Features

December 2009

- 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 < 1.5×10^{-10} BER.

- Very few external components (3 pcs + antenna matching)

- Extremely low power consumption (5 mA, continuous TX / RX, 1 mA low power mode)

- Ultra low power wakeup circuit (250 nA)

- Standards compatible (MICS, FCC, IEC)

Applications

- Implantable Devices e.g., Pacemakers, ICD's, 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	
ZL70101LDG1A	48 pin QFN*, for base stations** (trays, bake and drypack)
ZL70101UBJ	die, implantable grade (trays and drypack)
ZL70101LDG1 -	48 pin QFN*, for evaluation only** (not available in volume)

* Pb Free Matte Tin ** Not for implantable use

Description

The ZL70101 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.
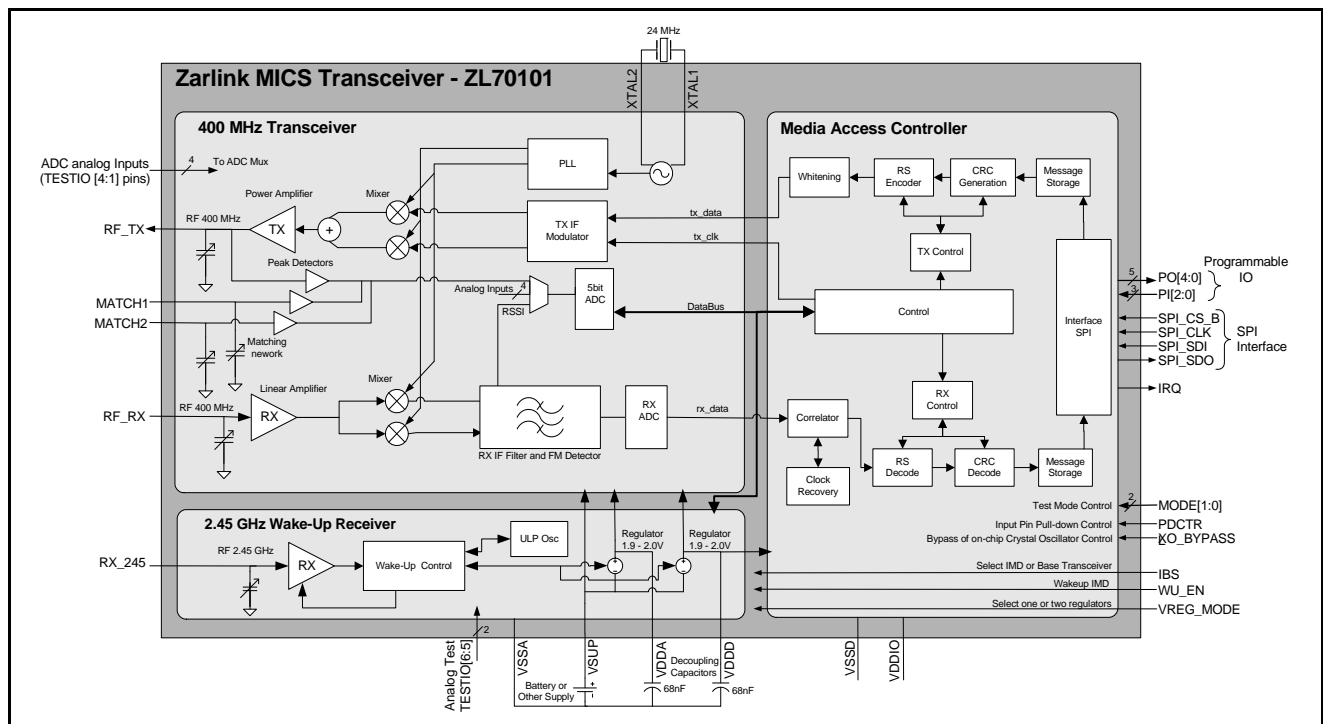

Figure 1 - ZL70101 Block Diagram

1

1.0 ZL70101 Functional Description

1.1 General

The ZL70101 is an ultra low power, high bandwidth RF link for medical implantable applications. It operates in the MICS (Medical Implant Communication Service) 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 1.5×10^{-10} is provided assuming a raw radio channel quality of 10^{-3} BER. An even higher quality of 2×10^{-14} BER is available using housekeeping messages, a facility fully described in the ZL70101 Design Manual.

