

# AN APPLIED MATERIALS COMPANY

# **NEMA**| pico VG 1000 Graphics Processing Unit

## **Hardware User Manual**

Version v24.10.1

Part Number: D-RS-PV1

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#### 1 Overview

NEMA| pico VG 1000, member of the NEMA-GPU Series, brings high quality graphics for User Interfaces in a very small silicon/ power budget targeting the Microcontrollers Market (MCU). NEMA| pico VG 1000 is the perfect candidate to support entry level IoT-platforms, wearable and embedded devices with low cost and ultra-low power requirements supporting SoC's with a 32/64-bit MCU (e.g. ARM Cortex-M processors) and provide fluid graphics experience for a wide range of applications. Developers are able to create compelling Graphical User Interfaces (GUIs) and software applications with ultra-long battery life at a significantly lower cost for power-memory-area constrained IoT devices.

#### 1.1 Features

- Hardware Components:
  - Programmable Shader engine with a VLIW instruction set
  - Command list based DMAs to minimize CPU overhead
  - Primitive Rasterizer
  - Texture Mapping unit (with radial fill capability)
  - Blending unit
- · Drawing Primitives:
  - Pixel/Line drawing
  - Filled rectangles
  - Triangles (Gouraud Shaded)
  - Quadrilateral
- Color formats
  - 32-bit RGBA8888/BGRA8888/ABGR8888
  - 24-bit RGB
  - 16-bit AL88/RGBA5551/BGRA5551/ARGB1555/ABGR1555/RGB565/BGR565/RG-BA4444/BGRA444/ARGB4444/ABGR4444
  - 8-bit A8/L8/AL44/RGB332/RGBA2222/ABGR2222/BGRA2222/ARGB2222
  - 4-bit A4/L4
  - 2-bit A2/L2
  - 1-bit A1/L1
  - YUV (Read only)
  - TSC
- Compression schemes (Optional)
  - TSC4(4 bits per pixel)
  - TSC6/ TSC6a/ TSC6a+(6 bits per pixel with/out Alpha)
  - TSC12/ TSC12a(12 bits per pixel with/out Alpha)



- · Image transformation
  - Texture mapping
  - Point sampling
  - Bilinear filtering
  - Blit support
  - Rotation any angle
  - Mirroring
  - Stretch (independently on x and y axis )
  - Source and/or destination color keying
  - Format conversions on the fly
  - 2.5D Perspective Correct Projections
- Text rendering supports
  - Bitmap antialiased A1/A2/A4/A8
  - Font Kerning
  - Unicode(UTF8)
- Blending Support
  - Fully Programmable Alpha blending modes(Source and Destination)
  - Source/Destination color keying
- Antialiasing
  - 8x MSAA
  - Quaddrilaterals per edge Antialising
  - Triangles per edge Antialiasing
  - Antialiased Thick lines
  - Antialiased Circles

#### 1.2 Configuration Options

NEMA| pico VG 1000 can be customized during design time by configuring a number of parameters that enable/disable several features of the design. The NEMA| pico VG 1000 GUI Configurator, a Graphical User Interface Configurator Tool, is used for the configuration of NEMA| pico VG 1000 parameters.

- Cache Sizes
- Compression Schemes
  - TSC4
  - TSC6 / TSC6a
  - TSC12 / TSC12a
- Master Interface
  - AMBA AHB 32bit
  - AMBA AXI4 32/64/128bit



#### 1.3 Integration - Verification

The NEMA| pico VG 1000 GPU IP Platform is available in Verilog/SystemVerilog code and is easily integrated and verified. The NEMA| pico VG 1000 ASIC reference designs have been evaluated in various process technologies and has been verified through extensive simulation and rigorous code coverage measurements. It is accompanied with a complete verification suite that compares reference images with rendered images.

#### 1.4 Software

- · OS support
  - Bare Metal (no-OS)
  - RTOS (NEMA| GFX Library in ANSI C)
  - Linux
- Graphics API support
  - NEMA| GFX API library in pure C
  - NEMA| GFX VG Extensions
  - Video Overlay Extensions
- Software Emulators and suites
  - NEMA| pix-presso
  - NEMA| gui-builder
  - NEMA| Bits

NEMA| GFX library which is available in pure ANSI C with no dependencies, allows easy portability to systems running RTOS or even to OS-less systems. The software package includes OS drivers for Linux and Software Libraries for supporting 2D Graphics APIs

NEMA| GFX: Enables high quality 2.5D graphics on RTOS and OS-less systems. NE-MA| GFX is a proprietary low level library that interfaces directly with the NEMA GPUs and provides a software abstraction layer to organize and employ drawing commands with ease and efficiency. NEMA| GFX can be used as a back-end to existing APIs and as a standalone Graphics API.

The software package includes Linux drivers, Software Libraries for 2D Graphics APIs and comes together with:

- NEMA| gui-builder, a graphical cross-platform software framework enabling rapid highend Graphics User Interface (GUI) development on low resource hardware (non-commercial version, free download https://www.think-silicon.com/?section=2335&language=en\_US)
- NEMA| pix-presso, a utility software for converting images to/from formats suitable for low power embedded devices (non-commercial version, free download https:// www.think-silicon.com/?section=2335&language=en\_US)
- NEMA| Bits, an EVK Kit for technology evaluation and pre-silicon application development



## 2 Register Specification (RDL)

## 2.1 Registers' Memory Map

The memory organization of the register map is shown in the tables of this section:

Address	Access	Reset Value	Name
0x0000	rw	0x0	NEMA_TEX0_BASE
0x0004	rw	0x0	NEMA_TEX0_FSTRIDE
8000x0	rw	0x0	NEMA_TEX0_RESXY
0x0010	rw	0x0	NEMA_TEX1_BASE
0x0014	rw	0x0	NEMA_TEX1_FSTRIDE
0x0018	rw	0x0	NEMA_TEX1_RESXY
0x001c	rw	0x0	NEMA_TEX_COLOR
0x0020	rw	0x0	NEMA_TEX2_BASE
0x0024	rw	0x0	NEMA_TEX2_FSTRIDE
0x0028	rw	0x0	NEMA_TEX2_RESXY
0x0030	rw	0x0	NEMA_TEX3_BASE
0x0034	rw	0x0	NEMA_TEX3_FSTRIDE
0x0038	rw	0x0	NEMA_TEX3_RESXY
0x0048	rw	0x0	NEMA_TSC_NEW_BLOCK_TRIG
0x004c	rw	0x0	NEMA_TSC_NEW_BLOCK_SEL
0x0080	rw	0x0	NEMA_BREAKPOINT
0x008c	rw	0x0	NEMA_BREAKPOINT_MASK
0x0094	rw	0x0	NEMA_CGCTRL
0x0098	rw	0xffffffff	NEMA_DIRTYMIN
0x009c	r	0x0	NEMA_DIRTYMAX
0x00c0	rw	0x0	NEMA_BUS_CTRL
0x00c4	rw	0x0	NEMA_IMEM_ADDR
0x00c8	rw	0x0	NEMA_IMEM_DATA_LOW
0x00cc	rw	0x0	NEMA_IMEM_DATA_HIGH



Address	Access	Reset Value	Name
0x00d0	rw	0x0	NEMA_BURST_SIZE
0x00e4	rw	0x80640007	NEMA_FLUSH_CTRL
0x00e8	rw	0x0	NEMA_CMDSTATUS
0x00ec	rw	0x0	NEMA_CMDRINGSTOP
0x00f0	rw	0x0	NEMA_CMDADDR
0x00f4	rw	0x0	NEMA_CMDSIZE
0x00f8	rw	0x0	NEMA_INTERRUPT
0x00fc	rw	0x0	NEMA_STATUS
0x0100	rw	0x0	NEMA_DRAW_CMD_NOHOLD
0x0104	rw	0x0	NEMA_DRAW_STARTXY
0x0108	rw	0x0	NEMA_DRAW_ENDXY
0x010c	rw	0x0	DRAW_FAN_X
0x0110	rw	0x0	NEMA_CLIPMIN
0x0114	rw	0x7fff7fff	NEMA_CLIPMAX
0x0118	rw	0x05000000	NEMA_MATMULT
0x011c	rw	0x0	NEMA_CODEPTR
0x0120	rw	0x0	NEMA_DRAW_PT0_X
0x0124	rw	0x0	NEMA_DRAW_PTO_Y
0x0128	rw	0x0	DRAW_FAN_Y
0x012c	rw	0x0	NEMA_DRAW_COLOR
0x0130	rw	0x0	NEMA_DRAW_PT1_X
0x0134	rw	0x0	NEMA_DRAW_PT1_Y
0x0138	rw	0x0	NEMA_BYPASS_ADDR
0x013c	rw	0x0	BYPASS_DATA
0x0140	rw	0x0	NEMA_DRAW_PT2_X
0x0144	rw	0x0	NEMA_DRAW_PT2_Y
0x0148	rw	0x0	NEMA_CLID
0x0150	rw	0x0	NEMA_DRAW_PT3_X
0x0154	rw	0x0	NEMA_DRAW_PT3_Y



Address	Access	Reset Value	Name
0x0158	rw	0x0	NEMA_CLIPMIN1
0x015c	rw	0x7fff7fff	NEMA_CLIPMAX1
0x0160	rw	0x0	NEMA_MM00
0x0164	rw	0x0	NEMA_MM01
0x0168	rw	0x0	NEMA_MM02
0x016c	rw	0x0	NEMA_MM10
0x0170	rw	0x0	NEMA_MM11
0x0174	rw	0x0	NEMA_MM12
0x0178	rw	0x0	NEMA_MM20
0x017c	rw	0x0	NEMA_MM21
0x0180	rw	0x0	NEMA_MM22
0x0184	rw	0x0	NEMA_DEPTH_START_L
0x0188	rw	0x0	NEMA_DEPTH_START_H
0x018c	rw	0x0	NEMA_DEPTH_DX_L
0x0190	rw	0x0	NEMA_DEPTH_DX_H
0x0194	rw	0x0	NEMA_DEPTH_DY_L
0x0198	rw	0x0	NEMA_DEPTH_DY_H
0x01a0	rw	0x0	NEMA_RED_DX
0x01a4	rw	0x0	NEMA_RED_DY
0x01a8	rw	0x0	NEMA_GRE_DX
0x01ac	rw	0x0	NEMA_GRE_DY
0x01b0	rw	0x0	NEMA_BLU_DX
0x01b4	rw	0x0	NEMA_BLU_DY
0x01b8	rw	0x0	NEMA_ALF_DX
0x01bc	rw	0x0	NEMA_ALF_DY
0x01c0	rw	0x0	NEMA_RED_INIT
0x01c4	rw	0x0	NEMA_GRE_INIT
0x01c8	rw	0x0	NEMA_BLU_INIT
0x01cc	rw	0x0	NEMA_ALF_INIT



