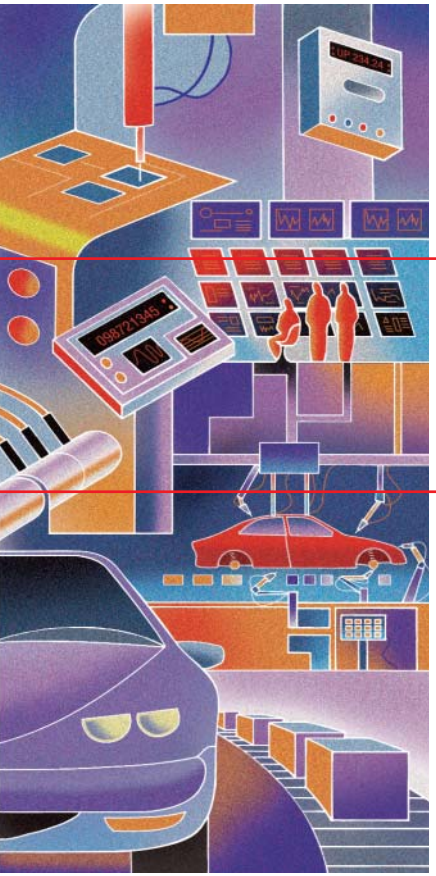
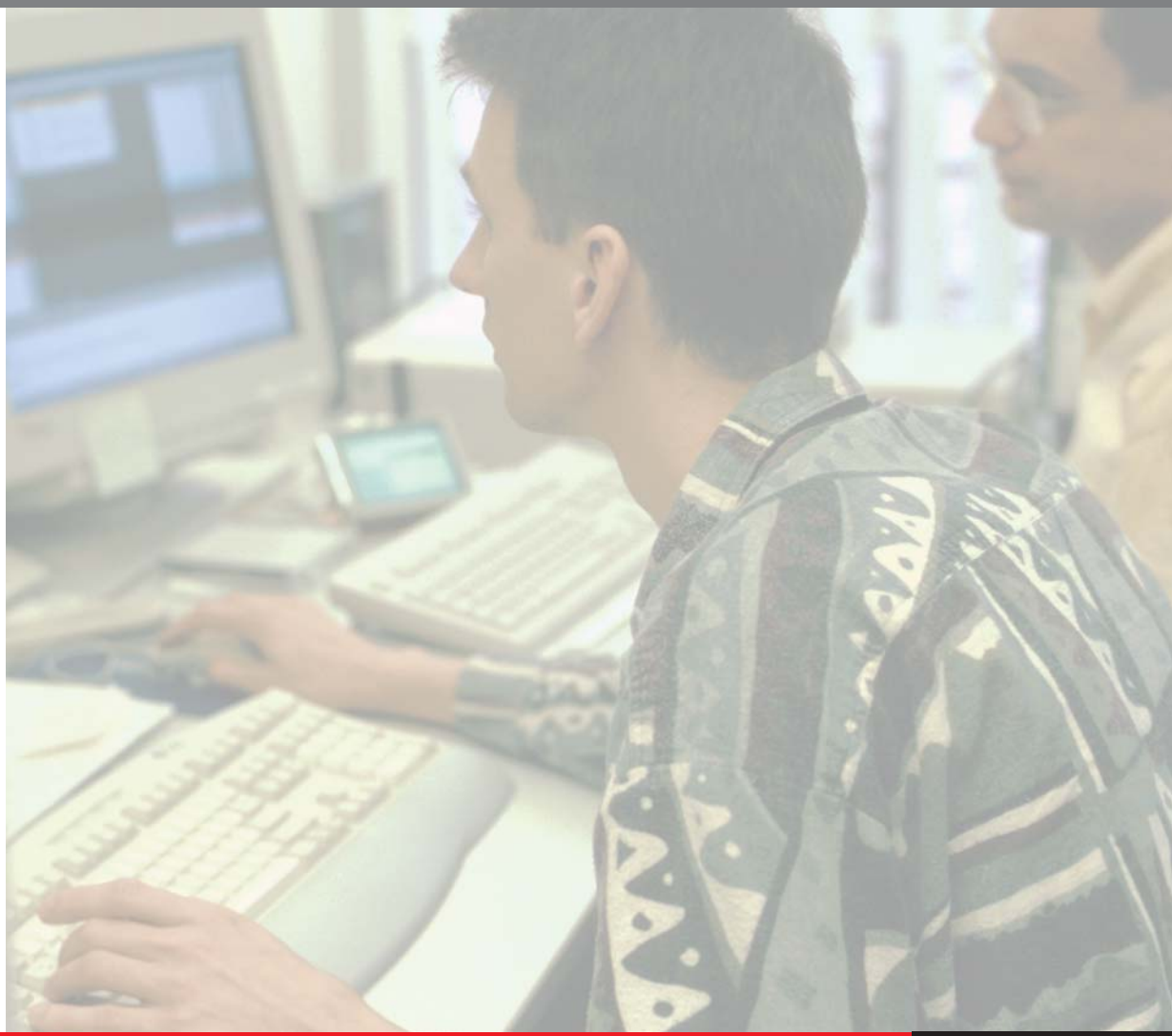


CAN BUS MICROCONTROLLER SOLUTIONS

CAN BUS MICROCONTROLLERS

PRODUCT OVERVIEW



INTRODUCTION TO CAN BUS CONTROLLERS & FLASH ROM MICROCONTROLLERS

CAN Bus Controllers

Fujitsu offers F²MC-16LX and FR devices with fully featured CAN Bus protocol controllers as on-chip peripherals for Automotive and Industrial applications.

Features

- CAN 2.0A and 2.0B protocol controller
- 16 message buffers (8 for MB90495, MB90385 series), each individually programmable for:
  - Transmit or receive
  - 11 or 29 identifier bits
  - Full identifier bit compare/ full mask/compare against 1 of 2 mask registers
- Ability to group buffers into flexible multi-level configuration
- Readable error counter

FLASH ROM Microcontrollers

All of Fujitsu's CAN MCUs are supported by at least one version with FLASH ROM as the user-programmable memory. This is the same technology used in standard Fujitsu Flash memories.

Features

- Available block sizes 24kB, 32kB, 64kB, 128kB, 256kB, 384kB, 512kB and 768kB
- Blocks divided into separately erasable and protectable sectors
- Supports programming by Embedded Algorithm™
- No additional, external programming voltage required
- 10,000 minimum erase cycles guaranteed – 100,000 under specification
- 10 year data retention
- Programming by three methods:
  - On ordinary programmer with adaptor as with traditional OTP devices
  - Using Fujitsu embedded serial programming mode via on-chip UART directly to the FLASH ROM
  - Copying or downloading to FLASH using customers' own bootstrap software
- Flash programming via CAN possible

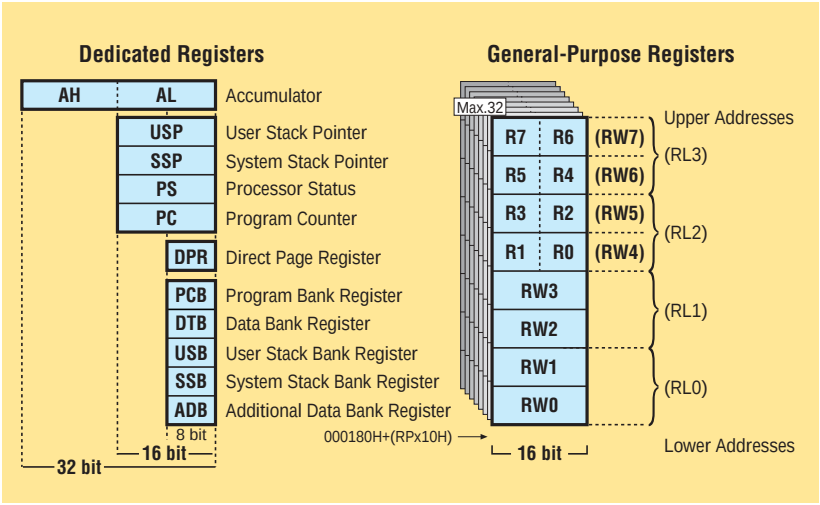
F²MC-16LX CPU-CORE ARCHITECTURE

One obvious strength of this 16 bit architecture is its excellent code efficiency. As Fujitsu has a long record in the C-Compiler business, dating back to the early days of mainframe computers, it was a logical move not only to equip the 16LX architecture with an instruction set that is C-code optimised but also to supply the actual C-Compiler which draws on this architectural strength – for example flexible addressing options. Bank registers for program code and data allow the use of 16 bit addresses – thus reducing code size while at the same time increasing processing performance.

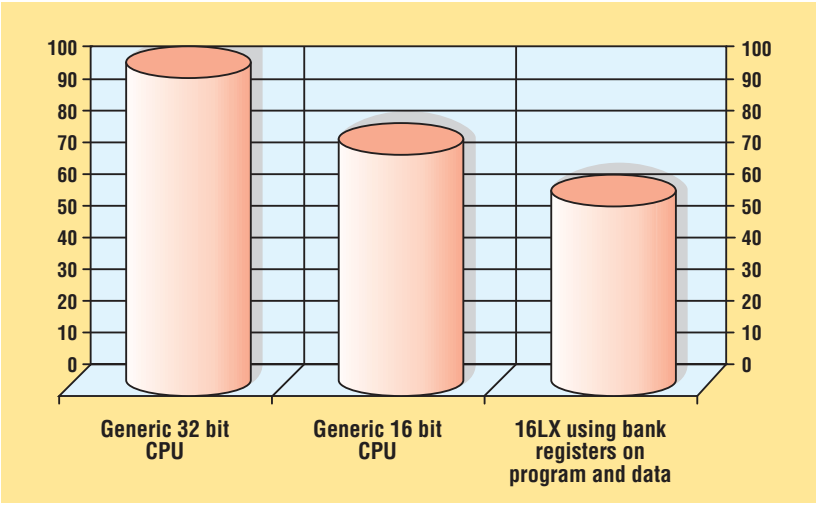
Alternatively several memory models exist, allowing linear addressing over the complete memory range.

As the die size of MCUs mainly depends on memory resources, it is obvious that fitting more lines of C-code into the same physical memory, saves cost.

This is particularly easy with 16 bit instructions sets. 32 bit instruction sets in general produce less efficient code resulting in larger chips and more cost.



16 bit CPU-Core Programming Model



Graph shows memory use (kB) for an example program written in C

F²MC-16LX DEVICE FEATURES

- 0.5µm/0.35µm CMOS Technology
- Flash ROM or Mask ROM versions
- 16MHz (62.5ns)/24MHz (42ns) maximum internal clock speed from external 4MHz
- On-chip PLL can multiply x1, x2, x3, x4 or x6 external clock speed
- Internal voltage regulator supports 3V MCU core offering low EMI and low power consumption figures
- Optimised instruction set for controller applications
  - bit, byte, word, long word data types
  - 23 addressing modes
  - barrel shifter
  - variety of pointers
- 4 Byte instruction queue
- Signed multiply instruction – 16 bit x 16 bit
- Signed divide instruction – 32 bit/16 bit
- EI²OS – Automatic transfer function independent of CPU with 16 channels of Intelligent I/O services
- 18 bit Time-base timer
- 15 bit Watch timer, (devices with 32kHz sub-clock only)
- Watchdog timer
- 16 bit reload timer
- 16 bit I/O timer
- 16 bit Output Compare Unit (OCU)
- 16 bit Input Compare Unit (ICU)
- 8/16 bit Programmable Pulse Generator (PPG)
- USART with LIN support
- 10 bit A/D converter
- Up to 24 analogue input channels
- LCD controller
- Stepper motor control
- CAN 2.0B interface
- Fast interrupt processing
- Powerful interrupt functions – 8 programmable priority levels, more than 30 possible hardware vectors and more than 200 software vectors
- Embedded Debugger Support Unit for in-system software debugging with a monitor debugger
- Power saving modes
  - 7 for single clock or 10 for dual clock
  - sleep, stop, CPU intermittent, hardware standby …

