



TABLE OF CONTENTS

1.	ABOUT THIS MANUAL.....	1
1.1	Copyright and Licence Expenses	1
1.2	Registered Trademarks.....	1
1.3	Disclaimer.....	1
1.4	Imprint.....	1
1.5	Service and Support.....	1
1.6	Tips on Safety	2
1.7	Symbols and Typographic Conventions.....	2
1.8	Handling and ESD Tips	2
1.9	Naming of Signals.....	3
1.10	Further Applicable Documents / Presumed Knowledge.....	3
2.	INTRODUCTION	4
2.1	Functional Overview	4
2.2	Specification Compliance.....	4
2.3	Versions.....	5
2.4	Accessories.....	5
3.	FUNCTIONAL SPECIFICATION.....	6
3.1	Block Diagram	6
3.2	Electrical Specification.....	6
3.2.1	Supply Voltage Characteristics	6
3.2.2	Power Consumption Specification	6
3.3	Environmental Specification	7
3.4	System Components.....	7
3.4.1	Gigabit Ethernet Controller.....	7
3.4.2	DP-LVDS Bridge	7
3.4.3	Dual UART.....	7
3.4.4	USB Hub.....	7
3.4.5	HD-Audio Codec.....	7
3.4.6	I ² C Test Devices.....	7
3.5	Connectors and Interfaces	8
3.5.1	Power Supply	10
3.5.2	DisplayPort.....	10
3.5.3	USB Host / Device Interfaces	10
3.5.4	Gigabit Ethernet	11
3.5.5	Serial Interfaces (RS232/RS422)	11
3.5.6	Embedded Display Port	13
3.5.7	LVDS.....	14
3.5.8	Mini PCIe Socket.....	15
3.5.9	SATA Interfaces.....	16
3.5.10	SD Card Socket.....	17
3.5.11	Audio.....	17
3.5.12	Fan Connectors.....	18
3.5.13	Riser Interface.....	18
3.5.14	Front Panel Connector	19
3.5.15	Debug LEDs.....	19
3.5.16	SMBus and I ² C Header	19
3.5.17	SPI Flash Socket	20
3.5.18	COM Express™ GPIO Header.....	20
3.5.19	Smart Battery Management Header	20
3.5.20	COM Express™ Connector	20



TABLE OF CONTENTS (continued)

4.	MECHANICS	21
4.1	Dimensions	21
4.2	Protection Against External Effects	21
5.	SOFTWARE.....	22
5.1	System Resources	22
5.1.1	I ² C Bus	22
5.1.2	SMBus	22
5.2	Operating Systems	22
5.2.1	Supported Operating Systems.....	22
5.2.2	Driver Download	22
6.	SAFETY REQUIREMENTS AND PROTECTIVE REGULATIONS.....	23
6.1	EMC.....	23
6.2	ESD.....	23
6.3	Operational Safety and Personal Security	23
6.4	Reliability and Service Life.....	23
6.4.1	RoHS Compliance.....	23
6.4.2	WEEE Regulation	23
6.5	Other Entries.....	23
7.	APPENDIX	24
7.1	Acronyms and Definitions.....	24
7.2	References	26

TABLE DIRECTORY

Table 1:	Terms and Conventions.....	2
Table 2:	Pinout Power-In Connector X10	10
Table 3:	TQ-Specific Feature for DDI1	10
Table 4:	Pinout USB Host Extension Connector X26	10
Table 5:	Ethernet LEDs.....	11
Table 6:	Serial Port COM Express™ Port Mapping.....	11
Table 7:	RS232 D-Sub Connector X6.....	12
Table 8:	RS232 Header X24	12
Table 9:	RS422 Header X25	12
Table 10:	eDP Connector X30.....	13
Table 11:	LVDS Connector X31.....	14
Table 12:	Backlight Power Connector X11	15
Table 13:	Backlight Connector X32.....	15
Table 14:	Headphone and Microphone Connector X12	17
Table 15:	Speaker Connector for Right Speaker X27	17
Table 16:	Speaker Connector for Left Speaker X28.....	17
Table 17:	12 V Fan Connector X17	18
Table 18:	5 V Fan Connector X18.....	18
Table 19:	Debug LEDs	19
Table 20:	I ² C Address Mapping COM Express™ I ² C Bus.....	22
Table 21:	I ² C Address Mapping COM Express™ SMBus Port.....	22
Table 22:	Acronyms	24
Table 23:	Further Applicable Documents and Links.....	26



ILLUSTRATION DIRECTORY

Illustration 1:	Block Diagram MB-COME10-1	6
Illustration 2:	MB-COME10-1, Top	8
Illustration 3:	MB-COME10-1, Bottom	9
Illustration 4:	RJ45 Connectors X8, X9	11
Illustration 5:	RS232 D-SUB Connector X6	12
Illustration 6:	RS232 Header X24	12
Illustration 7:	RS422 Header X25	12
Illustration 8:	eDP Connector X30	13
Illustration 9:	LVDS Connector X31	14
Illustration 10:	Backlight Connector X32	15
Illustration 11:	2.5" HDD/SSD Mounting	16
Illustration 12:	Headphone / Microphone X12	17
Illustration 13:	Speaker Connector X27	17
Illustration 14:	Speaker Connector X28	17
Illustration 15:	12 V Fan Connector X17	18
Illustration 16:	5 V Fan Connector X18	18
Illustration 17:	PCIe card Installation Configuration	18
Illustration 18:	Front Panel Connector	19
Illustration 19:	SMBus and I ² C Header	19
Illustration 20:	COM Express™ GPIO Header	20
Illustration 21:	Smart Battery Management Header	20
Illustration 22:	MB-COME10-1	21

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1.5 Service and Support

Please visit our website www.tq-group.com for latest product documentation, drivers, utilities and technical support.

You can register on our website www.tq-group.com to have access to restricted information and automatic update services.

For direct technical support you can contact our FAE team by email: support@tq-group.com.

Our FAE team can also support you with additional information like 3D-STEP files and confidential information, which is not provided on our public website.





For service/RMA, please contact our service team by email (service@tq-group.com) or your sales team at TQ.

1.6 Tips on Safety

Improper or incorrect handling of the product can substantially reduce its life span.


1.7 Symbols and Typographic Conventions

Table 1: Terms and Conventions


Symbol	Meaning
	This symbol represents the handling of electrostatic-sensitive modules and / or components. These components are often damaged / destroyed by the transmission of a voltage higher than about 50 V. A human body usually only experiences electrostatic discharges above approximately 3,000 V.
	This symbol indicates the possible use of voltages higher than 24 V. Please note the relevant statutory regulations in this regard. Non-compliance with these regulations can lead to serious damage to your health and also cause damage / destruction of the component.
	This symbol indicates a possible source of danger. Acting against the procedure described can lead to possible damage to your health and / or cause damage / destruction of the material used.
	This symbol represents important details or aspects for working with TQ-products.
Command	A font with fixed-width is used to denote commands, contents, file names, or menu items.

1.8 Handling and ESD Tips

General handling of your TQ-products

	<p>The TQ-product may only be used and serviced by certified personnel who have taken note of the information, the safety regulations in this document and all related rules and regulations.</p> <p>A general rule is: do not touch the TQ-product during operation. This is especially important when switching on, changing jumper settings or connecting other devices without ensuring beforehand that the power supply of the system has been switched off.</p> <p>Violation of this guideline may result in damage / destruction of the MB-COME10-1 module and be dangerous to your health.</p> <p>Improper handling of your TQ-product would render the guarantee invalid.</p>
---	--

Proper ESD handling

	<p>The electronic components of your TQ-product are sensitive to electrostatic discharge (ESD).</p> <p>Always wear antistatic clothing, use ESD-safe tools, packing materials etc., and operate your TQ-product in an ESD-safe environment. Especially when you switch modules on, change jumper settings, or connect other devices.</p>
---	--



1.9 Naming of Signals

A hash mark (#) at the end of the signal name indicates a low-active signal.

