



TESLA K20 GPU ACCELERATOR

BD-06455-001_v09 | October 2014

Board Specification



DOCUMENT CHANGE HISTORY

BD-06455-001_v09

Version	Date	Authors	Description of Change
01	August 1, 2012	GG, SM	Preliminary Information (Information contained within this document is subject to change)
02	September 6, 2012	GG, SM	<ul style="list-style-type: none">•Updated "Key Features" section•Updated Figure 1•Updated Table 1•Updated "Standard I/O Connector Placement" section
03	September 7, 2012	GG, SM	<ul style="list-style-type: none">•Updated Table 4•General edits throughout this specification
04	October 9, 2012	GG, SM	<ul style="list-style-type: none">•Changed Gen3 to Gen2•Updated block diagram (Figure 1)•Added memory bandwidth•Changed idle power to 25 W
05	November 9, 2012	GG, SM	<ul style="list-style-type: none">•Removed "Preliminary Information" from document as this board specification is now final•Removed "NVIDIA Confidential" from document•Updated package size•Updated block diagram (Figure 1)
06	January 14, 2013	GG, SM	Added MTBF to Table 1
07	July 5, 2013	GG, SM	Updated Figure 2
08	July 11, 2013	GG, SM	Updated memory configuration (20 pcs of 128M x 16) throughout the board specification
09	October 15, 2014	GG, SM	Updated Figure 2

TABLE OF CONTENTS

- Overview** 1
 - Key Features 1
 - Tesla K20 Block Diagram 2
 - Configuration 3
- Mechanical Specifications** 4
 - PCI Express System 4
 - Tesla K20 Bracket 5
 - Power Connectors 6
- Power Specifications** 9
- Support Information** 10
 - Certificates and Agencies 10
 - Agencies 10
 - Languages 11

LIST OF FIGURES

Figure 1.	Tesla K20 Block Diagram	2
Figure 2.	Tesla K20 GPU Accelerator.....	4
Figure 3.	Tesla K20 Bracket	5
Figure 4.	6-Pin PCI Express Power Connector	6
Figure 5.	8-Pin PCI Express Power Connector	7

LIST OF TABLES

Table 1.	Board Configuration.....	3
Table 2.	6-Pin PCI Express Power Connector Pinout	8
Table 3.	8-Pin PCI Express Power Connector Pinout	8
Table 4.	Auxiliary Power Connectors.....	9
Table 5.	Languages Supported	11

OVERVIEW

The NVIDIA® Tesla® K20 graphics processing unit (GPU) accelerator is a PCI Express, dual-slot full height (4.376 inches by 10.5 inches by 1.52 inches) form factor computing module comprising of a single GK110 GPU. The Tesla K20 is designed for servers and offers a total of 5 GB of GDDR5 on-board memory and supports PCI Express Gen2.

The Tesla K20 can be configured by the OEM or by the end user to enable or disable ECC or error correcting codes that can fix single-bit errors and detect double-bit errors. Enabling ECC will cause some of the memory to be used for the ECC bits, so the user available memory will decrease by 10%. On the Tesla K20, the register files, cache, and DRAM are ECC protected.

KEY FEATURES

GPU

- ▶ Number of processor cores: 2496
- ▶ Processor core clock: 706 MHz
- ▶ Package size: 45 mm × 45 mm 2397-pin ball grid array (S-FCBGA)

Board

- ▶ PCI Express Gen2 ×16 system interface
- ▶ Physical dimensions: 4.376 inches × 10.5 inches, dual-slot

Display Connectors

- ▶ None

Power Connectors

- ▶ One 6-pin PCI Express power connector
- ▶ One 8-pin PCI Express power connector

Memory

- ▶ Memory clock: 2.6 GHz
- ▶ Memory bandwidth: 208 GB/sec
- ▶ Interface: 320-bit
 - Total board memory: 5 GB
 - 20 pieces of 128M × 16 GDDR5, SDRAM

BIOS

- ▶ 2Mbit Serial ROM

TESLA K20 BLOCK DIAGRAM

Figure 1 is the block diagram for the Tesla K20 GPU dual-slot computing processor module.

