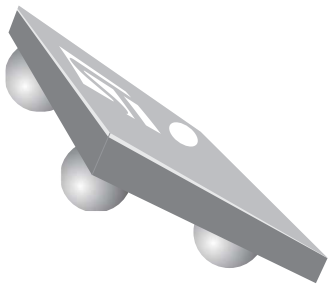
# BALF-CC25-02D3

## 50 ohm, conjugate match to CC2541 transformer balun

**Datasheet – production data**



Flip-Chip package
4 bumps

## 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 mm²

### Benefits

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

## 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.

**Figure 1. Pin configuration (top view)**

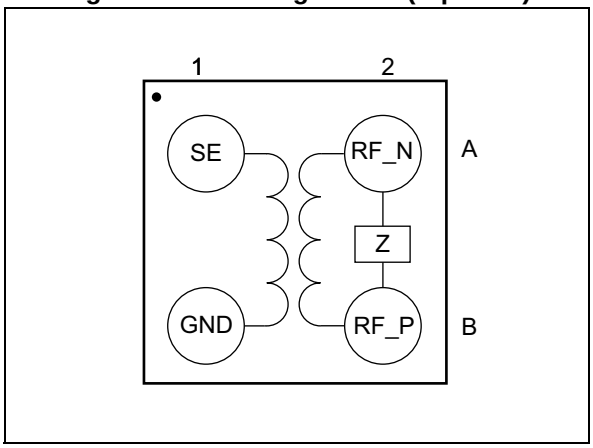
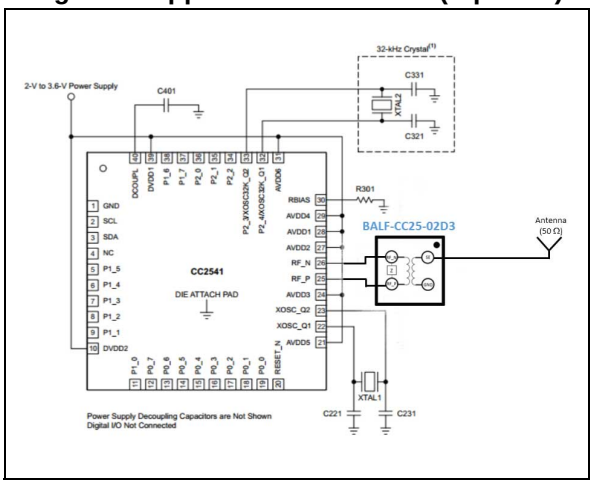



**Figure 2. Application schematic (top view)**



# 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 Ω, air discharge) | 2000 | V |
| | ESD ratings machine model (MM: C = 200 pF, R = 25 Ω, L = 500 nH) | 500 | |
| | ESD ratings charged device model (CDM, JESD22-C101D) | 500 | |
| $T_{OP}$ | Operating temperature | -40 to + 105 | °C |

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

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $Z_{OUT}$ | Nominal differential output impedance | Conjugate match to CC2541 | | | Ω |
| $Z_{IN}$ | 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 | | ° |
| $A_{imb}$ | Amplitude imbalance | | 0.6 | | dB |

