CC26xx HW Training

RF Front End options and Antennas

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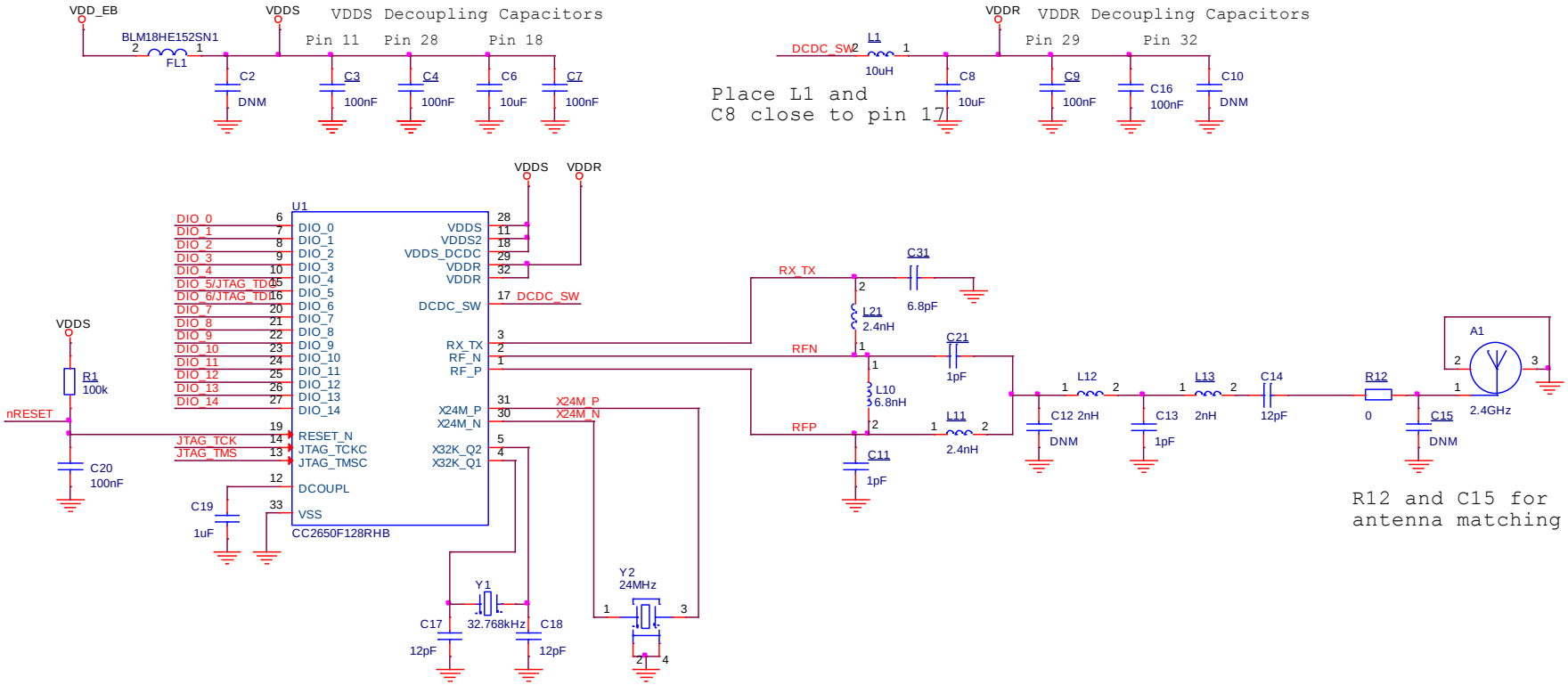
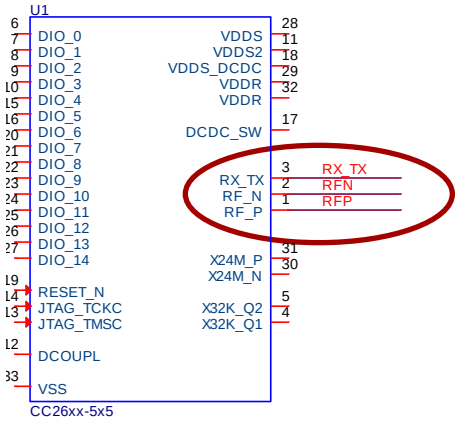
Reference Schematic



RF pins



RF_P: RF positive output / input

RF_N: RF negative output / input

RX_TX: Optional RF bias pin

Several options on output configuration:

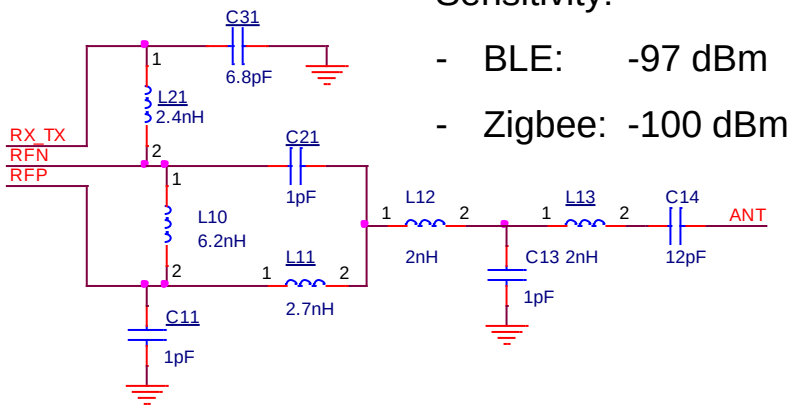
- Differential output: Both RF pins are used and a balun + a pi-filter is required between the CC26xx and the antenna
- Single ended output: Only one of the RF pins is used for RF output. Only a pi-filter is required between the CC26xx and the antenna. Output power is reduced and sensitivity is degraded
- External biasing of the RF pins can be applied through the RX_TX pin. This will improve sensitivity, but requires an additional inductor.
- For single ended configuration, the unused RF pin may alternatively be used as bias pin
- RX_TX can be used for external control of for example an RF switch

Note:

- The CC26xx 7x7 package does not have RX_TX-pin, while the CC13xx 7x7 package does.

