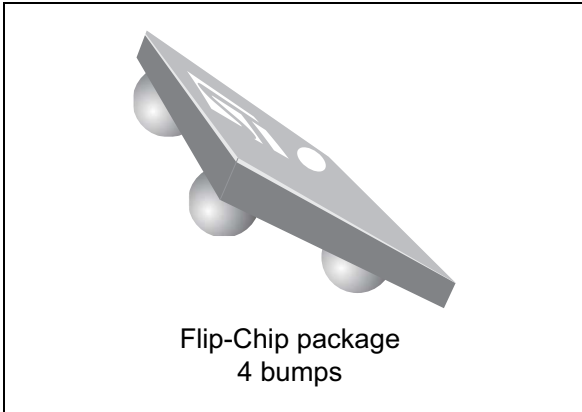


50 ohm, conjugate match to CC2541
transformer balun

Datasheet – production data



Description

STMicroelectronics BAL-CC25-02D3 is an ultra miniature balun which integrates a matching network in a monolithic glass substrate. This has been customized for the CC2541 RF transceivers.

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

Features

- 2.45 GHz balun with integrated matching network
- Matching optimized for following CC2541
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated Flip-Chip on glass
- Small footprint: < 0.88 mm²

Benefits

- Very low profile
- High RF performance
- PCB space saving versus discrete solution
- BOM count reduction
- Efficient manufacturability

Figure 1. Pin configuration (top view)

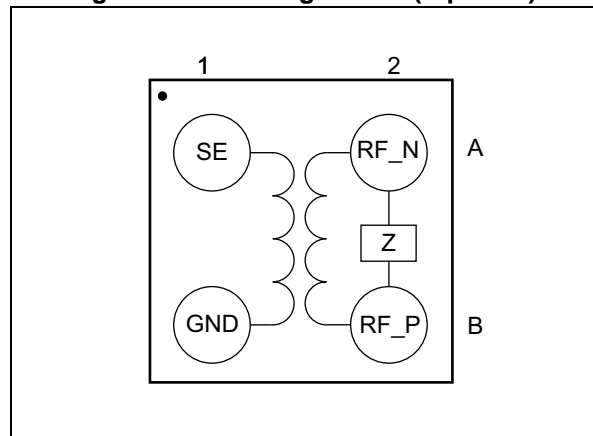
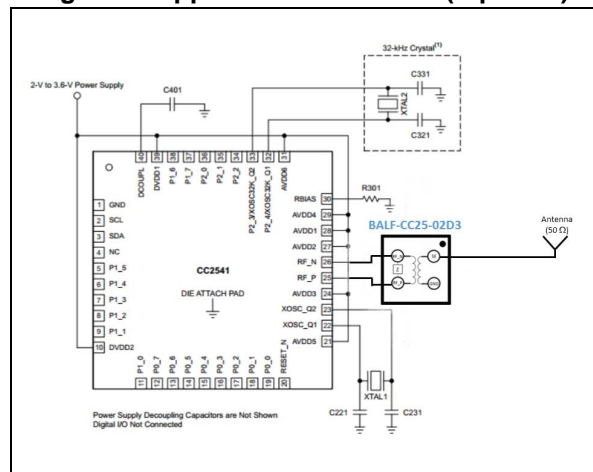


Figure 2. Application schematic (top view)



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 MIL STD883C (HBM: C = 100 pF, R = 1.5 Ω , air discharge)	2000	V
	ESD ratings machine model (MM: C = 200 pF, R = 25 Ω , L = 500 nH)	500	
	ESD ratings charged device model (CDM, JESD22-C101D)	500	
T_{OP}	Operating temperature	-40 to + 105	$^{\circ}C$

Table 2. Electrical characteristics - RF performance ($T_{amb} = 25^{\circ}C$)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{OUT}	Nominal differential output impedance	Conjugate match to CC2541			Ω
Z_{IN}	Nominal input impedance		50		
F	Frequency range (bandwidth)	2379		2507	
I_L	Insertion loss in bandwidth		1.6	1.8	dB
R_{L_SE}	Single ended return loss in bandwidth	9	10		dB
R_{L_DIFF}	Differential ended return loss in bandwidth	9	17		dB
Φ_{imb}	Phase imbalance		7		$^{\circ}$
A_{imb}	Amplitude imbalance		0.6		dB

