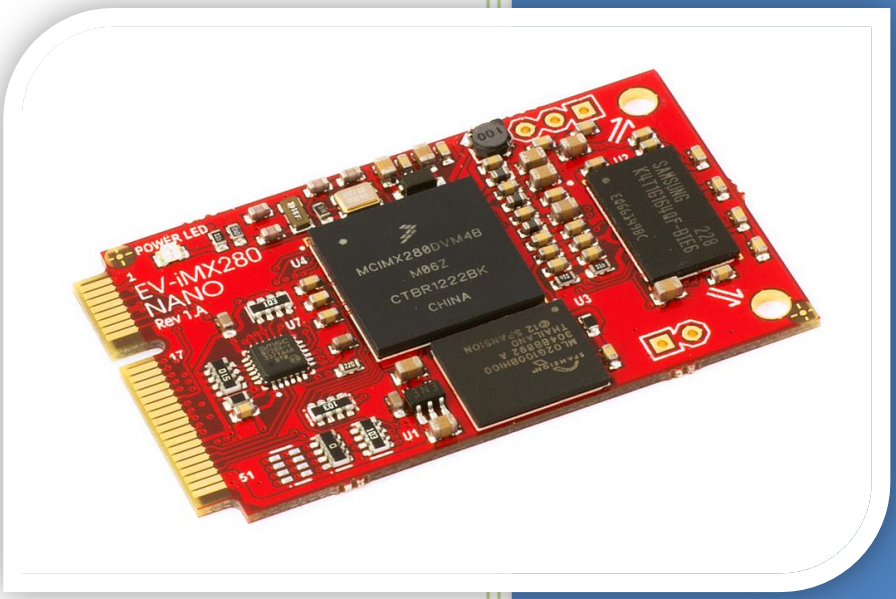
2015

EV-iMX280-NANO Module



Revision 1.0

Evodbg

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ATTENTION!

This module does not pin compatible with standard mini PCI-e card! Do not use it in laptops and computers with standard miniPCI-e connector.

IMPORTANT INFORMATION AND DISCLAIMER

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ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
ADC	Analog-digital converter
ARM	Advanced Risc Machine
BSP	Board Support Package
CAN	Controller Area Network
CPU	Central Processing Unit
DDR	Double Data Rate
GPIO	General Purpose Input Output
I2C	Inter Integrated Circuit
JTAG	Joint Test Action Group
LCD	Liquid Crystal Display
Mb	Megabit
MB	Megabyte
MMC	Multimedia Card
NAND	
NC	Not Connected
OTG	On-The-Go
PHY	Physical
PWM	Pulse Width Modulation
RMII	Reduced Media Independent Interface
RTC	Real Time Clock
SAIF	Serial Audio Interface
SD	Secure Digital
SLC	Single Layer Cell
SPI	Serial Peripheral Interface
SSI	Synchronous Serial Interface
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
WP	Write Protect
WVGA	Wide Video Graphics Array

PACKAGING

Part	Quantity
EV-iMX280-NANO Assembled and tested module	1

ORDERING INFORMATION

Name	Description
EV-iMX280-NANO-A1	iMX280, 128MB DDR2, 256MB SLC NAND Flash, 0C…+85C

Note - on the acquisition of other configurations, please contact

info@evodbg.com

BRIEF DESCRIPTION OF THE MODULE

Module EV-iMX280-NANO is built on high-performance microprocessor with the core ARM9. Processor frequency is 454 MHz. On the module EV-iM280-NANO are installed the components in a commercial version (0°C…+85°C). The list of installed components and connectors:

