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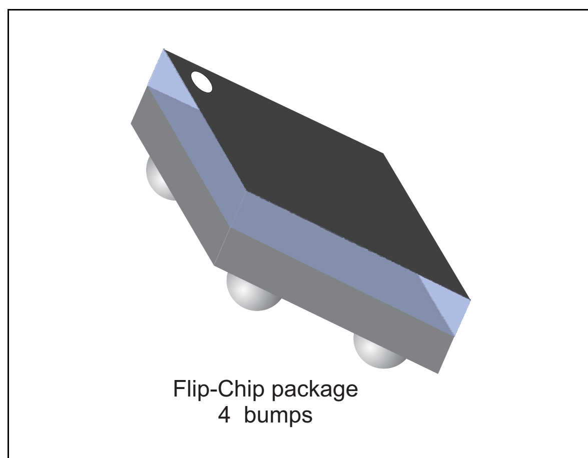
# BAL-CC1101-01D3

## 50 ohm nominal input / conjugate match balun to CC1101 / CC1150 (868-928 MHz), with integrated harmonic filter

**Datasheet — production data**



Flip-Chip package
4 bumps

## Features

- 50 Ω nominal input / conjugate match to CC1101 / CC1150
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated Flip-Chip on glass
- Small footprint: < 2.1 mm²

### Benefits

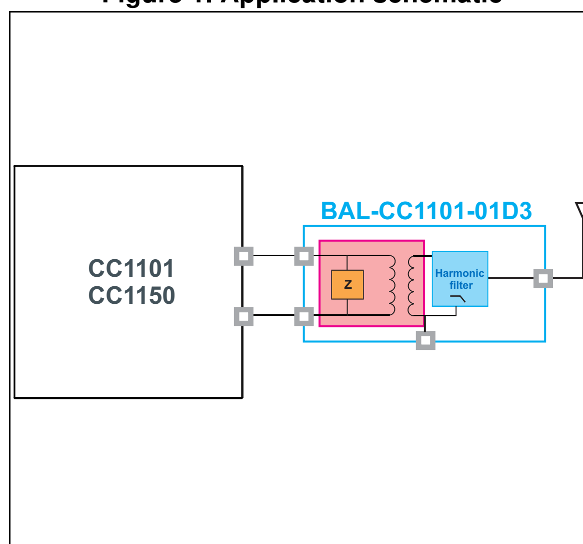
- Extremely low profile (< 550 µm after reflow)
- High RF performance
- RF BOM and area reduction

## Description

STMicroelectronics BAL-CC1101-01D3 is an ultra miniature balun which integrates a matching network in a monolithic glass substrate. This has been customized for the CC1101 / CC1150 TI transceiver.

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

**Figure 1. Application schematic**






This is information on a product in full production.

# 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 human body model (JESD22-A114C), all I/O one at a time while others connected to GND | 2000 | V |
| | ESD ratings machine model, all I/O | 500 | |
| | ESD ratings charged device model (JESD22-C101D) | 500 | |
| $T_{OP}$ | Operating temperature | -40 to +125 | ºC |

**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 CC1101 / CC1150 | | Ω |
| $Z_{IN}$ | Nominal input impedance | | 50 | | |
| F | Frequency range (bandwidth) | 779 | | 928 | MHz |
| $I_L$ | Insertion loss in bandwidth | | 1.7 | 1.9 | dB |
| $R_{L_SE}$ | Single ended return loss in bandwidth | | 15 | | dB |
| $R_{L_DIFF}$ | Differential ended return loss in bandwidth | | 15 | | dB |
| $\Phi_{imb}$ | Phase imbalance | -10 | | 10 | ° |
| $A_{imb}$ | Amplitude imbalance | -1 | | 1 | dB |
| Att | Harmonic levels (TX filter)<br>Attenuation at 2fo<br>Attenuation at 3fo | | <br>-25<br>-50 | | dB |

## 1.1 Measurements

Figure 2. Transmission (S21)