Example: RESET#

If a signal can switch between two functions and if this is noted in the name of the signal, the low-active function is marked with a hash mark and shown at the end.

Example: C / D#

If a signal has multiple functions, the individual functions are separated by slashes when they are important for the wiring. The identification of the individual functions follows the above conventions.

Example: WE2# / OE#

1.10 Further Applicable Documents / Presumed Knowledge

- **Specifications and manual of the modules used:**
These documents describe the service, functionality and special characteristics of the module used.
- **Specifications of the components used:**
The manufacturer's specifications of the components used, for example CompactFlash cards, are to be taken note of. They contain, if applicable, additional information that must be taken note of for safe and reliable operation. These documents are stored at TQ-Systems GmbH.
- **Chip errata:**
It is the user's responsibility to make sure all errata published by the manufacturer of each component are taken note of. The manufacturer's advice should be followed.
- **Software behaviour:**
No warranty can be given, nor responsibility taken for any unexpected software behaviour due to deficient components.
- **General expertise:**
Expertise in electrical engineering / computer engineering is required for the installation and the use of the device.

Implementation information for the carrier board design is provided in the COM Express™ Design Guide (2) maintained by the PICMG®. This Carrier Design Guide includes a very good guideline to design a COM Express™ carrier board.

It includes detailed information with schematics and detailed layout guidelines.

Please refer to the official PICMG® documentation for additional information (1), (2).



2. INTRODUCTION

The COM Express™ mainboard MB-COME10-1 is a carrier board for COM Express™ modules with Type 10 pinout. It can be used for embedded computers or as evaluation platform for COM Express™ modules. In combination with a standard COM Express™ module it forms a very compact hardware kit that can be used for a freely scalable embedded PC platform thanks to its modular design. Because of this – with uniform interfaces and mechanical dimensions – the PC system can be easily adjusted to suit the requirements of the application. The many extension options and storage media that can be added offer a high level of flexibility and allow functionalities and performance to be extended easily, quickly and inexpensively. Typical uses are found in embedded server applications, PC systems for automation, visualisation and monitoring and all applications that place high demands on quality, durability and long-term availability.

2.1 Functional Overview

The following key functions are implemented on the MB-COME10-1:

Supported Modules:

- COM Express™ Mini Modules with Type 10 pinout

External Interfaces:

- 2 × Gigabit Ethernet
- 4 × USB2.0 (1 × USB3.0)
- Up to 2 × DisplayPort (2nd DP is optional)
- RS232
- Power Button / Reset

Internal Interfaces:

- Embedded Display Port (optional)
- LVDS (optional)
- 1 × USB (e.g. for touch applications)
- 1 × USB 3.0 device
- Mini PCIe socket (with SIM Card support)
- mSATA socket
- SD card socket
- Socket for 2.5" HDD/SSD
- Audio: 1 × headphone out + 1 × microphone in + stereo speaker out
- RS232
- RS485/RS422
- Riser interface for PCIe add in cards

Power supply:

- Voltage: 12 V DC ±5 %

Environment:

- Extended temperature: –20 °C to +85 °C

Form factor / dimensions:

- 170 × 170 mm² (Mini ITX)

2.2 Specification Compliance

The MB-COME10-1 supports modules compliant to the PICMG™ COM Express™ Module Base Specification (COM.0 R2.1) with Type 10 pinout.



2.3 Versions

The MB-COME10-1 carrier is available in two standard configurations.

- **MB-COME10-1-AA ("eDP/LVDS")**
Single Front Display Port
eDP/ LVDS support (either eDP or LVDS can be active at the same time, automatic switchover)
- **MB-COME10-1-AB ("Dual DisplayPort")**
Dual Front Display Port
No eDP/ LVDS support

2.4 Accessories

- **COMSET-HDD**
Mounting Set for 2.5" HDD/SSD on the MB-COME10-1
- **RISER-COME-PCIE**
Riser for 1 × PCIe; PCIe card is below mainboard
- **RISER-COME-2 × PCIE**
Riser for 2 × PCIe; PCIe cards are beside mainboard
- **RISER-COME-2 × PCIE-2**
Riser for 2 × PCIe; PCIe cards are below mainboard
- **DK-USB-TYPA-MOL5**
Adapter cable from internal USB connector to an A-Type receptacle
- **ADAP-Audio-Kit**
Adapter for internal head-phone / microphone connector to dual 3.5 mm audio jack.

Please contact support@tq-group.com for more details about Display Port cables and Display Port to DVI/HDMI adapters.

3. FUNCTIONAL SPECIFICATION

3.1 Block Diagram

The following illustration shows the block diagram of the MB-COME10-1:

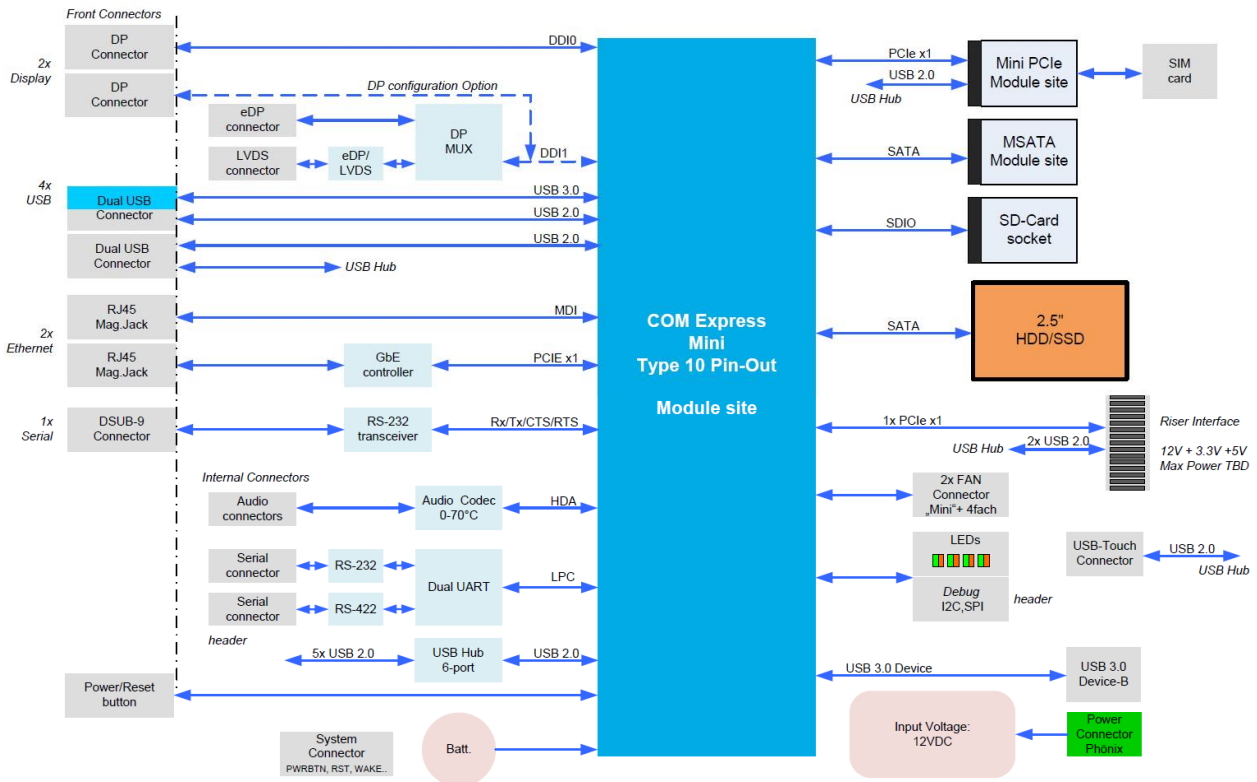


Illustration 1: Block Diagram MB-COME10-1

3.2 Electrical Specification

3.2.1 Supply Voltage Characteristics

The MB-COME10-1 requires an input voltage of 12 V DC $\pm 5\%$.

