» Kontron User's Guide «

COMe-mBT10

Document Revision 010 - preliminary

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1 User Information

1.1 About This Document

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1.4 Standards

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

Warranty does not apply for defects arising/resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, as well as the operation outside of the product´s environmental specifications and improper installation and maintenance.

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1.6   Technical Support

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

Please consult our Website at http://www.kontron.com/support for the latest product documentation, utilities, drivers and support contacts. Consult our customer section http://emdcustomersection.kontron.com for the latest BIOS downloads, Product Change Notifications, Board Support Packages, DemoImages, 3D drawings and additional tools and software. In any case you can always contact your board supplier for technical support.

2 Introduction

2.1 Product Description

At the SPS/IPC/Drives show, Kontron unveiled the new credit card sized Computer-on-Modules based on the world's leading form factor standard COM Express®. The performance range of the new COM Express® mini modules is highly scalable and covers the entire embedded range of Intel® Atom™ Processor E3800 and Intel® Celeron® Processor N2900 and J1900 Product Families, formerly codenamed 'Bay Trail'. The most impressive feature of the new Kontron COMe-mBT10 Computer-on-Module family is the three times higher graphics performance compared to previous Intel® Atom™ processors coupled with unbeatable TDP (thermal design power) values. And although all the Intel® Atom™ processor E3800 based modules are designed for the extended temperature range from -40 to +85°C, they offer an extensive set of features, including PCIe extension options, new security functions, and optional ECC memory . The rich, powerful and flexible x86 featureset in combination with the low-power credit card-sized footprint make the new COM Express® mini Computer-on-Modules a perfect fit for an extremely wide range of new, graphic-rich multi-touch applications.

Users in all markets will benefit from double the performance, significantly improved performance-per-watt ratios and the long-term availability which the rugged new x86 modules offer. The range of applications includes everything from slim but graphics-rich and open, programmable industrial tablets and handheld PCs to in-vehicle systems and stationary HMIs and controllers. Targeted industries are POS/POI, infotainment, digital signage, gaming, and medical technology as well as industrial automation, and machine and plant engineering. With the availability of the new COM Express® mini Computer-on-Modules, developers can directly make use of the extensive x86 ecosystem and the world's leading COM Express® form factor standard.

The new Kontron COMe-mBT10 COM Express® mini Computer-on-Module family (55 mm x 84 mm) with Type 10 pin-out is equipped with Intel® Atom™ processor E3800 or Intel® Celeron® processors. Several module variants are included in the range, offering wide scalability from low-power single-core Intel® Atom™ (1.46 GHz / 5 W TDP) processor performance for energy-sensitive applications through to genuine quad-core Intel® Atom™ (4x 1.91 GHz/ 10 W TDP) and Intel® Celeron® (4x 2.42 GHz / 10 W TDP) processor performance in high-end applications). The new Intel® Gen 7 HD graphics integrated on the SoC offer up to three times more graphical power, including DirectX 11, OpenGL 3.1, and OpenCL 1.1 support for two independent displays with 1x DP++ (DP/HDMI/DVI) up to 2560×1600@60Hz and 1x Single Channel LVDS 18/24bit with DPtoLVDS up to 1920×1200 (optional eDP). New video HD technology additionally enables brilliant video reproduction and stereoscopic 3D viewing for an immersive user experience. The modules come with options for data memory: two SATA II 300 Mbps interfaces or versions with additional eMMC memory (up to 64 GB) . In addition to having two serial ports, they include a Super Fast USB 3.0 interface, up to eight USB 2.0, Gigabit Ethernet, plus three Gen 2 PCI-Express x1 lanes for customer specific expansions.

2.2   Naming clarification

COM Express® defines a Computer-On-Module, or COM, with all components necessary for a bootable host computer, packaged as a super component.

» COMe-bXX# modules are Kontron's COM Express® modules in basic form factor (125mm x 95mm)

» COMe-cXX# modules are Kontron's COM Express® modules in compact form factor (95mm x 95mm)

» COMe-mXX# modules are Kontron's COM Express® modules in mini form factor (55mm x 84mm)

The product names for Kontron COM Express® Computer-on-Modules consist of a short form of the industry standard (**COMe-**), the form factor (**b**=basic, **c**=compact, **m**=mini), the capital letters for the CPU and Chipset Codenames (**XX**) and the pin-out type (**#**) followed by the CPU Name.

2.3   Understanding COM Express® Functionality

All Kontron COM Express® basic and compact modules contain two 220pin connectors; each of it has two rows called Row A & B on primary connector and Row C & D on secondary connector. COM Express® Computer-on-modules feature the following maximum amount of interfaces according to the PICMG module Pin-out type:

Feature	Pin-Out Type 1	Pin-Out Type 10	Pin-Out Type 2	Pin-Out Type 6
HD Audio	1x	1x	1x	1x
Gbit Ethernet	1x	1x	1x	1x
Serial ATA	4x	4x	4x	4x
Parallel ATA	-	-	1x	-
PCI	-	-	1x	-
PCI Express x1	6x	6x	6x	8x
PCI Express x16 (PEG)	-	-	1x	1x
USB Client	1x	1x	-	-
USB 2.0	8x	8x	8x	8x
USB 3.0	-	2x	-	4x
VGA	1x	-	1x	1x
LVDS	Dual Channel	Single Channel	Dual Channel	Dual Channel
DP++ (SDVO/DP/HDMI/DVI)	1x optional	1x	3x shared with PEG	3x
LPC	1x	1x	1x	1x
External SMB	1x	1x	1x	1x
External I2C	1x	1x	1x	1x
GPIO	8x	8x	8x	8x
SDIO shared w/GPIO	1x optional	1x optional	-	1x optional
UART (2-wire COM)	-	2x	-	2x
FAN PWM out	-	1x	-	1x

2.4   COM Express® Documentation

This product manual serves as one of three principal references for a COM Express® design. It documents the specifications and features of COMe-mBT10. Additional references are available at your Kontron Support or at PICMG®:

» The COM Express® Specification defines the COM Express® module form factor, pin-out, and signals. This document is available at the PICMG® website by filling out the order form.

» The COM Express® Design Guide by PICMG® serves as a general guide for baseboard design, with a focus on maximum flexibility to accommodate a wide range of COM Express® modules.

> Some of the information contained within this product manual applies only to certain product revisions (CE: xxx). If certain information applies to specific product revisions (CE: xxx) it will be stated. Please check the product revision of your module to see if this information is applicable.

2.5   COM Express® Benefits

COM Express® modules are very compact, highly integrated computers. All Kontron COM Express® modules feature a standardized form factor and a standardized connector layout which carry a specified set of signals. Each COM is based on the COM Express® specification. This standardization allows designers to create a single-system baseboard that can accept present and future COM Express® modules.

The baseboard designer can optimize exactly how each of these functions implements physically. Designers can place connectors precisely where needed for the application on a baseboard designed to optimally fit a system's packaging.

A single baseboard design can use a range of COM Express® modules with different sizes and pin-outs. This flexibility can differentiate products at various price/performance points, or when designing future proof systems that have a built-in upgrade path. The modularity of a COM Express® solution also ensures against obsolescence when computer technology evolves. A properly designed COM Express® baseboard can work with several successive generations of COM Express® modules.

