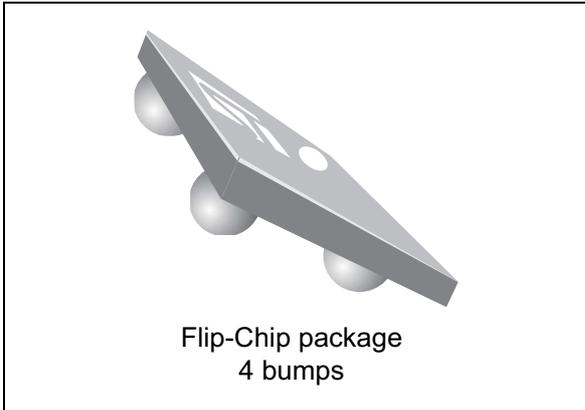


50 ohm, conjugate match to CC2541 transformer balun

Datasheet – production data



## Description

STMicroelectronics BAL-CC25-02D3 is an ultra miniature balun which integrates a matching network in a monolithic glass substrate. This has been customized for the CC2541 RF transceivers.

It's a design using STMicroelectronics IPD (integrated passive device) technology on non-conductive glass substrate to optimize RF performance.

## Features

- 2.45 GHz balun with integrated matching network
- Matching optimized for following CC2541
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated Flip-Chip on glass
- Small footprint: < 0.88 mm<sup>2</sup>

## Benefits

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

Figure 1. Pin configuration (top view)

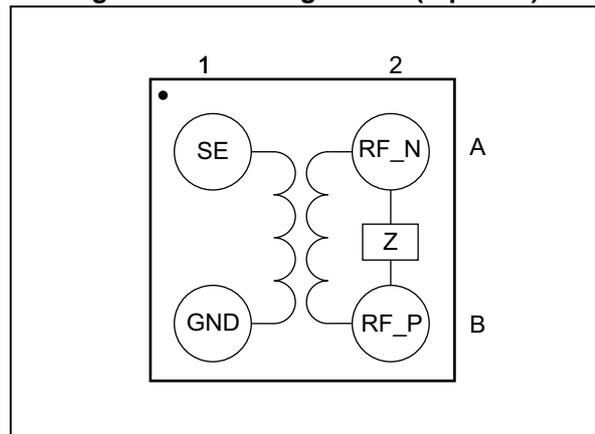
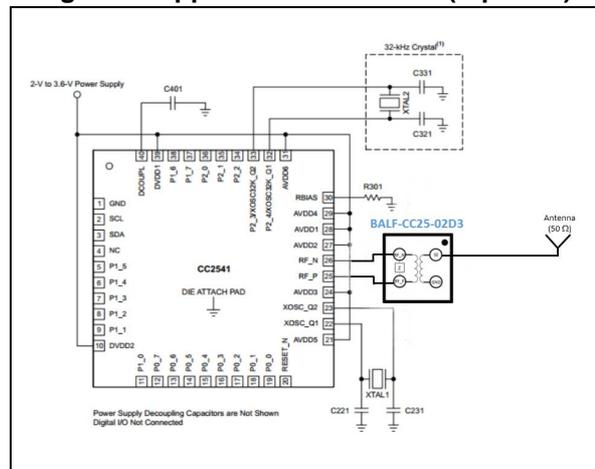


Figure 2. Application schematic (top view)



# 1 Characteristics

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

| Symbol    | Parameter   | Value        | Unit        |
|-----------|---|--------------|-------------|
| $P_{IN}$  | Input power $RF_{IN}$   | 20           | dBm         |
| $V_{ESD}$ | ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5 $\Omega$ , air discharge) | 2000         | V           |
|           | ESD ratings machine model (MM: C = 200 pF, R = 25 $\Omega$ , L = 500 nH)    | 500          |             |
|           | ESD ratings charged device model (CDM, JESD22-C101D)                        | 500          |             |
| $T_{OP}$  | Operating temperature   | -40 to + 105 | $^{\circ}C$ |

