MB-COME10-2
User's Manual

MB-COME10-2 UM 0100
2021-06-15

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Rev.	Date	Name	Pos.	Modification
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1. ABOUT THIS MANUAL

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1.4 Imprint

TQ-Systems GmbH
Gut Delling, Mühlstraße 2
D-82229 Seefeld

Tel: +49 8153 9308–0
Fax: +49 8153 9308–4223
E-Mail: Info@TQ-Group
Web: TQ-Group

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 denotes commands, contents, file names, or menu items.

1.8 Handling and ESD Tips

General handling of your TQ-products

	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. 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. Violation of this guideline may result in damage / destruction of the MB-COME10-2 module and be dangerous to your health. Improper handling of your TQ-product would render the guarantee invalid.

Proper ESD handling

	The electronic components of your TQ-product are sensitive to electrostatic discharge (ESD). 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.

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-COME10-2 is a carrier board for COM Express™ modules with Type 10 pinout.
It can be used for panel PCs, embedded computers or as an 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. Because of this – with uniform interfaces and dimensions – the PC system can be easily adapted to suit the requirements of the application. The manifold extension options and storage media, which can be added, offer a high level of flexibility and allow functionalities and performance to be extended easily, quickly and inexpensively.
Typical usage is 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-COME10-2:

Supported Modules:

- COM Express™ Mini Modules with Type 10 pinout

External Interfaces:

- 2 × Gigabit Ethernet (1× 1.0 Gb/s and 1× 2.5 Gb/s)
- 4 × USB (1x Type C with 5 Gb/s; 1x Type A with up to 10 Gb/s, 2x Type A with 480 Mb/s)
- 1 × DisplayPort (DP++)
- Audio (headphone out, line in and microphone in)
- Power Button / Reset

Internal Interfaces:

- LVDS or eDP
- 2 × USB 2.0
- M.2 socket with B key (for SATA SSDs or WWAN modules) (with micro SIM Card support)
- M.2 socket with E key (e.g. for WLAN / Bluetooth cards)
- M.2 socket with M key (for PCIe SSDs)
- SATA interface
- µSD card socket
- 4 serial interfaces (e.g. with RS-232 transceivers)
- CAN interface (galvanically isolated)
- PCIe slot (for PCI add in cards)
- GPIO / I^2C / MISC connectors

Power supply:

- Voltage: 12 V DC ±5 %

Environment:

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

Form factor / dimensions:

- 170 mm × 170 mm (Mini ITX)

2.2 Specification Compliance

The MB-COME10-2 supports modules compliant to the PICMG® COM Express™ Module Base Specification (COM.0 Revision 3.0) with Type 10 pinout.

2.3 Carrier Board Standard Configurations

- **MB-COME10-2-AA**
  COM Express™ Type 10 pinout for evaluation purposes

Other configurations are available on request.

2.4 Accessories

- **DK-USB-TYPA-MOL5**
  Adapter cable from internal USB connector to A-Type receptacle, 150 mm long

- **DK-RS-232-9POL-DSUB-PICOBLADE**
  Adapter cable from internal connector to 9-pin D-Sub male connector, 150 mm long

- **SPI Flash device MX25L25645GM2I-08G**

- **Battery CR2032 lithium coin cell**

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

3. FUNCTION

3.1 Block Diagram

The following illustration shows the block diagram of the MB-COME10-2:

