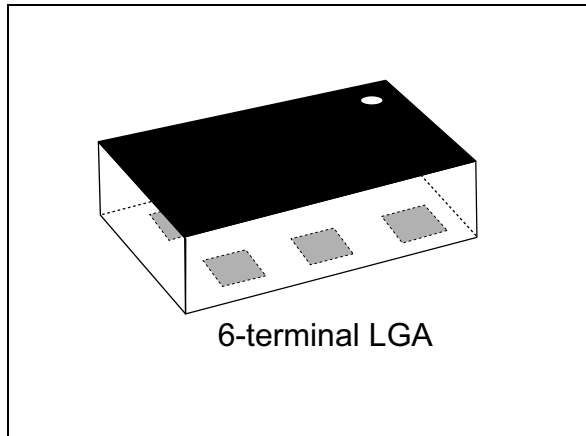


50  $\Omega$  nominal input / conjugate match balun to nRF51822-QFAAG0  
nRF51422-QFAAE0 and nRF51822-QFABB0 with integrated filter

Datasheet – production data



## Features

- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated CSP on Glass
- Small footprint: < 1.5 mm<sup>2</sup>

## Benefits

- Very low profile
- High RF performance
- PCB space saving versus discrete solution
- BOM count reduction
- Efficient manufacturability

## Applications

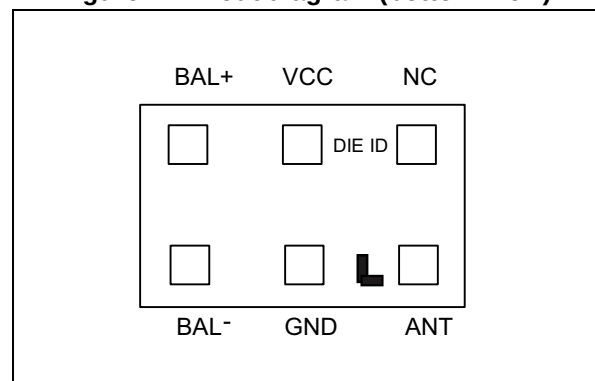
- 2.45 GHz balun with integrated matching network
- Matching optimized for following chipsets:  
nRF51822-QFAAG0, nRF51822-QFABB0 and  
nRF51422-QFAAE0

## Description

STMicroelectronics BALF-NRF01E3 is an ultraminiature balun. The BALF-NRF01E3 integrates matching network in a monolithic glass substrate. Matching impedance has been customized for the nRF51822-QFAAG0, nRF51822-QFABB0 and nRF51422-QFAAE0 RF transceivers.

It is using STMicroelectronics IPD technology on non-conductive glass substrate which optimize RF performances.

Figure 1. Pinout diagram (bottom view)



# 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 $\Omega$ , air discharge) | 2000  |      |      | V    |
|           | ESD ratings charge device model (JESD22-C101-C)                               | 500   |      |      |      |
|           | ESD ratings machine model (MM: C = 200 pF, R = 25 $\Omega$ , L = 500 nH)      | 500   |      |      |      |
| $T_{OP}$  | Operating temperature                                                         | -40   |      | +125 | °C   |

**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| Symbol       | Parameter                             | Value |                                                                                    |      | Unit     |
|--------------|---------------------------------------|-------|------------------------------------------------------------------------------------|------|----------|
|              |                                       | Min.  | Typ.                                                                               | Max. |          |
| $Z_{OUT}$    | Nominal differential output impedance |       | conjugate match to:<br>– nRF51822-QFAAG0<br>– nRF51822-QFABB0<br>– nRF51422-QFAAE0 |      | $\Omega$ |
| $Z_{IN}$     | Nominal input impedance               |       | 50                                                                                 |      | $\Omega$ |
| F            | Frequency range (bandwidth)           | 2400  |                                                                                    | 2540 |          |
| $I_L$        | Insertion loss in bandwidth           |       | 2.2                                                                                | 2.7  | dB       |
| $R_L$        | Return loss in band                   | 14    | 15                                                                                 |      | dB       |
| $\phi_{imb}$ | Phase imbalance                       | -10   | 4                                                                                  | 10   | °        |
| Aimb         | Amplitude imbalance                   | -1    | 0.3                                                                                | 1    | dB       |
| 2f0          | (4800-5080 MHz)                       | 15.8  | 16.3                                                                               |      | dB       |
| 3f0          | (7200-7620 MHz)                       | 22.7  | 24.1                                                                               |      | dB       |

