Emtronix

ESMARC 928x Datasheet

1. Introduction

ESMARC 928x is a set of low cost embedded computer modules with the same size and pin configuration. Five module types, ESM9283, ESM9287, ESM9283W, ESM9287W, and ESM9283L, are included in ESMARC 928x series. These computer modules come with different interfaces of WiFi, Ethernet, CAN, etc. so that they can meet various application requirements with low cost.

For briefly name ESM928x will be used to refer all ESM9283, ESM9287, ESM9283W, ESM9287W, and ESM9283L in the rest of this document except for features belonging to any specific the module.

1.1   Hardware

The ESM928x is a computer module based on the NXP iMX28 embedded System-on-Chip (SoC). The SoC features an ARM926EJ-S processor clocking on 454MHz. The modules are available in both a commercial temperature range (-10°C to 60°C) and an industrial temperature range (-40°C to 85°C).

The modules target a wide range of industrial applications, including smart meters, data communication and management, HMIs, POS, data acquisition, process control, and much more. It provides many interfaces which can be found in section 1.3.

The ESM928x modules are highly optimized for layout. The system robustness is also guaranteed in design with impedance matching for high speed connections and in practice with numerous testing in harsh environments. This allows the customer to create a carrier board which implements the application specific hardware, which significantly reduce the complexity of a project.

1.2   Software

The ESM928x comes with either embedded Linux, or a core runtime license for Windows CE6.0.

The embedded Linux image contains a kernel of Linux-4.1.14 and UBIFS root file system. The booting time of the image are about 8 seconds.

Windows CE6.0 images are with BinFS driver which shorten booting time to less than 10 seconds. A SDK are provided to support development of application programming in Visual Studio 2005 or higher version.

1.3   Main Features

Core Unit

- ARM926EJ-S

- CPU frequency: 454MHz

- 128MB DDR2, user space > 110MB

- 256MB FLASH, user file system >200MB

- USB host interface for mass storage

- Real-Time Clock backup with external battery

- Hardware Watchdog Timer

- UART port (115200，8-N-1) as console

Display

- LCD Interface with format of 18-bit RGB

- Multiple resolution configurable(320*240 to 1024*768)

- 4-wired resistive touch screen

General IO

- 32-bit GPIO

- Part of GPIO are pin multiplexed with other interfaces

- Interrupt source capable with rising edge

- 3.3V LVCMOS level

- All GPIO are in input mode on power up

Communication Interfaces

- Up to 2 Ethernet Ports, 10Mb/100Mb self-adaptive

- 2 CAN bus ports, multiplexed with GPIO (ESM9287, ESM927W)

- 5 Standard UART ports, maximum baud rate 3Mbps

- 1 I2C interface, master mode, 400kbps, multiplexed with GPIO

- 1 4-wire SPI, full-duplex, 12Mbps, multiplexed with GPIO

- 3 USB 2.0 host ports

- 1 USB 2.0 OTG port

- On-board WiFi interface (ESM9283W, ESM9287W)

- 4-bit SD memory interface, multiplexed with GPIO

Other Interfaces

- On-board main power and temperature monitoring

**Power Supply and Operation Temperature**

- +5V±10% power supply with consumption in section 4.2

- Operation Temperature: -10°C to 60°C (commercial)

  -40°C to 85°C (industrial)

1.4   ESM928x Comparison

Most of functions of ESM928x modules are the same. The following table lists the differences among them.

| Specifications	ESM9283	ESM9283W	ESM9283L	ESM9287	ESM9287W
SoC	iMX283	iMX283	iMX283	iMX287	iMX287
NET	1	1	1	2	2
CAN	-	-	-	2	2
USB HOST	3	3	1	3	3
WiFi	-	√	-	-	√

