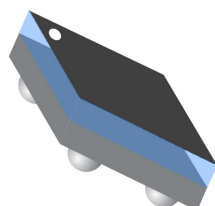
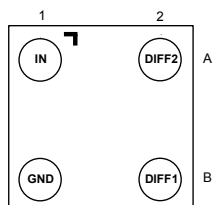


50  $\Omega$  / conjugate match to WILC1000 transformer balun



Chip scale package on glass  
4 bumps - 0.95 x 0.95 mm



## Features

- 2.45 GHz Balun with integrated matching network
- Matching optimized for ATMEL WILC1000
- Low insertion loss
- Low amplitude imbalance
- Coated Flip-Chip on glass
- Small footprint < 0.90 mm<sup>2</sup>
- Benefits
  - Very low profile
  - High RF performance
  - PCB space saving versus discrete solution
  - BOM count reduction
  - Efficient manufacturability

## Applications

- 2.45 GHz impedance matched balun
- Optimized for the ATMEL SmartConnect WILC1000 Wireless Link Controller
- Connectivity

## Description

This device is an ultra-miniature matched balun.

Matching impedance has been optimized for the ATMEL SmartConnect WILC1000 Wireless Link Controller.

It is using STMicroelectronics IPD technology on non-conductive glass substrate which optimizes RF performance.

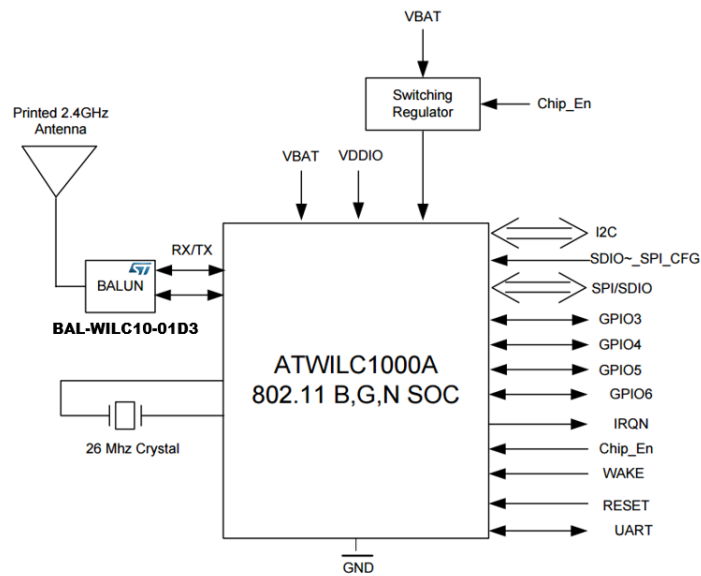
Product status link

[BAL-WILC10-01D3](#)

## 1 Characteristics

### 1.1 Circuit block diagram

Figure 1. Block diagram



### 1.2 Absolute ratings

Table 1. Absolute maximum ratings (limiting values)

| Symbol    | Parameter                                                                    | Value       | Unit        |
|-----------|------------------------------------------------------------------------------|-------------|-------------|
| $P_{IN}$  | Input power $RF_{IN}$                                                        | 20          | dBm         |
| $V_{ESD}$ | ESD ratings MIL STD 883C (HBM: C = 100pF, R = 1.5k $\Omega$ , air discharge) | 2000        | V           |
|           | ESD ratings machine model (MM: C = 200pF, R = 25 $\Omega$ , L = 500 nH)      | 500         |             |
|           | ESD ratings charged device model (CDM, JESD22-C101D)                         | 500         |             |
| $T_{OP}$  | Operating temperature                                                        | -40 to +105 | $^{\circ}C$ |