The input voltages shall rise from 10 % of nominal to 90 % of nominal within 0.1 ms to 20 ms ($0.1 \text{ ms} \leq \text{Rise Time} \leq 20 \text{ ms}$). There must be a smooth and continuous increase of each DC output voltage from 10 % to 90 % of its final set point within the regulation range.

3.2.2 Power Consumption Specification

The power consumption of the system significantly depends on the connected devices (COM Express™ module, Mass storage devices, USB devices, display backlight, speakers etc.). The power consumption of the MB-COME10-1 itself is approximately 190 mA @ 12 V (COM Express™ module supplied externally; UEFI-shell active; no keyboard, no mouse, no mass storage device, no Ethernet cable etc. connected). The maximum input current of the MB-COME10-1 is limited to 5 A by a fuse. The devices connected to the carrier should not exceed 50 W.

Note: Power requirement	
	<p>The power supply for the MB-COME10-1 must be configured with enough reserve. It should be calculated with the maximum power of all connected components.</p>



3.3 Environmental Specification

- Temperature operating, Extended: -20 °C to +85 °C
- Temperature storage: -40 °C to +85 °C
- Relative humidity (operating / storage): 10 % to 90 % (not condensing)

3.4 System Components

3.4.1 Gigabit Ethernet Controller

The MB-COME10-1 is equipped with an Intel® i210IT Ethernet controller with 10/100/1000 Mbps speed and IEEE1588 support. Please contact support@tq-group.com for further information about the IEEE1588 support.

3.4.2 DP-LVDS Bridge

The MB-COME10-1 is equipped with an NXP PTN3460IBS eDP to LVDS bridge. If a display is connected to eDP the eDP to LVDS bridge will be deactivated automatically. There is also an EDID EEPROM on the MB-COME10-1 where display specific data can be stored.

3.4.3 Dual UART

The MB-COME10-1 is equipped with an EXAR XR28V382 dual UART with its register set is based on the industry standard 16550 UART. The connected serial ports operate with standard serial port drivers.

3.4.4 USB Hub

The MB-COME10-1 is equipped with a Microchip USB2517 with 7 Hi-Speed downstream ports.

3.4.5 HD-Audio Codec

The MB-COME10-1 is equipped with a VIA VT1802P High Definition Audio Codec with a stereo Class D Amplifier with 2 W RMS output power per channel.

3.4.6 I²C Test Devices

The MB-COME10-1 is equipped with an EEPROM and an I/O Expander at the general purpose I²C bus (COM Express™ pin names I2C_DAT and I2C_CK) This devices can be used for software development and debug purposes. Further information can be found in the chapter Software.

