



MINI9G25 Module Reference User Manual



1. Introduction

1.1. About this Manual

This manual is intended to provide the user with an overview of the board and benefits, complete features specifications, and set up procedures. It contains important safety information as well.

1.2. Feedback and Update to this Manual

To help our customers make the most of our products, we are continually making additional and updated resources available on the Boardcon website (www.armdesigner.com).

These include manuals, application notes, programming examples, and updated software and hardware. Check in periodically to see what's new!

When we are prioritizing work on these updated resources, feedback from customers is the number one influence. If you have questions, comments, or concerns about your product or project, please do not hesitate to contact us at support@armdesigner.com.

1.3. Limited Warranty

Boardcon warrants this product to be free of defects in material and workmanship for a period of one year from date of buy. During this warranty period Boardcon will repair or replace the defective unit in accordance with the following process:

A copy of the original invoice must be included when returning the defective unit to Boardcon. This limited warranty does not cover damages resulting from lightning or other power surges, misuse, abuse, abnormal conditions of operation, or attempts to alter or modify the function of the product.

This warranty is limited to the repair or replacement of the defective unit. In no event shall Boardcon be liable or responsible for any loss or damages, including but not limited to any lost profits, incidental or consequential damages, loss of business, or anticipatory profits arising from the use or inability to use this products.

Repairs made after the expiration of the warranty period are subject to a repair charge and the cost of return shipping. Please contact Boardcon to arrange for any repair service and to obtain repair charge information.



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RJ45 OTHER 3 WIRES ARE REQUIRED TO HAVE THE LINK-UP AND TRAFFIC LEDS WORKING. ON THIS SCHEME IS ILLUSTRATED HOW TO WIRE THE LEDS INTEGRATED IN OUR LAN CONNECTOR BUT IT IS POSSIBLE TO USE ALSO TWO SIMPLE LEDS (NO RESISTORS ARE REQUIRED).

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Chapter 1 About the Module

1.1 Brief introduction

MINI9G25 is a cost-effective System-on-Module (SoM) thought of to drastically reduce the development time needed to design a low-power and low-EMI Linux Embedded device. The more complex hardware like CPU, RAM, Flash, Ethernet, power and EMI components are integrated on a single SMD component in just 40x40 mm (1.57x1.57 inch) using an complex six layers PCB permitting hardware designers to create their simple and cheap carrier boards.

1.2 Hardware features

- ◆ CPU
 - Atmel ARM9 @ 400Mhz on Atmel AT91SAM9G25
- ◆ RAM
 - 128 or 256 MByte DDR2
- ◆ ROM
 - On-board 128MB Nand Flash
 - 128MB to 1GB SLC Nand Flash selection
- ◆ POWER
 - high-efficiency DC-DC converter
 - 3.3V Power input
- ◆ Up to 3 host ports
 - One hi-speed host/device
 - One hi-speed host
 - One full-speed

- ◆ Watchdog
- ◆ Boot mode Setting
- ◆ 6 UARTs (3 five line and 1 three line)
- ◆ I2C: up to 2 I2C buses
- ◆ SPI: up to 2 SPI buses
- ◆ GPIO: up to 60 GPIO lines
- ◆ A/D: up to four channel @ 10 bit
- ◆ SDIO interface

1.3 Software features

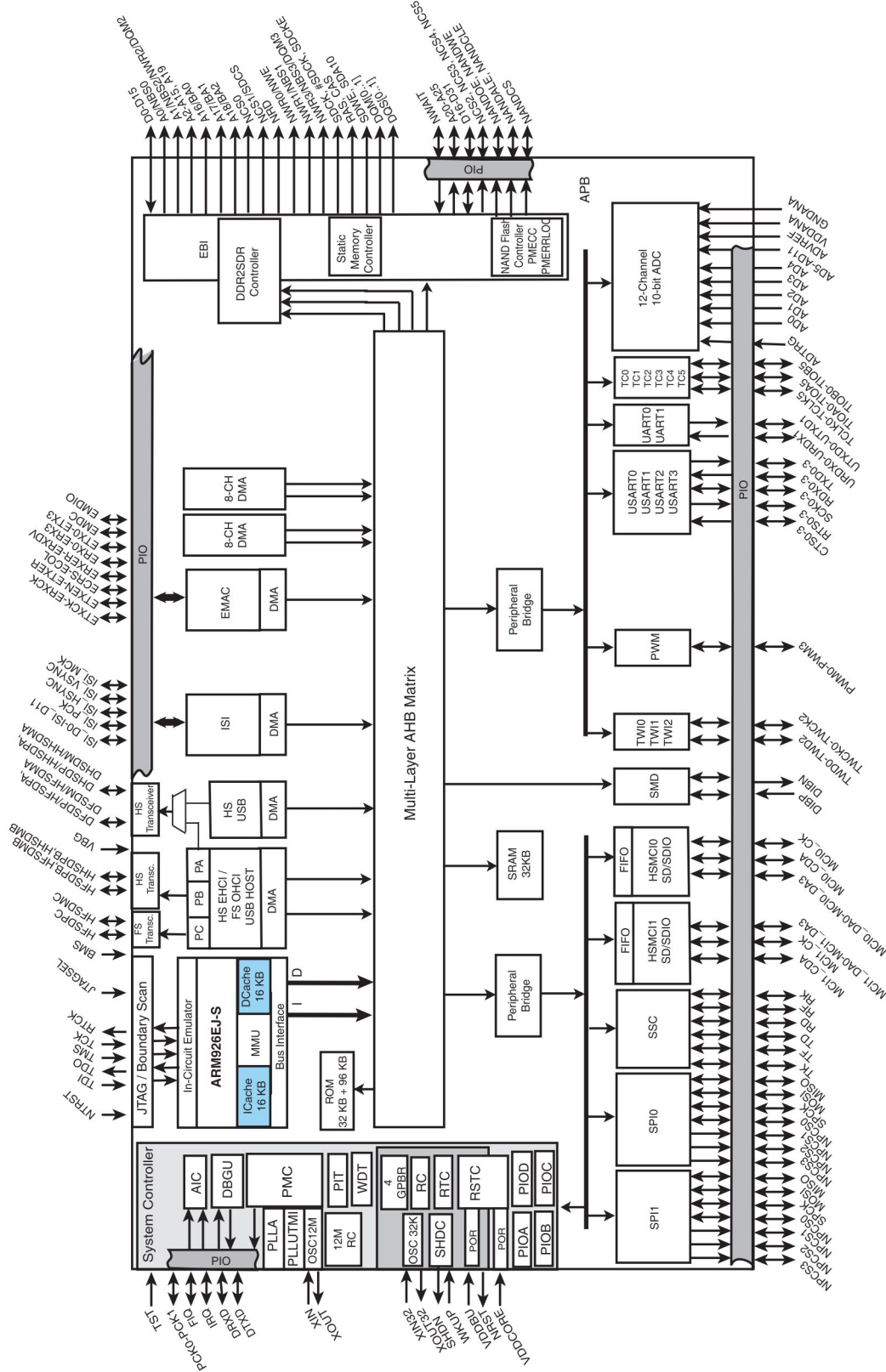
- ◆ Bootloader support(Support update the system by TF Card, USB Disk and Ethernet)
- ◆ Linux kernel version: Linux 3.6.9
- ◆ Buildroot roots provided(pre-install in the Nand Flash)
- ◆ DHCP, SSH, Telnet, Test Demo Support
- ◆ The Expand interface demo provide
- ◆ Fully open source firmware, software environments and toolchains available from Atmel sites
- ◆ Debian system provided(Need boot from SD/TF card)
- ◆ Thousands of Open Source applications available from the Debian repositories
- ◆ Almost all programming language available
- ◆ C, Python, Perl and PHP already installed on the factory default microSD for in-board development
- ◆ All the Bootloader/Linux Kernel Source code and system images provided

