

## 50 / 30+j25 balun transformer for 2.45 GHz ISM band

### Features

- 50  $\Omega$  nominal input / 30+j25 output differential impedance
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Small footprint: BAL-2690D3U < 1 mm<sup>2</sup>

### Benefits

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

### Applications

Balun transformer for applications such as:

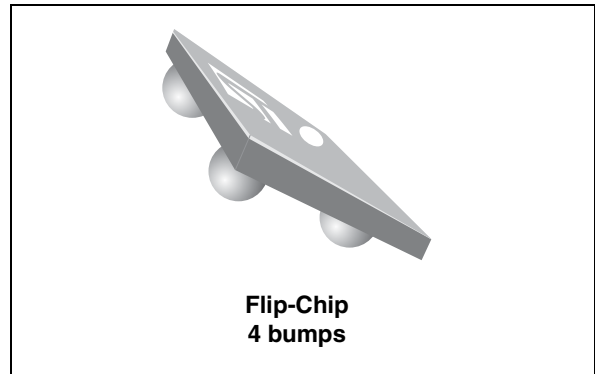
- Bluetooth STLC2690
- Mobile phone

### Description

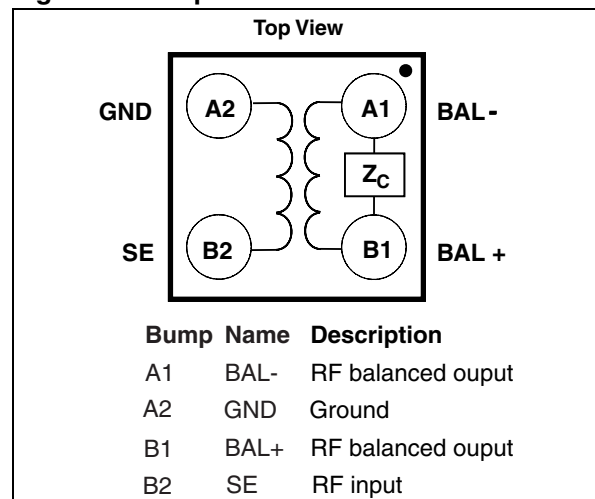
The BAL-2690D3U is a balun designed to transform single ended signals to differential signals in Bluetooth applications.

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  $S_{CC22}$  parameter.

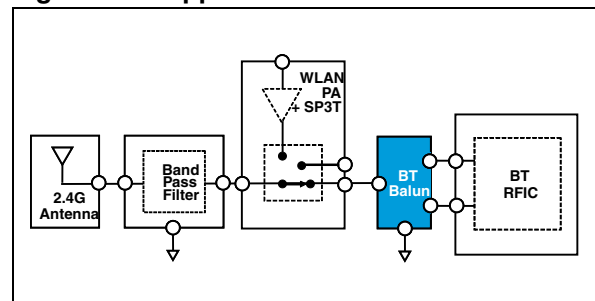
The BAL-2690D3U has been designed using STMicroelectronics IPD (integrated passive device) technology on non conductive glass substrate to optimize RF performances.



**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 $R_{FIN}$	-	-	20	dBm
$V_{ESD}$	ESD ratings MIL STD883G (HBM: C = 100 pF, R = 1.5k , air discharge)	2000	-	-	V
	ESD ratings, machine model (MM: C = 200 pF, R = 25 $\Omega$ L = 500 nH)	500			
	ESD ratings, charged device model (CDM) (JESD22-C101D)	500			
$T_{OP}$	Operating temperature	-40	-	+85	$^{\circ}\text{C}$

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

Symbol	Test condition	Min.	Typ.	Max.	Unit
$Z_{OUT}$	Nominal differential output impedance	-	$30 + j25$	-	$\Omega$
$Z_{IN}$	Nominal input impedance	-	50	-	$\Omega$

**Table 3. RF performance**

Symbol	Test condition		Min.	Typ.	Max.	Unit
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
$\Phi_{imb}$	Phase imbalance		-10	-	10	$^{\circ}$
$A_{imb}$	Amplitude imbalance		-1	-	1	dB
$R_{CMRR}$	Common mode rejection ratio ( $S_{SC12}$ )		20	-	-	dB
$S_{CC22}$	Magnitude for common mode harmonic rejection coefficient @ $2f_O$	From 4804 MHz to 4960 MHz, 25 $\Omega$ is considered as reference for CM	0.7	-	1	$^{\circ}$
	Phase for common mode harmonic rejection coefficient @ $2f_O$		-45	-	0	

