Renesas Direct Drive for Connecting to TFT-LCD Panels

Renesas Technology America, Inc.
David Hedley – Staff Applications Engineer

March 2009
Midsized TFT-LCD Panels:
- RGB Parallel Data Format
- Commonly 18bpp or 24bpp
- 3.5” to 10” in size
- QVGA (320x240) to WVGA (800x480)
MCU Direct Drive for TFT-LCD Displays
QVGA Display Synchronizing Pulses

QVGA Display

Each pixel consists of 16 bit RGB data

D1,DH1 D2,DH1 D3,DH1 D320,DH1

D1,DH240 D3,DH1 D320,DH240

D320,DH1

Vertical scan (1 per frame)

Horizontal scan

Vertical Sync Pulse

Horizontal Sync Pulses

Horizontal scans
Bus Loading Level During LCD Panel Operation

**Internal Bus Loading**
- 100%
- 50%
- 0%

**External Bus Loading**
- 100%
- 50%
- 0%

Only 5%!!

42%

Automatic ExDMA Transfer

100%

**Peripheral Bus**

- **Internal Bus**
- **External Bus Pins**

**External Addr Bus**

**External Data Bus**

**Pixel Timing**

**SRAM or PSRAM Frame Buffer**

**QVGA panel, static image driven at 60 fps**

**Components**

- **H8S CPU**
- **SRAM 32KB**
- **DAC 8 bit x 6 ch**
- **SCI x 5 ch**
- **TMR 8 bit x 3 ch**
- **ADC 10 bit**
- **I²C**
- **PPG**
- **ExDMA Interface**
- **TPU 16 bit x 16 ch**
- **TI**
- **BSC**
- **DMA 4 ch**
- **INTC**
- **bridge**
- **FLASH 512KB**
- **DTC**
- **External Bus Pins**
- **I/O Ports**
# Renesas API

## Commonly Used LCD Control API Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCDInit</td>
<td>Direct Driver initialization</td>
</tr>
<tr>
<td>LCDOff</td>
<td>Shuts down the LCD - powers down LCD module</td>
</tr>
<tr>
<td>LCDBacklight</td>
<td>Turns the backlight On/Off</td>
</tr>
</tbody>
</table>

## Commonly Used Graphics Display API Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCDBMPCopy</td>
<td>Copy BMP into Frame Buffer</td>
</tr>
<tr>
<td>LCDBMPFill</td>
<td>Fill a given area from a color table</td>
</tr>
<tr>
<td>LCDBMPGPuts</td>
<td>Puts a text string on the display</td>
</tr>
</tbody>
</table>
**The Complete Solution**

- **Firmware API description**
  - Full documentation
  - Example code
  - Transparency and Font Text support
  - API and Drivers code is FREE
  - HEW4 updated for LCD Application

- **Demonstration boards**
  - Schematics for LCD Connector Board
  - Users Guide
  - Software examples

- **Documentation, Application Notes**
  - http://america.renesas.com/h8lcd web page updated for LCD Solutions

**“Easy Path to TFT-LCD”**
Renesas LCD Demo Kit

Find out how to drive High Quality TFT-LCD animated images at a low system cost

Easy path to TFT-LCD

LCD specific software API is available to allow users to quickly and easily create applications driving images on an LCD panel.

The Software API takes away the complexity of the microcontroller operation to allow simple commands and configuration.

Virtually any LCD panel can be driven with quick and easy configuration. Complex images can be generated with API function calls, offering flicker free images with;

- Fast and Smooth animation
- Transparency
- Minimal System memory overhead
- Quick and easy bitmap manipulation
- Full Documentation
- Full Source Code
- Running out of the box demonstrations

Kit Contents:

- Renesas target boards with:
  - Renesas H8S or H8SX microcontrollers
  - RSK LCD Daughter Card
  - QVGA or VGA TFT LCD panel
  - Switches and LEDs
  - DC Power Supply
  - Input: 100-240V AC, 50-60Hz 0.6A, Output: 5V DC 2.6A
- E8 on-chip debugger emulator with USB cable and target board cable
- Quick Starter Guide
- Software License Agreement

CD ROM with:
- Software Drivers
- Application Examples
- Third party (Segger) demonstration
- Full documentation
- Software License Agreement

Learn more about H8 LCD solutions
Order LCD Demo Kit

Visit www.america.renesas.com/h8lcd