## 1.1 RF performances ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

Figure 2. Wide band frequency response



Figure 3. Insertion loss

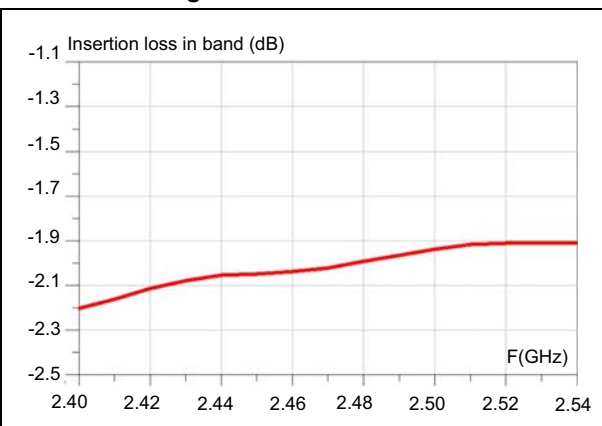


Figure 4. Phase imbalance

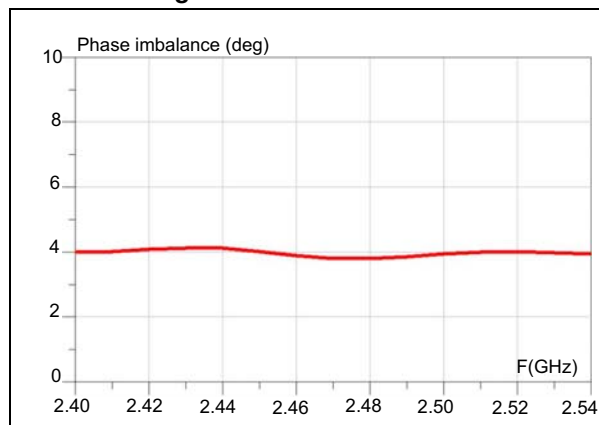


Figure 5. Amplitude imbalance

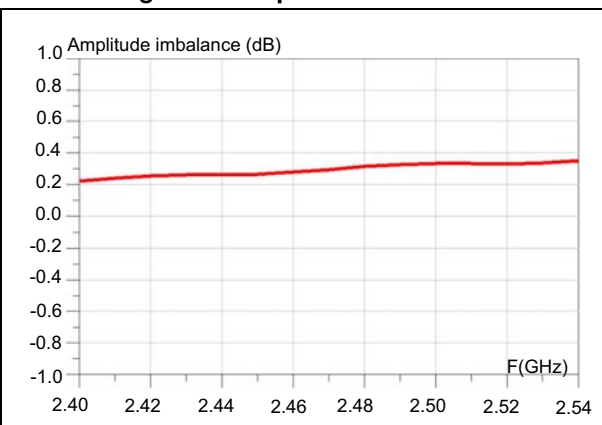


Figure 6. Return loss on SE port

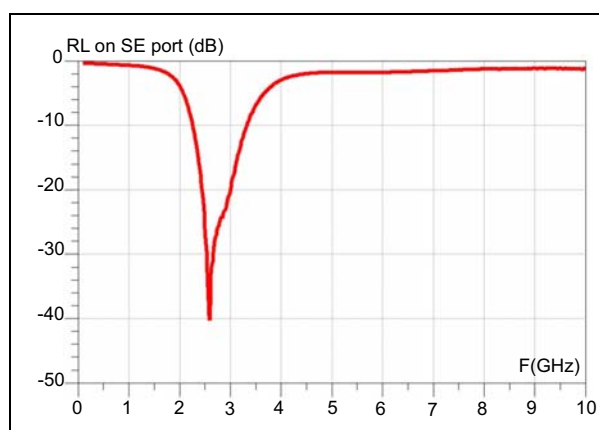
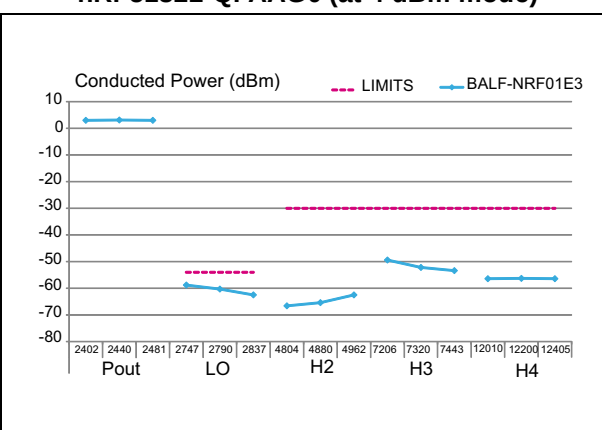


Figure 7. Conducted measurement with nRF51822-QFAAG0 (at 4 dBm mode)





### 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](http://www.st.com). ECOPACK® is an ST trademark.

Figure 9. Package dimensions (top, profile and bottom view)

