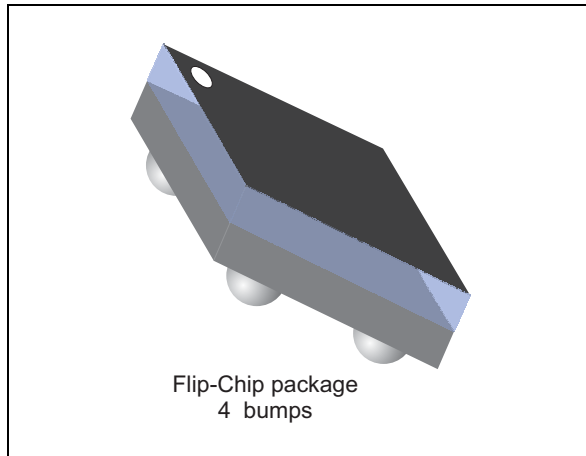


50 ohm nominal input / conjugate match balun to CC1101 / CC1150 (868-928 MHz), with integrated harmonic filter

Datasheet – production data



## 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.

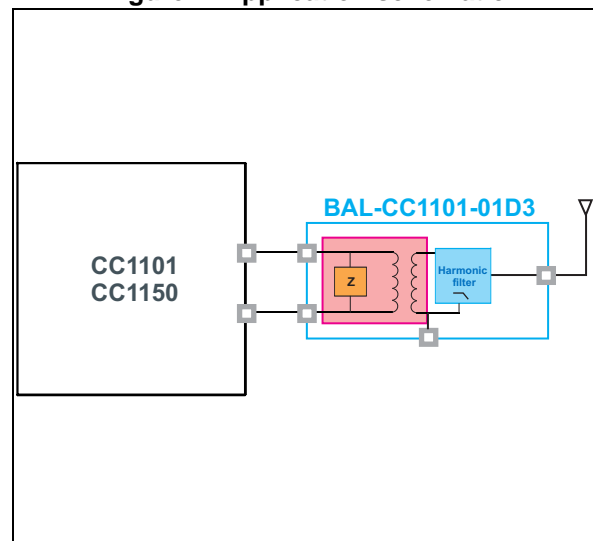
## Features

- 50  $\Omega$  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 mm<sup>2</sup>

## Benefits

- Extremely low profile (< 550  $\mu$ m after reflow)
- High RF performance
- RF BOM and area reduction

