

# Graphics SoC MB86R20 Series

Ideally Suitable for Integrated HMI Systems and 360° Wrap-Around View Systems with Recognition Functions



## MB86R20 Series

In addition to high graphics rendering performance, these devices come with exhaustive software tools which make them ideally suitable for the development of integrated HMI systems and 360° Wrap-Around View Systems with recognition functions.

## Introduction

In order to increase the environmental friendliness, safety, Relief, and comfort of automobiles, there is an increasing need for "Integrated HMI (Human – Machine Interface) Systems" that are windows of information linking together people, automobiles, and the world, and the need is also increasing for "360° Wraparound View Systems with Recognition Functions" that warn without fail about dangers surrounding the vehicle in a three-dimensional manner.

The "MB86R20 series" third-generation graphics SoC, compared to the second-generation graphics SoC of the "MB86R10 series", has its CPU and GPU performances increased by 2 times and 5 times, respectively, and also has 6 video inputs and 3 display output functions all available at the same time. Further, systems with one-stop procurement of all necessary items and with lesser number of man-hours can be developed because the necessary software is also provided along with the chips.

## Tendency of Integrated HMI

In order to experience driving that is environment-friendly, safe, relieved, and also comfortable, the amount of information linking people, automobiles, and the outside increases dramatically. Now-a-days, such information spans various aspects such as battery information of electric vehicles, vehicle fault diagnosis information, image information from cameras, warning information, navigation information, smart-phone-linked information, and cloud-linked information, and so on.

Until now individual display control was being made of such information using the center display, cluster display, head-up display, etc. (Figure 1). However, in order to transfer information in real time and in an easy-to-understand manner between the driver and the vehicle, it is necessary to aggregate all such information in one location and to carry out centralized control of how the information is portrayed to match with the driving situation.

This is done by an integrated HMI system, and this trend is considered to accelerate as the harmony among people, automobiles, and the harmony among people, automobiles, and the environment increases.

The MB86R20 series has a high-performance CPU/GPU, 6 video inputs, and 3 display output functions available all at the same time, aggregates video information from various sources such as a system of cameras, head unit, etc., and carries out appropriate display control of the center display, cluster display, head-up display, etc. to suit the driving situation (Figure 2). In addition, in an integrated HMI system, each display section is modularized and platformed, which not only greatly reduces the component count but also makes it easy to extend the product to other vehicle types.

### Towards Further Safety and Relief (360° Wrap-Around View System with recognition function)

In a 360° Wrap-Around View System, the entire surroundings of the vehicle can be checked clearly and also from any viewpoint by 3-D processing of the images from four cameras installed at the front, rear, left, and right of the vehicle. Systems using the MB86R10 series devices, which are second-generation SoC, have already been introduced in the market and are starting to spread worldwide (Figure 3).

The MB86R10 series can accept not only analog cameras but also mega-pixel digital cameras, whereby the surroundings of the vehicle can be portrayed as very clear images (Figure 4). Along with the proliferation of this system, the demand is not only for the ability to visually verify the surroundings of the vehicle but also for new functions that reduce items overlooked by the driver. The third-generation SoC of the MB86R20 series has much higher performance CPU/GPU, and it has been possible to realize both checking of the surroundings from any viewpoint and reduction of oversight by the driver due to object recognition (Figure 5). In addition, since 6 camera images can be handled at the same time, the concerned scene can be enlarged and the degree of freedom of portraying the 3-D image has been increased.

### MB86R20 Series (The block diagram is shown in Figure 6.)

**Strengthening CPU and GPU**  
Two ARM® Cortex™-A9 are used as the CPU. POWERVRTM SGX543 is used as the 3-D engine, and compared to the second-generation SoC's of the MB86R10 series, the CPU performance has been increased to about 2 times, and the GPU performance has been increased to about 5 times. In addition, at the same time, our company's excellent 2-D engine realizing warping-on-the-fly, etc. has been installed. Because these operate independently, a much higher performance has been obtained.

**Multiple video inputs and strengthening of display outputs**  
This series is compatible with 6 full high-density video inputs and 3 video outputs. High resolution camera images can be input implying that high resolution contents can be input, and outputs can be made to several high resolution displays.

**Rendering performance exceeding the specifications**  
In addition to simultaneously operating 2-D engine, 3-D engine, and video capture, by having eight rendering layers, optimum image processing can be done on different rendering layers to suit the application or the contents. For example, by 2-D/3-D processing of the rendering of the needle in the cluster display and of the rendering of the vehicle in different layers, a rendering performance is obtained that is higher than the specifications (Figures 7 to Figure 9).

**Automotive grade**  
The high reliability has been realized meeting the demands in automobile and other fields.

**System-level Software Tools**  
For integrated HMI systems, the authoring tool "CGI Studio" is provided so that the contents design can be done by the designer and the engineers by cooperative design (Figure 10). Using this tool, not only the performance of the MB86R20 series can be brought out to the maximum extent, but also because of cooperative design by the

designer and the engineer, the contents visualized by the designer can be reproduced instantly on the MB86R20, and reworks in the middle of merchandizing get reduced.

