Data Sheet

CX700 Series

Advanced All-in-One System Processor

Revision 2.1
April 3, 2007

VIA TECHNOLOGIES, INC.

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Offices:

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

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

REVISION HISTORY

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1.01	8/25/06	Initial public release	JW/TC
1.02	9/22/06	updated revision number to 1.02 updated release info style and inserted bookmark updated style under trademark notice to be consistent revised SDRAM ECC information in product features revised Macrovision information in product features removed C4 state from Power Management description changed signal name MA[13:0] to MA[12:0] removed C/Y/Y from CRT/TV Monitor Interface table removed extra GPIO Interface signal register table added note under Power On Sequence and Reset Signal timing diagram removed CPU C4 Sequence timing diagram and table	JW/TC
2.0	2/2/07	Removed S3 logos and related descriptions Updated legal page Removed Windows NT/98/2000/ME descriptions in Product Features and System Overview Removed LVDS/DVI interface and CRT/TV Monitor interface descriptions in Signal Descriptions Section Updated signal descriptions of USBOC[5:0]# and AZSDIN[1:0] Updated IO attribute of SERIRQ Updated Table 4. Absolute Maximum Ratings and Table 5. DC Characteristics Updated Power Sequence Section: 1. Power on sequence and reset signal timing 2. Suspend to RAM(S3) and resume sequence 3. Suspend to DISK and resume sequence	SY
2.1	4/3/07	Updated product features of FSB, Macrovision, LVDS transmitter and ACPI C4 state in sophisticated power management Updated Signal Ball List Updated ball# of HREQ[2:0]# in CPU interface signal description tables Modified the note numbers in the tables under Figure 6 and 7	SY

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CX700 SERIES

ALL-IN-ONE SYSTEM PROCESSOR

800 / 533 / 400 MHz FSB VIA C7 Processor
DDR2 533 / 400, DDR400 / 333 SDRAM Controller
Integrated UniChrome Pro II 3D / 2D Graphics & Video Processor
Unified Video Decoding Accelerator
Integrated HDTV Encoder and LVDS / DVI Transmitter
High Definition Audio Controller
Two Serial ATA Ports
One UltraDMA-133 EIDE Channel
Six USB 2.0 / 1.1 Ports
PCI 32-bit 33MHz Bus
Two RS-232 Serial Ports
RTC and LPC, SMBus
ACPI and Sophisticated Power Management

PRODUCT FEATURES

- **Process Technology and Package**
  - 0.15um, 1.5V core voltage
  - 37.5mm x 37.5mm Flip Chip BGA
- **CPU Interface**
  - Supports 800 / 533 / 400 MHz FSB VIA C7 processor
  - Supports 533 / 400 MHz FSB VIA C7 processor (Revision A3)
- **Memory System**
  - Supports DDR2 and DDR SDRAM
    - DDR2 Mode
      - Supports DDR2 533 / 400 SDRAM
      - Supports 64Mb / 128Mb / 256Mb / 512Mb (x8 / x16 / x32)
      - Supports 1Gb (x16)
      - Supports CL 2 / 3 / 4 / 5
      - Supports ECC under the following conditions:
        - DDR2 400 SDRAM
        - DRAM burst length of 4
        - No ECC error correction in the frame buffer space
    - DDR Mode
      - Supports DDR 400 / 333 SDRAM
      - Supports 64Mb / 128Mb / 256Mb / 512Mb / 1024Mb (x8 / x16 / x32)
      - Supports CL 2 / 2.5 for DDR 333, CL 2.5 / 3 for DDR 400
      - Supports ECC under the following conditions:
        - DRAM burst length of 4
        - No ECC error correction in the frame buffer space
  - Supports 1 or 2 unbuffered or register double-sided DIMMs with different clock buffering scheme
  - Supports 64/32-bit data width

- **Integrated 3D / 2D / Video Processors**
  - Optimized Unified Memory Architecture (UMA)
  - Supports 32 / 64 / 128 MB Frame Buffer sizes
  - 200 MHz Graphics Engine Clock

2D Graphics Processor

- 128-bit 2D graphics engine
- Hardware 2D rotation
- Supports ROP3, 256 operations
- Supports 8bpp, 15/16bpp and 32bpp color depth modes
- BitBLT (Bit BLock Transfer) functions including alpha BLTs
- True-color hardware cursor (64x64x32bpp) with 256-level blending effect
- Color expansion, source Color Key and destination Color Key
- Bresenham line drawing / style line function
- Transparency mode
- Window clipping
- Text function

3D Graphics Processor

3D Graphics Processor

- 128-bit 3D graphics engine
- Dual pixel rendering pipelines and dual texture units
- Floating-point setup engine
- Internal full 32-bit ARGB format for high rendering quality
- 8K Texture Cache

Capability

- Supports ROP2
- Supports various texture formats including 16/32bpp ARGB, 8bpp Palletized (ARGB), YUV 422/420 and compressed texture (DXTC)
- Texture sizes up to 2048x2048 with Microsoft DirectX texture compression
- High quality texture filter for Nearest, Linear, Bi-linear, Tri-linear and Anisotropic modes
- Flat and Gouraud shading
- Vertex Fog and Fog Table
- Z-Bias, LOD-Bias, Polygon offset, Edge Anti-aliasing and Alpha Blending
- Bump mapping and cubic mapping
- Hardware back-face culling
- Specular lighting

Performance

- Two textures per pass
- Triangle rate up to 4.5 million triangles per second
- Pixel rate up to 200 million pixels per second per texture
- Texel bilinear fill rate up to 400 million texels per second
- High quality dithering

Hi-Def Video Processor

High Quality Video Processor

- RGB555, RGB565, RGB8888 and YUV422 video playback formats
- High quality 5-tap horizontal and 5-tap vertical scaler for both horizontal and vertical scaling (linear interpolation for horizontal and vertical p-scaling and filtering for horizontal and vertical down-scaling)
- Independent graphics and video gamma tables
- 2 sets of Color and Chroma Key support
- Color enhancement for contrast, hue, saturation and brightness
- YUV-to-RGB color space conversion
- Display rotation in clockwise and counter-clockwise directions
- Bob, Weave, Median-filter and Adaptive de-interlacing modes
- 3:2 / 2:2 pull-down detection
- De-blocking mode support
- Combining of many special effects such as filter, scaling up or down, sub-picture blending, de-interlacing and deblocking to one pass process
- Tear-free double / triple buffer flipping
- Input video vertical blanking or line interrupt
- Video gamma correction

Video Overlay Engine

- Simultaneous graphics and TV video playback overlay
- Supports video window overlays
- Supports Microsoft VMR™ Through Front-End Video Scaling, Color Space Conversion and Blending
- Supports both YUV and RGB format Chroma Key
- Supports 16 operations for Color and Chroma Key
- Hardware sub-picture blending

Video Capture Capability

- Dual Transport Stream inputs or dual 8-bit or one 16-bit CCIR656/601input
- Video capture and playback tear free auto flipping
- External Hsync / Vsync support

- **External Display Support**

CRT / HDTV (CX700M/CX700M2) Display Interface

- 30-bit true-color RAMDAC up to 350 MHz pixel rate with gamma correction capability
- Supports RGB / YPbPr (CX700M/CX700M2) / CompYC (CX700M/CX700M2)
- Supports CRT resolutions up to 1920x1440
- Supports TV resolutions up to 1920x1080i (CX700M/CX700M2)
- Supports Macrovision copy protection (CX700M2), CGMS/A and CC

LVDS Panel Interface

- Support panel resolution from VGA through UXGA (1600 x 1200)
- Supports 1 x Dual-Channel / 2 x Single-Channel LVDS panel

DVI Panel Interface

- Supports panel resolution from VGA through UXGA (1600 x 1200)
- Supports 1 x Single-Channel DVI panel

LVDS + DVI Panel Interfaces

- Supports one Single-Channel LVDS + one Single-Channel DVI panels

TV-Out Interface (DVP1)

- 12-bit interface to external TV encoder for NTSC or PAL TV or HDTV display
- Optional 20-bit interface to external TV encoder
- Supports simultaneous SDTV and HDTV display output with the integrated HDTV encoder. (CX700M/CX700M2)

12-bit DVI Transmitter Interface (DVP1)

- Double-data-rate data transfer with clock rates up to 165 MHz
- Built-in digital phase adjuster to fine-tune signal timing between clock and data bus
- Optional 16-bit ARGB interface (DVP1)

- **DuoView+™ Dual Image Capability**
  - WinXP multi-monitor, extended desktop support
  - Two independent display engines which can display completely different information at different resolutions, pixel depths, and refresh rates
  - CRT, LVDS/DVI panel and TV refresh rates are independently programmable for optimum image quality
  - Improved display flexibility with simultaneous CRT / LVDS (or DVI), TV / LVDS (or DVI), TV / HDTV and other combined operations

- **Full Software Support**
  - Microsoft DirectX 7.0, 8.0 and 9.0 compatible
  - Microsoft DirectX Texture Compression (DXTC / S3TC)
  - Supports OpenGL™
  - Drivers for major operating systems and APIs: Windows XP, Direct3D™, DirectDraw™, DirectShow™ and OpenGL™ ICD for Windows XP

- **Graphics Power Management Support**
  - Built-in reference voltage generator and monitor sense circuits
  - Automatic panel power sequencing and VESA DPMS (Display Power Management Signaling) CRT power-down
  - External I/O signal controls enabling of graphics accelerator into standby / suspend-off state
  - Dynamic clock gating for inactive functions to achieve maximum power saving
  - I^2C Serial Bus and DDC / E-DDC Monitor Communications for Plug-and-Play configuration

- **Unified Video Decoding Accelerator**

MPEG-2 Decoding Mode

- Supports VLD (Various Length Decode)
- Supports iDCT
- Supports motion compensation
- Supports MP@HL

MPEG-4 Decoding Mode (CX700M/CX700M2)

- Supports ASP (Advanced Simple Profile) Level 5
- Supports GMC (Global Motion Compensation) L0 / L1
- Supports ¼-pixel MC support
- High video quality and performance

WMV9 Decoding Mode (CX700M/CX700M2)

- Accelerates MP@ML decoding from iDCT to motion compensation
- Supports adaptive macroblock quantization
- Supports variable-sized iDCT Transform
- Supports pre-processing function
- Supports intensity compensation
- Supports 4 MVs and long motion vector mode
- Supports V9 loop filter
- Supports simple and full quarter-pixel motion compensation
- Video auto-flipping
- Hardware DVD sub-picture blending

- **Integrated HDTV Encoder (CX700M/CX700M2)**

- VIA Advance ProScale Technology for studio grade HDTV output
- HDTV tri-level synchronization and broad pulse insertion
- Separate adjustable Y U V delay
- Programmable 2D scaling
- Adaptive deflicker filter to enhance TV image quality
- Programmable sharpness / adaptive filter control
- Support for CGMS-A / Wide Screen Signaling (WSS) / Closed Captioning for variable clock rates adheres to EIAJ-1204, 1204-1, 1204-2 and EN 300 294 standards
- Multiple Chroma and Luma filters
- Programmable power save management
- P:P2 clocking mode or fixed clock mode for full TV screen
- Automatic detection of TV presence
- Hot plug interrupt support
- DAC auto adjustment
- High Quality 3x10-Bit Video DAC (shared with CRT output)
  - Three flexible and programmable DACs for each specific video signal output
- Output format
  - Compliant with NTSC (M and J) or PAL (B, D, G, H, I, M, N and Nc) TV system
  - Composite, S-Video, Component (YPbPr) with interlaced or non-interlaced scan output
  - SDTV output mode (525p or 625p) compliant with EIA770-1 and EIA770-2
  - HDTV support for 1080i (D3) and 720p (D4) compliant with EIA770-1, EIA770-2, EIA770-3 and ITU-RBT 709-4
  - Output resolution support NTSC - 525i, 525p, PAL - 625i, 625p, HDTV - 1080i, 720p
  - D-Terminal support from D1 ~ D4 stage
- Macrovision (CX700M2)
  - Macrovision™ 7.1.L1 copy protection support
  - Macrovision™ 1.2 AGC copy protection with NTSC - 525i, 525p, PAL - 625i, 625p
  - Macrovision™ 1.2 AGC copy protection with NTSC - 525i, 525p, PAL - 625i (Revision A3)

- **Integrated LVDS / DVI Transmitter**

LVDS transmitter

- Compatible with TIA/EIA-644
- Supports panel resolution from VGA through UXGA (1600 x 1200)
- Supports one Dual-Channel and two Single-Channel LVDS panel(s)
- Supports LVDS panel that operates in “Data Enable Only” mode or accepts positive H and V-sync signals

DVI transmitter

- Standard compliant with DVI 1.0
- Supports panel resolution from VGA through UXGA (1600 x 1200)
- Supports one Single-Channel DVI panel
- Hot Plug detection input

- **High Definition (HD) Audio Controller**
  - High performance audio controller with 192 KHz sample rate, 32-bit per sample and up to 8 channels
  - Microsoft UAA (Universal Audio Architecture) driver support
  - Up to two independent playback streams and audio codecs
  - Multiple recording channels for array microphone
  - Supports jack sensing / retasking
- **Serial ATA Controller**
  - Supports up to 2 SATA devices
  - Integrated SATA PHY supporting 1.5 Gbit/s and 3 Gbit/s transfer rate
  - Complies with Serial ATA II PHY Specification
  - Complies with Serial ATA Specification Revision 1.0
  - Supports SATA port multiplier functions
- **Ultra DMA-133 / 100 / 66 / 33 Bus Master EIDE**
  - Single channel EIDE controller supporting 2 Enhanced IDE devices
  - Data transfer rate up to 133 MB/sec to cover PIO mode 4, multi-word DMA mode 2, and UltraDMA-133 interface
  - Full scatter gather capability
  - Supports ATAPI compliant devices including DVD devices
  - Supports PCI native and ATA compatibility modes
- **Universal Serial Bus Controller**
  - Six USB 2.0 ports, one USB 2.0 root hub, and three USB 1.1 root hubs
  - USB 2.0 and Enhanced Host Controller Interface (EHCI) v1.0 compliant
  - USB 1.1 and Universal Host Controller Interface (UHCI) v1.1 compliant
  - Legacy keyboard and PS/2 mouse support
  - One USB 2.0 debug port

- **Concurrent PCI Bus Controller**
  - PCI 2.3 compliant, 33MHz, 32 bit, 3.3V PCI interface with 5V tolerant inputs
  - Supports up to four PCI masters
  - Zero wait state PCI master and slave burst transfer rate, with up to 132 MB/sec data transfer rate
  - PCI master snoop ahead and snoop filtering
  - Byte merging in the write buffers to reduce the number of PCI cycles
  - Supports delay transaction
  - Transaction timer for fair arbitration between PCI masters
  - Symmetric arbitration between Host / PCI bus for optimized system performance
  - Complete steerable PCI interrupts
  - Supports PC / PCI DMA
- **System Management Bus Interface**
  - Compliant with System Management Bus (SMBus) Revision 2.0
  - I^2C devices compatible
  - Supports SMBus Address Resolution Protocol (ARP) by using host commands through software
  - Supports slave interface for external SMBus masters to control resume events
  - Supports Alarm-On-LAN 2 through a SMBus-interfaced register
- **Plug and Play Functions**
  - Steerable PCI interrupts
  - Steerable interrupts for integrated peripheral controllers
  - Microsoft Windows XP, and plug and play BIOS compliant
- **Integrated Legacy Functions**
  - Integrated Keyboard Controller with PS2 mouse and password wake-up support
  - Integrated two RS-232 serial ports (optional)
  - Integrated DS12885-style Real Time Clock with extended 256 byte CMOS RAM, Day / Month Alarm and century field
  - Integrated DMA, timer, and interrupt controller
  - Fast reset and Gate A20 operation
- **Sophisticated Power Management**
  - ACPI 2.0 and APM v1.2 Compliant
  - Supports CPU clock throttling and clock stop during ACPI C2 / C3 / C4 states
  - Supports CPU clock throttling and clock stop during ACPI C2 / C3 states (Revision A3)
  - Supports PCI clock run, Power Management Enable (PME) control, and PCI / CPU clock generator stop control
  - Supports multiple system suspend types: Power-on Suspend (POS) with flexible CPU / PCI bus reset options, Suspend to DRAM (STR), and Suspend to Disk (soft-off), all with hardware automatic wake-up
  - Multiple suspend power plane controls and suspend status indicators
  - Integrates an idle timer, a peripheral timer and a general purpose timer, plus a 24/32-bit ACPI compliant timer
  - Supports normal, doze, sleep, suspend and conserve modes
  - Global and local device power control
  - Supports system event monitoring with two event classes
  - Primary and secondary interrupt differentiation for individual channels
  - Dedicated input pins for power and sleep buttons, and external modem ring indicator
  - Multiple internal and external SMI sources for flexible power management models
  - Thermal alarm on external temperature sensing circuit
  - Dynamic clock gating control on functional blocks
  - Dynamic I/O pad driving control
  - I/O pad leakage control
- **Built-in NAND-tree pin scan test capability**

CX700 Series Feature Comparison Table

	CX700	CX700M	CX700M2
MPEG-2	☑	☑	☑
MPEG-4	☐	☑	☑
WMV9	☐	☑	☑
HDTV/SDTV	☐	☑	☑
Macrovision	☐	☐	☑

