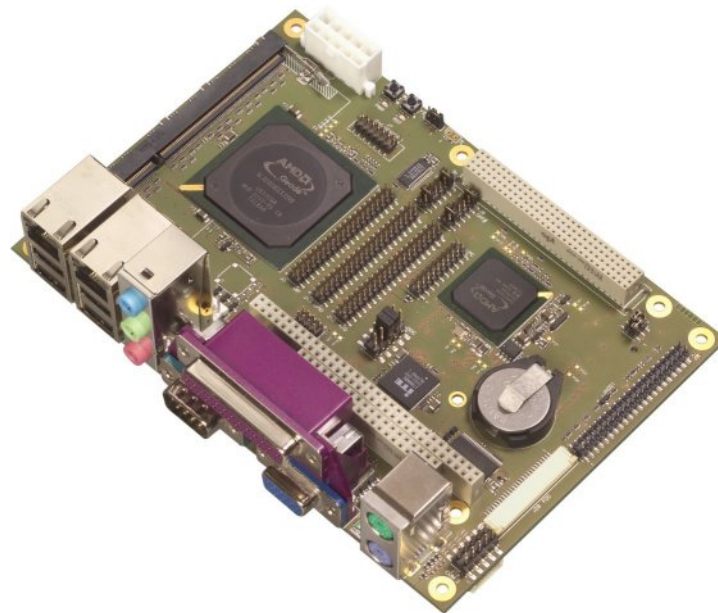




Hurricane-LX800

EPIC Single Board Computer

Technical Manual



TME-EPIC-HURRICANE-R1V3.DOC
Version 1.3 / February 07

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1 Functional Description

1.1 General

With the Hurricane, LiPPERT offers a high-performance EPIC board with AMD's Geode™ LX processor with very low power requirements. The board integrates all peripherals needed to build an embedded PC on a small 115 mm x 165 mm (4.5" x 6.5") printed circuit board. Together with a CS5536 I/O companion and a Super I/O chip, the board is a complete PC with all the standard peripherals already on board. There is graphics controller with VGA, LVDS, and parallel TFT adapters to connect many sorts of display terminals. Backlighting is provided for LCD modules.

Two fast 100/10BaseT Ethernet ports, RS232/RS422/RS485 serial ports, and four USB 2.0 host ports handle the communication with external devices. There are PS/2 connectors for keyboard and mouse as well as a parallel printer port available. Sound I/O according to AC97 is supported, too. An IDE ATA100 adapter allows connection of hard disk or CD drives. Applications that require non-moving storage can use the built-in μ DOC interface and connect a suitable FlashDrive to it.

The Hurricane is powered by a micro ATX supply and supports ACPI, advanced power management and PCI power management. Additionally, digital and analog I/O is available for the application. There is a high speed data input port for 8 bit data capture or video input with 300 Mb/s isochronous speed integrated to facilitate fast data acquisition.

System expansion is easily done using the PC/104-Plus, the PC/104 or the MiniPCI connectors and adding suitable specialized I/O modules.

1.2 The Hurricane LX800 at a glance

CPU:

- AMD Geode™ LX800 @ 500MHz

Cache Memory:

- 64 KB/64 KB Level1 I/D caches
- TLB
- 128KB Level2 cache
- Efficient Prefetch

Main Memory:

- One DDR333 SODIMM Module, up to 1GB
- Recommended: 256MB at minimum

Chipset:

- AMD CS5536 companion device

Extension slots:

- 1 x 32-bit PC/104-Plus
- 1 x 16-bit PC/104 with full DMA capability
- 1 x MiniPCI
- 1 x LPC Bus on IDC20 pin Header

Interfaces:

- Dual Ethernet 10/100BaseT
- ATA-6 EIDE (Ultra DMA-100)
- PS/2 Keyboard
- PS/2 Mouse
- Floppy connector (flat foil)
- 4 x USB 2.0 host ports, 1 x device (Type A Plug)
- µDOC Header for USB 2.0 Flash drives
- 2 x RS232/RS485 software selectable serial ports
- 1 x parallel port
- 5.1 Audio
 - Line-In (left/right) shared with Surround (left/right)
 - Line-Out (left/right)

- Microphone-In shared with Subwoofer/Center
- VGA monitor up to 1920 x 1440 pixels at 85Hz
- 18 Bit parallel TFT and 24 Bit LVDS Flat Panel up to 1600 X 1200 at 60Hz
- 16 Bit High Speed Data Input Port
- 30 Digital GPIO's
- 8 Analog Inputs (8 Bit)
- 4 PWM Outputs
- PWM Controlled Fan (5V or 12V)
- 10 Pin Mini ATX Power supply

Other configurations are possible at high order volumes.

Dimensions:

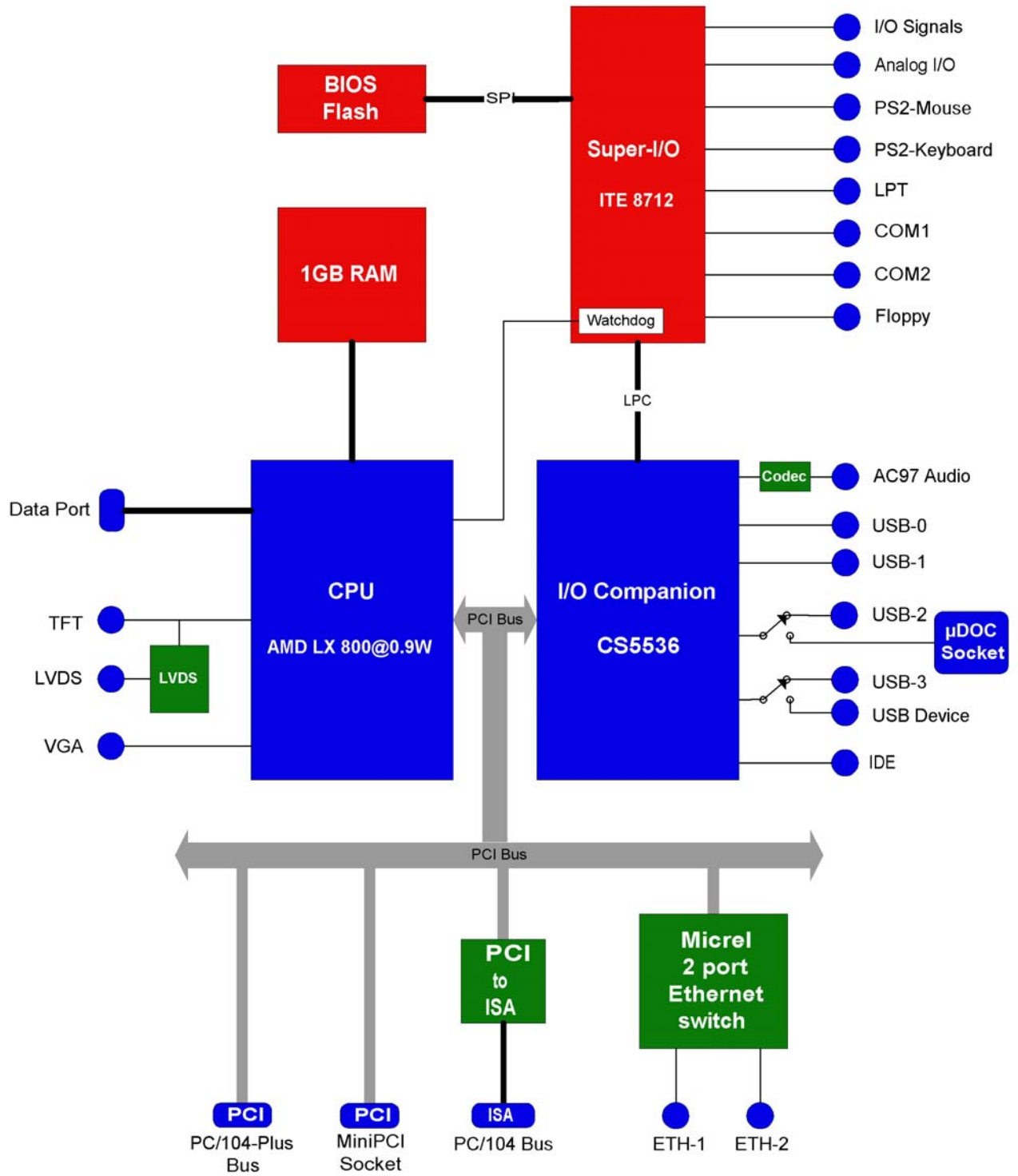
- EPIC, 115 mm x 165 mm (4.5" x 6.5")

Mounting:

- 4 mounting holes for PCB
- 4 mounting holes for PC104/PC104+ extension cards

Note: It is strongly recommend using plastic spacers instead of metal spacers to mount the board. With metal spacers, there is a possible danger to create a short circuit with the components located around the mounting holes. This can damage the board!

