Flexis™ Microcontroller Series

MCF51AC256/128

32-bit Industrial Microcontroller

Target Applications

- General Industrial Applications
  - Motor Control
  - Building Control
  - HVAC Systems
  - Inverters
  - Pumps
  - Compressors
  - Printers
- Appliance Applications
  - Dishwashers
  - Washing Machines
  - Dryers
  - Refrigerators

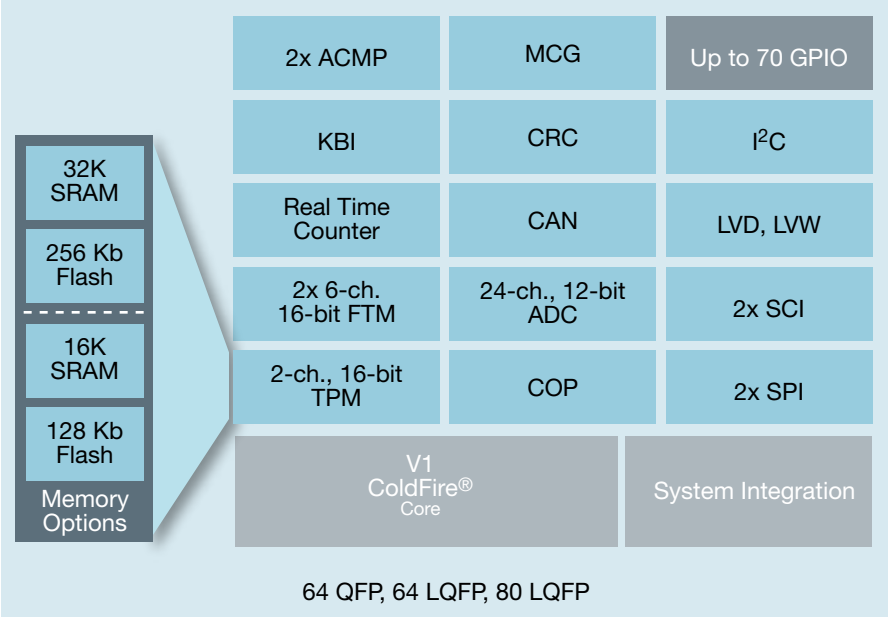
Overview

The MCF51AC256 is part of the Flexis™ microcontroller series, the connection point on the Freescale Controller Continuum where 8-bit and 32-bit compatibility becomes a reality. The Flexis series of devices includes complimentary families of 8-bit S08 and 32-bit ColdFire® V1 microcontrollers that have a common set of peripherals and development tools to deliver the ultimate in migration flexibility.

The MCF51AC256 expands the 32-bit ColdFire microcontroller roadmap by offering products with industry leading EMC/EMI performance, more advanced peripherals and up to 32KB RAM and 256KB Flash memory options. The standard peripheral set includes extensive communication options including an integrated CAN module, a 24-ch, 12-bit analog-to-digital converter (ADC), twelve programmable 16-bit flexible timer (FTM) channels on two independent time bases with center-aligned pulse-width modulation (PWM) capability, two analog comparators (ACMP), a cyclic redundancy check (CRC) and a watchdog timer (COP).

The MCF51AC256 products are pin, software and peripheral compatible with

AC256 Block Diagram



Features	Benefits
32-bit ColdFire® V1 Central Processing Unit (CPU)	

• High performance 50 MHz CPU
  ○ -5.5V to 2.7V operating range
  ○ -40C to +85C temperature range
• Implements instruction set revision C (ISA_C)
• Four low-power modes (Stop and Wait)
• Support for up to 40 interrupt exception sources
	• Provides high-performance across a wide range of operating voltages and temperatures
	• Provides additional instructions for easy handling of 8-, 16-, and 32-bit data
	• Allows sampling to continue in a reduced power state
	• Allows for exceptional software flexibility and optimization for real-time applications

On-Chip Memory	
• Up to 256 KB flash read/program/erase over full operating voltage and temperature. • Up to 32 KB random-access memory (RAM) • Security logic for securing memories	• Allows the user to take full advantage of in-application re-programmability benefits in any environment • Prevents unauthorized access to RAM or Flash
Multi-Purpose Clock Generator (MCG)	
• Programmable frequency-locked loop (FLL) • Programmable phase-locked loop (PLL) • Internal and external reference clock with divider • Clock source can be divided by 1, 2, 4, and 8	• Designed to reduce board space and system cost by eliminating the need for external components • Accuracy across temperature and voltage allows reliable serial communications without external clocks • The lack of external components decreases noise suseptibility • PLL allows for wide range of operating frequencies
12-bit Analog-to-Digital Converter (ADC)	
• 24-channel ADC • 2.5 µs, 10-bit single conversion time	• Fast, easy conversion from analog inputs such as temperature, pressure and fluid levels, to digital values

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Package Options

Part Number	Package	RAM	CAN	Temp Range
MCF51AC256ACLKE	80 LQFP	32k	Yes	-40 to +85C
MCF51AC256BCLKE	80 LQFP	32k	No	-40 to +85C
MCF51AC256ACPUE	64 LQFP	32k	Yes	-40 to +85C
MCF51AC256BCPUE	64 LQFP	32k	No	-40 to +85C
MCF51AC256ACFUE	64 QFP	32k	Yes	-40 to +85C
MCF51AC256BCFUE	64 QFP	32k	No	-40 to +85C
MCF51AC128ACLKE	80 LQFP	32k	Yes	-40 to +85C
MCF51AC128CCLKE	80 LQFP	16k	No	-40 to +85C
MCF51AC128ACPUE	64 LQFP	32k	Yes	-40 to +85C
MCF51AC128CCPUE	64 LQFP	16k	No	-40 to +85C
MCF51AC128ACFUE	64 QFP	32k	Yes	-40 to +85C
MCF51AC128CCFUE	64 QFP	16k	No	-40 to +85C

All parts are available in tape & reel packages. They are also available in extended temperature ranges. See datasheet for details.

the MC9S08AC60 and the MC9S08AC128 providing the flexibility to add or subtract functionality quickly and easily, reducing development time and cost.