Figure 1. Application schematic



# 1 Characteristics

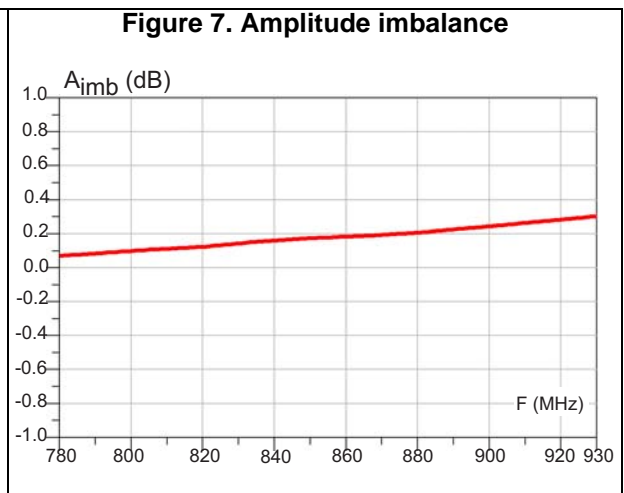
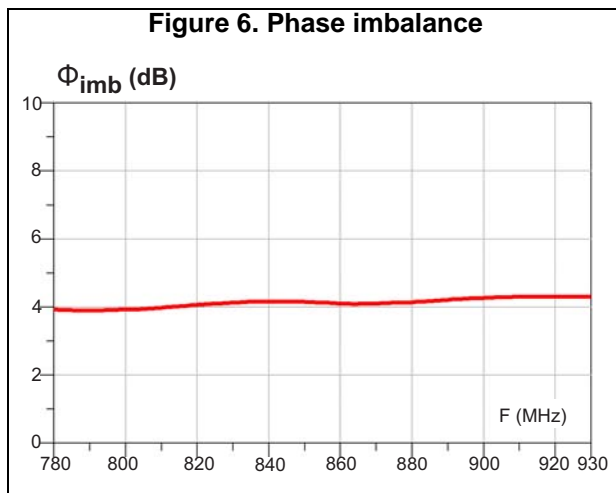
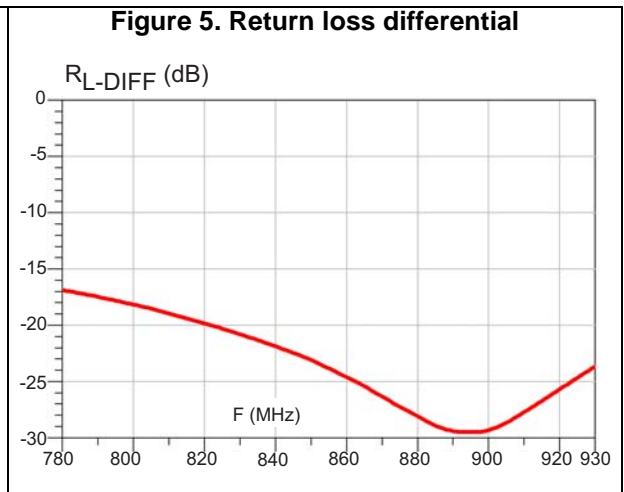
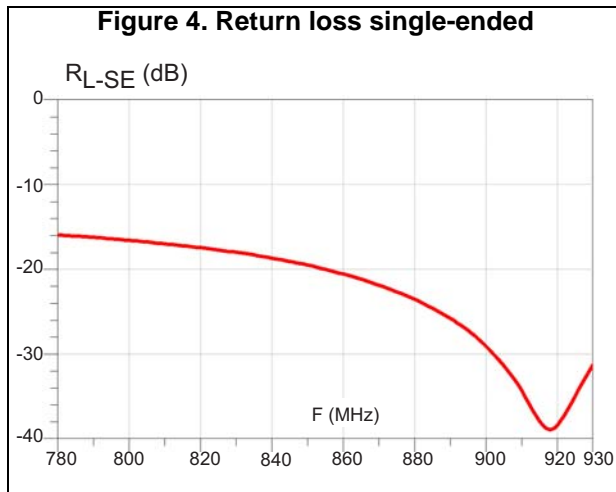
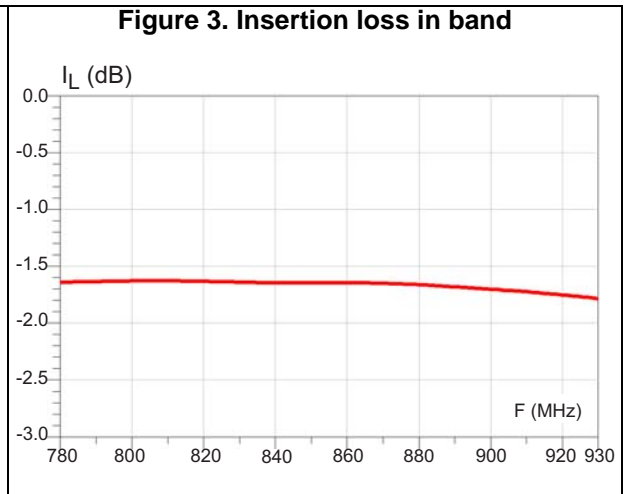
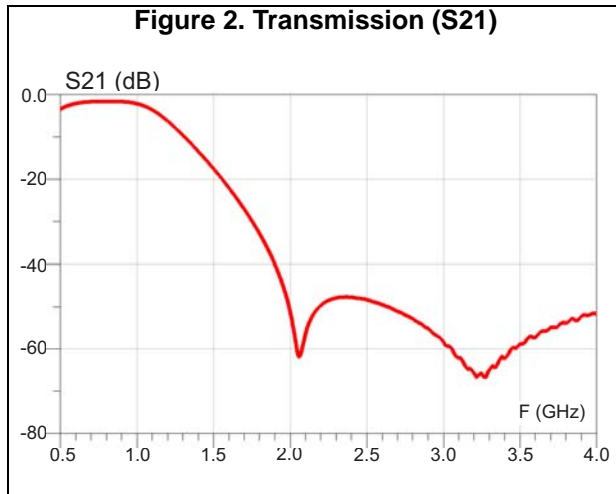
**Table 1. Absolute maximum rating (limiting values)**