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

| Symbol        | Parameter                                   | Value                     |      |      | Unit       |
|---------------|---|---------------------------|------|------|------------|
|               |   | Min.                      | Typ. | Max. |            |
| $Z_{OUT}$     | Nominal differential output impedance       | Conjugate match to CC2541 |      |      | $\Omega$   |
| $Z_{IN}$      | Nominal input impedance                     |                           | 50   |      |            |
| F             | Frequency range (bandwidth)                 | 2379                      |      | 2507 |            |
| $I_L$         | Insertion loss in bandwidth                 |                           | 1.6  | 1.8  | dB         |
| $R_{L\_SE}$   | Single ended return loss in bandwidth       | 9                         | 10   |      | dB         |
| $R_{L\_DIFF}$ | Differential ended return loss in bandwidth | 9                         | 17   |      | dB         |
| $\Phi_{imb}$  | Phase imbalance                             |                           | 7    |      | $^{\circ}$ |
| $A_{imb}$     | Amplitude imbalance                         |                           | 0.6  |      | dB         |

Figure 3. Balun transmission ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

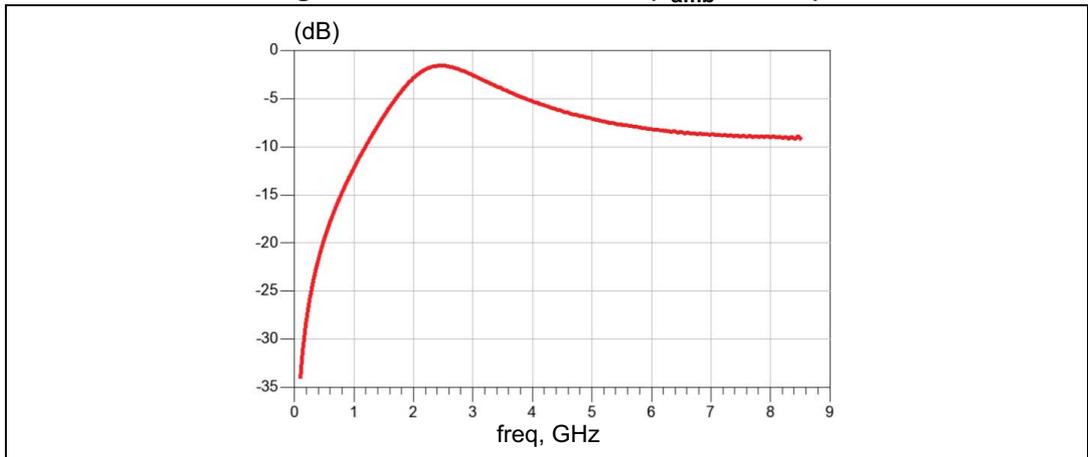


Figure 4. Insertion loss ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

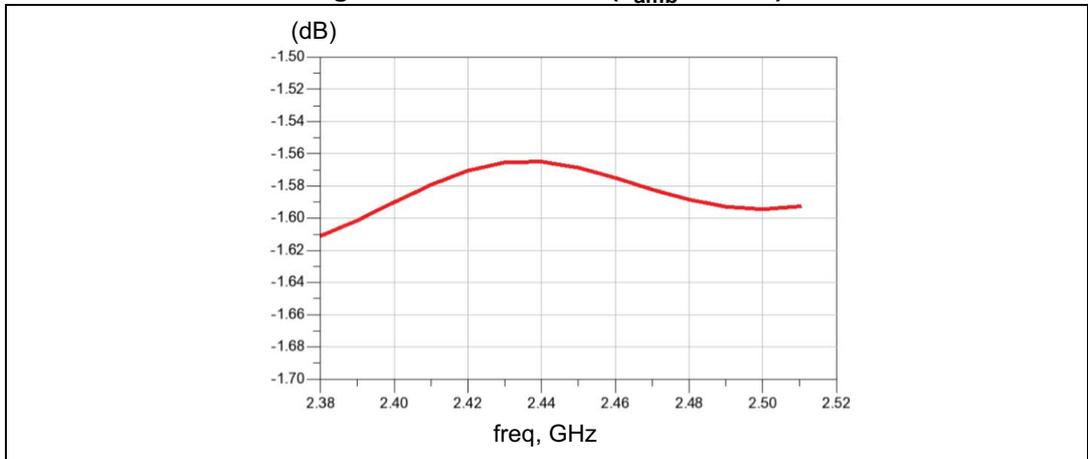


Figure 5. Return loss on SE port ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