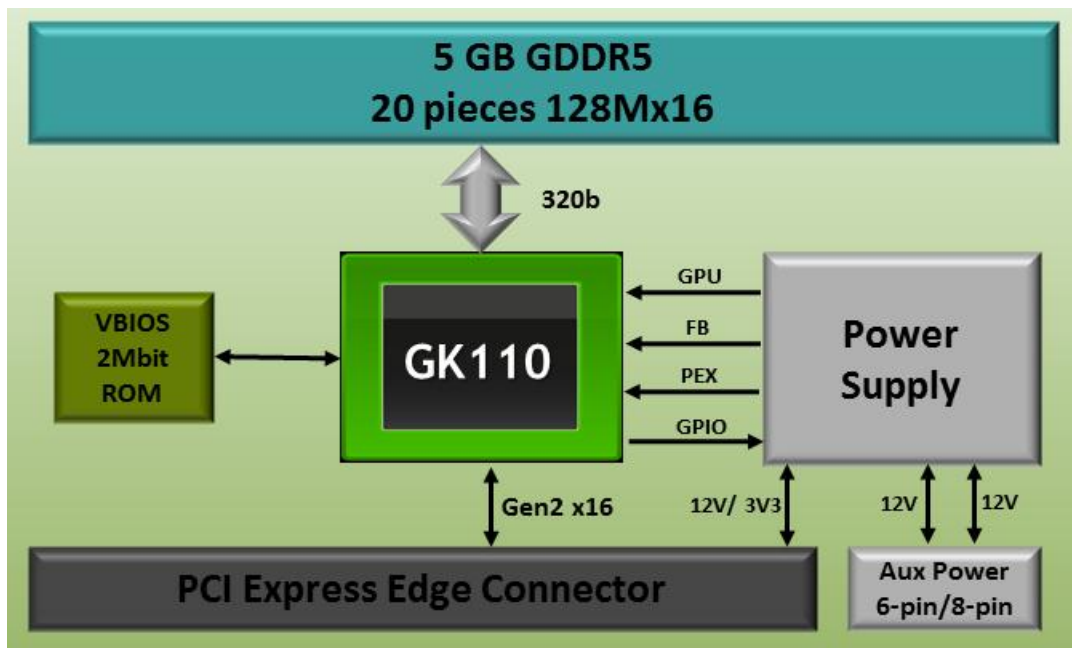


Figure 1. Tesla K20 Block Diagram

CONFIGURATION

The Tesla K20 board is available in the following configuration (Table 1).

Table 1. Board Configuration

Specifications	Tesla K20
Generic SKU reference	699-22081-0208-xxxx
Chip	GK110
Package size GPU	45 mm × 45 mm 2397-pin S-FCBGA
Processor clock	706 MHz
Memory clock	2.6 GHz
Memory size	5 GB
Memory I/O	320-bit GDDR5
Memory configuration	20 pieces of 128M ×16 GDDR5 SDRAM
Display connectors	None
Power connectors	<ul style="list-style-type: none"> •8-pin PCI Express power connector •6-pin PCI Express power connector
Board power	225 W
Idle power	25 W
Thermal cooling solution	Passive heat sink
Mean time between failures (MTBF)	<ul style="list-style-type: none"> •Uncontrolled environment: 136413 hours at 35 °C •Controlled environment: 219282 hours at 35 °C

MECHANICAL SPECIFICATIONS

PCI EXPRESS SYSTEM

The Tesla K20 board (Figure 2) conforms to the PCI Express full height (4.376 inches by 10.5 inches) form factor.

