



# 1 Characteristics

**Table 1: Absolute maximum ratings (limiting values)**

| Symbol           | Parameter   | Value |      |      | Unit |
|------------------|---|-------|------|------|------|
|                  |   | Min.  | Typ. | Max. |      |
| P <sub>IN</sub>  | Input power RFIN  |       | -    | 20   | dBm  |
| V <sub>ESD</sub> | ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5 Ω, air discharge) | 500   | -    |      | V    |
|                  | ESD ratings machine model (MM: C = 200 pF, R = 25 W, L = 500 nH)    | 250   | -    |      |      |
| T <sub>OP</sub>  | Operating temperature   | -40   | -    | +85  | °C   |

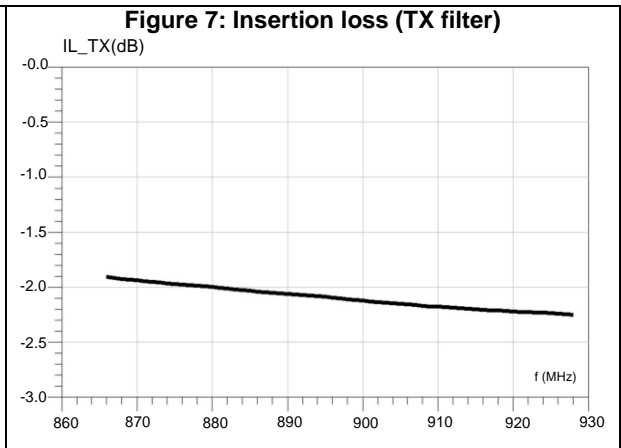
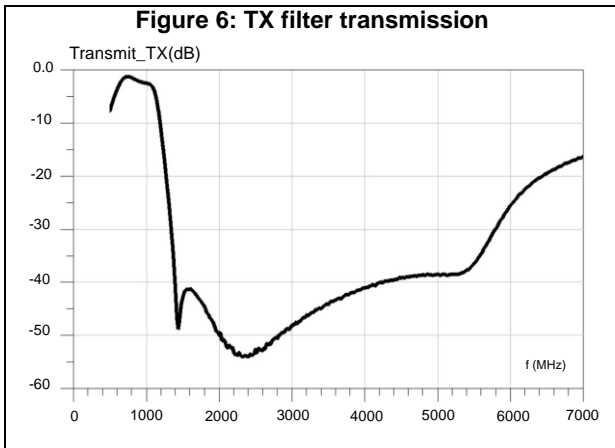
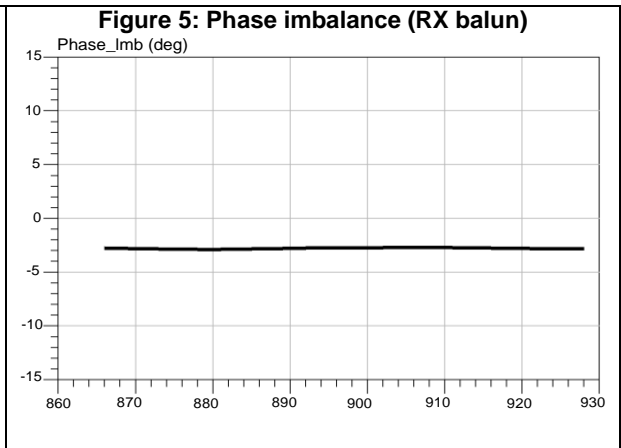
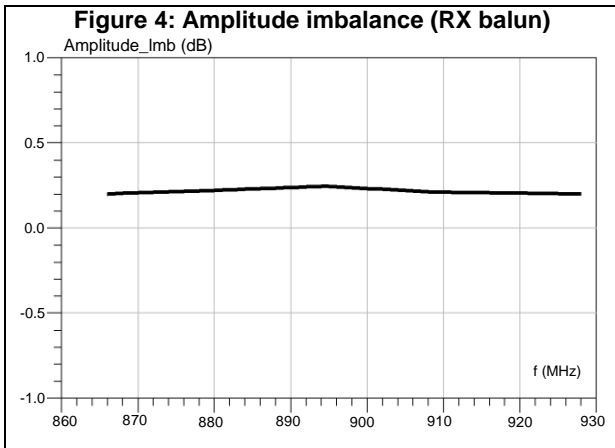
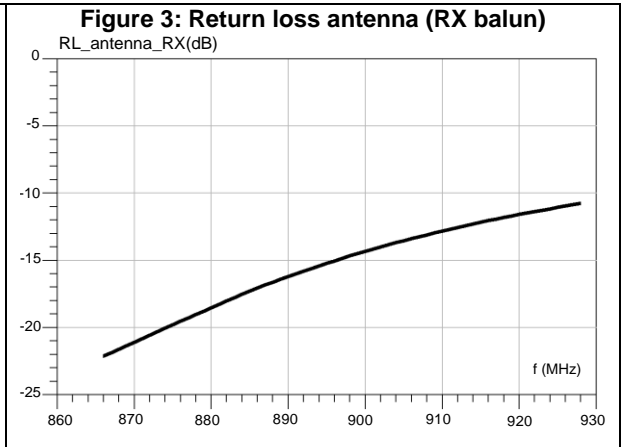
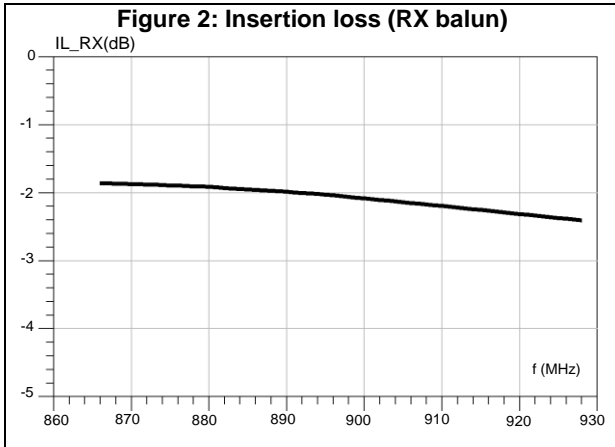
**Table 2: Electrical characteristics and RF performance (T<sub>amb</sub> = 25 °C) RX balun**

