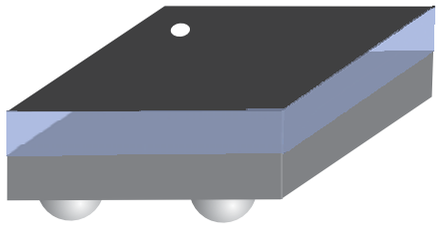
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# BAL-NRF02D3

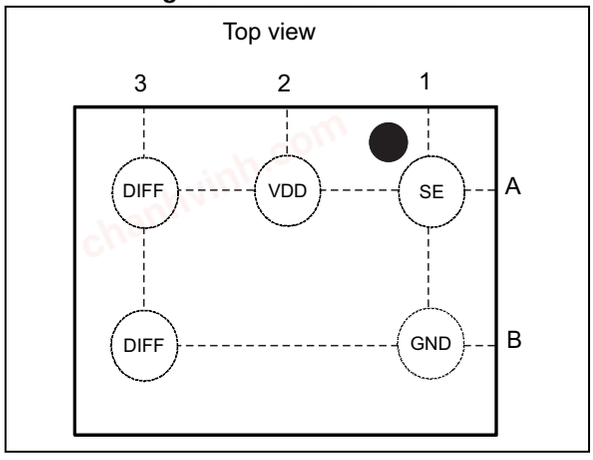
## 50 ohm nominal input / conjugate match balun to nRF51822-CEAA and nRF51422-CEAA

**Datasheet – production data**



Lead-free Flip-Chip package
5 bumps

**Figure 1. Pin coordinates**




## Features

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

### Benefits

- Very low profile: < 560 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 nRF51422-CEAA, nRF51822-CEAA.

## 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 and nRF51822-CEAA.

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.



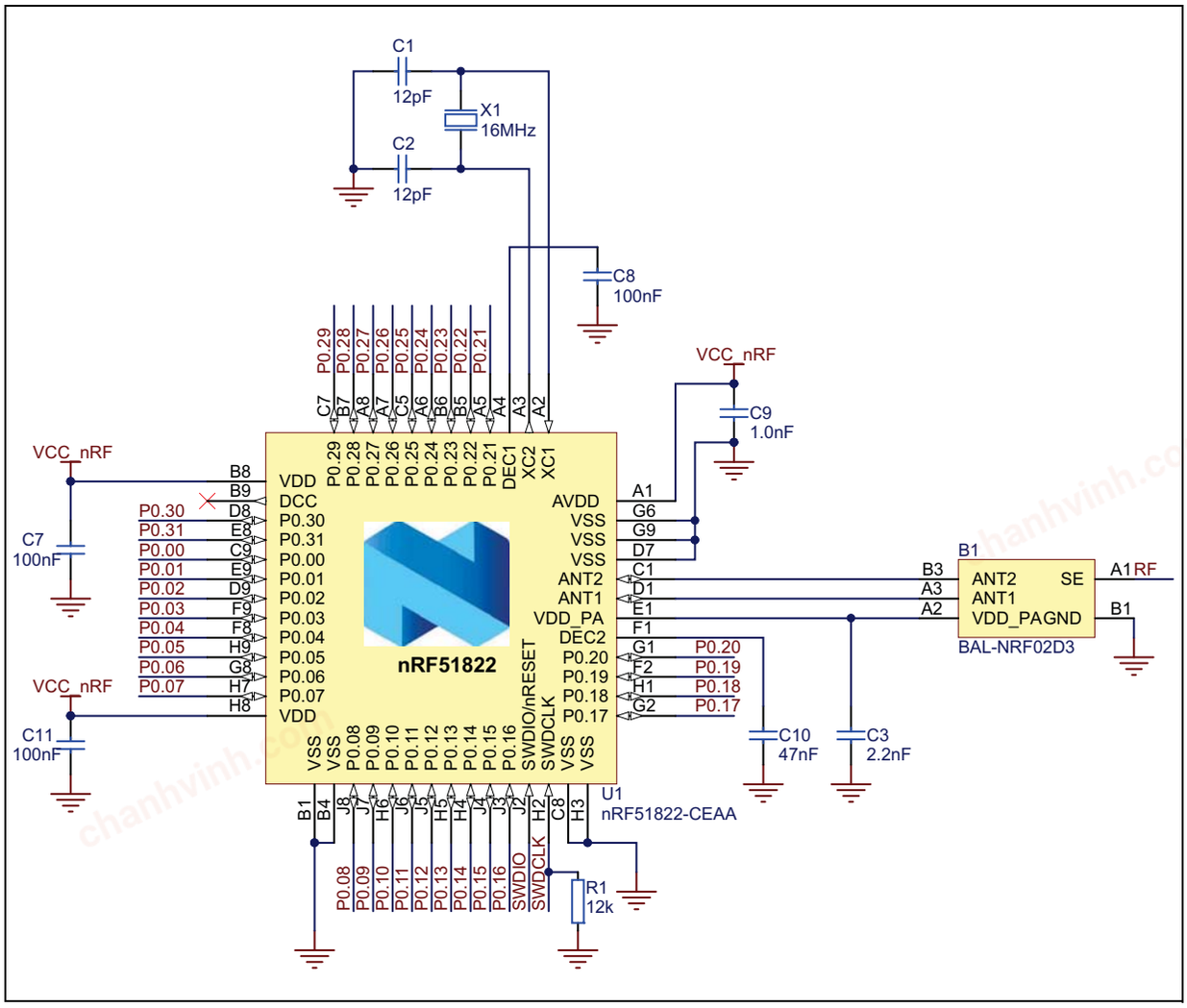
This is information on a product in full production. www.st.com

