Freescale's Wireless Connectivity Products Summary

Freescale Semiconductor offers embedded designers the silicon, software and hardware to implement a complete 250 Kbps, 2.4 GHz wireless network—from simple to complex. With five protocol stack alternatives to choose from—the broadest IEEE® 802.15.4-based protocol offering in the market—Freescale draws on extensive radio frequency (RF) and wireless experience accumulated from more than 50 years of developing semiconductor products. BeeKit graphical user interface (GUI) development software supports five protocol stacks, including simple media access controller (SMAC), IEEE 802.15.4 MAC, SynkroRF, BeeStack Consumer (ZigBee® RF4CE) and BeeStack (ZigBee/ZigBee Pro).

BeeKit Codebases

SMAC (approx. 4–8 KB memory)
- Proprietary SMAC 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
- Repeater functionality
- Over-the-air programming

IEEE 802.15.4-Compliant MAC (approx. 17–40 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

SynkroRF (approx. 32 KB memory)
- When SMAC is too simple
- When ZigBee is too complex
- 802.15.4 based, easy to use
- Provides complete network stack API with Black Box design option
- Channel agility with dynamic interference avoidance
- Supports larger data transfers with fragmentation
- Low latency transmission features for enhanced performance in noisy environments

ZigBee RF4CE (approx. 40 KB memory)
- Wireless for consumer electronics control, monitor and automation
- Reliable data delivery with CSMA-CA and message acknowledgement
- Additional interference avoidance techniques implemented
- Power saving modes
- Increased battery life
- Lower standby current
- Allows designs to meet Energy Star requirements
- Support for acknowledged, non-acknowledged, unicast and broadcast messages
- Support for non-secure and secure communications with AES 128-bit and CCM* encryption
- Simple mechanism for pairing
- Only authorized paired devices can communicate
- Support for interoperability through standardized profiles

ZigBee/ZigBee Pro (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, Home Automation and Health Care profiles
- Provides interoperability among end products
- Established routing algorithm
- Network recovery and healing
- Wireless embedded or dongle options

MC1323x System on Chip

Product	Supply Voltage V	Supply Current at 1% Duty Cycle, CPU at 1 MHz (Typ) mA	Standby Current (Typ) µA	Frequency Band GHz	Sensitivity at 1% PER (Typ) dBm	Data Rate (Spec) Kbps	MAC Options	Packages	Flash	RAM	Core	Interfaces and Peripherals	USD MSRP (10 Ku)
MC13233C	1.8–3.6	27 TX, 31 RX	0.5–.75	2.4–2.5	-93	250	SMAC, IEEE 802.15.4, SynkroRF, RF4CE	48 LGA	82 KB	5 KB	HCS08	Timers, KBI, SCI/UART, I²C, SPI, CMT, RTC	$2.99

1323x Development Kit Features

Feature	1323x USB Kit	1323x Developer Starter Kit	1323x Network Starter Kit
1323x-MRB	0	2	4
1323x-REM	0	1	3
1323x-RCM	0	1	1
1323X-USB	5	0	0
USB Multilink BDM	No	Yes, 1323xDSK-BDM only	Yes, 1323xNSK-BDM and 1323xNSK-SFTW only
CodeWarrior IDE	CodeWarrior Special Edition	CodeWarrior Special Edition	CodeWarrior Special Edition, CodeWarrior Standard Edition (1323xNSK-SFTW only)
BeeKit	Yes	Yes	Yes
Batteries, Cables and Power Adapters	Yes	Yes	Yes
Out-of-Box Application	N/A	Range Demo	RF4CE Remote Control
RoHS Compliant	Yes	Yes	Yes
USD MSRP—Part #	$199—1323xUSB	$199—1323xDSK $279—1323xDSK-BDM	$449—1323xNSK $529—1323xNSK-BDM $999—1323xNSK-SFTW

