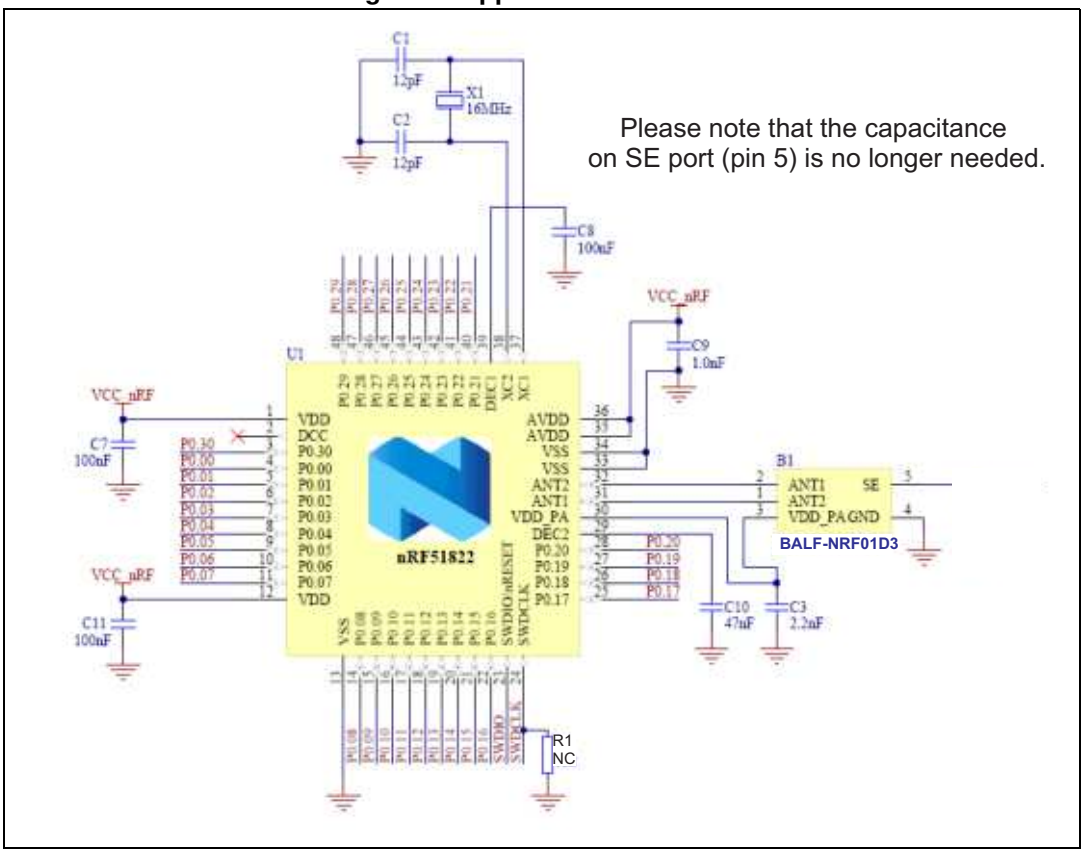

**Table 3. Compatibility matrix (nRF51422)**

| nRF51422 IC revision | Packet/variant | Build code |
|---|---|---|
| 2 | QFAA | DAA |
| | | Ex0 |
| | QFAB | A00 |

**Table 4. Compatibility matrix (nRF51822)**

| nRF51822 IC revision | Packet/variant | Build code |
|---|---|---|
| 2 | QFAA | FA0 |
| | | GC0 |
| | | Gx0 |
| | QFAB | Bx0 |

