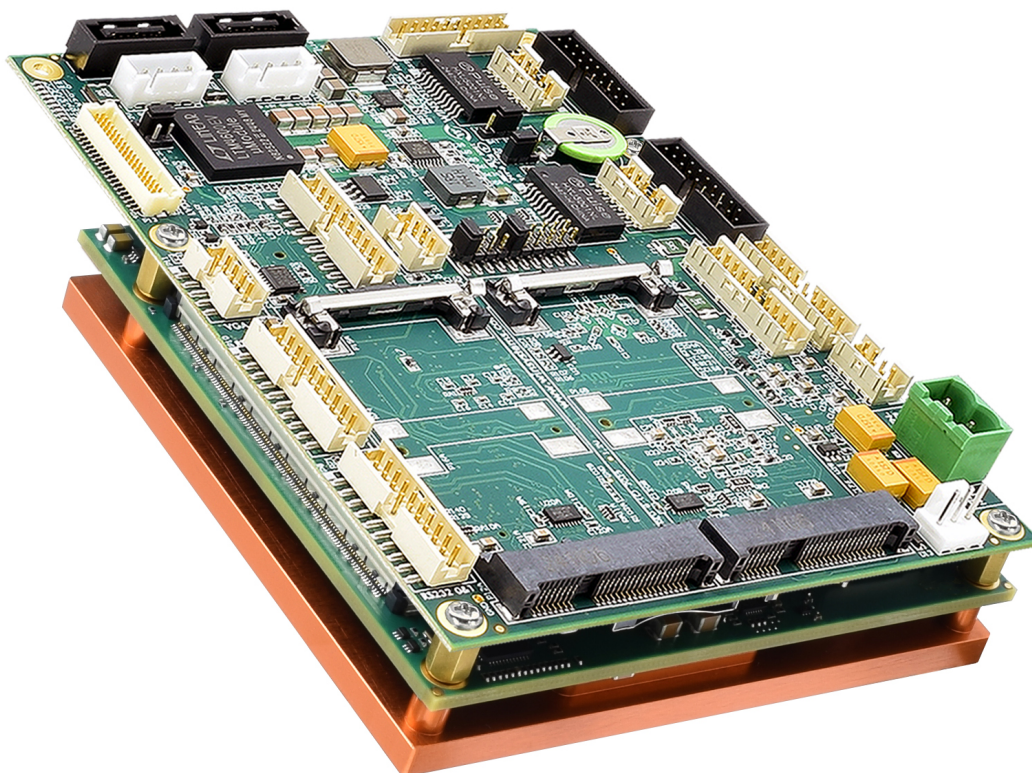


# SBC-477-TCA7

Rugged Compact Carrier with Intel Atom<sup>®</sup>  
x6425RE COM Express Type 6 Module,  
Mini PCIe expansion and USB 3.0

## Product Manual



## Revision History

Document Version	Last Updated Date	Brief Description of Change
v1.0	11/26/2024	Initial release
v1.1	07/02/2025	Updated warranty page and product images Updated product number, mechanical drawings and ordering information Updated USB 2.0 and USB 3.0 information Removed VGA and mSATA options

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# 1. Before You Begin

Review the warnings in this section and the best practice recommendations (See “Best Practices” on page 37.) when using and handling the WINSYSTEMS SBC-477-TCA7 module. Following these recommendations provides an optimal user experience and prevents damage. Read through this document and become familiar with the SBC-477-TCA7 before proceeding.



APPLYING CONFORMAL COATING AFTER PURCHASE WILL VOID YOUR WARRANTY. FAILING TO COMPLY WITH THESE BEST PRACTICES MAY DAMAGE THE PRODUCT AND VOID YOUR WARRANTY.

## 1.1 Warnings

Only qualified personnel should configure and install the SBC-477-TCA7. 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 SBC-477-TCA7. 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/> for other accessories (including cable drawings and pinouts) that can be used with your SBC-477-TCA7.

### 3. Functionality

This SBC-477-TCA7 COM and Carrier combination is a compact SBC board which matches the dimensions of a COM Express® Type 6 Basic module and offers the ultimate durability with locking, rugged pin headers.

The SBC-477-TCA7 is ideal for space constrained applications, harsh environments, demanding conditions and supports extended temperature ranges of -40°C to +85°C.

The COM module is an industrial COM Express Type 6 Compact module with an Atom® x6425RE processor. The small form factor module is designed as a processor mezzanine that can be plugged onto a carrier board that contains user-specific I/O requirements.

COM Express modules allow users to retain the same carrier board design across scalable CPU series and over multiple generations of COM Express modules providing a long project lifetime. Updating a COM Express module to improve performance or replace an end of life processor drastically improves time to market when revising existing projects. Users have the option to choose the default BIOS settings and layout, or request a custom branded configurable BIOS to support specific project requirements.

The SBC-477-TCA7 supports Microsoft® Windows 10 IoT Enterprise, Microsoft® Windows 11 IoT Enterprise and Linux (Ubuntu) operating systems. Drivers are available from the WINSYSTEMS website at <https://www.winsystems.com/>.

## 4. Product Features and Specifications

Carrier Board Features and Specifications	
<b>Compatibility</b>	COM Express Type 6 Modules PICMG COM Express® COM.0 R2.0
<b>Processor</b>	Intel® Atom® Elkhart Lake x6425RE Core Speed: 1.9 GHz Cache: 1.5 MB L2 Power: 12W typical
<b>Memory</b>	16GB or 32GB DDR4 SODIMM
<b>Expansion</b>	Mini PCIe Expansion: Both sockets support PCIe and USB 2.0. One socket support SIM Card expansion. <ul style="list-style-type: none"> <li>• 2x Full length cards</li> <li>• 1x SIM Card option</li> </ul>
<b>Storage</b>	2x SATA Ports (With External Locking Connectors)
<b>Network</b>	2x Ethernet Ports <ul style="list-style-type: none"> <li>• 1x Port 0, Intel I226IT, 2.5Gb from COM Express</li> <li>• 1x Port 1, 1Intel 82574I, 1Gb from Carrier</li> </ul>
<b>Security</b>	<ul style="list-style-type: none"> <li>• On-board discrete TPM 2.0 hardware security</li> <li>• vPro® Security Platform</li> </ul>
<b>GPIO</b>	8-bit GPIO
<b>USB 2.0</b>	6x USB 2.0 Ports (2 used for miniPCIe)
<b>USB 3.0</b>	2x USB 3.0 Ports
<b>Display</b>	2x DisplayPort++ (DDI) interface Which can be used for DisplayPort, HDMI, DVI or VGA 1 x LVDS interface (single ch 24-bit, dual ch 48-bit)
<b>Audio</b>	HD Audio (Cirrus Logic CS4207 codec) 1x stereo input 1x stereo output
<b>Serial</b>	1x Console RS-232 port (TX/RX) 2x RS-232 (w/ full modem signals) 2x RS-422/485
<b>Operating System</b>	<ul style="list-style-type: none"> <li>• Microsoft® Windows 11 IoT Enterprise</li> <li>• Microsoft® Windows 10 IoT Enterprise</li> <li>• Linux (Ubuntu)</li> <li>• Other x86 real-time OS</li> </ul>
<b>Software</b>	Custom configurable UEFI based AMI BIOS System Management Libraries and Tools
<b>External Interfaces</b>	<ul style="list-style-type: none"> <li>• SMBus</li> <li>• 12C</li> <li>• Battery Low Indication</li> <li>• PC speaker Interface</li> <li>• System Status (S3 and Reset Outputs)</li> </ul>

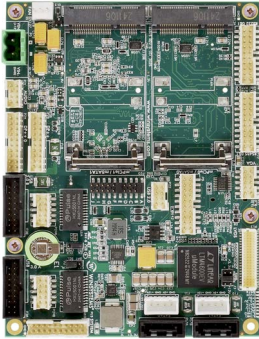

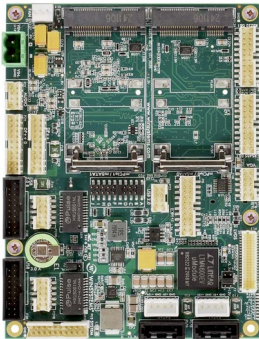
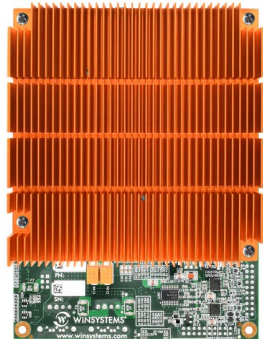


Carrier Board Features and Specifications	
<b>V<sub>cc</sub></b>	Input: +12V DC input +/- 5% (5mm pitch terminal connector) (Recommend power supplies with > 60W power budget)
<b>Battery</b>	On-board RTC Battery 3V 48mAh (BR1125A) With option to select from RTC external battery)
<b>I/O Connectors</b>	All low-profile shrouded locking ruggedized 2mm pitch headers. Can be mated to panel mountable cable set or MIL type connectors.
<b>I/O</b>	<ul style="list-style-type: none"> <li>• 8-bit GPIO</li> <li>• 2x USB 3.0</li> <li>• 6x USB 2.0 (2 used for Mini PCIe)</li> <li>• 2x miniPCIe</li> <li>• 1x Console RS-232 (TX/RX)</li> <li>• 2x RS-232 (w/ full modem signals)</li> <li>• 2x RS-422/485</li> <li>• SMBus</li> <li>• I2C</li> </ul>
<b>Mechanical Information</b>	SBC-477-TCA7-1 is 125mm x 95mm x 35mm SBC-477-TCA7-2 is 125mm x 95mm x 52mm
<b>Weight</b>	SBC-477-TCA7-1 is 355g / 12.5oz SBC-477-TCA7-2 is 425g / 15.0oz
<b>Thermal Solution</b>	SBC-477-TCA7-1 with Heat Spreader SBC-477-TCA7-2 with Heatsink
<b>MTBF</b>	717,128 hrs
<b>Operating Temperature</b>	-40°C to +85°C (-40°F to +185°F) (See NOTE below table)
<b>Humidity (RH)</b>	5% to 95% non-condensing
<b>RoHS compliant</b>	Yes
<b>CE Compliant</b>	Yes
<b>Warranty and Support</b>	Limited two-year Warranty and Free Technical Support

NOTE Requires appropriate thermal solution to achieve maximum 85°C such as our SBC-477-TCA7-2. The maximum measurable temperature on any spot of the heat spreader or heat sink, and module surfaces must not exceed the operating temperature specified in the table above.