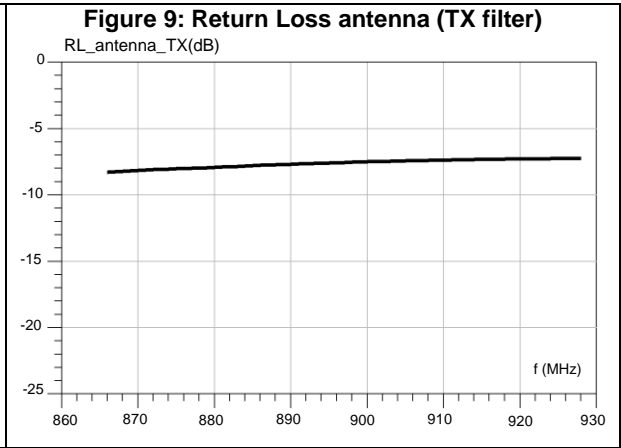
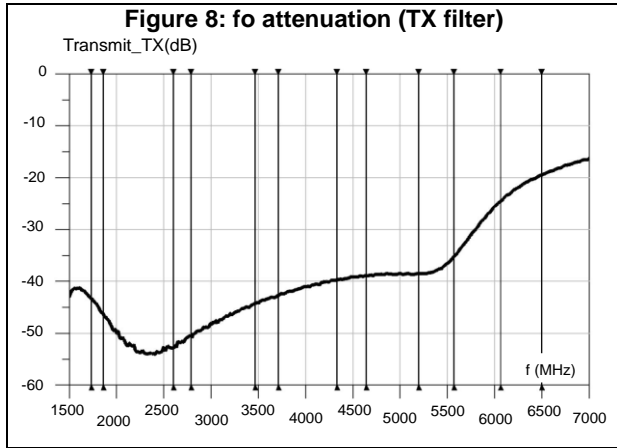
| Symbol                | Parameter                      | Test condition | Value |                 |      | Unit |
|-----------------------|--------------------------------|----------------|-------|-----------------|------|------|
|                       |                                |                | Min.  | Typ.            | Max. |      |
| Z <sub>RX</sub>       | Nominal differential impedance |                |       | Match to CC112X |      | Ω    |
| Z <sub>ANT</sub>      | Antenna impedance              |                |       | 50              |      | Ω    |
| f                     | Frequency range (bandwidth)    |                | 866   |                 | 928  | MHz  |
| S <sub>21RX-ANT</sub> | Insertion loss in bandwidth    | at 868 MHz     | -2.3  | -1.9            |      | dB   |
|                       |                                | at 928 MHz     | -2.8  | -2.4            |      |      |
| S <sub>11ANT</sub>    | Input return loss in bandwidth | at 868 MHz     |       | -22             | -20  | dB   |
|                       |                                | at 928 MHz     |       | -11             | -9   |      |
| Phase_imbal           | Output phase imbalance         |                | -10   | -2.9            | 10   | °    |
| Ampl_imbal            | Output amplitude imbalance     |                | -1    | -0.3            | 1    | dB   |

