

A New Lineup of F²MC-8FX Family MB95120/MB95160M Series



FUJITSU has added MB95120 Series (100-pin package products) and MB95160M Series (64-pin package products) to our new product of 8-bit microcontrollers, the F²MC-8FX family. MB95120 Series are 3V power supply voltage products and MB95160M Series are 5V power supply voltage products; both built-in LCD controllers. They are optimal not only for LCD displays in digital AV devices but also for typical applications in major home appliances such as rice cookers and refrigerators as sub-microcontrollers for power supply/system monitoring.

Overview

In recent years, the high function development of electronic devices has been advancing rapidly. However, 8-bit microcontrollers continue to be used as the main CPUs in major home appliances, toys, wattmeters and so on.

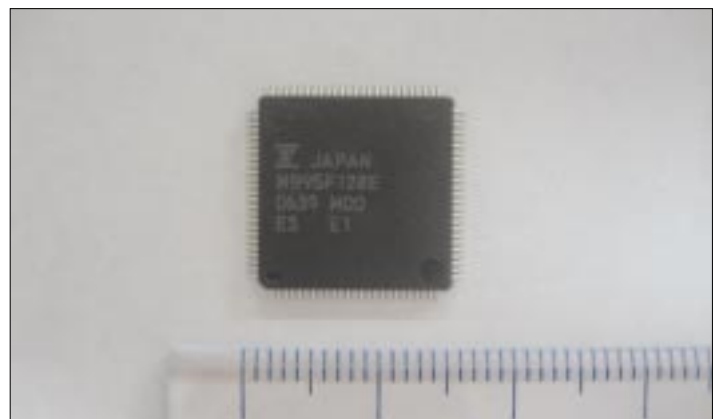
FUJITSU recognized this continued demand in the 8-bit market mainly in the Asian region so we introduced the 8-bit microcontroller F²MC-8FX family in 2004 to provide a lineup of eight series of 28-pin to 100-pin package products. These are now successively entering mass production.

FUJITSU has now added two more series to the lineup: MB95120 Series (100-pin package products) and MB95160M Series (64-pin package products). We will expand sales for MB95120 Series with the primary target applications being main microcontrollers for remote controllers with LCD display and sub-microcontrollers for DVD players, etc. For MB95160M Series, the focus will be sub-microcontrollers for major home appliances with LCD displays such as rice cookers and microwaves.

Product Features

This family mounts common functions with the following features. In addition to the six functions previously introduced in FIND, the following new ones are added:

Photo 1 Top View



- Return factor from a standby state expanded to the peripheral input functions as well as to the external interrupt
- An 8-/16-bit composite timer with which the user can select the function for each system
- An 8-/10-bit A/D converter with which the internal conversion time can be set up with software to match the external

