MeshConnect™ EM35x Mini Modules

ZICM35xSP0 and ZICM35xSP2

Ember™ EM35x Transceiver-Based Modules

Integrated Transceiver Modules for ZigBee®/Thread/IEEE 802.15.4

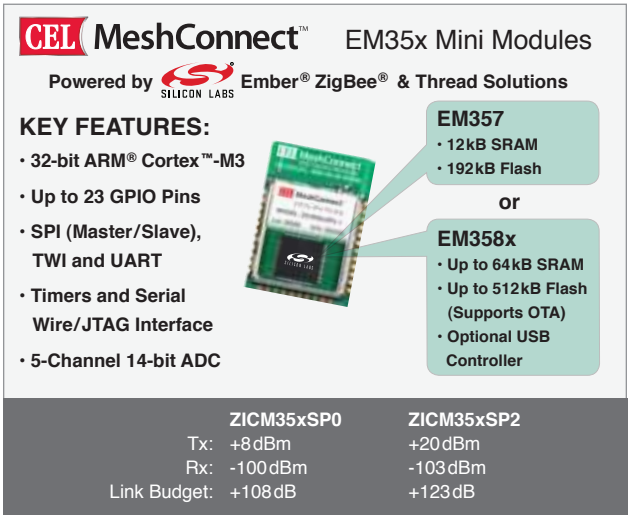
Development Kit Available: ZICM-EM35X-DEV-KIT-3

DESCRIPTION

The MeshConnect™ EM35x Mini Modules from California Eastern Laboratories (CEL) combine high performance RF solutions with the market's premier ZigBee® and Thread stacks. Available in low and high output power options (+8dBm and +20dBm), these modules can accommodate variable range and performance requirements. The tiny module footprint makes them suitable for a wide range of ZigBee and Thread applications. The MeshConnect EM35x Mini Modules are certified and qualified, enabling customers to accelerate time to market by greatly reducing the design and certification phases of development.

CEL's MeshConnect EM35x Mini Modules (ZICM35xSP0 and ZICM35xSP2) are based on the Ember EM35x (EM357 and EM358x) System on Chip (SoC) radio ICs. Each IC is a complete single-chip solution, compliant with ZigBee, Thread, and IEEE 802.15.4. specifications.

CEL's EM358x-based Mini Modules (ZICM358xSP0 and ZICM358xSP2) are ideal for customers requiring Over-the-Air (OTA) programming without an external Flash memory (such as Smart Energy or Home Automation), a larger memory footprint for complex application control, or the additional resources to run an IPv6-based networking stack like Thread. They also feature an optional on-board Universal Serial Bus (USB) 2.0 full-speed peripheral.



ADDITIONAL FEATURES

- **Data Rate: 250kbps**
- **Advanced Power Management**
- **16 RF Channels**
- **Industry's Premier Wireless Networking Stacks: EmbeZNet PRO™ (ZigBee) and Silicon Labs Thread**
- **Mini Footprint:**
  - 0.940" x 0.655" (23.9mm x 16.6mm)
- **Antenna Options:**
  1) Integrated PCB Trace Antenna
  2) RF Port for External Antenna
- **Supports Mesh Networks**
- **AES Encryption**
- **FCC, CE and IC Certifications**
- **RoHS Compliant**

APPLICATIONS

- **Smart Energy/Grid Markets**
  - Thermostats
  - In-Home Displays
  - Smart Plugs
- **Home Automation and Control**
  - Energy Management
  - Security Devices
  - HVAC Control
- **Building Automation and Control**
- **Commercial and Residential Lighting**
  - Fixtures and Control
- **Solar Inverters and Control**
- **General ZigBee and Thread Wireless Sensor Networking**

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ORDERING INFORMATION

Part Number	Order Number	Description	Min/ Multiple
MeshConnect EM35x Mini Modules	**ZICM357SP0-1-R**	EM357 IC, +8dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM357SP0-1C-R	EM357 IC, +8dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
	ZICM357SP2-1-R *	EM357 IC, +20dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM357SP2-1C-R *	EM357 IC, +20dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
	ZICM357SP2-2-R	EM357 IC, +20dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM357SP2-2C-R	EM357 IC, +20dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
	ZICM3588SP0-1-R	EM3588 IC, +8dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM3588SP0-1C-R	EM3588 IC, +8dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
	ZICM3588SP2-1-R *	EM3588 IC, +20dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM3588SP2-1C-R *	EM3588 IC, +20dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
	ZICM3588SP2-2-R *	EM3588 IC, +20dBm output power, PCB trace antenna; Tape and Reel Package	600/600
	ZICM3588SP2-2C-R *	EM3588 IC, +20dBm output power with castellation pin for external antenna; Tape and Reel Package	600/600
MeshConnect EM35x Development Kit	**ZICM-EM35X-DEV-KIT-3**	MeshConnect EM35x Ember Companion Kit for Ember EM35x Development Kit	1/1

