CEL

MeshConnect™ Module

ZICM2410P0

Integrated Transceiver Modules for ZigBee / IEEE 802.15.4
Development Kit available: ZICM2410P0-KIT2-1

DESCRIPTION

CEL's MeshConnect**™** modules provide a high performance and low cost RF transceiver solution for 2.4 GHz IEEE 802.15.4 / ZigBee data links and wireless networks.

CEL's MeshConnect radio module leverages the advanced features of CEL's ZIC2410 transceiver platform. The ZIC2410 is a true single-chip solution, compliant with ZigBee specifications and IEEE 802.15.4, a complete wireless solution for all ZigBee applications. The ZIC2410 consists of an RF transceiver with baseband modem, a hardwired MAC and an embedded 8051 microcontroller with internal Flash memory. The device provides numerous general-purpose I/O pins, peripheral functions such as timers and UART and is one of the first devices to provide an embedded Voice CODEC. This device is also ideal for low power applications.

Unique in the market, the ZIC2410 offers extended data rates, supporting 500 kbps and 1 Mbps modes of operation. When combined with the voice codec the ZIC2410's high speed modes offers an excellent voice platform. The high level of integration reduces component count, lowers power consumption, and reduces overall system costs.

CEL's MeshConnect™ Module Platform

- 96 kB FLASH Memory
- 8 kB SRAM
- 8051 compatible single-cycle microcontroller core
- 22 GPIO Ports
- SPI (Master/Slave) + UART
- I²S/PCM Interface with two 128-byte FIFOs
- μ-law/a-law/ADPCM Voice Codec
- 4-channel 8-bit ADC

APPLICATIONS

Industrial Controls
- Food processing controls
- Traffic Management
- Sensor Networks
- Asset Management
- Barcode reader
- Patient Monitoring
- Glucose monitor
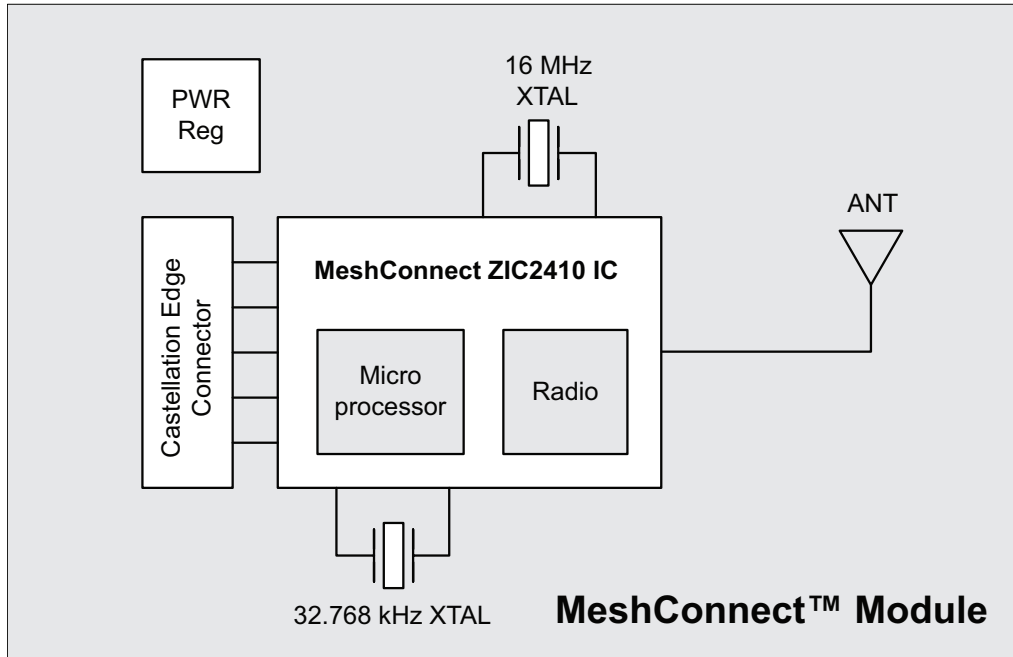
Home & Building Automation
- Security
- HVAC control
- Lighting control
- Thermostats

FEATURES

- High RF performance:
  - 103dB RF Link Budget
  - RX Sensitivity: -97 dBm @1.5V
  - RF TX Power: +6dBm @1.5V
- Scalable Data Rate: 250kbps for ZigBee, 500kbps and 1Mbps
- Miniature footprint: 1" x 1.350" (25.4 mm x 34.3 mm)
- Voice Codec Support: μ-law/a-law/ADPCM

- 4 Level Power Management Scheme w/ Deep Sleep Mode (0.3μA)
- Integrated PCB trace antenna
- 16 RF channels
- Over 3000 feet of range
- AES 128-bit encryption
- FCC, CE and IC certifications
- ROHS compliant

ORDERING INFORMATION

Part Number	Order Number	Supplying Form
ZICM2410P0 Series MeshConnect™ Module	**ZICM2410P0-1**	4 mW Output power, PCB Trace Antenna
	ZICM2410P0-1C	4 mW Output power, with U.FL Connector for external antenna
	ZICM2410P0-KIT2-1	Engineering Development Kit

The information in this document is subject to change without notice, please confirm data is current
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MODULE BLOCK DIAGRAM

DEVELOPMENT KIT

CEL's MeshConnect Development Kit assist users in both evaluation and development. As a stand-alone radio system, the kit allows users to place the modules in to the target environment and evaluate performance on-site. The MeshConnect Development Kit also serves as an invaluable aid in application development. Through the many interface headers on the board, the user has access to all the MeshConnect module pins enabling easy connection to target systems for application development. The key components of the MeshConnect Development Kits are the CEL's MeshConnect radio module and the interface board.