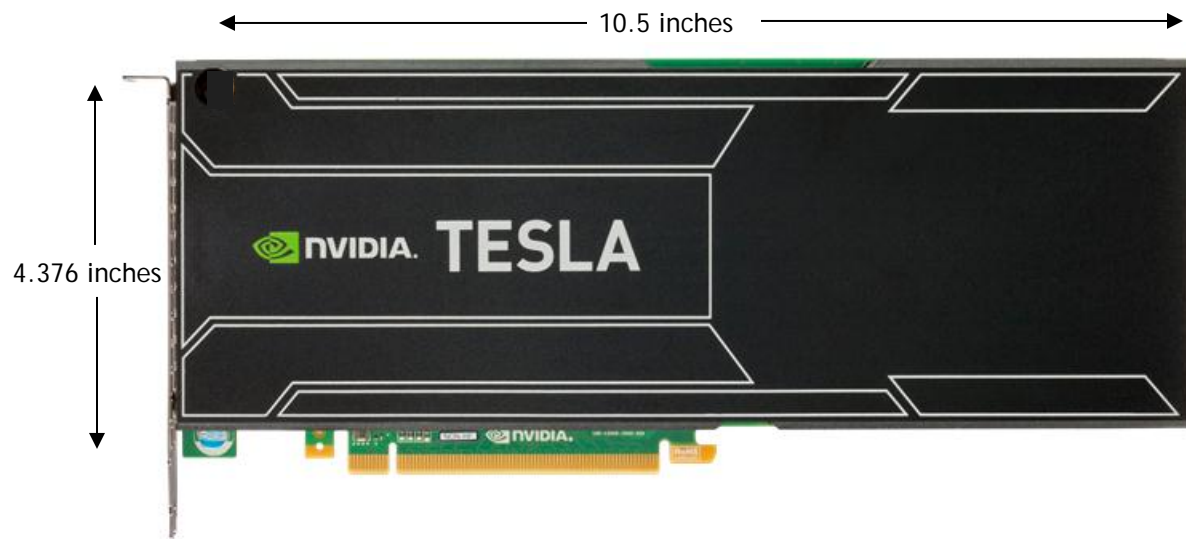


Figure 2. Tesla K20 GPU Accelerator

TESLA K20 BRACKET

As shown in Figure 3, the Tesla K20 includes a vented bracket. If you are an OEM who qualifies for bracket modifications, you have the option of receiving your module with no bracket installed.



Figure 3. Tesla K20 Bracket

POWER CONNECTORS

The Tesla K20 GPU accelerator is a performance optimized, high-end product and uses power from the PCI Express connector as well as external power connectors.

Figure 4 and Figure 5 show the specifications and Table 2 and Table 3 show the pinouts for the 6-pin and 8-pin PCI Express power connectors.

