



GoForce 2100 Media Processor

The NVIDIA® GoForce™ 2100 is an ultra low-power graphics controller chip for color S-STN panels and color TFT panels, in cellular phone or similar applications. The GoForce 2100 includes a high-performance 64-bit graphics acceleration engine that supports both 8 and 16 bit-per-pixel color depth modes. Also included is a video input port, a video post-processing unit, a JPEG encoder and a 160 KB embedded SRAM. The GoForce 2100 supports color PWM S-STN, color FRC S-STN, color TFT, Sharp ULC color TFT, and LTPS panel interfaces and can be programmed to support various panel sizes. The on-chip JPEG encoder meets the requirements for real-time baseline JPEG compression of video images produced by video sensors, up to VGA resolution (640x480 pixels.) The JPEG encoder hardware performs all the compression steps, excluding the insertion of the interchange header.

LCD INTERFACE

The GoForce 2100 is designed primarily for 176x220 and 240x320 panel resolutions at 16-bits/pixel (16-bpp). It is fully programmable so that other panel resolutions can be supported within the limitation of the frame buffer memory

(160kB), the pixel clock (max 20 MHz), and the horizontal/vertical display counters (9-bit).

VIDEO INTERFACE & PROCESSING

The GoForce 2100 supports a CCIR-656-compliant Video Input Port for interfacing to cameras. In addition to the input port, the GoForce 2100 also provides a video processing engine with color space conversion and scaling hardware to do the post-processing of the acquired image from the camera. The video processing engine supports front-end horizontal and vertical scaling with horizontal filtering. The video processing engine also provides post-processing support for MPEG4 video playback. The ability of the GoForce 2100 to off-load the baseband or host controller in the handset allows OEMs to deploy video and MMS applications with existing handset architectures while leveraging operating system investments. Given the size of the frame buffer and the resolution of the incoming camera image, the OEM has a choice of double buffering the incoming video stream for high quality tear-free display of images.

The video processing engine is coupled with a JPEG encoder capable of encoding still images with resolutions up to VGA

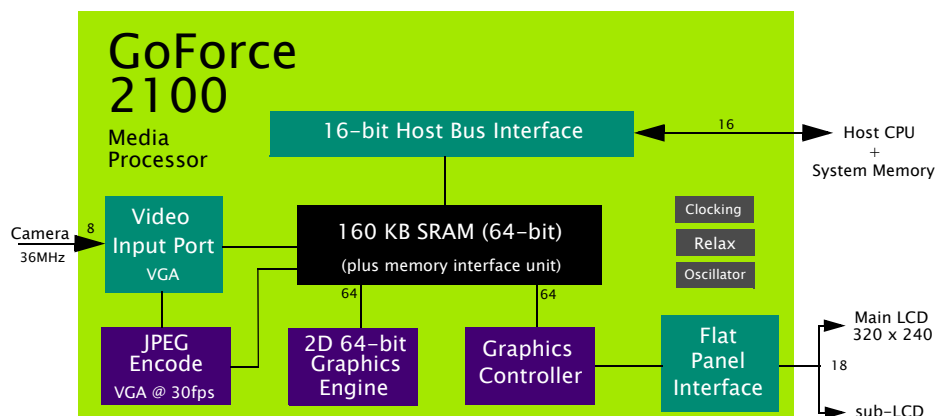
size. This allows implementation of a very low-cost camera for cost-sensitive applications, including wireless handsets and low cost PDAs. The JPEG encoder implements all computationally intensive tasks such as the DCT encoding, RLE, and Huffman encoding in hardware.

CLOCKING

The GoForce 2100 has flexible clocking support. For operating in low-power mode there is a relaxation oscillator. A built-in clock multiplier provides the needed clock frequencies for the image sensor in system applications that require a camera. The output of the clock multiplier is available at a pin to drive the clock input on the image sensor, thus reducing the system-level components and overall system costs.

INPUT & OUTPUT

The GoForce 2100 supports general-purpose outputs and input/output signals to further provide flexibility in generating other system-level signals under software control. These signals can be used to support LCD panels requiring signals that are unique to the vendor, as well as to provide a programming capability for the image sensor.





DISPLAY SUPPORT

- Embedded display frame buffer of 160KB SRAM
- Up to 320 x 240 resolution with up to 64K colors
- Double buffering for resolutions up to 176 x 220 at 64k colors
- Supports 8-bpp, 12-bpp (RGB444) 15-bpp (RGB555) and 16-bpp (RGB565) color depths
- Hardware display rotation (90°, 180°, and 270°)
- Color Look-Up Table
- 32 x 32 hardware cursor
- Color expansion for 18-bpp displays

GRAPHICS ACCELERATION

- BitBLT with 256 three-operand raster operations
- Mono and solid pattern
- Mono-to-color expansion
- Mono source/pattern transparency
- Destination read color transparency and destination write color transparency
- All angle (Bresenham) line draw
- Rectangle fill

FLAT PANEL (LCD) INTERFACE

- 4-bit, 8-bit, and 16-bit color FRC S-STN panel
- 9-bit, 12-bit, and 16-bit PWM S-STN panel
- 9-bit, 12-bit, and 16-bit TFT panel
- Differential signalling channel compatible with CMADS physical interface

JPEG ENCODER

- Hardware Support for JPEG encoding for images up to VGA
- Hardware DCT, RLE, and Huffman encoding, programmable Q-table

VIDEO INPUT

- CCIR656 compliant 8-bit interface
- Supports YUV 4:2:2 format and YCrCb 4:2:2 format
- Horizontal decimation with horizontal averaging and low-pass filtering
- Vertical decimation
- YUV422 to RGB565 color space conversion

- Single and double buffering support. Double buffering synchronization with Graphics Controller

FLEXIBLE HOST BUS INTERFACE

- MDB-style (Dragonball) 8-bit and 16-bit mode
- 8-bit and 16-bit asynchronous interface to CPUs

CLOCK OPTIONS

- On-chip oscillator for 12 to 27MHz crystals
- Digital bypass mode for external clock sources
- Low-power relaxation oscillator
- Clock multiplier with 1x, 2x, and 4x modes

ADVANCED POWER MANAGEMENT

- Fully-static CMOS technology
- Individual module enables for power saving
- Automatic shut-off of unused pipelines