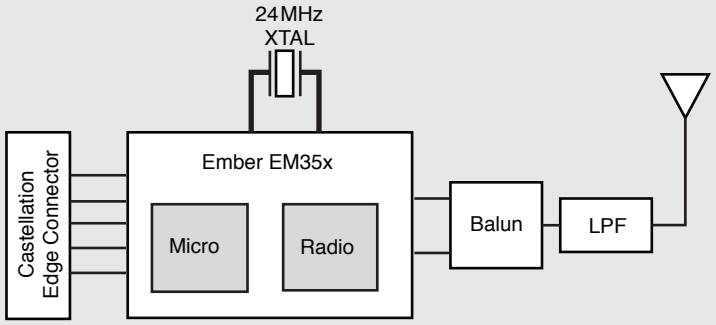
****Note:** *ZICM35xSP2-1(C) modules are not recommended for new designs, although there are no plans to stop production. Use ZICM35xSP2-2(C) instead. The -2 part numbers allow for faster 'time to sleep' state at the expense of one less GPIO (PC6).*

ZICM35xSPx PRODUCT COMPARISON TABLE

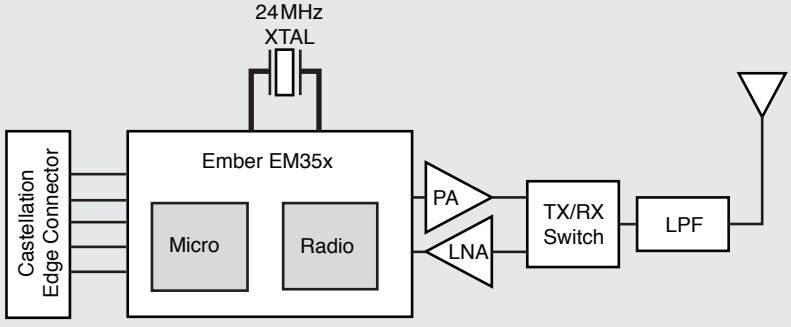
Order Number	MCU				Performance					Comments
	Flash Memory	SRAM Memory	USB	I/O	Tx Power Output	Rx Sensitivity	Rx Current	Tx Current	Sleep / Suspend Current	
					dBm	dBm	mA	mA	µA	
ZICM357SP0-1 ZICM357SP0-1C	192 kB	12 kB	–	23	+8	-100	30	44	1	
ZICM357SP2-1 ZICM357SP2-1C				22	+20	-103	34	150		
ZICM357SP2-2 ZICM357SP2-2C				21						Reduced GPIO allows for faster 'time to sleep' state
ZICM3588SP0-1 ZICM3588SP0-1C	512 kB	64 kB	✓	23	+8	-100	30	44	2.4	2.4 µA with entire RAM retained. Lower sleep current can be achieved by retaining less RAM
ZICM3588SP2-1 ZICM3588SP2-1C				22	+20	-103	34	150		
ZICM3588SP2-2 ZICM3588SP2-2C				21						1) 2.4 µA with entire RAM retained. Lower sleep current can be achieved by retaining less RAM 2) Reduced GPIO allows for faster 'time to sleep' state

MODULE BLOCK DIAGRAMS

EM35x Mini Module (ZICM35xSP0)



EM35x Mini Module (ZICM35xSP2)



DEVELOPMENT TOOLS

Ember Companion Kit

CEL's MeshConnect EM35x Ember Companion Kit is designed to work with the Silicon Laboratories/ Ember Development Kits (EM35X-DEV and EM35X-DEV-IAR). Each module in the CEL Development Kit is soldered on a carrier board making it pin-for-pin compatible with the Ember Development Board.

EM35x Ember Companion Kit



Kit Contents:

- **ZICM357SP0-1C-SL**
- **ZICM357SP2-1-SL**
- **ZICM357SP2-1C-SL**
- **ZICM3588SP0-1C-SL**
- **ZICM3588SP2-1-SL**
- **ZICM3588SP2-1C-SL**

Mini Modules Programming Fixture

CEL's MeshConnect EM35x Mini Modules Programming Fixture is a programming assembly designed to be used with the CEL ZICM35xSPx MeshConnect Mini Modules. It is useful for production programming or during application development when multiple firmware images are required to be loaded into a CEL Mini Module for testing and debugging. The programming assembly must be used in conjunction with an Ember Debug/InSight Adapter (ISA3) from Silicon Labs.

EM35x Programming Fixture



For more information regarding the MeshConnect Development Tools, refer to the respective documents, or visit www.cel.com/MeshConnect.

