Microcontrollers
More Than You Expect

Solutions for consumer and industrial applications

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For a complete listing of available products with full orderable part numbers, visit **freescale.com/MCU**.

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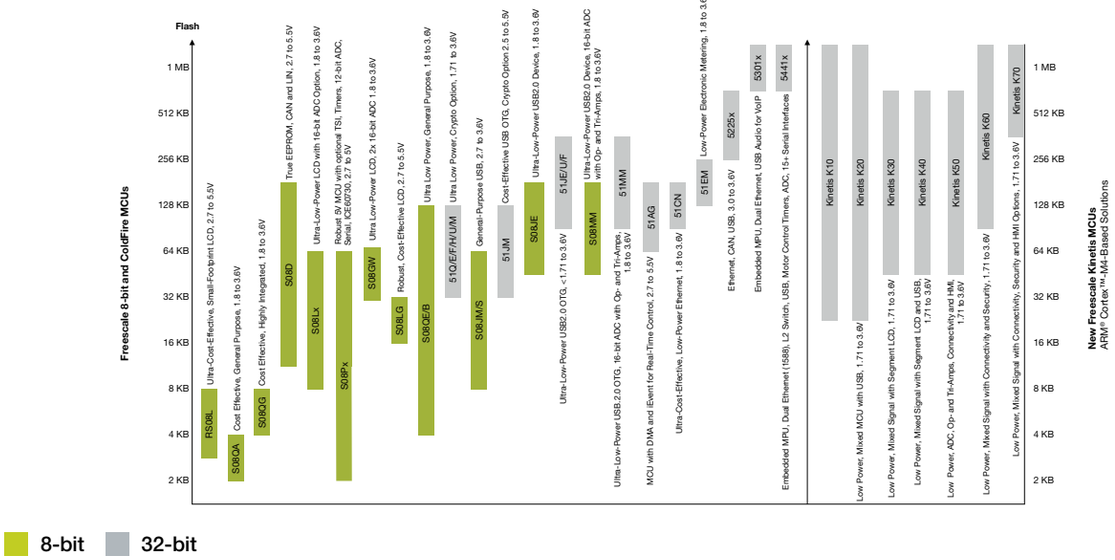
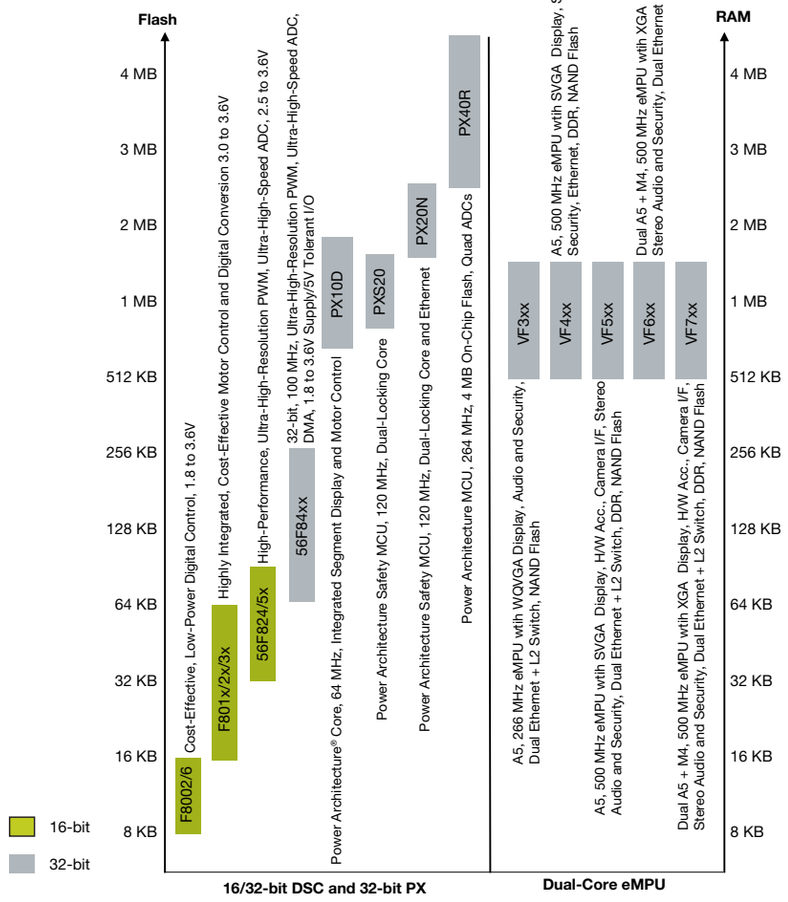
Controller Continuum Road Map



8-bit 32-bit

Application-Specific 16- and 32-bit Solutions

Application-Specific Road Map



Introduction

Freescale is a leading supplier of embedded controllers with a strong legacy in both the industrial and consumer market. We have a broad portfolio of MCUs across our 8- 16- and 32-bit platforms, featuring leading-edge low power, analog, control and communications IP. For more information on our portfolio, visit **freescale.com/MCU**. Freescale is committed to ensuring our products are available for our customers through the entire lifetime of their systems, to that extent, Freescale commits to a minimum product cycle of 10, and in some cases, 15 years for our MCUs targeting the industrial, automotive and medical markets. For more information on product longevity, visit **freescale.com/productlongevity**.

It's More Than Just Silicon

Freescale is dedicated to providing semiconductor solutions that build value into your products. When you purchase from us, you're buying more than just an embedded processor. You're getting access to a broad ecosystem of technical support services, development tools and training—all designed to make your job easier and your end products better.

Freescale 8-bit MCUs Simplify the Design Process

Freescale is focused on making it easier for companies to develop applications with 8-bit MCUs by providing a free software development suite. This enables companies to significantly reduce their development time and bill of materials. Our aim is to provide a fully bundled software and hardware platform that is ready to use out of the box, allowing designers to focus on developing application code.

Key Benefits of Our 8-bit Portfolio

- Broad, scalable portfolio ranging from small, cost-effective 1 KB MCUs to highly integrated 100-pin, 128 KB solutions
- Award-winning CodeWarrior software IDE to reduce the development cycle
- Flexible Tower hardware development platform for rapid evaluation and application development
- Hundreds of reference designs and example projects
- Direct support from **freescale.com/support**
- 10- or 15-year guaranteed lifetime

The 32-bit ColdFire Portfolio Advantage for Industrial and Consumer Markets

ColdFire architecture is unlike any other 32-bit architecture in the industry. With a wide portfolio of 32-bit solutions, an unparalleled range of performance and peripherals, and one of the lowest power 32-bit MCUs on the market, the ColdFire and ColdFire+ families offers incredible flexibility and choice. Enabled by a vast ecosystem of development tools and design resources, we help make 32-bit development possible.

The New 32-bit Kinetis Family of MCUs

32-bit Kinetis MCUs represent the most scalable portfolio of ARM® Cortex™-M4 MCUs in the industry. The portfolio consists of five MCU families with over 200 pin-, peripheral- and software-compatible devices with outstanding performance, memory and feature scalability. Enabled by innovative 90 nm thin-film storage (TFS) flash technology with unique FlexMemory (configurable embedded EEPROM), Kinetis MCUs feature the latest low-power innovations and high-performance, high-precision, mixed-signal capability. Kinetis MCUs are supported by a market-leading enablement bundle from Freescale and ARM third-party ecosystem partners.

The 16- and 32-bit DSC Family, Ideal for Advanced Digital Control and Power Conversion

Freescale is a pioneer in DSC solutions. Our 56800/56800E DSC architecture combines the computational power of a DSP with the control functionality of an MCU onto a single core. The 56800/56800E family combines the advantages of hybrid architecture with leading peripherals, advanced memory technology, software and development tools to give you the capability you need to develop winning solutions in complex digital control and measurement environments.

* Subject to licensing agreement and registration.

PX Series of Power Architecture® MCUs

The PX series of Power Architecture MCUs provides unmatched performance, comprehensive enablement and ruggedized safety features for the most complex industrial control applications, including motor drives, renewable energy, motion control, power generation, clinical medical, robotics applications and more. Options exist for both single- and multicore implementations with up to 600 DMIPs of performance. The family offers up to 4 MB of integrated flash memory. An embedded safety architecture helps meet challenging safety, reliability and environmental requirements. Runtime software, a development platform for rapid prototyping, and advanced debug and system modeling tools ensure easy development.

Software Enablement and Support

The increasing complexity of industrial applications and expanding functionality of semiconductors are driving embedded developers toward solutions that require the integration of proven hardware and software platforms. Freescale, along with a strong alliance network, offers comprehensive solutions that include development tools, debuggers, programmers and software.

Complimentary Software and Tools

- Freescale MQX™ RTOS, Ethernet, FileSystem, USB stacks and more
- Complimentary bare metal TCP/IP and USB stacks
- Freescale Linux® BSP
- CodeWarrior Development Studio
- Processor Expert software: A rapid application development tool in the CodeWarrior tool suite
- Digital signal processing library

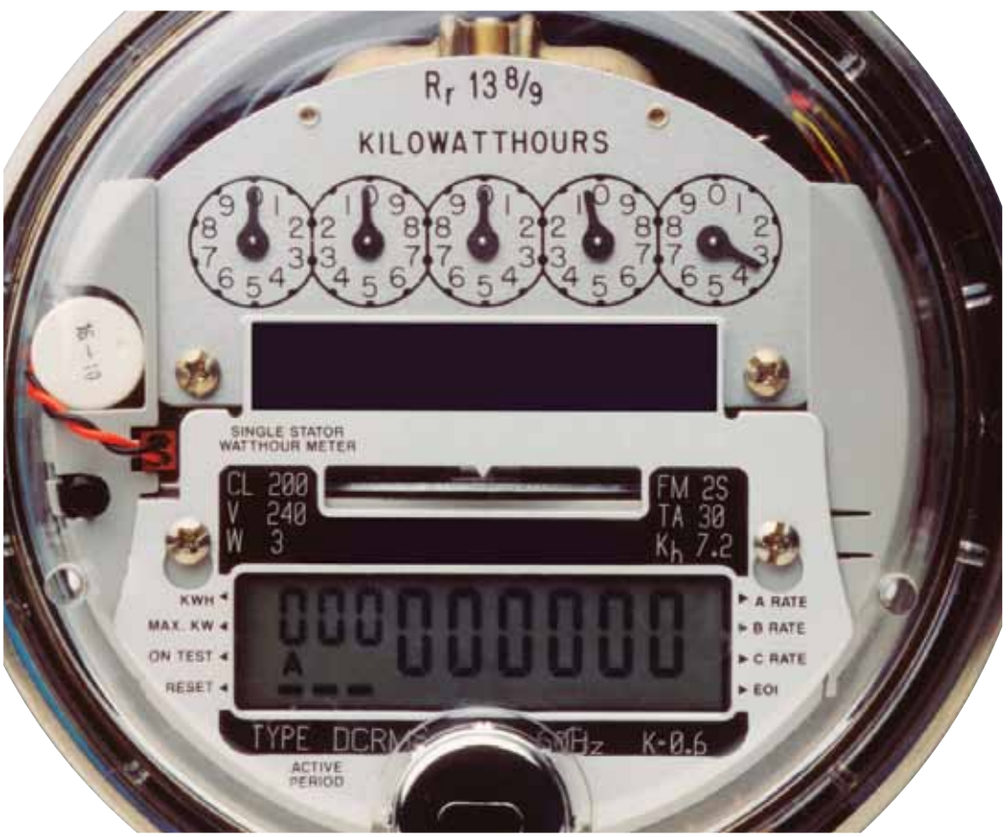
Tower System

The Freescale Tower System is a modular development platform for 8-, 16- and 32-bit embedded processors that enables advanced development through rapid prototyping. Featuring multiple plug and play modules, the Tower System provides designers with building blocks for entry-level evaluation to advanced application development. For a complete list of development kits and modules offered as part of the Freescale Tower System, please visit **freescale.com/Tower**.

You Are Never Very Far from Freescale

We have hundreds of sales people and application engineers in the field and an extensive network of distributors around the world. Your Freescale representatives are trained to understand your needs and help you find the best solutions for your products.

Need direct support from a Freescale expert? We can help. Freescale provides guidance for your project. Our technical sales representatives and product specialists are available to respond to technical product questions and help you select and obtain the right devices, tools and software to build your next application. For more information, visit **freescale.com/support**.



MC9S08QG/QA Family

So highly integrated, it's redefining "entry level"

Often it's not just the individual features, but the full feature set that matters. The MC9S08QG family enhances system functionality by integrating embedded modules that are frequently left off low-end MCUs.

These modules help to:

- Reduce system size
- Lessen the probability of board quality problems and conflicts
- Cut system cost
- Reduce design time

Key Features

- Powerful, advanced S08 core
- Multiple communications options: SCI, SPI and I²C, available on the S08QG8 only
- High-resolution analog: 8-ch., 10-bit ADC and analog comparator
- "Extras" included: 2-ch., 16-bit timer, internal/external oscillator, LVI, COP and up to 13 GPIOs
- Multiple memory options: 8 KB or 2 KB flash memory and up to 512B RAM

Target Applications

- Wireless sensors, including SMAC
- Watchdog coprocessors
- Small appliances
- Hand-held devices
- Secure boot coprocessors
- Security systems
- Control systems

Sample Application Notes

- AN2717/D: Transitioning from the HC08 Core to the MC9S08 Core
- AN3048: Analog-to-Digital Converter on an I²C Bus Using MC9S08QG8
- AN1818: Software SCI Routines with the 16-bit Timer Module

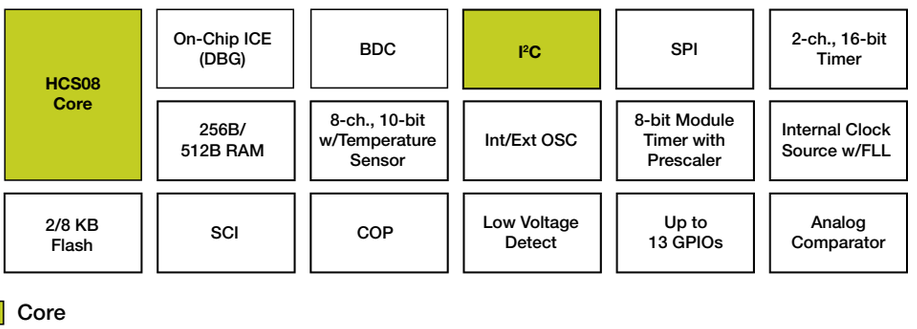
TWR-S08UNIV + TWR-S08DC-QG8

The Tower solution supports the RS08KA family and enables quick, simplified product evaluation and application development. It provides a cost-effective, extremely flexible development hardware platform, offering plug and play capabilities.

Features

- Tower System-compliant interface
- USB to BDM connection
- Two push button inputs
- A potentiometer
- USB powered
- TWR-PI interface for easy connection to sensor daughter cards

MC9S08QG/QA Block Diagram



Device	Flash	RAM	ADC Channels		SCI	ESCI	SPI	I²C	16-bit Timer Channels	Clock Type	Package	Applications/Additional Features
			10-bit	8-bit								All HC08 and S08 include COP, LVI, POR, KBI
MC9S08QG4CFQE	4 KB	256B	4-ch.	-	-	-	-	1	1-ch.	OSC	8 DFN	Fully integrated small packages
MC9S08QG4CDNE	4 KB	256B	4-ch.	-	-	-	-	1	1-ch.	OSC	8 SOIC	Fully integrated small packages
MC9S08QG4CPAE	4 KB	256B	4-ch.	-	-	-	-	1	1-ch.	OSC	8 PDIP	Fully integrated small packages
MC9S08QG4CDTE	4 KB	256B	8-ch.	-	1	-	1	1	2-ch.	OSC	16 TSSOP	Fully integrated small packages
MC9S08QG4CFFE	4 KB	256B	8-ch.	-	1	-	1	1	2-ch.	OSC	16 QFN	Fully integrated small packages
MC9S08QG4CFKE	4 KB	256B	8-ch.	-	1	-	1	1	2-ch.	ICS	24 QFN	Fully integrated small packages
MC9S08QG8CFKE	8 KB	512B	8-ch.	-	1	-	1	1	2-ch.	ICS	24 QFN	Fully integrated small packages
MC9S08QG8CDTE	8 KB	512B	8-ch.	-	1	-	1	1	2-ch.	OSC	16 TSSOP	Fully integrated small packages
MC9S08QG8CFFE	8 KB	512B	8-ch.	-	1	-	1	1	2-ch.	OSC	16 QFN	Fully integrated small packages
MC9S08QG8CPBE	8 KB	512B	8-ch.	-	1	-	1	1	2-ch.	OSC	16 PDIP	Fully integrated small packages
MC9S08QG8CDNE	8 KB	512B	4-ch.	-	-	-	-	1	1-ch.	OSC	8 SOIC	Fully integrated small packages
MC9S08QG8CFQE	8 KB	512B	4-ch.	-	-	-	-	1	1-ch.	OSC	8 DFN	Fully integrated small packages
MC9S08QA4CDNE	4 KB	256B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 SOIC	Fully integrated small packages
MC9S08QA4CFQE	4 KB	256B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 DFN	Fully integrated small packages
MC9S08QA4CPAE	4 KB	256B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 PDIP	Fully integrated small packages
MC9S08QA2CDNE	2 KB	160B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 SOIC	Fully integrated small packages
MC9S08QA2CFQE	2 KB	160B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 DFN	Fully integrated small packages
MC9S08QA2CPAE	2 KB	160B	-	4-ch.	-	-	-	-	1 x 1-ch.	ICS	8 PDIP	Fully integrated small packages

MC9RS08L Family

Small, cost-effective LCD solution driving more segments with fewer pins

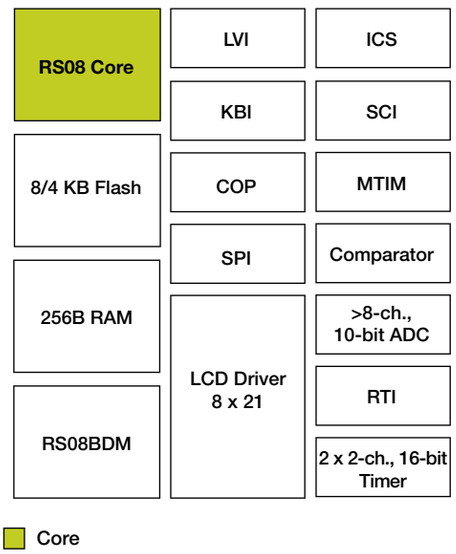
Freescale introduces the first RS08 cost-effective MCUs with LCD drivers. The highly integrated MC9RS08LA8 and MC9RS08LE4 MCUs are intended for small appliances, medical equipment and other industrial and multi-market applications. The LA and LE families provide design flexibility with a large segment-based (8x mode) driver and the RS08LA8 derviative features an integrated charge pump to provide true system-on-a-chip functionality.

Key Features

- Small-footprint LCD solutions in 28-pin and 48-pin packages
- Flexible LCD solutions
  - x8 mode means customer can drive more segments with less pins
  - Flexible glass, drive 3V or 5V glass
  - Blink capability available even in stop mode
  - Charge pump, RS08LA8 only
- Cost-effective solutions based on ultra-low-end RS08 core
- Feature-rich analog and serial functionality

- Coffee machines
- Microwaves
- Portable ovens
- Frying machines
- Portable medical equipment
- Thermometer
- HVAC applications
- Security and access control
- Remote controls

MC9RS08LA8 Block Diagram



Development Tools

DEMO9RS08LA8
DEMO9RS08LE4

The cost-effective demonstration kits contain everything a designer needs to develop and evaluate application code. The integrated USB multilink allows a designer to communicate with the board and target device with only a USB cable.

Features

- MC9RS08LA/E
- Integrated P&E USB-BDM
- On-board +5V regulator
- Power input selection jumpers
- Three push switches: User, reset and LED
- Buzzer
- Temperature sensor/themistor
- User option jumpers to disconnect peripherals
- MCU I/O connector
- 2.0 mm barrel connector
- BDM_PORT (not installed)
- USB connector
- DB9 connector

Target Applications

Device	Flash	RAM	ADC Channels		LCD	RTI	SCI	SPI	I²C	16-bit Timer Channels	8-bit MTIM	Clock Type	Package
			12-bit	10-bit									
MC9RS08LA8CGT	8 KB	256B		6-ch.	1		1	1		2-ch.	1	ICS	48 QFN
MC9RS08LA8CLF	8 KB	256B		6-ch.	1		1	1		2-ch.	1	ICS	48 QFP
MC9RS08LE4CWL	4 KB	256B		8-ch.	1	1	1			2 x 2-ch.		ICS	28 SOIC

MC9S08LG Family

Robust 5V LCD solution for industrial markets

The MC9S08LG family of 8-bit microcontrollers drives LCDs with up to 296 segments. This 5V LCD device offers improved performance and flexible pin functionality for a wide range of industrial and automotive applications, such as electric metering, home appliances, HVAC systems and entry-level instrument clusters.

Key Features/Benefits

- 2.7 to 5.5V operation available
- 16 KB and 32 KB flash, 4 KB RAM, 12-bit ADC
- Two hardware SCI, SPI, I²C
- Two independent 16-bit timers and one 8-bit timer
- Integrated LCD
  - Supporting both x8 and x4 mode up to 8 x 37 or 4 x 41 segments
  - Internal regulated charge pump for contrast control
- Dual bank flash for EEPROM emulation
- Internal clock source
- 40°C to 85°C for industrial and up to 105°C for automotive
- Up to 40 MHz HCS08 CPU core

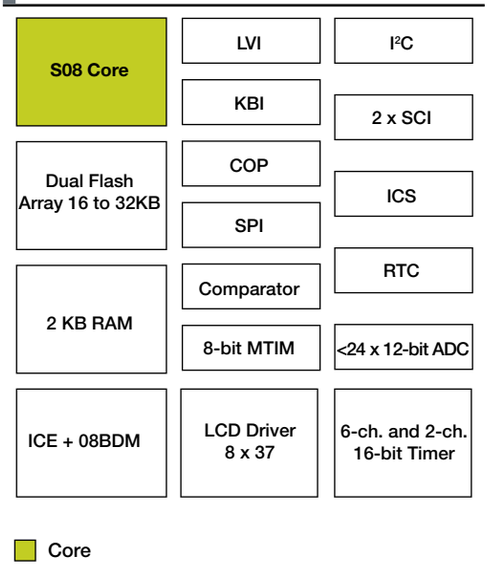
Target Applications

- White goods
- Automotive instrument clusters
- Factory automation
- HVAC applications
- Security and access control
- Building control

Sample Application Notes

- AN3828: Stepper Motor Motion Control Driver for MC9S08LG32
- AN3823: LCD Driver for MC9S08LG32
- AN3802: Interfacing an LCD with the MC9S08LG32
- AN3821: How to Handle Dual Flash Architecture in MC9S08LG32
- AN3817: Interfacing Stepper Motor with MC9S08LG32

MC9S08LG Block Diagram



DEMO9S08LG32

The DEMO9S08LG32 is a demonstration board for the MC9S08LG32 8-bit MCU. Application development is quick and easy with the integrated USB-BDM, sample software tools and examples. An optional BDM_PORT port is also provided to allow use of a BDM_PORT cable. One 80-pin connector provides access to all I/O signals on the target MCU.

Features

- MC9S08LG32, 80 LQFP
- On-board 4 x 40 custom LCD glass
- Integrated P&E USB-BDM
- On-board +5V regulator
- 10 push switches: Eight user, one reset, one IRQ
- 12 LED indicators: Eight user, one VDD, one IRQ, one USB and one reset
- 5K ohm POT w/LP filter for ADC input
- 80-pin MCU I/O pin header
- 2.0 mm barrel connector
- USB connector

Device	Flash	RAM	ADC Channels		LCD	RTC	SCI	SPI	I²C	16-bit Timer Channels	8-bit MTIM	Clock Type	Package
			12-bit	10-bit									
MC9S08LG32CLK	32 KB	2 KB	16-ch.		1	1	2	1	1	2 x 6-ch.	Y	ICS	80 LQFP
MC9S08LG32CLH	32 KB	2 KB	12-ch.		1	1	2	1	1	2 x 6-ch.	Y	ICS	64 LQFP
MC9S08LG32CLF	32 KB	2 KB	9-ch.		1	1	2	1	1	2 x 6-ch.	Y	ICS	48 LQFP
MC9S08LG16CLH	16 KB	2 KB	12-ch.		1	1	2	1	1	2 x 6-ch.	Y	ICS	64 LQFP
MC9S08LG16CLF	16 KB	2 KB	9-ch.		1	1	2	1	1	2 x 6-ch.	Y	ICS	48 LQFP

MC9S08LL Family

Ultra-low-power LCD solution driving more segments with fewer pins

Freescale introduces the first S08 ultra-low-power MCU with LCD driver. The MC9S08LL16/8 helps you reach your target performance levels while minimizing power consumption in your design, demonstrating extreme energy efficiency for ultra-long operation in battery-powered applications. The S08LL16 (LL16) MCU offers two ultra-low-power stop modes, new low-power run and wait modes, six microsecond wake-up time, ultra-low-power external oscillator and clock gating registers to disable clocks to unused peripherals.

Key Features

- Up to 40 MHz CPU (9S08LL64/36) 20 MHz bus speed
- Ultra-low-power MCU with six power saving modes, low-power oscillator and fast wake up from stop modes and industry-leading low power
- Flexible MCU solution
  - x8 mode means customer can drive more segments with less pins, up to 192 segments with 9S08LL16 and 288 segments with 9S08LL64
  - Flexible glass, drive 3V or 5V glass
  - Blink capability available even in stop mode
- Charge pump
- Time of day timer module for calendar/time recording/measurement with separate clock source

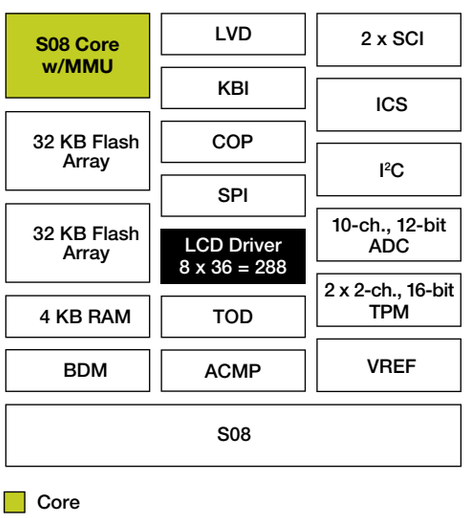
Target Applications

- Thermostats
- HVAC control
- Small and large appliances
- Remote control
- Industrial control terminals
- Portable medical equipment
- Building automation
- Security and access control

Application Notes

- AN3796: LCD Driver Specification
- AN3821: How to Handle Dual Flash Architecture in MC9S08LG32
- AN3822: Emulated EEPROM Implementation in Dual Flash Architecture and Demo Description on MC9S08LG32
- AN3990: Migrating from the MC9S08LL16 to
- MC9S08LL64 Microcontroller
- DRM106: Thermostat Reference Design Using the MC9S08LL16
- AN2764: Improving the Transient Immunity
- Performance of Microcontroller-Based Applications
- AN2111: A Coding Standard for HCS08 Assembly Language

MC9S08LL64 Block Diagram



DEMO9S08LL16

The cost-effective DEMO9S08LL16 demonstration kit contains everything a designer needs to develop and evaluate application code. The integrated USB multilink allows a designer to communicate with the board and target device with only a USB cable.

