

Freescale's Wireless Connectivity Products Summary

The most recently introduced Platform in a Package (PiP) family simplifies wireless network design even further—just add an antenna and a crystal and the network node is hardware ready. 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 MCUs 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

Simple MAC (SMAC) (approx. 4–8 KB 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 of the transceiver from the MCU
- Ultra-low-power requirements
- Ultra-low-memory requirements
- Repeater functionality
- Over-the-air programming
- Target applications
 - Point-to-point
 - Star networks

IEEE® 802.15.4-Compliant MAC (approx. 17–64 KB memory)

- 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

BeeStack™ ZigBee-Compliant Platforms (approx. 64–128 KB memory)

- Complete wireless networking standard—from antenna to application program interface (API)
- Supports ZigBee 2007
- Supports ZigBee Pro
- Supports ZigBee Smart Energy Profile
- Provides interoperability among end products
- 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

Synkro (approx. 32 KB memory)

- Lightweight networking stack built on the IEEE 802.15.4 standard
- For RF control, monitor and automation of consumer electronics products
- Optimized memory with standard command tables
- Two development options
 - Low-cost Synkro API using embedded processor running Synkro
 - Synkro BlackBox with complete access to API through serial command set
- Improved interference avoidance capabilities with channel agility and low latency transmissions
- Target applications
 - Televisions
 - DVD players and recorders
 - A/V receivers and set-top boxes
 - Other consumer electronics

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)
MC13201FC	2.0–3.4V	30, TX; 37, RX	500	2.4–2.5	-91	SPI	250	Yes	SMAC	32 QFN	\$2.12
MC13202FC	2.0–3.4V	30, TX; 37, RX	500	2.4–2.5	-92	SPI	250	Yes	SMAC, IEEE® 802.15.4, BeeStack™	32 QFN	\$2.48

System in a Package

Product	Supply Voltage V	Supply Current @ 1% Duty Cycle, CPU @ 2 MHz (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	2.0–3.4V	31.1, TX; 38.1, RX	0.2–0.675	2.4–2.5	-92	250	Yes	SMAC	71 LGA	16 KB	1 KB	HCS08	FC, SCI (2), Timer/PWM(2), KBI, 8-ch. 10-bit ADC, Up to 32 GPIO	\$3.26
MC13212	2.0–3.4V	31.1, TX; 38.1, RX	0.2–0.675	2.4–2.5	-92	250	Yes	SMAC, IEEE 802.15.4	71 LGA	32 KB	2 KB	HCS08	FC, SCI (2), Timer/PWM(2), KBI, 8-ch. 10-bit ADC, Up to 32 GPIO	\$3.56
MC13213	2.0–3.4V	31.1, TX; 38.1, RX	0.2–0.675	2.4–2.5	-92	250	Yes	SMAC, IEEE 802.15.4, BeeStack	71 LGA	60 KB	4 KB	HCS08	FC, SCI (2), Timer/PWM(2), KBI, 8-ch. 10-bit ADC, Up to 32 GPIO	\$3.90

Platform in a Package

Product	Supply Voltage V	Supply Current @ 1% Duty Cycle, CPU @ 1 MHz (Typ) mA	Standby Current (Typ) uA	Frequency Band GHz	Sensitivity @ 1% PER (Typ) dBm	Data Rate (Spec) Kbps	Data Rate TurboLink™ (Spec) Kbps	TX/RX Switch	MAC Options	Packages	Flash	RAM	ROM	Core	Interfaces and Peripherals	MSRP (10Ku)
MC13224V	2.0–3.4V	20 TX; 20 RX	0.3–0.675	2.4–2.5	-95	250	No	Yes	SMAC, IEEE 802.15.4, BeeStack	99 LGA	128 KB	96 KB	80 KB	ARM7 TDMI-S	12-bit ADC, Buck Converter, FC, SPI, SCI, SSI/Ls, 4–16-bit Timers/PWM(2), KBI, 2–8ch. Up to 64 GPIO	\$4.99

Development Tools

Freescale is proud to offer the newest development tool configurations to support its third-generation family, the MC1322X PiP. These development tools offer designers a leading demonstration and development platform for wireless connectivity with unsurpassed features and functionality. The unique kits provide headers for various MCU connectivity such as UART, I²C and analog to digital converters (ADC) which support LEDs and switches, flash reprogramming and in-circuit hardware debugging. See page two for complete details on the MC1322X and all Freescale ZigBee technology development kits.

