

# Freescale's ZigBee® Technology Products Summary

Freescale Semiconductor draws on extensive radio frequency (RF) and wireless experience accumulated from more than 50 years of developing semiconductor products. To help determine the best fit of transceiver and MCU, the products summary offers a matrix of ZigBee technology solution transceivers which may be paired with the Freescale 8-bit MCU's for system solutions. The System in a Package (SiP) alternatives offer the MCU and the transceiver in one package for reduced cost and board space requirements.

## Software

### SMAC (up to 4 KB MCU memory)

- Proprietary SMAC (simple MAC) software
- Cost-efficient solution
- Library of transceiver-related primitives
- Small size memory alternatives
- ANSI C source code provided
- Provides serial peripheral interface (SPI) and control interface to the transceiver from the MCU
- Ultra-low-power requirements
- Ultra-low-memory requirements
- Target applications
  - Point-to-point and star networks
- Repeater functionality
- Over-the-air programming

### IEEE® 802.15.4-Compliant MAC (approximately 17–35 KB MCU memory required)

- IEEE 802.15.4—compliant physical layer (PHY) and MAC software
- Compliant to all IEEE 802.15.4 specifications
- Supports beaconed and non-beaconed networks
- Guaranteed Time Slots (GTS)
- Advanced Encryption Standard (AES) encryption
- Target applications
  - Mesh and cluster tree networks
  - Robust communication and timing critical networks

### ZigBee-Compliant Platforms (approximately 32–56 KB MCU memory required)

- Complete wireless networking standard—from antenna to application program interface (API)
- Provides interoperability among different vendor platforms
- Established routing algorithm
- Network recovery and healing
- Wireless embedded or dongle options
- Target applications
  - Mesh and cluster tree networks
  - Robust communication and timing critical networks

## Transceivers

| Product   | Supply Voltage V | Supply Current @ 1% Duty Cycle (Typ) mA | Standby Current (Typ) uA | Frequency Band GHz | Sensitivity @ 1% PER (Typ) dBm | Control Interface | Data Rate (Spec) kbps | TX/RX Switch | MAC Options                              | Packages      | MSRP (USD) |
|-----------|------------------|-----------------------------------------|--------------------------|--------------------|--------------------------------|-------------------|-----------------------|--------------|------------------------------------------|---------------|------------|
| MC13191FC | 2.0–3.4          | 30 TX, 37 RX                            | 500                      | 2.4–2.5            | -91                            | SPI               | 250                   | No           | SMAC                                     | 1311 (32 QFN) | \$1.95     |
| MC13192FC | 2.0–3.4          | 30 TX, 37 RX                            | 500                      | 2.4–2.5            | -92                            | SPI               | 250                   | No           | SMAC, IEEE®, 802.15.4, ZigBee® BeeStack™ | 1311 (32 QFN) | \$2.35     |
| MC13201FC | 2.0–3.4          | 30 TX, 37 RX                            | 500                      | 2.4–2.5            | -91                            | SPI               | 250                   | Yes          | SMAC                                     | 1311 (32 QFN) | \$2.13     |
| MC13202FC | 2.0–3.4          | 30 TX, 37 RX                            | 500                      | 2.4–2.5            | -92                            | SPI               | 250                   | Yes          | SMAC, IEEE®, 802.15.4, ZigBee® BeeStack™ | 1311 (32 QFN) | \$2.51     |

## System in a Package

| Product      | Supply Voltage V | Supply Current @ 1% Duty Cycle, CPU @ 2MHz (Typ) mA | Standby Current (Typ) mA | Frequency Band GHz | Sensitivity @ 1% PER (Typ) dBm | Data Rate (Spec) kbps | TX/RX Switch | MAC Options                              | Packages      | Flash | RAM  | Core  | Interfaces and Peripherals                                        | MSRP (USD) |
|--------------|------------------|-----------------------------------------------------|--------------------------|--------------------|--------------------------------|-----------------------|--------------|------------------------------------------|---------------|-------|------|-------|-------------------------------------------------------------------|------------|
| MC13211 NEW! | 2.0–3.4          | 31.1 TX, 38.1 RX                                    | 0.2–0.675                | 2.4–2.5            | -92                            | 250                   | Yes          | SMAC                                     | 1664 (71-LGA) | 16 KB | 1 KB | HCS08 | I2C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO | \$3.33     |
| MC13212 NEW! | 2.0–3.4          | 31.1 TX, 38.1 RX                                    | 0.2–0.675                | 2.4–2.5            | -92                            | 250                   | Yes          | SMAC, IEEE®, 802.15.4                    | 1664 (71-LGA) | 32 KB | 2 KB | HCS08 | I2C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO | \$3.64     |
| MC13213 NEW! | 2.0–3.4          | 31.1 TX, 38.1 RX                                    | 0.2–0.675                | 2.4–2.5            | -92                            | 250                   | Yes          | SMAC, IEEE®, 802.15.4, ZigBee® BeeStack™ | 1664 (71-LGA) | 60 KB | 4 KB | HCS08 | I2C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO | \$3.98     |