For the 360° Wrap-around View System with recognition function, in addition to the conventional set of software tools for 360° Wrap-around View System (Figure 11), software products will be provided successively for realizing recognition functions. Development of 360° wraparound view system with recognition functions can be made easily using these system-level software products.

### In the Future

In the process of people, automobiles, and the environment becoming more harmonized and automobiles becoming the natural means of mobility in the day-to-day lives of people, there will be increasing demand for the window of information linking people, automobiles, and the world, that is, the "integrated HMI system", and the "360° Wrap-around View System with recognition function" supporting safety and relief. Our company will continue to provide LSI products towards the realization of a "human-centric" society in which people are at the center.

\* ARM is the registered trademark of ARM Limited in the EU and other countries.  
\* Cortex-A9 is trademark of ARM Limited in the EU and other countries.

Figure 1 Display control until now (Individual type)

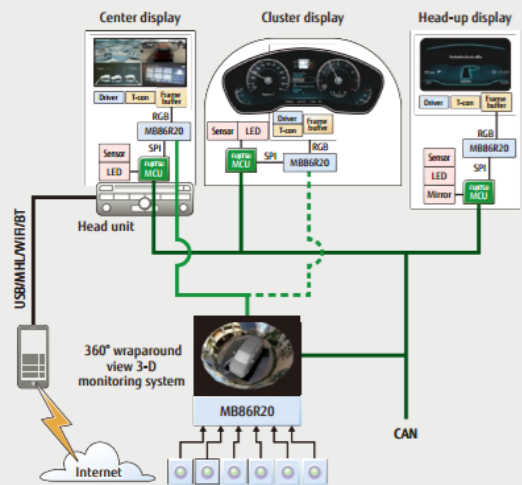


Figure 2 Display control by MB86R20 series (integrated HMI)

