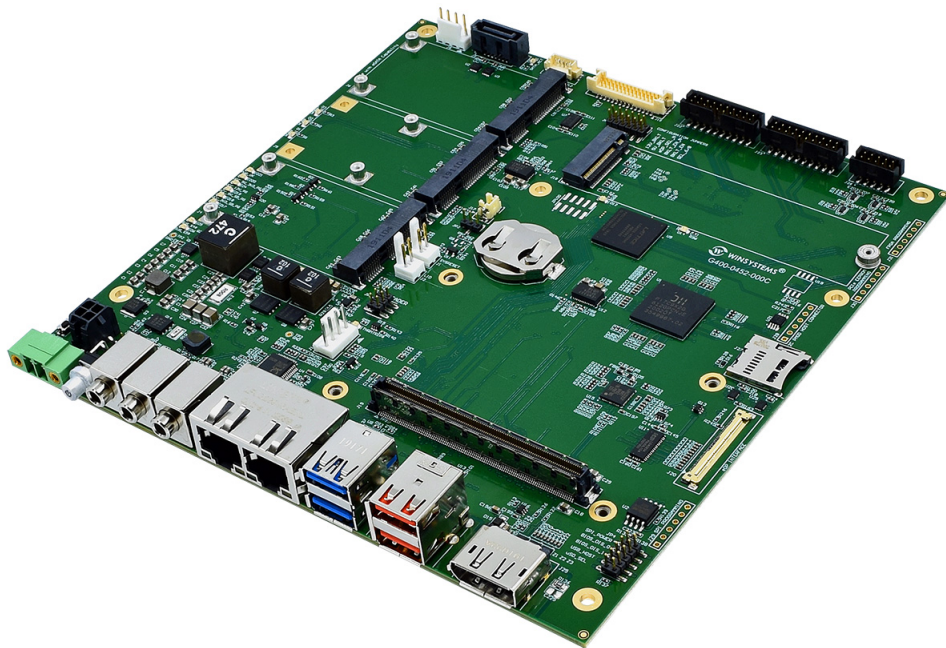


# ITX-M-CC452-T10

Industrial Mini-ITX Carrier Reference Board  
for COM Express Type 10 Module with  
Dual Ethernet, NVMe, and PCIe Expansion

## Product Manual



## Revision History

Document Version	Last Updated Date	Brief Description of Change
v1.0	9/22/2021	Initial release

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# 1. Before You Begin

Review the warnings in this section and the best practice recommendations (see “Best Practices” on page 31) when using and handling the WINSYSTEMS ITX-M-CC452-T10 board. Following these recommendations provides an optimal user experience and prevents damage. Read through this document and become familiar with the ITX-M-CC452-T10 before proceeding.



FAILING TO COMPLY WITH THESE BEST PRACTICES MAY DAMAGE THE ITX-M-CC452-T10 AND VOID YOUR WARRANTY.

## 1.1 Warnings

Only qualified personnel should handle the ITX-M-CC452-T10. While observing best practices, pay particular attention to the following:



### **Avoid Electrostatic Discharge (ESD)**

Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

# 2. Introduction

This manual provides configuration and usage information for the ITX-M-CC452-T10. If you still have questions, contact Technical Support at +1 (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

Refer to the WINSYSTEMS website at <https://www.winsystems.com/product/itx-m-cc452-t10/> for other accessories (including cable drawings and pinouts) that can be used with your ITX-M-CC452-T10.

# 3. Functionality

The ITX-M-CC452-T10 is an industrial Mini-ITX small form factor Type 10 reference carrier board designed to fully test WINSYSTEMS' COMeT10-3900 COM Express Type 10 Mini module. The carrier board adheres to the PICMG COM Express specifications providing compatibility with other COM Express mini type 10 modules.

## 4. Features

The ITX-M-CC452-T10 provides the following features.

### **Carrier Reference Board**

Compatibility for:

- COM Express mini Type 10 module
- COM Express compact Type 10 module

### **Video Interfaces (supports two simultaneous displays)**

- 1x DisplayPort
- 1x eDP interface
  - 8-bit color panel support
- 1x single-channel, low-voltage differential signaling (LVDS)
  - 6-bit and 8-bit color panel support

NOTE The eDP and LVDS interfaces cannot be used at the same time. The COMeT10-3900 or equivalent Type 10 COM module dictates which interface is being used.

### **Ethernet**

- 1x Gigabit Intel i210 Ethernet port from COM module
- 1x Gigabit Intel i210 from PCIe switch onboard ITX-M-CC452-T10
- Wake-on-LAN support, both channels

### **Storage**

- M.2 M-key 2280 with support for PCIe x4 NVMe
- SATA III (6 Gb/s)
- mSATA SSD (Mini PCIe card)
- microSD (muxed with GPIO lines)

### **Bus Expansion**

- 2x Mini PCIe card (mPCIe, USB)
- 1x Mini PCIe card (mPCIe, USB, mSATA)
- 1x SPI bus
- 1x I2C bus

## On-Board I/O

Supported from Type 10 Module	Provided by ITX-M-CC452-T10
2x TTL serial ports	<ul style="list-style-type: none"> <li>2x RS232 serial ports (3-wire) provided by onboard RS232 transceivers</li> </ul>
LPC bus	<ul style="list-style-type: none"> <li>2x RS232/422/485 serial ports (4-wire) provided by multi-protocol transceivers</li> </ul>
5x USB 2.0 and 2x 3.2 Gen 1 ports	<ul style="list-style-type: none"> <li>2x USB 3.2 Gen 1 ports (front panel I/O)</li> <li>2x USB 2.0 ports (front panel I/O)</li> <li>3x USB2.0 ports (mini-cards #1-3)</li> </ul>
GPIO signals	<ul style="list-style-type: none"> <li>4x general purpose input (GPI)</li> <li>4x general purpose output (GPO)</li> </ul>
HD audio signals	<ul style="list-style-type: none"> <li>Onboard HDA codec providing line out, line in, mic (front panel I/O)</li> </ul>
Speaker output	<ul style="list-style-type: none"> <li>Onboard speaker output for beep tones</li> </ul>

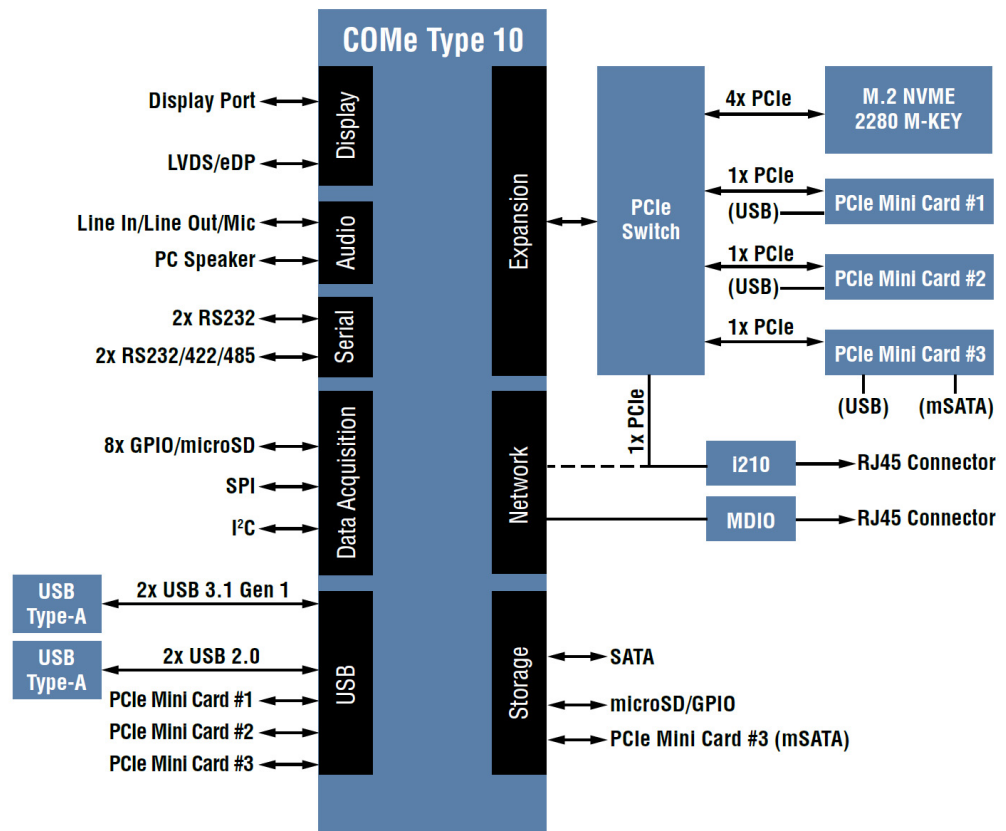
## Power

- Supports a wide range DC input power: 5 V to 20 V
- External battery connector or on-board button cell battery, operates with no battery connected
- +5 V and +12 V SATA power

