CIRRUS LOGIC

CL-GD5410

Preliminary Product Bulletin

FEATURES

- **100% hardware- and BIOS-compatible with IBM® VGA and VESA display standards**
- **Motherboard VGA solution with only three ICs**
- **High-performance, dual-FIFO architecture**
- **Resolutions up to 1024 x 768**
  - — 1024 x 768 x 16 and 256 colors interlaced and non-interlaced
  - — 800 x 600 x 16, 256, 32,768 and 65,536 colors
- **Integrated RAMDAC and Dual-Frequency Synthesizer**
- **Up to 1 Mbyte of display memory**
  - — 8-, 16- or 32-bit display memory bus
- **x4-, x8-, x16-wide DRAMs**
- **Dot clock up to 65 MHz**
- **ISA, E-ISA, and MCA bus interfaces**
- **8- or 16-bit host bus interface**
- **Built-in feature connector support (VESA/VGA pass-through connector)**
- **100- and 132-column text modes**
- **Video Subsystem Enable: 3C3 and 46E8 sleep mechanism**
- **Software can be customized without source code**
- **VGA BIOS can be integrated with the system BIOS**
- **Low-power CMOS, 160-pin QFP package**

High-Resolution VGA Graphics Controller

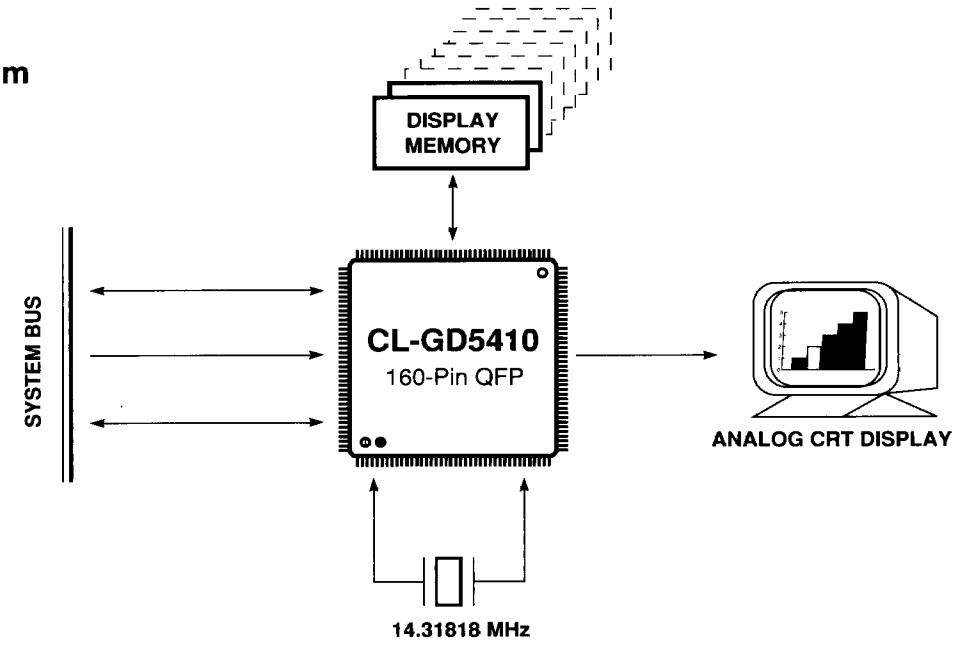
OVERVIEW

The single-chip CL-GD5410 VGA graphics controller is hardware-compatible with the IBM VGA standard and provides improved performance with additional functionality.

Ideally suited to highly integrated systems, the CL-GD5410 requires no external support other than display memory and a 14.31818 MHz frequency reference. A motherboard VGA solution supporting 1024K bytes can be achieved with two DRAMs. The CL-GD5410 connects directly to an ISA, E-ISA or MCA bus, allowing a minimum adapter solution of five ICs.

