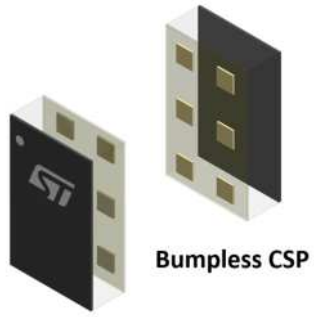
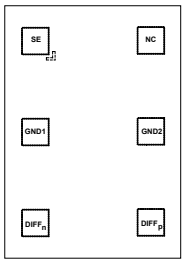
# BAL-UWB-01E3

Datasheet

## 50 Ω to 100 Ω balun for UWB 3 GHz to 8 GHz




Top view (pads down)

| Product status link |
| --- |
| BAL-UWB-01E3 |

## Features

- Very low profile
- High RF performance
- PCB space saving
- Efficient manufacturability
- LGA footprint compatible
- Low thickness ≤ 450 µm
- High RF performance
- PCB space saving

## Applications

- High value asset tracking
- People tracking / gate
- Secure entry / transaction
- Vehicle keyless entry
- Healthcare

## Description

The BAL-UWB-01E3 is an ultra-miniature balun that integrates matching network, dedicated to ultra-wide band 3 GHz to 8 GHz.

This device uses STMicroelectronics IPD technology on non conductive glass substrate which optimizes RF performance.

# 1 Characteristics

**Table 1. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $P_{IN}$ | Input power $RF_{IN}$ | 10 | dBm |
| $V_{ESD}$ | ESD ratings human body model (JESD22-A114-C), all I/O one at a time while others connected to GND | 2000 | V |
| | ESD ratings machine model, all I/O | 200 | |
| $T_{OP}$ | Maximum operating temperature | -40 to +105 | °C |

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

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $Z_{DIFF}$ | Nominal differential output impedance | | 100 | | Ω |
| $Z_{SE}$ | Nominal input impedance | | 50 | | Ω |
| F | Frequency range (bandwidth) | 3 | | 8 | GHz |
| IL | Insertion loss differential mode $\lvert S_{ds21}\rvert$ | | 1.0 | 1.2 | dB |
| $RL_{SE}$ | Input return loss single ended side $\lvert S_{11}\rvert$ | 12 | 18 | | dB |
| $RL_{DIFF}$ | Balanced return loss $\lvert S_{dd22}\rvert$ | 13 | 16 | | dB |
| φimb | Phase imbalance | -25 | | 25 | ° |
| Aimb | Amplitude imbalance | -2.5 | | 2.5 | dB |

