NVIDIA GOFORCE 5500

FEATURES	BENEFITS
Video Engine	Watch mobile digital TV broadcasts. Enjoy a camcorder in your phone allowing you to record and play back video up to D1 resolution (480P digital TV resolution for NTSC, 720x576 for PAL) and up to 30fps. Compatibility with the most popular video formats, including H.264, WMV9, Real Video, MPEG4 and H.263, means that you can watch video from your friends, or from the web.
24-bit Audio Engine	Play back CD-quality music in all of the popular formats (MP3, WMA, AAC+ and more). With the power to process multiple audio tracks, you can cross-fade from one song to the next and your MP3 ring tone still comes through crystal clear. Enjoy surround sound effects and equalizer capability so you hear your music the way you like it whether that means more bass, more treble or something in between.
GoForce 3D Engine Version 2.0	Your games and avatars run blazing fast with up to 2x the performance of the previous generation GPU. 2nd generation features enable cool new special effects to make those applications their best.
Camera Processor with ISP	Makes your cell phone camera more like your digital still camera. Delivers fluid frame rates at 5 megapixel resolution with support for extreme resolutions up to 10 megapixels. Enables rapid multi-shot where you press the button once and get a series of still-frame shots…great for hard-to-catch action shots.
2nd Generation NVIDIA nPower Technology	Minimizes the drain on your battery, so you get more hours of music, videos and games and still have plenty of talk time.
TV-Out	Show your photos and videos on a bigger screen so everyone can share the memories.

NVIDIA GOFORCE 5500 SPECIFICATIONS

H.264 VIDEO CODEC
- H.264 decode at D1 resolution [720x480 @ 30fps or 720x576 @ 25fps]
- H.264 encode QVGA at 15fps and 384Kbps
- H.264 codec QVGA at 15fps and 384Kbps

WMV AND REAL VIDEO DECODER
- WMV9 decode QVGA at 25fps
- Real Video 9 decode QCIF at 15fps

MPEG4 / H.263 HARDWARE CODEC
- MPEG4 encode or decode D1 resolution at 30fps
- MPEG4 codec D1 at 30fps
- MPEG4 Simple Profile, Levels 0 to 5 (ISO/IEC 14496-2)
- H.263 Profile 0, Level 50 and lower
- Video post-processing including hardware color space conversion and image scaling
- De-blocking and de-ringing filters to reduce the visibility of compression artifacts during playback

3D GRAPHICS ENGINE V2.0
- OpenGL® ES with NVIDIA Pixel Shading Extensions
- 200 million pixels/second 3D fill rate
- 2.67 million drawn triangles/second
- 128-bit interface to internal memory
- 32-bit interface to stacked memory
- Transform engine
- 40-bit color pipeline
- 5 simultaneous textures
- Signed, overbright color
- 7 surfaces (color, Z, texture 1..5)
- 16 4-bit palettes or one 8-bit palette
- Transform engine
- Setup engine
- Programmable pixel shading engine
- Bilinear/Trilinear texture filtering
- Fixed point & floating point data
- 3D rendering to XGA [1024x768] and smaller displays

AUDIO ENGINE
- Programmable Core
- I²S/AC97 codec interface

DECODE
- AMR NB [12.2kbps] and WB [23.5kbps]
- AAC LC, HE-AAC (AAC+), AAC+ Enhanced [128kbps]
- MP3 [320kbps]
- AAC [320kbps]
- WMA, WAV & PCM
- Real Audio 8, 9, 10
- Bluetooth SBC

ENCODE
- AMR NB [12.2kbps] and WB [23.5kbps]
- AAC LC [128kbps]
- MP3 [320kbps]
- Bluetooth SBC

MIDI
- Support for SP-MIDI, DLS, XMF
- 64 voice polyphony at 22kHz
- Standard Sound Bank

AUDIO EFFECTS
- Stereo Widening, Equalization, Noise Cancellation, Mixer, Acoustic Echo Cancellation, Environmental Effects