Address	Access	Reset Value	Name
0x01d0	rw	0x0	NEMA_ROPBLENDER_BLEND_MODE
0x01d4	rw	0x0	NEMA_ROPBLENDER_DST_CKEY
0x01d8	rw	0x0	NEMA_ROPBLENDER_CONST_COLOR
0x01dc	r	0x00241001	NEMA_IP_VERSION
0x01e0	rw	0x0	NEMA_CODEPTR2
0x01ec	r	0x86362000	NEMA_IDREG
0x01f0	r	0xf4030104	NEMA_CONFIG
0x01f4	r	0x000007e3	NEMA_CONFIGH
0x0200	w	0x0	NEMA_CO_REG
0x0204	w	0x0	NEMA_C1_REG
0x0208	w	0x0	NEMA_C2_REG
0x020c	w	0x0	NEMA_C3_REG
0x0320	w	0x0	DRAW_PT0_X
0x0324	w	0x0	DRAW_PTO_Y
0x0328	w	0x0	DRAW_FP_FAN_X
0x032c	w	0x0	DRAW_FP_FAN_Y
0x0330	w	0x0	DRAW_PT1_X
0x0334	w	0x0	DRAW_PT1_Y
0x0340	w	0x0	DRAW_PT2_X
0x0344	w	0x0	DRAW_PT2_Y
0x0350	w	0x0	DRAW_PT3_X
0x0354	w	0x0	DRAW_PT3_Y
0x0360	rw	0x3f800000	VMM00
0x0364	rw	0x0	VMM01
0x0368	rw	0x0	VMM02
0x036c	rw	0x0	VMM10
0x0370	rw	0x3f800000	VMM11
0x0374	rw	0x0	VMM12
0x0378	rw	0x0	VMM20



Address	Access	Reset Value	Name
0x037c	rw	0x0	VMM21
0x0380	rw	0x3f800000	VMM22
0x0388	rw	0x0	NEMA_RAST_BYPASS
0x04d0	rw	0x00000fff	NEMA_COORD_MASK
0x04d4	rw	0x00008000	DRAW_FLATNESS
0x0ff0	rw	0x0	NEMA_IRQ_ID
0x0ff4	rw	0x0	NEMA_GP_FLAGS
0x0ff8	rw	0x0	NEMA_SYS_INTERRUPT
0x0ffc	rw	0x0	NEMA_BUSERROR_MASK

## 2.2 Registers' Description

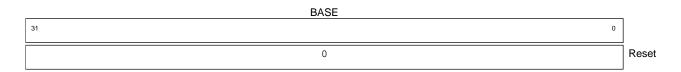
The following section is a detailed description of the register file. All registers are 32 bits wide.



## NEMA\_TEXO\_BASE

Address	Access	Reset	Description
0x0000	rw	0x0	Base address of drawing surface 0.

#### **Fields**



## **Fields Description**

#### **BASE**

Specifies the base address or drawing surface 0.



#### **NEMA\_TEXO\_FSTRIDE**

Address	Access	Reset	Description
0x0004	rw	0x0	Image 0 Mode and Stride

#### **Fields**

QÍ.	► FORMAT		P.P.	JEILL PEND	\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	E NRAP	Q(5)	NO CO	STRIDE		_
31	30	24	23	22 21	20	19 18	17	16		0	
0	0		0	0	0	0	0	0	0		Reset

#### **Fields Description**

#### **STRIDE**

Specifies the image stride distance in bytes from one scanline to another (signed)

#### MODE

Specifies the image mode (applicable only for Textures not for Framebuffer)

- \* 0x0 Point sampling
- \* 0x1 Bilinear filtering

#### **WRAP**

Specifies the image wrapping mode (applicable only for Textures not for Framebuffer).

- \* 0x0 Clamp
- \* 0x1 Repeat
- \* 0x2 Border
- \* 0x3 Mirror

#### TILE

Enables the Tile Mode.

#### **RADFILL**

Radial fill enable

#### **FORMAT**

Specifies the image format

- \* 0x00 RGBX8888
- \* 0x01 RGBA8888
- \* 0x02 XRGB8888
- \* 0x03 ARGB8888
- \* 0x04 RGBA5650
- \* 0x05 RGBA5551
- \* 0x06 RGBA4444
- \* 0x08 RGBA0008
- \* 0x09 L8
- \* 0x0B L1 (Only available as input format)



- \* 0x0C A1 (Only available as input format)
- \* 0x0D UYVY (Only available as input format)
- \* 0x0E ABGR8888
- \* 0x10 BGRA8888
- \* 0x11 BGRX8888
- \* 0x12 TSC4
- \* 0x16 TSC6
- \* 0x17 TSC6A
- \* 0x27 A1LE (Only available as input format)
- \* 0x28 A2LE (Only available as input format)
- \* 0x29 A4LE (Only available as input format)
- \* 0x2A L1LE (Only available as input format)
- \* 0x2B L2LE (Only available as input format)
- \* 0x2C L4LE (Only available as input format)
- \* 0x30 A2 (Only available as input format)
- \* 0x31 L2 (Only available as input format)
- \* 0x34 A4 (Only available as input format)
- \* 0x35 L4 (Only available as input format)
- \* 0x38 RGBA3320
- \* 0x39 BGR24
- \* 0x3C RGB24
- \* 0x40 RGBA2222
- \* 0x41 ABGR2222
- \* 0x42 BGRA2222
- \* 0x43 ARGB2222
- \* 0x44 AL88
- \* 0x45 AL44
- \* 0x46 ARGB1555
- \* 0x47 ARGB4444
- \* 0x48 BGRA5551
- \* 0x49 ABGR1555
- \* 0x4a BGRA4444
- \* 0x4b ABGR4444 \* 0x4C TSC12
- \* 0x4D TSC12A
- \* 0x4E TSC6AP (Only available as input format)

#### **DITH**

If set for destination texture, enables color dithering. (Applicable to output formats RGBA5650, RGBA5551, RGBA4444).



## NEMA\_TEXO\_RESXY

Address	Access	Reset	Description
0x0008	rw	0x0	Image 0 Resolution

#### **Fields**

	RESY	RESX	_
31	16	15 0	
	0	0	Reset

## **Fields Description**

#### **RESX**

Specifies the size of resolution X

#### **RESY**

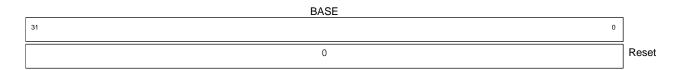
Specifies the size of resolution Y



## NEMA\_TEX1\_BASE

Address	Access	Reset	Description
0x0010	rw	0x0	Base address of drawing surface 1.

#### **Fields**



## **Fields Description**

#### **BASE**

Specifies the base address or drawing surface 1.



#### **NEMA\_TEX1\_FSTRIDE**

Address	Access	Reset	Description
0x0014	rw	0x0	Image 1 Mode and Stride

#### **Fields**

QÍ.	► FORMAT		P.P.	JEILL PEND	\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	E NRAP	Q(5)	NO CO	STRIDE		_
31	30	24	23	22 21	20	19 18	17	16		0	
0	0		0	0	0	0	0	0	0		Reset

#### **Fields Description**

#### **STRIDE**

Specifies the image stride distance in bytes from one scanline to another (signed)

#### MODE

Specifies the image mode (applicable only for Textures not for Framebuffer)

- \* 0x0 Point sampling
- \* 0x1 Bilinear filtering

#### **WRAP**

Specifies the image wrapping mode (applicable only for Textures not for Framebuffer).

- \* 0x0 Clamp
- \* 0x1 Repeat
- \* 0x2 Border
- \* 0x3 Mirror

#### TILE

Enables the Tile Mode.

#### **RADFILL**

Radial fill enable

#### **FORMAT**

Specifies the image format

- \* 0x00 RGBX8888
- \* 0x01 RGBA8888
- \* 0x02 XRGB8888
- \* 0x03 ARGB8888
- \* 0x04 RGBA5650
- \* 0x05 RGBA5551
- \* 0x06 RGBA4444
- \* 0x08 RGBA0008
- \* 0x09 L8
- \* 0x0B L1 (Only available as input format)



- \* 0x0C A1 (Only available as input format)
- \* 0x0D UYVY (Only available as input format)
- \* 0x0E ABGR8888
- \* 0x10 BGRA8888
- \* 0x11 BGRX8888
- \* 0x12 TSC4
- \* 0x16 TSC6
- \* 0x17 TSC6A
- \* 0x27 A1LE (Only available as input format)
- \* 0x28 A2LE (Only available as input format)
- \* 0x29 A4LE (Only available as input format)
- \* 0x2A L1LE (Only available as input format)
- \* 0x2B L2LE (Only available as input format)
- \* 0x2C L4LE (Only available as input format)
- \* 0x30 A2 (Only available as input format)
- \* 0x31 L2 (Only available as input format)
- \* 0x34 A4 (Only available as input format)
- \* 0x35 L4 (Only available as input format)
- \* 0x38 RGBA3320
- \* 0x39 BGR24
- \* 0x3C RGB24
- \* 0x40 RGBA2222
- \* 0x41 ABGR2222
- \* 0x42 BGRA2222
- \* 0x43 ARGB2222
- \* 0x44 AL88
- \* 0x45 AL44
- \* 0x46 ARGB1555
- \* 0x47 ARGB4444
- \* 0x48 BGRA5551
- \* 0x49 ABGR1555
- \* 0x4a BGRA4444
- \* 0x4b ABGR4444 \* 0x4C TSC12
- \* 0x4D TSC12A
- \* 0x4E TSC6AP (Only available as input format)

#### **DITH**

If set for destination texture, enables color dithering. (Applicable to output formats RGBA5650, RGBA5551, RGBA4444).



## **NEMA\_TEX1\_RESXY**

Address	Access	Reset	Description
0x0018	rw	0x0	Image 1 Resolution

#### **Fields**

RESY		RESX	_
31	16	15	
0		0	Reset

## **Fields Description**

#### **RESX**

Specifies the size of resolution X

#### **RESY**

Specifies the size of resolution Y



## NEMA\_TEX\_COLOR

Address	Access	Reset	Description
0x001c	rw	0x0	Texture Map default color (for use with Luminance and Alpha-only color formats)

#### **Fields**

ALPHA	BLUE	GREEN	RED	
31 24	23 16	15 8	7 0	
0	0	0	0	Reset

## **Fields Description**

**RED** 

Specifies the Red (R) value

**GREEN** 

Specifies the Green (G) value

**BLUE** 

Specifies the Blue (B) value

**ALPHA** 

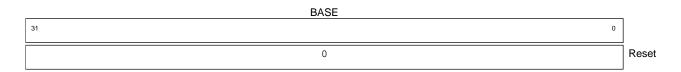
Specifies the Alpha (A) value



## NEMA\_TEX2\_BASE

Address	Access	Reset	Description
0x0020	rw	0x0	Base address of drawing surface 2.

#### **Fields**



## **Fields Description**

#### **BASE**

Specifies the base address or drawing surface 2.



#### NEMA\_TEX2\_FSTRIDE

Address	Access	Reset	Description
0x0024	rw	0x0	Image 2 Mode and Stride

#### **Fields**

Q	≻ FORMAT		8PZ	FILL	111/	E WRAP	& S	NO CO	STRIDE		_
31	30	24	23	22 21	20	19 18	17	16	5	0	
0	0		0	0	0	0	0	0	0		Reset

#### **Fields Description**

#### **STRIDE**

Specifies the image stride distance in bytes from one scanline to another (signed)

#### MODE

Specifies the image mode (applicable only for Textures not for Framebuffer)

- \* 0x0 Point sampling
- \* 0x1 Bilinear filtering

#### **WRAP**

Specifies the image wrapping mode (applicable only for Textures not for Framebuffer).