**Figure 3. Balun transmission ($T_{amb}$ = 25 °C)**

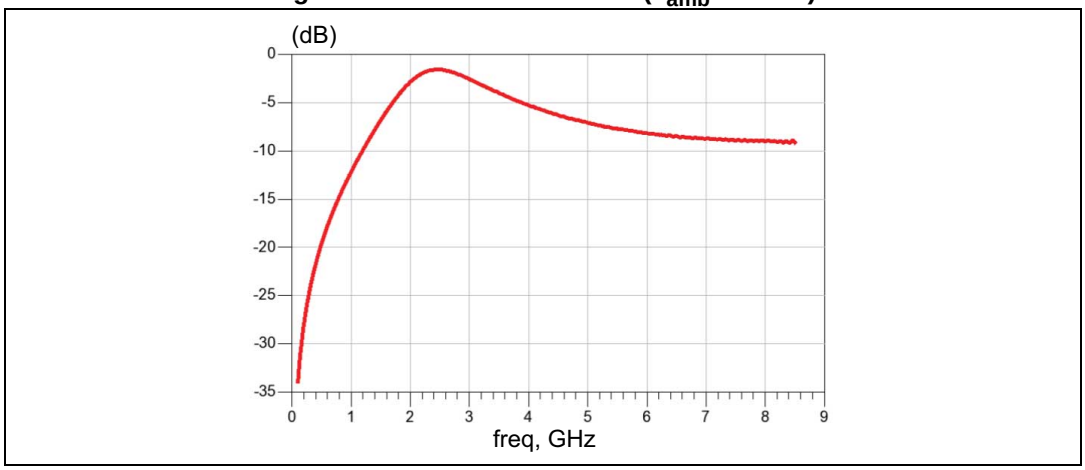



**Figure 4. Insertion loss ($T_{amb}$ = 25 °C)**

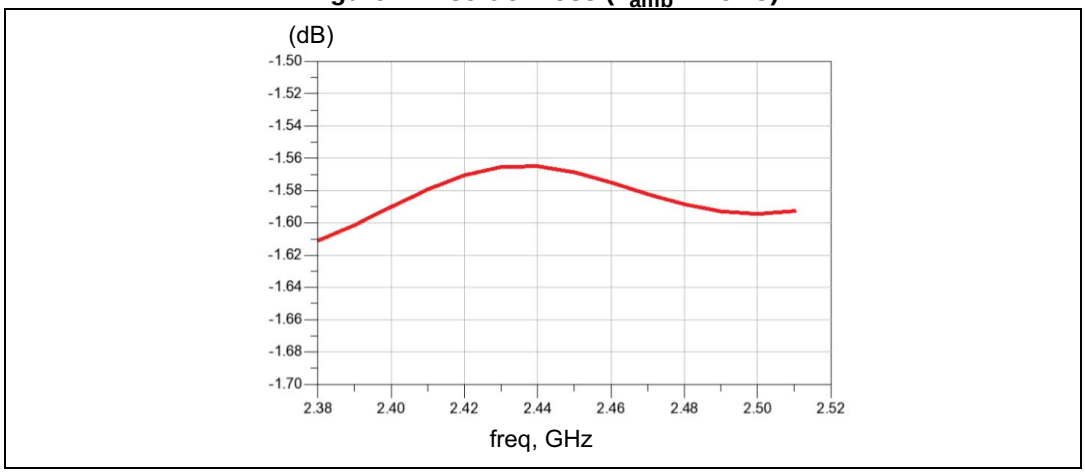



