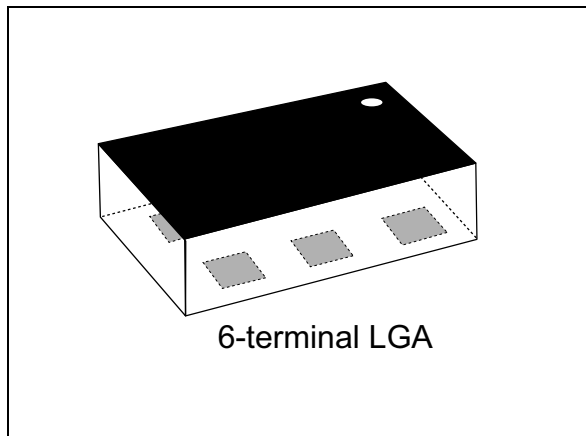


50  $\Omega$  nominal input / conjugate match balun to nRF51822-QFAAG0  
nRF51422-QFAAE0 and nRF51822-QFABB0 with integrated filter

Datasheet – production data

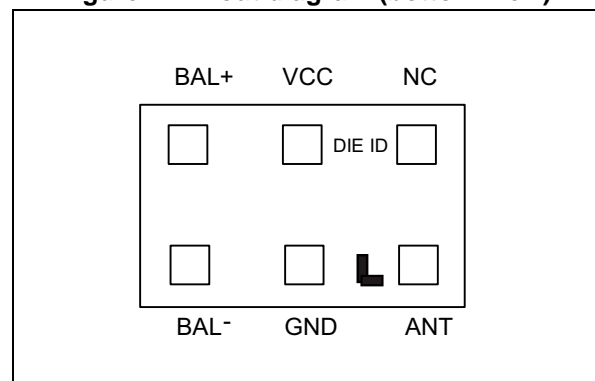


## Description

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)



## 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

# 1 Characteristics

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

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P <sub>IN</sub>	Input Power RF <sub>IN</sub>			20	dBm
V <sub>ESD</sub>	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 <sub>OP</sub>	Operating temperature	-40		+125	°C

**Table 2. Electrical characteristics (T<sub>amb</sub> = 25 °C)**

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z <sub>OUT</sub>	Nominal differential output impedance		conjugate match to: – nRF51822-QFAAG0 – nRF51822-QFABB0 – nRF51422-QFAAE0		Ω
Z <sub>IN</sub>	Nominal input impedance		50		Ω
F	Frequency range (bandwidth)	2400		2540	
I <sub>L</sub>	Insertion loss in bandwidth		2.2	2.7	dB
R <sub>L</sub>	Return loss in band	14	15		dB
φ <sub>imb</sub>	Phase imbalance	-10	4	10	°
A <sub>imb</sub>	Amplitude imbalance	-1	0.3	1	dB
2f <sub>0</sub>	(4800-5080 MHz)	15.8	16.3		dB
3f <sub>0</sub>	(7200-7620 MHz)	22.7	24.1		dB