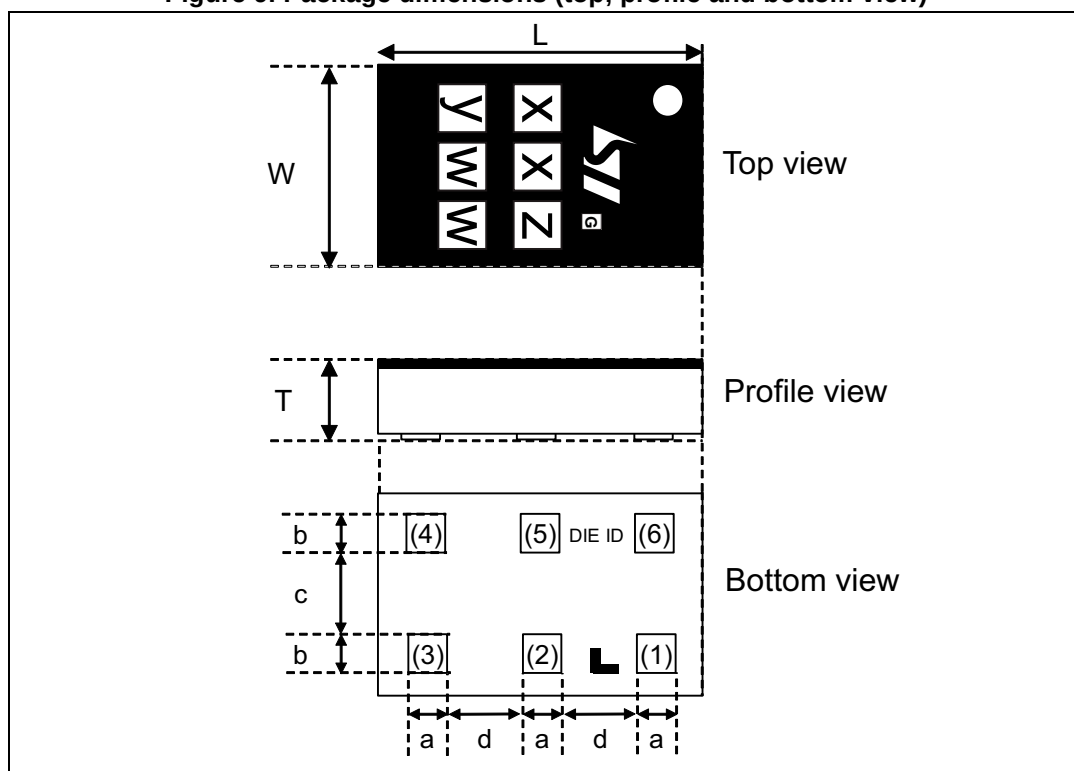


Table 3. Package dimensions

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| L    | 1.40 | 1.50 | 1.60 |
| W    | 0.90 | 1.00 | 1.10 |
| T    | 0.42 | 0.45 | 0.48 |
| a    | 0.18 | 0.20 | 0.20 |
| b    | 0.18 | 0.20 | 0.20 |
| c    | 0.38 | 0.40 | 0.42 |
| d    | 0.28 | 0.30 | 0.32 |

