Open Graphics Programming Manual

Chrome9 HC3 Graphics Processor

VX800 / VX820 Series

Part I: Graphics Core / 2D

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VIA TECHNOLOGIES, INC.

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Offices:

VIA Technologies Incorporated
Taiwan Office:
1st Floor, No. 531
Chung-Cheng Road, Hsin-Tien
Taipei, Taiwan ROC
Tel: 886-2-2218-5452
FAX: 886-2-2218-5453
Home page: http://www.via.com.tw

VIA Technologies Incorporated
USA Office:
940 Mission Court
Fremont, CA 94539
USA
Tel: 510-683-3300
FAX: 510-683-3301 or 510-687-4654
Home Page: http://www.viatech.com

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TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

This document contains detailed graphics registers descriptions and other general information for the Chrome9 HC3 graphic engine. The graphics registers for the Chrome9 HC3 main features and its underlying subsystems are described explicitly in the following chapters.

About This Programming Guide

The programming manual is organized into 2 volumes (Part I & Part II). A brief description of each chapter is given below:

Part I:

Introduction
An overview of the Chrome9 HC3 design features is given in this chapter, along with block diagram and reference list.

Register Overview
Register specifications for register addressing and I/O space division are shown in this chapter.

PCI Interface Register Descriptions
PCI interface summary table and detailed register descriptions are presented in this chapter.

VGA I/O Register Descriptions
This chapter provides detailed VGA-related register summary and descriptions. The various video modes support by the Chrome9 HC3 controller are also included in the configuration section.

2D Engine Register Descriptions
In this chapter provides detailed 2D Engine register summary and descriptions.

DMA Register Descriptions
In this chapter provides detailed DMA register summary and descriptions.

CBU Rotation Register Descriptions
In this chapter provides detailed CBU rotation register summary and descriptions.

LVDS Register Descriptions
In this chapter provides detailed LVDS register summary and descriptions.

Part II:

Video Register Descriptions
This chapter provides detailed video register summary and descriptions.

3D Engine Register Descriptions
In this chapter provides detailed 3D Engine register summary and descriptions.

REGISTER OVERVIEW

In the register descriptions, column “Default” indicates the default value of register bit. While column “Attribute” indicates access type of register bit.

Abbreviation

Attribute Definitions

Read / Write Attributes: read / write attributes may be used together to specify combined attributes

- **RO:** Read Only.
- **RZ:** Read as Zero.
- **R1:** Read as 1.
- **IW:** Ignore Write.
- **MW:** Must Write back what is read.
- **XW:** Backdoor Write.
- **W:** Write Only. (register value can not be read by the software)
- **WO/W1:** Write Once then Read Only after that.
- **RW**: Read / Write.
- **RW1C**: Read / Write of “1” clears bit to zero.

Sticky Attributes: adding a “S” in tail to indicate a sticky register, which means that register will not be set or altered by hot reset.
Ex. RWS: Sticky-Read/Write. **ROS**: Sticky-Read Only. **RW1CS**: Sticky-Write-1-to-Clear.

Default Value Definitions

- **Dip**: means the default value is set by dip switch or strapping.
- **HwInit**: Hardware initialized; bit default value is set by hardware.

I/O Address Space

The I/O space of the Chrome9 HC3 processor is divided into the following subspaces for various functions of the processor:

- PCI Interface: PCI/AGP/Power Management configuration space
- VGA space
- Extended I/O space
- Secondary Display Engine / LCD Display
- 2D engine space
- 3D engine space
- Video Playback / Blending engines space
- VIDEO engine space
- DMA engine space

Table 1 lists the various I/O space categories and their corresponding I/O addresses for the Chrome9 HC3 processor. Please note that in the monochrome mode, the "X" contained within the I/O addresses stands for **"B",** and in the color mode the "X" stands for **"D".**

Table 1. Chrome9 HC3 I/O Space

Categories	I/O Address
PCI Interface	PCI Configuration Space
VGA Space	Standard VGA Space
Extended I/O Space	3C5.10 ~ 3C5.FF / 3CF.20 ~ 3CF.2F / 3X5.30 ~ 3X5.4F
Secondary Display Engine / LCD Display	3X5.50 ~ 3X5.D2

Memory Address Space

There are three memory spaces implemented in the Chrome9 HC3 graphics processor:

1. Starting from PCI Memory Base 0, **MB0**, there is a **256MB** memory space reserved as the graphics and video playback buffer.(Named as **S.L.** – System Local Frame Buffer)
2. Starting from PCI Memory Base 1**, MB1**, there is a **16MB** memory space reserved for **memory-mapped I/O**, 2D Host BitBLT space and burst **command area**.
3. Starting from PCI Memory Base 2, **MB2**, there is a **512MB** memory space reserved as the graphics and video playback buffer. (Named as **L.L.** – Local Memory Local Frame Buffer, and dedicated for Graphics) – ***Do Not Support***

MB0 is decalred in the register with offset address 10h~17h in the PCI configuration space.

MB1 is declared in the register with offset address 18h~1Fh in the PCI configuration space.

MB2 is declared in the register with offset address 20h~27h in the PCI configuration space.

Memory Mapped I/O Register Address Spaces

Table 2. Memory Mapped I/O Address Space Partition Table

Memory Range (Note)	Usage
0 ~ 2M-1:	
0x00000000 ~ 0x000001FF	2D Engine Register Space
0x00000200 ~ 0x000003FF	Video Related Engines Register Space 1
0x00000400 ~ 0x000007FF	3D Engine Register Space
0x00000800 ~ 0x00000BFF	Burst Command Area
0x00000C00 ~ 0x00000DFF	Reserved
0x00000E00 ~ 0x00000FFF	DMA(AGP) Register Space
0x00001200 ~ 0x000013FF	Video Related Engines Register Space 2
0x00001C00 ~ 0x00001DFF	WMV MC Register Space
0x00001E00 ~ 0x00001FFF	CBU Rotate Related
0x00002200 ~ 0x000023FF	Extended Video Engines Register Space 1
0x00002E00 ~ 0x00002FFF	DMA(AGP) Register Space 2
0x00003200 ~ 0x000033FF	Extended Video Engines Register Space 2
0x000083CX ~ 0x000083DX	VGA memory mapped IO Space
0x0000C000 ~ 0x0000C1FF	Reserved
2M ~ 4M-1	**2D Host BitBLT Space**
4M ~ 8M-1	**Burst Command Area**
8M ~ 16M-1	**Reserved**

Notes These addresses are offset address from MB1.

PCI INTERFACE

This section provides a complete PCI register overview. Table 3 shows the supported PCI commands in Chrome9 HC3 and Table 4 is a PCI register summary table.

PCI Commands

Table 3 shows the PCI commands supported by the Chrome9 HC3 graphic processor. The Chrome9 HC3 processor complies with the PCI bus interface protocol, Rev. 2.2. The design clock rate is 66 MHz and both master and slave modes are supported.

Table 3. PCI Command

Command Code	Command
0000	**Interrupt Acknowledge**
0001	**Special**
0010	I/O Read
0011	I/O Write
0100	**Reserved**
0101	**Reserved**
0110	Memory Read
0111	Memory Write
1000	**Reserved**
1001	**Reserved**
1010	Configuration Read
1011	Configuration Write
1100	Memory Read Multiple; treated as 0110 memory read
1101	**Dual Address**
1110	Memory Read Line; treated as 0110 memory read
1111	Memory Write and Invalid; treated as 0111 memory write

Note: The command codes in **bold** are not supported in Chrome9 HC3.

PCI Configuration Registers

The following table summarizes PCI configuration registers of Chrome9 HC3 processor. This table also documents the power-on default value ("Default") and attribute ("Attribute") for each register. Access type definitions used are RW (Read/Write), RO (Read/Only) and RW1C (Read / Write of "1" clears bit to zero). Registers indicated as RW may have some read/only bits that always read back a fixed value (usually 0 if unused); registers designated as RW1C may have some read-only or read write bits (see individual register descriptions for details). All default values are shown in hexadecimal unless otherwise indicated.

Table 4. PCI Configuration Registers

Offset Address	Normal PCI Configuration Area	Default Value	Attribute
01-00	VIA Technology ID	1106h	RO
03-02	Device ID	1122h	RO
05-04	PCI Command	0000h	RW
07-06	PCI Status	0010h	RW
08	Revision ID	00h	RO
0B-09	Class Code	03 0000h	RO
17-10	Memory Base 0 Address (S.L.)	0000 0000 0000 000Ch	RW
1F-18	Memory Base 1 Address (MMIO)	0000 0000 0000 0004h	RW
27-20	Reserved	–	RO
2D-2C	Subsystem Vendor ID	1106h	RO
2F-2E	Subsystem ID	1122h	RO
33-30	ROM Base Address	0000 0000h	RW
34	Capabilities Pointer	60h	RO
3C	Interrupt Line	00h	RW
3D	Interrupt Pin	01h	RO

Offset Address	Power Management Configuration Area	Default Value	Attribute
60	Capability ID (01h)	01	RO
61	Next Item Pointer	90h	RO
63-62	Power Management Capability	0622h	RO
65-64	Power Management Control / Status	0000h	RO / RW
67-66h	Data + PMCSR_BSE	0000h	RO

Offset Address	PCI Express Configuration Area	Default Value	Attribute
70	PCI Express Cap ID	10h	RO
71	Next Cap Pointer	00h	RO
73-72	PCI Express Capabilities	0091h	RO
77-74	Device Capabilities	0000 0000h	RO
79-78	Device Control	0000h	RW
7B-7A	Device Status	0000h	RO

Table 5. PCI Configuration Registers

Offset Address	MSI Configuration Area	Default Value	Attribute
90	MSI Capability ID	05h	RO
91	Next Cap Pointer	00h	RO
93-92	Message Control	0000h	RW
9B~94	Message Address	0	RW
9D~9C	Message Data	0000h	RW

Offset Address	VIA GFX Configuration Area	Default Value	Attribute
B0	Memory Base Control	00h	RW
B1	Reserved	–	RO
B2	Memory Base 0 Size (S.L)	00h	RW

PCI REGISTER DESCRIPTIONS

This chapter provides PCI register summary table and detailed register descriptions are followed in the subsequent sections.

PCI Configuration Registers (AGP GFX)

Normal PCI Configuration Area (00-3Dh)

Offset Address: 01-00h

Vendor ID **Default Value: 1106h**

Bit	Attribute	Default	Description
15:0	RO	1106h	**VIA Technology ID**

Offset Address: 03-02h

Device ID **Default Value: 1122h**

Bit	Attribute	Default	Description
15:0	RO	1122h	**Device ID**

Offset Address: 05-04h

PCI Command **Default Value: 0000h**

Bit	Attribute	Default	Description
15:11	RO	0	**Reserved**
10	RW	0	**Interrupt Disable** 0: Disable 1: Enable
9	RW	0	**Fast Back-to-Back Enable** 0: Disable 1: Enable
8	RW	0	**SERR# Enable** 0: Disable 1: Enable
7	RW	0	**Wait Cycle Control** 0: Disable 1: Enable
6	RW	0	**Parity Error Response** 0: Disable 1: Enable
5	RW	0	**VGA Palette Snoop** 0: Disable 1: Enable
4	RW	0	**Memory Write and Invalidate Enable** 0: Disable 1: Enable
3	RW	0	**Special Cycle** 0: Disable 1: Enable
2	RW	0	**Bus Master** 0: Disable 1: Enable
1	RW	0	**Memory Space** 0: Disable 1: Enable
0	RW	0	**IO Space** 0: Disable 1: Enable

Offset Address: 07-06h

PCI Status **Default Value: 0010h**

Bit	Attribute	Default	Description
15	RW1C	0	**Detected Parity Error** Assert 1 whenever a parity error is detected.
14	RO	0	**Signaled System Error**
13	RW1C	0	**Received Master Abort** Assert 0 when a master abort is detected.
12	RW1C	0	**Received Target Abort** Assert 0 when a target abort is detected.
11	RW	0	**Signaled Target Abort**
10:9	RO	00b	**DEVSEL# Timing** 00: Fast 01: Medium 10: Slow 11: Reserved
8	RO	0	**Master Data Parity Error**
7	RO	0	**Fast Back-to-back Capable**
6	RO	0	**Reserved**
5	RO	0	**66MHz Capable**
4	RO	1b	**Capabilities List** Presence the extended capability list.
3	RW	0	**Interrupt Status** 1: Assert an interrupt at the INTA#.
2:0	RO	0	**Reserved**

Offset Address: 08h

Revision ID **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RO	0	**Revision ID**

Offset Address: 0B-09h

Class Code **Default Value: 03 0000h**

Bit	Attribute	Default	Description
23:0	RO	03 0000h	**Class Code**

Offset Address: 17-10h

Memory Base 0 Address (S.L.) **Default Value: 0000 0000 0000 000Ch**

Bit	Attribute	Default	Description
63::0	RW	0000 0000 0000 000Ch	**Memory Base 0 Address (S.L.)**

Offset Address: 1F-18h

Memory Base 1 Address (MMIO) **Default Value: 0000 0000 0000 0004h**

Bit	Attribute	Default	Description
63:0	RW	0000 0000 0000 0004h	**Memory Base 1 Address (MMIO)**

Offset Address: 27-20h − Reserved

Offset Address: 2D-2Ch
Subsystem Vendor ID **Default Value: 1106h**

Bit	Attribute	Default	Description
15:0	RO	1106h	**Subsystem Vendor ID**

Offset Address: 2F-2Eh
Subsystem ID **Default Value: 1122h**

Bit	Attribute	Default	Description
15:0	RO	1122h	**Subsystem ID**

Offset Address: 33-30h
ROM Base Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	**ROM Base**

Offset Address: 34h
Capabilities Pointer **Default Value: 60h**

Bit	Attribute	Default	Description
7:0	RO	60h	**Capabilities Pointer**

Offset Address: 3Ch
Interrupt Line **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Interrupt Line**

Offset Address: 3Dh
Interrupt Pin **Default Value: 01h**

Bit	Attribute	Default	Description
7:0	RO	01h	**Interrupt Pin**

Power Management Configuration Registers (60-67h)

Offset Address: 60h
Capability ID (01h) **Default Value: 01h**

Bit	Attribute	Default	Description
7:0	RO	01h	**Capability ID**

Offset Address: 61h
Next Item Pointer **Default Value: 90h**

Bit	Attribute	Default	Description
7:0	RO	90h	**Next Item Pointer**

Offset Address: 63-62h
Power Management Capability **Default Value: 0622h**

Bit	Attribute	Default	Description
15:11	RO	0	**Power Management Event (PME) Support**
10	RO	1b	**D2 Support**
9	RO	1b	**D1 Support**
8:6	RO	0	**3.3 Vaux Auxiliary Current**
5	RO	1b	**DSI Device Specific Initialization**
4	RO	0	**Reserved**
3	RO	0	**Power Management Event (PME) Clock**
2:0	RO	010b	**Version** Complies with version 1.1

Offset Address: 65-64h
Power Management Control / Status **Default Value: 0000h**

Bit	Attribute	Default	Description
15	RO	0	**Power Management Event (PME) Status**
14:13	RO	0	**Data Scale**
12:10	RO	0	**Reserved**
9	RO	0	**D1 Select**
8	RO	0	**PME Enable** 0: Disable 1: Enable
7:2	RO	0	**Reserved**
1:0	RW	00b	**Power State** 00: D0 State 01: D1 State 10: D2 State 11: D3 State

Offset Address: 67-66h
Data + PMCSR_BSE **Default Value: 0000h**

Bit	Attribute	Default	Description
15:0	RO	0	**Data + PMCSR_BSE**

PCI Express Configuration Area (71-7Bh)

Offset Address: 71-70h

PCI Express Capability List Register **Default Value: 0010h**

Bit	Attribute	Default	Description
15:8	RO	00h	**Next Capability Pointer** Point to MSI capability list
7:0	RO	10h	**Capability ID**

Offset Address: 73-72h

PCI Express Capabilities Register **Default Value: 0091h**

Bit	Attribute	Default	Description
15:14	RO	0	**Reserved**
13:9	RO	0	**Interrupt Message Number**
8	RO	0	**Slot Implemented**
7:4	RO	1001b	**Device/Port Type** PCI Express Legacy Endpoint
3:0	RO	0001b	**Capability Version**

Offset Address: 77-74h

Device Capabilities Register **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:28	RO	0	**Reserved**
27:26	RO	0	**Captured Slot Power Limit Scale**
25:18	RO	0	**Captured Slot Power Limit Value**
17:15	RO	0	**Reserved**
14	RO	0	**Power Indicator Present**
13	RO	0	**Attention Indicator Present**
12	RO	0	**Attention Button Present**
11:9	RO	0	**Endpoint L1 Acceptable Latency** Less than 1μs
8:6	RO	0	**Endpoint L0s Acceptable Latency** Less than 64ns
5	RO	0	**Extended Tag Field Supported** 5-bit tag field supported
4:3	RO	0	**Phantom Functions Supported** No phantom function
2:0	RO	0	**Max_Payload_Size Supported**

Offset Address: 79-78h
Device Control Register **Default Value: 0000h**

Bit	Attribute	Default	Description
15	RO	0	**Reserved**
14:12	RW	0	**Max_Read_Request_Size** Max. 128 Bytes read request
11	RW	0	**Enable No Snoop**
10	RW	0	**Auxiliary (AUX) Power PM Enable** 0: Disable 1: Enable
9	RW	0	**Phantom Functions Enable** 0: Disable 1: Enable
8	RW	0	**Extended Tag Field Enable** 0: Disable 1: Enable
7:5	RW	0	**Max_Payload_Size**
4	RW	0	**Enable Relaxed Ordering** 0: Disable 1: Enable
3	RW	0	**Unsupported Request Reporting Enable** 0: Disable 1: Enable
2	RW	0	**Fatal Error Reporting Enable** 0: Disable 1: Enable
1	RW	0	**Non-Fatal Error Reporting Enable** 0: Disable 1: Enable
0	RW	0	**Correctable Error Reporting Enable** 0: Disable 1: Enable

Offset Address: 7B-7Ah
Device Status Register **Default Value: 0000h**

Bit	Attribute	Default	Description
15:6	RO	0	**Reserved**
5	RO	0	**Transitions Pending**
4	RO	0	**Auxiliary (AUX) Power Detected**
3	RO	0	**Unsupported Request Detected**
2	RO	0	**Fatal Error Detected**
1	RO	0	**Non-Fatal Error Detected**
0	RO	0	**Correctable Error Detected**

MSI Configuration Area (90-9Dh)

Offset Address: 91-90h

MSI Capability List Register **Default Value: 0005h**

Bit	Attribute	Default	Description
15:8	RO	0	**Next Capability Pointer**
7:0	RO	05h	**Capability ID**

Offset Address: 93-92h

Message Control Register **Default Value: 0000h**

Bit	Attribute	Default	Description
15:8	RO	0	**Reserved**
7	RW	0	**64 Bits Address Capable**
6:4	RW	000b	**Multiple Message Enable**
3:1	RW	000b	**Multiple Message Capable** A message request
0	RW	0	**MSI Enable** 0: Disable 1: Enable

Offset Address: 9B-94h

Message Address Register **Default Value: 0**

Bit	Attribute	Default	Description
63:2	RW	0	**Message Address** System specified data.
1:0	RO	0	**Reserved**

Offset Address: 9D-9Ch

Message Control Register **Default Value: 0000h**

Bit	Attribute	Default	Description
15:0	RW	0	**Message Data** System specified data.