**Figure 5. Return loss on SE port ($T_{amb}$ = 25 °C)**

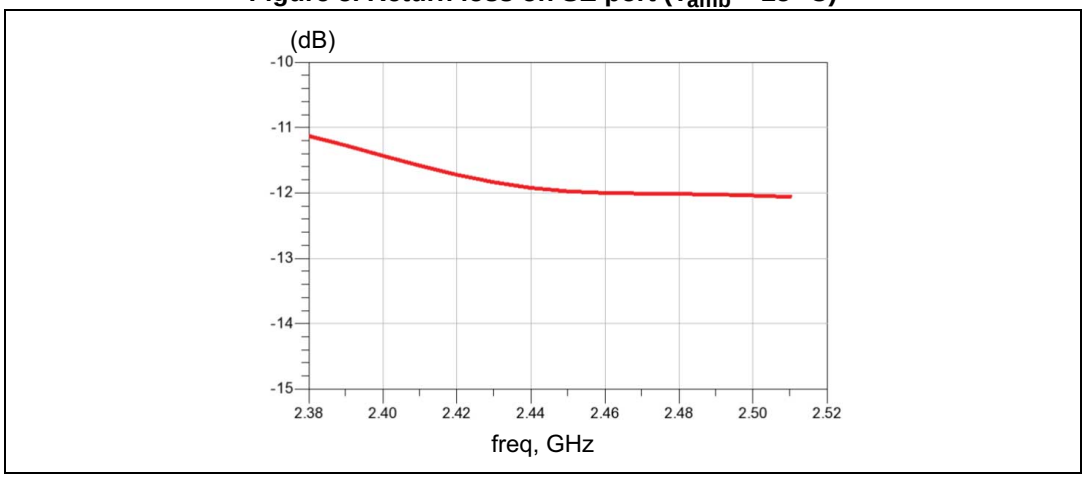


Figure 6. Return loss on DIFF port ($T_{amb}$ = 25 °C)

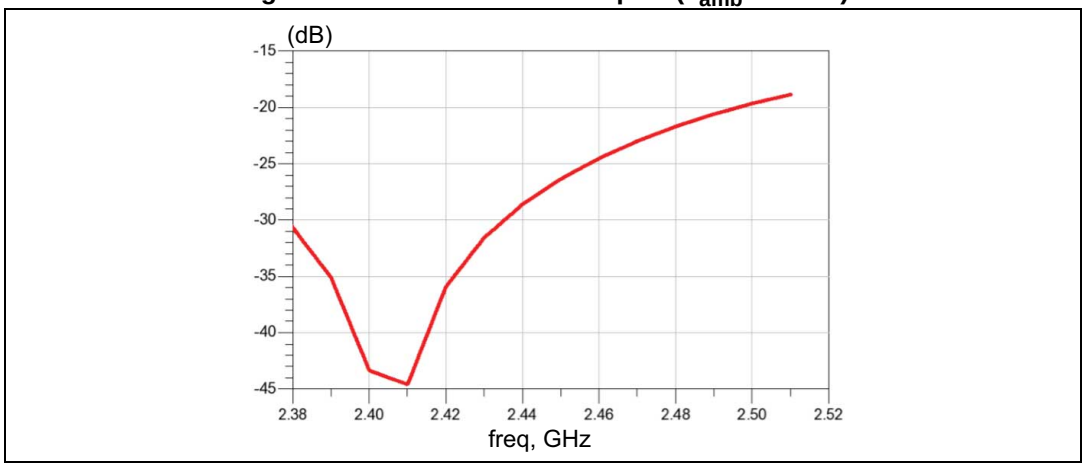



Figure 7. Amplitude imbalance ($T_{amb}$ = 25 °C)

