

## 50 ohm balun transformer for 2G45 ISM matched Nordic's chipset: nRF24LE1 QFN32, nRF24AP2-1CH and nRF24AP2-8CH

Datasheet – production data

### Features

- 50  $\Omega$  nominal input / conjugate match to nRF24LE1 QFN32, nRF24AP2-1CH and nRF24AP2-8CH
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: < 1.5 mm<sup>2</sup>

### Benefits

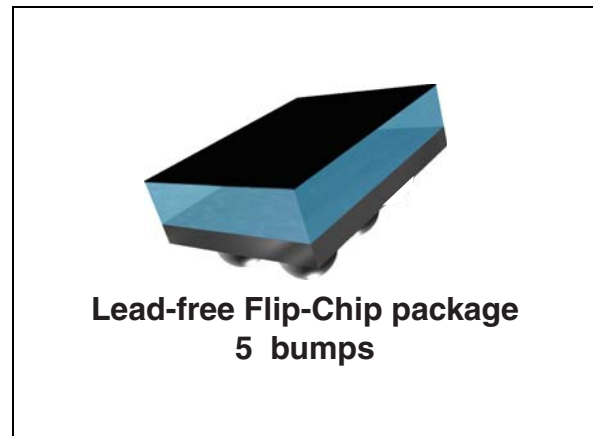
- Very low profile: < 595  $\mu$ m after reflow
- High RF performance
- RF BOM and area reduction

### Applications

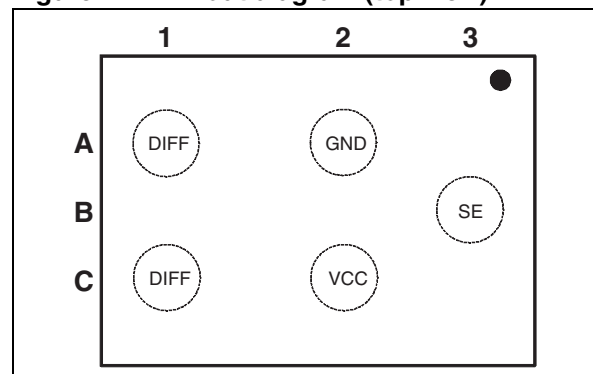
- 2.45 GHz impedance matched balun filter
- Optimized for Nordic's Chipset nRF24LE1/AP2

### Description

STMicroelectronics BAL-NRF01D3 is an ultraminiature balun. The BAL-NRF01D3 integrates matching network and harmonics filter. Matching impedance has been customized for the following Nordic Semiconductor circuits: nRF24LE1 QFN-32 pins, nRF24AP2-1CH and nRF24AP2-8CH. The BAL-NRF01D3 uses STMicroelectronics IPD technology on non conductive glass substrate which optimize RF performances. The BAL-NRF01D3 has been tested and approved by Nordic Semiconductor in their nRF2723 nRFgo module.



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



# 1 Characteristics

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

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P <sub>IN</sub>	Input Power RFIN			20	dBm
V <sub>ESD</sub>	ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5 kΩ, 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)	200			
T <sub>OP</sub>	Operating temperature	-40		+85	°C

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

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z <sub>OUT</sub>	Nominal differential output impedance		conjugate match to nRF24LE1/AP2		Ω
Z <sub>IN</sub>	Nominal input impedance		50		Ω

**Table 3. RF performance (T<sub>amb</sub> = 25 °C)**

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
F	Frequency range (bandwidth)		2400		2540	MHz
I <sub>L</sub>	Insertion loss in bandwidth			2.25		dB
R <sub>L</sub>	Return loss in bandwidth			10		dB
φ <sub>imb</sub>	Phase imbalance			3		°
A <sub>imb</sub>	Amplitude imbalance			0.1		dB
2f <sub>0</sub>	2nd harmonic filtering	4880 MHz		10		dB
3f <sub>0</sub>	3rd harmonic filtering	7320 MHz		20		dB