Table 1 Product Configuration and Available Functions

Item	Model	MB95120 Series	MB95160M Series
		MB95F128	MB95F168M
Class		Flash memory product	Flash memory product
ROM (Flash) size		60Kbytes	60Kbytes
RAM size		2Kbytes	2Kbytes
Clock system		2 channels	2 channels
CPU function		Number of instructions: 136, data bit length: 1-, 8-, 16-bit length Minimum instruction execution time: 62.5ns/16MHz, maximum storage space: 64Kbytes	
IO port (Max.)		87	53
Time-base timer		Interruption interval time: 0.5ms, 2.1ms, 8.2ms, 32.8ms (at main clock oscillation of 4MHz)	
Watchdog timer		Reset generation cycle: minimum 66ms (at main clock oscillation of 16MHz), minimum 250ms (at subclock oscillation of 32.768kHz)	
8-/16-bit composite timer		16-bit×2 channels (8-bit×4 channels)	16-bit×2 channels (8-bit×4 channels)
		Interval function, PWM function, PWC function, or input capture function can be selected.	
8-/16-bit PPG timer		16-bit×2 channels (8-bit×4 channels)	16-bit×2 channels (8-bit×4 channels)
		Output of square waveform with optional cycle and duty ratio possible. A function for simultaneous synchronization of multiple channels.	
16-bit PPG timer		2 channels	1 channel
		Output of square waveform with optional cycle and duty ratio possible. Successive/one-shot output supported. External trigger function supported.	
16-bit reload timer		1 channel	—
		Successive/one-shot/event counting function can be selected. Output of square waveform possible.	
Watch pre-scaler		Interval time: 125ms, 250ms, 500ms, 1sec (at subclock reference oscillation of 32.768kHz)	
Watch counter		Capable of 63 counts at maximum on clock from the watch pre-scaler. 1-minute count possible.	
UART/SIO		1 channel	
		Selection of clock synchronous/asynchronous mode possible. Built-in special baud rate generator.	
LIN/UART		1 channel	
		Selection of clock synchronous/asynchronous/LIN mode possible. Built-in special baud rate generator.	
I ² C bus		1 channel	
		Conforms to the Phillips I ² C specification. Master/slave transmission and reception supported.	
A/D converter		12 channels	8 channels
		Selection of 8- or 10-bit resolution possible. Selection of sampling/conversion time possible.	
External interruption		12 channels	8 channels
		Detection of rising/falling or both edges possible.	
LCD controller		40seg×4com	32seg×4com
Low voltage detection circuit		—	Optional for 5V product. Allowable supply of an internal reset signal in response to the detection of any power supply voltage drop.
Low power consumption mode		Stop/sleep/subclock/watch modes	
Package		LQFP-100 (0.5mm pitch) QFP-100 (0.65mm pitch)	LQFP-64 (0.65mm pitch) LQFP-64 (0.5mm pitch)
Power supply voltage		1.8V to 3.6V	2.5V to 5.5V

impedance

- A watch pre-scaler/watch counter capable of 1-minute counting with low power consumption mode Introduced in FIND, Vol.23 No.6*1
- An 8-/16-bit PPG timer capable of the simultaneous startup of several channels
- Low-voltage/high-speed CPU operation/substantiated PLL multiplication/frequency-division functions Introduced in FIND, Vol.24 No.2/No.3*2

Blinking function of the LCD controller

The LCD controller in this family provides hardware assistance related to the blinking function. By only selecting the register (bit) corresponding to the segment to blink, blinking can be controlled at an interval of 0.5 or 1.0 seconds.

Software load can be reduced through the blinking function without the conventional ON/OFF processing of the segment by software.

Dual-purpose use of the LCD controller pin as a general-purpose I/O port

Pins such as the power supply pin and common pin for the LCD controller can be used as general-purpose I/O ports when not in use. We included this so that the number of

ports available to users can be maximized.

Table 1 shows the list of functions and **Fig.1** shows the block diagram for MB95F128.

