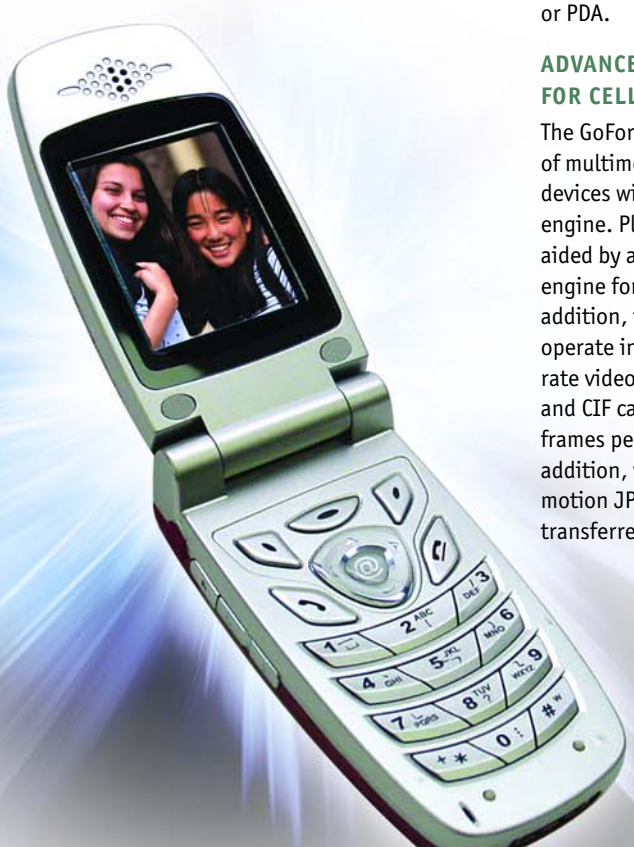
Media Processors for Advanced Handheld Devices

The digital age is everywhere, and users on the go want to be able to take advantage of it on wireless handheld devices. From digital photography to video games, cell phones and PDAs are used for a myriad of multimedia applications. Now, the NVIDIA® GoForce™ 2150 multimedia processors deliver megapixel digital photo resolution, richer graphics, better image quality, and longer battery life for cell phones and handheld devices. An ultra low power multimedia chip, the GoForce 2150 is the first product from the combined efforts of NVIDIA and MediaQ.

The GoForce 2150 offers a host of advanced features for cell phones and PDAs, including support for 1.3-megapixel image capture, accelerated graphics for gaming, and motion JPEG capture and playback. Using dedicated hardware accelerator engines, the GoForce 2150 delivers exceptionally high performance for multimedia applications and drives high-resolution displays, while extending handheld battery life through a variety of unique power management techniques.



POWERING THE LATEST INTEGRATED DIGITAL CAMERAS IN HANDHELD DEVICES

With the integration of megapixel resolution digital cameras into wireless handheld devices, capturing high-resolution digital images has become a reality. When printed in standard print sizes of 4x6 inches, these digital images have nearly the same level of detail as pictures taken with film. The GoForce 2150 enables 11 frames per second preview at megapixel resolution, which provides a fluid motion preview of images on the display. Immediate frame capture ensures that the preview frame the user sees is the same as the captured image.

In addition, GoForce 2150 has a dedicated hardware JPEG encoder that performs image compression and display for higher performance and longer battery life. With support for image correction tools, and by allowing users to trade off between file size and image quality, the GoForce 2150 provides users flexible options for capturing, storing, and sending digital images on their cell phone or PDA.

ADVANCED MULTIMEDIA FUNCTIONALITY FOR CELL PHONES AND PDAS

The GoForce 2150 enhances the performance of multimedia applications on handheld devices with an advanced 64-bit 2D graphics engine. Playback of MPEG-4 movie clips is aided by a hardware color space conversion engine for smoother video playback. In addition, the hardware JPEG encoder can operate in a continuous mode for high frame rate video capture. Image resolutions of QVGA and CIF can be encoded at the rate of 15 frames per second for fluid motion. In addition, video clips are encoded in a standard motion JPEG format and can be easily transferred to a PC for playback.

The GoForce 2150 powers high-resolution displays, supporting up to QVGA and over 200,000 colors, for richer, truer colors and higher image quality. GoForce 2150 also supports high-quality graphics on secondary displays found on “clamshell” or “flip” phones.

ADVANCED POWER MANAGEMENT DELIVERS LONGER BATTERY LIFE

Battery life, both in standby and full operation, is one of the most critical features of handheld devices. GoForce 2150 not only uses less power than any competitive solution on the market, but it can also dramatically reduce the overall power consumption of the entire system. With advanced power management technologies, the GoForce 2150 dissipates minimal power for increased battery life, even when performing multiple tasks such as storing digital images, performing image compression, and driving the LCD.

INDUSTRY TECHNOLOGY LEADERSHIP

NVIDIA GoForce 2150 is the first handheld multimedia accelerator product launched under the NVIDIA brand and the successor to the product offerings from MediaQ, now a wholly owned subsidiary of NVIDIA. The hallmark of every device in the NVIDIA GoForce family is to provide a high-performance, visually rich multimedia experience on a PDA or mobile phone.

