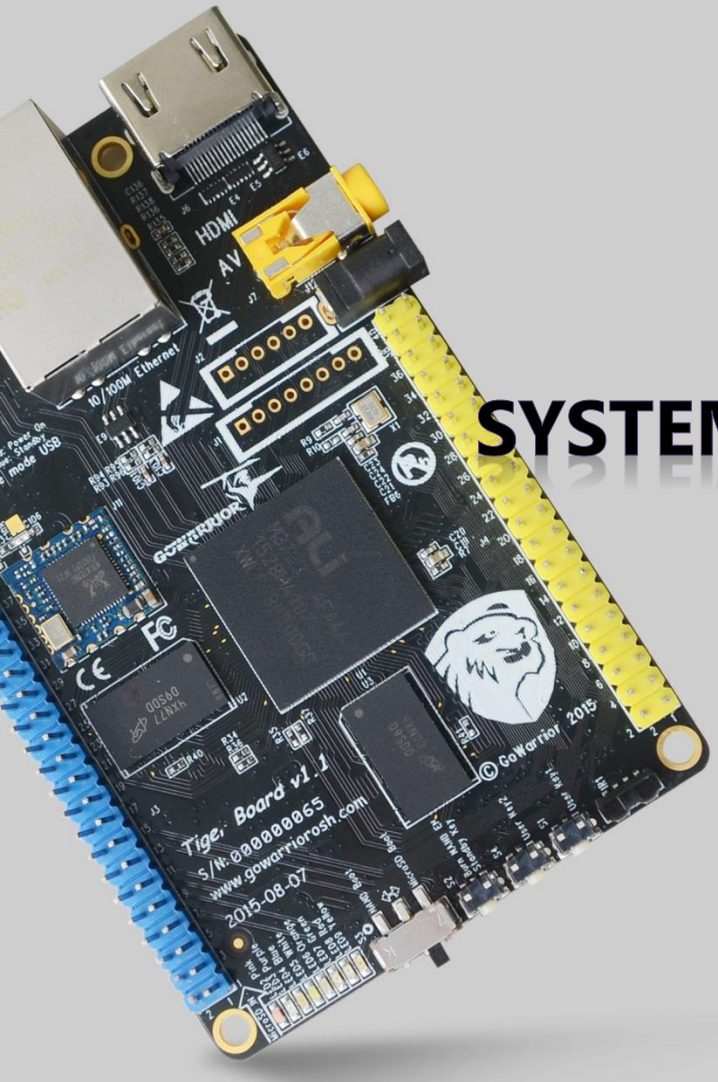
GOWARRIOR

TIGER



TIGER BOARD

SYSTEM REFERENCE MANUAL

V1.1

Copyright Statement

TIGER BOARD DESIGN

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Preface

Overview

The purpose of the manual is to provide below contents. It includes the following chapters:

- **Chapter 1: Introduction**

This chapter gives brief introduction of the TIGER Board System Reference Manual.

- **Chapter 2: Connecting Up Your TIGER Board**

This chapter provides information on connecting up the TIGER Board.

- **Chapter 3: TIGER Board Overview**

This chapter gives brief introduction of the TIGER Board

- **Chapter 4: TIGER Board High Level Specification**

This chapter provides information on TIGER Board High Level Specification.

- **Chapter 5: Detailed Hardware Design**

This chapter provides information on realization of the TIGER Board detailed hardware design.

- **Chapter 6: Platform Power Delivery**

This chapter provides information on realization of the TIGER Board platform power delivery.

- **Chapter 7: Connectors**

This chapter provides information on realization of the TIGER Board connectors.

- **Chapter 8: TIGER Board Mechanical**

This chapter provides information on realization of the TIGER Board mechanical.

- **Chapter 9: Pictures**

- **Chapter 10: Support Information**

Audience

This manual is primarily written to provide complete guidance for those who wants to exploit GoWarrior TIGER Board, such as makers, tinkers, innovators, students, etc.

Applicable Products

This manual is applicable for the GoWarrior TIGER Board

Reference Documents

TIGER Board Manual

GoWarrior_Brochure

Convention

Typographical Conventions

Item	Format
codes, keyboard input commands, file names, equations, and math	`Courier New, Size 10.5`
Variables, code variables, and code comments	`Courier New, Size, Italic`
Menu item, buttons, tool names	**Times New Roman, Size 10.5, Bold** e.g. Select **USB Debugging**
Screens, **windows**, dialog boxes, and tabs	**Times New Roman, Size 10.5, Bold** **Enclosed in double quotation marks** e.g. Open the **"Debug Configuration"** dialog box

Table 1. Typographical Conventions

Symbol Conventions

Item	Description
Caution	Indicates a potential hazard or unsafe practice that, if not avoided, could result in data loss, device performance degradation, or other unpredictable results.
Note	Indicates additional and supplemental information for the main contents.
Tip	Indicates a suggestion that may help you solve a problem or save your time.

Table 2. Symbol Conventions

How to Contact Us

Submit all your comments and error reports on documents to the author at:

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For questions regarding GoWarrior, contact our support team at the email listed below:

support@gowarriorosh.com

1 Introduction

This document is **System Reference Manual** for TIGER Board and covers its use and design. The board will primarily be referred to in the remainder of this document simply as the board, although it may also be referred to as the TIGER Board as a reminder. There are also references to the original TIGER Board as well, and will be referenced as simply TIGER Board.

This design is subject to change without notice as we will work to keep improving the design as the product matures based on feedback and experience. Software updates will be frequent and will be independent of the hardware revisions and as such not result in a change in the revision number.

http://www.gowarriorosh.com/wp/en_US/document/

2 Connecting Up Your TIGER Board

This section provides instructions on how to hook up your board. Two scenarios will be discussed:

- Tethered to a PC
- As a standalone development platform in a desktop PC configuration.

2.1 What's in the Box

In the box you will find the following main items as shown in Figure 1.

- TIGER Board
- TIGER Board Manual
- Micro USB cable

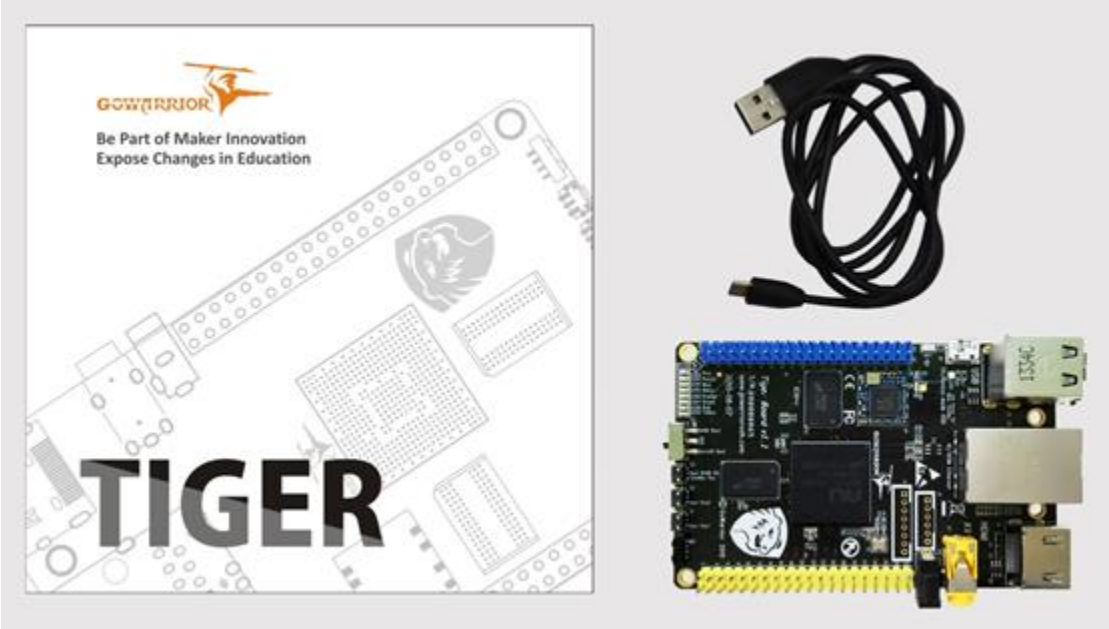


Figure 1. In the Box

2.2 Need Prepare by Yourself

In order to use the board in this configuration, you will need the following accessories:

Item		Recommended Specification
1	Power supply	USB Type A Male to Micro Male cable A good quality 5V output USB Type A receptacle power adapter 5V/2A power adapter is recommended
2	PC	A PC with the pre-built image to burn NAND Flash
3	HDMI	HDMI cable TV set should support one of these resolutions: 720x480, 720x576, 1280x720, 1920x1080
4	Analog audio/video	A 3.5mm to RCA composite video and stereo audio cable is required Display supports RCA input
5	Input device	Standard USB keyboard and mouse should work, USB devices may take a lot of power from USB ports, you may need a powered USB hub.
6	Input device	A remote controller also can work
7	Network	Wireless Network
8		Or wired network through an Ethernet cable

Table 3. Required Accessories

2.3 Main Connection Scenarios

This section will describe how to connect the board for use. The intent here is that someone looking to purchase the board will be able to read this section and get a good idea as to what the initial set up will be like.

The board can be configured in several different ways, but we will discuss the two most common scenarios as described in this Reference Manual.

1. Download Software from PC via Micro USB cable

- Board is burned from PC with FTool.exe

2. Standalone desktop

- Display
- Keyboard and mouse
- External 5V power supply

2.4 Downloading Software from PC

Press S2 (see below picture yellow ellipse location) then insert the Power cable, release the S2. Download software with FTool.exe in the PC.

Figure 2. Tethered Configuration

All the power for the board is provided by the PC via the Micro USB cable. In some instances, the PC may not be able to supply sufficient power for the board. In that case, an external 5V DC power supply can be used, but this should rarely be necessary.

2.5 Connect the Cable to the Board

1. Connect the Micro B USB connector on the Micro USB cable to the board as shown in Figure 3. The connector is on the top side of the board.

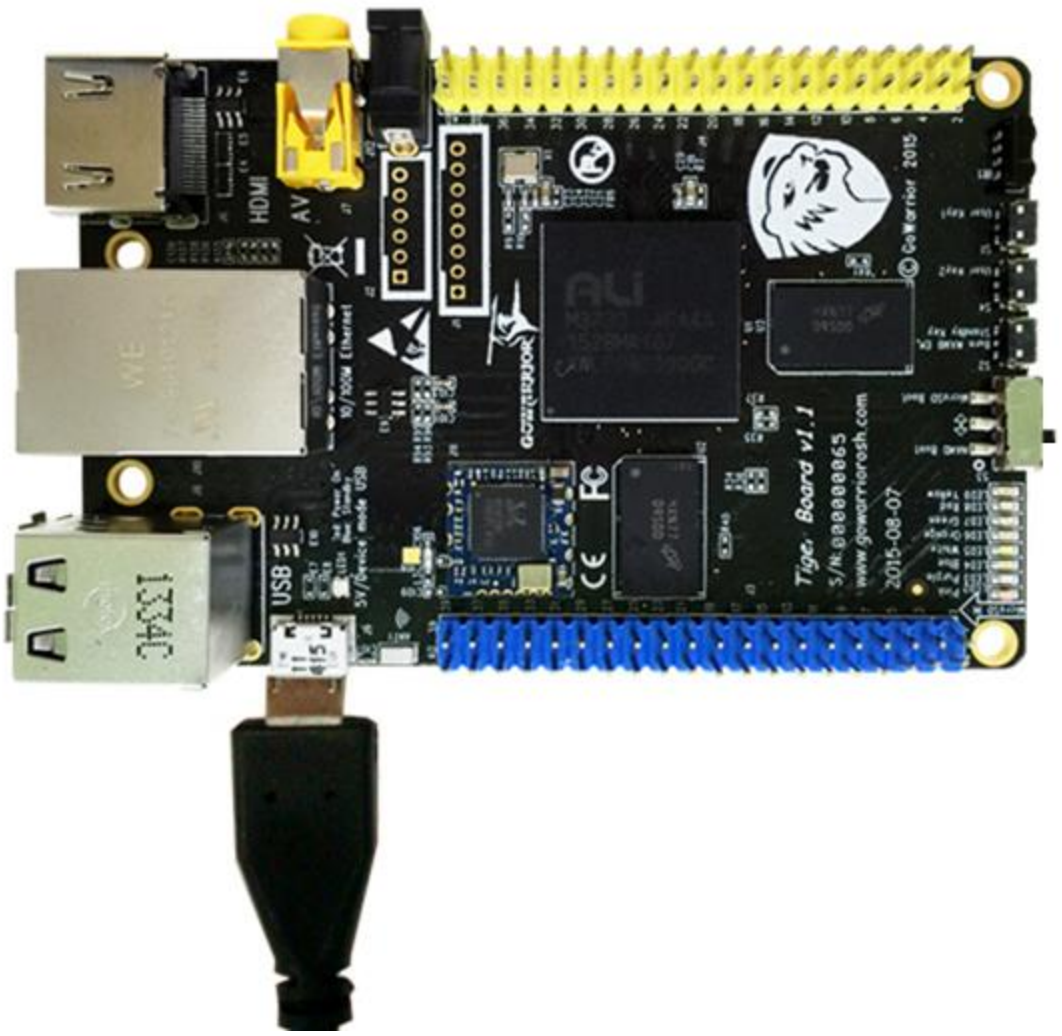


Figure 3. USB Connection to the Board

2. Connect the USB type A connector with USB cable to your PC or laptop USB port.
3. The board will power on and the power LED will be on as shown in Figure 4 below.

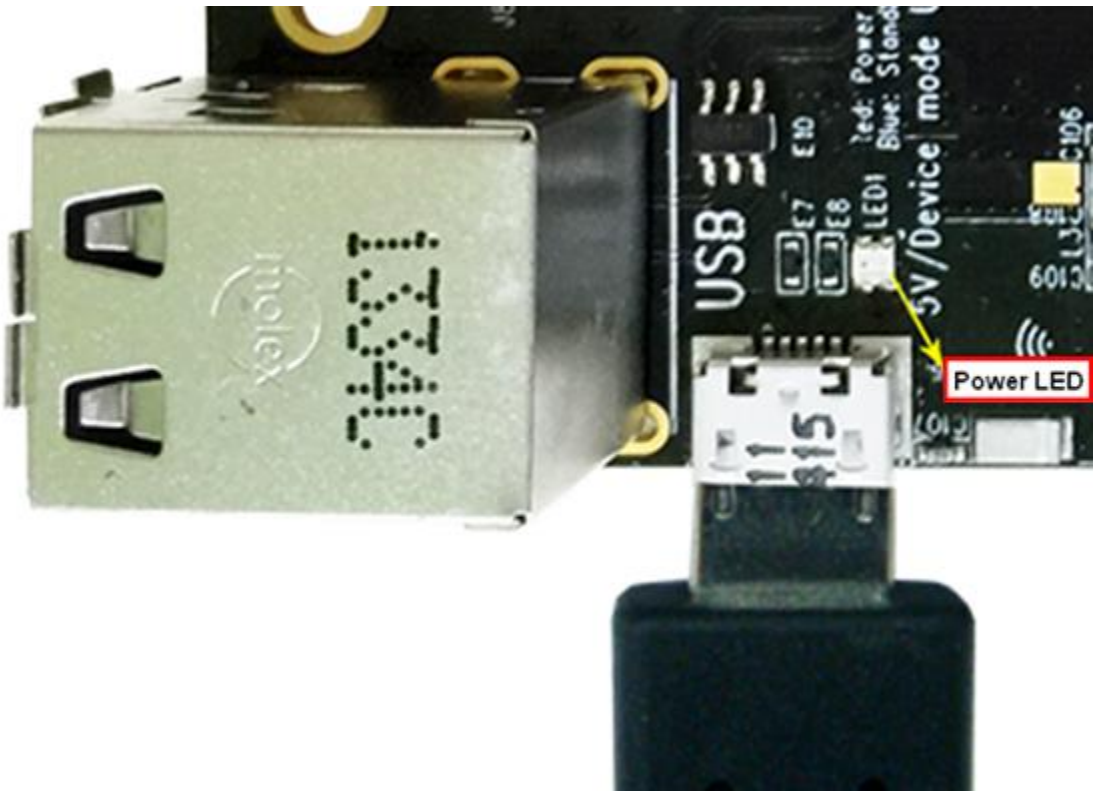


Figure 4. Board Power LED

4. When you release the power button the board starts the booting process and the LEDs will start blinking in the sequence as shown in Figure 5 below. It will take a few seconds for the status LEDs to lit, so be patient. The LEDs will be flashing in an erratic manner as it begins to boot the system.

Figure 5. Board Boot Status

2.6 Standalone with Display, Keyboard and Mouse

In this configuration, the board works more like a PC, totally free from any connection to a PC as shown in Figure 6. It allows you to create your codes to make the board do whatever you need it to do. It will however require certain common PC accessories. These accessories and instructions are described in the following section.

