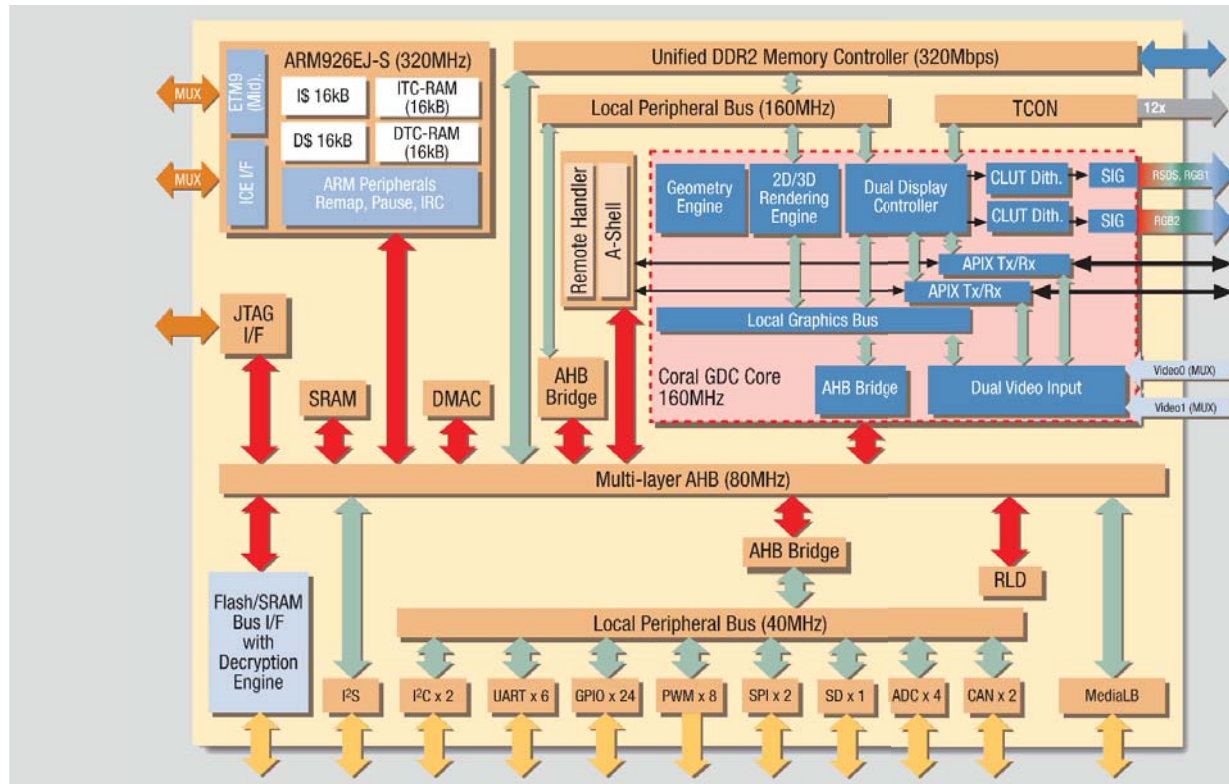# The Fujitsu MB86R02 "Jade-D" System-on-Chip Graphics Controller

▶ Description

MB86R02 "Jade-D" is a highly integrated device for embedded automotive graphics applications. Incorporating an ARM926EJ-S CPU core, an enhanced version of the successful MB86296 "Coral PA" graphics processor and a number of external interfaces, this 90nm device is highly optimized for applications that require superior CPU performance and sophisticated 2D/3D graphics features in a compact SoC.

One of the unique features of the MB86R02 is the dual APIX® serial gigabit interface from Inova Semiconductors. The APIX technology is becoming the new standard for peer-to-peer real-time transmissions of video and peripheral data in the car. The device meets the strict EMC requirements of display applications in vehicles, and because of its SoC-integration options, it leads to higher performance at significantly lower system costs.

Fujitsu was the first silicon vendor on the market to integrate this new video interface into a portfolio of microcontrollers and graphics controllers. The built-in links in the MB86R02 can be used for various link speeds up to 1Gbit/s. Both links are configurable as transmitter or receiver, and support the sideband channel for peripheral data.

The Fujitsu MB86R02 "Jade-D" Graphics Controller

▶ Applications

- On-board and mobile navigation systems
- Graphical dashboard systems
- HUD (head-up display) units
- Rear seat entertainment systems
- Point-of-sale terminals
- Industrial control panels

▶ Features

- CMOS 90nm technology
- ARM926EJ-S CPU core with 16kB instruction and 16kB data cache
- CPU core: 16kB ITCM / 16kB DTCM, ETM9 and JTAG ICE interface
- Internal/memory frequency: 320MHz
- Display resolutions typically from 320 x 240 up to 1280 x 768
- 6 layers of overlay display (Windows)
- Alpha plane and constant alpha value for each layer
- Dual display output (2 separate display controllers are integrated supporting RGB8, RGB16 and RGB24)
- Dual digital video input (2 separate video capture units supporting various formats including YUV, RGB and ITU656)
- Video scaler (up/down scaling)
- Brightness, contrast, saturation control
- Rendering engine for 2D/3D graphic acceleration functions
- Geometry processor supporting floating point transformations
- Texture mapping unit (up to 4096 x 4096)
- Bit BLT unit for transfers up to 4096 x 4096 surfaces
- Spread-spectrum clock generator (SSCG) for improved EMI reduction
- Alpha Bit BLT and ROP2 functions
- Run-length Decoder unit (RLD)
- External DDR2-SDRAM interface (320MHz) for graphic memory (up to 128MBytes), 3 chip selects
- Parallel flash/SRAM host interface with decryption engine
- CAN interface (2 ports)
- MediaLB interface
- APIX™ GBit/s interface (Automotive Pixel Link)
- 2 channels, both individually configurable for Tx (=clk master mode) or Rx (=slave mode)
- Embedded Timing Controller (TCON) for direct display connection and control
- I²C interface (x2)
- I²S interface
- UART interface (x6)
- BGA-484 package
- Temperature range -40 to +105°C

FUJITSU MICROELECTRONICS AMERICA, INC.

Corporate Headquarters
1250 E. Arques Avenue, M/S 333, Sunnyvale, CA 94085-5401
Tel: (800) 866-8608 Fax: (408) 737-5999
E-mail: inquiry@fma.fujitsu.com   Web Site: http://us.fujitsu.com/micro

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