The MeshConnect module contains the CEL ZIC2410 transceiver IC, Crystals, Power Regulator and an integrated PCB antenna with a connector for an external antenna (optional). The interface board features a serial communication interface, a power management module, and peripherals such as potentiometers, LEDs, and GPIO headers. The Development Kit also contains four AA batteries and two USB cables.

For more detail information regarding MeshConnect Development Kit, refer to the ZICM2410P0-KIT2-1 Development Kit User Guide document. (Available at CEL's website **http://www.cel.com**)

Kit Contents:
· **Evaluation Boards with Module (3)**
· **Network Analyzer (1)**
· **Antennas (1)**
· **USB Cables (2)**
· **Jumpers (10)**
· **AA Batteries (4)**
· **Universal AC/DC Power Supply (2)**
· **Software and Technical Information CD (2)**

Order Number	Description
ZICM2410P0-KIT2-1	Engineering Development Kit

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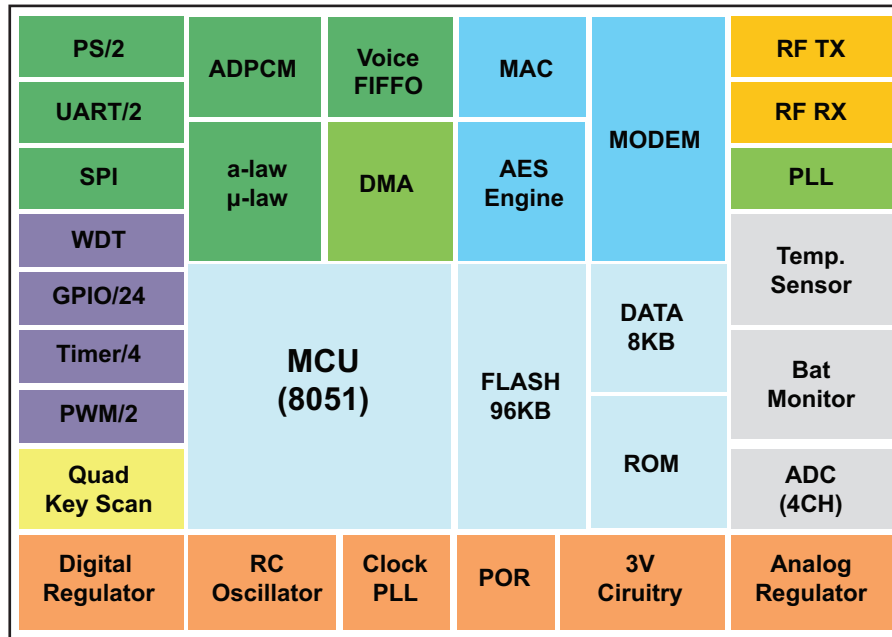
TRANSCEIVER IC

A true monolithic solution, the CEL ZIC2410 IEEE 802.15.4/ZigBee IC incorporates the RF transceiver with baseband modem, a hardwired MAC, and an embedded 8051 microcontroller, offering an excellent low cost high performance solution for all IEEE 802.15.4 / ZigBee applications.

PS/2	ADPCM	Voice FIFFO	MAC	MODEM	RF TX
UART/2	ADPCM	Voice FIFFO	MAC	MODEM	RF RX
SPI	a-law μ-law	DMA	AES Engine	MODEM	PLL
WDT	a-law μ-law	DMA	AES Engine	MODEM	Temp. Sensor
GPIO/24	MCU (8051)	MCU (8051)	FLASH 96KB	DATA 8KB	Temp. Sensor
Timer/4	MCU (8051)	MCU (8051)	FLASH 96KB	DATA 8KB	Bat Monitor
PWM/2	MCU (8051)	MCU (8051)	FLASH 96KB	ROM	Bat Monitor
Quad Key Scan	MCU (8051)	MCU (8051)	FLASH 96KB	ROM	ADC (4CH)
Digital Regulator	RC Oscillator	Clock PLL	POR	3V Ciruitry	Analog Regulator

With an industry best +6 dBm output power, the ZIC2410 will support a wide a variety of applications without the need for external amplification. Combined with a highly sensitive -97 dBm receiver the ZICM2410P0 leads the industry with 103 dB link budget.