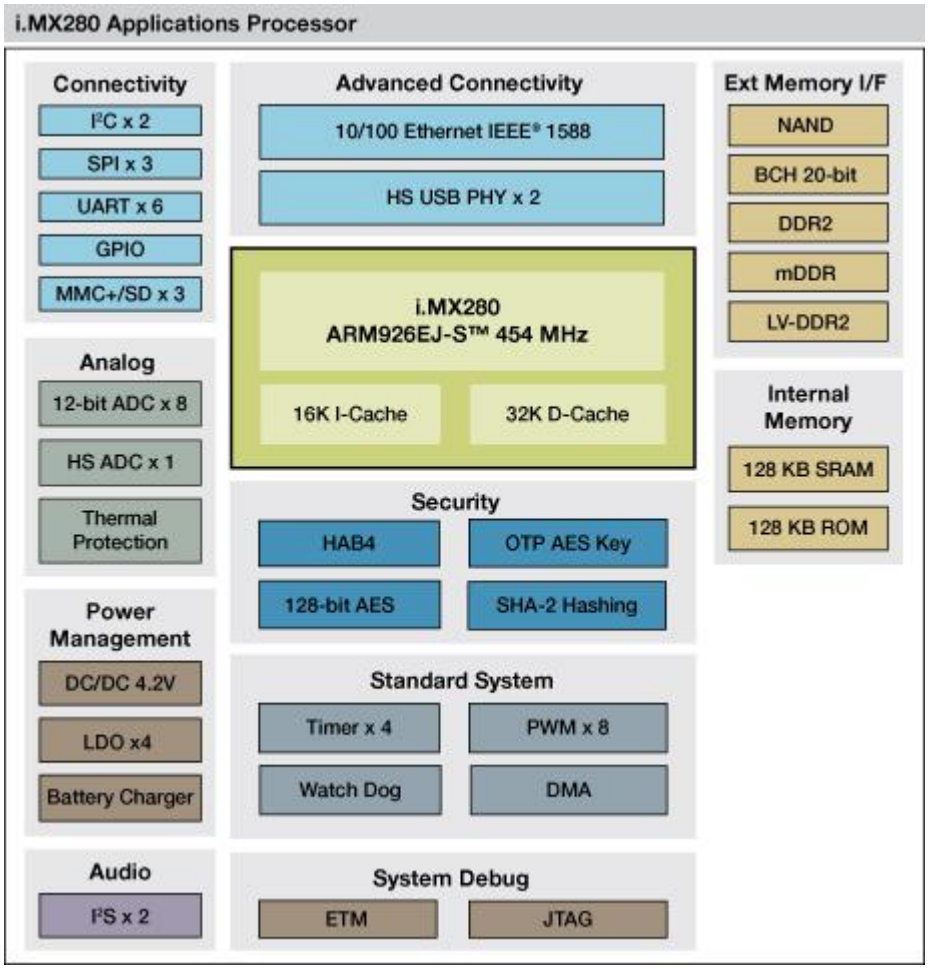
- Processor Freescale MCIMX280DVM4B
- DDR2 K4T1G164QE 128MB Memory or equivalent
- SLC NAND Flash S34ML02G100 256 MB Memory or equivalent
- Microchip PHY Ethernet LAN8720A
- 52-pin pcb connector
- Supply voltage of the module 5V
- Average current consumption 200 mA
- Overall dimensions 51*30*4 mm
- Net weight 10 gr.

