ZARLINK SEMICONDUCTOR

ZL70100
Medical Implantable RF Transceiver
Data Sheet

May 2005

Features

- 402-405 MHz (10 MICS channels) and 433-434 MHz (2 ISM channels)
- High data rate (800/400/200 kbps raw data rate)
- High performance MAC with automatic error handling and flow control, typ < $1.5x10^{-10}$ BER.
- Very few external components (2 pcs + antenna matching)
- Extremely low power consumption (5 mA, continuous TX/RX, <1 mA low power mode)
- Ultra low power wakeup circuit (200 nA)
- Standards compatible (MICS, FCC, IEC)

Applications

- Implantable Devices e.g., Pacemakers, ICD's, Cochlea implants, Neurostimulators, Implantable Insulin Pumps, Bladder Control Devices, implantable physiological monitors
- Body area network, short range device applications using the 433 MHz ISM band.

Ordering Information

ZL70100LDF1 - 48 pin QFN* (tape & reel, bake and drypack)

ZL70100LDG1 -48 pin QFN* (tray, bake and drypack)

*Pb Free Matte Tin

0°C to +55°C

Description

The ZL70100 is a high performance half duplex RF communications link for medical implantable applications. The system is very flexible and supports several low power wakeup options. Extremely low power is achievable using the 2.45 GHz ISM Band Wakeup-receiver option. The high level of integration includes a Media Access Controller, providing complete control of the device along with coding and decoding of RF messages. A standard SPI interface provides for easy access by the application

For further information please contact sales.

