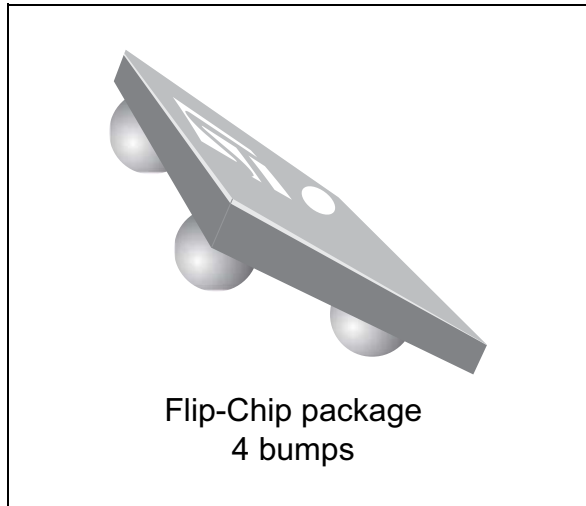




Description

The BAL-2690D3U is a balun designed to transform single ended signals to differential signals in Bluetooth applications.

The BAL-2690D3U has been customized for the STLC2690 Bluetooth transceiver with 0.8 dB insertion losses in the bandwidth (2400 MHz - 2500 MHz) and with a specific requirement for the SCC22 parameter.

The BAL-2690D3U has been designed using STMicroelectronics IPD (integrated passive device) technology on non conductive glass substrate to optimize RF performance.

Features

- 50 Ω nominal input / 30+j25 output differential impedance
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: BAL-2690D3U < 1 mm²

Benefits

- Very low profile (<700 μ m)
- High RF performances
- RF BOM and area reduction

Applications

Balun transformer for applications such as:

- Bluetooth STLC2690
- Mobile phone

Figure 1. Top view

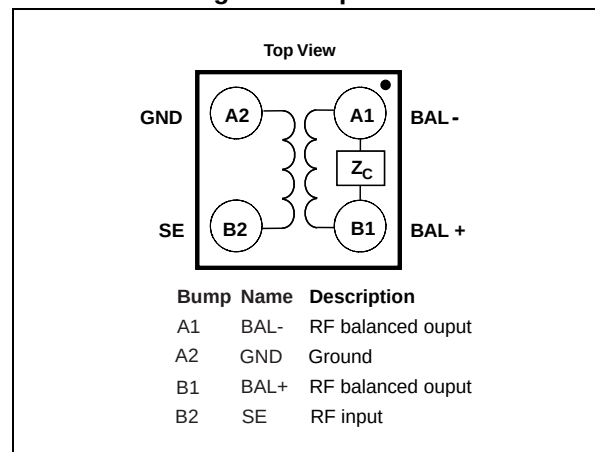
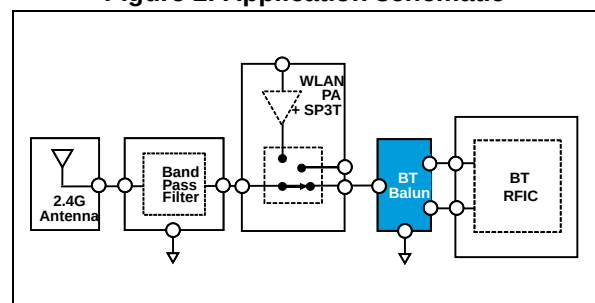


Figure 2. Application schematic



TM: IPAD is a trademark of STMicroelectronics

1 Characteristics

Table 1. Absolute maximum rating (limiting values)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P_{IN}	Input power RF_{IN}			20	dBm
V_{ESD}	ESD ratings MIL STD883G (HBM: C = 100 pF, R = 1.5 k 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 (JESD22-C101D)	500			
T_{OP}	Operating temperature	-40		+125	$^{\circ}\text{C}$

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

Symbol	Parameter		Value			Unit
			Min.	Typ.	Max.	
Z_{OUT}	Nominal differential output impedance			30 + j25		Ω
Z_{IN}	Nominal input impedance			50		
F	Frequency range (bandwidth)		2402	2441	2480	MHz
I_L	Insertion loss in bandwidth			0.8	1.1	dB
Ripple	Ripple in bandwidth				0.6	dB
R_L	Return loss in bandwidth		14			dB
Φ_{imb}	Phase imbalance		-10		10	$^{\circ}$
A_{imb}	Amplitude imbalance		-1		1	dB
R_{CMRR}	Common mode rejection ratio (SSC12)		20			dB
S_{CC22}	Magnitude for common mode harmonic rejection coefficient at 2fo	From 4804 MHz to 4960 MHz, 25 Ω is considered as reference for CM	0.7		1	dB
	Phase for common mode harmonic rejection coefficient at 2fo		-45		0	$^{\circ}$