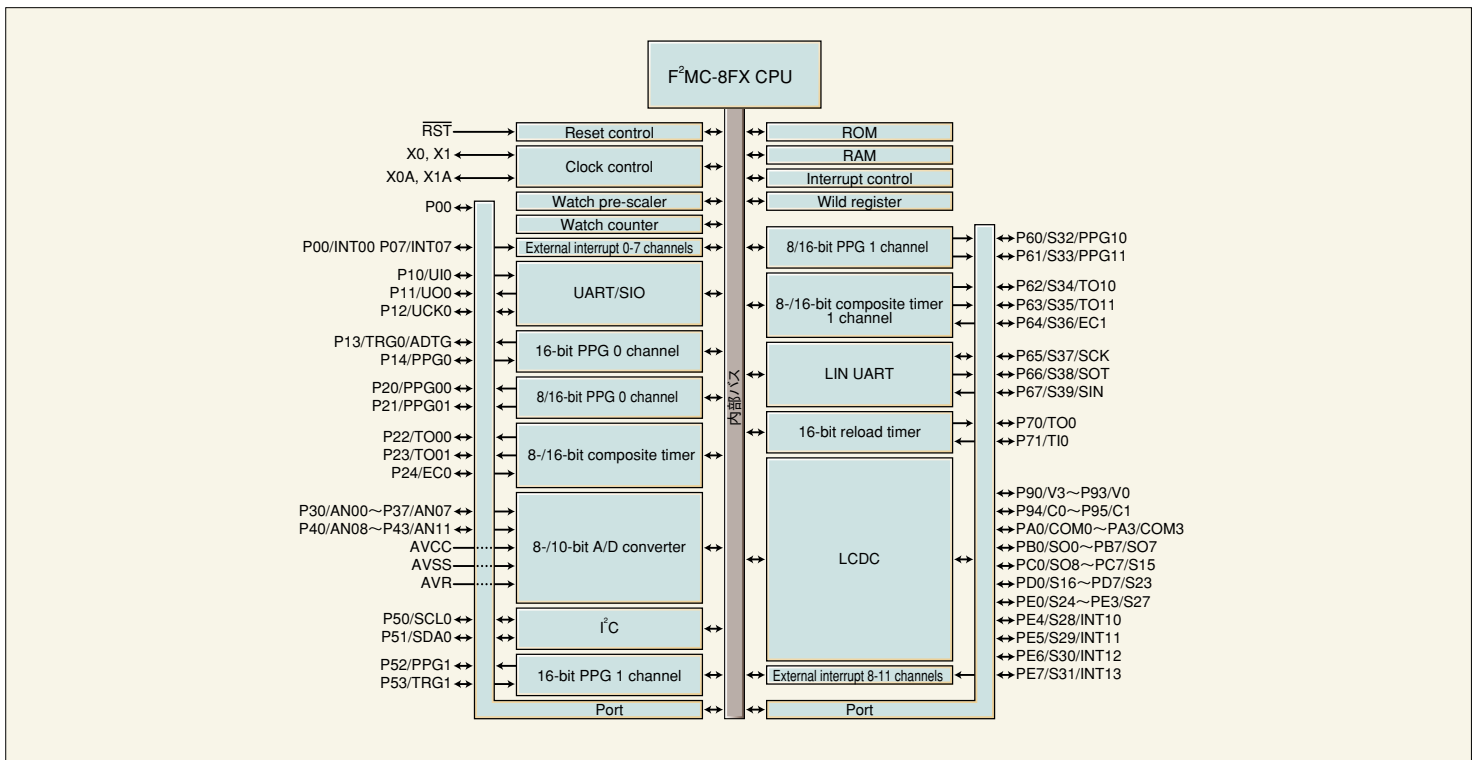
Features of MB95120 Series

- Two channels of the main clock and the subclock
- LCD controller: 40 segments×4 common, maximum of 160-pixel display
Blinking function included
- Mounting “dual-operation Flash memory” capable of writing/erasing one sector while executing CPU instructions in the other
- Package: LQFP-100-pin (14mm×14mm, 0.5mm pitch)
QFP-100-pin (14mm×20mm, 0.65mm pitch)

Features of MB95160M Series

- LCD controller: 32 segments×4 common, maximum of 128-pixel display
Blinking function included
- Two channels of the main clock and the subclock
- A one-sector Flash memory with only a single sector (MB95F168M)
- Package: LQFP-64-pin (10mm×10mm, 0.5mm pitch)
LQFP-64-pin (12mm×12mm, 0.65mm pitch)

Figure 1 MB95F128 Block Diagram



Application Examples

Figs.2 and **3** present some product application examples.

MB95F168M is capable of the main control of small systems with LCD displays such as fan heaters and microwaves. MB95F128 can be used in application subsystems with LCD displays such as DVD players and multi-input remote controllers with LCD.

Development Environment

Fig.4 shows the hardware configuration of the F²MC-8FX

development environment and **Table 2** shows the list of development tools.

An MCU board mounting the common evaluation chip MB95FV100D is utilized for this family. As such, software development is possible with the use of the same development environment; there is no need to replace the evaluation chip when developing products with different packages. It is also possible to apply previously developed software to a product with a different package. This will contribute to the reduction of customer man-hours in software development. A software program can be developed with versions supporting F²MC-8FX of FUJITSU's integrated development environment SOFTUNE V3.