1.5 ESM928x Block Diagram
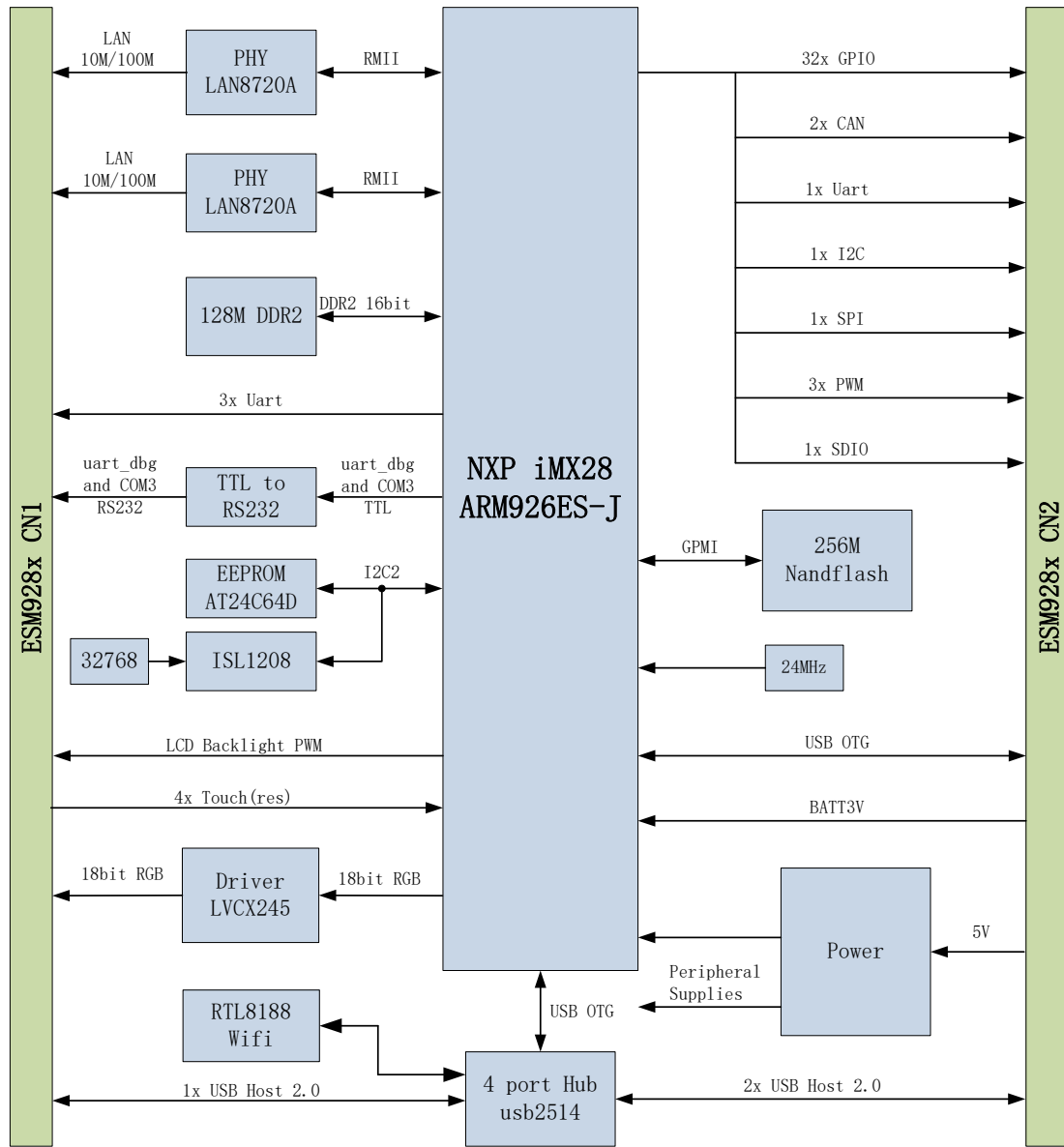
2. Emtronix Smart Module Architecture

Emtronix Smart Module Architecture (ESMARC) is a specification which describes mechanical characteristics of an embedded computer module and its connections with a carrier board. ESM928x is compliance with ESMARC specification.

2.1   Mechanical Characteristics

ESMARC defines small form factor computer module with size of 74mm*54mm and 4 mounting holes near the corners of the board. The following figure shows mechanical characteristics of ESMARC computer module.
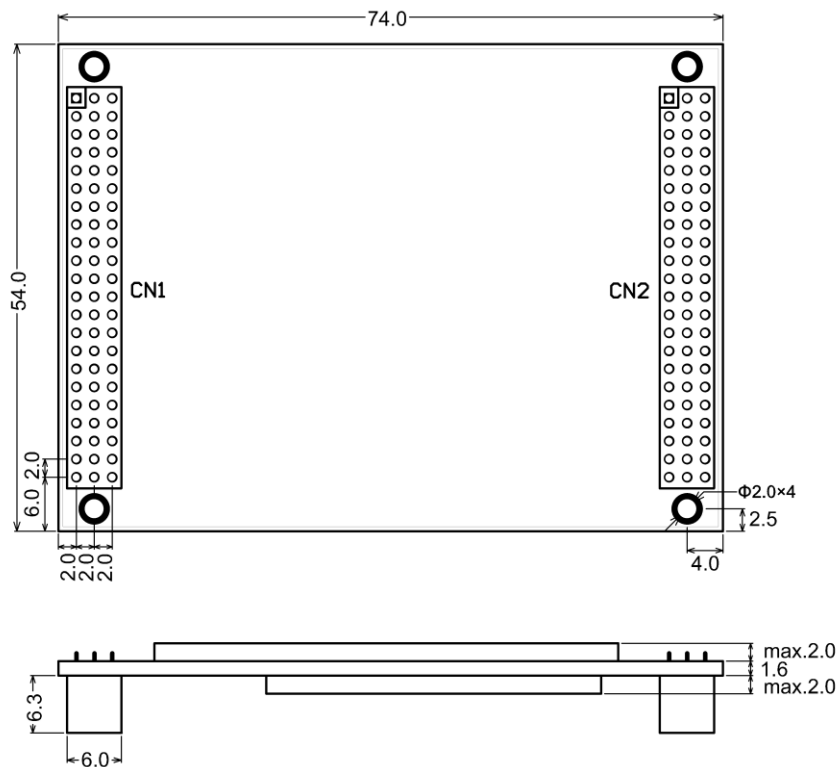
ESMARC Computer Module Size (unit: mm)