DEVELOPMENT TOOLS ORDERING INFORMATION

Part Number	Order Number	Description
MeshConnect EM35x Ember Companion Kit	**ZICM-EM35X-DEV-KIT-3**	MeshConnect EM35x Ember Companion Kit for Silicon Laboratories/ Ember EM35x Development Kit
MeshConnect EM35x Programming Fixture	**ZICM35xSPx-PF-1**	MeshConnect EM35x Mini Modules (ZICM35xSPx) Programming Fixture

TRANSCEIVER IC

CEL's MeshConnect EM35x Mini Modules use the Ember EM35x transceiver (EM357 or EM358x) IC. The IC incorporates a RF transceiver with baseband modem, a hardwired MAC and an embedded ARM® Cortex™-M3 microcontroller, offering an excellent low cost, high performance solution for all IEEE 802.15.4/ZigBee/Thread applications. For more information about the EM35x IC, visit www.silabs.com.

ANTENNA

CEL's MeshConnect EM35x Mini Modules include an integrated Printed Circuit Board (PCB) trace antenna. An optional configuration which uses a castellation pin on the module allows the user to connect an external antenna. The ZICM35xSP0 has been certified with the PCB trace antenna and two external antennas (E-2820-CA, LSR 001-0100). The ZICM35xSP2 has been certified with the PCB trace antenna and a Nearson half-wave dipole antenna (part number: S181AH-2450S) on a 4 inch cable using the castellation pin of the module. Please refer to the document *Mini Module External Antenna Implementation* for details describing the requirements that must be followed to take advantage of the CEL certification. See Ordering Information on Page 3.

The PCB antenna employs a topology that is compact and highly efficient. To maximize range, an adequate ground plane must be provided on the host PCB. Correctly positioned, the ground plane on the host PCB will contribute significantly to the antenna performance (it should not be directly under the module PCB Antenna). 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.

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 (a minimum of 1.5" x 1.5" is recommended). 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.

The following 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 away from the antenna in any direction

This radio transmitter IC: 8254A-ZICM357SP0 & IC: 8254A-ZICM357SP2 has been approved by IC Canada to operate with the antenna types listed above with the maximum permissible gain of 2dBi. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet émetteur radio IC: 8254A-ZICM357SP0 & IC: 8254A-ZICM357SP2 a été approuvé par IC Canada pour fonctionner avec les types d'antenne énumérés ci-dessus avec le gain maximal admissible de 2dBi. Types d'antennes non inclus dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

POWER AMPLIFIER

CEL's MeshConnect EM35x High Power Mini Module (ZICM35xSP2) includes a Power Amplifier (PA). This PA delivers high efficiency, high gain and high output power (P_{out} = +20.0dBm typical) to provide an extended range and reliable transmission for fewer nodes in a network. For the ZICM35xSP2, Power Mode 2 with Power Setting -2 is the maximum setting allowed for FCC Compliance. Operating in Power Mode 3 at higher power settings may damage the PA.

USB

The ZICM3588SPx-x Modules have an integrated USB 2.0-compliant, full-speed (12Mbps) device peripheral. For more information, refer to the *EM35x SoC Datasheet* link provided in the References Section of this document.

SOFTWARE/FIRMWARE

CEL's MeshConnect EM35x Mini Modules are ideal platforms for EmberZNet PRO, the industry's most deployed and field proven ZigBee compliant stack supporting the ZigBee PRO feature set. EmberZNet PRO is a complete ZigBee protocol software package containing all the elements required for mesh networking applications. The ZICM3588SPx variants are also ideal platforms for Thread, an IP-based mesh networking stack that allows direct IPv6 connectivity to all devices within the network. For more information regarding the software development for the EM35x IC family, visit www.silabs.com.

CEL provides reference software that runs multiple functions and executes various commands. For example, users can set up a simple ZigBee network to perform Range and Packet Error Rate (PER) tests between two devices. This allows the user to evaluate the module's RF performance in their own environment. The software can also place the module in various operating modes which allows for testing of low-level RF performance, GPIO functionality, etc.

The ZICM35xSP0 Module uses the transceiver's primary RF ports for transmitting and should use Power Mode 1 (EMBER_TX_POWER_MODE_BOOST in the EmberZNet API).

The ZICM35xSP2 Module uses the transceiver's alternate RF ports for transmitting and should use Power Mode 2 (EMBER_TX_POWER_MODE_ALTERNATE in the EmberZNet API). GPIO PC5 must also be configured as ALT_OUT (push/pull).

