Murata Balun for CC253x and CC254x LFB182G45BG2D280

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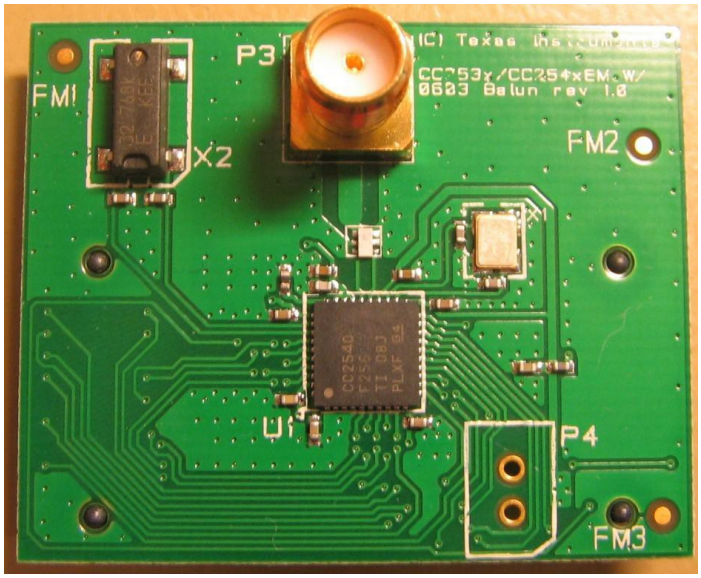
Keywords

- *Balun*
- *LFB182G45BG2D280*
- *CC253x*
- *CC254x*
- *CC257x*
- *CC85xx*

1 Introduction

Murata's LFB182G45BG2D280 integrated balun is specially designed for use with Texas Instruments' CC253x, CC254x, CC257x and CC85xx devices. This balun greatly simplifies the RF frontend by reducing required board space and also reduces possible design errors to a minimum. Additionally the balun has integrated filter components which greatly reduces harmonic radiation.

The LFB182G45BG2D280 is a six pin device with mechanical dimensions of only 1.6 mm x 0.8 mm (EIA 0603). The balun replaces 9 discrete 0402 components in the recommended discrete balun / filter design. Project collateral discussed in this application report can be downloaded from the following URL: http://www.ti.com/lit/zip/SWRA380.



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2 Abbreviations

EM	Evaluation module
ISM	Industrial, Scientific, Medical
TI	Texas Instruments

3 Description of the Reference Design

The traditional reference design for the CC253x and CC254x is shown in Figure 1. Murata has developed a single component which replaces all the discrete components needed for the balun and low pass filter.

As can be seen in Figure 2, the Murata design is much simpler than the discrete. As RF design is not straight forward this will also reduce the risk of any errors done in the board layout.

