

32-bit Microcontroller for Integration of Automotive CAN Bus Network FR Family

MB91F467BA

Integrating a 6-channel CAN controller in the 100MHz CPU core with a maximum operation frequency at the top speed in the industry, this highly versatile microcontroller addresses automotive network integration that requires high basic performance and is expected to increase in the future. This product is positioned as a concentrated version of the “MB91460 Series,” our core series of 32-bit automotive microcontrollers.

Overview

In recent years, CAN-application systems have been popularized for controlling automobile bodies and driving, resulting in automotive network speedup and the diversification of connected devices. Among the ECUs that control these devices, demand is increasing for an ECU that, in addition to being in charge of controlling the body, also controls the entire automotive network.

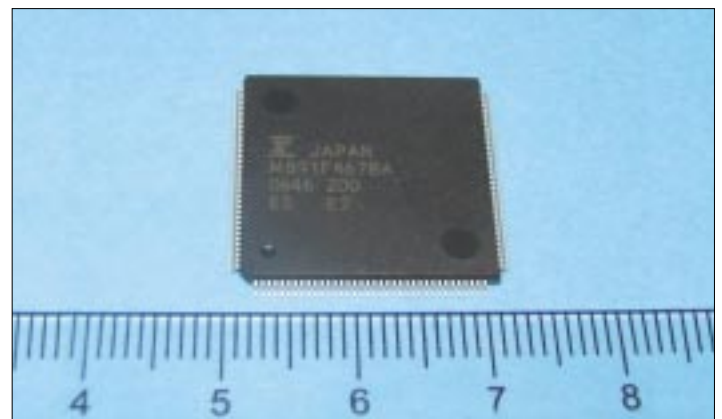
The newly developed 32-bit microcontroller “MB91F467BA” takes into consideration this need for the integration of the automotive network—a need that is expected to increase—and has a built-in 6-channel CAN controller, which is the greatest number in the industry, to enable the connection of CAN bus networks with different speeds and mutual connection between CAN and FlexRay (gateway function). This built-in 6-channel CAN controller enables the integration of the information CAN, power train CAN, failure diagnosis CAN, and so forth, centering at the body CAN on 1 chip, which had hitherto been difficult in conventional systems.

Its on-chip FR core, a 32-bit RISC, realizes a maximum operation frequency of 100MHz, which is the fastest in the

industry. In addition to its high basic performance, this product has rich built-in peripheral functions including 1Mbytes large-density Flash memory and 32-channel A/D converter for use in various applications such as dashboard control with graphic display and integrated control of the body system.

In this microcontroller product, “highly expandable automotive

Photo 1 External View



network functions” and “high basic performance/peripheral functions” coexist. Its development environment has the same common specifications of peripheral function circuits and development chip as the MB91460 Series, allowing compatibility of the application software and the succeeding of development assets from the existing products of the same series.

Fig.1 presents the lineup of the MB91460 Series.

Proposed Application Scenes

Integration of multiple CAN bus networks

Integration of the information CAN, power train CAN, failure diagnosis CAN, and so forth with the body CAN at the center can be addressed on 1 chip. An integrated network system of the automotive devices utilizing the multiple integrated CAN bus networks can be constructed (Fig.2).

Application in dashboard with large-capacity Flash memory

Built-in large-density Flash memory (1Mbytes) and SRAM (40Kbytes) will realize dashboard control in which various display data will be required (Fig.3).