Table 1. CX700 Series Feature Comparison

CX700 System Overview

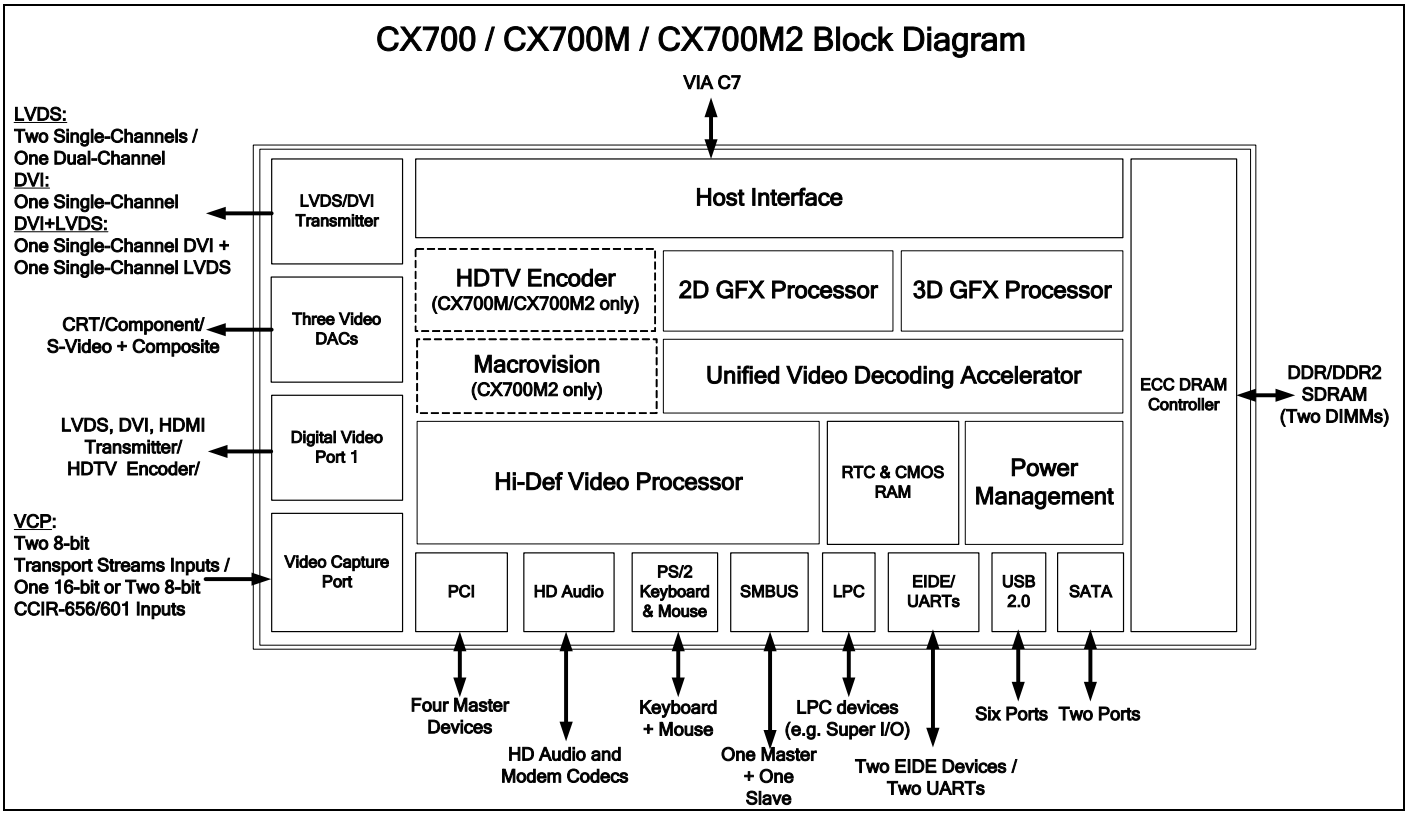


Figure 1. System Block Diagram

The VIA CX700 is the most advanced and complete all-in-one x86 system processor for today and next generation computing and media processing platforms. From quadruple host data bus, DDR2 memory controller, HDTV interface to Serial ATA and USB ports, the CX700 integrates all the desired, high quality, high performance controllers of modern media and computing platforms:

Host Interface

The CX700 supports VIA C7 with up to 533MHz data transfer speed. The host bus protocol is determined through automatic negotiation between CPU and the system processor during reset.

Memory Controller

The CX700 memory controller supports two DDR/DDR2 DIMMs, up to 2GB system memory. A memory clock buffer is integrated for 1-DIMM system memory architecture. For applications that do not require large system memory or high memory bandwidth, CX700 supports 32-bit memory data width to reduce total system cost while maintaining adequate memory performance. The memory ECC scheme is integrated to improve the system robustness in applications where high reliability is a priority.

2D / 3D Graphics Processor

The integrated 200MHz, 128-bit UniChrome Pro II graphics processor is implemented on Unified Memory Architecture with frame buffer size of up to 128MB. 32bpp color depth, hardware 2D rotation, true-color hardware cursor and window clipping functions are supported. The high performance 3D graphics processor includes dual pixel rendering pipelines and dual texture units. It delivers up to 4.5 million/second triangle rate, 200 million pixels/second per texture and 400 million texels/second bilinear fill rate for advanced 3D applications.

Unified Video Decoding Accelerator (CX700M/CX700M2)

The CX700M/CX700M2 integrates an industry unique, high performance "Unified Video Decoding Accelerator" for high definition MPEG-2/4 as well as the latest WMV9 HD video stream decoding. This feature significantly reduces host processor utilization rate enabling advanced media applications to be implemented without the needs of high frequency CPU, and further reduces the power consumption of the overall platform.

High Quality Video Processor

The video processor supports RGB555 / 565 / 8888 and YUV422 video formats, and it provides complete video processing capability such as 5-tap horizontal and vertical scaling, clockwise / counter-clockwise display rotation, video de-interlacing / interlacing, de-blocking and video gamma correction. Advanced video display features such as video window overlays, sub-picture blending and Microsoft VMR™ support are also implemented for new generation media applications.

Display Interface

The CX700 provides several types of display interfaces for different applications:

CRT Interface: Three 10-bit 350MHz RAMDAC are integrated for high quality, high resolution (up to 1920x1440) monitor.

TV Interface: The CX700M/CX700M2 integrates a high definition TV Encoder, and supports YpbPr and CompYC TV interface modes through the three RAMDACs. Supported TV resolutions include NTSC - 525i (480i), 525p (480p), PAL - 625i (576i), 625p (576p), and HDTV - 1080i, 720p.

LCD Panel Interface: A LVDS/DVI Transmitter is integrated, which supports LCD Panel in four different modes:

- One Dual-Channel LVDS Interface
- Two Single-Channel LVDS Interface
- One Single-Channel DVI Interface
- One Single-Channel LVDS + One Single-Channel DVI Interfaces
- DVO Interface: Two 16-bit DVO interfaces are provided for interfacing to external TV Encoder or DVI Transmitter.

The DuoView+™ feature is implemented with two independent display engines. Each engine can display completely different contents at different resolution, pixel depth and refresh rate. DuoView+™ includes WinXP multi-monitor, extended desktop support; the CRT, LVDS/DVI LCD panel, TV refresh rates are independently programmable for optimum image quality.

High Definition Audio Interface

A high definition audio controller with up to 32-Bit Sample Size @192KHz Sampling Rate is implemented in CX700 for high-end media applications with up to 8 high definition audio channels.

Storage Device Interface

The CX700 integrates the Serial ATA and EIDE Controllers. These two controllers provide maximum flexibility in selecting storage devices (both HD and Optical drives). The Serial ATA controller is Serial ATA II PHY compliant and supports up to two SATA IDE devices with 3Gb/s data transfer rate. The EIDE controller supports up to two EIDE devices in PIO mode 4, multi-word DMA mode 2, and UltraDMA-33/66/100/133 modes.

USB Interface

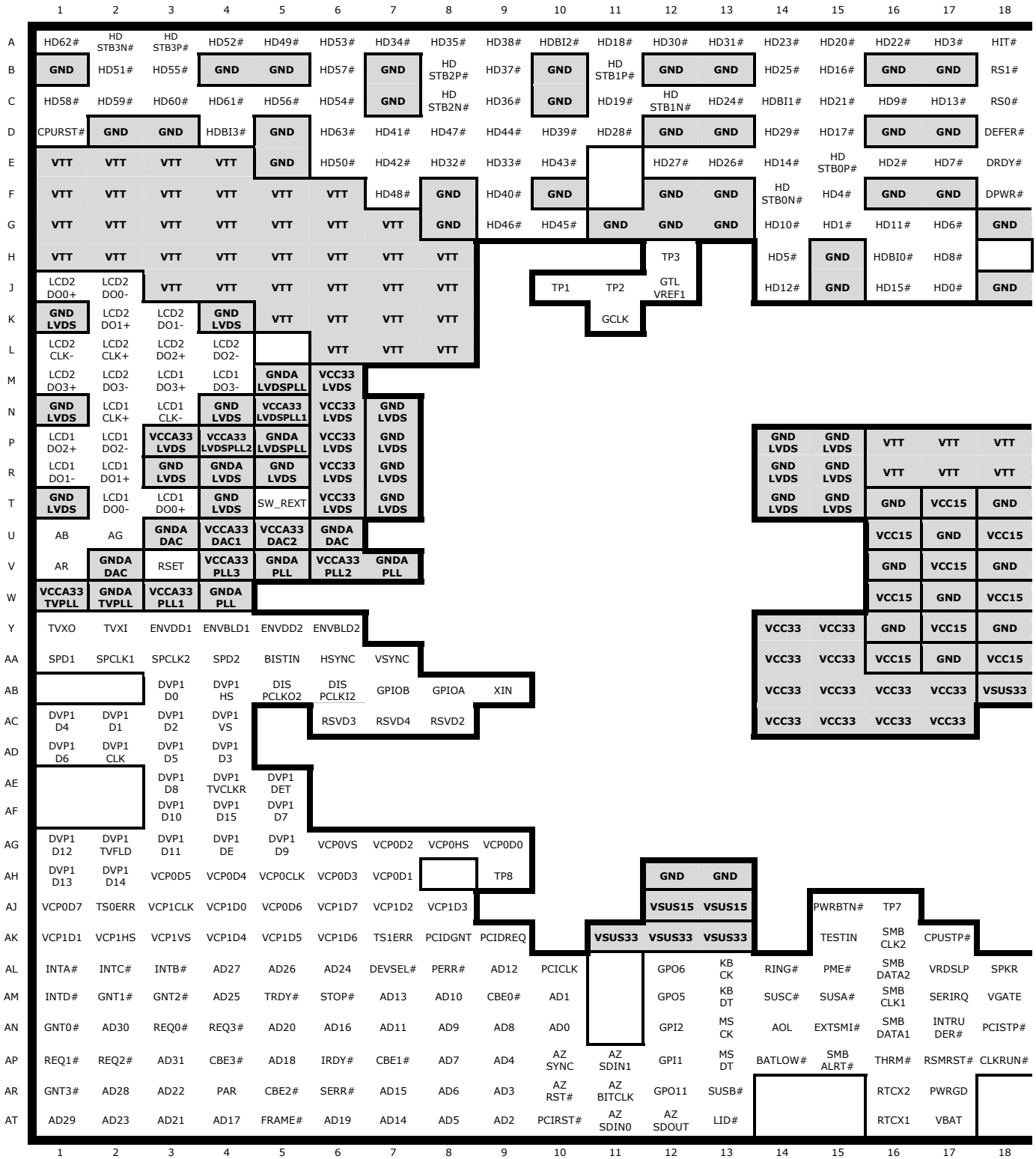
Six USB 2.0/1.1 ports are integrated to support wide ranging connectivity needs on the platform.

In addition, the CX700 supports PCI bus, LPC bus, UART as well as legacy functions, such as PS/2 keyboard/mouse and RTC CMOS RAM. Through sophisticated power management scheme and state-of-the-art system functions, VIA CX700 makes High Performance, Low Power, Thin-&-Light computing/media processing a reality!

