Think Silicon

AN APPLIED MATERIALS COMPANY

NEMA®| pico VG 1000 Graphics Processing Unit

Hardware User Manual

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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/RGBA4444/BGRA4444/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(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
  - DirectFB
  - Qt
- 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 such as DirectFB and Qt

- NEMA| GFX: Enables high quality 2.5D graphics on RTOS and OS-less systems. NEMA| 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.
- DirectFB: Enables software development with application and Graphic User Interface (GUI) creation frameworks, such as GTK. DirectFB (Direct Frame Buffer) is a set of graphics APIs implemented on top of the Linux Frame Buffer abstraction layer.

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 high-end Graphics User Interface (GUI) development on low resource hardware (non-com-

mercial 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
0x0008	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_PT0_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	0x00230602	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_C0_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_PT0_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

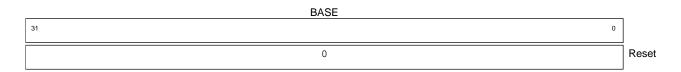| Address	Access	Reset Value	Name
0x037c	rw	0x0	VMM21
0x0380	rw	0x3f800000	VMM22
0x04d0	rw	0x00000fff	NEMA_COORD_MASK
0x04d4	rw	0x00008000	DRAW_FLATNESS
0x0ff0	rw	0x0	NEMA_IRQ_ID
0x0ff4	rw	0x0	NEMA_GP_FLAGS
0x0ff8	rw	0x0	NEMA_SYS_INTERRUPT
0x0ffc	rw	0x0	NEMA_BUSERROR_MASK

2.2 Registers' Description

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

NEMA_TEX0_BASE

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

Fields

BASE

31	0
0	Reset

Fields Description

BASE

Specifies the base address or drawing surface 0.

NEMA_TEX0_FSTRIDE

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

Fields

DITH	FORMAT	RADFILL	RSVD	TILE	WRAP	RSVD	MODE	STRIDE	
31	30 24	23	22 21	20	19 18	17	16	15 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 (Only available as input format)
  * 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 (Only available as input format)
* 0x10 BGRA (Only available as input format)
* 0x11 BGRX (Only available as input format)
* 0x12 TSC4
* 0x16 TSC6
* 0x17 TSC6A
* 0x4C TSC12
* 0x4D TSC12A
* 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 (Only available as input format)
* 0x39 BGR24
* 0x3C RGB24
* 0x40 RGBA2222
* 0x41 ABGR2222
* 0x42 BGRA2222
* 0x43 ARGB2222

DITH

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

NEMA_TEX0_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

BASE

31	0
0	Reset

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

DITH	FORMAT	RADFILL	RSVD	TILE	WRAP	RSVD	MODE	STRIDE	
31	30 24	23	22 21	20	19 18	17	16	15 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 (Only available as input format)
   * 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 (Only available as input format)
* 0x10 BGRA (Only available as input format)
* 0x11 BGRX (Only available as input format)
* 0x12 TSC4
* 0x16 TSC6
* 0x17 TSC6A
* 0x4C TSC12
* 0x4D TSC12A
* 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 (Only available as input format)
* 0x39 BGR24
* 0x3C RGB24
* 0x40 RGBA2222
* 0x41 ABGR2222
* 0x42 BGRA2222
* 0x43 ARGB2222

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		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's 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

BASE

31	0
0	Reset

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

DITH	FORMAT	RADFILL	RSVD	TILE	WRAP	RSVD	MODE	STRIDE	
31	30 24	23	22 21	20	19 18	17	16 15	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 (Only available as input format)
> * 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 (Only available as input format)
* 0x10 BGRA (Only available as input format)
* 0x11 BGRX (Only available as input format)
* 0x12 TSC4
* 0x16 TSC6
* 0x17 TSC6A
* 0x4C TSC12
* 0x4D TSC12A
* 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 (Only available as input format)
* 0x39 BGR24
* 0x3C RGB24
* 0x40 RGBA2222
* 0x41 ABGR2222
* 0x42 BGRA2222
* 0x43 ARGB2222