ESMARC specification defines two insulation-displacement contact (IDC) connectors to connect a computer module and its carrier board. The two IDC connectors CN1 and CN2 are located on the opposite side of the module. Each connector has the same 3 x 22 pin configuration with 2mm pitch. The following figure shows the connection between ESMARC

computer module and its carrier board.
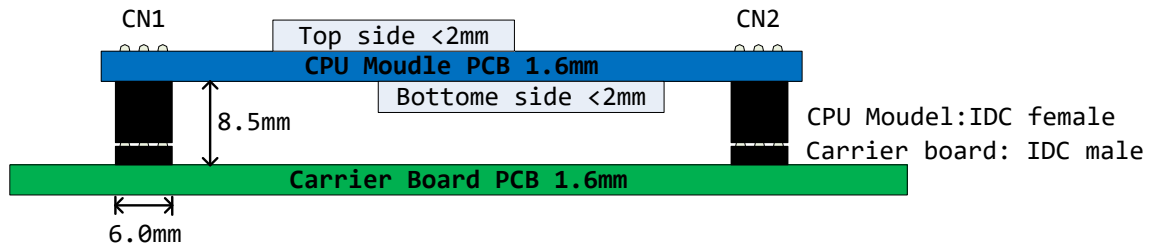
Relationship of Connection in ESMARC

The female connectors are on the computer module and male connectors are to be placed on the carrier board. The female connectors on computer module have certain header pin filled which enforces correct docking orientation with the carrier board.

2.2   Connectors

The rows in the two connectors are indexed from A to F and the pins in each row are numbered from 1 to 22. The following figure shows header pin indexes in ESMARC connectors.
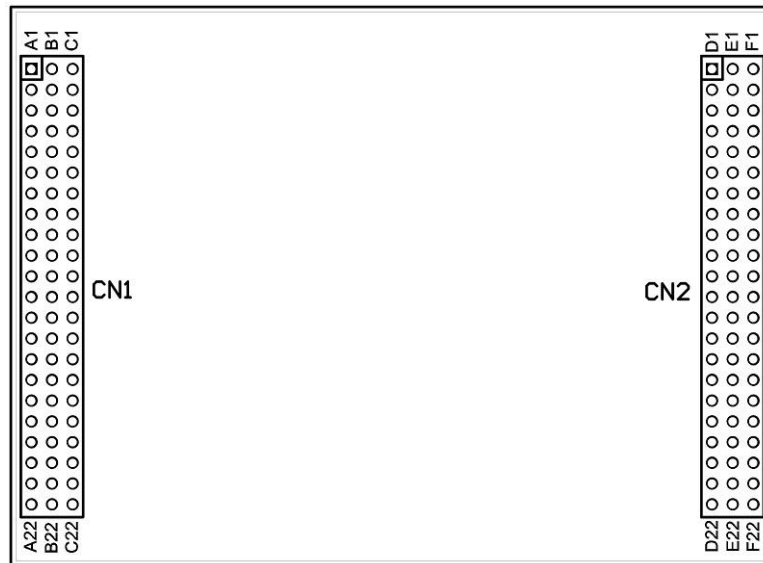
Locations of Connector in ESMARC Module

Row A to C are in CN1 and row D to F are in CN2. The row A and F are located in outside of connectors, and row C and D are located in inside of connectors.

2.3   Reverse-Mate Proof

The pin B1 in CN1 is filled for purpose of reverse-mate proof. It is required that the correspondent header pin in carrier board has to be blanked out so that ESMARC module can be plugged in correct orientation.