VIA GFX Configuration Area (B0-B2h)

Offset Address: B0h

Memory Base Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3	RW	0	**UNLOCK**
2:1	RO	0	**Reserved**
0	RW	0	**VGA Memory Selection** 0: VGA in L.L 1: VGA in S.L.

Offset Address: B1h – Reserved

Offset Address: B2h

Memory Base 0 Size (S.L.) **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RW	000 0000b	000 0000: Reserved 100 0000: 256MB 110 0000: 128MB 111 0000: 64MB 111 1000: 32MB 111 1100: 16MB 111 1110: 8MB 111 1111: 4MB
0	RO	0	**Reserved**

VGA REGISTERS DESCRIPTIONS

This chapter provides VGA register summary table and detailed register descriptions.

VGA I/O Registers

These VGA register tables document the I/O port, I/O index and attribute ("Attribute") for each register. Attribute definitions being used are RW (Read/Write), RO (Read/Only) and RWC (or just WC) (Read / Write 1's to Clear individual bits). Registers indicated as RW may have some read/only bits that always read back a fixed value (usually 0 if unused); registers designated as RWC or WC may have some read-only or read write bits (see individual register descriptions for details). All offset and default values are shown in hexadecimal unless otherwise indicated.

Table 6. VGA I/O Registers

I/O Port	I/O Index	Attribute Control Register	Attribute
3C0	-	Address	RW
3C1	00 – 0F	Palette	RW
3C1	10	Mode Control	RW
3C1	11	Overscan Color	RW
3C1	12	Color Plane Enable	RW
3C1	13	Horizontal Pixel Panning	RW
3C1	14	Color Select	RW

I/O Port	I/O Index	General Register	Attribute
3C2	-	Miscellaneous Output	WO
3CC	-	Miscellaneous Output	RO
3C2	-	Input Status 0	RO
3XA	-	Input Status 1	RO
3C3	-	Video Subsystem Enable	RW
46E8	-	Video Adapter Enable	RW

I/O Port	I/O Index	Sequencer Register	Attribute
3C4	-	Address	RW
3C5	00	Reset	RW
3C5	01	Clocking Mode	RW
3C5	02	Map Mask	RW
3C5	03	Character Map Select	RW
3C5	04	Memory Mode	RW

I/O Port	I/O Index	Graphic Controller Register	Attribute
3CE	-	Address	RW
3CF	00	Set / Reset	RW
3CF	01	Enable Set / Reset	RW
3CF	02	Color Compare	RW
3CF	03	Data Rotate	RW
3CF	04	Read Map Select	RW
3CF	05	Mode	RW
3CF	06	Miscellaneous	RW
3CF	07	Color Don't Care	RW
3CF	08	Bit Mask	RW

I/O Port	I/O Index	CRTC Controller Register	Attribute
3X4	-	Address	RW
3X5	00	Horizontal Total	RW
3X5	01	Horizontal Dipslay End	RW
3X5	02	Start Horizontal Blank	RW
3X5	03	End Horizontal Blank	RW
3X5	04	Start Horizontal Retrace	RW
3X5	05	End Horizontal Retrace	RW
3X5	06	Vertical Total	RW
3X5	07	Overflow	RW
3X5	08	Preset Row Scan	RW
3X5	09	Max Scan Line	RW
3X5	0A	Cursor Start	RW
3X5	0B	Cursor End	RW
3X5	0C	Start Address High	RW
3X5	0D	Start Address Low	RW
3X5	0E	Cursor Location High	RW
3X5	0F	Cursor Location Low	RW
3X5	10	Vertical Retrace Start	RW
3X5	11	Vertical Retrace End	RW
3X5	12	Vertical Display End	RW
3X5	13	Offset	RW
3X5	14	Underline Location	RW
3X5	15	Start Vertical Blank	RW
3X5	16	End Vertical Blank	RW
3X5	17	CRTC Mode Control	RW
3X5	18	Line Compare	RW

Table 7. Extended I/O Registers

I/O Port	I/O Index	Sequencer Extended Register	Attribute
3C5	10	Extended Register Unlock	RW
3C5	11	Configuration Register 0	RO
3C5	12	Configuration Register 1	RO
3C5	13	Configuration Register 2	RO
3C5	14	Frame Buffer Size Control	RO
3C5	15	Display Mode Control	RW
3C5	16	Display FIFO Threshold Control	RW
3C5	17	Display FIFO Control	RW
3C5	18	Display Arbiter Control 0	RW
3C5	19	Power Management	RW
3C5	1A	PCI Bus Control	RW
3C5	1B	Power Management Control 0	RW
3C5	1C	Horizontal Display Fetch Count Data	RW
3C5	1D	Horizontal Display Fetch Count Control	RW
3C5	1E	Power Management Control	RW
3C5	1F	Reserved	RW
3C5	20	Typical Arbiter Control 0	RW
3C5	21	Typical Arbiter Control 1	RW
3C5	22	Display Arbiter Control 1	RW
3C5	26	IIC Serial Port Control 0	RW
3C5	2A	Power Management Control 5	RW
3C5	2B	LVDS Interrupt Control	RW
3C5	2C	General Purpose I/O Port	RW
3C5	2D	Power Management Control 1	RW
3C5	2E	Power Management Control 2	RW
3C5	31	IIC Serial Port Control 1	RW
3C5	34-32	Reserved	RO
3C5	36-35	Subsystem Vender ID	RW
3C5	38-37	Subsystem ID	RW
3C5	3A-39	BIOS Reserved Register 1-0	RW
3C5	3B	PCI Revision ID Back Door	RW
3C5	3C	Miscellaneous	RW
3C5	3D	General Purpose I/O Port	RW
3C5	3E	Miscellaneous Register for AGP Mux	RW
3C5	3F	Power Management Control 2	RW
3C5	40	PLL Control	RW

I/O Port	I/O Index	Sequencer Extended Register (Continued)	Attribute
3C5	41	Typical Arbiter Control 1	RW
3C5	42	Typical Arbiter Control 2	RW
3C5	43	Graphics Bonding Option	RO

I/O Port	I/O Index	Clock Synthesizer Register	Attribute
3C5	44	VCK Clock Synthesizer Value 0	RW
3C5	45	VCK Clock Synthesizer Value 1	RW
3C5	46	VCK Clock Synthesizer Value 2	RW
3C5	47	ECK Clock Synthesizer Value 0	RW
3C5	48	ECK Clock Synthesizer Value 1	RW
3C5	49	ECK Clock Synthesizer Value 2	RW
3C5	4A	Secondary Display (LCDCK) Clock Synthesizer Value 0	RW
3C5	4B	Secondary Display (LCDCK) Clock Synthesizer Value 1	RW
3C5	4C	Secondary Display (LCDCK) Clock Synthesizer Value 2	RW
3C5	4D	Preemptive Arbiter Control	RW
3C5	4E	Software Reset Control	RW
3C5	4F	CR Gating Clock Control	RW
3C5	50	AGP Control Register	RW
3C5	51	Display FIFO Control 1	RW
3C5	52	Integrated TV Shadow Register Control	RW
3C5	53	DAC Sense Control Register 1	RW
3C5	54	DAC Sense Control Register 2	RW
3C5	55	DAC Sense Control Register 3	RW
3C5	56	DAC Sense Control Register 4	RW
3C5	57	Display FIFO Control 2	RW
3C5	58	GFX Power Control Register 1	RW
3C5	59	GFX Power Control Register 2	RW
3C5	5A	PCI Bus Control 2	RW
3C5	5B	Device Used Status 0	RO
3C5	5C	Device Used Status 1	RO
3C5	5D	Timer Control Register	RW
3C5	5E	DAC Control Register 2	RW
3C5	60	I2C Mode Control	RW
3C5	61	I2C Host Address	RW
3C5	62	I2C Host Data	RW
3C5	63	I2C Host Control	RW
3C5	64	I2C Status	RW
3C5	65	Power Management Control 6	RW
3C5	66	GTI Control 0	RW
3C5	67	GTI Control 1	RW
3C5	68	GTI Control 2	RW
3C5	69	GTI Control 3	RW
3C5	6A	GTI Control 4	RW
3C5	6B	GTI Control 5	RW
3C5	6C	GTI Control 6	RW
3C5	6D	GTI Control 7	RW
3C5	6E	GTI Control 8	RW
3C5	6F	GTI Control 9	RW
3C5	70	GARB Control 0	RW
3C5	71	Typical Arbiter Control 2	RW
3C5	72	Typical Arbiter Control 3	RW
3C5	73	Typical Arbiter Control 4	RW
3C5	74	Typical Arbiter Control 5	RW
3C5	75	Typical Arbiter Control 6	RW
3C5	76	Backlight Control 1	RW
3C5	77	Backlight Control 2	RW
3C5	78	Backlight Control 3	RW

I/O Port	I/O Index	Graphics Controller Extended Register	Attribute
3CF	20	Offset Register Control	RW
3CF	21	Offset Register A	RW
3CF	22	Offset Register B	RW

I/O Port	I/O Index	CRT Controller Extended Register	Attribute
3X5	30	Display Fetch Blocking Control	RW
3X5	31	Half Line Position	RW
3X5	32	Mode Control	RW
3X5	33	HSYNC Adjuster	RW
3X5	34	Starting Address Overflow	RW
3X5	35	Extended Overflow	RW
3X5	36	Power Management Control 3 (Monitor Control)	RW
3X5	37	DAC Control Register	RW
3X5	38	Signature Data B0	RW
3X5	39	Signature Data B1	RW
3X5	3A	Signature Data B2	RW
3C5	3F-3B	Scratch Pad Register 6-2	RW
3X5	40	Test Mode Control 0	RW
3X5	43	IGA1 Display Control	RW
3X5	45	Power Now Indicator Control 3	RW
3X5	46	Test Mode Control 1	RW
3X5	47	Test Mode Control 2	RW
3X5	48	Starting Address Overflow	RW
3X5	49-4F	Reserved	RW

Note: In monochrome mode, the “X” in the above table stands for **“B”**
In color mode, the “X” in the above table stands for **“D”.**

Table 8. Secondary Display I/O Registers

I/O Port	I/O Index	Sequencer Extended Registers	Attribute
3X5	50	Second CRTC Horizontal Total Period	RW
3X5	51	Second CRTC Horizontal Active Data Period	RW
3X5	52	Second CRTC Horizontal Blanking Start	RW
3X5	53	Second CRTC Horizontal Blanking End	RW
3X5	54	Second CRTC Horizontal Blanking Overflow	RW
3X5	55	Second CRTC Horizontal Period Overflow	RW
3X5	56	Second CRTC Horizontal Retrace Start	RW
3X5	57	Second CRTC Horizontal Retrace End	RW
3X5	58	Second CRTC Vertical Total Period	RW
3X5	59	Second CRTC Vertical Active Data Period	RW
3X5	5A	Second CRTC Vertical Blanking Start	RW
3X5	5B	Second CRTC Vertical Blanking End	RW
3X5	5C	Second CRTC Vertical Blanking Overflow	RW
3X5	5D	Second CRTC Vertical Period Overflow	RW
3X5	5E	Second CRTC Vertical Retrace Start	RW
3X5	5F	Second CRTC Vertical Retrace End	RW
3X5	60	Second CRTC Vertical Status 1	RO
3X5	61	Second CRTC Vertical Status 2	RO
3X5	62	Second Display Starting Address Low	RW
3X5	63	Second Display Starting Address Middle	RW
3X5	64	Second Display Starting Address High	RW
3X5	65	Second Display Horizontal Quadword Count Data	RW
3X5	66	Second Display Horizontal Offset	RW
3X5	67	Second Display Color Depth and Horizontal Overflow	RW
3X5	68	Second Display Queue Depth and Read Threshold	RW
3X5	69	Second Display Interrupt Enable and Status	RW
3X5	6A	Second Display Channel and LCD Enable	RW
3X5	6B	Channel 1 and 2 Clock Mode Selection	RW
3X5	6C	TV Clock Control	RW
3X5	6D	Horizontal Total Shadow	RW
3X5	6E	End Horizontal Blanking Shadow	RW
3X5	6F	Vertical Total Shadow	RW
3X5	70	Vertical Display Enable End Shadow	RW
3X5	71	Vertical Display Overflow Shadow	RW
3X5	72	Start Vertical Blank Shadow	RW
3X5	73	End Vertical Blank Shadow	RW
3X5	74	Vertical Blank Overflow Shadow	RW
3X5	75	Vertical Retrace Start Shadow	RW
3X5	76	Vertical Retrace End Shadow	RW
3X5	77	LCD Horizontal Scaling Factor	RW
3X5	78	LCD Vertical Scaling Factor	RW
3X5	79	LCD Scaling Control	RW
3X5	7A	LCD Scaling Parameter 1	RW
3X5	7B	LCD Scaling Parameter 2	RW
3X5	7C	LCD Scaling Parameter 3	RW
3X5	7D	LCD Scaling Parameter 4	RW
3X5	7E	LCD Scaling Parameter 5	RW
3X5	7F	LCD Scaling Parameter 6	RW
3X5	80	LCD Scaling Parameter 7	RW
3X5	81	LCD Scaling Parameter 8	RW

I/O Port	I/O Index	Sequencer Extended Registers	Attribute
3X5	82	LCD Scaling Parameter 9	RW
3X5	83	LCD Scaling Parameter 10	RW
3X5	84	LCD Scaling Parameter 11	RW
3X5	85	LCD Scaling Parameter 12	RW
3X5	86	LCD Scaling Parameter 13	RW
3X5	87	LCD Scaling Parameter 14	RW
3X5	88	LCD Panel Type (See LVDS Chapter)	RW
3X5	89	Reserved	RO
3X5	8A	LCD Timing Control 1	RW
3X5	8B	LCD Power Sequence Control 0	RW
3X5	8C	LCD Power Sequence Control 1	RW
3X5	8D	LCD Power Sequence Control 2	RW
3X5	8E	LCD Power Sequence Control 3	RW
3X5	8F	LCD Power Sequence Control 4	RW
3X5	90	LCD Power Sequence Control 5	RW
3X5	91	Software Control Power Sequence	RW
3X5	92	Read Threshold 2	RW
3X5	93	Reserved	RO
3X5	94	Expire Number and Display Queue Extend Bit	RW
3X5	95	Extend Threshold Bit	RW
3X5	97	LVDS Channel 2 Function Select 0 (See LVDS Chapter)	RW
3X5	98	LVDS Channel 2 Function Select 1 (See LVDS Chapter)	RW
3X5	99	LVDS Channel 1 Function Select 0 (See LVDS Chapter)	RW
3X5	9A	LVDS Channel 1 Function Select 1 (See LVDS Chapter)	RW
3X5	9B	Digital Video Port 1 Function Select 0	RW
3X5	9C	Digital Video Port 1 Function Select 1	RW
3X5	9D	Power Now Control 2	RW
3X5	9E	Power Now Control 3	RW
3X5	9F	Power Now Control 4	RW
3X5	A0	Horizontal Scaling Initial Value	RW
3X5	A1	Vertical Scaling Initial Value	RW
3X5	A2	Horizontal and Vertical Scaling Enable Bit	RW
3X5	A3	Second Display Starting Address Extended	RW
3X5	A4	Reserved	RO
3X5	A5	Second LCD Vertical Scaling Factor	RW
3X5	A6	Second LCD Vertical Scaling Factor	RW
3X5	A7	Expected IGA1 Vertical Display End	RW
3X5	A8	Expected IGA1 Vertical Display End	RW
3X5	A9	Hardware Gamma Control Register	RW
3X5	AA	FIFO Depth & Threshold Overflow bit	RW
3X5	AB	IGA2 Interlace Half Line Register	RW
3X5	AC	IGA2 Interlace Half Line Register	RW
3X5	AF	P-Arbiter Write Expired Number Register	RW
3X5	B0	IGA2 Pack Circuit Request Threshold	RW

I/O Port	I/O Index	Sequencer Extended Registers	Attribute
3X5	B1	IGA2 Pack Circuit Request High Threshold	RW
3X5	B2	IGA2 Pack Circuit Request Expire Number	RW
3X5	B3	IGA2 Pack Circuit Control Register	RW
3X5	B4	IGA2 Pack Circuit Target Base Address 0	RW
3X5	B5	IGA2 Pack Circuit Target Base Address 0	RW
3X5	B6	IGA2 Pack Circuit Target Base Address 0	RW
3X5	B7	IGA2 Pack Circuit Target Base Address 0	RW
3X5	B8	IGA2 Pack Circuit Target Line Pitch	RW
3X5	B9	IGA2 Pack Circuit Target Line Pitch	RW
3X5	BA	V Counter Set Pointer	RW
3X5	BB	V Counter Set Pointer	RW
3X5	BC	V Counter Reset Value	RW
3X5	BD	V Counter Reset Value	RW
3X5	BE	Frame Buffer Limit Value	RW
3X5	BF	Frame Buffer Limit Value	RW
3X5	C0	Expected IGA1 Vertical Display End 1	RW
3X5	C1	Expected IGA1 Vertical Display End 1	RW
3X5	C2	Third LCD Vertical Scaling Factor	RW
3X5	C3	Third LCD Vertical Scaling Factor	RW
3X5	C4	Expected IGA1 Vertical Display End 2	RW
3X5	C5	Expected IGA1 Vertical Display End 2	RW
3X5	C6	Fourth LCD Vertical Scaling Factor	RW
3X5	C7	Fourth LCD Vertical Scaling Factor	RW
3X5	C8	IGA2 Pack Circuit Target Base Address 1	RW
3X5	C9	IGA2 Pack Circuit Target Base Address 1	RW
3X5	CA	IGA2 Pack Circuit Target Base Address 1	RW
3X5	CD	IGA2 Pack Circuit Target Base Address 1	RW
3X5	D0	LVDS PLL Control Register (See LVDS Chapter)	RW
3X5	D1	PLL Control Register (See LVDS Chapter)	RW
3X5	D2	LVDS Control Register (See LVDS Chapter)	RW
3X5	D3	Second Power sequence Control Register 0 (See LVDS Chapter)	RW
3X5	D4	Second Power sequence Control Register 1 (See LVDS Chapter)	RW
3X5	D5	LVDS Settting Mode Control Register (See LVDS Chapter)	RW
3X5	D6	DCVI Control Register 0	RW
3X5	D7	DCVI Control Register 1	RW
3X5	D8	Reserved	RW
3X5	D9	Scaling Down Source Data Offset Control	RW
3X5	DA	Scaling Down Source Data Offset Control	RW
3X5	DB	Scaling Down Source Data Offset Control	RW
3X5	DC	Scaling Down Horizontal Scale Control	RW
3X5	DD	Scaling Down Horizontal Scale Control	RW
3X5	DE	Scaling Down Vertical Scale Control	RW
3X5	DF	Scaling Down Vertical Scale Control	RW
3X5	E0	Scaling Down Destination Frame Buffer Starting Address 0	RW