1.3 Functional Block Diagram



2 Hardware Description

2.1 Processor

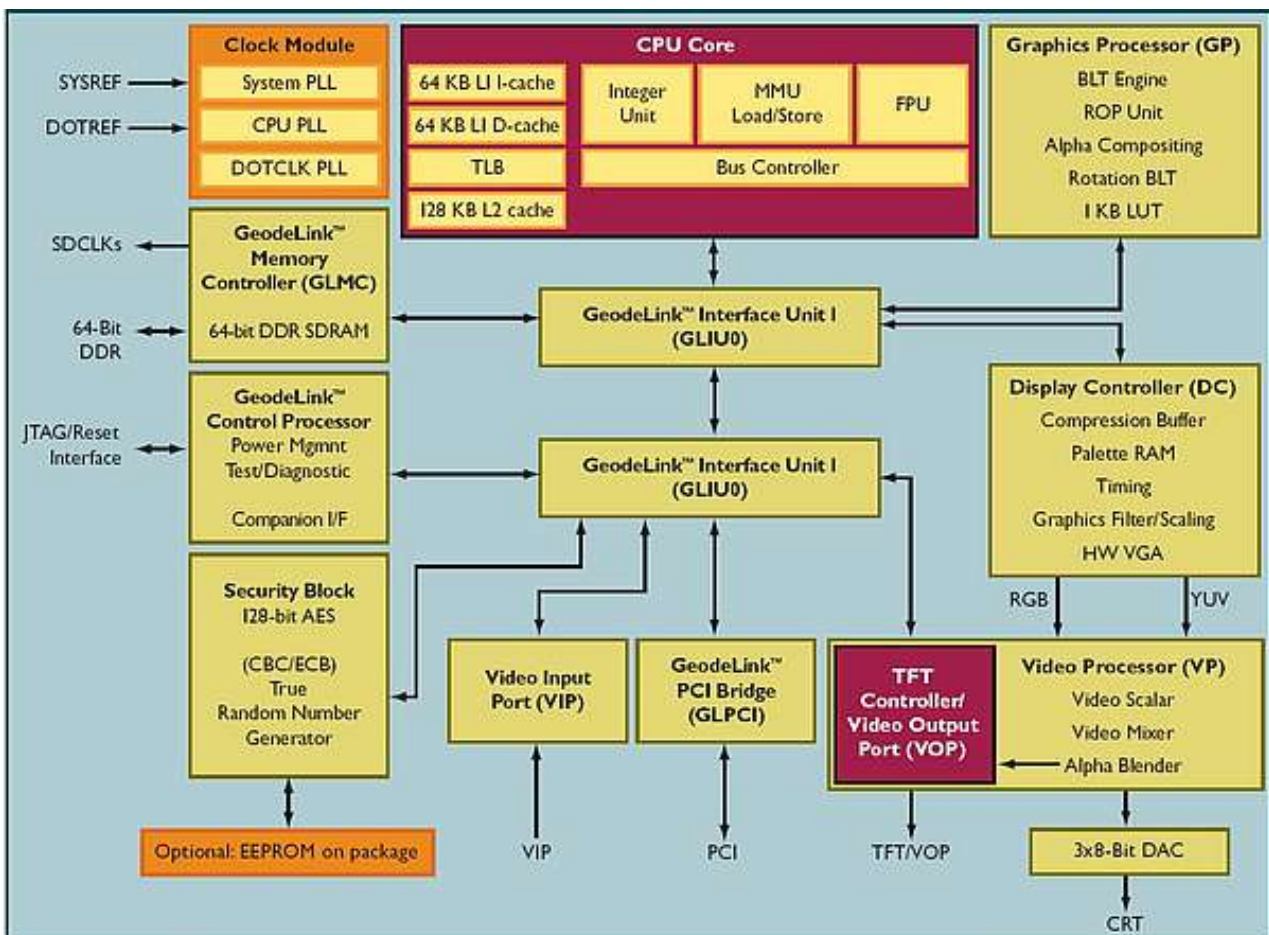
AMD Geode™ LX800

The AMD Geode LX 800@0.9W processor delivers the best performance per watt in the industry today, providing X86 power and versatility to embedded products. Its architecture and high level of integration guarantees longer battery life and allows very small designs, while delivering full X86 functionality.

The AMD Geode LX 800 processor consumes a maximum power of 3.9W and 1.8W typical at 500 MHz, enabling systems that only need to be passively cooled.

The x86 compatibility allow designers to focus on developing end products that efficiently meet consumer needs without being concerned with software porting or compatibility issues.

Coupled with the AMD Geode™ CS5536 companion device, the combined chipset, which operates at 1.9W typical at 433MHz and at 2.4W typical at 500MHz, offers a complete set of features that deliver full desktop functionality to embedded and portable devices.



Processor functional blocks are

- CPU Core
- GeodeLink™ Control Processor
- GeodeLink Interface Units
- GeodeLink Memory Controller
- Graphics Processor
- Display Controller
- Video Processor
- Video Input Port
- GeodeLink PCI Bridge
- Security Block

For further information, please refer to the data book of the AMD Geode™ LX 800

2.2 Companion

AMD Geode™ CS5536 companion device

The AMD Geode™ CS5536 companion device is designed to work with an integrated processor North Bridge component such as the AMD Geode™ LX processor. Together, the Geode LX processor and Geode CS5536 companion device provide a system-level solution well suited for the high-performance and low-power needs of a host of embedded devices including digital set-top boxes, mobile computing devices, thin client applications, and single board computers.

The internal architecture uses a single, high-performance modular structure based on GeodeLink™ architecture. This architecture yields high internal speed (over 4 GB/s) data movement and extremely versatile internal power management. The GeodeLink architecture is transparent to application software. Communication with the Geode LX processor is over a 33/66 MHz PCI bus. The Geode CS5536 companion device incorporates many I/O functions, including some found in typical Super I/O chips, simplifying many system designs. Since the graphics subsystem is entirely contained in the Geode LX processor, system interconnect is simplified. The device contains state-of-the-art power management that enables systems, especially battery powered systems, to significantly reduce power consumption. Audio is supported by an internal controller, designed to connect to multiple AC97 compatible codecs. An IR (infrared) port supports all popular IR communication protocols.

A LPC (low pin count) port is provided to facilitate connections to a Super I/O should additional expansion, such as a floppy drive, be necessary, and/or to an LPC ROM for the system BIOS.

The hard disk controller is compatible to the ATA-5 specification. The bus mastering IDE controller includes support for two ATA-compliant devices on one channel. The CS5536 companion device provides four Universal Serial Bus (USB) 2.0 compliant ports, supporting low speed, full speed, and high speed connections. All four ports are individually automatically associated with either the Open Host Controller Interface (OHCI) or the Enhanced Host Controller Interface (EHCI) depending on the attached device type. A battery-backed real-time clock (RTC) keeps track of time and provides calendar functions.

A suite of 82xx devices provides the legacy PC functionality required by most designs, including two PIC's (programmable interrupt controllers), one PIT (programmable interval timer) with three channels, and DMA (direct memory access) functions. The CS5536 companion device contains eight MFGPT's (multi-function general purpose timers) that can be used for a variety of functions. A number of GPIO's (general purpose input/outputs) are provided, and are assigned to system functions on power-up (i.e., LPC port).

State-of-the-art power management features are attained with the division of the device into two internal power domains. The GPIO's and multi-function timers are distributed into each domain allowing them to act as wakeup sources for the device. The device provides full ACPI (Advanced Configuration Power Interface) compliance and supports industry-standard Wakeup and Sleep modes.

2.3 PC/104-Plus Bus Interface

The PC/104-Plus bus is a modification of the standard PCI bus. It incorporates all of the PC/104 features, with the added advantage of the high speed PCI bus.

The main features are:

- PC/104-Plus Bus slot fully compatible with PCI version 2.2 specifications.
- Integrated PCI arbitration interface (32 bit wide, 3.3V).
- Translation of PCI cycles to ISA bus.
- Translation of ISA master initiated cycle to PCI.
- Support for burst read/write from PCI master.
- 33 MHz PCI clock.

2.4 PC/104 Bus Interface

The PC/104 bus is a modification of the industry standard (ISA) PC bus specified in IEEE P996. The PC/104 bus has different mechanics than P966 to allow the stacking of modules. The main features are:

- Supports programmable extra wait state for ISA cycles
- Supports I/O recovery time for back-to-back I/O cycles

The specifications for the PC/104 bus and the PC/104-Plus bus are available from the PC/104 Consortium at <http://www.pc104.org>.

2.5 Mini-PCI Bus Interface

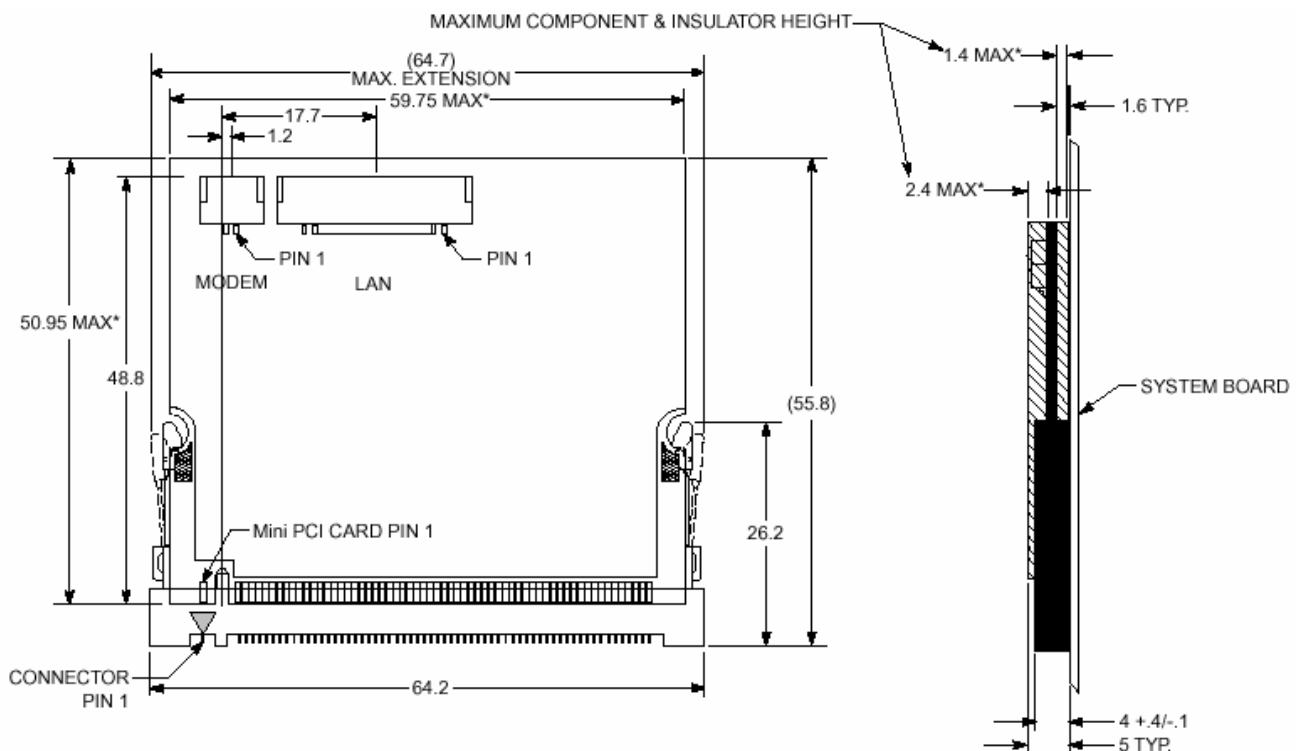
The Mini-PCI specification defines a small form factor daughter card for the 32bit PCI bus that can be used on CPU-boards in which standard PCI cards cannot be used due to mechanical constraints. A CPU board with such a card can easily be enhanced with new functionality. The onboard Type IIIA Mini PCI Slot can be used to extend the system easily with peripheral functionality, like:

- WLAN modules
- Fire Wire ports
- USB 2.0 ports

Several Mini PCI extension boards are available on request.

There are 3.3V available on the Mini-PCI Slot, powered by the onboard PSU.

Mini-PCI Type IIIA:



2.6 Micrel KSZ8842 Ethernet Switch

The KSZ8842-PMQL is the industry's first fully managed 2-port switch with a 32 bit/33MHz PCI processor interface. It is a proven, 4th generation, integrated Layer 2 switch that is compliant with the IEEE 802.3u standard.

The KSZ8842-PMQL can be configured as a switch or as a low-latency (<310 nanoseconds) repeater in latency-critical, embedded or industrial Ethernet applications. For industrial automation applications, the KSZ8842-PMQL can run in half duplex mode regardless of the application.

The KSZ8842-PMQL offers an extensive feature set that includes tag/port-based VLAN, quality of service (QoS) priority management, management information base (MIB) counters, and CPU control/data interfaces to effectively address Fast Ethernet applications.

The KSZ8842-PMQL contains two 10/100 transceivers with patented, mixed-signal, low-power technology three media access control (MAC) units, a direct memory access (DMA) channel, a high-speed, non-blocking, switch fabric, a dedicated 1K entry forwarding table, and an on-chip frame buffer memory.

