

The MeshConnect™ EM357 module (ZICM357P2) is based on the *Ember EM357 system on chip (SoC)*. The module includes a high performance Renesas power amplifier that increases power out to +20 dBm, making it one of the most powerful modules on the market. With its 120 dB link budget, the module provides range up to 2.5 miles, ensuring reliable transmission even in harsh environments and reducing the number of nodes needed in the network. The increased output power also provides better interior penetration from devices installed outside the home such as smart meters that need to connect to devices inside the home. The MeshConnect EM357 module also integrates 1 MB of flash memory which enables over-the-air programming updates in the field.

The MeshConnect EM357 module is compliant with ZigBee Alliance specifications and IEEE 802.15.4, making it applicable for all ZigBee applications and profiles. The SoC consists of an RF transceiver with a baseband modem, a hardwired MAC and an embedded 32-bit ARM® Cortex™-M3 microcontroller with internal RAM (12kB) and flash (192kB) memory. The SoC provides numerous general-purpose I/O pins and peripheral functions such as timers and UARTs enabling customers to access a rich mix of on-chip functionality.

A complete development kit is available including evaluation boards, software tools, and cables which help engineering staff quickly develop their end product.

CEL's MeshConnect™ line of 802.15.4/ZigBee products delivers industry-leading range, high performance, and a rich feature set at low cost. CEL's design examples, reference designs, and engineering support help customers get their product designs to market quickly. Key applications include ZigBee Pro Smart Energy focused applications: thermostats, meters, in-home-displays, as well as LED lighting control, solar/wind power, HVAC control, and security systems. MeshConnect certified and qualified modules enable customers to reduce their design and certification costs of development as well as development risk, while reducing time to market.

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MeshConnect™ EM357 Module for 802.15.4/ZigBee™ Applications



FEATURES

- Transmit Power: +20 dBm
- 1MB integrated Flash memory for over the air program updates
- Sensitivity: - 100 dBm
- RF link budget: up to +120 dB
- Range: up to 2.5 miles (line of sight)
- Network Speed: 250Kbps
- 16 RF channels
- Inverted-F PCB antenna with Optional U.FL external Antenna
- Advanced Power Management Scheme w/ Deep Sleep Mode
- Integrated MCU functionality:
 - 32-bit ARM® Cortex™-M3*
 - Up to 23 GPIO Pins*
 - 192KB Flash; 12KB RAM*
 - SPI Master /Slave, TWI, UART*
 - Timers, Serial Wire /JTAG Interface*
 - 5-channel, 14-bit ADC*
- Software support: *EmberZNet PRO™ (ZigBee PRO)*
- Mesh, point-to-point, and point-to-multipoint networks
- Small footprint: 25.4 mm x 35.9 mm (1" x 1.41")

SPECIFICATIONS

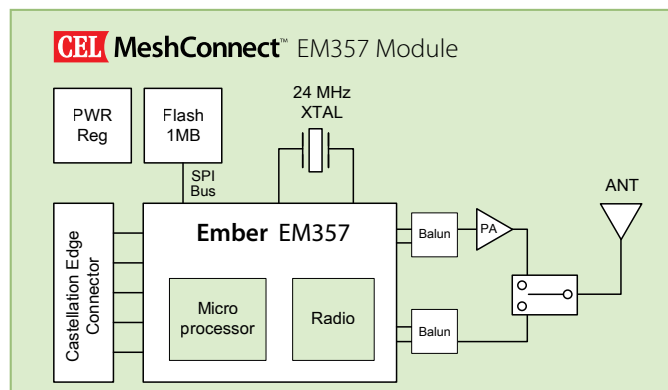
- ▶ Frequency: 2405 to 2475 MHz
- ▶ Operating Voltage: 2.7 to 3.6 V
- ▶ Output Power: +20 dBm
- ▶ Rx Sensitivity: -100 dBm
- ▶ Power Consumption:
 - Transmit Mode: 170 mA @ 20 dBm*
 - Receive Mode: 28 mA*
 - Sleep Mode: 6 µA*
- ▶ Operating Temperature:
 - 40°C to +85°C*
- ▶ AES encryption
- ▶ RoHS Compliant
- ▶ Regulatory Certification:
 - FCC /IC /CE*

