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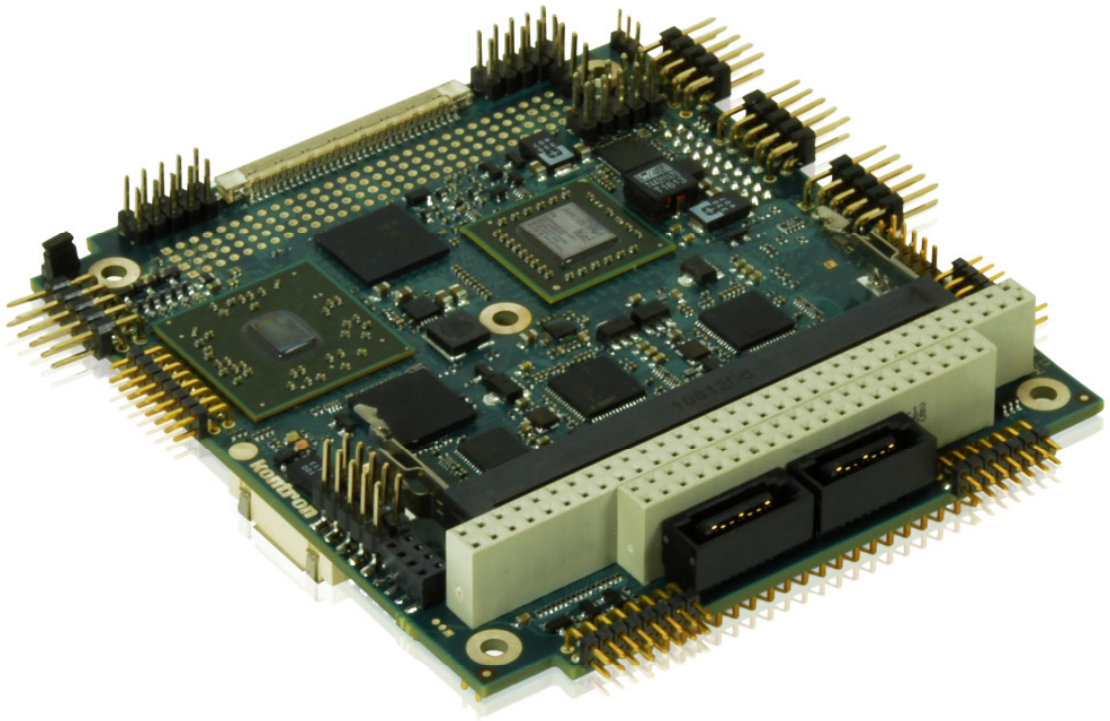
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kontron

» Kontron User's Guide «



MSM-e0

Document Revision 102

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1 User Information

1.1 About this Document

This document provides information about products from Kontron AG and/or its subsidiaries. No warranty of suitability, purpose, or fitness is implied. While every attempt has been made to ensure that the information in this document is accurate, the information contained within is supplied "as is" and is subject to change without notice.

1.2 Copyright Notice

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1.3 Trademarks

MICROSPACE®, smartModule® and smartCore® are trademarks or registered trademarks of Kontron Compact Computers AG. Kontron is a trademark or registered trademark of Kontron AG.

The following lists the trademarks of components used in this product.

- IBM, XT, AT, PS/2 and Personal System/2 are trademarks of International Business Machines Corp.
- Microsoft is a registered trademark of Microsoft Corp.
- Intel is a registered trademark of Intel Corp.

All other products and trademarks mentioned in this manual are trademarks of their respective owners. For the circuits, descriptions and tables indicated, Kontron assumes no responsibility as far as patents or other rights of third parties are concerned.

1.4 Standards

Kontron AG is certified to ISO 9000 standards.

1.5 Warranty

This Kontron AG product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron AG 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 AG will not be responsible for any defects or damages to other products not supplied by Kontron AG that are caused by a faulty Kontron AG product.

Empty batteries (external and onboard), as well as all other battery failures, are not covered by this manufacturer's limited warranty.

1.6 Technical Support

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

For technical support, please consult our technical support department:

Web: http://support.kcc-ag.ch
Tel.: +41 (0) 32 681-5848
Fax: +41 (0) 32 681-5801

For the latest product documentation, utilities, drivers, additional tools and software please consult our website:

Web: http://kontron.com

1.7 Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements wherever possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations. All components within this product fulfill the requirements of the RoHS (Restriction of Hazardous Substances Directive). The product is soldered using a lead-free process.

1.8 RoHS Commitment

Kontron Compact Computers AG (Switzerland) is committed to developing and producing environmentally friendly products in accordance with the Restriction of Hazardous Substances (RoHS) Directive (2002/95/EC) and the Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) established by the European Union. The RoHS directive was adopted in February 2003 by the European Union and came into effect on 1 July 2006. It is not a law but a directive, which restricts the use of six hazardous materials in the manufacturing of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE) 2002/96/EC, which has set targets for the collection, recycling and recovery of electrical goods, and is part of a legislative initiative to solve the problem of huge amounts of toxic e-waste.

Each European Union Member State is adopting its own enforcement and implementation policies using the Directive as a guide. Therefore, there could be as many different versions of the law as there are Member States in the EU. Additionally, non-EU countries like China, Japan, or states in the U.S. such as California, may have their own regulations for green products, which are similar, but not identical, to the RoHS Directive.

RoHS is often referred to as the "lead-free" directive, but it restricts the use of the following substances:

- Lead
- Mercury
- Cadmium
- Chromium VI
- PBB and PBDE

The maximum allowable concentration of any of the above-mentioned substances is 0.1% (except for cadmium, which is limited to 0.01%) by weight of homogeneous material. This means that the limits do not apply to the weight of the finished product, or even to a component, but to any single substance that could (theoretically) be separated mechanically.

1.8.1 RoHS Compatible Product Design

All standard products from Kontron Compact Computers (KCC) AG comply with RoHS legislation.

Since July 1, 2006, there has been a strict adherence to the use of RoHS compliant electronic and mechanical components during the design-in phase of all KCC AG standard products.

1.8.2 RoHS Compliant Production Process

KCC selects external suppliers that are capable of producing RoHS compliant devices verified by:

- A confirmation from the supplier indicating that their production processes and resulting devices are RoHS compliant.
- If there is any doubt of RoHS compliancy, the concentration of the previously mentioned substances in a produced device will be measured. These measurements are carried out by an accredited laboratory.

1.8.3 WEEE Application

The WEEE Directive is closely related to the RoHS Directive and applies to the following devices:

- Large and small household appliances
- IT equipment
- Telecommunications equipment (although infrastructure equipment is exempt in some countries)
- Consumer equipment
- Lighting equipment – including light bulbs
- Electronic and electrical tools
- Toys, leisure and sports equipment
- Automatic dispensers

It does not apply to fixed industrial plants and tools. Compliance is the responsibility of the company that brings the product to market, as defined in the Directive. Components and sub-assemblies are not subject to product compliance. In other words, since Kontron Compact Computers AG does not deliver ready-made products to end users, the WEEE Directive is not applicable for KCC AG. Users are nevertheless encouraged to properly recycle all electronic products that have reached the end of their life cycle.

1.9 The Swiss Association for Quality and Management Systems

The Swiss Association for Quality and Management Systems (SQS) provides certification and assessment services for all types of industries and services. SQS certificates are accepted worldwide thanks to accreditation by the Swiss Accreditation Service (SAS), active membership in the International Certification Network, IQNet, and co-operation contracts/agreements with accredited partners.

www.sqs.ch

The SQS Certificate ISO 9001:2000 has been issued to Kontron Compact Computers AG in the field of development, manufacturing and sales of embedded computer boards, embedded computer modules and computer systems. The certification is valid for three years, after which time an audit is performed for recertification.

2 Specifications

2.1 Available Modules

Part No.	Article	AMD® CPU	Remarks
802400	MSM-e0	T44R	With single-core AMD T44R processor 1.2GHz
802410	MSM-e0-N	T24L	With single-core AMD T24L processor 1.0GHz headless (no graphics/audio)