Operating at dot clock rates up to 65 MHz, the CL-GD5410 chip supports standard resolutions to 1024 by 768 at up to eight bits per pixel (256 simultaneous colors). The internal RAMDAC may be configured as an industry-standard RAMDAC to provide a palette of 262,144 colors. *(cont. next page)*

System Block Diagram



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OVERVIEW (cont.)

In Direct Color™ Mode, the CL-GD5410 supports up to 800 by 600 at 15 or 16 bits per pixel (32,768 or 65,536 colors).

The internal dual-frequency synthesizer requires a single crystal or reference for all supported screen resolutions, as well as all standard display memory speeds and formats. The CL-GD5410 also supports an external RAMDAC or synthesizer.

The CL-GD5410 implements all control and data registers in the current VGA standard. It also implements all standard data path and data manipulation functions, providing complete hardware compatibility. In addition, the CL-GD5410 supports extension registers and extended capabilities to provide functionality and performance enhancements beyond standard VGA. The CL-GD5410 supports a 16-bit host interface in all operations, including I/O and memory operations in planar modes.

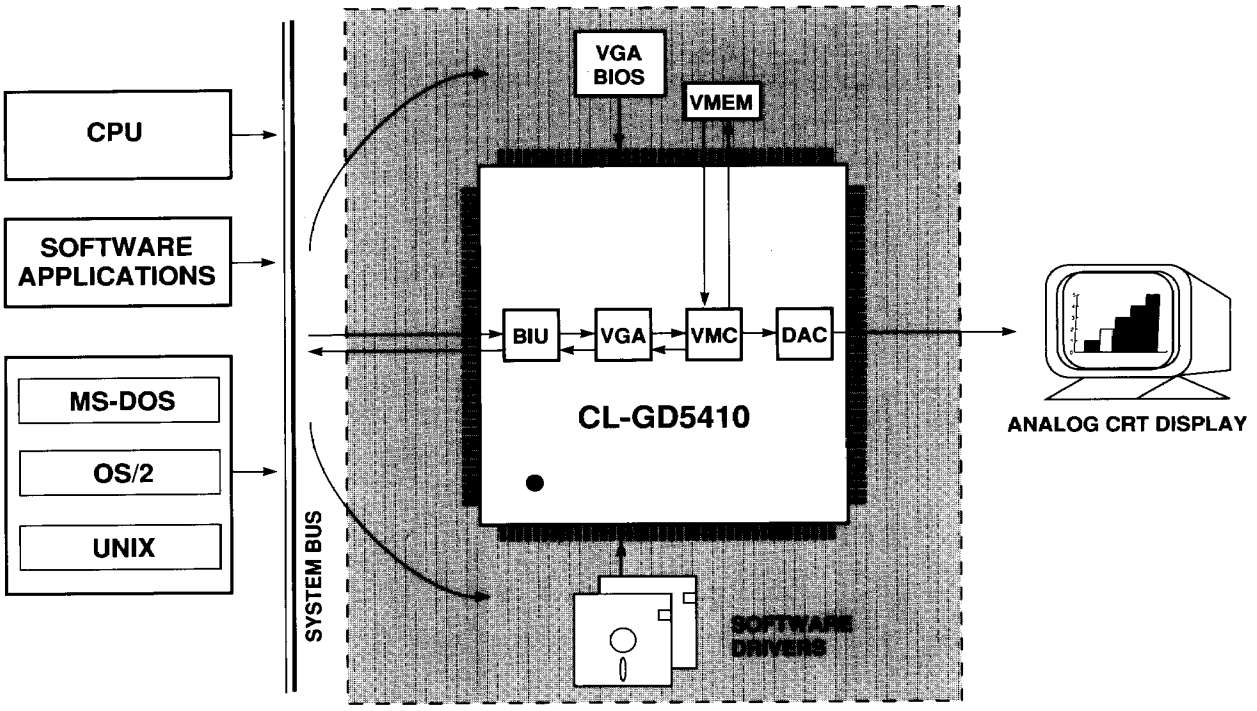
The CL-GD5410 BIOS is based on proven BIOS technology and is fully compatible with the IBM VGA BIOS interrupt 10h interface. The BIOS is designed to provide a well-defined interface between MS-DOS application software and special OEM utility programs. In addition, it provides an extended set of functions to support the CL-GD5410 controller.