3.5 Connectors and Interfaces

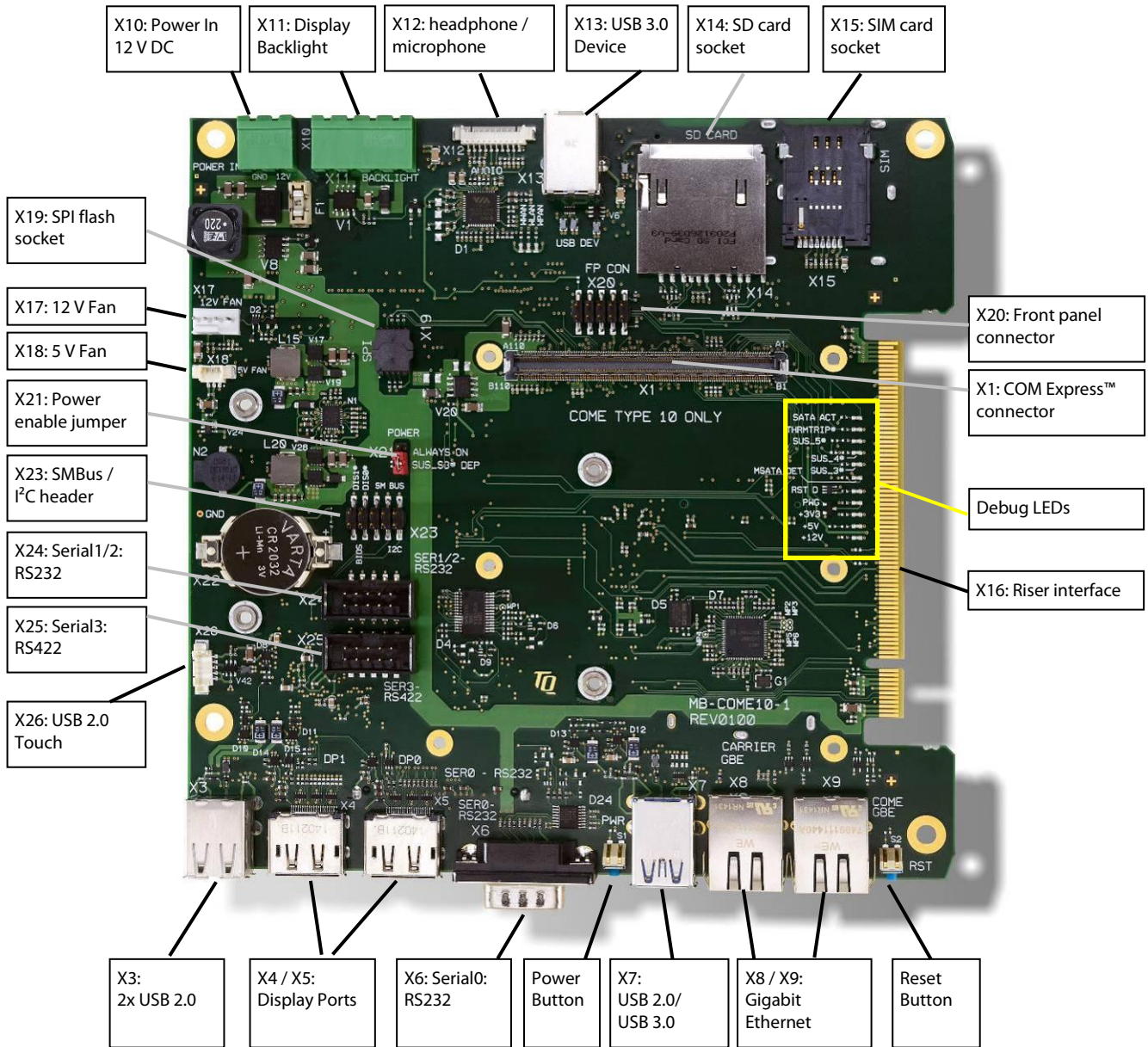


Illustration 2: MB-COME10-1, Top

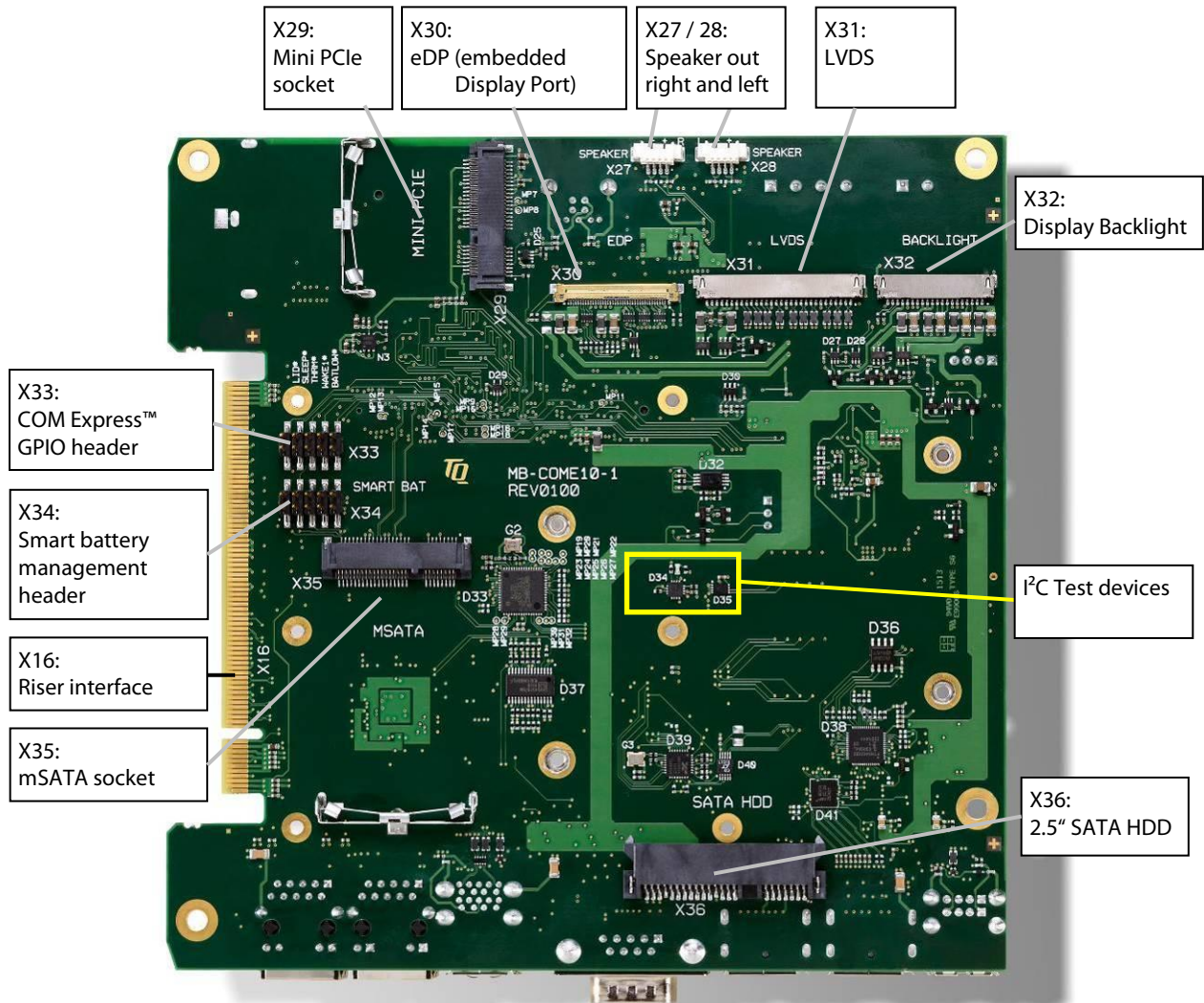


Illustration 3: MB-COME10-1, Bottom

3.5.1 Power Supply

The MB-COME10-1 requires a single 12 V DC power supply. The voltage should not vary more than $\pm 5\%$.

X10: Power-In Connector

- Connector type: Phoenix MSTBA 2,5/ 2-G-5,08
- Mating connector: e.g. Phoenix MSTBA 2,5/ 2-ST-5,08

Table 2: Pinout Power-In Connector X10

Pin	Signal	Remark
1	12 V	fused @ 5 A
2	GND	

3.5.2 DisplayPort

The MB-COME10-1 supports up to two DisplayPort interfaces. The support of adapters from DP to HDMI, DVI or VGA depends on the combination of the COM Express™ module and the adapter used. The combination of some modules with some adapters might not work.

The COM Express™ Specification does not provide signal definitions for the DDI1 port to support dual mode (DP++) passive adapter to convert the DP to HDMI/DVI. There is a missing select signal (DDI1_DDC_AUX_SEL) to switch between the DP Aux+/- signals and the HDMI/DVI DDC signals.

The combination of TQMxE38M module and MB-COME10-1 supports the missing DDI1_DDC_AUX_SEL signal to the COM Express™ connector, to solve this limitation.

Table 3: TQ-Specific Feature for DDI1

COM Express™ Signal	COM Express™ Pin	TQMxE38M / MB-COME10-1	Remark
RSVD9	A86	DDI1_DDC_AUX_SEL	3.3 V input

3.5.3 USB Host / Device Interfaces

The MB-COME10-1 supports several USB Hosts and one USB device interface.

- X7: Double A-Type (USB3.0) connector for direct usage of USB host ports
 Dependent on the configuration USB1 Super Speed lines can be either used for an USB3.0 device or a 2nd USB3.0 Host.
 If the COM Express™ module supports USB Super Speed on USB port 0 of COM Express™ connector, USB 3.0 devices are supported on X7 Top.
 If the COM Express™ module supports USB host Super Speed on USB port 1 of COM Express™ connector, MB-COME10-1 can be configured that USB 3.0 devices are supported on X7 Bottom.
- X3: Double A-Type (USB2.0) connector for direct usage of USB host ports
- X26: USB host extension connector for usage of an USB host port with an adapter cable (e.g. for touch display applications)
- Connector type: Molex 53398-0571
 - Mating connector: Molex 51021-0500

Table 4: Pinout USB Host Extension Connector X26

Pin	Signal	Cable Colour	Remark
1	+5 V	Red	Fused @ 0.9 A
2	D-	White	-
3	D+	Green	-
4	GND	Black	-
5	GND	-	-

- X13: USB B-Type (USB3.0) connector for direct usage of the COM Express™ module as USB device.
 If the COM Express™ module supports USB device on USB port 7 of COM Express™ connector, the interface can be connected to a USB3.0 Host.
 If the COM Express™ module supports USB device Super Speed on USB port 1 of COM Express™ connector, MB-COME10-1 can be configured that the interface can be connected to a USB3.0 Host.

3.5.4 Gigabit Ethernet

The MB-COME10-1 supports 2 common Gigabit Ethernet ports.

The Ethernet signals of the COM Express™ connector are routed to X9.

An Intel® i210IT Ethernet controller with 10/100/1000 Mbps speed implemented on the MB-COME10-1 is connected to X8.

Table 5: Ethernet LEDs

LED	Colour/ State	Description
Left (ACT)	off	No link
Left (ACT)	yellow on	Link (no activity)
Left (ACT)	yellow blinking	Link and activity
Right (speed)	off	No link or 10 Mbit/s
Right (speed)	green	100 Mbit/s
Right (speed)	orange/yellow	1000 Mbit/s

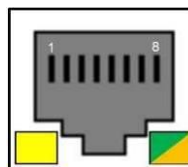


Illustration 4: RJ45 Connectors X8, X9

3.5.5 Serial Interfaces (RS232/RS422)

The MB-COME10-1 supports up to 3 serial ports:

- 2 × RS232 port (D-Sub front connector and on-board header)
- 1 × RS422 (on-board header)

The COM Express™ Specification does only provide signal definitions for RX and TX lines for the serial interface. Due to the TQ-flexiCFG feature the serial ports can be configured to route the handshake signals to free pins on the COM Express connector.

Table 6: Serial Port COM Express™ Port Mapping

COM Express Signal	COM Express Pin	MB-COME10-1	Remark
SER0_TX	A98	SER0_TX	3.3 V input
SER0_RX	A99	SER0_RX	3.3 V output
SER1_TX	A101	SER1_TX	3.3 V input
SER1_RX	A102	SER1_RX	3.3 V output
SER0_RTS# ¹	B77	SER0_RTS#	3.3 V input
SER0_CTS# ¹	B78	SER0_CTS#	3.3 V output
SER1_RTS# ¹	A78	SER1_RTS#	3.3 V input
SER1_CTS# ¹	A79	SER1_CTS#	3.3 V output

The four COM Express™ serial signals (RX/TX) are specified to provide a protection and level shifter circuit.

The implementation of this circuit would result in a lower transfer speed on the two serial ports of the COM Express™ module.

On the MB-COME10-1 the protection circuit is removed and the serial ports provide a transfer rate of up to 115 kbaud.

The MB-COME10-1 can only be used in combination with COM Express™ modules Type 10 pinout.

1: These signals are not specified in COM Express™ specification.
These signals are only available when the TQ flexiCFG feature is available on the COM Express™ module. TQMxE38M modules support this feature.