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

BASE

31	0

0	Reset

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

DITH	FORMAT		RADFILL	RSVD	TILE	WRAP	RSVD	MODE	STRIDE	
31	30	24	23	22 21	20	19 18	17	16	15	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 (Only available as input format)
    * 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 (Only available as input format)
* 0x10 BGRA (Only available as input format)
* 0x11 BGRX (Only available as input format)
* 0x12 TSC4
* 0x16 TSC6
* 0x17 TSC6A
* 0x4C TSC12
* 0x4D TSC12A
* 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 (Only available as input format)
* 0x39 BGR24
* 0x3C RGB24
* 0x40 RGBA2222
* 0x41 ABGR2222
* 0x42 BGRA2222
* 0x43 ARGB2222

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

RSVD

31	0
0	Reset

Fields Description

NEMA_TSC_NEW_BLOCK_SEL

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

Fields

RSVD		SEL	
31	2	1	0
0		0	Reset

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

ALL	RSVD	RSVD	RSVD	MEM_C0	RSVD	RSVD	RSVD	C0	RSVD	RSVD	RSVD	SCH_C0	RSVD	RSVD	RSVD	RF_C0	RSVD	RSVD	RSVD	PIPE_C0	RSVD	RSVD	RSVD	BUS_TEX_C0	RSVD	RSVD	RSVD	ROP_C0	RAST	RF	CL	
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Reset

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_C0
  Disable clock gating for the Render Output Unit of core 0
BUS_TEX_C0
  Disable clock gating for the BusInterface (memory System) and Core 0 Texture
   Map
PIPE_C0
  Disable clock gating for Core 0 Pipeline
RF_C0
  Disable clock gating for Core 0 Register File
SCH_C0
  Disable clock gating for Core 0 Scheduler
C0
  Disable clock gating for Core 0
MEM_C0
  Disable clock gating for Core 0 Instruction Memory
ALL
  Disable clock gating for all modules

NEMA_DIRTYMIN

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

Fields

DIRTYMIN

31	0
FFFFFFFF	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

31	0
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		AWCACHE		ARCACHE		
31	8	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

RSVD		ADDR	
31	4	3	0
0		0	Reset

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
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

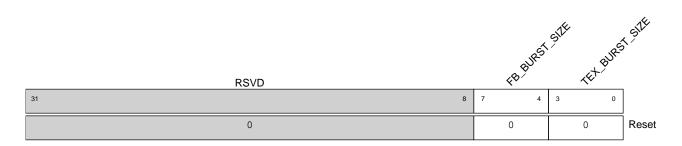| 31	0
0	

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

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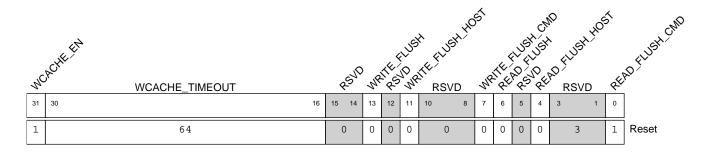
    Value should be greater or equal to the framebuffer format size used, e.g. TSc6 (12 bytes) mode requires a value greater or equal to 4.

NEMA_FLUSH_CTRL

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

Fields

WCACHE_EN	WCACHE_TIMEOUT		RSVD	WRITE_FLUSH	RSVD	WRITE_FLUSH_HOST	RSVD	WRITE_FLUSH_CMD	READ_FLUSH	RSVD	READ_FLUSH_HOST	RSVD	READ_FLUSH_CMD
31	30	16	15 14	13	12	11	10 8	7	6	5	4	3 1	0
1	6 4		0	0	0	0	0	0	0	0	0	3	1	Reset

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
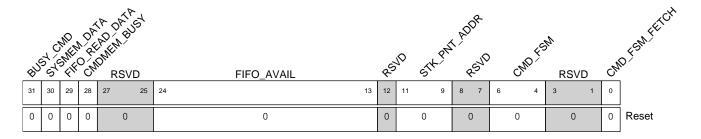
WCACHE_EN
  When set to 1, write cache is enabled

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

BUSY_CMD	SYSMEM_DATA	FIFO_READ_DATA	CMDMEM_BUSY	RSVD	FIFO_AVAIL	RSVD	STK_PNT_ADDR	RSVD	CMD_FSM	RSVD	CMD_FSM_FETCH	
31	30	29	28	27 25	24 13	12	11 9	8 7	6 4	3 1	0	
0	0	0	0	0	0	0	0	0	0	0	0	Reset

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's pointer.