### 1.1 RF performances (T<sub>amb</sub> = 25 °C)

Figure 2. Wide band frequency response

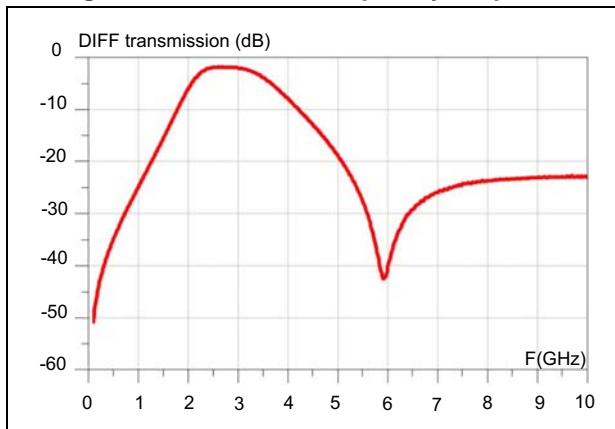


Figure 3. Insertion loss

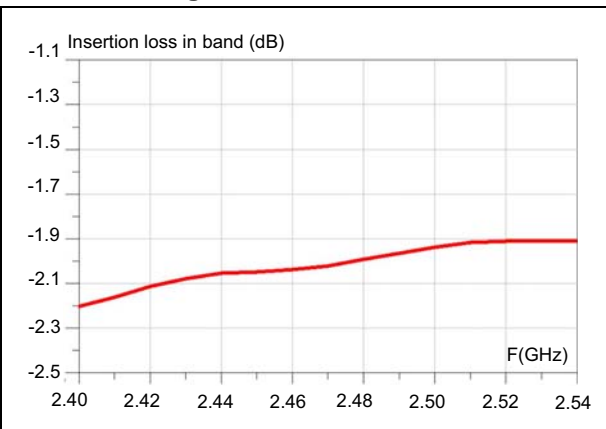


Figure 4. Phase imbalance

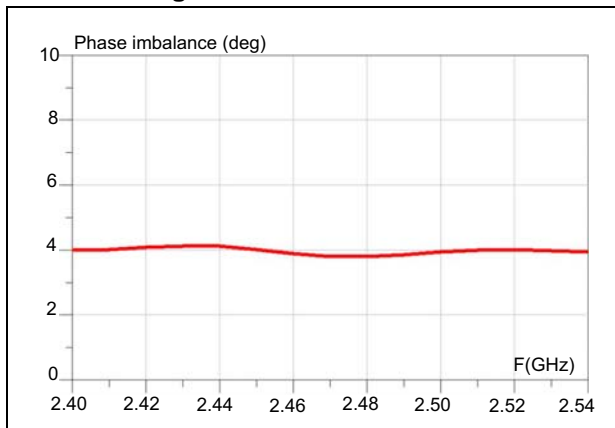


