



BAL-NRF01D3

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

Datasheet – production data

Features

- 50 Ω 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 mm²

Benefits

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

Applications

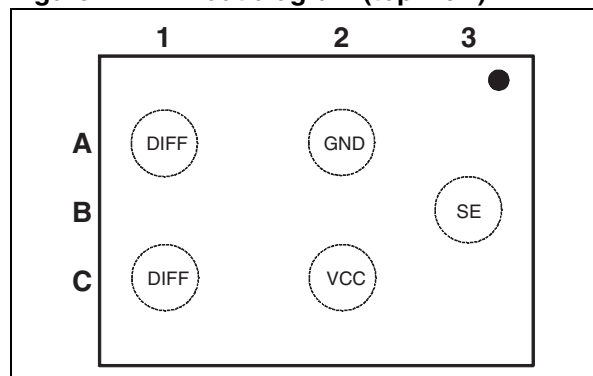
- 2.45 GHz impedance matched balun filter
- Optimized for Nordic's Chipset nRF24LE1/AP2

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_{IN}	Input Power RFIN			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)	200			
T_{OP}	Operating temperature	-40		+85	$^{\circ}C$

Table 2. Impedances ($T_{amb} = 25^{\circ}C$)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{OUT}	Nominal differential output impedance		conjugate match to nRF24LE1/AP2		Ω
Z_{IN}	Nominal input impedance		50		Ω

Table 3. RF performance ($T_{amb} = 25^{\circ}C$)

Symbol	Parameter	Test condition	Value			Unit
			Min.	Typ.	Max.	
F	Frequency range (bandwidth)		2400		2540	MHz
I_L	Insertion loss in bandwidth			2.25		dB
R_L	Return loss in bandwidth			10		dB
ϕ_{imb}	Phase imbalance			3		$^{\circ}$
Aimb	Amplitude imbalance			0.1		dB
2f0	2nd harmonic filtering	4880 MHz		10		dB
3f0	3rd harmonic filtering	7320 MHz		20		dB

1.1 On-board simulations

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

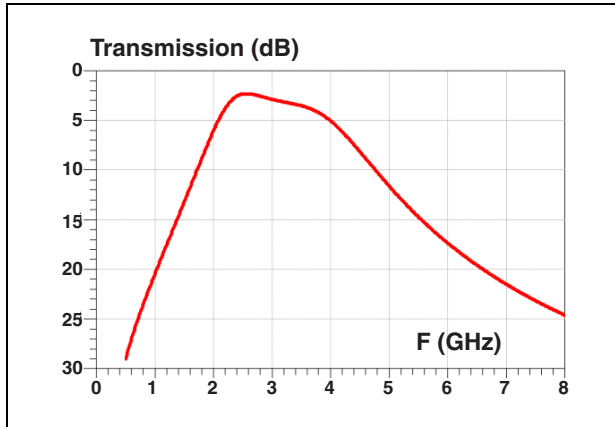


Figure 3. Return loss @ single port ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

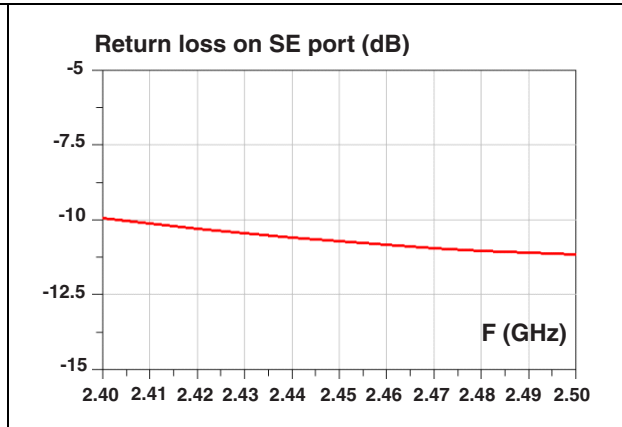


Figure 4. Amplitude imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$) Figure 5. Phase imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