Table 7: RS232 D-Sub Connector X6

Pin	RS232 Signal (all signals)	MB-COME10-1
1	DCD	NC ²
2	RXD	RXD
3	TXD	TXD
4	DTR	NC ²
5	GND	GND
6	DSR	NC ²
7	RTS	RTS ³
8	CTS	CTS ³
9	RI	NC ²

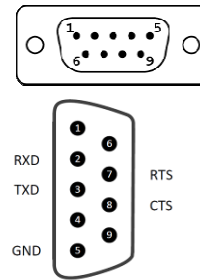


Illustration 5: RS232 D-SUB Connector X6

Table 8: RS232 Header X24

Pin	RS232 Signal (all signals)	MB-COME10-1	D-Sub connector (with standard adapter)
1	DCD	NC ²	–
2	DSR	NC ²	RXD
3	RXD	RXD	TXD
4	RTS	RTS ³	–
5	TXD	TXD	GND
6	CTS	CTS ³	–
7	DTR	NC ²	RTS
8	RI	NC ²	CTS
9	GND	GND	–
10	NC	NC	–

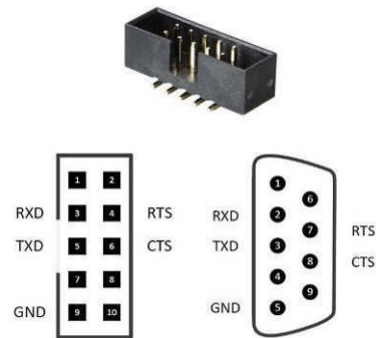


Illustration 6: RS232 Header X24

Table 9: RS422 Header X25

Pin	MB-COME10-1	D-Sub connector (with standard adapter)
1	NC	–
2	NC	RS422 RX–
3	RS422 RX–	RS422 TX+
4	RS422 TX–	–
5	RS422 TX+	GND
6	RS422 RX+	–
7	NC	RS422 TX–
8	NC	RS422 RX+
9	GND	–
10	NC	–

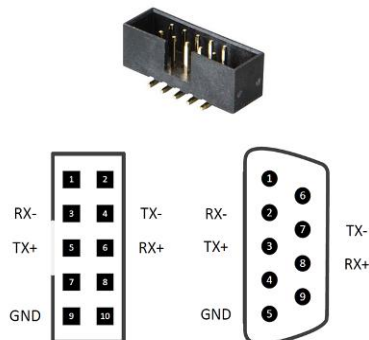


Illustration 7: RS422 Header X25

2: Not available since signal is not defined in COM Express™ specification.
 3: Only available when the TQ flexICFG feature is available on the COM Express™ module.

3.5.6 Embedded Display Port

The MB-COME10-1 supports an embedded DisplayPort (eDP) interface where suitable displays can be connected directly. This functionality is only available for the eDP/LVDS variant.

Either eDP or LVDS can be used at the same time. LVDS is only working if there is no display connected to the eDP interface.

X30: eDP connector

- Connector type: JAE HD1S040HA1
- Mating connector: e.g. JAE HD1P040MA1

Table 10: eDP Connector X30

Pin	Signal	Remark
1	NC	
2	GND	
3	TX3-	Lane 3 differential pair
4	TX3+	
5	GND	
6	TX2-	Lane 2 differential pair
7	TX2+	
8	GND	
9	TX1-	Lane 1 differential pair
10	TX1+	
11	GND	
12	TX0-	Lane 0 differential pair
13	TX0+	
14	GND	
15	AUX+	AUX - channel
16	AUX-	
17	GND	
18	3V3	3.3 V supply voltage
19	3V3	
20	3V3	
21	3V3	
22	NC	
23	GND	
24	GND	
25	GND	
26	GND	
27	HPD	Hot Plug Detect
28	GND	
29	GND	
30	GND	
31	GND	
32	BLKT_EN	Backlight enable
33	BLKT_CTRL	Backlight (brightness) control
34	VDD_EN	Panel power enable
35	AUX_SEL	Low ⇔ AUX; High ⇔ I ² C
36	V_BLKT	12 V Backlight supply voltage
37	V_BLKT	
38	V_BLKT	
39	V_BLKT	
40	NC	

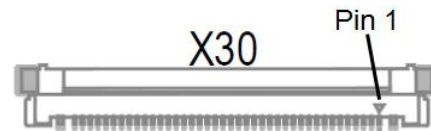


Illustration 8: eDP Connector X30

3.5.7 LVDS

The MB-COME10-1 supports an embedded DisplayPort (eDP) and an LVDS interface where suitable displays can be connected directly. This functionality is only available for the eDP/LVDS variant.

Either eDP or LVDS can be used at the same time. LVDS is only working if there is no display connected to the eDP interface. There are also connectors for powering the backlight of the connected display.

The MB-COME10-1 has an on-board EDID EEPROM to store display specific timing information. This EEPROM can be programmed with an external I²C programmer. If the programmer supports a 3.3 V output voltage the MB-COME10-1 can be programmed without any additional power supply. In this case no COM Express™ module should be connected to the carrier.

X31: LVDS connector

- Connector type: Hirose DF19G-30P-1H
- Mating connector: e.g. Hirose DF19-30S-1C

Table 11: LVDS Connector X31

Pin	Signal	Remark
1	A0-	Odd bus
2	A0+	Odd bus
3	A1-	Odd bus
4	A1+	Odd bus
5	A2-	Odd bus
6	A2+	Odd bus
7	GND	
8	ACLK-	Odd bus
9	ACLK+	Odd bus
10	A3-	Odd bus
11	A3+	Odd bus
12	B0-	Even bus
13	B0+	Even bus
14	GND	
15	B1-	Even bus
16	B1+	Even bus
17	GND	
18	B2-	Even bus
19	B2+	Even bus
20	BCLK-	Even bus
21	BCLK+	Even bus
22	B3-	Even bus
23	B3+	Even bus
24	GND	
25	5V_PANEL	5 V Panel supply voltage
26	5V_PANEL	
27	5V_PANEL	
28	3V3_PANEL	3.3 V Panel supply voltage
29	3V3_PANEL	
30	3V3_PANEL	



Illustration 9: LVDS Connector X31

X11: Backlight Power connector

- Connector type: Phoenix MSTBA2,5/ 4-G-5,08
- Mating connector: e.g. Phoenix MSTBA2,5/ 4-ST-5,08

Table 12: Backlight Power Connector X11

Pin	Signal	Remark
1	12V_BL_ALW	12 V always-on output
2	VCC_IN ¹⁾	Backlight voltage input
3	GND	–
4	VCC_SWITCHED	Backlight voltage output

¹⁾ A voltage of up to 30 V can be supplied at this pin. Connect Pin 1 and 2 to use the 12 V of the MB-COME10-1 for the backlight.

X32: Backlight connector

- Connector type: Hirose DF19G-20P-1H
- Mating connector: e.g. Hirose DF19-20S-1C

Table 13: Backlight Connector X32

Pin	Signal	Remark
1	12V_BL_ALW	12 V always-on output
2	12V_BL_ALW	
3	12V_BL_SL	12 V switched output
4	12V_BL_SL	
5	GND	–
6		
7		
8	5V_BL_ALW	5 V always-on output
9	5V_BL_ALW	
10	5V_BL_ALW	
11	5V_BL_SL	5 V switched output
12	5V_BL_SL	
13	5V_BL_SL	
14	BLEN	Backlight Enable output
15	BLT_CTRL	Backlight (brightness) control
16	GND	–
17	3V3_PROG ¹⁾	3.3 V input (programming)
18	EDID_CLK ¹⁾	EDID I ² C clock
19	EDID_DAT ¹⁾	EDID I ² C data
20	GND	–

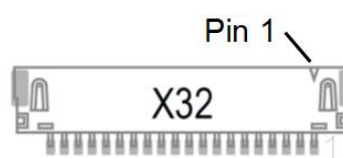


Illustration 10: Backlight Connector X32

¹⁾ These pins can be used for programming the on-board EDID EEPROM. The EEPROM can be powered by the 3V3_PROG pin.

3.5.8 Mini PCIe Socket

The MB-COME10-1 is equipped with a socket to support one full size Mini PCIe card. There is also a SIM card socket for native support of UMTS or LTE Mini PCIe cards.