COMPARATIVE TABLE FOR PROCESSOR FAMILY IMX28

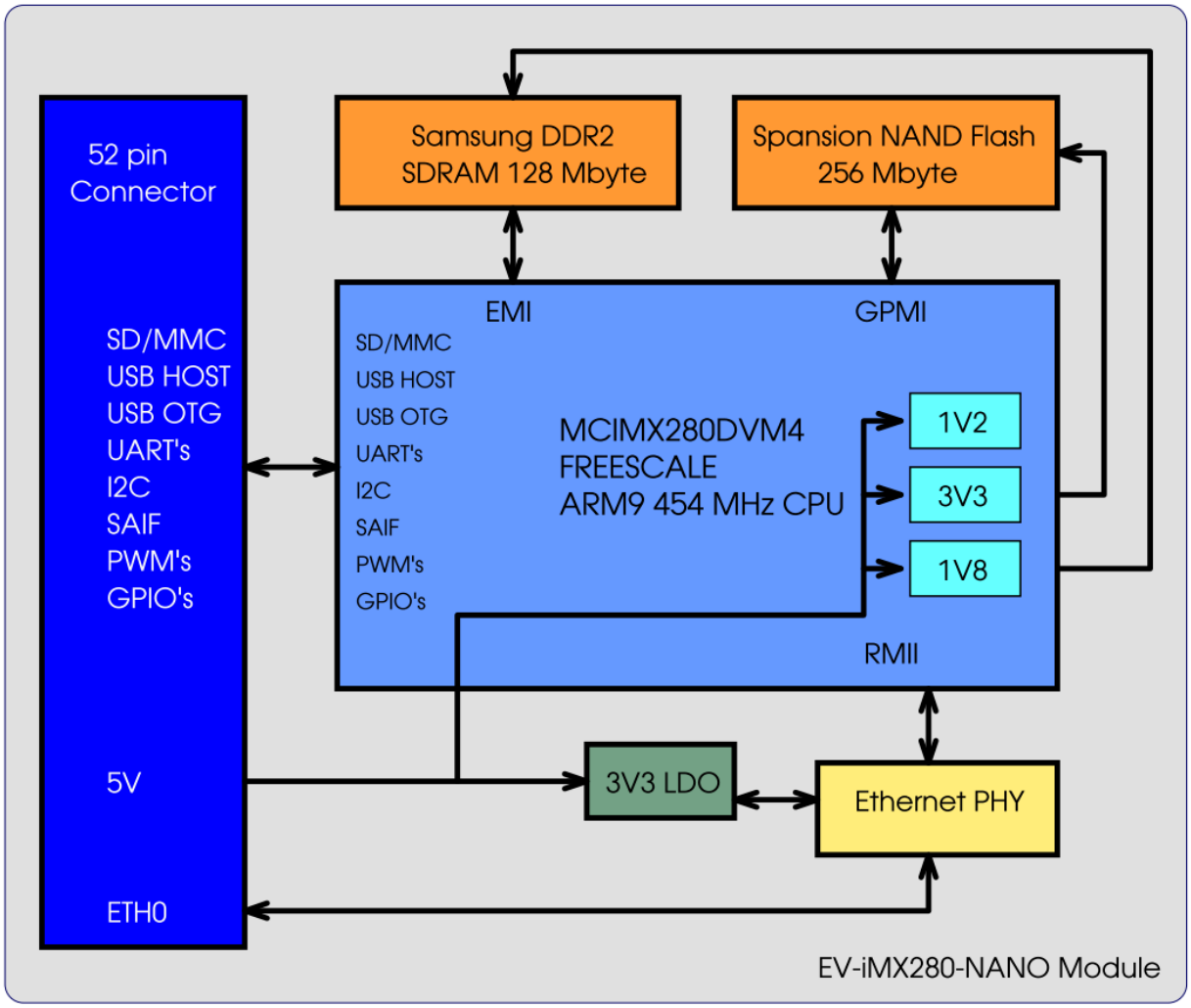
Module	i.MX280	i.MX281	i.MX283	i.MX285	i.MX286	i.MX287
Application UART	5	5	5	5	5	5
Debug UART	1	1	1	1	1	1
Flex CAN	-	2	-	2	2	2
High-speed ADC	1	1	1	1	1	1
L2Switch	-	-	-	-	-	Yes
LCD interface	No	No	Yes	Yes	Yes	Yes
LowSpeed ADC	8	8	8	8	8	8
PWM	8	8	8	8	8	8
SPDIF out	No	Yes	No	Yes	Yes	Yes
SD/SDIO/MMC	4	4	4	4	4	4
Security	Yes	Yes	Yes	Yes	Yes	Yes
SPI	4	4	4	4	4	4
Touchscreen	Нет	Нет	Есть	Есть	Есть	Есть
USB 2.0 OTG	1	1	1	1	1	1