## 8-bit Microcontrollers

| Product     | Supply Voltage V | Flash | RAM  | 10-bit ADC | Timer/ PWM | Clock Type | Package                   | Low Cost Demo | EVB or FSICE | Control Interface | Applications/Additional Features | MSRP (USD) Device and Package Dependent |
|-------------|------------------|-------|------|------------|------------|------------|---------------------------|---------------|--------------|-------------------|----------------------------------|-----------------------------------------|
| MC9S08GB60A | 1.8–3.6          | 60 KB | 4 KB | 8-ch.      | 3+5-ch.    | ICG        | 64 LQFP                   | ✓             | ✓            | I2C, SCI, SPI     | Flash programmable down to 1.8   | \$3.52                                  |
| MC9S08GT60A | 1.8–3.6          | 60 KB | 4 KB | 8-ch.      | 2+2-ch.    | ICG        | 44 LQFP, 48 LQFP          | ✓             | ✓            | I2C, SCI, SPI     | Flash programmable down to 1.8   | \$3.26                                  |
| MC9S08GB32A | 1.8–3.6          | 32 KB | 2 KB | 8-ch.      | 3+5-ch.    | ICG        | 64 LQFP                   | ✓             | ✓            | I2C, SCI, SPI     | Flash programmable down to 1.8   | \$2.63                                  |
| MC9S08GT32A | 1.8–3.6          | 32 KB | 2 KB | 8-ch.      | 2+2-ch.    | ICG        | 44 LQFP, 48 LQFP          | ✓             | ✓            | I2C, SCI, SPI     | Flash programmable down to 1.8   | \$2.37                                  |
| MC9S08GT16  | 1.8–3.6          | 16 KB | 1 KB | 8-ch.      | 2+2-ch.    | ICG        | 42 PDIP, 44 LQFP, 48 LQFP | ✓             | ✓            | I2C, SCI, SPI     | Flash programmable down to 1.8   | \$1.65                                  |

## Development Tools

| Features                                    | 13192DSK-A0E<br>13192DSK-BDM-A0E | 13192EVB-A0E<br>13192EVB-BDM-A0E | 13192EVK-A0E<br>13192EVK-SFTE                          | Features                                    | 1321XDSK<br>1321XDSK-BDM       | 1321XNSK<br>1321XNSK-BDM         | 1321XEVK<br>1321XEVK-SFTW                               |
|---------------------------------------------|----------------------------------|----------------------------------|--------------------------------------------------------|---------------------------------------------|--------------------------------|----------------------------------|---------------------------------------------------------|
| 13192SARD (boards per kit)                  | 2                                | 0                                | 2                                                      | 13213-SRB (boards per kit)                  | 2                              | 2                                | 4                                                       |
| 13192EVB (boards per kit)                   | 0                                | 2                                | 3                                                      | 13213-NCB (boards per kit)                  | 0                              | 1                                | 3                                                       |
| Freescale BeeKit                            | Yes                              | Yes                              | Yes                                                    | Freescale BeeKit                            | Yes                            | Yes                              | Yes                                                     |
| CodeWarrior® IDE Version                    | Special Edition                  | Special Edition                  | Special Edition, Standard Edition (13192EVK-SFTE only) | CodeWarrior® IDE Version                    | Special Edition                | Special Edition                  | Special Edition, Standard Edition (1321X EVK-SFTW only) |
| ZigBee® BeeStack™ Development License       | 90-day Evaluation                | 90-day Evaluation                | 90-day Evaluation, Full Version (13192EVK-SFTE only)   | ZigBee® BeeStack™ Development License       | 90-day Evaluation              | 90-day Evaluation                | 90-day Evaluation, Full Version (1321X EVK-SFTW only)   |
| ZigBee Packet Analyzer Hardware             | No                               | No                               | Yes                                                    | ZigBee Packet Analyzer Hardware             | No                             | No                               | Yes                                                     |
| Daintree Standard Edition Protocol Analyzer | No                               | No                               | Yes                                                    | Daintree Standard Edition Protocol Analyzer | No                             | No                               | Yes                                                     |
| Out-of-Box Application                      | Accelerometer Application Demo   | Range Test Demo                  | ZigBee Environment Demo (ZED) Application              | Out-of-Box Application                      | Accelerometer Application Demo | IEEE® 802.15.4 Star Network Demo | ZigBee Environment Demo (ZED) Application               |

All MSRP shown are 10 Ku price point unless otherwise specified.  
MSRP are subject to change.

## BeeKit™

**BeeKit™ Software Development Tool Complimentary to Freescale customers\*, included in hardware development kits or downloadable from [www.freescale.com/zigbee](http://www.freescale.com/zigbee).**

BeeKit is Freescale's simplified integrated development environment (IDE) for ZigBee technology solutions and includes development capability for Simple MAC (SMAC), IEEE® 802.15.4 MAC and full-function 90-day evaluation copy of ZigBee BeeStack. BeeStack license is available for purchase upon expiration of evaluation copy (see BeeStack™ below). The IDE includes a GUI (graphical users interface) for creating, modifying and updating wireless networking designs. The BeeKit offers a comprehensive code base of wireless networking libraries, application templates and sample applications. Easily scalable to support new code bases and functionality, the BeeKit is a complementary tool to the CodeWarrior® IDE for MCU development.