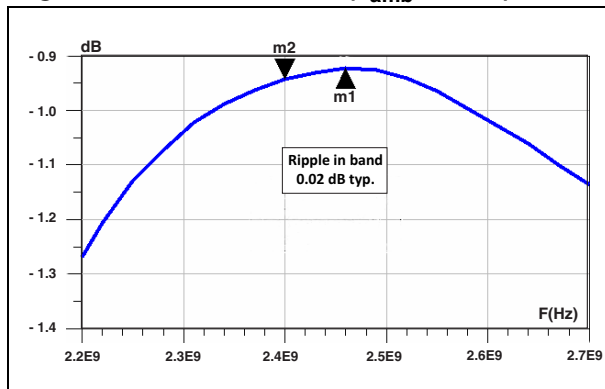
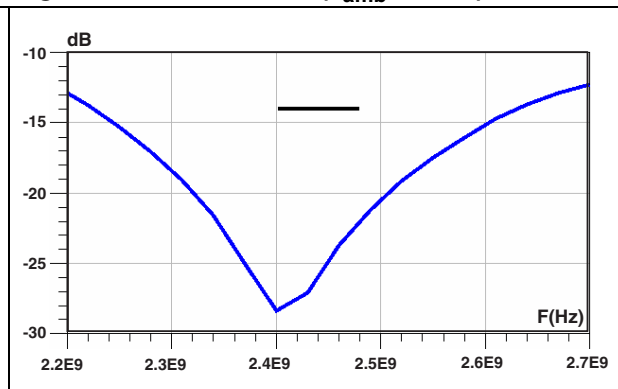
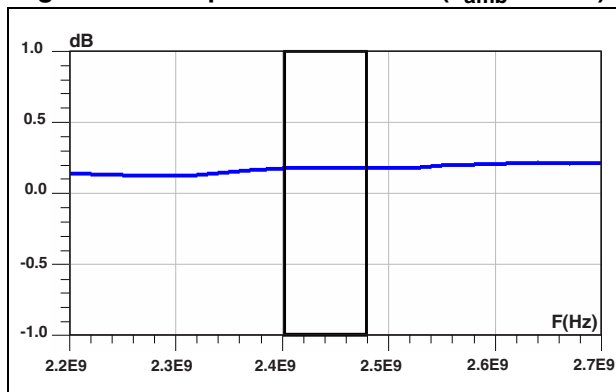
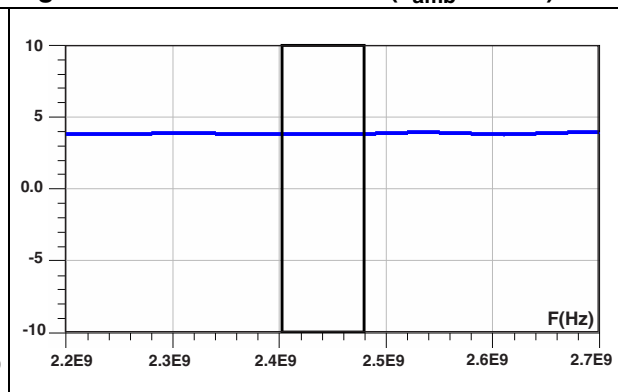
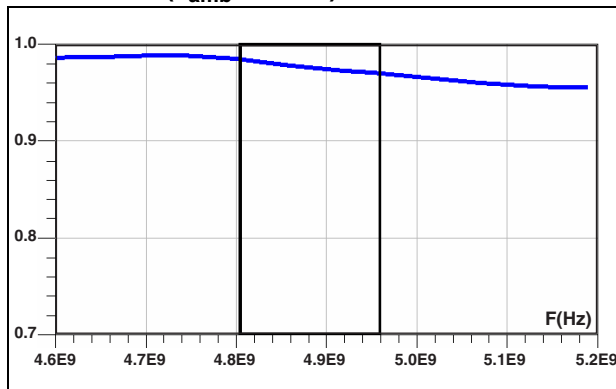
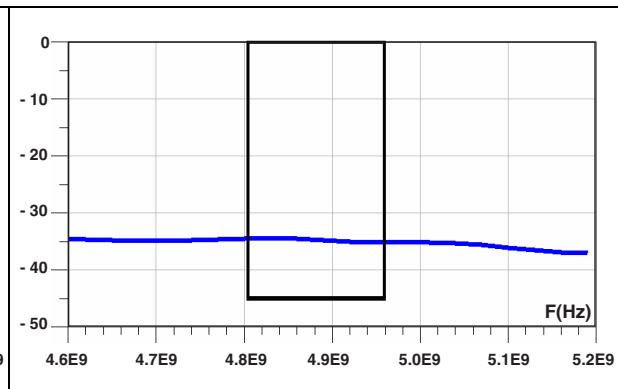
Figure 3. Insertion loss ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )Figure 4. Return loss ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )Figure 5. Amplitude imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )Figure 6. Phase imbalance ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )Figure 7.  $S_{cc22}$  magnitude @  $2f_0$  ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )Figure 8.  $S_{cc22}$  phase @  $2f_0$  ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )