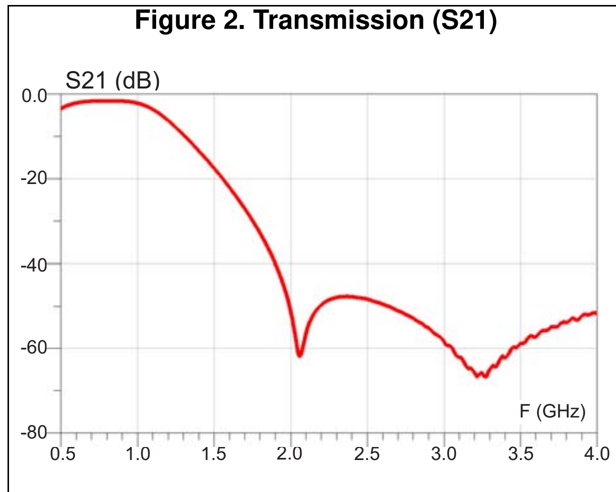



Figure 3. Insertion loss in band

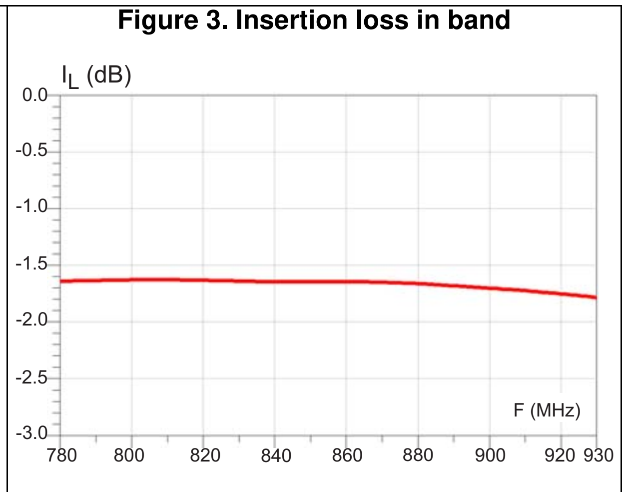



Figure 4. Return loss single-ended

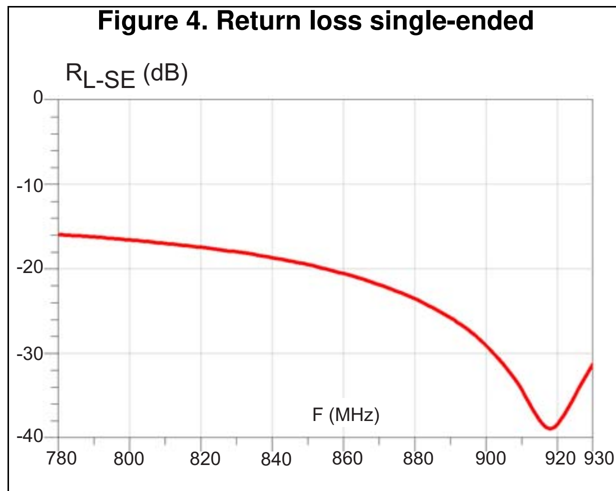



Figure 5. Return loss differential

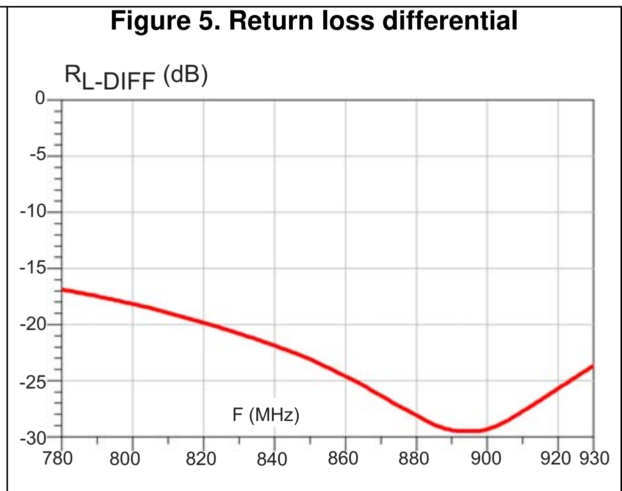



Figure 6. Phase imbalance

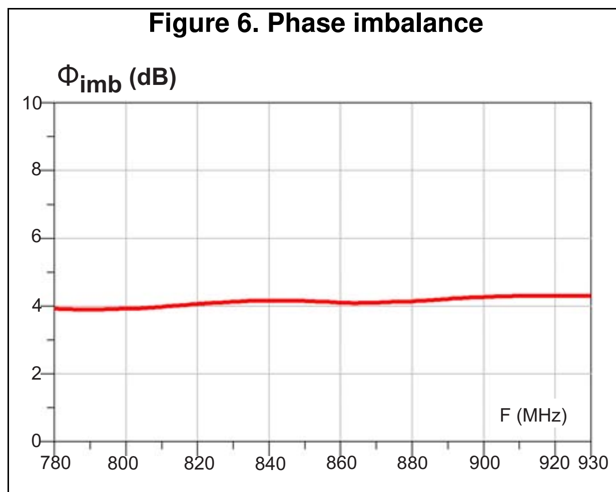
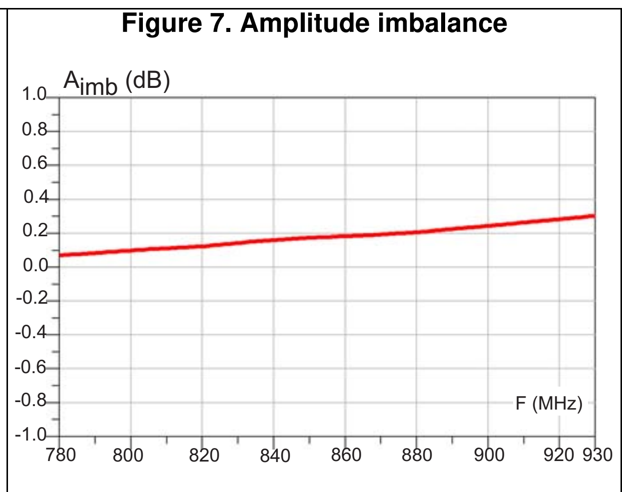