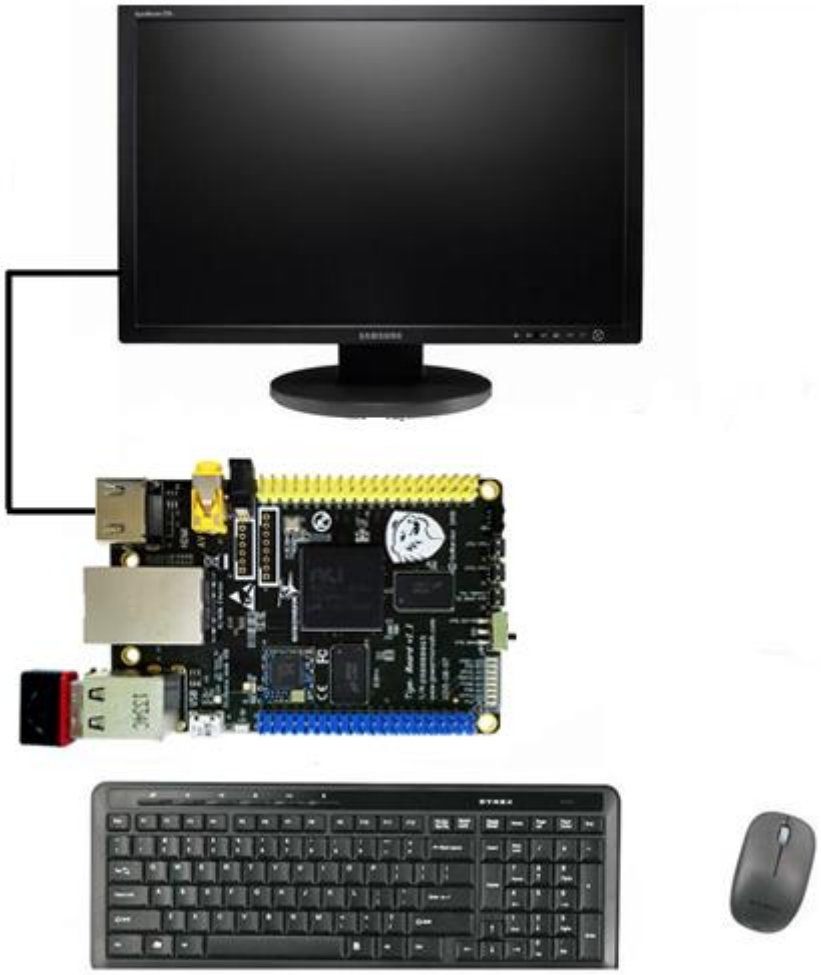


Figure 6. Desktop Configuration

Optionally an Ethernet cable can also be used for network access.

2.7 Connecting Up the Board

1. Connect the HDMI cable as shown in Figure 7 to your HDMI TV SET. Refer to your TV SET Owner's Manual for the location of your HDMI port.

Figure 7. Connecting HDMI Cable to the TV SET

2. Connect the CVBS (RCA) cable as shown in **Figure 8** to your CVBS TV SET.

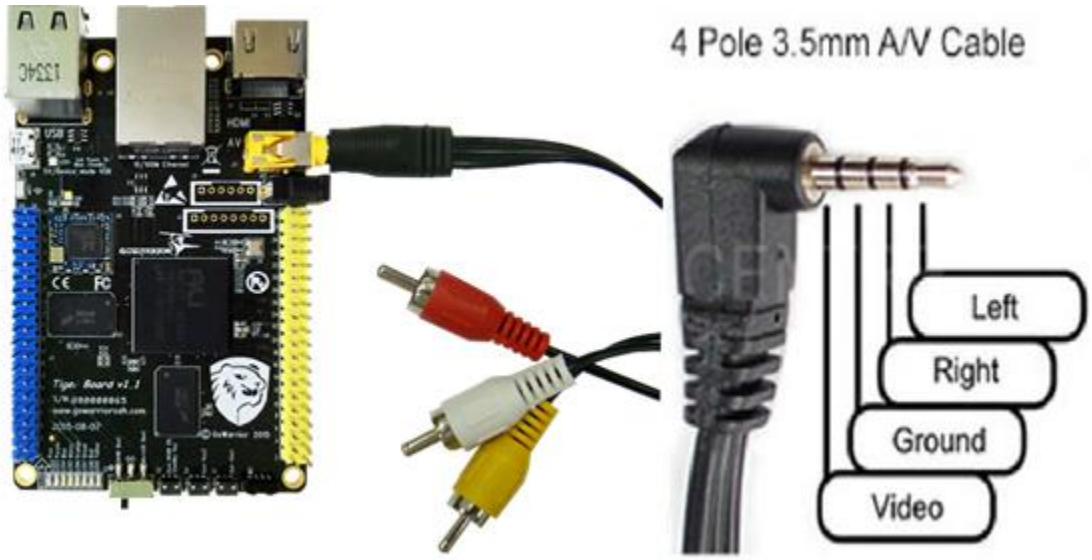


Figure 8. Connecting CVBS (RCA) Cable to the TV SET

Note: The 3.5mm jack to RCA cable defines as up figure 8.

3. If you have a single wireless keyboard and mouse combination such as seen in Figure 9 below, you need to plug the receiver in the USB host port of the board as shown in Figure 10.

Figure 9. Wireless Keyboard and Mouse Combo

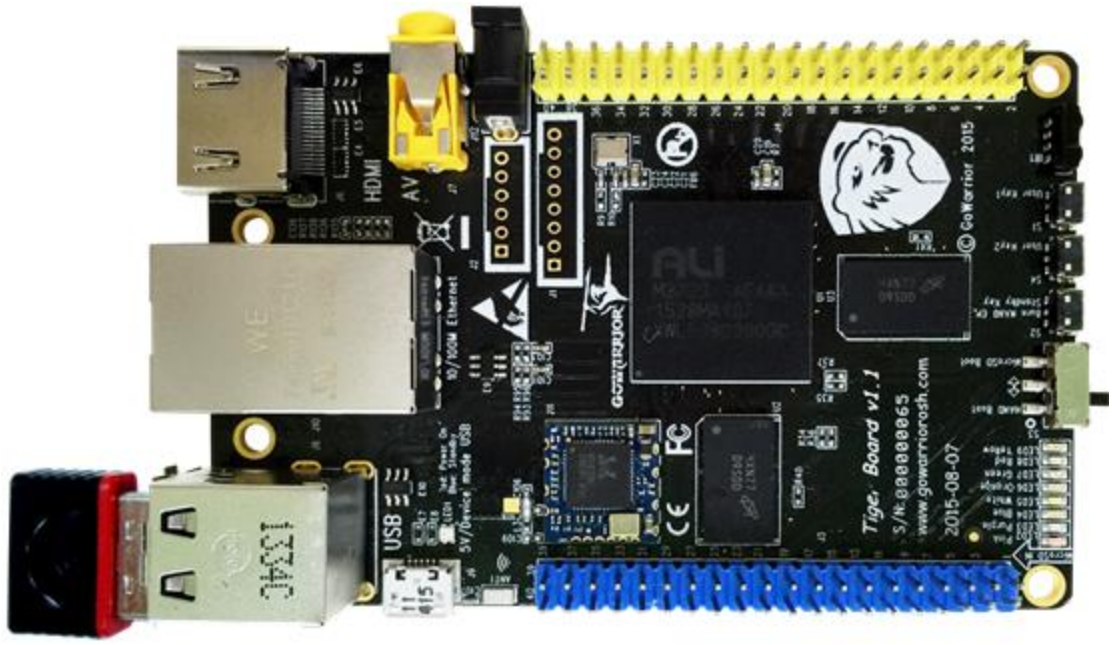


Figure 10. Connecting Keyboard and Mouse Receiver to the Board

If you have a wired USB keyboard requiring more USB ports, you will use a HUB similar to the ones shown in Figure 11. You may want to have more than one port for other devices. Note that the board can only supply up to 500mA, so if you plan to load it down, it will need to be externally powered.

Figure 11. Keyboard and Mouse Hubs

4. Connect the Ethernet Cable

If you decide you want to connect to your local area network, an Ethernet cable can be used. Connect the Ethernet Cable to the Ethernet port as shown in Figure 12. Any standard 100M Ethernet cable should work.

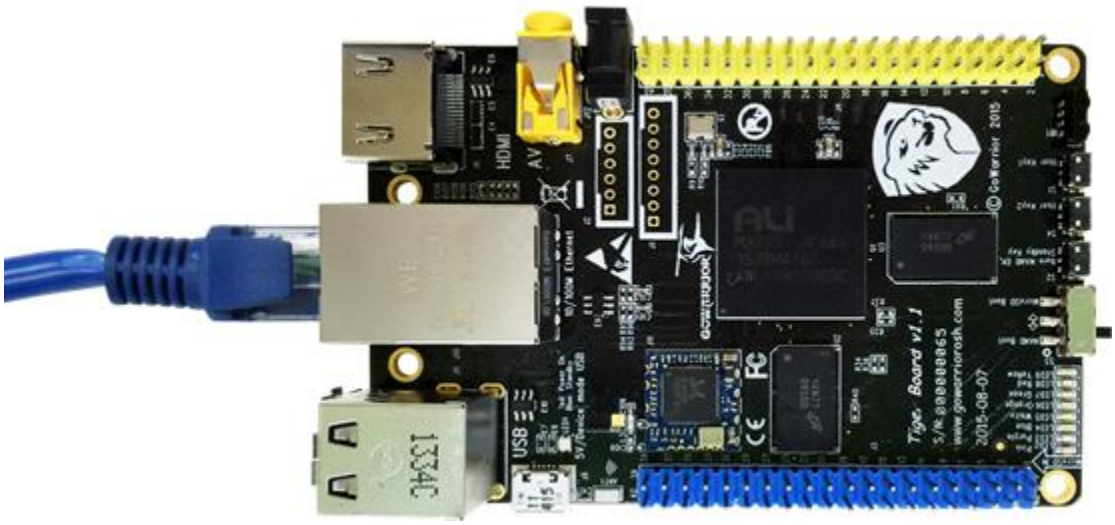


Figure 12. Ethernet Cable Connection

2.8 Applying Power

1. The final step is to plug in the Micro USB cable to the Micro USB Connector as shown in Figure 13 below.

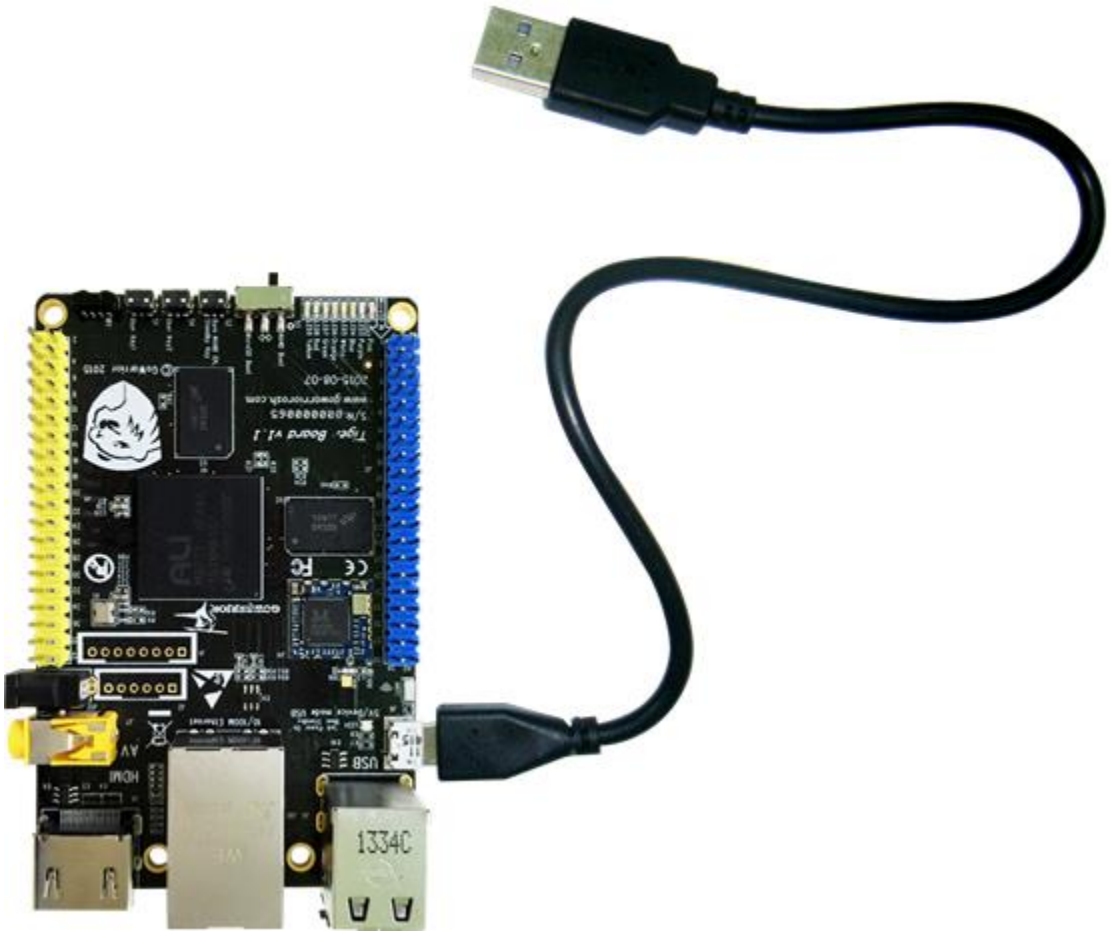


Figure 13. Micro USB Power

2. Connect HDMI Cable between TIGER Board and TV set. The connector is shown in Figure 14 below.

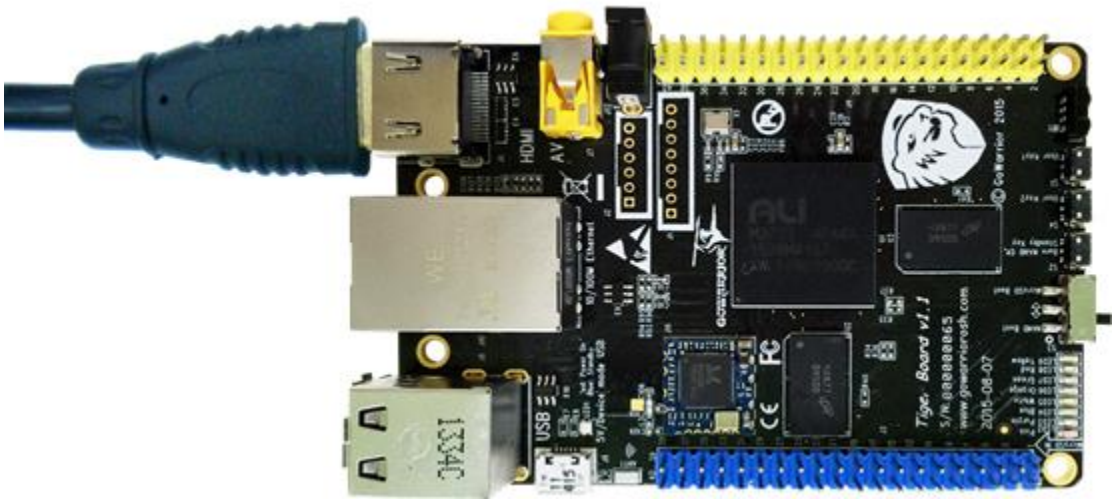


Figure 14. Connecting HDMI Cable to the Board

3. Booting the Board

As soon as the power is applied to the board, it will start the booting up process. When the board starts to boot the LEDs will come on in sequence as shown in Figure 15 below. It will take a few seconds for the status LEDs to come on, so be patient. The LEDs will be flashing in an erratic manner as it boots the system.

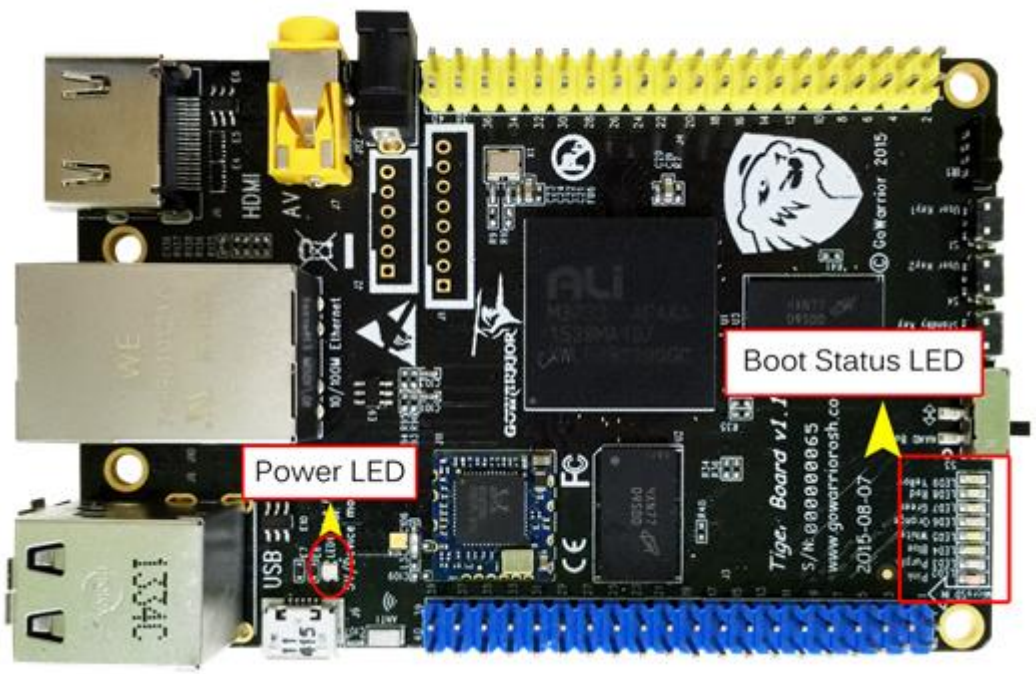


Figure 15. Board Boot Status

While the all LEDS (LED2, LED3, LED4, LED5, LED6, LED7, LED8, LED9) can be over written and used as desired, they do have specific meanings in the image that is shipped with the board once the Linux kernel has booted.