1.1 Measurements

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

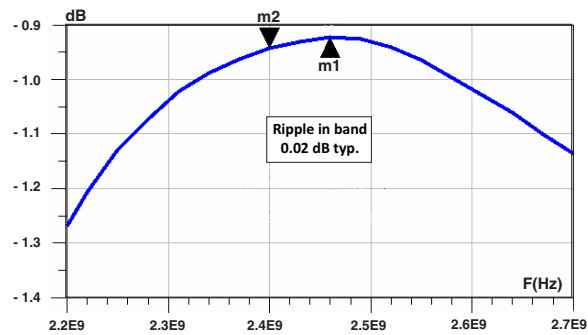


Figure 4. Return loss ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

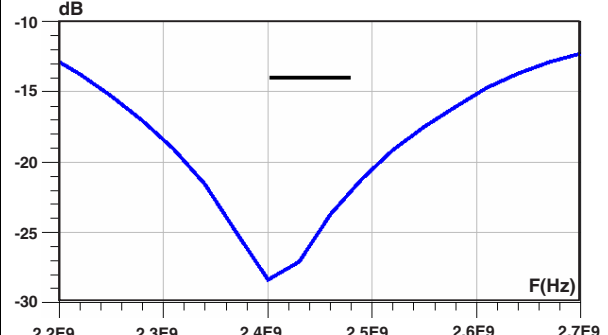


Figure 5. Amplitude imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

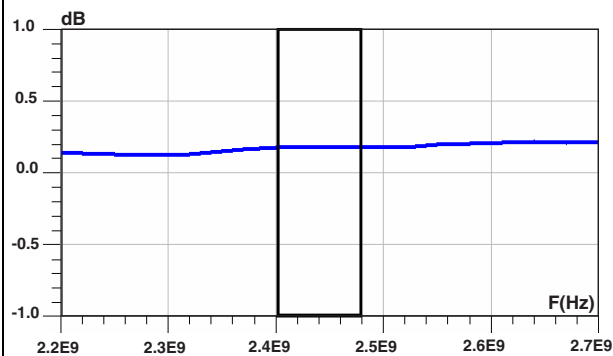


Figure 6. Phase imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

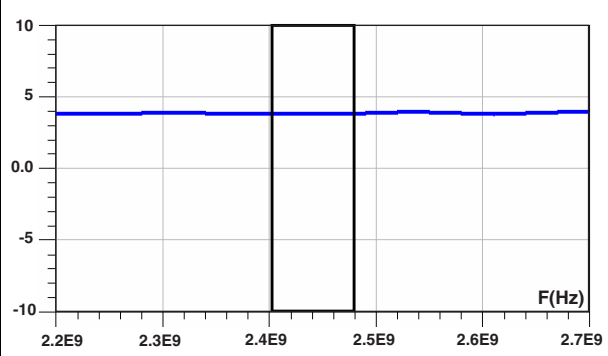


Figure 7. Scc22 magnitude at 2f0 ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

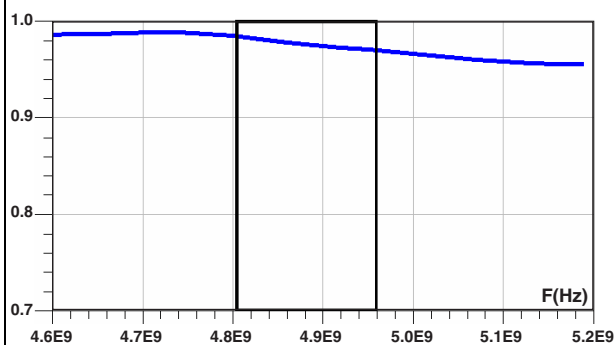
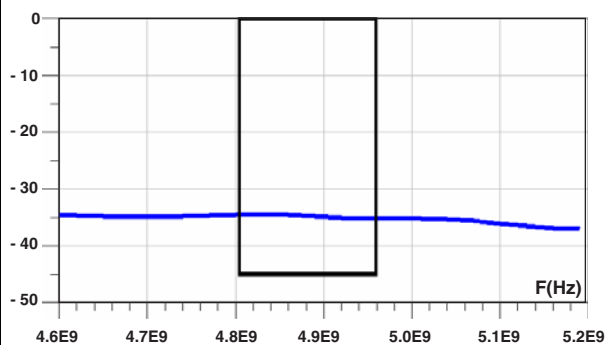