I/O Port	I/O Index	Sequencer Extended Registers	Attribute
3X5	E1	Scaling Down Destination Frame Buffer Starting Address 0	RW
3X5	E2	Scaling Down Destination Frame Buffer Starting Address 0	RW
3X5	E3	Scaling Down Destination Frame Buffer Starting Address 0	RW
3X5	E4	Scaling Down SW Source Frame Buffer Stride	RW
3X5	E5	Scaling Down Destination Frame Buffer Starting Address 1	RW
3X5	E6	Scaling Down Destination Frame Buffer Starting Address 1	RW
3X5	E7	Scaling Down Destination Frame Buffer Starting Address 1	RW
3X5	E8	Scaling Down Destination Frame Buffer Starting Address 1	RW
3X5	E9	Scaling Down Destination Frame Buffer Starting Address 2	RW
3X5	EA	Scaling Down Destination Frame Buffer Starting Address 2	RW
3X5	EB	Scaling Down Destination Frame Buffer Starting Address 2	RW
3X5	EC	IGA1 Down Scaling Destination Control Register	RW
3X5	F0	SNAPSHOP Mode – Starting Address of Display Data	RW
3X5	F1	SNAPSHOP Mode – Starting Address of Display Data	RW
3X5	F2	SNAPSHOP Mode – Starting Address of Display Data	RW
3X5	F3	SNAPSHOP Mode Control	RW
3X5	F4	SNAPSHOP Mode Control	RW
3X5	F5	SNAPSHOP Mode Control	RW

Extended I/O Space Register Descriptions

Sequencer Extended Registers

IO Port / Index: 3C5.10
Extended Register Unlock **Default Value: 01h**

Bit	Attribute	Default	Description
7:1	RO	0	**Reserved**
0	RW	1b	**Unlock Accessing of I/O Space** 0: Disable 1: Enable

IO Port / Index: 3C5.11
Configuration Register 0 **Default Value: 58h**

Bit	Attribute	Default	Description
7	RO	0	**VGA Port Select** 0: 3C3 1: 46E8
6	RO	1b	**PC AT Space Disable** 0: Disable VGA & memory space: A0000h-BFFFFh 1: IBM VGA standard space
5	RO	0	**Reserved.** Always reads 0.
4:3	RO	11b	**Bus Type** 00: Reserved 01: Reserved 10: Reserved 11: 1x, 2x, 4x (8x) side band AGP Bus
2:0	RO	0	**Reserved**

IO Port / Index: 3C5.12
Configuration Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3:0	RO	0	**Test Group 1 Select**

IO Port / Index: 3C5.13
Configuration Register 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RO	0	**DVP1 Output Select (Reflects strapping from signal VCPD13.)** See bit [2:1] for bit value description detail.
5:3	RO	0	**Reserved**
2:1	RO	0	**DVP1 Output Select (Reflects strapping from signal VCPD12 / VCPD11)** **Bit [6, 2, 1] / Description** 00x: DVP-TV output 01x: DVP with alpha output 100: DCVI 10-bit data output 101: DCVI 8-bit data output 110: DCVI 20-bit data output 111: DCVI 16-bit data output
0	RO	0	**Reserved**

IO Port / Index: 3C5.12

Shadow Configuration Register 1 (3C5.5A[0]=1) **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0000b	**Video Capture Port 1 Type Select (Reflects strapping from signals DVP1D7/6/5/4)** 0000: CAP 8 bit CCIR656 0001: CAP 8 bit CCIR601 0010: CAP 8 bit VIP 1.1 0011: CAP 8 bit VIP 2.0 0100: CAP 16 bit CCIR656 0101: CAP 16 bit CCIR601 0110: CAP 16 bit VIP 1.1 0111: CAP 16 bit VIP 2.0 1xxx: TS 8 bit
3:0	RO	0000b	**Video Capture Port 0 Type Select (Reflects strapping from singals DVP1D3/2/1/0)** 0000: CAP 8 bit CCIR656 0001: CAP 8 bit CCIR601 0010: CAP 8 bit VIP 1.1 0011: CAP 8 bit VIP 2.0 0100: CAP 16 bit CCIR656 0101: CAP 16 bit CCIR601 0110: CAP 16 bit VIP 1.1 0111: CAP 16 bit VIP 2.0 1xxx: TS 8 bit

IO Port / Index: 3C5.13

Configuration Register 2 (3C5.5A[0]=1) **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	00b	**Integrated LVDS Mode Select (Reflects strapping from signal DVP1D15/14) - *Refer to LVDS chapter for details***
5:3	RO	000b	**Second DAC (TV/CRT) Output Mode Select (Reflects strapping from signal DVP1D13/12/11)** 1xx: DAC D/E/F = R/G/B for CRT 000: DAC D/E/F = C/Y/CVBS for TV 001: DAC D/E/F = C/Y/C for TV 010: DAC D/E/F = R/G/B for TV 011: DAC D/E/F = Pr/Y/Pb for TV
2:0	RO	000b	**First DAC (CRT/TV) Output Mode Select (Reflects strapping from signal DVP1D10/09/08)** 0xx: DAC A/B/C = R/G/B for CRT 100: DAC A/B/C = C/Y/CVBS for TV 101: DAC A/B/C = C/Y/Y for TV 110: DAC A/B/C = R/G/B for TV 111: DAC A/B/C = Pr/Y/Pb for TV

IO Port / Index: 3C5.14

Frame Buffer Size Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Frame Buffer Size Control** 00h: 512MB (Do not support, must set to other value) 80h: 256MB C0h: 128MB E0h: 64MB F0h: 32MB F8h: 16MB The minimum frame buffer size is 16MB.

IO Port / Index: 3C5.15
Display Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**8/6 Bits LUT** 0: 6-bit 1: 8-bit
6	RW	0	**Text Column Control** 0: 80 column 1: 132 column
5	RW	0	**Wrap Around Disable** 0: Disable (For Mode 0-13) 1: Enable
4	RW	0	**Hi Color Mode Select** 0: 555 1: 565
3:2	RW	00b	**Display Color Depth Select** 00: 8bpp 01: 16bpp 10: 30bpp 11: 32bpp
1	RW	0	**Extended Display Mode Enable** 0: Disable 1: Enable
0	RO	0	**Reserved**

IO Port / Index: 3C5.16
Display FIFO Threshold Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5:0	RW	0	**Display FIFO Normal Threshold**

IO Port / Index: 3C5.17
Display FIFO Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Display FIFO Depth Select** See also Rx3C5.51[2].

IO Port / Index: 3C5.18
Display Arbiter Control 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**Force The PREQ Always Higher Than TREQ** 0: Disable 1: Enable
5:0	RW	0	**Display FIFO High Reg Threshold**

IO Port / Index: 3C5.19

Power Management **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**MIU/AGP Interface Clock Control** 0: Clocks always on 1: Enable clock gating
5	RW	0	**P-Arbiter Interface Clock Control** 0: Clocks always on 1: Enable clock gating
4	RW	0	**AGP Interface Clock Control** 0: Clocks always on 1: Enable clock gating
3	RW	0	**Typical Arbiter Interface Clock Control** 0: Clocks always on 1: Enable clock gating
2	RW	0	**MC Interface Clock Control** 0: Clocks always on 1: Enable clock gating
1	RW	0	**Display Interface Clock Control** 0: Clocks always on 1: Enable clock gating
0	RW	0	**CPU Interface Clock Control** 0: Clocks always on 1: Enable clock gating

IO Port / Index: 3C5.1A

PCI Bus Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Read Cache Enable** 0: Disable 1: Enable
6	RW	0	**Software Reset** 0: Default value 1: Reset
5:4	RW	0	**Reserved**
3	RW	0	**Extended Mode Memory Access Enable** 0: Disable 1: Enable
2	RW	0	**PCI Burst Write Wait State Select** 0: 0 Wait state 1: 1 Wait state
1	RO	0	**Reserved**
0	RW	0	**LUT Shadow Access** 0: 3C6/3C7/3C8/3C9 addresses map to Primary Display's LUT 1: 3C6/3C7/3C8/3C9 addresses map to Secondary Display's LUT

IO Port / Index: 3C5.1B

Power Management Control 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	00b	**Secondary Display Engine (Gated Clock <LCK>)** 0x: Clock always off 10: Clock always on 11: Clock on/off according to the Power Management Status (PMS)
5:4	RW	00b	**Primary Display Engine (Gated Clock <VCK>)** 0x: Clock always off 10: Clock always on 11: Clock on/off according to the PMS
3:1	RO	0	**Reserved**
0	RW	0	**Primary Display's LUT On/Off** 0: On 1: Off

IO Port / Index: 3C5.1C

Horizontal Display Fetch Count Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Display Fetch Count Data [7:0]** Unit: 16 bytes

IO Port / Index: 3C5.1D

Horizontal Display Fetch Count Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:2	RO	0	**Reserved**
1:0	RW	0	**Horizontal Display Fetch Count Data Bit [9:8]** Used in conjunction with Rx3C5.1C register.

IO Port / Index: 3C5.1E

Power Management Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	00b	**Video Capture Port Power Control** 0x: Pad always off 10: Depend on the other control signal 11: Pad on/off according to the PMS
5:4	RW	00b	**Digital Video Port 1 Power Control** 0x: Pad always off 10: Depend on the other control signal 11: Pad on/off according to the PMS
3	RW	0	**Spread Spectrum On/Off** 0: Off 1: On
2	RW	0	**Reserved**
1	RW	0	**Replace ECK by MCK** For BIST purpose.
0	RW	0	**On/Off ROC ECK** 0: Off 1: On

IO Port / Index: 3C5.20
Typical Arbiter Control 0 — **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Typical Request Max. Queuing Number for Channel 0** Min: 0 Max: 62 (The recommended value is 4.)

IO Port / Index: 3C5.21
Typical Arbiter Control 1 — **Default Value: 0Eh**

Bit	Attribute	Default	Description
7:0	RW	0	**Typical Request Track FIFO Number for Channel 0**

IO Port / Index: 3C5.22
Display Arbiter Control 1 — **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Display Queue Request Expire Number** Hardware multiples this register value by 4 to handle the FIFO control

IO Port / Index: 3C5.26
IIC Serial Port Control 0 — **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5	RW	0	**CRTSPCLK Pin Control** 0: Driven low 1: Tri-Stated
4	RW	0	**CRTSPD Pin Control** 0: Driven low 1: Tri-Stated
3	RO	0	**CRTSPCLK Pin Status**
2	RO	0	**CRTSPD Pin Status**
1	RW	0	**CRTSPCLK Wait State Enable** 0: Disable 1: Enable (Drive DDCSCL low upon receipt of serial port start).
0	RW	0	**Serial Port Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.2A
Power Management Control 5 — **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**Spread Spectrum Type Control** 0: Original Type 1: FIFO Type
5:4	RW	0	**Reserved**
3:2	RW	00b	**LVDS Channel 2 I/O Pad Control** 0x: Pad always off 10: Depend on the other control signal 11: Pad on/off according to the PMS
1:0	RW	00b	**LVDS Channel 1 Pad Control** 0x: Pad always off 10: Depend on the other control signal 11: Pad on/off according to the PMS

IO Port / Index: 3C5.2B
LVDS Interrupt Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	0	**Reserved**
5	RW	0	**LVDS Sense Interrupt Enable** - ***Refer to LVDS chapter for details***
4	RW1C	0	**LVDS Sense Interrupt Status** - ***Refer to LVDS chapter for details***
3	RW	0	**CRT Sense Interrupt Enable** 0: Disable 1: Enable
2	RW1C	0	**CRT Sense Interrupt Status**
1	RW	0	**CRT Hot Plug Detection Function Enable** 0: Disable 1: Enable Please wait at least 2 frames to enable interrupt, when this function is enabled.
0	RW1C	0	**MSI Pending Interrupt Re-trigger Bit** When SW wants to exit interrupt service, please clear the bit. HW may send out interrupt again if pending interrupt exists. The funciton is enabled when MSI Enable = 1'b1.

IO Port / Index: 3C5.2C
General Purpose I/O Port **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**GPIO_2 Output Enable** 0: Disable 1: Enable
6	RW	0	**GPIO_3 Output Enable** 0: Disable 1: Enable
5	RW	0	**GPIO_2 Output Data**
4	RW	0	**GPIO_3 Output Data**
3	RO	0	**GPIO_2 Pin Status**
2	RO	0	**GPIO_3 Pin Status**
1	RW	0	**GPIO Port Enable** 0: HW controlled 1: SW controlled
0	RW	0	**Spectrum IO Selected** 0: GPIO port 1: GPIO_2 as DISPCLKI0, GPIO_3 as DISPCLKO0

IO Port / Index: 3C5.2D
Power Management Control 1 **Default Value: 2Ah**

Bit	Attribute	Default	Description
7:6	RW	00b	**E3_ECK_N Selection** 00: E3_ECK_N 01: E3_ECK 10: Delayed E3_ECK_N 11: Delayed E3_ECK
5:4	RW	10b	**VCK (Primary Display Clock) PLL Power Control** 0x: PLL power-off 10: PLL always on 11: PLL on/off according to the PMS
3:2	RW	10b	**LCK (Secondary Display Clock) PLL Power Control** 0x: PLL power-off 10: PLL always on 11: PLL on/off according to the PMS
1:0	RW	10b	**ECK (Engine Clock) PLL Power Control** 0x: PLL power-off 10: PLL always on 11: PLL on/off according to the PMS

IO Port / Index: 3C5.2E
Power Management Control 2 **Default Value: AAh**

Bit	Attribute	Default	Description
7:6	RO	10b	**Capturer (Gated Clock <ECK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
5:4	RW	10b	**Video Processor (Gated Clock <ECK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
3:2	RW	10b	**PCI Master/DMA (Gated Clock <ECK/CPUCK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
1:0	RW	10b	**Video Playback Engine (V3/V4 Gated Clock <VCK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status

IO Port / Index: 3C5.31
IIC Serial Port Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5	RW	0	**DVP1SPCLK Pin Control** 0: DVP1SPLCK driven low 1: DVP1SPLCK tri-stated
4	RW	0	**DVP1SPD Pin Control** 0: DVP1SPD driven low 1: DVP1SPD tri-stated
3	RO	0	**DVP1SPCLK Pin Status** 0: DVP1SPCLK driven low 1: DVP1SPCLK tri-stated
2	RO	0	**DVP1SPD Pin Status** 0: DVP1SPD driven low 1: SDATA tri-stated
1	RW	0	**DVP1SPCLK Wait State Enable** 1: Enable (Drive DVP1SPCLK low upon receipt of serial port start).
0	RW	0	**Serial Port Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.35
Subsystem Vendor ID 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Subsystem Vendor ID [7:0]**

IO Port / Index: 3C5.36
Subsystem Vendor ID 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Subsystem Vendor ID [15:8]**

IO Port / Index: 3C5.37
Subsystem ID 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Subsystem ID [7:0]**

IO Port / Index: 3C5.38
Subsystem ID 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Subsystem ID [15:8]**

IO Port / Index: 3C5.39
BIOS Reserved Register 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**BIOS Reserved Register 0**

IO Port / Index: 3C5.3A
BIOS Reserved Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**BIOS Reserved Register 1**

IO Port / Index: 3C5.3B
PCI Revision ID Back Door **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**PCI Revision ID Back Door**

IO Port / Index: 3C5.3C
Miscellaneous **Default Value: 01h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6:5	RW	00b	**PLL Frequency Division Select for Testing** 00: Original 01: 1/2 10: 1/4 11: 1/8
4	RO	0	**ECK PLL Locked Detect** 0: Unlocked 1: Locked
3	RO	0	**VCK PLL Locked Detect** 0: Unlocked 1: Locked
2	RO	0	**LCDCK PLL Locked Detect** 0: Unlocked 1: Locked
1	RW	0	**Switch 3 PLLs to Prime Output** 0: Disable 1: Enable
0	RW	1b	**AGP Bus Back Door** 0: ACP2.0 Spec 1: ACP3.0 Spec

IO Port / Index: 3C5.3D

General Purpose I/O Port **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**GPIO_4 Output Enable** 0: Disable 1: Enable
6	RW	0	**GPIO_5 Output Enable** 0: Disable 1: Enable
5	RW	0	**GPIO_4 Output Data**
4	RW	0	**GPIO_5 Output Data**
3	RO	0	**GPIO_4 Pin Status**
2	RO	0	**GPIO_5 Pin Status**
1	RO	0	**Reserved**
0	RW	0	**Spectrum IO Selected** 0: GPIO Port 1: GPIO_4 as DISPCLKI1, GPIO_5 as DISPCLKO1

IO Port / Index: 3C5.3E

Miscellaneous Register for AGP Mux **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RW	0	**Reserved**
3	RW	0	**PCIe Capability Control Back Door -** ***Refer to LVDS chapter for details***
2	RO	0	**Reserved**
1	RW	0	**Multi-function Selection -** ***Refer to LVDS chapter for details***
0	RW	0	**Second DVIDET Sense Signal Source -** ***Refer to LVDS chapter for details***

IO Port / Index: 3C5.3F

Power Management Control 2 **Default Value: AAh**

Bit	Attribute	Default	Description
7:6	RW	10b	**CR Clock Control (Gated Clock <ECK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
5:4	RW	10b	**3D Clock Control (Gated Clock <ECK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
3:2	RW	10b	**2D Clock Control (Gated Clock <ECK/CPUCK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to the engine IDLE status
1:0	RW	10b	**VIDEO Clock Control (Gated Clock <ECK>)** 0x: Clock off 10: Clock always on 11: Clock on/off according to each engine IDLE status