F²MC-16LX DEVICE FEATURES

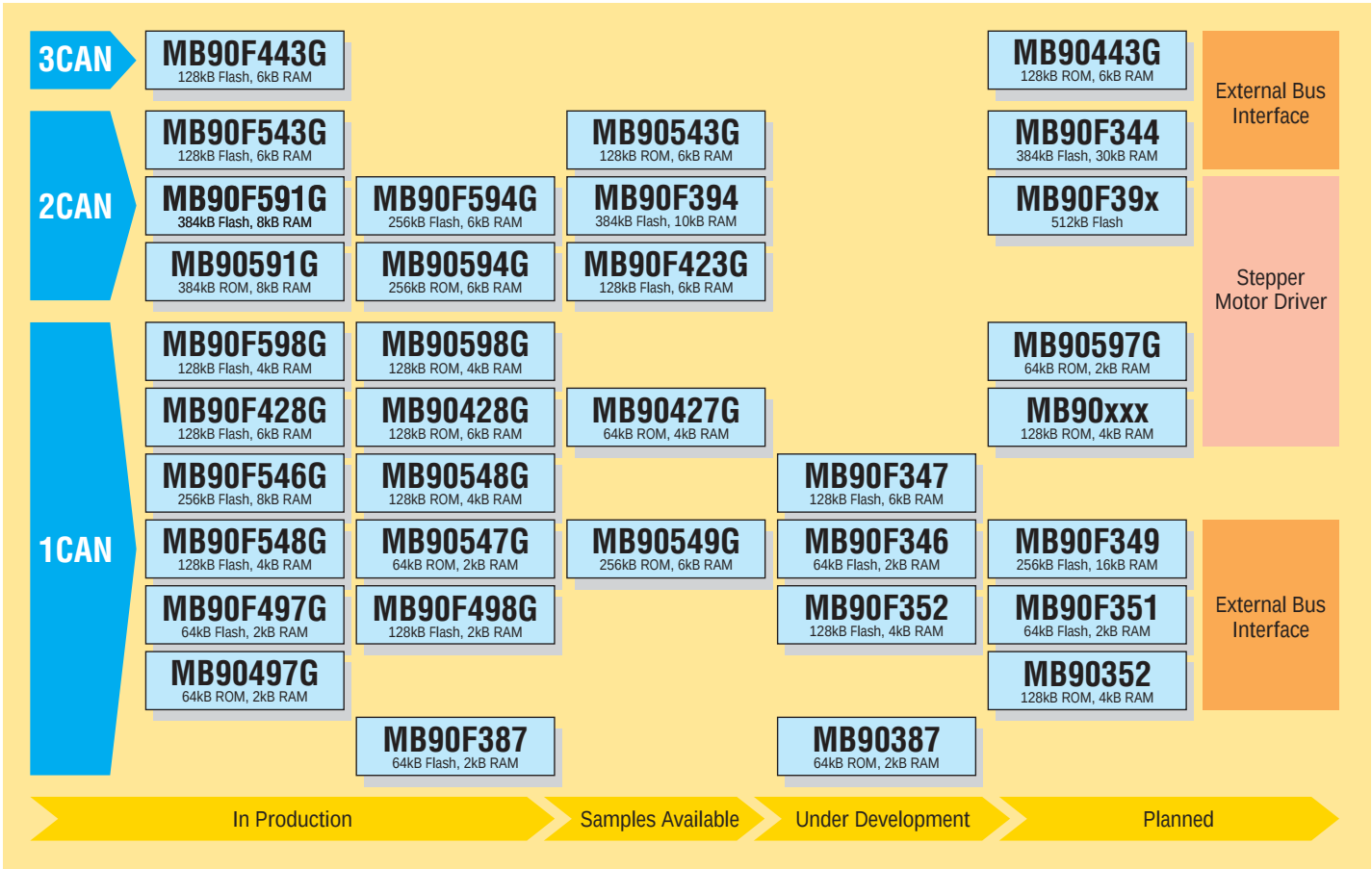
Overview of 16LX CAN MCUs

Series	Device Part Number	RAM	Flash/ Mask (ROM)	Flash Code Security	PLL max.	Max. Frequency	Sub-clock (32kHz)	Operating voltage	Operating Temp	Package	Max. I/O Ports	EIOS Channels	Interrupt levels	Watchdog	CPU Operation detect circuit	CAN interface	CAN Message Buffers/ channel	UART Standard	UART LIN	SIO	A/D convertor	A/DC conversion time	PPG	OCU	ICU	16 bit I/O Timer	16 bit reload Timer	Timebase Timer	Watch Timer	External Bus interface	Stepper motor drivers	External interrupts	I²C channel	Sound generator	Clock Timer	LCD interface	Power saving modules
MB90340/S/C/CS	F346/S/C/CS 346/S/C/CS F347/S/C/CS 347/S/C/CS F342/S/C/CS 342/S/C/CS	2K 2K 6K 6K 15.75K 15.75K	64K 64K 128K 128K 256K 256K	Yes	x6	24MHz	not for S versions	3.5 to 5.5V*	-40 to 105°C	QFP-100	80 (82 for S version)	16	7	Yes	No	1 1 1 1 2 2	16	No	4	No	10 bit 16/24ch	3µs (f= 24 MHz)	8 x 16 bit/ 16 x 8 bit	8	8	2	4	Yes	Not on S version	Yes	No	16	2ch on C version	No	No	No	Sleep, stop, timer, watch
MB90350/S/C/CS	F352/S/C/CS 352/S/C/CS	4K 4K	128K 128K	Yes	x6	24MHz	not for S versions	3.5 to 5.5V*	-40 to 105°C	QFP-64	49 (51 for S version)	16	7	Yes	No	1	16	No	2	No	10 bit 15ch	3µs (f= 24 MHz)	6 x 16 bit/ 12 x 8 bit	4	6	2	4	Yes	Not on S version	Yes	No	8	1ch on C version	No	No	No	Sleep, stop, timer, watch
MB90385/S	F387/S 387/S	2K 2K	64K 64K	No	x4	16MHz	not for S versions	3.5 to 5.5V*	-40 to 105°C	LQFP-48	34 (36 for S version)	16	7	Yes	No	1	8	1	No	No	10 bit 8ch	6.125µs (f=16MHz)	2 x 16 bit/ 4 x 8 bit	No	4	1	2	Yes	Not on S version	No	No	4	No	No	No	No	Sleep, stop, timer, watch
MB90390	F394H	10K	384K	No	x4	20MHz	No	3.5 to 5.5V*	-40 to 85°C	LQFP-120	96	16	7	Yes	No	2	16	2	1	1	10 bit 8ch	4.9µs (f=20MHz)	6 x 16 bit/ 12 x 8 bit only 6 connected to IOs	8	6	2	2	Yes	No	No	6ch	8	No	Yes	Yes	No	Sleep, stop, timer
MB90420G/425G	F428GA/GB/GC 428GA/GB/GC 427GA/GB/GC F423GA/GB/GC 423GA/GB/GC	6K 6K 4K 6K 6K	128K 128K 64K 128K 128K	No	x4	16MHz	not for A versions	3.7V to 5.5V* 3.0 to 5.5V for C version	-40 to 105°C	QFP-100	58	16	7	Yes	No not for C version	1 1 1 2 2	16	2	No	No	10 bit 8ch	6.125µs (f=16MHz)	3 x 16 bit/ 6 x 8 bit only 3 connected to IOs	No	4	1	2	Yes	Not on A version	No	4ch	8	No	Yes	No	4 x 24	Sleep, stop, timer, watch
MB90440G	F443G	6K	128K	Yes	x4	16MHz	Yes	5V +/- 10%	-40 to 105°C	QFP-100	81	16	7	Yes	No	3	16	2	No	1	10 bit 8ch	6.125µs (f=16MHz)	4 x 16 bit/ 8 x 8 bit only 4 connected to IOs	4/2	6/8	1	2	Yes	Yes	Yes	No	8	No	No	No	No	Sleep, stop, timer, watch
MB90495G	F497G 497G F498G	2K 2K 2K	64K 64K 128K	No	x4	16MHz	Yes	5V +/- 10%	-40 to 105°C	LQFP-64	49	16	7	Yes	No	1	8	2	No	No	10 bit 8ch	6.125µs (f=16MHz)	2 x 16 bit/ 4 x 16 bit	No	4	1	2	Yes	Yes	Yes	No	8	No	No	No	No	Sleep, stop, timer, watch
MB90540G/GS MB90545G/GS	F543G/GS 543G/GS F548G/GS 548G/GS F546G/GS 549G/GS	6K 6K 4K 4K 8K 6K	128K 128K 128K 128K 256K 256K	Yes	x4	16MHz	not for S versions	5V +/- 10%	-40 to 105°C	QFP-100	83 81	16	7	Yes	No	2 2 1 1 1 1	16	2	No	1	10 bit 8ch	26.3µs (f=16MHz)	4 x 16 bit/ 8 x 8 bit only 4 connected to IOs	4/2	6/8	1	2	Yes	Not on S version	Yes	No	8	No	No	No	No	Sleep, stop, timer, watch
MB90590G	F591G 591G F594G 594G	8K 8K 6K 6K	384K 384K 256K 256K	No	x4	16MHz	No	5V +/- 5%	-40 to 85°C	QFP-100	78	16	7	Yes	No	2	16	3	No	1	10 bit 8ch	26.3µs (f=16MHz)	6 x 16 bit/ 12 x 8 bit only 6 connected to IOs	6	6	1	2	Yes	No	No	4ch	8	No	Yes	Yes	No	Sleep, stop, timer, watch
MB90595G	F598G 598G	4K 4K	128K 128K	Yes	x4	16MHz	No	5V +/- 10%	-40 to 85°C	QFP-100	78	16	7	Yes	No	1	16	2	No	1	10 bit 8ch	26.3µs (f=16MHz)	6 x 16 bit/ 12 x 8 bit only 6 connected to IOs	4	4	1	2	Yes	No	No	4ch	8	No	No	No	No	Sleep, stop, timer, watch

Note

Part numbers with prefix F are Flash versions
Part numbers without prefix F are mask versions
* supply voltage 4.5V - 5.5V if AD converter is used

16 BIT CAN MCU ROADMAP



This diagram shows Fujitsu's roadmap of CAN microcontrollers

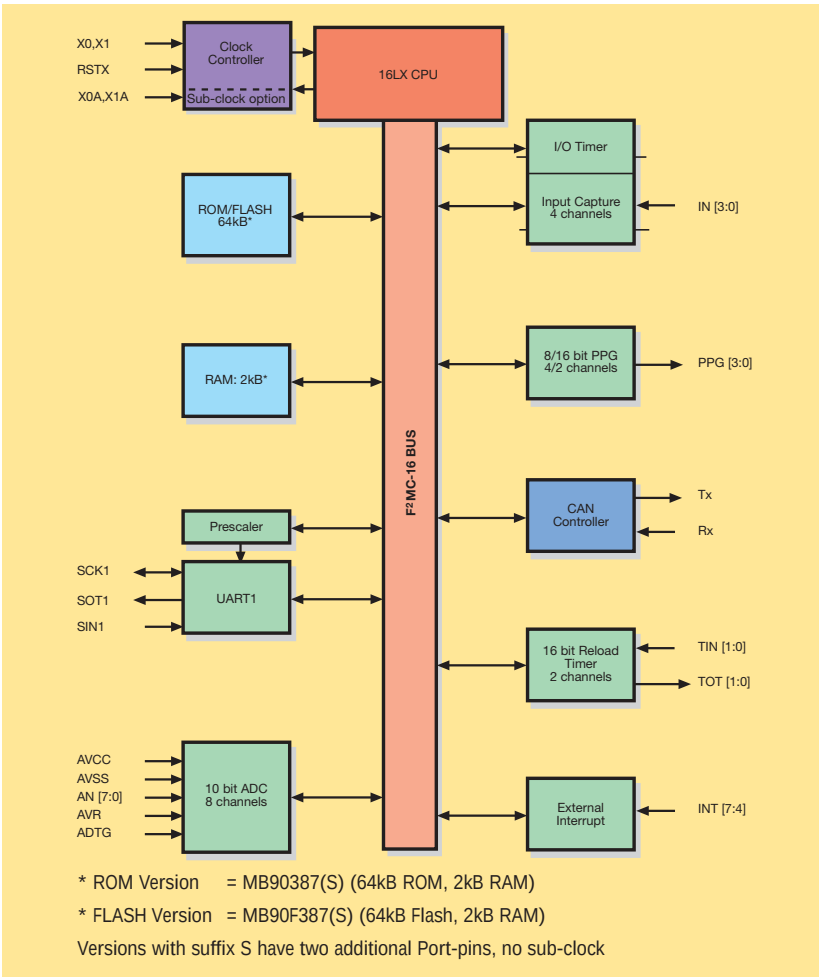
16 BIT SINGLE CAN BUSMICROCONTROLLERS

The **MB90385(S)** series offers full CAN performance in a very small 48-pin QFP package for cost sensitive automotive and industrial applications which have used 8 bit basic CAN devices up to now. It also provides an entry level to Fujitsu's range of F²MC-16LX microcontrollers with on-chip CAN with full compatibility except that the number of message buffers is reduced from 16 to 8.

