Connect Tech Inc.

Xtreme/GPU
User Manual

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Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our support section is available 24 hours a day, 7 days a week on our website at: www.connecttech.com/sub/support/support.asp. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

Contact Information

Mail/Courier
Connect Tech Inc.
Technical Support
42 Arrow Road
Guelph, Ontario
Canada N1K 1S6

Email/Internet

sales@connecttech.com
support@connecttech.com
www.connecttech.com

Note:
Please go to the **Download Zone** or the **Knowledge Database** in the **Support Center** on the Connect Tech website for product manuals, installation guides, and technical tips.
Submit your technical support questions to our customer support engineers via the **Support Center** on the Connect Tech website.

Telephone/Facsimile
Technical Support representatives are ready to answer your call Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. Our numbers for calls are:

Toll Free: 800-426-8979 (North America only)
Telephone: 519-836-1291 (Live assistance available 8:30 a.m. to 5:00 p.m. EST, Monday to Friday)
Facsimile: 519-836-4878 (on-line 24 hours)

Limited Warranty

Connect Tech Inc. provides a one-year warranty for the Xtreme/GPU products. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non-Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid ground shipment service.

The Connect Tech Inc. Warranty is defined as the appropriate serviceable time of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract the Warranty if no replacement is available.

The above warranty is the only warranty authorized by Connect Tech Inc. Under no circumstances will Connect Tech Inc. be liable in any way for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, such product.

Copyright Notice

Trademark Acknowledgment

Revision History

Revision	Date	Changes
0.00	01/05/2013	Original
0.01	03/06/2013	Added Images of Connectors and PCB
0.02	17/07/2013	Added Jumper Selection Information and Image
0.03	24/07/2013	Added AMD Power Consumption Information
0.04	03/08/2013	Added MXM Module Summary
0.05	23/08/2013	Added NVIDIA Power Consumption Information and 3D Mark Benchmark Data
0.06	12/09/2013	Updated NVIDIA Multi Monitor Information, Updated Power Consumption Information
0.07	30/09/2013	Added Stack Configurations, Corrected Driver Information, Updated to REV C, Removed +3.3V Rail
0.08	18/11/2013	Completed Changes Relating to REV C, Updated Mechanical Drawings for XHG003 and XHG004, Added Missing Images
0.09	16/04/2014	Correct PCIe/104 Connector and PCIe x16 Linking Instructions
0.10	15/12/2014	
0.11	31/10/2016	Updated Warranty Policy

Introduction

Connect Tech's Xtreme/GPU is an exceptional desktop-level graphics board, with outstanding multimedia features, utilizing high end GPU's. Designed around the PCIe/104 specification, this compact design features four Mini DisplayPort ++ connectors, capable of displaying in native DisplayPort, or in HDMI, DVI, or even VGA with the use of a Mini DisplayPort++ Adapter.

Connect Tech's Xtreme/GPU is ideal for compact and high performance computing applications in mobile entertainment, kiosks, digital signage, automation, ROVs and gaming applications.

ESD Warning

Electronic components and circuits are sensitive to ElectroStatic Discharge (ESD). When handling any circuit board assemblies including Connect Tech Xtreme/GPU, it is recommended that ESD safety precautions be observed. ESD safe best practices include, but are not limited to:

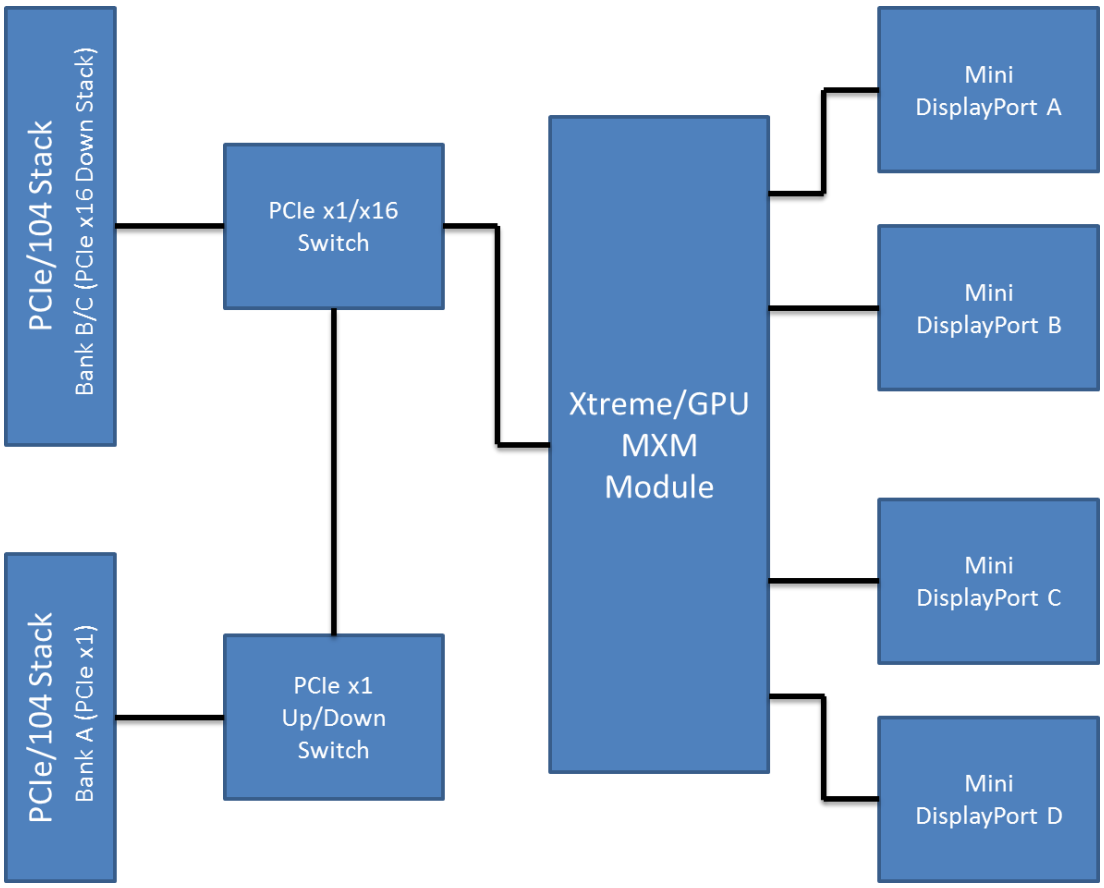
- Leaving circuit boards in their antistatic packaging until they are ready to be installed.
- Using a grounded wrist strap when handling circuit boards, at a minimum you should touch a grounded metal object to dissipate any static charge that may be present on you.
- Only handling circuit boards in ESD safe areas, which may include ESD floor and table mats, wrist strap stations and ESD safe lab coats.
- Avoiding handling circuit boards in carpeted areas.
- Try to handle the board by the edges, avoiding contact with components.