A half size card can be inserted into this socket by means of a mechanical adapter.

The reachable transfer rate of this interface depends mainly on the COM Express™ module used and the connected device.

3.5.9 SATA Interfaces

The MB-COME10-1 supports two SATA interfaces:

- One mSATA socket for mSATA-SSDs
- One connector for 2.5" HDD/SSDs, which can be mounted on the carrier with a mounting set

The maximum transfer rates of these interfaces mainly depend on the COM Express™ module used and the connected devices.

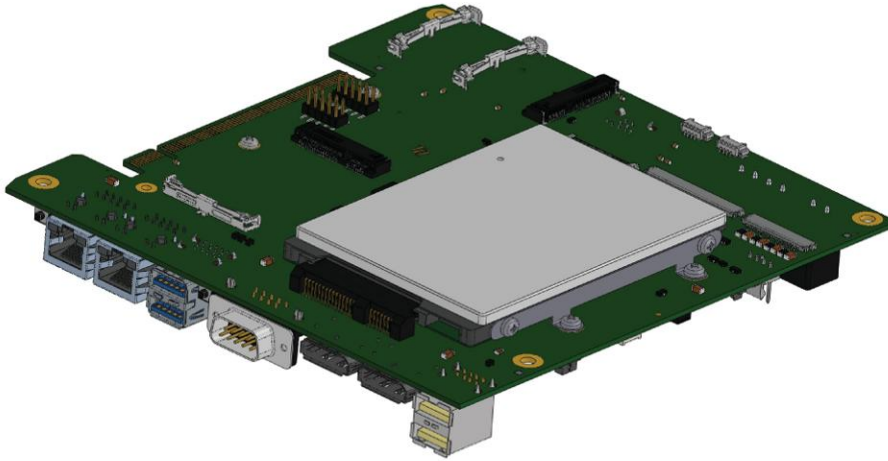


Illustration 11: 2.5" HDD/SSD Mounting

3.5.10 SD Card Socket

The MB-COME10-1 is equipped with a socket to support SD cards.

The Signals for SDIO on COM Express™ modules can also be used as GPIO signals. Please ensure that the module is configured for SDIO-usage of these pins.

3.5.11 Audio

The MB-COME10-1 is equipped with an audio codec to support following audio features:

- Headphone out
- Microphone in
- Speaker out (up to 2 × 2 W RMS)

X12: Headphone and microphone connector

- Connector type: Molex 53261-1071
- Mating connector: e.g. Molex 51021-1000 crimp housing

Table 14: Headphone and Microphone Connector X12

Pin	Signal	Remark
1	GND	–
2	HP_OUT_L	Headphone out left
3	HP_OUT_R	Headphone out right
4	GND	–
5	SENSE_HPOUT	Connect to GND if headphone is connected
6	SENSE_MIC	Connect to GND if microphone is connected
7	GND	–
8	MIC_L	Microphone in left
9	MIC_R	Microphone in right
10	GND	–

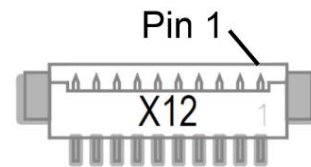


Illustration 12: Headphone / Microphone X12

X27: Speaker connector for right speaker

- Connector type: Molex 53261-0471
- Mating connector: e.g. Molex 51021-0400 crimp housing

Table 15: Speaker Connector for Right Speaker X27

Pin	Signal	Remark
1	SPK_OUT_R+	Speaker out right +
2		
3	SPK_OUT_R-	Speaker out right –
4		

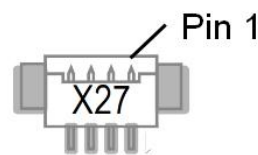


Illustration 13: Speaker Connector X27

X28: Speaker connector for left speaker

- Connector type: Molex 53261-0471
- Mating connector: e.g. Molex 51021-0400 crimp housing

Table 16: Speaker Connector for Left Speaker X28

Pin	Signal	Remark
1	SPK_OUT_L+	Speaker out left +
2		
3	SPK_OUT_L-	Speaker out left –
4		

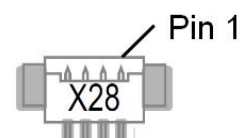


Illustration 14: Speaker Connector X28

3.5.12 Fan Connectors

The MB-COME10-1 is equipped with two connectors for connecting a fan. Don't use both connectors at the same time.

X17: 12 V fan connector

- Connector type: Molex 47053-1000
- Mating connector: 4-pin fan connector (2.54 mm contact spacing)

Table 17: 12 V Fan Connector X17

Pin	Signal	Remark
1	GND	-
2	12 V	-
3	SENSE	Sense input for fan speed
4	CONTROL	Speed control output

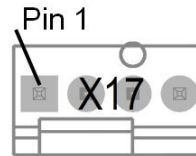


Illustration 15: 12 V Fan Connector X17

If a standard 3-pin 12 V – fan is connected it will run at its full speed.

X18: 5 V fan connector

- Connector type: Molex 53398-0371
- Mating connector: e.g. Molex 51021-0300 crimp housing

Table 18: 5 V Fan Connector X18

Pin	Signal	Remark
1	SENSE	Sense input for fan speed
2	PWM_OUT	Speed control/power output
3	GND	-

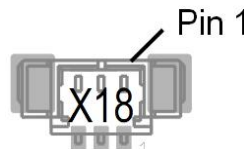


Illustration 16: 5 V Fan Connector X18

3.5.13 Riser Interface

The MB-COME10-1 is equipped with a card edge connector for extension purposes. Up to two PCIe cards can be connected to this interface with adapters.

For further information about the Riser interface, please contact TQ-Systems GmbH.

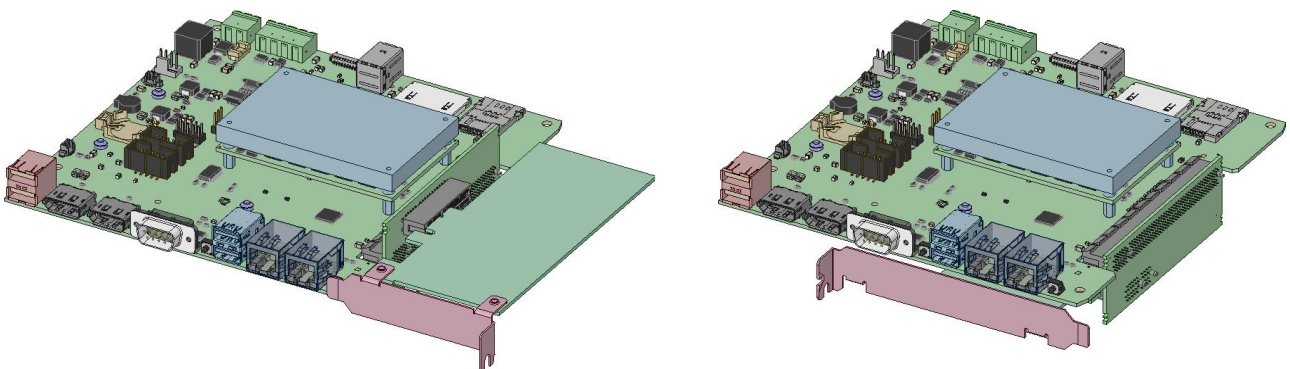


Illustration 17: PCIe card Installation Configuration

3.5.14 Front Panel Connector

The MB-COME10-1 is equipped with a front panel connector where LEDs for Power or Hard Disk activity indication or buttons for Power or Reset can be connected. LEDs can be connected directly. There is a series resistor (330 Ω) to 3.3 V.

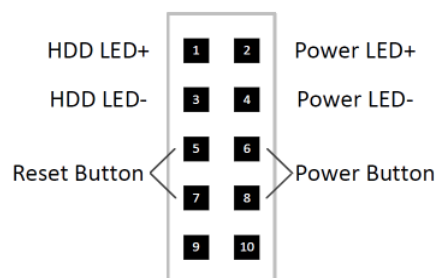


Illustration 18: Front Panel Connector

3.5.15 Debug LEDs

The MB-COME10-1 is equipped with several LEDs for debug purposes.