A COM Express® baseboard design has many advantages of a customized computer-board design and, additionally, delivers better obsolescence protection, heavily reduced engineering effort, and faster time to market.

3 Product Specification

3.1 Modules & Accessories

The COM Express® mini sized Computer-on-Module COMe-mBT10 (MVV1) follows pin-out Type 10 and is compatible to PICMG specification COM.0 Rev 2.1. The COMe-mBT10, based on Intel's Bay Trail platform, is available in different variants to cover the demand of different performance, price and power:

Industrial temperature grade modules (E2: -40°C to +85°C operating)

Part Number	Product Name	Processor	Memory	ECC	eMMC	Ethernet	SDIO	USB 2.0
34006-4016-19-4	COMe-mBTi10 E3845 4E/16GB	BayTrail-I Intel® Atom E3845	4GB	Yes	16GB MLC	Intel® i210IT	shared w/GPIO	8x
34006-2000-19-4	COMe-mBTi10 E3845 2GB	BayTrail-I Intel® Atom E3845	2GB	-	-	Intel® i210IT	shared w/GPIO	8x
34006-2000-17-2	COMe-mBTi10 E3827 2GB	BayTrail-I Intel® Atom E3827	2GB	-	-	Intel® i210IT	shared w/GPIO	8x
34006-1040-17-2	COMe-mBTi10 E3827 1E/4S	BayTrail-I Intel® Atom E3827	1GB	Yes	4GB SLC	Intel® i210IT	shared w/GPIO	8x
34006-2000-15-2	COMe-mBTi10 E3826 2GB	BayTrail-I Intel® Atom E3826	2GB	-	-	Intel® i210IT	shared w/GPIO	8x
34006-2000-13-2	COMe-mBTi10 E3825 2GB	BayTrail-I Intel® Atom E3825	2GB	-	-	Intel® i210IT	shared w/GPIO	8x
34006-1000-15-1	COMe-mBTi10 E3815 1GB	BayTrail-I Intel® Atom E3815	1GB	-	-	Intel® i210IT	shared w/GPIO	8x

Commercial temperature grade modules (0°C to +60°C operating)

Part Number	Product Name	Processor	Memory	ECC	eMMC	Ethernet	SDIO	USB 2.0
34007-4000-20-4	COMe-mBTc10 J1900 4GB	BayTrail-D Intel® Celeron J1900	4GB	n/a	n/a	Intel® i211AT	n/a	4x
34007-2000-19-4	COMe-mBTc10 N2920 2GB	BayTrail-M Intel® Celeron N2920	2GB	n/a	n/a	Intel® i211AT	n/a	4x

Memory configurations:

- » MM = 10: 1024MB DDR3L Memory (8x1Gbit / 128Mx8)
- » MM = 20: 2048MB DDR3L Memory (8x2Gbit / 256Mx8)
- » MM = 40: 4096MB DDR3L Memory (8x4Gbit / 512Mx8)
- » MM = 80: 8192MB DDR3L Memory (8x8Gbit / 1024Mx8)

Onboard Flash configurations, COMe-mBTi10 only

- » FF = 00: without eMMC Flash
- » FF = 20: 2GB onboard eMMC Flash
- » FF = 40: 4GB onboard eMMC Flash
- » FF = 80: 8GB onboard eMMC Flash
- » FF = 16: 16GB onboard eMMC Flash
- » FF = 32: 32GB onboard eMMC Flash
- » FF = 64: 64GB onboard eMMC Flash

Optional hardware features COMe-mBTi10:

» TPM

» ECC memory

» eMMC Flash

» eDP on COMe

Optional hardware features COMe-mBTc10:

» TPM

» eDP on COMe

» USB Hub for USB #4-7 support on COMe

Optional BIOS/Software features:

» AES-NI Support

» FSP with Coreboot

> Optional hardware and BIOS features are available project based only for variants not listed above. Please contact your local sales for customized articles.

Accessories

Product Number	Carrier Boards
34101-0000-00-1	COM Express® Eval Carrier Type 10
34104-0000-00-0	COM Express® Reference Carrier-i Type 10

Product Number	Cooling & Mounting
34006-0000-99-0	HSP COMe-mBT10 thread (11mm)
34006-0000-99-1	HSP COMe-mBT10 through (11mm)
34006-0000-99-2	HSP COMe-mBT10 slim thread (6.5mm)
34006-0000-99-3	HSP COMe-mBT10 slim through (6.5mm)
34099-0000-99-0	COMe mini Active Uni Cooler (for CPUs up to 10W)
34099-0000-99-1	COMe mini Passive Uni Cooler (for CPUs up to 5W)
34099-0000-99-2	COMe mini Passive Uni Cooler Slim (for CPUs up to 3-5W)
34017-0000-00-0	COMe mMount Kit 5/8mm 1set

Product Number	Adapter & Cables
96007-0000-00-8	ATA-Type10-Mezzanine (for Evaluation Carrier)
9-5000-0352	ADA-LVDS-DVI 18bit (LVDS to DVI converter)
9-5000-0353	ADA-LVDS-DVI 24bit (LVDS to DVI converter)
96006-0000-00-8	ADA-DP-LVDS (DP to LVDS adapter)
96082-0000-00-0	KAB-ADAPT-DP-DVI (DP to DVI adapter cable)
96083-0000-00-0	KAB-ADAPT-DP-VGA (DP to VGA adapter cable)
96084-0000-00-0	KAB-ADAPT-DP-HDMI (DP to HDMI adapter cable)
96007-0000-00-8	ADA-Type10-Mezzanine
96006-0000-00-1	COMe POST T10
38019-0000-00-1	ADA-COMe-Height-single (Height adapter)

3.2   Functional Specification

Processor

The 32nm Intel® ATOM™ / Celeron® (BayTrail-I/M/D SOC (Valleyview)) CPU family supports:

- » Intel® 64
- » Enhanced Intel SpeedStep® Technology
- » Thermal Monitoring Technologies
- » Execute Disable Bit
- » Virtualization Technology VT-x
- » 2 Display Pipes for dual independent displays

CPU specifications

Intel®	Atom™	Atom™	Atom™	Atom™	Atom™	Celeron®	Celeron®
-	E3845	E3827	E3826	E3825	E3815	J1900	N2920
# of Cores	4	2	2	2	1	4	4
# of Threads	4	2	2	2	1	4	4
CPU Nominal frequency	**1.91GHz**	**1.75GHz**	**1.46GHz**	**1.33GHz**	**1.46GHz**	**2.00GHz**	**1.86GHz**
CPU Burst frequency	-	-	-	-	-	2.42GHz	2.00GHz
LFM/LPM Frequency	800MHz	800MHz	800MHz	800MHz	800MHz	-	800MHz
Tjunction	-40 to 110°C	-40 to 110°C	-40 to 110°C	-40 to 110°C	-40 to 110°C	0 to 105°C	0 to 105°C
Thermal Design Power (TDP)	10W	8W	7W	6W	5W	10W	7.5W
SDP	-	-	-	-	-	-	4.5W
Smart Cache	2x1MB	2x512kB	2x512kB	2x512kB	512kB	2x1MB	2x1MB
Memory Type	DDR3L-1333	DDR3L-1333	DDR3L-1066	DDR3L-1066	DDR3L-1066	DDR3L-1333	DDR3L-1066
Max Memory Size	8GB	8GB	8GB	8GB	8GB	8GB	8GB
ECC Memory(optional)	Yes	Yes	Yes	Yes	Yes	No	No
Graphics Model	Intel HD®	Intel HD®	Intel HD®	Intel HD®	Intel HD®	Intel HD®	Intel HD®
GFX Base Frequency	542MHz	542MHz	533MHz	533MHz	400MHz	688MHz	311MHz
GFX Max Dynamic Frequ.	792MHz	792MHz	667MHz	-	-	854MHz	844MHz
GFX Technology	GT1 4EU	GT1 4EU	GT1 4EU	GT1 4EU	GT1 4EU	GT1 4EU	GT1 4EU
AEC Q100 automtovie Qual.	Yes	Yes	Yes	Yes	Yes	No	No
SDIO	Yes	Yes	Yes	Yes	Yes	No	No
eMMC	Yes	Yes	Yes	Yes	Yes	No	No
AES-NI (optional)	Yes	Yes	Yes	Yes	Yes	No	No