Product Features and Specifications

Feature	XGG00#
PCB Size / Overall Size	95.89mm x 107.95mm (PCIe/104 Compliant) Maximum Top Side Assembly Height (Attached Thermal Plate): 11.75mm Maximum Top Side Assembly Height (Active Heat Sink): 21.75mm Maximum Top Side Assembly Height (Passive Heat Pipe): 20.25mm 3D STEP Model: **download here**
Mini DisplayPort Connectors	4
HDMI	Available through DisplayPort++
DVI	Available through DisplayPort++
VGA	Available through DisplayPort++
Power Connector	Available through PCIe/104 Up and Down Connector
PCIe/104	3 Bank PCIe/104 Connector (x1/x16 PCIe [1,2])
Accessories	Active Heat Sink XHG001 Passive Heat Pipe XHG002 Cable Kit (DisplayPort, DP++ Passive Adapter)
Operating Temperature	Industrial Variant (XGG001) -40 to +85 Celsius Commercial Variant (XGG002, XGG003) -10 to +70 Celsius
Power Input	+12V ± 5% +5V ± 5% (Sourced from PCIe/104 Bus)
Embedded Power	+3.3V @ 4A (Provided from on-board supply, sourced from +5V rail)
Warranty and Support	Limited one-year warranty and free technical support

Note [1]: Jumper Selectable.
Note [2]: PCIe x16 Link only available in Bottom Stacking Configuration.

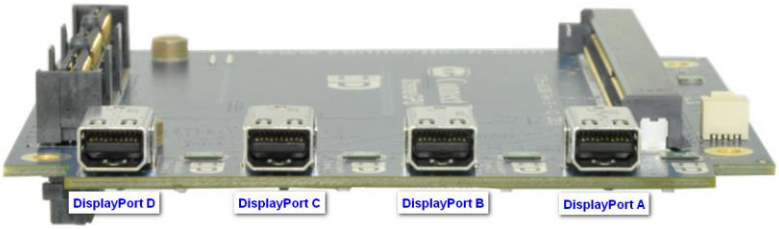
Block Diagram



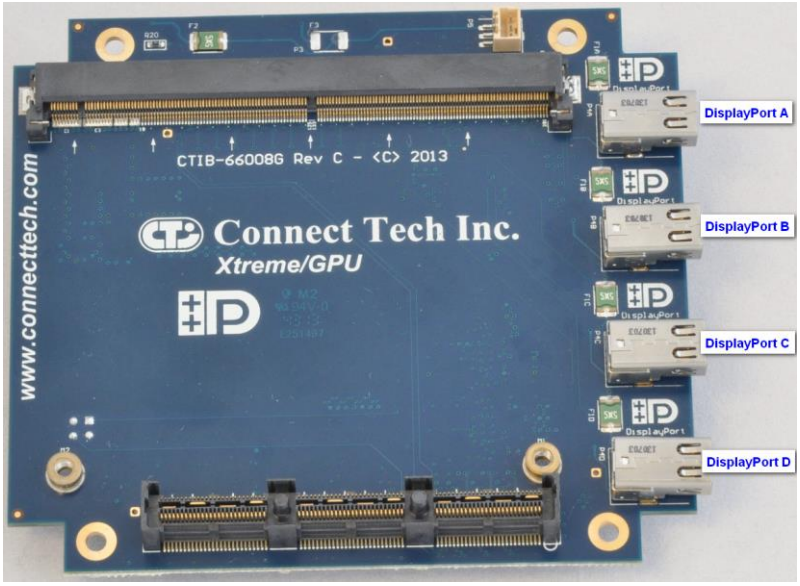
Connector Locations

Top View

Side View



Bottom View



MXM Module Summary

The Xtreme/GPU has multiple MXM Modules available. These have different specifications and operating conditions, as detailed below.

