

50 / 50+j50 balun transformer for 2.45 GHz ISM band

Features

- 50 Ω nominal Input / 50+j50 output differential impedance
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: BAL-2593D5U < 1.5 mm²

Benefits

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

Application

- Bluetooth balun for STL2592/2593/2500D transceiver
- Portable applications

Description

The BAL-2593D5U is a balun designed to transform a single ended signal to differential signals in Bluetooth applications.

This BAL-2593D5U, with less than 1.2 dB insertion losses in the bandwidth 2400 MHz to 2500 MHz, has been customized for STLC2592/2593/2500D Bluetooth transceivers and specific requirements for S_{CC22} parameter at 2f₀ (4.88 GHz).

The BAL-2593D5U has been designed using STMicroelectronics IPD (integrated passive device) technology on non conductive glass substrate to optimize RF performances.

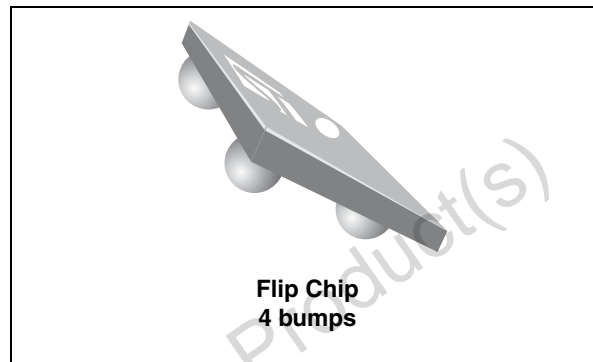


Figure 1. Top view

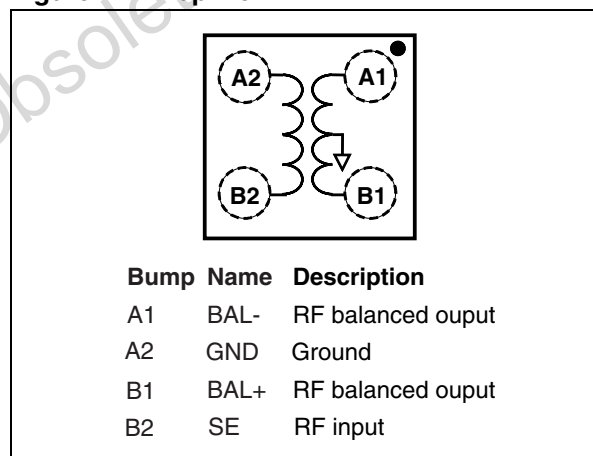
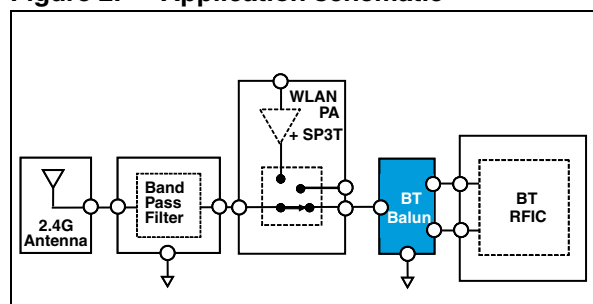


Figure 2. Application schematic



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1 Electrical characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Test condition	Min.	Typ.	Max.	Unit
P_{IN}	Input power R_{FIN}		-	10	dBm
V_{ESD}	ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5k Ω , air discharge)	1000			V
	ESD ratings machine model (MM: C = 200 pF, R = 25 Ω , L = 500 nH)	200	-	-	
	ESD ratings, charged device model (JESD22-C101D)	500			
T_{OP}	Operating temperature	-30	-	+85	$^{\circ}C$

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

Symbol	Test condition	Min.	Typ.	Max.	Unit
Z_{OUT}	Nominal differential output impedance	-	50 + j50	-	Ω
Z_{IN}	Nominal input impedance	-	50	-	Ω

Table 3. RF performance ($T_{amb} = 25^{\circ}C$)

Symbol	Test condition		Min.	Typ.	Max.	Unit
F	Frequency range (bandwidth)		2400	-	2500	MHz
I_L	Insertion loss in bandwidth		-	1.0	1.2	dB
R_L	Return loss in bandwidth		10	17	-	dB
Φ_{imb}	Phase imbalance	Measured on EVB with GND on L1	0	6	20	$^{\circ}$
A_{imb}	Amplitude imbalance		-2	-	2	dB