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# 1 Application

**Figure 2. Application schematic**



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# 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 | | +85 | °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 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 | | | 1.9 | | dB |
| $R_L$ | Return loss in bandwidth | | | 12 | | dB |
| ϕimb | 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 |

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## 2.1 On-board measurements

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

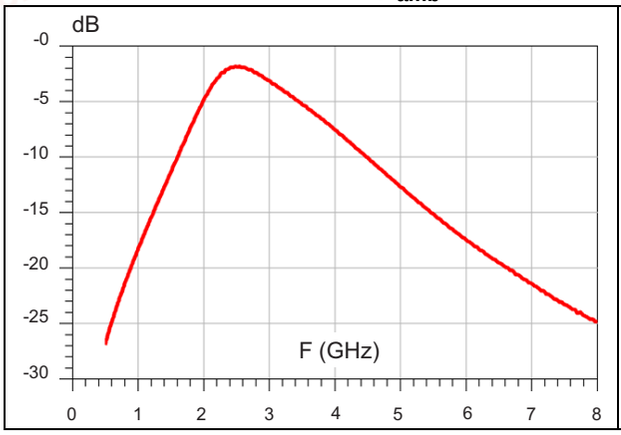



Figure 4. Insertion loss ($T_{amb}$ = 25 °C)

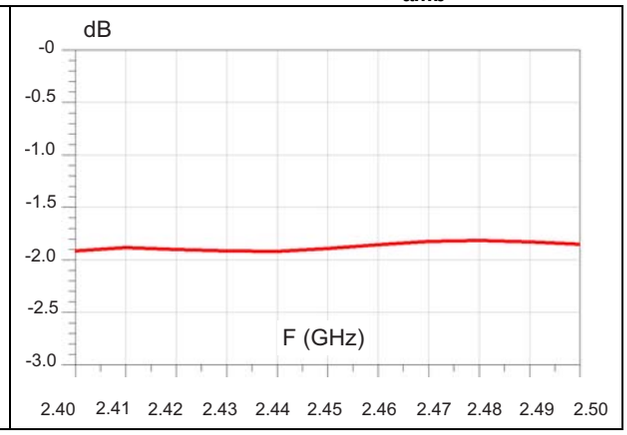



Figure 5. Return loss on SE port ($T_{amb}$ = 25 °C)