XGG001: Industrial AMD Radeon E6760

Operating Temperature Range: -40^{O}C to +85^{O}C
GPU Engine/Memory Clock: 600 MHz Engine/800 MHz Memory
Memory: 1GB GDDR5, 128-bit, 51.2GB/s
Graphics: 480 Shaders
Compute: 576 GFLOPs/s Single Precision Floating Point (Peak)[3]
Display Output: Up to 4 Displays, 2560 x 1600 Maximum Digital Resolution[4]
Additional Features: OpenGL 4.1, OpenCL 1.1, AMD Eyefinity, DirectX 11

XGG002: Commercial AMD Radeon E6760

Operating Temperature Range: -10^{O}C to +70^{O}C
GPU Engine/Memory Clock: 600 MHz Engine/800 MHz Memory
Memory: 1GB GDDR5, 128-bit, 51.2GB/s
Graphics: 480 Shaders
Compute: 576 GFLOPs/s Single Precision Floating Point (Peak)[3]
Display Output: Up to 4 Displays, 2560 x 1600 Maximum Digital Resolution[4]
Additional Features: OpenGL 4.1, OpenCL 1.1, AMD Eyefinity, DirectX 11

XGG003: Commercial NVIDIA GeForce GT 745M

Operating Temperature Range: -10^{O}C to +70^{O}C
GPU Engine/Memory Clock: 837 MHz/1250 MHz Memory
Memory: 2GB GDDR5
CUDA: 384 Cores
Graphics: 384 Shaders
Compute: 642.82 GFLOPS/s Single Precision Floating Point[5,6]
Display Output: 3840 x 2160 Maximum Digital Resolution[5]
Additional Features: OpenGL 4.2, OpenCL 1.2, CUDA 3.5[5], DirectX 11

MXM Module Drivers/Software:

Software drivers for both the AMD and NVIDIA MXM Modules can be found at the following websites:

NVIDIA: http://www.geforce.com/drivers
- System Type: GeForce
- Product Family: GeForce 700M Series (Notebook)
- Product: GeForce GT 745M

AMD: http://www.amd.com/drivers
- System Type: Embedded Graphics
- Product Family: Radeon Embedded
- Product: E6760

Note [3]: Value given on AMD Radeon E6760 Product Brief (http://www.amd.com/us/products/embedded/graphics-processors/Pages/radeon-e6760-mxm-v3-0.aspx)
Note [4]: Value given on GPUZoo website (http://www.gpuzoo.com/GPU-AMD/Radeon_E6760_MXM.html)
Note [5]: Value given on GPUZoo website (http://www.gpuzoo.com/GPU-NVIDIA/GeForce_GT_745M.html)
Note [6]: Value given on TechPowerUp website (http://www.techpowerup.com/gpudb/2320/geforce-gt-745m.html)

Jumper and Connector Summary

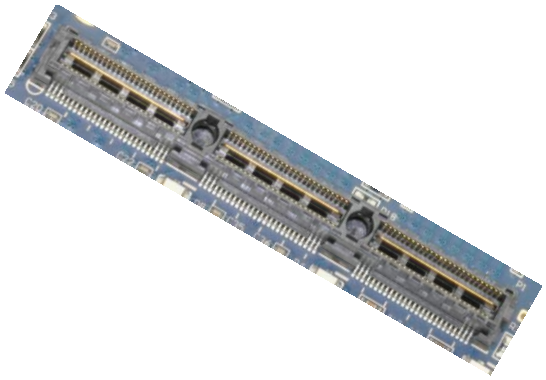
Designator	Connector	Description
P1	PCIe/104 Top	PCIe/104 Top Side Connector
P2	PCIe/104 Bot	PCIe/104 Bottom Side Connector
P3	MXM 3.0	MXM 3.0 Module Connector
P4A	DP++A	Mini DisplayPort A Connector
P4B	DP++B	Mini DisplayPort B Connector
P4C	DP++C	Mini DisplayPort C Connector
P4D	DP++D	Mini DisplayPort D Connector
P5	FAN Conn	+12V Fan Connector
J1	Jumper	PCIe Selection Jumper

Detailed Feature Pinouts and Descriptions

PCIe/104 Top Connector

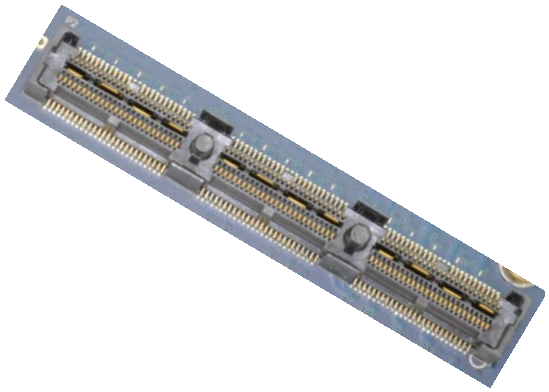
The GPU connects to a PCIe/104 Stack via a connector.

