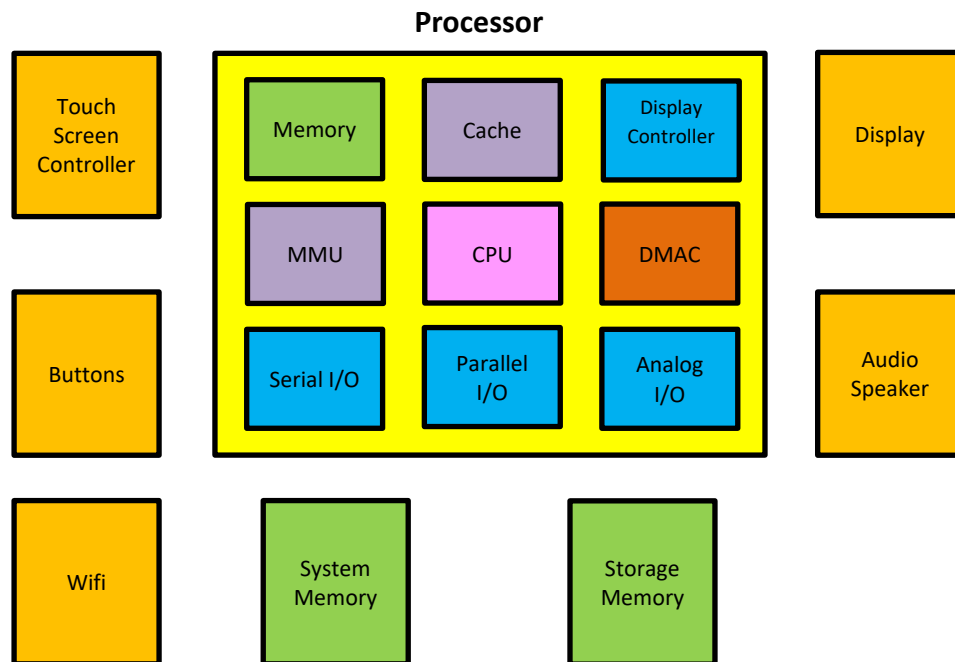


## Computer System

- 1) Figure 1 shows a high level system block diagram of the computer system used for the case study.




**Figure 1: Computer System Block Diagram**

**Table 1: Processor Information**



Overview	Peripheral	Electrical Interface
<ul style="list-style-type: none"> <li>• Von-Neumann Architecture</li> <li>• 12 Data Registers (32-bit)</li> <li>• 256 Kbyte on-chip SRAM, 512 Kbyte on-chip Flash,</li> <li>• 2 Kbyte on-chip EEPROM</li> <li>• 4 Kbyte Cache (Data and Instruction)</li> <li>• 400 Mhz CPU clock</li> <li>• 200 Mhz External Parallel Bus interface (16-bits)</li> <li>• DMA Controller</li> <li>• Memory Management Unit</li> </ul>	<ul style="list-style-type: none"> <li>• <b>SPI</b> Max clock speed: 50 Mhz</li> <li>• <b>UART</b> Max baud rate: 115200 Kbps</li> <li>• <b>I2C</b> Max clock rate: 400 Khz</li> <li>• <b>USB 2.0 Host</b> Max bitrate: 480Mbps</li> <li>• <b>ADC</b> Max Sampling rate: 48 Khz Data width: 16bits</li> <li>• <b>DAC</b> Max Sampling rate: 48 Khz Data width: 16bits</li> <li>• <b>Display Controller</b> 24-bit bus Maximum speed 270 Mhz</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 3V(max), 2.4V(min)</li> <li>• V(OL): 0.8V(max), 0V(min)</li> <li>• V(IH): 3V(max), 1.8V(min)</li> <li>• V(IL): 1.2V(max), 0V(min)</li> </ul>

**Device/Module Information****2) Touch Screen Controller**



(a) Part Number: TS001SPI

Overview	SPI 	Electrical Interface
<ul style="list-style-type: none"> <li>Maximum screen size supported = 1080x720</li> <li>8Kbyte on-chip memory</li> <li>200Hz position report rate for (x,y) coordinates</li> <li>SPI interface</li> </ul>	<ul style="list-style-type: none"> <li>Max Clock rate: 10Mhz</li> <li>Full duplex operation</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 5V(max), 4.2V(min)</li> <li>V(OL): 1.3V(max), 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