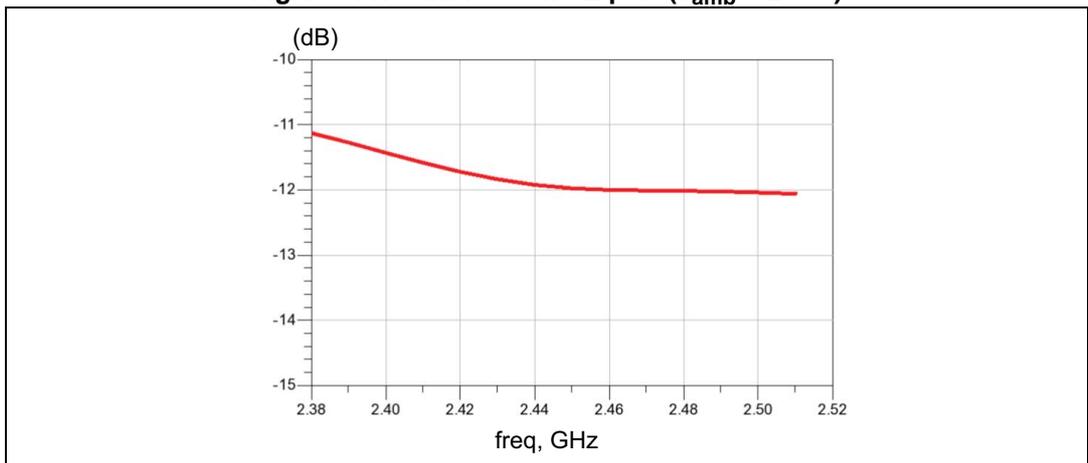


Figure 6. Return loss on DIFF port ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