**Figure 9. Application schematic**



# 2 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)**

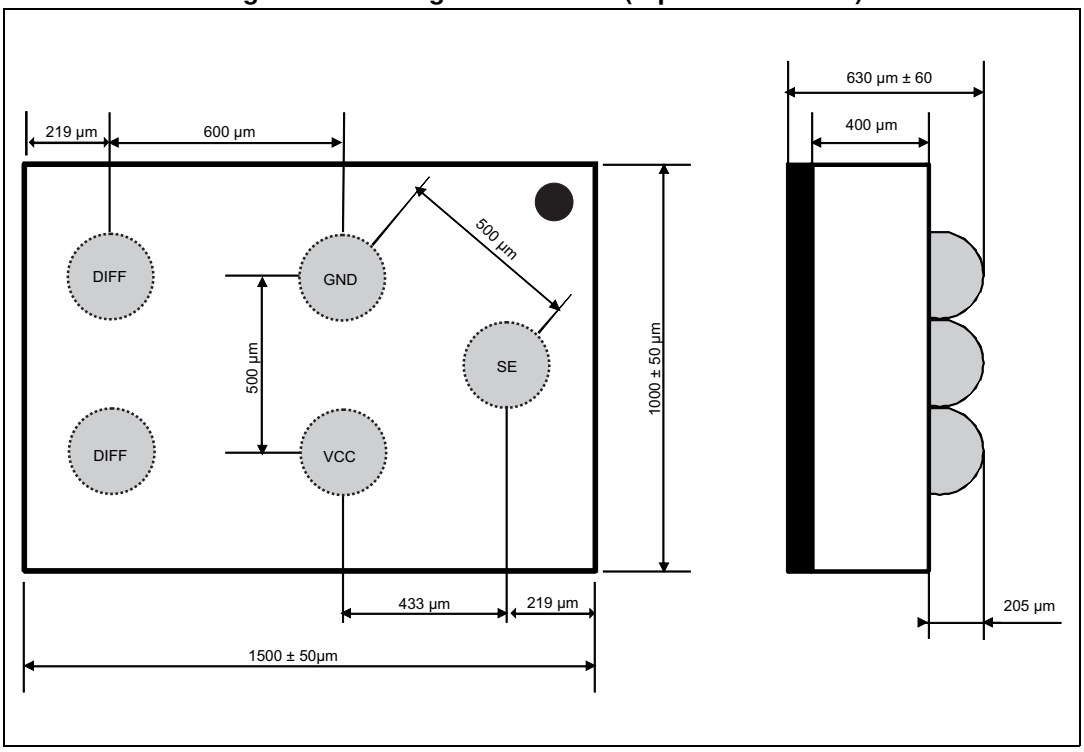