Table 19: Debug LEDs

Function	PCB Text	Remark
12 V Power	+12 V	Green if 12 V input power is present
5 V Power	+5 V	Green if 5 V on-board power is present
3.3 V Power	+3V3	Green if 3.3 V on-board power is present
Power Good	PWG	Green if PWR_OK signal is sent to module
Reset inactive	RST_D	Green if Reset is deasserted
mSATA	MSATA DET	Green if an mSATA SSD is detected
SUS S3 inactive	SUS_3#	Green if module is not in power-saving mode S3 (Suspend to RAM)
SUS S4 inactive	SUS_4#	Green if module is not in power-saving mode S4 (Suspend to disk)
SUS S5 inactive	SUS_5#	Green if module is not in power-saving mode S5 (Soft off)
Thermal shutdown	THRMTRIP#	Green if module is not in thermal shutdown
SATA activity	SATA ACT	Green during SATA activity

3.5.16 SMBus and I²C Header

The MB-COME10-1 is equipped with a header, the user can easily access to SMBus. The I²C Bus (in the TQ-flexiCFG block) can also be accessed here. On this header there is also the possibility to set 2 jumpers for the BIOS disable signals of the module. This header is only used for debug purposes.

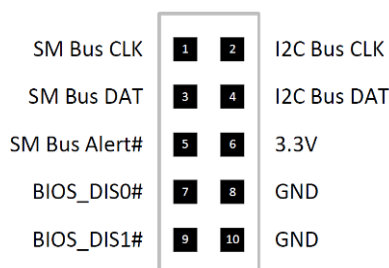


Illustration 19: SMBus and I²C Header

If there is no Jumper present on the BIOS_DIS0# or the BIOS_DIS1# signal the module will load its BIOS from the internal SPI flash. If there is a Jumper on the BIOS_DIS1# - signal (between pin 9 and 10) the module loads its BIOS from the flash in the SPI socket of the MB-COME10-1.

3.5.17 SPI Flash Socket

The MB-COME10-1 is equipped with a socket for SPI flashes. This is useful if a BIOS update fails or for BIOS development purposes. SPI-Flashes with SO8W package can be inserted. Whether a distinct flash device is supported depends on the COM Express™ module used.

3.5.18 COM Express™ GPIO Header

The MB-COME10-1 is equipped with a header for distinct COM Express™ signals. This header is used for debug purposes only.

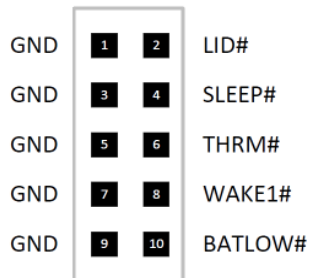


Illustration 20: COM Express™ GPIO Header

3.5.19 Smart Battery Management Header

The MB-COME10-1 is equipped with a header for smart battery development and debug purposes.

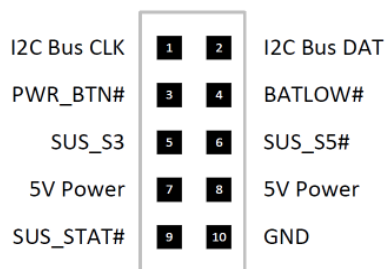


Illustration 21: Smart Battery Management Header

3.5.20 COM Express™ Connector

As COM Express™ connector the EPT 401-55101-51 or equivalent is used. The stacking height (board to board distance between carrier and module) is 8 mm.

4. MECHANICS

4.1 Dimensions

The dimensions are oriented on the Mini-ITX form factor, which is $170 \times 170 \text{ mm}^2$.
The following illustration shows the MB-COME10-1.

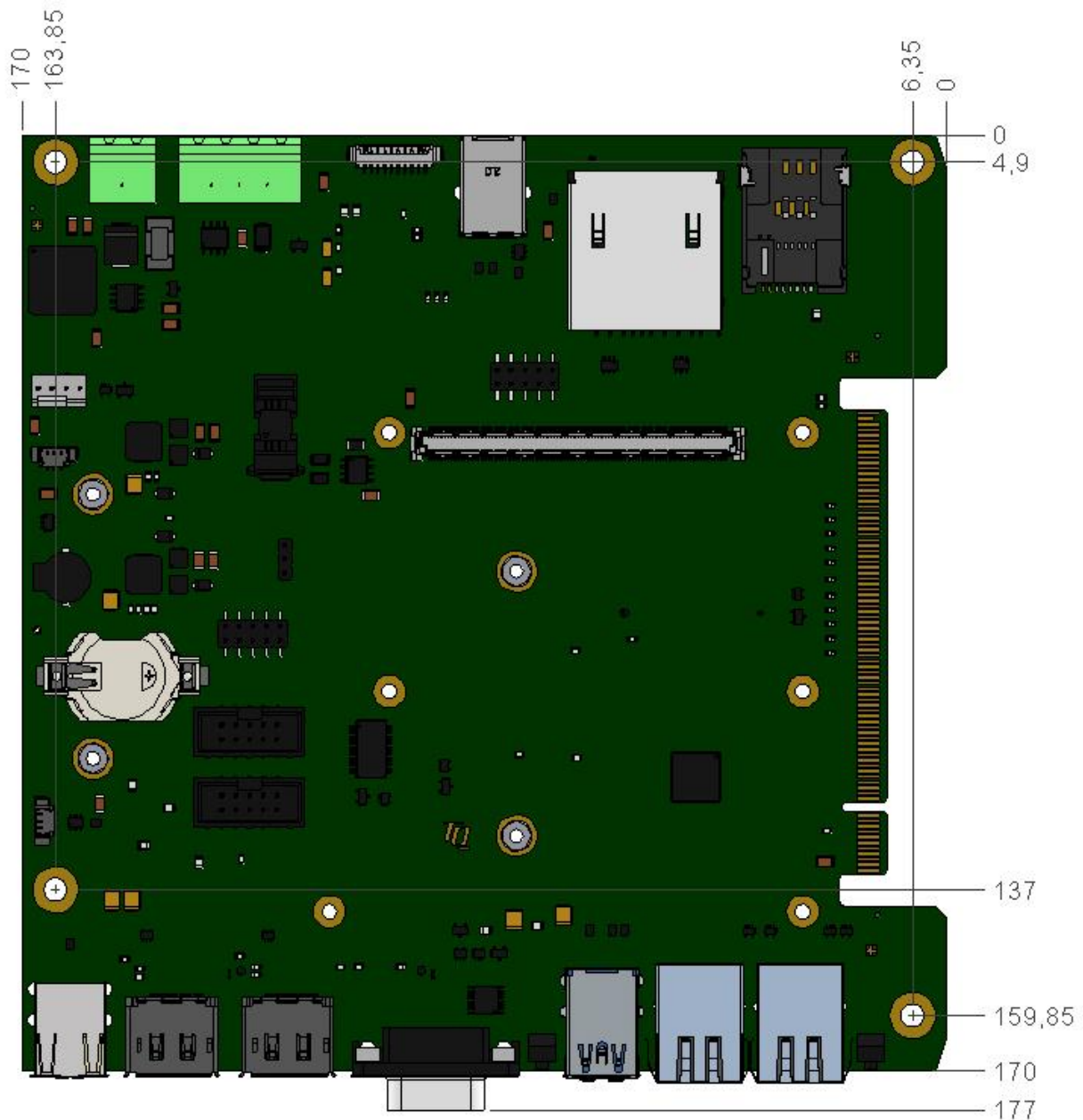


Illustration 22: MB-COME10-1

Please contact support@tq-group.com for more details about 2D/3D Step models.

4.2 Protection Against External Effects

The MB-COME10-1 is not protected against dust, external impact and contact (IP00).
Adequate protection has to be guaranteed by the surrounding system.