2.7 Watchdog

A watchdog is implemented by an internal circuit of the ITE8712 Super I/O. It is accessible through some general-purpose ports of the Super I/O. controller.

Please refer to chapter 5.4 for programming watchdog functions.

2.8 CPU/Ambient Temperature Monitoring

AMD Geode™ LX 800 processor contains a temperature sensor to monitor the CPU temperature. The current temperature is shown in the **Thermal Configuration** under the **Motherboard Device Configuration** screen of BIOS setup. Additionally the environment temperature is measured and shown in the **Thermal Configuration** screen.

The Hurricane LX800 does not need any cooling measures at the standard environment temperatures from -20 °C ... +60 °C.

2.9 On Board Power Supply

The on board power supply generates all necessary voltages from the Mini ATX compliant power supply unit. To use a standard ATX 1.3 compliant power supply unit, an adapter is delivered with the board.

The 3.3V (also 5V, 12V, -12V) available on the PC104 Plus Connector is delivered directly from the external power supply unit, so refer to the specification of your power supply unit for information on maximum available power on the PC1104 Plus connector.

2.10 EIDE Port

An EIDE (**E**nhanced **I**ntegrated **D**rive **E**lectronics) port is provided by the chipset to connect up to two drives that integrate the controller (hard disk, CD-ROM etc.). To enhance the performance, this port has a 100 MB/s IDE controller in UDMA mode per the ATA-5 specification. The EIDE port is available on a standard 44-pin header (2 mm) for 2.5" hard disks. An adapter cable is available to connect standard EIDE devices with a 40 pin IDC header.

2.11 PS/2 Mouse/Keyboard Interface

The mouse/keyboard interface is located on the I/O panel of the board. Standard PS/2 peripherals can be used with this board.

2.12 USB 2.0 Ports

4 standard USB 2.0 host ports are provided at the I/O panel of the Hurricane LX800.

It is possible to use an USB keyboard under MSDOS without special driver software¹.

¹ Note: not all keyboard models are supported.

Port 3 can be used as USB device port. This feature must be enabled in BIOS under **Motherboard Device Configuration → PCI Configuration**. UDC must be enabled; Port 3 assignment should be set to device.

2.13 Serial Ports

COM1 is located at the I/O panel while COM2 is an IDC10 pin header (J19). An adapter cable with a standard DB9 male connector is available. The ports either work in RS232 or RS485 mode, selectable in the BIOS. When entering (to be defined), **COM Port 1 Mode** and **COM Port 2 Mode** can be selected. Termination resistors for RS485 Mode can be set with Jumpers on pin header J26 as described in chapter 4.26.

To enable transmitters of COM1 and COM2 in RS485 Mode set RTS signal to '1'.

The serial ports are programmable in BIOS setup. When entering **Motherboard Device Configuration → LPC CARD I/O Device Configuration**, configuration of the serial ports is accessible.

The following settings are possible for COM1 and COM2:

- Disabled
- 3F8 / IRQ4 (base address / interrupt channel)
- 2F8 / IRQ3 (base address / interrupt channel)
- 3E8 / IRQ4 (base address / interrupt channel)
- 2E8 / IRQ3 (base address / interrupt channel)

The modes can be switched between RS232 and RS485.

2.14 Parallel Port LPT1

The parallel port is located at the I/O panel.

The parallel port is programmable in BIOS. Entering **Motherboard Device Configuration → LPC CARD I/O Device Configuration**, configuration of LPT1 is accessible.

LPT1 can be set to these base addresses:

- Disabled
- 0x3BC (not recommended, possible conflict with PCI to ISA Bridge)
- 0x378
- 0x278 (not recommended, possible conflict with PCI to ISA Bridge)

MODE can be set to:

- Compatible
- PS/2 Bi-directional
- EPP 1.7
- EPP 1.9

IRQ can be set to:

- Disabled
- IRQ 5
- IRQ 7
- IRQ 9
- IRQ 10
- IRQ 11

DMA can be set to:

- None
- Channel 3
- Channel 1

2.15 Audio Interface

The audio signals are located at the boards I/O panel. The signals are:

- Line-In (left/right) shared with Surround (left/right)
- Line-Out (left/right)
- Microphone-In shared with Subwoofer/Center

Driver packages for MS-Windows XP/XPe are available.

2.16 Buzzer

There is a buzzer available on the Hurricane LX800 to send out beep codes but it is not populated in the standard version. In higher volumes it is possible to populate the buzzer when needed.

2.17 Power-Button

The Power-Button is located next to the 10-Pin ATX power connector. Push button to turn-on/off the board. Additionally the signal is available at the front panel header (J31) to use a cases switch.

2.17.1 Instant-On

With BIOS revision 1.01.13 and higher it is possible to use an instant-on feature for the Hurricane LX800. Enable instant-on feature in the BIOS under Miscellaneous Configuration. Save values and exit, then turn-off the board. Install a 2mm jumper on J31-pins 5 and 6. Now instant-on is enabled and Power-button is disabled. Therefore a sleep-button is configured on J13-pin 32 to wake up the board from standby.

2.18 Reset-Button

The Reset-Button is located next to the 10-Pin ATX power connector. Push this button to reset the board. Additionally the signal is available at the front panel header (J31) to use a cases switch.

2.19 CRT/LCD Graphics-Controller

The graphics controller is integrated in the Geode LX and does high performance 2D-graphics handling. CRT monitors can be used as well as TFT- or LVDS displays. Therefore, different connectors are on the board. It is possible to switch between CRT and TFT via BIOS or driver settings (Chapter 4.17). It is also possible to use a CRT and a TFT/LVDS display simultaneously (driver setting).

The VGA connector is located at the I/O panel. The following display modes are supported:

| Resolution | Color Depth (bpp) | Refresh Rate (Hz) | Dot Clock (MHz) | Min. GLIU Frequency (MHz) |
|------------------|-------------------|-------------------|-----------------|---------------------------|
| 640 x 480 | 8, 16, or 24/32 | 60 | 25.175 | 75 |
| | 8, 16, or 24/32 | 70 | 28.560 | 75 |
| | 8, 16, or 24/32 | 72 | 31.500 | 75 |
| | 8, 16, or 24/32 | 75 | 31.500 | 75 |
| | 8, 16, or 24/32 | 85 | 36.000 | 75 |
| | 8, 16, or 24/32 | 90 | 37.889 | 400 |
| 800 x 600 | 8, 16, or 24/32 | 100 | 43.163 | 400 |
| | 8, 16, or 24/32 | 60 | 40.000 | 75 |
| | 8, 16, or 24/32 | 70 | 45.720 | 75 |
| | 8, 16, or 24/32 | 72 | 49.500 | 75 |
| | 8, 16, or 24/32 | 75 | 49.500 | 75 |
| | 8, 16, or 24/32 | 85 | 56.250 | 75 |
| 1024 x 768 | 8, 16, or 24/32 | 90 | 60.065 | 400 |
| | 8, 16, or 24/32 | 100 | 68.179 | 400 |
| | 8, 16 or 24/32 | 60 | 65.000 | 75 |
| | 8, 16, or 24/32 | 70 | 75.000 | 100 |
| | 8, 16, or 24/32 | 72 | 78.750 | 100 |
| | 8, 16, or 24/32 | 75 | 78.750 | 100 |
| 1152x864 | 8, 16, or 24/32 | 85 | 94.500 | 100 |
| | 8, 16, or 24/32 | 90 | 100.187 | 400 |
| | 8, 16, or 24/32 | 100 | 113.310 | 400 |
| | 8, 16, or 24/32 | 60 | 81.600 | 100 |
| | 8, 16, or 24/32 | 70 | 97.520 | 100 |
| | 8, 16, or 24/32 | 72 | 101.420 | 200 |
| 1280 x 1024 | 8, 16, or 24/32 | 75 | 108.000 | 200 |
| | 8, 16, or 24/32 | 85 | 119.650 | 200 |
| | 8, 16, or 24/32 | 90 | 129.600 | 400 |
| | 8, 16, or 24/32 | 100 | 144.000 | 400 |
| | 8, 16, or 24/32 | 60 | 108.000 | 200 |
| | 8, 16, or 24/32 | 70 | 129.600 | 200 |
| 1600 x 1200 | 8, 16, or 24/32 | 72 | 133.500 | 200 |
| | 8, 16, or 24/32 | 75 | 135.000 | 200 |
| | 8, 16, or 24/32 | 85 | 157.500 | 200 |
| | 8, 16, or 24/32 | 90 | 172.800 | 400 |
| | 8, 16, or 24/32 | 100 | 192.000 | 400 |
| | 8, 16, or 24/32 | 60 | 162.000 | 200 |
| 1920x1440 | 8, 16, or 24/32 | 70 | 189.000 | 200 |
| | 8, 16, or 24/32 | 72 | 198.000 | 233 |
| | 8, 16, or 24/32 | 75 | 202.500 | 233 |
| | 8, 16, or 24/32 | 85 | 229.500 | 266 |
| | 8, 16, or 24/32 | 90 | 251.182 | 400 |
| | 8, 16, or 24/32 | 100 | 280.640 | 400 |
| Television Modes | 8, 16, or 24/32 | 60 | 234.000 | 266 |
| | 8, 16, or 24/32 | 70 | 278.400 | 400 |
| | 8, 16, or 24/32 | 72 | 288.000 | 400 |
| | 8, 16, or 24/32 | 75 | 297.000 | 400 |
| | 8, 16, or 24/32 | 85 | 341.349 | 400 |
| 720x483 SD NTSC | up to 32 | 59.94i | 27.000 | 200 |
| 640x480 SD NTSC | up to 32 | up to 60.00i | 27.000 | 200 |
| 768x576 SD PAL | up to 32 | 50.00i | 27.000 | 200 |
| 720x576 SD PAL | up to 32 | 50.00i | 27.000 | 200 |
| 1280x720 HD | up to 32 | up to 60.00i | up to 74.750 | 200 |
| 1280x768 HD | up to 32 | 50.00i | 74.750 | 200 |
| 1440x720 HD | up to 32 | 60.00i | 74.750 | 400 |
| 1440x768 HD | up to 32 | 50.00i | 74.750 | 400 |
| 1920x1080 HD | up to 32 | up to 60.00i | up to 148.500 | 400 |

The Hurricane LX800 supports 3,3V and 5V TFT displays up to 18bit, and LVDS displays with 18/24bit interfaces with unconventional signal configuration. The display type and resolution can be selected in BIOS **Motherboard Device Configuration → Video and Flat Panel Configuration**.

2.19.1 Flat Panel Configuration

When output display type is set to flat panel the following options can be selected in the BIOS:

Type

- Auto
- TFT
- LVDS

Resolution

- 320x240
- 640x480
- 800x600
- 1024x768
- 1152x864
- 1280x1024
- 1600x1200

Data Bus Type

- 9-24 Bits, 1ppc

Refresh Rate

- 60 Hz

HSYNC Polarity

- Active High
- Active Low

VSYNC Polarity

- Active High
- Active Low

LP Active Period

- Active Only → only active during SYNC
- Free Running → always active

SHFCLK Active Period

- Active Only → only active during SYNC
- Free Running → always active

For an easy connection of these displays it's possible to choose the display and backlight supply voltages on the on board Voltage Selector jumpers (J29, Chapter 4.8).