- \* 0x0 Clamp
- \* 0x1 Repeat
- \* 0x2 Border
- \* 0x3 Mirror

#### TILE

Enables the Tile Mode.

#### **RADFILL**

Radial fill enable

#### **FORMAT**

Specifies the image format

- \* 0x00 RGBX8888
- \* 0x01 RGBA8888
- \* 0x02 XRGB8888
- \* 0x03 ARGB8888
- \* 0x04 RGBA5650
- \* 0x05 RGBA5551
- \* 0x06 RGBA4444
- \* 0x08 RGBA0008
- \* 0x09 L8
- \* 0x0B L1 (Only available as input format)



- \* 0x0C A1 (Only available as input format)
- \* 0x0D UYVY (Only available as input format)
- \* 0x0E ABGR8888
- \* 0x10 BGRA8888
- \* 0x11 BGRX8888
- \* 0x12 TSC4
- \* 0x16 TSC6
- \* 0x17 TSC6A
- \* 0x27 A1LE (Only available as input format)
- \* 0x28 A2LE (Only available as input format)
- \* 0x29 A4LE (Only available as input format)
- \* 0x2A L1LE (Only available as input format)
- \* 0x2B L2LE (Only available as input format)
- \* 0x2C L4LE (Only available as input format)
- \* 0x30 A2 (Only available as input format)
- \* 0x31 L2 (Only available as input format)
- \* 0x34 A4 (Only available as input format)
- \* 0x35 L4 (Only available as input format)
- \* 0x38 RGBA3320
- \* 0x39 BGR24
- \* 0x3C RGB24
- \* 0x40 RGBA2222
- \* 0x41 ABGR2222
- \* 0x42 BGRA2222
- \* 0x43 ARGB2222
- \* 0x44 AL88
- \* 0x45 AL44
- \* 0x46 ARGB1555
- \* 0x47 ARGB4444
- \* 0x48 BGRA5551
- \* 0x49 ABGR1555
- \* 0x4a BGRA4444
- \* 0x4b ABGR4444
- \* 0x4C TSC12
- \* 0x4D TSC12A
- \* 0x4E TSC6AP (Only available as input format)

#### **DITH**

If set for destination texture, enables color dithering. (Applicable to output formats RGBA5650, RGBA5551, RGBA4444).



## NEMA\_TEX2\_RESXY

Address	Access	Reset	Description
0x0028	rw	0x0	Image 2 Resolution

#### **Fields**

RESY	RESX	_
31 16	15 0	
0	0	Reset

## **Fields Description**

#### **RESX**

Specifies the size of resolution X

#### **RESY**

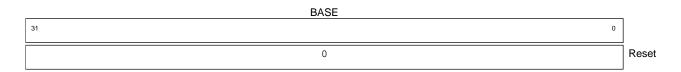
Specifies the size of resolution Y



## NEMA\_TEX3\_BASE

Address	Access	Reset	Description
0x0030	rw	0x0	Base address of drawing surface 3.

#### **Fields**



## **Fields Description**

#### **BASE**

Specifies the base address or drawing surface 3.



#### NEMA\_TEX3\_FSTRIDE

Address	Access	Reset	Description
0x0034	rw	0x0	Image 3 Mode and Stride

#### **Fields**

QÍ.	► FORMAT		P.P.	JEILL PEND	\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	E NRAP	Q(5)	NO CO	STRIDE		_
31	30	24	23	22 21	20	19 18	17	16		0	
0	0		0	0	0	0	0	0	0		Reset

#### **Fields Description**

#### **STRIDE**

Specifies the image stride distance in bytes from one scanline to another (signed)

#### MODE

Specifies the image mode (applicable only for Textures not for Framebuffer)

- \* 0x0 Point sampling
- \* 0x1 Bilinear filtering

#### **WRAP**

Specifies the image wrapping mode (applicable only for Textures not for Framebuffer).

- \* 0x0 Clamp
- \* 0x1 Repeat
- \* 0x2 Border
- \* 0x3 Mirror

#### TILE

Enables the Tile Mode.

#### **RADFILL**

Radial fill enable

#### **FORMAT**

Specifies the image format

- \* 0x00 RGBX8888
- \* 0x01 RGBA8888
- \* 0x02 XRGB8888
- \* 0x03 ARGB8888
- \* 0x04 RGBA5650
- \* 0x05 RGBA5551
- \* 0x06 RGBA4444
- \* 0x08 RGBA0008
- \* 0x09 L8
- \* 0x0B L1 (Only available as input format)



- \* 0x0C A1 (Only available as input format)
- \* 0x0D UYVY (Only available as input format)
- \* 0x0E ABGR8888
- \* 0x10 BGRA8888
- \* 0x11 BGRX8888
- \* 0x12 TSC4
- \* 0x16 TSC6
- \* 0x17 TSC6A
- \* 0x27 A1LE (Only available as input format)
- \* 0x28 A2LE (Only available as input format)
- \* 0x29 A4LE (Only available as input format)
- \* 0x2A L1LE (Only available as input format)
- \* 0x2B L2LE (Only available as input format)
- \* 0x2C L4LE (Only available as input format)
- \* 0x30 A2 (Only available as input format)
- \* 0x31 L2 (Only available as input format)
- \* 0x34 A4 (Only available as input format)
- \* 0x35 L4 (Only available as input format)
- \* 0x38 RGBA3320
- \* 0x39 BGR24
- \* 0x3C RGB24
- \* 0x40 RGBA2222
- \* 0x41 ABGR2222
- \* 0x42 BGRA2222
- \* 0x43 ARGB2222
- \* 0x44 AL88
- \* 0x45 AL44
- \* 0x46 ARGB1555
- \* 0x47 ARGB4444
- \* 0x48 BGRA5551
- \* 0x49 ABGR1555
- \* 0x4a BGRA4444
- \* 0x4b ABGR4444 \* 0x4C TSC12
- \* 0x4D TSC12A
- \* 0x4E TSC6AP (Only available as input format)

#### **DITH**

If set for destination texture, enables color dithering. (Applicable to output formats RGBA5650, RGBA5551, RGBA4444).



## NEMA\_TEX3\_RESXY

Address	Access	Reset	Description
0x0038	rw	0x0	Image 3 Resolution

#### **Fields**

RESY	RESX	
31 16	15 0	
0	0	Reset

## **Fields Description**

#### **RESX**

Specifies the size of resolution X

#### **RESY**

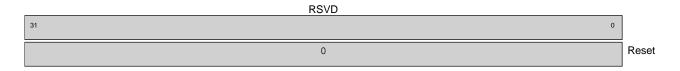
Specifies the size of resolution Y



## NEMA\_TSC\_NEW\_BLOCK\_TRIG

Address	Access	Reset	Description
0x0048	rw	0x0	Trigger to reset TSc block.

#### **Fields**



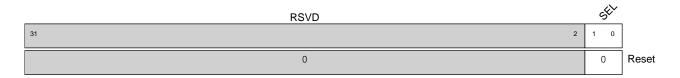
## **Fields Description**



#### NEMA\_TSC\_NEW\_BLOCK\_SEL

Address	Access	Reset	Description
0x004c	rw	0x0	Select how TSc block will be reset.

#### **Fields**



#### **Fields Description**

#### **SEL**

- 0: Reset TSc block when NEMA\_DRAW\_CMD\_NOHOLD is written or tesselator starts new geometry or NEMA\_TSC\_NEW\_BLOCK\_TRIG is written.
- 1: Reset TSc block when NEMA\_DRAW\_CMD\_NOHOLD is written or NEMA\_TSC\_NEW\_BLOCK\_TRIG is written.
- 2: Reset TSc block when NEMA\_TSC\_NEW\_BLOCK\_TRIG is written.



## **NEMA\_BREAKPOINT**

Address	Access	Reset	Description
0x0080	rw	0x0	Debug feature. Specifies a Breakpoint on the Command List

#### **Fields**

	NEMA_BREAKPOINT		_
31		0	
	0		Reset

## **Fields Description**

## **NEMA\_BREAKPOINT**

Specifies the Breakpoint ID



## NEMA\_BREAKPOINT\_MASK

Address	Access	Reset	Description
0x008c	rw	0x0	Debug feature. Specifies a Breakpoint Mask.

#### **Fields**

MASK	_
31 0	
0	Reset

## **Fields Description**

#### **MASK**

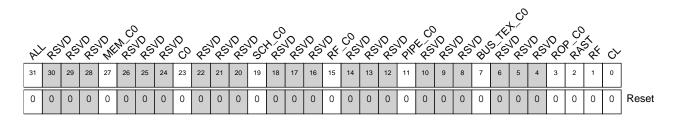
Specifies the Breakpoint Mask



#### **NEMA\_CGCTRL**

Address	Access	Reset	Description
0x0094	rw	0x0	Clock gating controller

#### **Fields**



#### **Fields Description**

CL

Disable clock gating for the Command List Processor

RF

Disable clock gating for the NemaP Configuration Register File

**RAST** 

Disable clock gating for the NemaP Rasterizer

**ROP CO** 

Disable clock gating for the Render Output Unit of core 0

**BUS TEX CO** 

Disable clock gating for the BusInterface (memory System) and Core 0 Texture Map

PIPE CO

Disable clock gating for Core 0 Pipeline

RF\_C0

Disable clock gating for Core 0 Register File

SCH CO

Disable clock gating for Core 0 Scheduler

C0

Disable clock gating for Core 0

MEM CO

Disable clock gating for Core 0 Instruction Memory

**ALL** 

Disable clock gating for all modules



#### **NEMA\_DIRTYMIN**

Address	Access	Reset	Description
0x0098	rw	0xfffffff	Read the Dirty_Min value. Resets dirty region to resolution size on write function.

#### **Fields**

DIRTYMIN	_
31 0	
FFFFFFF	Reset

## **Fields Description**

#### **DIRTYMIN**

Write any value to reset dirty region to resolution size Read the Dirty\_min value



## **NEMA\_DIRTYMAX**

Address	Access	Reset	Description
0x009c	r	0x0	Read the Dirty Max value

#### **Fields**

# DIRTYMAX 0 Reset

## **Fields Description**

## **DIRTYMAX** (Read only)

Read the Dirty\_max value



#### **NEMA\_BUS\_CTRL**

Address	Access	Reset	Description
0x00c0	rw	0x0	Indicates the value of the AWCACHE and the ARCACHE signals of the AXI Bus Interface.

