



NVIDIA vGaming R465 GA2

Application Note

Table of Contents

Chapter 1. NVIDIA vGaming Release Information.....	1
Chapter 2. Validated Platforms.....	3
2.1. Supported NVIDIA GPUs and Validated Server Platforms.....	3
2.1.1. Switching the Mode an NVIDIA A40 or NVIDIA RTX A6000 GPU.....	4
2.1.2. Switching the Mode of a Tesla M60 GPU.....	4
2.2. Hypervisor Software Releases.....	5
2.3. Guest OS Support.....	5
2.3.1. Windows Guest OS Support.....	5
2.3.2. Linux Guest OS Support.....	6
2.4. NVIDIA CUDA Toolkit Version Support.....	6
2.5. NVIDIA Deep Learning Super Sampling (DLSS) Support.....	6
Chapter 3. NVIDIA vGaming Virtual GPU Types.....	8
3.1. NVIDIA A40 Virtual GPU Types.....	8
3.2. NVIDIA A10G Virtual GPU Types.....	9
3.3. NVIDIA A10 Virtual GPU Types.....	9
3.4. NVIDIA RTX A6000 Virtual GPU Types.....	10
3.5. NVIDIA RTX A5000 Virtual GPU Types.....	10
3.6. Tesla P40 Virtual GPU Types.....	11
3.7. Tesla P4 Virtual GPU Types.....	11
3.8. Tesla T10 16GB Virtual GPU Types.....	11
3.9. Tesla T4 Virtual GPU Types.....	12
3.10. Tesla V100 PCIe 32GB Virtual GPU Types.....	12
3.11. Quadro RTX 8000 Virtual GPU Types.....	13
3.12. Quadro RTX 8000 Passive Virtual GPU Types.....	13
3.13. Quadro RTX 6000 Virtual GPU Types.....	13
3.14. Quadro RTX 6000 Passive Virtual GPU Types.....	14
Chapter 4. NVIDIA vGaming Licensing.....	15
4.1. NVIDIA vGaming Licensed Deployments.....	15
4.2. How NVIDIA vGaming Licensing Is Enforced.....	15
4.3. Licensing an NVIDIA vGPU or Physical GPU.....	15
Appendix A. NVIDIA vGaming Resources.....	17

Chapter 1. NVIDIA vGaming Release Information

This *Application Note* supplements the documentation for NVIDIA vGPU software with information that is specific to NVIDIA vGaming.

NVIDIA vGaming supports NVIDIA vGPU, GPU pass through, and bare-metal deployments.

Contents of this Release

This release of NVIDIA vGaming includes the software listed in the following table:

Software	Version
NVIDIA Virtual GPU Manager	465.24.02
NVIDIA Windows driver	466.11
NVIDIA Linux driver	465.24.02

Version Requirements for the vGPU Manager and Guest VM Drivers



CAUTION: The NVIDIA Virtual GPU Manager (vGPU Manager) and guest VM drivers must be installed together. Older releases of the guest VM drivers are not supported with this release of the NVIDIA vGPU Manager. Similarly, older releases of the NVIDIA vGPU Manager are not supported with this release of the guest VM drivers.

This requirement does not apply to the NVIDIA vGPU software license sever. All releases of NVIDIA vGaming are compatible with **all** releases of the license server.

Updates in this Release

Support for the following GPUs:

- ▶ NVIDIA A40
- ▶ NVIDIA A10G
- ▶ NVIDIA A10
- ▶ NVIDIA RTX A6000

► NVIDIA RTX A5000

Chapter 2. Validated Platforms

This release of NVIDIA vGaming provides support for several NVIDIA GPUs on validated server hardware platforms, hypervisor software versions, and guest operating systems. It also supports NVIDIA CUDA Toolkit 11.2.