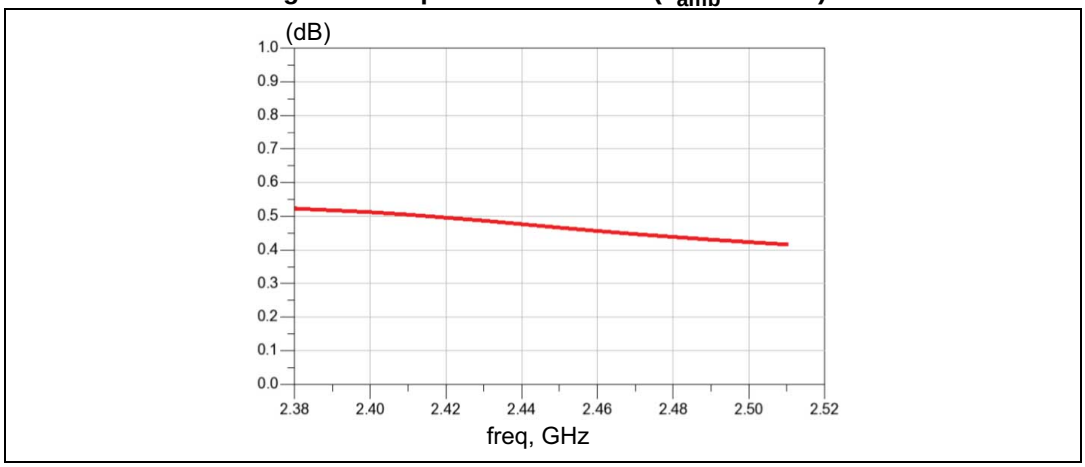
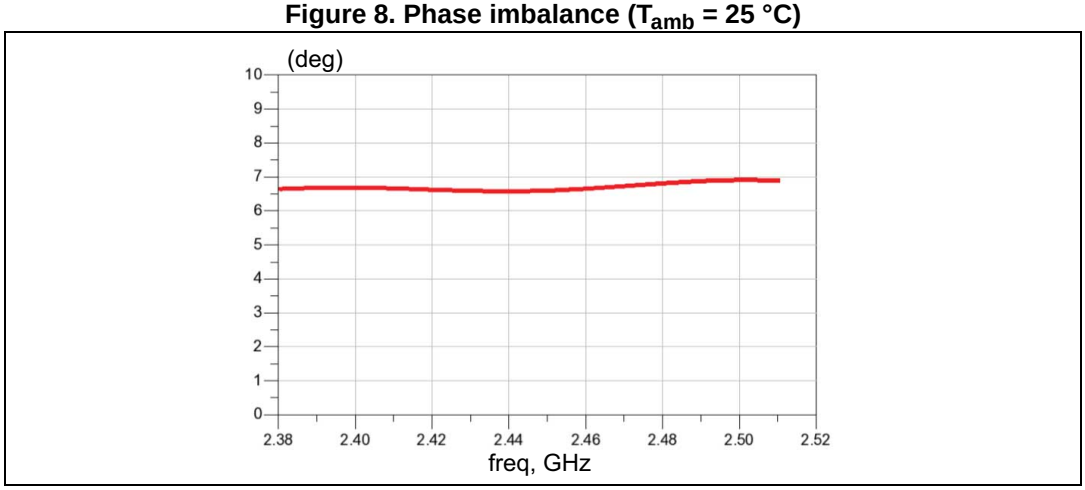



Figure 8. Phase imbalance ($T_{amb}$ = 25 °C)