5. SOFTWARE

5.1 System Resources

5.1.1 I²C Bus

The general purpose I²C bus (COM Express™ pin names I2C_DAT and I2C_CK) is accessible on the SMBus and I²C header. Additional there are I²C test devices on the MB-COME10-1: An EEPROM and an I/O-Expander.

The following table shows the I²C address mapping for the COM Express I²C port:

Table 20: I²C Address Mapping COM Express™ I²C Bus

8-bit Address	Function	Device	Remark
0xAE	Carrier EEPROM	Microchip 24AA32A	Address recommended in COM Express™ specification
0xE0	I/O Expander	NXP PCA9538A	Test device for I ² C I/O access

5.1.2 SMBus

The SMBus (System Management Bus) on the MB-COME10-1 is connected to the PCIe clock buffer, the MiniPCIe socket and to the Riser interface. It is accessible on the SMBus and I²C header.

The following table shows the I²C address mapping for the COM Express™ SMBus port:

Table 21: I²C Address Mapping COM Express™ SMBus Port

8-bit Address	Function	Device	Remark
0xD4	PCIe Clock buffer	IDT 9DB106	

5.2 Operating Systems

5.2.1 Supported Operating Systems

The MB-COME10-1 supports various Operating Systems:

- Microsoft® Windows® 10
- Microsoft® Windows® 8.1 / Microsoft® Windows® Embedded Standard 8 (WES8)
- Microsoft® Windows® 7 / Microsoft® Windows® Embedded Standard 7 (WES7)
- Linux (i.e. Ubuntu 14.10 or later)

Other Operating Systems are supported on request.

Please contact support@tq-group.com for further information about supported Operating Systems.

5.2.2 Driver Download

The MB-COME10-1 module is well supported by the Standard Operating Systems, which already include most of the required drivers. It is recommended to use the latest drivers for optimal performance and the full feature set of the module.

Drivers for the Intel® i201IT Gigabit Ethernet controller can be downloaded at this Intel® page:

- Intel® Download Center: Intel® Ethernet Controller i210 Series
<https://downloadcenter.intel.com/product/64399/Intel-Ethernet-Controller-I210-Series>

Please contact support@tq-group.com for further driver download assistance.



6. SAFETY REQUIREMENTS AND PROTECTIVE REGULATIONS

6.1 EMC

The MB-COME10-1 was developed according to the requirements of electromagnetic compatibility (EMC). Depending on the target system, anti-interference measures may still be necessary to guarantee the adherence to the limits for the overall system. (Incl. housing)

6.2 ESD

In order to avoid interspersions on the signal path from the input to the protection circuit in the system, the protection against electrostatic discharge should be arranged directly at the inputs of a system. Most external interfaces are protected using ESD protection diodes. Measurements for ESD protection have to be done with the electronic parts mounted in a housing. Since TQ-Systems GmbH does not offer a housing for the MB-COME10-1 so far, no special preventive measures were done up to now.

6.3 Operational Safety and Personal Security

Due to the occurring voltages (12 V DC), tests with respect to the operational and personal safety haven't been carried out.

6.4 Reliability and Service Life

6.4.1 RoHS Compliance

The MB-COME10-1 is manufactured RoHS compliant.

- All components and assemblies used are RoHS compliant
- RoHS compliant soldering processes are used

6.4.2 WEEE Regulation

The company placing the product on the market is responsible for the observance of the WEEE regulation. To be able to reuse the product, it is produced in such a way (a modular construction) that it can be easily repaired and disassembled.

6.5 Other Entries

By environmentally friendly processes, production equipment and products, we contribute to the protection of our environment.

The energy consumption of this subassembly is minimised by suitable measures.

Printed PC-boards are delivered in reusable packaging.

Modules and devices are delivered in an outer packaging of paper, cardboard or other recyclable material.

Due to the fact that at the moment there is still no technical equivalent alternative for printed circuit boards with bromine-containing flame protection (FR-4 material), such printed circuit boards are still used.

No use of PCB containing capacitors and transformers (polychlorinated biphenyls).

These points are an essential part of the following laws:

- The law to encourage the circular flow economy and assurance of the environmentally acceptable removal of waste as at 27.9.94 (source of information: BGBl I 1994, 2705)
- Regulation with respect to the utilization and proof of removal as at 1.9.96 (source of information: BGBl I 1996, 1382, (1997, 2860)
- Regulation with respect to the avoidance and utilization of packaging waste as at 21.8.98 (source of information: BGBl I 1998, 2379)
- Regulation with respect to the European Waste Directory as at 1.12.01 (source of information: BGBl I 2001, 3379)

This information is to be seen as notes. Tests or certifications were not carried out in this respect.

7. APPENDIX

7.1 Acronyms and Definitions

The following acronyms and abbreviations are used in this document.

Table 22: Acronyms

Acronym	Meaning
ATA	AT Attachment
BIOS	Basic Input/Output System
CPU	Central Processing Unit
CSM	Compatibility Support Module
DC	Direct Current
DDC	Display Data Channel
DDI	Digital Display Interface
DDR3L	DDR3 Low Voltage
DMA	Direct Memory Access
DP	DisplayPort
DVI	Digital Visual Interface
ECC	Error-Correcting Code
eDP	embedded DisplayPort
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electromagnetic Compatibility
eSATA	external Serial ATA
ESD	Electrostatic Discharge
FAE	Field Application Engineer
FIFO	First In First Out
flexiCFG	Flexible Configuration
FPGA	Field Programmable Gate-Array
FR-4	Flame Retardant 4
GND	Ground
GPIO	General Purpose Input/Output
HD	High Definition
HDA	High Definition Audio
HDMI	High Definition Multimedia Interface
HSP	Heat Spreader
I	Input
I PD	Input with internal Pull-Down resistor
I PU	Input with internal Pull-Up resistor
I/O	Input/Output
IEEE®	Institute of Electrical and Electronics Engineers
IP	Ingress Protection
IRQ	Interrupt Request
iRTC	Industrial Real Time Clock
I ² C	Inter-Integrated Circuit
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LP	Low-Profile
LPC	Low Pin Count
LVDS	Low Voltage Differential Signal

Table 22: Acronyms (continued)

Acronym	Meaning
MMC	Multimedia Card
mSATA	Mini-SATA
MTBF	Mean operating Time Between Failures
NC	Not Connected
O	Output
OD	Open drain output
OpROM	Option ROM
PC	Personal Computer
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect express
PCMCIA	People Can't Memorize Computer Industry Acronyms
PD	Pull-Down
PICMG®	PCI Industrial Computer Manufacturers Group
PU	Pull-Up
PWM	Pulse-Width Modulation
PWR	Power
RMA	Return Merchandise Authorization
RoHS	Restriction of (the use of certain) Hazardous Substances
RTC	Real-Time Clock
SATA	Serial ATA
SCU	System Control Unit
SD	Secure Digital
SD/MMC	Secure Digital Multimedia Card
SDRAM	Synchronous Dynamic Random Access Memory
SMB	System Management Bus
SO-DIMM	Small Outline Dual In-Line Memory Module
SPD	Serial Presence Detect
SPI	Serial Peripheral Interface
SSD	Solid-State Drive
TDP	Thermal Design Power
TPM	Trusted Platform Module
UART	Universal Asynchronous Receiver/Transmitter
uEFI	Unified Extensible Firmware Interface
USB	Universal Serial Bus
WEEE®	Waste Electrical and Electronic Equipment
WES	Microsoft® Windows® Embedded Standard



7.2 References

Table 23: Further Applicable Documents and Links

No.	Name	Rev. / Date	Company
(1)	PICMG® COM0 COM Express™ Module Base Specification	Rev. 2.1, May 14, 2014	PICMG®
(2)	PICMG® COM Express™ Carrier Design Guide (available for public download) https://www.picmg.org/wp-content/uploads/PICMG_COMDG_2.0-RELEASED-2013-12-061.pdf	Rev. 2.0, Dec. 6, 2013	PICMG®
(3)	Intel® Download Center: Intel® Ethernet Controller i210 Series https://downloadcenter.intel.com/product/64399/Intel-Ethernet-Controller-I210-Series		Intel®

