chipDISK-IDE

User's Guide

Document Revision 2.3

Kontron

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1. USER INFORMATION

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1.1 *About This Manual*

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1.4 *Standards*

Kontron Embedded Modules is certified to ISO 9000 standards.

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This Kontron Embedded Modules product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron Embedded Modules will at its discretion decide to repair or replace defective products.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

Kontron Embedded Modules will not be responsible for any defects or damages to other products not supplied by Kontron Embedded Modules that are caused by a faulty Kontron Embedded Modules product.

1.6 Technical Support

Technicians and engineers from Kontron Embedded Modules and/or its subsidiaries and official distributors are available for technical support. We are committed to making our product easy to use and will help you use our products in your systems.

Before contacting Kontron Embedded Modules technical support, please contact your local representative or consult our Web site for the latest product documentation, utilities, and drivers. If the information does not help to solve the problem, contact us by telephone.

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2. INTRODUCTION

The *chip*DISK-IDE provides high-capacity, solid-state Flash memory and is electricallly compatible with IDE disk drives. *chip*DISK-IDE modules are available with up to 512MB of formatted storage capacity and will later carry even higher capacities. Please contact your local sales support for information about currently available capacities of this module.

It comes with a 44-pin, 2mm IDE connector onboard and therefore perfectly fits onto most PC/104 family products as well as the PISA® Slot-PC line of Kontron Embedded Modules GmbH. However it also can be used on all other modules of any manufacturer on the market that provide an IDE compatible hard disk interface.

A special mounting hole on its PCB can provide a way of secure assembly to the system it is used on.

As the *chip*DISK-IDE operates in true-IDE mode there is no need for special operating system drivers, which is a big advantage against other Flash based solid-state disks on the market.

*Chip*DISK products are available on the market since several years now. During this time the product has been redesigned several times to allow bigger capacities and increase the performance. There are basically 3 main revisions sold throughout the last years:

➤ Revision 3 based on SanDisk NOR technology

➤ Revison 4 based on SanDisk NAND technology

➤ Revision 5 based on SMI NAND technology

You can easily find out which product you have by viewing the label on the product or on the box the product is delivered with. The label shows the product revision in the format CE xyz, where the digit y is the main revision number.

This document is only valid for the *chip*DISK-IDE products designed in NAND technology labeled with CE ?4? or CE ?5?. For older products designed in NOR technology refer to their corresponding technical manual.

3. SPECIFICATIONS

3.1 Functional Specifications

The *chip*DISK-IDE hard disk incorporates the following features:

➤ **True IDE hardware-compatible disk**

➤ **Based on NAND Flash technology**

➤ **Very low-power CMOS operation and ultra-low-power (ULP) standby modes**

➤ **5V only supply voltage**

➤ **No formatting by special software and no special operating system drivers needed**

➤ **Automatic error correction and retry**

➤ **Supports power-down commands and sleep modes**

➤ **One of the industry's smallest IDE hard disks**

➤ **Space saving design optimized for MOPS family products and SLOT-PC line**

➤ **Low weight**

➤ **Noiseless operation**

3.2 Mechanical Specifications

3.2.1. PCB Dimensions

➤ 31 x 52.5 mm (1.22″ x 2.07″)

3.2.2. Height

➤ 7 mm (0.28″)

3.2.3. Weight

➤ < 10g

3.3 Electrical Specifications

3.3.1. Supply Voltage

➤ 5V DC +/- 5%

3.3.2. Supply Voltage Ripple

➤ 400 mV peak to peak 50MHz

3.3.3. Supply Current (Typical)

➤ Sleep mode(*):   <1mA at 5V

➤ Reading: <40mA at 5V

➤ Writing: <40mA at 5V

Note: (*) The sleep-mode current is specified under the condition that all *chip*DISK-IDE inputs are at static CMOS levels and in a "Not Busy" operating state at 33MHz.