### 1.1 On-board simulations

Figure 2. Insertion loss ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

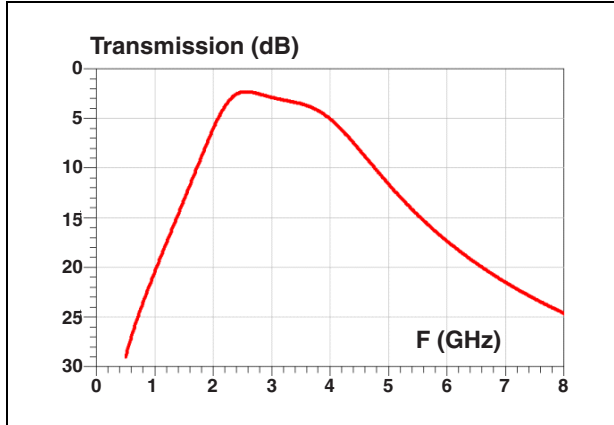


Figure 3. Return loss @ single port ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

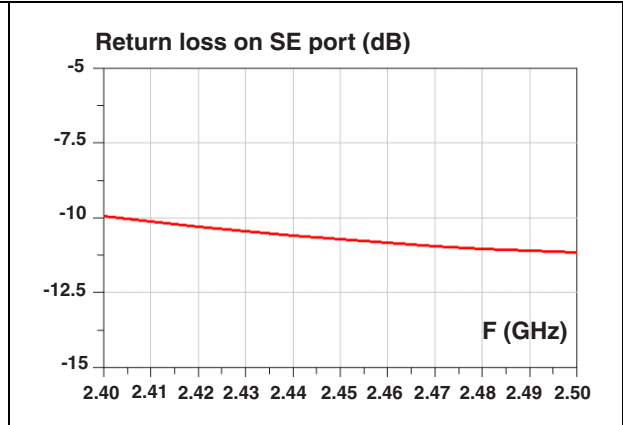


Figure 4. Amplitude imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ) Figure 5. Phase imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

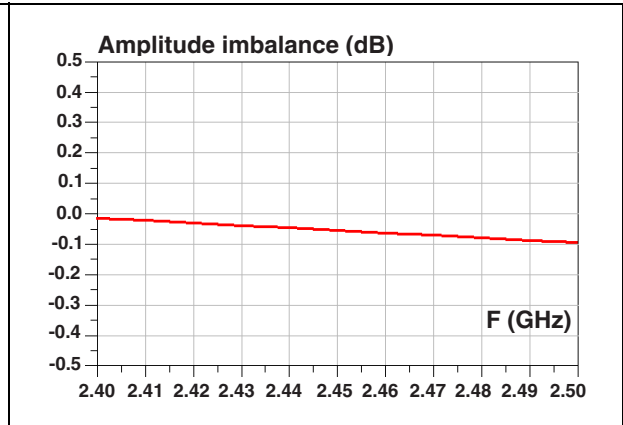
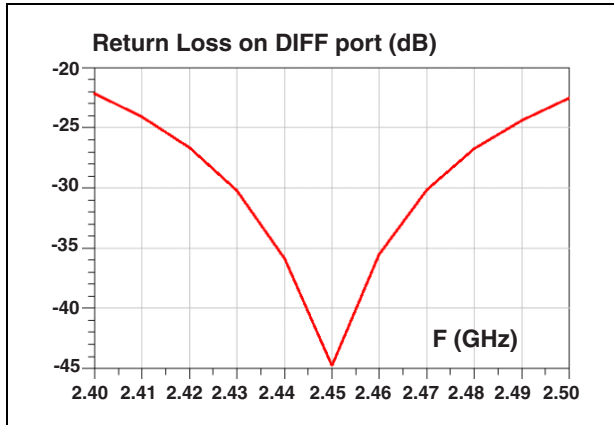
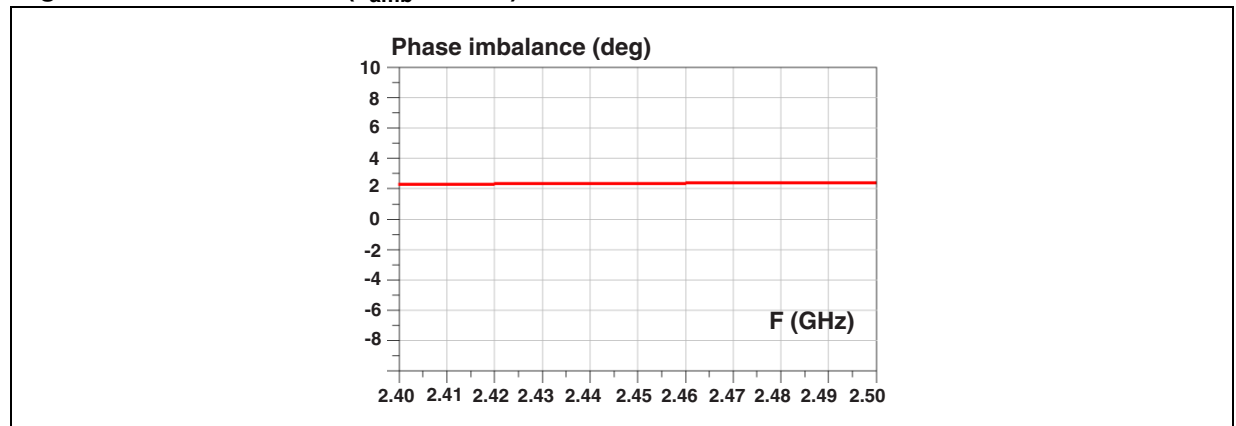