USB 2.0 HOST	1	1	1	1	1	1

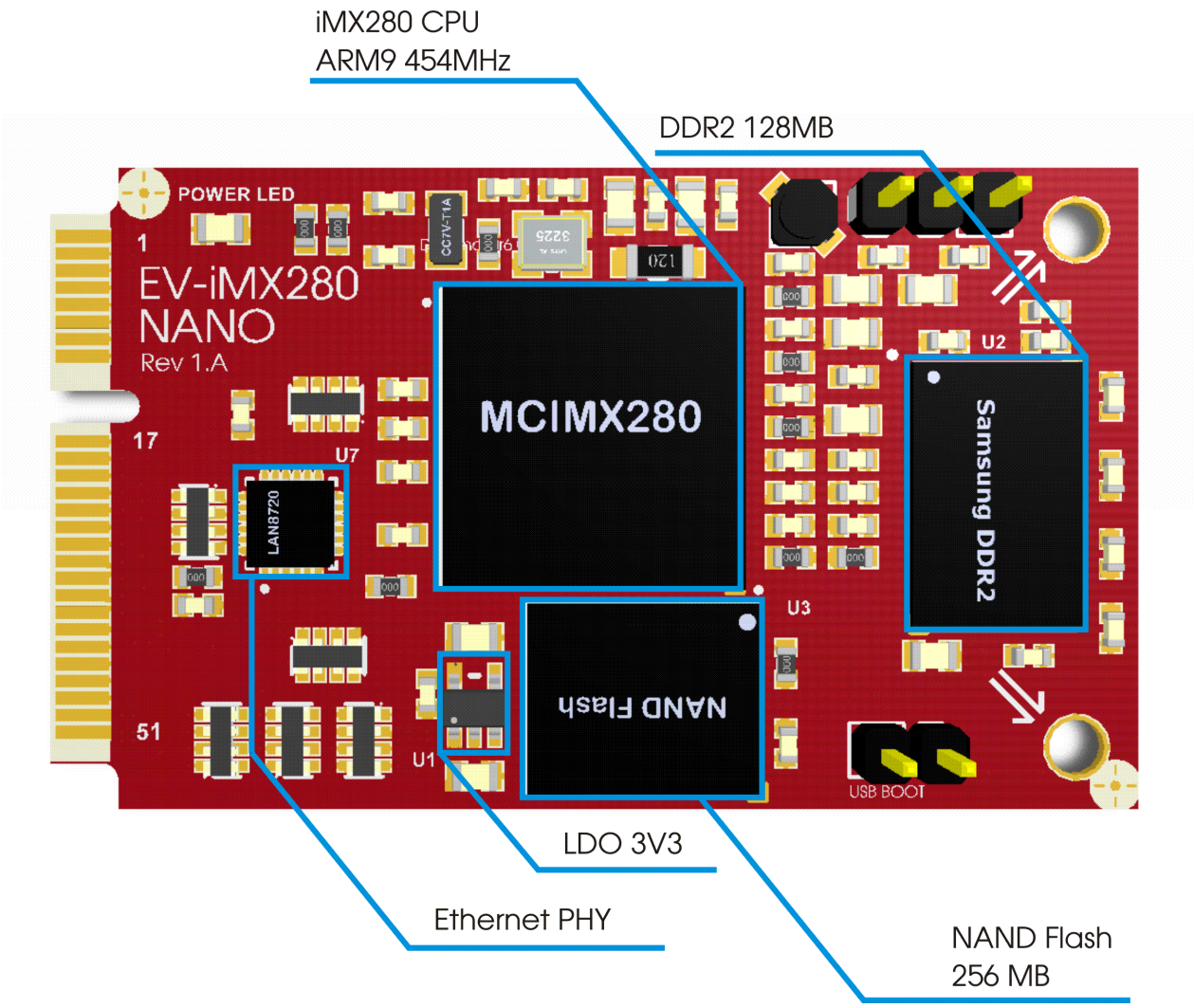
THE BLOCK DIAGRAMM OF THE PROCESSOR MCIMX280



THE FUNCTION CHART OF THE MODULE EV-IMX280-NANO



LOCATION OF MAIN COMPONENTS ON THE MODULE BOARD



SUPPLY SYSTEM

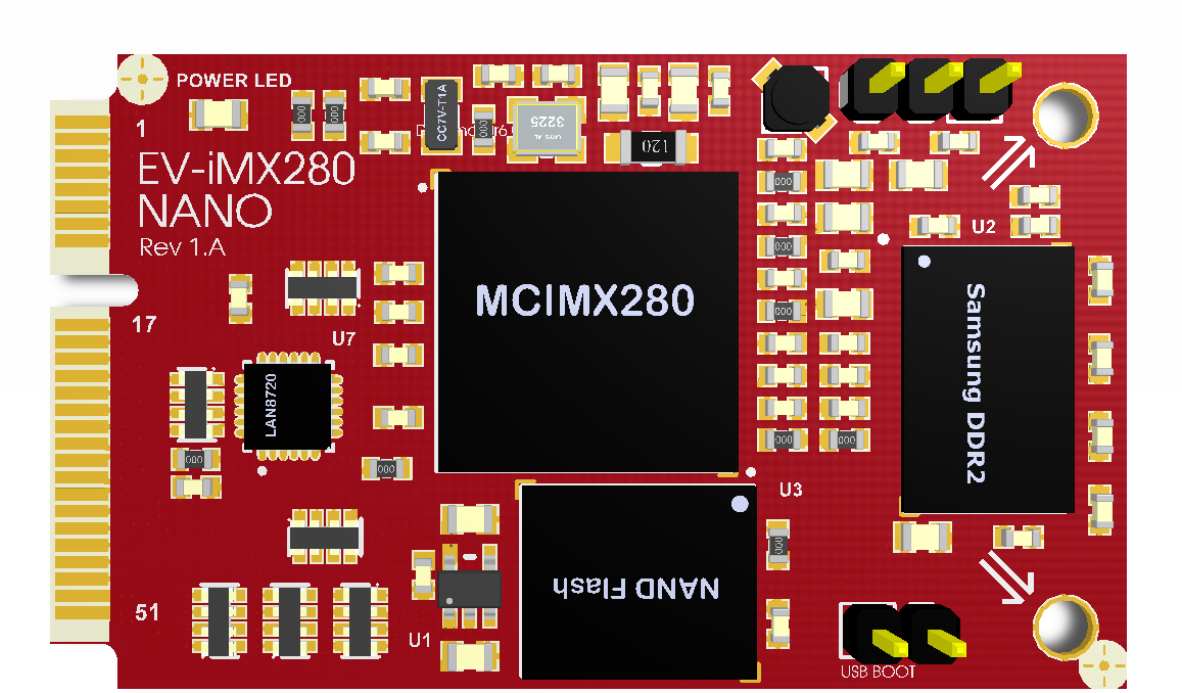
A single 5V (±5%) supply must be provided by the motherboard. Voltage 1.8V (power of DDR2 memory), 1.2V (processor core power) and 3.3V (power of chips memory NAND/SPI Flash) is generated by the processor. To power the chip of physical layer Ethernet (PHY) - LDO stabilizer TPS76333 (U1) is provided.