Features

- MC9S08LL16, 64 LQFP
- Integrated P&E USB-BDM
- On-board +5V regulator
- Battery holder for li-ion battery
- Power input selection jumpers
- Five push switches: Four user and one reset
- 10 LED indicators: Eight user, one VDD and one USB
- 5K ohm POTs w/LP filter
- Light sensor w/LP filter and op amp
- User option jumpers to disconnect peripherals
- 40-pin MCU I/O connector
- 2.0 mm barrel connector
- BDM_PORT (not installed)
- USB connector
- DB9 connector

TWR-S08LL64-KIT
TWR-S08LL64

Features

- 5K one turn potentiometer—RS232 port
- MC9S08LL64 MCU
- 32,768 Hz Crystal
- Freescale 3-axis accelerometer
- ADC input to MCU buzzer light sensor with LP filter and opamp
- Mini-B USB connector
- One reset push button and four switches
- 2 x 28 segments LCD display

Device	Flash	RAM	ADC Channels		LCD	SCI	SPI	I²C	16-bit Timer Channels	Clock Type	Package
			12-bit	10-bit							
MC9S08LL64CLK	64 KB	4 KB	10-ch.		1	2	1	1	2 x 2-ch.	ICS	80 LQFP
MC9S08LL64CLH	64 KB	4 KB	8-ch.		1	2	1	1	1 x 2-ch.	ICS	64 LQFP
MC9S08LL36CLK	36 KB	4 KB	10-ch.		1	2	1	1	2 x 2-ch.	ICS	80 LQFP
MC9S08LL36CLH	36 KB	4 KB	8-ch.		1	2	1	1	1 x 2-ch.	ICS	64 LQFP
MC9S08LL16CLH	16 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	64 LQFP
MC9S08LL16CLF	16 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	48 LQFP
MC9S08LL16CGT	16 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	48 QFN
MC9S08LL8CLF	8 KB	2 KB	8-ch.		1	1	1	1	1 x 2-ch.	ICS	48 LQFP
MC9S08LL8CGT	8 KB	2 KB	8-ch.		1	1	1	1	1 x 2-ch.	ICS	48 QFN

8-bit MC9S08LH

Low-power segment LCD MCU with 16-bit ADC

Freescale expands the first S08 ultra-low-power MCU with LCD driver and increased ADC accuracy for medical and metering applications. The MC9S08LH family available with up to 64 KB flash helps you reach your target performance levels while minimizing power consumption in your design, demonstrating extreme energy efficiency for ultra-long operation in battery-powered applications. The S08LH also features a 16-bit ADC for accurate measurement.

Key Features

- 40 HMz S08 CPU
- Up to 64 KB flash memory, dual bank memory support
- Time of day for time stamping
- 288 segment LCD display with blink in stop mode capability
- Six flexible modes of operation to reduce overall power consumption
- 10-ch., 16-bit ADC
- 64-pin and 80-pin LQFP packages

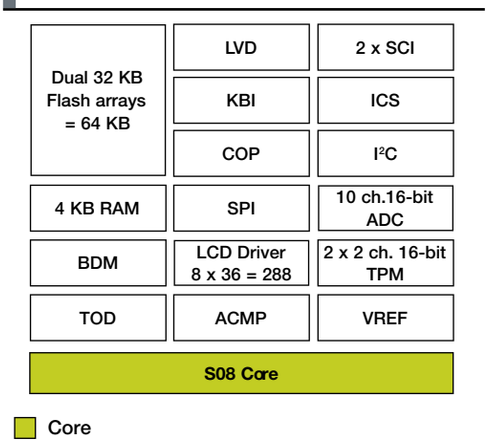
Target Applications

- Single-phase electricity meters
- Flow meters
- Measurement equipment
- Portable medical devices
- Building access control
- HVAC control systems
- Portable consumer devices

Application Note

- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- AN3796: LCD Driver Specification
- AN3821: How to Handle Dual Flash Architecture in MC9S08LG32
- AN3822: Emulated EEPROM Implementation in Dual Flash Architecture and Demo Description on MC9S08LG32
- AN3824: EEPROM Emulation Driver for MC9S08LG32 Application Notes
- AN3990: Migrating from the MC9S08LL16 to MC9S08LL64 Microcontroller
- DRM106: Thermostat Reference Design Using the MC9S08LL16
- AN2764: Improving the Transient Immunity Performance of Microcontroller-Based Applications
- AN2111: A Coding Standard for HCS08 Assembly Language

MC9S08LH64/36



TWR-S08LH64-KIT

The cost-effective TWR-S08LH64-KIT development tool is part of the Tower System and features the MC9S08LH64 segment LCD controller with integrated 16-bit ADC. It provides everything needed to develop and evaluate application code. The integrated OSBDM allows communication with the board and target device with only a USB cable, while the board highlights the MCU's low power features.

This module is designed to be combined and used with a variety of peripheral modules in the Tower System, and can also operate as a stand-alone debug tool that can be purchased separately from the complete kit, part number TWR-S08LH64.

Features

- 5K one-turn potentiometer
- RS232 port
- MC9S08LH64 MCU
- 32,768 Hz crystal
- Freescale 3-axis accelerometer ADC input to MCU
- Buzzer
- Light sensor with LP filter and opamp
- Mini-B USB connector
- One reset push button and four push switches
- 2 x 28 segments LCD display
  - 40-pin MCU I/O connector
  - 2 mm barrel connector
  - BDM_PORT (not installed)
  - USB connectors
  - DB9 connector

Device	Flash	RAM	ADC Channels		LCD	SCI	SPI	I²C	16-bit Timer Channels	Clock Type	Package
			16-bit	12-bit							
MC9S08LH64CLK	64 KB	2 KB	10-ch.		1	1	1	1	2 x 2-ch.	ICS	80 LQFP
MC9S08LH64CLH	64 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	64 LQFP
MC9S08LH36CLK	32 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	80 LQFP
MC9S08LH36CLH	32 KB	2 KB	8-ch.		1	1	1	1	2 x 2-ch.	ICS	64 LQFP

8-bit MC9S08GW

8-bit MCU for flow metering

The MC9S08GW is a low-power 8-bit MCU family, based on the proven S08 core, and used in gas or water flow meters as well as single-phase electric meters. Two independent 16-bit SAR ADCs with a programmable delay block and a pulse counter with automatic sensor decoding for gas and water flow meters make this family ideal for electric metering applications. In addition, the flexible LCD controller enables it to be highly integrated. The MC9S08GW family comes with a full suite of hardware and software tools to make development quick and easy, including a cost-effective Tower module for getting started fast.

Key Features

- 40 MHz S08 CPU
- Up to 64 KB flash memory, dual bank memory support
- 288 segment LCD display with blink in stop mode capability
- Six flexible modes of operation to reduce overall power consumption
- 2 x 16-bit ADC with programmable delay block
- 64-pin and 80-pin LQFP packages
- Adanced iRTC for accurate calendaring with support for dedicated VBAT and anti-tamper capabilities

Target Applications

- Low-end single-phase electricity meters
- Flow meters
- Measurement equipment
- Portable medical devices
- Building access control
- HVAC control systems
- Portable consumer devices

Sample Application Notes

- AN4257: IRTC Compensation and 1 Hz Clock Generation
- AN4262: Gas and Water Metering Application With MC9S08GW64
- AN4169: ADC Driver for MC9S08GW64
- AN4170: IRTC Driver for MC9S08GW64
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- AN4179: How to Interface and Drive a 3V or 5V LCD Glass with MC9S08GW64
- AN4168: ADC16 Calibration Procedure and Programmable Delay Block Synchronization For MC9S08GW64
- AN3827: Differences Between Controller Continuum ADC Modules
- AN4159: LCD Driver for the MC9S08LGW64
- AN4161: SCI Driver for the MC9S08GW64
- AN4158: I²C Driver for the MC9S08GW64
- AN4160: MTIM Driver for the MC9S08GW64
- AN2111: A Coding Standard for HCS08 Assembly Language

TWR-S08GW64-KIT

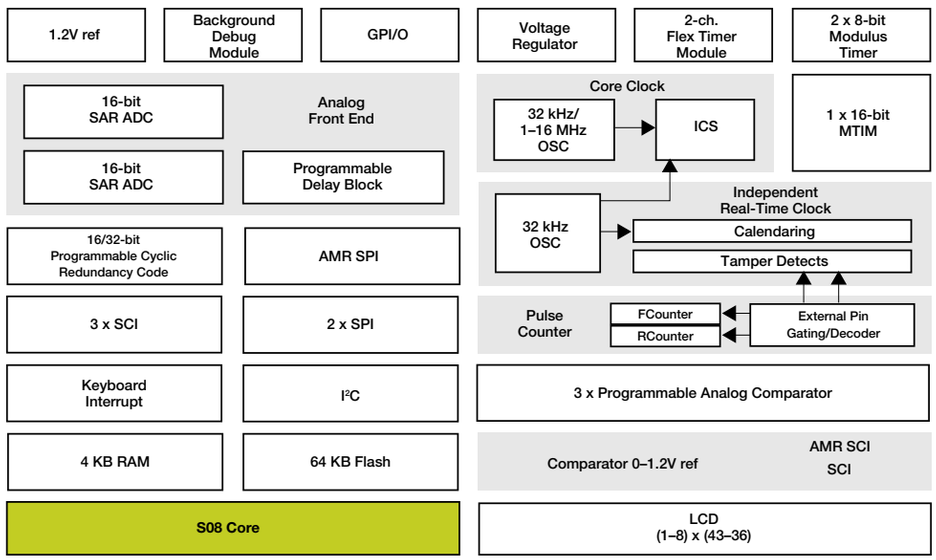
The cost-effective TWR-S08GW64-KIT development tool is part of the Tower System and features the MC9S08GW64 segment LCD controller with integrated dual 16-bit ADC and P counter. It provides everything needed to develop and evaluate application code. The integrated OSBDM allows communication with the board and target device with only a USB cable, while the board highlights the MCU's low power features.

This module is designed to be combined and used with a variety of peripheral modules in the Tower System, and can also operate as a stand-alone debug tool that can be purchased separately from the complete kit, part number TWR-S08LH64.

Features

- 5K one-turn potentiometer
- RS232 port
- MC9S08GW64 MCU
- 32,768 Hz cystal
- Freescale 3-axis accelerometer ADC input to MCU
- Buzzer
- Light sensor with LP filter and op-amp
- Mini-B USB connector
- One reset push button and four push switches
- 2 x 28 segment LCD display
  - 40-pin MCU I/O connector
  - 2 mm barrel connector
  - BDM_PORT (not installed)
  - USB connectors
  - DB9 connector

9S08GW 64/32 Block Diagram



Core

Device	Flash	RAM	ADC Channels		AMCP	LCD	SCI	SPI	I²C	Timers	Clock Type	Package
			16-bit	16-bit								
MC9S08GW64CLK	64 KB	4 KB	7-ch.	6-ch.	3	8 x 36	4	3	1	P Countrer, PDB, RTC, 2-ch., 16-bit TPM, 16-bit MTIM, 8-bit MTIM	ICS	80 LQFP
MC9S08GW64CLH	64 KB	4 KB	7-ch.	6-ch.	3	8 x 24	4	3	1		ICS	64 LQFP
MC9S08GW32CLK	32 KB	2 KB	7-ch.	6-ch.	3	8 x 36	4	3	1		ICS	80 LQFP
MC9S08GW32CLH	32 KB	2 KB	7-ch.	6-ch.	3	8 x 24	4	3	1		ICS	64 LQFP

MC9S08D Family

The industry's first 8-bit MCU family with embedded CAN, embedded EEPROM and on-chip emulation/debug for automotive and industrial markets

As power budgets tighten and the demand for more embedded content increases, the need for cost-effective, low-power and high-performance MCUs becomes essential. The S08 D family is the industry's first family of 8-bit MCUs to offer embedded CAN, embedded EEPROM and on-chip emulation/debug. This highly integrated, next-generation family of MCUs is packed with features designed to provide increased performance as well as save power, development time, board space and cost.

There are three device sub-families within the S08 D-family: DZ, DV and DN MCUs. They provide developers freedom of choice to match their application and system requirements. The S08DZ is the high-end sub-family offering embedded CAN along with embedded EEPROM. S08DV is a lower cost option for those who need CAN but not embedded EEPROM. Finally, the S08DN removes the CAN module but still integrates embedded EEPROM for maximum design versatility in non-CAN-enabled applications.

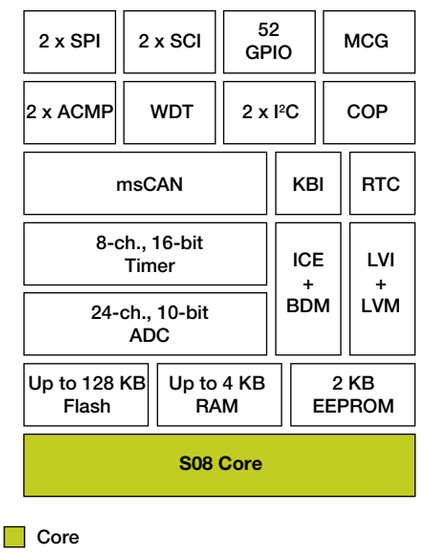
Key Features

- On-chip components that help eliminate the need for external EEPROM, LVI circuit, voltage regulator, input/output (I/O) multiplexing, crystal, watchdog circuit, ADC and development tools
- On-chip emulation/debug that helps reduce development time since changes can be made on-board and in real time
- Increased RAM (up to 8 KB) that helps provide C/C++ developers the required memory to create code quickly
- Common tools among S08 D-families that help shorten development time
- 0.25µ technology that exhibits lower power consumption and increased CPU performance compared to its HC08 predecessor, allowing for more embedded content

Target Applications

- Industrial
  - Factory automation
  - Industrial machine control
  - Elevators
  - Escalators
  - Solar power systems
  - Measurement systems
  - Building automation
    - Cooling, heating
    - Security systems
    - Studio equipment
    - Deep freezers and refrigerators
- Automotive and more
  - Passenger vehicles
    - Body control
    - Motor control
    - Watchdog
  - Motorcycles
  - Passenger and cargo trains
  - Boats, ships and vessels as embedded network
  - Aircraft and aerospace electronics

MC9S08DZ60 Block Diagram



Sample Application Notes

- AN3331: Migrating from the HC908AZ60A to MC9S08DZ60
- AN2717: M68HC08 to HCS08 Transition
- AN3499: Clock Options on the HC9S08 Family
- AN3305: On-Chip System Protection Basics for Automotive HCS08 Microcontrollers
- AN3387: HCS08 Automotive Low-Power Modes
- AN2111: A Coding Standard for HCS08 Assembly Language
- AN2497: HCS08 Background Debug Mode Versus HC08 Monitor Mode

MC9S08D Family Continued

DEMO9S08DZ60
EVB9S08DZ128

The DEMO9S08DZ60 is a demonstration board for the MC9S08DZ60 MCU. Application development is quick and easy with the integrated USB BDM, sample software tools and examples. An optional BDM_PORT is also provided to allow use of a BDM_PORT cable. Two, 40-pin connectors provide access to all I/O signals on the target MCU. The EVB9S08DZ128 should be used to evaluate the 9S08DZ/V/N128/96 parts only. Below are the features of the demo board. The EVB is more fully featured.

- MC9S08DZ, 64 LQFP
- 4 MHz XTAL
- OSC socket
- BNC connector
- Integrated P&E USB BDM
- BDM_PORT header for BDM cable support (not installed)
- LIN PHY with two four-position Molex connectors
- HS-CAN PHY with three-position pin header connector
- LP filters on ADC inputs
- Two MCU_PORT socket headers for access to MCU IO signals
- On-board +5V regulator
- Optional power from USB BDM or MCU_PORT connector
- Power input selection jumpers
- Power input from USB BDM
- Power input from on-board regulator
- Power input from connector J1
- Optional power output through connector J1
- User components provided
- Three push switches: Two user, one reset
- One four-position DIP switch
- Seven LED indicators: Four user, VDD, USB power, USB power out
- Jumpers
- Connectors

Device	Flash	RAM	EEPROM	ADC	CAN	SCI	SPI	I²C	16-bit Timer Channels	Clock Type	Package	Applications/Additional Features
				10-bit								
MC9S08DZ128CLF	128 KB	8 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	All HC08 and S08 include COP, LVI, POR, KBI
MC9S08DZ128CLH	128 KB	8 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ128CLL	128 KB	8 KB	2 KB	24-ch.	1	2	2	2	1 x 6-ch., 1 x 2-ch.	MCG	100 LQFP	
MC9S08DZ128MLF	128 KB	8 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DZ128MLH	128 KB	8 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ128MLL	128 KB	8 KB	2 KB	24-ch.	1	2	2	2	1 x 6-ch., 1 x 2-ch.	MCG	100 LQFP	
MC9S08DZ96CLF	96 KB	4 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DZ96CLH	96 KB	4 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ96CLL	96 KB	4 KB	2 KB	24-ch.	1	2	2	2	1 x 6-ch., 1 x 2-ch.	MCG	100 LQFP	
MC9S08DZ96MLF	96 KB	4 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DZ96MLH	96 KB	4 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ96MLL	96 KB	4 KB	2 KB	24-ch.	1	2	2	2	1 x 6-ch., 1 x 2-ch.	MCG	100 LQFP	
MC9S08DZ60MLH	60 KB	4 KB	2 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DZ60MLF	60 KB	4 KB	2 KB	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ60MLC	60 KB	4 KB	2 KB	10-ch.	1	2	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DZ32MLH	32 KB	2 KB	1 KB	24-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DZ32MLF	32 KB	2 KB	1 KB	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ32MLC	32 KB	2 KB	1 KB	10-ch.	1	2	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DZ16MLF	16 KB	1 KB	512B	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DZ16MLC	16 KB	1 KB	512B	10-ch.	1	2	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DV60MLH	60 KB	3 KB	-	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DV60MLF	60 KB	3 KB	-	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DV60MLC	60 KB	3 KB	-	10-ch.	1	2	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DV32MLH	32 KB	2 KB	-	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DV32MLF	32 KB	2 KB	-	16-ch.	1	2	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DV32MLC	32 KB	2 KB	-	10-ch.	1	2	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DV16MLF	16 KB	1 KB	-	16-ch.	1	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DV16MLC	16 KB	1 KB	-	10-ch.	1	1	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DN60MLH	60 KB	2 KB	2 KB	16-ch.	-	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DN60MLF	60 KB	2 KB	2 KB	16-ch.	-	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DN60MLC	60 KB	2 KB	2 KB	10-ch.	-	1	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DN32MLH	32 KB	1.5 KB	1 KB	16-ch.	-	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP	
MC9S08DN32MLF	32 KB	1.5 KB	1 KB	16-ch.	-	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DN32MLC	32 KB	1.5 KB	1 KB	10-ch.	-	1	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	
MC9S08DN16MLF	16 KB	1 KB	512B	16-ch.	-	1	1	1	1 x 6-ch., 1 x 2-ch.	MCG	48 LQFP	
MC9S08DN16MLC	16 KB	1 KB	512B	10-ch.	-	1	1	1	1 x 4-ch., 1 x 2-ch.	MCG	32 LQFP	

S08P Family

5V MCU family with excellent ESD/EFT for robust industrial environments

The scalable S08P family offers a wide range of feature and price options for product differentiation. Choose between the full-featured TSI enabled PT class, the equally full-featured PA class without TSI or the basic PL class for cost-sensitive applications.

Key Features

- Touch-sensing interface (PT class only)
- Scalable from .5 to 4 KB of RAM and 2 to 60 KB flash
- Up to 256B of EEPROM
- Up to 3x UART, 2x serial peripheral interface (SPI) and an inter-integrated circuit (I^2C)
- Up to 16-channel, 12-bit analog to-digital converter (ADC) with four entry buffers
- 6-ch. + 2-ch. + 2-ch. Flex Timer: Two module timers
- Analog comparator, RTC and CRC
- Eight pins with 20 mA sink
- Two pins with true open drain
- 2.7–5.5-volt (PT/PA class only)
- Scalable from 8-pin DFN up to 64-pin QFP
- Serial communications

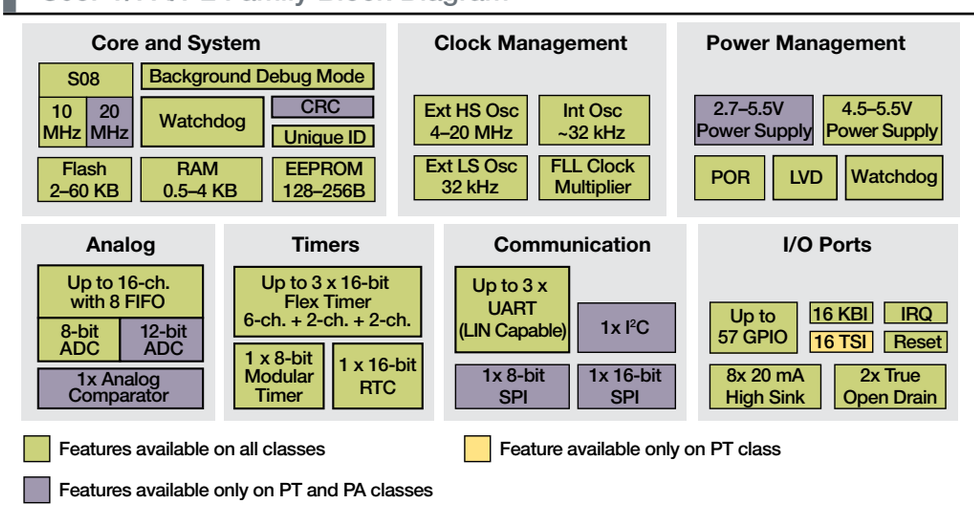
Target Applications

- Small appliances
- Power tools
- Home appliances
- Lighting
- Advanced lighting control
- Hvac building and control systems
- Electric metering
- Electric motor control
- Battery chargers and management
- High-end lighting control
- Circuit breakers
- Smart grid and smart metering

Application Notes

- AN4438: EMC Design Considerations for MC9S08PT60
- AN4347: Transitioning Applications from S08AC and S08FL Family to S08PT Family
- AN4431: TSI Module Application on the S08PT Family

S08PT/PA/PL Family Block Diagram



TWR-S08PT60

The cost-effective TWR-S08PT60 development tool is part of the Tower System and features the new rugged 5V MC9S08PT60, combining exceptional EMC/ESD performance with integrated touch sensing and EEPROM. It provides everything a designer needs to develop and evaluate application code. The integrated OSBDM allows a designer to communicate with the board and target device with only a USB cable and the board highlights the MCU's touch sensing and motor control features.

Key Features

- MC9S08PT60 MCU
- Eight MHz crystal for system clock
- Potentiometer for ADC input
- Low-G sensor (MA8451) through I^2C connection
- Infra-red Tx/Rx through SCI
- RS232 port
- Four touch pads each with LED indicator
- Reset button and three functional switches
- Sockets for touch sensing and motor control daughter card expansion
- On-board OSBDM debug support with Mini-B USB connector
- Works stand-alone or as part of full Tower System
- USB, Ethernet, RS232/RS485, CAN, SPI, I^2C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

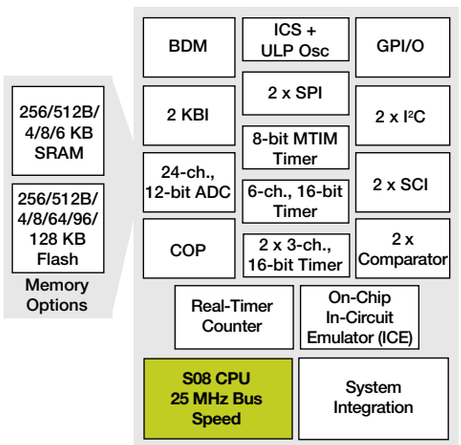
S08P Part Numbers

Device	Flash	RAM	EEPROM	Touch Sensing I/F	ADC		HSAMCP	SCI	SPI	I²C	16-bit Timers	Other	Pacakge Type				
					10-bit	12-bit							DFN	SOIC	TSSOP	QFP	LQFP
MC9S08PT60	60 KB	4 KB	256B	16-ch.	-	>16-ch.	1	>3	1 x 8-bit SPI 1 x 16-bit SPI	1	3x 16-bit Flex Timer	Up to 2x MTIM Timers, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 2.7 to 5.5V, –40 °C to +105 °C	-	-	-	64	32, 44, 48, 64
MC9S08PA60	60 KB			-													
MC9S08PT32	32 KB			16-ch.													
MC9S08PA32	32 KB			-													
MC9S08PL60	32 KB	4 KB	256B	-	>16-ch.	-	1	<2	1 x 8-bit SPI	-		Up to 2x MTIM Timers, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 4.5 to 5.5V, –40 °C to +85 °C					
MC9S08PL32	32 KB			-													
MC9S08PT16	16 KB	2 KB	256B	16-ch.		>12-ch.	1	<2	1 x 8-bit SPI	1	2x 16-bit Flex Timer	Up to 1x MTIM Timer, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 2.7 to 5.5V, –40 °C to +105 °C	-	20	20, 16	-	44, 32
MC9S08PA16	16 KB			-													
MC9S08PT8	16 KB			16-ch.													
MC9S08PA8	8 KB			-													
MC9S08PL16	8 KB	2 KB	256B	-	>12-ch.	-	1	<2	1 x 8-bit SPI	-	2x 16-bit Flex Timer	Up to 1x MTIM Timer, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 4.5 to 5.5V, –40 °C to +85 °C					
MC9S08PL8	8 KB			-													
MC9S08PA4	4 KB	512B	128B	-	-	>8-ch.	-	1	-	-	2x 16-bit Flex Timer	Up to 1x MTIM Timer, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 2.7 to 5.5V, –40 °C to +105 °C	8	20, 8	20, 16	-	-
MC9S08PA2	4 KB			-													
MC9S08PL4	4 KB	512B	128B	-	>8-ch.	-	-	1	-	-	2x 16-bit Flex Timer	Up to 1x MTIM Timer, RTC, Interrupt Priority Control, ICS, XOSC, Power Management, CRC, WDOG, IRQ, LVD, KBI, 4.5 to 5.5V, –40 °C to +105 °C					
MC9S08PL2	2 KB			-													

MC9S08QB/E Family

Outstanding low power consumption from industry's first series of 8- and 32-bit pin, peripheral- and tool-compatible MCUs

MC9S08QE Block Diagram



The Freescale Controller Continuum provides unique flexibility to transition from 8- to 32-bit. With pin, peripheral and tool compatibility, the QE128 devices simplify and speed the design process. Through an optimized architecture that provides lower operating voltage and current, the QE128 devices offer industry-leading ultra-low-power benefits to extend battery life. The MC9S08QB offers a lower cost alternative to the MC9S08QE in small flash sizes. The MC9S08QB/E selection criteria in end applications includes:

- Absolute minimum power consumption required
- Lower pin count or pin count options desired
- No application requirement for higher performance calculations or peripherals
- Greater cost sensitivity

Key Features

- High-performance 8-bit core
- 25 MHz bus frequency
- Memory
  - Up to 8 KB SRAM
  - Up to 128 KB flash
- 2 x SCI, 2 x I²C, 2 x SPI
- 16-bit timers: 1 x 6-ch., 2 x 3-ch.
- 12-bit, 24-ch. ADC with two analog comparators
- Real-time counter
- 70 (mux-ed) GPIOs for 80-pin package
- Low-power features:
  - Internal clock source (ICS)
  - Vreg with fast start-up time and low regulation voltage
  - Ultra-low-power 32 kHz oscillator (standby current 1.5 uA)
  - Optimized clock tree and clock gating techniques
- Single wire background debug interface
- On-chip in-circuit emulator

Applications

- Health care monitoring and instrumentation
- HVAC and building control
- Gas, water and heater meters
- Security cameras
- Digital cameras
- Measurement equipment
- Cell phone accessories
- Low-power wireless

Application Notes

- AN3465: Migrating within the Controller Continuum
- AN3460: Low-Power Design Enabled by MC9S08QE128 and MCF51QE128 Microcontrollers
- AN3502: Differences Between the TI MSP430 and MC9S08QE128 and MCF51QE128 Flexis Microcontrollers
- AN3500: Blood Pressure Monitor Using Flexis QE128
- AN3499: Clock Options on the HC9S08 Family
- AN2497: HCS08 Background Debug Mode Versus HC08 Monitor Mode

DEMOQE128
(Supports 8- and 32-bit QE families)
TWR-S08UNIV + TWR-S08DC-QE64

DEMOQE128 Features

- MCU operates from internal clock source
- Footprint for external crystal components
- RS232 COM port
- Piezzo buzzer
- Potentiometer
- 3-axis accelerometer
- Five push buttons
- Eight LEDs
- USB MCU debug interface (MDI)
  - BDM protocol
  - Logic analyzer
  - SCI traffic
- External BDM connector
- Prototyping areas
- Supports plug-in RF daughter cards for SMAC and 802.15.4