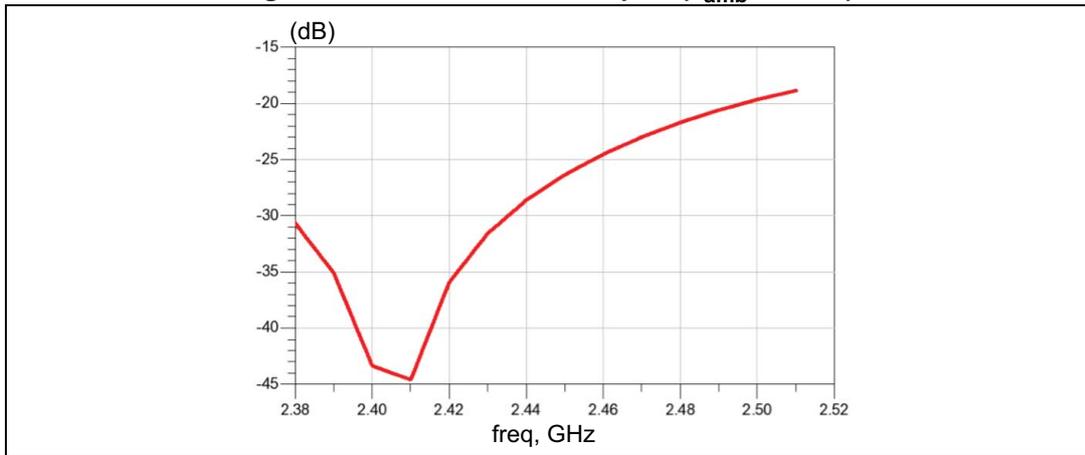


Figure 7. Amplitude imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

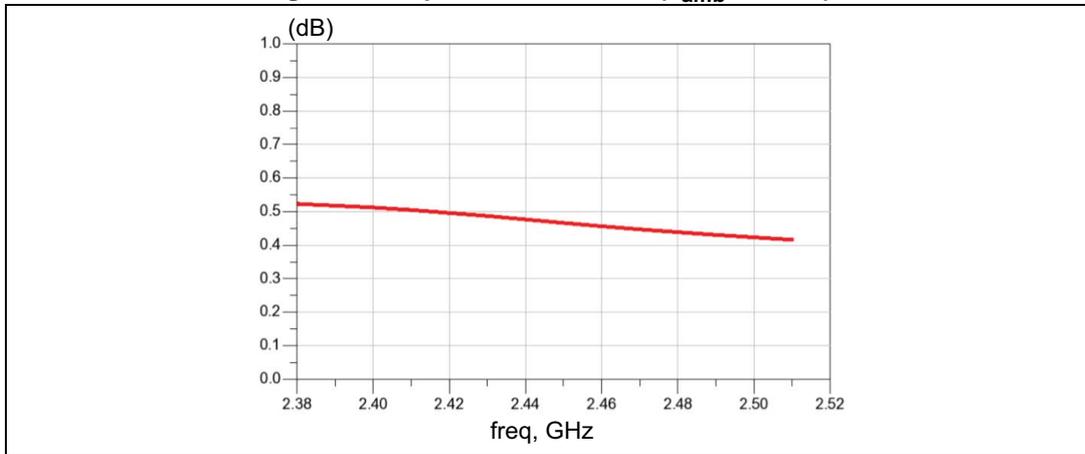
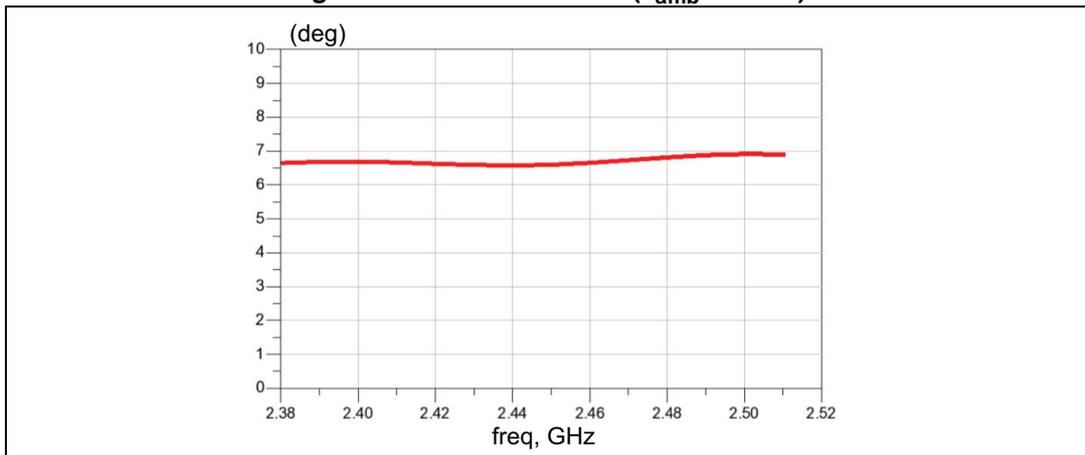


Figure 8. Phase imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )



