

NEC Electronics Sharpens Image Quality with Super-Resolution ASSP

Company Unveils Plans to Proliferate Single-Frame Super-Resolution Technology

KAWASAKI, Japan, SANTA CLARA, Calif., DUESSELDORF, Germany, February 4, 2009 — NEC Electronics today introduced a new application-specific standard product (ASSP) to address the dramatic divergence between yesterday's image resolution and the high resolution of today's audio-visual (AV) display systems. Based on the company's unique single-frame super-resolution technology, the small, low-power ASSP (part number uPD9245GJ) reduces the blurring that occurs when low-resolution images are expanded and displayed in high-resolution. The ASSP sharpens out-of-focus images, smoothes rough edges and refines contours by analyzing and processing information contained in one frame of data in real time. Using standard video interfaces for data input and output, designers can easily integrate the ASSP into a wide variety of consumer, industrial, medical and automotive devices that handle images and video.

The technology is also available as an intellectual property (IP) core that can be embedded into ASICs or other ASSP products, such as NEC Electronics' Enhanced Multimedia Architecture (EMMA) ASSP for digital AV devices. NEC Electronics plans to continue developing next-generation super-resolution ASSPs with increased operating frequency and expanded video output size, and by 2010, the company expects to receive orders totaling more than US\$110 million for super-resolution products.

The rapid development of today's high-performance digital AV devices—from computers, digital cameras and mobile phones to DVD recorders and high-definition televisions—has left consumers with the challenge of how to view low-resolution images on their new high-definition electronic products. The new NEC Electronics ASSP successfully corrects the difference between yesterday's data resolution and today's. Now, clearer images can be achieved quickly, easily and inexpensively. NEC Electronics expects this new technology to "digitize" consumers' lives, helping them hold onto valuable memories previously recorded with lower-resolution technologies.

Super-Resolution Technology Previous image-resolution technologies used a multiframe technique to process image data, which required large-capacity external memory that made it expensive and difficult to create hardware capable of real-time processing. NEC Electronics' new technology enables very high-resolution processing with just one frame of image data. Reducing the processing load eliminates the need for expensive, external high-capacity memory, such as double-data-rate (DDR) SDRAM, thereby reducing cost and power consumption, and simplifying connections to existing systems. With standard video interfaces such as 24-bit CMOS I/O with RGB or YUV for easy connection, the super-resolution ASSP easily can be added to existing designs.

The technology enhances image data from quarter video graphics array (QVGA) resolution (320 x 240 pixels) to wide VGA (WVGA) resolution (800 x 480 pixels) for clear image display on mobile phones and car navigation systems. The technology also achieves crisp images in 1920 x 1080-pixel high-definition (HD) television broadcasts by boosting image data in the 640 x 480-pixel VGA format ordinarily used for TV broadcasts and DVD storage to 6x the resolution.

Key features of the ASSP include:

- Resolution of 60 frames per second (fps) for 1280 x 1024-pixel super extended graphic array (SXGA) resolution
- 60 fps resolution for HDTV (1366 x 768 pixels)
- Built-in I2C bus for register setting
- JTAG support

- 10 to 30 megahertz (MHz) system clock
- 108 MHz pixel clock (max.)
- 3.3 volt (V) power supply for I/O and 1.5V supply for the core
- 0.9 watts typical power consumption at 60 fps for SXGA resolution
- -40C to +70C operating temperature
- 144-pin low-profile quad flat package (LQFP)

Other possible application uses for the new ASSP include shooting photos and video on lower-resolution digital cameras and other devices, and for playing them back as high-resolution images, enabling the consumer to capture more images using the same amount of memory. For example, if one gigabyte of memory is used, NEC Electronics' super-resolution technology allows about 34 minutes of video to be shot in a standard four-megabyte resolution mode, which would be similar to a 17-minute video shot using an eight-megabyte high-resolution mode. Alternatively, scanning with low-resolution sensors and rendering the image in high resolution shortens scanning time and reduces system costs. More information about NEC Electronics' super-resolution ASSP can be found at <http://www.am.necel.com/superres>. To view a video of the super-resolution technology, visit <http://www.am.necel.com/superresvideo>.

Pricing and Availability

Samples of NEC Electronics' uPD9245GJ ASSP are available now with pricing beginning under US\$10 for more than 1,000 pieces and US\$30 in lower volumes. Super-resolution IP cores are also available for NEC Electronics' cell-based ASIC (CB-90 and CB-12) and gate array (CMOS-12M) libraries.

NEC Electronics also has developed an evaluation board to support the uPD9245GJ ASSP. The small, four-by-two-inch board includes an evaluation version of the ASSP running alongside an NEC Electronics 78K0/KE2 microcontroller, a DVI-D video interface and an I2C slave interface and USB connector. (Pricing and availability are subject to change without notice.)

About NEC Electronics

NEC Electronics Corporation (TSE: 6723) specializes in semiconductor products encompassing advanced technology solutions for the high-end computing and broadband networking markets, system solutions for the mobile handset, PC peripheral, automotive and digital consumer markets, and multi-market solutions for a wide range of customer applications. NEC Electronics Corporation has subsidiaries worldwide including [NEC Electronics America, Inc.](#) and [NEC Electronics \(Europe\) GmbH](#). More information about NEC Electronics worldwide can be found at www.necel.com.

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