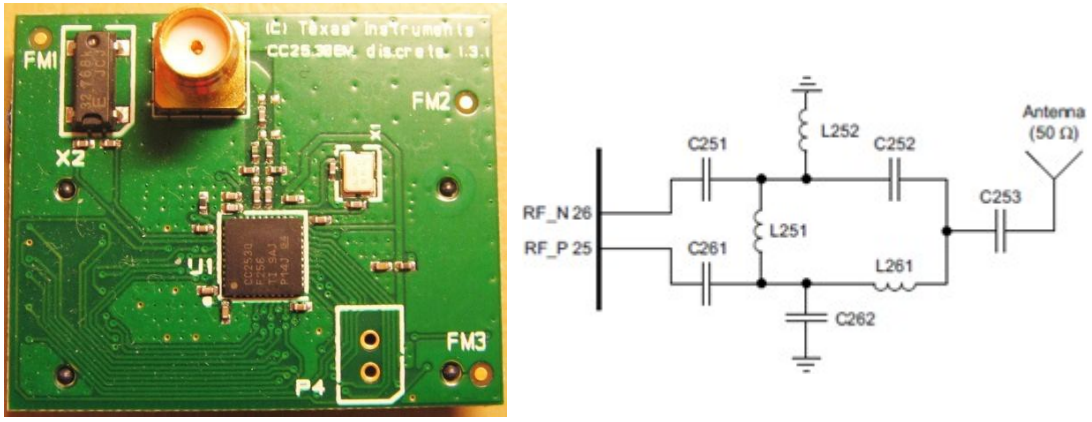


Figure 1, Discrete reference design

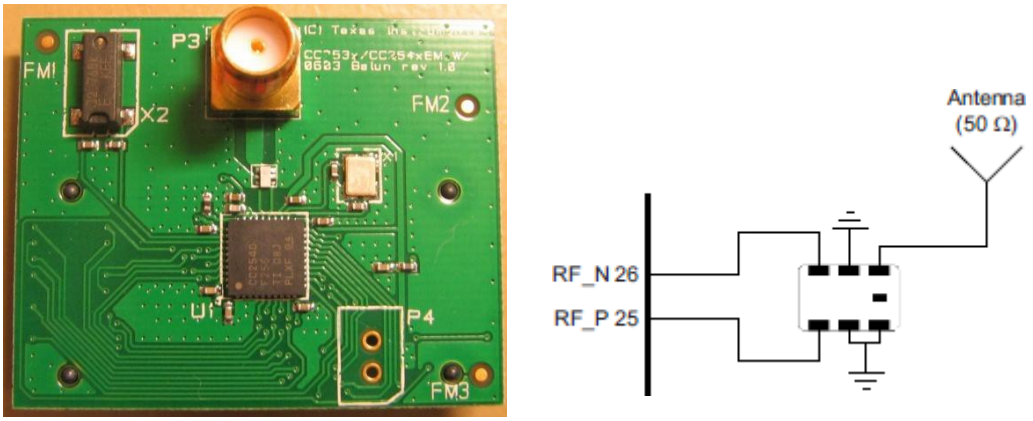


Figure 2, Murata Balun reference design

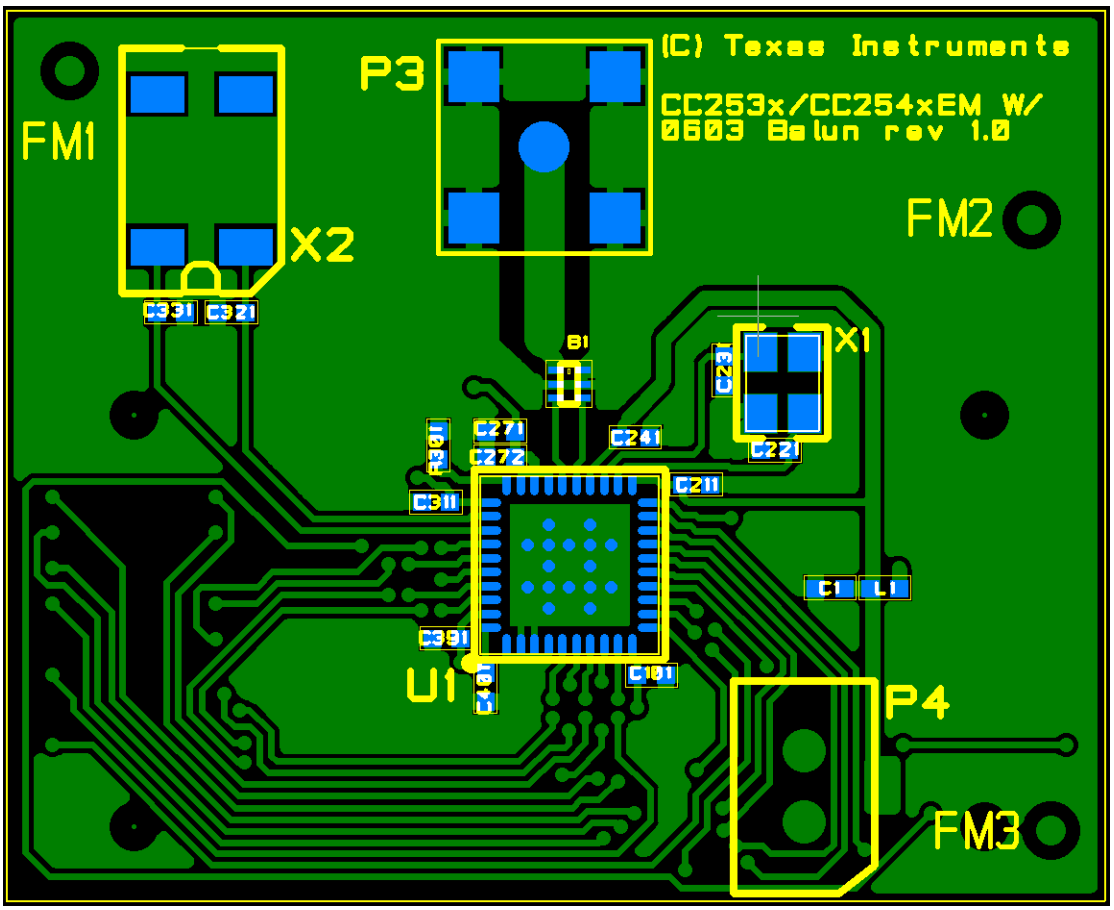


Figure 3, TI evaluation board for LFB182G45BG2D280

In **Figure 3** the layout out TI's evaluation board for LFB182G45BG2D280 can be seen. This figure clearly emphasizes the compact size of the balun and also the simplicity of its required design/layout.