Function	**PCIe/104 Stack Interface**
Location	P1
Type	Samtec fine pitch stacking connector, part number: ASP-129637-03 PCIe/104 Top Side Connector (Connects in Stack Down Configurations) 15mm stack height.
Pinout	Refer to PCI/104-Express & PCIe/104 Specification, Rev 2.01 NOTE: PCIe x16 Connected (Down Stack Link ONLY)



PCIe/104 Bottom Connector

Function	**PCIe/104 Stack Interface**
Location	P2
Type	Samtec fine pitch stacking connector, part number: ASP-129646-03 PCIe/104 Bottom Side Connector (Connects in Stack Up Configurations) 15mm stack height.
Pinout	Refer to PCI/104-Express & PCIe/104 Specification, Rev 2.01 NOTE: PCIe x16 Not Connected (Down Stack Link ONLY)

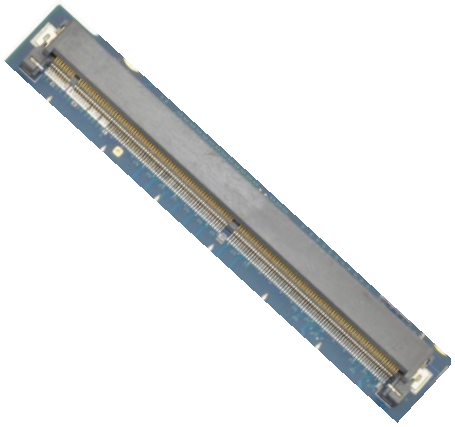


Power

The required power rails for the Xtreme/GPU are provided as part of the PCIe/104 Stack Connectors. Please refer to the PCI/104-Express & PCIe/104 Specification, Rev 2.01 for additional details on the pin out structure.

MXM 3.0 Connector

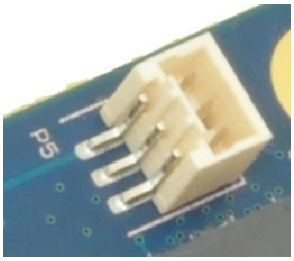
Function	**MXM 3.0 Module Connector**
Location	P3
Type	JAE Electronics fine pitch MXM 3.0 connector, part number: MM70-314-310B1-2-R300 3mm stack height.
Pinout	Refer to MXM Graphics Module Mobile PCI Express Module Electromechanical Specification Version 3.1, Rev 1.0



Fan Connector

For custom active thermal designs, the pinout for the fan connector is required.

Function	**Active Thermal Fan Connection**
Location	P5
Type	Molex 3 Position, 1.5mm, Shrouded Header (87437-0343)
Pinout	Pin 1: +12V/+5V (Fuse F2/F3) Pin 2: NC Pin 3: GND



Video Outputs

The Xtreme/GPU features up to four Mini DisplayPort outputs. The availability of these graphical interfaces depends on your selected Xtreme/GPU MXM Module.

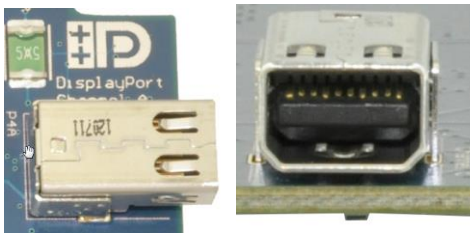
The configuration of either interface as the primary or secondary or tertiary display depends on the MXM Modules capabilities and settings.

AMD Radeon E6760:	Primary Output	P4A
	Secondary Output	P4C
	Tertiary Output	P4B
NVIDIA GeForce GT 745M:	Primary Output	P4C
	Secondary Output	P4D
	Tertiary Output	P4A[7] or P4B[7]

Note [7]: The NVIDIA GeForce GT 745M is unable to display on P4A and P4B at the same time due to GPU design. Max multi-monitor configuration is 3 monitors.

Mini DisplayPort Connector

Function	**DisplayPort Video Output**
Location	P4A, P4B, P4C, P4D
Type	Mini DisplayPort++



PCIe Jumper

The Xtreme/GPU features the ability to work on either the x1 PCIe Link in BANK 1, or the x16 PCIe Link located in BANK 2 and 3 of the PCIe/104 Connector.

Without the Jumpers, the XGG is set to x1 PCIe mode. To enable x16 PCIe mode, a jumper connecting pin 1 to 2 or 4, and a jumper connecting pin 3 to 2 or 4 is required.

PCIe Jumper

Function	**PCIe Selection Jumper**
Location	J1
Type	2.00mm Jumper
Pinout	Pin 1 - +3.3V Pull Up Pin 2 - GND Pin 3 - PEG_ENA# Pin 4 - GND 4○ ○1 3○ ○2

Stack Configuration

The XGG is designed to operate in multiple stack configurations. Typically the best configuration is to have the XGG at the end of the stack to allow for better thermal dispersion. If the XGG needs to be placed in the middle of a stack, ADG038's will be required.

Typical Hardware Installation for a PCIe Stack

1. Ensure all external system power supplies are off.

2. Ensure that the MXM Module is correctly seated and held in place by the provided M3 screws; as well, check that the provided Thermal Solution (If one was requested) is firmly in place.

   a) Active Thermal Solution: Please make sure that the three pin connector for the Fan is plugged in

3. Install the Xtreme/GPU into the PCIe/104 stack (For installations in the middle or the top of the stack, PCIe/104 Bus Extenders may be required).

4. Install the necessary cables for the application. At a minimum, this would include:

   a) Mini DisplayPort to DisplayPort Cable

   Or

   b) Mini DisplayPort++ Adapter with appropriate cable (HDMI/DVI/VGA)

   For the relevant cables, see the Cables & Interconnect section of this manual

5. Switch on the power for the PCIe/104 stack. DO NOT power up your system by plugging in live power. Please ensure that all three blue power LED's are lit before using the product.