BALLOUTS

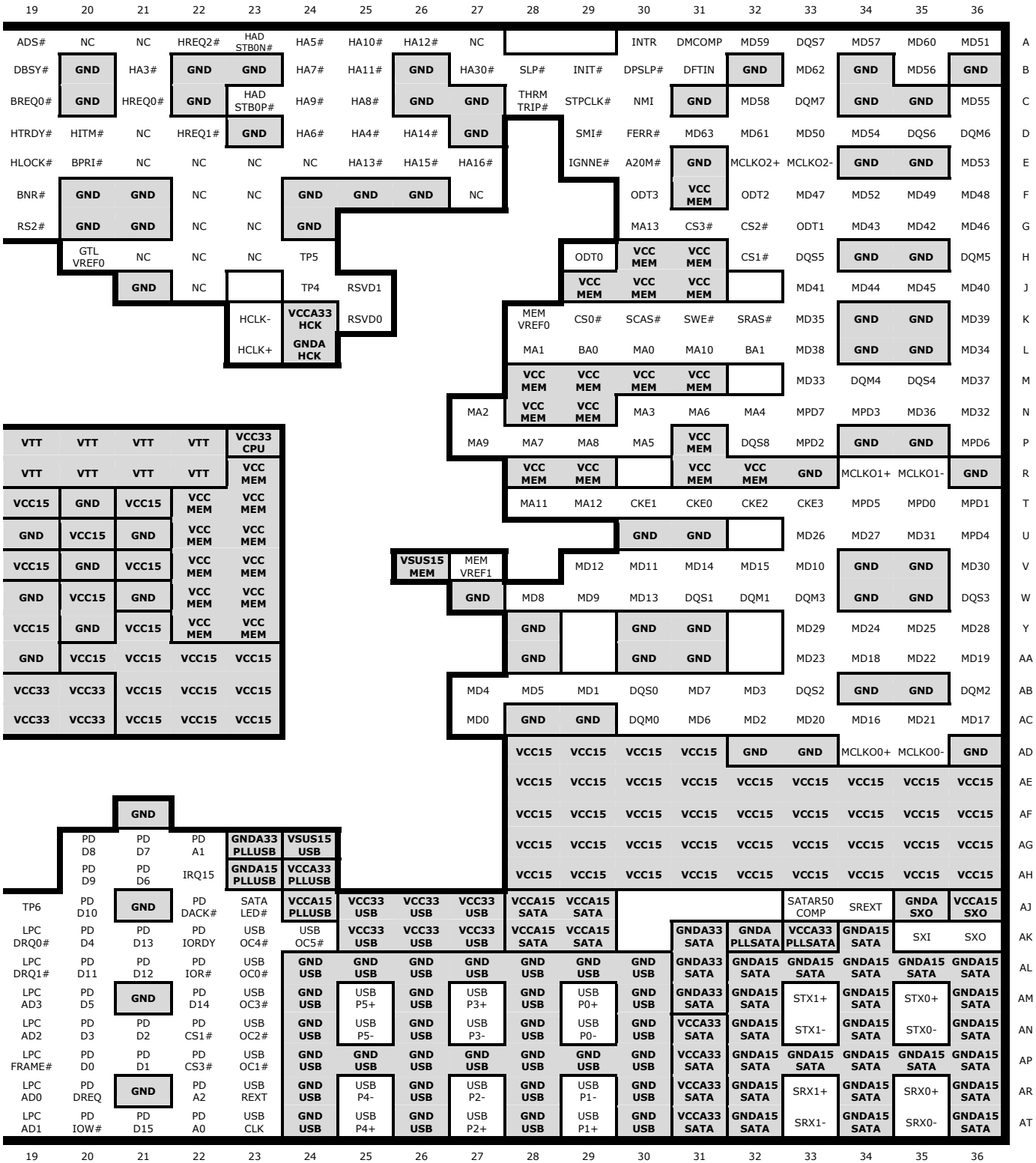
Ball Map

Figure 2. CX700 Ball Map (C7 CPU Interface) – Left Side Top View



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	HD62#	HD STB3N#	HD STB3P#	HD52#	HD49#	HD53#	HD34#	HD35#	HD38#	HDBI2#	HD18#	HD30#	HD31#	HD23#	HD20#	HD22#	HD3#	HIT#
B	GND	HD51#	HD55#	GND	GND	HD57#	GND	HD STB2P#	HD37#	GND	HD STB1P#	GND	GND	HD25#	HD16#	GND	GND	RS1#
C	HD58#	HD59#	HD60#	HD61#	HD56#	HD54#	GND	HD STB2N#	HD36#	GND	HD19#	HD STB1N#	HD24#	HDBI1#	HD21#	HD9#	HD13#	RS0#
D	CPURST#	GND	GND	HDBI3#	GND	HD63#	HD41#	HD47#	HD44#	HD39#	HD28#	GND	GND	HD29#	HD17#	GND	GND	DEFER#
E	VTT	VTT	VTT	VTT	GND	HD50#	HD42#	HD32#	HD33#	HD43#		HD27#	HD26#	HD14#	HD STB0P#	HD2#	HD7#	DRDY#
F	VTT	VTT	VTT	VTT	VTT	VTT	HD48#	GND	HD40#	GND		GND	GND	HD STB0N#	HD4#	GND	GND	DPWR#
G	VTT	VTT	VTT	VTT	VTT	VTT	VTT	GND	HD46#	HD45#	GND	GND	GND	HD10#	HD1#	HD11#	HD6#	GND
H	VTT	VTT	VTT	VTT	VTT	VTT	VTT	VTT				TP3		HD5#	GND	HDBI0#	HD8#	
J	LCD2 DO0+	LCD2 DO0-	VTT	VTT	VTT	VTT	VTT	VTT		TP1	TP2	GTL VREF1		HD12#	GND	HD15#	HD0#	GND
K	GND LVDS	LCD2 DO1+	LCD2 DO1-	GND LVDS	VTT	VTT	VTT	VTT			GCLK							
L	LCD2 CLK-	LCD2 CLK+	LCD2 DO2+	LCD2 DO2-		VTT	VTT	VTT										
M	LCD2 DO3+	LCD2 DO3-	LCD1 DO3+	LCD1 DO3-	GNDA LVDSPLL	VCC33 LVDS												
N	GND LVDS	LCD1 CLK+	LCD1 CLK-	GND LVDS	VCCA33 LVDSPLL1	VCC33 LVDS	GND LVDS											
P	LCD1 DO2+	LCD1 DO2-	VCCA33 LVDS	VCCA33 LVDSPLL2	GNDA LVDSPLL	VCC33 LVDS	GND LVDS							GND LVDS	GND LVDS	VTT	VTT	VTT
R	LCD1 DO1-	LCD1 DO1+	GND LVDS	GNDA LVDS	GND LVDS	VCC33 LVDS	GND LVDS							GND LVDS	GND LVDS	VTT	VTT	VTT
T	GND LVDS	LCD1 DO0-	LCD1 DO0+	GND LVDS	SW_REXT	VCC33 LVDS	GND LVDS							GND LVDS	GND LVDS	GND	VCC15	GND
U	AB	AG	GNDA DAC	VCCA33 DAC1	VCCA33 DAC2	GNDA DAC										VCC15	GND	VCC15
V	AR	GNDA DAC	RSET	VCCA33 PLL3	GNDA PLL	VCCA33 PLL2	GNDA PLL									GND	VCC15	GND
W	VCCA33 TVPLL	GNDA TVPLL	VCCA33 PLL1	GNDA PLL												VCC15	GND	VCC15
Y	TVXO	TVXI	ENVDD1	ENVBLD1	ENVDD2	ENVBLD2								VCC33	VCC33	GND	VCC15	GND
AA	SPD1	SPCLK1	SPCLK2	SPD2	BISTIN	HSYNC	VSYNC							VCC33	VCC33	VCC15	GND	VCC15
AB			DVP1 D0	DVP1 HS	DIS PCLKO2	DIS PCLKI2	GPIOB	GPIOA	XIN					VCC33	VCC33	VCC33	VCC33	VSUS33
AC	DVP1 D4	DVP1 D1	DVP1 D2	DVP1 VS		RSVD3	RSVD4	RSVD2						VCC33	VCC33	VCC33	VCC33	
AD	DVP1 D6	DVP1 CLK	DVP1 D5	DVP1 D3														
AE			DVP1 D8	DVP1 TVCLKR	DVP1 DET													
AF			DVP1 D10	DVP1 D15	DVP1 D7													
AG	DVP1 D12	DVP1 TVFLD	DVP1 D11	DVP1 DE	DVP1 D9	VCP0VS	VCP0D2	VCP0HS	VCP0D0									
AH	DVP1 D13	DVP1 D14	VCP0D5	VCP0D4	VCP0CLK	VCP0D3	VCP0D1		TP8			GND	GND					
AJ	VCP0D7	TS0ERR	VCP1CLK	VCP1D0	VCP0D6	VCP1D7	VCP1D2	VCP1D3				VSUS15	VSUS15		PWRBTN#	TP7		
AK	VCP1D1	VCP1HS	VCP1VS	VCP1D4	VCP1D5	VCP1D6	TS1ERR	PCIDGNT	PCIDREQ		VSUS33	VSUS33	VSUS33		TESTIN	SMB CLK2	CPUSTP#	
AL	INTA#	INTC#	INTB#	AD27	AD26	AD24	DEVSEL#	PERR#	AD12	PCICLK		GPO6	KB CK	RING#	PME#	SMB DATA2	VRDSLP	SPKR
AM	INTD#	GNT1#	GNT2#	AD25	TRDY#	STOP#	AD13	AD10	CBE0#	AD1		GPO5	KB DT	SUSC#	SUSA#	SMB CLK1	SERIRQ	VGATE
AN	GNT0#	AD30	REQ0#	REQ3#	AD20	AD16	AD11	AD9	AD8	AD0		GPI2	MS CK	AOL	EXTSMI#	SMB DATA1	INTRU DER#	PCISTP#
AP	REQ1#	REQ2#	AD31	CBE3#	AD18	IRDY#	CBE1#	AD7	AD4	AZ SYNC	AZ SDIN1	GPI1	MS DT	BATLOW#	SMB ALRT#	THRM#	RSMRST#	CLKRUN#
AR	GNT3#	AD28	AD22	PAR	CBE2#	SERR#	AD15	AD6	AD3	AZ RST#	AZ BITCLK	GPO11	SUSB#			RTCX2	PWRGD	
AT	AD29	AD23	AD21	AD17	FRAME#	AD19	AD14	AD5	AD2	PCIRST#	AZ SDIN0	AZ SDOUT	LID#			RTCX1	VBAT	

Figure 3. CX700 Ball Map (C7 CPU Interface) – Right Side Top View



Signal Ball List

Table 2. CX700 Signal Ball List (Listed by Ball Name)

Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name
F30	A20M#	AH21	DCD1	AN14	GPI3	A14	HD23#	AH22	IRQ15	AA36	MD19
U01	AB	AM22	DCD2	AP14	GPI4	C13	HD24#	AL13	KBCK	AC33	MD20
AN10	AD0	D18	DEFER#	AN15	GPI5	B14	HD25#	AM13	KBDT	AC35	MD21
AM10	AD1	AL07	DEVSEL#	AN17	GPI6	E13	HD26#	N03	LCD1CLK-	AA35	MD22
AT09	AD2	B31	DFTIN	AT13	GPI7	E12	HD27#	N02	LCD1CLK+	AA33	MD23
AR09	AD3	AB06	DISPCLKI2	AL14	GPI8	D11	HD28#	T02	LCD1DO0-	Y34	MD24
AP09	AD4	AB05	DISPCLKO2	AP16	GPI9	D14	HD29#	T03	LCD1DO0+	Y35	MD25
AT08	AD5	A31	DMCOMP	C28	GPI10	A12	HD30#	R01	LCD1DO1-	U33	MD26
AR08	AD6	B30	DPSLP#	AM18	GPI11	A13	HD31#	R02	LCD1DO1+	U34	MD27
AP08	AD7	F18	DPWR#	AL16	GPIO0	E08	HD32#	P02	LCD1DO2-	Y36	MD28
AN09	AD8	AC30	DQM0	AK16	GPIO1	E09	HD33#	P01	LCD1DO2+	Y33	MD29
AN08	AD9	W32	DQM1	AK09	GPIO2	A07	HD34#	M04	LCD1DO3-	V36	MD30
AM08	AD10	AB36	DQM2	AK08	GPIO3	A08	HD35#	M03	LCD1DO3+	U35	MD31
AN07	AD11	W33	DQM3	AB08	GPIOA	C09	HD36#	L01	LCD2CLK-	N36	MD32
AL09	AD12	M34	DQM4	AB07	GPIOB	B09	HD37#	L02	LCD2CLK+	M33	MD33
AM07	AD13	H36	DQM5	AB06	GPIOC	A09	HD38#	J02	LCD2DO0-	L36	MD34
AT07	AD14	D36	DQM6	AB05	GPIOD	D10	HD39#	J01	LCD2DO0+	K33	MD35
AR07	AD15	C33	DQM7	AL22	GPO0	F09	HD40#	K03	LCD2DO1-	N35	MD36
AN06	AD16	AB30	DQS0	AT20	GPO1	D07	HD41#	K02	LCD2DO1+	M36	MD37
AT04	AD17	W31	DQS1	AT22	GPO2	E07	HD42#	L04	LCD2DO2-	L33	MD38
AP05	AD18	AB33	DQS2	AG22	GPO3	E10	HD43#	L03	LCD2DO2+	K36	MD39
AT06	AD19	W36	DQS3	AR22	GPO4	D09	HD44#	M02	LCD2DO3-	J36	MD40
AN05	AD20	M35	DQS4	AM12	GPO5	G10	HD45#	M01	LCD2DO3+	J33	MD41
AT03	AD21	H33	DQS5	AL12	GPO6	G09	HD46#	AT13	LID#	G35	MD42
AR03	AD22	D35	DQS6	AL18	GPO7	D08	HD47#	AR19	LPCAD0	G34	MD43
AT02	AD23	A33	DQS7	AM15	GPO8	F07	HD48#	AT19	LPCAD1	J34	MD44
AL06	AD24	P32	DQS8	AR13	GPO9	A05	HD49#	AN19	LPCAD2	J35	MD45
AM04	AD25	E18	DRDY#	AM14	GPO10	E06	HD50#	AM19	LPCAD3	G36	MD46
AL05	AD26	AP21	DSR1	H20	GTLVREF0	B02	HD51#	AK19	LPCDRQ0#	F33	MD47
AL04	AD27	AH20	DSR2	J12	GTLVREF1	A04	HD52#	AL19	LPCDRQ1#	F36	MD48
AR02	AD28	AN20	DTR1	B21	HA3#	A06	HD53#	AP19	LPCFRAME#	F35	MD49
AT01	AD29	AL20	DTR2	D25	HA4#	C06	HD54#	L30	MA0	D33	MD50
AN02	AD30	AD02	DVP1CLK	A24	HA5#	B03	HD55#	L28	MA1	A36	MD51
AP03	AD31	AB03	DVP1D0	D24	HA6#	C05	HD56#	N27	MA2	F34	MD52
A19	ADS#	AC02	DVP1D1	B24	HA7#	B06	HD57#	N30	MA3	E36	MD53
U02	AG	AC03	DVP1D2	C25	HA8#	C01	HD58#	N32	MA4	D34	MD54
AN14	AOL	AD04	DVP1D3	C24	HA9#	C02	HD59#	P30	MA5	C36	MD55
V01	AR	AC01	DVP1D4	A25	HA10#	C03	HD60#	N31	MA6	B35	MD56
AR11	AZBITCLK	AD03	DVP1D5	B25	HA11#	C04	HD61#	P28	MA7	A34	MD57
AR10	AZRST#	AD01	DVP1D6	A26	HA12#	A01	HD62#	P29	MA8	C32	MD58
AT11	AZSDIN0	AF05	DVP1D7	E25	HA13#	D06	HD63#	P27	MA9	A32	MD59
AP11	AZSDIN1	AE03	DVP1D8	D26	HA14#	H16	HDBI0#	L31	MA10	A35	MD60
AT12	AZSDOUT	AG05	DVP1D9	E26	HA15#	C14	HDBI1#	T28	MA11	D32	MD61
AP10	AZSYNC	AF03	DVP1D10	E27	HA16#	A10	HDBI2#	T29	MA12	B33	MD62
L29	BA0	AG03	DVP1D11	B27	HA30#	D04	HDBI3#	G30	MA13	D31	MD63
L32	BA1	AG01	DVP1D12	K23	HCLK-	F14	HDSTB0N#	AD35	MCLKO0-	K28	MEMVREF0
G30	BA2	AH01	DVP1D13	L23	HCLK+	E15	HDSTB0P#	AD34	MCLKO0+	V27	MEMVREF1
AP14	BATLOW#	AH02	DVP1D14	J17	HD00#	C12	HDSTB1N#	R35	MCLKO1-	T35	MPD0
AA05	BISTIN	AF04	DVP1D15	G15	HD1#	B11	HDSTB1P#	R34	MCLKO1+	T36	MPD1
F19	BNR#	AG04	DVP1DE	E16	HD2#	C08	HDSTB2N#	E33	MCLKO2-	P33	MPD2
E20	BPRI#	AE05	DVP1DET	A17	HD3#	B08	HDSTB2P#	E32	MCLKO2+	N34	MPD3
C19	BREQ0#	AB04	DVP1HS	F15	HD4#	A02	HDSTB3N#	AC27	MD0	U36	MPD4
AM09	CBE0#	AE04	DVP1TVCLKR	H14	HD5#	A03	HDSTB3P#	AB29	MD1	T34	MPD5
AP07	CBE1#	AG02	DVP1TVFLD	G17	HD6#	A18	HIT#	AC32	MD2	P36	MPD6
AR05	CBE2#	AC04	DVP1VS	E17	HD7#	D20	HITM#	AB32	MD3	N33	MPD7
AP04	CBE3#	Y04	ENVBLD1	H17	HD8#	E19	HLOCK#	AB27	MD4	AN13	MSCK
T31	CKE0	Y06	ENVBLD2	C16	HD9#	C21	HREQ0#	AB28	MD5	AP13	MSDT
T30	CKE1	Y03	ENVDD1	G14	HD10#	D22	HREQ1#	AC31	MD6	A27	NC
T32	CKE2	Y05	ENVDD2	G16	HD11#	A22	HREQ2#	AB31	MD7	F27	NC
T33	CKE3	AN15	EXTSMI#	J14	HD12#	AA06	HSYNC	W28	MD8	D21	NC
AP18	CLKRUN#	D30	FERR#	C17	HD13#	D19	HTRDY#	W29	MD9	E24	NC
D01	CPURST#	AT05	FRAME#	E14	HD14#	E29	IGNNE#	V33	MD10	E23	NC
AK17	CPUSTP#	K11	GCLK	J16	HD15#	B29	INIT#	V30	MD11	G23	NC
K29	CS0#	AN01	GNT0#	B15	HD16#	AL01	INTA#	V29	MD12	F22	NC
H32	CS1#	AM02	GNT1#	D15	HD17#	AL03	INTB#	W30	MD13	E22	NC
G32	CS2#	AM03	GNT2#	A11	HD18#	AL02	INTC#	V31	MD14	J22	NC
G31	CS3#	AR01	GNT3#	C11	HD19#	AM01	INTD#	V32	MD15	H21	NC
AP20	CTS1	AH22	GPI0	A15	HD20#	A30	INTR	AC34	MD16	H22	NC
AG20	CTS2	AP12	GPI1	C15	HD21#	AN17	INTRUDER#	AC36	MD17	E21	NC
B19	DBSY#	AN12	GPI2	A16	HD22#	AP06	IRDY#	AA34	MD18	F23	NC

CX700 Signal Ball List Continued (Listed by Ball Name)

Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name	Ball #	Ball Name
H23	NC	AL21	PDD12	AT16	RTCX1	C29	STPCLK#	N03	TX2-	AJ01	VCP0D7
G22	NC	AK21	PDD13	AR16	RTCX2	AN35	STX0-	N02	TX2+	AG08	VCP0HS
A20	NC	AM22	PDD14	AN21	RTS1	AM35	STX0+	T02	TXC-	AG06	VCP0VS
A21	NC	AT21	PDD15	AJ20	RTS2	AN33	STX1-	T03	TXC+	AJ03	VCP1CLK
C30	NMI	AJ22	PDDACK#	AJ23	SATALED#	AM33	STX1+	AT23	USBCLK	AJ04	VCP1D0
H29	ODT0	AR20	PDDREQ	AJ33	SATAR50COMP	AM15	SUSA#	AL23	USBOC0#	AK01	VCP1D1
G33	ODT1	AL22	PDIOR#	K30	SCAS#	AR13	SUSB#	AP23	USBOC1#	AJ07	VCP1D2
F32	ODT2	AK22	PDIORDY	AM20	SDOUT1	AM14	SUSC#	AN23	USBOC2#	AJ08	VCP1D3
F30	ODT3	AT20	PDIOW#	AK21	SDOUT2	T05	SW_REXT	AM23	USBOC3#	AK04	VCP1D4
AR04	PAR	AL08	PERR#	AM17	SERIRQ	K31	SWE#	AK23	USBOC4#	AK05	VCP1D5
AL10	PCICLK	AL15	PME#	AR06	SERR#	AK35	SXI	AK24	USBOC5#	AK06	VCP1D6
AK08	PCIDGNT	AJ15	PWRBTN#	AK20	SIN1	AK36	SXO	AN29	USBP0-	AJ06	VCP1D7
AK09	PCIDREQ	AR17	PWRGD	AL21	SIN2	AK15	TESTIN	AM29	USBP0+	AK02	VCP1HS
AT10	PCIRST#	AN03	REQ0#	B28	SLP#	AP16	THRM#	AR29	USBP1-	AK03	VCP1VS
AN18	PCISTP#	AP01	REQ1#	AP15	SMBALRT#	C28	THRMTRIP#	AT29	USBP1+	AM18	VGATE
AT22	PDA0	AP02	REQ2#	AM16	SMBCLK1	J10	TP1	AR27	USBP2-	AL17	VRDSLP
AG22	PDA1	AN04	REQ3#	AK16	SMBCLK2	J11	TP2	AT27	USBP2+	AA07	VSYNC
AR22	PDA2	AG21	RI1	AN16	SMBDATA1	H12	TP3	AN27	USBP3-	AB09	XIN
AN22	PDCS1#	AT21	RI2	AL16	SMBDATA2	J24	TP4	AM27	USBP3+		
AP22	PDCS3#	AL14	RING#	D29	SMI#	H24	TP5	AR25	USBP4-		
AP20	PDD0	C18	RS0#	AA02	SPCLK1	AJ19	TP6	AT25	USBP4+		
AP21	PDD1	B18	RS1#	AA03	SPCLK2	AJ16	TP7	AN25	USBP5-		
AN21	PDD2	G19	RS2#	AA01	SPD1	AH09	TP8	AM25	USBP5+		
AN20	PDD3	V03	RSET	AA04	SPD2	AM05	TRDY#	AR23	USBREXT		
AK20	PDD4	AP17	RSMRST#	AL18	SPKR	AJ02	TS0ERR	AH05	VCP0CLK		
AM20	PDD5	A23	RSVD	K32	SRAS#	AK07	TS1ERR	AG09	VCP0D0		
AH21	PDD6	C23	RSVD	AJ34	SREXT	Y02	TVXI	AH07	VCP0D1		
AG21	PDD7	K25	RSVD0	AT35	SRX0-	Y01	TVXO	AG07	VCP0D2		
AG20	PDD8	J25	RSVD1	AR35	SRX0+	R01	TX0-	AH06	VCP0D3		
AH20	PDD9	AC08	RSVD2	AT33	SRX1-	R02	TX0+	AH04	VCP0D4		
AJ20	PDD10	AC06	RSVD3	AR33	SRX1+	P02	TX1-	AH03	VCP0D5		
AL20	PDD11	AC07	RSVD4	AM06	STOP#	P01	TX1+	AJ05	VCP0D6		