ETHERNET

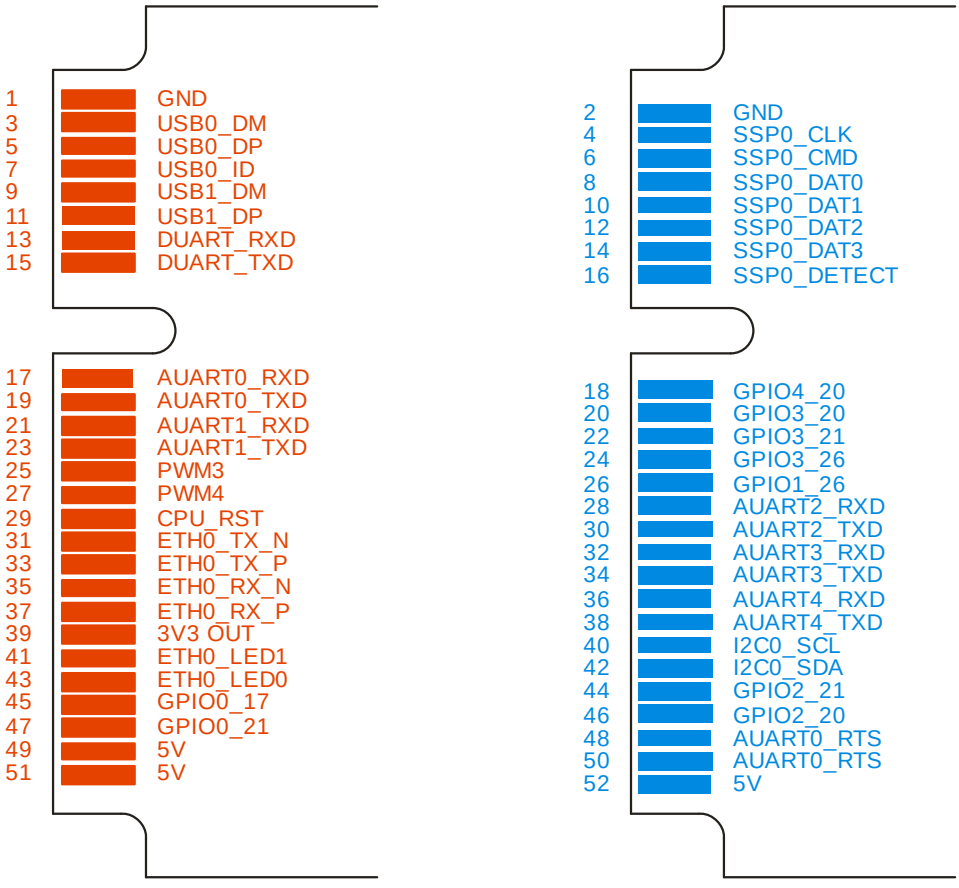
There is a chip LAN8720 (U7) PHY Ethernet 10/100Mb installed on the board and connected to the processor via RMII interface. Lines TX/RX and its LED control signals are connected on the module contacts.

PIN CONFIGURATION OF THE MODULE CONNECTOR

Top view, from components side.



Red color – Top side, Blue color – Bottom side.