Fields

CMDRINGSTOP

31	0
0	Reset

Fields Description

CMDRINGSTOP

Stores the Ring Buffer's last written address

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

CMDSIZE

31	0
0	Reset

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

CLK_DVFS		RSVD	THROTTLE	RSVD		CLEAR	DRAW	CL	POLARITY	
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

CLEAR

    When set to 1, the interrupt in the NEMA_IRQ_ID register is cleared

THROTTLE

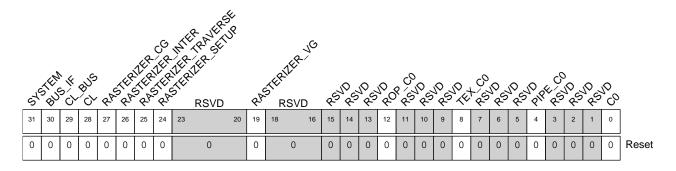   When set to 1, the throttle signal will be ignored.

CLK_DVFS

    Specify the core_clk_dvfs output

NEMA_STATUS

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

Fields

Bit	Field
31	SYSTEM
30	BUS_IF
29	CL_BUS
28	CL
27	RASTERIZER_CG
26	RASTERIZER_INTER
25	RASTERIZER_TRAVERSE
24	RASTERIZER_SETUP
23:20	RSVD
19	RASTERIZER_VG
18:16	RSVD
15	RSVD
14	RSVD
13	RSVD
12	ROP_C0
11	RSVD
10	RSVD
9	RSVD
8	TEX_C0
7	RSVD
6	RSVD
5	RSVD
4	PIPE_C0
3	RSVD
2	RSVD
1	RSVD
0	C0

Reset: all bits 0

Fields Description

C0
  Indicates if the Core 0 is busy

PIPE_C0
  Indicates if the Core 0 graphics pipeline is busy

TEX_C0
  Indicates if the Core 0 Texture Map Unit is busy

ROP_C0
  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
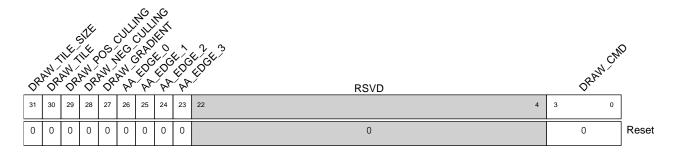 Indicates if the Bus Interface Unit is busy

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

31	30	29	28	27	26	25	24	23	22 RSVD 4	3 DRAW_CMD 0
0	0	0	0	0	0	0	0	0	0	0

Reset

Fields (labels): DRAW_TILE_SIZE, DRAW_TILE, DRAW_POS_CULLING, DRAW_NEG_CULLING, DRAW_GRADIENT, AA_EDGE_0, AA_EDGE_1, AA_EDGE_2, AA_EDGE_3

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

Fields

X	

31	0	
0		Reset

Fields Description

X

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

http://www.think-silicon.com

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

RSVD		ADD_HALF	BYPASS_MM	RSVD		RSVD	BYPASS_VMM	RSVD	
31	30	29	28	27	26	25	24	23	0
0		0	0	1		0	1	0	Reset

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_PT0_X

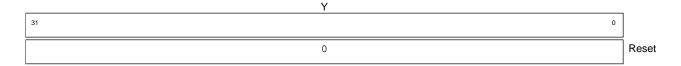| Address	Access	Reset	Description
0x0120	rw	0x0	X coordinate of vertex 0 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

Fields

X

31	0
0	Reset

Fields Description

X

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

NEMA_DRAW_PT0_Y

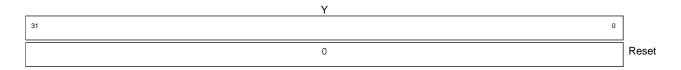| Address	Access	Reset	Description
0x0124	rw	0x0	Y coordinate of vertex 0 drawing primitive. The value is 16.16 fixed point. This register is updated also by NEMA_DRAW_PT0 and NEMA_DRAW_PT1. Its content should be considered volatile.