2.1. Supported NVIDIA GPUs and Validated Server Platforms

This release of NVIDIA vGaming provides support for the following NVIDIA GPUs running on validated server hardware platforms:

- ▶ GPUs based on the NVIDIA Maxwell™ graphic architecture:
 - ▶ Tesla M60 in GPU pass through mode and bare-metal deployments only (**not** supported with NVIDIA vGPU)
- ▶ GPUs based on the NVIDIA Pascal™ architecture:
 - ▶ Tesla P4
 - ▶ Tesla P40
- ▶ GPUs based on the NVIDIA Volta architecture:
 - ▶ Tesla V100 PCIe 32GB
- ▶ GPUs based on the NVIDIA Turing™ architecture:
 - ▶ Tesla T4
 - ▶ Tesla T10
 - ▶ Quadro RTX 6000 in displayless mode
 - ▶ Quadro RTX 6000 passive in displayless mode
 - ▶ Quadro RTX 8000 in displayless mode
 - ▶ Quadro RTX 8000 passive in displayless mode
- ▶ GPUs based on the NVIDIA Ampere architecture:
 - ▶ NVIDIA A40 in displayless mode
 - ▶ NVIDIA A10G

- ▶ NVIDIA A10
- ▶ NVIDIA RTX A6000 in displayless mode
- ▶ NVIDIA RTX A5000 in displayless mode

In displayless mode, local physical display connectors are disabled.



Note: These GPUs are supported as a secondary device in a bare-metal deployment.

In displayless mode, local physical display connectors are disabled.

For a list of validated server platforms, refer to [NVIDIA GRID Certified Servers](#).

2.1.1. Switching the Mode an NVIDIA A40 or NVIDIA RTX A6000 GPU

NVIDIA A40 and NVIDIA RTX A6000 GPUs support displayless and display-enabled modes but must be used in NVIDIA vGPU software deployments in displayless mode.

NVIDIA A40 GPUs are supplied from the factory in displayless mode. However, NVIDIA RTX A6000 GPUs are supplied in a display-enabled mode and your NVIDIA A40 GPU might be in a display-enabled mode if its mode has previously been changed.

To change the mode of NVIDIA A40 and NVIDIA RTX A6000 GPUs, use the `displaymodeselector` tool, which you can request from the [NVIDIA Display Mode Selector Tool](#) page on the NVIDIA Developer website.



Note:

Only NVIDIA A40 and NVIDIA RTX A6000 GPUs support the `displaymodeselector` tool. Other GPUs that support NVIDIA vGPU software do not support the `displaymodeselector` tool and, unless otherwise stated, do not require mode switching.

2.1.2. Switching the Mode of a Tesla M60 GPU

Tesla M60 GPUs support compute mode and graphics mode. NVIDIA vGPU requires GPUs that support both modes to operate in graphics mode.

Recent Tesla M60 GPU are supplied in graphics mode. However, your GPU might be in compute mode if it is an older Tesla M60 GPU, or if its mode has previously been changed.

To configure the mode of Tesla M60 GPUs, use the `gpumodeswitch` tool provided with NVIDIA vGPU software releases. If you are unsure which mode your GPU is in, use the `gpumodeswitch` tool to find out the mode.



Note: Only Tesla M60 and M6 GPUs support the `gpumodeswitch` tool. Other GPUs that support NVIDIA vGPU do not support the `gpumodeswitch` tool and, unless otherwise stated, do not require mode switching.

For more information, see [gpumodeswitch User Guide](#).

2.2. Hypervisor Software Releases

This release of NVIDIA vGaming is supported on the hypervisor software releases listed in the table.



Note: If a specific release, even an update release, is not listed, it's **not** supported.

Software	Releases Supported	Notes
Citrix Hypervisor	8.2	The RTM build and compatible cumulative update releases are supported.
Red Hat Enterprise Linux with KVM	8.2	All NVIDIA GPUs that NVIDIA vGaming supports are supported with vGPU and in pass-through mode.

2.3. Guest OS Support

NVIDIA vGaming supports several Windows releases and Linux distributions as a guest OS.



Note:

Use only a guest OS release that is listed as supported by NVIDIA vGaming with your virtualization software. To be listed as supported, a guest OS release must be supported not only by NVIDIA vGaming, but also by your virtualization software. NVIDIA **cannot** support guest OS releases that your virtualization software does not support.

NVIDIA vGaming supports **only** 64-bit guest operating systems. No 32-bit guest operating systems are supported.

2.3.1. Windows Guest OS Support

NVIDIA vGaming supports **only** the 64-bit Windows releases listed as a guest OS.



Note: If a specific release, even an update release, is not listed, it's **not** supported.

- ▶ Windows Server 2019
- ▶ Windows Server 2016
- ▶ Windows Server 2012 R2

2.3.2. Linux Guest OS Support

NVIDIA vGaming supports **only** the Linux distributions listed as a guest OS.



Note: If a specific release, even an update release, is not listed, it's **not** supported.