3.3.4. Supply Current (Maximum)

➤ 160mA

(calculated theoretical value from all components maximum supply currents)

3.3.5. MTBF

➤ TO BE DONE

3.3.6. Endurance

➤ 100,000 erase/program cycles per logical sector guaranteed

3.4 *Capacity Specifications*

Model Number		Capacity (bytes)	Sectors	Heads	Sectors/Track	Cylinders
chipDISK-IDE-16	Rev. 4	16,056320	31,360	2	32	490
chipDISK-IDE-32	Rev. 4	32,112,640	62,720	4	32	490
chipDISK-IDE-64	Rev. 4	64,225,280	125,440	8	32	490
chipDISK-IDE-96	Rev. 4	96,251,904	187,992	4	63	746
chipDISK-IDE-256	Rev. 4	256,638,976	501,248	16	32	979
chipDISK-IDE-16	Rev. 5	15,859,712	30,976	4	16	484
chipDISK-IDE-32	Rev. 5	32,243,712	62,976	8	16	492
chipDISK-IDE-64	Rev. 5	65,011,712	126,976	8	32	496
chipDISK-IDE-96	Rev. 5	97,779,712	190,976	4	16	2984
chipDISK-IDE-256	Rev. 5	261,919,712	510,976	16	32	998
chipDISK-IDE-512	Rev. 5	522,805,248	1,022,112	16	63	1014

3.5 *Environmental Specifications*

3.5.1. Temperature

➤ Operating: 0 to +70 C(*) (extended temperature -40 to +80 C)

➤ Nonoperating: -40 to +85 °C (noncondensing)

Note: The maximum operating temperature is the maximum measurable temperature on any spot on the module's surface. You must maintain the temperature according to the above specification.

3.5.2. Thermal Gradient

➤ Operating: -25°C per hour

➤ Nonoperating: 40°C per hour

3.5.3. Humidity

➤ Operating: 10% to 90% (RH noncondensing)

➤ Nonoperating: 5% to 95% (RH noncondensing)

3.5.4. Mechanical

➤ Shock: 50G/20ms square-wave maximum

➤ Vibration: 1G/0-600Hz, dwell not to exceed

3.5.5. Altitude

➤ Operating: 0 – 3000m

➤ Nonoperating: 0 – 5000m

4. CHIPSET

The Flash chipset (FCS) on *chip*DISK-IDE .consists of two parts:

➤ One highly integrated Flash controller

➤ One to four Flash memory modules (depending on the capacity)

4.1 *Flash Controller*

The Flash controller provides a true Integrated Drive Electronics (IDE) compatible interface to the host computer. The controller manages:

➤ Interfacing to the host system

➤ Storing data

➤ Retrieving data

➤ Error checking and correcting (ECC) memory

➤ Handling defects

➤ Diagnosing

➤ Managing power

The controller manages all defects and errors and makes the Flash memory appear as perfect memory to the host. After the *chip*DISK-IDE has been configured by the host, it appears to the host as a standard IDE disk drive with transfer mode up to PIO 1 with SanDisk SDC-1 controller and PIO 2 with the Silicon Motion SM221T controller.

4.2 *Flash Memory*

The *chip*DISK-IDE can come in different versions, however not all possible configurations mentioned here are available as standard products.

- ➤ 128MB
- ➤ 256MB
- ➤ 512MB
- ➤ 1GB
- ➤ 2GB
- ➤ **4GB**
- ➤ 8GB

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5. IDE INTERFACE

The *chip*DISK-IDE comes with a 44pin, 2mm female IDE interface connector. That way it is possible to directly assemble it with a product of the PC/104 MOPS family or a PISA Slot-PC from Kontron Embedded Modules GmbH. However it can also be used with other products offering an IDE interface, either directly or with an adapter available by Kontron (*chip*DISK-ADA1, Part Number 96004-0000-00-0).

5.1 *Connector*

The following table provides information about the IDE interface connector pinout.