## 1.1 RF simulation (Tamb = 25 °C)

Figure 1. **Insertion loss (dB)**

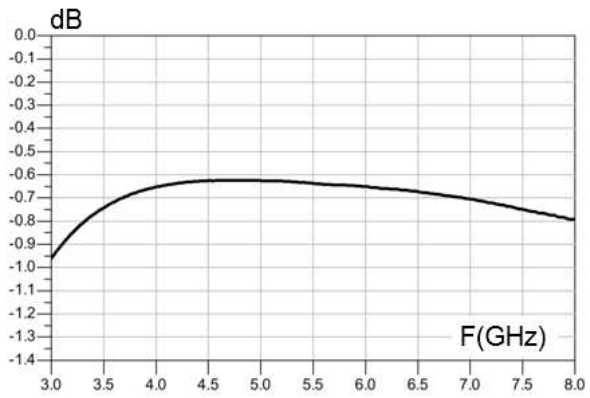



Figure 2. **SE return loss (dB)**

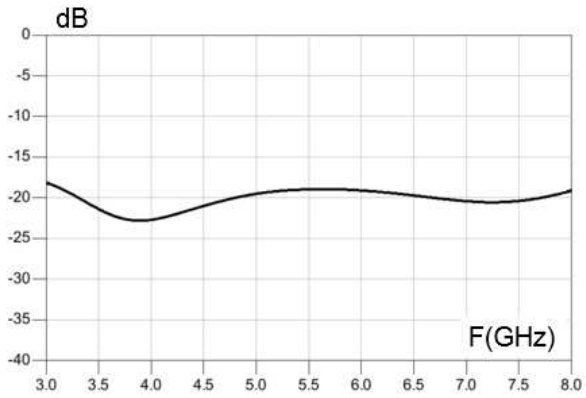



Figure 3. **Amplitude imbalance (dB)**

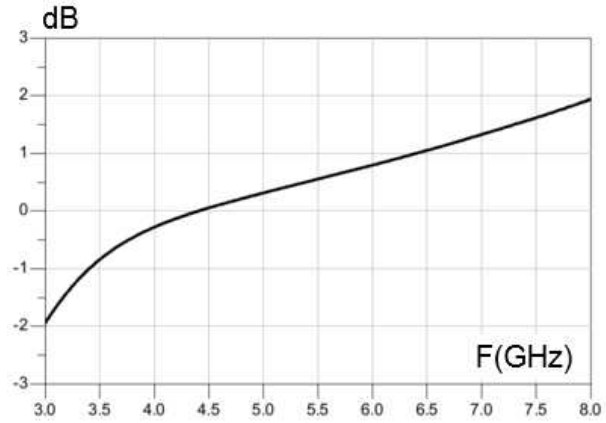



Figure 4. **Phase balance (°)**

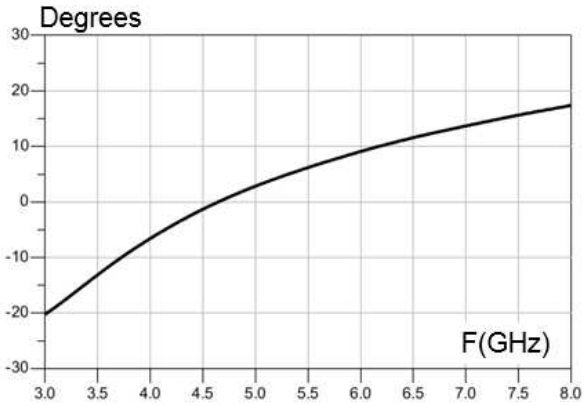
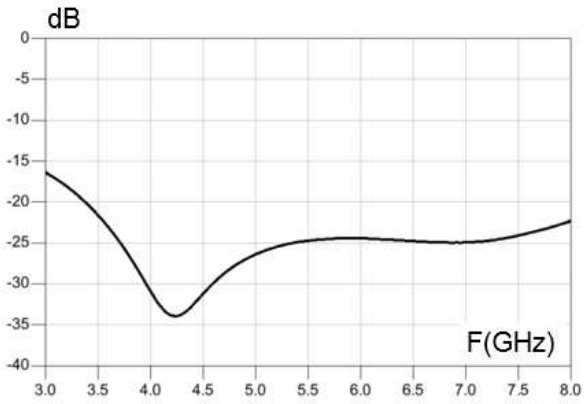
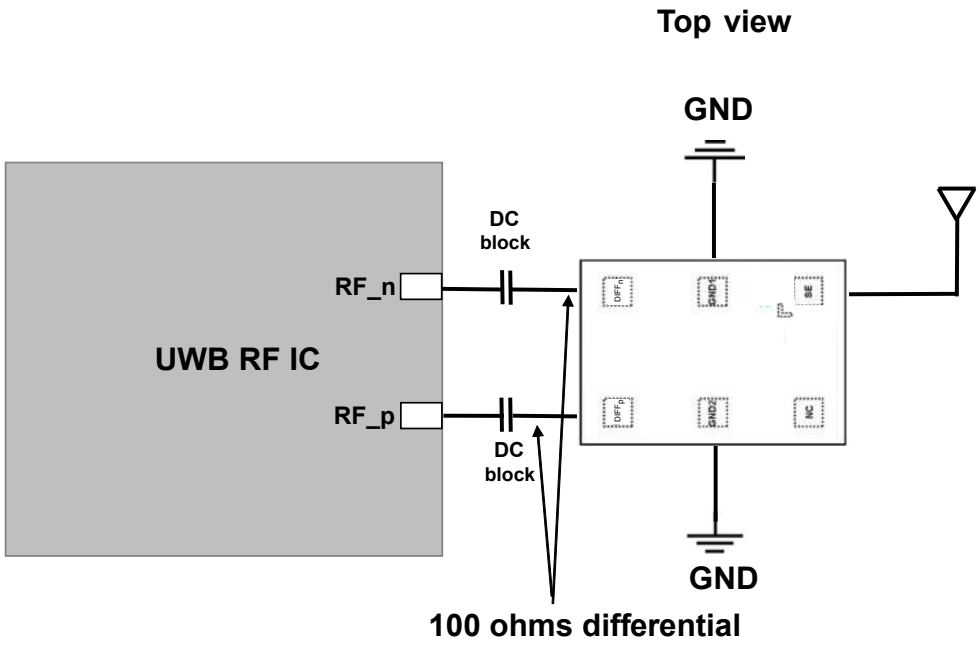