IO Port / Index: 3C5.40
PLL Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**CRT Sense Enable** Hardware sends constant value to DAC for sense. 0: Disable 1: Enable. When enabled, send pattern 24'h555555 to DAC.
6	RW	0	**CAP_ON**
5:4	RW	00b	**Free Run ECK Frequency Within the Idle Mode** 00: No change 01: 1/2 ECK 10: 1/4 ECK 11: 1/8 ECK
3	RW	0	**LVDS Interrupt Method -** ***Refer to LVDS chapter for details***
2	RW	0	**Reset LCDCK PLL**
1	RW	0	**Reset VCK PLL**
0	RW	0	**Reset ECK PLL**

IO Port / Index: 3C5.41
Typical Arbiter Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Typical Request T-Hold**
3:0	RO	0	**Typical Request Pre-T-Hold**

IO Port / Index: 3C5.42
Typical Arbiter Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Linear Addressing Mode Enable** 0: Force all engine use linear addressing mode 1: The addressing mode is decided by engine itself
6	RO	0	**P_ARB Request Attribute** 1: Supports Fetch Cycle With Length (2) Capability
5	RO	0	**P_ARB Arbitration Type** 0: Run-robin Like 1: Fix
4:0	RO	0	**Typical Request Max. Queuing Number**

IO Port / Index: 3C5.43
Graphics Bonding Option **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Advance Video Enable Flag** 0: Disable 1: Enable
6	RO	0	**Windows Media Video Enable Flag** 0: Disable 1: Enable
5	RW1C	0	**IGA2 Display FIFO Underflow Flag**
4	RW1C	0	**IGA1 Display FIFO Underflow Flag**
3	RW1C	0	**Typical Channel 0 Arbiter Read Back Data Overwrite Flag**
2	RW1C	0	**Typical Channel 1 Arbiter Read Back Data Overwrite Flag**
1	RO	0	**Reserved**
0	RO	0	**Notebook Used Flag** 1: Notebook 0: Desktop

Clock Synthesizer Registers

IO Port / Index: 3C5.44
Primary Display (VCK) Clock Synthesizer Value 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**DM[7:0]**

IO Port / Index: 3C5.45
Primary Display (VCK) Clock Synthesizer Value 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[0], 2'b00, DR[2:0], DM[9:8]}**

IO Port / Index: 3C5.46
Primary Display (VCK) Clock Synthesizer Value 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[1], DN[6:0]}**

IO Port / Index: 3C5.47
ECK Clock Synthesizer Value 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**DM[7:0]**

IO Port / Index: 3C5.48
ECK Clock Synthesizer Value 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[0], 2'b00, DR[2:0], DM[9:8]}**

IO Port / Index: 3C5.49
ECK Clock Synthesizer Value 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[1], 1'b0, DN[5:0]}**

IO Port / Index: 3C5.4A
Secondary Display (LCDCK) Clock Synthesizer Value 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**DM[7:0]**

IO Port / Index: 3C5.4B
Secondary Display (LCDCK) Clock Synthesizer Value 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[0], 2'b00, DR[2:0], DM[9:8]}**

IO Port / Index: 3C5.4C
Secondary Display (LCDCK) Clock Synthesizer Value 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**{DTZ[1], DGAIN[6:0]}**

Note:
1. DTZ[1:0]: Select charge-pump current. Default value = 00b.
2. DGAIN[1:0] is for testing purpose and must be 00b in normal mode.
3. Frequency equations: the following two equations must be asserted
   a) Internal Working Frequency
      Fvco = Fref * (DM+2) / (DN+2) and 300MHz <= Fvco <= 600MHz
   b) True Output Frequency
      Fout = Fref * (DM+2) / [(DN+2) (2DR)]

IO Port / Index: 3C5.4D
Preemptive Arbiter Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Ypical Arbiter Tracking FIFO Type** 0: 64 level 1: 128 level (only single channel can use)
6	RO	0	**Reserved**
5:4	RW	00b	**P Arbiter Length Control** 0x: 2 quad words 10: 4 quad words 11: 8 quad words
3:0	RO	0	**Reserved**

IO Port / Index: 3C5.4E
Software Reset Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	00b	**CR Reset Control** 01: Engine reset (high active) 10: Register reset (high active)
5:4	RW	00b	**3D Reset Control** 01: Engine reset (high active) 10: Register reset (high active)
3:2	RW	00b	**2D Reset Control** 01: Engine reset (high active) 10: Register reset (high active)
1:0	RW	00b	**HQV/VIDEO/Capture Reset Control** 01: Engine reset (high active) 10: Register reset (high active)

IO Port / Index: 3C5.4F
CR Gating Clock Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Channel 2 and 3 DMA Register Select** 0: From CBU 1: From CR
6	RW	0	**Channel 0 and 1 DMA Register Select** 0: From CBU 1: From CR
5	RO	0	**Reserved**
4:0	RW	0	**Threshold Value of Engine Idle for Gating Engine Clock**

IO Port / Index: 3C5.50
AGP Control Register **Default Value: 1Bh**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**AGP Request Attribute** 0: Only support length 1 1: Support length 2
5:0	RW	63h	**AGP Track FIFO Number** The default value is 63h.

IO Port / Index: 3C5.51
Display FIFO Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**NB FIFO Clock Control** 0: Disable 1: Enable
6	RW	0	**IGA1 Request Using New Method** 0: Original method 1: New method
5	RW	0	**GFIFO1_SRC for Text Mode** 0: Original method 1: Write out font and attribute to NB FIFO
4	RO	0	**Reserved**
3	RW	0	**ARB_TYP Software Reset** 1: Reset (high active)
2	RW	0	**IGA1_FIFO_VAL_TYPE** 0: THD/DEPTH/HighTHD : x2/x1/x2 1: THD/DEPTH/HighTHD : x4/x2/x4
1	RW	0	**P_ARB and NB FIFO Software Reset** 1: Reset (high active)
0	RW	0	**NB FIFO Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.52
Integrated TV Shadow Register Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:1	RW	00b	**Integrated TV Shadow Memory Window** 00: A0000 01: A8000 10: B0000 11: B8000
0	RW	0	**Integrated TV Shadow Register Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.53
DAC Sense Control Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Line Count for Sense Bit[7:0]** Programming which line that HW can assert HW_SENSE

IO Port / Index: 3C5.54
DAC Sense Control Register 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Pixel Count for Sense Start Bit[7:0]** Programming which pixel that HW asserts HW_SENSE

IO Port / Index: 3C5.55
DAC Sense Control Register 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Pixel Count for Sense End Bit[7:0]** Programming which pixel that HW asserts HW_SENSE

IO Port / Index: 3C5.56
DAC Sense Control Register 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4	RW	0	**Horizontal Pixel Count for Sense End Bit[8]** Programming which pixel that HW asserts HW_SENSE
3	RW	0	**Horizontal Pixel Count for Sense Start Bit[8]** Programming which pixel that HW asserts HW_SENSE
2:0	RW	0	**Vertical Line Count for Sense Bit[10:8]** Programming which line that HW can assert HW_SENSE

IO Port / Index: 3C5.57
Display FIFO Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**Display Queue Request Expire Number Bit [5]**
5	RW	0	**NB FIFO Delay Mode** 0: Original 1: Delay 1 Cycle
4	RW	0	**Display FIFO Threshold Select Bit [7]**
3	RW	0	**Display FIFO Depth Select Bit [8]**
2	RW	0	**Display FIFO Threshold High Select Bit [7]**
1	RW	0	**NB FIFO Extended Source Select** 0: IGA1 1: IGA2
0	RW	0	**NB FIFO Length Extended Control** 0: Disable 1: Enable

IO Port / Index: 3C5.58
GFX Power Control Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Display FIFO Low Threshold Select** HW will multiples the value by 4 to handle

IO Port / Index: 3C5.59
GFX Power Control Register 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**IGA1 Enable** When IGA1 engine is active, this bit need to set to 1
6	RO	0	**Reserved**
5	RW	0	**IGA Low Threshold Enable** 0: Disable 1: Enable
4	RW	0	**GFX-NM IGA Vertical Blanking Enable** 0: Disable 1: Enable
3	RW	0	**GFX-NM PCIC Dynamic Clock Enable** 0: Disable 1: Enable
2	RW	0	**GFX-NM GMINT Channel 1 Dynamic Clock Enable** 0: Disable 1: Enable
1	RW	0	**GFX-NM GMINT Channel 0 Dynamic Clock Enable** 0: Disable 1: Enable
0	RW	0	**GFX-NM AGP Dynamic Clock Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.5A
PCI Bus Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RO	0	**Reserved**
0	RW	0	**Scratch Pad Register Shadow Access** 0: This bit controls Rx3X5.49-4F, Rx3C5.39/3A, Rx3X5.3B-3F (total 14) addresses map to original registers 1: This bit controls Rx3X5.49-4F, Rx3C5.39/3A, Rx3X5.3B-3F (total 14) addresses map to secondary registers

IO Port / Index: 3C5.5B
Device Used Status 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**DCVI Source Selection Flag** 0:Graphic 1:TV
6	RO	0	**DAC0 User Flag** 0: Graphic 1: TV
5	RO	0	**DAC0 Used IGA1 Source Flag** 0: No use 1: Use
4	RO	0	**DAC0 Used IGA2 Source Flag** 0: No use 1: Use
3	RO	0	**LVDS0 Used IGA1 Source Flag** - ***Refer to LVDS chapter for details***
2	RO	0	**LVDS0 Used IGA2 Source Flag** - ***Refer to LVDS chapter for details***
1	RO	0	**LVDS1 Used IGA1 Source Flag** - ***Refer to LVDS chapter for details***
0	RO	0	**LVDS1 Used IGA2 Source Flag**- ***Refer to LVDS chapter for details***

IO Port / Index: 3C5.5C
Device Used Status 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RO	0	**DAC1 User Flag** 0: Graphic 1: TV
5	RO	0	**DAC1 Used IGA1 Source Flag** 0: No use 1: Use
4	RO	0	**DAC1 Used IGA2 Source Flag** 0: No use 1: Use
3:2	RO	0	**Reserved**
1	RO	0	**DVP1 Used IGA1 Source Flag** 0: No use 1: Use
0	RO	0	**DVP1 Used IGA2 Source Flag** 0: No use 1: Use

IO Port / Index: 3C5.5D
Timer Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Timer Status** When the bit is asserted, it means the timer is reached.
6:0	RW	0	**Timer Step Setting** Countdown step value for timer. (one step is about 10us (8.9us))

IO Port / Index: 3C5.5E
DAC Control Register 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3	RW	0	**DAC3 Off (B)**
2	RW	0	**DAC2 Off (G)**
1	RW	0	**DAC1 Off (R)**
0	RW	0	**CRT DACOFF setting** When this bit is 1, CRT DACOFF signal will be controlled by screen off register (Rx3C5.01[5]).

IO Port / Index: 3C5.60
I2C Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RW	0	**I2C Byte Count** This field is programmed with the data transfer count (a value between 0 and 15)
3	RW	0	**Internal Timer Count using Clock Divided by 2** 0: Counter using original clock 1: Counter using clock divided by 2
2	RW	0	**NO STOP Command Generation** When this bit is enabled, master controller finishes the transaction without STOP
1	RW	0	**I2C Mode** 0: Standard mode 1: Fast mode
0	RW	0	**I2C Master Interrupt Enable** 0: Disable interrupt generation 1: Enable generation of interrupts on completion of the current transaction

IO Port / Index: 3C5.61

I2C Host Address **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RW	0	**I2C Host Address** This field contains the 7 bit address of the targeted slave device
0	RW	0	**I2C Write or Read** 0: Write 1: Read

IO Port / Index: 3C5.62

I2C Host Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**I2C Host Data** Hardware supports the queue of 2-byte data. Reads and writes to this register are used to access the 2-byte data queue. An internal index pointer is used to address the queue. It is reset to 0 by reads of the I2C Host Control register and incremented automatically by each access to this register.

IO Port / Index: 3C5.63

I2C Host Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Software Reset** 0: Normal function 1: Reset I2C master controller
6	RW	0	**No Active Driving to High before Release the Bus** 0: Driving to high 1: No driving to high
5	RO	0	**Reserved**
4	RW	0	**I2C Master Clock Control** 0: Disable 1: Enable
3:2	RW	00b	**Which Port I2C Master Process** 00: 31h 01: 2Ch 10: 26h 11: 25h
1	RW	0	**Kill Transaction in Progress** 0: Normal master controller operation 1: Stop transaction currently in progress
0	RW	0	**Fire** 0: No effect 1: Writing one to this bit causes master controller to start transaction

IO Port / Index: 3C5.64

I2C Status **Default Value: 40h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5	RW	1b	**Queue Empty Status** When this bit is one, it means hardware queue is empty.
4	RW1C	0	**I2C Data Transferred Status**
3	RW1C	0	**I2C Transaction Done Status**
2	RW1C	0	**I2C Abnormal Status**
1	RW	0	**Queue Full Status** When this bit is one, it means hardware queue is full.
0	RW	0	**Master Busy Status** When this bit is one, it means master controller is busy processing a command

IO Port / Index: 3C5.65

Power Management Control 6 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3:2	RW	00b	**DVP1 Clock Pads Driving Select** 00 (Low) ←→ 11 (high)
1:0	RW	00b	**DVP1 Data Pads Driving Select** 00 (Low) ←→ 11 (high)

IO Port / Index: 3C5.66

GTI Control 0 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**Typical Request Kill Number for Channel 0**

IO Port / Index: 3C5.67

GTI Control 1 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**3D Request Kill Number for Channel 0**

IO Port / Index: 3C5.68
GTI Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**SLSZ** 00h: 512MB (Do not support, must set to other value) 80h: 256MB C0h: 128MB E0h: 64MB F0h: 32MB F8h: 16MB FCh: 8MB FEh: 4MB FFh: 2MB

IO Port / Index: 3C5.69
GTI Control 3 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**GTI Request Kill Number for Channel 0**

IO Port / Index: 3C5.6A
GTI Control 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Base Address [19:12] of RTSF in SL**

IO Port / Index: 3C5.6B
GTI Control 5 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Base Address [27:20] of RTSF in SL**

IO Port / Index: 3C5.6C
GTI Control 6 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**GART Table Write Protect Enable** Enable to avoid hardware write. 0: Disable 1: Enable
6	RW	0	**GARB SAMPLE_GFX1DATA**
5	RW	0	**GTI SAMPLE_GFX0DATA**
4:1	RO	0	**Reserved**
0	RW	0	**Base Address [28] of RTSF in SL**

IO Port / Index: 3C5.6D
GTI Control 7 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Base Address [28:21] of SL in System Memory**

IO Port / Index: 3C5.6E
GTI Control 8 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Base Address [36:29] of SL in System Memory**

IO Port / Index: 3C5.6F
GTI Control 9 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**GTI Cache Flush** Set by SW and reset by GTI.
6:0	RW	0	**Base Address [43:37] of SL in System Memory**

IO Port / Index: 3C5.70
GARB Control 0 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**G_ARB Request Kill Number for Channel 1**

IO Port / Index: 3C5.71
Typical Arbiter Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Typical Request Max. Queuing Number for Channel 1** Min: 0 Max: 62 (The recommended value is 4.)

IO Port / Index: 3C5.72
Typical Arbiter Control 3 **Default Value: 1Dh**

Bit	Attribute	Default	Description
7:0	RW	0	**Typical Request Track FIFO Number for Channel 1**

IO Port / Index: 3C5.73
Typical Arbiter Control 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5:4	RW	00b	**Typical Request Max. Burst Length to GTI for Channel 1** 00: 1 01: 2 11: 4
3:2	RO	0	**Reserved**
1:0	RW	00b	**Typical Request Max. Burst Length to GTI for Channel 0** 00: 1 01: 2 11: 4

IO Port / Index: 3C5.74
Typical Arbiter Control 5 **Default Value: 1Fh**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5:0	RW	1Fh	**Typical Request Max. ACK Number Minus One for Channel 1** 00h: Disable the function

IO Port / Index: 3C5.75
Typical Arbiter Control 6 **Default Value: 1Fh**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5:0	RW	1Fh	**Typical Request Max. ACK Number Minus One for Channel 0** 00h: Disable the function

IO Port / Index: 3C5.76
Backlight Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RO	0	**Reserved**
0	RW	0	**Backlight Control Enable** 0: Disable 1: Enable

IO Port / Index: 3C5.77
Backlight Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**PWM Level Indicator** Total 256 level from 0% ~ 100%.

IO Port / Index: 3C5.78
Backlight Control 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**South Module Pad Share Enable** 0: Disable 1: Enable
6	RW	0	**Inverse IGA2 HSYNC to LVDS -** ***Refer to LVDS chapter for details***
5	RW	0	**Inverse IGA2 VSYNC to LVDS -** ***Refer to LVDS chapter for details***
4	RW	0	**Inverse IGA1 HSYNC to LVDS -** ***Refer to LVDS chapter for details***
3	RW	0	**Inverse IGA1 VSYNC to LVDS -** ***Refer to LVDS chapter for details***
2:1	RW	00b	**Clock Source Selection** 00: 14.318 MHz / 128 01: 14.318 Mhz / 256 10: 14.318 Mhz / 512 11: 14.318 Mhz / 1024
0	RW	0	**Backlight Control Fire** 1: Fire (3C5.76[0] must be 1

IO Port / Index: 3C5.79

SL/SF Request Kill Number 0 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**SL/SF Request Kill Number 0** Kill number setting by SW.

IO Port / Index: 3C5.7A

SL/SF Request Kill Number 1 **Default Value: C8h**

Bit	Attribute	Default	Description
7:0	RW	C8h	**SL/SF Request Kill Number 1** Kill number setting by SW.

Graphics Controller Extended Register

This section describes the graphics controller extended register definitions in detail.

IO Port / Index: 3CF.20
Offset Register Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**Offset Register A Overflow Bit 9**
5	RW	0	**Offset Register A Overflow Bit 8**
4	RW	0	**Offset Register B Overflow Bit 8**
3:2	RO	0	**Reserved**
1	RW	0	**Offset Read/Write Control** 0: Offset A (Rx3CF.21) and B (Rx3CF.22) as read/write 1: Offset A as write and offset B as read
0	RW	0	**Offset Configuration** 0: Offset A and B configured as 64KB 1: Offset A and B configured as 16KB

IO Port / Index: 3CF.21
Offset Register A **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Offset A**

IO Port / Index: 3CF.22
Offset Register B **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Offset B**

CRT Controller Extended Registers

This section provides detail CRT controller extended register bit definitions. The "X" contained within the I/O port address stands for **"B"** during monochrome mode and is changed to **"D"** in color mode. For example, the I/O index for Mode Control register will be **Rx3B5.32** in monochrome mode and **Rx3D5.32** in color mode.

