

PC Card and OHCI Controller

FEATURES

- 1997 PC Standard compliant
- PCI Bus Power Management Interface Specification 1.1 compliant
- ACPI 1.0 compliant
- PCI Local Bus Specification Revision 2.1/2.2 compliant
- PC 98/99 compliant
- Compliant with the PCI Bus Interface Specification for PCI-to-CardBus Bridges
- Ultra zoomed Video
- Zoomed video auto-detect
- Advanced filtering on card detect lines provides 90 microseconds of noise immunity.
- Programmable D3 status terminal
- Internal ring oscillator
- 3.3-V core logic with universal PCI interfaces compatible with 3.3-V and 5-V PCI signaling environments
- Mix-and-match 5-V/3.3-V PC Card16 cards and 3.3-V CardBus cards
- Supports two PC Card or CardBus slots with hot insertion and removal
- Uses serial interface to TI™ TPS2216 dual power switch
- Supports 132 Mbyte/second burst transfers to maximize data throughput on both the PCI bus and the CardBus bus
- Supports serialized IRQ with PCI interrupts
- 8 programmable multifunction terminals
- Interrupt modes supported: serial ISA/serial PCI, serial ISA/parallel PCI, parallel PCI only.
- Serial EEPROM interface for loading subsystem ID and subsystem vendor ID
- Supports zoomed video with internal buffering
- Dedicated terminal for PCI $\overline{\text{CLKRUN}}$
- Four general-purpose event registers
- Multifunction PCI device with separate configuration space for each socket
- Five PCI memory windows and two I/O windows available to each PC Card16 socket
- Two I/O windows and two memory windows available to each CardBus socket
- ExCA™-compatible registers are mapped in memory or I/O space
- Supports distributed DMA and PC/PCI DMA
- Intel™ 82365SL-DF register compatible
- Supports 16-bit DMA on both PC Card sockets
- Supports ring indicate, $\overline{\text{SUSPEND}}$, and PCI $\overline{\text{CLKRUN}}$
- Advanced submicron, low-power CMOS technology
- Provides VGA/palette memory and I/O, and subtractive decoding options
- LED activity terminals
- Supports PCI bus lock ($\overline{\text{LOCK}}$)
- Packaged in a 256-terminal BGA or 257-terminal MicroStar BGA™
- OHCI link function designed to IEEE 1394 Open Host Controller Interface (OHCI) Specification
- Implements PCI burst transfers and deep FIFOs to tolerate large host latency
- Supports physical write posting of up to three outstanding transactions
- OHCI link function is IEEE 1394-1995 compliant and compatible with Proposal 1394a
- Supports serial bus data rates of 100, 200, and 400 Mbits/second
- Provides bus-hold buffers on the PHY-Link I/F for low-cost single capacitor isolation



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

MicroStar BGA is a trademark of Texas Instruments.

Intel is a trademark of Intel Corporation.

Microsoft is a trademark of Microsoft Corporation.

DESCRIPTION

The Texas Instruments PCI4451 is an integrated dual-socket PC Card controller and IEEE 1394 Open HCI host controller. This high-performance integrated solution provides the latest in both PC Card and IEEE 1394 technology.

The PCI4451 is a three-function PCI device compliant with *PCI Local Bus Specification 2.2*. Functions 0 and 1 provide the independent PC Card socket controllers compliant with the *1997 PC Card Standard*. The PCI4451 provides features that make it the best choice for bridging between the PCI bus and PC Cards, and supports any combination of 16-bit and CardBus PC Cards in the two sockets, powered at 5 V or 3.3 V, as required.

All card signals are internally buffered to allow hot insertion and removal without external buffering. The PCI4451 is register compatible with the Intel™ 82365SL–DF ExCA controller. The PCI4451 internal data path logic allows the host to access 8-, 16-, and 32-bit cards using full 32-bit PCI cycles for maximum performance. Independent buffering and a pipeline architecture provide an unsurpassed performance level with sustained bursting. The PCI4451 can be programmed to accept posted writes to improve bus utilization.

Function 2 of the PCI4451 is compatible with IEEE 1394A and the latest 1394 open host controller interface (OHCI) specifications. The chip provides the IEEE 1394 link function and is compatible with data rates of 100, 200, and 400 Mbits per second. Deep FIFOs are provided to buffer 1394 data and accommodate large host bus latencies. The PCI4451 provides physical write posting and a highly tuned physical data path for SBP-2 performance. Multiple cache line burst transfers, advanced internal arbitration, and bus holding buffers on the PHY/Link interface are other features that make the PCI4451 an excellent 1394 open HCI solution.

The PCI4451 provides an internally buffered zoomed video (ZV) path. This reduces the design effort of PC board manufacturers to add a ZV-compatible solution and ensures compliance with the CardBus loading specifications.

Various implementation specific functions and general-purpose inputs and outputs are provided through eight multifunction terminals. These terminals present a system with options in PC/PCI DMA, PCI LOCK and parallel interrupts, PC Card activity indicator LEDs, and other platform specific signals. ACPI-compliant general-purpose events may be programmed and controlled through the multifunction terminals, and an ACPI-compliant programming interface is included for the general-purpose inputs and outputs.