2.20 μ Disk On Chip (μ DOC)

It is possible to mount an M-Systems μ DOC device on pin header J16. To do so, remove the jumpers on J16. Mount μ DOC on the header and secure it with a plastic spacer in conjunction with the mounting hole to avoid damage to the boards. Drivers may be needed under several operating systems for proper usage of the device. Note that USB port 2 will not be longer available when using μ DOC. For using USB port 2 again, reinstall Jumpers on J16.

2.21 On Board LED indicators

- Power: A green LED lights up when ATX Power is supplied.
- Suspend: A red LED lights up after POST is done without error. It flashes in Suspend to RAM mode.
- HDD: An orange LED flashes when IDE activity is recognized.

2.22 Floppy Disk Interface

The floppy interface connector is built for slim-line floppy disk drives. For connection of a conventional floppy disk drive, an optional adapter connector is available.

2.23 High Speed Data Input Port

The High Speed Data Input Port (VIP, J29) receives 8- or 16-bit video or ancillary data, 8-bit message data, or 8-bit raw video and passes it to data buffers located in system memory. The VIP is a DMA engine. The primary operational mode is as a compliant VESA 2.0 slave. The VESA 2.0 specification defines the protocol for receiving video, VBI, and ancillary data. The addition of the message passing and data streaming modes provides additional flexibility in receiving non-VESA 2.0 compliant data streams. Input data is packed into QWORDS, buffered into a FIFO, and sent to system memory over the GLIU. The VIP masters the internal GLIU and transfers the data from the FIFO to system memory. The maximum input data rate (8- or 16-bits) is 150 MHz.

2.24 Security Block

The Geode LX processor has an on-chip AES 128-bit crypto acceleration block capable of 44 Mbps throughput on either encryption or decryption at a processor speed of 500 MHz. The AES block runs asynchronously to the processor core and is DMA based. The AES block supports both EBC and CBC modes and has an interface for accessing the optional EEPROM memory for storing unique IDs and/or security keys. The AES and EEPROM sections have separate control registers but share a single set of interrupt registers. The AES module has two key sources: one hidden 128-bit key stored in the "on-package" EEPROM, and a write only 128-bit key (reads as all zeros).

The hidden key is loaded automatically by the hardware after reset and is not visible to the processor. The EEPROM can be locked. The initialization vector for the CBC mode can be generated by the True Random Number Generator (TRNG). The TRNG is addressable separately and generates a 32-bit random number.

2.25 GPIO's

The Hurricane LX800 has 30 GPIO's (26 from Super I/O, 4 from CS5536) available on pin header J13. They can be programmed by accessing the devices configuration registers. An example how to do this is shown in chapter 5.3.

2.26 Analog Inputs

There are eight 8 Bit Analog Inputs at pin header J12. It's possible to measure voltages between 0V and 4.096V. Chapter 5.5 shows how to configure and readout the analog inputs.

2.27 PWM Outputs

At pin header J12 there are also 4 programmable PWM outputs. There are 8 selectable output frequency that range between 5.86 KHz and 375 KHz at a voltage of 5V. Duty cycle can be programmed in 128 steps from 0% to 100%. Note that all output have the same frequency, but can have different duty cycles. Configuring the PWM output is shown in chapter 5.6.

3 Installation

3.1 General

The Hurricane LX800 is delivered with the correct jumper settings for proper operation. The customer must not change the default jumper settings. Improper jumper settings will cause system instability or system hang-ups.

An adapter cable 10 Pin ATX power supply connector female to 20 Pin ATX power supply connector male for supplying the board with a standard PC power supply comes with the board.

| |
|---|
| <p>Attention: The board must not be connected or disconnected to peripherals (e.g. HDD, etc.) with the power supply switched ON!</p> |
|---|

3.2 Adapter Cable Set

With the optionally available cable set, standard PC peripherals can be easily connected to the board. The adapter cable set comprises the following items:

- One flat foil cable for floppy plus adapter to standard floppy cable
- One adapter cables IDC10 female to DB9 male for serial port 2
- Adapter cable IDC44 / 2mm female to IDC44 / 2mm female to connect 2.5" EIDE hard disks
- Adapter IDC44 / 2mm female to IDC40 / 2.54mm male to connect standard IDE cables
- Adapter cable IDC44 / 2mm female to 2 X IDC40 / 2.54mm female

4 Connector Definitions

Refer to chapter 7.4 Mechanical specifications for an overview of the connector positions.

4.1 PC104-Plus Bus (J22)

| Pin | A | B | C | D |
|-----|------------|------------|------------|------------|
| 1 | GND | Reserved | +5 Volts | AD00 |
| 2 | VI/O | AD02 | AD01 | +5 Volts |
| 3 | AD05 | GND | AD04 | AD03 |
| 4 | C/BE0 | AD07 | GND | AD06 |
| 5 | GND | AD09 | AD08 | GND |
| 6 | AD11 | VI/O | AD10 | M66EN |
| 7 | AD14 | AD13 | GND | AD12 |
| 8 | +3.3 Volts | C/BE1 | AD15 | +3.3 Volts |
| 9 | SERR | GND | SB0 | PAR |
| 10 | GND | PERR | +3.3 Volts | SDONE |
| 11 | STOP | +3.3 Volts | LOCK | GND |
| 12 | +3.3 Volts | TRDY | GND | DEVSEL |
| 13 | FRAME | GND | IRDY | +3.3 Volts |
| 14 | GND | AD16 | +3.3 Volts | C/BE2 |
| 15 | AD18 | +3.3 Volts | AD17 | GND |
| 16 | AD21 | AD20 | GND | AD19 |
| 17 | +3.3 Volts | AD23 | AD22 | +3.3 Volts |
| 18 | IDSEL0 | GND | IDSEL | IDSEL2 |
| 19 | AD24 | C/BE3 | VI/O | IDSEL3 |
| 20 | GND | AD26 | AD25 | GND |
| 21 | AD29 | +5 Volts | AD28 | AD27 |
| 22 | +5 Volts | AD30 | GND | AD31 |
| 23 | REQ0 | GND | REQ1 | VI/O |
| 24 | GND | REQ2 | +5 Volts | GNT0 |
| 25 | GNT1 | VI/O | GNT2 | GND |
| 26 | +5 Volts | CLK0 | GND | CKL1 |
| 27 | CLK2 | +5 Volts | CLK3 | GND |
| 28 | GND | INTD | +5 Volts | RST |
| 29 | +12 Volts | INTA | INTB | INTC |
| 30 | -12 Volts | REQ3 | GNT3 | GND |

Note: All VIO pins are connected to +3.3V.
The voltages +3.3V, +5V, 12V and -12 V are not generated by the onboard power-supply but routed from the Micro ATX Connector. The maximum current is limited to 1.0 amp each.

4.2 PC/104 Bus (J21)

| Pin | D | C |
|-----|----------|------|
| 0 | GND | GND |
| 1 | MEMCS16 | SBHE |
| 2 | IOCS16 | LA23 |
| 3 | IRQ10 | LA22 |
| 4 | IRQ11 | LA21 |
| 5 | IRQ12 | LA20 |
| 6 | IRQ15 | LA19 |
| 7 | IRQ14 | LA18 |
| 8 | DACK0 | LA17 |
| 9 | DRQ0 | MEMR |
| 10 | DACK5 | MEMW |
| 11 | DRQ5 | SD8 |
| 12 | DACK6 | SD9 |
| 13 | DRQ6 | SD10 |
| 14 | DACK7 | SD11 |
| 15 | DRQ7 | SD12 |
| 16 | +5 Volts | SD13 |
| 17 | MASTER | SD14 |
| 18 | GND | SD15 |
| 19 | GND | GND |

| Pin | A | B |
|-----|---------|-----------|
| 1 | IOCHCK | GND |
| 2 | D7 | RSTDRV |
| 3 | D6 | +5 Volts |
| 4 | D5 | IRQ9 |
| 5 | D4 | -5 Volts |
| 6 | D3 | DRQ2 |
| 7 | D2 | -12 Volts |
| 8 | D1 | ENDXFR |
| 9 | D0 | +12 Volts |
| 10 | IOCHRDY | KEY |
| 11 | AEN | SMEMW |
| 12 | A19 | SMEMR |
| 13 | A18 | IOW |
| 14 | A17 | IOR |
| 15 | A16 | DACK3 |
| 16 | A15 | DRQ3 |
| 17 | A14 | DACK1 |
| 18 | A13 | DRQ1 |
| 19 | A12 | REFRESH |
| 20 | A11 | SYSCLK |
| 21 | A10 | IRQ7 |
| 22 | A9 | IRQ6 |
| 23 | A8 | IRQ5 |
| 24 | A7 | IRQ4 |
| 25 | A6 | IRQ3 |
| 26 | A5 | DACK2 |
| 27 | A4 | TC |
| 28 | A3 | BALE |
| 29 | A2 | +5 Volts |
| 30 | A1 | OSC |
| 31 | A0 | GND |
| 32 | GND | GND |

-5 Volts are not supported on this board.

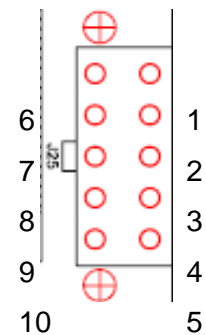
The voltages +3.3V, +5V, 12V and -12 V are not generated by the onboard power-supply but routed from the Micro ATX Connector. The maximum current is limited to 1.0 amp each.