Figure 5. **Balanced return loss (dB)**



# 2 Application information

Figure 6. **Application schematic**



# 3 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. ECOPACK is an ST trademark.

## 3.1 Bumpless CSP package information

**Figure 7. Bumpless CSP package outline**

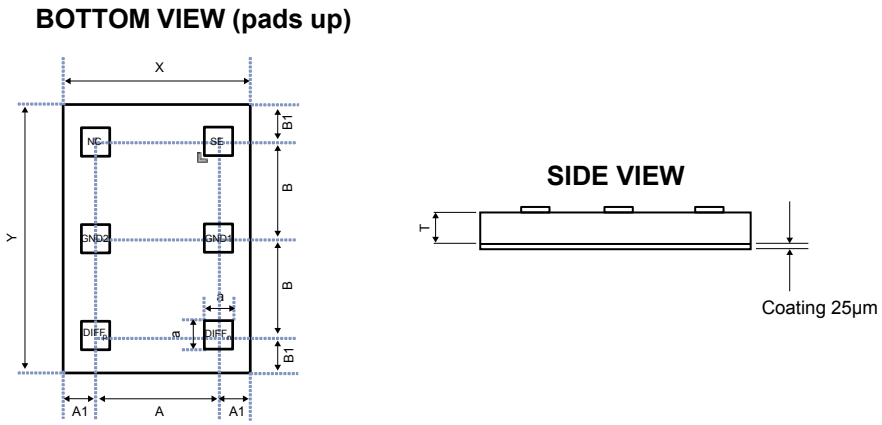



**Table 3. Bumpless CSP package mechanical data**

| Parameter | Description | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| X | X dimension of the die | 1225 | 1250 | 1275 | µm |
| Y | Y dimension of the die | 1775 | 1800 | 1825 | µm |
| A | X pitch | | 824 | | µm |
| B | Y pitch | | 650 | | µm |
| A1 | Distance from bump to edge of die on X axis | | 213 | | µm |
| B1 | Distance from pad to edge of die on Y axis | | 250 | | µm |
| a | Pad dimension | | 200 | | µm |
| T | Substrate thickness | 375 | 400 | 425 | µm |

**Figure 8. Marking**

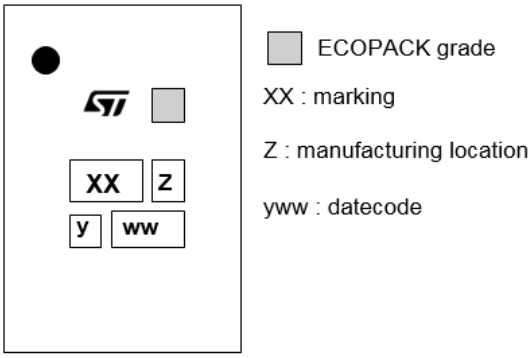
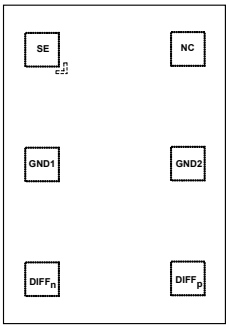