#### **Fields**

RSVD		ARCACHE	_
31	7 4	3 0	
0	0	0	Reset

#### **Fields Description**

#### **ARCACHE**

Specifies the value of the output ARCACHE signal of the AXI Master Read Bus Interface

#### **AWCACHE**

Specifies the value of the output AWCACHE signal of the AXI Master Write Bus Interface



# NEMA\_IMEM\_ADDR

Address	Access	Reset	Description
0x00c4	rw	0x0	Load shader instruction memory address. This register can be auto incremented. Its content should be considered volatile

### **Fields**



# **Fields Description**

### **ADDR**

Specifies the load shader instruction memory address



# NEMA\_IMEM\_DATA\_LOW

Address	Access	Reset	Description
0x00c8	rw	0x0	The lower bits (31-0) of the 64-bit load shader instruction memory data

### **Fields**

IMEM_DATA_LOW	_
31	
0	Reset

# **Fields Description**

# IMEM\_DATA\_LOW

Specifies the lower bits (31-0) of the load shader instruction memory data



# **NEMA\_IMEM\_DATA\_HIGH**

Address	Access	Reset	Description
0x00cc	rw	0x0	The higher bits (63-32) of the 64-bit load
			shader instruction memory data

### **Fields**

IMEM_DATA_HIGH	
31	
0	Reset

# **Fields Description**

# IMEM\_DATA\_HIGH

Specifies the higher bits (63-32) of the load shader instruction memory data



### **NEMA\_BURST\_SIZE**

Address	Access	Reset	Description
0x00d0	rw	0x0	Controls the size of the burst for the texture and framebuffer read.

#### **Fields**

	BURET	SILE BURE	, sile
RSVD	⟨�^	₹6,	
31 8	7 4	3 0	
0	0	0	Reset

#### **Fields Description**

#### **TEX BURST SIZE**

Value of the texture read burst size in log2(bytes).

Value of 0 or greater than log2(UNEMA\_TEX\_BURST) will result in burst size equal to UNEMA TEX BURST (biggest possible).

Value of 1 or smaller than log2(UNEMA\_AXI\_WIDTH\_M/8) will result in burst size equal to UNEMA\_AXI\_WIDTH\_M/8 (smallest possible).

Value should be greater or equal to the texture format size used, e.g. TSc6 (12 bytes) mode requires a value greater or equal to 4.

#### **FB BURST SIZE**

Value of the framebuffer read burst size in log2(bytes).

Value of 0 or greater than log2(UNEMA\_FB\_BURST) will result in burst size equal to UNEMA\_FB\_BURST (biggest possible).

Value of 1 or smaller than log2(UNEMA\_AXI\_WIDTH\_M/8) will result in burst size equal to UNEMA\_AXI\_WIDTH\_M/8 (smallest possible).

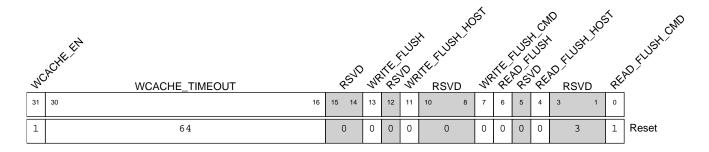
Value should be greater or equal to the framebuffer format size used, e.g. TSc6 (12 bytes) mode requires a value greater or equal to 4.



#### **NEMA\_FLUSH\_CTRL**

Address	Access	Reset	Description
0x00e4	rw	0x80640007 Controls the system flush	

#### **Fields**



#### **Fields Description**

#### READ\_FLUSH\_CMD

If set to 1, the read caches are flushed when the Command List Processor triggers the Rasterizer (Register NEMA\_DRAW\_CMD\_NOHOLD)

### **READ FLUSH HOST**

If set to 1, the read caches are fluhsed when the Host triggers the Rasterizer (Register NEMA\_DRAW\_CMD\_NOHOLD)

#### **READ FLUSH**

When set to 1, flush read caches

#### WRITE FLUSH CMD

If set to 1, the write caches are flushed when the Command List Processor triggers the Rasterizer (Register NEMA\_DRAW\_CMD\_NOHOLD)

#### WRITE FLUSH HOST

If set to 1, the write caches are flushed when the Host triggers the Rasterizer (Register NEMA\_DRAW\_CMD\_NOHOLD)

#### **WRITE FLUSH**

When set to 1, flush write caches

#### WCACHE TIMEOUT

Timeout for the lines of the WCache

#### **WCACHE EN**

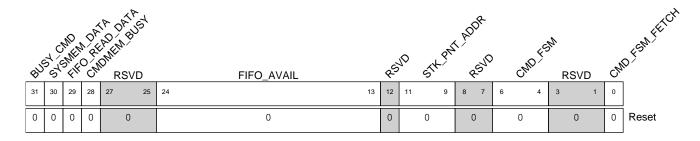
When set to 1, write cache is enabled



### **NEMA\_CMDSTATUS**

Address	Access	Reset	Description
0x00e8	rw	0x0	On read, returns internal CL processor status. On write, resets CL processor. Its content should be considered volatile.

#### **Fields**



### **Fields Description**

# CMD\_FSM\_FETCH

Indicates the state of the FSM responsible for fetching

#### CMD FSM

Indicates the state of CMDList internal FSM.

#### **STK PNT ADDR**

Show the address of the stack pointer

#### **FIFO AVAIL**

Show how many cells are still available in FIFO

#### **CMDMEM BUSY**

Indicates if the Command List Processor System Memory is busy

### FIFO\_READ\_DATA

Indicates if there are available data to read from FIFO

### **SYSMEM DATA**

Indicates if there are data available in System Memory

### **BUSY CMD**

Indicates if the Command List Processor is busy



# **NEMA\_CMDRINGSTOP**

Address	Access	Reset	Description
0x00ec	rw	0x0	Ring Buffer pointer.

### **Fields**

CMDRINGSTOP		
31	0	
0		Reset

# **Fields Description**

### **CMDRINGSTOP**

Stores the Ring Buffer last written address



# ${\bf NEMA\_CMDADDR}$

Address	Access	Reset	Description
0x00f0	rw	0x0	Command list base address.

### **Fields**

CMDADDR		
31	0	
0		Reset

# **Fields Description**

### **CMDADDR**

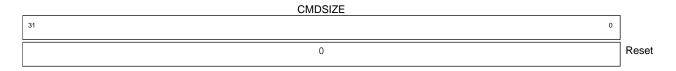
Specifies the base address of every new command list ready to be executed



# **NEMA\_CMDSIZE**

Address	Access	Reset	Description
0x00f4	rw	0x0	Command list length in words(32-bits)

### **Fields**



# **Fields Description**

### **CMDSIZE**

Specifies the length of the command list ready to be executed.



### **NEMA\_INTERRUPT**

Address	Access	Reset	Description
0x00f8	rw	0x0	Interrupt control register

#### **Fields**

out outs				RSVD	کی	ind,	Mr.C	<b>₽</b> 0	ARITY
	31 30	29 28	27	26 4	3	2	1	0	
	0	0	0	0	0	0	0	0	Reset

### **Fields Description**

#### **POLARITY**

1: IRQ signal is active low

0: IRQ signal is active high

#### CL

When set to 1, signals an interrupt at the end of a command list

#### **DRAW**

When set to 1, signals an interrupt at the end of a drawing command

When set to 1, the interrupt in the NEMA\_IRQ\_ID register is cleared

#### **THROTTLE**

When set to 1, the throttle signal will be ignored.

### **CLK DVFS**

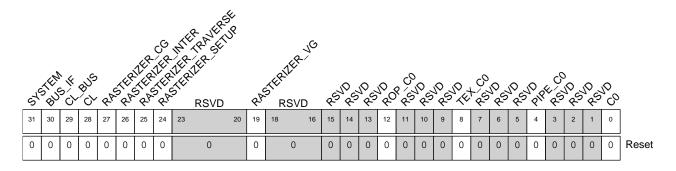
Specify the core\_clk\_dvfs output



### **NEMA\_STATUS**

Address	Access	Reset	Description
0x00fc	rw	0x0	On read, returns Nema status. On writes, resets the GPU.

#### **Fields**



#### **Fields Description**

C<sub>0</sub>

Indicates if the Core 0 is busy

PIPE CO

Indicates if the Core 0 graphics pipeline is busy

TEX\_C0

Indicates if the Core 0 Texture Map Unit is busy

**ROP CO** 

Indicates if the Core 0 Render Output Unit is busy

#### RASTERIZER VG

Indicates if the Rasterizer Vertex Matrix Multiplication Unit and Tesselation Unit are busy

#### RASTERIZER SETUP

Indicate if the Rasterizer Setup Unit is busy

#### **RASTERIZER TRAVERSE**

Indicate if the Rasterizer Traverse Unit is busy

#### RASTERIZER INTER

Indicate if the Rasterizer Interpolation Unit is busy

#### RASTERIZER CG

Indicate if the Rasterizer Clockgating Unit is busy

CL

Indicates if the Command List Processor is busy

#### **CL BUS**

Indicates if the Command List bus is busy

#### **BUS IF**

Indicates if the Bus Interface Unit is busy



### **SYSTEM**

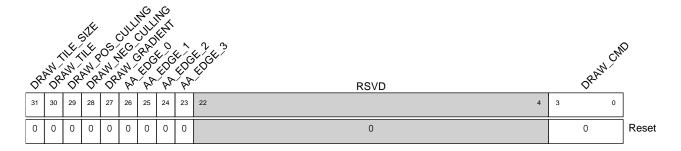
Indicates if the system is busy



### NEMA\_DRAW\_CMD\_NOHOLD

Address	Access	Reset	Description
0x0100	rw	0x0	Rasterizer Command (e.g. draw triangle, rectangle etc)

#### **Fields**



#### **Fields Description**

#### **DRAW CMD**

**Draw Command** 

- \* 0x01 Draw Line
- \* 0x02 Draw Rectangle
- \* 0x03 Draw Point
- \* 0x04 Draw Triangle
- \* 0x05 Draw Quadrilateral
- \* 0x06 Draw Quadratic Bezier
- \* 0x07 Draw Cubic Bezier
- \* 0x08 Draw Ouadratic Bezier Line
- \* 0x09 Draw Cubic Bezier Line
- \* 0x0A Stroke line (1 pixel width)
- \* 0x0B Draw Triangle Fan

#### AA EDGE 3

When set to 1, Antialiasing feature is enabled for edge 3

#### AA EDGE 2

When set to 1, Antialiasing feature is enabled for edge 2

#### AA EDGE 1

When set to 1, Antialiasing feature is enabled for edge 1

#### AA EDGE 0

When set to 1, Antialiasing feature is enabled for edge 0

#### **DRAW GRADIENT**

When set to 1, color gradient is enabled

#### **DRAW NEG CULLING**

When set to 1, negative culling (clockwise) is enabled



# DRAW\_POS\_CULLING

When set to 1, positive culling (counter-clockwise) is enabled

# DRAW\_TILE

When set to 1, tile mode is enabled

### DRAW\_TILE\_SIZE

When set to 1, tile size is 2x2



# **NEMA\_DRAW\_STARTXY**

Address	Access	Reset	Description
0x0104	rw	0x0	Vertex 0 drawing primitive. This register is used only for integer values. For greater accuracy NEMA_DRAW_START_X and NEMA_DRAW_START_Y registers are used which accept 16.16 fixed point values. This register is updated also by NEMA_DRAW_START_X and NEMA_DRAW_START_Y. Its content should be considered volatile.

