FEATURES

■ **Single-chip XGA/Super VGA LCD controller**

— Pin-compatible superset of CL-GD7541/GD7543 SVGA LCD controllers

— IBM® VGA hardware-compatible

■ **GUI acceleration**

— BitBLT engine (double-buffering, auto-start, memory-mapped I/O, and transparent BitBLT)

— Color expansion for 8- or 16-bit pixels

— True packed-pixel addressing for 4, 8, 16, and 24 bits per pixel

— Programmable linear memory addressing

— 32×32 or 64×64 hardware cursor

■ **Cost-effective multimedia enhancements with 1-MByte DRAM**

— Enhanced MVA™ (Motion Video Acceleration™)

● True-color, full-motion video playback

● Mixed graphics/video color depths (multi-format frame buffer)

● Supports 4:2:2 YCrCb, RGB 5-5-5, and AccuPak™ (8-bit) color space formats

● Integrated 4:2:2 YCrCb-to-RGB 8-8-8 color space converter

● Up to $4\times$ continuous horizontal/vertical upscaling

● Full MVA support with TFT and STN color LCDs

— Dual apertures (video/graphics) with VESA® VL-Bus™ and PCI bus

— Interface to analog NTSC/PAL encoders for TV OUT

GUI-Accelerated XGA/SVGA LCD Controller with Low-Cost Multimedia Options from Enhanced MVA™

■ **Cost-effective multimedia enhancements with 1-MByte DRAM** *(cont.)*

— Flexible V-Port™

● 8/16-bit V-Port™ connected to display memory

● Single-chip live video solution with popular decoders (such as the CL-PX4072 or the Philips® SAA7110)

● Two-chip MPEG solution (MPEG decoder and $256K \times 16$ DRAM)

● 1024×768 video using AccuPak™ (live video and playback)

● On-chip AccuPak™: compression through V-Port™, decompression at display time

● Low-cost multimedia solution through multimedia PC Cards (PCMCIA)

● Supports serial programming interface to popular decoders (video, audio, MPEG) through DDCC/DDCD (DDC-2b)

● V-Port™ compliance with DCI 1.x and Windows® 95 DirectDraw™

System Block Diagram
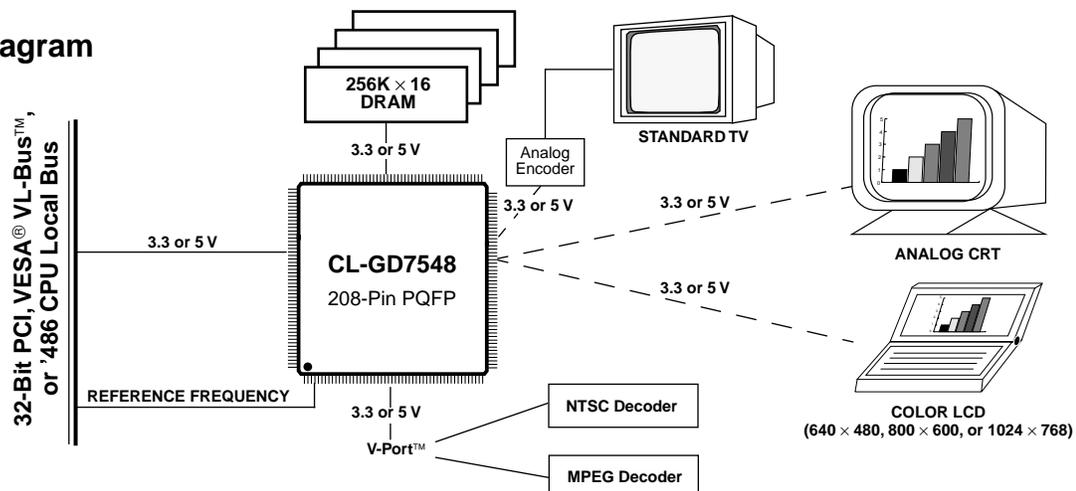
FEATURES (cont.)

■ **32-bit direct-connect CPU host bus interfaces**
  — '486 CPU local bus (up to 50 MHz)
  — VESA® VL-Bus™ @ 50-MHz bus clock
  — PCI bus @ 33-MHz bus clock with burst support: big-endian byte-order hardware support for PowerPC™

■ **64 × 64 pixel size hardware pop-up icons**
  — Displays up to four independently controlled, 4-color icons

■ **Scalable 1- and 2-Mbyte display memory**
  — 32-bit-wide interface to display memory
  — Two/four 256K × 16 DRAMs
  — Four 512K × 8 DRAMs
  — Optimized support for Extended Data-Out (Hyper-Page-Mode) DRAMs

■ **Integrated programmable frequency synthesizer**
  — VCLK up to 80 MHz at 5 V; 77 MHz at 3.3 V
  — MCLK up to 66 MHz at 5 V; 55 MHz at 3.3 V