- **LED2:** Light LED2 before load the kernel in uboot.
- **LED3:** After entering the kernel, light LED3 when pinmux set completion.
- **LED6:** When entering the android, light LED6 after the init program complete file system to create. After 20 seconds, Android system_server during normal operation, flashing LED6 at a interval of one second.
- **LED7:** Into the Android desktop, light LED7.
- **LED4/LED5/LED8/LED9:** The four LEDs light up behavior can be customized according to end users.

  Note: These LEDs are controlled by GPIOs as below description.

LED2<->GPIO79; LED3<->GPIO81; LED4<->GPIO80; LED5<->GPIO78;
LED6<->GPIO76; LED7<->GPIO82; LED8<->GPIO83; LED9<->GPIO84

4. Powering Down

a) Remove the power jack (into the complete power off mode).

b) Press remote control power off key (into the platform standby mode).

c) Press S2 button (into the platform standby mode).

3 TIGER Board Overview

Note: The TIGER Board is the first generation open source hardware development board of the GoWarrior computing platform. The TIGER Board is a low-cost computing platform hardware that is able to run Android.

GoWarrior is a compact, open-source, community-supported embedded Android/Linux computing platform geared toward maker/ hacker/ entrepreneur/ dreamer/ artist/ student/ inventor/ hobbyist/ tinker. It brings together a rich feature set of innovative building blocks with cloud-driven back-end service deployment. It can be used to build complex applications that interact high-level software and low-level electronic circuits, helping you from idea through prototype to commercial mass production delivery.

It is also an ideal platform for prototyping to project and product design that take advantage of the power and freedom of Android/Linux ecosystem, combined with direct access to input/output pins and buses, allowing you to interface with electronics components, modules, and USB/Wi-Fi devices.

3.1 TIGER BOARD Features and Specification

This section covers the specifications and features of the board and provides a high level description of the major components and interfaces that make up the board. The following Table 2 provides a list of the features.

Function	Physical	Details
Processor	M3733-AFAAA	A powerful 1GHz ARM Cortex A9 Dual Core processor
	Graphics Engine	Processor has ARM Mali-400 MP2
Graphics	HDMI	Embedded HDMI PHY which is fully compliant with HDMI 1.4 specification

Function	Physical	Details
Memory	1GB DDR3 Dual Channel 1600 MT/s, 800MHz	The amount of system memory and the data bandwidth affect performance and the type of applications that can be run
Storage	NAND Flash	A 4GB on-board NAND Flash, TIGER Board can boot without a MicroSD.
Power Management	PMU	Embedded Power Management Unit which supports Real Time Clock, IR/KEY standby and resume, system deep standby mode compliant with Euro Green Power Standard
Ethernet Processor	Ethernet PHY (10/100M)	Embedded Ethernet PHY (10/100M), can be immediately connected to a network
LEDs	11 x LEDs	1 double color LED is Power/Standby LEDs (Red: Power, Blue: Standby) 8 colors user LEDs (Pink, Purple, Blue, White, Orange, Green, Red, Yellow) 2 LEDs on the RJ45 Ethernet socket (Yellow = 100M link up, Green = Traffic)
Buttons Switch	3 x Buttons	Shared function for client mode (during power on) and standby/resume button The other two buttons are user defined buttons
	1 x Switch	Switch for choosing to boot from NAND Flash or MicroSD
Network	Wi-Fi Bluetooth	On-board 802.11n Wi-Fi and Bluetooth 4.0 Module
IR	IR Receiver	On-board IR receiver
Connectors		
Audio Video Out	HDMI	For connection to Television. Support four resolutions: 720x480, 720x576, 1280x720, 1920x1080. Supports HDMI CEC and HDCP.
	3.5mm Jack	3.5mm Jack carries both stereo audio and composite video signals simultaneously.
Network	Ethernet (RJ45)	10/100M Ethernet via a RJ45 connector

Function	Physical	Details
MicroSD	Card slot	MicroSD slot (3.3V). TIGER Board can boot from this slot, or used for additional storage when booting from the NAND Flash.
Serial Debug	In J4 Expansion Headers	UART0 used with a serial TTL 3.3V cable to connect to the serial console of the TIGER Board
USB	1x USB 2.0 Client 5V power input (Micro USB)	USB0 connects to user's desktop computer and can power the TIGER Board directly and/or burn NAND Flash data.
	2x USB 2.0 Host (USB-A)	USB1/2 can be connected USB peripherals (eg keyboard, mouse, webcam), also supports USB hub to add more USB devices.
Other Debug	JTAG	There is a JTAG connector reserved on the board. JTAG allows users debugging their boards, but requires additional hardware and software.
Power	Power Jack	5V power adapter could be used for stronger power supply
J3 and J4 Expansion Headers		**80 pins in two headers that are multiplexed to provide access to the features. Not all functionality is available at the same time. Can be used to connect capes.** **J3 40 pins headers are compliant with Raspberry Pi 2 Model B**
GPIO	63 x GPIOs max	Maximum number of GPIOs is 63. All GPIOs are 3.3V tolerant. Using buses and interfaces below reduces the number of available GPIOs.
Power Supply	5V, 3.3V	5V and 3.3V supplies, Nine pins on the headers route to regular ground.
Buses	I^2C	I^2C is a digital bus that allows you to connect several modules to each of these two-wire buses at the same time. There is one public buse and all GPIO could be used as I^2C signals by software.
	2x UART	Used for serial communication between two devices. UART0 is the Serial Debug port.

Function	Physical	Details
	SPI	Serial peripheral interface provides a synchronous serial data link over short distances. It uses a master/slave configuration and requires four wires for communication on the TIGER Board.
	Digital VOUT	Useful for LCD screens, max supports 24bit data. Supports resolutions like: 720x480, 720x576, 1280x720, 1920x1080.
	Digital VIN	Useful for digital video input.
	I^2S OUT/IN	It is an electrical serial bus interface standard used for connecting digital audio devices together.
	SD	It is SD bus shared with the MicroSD slot. So SD and MicroSD can't be used at the same time.
	PCM	It is another type of electrical serial bus interface standard of digital audio.
	TSI SSI	It is the serial interface used for transmission of audio, video, program and system information protocol data. It is used in broadcast systems such as DVB, ATSC and IPTV.

Table 4. TIGER Board Features and Specification

3.2 Board Component Locations

This section describes the key components on the board. It provides information on their location and function. Familiarize yourself with the various components on the board.

3.2.1 Connectors, LEDs, and Switches

Figure 16 below shows the locations of the connectors, LEDs, and switches on the PCB layout of the board.

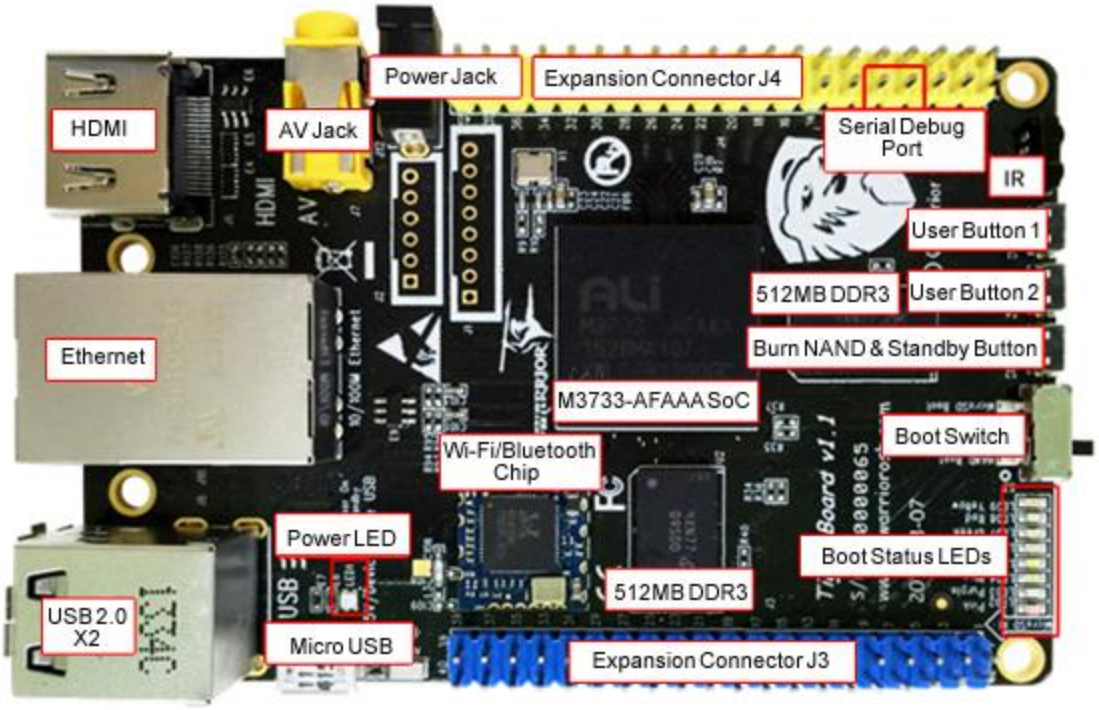


Figure 16. Connectors, LEDs and Switches

- **10/100 Ethernet** is the connection to the LAN.
- **Uart Connector** is the serial debug port.
- **USB Port 0** is a Micro USB connection to a PC that can also power the board.
- **BOOT switch** BOOT switch for choosing to boot from NAND Flash or MicroSD.
- There are eight **LED**s that can be used by the software.
- **MicroSD** slot is where a MicroSD can be installed.
- **HDMI** connector is where the display is connected to.
- **AV Jack** connector is link to the CVBS TV SET.
- **Power Jack** connector is a 5v power adapter for stronger power supply.
- **USB Port 1/2** can be connected different USB interfaces such as Keyboard, mouse etc.

3.2.2 Key Components

Figure 17 below shows the locations of the key components on the PCB

layout of the board.

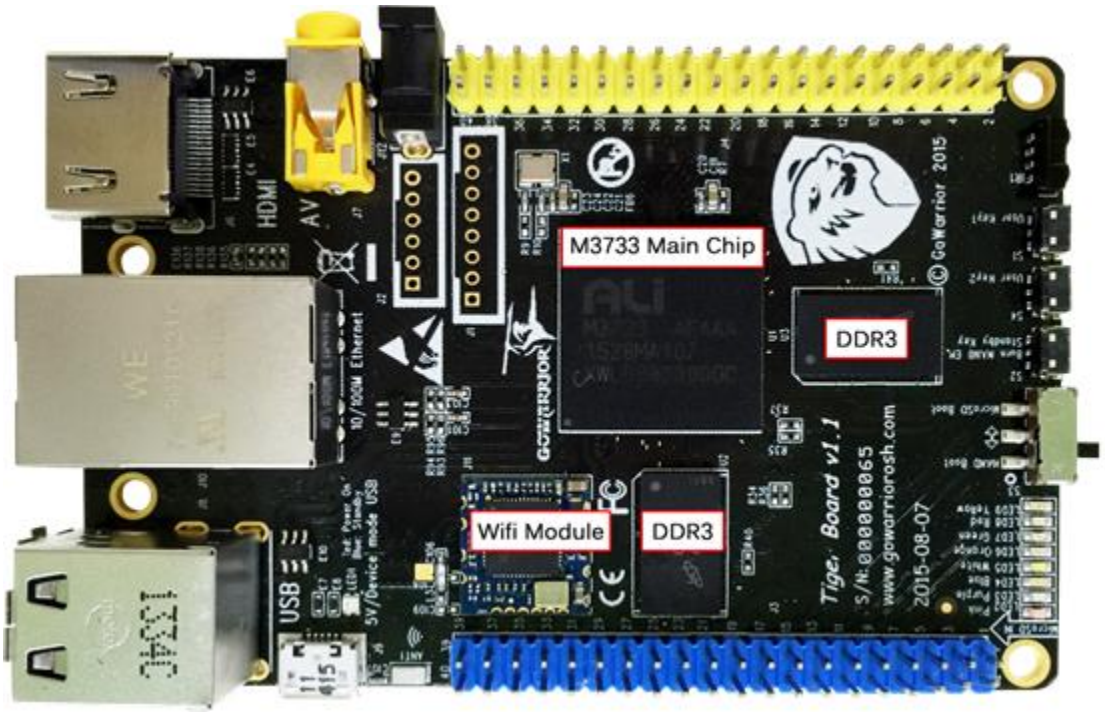


Figure 17. Key Components

- **ALi M3733** is the processor for the board.
- **Hynix 512MB DDR3L** or **NANYA 512MB DDR3** is the Dual Data Rate RAM memory.
- **NAND Flash** is an onboard NAND chip that holds up to 4GB of data.

4 TIGER Board High Level Specification

This section provides the high level specification of the TIGER Board.

4.1 Block Diagram

Figure 18 below is the high level block diagram of the TIGER Board.

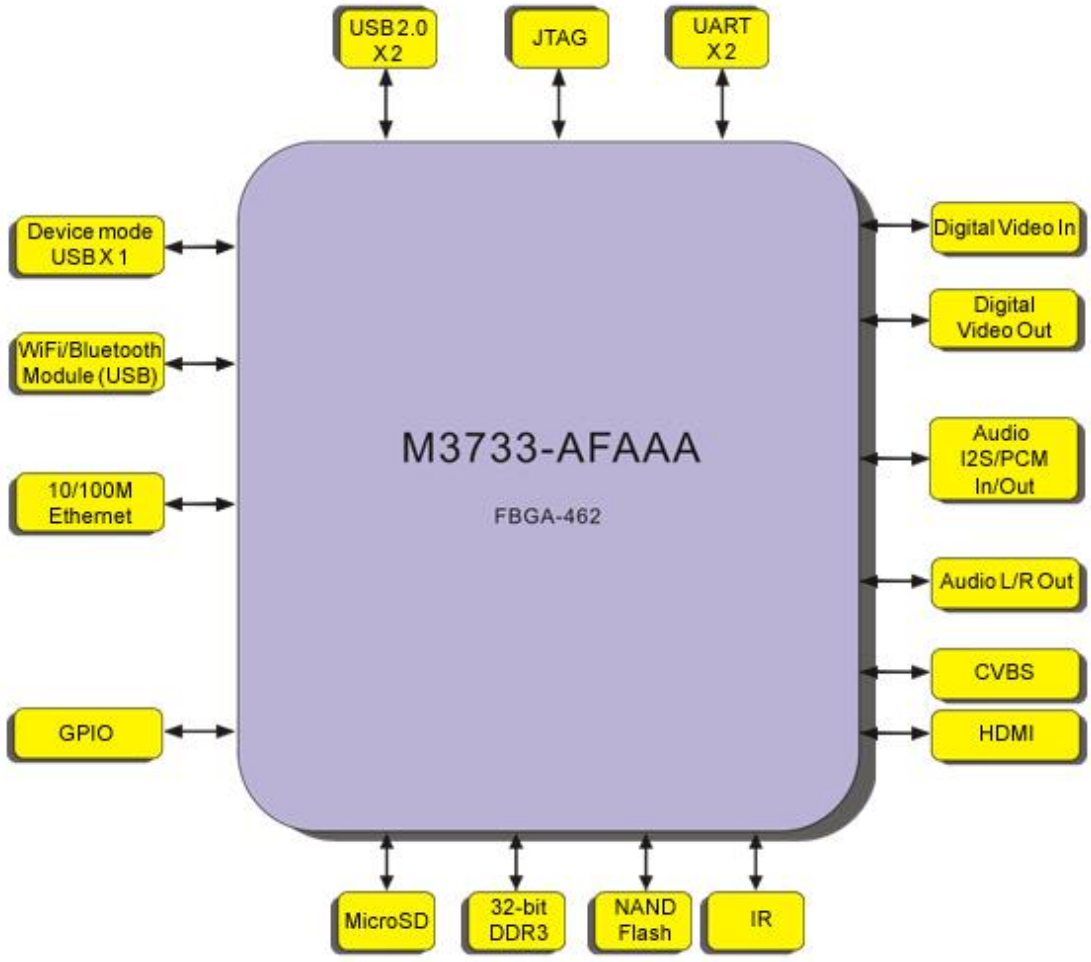


Figure 18. TIGER Board Key Components

4.2 Processor

ARM Dual-Core Cortex-A9 up to 1GHz with one RISC 32-bit microcontroller used for real-time interfacing and one dedicated multimedia DSP core for audio coding and processing

4.3 Memory

Described in the following sections are the two memory devices found on the board.