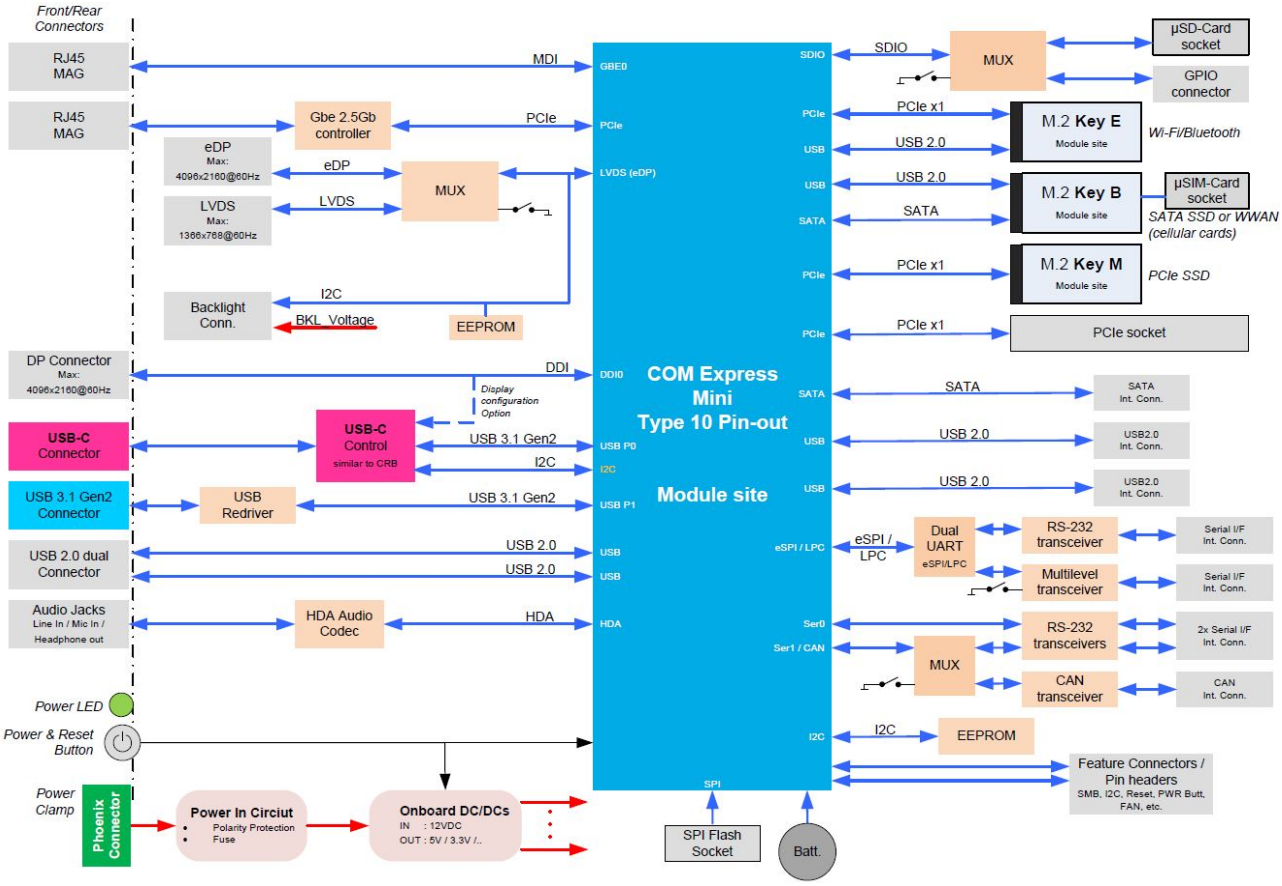

Figure 1: Block Diagram MB-COME10-2

3.2 Electrical Specification

3.2.1 Supply Voltage Characteristics

The MB-COME10-2 requires an input voltage of 12 V DC ±5 %.

The input voltages shall rise from 10 % to 90 % of nominal within 0.1 msec to 20 msec (0.1 msec ≤ Rise Time ≤ 20 msec).

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; e.g., COM Express™ module, mass storage devices, PCIe card, USB devices, display backlight, speakers, etc.

The power consumption of the MB-COME10-2 itself is approximately 2 watts (COM Express™ module supplied externally; UEFI-shell active; no keyboard, no mouse, no mass storage device, no Ethernet cable etc. connected).

The MB-COME10-2 input current is fused with 5 A. The load caused by devices connected to the carrier board should not exceed 50 watts.

Note: Power requirement	
	The power supply for the MB-COME10-2 must be configured with enough reserve. It should be calculated with the maximum power consumption of all connected components.

3.3 Environmental Specification

- Operating temperature, extended: –20 °C to +85 °C
- Storage temperature: –40 °C to +85 °C
- Relative humidity (operating / storage): 10 % to 90 % (not condensing)

3.4 System Components

3.4.1 2.5 Gigabit Ethernet Controller

The MB-COME10-2 provides an Intel® i225IT Ethernet controller with 10/100/1000/2500 Mbps speed and IEEE1588 support.

Please contact support@tq-group.com for further information about the IEEE1588 support.

3.4.2 HD-Audio

The MB-COME10-2 provides a Realtek ALC262 High Definition Audio Codec with a headphone output a line in input a microphone input.

3.4.3 Dual UART

The MB-COME10-2 is equipped with a Fintek F81214 dual UART which supports eSPI and LPC interface. If the connected module supports eSPI and LPC a hardware switch can be used to select LPC or eSPI. The register set of the UART is based on the industry standard 16550 UART. The connected serial ports operate with standard serial port drivers.