3. I/O Pins

There are 132 pins in the two connectors. Some pins are not used in some type of module as the pins usage depends on the interfaces implemented in the module. If a pin is not used, it should be in state of no connection (NC) instead of routing it to ground or power which may damage the module.

Warning: All of digital pins in ESM928x are 3.3V LVCMOS level signals which are NOT 5V input tolerant. It is important to ensure none of these pins are in contact with any 5V signal including VCC.

The signal name and description of all of pins in ESM928x will be listed in following sections.

3.1   Pins in ESM928x CN1

Table of CN1 in CE platform

Column A(Outside)		Column B		Column C(Inside)	
A1	TPTX1+	B1	(Filled)	C1	TPTX2+
A2	TPTX1-	B2	LINK1	C2	TPTX2-
A3	VDD_CMT1	B3	SPEED1	C3	VDD_CMT2
A4	TPRX1+	B4	LINK2	C4	TPRX2+
A5	TPRX1-	B5	SPEED2	C5	TPRX2-
A6	GND	B6	GND	C6	GND
A7	COM2_RXD	B7	COM4_RXD	C7	USB3_HD+
A8	COM2_TXD	B8	COM4_TXD	C8	USB3_HD-
A9	COM3_RXD	B9	COM5_RXD	C9	-
A10	COM3_TXD	B10	COM5_TXD	C10	-
A11	GND	B11	GND	C11	GND
A12	DBG_RX	B12	Y-	C12	X-
A13	DBG_TX	B13	Y+	C13	X+
A14	GND	B14	GND	C14	GND
A15	LCD_HSYNC	B15	BD_SPEC	C15	LCD_DCLK
A16	LCD_VSYNC	B16	LCD_BLn	C16	LCD_DE
A17	LCD_B2	B17	LCD_G2	C17	LCD_R2
A18	LCD_B3	B18	LCD_G3	C18	LCD_R3

A19	LCD_B4	B19	LCD_G4	C19	LCD_R4
A20	LCD_B5	B20	LCD_G5	C20	LCD_R5
A21	LCD_B6	B21	LCD_G6	C21	LCD_R6
A22	LCD_B7	B22	LCD_G7	C22	LCD_R7

Table of CN1 in Linux platform

Column A(Outside)		Column B		Column C(Inside)	
A1	TPTX1+	B1	(Filled)	C1	TPTX2+
A2	TPTX1-	B2	LINK1	C2	TPTX2-
A3	VDD_CMT1	B3	SPEED1	C3	VDD_CMT2
A4	TPRX1+	B4	LINK2	C4	TPRX2+
A5	TPRX1-	B5	SPEED2	C5	TPRX2-
A6	GND	B6	GND	C6	GND
A7	ttyS1_RXD	B7	ttyS3_RXD	C7	USB3_HD+
A8	ttyS1_TXD	B8	ttyS3_TXD	C8	USB3_HD-
A9	ttyS2_RXD	B9	ttyS4_RXD	C9	-
A10	ttyS2_TXD	B10	ttyS4_TXD	C10	-
A11	GND	B11	GND	C11	GND
A12	DBG_RX	B12	Y- / TSC_I2C_SCL	C12	X- / TSC_IRQn
A13	DBG_TX	B13	Y+ / TSC_I2C_SDA	C13	X+ / TSC_RSTn
A14	GND	B14	GND	C14	GND
A15	LCD_HSYNC	B15	BD_SPEC	C15	LCD_DCLK
A16	LCD_VSYNC	B16	LCD_BLn	C16	LCD_DE
A17	LCD_B2	B17	LCD_G2	C17	LCD_R2
A18	LCD_B3	B18	LCD_G3	C18	LCD_R3
A19	LCD_B4	B19	LCD_G4	C19	LCD_R4
A20	LCD_B5	B20	LCD_G5	C20	LCD_R5
A21	LCD_B6	B21	LCD_G6	C21	LCD_R6
A22	LCD_B7	B22	LCD_G7	C22	LCD_R7

3.2   Interfaces Description in CN1

The pins in ESM928x CN1 connector include interface of Ethernet, UART, USB Host and LCD etc.