## BeeStack™

**BeeStack™ ZigBee Stack Software Development Tool (BEESTK-S08-STD, BEESTK-S08-FLT)**

**MSRP \$995 and \$1495 respectively\***

The BeeStack is a licensable ZigBee stack object code software for developing fully compliant, interoperable ZigBee network applications. The BeeKit and BeeStack work seamlessly to provide fast time-to-market when implementing ZigBee-compliant networks.



**1319X Developer's Starter Kit (13192DSK-A0E and 13192DSK-BDM-A0E)**

**MSRP starting at \$199**

The 1319X Developer's Starter Kit is a cost-effective, reusable development kit used to implement wireless network designs compatible with simple MAC (SMAC), IEEE 802.15.4 standard or ZigBee. The kit contains all the hardware, software and documentation necessary to create proprietary and standards based peer-to-peer, star and mesh networks. The development boards in these kits include Freescale X, Y and Z accelerometers.



**1319X Evaluation Boards (13192EVB-A0E and 13192EVB-BDM-A0E)**

**MSRP starting at \$399**

The Evaluation Board Kit contains all the hardware, software and documentation necessary to create proprietary and standards-based, peer-to-peer and star networks. The 13192 Evaluation Boards are designed to provide the maximum performance in range with the F-antenna implementation. The boards include an optional LNA, that when enabled, can increase the line-of-sight transmission distance by up to 600m.



**1319X Evaluation Kit (13192EVK-A0E and 13192EVK-SFTE)**

**MSRP starting at \$1,499**

The Evaluation Kit is a comprehensive kit that provides capabilities for demonstration and development of complete ZigBee protocol-based mesh networks. It includes five hardware nodes, an 802.15.4 packet analyzer and Daintree protocol analyzing software, ZigBee protocol stack, cables and power adapters, providing the ideal platform for point-to-point, star and mesh networks. The 13192EVK-SFTE contains a developer license for Freescale's CodeWarrior IDE and ZigBee stack. The development kit comes preloaded with Freescale's ZigBee Environment Demo (ZED) featuring a complete ZigBee network based on the ZigBee Alliance Home Automation Profile.



**1320XRFC**

**MSRP starting at \$79**

The RF daughter card is a cost-effective development board that provides a simple interface to Freescale's MC13202 transceiver, providing a direct connection to Freescale's 8-bit and ColdFire microcontroller EVBs. The board has a printed PCB F-antenna and SMA connector for connecting RF test equipment.



**1321X Developer's Starter Kit (1321XDSK and 1321XDSK-BDM)**

**MSRP starting at \$249**

Freescale's second-generation Developer's Starter Kit is an ideal cost-effective development and demonstration kit used to implement wireless network designs compatible with simple MAC (SMAC), IEEE 802.15.4 standard or ZigBee solutions. The kit comes with everything you need to get started, including MC13213-based hardware boards, cables, batteries, power adapters, software and sample applications to create proprietary and standards-based peer-to-peer, star or mesh networks. The boards also contain Freescale's advanced MMA7260 X, Y, Z, low-power, low-voltage accelerometer as well as a temperature sensor.



**Network Starter's Kit (1321XNSK and 1321XNSK-BDM)**

**MSRP starting at \$499**

The Network Starter's Kit provides a solid basis for demonstrating and developing more complex networks, including star and mesh networks. The development kit comes with three hardware boards that are pre-programmed with a demonstration written on top of Freescale's IEEE 802.15.4 MAC.



**ZigBee Evaluation Kit (1321XEVK and 1321XEVK-SFTW)**

**MSRP starting at \$1749**

Freescale Semiconductor's second-generation ZigBee Evaluation Kit provides one of the most comprehensive kits for demonstration and development of complete ZigBee mesh networks. The platform includes seven hardware nodes, an 802.15.4 packet analyzer and Daintree protocol analyzing software, ZigBee protocol stack, cables and power adapters which provide the ideal platform for point-to-point, star, and mesh networks. The 1321XEVK-SFTW contains a developer license for Freescale's CodeWarrior IDE and the BeeStack ZigBee stack. The development kit comes preloaded with Freescale's ZigBee Environment Demo (ZED) featuring a complete ZigBee network based on the ZigBee Alliance Home Automation Profile.

\*Subject to license agreement and registration.

### Acronyms:

BDM: Background debug module

DSK: Developer's starter kit

EVB: Evaluation board

NSK: Network starter's kit

PCB: Printed Circuit Board

RFC: RF daughter card

SRB: Sensor reference board

### Learn More:

For more information about ColdFire family products, please visit [www.freescale.com/zigbee](http://www.freescale.com/zigbee).