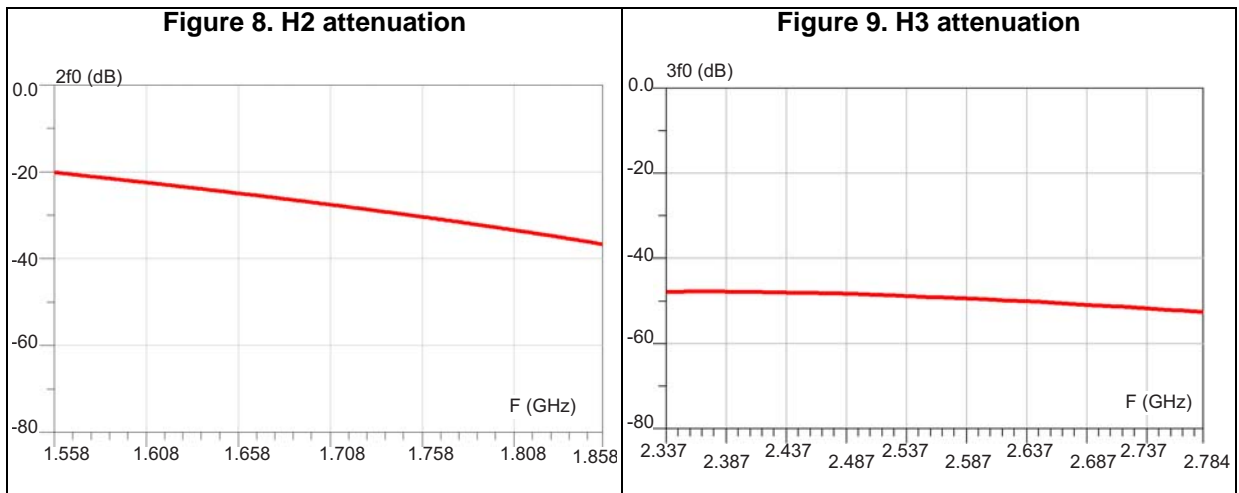
| Symbol    | Parameter  | Value       | Unit |
|-----------|--|-------------|------|
| $P_{IN}$  | Input power $RF_{IN}$  | 20          | dBm  |
| $V_{ESD}$ | ESD ratings human body model (JESD22-A114C), all I/O one at a time while others connected to GND | 2000        | V    |
|           | ESD ratings machine model, all I/O   | 500         |      |
|           | ESD ratings charged device model (JESD22-C101D)  | 500         |      |
| $T_{OP}$  | Operating temperature  | -40 to +125 | °C   |

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

| Symbol        | Parameter                                   | Value |                                    |      | Unit     |
|---------------|---|-------|------------------------------------|------|----------|
|               |   | Min.  | Typ.                               | Max. |          |
| $Z_{OUT}$     | Nominal differential output impedance       |       | Conjugate match to CC1101 / CC1150 |      | $\Omega$ |
| $Z_{IN}$      | 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)                 |       |                                    |      | dB       |
|               | Attenuation at 2fo                          |       | -25                                |      |          |
|               | Attenuation at 3fo                          |       | -50                                |      |          |