Figure 5. Amplitude imbalance

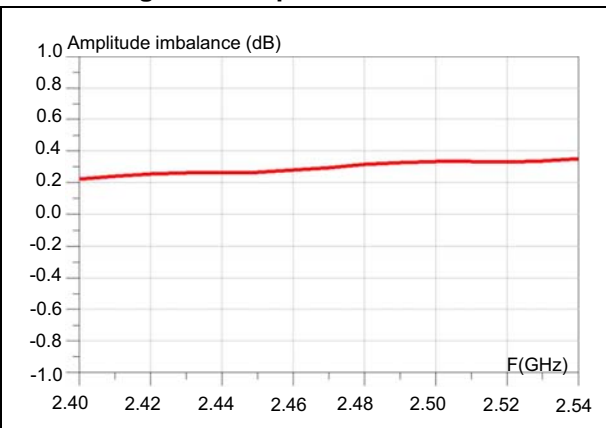


Figure 6. Return loss on SE port

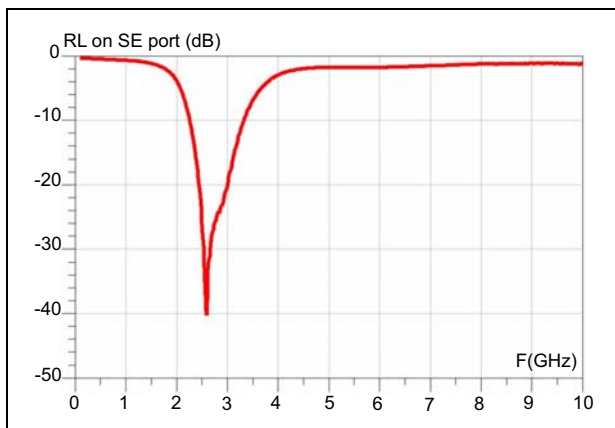
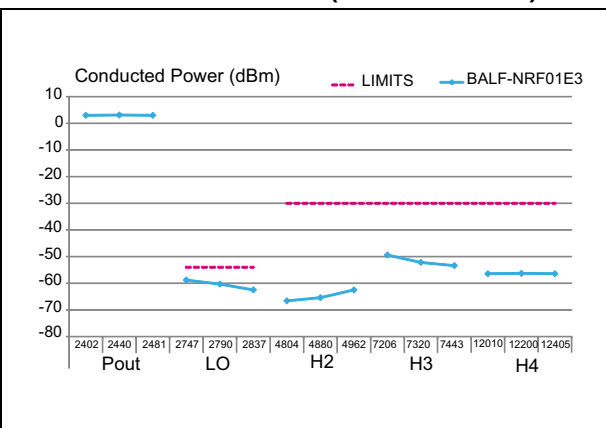
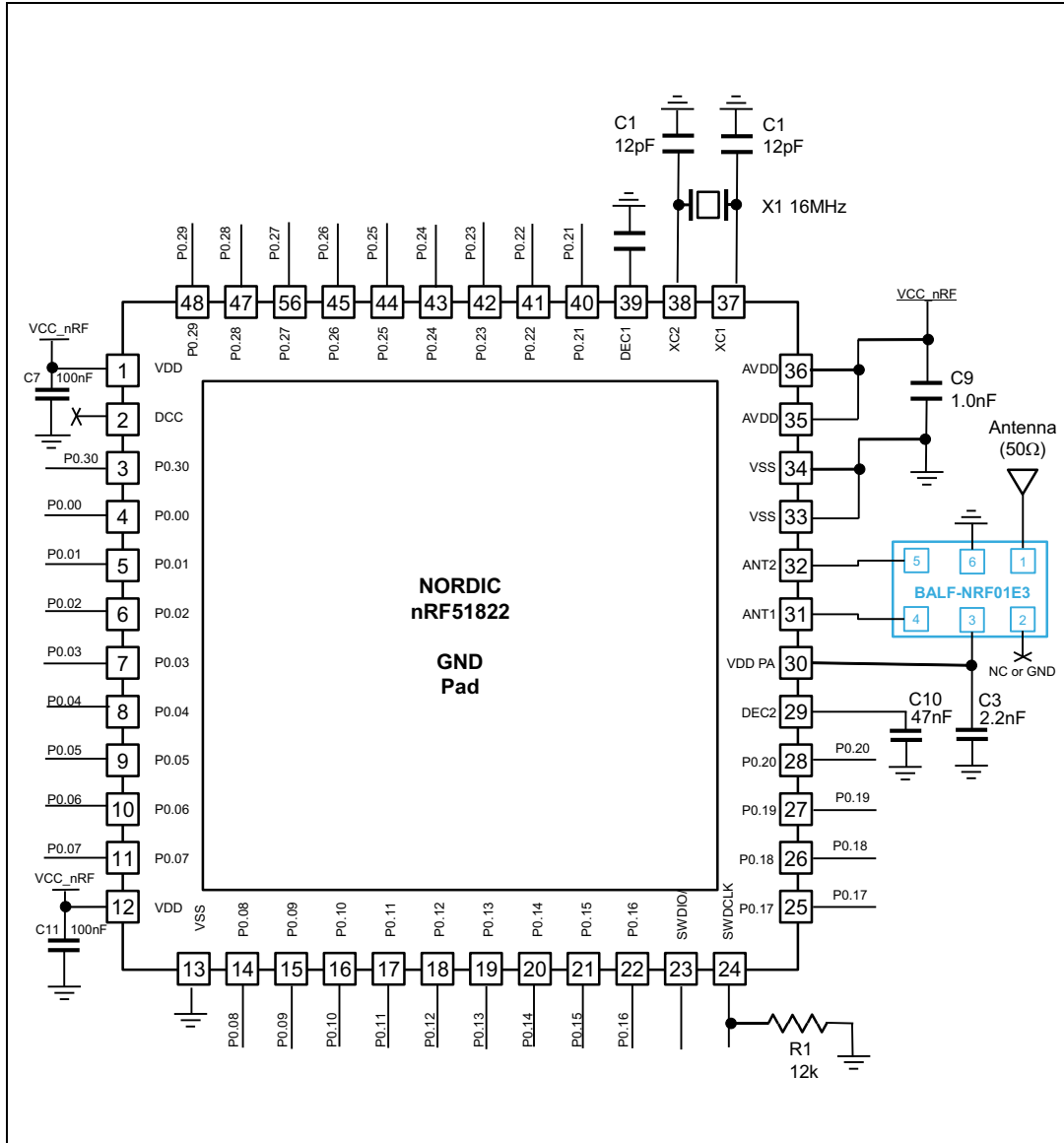