3.5 Connectors and Interfaces

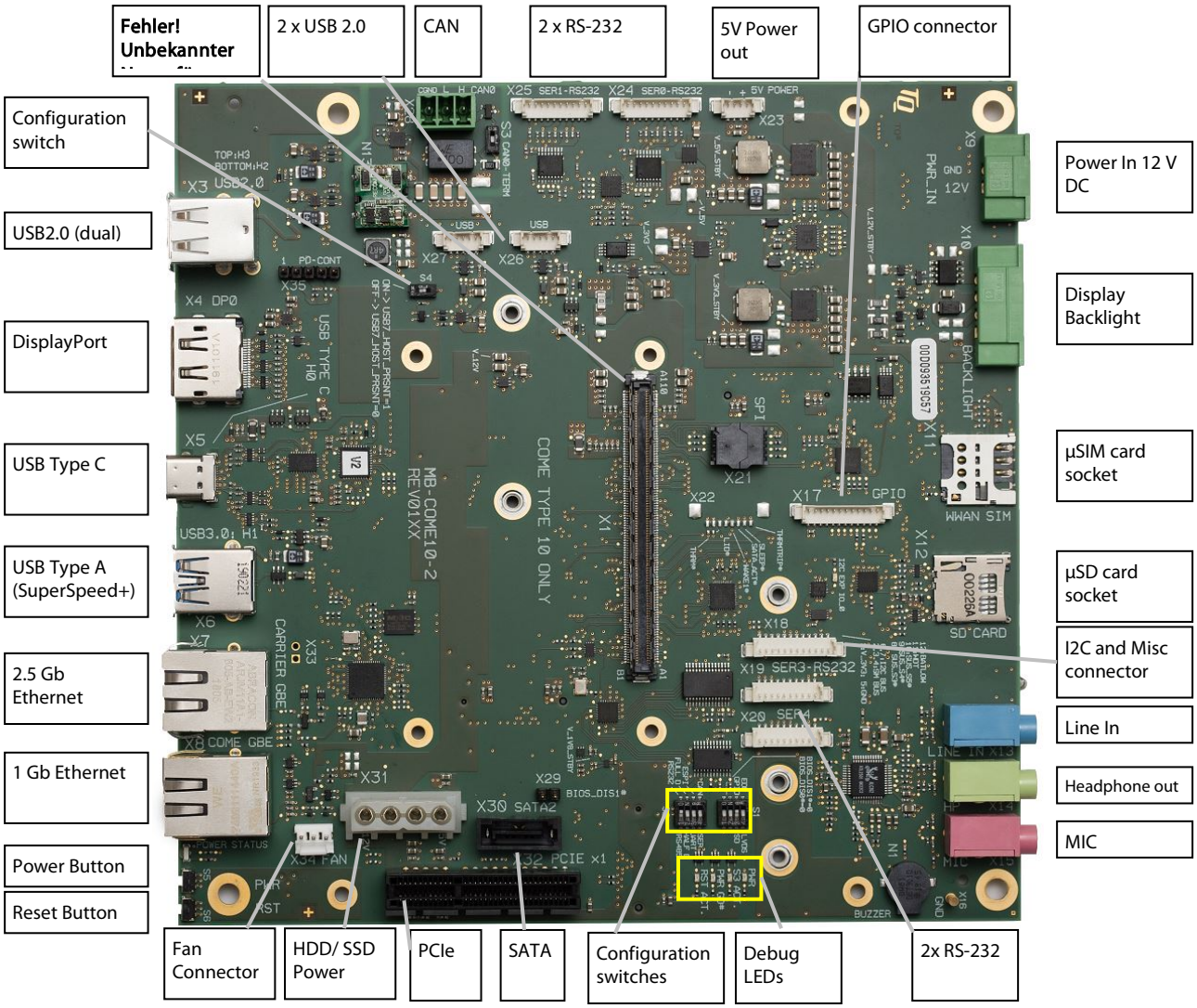

Figure 2: MB-COME10-2, Top

3.5 Connectors and Interfaces (continued)

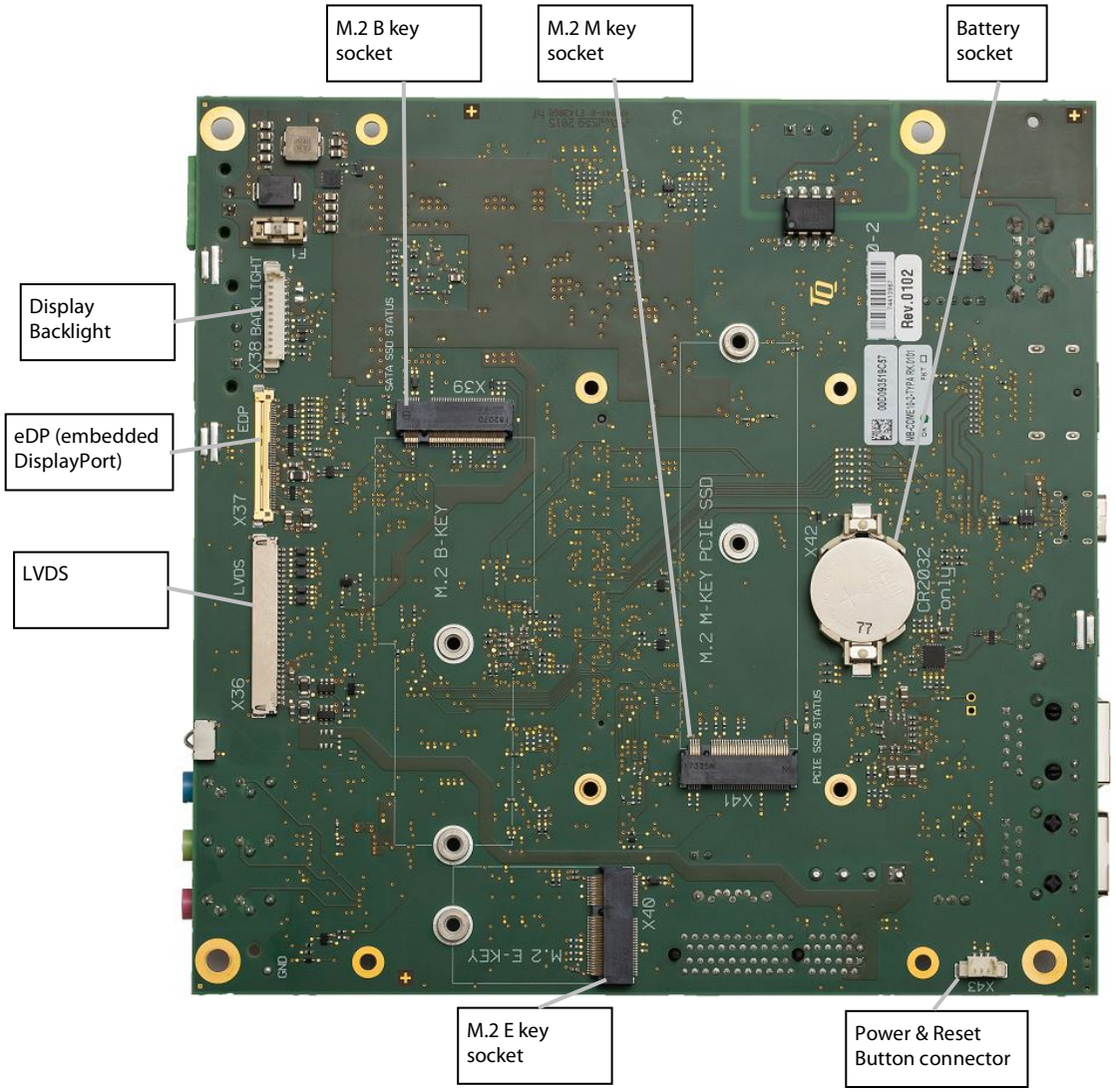

Figure 3: MB-COME10-2, Bottom

3.5.1 Power Supply

The MB-COME10-2 requires a single 12 V DC power supply. The supply voltage should not vary more than ±5 %.

X12: Power-In Connector:

- Connector type: Phoenix MC 1,5/ 2-GF-3,5-LR (1817615)
- Mating connector: e.g. Phoenix FMC 1,5/ 2-STF-3,5 (1966091)

Table 2: Pinout Power-In Connector, X9

Pin	Signal	Remark
1	12 V	Fused @ 5 A
2	GND	–

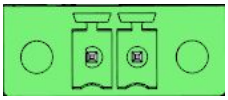

Figure 4: DC Power Supply Connector

3.5.2 DisplayPort

On the MB-COME10-2 there is a DisplayPort interface. The support of the interfaces and 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.

3.5.3 USB Host Interfaces

The MB-COME10-2 supports several USB Host interfaces.

X5: C-Type connector connected to Host 0 of the COM Express™ module. Data rates of up to 5 Gb/s are supported. The USB device and OTG capability is dependent on the connected COM Express™ module.