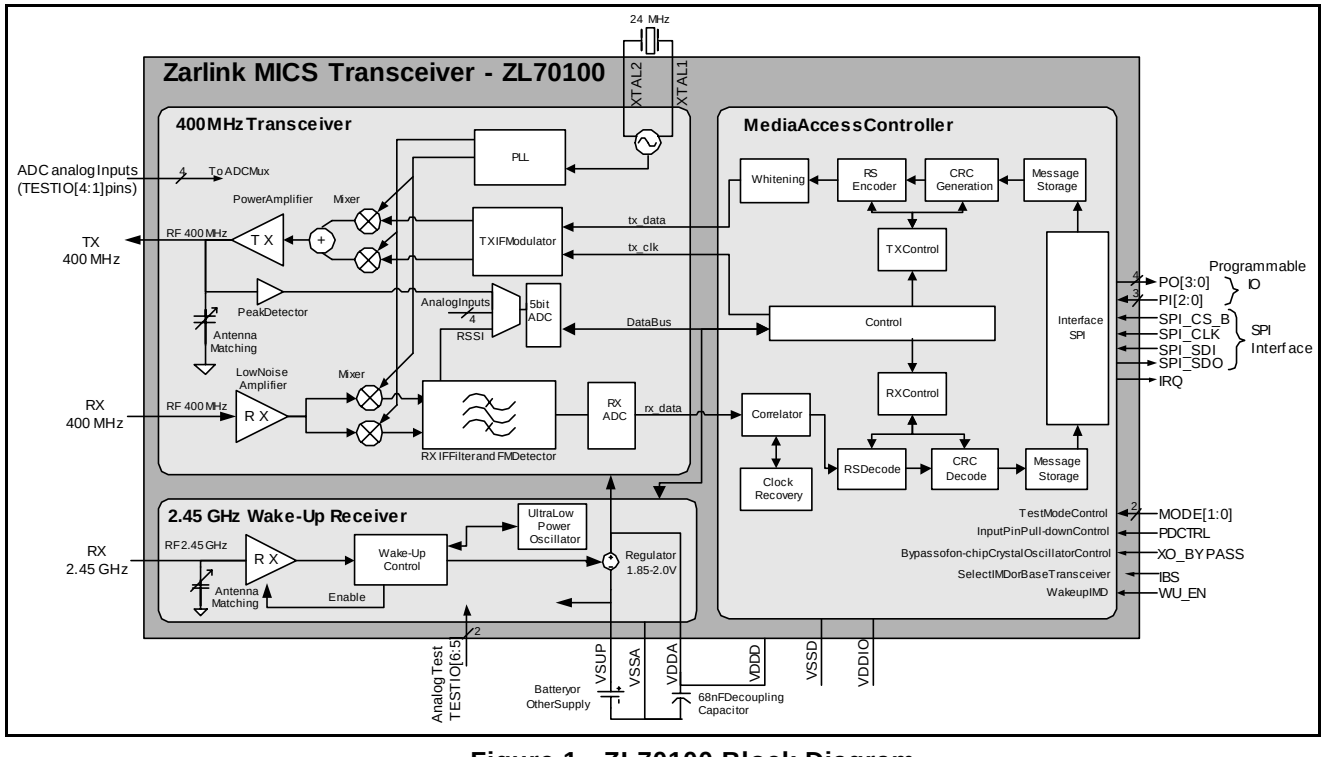


Figure 1 - ZL70100 Block Diagram

1.0 Functional Description

1.1 General

The ZL70100 is an ultra low power, high bandwidth RF link for medical implantable applications. It operates in the MICS (Medical Implantable Service Band) at 402-405 MHz. It uses a Reed-Solomon coding scheme together with CRC error detection to achieve an extremely reliable link. For data-blocks, a maximum BER (Bit Error Rate) of less than $1.5x10^{-10}$ is provided assuming a raw radio channel quality of 10^{-3} BER. An