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Using an External Flash Memory with the ZICM357SPx Mini Module

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Introduction

An external flash memory can be used in conjunction with the ZICM357SPx Mini Module for Over-the-Air (OTA) programming. This allows the EM357 firmware to be upgraded in the field to add new features or make software changes. The Ember EM357 stack natively supports using an external flash memory with the ZigBee® OTA cluster.

Typically the external flash is only directly connected to the ZICM357SPx Mini Module if the EM357 is used in System-on-Chip (SoC) mode. If the EM357 is used in Network Co-Processor (NCP) mode, the external flash is connected to the host processor instead.

CEL's MeshConnect™ EM357 Mini Modules combine high performance RF solutions with the market's premier ZigBee stack. These modules can accommodate variable range and performance requirements.

The MeshConnect EM357 Mini Modules are certified and qualified, enabling customers to accelerate time to market by greatly reducing the design and certification phases of development.

For more information on MeshConnect Mini Modules, contact CEL at www.cel.com/MeshConnect.

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Part Numbers Available

- ZICM357SP0-1**
+8 dBm Output Power, PCB Trace antenna
- ZICM357SP0-1C**
+8 dBm Output Power with Castellation pin for external antenna
- ZICM357SP2-1**
+20 dBm Output Power, PCB Trace antenna
- ZICM357SP2-1C**
+20 dBm Output Power with Castellation pin for external antenna

Flash Memory Selection

A flash memory, which contains enough memory space to store the entire application image, must be selected. For the EM357, the flash memory must be at least 2Mbit. Some flash memory ICs that are natively supported by the Ember stack are:

- Atmel AT45DB021D/E (2Mbit)
- Micron M45PE20-VMN6TP (2Mbit)
- Winbond W25Q80BVSNIG (8Mbit)

A complete list of flash memory ICs that are supported by the Ember stack can be found in the Silicon Laboratories Application Note *Development Fundamentals for the Ember EM2xx and EM3xx Platforms*. It is possible to use an unsupported flash IC, but a suitable software driver may need to be written.

Hardware Connections

Two schematic options are shown for adding an external flash memory to a design using the ZICM357SPx Mini Module:

- Design without EM357 Flash Shutdown GPIO
- Design with EM357 Flash Shutdown GPIO

Design without EM357 Flash Shutdown GPIO

The external flash is connected to EM357 Serial Controller 2 (SC2) using the following connections as shown in Figure 1.

Notes on the schematic connections:

- A 10nF capacitor is added to the VCC line for voltage stability.
- The /WP (Write Protect) line of the external flash is pulled up to VCC through a 10kΩ resistor.
- The /HOLD line of the external flash is directly connected to VCC.
- The /CS (Chip Select) line of the external flash, in addition to being connected to the EM357 PA3 line, is pulled up to VCC through a 10kΩ resistor. This prevents the /CS line from being inadvertently selected during EM357 resets.

External Flash Signal Name	EM357 Signal Name	Function
VCC	VCC	Supply Voltage
GND	GND	Ground
DI	PA0	SC2 MOSI (slave data in)
DO	PA1	SC2 MISO (slave data out)
CLK	PA2	SC2 SPI Clock
/CS	PA3	SC2 SPI Slave Select

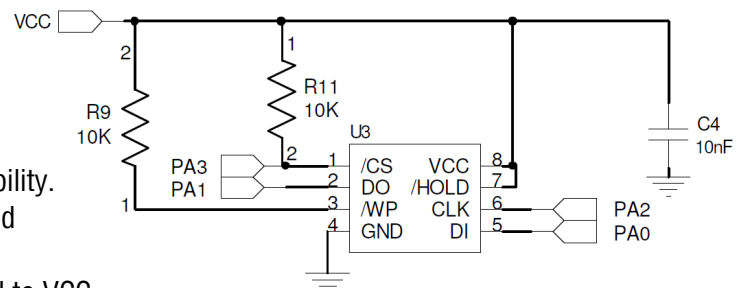


Figure 1

Design with EM357 Flash Shutdown GPIO

With some flash memory ICs, (e.g. the Atmel AT45DB021D/E), adding an NPN transistor to disconnect the ground pin in sleep mode can reduce the current draw of the flash memory IC. A schematic with this implementation is shown to the right. The default GPIO used for this functionality in the Ember stack is PB7, but any available GPIO can be used. See Figure 2.

Notes on the schematic connections:

- To reduce part count, Q1 contains a series base resistor and a base-emitter resistor integrated into the transistor package. Three discrete components (one transistor and two resistors) can be substituted if desired.

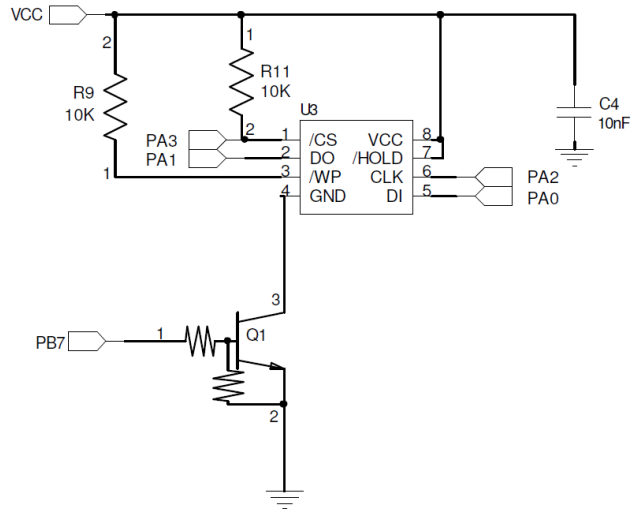


Figure 2

Bill of Materials for Reference Schematic

Quantity	Reference	Value	Part Number	Manufacturer #1	Description
1	C4	10nF	GRM155R71E103KA01D	MURATA	CAP CER 10000PF 25V 10% X7R 0402
1	Q1	SOT-23-3	MMUN2211LT1G	ON Semiconductor	TRANS BRT NPN 100MA 50V SOT23
2	R9 R11	10K	RC0402JR-0710KL	YAGEO	RES 10K OHM 1/16W 5% 0402 SMD
1	U3	Flash Mem	W25Q80BVSNI	Winbond Electronics	IC SPI FLASH 8MBIT 8SOIC

References

Silicon Laboratories, Inc.

1. 120-3029-000E: *Application Development Fundamentals for the Ember EM2xx and EM3xx Platforms*
2. 120-035X-000M *EM35x Datasheet*

California Eastern Laboratories

1. *MeshConnect EM357 Mini Modules (ZICM357SPx) Datasheet*

About CEL

California Eastern Laboratories (CEL) has over 50 years of experience providing a wide range of RF and wireless semiconductors, Optocouplers and Solid State Relays, Fiber Optics and Detectors. CEL develops the MeshConnect™ line of professional grade modules that provide hardware and software solutions in the 2.4 GHZ (IEEE 802.15.4/ SNAP/ZigBee) frequency range. These solutions offer customers qualified and certified platforms that greatly simplify design and greatly reduce time to market. For more information, visit our MeshConnect products and solutions at www.cel.com/MeshConnect.

Revision History

Revision	Date	Description	Page(s)
A 0011-00-16-02-000	12/7/12	Initial Release.	N/A