2.2 Available Options

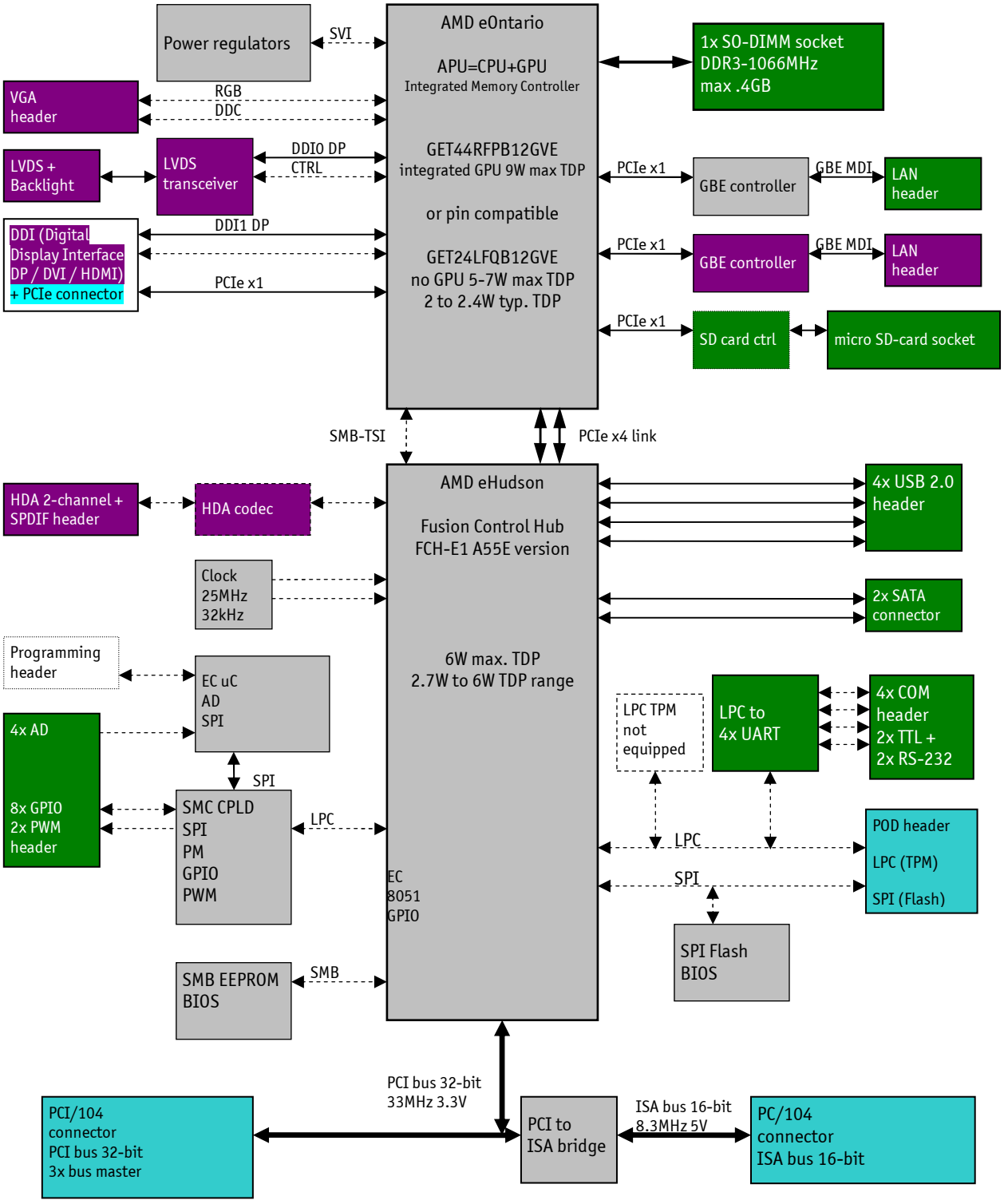
Part No.	Article	Remarks
802365	RAM 1GB DDR3 SODIMM	Option MSM PC/104 SBC with 1GB DDR3 memory
802366	RAM 2GB DDR3 SODIMM	Option MSM PC/104 SBC with 2GB DDR3 memory
802367	RAM 4GB DDR3 SODIMM	Option MSM PC/104 SBC with 4GB DDR3 memory
802312	PC/104 ISA connector	Option PC/104 ISA press-fit connector
802313	PC/104 PCI connector	Option PC/104 PCI press-fit connector
802408	MSM-e0 Heat Spreader Kit	Heat spreader, screw set included
802314	MSM-PC104 Passive Cooler Kit	Heat sink without fan including assembly material.
802316	MSM-PC104 Active Cooler Kit	Heat sink with fan including assembly material.
802040	MSM-PC104 CK	Cable kit including: Interfaces: Line-In/Out or Mic-In, S/PDIF, 1Gb Ethernet Cables: Power, USB, VGA, COM single, SATA, LAN, Audio

2.3 Evaluation Kit

This kit is used for the evaluation of the MSM-e0 product family and is ready-to-use.

Part No.	Article	Remarks
802409	MSM-e0-Evalkit	Ready to Run package including: MSM-e0 MSM-e0 Heat Spreader Kit, MSM-PC104 Active Cooler, MSM-PC104 CK, 2GB SODIMM DDR3, Power supply 250GB 2.5" SATA hard disk with: Dual boot system Windows Embedded Standard 7 (Evaluation Version), Linux Fedora Board Support Package Test GUI for Win XPe, Linux Documentation

2.4 Block Diagram



Onboard core components / Low cost variant connectors / Expansions / Graphic, audio, 2nd GBE

2.5 Functional Specifications

Processor

- CPU: AMD® T44R / T24L
- Speed: 1.2GHz / 1.0GHz

Video

- Controller: AMD Radeon™ HD 6250 multi-display support
- Memory: Up to 384 MB (UMA)
- Drivers: AMD G-Fusion driver

Display Interfaces

- CRT Interface: Up to 1920 x 1200, 30 bpp @ 60Hz
- LCD Interface: Up to 1920 x 1200, 24 bpp @ 60Hz
- Digital Display Interface (needs an external circuit with connector):
  - DVI: Up to 1920 x 1200, 24 bpp @ 60Hz
  - or Display Port: Up to 1920 x 1200, 30 bpp @ 60Hz
  - or HDMI™: Up to 1920 x 1200, 36 bpp @ 60Hz

Storage

- MicroSD card: MicroSD card socket

Interfaces

- 2x SATA
- 2x Gigabit LAN
- 4x USB 2.0
- 4x COM
- GPIO/ADC/PWM
- Audio
- PCIe x1 lane
- PCI optional press-fit connector
- ISA optional press-fit connector

Power Management

- S-States: S0, S3, S4, S5, S5eco

2.6 Mechanical Specifications

» 90.17 mm x 102.0mm (95.89 mm on edge for PC/104 box mount)

» Height approx. 17.2 mm (21.6 mm with PCI connector, 23.65 mm with ISA connector)

2.7 Electrical Specifications

2.7.1 Supply Voltage

» 5VDC ± 5%

2.7.2 Supply Current (Windows XP SP3)

The tested boards were mounted standalone; a mouse and a keyboard were connected. The power-consumption tests were executed under Windows XP SP3 by using a tool to stress the CPU (AMD® Thermal Analysis Tool at 100 % load). The power measurement values were acquired after 15 minutes at full load and a stable CPU die temperature. To ensure a stable die temperature, a corresponding heat sink was used to hold the temperature under the critical trip point.

MSM-e0 / MSM-e0-N

Mode	[A]	[W]	[A]	[W]
S0 Full load	3	15	2	10
S0	2	10	1.35	6.75
S0 idle	1.2	6	1.0	5
S3	0.01	0.5	0.01	0.5
S5	0.05	0.25	0.05	0.25
S5 eco	0.001	0.007	0.001	0.007

2.8 MSM-e0 Environmental Specifications

Temperature

Operating with Kontron Compact Computers AG cooling solution:

» Standard operating temperature: 0 to +70°C

» Extended operating temperature: -40 to +85°C

Note:	In any case, the maximum operating temperature should never be exceeded!

Humidity

» Operating: 5% to 90% (non-condensing)