In addition to excellent RF performance at ZigBee (250 kbps) data rates, the ZIC2410 adds high speed modes, Turbo (500 kbps) and Premium (1 Mbps), for networks looking for increased throughput. The device provides numerous general-purpose I/O pins, peripheral functions such as timers and UART and is one of the first devices to provide an embedded Voice CODEC.

CEL provides its customers with the CEL ZigBee Stack as part of the software library. Also available are the hardware & software tools required to develop custom applications.

The combination of industry leading link budget, high speed RF, and integrate voice CODEC make the ZIC2410 a truly distinct single chip solution.

ANTENNA

CEL's MeshConnect modules include an integrated Printed Circuit Board (PCB) trace antenna. An optional u.FL connector can be specified, providing connection to a 50-ohm external antenna of the user's choice. See Ordering Information on page 1.

The PCB antenna employs an F-Antenna topology that is compact and supports an omni-directional radiation pattern. To maximize antenna efficiency, an adequate ground plane must be provided on the host PCB. Correctly positioned, the ground plane on the host PCB (but not directly under the F-Antenna). Correctly positioned, the ground plane on the host PCB board under the module will contribute significantly to the antenna performance. The position of the module on the host board and overall design of the product enclosure contribute to antenna performance. Poor design affects radiation patterns and can result in reflection, diffraction, and/or scattering of the transmitted signal.

Here are some design guidelines to help ensure antenna performance:
- Never place the ground plane or route copper traces directly underneath the antenna portion of the module.
- Never place the antenna close to metallic objects.
- In the overall design, ensure that wiring and other components are not placed near the antenna.
- Do not place the antenna in a metallic or metalized plastic enclosure.
- Keep plastic enclosures 1cm or more from the antenna in any direction.

For optimum antenna performance, the MeshConnect modules should be mounted with the PCB trace antenna overhanging the edge of the host board. To further improve performance, a ground plane may be placed on the host board under the module, up to the antenna. The installation of an uninterrupted ground plane on a layer directly beneath the module will also allow you to run traces under this layer. CEL can provide assistance with your PCB layout.

MODES OF OPERATION

There are three power down modes in the ZIC2410. Each mode can be set using the PDMODE [1:0] bits in the PDCON register and power down modes can be started by setting the PDSTART bit to 1. Each mode has a different current consumption and wake-up sources, please refer to the ZIC2410 datasheet for further information on the available power down modes. Table 8 describes the three power down modes.

Table 8 – Power Down Modes

PDMODE [1:0]	Description	Wake-Up Source	Regulator for Digital block
0	Active (Normal Operation)	-	-
1	PM1 mode	Hardware Reset, Sleep Timer interrupt, External interrupt	ON
2	PM2 mode	Hardware Reset, Sleep Timer interrupt, External interrupt	OFF (After wake-up, register configuration is required)
3	PM3 mode	Hardware Reset, External interrupt	OFF (After wake-up, register configuration is required)

POWER AMPLIFIER

The MeshConnect module does not incorporate an external Power Amplifier and therefore the RF output port is connected directly (through matching components) to the RF antenna. As CEL's ZIC2410 IEEE 802.15.4 / ZigBee transceiver already offers the industry's best link budget at 106 dB, even without an external PA the MeshConnect can maintain wireless connection over long distance (3,000 ft line-of-sight).

INTERFACE

The MeshConnect has all major communication interfaces routed from the ZIC2410 to the module edge connectors:

> • UART1 & UART 2
> • I²S
> • SPI

VOICE CODEC

ZIC2410 includes three voice codec algorithms: µ-law, a-law and ADPCM.

The µ-law algorithm is a companding algorithm primarily used in the digital telecommunication systems of North America and Japan. As with other companding algorithms, its purpose is to reduce the dynamic range of an audio signal. In the analog domain this can increase the signal-to-noise ratio (SNR) achieved during transmission and in the digital domain, it can reduce the quantization error (hence increasing signal to quantization noise ratio). These SNR improvements can be traded for reduced bandwidth and equivalent SNR instead. The a-law algorithm is a standard companding algorithm used in European digital communications systems to optimize/modify the dynamic range of an analog signal for digitizing.

The a-law algorithm provides a slightly larger dynamic range than the µ-law at the cost of worse proportional distortion for small signals.

Adaptive DPCM (ADPCM) is a variant of DPCM [Differential (or Delta) pulse-code modulation] that varies the size of the quantization step, allowing further reduction of the required bandwidth for a given signal-to-noise ratio. DPCM encodes the PCM values as differences between the current and the previous value. For audio applications this type of encoding reduces the number of bits required per sample by about 25% compared to PCM.

SOFTWARE TOOLS

CEL offers complete SW tools for MeshConnect that customers need to create their ZigBee application.

PROFILE BUILDER

> • Profile Builder allows for easy creation of custom ZigBee profiles for use in end-user applications.
>
> • Uses the input requirements to modify a set of 'C' source files which include the necessary ZigBee functions.
>
> • Output files will contain the ZigBee Device Object (ZDO) descriptors and the ZigBee Device Profile (ZDP) descriptors.
>
> • The ZDO and ZDP define the ZigBee node and functionality.