IO Port / Index: 3X5.30

Display Fetch Blocking Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**IGA1 Digital Interface Test Enable** 0: Disable 1: Enable
6	RW	0	**Convert Primary Display Data From RGB TO YcbCr** 0: Disable 1: Enable
5	RW	0	**FTTYPE1. DAC Vref Select**
4:3	RW	0	**DR. DAC Speed Enhancement**
2	RW	0	**On / Off Power Now Signals in Primary Path** 0: Disable 1: Enable
1:0	RW	00b	**Block T_REQ Path** 0x: Disable 10: Block request within the vertical & horizontal display area 11: Block request within the vertical display area

IO Port / Index: 3X5.31

Half Line Position **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5	RW	0	**DVP1SPCLK Pin Control** 0: DVP1SPCLK driven low 1: DVP1SPCLK tri-stated
4	RW	0	**DVP1SPD Pin Control** 0: DVP1SPD driven low 1: DVP1SPD tri-stated
3	RO	0	**DVP1SPCLK Pin Status**
2	RO	0	**DVP1SPD Pin Status**
1	RW	0	**DVP1SPCLK Wait State Enable** 0: Disable 1: Enable (Drive DVP1SPCLK low upon receipt of serial poert start).
0	RW	0	**Serial Port Enable** 0: Disable 1: Enable

IO Port / Index: 3X5.32
Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RW	000b	**HSYNC Delay Number by VCLK** 000: No delay 001: Delay + 4 VCKs 010: Delay + 8 VCKs 011: Delay + 12 VCKs 100: Delay + 16 VCKs 101: Delay + 20 VCKs Others: Undefined
4	RO	0	**Reserved**
3	RW	0	**CRT SYNC Driving Selection** 0: Low 1: High
2	RW	0	**Display End Blanking Enable** 0: Disable 1: Enable
1	RW	0	**Digital Video Port (DVP) Grammar Correction** If the Grammar correction of primary display is turned on, the grammar correction in DVP can be enabled/disabled by this bit. 0: Disable 1: Enable
0	RW	0	**Real-Time Flipping** 0: Flip by the frame 1: Flip by each scan line

IO Port / Index: 3X5.33
HSYNCH Adjuster **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Primary Display Gamma Correction** 0: Disable 1: Enable
6	RW	0	**Primary Display Interlace Mode**
5	RW	0	**Horizontal Blanking End Bit [6]**
4	RW	0	**HSYNC Start Bit [8]**
3	RW	0	**Prefetch Mode** 0: Disable 1: Enable
2:0	RW	000b	**The value will shift the HSYNC to be early than planned** 000: Shift to early time by 3 character (VGA mode sugested value; default value) 001: Shift to early time by 4 character 010: Shift to early time by 5 character 011: Shift to early time by 6 character 100: Shift to early time by 7 character 101: Shift to early time by 0 character (Non-VGA mode sugested value) 110: Shift to early time by 1 character 111: Shift to early time by 2 character

IO Port / Index: 3X5.34
Starting Address Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Starting Address Overflow Bits [23:16]**

IO Port / Index: 3X5.35
Extended Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RW	0	**Offset Bits [10:8]**
4	RW	0	**Line Compare Bit [10]**
3	RW	0	**Vertical Blanking Start Bit [10]**
2	RW	0	**Vertical Display End Bit [10]**
1	RW	0	**Vertical Retrace Start Bit [10]**
0	RW	0	**Vertical Total Bit [10]**

IO Port / Index: 3X5.36
Power Management 3 (Monitor Control) **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**DPMS VSYNC Output**
6	RW	0	**DPMS HSYNC Output**
5:4	RW	00b	**DPMS Control** 00: On 01: Stand-by 10: Suspend 11: Off When the DPMS state is off, both HSYNC and VSYNC are grounded, saving monitor power consumption.
3	RW	0	**Horizontal Total Bit [8]**
2:1	RO	0	**Reserved**
0	RW	0	**PCI Power Management Control** 0: Disable 1: Enable

IO Port / Index: 3X5.37
DAC Control Register **Default Value: 04h**

Bit	Attribute	Default	Description
7	RW	0	**DAC Power Save Control 1** 0: Depend on Rx3X5.37[5:4] setting 1: DAC always goes into power save mode
6	RW	0	**DAC Power Down Control** 0: Depend on Rx3X5.47[2] setting 1: DAC never goes to power down mode
5:4	RW	00b	**DAC Power Save Control 2** 00: DAC never goes to power save mode 01: DAC goes to power save mode by line 10: DAC goes to power save mode by frame 11: DAC goes to power save mode by line and frame
3	RW	0	**DAC PEDESTAL Control**
2:0	RW	100b	**DAC Factor**

IO Port / Index: 3X5.38
Signature Data Register B0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Signature Data Register B0**

IO Port / Index: 3X5.39
Signature Data Register B1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Signature Data Register B1**

IO Port / Index: 3X5.3A
Signature Data Register B2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Signature Data Register B2**

IO Port / Index: 3X5.3B
Scratch Pad Register 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scratch Pad Register 2**

IO Port / Index: 3X5.3C
Scratch Pad Register 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scratch Pad Register 3**

IO Port / Index: 3X5.3D
Scratch Pad Register 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scratch Pad Register 4**

IO Port / Index: 3X5.3E
Scratch Pad Register 5 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scratch Pad Register 5**

IO Port / Index: 3X5.3F
Scratch Pad Register 6 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scratch Pad Register 6**

IO Port / Index: 3X5.40
Test Mode Control 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RW	0	**Test Group Select**
3	RW	0	**Test Mode Control** 0: Disable 1: Enable
2	RW	0	**Signature Test Source** 0: Primary display 1: Secondary display
1	RW	0	**Signature Test Enable** 0: Disable 1: Enable
0	RW	0	**DAC Test Mode Control Enable** 0: Disable 1: Enable Data come from MDI[23:0].

IO Port / Index: 3X5.43
IGA1 Display Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3	RW	0	**IGA1 10 Bit Gamma Algorithm LUT256 Index 0 for Color 0** 0: Color 0 always output 10'b0 1: Color 0 output value from index 0' data
2	RW	0	**IGA1 Address Mode Selection** 0: Linear 1: Tile
1	RW	0	**IGA1 Hardware 10 Bit Gamma Enable** 0: Disable 1: Enable
0	RW	0	**IGA1 Extend 10 Bit Mode LSB Selection** 0: Always 00b 1: MSB bits

IO Port / Index: 3X5.45
Power Now Indicator Control 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RO	0	**Reserved**
0	RW	0	**Display FIFO Threshold for Power Now Indicator Bit [7]**

IO Port / Index: 3X5.46
Test Mode Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Load a Value to the Vertical Counter**

IO Port / Index: 3X5.47
Test Mode Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**IGA1 Timing Plus 2 VCK**
6	RW	0	**IGA1 Timing Plus 4 VCK**
5	RW	0	**Peep at the PCI Bus** 0: Disable 1: Enable
4	RO	0	**Reserved**
3	RW	0	**IGA1 Timing Plus 6 VCK**
2	RW	0	**DACOFF Backdoor Register**
1	RW	0	**LCD Simultaneous Mode Backdoor Register for 8/9 Dot Clocks**
0	RW	0	**LCD Simultaneous Mode Backdoor Register for Clock Select and CRTC Register Protect**

IO Port / Index: 3X5.48
Starting Address Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Starting Address Overflow Bits[28:24]**

Secondary Display Registers

This section describes the secondary display I/O register bit definitions. The "X" contained within the I/O port address stands for **"B"** during monochrome mode and is changed to **"D"** in color mode. For example, the I/O index for the Second CRTC horizontal Total Period register will be **Rx3B5.50** in monochrome mode and **Rx3D5.50** in color mode.

IO Port / Index: 3X5.50
Second CRTC Horizontal Total Period **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Total Period Bit [7:0]**

IO Port / Index: 3X5.51
Second CRTC Horizontal Active Data Period **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Active Data Period Bit [7:0]**

IO Port / Index: 3X5.52
Second CRTC Horizontal Blanking Start **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second CRTC Horizontal Blanking Start Bit [7:0]**

IO Port / Index: 3X5.53
Second CRTC Horizontal Blanking End **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second CRTC Horizontal Blanking End Bit [7:0]**

IO Port / Index: 3X5.54
Second CRTC Horizontal Blanking Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	0	**Horizontal Retrace Start Bit [9:8]**
5:3	RW	0	**Horizontal Blanking End Bit [10:8]**
2:0	RW	0	**Horizontal Blanking Start Bit [10:8]**

IO Port / Index: 3X5.55
Second CRTC Horizontal Period Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6:4	RW	0	**Horizontal Active Data Period Bit [10:8]**
3:0	RW	0	**Horizontal Total Period Bit [11:8]**

IO Port / Index: 3X5.56
Second CRTC Horizontal Retrace Start **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Retrace Start Bit [7:0]**

IO Port / Index: 3X5.57
Second CRTC Horizontal Retrace End **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Retrace End**

IO Port / Index: 3X5.58
Second CRTC Vertical Total Period **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Vertical Total Period [7:0]

IO Port / Index: 3X5.59
Second CRTC Vertical Active Data Period **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Vertical Active Data Period Bit [7:0]

IO Port / Index: 3X5.5A
Second CRTC Vertical Blanking Start **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Vertical Blanking Start Bit [7:0]

IO Port / Index: 3X5.5B
Second CRTC Vertical Blanking End **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Vertical Blanking End Bit [7:0]

IO Port / Index: 3X5.5C
Second CRTC Vertical Blanking Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	Horizontal Retrace Bit [10]
6	RW	0	Horizontal Retrace End Bit [8]
5:3	RW	0	Vertical Blanking End Bit [10:8]
2:0	RW	0	Vertical Blanking Start Bit [10:8]

IO Port / Index: 3X5.5D
Second CRTC Vertical Period Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	Horizontal Retrace Start Bit [11]
6	RW	0	Horizontal Blanking End Bit [11]
5:3	RW	0	Vertical Active Data Period Bit [10:8]
2:0	RW	0	Vertical Total Period Bit [10:8]

IO Port / Index: 3X5.5E
Second CRTC Vertical Retrace Start **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Vertical Retrace Start Bit [7:0]

IO Port / Index: 3X5.5F
Second CRTC Vertical Retrace End **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RW	0	Vertical Retrace Start Bit [10:8]
4:0	RW	0	Vertical Retrace End

IO Port / Index: 3X5.60
Second CRTC Vertical Status 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RO	0	**Vertical Count Number [7:0]**

IO Port / Index: 3X5.61
Second CRTC Vertical Status 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Vertical Retrace Status** 1: Retrace Period
6	RO	0	**Vertical Active Data Status** 1: Active Data Period
5	RO	0	**Flip Flag**
4	RO	0	**Power Sequence Flag 0** 0: Invalid 1: Valid
3	RO	0	**Power Sequence Flag 1** 0: Invalid 1: Valid
2:0	RO	0	**Vertical Count Number [10:8]**

IO Port / Index: 3X5.62
Second Display Starting Address Low **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RW	0	**Second Display Starting Address Bit [9:3]** This is quadword boundary.
0	RW	0	**Second Display Address Mode Selection** 0: Linear mode 1: Tile mode

IO Port / Index: 3X5.63
Second Display Starting Address Middle **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second Display Starting Address Bit [17:10]**

IO Port / Index: 3X5.64
Second Display Starting Address High **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second Display Starting Address Bit [25:18]**

IO Port / Index: 3X5.65
Second Display Horizontal Quadword Count Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second Display Horizontal Quadword Count Data Bit [7:0]**

IO Port / Index: 3X5.66
Second Display Horizontal Offset **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Second Display Horizontal Offset Bit [10:3] or** **Horizontal Synchronous Point**

IO Port / Index: 3X5.67

Second Display Color Depth and Horizontal Overflow **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	00b	**Color Depth** 00: 8bpp 01: 16bpp 10: 30bpp 11: 32bpp
5	RW	0	**Second Display Interlace Mode**
4	RW	0	**IGA2 Extend 10 Bit Mode LSB Selection** 0: 2'b00 1: MSB[7:6]
3:2	RW	0	**Second Display Horizontal Quadword Count Data Bit [9:8]**
1:0	RW	0	**Second Display Horizontal Offset Bit [12:11]**

IO Port / Index: 3X5.68

Second Display Queue Depth and Read Threshold **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RW	0	**Display Queue Depth [3:0]** Unit 8 level ([5:4] on Rx3X5..95[7] and Rx3X5..94[7])
3:0	RW	0	**Display Queue Read Threshold 1** Unit 4 level ([6:4] on Rx3X5.95[6:4])

IO Port / Index: 3X5.69

Second Display Interrupt Enable and Status **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**For Write:** **Interrupt Clear** 1: Clear **For Read:** **Interrupt Status** 0: No interrupt 1: Interrupt period
6	RW	0	**Interrupt Enable** 0: Disable 1: Enable
5:0	RO	0	**Reserved**

IO Port / Index: 3X5.6A

Second Display Channel and LCD Enable **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Second Display Channel Enable** 0: Disable 1: Enable
6	RW	0	**Second Display Channel Reset** 0: Reset
5	RW	0	**Second Display 8/6 Bits LUT** 0: 6-bits 1: 8-bits
4	RW	0	**Horizontal Count by 2** 0: Disable 1: Enable
3	RW	0	**First Hardware Power Sequence** - ***Refer to LVDS chapter for details***
2	RW	0	**Second Display Channel Vertical Clear** 1: Clear
1	RW	0	**LCD Gamma Enable** 0: Disable 1: Enable
0	RW	0	**LCD Pre-fetch Mode Enable** 0: Disable 1: Enable

IO Port / Index: 3X5.6B

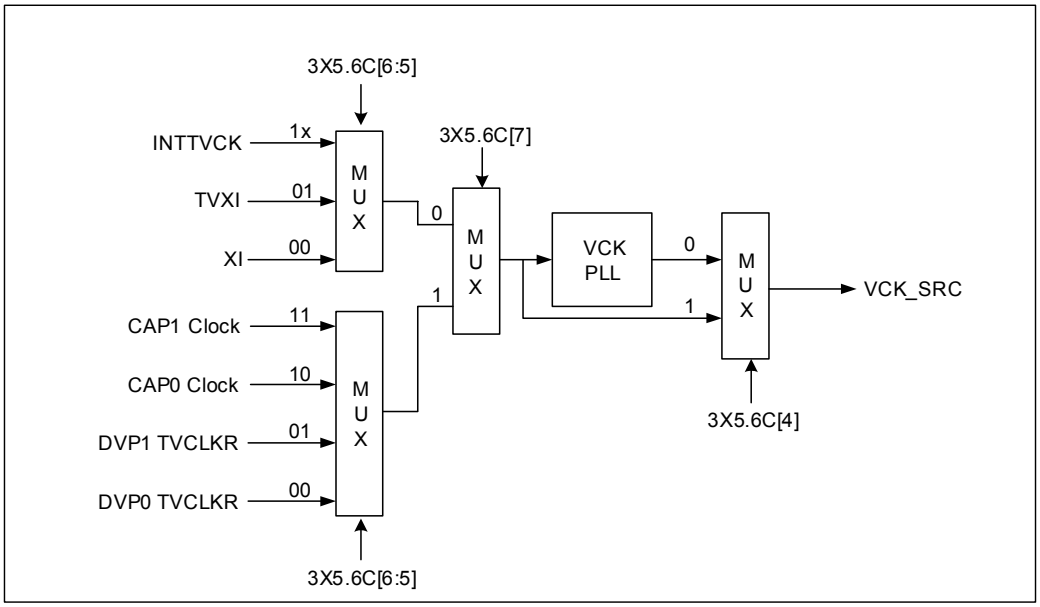
Channel 1 and 2 Clock Mode Selection **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	00b	**First Display Channel Clock Mode Selection** 0x: Normal 1x: Division by 2
5:4	RW	00b	**Second Display Channel Clock Mode Selection** 0x: Normal 1x: Division by 2
3	RW	0	**Simultaneous Display Enable** 0: Disable 1: Enable
2	RW	0	**IGA2 Screen Off** 0: Normal 1: Screen off
1	RW	0	**IGA2 Screen Off Selection Method** 0: IGA2 Screen off 1: IGA1 Screen off
0	RO	0	**Reserved**

IO Port / Index: 3X5.6C
TV CLK Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RW	000b	**VCK PLL Reference Clock Source Selection** 000: From XI pin 001: From TVXI 01x: From TVPLL 100: Reserved 101: DVP1TVCLKR 110: CAP0 Clock 111: CAP1 Clock
4	RW	0	**VCK Source Selection** 0: VCK PLL output clock 1: VCK PLL reference clock
3:1	RW	000b	**LCDCK PLL Reference Clock Source Selection** 000: From XI pin 001: From TVXI 01x: From TVPLL 100: Reserved 101: DVP1TVCLKR 110: CAP0 Clock 111: CAP1 Clock
0	RW	0	**LCDCK Source Selection** 0: LCDCK PLL output clock 1: LCDCK PLL reference clock

VCK Example:



IO Port / Index: 3X5.6D
Horizontal Total Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Total Bit [7:0]**

IO Port / Index: 3X5.6E
End Horizontal Blanking Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**End Horizontal Blanking Bit [7:0]**

IO Port / Index: 3X5.6F
Vertical Total Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Total Bit [7:0]**

IO Port / Index: 3X5.70
Vertical Display Enable End Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Display Enable End Bit [7:0]**

IO Port / Index: 3X5.71
Vertical Display Overflow Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Second Display Horizontal Offset Bit [13]**
6:4	RW	0	**Vertical Display Enable End Bit [10:8]**
3	RW	0	**Horizontal Total Bit [8]**
2:0	RW	0	**Vertical Total Bit [10:8]**

IO Port / Index: 3X5.72
Start Vertical Blank Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Start Vertical Blanking Bit [7:0]**

IO Port / Index: 3X5.73
End Vertical Blank Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**End Vertical Blanking Bit [7:0]**

IO Port / Index: 3X5.74
Vertical Blank Overflow Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**For 6 bit-LUT** 0: Send back original 8 bits data 1: Send back transformed 8 bits data
6:4	RW	0	**Start Vertical Blanking Bit [10:8]**
3	RO	0	**Reserved**
2:0	RW	0	**End Vertical Blanking Bit [10:8]**

IO Port / Index: 3X5.75
Vertical Retrace Start Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Retrace Start Bit [7:0]**

IO Port / Index: 3X5.76
Vertical Retrace End Shadow **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6:4	RW	0	**Vertical Retrace Start Bit [10:8]**
3:0	RW	0	**Vertical Retrace End**

IO Port / Index: 3X5.77
LCD Horizontal Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Scaling Factor Bit [9:2]**

IO Port / Index: 3X5.78
LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Scaling Factor Bit [8:1]**