(b) Part Number: TS002UART

Overview	UART	Electrical Interface
<ul style="list-style-type: none"> <li>Maximum screen size supported = 960x640</li> <li>4Kbyte on-chip memory</li> <li>100Hz position report rate for (x,y) coordinates</li> <li>UART interface</li> </ul>	<ul style="list-style-type: none"> <li>Max Baud rate: 115200bps</li> <li>Full duplex operation</li> </ul>	<ul style="list-style-type: none"> <li>V(OH):  3V(max), 2.4V(min)</li> <li>V(OL):  0.8V(max), 0V(min)</li> <li>V(IH): 3V(max), 1.8V(min)</li> <li>V(IL): 1.2V(max), 0V(min)</li> </ul>

(c) Part Number: TS003UART

Overview	UART	Electrical Interface
<ul style="list-style-type: none"> <li>Maximum screen size supported = 960x640</li> <li>4Kbyte on-chip memory</li> <li>100Hz position report rate for (x,y) coordinates</li> <li>UART interface</li> </ul>	<ul style="list-style-type: none"> <li>Max Baud rate: 115200bps</li> <li>Full duplex operation</li> </ul>	<ul style="list-style-type: none"> <li>V(OH):  5V(max), 4.2V(min)</li> <li>V(OL):  1.3V(max), 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

**3) Wifi Module**

(a) Part Number: WIFI0001N

Overview	USB ✕	Electrical Interface
<ul style="list-style-type: none"> <li>Max wireless data rate 100Mbps</li> <li>USB interface</li> </ul>	<ul style="list-style-type: none"> <li>Supports up to USB2.0, 480Mbps.</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 5V(max), 4.2V(min)</li> <li>V(OL): 1.3V(max), 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

(b) Part Number: WIFI0010AC

Overview	SPI ✓	Electrical Interface
<ul style="list-style-type: none"> <li>Max wireless data rate 100Mbps</li> <li>SPI interface</li> </ul>	<ul style="list-style-type: none"> <li>Max Clock rate: 50Mhz</li> <li>Full duplex operation</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): — 3V(max), 2.4V(min)</li> <li>V(OL): — 0.8V(max), 0V(min)</li> <li>V(IH): 3V(max), 1.8V(min)</li> <li>V(IL): 1.2V(max), 0V(min)</li> </ul>

(c) Part Number: WIFI0015AC

Overview	SPI ✓	Electrical Interface
<ul style="list-style-type: none"> <li>Max wireless data rate 100Mbps</li> <li>SPI interface</li> </ul>	<ul style="list-style-type: none"> <li>Max Clock rate: 50Mhz</li> <li>Full duplex operation</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 5V(max), — 4.2V(min)</li> <li>V(OL): 1.3V(max), — 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

OH IH  
OL IL

## 4) Memory

✗ (a) Part Number: DRAM0001-4M8 ✗

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>• 4 Mbyte Dynamic RAM</li> <li>• 8-bit Parallel interface</li> <li>• Maximum data strobe rate = 100Mhz</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 5V(max), 4.2V(min)</li> <li>• V(OL): 1.3V(max), 0V(min)</li> <li>• V(IH): 5V(max), 3.6V(min)</li> <li>• V(IL): 1.8V(max), 0V(min)</li> </ul>

✗ (b) Part Number: DRAM0002-16M16 ✓

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>• 16 Mbyte Dynamic RAM</li> <li>✓ 16-bit Parallel interface</li> <li>• Maximum data strobe rate = 100Mhz</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 3V(max), 2.4V(min)</li> <li>• V(OL): 0.8V(max), 0V(min)</li> <li>• V(IH): 3V(max), 1.8V(min)</li> <li>• V(IL): 1.2V(max), 0V(min)</li> </ul>

✗ (c) Part Number: SRAM0001-1M8 ✗

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>• 1 Mbyte Static RAM</li> <li>• 8-bit Parallel interface</li> <li>• Maximum data strobe rate = 200Mhz</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 5V(max), 4.2V(min)</li> <li>• V(OL): 1.3V(max), 0V(min)</li> <li>• V(IH): 5V(max), 3.6V(min)</li> <li>• V(IL): 1.8V(max), 0V(min)</li> </ul>