The output files can be seamlessly integrated with the CEL ZigBee stack libraries.

SOFTWARE TOOLS *(Continued)*

DEVICE PROGRAMMER

- Device Programmer is used to program the application firmware to the on-chip Flash program memory of the ZIC2410 device.

- Device Programmer supports:

    - <u>ISP Mode</u>: Download the firmware from the host PC via serial communication through the ZIC2410's UART1 interface.

        - The evaluation boards utilize a USB -> Serial converter.

    - <u>OTA Mode</u>: Download the firmware from the host PC using wireless communication (Over-The-Air).

        - This requires two nodes, the host (connected to a PC) and the target device to be programmed.

Device Programmer can read / write hardware information (i.e. IEEE Address, Channel #, etc) directly via the aforementioned communication modes.

PROFILE SIMULATOR

- Profile Simulator is used to simulate and test a ZigBee network consisting of a coordinator, router and / or end devices.

- Profile Simulator includes:

    - <u>Device Manager</u>: Setting parameters of a ZigBee node.

    - <u>Bind Manager</u>: Managing "bindings" in a ZigBee network.

    - <u>ZStack manager</u>: Setting parameters of a ZigBee network.

    - <u>ZigBee Device Wizard</u>: Selects network configuration during ZigBee network formation.

Can be used to generate ZigBee standard primitive functions for MAC, NWK and APS layers and the ZDO and APP.

PACKET ANALYZER AND WIRELESS NETWORK ANALYZER

- Packet Analyzer monitors traffic over a wireless network channel by capturing RF packet data in real-time.

- Packet Analyzer requires the Wireless Network Analyzer to "sniff" the RF packets.

- Packet Analyzer also includes diagnostic tools:

    - <u>Energy Scan</u>: Evaluates the received signal power within the bandwidth of an IEEE 802.15.4 channel yielding available channels.

    - <u>Active Scan</u>: Scanning for active Coordinators and Routers broadcasting a Beacon frame.

- Packet Analyzer is capable of displaying network configuration (i.e. tree vs. star), network nodes, packet details, etc.

- Can be used in conjunction with any IEEE 802.15.4 or ZigBee network.

KEIL 8051 DEVELOPMENT TOOLS (Evaluation version provided in development kit).

- Supports all 8051 derivatives and variants.

- Easy-to-Use μVision Integrated Development Environment (IDE) supports the complete development cycle.

- Supports memory banking for CODE and variables beyond the 64 kbyte threshold.

Numerous optimization levels yield the ability to place more features into less memory providing the utmost code density.

ABSOLUTE MAXIMUM RATINGS

Description	Min	Max	Unit
Power Supply Voltage (Vcc)	-0.3	3.3	VDC
Voltage on any digital pin	-0.3	3.3	VDC
Input RF Level		10	dBm
Storage Temperature	-55	125	°C
Reflow Soldering Temperature		260	°C

Note: Exceeding the maximum ratings may cause permanent damage to the module or devices.

RECOMMENDED (OPERATING CONDITIONS)

Description	Min	Typ	Max	Unit
Operating ambient temperature range, T_A	-40	25	85	°C
Operating Supply Voltage	2.1		3.0	VDC
Crystal Reference Oscillator		16		MHz

DC CHARACTERISTICS *(@ 25°C, VCC = 3.0V unless otherwise noted)*

Description	Min	Typ	Max	Unit
Vcc Supply (Vcc)	2.1		3.3	VDC
RX mode Current (Vcc = 3.0V)	33	35	38	mA
TX mode Current (Vcc = 3.0V)	40	44	48	mA
Sleep Mode (Deep) Current			< 1.0	µA

RF CHARACTERISTICS *(@ 25°C, VCC = 3.0V unless otherwise noted)*

Description	Min	Typ	Max	Unit
Frequency Band (16 – 5MHz wide channels)	2.405		2.480	GHz
RX Sensitivity for 1% PER		-97	-90	dBm
TX Output Power	4.8	6.1	6.8	dBm
Error Vector Magnitude		17	35	%

Adjacent Channel Rejection
  +/- 5 MHz
  +/- 10 MHz
		47
		51
				dB

Frequency Error Tolerance			40	ppm
Output Power Control Range		30		dB
Over the Air Data Rate		250		kbps
Harmonics (2nd & 3rd)		-41.2		dBm/MHz