Device	Flash	RAM	ADC Channels		ESCI	SPI	I²C	16-bit Timer Channels	8-bit MTIM	Clock Type	Package
			12-bit	10-bit							
MC9S08QE128CLK	128 KB	8 KB	24-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	80 LQFP
MC9S08QE128CLH	128 KB	8 KB	22-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	64 LQFP
MC9S08QE128CFT	128 KB	8 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	48 QFN
MC9S08QE128CQD	128 KB	8 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	44 LQFP
MC9S08QE128CLC	128 KB	8 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	32 LQFP
MC9S08QE96CLK	96 KB	6 KB	24-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	80 LQFP
MC9S08QE96CLH	96 KB	6 KB	22-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	64 LQFP
MC9S08QE96CFT	96 KB	6 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	48 QFN
MC9S08QE96CQD	96 KB	6 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	44 LQFP
MC9S08QE96CLC	96 KB	6 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	32 LQFP
MC9S08QE64CLK	64 KB	4 KB	24-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	80 LQFP
MC9S08QE64CLH	64 KB	4 KB	22-ch.		2	2	2	2 x 3-ch., 1 x 6-ch.		ICS	64 LQFP
MC9S08QE64CFT	64 KB	4 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	48 QFN
MC9S08QE64CQD	64 KB	4 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	44 LQFP
MC9S08QE64CLC	64 KB	4 KB	10-ch.		2	2	1	2 x 3-ch., 1 x 6-ch.		ICS	32 LQFP
MC9S08QE32CFT	32 KB	2 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	48 QFN
MC9S08QE32CLC	32 KB	2 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	32 LQFP
MC9S08QE32CLD	32 KB	2 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	44 LQFP
MC9S08QE32CWL	32 KB	2 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	28 SOIC
MC9S08QE16CFT	16 KB	1 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	48 QFN
MC9S08QE16CLC	16 KB	1 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	32 LQFP
MC9S08QE16CLD	16 KB	1 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	44 LQFP
MC9S08QE16CWL	16 KB	1 KB	10-ch.		2	1	1	2 x 3-ch., 1 x 6-ch.		ICS	28 SOIC
MC9S08QE8CLC	8 KB	512B	10-ch.		1	1	1	2 x 3-ch.		ICS	32 LQFP
MC9S08QE8CWL	8 KB	512B	10-ch.		1	1	1	2 x 3-ch.		ICS	28 SOIC
MC9S08QE8CWJ	8 KB	512B	8-ch.		1	1	1	2 x 3-ch.		ICS	20 SOIC
MC9S08QE8CTG	8 KB	512B	8-ch.		1	1	1	2 x 2-ch.		ICS	16 TSSOP
MC9S08QE8CPG	8 KB	512B	8-ch.		1	1	1	2 x 2-ch.		ICS	16 PDIP
MC9S08QE4CLC	4 KB	256B	10-ch.		1	1	1	2 x 3-ch.		ICS	32 LQFP
MC9S08QE4CWL	4 KB	256B	10-ch.		1	1	1	2 x 3-ch.		ICS	28 SOIC
MC9S08QE4CWJ	4 KB	256B	8-ch.		1	1	1	2 x 3-ch.		ICS	20 SOIC
MC9S08QE4CTG	4 KB	256B	8-ch.		1	1	1	2 x 2-ch.		ICS	16 TSSOP
MC9S08QE4CPG	4 KB	256B	8-ch.		1	1	1	2 x 2-ch.		ICS	16 PDIP
MC9S08QB8CWL	8 KB	512B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	28 SOIC
MC9S08QB8CGK	8 KB	512B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	24 QFN
MC9S08QB8CTG	8 KB	512B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	16 TSSOP
MC9S08QB4CWL	4 KB	256B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	28 SOIC
MC9S08QB4CTG	4 KB	256B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	24 QFN
MC9S08QB4CWL	4 KB	256B	8-ch.		1			1 x 1-ch.	1 x MTIM	ICS	16 TSSOP

MCF51QE ColdFire Family

Making the design process quick, easy and limitless

The Freescale Controller Continuum provides unique flexibility to transition from 8-bit to 32-bit. With pin, peripheral and tool compatibility, the QE128 devices simplify and speed the design process. Through an optimized architecture that provides lower operating voltage and current, the QE128 devices offer industry-leading, ultra-low-power benefits to extend battery life.

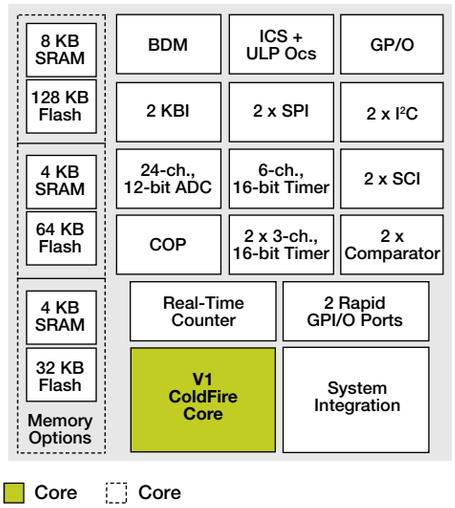
Key Features

- New ColdFire V1 50 MHz core
  - Improved handling of byte and word operands
  - Standardized 8-bit bus to S08 peripherals
  - Same programming model as other ColdFire cores (V2–V4)
- Peripheral compatible with MC9S08QE family
- Pin compatible with MC9S08QE family
- Development tool compatible with MC9S08QE family
  - New BDM interface compatible SS08 single-wire BDM
  - Single CodeWarrior IDE
- New ultra-low-power features
  - Clock gating (turns clocks off to unused peripherals)
  - Low-power Run and Wait modes
  - Internal clock source and ultra-low-power 32 kHz oscillator
  - Voltage regulator with fast startup (6–7 us)
  - Ultra-low-power real-time counter

Applications

- HVAC building and control systems
- Health care monitoring and instrumentation
- Fire/security control and monitoring systems
- Factory and automation systems
- Measurement equipment
- Hand-held health care/industrial applications
- Low-power industrial applications

MCF51QE Block Diagram



DEMOQE128
(Supports 8- and 32-bit QE families)

DEMO51QE128
(Supports only ColdFire MCF51QE family)

Features

- MCU operates from internal clock source
- Footprint for external crystal components
- RS232 COM port
- Piezzo buzzer
- Potentiometer
- 3-axis accelerometer
- Five push buttons
- Eight LEDs
- USB MCU debug interface (MDI)
  - BDM protocol
  - Logic analyzer
  - SCI traffic
- External BDM connector
- Prototyping areas
- Supports plug-in RF daughter cards for SMAC and 802.15.4

Device	Flash	RAM	ADC Channels (12-bit)	ESCI	SPI	I²C	16-bit Timer Channels	ACMP	Clock Type	RTC	Temp	Package
MCF51QE128CLH	128 KB	8 KB	24	2	2	2	2 x 3-ch. + 1 x 6-ch.	2	ICS	Yes	–40 °C to +85 °C	64 LQFP
MCF51QE128CLK	128 KB	8 KB	24	2	2	2	2 x 3-ch. + 1 x 6-ch.	2	ICS	Yes	–40 °C to +85 °C	80 LQFP
MCF51QE64CLH	64 KB	8 KB	22	2	2	2	2 x 3-ch. + 1 x 6-ch.	2	ICS	Yes	–40 °C to +85 °C	64 LQFP
MCF51QE32LH	32 KB	8 KB	22	2	2	2	2 x 3-ch. + 1 x 6-ch.	2	ICS	Yes	0 °C to 70 °C	64 LQFP
MCF51QE32CLH	32 KB	8 KB	22	2	2	2	2 x 3-ch. + 1 x 6-ch.	2	ICS	Yes	–40 °C to +85 °C	64 LQFP

MC9S08JS/M Family

Industry-leading 8- and 32-bit compatible USB MCUs with complete hardware and software solutions

With 8- and 32-bit compatibility, as well as compatibility within our USB MCU portfolio, the JM family offers exceptional migration flexibility. The S08JM family of MCUs provides a completely integrated USB solution with a complimentary USB stack to make development quick and easy while expanding our low-end USB portfolio. The MC9S08JS offers smaller package options to optimize cost in USB-enabled designs. The MC9S08JS also featured a pre-loaded USB bootloader.

Key Features

- Up to 4 KB SRAM, up to 60 KB flash
- Integrated USB 2.0 device
- 2 x SCI, I²C, 2 x SPI
- 8-ch. KBI
- 16-bit timers: 1 x 2-ch., 1 x 6-ch.
- 12-bit, 12-ch. ADC
- Analog comparator
- Up to 51 general-purpose I/Os
- Multiple-purpose clock generation
  - Phase-lock loop (PLL)
  - On-chip oscillator
  - External crystal support
- Complimentary USB software stack
- CodeWarrior for MCUs
- Processor Expert
- Complimentary USB stacks
- Packages: 64 LQFP, 64 QFP, 48 QFN, 44 LQFP

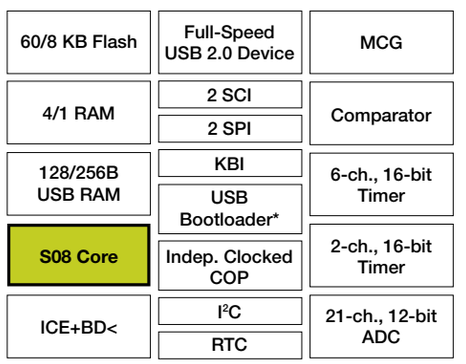
Applications

- PC peripherals and I/O modules
- Lighting control systems
- Test and measurement equipment
- Environmental and building automation
- Security and access control panels
- Stationary barcode scanners and barcode printers
- Patient monitoring systems
- Laboratory equipment
- Industrial networking products
- Hospital beds and electric wheel chairs
- Point-of-sale printers

Application Notes

- AN3564: In-Depth Understanding of the Freescale USB Stack for S08JM Devices
- AN3561: USB Bootloader for HCS08JM60
- AN3560: USB Device Development with JM60/16
- AN3565: USB and Using the CMX USB Stack with the JM Devices

MC9S08JM Block Diagram



DEMOJM

DEMOJM is a cost-effective kit enabling quick MCU evaluation. The kit includes a DEMOJM base board, a red MCF51JM128 daughter card and a green MC9S08JM60 daughter card. The included kit can first be used to demonstrate the features of the MC9S08JM60 devices, starting with an on-chip USB device controller and transceiver. Then, move to MCF51JM128 with an on-chip USB host and device dual-role controller. The USB features are supported in hardware through a dedicated USB mini-AB connector and in software through the included complimentary USB-LITE stack by CMX.

- MC9S08JM60 and MCF51JM128 daughter cards
- Freescale MMA7260QT 3-axis accelerometer
- Virtual serial port
- USB device mode and host mode support with mini-AB USB connector
- CAN transceiver
- Eight user LEDs
- One Piezzo buzzer
- I²C pull-ups
- ADC with 10K ohm potentiometer
- Five push buttons
- CodeWarrior Special Edition
- Complimentary USB stack

Device	Flash	RAM	USB Bootloader	ADC Channels		USB	SCI	SPI	I²C	16-bit Timer Channels	Clock Type	Package
				12-bit	10-bit							
MC9S08JM60CLH	60 KB	4 KB		12-ch.		1	2	2	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP
MC9S08JM60CQH	60 KB	4 KB		12-ch.		1	2	2	1	1 x 6-ch., 1 x 2-ch.	MCG	64 QFP
MC9S08JM60CGT	60 KB	4 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	48 QFN
MC9S08JM60CLD	60 KB	4 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	44 LQFP
MC9S08JM32CLH	32 KB	2 KB		12-ch.		1	2	2	1	1 x 6-ch., 1 x 2-ch.	MCG	64 LQFP
MC9S08JM32CQH	32 KB	2 KB		12-ch.		1	2	2	1	1 x 6-ch., 1 x 2-ch.	MCG	64 QFP
MC9S08JM32CGT	32 KB	2 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	48 QFN
MC9S08JM32CLD	32 KB	2 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	44 LQFP
MC9S08JM16CGT	16 KB	1 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	48 QFN
MC9S08JM16CLD	16 KB	1 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	44 LQFP
MC9S08JM16CLC	16 KB	1 KB		4-ch.		1	1	1	1	2 x 2-ch.	MCG	32 LQFP
MC9S08JM8CGT	8 KB	1 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	48 QFN
MC9S08JM8CLD	8 KB	1 KB		8-ch.		1	2	2	1	1 x 4-ch., 1 x 2-ch.	MCG	44 LQFP
MC9S08JM8CLC	8 KB	1 KB		4-ch.		1	1	1	1	2 x 2-ch.	MCG	32 LQFP
MC9S08JS16CFK	16 KB	512B	Y			1	1	1	1	1 x 2-ch.	MCG	24 QFN
MC9S08JS16CWJ	16 KB	512B	Y			1	1	1	1	1 x 2-ch.	MCG	20 SOIC
MC9S08JS8CFK	8 KB	512B	Y			1	1	1	1	1 x 2-ch.	MCG	24 QFN
MC9S08JS8CWL	8 KB	512B	Y			1	1	1	1	1 x 2-ch.	MCG	20 SOIC

MCF51JM ColdFire Family

Cost-effective Flexis 8- to 32-bit compatibility meets high performance and secure USB connectivity

The 32-bit MCF51JM128 device further extends the low end of the ColdFire embedded USB controller family with up to 128 KB of flash memory, a Full-Speed USB 2.0 controller with host, device and On-The-Go (OTG) support. An integrated CAN module which is ideal for linking industrial automation and control systems. The ColdFire JM family also features a hardware cryptographic acceleration unit (CAU), a random number generator accelerator (RNGA) and several system protection features such as low-voltage detect and a computer operating properly (COP) module.

Features

- CAN
- CAU
- 2 x SCI, I²C, 2 x SPI
- 8-channel KBI
- 16-bit timers: 1 x 2-ch., 1 x 6-ch.
- 12-bit, 12-ch. ADC
- Analog comparator
- Up to 51 general-purpose I/O
- Multiple purpose clock generation
- PLL
- FLL
- On-chip oscillator
- External crystal support
- Integrated USB 2.0 Full-Speed host/device/OTG
- Complimentary USB software stack
- CodeWarrior for MCUs with Processor Expert

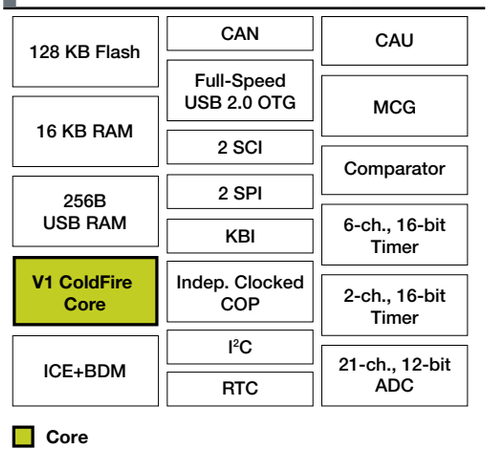
Applications

- HVAC building and control systems
- Test and measurement equipment
- Environmental and building automation
- Security and access control panels
- Stationary barcode scanners and barcode printers
- PC peripherals and I/O modules
- Patient monitoring systems
- Laboratory equipment
- Industrial networking products
- Hospital beds and electric wheel chairs

Application Notes

- AN3565: USB and Using the CMX USB Stack with the JM Devices
- AN3564: In-Depth Understanding of the Freescale USB Stack for S08JM Devices
- AN3560: The USB Device Development with S08JM (or In-Depth Understanding of the S08JM USB Module)
- AN3561: USB Bootloader for S08JM60
- AN3582: The USB Data Logger Based on S08JM60

MCF51JM128 Block Diagram



DEMOJM

DEMOJM is a cost-effective kit enabling quick MCU evaluation. The kit includes a DEMOJM base board, a red MCF51JM128 daughter card and a green MC9S08JM60 daughter card. The included kit can first be used to demonstrate the features of the MC9S08JM60 devices, starting with an on-chip USB device controller and transceiver. Then, move to MCF51JM128 with an on-chip USB host and device dual-role controller. The USB features are supported in hardware through a dedicated USB mini-AB connector and in software through the included complimentary USB-LITE stack by CMX.

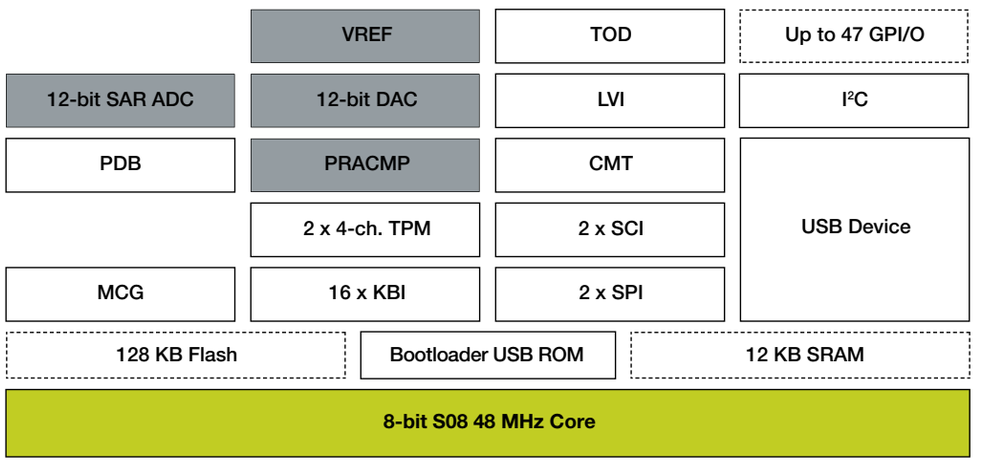
- MC9S08JM60 and MCF51JM128 daughter cards
- Freescale MMA7260QT 3-axis accelerometer
- Virtual serial port
- USB device mode and host mode support with mini-AB USB connector
- CAN transceiver
- Eight user LEDs
- One Piezzo buzzer
- I²C pull-ups
- ADC with 10K ohm potentiometer
- Five push buttons
- CodeWarrior Special Edition
- Complimentary USB stack

Part Numbers	Flash	RAM	12-bit ADC	USB 2.0 Device (FS)	SCI	SPI	I²C	CAN	Crytpo	Timers	AMCP	Clock Source	Package
MCF51JM128EVLK	128 KB	16 KB	12	1	2	2	2	1	1	1 x 6-ch., 1 x 2-ch.	1	MCG	80 LQFP
MCF51JM128EVLH	128 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM128EVQH	128 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MCF51JM128EVLD	128 KB	16 KB	8	1	2	2	1	-	1	1 x 4-ch., 1 x 2-ch.	1		44 LQFP
MCF51JM128VLK	128 KB	16 KB	12	1	2	2	2	1	-	1 x 6-ch., 1 x 2-ch.	1		80 LQFP
MCF51JM128VLH	128 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM128VQH	128 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MCF51JM128VLD	128 KB	16 KB	8	1	2	2	1	-	-	1 x 4-ch., 1 x 2-ch.	1		44 LQFP
MCF51JM64EVLK	64 KB	16 KB	12	1	2	2	2	1	1	1 x 6-ch., 1 x 2-ch.	1		80 LQFP
MCF51JM64EVLH	64 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM64EVQH	64 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MCF51JM64EVLD	64 KB	16 KB	8	1	2	2	1	-	1	1 x 4-ch., 1 x 2-ch.	1		44 LQFP
MCF51JM64VLK	64 KB	16 KB	12	1	2	2	2	1	-	1 x 6-ch., 1 x 2-ch.	1		80 LQFP
MCF51JM64VLH	64 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM64VQH	64 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MCF51JM64VLD	64 KB	16 KB	8	1	2	2	1	-	-	1 x 4-ch., 1 x 2-ch.	1		44 LQFP
MCF51JM32EVLK	32 KB	16 KB	12	1	2	2	2	1	1	1 x 6-ch., 1 x 2-ch.	1		80 LQFP
MCF51JM32EVLH	32 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM32EVQH	32 KB	16 KB	12	1	2	2	1	1	1	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MC51JM32EVLD	32 KB	16 KB	8	1	2	2	1	-	1	1 x 4-ch., 1 x 2-ch.	1		44 LQFP
MCF51JM32VLK	32 KB	16 KB	12	1	2	2	2	1	-	1 x 6-ch., 1 x 2-ch.	1		80 LQFP
MCF51JM32VLH	32 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 LQFP
MCF51JM32VQH	32 KB	16 KB	12	1	2	2	1	1	-	1 x 6-ch., 1 x 2-ch.	1		64 QFP
MCF51JM32VLD	32 KB	16 KB	8	1	2	2	1	-	-	1 x 4-ch., 1 x 2-ch.	1		44 LQFP

8-bit MC9S08JE

Ultra-low-power USB MCU family

MC9S08JE128 Block Diagram



The MC9S08JE128/64 (JE128/64) provides ultra-low-power operation, USB connectivity and high measurement accuracy, all in a single 8-bit MCU, allowing designers to develop a more fully featured system at a lower cost. The JE128/64 integrates high-resolution ADC and DAC modules, a rich peripheral set including a USB 2.0 device controller and multiple serial interfaces.

The JE128/64 is part of the Freescale Flexis series, which includes both 8-bit S08 and 32-bit ColdFire V1 MCUs that have a common set of peripherals and development tools to deliver the ultimate in migration flexibility and ease of use. Freescale provides a comprehensive suite of development tools and software to help developers design quickly and easily.

Features

- Up to 128 KB flash,12 KB SRAM
- 12-bit SAR ADC with PDB
- Analog comparator
- VREF internal voltage reference
- Full-Speed USB 2.0 device supported with USB stack
- 2 x SPI, 2 x SCI and I²C
- Seven flexible modes for low-power applications
- Low current consumption in stop modes
- Flexis series with compatible 32-bit MCU

Applications

- PC peripherals
- Data logger
- Portable medical devices
- USB bridge

Application Notes

- AN4115: IrDA Driver and SD Card File System on the MM/JE Flexis Families
- AN4116: Using the MM/JE Flexis Families for Infrared Communication
- AN3412: Dynamic LCD Driver Using GPIO Pins
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- ANPERIPHQRUG: Quick Reference User Guide for Analog Peripherals on the MM and JE Family
- AN3827: Differences Between Controller Continuum ADC Modules
- AN4223: Connecting Low-Cost External Electrodes to MED-EKG

TWR-S08JE128-KIT

The TWR-S08JE128-KIT is a cost-effective development tool for the MC9S08JE low-power USB MCU. This kit is part of the Freescale Tower System, a modular, reconfigurable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software.

The MC9S08JE MCU module is designed to be a stand-alone debug tool and can also be purchased separately from the kit, part number TWR-MC9S08JE.

Features

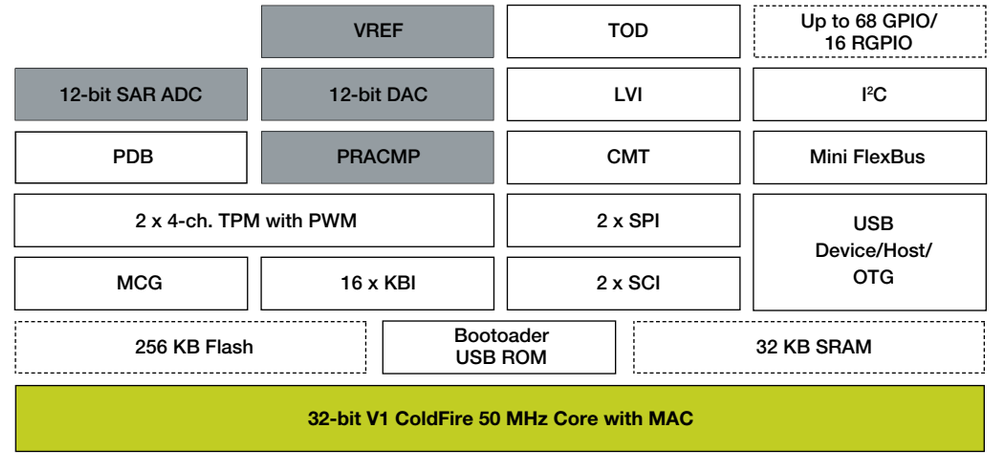
- Freescale Tower System compliant
- Integrated open-source BDM debugging tool
- Small form factor (59 mm x 90 mm)
- Supports external communications interfaces
- Includes power regulation circuitry with standardized bus
- Two 80-pin connectors on the outside to support debugging or expansion to LCD module
- RS232, RS485, CAN, USB
- Low power

Device	Flash	RAM	ADC Channels		AMCP	USB OTG	SCI	SPI	I²C	Timers	Clock Type	Package
			16-bit	12-bit								
MC9S08JE128VLH	128 KB	12 KB	8-ch.		1	Y	2	2	1	2 x 6-ch., 16-bit, TOD, PDB	MCG	64 LQFP
MC9S08JE128VLK	128 KB	12 KB	8-ch.		1	Y	2	2	1	2 x 8-ch., 16-bit, TOD, PDB	MCG	80 LQFP
MC9S08JE128VMB	128 KB	12 KB	8-ch.		1	Y	2	2	1	2 x 8-ch., 16-bit, TOD, PDB	MCG	81 MAPBGA
MC9S08JE64VLH	64 KB	12 KB	8-ch.		1	Y	2	2	1	2 x 6-ch., 16-bit, TOD, PDB	MCG	64 LQFP

32-bit ColdFire MCF51JE

Ultra-low-power USB MCU family

MCF51JE256 Block Diagram



The MCF51JE256/128 (JE256/128) provides ultra-low-power operation, USB connectivity and high measurement accuracy, all in a single 32-bit MCU, allowing designers to develop a more fully featured system at a lower cost. The JE256/128 integrates high-resolution ADC and DAC modules, rich peripheral set including a USB 2.0 host/device/OTG controller, multiple serial interfaces and an external bus interface.

The JE256/128 is part of the Freescale Flexis MCU series, which includes both 8-bit S08 and 32-bit ColdFire V1 MCUs with a common set of peripherals and development tools to deliver the ultimate in migration flexibility. The JE246/128 family is also easy to use. Freescale provides a comprehensive suite of development tools and software to help developers design quickly and easily.

Features

- ColdFire V1 core delivering a 50 MHz core speed and 25 MHz bus speed
- Up to 256 KB flash and 32 KB SRAM
- Low-power Stop 2 current: 500 nA (32 KB of active SRAM)
- 12-bit SAR ADC: High-resolution ADC
- PRACMP: Analog comparator with 5-bit DAC
- VREF: Internal voltage reference
- USB: Device/host/OTG controller support with USB Stacks
- 2 x SPI, 2 x SCI and 1 x I²C
- Mini FlexBus (external bus interface)

Applications

- Blood glucose meter
- Portable ECG
- Heart rate monitor
- Blood pressure monitor
- Test and measurement equipment
- Fitness machines

Application Notes

- AN4115: IrDA Driver and SD Card File System on the MM/JE Flexis Families
- AN4116: Using the MM/JE Flexis Families for Infrared Communication
- AN3412: Dynamic LCD Driver Using GPIO Pins
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- ANPERIPHQRUG: Quick Reference User Guide for Analog Peripherals on the MM and JE Family
- AN3827: Differences Between Controller Continuum ADC Modules
- AN4223: Connecting Low-Cost External Electrodes to MED-EKG

TWR-MCF51JE256-KIT

The TWR-MCF51JE-KIT is a cost-effective development tool for the MCF51JE low-power USB MCU. This kit is part of the Freescale Tower System, a modular, reconfigurable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software.

The MCF51JE MCU module is designed to be a stand-alone debug tool and can also be purchased separately from the kit, part number TWR-MCF51JE.