4.3.1 1GB DDR3

Two pieces 256Mb x16 DDR3 4GB (512MB) memory device are used. The memory manufacturer and part number as below:

- SKhynix H5TQ4G63AFR-PBC
- Or used SKhynix H5TQ4G63CFR-RDC
- Or used Micron MT41K256M16LY-107:N
- Or used NANYA NT5CC256M16DP-DI

It will operate at a clock frequency of 800MHz.

4.3.2 NAND Flash Features

A single 4GB NAND Flash device is on the board. The manufacturer and part number as below:

- Micro MT29F32G08CBADA

4.3.3 MicroSD Connector

The board is equipped with a single MicroSD connector to act as the secondary boot source for the board and, if selected as such, can be the primary boot source. The connector will support larger capacity MicroSD. The MicroSD is not provided with the board.

4.4 Boot Modes

As mentioned earlier, there are two boot modes:

The platform can boot from **NAND Flash** or **MicroSD**. Please refer to below picture.

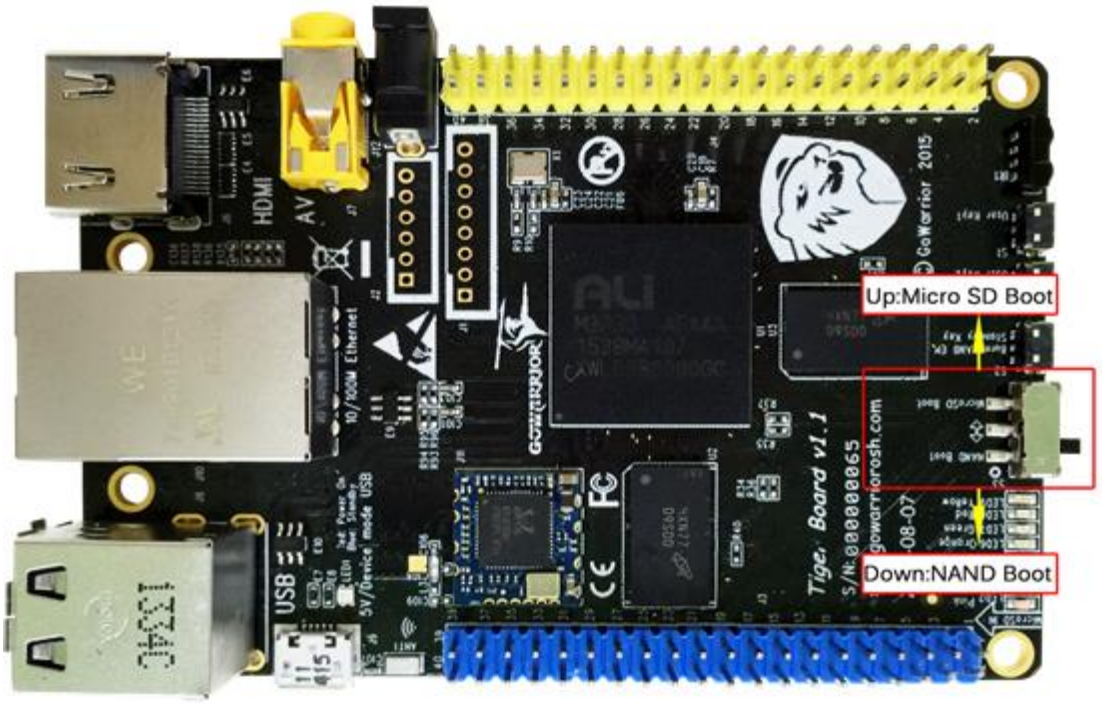


Figure 19. TIGER Board Boot Modes Selection

4.5 Power Management

System 3V3	VDDO	VDDCORE	VDDCORE CPU
3.3V +/-5%	1.5V +/-3%	1.06V +/-3%	1.31V +/-3% for 1GHz

Table 5. M3733 Power Delivery Guidelines

5 Detailed Hardware Design

5.1 Basic System Design

5.1.1 External Crystal Selection

System clock for TIGER Board should be 27 MHz.

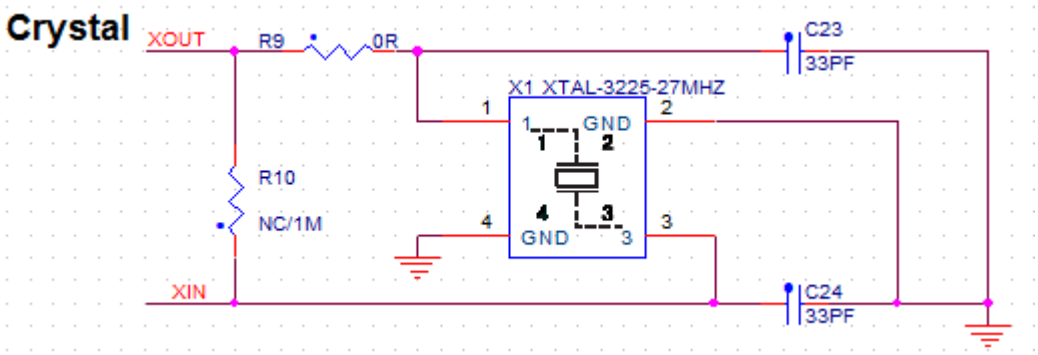


Figure 20. External Crystal Circuit

5.1.2 PLL Peripheral Circuit

There are 3 sets of PLL modules in TIGER Board for PLL power supply.

One is the general HDMI, Ethernet clock. Please follow the design in Figure 21.

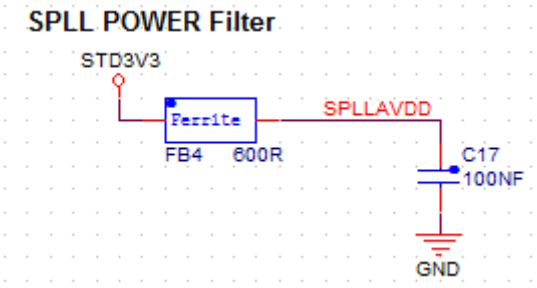


Figure 21. External Crystal Circuit for SPLL

One is the CPU clock. Please follow the design in Figure 22.

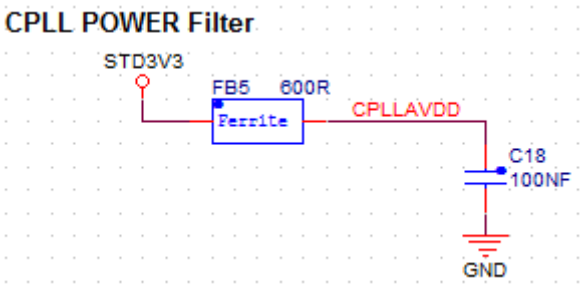


Figure 22. External Crystal Circuit for CPLL

One is the Memory clock. Please follow the design in Figure 23.

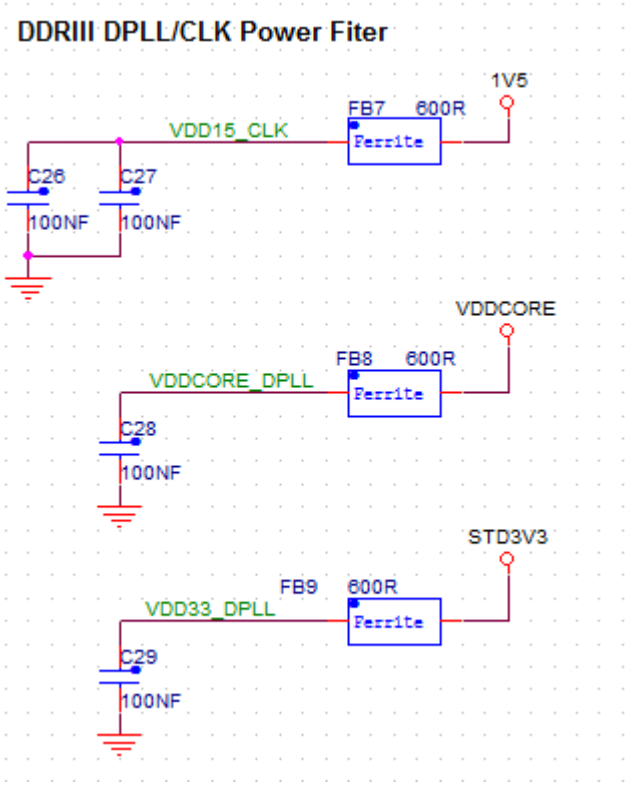


Figure 23. External Crystal Circuit for DPLL/CLK

5.1.3 Resetting

Because TIGER Board main Chip has embedded a reset module, only RC needs to be connected to the system reset pin with outside circuit, as shown in Figure 24.

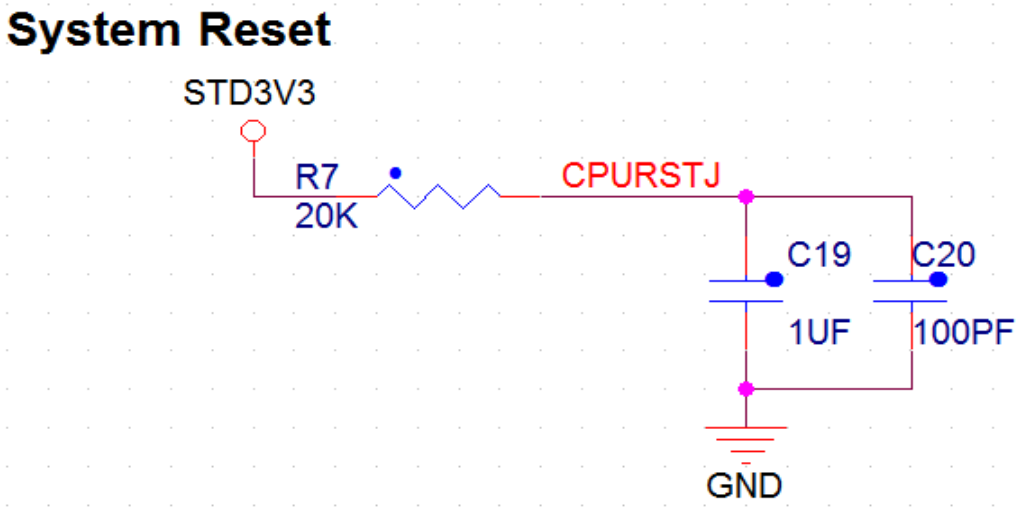


Figure 24. Reset Circuit

As the resetting signal is very important for the whole system, EMI/crosstalk/pulse noises and all factors that will affect reset signals should be carefully considered. We use two ceramic capacitors (1uF and 100pF) to remove noise.

5.2 High Speed Circuit Design

5.2.1 DDR3

The DDR3 features are listed as below.

- 2*16-bit DDR3 DRAM interface
- Supports DDR3 DRAM running at 1600 MT/s data rate
- Supports 2 sets of 16-bit devices DDR3; the DDR3 component density can be 2Gb/4Gb/8Gb, the max DRAM size of the system provided is 2Gbyte
- Supports fast resume.
- There are 2 reference voltages, VREFDQ and VREFCA. They are the reference voltages for DQ/ADD, CMD input level, so they should be very precise. 1% resistors should be employed in the below circuit.

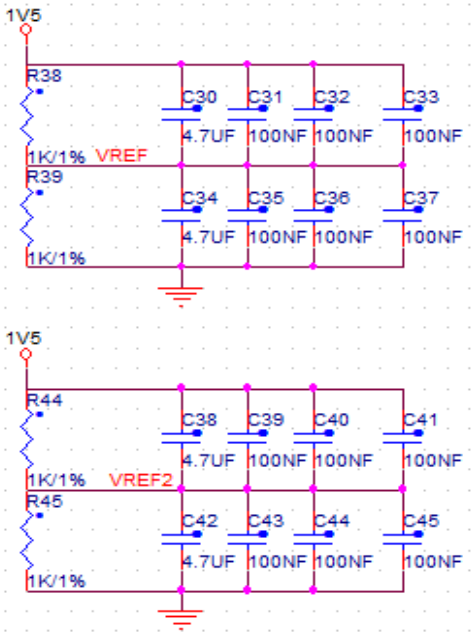


Figure 25. VREFDQ and VREFCA Circuit

5.2.2 USB

The USB features are listed as below.

- USB0 supports Host/Device mode. Device mode can be used for NAND Flash upgrade. USB Port1/USB Port2 supports Host mode.
- Fully compliant with USB 2.0 protocol. Supports low speed, high speed and full speed work modes.

Below is the relevant circuit:

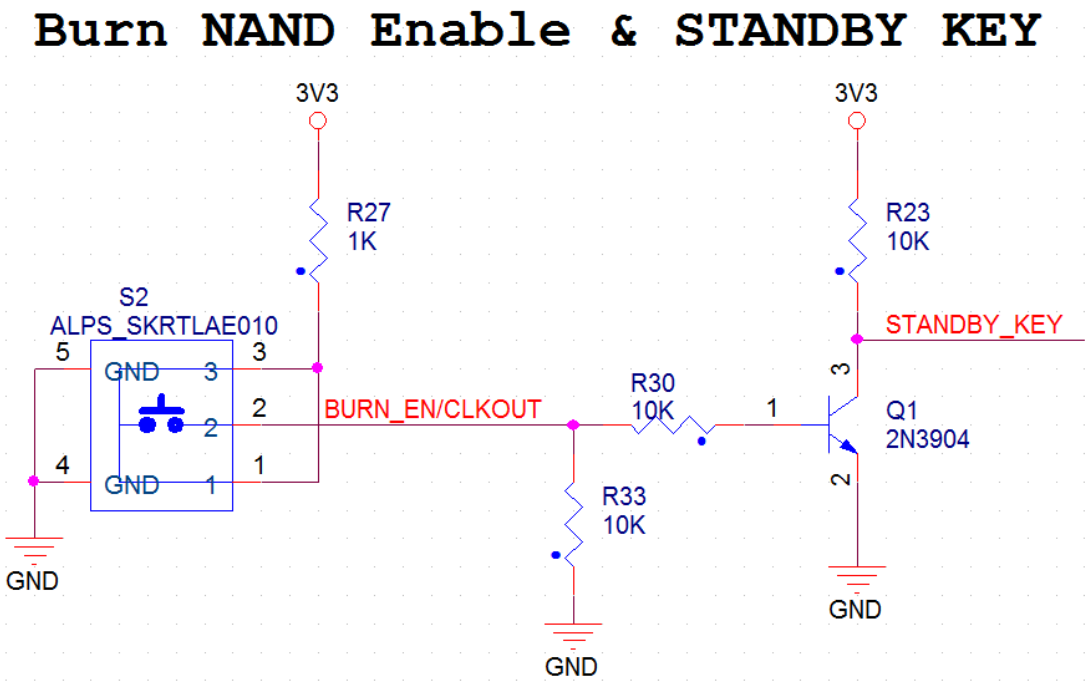


Figure 26. Burning NAND Flash/Standby Key Circuit

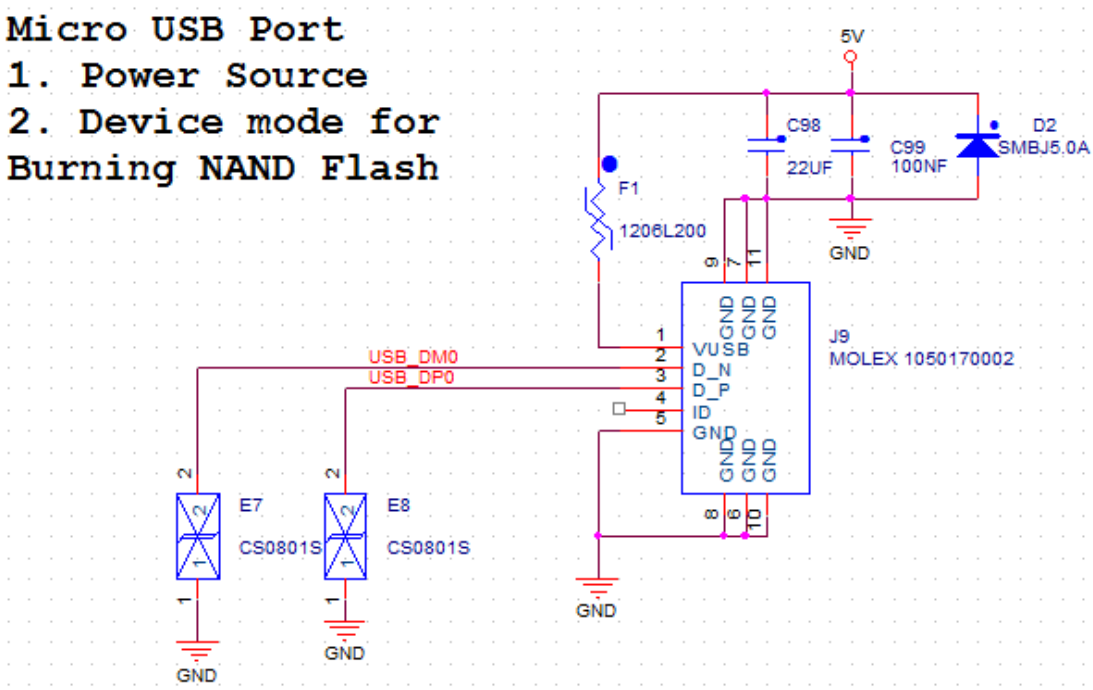


Figure 27. USB Circuit

5.2.3 HDMI

The HDMI features are listed as below.