Table 3. Power / Ground Ball List

Ball Name	Ball Numbers
GND	B01, B04, B05, B07, B10, B12, B13, B16, B17, B20, B22, B23, B26, B32, B34, B36 C07, C10, C20, C22, C26, C27, C31, C34, C35, D02, D03, D05, D12, D13, D16, D17, D23, D27 E05, E31, E34, E35, F08, F10, F12, F13, F16, F17, F20, F21, F24, F25, F26, G08, G11, G12, G13, G18, G20, G21, G24 H15, H34, H35, J15, J18, J21, K34, K35, L34, L35, P34, P35, R33, R36, T16, T18, T20, U17, U19, U21, U30, U31 V16, V18, V20, V34, V35, W17, W19, W21, W27, W34, W35, Y16, Y18, Y20, Y28, Y30, Y31 AA17, AA19, AA28, AA30, AA31, AB34, AB35, AC28, AC29, AD32, AD33, AD36, AF21, AH12, AH13, AJ21, AM21, AR21
GNDA15SATA	AK34, AL32, AL33, AL34, AL35, AL36, AM32, AM34, AM36, AN32, AN34, AN36, AP32, AP33, AP34, AP35, AP36, AR32, AR34, AR36, AT32, AT34, AT36
GNDA15PLLUSB	AH23
GNDA33SATA	AK31, AL31, AM31
GNDA33PLLUSB	AG23
GNDADAC	U03, U06, V02
GNDAHCK	L24
GNDALVDS	R04
GNDALVDSPLL	M05, P05
GNDAPLL	V05, V07, W04
GNDAPLLSATA	AK32
GNDASXO	AJ35
GNDATVPLL	W02
GNDLVDS	K01, K04, N01, N04, N07, P07, P14, P15, R03, R05, R07, R14, R15, T01, T04, T07, T14, T15
GNDUSB	AL24, AL25, AL26, AL27, AL28, AL29, AL30, AM24, AM26, AM28, AM30 AN24, AN26, AN28, AN30, AP24, AP25, AP26, AP27, AP28, AP29, AP30 AR24, AR26, AR28, AR30, AT24, AT26, AT28, AT30
VBAT	AT17
VCC15	T17, T19, T21, U16, U18, U20, V17, V19, V21, W16, W18, W20, Y17, Y19, Y21 AA16, AA18, AA20, AA21, AA22, AA23, AB21, AB22, AB23, AC21, AC22, AC23, AD28, AD29, AD30, AD31 AE28, AE29, AE30, AE31, AE32, AE33, AE34, AE35, AE36, AF28, AF29, AF30, AF31, AF32, AF33, AF34, AF35, AF36 AG28, AG29, AG30, AG31, AG32, AG33, AG34, AG35, AG36, AH28, AH29, AH30, AH31, AH32, AH33, AH34, AH35, AH36
VCC33	Y14, Y15, AA14, AA15, AB14, AB15, AB16, AB17, AB19, AB20, AC14, AC15, AC16, AC17, AC19, AC20
VCC33CPU	P23
VCC33LVDS	M06, N06, P06, R06, T06
VCC33USB	AJ25, AJ26, AJ27, AK25, AK26, AK27
VCCA15SATA	AJ28, AJ29, AK28, AK29
VCCA15SXO	AJ36
VCCA15PLLUSB	AJ24
VCCA33DAC[2:1]	U05, U04
VCCA33HCK	K24
VCCA33LVDS	P03
VCCA33LVDSPLL[2:1]	P04, N05
VCCA33PLL[3:1]	V04, V06, W03
VCCA33SATA	AN31, AP31, AR31, AT31
VCCA33PLLSATA	AK33
VCCA33TVPLL	W01
VCCA33PLLUSB	AH24
VCCMEM	F31, H30, H31, J29, J30, J31, M28, M29, M30, M31, N28, N29, P31, R23, R28, R29, R31, R32 T22, T23, U22, U23, V22, V23, W22, W23, Y22, Y23
VSUS15	AJ12, AJ13
VSUS15MEM	V26
VSUS15USB	AG24
VSUS33	AB18, AK11, AK12, AK13
VTT	E01, E02, E03, E04, F01, F02, F03, F04, F05, F06, G01, G02, G03, G04, G05, G06, G07 H01, H02, H03, H04, H05, H06, H07, H08, J03, J04, J05, J06, J07, J08, K05, K06, K07, K08 L06, L07, L08, P16, P17, P18, P19, P20, P21, P22, R16, R17, R18, R19, R20, R21, R22

Signal Descriptions

CPU Interface

The CPU interface supports the VIA V4 host protocol. Strapping ball TP7 is used to select the operating mode for the interface. See the Strapping Table for the setup.

CPU Interface (VIA V4 Host Protocol)				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
HCLK+/-	L23, K23	I	**Host Clock.** CPU clock (100 / 133 MHz).	**VTT**
HA[30, 16:3]#	(see ball list)	IO	**Host Data Address.** Host data addresses are transferred in 4X rate. On beat 0 and 2, address bits HA[30, 16:3]# are transferred. On beat 1 and 3, address bits HA[31, HAP, 29:17]# are transferred.	**VTT**
HD[63:0]#	(see ball list)	IO	**Host Data.** These signals are connected to the CPU data bus.	**VTT**
ADS#	A19	IO	**Address Strobe**. The CPU asserts ADS# in T1 of the CPU bus cycle.	**VTT**
BNR#	F19	IO	**Block Next Request**. Used to block the current request bus owner from issuing new requests. This signal is used to dynamically control the processor bus pipeline depth.	**VTT**
BPRI#	E20	IO	**Priority Agent Bus Request**. The owner of this signal will always be the next bus owner. This signal has priority over symmetric bus requests and causes the current symmetric owner to stop issuing new transactions unless the HLOCK# signal is asserted.	**VTT**
DBSY#	B19	IO	**Data Bus Busy**. Used by the data bus owner to hold the data bus for transfers requiring more than one cycle.	**VTT**
DEFER#	D18	IO	**Defer**. A dynamic deferring policy is used to optimize system performance. The DEFER# signal is also used to indicate a processor retry response.	**VTT**
DRDY#	E18	IO	**Data Ready**. Asserted for each cycle that data is transferred.	**VTT**
HIT#	A18	IO	**Hit**. Indicates that a caching agent holds the requested line. Also driven in conjunction with HITM# by the target to extend the snoop window.	**VTT**
HITM#	D20	I	**Hit Modified**. Asserted by the CPU to indicate that the address presented with the last assertion of EADS# is modified in the L1 cache and needs to be written back.	**VTT**
HLOCK#	E19	I	**Host Lock**. All CPU cycles sampled with the assertion of HLOCK# and ADS# until the negation of HLOCK# must be atomic.	**VTT**
HREQ[2:0]#	A22, D22, C21	IO	**Host Request Command**. Host request commands are transferred in 4X rate. On beat 0 and 2, host request bits HREQ[2:0]# are transferred. On beat 1 and 3, host request bits HREQ[4:3]# are transferred on signal balls HREQ[1:0]#.	**VTT**

CPU Interface (VIA V4 Host Protocol) – continued				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
HTRDY#	D19	IO	**Host Target Ready**. Indicates that the target of the processor transaction is able to enter the data transfer phase.	**VTT**
RS[2:0]#	G19, B18, C18	IO	**Response Signals**. Indicates the type of response per the table below: **RS[2:0]# Response type** 000 Idle State 001 Retry Response 010 Defer Response 011 Reserved 100 Hard Failure 101 Normal Without Data 110 Implicit Writeback 111 Normal With Data	**VTT**
CPURST#	D01	O	**CPU Reset.** Reset output to CPU. External pull-up and filter capacitor to ground should be provided per CPU manufacturer's recommendations.	**VTT**
BREQ0#	C19	I	**Bus Request 0.** Connect to CPU bus request 0.	**VTT**
HDBI[3:0]#	D04, A10, C14, H16	IO	**Host Dynamic Bus Inversion.** Driven along with HD[63:0]# to indicate if the associated signals are inverted or not. Used to limit the number of simultaneously switching signals to 8 for the associated 16-bit data signal group (HDBI3# for HD[63:48]#, HDBI2# for HD[47:32]#, HDBI1# for HD[31:16]#, and HDBI0# for HD[15:0]#). HDBIn# is asserted to limit the number of switching data signals simultaneously.	**VTT**
HADSTB0P# **HADSTB0N#**	C23 A23	IO	**Host Address Strobe.** HADSTB0P# / HADSTB0N# are differential synchronous strobes used to transfer HA[30, 16:3]# and HREQ[2:0]# at a 4x transfer rate.	**VTT**
HDSTB[3:0]P# **HDSTB[3:0]N#**	A03, B08, B11, E15 A02, C08, C12, F14	IO	**Host Differential Data Strobes.** Source synchronous strobes used to transfer HD[63:0]# & HDBI[3:0]# at a 4x transfer rate. HDSTB3P# / HDSTB3N# are the strobes for HD[63:48]# & HDBI3#; HDSTB2P# / HDSTB2N# are the strobes for HD[47:32]# & HDBI2#; HDSTB1P# / HDSTB1N# are the strobes for HD[31:16]# & HDBI1#; and HDSTB0P# / HDSTB0N# are the strobes for HD[15:0]# & HDBI0#.	**VTT**
DPWR#	F18	O	**Data Bus Power Reduction.** Request to reduce power on the mobile CPU data bus input buffer. HIGH will disable the CPU data bus input buffer.	**VTT**

CPU Control Interface (VIA V4 Host Protocol)				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
A20M#	E30	OD	**A20 Mask.** Connect to A20 mask input of the CPU to control address bit-20 generation. Logical combination of the A20GATE input (from internal or external keyboard controller) and Port92 bit-1 (Fast_A20).	**VCC33CPU**
FERR#	D30	I	**Numerical Coprocessor Error.** This signal is tied to the coprocessor error signal on the CPU. Internally generates interrupt 13 if active.	**VCC33CPU**
IGNNE#	E29	OD	**Ignore Numeric Error.** This signal is connected to the CPU "ignore error" signal.	**VCC33CPU**

CPU Control Interface (VIA V4 Host Protocol) - continued				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
INIT#	B29	OD	**Initialization.** INIT# is asserted if a shut-down special cycle on the PCI bus is detected or if a soft reset is initiated by the register.	**VCC33CPU**
INTR	A30	OD	**CPU Interrupt.** INTR is driven by the CX700 to signal the CPU that an interrupt request is pending and needs service.	**VCC33CPU**
NMI	C30	OD	**Non-Maskable Interrupt.** NMI is used to force a non-maskable interrupt to the CPU. CX700 generates an NMI when PCI bus SERR# is asserted.	**VCC33CPU**
SLP#	B28	OD	**Sleep.** Used to put the CPU into a sleep state.	**VCC33CPU**
SMI#	D29	OD	**System Management Interrupt.** SMI# is asserted by CX700 to the CPU in response to power management events.	**VCC33CPU**
STPCLK#	C29	OD	**Stop Clock.** This signal is asserted by the CX700 to throttle the processor clock.	**VCC33CPU**
THRMTRIP# / GPI10	C28	I	**Thermal Detect Power Down.** This signal indicates a thermal trip from the processor. THRMSTRIP# can optionally be used as GPI10.	**VCC33CPU**
DPSLP#	B30	OD	**CPU Deep Sleep.** Used to put the CPU into a deeper sleep mode.	**VCC33CPU**

DDR/DDR2 SDRAM Memory Interface

SDRAM Memory Interface supports two operating modes: DDR or DDR2 mode. Signal ball TP8 is used to select the operating mode for the interface. See the Strapping Table for the setup.

DDR/DDR2 SDRAM Memory Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
MA[12:0]	(see ball list)	O	**DRAM Row/Column Address.**	**VCCMEM**
MA13 / BA2	G30	O	**DRAM Row/Column Address.** MA13 can optionally be used as BA2 to support 1Gb (64Mb x 16) DRAM.	**VCCMEM**
BA[1:0]	L32, L29	O	**DRAM Bank Address.**	**VCCMEM**
SRAS#	K32	O	**DRAM Row Address Strobe.**	**VCCMEM**
SCAS#	K30	O	**DRAM Column Address Strobe.**	**VCCMEM**
SWE#	K31	O	**DRAM Write Enable.**	**VCCMEM**
MD[63:0]	(see ball list)	IO	**Memory Data.** In 32-bit memory interface mode, connect memory data lines to MD[31:0].	**VCCMEM**
MPD[7:0]	(see ball list)	IO	**Memory Parity Data Bits.** For ECC function.	**VCCMEM**
DQM[7:0]	(see ball list)	O	**Memory Data Mask.** Data mask for the eight data bytes.	**VCCMEM**
ODT[3:0]	F30, F32, G33, H29	O	**DDR2 On-Die Termination Enable.** For the four DDR2 memory banks. Not used in DDR mode.	**VCCMEM**
DQS[8:0]	(see ball list)	IO	**DDR/DDR2 Memory Data Strobes.** Data strobe for the eight data bytes and the MPD[7:0] byte.	**VCCMEM**
CS[3:0]#	G31, G32, H32, K29	O	**Memory Chip Select.** Chip select for the four memory banks.	**VCCMEM**
CKE[3:0]	T33, T32, T30, T31	O	**Memory Clock Enable.** For the four memory banks to enable DRAM power down mode.	**VCCMEM**
MCLKO[2:0]+ **MCLKO[2:0]-**	E32, R34, AD34 E33, R35, AD35	O	**Differential Memory Clock Output.** In one DIMM system memory configuration, connect memory clock outputs to the DIMM socket directly. Use Zero Delay buffer for two DIMM system memory configurations.	**VCCMEM**

LVDS / DVI Interface

LVDS Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
LCD1DO0+/– TXC+/-	T03, T02	O	**LVDS Single Channel Mode:** LVDS Differential Data Output 0 for Panel 1. **LVDS Dual Channel Mode:** LVDS Differential Data Output 0. In DVI Mode, used as DVI Differential Clock Output.	**VCC33LVDS**
LCD1DO1+/– TX0+/-	R02, R01	O	**Single Channel Mode:** LVDS Differential Data Output 1 for Panel 1. **Dual Channel Mode:** LVDS Differential Data Output 1. In DVI Mode, used as DVI Differential Data Output 0.	**VCC33LVDS**
LCD1DO2+/– TX1+/-	P01, P02	O	**Single Channel Mode:** LVDS Differential Data Output 2 for Panel 1.. **Dual Channel Mode:** LVDS Differential Data Output 2. In DVI Mode, used as DVI Differential Data Output 1.	**VCC33LVDS**
LCD1DO3+/–	M03, M04	O	**Single Channel Mode:** LVDS Differential Data Output 3 for Panel 1. **Dual Channel Mode:** LVDS Differential Data Output 3.	**VCC33LVDS**
LCD2DO0+/–	J01, J02	O	**Single Channel Mode:** LVDS Differential Data Output 0 for Panel 2. **Dual Channel Mode:** LVDS Differential Data Output 4.	**VCC33LVDS**
LCD2DO1+/–	K02, K03	O	**Single Channel Mode:** LVDS Differential Data Output 1 for Panel 2. **Dual Channel Mode:** LVDS Differential Data Output 5.	**VCC33LVDS**
LCD2DO2+/–	L03, L04	O	**Single Channel Mode:** LVDS Differential Data Output 2 for Panel 2 **Dual Channel Mode:** LVDS Differential Data Output 6.	**VCC33LVDS**
LCD2DO3+/–	M01, M02	O	**Single Channel Mode:** LVDS Differential Data Output 3 for Panel 2 **Dual Channel Mode:** LVDS Differential Data Output 7.	**VCC33LVDS**
LCD1CLK+/– TX2+/-	N02, N03	O	**Single Channel Mode:** LVDS Differential Clock Output for Panel 1. **Dual Channel Mode:** Not Connected. In DVI mode, used as DVI Differential Data Output 2.	**VCC33LVDS**
LCD2CLK+/–	L02, L01	O	**Single Channel Mode:** LVDS Differential Clock Output for Panel 2. **Dual Channel Mode:** LVDS Differential Clock Output.	**VCC33LVDS**

DVI Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
TXC+/- LCD1DO0+/–	T03, T02	O	**DVI Differential Clock Output.** In LVDS mode, used as Channel 1 differential data output 0**.**	**VCC33LVDS**
TX0+/- LCD1DO1+/–	R02, R01	O	**DVI Differential Data Output 0.** In LVDS mode, used as Channel 1 differential data output 1.	**VCC33LVDS**
TX1+/- LCD1DO2+/–	P01, P02	O	**DVI Differential Data Output 1.** In LVDS mode, used as Channel 1 differential data output 2.	**VCC33LVDS**
TX2+/- LCD1CLK+/–	N02, N03	O	**DVI Differential Data Output 2.** In LVDS mode, used as Channel 1 differential clock output.	**VCC33LVDS**
SW_REXT	T05	AI	**Voltage Swing Adjustment of Pixel Channel in DVI Mode** This signal controls the amplitude of the DVI output voltage swing. A 410 ohm pull-up resistor should connect this ball to VCCA33LVDS. If DVI interface is not needed, leave it unconnected.	**VCC33LVDS**

LCD Panel Power Control				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
ENVDD[2:1]	Y05, Y03	O	**Enable Panel VDD Power.** For the two panels.	**VCC33**
ENVBLD[2:1]	Y06, Y04	O	**Enable Panel Back Light.** For the two panels.	**VCC33**

CRT / TV Monitor Interface

CRT / TV Monitor Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
AR, AG, AB	V01, U02, U01	AO	**CRT Mode:** **Analog Red / Green / Blue.** DAC outputs. **TV Mode:** The AR / AG / AB outputs could be used as **C / Y / CVBS** or **R / G / B** or **Pr / Y / Pb** outputs depends on the strapping settings. See the Strapping Table for DVP1D[10:8] strapping setup for the desired DAC operating mode.	**VCCA33DAC**
HSYNC	AA06	O	**Horizontal Sync.**	**VCC33**
VSYNC	AA07	O	**Vertical Sync.**	**VCC33**
RSET	V03	AI	**Reference Resistor.** Tie to GNDADAC through an external resistor to control the RAMDAC full-scale current.	**VCCA33DAC**
SPCLK2 **SPD2** **SPCLK1** **SPD1**	AA03 AA04 AA02 AA01	IO	**Serial Port (SMBus) Clock and Data.** The SPCLKn signals are the clocks for serial data transfer. The SPDn signals are the data signals used for serial data transfer. SPCLK1/SPD1 is typically used for DVI monitor communications and SPCLK2/SPD2 is typically used for DDC for CRT monitor communications.	**VCC33**

Video Capture Port Interface

VCP Interface supports multiple operating modes, signal balls DVP1D[7:0] are used to select the operating mode for the interface. See the Strapping Table for the setup.