Figure 10. PCB layout recommendation

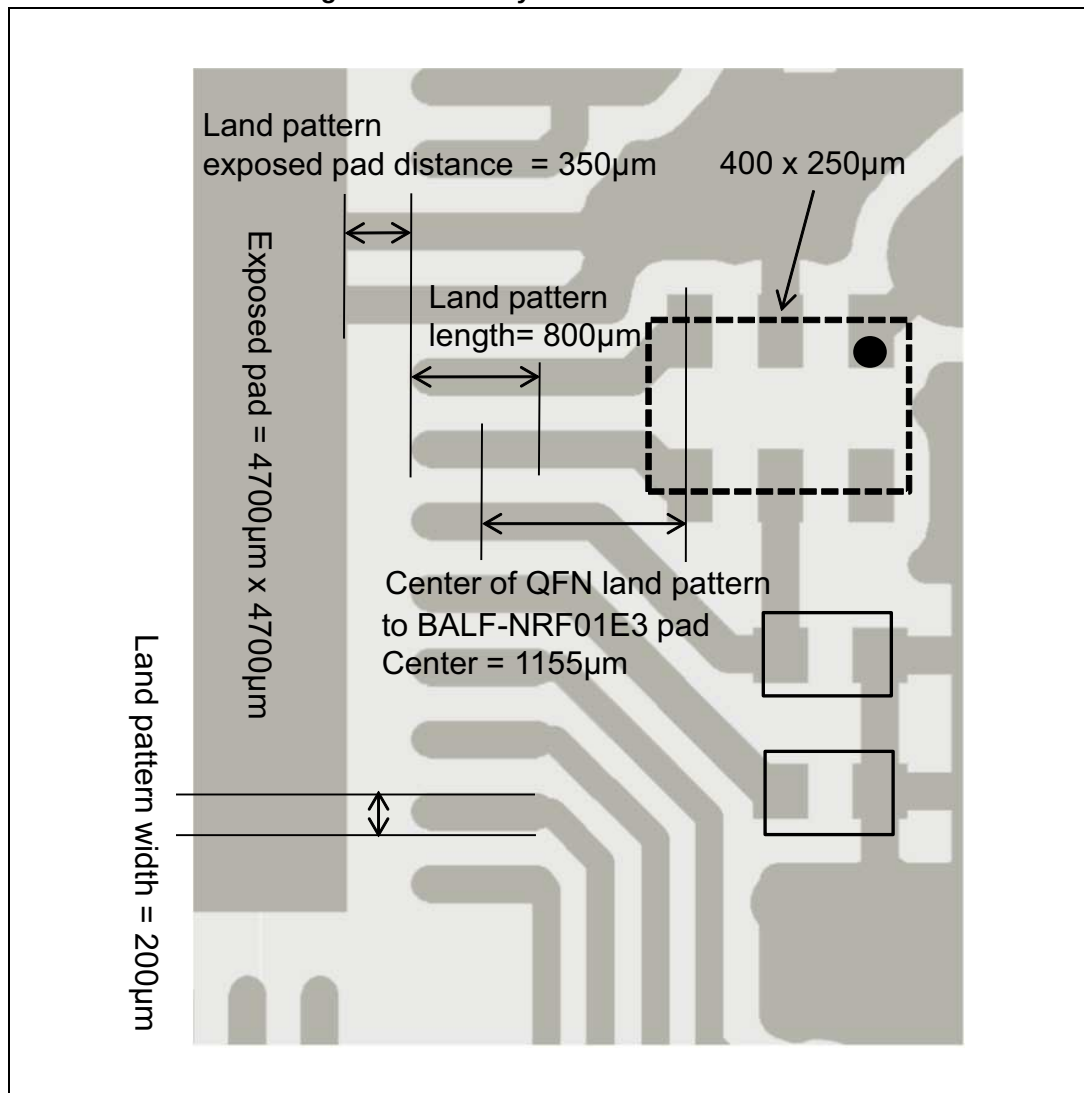
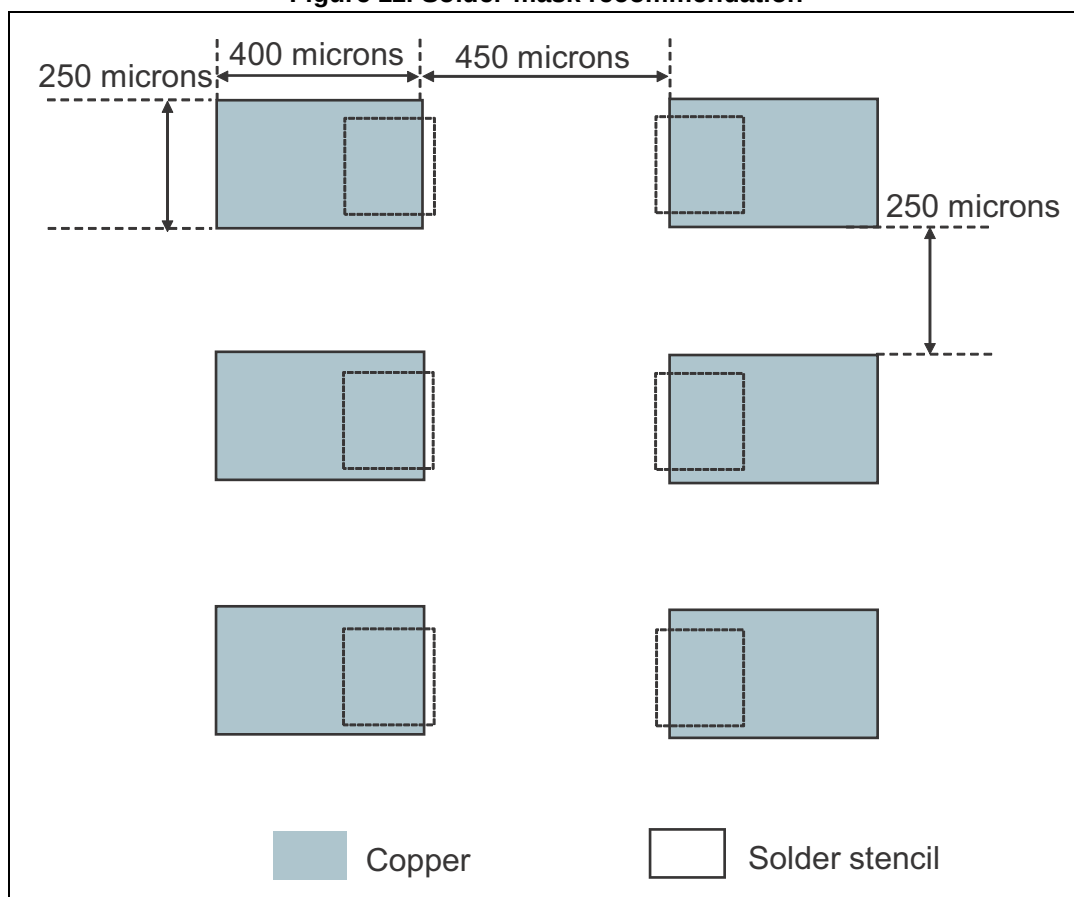


Figure 11. Solder-mask recommendation



#### Solder Paste

- 100  $\mu\text{m}$  Solder stencil thickness is recommended.
- Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
- “No Clean” solder paste is recommended.
- Offers a high tack force to resist component movement during high speed.
- Solder paste with fine particles: powder particle size is 20-45  $\mu\text{m}$ .