X6: A-Type connector connected to Host 1 of the COM Express™ module. This port is equipped with a 10 Gb/s redriver and is SuperSpeed+ (USB 3.2 Gen2) capable, if this is supported by the connected COM Express™ module.

X3: Double A-Type (USB2.0) connector for direct usage of USB host ports

X26 / X27: USB host extension connector for usage of a USB host port with an adapter cable

- Connector type: Molex 53398-0571
- Mating connector: Molex 51021-0500 crimp housing

Table 3: Pinout USB Host Extension Connectors

Pin	Signal	Cable Colour
1	+5 V	Red
2	D–	White
3	D+	Green
4	GND	Black
5	GND	–

Figure 5: USB on-board Connectors X26, X27

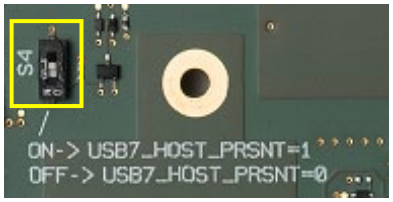

Figure 6: Configuration Switch S4

S4 should be set to OFF for USB Port 7 (X27) host operation

3.5.4 Gigabit Ethernet

The MB-COME10-2 supports one Gigabit Ethernet port. The Ethernet signals of the COM Express™ connector are routed to X8. The maximum supported speed on this connector is 1 Gb/s.

Table 4: Ethernet LEDs, X8

LED	Status	
Left, green (Link)	Off:	No link
	On:	Link established
Right, yellow (ACT)	Off:	No activity
	On:	Activity

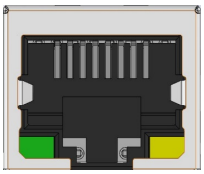

Figure 7: RJ45 Connector X8

3.5.5 2.5 Gigabit Ethernet

An Intel® i225 Ethernet controller with 10/100/1000/2500 Mbps is implemented on the MB-COME10-2. It is connected to X7.

Table 5: Ethernet LEDs, X7

LED	Status	
Left, green (Link)	Off:	No link
	On:	Link established
Right, yellow (ACT)	Off:	No activity
	On:	Activity

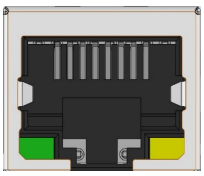

Figure 8: RJ45 Connector X7

3.5.6 Serial Interface (RS-232)

The MB-COME10-2 supports four RS-232 serial port at an on-board connector:

- Connector type: Molex 53398-1071
- Mating connector: Molex 51021-1000 crimp housing

The COM Express™ Specification only provides 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: MB-COME10-2, Serial Port Pin Mapping

COM Express™ Signal	COM Express™ Pin	MB-COME10-2	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]	B91	SER1_RTS#	3.3 V input
SER1_CTS# [1]	B92	SER1_CTS#	3.3 V output

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

3.5.6 Serial Interface (RS-232) (continued)

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-COME10-2 the protection circuit is removed and the serial ports provide a transfer rate of up to 115 kbaud.
The MB-COME10-2 can only be used in combination with Type 10 pinout COM Express™ modules.
For SER1 functionality the corresponding hardware switch on the carrier has to be set to "SER" position.
The SER1 COM Express™ pins are multiplexed with CAN functionality.

Table 7: Serial interfaces on MB-COME10-2

Connector	UART	Remark
X24	Port COM Express™ module SER0	RS-232 transceiver (Rx/Tx/RTS/CTS capable if supported by module)
X25	Port COM Express™ module SER1	RS-232 transceiver (Rx/Tx/RTS/CTS capable if supported by module)
X19	Fintek 81214	RS-232 transceiver (Rx/Tx/RTS/CTS/DTR/DSR/DCD/RI capable)
X20	Fintek 81214	RS-232 / RS-485 transceiver (Rx/Tx/RTS/CTS capable for RS-232)

Table 8: RS-232 Signals

Pin	RS-232 Signal (all signals)	MB-COME10-2	D-Sub connector (with DSUB-Adaptor)
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	–

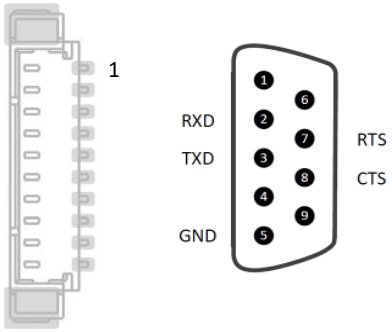

Figure 9: Molex Connector and RS-232 D-SUB Connector

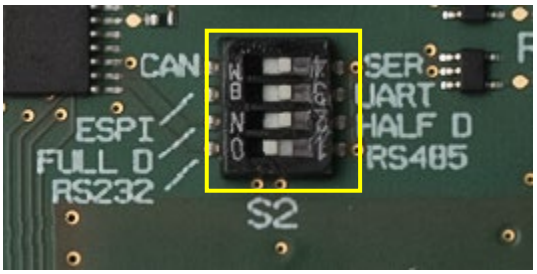

Figure 10: Configuration Switch S2

Configuration Switch S2
S2.4: Switch to "SER" for RS-232 at X25
S2.3: "ESPI" for ESPI UART / "UART" for LPC UART
S2.2: "Full D" for full duplex at X20 / "Half D" for half duplex at X20
S2.1: "RS-232" for RS-232 operation at X20 / "RS-485" for RS-485 at X20

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

3.5.7 Embedded Display Port

The MB-COME10-2 provides an embedded DisplayPort (eDP) interface where suitable displays can be directly connected.
If an eDP COM Express™ module is connected to the MB-COME10-2 the corresponding hardware switch on the carrier has to be set to the "EDP" position. This function is only available with COM Express™ modules, which provide eDP.

Please contact support@tq-group.com for further information about eDP or LVDS support.