Figure 11. PCB layout recommendation

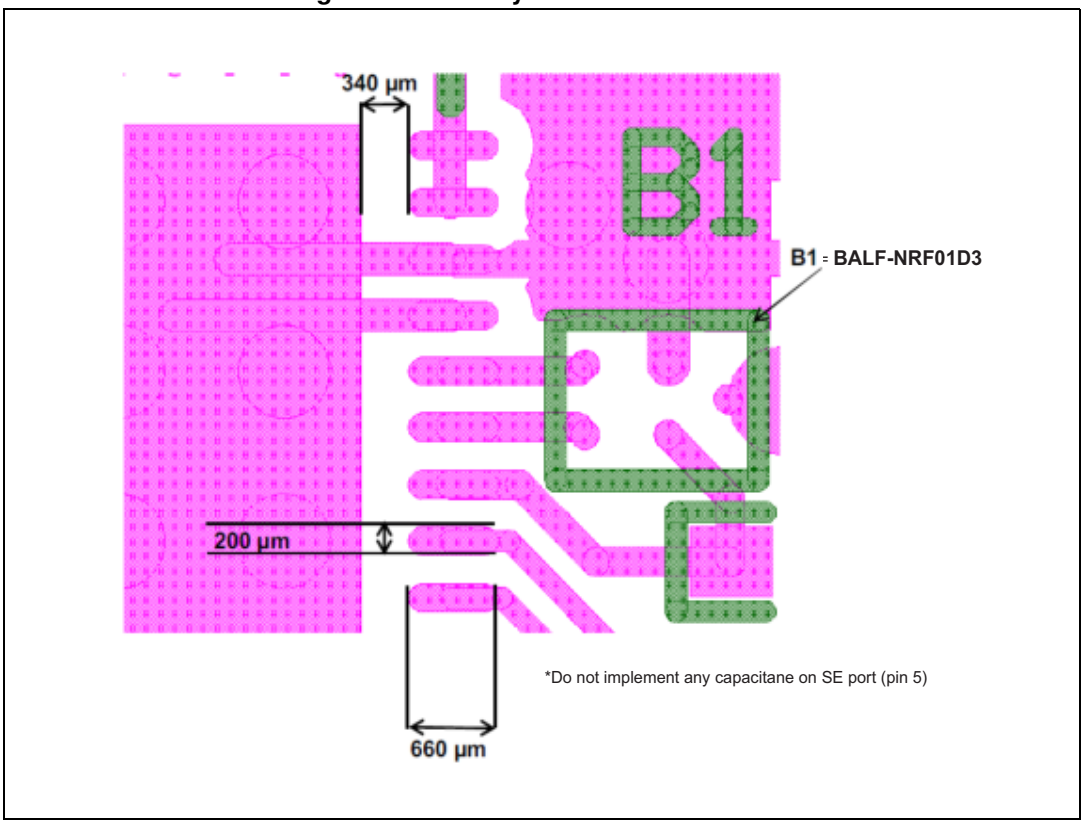



Figure 12. BALF-NRF01D3 position