Figure 7. Conducted measurement with nRF51822-QFAAG0 (at 4 dBm mode)



## 2 Application information

Figure 8. Application schematic



### 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)

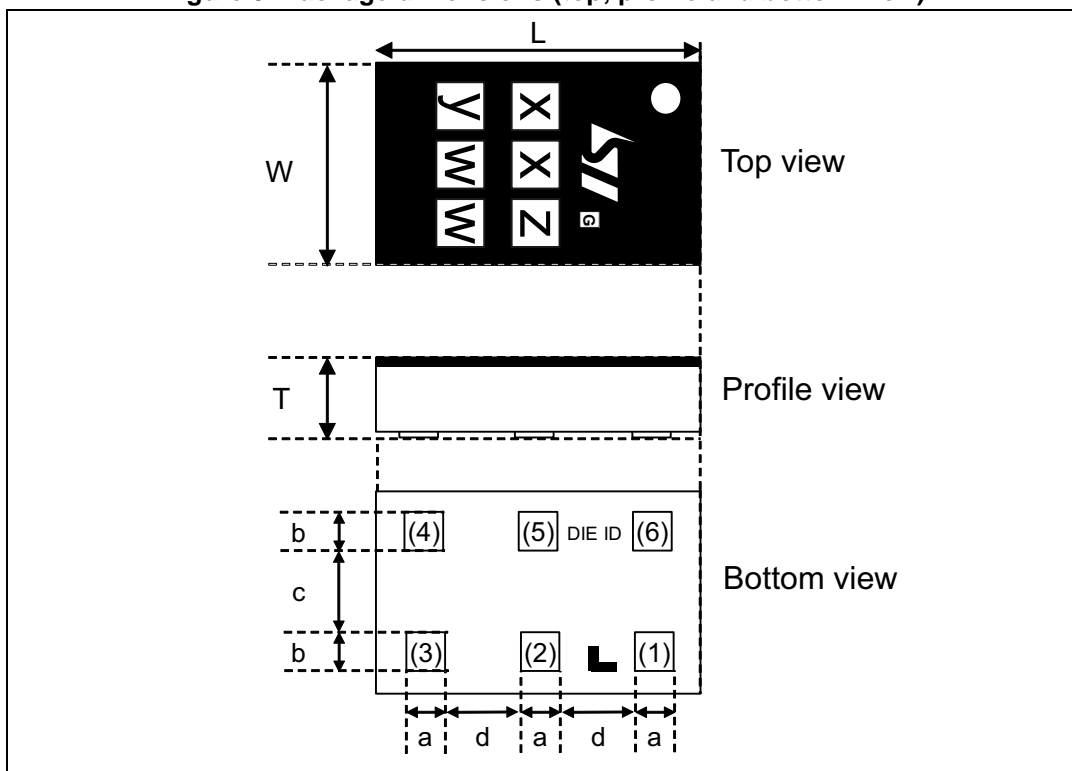


Table 3. Package dimensions