X37: eDP connector:

- Connector type: JAE HD1S040HA1
- Mating connector: JAE HD1P040MA1

Table 9: eDP Connector, X37

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 ⇨ I²C
36	V_BLKT	12 V Backlight supply voltage
37	V_BLKT	
38	V_BLKT	
39	V_BLKT	
40	NC	–

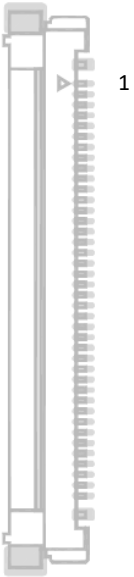

Figure 11: eDP Connector

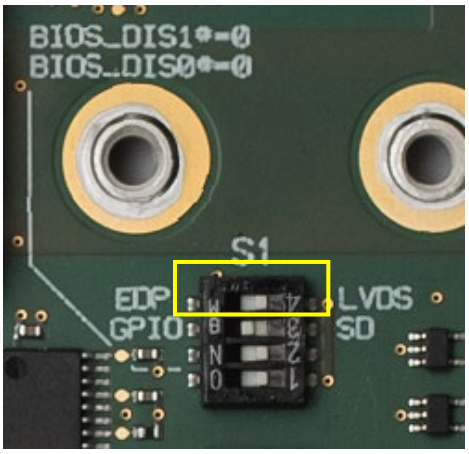

Figure 12: Config Switch S1: eDP/LVDS

3.5.8 LVDS

The MB-COME10-2 provides an LVDS interface where suitable displays can be directly connected.
This functionality is only available if the COM Express™ module used provides LVDS. If an LVDS COM Express™ module is connected to the MB-COME10-2 the corresponding hardware switch on the carrier has to be set to the "LVDS" position.

Connectors to power the backlight of the display are provided on the MB-COME10-2.

The MB-COME10-2 has an on-board EDID EEPROM to store display specific timing information. The EEPROM can be programmed with an I²C programmer.

X36: LVDS connector:
- Connector type: Hirose DF19G-30P-1H
- Mating connector: Hirose DF19-30S-1C

Table 10: LVDS Connector, X36

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[4]
13	B0+	Even bus[4]
14	GND	–
15	B1–	Even bus[4]
16	B1+	Even bus[4]
17	GND	–
18	B2–	Even bus[4]
19	B2+	Even bus[4]
20	BCLK–	Even bus[4]
21	BCLK+	Even bus[4]
22	B3–	Even bus[4]
23	B3+	Even bus[4]
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	

Figure 13: LVDS Connector X36

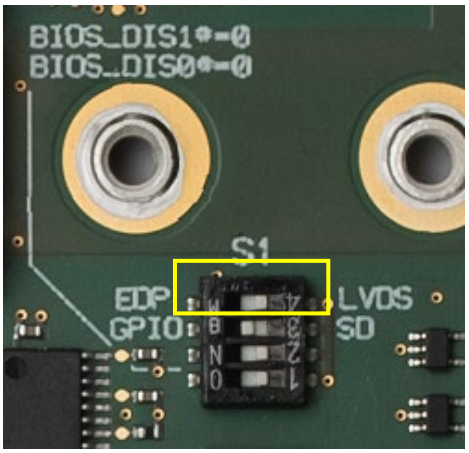

Figure 14: Config Switch S1: eDP/LVDS

4: Not available for COM Express™ Type 10 designs since signal is not defined in COM Express™ specification.

3.5.8 LVDS (continued)

X10: Backlight Power connector:

- Connector type: Phoenix MC 1,5/ 4-GF-3,5-LR (1817631)
- Mating connector: e.g. Phoenix FMC 1,5/ 4-STF-3,5 (1966114)

Table 11: Backlight Power Connector, X10

Pin	Signal	Remark
1	12V_BL	12 V always-on output
2	VCC_IN [5]	Backlight voltage input
3	GND	–
4	VCC_BKLT_OUT	Backlight voltage output

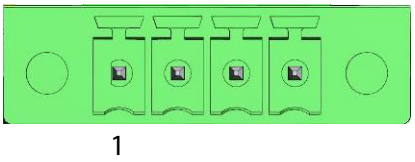

Figure 15: Backlight Power Connector X10

Connect Pin 1 and 2 to use the 12 V of the MB-COME10-2 for the backlight.

X38: Backlight connector:

- Connector type: Molex 53398-1271
- Mating connector: Molex 51021-1200 crimp housing

Table 12: Backlight Connector, X38

Pin	Signal	Remark
1	V_BKLT_OUT	12 V switched output
2		
3		
4	GND	–
5		
6		
7	NC	–
8	BLEN	Backlight Enable output
9	BLT_CTRL	Backlight (brightness) control
10	3V3_PROG [6]	3.3 V input (programming)
11	EDID_CLK [6]	EDID I²C clock
12	EDID_DAT [6]	EDID I²C data

Figure 16: Backlight Connector X38

5: Connect Pin 1 and 2 to use the 12 V of the MB-COME10-2 for the backlight.
6: These pins can be used to program the on-board EDID EEPROM. The EEPROM can be powered by the 3V3_PROG pin.

3.5.9 M.2 Socket with B Key

The MB-COME10-2 provides a socket to support SATA based M.2 SSDs or USB based WWAN modules.
SATA and USB 2.0 interface signals are routed to this socket. A Micro SIM card socket for native support of UMTS or LTE modules is also available.
M.2 with sizes 2280, 2242 or 3042, single and double sided, with B or B+M key can be inserted. Modules with 42 mm length have to be mounted with an additional distance spacer.
The maximum transfer rate of this interface mainly depends on the COM Express™ module used and the connected device.

3.5.10 M.2 Socket with E Key

The MB-COME10-2 provides a socket to support M.2 modules with 22 mm width and 30 mm length.
USB and a PCIe ×1 interface signals are routed to this socket.
M.2 2230 single and double sided modules with E or A+E key can be inserted.
The transfer rate of this interface mainly depends on the COM Express™ module and the connected device.

3.5.11 M.2 Socket with M Key

The MB-COME10-2 provides a socket to support PCIe based M.2 SSDs. with 22 mm width and 80 or 42 mm length.
PCIe x1 interface signals are routed to this socket.
M.2 2280 or 2242 single and double sided modules with M or B+M key can be inserted. Modules with 42 mm length have to be mounted with an additional distance spacer.
The transfer rate of this interface mainly depends on the COM Express™ module and the connected device.