■ **Integrated 24-bit true-color RAMDAC**
  — Non-interlaced CRTs: 640 × 480 with 16M colors, 800 × 600 with 64K colors, or 1024 × 768 with 256 colors
  — Interlaced CRTs: 1280 × 1024 with 256 colors

■ **640 × 480 (VGA), 800 × 600 (SVGA), and 1024 × 768 (XGA) LCDs**
  — Color TFT LCDs
    ● 1-pixel/shift clock (9-, 12-, 18-, and 24-bit interfaces)
    ● 2-pixel/shift clock with external multiplexor (18- and 24-bit interfaces)
  — Dual-scan color STN LCDs (640 × 480 and 800 × 600)
  — 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
  — Hardware expansion to 800 × 600 with lower-resolution VGA modes
  — SimulSCAN™ (simultaneous CRT and LCD)

■ **Power-management capabilities**
  — 3.3-V, 5.0-V, and mixed-voltage operation
  — VESA® DPMS (Display Power Management Signaling)
  — DDC-1 and DDC-2b (Display Data Channel) support

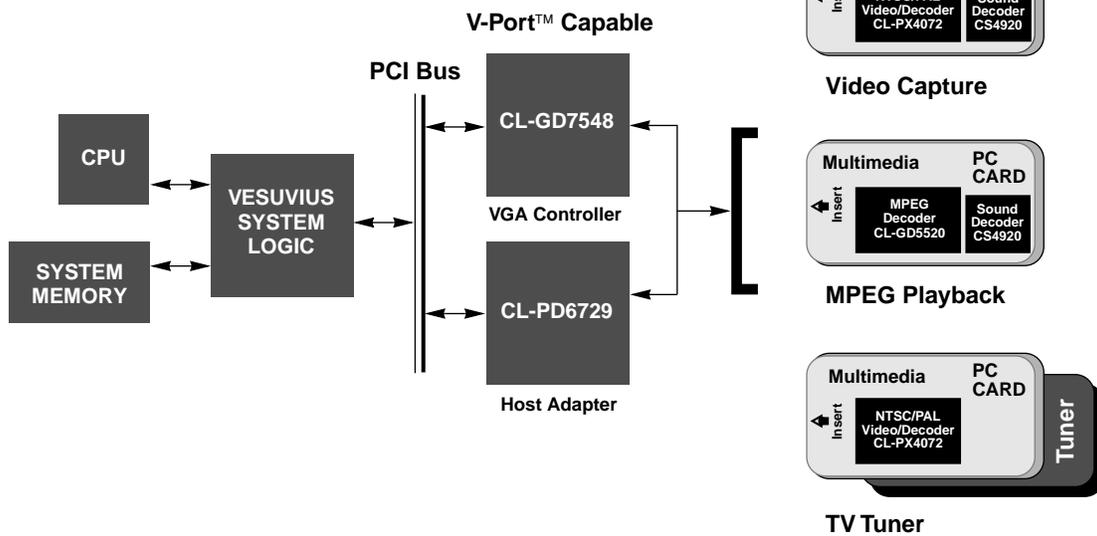■ **EIAJ standard 208-pin plastic quad flat package**

OVERVIEW

The CL-GD7548 GUI-accelerated SVGA LCD controller with MVA (Motion Video Acceleration) provides an extremely flexible, high-quality, cost-effective multimedia option for the next generation of mid-range to premium portable computers.

With its enhanced BitBLT GUI acceleration, continuous upscaling for 1024 × 768 and 800 × 600 LCDs, true-color capability, and mixed-voltage operation for low power consumption, the CL-GD7548 delivers exceptional graphics/video performance.

The CL-GD7548 V-Port enables high-quality, low-cost multimedia options such as a single-chip NTSC/PAL video decoder or MPEG decoder by eliminating the need for an additional video frame buffer and providing a dedicated path to a PC Card (PCMCIA). The CL-GD7548 V-Port is fully Zoomed Video compliant. A complete graphics subsystem can be built with only three active components: the CL-GD7548 and two 256K × 16 DRAMs

The CL-GD7548 fully supports all features of the CL-GD7543, including MVA™ for playback of MPEG or Video for Windows .AVI (audio-video interleaved) files.