## 2 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

### 2.1 Flip-Chip package information

Figure 9. Flip-Chip package outline

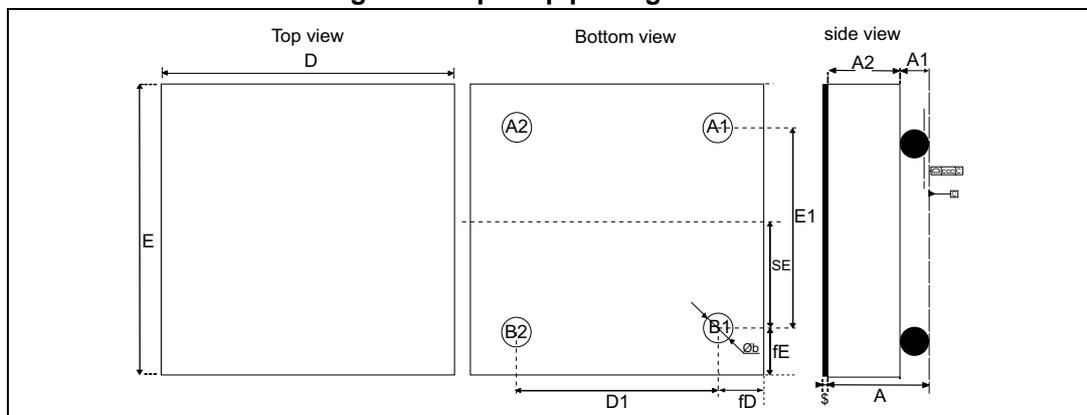


Table 3. Flip-Chip package mechanical data

| Parameter | Description                                 | Min.  | Typ.  | Max.  | Unit |
|-----------|---|-------|-------|-------|------|
| A         | Bump height + substrate thickness           | 0.570 | 0.630 | 0.690 | mm   |
| A1        | Bump height                                 | 0.155 | 0.205 | 0.255 | mm   |
| A2        | Substrate thickness                         |       | 0.400 |       | mm   |
| b         | Bump diameter                               | 0.215 | 0.255 | 0.295 | mm   |
| D         | Y dimension of the die                      | 0.890 | 0.940 | 0.990 | mm   |
| D1        | Y pitch                                     |       | 0.500 |       | mm   |
| E         | X dimension of the die                      | 0.890 | 0.940 | 0.990 | mm   |
| E1        | X pitch                                     |       | 0.500 |       | mm   |
| SE        |   |       | 0.250 |       | mm   |
| fD        | Distance from bump to edge of die on Y axis |       | 0.220 |       | mm   |
| fE        | Distance from bump to edge of die on X axis |       | 0.220 |       | mm   |
| ccc       |   |       |       | 0.05  | mm   |
| \$        |   |       | 0.025 |       | mm   |