Video Capture Port (VCP)				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
VCP1D[7:0] / TS1D[7:0] **VCP0D[7:0]** / TS0D[7:0]	(see ball list)	IO	**Video Capture Mode:** VCP1D[7:0] is 8-bit CCIR-601/656 Port 1 or Upper half of 16-bit CCIR-601/656. VCP0D[7:0] is 8-bit CCIR-601/656 Port 0 or Lower half of 16-bit CCIR-601/656. VCP1D[7:0] plus VCP0D[7:0] can be used for 16-bit CCIR-601/656. **Transport Stream Input Mode:** TS1D[7:0] is 8-bit Transport Stream Port 1. TS0D[7:0] is 8-bit Transport Stream Port 0.	**VCC33**
VCP0HS / TS0VLD	AG08	IO	**Video Capture Mode:** VCP0HS: Video Capture Port 0 Horizontal Sync. **Transport Stream Input Mode:** TS0VLD: Transport Stream Port 0 Data Valid.	**VCC33**
VCP0VS / TS0SYNC	AG06	IO	**Video Capture Mode:** VCP0VS: Video Capture Port 0 Vertical Sync. **Transport Stream Input Mode:** TS0SYNC: Transport Stream Port 0 Data Sync.	**VCC33**
VCP1HS / TS1VLD	AK02	I	**Video Capture Mode:** VCP1HS: Video Capture Port 1 Horizontal Sync. **Transport Stream Input Mode:** TS1VLD: Transport Stream Port 1 Data Valid. If the interface is not needed, leave it unconnected.	**VCC33**
VCP1VS / TS1SYNC	AK03	I	**Video Capture Mode:** VCP1VS: Video Capture Port 1 Vertical Sync. **Transport Stream Input Mode:** TS1SYNC: Transport Stream Port 1 Data Sync. If the interface is not needed, leave it unconnected.	**VCC33**
NC / **TS0ERR**	AJ02	IO	**Video Capture Mode:** NC: Not Connected. **Transport Stream Input Mode:** TS0ERR: Transport Stream Port 0 Error.	**VCC33**
VCP0CLK / TS0CLK	AH05	IO	**Video Capture Mode:** VCP0CLK: Video Capture Port 0 Clock. **Transport Stream Input Mode:** TS0CLK: Transport Stream Port 0 Clock.	**VCC33**
VCP1CLK / TS1CLK	AJ03	IO	**Video Capture Mode:** VCP1CLK: Video Capture Port 1 Clock. **Transport Stream Input Mode:** TS1CLK: Transport Stream Port 1 Clock.	**VCC33**
NC / **TS1ERR**	AK07	I	**Video Capture Mode:** NC: Not Connected. **Transport Stream Input Mode:** TS1ERR: Transport Stream Port 1 Error. If the interface is not needed, leave it unconnected.	**VCC33**

Note: Please use the **bold signal name** to find the ball location in the signal ball list.

Digital Video Port 1 (DVP1) Interface

DVP1 Interface supports multiple operating modes, signal balls VCP1D[5:3] are used to select the operating mode for the interface. See the Strapping Table for the setup.

Digital Video Port 1 (DVP1) Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
DVP1D [15:0]	(see ball list)	O	**12-Bit Digital Video Output Mode:** DVP1D [11:0] is for 12-Bit DVO Interface. **20-Bit TV Output Mode:** DVP1D [15:0] is the first 16 Bits of the TV Interface. **ARGB Mode:** DVP1D[15:0] supports 16-bit ARGB interface.	**VCC33**
DVP1HS / DVP1D[16]	AB04	O	**12-Bit Digital Video Output Mode:** DVP1HS is Digital Video Port 1 Horizontal Sync. **20-Bit TV Output Mode:** DVP1D[16] is the 17th Bit of the TV Interface.	**VCC33**
DVP1VS / DVP1D[17]	AC04	O	**12-Bit Digital Video Output Mode:** DVP1VS is Digital Video Port 1 Vertical Sync. **20-Bit TV Output Mode:** DVP1D[17] is the 18th Bit of the TV Interface.	**VCC33**
DVP1DE / DVP1D[18]	AG04	O	**12-Bit Digital Video Output Mode:** DVP1DE is Digital Video Port 1 Data Enable. **20-Bit TV Output Mode:** DVP1D[18] is the 19th Bit of the TV Interface.	**VCC33**
DVP1TVFLD / DVP1D[19]	AG02	IO	**12-Bit Digital Video Output Mode:** DVP1TVFLD is Digital Video Port 1 Field Out. **20-Bit TV Output Mode:** DVP1D[19] is the 20th Bit of the TV Interface.	**VCC33**
DVP1DET	AE05	I	**Display Detect.** Tie to GND if not used.	**VCC33**
DVP1CLK	AD02	O	**Digital Video Port 1 Clock / TV Clock**	**VCC33**
DVP1TVCLKR	AE04	I	**TV Return Clock.** Tie to GND if not used.	**VCC33**

Note: Please use the **bold signal name** to find the ball location in the signal ball list.

PCI Bus Interface

PCI Bus Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
AD[31:0]	(see ball list)	IO	**Address / Data Bus.** Multiplexed address and data. The address is driven with FRAME# assertion and data is driven or received in following cycles.	**VCC33**
CBE[3:0]#	AP04, AR05, AP07, AM09	IO	**Command / Byte Enable.** The command is driven with FRAME# assertion. Byte enables corresponding to supplied or requested data are driven on following clocks.	**VCC33**
DEVSEL#	AL07	IO	**Device Select.** The CX700 asserts this signal to claim PCI transactions through positive or subtractive decoding. As an input, DEVSEL# indicates the response to a CX700-initiated transaction and is also sampled when decoding whether to subtractively decode the cycle. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]).	**VCC33**
FRAME#	AT05	IO	**Frame.** Assertion indicates the address phase of a PCI transfer. Negation indicates that one additional data transfer is desired by the cycle initiator. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]).	**VCC33**
IRDY#	AP06	IO	**Initiator Ready.** Asserted when the initiator is ready for data transfer. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]).	**VCC33**
TRDY#	AM05	IO	**Target Ready.** Asserted when the target is ready for data transfer. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]).	**VCC33**
STOP#	AM06	IO	**Stop.** Asserted by the target to request the master to stop the current transaction. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]).	**VCC33**
SERR#	AR06	I	**System Error.** SERR# can be pulsed active by any PCI device that detects a system error condition. Upon sampling SERR# active, the CX700 can be programmed to generate an NMI to the CPU. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]). If internal pull-up is used, this signal can be left unconnected.	**VCC33**
PERR#	AL08	-	**Parity Error.** PERR#, sustained tri-state, is only for the reporting of data parity errors during all PCI transactions except a Special Cycle. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[0]). If internal pull-up is used, this signal can be left unconnected.	**VCC33**
PAR	AR04	IO	**Parity.** A single parity bit is provided over AD[31:0] and C/BE[3:0]#.	**VCC33**

PCI Bus Interface - continued				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
INTA# **INTB#** **INTC#** **INTD#**	AL01 AL03 AL02 AM01	I	**PCI Interrupt Request**. The INTA# through INTD# signal balls are typically connected to the PCI bus INTA#-INTD# signals per the table below. BIOS settings must match the physical connection method. INTA# INTB# INTC# INTD# PCI Slot 1 INTA# INTB# INTC# INTD# PCI Slot 2 INTB# INTC# INTD# INTA# PCI Slot 3 INTC# INTD# INTA# INTB# PCI Slot 4 INTD# INTA# INTB# INTC# This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[1]). If internal pull-up is used, this signal can be left unconnected.	**VCC33**
REQ3#, **REQ2#,** **REQ1#,** **REQ0#**	AN04 AP02 AP01 AN03	I	**PCI Request.** These signals connect to the CX700 from each PCI slot (or each PCI master) for access request to the PCI bus. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[1]). If internal pull-up is used, this signal can be left unconnected.	**VCC33**
GNT3#, **GNT2#,** **GNT1#,** **GNT0#**	AR01 AM03 AM02 AN01	O	**PCI Grant.** These signals are driven by the CX700 to grant PCI bus access to a specific PCI master. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[1]).	**VCC33**
PCIRST#	AT10	O	**PCI Reset.** This signal is used to reset devices attached to the PCI bus.	**VCC33**
PCICLK	AL10	I	**PCI Clock.** This signal provides timing for all transactions on the PCI Bus. This clock is necessary even if the system does not need PCI interface.	**VCC33**

USB 2.0 Interface

USB 2.0 Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
USBP0+/–	AM29, AN29	IO	**USB Port 0 Differential Data**	**VCC33USB**
USBP1+/–	AT29, AR29	IO	**USB Port 1 Differential Data**	**VCC33USB**
USBP2+/–	AT27, AR27	IO	**USB Port 2 Differential Data**	**VCC33USB**
USBP3+/–	AM27, AN27	IO	**USB Port 3 Differential Data**	**VCC33USB**
USBP4+/–	AT25, AR25	IO	**USB Port 4 Differential Data**	**VCC33USB**
USBP5+/–	AM25, AN25	IO	**USB Port 5 Differential Data**	**VCC33USB**
USBCLK	AT23	I	**USB Clock.** 48 MHz clock input for the USB and HD Audio. If USB and HD Audio interfaces are not used, leave it unconnected.	**VCC33USB**
USBOC0#	AL23	I	**USB Port 0 Over Current Detect.** Port 0 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBOC1#	AP23	I	**USB Port 1 Over Current Detect.** Port 1 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBOC2#	AN23	I	**USB Port 2 Over Current Detect.** Port 2 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBOC3#	AM23	I	**USB Port 3 Over Current Detect.** Port 3 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBOC4#	AK23	I	**USB Port 4 Over Current Detect.** Port 4 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBOC5#	AK24	I	**USB Port 5 Over Current Detect.** Port 5 is disabled if low. If USB interface is not needed, leave it unconnected.	**VCC33USB**
USBREXT	AR23	AI	**USB External Resistor** If USB interface is not needed, leave it unconnected.	**VCC33USB**

SATA Interface

SATA Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
SRX0+/–	AR35, AT35	I	**SATA Port 0 Differential Receiver**	**VCCA33SATA**
SRX1+/–	AR33, AT33	I	**SATA Port 1 Differential Receiver**	**VCCA33SATA**
STX0+/–	AM35, AN35	O	**SATA Port 0 Differential Transmitter**	**VCCA33SATA**
STX1+/–	AM33, AN33	O	**SATA Port 1 Differential Transmitter**	**VCCA33SATA**
SXI	AK35	I	**SATA Crystal Input.** 25MHz Crystal Input. If SATA interface is not needed, SATA crystal can be removed. Tie to GND if not used.	**VCCA33SATA**
SXO	AK36	O	**SATA Crystal Output.** 25MHz crystal output. If SATA interface is not needed, SATA crystal can be removed.	**VCCA33SATA**
SREXT	AJ34	AI	**SATA External Resistor.** If SATA interface is not needed, leave it unconnected.	**VCCA33SATA**
SATALED#	AJ23	O	**SATA LED.**	**VCC33**

SMBus Interface

SMBus Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
SMBCLK1	AM16	OD	**SMB Channel 1 Clock.** Master Mode.	**VSUS33**
SMBDATA1	AN16	OD	**SMB Channel 1 Data.** Master Mode.	**VSUS33**
SMBCLK2 / GPIO1	AK16	OD	**SMB Channel 2 Clock.** Slave Mode. SMBCLK2 can optionally be used as GPIO1.	**VSUS33**
SMBDATA2 / GPIO0	AL16	OD	**SMB Channel 2 Data.** Slave Mode. SMBDATA2 can optionally be used as GPIO0.	**VSUS33**
SMBALRT#	AP15	I	**SMB Alert.** (With optional 10K ohms built-in pull-up resistor) Enabled by System Management Bus I/O space. When enabled, SMBALRT# assertion generates an IRQ or SMI interrupt or a power management resume event. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If internal pull-up is used, this signal can be left unconnected.	**VSUS33**

Enhanced IDE Interface

Enhanced IDE is enabled when signal ball PDDACK# is strapped HIGH.

Enhanced IDE Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
PDIORDY	AK22	I	EIDE Mode: **PDIORDY:** Device ready indicator UltraDMA Mode: **(Write) PDDMARDY**: Output flow control. The device may assert PDDMARDY to pause output transfers **(Read) PDSTROBE:** Input data strobe (both edges). The device may stop assertion of PDSTROBE to pause input data transfers	**VCC33**
PDIOR# / GPO0	AL22	O	EIDE Mode: **PDIOR#:** Device read strobe UltraDMA Mode: **(Write) PHSTROBE:** Output data strobe (both edges). The host may stop assertion of PHSTROBE to pause output data transfers **(Read) PHDMARDY:** Input flow control**.** The host may assert PHDMARDY to pause input transfers PDIOR# can optionally be used as GPO0.	**VCC33**
PDIOW# / GPO1	AT20	O	EIDE Mode: **PDIOW#:** Device write strobe UltraDMA Mode: **PSTOP:** Stop transfer. Asserted by the host prior to initiation of an UltraDMA burst; negated by the host before data is transferred in an UltraDMA burst. Assertion of PSTOP by the host during or after data transfer signals the termination of the burst. PDIOW# can optionally be used as GPO1.	**VCC33**
PDDREQ	AR20	I	**IDE Device DMA Request.**	**VCC33**
PDDACK#	AJ22	O	**IDE Device DMA Acknowledge.**	**VCC33**

Enhanced IDE Interface - continued				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
PDCS1#	AN22	O	**IDE Master Chip Select.** This signal has an internal 10K ohms pull-up resistor.	**VCC33**
PDCS3#	AP22	O	**IDE Slave Chip Select.**	**VCC33**
PDA[2:0] / GPO[4:2]	AR22, AG22, AT22	O	**IDE Disk Address.** PDA[2:0] are used to indicate which byte in either the ATA command block or control block is being accessed. PDA[2:0] can optionally be used as GPO[4:2].	**VCC33**
PDD[15:0]	(see ball list)	IO	**IDE Data Bus.**	**VCC33**
IRQ15 / GPI0	AH22	I	**IDE Channel Interrupt Request.** This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F7 Rx55[2]). If it is not used, leave it unconnected.	**VCC33**

LPC Bus Interface

LPC Bus Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
LPCAD[3:0]	AM19, AN19, AT19, AR19	IO	**LPC Address / Data.** This signal has an internal 10K ohms pull-up resistor.	**VCC33**
LPCFRAME#	AP19	O	**LPC Frame.** This signal has an internal 10K ohms pull-up resistor.	**VCC33**
LPCDRQ0#	AK19	I	**LPC DMA / Bus Master Request 0.** Pull up 10K ohms to VCC33 if not used.	**VCC33**
LPCDRQ1#	AL19	I	**LPC DMA / Bus Master Request 1.** Pull up 10K ohms to VCC33 if not used.	**VCC33**

Serial Port Interface

Serial ports are enabled when signal ball PDDACK# is strapped LOW.

Serial Port Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
SDOUT1 / PDD5	AM20	O	**Transmit Data for Serial Port 1.** SDOUT1 can optionally be used as PDD5.	**VCC33**
SDOUT2 / PDD13	AK21	O	**Transmit Data for Serial Port 2.** SDOUT2 can optionally be used as PDD13.	**VCC33**
SIN1 / PDD4	AK20	I	**Receive Data for Serial Port 1.** SIN1 can optionally be used as PDD4.	**VCC33**
SIN2 / PDD12	AL21	I	**Receive Data for Serial Port 2.** SIN2 can optionally be used as PDD12.	**VCC33**
RTS1 / PDD2	AN21	O	**Request To Send for Serial Port 1.** RTS1 can optionally be used as PDD2.	**VCC33**
RTS2 / PDD10	AJ20	O	**Request To Send for Serial Port 2.** RTS2 can optionally be used as PDD10.	**VCC33**
CTS1 / PDD0	AP20	I	**Clear To Send for Serial Port 1.** CTS1 can optionally be used as PDD0.	**VCC33**
CTS2 / PDD8	AG20	I	**Clear To Send for Serial Port 2.** CTS2 can optionally be used as PDD8.	**VCC33**
DTR1 / PDD3	AN20	O	**Data Terminal Ready for Serial Port 1.** DTR1 can optionally be used as PDD3.	**VCC33**
DTR2 / PDD11	AL20	O	**Data Terminal Ready for Serial Port 2.** DTR2 can optionally be used as PDD11.	**VCC33**
DSR1 / PDD1	AP21	I	**Data Set Ready for Serial Port 1.** DSR1 can optionally be used as PDD1.	**VCC33**
DSR2 / PDD9	AH20	I	**Data Set Ready for Serial Port 2.** DSR2 can optionally be used as PDD9.	**VCC33**
DCD1 / PDD6	AH21	I	**Data Carrier Detect for Serial Port 1.** DCD1 can optionally be used as PDD6.	**VCC33**
DCD2 / PDD14	AM22	I	**Data Carrier Detect for Serial Port 2.** DCD2 can optionally be used as PDD14.	**VCC33**
RI1 / PDD7	AG21	I	**Ring Indicator for Serial Port 1.** RI1 can optionally be used as PDD7.	**VCC33**
RI2 / PDD15	AT21	I	**Ring Indicator for Serial Port 2.** RI2 can optionally be used as PDD15.	**VCC33**

High Definition Audio Interface

High Definition Audio Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
AZRST#	AR10	O	**High Definition Audio Reset.**	**VSUS33**
AZBITCLK	AR11	O	**High Definition Audio Bit Clock.** 24.00 MHz.	**VCC33**
AZSYNC	AP10	O	**High Definition Audio Sync.** 48 KHz Frame Sync and outbound tag signal.	**VCC33**
AZSDOUT	AT12	O	**High Definition Audio Serial Data Output.**	**VCC33**
AZSDIN[1:0]	AP11, AT11	I	**High Definition Audio Serial Data Input.** These signals have internal 10K ohms pull-down resistors.	**VSUS33**

Speaker Interface

Speaker Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
SPKR / GPO7	AL18	O	**Speaker Out.** SPKR can optionally be used as GPO7.	**VCC33**

Internal Keyboard Controller Interface

Internal Keyboard Controller Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
MSCK	AN13	IO	**Mouse Clock.** From internal mouse controller. This signal has an internal 10K ohms pull-up resistor.	**VSUS33**
MSDT	AP13	IO	**Mouse Data.** From internal mouse controller. This signal has an internal 10K ohms pull-up resistor.	**VSUS33**
KBCK / A20GATE	AL13	IO	**Keyboard Clock.** From internal keyboard controller. This signal has an internal 10K ohms pull-up resistor. This signal is used as A20GATE to connect to external keyboard controller's A20Gate signal if external KBC is used.	**VSUS33**
KBDT / KBC_CPURST#	AM13	IO	**Keyboard Data.** From internal keyboard controller. This signal has an internal 10K ohms pull-up resistor. This signal is used as KBC_CPURST# to connect to external keyboard controller's CPURST# signal if external KBC is used.	**VSUS33**

Note: Please use the **bold signal name** to find the ball location in the signal ball list.

