

Datasheet for Graphics LCD Controller

Functional Description:

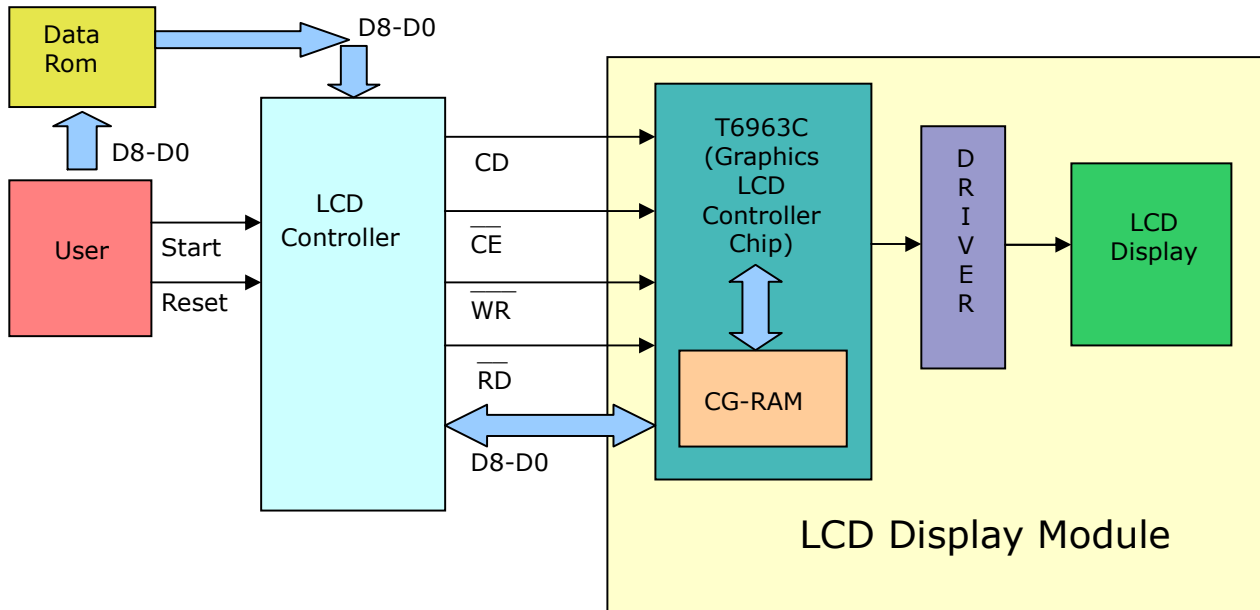
The Graphics LCD Controller module interfaces with Toshiba T6963C LCD Graphics Controller Chip. The controller displays an image (Graphics data) as well as Text data on the LCD through an 8-bit interface. The characters for displaying text are fetched from the built-in 128-character CGROM of the T6963C controller. The voltage levels of I/O signals are configured to meet the voltage levels recognized by LCD Display.

Features:

- Character Font (pin selectable):
 - Vertical Dots: Text Mode – 8 and Graphics Mode – 1
 - Horizontal Dots: 6 or 8 for both Text and Graphics Mode
- 8-bit interface with the LCD module
- Software allocation of Text, Graphic and Character Generator RAM (CG-RAM) areas in the display memory.
- Data in the Graphics area can:
 - Only Graphics data
 - Combination of Text and Graphics (ability to mix and merge text with graphics).
- Characters displayed in the Text area can be from:
 - Built-in CG-ROM (predefined)
 - Characters stored in the CG-RAM area of the display memory. These are user's own external characters.
- Cursor:
 - Cursor on-off
 - Cursor pointer set (for moving the cursor)
 - Set cursor size (1-line to 8-line)

- Cursor blink (on or off)
- Mode Set:
 - OR, EX-OR, AND of Text and Graphics data can be displayed.
 - Internal Character Generator mode
 - External Character Generator mode
- Attribute functions:
 - Normal / Reverse / Inhibit display
 - Blink normal / Reverse / Inhibit display
- Display Modes:
 - Display off.
 - Cursor blink on / off
 - Text on, Graphic off
 - Text off, Graphic on
 - Text on, Graphic on
 - Data Auto read and write
- Screen Peek:
- Screen Copy:
 - Copies a single raster line of data to the graphic area.
- Bit Set/ Reset:
 - Used to set or reset a bit of the byte specified by the address pointer.
- C- Library Functions
 - Line, Circle, Polygon etc.
 - Text
 - Image (bmp) display

Block Diagram:



Performance:

Device	Slice Count	Frequency
Spartan-3A (xc3s700a-4fg484)	174	145Mhz

Verification:

The LCD controller module has been verified with the following approaches:

- Exhaustive Functional/Timing simulation
- Prototyped on Xilinx Spartan-3A development board
- Displaying Graphics data(an image) in the graphics area
- Displaying Text data from internal CG-ROM in

the Text area.

Deliverables:

- Verilog RTL source code
- Test benches
- Synthesis and Simulation scripts
- Detailed user documentation, including RTL source code documentation

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