1.2 Mechanical features

- ◆ Power supply: single at 3.3 Volt DC
- ◆ Line level: TTL 3.3VROM
- ◆ Size: 40 x 40 mm (1.57x1.57 inch)
- ◆ Weight: 5g
- ◆ Pads pitch: 1.27 mm (50 mill)
- ◆ PCB layers: 6
- ◆ User configurable led on board

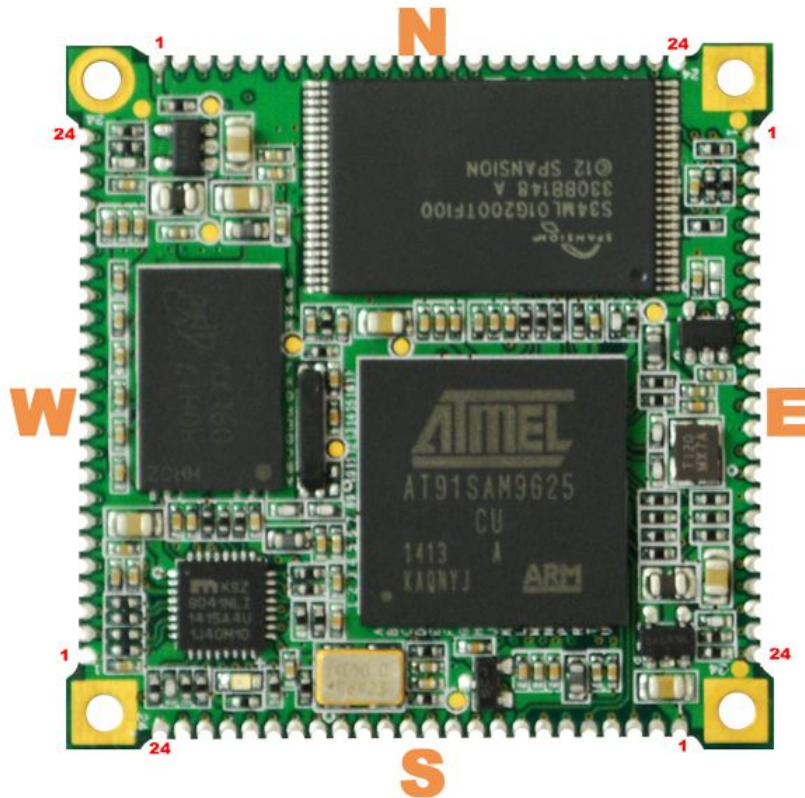
1.3 Block Diagram

◆ CPU





1.4 Module Pinout





Pin	IC Pin	Default	Alt	GPIO	Note
N1		3V3			Power In Vcc
N2	PC0	SDA1	GPIO	64	I2C bus 1 Data or GPIO
N3	PC1	SCL1	GPIO	65	I2C bus 1 Clock or GPIO
N4	PC2	GPIO		66	
N5	PC3	GPIO		67	
N6	PC4	GPIO		68	
N7	PC5	GPIO		69	
N8	PC6	GPIO		70	
N9	PC7	GPIO		71	
N10	PC8	UTXD0	GPIO	72	UART0: /dev/ttyS5 TXD
N11	PC9	URXD0	GPIO	73	UART0: /dev/ttyS5 RXD
N12	PC10	GPIO		74	
N13	PC11	GPIO		75	
N14	PC12	GPIO		76	
N15	PC13	GPIO		77	
N16	PC14	GPIO		78	
N17	PC15	GPIO		79	
N18	PC16	UTXD1	GPIO	80	UART1: /dev/ttyS6 TXD
N19	PC17	URXD1	GPIO	81	UART1: /dev/ttyS6 RXD
N20	PC18	GPIO	PWM0	82	GPIO or Pulse Wave Modulation Out 0
N21	PC19	GPIO	PWM1	83	GPIO or Pulse Wave Modulation Out 1
N22	PC20	GPIO	PWM2	84	GPIO or Pulse Wave Modulation Out 2
N23	PC21	GPIO	PWM3	85	GPIO or Pulse Wave Modulation Out 3
N24		GND			Power In GND