Serial IRQ Interface

Serial IRQ Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
SERIRQ	AM17	IO	**Serial IRQ.** This signal has an internal 10K ohms pull-up resistor. If it is not used, leave it unconnected.	**VCC33**

PC / PCI DMA Interface

PC / PCI DMA Interface				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
PCIDREQ / GPIO2	AK09	I	**PC / PCI DMA Request.** PCIDREQ can optionally be used as GPIO2. Tie to GND if not used.	**VCC33**
PCIDGNT / GPIO3	AK08	O	**PC / PCI DMA Grant.** PCIDGNT can optionally be used as GPIO3.	**VCC33**

General Purpose Input Interface

General Purpose Input Interface – Signal Attributes										
Signal Name	**Ball #**	**I/O**	**Default Function**	**Signal State**					**Interrupt Triggered by GPI**	**Power Plane**
				Reset	**After Reset**	**POS**	**STR**	**STD**		
GPI0 / IRQ15	AH22	I	IRQ15	IRQ15	IRQ15	Driven	Off	Off	No	**VCC33**
GPI1	AP12	I	—	Reserved for TV/CRT output select function HIGH: TV, LOW: CRT					No	**VCC33**
GPI2	AN12	I	—	—	—	Driven	Driven	Driven	No	**VSUS33**
GPI3 / AOL	AN14	I	—	—	—	Driven	Driven	Driven	No	**VSUS33**
GPI4 / BATLOW#	AP14	I	GPI4	Static	Driven	Driven	Driven	Driven	No	**VSUS33**
GPI5 / EXTSMI#	AN15	I	GPI5	Static	Driven	Driven	Driven	Driven	No	**VSUS33**
GPI6 / INTRUDER#	AN17	I	GPI6	Static	Driven	Driven	Driven	Driven	No	**VBAT**
GPI7 / LID#	AT13	I	GPI7	Static	Driven	Driven	Driven	Driven	No	**VSUS33**
GPI8 / RING#	AL14	I	GPI8	Static	Driven	Driven	Driven	Driven	SCI/SMI	**VSUS33**
GPI9 / THRM#	AP16	I	GPI9	Static	Driven	Driven	Driven	Driven	SCI/SMI	**VSUS33**
GPI10 / THRMTRIP#	C28	I	THRMTRIP#	THRMTRIP#	THRMTRIP#	Driven	Off	Off	SCI/SMI	**VCC33**
GPI11/ VGATE	AM18	I	GPI11	Static	Driven	Driven	Driven	Driven	Generate Wakeup Event Then SCI/SMI	**VSUS33**

GPI Signal States:

1. **Static:** The input signal must remain static, either high or low.
2. **Driven:** The input signal is driven from outside. It is allowed to change.
3. **Off:** The power plane of the input signal is off.

System States:

1. **Reset:** During <RSMRST#, PCIRST#> is <0, 0>
2. **After Reset:** Immediately after <RSMRST#, PCIRST#> is <1, 1>

General Purpose Input Interface – Signal Control Registers				
Signal Name	**Control Register**	**GPI Status Register**	**GPI SCI/SMI Register**	**Status Change Register**
GPI0	B0D17F0 RxE4[3] = 1	PMIO Rx48[0]	N/A	N/A
GPI1	B0D17F0 Rx94[3] = 1	PMIO Rx48[1]	N/A	N/A
GPI2	B0D17F0 Rx94[3] = 1	PMIO Rx48[2]	N/A	N/A
GPI3	B0D17F0 Rx95[1] = 1	PMIO Rx48[3]	N/A	N/A
GPI4	PMIO Rx25[4] = 0 & PMIO Rx23[4] = 0	PMIO Rx48[4]	N/A	N/A
GPI5	PMIO Rx24[4] = 0 & PMIO Rx22[4] = 0	PMIO Rx48[5]	N/A	N/A
GPI6	PMIO Rx24[6] = 0 & PMIO Rx22[6] = 0	PMIO Rx48[6]	N/A	N/A
GPI7	PMIO Rx25[3] = 0 & PMIO Rx23[3] = 0	PMIO Rx48[7]	N/A	N/A
GPI8	PMIO Rx25[0] = 0 & PMIO Rx23[0] = 0	PMIO Rx49[0]	PMIO Rx52[0] = 1, B0D17F0 RxE0[0], B0D17F0 RxE1[0]	PMIO Rx50[0]
GPI9	PMIO Rx25[2] = 0 & PMIO Rx23[2] = 0 & B0D17F0 Rx8C[3] = 0	PMIO Rx49[1]	PMIO Rx52[1] = 1, B0D17F0 RxE0[1], B0D17F0 RxE1[1]	PMIO Rx50[1]
GPI10	PMIO Rx2B[1] = 0	PMIO Rx49[2]	PMIO Rx52[2] = 1, B0D17F0 RxE0[2], B0D17F0 RxE1[2]	PMIO Rx50[2]
GPI11	B0D17F0 RxE5[4] = 0	PMIO Rx49[3]	PMIO Rx22[1] or PMIO Rx24[1]	PMIO Rx20[1]

General Purpose Output Interface

General Purpose Output Interface – Signal Attributes									
Signal Name	**Ball #**	**I/O**	**Default Function**	**Signal State**					**Power Plane**
				Reset	**After Reset**	**POS**	**STR**	**STD**	
GPO0 / PDIOR#	AL22	O	PDIOR#	PDIOR#/	PDIOR#	Defined	Off	Off	**VCC33**
GPO1 / PDIOW#	AT20	O	PDIOW#	PDIOW#	PDIOW#	Defined	Off	Off	**VCC33**
GPO2 / PDA0	AT22	O	PDA0	PDA0	PDA0	Defined	Off	Off	**VCC33**
GPO3 / PDA1	AG22	O	PDA1	PDA1	PDA1	Defined	Off	Off	**VCC33**
GPO4 / PDA2	AR22	O	PDA2	PDA2	PDA2	Defined	Off	Off	**VCC33**
GPO5	AM12	O	—	—	—	Defined	Off	Off	**VCC33**
GPO6	AL12	O	—	—	—	Defined	Defined	Defined	**VSUS33**
GPO7 / SPKR	AL18	O	SPKR	SPKR	SPKR	Defined	Off	Off	**VCC33**
GPO8 / SUSA#	AM15	O	SUSA#	SUSA#	SUSA#	Defined	Defined	Defined	**VSUS33**
GPO9 / SUSB#	AR13	O	SUSB#	SUSB#	SUSB#	Defined	Defined	Defined	**VSUS33**
GPO10 / SUSC#	AM14	O	SUSC#	SUSC#	SUSC#	Defined	Defined	Defined	**VSUS33**
GPO11	AR12	O	—	—	—	Defined	Off	Off	**VCC33**

GPO Signal States:

1. **High-Z:** Tri-State.
2. **High:** The output signal is logic “1”.
3. **Low:** The output signal is logic “0”.
4. **Defined:** The output signal can be high or low, defined by the GPO function.
5. **Undefined:** The output signal is undetermined.
6. **Off:** The power plane of output signal is off.

System States:

1. **Reset:** During <RSMRST#, PCIRST#> is <0, 0>
2. **After Reset:** Immediately after <RSMRST#, PCIRST#> is <1, 1>

General Purpose Output Interface – Signal Control Registers		
Signal Name	**Control Register**	**GPO Output Register**
GPO0	B0D17F0 RxE4[3] = 1	PMIO Rx4C[0]
GPO1	B0D17F0 RxE4[3] = 1	PMIO Rx4C[1]
GPO2	B0D17F0 RxE4[3] = 1	PMIO Rx4C[2]
GPO3	B0D17F0 RxE4[3] = 1	PMIO Rx4C[3]
GPO4	B0D17F0 RxE4[3] = 1	PMIO Rx4C[4]
GPO5	B0D17F0 Rx94[3] = 1	PMIO Rx4C[5]
GPO6	B0D17F0 Rx94[3] = 1	PMIO Rx4C[6]
GPO7	B0D17F0 RxE4[4] = 1	PMIO Rx4C[7]
GPO8	B0D17F0 Rx94[2] = 1	PMIO Rx4D[0]
GPO9	B0D17F0 Rx94[2] = 1	PMIO Rx4D[1]
GPO10	B0D17F0 Rx94[2] = 1	PMIO Rx4D[2]
GPO11	B0D17F0 Rx94[3] = 1	PMIO Rx4D[3]

General Purpose Input/Output Interface

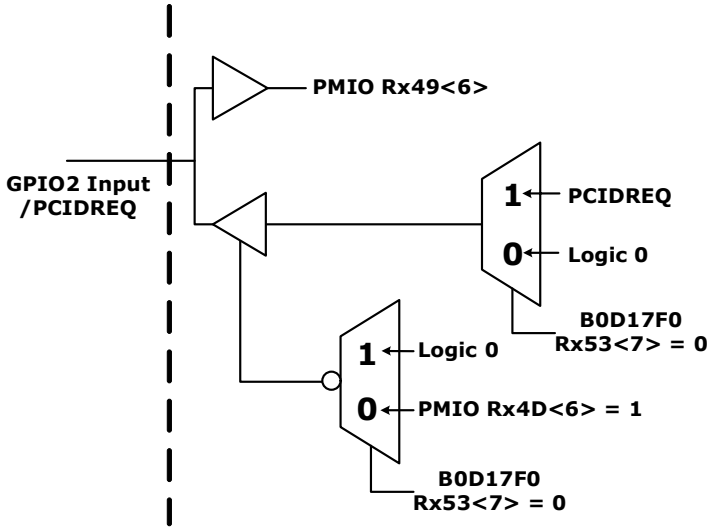
General Purpose Input/Output Interface – Signal Attributes									
Signal Name	**Ball #**	**I/O**	**Default Function**	**Signal State**					**Power Plane**
				Reset	**After Reset**	**POS (GPO)**	**STR (GPO)**	**STD (GPO)**	
GPIO0 / SMBDATA2	AL16	IO	GPI Mode	Static	Driven	Defined	Defined	Defined	**VSUS33**
GPIO1 / SMBCLK2	AK16	IO	GPI Mode	Static	Driven	Defined	Defined	Defined	**VSUS33**
GPIO2 / PCIDREQ	AK09	IO	GPI Mode	Static	Driven	Defined	Off	Off	**VCC33**
GPIO3 / PCIDGNT	AK08	IO	GPI Mode	Static	Driven	Defined	Off	Off	**VCC33**
GPIOA	AB08	IO	—	Reserved for display					**VCC33**
GPIOB	AB07	IO	—	Reserved for display					**VCC33**
GPIOC / DISPCLKI2	AB06	IO	DISPCLKI2	Reserved for display					**VCC33**
GPIOD / DISPCLKO2	AB05	IO	DISPCLKO2	Reserved for display					**VCC33**

General Purpose Input/Output Interface – Signal Registers					
Signal Name	**Control Register**	**GPI Status Register**	**GPI SCI/SMI Register**	**GPI Status Change Register**	**GPO Output Register**
GPIO0	B0D17F0 Rx95[3] = 1 B0D17F0 Rx95[2] = 1	PMIO Rx49[4]	PMIO Rx52[4] = 1, B0D17F0 RxE0[4], B0D17F0 RxE1[4]	PMIO Rx50[4]	PMIO Rx4D[4]
GPIO1	B0D17F0 Rx95[3] = 1 B0D17F0 Rx95[2] = 1	PMIO Rx49[5]	PMIO Rx52[5] = 1, B0D17F0 RxE0[5], B0D17F0 RxE1[5]	PMIO Rx50[5]	PMIO Rx4D[5]
GPIO2	B0D17F0 Rx53[7] = 0	PMIO Rx49[6]	PMIO Rx52[6] = 1, B0D17F0 RxE0[6], B0D17F0 RxE1[6]	PMIO Rx50[6]	PMIO Rx4D[6]
GPIO3	B0D17F0 Rx53[7] = 0	PMIO Rx49[7]	PMIO Rx52[7] = 1, B0D17F0 RxE0[7], B0D17F0 RxE1[7]	PMIO Rx50[7]	PMIO Rx4D[7]

GPIO Programming Sequence

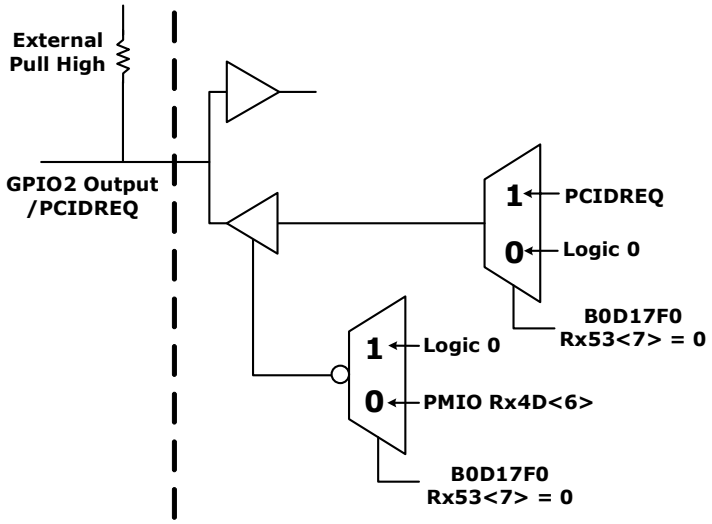
1. To Input from a GPIO[3:0] signal:
   → Enable the control register and write "1" to the corresponding PMIO Rx4D<7:4> register bit:
   → Read the corresponding input register to retrieve the current signal state.

   Example: GPIO2 I/O Pad Circuit Diagram (Input Mode)



2. To Output through a GPIO[3:0] signal:
   → Enable the control register
   → Program the corresponding output register bit, PMIO Rx4D<7:4>, to the desired state.

   Example: GPIO2 I/O Pad Circuit Diagram (Output Mode)



Power Management Control and Event Signals

Power Management Control and Event Signals				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
PWRBTN#	AJ15	I	**Power Button.** Used by the Power Management subsystem to monitor an external system on/off button or switch. Internal logic powered by VSUS33. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If internal pull-up is used, this signal can be left unconnected.	**VSUS33**
EXTSMI# / GPI5	AN15	IO	**External System Management Interrupt.** When enabled, a falling edge on this input causes an SMI# to be generated to the CPU to enter SMI mode. EXTSMI# can optionally be used as GPI5. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]).	**VSUS33**
PME#	AL15	I	**Power Management Event.** This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If it is not used, leave it unconnected.	**VSUS33**
LID# / GPI7	AT13	I	**Notebook Computer Display Lid Open / Closed Monitor.** Used by the Power Management subsystem to monitor the opening and closing of the display lid of notebook computers. Can be used to detect either low-to-high or high-to-low transitions to generate an SMI#. LID# can optionally be used as GPI7. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If it is not used, leave it unconnected.	**VSUS33**
INTRUDER# / GPI6	AN17	I	**Intrusion Indicator.** INTRUDER# can optionally be used as GPI6. If it is not used, leave it unconnected.	**VBAT**
THRM# / GPI9	AP16	I	**Thermal Alarm Monitor.** This signal is to enable the throttling mode of the STPCLK# signal for thermal control. THRM# can optionally be used as GPI9. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If it is not used, leave it unconnected.	**VSUS33**
RING# / GPI8	AL14	I	**Ring Indicator.** May be connected to external modem circuitry to allow the system to be re-activated by a received phone call. RING# can optionally be used as GPI8. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If it is not used, leave it unconnected.	**VSUS33**
BATLOW# / GPI4	AP14	I	**Battery Low Indicator.** BATLOW# can optionally be used as GPI4. This signal has a programmable internal 10K ohms pull-up resistor (default enable, B0D17F0 Rx97[1]). If it is not used, leave it unconnected.	**VSUS33**

Power Management Control and Event Signals - continued				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
CPUSTP#	AK17	O	**CPU Clock Stop.** Signals the system clock generator to disable the CPU clock outputs.	**VCC33**
PCISTP#	AN18	O	**PCI Clock Stop.** Signals the system clock generator to disable the PCI clock outputs.	**VCC33**
SUSA# / GPO8	AM15	O	**Suspend Plane A Control**. Asserted during power management POS, STR, and STD suspend states. Used to control the primary power plane. SUSA# can optionally be used as GPO8.	**VSUS33**
SUSB# / GPO9	AR13	O	**Suspend Plane B Control**. Asserted during power management STR and STD suspend states. Used to control the secondary power plane. SUSB# can optionally be used as GPO9.	**VSUS33**
SUSC# / GPO10	AM14	O	**Suspend Plane C Control.** Asserted during power management STD suspend state. Used to control the tertiary power plane. Also connected to ATX power-on circuitry. SUSC# can optionally be used as GPO10.	**VSUS33**
AOL / GPI3	AN14	I	**Alert On LAN.** AOL may optionally be used as GPI3. If it is not used, leave it unconnected.	**VSUS33**
CLKRUN#	AP18	IO	**PCI Clock Run.** Suspend PCICLK when CLKRUN# is high. See PCI Specification for CLKRUN# protocol.	**VCC33**
VGATE / GPI11	AM18	I	**Voltage Gate.** This signal is not implemented. VGATE may optionally be used as GPI11. If it is not used, leave it unconnected.	**VSUS33**
VRDSLP	AL17	OD	**Voltage Regulator Deep Sleep.** Connected to the CPU voltage regulator. High selects the proper voltage for deep sleep mode.	**VCC33**