Current Consumption Details

Below are the maximum ratings of the Xtreme/GPU.

Maximums	Amps	Watts
Theoretical absolute maximum total draw of all functionality on the board	10.00 A	120 W

Below are measurements taken with the Xtreme/GPU running in various configurations. These values also include the power consumption of the test system that the Xtreme/GPU was installed in. Some values will change depending on what mode the Xtreme/GPU is running in and what MXM Module is installed.

Actual Measurements	Amps	Watts
Commercial AMD Radeon E6760 Single DisplayPort[8]	1.92 A	23.10 W
Commercial AMD Radeon E6760 Single DisplayPort under Stress[8,9]	5.19 A	62.34 W
Commercial AMD Radeon E6760 Dual DisplayPort[8]	2.49 A	29.90 W
Commercial AMD Radeon E6760 Dual DisplayPort under Stress[8,10]	5.41 A	64.94 W
Commercial AMD Radeon E6760 Triple DisplayPort[8,11]	2.66 A	31.89 W
Commercial AMD Radeon E6760 Triple DisplayPort under Stress[8,11]	5.92 A	71.07 W
Commercial NVIDIA GeForce GT745M Single DisplayPort[8]	1.67 A	19.99 W
Commercial NVIDIA GeForce GT745M Single DisplayPort under Stress[8,9]	4.84 A	58.09 W
Commercial NVIDIA GeForce GT745M Triple DisplayPort[8]	1.78 A	21.40 W
Commercial NVIDIA GeForce GT745M Triple DisplayPort under Stress[8,10]	4.87 A	58.48 W

Note [8]: System Specs/Testing Configuration: Intel i7-3615, 4GB RAM, Windows 7 Enterprise N (32-Bit), XGG PCIe x16 Connection
Note [9]: Stress test was performed using 3DMark 1.10 Software.
Note [10]: Stress test was performed using 3DMark 1.10 Software on Primary Display.
Note [11]: Stress test was performed using 3DMark 1.10 Software on 3x1 Portrait Eyefinity Display Setup (3240x1920 Resolution).

Benchmark Details

Below are the 3D Mark 1.10 benchmarks of the Xtreme/GPU in various configurations. These values may change depending upon individualize setups.

	Combined Score	Ice Storm	Cloud Gate	Fire Strike
Commercial AMD Radeon E6760 Single Display[12,13]	847	34461	3723	847
Commercial AMD Radeon E6760 Single Display[12,14]	863	38741	3752	863
Commercial AMD Radeon E6760 Eyefinity 3x1(3240x1920) Display[12,14]	859	30641	3635	859
Commercial NVIDIA GeForce GT 745M Single Display[12,13]	1218	36709	3851	1218
Commercial NVIDIA GeForce GT 745M Single Display[12,14]	1235	42182	3892	1235

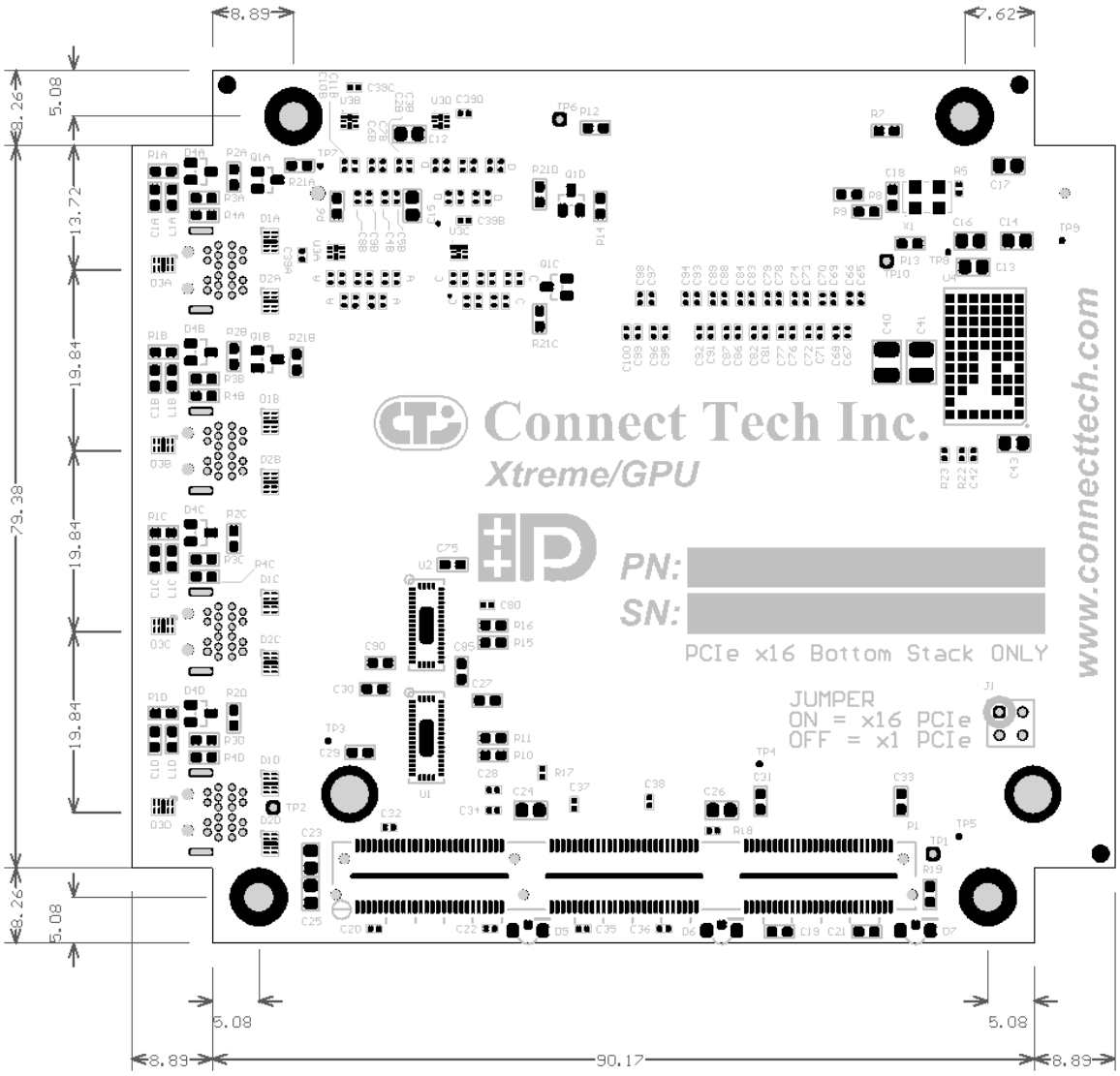
Note [12]: System Specs/Testing Configuration: Intel i7-2600, 8GB RAM, Windows 7 Enterprise N (32-Bit)
Note [13]: XGG PCIe x1Configuration
Note [14]: XGG PCIe x8Configuration