Figure 8. Scc22 phase 2f0 ($T_{amb} = 25\text{ }^{\circ}\text{C}$)



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

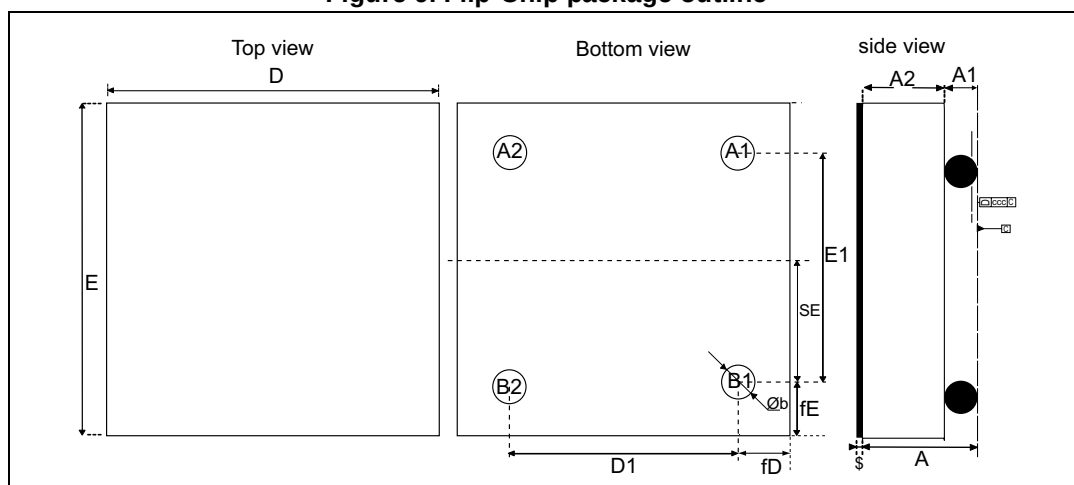


Table 3. Flip-Chip package mechanical data

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	0.860	0.910	0.960	mm
D1	Y pitch		0.474		mm
E	X dimension of the die	0.860	0.910	0.960	mm
E1	X pitch		0.474		mm
SE			0.237		mm
fD	Distance from bump to edge of die on Y axis		0.213		mm
fE	Distance from bump to edge of die on X axis		0.213		mm
ccc				0.05	mm
\$			0.025		mm