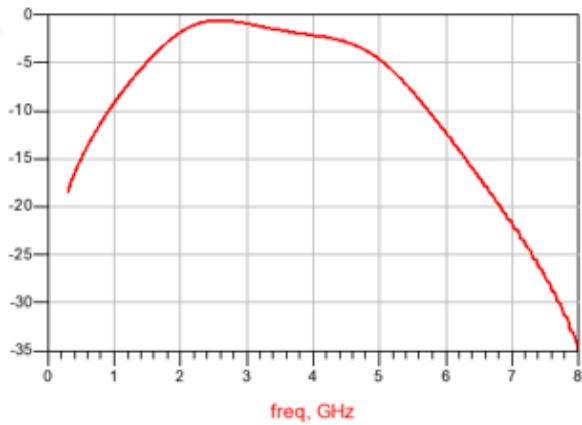
### 1.3 Electrical characteristics

**Table 2.** Electrical characteristics (values,  $T_{amb} = 25\text{ °C}$ )

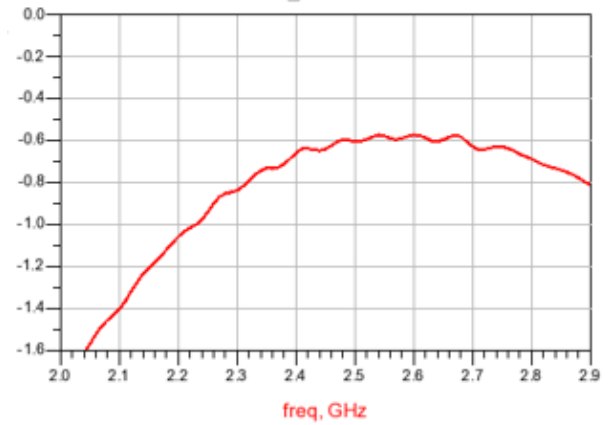
| Symbol        | Parameter                                     | Value                       |      |      | Unit     |
|---------------|-----------------------------------------------|-----------------------------|------|------|----------|
|               |                                               | Min.                        | Typ. | Max. |          |
| $Z_{OUT}$     | Nominal differential output impedance         | Conjugate match to WILC1000 |      |      | $\Omega$ |
| $Z_{IN}$      | Nominal input impedance                       |                             | 50   |      | $\Omega$ |
| f             | Frequency range (bandwidth)                   | 2400                        |      | 2500 | MHz      |
| $I_L$         | Insertion loss in bandwidth                   |                             | 0.65 | 0.8  | dB       |
| $R_{L\_SE}$   | Single ended return loss in bandwidth         |                             | -16  | -15  |          |
| $R_{L\_DIFF}$ | Differential return loss in bandwidth         |                             | -17  | -15  |          |
| $H_2$         | Second harmonic rejection (differential mode) |                             |      | -3.8 |          |
| $H_3$         | Third harmonic rejection (differential mode)  |                             |      | -23  |          |
| $\Phi_{imb}$  | Phase imbalance                               | -2                          | 1.3  | 2    | °        |
| $A_{imb}$     | Amplitude imbalance                           | -0.9                        | 0.8  | 0.9  | dB       |