Figure 10. Footprint

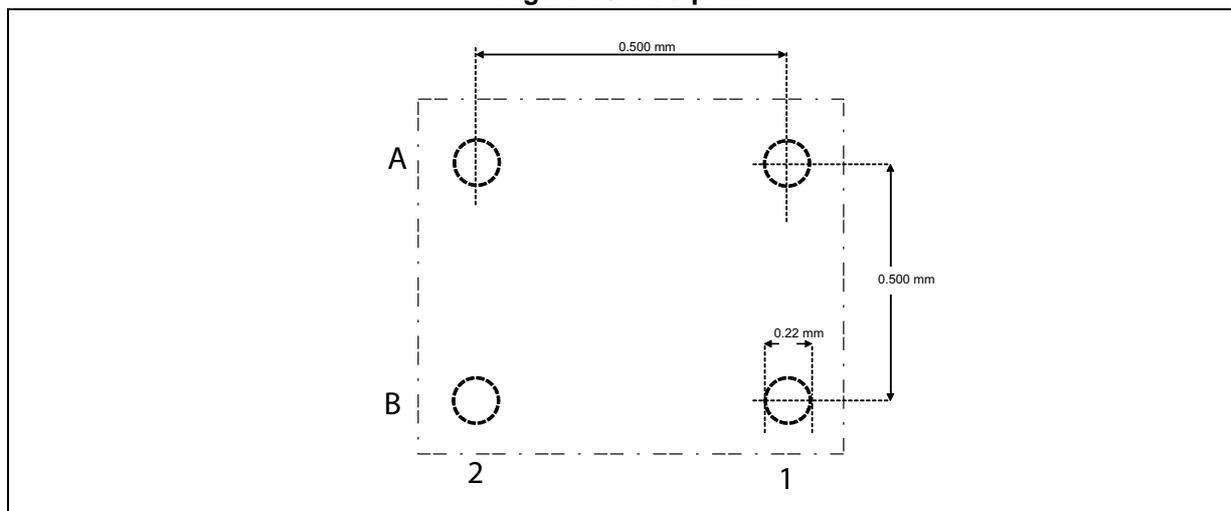
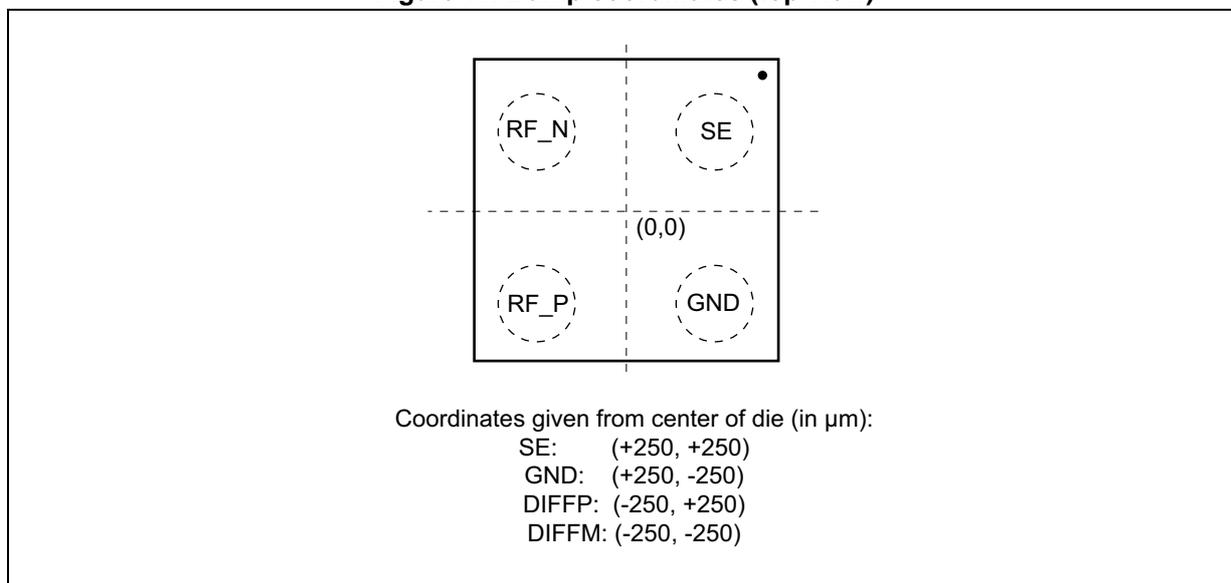


Figure 11. Bump coordinates (top view)

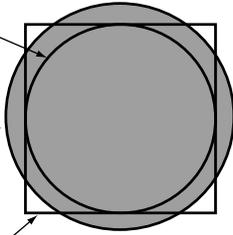


**Figure 12. Footprint - 3 mils stencil - non solder mask defined**

Copper pad diameter:  
220  $\mu\text{m}$  recommended  
180  $\mu\text{m}$  minimum  
260  $\mu\text{m}$  maximum

Solder mask opening:  
320  $\mu\text{m}$  recommended  
300  $\mu\text{m}$  minimum  
340  $\mu\text{m}$  maximum

Solder stencil opening:  
220  $\mu\text{m}$  recommended

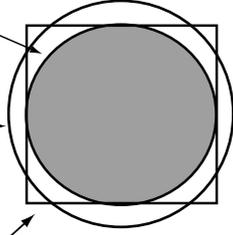


**Figure 13. Footprint - 3 mils stencil - solder mask defined**

Solder mask opening:  
220  $\mu\text{m}$  recommended  
180  $\mu\text{m}$  minimum  
260  $\mu\text{m}$  maximum

Copper pad diameter:  
320  $\mu\text{m}$  recommended  
300  $\mu\text{m}$  minimum

Solder stencil opening:  
220  $\mu\text{m}$  recommended



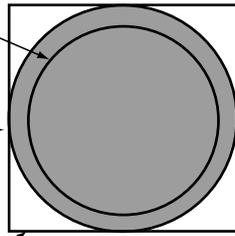
**Figure 14. Footprint - 5 mils stencil - non solder mask defined**