1.2 Basic Operation and Modes

The ZL70101 transceiver is intended for operation in both an implant and base station. These systems have different requirements especially with regard to power consumption. Therefore, the ZL70101 transceiver has defined two fundamental startup modes of operation:

- Implantable Medical Device (IMD) Mode
- Base Mode

When configured as an IMD, the transceiver is usually asleep and in a very low current state. The IMD may be woken up to initiate communications by using a 2.45 GHz link 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 ZL70101 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 ZL70101 Transceiver device is configurable as an implant transceiver or as a base station transceiver. Typical configurations are shown in the following diagrams. Two different configurations for implants are shown, the first is optimized for few external components and the second is optimized for highest performance.
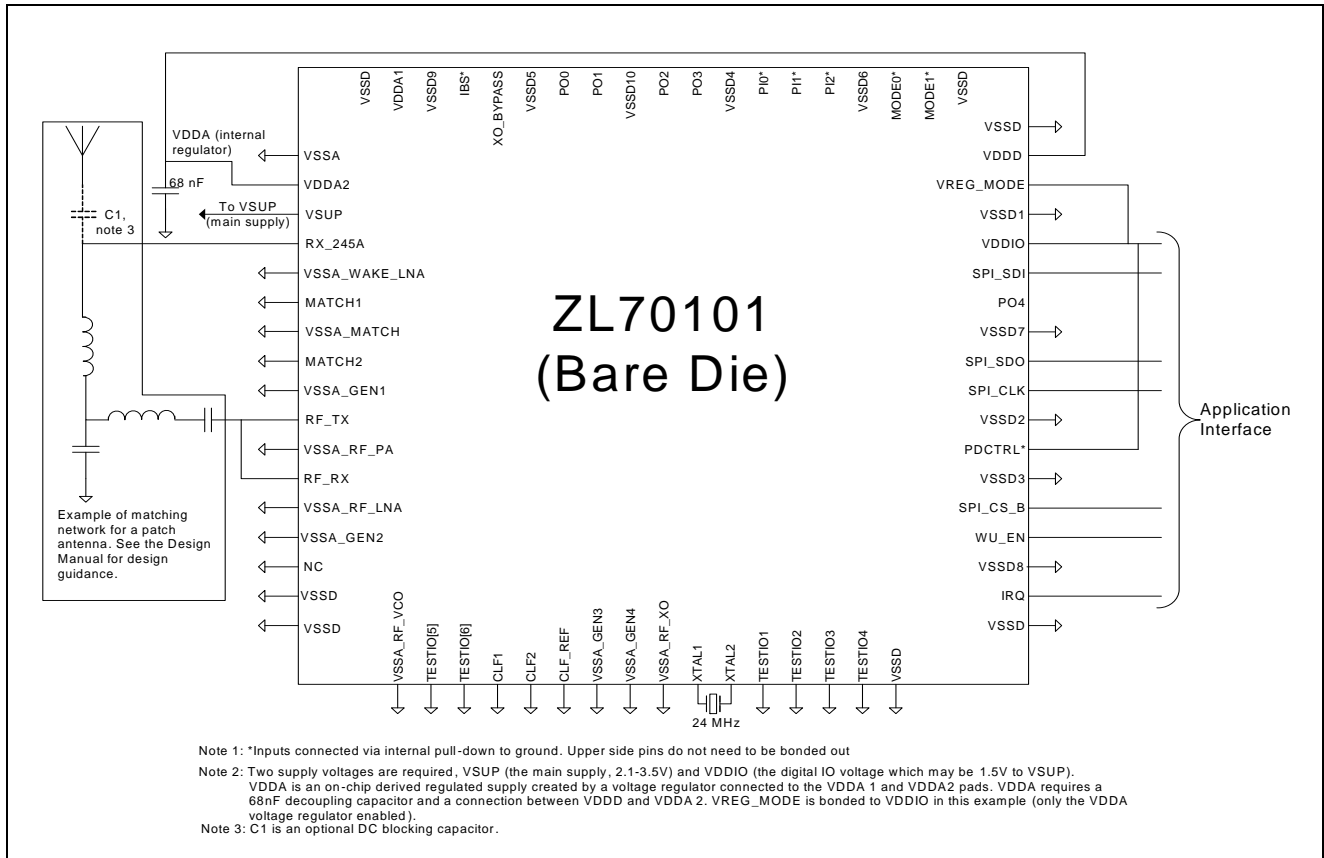