Figure 3. Balun transmission ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

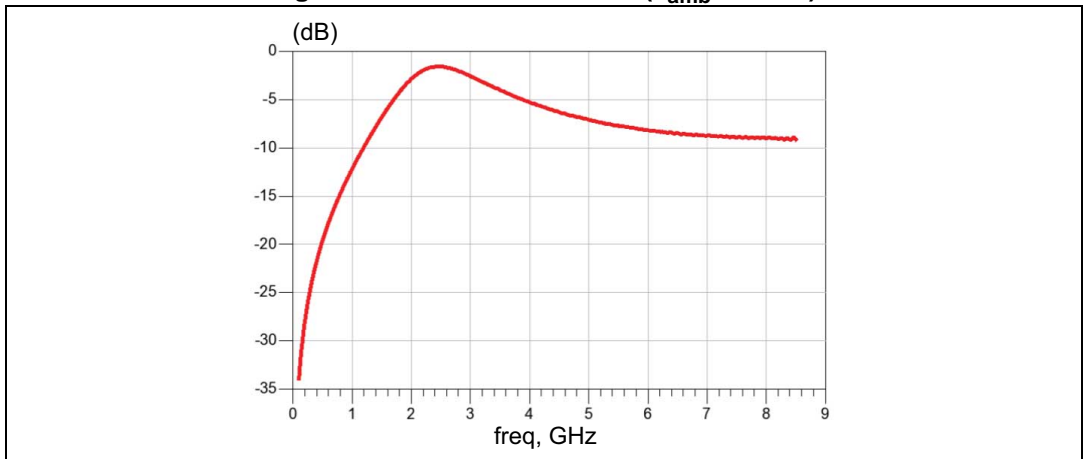


Figure 4. Insertion loss ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

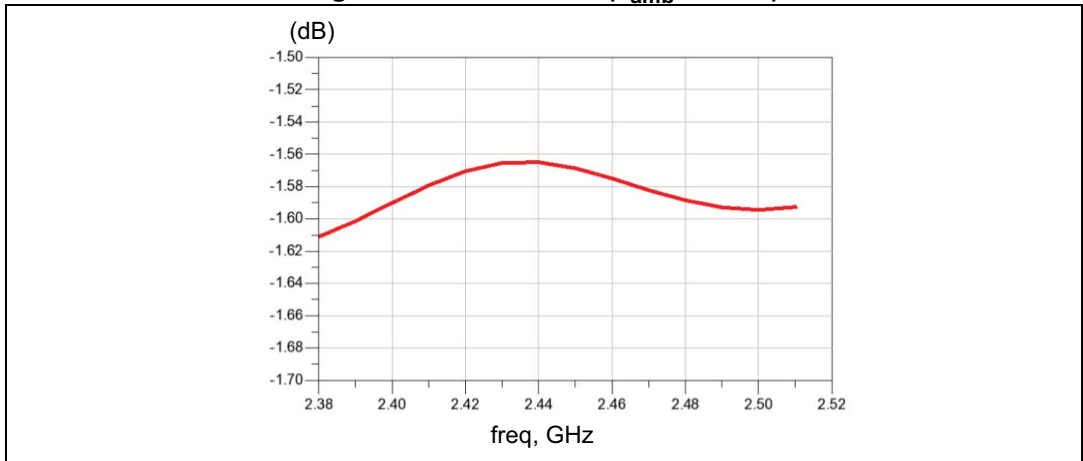


Figure 5. Return loss on SE port ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