# 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® 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.

## 2.1 Flip-Chip package information

**Figure 9. Flip-Chip package outline**

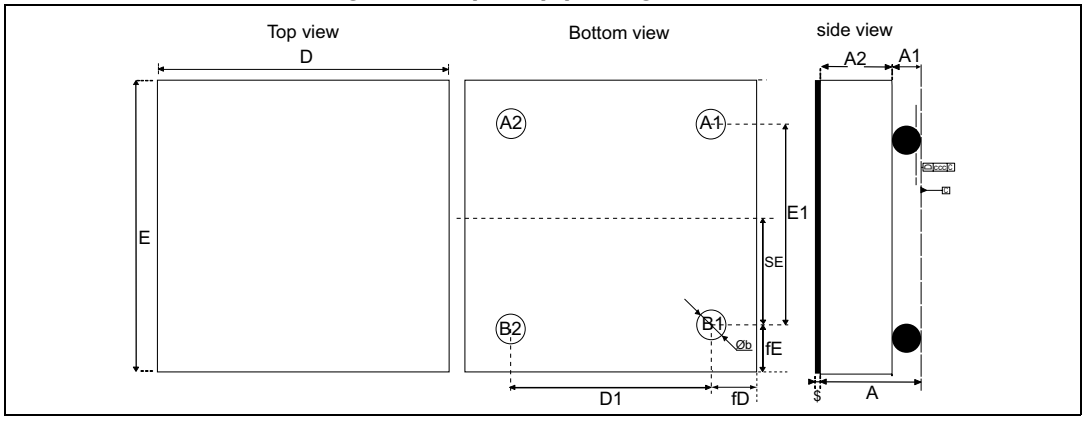



**Table 3. Flip-Chip package mechanical data**

| 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**

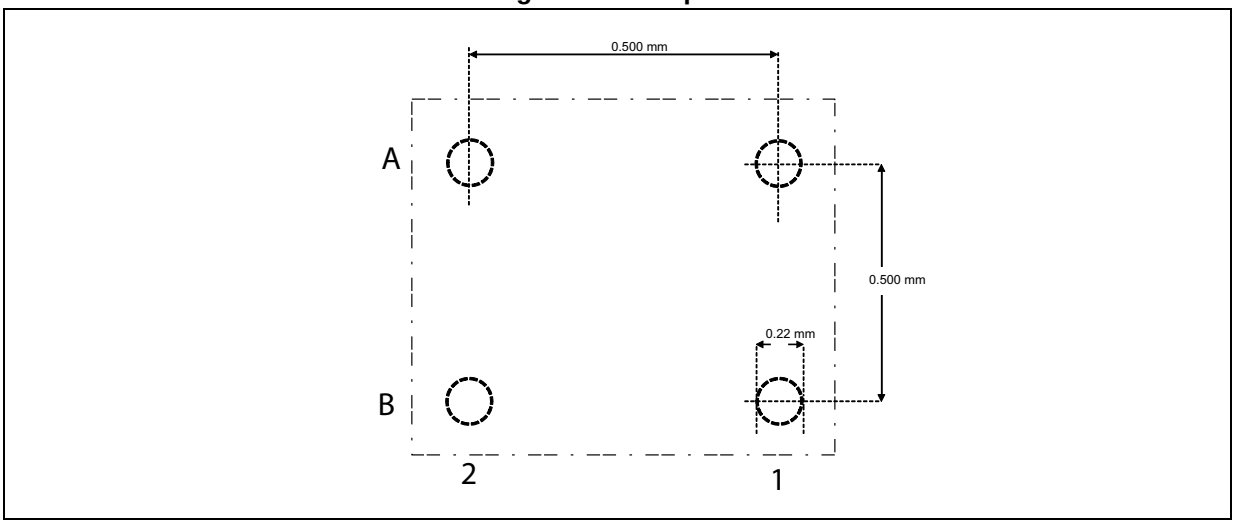
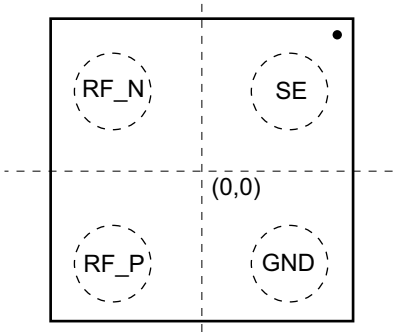



**Figure 11. Bump coordinates (top view)**




Coordinates given from center of die (in µm):
SE: (+250, +250)
GND: (+250, -250)
DIFFP: (-250, +250)
DIFFM: (-250, -250)