Figure 6. Transmission ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )



## 2 Application information

Figure 7. Application schematic (courtesy of Nordic Semiconductor)

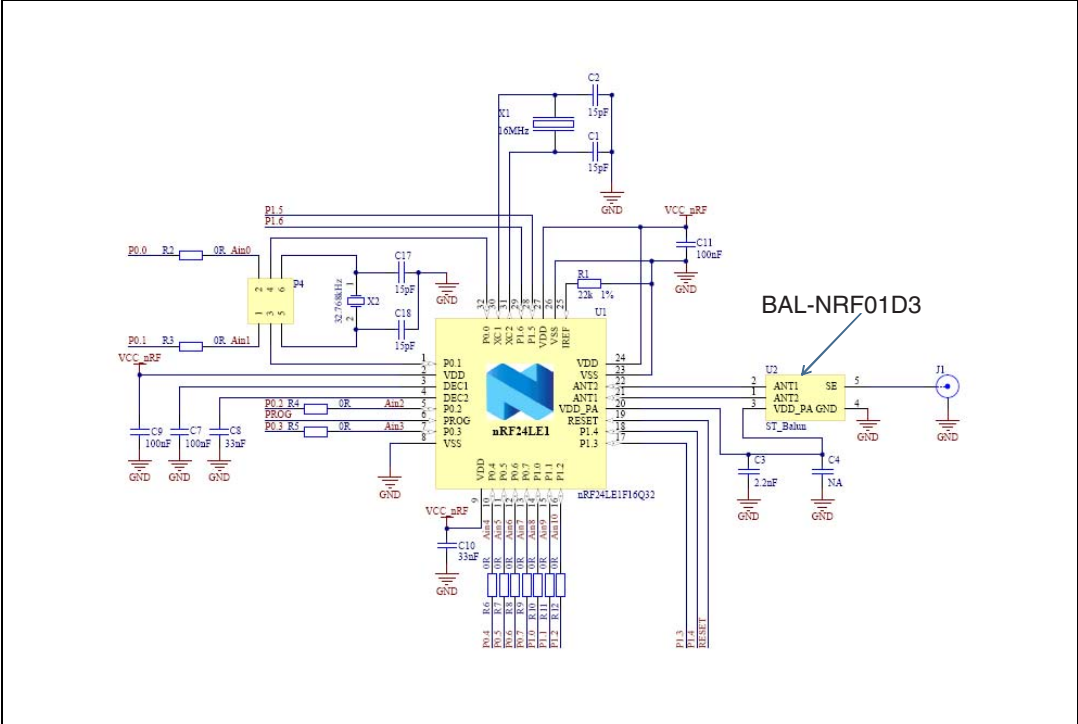
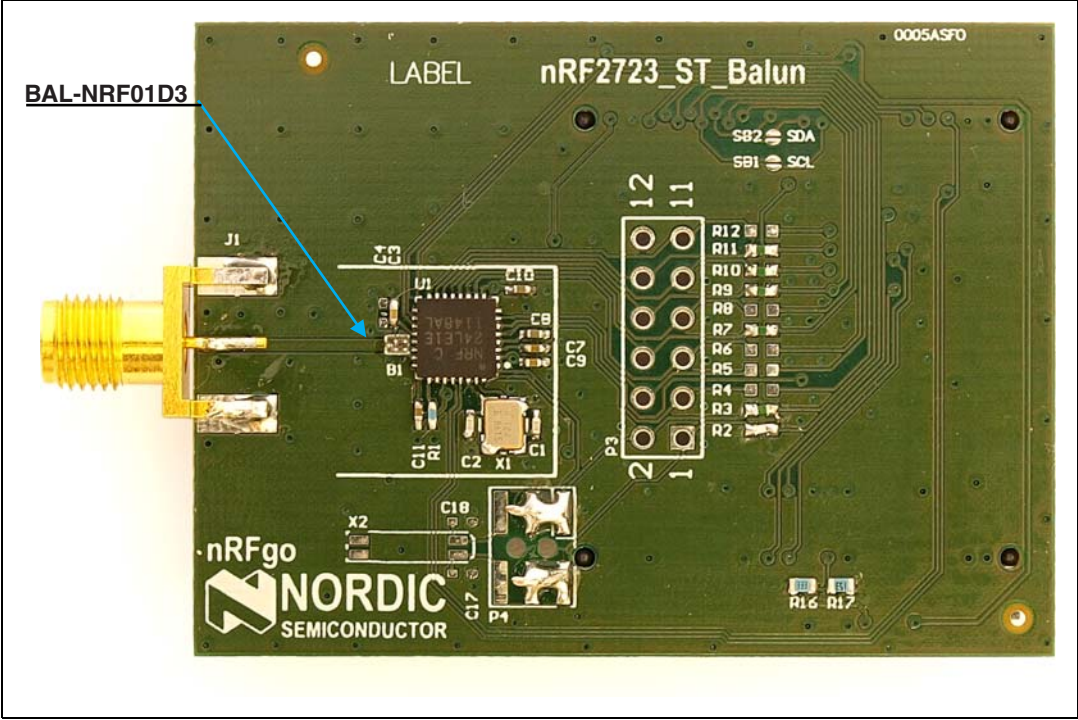