IO Port / Index: 3X5.79
LCD Scaling Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	0	**Vertical Scaling Factor Bit [10:9]**
5:4	RW	0	**Horizontal Scaling Factor Bit [11:10]**
3	RW	0	**Vertical Scaling Factor Bit [0]**
2	RO	0	**Reserved**
1	RW	0	**Horizontal Scaling Selection** 0: Duplication 1: Interpolation
0	RW	0	**LCD Scaling Enable** 0: Disable 1: Enable

IO Port / Index: 3X5.7A
LCD Scaling Parameter 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 1**

IO Port / Index: 3X5.7B
LCD Scaling Parameter 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 2**

IO Port / Index: 3X5.7C
LCD Scaling Parameter 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 3**

IO Port / Index: 3X5.7D
LCD Scaling Parameter 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 4**

IO Port / Index: 3X5.7E
LCD Scaling Parameter 5 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 5**

IO Port / Index: 3X5.7F
LCD Scaling Parameter 6 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 6**

IO Port / Index: 3X5.80
LCD Scaling Parameter 7 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 7**

IO Port / Index: 3X5.81
LCD Scaling Parameter 8 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 8**

IO Port / Index: 3X5.82
LCD Scaling Parameter 9 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 9**

IO Port / Index: 3X5.83
LCD Scaling Parameter 10 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 10**

IO Port / Index: 3X5.84
LCD Scaling Parameter 11 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 11**

IO Port / Index: 3X5.85
LCD Scaling Parameter 12 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 12**

IO Port / Index: 3X5.86
LCD Scaling Parameter 13 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 13**

IO Port / Index: 3X5.87
LCD Scaling Parameter 14 **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**Parameter 14**

IO Port / Index: 3X5.88
LCD Panel Type **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.8A
LCD Timing Control 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6:4	RW	0	**Adjust FLM**
3	RO	0	**Reserved**
2:0	RW	0	**Adjust LP**

IO Port / Index: 3X5.8B
LCD Power Sequence Control 0 **Default Value: CAh**

Bit	Attribute	Default	Description
7:0	RW	0	**TD0 Timer Bit [7:0] (default 32ms)**

IO Port / Index: 3X5.8C
LCD Power Sequence Control 1 **Default Value: CAh**

Bit	Attribute	Default	Description
7:0	RW	0	**TD1 Timer Bit [7:0] (default 32ms)**

IO Port / Index: 3X5.8D
LCD Power Sequence Control 2 **Default Value: CAh**

Bit	Attribute	Default	Description
7:0	RW	0	**TD2 Timer Bit [7:0] (default 32ms)**

IO Port / Index: 3X5.8E
LCD Power Sequence Control 3 **Default Value: CAh**

Bit	Attribute	Default	Description
7:0	RW	0	**TD3 Timer Bit [7:0] (default 32ms)**

IO Port / Index: 3X5.8F
LCD Power Sequence Control 4 **Default Value: 11h**

Bit	Attribute	Default	Description
7:4	RW	0	**TD1 Timer [11:8]**
3:0	RW	0	**TD0 Timer [11:8]**

IO Port / Index: 3X5.90
LCD Power Sequence Control 5 **Default Value: 11h**

Bit	Attribute	Default	Description
7:4	RW	0	**TD3 Timer [11:8]**
3:0	RW	0	**TD2 Timer [11:8]**

IO Port / Index: 3X5.91
Software Control Power Sequence **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Software Direct On / Off Display Period in the Panel Path** 0: On 1: Off
6	RW	0	**Software On / Off Back Light Directly** 0: On 1: Off
5	RW	0	**Software Direct On / Off Display Period in the Secondary Display Path** 0: On 1: Off
4	RW	0	**Software VDD On**
3	RW	0	**Software Data On**
2	RW	0	**Software VEE On**
1	RW	0	**Software Back Light On**
0	RW	0	**Hardware or Software Control Power Sequence** 1: Software Control

IO Port / Index: 3X5.92
Read Threshold 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3:0	RW	0	**Read Threshold 2**

IO Port / Index: 3X5.94
Expire Number and Display Queue Extend Bit **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Display Queue Depth Bit [4]**
6:0	RW	0	**Display2 Expire_ Number Bits [6:0]**

IO Port / Index: 3X5.95
Extend Threshold Bit **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Display Queue Depth Bit[5]**
6:4	RW	0	**Read Threshold 1 Bits [6:4]**
3	RO	0	**Reserved**
2:0	RW	0	**Read Threshold 2 Bits [6:4]**

IO Port / Index: 3X5.97
LVDS Channel 2 Function Select 0 **Default Value: 00h**

Refer to LVDS chapter for more details

IO Port / Index: 3X5.98
LVDS Channel 2 Function Select 1 **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.99
LVDS Channel 1 Function Select 0 **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.9A
LVDS Channel 1 Function Select 1 **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.9B
Digital Video Port 1 Function Select 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**DVP1 ALPHA Enable** 0: Disable 1: Enable
6	RW	0	**DVP1 VSYNC Polarity** 0: Positive 1: Negative
5	RW	0	**DVP1 HSYNC Polarity** 0: Positive 1: Negative
4	RW	0	**DVP1 Data Source Selection 0** 0: Primary Display 1: Secondary Display
3	RW	0	**DVP1 Clock Polarity**
2:0	RW	0	**DVP1 Clock Adjust**

IO Port / Index: 3X5.9C
Digital Video Port 1 Function Select 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3	RW	0	**DVP 1 Clock Polarity**
2:0	RW	0	**DVP 1 Clock Adjust**

IO Port / Index: 3X5.9D
Power Now Control 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Specifies the Indicator Ending Reference Point in the Vertical Blanking Period** 0: Use vertical retrace starting position 1: Use bits [6:0] of this register
6:3	RO	0	**Reserved**
2:0	RW	0	**Ending Position of Power Now Indicator**

IO Port / Index: 3X5.9E
Power Now Control 3 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Use Which Condition As The Power Now Indicator** 0: Active in the vertical blanking area 1: Active while display FIFO is almost full (refer bit[6:0])or vertical blanking period
6:0	RW	0	**Display FIFO Threshold for Power Now Indicator** The value must be divided by 4.

IO Port / Index: 3X5.9F
Power Now Control 4 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Enable the Power Now Indicator** 0: Disable 1: Enable
6:2	RO	0	**Reserved**
1:0	RW	0	**Horizontal Scaling Factor Bit [1:0]**

IO Port / Index: 3X5.A0
Horizontal Scaling Initial Value **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Scaling Initial Value** Add on scaling factor high 8 bits.

IO Port / Index: 3X5.A1
Vertical Scaling Initial Value **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Scaling Initial Value** Add on scaling factor high 8 bits.

IO Port / Index: 3X5.A2
Scaling Enable Bit **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Horizontal Scaling Enable Bit**
6	RW	0	**Horizontal Scaling Factor Selection** 0: Original 1: Linear Mode
5:4	RO	0	**Reserved**
3	RW	0	**Vertical; Scaling Enable Bit**
2:0	RO	0	**Reserved**

IO Port / Index: 3X5.A3
Second Display Starting Address Extended **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**Second Display Starting Address Bit [28:26]**

IO Port / Index: 3X5.A5
Second LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RO	0	**Second LCD Vertical Scaling Factor Bits [8:1]**

IO Port / Index: 3X5.A6
Second LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2	RW	0	**Second Vertical Scaling Factor Bit [0]**
1:0	RW	0	**Second Vertical Scaling Factor Bits [10:9]**

IO Port / Index: 3X5.A7
Expected IGA1 Vertical Display End **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Expected IGA1 Vertical Display End Bits [7:0]**

IO Port / Index: 3X5.A8
Expected IGA1 Vertical Display End **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**Expected IGA1 Vertical Display End Bits [10:8]**

IO Port / Index: 3X5.A9
Hardware Gamma Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:2	RO	0	**Reserved**
1	RW	0	**Hardware 10 bit Gamma Enable**
0	RW	0	**10 Bit Gamma Algorithm LUT256 Index 0 for Color 0** 0: Color 0 always output 10'b0

IO Port / Index: 3X5.AA
FIFO Depth & Threshold Overflow Bit **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RO	0	**Reserved**

IO Port / Index: 3X5.AB
IGA2 Interlace Half Line Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**IGA2 Interlace Half Line RegisterBits [7:0]**

IO Port / Index: 3X5.AC
IGA2 Interlace Half Line Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**IGA2 Interlace Half Line Register Bits [10:8]**

IO Port / Index: 3X5.AF

P-Arbiter Write Expired Number Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**P-Arbiter Write Expired NumberBits [4:0]**

IO Port / Index: 3X5.B0

IGA2 Pack Circuit Request Threshold **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**IGA2 Pack Circuit Request Threshold**

IO Port / Index: 3X5.B1

IGA2 Pack Circuit Request High Threshold **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**IGA2 Pack Circuit Request High Threshold**

IO Port / Index: 3X5.B2

IGA2 Pack Circuit Request Expire Number **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RO	0	**Reserved**
4:0	RW	0	**IGA2 Pack Circuit Request Expire Number**

IO Port / Index: 3X5.B3

IGA2 Pack Circuit Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**VCNT Reset Method Selection** 0: IGA1 reset IGA2 1: IGA2 reset IGA1
6:3	RO	0	**Reserved**
2	RW	0	**Flip Function Enable**
1	RW	0	**Simultaneous Mode New Method Enable**
0	RW	0	**Pack Circuit Enable**

IO Port / Index: 3X5.B4

IGA2 Pack Circuit Target Base Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Pack Circuit Target Base Address 0 Bits [11:4]**

IO Port / Index: 3X5.B5

IGA2 Pack Circuit Target Base Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Pack Circuit Target Base Address 0 Bits [19:12]**

IO Port / Index: 3X5.B6

IGA2 Pack Circuit Target Base Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Pack Circuit Target Base Address 0 Bits [27:20]**

IO Port / Index: 3X5.B7
IGA2 Pack Circuit Target Base Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RO	0	**Reserevd**
0	RW	0	**Pack Circuit Target Base Address 0 Bit [28]**

IO Port / Index: 3X5.B8
IGA2 Pack Circuit Target Line Pitch **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Pack Circuit Target Line Pitch Bits [11:4]**

IO Port / Index: 3X5.B9
IGA2 Pack Circuit Target Line Pitch **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**Pack Circuit Target Line Pitch Bits [14:12]**

IO Port / Index: 3X5.BA
V Counter Set Pointer **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**V Counter Set Pointer Bits [7:0]** The set pointer reference is decided according to Rx3X5.B3[7].

IO Port / Index: 3X5.BB
V Counter Set Pointer **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**V Counter Set Pointer Bits [10:8]** The set pointer reference is decided according to Rx3X5.B3[7].

IO Port / Index: 3X5.BC
V Counter Reset Value **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**V Counter Set Pointer Bits [7:0]** Decides which v counter will reset depending on Rx3X5.B3[7].

IO Port / Index: 3X5.BD
V Counter Reset Value **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	**Reserved**
2:0	RW	0	**V Counter Set Pointer Bits [10:8]** Decides which v counter will reset depending on Rx3X5.B3[7].

IO Port / Index: 3X5.BE
Frame Buffer Limit Value **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Frame Buffer Limit Bits [7:0]**

IO Port / Index: 3X5.BF
Frame Buffer Limit Value **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	Frame Buffer Limit Enable
6:3	RO	0	Reserved
2:0	RW	0	Frame Buffer Limit Bits [10:8]

IO Port / Index: 3X5.C0
Expected IGA1 Vertical Display End 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Expected IGA1 Vertical Display End 1 Bits [7:0]

IO Port / Index: 3X5.C1
Expected IGA1 Vertical Display End 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	Reserved
2:0	RW	0	Expected IGA1 Vertical Display End 1 Bits [10:8]

IO Port / Index: 3X5.C2
Third LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Third Vertical Scaling Factor Bits [8:1]

IO Port / Index: 3X5.C3
Third LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	Reserved
2	RW	0	Third Vertical Scaling Factor Bit [0]
1:0	RW	0	Third Vertical Scaling Factor Bits [10:9]

IO Port / Index: 3X5.C4
Expected IGA1 Vertical Display End 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Expected IGA1 Vertical Display End 2 Bits [7:0]

IO Port / Index: 3X5.C5
Expected IGA1 Vertical Display End 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	Reserved
2:0	RW	0	Expected IGA1 Vertical Display End 2 Bits [10:8]

IO Port / Index: 3X5.C6
Fourth LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Fourth Vertical Scaling Factor Bits [8:1]

IO Port / Index: 3X5.C7
Fourth LCD Vertical Scaling Factor **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	Reserved
2	RW	0	Fourth Vertical Scaling Factor Bit [0]
1:0	RW	0	Fourth Vertical Scaling Factor Bits [10:9]

IO Port / Index: 3X5.C8
IGA2 Pack Circuit Target Base Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Pack Circuit Target Base Address 1 Bits [11:4]

IO Port / Index: 3X5.C9
IGA2 Pack Circuit Target Base Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Pack Circuit Target Base Address 1 Bits [19:12]

IO Port / Index: 3X5.CA
IGA2 Pack Circuit Target Base Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Pack Circuit Target Base Address 1 Bits [27:20]

IO Port / Index: 3X5.CB
IGA2 Pack Circuit Target Base Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:1	RO	0	Reseved
0	RW	0	Pack Circuit Target Base Address 1 Bit [28]

IO Port / Index: 3X5.D0
LVDS PLL Control Register **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D1
PLL Control Register **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D2
LVDS Control Register **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D3
Second Power Sequence Control Register 0 **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D4
Second Power Sequence Control Register 1 **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D5
LVDS Testing Mode Control Register **Default Value: 00h**
Refer to LVDS chapter for more details

IO Port / Index: 3X5.D6
DCVI Control Register 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**DCVI Data Testing Mode** 0: Disable 1: Enable
6	RW	0	**DCVI Format Selection** 0: 656 or 601 output 1: 20 bit output
5	RW	0	**DVCI Format Source Selection High Bit** 0: Reference Rx3X5.9B[4] 1: P2I mode
4	RO	0	**Reserved**
3	RW	0	**DCVI Output Format Selection** 0: Original 1: TV5 mode
2	RW	0	**DCVI Dither Enable**
1	RW	0	**DCVI Color Space Convert Enable**
0	RW	0	**DCVI Enable** 0: Off 1: On

IO Port / Index: 3X5.D7
DCVI Control Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:4	RO	0	**Reserved**
3	RW	0	**DCVI Output Field Polarity** 0: Original 1: Invert
2:0	RW	0	**DCVI Field Delay Lines After Vertical Blank Start**

IO Port / Index: 3X5.D9
Scaling Down Source Data Offset Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scaling Down Source Data Horizontal Offset Bits [7:0]** Unit: pixel (2P)

IO Port / Index: 3X5.DA
Scaling Down Source Data Offset Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Scaling Down Source Data Vertical Offset Bits [7:0]** Unit: pixel (2P)

IO Port / Index: 3X5.DB
Scaling Down Source Data Offset Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	0	**Reserved**
5:3	RW	0	**Scaling Down Source Data Vertical Offset Bits [10:8]** Unit : pixel (2P)
2:0	RW	0	**Scaling Down Source Data Horizontal Offset Bits [10:8]** Unit : pixel (2P)

IO Port / Index: 3X5.DC
Scaling Down Horizontal Scale Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Horizontal Scale Factor Bits [7:0]**

IO Port / Index: 3X5.DD
Scaling Down Horizontal Scale Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**DN Flip Select**
6	RW	0	**Horizontal Scale Down Enable** 0: Disable 1: Enable
5:0	RW	0	**Horizontal Scale Factor Bits [13:8]**

IO Port / Index: 3X5.DE
Scaling Down Vertical Scale Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Vertical Scale Factor Bits [7:0]**

IO Port / Index: 3X5.DF
Scaling Down Vertical Scale Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**Vertical Scale Down Enable** 0: Disable 1: Enable
5:0	RW	0	**Vertical Scale Factor Bits [13:8]**

IO Port / Index: 3X5.E0
Scaling Down Destination Frame Buffer Starting Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 0 Bits [10:3]**

IO Port / Index: 3X5.E1
Scaling Down Destination Frame Buffer Starting Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 0 Bits [18:11]**

IO Port / Index: 3X5.E2
Scaling Down Destination Frame Buffer Starting Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 0 Bits [26:19]**

IO Port / Index: 3X5.E3

Scaling Down Destination Frame Buffer Starting Address 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RW	0	**SCL_DOWN_R_FORMAT**
5:4	RW	0	**SW source Frame Buffer Stride Bits [9:8]**
3:2	RW	0	**Memory Location Tied to SL.**
1:0	RW	0	**Destination Frame Buffer Starting Address 0 Bits [28:27]**

IO Port / Index: 3X5.E4

Scaling Down SW Source Frame Buffer Stride **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**SW source Frame Buffer Stride Bits [7:0]** Unit: 16 bytes

IO Port / Index: 3X5.E5

Scaling Down Destination Frame Buffer Starting Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 1 Bits [10:3]**

IO Port / Index: 3X5.E6

Scaling Down Destination Frame Buffer Starting Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 1 Bits [18:11]**

IO Port / Index: 3X5.E7

Scaling Down Destination Frame Buffer Starting Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**Destination Frame Buffer Starting Address 1 Bits [26:19]**

IO Port / Index: 3X5.E8

Scaling Down Destination Frame Buffer Starting Address 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Which IGA Run Scaling Down** 0:IGA1 1:IGA2
6	RW	0	**Line Flip Enable** 0: Disable 1: Enable
5	RW	0	**Flip** IGA2 can start to get next frame
4	RW	0	**Scaling Down Enable** 0: Disable 1: Enable
3:2	RW	0	**Destination Frame Buffer Starting Address 2 Bits [28:27]**
1:0	RW	0	**Destination Frame Buffer Starting Address 1 Bits [28:27]**

IO Port / Index: 3X5.E9

Scaling Down Destination Frame Buffer Starting Address 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Destination Frame Buffer Starting Address 2 Bits [10:3]

IO Port / Index: 3X5.EA

Scaling Down Destination Frame Buffer Starting Address 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Destination Frame Buffer Starting Address 2 Bits [18:11]

IO Port / Index: 3X5.EB

Scaling Down Destination Frame Buffer Starting Address 2 **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Destination Frame Buffer Starting Address 2 Bits [26:19]

IO Port / Index: 3X5.EC

IGA1 Down Scaling Destination Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7:3	RO	0	Reserved
2	RW	0	IGA1 Down Scalar Line Flip
1	RW	0	IGA1 Down Scalar Flip
0	RW	0	IGA1 Down Scalar Enable

IO Port / Index: 3X5.F0

SNAPSHOT Mode – Starting Address of Display Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Snapshot Mode TVPK_SRC Bits [11:4]

IO Port / Index: 3X5.F1

SNAPSHOT Mode – Starting Address of Display Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Snapshot Mode TVPK_SRC Bits [19:12]

IO Port / Index: 3X5.F2

SNAPSHOT Mode – Starting Address of Display Data **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	Snapshot Mode TVPK_SRC Bits [27:20]

IO Port / Index: 3X5.F3
SNAPSHOT Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**For 18 bits TTL_LCD**
6	RW	0	**Snapshot Mode TVPK_SRC Bit [28]**
5	RW	0	**SW Set NM and GFX Entering Snapshot in C0 State** 0: Disable 1: Enable
4	RW	0	**Snapshot Mode** 0 : Mode 0 1 : Mode 1
3	RO	0	**Snapshot PLL Wakeup Setting** 0: Counter (2ms) 1: PLL_OK
2	RW	0	**Snapshot Mode Enable** 0: Disable 1: Enable GFX support Snapshot mode.
1	RW	0	**Enable GFX PLL Power Off When In Snapshot Mode** 0: Disable 1: Enable
0	RW	0	**The VSYNC and HSYNC of DAC0 are tied** 0: VSYNC and HSYNC are normal 1: Tied

IO Port / Index: 3X5.F4
SNAPSHOT Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:5	RW	0	**PK_HREQ_THD Bits [2:0]**
4:0	RW	0	**PK_REQ_THD Bits [4:0]**

IO Port / Index: 3X5.F5
SNAPSHOT Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**The VSYNC and HSYNC of DAC1 are tied** 0: VSYNC and HSYNC are normal 1: Tied
6:5	RW	0	**PK_HREQ_THD Bits [4:3]**
4:0	RW	0	**PK_EXPIR_NUM Bits [4:0]**

IO Port / Index: 3X5.F6
SNAPSHOT Mode Control **Default Value: 00h**

Bit	Attribute	Default	Description
7:0	RW	0	**The VSYNC Count While Engine is Idle and SW Enables Snapshot (G2N_SW_VIDLE_CNT)** In C0 state, the idle VSYNC count to disable the G2N_SW_SNAPSHOT_EN.