Ethernet

ESM928x supports up to 2 Ethernet ports with Auto-MDIX enabled. The signals in CN1 are listed as follows

Signal	Description
TPTX1+	Port 1 Transmit/Receive Differential Channel 1, default setting as transmit
TPTX1-	
TPRX1+	Port 1 Transmit/Receive Differential Channel 2, default setting as receive
TPRX1-	
VDD_CMT1	Port 1 Bias Voltage(3.3V), connecting to common point of chip side of transformer
LINK1	Port 1 Link Indication Output, active high
SPEED1	Port 1 Speed Indication Output, active high
TPTX2+	Port 2 Transmit/Receive Differential Channel 1, default setting as transmit
TPTX2-	
TPRX2+	Port 2 Transmit/Receive Differential Channel 2, default setting as receive
TPRX2-	
VDD_CMT2	Port 2 Bias Voltage(3.3V), connecting to common point of chip side of transformer
LINK2	Port 2 Link Indication Output, active high
SPEED2	Port 2 Speed Indication Output, active high

LINK and SPEED signals can drive LED with a series resistor. Ethernet transformer should be as close to the RJ45 connector as possible.

UART

There are 5 serial ports for application in ESM928x. The baud rate of each port can be set up to 3Mbps. The name of serial ports in CE are different from those in Linux. In CE platform, serial port is named from COM2 to COM6, COM1 is used by CE ActiveSync. With manufacture default setting, COM3 is configured as RS232 with ±9V level, and others in 3.3V LVCMOS. COM6 pins are

multiplexed with GPIO. COM2 can be enabled with hardware RTS/CTS flow control, and other ports can be configured by software to use a GPIO (GPIO6 – GPIO31) as hardware direction control for application of RS485. In Linux platform, name of serial port starts from ttyS1.

The following table lists information of UART ports in ESM335x.

Name in CE	Name in Linux	Function Description
COM2	ttyS1	RTS/CTS hardware flow control
COM3	ttyS2	3-wire, RS232, ±9V level
COM4	ttyS3	3-wire, 3.3V LVCMOS level
COM5	ttyS4	3-wire, 3.3V LVCMOS level
COM6	ttyS5	3-wire, 3.3V LVCMOS level

The signals are named with COM#_RXD (receive) and COM#_TXD (transmit) in CE platform, and ttyS#_RXD, ttyS#_TXD in Linux platform.

There is another independent UART port in ESM928x, which is used as debug port (DBG_RX, DBG_TX). In CE platform, the debug port is mainly used to dump booting message from kernel. In Linux platform, the debug port is used as system console. The debug port comes with RS232 level, 115200 baud rate and 8-N-1 frame format default setting.

LCD

The ESM928x LCD interface is parallel RGB interface which is suitable for low cost display and the signals of RGB interface are shown in following table.

Signals	Description
LCD_R2 – LCD_R7	Red component output, R7(MSB), R2(LSB)
LCD_G2 – LCD_G7	Green component output, G7(MSB), G2(LSB)
LCD_B2 – LCD_B7	Blue component output, B7(MSB), B2(LSB)
LCD_DCLK	Pixel Clock, falling edge update data, rising edge latch data
LCD_HSYNC	Horizontal Sync Pulse, active low
LCD_VSYNC	Vertical Sync Pulse, active low
LCD_DE	Display Enable, active high
LCD_BLn	Backlight control, active low, PWM configurable

The table lists information of typical display panel used with ESM928x.

Resolution	Size in Inches	Description
480×272	4.3"	High price-performance ratio
640×480	5.6" – 6.4"	
800×480	7" – 8"	ESM9288 default setting
800×600	8.4" – 10.4"	LVDS conversion is recommended
1024×768	10.4" – 12.1"	LVDS conversion is recommended

Touch Screen

The touchscreen in ESM928x is 4-wire resistive. The value of resistor on touchscreen should be normally in range of 200 – 600 ohms. The pins for touchscreen are listed as following table.

CN1 Pin#	Resistive Touchscreen	CN1 Pin#	Resistive Touchscreen
B12	Y-	C12	X-
B13	Y+	C13	X+

USB Host

The Microchip USB2514 USB hub is connected to the USB_H1 port of the iMX28 SoC. Three USB hub ports are assigned to CN1 (USB3_HD) and CN2 (USB1_HD, USB2_HD) respectively, and the forth port (USB4_HD) is assigned to WiFi module on board.

Signal Name	Description
USB3_HD+	USB3 data differential pair
USB3_HD-	

+5V power supplies of the ports should be provided by customer's carrier board.

3.3   Pins in ESM928x CN2

The pins and the associated signals in CN2 are listed as follows.