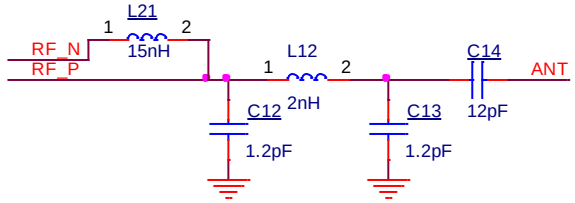
RF Frontend options

External bias



Sensitivity:

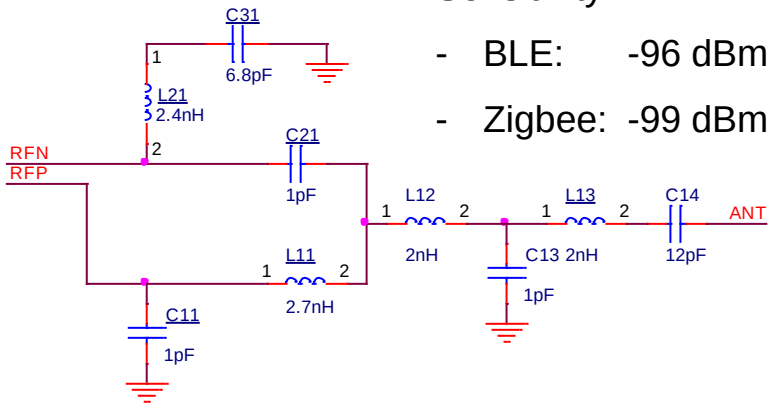
- BLE: -97 dBm
- Zigbee: -100 dBm



Sensitivity:

- BLE: -96 dBm
- Zigbee: -97 dBm

Internal bias

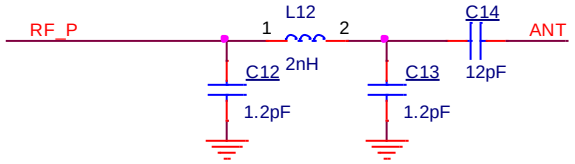


Sensitivity:

- BLE: -96 dBm
- Zigbee: -99 dBm

Pout_max = 5 dBm

Differential output



Sensitivity:

- BLE: -94 dBm
- Zigbee: -95 dBm

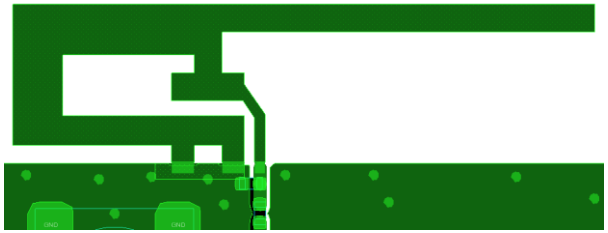
Pout_max = 2 dBm

Single-ended output

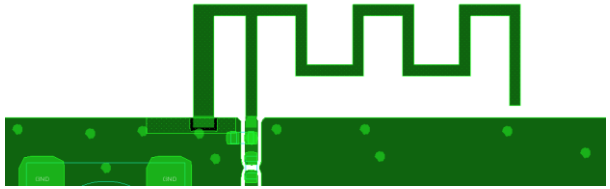
RF Frontend options

	Differential		Single Ended		
	Ext. Bias	Int. Bias	Ext. Bias	Int. Bias	
Output Power	5	5	2	2	[dBm]
BLE Sensitivity	-97	-96	-96	-94	[dBm]
Zigbee Sensitivity	-100	-99	-97	-95	[dBm]
Inductors	5	4	2	1	
Capacitors	5	5	3	3	
	10	9	5	4	

Antennas for 2.4 GHz



DN007



AN043

- PCB antennas
  - Low (no) cost
  - Simple to integrate (follow the reference design ☺)
  - Good performance
  - TI reference design for two different sizes which typically fits within customer requirements (board space), DN007 and AN043
  - Application Notes:
    - DN007: http://www.ti.com/litv/pdf/swru120b
    - AN043: http://www.ti.com/litv/pdf/swra117d
    - Antenna selection guide: http://www.ti.com/litv/pdf/swra161b
- Chip antennas
  - Can be used in applications where size is critical
  - Performance is comparable to PCB antennas (depending on size)
  - Cost is (obviously) higher
  - Contact antenna manufacturer for recommendations
    - Johanson, TDK, etc.
- Antenna tuning
  - Required for both PCB- and chip antennas
  - Can be don with matching network.....
  - ..... or Antenna length (PCB antennas)

Available reference designs

- CC2650EM-7ID (7x7, Internal bias, Differential output)
- CC2650EM-5XD (5x5, External bias, Differential output)
- CC2650EM-4XS (4x4, External bias, Single ended output)
- CC2650EM-Murbal (5x5, Internal bias, Integrated balun)