even higher quality of $2x10^{-14}$ BER is available using Housekeeping messages, a facility fully described in the ZL70100 Design Manual.

1.2 Basic Operation and Modes

The MICS transceiver is intended for operation in both an Implant and Basestation. These systems have different requirements especially with regard to power consumption. Therefore, the MICS transceiver has defined two fundamental startup modes of operation:

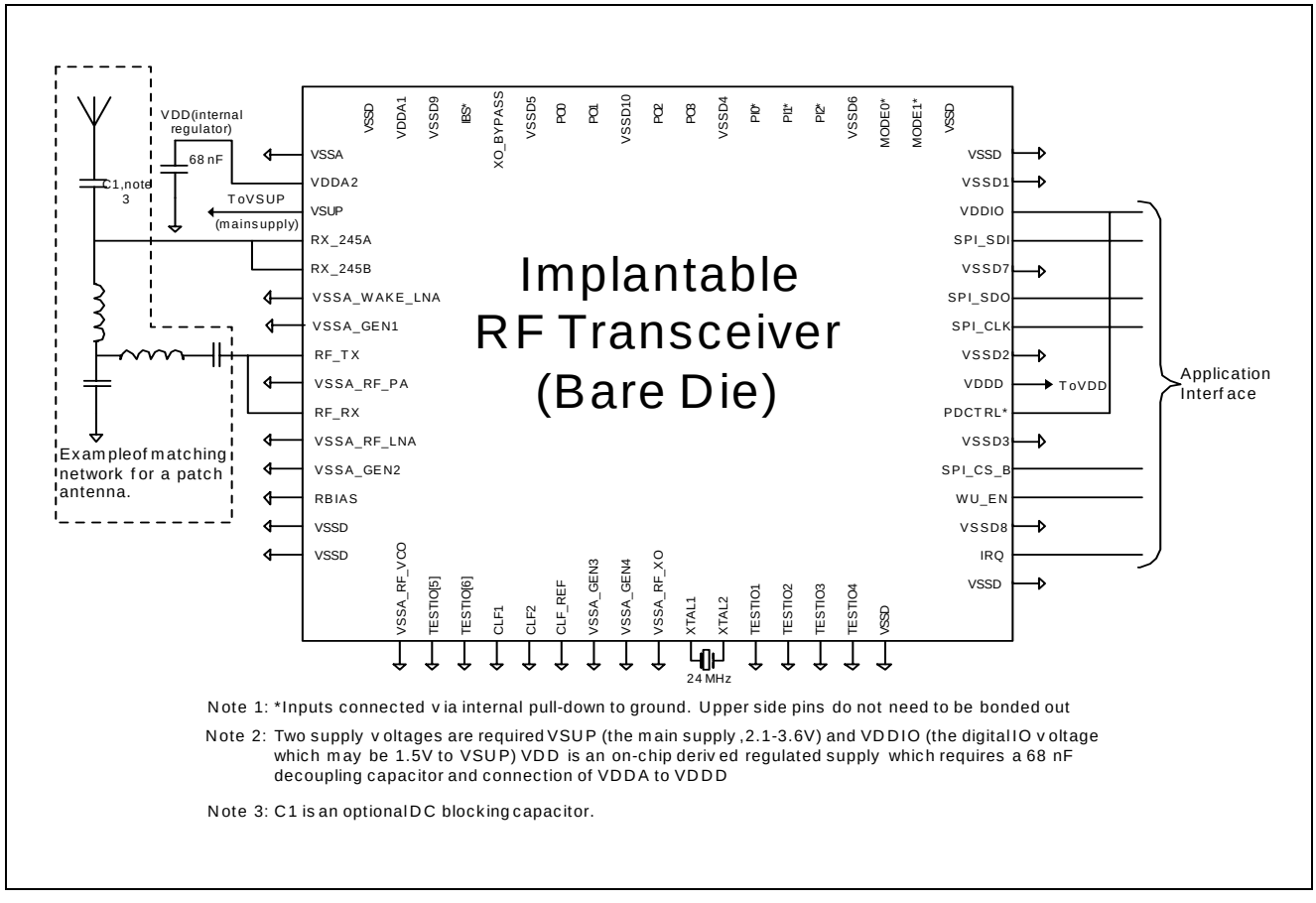
- Implantable Medical Device (IMD) Mode
- Basestation Mode