Memory

Sockets	memory down
Memory Type	LPDDR3-1066/1333
Maximum Size	1 - 8GB (ECC optional)
Technology	Single Channel (64bit)

Graphics Core

The integrated Intel® HD Graphics (Gen 7) supports:

Graphics Core Render Clock	311-542MHz Clock, 667-854MHz Turbo,
Execution Units / Pixel Pipelines	4
Max Graphics Memory	tbd
GFX Memory Bandwidth (GB/s)	tbd
GFX Memory Technology	DVMT
API (DirectX/OpenGL)	11 / 3.0 + OCL 1.1
Shader Model	3.0
Hardware accelerated Video	H.264 / MPEG1,2,4 / VC1 / WMV9 / Blu-ray
Independent/Simultaneous Displays	2
Display Port	DP 1.1a / eDP 1.3
HDCP support	HDCP / PAVP 2

Monitor output

CRT max Resolution	-
TV out:	-

LVDS

LVDS Bits/Pixel	1x18 / 1x24 with DP2LVDS
LVDS Bits/Pixel with dithering	-
LVDS max Resolution:	1920x1200
PWM Backlight Control:	YES
Supported Panel Data:	EDID/DID

Display Interfaces

Discrete Graphics	-
Digital Display Interface DDI1	DP++
Digital Display Interface DDI2	-
Digital Display Interface DDI3	-
Maximum Resolution on DDI	2560x1600@60Hz

Storage

onboard SSD	2-64GB eMMC
SD Card support	1x SDIO 3.0 shared with GPIO(COMe-mBTi10 only)
IDE Interface	-
Serial-ATA	2x SATA 3Gb/s
SATA AHCI	AHCI
SATA RAID	-

Connectivity

USB	up to 8x USB 2.0
USB Client	-
PCI	-
PCI External Masters	-
PCI Express	3x PCIe x1 Gen2
Max PCI Express	4x PCIe x1 without LAN
PCI Express x2/x4 configuration	YES
Ethernet	10/100/1000 Mbit
Ethernet controller	Intel® i210IT / i211AT

Ethernet

The Intel® i210IT / i211AT ethernet supports:

» Jumbo Frames

» Time Sync Protocol Indicator

» WOL (Wake On LAN)

» PXE (Preboot eXecution Environment)

Misc Interfaces and Features

Audio	HD Audio
Onboard Hardware Monitor	Nuvoton NCT7802Y
Trusted Platform Module	Atmel AT97SC3204 optional
Miscellaneous	2x UART / PWM FAN

Kontron Features

External I2C Bus	Fast I2C, MultiMaster capable
M.A.R.S. support	YES
Embedded API	PICMG EAPI / KEAPI3
Custom BIOS Settings / Flash Backup	YES
Watchdog support	Dual Staged

Additional features

» All solid capacitors (POSCAP). No tantalum capacitors used.

» Optimized RTC Battery monitoring to secure highest longevity

» Real fast I2C with transfer rates up to 40kB/s.

» Discharge logic on all onboard voltages for highest reliability

Power Features

Singly Supply Support	YES
Supply Voltage	4.75 - 20V
ACPI	ACPI 3.0
S-States	S0, S3, S4, S5
S5 Eco Mode	YES
Misc Power Management	DPST 4.0, iFFS

Power Consumption and Performance

Full Load Power Consumption	tbd
Kontron Performance Index	tbd
Kontron Performance/Watt	tbd

Detailed Power Consumption measurements in all states and bechmarks for CPU, Graphics and Memory performance are available in Application Note KEMAP054 at EMD Customer Section.
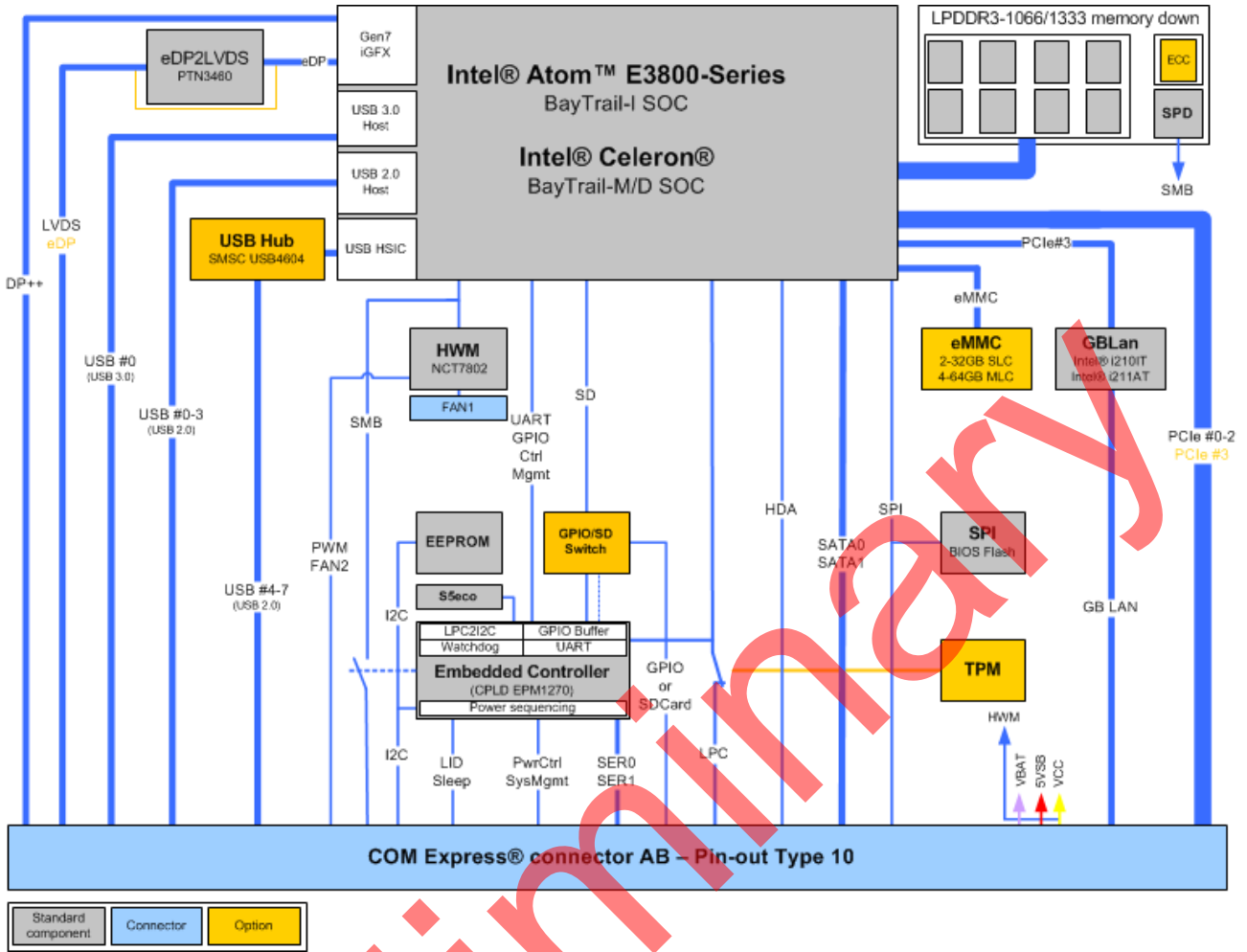
Supported Operating Systems