The PCI4451 is compliant with *PCI Bus Power Management Specification 1.1*, and provides several low-power modes which enable the host power system to further reduce power consumption. The *PC Card (CardBus) Controller* and *IEEE 1394 Host Controller Device Class Specifications* required for Microsoft™ OnNow Power Management are supported. Furthermore, an advanced complementary metal-oxide semiconductor (CMOS) process achieves low system power consumption.

NOTE:

This product is for high-volume PC applications only. For a complete datasheet or more information contact support@ti.com.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
PCI4451GFN	OBSOLETE	BGA	GFN	256		TBD	Call TI	Call TI
PCI4451GJG	OBSOLETE	BGA MI CROSTA R	GJG	257		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

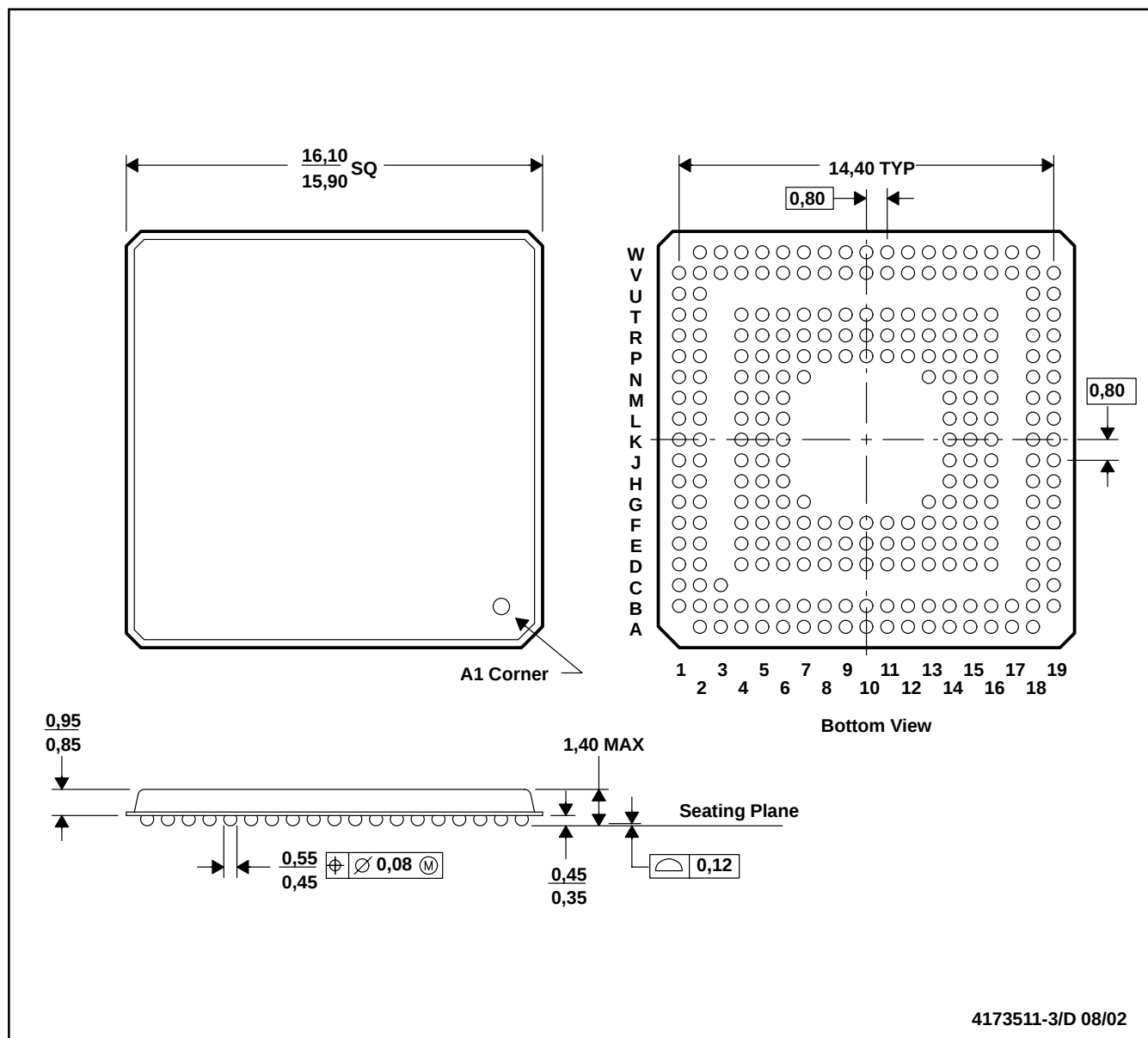
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

GJG (S-PBGA-N257)

PLASTIC BALL GRID ARRAY

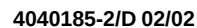


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. MicroStar BGA™ configuration

MicroStar BGA is a trademark of Texas Instruments.



PLASTIC BALL GRID ARRAY



- NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Falls within JEDEC MO-151

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2009, Texas Instruments Incorporated