Column D (Inside)		Column E		Column F (Outside)	
D1	GPIO0 / COM2_CTS#	E1	GND	F1	GPIO16 / SD_CLK
D2	GPIO1 / COM2_RTS#	E2	-	F2	GPIO17 / SD_CMD
D3	GPIO2 / COM6_RXD	E3	-	F3	GPIO18 / SD_D0
D4	GPIO3 / COM6_TXD	E4	-	F4	GPIO19 / SD_D1
D5	GPIO4	E5	-	F5	GPIO20 / SD_D2
D6	GPIO5	E6	-	F6	GPIO21 / SD_D3
D7	GPIO6 / PWM1	E7	-	F7	GPIO22 / SD_DET
D8	GPIO7 / PWM2	E8	-	F8	GPIO23
D9	GPIO8 / PWM3	E9	-	F9	GPIO24 / IRQ1
D10	GPIO9	E10	-	F10	GPIO25 / IRQ2
D11	GPIO10 / CAN1_RXD	E11	-	F11	GPIO26 / I2C_SDA
D12	GPIO11 / CAN1_TXD	E12	-	F12	GPIO27 / I2C_SCL
D13	GPIO12 / CAN2_RXD	E13	-	F13	GPIO28 / SPI_MISO
D14	GPIO13 / CAN2_RXD	E14	GND	F14	GPIO29 / SPI_MOSI
D15	GPIO14	E15	DBGSLn	F15	GPIO30 / SPI_SCLK
D16	GPIO15	E16	RSTIN_OUTn	F16	GPIO31 / SPI_CS0N
D17	GND	E17	GND	F17	GND
D18	USB1_HD+	E18	VCC	F18	USB_OTG_VBUS
D19	USB1_HD-	E19	VCC	F19	USB_OTG_ID
D20	USB2_HD+	E20	VCC	F20	USB_OTG_D+
D21	USB2_HD-	E21	VCC	F21	USB_OTG_D-
D22	BATT3V	E22	VCC	F22	VCC

3.4   Interfaces Description in CN2

The pins in ESM928x CN2 connector include interface of GPIO, USB and power supply etc.

GPIO

ESM928x can provide up to 32 GPIOs. Each GPIO can be configured as input or output mode independently. All of GPIO are default setting in input mode on power up or external reset. Some pins of GPIO are multiplexed with other interfaces, and state of the pins are automatically switched to interface state as long as the corresponding device driver file is opened.

Table of GPIO pins with multiplexed function

GPIO	Multiplexed Function	CE Device	Linux Device
GPIO0 – GPIO1	RTS/CTS flow control	L"COM2:"	/dev/ttyS1
GPIO2 – GPIO3	COM6/ttyS5 (RXD, TXD)	L"COM6:"	/dev/ttyS5
GPIO6	PWM1 output	L"PWM1:"	/dev/pwm1
GPIO7	PWM2 output	L"PWM2:"	/dev/pwm2
GPIO8	PWM3 output	L"PWM3:"	/dev/pwm3
GPIO10 – GPIO11	CAN1 (RXD, TXD)	L"CAN1:"	can0
GPIO12 – GPIO13	CAN2 (RXD, TXD)	L"CAN2:"	can1
GPIO24	IRQ1	L"IRQ1:"	/dev/irq1
GPIO25	IRQ2	L"IRQ2:"	/dev/irq2
GPIO26 – GPIO27	I2C (SDA, SCL)	L"I2C1:"	/dev/i2c-0
GPIO28 – GPIO31	4-wire SPI (MISO, etc.)	L"SPI1:"	/dev/spidev1.0

USB OTG

The USB_OTG port of the SoC is directly available on connector CN2.

Signal Name	Description
USB_OTG_D+	Positive differential USB signal, OTG capable
USB_OTG_D-	Negative differential USB signal, OTG capable
USB_OTG_VBUS	+5V output (host), input only for voltage sensing
GND	Digital ground
USB_OTG_ID	USB OTG identification

USB Host

The Microchip USB2514 USB hub is connected to the USB_H1 port of the iMX28 SoC. Three USB hub ports are assigned to CN1 (USB3_HD) and CN2 (USB1_HD, USB2_HD) respectively, and the forth port (USB4_HD) is assigned to WiFi module on board.

Signal Name	Description
USB1_HD+	USB1 data differential pair
USB1_HD-	
USB2_HD+	USB2 data differential pair
USB2_HD-	

+5V power supplies of the ports should be provided by customer's carrier board.

SD memory

GPIO16 – GPIO22 pins can be configured as a 4-bit SD interface by ground pin BD_SPEC in CN1. The SD interface works with both SD memory and SDHC cards.