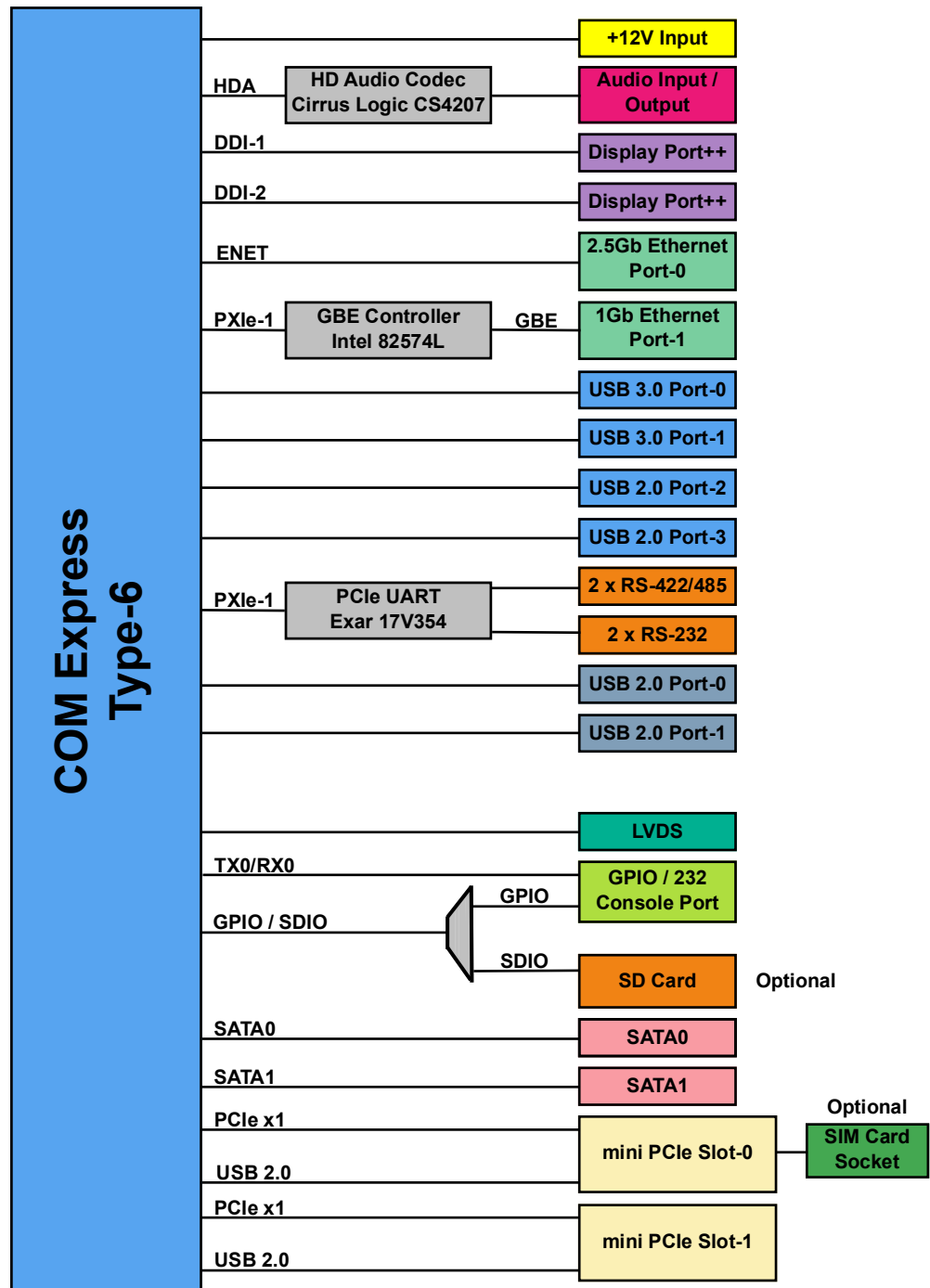
Contact Winsystems at <https://winsystems.com/contact/> for more information.

## 5. Part Numbers / Ordering Information

Part Number	Description	
<b>SBC-477-TCA7-1</b>	With Heatspreader	
<b>SBC-477-TCA7-2</b>	With Heatsink	
Part Number	Top View	Bottom View
<b>SBC-477-TCA7-1</b>		
<b>SBC-477-TCA7-2</b>		

## 6. Product Overview

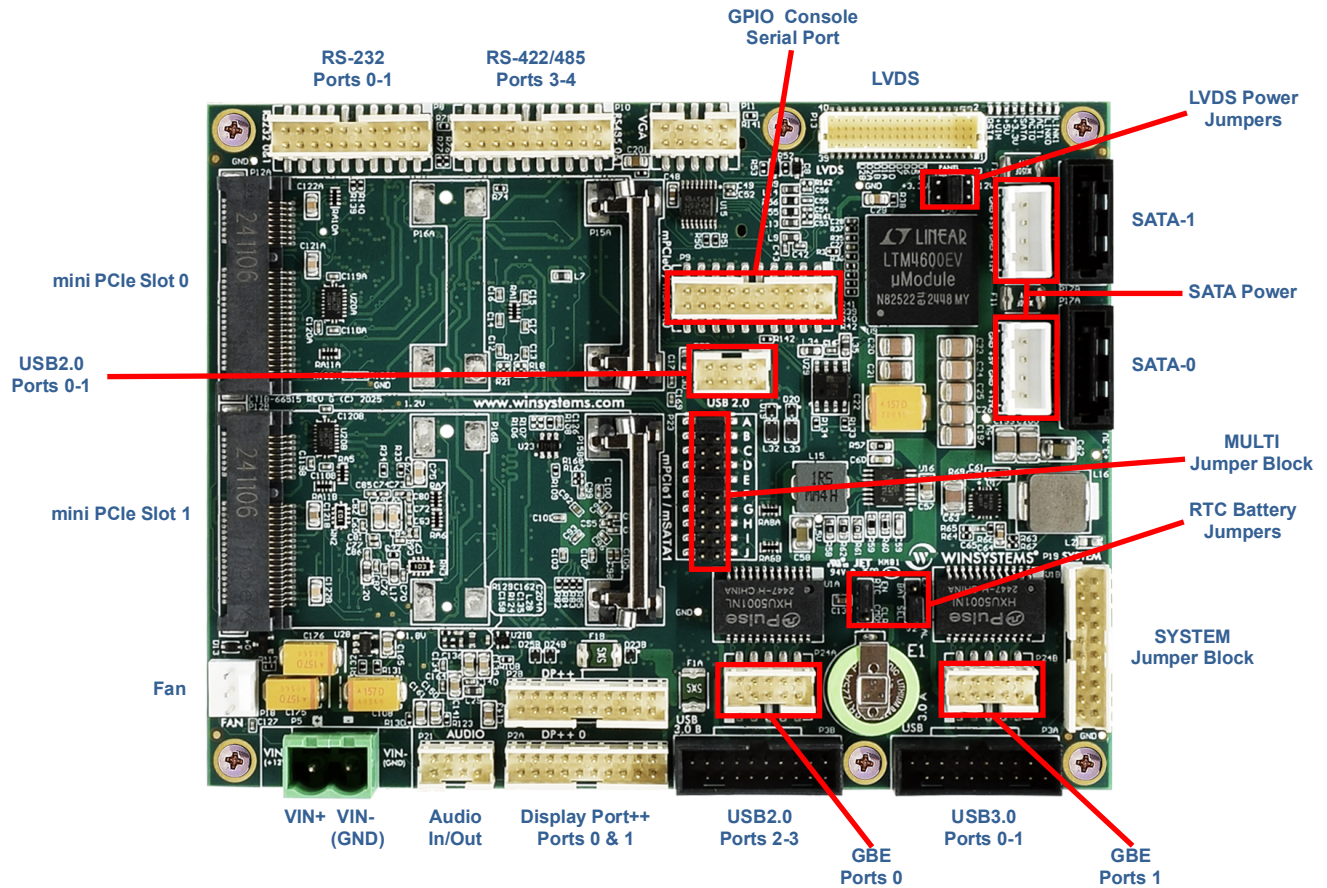
### 6.1 Block Diagram



## 7. Connector Locations

This section describes the SBC-477-TCA7 components and configuration.