## 1.4 Characteristics curves

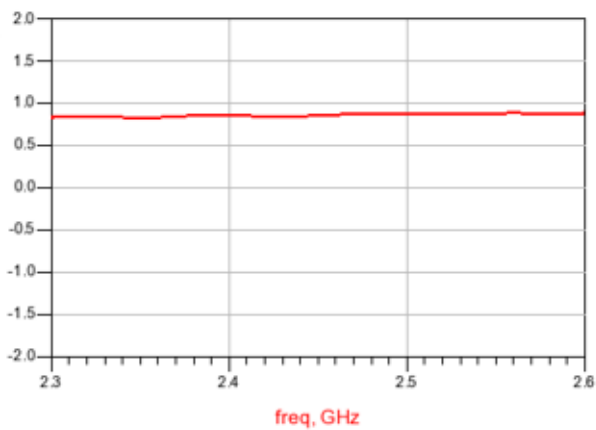
**Figure 2. Transmission (dB)**



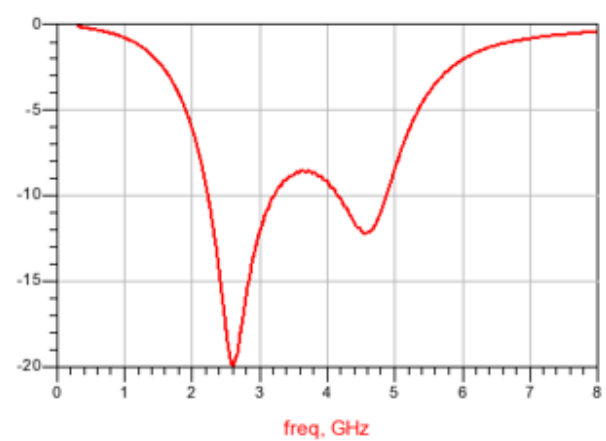
**Figure 3. Insertion loss (dB)**



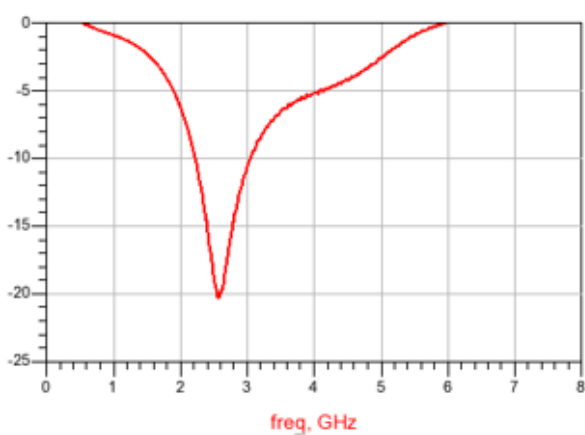
**Figure 4. Amplitude imbalance (dB)**



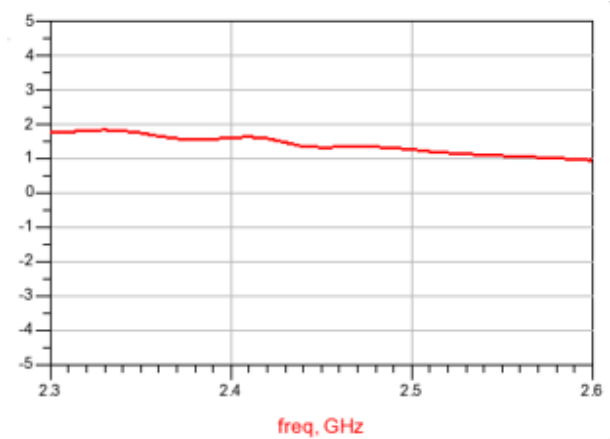
**Figure 5. Return loss single ended (dB)**



**Figure 6. Return loss differential (dB)**



**Figure 7. Phase imbalance (°)**

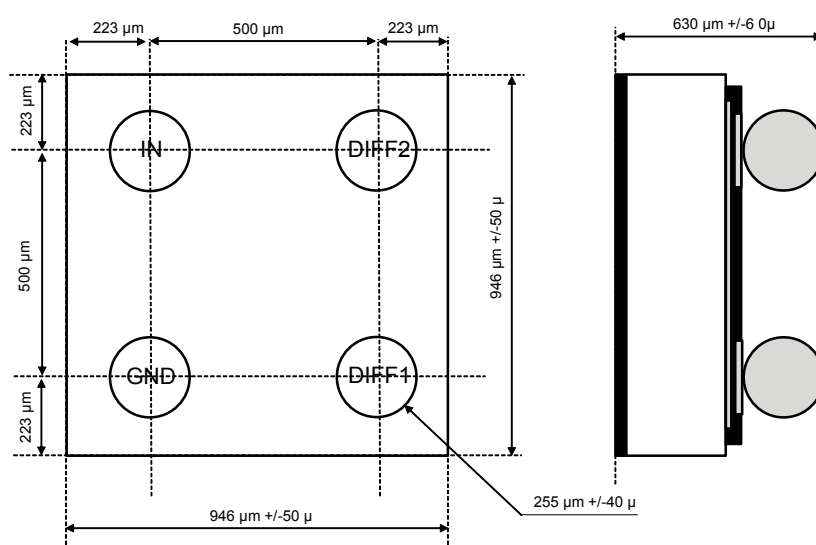


## 2 Package information

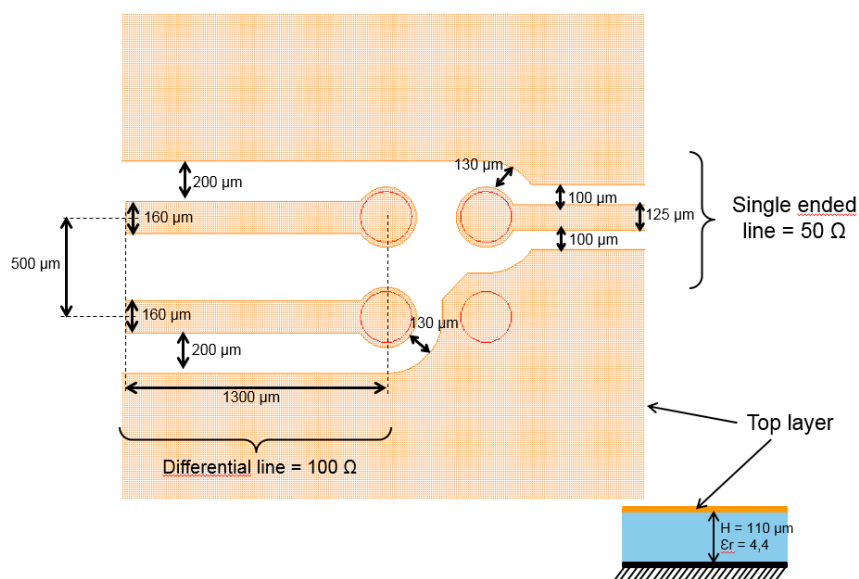
In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