✗ (d) Part Number: SRAM0002-2M16 ✓

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>• 2 Mbyte Static RAM</li> <li>✓ 16-bit Parallel interface</li> <li>• Maximum data strobe rate = 200Mhz</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 3V(max), 2.4V(min)</li> <li>• V(OL): 0.8V(max), 0V(min)</li> <li>• V(IH): 3V(max), 1.8V(min)</li> <li>• V(IL): 1.2V(max), 0V(min)</li> </ul>

(e) Part Number: EEPROM0001-256K ✗

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>• 256 Kbyte EEPROM</li> <li>• SPI interface</li> <li>• Maximum SPI clock rate = 50Mhz ✗</li> <li>• Page Size = 64bytes</li> </ul>	<ul style="list-style-type: none"> <li>• V(OH): 3V(max), 2.4V(min)</li> <li>• V(OL): 0.8V(max), 0V(min)</li> <li>• V(IH): 3V(max), 1.8V(min)</li> <li>• V(IL): 1.2V(max), 0V(min)</li> </ul>

(f) Part Number: NAND0001-64M

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>64 Mbyte NAND Flash</li> <li>8-bit parallel interface</li> <li>Maximum data strobe rate = 50Mhz</li> <li>Page Size = 64Kbytes</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 3V(max), 2.4V(min)</li> <li>V(OL): 0.8V(max), 0V(min)</li> <li>V(IH): 3V(max), 1.8V(min)</li> <li>V(IL): 1.2V(max), 0V(min)</li> </ul>

(g) Part Number: NOR0001-1M

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>1 Mbyte NOR Flash</li> <li>16-bit parallel interface</li> <li>Maximum data strobe rate = 10Mhz</li> <li>Page Size = 4Kbytes</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 3V(max), 2.4V(min)</li> <li>V(OL): 0.8V(max), 0V(min)</li> <li>V(IH): 3V(max), 1.8V(min)</li> <li>V(IL): 1.2V(max), 0V(min)</li> </ul>

(h) Part Number: HDD001

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>4 surfaces</li> <li>1024 tracks per surface</li> <li>128 sectors per track</li> <li>512 bytes/sector</li> <li>Track-to-track seek time = 5 msec</li> <li>Rotational speed = 5000 RPM</li> <li>MTTF = 500,000 hours</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 5V(max), 4.2V(min)</li> <li>V(OL): 1.3V(max), 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

(i) Part Number: HDD002

Overview	Electrical Interface
<ul style="list-style-type: none"> <li>8 heads</li> <li>1024 cylinders</li> <li>256 sectors per track</li> <li>512 bytes/sector</li> <li>Track-to-track seek time = 4 msec</li> <li>Rotational speed = 10000 RPM</li> <li>MTTF = 1,000,000 hours</li> </ul>	<ul style="list-style-type: none"> <li>V(OH): 5V(max), 4.2V(min)</li> <li>V(OL): 1.3V(max), 0V(min)</li> <li>V(IH): 5V(max), 3.6V(min)</li> <li>V(IL): 1.8V(max), 0V(min)</li> </ul>

## 5) Display Controller

(a) Part Number: LCD0001-HD

Overview	Electrical Interface
<ul style="list-style-type: none"><li>• Supports up to 1920x1080 pixels display</li><li>• 24-bit Parallel interface</li><li>• Maximum clock rate = 200Mhz</li><li>• 16Mbyte video buffer</li></ul>	<ul style="list-style-type: none"><li>• V(OH): 3V(max), 2.4V(min)</li><li>• V(OL): 0.8V(max), 0V(min)</li><li>• V(IH): 3V(max), 1.8V(min)</li><li>• V(IL): 1.2V(max), 0V(min)</li></ul>

(b) Part Number: LCD0002-XVGA

Overview	Electrical Interface
<ul style="list-style-type: none"><li>• Supports up to 960x640 pixels display</li><li>• SPI interface</li><li>• Maximum clock rate = 20Mhz</li><li>• 1Mbyte video buffer</li></ul>	<ul style="list-style-type: none"><li>• V(OH): 3V(max), 2.4V(min)</li><li>• V(OL): 0.8V(max), 0V(min)</li><li>• V(IH): 3V(max), 1.8V(min)</li><li>• V(IL): 1.2V(max), 0V(min)</li></ul>