4 Measurement Results

All results presented in this chapter are based on measurements performed with TI's evaluation board for LFB182G45BG2D280, as shown in **Figure 3**, with the CC2530. All measurement results are the average of several typical devices. Comparative values are from the CC2530EM reference design with the discrete balun.

As can be seen from the results LFB182G45BG2D280 offers improved performance on harmonic radiation, thus increasing margins to FCC/ETSI compliance limits.

Table 1, Measurement Results

		CC2530 discrete Ref. des.	CC2530 w/Murata Balun	
Receiver sensitivity	PER =1% as specified by [1] [1] requires -85dB	-97	-96,1	dBm
Output Power (0xF5)	Delivered to a single ended 50Ω load through a balun using max recommended output setting (0xF5) [1] requires minimum -3dBm	4,5	3,1	dBm
Spurious Emission	25MHz-1000MHz (outside restricted bands)	-60	-71.6	dBm
	25MHz-2400MHz (within FCC restricted bands)	-60	-71.7	dBm
	25MHz-1000MHz (within ETSI restricted bands)	-60	-71.6	dBm
	1800-1900MHz (ETSI restricted band)	-57	-67,7	dBm
	5150-5300MHz (ETSI restricted band)	-55	-66,1	dBm
	At 2xfc and 3xfc (FCC restricted band)	-42	-62,7	dBm
	At 2xfc and 3xfc (ETSI EN 300-440 and EN300-328)	-31	-51,6	dBm
	At 2483.5MHz and above (FCC restr. bands) fc=2480MHz	-42	-58,5	dBm
EVM	Measured as defined by [1] using maximum recommended output power setting [1] Requires maximum 35 %	2	2	%

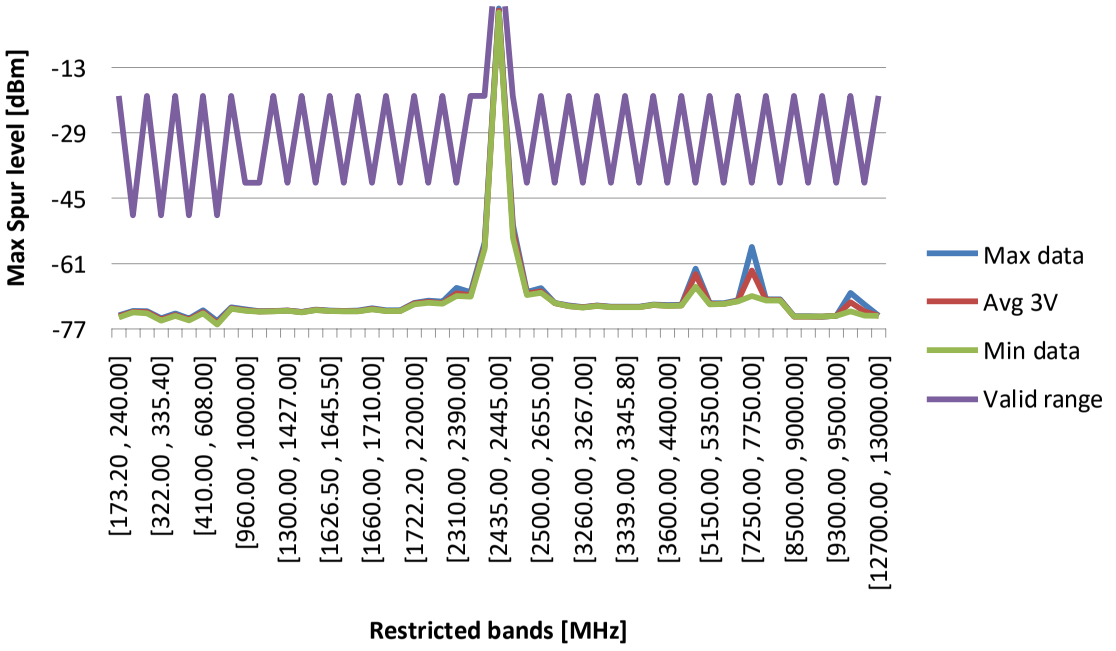


Figure 4, Spurious Emission (FCC)