Pin	IC Pin	Default	Alt	GPIO	Note
E1		GND			Power In Vcc
E2	PC22	TXD3	GPIO	86	USART3: /dev/ttyS4 TXD
E3	PC2	RXD3	GPIO	87	USART3: /dev/ttyS4 RXD
E4	PC2	RTS3	GPIO	88	USART3: /dev/ttyS4 RTS
E5	PC2	CTS3	GPIO	89	USART3: /dev/ttyS4 CTS
E6	PC2	GPIO		90	
E7	PC2	RTS1	GPIO	91	USART1: /dev/ttyS2 RTS
E8	PC2	CTS1	GPIO	92	USART1: /dev/ttyS2 CTS
E9	PC2	GPIO		93	
E10	PC30	GPIO		94	



E11	PC31	GPIO		95	
E12	USBCP	D+			USB 2.0 Host full-speed port C
E13	USBC N	D-			USB 2.0 Host full-speed port C
E14		GND			Power In GND
E15	USBB N	D-			USB 2.0 Host hi-speed port B
E16	USBBP	D+			USB 2.0 Host hi-speed port B
E17		GND			Power In GND
E18	USBA N	D-			USB 2.0 Host/Device hi-speed port A
E19	USBAP	D+			USB 2.0 Host/Device hi-speed port A
E20	VBAT				RTC battery backup +3 volt DC input
E21	NRST				Reset input signal (active low)
E22	SHDN				Shutdown output signal (active low)
E23	WKUP				Wake-up input signal (active low)
E24		3V3			Power In Vcc

Pin	IC Pin	Default	Alt	GPIO	Note
S1		3V3			Power In Vcc
S2	PA21	1W	GPIO	21	Bit banging 1-wire bus or GPIO
S3	PA20	DA3		20	Micro SD Card memory
S4	PA19	DA2		19	Micro SD Card memory
S5	PA18	DA1		18	Micro SD Card memory
S6	PA17	CK		17	Micro SD Card memory
S7	PA16	CDA		16	Micro SD Card memory
S8	PA15	DA0		15	Micro SD Card memory
S9	PA14	NPCS0	GPIO	14	SPI bus 0 chip select 0 or GPIO
S10	PA13	SPCK	GPIO	13	SPI bus 0 clock or GPIO
S11	PA12	MOSI	GPIO	12	SPI bus 0 Master Output or GPIO
S12	PA11	MISO	GPIO	11	SPI bus 0 Master Input or GPIO
S13	PA10	DTXD		10	Debug serial port
S14	PA9	DRXD		9	Debug serial port
S15	PA8	RXD2	GPIO	8	USART2: /dev/ttyS3 RXD or GPIO
S16	PA7	TXD2	GPIO	7	USART2: /dev/ttyS3 TXD or GPIO
S17	PA6	RXD1	GPIO	6	USART2: /dev/ttyS2 RXD or GPIO
S18	PA5	TXD1	GPIO	5	USART2: /dev/ttyS2 TXD or GPIO
S19	PA4	GPIO		4	



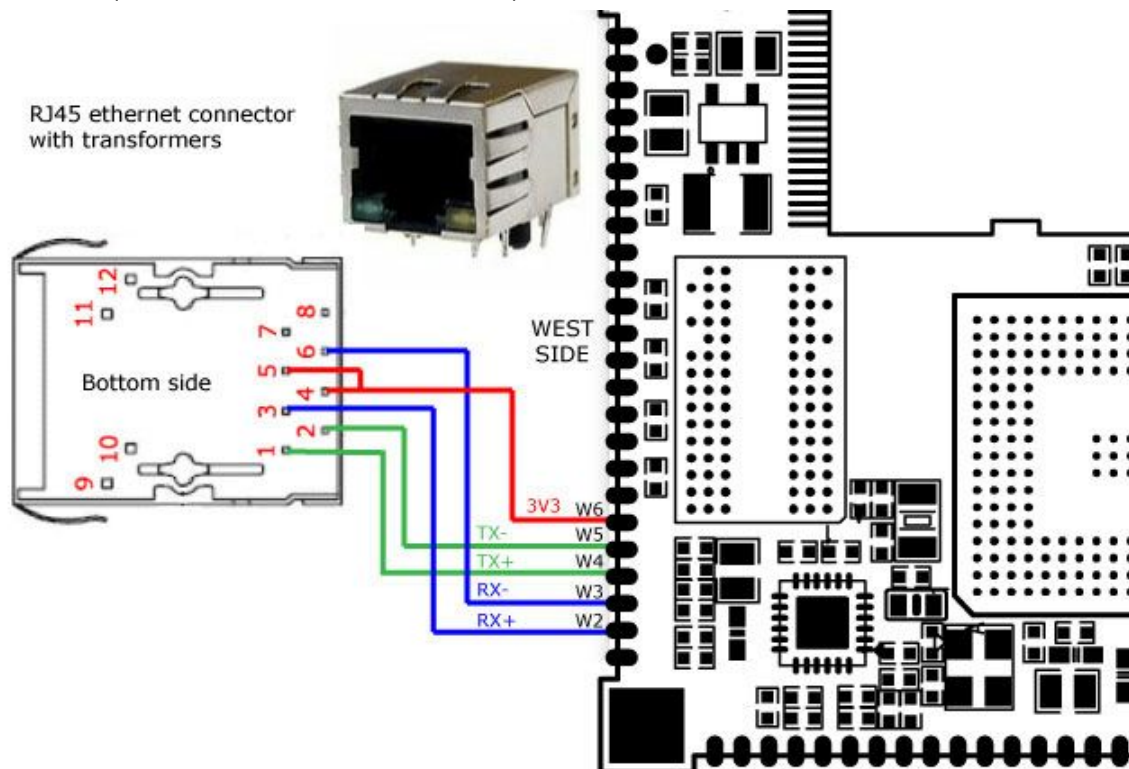
S20	PA3	CTS0	GPIO	3	USART1: /dev/ttyS1 CTS or GPIO
S21	PA2	RTS0	GPIO	2	USART1: /dev/ttyS1 RTS or GPIO
S22	PA1	RXD0	GPIO	1	USART1: /dev/ttyS1 RXD or GPIO
S23	PA0	TXD0	GPIO	0	USART1: /dev/ttyS1 TXD or GPIO
S24		GND			Power In GND