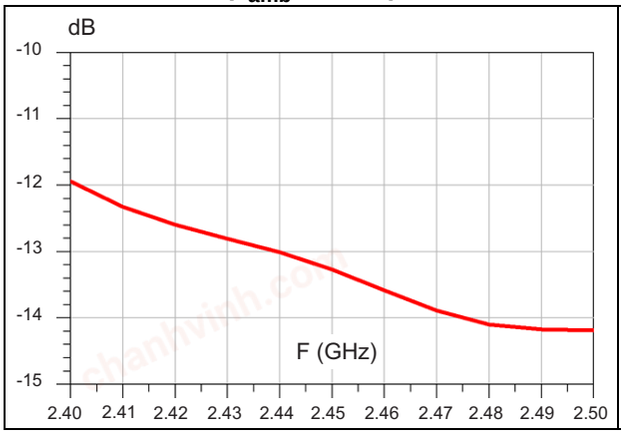



Figure 6. Return loss on DIFF port ($T_{amb}$ = 25 °C)

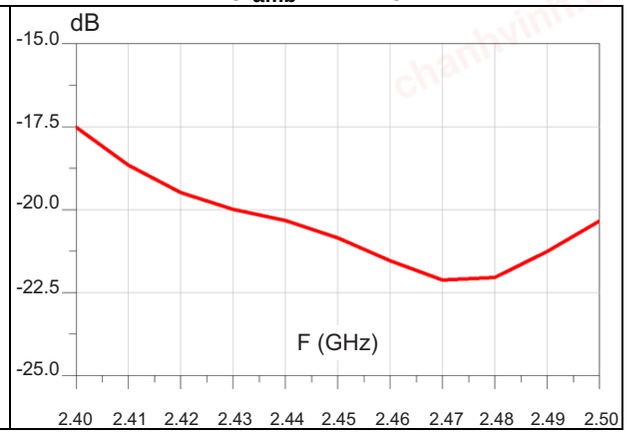



Figure 7. Amplitude imbalance ($T_{amb}$ = 25 °C)

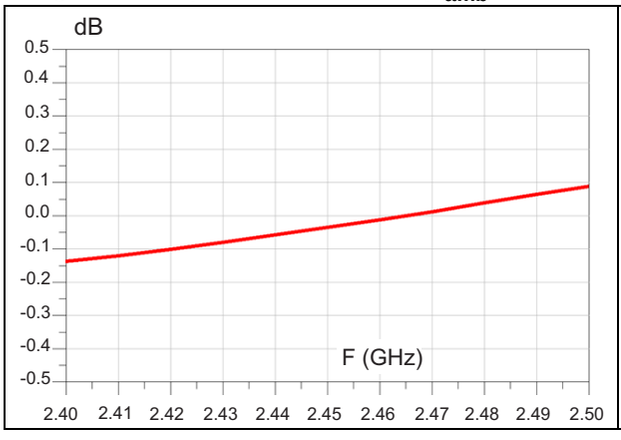
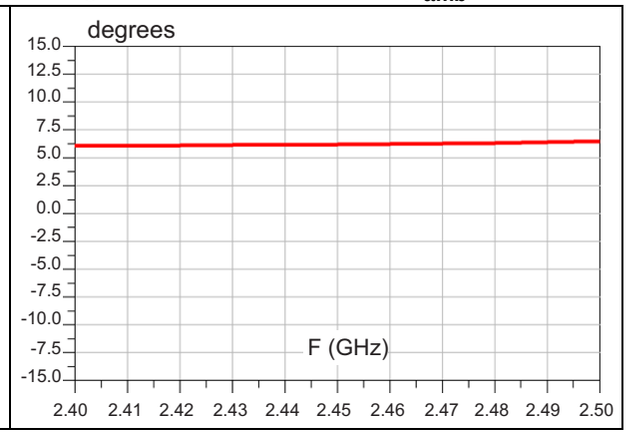