### **Fields**

	START_Y	START_X	_
31	16	15 0	
	0	0	Reset

# **Fields Description**

### START X

Specifies the X coordinate (integer value) of vertex 0 **START\_Y** 

Specifies the Y coordinate (integer value) of vertex 0



# **NEMA\_DRAW\_ENDXY**

Address	Access	Reset	Description
0x0108	rw	0x0	Vertex 1 drawing primitive. This register is used only for integer values. For greater accuracy NEMA_DRAW_END_X and NEMA_DRAW_END_Y registers are used which accept 16.16 fixed point values. This register is updated also by NEMA_DRAW_END_X and NEMA_DRAW_END_Y. Its content should be considered volatile.

### **Fields**

END_Y	END_X	_
31 16	15 0	
0	0	Reset

# **Fields Description**

### **END** X

Specifies the X coordinate (integer value) of vertex 1

# END\_Y

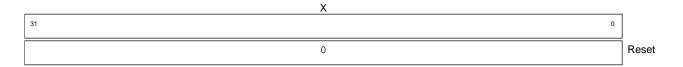
Specifies the Y coordinate (integer value) of vertex 1



# DRAW\_FAN\_X

Address Ad	cess Reset	Description
0x010c rw	0x0	X coordinate of the Fan center point. Its content should be considered volatile.

### **Fields**



# **Fields Description**

X

Specifies the X coordinate of bezier vertex 4 drawing primitive (fixed point 16.16 format)



# NEMA\_CLIPMIN

Address	Access	Reset	Description
0x0110	rw	0x0	Clipping Rectangle upper left vertex

### **Fields**

CLIPMIN_Y	CLIPMIN_X	_
31 16	15 0	
0	0	Reset

# **Fields Description**

# CLIPMIN\_X

Define the upper left X coordinate

### CLIPMIN\_Y

Define the upper left Y coordinate



# **NEMA\_CLIPMAX**

Address	Access	Reset	Description
0x0114	rw	0x7fff7fff	Clipping Rectangle bottom right vertex

### **Fields**

CLIPMAX_Y	CLIPMAX_X	_
31 16	15 0	
7FFF	7FFF	Reset

# **Fields Description**

### **CLIPMAX X**

Define the bottom left X coordinate

### CLIPMAX\_Y

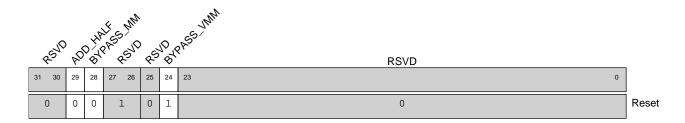
Define the bottom left Y coordinate



### **NEMA\_MATMULT**

Address	Access	Reset	Description
0x0118	rw	0x5000000	Rasterizer matrix multiplication control. This register is partially updated by other registers. Its content should be considered volatile.

#### **Fields**



### **Fields Description**

### **BYPASS\_VMM**

When set to 1, the vertex matrix multiplications are bypassed

#### **BYPASS MM**

When set to 1, the matrix multiplications are bypassed

# ADD\_HALF

When set to 1, the 0.5 value is added to the X and Y coordinates



# **NEMA\_CODEPTR**

Address	Access	Reset	Description
0x011c	rw	0x0	Shader code pointer

#### **Fields**

	BCG	FRG	_
31	16	15 0	
	0	0	Reset

### **Fields Description**

### **FRG**

Specifies the pointer for the instruction that will be executed for the foreground pixels

#### **BCG**

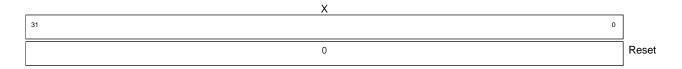
Specifies the pointer for the instruction that will be executed for the background pixels



# NEMA\_DRAW\_PTO\_X

Address	Access	Reset	Description
0x0120	rw	0x0	X coordinate of vertex 0 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

### **Fields**



# **Fields Description**

X

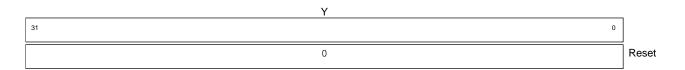
Specifies the X coordinate of vertex 0 drawing primitive (16.16 fixed point)



# NEMA\_DRAW\_PTO\_Y

Address	Access	Reset	Description
0x0124	rw	0x0	Y coordinate of vertex 0 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

### **Fields**



# **Fields Description**

Υ

Specifies the Y coordinate of vertex 0 drawing primitive (16.16 fixed point)



# DRAW\_FAN\_Y

Address	Access	Reset	Description
0x0128	rw	0x0	Y coordinate of the Fan center point. Its content should be considered volatile.

### **Fields**



# **Fields Description**

Υ

Specifies the X coordinate of bezier vertex 4 drawing primitive (fixed point 16.16 format)



# **NEMA\_DRAW\_COLOR**

Address	Access	Reset	Description
0x012c	rw	0x0	Rasterizer drawing color for filling primitives

### **Fields**

DRAW_COLOR		
31		
	]	
0	Reset	

# **Fields Description**

# DRAW\_COLOR

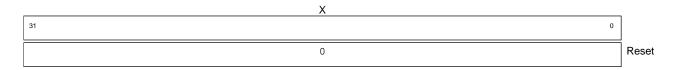
Specifies the drawing color for filling primitives



# NEMA\_DRAW\_PT1\_X

Address	Access	Reset	Description
0x0130	rw	0x0	X coordinate of vertex 1 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

### **Fields**



# **Fields Description**

X

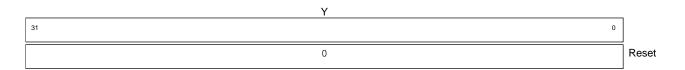
Specifies the X coordinate of vertex 1 drawing primitive (16.16 fixed point)



# NEMA\_DRAW\_PT1\_Y

Address	Access	Reset	Description
0x0134	rw	0x0	Y coordinate of vertex 1 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

### **Fields**



# **Fields Description**

Υ

Specifies the Y coordinate of vertex 1 drawing primitive (16.16 fixed point)



# **NEMA\_BYPASS\_ADDR**

Address	Access	Reset	Description
0x0138	rw	0x0	Address of bypass mode of rasterizer setup access

### **Fields**

NEMA_BYPASS_ADDR					
31 0					
0	Reset				

# **Fields Description**

# **NEMA\_BYPASS\_ADDR**

Address of bypass mode of rasterizer setup access



# BYPASS\_DATA

Address	Access	Reset	Description
0x013c	rw	0x0	Data and enable of bypass mode of rasterizer

### **Fields**

NEMA_BYPASS_DATA					
31					
0	Reset				

# **Fields Description**

# **NEMA\_BYPASS\_DATA**

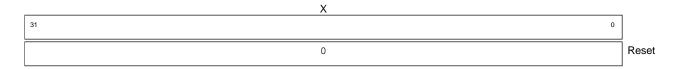
Data and enable of bypass mode of rasterizer



# NEMA\_DRAW\_PT2\_X

Address	Access	Reset	Description
0x0140	rw	0x0	X coordinate of vertex 2 drawing primitive. The value is 16.16 fixed point

### **Fields**



# **Fields Description**

X

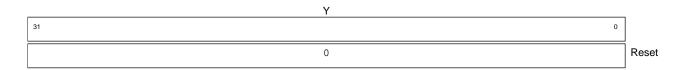
Specifies the X coordinate of vertex 2 drawing primitive (16.16 fixed point)



# NEMA\_DRAW\_PT2\_Y

Address	Access	Reset	Description
0x0144	rw	0x0	Y coordinate of vertex 2 drawing primitive. The value is 16.16 fixed point

### **Fields**



# **Fields Description**

Υ

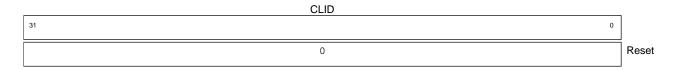
Specifies the Y coordinate of vertex 2 drawing primitive (16.16 fixed point)



# **NEMA\_CLID**

Address	Access	Reset	Description
0x0148	rw	0x0	Command List ID Kev

### **Fields**



# **Fields Description**

### **CLID**

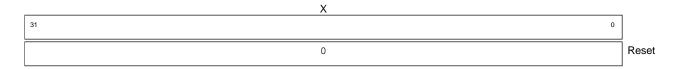
Specifies the last executed command list



# NEMA\_DRAW\_PT3\_X

Address	Access	Reset	Description
0x0150	rw	0x0	X coordinate of vertex 3 drawing primitive. The value is 16.16 fixed point

### **Fields**



# **Fields Description**

X

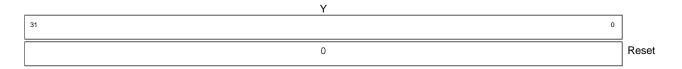
Specifies the X coordinate of vertex 3 drawing primitive (16.16 fixed point)



# **NEMA\_DRAW\_PT3\_Y**

Address	Access	Reset	Description
0x0154	rw	0x0	Y coordinate of vertex 3 drawing primitive. The value is 16.16 fixed point

### **Fields**



# **Fields Description**

Υ

Specifies the Y coordinate of vertex 3 drawing primitive (16.16 fixed point)



# **NEMA\_CLIPMIN1**

Address	Access	Reset	Description
0x0158	rw	0x0	Second Clipping Rectangle upper left vertex

### **Fields**

CLIPMIN_Y	CLIPMIN_X	
31 16	15 0	
0	0	Reset

# **Fields Description**

# CLIPMIN\_X

Define the upper left X coordinate

# CLIPMIN\_Y

Define the upper left Y coordinate



# **NEMA\_CLIPMAX1**

Address	Access	Reset	Description
0x015c	rw	0x7fff7fff	Second Clipping Rectangle bottom right vertex

### **Fields**

CLIPMAX_Y	CLIPMAX_X	_
31 16	15 0	
7FFF	7FFF	Reset

# **Fields Description**

### **CLIPMAX X**

Define the bottom left X coordinate

### **CLIPMAX\_Y**

Define the bottom left Y coordinate



Address	Access	Reset	Description
0x0160	rw	0x0	(0,0) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM00	
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM00**

Specifies the (0,0) element



Address	Access	Reset	Description
0x0164	rw	0x0	(0,1) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

RSVD	MM01	_
31 21	20 0	
0	0	Reset

# **Fields Description**

## **MM01**

Specifies the (0,1) element



Address	Access	Reset	Description
0x0168	rw	0x0	(0,2) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM02	_
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM02**

Specifies the (0,2) element



Address	Access	Reset	Description
0x016c	rw	0x0	(1,0) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM10	_
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM10**

Specifies the (1,0) element



Address	Access	Reset	Description
0x0170	rw	0x0	(1,1) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM11	_
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM11**

Specifies the (1,1) element



Address	Access	Reset	Description
0x0174	rw	0x0	(1,2) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM12	_
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM12**

Specifies the (1,2) element



Address	Access	Reset	Description
0x0178	rw	0x0	(2,0) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM20	
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM20**

Specifies the (2,0) element



Address	Access	Reset	Description
0x017c	rw	0x0	(2,1) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

RSVD	MM21		
31 21	20 0		
0	0	Reset	

# **Fields Description**

## **MM21**

Specifies the (2,1) element



Address	Access	Reset	Description
0x0180	rw	0x0	(2,2) matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**