ABSOLUTE MAXIMUM RATINGS

Description		MeshConnect ZICM35xSPx Module		Unit
		Min	Max	
Power Supply Voltage (V_{DD})		-0.3	3.6	VDC
Voltage on any I/O Line		-0.3	V_{DD} + 0.3	VDC
RF Input Power	ZICM35xSP0	–	+15	dBm
	ZICM35xSP2	–	+5	
Storage Temperature Range		-40	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	MeshConnect ZICM35xSPx Module			Unit
	Min	Typ	Max	
Power Supply Voltage (V_{DD})	2.1	3.3	3.6	VDC
Input Frequency	2405	–	2480	MHz
Ambient Temperature Range	-40	25	85	°C

DC CHARACTERISTICS *(@ 25°C, V_{DD} = 3.3 V, ZICM35xSP0 TX Power Mode 1, ZICM35xSP2 TX Power Mode 2)*

Description		MeshConnect ZICM35xSPx Module			Unit
		Min	Typ	Max	
Transmit Mode Current @ +8 dBm	ZICM35xSP0	–	44	–	mA
Transmit Mode Current @ 0 dBm		–	31	–	mA
Receive Mode Current		–	30	–	mA
Transmit Mode Current @ +20 dBm	ZICM35xSP2	–	150	–	mA
Transmit Mode Current @ 0 dBm		–	58	–	mA
Receive Mode Current		–	34	–	mA
Sleep Mode Current	ZICM357SPx	–	1	–	µA
Sleep Mode Current	ZICM358xSPx	–	2.4*	–	µA

***Note:** The increased sleep current on the ZICM358xSPx is at 3.6VDC with all the RAM retained. Lower sleep currents can be achieved if less RAM is retained during sleep.*

RF CHARACTERISTICS *(@ 25°C, V_{DD} = 3.3 V, ZICM35xSP0 TX Power Mode 1, ZICM35xSP2 TX Power Mode 2)*

Description		MeshConnect ZICM35xSPx Module			Unit
		Min	Typ	Max	
General Characteristics					
RF Frequency Range		2405	–	2480	MHz
RF Channels		11	–	26	–
Frequency Error Tolerance		-96.2	–	96.2	kHz
Transmitter					
Maximum Output Power	ZICM35xSP0	–	+8	–	dBm
Minimum Output Power		–	-40	–	dBm
Offset Error Vector Magnitude		–	5	35	%
Maximum Output Power *(using Power Mode 2, Power Setting -2)*	ZICM35xSP2	–	+20	21	dBm
Minimum Output Power		–	-40	–	dBm
Offset Error Vector Magnitude		–	5	35	%
Receiver					
Sensitivity (1% PER, Boost Mode)	ZICM35xSP0	–	-100	-94	dBm
Saturation (Maximum Input Level)		0	–	–	dBm
Sensitivity (1% PER, Normal Mode)	ZICM35xSP2	–	-103	-97	dBm
Saturation (Maximum Input Level)		-10	–	–	dBm

Note: *The ZICM35xSP2, Power Mode 2 with Power Setting -2 is the maximum setting allowed for FCC Compliance. Operating in Power Mode 3 at higher power settings may damage the PA.*