MAIN MODULE CONNECTOR

Table 1. Module pin description

Pin №	Name	MUX1	MUX2	MUX3	GPIO	CPU pin
1	GND					
2	GND					
3	USB0DM					A10
4	SSP0_SCK	SSP0_SCK			GPIO2_10	A6
5	USB0DP					B10
6	SSP0_CMD	SSP0_CMD			GPIO2_8	A4
7	PWM2	PWM2	USB0_ID	USB1_OVERCURRENT	GPIO3_18	K8
8	SSP0_DATA0	SSP0_DATA0			GPIO2_0	B6
9	USB1DM					B8
10	SSP0_DATA1	SSP0_DATA1			GPIO2_1	C6
11	USB1DP					A8
12	SSP0_DATA2	SSP0_DATA2			GPIO2_2	D6
13	PWM0	PWM0	I2C1_SCL	DUART_RX	GPIO3_16	K7
14	SSP0_DATA3	SSP0_DATA3			GPIO2_3	A5
15	PWM1	PWM1	I2C1_SDA	DUART_TX	GPIO3_17	L7
16	SSP0_DETECT	SSP0_CARD_DETECT				D10
17	AUART0_RX	AUART0_RX	I2C0_SCL	DUART_CTS	GPIO3_0	G5
18	JTAG_RTCK	JTAG_RTCK			GPIO4_20	E14
19	AUART0_TX	AUART0_TX	I2C0_SDA	DUART_RTS	GPIO3_1	H5
20	SAIF0_MCLK	SAIF0_MCLK	PWM3	AUART4_CTS	GPIO3_20	G7
21	AUART1_RX	AUART1_RX	SSP2_CARD_DETECT	PWM_0	GPIO3_4	L4
22	SAIF0_LRCLK	SAIF0_LRCLK	PWM_4	AUART4_RTS	GPIO3_21	G6
23	AUART1_TX	AUART1_TX	SSP3_CARD_DETECT	PWM1	GPIO3_5	K4
24	SAIF1_SDATA0	SAIF1_SDATA0	PWM_7	SAIF0_SDATA1	GPIO3_26	E8
25	PWM3	PWM3			GPIO3_28	E9
26	LCD_RS	LCD_RS	LCD_DOTCLK		GPIO1_26	M4
27	PWM4	PWM4			GPIO3_29	E10
28	SSP2_SCK	SSP2_SCK	AUART2_RX	SAIF0_SDATA1	GPIO2_16	A3
29	RESETN					A14
30	SSP2_MOSI	SSP2_CMD	AUART2_TX	SAIF0_SDATA2	GPIO2_17	C3
31	ETH0_TX_N	LAN8720				
32	SSP2_MISO	SSP2_D0	AUART3_RX	SAIF1_SDATA1	GPIO2_18	B3
33	ETH0_TX_P	LAN8720				
34	SSP2_SS0	SSP2_D3	AUART3_TX	SAIF1_SDATA2	GPIO2_19	C4
35	ETH0_RX_N	LAN8720				
36	SAIF0_BITCLK	SAIF0_BITCLK	PWM_5	AUART4_RX	GPIO3_22	F7
37	ETH0_RX_P	LAN8720				
38	SAIF0_SDATA0	SAIF0_SDATA0	PWM_6	AUART4_TX	GPIO3_23	E7
39	VOUT 3V3					
40	I2C0_SCL	I2C0_SCL	TIMROT_ROTARYA	DUART_RX	GPIO3_24	C7
41	ETH0_LED1	LAN8720				
42	I2C0_SDA	I2C0_SDA	TIMROT_ROTARYB	DUART_TX	GPIO3_25	D8
43	ETH0_LED0	LAN8720				
44	SSP2_SS2	SSP2_D5	SSP2_D2	USB0_OVERCURRENT	GPIO2_21	D4
45	GPMI_CE1N	GPMI_CE1N	SSP3_D3		GPIO0_17	N9
46	SSP2_SS1	SSP2_D4	SSP2_D1	USB1_OVERCURRENT	GPIO2_20	D3
47	GPMI_RDY1	GPMI_READY1	SSP1_CMD		GPIO0_21	N8
48	AUART0_RTS	AUART0_RTS	AUART4_TX	DUART_TX	GPIO3_3	J7
49	5V					
50	AUART0_CTS	AUART0_CTS	AUART4_TX	DUART_TX	GPIO3_2	J6