CL-GD5410 Highlights

Features	Benefits
Cost Effectiveness —	
❒ *Interface to two, four, or eight DRAMs*	Minimum chip count for cost effective solution, expandable for higher resolutions.
❒ *Interface to x4, x8, x16 DRAMs*	Accommodates appropriate memory type and amount.
❒ *Built-in RAMDAC and Dual-Frequency Synthesizer*	Minimal part count, system cost and real estate.
High Performance —	
❒ *Independent video and DRAM timing*	Allows optimized timing for increased performance.
❒ *Fast Page Mode access to display memory DRAMs*	Improved CPU performance when accessing display memory.
❒ *Host access cache (CPU FIFO)*	Faster host access for writes to display memory.
❒ *BIOS uses 16-bit interface of CL-GD5410 controller and its internal FIFOs*	Optimal BIOS utilization
❒ *Time-critical routines, such as TTY output and scroll, have been optimized to provide maximum throughput in Text Mode*	High-performance text mode.
❒ *15- or 16-bit direct color RAMDAC*	32,768 or 65,536 colors on screen at once allow life-like images. Provides full-color resolution for TV image capture systems.
Compatibility —	
❒ *Compatible with VGA, EGA, and VESA standards*	Compatibility with installed software system base.
❒ *Drivers supplied for various applications and resolutions*	Provides a 'ready-to-go' solution that minimizes the need for additional driver development.
❒ *Connects directly to IBM® PS/2™ and multi-frequency analog monitors*	Drives most industry-standard, high-resolution monitors to ensure compatibility.

System Performance

Cirrus Logic, Inc. technology improves PC performance by optimizing the design and implementation of items highlighted in the diagram below.



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The Cirrus Logic, Inc. CL-GD5410 Solution

Legend

BIU: Bus Interface Unit connects the ISA, E-ISA, or MCA Bus to the CPU FIFO. The CPU FIFO contains a queue of CPU write accesses to display memory that have not been executed because of access conflicts. Maintaining a queue allows the CL-GD5410 to release the CPU as soon as it has recorded the address and data, and to execute the operation when display memory is available, increasing system performance.

VGA: The standard VGA core is streamlined for faster data transfer.

VMC: Video Memory Control includes the Memory Sequencer, the Memory Arbitrator, and the Video FIFO. The Memory Arbitrator allocates the bandwidth to three functions that compete for the display memory: CPU access, screen refresh, and DRAM refresh. The Memory Sequencer generates timing for display memory. The Video FIFO allows the Memory Sequencer to execute the display memory accesses needed for screen refresh at the maximum memory speed rather than at the screen refresh rate. This makes it possible to collect the accesses for screen refresh near the beginning of the scan line and to execute them in Fast Page Mode rather than in the slower Random Mode.

DAC: The Digital-to-Analog Converter is integrated — operating at up to 65 MHz — to make the solution more cost effective (requires less board space).

VMEM: Video Memory. Fast Page Mode operations allow faster access to display memory. A wide range of display memory bus widths and types provide flexibility in various performance configurations. And, up to 1 Mbyte of display memory is available for high resolution and the display of 65,536 simultaneous colors.

VGA BIOS: The BIOS is developed by Cirrus Logic, and is optimized for CL-GD5410 features.

Software Drivers: Developed by Cirrus Logic, these are optimized to improve performance with the system and software applications.

System Design Support

The CL-GD5410, along with the other Cirrus Logic graphics products, is fully supported by software and hardware development tools, including:

Manufacturing Kit — GDK5410-A-MF1-1

This provides the tools to evaluate the manufacturability of a CL-GD5410 solution. It includes the chip on a fully functional demonstration board, the CL-GD5410 Technical Reference Manual, bill of materials, Gerber files, board films, fab drawings, assembly drawings, manufacturing test software, FCC test results, and demonstration software. The Production Software Driver Kit (including user's manual), Production BIOS Kit, and Binary License Agreement are also included.