Features

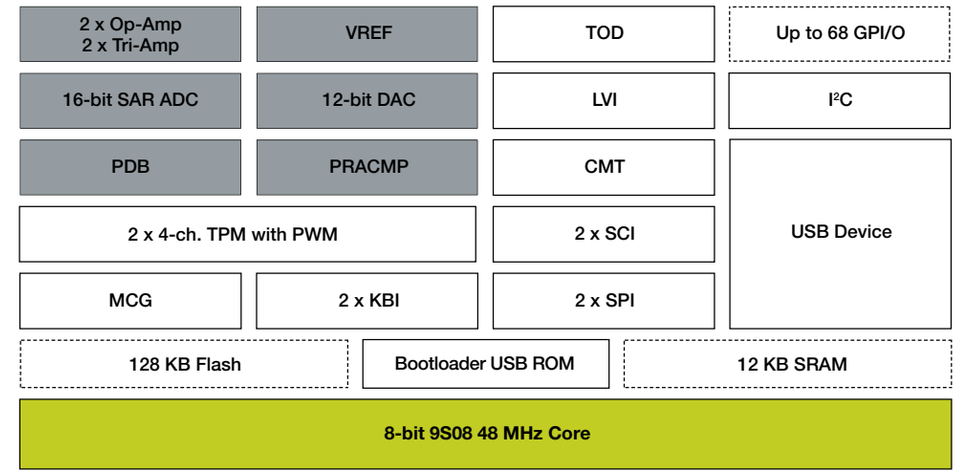
- Freescale Tower System compliant
- Integrated open-source BDM debugging tool
- Small form factor (59 mm x 90 mm)
- Supports external communications interfaces
- Includes power regulation circuitry with standardized bus
- Two 80-pin connectors on the outside to support debugging or expansion to LCD module
- RS232, RS485, CAN, USB
- Low power

Device	Flash	RAM	ADC Channels		AMCP	USB OTG	SCI	SPI	I²C	Timers	Clock Type	Package
			16-bit	12-bit								
MCF51JE256VML	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	104 MAPBGA
MCF51JE256VLL	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	100 LQFP
MCF51JE256VMB	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit,TOD, PDB	MCG	81 MAPBGA
MCF51JE256VLK	256 KB	32KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	80 LQFP
MCF51JE128VML	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	104 MAPBGA
MCF51JE128VLL	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit,TOD, PDB	MCG	100 LQFP
MCF51JE128VMB	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	81 MAPBGA
MCF51JE128VLK	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	80 LQFP

8-bit MC9S08MM

Ultra-low-power MCU for portable medical applications

MC9S08MM128 Block Diagram



The 9S08MM128/64/32 provides ultra-low-power operation, USB connectivity, graphic display support and unparalleled measurement accuracy, all in a single 8-bit MCU, allowing device designers to create more fully featured products at a lower cost.

The 9S08MM128/64/32 is ideal for medical applications or any other application requiring a significant amount of precision analog such as instrumentation and industrial control. The 9S08MM128/64/32 is part of the Flexis MCU series.

Features

- HCS08 core delivering a 48 MHz core speed and 24 MHz bus speed
- Up to 128 KB flash and 12 KB SRAM
- Low-power Stop 2 current: 450 nA (12 KB of active SRAM)
- 2 x general-purpose op-amps
- 2 x tri-amps
- 16-bit SAR ADC: High-resolution ADC
- PRACMP: Analog comparator

Applications

- Blood glucose meter
- Portable ECG
- Heart rate monitor
- Blood pressure monitor
- Test and measurement equipment
- Fitness machines

Application Notes

- AN4115: IrDA Driver and SD Card File System on the MM/JE Flexis Families
- AN4116: Using the MM/JE Flexis Families for Infrared Communication
- AN3412: Dynamic LCD Driver Using GPIO Pins
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- ANPERIPHQRUG: Quick Reference User Guide for Analog Peripherals on the MM and JE Family
- AN3827: Differences Between Controller Continuum ADC Modules
- AN4223: Connecting Low-Cost External Electrodes to MED-EKG

TWR-S08MM128-KIT

The TWR-S08MM128-KIT is a medical-oriented development tool for the 9S08MM128 MCU. This kit is part of the Freescale Tower System, a modular, reconfigurable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software.

The kit includes the MED-EKG which is an electrocardiograph sensor for medical applications development. The 9S08MM MCU module is designed to be a stand-alone debug tool and can also be purchased separately from the kit, part number TWR-S08MM128.

Features

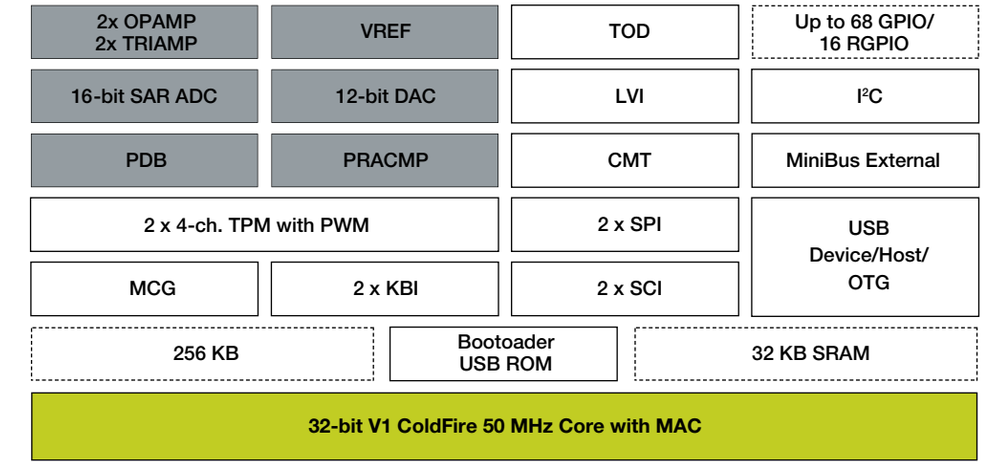
- Freescale Tower System compliant
- Integrated open-source BDM debugging tool
- Small form factor (59 mm x 90 mm)
- Supports external communications interfaces
- Includes power regulation circuitry with standardized bus
- Two 80-pin connectors on the outside to support debugging or expansion to LCD module
- RS232, RS485, CAN, USB
- Open connector for MED-EKG development board
- Low power
- MED-EKG plug-in card

Device	Flash	RAM	ADC Channels		AMCP	USB	SCI	SPI	I²C	Timers	Clock Type
			16-bit	12-bit							
MC9S08MM128VLK	128 KB	12 KB	8-ch.		Y	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG
MC9S08MM128VLH	128 KB	12 KB	6-ch.		Y	Y	2	2	1	4-ch., 2-ch., 16-bit, TOD, PDB	MCG
MC9S08MM128VMB	128 KB	12 KB	8-ch.		Y	Y	2	2	1	2 x 4-ch., 16-bit TOD, PDB	MCG
MC9S08MM64VLH	64 KB	12 KB	6-ch.		Y	Y	2	2	1	4-ch., 2-ch., 16-bit TOD, PDB	MCG
MC9S08MM32VLH	32 KB	4 KB	6-ch.		Y	Y	2	2	1	4-ch., 2-ch., 16-bit TOD, PDB	MCG
MC9S08MM32AVLH	32 KB	2 KB	6-ch.		Y	N	2	2	1	4-ch., 2-ch., 16-bit TOD, PDB	MCG

32-bit ColdFire MCF51MM

Ultra-low-power OTG enabled MCU for portable medical applications

MCF51MM256 Block Diagram



The MCF51MM256/128 provides ultra-low-power operation, USB connectivity, graphic display support and unparalleled measurement accuracy, all in a single 32-bit MCU, allowing device designers to create more fully featured products at a lower cost.

The MCF51MM256/128 is ideal for medical applications or any other application requiring a significant amount of precision analog such as instrumentation and industrial control.

The MCF51MM256/128 is part of the Flexis MCU series.

Features

- ColdFire V1 core delivering a 50 MHz core speed and 25 MHz bus speed
- Up to 256 KB flash and 32 KB SRAM
- Low-power Stop 2 current: 500 nA (32K of active SRAM)
- 2 x op-amps
- 2 x tri-amps
- 16-bit SAR ADC: High-resolution ADC
- PRACMP: Analog comparator with 5-bit DAC
- VREF: Internal voltage reference
- USB: Device/host/OTG controller
- 2 x SPI, 2 x SCI and 1 x I²C
- Mini FlexBus (external bus interface)

Applications

- Blood glucose meter
- Portable ECG
- Heart rate monitor
- Blood pressure monitor
- Test and measurement equipment
- Fitness machines

Application Notes

- AN4115: IrDA Driver and SD Card File System on the MM/JE Flexis Families
- AN4116: Using the MM/JE Flexis Families for Infrared Communication
- AN3412: Dynamic LCD Driver Using GPIO Pins
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- ANPERIPHQRUG: Quick Reference User Guide for Analog Peripherals on the MM and JE Family
- AN3827: Differences Between Controller Continuum ADC Modules
- AN4223: Connecting Low-Cost External Electrodes to MED-EKG

TWR-MCF51MM-KIT

The TWR-MCF51MM-KIT is a medical-oriented development tool for the MCF51MM256 MCU. This kit is part of the Freescale Tower System, a modular, reconfigurable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software.

The kit includes the MED-EKG which is an electrocardiograph sensor for medical applications development. The MCF51MM MCU module is designed to be a stand-alone debug tool and can also be purchased separately from the kit, part number TWR-MCF51MM.

Features

- Freescale Tower System compliant
- Integrated open-source BDM debugging tool
- Small form factor
- Supports external communications interfaces
- Includes power regulation circuitry with standardized bus
- Two 80-pin connectors on the outside to support debugging or expansion to LCD module
- RS232, RS485, CAN , USB
- Open connector for MED-EKG development board
- Low power

Device	Flash	RAM	DC Channels		AMCP	USB OTG	SCI	SPI	I²C	Timers	Clock Type	Package
			16-bit	12-bit								
MCF51MM256VML	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	104 MAPBGA
MCF51MM256VLL	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	100 LQFP
MCF51MM256VMB	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	81 MAPBGA
MCF51MM256VLK	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	80 LQFP
MCF51MM128VML	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	104 MAPBGA
MCF51MM128VLL	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	100 LQFP
MCF51MM128VMB	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	81 MAPBGA
MCF51MM128VLK	256 KB	32 KB	8-ch.		1	Y	2	2	1	2 x 4-ch., 16-bit, TOD, PDB	MCG	80 LQFP

MCF51CN Family

Small, sub-$3 Ethernet-enabled MCU

MCF51EM256 is Freescale's new smart-meter-on-a-chip 32-bit ColdFire V1 core MCU with embedded LCD controller, 16-bit ADC and metrology-specific peripherals optimized for smart meter applications. MCF51EM256 comes with a full suite of hardware and software tools to make development quick and easy.

Key Features

- 32-bit ColdFire V1 CPU offering 47 MIPS at 50 MHz 3.3V single supply
- Up to 256 KB flash (dual bank)
- Up to 16 KB SRAM
- 1.8 to 3.6V operation
- Ultra-low-power operation
- 4 x 16 bit SAR ADC
- 288 segment LCD driver with integrated charge pump
- Up to 50 general-purpose input/outputs
- iRTC with dedicated 32 kHz Osc/ battery backup
- AMR SPI for simple connection to RF/PLM chipsets
- Freescale complimentary MQX RTOS available
- Background debug mode (BDM) for in-circuit debugging

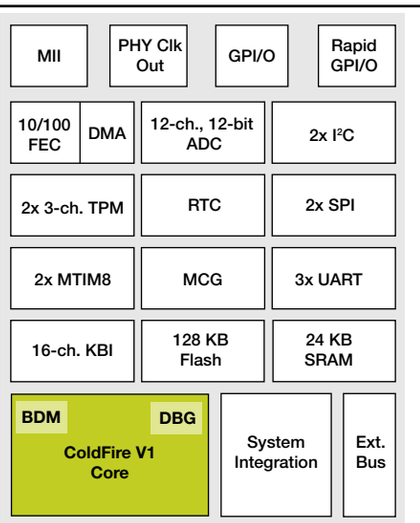
Applications

- Industrial operator interfaces
- Consumer and industrial appliances
- Medical monitoring and instrumentation
- Point-of-sale and courier systems
- Security and building control systems single-phase e-meters
- PAN coordinator
- Serial-to-Ethernet bridge

Application Notes

- AN3942: Flash Programming Routines for the HCS08 and the ColdFire V1 Devices
- AN3906: Serial-to-Ethernet Bridge Using MCF51CN Family and FreeRTOS
- AN3930: Email Client Using MCF51CN Family and FreeRTOS
- AN3928: Web Server Using the MCF51CN Family and FreeRTOS
- AN3931: FTP Server Using MCF51CN Family and FreeRTOS

MCF51CN Block Diagram



TWR-MCF51CN-KIT

The TWR-MCF51CN-KIT is a cost-effective development tool for the MCF51CN128 Ethernet microcontroller. This kit is part of the Freescale Tower System, a modular, reconfigurable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software.

The MCF51CN microcontroller module is designed to be a standalone debug tool and can also be purchased separately from the kit: part number TWR-MCF51CN.

Features

- TWR-MCF51CN MCU module features
  - Freescale Tower System compliant
  - MCF51CN128 MCU
  - Integrated, open-source BDM
  - Small form factor (59 mm x 90 mm)
  - TWR-SER peripheral module features
  - RS232 and RS485
  - Ethernet
  - CAN
  - USB supporting host, device and OTG modes
- TWR-ELEV features
  - Supports external communications interfaces
  - Includes power regulation circuitry with standardized bus
  - Four card-edge PCI Express® connectors
  - Two 80-pin connectors on the outside to support debugging or expansion to LCD module, MCF51EM256, 100 LQFP MCU

Device	Flash	RAM	Ethernet	ADC Channels		MiniBus	SCI	SPI	I²C	16-bit Timers	GPIO	RTC	Temp	Package
				10-bit	12-bit									
MCF51CN128CLK	128 KB	24 KB	Y		12-ch.	yes	3	2	2	2 x 3-ch.	70	Y	–40 °C to +85 °C	80 LQFP
MCF51CN128CLH	128 KB	24 KB	Y		12-ch.	No	3	2	2	2 x 3-ch.	54	Y	–40 °C to +85 °C	64 LQFP
MCF51CN128CTG	128 KB	24 KB	Y		12-ch.	No	3	2	2	2 x 3-ch.	38	Y	–40 °C to +85 °C	48 QFN

MCF51EM Family

Secure and robust MCU for e-metering/smart grid applications

MCF51EM256 is a smart-meter-on-a-chip 32-bit ColdFire V1 core MCU with embedded LCD controller, 16-bit ADC and metrology-specific peripherals optimized for smart meter application. MCF51EM256 comes with a full suite of hardware and software tools to make development quick and easy.

Features

- 32-bit ColdFire V1 CPU offering 47 MIPS at 50 MHz 3.3V single supply
- Up to 256 KB flash (dual bank)
- Up to 16 KB SRAM
- 1.8 to 3.6V operation
- Ultra-low-power operation
- 4 x 16 bit SAR ADC
- 288 segment LCD driver with integrated charge pump
- Up to 50 general-purpose input/outputs
- iRTC with dedicated 32 kHz osc/battery backup
- AMR SPI for simple connection to RF/PLM chipsets
- Freescale complimentary MQX RTOS available
- Background debug mode (BDM) for in-circuit debugging

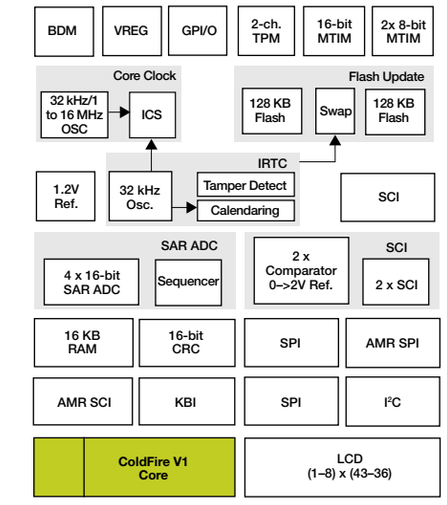
Applications

- Single phase e-meters
- Three phase e-meters
- Smart grids
- Test and measurement equipment
- HMI applications

Application Notes

- AN3796: LCD Driver Specification
- AN3827: Differences Between Controller Continuum ADC Modules
- AN3896: MCF51EM256 Performance Assessment with Algorithms Used in Metering Applications
- AN3949: ADC16 Calibration Procedure and Programmable Delay Block Synchronization
- AN3938: Using the MCF51EM Family for Infrared Communication
- RDMCF51EM: MCF51EM Ply-Phase Metering Reference Design

MCF51EM Block Diagram



Core

DEMOEM

Cost-effective demo based on MCF51EM256 with integrated BDM LCD glass, SPI external memory and MC9S08QE8 to emulate three-phase signals. USB-to-BDM circuitry is built in to enable simple connection to your PC. An out-of-the-box DVD is included featuring example labs and all of the software need to get you up and running quickly.

Features

- MCF51EM256, 100LQFP MCU
- USB-to-BDM circuitry
- Optional AAA battery holder for two batteries, alternate board power supply
- Reset push button, plus reset out signal LED
- IRQ button
- Crystal circuit for 4 MHz crystal for OSC2 input (not populated)
- 3V LCD glass
- Add jumpers in order to demonstrate the FP/BP selection
- Four buttons
- Four LEDs
- Four touch cap pads
- Small lithium battery for iRTC battery backup
- Tamper button connected to tamper pin
- Analog signal syntheses capability with three potentiometers, six PWM outputs with low-pass filters in order to generate 60/50 Hz signals connected to Nucleus ADC inputs via jumpers
- Serial communication
- IR interface (Tx and Rx)
- RS-232 circuitry with BD9 connector

Device	Flash	RAM	ADC		16-bit FlexTimer	MTIM	PGA	HSCMP	PDB	SCI	SPI	I²C	Temp	Package
			10-bit	12-bit										
MCF51EM256CLL	256 KB	16 KB		16-ch.	2-ch.	2 x 8-bit, 1 x 16-bit	288	2	1	3	3	Y	–40 °C to +85 °C	100 LQFP
MCF51EM256CKL	256 KB	16 KB		12-ch.	2-ch.	2 x 8-bit, 1 x 16-bit	176	2	1	3	2	Y	–40 °C to +85 °C	80 LQFP
MCF51EM128CLL	128 KB	8 KB		16-ch.	2-ch.	2 x 8-bit, 1 x 16-bit	288	2	1	3	3	Y	–40 °C to +85 °C	100 LQFP
MCF51EM128CKL	128 KB	8 KB		12-ch.	2-ch.	2 x 8-bit, 1 x 16-bit	176	2	1	3	2	Y	–40 °C to +85 °C	80 LQFP

MCF5301x Family

Rich connectivity MPU with complete VoIP solution

The MCF5301x family of 32-bit MCUs combines low power, high integration and extensive connectivity with an audio subsystem, into a powerful platform for general industrial control applications, including digital voice functionality for intercom and public address systems.The audio system includes a speech codec, microphone, headset and loud speaker amplifiers, and an optional NRE-free VoIP-based digital voice solution designed specifically for industrial and consumer applications.

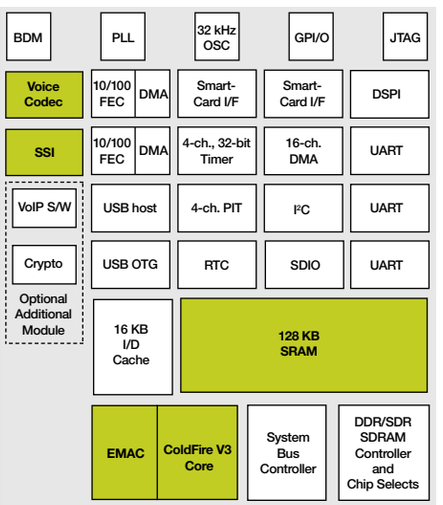
Features

- 32-bit ColdFire V3 CPU 240 MHz 47 MIPS
- 128 KB SRAM
- Audio codec
- NRE-free VoIP software with uCLinux RTOS
- 2 x Ethernet MAC
- USB host control and USB OTG with integrated PHY
- CAN controller
- Freescale complimentary MQX RTOS available

Applications

- Building automation
- Home automation
- Fire and alarm systems
- Access control
- Factory automation
- Medical monitoring equipment
- Point of sale systems
- Intercom and public address systems

MCF5301x Block Diagram



M53015EVB

The EVB provides a complete evaluation system with easy interface to a PC for evaluation and debugging. It is not suitable for development of VoIP applications.

Key Features

- 16 MB flash
- 32 MB DDR SDRAM
- 512 KB MRAM
- 2 KB serial boot flash
- Connectivity
- USB OTG
- Dual Ethernet
- Serial interface
- Audio interfaces and codec
- MQX RTOS

M53015KIT—$749 MRSP

The Digital Voice Kit developed from Arcturus provides a complete environment for developing VoIP applications. It includes a VoIP module card featuring the MCF53015, suitable for use in end applications and a base board with additional functionality.

Key Features

- VoIP module
- Host board
- Cables/power supply
- Getting started guide
- Dedicated support site access
- Audio headset
- P&E BDM wiggler
- uClinux/GNU tools
- VoIP software
- All licenses for kit use
- Power supply

Part Number	Core	Frequency	SRAM	DMA	Other	VoIP Codec /SSI	Crypto	Serial Comms	VOIP S/W	Temp	Package
MCF53010CQT240	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	-	3 x UART, DSPI, I²C	-	–40 °C to +85 °C	208 LQFP
MCF53011CQT240	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	Y	3 x UART, DSPI, I²C	-	–40 °C to +85 °C	208 LQFP
MCF53012CQT240	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	-	3 x UART, DSPI, I²C	Y	–40 °C to +85 °C	208 LQFP
MCF53013CQT240	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	Y	3 x UART, DSPI, I²C	Y	–40 °C to +85 °C	208 LQFP
MCF53014CMJ240**	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	-	3 x UART, DSPI, I²C	-	–40 °C to +85 °C	256 MAPBGA
MCF53015CMJ240**	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	Y	3 x UART, DSPI, I²C	-	–40 °C to +85 °C	256 MAPBGA
MCF53016CMJ240**	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	-	3 x UART, DSPI, I²C	Y	–40 °C to +85 °C	256 MAPBGA
MCF53017CMJ240**	V3 with eMAC and H/W Div	240 MHz	128 KB	16-ch.	2 x Ethernet, USB OTG, USB Host, SDIO	Y	Y	3 x UART, DSPI, I²C	Y	–40 °C to +85 °C	256 MAPBGA

MCF5225x Family

One-stop connectivity MCU, including free RTOS

The MCF5225x family consists of highly integrated devices with on-chip USB, Ethernet, CAN and encryption functions, featuring the complete Freescale MQX RTOS software at no additional cost. This solution is ideal for factory automation, building control and medical applications.

Features

- 32-bit ColdFire architecture running up to 80 MHz core and bus speed, with excellent code density and interrupt handling for small real-time applications
- Rich range of connectivity peripherals
  - 10/100 Ethernet MAC
  - USB 2.0 OTG controller plus transceiver
  - CAN controller with optional hardware encryption accelerator
- Functional as single-chip solution with up to 512 KB flash or expanded mode with cost-effective external memory
- Freescale MQX RTOS with full kernel, stacks and drivers
- Fully integrated software and hardware solution, including RTOS, compilers and debuggers to save on development time and resources
  - Including bundled Freescale MQX free-of-charge RTOS featuring RTCS TCP/IP stack, USB stack and file system
- Bundled VoIP software available for industrial VoIP applications. NRE free, royalties required. Contact your Freescale representative for more information.

Applications

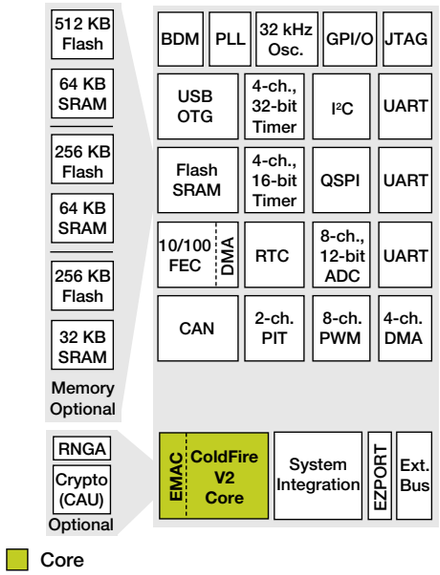
- Building and factory automation
- Small industrial Web servers
- Security access and control
- Network bridges
- Home automation Web servers
- Remote monitoring and control
- Medical networks

TWR-MCF5225x-KIT

Features

- Freescale Tower System compliant
- MCF5225X ColdFire V2 MCU
- Integrated OSBDM interface
- TWR-SER peripheral module features:
  - RS232 and RS485
  - Ethernet
  - CAN
  - USB supporting host, device and OTG modes

MCF5225x Block Diagram



Device	Core	(MHz)	Flash	SRAM	MAC/ eMAC	HW Divide	DMA	GPT*	Other	I²C	UART	SPI	TEMP	Package
MCF52252AF80	V2	80	256	32	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	100 LQFP
MCF52254AF80	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	100 LQFP
MCF52252CAF66	V2	66	256	32	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	100 LQFP
MCF52254CAF66	V2	66	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	100 LQFP
MCF52255CAF80	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, Crypto, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	100 LQFP
MCF52256AG80	V2	80	256	32	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	144 LQFP
MCF52258AG80	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	144 LQFP
MCF52256CAG66	V2	66	256	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 LQFP
MCF52259CAG80	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, Crypto, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 LQFP
MCF52258CAG66**	V2	66	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 LQFP
MCF52258VN80**	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	144 MAPBGA
MCF52256VN80**	V2	80	256	32	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	Ethernet, USB OTG	Y	3	QSPI	0 °C to 70 °C	144 MAPBGA
MCF52258CVN66**	V2	66	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 MAPBGA
MCF52256CVN66**	V2	66	256	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 MAPBGA
MCF52259CVN80**	V2	80	512	64	Y	Y	4-ch.	4-ch., 32-bit, PIT, 4-ch. PWM	CAN, Crypto, USB OTG, Ethernet	Y	3	QSPI	–40 °C to +85 °C	144 MAPBGA

32-bit ColdFire MCF51AG

Cost-effective MCU for robust and reliable control

The MCF51AG family expands the 32-bit ColdFire MCU portfolio by offering products with DMA and iEvent modules to handle data transaction and interrupt management, thereby off-loading CPU overhead and increasing overall performance. The device targets intelligent smart appliance and industrial applications. The peripheral set is also well aligned to the needs of advanced three-phase motor control applications, where it can to improve the overall energy efficiency of the application. Also included is functionality important for system safety and integrity, such as an advanced independently clocked COP, external watchdog monitor and a cyclic redundancy check (CRC) engine providing CLK failure protection and memory content validation for applications covered by regulations such as IEC60730.

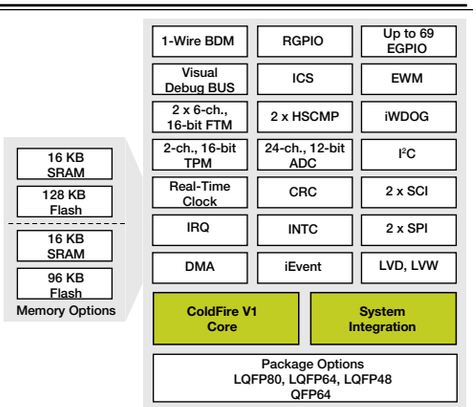
Applications

- Room air conditioning
- White goods control panel
- Small appliances
- Three-phase BLDC motor control
- Heating and boiler control

Application Notes

- AN3628: Creating an External Bus Interface Using Rapid GPIO and Timers Application
- AN4213: Migration to TSS 2.0
- AN3464: Migrating Code Between ColdFire V1 and V2
- TNCWMCUPORT: Porting Tip: Migrating from 8-bit S08 to 32-bit ColdFire V1 Using CodeWarrior for Microcontrollers V6.x
- AN3942: Flash Programming Routines for the HCS08 and the ColdFire (V1) Devices
- TN270: Converting Projects for ColdFire V1 to CodeWarrior Microcontrollers V6.3
- AN3465: Migrating Within the Controller Continuum

MCF51AG128 Block Diagram



Freescale Technology

TWR-MCF51AG-KIT

The TWR-MCF51AG-KIT is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. The kit contains the TWR-MCF51AG MCU module, along with elevator boards (TWR-ELEV), and prototyping board (TWR-PROTO). The TWR-MCF51AG MCU module is designed to be a stand-alone debug tool and can also be purchased separately from the kit, part number TWR-MCF51AG.