## Industrial Operating Temperature

- -40 to +85°C (-40 to +185°F)

## 4.1 System Block Diagram



This full-featured reference carrier board supports two independent video displays (DisplayPort and LVDS/eDP), dual Gigabit Ethernet, two USB 3.2 Gen 1 ports, two USB 2.0 ports, four general-purpose inputs, four general-purpose outputs, stereo audio, and a watchdog timer.

The board also includes expansion capabilities via three Mini-PCIe socket (one with mSATA support), M.2 M-key 2280 with support for PCIe x4 NVMe SSD drives, and a SATA port for external SSDs.

The ITX-M-CC452-T10 is a fully production ready platform and is a versatile and easily configured solution with customizable COM module, storage, and I/O options to suit the industrial use case. With design details available, the ITX-M-CC452-T10 is also an excellent reference design and evaluation carrier board for WINSYSTEMS Type 10 COM Express modules.

The ITX-M-CC452-T10 supports Linux, Windows 10, DOS, and x86-compatible real-time operating systems. Drivers are available from the WINSYSTEMS website.



## 5. Specifications

The ITX-M-CC452-T10 adheres to the following specifications and requirements.

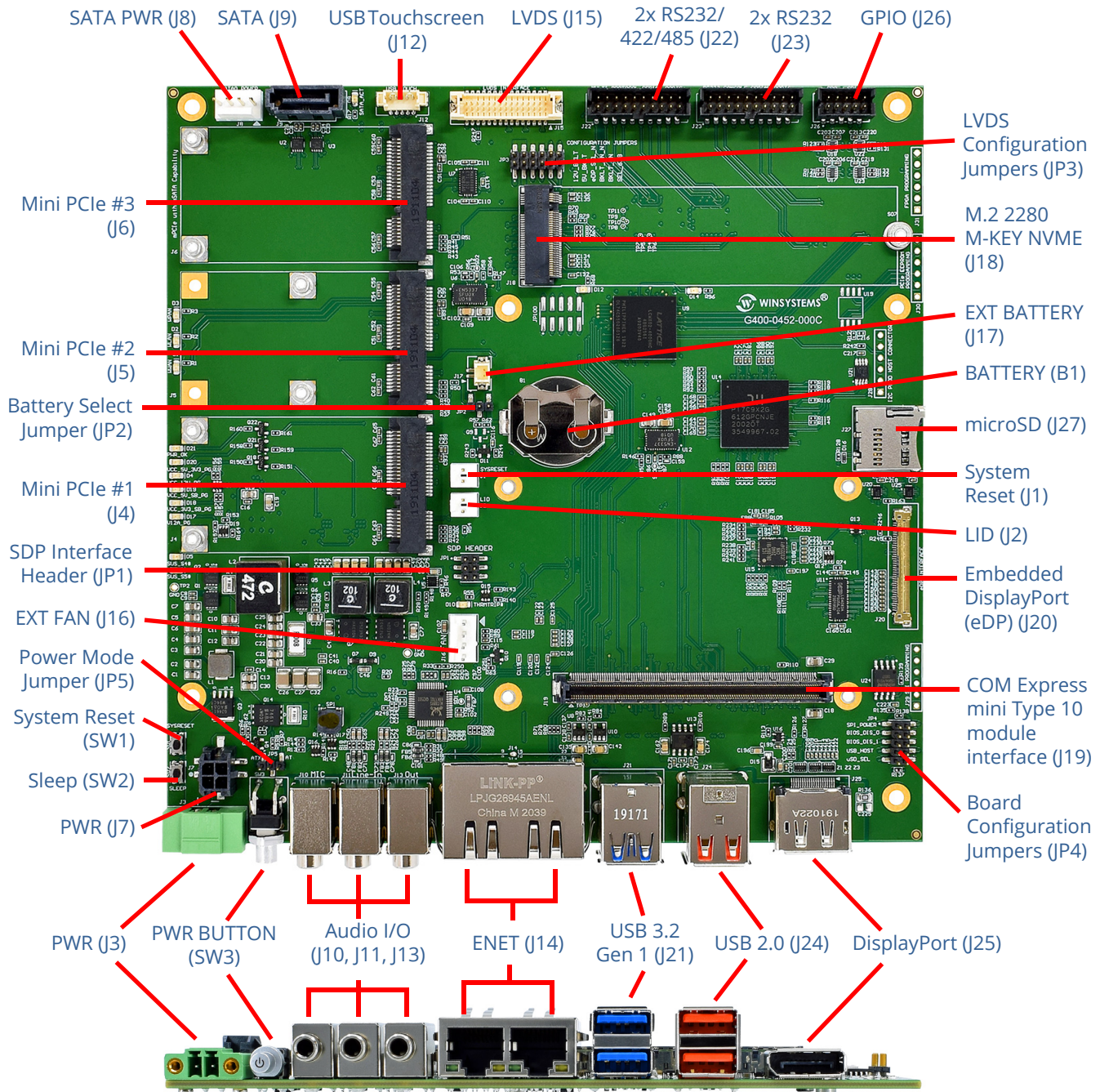
Feature	Specification
<b>Electrical</b>	
V <sub>CC</sub>	Wide range DC input: 9 V to 20 V
Models	<b>ITX-M-CC452-T10-m-t</b> <b>m</b> = Module installed (0 = no module is default) <b>t</b> = Thermal solution installed (0 = no thermal solution is default)
<b>Mechanical</b>	
Dimensions	6.7 in x 6.7 in. (170 x 170 mm) (Mini-ITX)
Weight	8 oz. (225 g), without COMe module
PCB thickness	0.078 in. (2 mm)
<b>Environmental</b>	
Temperature	-40 to +85°C (-40 to +185°F)
Humidity (RH)	5% to 95% non-condensing
RoHS compliant	Yes

## 6. Configuration

This section describes the ITX-M-CC452-T10 components and configuration.