The COMe-mBT10 supports:

» Microsoft Windows 8 32bit/64bit

» Microsoft Windows Embedded Standard 8 (WES8)

» Microsoft Windows 7 32bit/64bit

» Microsoft Windows Embedded Standard 7 (WES7)

» Microsoft Windows Embedded Compact 7 (WEC7)

» Linux

» Android

» WindRiver VxWorks 6.9 32bit/64bit

3.3   Block Diagram

3.4 Electrical Specification

3.4.1 Supply Voltage

Following supply voltage is specified at the COM Express® connector:

VCC:	4.75 - 20V
Standby:	5V DC +/- 5%
RTC:	2.5V - 3.3V

> - 5V Standby voltage is not mandatory for operation.
>
> - Extended Temperature (E1) variants are validated for 12V supply only

3.4.2 Power Supply Rise Time

» The input voltages shall rise from ≤10% of nominal to within the regulation ranges within 0.1ms to 20ms.

» There must be a smooth and continuous ramp of each DC input voltage from 10% to 90% of its final set-point following the ATX specification

3.4.3 Supply Voltage Ripple

» Maximum 100 mV peak to peak 0 – 20 MHz

3.4.4 Power Consumption

The maximum Power Consumption of the different COMe-mBT10 variants is tbd (100% CPU load on all cores; 90°C CPU temperature). Further information with detailed measurements are available in Application Note KEMAP054 available on EMD Customer Section. Information there is available after registration.

3.4.5 ATX Mode

By connecting an ATX power supply with VCC and 5VSB, PWR_OK is set to low level and VCC is off. Press the Power Button to enable the ATX PSU setting PWR_OK to high level and powering on VCC. The ATX PSU is controlled by the PS_ON# signal which is generated by SUS_S3# via inversion. VCC can be 4.75 - 20V in ATX Mode. On Computer-on-Modules supporting a wide range input down to 4.75V the input voltage shall always be higher than 5V Standby (VCC > 5VSB).

State	PWRBTN#	PWR_OK	V5_StdBy	PS_ON#	VCC
G3	x	x	0V	x	0V
S5	high	low	5V	high	0V
S5 → S0	PWRBTN Event	low → high	5V	high → low	0 V→ VCC
S0	high	high	5V	low	VCC

3.4.6 Single Supply Mode

In single supply mode (or automatic power on after power loss) without 5V Standby the module will start automatically when VCC power is connected and Power Good input is open or at high level (internal PU to 3.3V). PS_ON# is not used in this mode and VCC can be 4.75 - 20V.

To power on the module from S5 state press the power button or reconnect VCC. Suspend/Standby States are not supported in Single Supply Mode.

State	PWRBTN#	PWR_OK	V5_StdBy	VCC
G3	x	x	x	0
G3 → S0	high	open / high	x	connecting VCC
S5	high	open / high	x	VCC
S5 → S0	PWRBTN Event	open / high	x	reconnecting VCC

> **note**
>
> Signals marked with "x" are not important for the specific power state. There is no difference if connected or open.
>
> All ground pins have to be tied to the ground plane of the carrier board.

3.5 Power Control

Power Supply

The COMe-mBT10 supports a power input from 4.75 - 20V. The supply voltage is applied through the VCC pins (VCC) of the module connector.

Power Button (PWRBTN#)

The power button (Pin B12) is available through the module connector described in the pinout list. To start the module via Power Button the PWRBTN# signal must be at least 50ms (50ms ≤ t < 4s, typical 400ms) at low level (Power Button Event).

Pressing the power button for at least 4seconds will turn off power to the module (Power Button Override).

Power Good (PWR_OK)

The COMe-mBT10 provides an external input for a power-good signal (Pin B24). The implementation of this subsystem complies with the COM Express® Specification. PWR_OK is internally pulled up to 3.3V and must be high level to power on the module.

Reset Button (SYS_RESET#)

The reset button (Pin B49) is available through the module connector described in the pinout list. The module will stay in reset as long as SYS_RESET# is grounded. If available, the BIOS setting for "Reset Behavior" must be set to "Power Cycle".

> **note**
> Modules with Intel® Chipset and active Management Engine do not allow to hold the module in Reset out of S0 for a long time. At about 10s holding the reset button the ME will reboot the module automatically

SM-Bus Alert (SMB_ALERT#)

With an external battery manager present and SMB_ALERT# (Pin B15) connected the module always powers on even if BIOS switch "After Power Fail" is set to "Stay Off".

3.6   Environmental Specification

3.6.1   Temperature Specification

General Specification for COMs	Operating	Non-operating	Validated Input Voltage
Commercial grade	0°C to +60°C	-30°C to +85°C	VCC: 4.75 - 20V
Extended Temperature (E1)	-25°C to +75°C	-30°C to +85°C	VCC: 12V
Industrial grade by **Screening** (XT)	-40°C to +85°C	-40°C to +85°C	VCC: 12V
Industrial grade by **Design** (E2)	-40°C to +85°C	-40°C to +85°C	VCC: 4.75 - 20V

> **note** Please see chapter Product Specification for available variants

Operating with Kontron heatspreader plate assembly

The operating temperature defines two requirements:

» the maximum ambient temperature with ambient being the air surrounding the module.

» the maximum measurable temperature on any spot on the heatspreader's surface

Test specification:

Temperature Grade	Validation requirements
Commercial grade	at 60°C HSP temperature the CPU @ 100% load needs to run at nominal frequency
Extended Temperature (E1)	at 75°C HSP temperature the CPU @ 75% load is allowed to start speedstepping for thermal protection
Industrial grade by **Screening** (XT)	at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection
Industrial grade by **Design** (E2)	at 85°C HSP temperature the CPU @ 50% load is allowed to start throttling for thermal protection

Operating without Kontron heatspreader plate assembly

The operating temperature is the maximum measurable temperature on any spot on the module's surface.

3.6.2   Humidity

» 93% relative Humidity at 40°C, non-condensing (according to IEC 60068-2-78)

3.7　Standards and Certifications

RoHS II

The **COMe-mBT10** is compliant to the directive 2011/65/EU on the Restriction of the use of certain Hazardous Substances (RoHS II) in electrical and electronic equipment

Component Recognition UL 60950-1

The **COM Express® mini** form factor Computer-on-Modules are Recognized by Underwriters Laboratories Inc. Representative samples of this component have been evaluated by UL and meet applicable UL requirements.