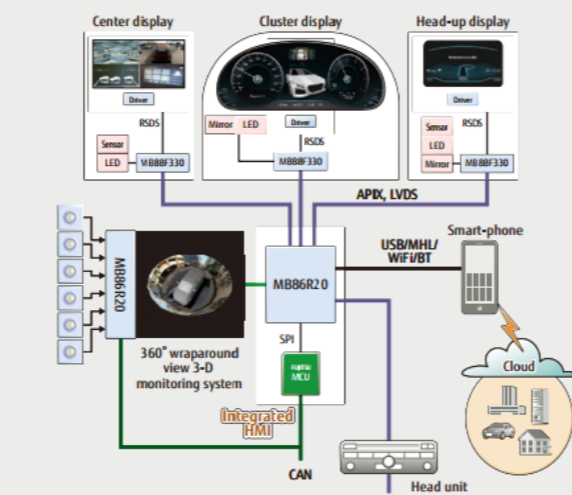


Figure 3 360° wraparound view system using MB86R10 series

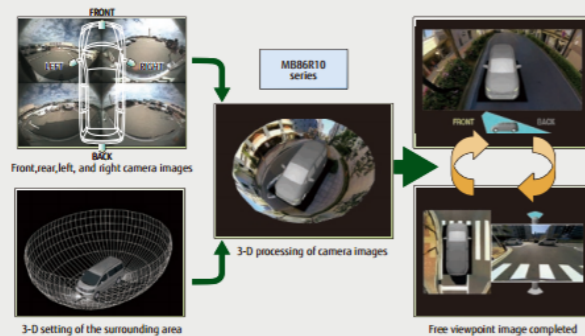


Figure 4 The MB86R10 series is also compatible with mega-pixel cameras

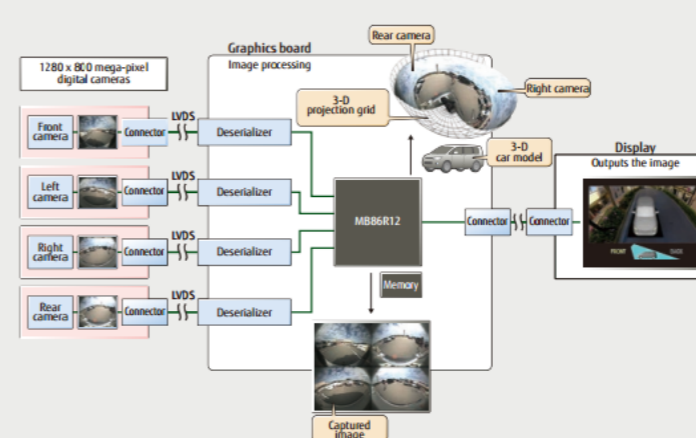


Figure 6 Block diagram

UART	Gen. Purpose Bus	16ch DMA	DDR3/L 800/1066 (16.3264-bit (2 x32))	ext. I/O	Processor Dual ARM® Cortex™-A9 2 x 533MHz (Automotive) ARM® Neon™ SIMD Engine
USART	ARM® Neon™ SIMD		ARM® Cortex™-A9	USB 2.0	
PC	ARM® Cortex™-A9	533MHz	ARM® Cortex™-A9	SOMMAC	Graphics POWERVRTM SGX543 3D Engine 1.4GLOPS, 16Pixel, 3300poly @ 200MHz OpenGL™ ES, OpenVG™, OpenCL™ Fujitsu proprietary 3D Engine
PWM	L1-Cache 32/32 KB	L1-Cache 32/32 KB	PWR Regmt Watchdog	GPIO	
ADC	Internal SDRAM	L2-Cache 512KB			Video Video Capture 8 x 1920x1080
PS	POWERVRTM SGX543 3D Engine	OpenGL ES, VG, CL	Dithering Gamma	Display Cnt RGB, LVDS	
HS-SPI	Video Capture	Ints Core 2D Engine	SIG Unit	Display Cnt RGB	Memory DDR3/L-1066 x16, x32, x64
SPI	Video Capture			Display Cnt RGB	
Video Capture	Video Capture				Peripherals Standard I/O PC, PS, UART, SPI, FPD-Link Network LAN, Ethernet
Video Capture	Video Capture				
CAN	MediaLB™			Ethernet MAC IEEE 1588	

Figure 5 360° wraparound view monitor image with recognition function using the MB86R20 series

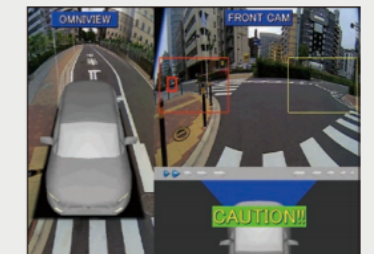
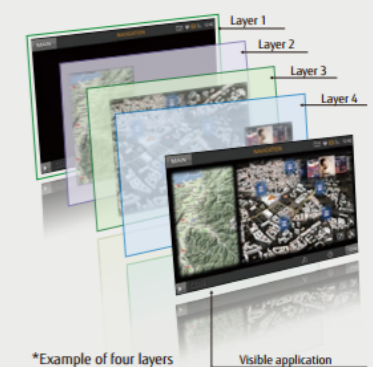


Figure 7 Example of processing in four rendering layers (possible up to 8 layers)



\*Example of four layers Visible application

Figure 8 Rendering the needles of cluster display and the image of the vehicle



Figure 9 Rendering the needles of cluster display and the captured image

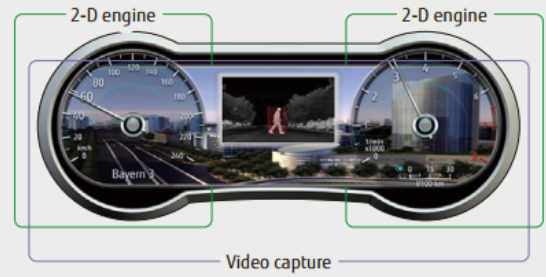


Figure 10 Organizational chart of the CGI Studio

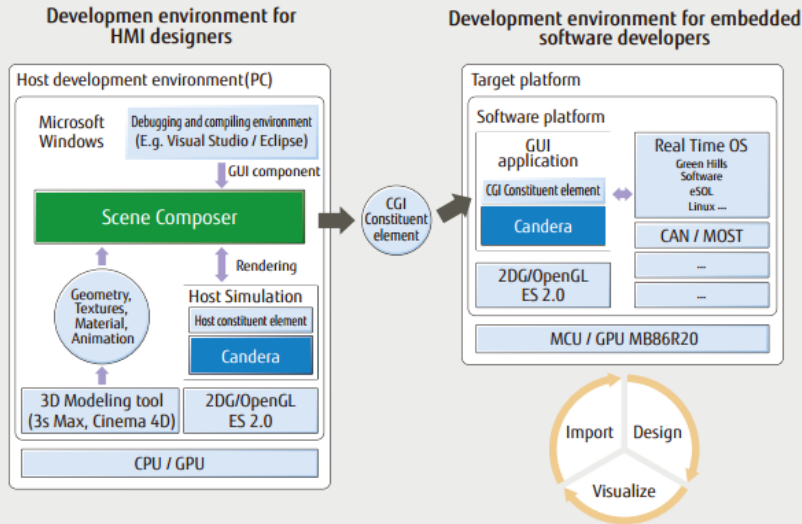
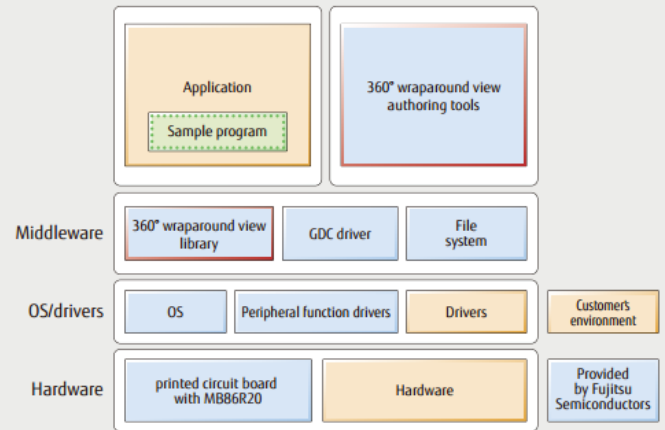


Figure 11 Software configuration diagram



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