

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 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



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 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 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							





Package Options Peakage At Number Package At Number Peakage At Number							
Description Package RAM CAN Time Park Number Description Descript	Package Onti	one				Features	Ronofits
Part Number Package RM Cale and the provide set of the independence of	Раскаде Орн					Timore/Pulse Width Medulatore (PW/M)	Denents
MRCS1A2280ALLE 80 LOPP 32k Yes 40 e +85C MRCS1A2280AULE 64 LOPP 32k Yes 40 to +85C MCS1A2280AULE 64 LOPP 32k Yes 40 to +85C MCS1A2280AULE 64 LOPP 32k Yes 40 to +85C <td>Part Number</td> <td>Package</td> <td>KAM</td> <td>CAN</td> <td>Temp Range</td> <td>12-channel 16-bit flexible timer/pulse width modulator (FTM)</td> <td>Synchronization with the ADC and deadtime insertion</td>	Part Number	Package	KAM	CAN	Temp Range	12-channel 16-bit flexible timer/pulse width modulator (FTM)	Synchronization with the ADC and deadtime insertion
MC31A22600LK 80 UDP 32k No 40 to +85C MC51A22560CFL 64 UPP 32k No 40 to +85C MC51A22260CFL 74 NO 40 to +85C MC51A2260CFL 74 UPP 32k No 40 to +85C No 40 to +85C MC51A2260CFL 74 UPP 32k No 40 to +85C No 40 to +85C MC51A2260CFL 74 UPP 32k No 40 to +85C No 40 to	MCF51AC256ACLKE	80 LQFP	32k	Yes	-40 to +85C	 Selectable clock source 	allows for precise motor control
MCF3 MC238CPUE 64 LOP 32x Vis -0 to -85C - Discuting mathemation for least company on buffered PMM - Provides to bability of num of the core clock will MCF3 MC238CPUE 64 OP 32x Vis -0 to +85C - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will MCF3 MC238CPUE 64 OP 32x Vis -0 to +85C - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will MCF3 MC238CPUE 64 OP 32x Vis -0 to +85C - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to bability of num of the core clock will - Provides to maintain of the cloce clock will - Provides to maintain of the cloce clock will - Provides to maintain of the cloce clock will - Provides to maintain of the cloce clock will - Provides to mainta	MCF51AC256BCLKE	80 LQFP	32k	No	-40 to +85C	 Prescaler divide-by 1, 2, 4, 8, 16, 32, 64 or 128. 	Timers can be daisy chained together providing higher
Mich J. ZuberUbe 64 UP 324 No 40 UB 430C • Programmable for input, capture, output compare or bufferd PWM • Center aligned MICS J. ACLESERCHLE 64 OP 324 No - 40 to +85C • Programmable for input, capture, output, captur	MCF51AC256ACPUE	64 LQFP	32k	Yes	-40 to +85C	 Deadume insertion for each complimentary pair Generation of the triggers to ADC 	 Provides the ability of run off the core clock with high
MIX13/L250AULE 64 0P 32k Ns 40 b 4350 MC51A/L250AULE 64 0P 32k Ns 40 b 4350 MC51A/L250AULE 80 L0P 18k Ns 40 b 4350 MC51A/L250AULE 80 L0P 18k Ns 40 b 4350 MC51A/L250AULE 64 L0P 32k Ns 40 b 4350 MC51A/L250CPUE 64 L0P 32k Ns 40 b 4350 MC51A/L250CPUE 64 L0P 32k Ns 40 b 4350 MC51A/L250CPUE 64 L0P 18k No 40 b 4350 MC51A/L250CPUE 64 UP 16k No 40 b 4350 All parts are available in tage & reel packages. They are also available in tage a transmission 5 Clinterurus an attaining Asynchronous communication between the MC Standard and extended data frames Porgarmable but faits up to 1 Mbps SClinterurus ant tage can be est when an account on the matching Standard and extended data frames Porgarmable for use in parality symminication between the MC SClinterurus ant tage can be est when an account on the MC symminication between the MC symminication between the MC symminication data section tage symminication between the MC symminication data section tage symminication tage symminication tage symminication tage sy	MCF51AC256BCPUE	64 LQFP	32k	NO	-40 to +850	 Programmable for input, capture, output compare or buffered PWM 	speed and high resolution
Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Hub 14 Sec Midd JuckSonduck Bit UP Sak Nor Asynchronous communication the Mub Midd JuckSonduck Sol Controller area network (CAN) Sol Controller area network (CAN) Sol Controller area network (CAN) Provide Sak Nor Nor Sol Controller area network (CAN) Sol Controller area network (CAN) Provide Sak Nor Nor Sol Controller area network (CAN) Sol Controller area network (CAN) Provide Sak Nor Nor Nor Sol Controller area network (CAN) Sol Controller area network (CAN)	MCF51AC256ACFUE	64 QFP	32K	Yes	-40 to +850	 PWM can be edge or center aligned 8 channel 16 bit timer/pulse width modulator (TDM) 	 Center aligned PWM's minimize noise by distributing the edges of the PWM
Individual Conducts is all upper is all upppe			32K	NO	-40 to +850	 Programmable for input, capture, output compare or buffered PWM 	
Minuscription Set Vestion Approximation MORENALIZZAGE/UE Get LOPP Fisk No -40 to +850 MORENALIZZAGE/UE Get LOPP Fisk No -40 to +850 MORENALIZZAGE/UE Get LOPP Fisk No -40 to +850 All parts are available in tage X rele gaackages. They are also available in the XetOS08ACC128 - Moreaver the MC - Moreaver the MC You All synchronous S01's - Relevable 13-bit module-based baud rate generators - Active deg on receive in indetection - Solicitation are available in tage Xeto Set View and Case Withe and and Xeto View and Moreaver View and View Set View and Case With and Active Asset View and Case With and Active Asset View and Case View and View and Yeto View and View and Yeto View and View Asset View Asset View And View and View Asset View As			32K 16k	No	-40 to + 850	• PWM can be edge or center aligned	