Figure 7. Amplitude imbalance



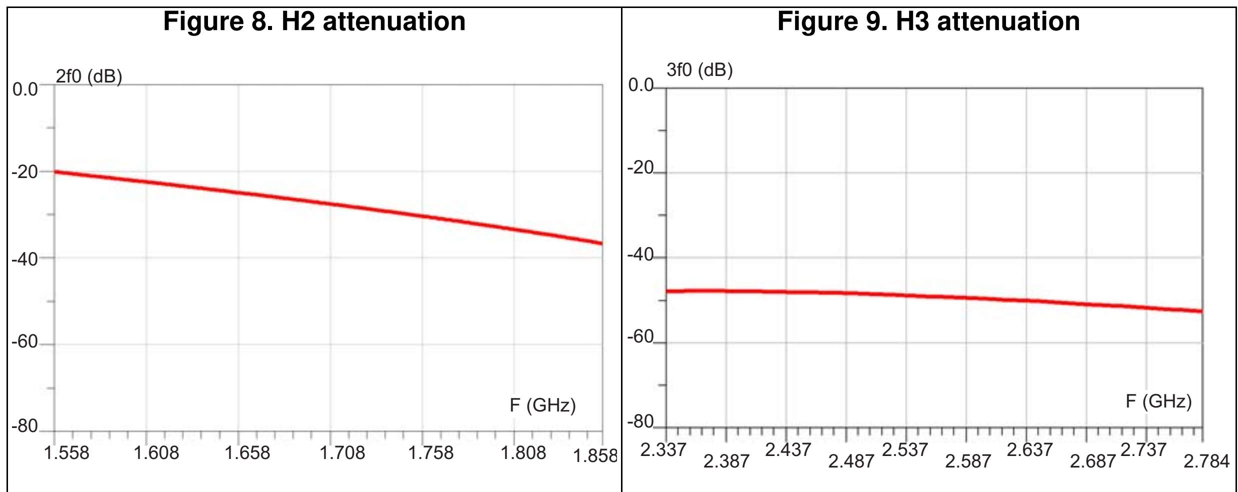



Figure 8. H2 attenuation

Figure 9. H3 attenuation

# 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 10. Flip-Chip package outline**

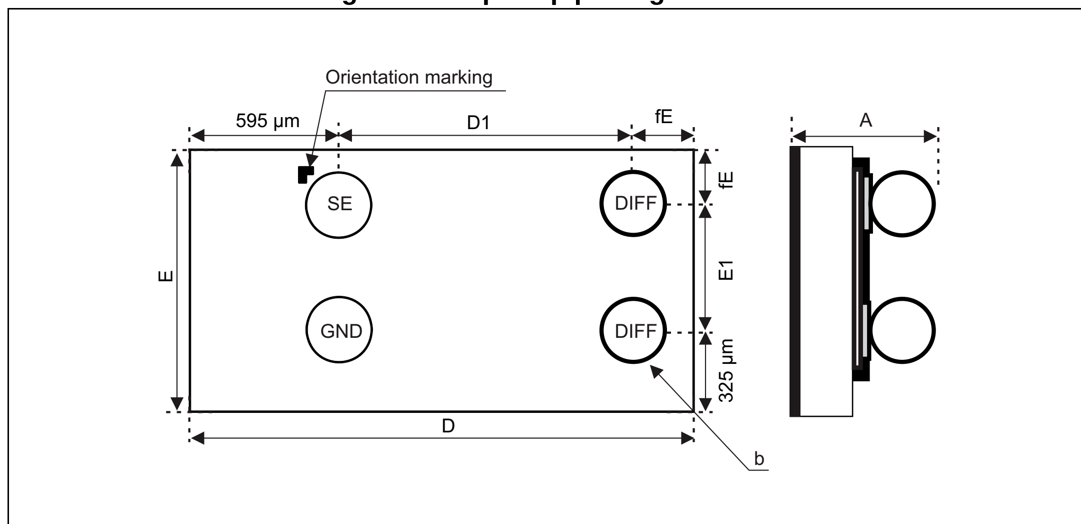



**Table 3. Flip-Chip package mechanical data**

| Parameter | Description | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| A | Bump height + substrate thickness | 0.570 | 0.630 | 0.690 | mm |
| b | Bump diameter | 0.215 | 0.255 | 0.295 | mm |
| D | Y dimension of the die | 1.970 | 2.020 | 2.070 | mm |
| D1 | Y pitch | | 1.200 | | mm |
| E | X dimension of the die | 1.000 | 1.050 | 1.100 | mm |
| E1 | X pitch | | 0.500 | | mm |
| fE | Distance from bump to edge of die on X axis | | | 0.225 | mm |