Table 3: Electrical characteristics and RF performance ( $T_{amb} = 25\text{ °C}$ ) TX filter

| Symbol            | Parameter                      | Test condition      | Value |                 |      | Unit     |
|-------------------|--------------------------------|---------------------|-------|-----------------|------|----------|
|                   |                                |                     | Min.  | Typ.            | Max. |          |
| $Z_{TX}$          | Nominal TX impedance           |                     |       | Match to CC112X |      | $\Omega$ |
| $Z_{ANT}$         | Antenna impedance              |                     |       | 50              |      | $\Omega$ |
| f                 | Frequency range (bandwidth)    |                     | 866   |                 | 928  | MHz      |
| $S_{21_{TX-ANT}}$ | Insertion loss in bandwidth    | at 868 MHz          | -2.3  | -1.9            |      | dB       |
|                   |                                | at 928 MHz          | -2.7  | -2.3            |      |          |
| $S_{11_{ANT}}$    | Input return loss in bandwidth | at 868 MHz          |       | -8              | -6   | dB       |
|                   |                                | at 928 MHz          |       | -7              | -5   |          |
| Att               | Harmonic levels                | Attenuation at 2 fo |       | -43             | -41  | dBm      |
|                   |                                | Attenuation at 3 fo |       | -50             | -46  |          |
|                   |                                | Attenuation at 4 fo |       | -43             | -40  |          |
|                   |                                | Attenuation at 5 fo |       | -39             | -37  |          |
|                   |                                | Attenuation at 6 fo |       | -35             | -33  |          |
|                   |                                | Attenuation at 7 fo |       | -19             | -17  |          |