- Supports hot plug detection
- Power down mode
- High bandwidth supports HDTV formats, including 1080p, 1080i and 720p
- Supports CEC

Below is the HDMI Power Filter circuit:

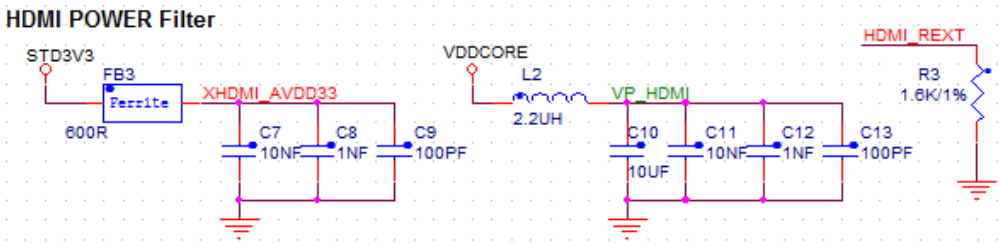


Figure 28. HDMI Power Filter

5.2.4 10/100M Ethernet Design

TIGER Board has integrated one 10/100M MAC and PHY.

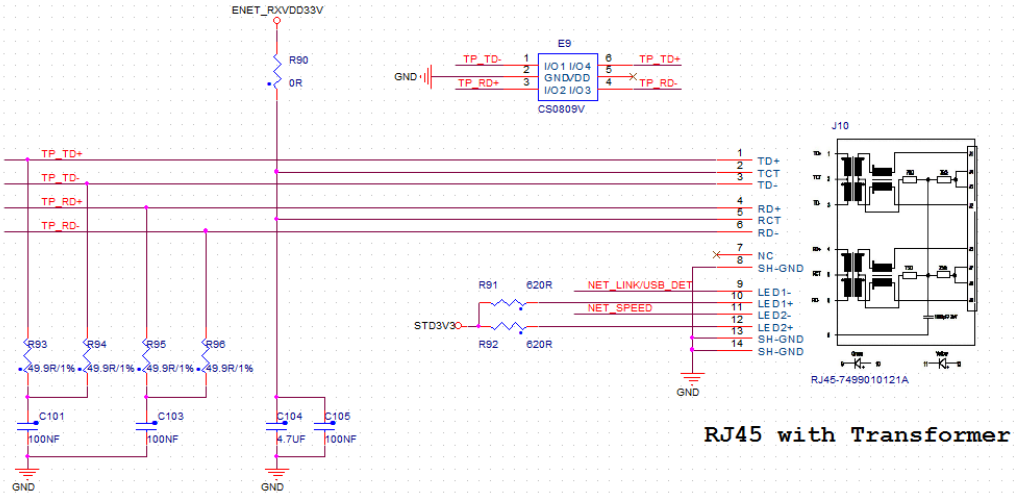


Figure 29. 10/100M Ethernet Design

5.3 Analog Circuit and Low Speed Digital Circuit Design

5.3.1 Analog Video Design

The DACs can drive 2 channel video devices directly. If it is CVBS output, a series 220uF capacitor is needed. There is a 75ohm series resistor for every channel.

A TVS diode is needed for ESD performance for every DAC; otherwise ESD from TV may damage TIGER Board main chip.

Only CVBS output

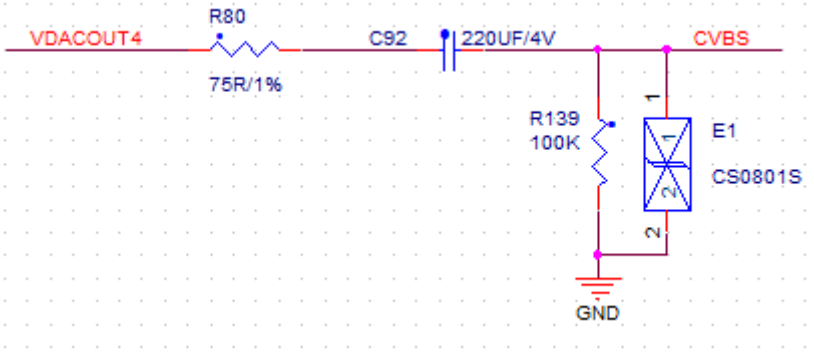


Figure 30. CVBS Output Circuit

5.3.2 Audio Design

TIGER Board supports analog audio, which outputs analog audio signals.

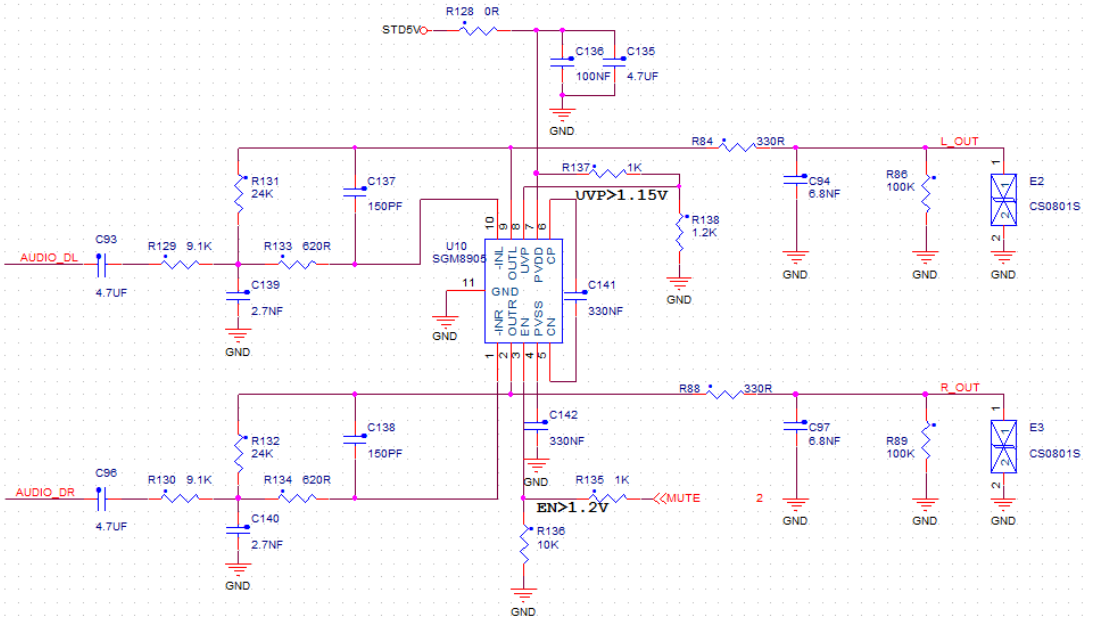


Figure 31. Audio Circuit

5.3.3 SDIO Design

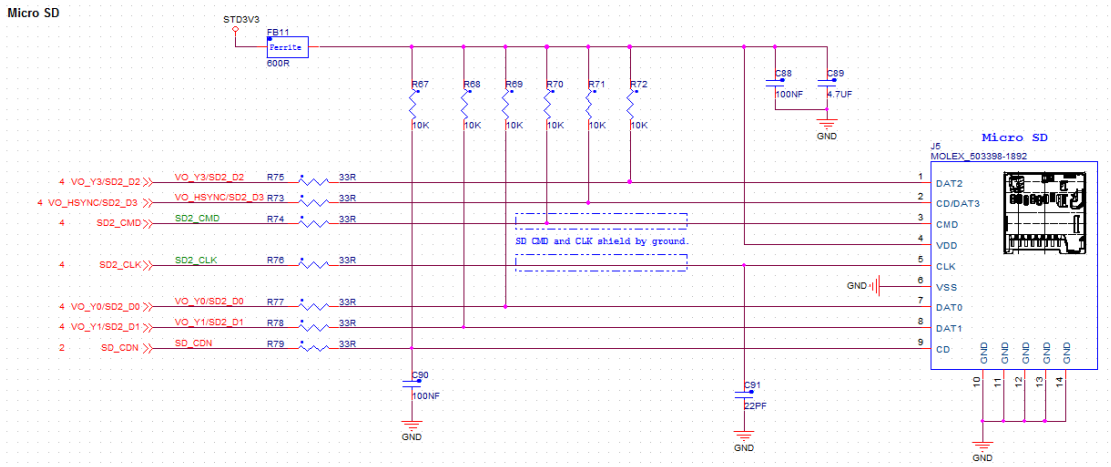


Figure 32. SDIO Design

6 Platform Power Delivery

This section provides an example for TIGER Board power delivery. There are many methods to implement a power delivery system, and this is only one example. This specification provides one power distribution method to keep system on stable status. Other methods can achieve similar results. We can use linear or switching regulator to get those voltages but it should ensure to meet the below requirements.

6.1 TIGER Board Power Consumption

TIGER Board requires the following voltages. Voltage value test point is the IC pin which is the farthest pin with the VDDO=1.5V +/- 5%; VDDIO=3.3V +/- 10%; VDDCORE=1.06 +/- 3%; VDDCORE_CPU=1.31+/- 3%.

6.2 AC 0.5W Power Consumption Design at Standby

In order to meet the 0.5W power consumption requirement at standby, we should shut down all power except PMU_PWR (3.3V) and IR power (3.3V). System can reboot by the control of the embedded PMU.

At standby, the power loop of 5V to 3.3V is active, so the converter efficiency of 5V to 3.3V should be high. Greater than 80% in light loading is recommended.

6.3 1.06V/1.31V/3.3V/1.5V Power-On Sequence

Signals involved in this sequence are: PMU_VDDIO, VDDIO, VDDCORE/VDDCORE_CPU, VDDQ and C_RST# (cold reset signal). C_RST# (cold reset signal) should always be the last signal. The sequence is shown in the below figure.

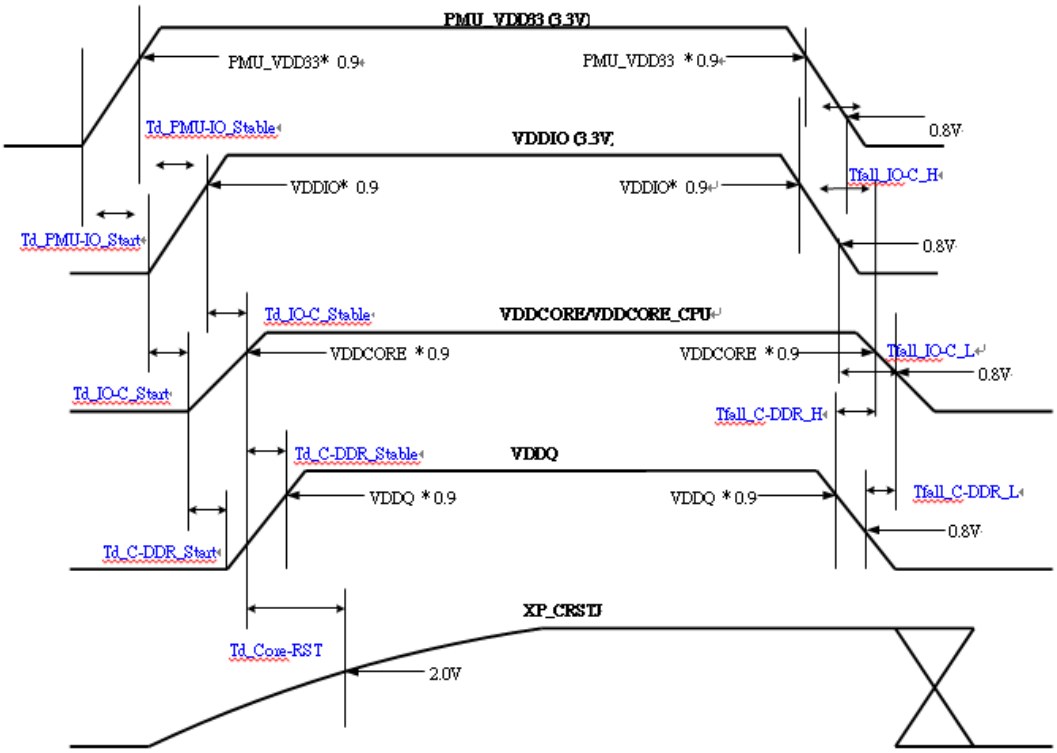


Figure 33. 1.06V/1.31V/3.3V/1.5V Power Sequence

7 Connectors

This section describes each of the connectors on the board.

7.1 Expansion Connector J3 and Expansion Connector J4

The expansion interface on the board is comprised of two 40 pin connectors. All signals on the expansion headers are **3.3V** unless otherwise indicated.

Note

Do not connect 5V logic level signals to these pins or the board will be damaged.

Note

Do not apply voltage to any I/O pin when power is not supplied to the board. It will damage the processor and void the warranty.

No pins to be driven until after the SYS_RESET line goes high.

Figure 34 shows the location of the expansion connectors.

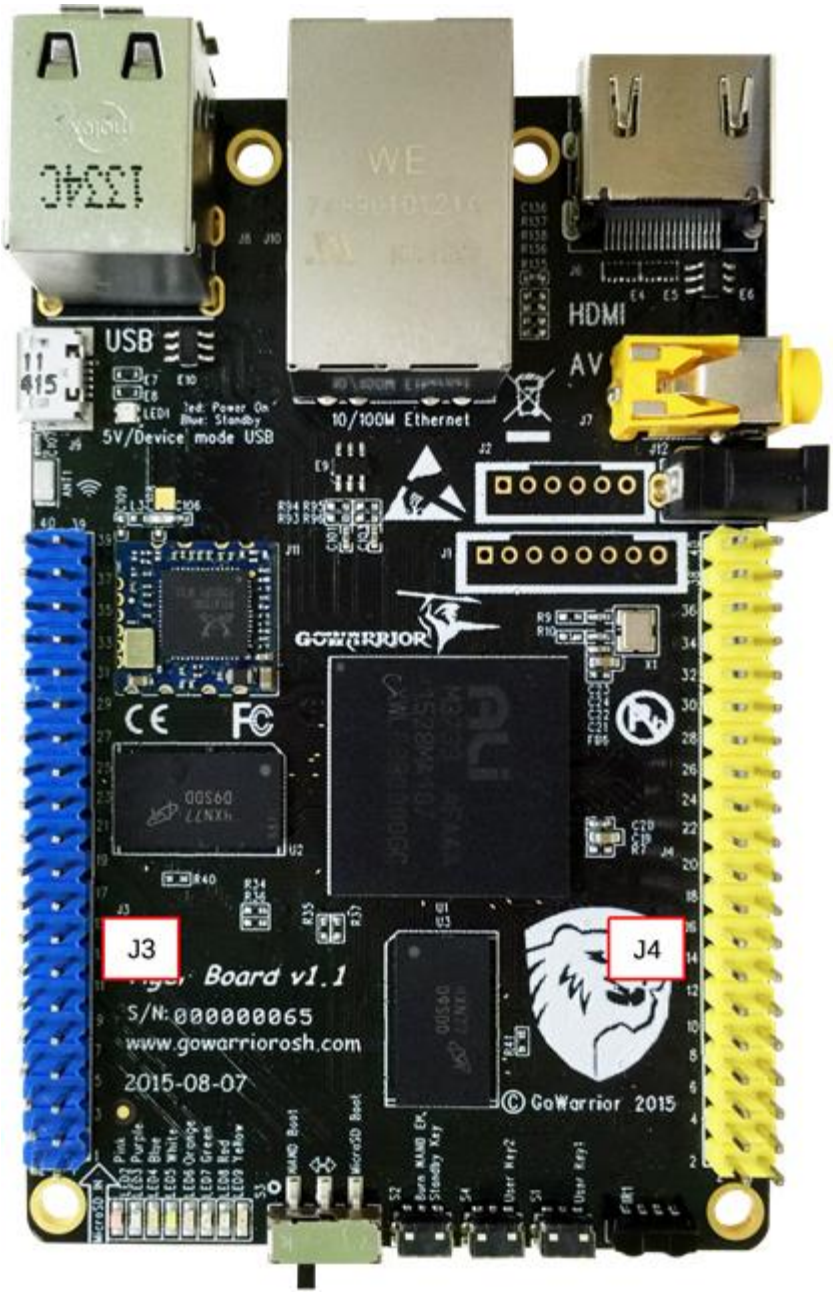


Figure 34. Expansion Connector Location

7.1.1 Connector J3

Table 6 shows the pinout of the **J3** expansion header. Other signals can be connected to this connector based on setting the pin mux with software. The Software is responsible for setting the default function of each pin.