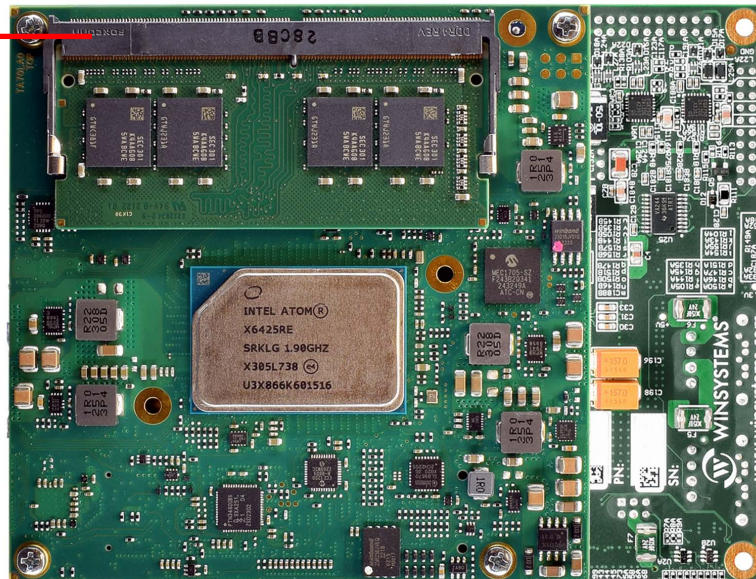
### Carrier Top View





## COM and Carrier Bottom View

SODIMM Sockets



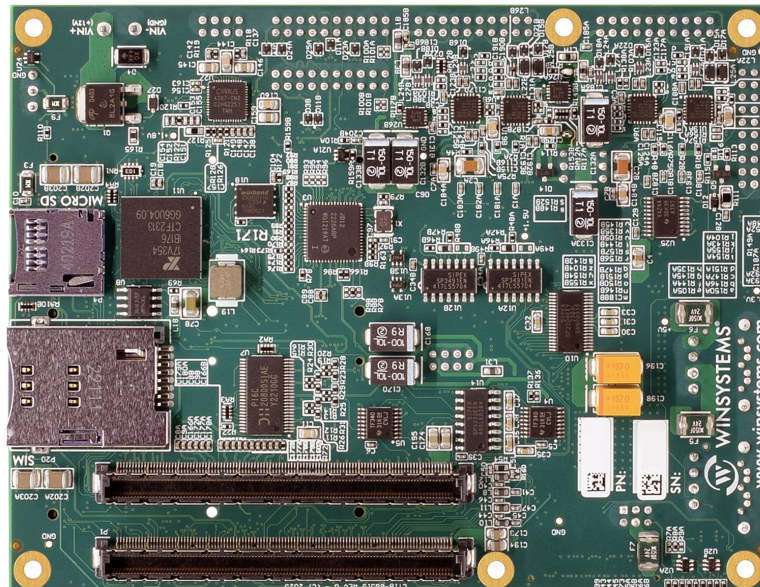
## Carrier Bottom View

(Showing Options Below)

micro SD Card Slot  
P4

SIM Card Slot for  
mini PCIe P20

(See NOTE Below)



NOTE SIM's Card option requires a WAN interface controller card that allows the device to connect to a wide area network.

## 8. Carrier Jumper and Connector Summary

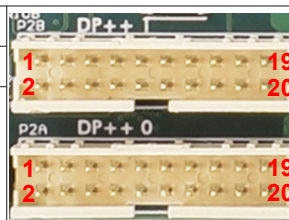

Item	Description	Reference
P2A P2B	DisplayPort ++ Video	<a href="#">page 15</a>
P3A	USB 3.0 Ports 0, 1	<a href="#">page 16</a>
P3B	USB 2.0 Ports 2,3	<a href="#">page 17</a>
P4	Micro SD card (Optional)	<a href="#">page 18</a>
P5	+12VDC Power In	<a href="#">page 19</a>
P6, P7	External SATA HDD Power	<a href="#">page 29</a>
P8, P10	Asynchronous Serial Ports	<a href="#">page 20</a>
P8	RS232 Ports 1 & 2	<a href="#">page 21</a>
P9	GPIO and COM Express Type 6 simple serial	<a href="#">page 23</a>
P10	Serial Connector RS-422/485 Ports 3 & 4	<a href="#">page 21</a>
P12A, P12B	miniPCle Slots	<a href="#">page 24</a>
P12A, P12B	Full Length mini PCle Installation	<a href="#">page 25</a>
P13	LVDS Video	<a href="#">page 27</a>
P17A, P17B	External SATA	<a href="#">page 29</a>
P18	CPU FAN Power	<a href="#">page 30</a>
P19	Miscellaneous Control Header	<a href="#">page 30</a>
P20	SIM card slot (Optional)	<a href="#">page 31</a>
P21	Stereo Audio In and Out	<a href="#">page 31</a>
P22	USB2.0 Connector	<a href="#">page 32</a>
P23	Multifunction Jumper Block	<a href="#">page 33</a>
P24A P24B	10/100/1000 Ethernet	<a href="#">page 32</a>
J1	RTC Clear	<a href="#">page 20</a>
J2	RTC Selection	<a href="#">page 20</a>
J3	LVDS power selection	<a href="#">page 28</a>

## 9. Detailed Feature Pinouts and Descriptions

### 9.1 DisplayPort ++ Video [P2A,P2B]

The SBC-477-TCA7 Carrier features two DisplayPort++ connectors. This can be configured to output Display Port and HDMI/DVI.

The configuration of each interface is setup via the COM Express module's BIOS settings. Refer to the COM Express module's documentation for more details.

<b>Function</b>	DisplayPort++ Video Output Connectors							
<b>Location</b>	P2A, P2B							
<b>Type</b>	FCI 98414-G06-20LF, 2x10 2mm							
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>				
	1	DP0+	2	DP3+	1		2	
	3	DP0-	4	DP3-	3		4	
	5	GND	6	GND	5		6	
	7	DP1+	8	DPAUX-	7		8	
	9	DP1-	10	DPAUX+	9		10	
	11	GND	12	GND	11		12	
	13	DP2+	14	DP Hot Plug Detect	13		14	
	15	DP2-	16	GND	15		16	
	17	GND	18	GND	17		18	
	19	DP Power	20	DP AUX SEL [1]	19		20	

[1]- For **DP\_AUX\_SEL**-Cable assembly must tie high (+3.3V) for HDMI/DVI output and low (GND) for DisplayPort output.

## 9.2 HDMI / DVI / VGA from DisplayPort++

The SBC-477-TCA7 DisplayPort++ connector can be used for display outputs other than DisplayPort. The use of HDMI, DVI or VGA can be done through a simple dongle or cable assembly like the ones shown below. These can be purchased from any OEM vendor (such as [www.startech.com](http://www.startech.com)) or contact Winsystems.



## 9.3 USB 3.0 Ports [P3A]

The SBC-477-TCA7 implements 2x USB 3.0 ports on one 19-pin header, 2x USB 2.0 ports on a second 19-pin header, 2x USB 2.0 ports on 8-pin headers and 2x through the miniPCle slots. Below is a description of the 19-pin USB 3.0 header on the SBC-477-TCA7 carrier.

Each USB 3.0 port is capable of bitrates of up to 5Gbps, as well as accepting USB 2.0 connections.

<b>Function</b>	Dual, USB 3.0			
<b>Location</b>	P3A			
<b>Type</b>	Intel Locking Motherboard Style 19-pin USB 3.0 connector			
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>
	-	-	1	P1-VBUS
	19	P2-VBUS	2	P1-SSRX
	18	P2-SSRX-	3	P1-SSRX+
	17	P2-SSRX+	4	GND
	16	GND	5	P1-SSTX-
	15	P2-SSTX-	6	P1-SSTX+
	14	P2-SSTX+	7	GND
	13	GND	8	P1-D-
	12	P2-D-	9	P1-D+
	11	P2-D+	10	-

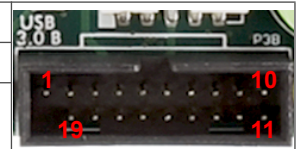




## 9.4 USB 2.0 Ports [P3B]

Below is a description of the 19-pin USB 2.0 header on the SBC-477-TCA7 carrier.

<b>Function</b>	Dual, USB 2.0			
<b>Location</b>	P3B			
<b>Type</b>	Intel Locking Motherboard Style 19-pin USB 3.0 connector			
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>
	-	-	1	P1-VBUS
	19	P2-VBUS	2	-
	18	-	3	-
	17	-	4	GND
	16	GND	5	-
	15	-	6	-
	14	-	7	GND
	13	GND	8	P1-D-
	12	P2-D-	9	P1-D+
	11	P2-D+	10	-



## 9.5 MicroSD Card [P4] (Optional)

The SBC-477-TCA7 provides a Micro SD Card Slot at P4. This Micro SD Card slot sources the SDIO interface from the COM Express modules GPIO pins.

**NOTE** This SD card slot will **ONLY** operate if the COM Express module provides the SDIO interface over the GPIO pins. See below for the SDIO / GPIO mapping.

Also ensure **MULTI-JUMPER position "B"** is installed to select the SDIO interface.

<b>Function</b>	micro SD Card Slot		
<b>Locations</b>	P4		
<b>Type</b>	Micro SD Card Socket Molex 502570-0893		
<b>Pinout</b>	<b>Pin</b>	<b>SDIO Signal</b>	<b>COM Express GPIO Mapping</b>
	1	SD D2	GPI2
	2	SD D3	GPI3
	3	SD CMD	GP01
	4	SD_VCC (+3.3V)	-
	5	SD CLK	GPO0
	6	GND	-
	7	SD D0	GPIO
	8	SD D1	GPI1
	9	GND	-
	10	SD CD#	GP03




micro SD Card Slot

## 9.6 Input Power [P5]

The SBC-477-TCA7 is designed to be powered from a regulated single +12VDC power supply. The carrier board features a 5mm screw terminal style connector. The COM Express carrier generates all of the necessary voltages on board from this single input.

<b>Function</b>	Main Input Power		
<b>Locations</b>	P5		
<b>Range</b>	+12V DC (+/-5%)		
<b>Type</b>	2 Position 5mm pitch terminal connector Mating Connector: PN: 796634-2 MFG: TE Connectivity		
<b>Power Supply</b>	Recommend power supplies with > 60W power budget.		
<b>Fuse</b>	+12V is protected with a one-time 10A fuse, at F4.		
<b>Pinout</b>	<b>Pin</b>	<b>Signal</b>	<b>Description</b>
	1	+12V	Power In
	2	GND	Power Return
<b>*DO NOT REVERSE POLARITY!</b>			



VIN+ VIN-  
+12V GND


## 9.7 RTC Battery [J1, J2]

The Panasonic Lithium battery (BR1225A/FA) provides 3V@48mAh to VBAT. VBAT is the supply for the RTC Clock of the COM Express module.

