

SPIRIT1 Application Hints

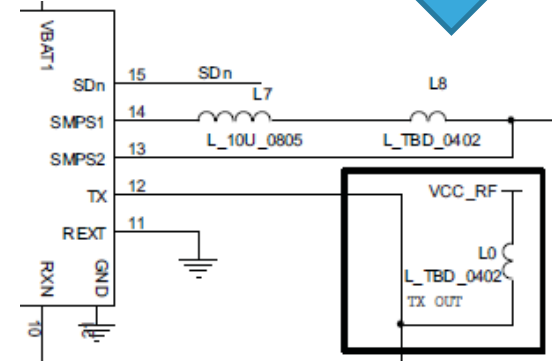
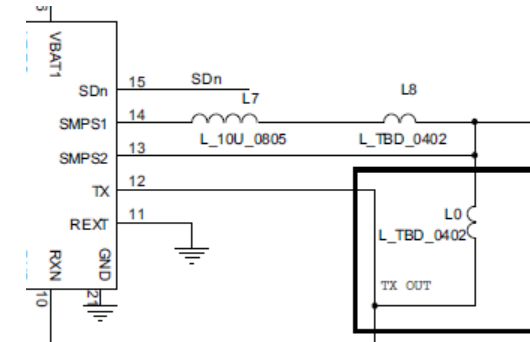


AN4198: Increasing the radiated Output Power up to +16dBm

- In the default configuration the transmitter internal power amplifier output (pin 12) is biased by the 1.4V SMPS voltage output through the L0 external inductor
- Biasing the PA output through the inductor L0 directly connected to the battery, instead of the SMPS output allows to increase the maximum output power delivered to the antenna
- Example

Table 1. 170 MHz maximum output power and current consumption

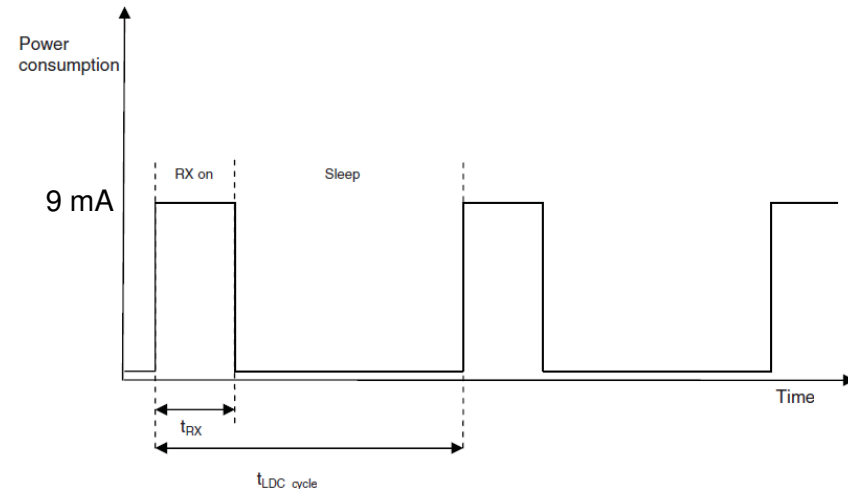
| Voltage supply V_{BAT} | Maximum output power (measured at connector) | Current consumption (TX mode) |
|-----------------------------|---|----------------------------------|
| 3.6 V | +16.1 dBm | 54 mA |
| 3.0 V | +15.6 dBm | 51 mA |
| 2.4 V | +14.8 dBm | 44 mA |
| 1.8 V | +13.0 dBm | 27 mA |



AN4193: Low duty cycle operation with SPIRIT1 transceiver [1/X]

Why?

- To reduce average power consumption during RX and TX operation
- To build a synchronized star network where both transmitter and receiver can sleep periodically to reduce average power consumption
- LDC mode is controlled by two timers:
 - The LDC timer which defines the window where the duty cycle operation take place (t_{LDC_CYCLE})
 - The RX_TIMEOUT timer which defines the amount of time that the receiver is active (t_{RX})



t_{LDC_CYCLE} – max. 2s, granularity 29µs

$$RX_{consumption_average} = \frac{t_{RX}}{t_{LDC_cycle}} \cdot 9 + \frac{t_{LDC_cycle} - t_{RX}}{t_{LDC_cycle}} \cdot 0.00085 \text{ mA}$$

RX current

Sleep current



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How to define t_{RX} ?

AN4193: Low duty cycle operation with SPIRIT1 transceiver [2/X]

How to define t_{RX} ?

- RX timeout using the Sync detection
 - When valid Sync is detected, we are receiving a valid data packet
 - RX timeout is stopped when a valid SYNC word is detected and the receiver is expected to receive a complete packet

- RX timeout using the RSSI detection
 - RX timeout is stopped upon detection of signal energy above a certain user defined threshold
 - This mode will further reduce average power consumption by decreasing the time when receiver must be on. On the other hand the MCU needs to check that a valid message is received within a user defined timeout.
 - The time to measure RSSI of the incoming signal will vary according to the RX filter bandwidth

| | | | | | | | | | |
|----------|------|--------|---------------|----------------|---------|----------|--------|---------|-----|
| Preamble | Sync | Length | Dest. address | Source address | Control | Seq. No. | NO_ACK | Payload | CRC |
|----------|------|--------|---------------|----------------|---------|----------|--------|---------|-----|

STack packet format

| RX filter min (kHz) | RX filter max (kHz) | RSSI detection time (μ S) |
|---------------------|---------------------|--------------------------------|
| 4.2 | 7.0 | 1800 |
| 7.0 | 14.0 | 950 |
| 14.0 | 28.0 | 550 |
| 28.0 | 56.1 | 346 |
| 56.1 | 112.3 | 280 |
| 112.3 | 224.7 | 175 |
| 224.7 | 450.9 | 90 |
| 450.9 | 800.1 | 34 |



AN4193: SPIRIT1 Current consumption profile during wake up to RX