PIN SIGNALS I/O PORT CONFIGURATION

MeshConnect module has 56 edge I/O interfaces for connection to the user's host board. The MeshConnect Module Dimensions shows the layout of the 56 edge castellations.
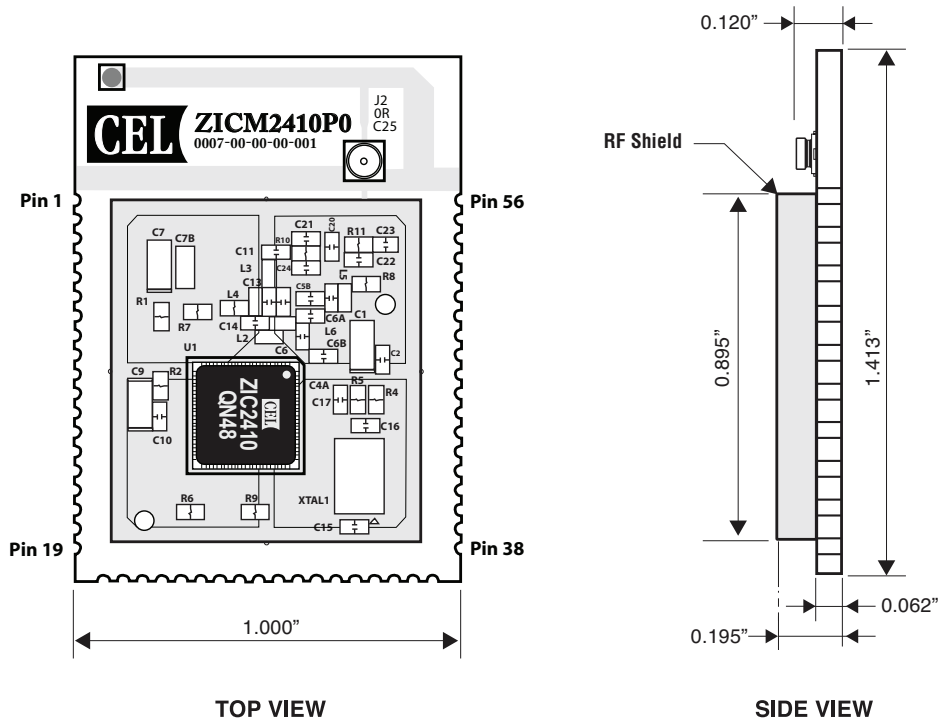
MeshConnect I/O PIN ASSIGNMENTS

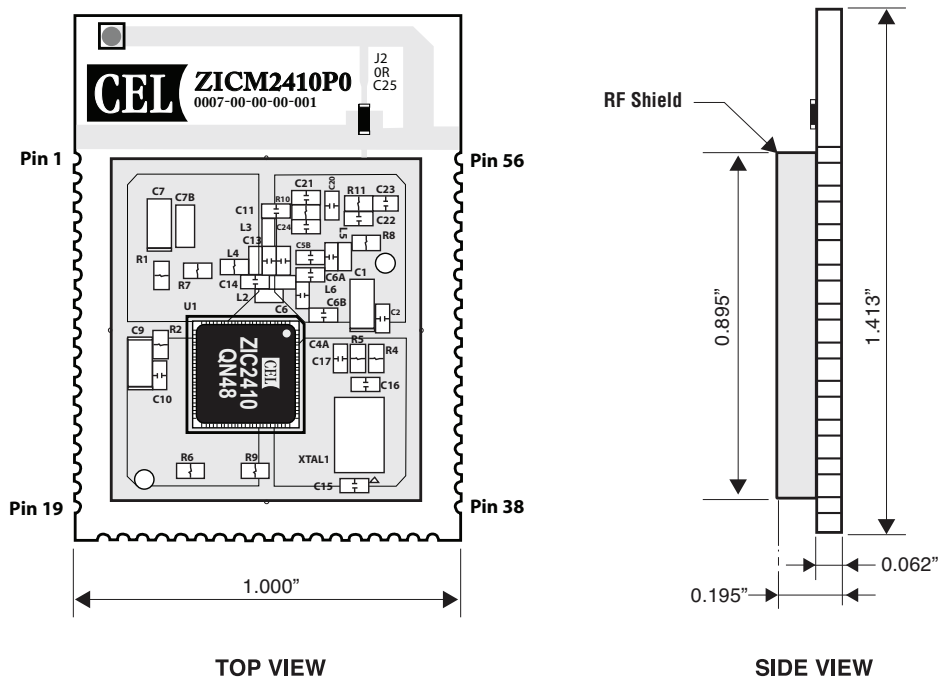| Pin #	Name	Type	Description	IC Pin #
1	GND4	RF GND	RF Ground	
2	GND3	RF GND	RF Ground	
3	MS1	Control Input	Mode Select, Bit #1. Active Low Internal Voltage Regulator Enable: 0: Internal Voltage Regulator Enabled 1: Internal Voltage Regulator Disabled, Supply Analog and Digital Supply Voltages Externally	14
4	GND0	RF GND	RF Ground	
5	MS0	Control Input	Mode Select, Bit #0. This pin should be connected to Ground externally.	13
6	NC2	N/C	No Connect	
7	GND20	GND	Digital Ground	49
8	GND12	GND	Digital Ground	49
9	GND13	GND	Digital Ground	49
10	GND17	GND	Digital Ground	49
11	GND5	GND	Digital Ground	49
12	ACH0	Analog Input	A/D Channel #0 Input, 0 - 1.5 Volts.	8
13	ACH1	Analog Input	A/D Channel #1 Input, 0 - 1.5 Volts.	9
14	ACH2	Analog Input	A/D Channel #2 Input, 0 - 1.5 Volts.	10
15	ACH3	Analog Input	A/D Channel #3 Input, 0 - 1.5 Volts.	11
16	P1_7	Digital Output	8051 GPIO P1.7 (Output Only) Alternate Functions: P0AND	20
17	P1_6	Digital I/O	8051 GPIO P1.6 Alternate Functions: N/A	21
18	P1_4	Digital I/O	8051 GPIO P1.4 Alternate Functions: QUADZB / Sleep Timer Oscillator Input	22
19	P1_3	Digital I/O	8051 GPIO P1.3 Alternate Functions: QUADZA / Sleep Timer Oscillator Output / RTCLKOUT	23
20	GND9	GND	Digital Ground	49
21	GND8	GND	Digital Ground	49
22	GND7	GND	Digital Ground	49
23	P1_1	Digital I/O	8051 GPIO P1.1 Alternate Functions: TXD1	24
24	VCC_3V	Power Input	Power Supply Input for Internal Voltage Regulators and Digital I/Os. VCC = 3.0 Volts	7
25	P1_0	Digital I/O	8051 GPIO P1.0 Alternate Functions: RXD1	26
26	P3_7	Digital I/O	8051 GPIO P3.7 (12 mA Drive) Alternate Functions: PWM3 / CTS1 / SPICSN	27
27	P3_6	Digital I/O	8051 GPIO P3.6 (12 mA Drive) Alternate Functions: PWM2 / RTS1 / SPICLK	28
28	P3_5	Digital I/O	8051 GPIO P3.5 Alternate Functions: T1 / CTS0 / QUADYB / SPIDO	29
29	P3_4	Digital I/O	8051 GPIO P3.4 Alternate Functions: T0 / RTS0 / QUADYA / SPIDI	30
30	GND10	GND	Digital Ground	49