Figure 2 Typical Application of MB95160M (Fan Heater)

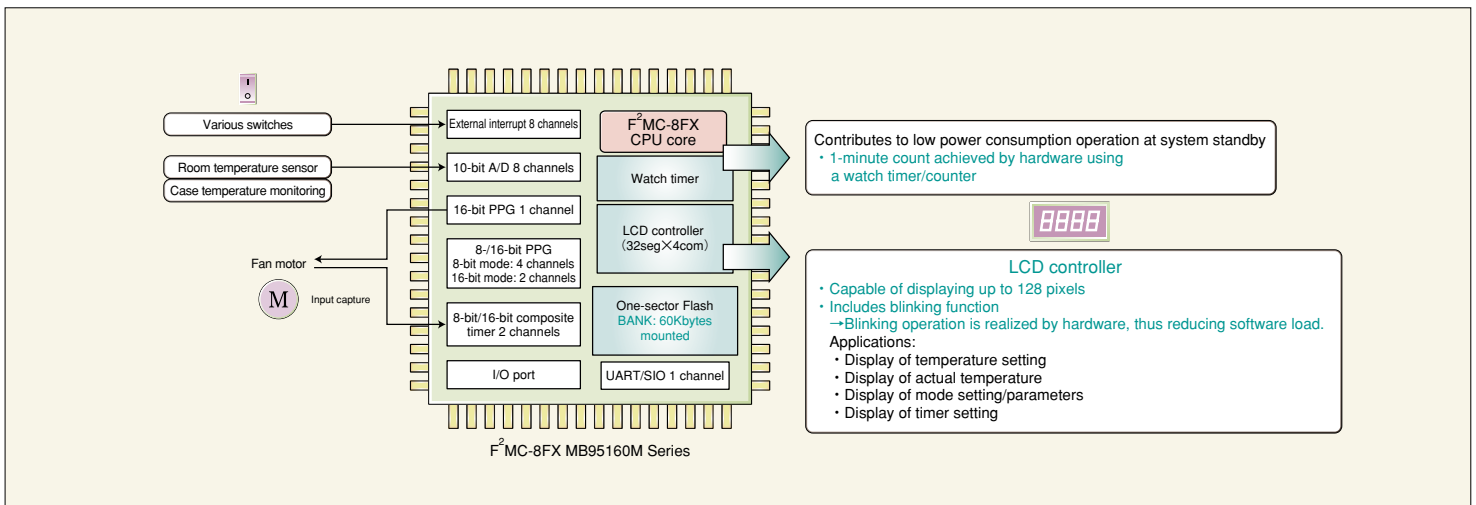
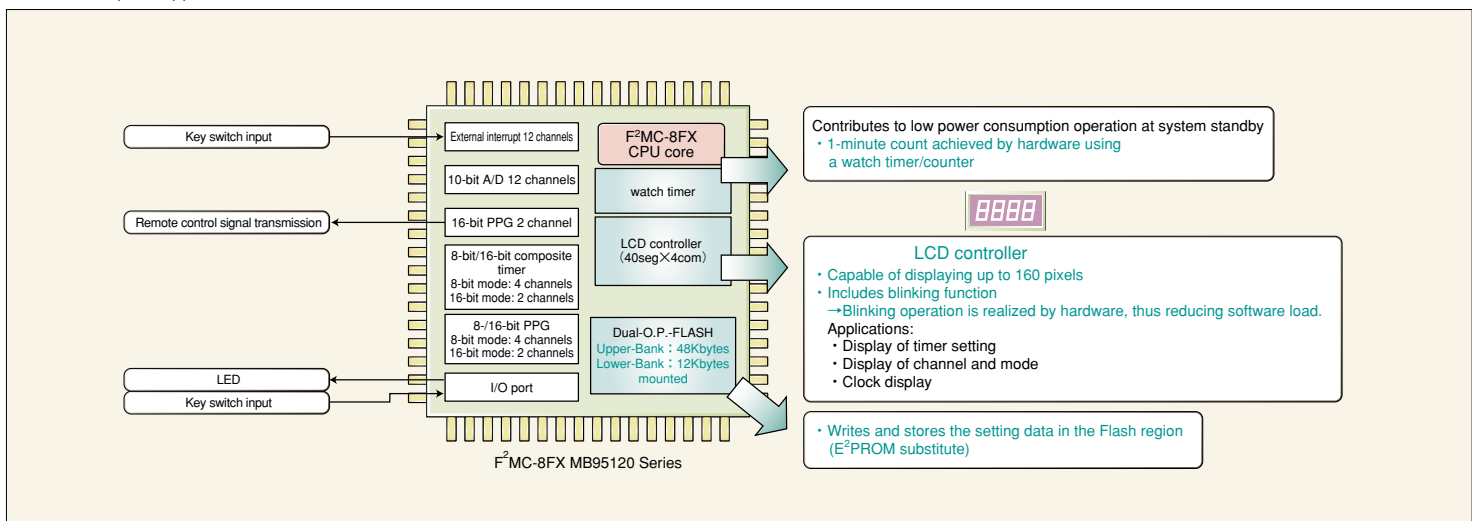