4.3 Power Connector (J25, Top)

Connector type: 10 Pin Mini ATX-Power connector

The board itself only needs +5 V and +5 V SBY.

| PIN | Signal | PIN | Signal |
|-----|----------|-----|-----------------|
| 6 | +5 V SBY | 1 | Power Switch ON |
| 7 | +5 V | 2 | GND |
| 8 | +5 V | 3 | GND |
| 9 | -12 V | 4 | +12 V |
| 10 | GND | 5 | +3,3 V |



4.4 Clear CMOS (J9, Top)

- 3 Delete CMOS settings
- 2
- 1 Default setting: Store CMOS settings

4.5 EIDE Connector (JHDD1, Top)

Connector type: IDC44 pin header 2.00 mm

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| /Reset | 1 | GND | 2 |
| Data7 | 3 | Data8 | 4 |
| Data6 | 5 | Data9 | 6 |
| Data5 | 7 | Data10 | 8 |
| Data4 | 9 | Data11 | 10 |
| Data3 | 11 | Data12 | 12 |
| Data2 | 13 | Data13 | 14 |
| Data1 | 15 | Data14 | 16 |
| Data0 | 17 | Data15 | 18 |
| GND | 19 | NC | 20 |
| DRQ0 | 21 | GND | 22 |
| Write | 23 | GND | 24 |
| Read | 25 | GND | 26 |
| Ready | 27 | CSEL | 28 |
| DACK0 | 29 | GND | 30 |
| IRQ | 31 | IOCS16- | 32 |
| Address1 | 33 | PD66 | 34 |
| Address0 | 35 | Address2 | 36 |
| CS1 | 37 | CS3 | 38 |
| NC | 39 | GND | 40 |
| +5 Volts | 41 | +5 Volts | 42 |
| GND | 43 | GND | 44 |

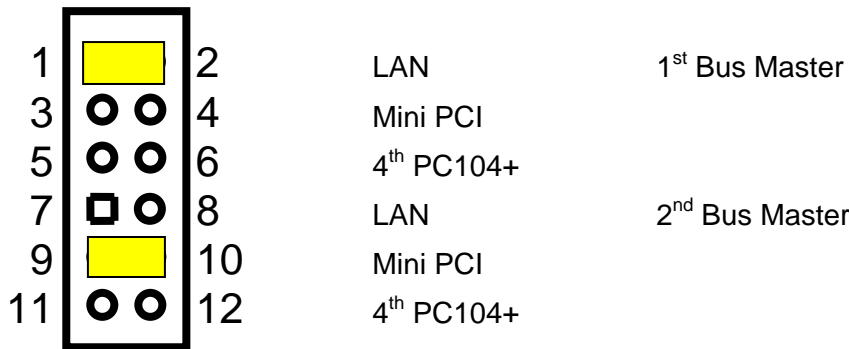
4.6 JTAG Header (J7, Top)

Connector type: IDC14 pin header 2.00 mm

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| GND | 1 | +3.3 Volts | 2 |
| GND | 3 | TCK | 4 |
| GND | 5 | TMS | 6 |
| GND | 7 | TDI | 8 |
| GND | 9 | TDO | 10 |
| TDBGI | 11 | #Reset | 12 |
| TDBGO | 13 | GND | 14 |

4.7 REQ#/GNT# Select Panel (J5=REQ#, J6=GNT#, Top)

Connector type: IDC12 pin header 2.00 mm.



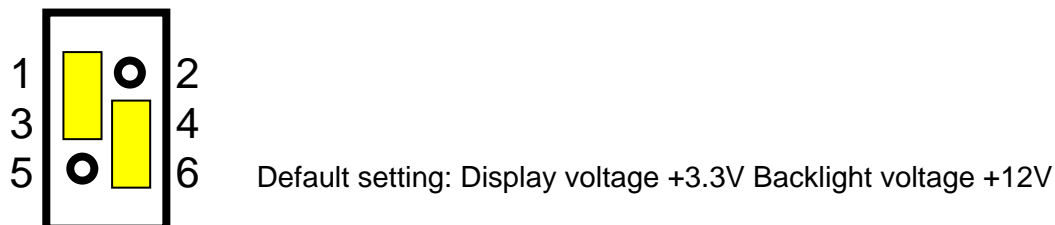
These Jumper Fields are to select two out of three PCI device to act as Bus Masters. By default the Ethernet controller and the Mini PCI extension card act as Bus Masters. In case a 4th Bus Master is needed at the PC104+ Bus, switch Jumper to desired setting. Note that Jumpers on J5 and J6 **must** be in the same positions.

4.8 Display Voltage Selector (J29, Top)

Connector type: IDC6 pin header 2.00 mm.

Use a 2 mm jumper between 1-3 or 3-5 to select the display voltage.

Use a 2 mm jumper between 2-4 or 4-6 to select the backlight voltage.



| Signal name | Pin | Signal name | Pin |
|----------------------------|-----|-----------------|-----|
| +12 Volts (from Micro ATX) | 1 | +5 Volts | 2 |
| Backlight voltage | 3 | Display voltage | 4 |
| + 5 Volts | 5 | +3.3 Volts | 6 |

4.9 High Speed Data Input Port (J3, Top)

Connector type: IDC40 pin header 2.00 mm.

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| +3.3 Volts | 1 | SYNC | 2 |
| +5 Volts | 3 | GND | 4 |
| CLK | 5 | GND | 6 |
| D0 | 7 | GND | 8 |
| D1 | 9 | GND | 10 |
| D2 | 11 | GND | 12 |
| D3 | 13 | GND | 14 |
| D4 | 15 | GND | 16 |
| D5 | 17 | GND | 18 |
| D6 | 19 | GND | 20 |
| D7 | 21 | GND | 22 |
| D8 | 23 | GND | 24 |
| D9 | 25 | GND | 26 |
| D10 | 27 | GND | 28 |
| D11 | 29 | GND | 30 |
| D12 | 31 | GND | 32 |
| D13 | 33 | GND | 34 |
| D14 | 35 | GND | 36 |
| D15 | 37 | GND | 38 |
| VSYNC | 39 | HSYNC | 40 |

4.10 GPIO Header (J13, Top)

Connector type: IDC40 pin header 2.00 mm.

| Signal name | Pin | Signal name | Pin |
|----------------|-----|---------------|-----|
| +3.3 Volts | 1 | +5 Volts | 2 |
| +3.3 Volts SBY | 3 | SIO_GPIO 40 | 4 |
| NC | 5 | SIO_GPIO 41 | 6 |
| SIO_GPIO 10 | 7 | SIO_GPIO 42 | 8 |
| SIO_GPIO 13 | 9 | SIO_GPIO 43 | 10 |
| SIO_GPIO 14 | 11 | SIO_GPIO 44 | 12 |
| SIO_GPIO 17 | 13 | SIO_GPIO 45 | 14 |
| SIO_GPIO 20 | 15 | SIO_GPIO 46 | 16 |
| SIO_GPIO 21 | 17 | SIO_GPIO 47 | 18 |
| SIO_GPIO 24 | 19 | SIO_GPIO 50 | 20 |
| GND | 21 | GND | 22 |
| SIO_GPIO 25 | 23 | SIO_GPIO 52 | 24 |
| SIO_GPIO 30 | 25 | SIO_GPIO 53 | 26 |
| SIO_GPIO 31 | 27 | NC | 28 |
| SIO_GPIO 32 | 29 | NC | 30 |
| SIO_GPIO 33 | 31 | CS5536_GPIO25 | 32 |
| SIO_GPIO 34 | 33 | CS5536_GPIO9 | 34 |
| SIO_GPIO 35 | 35 | CS5536_GPIO8 | 36 |
| SIO_GPIO 37 | 37 | CS5536_GPIO6 | 38 |
| GND | 39 | GND | 40 |

4.11 Analog Inputs and PWM Outputs (J12, Top)

Connector type: IDC40 pin header 2.00 mm.

| Signal name | Pin | Signal name | Pin |
|--------------|-----|-------------|-----|
| +5 Volts | 1 | +5 Volts | 2 |
| +5 Volts | 3 | +5 Volts | 4 |
| NC | 5 | SIO_AGND | 6 |
| SIO_PWM2 | 7 | SIO_AGND | 8 |
| SIO_PWM3 | 9 | SIO_AGND | 10 |
| SIO_PWM4 | 11 | SIO_AGND | 12 |
| SIO_PWM5 | 13 | SIO_AGND | 14 |
| SIO_ADC0 | 15 | SIO_AGND | 16 |
| SIO_ADC1 | 17 | SIO_AGND | 18 |
| SIO_ADC2 | 19 | SIO_AGND | 20 |
| SIO_ADC3 | 21 | SIO_AGND | 22 |
| SIO_ADC4 | 23 | SIO_AGND | 24 |
| SIO_ADC5 | 25 | SIO_AGND | 26 |
| SIO_ADC6 | 27 | SIO_AGND | 28 |
| SIO_ADC7 | 29 | SIO_AGND | 30 |
| SIO_ADC_VREF | 31 | SIO_AGND | 32 |
| +3.3 Volts | 33 | SIO_AGND | 34 |
| +3.3 Volts | 35 | SIO_AGND | 36 |
| GND | 37 | GND | 38 |
| GND | 39 | GND | 40 |

4.12 LPC Header (J8, Top)

Connector type: IDC20 pin header 2.00 mm

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| +3.3 Volts | 1 | +3.3 Volts | 2 |
| GND | 3 | PCI_RST# | 4 |
| GND | 5 | CLK | 6 |
| GND | 7 | LPC_AD3 | 8 |
| GND | 9 | LPC_AD2 | 10 |
| GND | 11 | LPC_AD1 | 12 |
| GND | 13 | LPC_AD0 | 14 |
| GND | 15 | LPC_FRAME# | 16 |
| GND | 17 | SERIRQ | 18 |
| GND | 19 | LPC_DRQ# | 20 |

4.13 Floppy connector (J20, Top)

Connector type: FFC 26 pin 1.00 mm

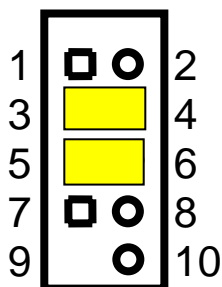
| Signal name | Pin | Signal name | Pin |
|-------------|-----|----------------|-----|
| +5 Volt | 1 | Index | 2 |
| +5 Volt | 3 | Drive Select 0 | 4 |
| +5 Volt | 5 | Disk change | 6 |
| NC | 7 | NC | 8 |
| NC | 9 | Motor On 0 | 10 |
| NC | 11 | Direction | 12 |
| NC | 13 | Step | 14 |
| GND | 15 | Write Data | 16 |
| GND | 17 | Write Gate | 18 |
| GND | 19 | Track 0 | 20 |
| GND | 21 | Write Protect | 22 |
| GND | 23 | Read Data | 24 |
| GND | 25 | Head Select | 26 |

4.14 µDOC Header (J16, Top)

Connector type: IDC10 pin header 2.54 mm

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| +5 Volts | 1 | NC | 2 |
| USB2- | 3 | USB2_CON- | 4 |
| USB2+ | 5 | USB2_CON+ | 6 |
| GND | 7 | NC | 8 |
| KEY | 9 | NC | 10 |

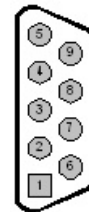
When DOC is not used, jumper pins 3 to 4 and 5 to 6 using a 2.54mm Jumper (default).