PIN SIGNALS I/O PORT CONFIGURATION

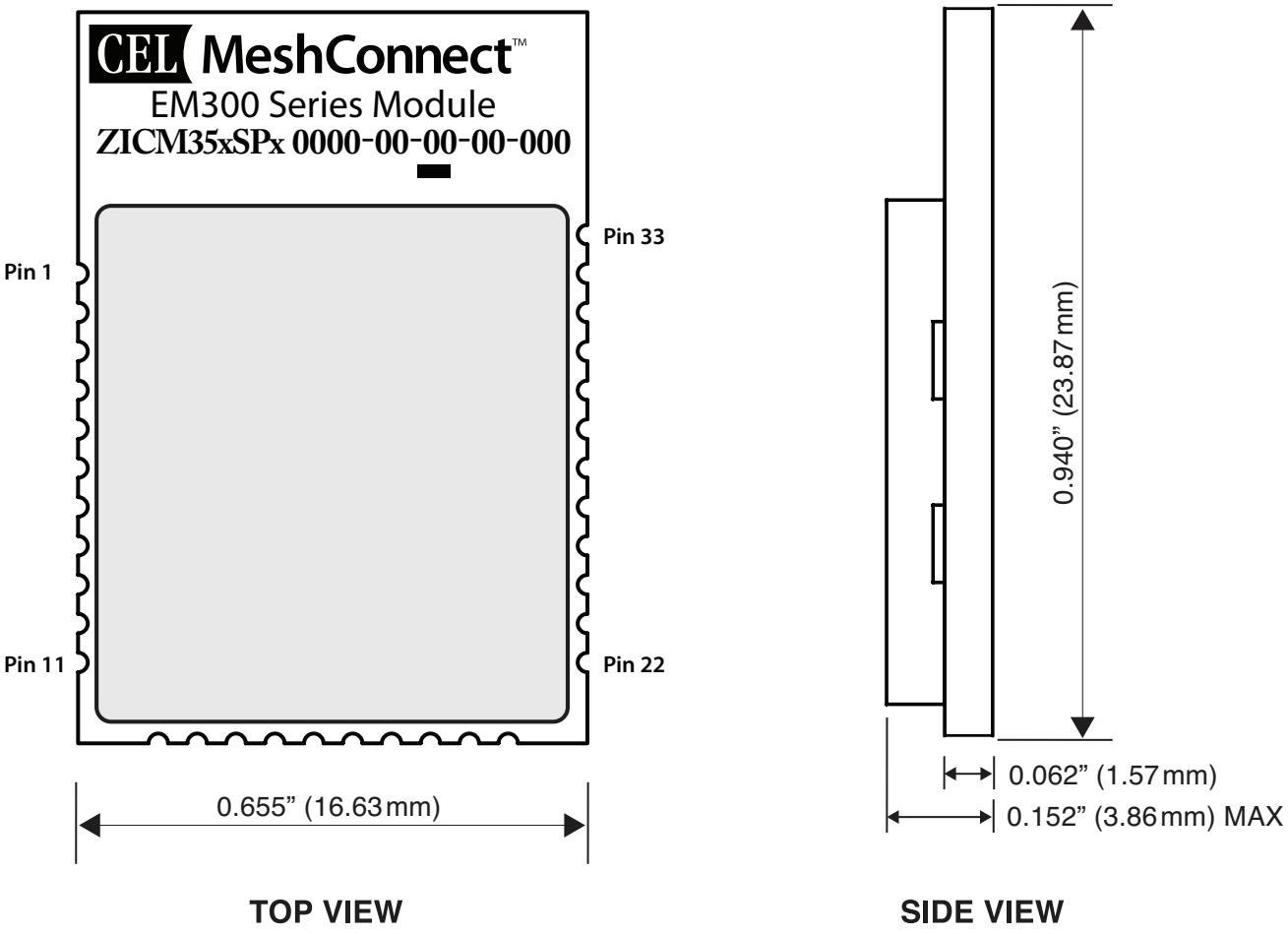
CEL's MeshConnect Module has 33 edge I/O interfaces for connection to the user's host board. See the MeshConnect Module Dimensions Section which details the layout of the 33 edge castellations.

I/O PIN ASSIGNMENTS

CEL MeshConnect ZICM35xSPx Module Pin Number	EM35x IC Pin Number	Name	Notes
1, 2, 12, 31, 33	49	GROUND	
3	11	PC5	ZICM35xSP0: Digital I/O ZICM35xSP2: Dedicated as TX_ACTIVE. The EM35x baseband controls TX_ACTIVE and drives it high when in TX mode; since it is used internally in the module, PC5 is not connected to module I/O pin 3
4	12	RESET	Active Low chip reset (Input)
5	13	PC6	ZICM35xSP0: Digital I/O ZICM35xSP2-1: Digital I/O ZICM35xSP2-2: Used internally in the module; PC6 is not connected to module I/O pin 5
6	14	PC7	Digital I/O
7	18	PA7	Digital I/O
8	19	PB3	Digital I/O
9	20	PB4	Digital I/O
10	21	PA0	Digital I/O
11	22	PA1	Digital I/O
13	16, 23, 28, 37	V_{DD}	
14	24	PA2	Digital I/O
15	25	PA3	Digital I/O
16	26	PA4	Digital I/O
17	27	PA5	Digital I/O
18	29	PA6	Digital I/O
19	30	PB1	Digital I/O
20	31	PB2	Digital I/O
21	32	JTCK	JTAG clock input from debugger
22	33	PC2	Digital I/O
23	34	PC3	Digital I/O
24	35	PC4	Digital I/O
25	36	PB0	Digital I/O
26	38	PC1	Digital I/O
27	40	PC0	Digital I/O
28	41	PB7	Digital I/O
29	42	PB6	Digital I/O
30	43	PB5	Digital I/O
32	NC	RF Out	Castellation Pin for external Antenna