Signals	Description
SD_CLK	Clock may up to 25MHz
SD_CMD	Command signal
SD_D0 – SD_D3	Bidirectional data signals
SD_DET	SD card detect, active high

Power Signals

Pin #	Signal Name	Description
A6, B6, C6, A11, B11, C11, A14, B14, C14, E1, E14, D17, E17, F17	GND	Digital Ground
E18, E19, E20, E21, E22, F22	VCC	+5V main power supply
D22	BATT3V	RTC backup power supply

Other Control Signals

RSTIN_OUTn is a bidirectional reset signal, active low. On power up, RSTIN_OUTn works as an output signal, and can be used to reset external devices. RSTIN_OUTn becomes an input signal after booting up, and system can be reset with RSTIN_OUTn driven to low by external reset device. There is a 10k pullup resistor on this pin. RSTIN_OUTn can be unconnected if not used.

DBGSLn is an input signal with 100k pullup resistor in the module. ESM928x can start up in debug mode by connecting DBGSLn to ground. In debug mode, some necessary parameters and customer's main program can be configured so that customer's main program can be automatically executed when system booting up with DBGSLn unconnected (running mode).

BD_SPEC is a pin when it connected to ground, a board specified function is enabled. In case of ESM928x, the specified function is SD memory interface which is multiplexed with GPIO16 – GPIO22. BD_SPEC should be in state of no connection if the board specified function is not required.

3.5   On-board WiFi

ESM9283W and ESM9287W come with an on-board WiFi interface which is based RTL8188CUS module. The RTL8188CUS is compatible with 802.11b/g/n specifications and supports WPA, WPA2, open, shared key, and pair-wise key authentication services. An external antenna with 0~2 dBi peak gain is required to be connected to the coax connector on board.

4. Electrical Specifications

4.1 Absolute Maximum Ratings

Symbol	Description	Min	Max
VCC	Main power supply	-0.3V	+6.0V
ICC	Max current consumption on VCC	-	2A
BATT3V	RTC backup power supply	-0.3V	+5.5V
GPIO_VCC	Maximum input voltage on GPIO	-0.3V	+3.63V
GPIO_ICC	Total DC I/O Current on all GPIO	-	150mA
ESD_HUB	Body discharge voltage on GPIO/LCD	-	±2kV

4.2 Recommended Operation Conditions

Symbol	Description	Min	Typ	Max
VCC	Main power supply	4.5V	5.0V	5.5V
BATT3V	RTC backup power supply	2.7V	3.0V	3.3V
Tc	Commercial operation temperature range	-10℃		60℃
Ti	Industrial operation temperature range	-40℃		85℃

4.3 Power Consumption

ESM928x Power Consumption for Different Modes

Power Source	Conditions	Unit	Min	Typ	Max
Main Power	Without WiFi module	mA	160	200	300
WiFi Power	Reference to RTL8188 datasheet	mA	-	-	500
Backup Power	Main power is off	uA	-	3	-

Note: The consumption of backup power (BATT3V) is 0 when the main power of ESM928x is on.

4.4   RS232 I/O Characteristics

Parameter	Condition	Min	Max
RX input voltage range		-25V	25V
RX input resistance		3kΩ	7kΩ
TX output voltage swing	RL = 3kΩ	±5V	±9V
TX output current range	RL = 3kΩ	-	±10mA
TX output impedance		300Ω	-

The COM3/ttyS2 port and debug/console port are set in RS232 mode by default.

4.5   Ethernet PHY Characteristics

Parameter	Typ	Units
100BASE-TX Differential Output Voltage	2.0	V
100BASE-TX Differential Output Current	26	mA
10BASE-T Differential Output Voltage	2.5	V
Common Bias Voltage VDD_CMT	3.3	V

ESD Performance

Parameter	Conditions	Min	Typ	Max	Unit
All Pins	Human Body Model			±5	KV
System	IED61000-4-2 Contact Discharge			±8	KV
System	IED61000-4-2 Air-Gap Discharge			±15	KV

LATCH-UP Performance

Parameter	Conditions	Min	Typ	Max	Unit
All Pins	EIA/JESD 78, Class II		150		mA

More details about ethernet port can be found in datasheet of LAN8720a.

4.6   LVCMOS Signal DC Characteristics

Symbol	Parameter	Min	Typ	Max	Units
V_{IL}	Low-level input voltage			0.8	V
V_{IH}	High-level input voltage	2.0			V
V_{OL}	Low-level output voltage			0.4	V
V_{OH}	High-level output voltage	2.5		3.3	V
I_i	Source sink current	3.8	7.7	9	mA
I_O	Output current	5	9.5	11	mA

The LVCMOS Signals in ESM928x include all pins of GPIO and UART, part pins of LCD, and RSTIN_OUTn.