Fields

Y

31	0
0	Reset

Fields Description

Y

   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

Y	
31	0
0	Reset

Fields Description

Y

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
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

X

31	0
0	Reset

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

Y

31	0
0	Reset

Fields Description

Y

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
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

	X	
31		0
	0	Reset

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

Y

31	0
0	Reset

Fields Description

Y

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 Key

Fields

CLID

31	0
0	Reset

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

X

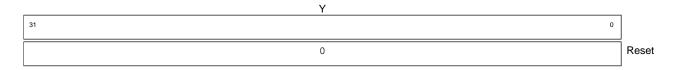| 31	0

0	Reset

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

Y

31	0
0	Reset

Fields Description

Y

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

NEMA_MM00

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

NEMA_MM01

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

NEMA_MM02

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

NEMA_MM10

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

NEMA_MM11

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

NEMA_MM12

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

NEMA_MM20

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

NEMA_MM21

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

NEMA_MM22

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

START_L

31	0
0	Reset

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

START_H

31	0
0	Reset

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

DX_L

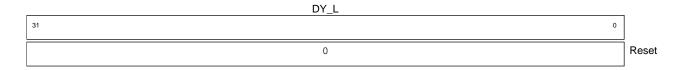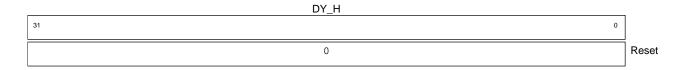| 31	0	
0		Reset

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

DX_H

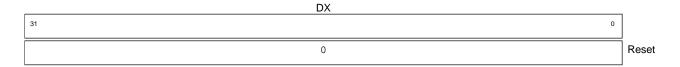| 31	0
0	Reset

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

DY_L

31	0
0	Reset

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

DY_H

31	0
0	Reset

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

DX

31	0
0	Reset

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

DY

31	0
0	Reset

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

DX

31	0
0	Reset

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

DY

31	0
0	Reset

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

DX

31	0
0	Reset

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

DY

31	0
0	Reset

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

<div align="center">DX</div>

31	0	
0		Reset

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

DY

31	0
0	Reset

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

INIT

31	0
0	Reset

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

INIT

31	0
0	Reset

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
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

INIT

31	0
0	Reset

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

CLKEY_DST	CLKEY_SRC	RSVD	BLD_OFF	RSVD	ANTIALIASING	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
BLD_OFF
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	0x230602	Returns the current GPU IP version

Fields

UNEMA_VERSION

31	0
230602	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)
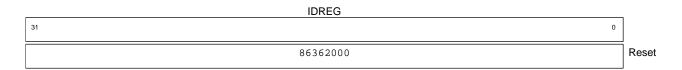
BCG
Specifies the pointer for the instruction that will be executed for the background pixels if we are working on neg_area geometries (rasterizer)

NEMA_IDREG

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

Fields

IDREG

31	0
86362000	Reset

Fields Description

IDREG *(Read only)*
　　The fixed value is 0x86362000

NEMA_CONFIG

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

Fields

BUS	BL	TSC6	BLENDER	ASYNC	DIRTY	RSVD	COMPRESS	CG	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)*
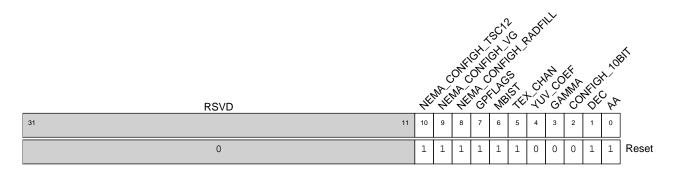When set to 1, indicates that the master bus is AXI