Features

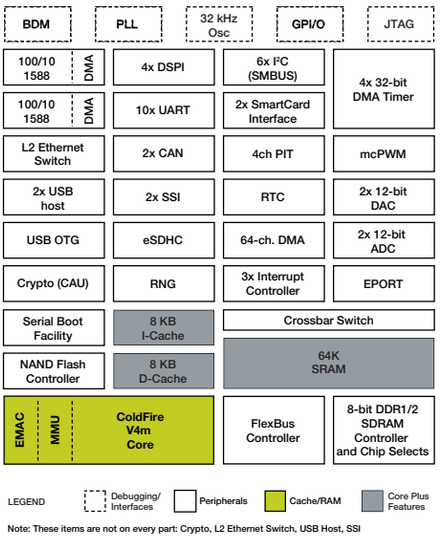
- Freescale Tower System compliant
- Integrated open-source BDM debugging tool
- MPR121 touch sensor
- Capacitive touch pads
- 3-axis accelerometer
- Potentiometer
- Four LEDs
- Small form factor
- Mini-B USB connector
- Supports external communications interfaces
- Includes power regulation circuitry with standardized bus

Device	Flash	RAM	ADC Channels		HSAMCP	SCI	SPI	I²C	16-bit Timers	Other	Package
			10-bit	12-bit							
MCF51AG128VLF	128 KB	16 KB		12-ch.	1	2	1	0	2 x 6-ch., 16-bit FTM, 2-ch., 16-bit TPM, RTC, WDT	4-ch. DMA, Internal DAC (x2), iEvent, iCOP, CRC	48 LQFP
MCF51AG128VLH	128 KB	16 KB		19-ch.	2	2	1	1			64 LQFP
MCF51AG128VLK	128 KB	16 KB		24-ch.	2	2	2	1			80 LQFP
MCF51AG128VQH	128 KB	16 KB		19-ch.	2	2	1	1			64 QFP
MCF51AG96VLF	96 KB	16 KB		12-ch.	1	2	1	0			48 LQFP
MCF51AG96VLH	96 KB	16 KB		19-ch.	2	2	1	1			64 LQFP
MCF51AG96VLK	96 KB	16 KB		24-ch.	2	2	2	1			80 LQFP
MCF51AG96VQH	96 KB	16 KB		19-ch.	2	2	1	1			64 QFP

32-bit ColdFire MCF5441x

Integrated control and connectivity solution

MCF5441x



The MCF5441x offers MCU peripherals with MPU performance, including integrated analog, an L2 switch and dual Ethernet. Add Linux and MQX RTOS, plus Eclipse-based CodeWarrior IDE and you've got a powerful development package for network-connected industrial applications.

Features

- Dual Ethernet with integrated L2 switch and high precision hardware time stamping (IEEE® 1588) with optional hardware encyption
- ColdFire V4M core with MPU, MAC and H/W Divide running up to 250 MHz
- Integrated motion control/timer with high-speed precision PWM and dual high-speed ADCs
- USB 2.0 OTG controller and optional USB 2.0 host controller
- Up to 10 UARTs possible, saving the expense of external UART expansion chips
- A range of interface for external memory including a DDR2 DRAM controller, SDIO, NAND flash interface, serial boot facility and system bus
- Low-power, real-time control industrial MPU addressing the rapid growth in industrial Ethernet
- Turn key support for embedded voice and VoIP applications

Applications

- Access panels
- Elevators
- Security
- HVAC
- Ethernet to serial bridges
- Networked control power grid controller
- Medical diagnostics, non-portable data analysis and processing
- Motor control
- VoIP phones

Application Notes

- AN3514: ColdFire Serial Boot Facility
- AN3520: Simplified EHCI Data Structures for High-End ColdFire Family USB Modules
- AN3522: DDR2 SDRAM on the ColdFire MCF5445x Microprocessor

TWR-MCF5441x-KIT

The TWR-MCF5441X-KIT module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware.

The TWR-MCF5441X-KIT features the MCF54418 MPU, which offers MCU peripherals with MPU performance, including integrated analog, an L2 switch and dual Ethernet.

Features

- MCF54418 ColdFire V4 processor card
- Industrial Ethernet PHY configurable as:
  - 10/100 dual- or single-port RMII
  - 10/100 single-port MII
- Industrial high-speed, dual-role USB (host/device) over UPLI
- Dedicated host mode USB port
- Four concurrent RS232 serial transceivers, including one S08JS16 based serial-to-USB
- RS485 transceiver
- CAN transceiver

Device	Core	Freq (MHz)	Other	SRAM	I/D	DAC 12-bit	ADC 12-bit	DMA	GPT*	Other	I²C	UART	SPI	SSI	Package
MCF54415CMJ250	V4m with MMU	250	32 x 32 MAC, H/W Div	64 KB	8 KB/ 8 KB	2-ch.	2 x 4-ch.	64-ch.	8-ch. PWM, 4 x 32-bit Timers, PIT, RTC, WDT	SDHC, 2 x Ethernet (1588) with DMA, USB OTG, USB Host, 2 x CAN, Serial Boot, NAND Flash I/F, DDR DRAM I/F, Ext. Bus	6	10	6	2	256 MAPBGA
MCF54416CMJ250	V4m with MMU	250		64 KB	8 KB/ 8 KB	2-ch.h	2 x 4-ch.	64-ch.		SDHC, 2 x Ethernet (1588) with DMA, USB OTG, USB Host, 2 x CAN, HW Crypto Accelerator, Serial Boot, NAND Flash I/F, DDR DRAM I/F, Ext. Bus	6	10	6	2	256 MAPBGA
MCF54417CMJ250	V4m with MMU	250		64 KB	8 KB/ 8 KB	2-ch.	2 x 4-ch.	64-ch.		SDHC, 2 x Ethernet (1588) with DMA, L2 Switch, USB OTG, USB Host, 2 x CAN, Serial Boot, NAND Flash I/F, DDR DRAM I/F, Ext. Bus	6	10	6	2	256 MAPBGA
MCF54418CMJ250	V4m with MMU	250		64 KB	8 KB/ 8 KB	2-ch.	2 x 4-ch.	64-ch.		SDHC, 2 x Ethernet (1588) with DMA, L2 Switch, USB OTG, USB Host, 2 x CAN, H/W Crypto Accelerator, Serial Boot, NAND Flash I/F, DDR DRAM I/F, Ext. Bus	6	10	6	2	256 MAPBGA

32-bit ColdFire+ MCF51Qx

Low-power, small-footprint 90 nm MCU

The ColdFire+ MCF51Qx portfolio is defined by four families that scale from 32 to 128 KB of flash with innovative FlexMemory, configurable embedded EEPROM. Featuring ultra-low-power capabilities and available in small 5 x 5 mm footprint packages, the MCF51QX family also offers a rich combination of analog peripherals, including high-accuracy 16-bit analog-digital-conversion (ADC), hardware encryption, an innovative touch-sensing interface and more. These key features make this a highly integrated, cost-effective 32-bit MCU solution for consumer and industrial applications. All four ColdFire+ MCF51Qx families are software and pin compatible with each other as well as the ColdFire+ MCF51Jx families to maximize code re-use and shorten development time and investment.

Features

- Innovative FlexMemory, configurable EEPROM
- 10 flexible ultra-low-power modes
- 16-bit ADC and 12-bit DAC provide flexible and powerful mixed signal capability
- Crypto acceleration unit and random number generator for secure communication
- Integrated capacitive touch sensing and display support: Low-power touch-sensing interface (TSI)
- Small foot-print packages designed for space-constrained applications
- Ultra-low-power operation making it suitable for portable and battery-operated devices

Applications

- Secure portable or battery-powered applications
- Wireless sensor nodes
- Security control pads
- Video game accessories
- eToll machines
- Digital audio bridges
- Medical devices
- Building control systems

Application Notes

- AN3949: ADC16 Calibration Procedure and Programmable Delay
- AN3827: Differences Between Controller Continuum ADC Modules
- AN3464: Migrating Code Between ColdFire V1 and V2
- AN3942: Flash Programming Routines for the HCS08 and the ColdFire (V1) Devices
- AN3465: Migrating within the Controller Continuum
- AN4223: Connecting Low-Cost External Electrodes to MED-EKG

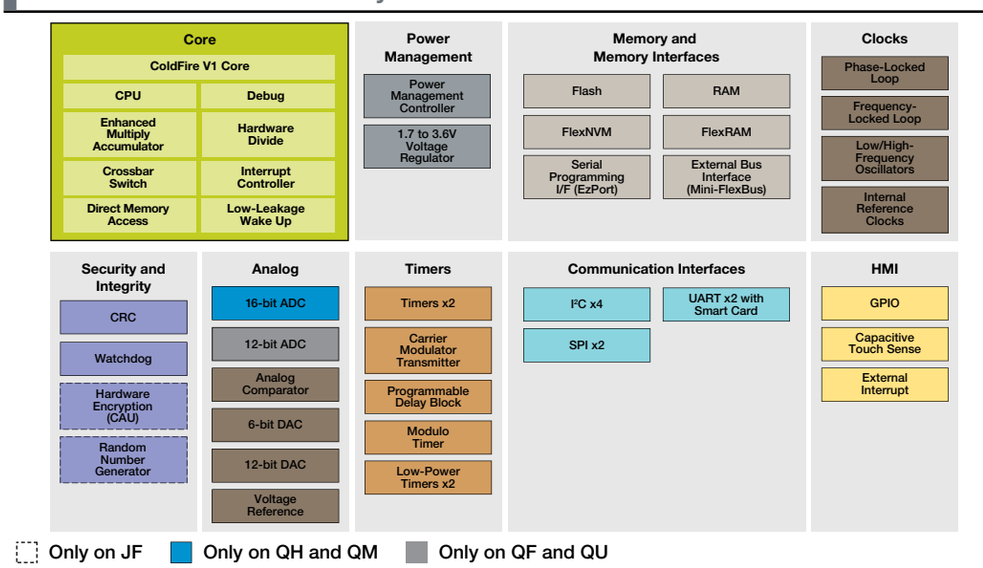
TWR-MCF51QM-KIT

The TWR-MCF51QM module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Take your design to the next level and begin constructing your Tower System today. The TWR-MCF51QM tower system can operate as a stand-alone debug tool and can be purchased separately as a kit, part number TWR-MCF51QM-KIT, including the TWR-MCF51QM module, TWR-PROTO and TWR-ELEV.

Features

- MCF51QM128 in 64 LQFP package
- On-board debugger (OSBDM)
- Easy access to high-precision analog I/O
- Capacitive touch and push buttons
- Potentiometer
- Audio I/O
- Power plug-in sockets

ColdFire+ MCF51Qx Family



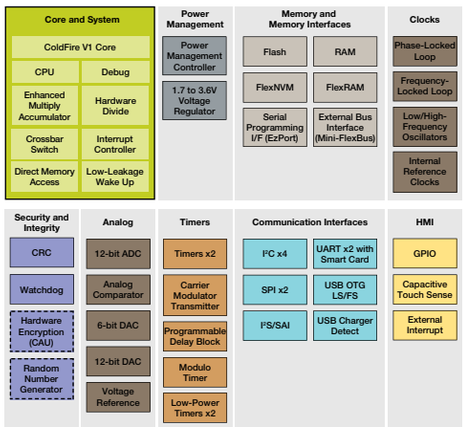
32-bit ColdFire+ MCF51Qx
Continued

Device	Flash	RAM	Flexmemory		Crypto	ADC		Touch Sense	SCI	I²C	SPI	FlexBus	Timers	Clock	Package
			FlexNVM	FlexRAM (EEPROM)		12-bit	16-bit								
MCF51QU128VLH	128 KB	32 KB	32 KB	2 KB	No	19-ch.		16	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51QU128VFX	128 KB	32 KB	32 KB	2 KB	No	19-ch.		16	2	4	2	Yes		MCG	64 QFN
MCF51QU128VHS	128 KB	32 KB	32 KB	2 KB	No	19-ch.		7	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51QU64VLF	64 KB	16 KB	32 KB	2 KB	No	19-ch.		8	2	3	2	Yes		MCG	48 LQFP
MCF51QU64VHS	64 KB	16 KB	32 KB	2 KB	No	19-ch.		7	2	3	2	Yes		MCG	44 QFN
MCF51QU32VHS	32 KB	8 KB	16 KB	1 KB	No	19-ch.		7	2	3	2	Yes		MCG	44 QFN
MCF51QU32VFM	32 KB	8 KB	16 KB	1 KB	No	19-ch.		5	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN
MCF51QH128VLH	128 KB	32 KB	32 KB	2 KB	No		18-ch.	16	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51QH128VFX	128 KB	32 KB	32 KB	2 KB	No		18-ch.	16	2	4	2	Yes		MCG	64 QFN
MCF51QH128VHS	128 KB	32 KB	32 KB	2 KB	No		18-ch.	7	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51QH64VLF	64 KB	16 KB	32 KB	2 KB	No		18-ch.	8	2	3	2	Yes		MCG	48 LQFP
MCF51QH64VHS	64 KB	16 KB	32 KB	2 KB	No		18-ch.	7	2	3	2	Yes		MCG	44 QFN
MCF51QH32VHS	32 KB	8 KB	16 KB	1 KB	No		18-ch.	7	2	3	2	Yes		MCG	44 QFN
MCF51QH32VFH	32 KB	8 KB	16 KB	1 KB	No		18-ch.	5	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN
MCF51QF128VLH	128 KB	32 KB	32 KB	2 KB	DES, AES (-128, -192, -256) SHA-1 and SHA-256, MD5	19-ch.		16	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51QF128VFX	128 KB	32 KB	32 KB	2 KB		19-ch.		16	2	4	2	Yes		MCG	64 QFN
MCF51QF128VHS	128 KB	32 KB	32 KB	2 KB		19-ch.		7	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51QF64VLF	64 KB	16 KB	32 KB	2 KB		19-ch.		8	2	3	2	Yes		MCG	48 LQFP
MCF51QF64VHS	64 KB	16 KB	32 KB	2 KB		19-ch.		7	2	3	2	Yes		MCG	44 QFN
MCF51QF32VHS	32 KB	8 KB	16 KB	1 KB		19-ch.		7	2	3	2	Yes		MCG	44 QFN
MCF51QF32VFH	32 KB	8 KB	16 KB	1 KB		19-ch.		5	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN
MCF51QM128VLH	128 KB	32 KB	32 KB	2 KB	DES, AES (-128, -192, -256) SHA-1 and SHA-256, MD5		18-bit	16	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51QM128VFX	128 KB	32 KB	32 KB	2 KB			18-bit	16	2	4	2	Yes		MCG	64 QFN
MCF51QM128VHS	128 KB	32 KB	32 KB	2 KB			18-bit	7	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51QM64VLF	64 KB	16 KB	32 KB	2 KB			18-bit	8	2	3	2	Yes		MCG	48 LQFP
MCF51QM64VHS	64 KB	16 KB	32 KB	2 KB			18-bit	7	2	3	2	Yes		MCG	44 QFN
MCF51QM32VHS	32 KB	8 KB	16 KB	1 KB			18-bit	7	2	3	2	Yes		MCG	44 QFN
MCF51QM32VFH	32 KB	8 KB	16 KB	1 KB			18-bit	5	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN

32-bit ColdFire+ MCF51Jx

Low-power, small-footprint 90 nm MCU

ColdFire+ MCF51Jx Block Diagram



Only on JF

The ColdFire+ MCF51Jx portfolio is defined by two families that scale from 32 to 128 KB of flash with innovative FlexMemory and configurable embedded EEPROM. Featuring ultra-low-power capabilities and available in small 5 x 5 mm footprint packages, the MCF51Jx family also offers a rich combination of additive peripherals including USB On-the-GO (OTG), a serial audio interface, high-accuracy analog, hardware encryption, an integrated touch-sensing interface and more. These key features make these 32-bit MCUs a highly integrated, cost-effective solution for consumer and industrial applications.

The ColdFire+ MCF51Jx families are software and pin compatible with each other as well as the ColdFire+ MCF51Qx families to maximize code re-use and shorten development time and investment.

Features

- Innovative FlexMemory, configurable EEPROM
- 10 flexible ultra-low-power modes
- Crypto acceleration unit and random number generator for secure communication
- Integrated capacitive touch sensing and display support: Low-power touch-sensing interface (TSI)
- Small foot-print packages designed for space-constrained applications
- Integrated USB 2.0 Full-Speed device/host/OTG controller supports connection via USB and battery charging
- Serial audio interface provides direct interface to codecs and to Inter-IC sound (I^2S) audio devices

Applications

- Digital audio bridges
- Portable accessories
- Secure portable or battery-powered applications
- Wireless sensor nodes
- Security control pads
- Video game accessories
- Medical devices
- Building control systems
- Data loggers

Application Notes

- AN3949: ADC16 Calibration Procedure and Programmable Delay
- AN3827: Differences Between Controller Continuum ADC Modules
- AN3464: Migrating Code Between ColdFire V1 and V2
- AN3942: Flash Programming Routines for the HCS08 and the ColdFire (V1) Devices
- AN3465: Migrating Within the Controller Continuum
- AN3577: Creating a USB-to-Wireless Bridge with the MC1319x/20x and ColdFire Processors with USB OTG Module
- AN3927: Freescale USB Mass Storage Device Boot Loader
- AN3748: USB Boot Loader for MCF51JM128

TWR-MCF51JF-KIT

The TWR-MCF51JF module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Take your design to the next level and begin constructing your Tower System today. The TWR-MCF51JF tower system can operate as a stand-alone debug tool and can be purchased separately as a kit, part number TWR-MCF51JF-KIT, including the TWR-MCF51JF module, TWR-PROTO and TWR-ELEV.

Key Features

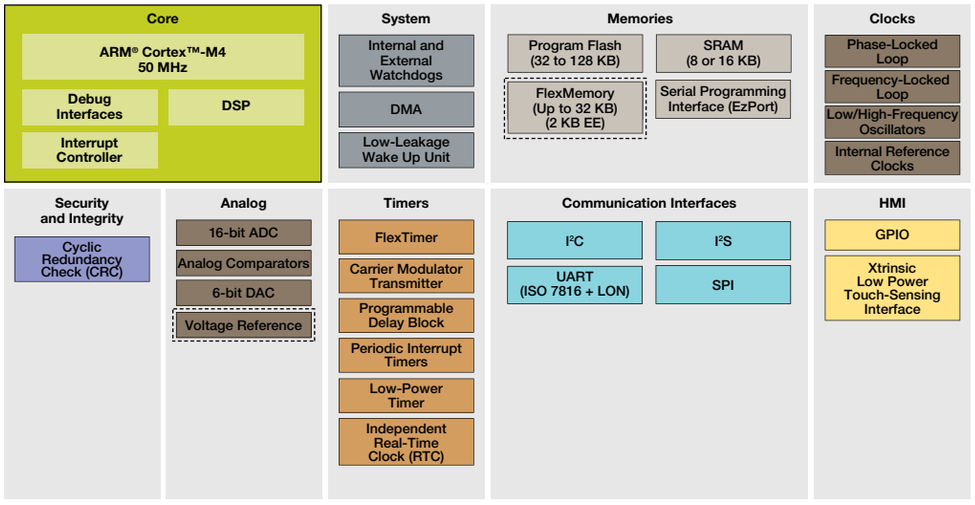
- MCF51JF128 device in a 64 LQFP package.
- On-board debugger (OSBDM)
- Full-Speed USB 2.0 dual-role interface
- Capacitive touch and push buttons
- Potentiometer
- Audio input/output
- Power plug-in sockets
- TWR-SER card for serial plug-in functionality
- Potentiometer, 4x LEDs, 2s push buttons, infrared port

Device	Flash	RAM	Flexmemory		Crypto	ADC 12-bit	USB OTG with DCD	Touch Sense	Serial Audio I/F	SCI	I^2C	SPI	FlexBus	Timers	Clock	Package
			FlexNVM	FlexRAM (EEPROM)												
MCF51JU128VLH	128 KB	32 KB	32 KB	2 KB	No	19-ch.	Y	16	1	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51JU128VFX	128 KB	32 KB	32 KB	2 KB	No	19-ch.	Y	16	1	2	4	2	Yes		MCG	64 QFN
MCF51JU128VHS	128 KB	32 KB	32 KB	2 KB	No	19-ch.	Y	7	1	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51JU64VLF	64 KB	16 KB	32 KB	2 KB	No	19-ch.	Y	8	1	2	3	2	Yes		MCG	48L QFP
MCF51JU64VHS	64 KB	16 KB	32 KB	2 KB	No	19-ch.	Y	7	1	2	3	2	Yes		MCG	44 QFN
MCF51JU32VHS	32 KB	8 KB	16 KB	1 KB	No	19-ch.	Y	7	1	2	3	2	Yes		MCG	44 QFN
MCF51JU32VFM	32 KB	8 KB	16 KB	1 KB	No	19-ch.	Y	5	1	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN
MCF51JF128VLH	128 KB	32 KB	32 KB	2 KB	DES, AES (-128, -192, -256) SHA-1 and SHA-256, MD5	19-ch.	Y	16	1	2	4	2	Yes	2/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	64 LQFP
MCF51JF128VFX	128 KB	32 KB	32 KB	2 KB		19-ch.	Y	16	1	2	4	2	Yes		MCG	64 QFN
MCF51JF128VHS	128 KB	32 KB	32 KB	2 KB		19-ch.	Y	7	1	2	3	2	Yes	1/6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	44 QFN
MCF51JF64VLF	64 KB	16 KB	32 KB	2 KB		19-ch.	Y	8	1	2	3	2	Yes		MCG	48 LQFP
MCF51JF64VHS	64 KB	16 KB	32 KB	2 KB		19-ch.	Y	7	1	2	3	2	Yes		MCG	44 QFN
MCF51JF32VHS	32 KB	8 KB	16 KB	1 KB		19-ch.	Y	7	1	2	3	2	Yes		MCG	44 QFN
MCF51JF32VFH	32 KB	8 KB	16 KB	1 KB		19-ch.	Y	5	1	2	3	2	No	6-ch., 16-bit FTM, PDB, RTC, COP, WDT	MCG	32 QFN

32-bit Kinetis K10

General-purpose, low-power, mixed-signal MCU

Kinetis K10 Family



Optional

The K10 MCU family is the entry point into the Kinetis portfolio. Devices start from 32 KB of flash in a small-footprint 5 x 5 mm 32 QFN package extending up to 1 MB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals. High memory density K10 family devices include a single precision floating point unit and NAND flash controller. Pin compatibility, flexible low-power capabilities and innovative FlexMemory help to solve many of the major pain points for system implementation.

Features

- Up to 150 MHz ARM Cortex-M4 core
- 32 KB flash: 1 MB program flash and 128 KB SRAM
- FlexMemory providing H/W EEPROM
- 32-pin QFN through to 256 MAPBGA
- 2 x CAN
- Up to 2 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference
- Motor control timers
- Low-power operation
- Serial communications

Applications

- Building access control
- HVAC
- Fire and security systems
- Remote sensor networks
- Metering and measurement
- Motor control

TWR-K60N512-KIT

The TWR-K60N512-KIT is a development tool for the K60 and K10/20 families of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K60 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K60N512.

Key Features

- K60N512 capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards
- TWR-SER board with USB, Ethernet, RS232/ RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

Application Notes

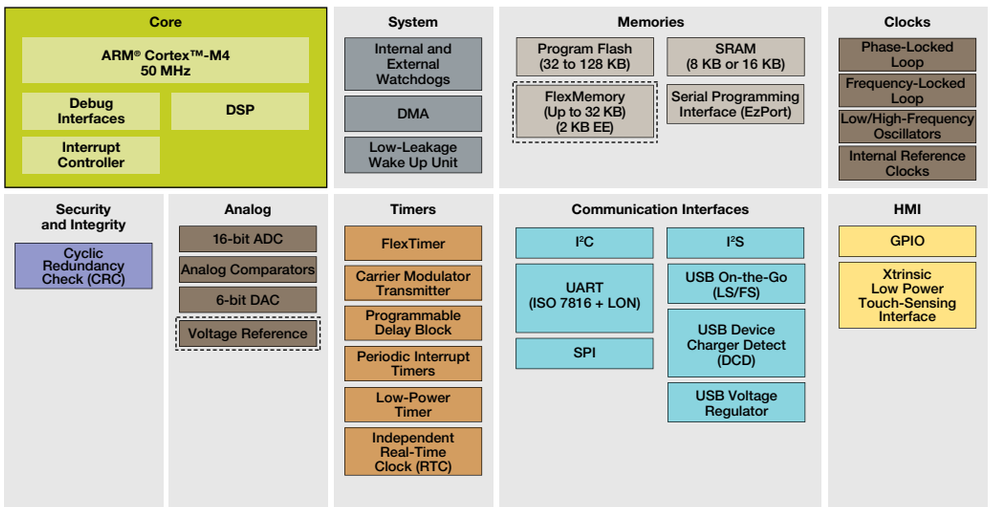
- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

Device	CPU (MHz)	Memory				Feature Options								Packages										
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	CAN	Memory Protection Unit	Secure Digital Host Controller	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	32 QFN (5 x 5)	48 QFN (7 x 7)	48 LQFP (7 x 7)	64 LQFN (9 x 9)	64MAPBGA (8 x 8)	80 LQFP (12 x 12)	81 BGA (8 x 8)	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)
MK10N32Vyy50	50	32	-	8										FM	FT	LF	EX	MB						
MK10N64Vyy50	50	64	-	16										FM	FT	LF	EX	LH						
MK10X32Vyy50	50	32	32	8										FM	FT	LF	EX	MB						
MK10X64Vyy50	50	64	32	16										FM	FT	LF	EX	MB						
MK10N96Vyy50	50	96	-	16										FM	FT	LF	EX							
MK10X64Vyy72	72	64	32	16			√			√	√	√	√				EX		LK	MB				
MK10X128Vyy72	72	128	32	32			√			√	√	√	√				EX		LK	MB	LL	MC		
MK10X256Vyy72	72	256	32	64			√			√	√	√	√						LK	MB	LL	MC		
MK10X128Vyy100	100	128	128	32			√	√	√	√	√	√	√										LQ	MD
MK10X256Vyy100	100	256	256	64			√	√	√	√	√	√	√										LQ	MD
MK10N512Vyy100	100	512	-	128			√	√	√	√	√	√	√						LK	MB	LL	MC	LQ	MD
MK10X512Vyy120	120	512	512	128	16	√	√	√	√	√	√	√	√										LQ	MD
MK10N1M0Vyy120	120	1024	-	128	16	√	√	√	√	√	√	√	√										LQ	MD

32-bit Kinetis K20

USB-enabled, low-power, mixed-signal MCU

Kinetis K20 Family



Optional

The K20 MCU family is pin, peripheral and software compatible with the K10 MCU family and adds full and High-Speed USB 2.0 On-The-Go with device charge detect capability. Devices start from 32 KB of flash in 5 x 5 mm 32 QFN packages extending up to 1 MB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals. High memory density K20 family devices include a single precision floating point unit and NAND flash controller.

Features

- Up to 150 MHz ARM Cortex-M4 core
- 32 KB flash: 1 MB program flash and 129 KB SRAM
- FlexMemory providing H/W EEPROM
- 32-pin QFN through to 256 MAPBGA
- USB 2.0-compliant OTG module with integrated PHY (option to support external ULPI PHY for High-Speed USB)
- Up to 2 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference
- Motor control timers
- Low-power operation
- Serial communciations

Applications

- Building access control
- HVAC
- Fire and security systems
- Remote sensor networks
- Metering and measurement
- Motor control
- USB data loggers
- Portable medical devices
- Digital audio bridges and accessories

TWR-K60N512-KIT

The TWR-K60N512-KIT is a development tool for the K60 and K10/20 families of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K60 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K60N512.