5. Timings
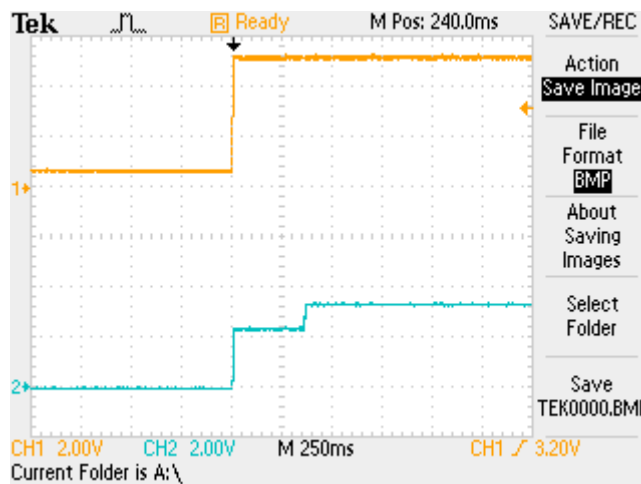
5.1 Module Power Up Timing
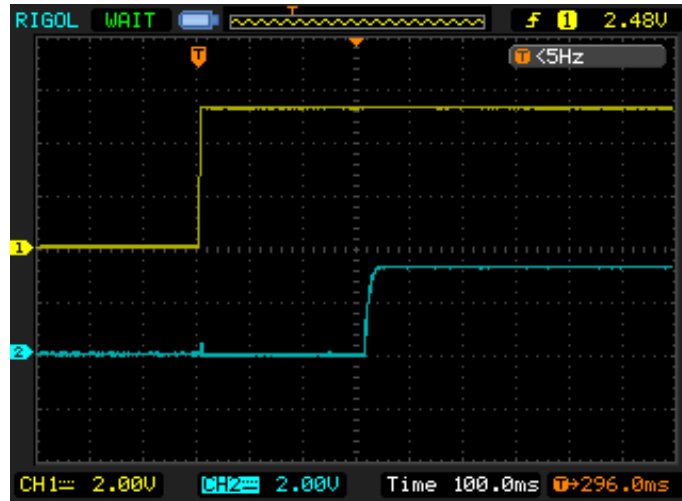
CH1 (yellow) = VCC, +5V main power

CH2 (cyan) = RSTIN_OUTn, no external reset device connected

5.2 GPIO Power Up Timing

All the GPIOs are in input mode on power up. The power up timing of GPIOs come with two segments. In the first segment, GPIOs are clamped to about 2.5V during RSTIN_OUTn enabled, and then pulled up to about 3.3V by bootloader.

CH1 (yellow) = VCC, +5V main power   CH2 (cyan) = one of GPIOs in ESM928x

6. Carrier Board Design Notes

1. As the maximum pay load current of ESM928x can reach up to 2A, the capability of power supply should at least be larger than 5V/3A. Considering consumption of other device in system, for example LCD module, WiFi, etc. a minimum 5V/4A power supply is recommended.

2. Some pins in ESM928x CN1 and CN2 come directly from SoC chip iMX28, and these pin's body discharge voltage only have 2kV. Some ESD protection may be required, especially in winter.

3. Input voltage of GPIO must be less than its absolute maximum voltage 3.6V. It is possible for any input voltage higher than 3.6V to make the SoC chip booting failed. It may destroy the SoC chip if a 5V voltage is applied to any GPIO pins!

4. Although the drive capability of each GPIO is ±6mA, but it is necessary to control total current from all GPIO pins within 150mA (see 4.1). It may damage the GPIO controller in SoC if total current from GPIO is over maximum threshold form a long time. Some driver chip like 74HC245 can been used in carrier board to protect GPIO from damaged.

5. It's highly recommended to use ESD device for USB port in carrier board. A series ferrite in USB power rail is also recommended. Reference can be found in schematics of ESMARC Evaluation Board.

7. Order Information

Module Type	Description
ESM9283	iMX283 based module, base version
ESM9283W	ESM9283 plus WiFi on board
ESM9283L	ESM9288 with one USB host port only, low cost
ESM9287	iMX287 with dual ethernet ports and dual CAN ports
ESM9287W	ESM9287 plus WiFi on board

8. Technical Support

Emtronix is a company specializing on embedded computer modules for industrial applications. Technical support can be obtained from company's website, forum, email and telephone. The contact details are below:

Website: http://www.emtronix.com

Email: support@emtronix.com

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9. Revision History

Version	Module Type	Description	Date
V1.0	ESM928x V1.1	Datasheet created	2016-2

Note: The manual will be updated without notice. The latest version of the manual can be downloaded

from Emtronix's website.