Cost Effective Development tools

DEMOACKIT
$99*

A flexible and cost-effective evaluation system for the Flexis AC device family. The DEMOACKIT contains daughter cards for both the MC9S08AC128CLKE (S08) and the MCF51AC256CLKE (ColdFire® V1) processor. It features a built-in USB BDM, LED's, a serial port, an acceleration sensor and an I/O header. This kit comes complete with everything you need to get your board up and running quickly and easily.

DEMOACEX
$30*

An expansion board that plugs into the DEMOACKIT and provides additional functionality such as large prototype area that allow for the surface mount of SOICs and TSSOPs, a CAN Phy, and 12 additional LEDs. The DEMOACEX also contains Freescale touch sensing technology with 1 rotary sensor and 7 button sensors.

Features	Benefits
Timers/Pulse Width Modulators (PWM)	

• 12-channel 16-bit flexible timer/pulse width modulator (FTM)
  ○ Selectable clock source
  ○ Prescaler divide-by 1, 2, 4, 8, 16, 32, 64 or 128.
  ○ Deadtime insertion for each complimentary pair
  ○ Generation of the triggers to ADC
  ○ Programmable for input, capture, output compare or buffered PWM
  ○ PWM can be edge or center aligned
• 8-channel 16-bit timer/pulse width modulator (TPM)
  ○ Programmable for input, capture, output compare or buffered PWM
  ○ PWM can be edge or center aligned
	• Synchronization with the ADC and deadtime insertion allows for precise motor control
	• Timers can be daisy chained together providing higher resolution
	• Provides the ability of run off the core clock with high speed and high resolution
	• Center aligned PWM's minimize noise by distributing the edges of the PWM

Extensive Communications	

• Controller area network (CAN)
  ○ Version 2.0 A/B Implementation
  ○ Standard and extended data frames
  ○ Programmable bit rate up to 1 Mbps
• Dual Asynchronous SCI's
  ○ Flexible 13-bit module-based baud rate generators
  ○ Active edge on receive pin detection
  ○ Selectable receiver input polarity
  ○ LIN compatible
• Inter IC-bus (I2C)
  ○ Up to 100 kbps under full IIC spec loads, up to 400 kbps with reduced loads
  ○ Supports broadcasting mode and 10-bit addressing
• Dual Synchronous SPI
  ○ Multimaster operation
  ○ 256 clock configurations
  ○ Send/receive up to 16b data and has a 64b FIFO buffer for the data register
	• Asynchronous communication between the MCU and a terminal, computer, or a network with accurate buad rate matching
	• SCI interrupts and flags can be set when an active edge occurs on RxD pin
	• SCI can correctly receive data whose polarity was inverted during transmission
	• High-speed synchronous communication between multiple MCU's or between MCU and serial peripherals
	• Provides a simple, efficient method of data exchange between devices
	• Serial peripherals are available for use in parallel

System Protection	
• Selectable low-voltage detect/reset with enhanced low-voltage warning • Cyclic Redundancy Check (CRC) • COP watchdog timer ○ Option to run COP off independent clock source or bus.	• Protect against system failure due to brownouts. • Allows fast cyclic redundancy checks on system memory • Prevents runaway code caused by noise spikes, EMC, and/or voltage drops
Input/Output	

• Up to 70 GPIO pins
  ○ Programmable pull-ups
  ○ High-current drivers
  ○ Eight keyboard interrupts
  ○ Controlled rise/fall times minimize noise
	• Results in a large number of flexible I/O pins that allow vendors to easily interface the device into their own designs as every peripheral pin is GPIO capable

On-Chip Debug Interface	
• Single-wire background debug mode • On-chip trace buffer with 9 flexible trigger modes and multiple hardware breakpoints. • Non-intrusive emulation • Hotsync capabilities to connect to MCU while it is running	• Real-time emulation of MCU functions at full operating voltage and frequency range with no limitations • On-chip trigger and buffer hardware replaces and emulator's expensive bus state analyzer • Non-intrusive debugging through a single dedicated pin helps eliminate the need and cost emulator cables • View and change internal registers and memory while running an application

CodeWarrior® Development Studio for Microcontrollers, V6.2 Complimentary**

CodeWarrior Development Studio for Microcontrollers is an integrated tool suite that supports software development for Freescale's 8-bit or 32-bit microcontrollers. Designers can further accelerate applications development with the help of the Processor Expert™ tool, which is an award-winning rapid application development tool in the CodeWarrior tool suite.

For more information, please refer to the Freescale Development Tool Selector Guide (SG1011).

* Prices indicated are MSRP
** Subject to license agreement

Learn More: For more information on the Flexis AC family, please visit **www.freescale.com/flexis**

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