IMAGE SIGNAL PROCESSOR (ISP)
- Optical black calibration
- "De-knee" compensation
- Lens-shading (radial) compensation
- Exposure compensation
- White balance
- Defective pixel correction
- Demosaic & denoise
- Edge enhancement
- Color correction to sRGB
- Gamma correction
- Color conversion (to YUV)
- Statistics gathering for Auto Exposure, Auto White Balance, and Auto Focus

JPEG HARDWARE CODEC
- 10MP (and lower) encode or decode using ISO/IEC 10918 Baseline
- Motion JPEG capture/playback
- Low shutter lag image capture
- Composite, framing, and overlay
- Thumbnail support (store both image and thumbnail in same file)
- Support Huffman decode for JPEG
- Programmable quantization table
- Hardware DCT, RLE, Huffman encode

DISPLAY CONTROLLER
- Support for XGA [1024x768] LCD
- Double-buffering support for VGA and lower resolution display
- Fast switching between main/sub-LCD
- Hardware support for sub-LCD display
- Up to 24-bpp panel support

SD/SDIO HOST CONTROLLER
- 1-bit and 4-bit SD/SDIO
- Support for storage or wireless cards

VIDEO INPUT (BAYER & YUV)
- 10MPix Bayer camera module support via 10-bit RGGB Bayer Interface
- 5MPix Bayer @ 15 fps
- 3MPix @ 10fps camera preview via ITU-R 656-compliant 8-bit interface
- 96MHz output to camera master clock
- Horizontal scaling with horizontal averaging and low-pass filtering
- Vertical averaging
- I²C for camera control & programming
- YUV422 to RGB565 color space conversion
- Single- and double-buffering support
- Double buffering synchronization with graphics controller
- Image/Video Rotation

64-BIT 2D GRAPHICS ACCELERATION
- BitBLT with 256 3-operand raster ops
- Video scaling with range of 8x expansion to 1/64th contraction
- Mono and solid pattern
- Mono-to-color expansion
- Mono source/pattern transparency
- Destination read/write color transparency
- All-angle Bresenham line draw
- Rectangle fill
- Image/Video Rotation
- Alpha Blending

FLAT PANEL (LCD) INTERFACE
- 16.8 million colors in 24-bpp mode
- Direct interface to LCD
- Built-in timing generator
- Color TFT at 9, 12, 16, 18, 24-bit/clock
- Partial pixel-per-clock mode
- CPU, RGB, Serial, M-CMADS, AMLCD, LTPS, SPI and Sharp ULC support
- Support for over 80 popular displays

GRAPHICS CONTROLLER
- Alpha Blending
- 16 to 24-bpp color expansion
- Color Space Conversion (YUV to RGB)
- Hardware rotation (90°, 180°, 270°)
- Flip and mirror
- Partial display support (any size/position)
- Triple 6-bit look-up-table
- Overlay support
- Encode predefined region of display

INTEGRATED 640KB 128-BIT WIDE SRAM
- 640KB of 128-bit wide on-die memory

32-BIT FLEXIBLE HOST BUS INTERFACE
- Indirect and direct addressing support
- 16/32-bit asynchronous interface
- Burst mode support
- Fixed and variable latency host bus
- Automatic address incrementing
- Programmable interrupt

CLOCK OPTIONS
- On-chip oscillator for 2 to 13MHz crystal
- Digital bypass mode for external clock sources (e.g. baseband or CPU)
- Low-power relaxation oscillator
- Two on-chip PLLs with independent VCOs (range of 50MHz to 400MHz)

NVIDIA NPOWER POWER MANAGEMENT
- Fully-static CMOS technology
- Low-power 90nm process
- Individual module enables
- Automatic shut-off of unused pipeline stages

PACKAGING & VOLTAGE
- Available with 2MB stacked, 8MB stacked, or external memory interface
- JTAG boundary scan & BIST
- 0.95 to 1.32V core, 1.71V to 3.30V I/O