3.5.12 SATA Connector

The MB-COME10-2 provides a standard 7-pin SATA connector where SSDs or HDDs can be connected. For powering these drives with an appropriate adaptor an additional power connector is on the MB-COME10-2.
The transfer rate of this interface mainly depends on the COM Express™ module and the connected device.

3.5.13 PCI Express Socket

The MB-COME10-2 provides a socket to support PCI Express extension cards.
PCIe x1 interface signals are routed to this socket.
The transfer rate of this interface mainly depends on the COM Express™ module and the connected device.

3.5.14 µSD Card

The MB-COME10-2 is equipped with a socket to support micro SD cards.
This functionality is only working if the connected COM Express™ module provides an SD card interface. If a COM Express™ module with SD card interface is connected to the MB-COME10-2 the corresponding hardware switch on the carrier has to be set to the “SD” position.

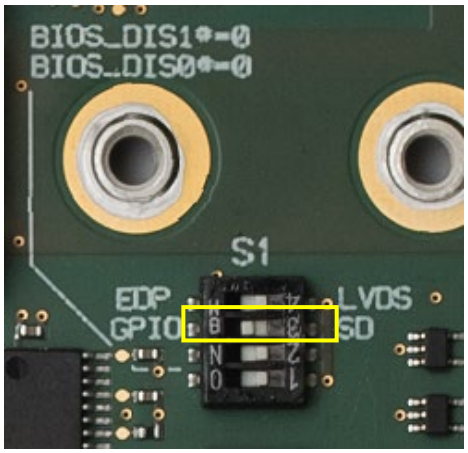

Figure 17: Config Switch S1: GPIO / SD

3.5.15 Audio

The MB-COME10-2 provides an audio codec to support following audio features:

- Headphone out
- Microphone in
- Line in

3.5.16 CAN

The MB-COME10-2 provides one isolated CAN interface.

This functionality is only working if the connected COM Express™ module provides a CAN interface on the SER1_TX and SER1_RX pins. For CAN functionality the corresponding hardware switch on the carrier has to be set to “CAN” position.

Table 13: CAN Connector, X28

Pin	Signal	Remark
1	CAN_H	CAN High
2	CAN_L	CAN Low
3	GND_CAN	Isolated CAN Ground

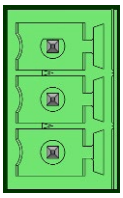

Figure 18: CAN Connector X28

The CAN port can be terminated with 120 Ω. Set switch S3 to “ON” to activate the termination.

3.5.17 Fan Connector

The MB-COME10-2 provides a connector for 12 V fans with a standard 3-pin connector.

Table 14: 12 V Fan Connector, X34

Pin	Signal	Remark
1	GND	–
2	Fan Voltage	Output voltage (0 to 12 V PWM)
3	SENSE	Sense input for fan speed (for open drain outputs of fans)

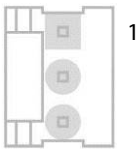

Figure 19: 12 V Fan Connector X34

3.5.18 Power and Reset Button Connector

A power and a reset button can be connected to the MB-COME10-2.

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

Table 15: Power and Reset Button Connector, X43

Pin	Signal
1	PWR_BTN#
2	GND
3	RST_BTN#

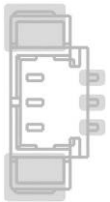

Figure 20: PWR and RST Button Connector X43

3.5.19 GPIO Connector

The MB-COME10-2 provides a connector for access to the COM Express™ module's GPIOs.

This functionality is only working if the connected COM Express™ module provides GPIO functionality. If a COM Express™ module with GPIO functionality is connected to the MB-COME10-2 the corresponding hardware switch on the carrier has to be set to the "GPIO" position.

- Connector type: Molex 53398-1271
- Mating connector: Molex 51021-1200 crimp housing

Table 16: Power and Reset Button Connector, X17

Pin	Signal
1	GPO0
2	GPO1
3	GPO2
4	GPO3
5	GPI0
6	GPI1
7	GPI2
8	GPI3
9	NC
10	NC
11	V_3V3
12	GND

Figure 21: GPIO Connector X17

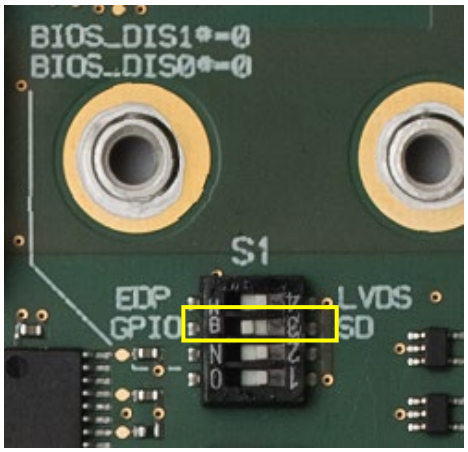

Figure 22: Config Switch S1: GPIO / SD

3.5.20 I²C and Misc Connector

The MB-COME10-2 provides a connector, where the COME I²C, the SMBus and a few COM Express™ signals are available.
This connector is for debug and software development purposes. The user can access to SMBus, I²C bus and a few other signals.

- Connector type: Molex 53261-1271
- Mating connector: Molex 51021-1200 crimp housing

Table 17: I²C and Misc. Connector, X18

Pin	Signal	Remark
1	V_3V3#	3.3 V supply
2	SMB_CK	SM bus clock
3	SMB_DAT	SM bus data
4	SMB_ALERT#	SM bus alert
5	GND	–
6	I2C_CK	COM Express™ I²C bus clock
7	I2C_DAT	COM Express™ I²C bus data
8	SUS_S3#	Suspend to RAM state signal
9	SUS_S4#	Suspend to disk state signal
10	SUS_S5#	Soft off state signal
11	COME_WDT	COM Express™ Watch dog timer
12	BATLOW#	COM Express™ BATLOW signal

Figure 23: I²C and Misc. Connector X18

3.5.21 Debug LEDs

The MB-COME10-2 provides several LEDs for debug purposes.