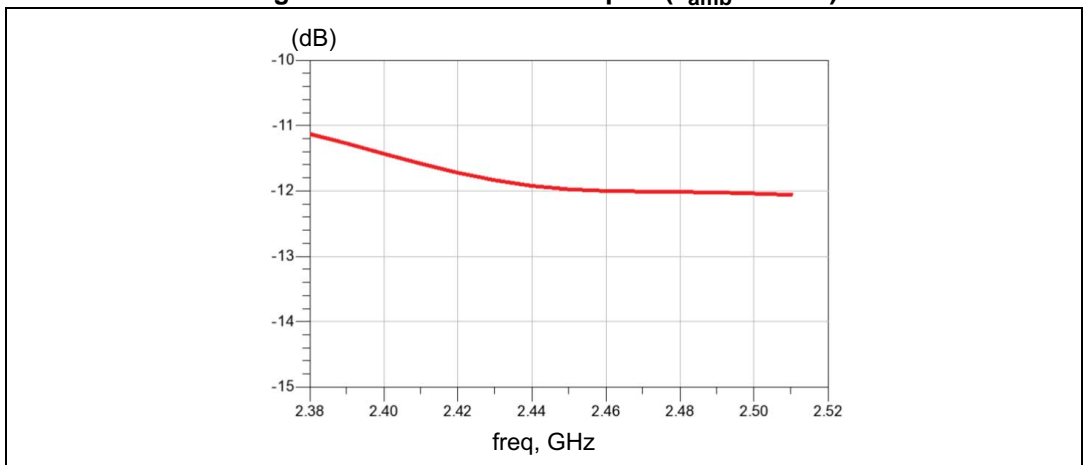


Figure 6. Return loss on DIFF port ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