2D ENGINE REGISTER SPACE

This chapter provides 2D register summary table and detailed graphics engine register descriptions.

2D Engine Registers

These 2D engine register table documents the I/O port, I/O index and attribute ("Attribute") for each register. Attribute definitions being used are RW (Read/Write), RO (Read/Only) and and RW1C (Read / Write of "1" clears bit to zero). Registers indicated as RW may have some read/only bits that always read back a fixed value (usually 0 if unused); registers designated as RW1C may have some read-only or read write bits (see individual register descriptions for details). All default values are shown in hexadecimal unless otherwise indicated.

Please note that the actual address equals to MB1 (MMIO Base Address) + Offset Address. **MB1** is declared in the register with offset address 18h~1Fh in the PCI configuration space.

Table 9. Graphics Engine Registers

Offset	2D Engine Registers	Attribute
03-00	GE Command	RW
07-04	GE Mode and Status	RW
0B-08	Pitch & FB Location	RW
0F-0C	Destination Dimension	RW
13-10	BitBLT Destination Address	RW
17-14	Destination Map Base Address	RW
1B-18	BitBLT Source Address	RW
1F-1C	Source Map Base Address	RW
23-20	Pattern Address	RW
27-24	Mono Pattern Data Port 0 or Style line	RW
2B-28	Mono Pattern Data Port 1	RW
2F-2C	Error Term of Line Draw	RW
43-40	Clipping Window Top and Left Limit	RW
47-44	Clipping Window Bottom and Right Limit	RW
4B-48	Color Key and Chroma Key Control	RW
4F-4C	Foreground Color or Destination Color Key or Line Color or Rectangle Fill Color	RW
53-50	Background Color or Source Color key	RW
5B-58	Foreground Color of Pattern	RW
5F-5C	Background Color of Pattern	RW
60	3D / 2D ID Control	WO
6C	3D / 2D Wait Control	WO
6D-9F	Reserved	RO
1FC-100	Color Pattern RAM Port 0 – 63	WO

Note: Port Address: MB1 + Offset Address

Graphics Engine Register Descriptions

This section provides detailed register descriptions for the 2D graphics engine.

Offset Address: 03-00h

GE Command **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:24	RW	0	**Raster Operation Code (ROP code)**
23	RW	0	**Quick Start Enable** 0: Disable 1: Enable When enabled, a command will be kicked off when a command writes to register 10h, saving one command write instruction.
22	RW	0	**Pattern Keep** 0: Must get somewhere (bitmap pattern register or frame buffer) to pattern RAM. 1: Current pattern RAM (directly use pattern RAM data without filling it again).
21	RW	0	**Line Draws Major** 0: X major 1: Y major
20	RW	0	**Line Draw Last Pixel Turn On Disable** 0: Enable, draw the last pixel or not. 1: Disable, do not draw the last pixel.
19:18	RW	0	**Monochrome Data Next Line Alignment Type (if Alignments Enable)** 00: Byte 01: Reserved 10: Dword 11: Reserved
17	RW	0	**Monochrome Data Alignment Enable** 0: Disable 1: Enable
16	RW	0	**Monochrome Pattern Transparency Enable** 0: Opaque 1: Transparency
15	RW	0	**Destination X-Direction Select** 0: Increment 1: Decrement
14	RW	0	**Destination Y-Direction Select** 0: Increment 1: Decrement
13	RW	0	**Fix Color Pattern** 0: Normal 1: Fix Color
12	RW	0	**Clipping Enable** 0: Disable 1: Enable
11	RW	0	**Pattern Source Select** 0: Pattern from frame buffer. 1: Pattern from pattern register.
10	RW	0	**Monochrome Source Transparency Enable** 0: Opaque 1: Transparency
9	RW	0	**Pattern Data Format** 0: Color 1: Monochrome
8	RW	0	**Source Data Format** 0: Color 1: Monochrome
7	RO	0	**Reserved**
6	RW	0	**Source Select** 0: On-screen frame buffer 1: From host
5:4	RW	0	**Reserved**
3:0	RW	0000b	**GE Command Select** 0000: No operation. 0001: Bit BLT. 0010: Text (mono, ROP == CC). 0101: Bresenham line draw. 1001: Bitblt then rotate. 1010: Text (mono, ROP == CC) then rotate. Others: Reserved

Offset Address: 07-04h

GE Mode and Status **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:10	RO	0	**Reserved**
9:8	RW	0	**Destination Color Depth Select** 00: 8 bpp 01: 16 bpp 10: Reserved 11: 32 bpp
7:2	RO	0	**Reserved**
1:0	RW	00b	**Rotation Angle (Hardware: 90=270, diff. X/YDIR)** 00: Rotate 0 degree. 01: Rotate anticlockwise 90 degree. 10: Rotate anticlockwise 180 degree. 11: Rotate anticlockwise 270 degree.

Offset Address: 0B-08h

Pitch and FB Location **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:30	RW	00b	**Destination FB Location** 00: S.L. 01: S.F. 1x: Reserved
29:27	RO	0	**Reserved**
26:16	RW	0	**Destination Pitch; 64-bit Address (128 Bit Alignment).**
15:14	RW	00b	**Pattern FB Location** 00: S.L. 01: S.F. 1x: Reserved
13:12	RW	00b	**Source FB Location** 00: S.L. 01: S.F. 1x: Reserved
11	RO	0	**Reserved**
10:0	RW	0	**Source Pitch** 64-bit address (128-bit alignment).

Offset Address: 0F-0Ch

Destination Dimension **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:28	RO	0	**Reserved**
27:16	RW	0	These bits specify the destination rectangle height (value = height – 1) for the BitBLT operation.
15:12	RO	0	**Reserved**
11:0	RW	0	These bits specify the destination rectangle width (value = width – 1) for the BitBLT operation.

Offset Address: 13-10h

BitBLT Destination Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31	RW	0	**Destination Tile Add Control** 0: Normal 1: Tile
30:28	RO	0	**Reserved**
27:16	RW	0	**BitBILT Destination Address** For BitBLT, bit [27:16] specify the destination y-position.
15:12	RW	0	**Reserved**
11:0	RW	0	**BitBILT Destination Address** For BitBLT, bit [11:0] specify the destination x-position operation.

Offset Address: 17-14h

Destination Map Base Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:26	RO	0	**Reserved**
25:0	RW	0	**Destination Map Base Address** 64-bit address (128-bit alignment).

Offset Address: 1B-18h
BitBLT Source Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31	RW	0	**Source Tile Add Control** 0: Normal 1: Tile
30	RO	0	**Reserved**
29:16	RW	0	**BitBILT Source Address** These bits are used for three different commands: 1. For color or mono BitBLT, bit [27:16] specify the source y-position (XY based). 2. For line draw, bit [29:16] specify the axial step (K1 term of Bresenham line draw).
15:0	RW	0	**BitBILT Source Address** These bits are used for four different commands: 1. For color BitBLT, bit [11:0] specify the source x-position (XY based). 2. For mono BitBLT, bit [14:0] specify the source x-position. 3. For line draw, bit [13:0] specify the diagonal step (K2 term of Bresenham line draw).

Offset Address: 1F-1Ch
Source Map Base Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:26	RO	0	**Reserved**
25:0	RW	0	Source Base Address; 64-bit address (128 bit alignment).

Offset Address: 23-20h
Pattern Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:26	RW	0	**Pattern Offset** Bit [31:29]: Start line(Y) location (0~7) Bit [28:26]: 1. Pattern from frame buffer : Start location(X) in a line (0~7) 2. Pattern from frame host : Dest. start location(X) in a line (0~7)
25:0	RW	0	**Pattern Base Address** These bits are used for the following different purposes: For 8x8 pattern, bit [25:0] specify the 8x8 pattern address stored in the off-screen frame buffer, 64-bit address (128 bit alignment).

Offset Address: 27-24h
Mono Pattern Data Port 0 / Style Line **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	**Pattern 0**

Offset Address: 2B-28h
Mono Pattern Data Port 1 **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	**Pattern 1**

Offset Address: 2F-2Ch
Error Term of Line Draw **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:16	RW	0	**Error Term for Textured Line** The error term for textured line.
15:14	RO	0	**Reserved**
13:0	RW	0	**Error Term** The error term for line.

Offset Address: 3F-30h – Reserved

Offset Address: 43-40h
Clipping Window Top and Left Limit **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:28	RO	0	**Reserved**
27:16	RW	0	For clipping operation, these bits specify the top limit.
15:12	RO	0	**Reserved**
11:0	RW	0	For clipping operation, these bits specify the left limit.

Offset Address: 47-44h
Clipping Window Bottom and Right Limit **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:28	RO	0	**Reserved**
27:16	RW	0	For clipping operation, these bits specify the bottom limit.
15:12	RO	0	**Reserved**
11:0	RW	0	For clipping operation, these bits specify the right limit.

Offset Address: 4B-48h
Color Key and Chroma Key Control **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:28	RW	0	**The Byte Mask of 32 bpp in Rectangle Fill Mode.** 0: Write 1: Not write (mask)
27:16	RO	0	**Reserved**
15	RW	0	**Destination Key Select** 0: Disable 1: Enable
14	RW	0	**Source Key Select** 0: Disable 1: Enable
13	RW	0	**Key Type** 0: Write if same / match. 1: Write if diff / not match.
12:0	RO	0	**Reserved**

Offset Address: 4F-4Ch
Foreground Color or Destination Color Key or Line Color or Rectangle Fill Color **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	For each bpp mode, bits [bpp-1:0] specify foreground color or destination color key.

Offset Address: 53-50h
Background Color or Source Color Key or Chroma Key Upper Bound **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	For each bpp mode, bits [bpp-1:0] specify background color or source color key or chroma key upper bound.

Offset Address: 54-57h – Reserved

Offset Address: 5B-58h
Foreground Color of Pattern **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	**Foreground Color of Mono Pattern**

Offset Address: 5F-5Ch
Background color of Pattern **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	RW	0	**Background Color of Mono Pattern**

3D / 2D Control Registers (60-6Ch)

Offset Address: 60h

3D / 2D ID Control - *Refer to 3D Chapter's "CR Registers in 2D Register Space" for more details*

Offset Address: 6Ch

3D / 2D Wait Control - *Refer to 3D Chapter's "CR Registers in 2D Register Space" for more details*

Offset Address: 9F-6Dh – Reserved

Offset Address: 1FC-100h

Color Pattern RAM Port 0 – 63 **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:0	WO	0	**Color Pattern Data**

DMA REGISTERS

This chapter provides detailed DMA register summary table and register descriptions are followed in the sequent section.

DMA Registers

These DMA register tables document the I/O port, I/O index and attribute ("Attribute") for each register. Attribute definitions being used are RW (Read/Write), RO (Read/Only) and RWC (or just WC) (Read / Write 1's to Clear individual bits). Registers indicated as RW may have some read/only bits that always read back a fixed value (usually 0 if unused); registers designated as RWC or WC may have some read-only or read write bits (see individual register descriptions for details). All offset and default values are shown in hexadecimal unless otherwise indicated.

Table 10. DMA Controller Operation Registers

Offset	DMA Controller Operation Registers	Attribute
03-00	Channel 0 Mode (MR0)	RW
07-04	Channel 0 Command / Status (CSR0)	RW
0B-08	Channel 1 Mode (MR1)	RW
0F-0C	Channel 1 Command / Status (CSR1)	RW
13-10	Channel 2 Mode (MR2)	RW
17-14	Channel 2 Command / Status (CSR2)	RW
1B-18	Channel 3 Mode (MR3)	RW
1F-1C	Channel 3 Command / Status (CSR3)	RW
23-20	Memory Address Low Register of Channel 0 (MARL0)	RW
27-24	Memory Address High Register of Channel 0 (MARH0)	RW
2B-28	Channel 0 Device Address (DAR0)	RW
2F-2C	Double Quad-Word Count Register of Channel 0 (DQWCR0)	RW
33-30	Tile Mode Register of Channel 0 (TMR0)	RW
37-34	Descriptor Pointer Low Register of Channel 0 (DPRL0)	RW
3B-38	Descriptor Pointer High Register of Channel 0 (DPRH0)	RW
43-40	Memory Address Low Register of Channel 1 (MARL1)	RW
47-44	Memory Address High Register of Channel 1 (MARH1)	RW
4B-48	Channel 1 Device Address (DAR1)	RW
4F-4C	Double Quad-Word Count Register of Channel 1 (DQWCR1)	RW
53-50	Tile Mode Register of Channel 1 (TMR1)	RW
57-54	Descriptor Pointer Low Register of Channel 1 (DPRL1)	RW
5B-58	Descriptor Pointer High Register of Channel 1 (DPRH1)	RW
63-60	Memory Address Low Register of Channel 2 (MARL2)	RW
67-64	Memory Address High Register of Channel 2 (MARH2)	RW
6B-68	Device Address Register of Channel 2 (DAR2)	RW
6F-6C	Double Quad-Word Count Register of Channel 2 (DQWCR2)	RW
73-70	Tile Mode Register of Channel 2 (TMR2)	RW
77-74	Descriptor Pointer Low Register of Channel 2 (DPRL2)	RW
7B-78	Descriptor Pointer High Register of Channel 2 (DPRH2)	RW
83-80	Memory Address Low Register of Channel 3 (MARL3)	RW
87-84	Memory Address High Register of Channel 3 (MARH3)	RW
8B-88	Channel 3 Device Address (DAR3)	RW
8F-8C	Double Quad-Word Count Register of Channel 3 (DQWCR3)	RW
93-90	Tile Mode Register of Channel 3 (TMR3)	RW
97-94	Descriptor Pointer Low Register of Channel 3 (DPRL3)	RW
9B-98	Descriptor Pointer High Register of Channel 3 (DPRH3)	RW

Note: 1. The offset address for all registers is 0x0E00 and these registers can be re-allocated by changing the base address registers.

2. R/W Attribute Definition

RO	**Read Only**	If a register is read only, write to this register will have no effect.
R/W	**Read / Write**	A register with this attribute can be read and written.
R/WC	**Read / Write**	A register bit with this attribute can be read and written. However, a write of 1 clears the corresponding bit and a write of 0 has no effects.

3. DMA Controller Access Attribute Abbreviation List

Note 1 Bits 0 – 1 in the register are read/write. Other bits are read only.
Note 2 Bits 0 – 2 in the register are read/write. Bit 3 is read/write clear. Other bits are read only.
Note 3 Bits 4 – 31 in the register are read/write. Other bits are read only.
Note 4 Bits 0 – 11 in the register are read/write. Other bits are read only.
Note 5 Bits 4 – 28 and bits 30 – 31 in the register are read/write. Other bits are read only.
Note 6 Bits 0 – 24 in the register are read/write. Other bits are read only.
Note 7 Bits 0 – 7 and bits 16 – 27 and bit 31 in the register are read/write. Other bits are read only.
Note 8 Bit 1 and bits 3 – 31 in the register are read/write. Other bits are read only.

Table 11. DMA Controller Operation Registers

Register Name	Channel 0		Channel 1		Channel 2		Channel 3	
	Offset	Register	Offset	Register	Offset	Register	Offset	Register
MRn: Channel n Mode	03-00	MR0	0B-08	MR1	13-10	MR2	1B-18	MR3
CSRn: Channel n Command / Status	07-04	CSR0	0F-0C	CSR1	17-14	CSR2	1F-1C	CSR3
MARLn: Memory Address Low Register of Channel n	23-20	MARL0	43-40	MARL1	63-60	MARL2	83-80	MARL3
MARHn: Memory Address High Register of Channel n	27-24	MARH0	47-44	MARH1	67-64	MARH2	87-84	MARH3
DARn: Channel n Device Address	2B-28	DAR0	4B-48	DAR1	6B-68	DAR2	8B-88	DAR3
DQWCRn: Double Quad-Word Count Register of Channel n	2F-2C	DQWCR0	4F-4C	DQWCR1	6F-6C	DQWCR2	8F-8C	DQWCR3
TMRn: Tile Mode Register of Channel n	33-30	TMR0	53-50	TMR1	73-70	TMR2	93-90	TMR3
DPRLn: Descriptor Pointer Low Register of Channel n	37-34	DPRL0	57-54	DPRL1	77-74	DPRL2	97-94	DPRL3
DPRHn: Descriptor Pointer High Register of Channel n	3B-38	DPRH0	5B-58	DPRH1	7B-78	DPRH2	9B-98	DPRH3

DMA Operation Registers Description

Following registers are the DMA Operation registers used to control the operation of the DMA controller. Address space mentioned in the following registers (expect MAR) is PCI address space.

Mode Register (MRn)

Offset Address: {MR0 = 0x00, MR1 = 0x08, MR2 = 0x10, MR3 = 0x18} **Attribute: RW**

Bit	Attribute	Default	Description
31:2	RO	0	**Reserved**
1	RW	0	**Transfer Done Interrupt Enable (TDIE)** A value of 1 enables the interrupt to be generated when transfer is done.
0	RW	0	**Chaining Mode (CM)** A value of 1 causes the DMA controller to operate in chaining mode.