UL Listings:

» NWGQ2.E304278

» NWGQ8.E304278

WEEE Directive

WEEE Directive 2002/96/EC is not applicable for Computer-on-Modules.

Conformal Coating

Conformal Coating is available for Kontron Computer-on-Modules and for validated SO-DIMM memory modules. Please contact your local sales or support for further details.

Shock & Vibration

The **COM Express® mini** form factor Computer-on-Modules successfully passed shock and vibration tests according to

» IEC/EN 60068-2-6 (Non operating Vibration, sinusoidal, 10Hz-4000Hz, +/-0.15mm, 2g)

» IEC/EN 60068-2-27 (Non operating Shock Test, half-sinusoidal, 11ms, 15g)

EMC

Validated in Kontron reference housing for EMC the **COMe-mBT10** follows the requirements for electromagnetic compatibility standards

» EN55022

3.8   MTBF

The following MTBF (Mean Time Before Failure) values were calculated using a combination of manufacturer's test data, if the data was available, and the Telcordia (Bellcore) issue 2 calculation for the remaining parts.

The calculation method used is "Telcordia Method 1 Case 3" in a ground benign, controlled environment (GB,GC). This particular method takes into account varying temperature and stress data and the system is assumed to have not been burned in.

Other environmental stresses (extreme altitude, vibration, salt water exposure, etc) lower MTBF values.

System MTBF (hours): tbd

> Fans usually shipped with Kontron Europe GmbH products have 50,000-hour typical operating life. The above estimates assume no fan, but a passive heat sinking arrangement Estimated RTC battery life (as opposed to battery failures) is not accounted for in the above figures and need to be considered separately. Battery life depends on both temperature and operating conditions. When the Kontron unit has external power; the only battery drain is from leakage paths.
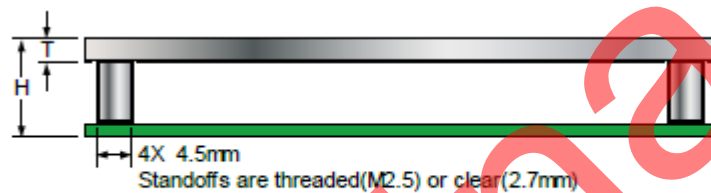
3.9   Mechanical Specification

Module Dimension

» 55mm x 84mm (±0.2mm)

» Height approx. 3.5mm (withouth printed circuit board)

> CAD drawings are available at EMD CustomerSection

Height

The COM Express® specification defines a module height of 13mm from bottom to heatspreader top:

4X 4.5mm
Standoffs are threaded(M2.5) or clear(2.7mm).

Thickness 'T' is implemantation specific and may be 3mm.
Height 'H' (which includes PCB thickness) shall be 13.00mm

Kontron provides standard HSP for the specified height of 13mm and slim-line Heatspreader for a reduced height of 8.5mm for mini sized Computer-on-Modules. Universal Cooling solutions to be mounted on the HSP are 14.3mm (34099-0000-00-0/1) or 8mm (34099-0000-00-2) in height. This allows combinations of a total module height of 8.5mm or 13mm with the Heatspreader and between 16.5mm and 27.3mm with a cooling solution.

3.10   Module Dimensions
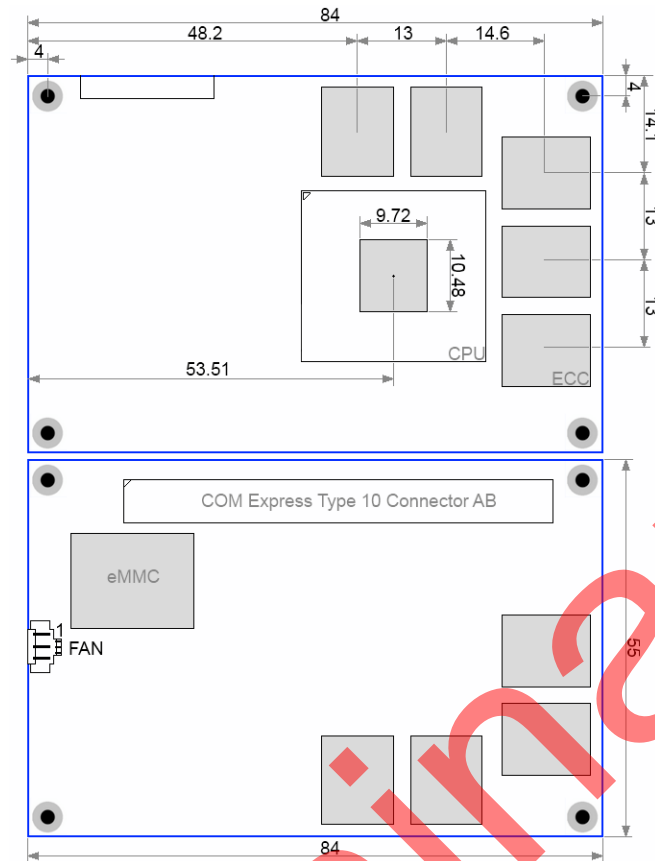
> All dimensions in mm

3.11   Onboard Fan Connector

Specification

» Part number (Molex) J3: 53261-0371

» Mates with: 51021-0300

» Crimp terminals: 50079-8100

Pin assignment

» Pin1: Tacho, Pin2: VCC, Pin3: GND

Electrical characteristic

Module Input Voltage	4.75 - 13V	>13
FAN Output Voltage	4.75 - 13V	13V
Max. FAN Output Current	350mA	150mA

3.12 Thermal Management, Heatspreader and Cooling Solutions

A heatspreader plate assembly is available from Kontron Europe GmbH for the COMe-mBT10. The heatspreader plate on top of this assembly is NOT a heat sink. It works as a COM Express®-standard thermal interface to use with a heat sink or external cooling devices.

External cooling must be provided to maintain the heatspreader plate at proper operating temperatures. Under worst-case conditions, the cooling mechanism must maintain an ambient air and heatspreader plate temperature on any spot of the heatspreader's surface according the module specifications:

» 60°C for commercial grade modules

» 75°C for extended temperature grade modules (E1)

» 85°C for industrial temperature grade modules (E2/XT)

The aluminum slugs and thermal pads or the heat-pipe on the underside of the heatspreader assembly implement thermal interfaces between the heatspreader plate and the major heat-generating components on the COMe-mBT10. About 80 percent of the power dissipated within the module is conducted to the heatspreader plate and can be removed by the cooling solution.

You can use many thermal-management solutions with the heatspreader plates, including active and passive approaches. The optimum cooling solution varies, depending on the COM Express® application and environmental conditions. Active or passive cooling solutions provided from Kontron Europe GmbH for the COMe-mBT10 are usually designed to cover the power and thermal dissipation for a commercial grade temperature range used in a housing with proper air flow.

Documentation and CAD drawings of COMe-mBT10 heatspreader and cooling solutions are provided at
http://emdcustomersection.kontron.com.