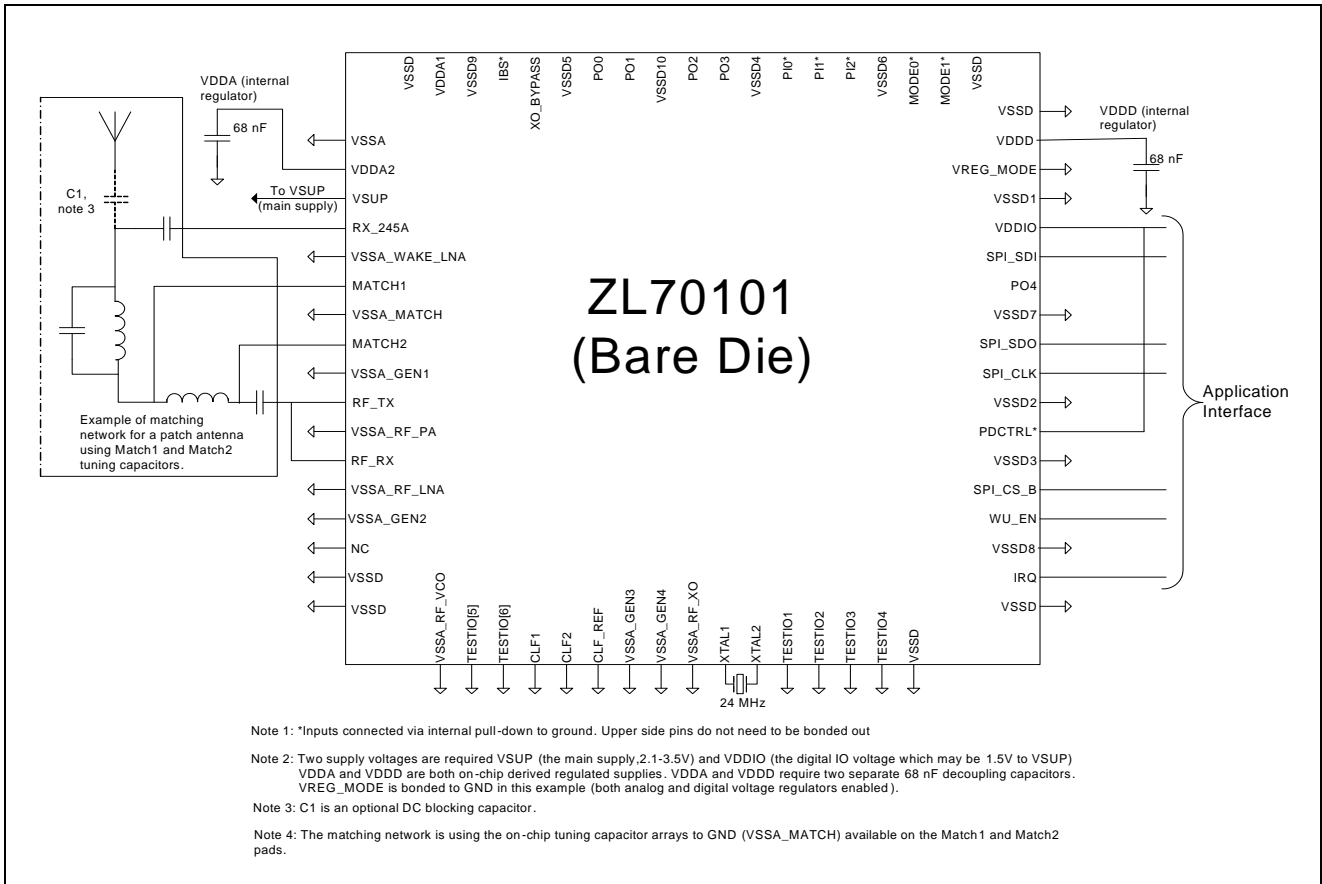**Figure 2 - ZL70101 Transceiver Configured for an Implant - Minimum External Components**