MediaQ has a long history of design wins with leading OEMs, and is the leader in the wireless multimedia coprocessor market. MediaQ achieved this dominant position in the marketplace by developing innovative products that provide the best possible visual experience on mobile handheld devices. This includes directly interfacing to a vast array of LCD panels, supporting the most demanded features and capabilities, and implementing innovative design techniques, both inside the chips and at the system level, which result in high performance without penalty. The GoForce 2150 continues that evolution under the NVIDIA name.

FEATURES	BENEFITS
Megapixel Camera Support	High-resolution camera support makes it possible to capture photographic quality images with your cell phone or PDA that can be printed in the standard 4x6 inch (10x15cm) size, or displayed, full screen, on a high resolution (SXGA) computer monitor.
Hardware JPEG Encoding	Megapixel images can be previewed and encoded without relying on the baseband or application processor, which results in significantly reduced system power consumption and impressive preview and encode performance. Due to hardware acceleration for preview and JPEG encode, GoForce 2150 delivers multi-FPS megapixel review, encode, and continuous motion JPEG video capture at up to 15 FPS at less than 11 mW. In single shot mode, this also ensures what you see on the preview screen is exactly the image you capture to the memory card.
160KB of 64-bit Wide Embedded SRAM Memory	Enough to support for high-resolution displays without the need to access external memory, reducing the power required to power the display. The wide data paths allow the memory interface to run at lower speeds, saving even more power.
64-bit 2D Graphics Engine	High-performance precision graphics that improve everything from simple text scrolling to playing a fast-motion game or watching a video clip.
Standard Host Bus Interface	Industry standard interface to 8-bit and 16-bit CPUs provides rapid, flexible system design and eases software development to enable fastertime-to-market.
QVGA LCD Support + Dual LCD Interface	Provides a high resolution display so you can see more of your phone book, web page, or game on the screen, and more detail in the pictures you view. Support for dual displays on "flip" or "clamshell" devices providing fast switching between the two displays - and each display can be of different sizes and resolution. Nearly 70 popular LCD panels are supported.
MPEG 4 Post Processing	Offloads the processor by handling computationally intensive tasks (such as color space conversion) which represent approximately 20% of the MPEG 4 decoder cycles to provide a higher quality, more fluid playback of video.

NVIDIA GOFORCE 2150 SPECIFICATIONS

DISPLAY SUPPORT

- Embedded display frame buffer of 160 KB SRAM
- Support for QVGA resolution and S-STN displays
- Support for double buffered 176 x 208 frame buffer (improved gaming visuals)
- 16bpp to 18bpp conversion (> 200,000 colors)
- Hardware display rotation (90°, 180°, and 270°) plus flip and mirror
- Support for sub-LCD display in hardware
- Fast switching between main/sub-LCD

GRAPHICS ACCELERATION

- BitBLT with 256 3-op 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

- Direct interface with LCD drivers with embedded memory
- Color FRC S-STN at 4, 8, and 16 bits/clock
- Color PWM S-STN at 9 and 12 bits/clock
- Color TFT at 9, 12, 16 and 18 bit/clock
- Half pixel per clock support for 16 and 18 bit panels
- Up to 16-level FRC and up to 4-bit spatial dithering

JPEG ENCODER

- Hardware support for JPEG encoding for images up to SXGA in continuous mode
- Hardware DCT, RLE, and Huffman encoding
- Programmable Q-table

VIDEO INPUT

- CCIR656 compliant 8-bit interface
- Horizontal scaling with horizontal averaging and low-pass filtering
- Vertical scaling
- GPIOs for camera control
- Clock output to drive the camera master clock
- YUV422 to RGB565 color space conversion
- Single and double buffering support
- Double buffering synchronization with graphics controller

FLEXIBLE HOST BUS INTERFACE

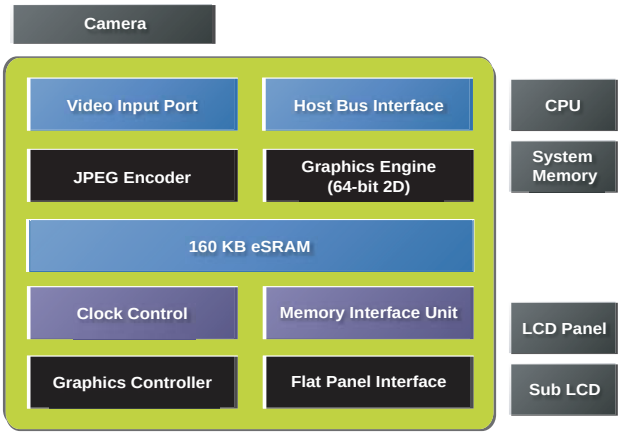
- Indirect or direct addressing support
- M68-style 8-bit and 16-bit mode
- MDB-style (Dragonball) 8-bit and 16-bit mode
- 16-bit asynchronous interface for baseband processors (ARM based)

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 shutdown of unused pipeline stages



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