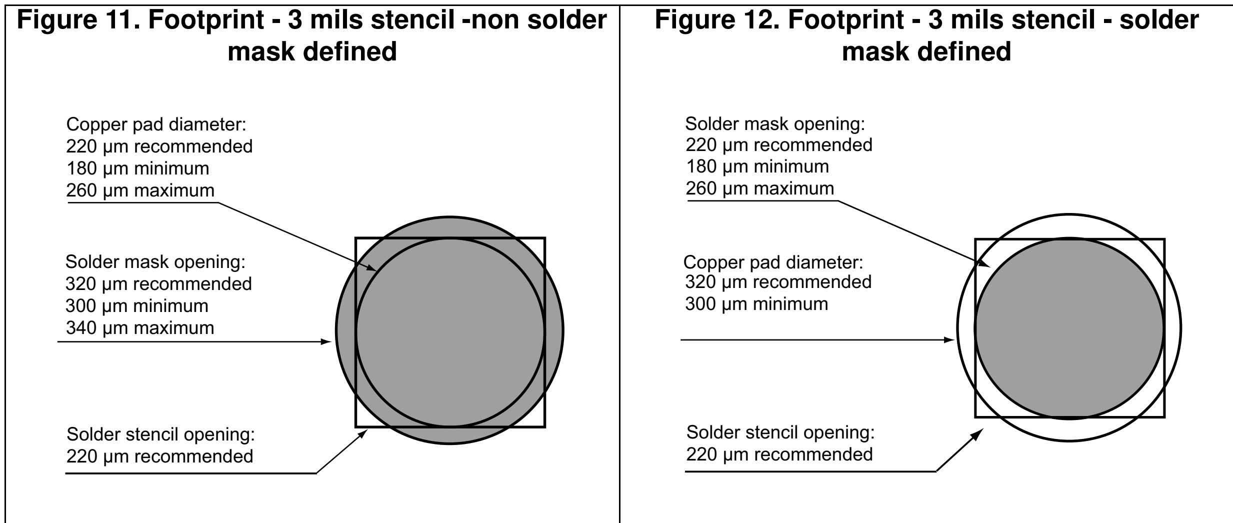



**Figure 11. Footprint - 3 mils stencil -non solder mask defined**

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

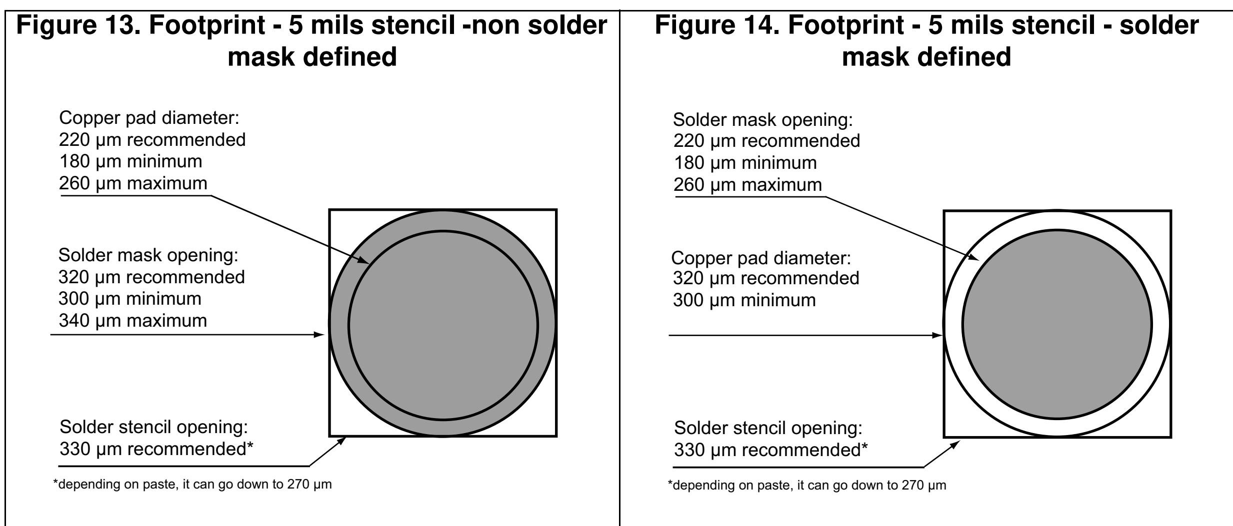



**Figure 13. Footprint - 5 mils stencil -non solder mask defined**

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

Figure 15. PCB view CC1101 with BAL-CC1101-01D3