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

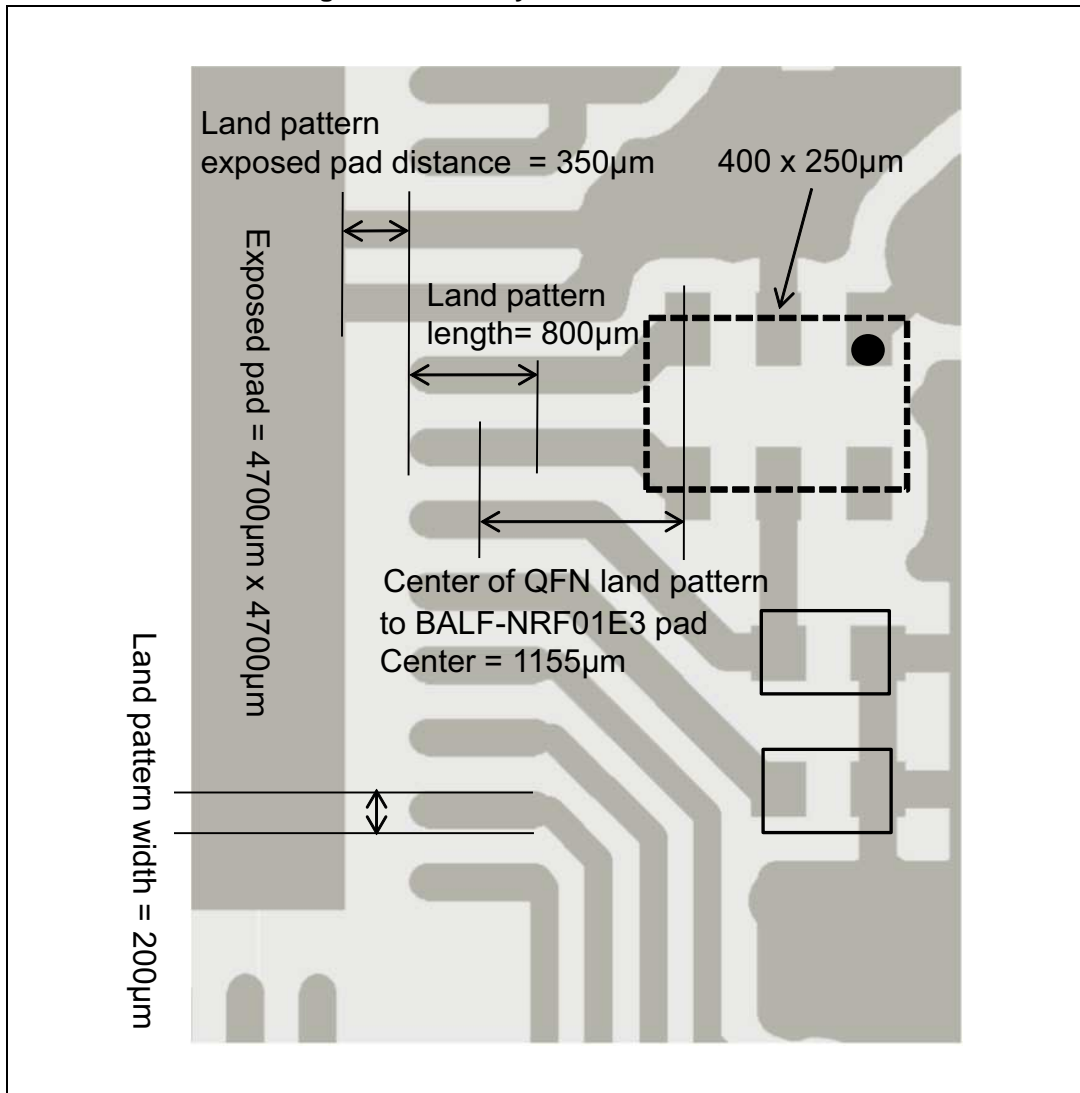
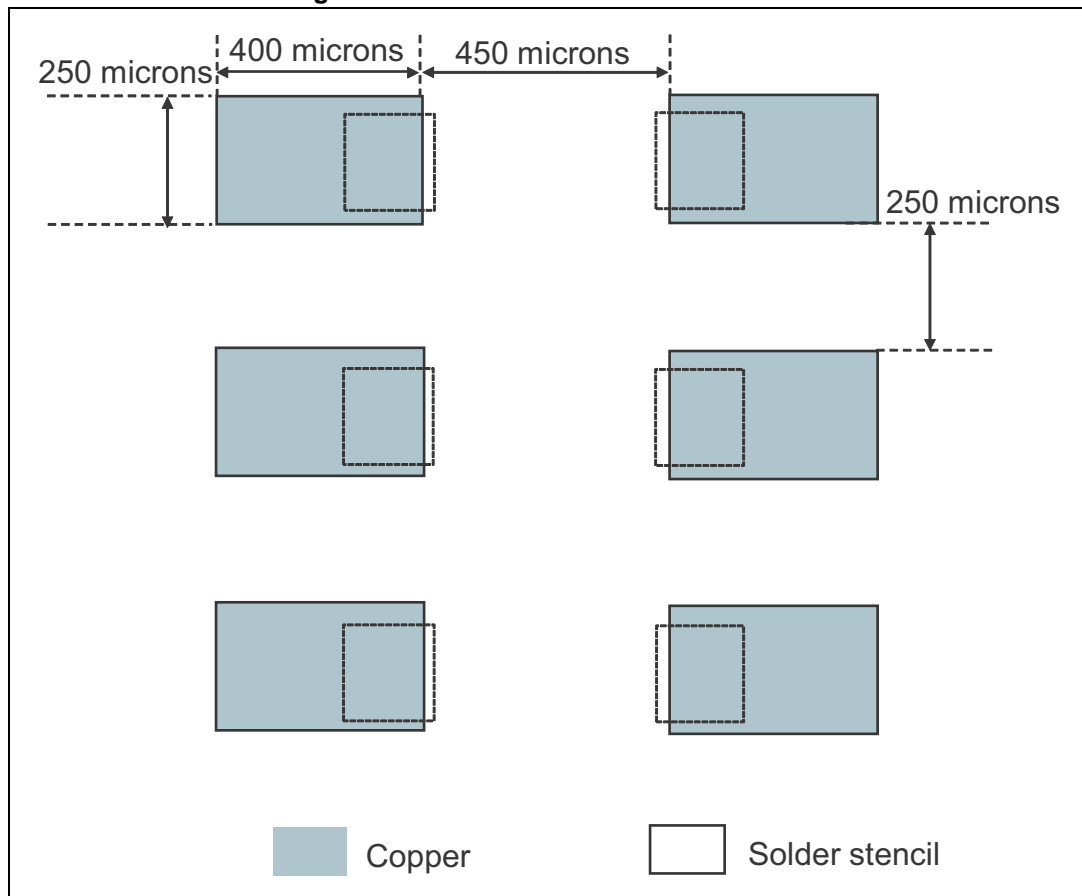