Demonstration Kit — GDK5410-A-DM1-1

This provides a chip on a fully functional demonstration board to demonstrate and evaluate functionality. It includes the CL-GD5410 Technical Reference Manual, manufacturing test software, FCC test results, and demonstration software. Also included are the Evaluation Software Driver Kit, Evaluation BIOS Kit, and Binary License Agreement.

Sample Kit — GDK5410-A-SMP-1

This includes a sample CL-GD5410 chip, the CL-GD5410 Technical Reference Manual, manufacturing test software, the Evaluation Software Driver Kit, Evaluation BIOS Kit, and Binary License Agreement.

Engineering Support

Field applications engineers and graphics application specialists are available for design assistance to ensure that your design is planned and implemented smoothly.

Software Support

To enable complete system design solutions, Cirrus Logic provides the following software products:

Drivers

OS Environments, Misc.

Windows™
SCO® Open Desktop™
OS/2™ Presentation Manager
VESA BIOS Extension

Illustration/Design

Generic™ CADD
CADVANCE™
OrCAD™
PCAD™
AutoCAD™
AutoShade™

Document Processing

Word™
Lotus 123™
WordPerfect™
GEM™
Framework™
WordStar™
Ventura Publisher™

BIOS

Cirrus Logic's BIOS provides many extended functions that control and take advantage of the features of the CL-GD5410.

Utilities

- Video Parameters Table Loader
- RAM BIOS
- VGA Configuration Utility
- VGA Register Editor
- OEMSI (OEM System Integration) Utility

CL-GD5410 Highlights (cont.)

Features	*Benefits*
Flexibility –	
❒ *The VGA BIOS can be incorporated into the system BIOS ROM at either C000 or E000 segments; includes a sleep mechanism*	Meets the need of motherboard (or co-resident) or adaptor card configurations.
❒ *Four RAMDAC configurations: industry standard (256 colors), or 15- or 16-bit direct color (32,768 or 65,536 colors), or external RAMDAC, or internal RAMDAC with an external video source*	Accommodates various RAMDAC configuration requirements.
❒ *Internal Dual-Frequency Synthesizer for display and memory clocks (source: crystal or oscillator), or external dual source (memory clock, selectable dot clock)*	Programmable Frequency Synthesizer to accommodate various clock source configurations.
❒ *BIOS OEM System Integration (OEMSI) utility program allows modifications to BIOS parameters and features*	BIOS customization possible (without source code) for specialized system environments

CL-GD5410 Demonstration Board Kits

	Sample Kit GDK5410–A–SMP–1	Demonstration Kit GDK5410–A–DM1–1	Manufacturing Kit GDK5410–A–MF1–1
Hardware			
CL-GD5410 Chip	✔	–	✔
Demonstration board with CL-GD5410 installed	–	✔	✔
Documentation			
Packing List	✔	✔	✔
CL-GD5410 Technical Reference Manual	✔	✔	✔
Demonstration Board Bill of Materials	–	✔	✔
Demonstration Board Configuration Guide	–	✔	✔
FCC Test Results	–	✔	✔
Board Films, Gerber Files	–	–	✔
Fab Drawings, Assembly Drawings	–	–	✔
Errata	✔	✔	✔
Software			
Demonstration Software	–	✔	✔
Production Driver Kit	–	–	✔
Evaluation Driver Kit	✔	✔	–
Production BIOS Kit	–	–	✔
Evaluation BIOS Kit	✔	✔	–
BIOS License Agreement	✔	✔	✔

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The Company

Cirrus Logic, Inc., produces high-integration peripheral controller circuits for mass storage, graphics, and data communications. Our products are used in leading-edge personal computers, engineering workstations, and office automation equipment.

The Cirrus Logic formula combines proprietary S/LA™† IC design automation with system design expertise. The S/LA design system is a proven tool for developing high-performance logic circuits in half the time of most semiconductor companies. The results are better VLSI products, on-time, that help you win in the marketplace.

Cirrus Logic's fabless 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.

† U.S. Patent No. 4,293,783

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