Key Features

- K60N512 capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards
- TWR-SER board with USB, Ethernet, RS232/RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

Application Notes

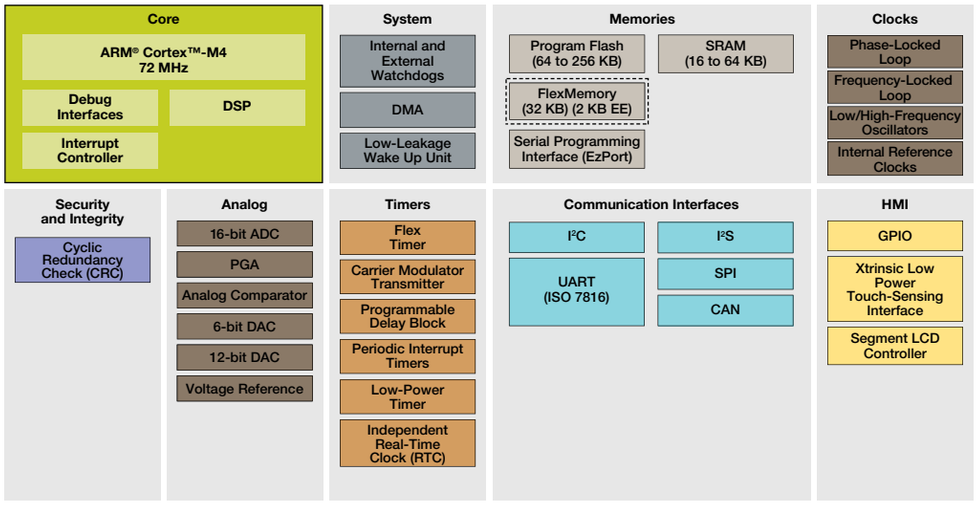
- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

Device	CPU (MHz)	Memory				Feature Options									Packages												
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	CAN	Memory Protection Unit	Secure Digital Host Controller	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	32 QFN (5 x 5)	48 QFN (7 x 7)	48 LQFP (7 x 7)	64MAPBGA (8 x 8)	64 LQFP (10 x 10)	80 LQFP (12 x 12)	81 BGA (8 x 8)	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)	196 BGA (15 x 15)	2566 BGA (17 x 17)
MK20N32Vyy50	50	32	-	8										US	FM	FT	LF	MB	LH								
MK20N64Vyy50	50	64	-	16										US	FM	FT	LF	MB	LH								
MK20X32Vyy50	50	32	32	8										US	FM	FT	LF	MB	MB								
MK20X64Vyy50	50	64	32	16										US	FM	FT	LF	MB	MB								
MK20N96Vyy50	50	96	-	16										US	FM	FT	LF	MB	LH								
MK20X64Vyy72	72	64	32	16			√			√	√	√	√	US					LH	LK	MB						
MK20X128Vyy72	72	128	32	32			√			√	√	√	√	US					LH	LK	MB	LL	MC				
MK20X256Vyy72	72	256	32	64			√			√	√	√	√	US						LK	MB	LL	MC				
MK20X128Vyy100	100	128	128	32			√	√	√	√	√	√	√	US										LQ	MD		
MK20X256Vyy100	100	256	256	64			√	√	√	√	√	√	√	US										LQ	MD		
MK20N512Vyy100	100	512	-	128			√	√	√	√	√	√	√	US						LK	MB	LL	MC	LQ	MD		
MK20X512Vyy120	120	512	512	128	16	√	√	√	√	√	√	√	√	US										LQ	MD		
MK20N1M0Vyy120	120	1024	-	128	16	√	√	√	√	√	√	√	√	US										LQ	MD		

32-bit Kinetis K30

Low-power segment display-enabled MCU with rich mixed-signal capabilities

Kinetis K30 Mid-Performance Segment LCD MCUs



Optional

The K30 MCU family is pin, peripheral and software compatible with the K10 MCU family and adds a flexible low-power segment LCD controller with support for up to 320 segments. Devices start from 64 KB of flash in 64 QFN packages extending up to 512 KB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals.

Features

- Up to 100 MHz ARM Cortex-M4 core
- 32 KB flash: 512 KB program flash and 128 KB SRAM
- FlexMemory providing H/W EEPROM
- 32-pin QFN through to 144-pin packages
- Low-power segment LCD, supporting up to 288 pins with segment fail detect option
- Up to 2 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference
- Motor control timers
- Low-power operation
- Serial communications

Applications

- Single- and three-phase e-meters
- Flow meters
- Test and measurement equipment
- Portable medical devices
- Building access control
- HVAC control systems
- Instrumentation
- Digital audio bridges and accessories

Application Notes

- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

TWR-K40X256-KIT

The TWR-K40X256-KIT is a development tool for the K40 and K30 families of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K40 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K40X256.

Key Features

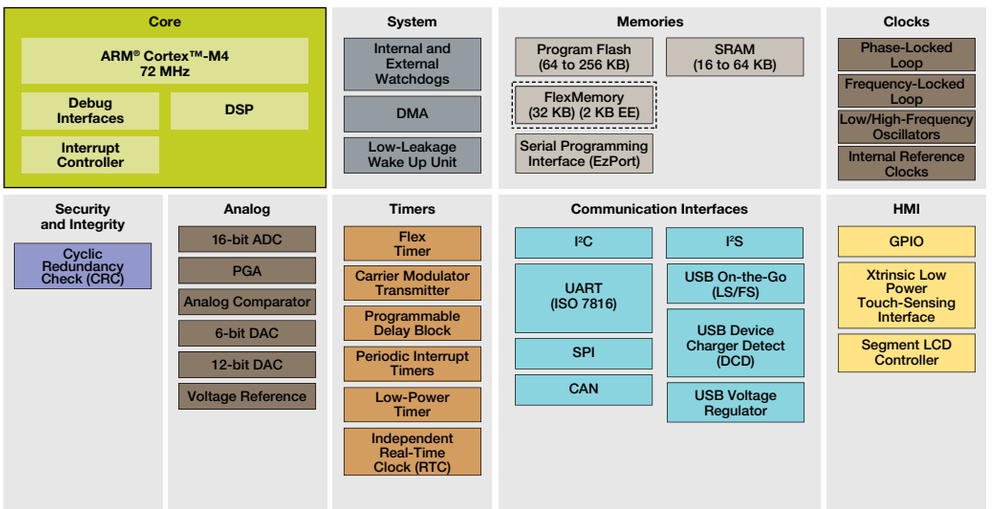
- K40X256 in 144 MAPBGA
- Capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Segment LCD 28 segments
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards (e.g. keypads, rotary dials, sliders, etc.)
- Tower connectivity for access to USB, Ethernet, RS232/RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

Device	CPU (MHz)	Memory			Feature Options								Packages						
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	CAN	Memory Protection Unit	Secure Digital Host Controller	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	64 LQFP (10 x 10)	80 LQFP (12 x 12)	81 BGA (8 x 8)	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)
MK30X64Vyy72	72	64	32	16	√				√	√	√	Segment LCD (up to 25 x 8/29 x 4)	LH	LK	MB				
MK30X128Vyy72	72	128	32	32	√				√	√	√	Segment LCD (up to 36 x 8/40 x 4)	LH	LK	MB	LL	MC		
MK30X256Vyy72	72	256	32	64	√				√	√	√	Segment LCD (up to 36 x 8/40 x 4)		LK	MB	LL	MC		
MK30X128Vyy100	100	128	128	32	√	√	√	√	√	√	√	Segment LCD (40 x 8/44 x 4)						LQ	MD
MK30X256Vyy100	100	256	256	64	√	√	√	√	√	√	√	Segment LCD (40 x 8/44 x 4)						LQ	MD
MK30N512Vyy100	100	512	-	128	√	√	√	√	√	√	√	Segment LCD (up to 40 x 8/44 x 4)		LK	MB	LL	MC	LQ	MD

32-bit Kinetis K40

Low-power segment display- and USB-enabled MCU with rich mixed-signal capabilities

Kinetis K40 Mid-Performance USB and Segment LCD MCUs



Optional

The K40 MCU family is pin, peripheral and software compatible with the K10 MCU family and adds Full-Speed USB 2.0 On-The-Go with device charge detect capability and a flexible low-power segment LCD controller with support for up to 320 segments. Devices start from 64 KB of flash in 64 QFN packages extending up to 512 KB in a 144 MAPBGA package with a rich suite of analog, communication, timing and control peripherals.

Features

- Up to 100 MHz ARM Cortex-M4 core
- 32 KB flash: 512 KB program flash and 128 KB SRAM
- FlexMemory providing H/W EEPROM
- 32-pin QFN through to 144-pin packages
- Low-power segment LCD, supporting up to 288 pins with segment fail detect option
- Low-/Full-Speed USB2.0 On-the-Go module
- Up to 2 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference
- Motor control timers
- Low-power operation
- Serial communications

Applications

- GPS receivers
- Blood glucose meters
- Bike computers
- Currency counters
- Single and three-phase e-meters
- Test and measurement equipment
- Portable medical devices
- Building access control
- HVAC control systems
- Instrumentation
- Digital audio bridges and accessories

Application Notes

- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

TWR-K40X256-KIT

The TWR-K40X256-KIT is a development tool for the K40 and K30 families of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K40 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K40X256.

Key Features

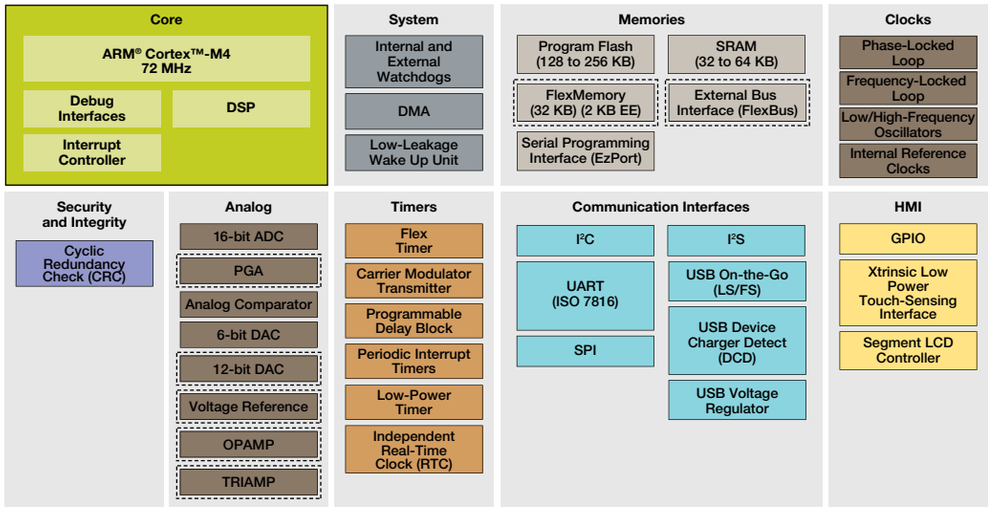
- K40X256 in 144 MAPBGA
- Capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Segment LCD 28 segments
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards (keypads, rotary dials, sliders, etc.)
- Tower connectivity for access to USB, Ethernet, RS232/RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

Device	CPU (MHz)	Memory			Feature Options								Packages						
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	CAN	Memory Protection Unit	Secure Digital Host Controller	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	64 LQFP (10 x 10)	80 LQFP (12 x 12)	81 BGA (8 x 8)	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)
MK40X64Vyy72	72	64	32	16	√				√	√	√	Segment LCD (up to 25 x 8/29 x 4)	LH	LK	MB				
MK40X128Vyy72	72	128	32	32	√				√	√	√	Segment LCD (up to 36 x 8/40 x 4)	LH	LK	MB	LL	MC		
MK40X256Vyy72	72	256	32	64	√				√	√	√	Segment LCD (up to 36 x 8/40 x 4)		LK	MB	LL	MC		
MK40X128Vyy100	100	128	128	32	√	√	√	√	√	√	√	Segment LCD (40 x 8/44 x 4)						LQ	MD
MK40X256Vyy100	100	256	256	64	√	√	√	√	√	√	√	Segment LCD (40 x 8/44 x 4)						LQ	MD
MK40N512Vyy100	100	512	-	128	√	√	√	√	√	√	√	Segment LCD (up to 40 x 8/44 x 4)		LK	MB	LL	MC	LQ	MD

32-bit Kinetis K50

Low-power MCU with integrated measurement engine, LCD, USB and Ethernet

Kinetis K50 Mid-Performance Measurement MCUs



Optional

The K50 MCU family is pin-, peripheral- and software-compatible with other Kinetis MCUs and provides designers with an analog measurement engine consisting of integrated operational and transimpedance amplifiers and high-resolution ADC and DAC modules. The family also features IEEE 1588 Ethernet and hardware encryption, Full-Speed USB 2.0 On-The-Go with device charger detect capability and a flexible low-power segment LCD controller with support for up to 320 segments. Devices start from 128 KB of flash in 64 QFN packages extending up to 512 KB in a 144 MAPBGA package.

Features

- Up to 100 MHz ARM Cortex-M4 core
- 128 KB flash: 512 KB program flash and up to 128 KB SRAM
- FlexMemory providing H/W EEPROM
- Small 64-pin QFN through to 144-pin packages
- Low-power segment LCD, supporting up to 288 pins with segment fail detect option
- Low/Full-Speed USB 2.0 On-the-Go module
- Up to 2 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference, op-amp and tri-amp
- Optional Ethernet and H/W encryption
- Motor control timers

Applications

- Low-power portable medical devices
- Clinical and lab equipment
- Test/measurement equipment
- Instrumentation applications
- Monitor and telehealth applications

Application Notes

- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

TWR-K53N512-KIT

The TWR-K53N512-KIT is a development tool for the K53 family of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The TWR-K53N512 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit. The module provides interface to the medical expansion connector and TWRPI-SLCD modules.

Key Features

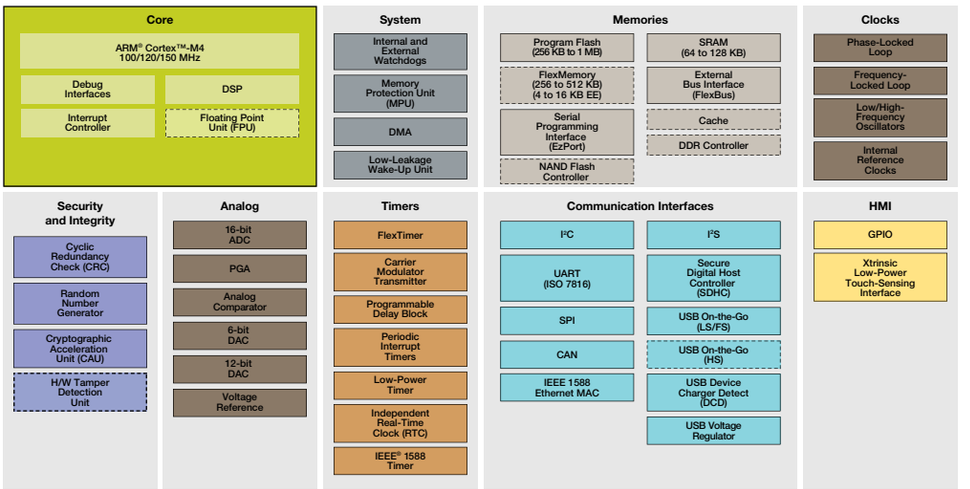
- Features MK53N512CMD100 MAPBGA 144-pin MCU
- Tower-compatible processor module
- S08JM60 based open-source JTAG (JTAG) circuit
- User-controlled status LEDs
- Capacitive touch pad sensors and mechanical push buttons
- Medical expansion connector (connect AFE plug-in such as TWR-MCF51MM)
- SD card slot
- Connect TWRPI-SLCD board (28 segment LCD) through TWRPI interface
- Compatible with TWR-SER (Ethernet, USB connectivity)
- MMA7660 accelerometer

Device	CPU (MHz)	Memory			Feature Options								64 LQFP (10 x 10)	80 LQFP (12 x 12)	81 BGA (8 x 8)	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	Tri-Amp	Op-Amp	DAC	Ethernet	LCD	External Bus Interface	ADC	Other							
MK50X128Vyy72	72	128	32	32	√	√	√			√	√		LH	LK	MB				
MK51X128Vyy72	72	128	32	32	√	√	√		√		√	PDB, VREF	LH	LK	MB				
MK50X256Vyy72	72	256	32	64	√	√	√			√	√			LK	MB	LL	MC		
MK51X256Vyy72	72	256	32	64	√	√	√		√		√	PDB, VREF		LK	MB	LL	MC		
MK51N256Vyy100	100	256	-	64	√	√	√		√	√	√	PDB, VREF						LQ	MD
MK50X256Vyy100	100	256	256	64	√	√	√			√	√			LK	MB	LL	MC		
MK51X256Vyy100	100	256	256	64	√	√	√		√		√	PDB, VREF		LK	MB	LL	MC		
MK53X256Vyy100	100	256	256	128	√	√	√	√	√	√	√	IEEE® 1588 Eth, CAU + RNG, PDB, VREF						LQ	MD
MK50N512Vyy100	100	512	-	128	√	√	√			√	√					LL	MC	LQ	MD
MK51N512Vyy100	100	512	-	128	√	√	√		√	√	√	PDB, VREF				LL	MC	LQ	MD
MK52N512Vyy100	100	512	-	128	√	√	√	√		√	√	CAU + RNG, PDB, VREF						LQ	MD
MK53N512Vyy100	100	512	-	128	√	√	√	√	√	√	√	IEEE 1588 Eth, CAU + RNG, PDB, VREF						LQ	MD

32-bit Kinetis K60

Low-power MCU with integrated rich connectivity, HMI and mixed-signal IP

Kinetis K60 Family



☐ STandard Feature ⬚ Optional

The K60 MCU family includes IEEE 1588 Ethernet, Full- and High-Speed USB 2.0 On-The-Go with device charge detect capability, hardware encryption and tamper detection capabilities. Devices start from 256 KB of flash in 100 LQFP packages extending up to 1 MB in a 256 MAPBGA package with a rich suite of analog, communication, timing and control peripherals. High memory density K60 family devices include an optional single precision floating point unit, NAND flash controller and DRAM controller.

Features

- Up to 150 MHz ARM Cortex-M4 core
- 128 KB flash: 1 MB program flash and 128 KB SRAM
- FlexMemory providing H/W EEPROM
- 80 pin QFN through to 256MAPBGA
- USB 2.0-compliant OTG module with integrated PHY (option to support external ULPI PHY for High-Speed USB)
- IEEE 1588 enabled Ethernet MAC controller
- Optional H/W encryption accelerator
- Anti-tamper support
- Up to 4 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference

Applications

- Building automation controllers
- Elevator control panels
- Instrumentation clusters
- Surveillance cameras

Application Notes

- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

TWR-K60N512-KIT

The TWR-K60N512-KIT is a development tool for the K60 and K10/20 families of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K60 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K60N512.

Key Features

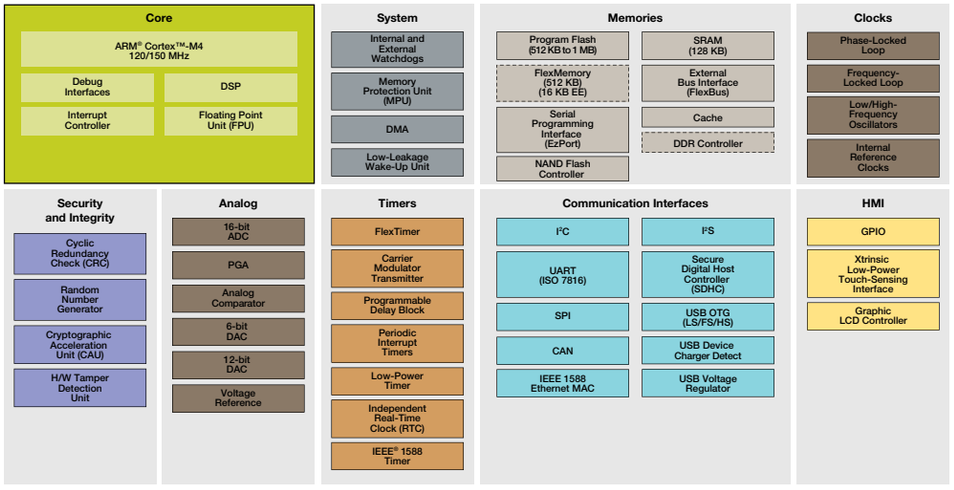
- K60N512 in 144 MAPBGA, K60N512VMD100
- Capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards (keypads, rotary dials, sliders, etc.)
- Tower connectivity for access to USB, Ethernet, RS232/RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push-buttons, infrared port

Device	CPU (MHz)	Memory			Feature Options															
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	CAN	Memory Protection Unit	Secure Digital Host Controller	NAND Flash Controlle	External Bus Interface	12-bit DAC	Prog. Gain Amplifier	5V Tolerant I/O	Other	100 LQFP (14 x 14)	121 BGA (8 x 8)	144 LQFP (20 x 20)	144 BGA (13 x 13)	2566 BGA (17 x 17)
MK60N256Vyy100	100	256	-	64			√	√	√		√	√	√	√	IEEE® 1588 Eth, USB OTG (FS), CAU+RNG					
MK60N512Vyy100	100	512	-	128			√	√	√		√	√	√	√	IEEE 1588 Eth, USB OTG (FS), CAU+RNG	LL	MC			
MK60X256Vyy100	100	256	256	64			√	√	√		√	√	√	√	IEEE 1588 Eth, USB OTG (FS), CAU+RNG	LL	MC			
MK60X512Vyy120	120	512	512	128	16	√	√	√	√	√	√	√	√	√	IEEE 1588 Eth, USB OTG (FS/HS), CAU+RNG, Tamper Detect, NAND Controller, 4 ADC Blocks, FPU, DRAM Controller			LQ	MD	MJ
MK60X512Vyy150	150	512	512	128	16	√	√	√	√	√	√	√	√	√	IEEE 1588 Eth, USB OTG (FS/HS), CAU+RNG, Tamper Detect, NAND Controller, 4 ADC Blocks, FPU, DRAM Controller			LQ	MD	MJ
MK60N1M0Vyy120	120	1024	-	128	16	√	√	√	√	√	√	√	√	√	IEEE 1588 Eth, USB OTG (FS/HS), CAU+RNG, Tamper Detect, NAND Controller, 4 ADC Blocks, FPU, DRAM Controller	LL	MC	LQ	MD	MJ
MK60N1M0Vyy150	150	1024	-	128	16	√	√	√	√	√	√	√	√	√	IEEE 1588 Eth, USB OTG (FS/HS), CAU+RNG, Tamper Detect, NAND Controller, 4 ADC Blocks, FPU, DRAM Controller					MJ

32-bit Kinetis K70

Rich connectivity and HMI-enabled MCU with anti-tamper capabilities

Kinetis K70 Family



☐ STandard Feature ⬚ Optional

The K70 MCU family is a highly intergrated MCU with feature-rich HMI peripherals including a 24-bit graphical display controller as well as a range of to address the growing needs for a connected world, including an IEEE 1588 Ethernet controller. There are also a range of security and anti-tamper features integrated on-chip to enable designers to develop robust and secure systems.

Features

- Up to 1150 MHz ARM Cortex-M4 core
- 512 KB flash: 1 MB program flash and 128 KB SRAM
- FlexMemory providing H/W EEPROM
- 196 or 256 MAPBGA packages
- 24-bit SVGA graphics controller
- IEEE 1588 enabled Ethernet MAC
- USB 2.0-compliant OTG module with integrated PHY (option to support external ULPI PHY for High-Speed USB)
- Optional H/W encryption accelerator
- Anti-tamper support
- Up to 4 x 16-bit ADC with PGA, 12-bit DAC, analog comparators, voltage reference

Applications

- Building automation controllers
- Elevator control panels
- Instrumentation clusters
- Surveillance cameras

Application Notes

- KQURG: Kinetis Peripheral Module Quick Reference
- ADC Calculator: Define Requirements of ADC and Calculate Conversion Times

TWR-K70N1M0-KIT

The TWR-K70N1M0-KIT is a development tool for the K70 family of Kinetis MCUs. This kit is part of the Freescale Tower System, a modular, reusable development platform that allows designers to get to market faster with packaged evaluation boards, tools and runtime software. The K70 MCU module can operate as a stand-alone debug tool and can be purchased separately from the kit, part number TWR-K70N1M0.

Key Features

- K70N1M0 in 256 MAPBGA
- Capacitive touch pads
- Integrated, open-source JTAG
- SD card slot
- MMA7660 3-axis accelerometer
- Tower plug-in (TWRPI) socket for expansion (sensors, etc.)
- Touch TWRPI socket adds support for various capacitive touch boards (keypads, rotary dials, sliders, etc.)
- Tower connectivity for access to graphical display, USB, Ethernet, RS232/RS485, CAN, SPI, I²C, Flexbus, etc.
- Potentiometer, four LEDs, two push buttons, infrared port

Device	CPU (MHz)	Memory			Feature Options											
		Flash (KB)	Flex Memory (KB)	SRAM (KB)	Cache (KB)	Single Precision Floating Point Unit	CAN	Memory Protection Unit	Secure Digital Host Controller	NAND Flash Controller	External Bus Interface	12-bit DAC	Programmable Gain Amplifier	5V Tolerant I/O	Other	2566 BGA (17 x 17)
MK70X512Vyy120	120	512	512	128	16	√	√	√	√	√	√	√	√	√	Graphic LCD, IEEE 1588 Eth, USB OTG (FS/HS), CAU+RNG, Tamper Detect, NAND Controller, 4 ADC Blocks, FPU, DRAM Controller	MJ
MK70X512Vyy150	150	512	512	128	16	√	√	√	√	√	√	√	√	√		MJ
MK70N1M0Vyy120	120	1024	-	128	16	√	√	√	√	√	√	√	√	√		MJ
MK70N1M0Vyy150	150	1024	-	128	16	√	√	√	√	√	√	√	√	√		MJ

MC56F8006/2 Family

Small cost. Low power. Big performance.

The devices in the MC56F8006 series are members of the Freescale family of DSCs. The entry-level MC56F8006/2 DSC provides the most cost-optimized solution for mathematically intensive, power-sensitive real-time control applications.

Features

- 568000E core running at 32 MHz
- Single-cycle 16 × 16-bit parallel multiplier-accumulator (MAC)
- Four 36-bit accumulators, including extension bits
- Two 2x–16x programmable gain amplifiers (GPAs)
- Three analog comparators
- Two 12-bit ADCs
- Six output PWM with programmable fault capability
- Up to two fault inputs
- Two 16-bit timers: One 16-bit periodic interval timer, one programmable delay timer
- Ultra-low-power operation (nine different power modes)

Applications

- Power tools
- Arc fault detection
- Small and large appliances
- Servo drives
- HVAC
- Facotry automation
- Portable medical applications
- General motor control
- Security and access control

Application Notes

- AN3815: Implementing a Modular High Brightness RGB LED Network
- AN3843: Single-Phase Two-Channel Interleaved PFC Converter Using MC56F8006
- AN3814: Static Serial Bootloader for MC56F800x/801x/802x/803x

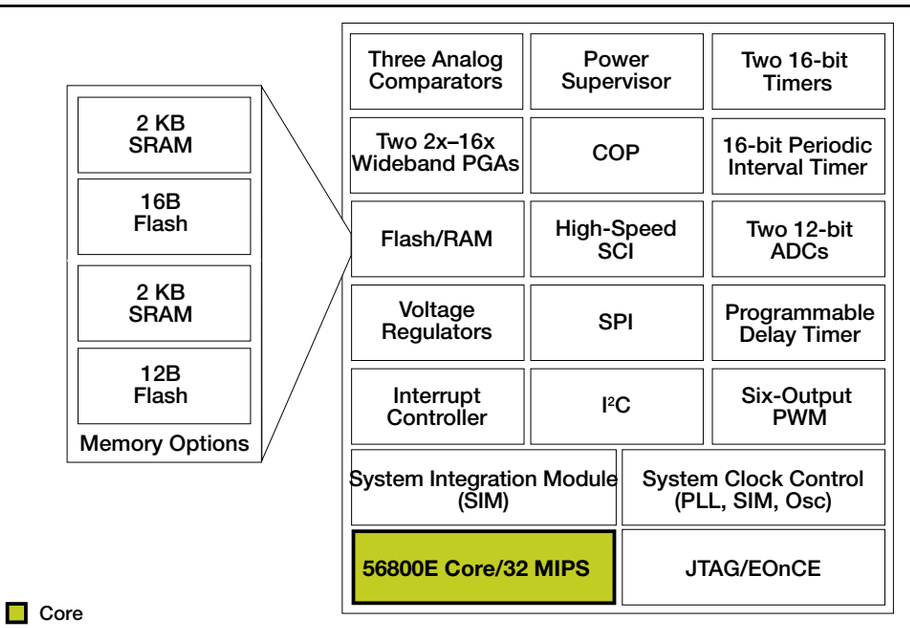
MC56F8006DEMO-T

MC56F8006DEMO is a cost-effective board targeting quick evaluation, demonstration and debugging of the Freescale MC56F8006VLF DSC.