MeshConnect I/O PIN ASSIGNMENTS *(Continued)*

Pin #	Name	Type	Description	IC Pin #
31	P3_3	Digital I/O	8051 GPIO P3.3 Alternate Functions: INT1 (Active Low)	31
32	P3_2	Digital I/O	8051 GPIO P3.2 Alternate Functions: INT0 (Active Low)	32
33	GND11	GND	Digital Ground	49
34	P3_1	Digital I/O	8051 GPIO P3.1 Alternate Functions: TXD0 / QUADXB	33
35	P3_0	Digital I/O	8051 GPIO P3.0 Alternate Functions: RXD0 / QUADXA	35
36	GND6	GND	Digital Ground	49
37	P0_7	Digital I/O	8051 GPIO P0.7 Alternate Functions: I2STX_MCLK	36
38	P0_6	Digital I/O	8051 GPIO P0.6 Alternate Functions: I2STX_BCLK	37
39	P0_5	Digital I/O	8051 GPIO P0.5 Alternate Functions: I2STX_LRCLK	38
40	P0_4	Digital I/O	8051 GPIO P0.4 Alternate Functions: I2STX_DO	39
41	P0_3	Digital I/O	8051 GPIO P0.3 Alternate Functions: I2SRX_MCLK	40
42	P0_2	Digital I/O	8051 GPIO P0.2 Alternate Functions: I2SRX_BCLK	41
43	P0_1	Digital I/O	8051 GPIO P0.1 Alternate Functions: I2SRX_LRCLK	42
44	P0_0	Digital I/O	8051 GPIO P0.0 Alternate Functions: I2SRX_DI	43
45	DVDD_1_5	Power I/O	Digital Power Supply I/O: Input: When the Mode Select Bit #1 (MS1, Module Pin #3) is tied high this pin functions as the 1.5 Volt power supply input for the Digital Core. Output: When the Mode Select Bit #1 (MS1, Module Pin #3) is tied low this pin functions as the output of the Internal Digital Voltage Regulator (1.5 Volts).	19
46	ISP	Control Input	Mode Select, Bit #2. Active High In-System Programming (ISP) Input: 0: Normal Mode 1: ISP Mode	15
47	RESET#	Control	Reset (Active Low)	17
48	AVDD_1_5	Power I/O	Analog Power Supply I/O: Input: When the Mode Select Bit #1 (MS1, Module Pin #3) is tied high this pin functions as the 1.5 Volt power supply input for the Mixer, VGA and LPF. Output: When the Mode Select Bit #1 (MS1, Module Pin #3) is tied low this pin functions as the output of the Internal Analog Voltage Regulator (1.5 Volts).	6
49	GND14	GND	Digital Ground	49
50	GND15	GND	Digital Ground	49
51	GND16	GND	Digital Ground	49
52	GND18	GND	Digital Ground	49
53	GND19	GND	Digital Ground	49
54	NC1	N/C	No Connect	
55	GND1	RF GND	RF Ground	
56	GND2	RF GND	RF Ground	