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

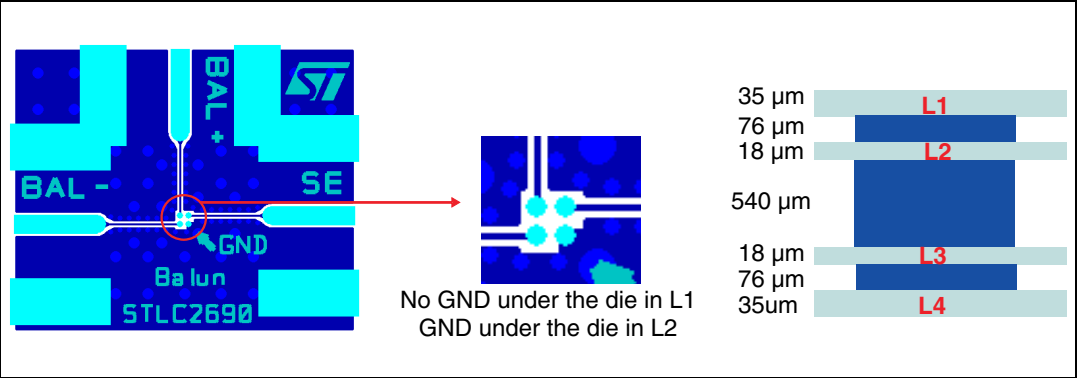
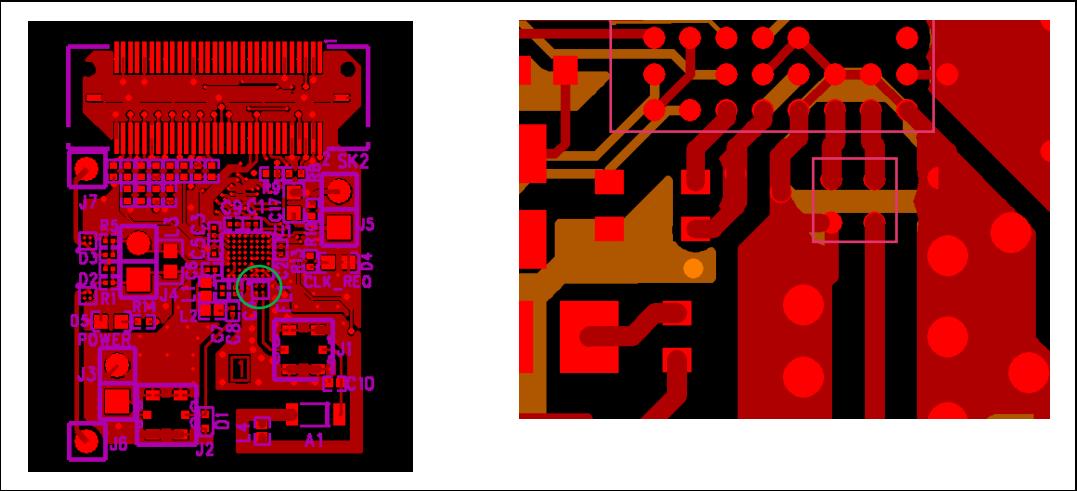


Figure 10. Example of transceiver application board land pattern



## 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](http://www.st.com). ECOPACK® is an ST trademark.

**Table 4. Package dimensions (values)**

Ref.	Dimensions					
	Millimetres			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.565	0.63	0.695	0.022	0.025	0.027
A1	0.17	0.205	0.24	0.007	0.008	0.009
A2	-	0.4	-	-	0.016	-
b	0.215	0.255	0.295	0.008	0.010	0.012
D	0.86	0.91	0.96	0.034	0.036	0.038
D1	-	0.474	-	-	0.019	-
E	0.86	0.91	0.96	0.034	0.036	0.038
E1	-	0.474	-	-	0.019	-
SE	-	0.237	-	-	0.009	-
\$	-	0.025	-	-	0.001	-