Mechanical Details

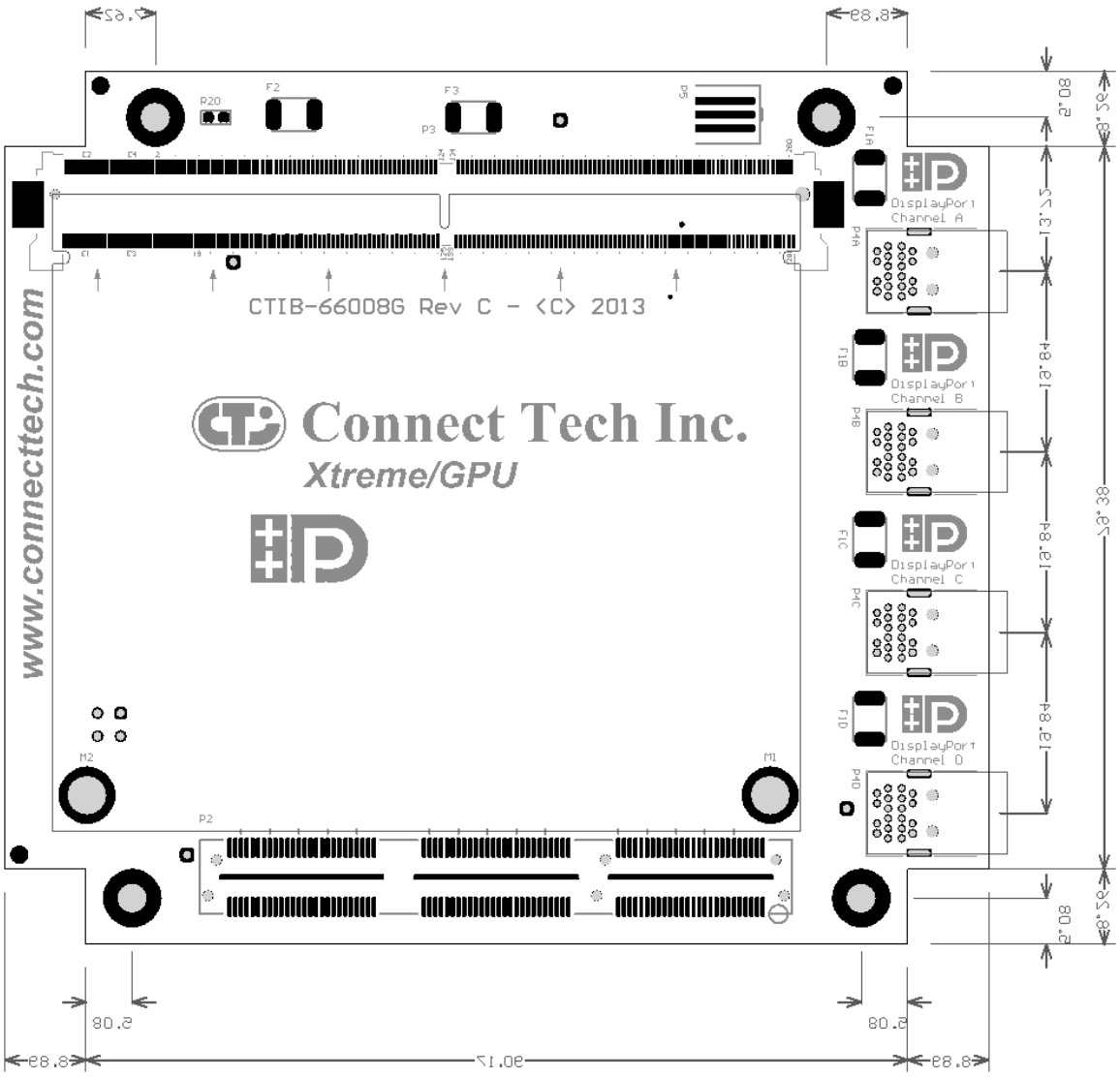
A complete **3D STEP Model** file of Xtreme/GPU can be downloaded here:
http://www.connecttech.com/ftp/3d_models/XGG001_3D_MODEL.zip