Figure 11. Solder-mask recommendation



#### 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

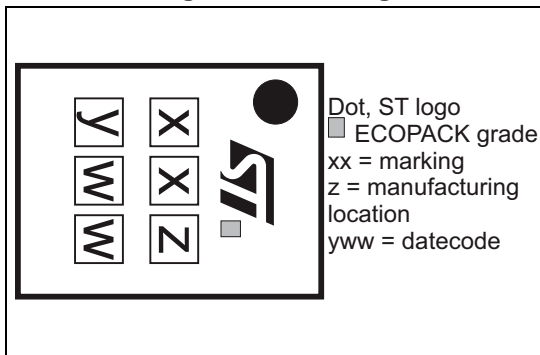


Figure 13. Pad bottom view

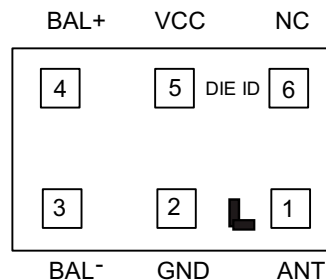
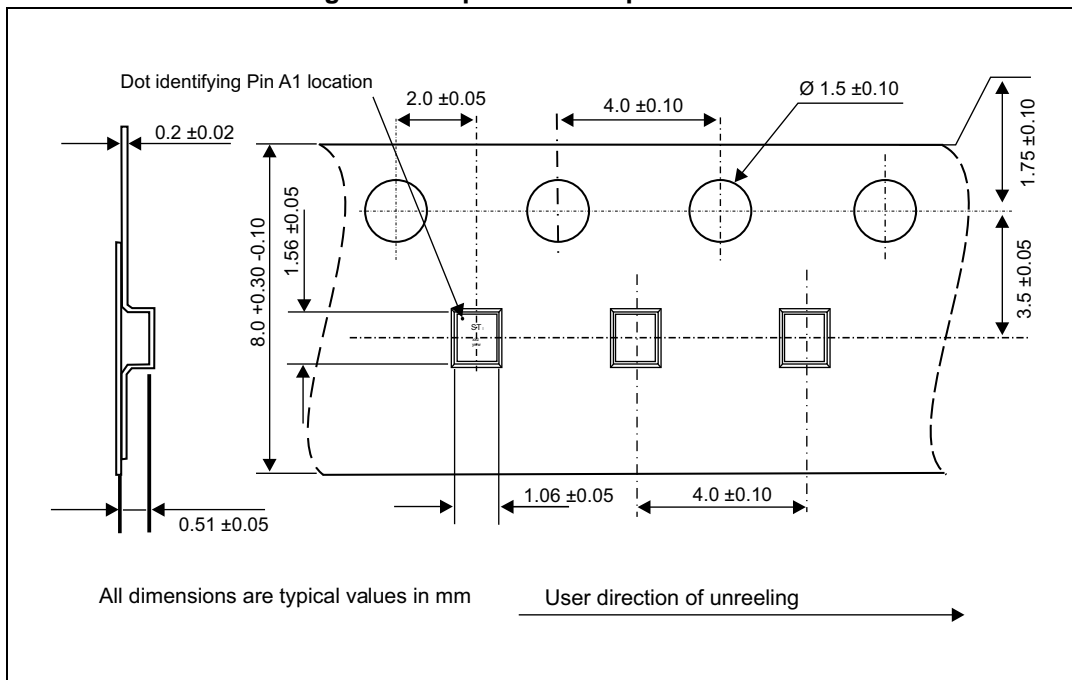


Table 4. Pad assignment details

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

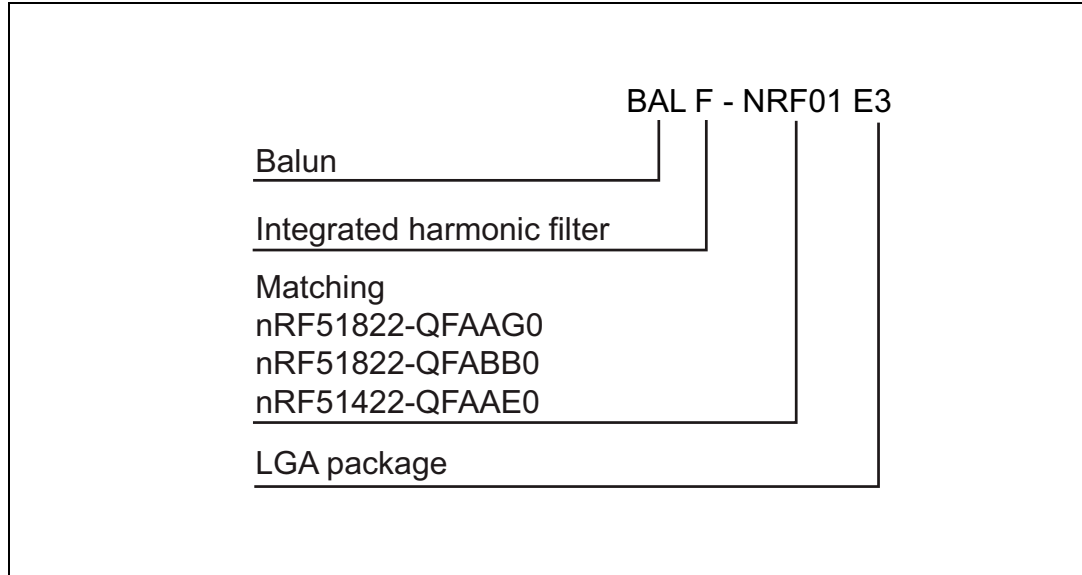


Table 5. Ordering information

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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