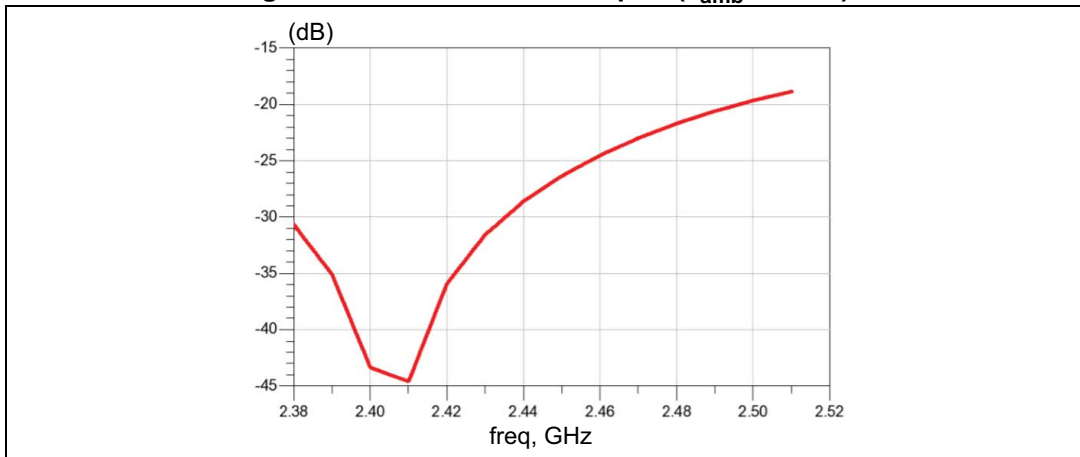


Figure 7. Amplitude imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

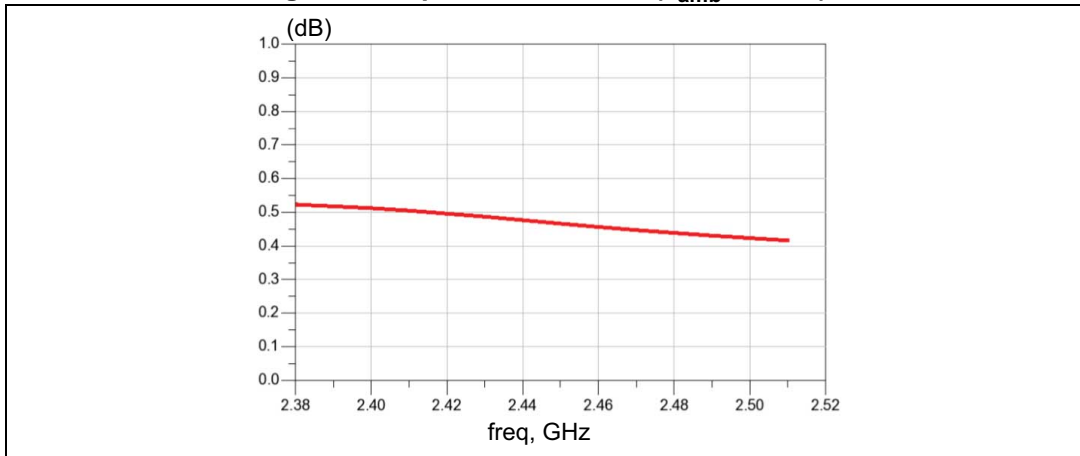
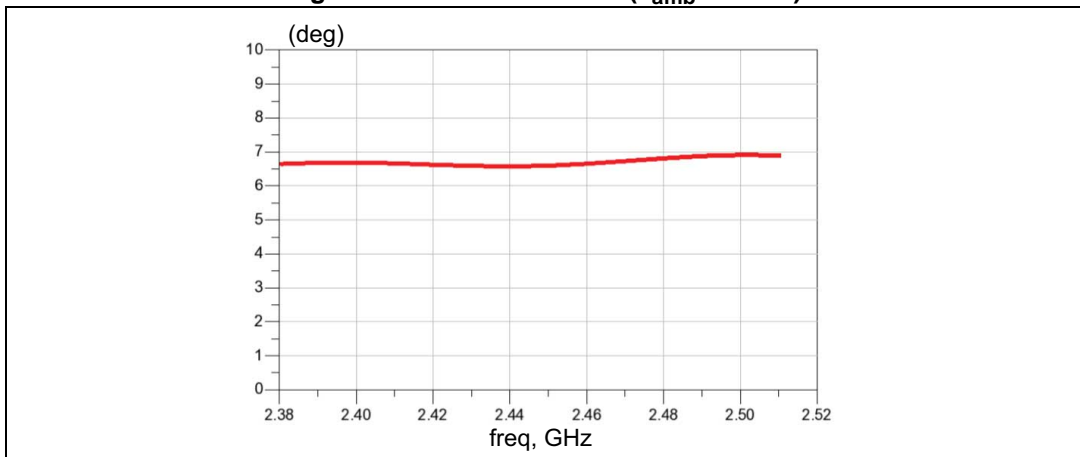


Figure 8. Phase imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)



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 9. Flip-Chip package outline

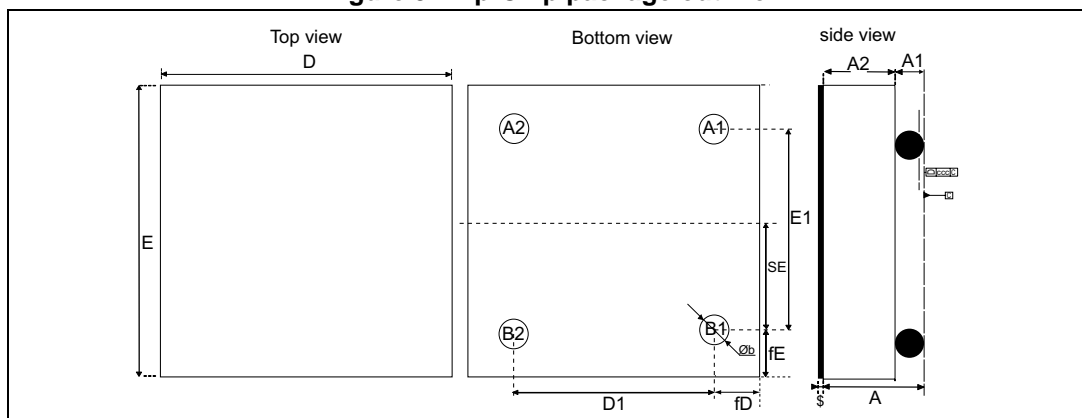


Table 3. Flip-Chip package mechanical data

Parameter	Description	Min.	Typ.	Max.	Unit
A	Bump height + substrate thickness	0.570	0.630	0.690	mm
A1	Bump height	0.155	0.205	0.255	mm
A2	Substrate thickness		0.400		mm
b	Bump diameter	0.215	0.255	0.295	mm
D	Y dimension of the die	0.890	0.940	0.990	mm
D1	Y pitch		0.500		mm
E	X dimension of the die	0.890	0.940	0.990	mm
E1	X pitch		0.500		mm
SE			0.250		mm
fD	Distance from bump to edge of die on Y axis		0.220		mm
fE	Distance from bump to edge of die on X axis		0.220		mm
ccc				0.05	mm
\$			0.025		mm