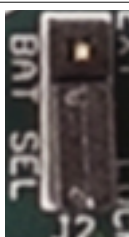
If the BR1225A is not sufficient for the application, an external battery can be connected to P19 with J2 selection jumper set appropriately.

**NOTE** The battery ships with a non-conductive label to prevent accidental discharge. It can be removed before installation.

Function	RTC Clear	
Locations	J1	
Type	1x3	
Pinout	Location	Description
	1-2	Enable RTC
	2-3	Clear CMOS



Function	RTC Battery Selection	
Locations	J2	
Type	1x3	
Pinout	Location	Description
	1-2	External battery
	2-3	Local On-board Battery



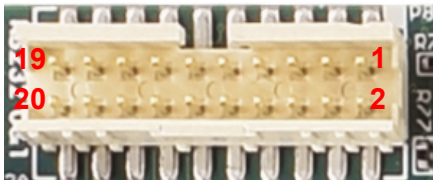

## 9.8 Asynchronous Serial Ports [P8, P10]

The SBC-477-TCA7 features four “external” serials ports. Port1 and Port2 are standard RS-232 and Port3 and Port4 can be configured as RS-422/485. These serial ports are generated from on-board PCIe 4-port UART the Exar 17V358

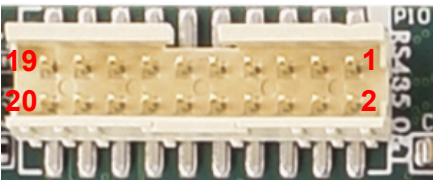

## 9.9 Software Support for the Exar 17V358

Additional drivers will be needed to properly operate the 4 additional serial ports on the COM Express carrier. Drivers for this functionality can be found on Winsystems website: <https://www.winsystems.com/>.

## 9.10 Serial Connector RS-232 [P8]

Function	RS232 Serial				
Location	P8				
Type	FCI 98424-G52-20LF, 2x10 2mm				
Pinout	Pin	Description	Pin	Description	
	1	Port A, DCD	2	Port A, DSR	
	3	Port A, RXD	4	Port A, RTS	
	5	Port A, TXD	6	Port A, CTS	
	7	Port A, DTR	8	Port A, RI	
	9	GND	10	-	
	11	Port B, DCD	12	Port B, DSR	
	13	Port B, RXD	14	Port B, RTS	
	15	Port B, TXD	16	Port B, CTS	
	17	Port B, DTR	18	Port B, RI	
	19	GND	20	-	

## 9.11 Serial Connector RS-422/485 Ports 3 & 4 [P10]

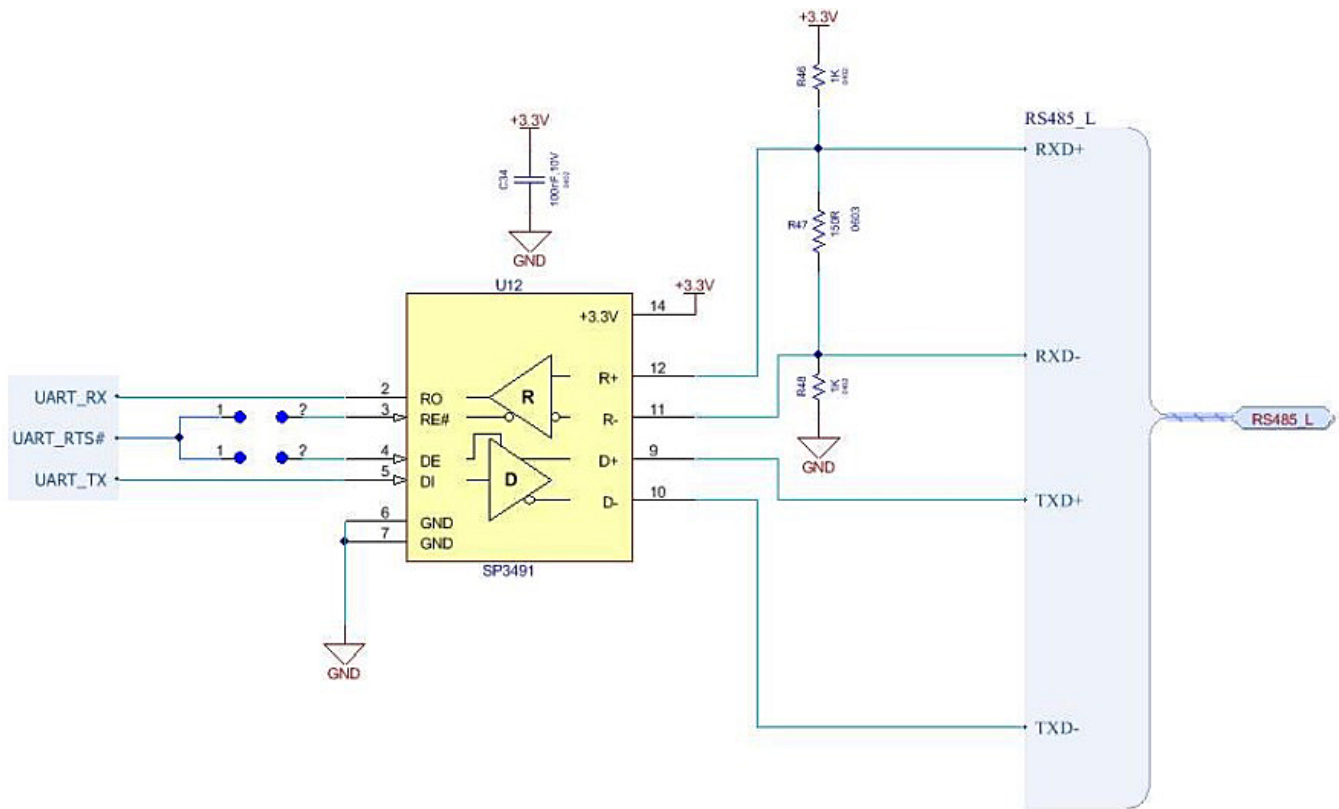
Function	RS-422/485 Serial		
Location	P10		
Type	FCI 98424-G52-20LF, 2x10 2mm		
Pinout	Pin	Description	
	1	Port A, RXD+	
	3	Port A, TXD+	
	5	Port A, TXD-	
	7	Port A, RXD-	
	9	GND	
	11	Port B, RXD+	
	13	Port B, TXD+	
	15	Port B, TXD-	
	17	Port B, RXD-	
	19	GND	

## 9.12 RS485 Control Jumpers

The RS485 Control Jumpers are used for implementing the following RS485 modes of operations:

- 1/2 Duplex Multidrop
- Full Duplex Multidrop

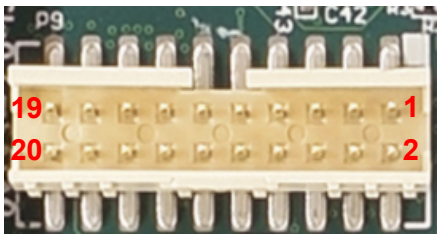
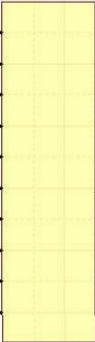
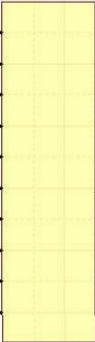
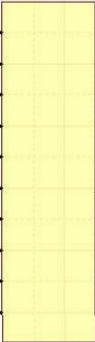
The UART RTS signals can be used for TX/RX control and can be enabled via the MULTI jumper block. See below for the RS-422/485 circuit diagram.



Sample circuit shown (not exact circuit that is on-board)

### 9.13 GPIO and Console Serial Port [P9]

The SBC-477-TCA7 provides additional functionality of COM Express Type-6 specification.

Function	Console RS-232 / GPIO																										
Location	P9																										
Type	FCI 98424-G52-20LF																										
Pinout	Pin	Description	Pin	Description	<p>p9</p> <table><tr><td>1</td><td rowspan="12"></td><td>2</td></tr><tr><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td></tr><tr><td>7</td><td>8</td></tr><tr><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td></tr><tr><td>13</td><td>14</td></tr><tr><td>15</td><td>16</td></tr><tr><td>17</td><td>18</td></tr><tr><td>19</td><td>20</td></tr></table>		1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1		2																								
	3		4																								
	5		6																								
	7		8																								
	9		10																								
	11		12																								
	13		14																								
	15		16																								
	17		18																								
	19		20																								
	1		GPIO Input 0	2	GPIO Output 3																						
3	GPIO Input 1		4	GPIO Output 2																							
5	GPIO Input 2	6	GPIO Output 1																								
7	GPIO Input 3	8	GPIO Output 0																								
9	GND	10	-																								
11	-	12	-																								
13	RS-232 RX	14	-																								
15	RS-232 TX	16	-																								
17	-	18	-																								
19	GND	20	-																								

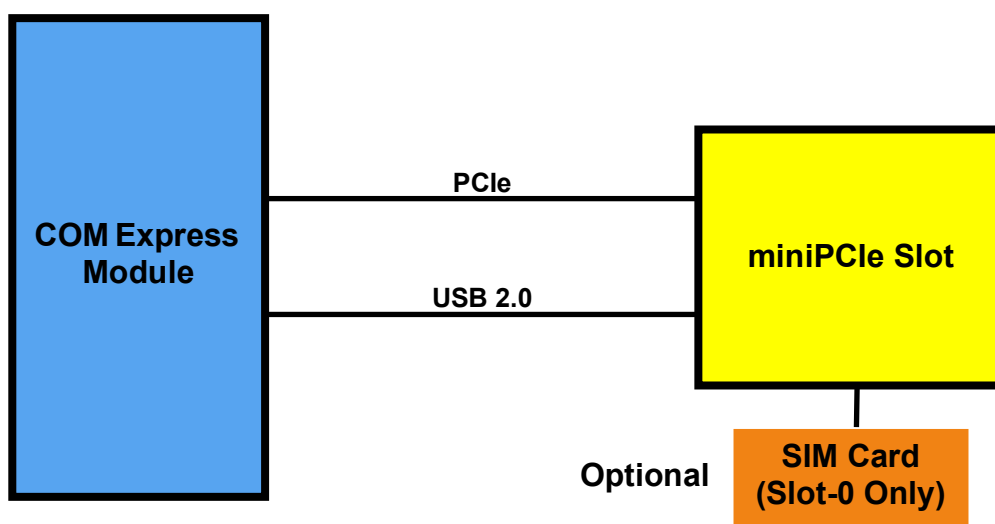
## 9.14 miniPCle Slots [P12A, P12B]

### Dual Function miniPCle Slots

The SBC-477-TCA7 has two special dual purpose functionality mini PCIe slots. Each of these slots can accept a mini PCIe module. These slots have special circuitry that allows for connecting PCIe lanes.