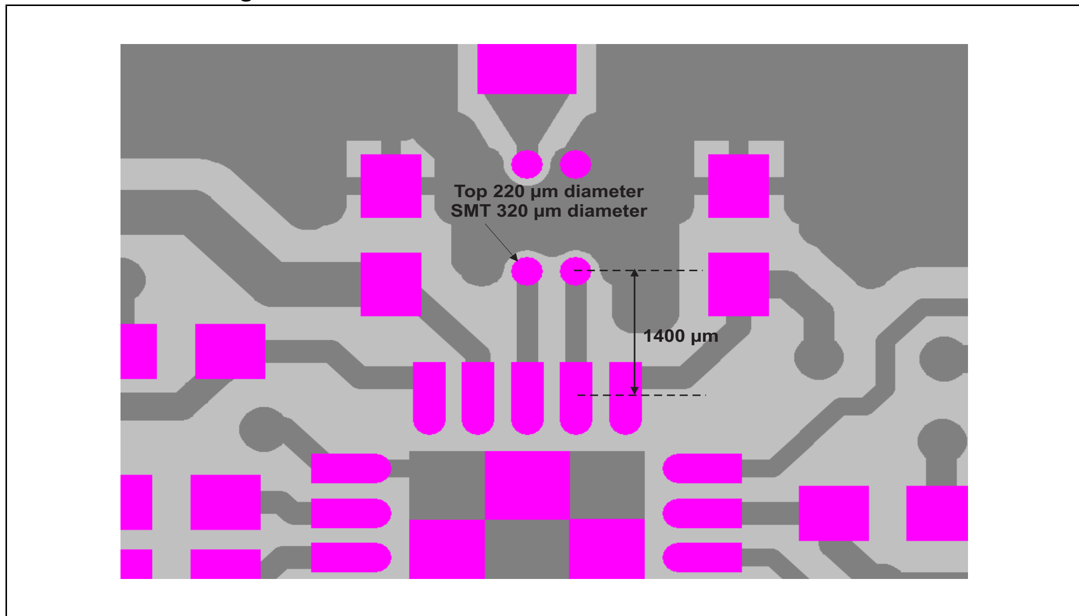



Figure 16. Marking

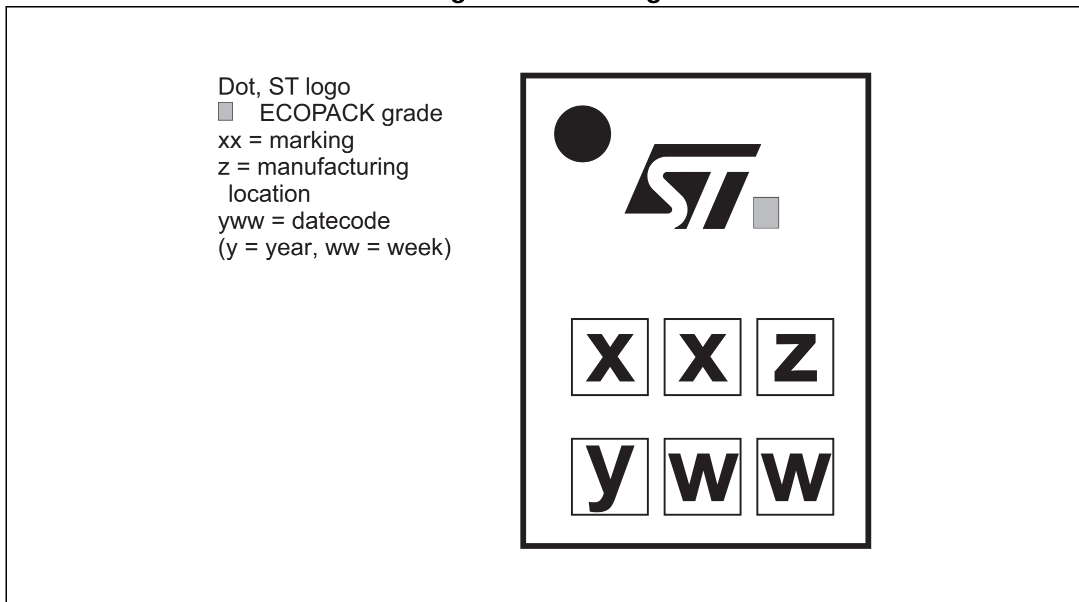
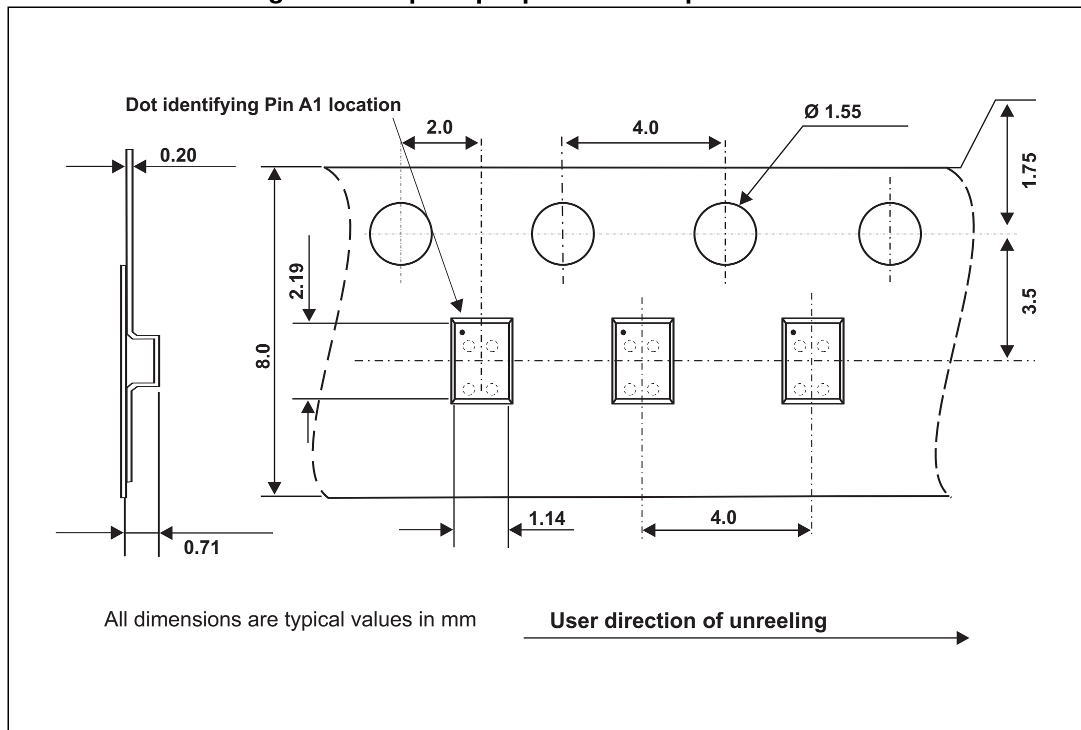


Figure 17. Flip Chip tape and reel specifications




*Note:* *More information is available in the STMicroelectronics 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-CC1101-01D3 | SS | Flip-Chip | 2.21 mg | 5000 | Tape and reel (7”) |

# 4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 23-Jan-2014 | 1 | Initial release |
| 18-Sep-2015 | 2 | Updated Figure 10. Added Figure 11, Figure 12, Figure 13, Figure 14 and Table 3. |
| 02-May-2016 | 3 | Updated *Figure 10* and *Table 3*. |

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