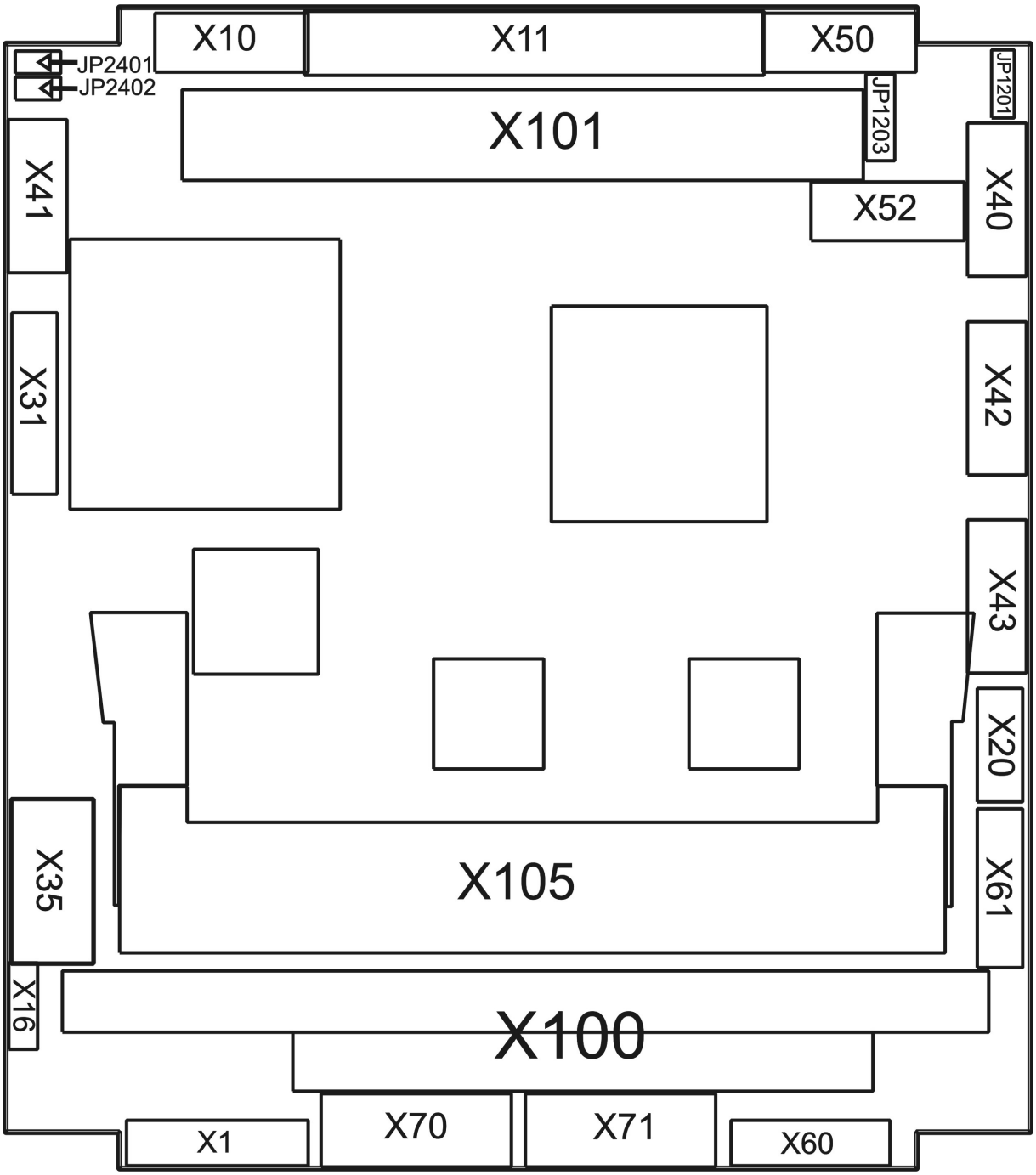
2.9 External Real-Time Clock Battery

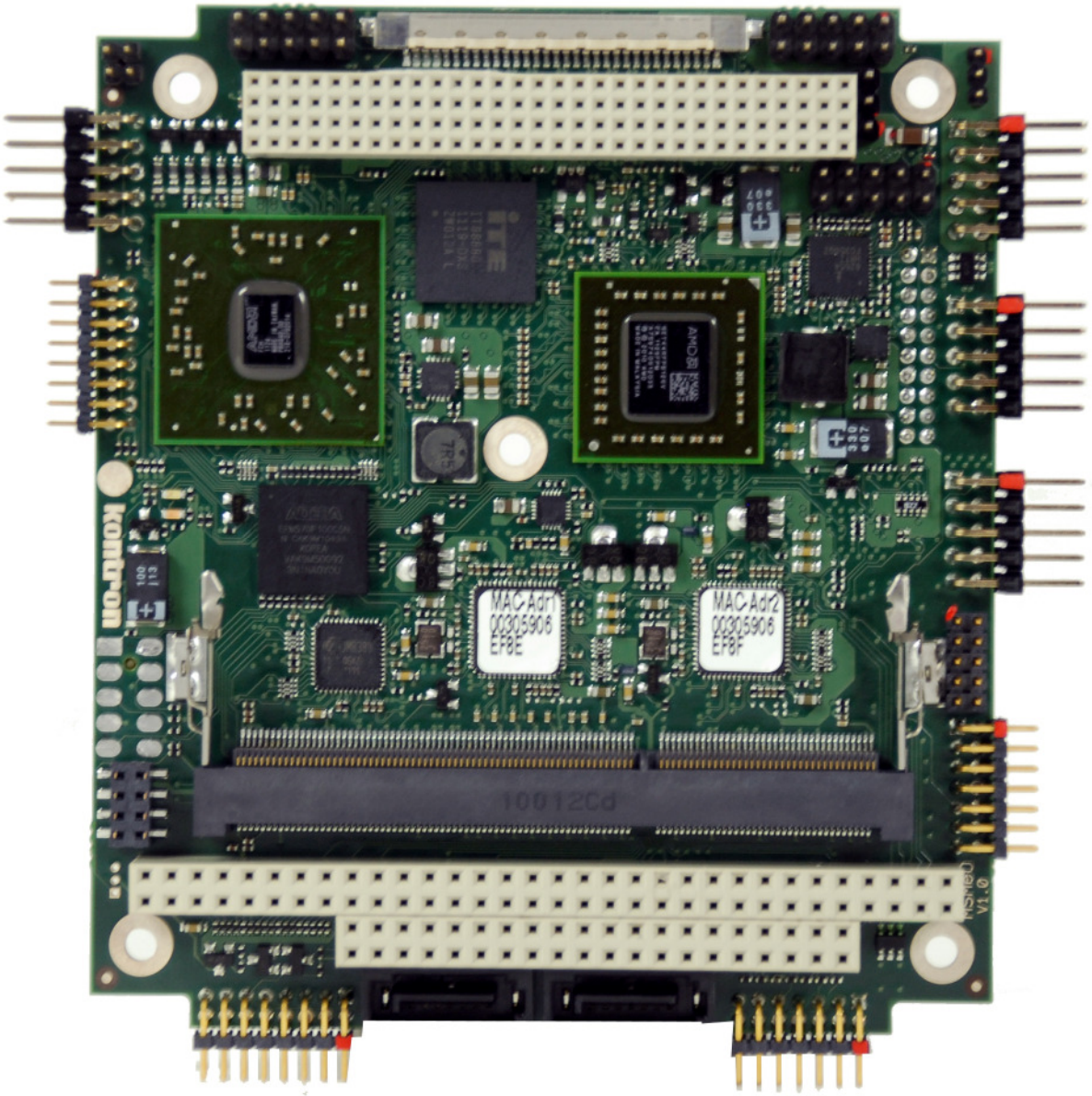
» Nominal voltage: 3.0V (2.5-3.6V)

» Current consumption: Typ. 3µA (max. 6µA)

3 MSM-e0 Connectors & Jumpers

3.1 Top Layer Assembly

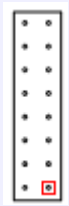



kontron
MAC Adr1
00305906
EF8E
MAC Adr2
00305906
EF8F
10012Cd
V1.0

3.2 Connector Descriptions – Top

3.2.1 Power Supply – X1

A power connector for the main power supply is provided. The single board computer functions with a single +5V power supply. Additional voltages for PC/104 peripherals (+12V, -5V, -12V) must be generated externally.

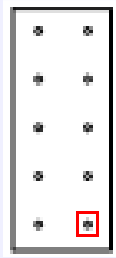
Header	Pin	Signal Name	Function
2.00mm grid 	1	V_12V_IN	Supplemental power supply input +12V (PC/104 connectors)
	2	PSON#	ATX power on (Power LED)
	3	V_5V0_IN	Main power supply input +5V
	4	V_5V0_IN	Main power supply input +5V
	5	GND	Ground
	6	GND	Ground
	7	GND	Ground
	8	GND	Ground
	9	POWER_BTN#	External main button
	10	RESET_BTN#	External reset button
	11	IGNITION#	Ignition input
	12	HDD_ACT#	HDD activity LED (SATA and micro SD card)
	13	VBAT	RTC battery input (3.6 volt)
	14	SMB_ALERT#	System management alert
	15	SMB_DAT	System management bus data
	16	SMB_CLK	System management bus clock

3.2.2 AMP Power Input

The MSM-e0 does not provide AMP power input plugs.

3.2.3 USB Interfaces – X50/X52

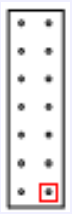
The board is populated with four USB interfaces. Two connectors with 2 USB ports each are defined.

Header	Pin	Signal Name	Function
2.54mm grid 	1	USBx_VBUS	Power +5V (switched)
	2	USBy_VBUS	Power +5V (switched)
	3	USBxN	USBx data negative
	4	USByN	USBy data negative
	5	USBxP	USBx data positive
	6	USByP	USBy data positive
	7	GND	Ground
	8	GND	Ground
	9	SHD	Shield (tied to ground at the host side)
	10	SHD	Shield (tied to ground at the host side)
x (y) is the number of the USB port (USB1: x -> 1)			

3.2.4 SATA Interfaces – X70/X71

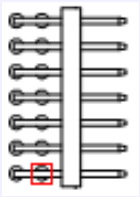
The board layout supports two SATA interfaces. The standard SATA interfaces have standard connectors and pinouts. It is not intended that the standard SATA connectors are assembled from the bottom side. Any connections to a baseboard or to a system I/O must be done with standard cables.

Customer-specific boards with the following connector for the SATA interface (assembled from the bottom side) can be ordered.

Header	Pin	Signal Name	SATA Connector Pin	Function
1.27mm grid 	1	GND		Ground
	2	GND	1	Ground
	3	SATAx_TXP	2	Data transmit positive
	4	NC		NC
	5	SATAx_TXN	3	Data transmit negative
	6	NC		NC
	7	GND		Ground
	8	GND	4	Ground
	9	SATAx_RXN	5	Data receive negative
	10	NC		NC
	11	SATAx_RXP	6	Data receive positive
	12	NC		NC
	13	GND		Ground
	14	GND	7	Ground
x is the number of the SATA port (SATA1: x -> 1)				

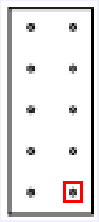
3.2.5 LAN Interfaces – X60/X61

Two Gbit Ethernet ports are defined. Suitable transformers must be provided externally. Only one GbE is equipped as a headless variant.

Header	Pin	Signal Name	Function
2.00mm grid 	1	GbEx_MDI0N	Bidirectional pair 0 negative
	2	GbEx_MDI0P	Bidirectional pair 0 positive
	3	GbEx_MDI1N	Bidirectional pair 1 negative
	4	GbEx_MDI1P	Bidirectional pair 1 positive
	5	GbEx_LED1	LED Link 1000
	6	V_1V8	Center tap voltage
	7	GND	Ground
	8	V_3V3_GbEx	Power +3.3V (switched)
	9	GbEx_LED2	LED activity
	10	GbEx_LED0	LED link 100
	11	GbEx_MDI2N	Bidirectional pair 2 negative
	12	GbEx_MDI2P	Bidirectional pair 2 positive
	13	GbEx_MDI3N	Bidirectional pair 3 negative
	14	GbEx_MDI3P	Bidirectional pair 3 positive
x is the number of the GbE port (GbE1: x -> 1)			

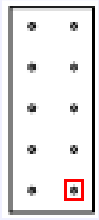
3.2.6 Audio Interface – X20

The audio interface provides stereo analog and digital audio signals. Not equipped as a headless variant.

Header	Pin	Signal Name	Function
2.00mm grid 	1	LINE_R	Line right
	2	GND_A	Analog ground
	3	LINE_L	Line left
	4	MIC_R	Mic right
	5	GND_A	Analog ground
	6	MIC_L	Mic left
	7	V_5V0_S0	Power +5V S0 state
	8	SPDIF_IN	Digital audio input
	9	GND	Ground
	10	SPDIF_OUT	Digital audio output

3.2.7 CRT Interface – X10

The board provides an onboard analog CRT interface. Not equipped as a headless variant.

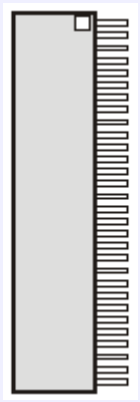
Header	Pin	Signal Name	Function
2.54mm grid 	1	GND	Ground
	2	RED	Red video signal
	3	NC	Not connected
	4	GREEN	Green video signal
	5	NC	Not connected
	6	BLUE	Blue video signal
	7	CRT_DDATA	DDC data
	8	CRT_HSYNC	Horizontal sync
	9	CRT_VSYNC	Vertical sync
	10	CRT_DCLK	DDC clock

3.2.8 LVDS Interface – X11

The LVDS implementation complies with the JILI specification of Kontron (JILI30). When using an LCD, additional voltages may be required to drive the display logic and supply the backlight converter therefore an additional connector for supply voltages is provided.