4.15 COM1 Port Connector (P1)

Connector type: D-SUB9, male
 RS232 function (names in brackets for RS485/RS422 function)

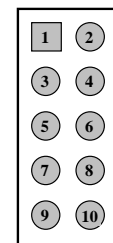
| PIN | Signal |
|-----|------------|
| 1 | DCD |
| 2 | RXD (RXD-) |
| 3 | TXD (TXD-) |
| 4 | DTR |
| 5 | GND |
| 6 | DSR (RXD+) |
| 7 | RTS (TXD+) |
| 8 | CTS |
| 9 | NC |



4.16 COM2 Port Connector (J19, Top)

Connector type: IDC10 pin header 2.54 mm
 RS232 function (names in brackets for RS485/RS422 function)

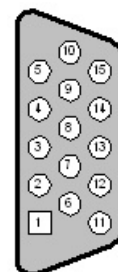
| PIN | Signal | PIN | Signal |
|------------|--------|------------|--------|
| DCD | 1 | DSR (RXD+) | 2 |
| RXD (RXD-) | 3 | RTS (TXD+) | 4 |
| TXD (TXD-) | 5 | CTS | 6 |
| DTR | 7 | NC | 8 |
| GND | 9 | +5 Volts | 10 |



4.17 VGA Connector (P1)

Connector type: D-SUB15, female

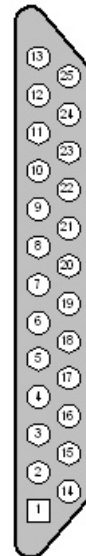
| PIN | Signal |
|-----|-----------------|
| 1 | RED |
| 2 | GREEN |
| 3 | BLUE |
| 4 | NC |
| 5 | GND |
| 6 | GND |
| 7 | GND |
| 8 | GND |
| 9 | + 5 Volts (VGA) |
| 10 | GND |
| 11 | NC |
| 12 | DDC_DATA |
| 13 | HSYNC |
| 14 | VSYNC |
| 15 | DDC_CLK |



4.18 LPT1 Port Connector (P1)

Connector type: D-SUB25, female

| PIN | Signal |
|-----|-----------|
| 1 | #Strobe |
| 2 | D0 |
| 3 | D1 |
| 4 | D2 |
| 5 | D3 |
| 6 | D4 |
| 7 | D5 |
| 8 | D6 |
| 9 | D7 |
| 10 | #ACK |
| 11 | BUSY |
| 12 | PE |
| 13 | Select |
| 14 | #Auto LF |
| 15 | #ERR |
| 16 | #INIT |
| 17 | Select IN |
| 18 | GND |
| 19 | GND |
| 20 | GND |
| 21 | GND |
| 22 | GND |
| 23 | GND |
| 24 | GND |
| 25 | GND |



4.19 Flat Panel Backlight (J30, Bottom)

Connector type: Hirose DF13 8 pin

| Signal name | Pin | Signal name | Pin |
|-------------|-----|------------------|-----|
| +12 Volts | 1 | +12 Volts | 2 |
| +5 Volts | 3 | +5 Volts | 4 |
| EN | 5 | VBKL (12V or 5V) | 6 |
| GND | 7 | GND | 8 |

4.20 Flat Panel Connector (J2, Bottom)

Connector type: Hirose DF14 30 pin

| Signal name | Pin | Signal name | Pin |
|----------------|-----|----------------|-----|
| GND | 1 | FPCLK | 2 |
| HSYNC | 3 | VSYNC | 4 |
| GND | 5 | R0 (LSB Red) | 6 |
| R1 | 7 | R2 | 8 |
| R3 | 9 | R4 | 10 |
| R5 (MSB Red) | 11 | GND | 12 |
| G0 (LSB Green) | 13 | G1 | 14 |
| G2 | 15 | G3 | 16 |
| G4 | 17 | G5 (MSB Green) | 18 |
| GND | 19 | B0 (LSB Blue) | 20 |
| B1 | 21 | B2 | 22 |
| B3 | 23 | B4 | 24 |
| B5 (MSB Blue) | 25 | GND | 26 |
| EN | 27 | VLCD-SW | 28 |
| VLCD-SW | 29 | GND | 30 |

4.21 LVDS Connector (J28, Bottom)

Connector type: Hirose DF14 20-pin header

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| SW-VDD | 1 | SW-VDD | 2 |
| GND | 3 | GND | 4 |
| TX3- | 5 | TX3+ | 6 |
| GND | 7 | TXCLK- | 8 |
| TXCLK+ | 9 | GND | 10 |
| TX2- | 11 | TX2+ | 12 |
| GND | 13 | TX1- | 14 |
| TX1+ | 15 | GND | 16 |
| TX0- | 17 | TX0+ | 18 |
| DDC Data | 19 | DDC Data | 20 |

4.22 Keyboard/Mouse Connector (P2)

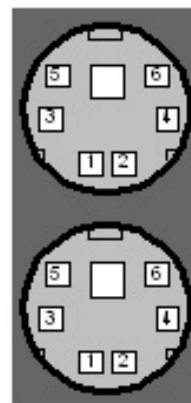
Connector type: PS/2

PS/2 – Mouse – Connector (above)

| PIN | Signal |
|-----|-------------------------------|
| 1 | Mouse Data |
| 2 | NC |
| 3 | GND (Power Supply Mouse) |
| 4 | +5 Volts (Power Supply Mouse) |
| 5 | Mouse Clock |
| 6 | NC |

PS/2 – Keyboard – Connector (below)

| PIN | Signal |
|-----|-----------------------------|
| 1 | Kbd Data |
| 2 | NC |
| 3 | GND (Power Supply Kbd) |
| 4 | +5 Volts (Power Supply Kbd) |
| 5 | Kbd Clock |
| 6 | NC |



4.23 Audio Connectors (J10)

4.23.1 Line Out

Color: green

Connector type: 1/8"

| PIN | Signal |
|-----|----------------|
| 1 | Line Out Left |
| 2 | GND |
| 3 | Line Out Right |



4.23.2 Line In

Color: blue

Connector type: 1/8"

| PIN | Signal |
|-----|---------------|
| 1 | Line In Left |
| 2 | GND |
| 3 | Line In Right |



4.23.3 Microphone In

Color: red

Connector type: 1/8"

| PIN | Signal |
|-----|---------------------|
| 1 | Microphone In Left |
| 2 | GND |
| 3 | Microphone In Right |



4.24 10/100BaseT Ethernet/USB Combi Connector (J14)

Connector type: RJ45/2xUSB (left, back view)

4.24.1 J14-1: Ethernet – RJ 45 – Connector

| PIN | Signal |
|-----|--------|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | PE |
| 5 | PE |
| 6 | RX- |
| 7 | PE |
| 8 | PE |

| LED | Signal | Color |
|-----|----------|--------|
| A | Link | Green |
| B | Activity | Orange |

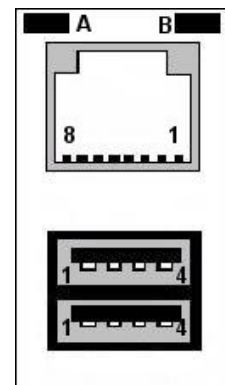
4.24.2 J14-2: USB 0/1 – Connector

USB1 (top)

| PIN | Signal |
|-----|----------|
| 1 | USB_VCC1 |
| 2 | USB1- |
| 3 | USB1+ |
| 4 | GND |

USB0 (bottom)

| PIN | Signal |
|-----|----------|
| 1 | USB VCC0 |
| 2 | USB0- |
| 3 | USB0+ |
| 4 | GND |



4.25 10/100BaseT Ethernet/USB Combi Connector (J15)

Connector type: RJ45/2xUSB (right, back view)

4.25.1 J15-1: Ethernet – RJ 45 – Connector

| PIN | Signal |
|-----|--------|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | PE |
| 5 | PE |
| 6 | RX- |
| 7 | PE |
| 8 | PE |

| LED | Signal | Color |
|-----|----------|--------|
| A | Link | Green |
| B | Activity | Orange |

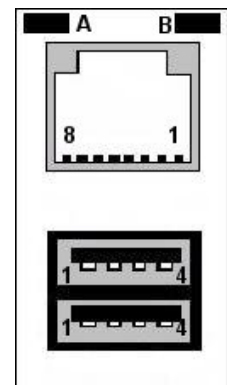
4.25.2 J15-2: USB 2/3 – Connector

USB3 (top)

| PIN | Signal |
|-----|----------|
| 1 | USB_VCC3 |
| 2 | USB3- |
| 3 | USB3+ |
| 4 | GND |

USB2 (bottom)

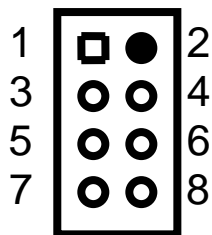
| PIN | Signal |
|-----|----------|
| 1 | USB VCC2 |
| 2 | USB2- |
| 3 | USB2+ |
| 4 | GND |



4.26 RS485-Termination Jumper (J26, Top)

Connector type: IDC8 pin header 2.00 mm. Use 2 mm jumpers to terminate lines correctly.

| Signal name | Pin | Signal name | Pin |
|-------------|-----|-------------|-----|
| COM1TX | 1 | #COM1TX | 2 |
| COM1RX | 3 | #COM1RX | 4 |
| COM2TX | 5 | #COM2TX | 6 |
| COM2RX | 7 | #COM2RX | 8 |

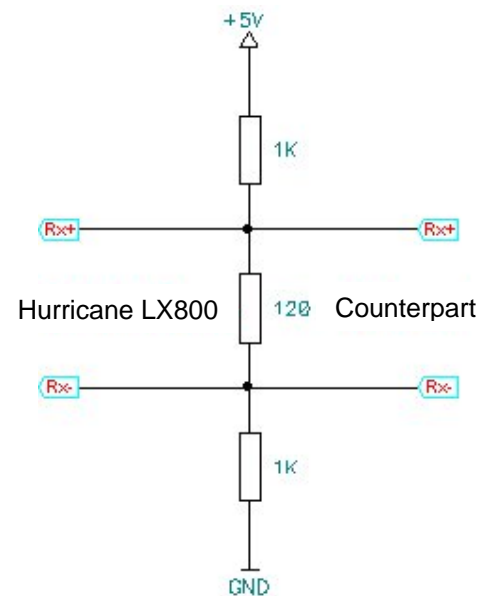


Default setting: no termination

When the jumper is set (1-2, 3-4, 5-6, 7-8), differential pairs (e.g. RX+ and RX-) are terminated with 120Ω between them.

Additionally positive/negative receive lines are pulled up/down with 1kΩ to 5V/GND in order to protect the transceivers of the Hurricane LX800 from overvoltages.

It is recommended to protect the receive lines of the communication partner device in the same way!



Caution: Termination Resistors **must not** be set in RS232 Mode. Otherwise the Serial Ports will not work.

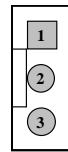
4.27 Front Panel Header (J31, Top)

Connector type: IDC8 pin header 2.00 mm.

| Signal name | Pin | Signal name | Pin |
|----------------|-----|----------------|-----|
| Ext. SBY LED - | 1 | Ext. SBY LED + | 2 |
| Ext. HDD LED - | 3 | Ext. HDD LED + | 4 |
| Ext. PWRBTN# | 5 | GND | 6 |
| Ext. RESET# | 7 | GND | 8 |



4.28 Cooling Fan Supply (J11, Top)

Connector type: Standard 3 Pin FAN Connector



| PIN | Signal |
|-----|--------------------------------|
| 1 | GND (black) |
| 2 | FAN Voltage (red) |
| 3 | Speed Signal from fan (yellow) |

4.29 FAN Voltage Select (J27, Top)

- 3  +12 Volts
- 2  FAN Voltage
- 1  +5 Volts (default)

5 Software

5.1 BIOS

The Hurricane LX800 is delivered with a standard PC BIOS. The default setting guarantees a "ready to run" system, even without a BIOS setup backup battery.

If the user wants to change settings, pressing the <F1> key on power up accesses the setup utility.

The BIOS is located in a flash PROM and can be easily updated on board with software under DOS.

All changes in the setup of the BIOS are stored in the CMOS RAM of the real time clock.

