

High-Performance, Power-Saving 32-bit RISC Microcontroller FR60Lite Series

The newly developed 32-bit RISC CPU core built into FR60Lite ensures high speed and energy efficiency. The device delivers 20VAX/MIPS throughput with the power consumption of 1mA/MHz (core performance).

Product Description

FUJITSU has just developed FR60Lite, a new series of 32-bit RISC microcontrollers. As digital home appliances and other devices come to handle more and more functions, the CPUs that control them must offer high-throughput and energy-efficient features. To meet these two requirements—high-throughput operation and low power consumption—this new series incorporates a newly developed 32-bit RISC CPU core based on an innovative concept.

FR60Lite series delivers a high performance of 20VAX/MIPS with the power consumption equivalent to the conventional 16-bit CPU core. By enabling the design of high-performance, power-saving products equipped with only a single microcontroller, this series reduces the man-hours required for product development. FR60Lite is based on the same architecture as FUJITSU's FR family, thus allowing easy expansion to more advanced products.

Fig. 1 shows the product concept for this series.

Product Features

■ Compact size and low power consumption

- Compact design by optimizing the performance of FUJITSU's high-performance 32-bit FR series core
- Low power consumption of 1mA/MHz (core performance)
- A clock control function to control throughput, power

consumption of the CPU clock, and peripheral resources

■ High-performance RISC CPU core

High-throughput of 20VAX/MIPS

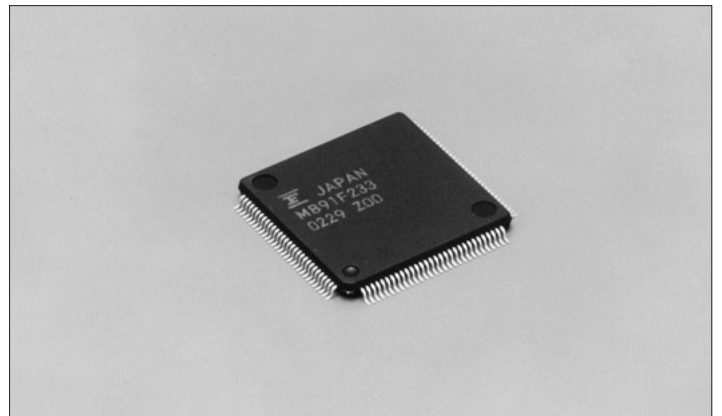
■ Supports system control instructions (bit-control instructions, I/O access instructions) and high-level language instructions

Code size just as compact as that for the 16-bit microcontroller

■ Adopts the same architecture used for the high-performance 32-bit FR family

Adoption of the same architecture used for FUJITSU's

Photo 1 MB91F233 External View



high-performance FR family lineups allows expansion to more advanced FR family products.

FUJITSU will continue to develop the high-performance system control microcontrollers that meet the crucial requirements of digital home electronic appliances, automotive meter control, and other applications. Development efforts will focus on the system LSI technology and embedded flash memory technology.

Fig. 2 shows the position of this series among the FUJITSU microcontroller families. **Fig. 3** shows the scheduled series lineup.

MB91230 Series

FUJITSU has just commenced shipment of the first commercially available model in its MB91230 Series LCDs controller