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

RSVD		NEMA_CONFIGH_TSC12	NEMA_CONFIGH_VG	NEMA_CONFIGH_RADFILL	GPFLAGS	MBIST	TEX_CHAN	YUV_COEF	GAMMA	CONFIGH_10BIT	DEC	AA
31	11	10	9	8	7	6	5	4	3	2	1	0
0		1	1	1	1	1	1	0	0	0	1	1	Reset

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_C0_REG

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

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	
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

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		
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)*
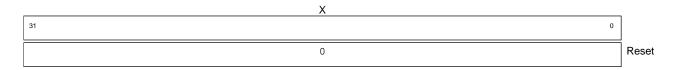> Specifies the Blue (B) value

ALPHA *(Write only)*
> Specifies the Alpha (A) value

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_PT0_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

X

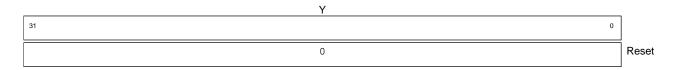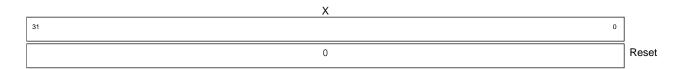| 31	0
0	Reset

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

Y

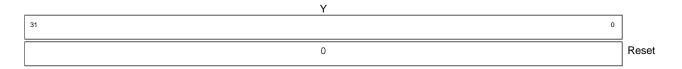| 31	0
0	Reset

Fields Description

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

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

X	
31	0
0	Reset

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

Y

31	0

0	Reset

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

X

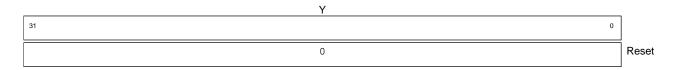| 31	0
0	Reset

Fields Description

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

DRAW_PT1_Y

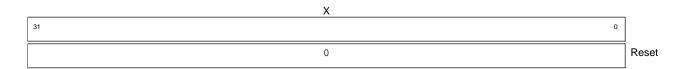| Address	Access	Reset	Description
0x0334	w	0x0	Y coordinate of bezier vertex 1 drawing primitive. This register is written in FP32 IEEE format and can be read from the corresponding PT_Y (0x163) register. Its content should be considered volatile.

Fields

Y

31	0
0	Reset

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

X	
31	0
0	Reset

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

Y

31	0
0	Reset

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

X	
31	0
0	Reset

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

Y

31	0
0	Reset

Fields Description

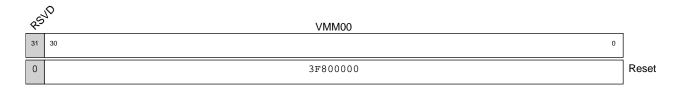**Y** *(Write only)*
Specifies the Y coordinate of bezier vertex 3 drawing primitive (fp32 format)

VMM00

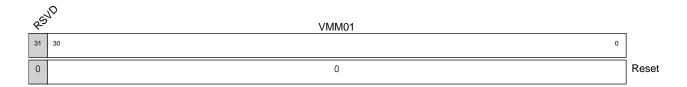| Address	Access	Reset	Description
0x0360	rw	0x3f800000	(0,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

Fields Description

VMM00

   Specifies the (0,0) element

VMM01

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

RSVD	VMM01	
31	30	0
0	0	Reset

Fields Description

VMM01
Specifies the (0,1) element

VMM02

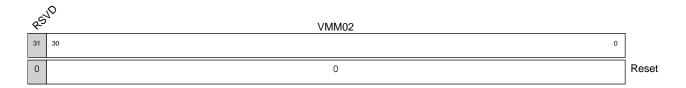| Address	Access	Reset	Description
0x0368	rw	0x0	(0,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