### 1.1 Measurements





## 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](http://www.st.com). ECOPACK® is an ST trademark.

### 2.1 Flip-Chip package information

Figure 10. Flip-Chip package outline

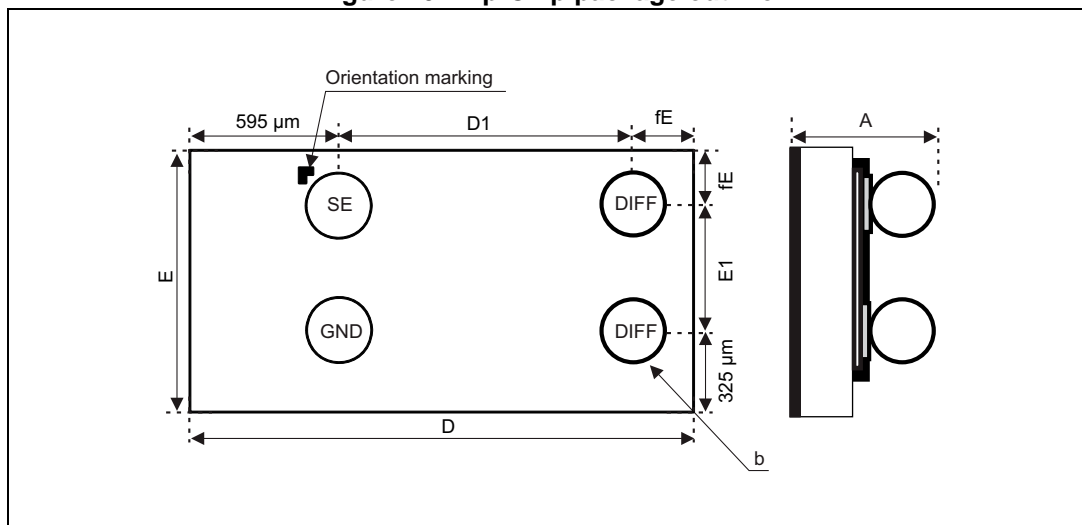


Table 3. Flip-Chip package mechanical data

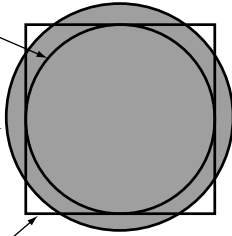
| Parameter | Description                                 | Min.  | Typ.  | Max.  | Unit |
|-----------|---|-------|-------|-------|------|
| A         | Bump height + substrate thickness           | 0.570 | 0.630 | 0.690 | mm   |
| b         | Bump diameter                               | 0.215 | 0.255 | 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**

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

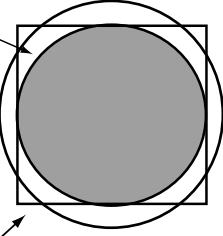


**Figure 12. Footprint - 3 mils stencil - solder mask defined**

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



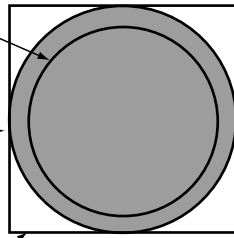
**Figure 13. Footprint - 5 mils stencil - non solder mask defined**

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 14. 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  $\mu\text{m}$