Figure 1 FR60Lite Series Product Concept

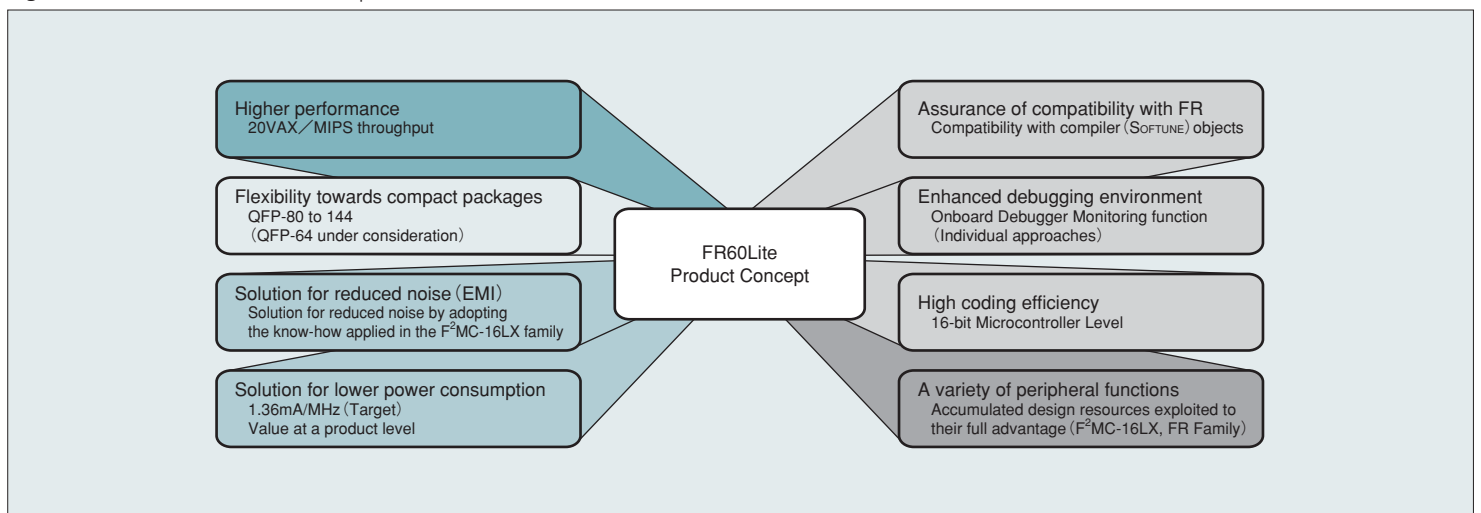
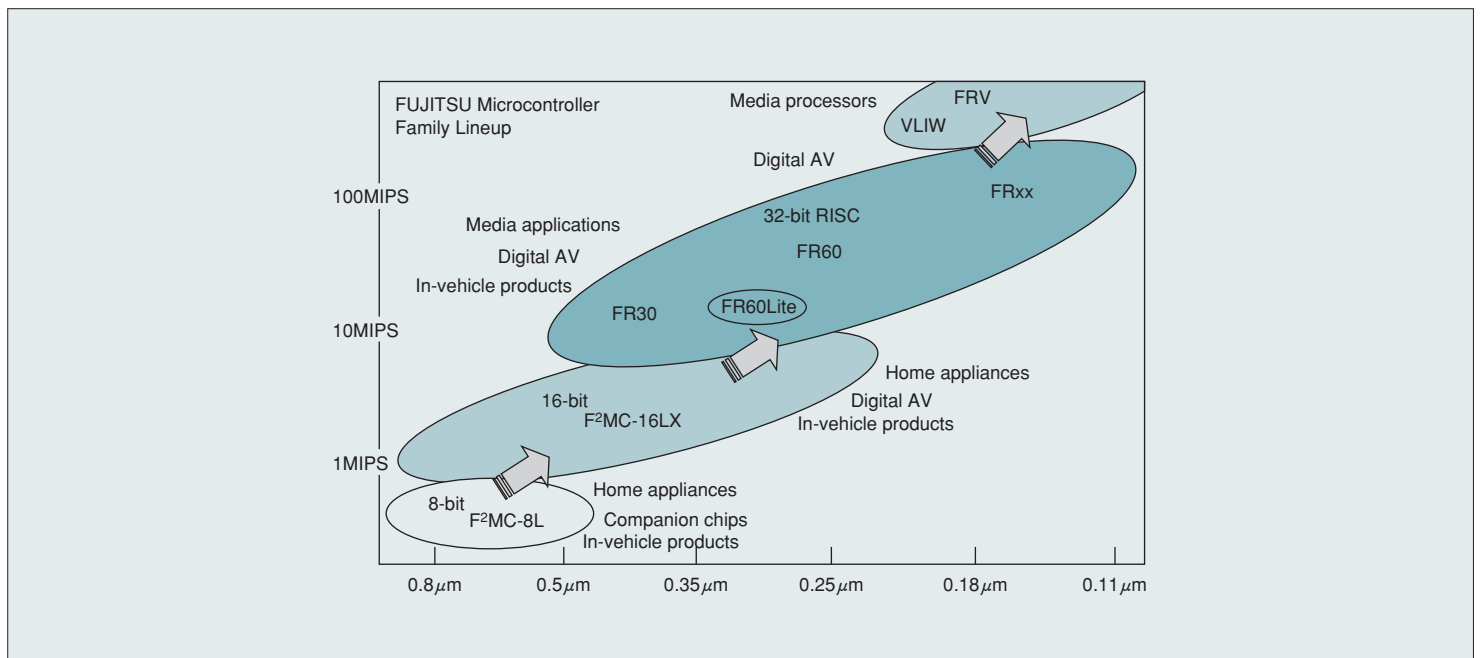


Figure 2 FR60Lite Series Roadmap



mounted. This series will be followed by the active introduction of lineups ideally suited for the control of audio equipment, motors, storage, and automobile onboard equipment.