Pin	IC Pin	Default	Alt	GPIO	Note
W1		GND			Power In GND
W2		ETHRXP			Eth RX+
W3		ETHRXN			Eth RX-
W4		ETHTXP			Eth TX+
W5		ETHTXN			Eth TX-
W6		ETH3V3			Eth 3V3
W7		ETHLED1			Eth Yellow led (traffic)
W8		ETHLED2			Eth Green led (link)
W9	PA22	GPIO		22	
W10	PA23	GPIO		23	
W11	PA24	GPIO		24	
W12	PA25	GPIO		25	
W13	PA26	GPIO		26	
W14	PA27	GPIO		27	
W15	PA28	GPIO		28	
W16	PA29	GPIO		29	
W17	PA30	SDA0	GPIO	30	I2C bus 0 Data or GPIO
W18	PA31	SCL0	GPIO	31	I2C bus 0 Clock or GPIO
W19	ADVREF				A/D converter voltage reference In (max 3.3V)
W20	PB11	AD0	GPIO	43	A/D converter Input 0 or GPIO
W21	PB12	AD1	GPIO	44	A/D converter Input 1 or GPIO
W22	PB13	AD2	GPIO	45	A/D converter Input 2 or GPIO
W23	PB14	AD3	GPIO	46	A/D converter Input 3 or GPIO
W24		3V3			Power In Vcc

Chapter 2 How to use the module

2.1 The Ethernet part circuit

MINI9G25 needs just 5 wires to have a working 10/100 MBit LAN port and a RJ45 ethernet connector (with embedded line transformers).



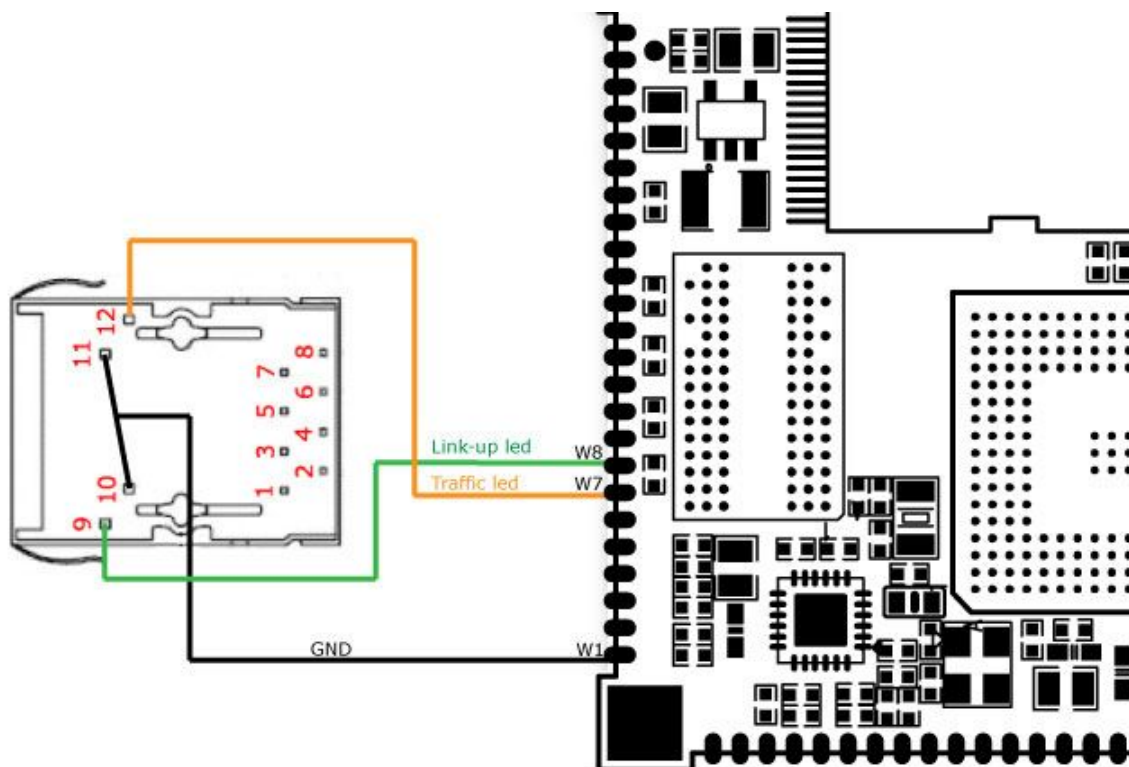
Five lines are used below:

Board pins	Ethernet connector pins
W2 (ETH RX+)	3 (TX+)
W3 (ETH RX-)	6 (TX+)
W4 (ETH TX+)	1 (RX+)
W5 (ETH TX-)	2 (RX-)
W6 (ETH 3V3)	4 (RCT) and 5 (TCT)

Note: Do not use simple LAN connectors without the embedded line transformers.

