8-bit Microcontrollers

Powering ZigBee™ Designs with Freescale 8-bit Microcontrollers

Freescale offers a wide selection of high-performance 8-bit microcontrollers (MCUs) that are ideal control solutions for the Freescale MC1319x and MC1320x families of transceivers that are compatible with the ZigBee specification transceivers. By matching the most appropriate controller with the transceiver that fits application design requirements, ZigBee specification product developers will experience the advantages of rapid processing, lower power consumption and proven reliability while minimizing overall design costs.

Choosing an MCU that is most fitting for a cost-effective design should be simple. Two important factors must be considered:

Input/Output—This defines the input/output (I/O) and peripheral requirements of the overall design. Consider analog and digital sensors, switches, keypads, output light-emitting diodes (LEDs) and liquid crystal displays (LCDs) as important I/O and peripheral functions.

MCU Memory Size—The memory size must accommodate both the application program code and the radio frequency (RF) communication software. This software is available in three forms, offering distinct levels of functionality: simple media access controller (SMAC or Simple MAC), IEEE(r) 802.15.4 standard based MAC and the ZigBee specification. Shown below are the memory requirement ranges for each of the media access controller solutions:

> Proprietary Simple MAC up to 4 KB

> IEEE® 802.15.4 MAC 17 KB–35 KB

> Fully compliant with the ZigBee specification 36 KB–52 KB

Memory requirements vary when enabling particular features, such as security protection, guaranteed time slots (GTS), beaconing and full functionality device support.

8-BIT ZIGBEE COMPATIBLE MICROCONTROLLER PRODUCTS

Memory Size (Design + RF Requirements) \ Design Functionality (Input/Output Requirements)	14 I/O	39 I/O	56 I/O
4K	MC9S08QG4		
8K	MC9S08QG8	MC9S08GT8A	
16K		MC9S08GT16A	
32K		MC9S08GT32A	MC9S08GB32A
60K		MC9S08GT60A	MC9S08GB60A

Cross reference your memory requirements with your I/O requirements to find the Freescale 8-bit MCU best suited for your design.

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8-bit MCU/RF Solutions

Optimized for high-performance and extreme operating economy with a number of low-power options, the HCS08 core is particularly attractive for battery-powered and handheld applications. Multiple Stop modes, along with Wait and Standby modes, will enable product developers to achieve new thresholds in low-power performance under a variety of operating conditions. The wide variety of MCU and transceiver combinations gives designers the flexibility to explore new network applications while still maintaining a high-performance, cost-effective profile.

Device	Flash	RAM	ADC	Timers	Packages	Serial Comm.	Max I/O	Compatible ZigBee™ Devices
MC9S08QG4	4K	256B	8-ch., 10-bit	2-ch., 16-bit	8-DIP, 8-SOIC, 8-DFN, 16-TSSOP, 16-QFN	SCI, SPI, IIC	14	MC13191FC, MC13201FC
MC9S08QG8	8K	512B	8-ch., 10-bit	2-ch., 16-bit	8-SOIC, 8-DFN, 16-DIP, 6-QFN, 16-TSSOP	SCI, SPI, IIC	14	MC13191FC, MC13201FC
MC9S08GT8A	8K	1K	8-ch., 10-bit	3-ch., 16-bit 2-ch., 16-bit	48-QFN, 44-QFP, 42-SDIP, 32-QFN	2xSCI, SPI, IIC	39	MC13191FC, MC13201FC
MC9S08GT16A	16K	2K	8-ch., 10-bit	3-ch., 16-bit 2-ch., 16-bit	48-QFN, 44-QFP, 42-SDIP, 32-QFN	2xSCI, SPI, IIC	39	MC13191FC, MC13201FC
MC9S08GT32A	32K	2K	8-ch., 10-bit	2-ch., 16-bit 2-ch., 16-bit	48-8QFN, 44-QFP, 42-SDIP	2xSCI, SPI, IIC	39	MC13191FC, MC13192FC, MC13201FC, MC13202FC
MC9S08GT60A	60K	4K	8-ch., 10-bit	2-ch., 16-bit 2-ch., 16-bit	48-QFN, 44-QFP, 42-SDIP	2xSCI, SPI, IIC	39	MC13191FC, MC13192FC, MC13193FC, MC13201FC, MC13202FC, MC13203FC
MC9S08GB32A	32K	2K	8-ch., 10-bit	5-ch., 16-bit 3-ch., 16-bit	64-LQFP	2xSCI, SPI, IIC	56	MC13191FC, MC13192FC, MC13201FC, MC13202FC
MC9S08GB60A	60K	4K	8-ch., 10-bit	5-ch., 16-bit 3-ch., 16-bit	64-LQFP	2xSCI, SPI, IIC	56	MC13191FC, MC13192FC, MC13193FC, MC13201FC, MC13202FC, MC13203FC

Proprietary Simple MAC

> Most cost-effective of the three solutions

> Simple MAC software

> 16 primitives

> With implementations as low as 2.5 KB of memory

> ANSI C source code provided

> Generic serial peripheral interface (SPI) targets any MCU

> Target applications

- Point-to-point and Star networks
- Ultra low-power requirements
- Ultra low-memory requirements

IEEE 802.15.4 Standard-Based MAC

> 802.15.4 physical layer (PHY) and MAC software compliant

> Supports packet and streaming mode

> Compliant to RF specs

> Standardized communication protocol

> Supports beaconed and non-beaconed networks

> GTS

> Advanced Encryption Standard (AES) encryption

> Target applications

- Mesh and ClusterTree networks
- Robust communication and timing critical networks

Compliant with the ZigBee Specification

> Platform compliant with the ZigBee specification.

> Comprehensive 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 ClusterTree networks
- Robust communication and timing critical networks

Learn More: For more information about Freescale's products, please visit **www.freescale.com**.

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