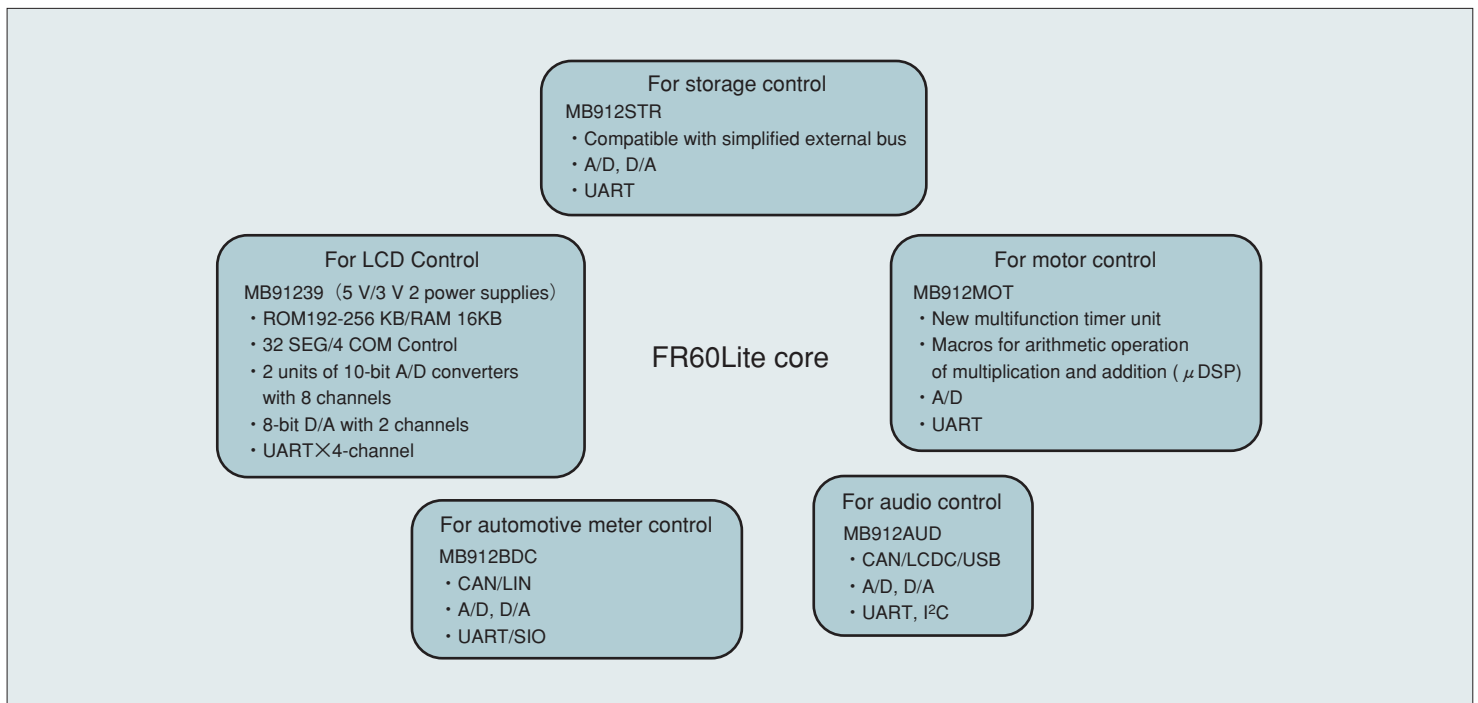
MB91230 Series is best suited for LCD panels and system controls for portable audiovisual (AV) equipment, voice recorders, and single-lens reflex cameras. It operates on an operating voltage of 2.4V to 3.6V, or 2.2V (min.) in the real-time clock operation mode. While connected to an inexpensive external oscillator operating at a frequency of 4.2MHz, it can be programmed to operate at frequencies between 2.1MHz and 33.6MHz with the aid of the PLL multiplier and gear setting function. The current consumption can also be set from 12mA to 50mA in small increments to match the condition of the system. The product incorporates a 2-channel clock system that enables operation on the sub-clock at 32kHz. In addition to the high-performance CPU core, this series incorporates a 22-channel timer function, 4-channel \times 2-unit 10-bit resolution A/D converters for analog processing, a 2-channel 8-bit resolution D/A converter, and a maximum of 98 I/O ports, allowing real-time control.

Fig. 4 provides the pin assignments and **Fig. 5** shows the block diagram.

