

## (PCILynx-2) IEEE 1394 LINK LAYER CONTROLLER

### FEATURES

- **Controlled Baseline**
    - One Assembly Site
    - One Test Site
    - One Fabrication Site
  - **Extended Temperature Performance of –55°C to 125°C**
  - **Enhanced Diminishing Manufacturing Sources (DMS) Support**
  - **Enhanced Product-Change Notification**
  - **Qualification Pedigree <sup>(1)</sup>**
  - **IEEE Standard for 1394-1995 Compliant**
  - **IEEE Standard for 1212-1991 Compliant**
  - **Supports IEEE 1394-1995 Link Layer Control**
  - **PCI Local Bus Specification Rev. 2.1 Compliant**
  - **Supports IEEE 1394 Transfer Rates of 100, 200, and 400 Mbit per Second**
  - **3.3-V Core Logic While Maintaining 5-V Tolerant Inputs**
  - **Performs the Function of 1394 Cycle Master**
  - **Provides 4 KBytes of Configurable FIFO RAM**
  - **Provides Five Scatter-Gather DMA Channels**
  - **Provides Software Control of Interrupt Events**
  - **Provides Four General-Purpose Input/Outputs**
  - **Supports Plug-and-Play (PnP) Specification**
  - **Generates 32-Bit CRC for Transmission of 1394 Packets**
  - **Performs 32-Bit CRC Checking on Reception of 1394 Packets**
  - **Provides PCI Bus Master Function for Supporting DMA Operations**
  - **Provides PCI Slave Function for Read/Write Access of Internal Registers**
  - **Supports Distributed DMA Transfers Between 1394 and Local Bus RAM, ROM, AUX, or Zoomed Video**
  - **Advanced Submicron, Low-Power CMOS Technology**
  - **Packaged in a 176-Pin PQFP (PGF)**
- (1) Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

### DESCRIPTION

The TSB12LV21B (PCILynx-2) provides a high-performance IEEE 1394-1995 interface with the capability to transfer data between the 1394 PHY-link interface, the PCI bus interface, and external devices connected to the local bus interface. The 1394 PHY-link interface provides the connection to the 1394 physical layer device; it is supported by the onboard link layer controller (LLC). The LLC provides the control for transmitting and receiving 1394 packet data between the FIFO and PHY-link interface at rates of 100 Mbit/s, 200 Mbit/s, and 400 Mbit/s. The link layer also provides the capability to receive status from the physical layer device and to access the physical layer control and status registers by the application software. The PCILynx-2 complies with

- PCI Local Bus Specification, Revision 2.1
- IEEE Standard for a 1394-1995 High Performance Serial Bus
- IEEE Standard 1212-1991
- IEEE Standard Control and Status Register (CSR) Architecture for Microcomputer Buses

An internal 4 Kbyte memory can be configured as multiple variable-size FIFOs, eliminating the need for external FIFOs. Separate FIFOs are user configurable to support 1394 receive, asynchronous transmit, and isosynchronous transmit transfer operations.



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2008, Texas Instruments Incorporated  
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.



The PCI interface supports 32-bit burst transfers up to 33 MHz and is capable of operating both as a master and as a target device. Configuration registers can be loaded from an external serial EEPROM, allowing board and system designers to assign their own unique identification codes. An autoboot mode allows data-moving systems (such as docking stations) to be designed to operate on the PCI bus without the need for a host CPU.

The DMA controller uses packet control list (PCL) data structures to control the transfer of data and allow the DMA to operate without host CPU intervention. These PCLs can reside in PCI memory or in memory that is connected to a local bus port. The PCLs implement an instruction set that allows linking, conditional branching, 1394 data transfer control, auxiliary support commands, and status reporting. Five DMA channels accommodate programmable data types. PCLs can be chained together to form a channel control program that can be developed to support each DMA channel. Data can be stored in either big endian or little endian format, eliminating the need for the host CPU to perform byte swapping. Data can be transferred either to 4-byte aligned locations, to provide the highest performance, or to nonaligned locations, to provide the best memory use.

The RAM, ROM, AUX, ZV, and general-purpose I/O (GPIO) ports collectively make up the local bus interface. These ports mapped into the PCI address, can be accessed either through the PCI bus or through internal DMA transactions. Internal transactions do not appear on the external PCI bus, thereby conserving PCI bandwidth. DMA packet control lists or other data may be stored in external RAM or ROM attached to the local bus interface. This further reduces PCI bus use and generally improves performance. The ZV local bus port is designed to transfer data from 1394 video devices to an external device connected to the PCILynx-2 ZV port. This interface provides a method for receiving 1394 digital camera packets directly from a ZV-compliant device attached to the local bus interface.

Built-in test registers, a dedicated test output terminal, and four GPIO terminals allow observation of internal states and provide a convenient software debug capability. Programmable interrupts are available to inform driver software of important events, such as 1394 bus resets and DMA-to-PCL transfer completion.

The 3.3-V internal operation provides reduced power consumption, while maintaining compatibility with 5-V signaling environments. The PCI interface is compatible with both 3-V and 5-V PCI systems.