Each of these slots are also provided with a USB 2.0 in addition to the PCIe as per the mini PCIe specification, see below for a block diagram of the slots functionality.

A SIM Card can be used in Slot-0 only.



PCIe / USB 2.0 Dual Functionality Diagram

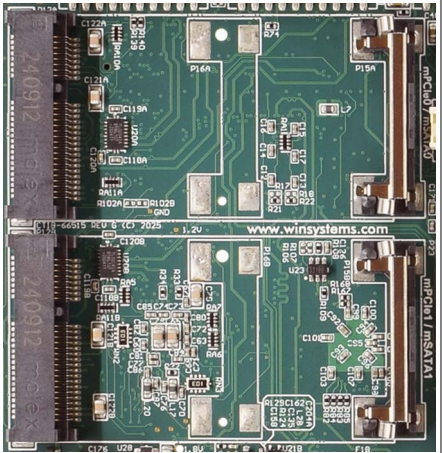
Selection for the miniPCIe on and off is done on the MULTI-JUMPER block (P23)

Position	Jumper ON
C	Slot-0 miniPCIe selected
D	Slot-1 miniPCIe selected



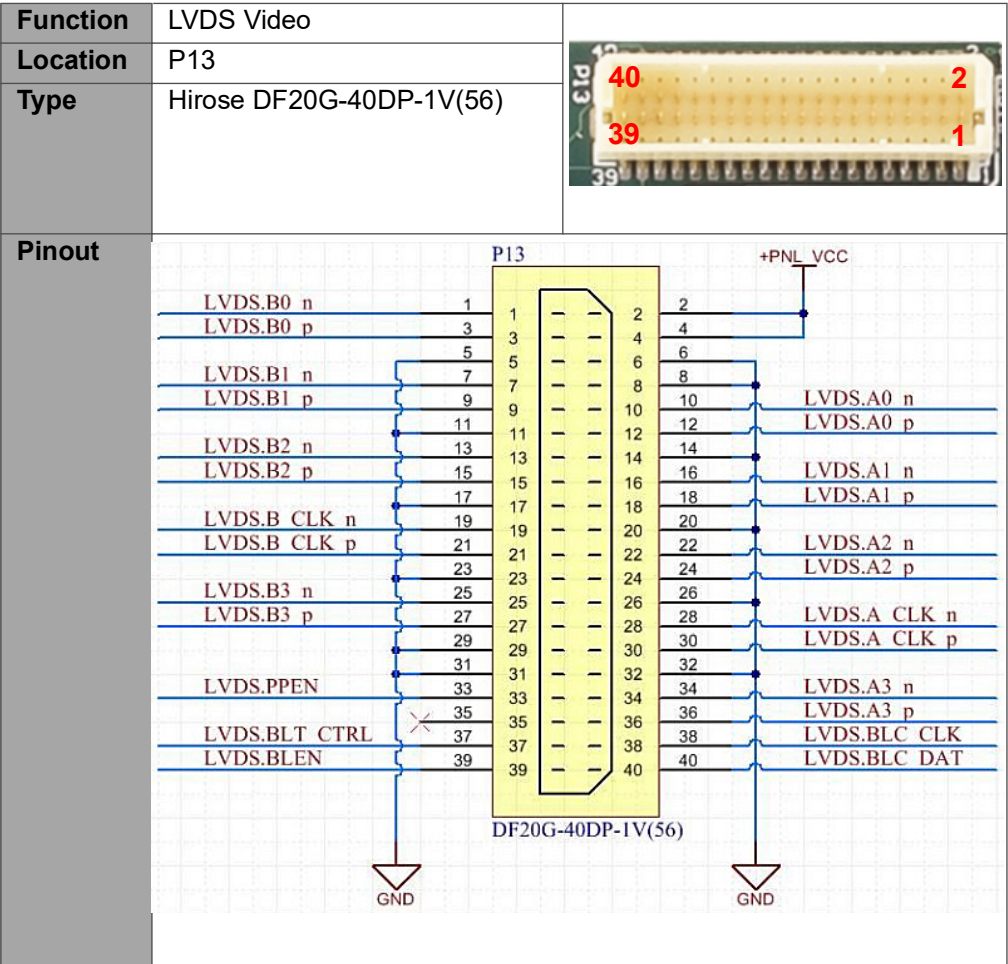
### 9.15 Full Length mini PCIe Installation [P12A, P12B]

The SBC-477-TCA7 comes with its latches in the full length position.

Function	mini PCIe Slots	
Location	P12A, P12B	
Type	Standard miniPCIe Slots	

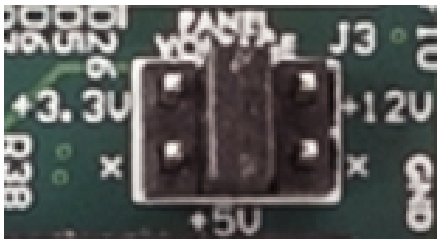
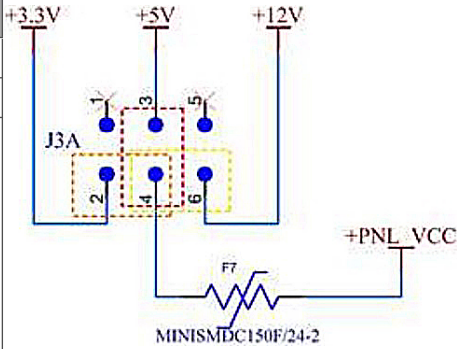
Position	mSATA Pinout		miniPCle Pinout	
	Pin Number	Description	Pin Number	Description
	1	NC	1	NC
	2	+3.3V	2	+3.3V
	3	NC	3	NC
	4	GND	4	GND
	5	NC	5	NC
	6	+1.5V	6	+1.5V
	7	NC	7	CLKREQ#
	8	NC	8	UIM_PWR
	9	GND	9	GND
	10	NC	10	UIM_DATA
	11	NC	11	PCle CLK+
	12	NC	12	UIM_CLK
	13	NC	13	PCle CLK-
	14	NC	14	UIM_RESET
	15	GND	15	GND
	16	NC	16	UIM_VPP
	17	NC	17	NC
	18	GND	18	GND
	19	NC	19	NC
	20	NC	20	W_DISABLE#
	21	RESV	21	RESV
	22	NC	22	NC
	23	SATA TX+ To Host System	23	PCle RX+ To Host System
	24	+3.3V	24	+3.3V
	25	SATA TX- To Host System	25	PCle RX- To Host System
	26	GND	26	GND
	27	GND	27	GND
	28	+1.5V	28	+1.5V
	29	GND	29	GND
	30	NC	30	SMB_CLK
	31	SATA RX- From Host System	31	PCle TX- From Host System
	32	NC	32	SMB_DATA
	33	SATA RX+ From Host System	33	PCle TX+ From Host System
	34	GND	34	GND
	35	GND	35	GND
	36	NC	36	USB D-
	37	GND	37	GND
	38	NC	38	USB D+
	39	+3.3V	39	+3.3V
	40	GND	40	GND
	41	+3.3V	41	+3.3V
	42	NC	42	NC
	43	RESV	43	RESV
	44	NC	44	NC
	45	NC	45	NC
	46	NC	46	NC
	47	NC	47	NC
	48	+1.5V	48	+1.5V
	49	NC	49	NC
	50	GND	50	GND
	51	NC	51	NC
	52	+3.3V	52	+3.3V

9.16 LVDS Video [P13]



### 9.17 LVDS power selection [J3]

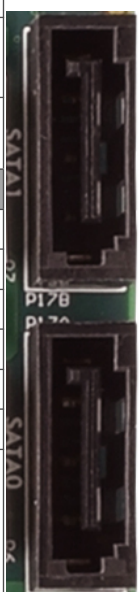
The LVDS Panel VCC voltage is selected via the J3 jumper block. The current is limited to 1.5A

Function	LVDS Panel VCC voltage		
Location	J3		
Type	2x3		
Pinout	Location	Description	
	2-4	3.3V	
	3-4	5V	
	6-4	12V	

## 9.18 External SATA Ports [P17A, P17B]

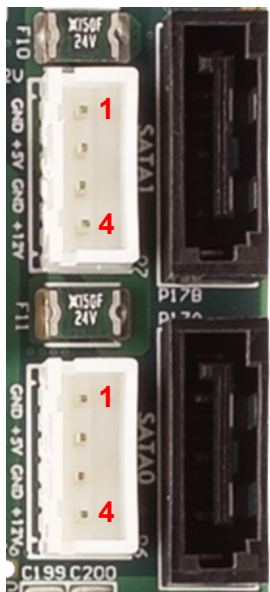
The SBC-477-TCA7 provides two SATA HDD connections as well as external power connectors for each drive.