2.2 The Ethernet state leds

RJ45 other 3 wires are required to have the link-up and traffic leds working. On this scheme is illustrated how to wire the leds integrated in our LAN connector but it is possible to use also two simple leds (no resistors are required).1.8 The baseboard for application



Three lines are used below:

pins	Ethernet connector pins
W8 (ETH green link led)	9 (Green led anode)
W7 (ETH yellow traffic led)	12 (Yellow led anode)
W1 (GND)	10 (Green led cathode) and 11 (Yellow led cathode)

2.3 The USB ports

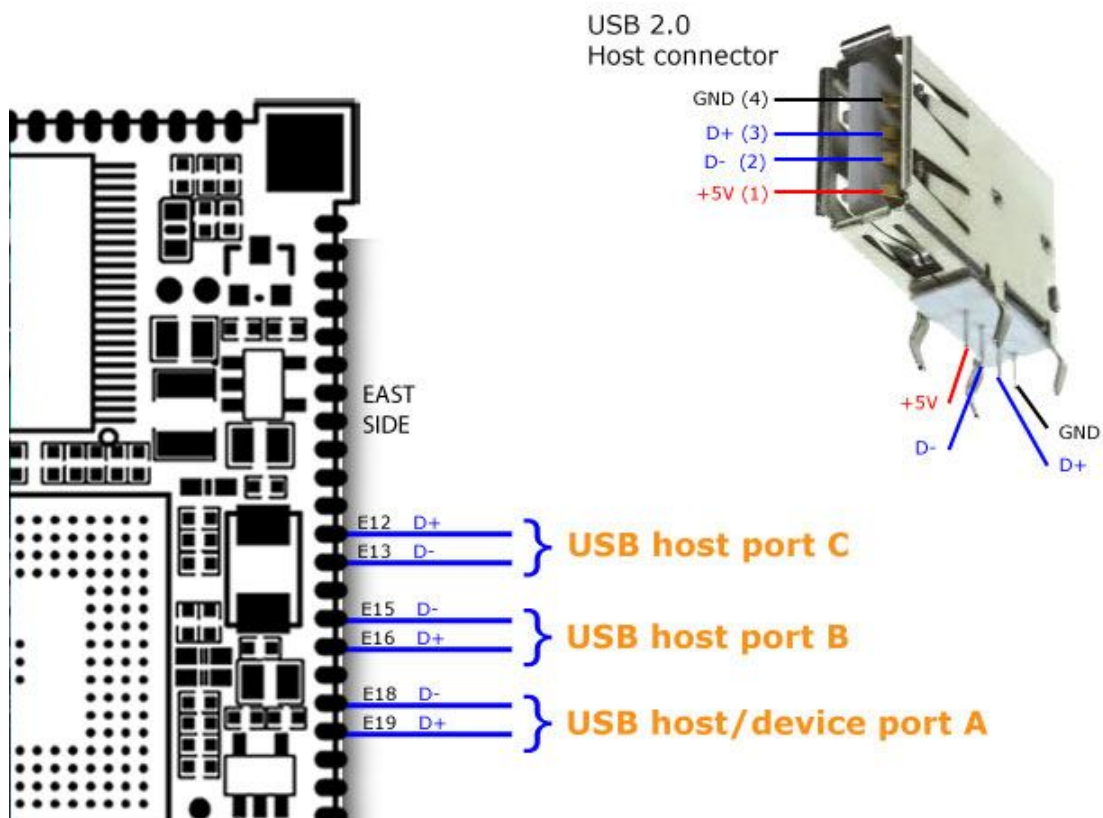
Up to 3 USB 2.0 host ports are available on MINI9G25 module:

- ◆ Two hi-speed port at 480 Mbps
- ◆ One full speed at 12 Mbps
- ◆ ne of the hi-speed port can be used as device port

The pins used are:

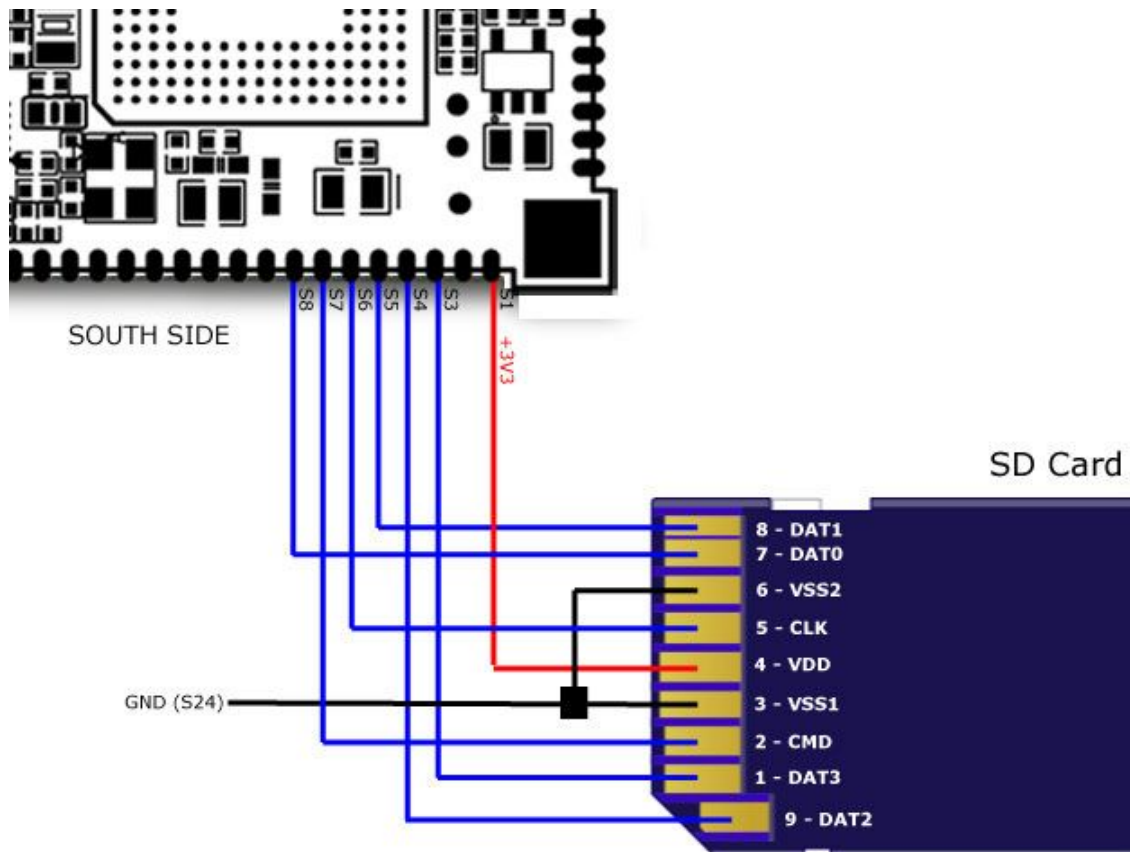
Aria pins	Port	Description	Mode
E18 (D-), E19 (D+)	Port A	High Speed (480 Mbps)	Host or Device
E15 (D-), E16 (D+)	Port B	High Speed (480 Mbps)	Host
E12 (D+), E13 (D-)	Port C	Full Speed (12 Mbps)	Host

Here is a simple but working scheme.



2.4 The SD Card

MINI9G25 can load from a SD card all the software it needs.

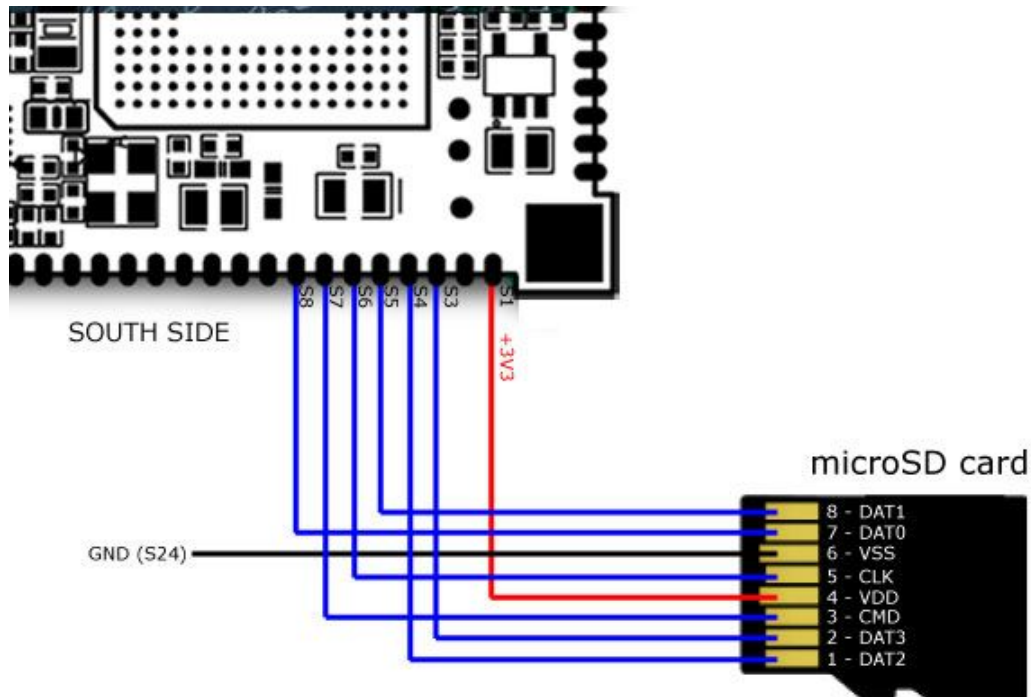


The Lines are used below:

Aria pins	SD card pins
S1 (3V3)	4 (VDD)
S3 (DA3)	1 (DAT3)
S4 (DA2)	9 (DAT2)
S5 (DA1)	8 (DAT1)
S6 (CK)	5 (CLK)
S7 (CDA)	2 (CMD)
S8 (DA0)	7 (DAT0)
S24 (GND)	3 (VSS1) and 6 (VSS2)