The FPC connector is mounted on the top side. Not equipped as a headless variant. The corresponding backlight connector is assembled on the opposite side.

FPC Connector – X11



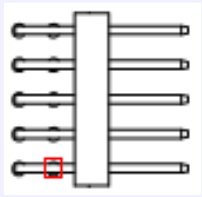
Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	LVDS_L0N	Odd channel data out 0	16	LVDS_U1P	Even channel data out 1
	2	LVDS_L0P	Odd channel data out 0	17	GND	Ground
	3	LVDS_L1N	Odd channel data out 1	18	LVDS_U2N	Even channel data out 2
	4	LVDS_L1P	Odd channel data out 1	19	LVDS_U2P	Even channel data out 2
	5	LVDS_L2N	Odd channel data out 2	20	LVDS_UCLKN	Even channel clock
	6	LVDS_L2P	Odd channel data out 2	21	LVDS_UCLKP	Even channel clock
	7	GND	Ground	22	LVDS_U3N	Even channel data out 3
	8	LVDS_LCLKN	Odd channel clock	23	LVDS_U3NP	Even channel data out 3
	9	LVDS_LCLKP	Odd channel clock	24	GND	Ground
	10	LVDS_L3N	Odd channel data out 3	25	SDA	DDC data line
	11	LVDS_L3P	Odd channel data out 3	26	DIGON	LCDVCC on control
	12	LVDS_U0N	Even channel data out 0	27	SCL	DDC clock line
	13	LVDS_U0P	Even channel data out 0	28	V_VCC_LVDS	+3.3V or +5V power
	14	GND	Ground	29	V_VCC_LVDS	+3.3V or +5V power
	15	LVDS_U1N	Even channel data out 1	30	V_VCC_LVDS	+3.3V or +5V power

Panel power +3.3V or +5V set by jumper JP1203 (2.54mm pitch);
Position 1-2 +3.3 volt (default) or position 2-3 +5 volt.

3.2.9 Serial Port Interfaces – X40/X41/X42/X43

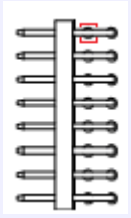
Four serial ports for asynchronous serial communication are defined. X40, X41 support RS-232 level and X42, X43 support TTL level. An external conversion to RS-232 and RS-422/485 is possible for all ports.

Note: External converters to RS-232 or RS-422/485 with galvanic separation are available. All four ports can bypass the level-shifters to support TTL levels (OEM high volume placement option).

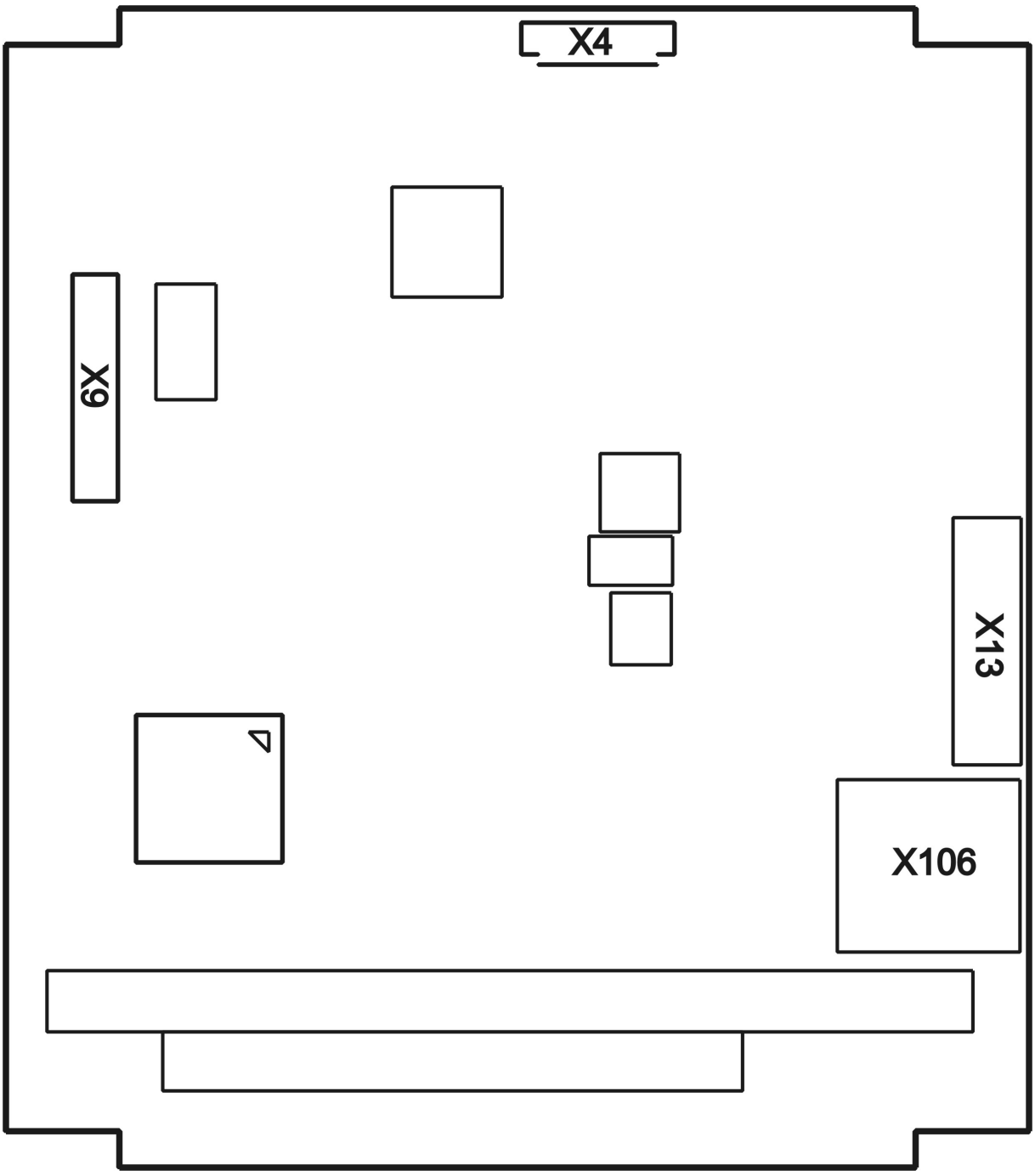
Header	Pin	Signal Name	Function	DSUB9
2.54mm grid 	1	DCDXx#	Data carrier detect	1
	2	DSRXx#	Data set ready	6
	3	RXDXx#	Receive data	2
	4	RTSXx#	Request to send	7
	5	TXDXx#	Transmit data	3
	6	CTSXx#	Clear to send	8
	7	DTRXx#	Data terminal ready	4
	8	RIXx#	Ring indicator	9
	9	GND	Ground	5
	10	V5.0_S0	Power +5V	-
x is the number of the COM port (COM1: x -> 1)				

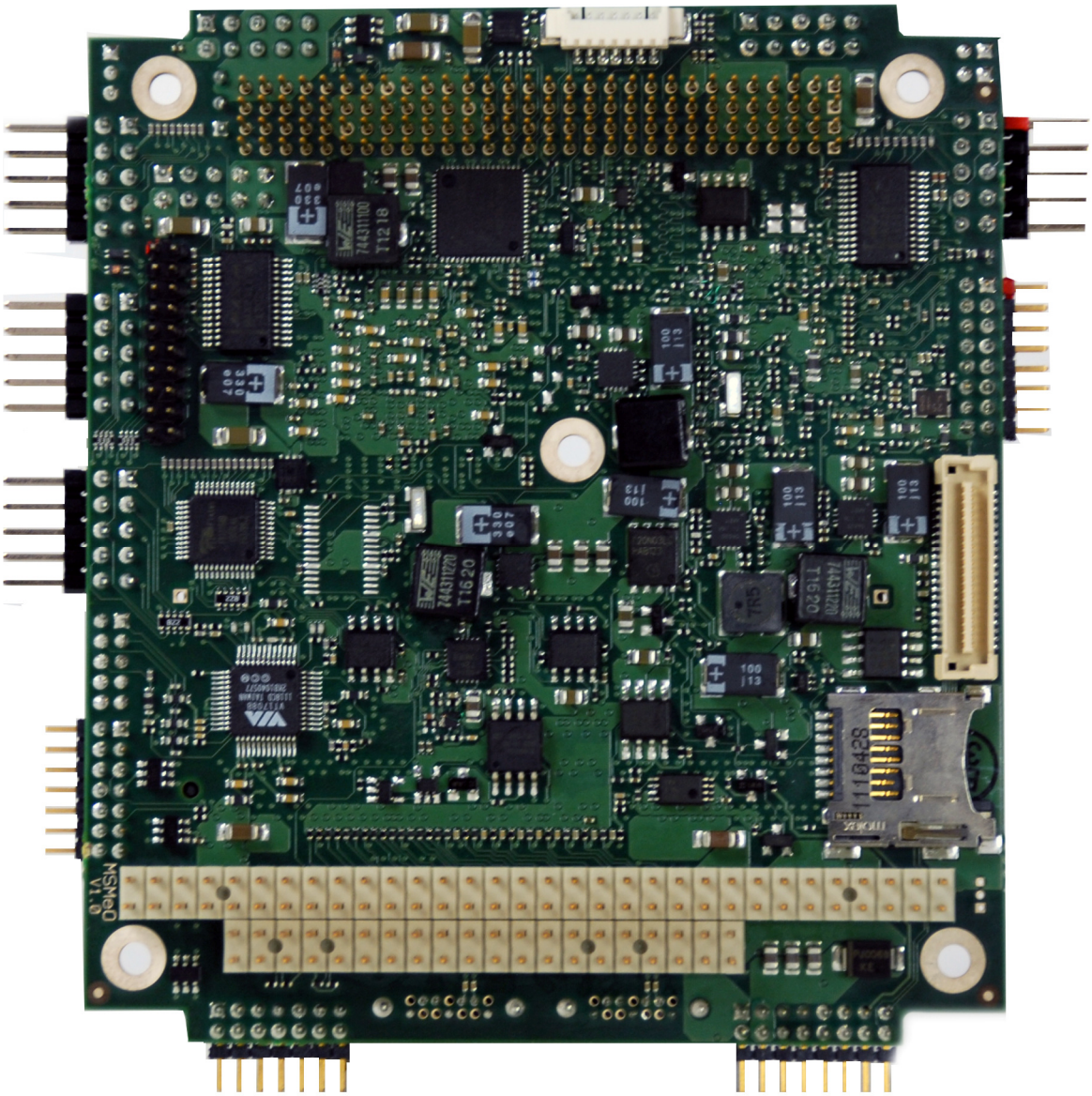
3.2.10 GPIO and AD/DA Interface – X31

The board has a GPIO header interface with additional AD/DA channels. Any filtering must be done externally.