- ▶ Ubuntu 20.04
- ▶ Ubuntu 18.04

2.4. NVIDIA CUDA Toolkit Version Support

This release of NVIDIA vGaming supports NVIDIA CUDA Toolkit 11.2.

For more information about NVIDIA CUDA Toolkit, see [CUDA Toolkit 11.2 Documentation](#).



Note:

If you are using NVIDIA vGPU software with CUDA on Linux, avoid conflicting installation methods by installing CUDA from a distribution-independent runfile package. Do not install CUDA from distribution-specific RPM or Deb package.

To ensure that the NVIDIA vGPU software graphics driver is not overwritten when CUDA is installed, deselect the CUDA driver when selecting the CUDA components to install.

For more information, see [NVIDIA CUDA Installation Guide for Linux](#).

2.5. NVIDIA Deep Learning Super Sampling (DLSS) Support

NVIDIA vGaming supports NVIDIA DLSS in NVIDIA vGPU, GPU pass through, and bare metal deployments.

Supported DLSS versions: 2.0. Version 1.0 is **not** supported.

Supported GPUs:

- ▶ NVIDIA A40
- ▶ NVIDIA A10G
- ▶ NVIDIA A10
- ▶ NVIDIA RTX A6000
- ▶ NVIDIA RTX A5000
- ▶ Tesla T10
- ▶ Tesla T4
- ▶ Quadro RTX 8000

- ▶ Quadro RTX 8000 passive
- ▶ Quadro RTX 6000
- ▶ Quadro RTX 6000 passive



Note: NVIDIA graphics driver components that DLSS requires are installed only if a supported GPU is detected during installation of the driver. Therefore, if the creation of VM templates includes driver installation, the template should be created from a VM that is configured with a supported GPU while the driver is being installed.

Supported games: only games that use `nvngx_dlass.dll` version 2.0.18 or newer

Chapter 3. NVIDIA vGaming Virtual GPU Types

A physical GPU can support several different types of virtual GPU (vGPU). Different NVIDIA vGaming vGPU types have different amounts of frame buffer, but they all support a single virtual display head with a maximum resolution of 4K. They are grouped into different series according to the different classes of workload for which they are optimized. Each series is identified by a three-letter prefix in the vGPU type name.

Series	Optimal Workload
GTX series	NVIDIA vGaming on GPUs based on the NVIDIA Pascal™ architecture and the NVIDIA Volta architecture
RTX series	NVIDIA vGaming on GPUs based on the NVIDIA Turing™ architecture

The number after the board type in the vGPU type name denotes the amount of frame buffer that is allocated to a vGPU of that type. For example, a vGPU of type RTX T10-4 is allocated 4096 Mbytes of frame buffer on a Tesla T10 16GB board.

Due to their differing resource requirements, the maximum number of vGPUs that can be created simultaneously on a physical GPU varies according to the vGPU type. For example, a Tesla T10 16GB board can support up to four RTX T10-4 vGPUs on its physical GPU, but only two RTX T10-8 vGPUs, and only one RTX T10-16 vGPU.



Note: NVIDIA vGaming is a licensed product on all supported GPU boards. A software license for NVIDIA vGaming is required to enable all vGPU features within the guest VM.

3.1. NVIDIA A40 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
A40-48	NVIDIA vGaming	49152	1	4096×2160	1	1	NVIDIA vGaming

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
A40-24	NVIDIA vGaming	24576	1	4096×2160	2	2	NVIDIA vGaming
A40-16	NVIDIA vGaming	16384	1	4096×2160	3	3	NVIDIA vGaming
A40-12	NVIDIA vGaming	12288	1	4096×2160	4	4	NVIDIA vGaming

3.2. NVIDIA A10G Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
A10G-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
A10G-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
A10G-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming
A10G-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

3.3. NVIDIA A10 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
A10-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
A10-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
A10-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
A10-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

3.4. NVIDIA RTX A6000 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTXA6000-48	NVIDIA vGaming	49152	1	4096×2160	1	1	NVIDIA vGaming
RTXA6000-24	NVIDIA vGaming	24576	1	4096×2160	2	2	NVIDIA vGaming
RTXA6000-16	NVIDIA vGaming	16384	1	4096×2160	3	3	NVIDIA vGaming
RTXA6000-12	NVIDIA vGaming	12288	1	4096×2160	4	4	NVIDIA vGaming