Clock, Test and Miscellaneous Signals

Signal Name	Ball #	I/O	Signal Description	Power Plane
Clock Signals of Graphics & Video Processors				
DISPCLKI2 / GPIOC	AB06	I	**SSC Dot Clock 2 (Pixel Clock) In.** DISPCLKI2 can optionally be used as GPIOC.	**VCC33**
DISPCLKO2 / GPIOD	AB05	O	**Dot Clock 2 (Pixel Clock) Out.** DISPCLKO2 can optionally be used as GPIOD.	**VCC33**
GCLK	K11	I	**Graphics clock (66Mhz)**	**VCC33CPU**
TVXI	Y02	I	**TV Encoder Crystal Input.** 27 MHz Crystal Input. If TV interface is not needed, TV crystal can be removed. Tie to GND if not used.	**VCCA33TVPLL**
TVXO	Y01	O	**TV Encoder Crystal Output.** 27 MHz Crystal Output. If TV interface is not needed, TV crystal can be removed.	**VCCA33TVPLL**
XIN	AB09	I	**14.31818MHz Reference Frequency Input.** External 14.31818 MHz clock source. All internal graphics controller clocks and internal timer are synthesized on chip using this frequency as a reference.	**VCC33**
RTC Crystal Interface				
RTCX1	AT16	I	**RTC Crystal Input**: 32.768 KHz Crystal Input.	**VBAT**
RTCX2	AR16	O	**RTC Crystal Output**: 32.768 KHz Crystal Output.	**VBAT**
Power State and System Reset				
PWRGD	AR17	I	**Power Good.** Connected to the Power Good signal on the Power Supply. Internal logic powered by VBAT.	**VBAT**
RSMRST#	AP17	I	**Resume Reset.** When asserted, this signal resets the CX700 and sets all register bits to the default value. The rising edge of this signal is used to sample all power-up strap options	**VBAT**
Test and Miscellaneous Signals				
TESTIN	AK15	I	**Test In.** This signal is used for testing. Tie to GND for normal system operation.	**VSUS33**
DFTIN	B31	I	**DFT In.** This signal is used for testing. Tie to GND for normal system operation.	**VCCMEM**
BISTIN	AA05	I	**BIST In.** This signal is used for testing. Tie to GND for normal system operation.	**VCC33**
TP1	J10	-	**Test Pad.** Also serve as a strapping pin.	**VTT**
TP2	J11	-	**Test Pad.** Also serve as a strapping pin.	**VTT**
TP3	H12	-	**Test Pad.** Also serve as a strapping pin.	**VTT**
TP4	J24	-	**Test Pad.** Also serve as a strapping pin.	**VCC33CPU**
TP5	H24	-	**Test Pad.** Also serve as a strapping pin.	**VCCMEM**
TP6	AJ19	-	**Test Pad.** Also serve as a strapping pin.	**VCC33**
TP7	AJ16	-	**Test Pad.** Also serve as a strapping pin.	**VCC33**
TP8	AH09	-	**Test Pad.** Also serve as a strapping pin.	**VCC33**
RSVD[4:0]	AC07, AC06, AC08, J25, K25	-	**Reserved.** No connection.	-

Compensation and Reference Voltage Signals

Compensation				
Signal Name	**Ball #**	**I/O**	**Signal Description**	**Power Plane**
DMCOMP	A31	AI	**DRAM Compensation.**	**VCCMEM**
SATAR50COMP	AJ33	AI	**Serial ATA Auto Compensation.** If SATA interface is not needed, leave it unconnected.	**VCCA33SATA**

Reference Voltages			
Signal Name	**Ball #**	**I/O**	**Signal Description**
GTLVREF[1:0]	J12, H20	AI	**Host CPU Interface AGTL+ Voltage Reference.** Set it to 2/3 of VTT.
MEMVREF[1:0]	V27, K28	AI	**Memory Voltage Reference.** Set it to 1/2 of VCCMEM.

Power / Ground Signals

Digital Power / Ground		
Signal Name	**Ball #**	**Signal Description**
VTT	(see ball list)	**I/O Power for CPU Interface.**
VCCMEM	(see ball list)	**I/O Power for Memory Interface.** 2.5V (DDR) /1.8V (DDR2) ±5%.
VSUS15MEM	V26	**Suspend Power for Memory Module.** 1.5V ±5%
VSUS15	AJ12, AJ13	**Suspend Power.** 1.5V ±5%
VSUS15USB	AG24	**Suspend Power for USB.** 1.5V ±5%
VSUS33	AB18, AK11, AK12, AK13	**Suspend Power.** 3.3V ±5%. Always available unless the mechanical switch of the power supply is turned off. If the "soft-off" state is not implemented, then these signal balls can be connected to VCC33.
VCC15	(see ball list)	**Core Power.** 1.5V ±5%. This supply is turned on only when the mechanical switch on the power supply is turned on and the PWRON signal is conditioned high.
VCC33	(see ball list)	**I/O Power.** 3.3V ±5%
VCC33CPU	P23	**Power for 3.3V CPU Interface.** 3.3V ±5%
VBAT	AT17	**RTC Battery.** Battery input for internal RTC (RTCX1, RTCX2).
GND	(see ball list)	**Ground.** Connect to primary motherboard ground plane.
VCC33LVDS	(see ball list)	**Power for LVDS Transmitter.** 3.3V ±5%.
GNDLVDS	(see ball list)	**Ground for LVDS Transmitter.**

Analog Power / Ground		
Signal Name	**Ball #**	**Signal Description**
Host Interface		
VCCA33HCK	K24	**Power for Host CPU Clock PLL.** 3.3V ±5%.
GNDAHCK	L24	**Ground for Host CPU Clock PLL**
Graphics and Video		
VCCA33PLL[3:1]	V04, V06, W03	**Power for Graphics Controller PLL.** 3.3V ±5%.
GNDAPLL	V05, V07, W04	**Ground for Graphics Controller PLL.**
VCCA33DAC[2:1]	U05, U04	**Power for DAC.** 3.3V ±5%.
GNDADAC	U03, U06, V02	**Ground for DAC.**
LVDS Transmitter		
VCCA33LVDSPLL[2:1]	P04, N05	**LVDS PLL Power.** 3.3V ±5%
GNDALVDSPLL	M05, P05	**LVDS PLL Ground.**
VCCA33LVDS	P03	**LVDS Analog Power.** 3.3V ±5%
GNDALVDS	R04	**LVDS Analog Ground.**
TV Encoder		
VCCA33TVPLL	W01	**TV Encoder PLL Power.** 3.3V ±5%
GNDATVPLL	W02	**TV Encoder PLL Ground.**
SATA Controller		
VCCA15SXO	AJ36	**SATA Oscillator Power.** 1.5V ±5%.
GNDASXO	AJ35	**SATA Oscillator Ground.**
VCCA15SATA	(see ball list)	**SATA Analog Power.** 1.5V ±5%.
GNDA15SATA	(see ball list)	**SATA Analog Ground.**
VCCA33SATA	AN31, AP31, AR31, AT31	**SATA Analog Power.** 3.3V ±5%.
GNDA33SATA	AK31, AL31, AM31	**SATA Analog Ground.**
VCCA33PLLSATA	AK33	**SATA PLL Analog Power.** 3.3V ±5%.
GNDAPLLSATA	AK32	**SATA PLL Analog Ground.**
USB Controller		
VCCA15PLLUSB	AJ24	**USB PLL Analog Voltage.** 1.5V ±5%.
GNDA15PLLUSB	AH23	**USB PLL Analog Ground.**
VCCA33PLLUSB	AH24	**USB PLL Analog Voltage.** 3.3V ±5%.
GNDA33PLLUSB	AG23	**USB PLL Analog Ground.**
VCC33USB	(see ball list)	**I/O Power for USB Interface.** 3.3V ±5%.
GNDUSB	(see ball list)	**Ground for USB.**

Strapping Signal Table

Strapping Signal (External pull-up / pulldown straps are required to select "H" / "L". "X" means the strapping is ignored.)			
Signal	**Ball #**	**Function**	**Description**
TP[2:1]	J11, J10	**FSB Clock**	State (TP[2:1]) Mode (MHz) LL 100 Mhz LH 133 Mhz HL Reserved HH Auto
TP3	H12	**IO Queue Depth**	L: 8-level deep H: 1-level deep
TP4	J24	**GTL Pull-up**	L: Enable internal GTL Pull-up H: Disable internal GTL Pull-up
TP5	H24	**Reserved**	Always strapped LOW
TP6	AJ19	**Reserved**	Always strapped HIGH
TP7	AJ16	**V4 Data Width**	L: 64 bit H: 32 bit
PDCS1#	AN22	**Dual Processor Configuration**	L: Single Processor H: Dual Processor
TP8	AH09	**Memory Type**	L: DDR H: DDR2
SPKR	AL18	**CPU Frequency Strapping**	L: Enable H: Disable
AZSDOUT	AT12	**Auto Reboot**	L: Enable H: Disable
AZSYNC	AP10	**LPC FWH Command**	L: Enable H: Disable
PDDACK#	AJ22	**COM Port Enable**	L: Enable COM ports H: Enable EIDE port
SUSA#	AM15	**Reserved**	Always strapped HIGH
LPCFRAME#	AP19	**Reserved**	Always strapped HIGH.

Strapping Signal - continued (External pull-up / pulldown straps are required to select "H" / "L". "X" means the strapping is ignored.)			
Signal	**Ball #**	**Function**	**Description**
VCP1D[5:3]	AK05 AK04 AJ08	**DVP1 Output Selection**	LLX: DVP-TV output LHX: DVP with alpha output HLL: DCVI 10-bit data output HLH: DCVI 8-bit data output HHL: DCVI 20-bit data output HHH: DCVI 16-bit data output
VCP1D2	AJ07	**Reserved**	Always strapped LOW.
VCP1D1	AK01	**Reserved**	Always strapped LOW.
VCP1D0	AJ04	**Reserved**	Always strapped HIGH.
VCP0D7	AJ01	**Reserved**	Always strapped LOW.
VCP0D6	AJ05	**Reserved**	Always strapped LOW.
VCP0D[3:0]	AH06 AG07 AH07 AG09	**Panel Type Selection**	
DVP1D[15:14]	AF04 AH02	**LVDS/DVI Mode Selection**	LL: Two Single LVDS Channel: LVDS1 + LVDS2 LH: Reserved HL: One Dual LVDS Channel (High resolution panel) HH: One DVI only
DVP1D[10:8]	AF03 AG05 AE03	**DAC (CRT/TV) Output Mode Selection**	LXX: DAC A/B/C = R/G/B for CRT HLL: DAC A/B/C = C/Y/CVBS for TV HLH: DAC A/B/C = C/Y/Y for TV HHL: DAC A/B/C = R/G/B for TV HHH: DAC A/B/C = Pr/Y/Pb for TV
DVP1D[7:4]	AF05 AD01 AD03 AC01	**Video Capture Port 1 Type Selection**	LLLL: CAP 8 bit CCIR656 LLLH: CAP 8 bit CCIR601 LLHL: CAP 8 bit VIP 1.1 LLHH: CAP 8 bit VIP 2.0 LHLL: CAP 16 bit CCIR656 LHLH: CAP 16 bit CCIR601 LHHL: CAP 16 bit VIP 1.1 LHHH: CAP 16 bit VIP 2.0 HXXX: TS 8 bit
DVP1D[3:0]	AD04 AC03 AC02 AB03	**Video Capture Port 0 Type Selection**	LLLL: CAP 8 bit CCIR656 LLLH: CAP 8 bit CCIR601 LLHL: CAP 8 bit VIP 1.1 LLHH: CAP 8 bit VIP 2.0 LHLL: CAP 16 bit CCIR656 LHLH: CAP 16 bit CCIR601 LHHL: CAP 16 bit VIP 1.1 LHHH: CAP 16 bit VIP 2.0 HXXX: TS 8 bit

IO Pads with Integrated Pull Up Resistors

Some of the CX700 IO pads, as listed below, are integrated with internal 10K Ohms ± 30% Pull Up resistor to reduce component counts on the motherboards.

1. IO pads with hardwired Pull Up: LPCFRAME#, LPCAD[3:0], MSCK, MSDT, KBCK, KBDT, PDCS1#, SERIRQ
2. IO pads with programmable Pull Up:
   - PCI bus signals: FRAME#, TRDY#, IRDY#, STOP#, DEVSEL#, PERR#, SERR#
   - PCI bus signals: INT[A, B, C, D]#, REQ[0-3]#, GNT[0-3]#
   - EIDE signals: IRQ15
   - Power management event signals: BATLOW#, THRM#, PME#, RING#, EXTSMI#, LID#, SMBALRT#, PWRBTN#

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Table 4. Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit	Notes
T_C	Operating case temperature	0	85	^oC	1
T_S	Storage temperature	–55	125	^oC	1
V_{IN}	Input voltage	0	V_{RAIL} + 10%	Volts	1, 2
V_{OUT}	Output voltage	0	V_{RAIL} + 10%	Volts	1, 2

Note 1. Stress above the conditions listed may cause permanent damage to the device. Functional operation of this device should be restricted to the conditions described under operating conditions.

Note 2. V_{RAIL} is defined as the V_{CC} level of the respective rail. Memory is 2.5V (DDR) or 1.8V (DDR2). Graphics / Display is 3.3V.

DC Characteristics

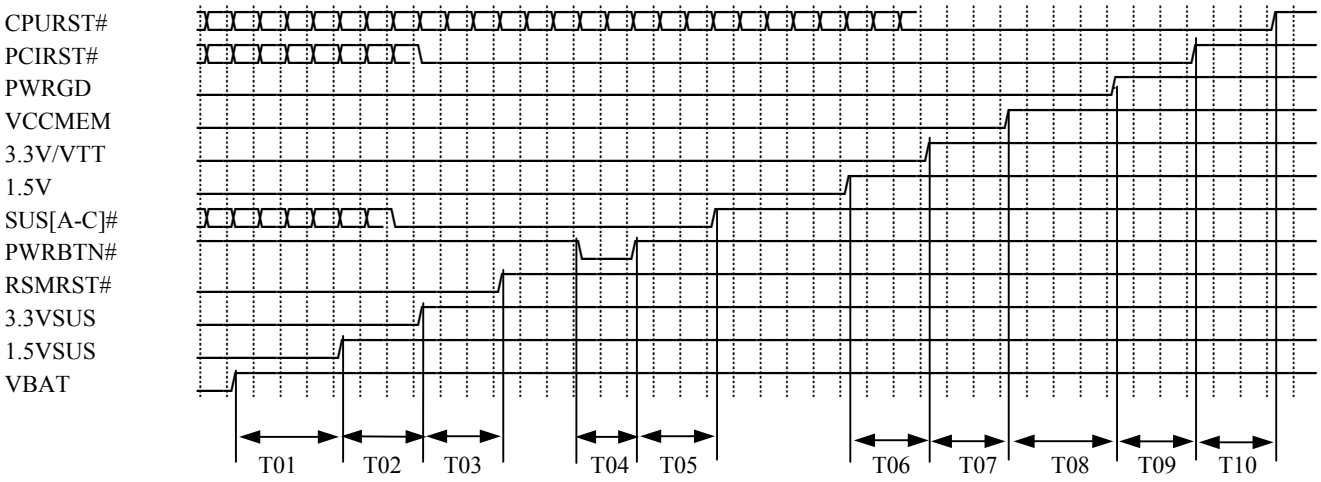
T_C = 0-85^{o}C, V_{RAIL} = V_{CC} ±5%, V_{CORE} = 1.5V ±5%, GND=0V

Table 5. DC Characteristics

Symbol	Parameter	Min	Max	Unit	Condition
V_{IL}	Input Low Voltage	0	0.8	V	
V_{IH}	Input High Voltage	2.0	V_{CC}	V	
V_{OL}	Output Low Voltage	–	0.55	V	I_{OL} = 4.0mA
V_{OH}	Output High Voltage	2.4	–	V	I_{OH} = –1.0mA
I_{IL}	Input Leakage Current	–	±10	uA	0 < V_{IN} < V_{CC}
I_{OZ}	Tristate Leakage Current	–	±20	uA	0 < V_{OUT} < V_{CC}

Power Sequence

Figure 4. Power On Sequence and Reset Signal Timing

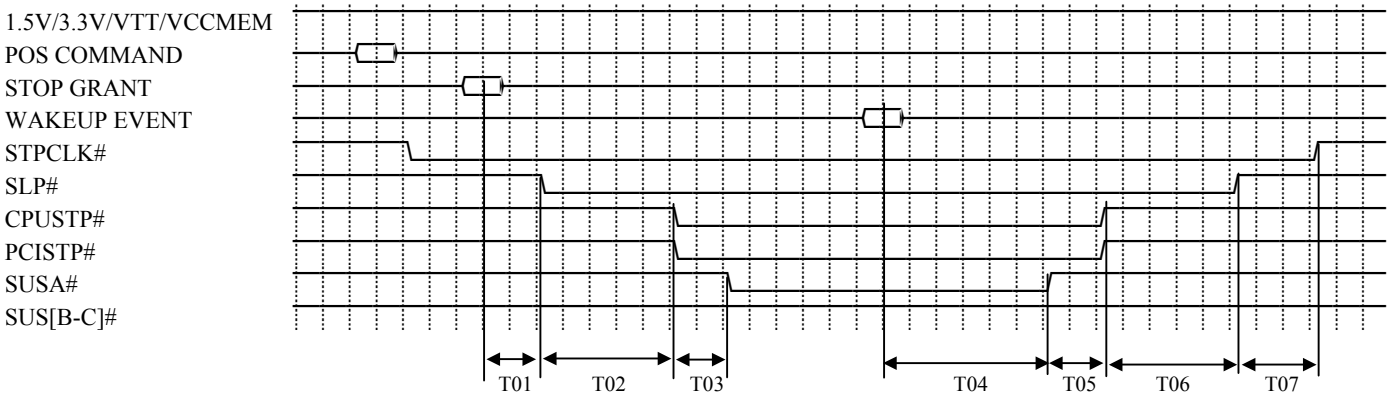


Note: This sequence should be followed regardless of the power supply type (ATX or AT).