### 6.1 Component Layout

#### 6.1.1 Top and Side View



Item	Description	Reference
<b>Power</b>		
J3	Power input	page 15
J7	Power input header	page 16
J17	CMOS battery input	page 16
B1	Internal coin cell battery	page 17
J8	SATA power output	page 18
J16	External fan power output	page 18
SW3	Power button	page 19
J1, SW1	System reset button	page 19
J2	Lid	page 19
SW2	Sleep button	page 19
<b>Storage</b>		
J18	M.2 Socket 3, with M Key, Type 2280 NVMe	page 19
J6	Mini PCIe #3 connector with mSATA support	page 19
J9	SATA 3 (6 Gbps)	page 19
J27	microSD	page 20
<b>Video and Audio</b>		
J25	DisplayPort	page 20
J20	Embedded DisplayPort (eDP)	page 21
J15	LVDS and backlight	page 22
J10, J11, J13	Audio I/O	page 23
SP1	Speaker	page 23
<b>System I/O</b>		
J19	COM Express mini type 10 module interface	page 24
J14	Ethernet (RJ45) 1 and 2	page 26
J21	USB 3.2 Gen 1 Type-A	page 26
J24	USB 2.0 Type-A	page 26
J12	USB touchscreen	page 26
J23	Serial RS232 ports 1 and 2 (3-wire)	page 27
J22	Serial RS232/422/485 ports 3 and 4	page 27
J26	GPIO	page 28
J4	Mini PCIe #1 connector	page 29
J5	Mini PCIe #2 connector with network LEDs	page 29
J6	Mini PCIe #3 connector with mSATA support	page 29
<b>Configuration Jumpers</b>		
JP1	SDP interface header	page 13
JP2	Battery select jumper	page 13
JP3	LVDS configuration jumpers	page 14
JP4	Board configuration jumpers	page 14
JP5	Power mode jumper	page 14

## 6.2 Configuration and Installation

When installing a Type 10 COM module onto a compatible COM Express Type 10 carrier board, follow the instructions below to ensure that there is no damage to the COM module or the carrier board.



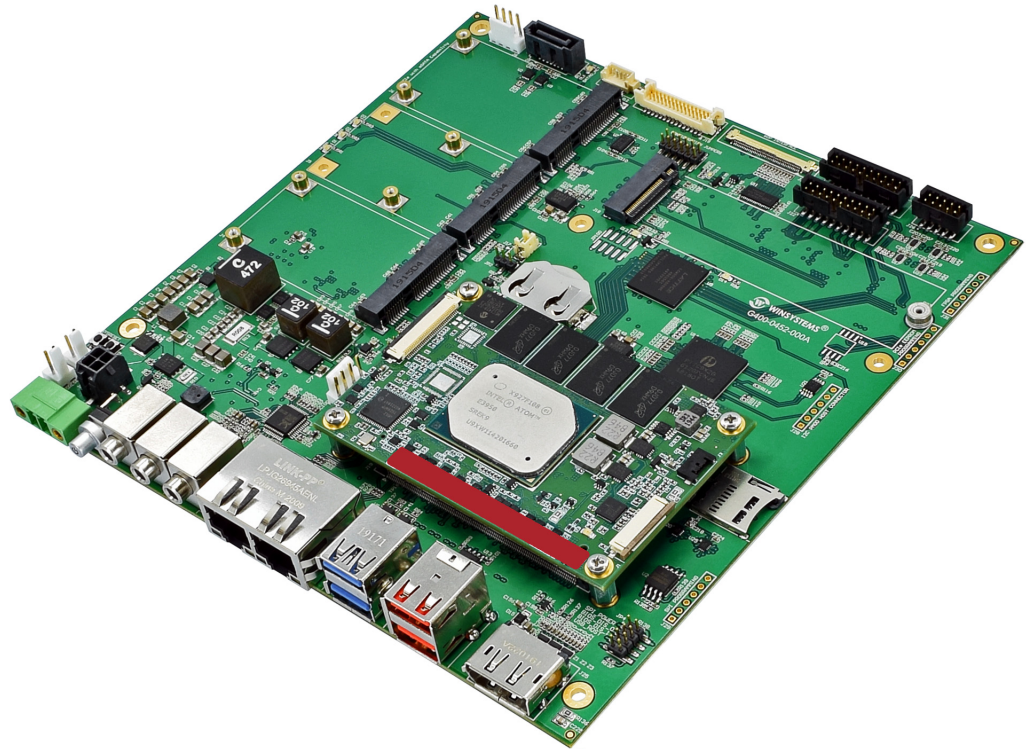
### Avoid Electrostatic Discharge (ESD)

Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

1. Align the COM module standoffs with the mounting holes on the carrier board.
2. Ensure that the COM Express Type 10 mini interface connector is nicely seated in the COMe connector socket on the carrier board.
3. Apply pressure to the red region denoted in the following figure.

**NOTE** To minimize board flex on the carrier board, make sure the carrier board is supported on the opposite side prior to applying pressure to the COM module.

4. Insert and tighten down the screws supplied with your COM module's heat spreader/ heat sink.

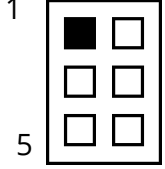


## 6.3 Jumpers

### 6.3.1 JP1 - SDP Interface Header

The ITX-M-CC452-T10 has four software-defined pins (SDPs) that can be used for IEEE1588 auxiliary device connections, enable/disable of the device, and for other miscellaneous hardware or software-control purposes.

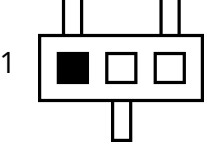
#### Layout and Pin Reference

Diagram	Pin	Name
	1	SDP0
	2	SDP1
	3	SDP2
	4	SDP3
	5	GBE_SDP
	6	GND

### 6.3.2 JP2 - Battery Select Jumper

Select external battery connection or internal button cell battery for standby power for the real-time clock.

#### Layout and Pin Reference

Diagram	Selection	Jumper Position
	External battery	1 - 2
	Internal button cell battery	2 - 3 (default)

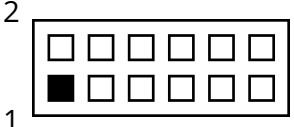


### 6.3.3 JP3 - LVDS Configuration Jumpers

NOTE Do NOT install jumpers 1 - 2 and 3 - 4 at the same time.

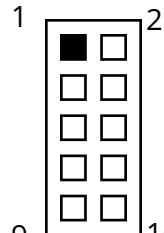
NOTE Do NOT install jumpers 7 - 8 and 9 - 10 at the same time.

#### Layout and Pin Reference

Diagram	Selection	Jumper Position
	12V output for backlight	1 - 2
	5V output for backlight	3 - 4
	eDP Select (installed) / LVDS Select (removed)	5 - 6
	Backlight enable active low	7 - 8
	Backlight enable active high	9 - 10
	LVDS 6-bit (installed) / 8-bit (removed)	11 - 12

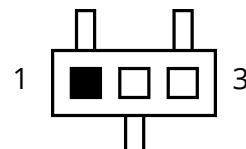
### 6.3.4 JP4 - Board Configuration Jumpers

#### Layout and Pin Reference

Diagram	Selection	Jumper Position
	SPI_POWER	Must be installed for normal operation. Remove if trying to externally program the SPI on the carrier.
	BIOS_DIS_0	Refer to COMe spec for BIOS_DIS options.
	BIOS_DIS_1	
	USB_HOST	Refer to COMe spec.
	uSD_SEL	Select uSD support (installed), disabling GPIO support.

### 6.3.5 JP5 - Power Mode Jumper

#### Layout and Pin Reference

Diagram	Selection	Jumper Position
	ATX Mode	1 - 2
	AT Mode	2 - 3 (default)

## 6.4 LED Indicators

D1-D3 are for WiFi mini-cards to indicate activity.