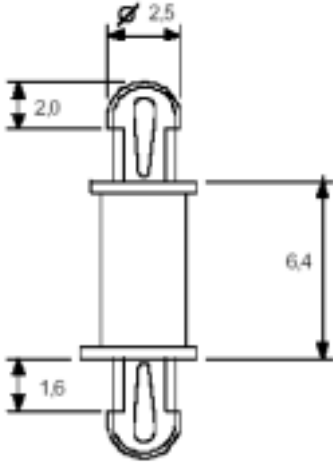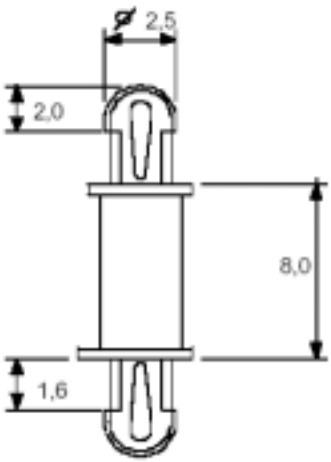| Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	/RESET	Reset	2	GND	Ground
	3	DD7	Data 7	4	DD8	Data 8
	5	DD6	Data 6	6	DD9	Data 9
	7	DD5	Data 5	8	DD10	Data 10
	9	DD4	Data 4	10	DD11	Data 11
	11	DD3	Data 3	12	DD12	Data 12
	13	DD2	Data 2	14	DD13	Data 13
	15	DD1	Data 1	16	DD14	Data 14
	17	DD0	Data 0	18	DD15	Data 15
	19	GND	Ground	20	Key (NC)	Key pin
	21	NC	Not connected	22	GND	Ground
	23	/DIOW	I/O write	24	GND	Ground
	25	/DIOR	I/O read	26	GND	Ground
	27	IOCHRDY	channel ready	28	NC	Not connected
	29	NC	Not connected	30	GND	Ground
	31	INTRQ	Interrupt	32	/IOCS16	16bit I/O
	33	DA1	Addr 1	34	/PDIAG	Passed Diag.
	35	DA0	Addr 0	36	DA2	Addr 2
	37	/CS0	Chip select 0	38	/CS1	Chip select 1
	39	/DASP	Device active	40	GND	Ground
	41	VCC	+5V	42	VCC	+5V
	43	GND	Ground	44	NC	Not connected

5.2 *Configuration*

The *chip*DISK-IDE is by hardware configured as a master. It cannot be configured as a slave by the customer. Therefore an additional devices connected to the same IDE channel has to be configured as slave.

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6. MOUNTING HOLE

The printed circuit board (PCB) of the *chip*DISK-IDE is equipped with a mounting hole. This hole can be used to fix the *chip*DISK to the carrier board. Products of the PC/104 MOPS family, SLOT-PCs of the PISA line and the *chip*DISK-ADA1 also offer a hole as counterpart. That way the *chip*DISK can be secured against fall off caused by vibration. You can use either a mini-spacer or other suitable mounting parts.

The diameter of the *chip*DISK hole is 2.6mm (0.103"). If you are using metal screws and bolts, make sure that they don't exceed the tin-plated area around the hole. We recommend to use a plastic mini-spacer (e.g. ELPAC LPR 8234-6,4 or LPR 8313-Mini). The height of the mini-spacer or bolts is depending on the IDE-connector used on the carrier board, which is normally either 6mm (0.236") or 7.64mm (0.3"). About 0.4mm have to be added when the chipDISK is plugged.

