

## FEATURES

### ■ Single-chip Super VGA LCD controller

- Pin compatible with CL-GD7542
- IBM® VGA hardware-compatible

### ■ GUI acceleration

- BitBLT (bit block transfer) engine
- Color expansion for 8- or 16-bit pixels
- True packed-pixel addressing for 8 and 16 bpp
- Programmable linear memory addressing
- 32 × 32 or 64 × 64 hardware cursor

### ■ Multimedia acceleration and enhancement

- 8-bit feature connector port for video overlay
- Interface to analog encoders for NTSC/PAL-out
- MVA™ (MotionVideo™ Acceleration) *CL-GD7543 only*
  - True-color, full-motion video playback
  - Multi-format frame buffer
  - Integrated YCrCb: RGB color space converter
  - 2× horizontal/vertical hardware scaling

### ■ 32-bit direct-connect CPU host bus interfaces

- '486 CPU local bus (up to 50 MHz @ 5 V)
- VESA® VL-Bus™
- PCI system bus with burst support: big-endian byte-order hardware support for PowerPC™

### ■ Scalable 1- and 2-Mbyte display memory

- Two or four 256K × 16 DRAMs, or four 512K × 8 DRAMs
- Extended-Data-Out/Hyper-Page-Mode DRAM support

### ■ Integrated programmable frequency synthesizer

- Core VCLK up to 80 MHz @ 5 V; 77 MHz @ 3.3 V
- Core MCLK up to 60 MHz @ 5 V; 50 MHz @ 3.3 V
- Vertical refresh rates up to 75 Hz (depending on the graphics mode, MCLK, and voltage level of core VCC)

## GUI-Accelerated SVGA LCD Controller for Portable Computers

### ■ 64 × 64 pixel size hardware pop-up icons

- Displays up to four independently controlled, 4-color icons

### ■ Integrated 24-bit true-color RAMDAC

- 640 × 480 non-interlaced, 16M colors (CL-GD7543 only)
- 800 × 600 non-interlaced, 64K colors
- 1024 × 768 non-interlaced, 256 colors
- 1280 × 1024 interlaced, 256 colors

### ■ Support for 640 × 480 and 800 × 600 LCDs

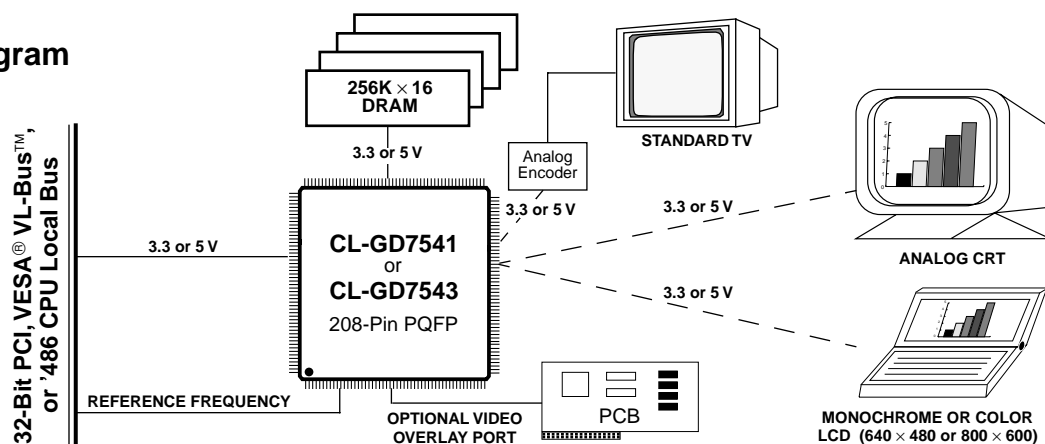
- Dual-scan color and monochrome STN LCDs
- Color TFT LCDs (9-, 12-, 18-, and 24-bit interfaces)
- Dithering algorithm automatically adds up to 6 bits per primary color without decreasing spatial resolution
- Enhanced frame-rate modulation algorithm improves display quality with fast-response STN LCDs (~100 ms)
- SimulSCAN™ (simultaneous CRT and LCD)
- Full-screen VGA support on 800 × 600 LCDs