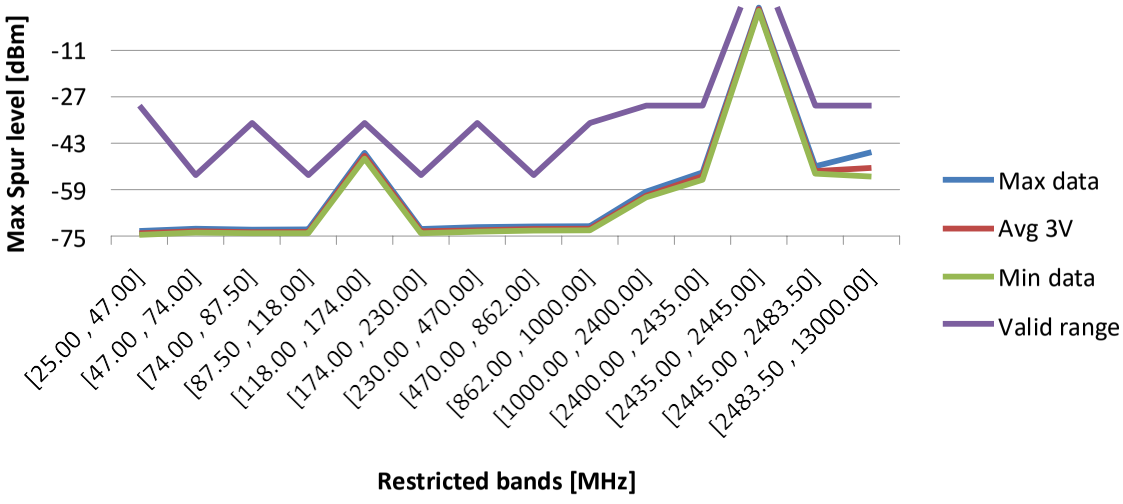


Figure 5, Spurious Emission (ETSI EN 300-440)

5 Balun Specifications

Table 2, Murata Datasheet Values

Part Number	LFB182G45BG2D280
Unbalanced Port Impedance	50 Ω
Balanced Port Impedance	Conjugate match to TI CC253x, CC254x
Frequency Range	2450.00 ± 50 MHz
Insertion Loss in BW	1.75 dB typ at 25 °C
Attenuation (Absolute value)	20 dB min. at 4800.00 ~ 5000.00 MHz 20 dB min. at 7200.00 ~ 7500.00 MHz
Power Capacity	500 mW max.