MC1322x Platform in a Package

Product	Supply Voltage V	Supply Current @ 1% Duty Cycle, CPU @ 1 MHz (Typ) mA	Standby Current (Typ) µA	Frequency Band GHz	Sensitivity at 1% PER (Typ) dBm	Data Rate (Spec) Kbps	MAC Options	Packages	Flash	RAM	ROM	Core	Interfaces and Peripherals	USD MSRP (10 Ku)
MC13224V	1.8–3.6	29 TX, 22 RX	0.3–0.675	2.4–2.5	-95	250	SMAC, IEEE 802.15.4, SynkroRF, RF4CE, ZigBee	99 LGA	128 KB	96 KB	80 KB	ARM7™ TDMI-S	12-bit ADC, Buck Converter, I²C, SPI, SCI, SSI/I²S, 4–16-bit Timers/PWM(2), KBI, 2–8-ch., Up to 64 GPIO	$4.50
MC13226V	1.8–3.6	29 TX, 22 RX	0.3–0.675	2.4–2.5	-95	250	SMAC, IEEE 802.15.4, SynkroRF, RF4CE, ZigBee, ZigBee Pro	99 LGA	128 KB	96 KB	80 KB	ARM7 TDMI-S	12-bit ADC, Buck Converter, I²C, SPI, SCI, SSI/I²S, 4–16-bit Timers/PWM(2), KBI, 2–8-ch., Up to 64 GPIO	$4.50

1322x Development Kit Features

Feature	1322x USB Kit	1322x Developer Starter Kit	1322x Network Starter Kit	1322x ZigBee Evaluation Kit	13226PRO Evaluation Kit
1322x-SRB	0	1	1	4	2
1322x-NCB	0	1	1	3	2
1322x-LPB	0	0	1	2	N/A
1322x-USB	1	0	1	1	1
J-Link JTAG Debugger	No	Yes	Yes	Yes	Yes
IAR IDE	IAR EWARM 32K	IAR EWARM 32K	IAR EWARM 32K IAR EWARM 256K Edition (1322xNSK-IAR only)	IAR EWARM 32K IAR EWARM 256K Edition (1322xEVK-SFTW only)	IAR EWARM 32K
BeeKit	Yes	Yes	Yes	Yes	Yes
Batteries, Cables and Power Adapters	Yes	Yes	Yes	Yes	Yes
Out-of-Box Application	None	Weather Station Demo	802.15.4 Network Demo	ZigBee Environement Demo	ZigBee Smart Energy Demonstration
RoHS Compliant	Yes	Yes	Yes	Yes	Yes
USD MSRP—Part #	$79—1322x-USB	$379—1322xDSK-DBG	$579—1322xNSK-DBG $2599—1322xNSK-IAR	$1999—1322xEVK $3999—1322xEVK-SFTW	$699—13226PRO-DBG

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

MC1321x System in a Package

Product	Supply Voltage V	Supply Current at 1% Duty Cycle, CPU at 2 MHz (Typ) mA	Standby Current (Typ) µA	Frequency Band GHz	Sensitivity @ 1% PER (Typ) dBm	Data Rate (Spec) Kbps	MAC Options	Packages	Flash	RAM	Core	Interfaces and Peripherals	USD MSRP
MC13211	2.0–3.4	31.1 TX, 38.1 RX	0.2–0.675	2.4–2.5	-92	250	SMAC	71 LGA	16 KB	1 KB	HCS08	I²C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO	$2.94
MC13212	2.0–3.4	31.1 TX, 38.1 RX	0.2–0.675	2.4–2.5	-92	250	SMAC, IEEE 802.15.4, SynkroRF, RF4CE	71 LGA	32 KB	2 KB	HCS08	I²C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO	$3.21
MC13213	2.0–3.4	31.1 TX, 38.1 RX	0.2–0.675	2.4–2.5	-92	250	SMAC, IEEE 802.15.4, SynkroRF, RF4CE, ZigBee	71 LGA	60 KB	4 KB	HCS08	I²C, SCI (2), Timer/PWM(2), KBI, 8-ch., 10-bit ADC, Up to 32 GPIO	$3.52