4   Features and Interfaces

4.1   Onboard eMMC Flash

The COMe-mBT10 features a 14x18mm onboard Micron NAND Flash drive with capacities of 2-64GB eMMC. The Flash drive includes a Phison PS8200 micro controller and supports:

» JEDEC/MMC standard version 4.41 compliant

» class 0 (basic); class 2 (block, read); class 4 (block write); class 5 (erase); class 6 (write protect); class 7 (lock card)

» MMCplus™ and MMCmobile™ protocols

» 52 MHz clock speed (MAX)

» Boot operation (high-speed boot)

» Sleep mode

» Replay-protected memory block (RPMB)

» Secure erase and trim

» Permanent and power-on write protection

» Double data rate (DDR) function

» Wear Leveling, ECC and block management

» -40°C to +85°C indutrial temperature range

» Multi-Level-Cell (MLC) technology

» Single-Level-Cell (SLC) technology optional by firmware re-configuration during COMe-mBT10 manufacturing

Flash Part No.	MTFC4GMVEA-4M IT	MTFC8GLVEA-4M IT	MTFC16GJVEC-4M IT	MTFC32GJVED-4M IT	MTFC64GJVDN-4M IT
Nominal Flash Size MLC	4GByte	8GByte	16GByte	32GByte	64GByte
Nominal Flash Size SLC	2GByte	4GByte	8GByte	16GByte	32GByte
Sequential MLC read speed	44 MB/s	44 MB/s	44 MB/s	44 MB/s	44 MB/s
Sequential MLC write speed	13.5 MB/s	13.5 MB/s	20 MB/s	20MB/s	20 MB/s
I/O Performance read/write	1100 / 100 IOPS	1100 / 100 IOPS	1100 / 100 IOPS	1100 / 100 IOPS	1100 / 100 IOPS
Endurance (# of P/E cycles)	MLC: 3k SLC: 60k	MLC: 3k SLC: 60k	MLC: 3k SLC: 60k	MLC: 3k SLC: 60k	MLC: 3k SLC: 60k

Notes:

» Random access of 4KB chunk, sequential read access of 1MB chunk

» Data based on Datasheet Micron eMMC Rev.B from 2/2012

» ~10% of the nominal flash size are reserved for Firmware and Block Management

4.2   Secure Digital Card

The COMe-mBT10 supports an SDIO Interface to be used for micro/mini/standard SD Card sockets. Following SD Cards are validated from Kontron and recommended for use:

swissbit® S-200U & S-300U Series Industrial microSD Card

» compliant to SD Card specification 2.0

» Wear Leveling of static and dynamic data

» High reliability (MTBF >3,000,000 hours, > 10,000 insertions)

» Extended or Industrial Temperature range

» up to 25MB/s data transfer speed

Delkin Devices Inc. MicroSD

» compliant to SD Card specification 2.0

» Wear Leveling and ECC

» High reliability (MTBF >2,000,000 hours, > 2,000,000 write/erase cycles)

» Industrial Temperature range

» up to 17MB/s data transfer speed

Order information

Density	Manufacturerer & Part.No.	Temperature range	mSD-SD Adapter
1GB SD1.1	swissbit SFSD1024N1BN1T0-I-DF-151-STD	-40°C to 85°C	No
2GB SD1.1	swissbit SFSD2048N1BW1MT-E-ME-111-STD	-25°C to 85°C	No
2GB SD1.1	Delkin SD02GHMSH-S2047-B	-40°C to 85°C	No
2GB SDHC	Delkin SD02GHMSH-S2000-B	-40°C to 85°C	Yes
4GB SDHC	swissbit SFSD4096N1BW1MT-E-DF-111-STD	-25°C to 85°C	No
4GB SDHC	Delkin SD04GHMSH-S2647-B	-40°C to 85°C	No
4GB SDHC	Delkin SD04GHMSH-S2600-B	-40°C to 85°C	Yes
8GB SDHC	Delkin SD08GHMSH-S2647-B	-40°C to 85°C	No
8GB SDHC	Delkin SD08GHMSH-S2600-B	-40°C to 85°C	Yes

4.3   S5 Eco Mode

Kontron's new high-efficient power-off state S5 Eco enables lowest power-consumption in soft-off state – less than 1 mA compared to the regular S5 state this means a reduction by at least factor 200!

In the "normal" S5 mode the board is supplied by 5V_Stb and needs usually up to 300mA just to stay off. This mode allows to be switched on by power button, RTC event and WakeOnLan, even when it is not necessary. The new S5 Eco mode reduces the current enormous.

The S5 Eco Mode can be enabled in BIOS Setup, when the BIOS supports this feature.

Following prerequisites and consequences occur when S5 Eco Mode is enabled

> » The power button must be pressed at least for 200ms to switch on.

> » Wake via Power button only.

> » "Power On After Power Fail"/"State after G3": only "stay off" is possible

4.4　LPC

The Low Pin Count (LPC) Interface signals are connected to the LPC Bus bridge located in the CPU or chipset. The LPC low speed interface can be used for peripheral circuits such as an external Super I/O Controller, which typically combines legacy-device support into a single IC. The implementation of this subsystem complies with the COM Express® Specification. Implementation information is provided in the COM Express® Design Guide maintained by PICMG. Please refer to the official PICMG documentation for additional information.

The LPC bus does not support DMA (Direct Memory Access) and a clock buffer is required when more than one device is used on LPC. This leads to limitations for ISA bus and SIO (standard I/O´s like Floppy or LPT interfaces) implementations.

All Kontron COM Express® Computer-on-Modules imply BIOS support for following external baseboard LPC Super I/O controller features for the **Winbond/Nuvoton 5V 83627HF/G and 3.3V 83627DHG-P**:

83627HF/G	Phoenix BIOS	AMI CORE8	AMI / Phoenix EFI
PS/2	YES	YES	YES
COM1/COM2	YES	YES	YES
LPT	YES	YES	YES
HWM	YES	YES	NO
Floppy	NO	NO	NO
GPIO	NO	NO	NO
83627DHG-P	**Phoenix BIOS**	**AMI CORE8**	**AMI / Phoenix EFI**
PS/2	YES	YES	YES
COM1/COM2	YES	YES	YES
LPT	YES	YES	YES
HWM	NO	NO	NO
Floppy	NO	NO	NO
GPIO	NO	NO	NO

 Features marked as not supported do not exclude OS support (e.g. HWM can be accessed via SMB). For any other LPC Super I/O additional BIOS implementations are necessary. Please contact your local sales or support for further details.

4.5   Serial Peripheral Interface (SPI)

The Serial Peripheral Interface Bus or SPI bus is a synchronous serial data link standard named by Motorola that operates in full duplex mode. Devices communicate in master/slave mode where the master device initiates the data frame. Multiple slave devices are allowed with individual slave select (chip select) lines. Sometimes SPI is called a "four wire" serial bus, contrasting with three, two, and one wire serial buses.

> The SPI interface can only be used with a SPI flash device to boot from external BIOS on the baseboard.