Figure 3 Typical Application of MB95F128 (Remote Controller with LCD)



Future Development

FUJITSU will continue to add members to F²MC-8FX family product lineup supporting 16MHz operation. (Fig.5) We will increase ROM/RAM density, expand various packages and mask products to have superior cost/current consumption features, and improve Flash memory products. In this way, we shall be able to confidently provide our customers with a wider range of selection. *

NOTES

- *1: <http://www.fujitsu.com/downloads/EDG/binary/pdf/find/23-4e/7.pdf>
- *2: <http://www.fujitsu.com/downloads/EDG/binary/pdf/find/24-2e/1.pdf>
- * Other company names and brand names are the trademarks or registered trademarks of their respective owners.

Table 2 List of Development Tools

	MB95120 Series	MB95160M Series
Special adaptor for background monitor debugging	MB2146-09 (BGM adaptor)	
MCU board (mounting evaluation chip)	MB2146-301A (MB95FV100D-101: mounting special 3V products)	MB2146-303A (MB95FV100D-103: mounting special 5V products)
Header board for package conversion	MB2146-250 (for 0.5mm, 14×14mm package) MB2146-251 (for 0.65mm, 14×20mm package)	MB2146-222 (for 0.5mm, 10×10mm package) MB2146-223 (for 0.65mm, 12×12mm package)
Evaluation board	MB2146-401	
Software	SOFTUNE V3 Workbench SOFTUNE V3 C Compiler SOFTUNE V3 Assembler SOFTUNE V3 C Analyzer SOFTUNE V3 C Checker	

Figure 4 Example of Development Environment Hardware Connection Configuration

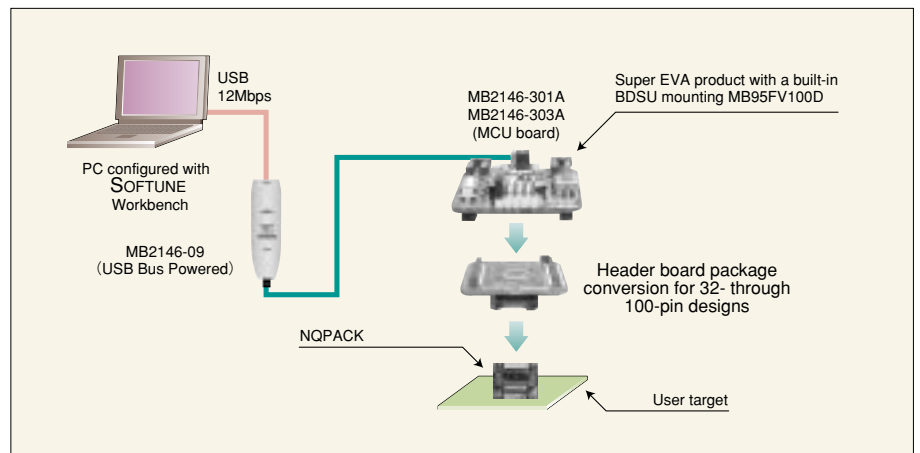


Figure 5 Product Lineup Plan (CPU: Product Supporting 16MHz Operation)