<b>Function</b>	SATA host	
<b>Location</b>	P17A- SATA- 0 P17B - SATA-1	
<b>Type</b>	Industry standard vertical entry SATA host connector with locking.	
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>
	1	GND
	2	SATA_TX_P
	3	SATA_TX_N
	4	GND
	5	SATA_RX_N
	6	SATA_RX_P
	7	GND



## 9.19 External SATA HDD Power [P6, P7]

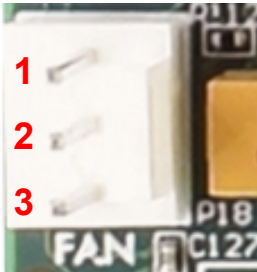
<b>Function</b>	SATA HDD Power	
<b>Locations</b>	P6, P7	
<b>Carrier Connector PN</b>	B4B-XH-AM(LF)(SN)(P) Manufacturer: JST	
<b>Mating Connector PN</b>	XHP-4 Manufacturer: JST	
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>
	1	GND (Black)
	2	+5V (Red)
	3	GND (Black)
	4	+12V (Yellow)
	+12V and +5V are protected with 1200mA Raychem Poly fuses.	



**NOTE** The SATA power connectors are fused independently from the main +12V fuse that provides + 2V power to the board, i.e. the SATA power connectors are not double fused.

## 9.20 CPU Fan [P18]

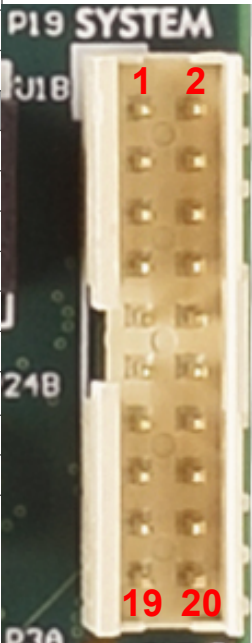
<b>Function</b>	Fan Power	
<b>Locations</b>	P18	
<b>Type</b>	Molex 22-23-2031	
<b>Pinout</b>	<b>Pin</b>	<b>Signal</b>
	1	Fan Tach
	2	+V
	3	GND



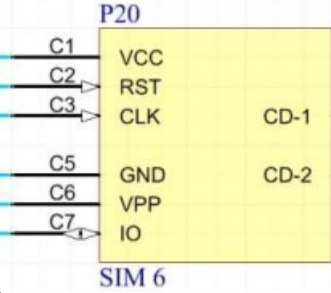
## 9.21 Miscellaneous Control Header [P19]

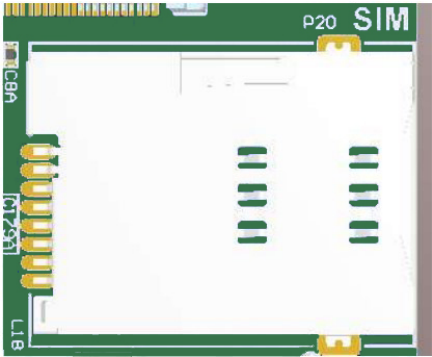
This misc header can be used to connect power button, reset button, PC speaker, I2C device and monitor other power rails. As well it provides the option of jumping the +5V rail to the +5VSB rail which may be needed by some modules.

<b>Function</b>	Miscellaneous Control Header			
<b>Location</b>	P19			
<b>Type</b>	FCI 98414-G06-20LF, 2x10 2mm			
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>
	1	+5V	2	Speaker
	3	+5V	4	+5VSB
	5	Ext CMOS Bat	6	GND
	7	System Reset	8	GND
	9	Power Button	10	GND
	11	Batlow#	12	GND
	13	Sus_S3#	14	GND
	15	I2C.CLK	16	GND
	17	I2C.DAT	18	GND
	19	+5V	20	GND



9.22 SIM card slot [P20] (Optional)


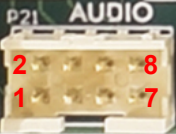
Function	SIM Socket	
Location	P20	
Type	Molex 0475530001	
Pinout		



9.23 Audio Interface [P21]

The SBC-477-TCA7 features HD Audio capabilities. 1 input (microphone) and 1 output (headphone) are available.

Function	Audio Connector			
Location	P21			
Type	FCI 98414-G06-08LF, 2x4 2mm			
Pinout	Pin	Description	Pin	Description
	1	-	2	-
	3	MicR	4	MicI
	5	GND	6	GND
	7	Head Phone R	8	Head Phone L

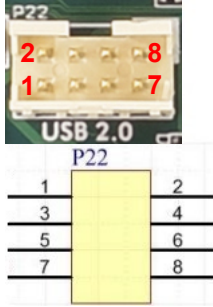




## 9.24 USB2.0 Connector [P22]

The SBC-477-TCA7 external USB 2.0 ports. Each of these are directly sourced from the COM Express Type 6 module and do not go through any external hubs or bridges.

<b>Function</b>	USB 2.0			
<b>Location</b>	P22			
<b>Type</b>	FCI 98414-G06-08LF, 2x4 2mm			
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>
	1	Port A-VBUS	2	Port B-VBUS [1]
	3	Port A-D-	4	Port B-D-
	5	Port A-D+	6	Port B-D+
	7	Port A-GND	8	Port B-GND

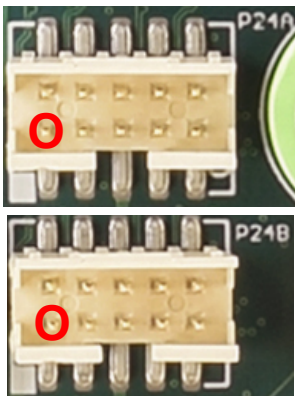


[1] - **B-VBUS**- This voltage can be disabled for USB Client mode on USB port 6, by un-installing jumper P23 position A.

## 9.25 10/100/1000 Ethernet [P24A, P24B]

The SBC-477-TCA7 features dual 10/100/1000 Ethernet Ports. Ethernet Port 0 is coming directly from the COM Express module. Ethernet Port 1 is coming from an Intel 82574 PCIe PHY Controller located on the carrier.

<b>Function</b>	LAN Connector			
<b>Location</b>	P24A, P24B			
<b>Type</b>	FCI 98424-G52-10LF			
<b>Pinout</b>	<b>Pin</b>	<b>Description</b>	<b>Pin</b>	<b>Description</b>
	1	MX1-	2	MX1+
	3	MX2-	4	MX2+
	5	SHELL	6	SHELL
	7	MX3-	8	MX3+
	9	MX4-	10	MX4+





## 9.26 Software Support for the Intel 82574

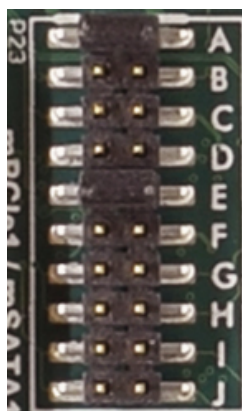
Additional drivers will be needed to properly operate the GBE Port 0 on the COM Express carrier.

These drivers can be downloaded directly from link below.

<https://www.intel.com/content/www/us/en/download-center/home.html?lang=eng&ProductFamily=Ethernet+Components&ProductLine=Ethernet+Controllers&ProductProduct=Intel%C2%AE+82574+Gigabit+Ethernet+Controller>

## 9.27 Multifunction Jumper Block [P23]

The SBC-477-TCA7 has a multi-function jumper that provides control for various interfaces and features. The "MULTI" jumper is located at P23.



Below are the full details of the MULTI jumper block functionality.

Position	Description	JUMPER IN	JUMPER OFF
A	USB Port-6 Client/Host	Port-6 USB Host enabled. Power connected	Port-6 USB Client enabled. Power Disconnected
B	SD Card/ GPIO Mux	SD Card Functionality is enabled	GPIO Functionality is enabled
C	miniPCle Slot-0 Selection	miniPCle enabled	-
D	miniPCle Slot-1 Selection	miniPCle enabled	-
E	PCle UART EEPROM	Enable PCle UART EEPROM	Disable PCle UART EEPROM
F	PCle UART - TRI State Enable	Enable TRI-State control for PCle UART	Disable TRI-State control for PCle UART
G	PCle UART - 485 Port 0- RTS-TX Control	Enable RS-485 Port-0 RTS-TX Control	Disable RS-485 Port-0 RTS· TX Control
H	PCle UART - 485 Port 0- RTS-RX Control	Enable RS-485 Port-0 RTS-RX Control	Disable RS-485 Port-0 RTS-RX Control
I	PCle UART - 485 Port 1- RTS-TX Control	Enable RS-485 Port-1 RTS-TX Control	Disable RS-485 Port-1 RTS· TX Control
J	PCle UART - 485 Port 1- RTS-RX Control	Enable RS-485 Port-1 RTS-RX Control	Disable RS-485 Port-1 RTS-RX Control

## 10. Typical Hardware Installation for +12V power input

1. Ensure all external system power supplies are off.
2. Install the necessary cables for the application. At a minimum, this would include:
  - a) + 12V Power cable to the input power connector.
  - b) Connect a video display cable HDMI, Display Port or LVDS.
  - c) Keyboard and mouse via USB
  - d) SATA Power and Signal to SATA HDD

For the relevant cables, see the Cables and Cable Kit Information section of this manual

3. Connect the power cable to power supply
4. Switch on the power supply. DO NOT power up your COM Express system by plugging in live power.

## 11. Power Consumption Details

Below are the maximum ratings of the carrier.

Maximums	Amps	Watts
The absolute maximum total draw of all functionality on the carrier board (this value excludes current draw from the module).	4.00A	48W
Safety Protected Maximum Current Draw Rating for Module and Carrier (from in-line fuse).	10.00A	120W

NOTE COM Express Type-6 Module used for measurements - Intel Core i5 Ivy Bridge 2700MHz Quad-Core Processor with QM77 chipset.

## 12. PCI Express Allocation Details

Below is a listing of how the PCI Express Links are allocated on the carrier board.