Copper pad diameter:  
220  $\mu\text{m}$  recommended  
180  $\mu\text{m}$  minimum  
260  $\mu\text{m}$  maximum

Solder mask opening:  
320  $\mu\text{m}$  recommended  
300  $\mu\text{m}$  minimum  
340  $\mu\text{m}$  maximum

Solder stencil opening:  
330  $\mu\text{m}$  recommended\*

\*depending on paste, it can go down to 270  $\mu\text{m}$



**Figure 15. Footprint - 5 mils stencil - solder mask defined**

Solder mask opening:  
220  $\mu\text{m}$  recommended  
180  $\mu\text{m}$  minimum  
260  $\mu\text{m}$  maximum

Copper pad diameter:  
320  $\mu\text{m}$  recommended  
300  $\mu\text{m}$  minimum

Solder stencil opening:  
330  $\mu\text{m}$  recommended\*

\*depending on paste, it can go down to 270  $\mu\text{m}$

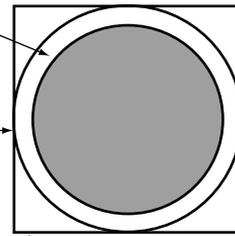


Figure 16. PCB layout recommendation

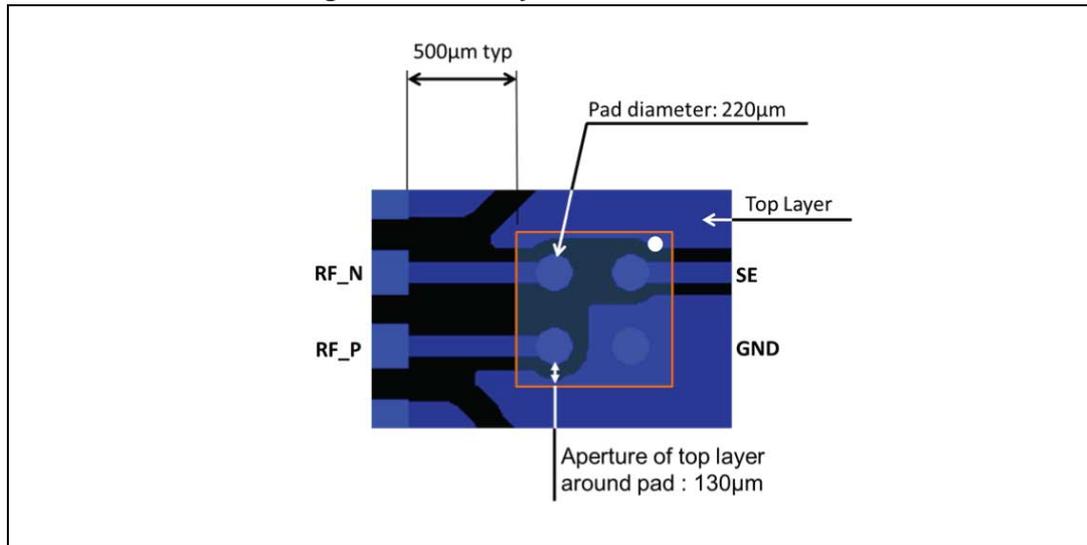
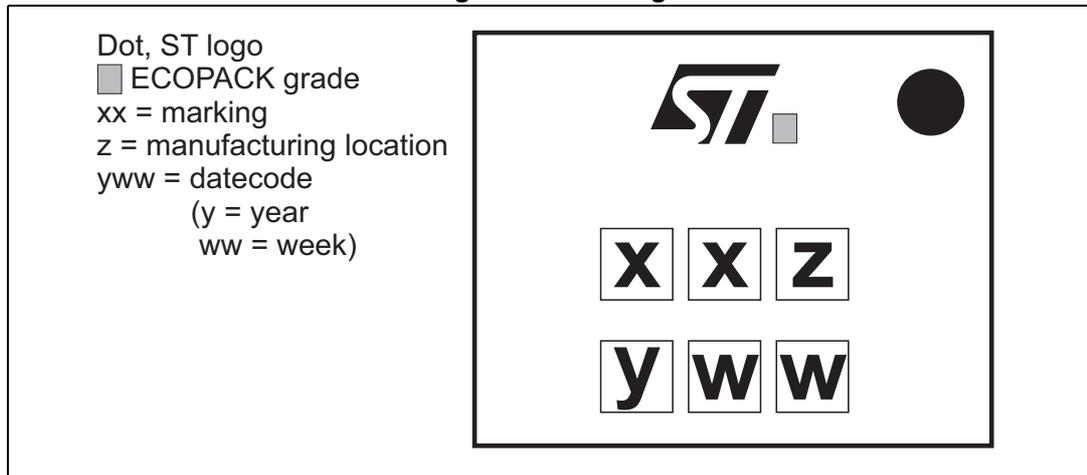
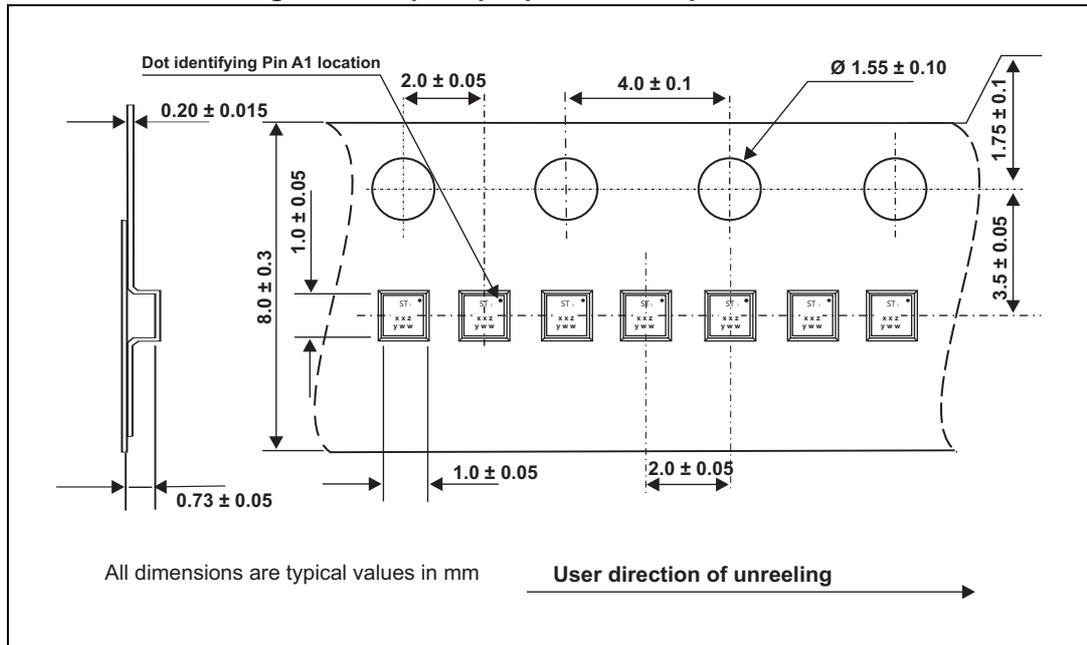


Figure 17. Marking



Note: More information is available in the STMicroelectronics Application note: AN2348 Flip-Chip: "Package description and recommendations for use"

Figure 18. Flip Chip tape and reel specifications



Note: More information is available in the application note:  
AN2348: "Flip Chip: package description and recommendations for use"

### 3 Ordering information

**Table 4. Ordering information**

| Order code    | Marking | Package   | Weight  | Base qty | Delivery mode      |
|---------------|---------|-----------|---------|----------|--------------------|
| BAL-CC25-02D3 | TE      | Flip Chip | 1.07 mg | 5000     | Tape and reel (7") |

### 4 Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 17-Nov-2015 | 1        | Initial release |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2015 STMicroelectronics – All rights reserved

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9