 Controller area network (CAN) Controller area network (CAN) Versina 2.266 (2A) Programmable bit rate up to 1Mps Dual Aginchronous SCI's Controller draw network with accurate generators Active edge on receiver ind relection Selectable lock or subtract Controller draw network with accurate generators Active edge on receive ind relection Selectable lock (CRC) Up to 100 kbps under full IC spec loads, up to 400 kbps Withinaster operation Selectable low-voltage detect/reset with enhanced low-voltage Selectable low-voltage drager Selectable low-voltage drager Selectable low-voltage drager Convertion accurate an on the CPO prime sentement of floate Prevents nuawy code caused by noise spike or voltage drager Convertion traves Convertion traves Convertion traves Convertion traves Controller dragen and to MCC for the SV1) processor. 			324	Voc	-40 to +850	Extensive Communications	
Microsoccus of the stand of the transmission Orestand transmission Microsoccus of the standard temperature ranges. See datasheet for details. All parts are available in tage & reel packages. They are also available in the MCSS08AC60 and the MCSS08AC128 providing the flexibility to add or subtract functionality quickly and easily, reducing development time and cost. Cost Effective Development tools Str DEMOACKIT \$\$99* A flexible and cost-effective evaluation system for the Flexis AC device family. The DEMOACKIT contains daughter cards for both the MCSS08AC128 CCML (\$C00) Fire® V1) processor. System for the Flexis AC device family. The DEMOACKIT contains daughter cards for both the MCSS08AC128CCK (\$C00) Fire® V1) processor. System for the Flexis AC device family. The DEMOACKIT contains daughter cards for both the MCSS08AC128CCK (\$C00) Fire® V1) processor. Serial peripherals and acceleration sensor and an I/O header. This kit comes complete with the everything you need to get your board up and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with the were the buffer with 9 flexible indegendent clock bug mode and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with everything you need to get your board up and I/O header. This kit comes complete with thexit but to they work and an application. <td>MCF51AC128CCPUE</td> <td>64 L OFP</td> <td>16k</td> <td>No</td> <td>-40 to $+850$</td> <td>Controller area network (CAN) Alexandrometerian</td> <td> Asynchronous communication between the MCU and a terminal commuter or a network with accurate hund </td>	MCF51AC128CCPUE	64 L OFP	16k	No	-40 to $+850$	Controller area network (CAN) Alexandrometerian	 Asynchronous communication between the MCU and a terminal commuter or a network with accurate hund
 Normalization and the field of the field of	MCF51AC128ACFUE	64 OFP	32k	Yes	-40 to +850	 version 2.0 A/B implementation Standard and extended data frames 	rate matching
 Dual Asynchronous SC/S Provide a reel packages. They are also available in extended temperature ranges. See datasheet for details. Provide 13-bit module-based baud rate generators Active edge on receive pin detection Selectable receiver input polarity LIN compatible Up to 100 kbps under full IC spec loads, up to 400 kbps Up to 100 kbps under full IC spec loads, up to 400 kbps Up to 100 kbps under full IC spec loads, up to 400 kbps Up to 100 kbps under full IC spec loads, up to 400 kbps Up to 100 kbps under full IC spec loads, up to 400 kbps Up to 100 kbps under full IC spec loads, up to 400 kbps Supports broadcasting mode and 10-bit addressing Dual Synchronous SPI Multimister operation Supports broadcasting mode and 10-bit addressing Dual Synchronous SPI Multimister operation Selectable low-voltage detect/reset with enhanced low-voltage warning Spice Redundancy Check (CRC) COP watchdg timer Optat/Output High-current divers Eight whyboard interrupts Corticule frace W (P) for GPD pins Provides ta advice interrupts Single-wire background debug mode On-chip trace with enhanced low-voltage Real-time emulation of MCU functions at full or woltage and multiple hardware treakpoints. Single-wire background debug mode On-chip trace with en iomization registers and hear or advice in the iomization of MCU functions at full or woltage and multiple hardware replaces a conducting registers and hear or advice in the iomization of MCU functions at full or woltage and multiple hardware replaces and change interrupts Single-wire background debug mode On-chip trace with enday conset to MCU while it is running<!--</td--><td>MCE51AC128CCEUE</td><td>64 0FP</td><td>16k</td><td>No</td><td>-40 to $+850$</td><td> Programmable bit rate up to 1 Mbps </td><td>SCI interrupts and flags can be set when an active edge</td>	MCE51AC128CCEUE	64 0FP	16k	No	-40 to $+850$	 Programmable bit rate up to 1 Mbps 	SCI interrupts and flags can be set when an active edge