The TSB12LV21B is characterized for operation over the military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

#### NOTE:

For a complete data sheet (literature number SLLS879) or more information, contact [support@ti.com](mailto:support@ti.com).

#### ORDERING INFORMATION<sup>(1)</sup>

T <sub>A</sub>	PACKAGE <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
$-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$	176-Pin PQFP	PGF	TSB12LV21BMPGFEP	12LV21BMPGFEP

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).

(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

## PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
TSB12LV21BMPGFEP	ACTIVE	LQFP	PGF	176	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR
V62/08625-01XE	ACTIVE	LQFP	PGF	176	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

<sup>(3)</sup> 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.

### OTHER QUALIFIED VERSIONS OF TSB12LV21B-EP :

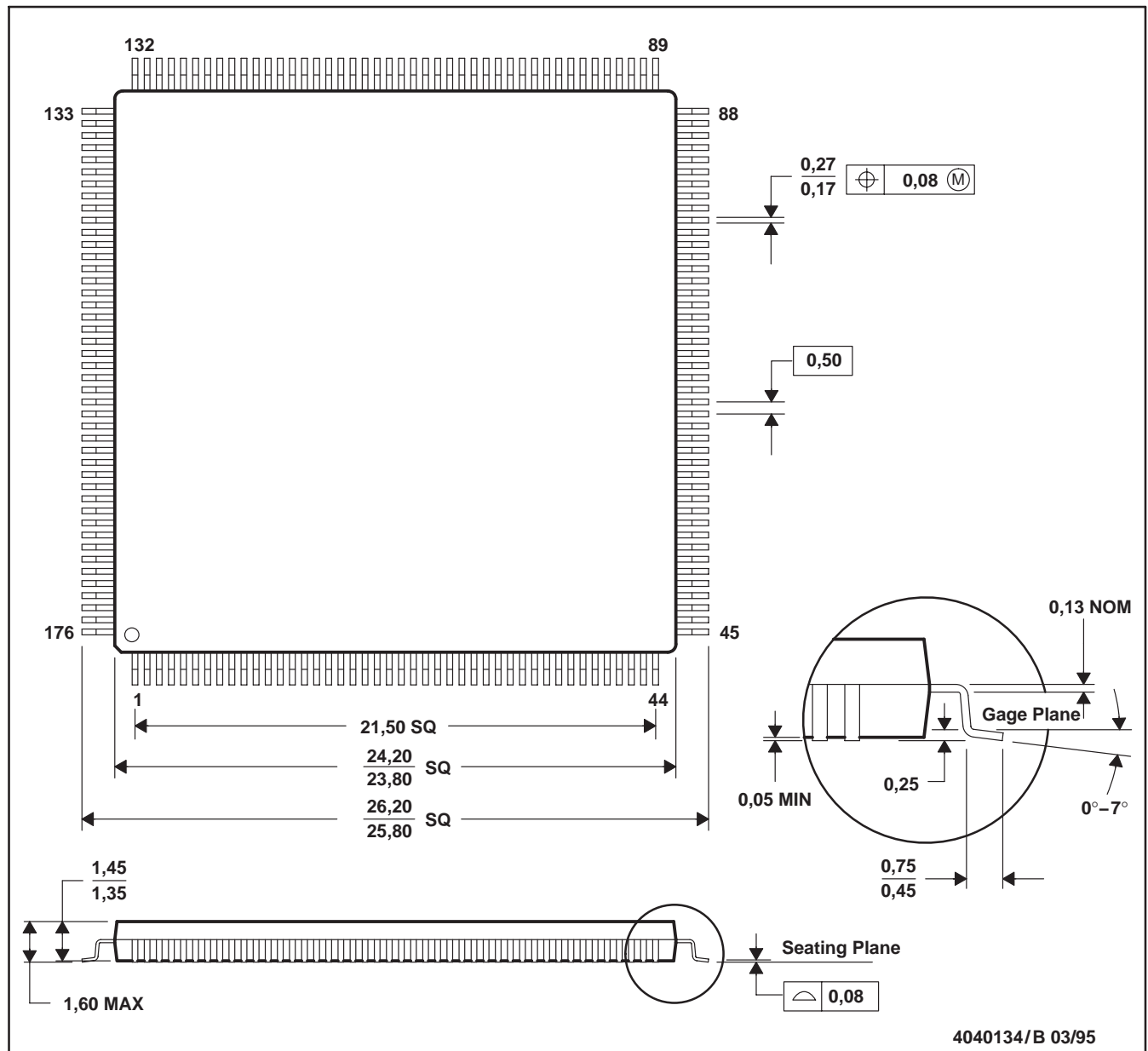
- Catalog: [TSB12LV21B](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

## PGF (S-PQFP-G176)

## PLASTIC QUAD FLATPACK



- NOTES: A. All linear dimensions are in millimeters.  
B. This drawing is subject to change without notice.  
C. Falls within JEDEC MO-136

## 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	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

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