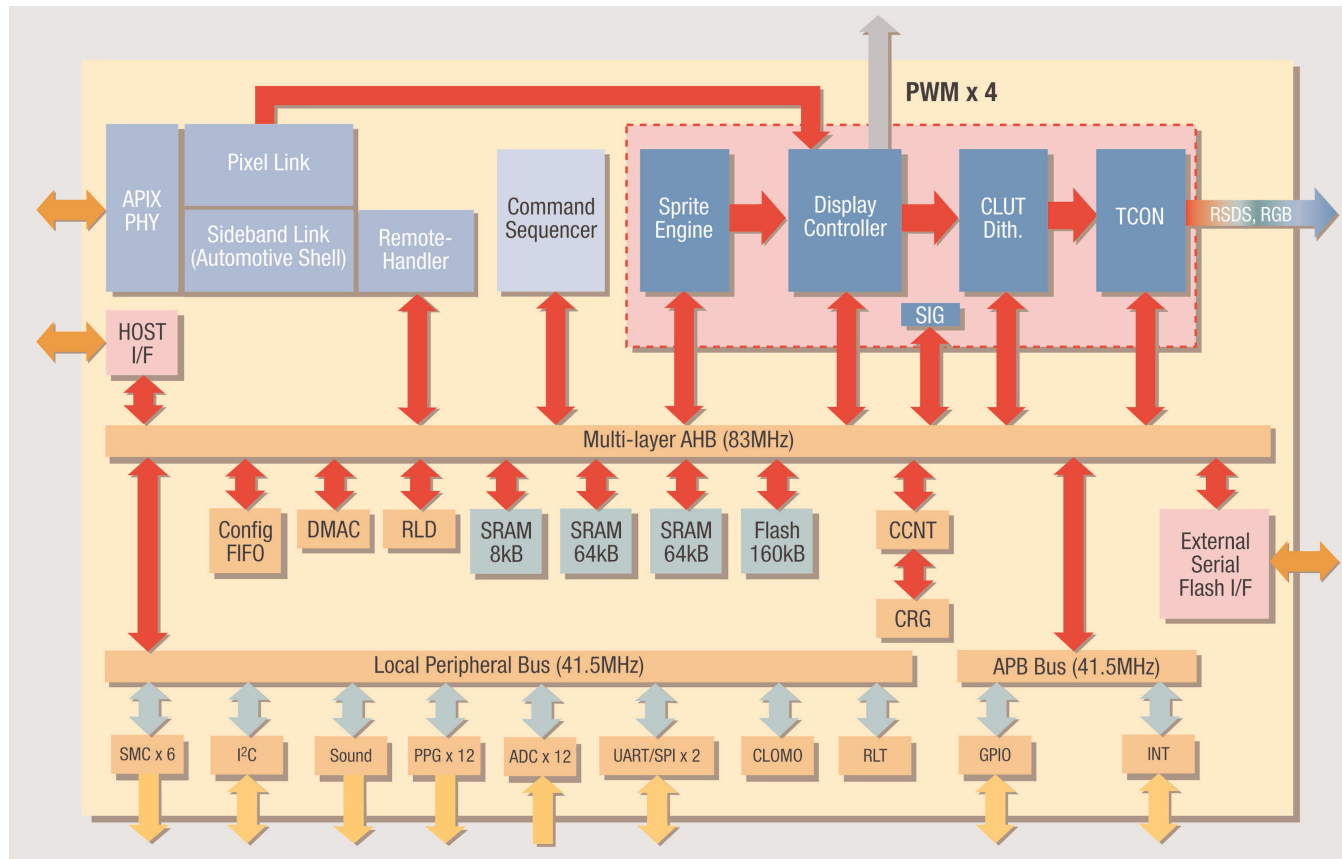FUJITSU

MB88F322 Graphics Display Controller

▶ Description

The Fujitsu MB88F322 Graphics Display Controller (GDC) is an extremely versatile and feature-rich device that has been designed specifically for today's most popular display-based automotive applications including instrument clusters, Heads-Up Display (HUD), Central Information Display (CID) and Rear-Seat Entertainment (RSE) systems. Packaged in a low-cost 208-pin Quad-flat package (QFP), this device has a number of advanced on-board features that significantly reduce bill-of-materials cost, form factor and system-level power consumption.

