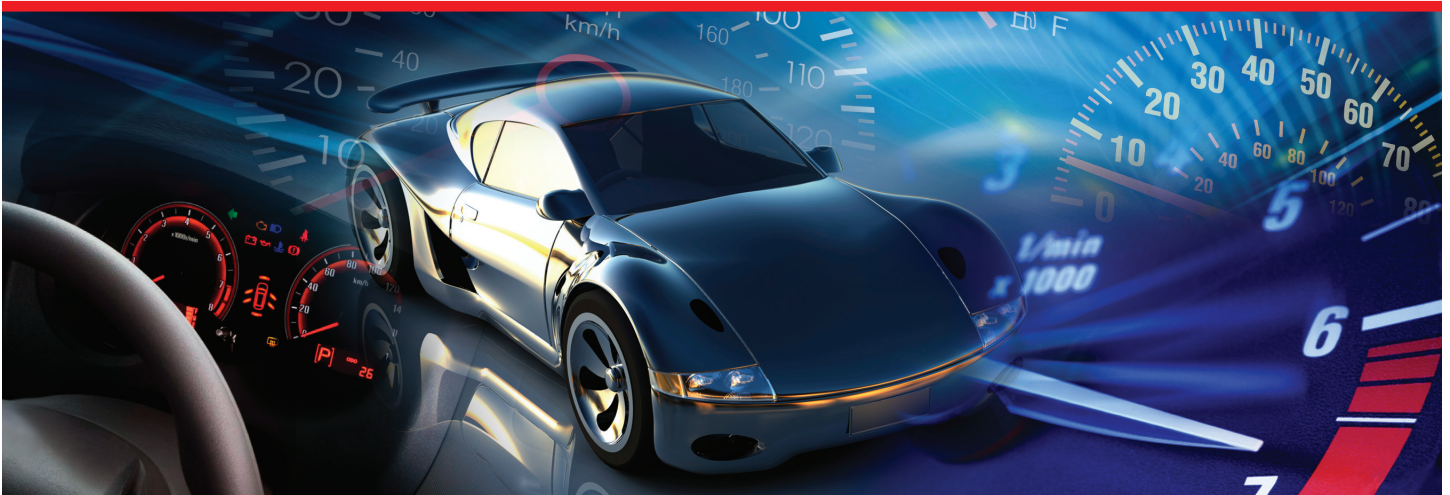# FUJITSU

MB91590 Series
32-bit MCU with Integrated Graphics Controller SoC

Description

The MB91590 series provides a System-on-a-Chip (SoC) solution for color display, video input and meter control systems for automotive dashboard and human machine interface (HMI) applications. It integrates a high performance FR81S CPU core offering the highest CPU performance level in the industry, a graphics display controller (GDC) with strong sprite functionality, rendering engine, and external video capture capabilities. The MB91590 series also features support for dual LCD displays.

The MB91590 series offers a single-chip solution for applications that require robust color display and video-input capabilities. It is particularly well-suited for use in automotive instrument clusters and center consoles using color displays to generate flexible and intuitive driver interfaces.

Key Features

The MB91590 series utilizes a FR81S CPU core operating at a maximum internal operating frequency of 128MHz. The MCU also includes a built-in single-precision floating point unit for high-speed operations, and a memory protection unit capable of providing selective access to protected memory areas.

Peripheral functions optimized for dashboard systems reduce the need for extra components. Multiple built-in regulators and a flexible standby mode enable the MB91590 series to operate with low power consumption.

The integrated GDC supports dual displays at a maximum 800×480 resolution, and features a powerful sprite and rendering engine capable of producing sophisticated effects for dashboard applications. It supports 512 sprites sized at up to 512×512 dots each with functions such as automatic blinking, movement, image switching and anti-aliased font display. The rendering engine can operate in combination with the video capture and NTSC-decoder functions to enable image manipulation, including zooming and 90-degree rotation. Overlaid graphics such as needles or parking guidelines can also be rendered in conjunction with captured video. Layered graphical images can be sent to either LCD flexibly.