MODULE DIMENSIONS

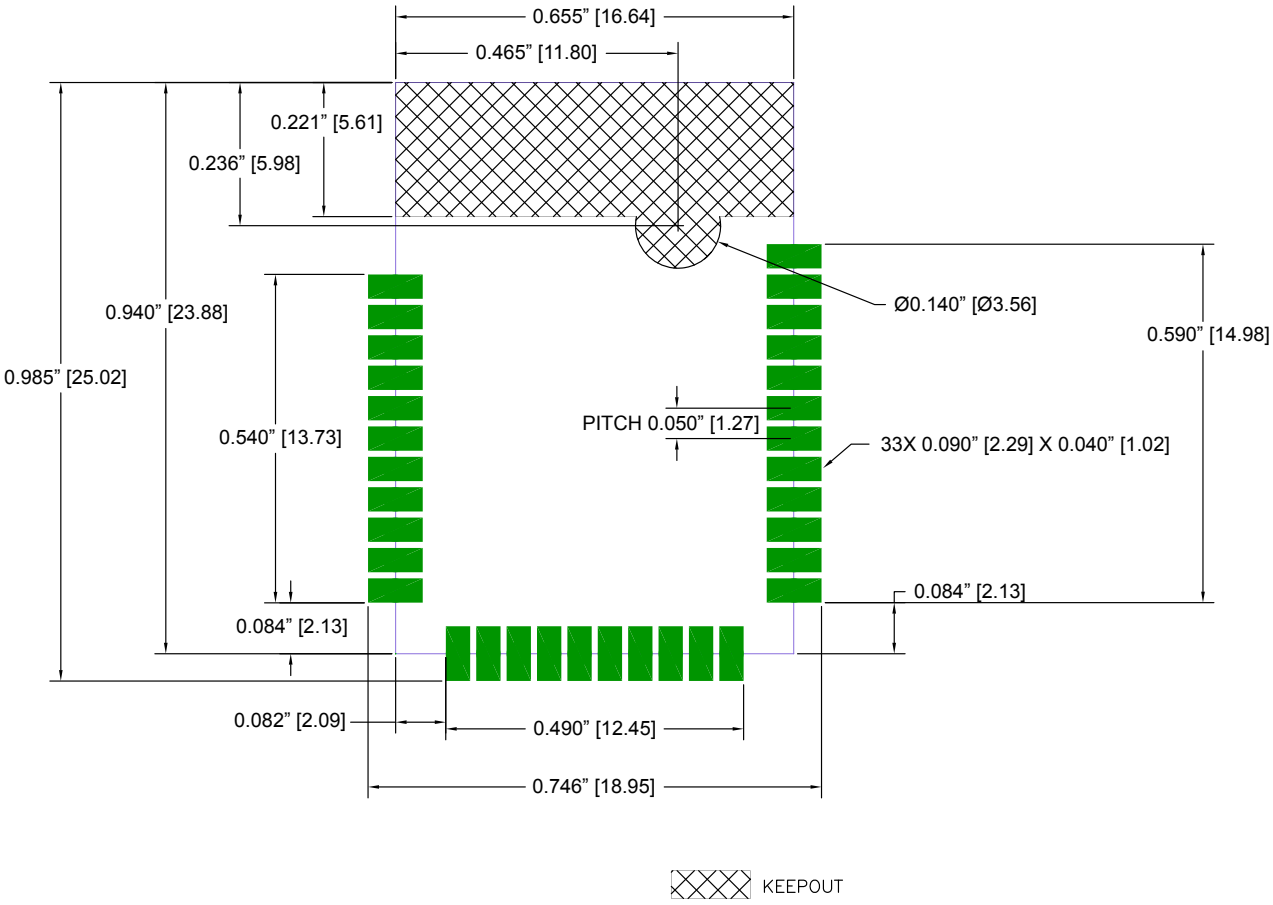
MeshConnect EM35x Mini Modules



Note: *All dimensions are +/- 0.005" (0.12 mm) unless otherwise specified.*

MODULE LAND FOOTPRINT

Dimensions are shown in inches, with millimeter conversions in brackets.



Note: *Refer to the Antenna Section in this document for layout recommendations which will yield optimal antenna performance.*

PROCESSING

Recommended Reflow Profile

Parameter Values	
Ramp Up Rate (from $T_{soakmax}$ to T_{peak})	3°/sec max
$T_{soakmin}$	150°C
$T_{soakmax}$	200°C
Soak Time	60-120 sec
$T_{Liquidus}$	217°C
Time above $T_{Liquidus}$	60-150 sec
T_{peak}	250°C
Time within 5° of T_{peak}	20-30 sec
Time from 25° to T_{peak}	8 min max
Ramp Down Rate	6°C/sec max

Pb-Free Solder 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 Specification. See the Castellated Terminations Section in the latest IPC-A-610 Acceptability of Electronic Assemblies document.*

Cleaning

In general, cleaning the populated module 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" solder 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.

Hand Soldering

Hand soldering is possible. When using a soldering iron, 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 should be programmable and the solder joint and module should not exceed the maximum peak reflow temperature of 250°C.

Caution
If temperature ramps exceed the reflow temperature profile, module and component damage may occur due to thermal shock. Avoid overheating.

Warning
Never attempt a rework on the module itself (i.e., replacing individual components); such actions will terminate warranty coverage.