2.5 The Micro SD Memory Card

MINI9G25 can load from a microSD card all the software it needs

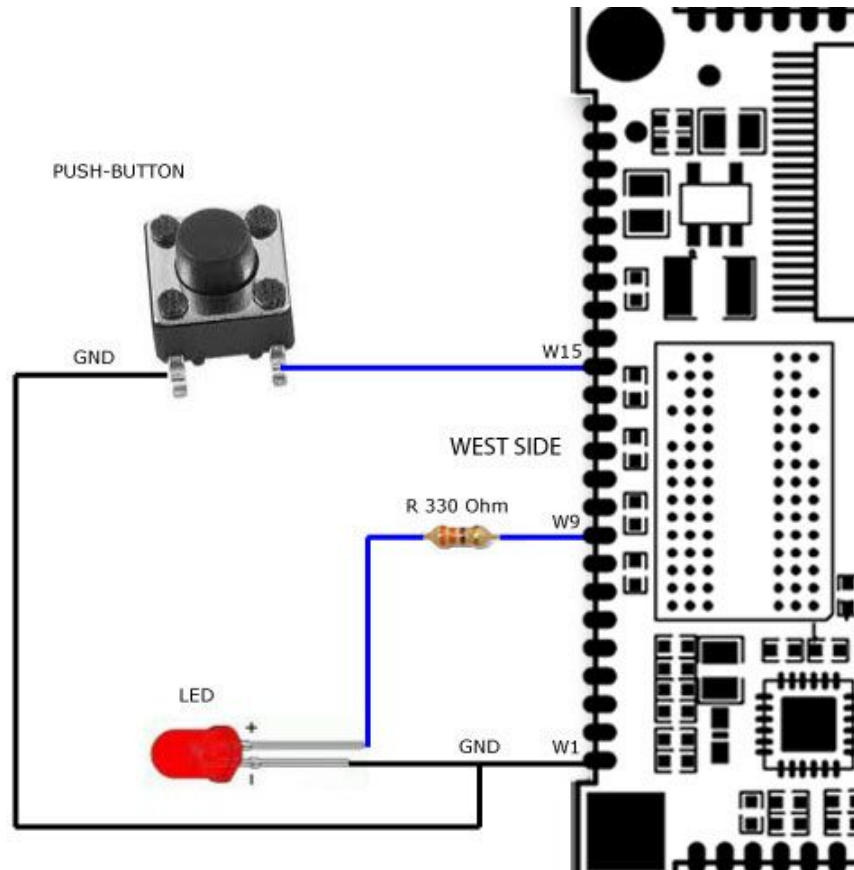


The Lines are used below:

Aria pins	SD card pins
S1 (3V3)	4 (VDD)
S3 (DA3)	1 (DAT3)
S4 (DA2)	9 (DAT2)
S5 (DA1)	8 (DAT1)
S6 (CK)	5 (CLK)
S7 (CDA)	2 (CMD)
S8 (DA0)	7 (DAT0)
S24 (GND)	3 (VSS1) and 6 (VSS2)

2.6 The GPIO Examples

Following is a simple example on how to wire a led or a push-button.



We used just two lines in this example but more lines are available and every one is configurable either in input or output mode: see the pin definition

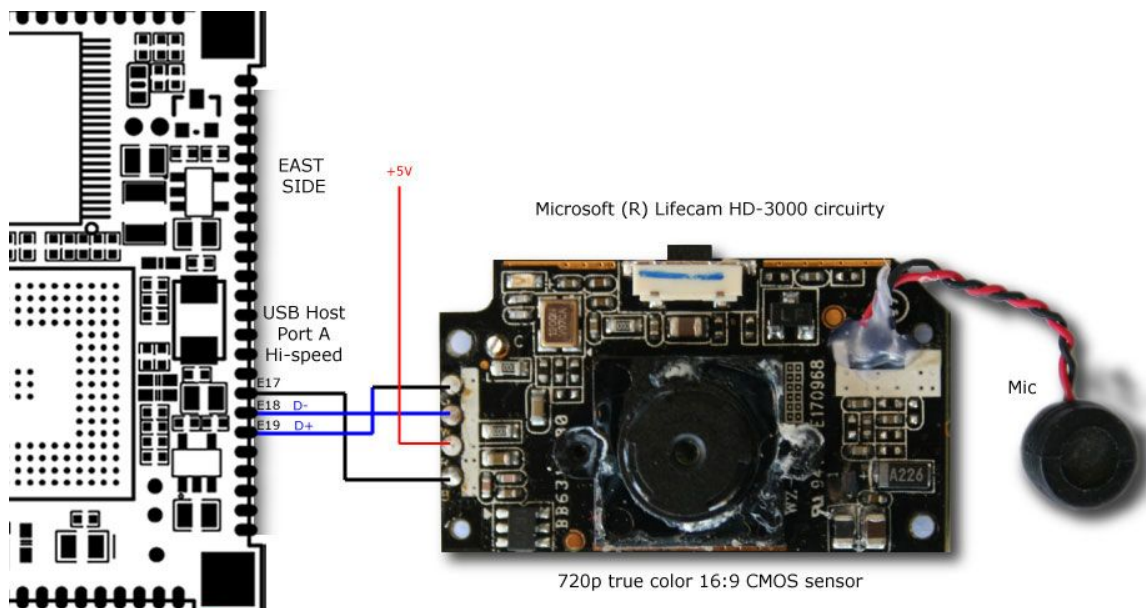
Note: All the lines are at 3.3 Volt. Do not connect any 5 Volt logic level signals to avoid damages.

2.7 The USB webcam

The Microsoft Lifecam HD3000 is a 720p HD 16:9 hi-res webcam with integrated mic. Removing the plastic shield and usb cable the internal circuitry is just 34x20x6 mm size perfect to be used with the MINI9G25 module.

Using the hi_speed USB port A or B it is possible to stream mjpg video at 1280x720 pixel @ 30fps.