When configured as an IMD, the transceiver is usually asleep and in a very low current state. The IMD transceiver may be woken up by either receipt of a specially coded 2.45 GHz wakeup message or directly by the IMD processor via the WU_EN pin. This flexibility leads to the following options for waking up an IMD transceiver for communication.

- IMD transceiver woken up by specially coded 2.45 GHz wakeup message using an ultra low power sniffing method.
- IMD transceiver woken up to sniff 400 MHz link. The ZL70100 supports such a mode of operation although the 2.45 GHz wakeup system has lower power consumption.
- IMD transceiver woken to send an emergency message in which case no clear channel assessment by the Basestation is required.
- IMD transceiver woken up by a low frequency inductive link (as typically used in pacemakers/ICDs) or some alternative mechanism.

2.0 Example Configurations

The MICS Transceiver device is configurable as an Implant transceiver or as a Basestation transceiver. Typical configurations are shown in the following diagrams.

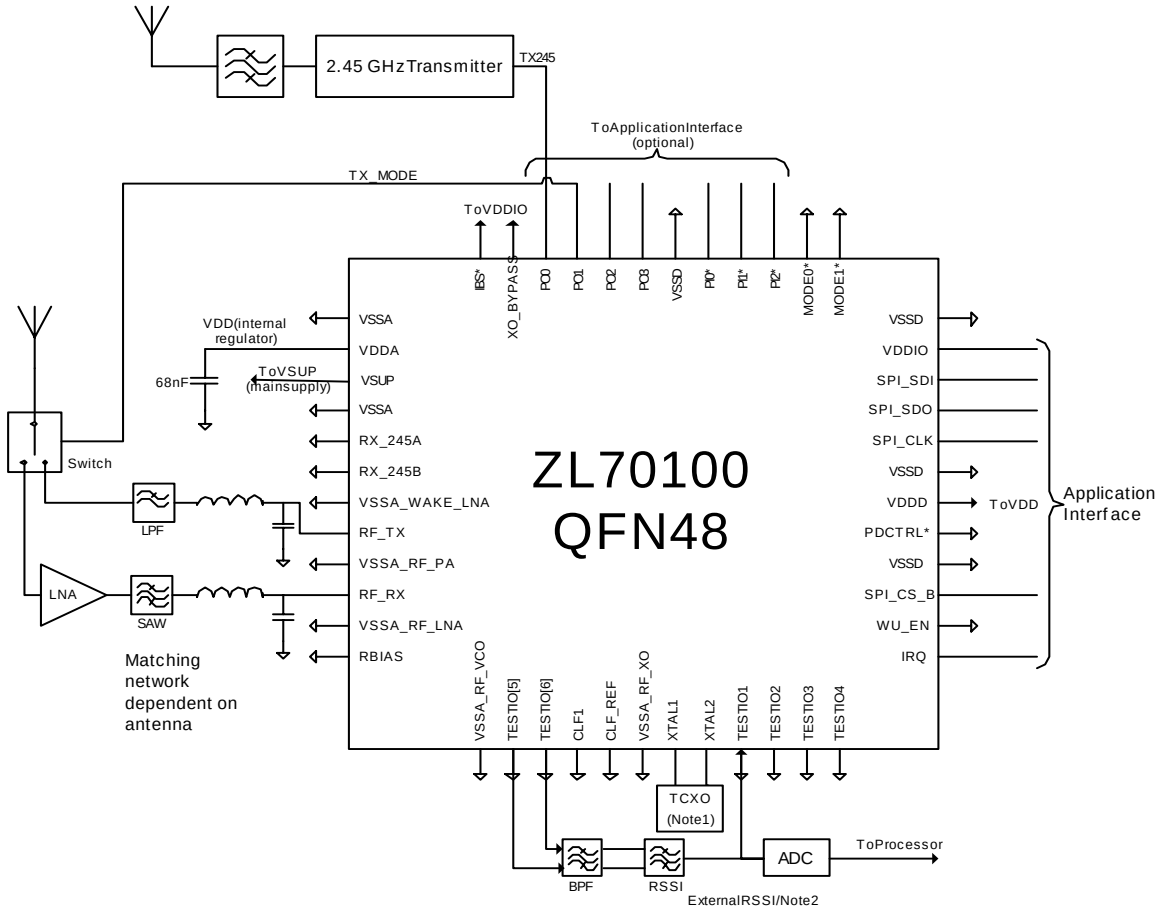


Note 1: *Inputs connected via internal pull-down to ground. Upper side pins do not need to be bonded out

Note 2: Two supply voltages are required VSUP (the main supply, 2.1-3.6V) and VDDIO (the digital IO voltage which may be 1.5V to VSUP) VDD is an on-chip derived regulated supply which requires a 68 nF decoupling capacitor and connection of VDDA to VDDD

Note 3: C1 is an optional DC blocking capacitor.

Figure 2 - MICS Transceiver Configured for an Implant



Note 1: For Basestation, a TCXO is recommended (in which case XO_BYPASS is tied high)

Note 2: External RSSI Detector System is recommended. Connection to be done either to MICS chip after RSSI or direct to application

Note 3: Two supply voltages are required VSUP (the main supply, 2.1-3.6V) and VDDIO (the digital IO voltage which may be 1.5V to VSUP) VDD is an on-chip derived regulated supply which requires a 68 nF decoupling capacitor and connection of VDDA to VDDD

Figure 3 - MICS Transceiver Configured for a Basestation

3.0 Electrical Characteristics

Absolute Maximum ratings - Voltages are with respect to ground (VSS) unless otherwise stated.

	Parameter	Symbol	Min.	Max.	Unit	Notes
1	Supply voltage	VSUP	0	3.6	V	
2	Input voltage (Digital IO)	VDDIO	0	3.6	V_{peak} rel. to VSS	
3	Storage temperature	T_{stg}	-40	+70	°C	

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Recommended Operating Conditions - Note1

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
4	Supply voltage	VSUP	2.1		3.5	V	
5	Input voltage (Digital IO)	VDDIO	1.5		VSUP	V	Note 2
6	Operating temperature	T_{op}	0		55	°C	

Note 1: The table above lists the external conditions under which the chip shall operate according to the specifications detailed within this document.

Note 2: Note that VDDIO must always be less than VSUP even during system startup.

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