Figure 8. Phase imbalance ($T_{amb}$ = 25 °C)



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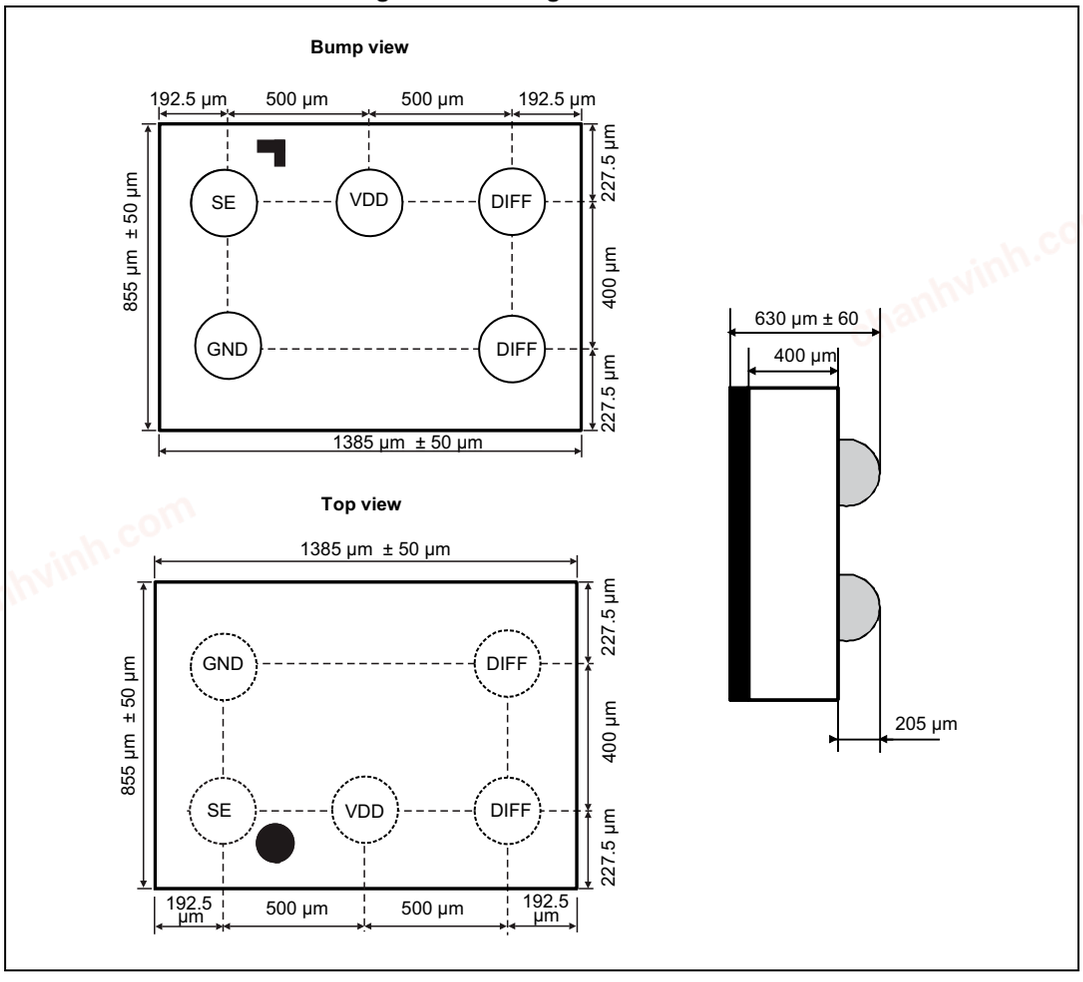


# 3 Package information

- 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**



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Figure 10. Recommended land pattern