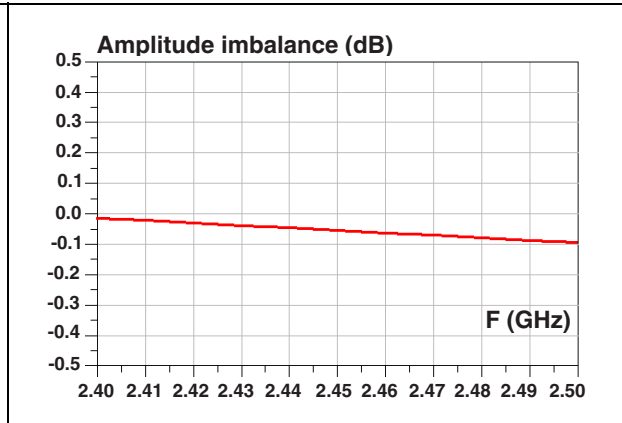
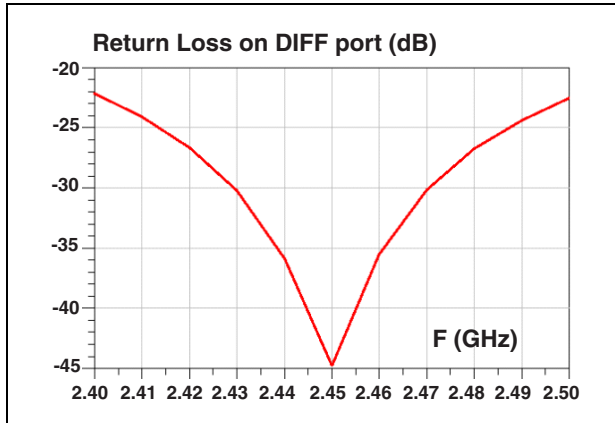
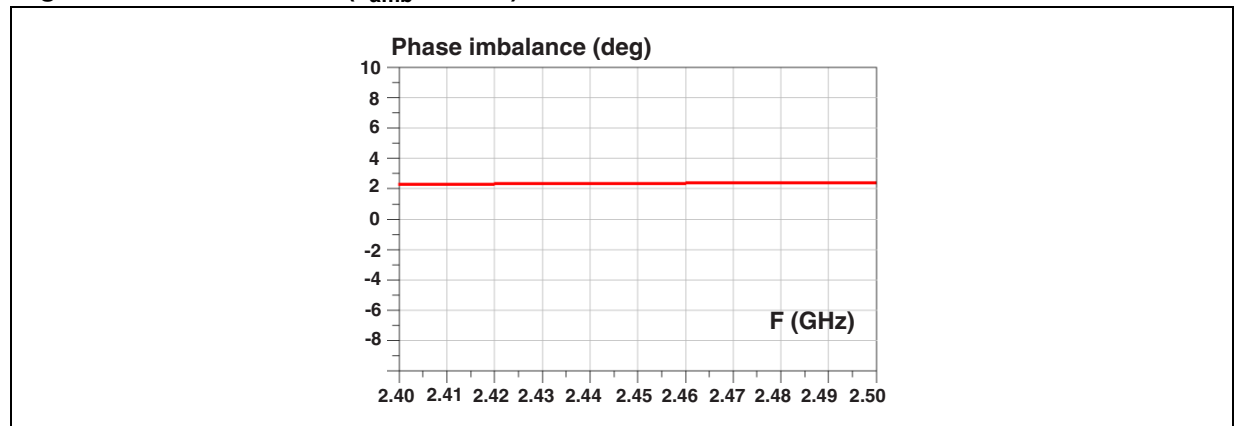


Figure 6. Transmission ($T_{amb} = 25\text{ }^{\circ}\text{C}$)



2 Application information

Figure 7. Application schematic (courtesy of Nordic Semiconductor)