## 2.1 WLCSP 8 bumps package information

**Figure 8. Flip-Chip 4 bumps CSPG 0.4 package outline**

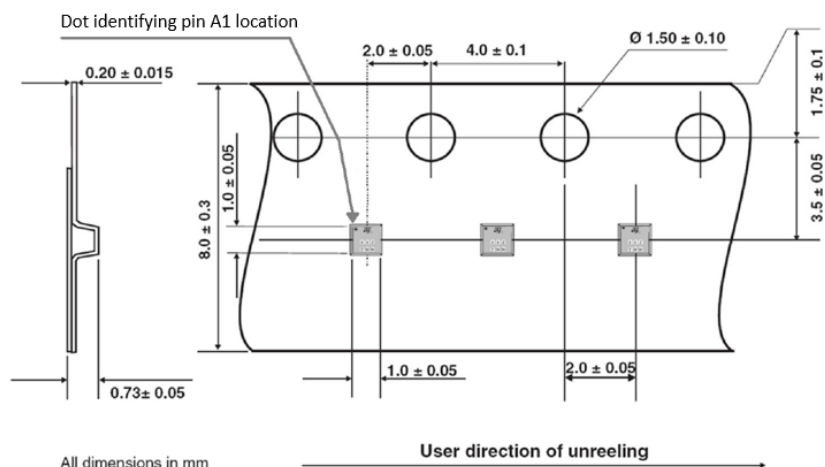


**Figure 9. PCB layout recommendation**



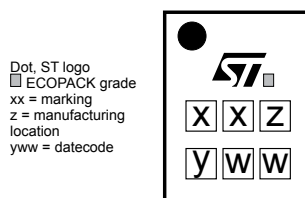
## 2.2 Flip-chip 4 bumps CSPG packing information

**Figure 10. Flip-chip tape and reel outline**

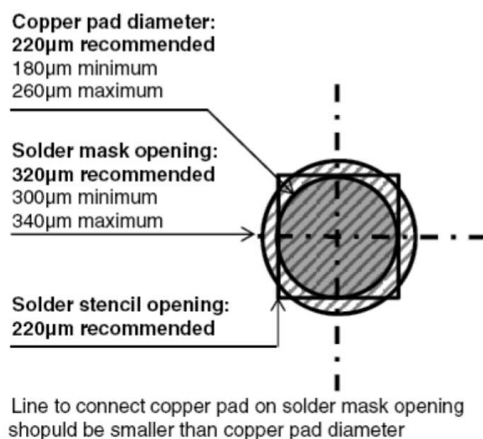


**Note:** *More information is available in the application note AN2348: "Flip Chip: Package description and recommendations for use"*

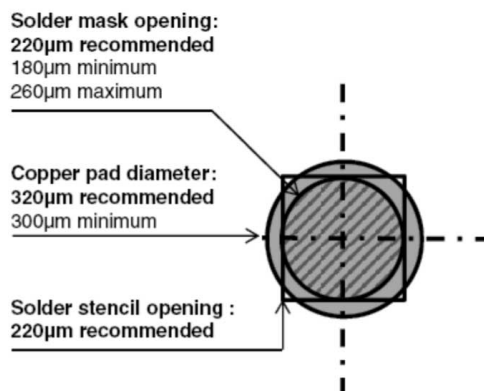
### Figure 11. Marking



**Figure 12. Footprint - non solder mask defined**



**Figure 13. Footprint - solder mask defined**



### 3 Ordering information

**Table 3. Ordering information**

| Order code      | Marking | Package | Weight   | Base qty. | Delivery mode      |
|-----------------|---------|---------|----------|-----------|--------------------|
| BAL-WILC10-01D3 | TI      | WLCSP   | 1.084 mg | 5000      | Tape and reel (7") |

## Revision history

**Table 4. Document revision history**

| Date        | Revision | Changes                                                       |
|-------------|----------|---------------------------------------------------------------|
| 10-Mar-2017 | 1        | Initial release.                                              |
| 03-Dec-2020 | 2        | Updated <a href="#">Table 3</a> . Added Applications section. |



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