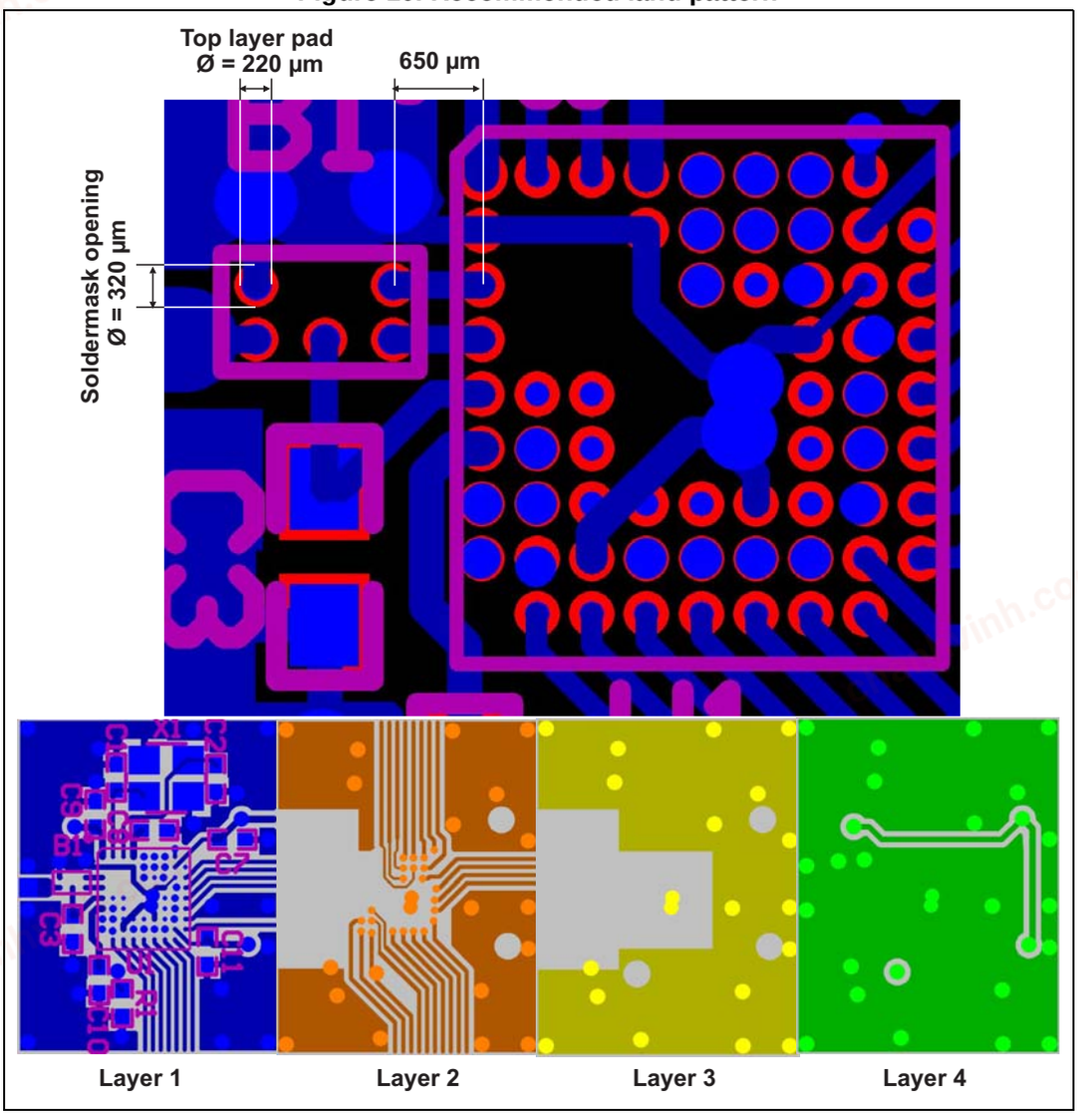
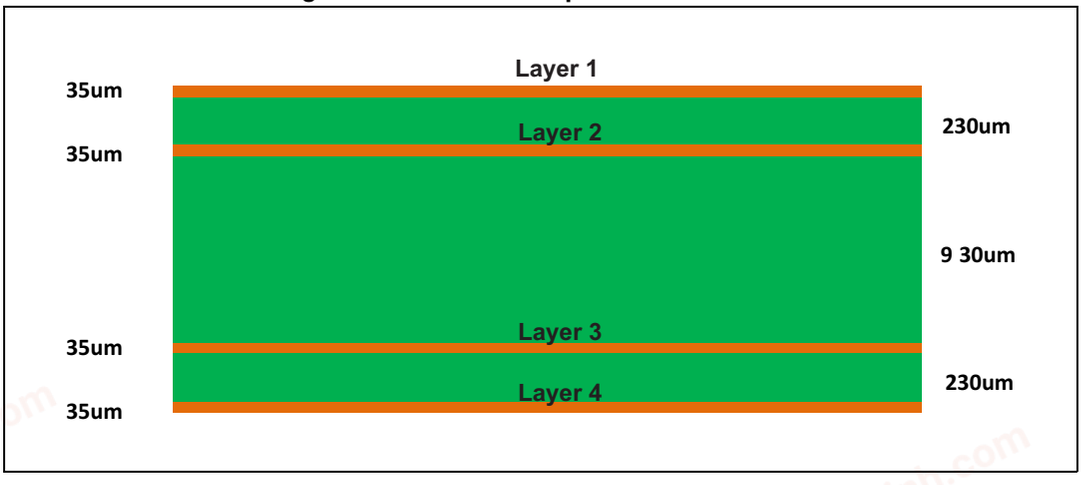