Header	Pin	Signal Name	Function
2.00mm grid 	1	GPIO0	General purpose I/O
	2	GPIO1	General purpose I/O
	3	GPIO2	General purpose I/O
	4	GPIO3	General purpose I/O
	5	GPIO4	General purpose I/O
	6	GPIO5	General purpose I/O
	7	GPIO6	General purpose I/O
	8	GPIO7	General purpose I/O
	9	PWM_OUT0	D/A output
	10	PWM_OUT1	D/A output
	11	ADC_IN0	A/D input
	12	ADC_IN1	A/D input
	13	ADC_IN2	A/D input
	14	ADC_IN3	A/D input
	15	GND	Ground
	16	+V3.3_S5	Power +3.3V

3.3 Bottom Layer Assembly

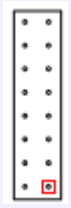




3.4 Connector Descriptions – Bottom

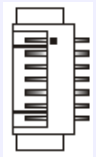
3.4.1 LPC/POD Interface – X9

This is a connector for additional LPC devices such as POD and Super-I/O. It can also be used for a second BIOS flash interface (SPI or LPC).

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
2.00mm grid 	1	V_3V3_S0	Power +3.3V	2	LPC_LDA0	Data
	3	LFRAME#	LPC frame	4	LPC_LDA1	Data
	5	RST#	Reset OUT	6	LPC_LDA2	Data
	7	RST#	Reset OUT	8	LPC_LDA3	Data
	9	V_5V0_S0	Power	10	RST#	Reset OUT
	11	LPC_CLK	Clock	12	BIOS_EN_EXT	External BIOS select
	13	GND	Ground	14	RESET_IN#	Reset IN
	15	V_3V3_PROG	Power IN	16	SERIRQ	Serial interrupt
	17	SPI_CS#	SPI chip select	18	SPI_CLK	SPI clock
	19	SPI_MISO	SPI Master Input	20	SPI_MOSI	SPI Master Output

3.4.2 Backlight Connector – X4

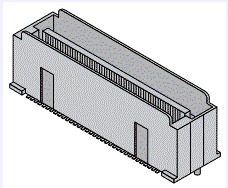
The backlight connector is always mounted on the bottom side, opposite of the LVDS FPC Connector . Not equipped as a headless variant.

Header	Pin	Signal Name	Function
	1	NC	Not connected
	2	BKLTADJ	Brightness control (0V - +5V)
	3	GND	Ground
	4	V_VCC_BKL	Backlight power +5V or +12V
	5	V_VCC_BKL	Backlight power +5V or +12V
	6	GND	Ground
	7	BKLTON	Backlight on

Backlight power +5V or +12V set by jumper JP1201 (2mm pitch);
Position 1-2 +5 volt (default) or position 2-3 +12 volt (needs supplemental power).

3.4.3 Extension Interface Digital Display and PCI-express – X13

The high speed connector provides expansion for multi-stream Display Port (DP), embedded Display Port (eDP) or DP++ (HDMI / DVI) / (LVDS) and a PCI express x1 lane slot.

Connector	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	ML_L0/TDMS_CH2+	Lane 0 / Channel 2	2	GND	Ground
	3	ML_L0/TDMS_CH2-	Lane 0 / Channel 2	4	ML_L1/TDMS_CH1+	Lane 1 / Channel 1
	5	GND	Ground	6	ML_L1/TDMS_CH1-	Lane 1 / Channel 1
	7	ML_L2/TDMS_CH0+	Lane 2 / Channel 0	8	GND	Ground
	9	ML_L2/TDMS_CH0-	Lane 2 / Channel 0	10	ML_L3/TDMS_CLK+	Lane 3 / Clock
	11	GND	Ground	12	ML_L3/TDMS_CLK+	Lane 3 / Clock
	13	CONFIG / CAD	Reserved (NC)	14	CONFIG / CEC	Reserved (NC)
	15	AUX_CH+/DDC_CLK	Auxiliary channel / DDC clock	16	GND	Ground
	17	AUX_CH-/DDC_DAT	Auxiliary channel / DDC data	18	HOTPLUG	DP hot plug signal
	19	GND_RETURN_PWR	Ground	20	V_3V3_S5	Power +3.3V S5
	21	PCIE_TX+	PCIe transmit	22	PCIE_RST#	PCIe reset
	23	PCIE_TX-	PCIe transmit	24	PCIE_RX+	PCIe receive
	25	GND	Ground	26	PCIE_RX-	PCIe receive
	27	PCIE_CLK+	PCIe clock	28	GND	Ground
	29	PCIE_CLK-	PCIe clock	30	SMB_CLK_S5	SMB clock S5 state
	31	GND	Ground	32	SMB_DAT_S5	SMB data S5 state
	33	PCIE_PRSNT#	PCIe present signal	34	PCIE_WAKE#	PCIe wake signal
	35	GND	Ground	36	GND	Ground
	37	CAN1_TX	Reserved (NC)	38	CAN2_TX	Reserved (NC)
	39	CAN1_RX	Reserved (NC)	40	CAN2_RX	Reserved (NC)

3.5 Other Connectors

Connector	Structure	Pins	Remarks
X16	Fan connector	1x3	Top, 2mm
X35	Manufacturing connector	2x7	Top, 2mm
X100	PC/104 ISA	2x32+2x20	Top, 2.54mm stack through
X101	PCI/104 PCI	4x30	Top, 2mm stack through
X105	SODIMM DDR3	204	Top, 0.6mm DDR3-1066MHz low voltage 1.35 volt socket
X106	MicroSD card		Bottom

3.6 Jumpers

3.6.1 THT Jumpers – Top

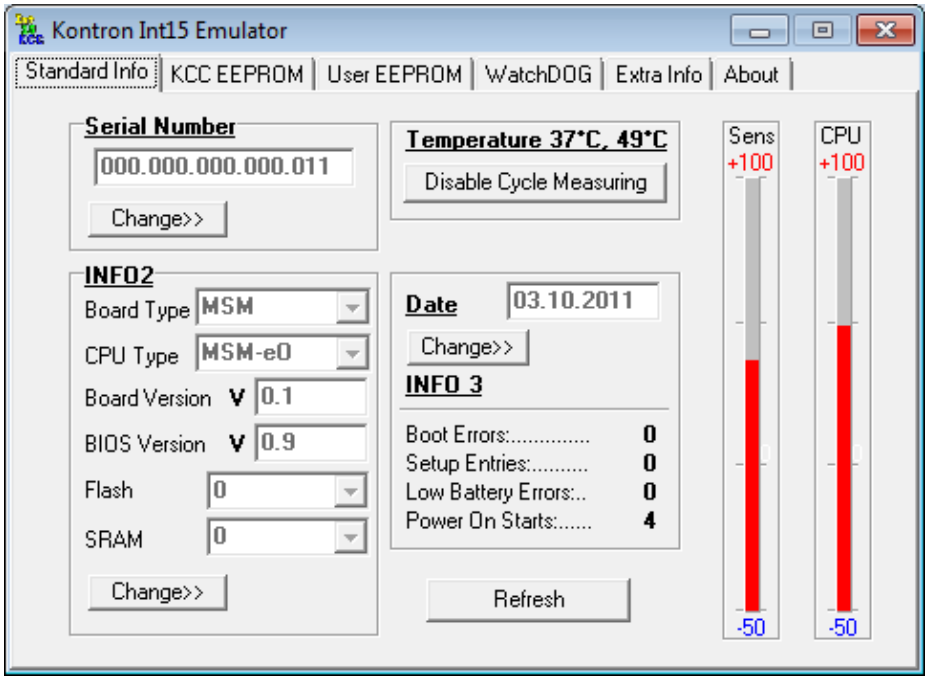
Settings written in bold are defaults!