Applications

- Automotive instrument clusters
- Center consoles using color display
- Vehicle camera system
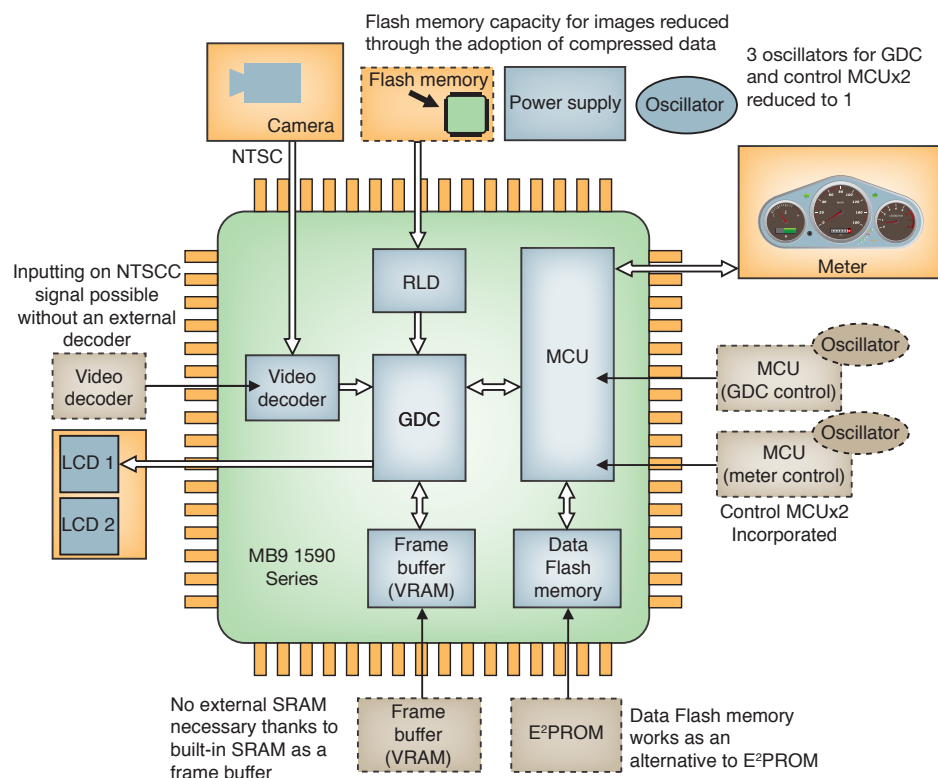- Industrial controllers with color display
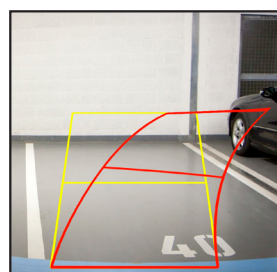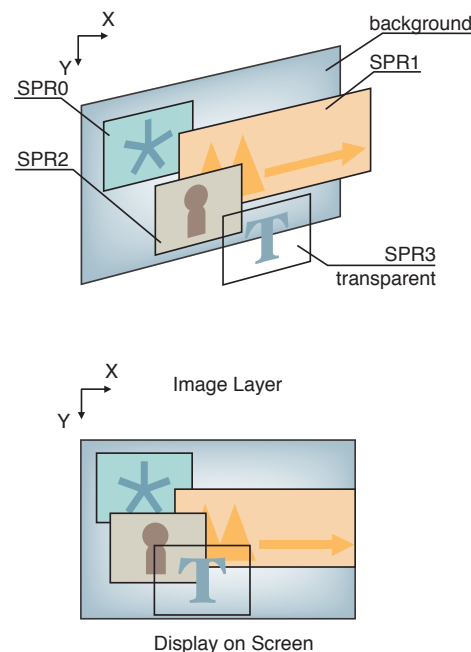

2-D Rendering Engine and Video Capture

Parking guidelines and proximity warning

Product Lineup	MB91F591	MB91F592	MB91F594	MB91F596	MB91F597	MB91F599
CPU Speed	80MHz	80MHz	80MHz	128MHz	128MHz	128MHz
Flash Size	576KB	576KB	1MB	576KB	576KB	1MB
RAM Size	32KB	32KB	64KB	32KB	32IKB	64KB
VRAM Size	260KB	800KB	800KB	260KB	800KB	800KB
Package	LQFP-208	LQFP-208	LQFP-208	QFP-208	QFP-208	QFP-208

System Example

Flash memory capacity for images reduced through the adoption of compressed data

3 oscillators for GDC and control MCUx2 reduced to 1

Camera
NTSC

Flash memory

Power supply

Oscillator

Inputting on NTSCC signal possible without an external decoder

RLD

Meter

Video decoder

Video decoder

MCU

GDC

Oscillator

MCU (GDC control)

LCD 1

LCD 2

Oscillator

MCU (meter control)

Control MCUx2 Incorporated

MB9 1590 Series

Frame buffer (VRAM)

Data Flash memory

No external SRAM necessary thanks to built-in SRAM as a frame buffer

Frame buffer (VRAM)

E²PROM

Data Flash memory works as an alternative to E²PROM

Sprite Engine

X
Y
SPR0
SPR2
background
SPR1
SPR3
transparent

X
Y
Image Layer

Display on Screen

Specifications

- FR81S CPU – 32-bit RISC, load/store architecture
- Maximum operating frequency
  CPU: 128MHz / 80MHz
  GDC: 81MHz
- DMA controller: 16 channels
- Timer — 16-bit reload timer   4-ch
    — 16-bit base timer   2-ch
    — 6-bit PPG timer   24-ch
    — 32-bit free-run time   2-ch
    — 32-bit input capture   6-ch
    — 32-bit output compare   4-ch

- UART/SIO
  UART/SIO/LIN-UART   6-ch
  Multifunction serial   2-ch
- 10-bit A/D converter   32-ch
- Sound generator   5-ch
- External interrupt   16-ch
- CRC generator
- Clock supervisor
- Hardware / software watchdog
- Data Flash memory
- Flash memory security function

- Low-voltage detection reset circuit GDC function
  Sprite engine: 512 sprites
  2-D rendering engine
     Line/polygon drawing, Bit Blt
  Run-length decoder (RLD)
  VRAM: 800Kbyte / 260Kbyte
  Video capture
  NTSC/PAL, digital RGB, BT656
- On-chip debug
  One-wire serial control
- Power supply: 4.5 – 5.5V
- Operating temperature: –40 to 105°

FUJITSU SEMICONDUCTOR AMERICA, INC.

CERTIFIED QUALITY MANAGEMENT SYSTEM
ISO 9001:2008
DNV