Figure 10. Footprint

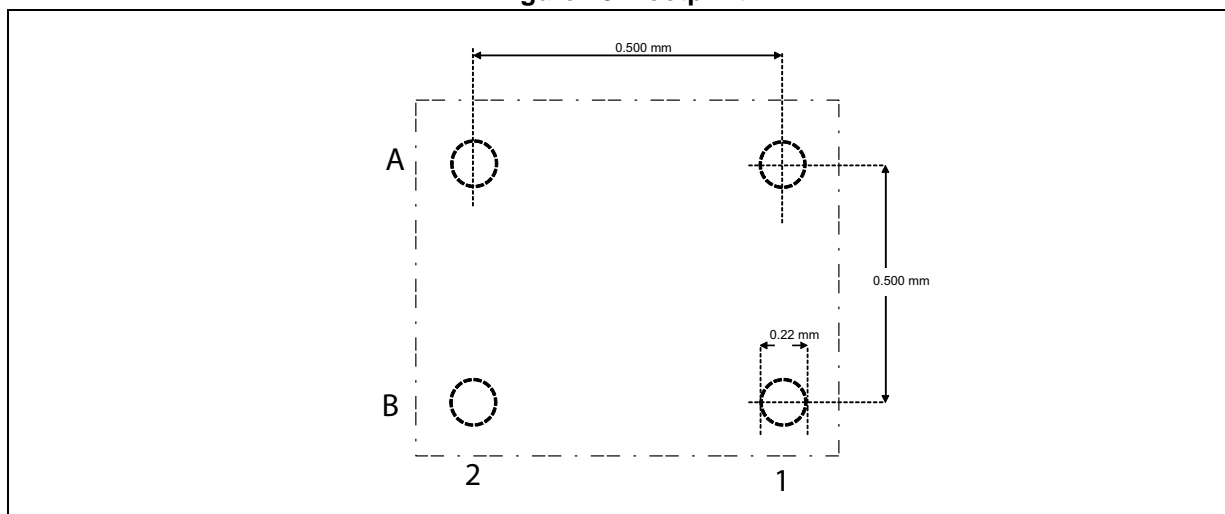


Figure 11. Bump coordinates (top view)