LED	Description	Color
D1	MiniCard WWAN	Red
D2	MiniCard WLAN	Red
D3	MiniCard WPAN	Red
D4	12 V power good indicator	Red
D5	Suspend state S4	Yellow
D6	Suspend state S5	Yellow
D8	SATA activity (from module)	Red
D10	Thermal trip	Red
D12	M.2 activity	Red
D14	FPGA activity	Green
D17	V12A power good	Red
D18	V3.3_SB power good	Red
D19	V5_SB power good	Red
D20	VS power good	Red
D21	Power OK to COM module	Green

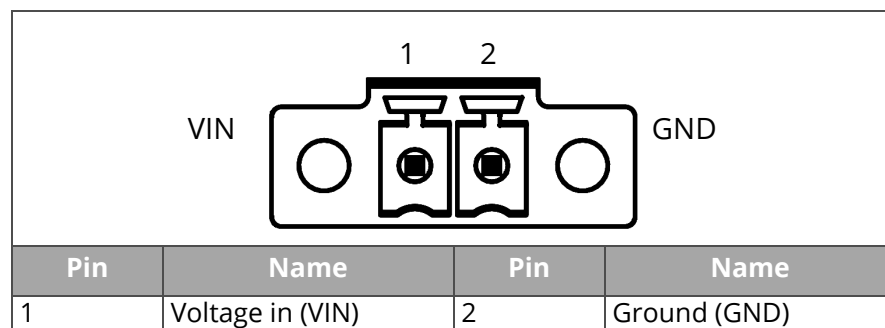
## 6.5 Connectors

### 6.5.1 J3 - Power Input

Use this connection to supply power to the ITX-M-CC452-T10. This computer supports a wide range DC input power from 9 V to 20 V.

NOTE Do not plug power into **J3** and **J7** at the same time.

#### Layout and Pin Reference



#### Connector

- Phoenix Contact Terminal Block Header  
Part Number: 1827868

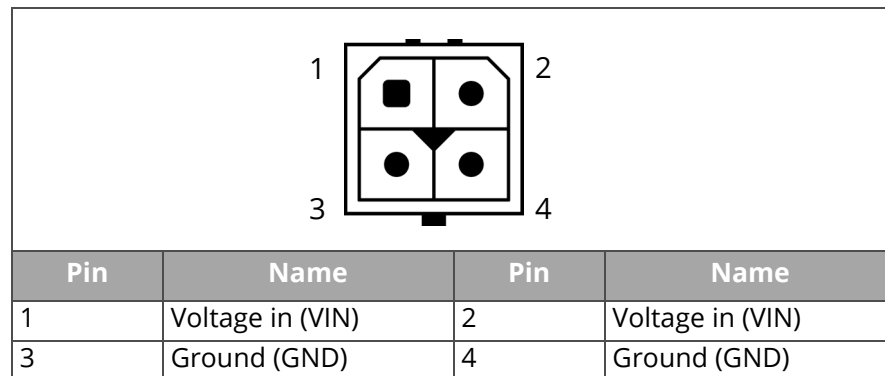
**Matching Connector**

- Phoenix Contact Terminal Block Plug  
Part Number: 1827703

**6.5.2 J7 - Power Input Header**

Use this connection to supply power to the ITX-M-CC452-T10. This computer supports a wide range DC input power from 9 V to 20 V.

NOTE Do not plug power into **J3** and **J7** at the same time.

**Layout and Pin Reference****Connector**

- Molex Micro-Fit 3.0 vertical header  
Part Number: 43045-0418

**Matching Connector**

- Molex Micro-Fit 3.0 receptacle housing  
Part Number: 43025-0400

**6.5.3 J17 - CMOS Battery Input**

An external battery connected to the ITX-M-CC452-T10 provides standby power for the real-time clock. An extended temperature lithium battery is available from WINSYSTEMS, part number BAT-LPC-BR2330.


A power supervisory circuit controls an internal power switch to route the battery or standby voltage to the RTC. If power is removed from the



system, or the power input voltage drops below the battery voltage, the RTC circuit automatically fails over to battery power.

NOTE Do not use **J17** and **B1** at the same time.

### Layout and Pin Reference

Pin	Name
	
1	VBAT
2	GND

### Connector

- Hirose DF13 series 1.25 mm 2-pin  
Part Number: DF13C-2P-1.25V (51)

### Matching Connector

- Hirose DF13C 1.25 mm 2-pin  
Part Number: DF13C-2S-1.25C

## 6.5.4 B1 - Internal Coin Cell Battery

The ITX-M-CC452-T10 accepts an external battery at **J17** or an internal coin cell battery at **B1**. Battery input is configured using jumper **JP2**. See “JP2 - Battery Select Jumper” on page 13.


### B1 Battery type

CR2032 coin cell battery

### 6.5.5 J8 - SATA Power Output

Power is supplied to the SATA device via the connector at **J8**.

#### Layout and Pin Reference

Pin	Name	Pin	Name
			
1	+5 V	2	GND
3	GND	4	+12 V

#### Connector

- Hirose DF11 series 2.00 mm dual-row 4-pin  
Part Number: DF11C-4DP-2V(57)


#### Matching Connector

- Hirose DF11 series 2.00 mm crimping socket 4-pin  
Part Number: DF11-4S-2C

### 6.5.6 J16 - External Fan Power Output

NOTE Errata on pinout. Subject to change on next revision.

#### Layout and Pin Reference

Pin	Name
	
1	GND
2	12 VCC
3	TACH
4	PWM

#### Connector

- Hirose DF13 series 1.25 mm 3-pin  
Part Number: DF13C-3P-1.25V (51)

#### Matching Connector

- Hirose DF13C 1.25 mm 3-pin  
Part Number: DF13C-2S-1.25C

### 6.5.7 SW3 - Power Button

The ITX-M-CC452-T10 turns on automatically when power is applied to the computer and does not require the power button to be pressed.

The power button connector can be used to wake the computer after shutdown, sleep, or system standby if power is not removed. A momentary switch that shorts the power pin and GND pin together activates the power button input.

This power button also functions with operating system power options, such as safely shutting down the computer or putting the computer to sleep.

Holding the power button for roughly 5 seconds performs a hard reset to the computer.

### 6.5.8 J1, SW1 - System Reset Button

The system reset button (SW1) instantly performs a hard reset to the computer. An external momentary switch attached to **J1** performs the same function.

**NOTE** To avoid potential operating system corruption, use the reset button only when the computer cannot safely shut down or restart due to a software crash or hardware fault. If the reset button operation is desired, an OS write protect filter is highly recommended.

### 6.5.9 J2 - Lid

Shorting the two lid header pins together mimics closing a laptop screen. This power function is configurable in your operating system.

### 6.5.10 SW2 - Sleep Button

The sleep button places the system to sleep. This power function is configurable in your operating system.

### 6.5.11 J18 - M.2 Socket 3, with M Key, Type 2280 NVMe

The M.2 SSD socket provides support for M Key, type 2280 NVMe (PCIe 3.0 x4) storage devices.

### 6.5.12 J6 - Mini PCIe #3 Connector with mSATA Support

The ITX-M-CC452-T10 Mini PCIe socket supports a variety of peripherals as available in this format. This Mini PCIe socket supports PCIe, USB 2.0, and mSATA channel.

### 6.5.13 J9 - SATA 3 (6 Gbps)

The ITX-M-CC452-T10 supports one SATA 3 (6 Gbps) interface.

#### **6.5.14 J27 - microSD**

The ITX-M-CC452-T10 provides a microSD card socket for loading an operating system or for additional storage. The microSD signals are muxed with the GPIO.

#### **6.5.15 J25 - DisplayPort**

Standard full-size 20-pin DisplayPort (Version 1.2).

### 6.5.16 J20 - Embedded DisplayPort (eDP)

The ITX-M-CC452-T10 supports one embedded DisplayPort (eDP) interface.

The eDP and LVDS interfaces cannot be used at the same time. The COMeT10-3900 or equivalent Type 10 COM module dictates which interface is being used.

eDP configuration options are available via jumper **JP3** on page 14. Options include backlight voltage, and backlight enable.

NOTE eDP Select (pins 5 - 6) on **JP3** must be jumpered for eDP operation.