#### Placement

- Manual positioning is not recommended.
- It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
- Standard tolerance of  $\pm 0.05$  mm is recommended.
- 3.5 N placement force is recommended. Too much placement force can lead to squeeze out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
- To improve the package placement accuracy, a bottom side optical control should be performed with high resolution.
- For assembly, a strong PCB support is recommended (especially on low thickness PCB) during solder paste printing, pick and place and reflow soldering by using optimized tools.

Figure 12. Marking

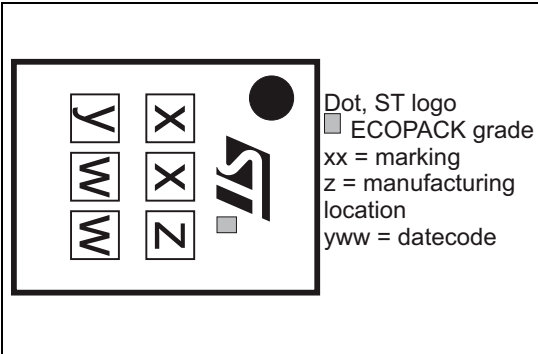


Figure 13. Pad bottom view

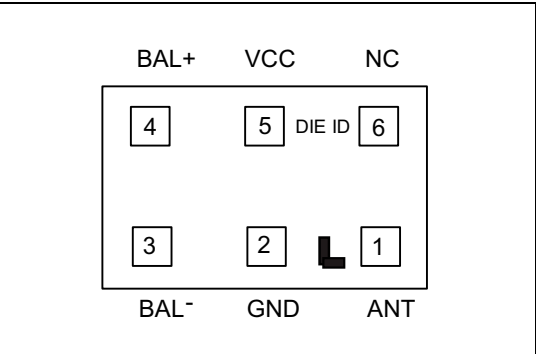
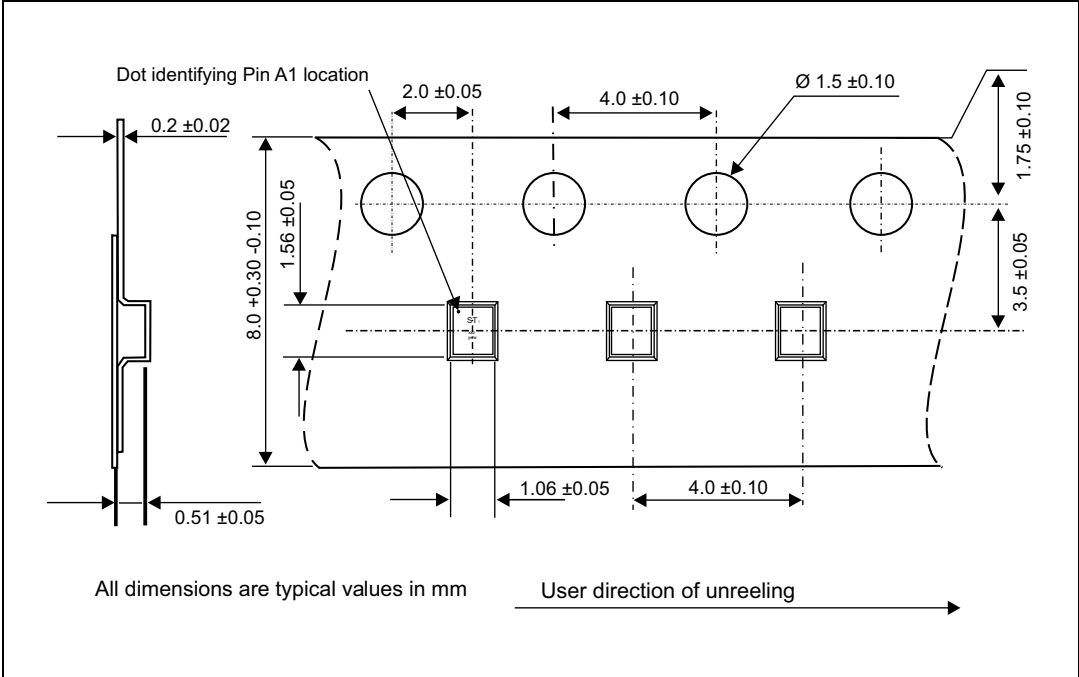