Table 6. Expansion Header J3 Pinout

Color	GPIO Number	Function 2	Function 1	Function 0	PIN No.		Function 0	Function 1	Function 2	GPIO Number
J3 Blue				3.3V	1	2	5V			
	GPIO[89]			I2C1_SDA	3	4	5V			
	GPIO[90]			I2C1_SCL	5	6	GND			
	GPIO[2]			BURN_EN/CLKOUT	7	8	UART1_TXD		ALISSI_ERROR	GPIO[87]
				GND	9	10	UART1_RXD		ALISSI_SYNC	GPIO[118]
	GPIO[66]			VO_CR2	11	12	PCM_RCK/VO_CR6			GPIO[70]
	GPIO[64]			VO_CR0	13	14	GND			
	GPIO[44]		XSD2_MMC_RSTJ	VO_DE	15	16	VO_CB6			GPIO[62]
				3.3V	17	18	VO_CB2			GPIO[58]
	GPIO[101]			ND_D6/SPI_MOSI/SD_D3	19	20	GND			
	GPIO[102]			ND_D5/SPI_MISO	21	22	VO_CB4			GPIO[60]
	GPIO[100]			ND_D7/SPI_CLK	23	24	SPI_CSJ0			GPIO[98]
				GND	25	26	GPIO[10]	AUD_I2SO_LRCLK		GPIO[10]
	GPIO[119]	ALISSI_VALID	AUD_I2SIO_MCLK	XPMU_GPIO2	27	28	XPMU_GPIO5	AUD_I2SI_BCK	ALISSI_DATA1	GPIO[9]
	GPIO[8]	ALISSI_DATA0	AUD_I2SI_LRCLK	XPMU_GPIO4	29	30	GND			
	GPIO[7]	ALISSI_CLK	AUD_I2SI_DATA	XPMU_GPIO3	31	32	VO_Y7			GPIO[55]

Color	GPIO Number	Function 2	Function 1	Function 0	PIN No.		Function 0	Function 1	Function 2	GPIO Number
	GPIO[11]		AUD_I2SO_BCK	GPIO[11]	33	34	GND			
	GPIO[71]			PCM_RFS/VO_CR7	35	36	VO_VSYNC			GPIO[47]
	GPIO[0]		AUD_I2SO_SDATA0	GPIO[0]	37	38	PCM_DI			GPIO[72]
				GND	39	40	PCM_DO/VO_CR5			GPIO[69]

Note

J3 pin7 (GPIO[2]) function cannot be used in original hardware circuit (If config GPIO[2] as high level, the system will enter standby mode). If you want to use GPIO[2] function, please NC resistor R30 refer to the following figure.

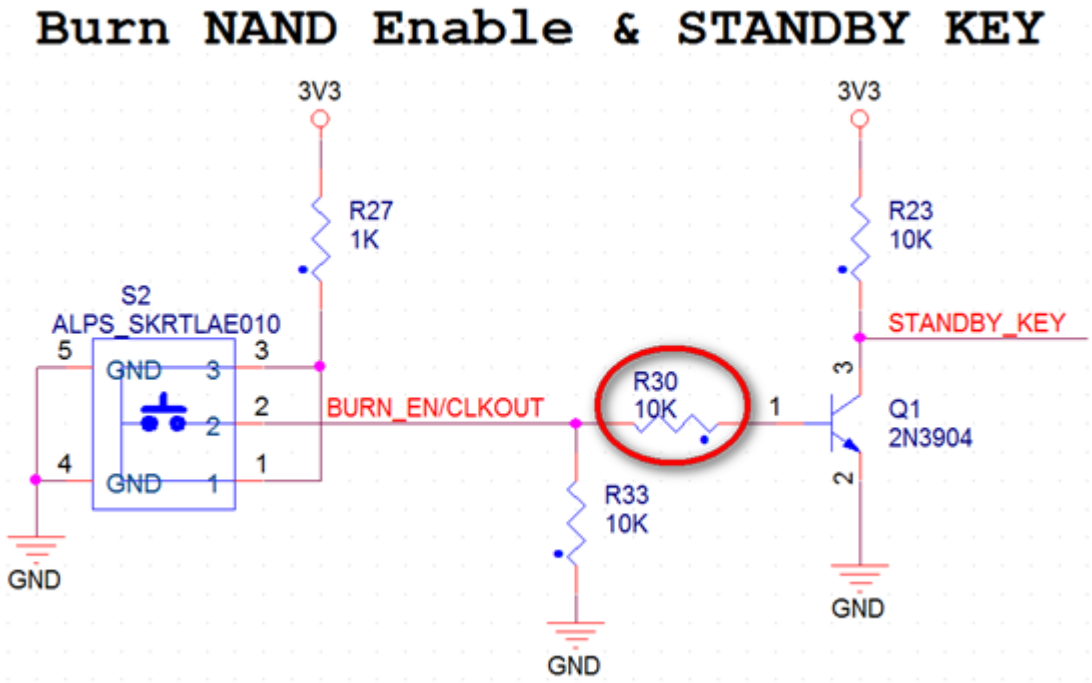


Figure 35. Resistor R30 Location

7.1.2 Connector J4

Table 7 lists the pinout of the **J4** expansion header. Other signals can be connected to this connector based on setting the pin mux with software. The Software is responsible for setting the default function of each pin.

Color	GPIO Number	Function 1	Function 0	PIN No.		Function 0	Function 1	GPIO Number
J4 Yellow			3.3V	1	2	5V		
	GPIO[18]		XVIN0_HSYNC	3	4	5V		
	GPIO[26]		XVIN0_Y6	5	6	GND		
	GPIO[22]		XVIN0_Y2	7	8	UART0_TX/SP9		GPIO[85]
	GPIO[20]		XVIN0_Y0	9	10	UART0_RX		GPIO[88]
	GPIO[16]		XVIN0_DE	11	12	XVIN0_PIXCLK		GPIO[17]
	GPIO[21]		XVIN0_Y1	13	14	XVIN0_Y4		GPIO[24]
	GPIO[25]		XVIN0_Y5	15	16	XVIN0_VSYNC		GPIO[19]
	GPIO[27]		XVIN0_Y7	17	18	XVIN0_Y3		GPIO[23]
	GPIO[35]	XSD2_DATA[7]	SD2_D7	19	20	VO_CLK	XSD2_DATA[4]	GPIO[45]
	GPIO[37]	XSD2_CLK	SD2_CLK	21	22	SD2_CMD	XSD2_CMD	GPIO[42]
	GPIO[43]	XSD2_DATA[5]	SD2_D5	23	24	VO_HSYNC/SD2_D3	XSD2_DATA[3]	GPIO[46]
	GPIO[49]	XSD2_DATA[2]	VO_Y1/SD2_D1	25	26	VO_Y2/SP6		GPIO[50]
	GPIO[52]		VO_Y4/SP14	27	28	VO_Y3/SD2_D2	XSD2_DATA[2]	GPIO[51]
	GPIO[54]		VO_Y6/SP13	29	30	VO_Y5	XSD2_DATA[6]	GPIO[53]
	GPIO[56]		VO_CB0/SP18	31	32	VO_CB1/SP10		GPIO[57]
	GPIO[63]		VO_CB7/SP5	33	34	VO_Y0/SD2_D0	XSD2_DATA[0]	GPIO[48]
	GPIO[61]		VO_CB5/SP16	35	36	VO_CR1/SP4		GPIO[65]
	GPIO[59]		VO_CB3/SP7	37	38	PCM_TCK/VO_CR3		GPIO[67]
			GND	39	40	PCM_TFS/VO_CR4		GPIO[68]

Table 7. Expansion Header J4 Pinout

7.2 USB Port0 (Micro USB)

The USB Port0 (Micro USB) connector is accessible on the top side of the board as shown in Figure 36. It uses a 5 pin Micro USB cable.

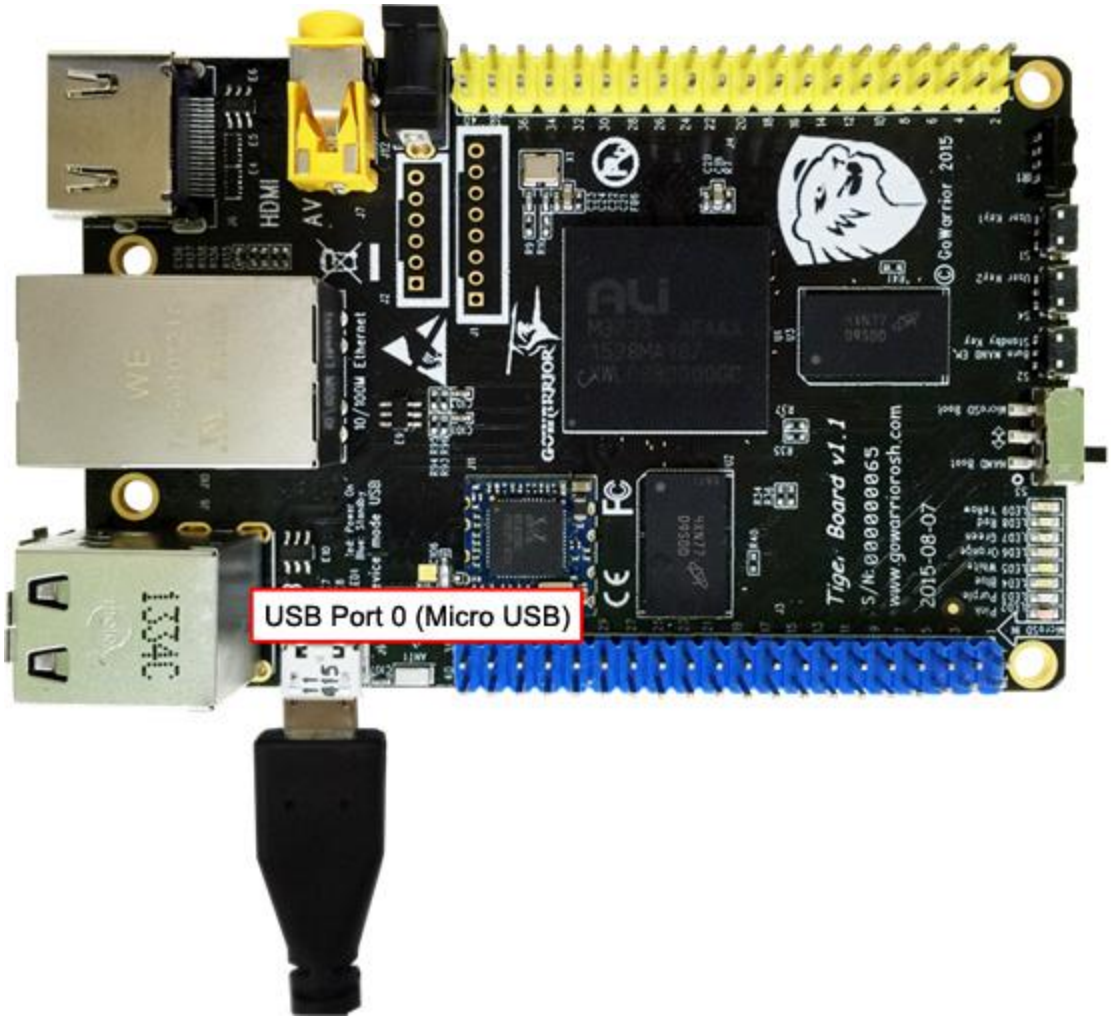


Figure 36. USB Port0 (Micro USB) Connector

This port is intended for connecting to a PC.

7.3 USB Port1/ Port2

There are two USB Port1/Port2. The two ports are USB Host connectors on the board，as shown in Figure 37 below.

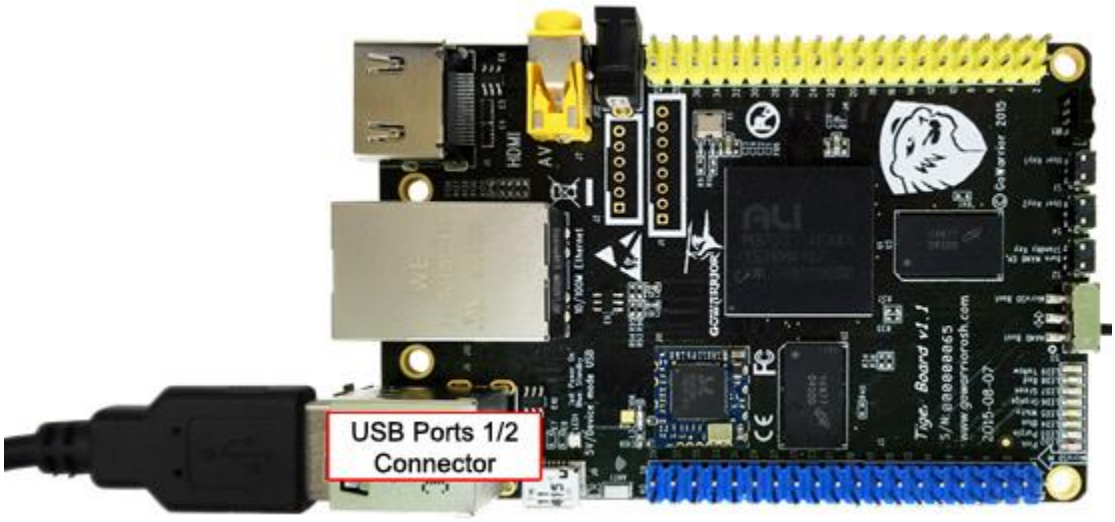


Figure 37. USB Port1/Port2 Connector

The ports are USB 2.0 HS compatible and can supply up to 500mA of current. If more current or ports is needed, then a HUB can be used.

Note: If USB Port0 used as device mode, the USB Port1 cannot work as host mode.

7.4 Serial Header

Each board has a debug serial interface that can be accessed by using a special serial cable that is plugged into the serial header as shown in Figure 38 below.

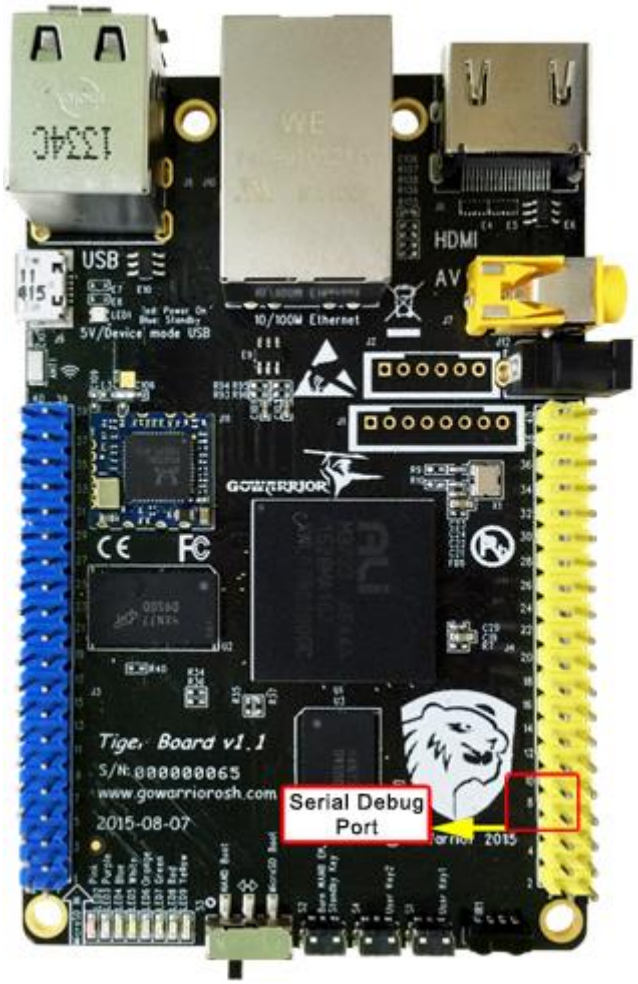


Figure 38. Serial Debug Header (Refer to J4 Signal Definition)

Two signals are provided, TX and RX on this connector. The levels on these signals are 3.3V. In order to access these signals, a USB to TTL Serial cable is recommended as shown in Figure 39 below.

Figure 39. USB to TTL Serial Cable

The pin numbers are defined in Table 8.

Pin Number	Functions
2	5V
4	5V
6	GND
8	UART0_TX/SP9
10	UART0_RX

Table 8. Serial Header Pins on J4

The pins location on the board is shown in Figure 40 below.