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Figure 3 - ZL70101 Transceiver Configured for an Implant - Optimal Performance
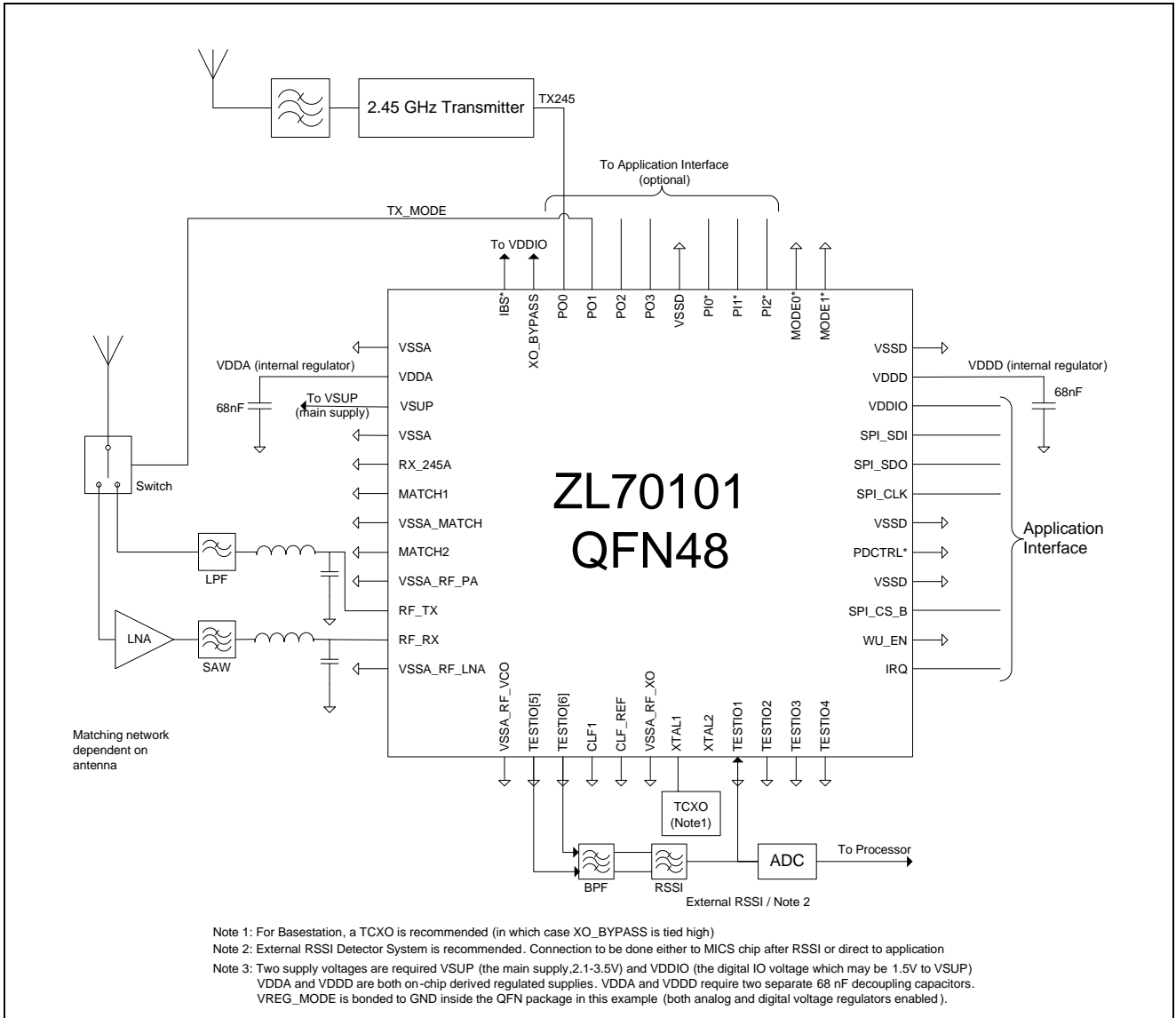
Figure 4 - ZL70101 Transceiver Configured for a Base Station

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,2.1-3.5V) and VDDIO (the digital IO voltage which may be 1.5V to VSUP) VDDA and VDDD are both on-chip derived regulated supplies. VDDA and VDDD require two separate 68 nF decoupling capacitors. VREG_MODE is bonded to GND inside the QFN package in this example (both analog and digital voltage regulators enabled).