	RSVD	MM22	_
31	21	20 0	
	0	0	Reset

# **Fields Description**

## **MM22**

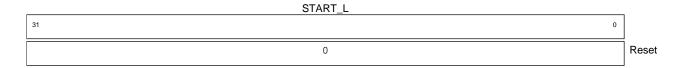
Specifies the (2,2) element



# **NEMA\_DEPTH\_START\_L**

Address	Access	Reset	Description
0x0184	rw	0x0	Depth value of the STARTXY pixel. This register defines the integral part of the depth value which is the lower 32 bits

## **Fields**



# **Fields Description**

## START\_L

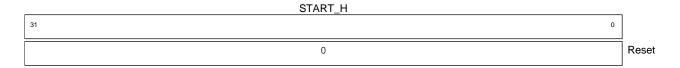
Specifies the fractional part of the depth value of the STARTXY pixel



#### **NEMA\_DEPTH\_START\_H**

Address	Access	Reset	Description
0x0188	rw	0x0	Depth value of the STARTXY pixel. This register defines the integral part of the depth value which is the higher 32 bits

## **Fields**



# **Fields Description**

## START\_H

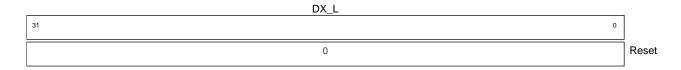
Specifies the integral value of the depth value of the STARTXY pixel



# NEMA\_DEPTH\_DX\_L

Address	Access	Reset	Description
0x018c	rw	0x0	For each step at x-axis, depth value is added. This register defines the fractional part of the depth value which is the lower 32 bits

#### **Fields**



# **Fields Description**

# $DX_L$

Specifies the fractional part of the added depth value for each step at x-axis



# NEMA\_DEPTH\_DX\_H

Address	Access	Reset	Description
0x0190	rw	0x0	For each step at x-axis, depth value is added. This register defines the integral part of the depth value which is the higher 32 bits

#### **Fields**



# **Fields Description**

# $DX_H$

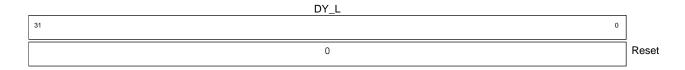
Specifies the integral part of the added depth value for each step at x-axis



# NEMA\_DEPTH\_DY\_L

Address	Access	Reset	Description
0x0194	rw	0x0	For each step at y-axis, depth value is added. This register defines the fractional part of the depth value which is the lower 32 bits

#### **Fields**



# **Fields Description**

# DY\_L

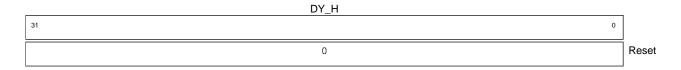
Specifies the fractional part of the added depth value for each step at y-axis



# NEMA\_DEPTH\_DY\_H

Address	Access	Reset	Description
0x0198	rw	0x0	For each step at y-axis, depth value is added. This register defines the integral part of the depth value which is the higher 32 bits

#### **Fields**



# **Fields Description**

# $DY_H$

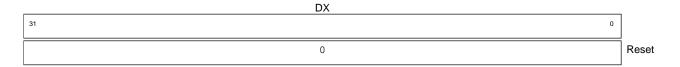
Specifies the integral part of the added depth value for each step at y-axis



# NEMA\_RED\_DX

Address	Access	Reset	Description
0x01a0	rw	0x0	For each step at x-axis, Red (R) value is added. The value is 16,16 fixed point

## **Fields**



# **Fields Description**

## DX

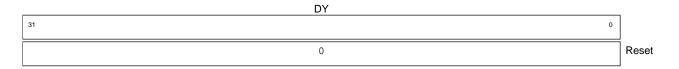
Specifies the added Red (R) value for each step at x-axis



# NEMA\_RED\_DY

Address	Access	Reset	Description
0x01a4	rw	0x0	For each step at y-axis, Red (R) value is added. The value is 16,16 fixed point

#### **Fields**



# **Fields Description**

## DY

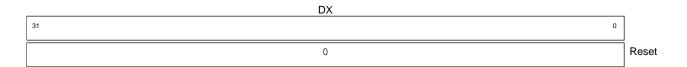
Specifies the added Red (R) value for each step at y-axis



# NEMA\_GRE\_DX

Address	Access	Reset	Description
0x01a8	rw	0x0	For each step at x-axis, Green (G) value is added. The value is 16,16 fixed point

## **Fields**



# **Fields Description**

## DX

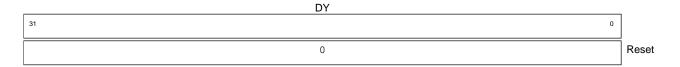
Specifies the added Green (G) value for each step at x-axis



# NEMA\_GRE\_DY

Address	Access	Reset	Description
0x01ac	rw	0x0	For each step at y-axis, Green (G) value is added. The value is 16.16 fixed point

#### **Fields**



# **Fields Description**

## DY

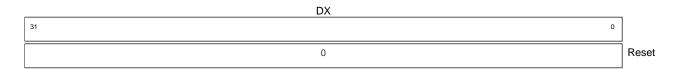
Specifies the added Green (G) value for each step at y-axis



# NEMA\_BLU\_DX

Address	Access	Reset	Description
0x01b0	rw	0x0	For each step at x-axis, Blue (B) value is added. The value is 16,16 fixed point

## **Fields**



# **Fields Description**

## DX

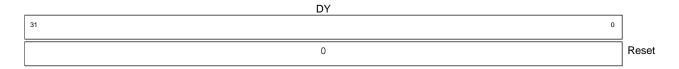
Specifies the added Blue (B) value for each step at x-axis



# NEMA\_BLU\_DY

Address	Access	Reset	Description
0x01b4	rw	0x0	For each step at y-axis, Blue (B) value is added. The value is 16.16 fixed point

#### **Fields**



# **Fields Description**

## DY

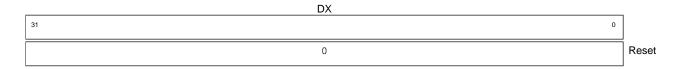
Specifies the added Blue (B) value for each step at y-axis



# NEMA\_ALF\_DX

Address	Access	Reset	Description
0x01b8	rw	0x0	For each step at x-axis, Alpha (A) value is added. The value is 16.16 fixed point

## **Fields**



# **Fields Description**

## DX

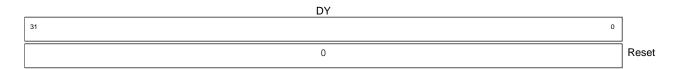
Specifies the added Alpha (A) value for each step at x-axis



# NEMA\_ALF\_DY

Address	Access	Reset	Description
0x01bc	rw	0x0	For each step at y-axis, Alpha (A) value is added. The value is 16.16 fixed point

#### **Fields**



# **Fields Description**

## DY

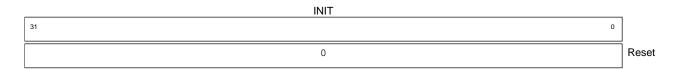
Specifies the added Alpha (A) value for each step at y-axis



# NEMA\_RED\_INIT

Address	Access	Reset	Description
0x01c0	rw	0x0	Red (R) value of the STARTXY pixel. The value is 16.16 fixed point

## **Fields**



# **Fields Description**

## INIT

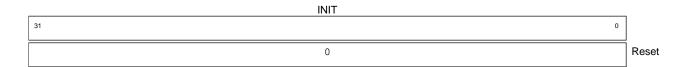
Specifies the Red (R) value of the STARTXY pixel



# **NEMA\_GRE\_INIT**

Address	Access	Reset	Description
0x01c4	rw	0x0	Green (G) value of the STARTXY pixel. The value is 16.16 fixed point

#### **Fields**



# **Fields Description**

## INIT

Specifies the Green (G) value of the STARTXY pixel



# NEMA\_BLU\_INIT

Address	Access	Reset	Description
0x01c8	rw	0x0	Blue (B) value of the STARTXY pixel. The value is 16,16 fixed point

## **Fields**

INIT	_
31	
0	Reset

# **Fields Description**

## INIT

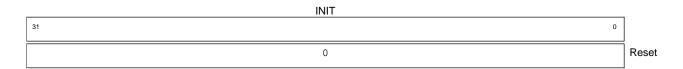
Specifies the Blue (B) value of the STARTXY pixel



# **NEMA\_ALF\_INIT**

Address	Access	Reset	Description
0x01cc	rw	0x0	Alpha (A) value of the STARTXY pixel. The value is 16.16 fixed point

#### **Fields**



# **Fields Description**

#### INIT

Specifies the Alpha (A) value of the STARTXY pixel



#### NEMA\_ROPBLENDER\_BLEND\_MODE

Address	Access	Reset	Description
0x01d0	rw	0x0	Blending Modes for different calculations between the source (Fragment Processing Core) and destination (Frame Buffer) colors

#### **Fields**

<b>م</b> `	E,	es esc		E JEI J	Ś	TALLASING						
C.	, C,	RSVD	C^	<sup>'</sup> RSVD	6,	RSVD		DEST		RSVD	SOURCE	_
31	30	29 26	25	24 17	16	15 12	11	8	7	4	3 0	
0	0	0	0	0	0	0		0		0	0	Reset

#### **Fields Description**

#### **SOURCE**

Blending mode of the current pixel (source pixel)

#### **DEST**

Blending mode of the stored pixel in the FrameBuffer (destination pixel)

#### **ANTIALIASING**

If set, disables Antialiasing

#### CLKEY\_DST\_N

If set, enables Negative Destination Color Keying.