4.6   SPI boot

The COMe-mBT10 supports boot from an external SPI Flash. It can be configured by pin A34 (BIOS_DIS#0) and pin B88 (BIOS_DIS1#) in following configuration:

BIOS_DIS0#	BIOS_DIS1#	Function
open	open	Boot on-module BIOS
GND	open	Boot baseboard LPC FWH
open	GND	Baseboard SPI = Boot Device 1, on-module SPI = Boot Device 2
GND	GND	Baseboard SPI = Boot Device 2, on-module SPI = Boot Device 1

> By default only SPI Boot Device 1 is used in configuration 3 & 4. Both SPI Boot Devices are used by splitting the BIOS with modified descriptor table in customized versions only

Using an external SPI flash

To program an external SPI flash follow these steps:

» Connect a SPI flash with correct size (similar to BIOS ROM file size) to the module SPI interface

» Open pin A34 and B88 to boot from the module BIOS

» Boot the module to DOS with access to the BIOS image and Firmware Update Utility provided on EMD Customer Section

» Connect pin B88 (BIOS_DIS1#) to ground to enable the external SPI flash

» Execute Flash.bat to flash the complete BIOS image to the external SPI flash

» reboot

Your module will now boot from the external SPI flash when BIOS_DIS1# is grounded.

External SPI flash on Modules with Intel® ME

If booting from the external (baseboard mounted) SPI flash then exchanging the COM Express® module for another one of the same type will cause the Intel® Management Engine to fail during next start. This is by design of the ME because it bounds itself to the very module it has been flashed to. In the case of an external SPI flash this is the module present at flash time.

To avoid this issue please make sure to conduct a complete flash of the external SPI flash device after changing the COMexpress module for another one. If disconnecting and reconnecting the same module again this step is not necessary.

4.7   M.A.R.S.

The Smart Battery implementation for Kontron Computer-on-Modules called **M**obile **A**pplication for **R**echargeable **S**ystems is a BIOS extension for external Smart Battery Manager or Charger. It includes support for SMBus charger/selector (e.g. Linear Technology LTC1760 Dual Smart Battery System Manager) and provides ACPI compatibility to report battery information to the Operating System.

Reserved SM-Bus addresses for Smart Battery Solutions on the carrier:

8-bit Address	7-bit Address	Device
12h	0x09	SMART_CHARGER
14h	0x0A	SMART_SELECTOR
16h	0x0B	SMART_BATTERY

4.8   UART

The COMe-mBT10 supports up to two Serial RX/TX only Ports defined in COM Express® specification on Pins A98/A99 for UART0 and Pins A101/A102 for UART1. The implementation of the UART is compatible to 16450 and is supported by default from most operating systems. Resources are subordinated to other UARTS e.g. from external LPC Super I/O.

UART features:

> » 450 to 115.2k Baud (except 56000)

> » 5, 6, 7 or 8bit characters

> » 1 or 2 Stop bit generation

> » Even, odd or no-parity generation/detection

> » Complete status reporting capabilities

> » Line break generation and detection

> » Full prioritized interrupt system control

> » No FIFO

> » One additional shift register for transmit and one for receive

> » No Flow Control

> » No FCR register due to unavailability of FIFO

> » MCR and MSR registers only implemented in loopback mode for compatibility with existing drivers and APIs

> » Initialized per default to COM3 3F8h/IRQ4 and COM4 2F8/IRQ3 without external SIO

> » Initialized per default to COM3 3E8h/IRQ5 and COM4 2E8/IRQ10 with external SIO present

The UART clock is generated by the 33MHz LPC clock which results in an accuracy of 0.5% on all UART timings

- Due to the protection circuitry required according COM Express® specification the transfer speed can only be guaranteed for 9600 Baud. Please contact your local sales or support for customized versions without protection circuitry

 - Legacy console redirection via onboard serial ports may be restricted in terms of serial input stream. Since they're only emulating a 16450 device (w/o FIFO) an input stream generated by a program may lose characters. Inputs from a keyboard via terminal program will be safe.

4.9   Fast I2C

The COMe-mBT10 supports a CPLD implemented LPC to I2C bridge using the WISHBONE I2C Master Core provided from opencores.org. The I2C Interface supports transfer rates up to 40kB/s and can be configured in Setup

Specification for external I2C:

» Speed up to 400kHz

» Compatible to Philips I2C bus standard

» Multi-Master capable

» Clock stretching support and wait state generation

» Interrupt or bit-polling driven byte-by-byte data-transfers

» Arbitration lost interrupt with automatic transfer cancellation

» Start/Stop signal generation/detection

» Bus busy detection

» 7bit and 10bit addressing

4.10   Dual Staged Watchdog Timer

Basics

A watchdog timer (or computer operating properly (COP) timer) is a computer hardware or software timer that triggers a system reset or other corrective action if the main program, due to some fault condition, such as a hang, neglects to regularly service the watchdog (writing a "service pulse" to it, also referred to as "kicking the dog", "petting the dog", "feeding the watchdog" or "triggering the watchdog"). The intention is to bring the system back from the nonresponsive state into normal operation.

The COMe-mBT10 offers a watchdog which works with two stages that can be programmed independently and used one by one.

Time-out events

Reset	A reset will restart the module and starts POST and operating system new.
NMI	A non-maskable interrupt (NMI) is a computer processor interrupt that cannot be ignored by standard interrupt masking techniques in the system. It is typically used to signal attention for non-recoverable hardware errors.
SCI	A system control interrupt (SCI) is a OS-visible interrupt to be handled by the OS using AML code
Delay	Might be necessary when an operating system must be started and the time for the first trigger pulse must extended. (Only available in the first stage)
WDT Signal only	This setting triggers the WDT Pin on baseboard connector (COM Express® Pin B27) only
Cascade:	Does nothing, but enables the 2nd stage after the entered time-out.

WDT Signal

B27 on COM Express® Connector offers a signal that can be asserted when a watchdog timer has not been triggered within time. It can be configured to any of the 2 stages. Deassertion of the signal is automatically done after reset. If deassertion during runtime is necessary please ask your Kontron technical support for further help.

4.11 Intel® Fast Flash Standby™ / Rapid Start Technology™

The target of Intel® Fast Flash Standby™ (iFFS) (also known as Intel® Rapid Start Technology™ iRST) is to get a wake-up time from S4 compareable to S3. Normally S4 is caused by OS which stores it's information to the hard disk and does then a normal shutdown. S4 resume takes quite long as the system does a normal BIOS POST and OS restores it's information from the hard disk.

IFFS does it in a different way. The Operating System initiates an S3 and stores it's information in memory. After that BIOS copies this OS information from DRAM to SSD and does a sleep state similar to S4 with nearly zero power. If system is resumed by power button, BIOS restores memory content from SSD to the DRAM and does an S3 resume which is much faster.