- 32kHz sub-clock
- 1 UARTs
- External interrupts 4-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 2-ch or 8 bit x 4-ch
- QFP 48 package
- -40 to +105°C temperature range

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 64kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- Full CAN 2.0A/2.0B interface with flexible buffering
- 2kB RAM

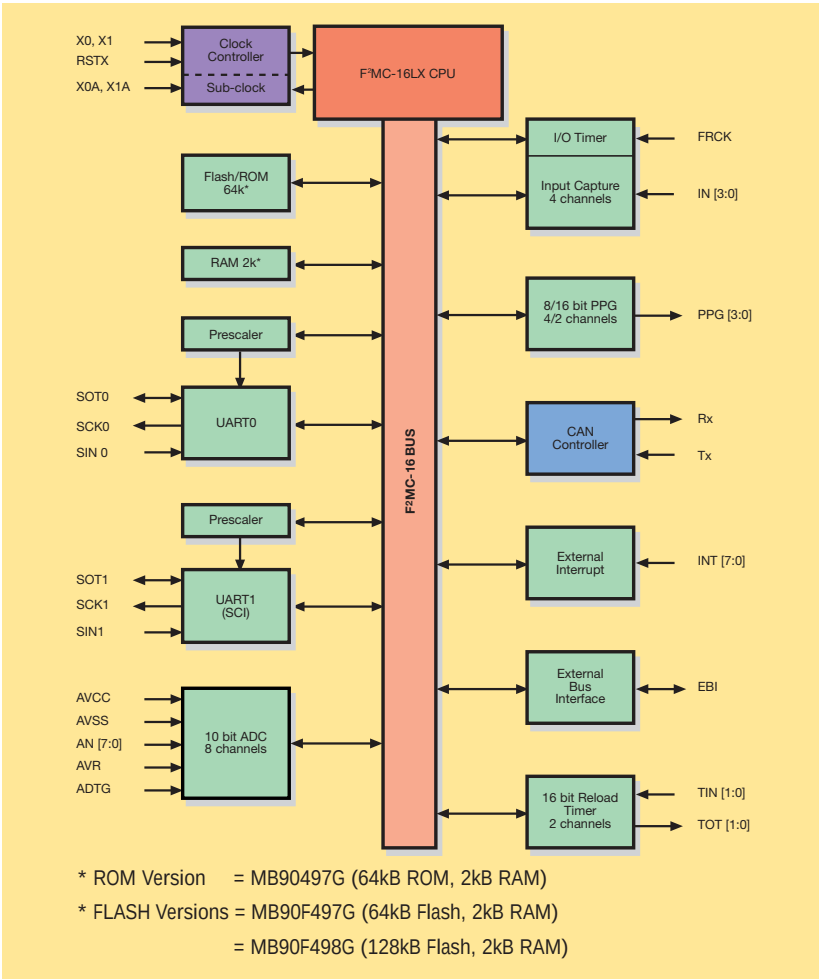


Shows the small sized MB90385(S) Series with full CAN performance

The **MB90495G** series brings 16 bit, full CAN performance to cost sensitive automotive and industrial applications which have used 8 bit CAN devices up to now. Compared to the MB90385 series, the second UART interface and the external bus interface especially expand the features of the MB90495G series. It also provides an entry level to Fujitsu's range of F²MC-16LX microcontrollers with on-chip CAN with full compatibility except that the number of message buffers is reduced from 16 to 8.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 64/128kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- Full CAN 2.0A/2.0B interface with flexible buffering
- 2kB RAM
- 32kHz sub-clock
- External bus interface
- 2 UARTs
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 2-ch or 8 bit x 4-ch
- QFP 64 package
- -40 to +105°C temperature range

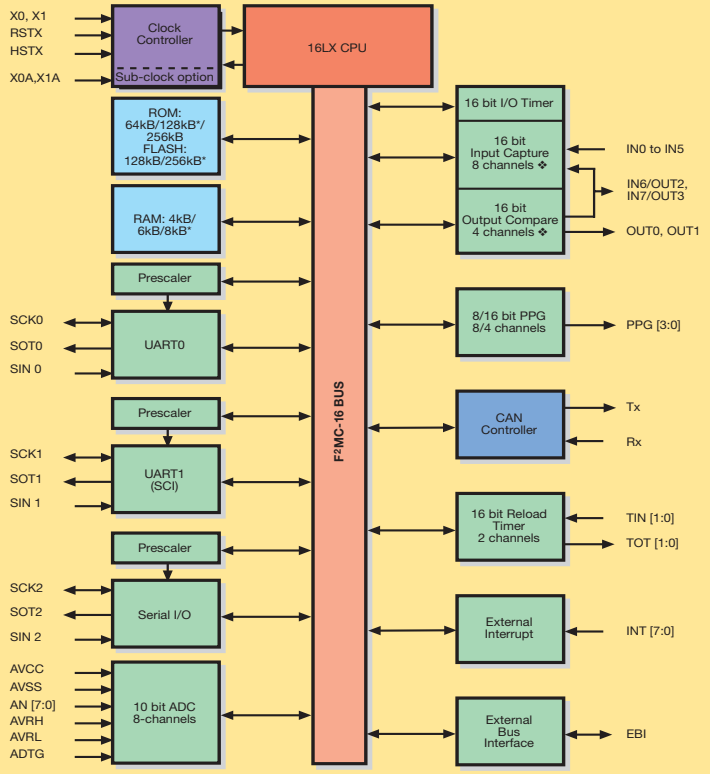


Shows the MB90495G Series with external bus and full CAN performance

The **MB90545G** series is a product rich in peripheral features and designed with more general-purpose CAN applications. The functions that particularly distinguish it from other devices in Fujitsu's range are the inclusion of an external bus interface and a 32kHz sub-clock. The MB90545G series is otherwise completely plug-compatible with its double and triple CAN counterparts.
A security feature is incorporated in this family, preventing the unauthorised reading of the contents of the Flash ROM.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 128kB/256kB Flash ROM (with single voltage and 10k erase cycles), or 128kB Mask ROM
- Flash security function
- Full CAN 2.0A/2.0B interface with flexible buffering
- 4kB/8kB RAM
- 32kHz sub-clock
- External bus interface
- 2 UARTs
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 8/6-ch
- Output compare 16 bit x 2/4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit or 8 bit x 4-ch
- QFP 100 package
- -40 to +105°C temperature range



* ROM Version = MB90547G/GS (64kB ROM, 2kB RAM)
= MB90548G/GS (128kB ROM, 4kB RAM)
= MB90549G/GS (256kB ROM, 6kB RAM)

* FLASH Version = MB90F548G/GS (128kB Flash, 4kB RAM)
= MB90F546G/GS (256kB Flash, 8kB RAM)

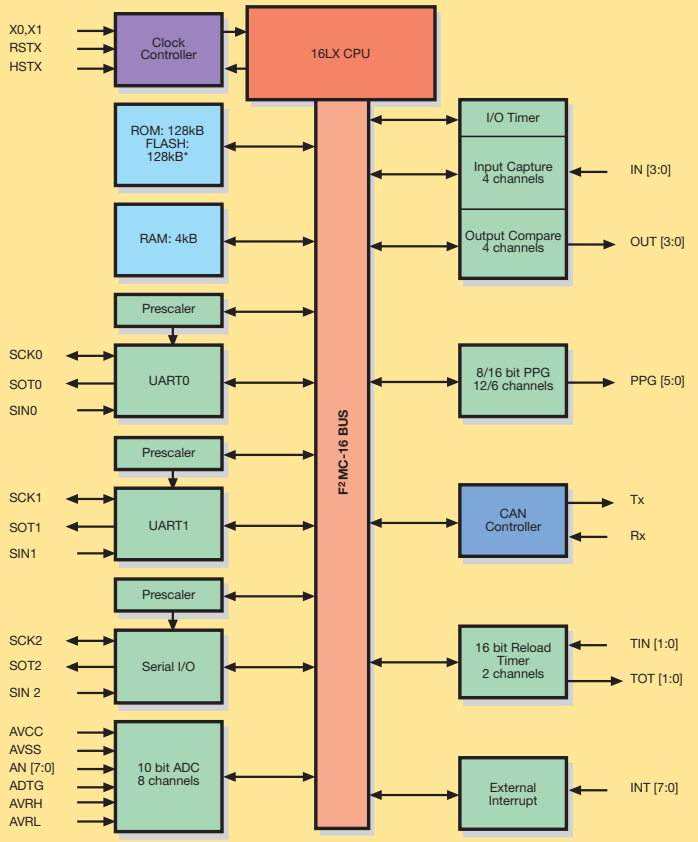
Versions with suffix GS do not support sub-clock
❖ Possible combinations: 8-ch ICU & 2-ch OCU or 6-ch ICU & 4-ch OCU

Shows the rich peripheral mixture of the MB90545G Series with external bus and full CAN performance

The **MB90595G** series is designed for mid- to high-end 16 bit automotive applications, especially dashboards as it features four on-chip stepper motor controller-drivers. It also contains a wealth of general-purpose peripherals such as UARTs, A/D converter and input capture / output compare. A security feature is incorporated in this family, preventing unauthorised reading of the Flash memory.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 128kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM.
- Full CAN 2.0A/2.0B interface with flexible buffering
- 4kB RAM
- Stepper Motor Controller-Driver 4 channel
- 2 UARTs
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 4-ch
- Output compare 16 bit x 4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit or 8 bit x 6-ch
- QFP 100 package
- -40 to +105°C temperature range



* ROM Version = MB90598G (128kB ROM, 4kB RAM)

* FLASH Version = MB90F598G (128kB Flash, 4kB RAM)

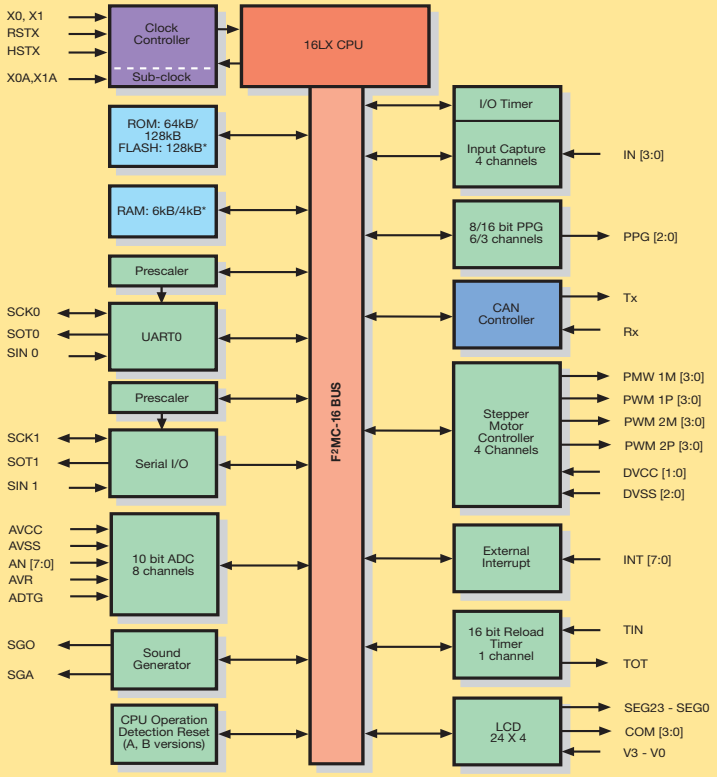
Shows the MB90595G Series with 4 stepper motor controller-drivers and full CAN performance

The **MB90425GA/B/C** series offers a highly integrated CAN solution for dashboard and other applications with a wealth of on-chip peripherals including four stepper motor controller-drivers, sound generator and a 24x4 segment LCD controller.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 64/128kB Flash ROM (with single voltage and 10k erase cycles), or 64kB Mask ROM
- Full CAN 2.0A/2.0B interface with flexible buffering
- 6kB/4kB RAM
- 32kHz sub-clock
- LCD controller-driver 24 segments x 4 commons
- Stepper Motor Controller-Driver 4 channel
- Sound generator
- UART
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 4-ch
- Reload timer 16 bit x 1-ch
- Programmable pulse generator 16 bit x 3-ch or 8 bit x 6-ch
- CPU operation detection circuit (A and B version only)
- QFP 100 package
- -40 to +105°C temperature range

Shows the MB90425G Series with LCD controller, 4 stepper motor controller-drivers and full CAN performance



* ROM Version = MB90427GA/B/C (64kB ROM, 4kB RAM
= MB90428GA/B/C (128kB ROM, 6kB RAM

* FLASH Version = MB90F428GA/B/C (128kB Flash, 6kB RAM)

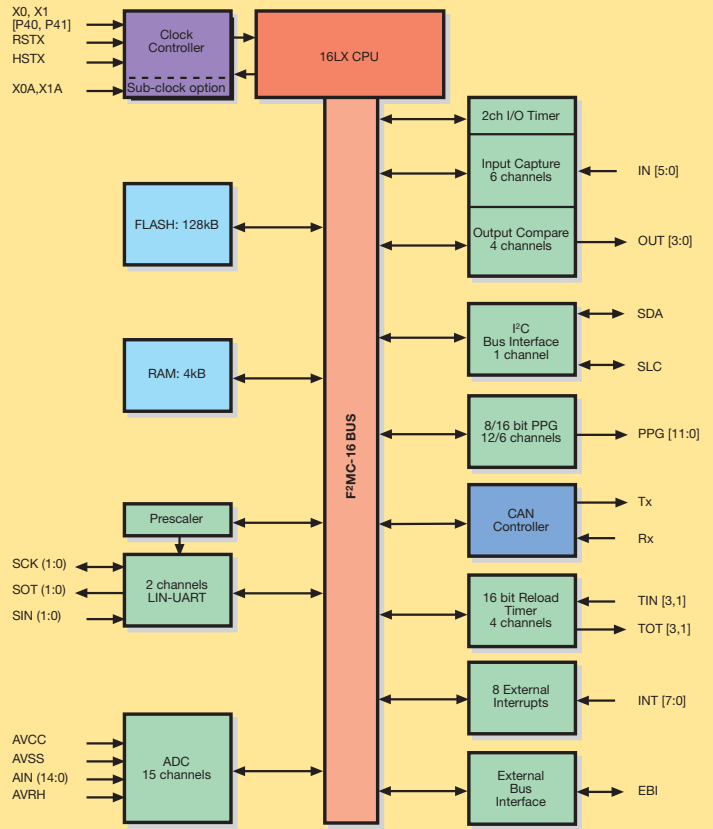
A version = no sub-clock support, CPU operation detection reset circuit
B version = sub-clock support, CPU operation detection reset circuit
C version = sub-clock support, no CPU operation detection reset