Command/ /Status Register (CSRn)

Offset Address: {CSR0 = 0x04, CSR1 = 0x0C, CSR2 = 0x14, CSR3 = 0x1C} **Attribute: RW**

Bit	Attribute	Default	Description
31:4	RO	0	**Reserved**
3	RWC	0	**Transfer Done (TD)** A value of 1 indicates that the transfer of this channel is complete. Writing a 1 will clear this bit and the interrupt due to this event when TDIE is set to 1. This field can ONLY be written from CBU path.
2	RW	0	**Transfer Abort (TA)** Writing a 1 to this bit causes the channel to abort the current transfer. This channel transfer done bit is set when the abort is complete. Reading this bit always gets 0. This field can ONLY be written from CBU path.
1	RW	0	**Transfer Start (TS)** Writing 1 to this bit causes the channel to start transferring data if the channel is enabled. Reading this bit always gets 0.
0	RW	0	**DMA Enable (DE)** A value of 1 enables this DMA channel.

Low 28 Bit Register (MARLn)

Offset Address: {MARL0 = 0x20, MARL1 = 0x40, MARL2 = 0x60, MARL3 = 0x80} **Attribute: RW**

Bit	Attribute	Default	Description
31:4	RW	0	**Memory Address Lower 28 bit (MAL)** This field indicates the starting memory address (lower 28 bits) of a DMA transfer. The unit is 128-bit.
3:0	RO	0	**Reserved**

High 12 Bit Register (MARHn)

Offset Address: {MARH0 = 0x24, MARH1 = 0x44, MARH2 = 0x64, MARH3 = 0x84} **Attribute: RW**

Bit	Attribute	Default	Description
31:12	RO	0	**Reserved**
11:0	RW	0	**Memory Address Higher 12 bit (MAH)** This field indicates the starting memory address (higher 13 bits) of a DMA transfer. The unit is byte.

Device Address Register (DARn)

Offset Address: {DAR0 = 0x28, DAR1 = 0x48, DAR2 = 0x68, DAR3 = 0x88} **Attribute: RW**

Bit	Attribute	Default	Description
31:30	R/W	0	**Device Addressing Type (DAT)** This field indicates the memory translation type of the starting device address of a DMA transfer. 0x0: System Local Frame Buffer (SL) 0x1: System Dynamic Frame Buffer (SF) 0x2: Reserved, do not use. 0x3: Local Memory / Local Frame Buffer (LL)
29	RO	0	**Reserved**
28:4	R/W	0	**Device Address (DA)** This field indicates the starting device address of a DMA transfer. In the Tile Mode transfer, this filed must point to the starting address of memory tile.
3:0	RO	0	**Reserved**

Double Quad-word Count Register(DQWCRn)

Offset Address: {DQWCR0 = 0x2C, DQWCR1 = 0x4C, DQWCR2 = 0x6C, DQWCR3 = 0x8C} **Attribute: RW**

Bit	Attribute	Default	Description
31:25	RO	0	**Reserved**
24:0	RW	0	**Double Quad-Word Count (DQWC)** This field indicates the number of 16-byte count, to be transferred during a DMA transfer. It will be cleared when the transfer is done by hardware.

Tile Mode Register (TMRn)

Offset Address: {TMR0 = 0x30, TMR1 = 0x50, TMR2 = 0x70, TMR3 = 0x90} **Attribute: RW**

Bit	Attribute	Default	Description
31	RW	0	**Tile Mode Enable (TME)** A value of 1 enables tile mode memory mapping for the coming device memory transfer.
30:28	RO	0	**Reserved**
27:24	RW	0	**Tile Mode Index (TMI)** This field indicates the starting location of the current tile for the current transfer descriptor. It will be cleared when the transfer is done by hardware. This filed is used ONLY in the tile mode, otherwise this field is reserved.
23:16	RW	0	**Tile Mode Pitch Count (TMPC)** This field indicates the pitch count for the tile mode transfer. A value of 8'h00 indicates the maximum pitch count, 256. This filed is used ONLY in the tile mode.
15:8	RO	0	**Reserved**
7:0	RW	0	**Tile Mode Horizontal Tile Index (TMHTI)** This field indicates the horizontal tile index for the tile mode transfer. This filed is used ONLY in the tile mode.

Low 32 Bit Register (DPRLn)

Offset Address: {DPRL0 = 0x34, DPRL1 = 0x54, DPRL2 = 0x74, DPRL3 = 0x94} **Attribute: RW**

Bit	Attribute	Default	Description
31:4	RW	0	**Next Descriptor Address Lower 28 bits (NDAL)** This field indicates the lower 28 bits of the double quad-word aligned address of the next descriptor.
3	RW	0	**Direction of Transfer (DT)** A value of 1 indicates transfers from Memory to PCI Device. A value of 0 indicates transfers from PCI Device to Memory.
2	RO	0	**Reserved**
1	RW	0	**End of Chain (EC)** A value of 1 indicates the end of chain.
0	RO	0	**Reserved**

High 12 Bit Register (DPRHn)

Offset Address: {DPRH0 = 0x38, DPRH1 = 0x58, DPRH2 = 0x78, DPRH3 = 0x98} **Attribute: RW**

Bit	Attribute	Default	Description
31:12	RO	0	**Reserved**
11:0	RW	0	**Next Descriptor Address Higher 12 bits (NDAH)** This field indicates the higher 12 bits of the double quad-word aligned address of the next descriptor.

CBU ROTATION REGISTERS

This chapter provides detailed CBU register summary table and detailed register descriptions are followed in the sequent sections.

CBU Registers

These CBU Rotation register tables document the I/O port, I/O index and attribute ("Attribute") for each register. Attribute definitions being used are RW (Read/Write), RO (Read/Only) and RWC (or just WC) (Read / Write 1's to Clear individual bits). Registers indicated as RW may have some read/only bits that always read back a fixed value (usually 0 if unused); registers designated as RWC or WC may have some read-only or read write bits (see individual register descriptions for details). All offset and default values are shown in hexadecimal unless otherwise indicated.

Table 12. CBU Rotation Function Registers

Offset	CDMA Controller Operation Registers	Attribute
1E1C-1E00	Rotate Window Register 0	RW
1E3C-1E20	Rotate Window Register 1	RW
1E5C-1E40	Rotate Window Register 2	RW
1E7C-1E60	Rotate Window Register 3	RW
1E9C-1E80	Rotate Window Register 4	RW
1EBC-1EA0	Rotate Window Register 5	RW
1EDC-1EC0	Rotate Window Register 6	RW
1EFC-1EE0	Rotate Window Register 7	RW
1F1C-1F00	Rotate Window Register 8	RW
1F3C-1F20	Rotate Window Register 9	RW
1F5C-1F40	Rotate Window Register 10	RW
1F7C-1F60	Rotate Window Register 11	RW
1F9C-1F80	Rotate Window Register 12	RW
1FBC-1FA0	Rotate Window Register 13	RW
1FDC-1FC0	Rotate Window Register 14	RW
1FFC-1FE0	Rotate Window Register 15	RW

Note: Rotation Base Address[28:16], Rotation End Address[28:16] and Rotation Source Pitch[21:0] are write-only. Read these bits always get 0.

CBU Rotation Registers Description

There are 16 Rotate Window Registers, ranging from Rotate Window Register 0 to Rotate Window Register 15. The table below specifies the standard structure of each Rotate Window Register.

Offset	CDMA Controller Operation Registers	Attribute
03h-00h	Rotate Control 0	RW
07h-04h	Rotate Base Address 0	RW
0Bh-08h	Rotate End Address 0	RW
0Fh-0Ch	Rotate Source Pitch 1 0	RW
13h-10h	Rotate Pitch 0	RW
17h-14h	Rotate Height and Width 0	RW
1Ch-18h	Reserved	RW

Offset Address: Rotate Window Register Address + (03h-00h)

Rotate Control **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:8	RO	0	**Reserved**
7	RW	0	**Tile Mapping Mode Select** When this bit is set to 1 and bit 6 (Rotate function with tile) is set to 0, 16 x 256 tile mapping mode is used to translate linear address to tiling address. 0: 8 x 256 tile mapping mode 1: 16 x 256 tile mapping mode
6	RW	0	**Rotate Function with Tile** When this bit is set to 1, translated linear address to tiling address within rotation mode is supported.
5	RW	0	**Tile Function Flag** When Rotate Function Enable is set to 1, this bit shows the function which is supported. 0: Rotate function 1: Tile function
4:3	RW	00b	**Rotate Type** 00: No support 01: 90 degrees 10: 180 degrees 11: 270 degrees
2:1	RW	00b	**Rotate Bpp** 00: 8 bpp 01: 16 bpp 1x: 32 bpp
0	RW	0	**Rotate Function Enable** 0: Disable 1: Enable

Offset Address: Rotate Window Register Address + (07h-04h)

Rotate Base Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:29	RO	0	**Reserved**
28:0	RW	0	**Rotate Base Address [28:0]** Bit [1:0] are read only. Unit: byte

Offset Address: Rotate Window Register Address + (0Bh-08h)

Rotate End Address **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:29	RO	0	**Reserved**
28:0	RW	0	**Rotate End Address [28:0]** Bit [1:0] are read only. Unit: byte

Offset Address: Rotate Window Register Address + (0Fh-0Ch)

Rotate Source Pitch 1 **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:22	RO	0	**Reserved**
21:0	RW	0	**Rotate Source Pitch Reciprocal** 22 bits (1/source pitch, source pitch unit: pixel) (1/sp = 0.x, for example, Source pitch = 256 d, x = 004000h)

Offset Address: Rotate Window Register Address + (13h-10h)

Rotate Pitch **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:27	RO	0	**Reserved**
26:16	RW	0	**Rotate Destination Pitch** Unit: pixel Scope: 1 ~ 2047
15:11	RO	0	**Reserved**
10:0	RW	0	**Rotate Source Pitch** Unit: pixel Scope: 1 ~ 2047

Offset Address: Rotate Window Register Address + (17h-14h)

Rotate Height and Width **Default Value: 0000 0000h**

Bit	Attribute	Default	Description
31:27	RO	0	**Reserved**
26:16	RW	0	**Rotate Window Height** Unit: pixel Scope: 1 ~ 2047
15:11	RO	0	**Reserved**
10:0	RW	0	**Rotate Window Width** Unit: pixel Scope: 1 ~ 2047

LVDS REGISTERS

This chapter provides detailed LVDS register descriptions.

IO Port / Index: 3C5.13 [7:6]
Configuration Register 2 (3C5.5A[0]=1) **Default Value: 00h**

Bit	Attribute	Default	Description
7:6	RO	00b	**Integrated LVDS Mode Select (Reflects strapping from signal DVP1D15/14)** 00: LVDS1 + LVDS2 01: Reserved 10: One Dual LVDS Channel (High Resolution Pannel) 11: Reserved

IO Port / Index: 3C5.2B [7:4]
LVDS Interrupt Control **Default Value: 00h**

Bit	Attribute	Default	Description
5	RW	0	**LVDS Sense Interrupt Enable** 0: Disable 1: Enable
4	RW1C	0	**LVDS Sense Interrupt Status**

IO Port / Index: 3C5.3E
Miscellaneous Register for AGP Mux **Default Value: 00h**

Bit	Attribute	Default	Description
3	RW	0	**PCIe Capability Control Back Door** 0: Capability = 00h 1: Capability = 70h
1	RW	0	**Multi-function Selection** 0: Emulate I2C and DDC Bus by GPIO2/3/4 1: Direct ENPVDD/ ENPVEE / ENBLT signals through AGP Bus
0	RW	0	**Second DVIDET Sense Signal Source** 0: From LVDS Channel 2 1: From DVP1

IO Port / Index: 3C5.40 [3]
PLL Control **Default Value: 00h**

Bit	Attribute	Default	Description
3	RW	0	**LVDS Interrupt Method** 0: New method (bypass and low active) 1: Old method

IO Port / Index: 3C5.5B [3:0]
Device Used Status 0 **Default Value: 00h**

Bit	Attribute	Default	Description
3	RO	0	**LVDS0 Used IGA1 Source Flag** 0: No use 1: Use
2	RO	0	**LVDS0 Used IGA2 Source Flag** 0: No use 1: Use
1	RO	0	**LVDS1 Used IGA1 Source Flag** 0: No use 1: Use
0	RO	0	**LVDS1 Used IGA2 Source Flag** 0: No use 1: Use

IO Port / Index: 3C5.78 [6:3]
Backlight Control 3 **Default Value: 00h**

Bit	Attribute	Default	Description
6	RW	0	**Inverse IGA2 HSYNC to LVDS**
5	RW	0	**Inverse IGA2 VSYNC to LVDS**
4	RW	0	**Inverse IGA1 HSYNC to LVDS**
3	RW	0	**Inverse IGA1 VSYNC to LVDS**

IO Port / Index: 3X5.6A [3]
Second Display Channel and LCD Enable **Default Value: 00h**

Bit	Attribute	Default	Description
3	RW	0	**First Hardware Power Sequence** 0: Off 1: On

IO Port / Index: 3X5.88
LCD Panel Type **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**LVDS First Channel 1 Output Format** 0: Rotation 1: Sequential
5	RW	0	**Flip Strategy** 0: By Frame 1: By Line
4:1	RO	0	**Reserved**
0	RW	0	**LVDS Second Channel 1 Output Bits** 0: 24 bits 1: 18 bits

IO Port / Index: 3X5.97
LVDS Channel 2 Function Select 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RO	0	**Reserved**
6	RW	0	**LVDS Channel 2 VSYNC Polarity** 0: Positive 1: Negative
5	RW	0	**LVDS Channel 2 VSYNC Polarity** 0: Positive 1: Negative
4	RW	0	**LVDS Channel 2 Data Source Selection** 0: Primary Display 1: Secondary Display
3:0	RO	0	**Reserved**

IO Port / Index: 3X5.98
LVDS Channel 2 Function Select 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**LVDS Channel 2 DE Mask to Zero Enable**
6:4	RW	0	**12-bit Output Format Rotation** 000:R G B 001:R B G 010:G R B 011:G B R 100:B R G 101:B G R Others: R G B
3:0	RO	0	**Reserved**

IO Port / Index: 3X5.99

LVDS Channel 1 Function Select 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**LVDS Channel 2 VSYNC Mask to Zero Enable**
6	RW	0	**LVDS Channel 1 VSYNC Polarity** 0: Positive 1: Negative
5	RW	0	**LVDS Channel 1 HSYNC Polarity** 0: Positive 1: Negative
4	RW	0	**LVDS Channel 1 Data Source Selection** 0: Primary Display 1: Secondary Display
3:0	RO	0	**Reserved**

IO Port / Index: 3X5.9A

LVDS Channel 1 Function Select 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**LVDS Channel 1 DE Mask to Zero Enable**
6	RW	0	**LVDS Channel 1 VSYNC Mask to Zero Enable**
5	RW	0	**LVDS Channel 1 HSYNC Mask to Zero Enable**
4	RW	0	**LVDS Channel 2 HSYNC Mask to Zero Enable**
3:0	RO	0	**Reserved**

IO Port / Index: 3X5.D0

LVDS PLL Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**PLL1 Reference Clock Edge Select Bit** 0: PLLCK lock to rising edge of reference clock 1: PLLCK lock to falling edge of reference clock
6:5	RW	0	**PLL1 Charge Pump Current Set Bits** 00: ICH = 12.5 uA 01: ICH = 25.0 uA 10: ICH = 37.5 uA 11: ICH = 50.0 uA
4:3	RO	0	**Reserved**
2:0	RW	0	**PLL1 Output Clock (PLLCK) Delay Select Bits** 000: T_{DLY} = 0.82 nS 001: T_{DLY} = 0.1T + 0.82 nS 010: T_{DLY} = 0.2T + 0.82 nS 011: T_{DLY} = 0.3T + 0.82 nS 100: T_{DLY} = 0.4T + 0.82 nS

IO Port / Index: 3X5.D1

PLL Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**PLL2 Reference Clock Edge Select Bit** 0: PLLCK lock to rising edge of reference clock 1: PLLCK lock to falling edge of reference clock
6:5	RW	0	**PLL2 Charge Pump Current Set Bits** 00: ICH = 12.5 uA 01: ICH = 25.0 uA 10: ICH = 37.5 uA 11: ICH = 50.0 uA
4:1	RO	0	**Reserved**
0	RW	0	**PLL2 Control Voltage Measurement Enable Bit**

IO Port / Index: 3X5.D2

LVDS Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Power Down (Active High) for Channel 1 LVDS**
6	RW	0	**Power Down (Active High) for Channel 2 LVDS**
5:4	RW	0	**Display Channel Select** 00: LVDS1 Channel + LVDS2 Channel 01: Reserved 10: One Dual LVDS Channel (High Resolution Pannel) 11: Reserved
3:2	RO	0	**Reserved**
1	RW	0	**LVDS Channel 1 Format Selection** 0: SPWG Mode 1: OPENLDI Mode
0	RW	0	**LVDS Channel 2 Format Selection** 0: SPWG Mode 1: OPENLDI Mode

IO Port / Index: 3X5.D3

Second Power Sequence Control Register 0 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**Software Direct On / Off Display Period in the Panel Path** 0: On 1: Off
6	RW	0	**Software On / Off Back Light Directly** 0: On 1: Off
5	RW	0	**Software Direct On / Off Display Period on DVP1 Port** 0: On 1: Off
4	RW	0	**Software VDD On**
3	RW	0	**Software Data On**
2	RW	0	**Software VEE On**
1	RW	0	**Software Back Light On**
0	RW	0	**Hardware or Software Control Power Sequence** 1: Software Control

IO Port / Index: 3X5.D4

Second Power Sequence Control Register 1 **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**LVDS Second Channel2 Output Format** 0: Rotation 1: Sequential
6	RW	0	**LVDS Second Channel2 Output Bits** 0: 24 bits 1: 18 bits
5:2	RO	0	**Reserved**
1	RW	0	**Secondary Power Hardware Power Sequence Enable** 0: Off 1: On
0	RW	0	**Power Sequence Timer Selection** 0: First 1: Second

IO Port / Index: 3X5.D5

LVDS Testing Mode Control Register **Default Value: 00h**

Bit	Attribute	Default	Description
7	RW	0	**PD1 Enable Selection** 0: Select by register 1: Select by power flag
6	RW	0	**PD2 Enable Selection** 0: Select by register 1: Select by power flag
5:3	RO	0	**Reserved**
2	RW	0	**LVDS Testing Mode Enable**
1:0	RW	0	**LVDS Testing Format Selection** 00: Always 0 01: Always 1 1x: 0,1 toggle