2D Mechanical Dimensioned Drawing (Top and Bottom Views) - All dimension are in (mm)

Top View



Bottom View


CTIB-66008G Rev C - <C> 2013
Connect Tech Inc.
Xtreme/GPU
www.connecttech.com
DisplayPort
Channel A
DisplayPort
Channel B
DisplayPort
Channel C
DisplayPort
Channel D
P2
M1
M2

Cables & Interconnect

The following table summarizes the Xtreme/GPU cables available.

PCB Connector	Cable Part Number	Description	PCB End	Interface End
Mini DisplayPort (P4A, P4B, P4C, P4D)	CBG107 (MDP2DPMM6)	Mini DisplayPort to DisplayPort Cable	Mini DisplayPort (Male)	DisplayPort (Male)
Mini DisplayPort (P4A, P4B, P4C, P4D)	CBG108 (MDP2HDMI)	Mini DisplayPort to HDMI Adapter	Mini DisplayPort (Male)	HDMI (Female)
Mini DisplayPort (P4A, P4B, P4C, P4D)	CBG109 (MDP2DPMM6)	Mini DisplayPort to DVI Adapter	Mini DisplayPort (Male)	DVI (Female)
Mini DisplayPort (P4A, P4B, P4C, P4D)	CBG110 (MDP2DPMM6)	Mini DisplayPort to VGA Adapter	Mini DisplayPort (Male)	VGA (Female)

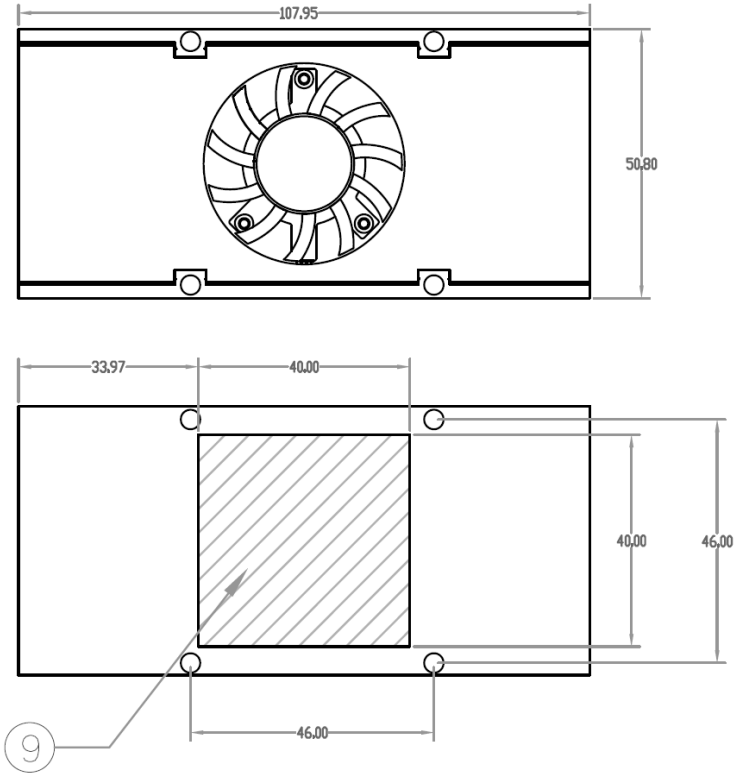
Cable drawings are available upon request. Send an email request to: **support@connecttech.com**