The **MB90350** series is a derivative of the new MB90340 series for applications which require small packages. This series offers 16 bit performance at low cost and a rich feature mix in a small package. It provides an entry level to the new MB90340 series with full soft- and hardware compatibility of the embedded peripherals. CAN, I²C bus, flexible UART interface providing LIN support and 15 analogue input channels are some of the main features. A security feature is incorporated, preventing unauthorised reading of the contents of the Flash memory.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- Flash security function
- 128kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- Full CAN 2.0A/2.0B interface with flexible buffering
- 4kB RAM
- 32kHz sub-clock
- LIN-UART 2-ch
- External interrupts 8-ch
- A/D converter 10 bit x 15-ch
- Input capture 16 bit x 6-ch
- Output Compare Unit 16 bit x 4-ch
- Reload timers 16 bit x 4-ch
- Programmable pulse generator 16 bit x 6-ch or 8 bit x 12-ch
- QFP 64 package
- -40 to +105°C temperature range

Shows the small sized MB90350 Series with LIN-UART, I²C-bus, 15AD-channels, external bus and full CAN performance



Flash Version = MB90F352/S/C/CS (128KB Flash, 4KB RAM)

Versions with suffix S = no sub-clock, two additional Port Pins
Versions with suffix C = 1ch. I²C bus interface
Versions without suffix C = no I²C bus interface

16 BIT SINGLE/DOUBLE CAN BUS MICROCONTROLLERS

The **MB90340** Series is a new CAN microcontroller in 0.35µm technology with many embedded peripherals. Numerous new devices are under development for this series, featuring different RAM/ROM sizes and different mixtures of peripherals. This enables the easy migration to other MCUs in this series, thus saving development time and costs.

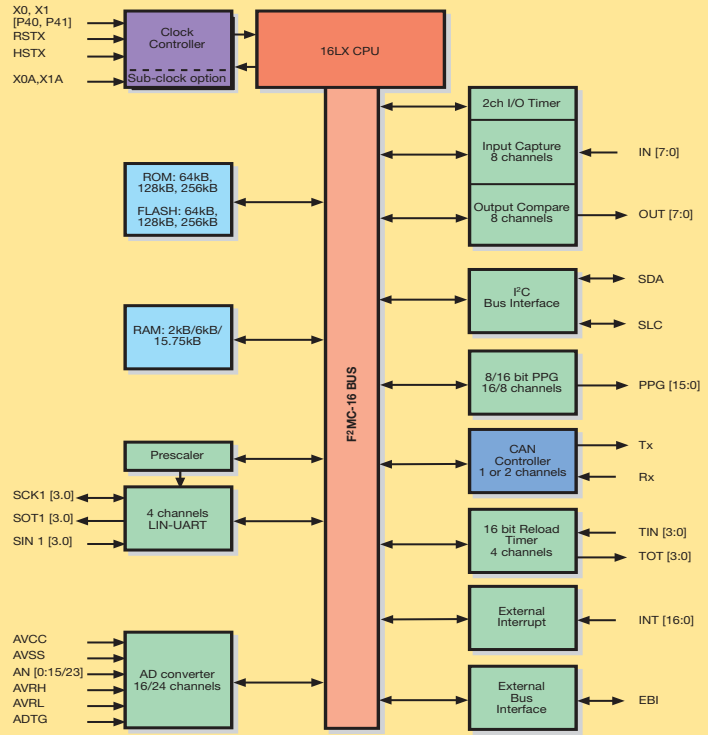
LIN support, optional I²C bus interface, up to 24 analogue input channels, external bus interface, selectable port levels for CMOS, TTL and automotive levels are some of the enhanced features of this series.

Moreover a pin compatible dual CAN derivative can also be offered in this series. A security feature is incorporated, preventing unauthorised reading of the contents of the Flash memory.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 64kB, 128kB, 256kB Flash ROM or 64kB, 128kB 256kB Mask ROM
- Flash security function
- Full CAN 2.0A/2.0B interface with flexible buffering
- 2kB, 6kB, 15.75kB RAM
- 32kHz sub-clock
- External bus interface
- 4 channel LIN-UART
- External interrupts 8-ch
- A/D converter 10 bit x 16/24-ch
- Input capture 16 bit x 8-ch
- Output compare 16 bit x 8-ch
- Reload timers 16 bit x 4-ch
- Programmable pulse generator 16 bit x 8-ch or 8 bit x 16-ch
- QFP 100 package
- -40 to +105°C temperature range

Shows the MB90340 Series with LIN-UART I² C -bus, 24AD-channels, external bus and full CAN performance



Flash Versions = MB90F346/C/S/CS (64KB Flash, 2KB RAM), single CAN
= MB90F347/C/S/CS (128KB Flash, 6KB RAM), single CAN
= MB90F342/C/S/CS (256KB Flash, 15.75KB RAM), dual CAN

ROM Versions = MB90346/C/S/CS (64KB Flash, 2KB RAM), single CAN
= MB90347/C/S/CS (128KB Flash, 6KB RAM), single CAN
= MB90342/C/S/CS (256KB Flash, 15.75KB RAM), dual CAN

versions with suffix S: no sub-clock support
versions with suffix C: 24 channels ADC, 2 channels I²C bus interface
versions without suffix C: 16channels ADC, no I²C bus interface

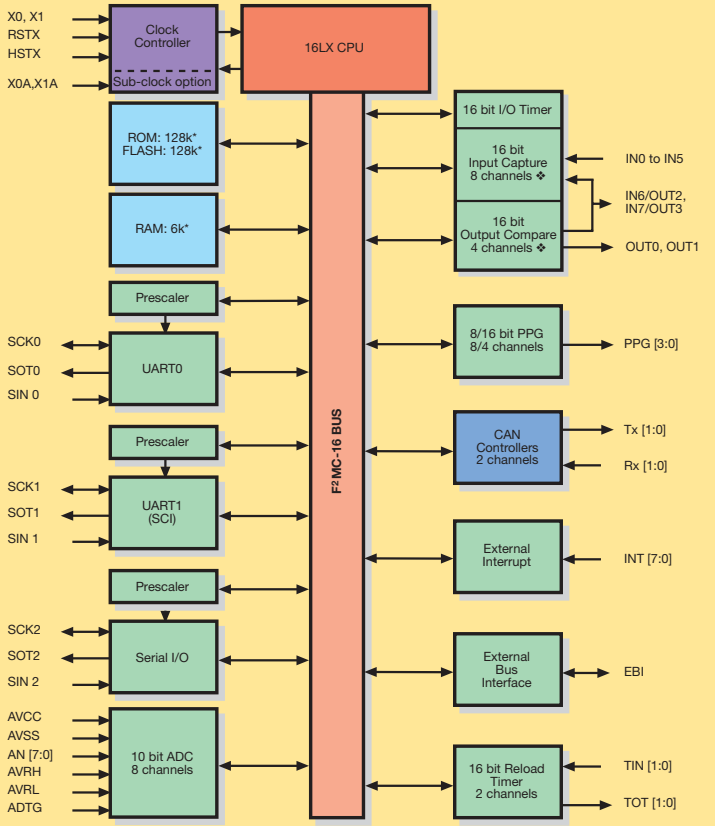
16 BIT DOUBLE CAN BUS MICROCONTROLLERS

The **MB90540G** series is a dual CAN microcontroller with a rich set of peripherals, features and designed for general-purpose CAN applications. The functions that particularly distinguish it from other devices in Fujitsu's range are the inclusion of an external bus interface and a 32kHz sub-clock. The MB90540 series is completely upwards compatible with its single and triple CAN counterparts.

A security feature is incorporated, preventing the unauthorised reading of the contents of the Flash ROM.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 128kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- Flash security function
- 2 Full CAN 2.0A/2.0B interfaces with flexible buffering
- 6kB RAM
- 32kHz sub-clock
- External bus interface
- 2 UARTs
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 8/6-ch
- Output compare 16 bit x 2/4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 4-ch or 8 bit x 8-ch
- QFP 100 package
- -40 to +105°C temperature range



* ROM Version = MB90543G/GS (128kB ROM, 6kB RAM)
* FLASH Version = MB90F543G/GS (128kB Flash, 6kB RAM)
Versions with suffix GS do not support sub-clock
❖ Possible combinations: 8-ch ICU & 2-ch OCU or 6-ch ICU & 4-ch OCU

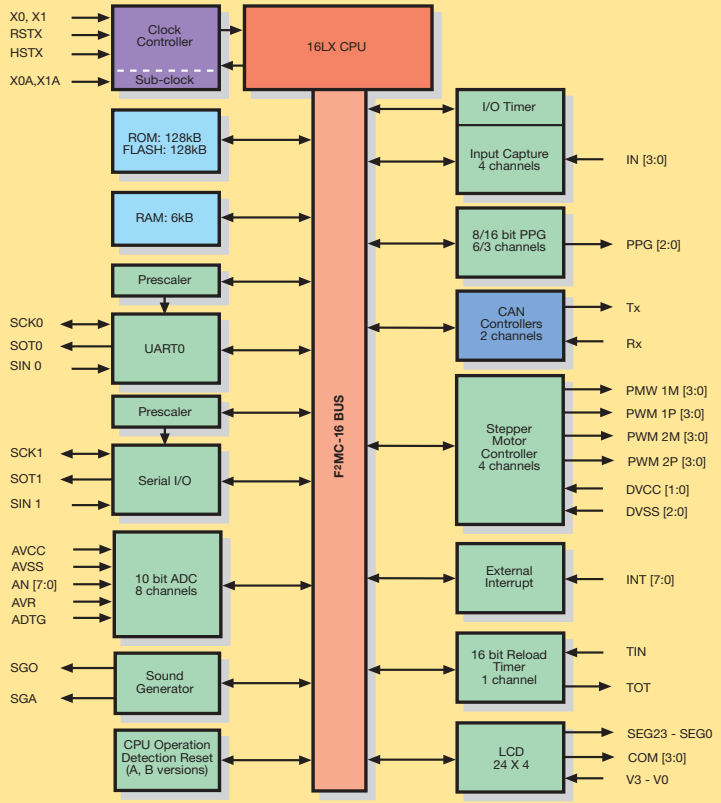
Shows the MB90540 Series with external bus and full dual CAN performance

The **MB90420GA/B/C** series offer two CAN interfaces and are fully pin and software compatible to MB90425 series. Thus migration to a two CAN solution is very easy, shortening development time and costs.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 128kB Mask version Flash ROM (with single voltage and 10k erase cycles)
- Full CAN 2.0A/2.0B interface with flexible buffering
- 6kB RAM
- 32kHz sub-clock
- LCD controller-driver 24 segments x 4 commons
- Stepper Motor Controller-Driver 4 channel
- Sound generator
- UART
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 4-ch
- Reload timer 16 bit x 1-ch
- Programmable pulse generator 16 bit x 3-ch or 8 bit x 6-ch
- CPU operation detection circuit (A and B version only)
- QFP 100 package
- -40 to +105°C temperature range

Shows the MB90420G Series LCD controller, 4 stepper motor controller-drivers and full dual CAN performance



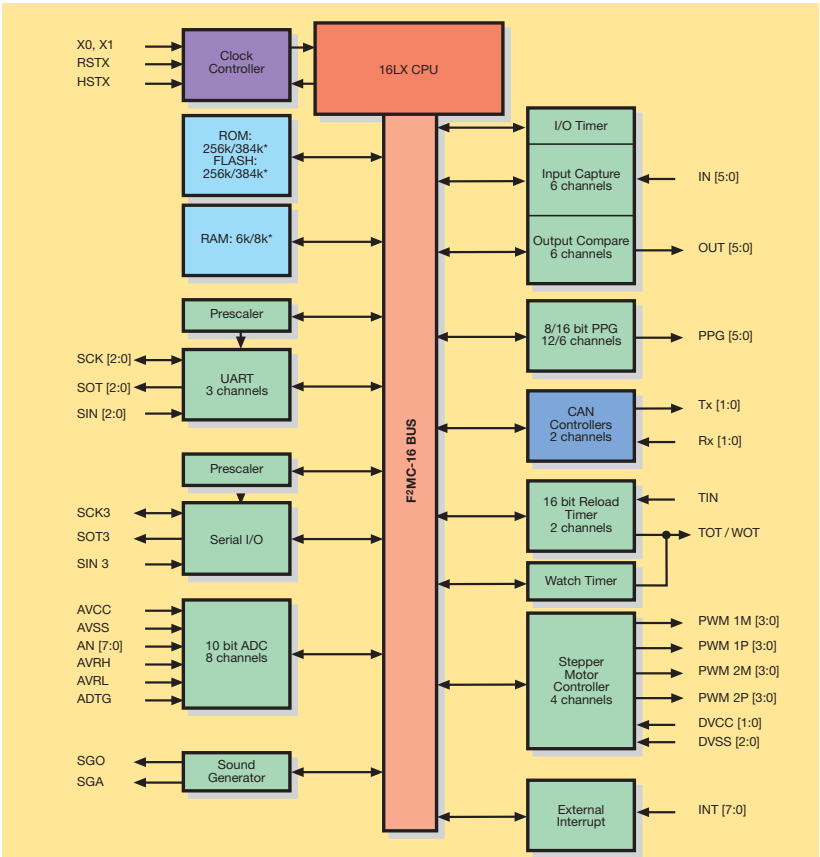
ROM Version = MB90423GA/B/C (128KB ROM, 6KB RAM)
Flash Version = MB90F423GA/B/C (128KB Flash, 6KB RAM)