#### Layout and Pin Reference

	Pin	Name	Description	Pin	Name	Description
	1	NC	Not connected	21	VCC	+3.3 VDC
	2	GND	Ground	22	NC	Not connected
	3	TX3-	eDP data 3-	23	GND	Ground
	4	TX3+	eDP data 3+	24	GND	Ground
	5	GND	Ground	25	GND	Ground
	6	TX2-	eDP data 2-	26	GND	Ground
	7	TX2+	eDP data 2+	27	HPD	Hot plug detect
	8	GND	Ground	28	BLK_GND	Ground
	9	TX1-	eDP data 1-	29	BLK_GND	Ground
	10	TX1+	eDP data 1+	30	BLK_GND	Ground
	11	GND	Ground	31	BLK_GND	Ground
	12	TX0-	eDP data 0-	32	BL_Enable	Backlight enable
	13	TX0+	eDP data 0+	33	BL_PWM_DIM	Backlight PWM dimming control
	14	GND	Ground	34	NC	Not connected
	15	AUX+	eDP auxiliary channel+	35	NC	Not connected
	16	AUX-	eDP auxiliary channel-	36	BL_PWR	Backlight power (+5 VDC or +12 VDC)
	17	GND	Ground	37	BL_PWR	Backlight power (+5 VDC or +12 VDC)
	18	VCC	+3.3 VDC	38	BL_PWR	Backlight power (+5 VDC or +12 VDC)
	19	VCC	+3.3 VDC	39	BL_PWR	Backlight power (+5 VDC or +12 VDC)
	20	VCC	+3.3 VDC	40	NC	Not connected

### 6.5.17 J15 - LVDS and Backlight

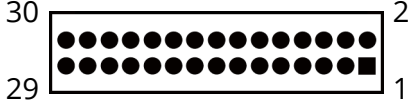
The ITX-M-CC452-T10 supports one single channel LVDS interface.

The eDP and LVDS interfaces cannot be used at the same time. The COMeT10-3900 or equivalent Type 10 COM module dictates which interface is being used.

LVDS configuration options are available via jumper **JP3** on page 14. Options include backlight voltage, backlight enable, and 6-bit or 8-bit operation.

NOTE LVDS Select (pins 5 - 6) on **JP3** must be open for LVDS operation.

#### Layout and Pin Reference

Pin	Name	Description	Pin	Name	Description
					
1	A0+	Channel A - positive LVDS output	2	A1+	Channel B - positive LVDS output
3	A0-	Channel A - negative LVDS output	4	A1-	Channel B - negative LVDS output
5	GND	Ground	6	GND	Ground
7	A2+	Channel C - positive LVDS output	8	A3+	Channel D - positive LVDS output
9	A2-	Channel C - negative LVDS output	10	A3-	Channel D - negative LVDS output
11	GND	Ground	12	GND	Ground
13	CLK+	Positive LVDS clock output	14	SCL	Open-drain DDC data I/O
15	CLK-	Negative LVDS clock output	16	SDA	Open-drain DDC clock I/O
17	GND	Ground	18	GND	Ground
19	NC		20	VCC_LVDS	+3.3 VDC
21	NC		22	VCC_LVDS	+3.3 VDC
23	GND	Ground	24	GND	Ground
25	BKLT_CTRL	Backlight PWM brightness control	26	BKLT_PWR	Backlight power (+5 VDC or +12 VDC)
27	BKLT_EN	Backlight enable	28	BKLT_PWR	Backlight power (+5 VDC or +12 VDC)
29	SEL68	Select 8/6-bit	30	BKLT_PWR	Backlight power (+5 VDC or +12 VDC)

#### Connector

- Hirose DF13 Series 1.25 mm double row 30-pin  
Part Number: DF13EA-30DP-1.25V(51)

#### Matching Connectors

- Hirose DF13C 1.25 mm double row 30-pin  
Part Number: DF13-30DS-1.25C

### 6.5.18 J10, J11, J13 - Audio I/O

Three 1/8th in. (3.5 mm) HD audio jacks are provided. The Type 10 module supports HD audio signals to the ITX-M-CC452-T10, which provides a Realtek ALC888S-VD HD audio codec.

#### Audio Connectors

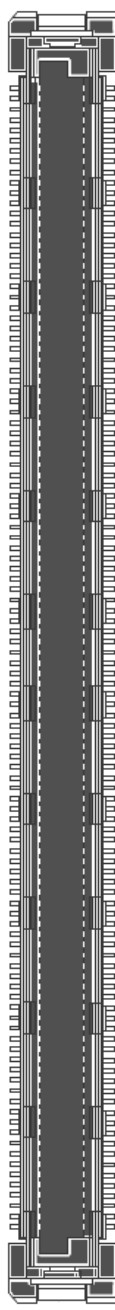
Number	Description
J10	Microphone input
J11	Line input
J13	Line output

### 6.5.19 SP1- Speaker

An on-board speaker, SP500, is available for sound generation. The BIOS activates the speaker to beep during POST failure. Each error has its own unique beep code.

## 6.5.20 J19 - COM Express Type 10 mini Module Interface Connector

### Layout and Pin Reference Row A

	Pin	Description	Pin	Description	Pin	Description
 <p>A1</p> <p>A11</p>	A1	GND(FIXED)	A38	USB_6_7_OC#	A75	LVDS_A2+
	A2	GBE0_MDI3-	A39	USB4-	A76	LVDS_A2-
	A3	GBE0_MDI3+	A40	USB4+	A77	LVDS_VDD_EN
	A4	GBE0_LINK100#	A41	GND(FIXED)	A78	LVDS_A3+
	A5	GBE0_LINK1000#	A42	USB2-	A79	LVDS_A3-
	A6	GBE0_MDI2-	A43	USB2+	A80	GND(FIXED)
	A7	GBE0_MDI2+	A44	USB_2_3_OC#	A81	LVDS_A_CK+
	A8	GBE0_LINK#	A45	USB0-	A82	LVDS_A_CK-
	A9	GBE0_MDI1-	A46	USB0+	A83	LVDS_I2C_CK
	A10	GBE0_MDI1+	A47	VCC_RTC	A84	LVDS_I2C_DAT
	A11	GND(FIXED)	A48	EXCD0_PERST#	A85	GPI3
	A12	GBE0_MDI0-	A49	EXCD0_CPPE#	A86	RSVD
	A13	GBE0_MDI0+	A50	LPC_SERIRQ	A87	eDP_HPD
	A14	GBE0_CTREF	A51	GND(FIXED)	A88	PCIE_CLK_REF+
	A15	SUS_S3#	A52	RSVD	A89	PCIE_CLK_REF-
	A16	SATA0_TX+	A53	RSVD	A90	GND(FIXED)
	A17	SATA0_TX-	A54	GPI0	A91	SPI_POWER
	A18	SUS_S4#	A55	RSVD	A92	SPI_MISO
	A19	SATA0_RX+	A56	RSVD	A93	GPO0
	A20	SATA0_RX-	A57	GND	A94	SPI_CLK
	A21	GND(FIXED)	A58	PCIE_TX3+	A95	SPI_MOSI
	A22	USB_SSRX0-	A59	PCIE_TX3-	A96	TPM_PP
	A23	USB_SSRX0+	A60	GND(FIXED)	A97	TYPE10#
	A24	SUS_S5#	A61	PCIE_TX2+	A98	SER0_TX
	A25	USB_SSRX1-	A62	PCIE_TX2-	A99	SER0_RX
	A26	USB_SSRX1+	A63	GPI1	A100	GND(FIXED)
	A27	BATLOW#	A64	PCIE_TX1+	A101	SER1_TX
	A28	(S)ATA_ACT#	A65	PCIE_TX1-	A102	SER1_RX
	A29	AC/HDA_SYNC	A66	GND	A103	LID#
	A30	AC/HDA_RST#	A67	GPI2	A104	VCC_12V
	A31	GND(FIXED)	A68	PCIE_TX0+	A105	VCC_12V
	A32	AC/HDA_BITCLK	A69	PCIE_TX0-	A106	VCC_12V
	A33	AC/HDA_SDOUT	A70	GND(FIXED)	A107	VCC_12V
	A34	BIOS_DIS0#	A71	LVDS_A0+	A108	VCC_12V
	A35	THRMTRIP#	A72	LVDS_A0-	A109	VCC_12V
	A36	USB6-	A73	LVDS_A1+	A110	GND(FIXED)
	A37	USB6+	A74	LVDS_A1-		