Development Tools

Features	1321XCXSK-BDM	1321XDSK 1321XDSK-BDM	1321XNSK 1321XNSK-BDM	1321XEVK 1321XEVK-SFTW
13213-SRB (boards per kit)	1	2	2	4
13213-NCB (boards per kit)	1	0	1	3
CodeWarrior™ IDE	CodeWarrior Special Edition	CodeWarrior Special Edition	CodeWarrior Special Edition	CodeWarrior Special Edition; CodeWarrior Standard Edition with 1321XEVK-SFTW only
BeeKit™ with BeeStack™ ZigBee® Protocol Stack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack (Full Node Locked Version-1322XEVK-SFTW only)
ZigBee Packet Analyzer Hardware	No	No	No	Yes
Daintree Basic Protocol Analyzer	No	No	No	Yes
Out-of-Box Application	Synkro Demo	Sensor Application Demo	Range Test Demo	ZigBee Application Network Demo

Features	1322XUSB	1322XDSK-DBG	1322XNSK-DBG/ 1322xNSK-IAR	1322XEVK 1322XEVK-SFTW
1322X-SRB (boards per kit)	0	1	1	4
1322X-NCB (boards per kit)	0	1	1	3
1322X-USB (boards per kit)	1	0	1	1
Low Power Node	0	0	1	2
J-Link JTAG Debugger	No	Yes	Yes	Yes
IAR EWARM IDE	IAR EWARM 32K Edition	IAR EWARM 32K Edition	IAR EWARM 32K Edition, 256K Edition (1322xNSK-IAR only)	IAR EWARM 32K Edition, 256K Edition (1322XEVK-SFTW only)
BeeKit with BeeStack ZigBee Protocol Stack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack	BeeKit with 90-day evaluation of BeeStack (Full Node Locked Version-1322XEVK-SFTW only)
ZigBee Packet Analyzer Hardware	No	No	No	Yes
Daintree Basic Protocol Analyzer	No	No	No	Yes
Out-of-Box Application	No	Wireless Environmental Monitoring Demo, Synkro Demo	802.15.4 Network Demo	ZigBee Environment Demo (ZeD)

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

BeeKit Software Development Tool Complimentary to Freescale Customers*, Included in Hardware Development Kits or Downloadable from www.freescale.com/zigbee

BeeKit™

BeeKit is Freescale's simplified integrated development environment (IDE) for 802.15.4 and ZigBee technology solutions. BeeKit is a GUI (graphical user interface) for creating, modifying and updating wireless networking design. 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, BeeKit is a complementary tool to the CodeWarrior IDE and the IAR EWARM which support MCU application development. BeeKit includes development capability using the following protocols: Simple MAC (SMAC), IEEE 802.15.4 MAC, ZigBee and Synkro. With Freescale's newest protocol, Synkro, create networks to control, monitor and automate consumer electronics products. BeeKit is included in each development kit and may also be downloaded from Freescale's Web site. BeeKit includes the complimentary SMAC and IEEE 802.15.4 MAC, Synkro and a 90-day evaluation of BeeStack (Freescale's ZigBee compliant stack). A BeeStack node or floating license may be purchased for ZigBee development.

BeeStack™

Freescale's BeeStack (ZigBee Compliant Software Development Tool) BEESTACK-STD and BEESTACK-FLT MSRP \$995 and \$1495 respectively*
BeeStack is Freescale's fully compliant ZigBee stack for ZigBee network application development. Provided as a 90-day version along with development kits and via web download, a node or floating license version may be purchased. BeeStack supports ZigBee 2007 (SP1 and 2), the ZigBee Smart Energy Profile and ZigBee Pro. The BeeKit and BeeStack work seamlessly to provide ease of use and a fast time to market when implementing ZigBee-compliant networks

CodeWarrior

CodeWarrior for HC(S)08/RS08

Freescale's CodeWarrior Development Studio for Microcontrollers is a single, integrated tool suite designed to help embedded engineers get started on the design fast track for HC(S)08 MCU. CodeWarrior provides optimized tools to take full advantage of the Freescale microcontroller selected for design. Go to www.freescale.com/codewarrior for licensing details.



NEW! IAR EWARM™

IAR Embedded Workbench for ARM provides a full suite of development tools for ARM and the Freescale MC1322X family of Platform in a Package solutions. The integrated development environment offers a continuous workflow, efficient code generation and ease of use. The tools include an editor, compiler, linker and debugger and optional IAR J-Link and J-Trace hardware debug probes. Go to www.IAR.com for licensing details.