Key Features

- MC56F8006 DSC evaluation board with MC9S08JM60 for USB (and more)
- J1: 40-pin header to access MC56F8006 pins compatible with 56F80xx demos
- J2: 8-pin header for remaining GPIO for 8006
- Option to power with jack, USB or a J1 pin
- USB allows any baud rate PC COM port bridge to SCI of MC56F8006
- JTAG control and debug of MC56F8006
- BDM control and debug of MC9S08JM60
- COM port ready for RS232 build out
- 6 x 8006 PWM LED indicators
- Watch crystal reference (Y1) pads for 8006
- USB TAP debug cable

56F8006 Block Diagram



Device	MHz	Flash (KB)	RAM (KB)	16-bit Timer	PWM	AMCP	12-bit ADC	SCI	SPI	I²C	Clock	RTC	Other	Package
MC56F8006VLF	32 MHz	16 KB	2 KB	2 x 16-bit + PIT	6-ch.	2	2 x 12-ch.	1	1	1	ICS	Y	PGA, PDB, ROSC, COP/WDT	48 LQFP
MC56F8006CLC	32 MHz	16 KB	2 KB	2 x 16-bit + PIT	6-ch.	2	2 x 9-ch.	1	1	1	ICS	Y	PGA, PDB, ROSC, COP/WDT	32LQFP
MC56F8006VWL	32 MHz	16 KB	2 KB	2 x 16-bit + PIT	6-ch.	2	2 x 8-ch.	1	1	1	ICS	Y	PGA, PDB, ROSC, COP/WDT	28 SOIC
MC56F8002VWL	32 MHz	12 KB	2 KB	2 x 16-bit + PIT	6-ch.	2	2 x 8-ch.	1	1	1	ICS	Y	PGA, PDB, ROSC, COP/WDT	28 SOIC

MC56F801x Family

32 MIPS DSP/MCU core + 96 MHz PWM/timers + fast 12-bit ADC = an unbeatable price/performance solution

Key Features

- 56800E core: 32 MIPS @ 32 MHz
- Single-cycle 16 x 16-bit parallel multiplier-accumulator (MAC)
- Memory: Up to 16 KB of program flash, up to 2 KB of unified data/program RAM
- Up to 6-ch. high-speed pulse-width modulator (PWM) that can be clocked at up to 96 MHz
- Four 16-bit timers that can be clocked at up to 96 MHz
- Up to 2 x 4-ch. 12-bit high-performance analog-to-digital converters (ADC)
- Serial communication interface (SCI) with LIN slave functionality
- Serial peripheral interface (SPI)
- Computer operating properly (COP)
- I^2C communication module

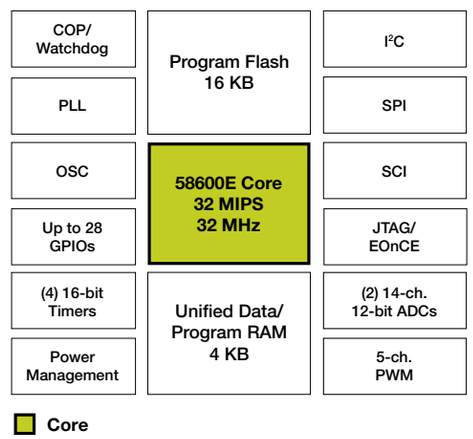
Applications

- Dimming lamp ballasts
- Switched-mode power supply
- Soft-switching PFC
- DC-DC power supplies
- Industrial motor control
- Appliance motor control
- Smart sensors
- Instrumentation

Application Notes

- AN1916-3: Phase BLDC Motor Control with Hall Sensors Using 56800/E Digital Signal Controllers
- AN3102: Unique Features of the 56F801x Family of Devices
- AN3103-56F8000: Clock Generation Guidelines to Ensure Correct Functionality
- AN3118: Production Flash Programming for the 56F8000 Family

56F8014 Block Diagram



DEMO56F8013-EE
DEMO56F8014-EE

The 56F8013/14 demonstration board is an evaluation module board that includes a 56F8013/14 DSC, RS-232 interface, user LEDs, user push button switches and a daughter card connector. The daughter card connector allows signal monitoring and expandability of user features.

- 56F8013/14 DSC
- JTAG port interface connector for an external debug host target interface
- RS-232 interface, for easy connection to a host processor [U2 and P3]
- Daughter card connector, to allow the user to connect his own PWM, ADC, SCI, SPI or GPIO-compatible peripheral to the digital signal controller
- On-board power regulation provided from an external +9V DC-supplied power input
- Light emitting diode (LED) power indicator
- Six on-board, real-time user debugging LEDs
- Manual reset push button
- Manual interrupt No. 1 push button
- Manual interrupt No. 2 push button

Device	MIPS/MHz	Program/Data Flash (KB)	Program/Data RAM (KB)	Timer (16-Bit)	PWM (6-ch.)	Operating Voltage	PWM Fault Inputs	ADC (12-Bit)	SCI	SPI	I^2C	Temp	Package
MC56F8011VFAE	32	12	2	4	1 x 6	3–3.6V	4	2 x 3-ch.	1	1	1	–40 °C to +105 °C	32 LQFP
MC56F8013VFAE	32	16	4	4	1 x 6	3–3.6V	4	2 x 3-ch.	1	1	1	–40 °C to +105 °C	32 LQFP
MC56F8013MFAE	32	16	4	4	1 x 6	3–3.6V	4	2 x 3-ch.	1	1	1	–40 °C to +105 °C	32 LQFP
MC56F8014VFAE	32	16	4	4	1 x 5	3–3.6V	3	2 x 4-ch.	1	1	1	–40 °C to +105 °C	32 LQFP

MC56F802x/3x Family

32 MIPS with extensive analog features for reduced system cost

The MC56F802x/3x family combines the processing power of a DSP with the functionality and ease of use of an MCU on a single chip. With a flexible set of peripherals, package and memory options from 16 to 64 KB flash memory, CAN and high-resolution PWM/timers running at up to 96 MHz, the 56F8000 series provides a cost-effective high-performance solution.

This family exceeds the requirements for Class B components for IEC60730 safety standards on automatic controls for household use, making it ideal for the appliance market.

Features

- 56800E core @ 32 MIPS/32 MHz
- 32 to 64 KB program/data flash
- 4 to 8 KB program/data RAM
- Tunable internal relaxation oscillator
- Eight 16-bit timers that can run at 96 MHz
- 6-ch. high-speed pulse width modulator (PWM) module with four programmable fault inputs, that can be clocked at 96 MHz
- Two 12-bit ADCs for six to eight inputs with internal or external Vreg
- Up to two 12-bit digital to analog converters
- Two analog comparators
- Synchronization between PWM and ADC
- Optional MSCAN

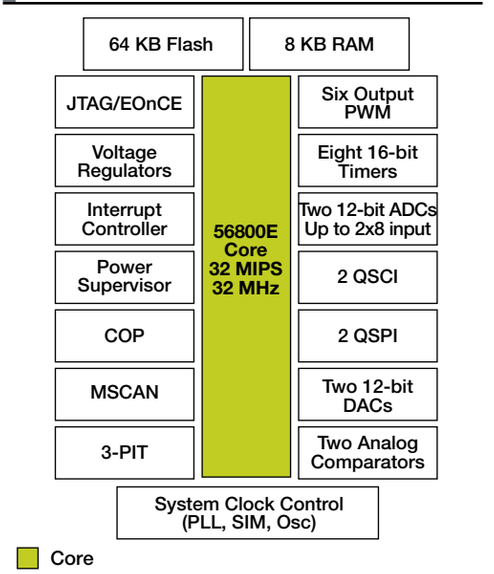
Applications

- Advanced appliances requiring motor control
- Power monitoring
- Multiple stepper control
- High-speed, dual-loop BLDC control (compressors)
- Remote and hand-held sensing
- Instrumentation
- Switching power supply

Application Notes

- AN3118: Production Flash Programming for the 56F8000 Family
- AN1965: Design of Indirect Power Using the 56F800/E
- AN1975: Multiple Target Features Using Processor Expert and CodeWarrior
- AN1983: HCS12/16 to 56800/E Software Porting Considerations

MC56F802x Block Diagram



MC56F8037EVM

The MC56F8037EVM evaluation module allows easier and faster development for 56F802x and 56F803x DSCs. The module includes an MC56F8037 DSC, RS-232 interface, user LEDs, user push button switches and a daughter card connector.

Features

- 56F8037 DSC
- JTAG port interface for external debug connection
- Built-in circuitry for RS-232 communication to host processor
- User LEDs
- User push button switches
- Daughter card connectors enabling connection to additional features such as the motor control daughter card (APMOTOR56F8000E)

Device	MIPS/ MHz	Program/ Data Flash (KB)	Program/ Data RAM (KB)	Timer (16-bit)	PWM (6-ch.)	Operating Voltage	PWM Fault Inputs	ADC (12-bit)	DAC (12-bit)	QSCI	QSPI	I²C	CAN	Compara-tors	Temp.	Package
MC56F8023VLC	32	32	4	4	1 x 6	3–3.6V	4	2 x 3-ch.	2 (Internal)	1	1	1	-	2	–40 °C to +105 °C	32 LQFP
MC56F8025VLD	32	32	4	4	1 x 6	3–3.6V	4	2 x 4-ch.	2 (Internal)	1	1	1	-	2	–40 °C to +105 °C	44 LQFP
MC56F8036VLF	32	64	8	4	1 x 6	3–3.6V	4	2 x 5-ch.	2 (Internal)	1	1	1	1	2	–40 °C to +105 °C	48 LQFP
MC56F8037VLH	32	64	8	8	1 x 6	3–3.6V	4	2 x 8-ch.	2 (External)	2	2	1	1	2	–40 °C to +105 °C	64 LQFP

56F824x/5x

Powerful DSC with ultra-high-resolution PWM and ultra-high-speed ADCs

The MC56F825x/MC56F824x is part of the 56800E core-based family of DSCs. It combines, on a single chip, DSP processing power and MCU functionality with a flexible set of peripherals including an eFlexPWM module with NanoEdge placement as well as two ultra-fast ADCs for a cost-effective solution. Because of its low cost, configuration flexibility and compact program code, it is a perfect fit for power conversion and motor control applications, making it well-suited for many other consumer and industrial applications.

Features

- 60 MHz operation frequency
- On-chip memory
- eFlexPWM with up to nine channels, including six channels with high-resolution NanoEdge placement
- Two 8-channel, 12-bit analog-to-digital converters (ADCs) with dynamic x2 and x4 programmable amplifier
- Three analog comparators with integrated 5-bit DAC references
- Cyclic redundancy check (CRC) generator
- Multiple communication interfaces such as QSPI, QSCI with LIN functionality, SMBus-compatible I^2C and MSCAN 2.0 A/B module
- Two 16-bit quad timers (2 x 4 16-bit timers)
- On-chip relaxation oscillator: 8 MHz (400 kHz at standby mode)
- Inter-module crossbar connection

Applications

- Solar inverters
- Advance power supplies
- High-end motor control
- Wireless charging devices

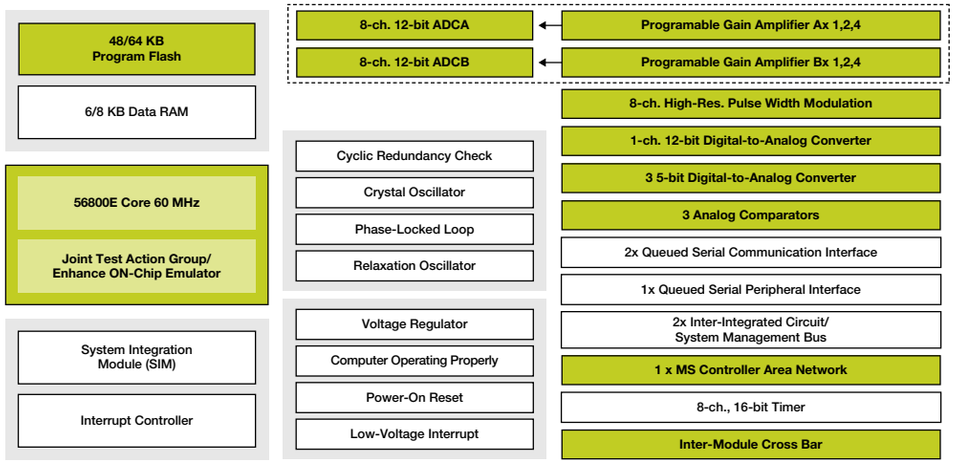
TWR-56F8257

MC56F8257 Tower MCU module (TWR-56F8257) is a cost-effective evaluation, demonstration and development board. The TWR-56F8257 can operate stand-alone or as the main control board in a Tower System with peripheral modules. It can also be used as the main control board with an APMOTOR56F8000E motor control board.

Features

- Tower-compatible MCU module
- MC56F8257 DSC in an 64 LQFP package
- Nine LEDs controlled by the MC56F8257 DSC
- Motor control board connector for the APMOTOR56F8000E motor control board
- Four thermistors for single-ended or differential analog inputs to the MC56F8257 DSC
- CAN transceiver, header and termination
- JTAG header for the MC56F8257 DSC with header to disconnect from OSBDM
- MC9S08JM60 MCU with a 4 MHz crystal
- USB to SCI bridge
- Bootloader enabled header

MC56F82xx Block Diagram



Application Notes

- AN3103: 56F8000 Clock Generation Guidelines to Insure Correct Functionality
- AN1916: Three-Phase BLDC Motor Control with Hall Sensors Using 56800/E Digital Signal Controllers
- AN3118: Production Flash Programming for the 56F8000 Family
- AN4275: Serial Bootloader for 56F82xx
- AN1965: AN1965 Design of Indirect Power factor Correction Using the 56F800/E
- AN1975: Multiple Target Features Using Processor Expert and CodeWarrior

Device	MHz	Flash (KB)	RAM (KB)	Timers	High-Resolution PWM	AMCP	12-bit ADC	SCI	SPI	I^2C	Clock	Other	Package
MC56F8245VLF	60	48 KB	6 KB	PDB, 8-ch., x 16-bit TPM, WDT, COP	6-ch.	3	2 x 4-ch.	2	1	2	Crystal OSC, PLL, Relax OSC	12-bit DAC, Voltage Reg, 2 x PGA	44 LQFP
MC56F8246VLF	60	48 KB	6 KB		6-ch.	3	2 x 5-ch.	2	1	2			48 LQFP
MC56F8247VLH	60	48 KB	6 KB		6-ch.	3	2 x 8-ch.	2	1	2			64 LQFP
MC56F8255VLD	60	64 KB	8 KB		6-ch.	3	2 x 4-ch.	2	1	2		12-bit DAC, msCAN, 2 x PGA	44 LQFP
MC56F8256VLF	60	64 KB	8 KB		6-ch.	3	2 x 5-ch.	2	1	2			48 LQFP
MC56F8257VLH	60	64 KB	8 KB		6-ch.	3	2 x 8-ch.	2	1	2			64 LQFP

32-bit 56F84xx

High-performance DSC for simplified design of advanced digital control systems

The MC56F84xx is based on our newly designed 32-bit DSP core. It is the market's fastest DSP MCU, offering exceptional precision, sensing and control for the most efficient digital power conversion and advanced motor control applications. The MC56F84xx includes advanced high-speed and high-accuracy peripherals such as high-resolution pulse width modulation (PWM) with 312 pico-second resolution and dual, high-speed 12-bit analog-to-digital converters (ADCs) with built-in PGA sampling up to 3.3 mega samples per second (Msps) and one high precision 16-bit ADC. Faster application-specific control loops are driven via a high-speed 32-bit DSP core with single-cycle math computations, fractional arithmetic support and parallel moves.

Features

- 100 MHz/100 MIPS 32-bit DSP core
- 64 KB to 256 KB flash memory flexibility and DMA controller
- Single-cycle math computations, fractional arithmetic support and parallel moves
- Up to 24 PWM channels with input capture
- High-resolution PWMs with 312 pico-second resolution
- Two 12-bit high-speed ADCs with 3.3 Msps resolution
- 16-bit ADC with 1 Mpsp resolution
- Four analog comparators with integrated 6-bit DACs speed system event identification and shutdown of the PWM outputs
- 12-bit DAC with auto waveform generation
- Various communication peripherals: 3 QSCIs, 3 QSPIs, dual I^2C/SMBus, FlexCAN

Applications

- Off-grid solar power inverters
- Commercial solar power inverters
- Residential solar power inverters
- Fire and security systems
- Switched mode power supplies
- Wireless charging
- Smart sensors
- Arc fault detectors
- Circuit breakers
- Power quality monitors
- Brushed/brushless DC motors
- Permanent magnet synchronous motors
- Single and three-phase AC induction motors

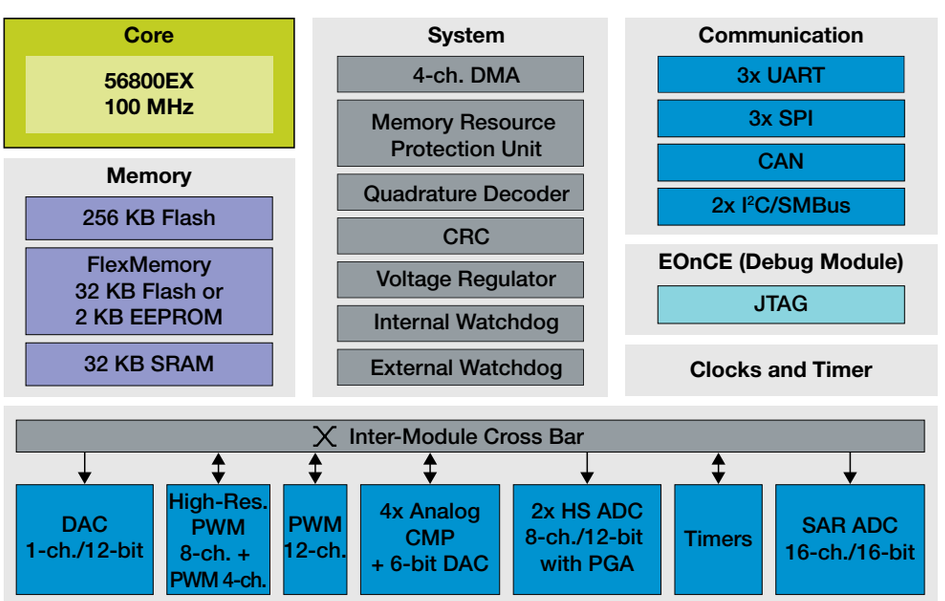
TWR-MC56F84xx

The MC56F84xx Tower MCU module is a low-cost evaluation, demonstration and development board. The TWR-56F84xx can operate stand-alone or as the main control board in a Tower system with peripheral modules.

Features

- MC56F84xx
- Nine controlled LEDs
- Four thermistors for single-ended or differential analog input to the DSC
- CAN transceiver, header and termination
- JTAG header
- MC9S08JM60 MCU with a 4 MHz crystal provide
- USB-to-SCI bridge
- Bootloader enable header

MC56F84xx Block Diagram



Device	MHz	P Flash (KB)	RAM (KB)	FlexNVM	FlexRAM	Key Features	Package
MC56F84789	100 MHz	256 KB	32 KB	32 KB	2 KB	High-Res. PWM, MC PWM, HS ADC, SAR ADC, DAC, CAN	100-pin LQFP
MC56F84786		256 KB	32 KB	32 KB	2 KB	High-Res. PWM, MC PWM, HS ADC, SAR ADC, DAC, CAN	80-pin LQFP
MC56F84769		128 KB	24 KB	32 KB	2 KB	High-Res. PWM, MC PWM, HS ADC, SAR ADC, DAC, CAN	100-pin LQFP
MC56F84766		128 KB	24 KB	32 KB	2 KB	High-Res. PWM, MC PWM, HS ADC, SAR ADC, DAC, CAN	80-pin LQFP
MC56F84763		128 KB	24 KB	32 KB	2 KB	High-Res. PWM, HS ADC, SAR ADC, DAC, CAN	64-pin LQFP
MC56F84587	80 MHz	256 KB	32 KB	32 KB	2 KB	2x MC PWM, HS ADC, SAR ADC, DAC, CAN	100-pin LQFP
MC56F84585		256 KB	32 KB	32 KB	2 KB	2x MC PWM, HS ADC, SAR ADC, DAC, CAN	80-pin LQFP
MC56F84567		128 KB	24 KB	32 KB	2 KB	2x MC PWM, HS ADC, SAR ADC, CAN	100-pin LQFP
MC56F84565		128 KB	24 KB	32 KB	2 KB	2x MC PWM, HS ADC, SAR ADC, CAN	80-pin LQFP
MC56F84553		96 KB	16 KB	32 KB	2 KB	High-Res. PWM, HS ADC, SAR ADC, DAC, CAN	64-pin LQFP
MC56F84550		96 KB	16 KB	32 KB	2 KB	High-Res. PWM, HS ADC, DAC, CAN	48-pin LQFP
MC56F84543		64 KB	8 KB	32 KB	2 KB	High-Res. PWM, HS ADC, SAR ADC, DAC, CAN	64-pin LQFP
MC56F84540		64 KB	8 KB	32 KB	2 KB	High-Res. PWM, HS ADC, DAC, CAN	48-pin LQFP
MC56F84462	60 MHz	128 KB	24 KB	32 KB	2 KB	MC PWM, HS ADC, DAC, CAN	64-pin LQFP
MC56F84452		96 KB	16 KB	32 KB	2 KB	MC PWM, HS ADC, CAN	64-pin LQFP
MC56F84451		96 KB	16 KB	32 KB	2 KB	MC PWM, HS ADC, CAN	48-pin LQFP
MC56F84442		64 KB	8 KB	32 KB	2 KB	MC PWM, HS ADC,	64-pin LQFP
MC56F84441		64 KB	8 KB	32 KB	2 KB	MC PWM, HS ADC	48-pin LQFP

32-bit PXN

Dual-core solution for industrial communication

The 32-bit dual-core PXN20 Power Architecture MCU supports a variety of communication protocols, allowing you to design a cost-effective, reliable industrial gateway with cutting-edge performance. A large amount of on-chip flash, on-chip SRAM with error correction code capability, 36-channel ADC, dual cores and a host of serial I/Os make the PXN20 a compelling solution for your next design cycle.

Features

- e200z6 and e200z0 dual processors running up to 116 MHz
- 2 MB on-chip flash
- Up to 592 KB on-chip SRAM
- 32-channel DMA
- EEPROM emulated in program flash (16 KB sectors)
- Up to 12x UART, 3x SPI, 6x CAN and 4x I^2C
- ADC: 36-channel, 10-bit
- Fast Ethernet controller support
- Debug support JTAG interface, Nexus 3
- Timed I/Os: eMIOS 24-channel, 16-bit
- Internal timers: 8-ch., 32-bit programmable interrupt timers
- Temperature range of –40 °C to +105 °C
- Package options 208 MAPBGA
- Low-power modes

Applications

- Industrial network concentrators
- Factory automation
- Process controls
- Serial-to-Ethernet bridge
- Fire and security systems
- Switched mode power supplies
- Wireless charging
- Smart sensors
- Arc fault detectors
- Circuit breakers
- Power quality monitors
- Brushed/brushless DC motors
- Permanent magnet synchronous motors
- Single- and three-phase AC induction motors

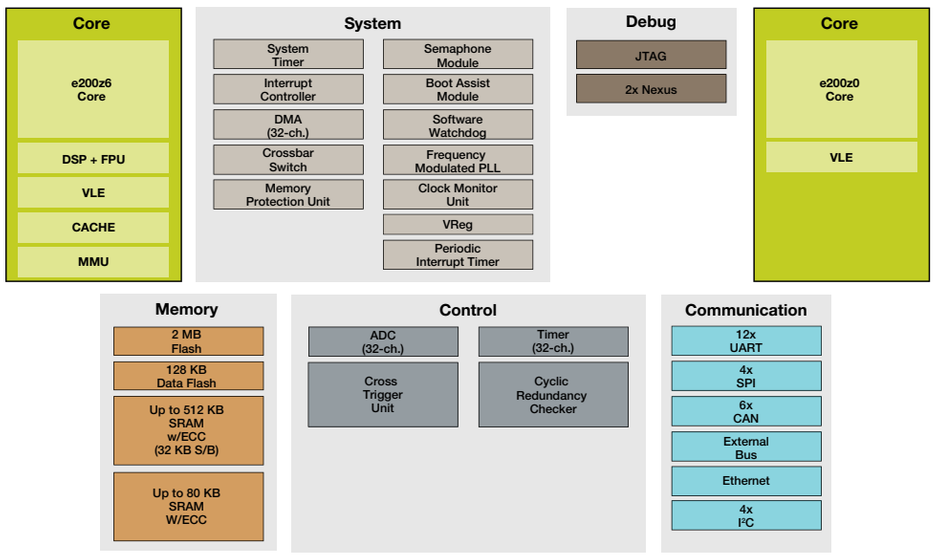
TWR-PXN20

The Tower kit supporting the PXN families provides a Tower-complaint platform for cost-effective vehicle applications and can be used with the Tower platform for advanced application validation work. The Tower kit comes with complete documentation, including a certification pack for engineers looking to develop functionally safe systems.

Features

- PXN20 in a 256 MAPBGA package
- FlexCAN header
- Potentiometer interfaced to ADC
- RS232/RS485 Interface
- GPIO buttons and LEDs
- TWRPI header
- MMA845x accelerometer
- Nexus interface, mini-JTAG and OSJTAG interfaces for debug and evaluation
- Expansion connectors to additional Tower peripheral cards
- Support for expanded TWR-Serial peripheral board for Ethernet and serial connectivity

PXN20 Block Diagram



Part Number	Core	Speed	Flash	SRAM	Timers	ADC	Ethernet	SCI	DSPI	FlexCAN	I^2C	Other	Temp.	Package
MPXN2020VMG116	Dual Core, e200z6 and e200z0	116 MHz	2 MB	59 2KB	32-ch., 32-bit	32-ch., 12-bit ADC	Yes	6	4	6	4	WDT, Sys Timer, 32-ch., eDMA, Ext. Bus I/F, Cross Trigger Unit, PIT, Semphore Module	–40 °C to +105 °C	208MABBGA
MPXN2120VMG116		116 MHz	2 MB	128 KB			-	12		5				208MABBGA

32-bit PXD

Dual-core, single-chip MCU for functional safety applications

The PXD10 family of 32-bit Power Architecture MCUs provides a cost-effective, single-chip display solution for the industrial market. An integrated TFT driver with digital video input ability from an external video source, significant on-chip memory and low-power design methodologies provide flexibility and reliability in meeting display demands in rugged environments.

The platform architecture includes an on-chip display control unit that directly drives the TFT display. In addition, system memory can be expanded via the on-chip serial peripheral interface should the need for more headroom arise. The PXD10 family offers you a cost effective entry-level industrial display solution with the ability to scale your designs to fit your performance needs.