Thermal Solutions

The following are thermal solution for the Xtreme/GPU

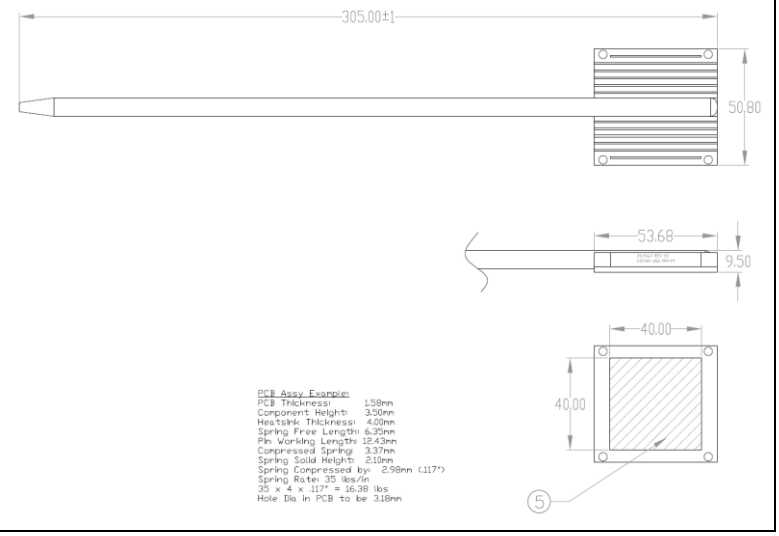
XHG001 - Active Thermal Solution

Active Heat Sink

Function	**Active Cooling of Xtreme/GPU**	
Type	Active	
Fan Power	+12V	

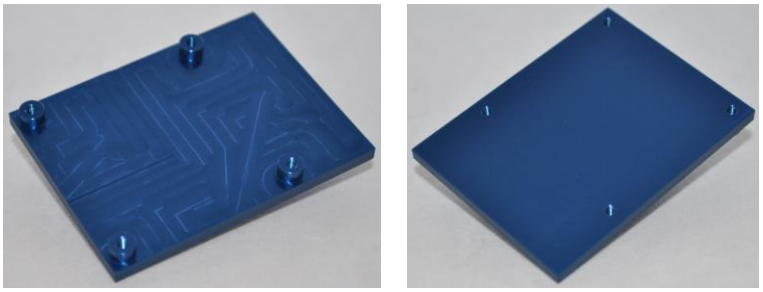
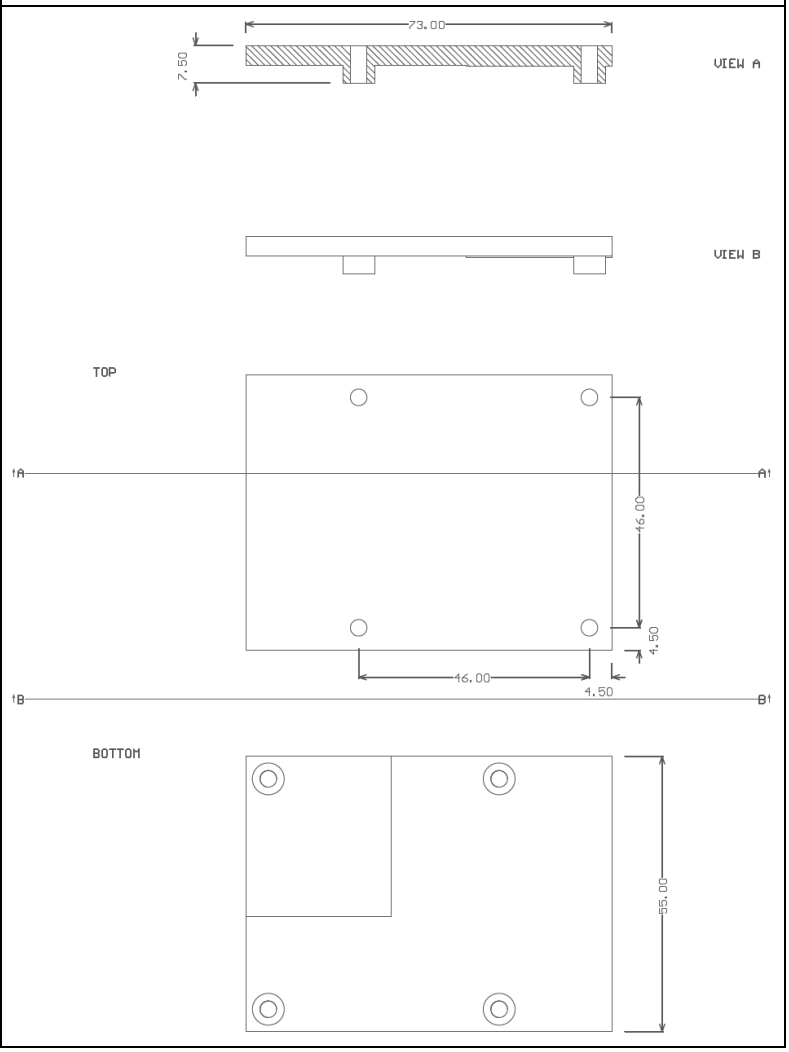
XHG002 - Passive Thermal Solution

Passive Heat Sink

Function	**Passive Cooling of Xtreme/GPU**	
Type	Passive	
Heat Pipe Spec	8mm Copper Heat Pipe Min Bend Radius: 24mm Min Bend Angle: 90 Degrees	

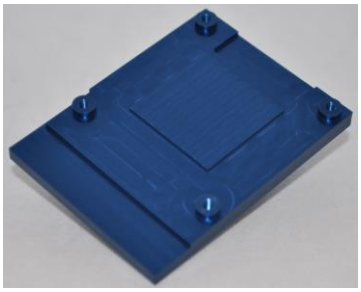
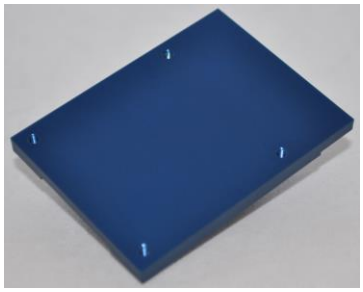
XHG003 - AMD Radeon E6760 Thermal Plate

Active Heat Sink

Function	**Thermal Plate for AMD Radeon E6760 GPU**	
Type	Passive Plate	
Screw Type	4 x M3	

XHG004 - NVIDIA GeForce GT 745M Thermal Plate

Active Heat Sink

Function	**Thermal Plate for NVIDIA GeForce GT 745M GPU**	 
Type	Passive Plate	
Screw Type	4 x M3