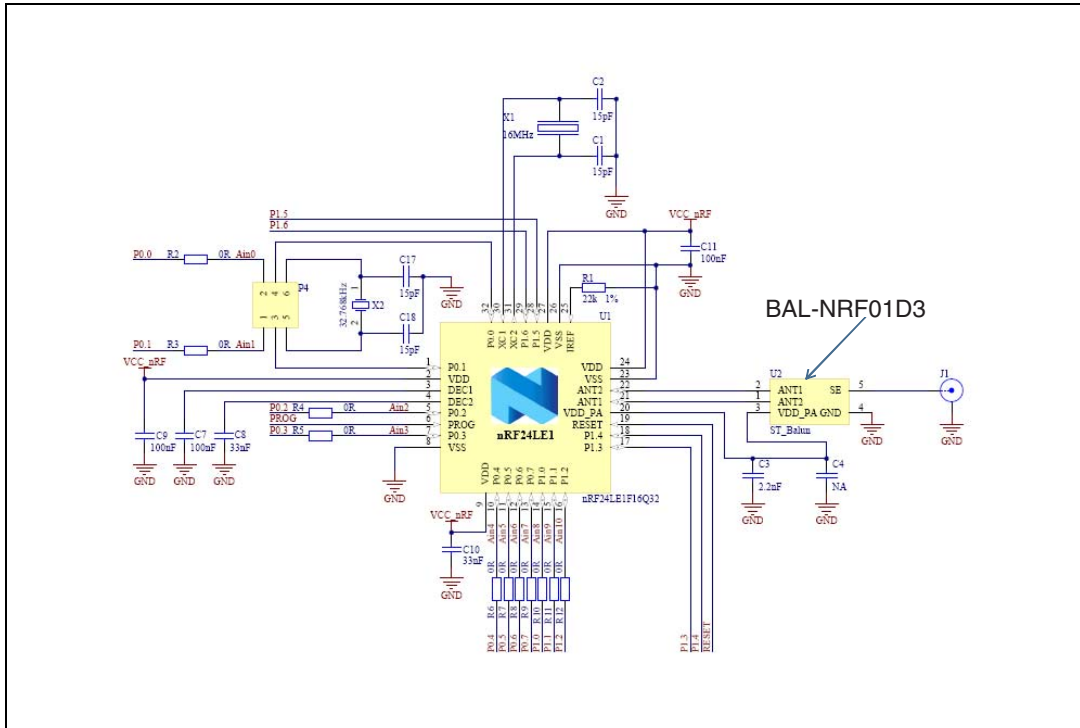
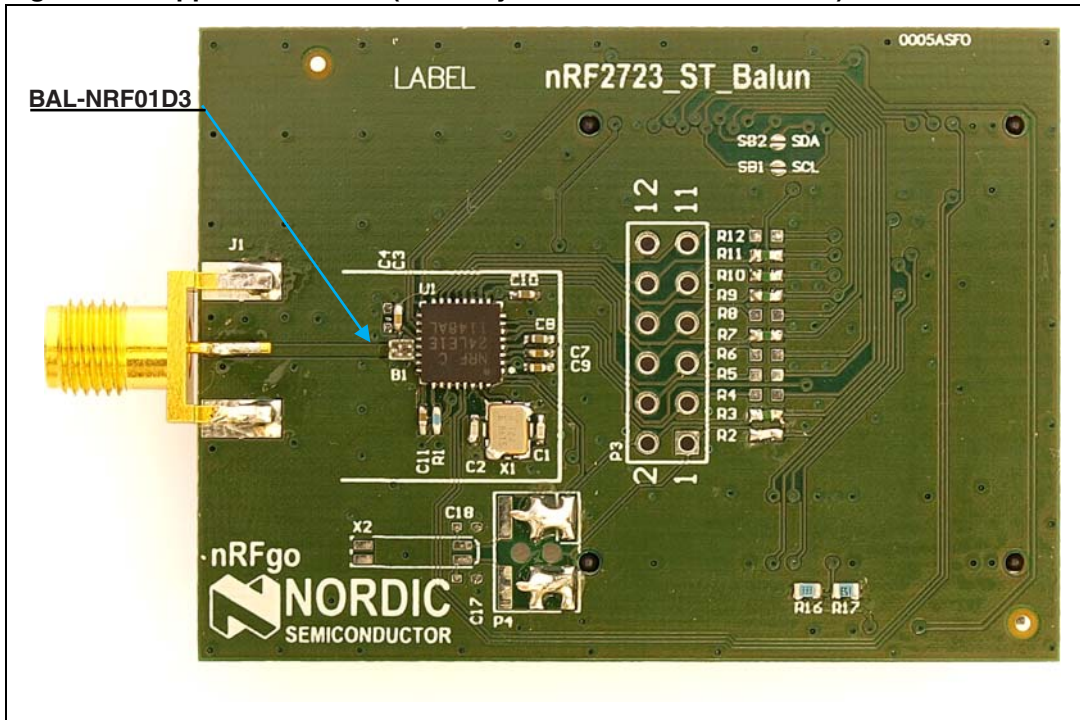