COM Express PCI Express Link	Peripheral Connection
PCIe x1 -0	PCIe UART (Exar 17V354)
PCIe x1 -1	miniPCIe Slot 0
PCIe x1 -2	miniPCIe Slot 1
PCIe x1 -3	PCIe GBE PHY (Intel 82574)
PCIe x1 -4	No Connect
PCIe x1 -5	No Connect
PCIe x1 -6	No Connect
PCIe x1 -7	No Connect
PEG /PCIe x16	No Connect

## 13. USB Allocation Details

Below is a listing of how the USB Ports are allocated on the carrier board.

COM Express USB Port	Peripheral Connection
USB 3.0 Port 0	USB 3.0 A Connector (P3A)
USB 3.0 Port 1	USB 3.0 A Connector (P3A)
USB 2.0 Port 2	USB 3.0 B Connector (P3B)
USB 2.0 Port 3	USB 3.0 B Connector (P3B)
USB 2.0 Port 4	miniPCIe Slot 0
USB 2.0 Port 5	miniPCIe Slot 1
USB 2.0 Port 6	USB 2.0 Connector (P22)
USB 2.0 Port 7	USB 2.0 Connector (P22)

## 14. Cables

Cable Set	
Part Number	
CBL-SET-477-CNT-1	<ul style="list-style-type: none"> <li>• SATA HDD Signal and Power Cable</li> <li>• Dual USB 2.0 to 8-Pin Minitex Cable</li> <li>• DisplayPort to 20-pin Minitex Cable</li> <li>• 20-Pin Minitex to Flying Leads</li> <li>• JR-45 to 10-Pin Minitex Cable</li> <li>• Dual Audio to 8-Pin Minitex Cable</li> <li>• VGA to 10-Pin Minitex Cable</li> <li>• Dual DB-9 to 20-Pin Minitex Cable</li> <li>• Dual USB 3.0 Panel Mount to 20-pin Locking Intl Style: Right Angle Inner Exit</li> <li>• Dual USB 3.0 Panel Mount to 20-pin Locking Intl Style: Right Angle Outer Exit</li> <li>• Dual USB 3.0 Panel Mount to 20-pin Locking Intl Style: Right Angle Vertical Exit</li> </ul>

Contact Winsystems at <https://winsystems.com/contact/> for cables options.

## Appendix A. Best Practices

The following paragraphs outline the best practices for operating the SBC-477-TCA7 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. It is usually good practice to budget twice the typical power requirement for all of your devices.

#### **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 SBC-477-TCA7 typical load is not lower than the power supply's minimum load. If the SBC-477-TCA7 board 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 SBC-477-TCA7.



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

When verifying the voltage, measure it at the power connector on the carrier board. Measuring it at the power supply does not account for voltage drop through the wire and connectors.

The SBC-477-TCA7 requires 12VDC input (+/- 5%) to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

#### **Power Harness**

Minimize the length of the power harness. This reduces the amount of voltage drop between the power supply and the SBC-477-TCA7.

#### **Gauge Wire**

Use the largest gauge wire that the pin and connector manufacture allows. Most pin and 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 to the embedded system. Do not hot-plug the SBC-477-TCA7 on a host carrier board that is already powered.

**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 SBC-477-TCA7

To avoid damage, mount the SBC-477-TCA7 properly. Standoff kits are available and recommended for use with the SBC-477-TCA7.

**Placing the SBC-477-TCA7 on mounting standoffs**—Be careful when placing the SBC-477-TCA7 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 SBC-477-TCA7**—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. 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.

**Avoid cutting the SBC-477-TCA7**—Never use star washers or any fastening hardware that cut into the SBC-477-TCA7.

**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.

## Conformal Coating

Conformal coating by any source other than WINSYSTEMS voids the product warranty and will not be accepted for repair by WINSYSTEMS. If such a product is sent to WINSYSTEMS for repair, it will be returned at customer expense and no service will be performed. A WINSYSTEMS product conformally coated by WINSYSTEMS will be subject to regular WINSYSTEMS warranty terms and conditions.

## Operations/Product Manuals

Every WINSYSTEMS product has an Operations manual or Product manual.

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

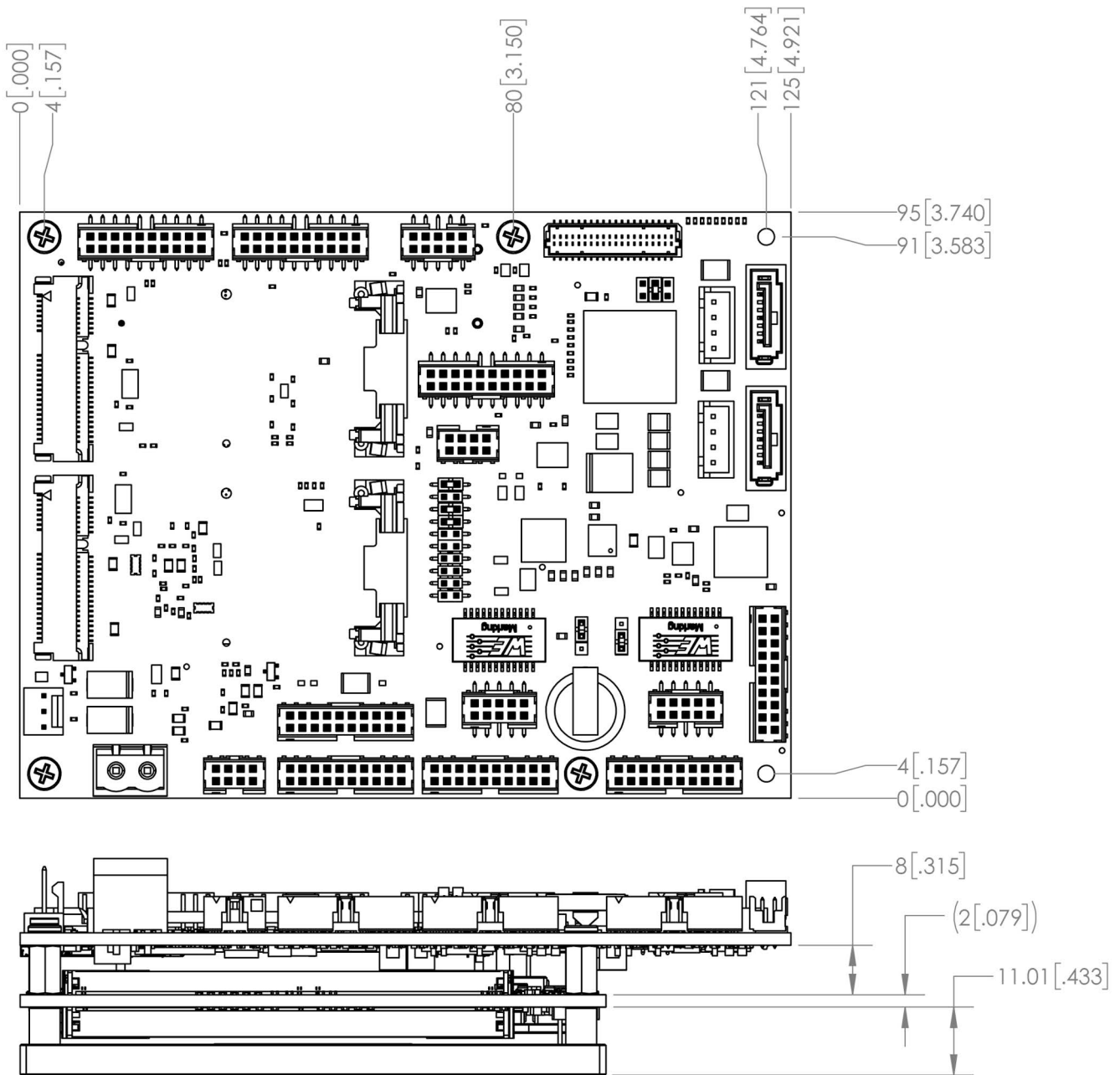
**Check pin-outs**—Always check the pin-out and connector locations in the manual before plugging in a cable. Many I/O modules have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