Figure 10. Footprint

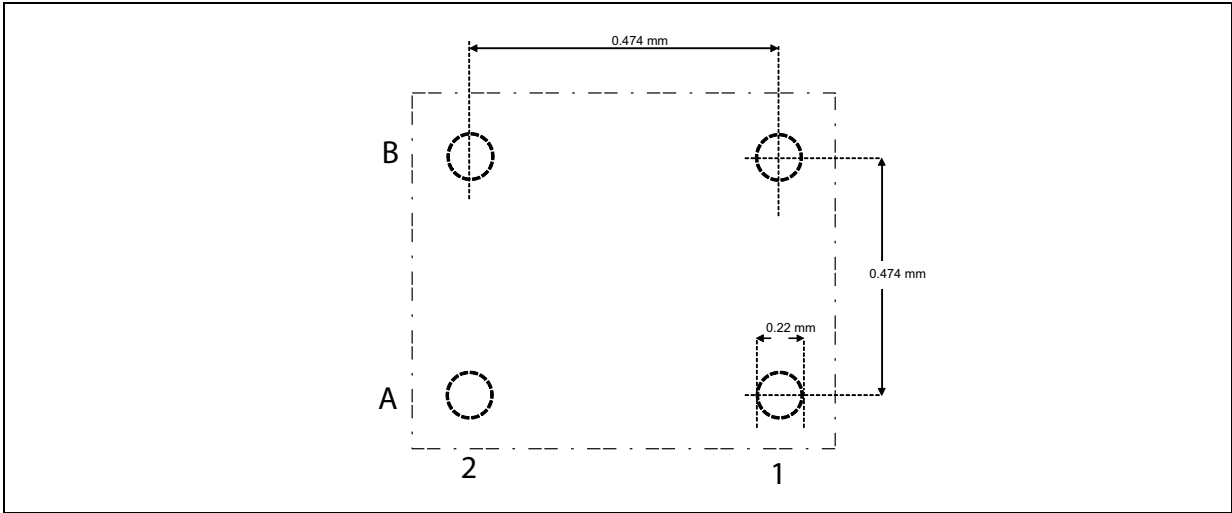


Figure 11. Footprint - 3 mils stencil - non solder mask defined

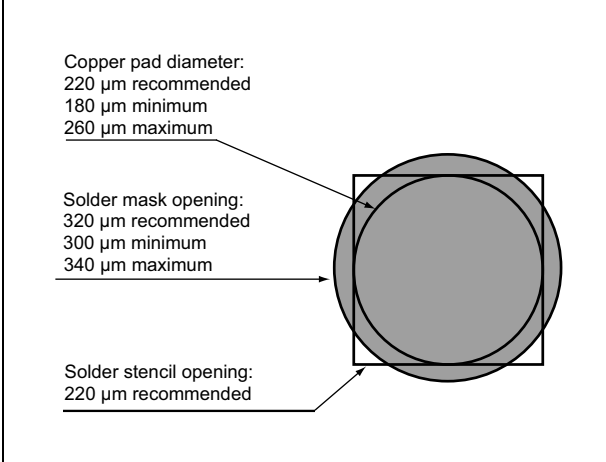


Figure 12. Footprint - 3 mils stencil - solder mask defined

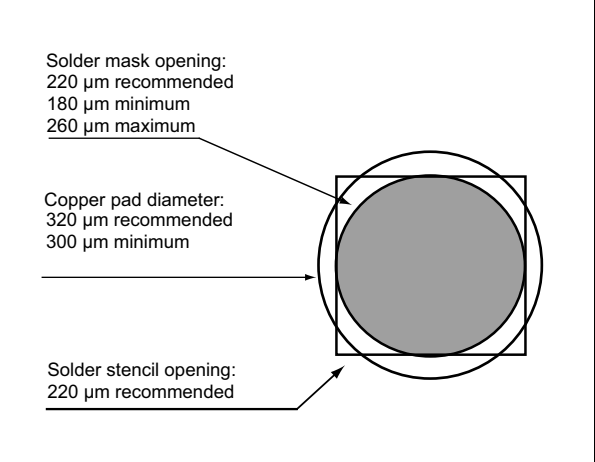


Figure 13. Footprint - 5 mils stencil - non solder mask defined

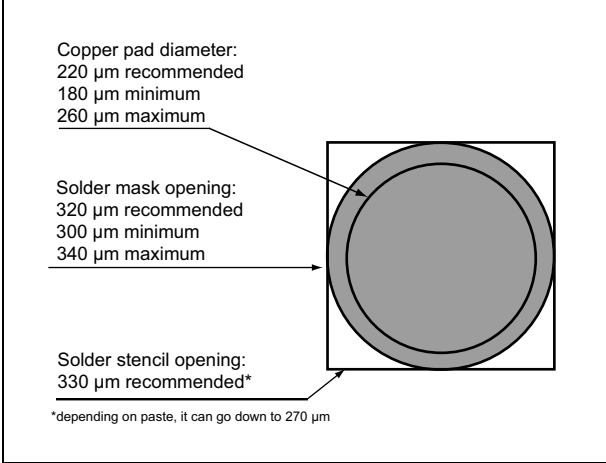


Figure 14. Footprint - 5 mils stencil - solder mask defined

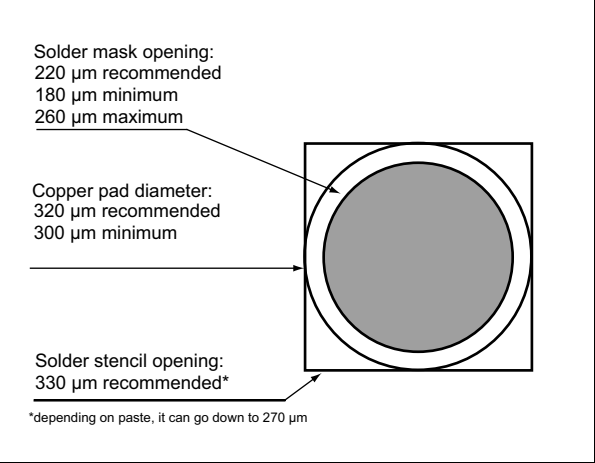


Figure 15. Recommend land pattern (used for balun characterization)