**Figure 9. Top view**

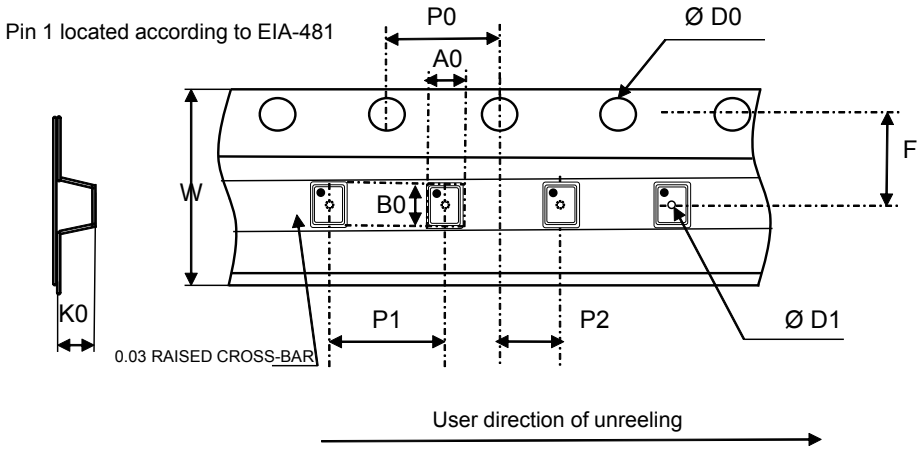



Top view (pads down)

More packing information is available in the application note:

- AN2348 Flip-Chip: “Package description and recommendations for use

**Figure 10. Tape and reel outline**




Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

**Table 4. Tape and reel mechanical data**

| Ref | Dimensions | | |
|---|---|---|---|
| | Millimeters | | |
| | Min | Typ | Max |
| A0 | 1.29 | 1.34 | 1.39 |
| B0 | 1.84 | 1.89 | 1.94 |
| K0 | 0.44 | 0.49 | 0.54 |
| P1 | 3.9 | 4.0 | 4.1 |
| P0 | 3.9 | 4.0 | 4.1 |
| Ø D0 | 1.4 | 1.5 | 1.6 |
| Ø D1 | 0.35 | 0.40 | 0.45 |
| F | 3.45 | 3.50 | 3.55 |
| P2 | 1.95 | 2.00 | 2.05 |
| W | 7.9 | 8.0 | 8.3 |

**Table 5. Pin description**

| Pad ref | Pad name | Description |
|---|---|---|
| A1 | SE | Single Ended antenna |
| A2 | GND1 | Ground |
| B2 | GND2 | Ground |
| B1 | NC | Non connected |
| A3 | $DIFF_n$ | Balun differential negative |
| B3 | $DIFF_p$ | Balun differential positive |