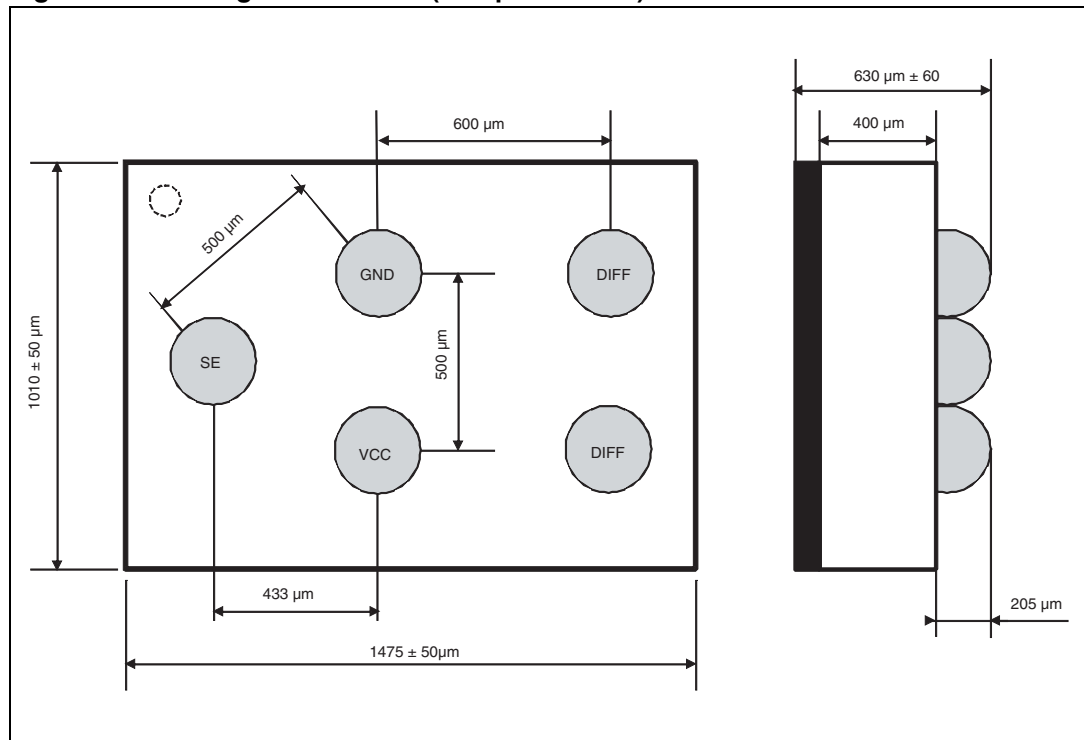
Figure 8. Application board (courtesy of Nordic Semiconductor)