#### **CLKEY SRC**

If set, enables Source Color Keying

#### **CLKEY DST**

If set, enables Destination Color Keying



# NEMA\_ROPBLENDER\_DST\_CKEY

Address	Access	Reset	Description
0x01d4	rw	0x0	When Color Keying is enabled. The new pixel is written in the Frame Buffer, only if the destination pixel has the same RGB value with the Destination Color Key, which is the value of this register

#### **Fields**

ALPHA	BLUE	GREEN	RED	
31 24	23 16	15 8	7 0	
0	0	0	0	Reset

# **Fields Description**

**RED** 

Specifies the Red (R) value

GREEN

Specifies the Green (G) value

**BLUE** 

Specifies the Blue (B) value

**ALPHA** 

Specifies the Alpha (A) value



# NEMA\_ROPBLENDER\_CONST\_COLOR

Address	Access	Reset	Description
0x01d8	rw	0x0	Constant Color value which is used for blending when the blending modes. DSBF_CONSTCOLOR and DSBF_CONSTALPHA are configured in the NEMA_ROPBLENDER_BLEND_MODE Register. * if the blending mode is DSBF_CONSTALPHA then the Constant Alpha value Ca is obtained from bits 31-24 * if the blending mode is DSBF_CONSTCOLOR then the Constant Alpha value Cc is obtained from bits 31-0

#### **Fields**

ALPHA	BLUE	GREEN	RED	
31 24	23 16	15 8	7 0	
0	0	0	0	Reset

# **Fields Description**

#### **RED**

Specifies the Red (R) value

#### **GREEN**

Specifies the Green (G) value

# BLUE

Specifies the Blue (B) value

#### **ALPHA**

Specifies the Alpha (A) value



# NEMA\_IP\_VERSION

Address	Access	Reset	Description
0x01dc	r	0x241001	Returns the current GPU IP version

#### **Fields**

#### UNEMA VERSION

***************************************	_
31 0	
241001	Reset

# **Fields Description**

# UNEMA\_VERSION (Read only) The current version of the GPU IP



#### **NEMA\_CODEPTR2**

Address	Access	Reset	Description
0x01e0	rw	0x0	Shader code pointer

#### **Fields**

	BCG			FRG		
31		16	15		0	
	0	-		0		Reset

## **Fields Description**

#### **FRG**

Specifies the pointer for the instruction that will be executed for the foreground pixels if we are working on neg\_area geometries (rasterizer)

#### **BCG**

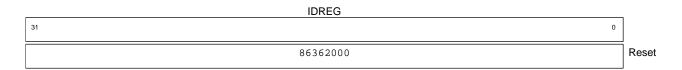
Specifies the pointer for the instruction that will be executed for the background pixels if we are working on neg area geometries (rasterizer)



# **NEMA\_IDREG**

Address Access	Reset	Description
0x01ec r	0x86362000 GPU ID Register (fixed value)	

#### **Fields**



# **Fields Description**

# IDREG (Read only)

The fixed value is 0x86362000



#### **NEMA\_CONFIG**

Address	Access	Reset	Description
0x01f0	r	0xf4030104	GPU configuration status

#### **Fields**

	NE A SE ALL FOR ALL REVD						RSVD		Ċ	MPR	, (2)	RSVD		CORES		THREADS		
31	30	29	28	27	26	25		18	17	16	15	12	11	8	7		0	
1	1	1	1	0	1		0		1	1		0		1		4		Reset

#### **Fields Description**

#### THREADS (Read only)

Indicates the log2 number of threads

#### CORES (Read only)

Indicates the number of cores

#### CG (Read only)

When set to 1, indicates that clock gating is enabled

#### COMPRESS (Read only)

When set to 1, indicates that TSC compression mode is enabled

#### **DIRTY** (Read only)

When set to 1, indicates that Dirty Region is enabled

#### ASYNC (Read only)

When set to 1, Bus to Memory is Asynchronous to core clock

#### **BLENDER** (Read only)

When set to 1, indicates that H/W Blender is enabled

#### TSC6 (Read only)

When set to 1, indicates that TSC6 compression mode is enabled.

#### BL (Read only)

When set to 1, indicates that Bilinear filtering is enabled

#### BUS (Read only)

When set to 1, indicates that the master bus is AXI

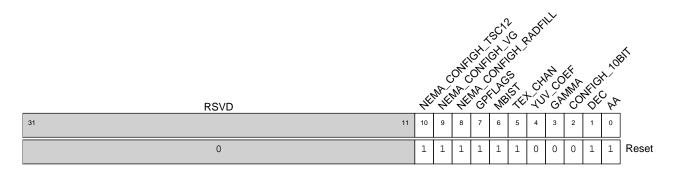
When set to 0, indicates that the master bus is AHB



#### **NEMA\_CONFIGH**

Address Access		Reset	Description
0x01f4	r	0x7e3	GPU configuration status (high bits)

#### **Fields**



#### **Fields Description**

#### AA (Read only)

Indicates that the Antialiasing feature is enabled

#### DEC (Read only)

Indicates that the TSc Framebuffer/Texture Decompression is enabled

#### **CONFIGH 10BIT (Read only)**

Indicates that 10-bit precision is selected

#### GAMMA (Read only)

Indicates that Gamma Correction is enabled

#### YUV COEF (Read only)

Indicates that YUV coefficients are present

#### **TEX CHAN (Read only)**

Indicates that Texture map unit has two channels

#### MBIST (Read only)

Indicates that separate logic/mem Clock Gating is enabled

#### GPFLAGS (Read only)

Indicates that external debug interface (GP\_FLAG, SYSERROR\_IRQ, FREEZE) is enabled

#### **NEMA CONFIGH RADFILL (Read only)**

Indicates that Radial Fill is enabled

#### **NEMA CONFIGH VG (Read only)**

Indicates that NemaVG is enabled

#### NEMA\_CONFIGH\_TSC12 (Read only)

When set to 1, indicates that TSC12 compression mode is enabled



#### NEMA\_CO\_REG

Address	Access	Reset	Description				
0x0200 w 0x0		0x0	A 32-bit integer RGBA value is stored in constant register 0 for fragment calculations.				

#### **Fields**

	ALPHA	BLUE	GREEN	RED	
3	1 24	23 16	15 8	7 0	
	0	0	0	0	Reset

# **Fields Description**

**RED** (Write only)

Specifies the Red (R) value

**GREEN** (Write only)

Specifies the Green (G) value

**BLUE** (Write only)

Specifies the Blue (B) value

**ALPHA** (Write only)

Specifies the Alpha (A) value



### NEMA\_C1\_REG

Address	Access	Reset	Description
0x0204	W	0x0	A 32-bit integer RGBA value is stored in constant register 1 for fragment calculations.

### **Fields**

	ALPHA	BLUE	GREEN	RED	
3	1 24	23 16	15 8	7 0	
	0	0	0	0	Reset

# **Fields Description**

**RED** (Write only)

Specifies the Red (R) value

**GREEN** (Write only)

Specifies the Green (G) value

**BLUE** (Write only)

Specifies the Blue (B) value

**ALPHA** (Write only)

Specifies the Alpha (A) value



### NEMA\_C2\_REG

Address	Access	Reset	Description
0x0208	W	0x0	A 32-bit integer RGBA value is stored in constant register 2 for fragment calculations.

### **Fields**

	ALPHA	BLUE	GREEN	RED	
3	1 24	23 16	15 8	7 0	
	0	0	0	0	Reset

# **Fields Description**

**RED** (Write only)

Specifies the Red (R) value

**GREEN** (Write only)

Specifies the Green (G) value

**BLUE** (Write only)

Specifies the Blue (B) value

**ALPHA** (Write only)

Specifies the Alpha (A) value



### NEMA\_C3\_REG

Address	Access	Reset	Description
0x020c	W	0x0	A 32-bit integer RGBA value is stored in constant register 3 for fragment calculations.

### **Fields**

	ALPHA	BLUE	GREEN	RED	
31	24	23 16	15 8	7 0	
	0	0	0	0	Reset

# **Fields Description**

**RED** (Write only)

Specifies the Red (R) value

**GREEN** (Write only)

Specifies the Green (G) value

**BLUE** (Write only)

Specifies the Blue (B) value

**ALPHA** (Write only)

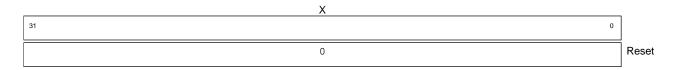
Specifies the Alpha (A) value



### DRAW\_PTO\_X

Address	Access	Reset	Description
0x0320	W	0x0	X coordinate of bezier vertex 0 drawing primitive. This register is written in FP32 IEEE format and can be read from the corresponding PT_X (0x162) register. Its content should be considered volatile.

### **Fields**



## **Fields Description**

## X (Write only)

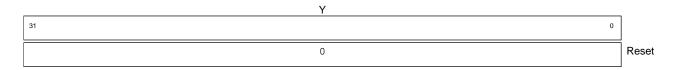
Specifies the X coordinate of bezier vertex 0 drawing primitive (fp32 format)



## DRAW\_PT0\_Y

Address	Access	Reset	Description
0x0324	W	0x0	Y coordinate of bezier vertex 0 drawing primitive. This register is written in FP32 IEEE format and can be read from the corresponding PT_Y (0x162) register. Its content should be considered volatile.

### **Fields**



# **Fields Description**

## Y (Write only)

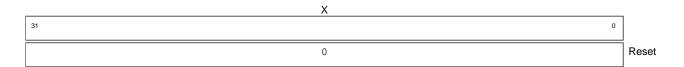
Specifies the Y coordinate of bezier vertex 0 drawing primitive (fp32 format)



# ${\bf DRAW\_FP\_FAN\_X}$

Address	Access	Reset	Description
0x0328	W	0x0	X coordinate of the Fan center point. Its content should be considered volatile.

## **Fields**



# **Fields Description**

# X (Write only)

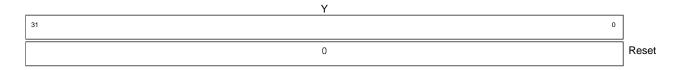
Specifies the X coordinate of bezier vertex 4 drawing primitive (fp32 format)



## DRAW\_FP\_FAN\_Y

Address	Access	Reset	Description
0x032c	W	0x0	Y coordinate of the Fan center point. Its content should be considered volatile.

### **Fields**



# **Fields Description**

# Y (Write only)

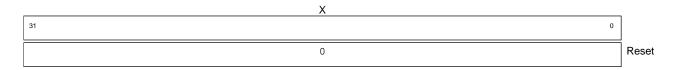
Specifies the X coordinate of bezier vertex 4 drawing primitive (fp32 format)



## DRAW\_PT1\_X

Address	Access	Reset	Description
0x0330	w	0x0	X coordinate of bezier vertex 1 drawing primitive. This register is written in FP32 IEEE format and can be read from the corresponding PT_X (0x163) register. Its content should be considered volatile.

### **Fields**



## **Fields Description**

## X (Write only)

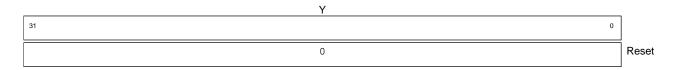
Specifies the X coordinate of bezier vertex 1 drawing primitive (fp32 format)



## DRAW\_PT1\_Y

Address	Access	Reset	Description
0x0334	w	0x0	Y coordinate of bezier vertex 1 drawing primitive. This register is written in FP32 IEEE format and can be read from the corresponding PT_Y (0x163) register. Its content should be considered volatile.

### **Fields**



# **Fields Description**

## Y (Write only)

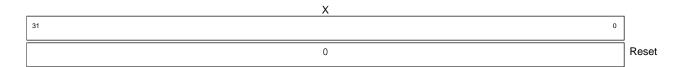
Specifies the Y coordinate of bezier vertex 1 drawing primitive (fp32 format)



# DRAW\_PT2\_X

Address	Access	Reset	Description
0x0340	W	0x0	X coordinate of bezier vertex 2 drawing primitive.

## **Fields**



# **Fields Description**

# X (Write only)

Specifies the X coordinate of bezier vertex 2 drawing primitive (fp32 format)



## DRAW\_PT2\_Y

Address	Access	Reset	Description
0x0344	W	0x0	Y coordinate of bezier vertex 2 drawing primitive.

### **Fields**



# **Fields Description**

# Y (Write only)

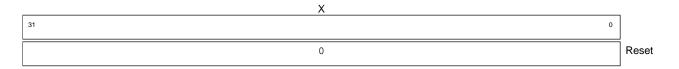
Specifies the Y coordinate of bezier vertex 2 drawing primitive (fp32 format)



# DRAW\_PT3\_X

Address	Access	Reset	Description
0x0350	W	0x0	X coordinate of bezier vertex 3 drawing primitive.