A version = no sub-clock support, CPU operation detection reset circuit
B version = sub-clock support, CPU operation detection reset circuit
C version = sub-clock support, no CPU operation detection reset circuit

The **MB90590** series is designed for high-end 16 bit automotive applications, especially dashboards as it features four on-chip stepper motor controller-drivers and sound generator. It also contains a high quantity of on-chip Flash or Mask ROM and RAM.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 256kB/384kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- 2 Full CAN 2.0A/2.0B interfaces with flexible buffering
- 6kB/8kB RAM
- Stepper Motor Controller-Driver 4 channel
- Sound generator
- 3 UARTs
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 6-ch
- Output compare 16 bit x 6-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 6-ch or 8 bit x 12-ch
- QFP 100 package
- -40 to +85°C temperature range

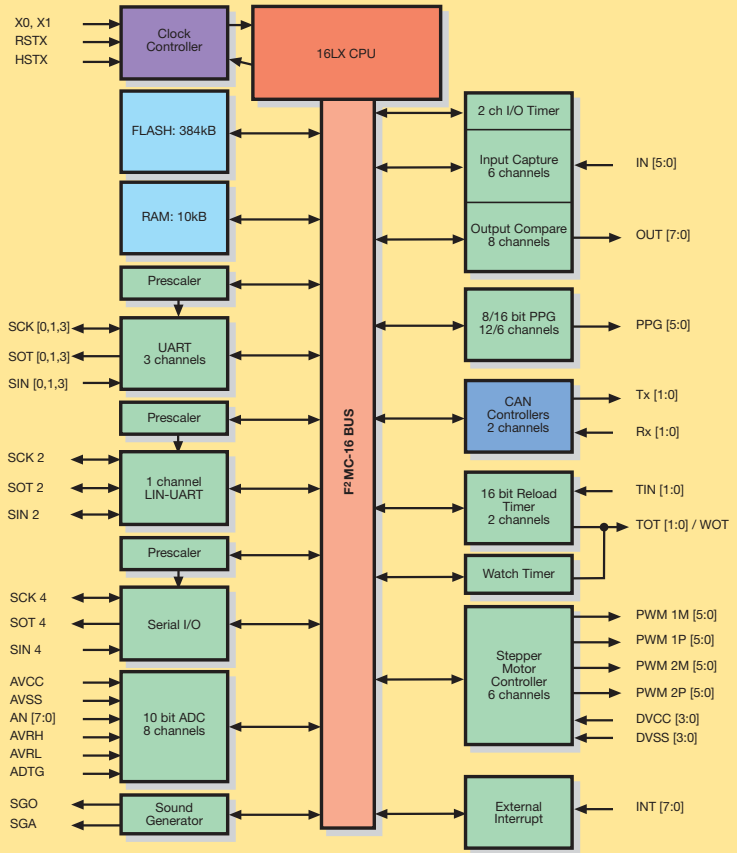


Shows MB90590 Series with Stepper Motor Controllers

The **MB90390** series is an enhanced upgrade of the MB90590 series. It is designed for high-end 16 bit automotive applications, especially dashboards. So operation frequency has been increased to 20MHz combined with new features such as 6 on-chip stepper motor controllers larger embedded Flash memory and SRAM.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 384kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- 2 Full CAN 2.0A/2.0B interfaces with flexible buffering
- 10kB RAM
- Stepper Motor Controller-Driver 4 channel
- Sound generator
- UART 2-ch
- LIN-UART 1-ch
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 6-ch
- Output compare 16 bit x 6-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 6-ch or 8 bit x 12-ch
- QFP 120 package
- -40 to +85°C temperature range



Shows the MB90390 Series with 6 stepper motor controller-drivers, LIN-UART and full dual CAN performance

Flash version = MB90F394H (384KB Flash, 10K RAM)

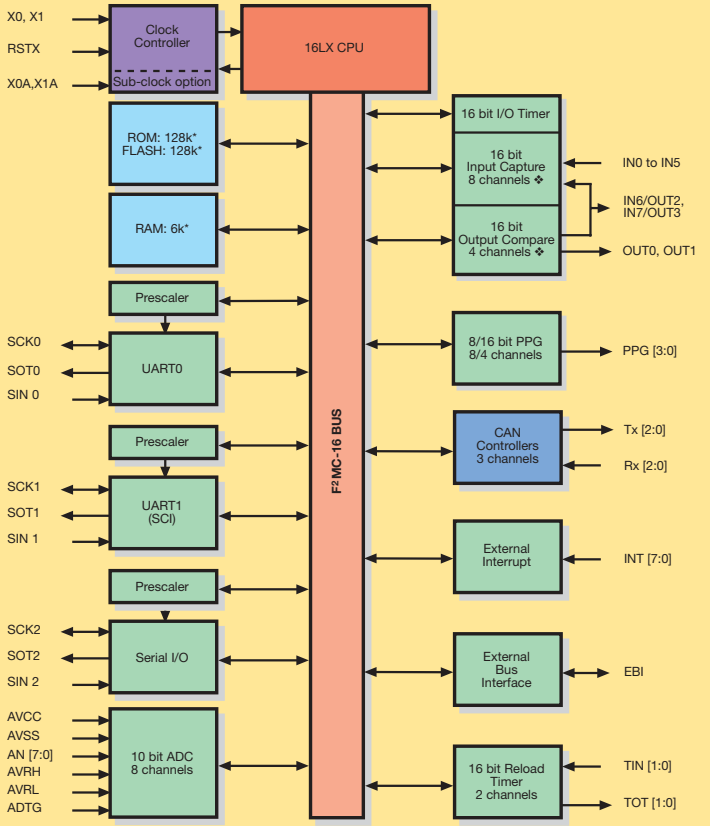
16 BIT TRIPLE CAN BUS MICROCONTROLLERS

The **MB90440G** series offers the same peripherals as MB90540 and MB90545 series but features a 3rd CAN Interface. Thus the migration between these three series is easy. Application areas of these products are demanding automotive body control applications. An external bus interface allows connection to off-chip memory.

A security feature is incorporated, preventing the unauthorised reading of the contents of the Flash ROM.

Features

- Fujitsu F²MC-16LX microcontroller architecture
- 128kB Flash ROM (with single voltage and 10k erase cycles), or Mask ROM
- Flash security function
- 3 Full CAN 2.0A/2.0B interfaces with flexible buffering
- 6kB RAM
- 32kHz sub-clock
- External bus interface
- 2 UARTs
- Synchronous serial I/O
- External interrupts 8-ch
- A/D converter 10 bit x 8-ch
- Input capture 16 bit x 8/6-ch
- Output compare 16 bit x 2/4-ch
- Reload timers 16 bit x 2-ch
- Programmable pulse generator 16 bit x 4-ch or 8 bit x 8-ch
- QFP 100 package
- -40 to +105°C temperature range



* FLASH Version = MB90F443G (128kB Flash, 6kB RAM)

❖ Possible combinations: 8-ch ICU & 2-ch OCU or 6-ch ICU & 4-ch OCU

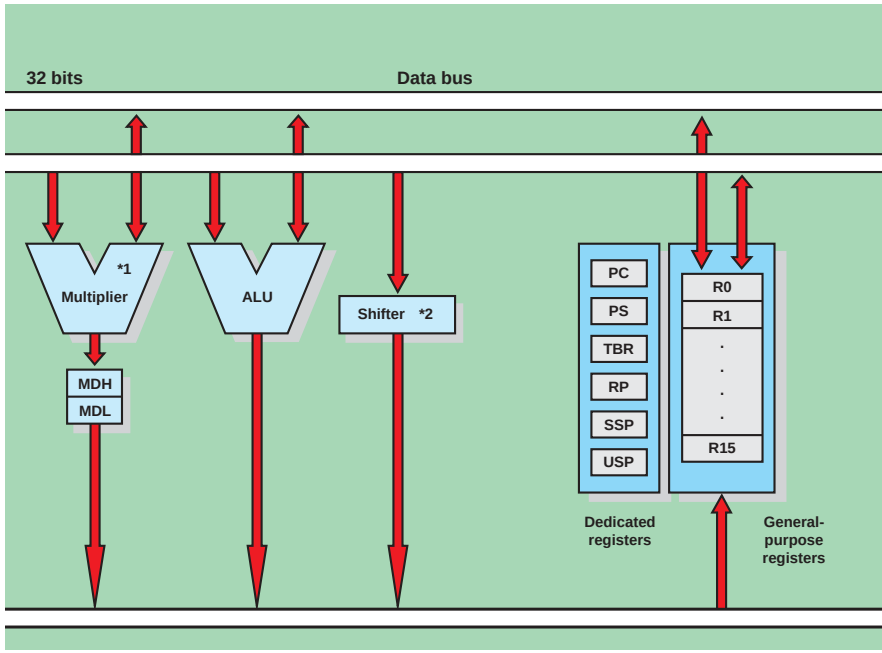
Shows the MB90440 Series with external bus and full triple CAN performance

INTRODUCTION TO FR SERIES - 32 BIT RISC ARCHITECTURE

The Fujitsu RISC (FR) architecture is a 32 bit microprocessor core which is dedicated to resolving the twin demands of high performance coupled with low cost, which are needed by today's high-end automotive, consumer and telecom applications.

Designed from the outset to be optimised for embedded applications, the CPU has a 16 bit instruction Op Code, enabling maximum performance from low cost, half word external memory and instruction cache widths, or else allowing double instruction fetches for each bus cycle. The CPU employs the same five-stage pipeline and 32 x 32 Multiplier as the successful SPARClite family but adds a new barrel shifter and a bit search unit which finds the first 1, 0 or change in a data word in a single cycle. The concept of the instruction cache architecture with its flexible locking mechanism is also replicated.

The CPU has eight dedicated 32 bit registers: program counter, processor status, interrupt table base register, return pointer, supervisor and user stack pointers and two for multiply/divide result. There are sixteen 32 bit, general-purpose registers arranged as a single bank. The functions of R13 to R15 are reserved as virtual accumulator, frame pointer and stack pointer respectively. The instruction set contains many bit manipulation instructions and data moving instructions, which are very helpful in supporting the on-chip peripheral blocks.



KEY ***1**: 32 bit x 32 bit: 5 clock cycles. 16 bit x 16 bit: 3 clock cycles **PC**: Program counter **PS**: Program status **TBR**: Table base register **RP**: Return pointer **SSP**: System stack pointer **USP**: User stack pointer **MDH/MDL**: Multiplication and division result register

Although the FR is a RISC, it contains a number of extended instructions, which help assembly level programming, often unavoidable in embedded applications. An example is the store of half of the register bank to memory.

Blocks that require fast access are connected to the FR-core within a 32 bit Harvard Bus system. These units are the instruction cache, internal RAM, the DMA-controller and the bit-search unit. Resources that require simple control or status access, such as UARTs, timers, etc., are hooked up on a 16 bit peripheral bus known as the R-Bus. The R-Bus gateway to the FR-core is a bus-convertor module like the one for the external bus interface.

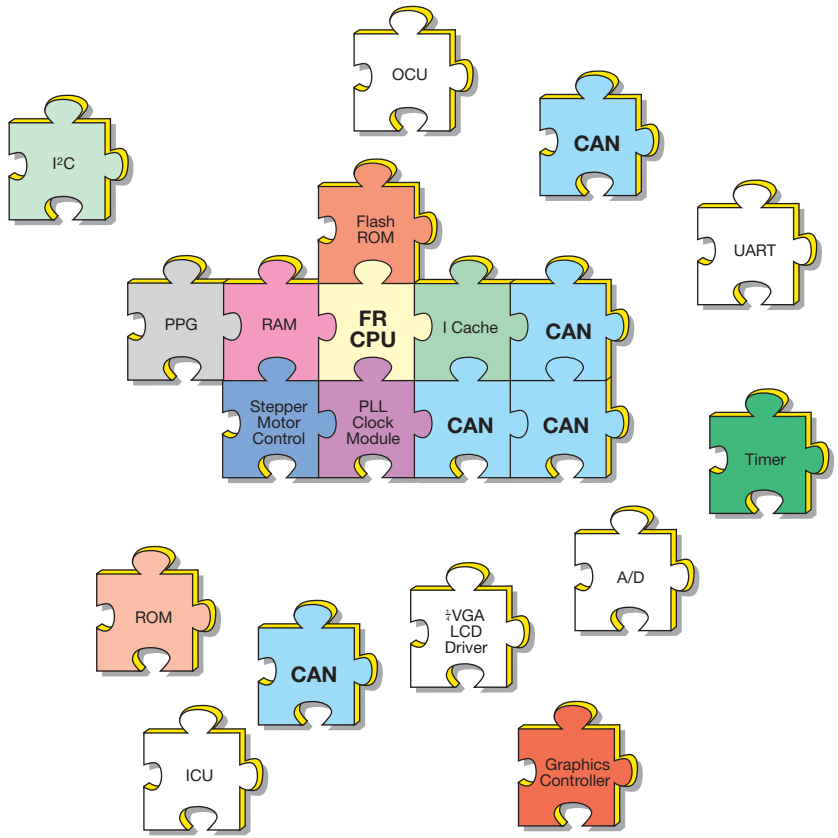
The external bus also gives the user the opportunity to access external memory or other memory-mapped devices on the target application, supporting up to 8 fully configurable chip-select areas with external chip-select pins which can be controlled individually in terms of memory-area, bus-width, wait-states or alignment.