Main Specifications

The on-chip resources of this product deliver the following features:

FR60 core

The FR60 core, which is instruction-compatible with the FR Series, has been adopted. The FR60 core is

Figure 1 Lineup of MB91460 Series

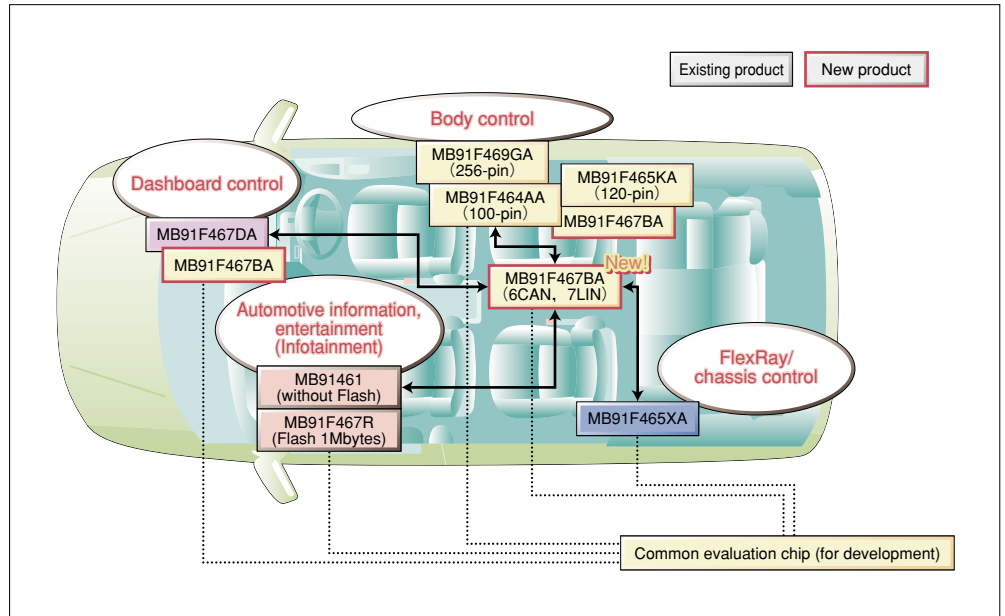


Figure 2 Integration of Multiple CAN Bus Network

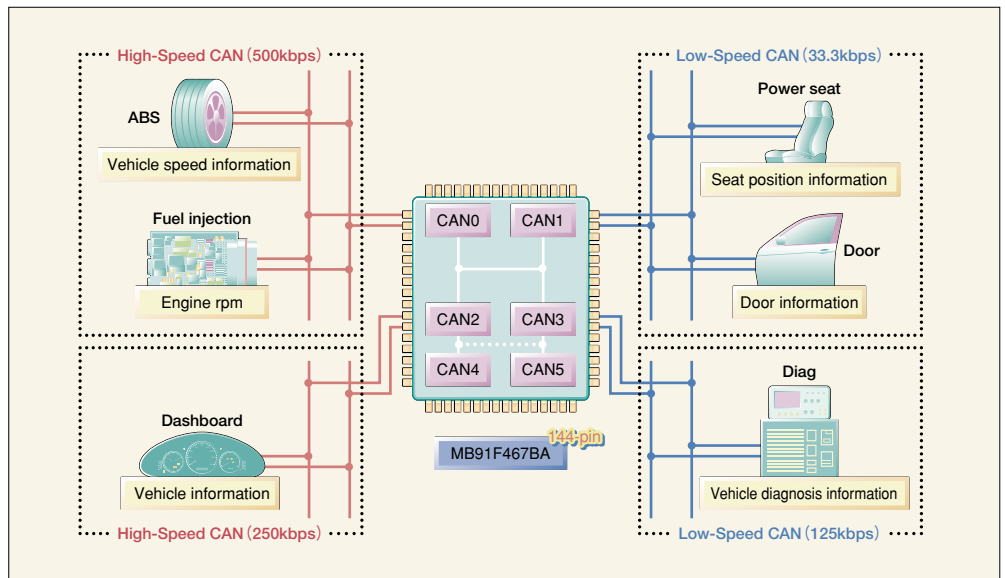
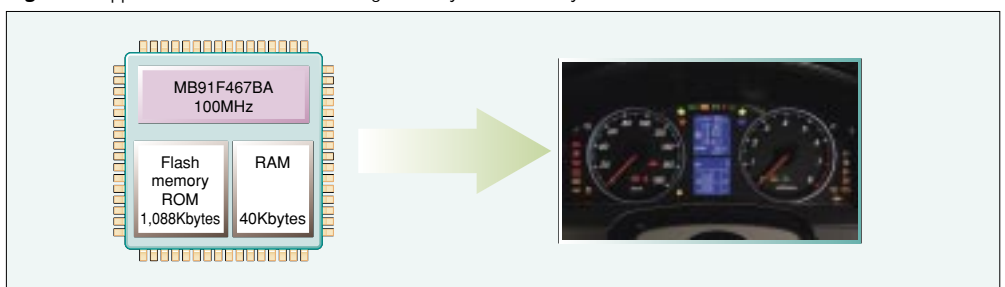