Figure 8. Application board (courtesy of Nordic Semiconductor)



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. ECOPACK® is an ST trademark.

Figure 9. Package dimensions (bump side view)

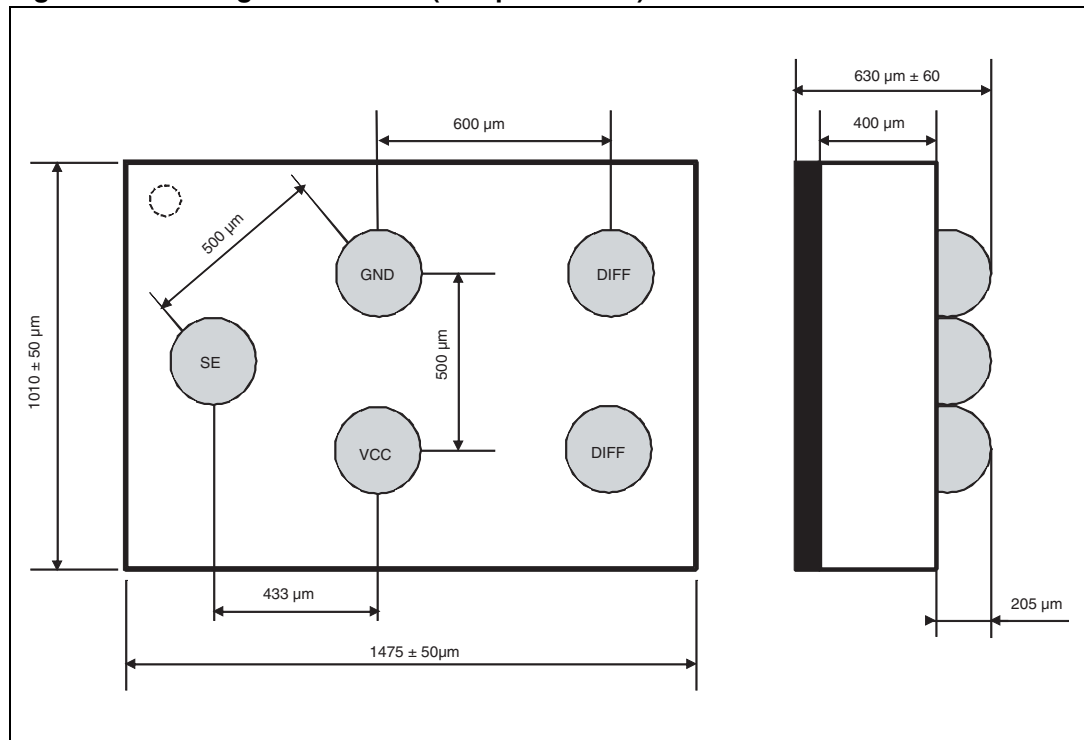


Figure 10. Footprint

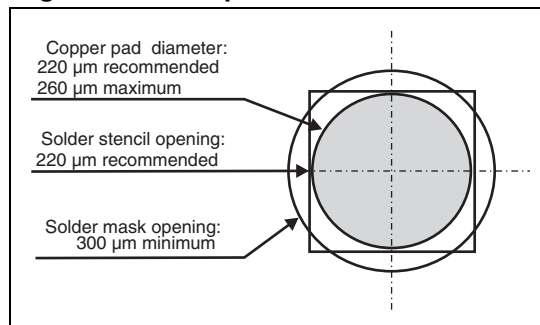