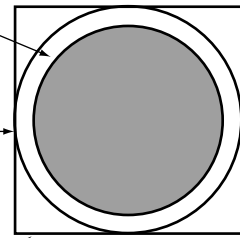


Figure 15. PCB view CC1101 with BAL-CC1101-01D3

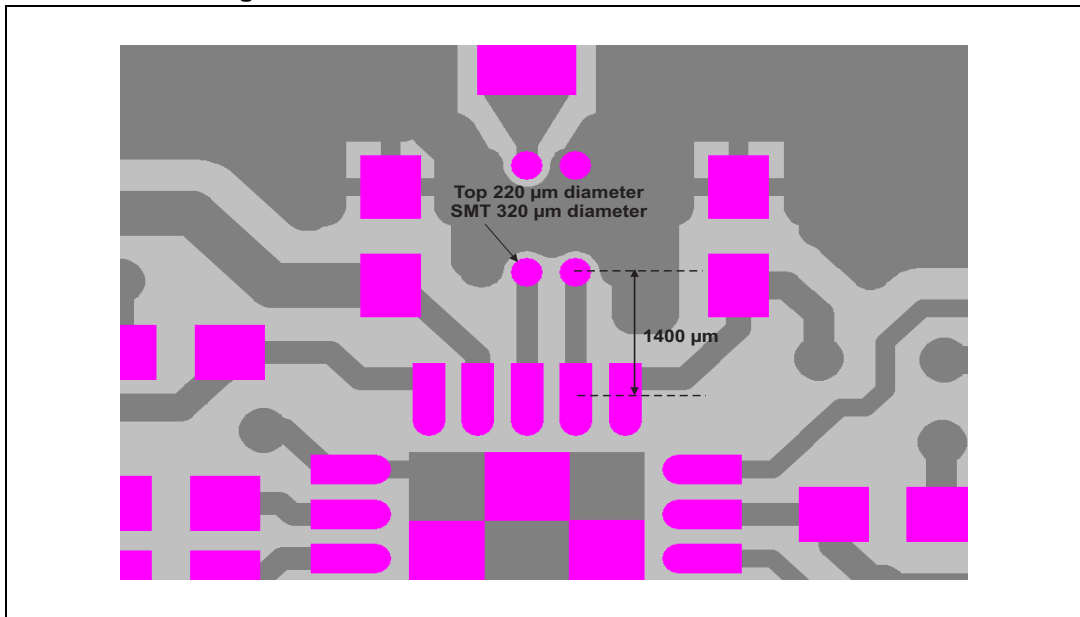


Figure 16. Marking

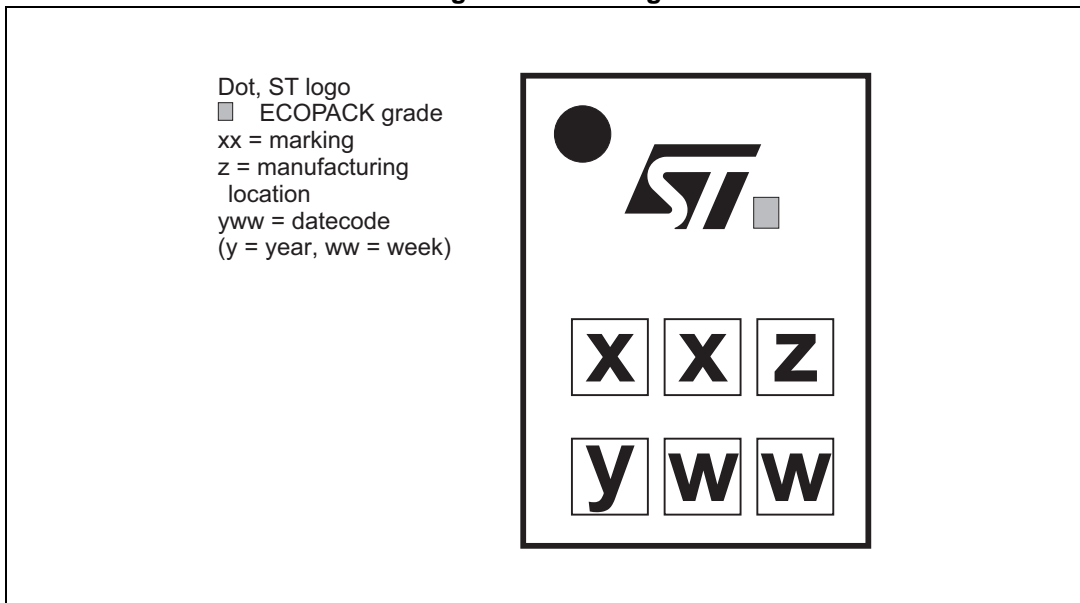
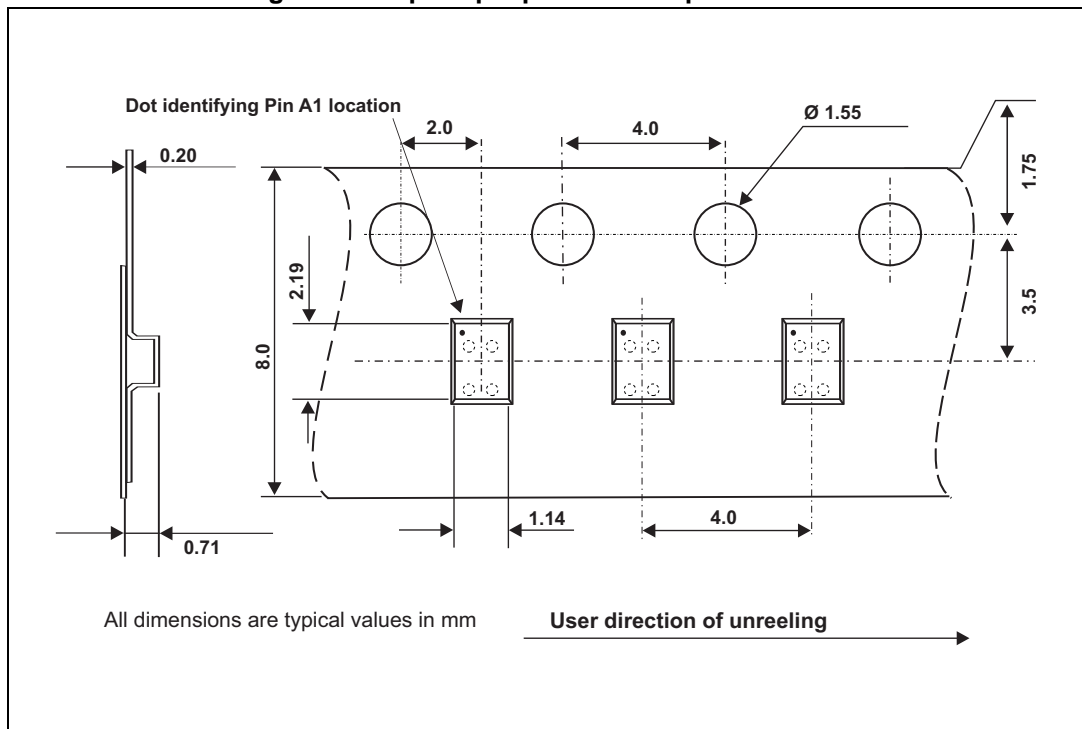


Figure 17. Flip Chip tape and reel specifications



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 <a href="#">Figure 10</a> and <a href="#">Table 3</a> .                  |

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