STACKED MEMORY/ PACKAGE DETAILS

	2MB	8MB	XT
Core Speed (MHz)	200	200	200
Embedded SRAM	640KB	640KB	640KB
Stacked Memory	2MB	8MB	N/A, up to 32MB external memory
Package Size (mm)	10 x 10 x 1.4	10 x 12 x 1.4	10 x 12 x 1.4

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Experience Entertainment Without Limits

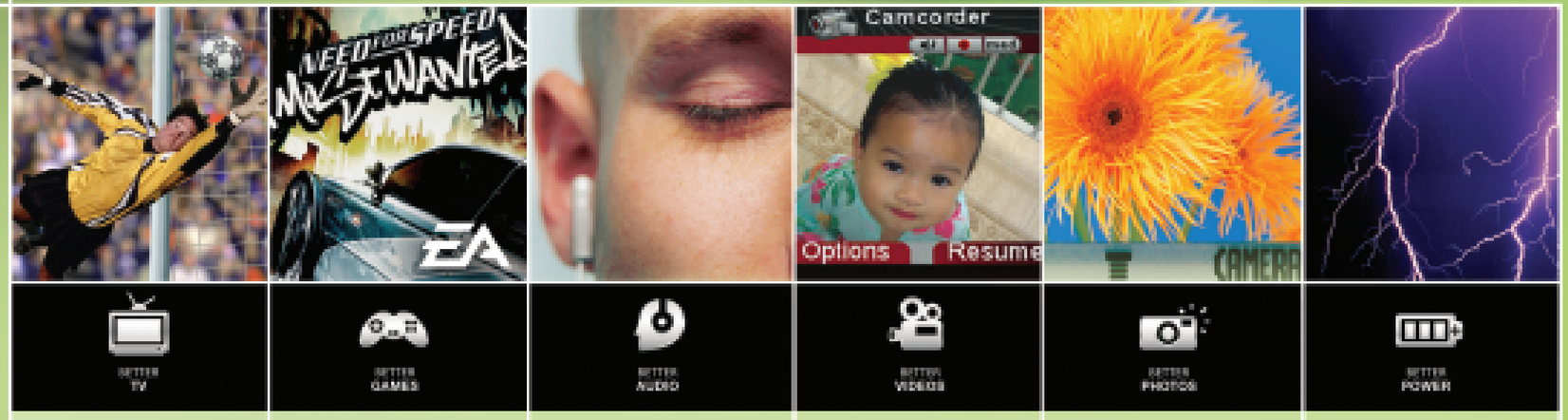
A revolution is underway in handheld technology. From digital television to high-resolution photography, from immersive audio/video playback to interactive 3D games, consumers not only want it all, they want it with the quality they demand from standalone digital devices.

Renowned for creating innovative, industry-changing products, NVIDIA® makes entertainment on the go possible with the NVIDIA® GoForce® family of handheld graphics processing units (GPUs). With advanced chip and system level design techniques, NVIDIA delivers unmatched features and performance to handheld devices, while maintaining long battery life that frees consumers to experience entertainment without limits.

The First GPU to Deliver The World of Portable Entertainment to Your Mobile Phone

NVIDIA GoForce 5500

Experience true, fluid digital TV, console-class 3D gaming, high-fidelity surround sound, smooth DVD-quality video playback, and sharp, vivid photos—all with longer battery life for more hours of entertainment.



TRUE, FLUID DIGITAL TV

Tired of chunky, choppy TV on your mobile phone? Most TV programming on handheld devices is streamed through cellular networks that aren't designed for broadcast. Because the high bandwidth of TV content can choke data networks, TV programming comes across choppy, blurry and at pitifully small resolutions such as QCIF or smaller. The NVIDIA GoForce 5500 GPU is compatible with new network standards, including DVB-H, ISDB-T and DMB, and data formats such as H.264 and WMV9, for broadcast television around the globe. The result—users get high quality content with fluid frame rates—just like broadcast television.