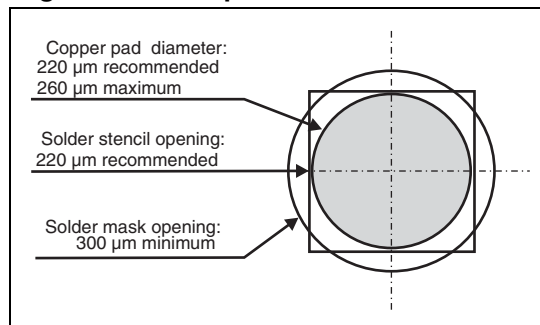
### 3 Package information

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.

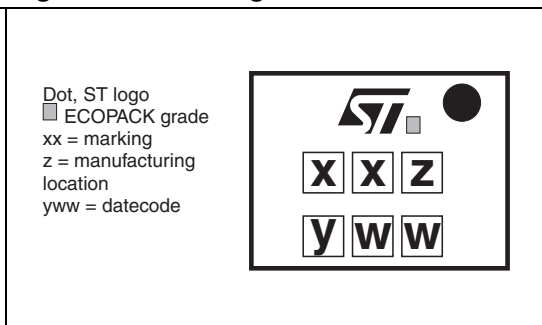
**Figure 9. Package dimensions (bump side view)**



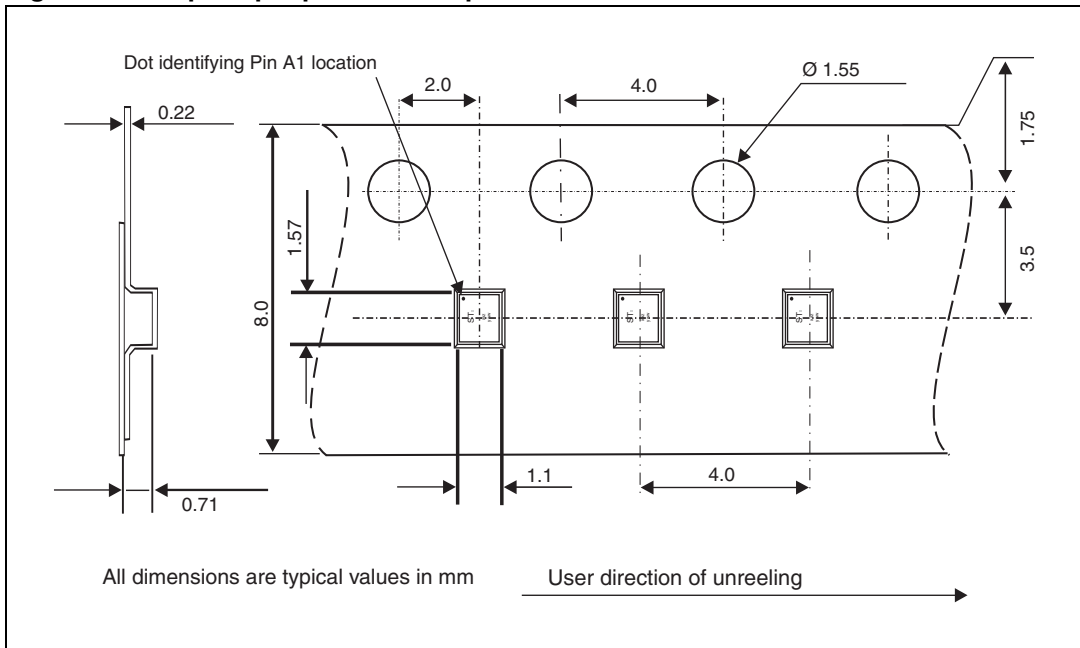
**Figure 10. Footprint**



**Figure 11. Marking**



**Figure 12. 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"  
 AN4111: "BAL-NRF01D3 matched balun with integrated harmonic filter for Nordic nRF24LE1 QFN32, nRF24AP2-1CH and nRF24AP2-8CH"

## 4 Ordering information

Table 4. Ordering information

Order code	Marking	Weight	Base Qty	Delivery mode
BAL-NRF01D3	SC	1.82 mg	5000	Tape and Reel

## 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
15-Oct-2012	1	Initial release.

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