MB91230 Series Principal Specifications

- **Process technology:** CMOS 0.35 μ m
- **Supply voltage: Two (2) power supplies**
 - Internal: 2.4V to 3.6V (2.2V (min.) in the RTC mode)
 - I/O: 3.0V to 5.5V (3.0V to 3.6V for the I/O in the A/D converter and the D/A converter)
- **Operating frequency:** 33.6MHz
- **Power consumption:** 50mA (MB91232)
80mA (MB91F233)
- **Onboard memory:** 256K-byte Flash Memory (MB91F233)
192K-byte ROM (MB91232)
16K-byte RAM
- **LCD controller:** 4COM, 32SEG
- **A/D converter:** 10-bit (4-channel \times 2-unit)
- **D/A converter:** 8-bit (2-channel)

Figure 3 FR60Lite Series Lineup (Projected)



- Clock output function
- Real-time clock
- UART communications function
- Timer function: PPG/Up/down counter/
Reload timer/Free-running timer/
Clock timer/PWC timer/U timer/
Watchdog function/ICU/ OCU

- Power-saving mode: Sleep/Stop/Clock modes

- Package: LQFP-120 pins



NOTES

* All company/product names contained herein are the trademarks or registered trademarks of their respective holders.

Figure 4 MB91F233/MB91232 Pin Assignments

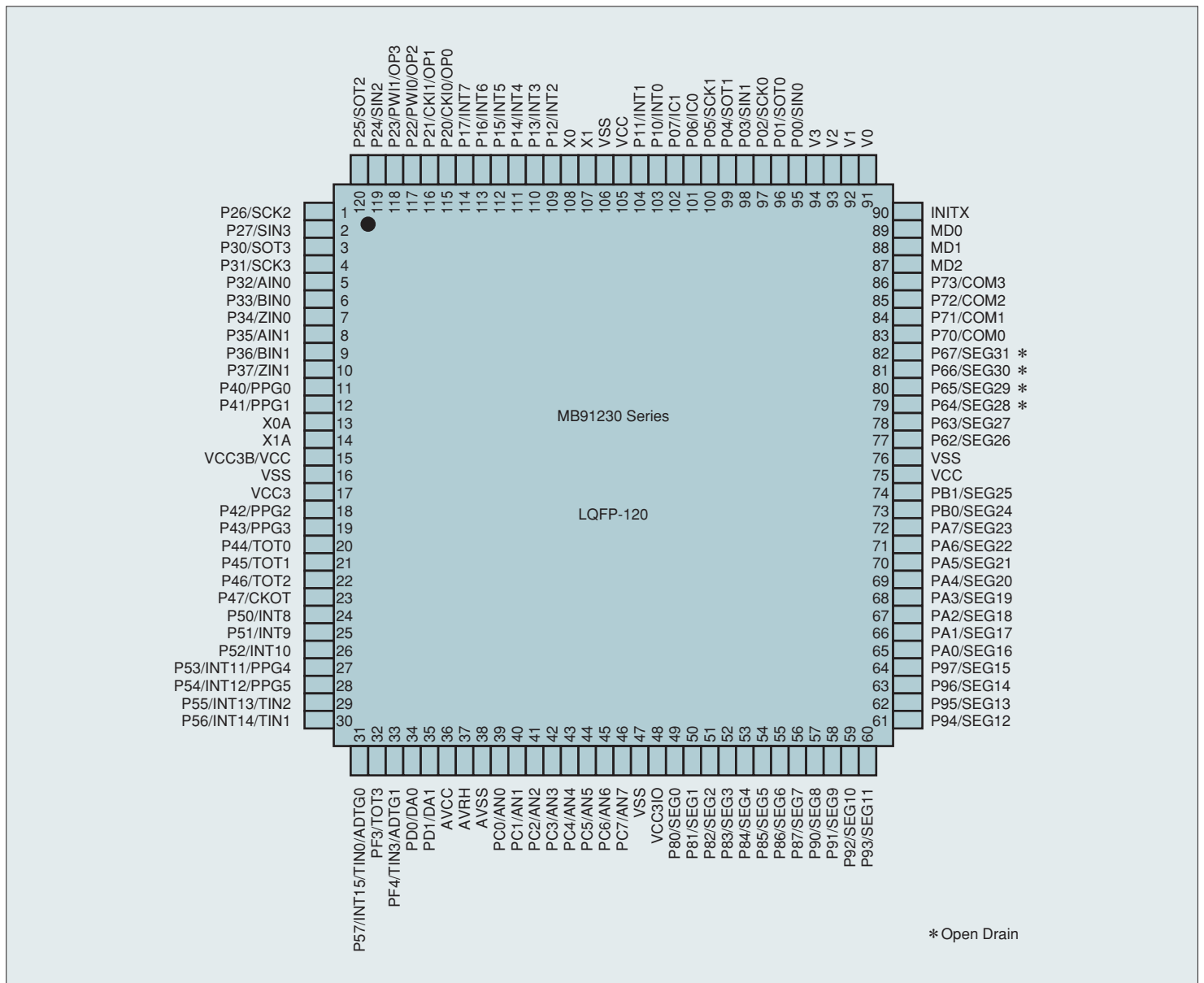


Figure 5 MB91230 Block Diagram