The default values of the BIOS can be automatically loaded at boot time. To achieve this, push the Reset-Button five times while the system is already booting. This will load the default values. Note that power-cycling the board five times in a row without the BIOS being able to complete its self test has the same effect.

5.2 Drivers

Software drivers for sound, Ethernet, AES and graphics adapter are available for the Hurricane LX800. These drivers can be downloaded from LiPPERT's website <http://www.lippert-at.com>. For installation, follow the instructions on the driver disks.

5.3 Programming GPIO's

The Hurricane LX800 GPIO's are part of the ITE8712 SuperIO. They are located in Logical Device 7 of the SuperIO and can be programmed with the MSDOS **debug** program using simple IN/OUT commands on Index/Data registers 2Eh/2Fh. GPIO's 1x belong to GPIO Set 1, GPIO's 2x to Set 2 and so on. The following lines show an example how to program GPIO Bank 1.

Set the SuperIO into configuration mode:

- o 2E 87
- o 2E 01
- o 2E 55
- o 2E 55

Enable Logical Device 7 for programming by writing 07h to register 07h of the SuperIO:

- o 2E 07
- o 2F 07

To activate GPIO-Set 1 Multifunction Pin Selection Register 25h write 3Fh to 2Ah:

- o 2E 2A
- o 2F 3F

Set GPIO-Set 1 Multifunction Pin Selection Register 25h to 9Fh to activate GPIO function for GPIO's 10..14 and GPIO17:

- o 2E 25
- o 2F 9F

Set Simple I/O enable register C0h to 9Fh:

- o 2E C0
- o 2F 9F

Set bits 0, 3, 4 and 7 of Simple I/O Set 1 Output Enable register C8h to '1' if GPIO's 10, 13, 14, and 17 shall be output. Set them to '0' to act as inputs. Here they are set on output mode:

- o 2E C8
- o 2F 9F

Since the GPIO Pins are Open Drain, enable internal Pull ups of GPIO's 10, 13, 14, and 17:

- o 2E B8
- o 2F 99

GPIO's values can be set on and read back from address 390h (391h for Set 2, etc...), but this address has to be set first by programming it to registers 62h, 63h:

- o 2E 62
- o 2F 03
- o 2E 63
- o 2F 90

For further information, please refer to chapter 8 of the ITE8712 datasheet.

5.4 Programming Watchdog

Since the Watchdog is disabled in delivery status, it must be programmed for proper use. Additionally a hardware change is necessary in order to read back the watchdog event. Note that you will loose GPIO 10 if want this feature.

The Watchdog is an internal feature of the ITE8712 Super I/O. If the Watchdog is activated and the timer is not set back within a programmed amount of time, the board does a system reset and the event can be read back at the Super I/Os GPIO 10 (look above).

The following program in C is an example how to test Watchdog function under DOS. Programming the Watchdog is quite similar programming GPIO's.

```
#include <stdio.h>
#include <conio.h>

typedef char BYTE;

void main()
{
    BYTE index71 = 0x0;
    BYTE index73 = 0x0;
    BYTE value = 0x0;
    BYTE keyval = 0x0;

    clrscr();

    outp(0x2E,0x87);           // sets SIO in configuration mode
    outp(0x2E,0x01);
    outp(0x2E,0x55);
    outp(0x2E,0x55);

    outp(0x2E,0x07);         // LDN=0x07
    outp(0x2F,0x07);

    outp(0x2E,0x71);         // mouse or kb sets watchdog timer back, settings made
```

```

index71 = (inp(0x2F)|0x60); // in watchdog timer control register 0x71
outp(0x2F,index71);

printf("Press '1' for timeout intervall in seconds.\n"); // sets timeout intervall to seconds or minutes, settings
printf("Press '2' for timeout intervall in minutes.\n"); // made in watchdog configuration register 0x72

keyval = getc(stdin);

if (keyval == 0x31) {
    outp(0x2E,0x72);
    outp(0x2F,0xC0);
    printf("\nseconds chosen\n");
}
else {
    if (keyval == 0x32) {
        outp(0x2E,0x72);
        outp(0x2F,0x40);
        printf("\nminutes chosen\n");
    }
    else {
        printf("\nwrong input!\n");
        return;
    }
}

printf("\nset the value for the time intervall (0..255): "); // sets value for the timeout intervall, settings made in
scanf("%d", &value); // watchdog timer timeout value register (LSB) 0x73

outp(0x2E,0x73);
outp(0x2F,value);
index73 = inp(0x2F);

printf("\n\nPress '1' to activate watchdog. Any other key exits program.\n");

keyval = 0x0;
keyval = getc(stdin);
keyval = getc(stdin);

if (keyval == 0x31) { // watchdog is activated by setting WDT status bit to '0'
    printf("watchdog activated. press any key to set back timer.\n"); // settings made in WDT control register 0x71
    outp(0x2E,0x71);
    index71 = inp(0x2F) & 0xFE;
    outp(0x2F,index71);
}
else
    printf("\nprocess cancelled\n");

return;
}

```

5.5 Analog Inputs

For activating all eight analog inputs of the Hurricane LX800 set the Super I/Os Extended 2 Multifunction Pin selection register 2Ch to 1Ch. It's located in Logical Device 07h.

The values can be read back using index/data port 295h/296h of the LPC Bus. The registers are located at addresses 20h...27h (SIO_ADC0...SIO_ADC7).

Example:

Set Super I/O in configuration mode:

- o 2E 87
- o 2E 01
- o 2E 55
- o 2E 55

Enable Logical Device 7 for programming by writing 07h to register 07h of the SuperIO:

}

5.7 PWM Outputs

Programming the PWM outputs works the same way as using GPIO's or Analog inputs.

Enter configuration mode and switch to logical device 7 (via 2Eh/2Fh).

Enable PWM outputs by setting

- Bit 6 of register 27h to '0' (SIO_PWM2)
- Bit 1 of register 29h to '0' (SIO_PWM3)
- Bits 3 and 4 of register 2Ch to '1' (SIO_PWM4+5, GPIO's 24+25 will not be longer available)

Enable channels 1-3 by programming the following registers via LPC-Bus (295h/296h):

- Bits 2,1 and 0 of register 13h to '1'
- Bits 2,1 and 0 of register 14h to '1'

Set the global frequency by programming bits 6-4 of register 14h via LPC-Bus (295h/296h):

| Bits 6, 5, 4 | PWM frequency |
|--------------|---------------|
| 000 | 375.000 KHz |
| 001 | 187.500 KHz |
| 010 | 93.750 KHz |
| 011 | 62.500 KHz |
| 100 | 46.875 KHz |
| 101 | 23.430 KHz |
| 110 | 11.700 KHz |
| 111 | 5.870 KHz |

Set Bit 3 of register 14h to '0' to allow duty cycles between 0...100%. ($PWM/128*100\%$)

Duty cycles can be set different for each PWM channel by programming an 8 Bit value to registers 16h for channel 2, 17h for channel 3, 88h for channel 4 and 89h for channel 5.

6 Address Map

This section describes the layout of the CPU memory and I/O address spaces.

Note: Depending on enabled or disabled functions in the BIOS, other or more resources may be used

6.1 Memory Address Map

| Address Range (Dec) | Address Range (Hex) | Size | Description |
|---------------------|---------------------|--------|------------------------|
| 1024K - 16384K | 100000 - FFFFFFFF | 15360K | Extended Memory |
| 960K - 1023K | F0000 - FFFFFF | 64K | System BIOS |
| 936K - 959K | EA000 - EFFFFF | 24K | Unused |
| 932K - 935K | E9000 - E9FFF | 4K | ACPI |
| 896K - 931K | E0000 - E8FFF | 36K | Unused |
| 800K - 895K | C8000 - DFFFF | 96K | Mapped to ISA |
| 768K - 799K | C0000 - C7FFF | 32K | Graphics BIOS |
| 736K - 768K | B8000 - BFFFF | 32K | Color Text Memory |
| 704K - 736K | B0000 - B7FFF | 32K | Monochrome Text Memory |
| 640K - 704K | A0000 - AFFFF | 64K | Graphic Memory |
| 0K - 640K | 0 - 9FFFF | 640K | Conventional Memory |

6.2 I/O Address Map

The system chip set implements a number of registers in I/O address space. These registers occupy the following map in the I/O space.

| Address Range (Hex) | Description |
|---------------------|---|
| 00000000 - 0000000F | DMA-Controller |
| 00000000 - 00000CF7 | PCI-Bus |
| 00000020 - 00000021 | Programmable Interrupt controller |
| 0000002E - 0000002F | System |
| 00000040 - 00000043 | System timer |
| 00000048 - 0000004B | System timer |
| 0000004E - 0000004F | Super I/O |
| 00000060 - 00000060 | Keyboard |
| 00000061 - 00000061 | System speaker |
| 00000064 - 00000064 | Keyboard |
| 00000070 - 00000073 | System CMOS/Realtime clock |
| 00000080 - 0000008F | DMA-Controller |
| 00000092 - 00000092 | System |
| 000000A0 - 000000A1 | Programmable Interrupt controller |
| 000000C0 - 000000DF | DDMA-Controller |
| 000000F0 - 000000FF | Numeric Coprocessor |
| 00000100 - 0000017F | PCI-ISA Bridge Positive Decode Range 1 |
| 00000180 - 000001BF | PCI-ISA Bridge Positive Decode Range 2 |
| 000001C0 - 000001CF | PCI-ISA Bridge Positive Decode Range 3 |
| 000001F0 - 000001FF | IDE Controller |
| 00000200 - 0000027F | PCI-ISA Bridge Positive Decode Range 4 |
| 00000279 - 00000279 | ISAPnP-Data port |
| 00000295 - 00000296 | LPC-Bus |
| 000002F8 - 000002FF | COM2 |
| 00000300 - 0000033F | PCI-ISA Bridge Positive Decode Range 5 |
| 00000340 - 0000035F | PCI-ISA Bridge Positive Decode Range 6 |
| 00000378 - 0000037F | LPT1 |
| 000003B0 - 000003BA | Advanced Micro Devices Win XP Graphics Driver |
| 000003C0 - 000003DF | Advanced Micro Devices Win XP Graphics Driver |
| 000003F0 - 000003F7 | Standard-Floppy controller |
| 000003F8 - 000003FF | COM1 |
| 00000480 - 0000048F | DMA-Controller |
| 000004D0 - 000004D1 | Programmable Interrupt controller |
| 00000A79 - 00000A79 | ISAPnP-Data port |
| 00000D00 - 0000AC17 | PCI-Bus |
| 00001200 - 00001207 | SPI-Flash |
| 00001220 - 00001227 | Simple-I/O (default) |
| 0000AC20 - 0000FFFF | PCI-Bus |
| 0000DF80 - 0000DFFF | Geode LX Audio Driver (WDM) |
| 0000EFF0 - 0000EFFF | Standard-Dual-Channel-PCI-IDE-Controller |