51	5V					
52	5V					

SIGNALS, USED INSIDE THE MODULE

Table 2. Signal used inside the module

CPU pin	Name	Used with	Main connector
G4	ENET0_MDC	LAN8720	No
H4	ENET0_MDIO	LAN8720	No
E4	ENET0_RX_EN	LAN8720	No
H1	ENET0_RXD0	LAN8720	No
H2	ENET0_RXD1	LAN8720	No
F4	ENET0_TX_EN	LAN8720	No
F1	ENET0_TXD0	LAN8720	No
F2	ENET0_TXD1	LAN8720	No
E2	ENET_CLK	LAN8720	No
U8	GPMI_D0	NAND Flash	No
T8	GPMI_D1	NAND Flash	No
R8	GPMI_D2	NAND Flash	No
U7	GPMI_D3	NAND Flash	No
T7	GPMI_D4	NAND Flash	No
R7	GPMI_D5	NAND Flash	No
U6	GPMI_D6	NAND Flash	No
T6	GPMI_D7	NAND Flash	No
L9	GPMI_RESET	NAND Flash	No
P7	GPMI_CLE	NAND Flash	No
P6	GPMI_ALE	NAND Flash	No
P8	GPMI_WR	NAND Flash	No
R6	GPMI_RD	NAND Flash	No
N7	GPMI_CE0	NAND Flash	No
N6	GPMI_RDY0	NAND Flash	No

SOURCES OF PROCESSOR BOOT

Boot source is determined when you reset your processor. A configuration on the module is forcibly set to boot from the chip NAND Flash. Under unprogrammed chip NAND Flash the boot is performed from USB interface. You can force the module to boot from USB, if NAND Flash is programmed. To do this you have to close contacts USB Boot and press Reset on the motherboard. In this mode, using the utility sb_loader.exe or MFGTool.exe you can boot the code and write the chip NAND Flash.

MEMORY

NAND FLASH MEMORY

The board uses a SLC NAND Flash chip memory (U3), bus width 8 bits, 256 MB. The memory is connected to the bus GPMI, GPMI_CE0 is used for sampling and GPMI_RDY0 for the signal Busy. Signal

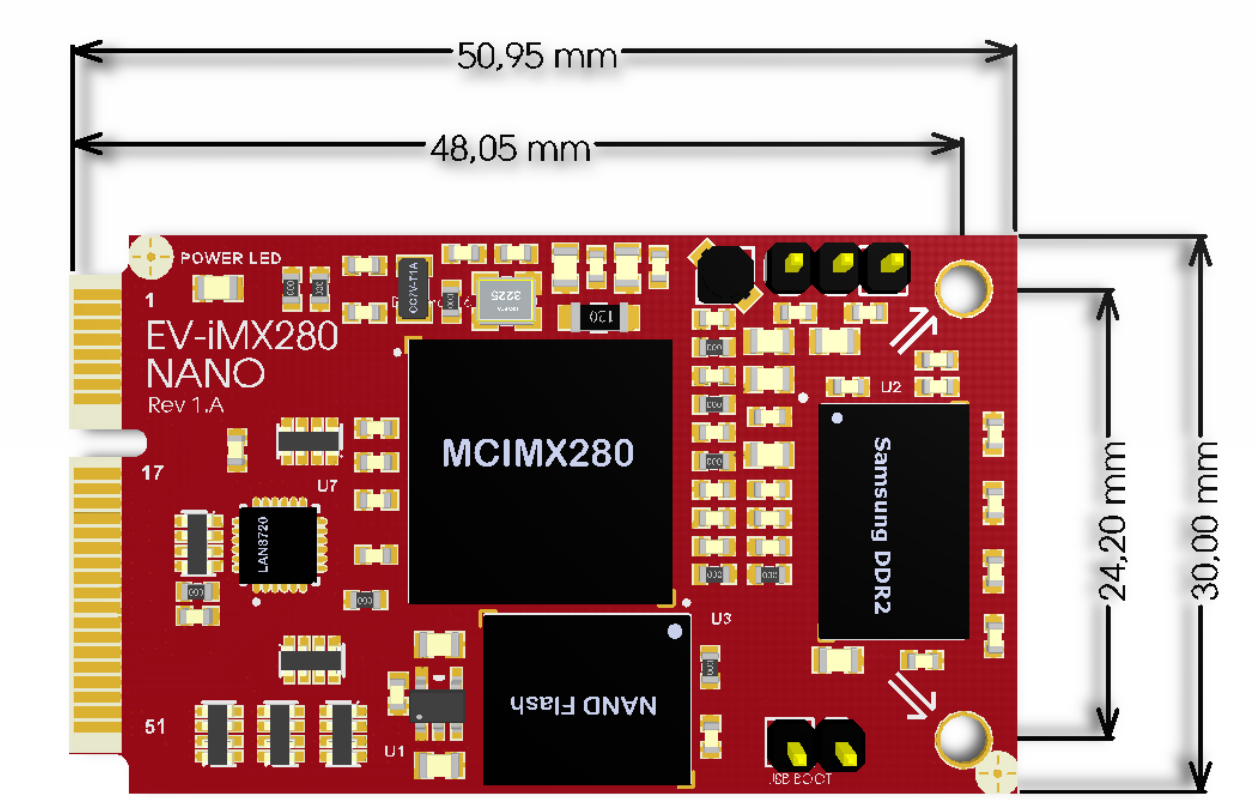
GPMI_RESET is used as a security control signal from the writing in NAND Flash. In agreement with the customer installation of another chip volume is possible.