### ■ Power-management capabilities

- 3.3-V, 5.0-V, and mixed-voltage operation
- Hardware-suspend input pin or software-suspend option
- Self-refresh DRAMs or DRAM refresh via 32-kHz clock
- Internal timers for Standby mode and backlight control
- LCD power sequencing
- VESA® DPMS (Display Power Management Signaling)
- DDC-1 (Display Data Channel) support

### ■ EIAJ standard 208-pin quad flat package

## System Block Diagram



## OVERVIEW

The GUI-accelerated SVGA LCD controllers — CL-GD7541 and CL-GD7543 — are the latest members of the pin compatible CL-GD754X family. They provide the performance and integration required for the next generation of mid-range to premium portable computers.

The CL-GD7541/GD7543 uses Cirrus Logic's advanced 0.6- $\mu$ m CMOS process to provide improved 3.3-V operation and support for 1024  $\times$  768 CRT refresh rates of 70 Hz. In addition, increased performance can be achieved through the use of high-speed Extended-Data-Out (EDO) / Hyper-Page-Mode DRAMs. A complete graphics subsystem can be built using only three active components: the CL-GD7541/GD7543 and two DRAMs.

Both the CL-GD7541 and CL-GD7543 provide the following CL-GD7542 features: BitBLT GUI acceleration, true-color capability, support for 800  $\times$  600 LCDs, and mixed-voltage operation for low power consumption.

The CL-GD7543 fully supports all features of the CL-GD7542, including MotionVideo™ Acceleration (MVA™) for playback of Video for Windows .AVI (audio-video interleaved) files.

For the cost-sensitive value market, the CL-GD7541 provides most of the performance and features of the CL-GD7543, including TV-out, Feature Connector, 3D game acceleration, and 2-Mbyte display memory. However, the CL-GD7541 does not support the MVA hardware playback enhancements, relying instead upon standard primary surface DCI support.

## UNIQUE FEATURES

### Design Flexibility

- Pin-compatible with CL-GD7542
- Big-endian byte ordering in display memory with PCI host interface

### High Performance

- BitBLT engine, color expansion, hardware cursor, linear addressing, and 32-bit memory interface
- 32-bit local bus interface, operating at up to 33 MHz, includes support for PCI with burst mode
- Hardware 'pop-up' icons

### Multimedia

- 8-bit dynamic Feature Connector port
- Interface to NTSC/PAL analog encoders
- Drivers supplied for 3D-graphics libraries and emerging APIs (advanced programming interface) for games

### MVA™ (CL-GD7543 only)

- MVA™ (MotionVideo™ Acceleration)
- Multi-format frame buffer and YCrCb-to-RGB color space conversion
- 2 $\times$  hardware scaling for playback

### Enhanced LCD Support

- 800  $\times$  600 LCD support (both TFT and dual-scan STN) with comprehensive resolution-compensation support
- Enhanced frame-rate modulation
- Intelligent dithering algorithm expands the number of bits per primary color (RGB) on TFT or STN LCDs

### Power Management

- 3.3-V, 5.0-V, or mixed-voltage support
- Hardware-initiated Standby and Suspend modes and VESA® DPMS support for CRTs

## BENEFITS

- CL-GD754X family offers products for a wide range of market segments. Design knowledge gained with any CL-GD754X device can be leveraged over entire CL-GD754X family.
- Supports 'X86 designs with little-endian data; supports PowerPC™ designs with big-endian data.
- Accelerates GUIs such as Microsoft® Windows®; provides high resolution and color-depth capabilities.
- Increases system throughput; PCI interface allows use in 'X86, PowerPC™, or other platforms.
- Provides hot-key display for on-screen symbols such as battery 'fuel gauge' and contrast/brightness controls.
- Allows overlay capability for live 'TV in a window'.
- Integrated design can be developed to display computer-generated data on a TV or to record to a VCR.
- Supports emerging standards for DOS and Windows®-based 3D applications.
- Hardware enhancement for playback of Video for Windows .AVI files.
- Displays separate graphics and video windows at independent color depths.
- Enlarges video clips with little or no frame-rate reduction.
- Supports latest LCD technology and enables full use of the display area whether in graphics or text mode.
- Improves display quality; increases stability of shades.
- Displays high- and true-color modes with smooth shading (no contouring) on all supported LCD types.
- Minimizes operating power consumption; provides manufacturing flexibility.
- Reduces power consumption; supports Energy Star monitors for 'green PC' compliance.