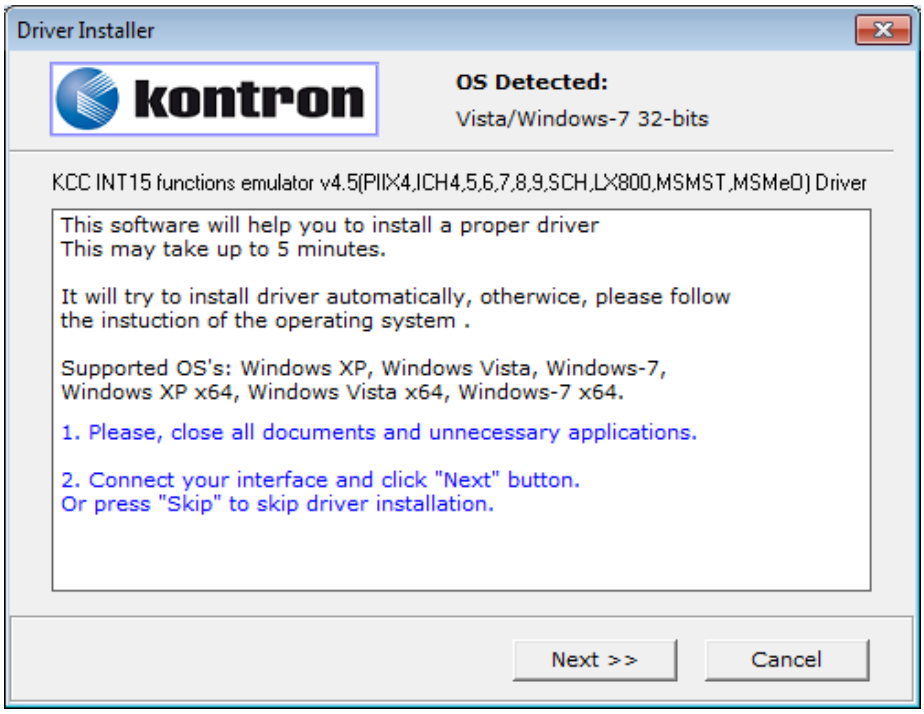
Assembly Defaults			Description		
Reference	Jumper	Position	Signal Name	Open / Position 1-2	Closed / Position 2-3
JP1201	3-way 2.0 mm	1-2	X4 Backlight power	**+5V**	+12V
JP1203	3-way 2.54 mm	1-2	X11 LVDS power	**+3.3V**	+5V
JP2401	2-way 2.0 mm	open	AUTOSTART#	**Power button start**	Auto start
JP2402	2-way 2.0 mm	open	RECOVERY#	**Normal BIOS startup**	Recovery BIOS settings

4 Special Features

4.1 INT15 Support

The INT15 SFR (Special Function Register) functions support access to an I2C EEPROM. Addresses 0h-3FFh are reserved for manufacturer's information and counters; addresses 400h-7FFh are for customer purposes.





4.2 System Controller Functions

4.2.1 MSM-e0 System Controller I/O Port Operations

- Read the system controller firmware/hardware version
- Read the state of the "AUTOSTART" and "DEFAULT" jumpers.
- GPIO-7 access
- PWM 0,1 control
- SPI Master communication interface for ADC
- Watchdog function

The base address for I/O operations of the system controller is fixed: BASEADDRESS = 0x580.

4.2.2 Register Attributes

Attribute	Description
RsvdP	RESERVED AND PRESERVED Reserved for future RW implementations. Registers are Read-only and the software must preserve the value for writes to this bit.
RW	READ-WRITE REGISTER Register bits are Read-Write and can be set or cleared by software.
RO	READ-ONLY Register bits are Read-only and cannot be altered by software.
WO	WRITE-ONLY Register bits can only be Written. Reading returns indeterminable data.

4.3 Digital I/O Ports/Operations

4.3.1 Firmware/Hardware Version

Address	Bits	Name	Type	Description
BASEADDRESS+0x00	7-0	FIRMWARE_VER	RO	System controller firmware version.
BASEADDRESS+0x01	3-0	HARDWARE_VER	RO	System controller hardware version, defined by R2432-R2435, R2422-R2425 onboard resistors.
BASEADDRESS+0x01	7-4		RsvdP	Read as "0".

4.3.2 Jumper State

Address	Bits	Name	Type	Description
BASEADDRESS+0x02	1	RECOVERY	RO	If bit 01 is "0" – "default" jumper is set. System is starting with restored default BIOS settings.
BASEADDRESS+0x02	2	AUTOSTART	RO	If bit 02 is "0" - System is in "auto-start" mode (it doesn't wait for the power button signal or any enabled start events).
BASEADDRESS+0x02	7-3, 0		RsvdP	Bit 0 – for internal use, it's not allowed to change it, bits 7-3 – read as "0".

4.3.3 GPIO Access Addresses

The board has 8 digital inputs/outputs accessible over system controller I/O port operations..

Address	Bits	Name	Type	Description
BASEADDRESS+0x04	7-0	GPIO_DIR	RW	Control of I/O direction. 1 = input, 0 –=output. Default value = 0xAA, GPIO 0, 2, 4, 6 output 1, 3, 5, 7 set to input.
BASEADDRESS+0x05	7-0	GPIO_IN	RO	GPIO input level. Read = input pin logical level. For output pins it returns the real logical level on the pin.
BASEADDRESS+0x06	7-0	GPIO_OUT	RW	GPIO control level for pins initialized as output. Read = the state of internal stored value. Write = set pin output logical level.

4.3.4 PWM 0, 1 Output Control

The board has 2 PWM (Pulse-width modulation) 8bit outputs, accessible over system controller I/O port operations. Basic clock frequency = 4MHz, PWM signal frequency = 4MHz/256 = 15625Hz. Output PWM operation is asynchronous, PWM counter is reloaded at the beginning of the PWM cycle.

Address	Bits	Name	Type	Description
BASEADDRESS+0x07	0,1	PWM_CTRL	RW	Read/Write Bit 0 – "1" = enable PWM0 output, "0" = disable PWM0 output. Read/Write Bit 1 – "1" = enable PWM1 output, "0" = disable PWM1 output. Default value = 0, both PWM channels are disabled, output = "0".
BASEADDRESS+0x07	7-2		RsvdP	Read as "0".
BASEADDRESS+0x08	7-0	PWM0_DATA	RW	Value 0-255 - PWM0 channel duty cycle.
BASEADDRESS+0x09	7-0	PWM1_DATA	RW	Value 0-255 - PWM1 channel duty cycle.

4.3.5 SPI Master to ADC Interface

The board has 4-channel 8bit ADC (Analog-Digital Converter), accessible over system controller SPI interface.

Address	Bits	Name	Type	Description
BASEADDRESS+0x0A	2	SPI_BUSY	RO	"0" = SPI interface is ready, "1" = busy.
BASEADDRESS+0x0A	7...3,1,0		RsvdP	Bits 0, 1 – for internal use, it's not allowed to change it; bits 7-3 – read as "0".
BASEADDRESS+0x0B	7...0	SPI_DATA	RW	Read: The last received data from SPI. Write: Send data to SPI.

4.3.6 Example: SPI Exchange Data

```
unsigned char SPI_exchange (unsigned char ch)
{
unsigned char cnt = 150;                //wait cycle counterinportb(BASEADDRESS+0x0B);    //IO delay
inportb(BASEADDRESS+0x0B);
outportb(BASEADDRESS+0x0B,ch); //send data, initiate SPI cycle
do
{
if((inportb(BASEADDRESS+0x0A)&0x04) == 0)return inportb(BASEADDRESS+0x0B);//return answer
} while (--cnt);
return 0;               //if there is no answer from interface – error, no communication
}
```

4.3.7 ADC I/O Control Requests/Answers

» Communication with ADC can be organized over a special SPI communication protocol.

» Every control request consists of a bytes package, with the leading (synch) byte always 0x15.

» The number of bytes in the answer is variable and depends on the request.

Control Request			Answer		
Synch	Command	Channels Mask	Synch	Argument	Value
0x15	'c' – set cyclic ADC	0 – disable measurement	-	-	-
0x15	'c' – set cyclic ADC	0x01- 0x0F - start cyclic measurement on masked channels	-	-	-
0x15	's' – set single shot	0 - disable measurement	-	-	-
0x15	's' – set single shot	0x01- 0x0F - start single measurement on masked channels	-	-	-
0x15	'r' – get ADC data	-	0x15	'D'	VS-VE where VS is the byte value of the first defined channel and VE is the byte value of the last defined channel.
0x15	'r' – get ADC data	-	0x15	'N'	ADC is not ready or not started.
0x15	'f' – ADC firmware	-	0x15	'V'	'M', 'S', 'M', 'e', '0', '_', '0', '7', 0. 8 bytes + final byte "0"

4.3.8 Watchdog Function

Address	Bits	Name	Type	Description
BASEADDRESS+0x03	7	WD_UNIT	RW	"0" = Watchdog reset time set up in seconds. "1" - watchdog reset time set up in minutes.
BASEADDRESS+0x03	6:0	WDT_CNT =0xNN (not 0 value)	RW	NN: Read - current watchdog timer value until watchdog timer is expired. Write - Enable/recharge a watchdog timer with value NN (seconds/minutes, depends on Bit 7).
BASEADDRESS+0x03	6:0	WDT_CNT = 0x00	RW	Write value 0x00 - disable watchdog function.

4.3.9 Example: Enable/Retrigger Watchdog

Assembler - Enable/retrigger watchdog:

```
mov dx, 0583h       ; Watchdog IO Port address BASE_ADDRESS +3
mov al, 02h         ; Set Watchdog Timer WDT_CNT = 2 second, WD_UNIT = 0 (seconds)
out dx, al ; outport
```

Disable watchdog:

```
mov dx, 0583h       ; Watchdog IO Port address BASE_ADDRESS +3
mov al, 00h         ; disable watchdog
out dx, al ; outport
```

In C language - Enable/retrigger watchdog:

```
outportb(0x583,0x02);       // Set Watchdog Timer WDT_CNT = 2 second, WD_UNIT = 0 (seconds)
Disable watchdog:
outportb(0x583,0x00);
```

4.3.10 Watchdog BIOS Setup

With this setting, the watchdog timer of the MSM-e0 can be enabled and the time until a reset is asserted can be selected. The watchdog timer is part of the system controller chip.

Set Watchdog timeout:

- » Disabled: The watchdog timer is disabled.
- » 1 / 5 / 15min: The watchdog timer resets the board after this amount of time.
- » **Default value:** Disabled.

Warning:	If this setting is enabled without a working watchdog reset in your program, your computer will reset after the time set in the BIOS setup.

5 Design Considerations

5.1 Board Drill-Hole Dimensions

The MSM-e0 board follows the PC/104-Plus™ specification. For more information see the PC/104-Plus™ specifications.