Symbol	Parameter	Min	Max	Unit	Note
T01	VBAT supply active to 1.5VSUS supply active	0	—	ms	
T02	1.5VSUS supply active to 3.3VSUS supply active	0.5	—	ms	
T03	3.3VSUS supply active to RSMRST# inactive	5	—	ms	
T04	PWRBTN# active width	1	—	RTCCLK	
T05	PWRBTN# rising to SUS[A-C]# inactive	4	5	RTCCLK	
T06	1.5V supply active to 3.3V/VTT supply active	0.5	—	ms	
T07	3.3V/VTT supply active to VCCMEM supply active	0	20	ms	
T08	VCCMEM supply active to PWRGD active	5	—	ms	
T09	PWRGD active to PCIRST# inactive	7	—	ms	
T10	PCIRST# inactive to CPURST# inactive	12	—	us	1

1. CPURST# is de-asserted after the completion of the ROMSIP cycle.

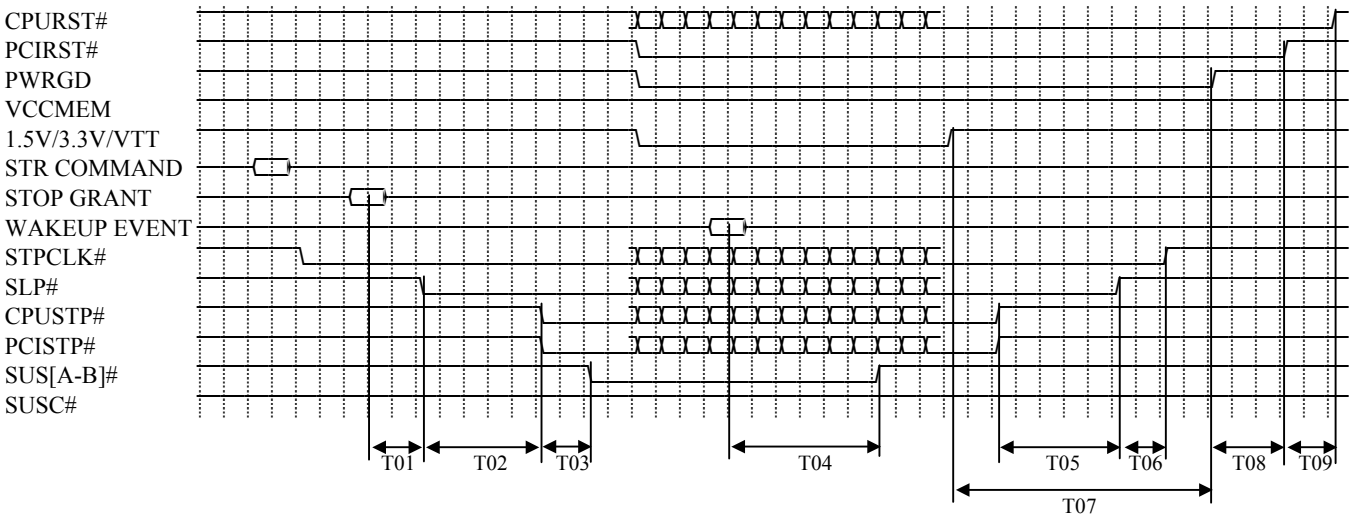
Figure 5. Power On Suspend (S1) and Resume Sequence



Symbol	Parameter	Min	Max	Unit	Note
T01	STOP GRANT to SLP# active	—	1	RTCCLK	
T02	SLP# active to CPUSTP# and PCISTP# active	—	2	RTCCLK	
T03	CPUSTP# and PCISTP# active to SUSA# active	—	1	RTCCLK	
T04	Wakeup Event to SUSA# inactive	—	2	RTCCLK	
T05	SUSA# inactive to CPUSTP# and PCISTP# inactive	16	32	ms	1
T06	CPUSTP# and PCISTP# inactive to SLP# inactive	1.03	2.03	ms	2
T07	SLP# inactive to STPCLK# inactive	—	1	RTCCLK	

1. If B0D17F0 Rx95[7] = 1, the minimum delay is 1ms and the maximum delay is 2ms.
2. If B0D17F0 Rx95[7] = 1, the minimum delay is 155us and the maximum delay is 280us.

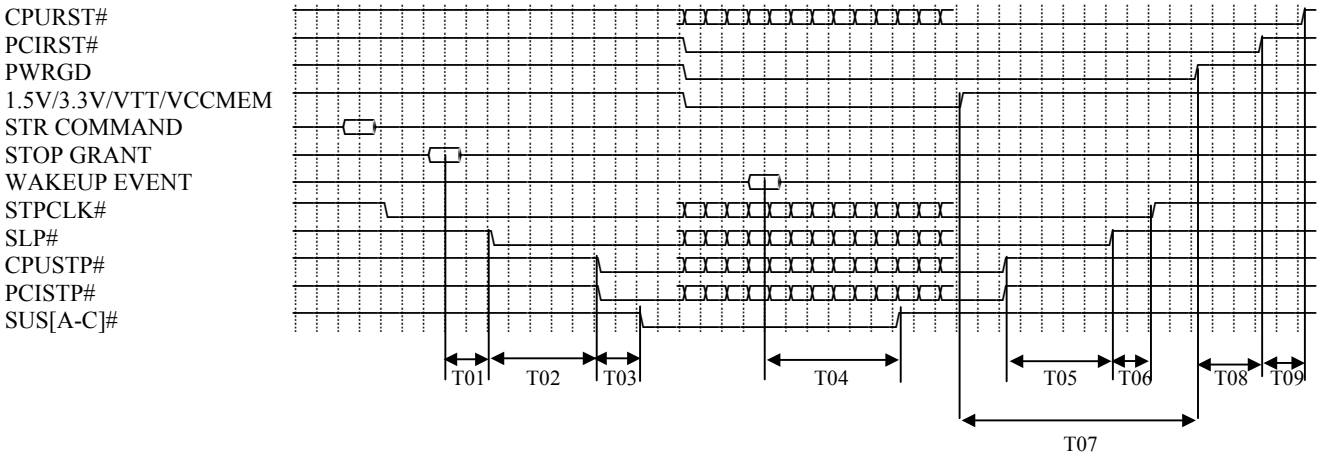
Figure 6. Suspend to RAM (S3) and Resume Sequence



Symbol	Parameter	Min	Max	Unit	Note
T01	STOP GRANT to SLP# active	—	1	RTCCLK	
T02	SLP# active to CPUSTP# and PCISTP# active	—	2	RTCCLK	
T03	CPUSTP# and PCISTP# active to SUS[A-B]# active	—	1	RTCCLK	
T04	Wakeup Event to SUS[A-B]# inactive	—	2	RTCCLK	
T05	CPUSTP# and PCISTP# inactive to SLP# inactive	1.03	2.03	ms	1
T06	SLP# inactive to STPCLK# inactive	—	1	RTCCLK	
T07	1.5V/3.3V/VTT supplies active to PWRGD active	99	—	ms	
T08	PWRGD active to PCIRST# inactive	7	—	ms	
T09	PCIRST# inactive to CPURST# inactive	12	—	us	2

1. If B0D17F0 Rx95[7] = 1, the minimum delay is 155us and the maximum delay is 280us.
2. CPURST# is de-asserted at the completion of the ROMSIP cycle.

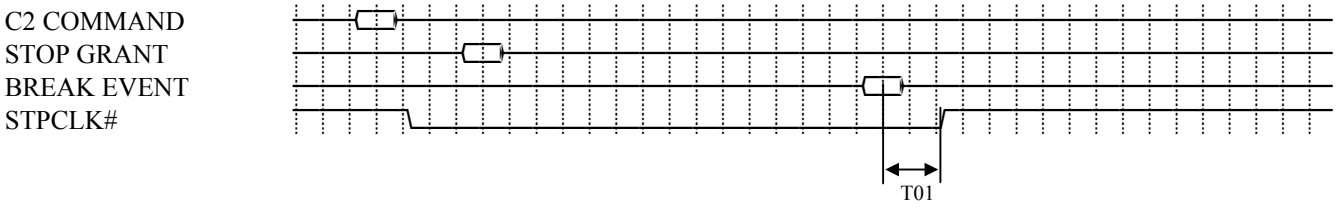
Figure 7. Suspend to DISK (S4) and Resume Sequence



Symbol	Parameter	Min	Max	Unit	Note
T01	STOP GRANT to SLP# active	—	1	RTCCLK	
T02	SLP# active to CPUSTP# and PCISTP# active	—	2	RTCCLK	
T03	CPUSTP# and PCISTP# active to SUS[A-C]# active	—	1	RTCCLK	
T04	Wakeup Event to SUS[A-C]# inactive	—	2	RTCCLK	
T05	CPUSTP# and PCISTP# inactive to SLP# inactive	1.03	2.03	ms	1
T06	SLP# inactive to STPCLK# inactive	—	1	RTCCLK	
T07	1.5V/3.3V/VTT/VCCMEM supplies active to PWRGD active	99	—	ms	
T08	PWRGD active to PCIRST# inactive	7	—	ms	
T09	PCIRST# inactive to CPURST# inactive	12	—	us	2

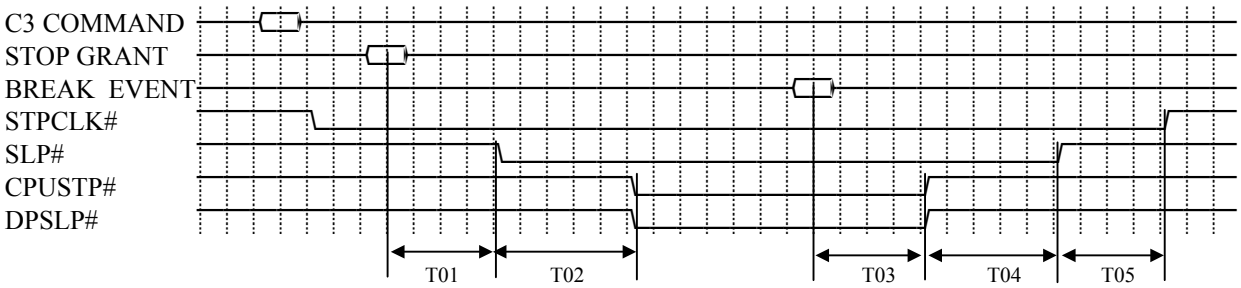
1. If B0D17F0 Rx95[7] = 1, the minimum delay is 155us and the maximum delay is 280us.
2. CPURST# is de-asserted at the completion of the ROMSIP cycle.

Figure 8. CPU C2 Sequence



Symbol	Parameter	Min	Max	Unit	Note
T01	Break Event to STPCLK# inactive	2	—	PCICLK	

Figure 9. CPU C3 Sequence



Symbol	Parameter	Min	Max	Unit	Note
T01	STOP GRANT to SLP# active	7.5	—	us	
T02	SLP# active to CPUSTP# and DPSLP# active	11.25	—	us	
T03	Break Event to CPUSTP# and DPSLP# inactive	7.5	—	us	
T04	CPUSTP# and DPSLP# inactive to SLP# inactive	7.5	—	us	
T05	SLP# inactive to STPCLK# inactive	7.5	—	us	

MECHANICAL SPECIFICATIONS

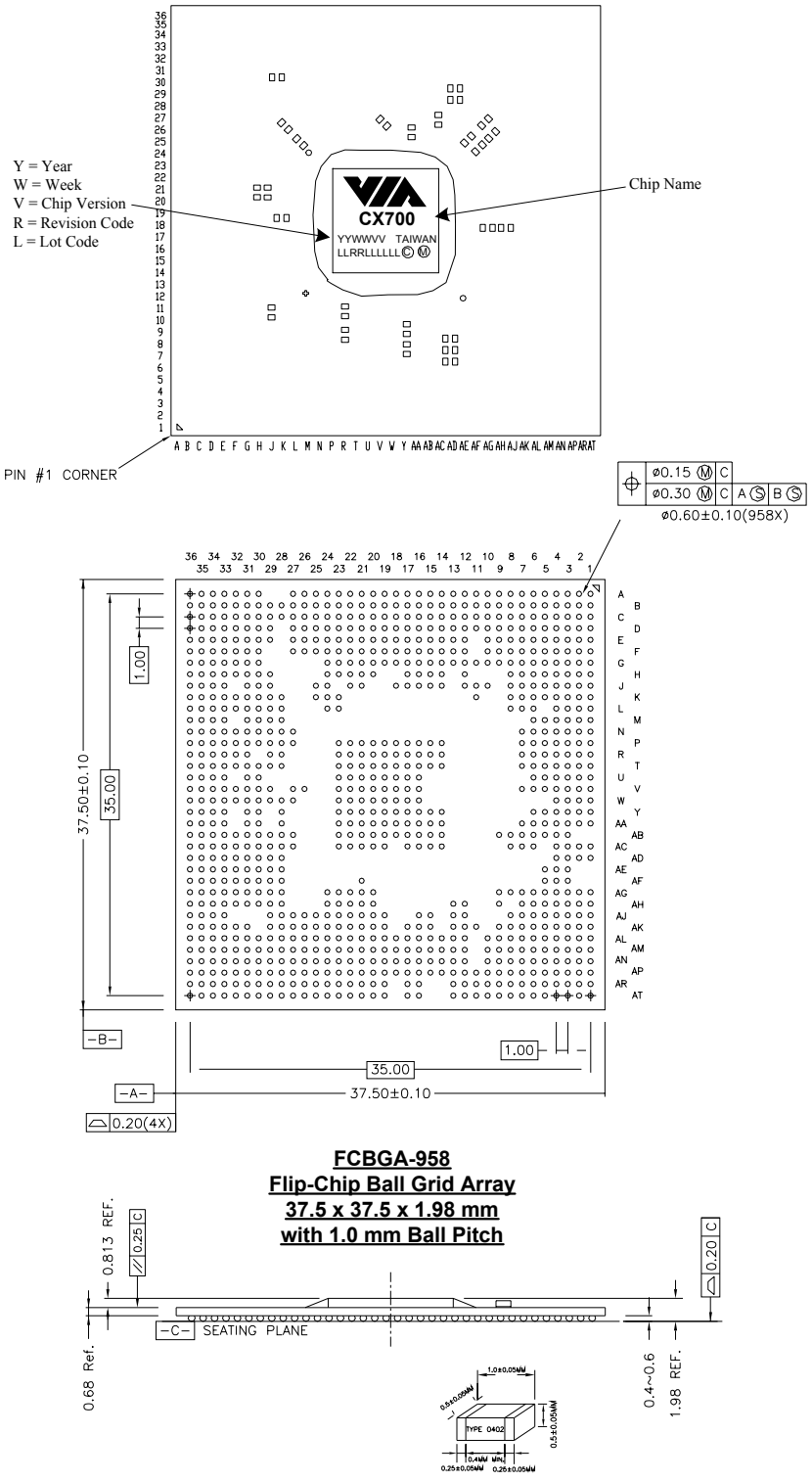


Figure 10. Mechanical Specifications – FCBGA-958 Ball Grid Array Package

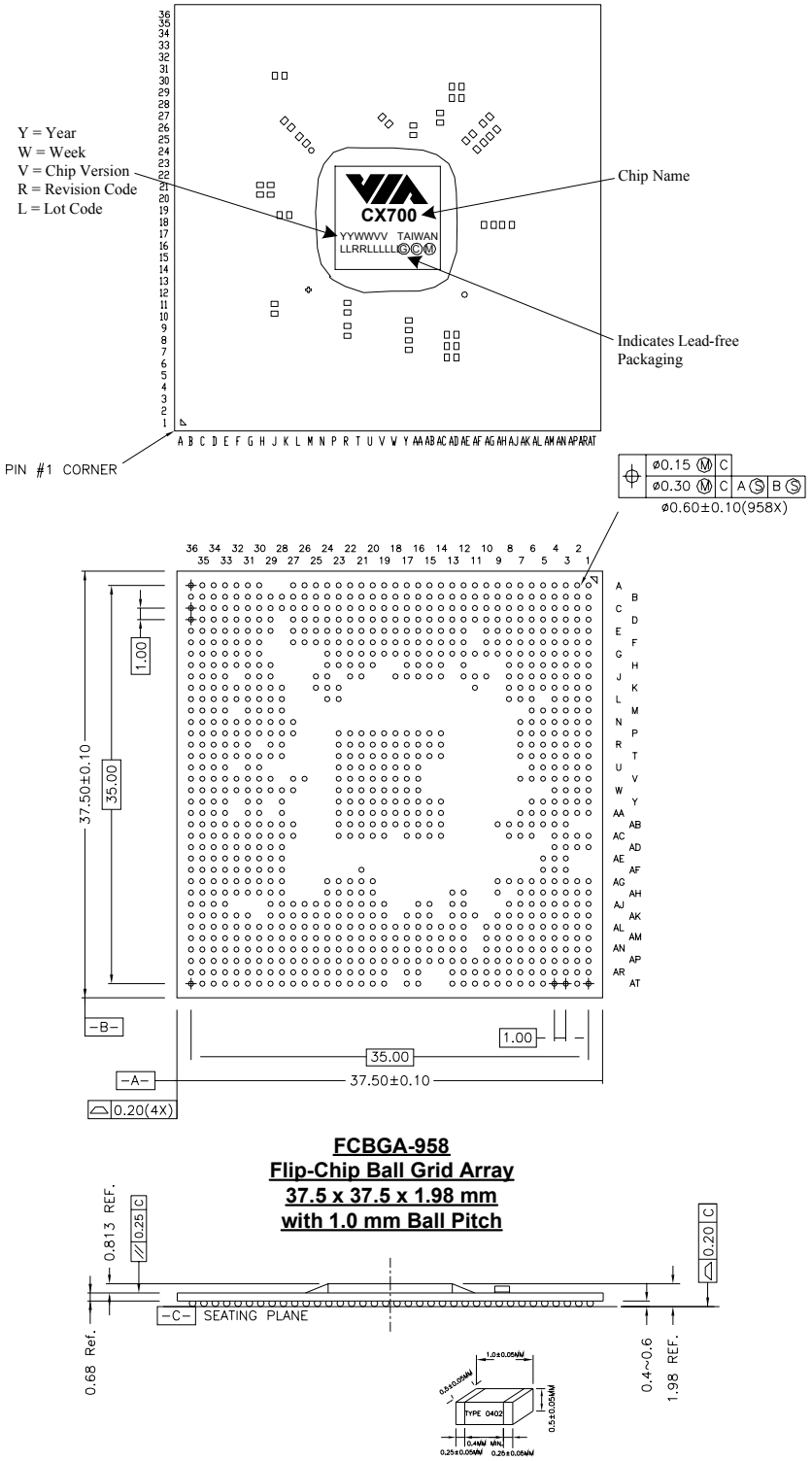


Figure 11. Lead-Free Mechanical Specifications – FCBGA-958 Ball Grid Array Package