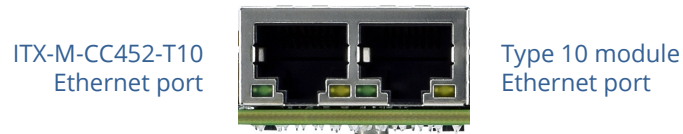
## Layout and Pin Reference Row B

	Pin	Description	Pin	Description	Pin	Description
	B1	GND(FIXED)	B38	USB_4_5_OC#	B75	DDIO_PAIR2+
	B2	GBE0_ACT#	B39	USB5-	B76	DDIO_PAIR2-
	B3	LPC_FRAME#	B40	USB5+	B77	DDIO_PAIR4+
	B4	LPC_AD0	B41	GND(FIXED)	B78	DDIO_PAIR4-
	B5	LPC_AD1	B42	USB3-	B79	LVDS_BKLT_EN
	B6	LPC_AD2	B43	USB3+	B80	GND(FIXED)
	B7	LPC_AD3	B44	USB_0_1_OC#	B81	DDIO_PAIR3+
	B8	LPC_DRQ0#	B45	USB1-	B82	DDIO_PAIR3-
	B9	LPC_DRQ1#	B46	USB1+	B83	LVDS_BKLT_CTRL
	B10	LPC_CLK	B47	EXCD1_PERST#	B84	VCC_5V_SBY
	B11	GND(FIXED)	B48	EXCD1_CPPE#	B85	VCC_5V_SBY
	B12	PWRBTN#	B49	SYS_RESET#	B86	VCC_5V_SBY
	B13	SMB_CK	B50	CB_RESET#	B87	VCC_5V_SBY
	B14	SMB_DAT	B51	GND(FIXED)	B88	BIOS_DIS1#
	B15	SMB_ALERT#	B52	RSVD	B89	DDIO_HPD
	B16	SATA1_TX+	B53	RSVD	B90	GND(FIXED)
	B17	SATA1_TX-	B54	GPO1	B91	DDIO_PAIR5+
	B18	SUS_STAT#	B55	RSVD	B92	DDIO_PAIR5-
	B19	SATA1_RX+	B56	RSVD	B93	DDIO_PAIR6+
	B20	SATA1_RX-	B57	GPO2	B94	DDIO_PAIR6-
	B21	GND(FIXED)	B58	PCIE_RX3+	B95	DDIO_DDC_AUX_SEL
	B22	USB_SSTX0-	B59	PCIE_RX3-	B96	USB_HOST_PRSNT
	B23	USB_SSTX0+	B60	GND(FIXED)	B97	SPI_CS#
	B24	PWR_OK	B61	PCIE_RX2+	B98	DDIO_CTRLCLK_AUX+
	B25	USB_SSTX1-	B62	PCIE_RX2-	B99	DDIO_CTRLDATA_AUX-
	B26	USB_SSTX1+	B63	GPO3	B100	GND(FIXED)
	B25	WDT	B64	PCIE_RX1+	B101	FAN_PWMOUT
	B28	AC/HDA_SDIN2	B65	PCIE_RX1-	B102	FAN_TACHIN
	B29	AC/HDA_SDIN1	B66	WAKE0#	B103	SLEEP#
	B30	AC/HDA_SDIN0	B67	WAKE1#	B104	VCC_12V
	B31	GND(FIXED)	B68	PCIE_RX0+	B105	VCC_12V
	B32	SPKR	B69	PCIE_RX0-	B106	VCC_12V
	B33	I2C_CK	B70	GND(FIXED)	B107	VCC_12V
	B34	I2C_DAT	B71	DDIO_PAIR0+	B108	VCC_12V
	B35	THRM#	B72	DDIO_PAIR0-	B109	VCC_12V
	B36	USB7-	B73	DDIO_PAIR1+	B110	GND(FIXED)
	B37	USB7+	B74	DDIO_PAIR1-		

### 6.5.21 J14 - Ethernet (RJ45) 1 and 2

The Type 10 module supports one Gigabit Ethernet port to the ITX-M-CC452-T10, which provides one Ethernet port to the right RJ45 connection on **J14**.

A second Gigabit Ethernet port is provided by the ITX-M-CC452-T10 via PCIe bridge to the left RJ45 connection on **J14**.



### 6.5.22 J21 - USB 3.2 Gen 1 Type-A

The Type 10 module supports two USB 3.2 Gen 1 ports to the ITX-M-CC452-T10, which provides two USB 3.2 Gen 1 ports to **J21**. These ports supply 1 A maximum continuous current and 5 Gbps transfer speed.

### 6.5.23 J24 - USB 2.0 Type-A

The Type 10 module supports five USB 2.0 ports to the ITX-M-CC452-T10, which provides two USB 2.0 ports to **J24** and three USB 2.0 ports to each Mini-Card #1-3. These ports supply 500 mA maximum continuous current and 480 Mbps transfer speed.

### 6.5.24 J12 - USB Touchscreen

**J12** provides plug-and-play support for a USB touchscreen. Aside from a simpler and faster interface, it also provides power within the USB cable, eliminating the need for a separate, dedicated cable to power the touchscreen.

#### Layout and Pin Reference

Pin	Name
1	GND
2	+5 V SB
3	DATA+
4	DATA-
5	GND

#### Connector

- Molex 1.25 mm PicoBlade  
Part Number: 53398-0571

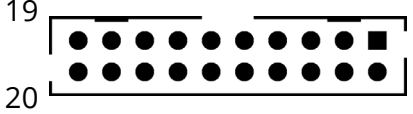
#### Matching Connector

- Molex 1.25 mm PicoBlade housing  
Part Number: 51021-0500

### 6.5.25 J23 - Serial RS232 Ports 1 and 2 (3-wire)

The Type 10 module supports two TTL serial ports to the ITX-M-CC452-T10, which provides two RS232 serial ports (3-wire port consisting of TX/RX and GND) via on-board RS232 transceivers.

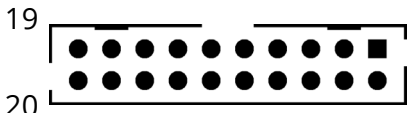
#### Layout and Pin Reference

Pin	Name	Pin	Name
			
1	NC	2	NC
3	RX1	4	NC
5	TX1	6	NC
7	NC	8	NC
9	GND	10	NC
11	NC	12	NC
13	RX2	14	NC
15	TX2	16	NC
17	NC	18	NC
19	GND	20	NC

### 6.5.26 J22 - Serial RS232/422/485 Ports 3 and 4

The Type 10 module supports an LPC bus to the ITX-M-CC452-T10, which provides two RS232/422/485 serial ports via on-board multi-protocol transceivers.

#### Layout and Pin Reference

Pin	Name	Pin	Name
			
1	DCD1/ TX-/ DATA-	2	DSR1
3	RXD1/ TX+/ DATA+	4	RTS1
5	TXD1/ RX+	6	CTS1
7	DTR1/ RX-	8	RI1
9	GND	10	NC
11	DCD2/ TX-/ DATA-	12	DSR2
13	RXD2/ TX+/ DATA+	14	RTS2
15	TXD2/ RX+	16	CTS2
17	DTR2/ RX-	18	RI2
19	GND	20	NC

**Connector**

- Molex Milli-Grid header, shrouded with center polarization slot and locking windows

Part Number: 87832-2020

**Matching Connectors**

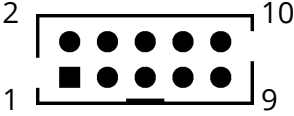
- Molex Milli-Grid receptacles with center polarization key and locking ramps

Part Number: 51110-2051

**6.5.27 J26 - GPIO**

The Type 10 module supports GPIO signals to the ITX-M-CC452-T10, which provides 4x general purpose inputs and 4x general purpose outputs.