### 1.1 RF measurement





## 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 Flip-Chip CSPG 0.4 package information

Figure 10: Flip-Chip CSPG 0.4 package outline

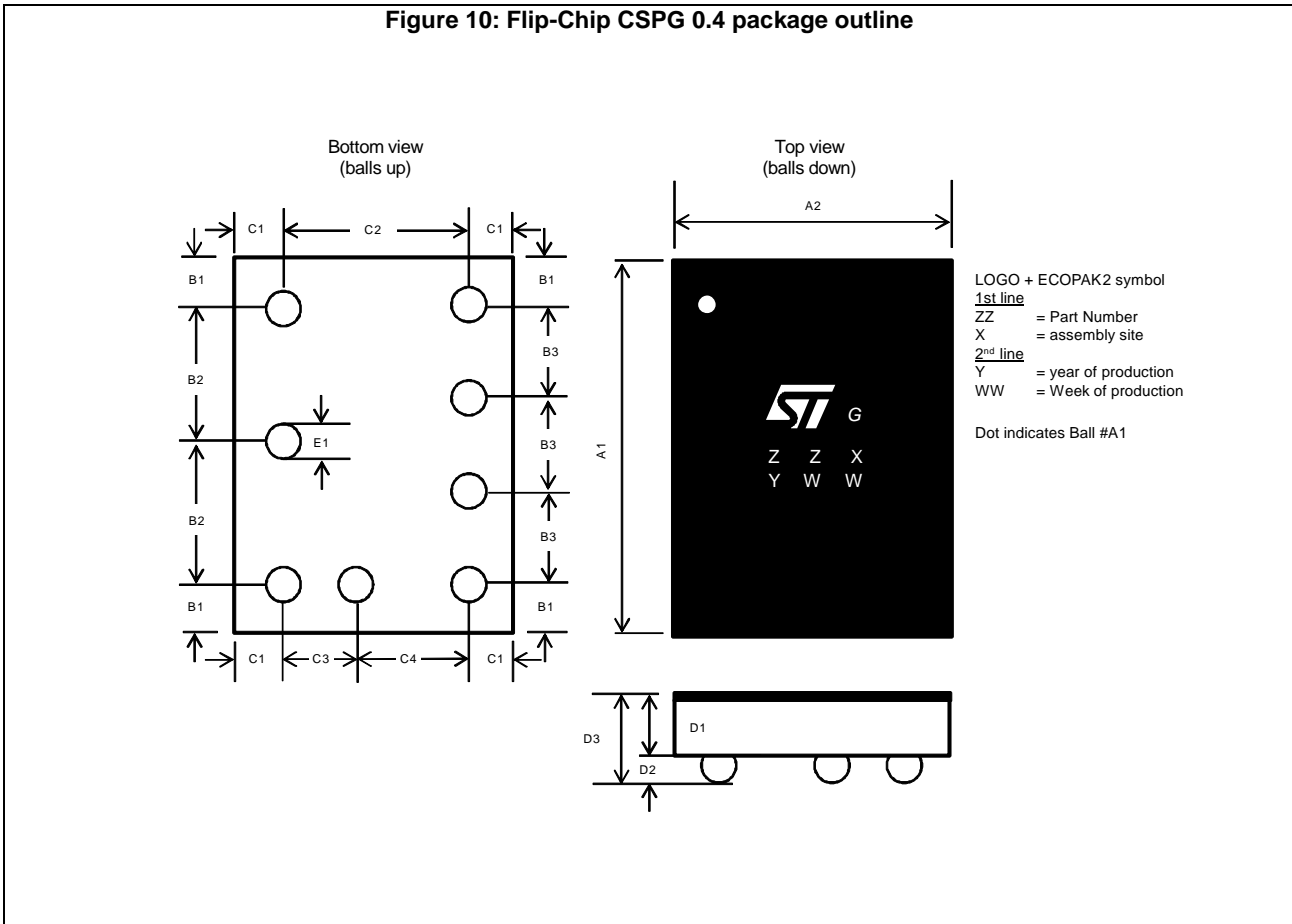


Table 4: Flip-Chip CSPG 0.4 mechanical data

| Dimensions    | Frequency | A1   | A2   | B1  | B2  | B3  | C1  | C2   | C3  | C4  | D1  | D2  | D3  | E1  |
|---------------|-----------|------|------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|
| BAL-112X-01D3 | 868 MHz   | 1950 | 1450 | 225 | 750 | 500 | 223 | 1004 | 400 | 604 | 425 | 205 | 630 | 255 |