**Figure 11. Package dimensions (definitions)**

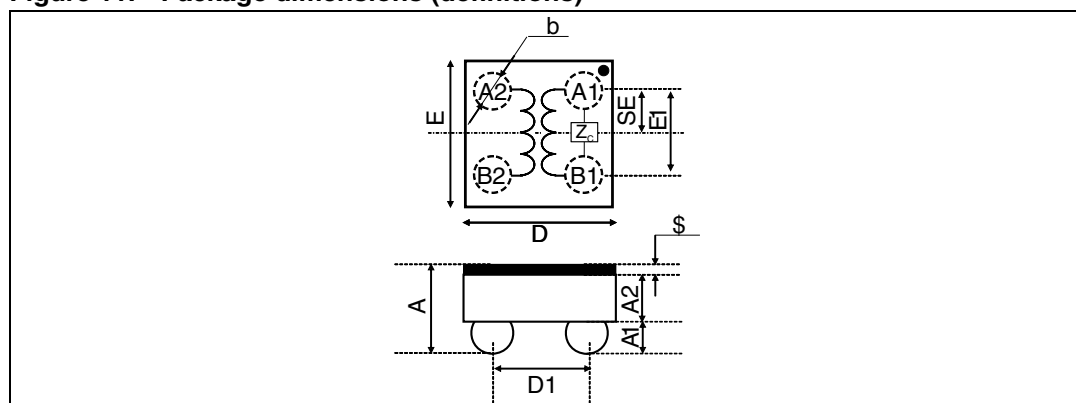


Figure 12. Footprint

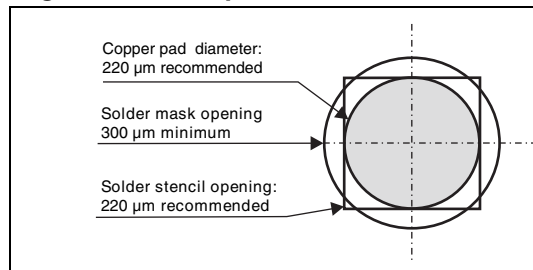


Figure 13. Marking

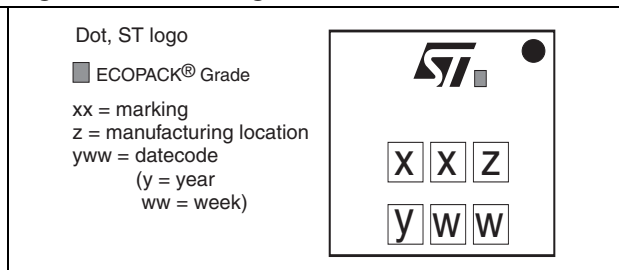
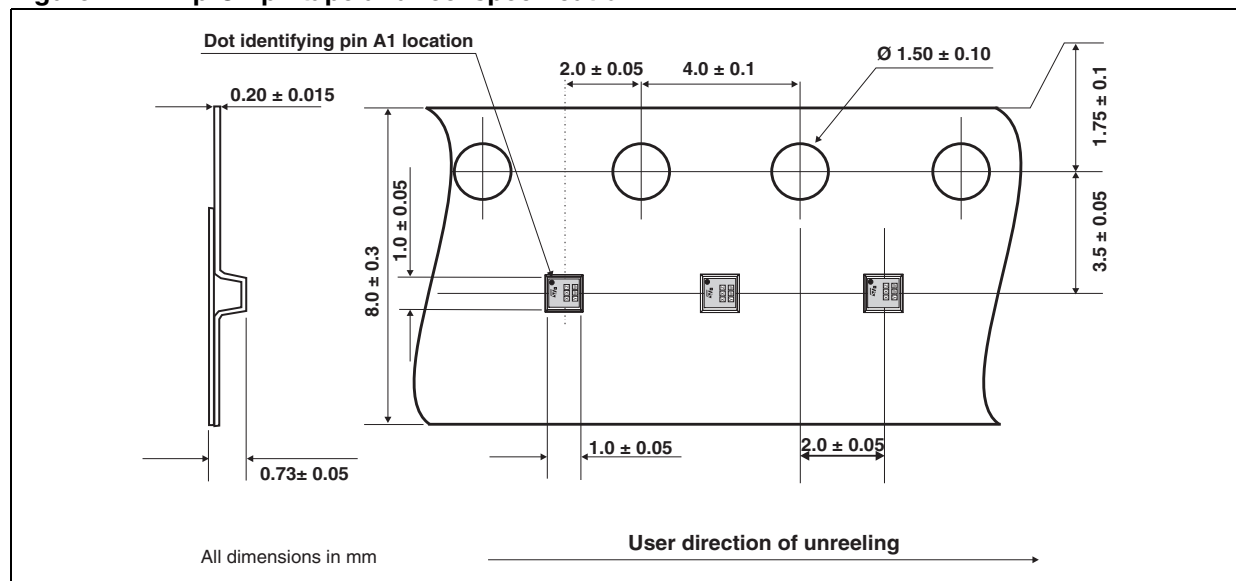


Figure 14. Flip-Chip - tape and reel specification



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

### 4 Revision history

Table 6. Document revision history

Date	Revision	Changes
25-Jan-2010	1	First issue.
08-Feb-2010	2	Updated <a href="#">Table 1</a> and <a href="#">Figure 10</a> .

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