Figure 3 Application in Dashboard with Large-Density Flash Memory



FUJITSU's 32-bit RISC CPU core. It has a maximum operation frequency of 100MHz and offers high performance and low power consumption.

Built-in Flash memory capacity

- Main Flash memory: 1Mbytes
- Flash memory security realized

Built-in RAM density

- 40Kbytes
- Instruction cache: 8Kbytes

CAN controller

Conforms to CAN Specification Version 2.0 Part A and Part B. There are 32 built-in message buffers with priorities for data and ID. Supports communication speeds up to 1Mbps.

Various timers

- 16-bit free-run timer (8 channels)
- 16-bit input capture (8 channels)
- 16-bit output compare (8 channels)
- 16-bit PPG (16 channels): Selection of one-shot output/PWM output possible
- 16-bit reload timer (8 channels)

Various interfaces

- LIN-supporting USART (7 channels, with 16bytes FIFO)
- I²C interface (2 channels)

High-speed A/D converter

Sequential transformation-type A/D converter realizing 10-bit resolution (32 channels)

(Minimum conversion time 3 μ s, overall error ± 3 LSB: V_{cc}=A_{vcc}=3.0V to 5.5V)

Lower power consumption mode: Sleep/stop function

The low power consumption modes of this product are sleep mode (program stops) and stop mode (device stops). Standby current consumption can be minimized by utilizing these low power consumption modes.

I/O port

- Input permission setting: Setting possible for each port
- Input level setting: Selection from 4 input

levels (CMOS (0307)/CMOS (0208)/Automotive/TTL) possible

- Pull-up resistance setting: Setting possible for each port (50k Ω Typ.)

Table 1 presents the voltage for each input level.

Other peripheral functions

- External interrupt (16 channels)
- DMAC (5 channels)
- Watchdog timer
- Real-time clock
- Alarm comparator
- Sound generator
- Low voltage detection circuit
- Power-supply voltage: 3.0V to 5.5V

Fig.4 presents the block diagram of this product.

Development Environment

This product is supported by SOFTUNE V6, a FUJITSU's integrated development environment. SOFTUNE V6 application

Table 1 Input Level Setting and Input Voltage

Item	VIL (V)	VIH (V)	Input level
Input voltage	0.3V _{cc}	0.7V _{cc}	CMOS input (0307)
	0.2V _{cc}	0.8V _{cc}	CMOS input (0208)
	0.5V _{cc}	0.8V _{cc}	Automotive
	0.8	2.1	TTL

Table 2 Development Tools

Hardware	Emulator main unit	MB2198-01
	Adapter board	MB2198-600
	Evaluation chip	MB91V460
	Header board	MB2198-604B (for external bus mode without level shifter) MB2198-634B (for external bus mode with level shifter) MB2198-664 (for single chip mode)
Software	SOFTUNE V6 Workbench	
	SOFTUNE V6 C compiler	
	SOFTUNE V6 assembler	
	SOFTUNE V6 C/C++ analyzer	
	SOFTUNE V6 C checker	

software is designed to simplify programming tasks in order to meet the diverse needs of program designers.

Table 2 lists the development tools.



NOTES

* FlexRay is a trademark of DaimlerChrysler AG.

* Other company names and brand names are the trademarks or registered trademarks of their respective owners.

Figure 4 Block Diagram