APPLICATIONS

- ▶ Smart Energy / Grid Markets
 - Smart Meters*
- ▶ Building automation and control
- ▶ Home automation and control
 - Thermostats*
 - Displays*
 - Energy Management*
 - Security Devices*
 - HVAC Control*
- ▶ General ZigBee wireless sensor networking

BLOCK DIAGRAM

See Data Sheet for more information.



CEL MeshConnect™ EM357 Product Family

MeshConnect™ EM357 Mini Modules

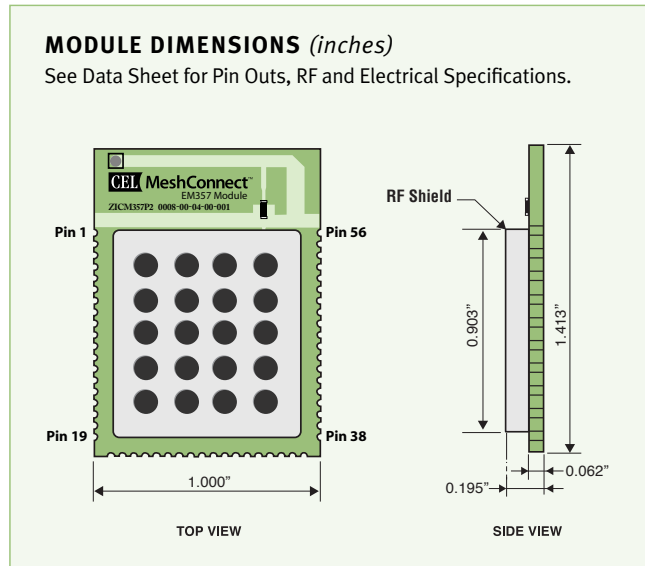
| | |
|-----------------------------|--|
| ZICM357SP0-1 | +8 dBm Output Power, PCB Trace antenna |
| ZICM357SP0-1C | +8 dBm Output Power, with RF port castellation pin for external antenna |
| ZICM357SP2-1 | +20 dBm Output Power, PCB Trace antenna |
| ZICM357SP2-1C | +20 dBm Output Power, with RF port castellation pin for external antenna |
| ZICM-EM35X-DEV-KIT-2 | MeshConnect EM35x Ember Companion Kit for Ember EM35x Dev Kits |

MeshConnect™ EM357 Module

| | |
|-----------------------------|---|
| ZICM357P2-1 | +20 dBm Output power, PCB Trace antenna, 1MB additional Flash |
| ZICM357P2-2C | +20 dBm Output power, with U.FL Connector for external antenna, 1MB additional Flash |
| ZICM357P2-1-NF | +20dBm Output Power, PCB Trace Antenna (No 1 MB Flash memory) |
| ZICM357P2-1C-NF | +20 dBm Output power, with U.FL Connector for external antenna (No 1 MB Flash memory) |
| ZICM357P2-KIT1-1 | +20 dBm Engineering Development Kit |
| ZICM-EM35X-DEV-KIT-1 | MeshConnect EM35x Ember Companion Kit for Ember EM35x Dev Kits |