6.3 Interrupts

| IRQ | System Resource |
|-----|--|
| NMI | Parity Error |
| 0 | Timer |
| 1 | Keyboard |
| 2 | Secondary Interrupt Controller |
| 3 | COM2 |
| 4 | COM1 |
| 5 | unused |
| 6 | Floppy |
| 7 | LPT1 |
| 8 | System CMOS/RTC |
| 9 | Microsoft ACPI-compliant System |
| 10 | Advanced Micro Devices Win XP Graphics Driver |
| 10 | Geode LX AES Crypto Driver |
| 11 | Geode LX Audio Driver (WDM) |
| 11 | Micrel KS8842 PCI Ethernet Adapter |
| 11 | Standard extended PCI-to-USB universal Host controller |
| 11 | Standard OpenHCD USB-Host controller |
| 12 | PS/2-compatible Mouse |
| 13 | Numeric Coprocessor |
| 14 | Primary IDE-channel |
| 15 | unused |

6.4 DMA Channels

| DMA | Data width | System Resource |
|-----|------------|---------------------------|
| 0 | 8 bits | Available |
| 1 | 8 bits | Available |
| 2 | 8 bits | Floppy |
| 3 | 8 bits | Available |
| 4 | | Reserved, Cascade Channel |
| 5 | 16 bits | Available |
| 6 | 16 bits | Available |
| 7 | 16 bits | Available |

7 Technical Characteristics

7.1 Electrical Specifications

| | |
|-------------------------------|---|
| Supply voltage: | 10 Pin Mini ATX The board itself only uses +5V and +5V SBY. +3.3V, +12V and -12V are only routed to connectors for external I/O extension. Their current is limited to 1A each. |
| Supply voltage ripple: | ± 5% |
| Supply current: | max. 1.4 A depending on operating system typ. 1.05 A (running Windows XP idle mode) typ. 0.18 A (running Windows XP Suspend to RAM) |

7.2 Environmental Specifications

Operating:

| | |
|-----------------------------|--|
| Temperature range: | -20 ... 60 °C (standard version) -40 ... 85 °C (extended version) |
| Temperature change: | max. 10K / 30 minutes |
| Humidity (relative): | 10 ... 90 % (non-condensing) |
| Pressure: | 450 ... 1100 hPa |

Storage temperature:

| | |
|-----------------------------|-----------------------------|
| Temperature range: | -40 ... +85°C |
| Temperature change: | max. 10K / 30 minutes |
| Humidity (relative): | 5% ... 95% (non-condensing) |
| Pressure: | 450 ... 1100 hPa |

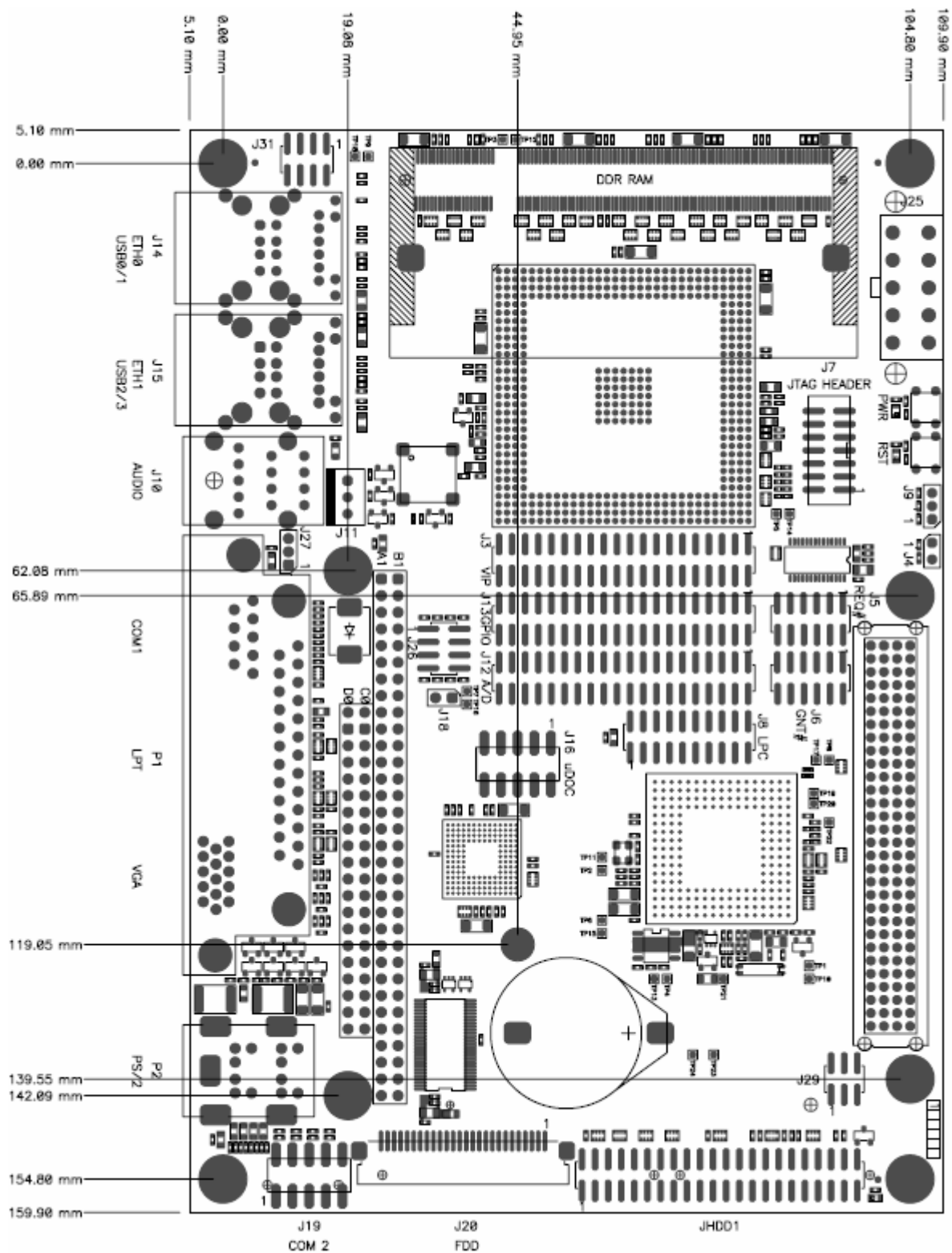
7.3 MTBF

T.b.d.

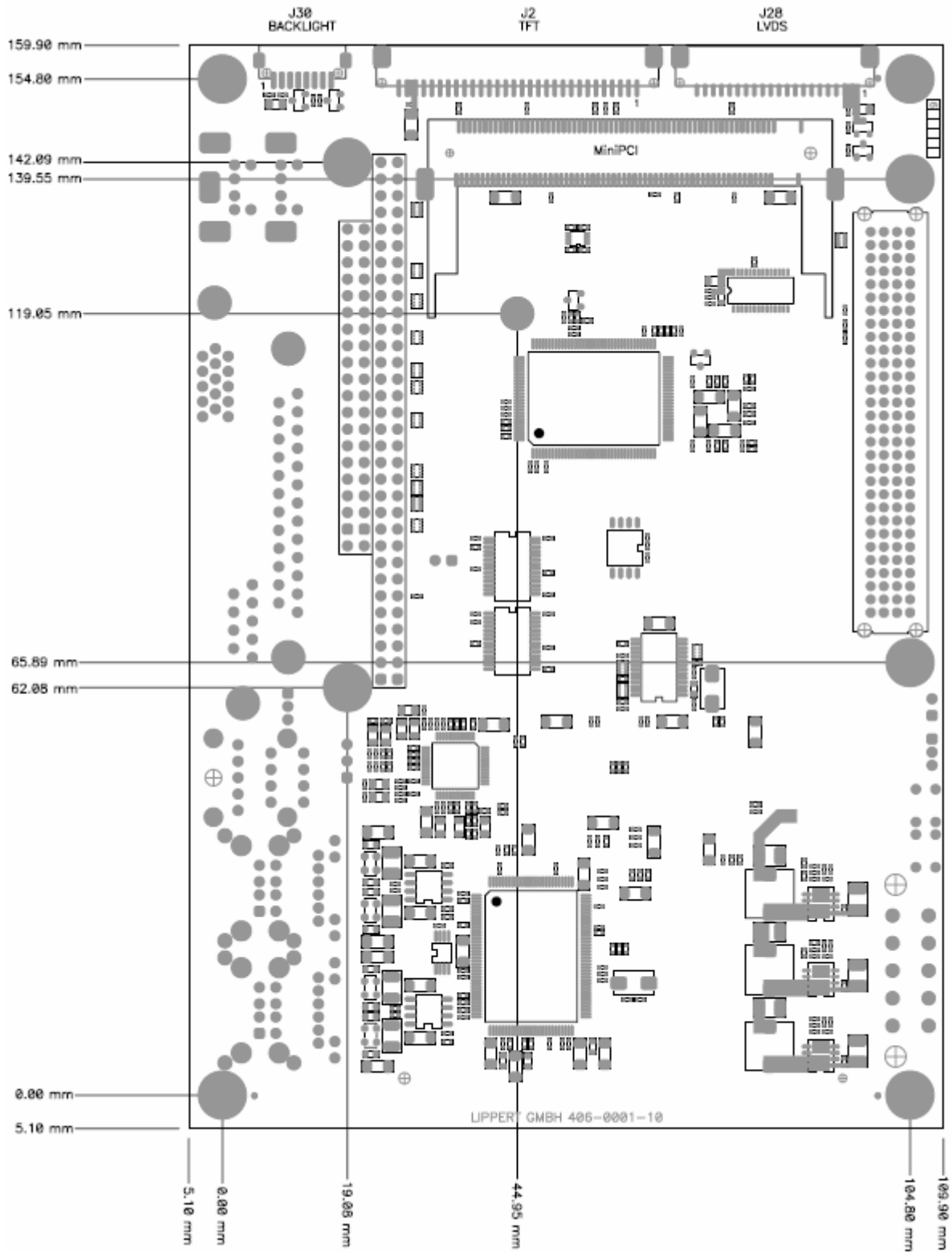
7.4 Mechanical

| | |
|--------------------------|--|
| Dimensions (LxW): | 165 mm x 115 mm |
| Height: | max. 40 mm on topside above PCB max. 12 mm on bottom side above PCB |
| Weight: | 275 g (incl. RAM) |

7.4.1 Top View



7.4.2 Bottom View



8 Options

There are some options available for the Hurricane LX800. Please check their availability before ordering.

- Extended temperature range
- Cable set

9 Revision History

| Filename | Date | Edited by | Change |
|-------------------------|------------|----------------|--|
| TME-EPIC-HURRICANE-R0V0 | 2006-04-27 | O. Freudenberg | Draft |
| TME-EPIC-HURRICANE-R1V0 | 2006-06-12 | O. Freudenberg | Released version |
| TME-EPIC-HURRICANE-R1V1 | 2006-06-19 | O. Freudenberg | Corrected chapter 4.19, description of J30-6 |
| TME-EPIC-HURRICANE-R1V2 | 2006-08-01 | O. Freudenberg | Edited chapter 2.24, added chapter 2.17.1 |
| TME-EPIC-HURRICANE-R1V3 | 2006-09-27 | O. Freudenberg | Memory and I/O Address Maps corrected |