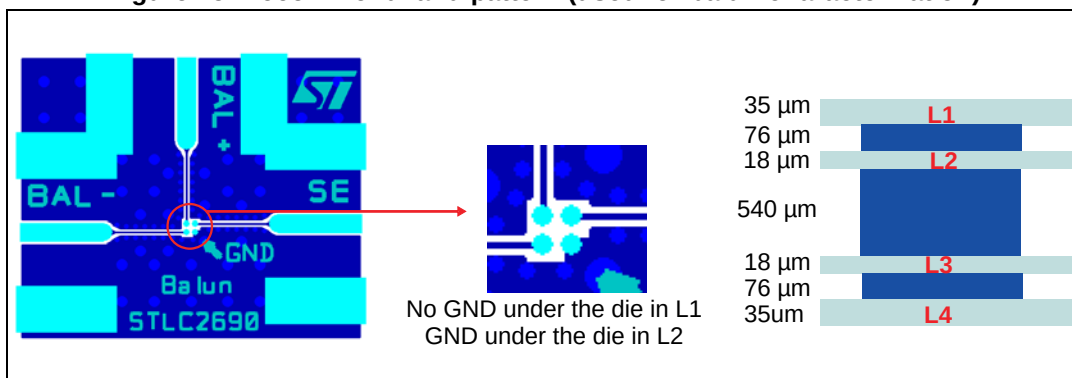


Figure 16. Example of transceiver application board land pattern

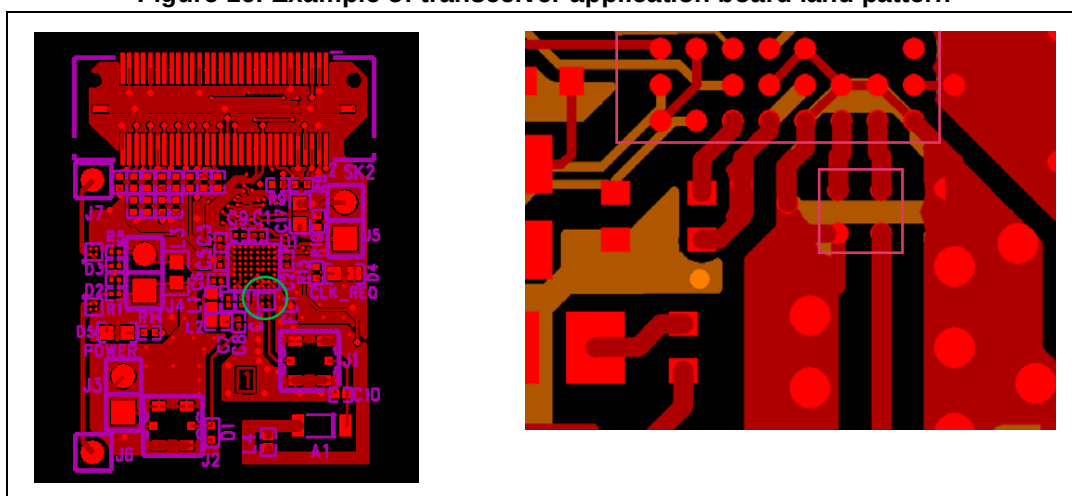


Figure 17. Marking

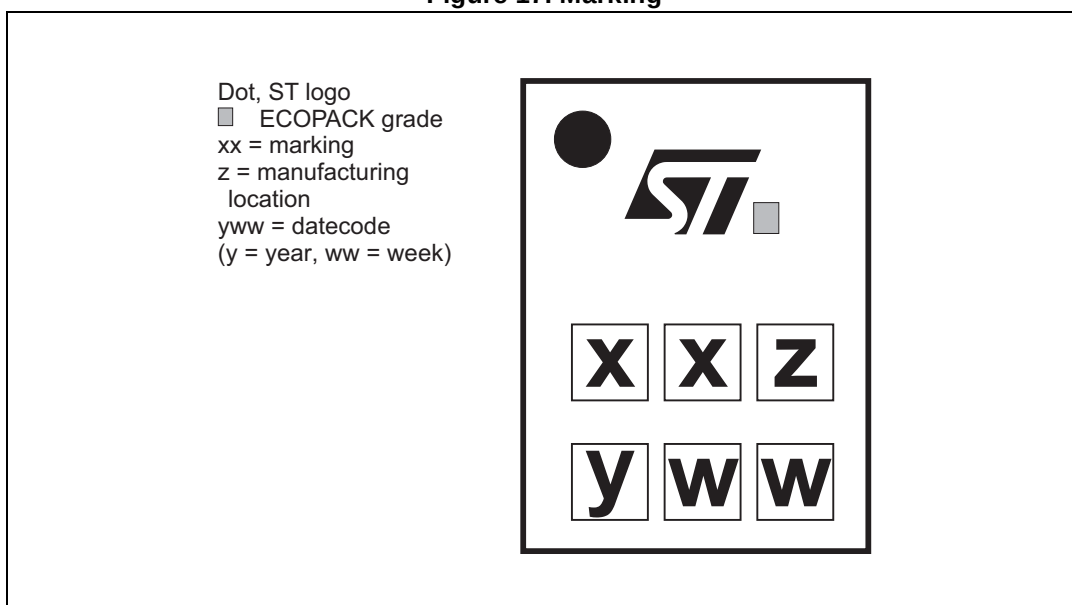
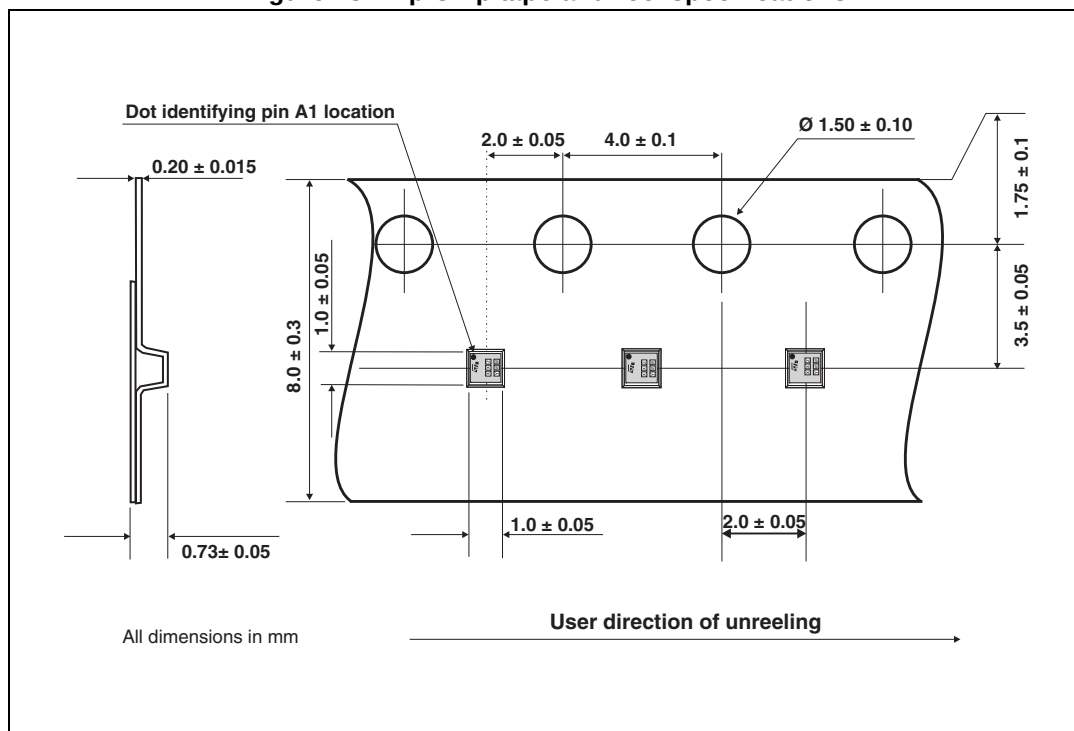


Figure 18. Flip Chip tape and reel specifications



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-2690D3U	RP	Flip-Chip	1.02 mg	5000	Tape and reel

4 Revision history

Table 5. Document revision history

Date	Revision	Changes
25-Jan-2010	1	First issue.
08-Feb-2010	2	Updated Table 1 and Figure 16 .
21-Sep-2015	3	Updated Figure 9 and Figure 9 . Added Figure 11 , Figure 12 , Figure 13 , Figure 14 and Table 3 .

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