5.2 Thermal Management

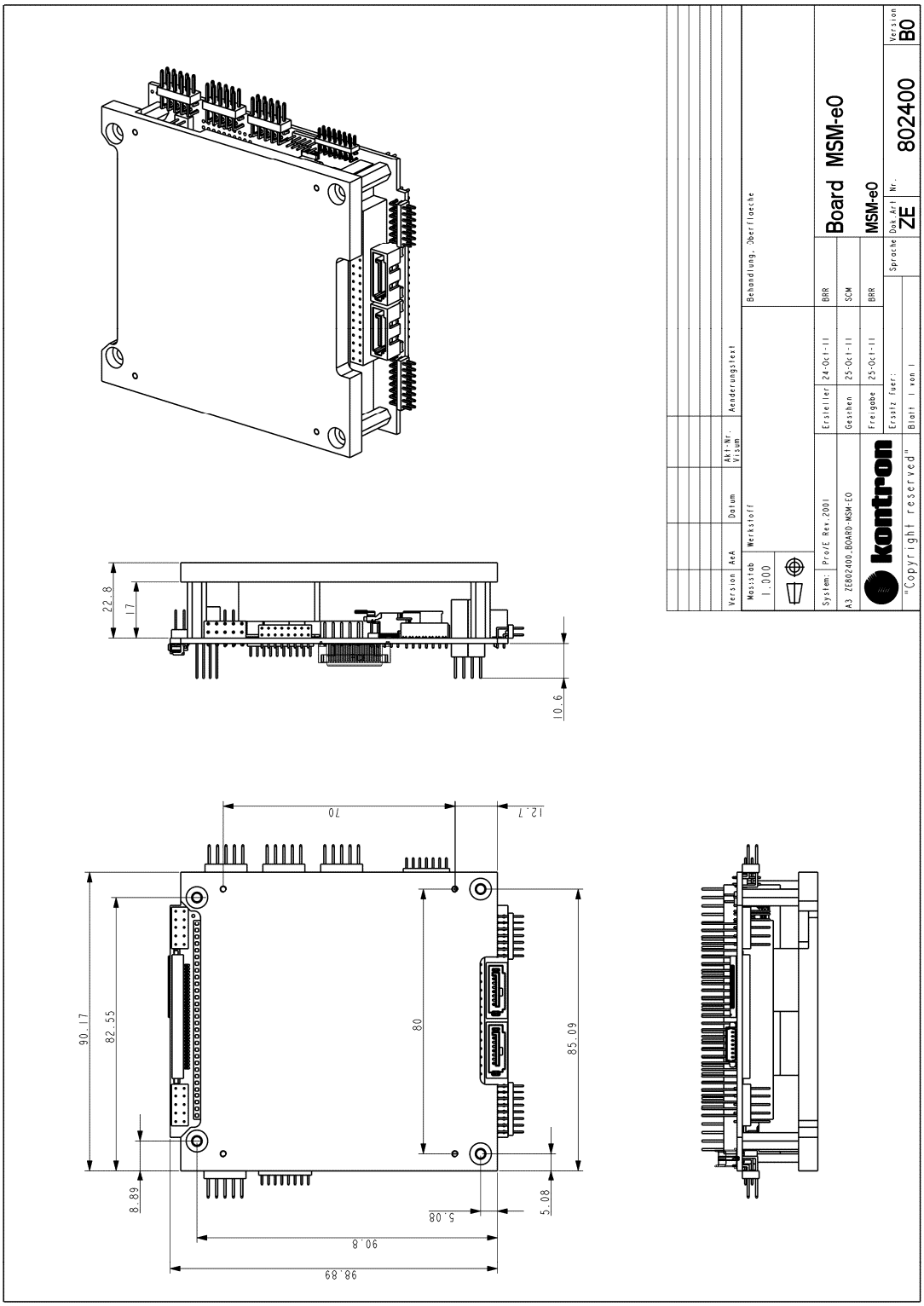
The heat spreader plate assembly is delivered by Kontron Compact Computers AG for the MSM-e0. The heat spreader plate on top of this assembly is ***not*** a heat sink. It works as a standard thermal interface to be used with a heat sink or other cooling device.

External cooling must be provided to maintain the heat spreader plate at proper operating temperatures. Under worst case conditions, the cooling mechanism must maintain an ambient air and heat spreader plate temperature of 85°C or less.

The aluminum blocks and thermal pads on the underside of the heat spreader assembly serve to provide thermal interfaces between the heat spreader plate and the major heat-generating components on the MSM-e0.

5.3 Heat Spreader Dimensions

The figures show the dimensions of the heat spreader plate mounted on the MSM-e0 board.



6 BIOS Operation

The module is equipped with the AMI Aptio® BIOS located in an onboard SPI serial flash memory. The BIOS can be updated using a flash utility.

6.1 Determining the BIOS Version

The AMI Aptio® BIOS version can be determined on the BIOS setup screen.

6.2 Setup Guide

System behavior can be modified by changing the BIOS configuration.

Note:	Selecting incorrect values may cause system boot failure. To recover, press **<F3>** to load setup default values. In cases where booting to the BIOS setup is not successful, use jumper JP2402 to boot with the recovery BIOS settings. Remove the jumper after loading the default settings or adjusting incorrect settings.

6.2.1 Start the AMI Aptio® BIOS Setup Utility

To start the AMI Aptio® BIOS setup utility, press **<DEL>** during boot-up.
Press <DEL> to enter setup.
The Main Menu then appears.

The Setup Screen is composed of several sections:

Setup Screen	Location	Function
Menu Bar	Top	Lists and selects all top level menus.
Legend Bar	Bottom right	Lists Setup navigation keys.
Item-Specific Help Window	Top right	Help for the selected item.
Menu Window	Center left	Selection fields for the current menu.

Temporary Boot Menu

By pressing the **<F7>** key at the beginning of the startup process the temporary boot menu will appear.



Menu Bar

The menu bar at the top of the window lists the different menus. Use the left/right arrow keys to make a selection.

Legend for Menu Bar

Key	Function
→ or ← Arrow key	Select Screen
↑ or ↓ Arrow key	Select Item
Enter	Select
+/-	Change Option
<F1>	General Help
<F2>	Previous Values
<F3>	Optimized Defaults
<F4>	Save and Exit
<F7>	Temporary Boot Menu
<ESC>	Exit

Selecting an Item

Use the ↑ or ↓ key to move. Use the + and – keys to select a value.

Displaying Submenus

Use the ↑ or ↓ key to move the cursor to the submenu then press **<Enter>**. The pointer (▸) marks all the submenus.

Item-Specific Help Window

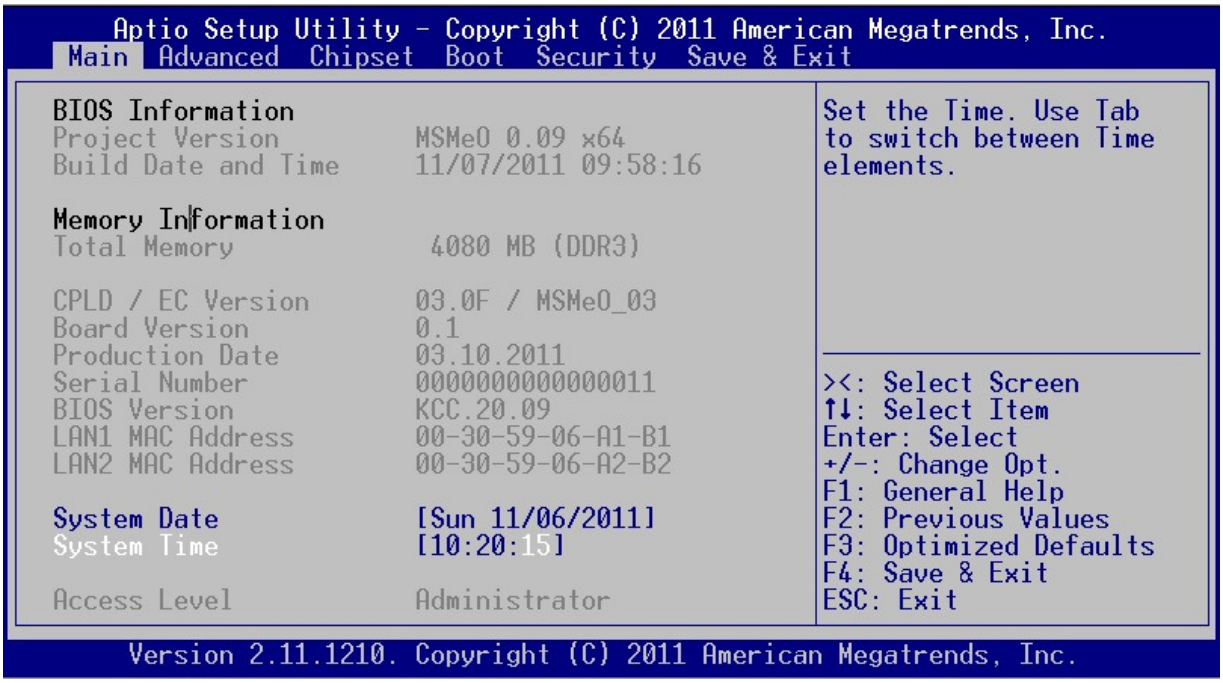
The Help window on the right side of each menu displays the Help text for the selected item.

General Help Window

Pressing **<F1>** on a menu brings up the general Help. Press **<Esc>** to exit.