MODULE DIMENSIONS

MeshConnect ZICM2410P0-1C

TOP VIEW

SIDE VIEW

MeshConnect ZICM2410P0-1

TOP VIEW

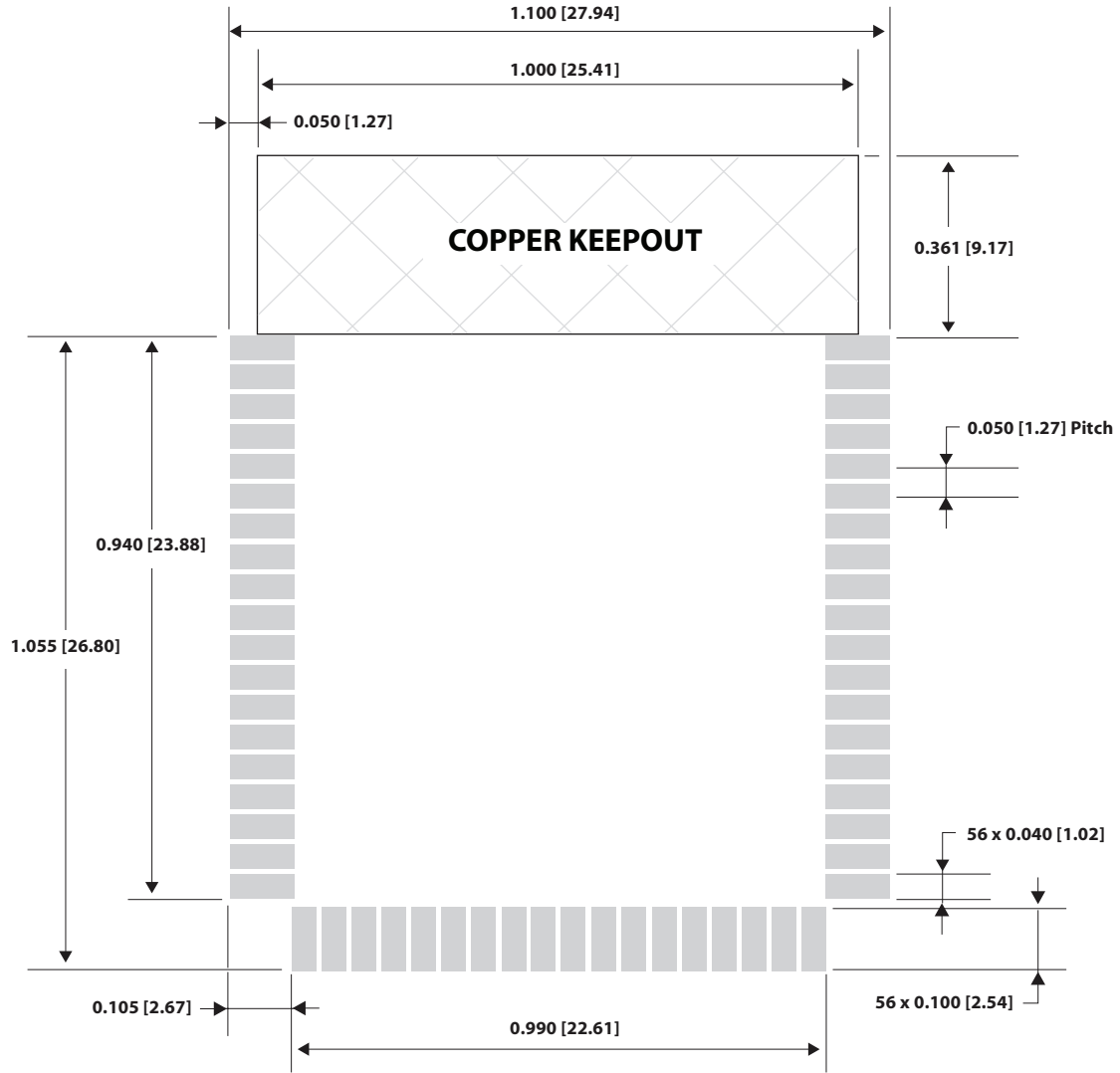SIDE VIEW

For layout recommendation for optimum antenna performance, refer to Antenna section in this document.

MODULE LAND FOOTPRINT

Note: Unless otherwise specified. Dimensions are in Inches [mm].

PROCESSING

Recommended Reflow Profile

Parameters Values	
Ramp up rate (from Tsoakmax to Tpeak)	3º/sec max
Minimum Soak Temperature	150ºC
Maximum Soak Temperature	200ºC
Soak Time	60-120 sec
TLiquidus	217ºC
Time above TL	60-150 sec
Tpeak	260 + 0ºC
Time within 5º of Tpeak	20-30 sec
Time from 25º to Tpeak	8 min max
Ramp down rate	6ºC/sec max

Achieve the brightest possible solder fillets with a good shape and low contact angle.

Pb-Free Soldering Paste

Use of "No Clean" soldering paste is strongly recommended, as it does not require cleaning after the soldering process.

Note: The quality of solder joints on the castellations ('half vias') where they contact the host board should meet the appropriate IPC Speci-fication. See **IPC-A-610-D "**Acceptability of Electronic Assemblies, section 8.2.4 Castellated Terminations."

Cleaning

In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process.