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 Synkro Development Kit (1321XCSK-BDM) MSRP \$399

Create your network design using Freescale's newest development kit, the 1321XCSK-BDM. Set up and run example application software to demonstrate the Synkro network protocol capability or begin prototype development for networks to control, monitor and automate consumer electronics (CE) products including televisions, DVD players and records, set top boxes, audio/video receivers, remote control and many more CE applications. The kit includes one sensor reference board (SRB), one network control board (NCB), BeeKit, the CodeWarrior Special Edition plus an out of the box application for quick demo set-up.



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.



1321X 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.



1321X 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.



NEW! 1322X USB Kit (1322XUSB) MSRP \$79

The 1322XUSB offers customers an opportunity to perform packet sniffing functions with a simple to use hardware alternative. The kit includes the USB stick, the IAR EWARM 32K edition, and the BeeKit with a 90-day evaluation of BeeStack.



NEW! 1322X Developer's Starter Kit (1322XDSK-DBG) MSRP \$379

The 1322X Developer's Starter Kit is a cost-effective, reusable development kit for implementation of wireless network designs compatible with simple MAC (SMAC), IEEE 802.15.4 standard MAC or ZigBee. The kit includes two board types (1322X-SRB and 1322X-NCB) which provide extended functionality and an additional flexibility not available in other development kits. The SRB with features such as the Freescale MMA7260Q 3-axis acceleration sensor, MPXV5010G integrated pressure sensor and temperature sensor offers designers an ideal platform for wireless monitoring and control development. The NCB includes a graphical display and joystick which enhance user control. With support for a SMA connector, the board offers easy connectivity for an antenna or to make radio measurements. The NCB also offers a headset jack and speaker for voice and audio functionality using the unique TurboLink™ function. Both boards include a removable plastic board enclosure and capability to run off two AA batteries or an AC power adapter or USB port which further extend application capabilities.



NEW! 1322X Network Starter's Kit (1322XNSK-DBG and 1322XNSK-IAR) MSRP starting at \$579

Building on the components of the DSK, the NSK adds two more development boards to further extend network capabilities. The 1322X-USB board provides simple USB connectivity via a small dongle based on the MC13225 device. The board is an ideal platform where simple PC connectivity is required. The 1322X-USB also functions as an IEEE 802.15.4/ZigBee packet sniffer. The 1322X-LPB is a simple design platform, but one that is ideal for taking power measurements. The LPB can be used with AA or coin cell batteries to develop and demonstrate low-power designs. The NSK simplifies development of peer-to-peer and mesh network applications. The 1322XNSK-IAR version includes the full 256 KB IAR EWARM integrated development environment (IDE).



NEW! 1322X Evaluation Kit (1322XEVK and 1322XEVK-SFTW) MSRP starting at \$1999

Expanding on the NSK, the comprehensive 1322X evaluation kit or EVK allows for development of more complex peer-to-peer and mesh network applications with additional hardware and software contents. The kit includes ten hardware nodes, the 256K IAR Embedded Workbench edition, the BeeKit (includes 90-day evaluation license), cables, power adapters and the Daintree SNA Basic Edition 802.15.4/ZigBee protocol analyzer. The SFTW kit adds the BeeKit with full BeeStack license and a 256K IAR EWARM IDE.



NEW! QE128 Wireless Connectivity Developer's Starter Kit (1320X-QE128-DSK and 1320X-QE-DSK-BDM) MSRP starting at \$349

The 1320X-QE128 Developer's Starter Kit offers essential design elements in a cost-effective development kit. The kit comes with everything you need to get started on a wireless network which uses the Freescale's premiere MC1320X transceiver and the HSC08QE128 microcontroller, including hardware boards, cables, batteries, power adapters, software and sample applications. The platform is ideal for developing IEEE 802.15.4 and ZigBee solutions that require optimized stack and application memory footprints. With 128 KB of flash and 8 KB of RAM, the QE128 provides exceptional application code space. The development boards have pushbuttons, headers, connectors and LEDs and are programmed via the BDM programming/debug port which offers a flexible development platform. The BeeKit Wireless Connectivity Toolkit supports the 1320X-QE128-EVK for IEEE 802.15.4 and BeeStack development.

*Subject to license agreement and registration.

Acronyms:

BDM: Background debug module
DSK: Developer's starter kit

EVB: Evaluation board
LPB: Low power board

MAC: Media access control
NCB: Network control board

NSK: Network starter's kit
PCB: Printed circuit board

RF: RF daughter card
SRB: Sensor reference board

USB: Universal serial bus
ZeD: ZigBee environment demo

Learn More:

For more information about wireless connectivity products, please visit www.freescale.com/802154.