Figure 11. Marking

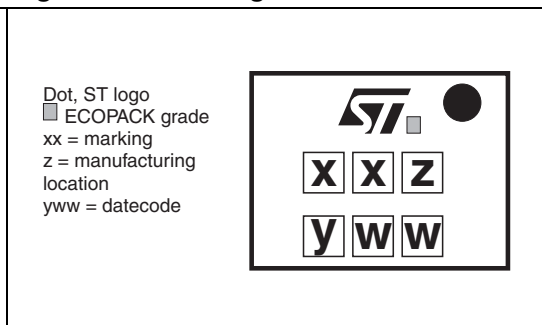
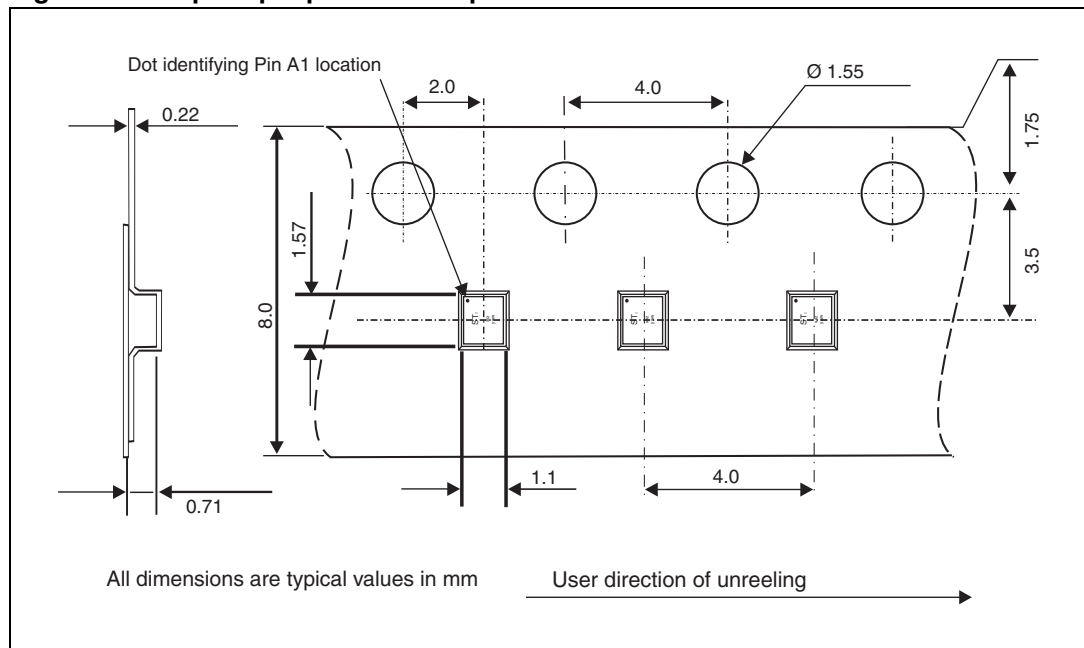


Figure 12. Flip Chip tape and reel specifications



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.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2012 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com