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

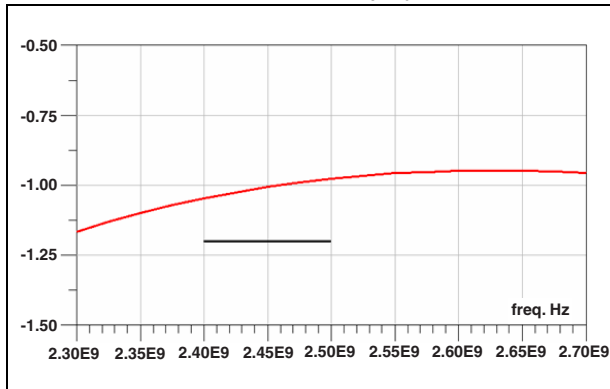


Figure 4. Return loss ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

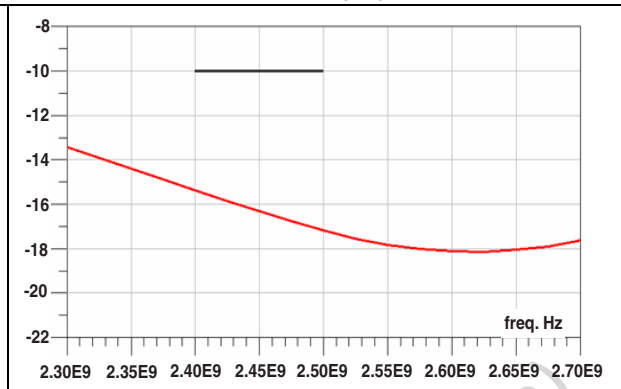


Figure 5. Amplitude imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

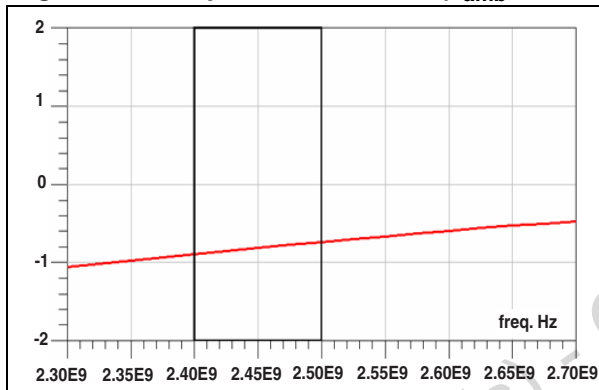


Figure 6. Phase imbalance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

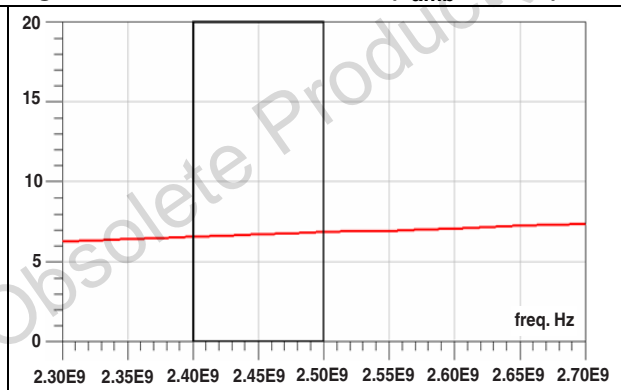


Figure 7. S_{dd22} @ f_0 ($T_{amb} = 25\text{ }^{\circ}\text{C}$),
freq (2.4000 GHz to 2.500 GHz)

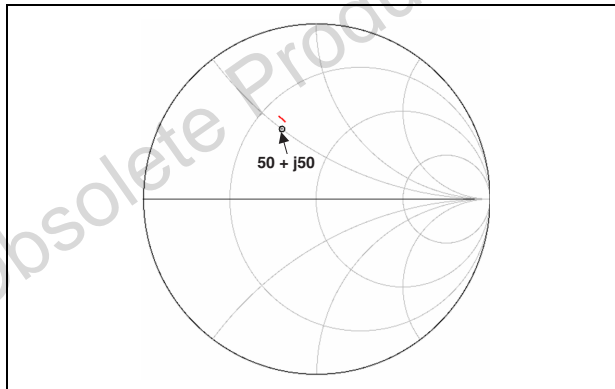


Figure 8. S_{cc22} @ $2f_0$ ($T_{amb} = 25\text{ }^{\circ}\text{C}$),
freq (4.8000 GHz to 5.000 GHz)

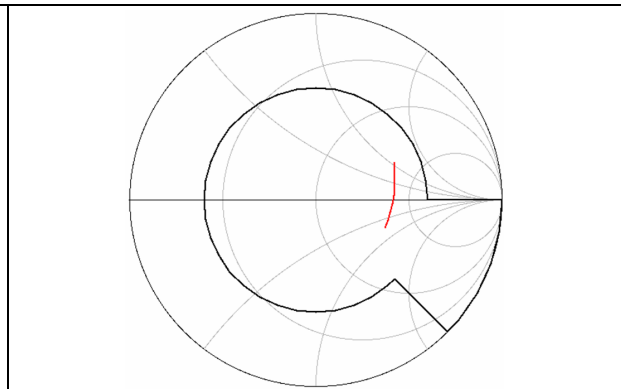


Figure 9. Recommend land pattern (used for balun characterization)