Figure 11. PCB stack-up recommendation



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**Figure 12. Footprint - non solder mask defined**

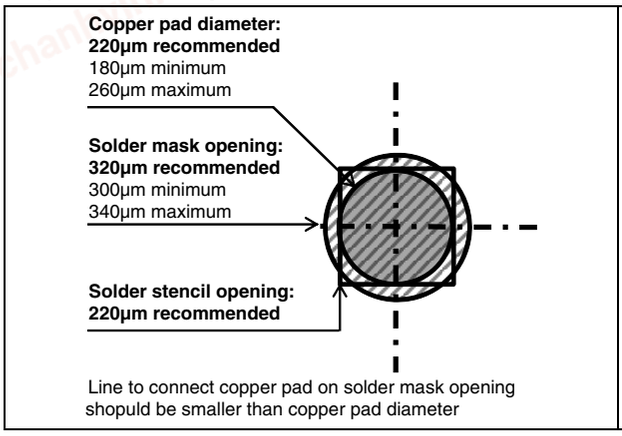



**Figure 13. Footprint - solder mask defined**

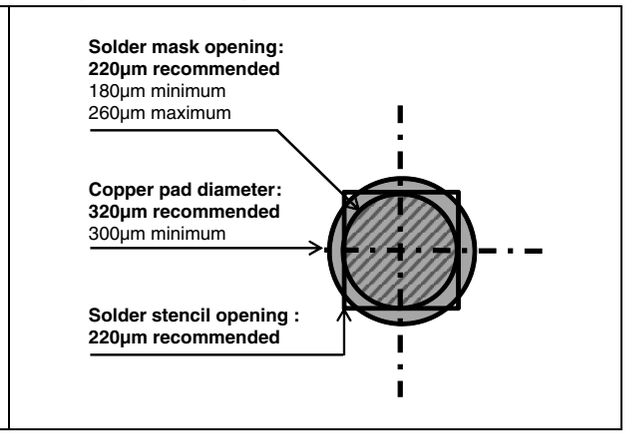
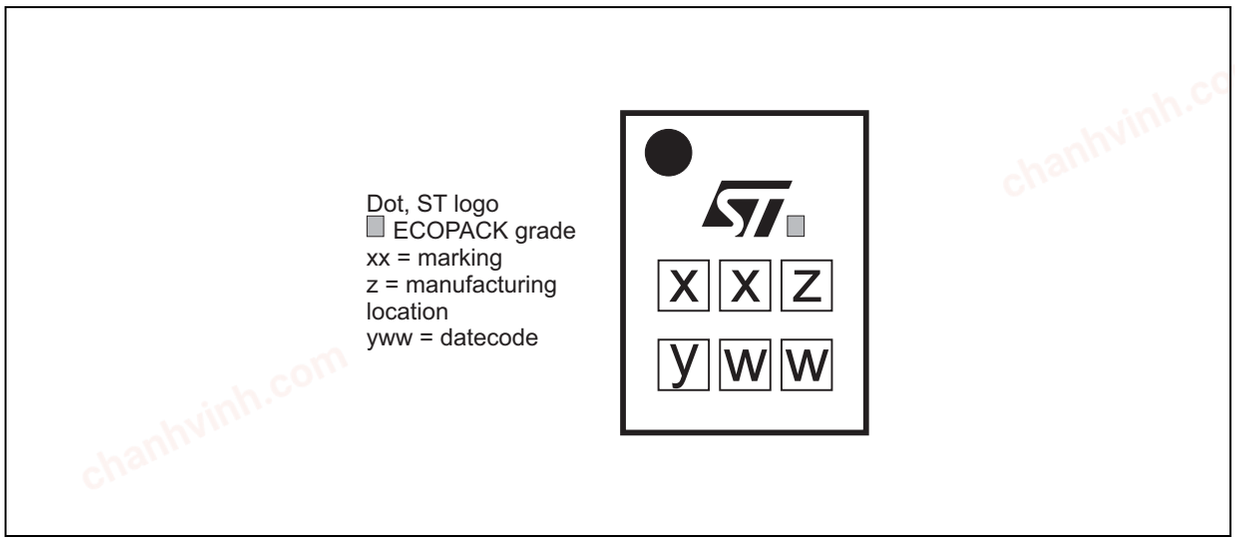


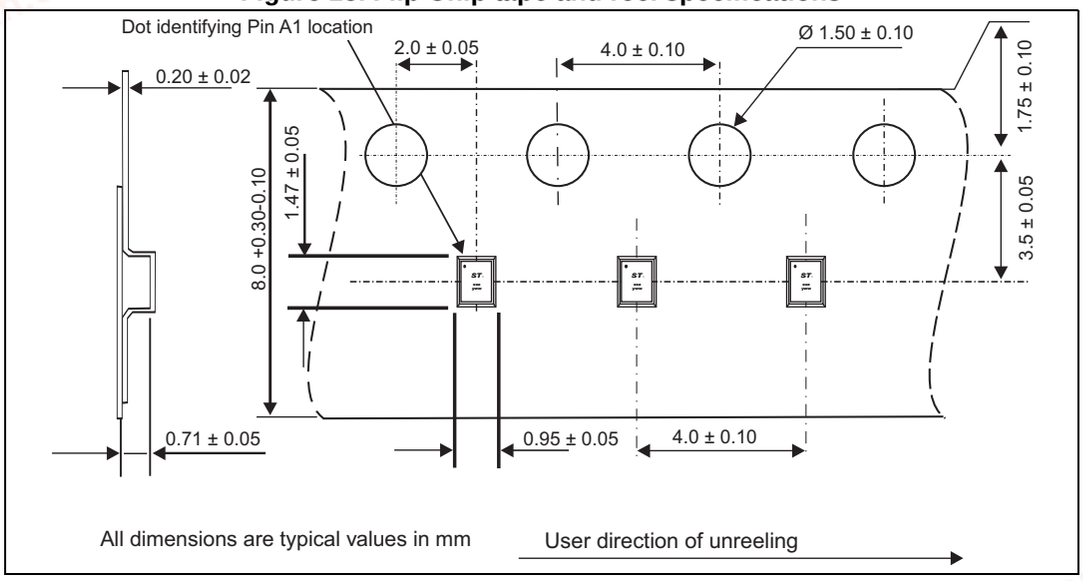

**Figure 14. Marking**



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**Figure 15. 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"*

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# 4 Ordering information

**Table 4. Ordering information**

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

# 5 Revision history

**Table 5. 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*. |

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