Table 18: Debug LEDs

Function	PCB Text	Remark
Power	PWR	Green, when 12 V input power is present
SUS S3	S3 act.	Green, when module is in power-saving mode S3 (Suspend to RAM)
Power Good #	PWR GD#	Green, when no PWR_OK signal is sent to module (means power fail/off on carrier board)
Reset active	RST ACT.	Green, when Reset is asserted
Power Status	POWER STATUS	Off: Carrier is not powered Green: Module in operation (S0 state) Orange: Module is turned off or in sleep state (S5: soft off or S3/S4: sleep)

3.5.22 SPI Flash Socket

The MB-COME10-2 provides 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.
It depends on the COM Express™ module used whether a certain flash device is supported.
If the "BIOS_DIS1#" jumper is set or the "BIOS_DIS1#" switch is "ON", the BIOS from the SPI flash in the socket is active.

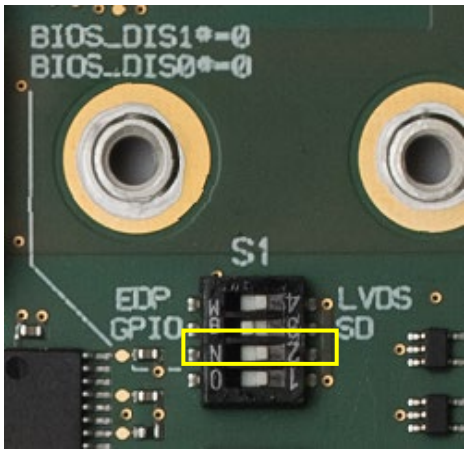

Figure 24: Config Switch S1: BIOS_DIS functionality

3.5.23 COM Express™ Connector

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

4. MECHANICS

4.1 Dimensions

The dimensions are according to Mini-ITX form factor, which is 170 × 170 mm².
The following illustration shows the dimensions of the MB-COME10-2.

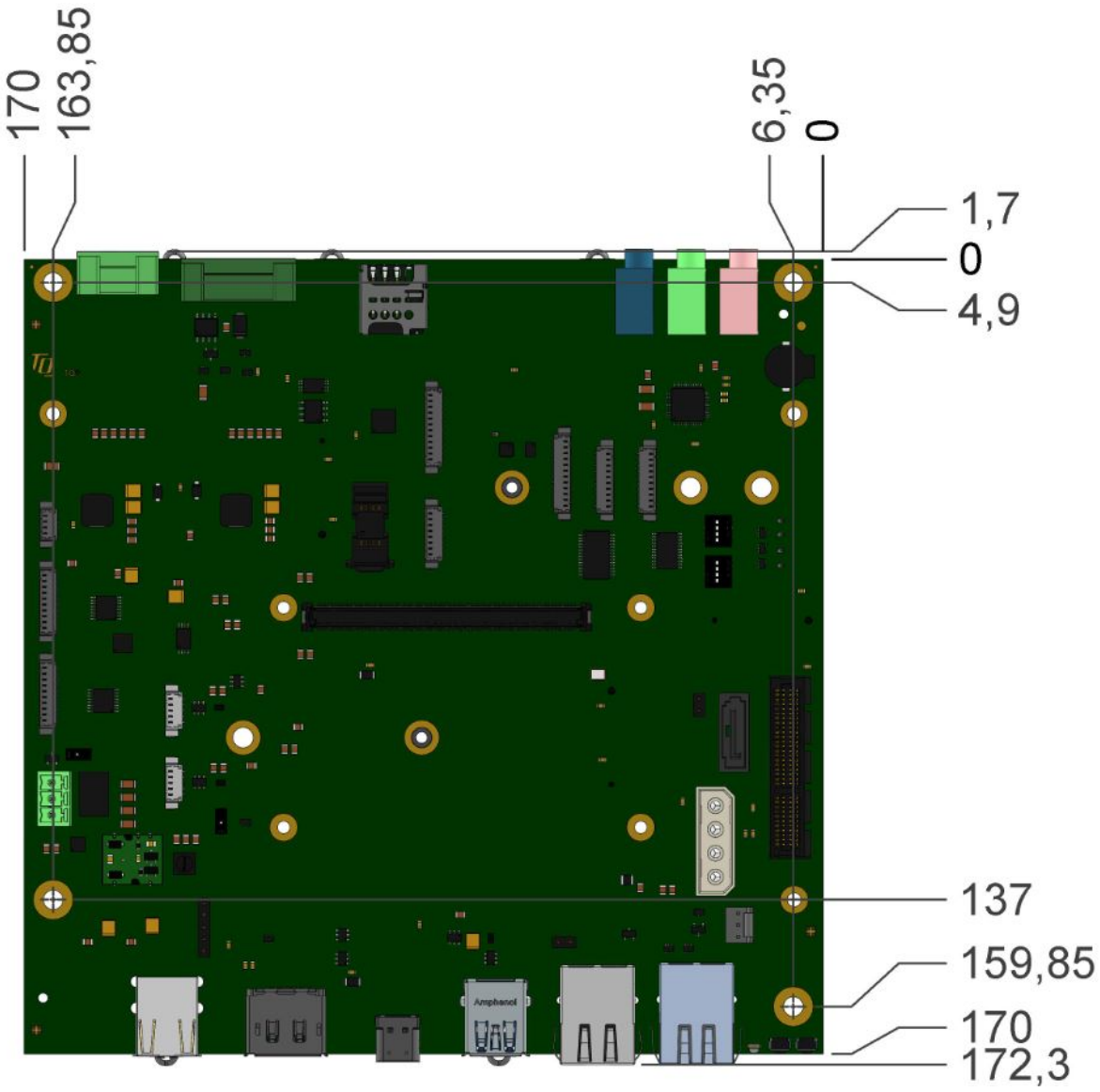

Figure 25: MB-COME10-2 Dimensions

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

4.2 Protection Against External Effects

The MB-COME10-2 is not protected against dust, external impact and contact (IP00).
Adequate protection has to be provided by the overall 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 I²C and COME connector.
The following table shows the I²C address mapping for the General Purpose I²C bus:

Table 19: I²C Address Mapping General Purpose I²C Bus

8-bit Address	Function	Device	Remark
0xAE	EEPROM	24AA32ATE	COM Express™ Carrier EEPROM
0xE0	GPIO Expander	PCA9538ABS	8-bit I/O Expander e.g. for software test purposes

5.1.2 SMBus

The SMBus (System Management Bus) on the MB-COME10-2 is routed to the i225 Ethernet controller.
The SMBus can be connected to the PCIe clock buffer, the PCIe slot and the M.2 E key socket by resistor assembly options.
The SMBus is also accessible at the I²C and Misc connector.
The following table shows the I²C address mapping for the COM Express™ SMBus port:

Table 20: I²C Address Mapping COM Express™ SMBus Port

8-bit Address	Function	Device	Remark
0xA2	Ethernet controller	Intel i225	–
0xC4	PCIe Clock buffer	Silicon Labs SI53106	–

5.2 Operating Systems

5.2.1 Supported Operating Systems

The MB-COME10-2 supports various Operating Systems:

- Microsoft® Windows® 10
- Linux (i.e. Ubuntu 20.10 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-COME10-2 module is well supported by the Standard Operating Systems, which already include most of the drivers required. 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 and Intel® i225IT 2.5 Gigabit Ethernet controllers can be downloaded at this Intel® page:

- Intel® Download Center: Intel® Ethernet Controller Series
  https://downloadcenter.intel.com/download/22283/Intel-Ethernet-Adapter-Complete-Driver-Pack

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

6. SAFETY REQUIREMENTS AND PROTECTIVE REGULATIONS

6.1 EMC

The MB-COME10-2 was developed according to the requirements of electromagnetic compatibility (EMC). Depending on the target system, anti-interference measures may still be necessary to guarantee that the limits for the overall system including housing are met.

6.2 ESD

In order to avoid interspersion 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-COME10-2, no special preventive measures are taken.

6.3 Shock & Vibration

The MB-COME10-2 is designed to be insensitive to shock, vibration and impact.

6.4 Operational Safety and Personal Security

Due to the occurring voltages (≤20 V DC), tests with respect to the operational and personal safety have not been carried out.

6.5 Reliability and Service Life

The MTBF according to MIL-HDBK-217F N2 is 401,843 hours, Ground Benign, at +40 °C.

7. ENVIRONMANT PROTECTION

7.1 RoHS

The MB-COME10-2 is manufactured RoHS compliant.

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

7.2 WEEE®

The final distributor is responsible for compliance with the WEEE® regulation.

Within the scope of the technical possibilities, the MB-COME10-2 was designed to be recyclable and easy to repair.

7.3 REACH®

The EU-chemical regulation 1907/2006 (REACH® regulation) stands for registration, evaluation, certification and restriction of substances SVHC (Substances of very high concern, e.g., carcinogen, mutagen and/or persistent, bio accumulative and toxic). Within the scope of this juridical liability, TQ-Systems GmbH meets the information duty within the supply chain with regard to the SVHC substances, insofar as suppliers inform TQ-Systems GmbH accordingly.

7.4 EuP

The Eco Design Directive, also Energy using Products (EuP), is applicable to products for the end user with an annual quantity >200,000. The MB-COME10-2 must therefore always be seen in conjunction with the complete device. The available standby and sleep modes of the components on the MB-COME10-2 enable compliance with EuP requirements for the MB-COME10-2.

7.5 Battery

No batteries are assembled on the MB-COME10-2 by default. The MB-COME10-2 provides a battery socket, which can be equipped with a CR2032, 3.0 V lithium coin cell. The MB-COME10-2 provides current limiting circuitry and protection against reverse current.

7.6 Packaging

The MB-COME10-2 is delivered in reusable packaging.

7.7 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.

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.

Capacitors and transformers containing PCB (polychlorinated biphenyls) are not used.

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.

8. APPENDIX

8.1 Acronyms and Definitions

The following acronyms and abbreviations are used in this document.

Table 21: Acronyms

Acronym	Meaning
ATA	Advanced Technology 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	Display Port
DP	DisplayPort
DVI	Digital Visual Interface
ECC	Error-Correcting Code
EDID	Extended Display Identification Data
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
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface
HPD	Hot Plug Detect
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
I^2C	Inter-Integrated Circuit
IEEE®	Institute of Electrical and Electronics Engineers
IP	Ingress Protection
IRQ	Interrupt Request
iRTC	Industrial Real Time Clock
LED	Light Emitting Diode
LP	Low-Profile
LPC	Low Pin Count
LTE	Long Term Evolution
LVDS	Low Voltage Differential Signal

8.1 Acronyms and Definitions (continued)

Table 21: 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
RAM	Random Access Memory
RMA	Return Merchandise Authorization
RoHS	Restriction of (the use of certain) Hazardous Substances
RS-232	Recommended Standard (serial interface)
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
SIM	Subscriber Identity Module
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
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
VGA	Video Graphics Array (640 × 480)
WEEE®	Waste Electrical and Electronic Equipment
WES	Microsoft® Windows® Embedded Standard
WLAN	Wireless Local Area Network
WWAN	Wireless Wide Area Network

8.2 References

Table 22: Further Applicable Documents and Links

No.	Name	Rev. / Date	Company
(1)	PICMG® COM0 COM Express™ Module Base Specification	Rev. 3.0 / Mar. 31, 2017	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 Series https://downloadcenter.intel.com/download/22283/Intel-Ethernet-Adapter-Complete-Driver-Pack	– current –	Intel®

TQ-Systems GmbH
Mühlstraße 2 l Gut Delling l 82229 Seefeld
info@tq-group.com l www.tq-group.com

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