## SOFTWARE SUPPORT

### Operating System and Application Software Drivers

Software Drivers <sup>a</sup>	Resolution Supported	Number of Colors
Microsoft®/Intel® DCI™ (Display Control Interface)	640 × 480, 800 × 600, 1024 × 768, 1280 × 1024	256
	640 × 480, 800 × 600	65,536
Microsoft® Windows® v3.1	640 × 480, 800 × 600, 1024 × 768, 1280 × 1024	256
	640 × 480, 800 × 600	65,536
	640 × 480	16.8 million (CL-GD7543 only)
Microsoft® Windows NT™ v3.1	640 × 480, 800 × 600, 1024 × 768	16 and 256
	640 × 480, 800 × 600, 1024 × 768	16 and 256
	640 × 480, 800 × 600	65,536
OS/2® v2.0, v2.1	640 × 480	16.8 million (CL-GD7543 only)
AutoCAD® v11, v12	640 × 480, 800 × 600, 1024 × 768	16 and 256
	640 × 480, 800 × 600	65,536
	640 × 480	16.8 million (CL-GD7543 only)
Autoshade® v2.0 3D Studio® v1, v2	640 × 480, 800 × 600, 1024 × 768	256
	640 × 480, 800 × 600	65,536
	640 × 480	16.8 million (CL-GD7543 only)

<sup>a</sup> Driver support for additional applications is provided by independent software vendors, either with specific drivers or through VESA mode support. In many instances, existing drivers for the CL-GD542X can be used with the CL-GD7541/GD7543. For more information concerning driver support, contact the software manufacturer.

### BIOS

Feature	Benefit
<ul style="list-style-type: none"> <li>■ Available as 48-Kbyte BIOS to provide optimum performance with VGA and VESA® extended mode support, or as a 32-Kbyte subset with a 16-Kbyte-relocatable module or loaded as TSRs (terminate and stay resident)</li> </ul>	<ul style="list-style-type: none"> <li>□ Provides system design options for the best combination of performance and functionality.</li> </ul>
<ul style="list-style-type: none"> <li>■ Fully IBM® VGA-compatible BIOS</li> </ul>	<ul style="list-style-type: none"> <li>□ Ensures compatibility with the existing base of PC applications.</li> </ul>
<ul style="list-style-type: none"> <li>■ VESA® VBE (VGA BIOS extensions) 1.2 and PM (power management) support</li> </ul>	<ul style="list-style-type: none"> <li>□ Compatible with industry standard for extended mode support beyond VGA and power-management control.</li> </ul>

### Software Utilities

Utility	Function
AutoResolution Switching	Windows® application for automatically switching display resolutions (for example, from a 1024 × 768 CRT to lower-resolution 640 × 480 or 800 × 600 LCDs) without relaunching Windows
CLDemo	Demonstration program to test various capabilities of the CL-GD7541/GD7543
CLMode	Video mode and video display configuration utility suitable for end-use distribution (includes foreign language translations)
OEMSI	BIOS-customization utility for OEM development use
PCLRegs	VGA controller register viewer/editor for OEM development use
Switcher	Video configuration TSR (terminate and stay resident)
WinMode	Windows® application for graphics mode and display type configuration (includes foreign language translations, selectable from within the utility)