- Cleaning with water can lead to capillary effects where water is absorbed into the gap between the host board and the module. The combination of soldering flux residuals and encapsulated water could lead to short circuits between neighboring pads. Water could also damage any stickers or labels.
- Cleaning with alcohol or a similar organic solvent will likely flood soldering flux residuals into the two housings, which is not accessible for post-washing inspection. The solvent could also damage any stickers or labels.
- Ultrasonic cleaning could damage the module permanently.

The best approach is to consider using a "no clean" soldering paste and eliminate the post-soldering cleaning step.

Optical Inspection

After soldering the Module to the host board, consider optical inspection to check the following:
- Proper alignment and centering of the module over the pads.
- Proper solder joints on all pads.
- Excessive solder or contacts to neighboring pads, or vias.

Repeating Reflow Soldering

Only a single reflow soldering process is encouraged for host boards.

Wave Soldering

If a wave soldering process is required on the host boards due to the presence of leaded components, only a single wave soldering process is encouraged.

PROCESSING *(Continued)*

Hand Soldering
Hand soldering is possible. Use a soldering iron temperature setting equivalent to 350°C, follow IPC recommendations/ reference document IPC-7711.

Rework
The MeshConnect Module can be unsoldered from the host board. Use of a hot air rework tool and hot plate for pre-heating from underneath is recommended. Avoid overheating.

Warning Never attempt a rework on the module itself, e.g. replacing individual components. Such actions will terminate warranty coverage.

Additional Grounding
Attempts to improve module or system grounding by soldering braids, wires, or cables onto the module RF shield cover is done at the customer's own risk. The numerous ground pins at the module perimeter should be sufficient for optimum immunity to external RF interference.

AGENCY CERTIFICATIONS

FCC Compliance Statement (Part 15.19) Section 7.15 of RSS-GEN
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)
Changes or modifications not expressly approved by CEL could void the user's authority to operate the equipment.

20 cm Separation Distance
To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

OEM Responsibility to the FCC Rules and Regulations
The MeshConnect Module has been certified per FCC Part 15 rules for integration into products without further testing or certification. To fulfill the FCC certification requirements, the OEM of the MeshConnect Module must ensure that the information provided on the MeshConnect Label is placed on the outside of the final product. The MeshConnect Module is labeled with its own FCC ID Number. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: W7Z-ZIC2410P0" or "Contains FCC ID: W7Z-ZIC2410P0"

The OEM of the MeshConnect Module must only use the approved antenna, (PCB Trace Antenna) that has been certified with this module. The OEM of the MeshConnect Module must test their final product configuration to comply with Unintentional Radiator Limits before declaring FCC compliance per Part 15 of the FCC rules.

AGENCY CERTIFICATIONS *(Continued)*

IC Certification — Industry Canada Statement

The term "IC" before the certification / registration number only signifies that the Industry Canada technical specifications were met.

Section 14 of RSS-210

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population. Consult Safety Code 6, obtainable from Health Canada's website: http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/99ehd-dhm237/index-eng.php

CE Certification — Europe

The MeshConnect RF module has been tested and certified for use in the European Union.

OEM Responsibility to the European Union Compliance Rules

If the MeshConnect module is to be incorporated into a product, the OEM must verify compliance of the final product to the European Harmonized EMC and Low-Voltage / Safety Standards. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive.

The manufacturer must maintain the user's guide and adhere to the settings described in the manual for maintaining European Union Compliance. If any of the specifications are exceeded in the final product, the OEM is required to make a submission to the notified body for compliance testing.

OEM Labeling Requirements

The `CE' mark must be placed on the OEM product in a visible location.
The CE mark shall consist of the initials "CE" with the following form:

- · If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be adhered to.
- · The CE mark must be a minimum of 5mm in height
- · The CE marking must be affixed visibly, legibly, and indelibly. Since the 2400 - 2483.5 MHz band is not harmonized by a few countries throughout Europe, the Restriction sign must be placed to the right of the "CE" marking as shown in the picture

SHIPMENT, HANDLING, AND STORAGE

Shipment

The MeshConnect Modules are delivered in trays of 28.

Handling

The MeshConnect Modules are designed and packaged to be processed in an automated assembly line.

Warning The MeshConnect Modules contain highly sensitive electronic circuitry. Handling without proper ESD protection may destroy or damage the module permanently.

Warning According to JEDEC ISP, the MeshConnect Modules are moisture-sensitive devices. Appropriate handling instructions and precautions are summarized in Section 2.1. Read carefully to prevent permanent damage due to moisture intake.

Moisture Sensitivity Level (MSL)

MSL 3, per J-STD-033

Storage

Storage/shelf life in sealed bags is 12 months at <40°C and <90% relative humidity.

REFERENCES & REVISION HISTORY

Previous Versions	Changes to Current Version	Page(s)
0007-00-07-00-000 (Issue A) February 05, 2009	Initial preliminary datasheet.	N/A
0007-00-07-00-000 (Issue B) June 11, 2009	Updated Development Kit and Agency Certification	2, 14, 15

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