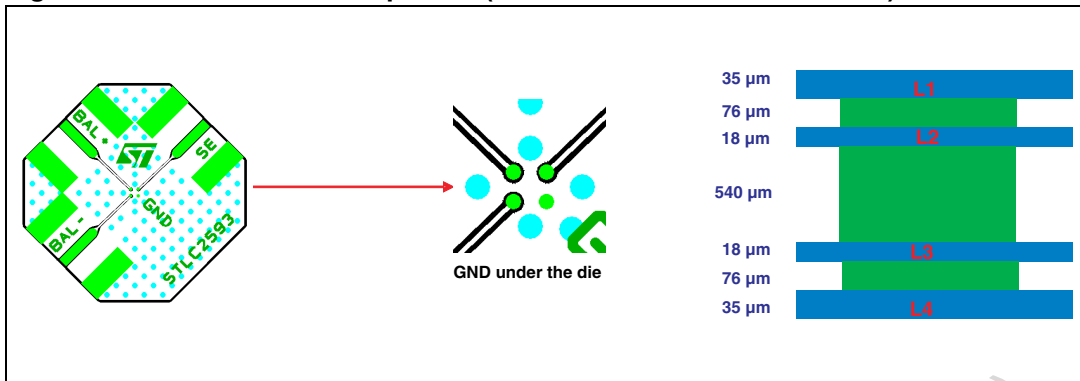
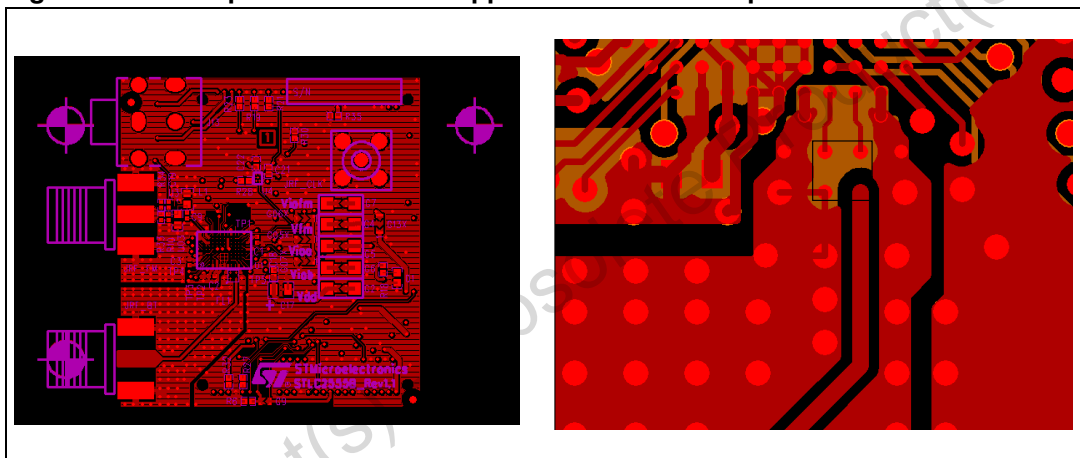


Figure 10. Example of transceiver application board land pattern



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.

Table 4. Package dimensions (values)

Ref.	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.61	0.675	0.74
A1	0.21	0.25	0.29
A2	-	0.4	-
b	0.265	0.315	0.365
D	1.21	1.26	1.31
D1	-	0.8	-
E	1.11	1.16	1.21
E1	-	0.7	-
SE	-	0.35	-
§	-	0.025	-

Figure 11. Package dimensions (definitions)