**Layout and Pin Reference**

Diagram	Pin	Name	Pin	Name
	1	GPIO	2	GPIO1
	3	GPIO2	4	GPIO3
	5	GND	6	5V
	7	GPO0	8	GPO1
	9	GPO2	10	GPO3

**Connector**

- Molex Milli-Grid header, shrouded with locking window

Part Number: 87832-1006

**Matching Connectors**

- Molex Milli-Grid receptacles (with locking ramp)

Part Number: 51110-1060

**Warning**

Do not use receptacle with center polarization key.

### 6.5.28 J4 - Mini PCIe #1 Connector

The ITX-M-CC452-T10 Mini PCIe socket supports a variety of peripherals as available in this format. Though the sockets support other devices, they are most often used to add WiFi or 3G/LTE modem support. This Mini PCIe socket supports PCIe, and USB 2.0.

### 6.5.29 J5 - Mini PCIe #2 Connector with Network LEDs

The ITX-M-CC452-T10 Mini PCIe socket supports a variety of peripherals as available in this format. This socket is specifically designed to test half-mPCIe WiFi cards. Three network LEDs are provided to show network traffic. This Mini PCIe socket supports PCIe and USB 2.0.

### 6.5.30 J6 - Mini PCIe #3 Connector with mSATA Support

The ITX-M-CC452-T10 Mini PCIe socket supports a variety of peripherals as available in this format. This Mini PCIe socket supports PCIe, USB 2.0, and mSATA channel.

## 7. Accessories and Cables

WINSYSTEMS cables and batteries simplify connection to the ITX-M-CC452-T10. The following table lists available items.

Go to [www.winsystems.com](http://www.winsystems.com) for more information on WINSYSTEMS cables and batteries.

Item	Part Number	Connection	Description
COM module	COMeT10-3900	Type 10 COM Interface	COM Express Type 10 Mini Module with Intel Atom E3900 processor
Cable	CBL-PWR-125-20	J7 - Power input header on page 16	Molex Micro-Fit 3.0 receptacle housing
Cable	CBL-PWR-117-12	J8 - SATA power output on page 18	Hirose DF11 series 2.00 mm crimping socket 4-pin
Cable	CBL-USB1-202-12	J12 - USB touchscreen on page 26	Molex 1.25 mm PicoBlade housing
Cable	CBL-SER2-202-12	J23/J24 - Serial RS232 ports 1 and 2 (3-wire) on page 27 and Serial RS232/422/485 ports 3 and 4 on page 27	Molex Milli-Grid receptacles
Battery	BAT-LPC-BR2330	J17 - CMOS Battery Input on page 16	Hirose DF13C 1.25 mm 2-pin

Standoff kits are available and recommended for use with the ITX-M-CC452-T10. The following table lists the items contained in each kit.

Kit	Component	Description	Qty
KIT-PCM-STANDOFF-4 4 pc. nylon hex PC/104 standoff kit	Standoff	Nylon 0.25" hex, 0.600" long male/female 4-40	4
	Hex nut	Hex nylon 4-40	4
	Screw	Phillips-pan head (PPH) 4-40 x 1/4" stainless steel	4
KIT-PCM-STANDOFF-B-4 4 pc. brass hex PC/104 standoff kit	Standoff	Brass 5 mm hex, 0.600" long male/female 4-40	4
	Hex nut	4-40 x 0.095 thick, nickel finish	4
	Screw	Phillips-pan head (PPH) 4-40 x 1/4" stainless steel	4

## Appendix A. Best Practices

The following paragraphs outline the best practices for operating the ITX-M-CC452-T10 in a safe, effective manner, that does not damage the board. Read this section carefully.

### Power Supply



#### **Avoid Electrostatic Discharge (ESD)**

Only handle the circuit board and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

#### **Power Supply Budget**

Evaluate your power supply budget. Recommended maximum power supply input rating for the ITX-M-CC452-T10 is 95 W.

#### **Zero-load Power Supply**

Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the single board computer's typical load is not lower than the power supply's minimum load. If the single board computer does not draw enough power to meet the power supply's minimum load, then the power supply does not regulate properly and can cause damage to the ITX-M-CC452-T10.



#### **Use Proper Power Connections (Voltage)**

When verifying the voltage, measure it at the power connector on the ITX-M-CC452-T10. Measuring it at the power supply does not account for voltage drop through the wire and connectors.

The ITX-M-CC452-T10 requires 5 V to 20 V to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

The ITX-M-CC452-T10 has two power connectors at **J3** and **J7**. A single 5 V to 20 V DC input and ground is required to power the board.

#### **Power Harness**

Minimize the length of the power harness. This reduces the amount of voltage drop between the power supply and the ITX-M-CC452-T10. Recommended DC power input wires/cable with a flammability rating of VW-1 or better.

### Gauge Wire

Use the largest gauge wire that you can. Most connector manufacturers have a maximum gauge wire they recommend for their pins.

### Contact Points

WINSYSTEMS boards mostly use connectors with gold finish contacts. Gold finish contacts are used exclusively on high-speed connections. Power and lower speed peripheral connectors may use a tin finish as an alternative contact surface. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion, resulting in unreliable connections.

### Pin Contacts

Often the pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact would include a design similar to Molex or Trifurcon designs, which provide three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

## Power Down

Make sure that power has been removed from the system before making or breaking any connections.



**Power Supply OFF**—Always turn off the power supply before connecting or disconnecting a COM module.

**I/O Connections OFF**—Turn off all I/O connections before connecting them to the embedded computer modules or any I/O cards. Connecting hot signals can cause damage whether the embedded system is powered or not.

## Mounting and Protecting the I/O Module

To avoid damage, mount the ITX-M-CC452-T10 properly. Standoff kits are available and recommended for use with the ITX-M-CC452-T10. See the table on page 29 for the items contained in each kit.

**Placing the ITX-M-CC452-T10 on mounting standoffs**—Be careful when placing the ITX-M-CC452-T10 on the mounting standoffs. Sliding the board around until the standoffs are visible from the top can cause component damage on the bottom of the board.



**Do not bend or flex the ITX-M-CC452-T10**—Bending or flexing can cause irreparable damage. Embedded computer modules are especially sensitive to flexing or bending around ball grid array (BGA) devices. BGA devices are extremely rigid by design, and flexing or bending the embedded computer module can cause the BGA to tear away from the printed circuit board.

**Mounting holes**—The mounting holes are plated on the top, bottom, and through the barrel of the hole. Solder dots SD501–SD508 can be soldered together to connect the mounting holes to the embedded computer module's ground plane. Traces are often routed in the inner layers right below, above, or around the mounting holes.

- Never use a drill or any other tool in an attempt to make the holes larger.
- Never use screws with oversized heads. The head could come in contact with nearby components causing a short or physical damage.
- Never use self-tapping screws; they compromise the walls of the mounting hole.
- Never use oversized screws that cut into the walls of the mounting holes.
- Always use all of the mounting holes. By using all of the mounting holes, you provide the support the embedded computer module needs to prevent bending or flexing.

**Plug or unplug connectors only on fully mounted boards**—Never plug or unplug connectors on a board that is not fully mounted. Many of the connectors fit rather tightly and the force needed to plug or unplug them could cause the embedded computer module to be flexed.

**Avoid cutting the ITX-M-CC452-T10**—Never use star washers or any fastening hardware that cut into the ITX-M-CC452-T10.