V-PORT™-ENABLED TECHNOLOGY

V-Port™ Capable

PCI Bus

CL-GD7548
VGA Controller

CPU

VESUVIUS SYSTEM LOGIC

SYSTEM MEMORY

CL-PD6729
Host Adapter

Multimedia **PC CARD**

Insert

H.320 CODEC

Teleconferencing

Multimedia **PC CARD**

Insert

NTSC/PAL Video/Decoder CL-PX4072

Sound Decoder CS4920

Video Capture

Multimedia **PC CARD**

Insert

MPEG Decoder CL-GD5520

Sound Decoder CS4920

MPEG Playback

Multimedia **PC CARD**

Insert

NTSC/PAL Video/Decoder CL-PX4072

Tuner

TV Tuner

SOFTWARE SUPPORT

Operating System and Application Software Drivers

Software Drivers[a]	Resolution Supported	Number of Colors
Microsoft®/Intel® DCI™ v1.x	640 × 480, 800 × 600, 1024 × 768	256
Microsoft® Windows® v3.1 Microsoft® Windows® 95™ with DirectDraw™ Cirrus Logic VPM (Video Port Manager)	640 × 480, 800 × 600, 1024 × 768, 1280 × 1024 640 × 480, 800 × 600 640 × 480	256 65,536 16.8 million
Microsoft® Windows NT™ v3.5	640 × 480, 800 × 600, 1024 × 768	16 and 256
OS/2® v2.0, WARP 3.0	640 × 480, 800 × 600, 1024 × 768 640 × 480, 800 × 600 640 × 480	16 and 256 65,536 16.8 million
AutoCAD® v11, v12	640 × 480, 800 × 600, 1024 × 768 640 × 480, 800 × 600 640 × 480	16 and 256 65,536 16.8 million
Autoshade® v2.0 3D Studio® v1, v2	640 × 480, 800 × 600, 1024 × 768 640 × 480, 800 × 600 640 × 480	256 65,536 16.8 million

a Driver support for additional applications is provided by independent software vendors, either with specific drivers or through
   VESA mode support. For more information concerning driver support, contact the software manufacturer.

BIOS

Feature	Benefit
■ 48-Kbyte BIOS	❏ Provides optimum performance with VGA and VESA® extended mode support. ❏ Provides system design options for the best combination of performance and functionality.
■ Fully IBM® VGA-compatible BIOS	❏ Compatible with the existing base of PC applications.
■ VESA® VBE (VGA BIOS extensions) 1.2 and PM (power management) support	❏ Compatible with industry standard for extended mode support beyond VGA and power-management control.

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
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
V-Port™ Regs	V-Port™ display configuration utility for OEM development use
WinMode	Windows® application for graphic mode and display type configuration (includes foreign language translations, selectable from within the utility)

UNIQUE FEATURES

High Performance

■ BitBLT engine, color expansion, hardware cursor, linear addressing, and 32-bit memory interface

■ BitBLT double-buffering, auto-start, and memory-mapped I/O

■ BitBLT with transparency

■ 32-bit local bus interfaces operating up to 50 MHz

■ Hardware 'pop-up' icons

Multimedia and MVA™

■ MVA™ (Motion Video Acceleration™)

■ Multi-format frame buffer

■ Dual independent apertures: one for graphics and one for video

■ Interface to CL-PX4072 video pixel decoder requires no external logic

■ 8 or 16-bit V-Port™ to display memory

■ 8-bit Overlay Port; video data overlay for display

■ Interface to NTSC/PAL analog encoders

■ AccuPak™ compression and decompression logic on-chip

Enhanced LCD Support

■ 1024 × 768 LCD support (TFT)

■ 800 × 600 LCD support (both TFT and dual-scan STN) with comprehensive hardware resolution-compensation support

■ Enhanced frame-rate modulation

■ Intelligent dithering algorithm expands the number of input 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

Software

■ Complete suite of drivers for multiple operating systems

■ User-friendly utilities

BENEFITS

❒ Accelerates GUIs such as Microsoft® Windows®; provides high resolution and color-depth capabilities.

❒ Reduced BLT setup, overlapped execution, more efficient Windows® GDI (graphical device interface) software.

❒ Accelerates games.

❒ 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.

❒ Hardware enhancement for playback of files that are compatible with the DCI (Display Control Interface) standard.

❒ Displays separate graphics and video windows at independent color depths. Maintains high rate of video playback without degrading performance.

❒ A BitBLT operation in Microsoft® Windows® can be in progress while live video data is being simultaneously shown through the secondary aperture.

❒ Allows capability for live 'TV in a window' at real-time speeds.

❒ Eliminates external video frame buffer and additional hardware; enables low-cost multimedia PC cards (PCMCIA).

❒ V-Port™ clock rate decoupled from display clock rate.

❒ Enables external hardware to support occlusion.

❒ Overlay regions defined with internal window registers and/or color keys.

❒ Integrated design can be developed to display computer-generated data on a TV or to record to a VCR.

❒ 2:1 reduction in storage and data rate requirements over 16-bpp formats.

❒ 2-pixel/shift clock external multiplexor.

❒ Up to 800 × 600 hardware expansion for lower-resolution modes.

❒ Enables full use of the display area whether in graphics or text mode.

❒ Improves display quality; increases stability of shades for dual-scan STNs.

❒ 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.

❒ Coverage of all popular application environments.

❒ Enable fast and on-the-fly changes.

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The Company

Headquartered in Fremont, California, Cirrus Logic is a leading manufacturer of advanced integrated circuits for desktop and portable computing, telecommunications, and consumer electronics. The Company applies its system-level expertise in analog and digital design to innovate highly integrated, software-rich solutions.

Cirrus Logic has developed a broad portfolio of products and technologies for applications spanning multimedia, graphics, communications, system logic, mass storage, and data acquisition.

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 ensures 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.