## **Fields**



# **Fields Description**

# X (Write only)

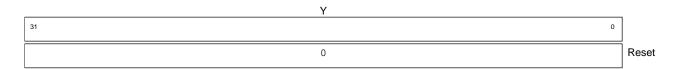
Specifies the X coordinate of bezier vertex 3 drawing primitive (fp32 format)



## DRAW\_PT3\_Y

Address	Access	Reset	Description
0x0354	W	0x0	Y coordinate of bezier vertex 3 drawing primitive.

### **Fields**



# **Fields Description**

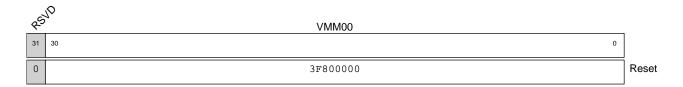
# Y (Write only)

Specifies the Y coordinate of bezier vertex 3 drawing primitive (fp32 format)



Address	Access	Reset	Description
0x0360	rw	0x3f800000	(0,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

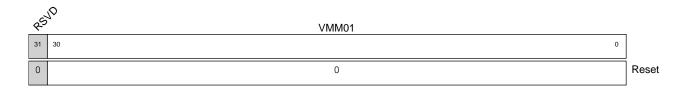
## **VMM00**

Specifies the (0,0) element



Address	Access	Reset	Description
0x0364	rw	0x0	(0,1) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

### **Fields**



# **Fields Description**

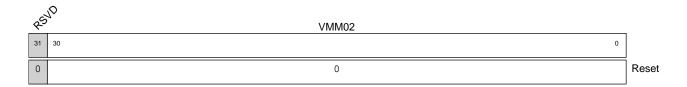
## VMM01

Specifies the (0,1) element



Address	Access	Reset	Description
0x0368	rw	0x0	(0,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

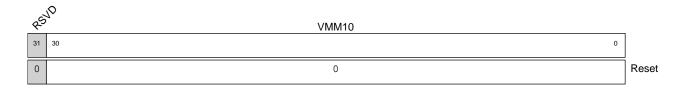
## **VMM02**

Specifies the (0,2) element



Address	Access	Reset	Description
0x036c	rw	0x0	(1,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

### **Fields**



# **Fields Description**

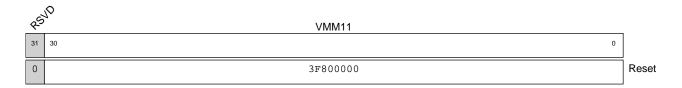
## **VMM10**

Specifies the (1,0) element



Address	Access	Reset	Description
0x0370	rw		(1,1) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

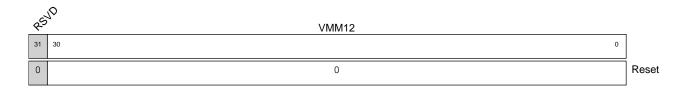
### **VMM11**

Specifies the (1,1) element



Address	Access	Reset	Description
0x0374	rw	0x0	(1,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

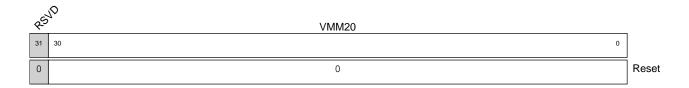
## VMM12

Specifies the (1,2) element



Address	Access	Reset	Description
0x0378	rw	0x0	(2,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

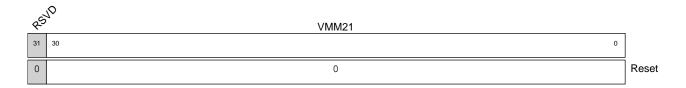
## VMM20

Specifies the (2,0) element



Address	Access	Reset	Description
0x037c	rw	0x0	(2,1) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

### **Fields**



# **Fields Description**

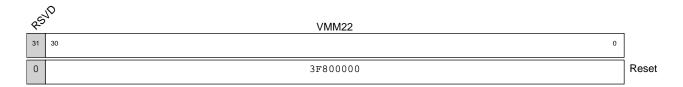
## **VMM21**

Specifies the (2,1) element



Address	Access	Reset	Description
0x0380	rw	0x3f800000	(2,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

## **Fields**



# **Fields Description**

## VMM22

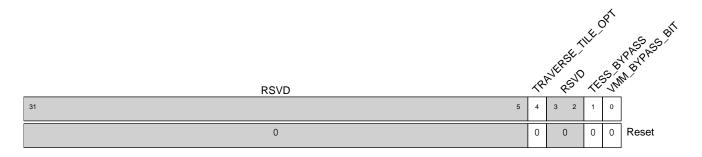
Specifies the (2,2) element



### **NEMA\_RAST\_BYPASS**

Address	Access	Reset	Description
0x0388	rw	0x0	Rasterizer Feature Bypass

#### **Fields**



## **Fields Description**

### **VMM BYPASS BIT**

Bypass Vertex MatMult Module

## TESS\_BYPASS

Bypass Tesselation Module

### TRAVERSE TILE OPT

When 0: Do not send last pixel of tile, when the whole tile is in background. When 1: Send tile last pixel even if the entire tile is in background



# **NEMA\_COORD\_MASK**

Address	Access	Reset	Description
0x04d0	rw	0xfff	Inverted mask for rasterizer coordinates

### **Fields**

	NEMA_COORD_MASK		
31		0	
	FFF		Reset

# **Fields Description**

# NEMA\_COORD\_MASK

Inverted mask for rasterizer coordinates



## DRAW\_FLATNESS

Address	Access	Reset	Description
0x04d4	rw	0x8000	Width in pixels of Bezier Curve flatness. (Lower values improve accuracy)

### **Fields**

FLATNESS	_
31 0	
8000	Reset

# **Fields Description**

## **FLATNESS**

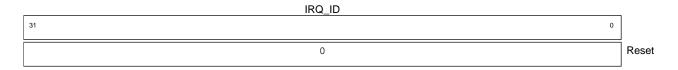
Specifies the convergence point of de Casteljau Algorithm for drawing Bezier Curves (fixed point 16.16 format)



# NEMA\_IRQ\_ID

Address	Access	Reset	Description
0x0ff0	rw	0x0	Signals an interrupt when written

### **Fields**



# **Fields Description**

# IRQ\_ID

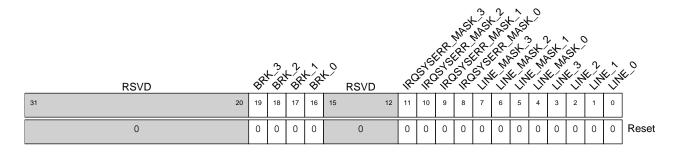
Write any value to signal an interrupt



### **NEMA\_GP\_FLAGS**

Address	Access	Reset	Description
0x0ff4	rw	0x0	Stop/Break the command list when debugging

#### **Fields**



### **Fields Description**

#### LINE 0

GP FLAG line 0.

#### LINE 1

GP FLAG line 1.

#### LINE 2

GP FLAG line 2.

#### LINE 3

GP FLAG line 3.

### LINE MASK 0

 $\ensuremath{\mathsf{GP\_FLAG\_mask}}$  when set to 1 masks/enables the generation of the output FREEZE signal from line 0

### **LINE MASK 1**

GP\_FLAG\_mask when set to 1 masks/enables the generation of the output FREEZE signal from line 1

#### **LINE MASK 2**

GP\_FLAG\_mask when set to 1 masks/enables the generation of the output FREEZE signal from line 2

### **LINE MASK 3**

GP\_FLAG\_mask when set to 1 masks/enables the generation of the output FREEZE signal from line 3

## IRQSYSERR\_MASK\_0

GP\_FLAG\_irqmask when set to 1 masks/enables the generation of the IRQ\_SYSERROR from line 0



### IRQSYSERR\_MASK\_1

GP\_FLAG\_irqmask when set to 1 masks/enables the generation of the IRQ SYSERROR from line 1

### **IRQSYSERR MASK 2**

GP\_FLAG\_irqmask when set to 1 masks/enables the generation of the IRQ\_SYSERROR from line 2

### **IRQSYSERR MASK 3**

GP\_FLAG\_irqmask when set to 1 masks/enables the generation of the IRQ\_SYSERROR from line 3

#### BRK 0

When set to 1, set breakpoint for GP\_FLAG line 0 if NEMA\_GP\_FLAGS[0] bit value is high.

### BRK 1

When set to 1, set breakpoint for GP\_FLAG line 0 if NEMA\_GP\_FLAGS[1] bit value is high.

#### BRK 2

When set to 1, set breakpoint for GP\_FLAG line 0 if NEMA\_GP\_FLAGS[2] bit value is high.

#### BRK 3

When set to 1, set breakpoint for GP\_FLAG line 0 if NEMA\_GP\_FLAGS[3] bit value is high.



### **NEMA\_SYS\_INTERRUPT**

Address	Access	Reset	Description
0x0ff8	rw	0x0	On Read: Returns the SYSERROR_IRQ ID. On write: Clears the SYSERROR IRQ.

#### **Fields**

RSVD	€ <sup>Q</sup>	Role file flee		~ \$)	20 C	SOL SOL	COO	io 3 th	July July July July July July July July
31 12	2 11	10 7	6 5	4	3	2	1	0	
0	0	0	0	0	0	0	0	0	Reset

### **Fields Description**

### **ERROR LINE 0**

Indicates that IRQ\_SYSERROR due to GP\_FLAG line 0.

### **ERROR LINE 1**

Indicates that IRQ SYSERROR due to GP FLAG line 1.

#### **ERROR LINE 2**

Indicates that IRQ SYSERROR due to GP FLAG line 2.

### ERROR\_LINE\_3

Indicates that IRQ SYSERROR due to GP FLAG line 3.

### **ERROR BUS CODEO**

Indicates the Interface Error Code(AXI only).

0: SLVERR

1: DECERR

### **ERROR BUS CODE1**

Indicates the Bus Error Code occurence direction (AXI only).

01: Read Direction

10: Write Direction

### ERROR\_BUS\_CODE2

Indicates the Bus Error Code Interface.

1000: AHB/AXI Slave Port

0100: AHB/AXI M0 Master Port

0010: AHB/AXI M1 Master Port

0001: AXI CL Master Port

### **ERROR BUS ERR**

Indicates that a bus error has occurred.



### **NEMA\_BUSERROR\_MASK**

Address	Access	Reset	Description
0x0ffc	rw	0x0	Sets the mask for the Buserror Interrupt.

### **Fields**

RSVD	MASK2	MASK	, 89	'NO
31 7	6 3	2 1	0	
0	0	0	0	Reset

## **Fields Description**

### MASK1

Sets the mask for the Bus Error Code occurence direction (AXI only).

01: Read Direction 10: Write Direction

### MASK2

Sets the mask for the Bus Error Code Interface.

1000: AHB/AXI Slave Port 0100: AHB/AXI M0 Master Port 0010: AHB/AXI M1 Master Port 0001: AXI CL Master Port