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

AGENCY CERTIFICATIONS

The following Part Numbers are Certified as shown below:

Part Number	Certifications	Antenna
ZICM35xSP0-1	FCC, IC, CE	PCB
ZICM35xSP0-1C	FCC, IC, CE	E-2820-CA, LSR 001-0100
ZICM35xSP2-x	FCC, IC	PCB
ZICM35xSP2-xC	FCC, IC	Nearson S181AH-2450S

FCC and Canada Compliance Statement

This device complies with Part 15 of the FCC Rules and with IC Canada licence-exempt RSS Standards. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Déclaration De Conformité FCC Et Au Canada

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Warning (Part 15.21)

Changes or modifications not expressly approved by CEL could void the user's authority to operate the equipment.

20cm Separation Distance

To comply with FCC/IC Canada 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 20cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter except in accordance with FCC muti-transmitter product procedures.

20cm Distance De Séparation

Pour se conformer aux limites d'exposition FCC / IC Canada RF pour la population générale / exposition non contrôlée, l'antenne(s) utilisée pour ce transmetteur doit être installé pour fournir une distance de séparation d'au moins 20cm de toutes les personnes et ne doit pas être co-implantés ou exploités en conjonction avec une autre antenne ou émetteur, sauf en conformité avec les procédures de produits muti-émetteur FCC.

OEM Responsibility to the FCC and IC Rules and Regulations

The MeshConnect Mini Module has been certified per FCC Part 15 Rules and to IC Canada license-exempt RSS Standards for integration into products without further testing or certification. To fulfill the FCC and IC 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 Mini Module is labeled with its own FCC ID Number and IC ID Number. If the FCC ID and the IC ID are 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. The exterior label can use wording such as the following:

"Contains Transmitter Module FCC ID: W7Z-ZICM357SP0" or "Contains FCC ID: W7Z-ZICM357SP0"
"Contains Transmitter Module IC: 8254A-ZICM357SP0" or "Contains IC: 8254A-ZICM357SP0"

or

"Contains Transmitter Module FCC ID: W7Z-ZICM357SP2" or "Contains FCC ID: W7Z-ZICM357SP2"
"Contains Transmitter Module IC: 8254A-ZICM357SP2" or "Contains IC: 8254A-ZICM357SP2"

The OEM of the MeshConnect Mini Module may only use the approved antennas (PCB Trace Antenna and external antenna) that have been certified with this module. The OEM of the MeshConnect Mini Module must test their final product configuration to comply with Unintentional Radiator Limits before declaring FCC Compliance per Part 15 of the FCC Rules. The OEM must also include in their manual the following statement:

FCC and Canada Compliance Statement
This device complies with Part 15 of the FCC Rules and with IC Canada licence-exempt RSS Standards. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Déclaration De Conformité FCC Et Au Canada
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

In addition to using only the approved external antennas, the OEM must follow the layout described in the "Mini Module External Antenna Implementation Guide" to be covered by the current approval.

CE Certification — Europe
The MeshConnect ZICM35xSP0 Module has been tested and certified for use in the European Union.

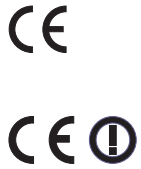
OEM Responsibility to the European Union Compliance Rules
If the MeshConnect Module is to be incorporated into a product, the OEM must verify compliance of the final product to the European Harmonized EMC and Low-Voltage/Safety Standards. A Declaration of Conformity must be issued for each of these standards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

The manufacturer must maintain the user 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 CE graduated drawing (to the right) must be adhered to
- The CE mark must be a minimum of 5 mm in height
- If the use of the module is subject to restrictions in the end application, the CE marking on the OEM product should also include the alert sign as shown in the image to the right



Software Compliance

The MeshConnect Mini Modules require software restrictions to meet agency certification requirements. These restrictions have been implemented in the sample application included with the Software Development Kit.

If a customer is not starting with the CEL Software Development Kit, they must implement the following output power restrictions to use the FCC, IC or CE Certifications:

Part Number	Certification	RF Channel	Valid TX Power Steps	Typical Max Output Power
ZICM35xSP0-1	FCC/IC	11 - 25	-43 to 8	8 dBm
		26	-43 to 0	1 dBm
	ETSI	11 - 26	-43 to 8	8 dBm
ZICM35xSP0-1C	FCC/IC	11 - 25	-43 to 8	8 dBm
		26	-43 to -7	-7 dBm
	ETSI	11 - 26	-43 to 8	8 dBm
ZICM35xSP2-x	FCC/IC	11 - 24	-43 to -2	20 dBm
		25	-43 to -6	17 dBm
		26	-43 to -21	-5 dBm
ZICM35xSP2-xC	FCC/IC	11 - 24	-43 to -2	20 dBm
		25	-43 to -12	9 dBm
		26	-43 to -21	-5 dBm