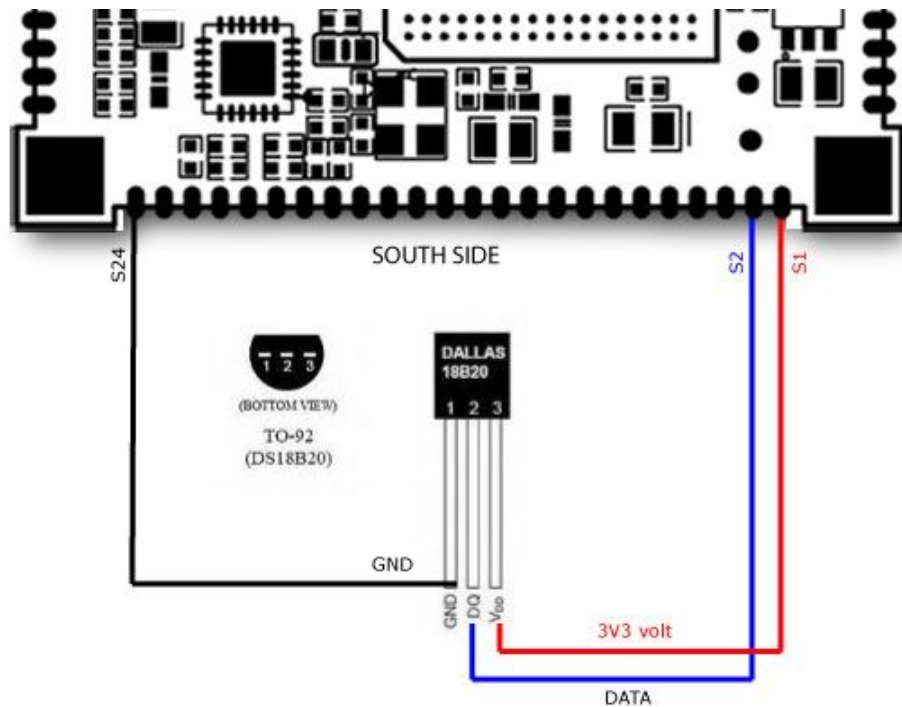
Aria pins	HD-3000
E19 (D+)	Green (D+)
E18 (D-)	White (D-)
	Red (+5V)
E17 (GND)	Black (GND)



- ◆ Video streaming over HTTP
- ◆ Time-laps video

2.8 1-wire thermal sensor

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements. It communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. It has an operating temperature range of -55°C to $+125^{\circ}\text{C}$ and is accurate to $\pm 0.5^{\circ}\text{C}$ over the range of -10°C to $+85^{\circ}\text{C}$.



Lines used as 1-wire bus:

Aria pins	Signals
S1	3V3
S2	1-wire data
S24	GND

2.9 Debug serial port

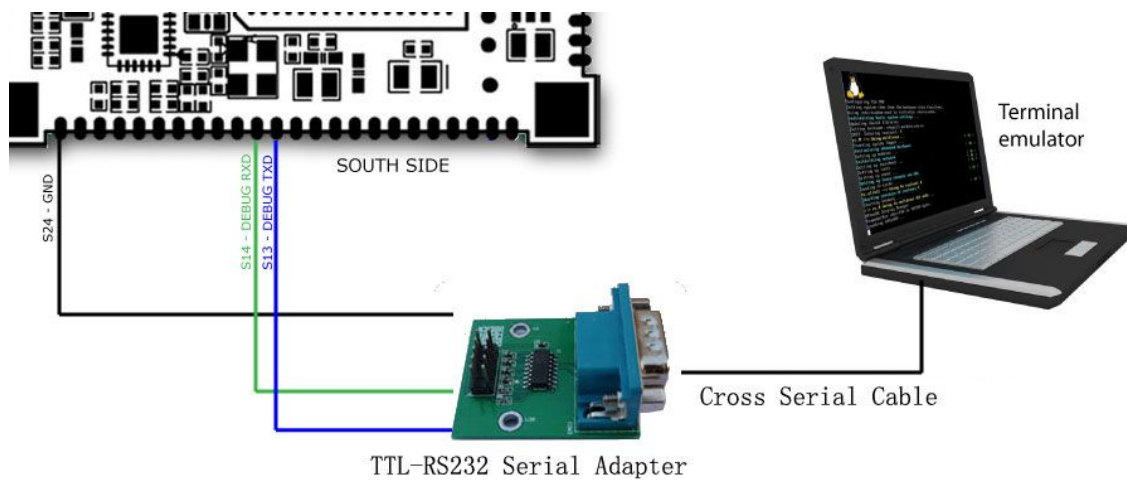
The debug port is a special serial port used by the RomBOOT firmware burned inside the CPU ROM, the boot loader and the Linux Kernel loaded from the SD memory card to send the systems messages during their execution. The debug port is used also to have a low level access to the Linux system console.

The asynchronous serial signals are available on these pins:

Aria pins	Signals
S13	Debug port TXD
S14	Debug port RXD
S24	GND

This are 3.3 volt level lines so an adapter is required to access them using a PC USB or RS232 serial port and have access to this system console using a terminal emulator.

This scheme shows how to wire the MINI9G25 Debug serial interface but any other 3.3 volt to USB or RS232 serial converter can be used.



2.9 RTC

MINI9G25 needs a single line 3.3 volt DC power supply which can be provided in any combination on the following pins:

Power lines	Aria pins
+3V3 DC power in	N1, S1, E24, W24
GND signal ground	N24, S24, E1, W1

RTC backup battery

RTC (Real Time Clock) active when the power supply is off. This will maintain the system clock up to 6 months with no power using a small CR1220 Lithium battery.

A bigger battery can be used to extend the time duration.