DEMOACKIT Selectable value of work outage decorreset with enhanced of work outage Indicet against system faulte due to down outage \$99* A flexible and cost-effective evaluation Cyclic Redundancy Check (CRC) Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP off independent clock source or bus. Input/Output Prevents runaway code caused by noise spikes 0 ption to run COP	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				y are also asheet for details. 8AC128 ubtract ducing ent tools	 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 	 occurs on RXD pin SCI can correctly receive data whose polarity was inverted during transmission High-speed synchronous communication between multip 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
 Option to run COP off independent clock source or bus. Option to run COP off independent clock source or bus. 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 OBEMOACEX 	DEMOACKIT \$99*					 Selectable low-voltage detectoreset with enhanced low-voltage warning Cyclic Redundancy Check (CRC) COP watchdog timer 	 Protect against system nature due to brownouts. Allows fast cyclic redundancy checks on system memory. Prevents runaway code caused by noise spikes, EMC, an or voltage drops
 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 Input/Output Up to 70 GPIO pins Programmable pull-ups High-current drivers Eight keyboard interrupts Controlled rise/fall times minimize noise 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 View and change internal registers and memor running an application 	A flexible and (cost-effe	CTIVE E	evalua		 Uption to run CUP off independent clock source or bus. 	
 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 	system for the	⊢lexis A	C devi	ce fai	mily. The		 Booulto in a large number of flexible I/O nine that allows
 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 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 	DEMOACKIT contains daughter cards for				ards for	 Op to 70 Grid pills Programmable pull-ups 	vendors to easily interface the device into their own
 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 	both the MC9S08AC128CLKE (S08) and the				8) and the	• High-current drivers	designs as every peripheral pin is GPIO capable
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. 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 View and change internal registers and memor running an application DEMOACEX A contraction of MCU service and multiple is running Non-intrusive emulation Hotsync capabilities to connect to MCU while it is running View and change internal registers and memor running an application 	MCF51AC256CLKE (ColdFire® V1) processor.				processor.	 Eight keyboard interrupts Controlled rise/fall times minimize noise 	
 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 View and change internal registers and memor running an application 	It features a bu	uilt-in US		, // IFI	D's a	On-Chip Debug Interface	
 Non-intrusive emulation Non-intrusive debugging through a single dedition helps eliminate the need and cost emulator calling an emplication View and change internal registers and memor running an application 	portal port on appolaration apport and an				and an	Single-wire background debug mode	Real-time emulation of MCU functions at full operating
 bardware breakpoints. complete with everything you need to get your board up and running quickly and easily. bardware breakpoints. Non-intrusive emulation Hotsync capabilities to connect to MCU while it is running bardware breakpoints. Non-intrusive emulation Hotsync capabilities to connect to MCU while it is running betwoard up and betwoard up and						 On-chip trace buffer with 9 flexible trigger modes and multiple 	voltage and frequency range with no limitations
 everything you need to get your board up and running quickly and easily. betwork data and the final data end to be persive dus state analyzer Hotsync capabilities to connect to MCU while it is running betwork data end to be persive dus state analyzer Non-intrusive debugging through a single deduction helps eliminate the need and cost emulator cal View and change internal registers and memor running an application 	I/O neader. This kit comes complete with			mplet	te with	 hardware breakpoints. Non-intrusive emulation 	 Un-chip trigger and buffer hardware replaces and emulator's expensive bus state analyzer
running quickly and easily. helps eliminate the need and cost emulator cal View and change internal registers and memor running an application	everything you need to get your board up and			our bo	bard up and	 Hotsync capabilities to connect to MCU while it is running 	 Non-intrusive debugging through a single dedicated pin
DEMOACEX running an application	running quickly	and ea	sily.			-	 helps eliminate the need and cost emulator cables View and change internal registers and memory while
	DEMOACEX						ו עוווווע און אַרָשָאָראָ אָראָאָראָאַראָאַראָאַראָאַראָאַר

\$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.

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





Document Number: MCF51AC256128FS REV 1 cc