Features

- TFT display controller capable to WVGA resolution
- Parallel data interface (PDI) for digital video input
- 40 x 4 LCD segment display driver
- Six stepper motor drivers
- Up to 1 MB on-chip flash with flash controller
- Separate 4x 16 KB flash block for EEPROM emulation
- Up to 48 KB on-chip SRAM with ECC
- Up to 160 KB on-chip graphics SRAM (no ECC)
- e200 32-bit Book E compliant CPU core complex built on Power Architecture technology
- Variable length encoding (VLE) instruction set enables significant code size reduction over conventional Book E compliant code
- Sound generation and playback using PWM channels and eDMA

Applications

- Building control display units
- Factory display units
- Ruggedized displays
- Industrial instrumentation

Application Notes

- AN4437: Solar Panel 3-Phase Inverter Controlled by the PXS20
- AN4389: PXS30 Self Test Control Unit (STCU) Reset Configuration Data in Shadow FlashAN4431: TSI Module Application on the S08PT Family

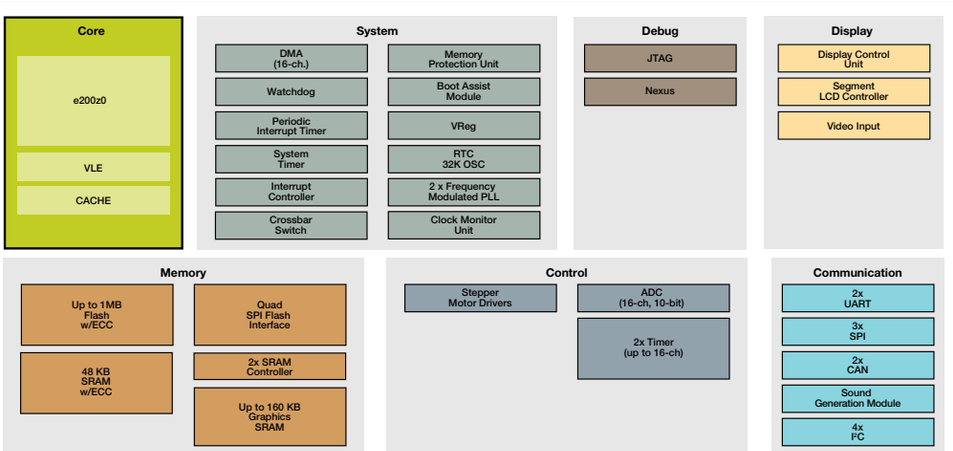
TWR-PXD1010

The Tower kit supporting the PXS30 and PXS20 families provides a Tower-complaint platform for cost-effective vehicle applications and can be used with the Tower platform for advanced application validation work. The Tower kit comes with complete documentation, including a certification pack for engineers looking to develop functionally safe systems.

Features

- PXD10 in 176 LQFP package
- FlexCAN header
- ADC header
- GPIO buttons and LEDs
- 2x RGB LEDs
- TWRPI header
- MMA845x accelerometer
- Nexus interface, mini-JTAG and OSJTAG interfaces for debug and evaluation
- Expansion connectors to additional Tower peripheral cards
- Support for expanded TWR-LCD-RGB interface

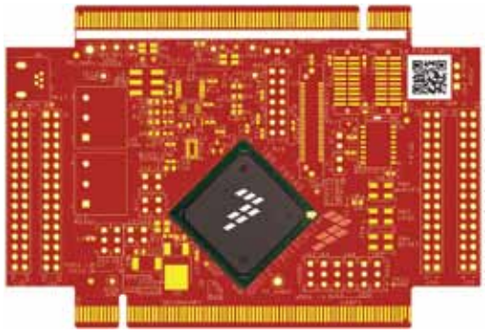
PXD10 Block Diagram



Part Number	Core	Speed	Flash	SRAM	Segment Display	Display Control Unit	Video Input	H/W Graphics Acc.	Graphics RAM	ADC	Stepper Motor Drive	DDR	Other	Temp.	Package
MPXD1005VLQ64	e200z0	64 MHz	512 KB	48 KB	384	-	-	-	-	16-ch., 10-bit	6	-	Up to 4x UART, 4x I²C, 3x DSPI, 3x FlexCAN, Optional EBI, Sound Generator, RTC, 2x 16-ch., 32-bit Timers, Quad SPI Flash Interface, 16-ch. eDMA, WDT	–40 °C to +105 °C	144 LQFP
MPXD1010VLQ64	e200z0	64 MHz	1 MB	48 KB	160	WVGA	Yes	-	160 KB		6	-			144 LQFP
MPXD1010VLU64	e200z0	64 MHz	1 MB	48 KB	160	WVGA	Yes	-	160 KB		6	-			176 LQFP
MPXD2020VLU125	e200z4	125 MHz	2 MB	64 KB	-	XGA	Yes	Yes	1 MB		6	Yes (optional)			176 LQFP
MPXD2020VLT125	e200z4	125 MHz	2 MB	64 KB	-	XGA	Yes	Yes	1 MB		6				208 LQFP
MPXD2020VVU125	e200z4	125 MHz	2 MB	64 KB	-	XGA	Yes	Yes	1 MB		6				416 PBGA

32-bit PXR

High-performance MCU for real-time applications



The PXR40 32-bit Power Architecture MCU family with integrated analog and processing power, offers industrial users a reliable, robust controller to meet a variety of timing critical application needs, such as motion/motor control, without sacrificing performance during complex operations.

The PXR40 Power Architecture MCU provides strong computing power with its 264 MHz clock speed and on-chip digital signal processing. Coupled with 4 MB of on-chip flash, quad ADCs, 64-channel dual timing unit and 256 KB RAM (for data storage), the designer has significant on-chip features to reduce external components.

The combination of exceptional performance, advanced signal processing capabilities and ultra-large flash memory array offered in the PXR40 Power Architecture MCU helps address the growing computational and timing demands within industrial markets.

Features

- e200z7 CPU at 264 MHz with integrated DSP capability provides the necessary computational performance for timing dependent applications
- SIMD module for DSP and floating point operations
- Variable length encoding (VLE)
- 4 MB flash memory with ECC
- 256 KB SRAM with ECC
- 64-channel dual programmable timing controller
- 64-channel 12-bit quad analog-to-digital converter (ADC)
- Robust communication capabilities: 4x CAN, 3x UART, 4x SPI ports

Applications

- Precision factory control
- Industrial automation
- Industrial transportation
- Motor control/drives
- Medical
- Timing applications

Application Notes

- AN4437: Solar Panel 3-Phase Inverter Controlled by the PXS20
- AN4389: PXS30 Self Test Control Unit (STCU) Reset Configuration Data in Shadow FlashAN4431: TSI Module Application on the S08PT Family

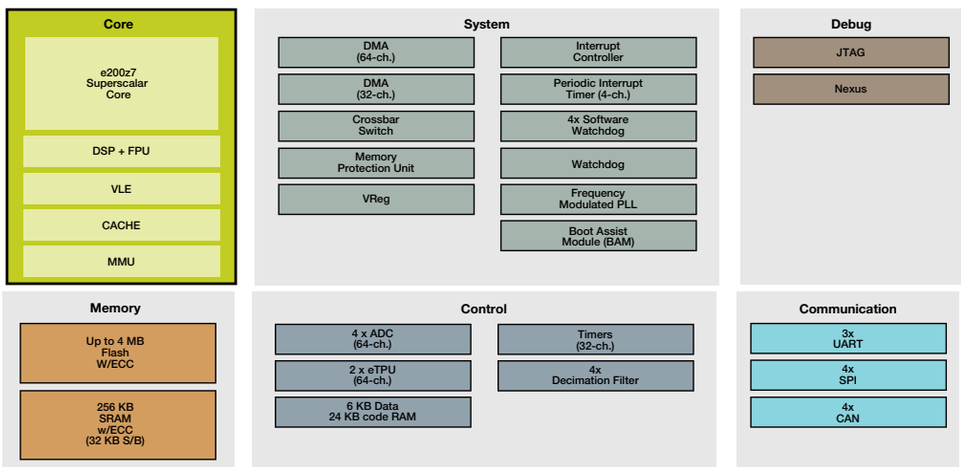
TWR-PXR40

The Tower Kit supporting the PXR40 family provides a tower complaint platform for cost-effective vehicle applications and may be used with the Tower platform for advanced application validation work. The Tower kit comes with complete documentation, including a certification pack for engineers looking to develop functionally safe systems.

Features

- PXR40 in 416 MAPBGA package
- FlexCAN header
- Potentiometer interfaced to ADC
- RS485 interface
- CAN header
- eTPU headers
- GPIO buttons and LEDs
- TWRPI header
- MMA7445L accelerometer
- Nexus interface, mini-JTAG and OSJTAG interfaces for debug and evaluation
- Expansion connectors to additional Tower peripheral cards

PXR40 Block Diagram



Part Number	Core	Speed	Flash	SRAM	Timers	ADC	eTPU	SCI	DSPI	FlexCAN	Ext. Bus	Other	Temp.	Package	Package
MPXR4030VVU264	e200z7	264 MHz	3 MB	192 KB	32-ch. x 32-bit Timer	4 x 16-ch., 12-bit ADC	2 x 32-ch. eTPU	3	2	3	Y	32-ch. eDMA and 64-ch. eDMA, 4x Dec Fil, 6 KB Data/24 KB Code RAM (eTPU), WDT	–40 °C to +105 °C	416 PBGA	144 LQFP
MPXR4040VVU264		264 MHz	4 MB	256 KB										416 PBGA	144 LQFP

32-bit PXS

Dual-core, single-chip MCU for functional safety applications

The PXS devices are 32-bit Power Architecture embedded MCUs designed for safety critical applications. All devices in this family are built around a dual core safety architecture and offer more processing power and larger memory sizes to handle a variety of industrial designs. The dual-core can be operated in lockstep mode (redundant processing and calculations) or decoupled parallel mode (independent core operations). The PXS MCUs are SafeAssure solutions.

Features

- High-performance 180 MHz e200z7d dual cores
- Up to 2 MB flash memory with ECC
- Up to 512 KB on-chip RAM with ECC
- Sphere of replication for key components (such as core, eDMA, XBAR)
- Redundancy checking units
- SoR connected to a Fault collection and control unit
- 3x PWM units with 4x 16-bit channels per module
- Communications interfaces
- 4x UART, 3x SPI, 4x CAN, 3x I^2C
- Ethernet
- Up to 4 12-bit analog-to-digital converters (ADCs)
- Safety Certification Pack available to support design efforts

Applications

- Boiler heating control
- Programmable logic control
- Input-output control
- Off-grid solar power inverters
- Commercial solar power inverters
- Residential solar power inverters
- Unmanned vehicles (ground, air, water)
- Motion control
- Process control
- Robot manipulation
- Robotics
- Medical/health care
- Anesthesia unit monitors
- Ventilators and respirators
- Motor control
- Stepper motor

Application Notes

- AN4437: Solar Panel 3-Phase Inverter Controlled by the PXS20
- AN4389: PXS30 Self Test Control Unit (STCU) Reset Configuration Data in Shadow FlashAN4431: TSI Module Application on the S08PT Family

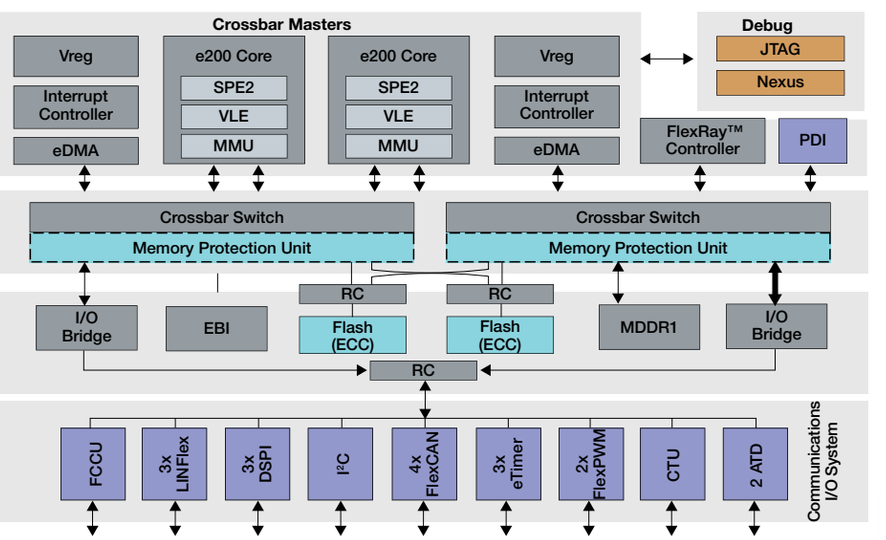
TWR-PXS

The Tower kit supporting the PXS30 and PXS20 families provides a Tower-compliant platform for cost-effective vehicle applications and may be used with the Tower platform for advanced application validation work. The Tower kit comes with complete documentation, including a certification pack for engineers looking to develop functionally safe systems.

Features

- MPXS20 or MPXS30 in 473 MAPBGA
- FlexCAN header
- ADC header
- DDR2 memory
- GPIO buttons and LEDs
- RS485 connector
- MMA845x accelerometer
- Nexus interface, JTAG and OSJTAG interfaces for debug and evaluation
- Safety certification pack
- Expansion connectors to additional Tower peripheral cards

PXS30 Block Diagram



Part Number	Core	Speed	Flash	SRAM	Timers	ADC	PWM	SCI	DSPI	FlexCAN	I^2C	Other	Temp.	Package
MPXS2005VLQ80	Dual e200z4	80 MHz	512 KB	128 KB	3x 6-ch., 32 Timers, PIT	4x 12-bit, <34-ch.	3 x 4-ch.	2	3	2	-	Full Sphere of Redundancy, Fault Collection Unit, Ext. Bus, FlexRay, ECC Protection for Internal Memory, eDMA	–40 °C + 105 °C	144 LQFP
MPXS2010VLQ80	Dual e200z4	80 MHz	1 MB	128 KB				2	3	2	-			144 LQFP
MPXS2010VLQ120	Dual e200z4	120 MHz	1 MB	128 KB				2	3	2	-			144 LQFP
MPXS2010VMM80	Dual e200z4	80 MHz	1 MB	128 KB				2	3	2	-			257 MAPBGA
MPXS2010VMM120	Dual e200z4	120 MHz	1 MB	128 KB				2	3	2	-			257 MAPBGA
MPXS3010VMM150	Dual e200z7d	150 MHz	1 MB	256 KB	3x 6-ch. 32 Timers, PIT	4x 12-bit	2 x 4-ch. Flex	3	3	4	1	Full Sphere of Redundancy, Fault Collection Unit, Ext. Bus, FlexRay, ECC Protection for Internal Memory, eDMA, Ethernet		257 MAPBGA
MPXS3015VMS180	Dual e200z7d	180 MHz	1.5 MB	384 KB				3	3	4	1			473 MAPBGA
MPXS3020VMS180	Dual e200z7d	180 MHz	2 MB	512 KB				3	3	4	1			473 MAPBGA

Freescale Ready Play Solutions

Seamlessly integrate functionality into embedded systems

Freescale Ready Play solutions integrate certified functionality into different applications, allowing customers to add features while reducing development cost, simplifying design cycles and enabling scalability in applications and systems.

- Reduce time to market
- Reduce development costs
- Simplify system design
- Reduce support costs
- Feature compatible with existing devices

Freescale is developing a complete range of Ready Play solutions, the first of which is a USB-to-Serial bridge (USB2SER) solution.

USB2SER

USB2SER is a simple, cost-effective solution to enable USB for an embedded system with a UART port, reducing external components count. It supports USB 2.0 Full-Speed and TTL RS232 or RS485 UART with options for hardware flow control, software flow control (Xon-Xoff), even or odd parity and stop bits configuration.

Features

- Single-chip USB to UART data transfer (RS232 or RS485)
- Certified Full-Speed USB 2.0 support
- UART with programmable custom baud rates from 300 bps to 115200 bps and hardware flow control (RTC/CTS) or software Xon/Xoff flow control
- Configurable USB VID, PID and device description strings in internal flash
- Compact 5 x 5 mm Pb-free RoHS-compliant 24 QFN package

Applications

- USB port to legacy applications
- Additional USB ports to application processors with limited bandwidth or USB ports
- Add USB to systems that require lengthy certifications (i.e. medical, military, aerospace)
- PC-peripheral bridges
- USB-to-Serial bridge

Ordering Information

	Item	Pricing (MSRP)
Device	USB2SERA10CFK	$1.47 (10 KU)
Development Tools	EVBUSB2SER	$19.99
Tools and Software	USB2SER Software and Drivers and Setup GUI	Free

Summary of Hardware and Software Enablement Solutions

Everything you need. Just add your imagination.

Reference Designs

Freescale provides a range of vertical market and horizontal technology-focused turn key reference designs providing complete hardware and software enabling designs to reduce their time to market by reusing what Freescale has developed. Our reference designs span a number of areas, including:

- Metering
- Medical
- Power conversion and motor control
- Lighting
- Appliances

Tower System: Modular and Expandable

- Controller modules provide easy-to-use, reconfigurable hardware
- Interchangeable peripheral modules—serial, memory and graphical LCD—make customization easy
- Open-source hardware and standardized specifications promote the development of additional modules for added functionality and customization

Speeds Development Time

- Open source hardware and software allow quick development with proven designs

Low Cost

- Peripheral modules can be re-used with all Tower System controller modules, eliminating the need to purchase redundant hardware for future designs
- Enabling technologies like LCD, serial and memory interfacing are offered off-the-shelf at a low cost to provide a customized enablement solution

Universal Multilink (U-MULTILINK)*

A cost-effective development tool for (R)S08, S12(X), ColdFire, Kinetis and PX products that provides real-time, in-circuit flash programming, emulation and debugging through the BDM interface.

New CodeWarrior Development Studio

CodeWarrior is a complete Integrated development environment that supports all key Freescale MCUs and MPUs across our 8-, 16- and 32-bit product range of Kinetis, ColdFire and Power Architecture-based families. The award-winning CodeWarrior IDE goes well beyond basic code generation and debugging by providing built-in features and utilities, so you can deliver better quality products to market faster.

More than 100 example projects are available to assist in your design efforts. By using the New Project Wizard, you can create a working project in as few as seven mouse clicks. And when market requirements change mid-project, the MCU Change Wizard allows you to re-target the project to a new MCU in as few as four mouse clicks, allowing you to choose the MCU and the default connection. The IDE automatically reconfigures your project with the correct build tools (compiler, assembler, linker) and the appropriate support files (header, libraries, linker).

Processor Expert is a rapid application design tool integrated into CodeWarrior tool suites that can be utilized with our Freescale MCU platforms to help halve your development cycle. It combines easy-to-use component-based application creation with an expert knowledge system.

Features

- A GUI that allows an application to be specified by the functionality needed
- Applications are created with embedded components that encapsulate initialization code and basic elements of embedded systems
- A code generator creates tested, optimized C code tuned to your application needs
- A built-in knowledge base immediately flags resource conflicts and incorrect settings
- A Component Wizard tool allows users to create their own hardware-independent embedded components

Freescale MQX RTOS

To help accelerate time to market and improve application development success, Freescale offers the Freescale MQX real-time operating system (RTOS) with TCP/IP and USB software stacks to particular ColdFire families at no additional charge. Freescale plans to expand the availability of this complimentary enablement software to include many embedded processors in its broad portfolio.

Full Featured and Powerful

The combination of Freescale MQX software solutions and silicon portfolio creates a comprehensive source for hardware, software, tools and services needs, providing a streamlined and powerful platform.

Proven and Valuable

MQX RTOS is a market-proven software, made available on Freescale processors for over 15 years and has been certified for use in military, avionics and medical applications.

Simple and Scalable

Freescale MQX software solutions offer a straightforward API with a modular architecture, making it simple to fine tune custom applications and scalable to fit most requirements.

For more information, please visit **freescale.com/MQX**.

Touch-Sensing Sofware (TSS)

Touch sensing helps increase product lifetimes by eliminating the mechanical wear and tear associated with push buttons and switches. The Xtrinsic TSS 2.5 now enables touch sensing in any ColdFire+ and Kinetis MCU in addition to all of our 8-bit S08 or 32-bit ColdFire V1 MCUs, giving designers the flexibility to select from more than 850 Freescale MCUs to add cost-effective touch-sensing functionality to their human-machine interface (HMI) designs.

The latest TSS library, TSS2.5 supports the touch-sensing input (TSI) module in the ColdFire+ and Kinetis MCU families for highly accurate and robust hardware-assisted touch-sensing, providing designers low-power modes (as low as 1 uA) with wake-up through touch via the TSI pins. The TSI module has extremely high sensitivity with a very low capacitance measurement resolution.

Development Tool Summary

8-bit Development Tool Summary						
Family	**Part Numbers**	**Starter Kit**		**Advanced Development**		
		Demo Board	**Software**	**Evaluation Board**	**Debug Interface Cable**	**Software**
S08JM/S	MC9S08JS16/8	DEMO9S08JS16	CWX-Hxx -SE (Compiler Limited to 64 KB Compiled C Code)		U-MULTILINK	CWP-BASIC-NL/FL (Perpetual License) CWA-BASIC-NL/FL (Annual Subscription License)
	MC9S08JM16/8	DEMO9S08JM16				
	MC9S08JM32/60	DEMOJM				
S08D	MC9S08DZ/V/N16/32/60	DEMO9S08DZ60 -		EVB9S08DZ60		
	MC9S08DZ/V/N96/128			EVB9S08DZ128		
S08LL	MC9S08LL16/8	DEMO9S08LL16				
	MC9S08LL36/64	TWR-MC9S08LL-KIT				
S08P	MC9S08PT8/16/32/60	TWR-S08DC-PT60		TWR-S08PT60-KIT		
	MC9S08PA2/4/8/16/32/60					
	MC9S08PL2/4/8/16/32/60					
S08LG	MC9S08LG32/16	DEMO9S08LG32				
RS08L	MC9RS08LA8	DEMO9RS08LA8				
	MC9RS08LE4	DEMO9RS08LE4				
S08QE/B	MC9S08QB8/4	DEMO9S08QB8				
	MC9S08QE8/4	DEMO9S08QE8				
	MC9S08QE32/16	DEMO9S08QE32				
	MC9S08QE64/96/128	DEMOQE128 -				
S08QA	MC9S08QA2/4	DEMO9S08QA4E -				
S08QG	MC9S08QG4/8	DEMO9S08QG8E				

DSC Dev Tool Summary						
Family	**Part Numbers**	**Starter Kit**		**Advanced Development**		
		Demo Board	**Software**	**Evaluation Board**	**Debug Interface Cable**	**Software**
56F8000	MC56F8006/2	M56F8006DEMO	CWX-Hxx-SE (Compiler Limited to 64 KB Compiled C Code)	-	U-MULTILINK	CW(A/P)-BASIC-NL/FL CW(A/P)-STANDARD-NL/FL CW(A/P)-PRO-NL/FL A = Annual Subscription P = Perpetual Subscription
	MC56F8013	DEMO56F8013		-		
	MC56F8014	DEMO56F8014		-		
	MC56F802x/3x	-		56F8037EVM		
	MC56F824x/5x	TWR-56F8257-KIT		-		
	MC56F84xxx	TWR-56F8400				
56F8300	MC56F8322/8323	-		MC56F8323EVM	CWH-UTP-ONCE-HX	
	MC56F8345/8346/8347			MC56F8376EVME		
	MC56F8355/8356/8357					
	MC56F8365/8366/8367					

DSC Dev Tool Summary					
Family	**Part Numbers**	**Advanced Development**			
		Evaluation Board	**Starter S/W**	**Debug Interface Cable**	**Software**
PXS	PXS2005/10	TWR-2010	CWX-HCx-SE (Compiler Limited to 512 KB Compiler Code)	U-MULTILINK	CW(A/P)-BASIC-NL/FL CW(A/P)-STANDARD-NL/FL CW(A/P)-PRO-NL/FL
	PXS3005/15/20	TWR-3020			
PXD	PXD1005/10	TWR-PXD10-KIT			
	PXD2020	TWR-PXD20-KIT			
PXN	PXN2020/21	TWR-PXN20-KIT			
PXR	PXR4030/40	TWR-PXR40-KIT			

32-bit Development Tool Summary						
Family	**Part Numbers**	**Starter Kit**		**Advanced Development**		
		Demo Board	**Software**	**Evaluation Board**	**Debug Interface Cable**	**Software**
51QExxx	MCF51QE128, 64, 32	DEMOQE128	CWX-HXX-SE	EVB51QE128	U-MULTILINK	CW-MCU-BASIC-CX/LX CW-MCU-STDED-CX/LX CW-MCU-PROED-CX/LX
51ACxxx	MCF51AC128/256	DEMOACKIT -				
51JMxxx	MCF51JM128, 64	DEMOJM		EVB51JM128		
51CNxxx	MCF51CN128	TWR-MCF51CN-KIT		-		
5225x	MCF5225x	TWR-MCF5225x-KIT	CW-MCU-SE	M52259EVB		
5301X	MCF53010/1/2/3/4/5/6/7	-				
MCF5441x	MCF54450/1/2/3/4/5	TWR-MCF5441x-KIT				

Kinetis Dev Tool Summary						
Family	**Part Numbers**	**Starter Kit**		**Advanced Development**		
		Basic	**Software**	**Complete Kit**	**Debug Interface Cable**	**Software**
K10	MK10X128, 256 N512	TWR-K60N512	CW-MCU-SE	TWR-K60N512-KIT	U-MULTILINK	CW-MCU-BASIC-CX/LX CW-MCU-STDED-CX/LX CW-MCU-PROED-CX/LX
K20	MK20X128, 256 N512					
K30	MK30X128, 256, N512	KWIKSTIK-K40		TWR-K40X256-KIT		
K40	MK40X128, 256, N512	KWIKSTIK-K40				
K50	MK51, 52, 53	TWR-K53N512		TWR-K53N512-KIT		
K60	K60X128, 256, N512	TWR-K60N512		TWR-K60N512-KIT		
K70	K70X512, N512, N1M0	TWR-K701M0		TWR-K701M0-KIT		

32-bit Third-Party Developer Resources

Everything you need. Just add your imagination.

Development Tools for ColdFire Families	
Evaluation Boards and Development Kits	
Freescale Semiconductor	freescale.com
Axiom	axman.com
FSI Systems	fsisys.com
Logic Product Development	logicpd.com
NetBurner	netburner.com
Intec Automation	steroidmicros.com
Real-Time Operating Systems (RTOSs)	
Accelerated Technology/Mentor Graphics	acceleratedtechnology.com
eCosCentric	ecoscentric.com
CMX Systems	cmx.com
ExpressLogic	rtos.com
Freescale MQX	freescale.com/MQX
Green Hills Software, Inc.	ghs.com
InterNiche Technologies	iniche.com
Keil	keil.com
Linux	linux.com
MicroDigital	smx-rtos.com
MQX Embedded	mqxembedded.com
NetBurner	netburner.com
Quadros Systems, Inc.	quadros.com
µClinux	uclinux.org
Compilers, Simulators, Debuggers	
Accelerated Technology/Mentor Graphics	acceleratedtechnology.com
Freescale CodeWarrior Tools	freescale.com/CodeWarrior
GNU	gnu.org
Green Hills Software, Inc.	ghs.com
IAR	iar.com
Keil	keil.com
P&E Microcomputer Systems	pemicro.com
NetBurner	netburner.com
Stacks, Drivers, Translators	
Accelerated Technology/Mentor Graphics	acceleratedtechnology.com
CMX Systems	cmx.com
ExpressLogic	rtos.com
Freescale	freescale.com
Green Hills Software, Inc.	ghs.com
InterNiche Technologies	iniche.com
Ixxat	ixxat.com
Keil	keil.com
Micro APL	microapl.com
Mocana Corporation	mocana.com
MQX Embedded	mqxembedded.com
NetBurner	netburner.com
Quadros Systems, Inc.	quadros.com
Treck Inc.	treck.com
Specialized Tools	
ASH WARE Inc. (eTPU)	ashware.com
Byte Craft Limited (eTPU)	bytecraft.com
Freescale (eTPU)	freescale.com
Nano-X (LCD)	microwindows.org
Freescale (Swell) PEG Software (LCD)	swellsoftware.com
Segger (LCD)	segger.com

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