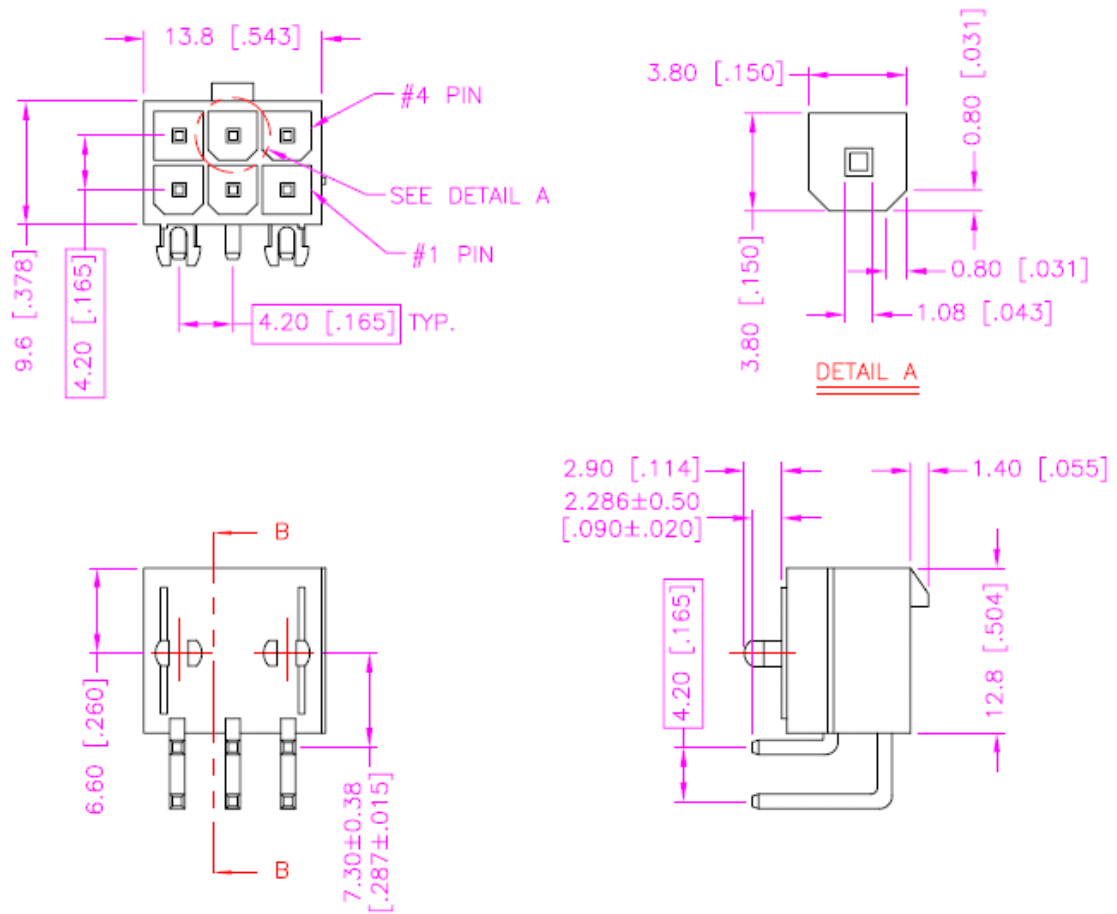


Figure 4. 6-Pin PCI Express Power Connector

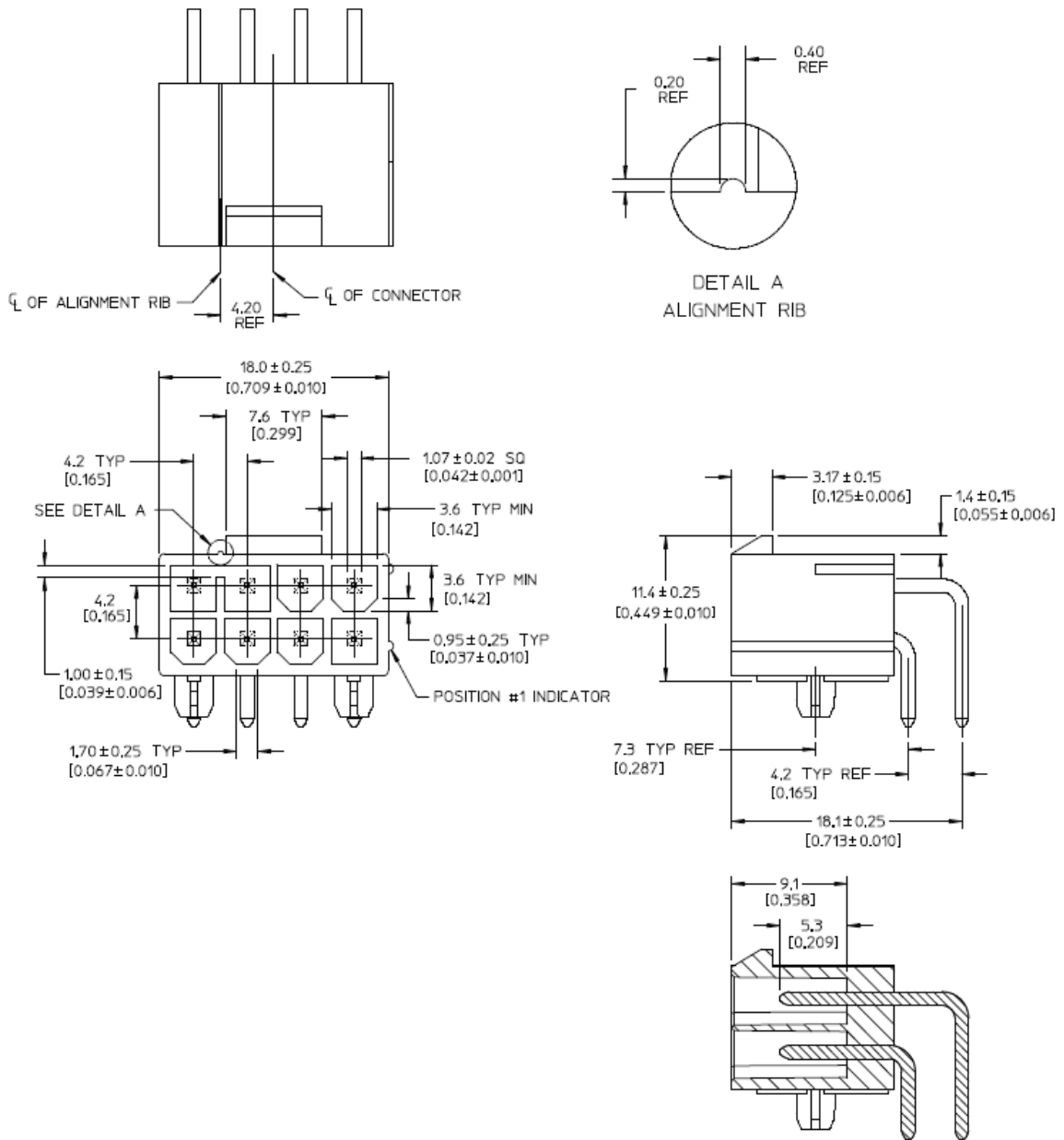


Figure 5. 8-Pin PCI Express Power Connector

Table 2. 6-Pin PCI Express Power Connector Pinout

Pin Number	Description
1	+12 V
2	+12 V
3	+12 V
4	GND
5	Sense
6	GND

Table 3. 8-Pin PCI Express Power Connector Pinout

Pin Number	Description
1	+12 V
2	+12 V
3	+12 V
4	Sense1
5	GND
6	Sense0
7	GND
8	GND

POWER SPECIFICATIONS

The Tesla K20 GPU accelerator requires power from the PCI Express connector as well as one or two auxiliary power connectors.