The MB88F322 GDC is principally a sprite engine that is optimized to efficiently process and animate sprites and bitmaps in a variety of sizes and color depths. The absence of a traditional 2D/3D rendering engine enables this device to operate at a lower frequency. This translates into reduced power consumption, improved EMI characteristics and an extended operating temperature range of -40°C to +105°C.

Perhaps most significantly, the sprite engine does not require the expensive frame-buffer memory that is necessary for graphics rendering units. This device uses a simpler and far-less-costly line-buffer technique that is commonly used in high-definition video products. Accordingly, the on-chip memory space is more than adequate to support an array of bit maps and sprites that are typical in automotive applications. For larger content, such as splash screens, the device features run-time data compression for expansion of run-length encoded data.

The MB88F322 GDC advanced image-processing system supports 1-, 2-, 4-, and 8-bit indirect color palettes. For applications that require finer gradient coloring, the device also supports 14- and 16-bit direct color modes. An available 4/8 bit alpha plane and dithering-and-gamma unit ensure high image quality. The display controller supports a variety of display sizes with resolutions up to 800 x 600 and color depths

MB88F322 Graphics Display Controller

▶ Description (Continued)

of 8-, 16- and 24-bits. An integrated programmable timing-control unit (TCON) enables the device to directly interface with display column and row drivers, improving the level of compatibility while reducing overall system cost.

Another feature of the MB88F322 GDC is that it is a traditional 5-volt device, allowing the inclusion of on-chip stepper motor controllers (SMC). The MB88F322 GDC includes six SMCs, making it ideal for use in amalgam clusters that feature both TFT and traditional mechanical gauges.

On-chip pulse width modulators (PWM), ADCs, I^2C, UARTs, and a sound generator are also integrated onto the MB88F322 GDC. This allows the device to control all the peripheral functions, including backlight circuits, LEDs, sensors and on-board communication, in a display sub-system. With so much functionality packed into one chip, combined with the elimination of frame-buffer memory, MB88F322 designs can be deployed on low-cost, two-layer PCBs with a minimum of external components.
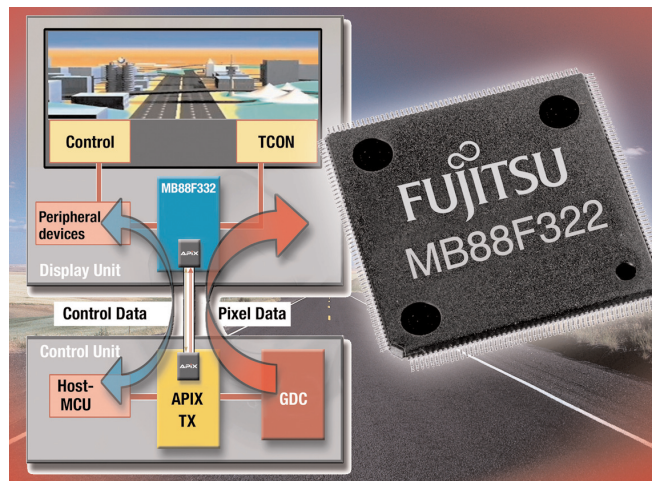
▶ Features

General Features

- 80MHz system clock
- CPU Interface: synchronous serial peripheral interface (SPI)
- 160kB embedded NOR-flash ROM
- 128kB + 8kB embedded SRAM
- External video synchronization functionality
- Seamless direct connection to displays using TCON with RSDS output
- Spread Spectrum Clock Modulation (for improved EMI ratings)
- Signature Calculation Function (can be used to reach a required Automotive Safety Integration Level (ASIL))
- Data expansion for Run-Length-Encoding (RLE) data
- Dual-mode DMA (DDMA/CDMA)
- Sprite engine

Graphics Core

- 1-, 2-, 4-, 8-bpp (indirect, e.g., color palettes) or 16-, 24-bpp (direct) color depth
- 4-/8-bpp alpha plane (256-level alpha blending)
- Line buffer technology: no need for external VRAM
- Maximum display resolution supported: 800 x 600 (SVGA)
- 24-, 16-, 8-bit color TFT LCD panel (max. 800 x 600, 1,677,216 colors)
- Dither and gamma unit
- Sprite technology:
  - Up to 512 sprites (including 32 special sprites)
  - Special sprites for blinking, movement and image switching, with priority property
  - Automatically animated sprites (command list auto load, special sprite functions)
  - Horizontal reverse feature
  - Support for alpha blending

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