**Figure 11. Stencil opening recommendation**

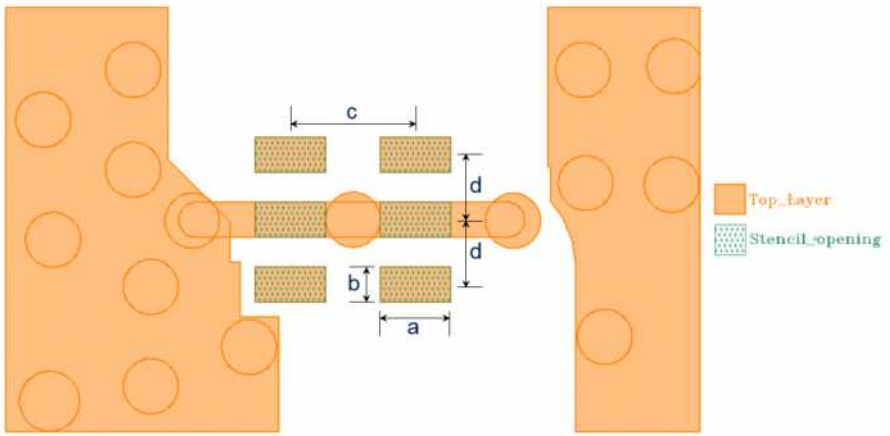



**Table 6. Stencil opening dimensions**

| Parameter | Dimension | Unit |
|---|---|---|
| a | 700 | µm |

| Parameter | Dimension | Unit |
|---|---|---|
| b | 350 | µm |
| c | 1250 | |
| d | 650 | |

# 4 Recommendation on PCB assembly

## 4.1 Land pattern recommendation

Figure 12. **Land pattern recommendations**

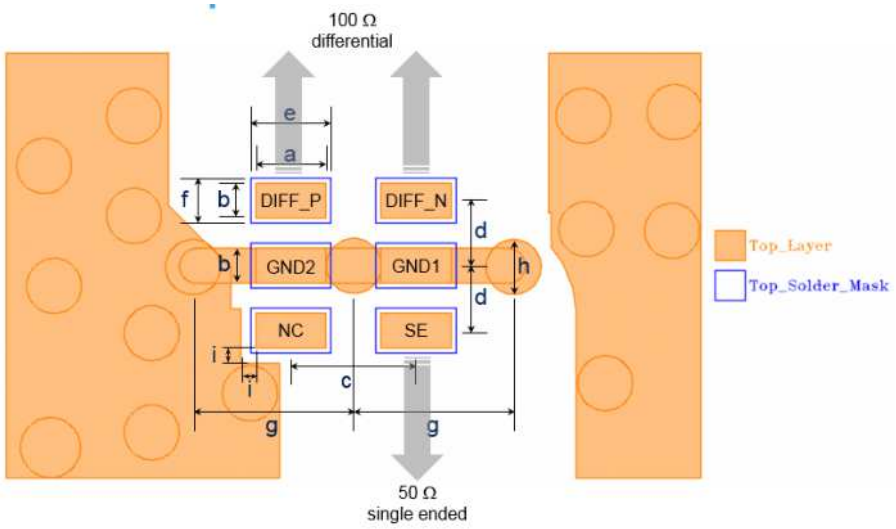
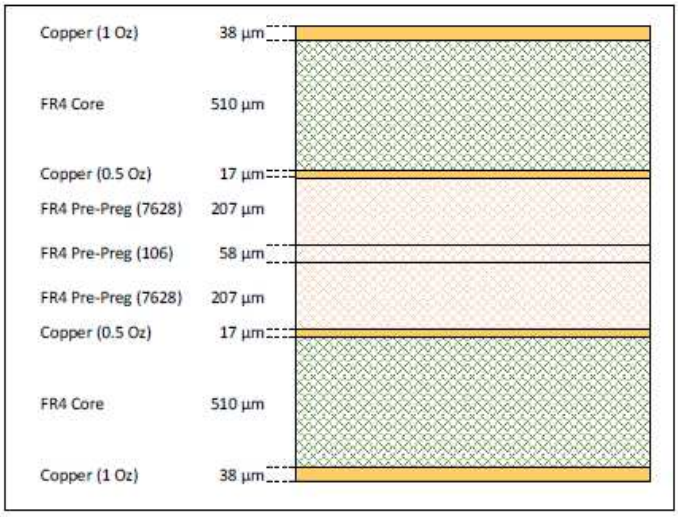