FR+CAN BUS MICROCONTROLLERS

The MB91360 series represents not only a huge leap forward in the level of integration and performance of CAN Bus microcontrollers but also should be viewed as a 'jumping off point' for customised and application specific solutions in Automotive electronic systems. This will be more than just a number of individual products; it is a whole new modular concept encompassing dashboards, navigation systems and body electronics based on Fujitsu's FR 32 bit RISC CPU. At the heart of these applications lies Fujitsu's CAN Bus macro which is in fact implemented four times on the MB91FV360G evaluation device.

Derivatives of the FR+CAN both for the open market and specific customers are planned or in design.

A special team within Fujitsu's European Microcontroller Design Centre is dedicated to these projects. Variations will include stripped-down parts for lower cost body and steering column applications, versions with many CAN Bus controllers for linking between different CAN circuits and high-end types with graphics and LCD display driving capabilities for navigation systems.



Shows the modular building block concept of the FR Family

MB91360 SERIES FR 32 BIT RISC TRIPLE CAN MICROCONTROLLERS

Created in Fujitsu's 0.35µm CMOS process, the triple CAN, MB91F362G Flash ROM version contains some 5 million transistors in 160 logical blocks. The FR CPU clocks at 64MHz internally and is supported by 4kB of Instruction RAM and 16kB RAM. It is conceived as the part ideally suited to the needs of the next generation of dashboards, including on-chip features such as stepper motor controllers, real-time watch timer, sound generator, high-current LED drivers and PPGs for light dimmers.

It also contains a wealth of general- purpose peripheral blocks such as 16-channels of 10 bit A/D and 2-channels of 10 bit D/A converter, 4-channels each of input capture and output compare, six reload timers and 8 external interrupts. Additional serial communications are 3 UARTs, 2 synchronous serial ports and an I^2C.

Power down management features include reset if the voltage drops below a defined threshold and over/ under voltage detection interrupt.

Key Features MB91360 Series

- 32 bit core CPU; max. 64MHz/ 15.6ns internal cycle time from 4MHz clock
- 0.35µm CMOS Technology
- Internal voltage regulator
- supports 3V MCU core from 5V supply, offering low EMI and low power consumption figures
- built-in clock modulator for EMC optimisation
- CAN 2.0B protocol controllers:
  - 16 message buffers, each individually programmable for: Transmit or receive
  - 11 or 29 identifier bits
  - Full identifier bit compare/full mask/compare against 1 of 2 mask registers
  - Ability to group buffers into flexible multi-level configuration
  - Readable error counter
- 512kB FLASH ROM; supports automatic programming, 10,000 erase cycles, 10 year data retention time, no second, separate programming voltage required
- 4kB instruction RAM
- up to 32kB static RAM
- 5 channels DMA, external and internal channels with 16 sources
- Internal boot ROM
- Up to 8 external interrupts + NMI
- Power down reset if supply voltage falls below pre-set threshold
- Under/over voltage detection
- ADC: up to 16 channel analogue inputs, resolution 10 bits
- DAC: up to 2 channel analogue outputs, resolution 10 bits
- ICU (Input Capture) 16 bit
- OCU (Output Compare) 16 bit
- Programmable pulse generator 16 bit
- Stepper motor controller
- UART full duplex up to 500kBaud (LIN optional)
- I^2C Bus controller up to 400kHz
- Synchronous serial I/O up to 1Mbit/s
- Re-load timer 16 bit
- LED driving port
- Sound generator
- Real-time watch timer
- Same emulation system for entire series
- Different package options from 120-pin to 208-pin (QFP)

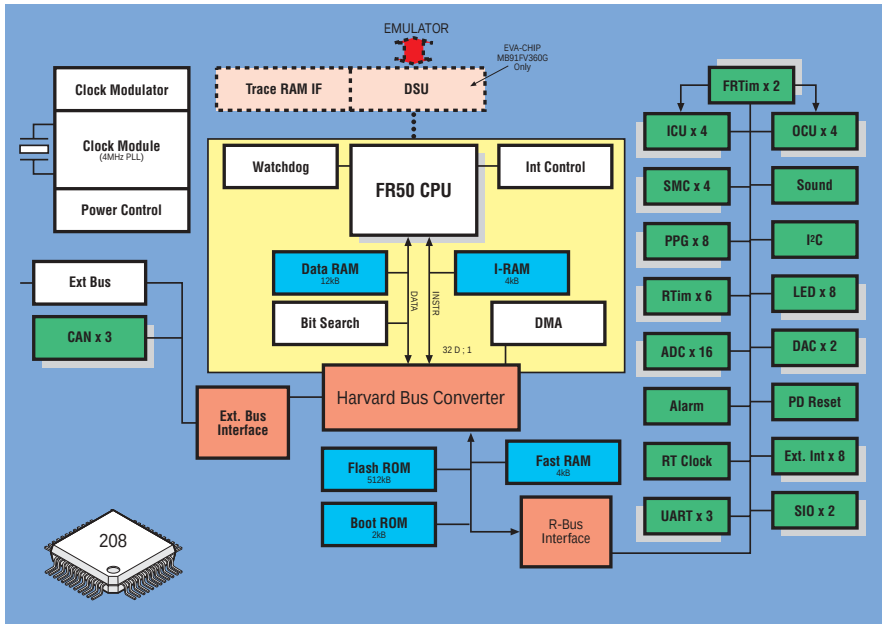
MB91360G SERIES

The MB91360G Series offers devices with the same core, but with different peripheral and package options:

The MB91F362G is the successor of the MB91F361 (both chips are 100% pin-, resource- and instruction-compatible) and as Fujitsu's most complex 32 bit microcontroller it offers over 20 on-chip peripherals including 3 CAN controllers, external bus interface and stepper-motor controllers. The package used for the MB91F362G is a QFP208.

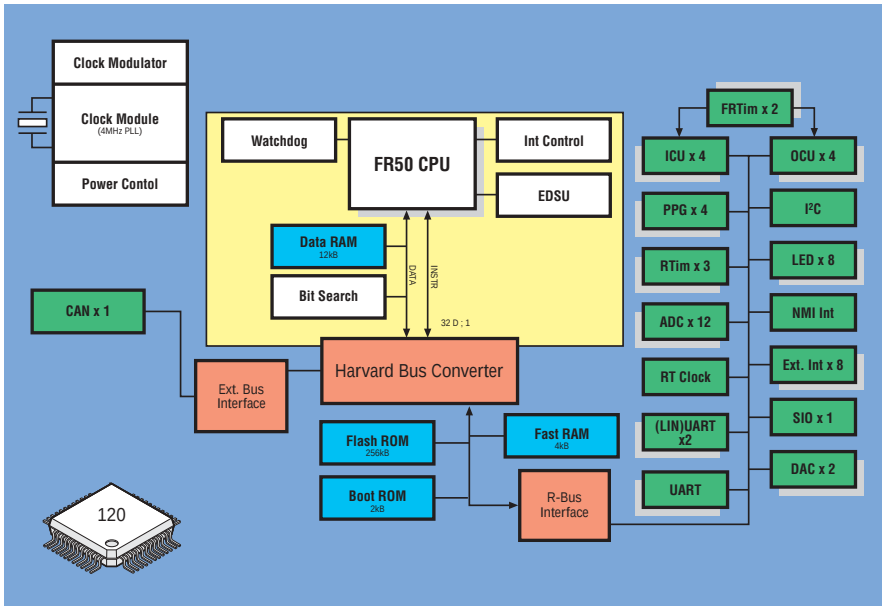
With its new MB91F364G, Fujitsu now offers a 32 bit single CAN interface device for applications demanding a small footprint. This new device satisfies today's requirement for higher performance coupled with 'platform'-based solutions, where many compatible devices are used for a wide variety of applications.

The device has a host of on-chip peripherals including UARTs, I²C and serial synchronous interfaces, in addition to the CAN interface, 16 bit reload timers, input-capture/output-compare units and real-time clock, as well as a 12-channel ADC and 8 external interrupts. This wealth of peripherals enables the MB91F364G to be used in a wide range of applications from automotive to industrial.



Shows MB91F362G - featuring 3 x CAN and more than 20 other on-chip peripherals

Particularly important for single-chip applications is the new on-chip Embedded Debug Support Unit (EDSU), which helps software development and debugging of the final application without the use of in-circuit emulator systems. This unit provides a number of instruction and data-breakpoints including mask and range-functionality. Used together with the appropriate background software, this unit speeds up application development and offers the ability to debug in the final application.

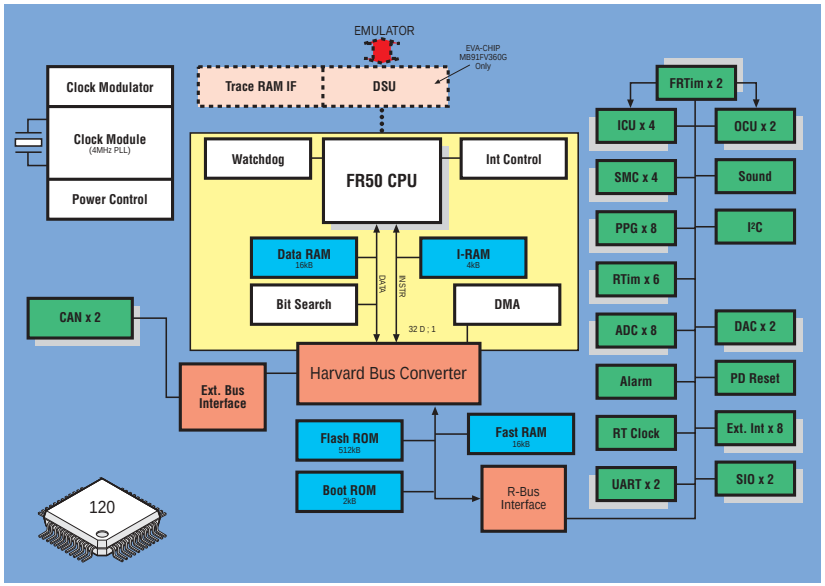


Shows MB91F364G - with new LIN-UART and EDSU

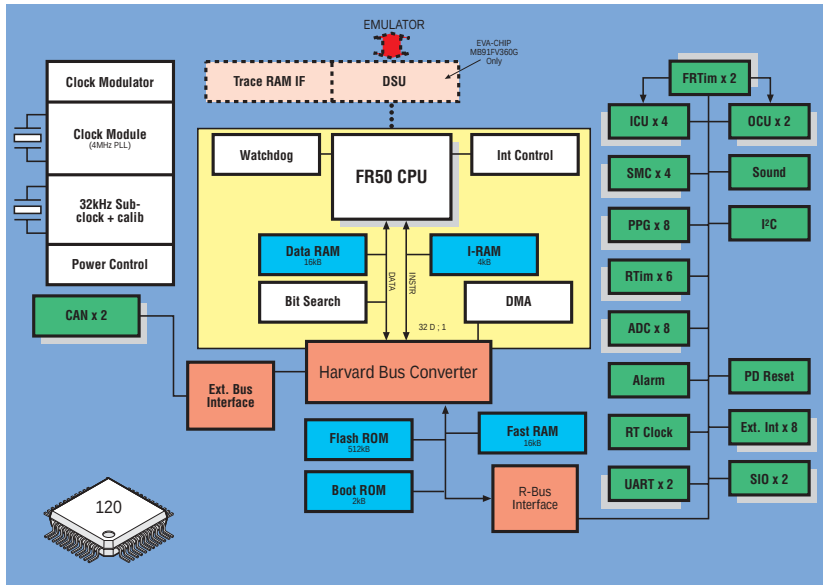
The **MB91F365G and MB91F366G** microcontrollers are powerful devices for all kinds of automotive and industrial applications, where motor-control, multiple CAN-busses and many kinds of serial interfaces are required. These devices are useful for single-chip applications (they have no external bus-interface) and are therefore housed in a compact QFP120 package.

The **MB91F366G** is a version which offers an additional 32kHz clock input for the RTC (Real Time Clock) plus calibration unit. All functions, pins and resources are 100% identical, but instead of the DAC, the MB91F366G has a 32kHz sub-clock connection which enables precise real time clock functions.

The MB91366G is the ROM variant of MB91F366G. It includes 512kB of mask ROM.