Table 4. Pad assignment details

| LGA | Name | Description              |
|-----|------|--------------------------|
| 6   | NC   | Not connected            |
| 5   | VCC  | Common collector voltage |
| 4   | BAL+ | Balun positive output    |
| 3   | BAL- | Balun negative output    |
| 2   | GND  | Ground                   |
| 1   | ANT  | Antenna connection       |

Figure 14. Tape and reel specifications



Note: More information is available in the STMicroelectronics Technical note: TN1197: “IPAD™, CSPG w/o bump: package description and recommendations for use”.

## 4 Ordering information

Figure 15. Ordering information scheme

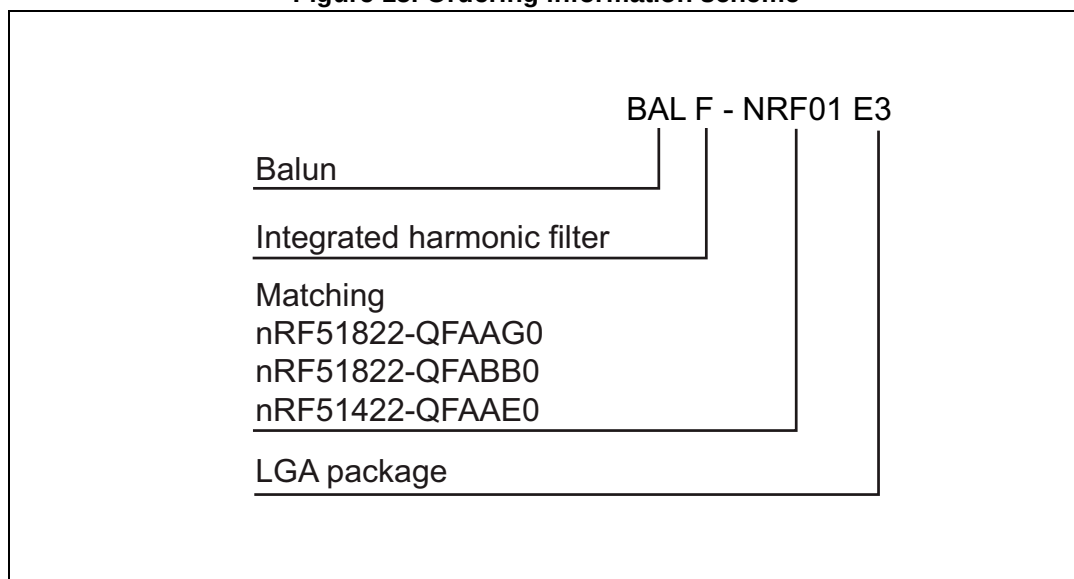


Table 5. Ordering information

| Order code   | Marking | Package | Weight   | Base Qty | Delivery mode     |
|--------------|---------|---------|----------|----------|-------------------|
| BALF-NRF01E3 | SYN     | LGA     | 1.324 mg | 5000     | Tape and Reel(7") |

## 5 Revision history

Table 6. Document revision history

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 28-Nov-2014 | 1        | Initial release |

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