Table 7. **Land pattern dimensions**

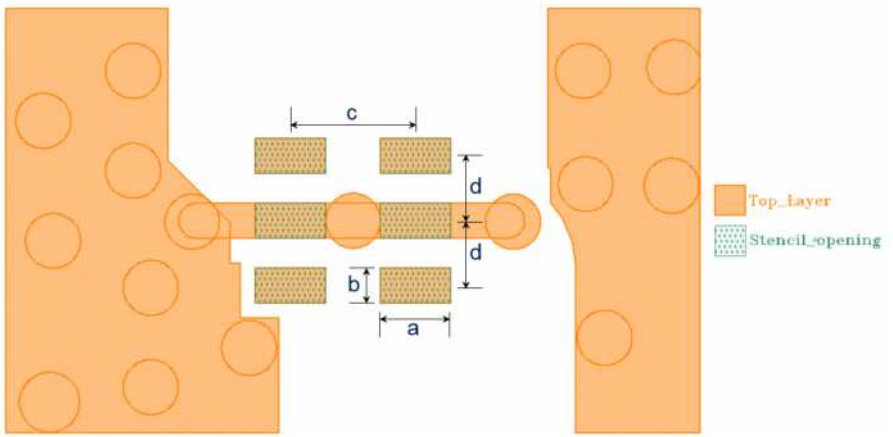
| Parameter | Dimension | Unit |
|---|---|---|
| a | 700 | µm |
| b | 350 | |
| c | 1250 | |
| d | 650 | |
| e | 800 | |
| f | 450 | |
| g | 1600 | |
| h | 550 | |
| i | 150 | |

Figure 13. **PCB stack-up recommendations**




## 4.2 Stencil opening design

Figure 14. **Stencil opening recommendations**




*Note: Dimensions are displayed in Table 6. Stencil opening dimensions.*

## 4.3 Solder paste

1. 100 µm solder stencil thickness is recommended to be drunk
2. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
3. “No clean” solder paste is recommended.
4. Offers a high tack force to resist component movement during PCB movement.
5. Solder paste with fine particles: powder particle size is 20-45 µm.

## 4.4 Placement

1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
3. Standard tolerance of ±0.05 mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
5. To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
6. For assembly, a perfect supporting of the PCB (all the more on flexible PCB) is recommended during solder paste printing, pick and place and reflow soldering by using optimized tools.

# 5 Ordering information

Figure 15. **Ordering information scheme**

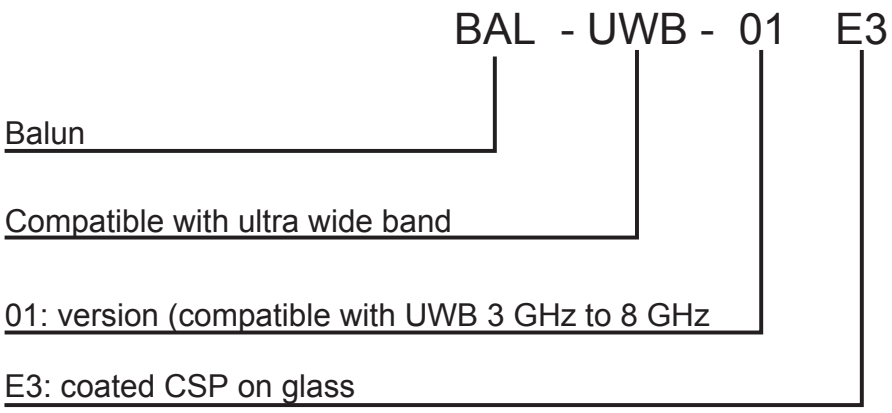



Table 8. **Ordering information**

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|---|---|---|---|---|---|
| BAL-UWB-01E3 | TR | Bumpless CSP | 2.16 mg | 5000 | Tape and reel (7") |

## Revision history

Table 9. **Document revision history**

| Date | Version | Changes |
|---|---|---|
| 04-Apr-2019 | 1 | Initial release. |
| 18-Dec-2020 | 2 | Updated Table 2. |

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