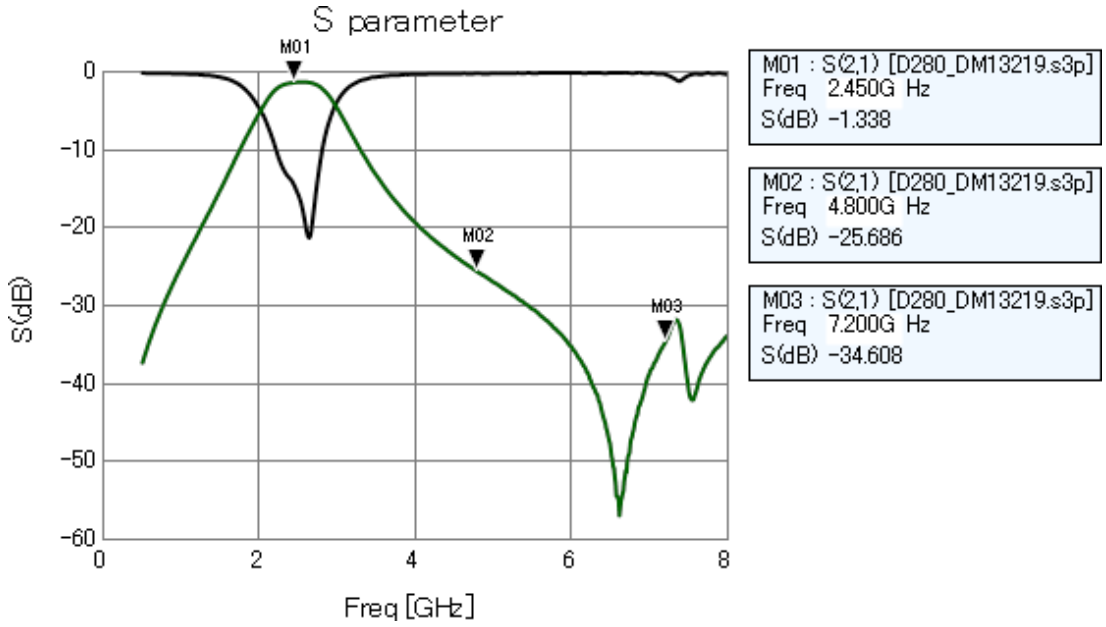


Figure 6, Filter Characteristics, measured by Murata

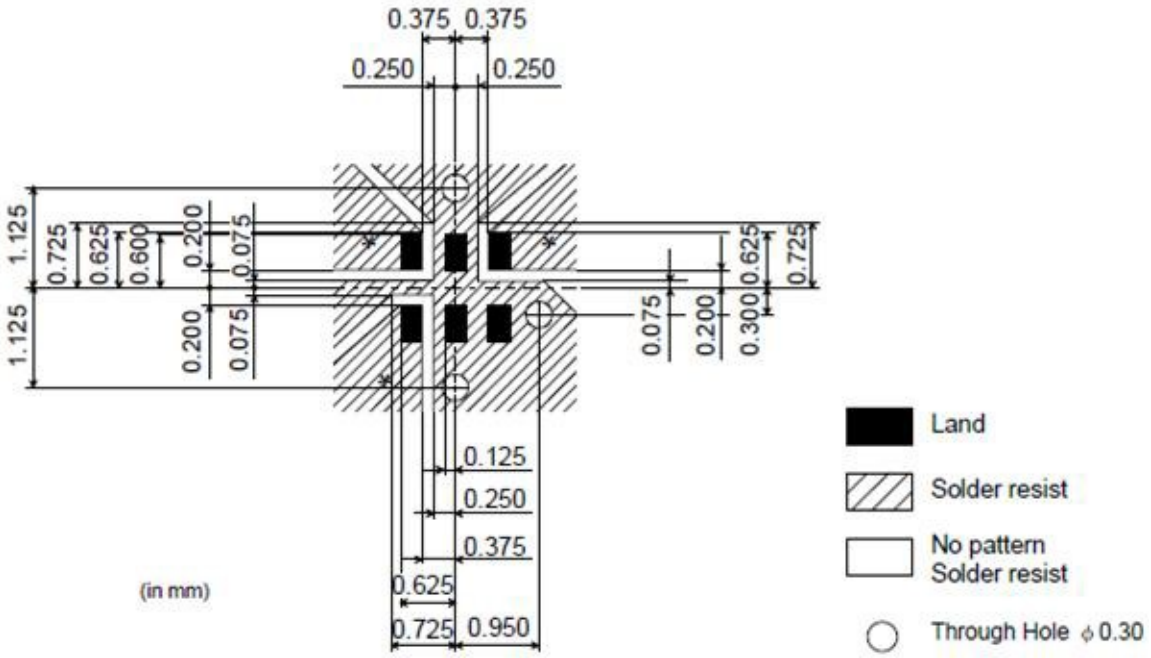
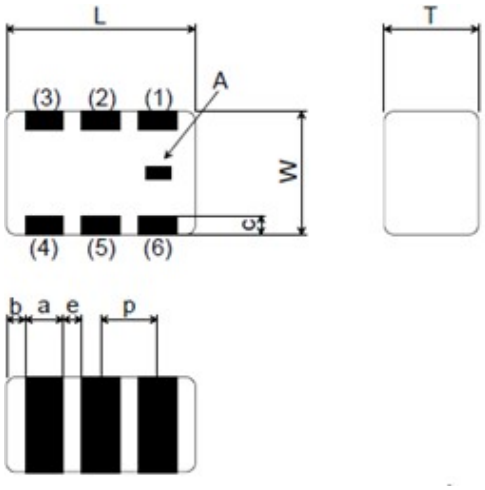


Figure 7, Recommended Footprint



(in mm)

Mark	Meaning
A	Directional Input Mark

Mark	Dimension	Mark	Dimension
L	1.6±0.1	b	0.20+0.10/-0.15
W	0.8±0.1	c	0.15±0.10
T	0.7 max.	e	0.3±0.1
a	0.2±0.1	p	0.50±0.05

TERMINAL CONFIGURATION

Terminal No.	Terminal Name	Terminal No.	Terminal Name
(1)	Unbalance Port	(4)	Balance Port
(2)	GND	(5)	GND
(3)	Balance Port	(6)	GND

Figure 8, Physical Dimensions

6 References

[1] IEEE Std. 802.15.4-2006: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications for Low Rate Wireless Personal Area Networks (LR-WPANs) http://standards.ieee.org/getieee802/download/802.15.4-2006.pdf

7 General Information

7.1 Document History

Revision	Date	Description/Changes
SWRA380A	2011.10.25	Added CC257x and CC85xx
SWRA380	2011.08.25	Initial release.

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