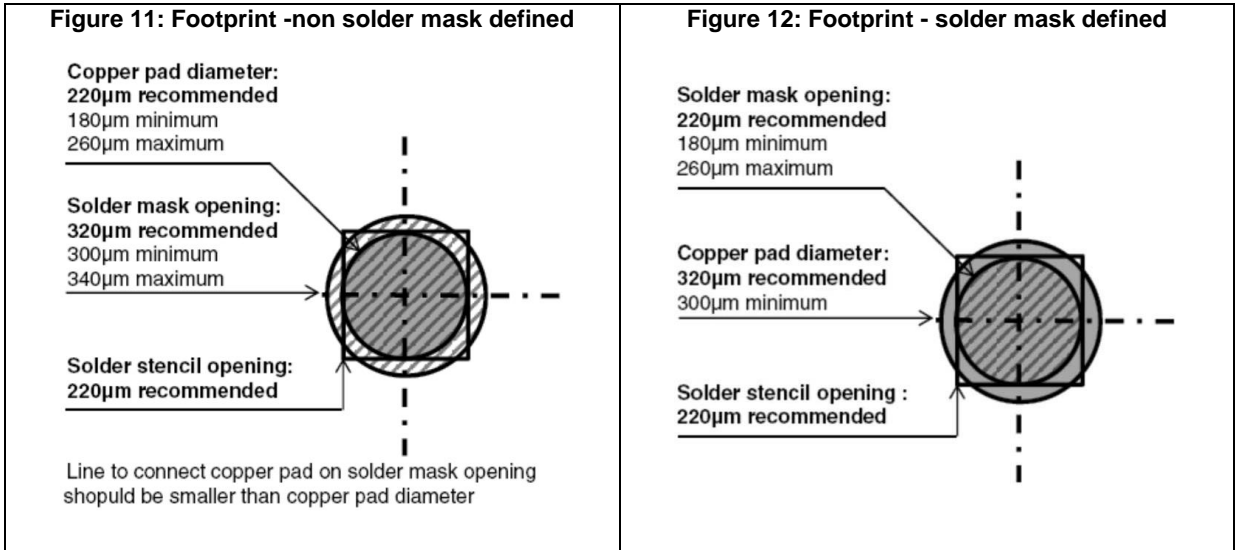


Figure 13: Ball assignment

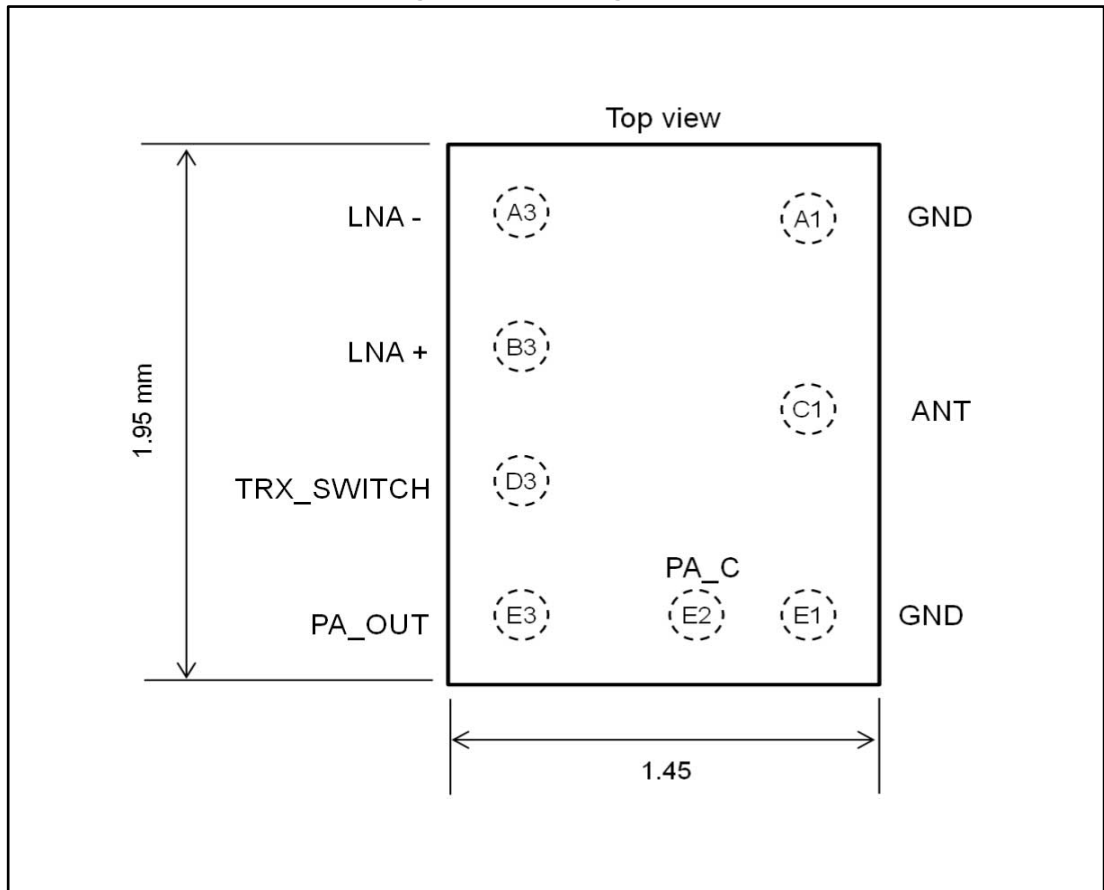
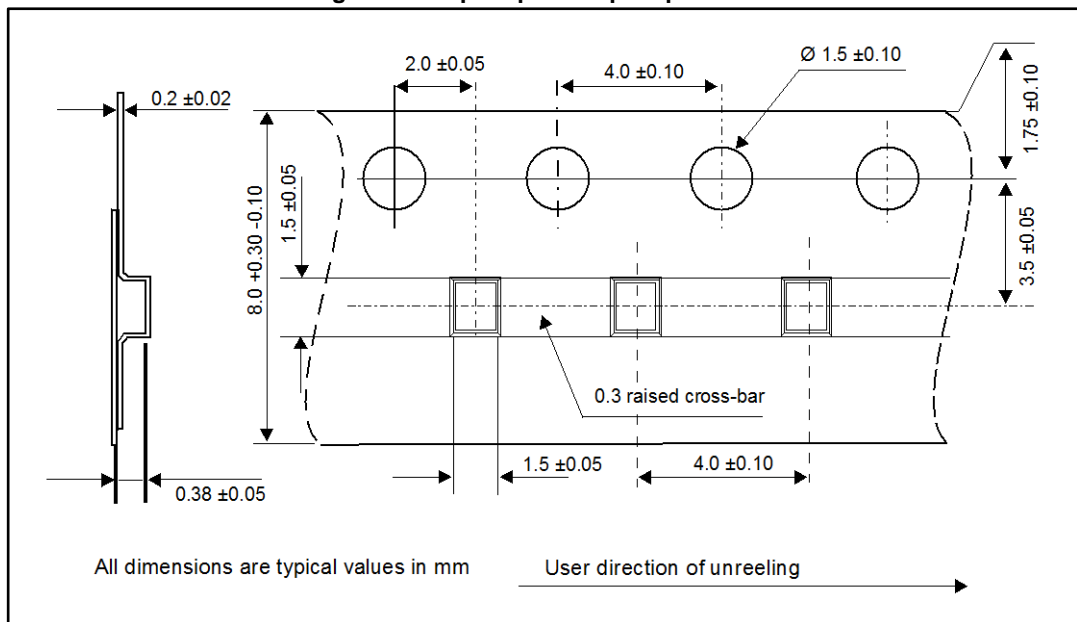


Table 5: Flip-Chip CSPG 0.4 ball description

| Ball | Name   | Designation                   |
|------|--------|-------------------------------|
| A1   | GND    | Ground                        |
| A3   | LNA-   | Connect to LNA_N              |
| B3   | LNA+   | Connect to LNA_P              |
| C1   | ANT    | Connect to antenna            |
| D3   | TRX_SW | Connect to TRX switch         |
| E1   | GND    | Ground                        |
| E2   | PA_C   | Connect to PA output thru C10 |
| E3   | PA_OUT | Connect to PA                 |

## 2.2 Flip-chip 8 bumps packing information

Figure 14: Flip-chip 8 bumps tape outline





### 3 Ordering information

Table 6: Ordering information

| Order code     | Marking | Package | Weight  | Base qty. | Delivery mode |
|----------------|---------|---------|---------|-----------|---------------|
| BALF-112X-01D3 | TF      | CSPG    | 3.02 mg | 5000      | Tape and reel |

### 4 Revision history

Table 7: Document revision history

| Date        | Revision | Changes             |
|-------------|----------|---------------------|
| 04-Jul-2016 | 1        | First issue.        |
| 20-Feb-2017 | 2        | Updated Front page. |

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