**Direct Sales Offices****Domestic****N. CALIFORNIA**

Fremont  
TEL: 510/623-8300  
FAX: 510/252-6020

Sacramento  
TEL: 916/933-4200  
FAX: 916/933-4211

**S. CALIFORNIA**

Tustin  
TEL: 714/573-9911  
FAX: 714/573-4665

Thousand Oaks  
TEL: 805/371-5381  
FAX: 805/371-5382

**NORTHWESTERN AREA**

Portland, OR  
TEL: 503/620-5547  
FAX: 503/624-5665

**ROCKY MOUNTAIN AREA**

Denver, CO  
TEL: 303/786-9696  
FAX: 303/786-9695

**SOUTH CENTRAL AREA**

Austin, TX  
TEL: 512/255-0080  
FAX: 512/255-0733

Dallas, TX  
TEL: 214/252-6698  
FAX: 214/252-5681

Houston, TX  
TEL: 713/379-5772  
FAX: 713/379-4341

**CENTRAL AREA**

Chicago, IL  
TEL: 708/981-6950  
FAX: 708/981-6846

**NORTHEASTERN AREA**

Andover, MA  
TEL: 508/474-9300  
FAX: 508/474-9149

Boston, MA  
TEL: 617/721-1439  
FAX: 617/721-4509

Iselin, NJ  
TEL: 908/632-2771  
FAX: 908/632-2914

Philadelphia, PA  
TEL: 215/625-0781  
FAX: 215/625-0731

**SOUTHEASTERN AREA**

Atlanta, GA  
TEL: 404/623-4653  
FAX: 404/497-0414

Boca Raton, FL  
TEL: 407/241-5777  
FAX: 407/241-7990

Raleigh, NC  
TEL: 919/481-9610  
FAX: 919/481-9640

**International****GERMANY**

Herrsching  
TEL: 49/8152-40084  
FAX: 49/8152-40077

**FRANCE**

Rosny sous bois  
TEL: 33/1-48-122812  
FAX: 33/1-48-122810

**HONG KONG**

Tsimshatsui  
TEL: 852/376-0801  
FAX: 852/375-1202

**JAPAN**

Tokyo  
TEL: 81/3-3340-9111  
FAX: 81/3-3340-9120

**KOREA**

Seoul  
TEL: 82/2-565-8561  
FAX: 82/2-565-8565

**SINGAPORE**

TEL: 65/353-2122  
FAX: 65/353-2166

**TAIWAN**

Taipei  
TEL: 886/2-718-4533  
FAX: 886/2-718-4526

**UNITED KINGDOM**

Hertfordshire, England  
TEL: 44/1727-872424  
FAX: 44/1727-875919

---

**The Company**

Headquartered in Fremont, California, Cirrus Logic Inc. develops innovative architectures for analog and digital system functions. The Company implements those architectures in proprietary integrated circuits and related software for applications that include user interface and multimedia (graphics, audio, and video), mass storage, communications, and data acquisition.

Key markets for Cirrus Logic's products include desktop and portable computing, workstations, telecommunications, and consumer electronics.

The Cirrus Logic formula combines innovative architectures in silicon with system design expertise. We deliver complete solutions — chips, software, evaluation boards, and manufacturing kits — on-time, to help you win in the marketplace.

Cirrus Logic's manufacturing strategy, unique in the semiconductor industry, employs a full manufacturing infrastructure to ensure maximum product quality, availability, and value for our customers.

Talk to our systems and applications specialists; see how you can benefit from a new kind of semiconductor company.

© Copyright, Cirrus Logic Inc., 1995. All rights reserved.

---

*Preliminary* product information describes products that are in production, but for which full characterization data is not yet available. Cirrus Logic Inc. has made best efforts to ensure that the information contained in this document is accurate and reliable. However, the information is subject to change without notice. No responsibility is assumed by Cirrus Logic Inc. for the use of this information, nor for infringements of patents or other rights of third parties. This document implies no license under patents, copyrights, or trade secrets. Cirrus Logic, AutoMap, Fair Share, FeatureChips, Good Data, MediaDAC, MotionVideo, MVA, PicoPower, SimulSCAN, S/LA, SofTarget, UXART, Vision Port, WavePort, WIC, and WindowInterChip are trademarks of Cirrus Logic Inc. Other trademarks in this document belong to their respective companies. Cirrus Logic Inc. products are covered by the following U.S. patents: 4,293,783; Re. 31,287; 4,763,332; 4,777,635; 4,839,896; 4,931,946; 4,975,828; 4,979,173; 5,032,981; 5,122,783; 5,131,015; 5,140,595; 5,157,618; 5,179,292; 5,185,602; 5,220,295; 5,241,642; 5,276,856; 5,280,488; 5,287,241; 5,291,499; 5,293,159; 5,293,474; 5,297,184; 5,298,915; 5,300,835; 5,311,460; 5,313,224; 5,327,128; 5,329,554; 5,351,231; 5,359,631; 5,384,524; 5,384,786; 5,388,083. Additional patents pending.