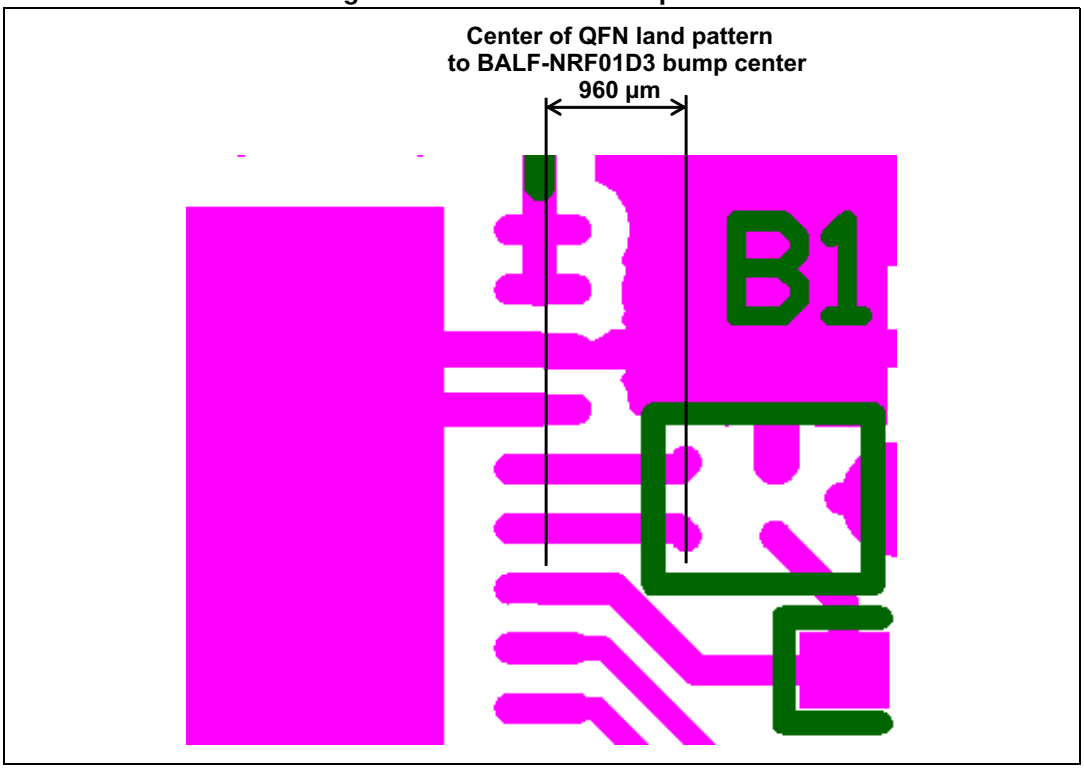


**Figure 13. Marking**

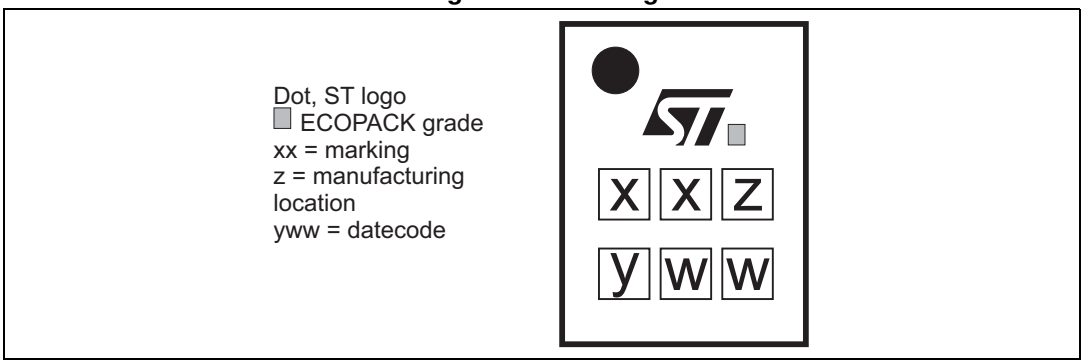
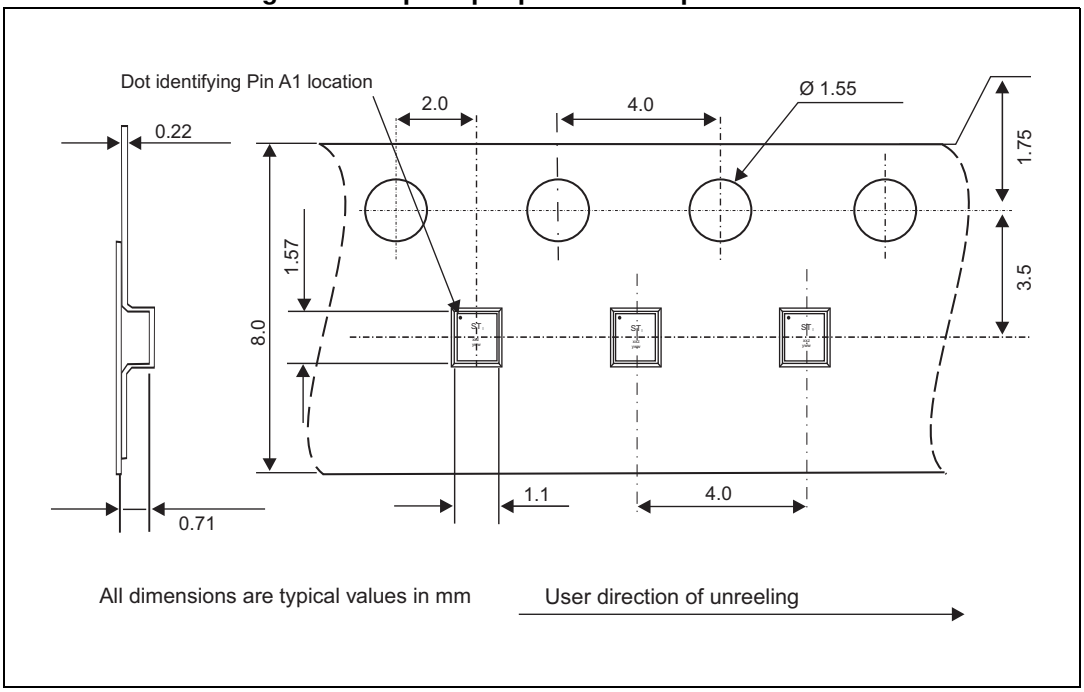