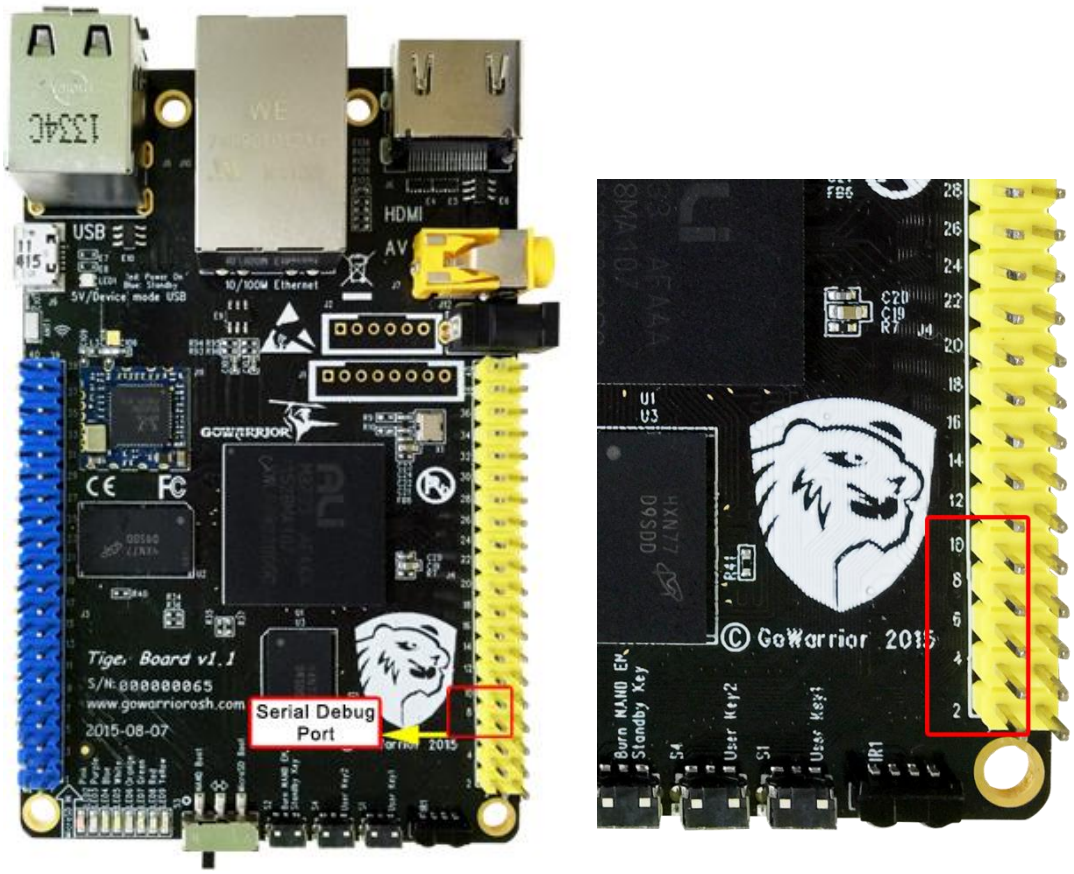


Figure 40. Serial Header

7.5 HDMI

The HDMI interface is accessed through the HDMI connector that is located on the top side of the board as shown in Figure 41 below.

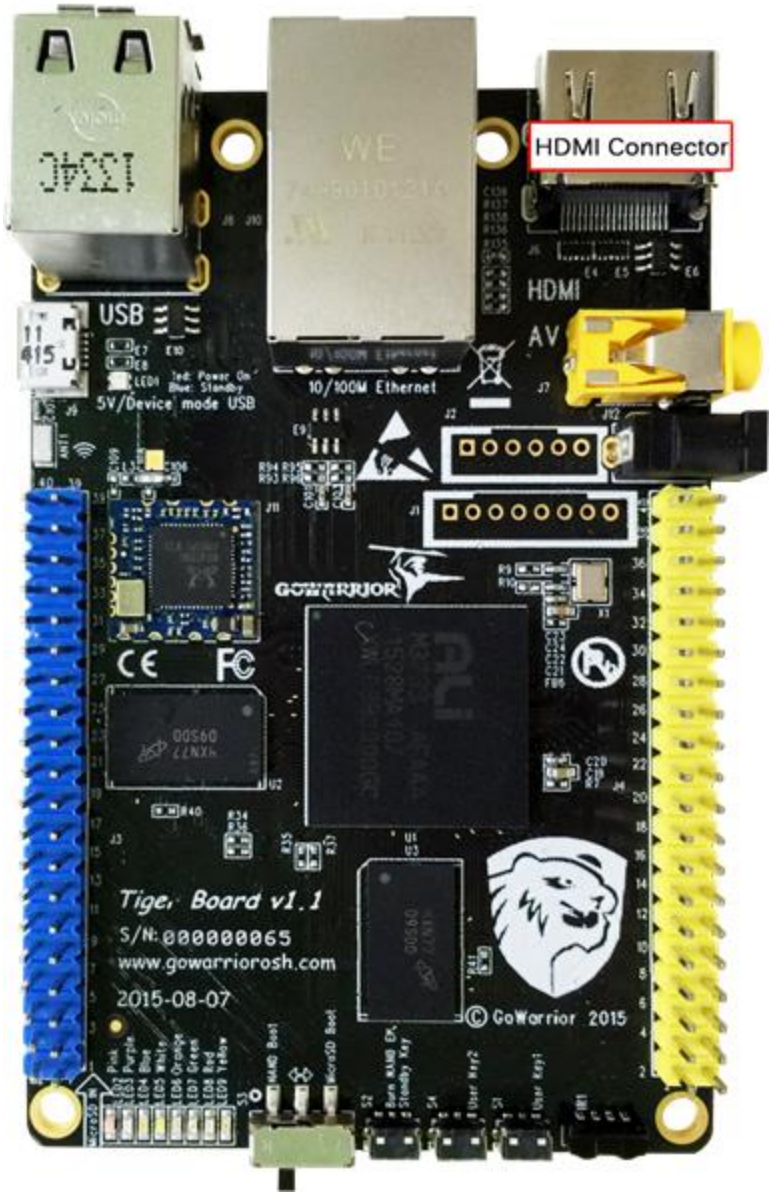


Figure 41. HDMI Connector

7.6 Power Jack

5V power adapter could be used for stronger power supply. The Power Jack is located on the top side of the board as shown in the following figure.

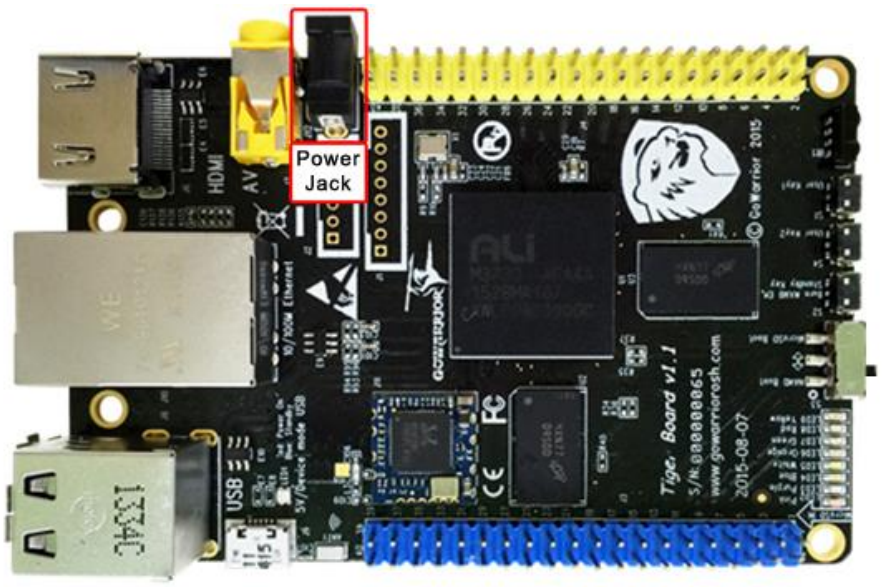


Figure 42. Power Jack Connector

7.7 MicroSD

A MicroSD connector is located on the back or bottom side of the board as shown in Figure 43 below. The MicroSD is not supplied with the board.

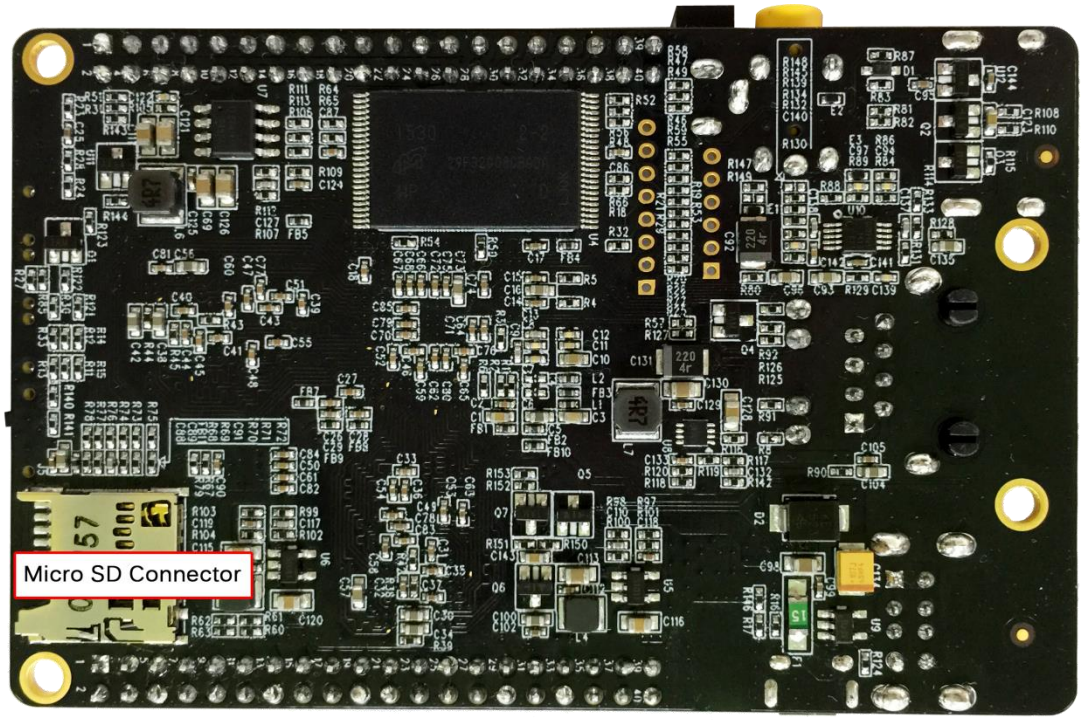


Figure 43. The MicroSD Connector

Align the card with the connector and push to insert, and then release it. There should be a click and the card will start to eject slightly, but it then should latch into the connector. To eject the card, push the MicroSD in and then remove your finger. The MicroSD will be ejected from the connector.

7.8 Ethernet

The board comes with a single 10/100 Ethernet interface as shown in Figure 44.

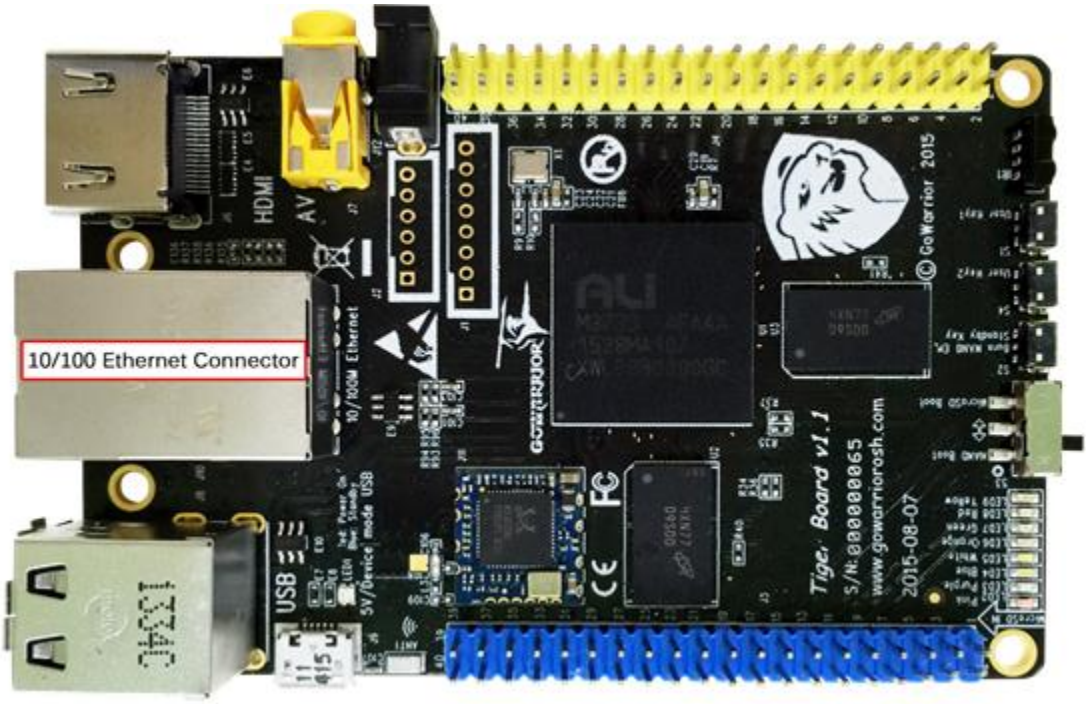


Figure 44. Ethernet Connector

7.9 JTAG Connector

A place for an optional 8 Pin (for ARM CPU) JTAG header is provided on the board to facilitate the SW development and debugging of the board by using various JTAG emulators.

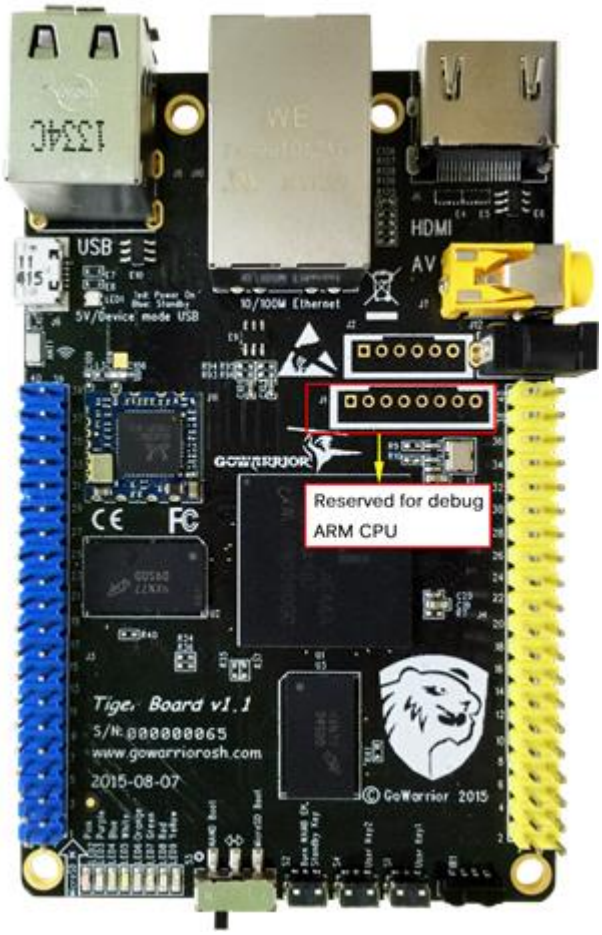


Figure 45. JTAG Connector

8 TIGER Board Mechanical

8.1 Dimension and Weight

Size	93.2mm x 59.7mm
PCB Layers	6
PCB thickness	.064″
RoHS Compliant:	Yes
Weight:	1.48 oz