RSVD	VMM02	
31	30	0
0	0	Reset

Fields Description

VMM02
Specifies the (0,2) element

VMM10

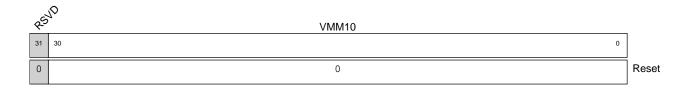| Address	Access	Reset	Description
0x036c	rw	0x0	(1,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

RSVD	VMM10	
31	30	0
0	0	Reset

Fields Description

VMM10
Specifies the (1,0) element

VMM11

Address	Access	Reset	Description
0x0370	rw	0x3f800000	(1,1) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

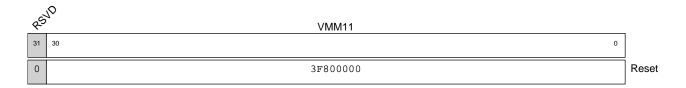| RSVD	VMM11	
31	30	0
0	3F800000	Reset

Fields Description

VMM11
Specifies the (1,1) element

VMM12

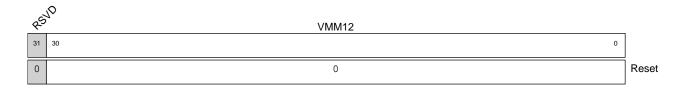| Address	Access	Reset	Description
0x0374	rw	0x0	(1,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

RSVD	VMM12	
31	30	0
0	0	Reset

Fields Description

VMM12
Specifies the (1,2) element

VMM20

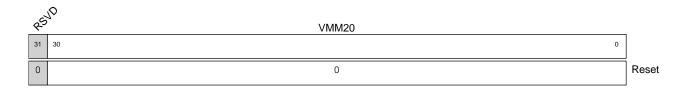| Address	Access	Reset	Description
0x0378	rw	0x0	(2,0) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

RSVD	VMM20	
31	30	0
0	0	Reset

Fields Description

VMM20
Specifies the (2,0) element

VMM21

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

RSVD	VMM21	
31	30	0
0	0	Reset

Fields Description

VMM21
Specifies the (2,1) element

VMM22

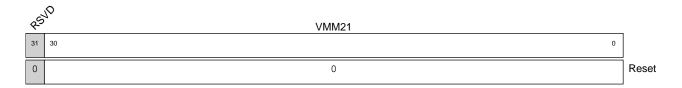| Address	Access	Reset	Description
0x0380	rw	0x3f800000	(2,2) Bezier Vertex Transformation matrix floating point element. On read return the floating point value with the selected characteristics

Fields

RSVD

VMM22
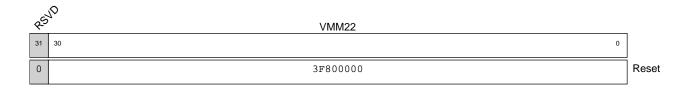
31	30	0
0	3F800000	Reset

Fields Description

VMM22

Specifies the (2,2) element

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

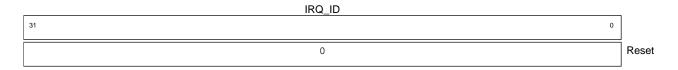| 31	0
8000	Reset

Fields Description

FLATNESS

Specifies the convergence point of de Casteljau's 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

IRQ_ID

31	0
0	Reset

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

RSVD		BRK_3	BRK_2	BRK_1	BRK_0	RSVD		IRQSYSERR_MASK_3	IRQSYSERR_MASK_2	IRQSYSERR_MASK_1	IRQSYSERR_MASK_0	LINE_MASK_3	LINE_MASK_2	LINE_MASK_1	LINE_MASK_0	LINE_3	LINE_2	LINE_1	LINE_0	
31	20	19	18	17	16	15	12	11	10	9	8	7	6	5	4	3	2	1	0	
0		0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	Reset

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
  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

		ERROR_BUS_ERR	ERROR_BUS_CODE2	ERROR_BUS_CODE1	ERROR_BUS_CODE0	ERROR_LINE_3	ERROR_LINE_2	ERROR_LINE_1	ERROR_LINE_0
RSVD									
31	12	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_CODE0
    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		MASK1	RSVD	
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