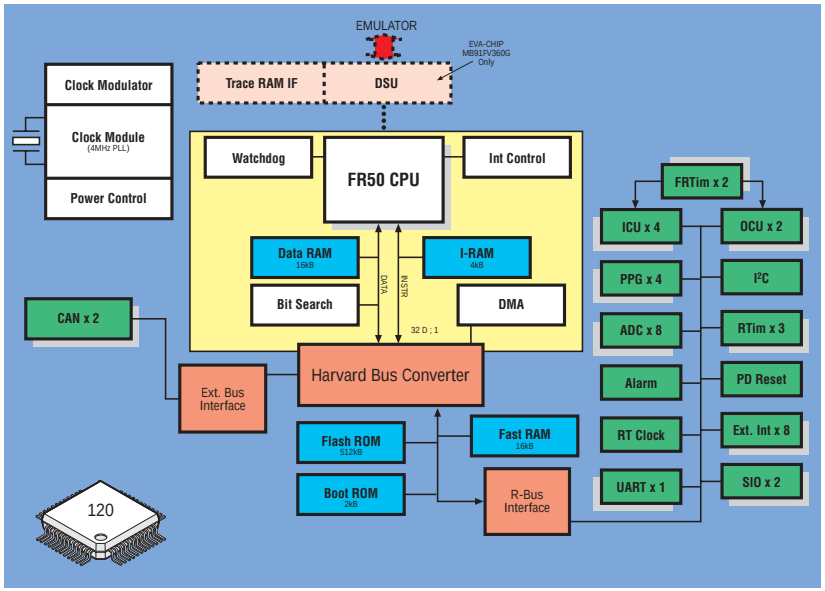
Shows MB91F365G - with 2 x CAN, SMCs and many other resources in a compact package



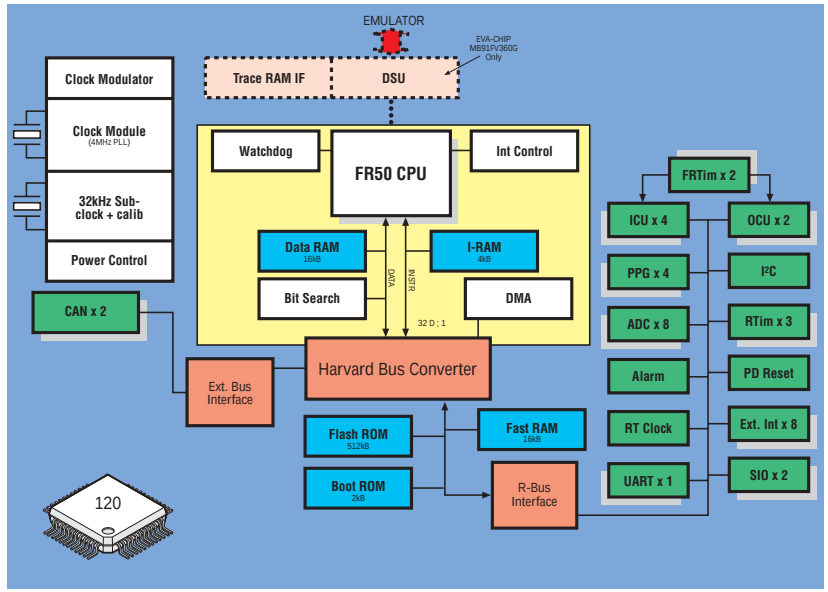
Shows MB91F366G - like F365G, but featuring a 32kHz sub-clock with calibration unit

The **MB91F367G and MB91F368G** microcontrollers are strip-down versions to fulfil the needs of small-footprint applications which require no external bus-interface and no special peripheral functions such as stepper-motor drivers, etc. For both devices, 120-pin packages are used and they offer 2 CAN controllers and a set of standard peripherals such as timers, serial interfaces, input capture/output compare units and many more.

The **MB91F368G** is a version which offers an additional 32kHz clock input for the RTC (Real Time Clock) plus calibration unit. All functions, pins and resources are 100% identical. Therefore this device can be used where accurate real-time clock information is mandatory.



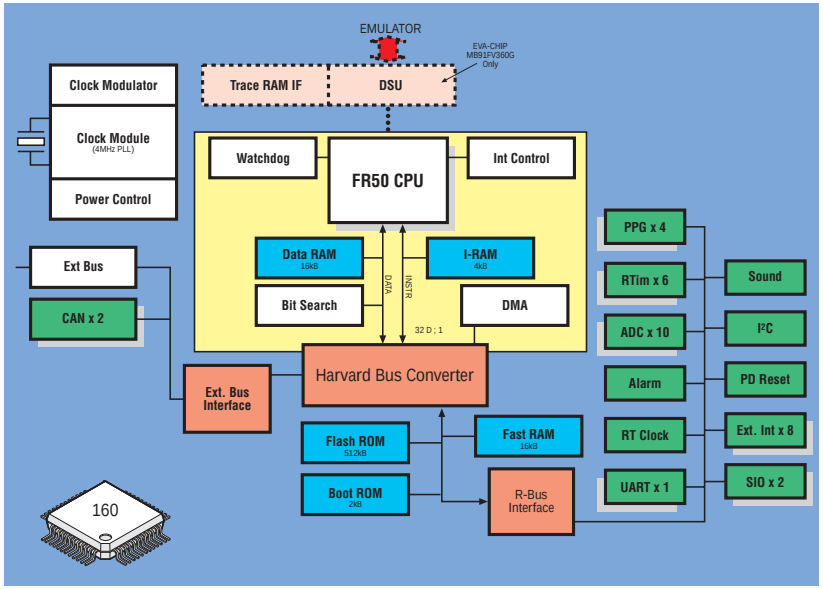
Shows MB91F367G - implementing 2 x CAN



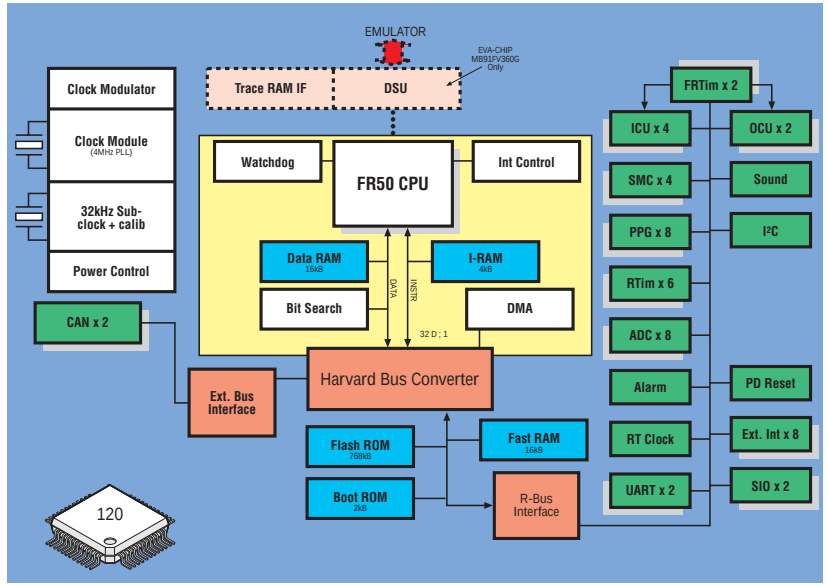
Shows MB91F368G - like F367G, but featuring a 32kHz sub-clock with calibration unit

Another member is the **MB91F369G**, a 160-pin version with 2 CAN controllers and a special external bus-interface for the Fujitsu Graphic Controllers. The MB91F369G is the ideal microcontroller for applications using these new graphic chips, but having all the benefits of the MB91360 family members (Flash, CAN, fast FR core, etc.).

The latest addition to the MB91360G family is the **MB91F376G**. This device is fully compatible to the MB91F366G, but it offers 768kB of flash memory.



Shows MB91F369G - ideally for support of Fujitsu Graphic Controllers



Shows MB91F376G - identical to F366G, but featuring 768kB of on-chip flash memory

	MB91FV360*	MB91F362G	MB91F364G	MB91F365G	MB91F366G	MB91F367G	MB91F368G	MB91F369G	MB91F376G
Package	PGA 401	QFP 208	QFP 120	QFP 120	QFP 120	QFP 120	QFP 120	QFP160	QFP160
Flash on F-Bus: size [kByte]	512	512	256	512	512	512	512	512	768
Boot ROM size [kByte]	2	2	2	2	2	2	2	2	2
D-Bus-RAM size [kByte]	16	12	12	16	16	16	16	16	16
F-Bus-RAM size [kByte]	16	4	4	16	16	16	16	16	16
I-RAM size [kByte]	4	4	-	4	4	4	4	4	4
Bit Search Module	1	1	1	1	1	1	1	1	1
DMA (5 channels), external ch	3	1	-	-	-	-	-	1	-
ext. Bus interface	yes	yes	no	no	no	no	no	yes	no
CAN channels	4	3	1	2	2	2	2	2	2
I^2C with 400 / 100kbit	1	1	1	1	1	1	1	1	1
UART/UTIMER [ch]	3	3	3 (2 LIN)	2	2	1	1	1	2
ICU [ch]	4	4	4	4	4	4	4	-	4
OCU [ch]	4	4	4	2	2	2	2	-	2
Free running Cnt. [ch]	2	2	2	2	2	2	2	-	2
SIO [ch]	2	2	1	2	2	2	2	2	2
PPG [ch]	8	8	4	8	8	4	4	4	8
10 bit ADC [ch]	16	16	12	8	8	8	8	8	8

	MB91FV360*	MB91F362G	MB91F364G	MB91F365G	MB91F366G	MB91F367G	MB91F368G	MB91F369G	MB91F376G
Reload-Timer [ch]	6	6	3	6	6	3	3	6	6
DAC [ch]	2	2	2	2	-	-	-	-	-
ext. Interr. [ch]	8	8	8 + NMI	8	8	8	8	8	8
Stepper Motor Ctrl [ch]	4	4	-	4	4	-	-	-	4
Sound generator	1	1	-	1	1	-	-	-	1
Alarm Comparator	1	1	-	1	1	1	1	1	1
Power-down reset	1	1	-	1	1	1	1	1	1
Real-time clock	1	1	1	1	1	1	1	1	1
RTC 32kHz input	yes	no	yes	no	yes	no	yes	no	yes
4MHz PLL	1	1	1	1	1	1	1	1	1
Clock Modulation	yes	yes	yes	yes	yes	yes	yes	yes	yes
LED Port (8 bit)	1	1	1	-	-	-	-	-	-
Watchdog	1	1	1	1	1	1	1	1	1
Voltage regulator	1	1	1	1	1	1	1	1	1
Debug Support Unit	yes	-	yes	-	-	-	-	-	-
Trace RAM Interface	yes	-	-	-	-	-	-	-	-
Temp Range °C	0..70	-40..+85	-40..+85	-40..+85	-40..+85	-40..+85	-40..+85	-40..+85	-40..+85

DEVELOPMENT TOOLS

Fujitsu offers a wide range of versatile development tools. In addition the software development environment Softune Workbench which includes C-Compiler, Assembler, Linker, Library Manager a lot of evaluation boards and In-circuit emulator systems are supplied. The following summary gives an overview about all available evaluation boards and emulator systems for 16LX and FR Family.

Softune Workbench Development Environment

The Softune Workbench is an integrated development tool which provides easy access to the tools. It incorporates the C-Compiler, Assembler, Linker, Library manager and offers also an integrated debug user interface to work with the emulator debugger or simulator. The look and feel of this development environment is throughout the families of 8, 16 and 32bit the same, which makes it very comfortable for developers to work with different series at different projects.

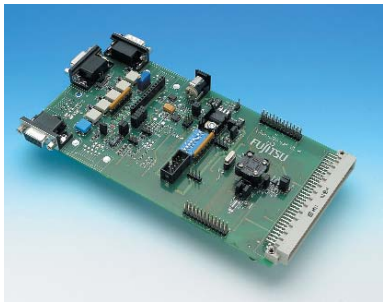
Features

- GUI language tools
- Automatic compilation and linking of associated pre-input files
- Dialog boxes for tool options and project settings
- Selection of build-in editor with error jump and syntax highlighting facility or user's own preferred editor
- On-Line help for C-Compiler, Assembler, Linker
- Integrated debugging environment for Simulator and Emulator support
- Simulator with I/O port and Interrupt stimulus
- Emulator features as:
  - Navigate functions:
  - Step-in, -over, -out, Go, Go To Line, Reset, Function Call
  - Watch window
  - Memory window
  - Read on the fly
  - CPU register window
  - Trace
  - Conditional Break

Tools for 16LX Family

Evaluation boards for 16LX Family

- Flash-CAN-120-390
  - Evaluation Board for MB90390 series
- Flash-CAN-100P-M06
  - Evaluation Board for MB90590/5, MB90540/5, MB90440, MB90420/5 Series
- Flash-CAN-100P-340
  - Evaluation Board for MB90340 Series
- Flash-CAN-64P-M09-V2
  - Evaluation Board for MB90495 Series



Flash-CAN-100P-48P-M26

- Flash-CAN-48P-M26, Flash-CAN-48P-90F387
  - Evaluation Board for MB90385 Series

In-Circuit emulator systems

- MB2141B main unit and MB2145-507 emulation pod
- MB2147-01 main unit and MB2147-10/20 emulation adaptor
- MB2147-05 low cost 16 bit Compact ICE

MB2147-01 In-Circuit Emulator

Tools for FR Family

- Evaluation boards for FR Family
  - StarterkitMB91360 Starterkit for MB91F362 and MB91F369 Series
  - StarterkitMB91364 Starterkit for MB91F364 Series

MB91360 Starterkit Evaluation Board

In-Circuit emulator system

- MB2197-01

MB2197-01 In-Circuit Emulator

REALOS, OSEK/VDX & EUROS

REALOS Real-Time OS for the F²MC-16LX and FR Family

REALOS is a Real-Time OS for the F²MC-16L/LX and FR families of microcontrollers which conforms to Version 2.01 of the µITRON specification.