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

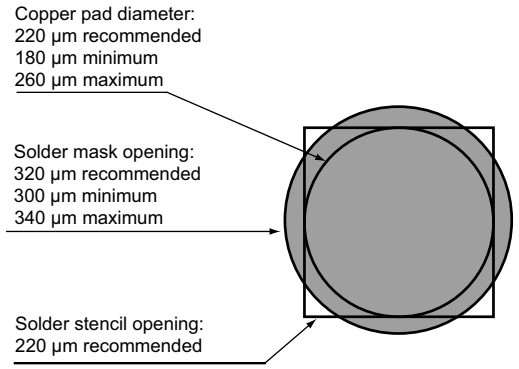



**Figure 13. Footprint - 3 mils stencil - solder mask defined**

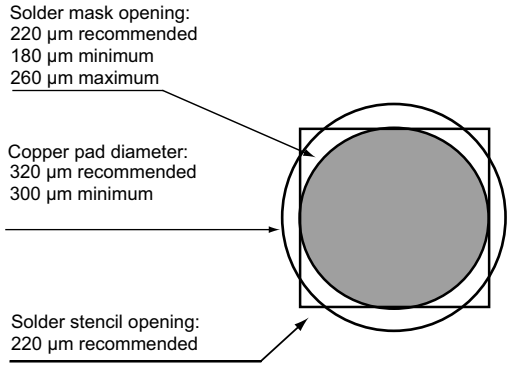



**Figure 14. Footprint - 5 mils stencil -non solder mask defined**

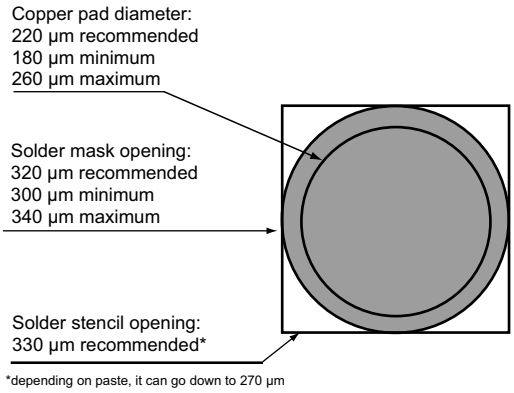