Table 9. Dimension and Weight

8.2 Board Dimension and Silkscreen

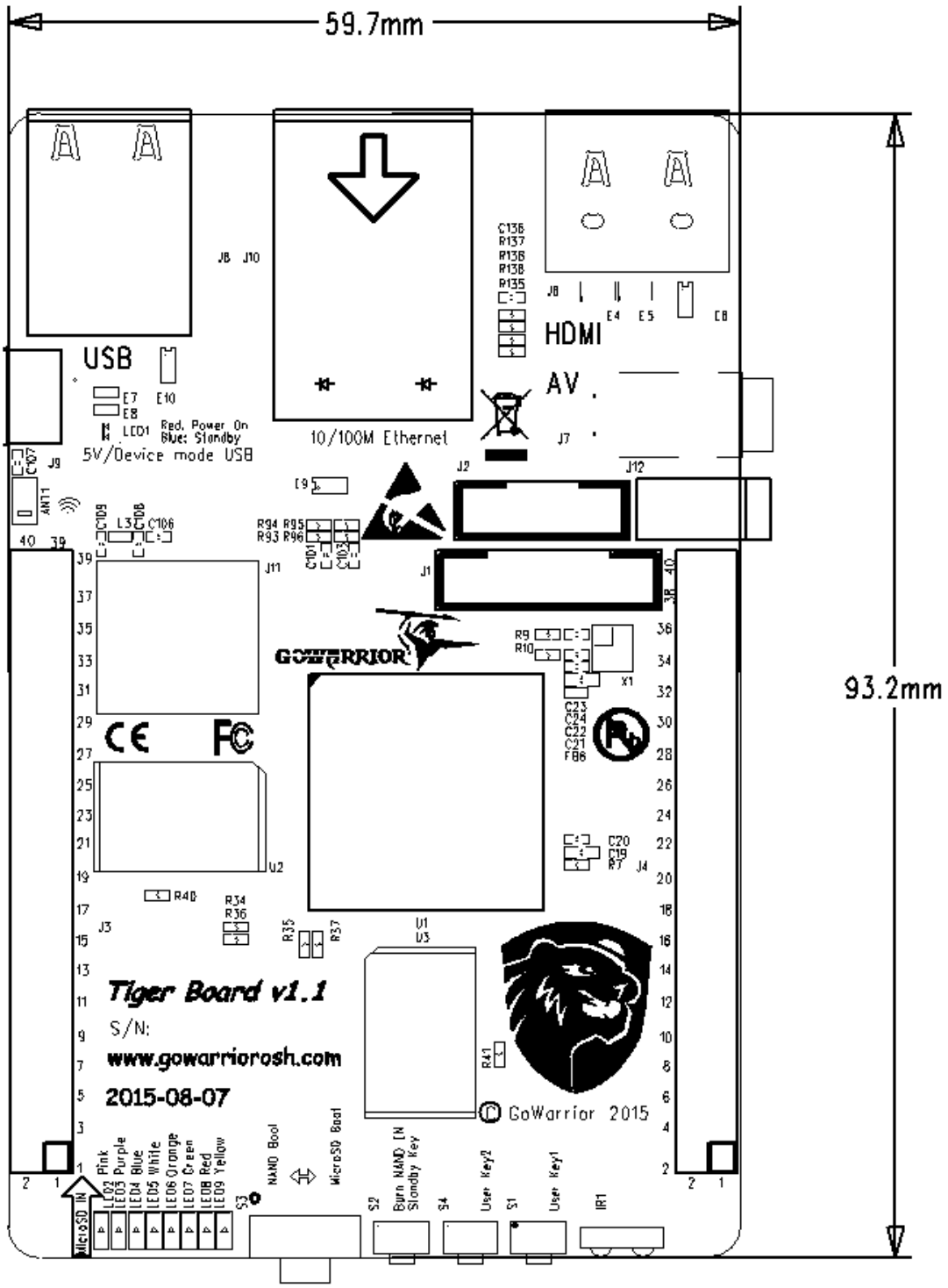


Figure 46. Board Dimension and Top Silkscreen

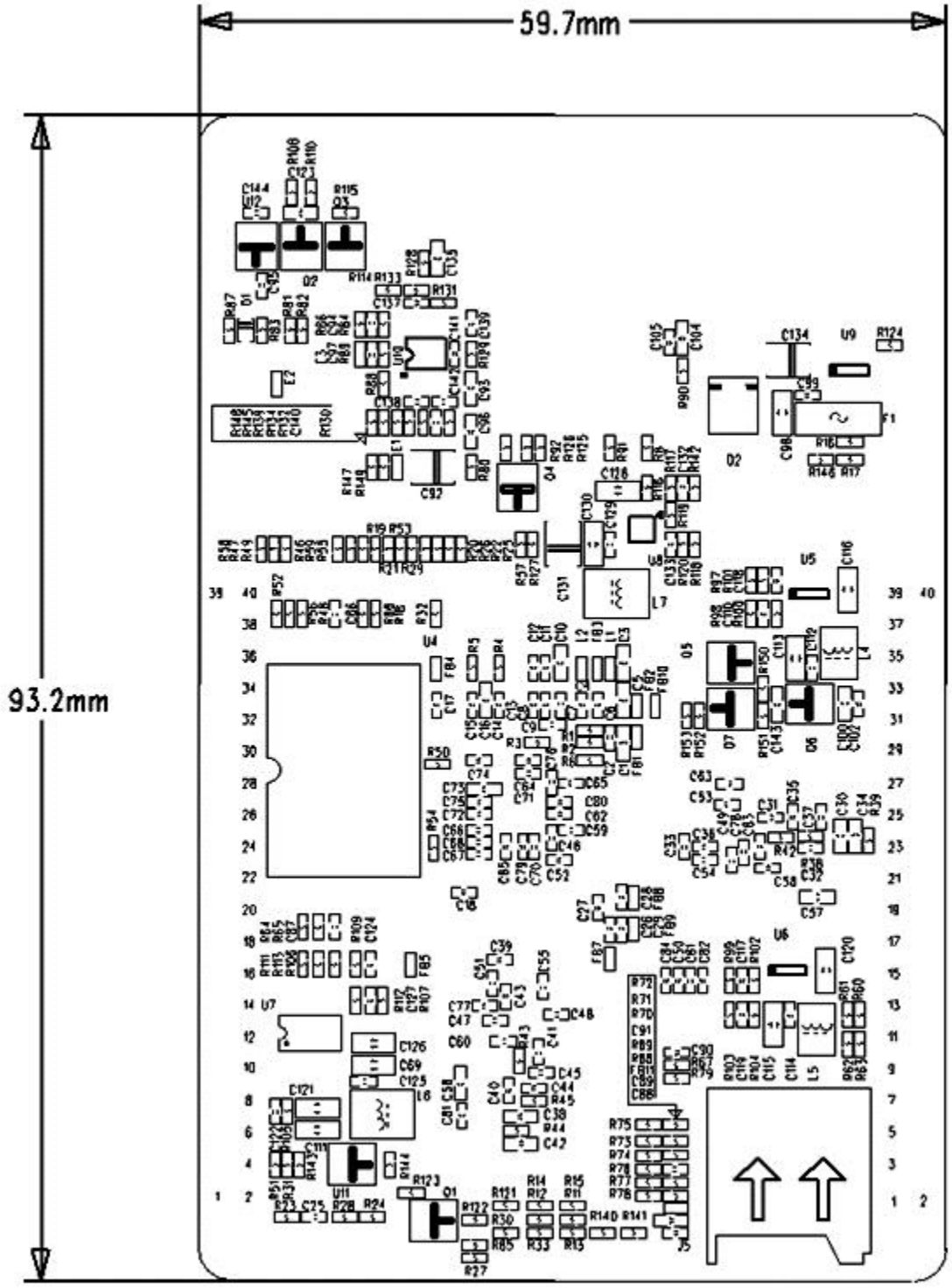


Figure 47. Board Dimension and Bottom Silkscreen

9 Pictures

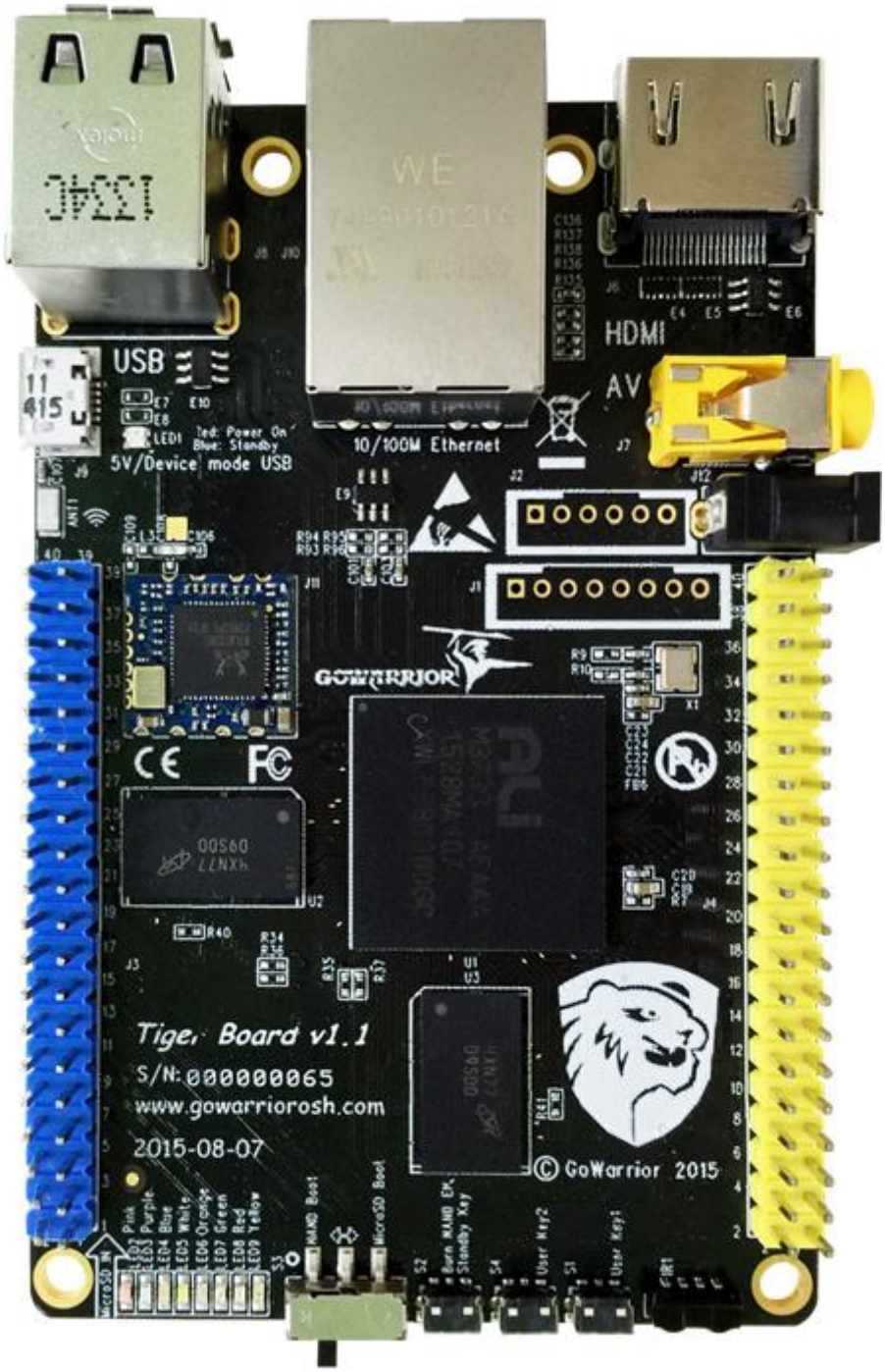


Figure 48. Top Side

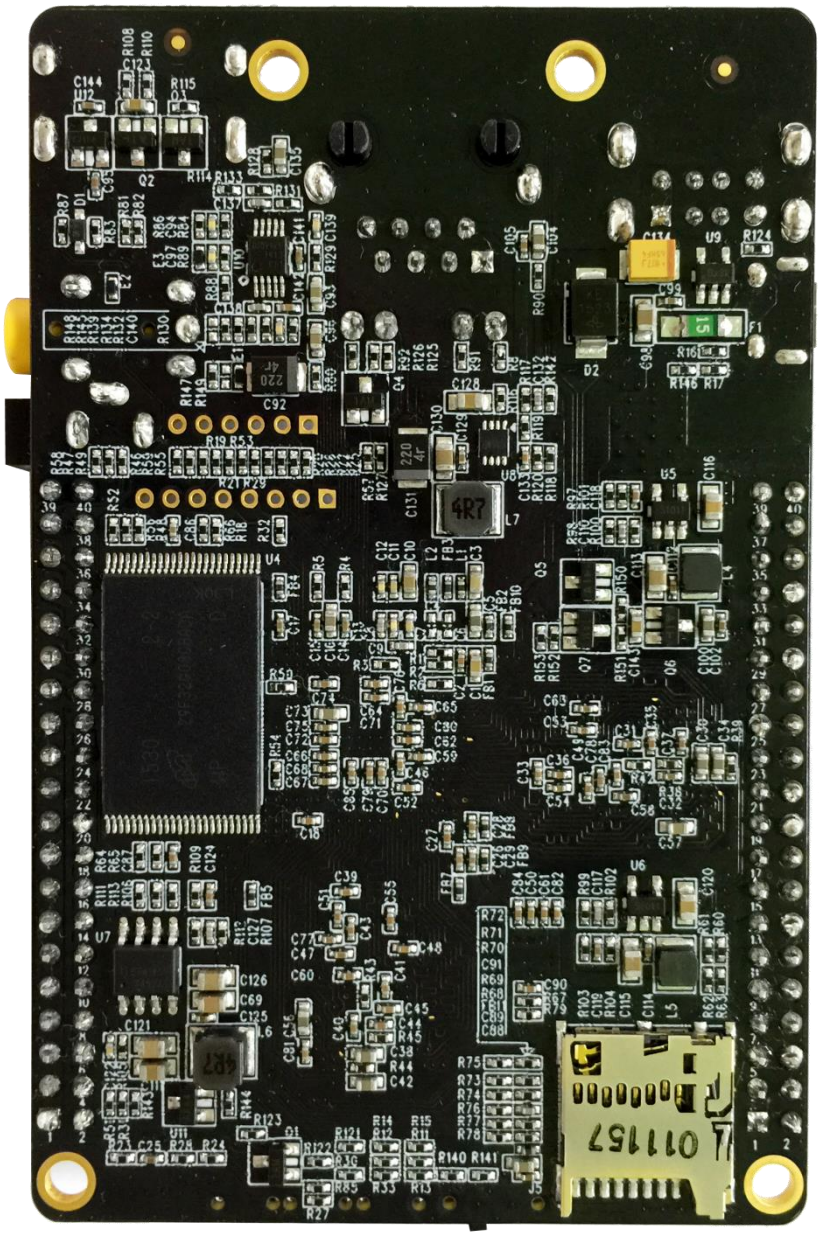


Figure 49. Bottom Side

10 Support Information

10.1 Hardware Design

- Schematic in PDF
- Schematic in OrCAD (Cadence Design Entry CIS 16.2)
- PCB Gerber
- PCB Layout File (PADS)
- Bill of Material
- System Reference Manual (This document).

You can download all the hardware related documents in *http://www.gowarriorosh.com/wp/en_US/document/*

10.2 Software Update

It is a good idea to always use the latest software. Instructions for how to update your software to the latest version can be found at:

http://www.gowarriorosh.com/wp/en_US/document/

Revision History

Document Change History

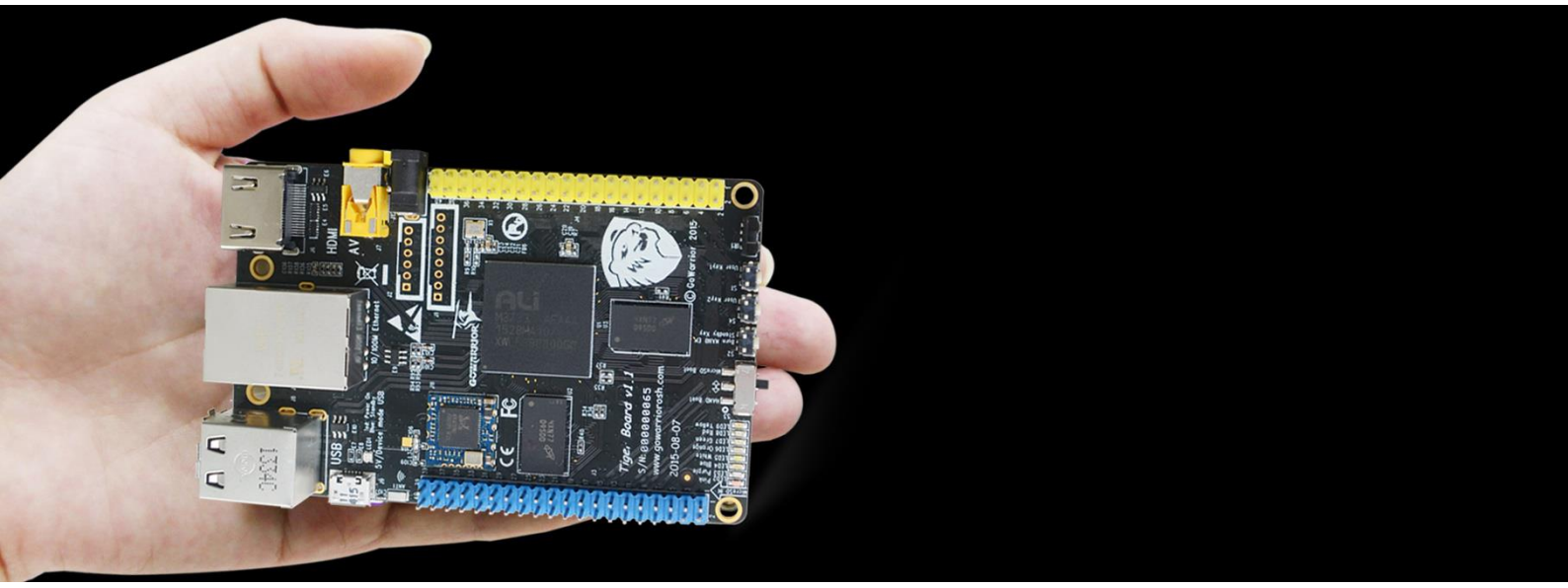
Revsion	Changes	Date
v1.1	Initial Release	September 07, 2015

Table 10. Document Change History

Board Changes

Revsion	Changes	Date
v1.1	Initial Release	September 07, 2015

Table 11. Board Change History



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