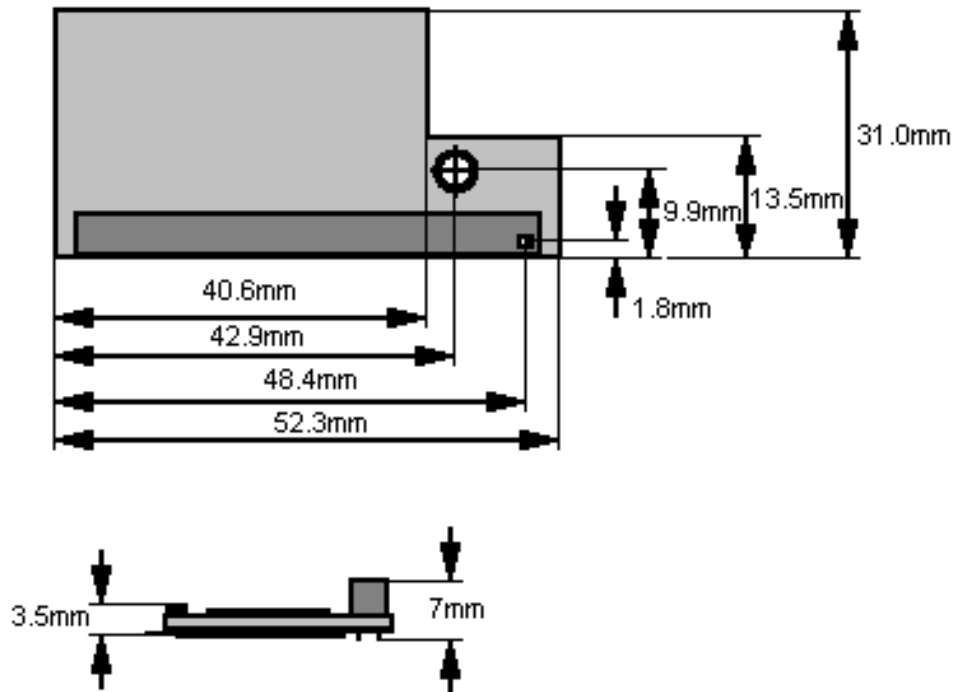| ELPAC LPR 8234-6,4	ELPAC LPR 8313-Mini

All dimensions in the above drawings in mm.

7.   APPENDIX A: MECHANICAL DIMENSIONS

IDE Connector

Mounting Hole
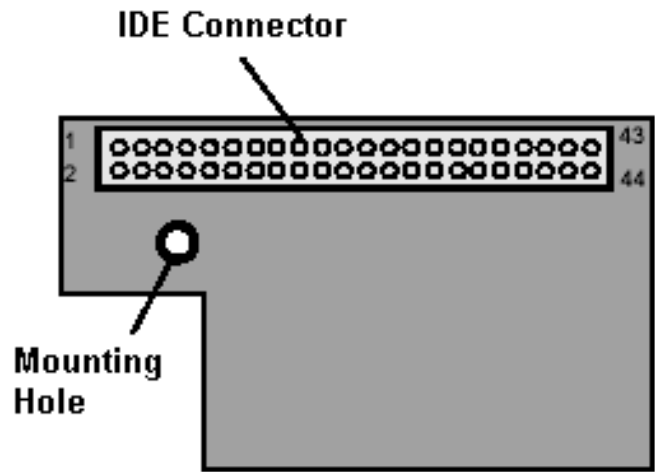
View from connector side

31.0mm

13.5mm

9.9mm

1.8mm

40.6mm

42.9mm

48.4mm

52.3mm

3.5mm   7mm

8.   APPENDIX B: PC ARCHITECTURE INFORMATION

The following sources of information can help you better understand PC architecture.

8.1   *Buses*

8.1.1. ATA

AT Attachment (ATA) Working Group
This X3T10 standard defines an integrated bus interface between disk drives and host processors. It provides a common point of attachment for systems manufacturers and the system. You can search for information about the working group on the Web.
We recommend you also search the Web for information on *4.2 I/O cable*, if you use hard disks in a DMA3 or PIO4 mode.

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9. APPENDIX C: DOCUMENT-REVISION HISTORY

Revision	Date	Edited by	Changes
SFLGM110	27.02.2002	JT	Manual created
SFLGM111	16.09.2002	JT	Updated chapter 3 information
SFLGM112	19.11.2003	BHO	Kontron style, added lots of information
SFLGM120	01.09.2004	WKA	Removed and added some electrical data for SM221 compatibility, added new capacity data, removed not necessary PC-architecture information
SFLGM121	09.09.2004	BHO	Minor corrections in layout, added chipDISK-IDE-512 information
SFLGM122	11.10.2004	BHO	Corrected Capacity Information of chipDISK-IDE-512