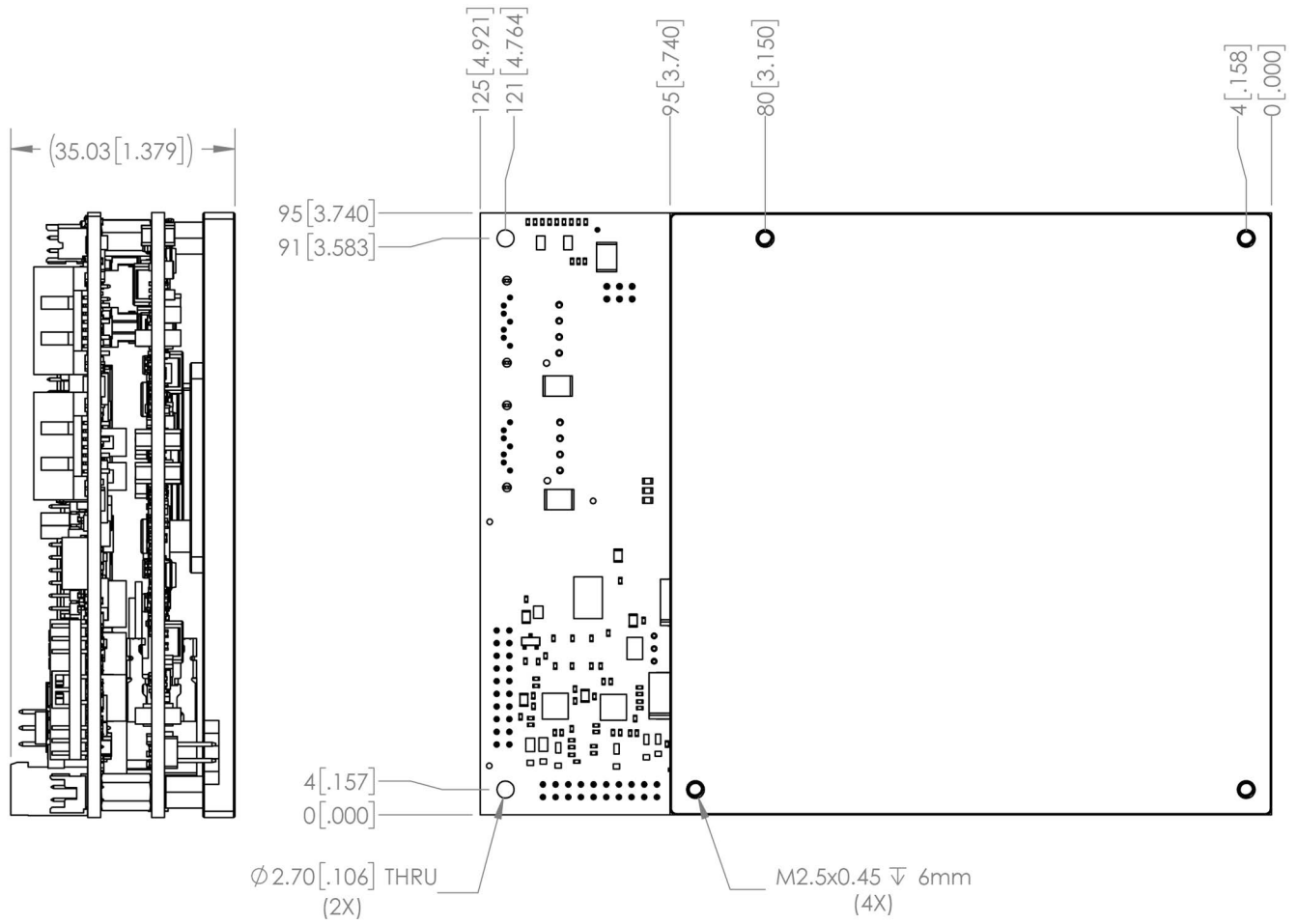
**Contact an applications engineer**—If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact a WINSYSTEMS applications engineer at +1-817-274-7553.



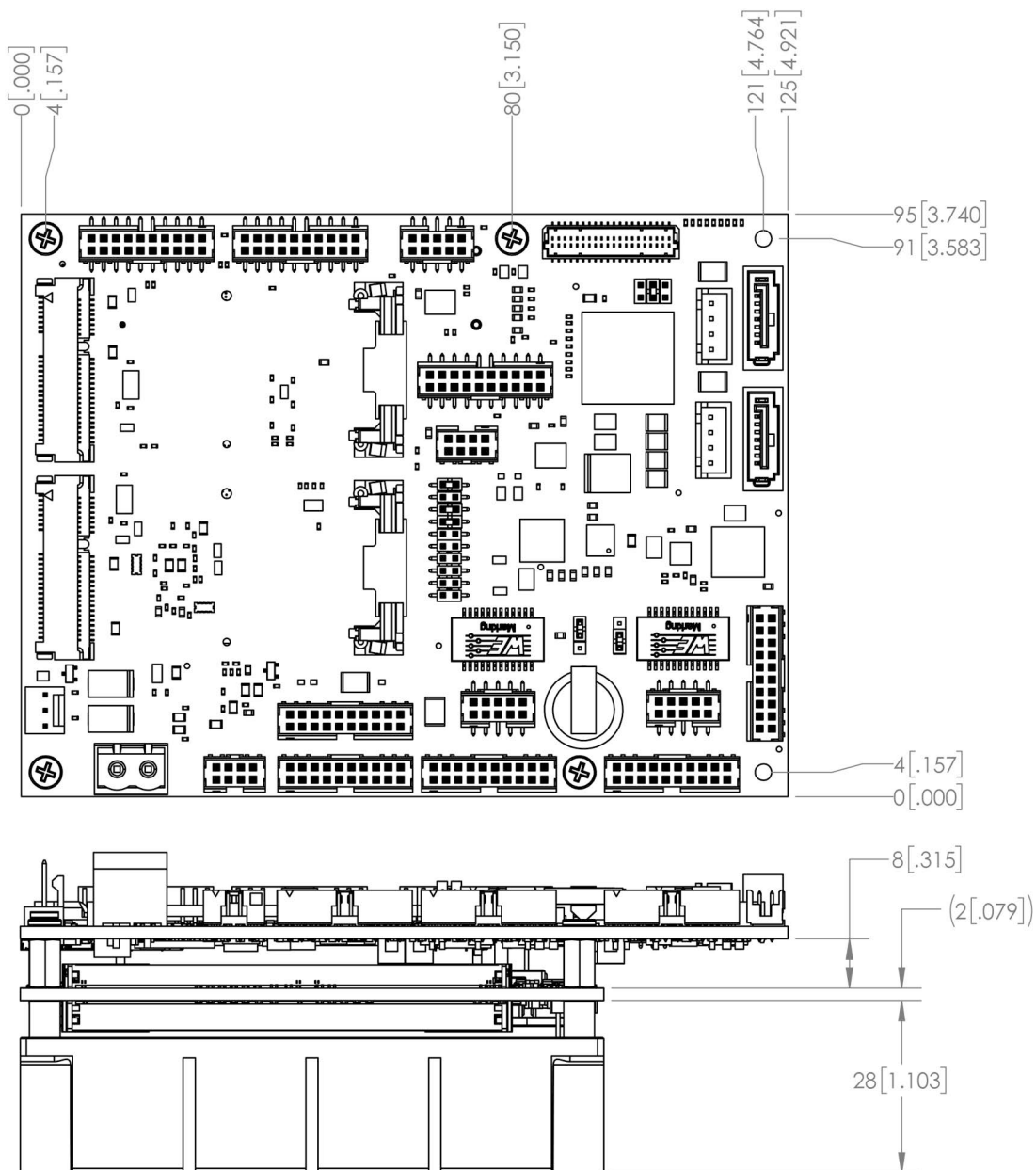
# Appendix B. Mechanical Drawings

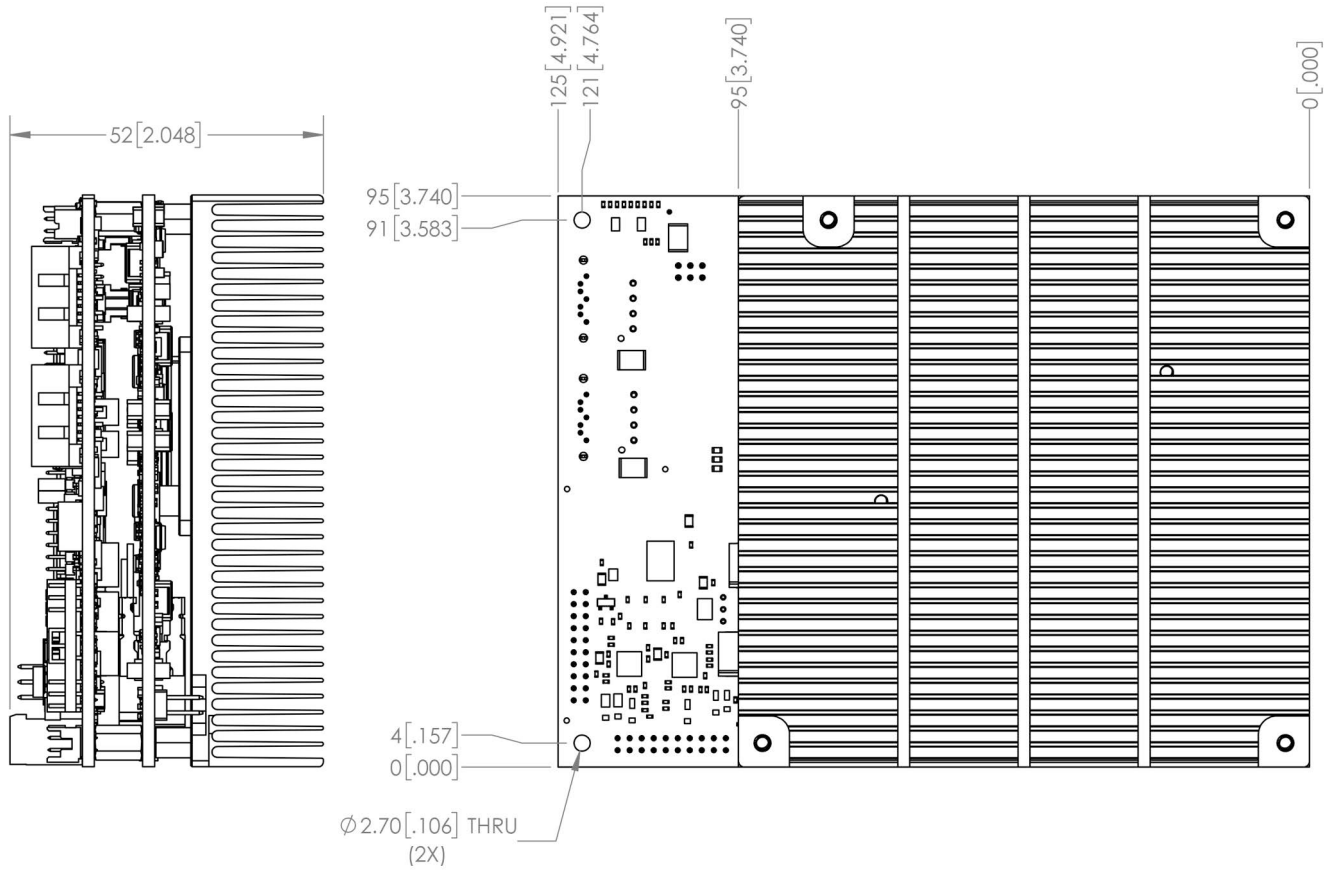
## SBC-477-TCA7-1





## SBC-477-TCA7-2





## Appendix C. Warranty Information

Full warranty information is at <https://winsystems.com/company-policies/warranty/>