

Renesas Technology Releases R61504 Single-Chip TFT Controller/Driver Supporting 16.77 Million Color Display and MDDI for Mobile Phone QVGA-Size TFT Color Liquid Crystal Display Panels

— QVGA single-chip liquid crystal display driver lineup extended by addition of MDDI compatible product —

Tokyo, June 30, 2005 — Renesas Technology Corp. today announced the R61504 liquid crystal display (LCD) controller/driver, providing QVGA*¹-size screen drive and 16.77 million color display capability plus high-speed serial interface standard MDDI (Mobile Display Digital Interface)*² support in a single chip, as a driver for amorphous TFT color LCD panels used in mobile phones. Sample shipments will begin in Japan in August 2005.

The R61504 offers the following features.

(1) QVGA-size screen drive and 16.77 million color display capability with a single chip

Renesas Technology has previously released the R61505 as a single-chip LCD driver for QVGA-size panels supporting 260k-color display. The new R61504 extends the number of display colors to 16.77 million, enabling high-quality display equivalent to that of a personal computer to be achieved. The two-product lineup allows a user to select the most suitable model for the application system specifications. Use of the R61504 in cases previously using a two-chip configuration comprising a gate driver and source driver enables the number of component parts to be reduced, making it possible to cut liquid LCD module costs and power consumption.

(2) Support for MDDI high-speed serial interface standard

MDDI is a small-amplitude-differential high-speed serial interface standard. The R61504 can be directly connected to an MDDI compatible baseband LSI, enabling the elimination of a previously necessary bridge chip and so reducing LCD panel module and system costs.

The R61504 is also provided with conventional parallel, serial, and RGB interfaces, allowing the same connection method as at present.

(3) RGB individual gamma adjustment function for higher image quality

The R61504 incorporates an RGB individual gamma adjustment function that allows R (Red), B (Blue), and G (Green) gray-scale generation circuits to be set individually. This enables image color reproducibility to be improved by adjusting RGB gray-scales more precisely, and, together with the 16.77 million color display capability, makes it possible to achieve higher display quality. Gray-scale adjustment is programmable, allowing switching to suit external lighting conditions.

(4) On-chip general-purpose ports for fewer signal lines

The R61504 is provided with nine general-purpose port pins that can be used in various ways. Possible uses include receiving backlight, incoming call LED, vibrator, and similar control signals by the MDDI or another interface from a baseband LSI, and outputting those control signals from these ports. This enables the number of signal lines to be reduced.

When the MDDI is used, it is also possible to transfer instructions and image data to a sub LCD panel module via these general-purpose ports.

< Product Background >

As mobile phone applications expand into such areas as high-resolution cameras, TV display functions, and game functions, larger volumes of display information are being handled and main screen resolution is improving to provide high-quality image displays, leading to increased use of the 240 × 320-pixel QVGA size. At the same time, various styles of mobile phone have appeared on the market, including clamshell and rotatable LCD panel models. Connection between the baseband LSI and LCD panel is currently performed via a parallel interface, but with the large number of signal lines involved it is expected to be difficult to increase transfer speed and handle wiring routing as display information volumes continue to increase in the future. For this reason, the industry is moving ahead with the development of high-speed serial interfaces that use serial transfer requiring far fewer signal lines than parallel transfer, and are also capable of transferring large volumes of data.

Following on from Renesas Technology's earlier development of the R61505 as a single-chip LCD driver for QVGA-size amorphous TFT LCD panels, the company has now developed the R61504 single-chip LCD controller/driver supporting the MDDI high-speed serial interface standard.

< Product Details >

The R61504 provides single-chip drive of a 240 × 320-pixel resolution QVGA-size screen. It has approximately 230 Kbytes of on-chip display RAM and offers 16.77 million color display capability, enabling high display quality to be achieved.

Support for the MDDI small-amplitude-differential high-speed serial interface standard allows direct connection to an MDDI compatible baseband LSI, eliminating the need for a previously necessary bridge chip. The MDDI standard also offers a major reduction in the number of signal lines compared with the conventional parallel transfer method, and enables low EMI*³ noise to be achieved.

The same kind of interfaces as at present are also provided. Connection to a baseband LSI and microcontroller is performed by means of an 8/16-bit high-speed bus interface, and highly efficient transfer can also be performed by a high-speed burst RAM write function. In addition, an RGB interface, Vsync*⁴ interface, and FMARK*⁵ interface are incorporated as image data interfaces, facilitating support for moving images featuring smooth motion display.