3.5. NVIDIA RTX A5000 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTXA5000-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
RTXA5000-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
RTXA5000-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming
RTXA5000-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

3.6. Tesla P40 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
GTX P40-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
GTX P40-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
GTX P40-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming
GTX P40-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

3.7. Tesla P4 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
GTX P4-8	NVIDIA vGaming	8192	1	4096×2160	1	1	NVIDIA vGaming
GTX P4-4	NVIDIA vGaming	4096	1	4096×2160	2	2	NVIDIA vGaming
GTX P4-2	NVIDIA vGaming	2048	1	4096×2160	4	4	NVIDIA vGaming

3.8. Tesla T10 16GB Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX T10-16	NVIDIA vGaming	16384	1	4096×2160	1	1	NVIDIA vGaming
RTX T10-8	NVIDIA vGaming	8192	1	4096×2160	2	2	NVIDIA vGaming
RTX T10-4	NVIDIA vGaming	4096	1	4096×2160	4	4	NVIDIA vGaming

3.9. Tesla T4 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX T4-16	NVIDIA vGaming	16384	1	4096×2160	1	1	NVIDIA vGaming
RTX T4-8	NVIDIA vGaming	8192	1	4096×2160	2	2	NVIDIA vGaming
RTX T4-4	NVIDIA vGaming	4096	1	4096×2160	4	4	NVIDIA vGaming

3.10. Tesla V100 PCIe 32GB Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
GTX V100D-32	NVIDIA vGaming	32768	1	4096×2160	1	1	NVIDIA vGaming
GTX V100D-16	NVIDIA vGaming	16384	1	4096×2160	2	2	NVIDIA vGaming
GTX V100D-8	NVIDIA vGaming	8192	1	4096×2160	4	4	NVIDIA vGaming

3.11. Quadro RTX 8000 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX8000-48	NVIDIA vGaming	49152	1	4096×2160	1	1	NVIDIA vGaming
RTX8000-24	NVIDIA vGaming	24576	1	4096×2160	2	2	NVIDIA vGaming
RTX8000-16	NVIDIA vGaming	16384	1	4096×2160	3	3	NVIDIA vGaming
RTX8000-12	NVIDIA vGaming	12288	1	4096×2160	4	4	NVIDIA vGaming

3.12. Quadro RTX 8000 Passive Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX8000P-48	NVIDIA vGaming	49152	1	4096×2160	1	1	NVIDIA vGaming
RTX8000P-24	NVIDIA vGaming	24576	1	4096×2160	2	2	NVIDIA vGaming
RTX8000P-16	NVIDIA vGaming	16384	1	4096×2160	3	3	NVIDIA vGaming
RTX8000P-12	NVIDIA vGaming	12288	1	4096×2160	4	4	NVIDIA vGaming

3.13. Quadro RTX 6000 Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX6000-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
RTX6000-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
RTX6000-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming
RTX6000-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

3.14. Quadro RTX 6000 Passive Virtual GPU Types

Physical GPUs per board: 1

Virtual GPU Type	Intended Use Case	Frame Buffer (MB)	Virtual Display Heads	Maximum Resolution per Display Head	Maximum vGPUs per GPU	Maximum vGPUs per Board	Required License Edition
RTX6000P-24	NVIDIA vGaming	24576	1	4096×2160	1	1	NVIDIA vGaming
RTX6000P-12	NVIDIA vGaming	12288	1	4096×2160	2	2	NVIDIA vGaming
RTX6000P-8	NVIDIA vGaming	8192	1	4096×2160	3	3	NVIDIA vGaming
RTX6000P-6	NVIDIA vGaming	6144	1	4096×2160	4	4	NVIDIA vGaming

Chapter 4. NVIDIA vGaming Licensing

NVIDIA vGaming is a licensed product on NVIDIA GPUs that support it.

4.1. NVIDIA vGaming Licensed Deployments

The NVIDIA vGaming license supports different classes of deployments.

Licensed Product	Target Users	Supported Deployments
NVIDIA vGaming	Online gamers using a cloud gaming service	<ul style="list-style-type: none">▶ GTX series NVIDIA vGPUs▶ RTX series NVIDIA vGPUs▶ GPU pass through▶ Bare metal

4.2. How NVIDIA vGaming Licensing Is Enforced

All NVIDIA vGaming deployments require a NVIDIA vGaming license. Licensing for all NVIDIA vGaming deployments is enforced through software.