**Avoid over-tightening of mounting hardware**—Causing the area around the mounting holes to compress could damage interlayer traces around the mounting holes.

**Use appropriate tools**—Always use tools that are appropriate for working with small hardware. Large tools can damage components around the mounting holes.

**Avoid conductive surfaces**—Never allow the embedded computer module to be placed on a conductive surface. Many embedded systems use a battery to back up the clock-calendar and CMOS memory. A conductive surface such as a metal bench can short the battery causing premature failure.

## Conformal Coating

Applying conformal coating to a WINSYSTEMS product does not in itself void the product warranty, if it is properly removed prior to return. Coating can change thermal characteristics and impedes our ability to test, diagnose, and repair products. Any coated product sent to WINSYSTEMS for repair will be returned at customer expense and no service will be performed.

## Operations/Product Manuals

Every single board computer has an Operations manual or Product manual.

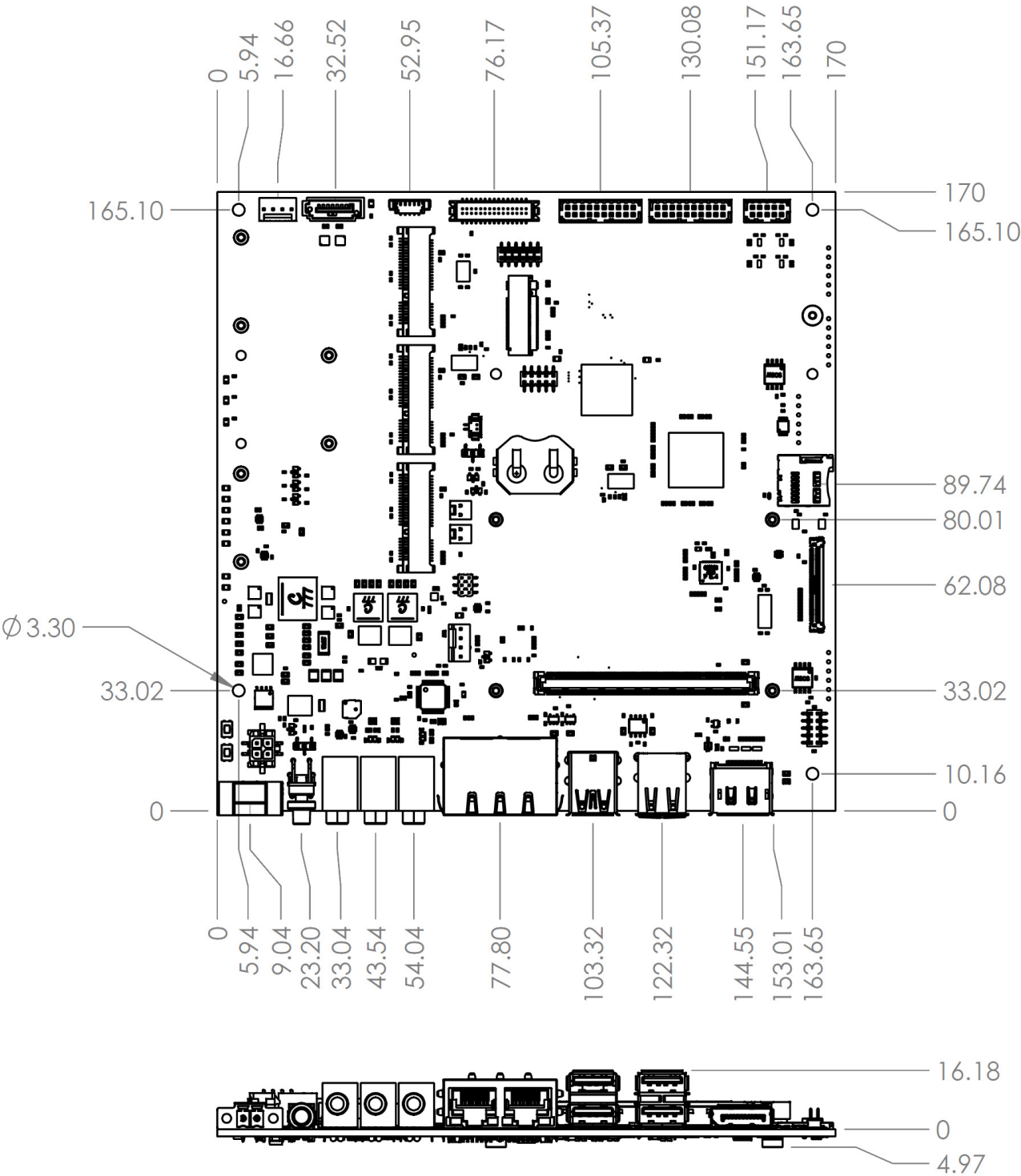
**Periodic updates**—Operations/product manuals are updated often. Periodically check the WINSYSTEMS website (<http://www.winsystems.com>) for revisions.

**Check pinouts**—Always check the pinout and connector locations in the manual before plugging in a cable. Many I/O modules have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

**Contact an Applications Engineer**—If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact a WINSYSTEMS Applications Engineer at +1-817-274-7553.

# Appendix B. Mechanical Drawings

ITX-M-CC452-T10 Mechanical Drawing



## Appendix C. Warranty Information

WINSYSTEMS warrants that for a period of two (2) years from the date of shipment, any Products and Software purchased or licensed hereunder which have been developed or manufactured by WINSYSTEMS shall be free of any defects and shall perform substantially in accordance with WINSYSTEMS' specifications therefor. With respect to any Products or Software purchased or licensed hereunder which have been developed or manufactured by others, WINSYSTEMS shall transfer and assign to Customer any warranty of such manufacturer or developer held by WINSYSTEMS, provided that the warranty, if any, may be assigned. The sole obligation of WINSYSTEMS for any breach of warranty contained herein shall be, at its option, either (i) to repair or replace at its expense any materially defective Products or Software, or (ii) to take back such Products and Software and refund the Customer the purchase price and any license fees paid for the same. Customer shall pay all freight, duty, broker's fees, insurance, charges and other fees and charges for the return of any Products or Software to WINSYSTEMS under this warranty. WINSYSTEMS shall pay freight and insurance charges for any repaired or replaced Products or Software thereafter delivered to Customer within the United States. All fees and costs for shipment outside of the United States shall be paid by Customer. The foregoing warranty shall not apply to any Products or Software which have been subject to abuse, misuse, vandalism, accident, alteration, neglect, unauthorized repair or improper installation.

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There are no understandings, agreements or representations, express or implied, other than those set forth herein. This Order embodies the entire agreement between the parties and may be waived, amended or supplemented only by a written instrument executed jointly by WINSYSTEMS and Customer as evidenced only by the signature of duly authorized officers of each party. The foregoing terms and conditions of any order which may be issued by Customer for the purchase of Products or licensing of Software hereunder.

In the event this Order is placed in the hands of an attorney or collection agency by WINSYSTEMS to collect any sums due hereunder to WINSYSTEMS, Customer shall pay all reasonable attorney's fees, expenses, collection and court costs incurred by WINSYSTEMS.

THIS AGREEMENT SHALL BE GOVERNED AND CONSTRUED UNDER THE TEXAS UNIFORM COMMERCIAL CODE AND THE APPLICABLE LAWS OF THE STATE OF TEXAS. THE PARTIES ACKNOWLEDGE THAT ANY ACTION BROUGHT HEREUNDER SHALL ONLY BE BROUGHT IN A COURT OF COMPETENT JURISDICTION IN TARRANT COUNTY, TEXAS.

## Warranty Service

1. To obtain service under this warranty, obtain a return authorization number. In the United States, contact the WINSYSTEMS Service Center for a return authorization number. Outside the United States, contact your local sales agent for a return authorization number.
2. You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WINSYSTEMS is not responsible for damage to the product due to static electricity.