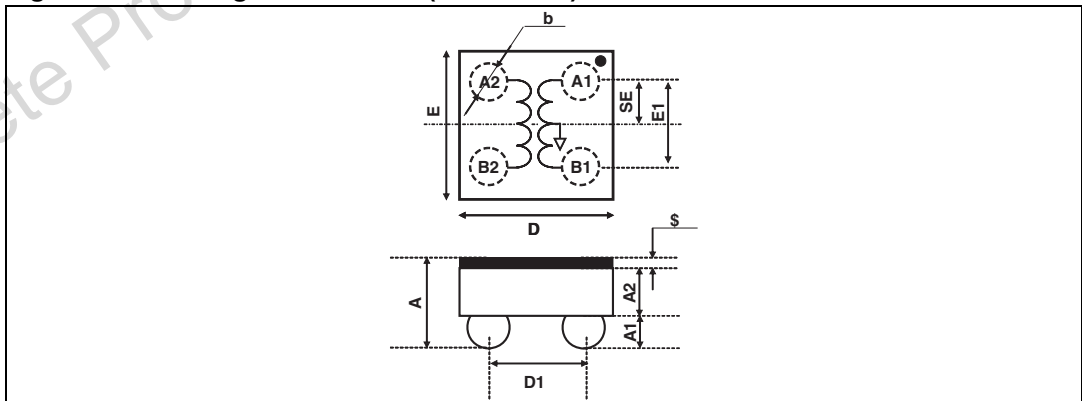


Figure 12. Footprint

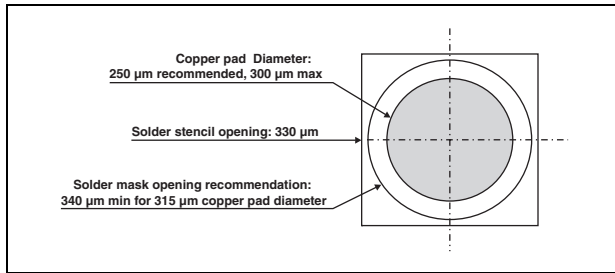


Figure 13. Marking

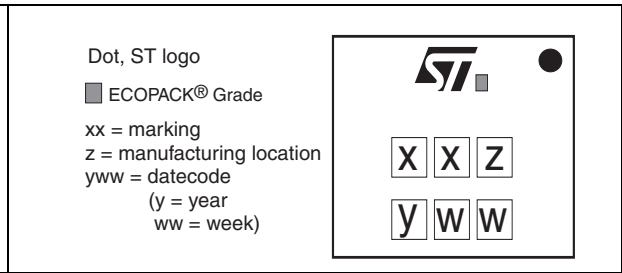
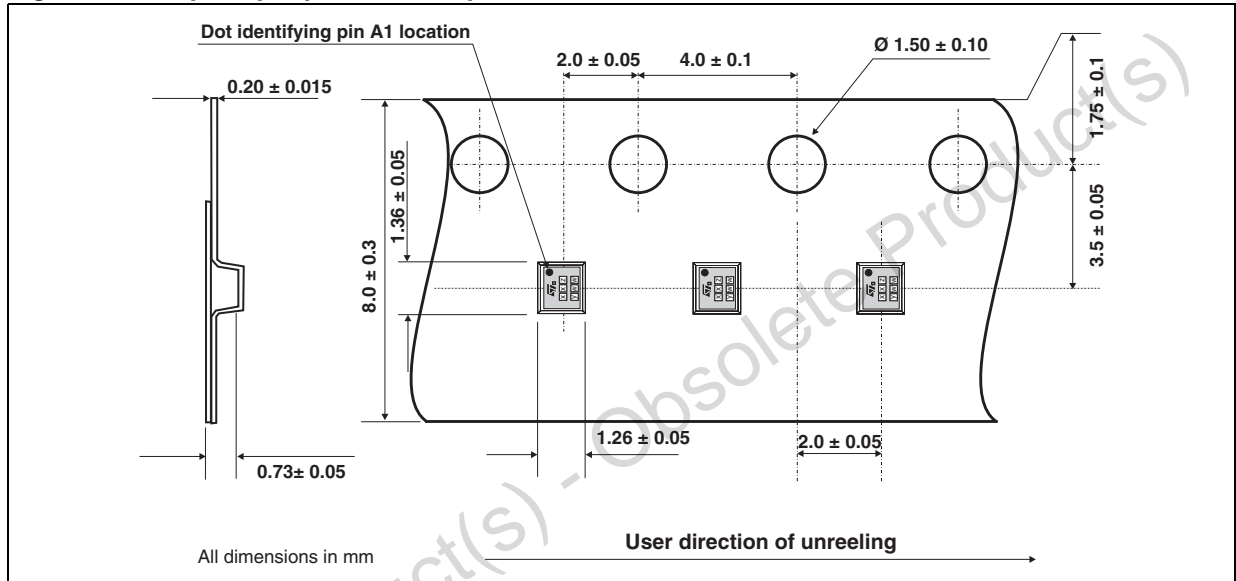


Figure 14. Flip Chip tape and reel specification



Note: More packing information is available in the applications note:
AN 2348: "Flip Chip: package description and recommendations for use"

3 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
BAL-2593D5U	RM	Flip Chip	1.75 mg	5000	Tape and reel

4 Revision history

Table 6. Document revision history

Date	Revision	Changes
12-Oct-2009	1	Initial release.

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