4.3. Licensing an NVIDIA vGPU or Physical GPU

Licensing through **NVIDIA Control Panel** on Windows and **NVIDIA X Server Settings** on Linux is disabled for NVIDIA vGaming guest drivers. How to license an NVIDIA vGPU or a pass-through or bare-metal physical GPU for NVIDIA vGaming depends on your guest OS:

- ▶ On Windows, you must use the Windows registry key `HKEY_LOCAL_MACHINE\SOFTWARE\NVIDIA Corporation\Global\GridLicensing`.
- ▶ On Linux, you must use the `/etc/nvidia/gridd.conf` configuration file.

If you do not require high availability for the license server and are using the default license server port (7070), you need set only the configuration parameters in the following table.

Configuration Parameter	Windows Data Type	Setting
ServerAddress	String (REG_SZ)	<p>The address of your license server.</p> <p>The address can be a fully-qualified domain name such as <code>gridlicense1.example.com</code>, or an IP address such as <code>10.31.20.45</code>.</p>
FeatureType	DWord (REG_DWORD)	<p>NVIDIA vGPU:</p> <ul style="list-style-type: none"> ▶ Windows: Do not change the value of this registry key. ▶ Linux: Set to 1. <p>Physical GPU: Set to 3 to specify a NVIDIA vGaming license.</p>

Appendix A. NVIDIA vGaming Resources

Getting Started

- ▶ [*Virtual GPU Software Quick Start Guide*](#)
- ▶ [*Virtual GPU Software for Citrix Hypervisor Release Notes*](#)
- ▶ [*Virtual GPU Software for Red Hat Enterprise Linux with KVM Release Notes*](#)

Game Ready Driver Release Information

- ▶ [*Release 465 Driver for Windows Release Notes*](#)
- ▶ [*NVIDIA Accelerated Linux Graphics Driver README and Installation Guide*](#)

License Server Installation and Setup

- ▶ [*Virtual GPU License Server Release Notes*](#)
- ▶ [*Virtual GPU License Server User Guide*](#)

NVIDIA vGaming Installation, Setup, and Client-Side Licensing

- ▶ [*Virtual GPU Software User Guide*](#)
- ▶ [*Virtual GPU Client Licensing User Guide*](#)
- ▶ [*gpumodeswitch User Guide*](#)

Notice

This document is provided for information purposes only and shall not be regarded as a warranty of a certain functionality, condition, or quality of a product. NVIDIA Corporation ("NVIDIA") makes no representations or warranties, expressed or implied, as to the accuracy or completeness of the information contained in this document and assumes no responsibility for any errors contained herein. 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 document is not a commitment to develop, release, or deliver any Material (defined below), code, or functionality.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and any other changes to this document, at any time without notice.

Customer should obtain the latest relevant information 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 ("Terms of Sale"). NVIDIA hereby expressly objects to applying any customer general terms and conditions with regards to the purchase of the NVIDIA product referenced in this document. No contractual obligations are formed either directly or indirectly by this document.

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 this document will be suitable for any specified use. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer's sole responsibility to evaluate and determine the applicability of any information contained in this document, ensure the product is suitable and fit for the application planned by customer, and perform 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 document. NVIDIA accepts no 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 document 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 document. 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 document is permissible only if approved in advance by NVIDIA in writing, reproduced without alteration and in full compliance with all applicable export laws and regulations, and accompanied by all associated conditions, limitations, and notices.

THIS DOCUMENT AND 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 NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL NVIDIA BE LIABLE FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF ANY USE OF THIS DOCUMENT, EVEN IF NVIDIA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. 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 Terms of Sale for the product.

VESA DisplayPort

DisplayPort and DisplayPort Compliance Logo, DisplayPort Compliance Logo for Dual-mode Sources, and DisplayPort Compliance Logo for Active Cables are trademarks owned by the Video Electronics Standards Association in the United States and other countries.

HDMI

HDMI, the HDMI logo, and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

OpenCL

OpenCL is a trademark of Apple Inc. used under license to the Khronos Group Inc.

Trademarks

NVIDIA, the NVIDIA logo, NVIDIA GRID, NVIDIA GRID vGPU, NVIDIA Maxwell, NVIDIA Pascal, NVIDIA Turing, NVIDIA Volta, GPUDirect, Quadro, and Tesla are trademarks 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

© 2013-2021 NVIDIA Corporation. All rights reserved.