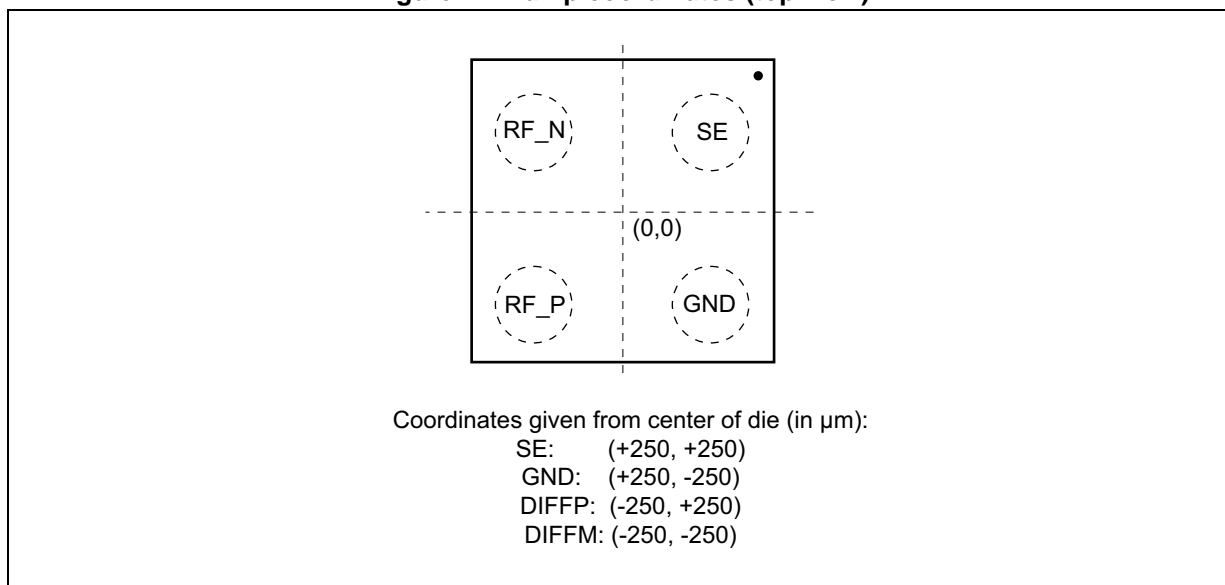


Figure 12. Footprint - 3 mils stencil - non solder mask defined

Copper pad diameter:
220 μm recommended
180 μm minimum
260 μm maximum

Solder mask opening:
320 μm recommended
300 μm minimum
340 μm maximum

Solder stencil opening:
220 μm recommended

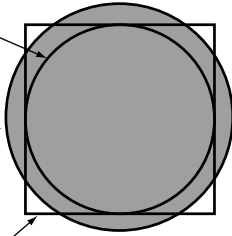


Figure 13. Footprint - 3 mils stencil - solder mask defined

Solder mask opening:
220 μm recommended
180 μm minimum
260 μm maximum

Copper pad diameter:
320 μm recommended
300 μm minimum

Solder stencil opening:
220 μm recommended

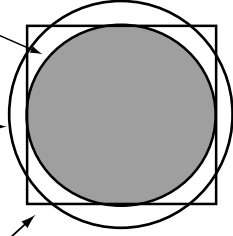


Figure 14. Footprint - 5 mils stencil - non solder mask defined

Copper pad diameter:
220 μm recommended
180 μm minimum
260 μm maximum

Solder mask opening:
320 μm recommended
300 μm minimum
340 μm maximum

Solder stencil opening:
330 μm recommended*

*depending on paste, it can go down to 270 μm

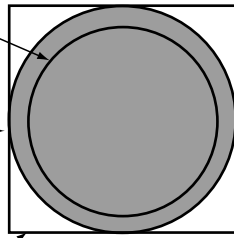


Figure 15. Footprint - 5 mils stencil - solder mask defined