Features

- High speed system calls
- High speed interrupt processing
- Up to 255 tasks for 16LX and 32767 tasks for FR Series
- Up to 16 priorities for 16LX and 32 priorities for FR Series
- Up to 46 system calls for 16LX and 50 system calls for FR Series
- Priority based and event driven scheduling system
- Kernel size from 0.8kB (resident) to 5.9kB (max) for 16LX and 2.7kB (resident) to 7.2kB for FR Series
- Multi-windows based Configurator which creates executable program with optimised environment of kernel and application programs
- Sample I/O driver
- Sample program
- Debugger macro enabling ordinary debugger to perform debugging of µITRON tasks
- Multi-windows based REALOS debugger, capable of working at the C level

OSEK/VDX

OSEK/VDX is an operating system targeted for automotive applications.

It consists of three parts, the OSEK kernel, the communications interface and the network management. Mainly automotive controller networks using CAN interfaces will employ the OSEK operating system. Both the F²MC-16LX and FR series microcontrollers are supported with optimised drivers for the Fujitsu CAN controller.

OSEK-OS defines the task types ‘Basic’ and ‘Extended’. Basic tasks cannot have a waiting state and so are suitable for those which run completely after each activation. Extended tasks can react to events; they can have a waiting state.

OSEK-OS also defines four conformance classes:

- BCC1 – basic tasks, single activation
- BCC2 – basic tasks, multiple activation
- ECC1 – basic and extended tasks, single activation
- ECC2 – basic and extended tasks, multiple activation

The FR series OSEK without CAN driver and network management requires 3.2kB ROM for class ECC1 (standard status)

EUROS Enhanced Universal Real-Time Operating System

EUROS is an innovative real-time operating system characterised by short response times, robustness, scalability and flexibility. The primary aim of EUROS development was to create a uniform, hardware-independent operating system for real-time and embedded applications which takes into account the growing complexity and diversity of processor architectures.

Features

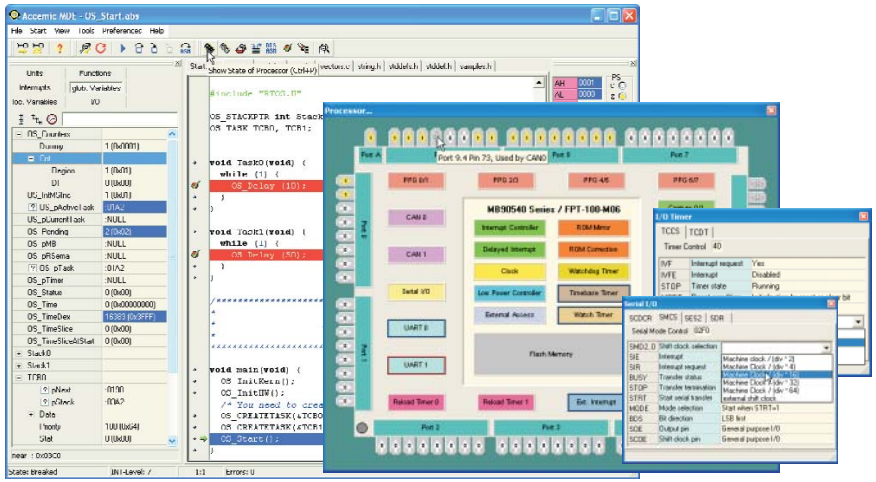
- Supports Fujitsu F²MC-16LX and FR series
- Unlimited number of system objects (tasks, mailboxes, signals, events, semaphores, drivers)
- Up to 256 priorities
- Memory management supports fixed and variable size memory blocks
- Flexible open driver interface
- Priority based scheduler with round robin support
- Re-entrant ANSI compatible C runtime library
- Generic graphic library
- TCP/IP network stack (BSD4.4 socket interface)
- Web server, FTP server, SMTP client, BOOTP client
- PPP, Ethernet
- CAN/CANopen
- MS-DOS™ compatible file system
- IDE hard disk drivers
- Floppy disk drivers
- Ramdisk, FTL for Flashdisks
- IrDA (IrLAP, IrLMP, IrComm)
- Profibus (slave)
- IEEE1394 (Firewire™)

ACCEMIC MDE MONITOR DEBUGGER

Fujitsu Microelectronics offers a Monitor Debugger for its 16LX and FR series that allows the debugging of single-chip, MCU embedded applications. The Accemic Monitor Debugger allows downloading of the debugger kernel and the application into the embedded Flash memory of the MCU. The monitor kernel can be started directly to load new programs and execute them under control. Additionally there is the option to start the user application directly after reset and enter debug mode on demand.

A special feature of this debugger is the processor status window, which shows all internal peripherals of the MCU, including pin status and direction. Detailed peripheral windows allow the user to check and modify the peripheral settings. Beside the usual available debug functionalities, online monitoring, powerful messaging functions can be linked to the application in order to send data and messages to the PC screen.

A well as a standard version, a professional version is also available, offering more powerful features. This version supports up to 16 breakpoints and the Multiprocessor/Multicore debugging feature allows different processors in a CAN network to be controlled at the same time. With the Accemic HSCI option several communication channels to the target MCU can be used: CAN, UART asynchronous mode, UART synchronous mode, emulation of serial communication via free I/O ports.



Accemic is a Munich-based third party supplier to Fujitsu.

A demonstration version of the Accemic MDE is available and can be downloaded either from the Fujitsu Microelectronics Europe (www.fme.gsdc.de.gsdc.htm) or from Accemic (www.accemic.com) web site.

Main Features

- Memory usage
  - ROM: 8kByte monitor kernel size +256Byte configuration data
  - RAM 128Byte used by Kernel
- Two hardware breakpoints
- Single Step, Step-In, Step-Out, Step-Over functions
- CALL function
- Target Message Window
- Debugging on C-Source code or Assembler level
- Dedicated Debug Windows
  - Source Window
  - Mixed Mode view for C-Source and Assembler view
  - Watch Window
  - Memory Window
  - Stack Window
  - Interrupt Vector table
  - CPU Core Register Window
  - Peripheral Status Window
  - Processor Status Window shows register contents of the internal MCU peripherals
- Browser Window
  - Interrupts, Functions, Units, Local/Global Variables, I/O Registers
- On-line help
- Supported devices:
  - MB90385 Series
  - MB90390 Series
  - MB90425 Series
  - MB90435 Series
  - MB90455 Series
  - MB90460 Series
  - MB90470 Series
  - MB90495 Series
  - MB90520 Series
  - MB90540/545 Series
  - MB90560/565 Series
  - MB90570 Series
  - MB90580 Series
  - MB90590/595 Series
  - MB91F364G

Debugger order number - MonDebugger16LX-ACC.

ACCEMIC accelerate your microcontroller design

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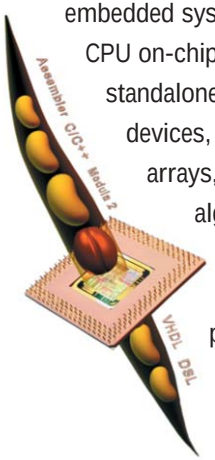
PROCESSOR EXPERT 2.70 FOR FUJITSU 16LX

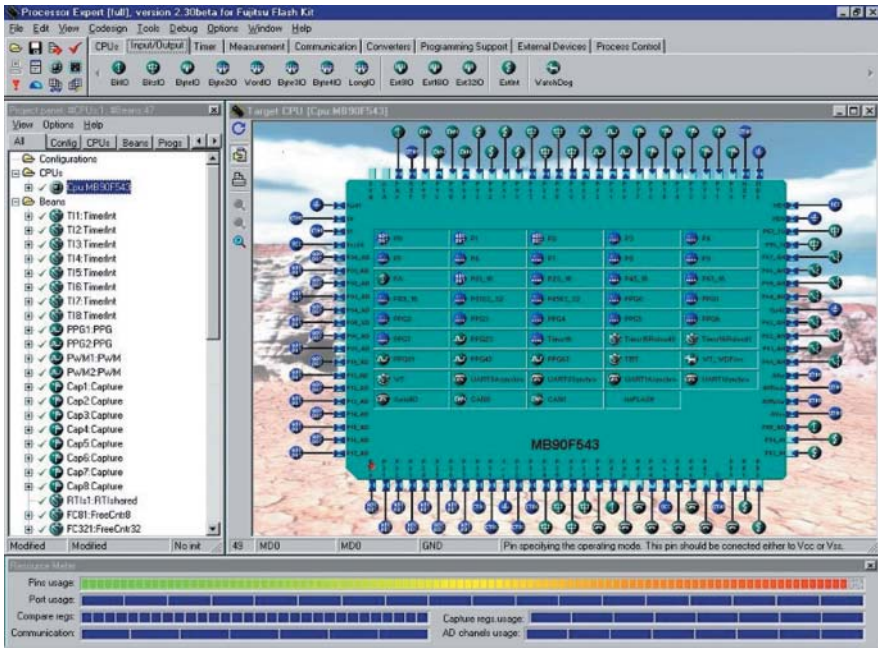
Processor Expert (PE) is an advanced component-oriented, open Rapid Advanced Development Environment for embedded systems. It is based on original methodology of embedded system decomposition to HW and SW elements. Processor Expert provides Delphi-like style component application building for 16 bit MCUs with:

- a high level of generated application code portability
- component reusability and inheritance
- a short learning curve using expert knowledge system assistanceProcessor Expert is based on the Embedded Beans specification, with code being generated from components to source code C and ASM.

Embedded Beans



Embedded Beans encapsulate the functionality of basic elements of embedded systems like CPU core, CPU on-chip peripherals, standalone peripherals, virtual devices, programmable arrays, and pure software algorithms and express these facilities using properties, methods, and events (like objects in OOP).



PE's intuitive user interface saves precious development time

Features

- PE provides system level code design of hardware and software with design consistency check
- Rapid Application Code design using component architecture (Embedded Beans) and a knowledge system for the hardware
- PE supports Fujitsu Softune Workbench
- FLASH programming support for CPU Flash and on-board Flash
- Easy development of application for Fujitsu FLASH MCUs with DevKit16 including debugging
- Portable design support – a microprocessor or any other part can be exchanged at any design phase
- PE provides interactive help on target CPU selection during the whole design
- Intelligent feedback to the designer in any design phase – based on the internal expert knowledge database
- Open to support next processors and their derivatives from 4 bit up to 64 bit
- Verification of user settings during design time brings much more safety in application runtime
- Beans Wizard handles creation and modification of the user's Embedded Beans
- PE handles the settings of the time critical properties, it also offers available proper selections
- PE provides electronic CAD-like view of the real microprocessor and the application behaviour
- Rapid design with drag & drop components
- Extensible user interface based on Open Tools API
- Syntax highlight for the supported languages
- Embedded Beans extensible libraries – hardware related libraries, virtual libraries, pure software solutions
- Extensive help and tutorial

Supported families

- Processor Expert supports following Fujitsu 16LX series:
  - MB90497G, MB90F497G
  - MB90543G, MB90F543, MB90F543G
  - MB90F546G
  - MB90548G, MB90F548G
  - MB90549G, MB90F549

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The European Microcontroller Design Centre (EMDC) was established in July 1997 at Fujitsu FME's European headquarters near Frankfurt.

The Centre represents a major investment in a market area of great strategic significance, and handles design projects and development support involving both standard microcontrollers and customised products.

Fujitsu can provide the basis for solutions to numerous applications from its wide portfolio of 8, 16 and 32 bit microcontroller devices.

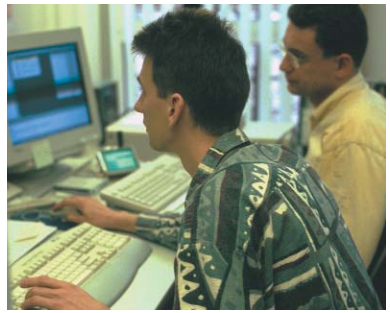
The Centre is focusing on some of the largest sectors for microcontrollers – automotive, industrial, and audio/video.

One of the Centre's key tasks is to adapt standard Fujitsu products, tailoring them in response to the specified requirements of major European customers.

In the automotive marketplace, critical areas on which the Centre concentrates, include instrumentation, navigation, and in-car communications. The CAN protocol controller forms the focus for the Centre. The majority of Fujitsu's CAN devices are designed in Europe.

CAN devices designed at the Fujitsu EMDC

EMDC is housed in Fujitsu's European headquarters near Frankfurt



Fujitsu's European Microcontroller Design Centre provides a multitude of design solutions

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