**Figure 15. Footprint - 5 mils stencil - solder mask defined**

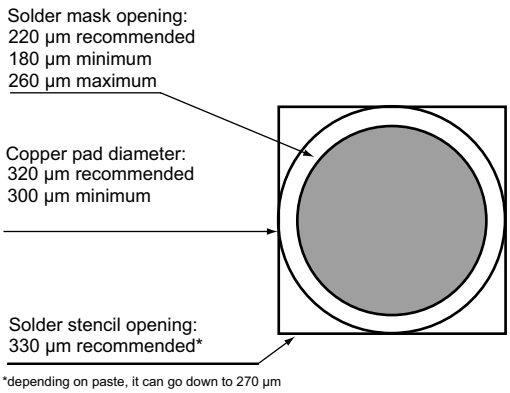


**Figure 16. PCB layout recommendation**

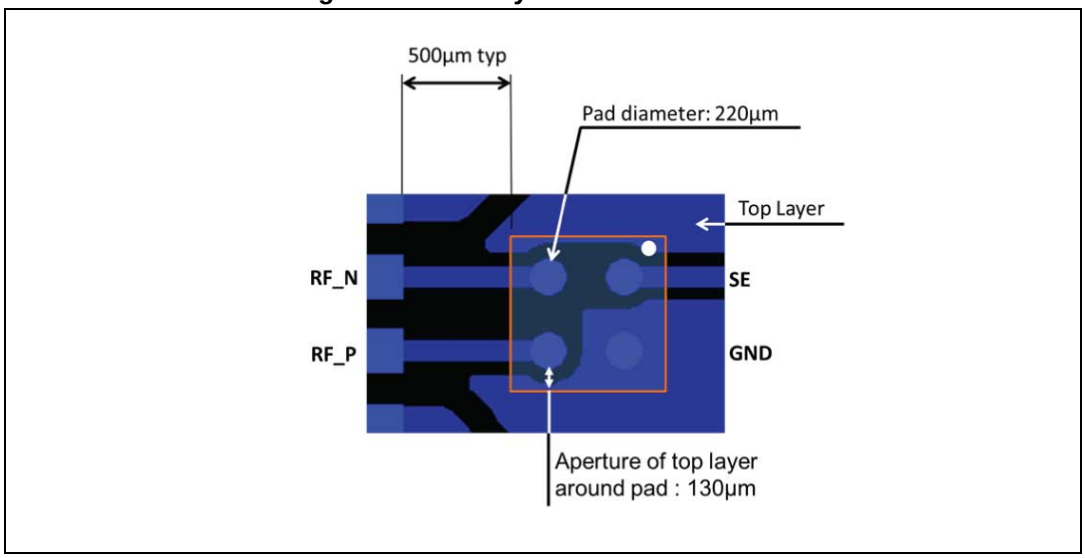
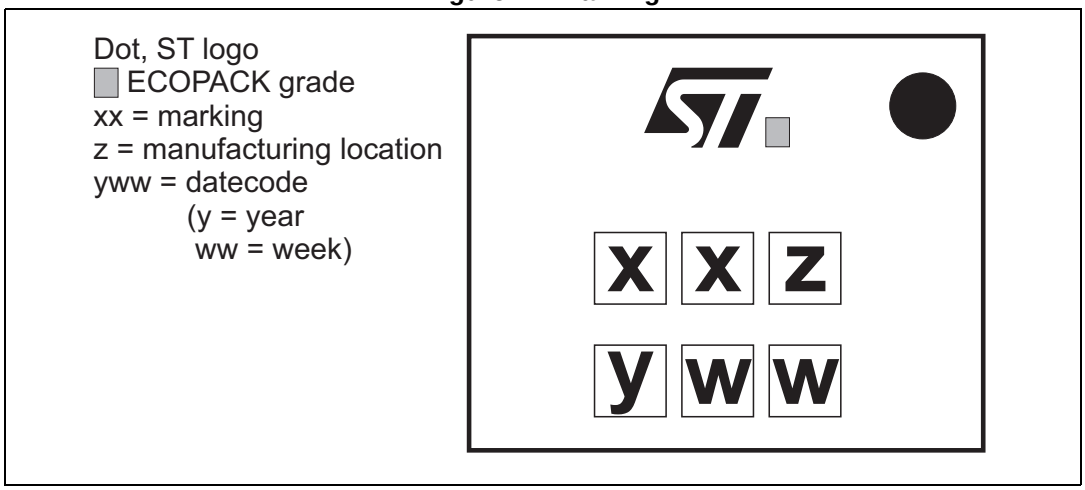
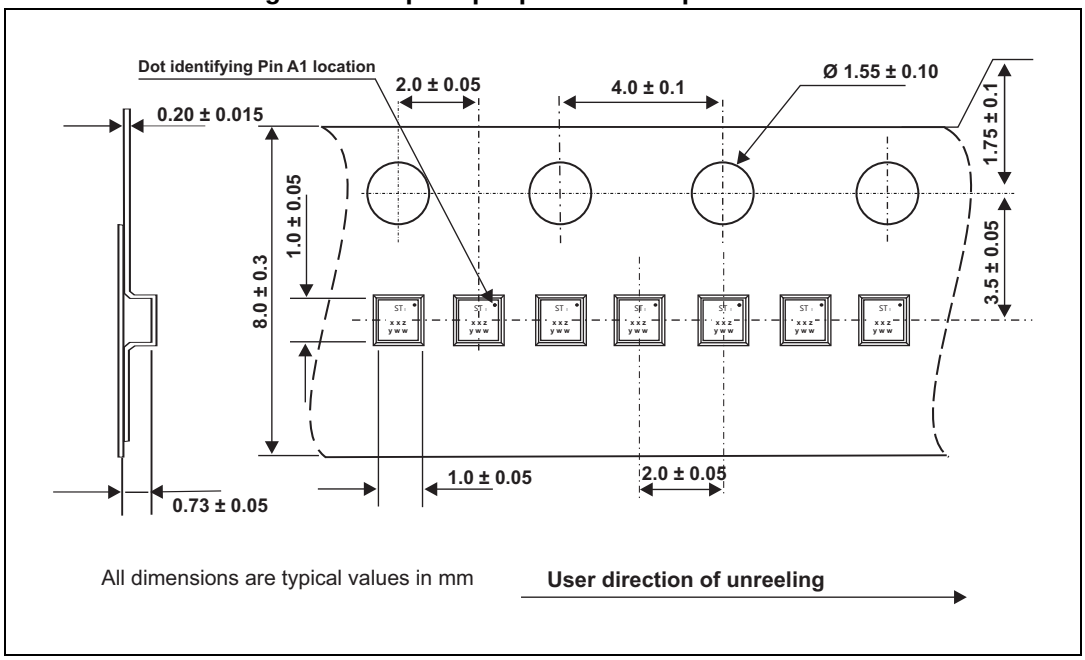



**Figure 17. Marking**




*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 |

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