Table 4. Auxiliary Power Connectors

8-Pin Header	6-Pin Header	Support	Notes
Connect 8-pin cable	Connect 6-pin cable	Yes	
Connect 8-pin cable	No cable installed	Yes	8-pin cable must supply 150 W
Connect 6-pin cable	Connect 6-pin cable	No	8-pin connector should always be connected



Note: Detailed information about power draw by rail will be available to authorized system partners in the *Tesla K20 System Design Guide*.

SUPPORT INFORMATION

CERTIFICATES AND AGENCIES

Agencies

- ▶ Australian Communications Authority and Radio Spectrum Management Group of New Zealand (C-Tick)
- ▶ Bureau of Standards, Metrology, and Inspection (BSMI)
- ▶ Conformité Européenne (CE)
- ▶ Federal Communications Commission (FCC)
- ▶ Industry Canada - Interference-Causing Equipment Standard (ICES)
- ▶ Korean Communications Commission (KCC)
- ▶ Underwriters Laboratories (cUL)
- ▶ Voluntary Control Council for Interference (VCCI)

LANGUAGES

Table 5. Languages Supported

	Windows Server 2008 and Windows Server 2008 R2	Linux
English (US)	X	X
English (UK)	X	
Arabic	X	
Chinese, Simplified	X	
Chinese, Traditional	X	
Danish	X	
Dutch	X	
Finnish	X	
French	X	
French (Canada)	X	
German	X	
Italian	X	
Japanese	X	
Korean	X	
Norwegian	x	
Portuguese (Brazil)	X	
Russian	X	
Spanish	X	
Spanish (Latin America)	X	
Swedish	X	
Thai	X	

Note: NVIDIA's CUDA™ software is only supported in English (U.S.)

Notice

The information provided in this specification is believed to be accurate and reliable as of the date provided. However, NVIDIA Corporation ("NVIDIA") does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information. NVIDIA shall have no liability for the consequences or use of such information or for any infringement of patents or other rights of third parties that may result from its use. This publication supersedes and replaces all other specifications for the product that may have been previously supplied.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and other changes to this specification, at any time and/or to discontinue any product or service without notice. Customer should obtain the latest relevant specification before placing orders and should verify that such information is current and complete.

NVIDIA products are sold subject to the NVIDIA standard terms and conditions of sale supplied at the time of order acknowledgement, unless otherwise agreed in an individual sales agreement signed by authorized representatives of NVIDIA and customer. NVIDIA hereby expressly objects to applying any customer general terms and conditions with regard to the purchase of the NVIDIA product referenced in this specification.

NVIDIA products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of the NVIDIA product can reasonably be expected to result in personal injury, death or property or environmental damage. NVIDIA accepts no liability for inclusion and/or use of NVIDIA products in such equipment or applications and therefore such inclusion and/or use is at customer's own risk.

NVIDIA makes no representation or warranty that products based on these specifications will be suitable for any specified use without further testing or modification. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer's sole responsibility to ensure the product is suitable and fit for the application planned by customer and to do the necessary testing for the application in order to avoid a default of the application or the product. Weaknesses in customer's product designs may affect the quality and reliability of the NVIDIA product and may result in additional or different conditions and/or requirements beyond those contained in this specification. NVIDIA does not accept any liability related to any default, damage, costs or problem which may be based on or attributable to: (i) the use of the NVIDIA product in any manner that is contrary to this specification, or (ii) customer product designs.

No license, either expressed or implied, is granted under any NVIDIA patent right, copyright, or other NVIDIA intellectual property right under this specification. Information published by NVIDIA regarding third-party products or services does not constitute a license from NVIDIA to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property rights of the third party, or a license from NVIDIA under the patents or other intellectual property rights of NVIDIA. Reproduction of information in this specification is permissible only if reproduction is approved by NVIDIA in writing, is reproduced without alteration, and is accompanied by all associated conditions, limitations, and notices.

ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, "MATERIALS") ARE BEING PROVIDED "AS IS." NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. Notwithstanding any damages that customer might incur for any reason whatsoever, NVIDIA's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the NVIDIA terms and conditions of sale for the product.

Trademarks

NVIDIA, the NVIDIA logo, CUDA, and Tesla are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

Copyright

© 2012, 2013, 2014 NVIDIA Corporation. All rights reserved.