MeshConnect™ EM357 USNAP Module

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|----------------------|--|
| ZUSNAP357P2-1 | EM357 USNAP module with integrated PCB antenna |
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CEL MeshConnect / ZigBee Modules / ICs

| MODULE / IC ▶ | MeshConnect™ | MeshConnect™ Extended Range | NEW: MeshConnect™ EM357 Mini | MeshConnect™ EM357 | FreeStar Pro | MeshConnect™ IC |
|-------------------------------|---|---|---|---|---|---|
| RADIO | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 | 2405 to 2480 MHz / DSSS / IEEE 802.15.4 |
| Transceiver Chipset | MeshConnect™ ZIC2410 (SoC) 8 bit, 8051 | MeshConnect™ ZIC2410 (SoC) 8 bit, 8051 | Ember™ EM357 32 bit, ARM® Cortex™-M3 | Ember™ EM357 32 bit, ARM® Cortex™-M3 | Freescal™ MC13224 / MC13226 32 bit, ARM7 | MeshConnect™ CEL ZIC2410 8 bit, 8051 |
| Fmax | 16 MHz | 16 MHz | 24 MHz | 24 MHz | 32 MHz | 16 MHz |
| Memory | 96 KB Flash; 8 KB RAM | 96 KB Flash; 8 KB RAM | 192 KB Flash; 12 KB RAM | 192 KB Flash; 12 KB RAM | 128 KB Flash | 96KB Flash |
| Inputs/Outputs | 22 | 20 | 23 | 23 | 46 | 22 / 24 |
| Network | Mesh, Point-to-Point, Point-to-Multipoint | Mesh, Point-to-Point, Point-to-Multipoint | Mesh, Point-to-Point, Point-to-Multipoint | Mesh, Point-to-Point, Point-to-Multipoint | Mesh, Point-to-Point, Point-to-Multipoint | Mesh, Point-to-Point, Point-to-Multipoint |
| Software/ ZigBee Stack | SNAP®, MAC, S-MAC, ZigBee® (RF4CE) | SNAP®, MAC, S-MAC, ZigBee® (RF4CE) | EmberZNet PRO™ (ZigBee Pro) | EmberZNet PRO™ (ZigBee Pro) | BeeStack™ ZigBee Pro - MC13226 MAC, S-MAC - MC13224 | MAC, S-MAC, SNAP® ZigBee® (RF4CE) |
| Tx Power Output | +6dBm | +20dBm | SP0 +7 dBm | SP2 +20dBm | +20dBm | +8 dBm |
| Rx Sensitivity | -97dBm | -103dBm | SP0 -100 dBm | SP2 -100 dBm | -100dBm | -98 dBm |
| Range (line of sight) | 2,000 ft (609 M) | 16,000 ft (4,876 M) | TBD | 13,000 ft (3,962 M) | 4,000 ft (1,219 M) | — |
| Vcc | 2.1 - 3.3V | 2.1 - 3.3V | 2.1 - 3.6V | 2.7 - 3.6V | 2.0 - 3.6V | 1.5V - 3.3V |
| Rx Current | 35mA | 38mA | SP0 30mA | SP2 34mA | 28mA | 33.2mA |
| Tx Current @ max dBm | 44mA | 200mA | SP0 44mA | SP2 150mA | 170mA | 30.6mA |
| Sleep Current | ⊕1.0µA | ⊕1.0µA | 1.0µA | 6.0µA | 13µA | 0.3µA |
| Dimensions | 25 x 36 mm | 25 x 36 mm | 23.9 x 16.6 mm | 25 x 36 mm | 25 x 36 mm | QFN 7 x 7 48 pin VFBGA 5 x 5 72 pin |
| PART NO. ▶ | ZICM2410P0-1 ZICM2410P0-1C | ZICM2410P2-2 ZICM2410P2-1C | ZICM357SP0-1 ZICM357SP0-1C | ZICM357P2-2 ZICM357P2-2C | ZFSM-201-1 ZFSM-201-1C | ZICM2410QN48 ZICM2410FG72 |
| EVAL KIT ▶ | ZICM2410P0-1-SN ZICM2410P0-1C-SN | ZICM2410P2-2-SN ZICM2410P2-1C-SN | ZICM357SP2-1 ZICM357SP2-1C | ZUSNAP357P2-1 | ZFSM-201-2 ZFSM-201-2C | ZICM2410P0-KIT2-1 |