1321x Development Kit Features

Feature	1321x Consumer Starter Kit	1321x Developers Starter Kit
1321x-SRB	1	2
1321x-NCB	1	0
USB Multilink BDM	Yes, 1321xCSK-BDM only	Yes, 1321xDSK-BDM only
CodeWarrior IDE	CodeWarrior Special Edition	CodeWarrior Special Edition
BeeKit	Yes	Yes
Batteries, Cables and Power Adapters	Yes	Yes
Out-of-Box Application	RF4CE Virtual Remote Demo	Triax
RoHS Compliant	Yes	Yes
USD MSRP—Part #	$399—1321xCSK-BDM	$249—1321xDSK $349—1321xDSK-BDM

MC1320x Transceivers

Product	Supply Voltage V	Supply Current at 1% Duty Cycle (Typ) mA	Standbby Current (Typ) µA	Frequency Band GHz	Sensitivity @ 1% PER (Typ) dBm	Control Interface	Data Rate (Spec) Kbps	TX/RX Switch	MAC Options	Packages	USD MSRP
MC13201FC	2.0–3.4	30 TX, 37 RX	0.2–0.675	2.4–2.5	-91	SPI	250	Yes	SMAC	32 QFN	$1.91
MC13202FC	2.0–3.4	30 TX, 37 RX	0.2–0.675	2.4–2.5	-92	SPI	250	Yes	SMAC, IEEE 802.15.4, SynkroRF, RF4CE, ZigBee	32 QFN	$2.24

MC1320x Development Kit Features

Feature	1320x RF Daughter Card Kit	1320x Developer Starter Kit
1320x-RFC	1	0
1320x-EVB	0	2
HCS08 Daughter Card	0	2
USB Multilink BDM	No	Yes 1320xDSK-BDM only
CodeWarrior IDE	No	CodeWarrior Special Edition
BeeKit	Yes	Yes
Batteries, Cables and Power Adapters	Yes	Yes
Out-of-Box Application	NA	Dimmable Light and Dimmable Switch
RoHS Compliant	Yes	Yes
USD MSRP—Part #	$79—1320xRFC	$349—1320x-QE128-DSK $399—1320x-QE-DSK-BDM

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

Development Software

BeeKit

BeeKit Software Development Tool Complimentary to Freescale Customers[1], Included in Hardware Development Kits or Downloadable from freescale.com/zigbee
BeeKit is Freescale's simplified integrated development environment (IDE) for 802.15.4 and ZigBee technology solutions. BeeKit is a GUI 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, BeeKit is a complementary tool to the CodeWarrior IDE and the IAR EAWARM which support MCU application development. BeeKit is included in each development kit and may also be downloaded at **freescale.com/zigbee**. BeeKit includes SMAC, IEEE 802.15.4, SynkroRF and BeeStack (ZigBee RF4CE and ZigBee/ZigBee Pro) codebases. BeeKit supports the ZigBee Remote Control, Smart Energy and Health Care profiles.

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 the HC(S)08 MCU. CodeWarrior provides optimized tools to take full advantage of the Freescale microcontroller selected for design. Visit **freescale.com/codewarrior** for licensing details.

IAR SYSTEMS

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, debugger, optional IAR J-Link and J-Trace hardware debug probes. Visit **IAR.com** for licensing details.

[1] Subject to license agreement and registration.

Markets

Consumer Electronics
- Remote control
- Blu-ray
- Digital TV
- Video player/recorder (VCR, DVR, others)
- Set-top box
- DTV
- Projector
- Satellite radio receiver
- Surround sound
- Consumer usage data
- Maintenance alerts
- Billing

Smart Energy
- Automated metering
- Home area networks
- Lighting control
- HVAC
- Access control
- Demand response
- Security
- Irrigation control
- Window or fan control
- Load management
- Occupancy detection
- Water heater control

Health and Wellness
- Home health
- Fitness monitoring
- Equipment/supplies tracking
- Independent living
- Child monitoring
- Drug access control
- Pulse oximetry
- Blood pressure monitor
- Fall warning
- Infusion pumps
- Glucose monitor

General Market
- Gaming
- Security
- Flow detects
- Motion sensing
- Glass breakage
- Container monitoring
- Temperature status
- Animal locating
- Computer peripherals
- Cable replacement

Learn More: For more information about wireless connectivity products, please visit **freescale.com/ZigBee**.

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