**Figure 14. Flip-Chip tape and reel specifications**




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

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

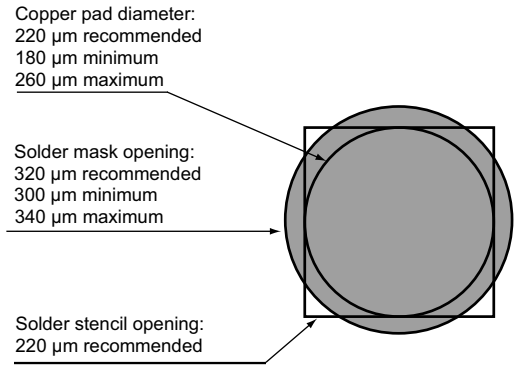



**Figure 16. Footprint - 3 mils stencil - solder mask defined**

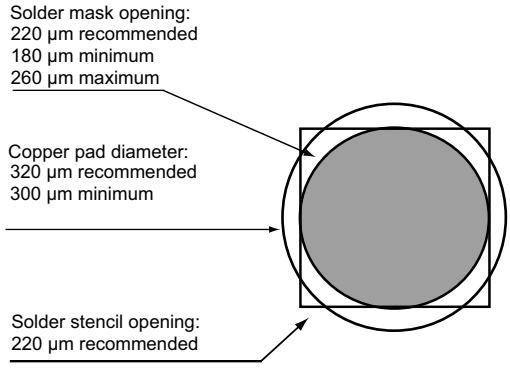



**Figure 17. Footprint - 5 mils stencil -non solder mask defined**

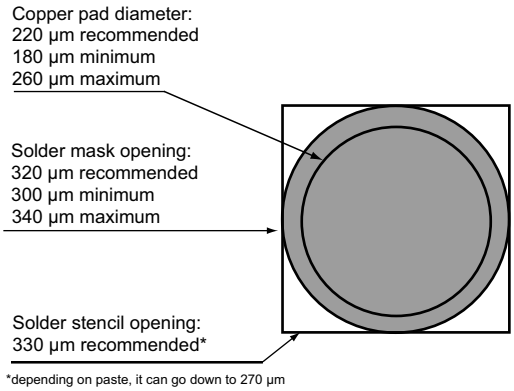
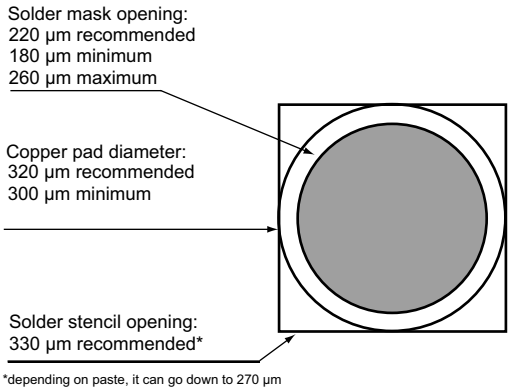



**Figure 18. Footprint - 5 mils stencil - solder mask defined**



# 3 Ordering information

Table 5. Ordering information

| Order code | Marking | Weight | Base Qty | Delivery mode |
|---|---|---|---|---|
| BALF-NRF01D3 | ST | 1.82 mg | 5000 | Tape and Reel |

# 4 Revision history

Table 6. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 27-Mar-2014 | 1 | Initial release |
| 04-Jun-2014 | 2 | Updated all curves and added *Table 4*. |
| 25-Mar-2015 | 3 | Updated cover page and *Table 2*, *Table 3* and *Table 4*. |
| 07-Jul-2015 | 4 | Updated *Table 1*. |

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