6.3 BIOS Setup

6.3.1 Main Menu



6.3.2 Advanced Menu

Serial Port Console Redirection

Managing the MSM-e0/N without a Monitor

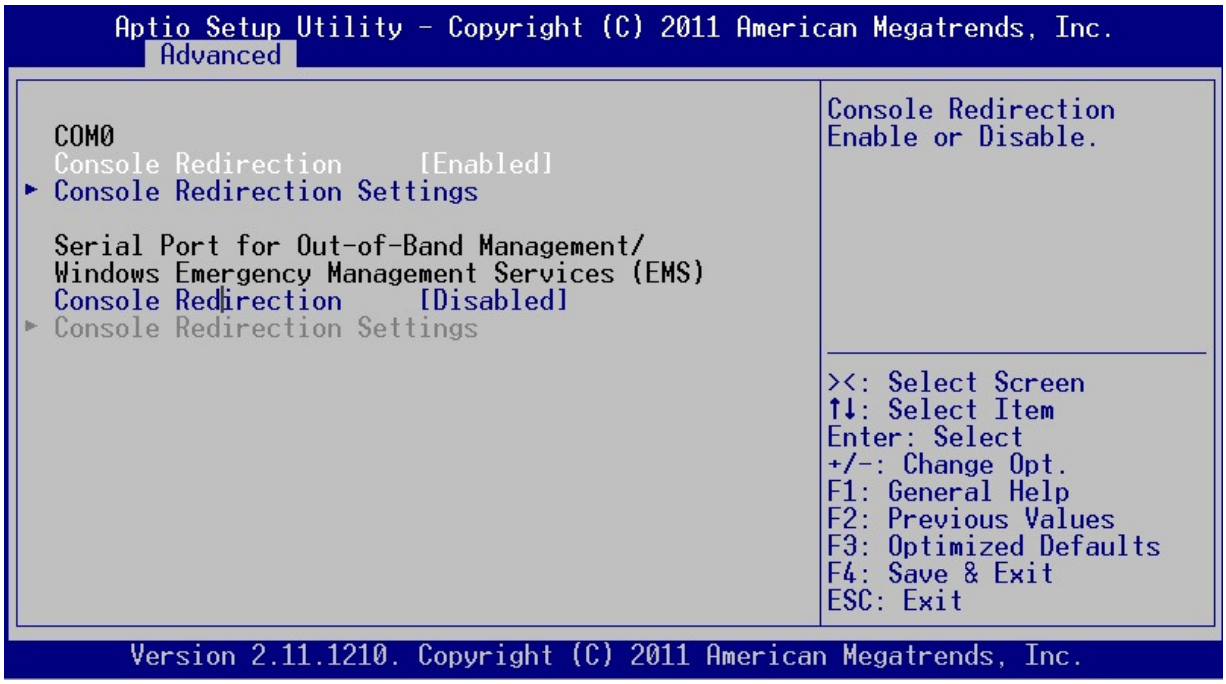
Console redirection allows a system to be maintained from a remote location by redirecting the keyboard input and text output through the serial port. Graphic output is not redirected.

Console Redirection Default configuration:

» Disabled by default on the MSM-e0 board with integrated video.

» Enabled by default on the MSM-e0-N board without video.

The following screenshot provides information about functions for specifying the configuration settings for Serial Port Console Redirection.



The COM0 port (Serial Port 0) in the BIOS corresponds to the COM1 serial port on the MSM-e0.

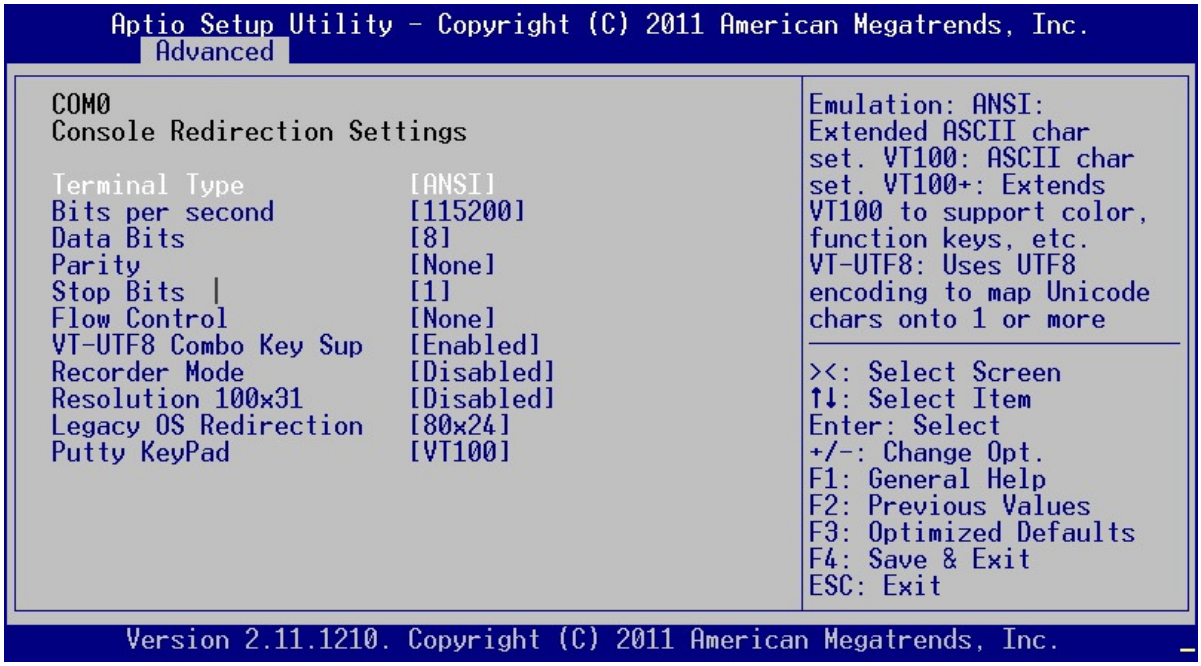
The functions of the Serial Port for Out-of-Band Management/Windows Emergency Management Services (EMS) control the presence and content of the ACPI serial port redirection table (SPCR).

This table is mainly used by the Windows server variants to provide Windows Emergency Management Services (EMS). This functionality is totally independent from the serial redirection of other console outputs.

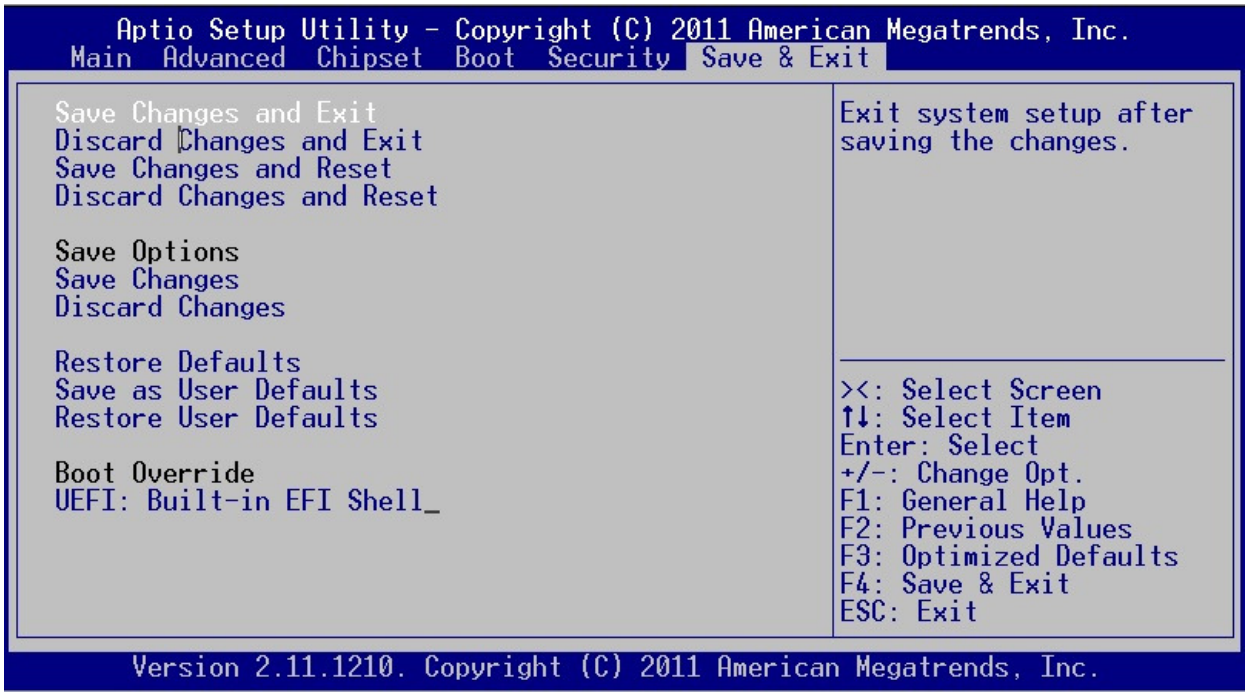
Console Redirection Settings

The following screenshot provides information about functions for specifying the Console Redirection configuration settings for Serial Port 0.

The displayed values are the default-settings.



6.3.3 Exit Menu



Feature	Description
Save Changes and Reset	Exit utility and save your changes to CMOS.
Discard Changes and Exit	Exit utility without saving setup data to CMOS.
Save Changes	Save setup data to CMOS.
Discard Changes	Load previous values from CMOS for all setup items.
Load Setup Defaults	Load default values for all setup items.

6.4 BIOS Update

Before downloading a BIOS, please check the following:

Make a bootable diskette which includes the following files:

- » afudos.exe
- » core BIOS (MSMe0xxx.ROM)
- » Rename the MSMe0xxx.ROM file to bios.rom

IMPORTANT: Do not use boot disks created in a Windows operating system. If you do not have an MSDOS 6.22 disk available, you can download a boot disk from www.bootdisk.com.

Notes:

- » Disable the EMM386 or other memory managers in the CONFIG.SYS of your boot disk.
- » Make sure that the AFUDOS.exe program and the BIOS are in the same path and directory!
- » Boot DOS without config.sys and autoexec.bat. (Press **F5** while starting the DOS boot).

Start the DOWNLOADING process:

1. Start the system using the bootable diskette.

WARNING: Always use AFUDOS.EXE with option /N to be sure that NVRAM is cleared during the BIOS update!

2. Run AFUDOS.EXE BIOS. ROM /X /B /P /N.
3. Reboot the system and press **DEL** to enter the setup mode. Set the default values by pressing **F3**.
4. "Save and exit" the setup by pressing **F4**.
5. Reboot the system.

7 Appendix A: Document Revision History

Revision	Date	Edited by	Changes
100	29.Nov.2011	WAS	Initial released version.
101	01.Dec.2011	WAS/BRM	Jumper defaults added. Eval Kit Windows version amended.
102	20.Dec.2011	WAS	Assembly diagrams enhanced. Console redirection subsection added under BIOS.

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