Note: *The ZICM35xSP2, Power Mode 2 with Power Setting -2 is the maximum setting allowed for FCC Compliance. Operating in Power Mode 3 at higher power settings may damage the PA.*

SHIPMENT, HANDLING AND STORAGE

Shipment

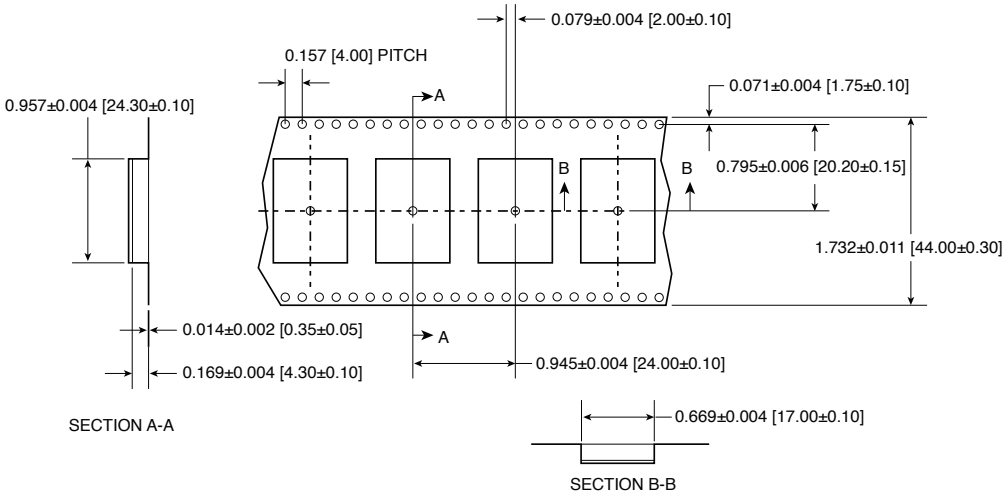
The MeshConnect Modules are delivered in Tape and Reel for easy assembly in a manufacturing environment. The reel diameter is 12.992 inches (330mm) and contains 600 modules

Tape and Reel Dimensions

Measurements are in inches [mm]

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

The MeshConnect Modules are moisture-sensitive devices. Appropriate handling instructions and precautions are summarized in J-STD-033. 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.

QUALITY

CEL Modules offer the highest quality at competitive prices. Our modules are manufactured in compliance with the IPC-A-610 specification, Class II. Our modules go through JESD22 qualification processes which include high temperature operating life tests, mechanical shock, temperature cycling, humidity and reflow testing. CEL conducts RF and DC factory testing on 100% of all production parts.

CEL builds the quality into our products, giving our customers confidence when integrating our products into their systems.

REFERENCES

Reference Documents	Download
120-035X-000 - Silicon Labs/Ember EM35x SoC Datasheet	Link
0011-02-17-00-000 - CEL EM35x Ember Mini Module Companion Kit Technical User Guide	Link
0011-01-16-05-000 - Using the ZICM35xSPx Mini Module Programming Fixture	Link
0011-00-16-11-000 - CEL ZICM35xSP2-1C External Antenna Implementation	Link

REVISION HISTORY

Previous Versions	Changes to Current Version	Page(s)
0011-00-07-01-000 (Issue A) July 22, 2013	Initial Preliminary Datasheet	All
0011-00-07-01-000 (Issue B) August 1, 2013	Updated Development Tools Section, Antenna Section, Agency Certifications, Software Compliance Section	4, 5, 14, 16, 17
0011-00-07-01-000 (Issue C) February 10, 2014	Updated Tape and Reel Packaging	3, 17
0011-00-07-01-000 (Issue D) March 17, 2014	Updated ZICM358xSPx Sleep Mode Current. Removed "Preliminary" status for this datasheet. Updated Software Compliance "Valid" TX Power Steps" table values	1, 7, 16
0011-00-07-01-000 (Issue E) March 18, 2014	This datasheet is now a "Preliminary Datasheet" due to the addition of new part numbers (ZICM357SP2-2, ZICM357SP2-2-R, ZICM357SP2-2C and ZICM357SP2-2C-R) to the "Ordering Information". Added new "ZICM35xSPx Product Comparison Table".	1, 3
0011-00-07-01-000 (Issue F) July 15, 2014	Removed "Preliminary" status for this datasheet. Updated Programming Fixture Product Photography	1, 5
0011-00-07-01-000 (Issue G) July 20, 2014	Added part numbers ZICM3588SP2-2(C), updated Logos	3
0011-00-07-01-000 (Issue H) October 11, 2016	Changed "Industry Canada" to "IC Canada" throughout document. Updated Antenna Section and added a new part number to Agency Certifications table. Added ZICM35xSP0-1C to Software compliance table. Removed option for tray configuration	4,6,15,17,18

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