Requirements

» SATA Solid State Disk in AHCI mode

» Free disk space on the SSD with at least the DRAM size

» Operating System with disk partition tool to allocate the hibernation partition (e.g. Windows 7/8)

» BIOS supporting iFFS feature

How to setup once the operating system is installed

» Prepare a free disk space on your onboard or external SSD with at least the size of DRAM

» Open *cmd.exe* in Administrator Mode and type *diskpart.exe* to open the Windows disk partition tool

» DISKPART> list disk

» DISKPART> select disk X (X is disk number where you want to create the store partition. Refer to results from "list disk" for exact disk number)

» DISKPART> create partition primary

» DISKPART> detail disk

» DISKPART> select Volume X (X is Volume of your store partition. Refer to results from "detail disk" for exact volume number)

» DISKPART> set id=84 override (ID 84 marks the partition as hibernate partition)

» DISKPART> exit

» Now there should be a Hibernate Partition visible in your disk management

» Reboot and enable iFFS in BIOS

Usage

» Activate Lid / move system to Sleep/Standby (→S3)

» After configured period of time in Setup the system powers on automatically and information in DRAM moves to non-volatile memory (Default is *'immediately'*)

» System switches off again to iFFS (→comparable to S4, Power Supply can now be disconnected)

» When System is powered on, information moved back to DRAM (No display output during copy process)

» System resumes same as Sleep/Standby S3

Note

» Depending on the platform iFFS enabled may disable the hibernate function in Windows automatically

Benefits

» System transitions from S3 to S4 automatically

» Up to 6x battery life compared to Standby

» Resume time reduced up to 75%

Measured resume times from Power-on to Win7 Log-on Screen on COMe-mCT10:

» 2.5" SATA II HDD 5400rpm: Hibernate: 22s, iFFs on onboard NANDrive: 17s

» 2.5" SATA III SSD: Hibernate: 18s, iFFS on SSD: 10s

4.12   Speedstep Technology

The Intel® processors offer the Intel® Enhanced SpeedStep™ technology that automatically switches between maximum performance mode and battery-optimized mode, depending on the needs of the application being run. It enables you to adapt high performance computing on your applications. When powered by a battery or running in idle mode, the processor drops to lower frequencies (by changing the CPU ratios) and voltage, conserving battery life while maintaining a high level of performance. The frequency is set back automatically to the high frequency, allowing you to customize performance.

In order to use the Intel® Enhanced SpeedStep™ technology the operating system must support SpeedStep™ technology.

By deactivating the SpeedStep feature in the BIOS, manual control/modification of CPU performance is possible. Setup the CPU Performance State in the BIOS Setup or use 3rd party software to control CPU Performance States.

4.13   C-States

New generation platforms include power saving features like SuperLFM, EIST (P-States) or C-States in O/S idle mode.

Activated C-States are able to dramatically decrease power consumption in idle mode by reducing the Core Voltage or switching of parts of the CPU Core, the Core Clocks or the CPU Cache.

Following C-States are defined:

C-State	Description	Function
C0	Operating	CPU fully turned on
C1	Halt State	Stops CPU main internal clocks via software
C1E	Enhanced Halt	Similar to C1, additionally reduces CPU voltage
C2	Stop Grant	Stops CPU internal and external clocks via hardware
C2E	Extended Stop Grant	Similar to C2, additionally reduces CPU voltage
C3	Deep Sleep	Stops all CPU internal and external clocks
C3E	Extended Stop Grant	Similar to C3, additionally reduces CPU voltage
C4	Deeper Sleep	Reduces CPU voltage
C4E	Enhanced Deeper Sleep	Reduces CPU voltage even more and turns off the memory cache
C6	Deep Power Down	Reduces the CPU internal voltage to any value, including 0V
C7	Deep Power Down	Similar to C6, additionally LLC (LastLevelCache) is switched off

C-States are usually enabled by default for low power consumption, but active C-States my influence performance sensitive applications or real-time systems.

» Active C6-State may influence data transfer on external Serial Ports

» Active C7-State may cause lower CPU and Graphics performance

It's recommended to disable C-States / Enhanced C-States in BIOS Setup if any problems occur.

4.14   Graphics Features

The integrated Intel® HD Graphics (Gen 7) graphics supports following OS dependent feature set:

O/S	Win8	Win7/WES7	WEC7	Linux (Fedora/Yocto)	Linux (Tizen)
Display Interfaces*	HDMI 1.4a, DP 1.1a, eDP 1.3, VGA				
Max HDMI/DVI Resolution	1920×1200				
Max DP Resolution	2560×1600				
Max VGA Resolution*	2560×1600				
Dual Independent Display	Yes				
2D HW acceleration	DirectDraw			X Server	Wayland Compositor
3D HW acceleration	OGL4.0, DX11.1/10/9		OGLES 2.0	OGL3.2/OGLES2.0	
HW Media Acceleration	DXVA 2		DirectShow	VAAPI	
HW Video Decode	H.264,MPEG2,VC1,VP8		H.264,MPEG2,VC1	H.264,MPEG2,VC1,VP8	H.264,MPEG2,VC1,VP8
HW Video Encode	tbd	tbd	-	H.264,MPEG2	H.264,MPEG2
Blu-Ray	v2.0	-	-	-	-
Media players	Windows Media Player or PowerDVD 10		CEPlayer	GStreamer - VAAPI	

* Module Form Factor / Featureset dependent, please check module specification for supported interfaces

4.15   ACPI Suspend Modes and Resume Events

The COMe-mBT10 supports the S-states S0, S3, S4, S5. S5eco Support: YES

The following events resume the system from S3:

» USB Keyboard (1)

» USB Mouse (1)

» Power Button

» WakeOnLan (2)

The following events resume the system from S4:

» Power Button

» WakeOnLan (2)

The following events resume the system from S5:

» Power Button

» WakeOnLan (2)
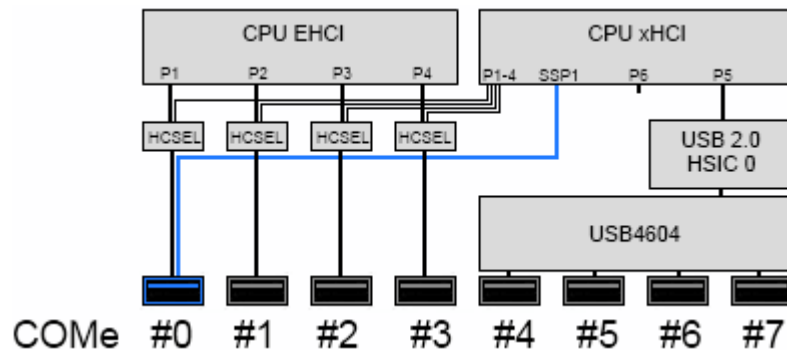
The following events resume the system from S5Eco:

» Power Button

> (1) OS must support wake up via USB devices and baseboard must power the USB Port with StBy-Voltage
> (2) Depending on the Used Ethernet MAC/Phy WakeOnLan must be enabled in BIOS setup and driver options

4.16 USB

The COMe-mBT10 supports up to 8x USB 2.0/1x USB 3.0 with following internal EHCI/xHCI configuration:

5   System Resources

5.1   Internal I2C Bus

I2C Address	Device	Comment
30h	USB HSIC Hub	Do not use under any circumstances
58h	S5eco resistor	Do not use under any circumstances
C0h	LVDS bridge	Do not use under any circumstances
A0h	LVDS EEPROM	Reserved for external LDVS EEPROM for Panel Data

5.2   External I2C Bus

I2C Address	Device	Comment
A0h	Module EEPROM	Do not use under any circumstances
AEh	Carrier EEPROM	Reserved for Baseboard EEPROM

5.3   System Management (SM) Bus

Address	Device	Comment
A0h	DDR3L SPD	Do not use under any circumstances
30h	Thermal sensor option	Do not use under any circumstances
5Ch	HWMonitor	Do not use under any circumstances
12h	SMART_CHARGER	Not to be used with any SM bus deivce except a charger
14h	SMART_SELECTOR	Not to be used with any SM bus deivce except a selector
16h	SMART_BATTERY	Not to be used with any SM bus deivce except a battery

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