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3.0 Mechanical Characteristics

3.1 48 pin QFN Package
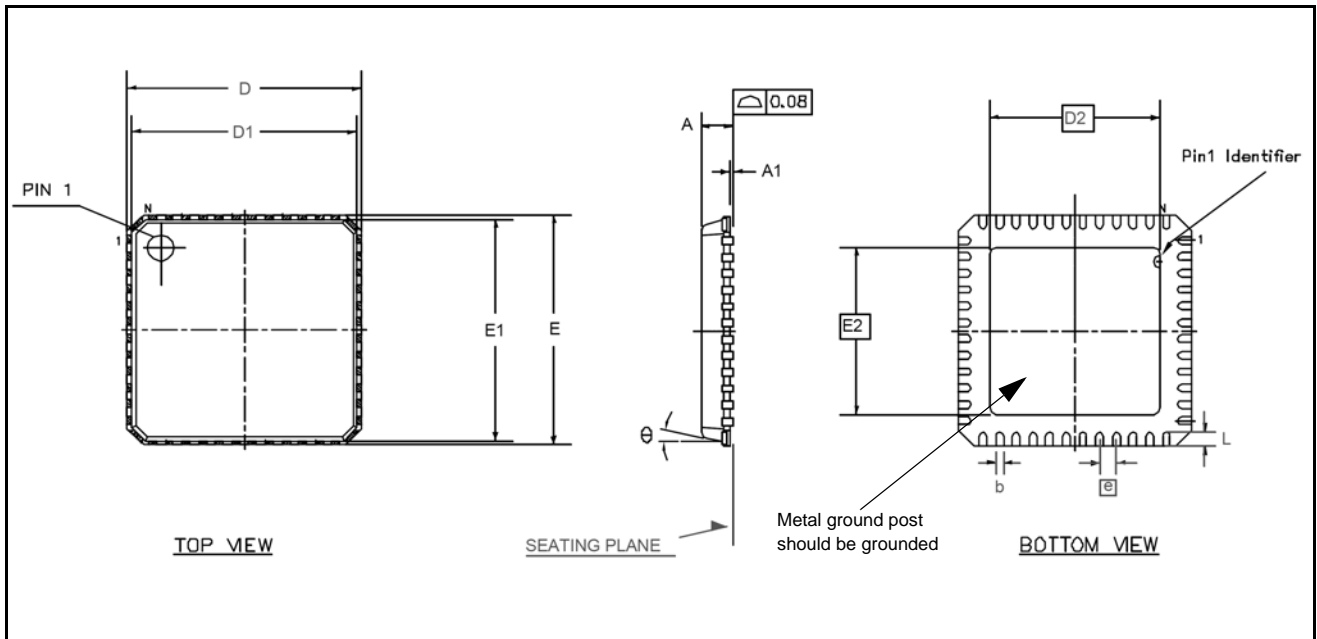
Figure 5 - 48 pin QFN Dimensions

SYMBOL	COMMON DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.800	0.850	0.900
A1	0.005	0.025	0.045
b	0.180	0.230	0.300
D	6.900	7.000	7.100
D1	6.650	6.750	6.850
D2	5.10 BSC		
E	6.900	7.000	7.100
E1	6.650	6.750	6.850
E2	5.10 BSC		
N	48		
Nd	12		
Ne	12		
e	0.50 BSC		
L	0.300	0.400	0.500
θ	10°	11°	12°

Conforms to JEDEC MO-220

NOTES: 1. DIMENSIONING & TOLERANCES CONFORM TO ASME Y14.5M. – 1994.
2. N IS THE NUMBER OF TERMINALS.
   Nd & Ne ARE THE NUMBER OF TERMINALS IN X & Y DIRECTION RESPECTIVELY.
3. ALL DIMENSIONS ARE IN MILLIMETERS.
4. LEAD COUNT IS 48
5. PACKAGE WARPAGE MAX 0.08mm.
6. NOT TO SCALE.

4.0   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	VSUP	V_{peak} rel. to VSS	
3	Unpowered Storage temperature	T_{stg}	-40	+125	°C	

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:   This table lists the external conditions under which the chip shall operate according to the specifications.

Note 2:   Note that VDDIO must never be higher than VSUP even during system startup.

5.0 Additional Information

5.1 Quality

Zarlink's QA procedures are based on MIL-PRF-38535 and MIL-STD 833.

ZL70101 can be delivered either as dies (ZL70101UBJ) or in a QFN package (ZL70101LDG1A), see ordering information on Page 1 for further details. The dies are suitable for implantable application but can also be used for non-implantable applications and base station applications. The QFN devices are only for non-implantable applications and base station applications.

The same chip is used for bare die and in the QFN packaged device. The QFN package and the assembly process are not qualified for implantable applications. The QFN devices can therefore not be used in implantable applications.

5.2 Technical Documentation

A Full Data sheet and a Design Manual are available for ZL70101. Please contact Zarlink for more information.

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**For more information about all Zarlink products
visit our Web Site at**

www.zarlink.com