Solder mask opening:
220 μm recommended
180 μm minimum
260 μm maximum

Copper pad diameter:
320 μm recommended
300 μm minimum

Solder stencil opening:
330 μm recommended*

*depending on paste, it can go down to 270 μm

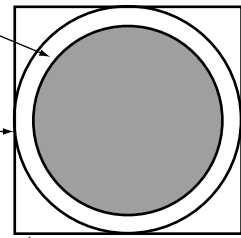


Figure 16. PCB layout recommendation

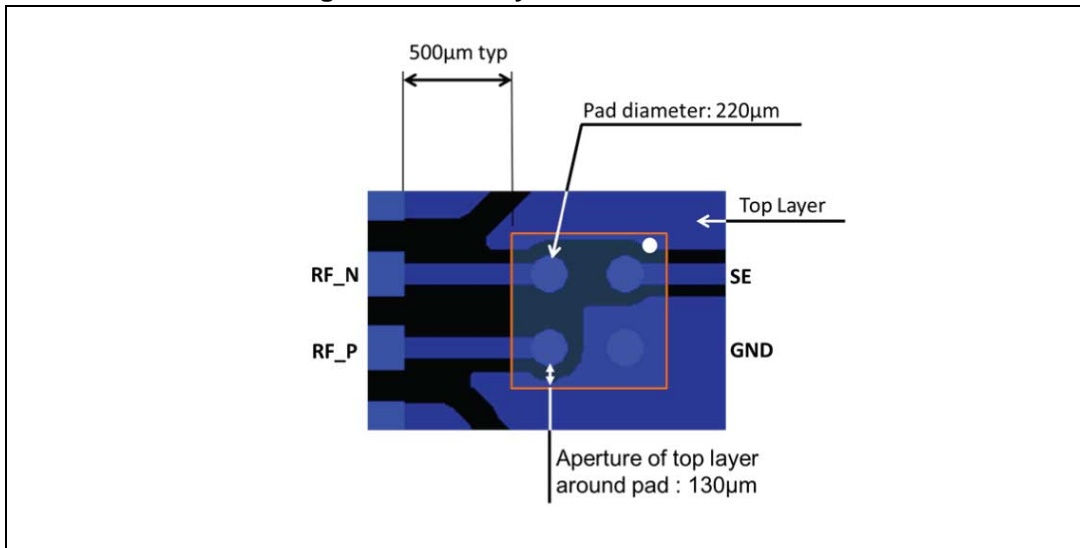
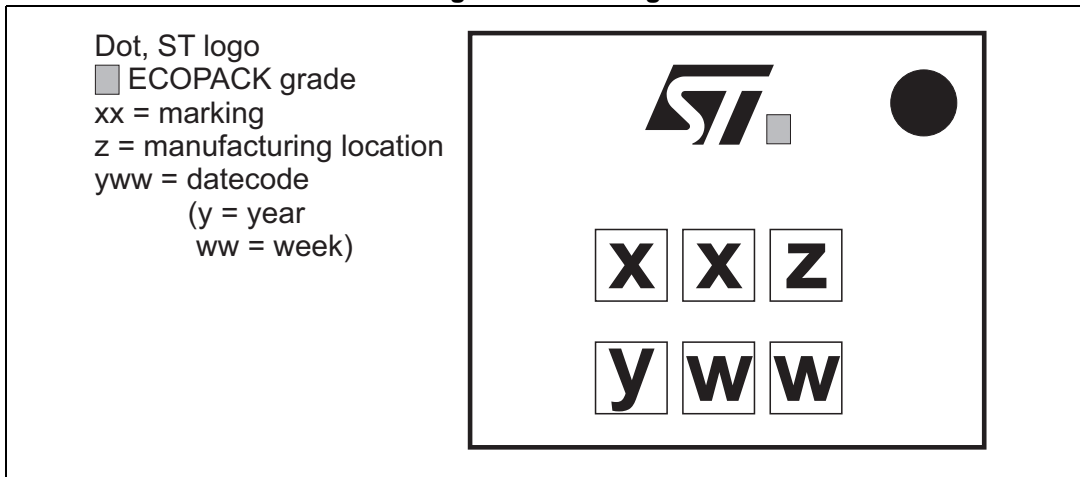
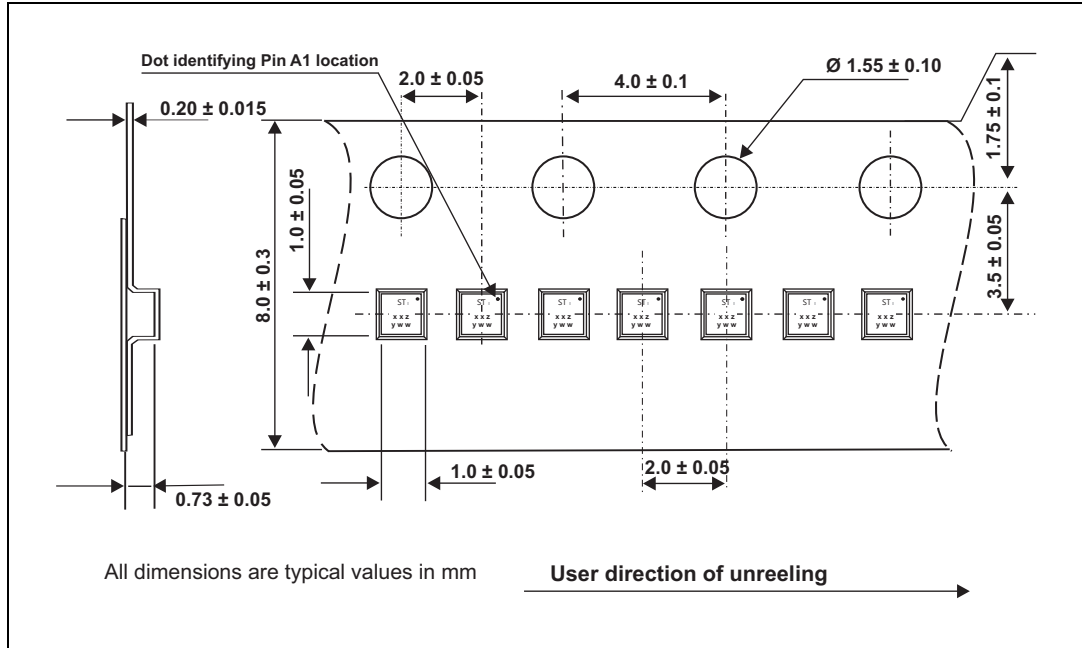


Figure 17. Marking



Note: More information is available in the STMicroelectronics Application note: AN2348 Flip-Chip: "Package description and recommendations for use"

Figure 18. Flip Chip tape and reel specifications



Note: More information is available in the 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-CC25-02D3	TE	Flip Chip	1.07 mg	5000	Tape and reel (7")

4 Revision history

Table 5. Document revision history

Date	Revision	Changes
17-Nov-2015	1	Initial release

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