Functions are also included that help to achieve high image quality and simplify development. An RGB individual gamma adjustment function is provided that allows more precise R, B, and G gamma settings, helping to improve image color reproducibility and achieve high display quality by making settings according to variations in image quality due to LCD panel color characteristics or external lighting conditions.

An endian*⁶-free function is also included. The term "endian" refers to the order in which data, etc., is stored in memory, and may differ depending on the system or CPU. The endian has previously been converted by a microcontroller or some other means to suit the LCD driver. The R61504 is provided with endian conversion instructions that enable endian conversion to be performed easily by software, making it possible to reduce the load on microcontroller software and helping to simplify development.

A hardware power supply sequencer is also incorporated that controls the LCD drive power supply startup sequence. There are a number of LCD drive power supplies, and the powering-on sequence of these power supplies has previously been entirely set by the user by means of a program. However, this has led to increased development times due to the occurrence of programming errors. With the R61504, an on-chip hardware sequencer handles the power supply startup sequence, and the program only contains a startup instruction for this sequencer, enabling user programming errors to be reduced and development efficiency to be improved.

The same 8-color display mode, standby mode, and deep standby mode as in previous products are provided as functions for reducing power consumption. Use of these modes makes it possible to achieve low current dissipation equivalent to that of a color STN liquid crystal panel, helping to extend the battery life of mobile phones and similar devices.

Chip short sides have been kept down to 2 mm or less in size, contributing to the implementation of narrow-framed LCD panels for mobile phone use.

COG*⁷ is supported as the mounting method.

Future development plans call for major extension of the product lineup to keep pace with evolving market needs, including the development of QVGA class models based on the R61504.

- Notes: 1. QVGA: A display definition standard of 240 × 320 pixels
2. MDDI (Mobile Display Digital Interface): A high-speed serial interface standard drawn up by the VESA (Video Electronics Standards Association), a standardization organization of the video devices for PCs, WSs, and so on. VESA URL: <http://www.vesa.org/>
 3. EMI (electromagnetic interference): A generic term for electromagnetic disturbance or interference caused by emissions from an electronic device
 4. Vsync (Vertical Synchronizing signal): A signal for vertical timing when drawing a display screen
 5. FMARK: A signal output at the frame cycle signal (frame marker) output position in the frame alternation image drawing method
 6. Endian: The method used when storing a multi-byte numeric value in memory. The term “big-endian” is used when the MSB (most significant bit) is in a lower address, and “little-endian” when the LSB (least significant bit) is in a lower address.
 7. COG (Chip On Glass): A mounting method in which a chip with gold bumps is directly mounted face-down on the LCD glass substrate

* Product names, company names, or brands mentioned are the property of their respective owners.

< Typical Applications >

- Mobile phones, PDAs, etc., with a 240 × 320-pixel resolution display function

< Prices in Japan > *For Reference

Product Name	Shipping Form	Sample Price [Tax Included] (Yen)
R61504 (R61504A0C3)	Chip with gold bumps (for COG mounting)	1,000 [1,050]

< Specifications >

Item	R61504 Specifications
Display size	240 × 320 pixels
Display colors	16.77 million colors
Outputs	720 source outputs, 320 gate outputs
Display RAM capacity	230,400 bytes
Display functions	<ul style="list-style-type: none">• Window address function (rectangular RAM address area writing)• Partial display function• 8-color display function• RGB individual gamma adjustment function• Resizing function (1/2, 1/4)
On-chip functions	<ul style="list-style-type: none">• Power supply sequencer• Endian-free function
Interfaces	<ul style="list-style-type: none">• 80-type interface: 8/16-bit bus• High-speed moving image interface: 8/16-bit bus• MDDI<ul style="list-style-type: none">—Instructions/image data both receive-only—Hibernation support (standby mode)• High-speed burst RAM write function: 10 MHz write frequency (normally 6.6 MHz)
Logic power supply voltage	2.5 V to 3.1 V
Interface I/O voltage	1.65 V to 3.1 V
Liquid crystal drive voltage	4.5 V to 5.5 V
Gate voltage	Gate on: 9.0 V to 15.0 V Gate off: -10 V to -4 V
Power-down functions	8-color display mode, sleep mode, shutdown mode
Shipping form	Chip with gold bumps (for COG mounting)

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.