CONSOLE-CLASS 3D GAMING

'Got game' on your phone? The GoForce 5500 GPU includes the latest NVIDIA 3D graphics for handheld devices. Your handheld games never looked better and never played faster. The all-new NVIDIA GoForce 5500 3D engine delivers up to 2.6M triangles per second and an unprecedented 200M pixels per second, barely sipping at your battery juice. As a result, you get more hours of console-class gaming—anytime, anywhere.

HIGH-FIDELITY SURROUND SOUND

Whether you're watching a movie or just chillin' with your latest tracks, the surround sound processing and 3D audio effects will make you forget you're listening to a mobile phone. With the NVIDIA GoForce 5500 audio processor, portable audio never sounded better. High bit rate MP3, AAC and AAC+ playback at up to 320kbits/sec with equalizer effects and cross-fading are the new standards. Combine that with longer battery life and your next phone can be a surprisingly better music player than the MP3 player you have today.

SMOOTH DVD-QUALITY VIDEO PLAYBACK

When you record or play video files, frame rate is a key factor in the quality of the experience. NVIDIA GoForce GPUs are capable of both encoding (recording) and decoding (play back) video at a fluid 30 frames per second—delivering smooth, jitter-free, high-quality video. Experience this quality improvement while viewing streaming video or using your phone as a camcorder to capture a movie. NVIDIA GoForce GPUs are also engineered for simultaneous encode and decode for applications like video conferencing.

SHARP, VIVID PHOTOS

Digital cameras are a standard feature on handheld devices. The NVIDIA GoForce 5500 raises the bar—up to 10-megapixel film-quality imaging—higher than most of the standalone digital cameras available today. And the revolutionary NVIDIA FotoPack™ technology stores these high-resolution images in one-half the space, allowing you to take twice as many pictures using the limited storage space of mobile devices. In addition, other features that are standard in digital cameras are now possible on your handheld device, including removable storage cards, 8x digital zoom, and real-time capture, storage, and viewing of multiple digital images on your phone for added convenience.

MORE HOURS OF ENTERTAINMENT, LESS DRAIN ON TALK TIME

Multimedia applications, like watching a movie or playing a game, require large amounts of processing power. If these functions had to be performed by the phone's main processor, battery life and performance would be dismal. NVIDIA nPower™ technology addresses this issue by offloading the main processor and running multimedia applications on the GPU. This way, the power required to run these applications is significantly reduced, while image quality is greatly improved.

NVIDIA GOFORCE FAMILY PRODUCT COMPARISON

FEATURES	NVIDIA GoForce 5500	NVIDIA GoForce 4800	NVIDIA GoForce 4000	NVIDIA GoForce 2150
Embedded SRAM Memory	640KB	1280KB	640KB	160KB
Megapixel Camera Support	10MP	3MP	3MP	1.3MP
Maximum Display Resolution	1024x768	640x480	640x480	320x240
JPEG Encode	✔	✔	✔	✔
JPEG Decode	✔	✔	✔	✔
Digital Zoom	8x	8x	8x	
Video Conferencing	✔	✔	✔	
MPEG-4 Encode	✔	✔	✔	
MPEG-4 Decode	✔	✔	✔	
SD/SDIO Support	✔	✔	✔	
VGA	✔	✔	✔	
3D Technology	✔	✔		
Geometry Processor	✔	✔		
Programmable Pixel Shaders	✔	✔		
Multi-Texturing	✔	✔		
Early-Z	✔	✔		
40-bit Color	✔	✔		
FotoPack Technology	✔	✔		
OpenGL ES with NVIDIA Extensions	✔	✔		
24-bit Audio Engine	✔			
Camera Image Signal Processor (ISP)	✔			
H.264 Decode	✔			
H.264 Encode	✔			
H.264 Codec	✔			
Additional Memory	2MB or 8MB stacked; up to 32MB supported externally			