DDR2 MEMORY

On the module there is a chip with DDR2 (U2) K4T1G164Q memory (or equivalent) of 128 MB. In agreement with the customer installation of chip of 256 MB is possible. The maximum frequency of EMI interface 205 MHz.

OVERALL DIMENSIONS

All dimensions are in mm. The maximum height of the module is 4.0mm.



CONNECTOR FOR MODULE INSTALL

To install the module you can use any standard mini PCI Express connector, for example:

Molex - 0679100002

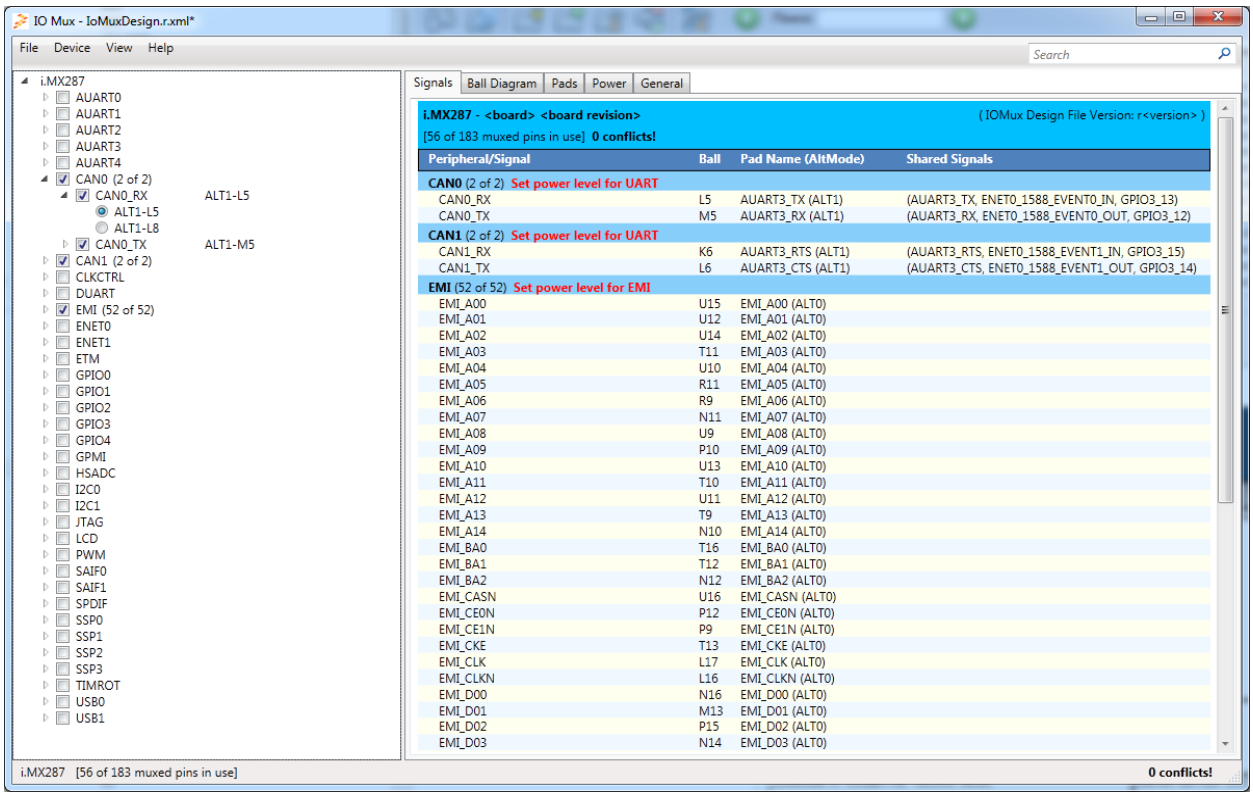
TE Connectivity - 292443

JAE Electronics – MM60-52B1-G1-R850

mini PCI Express appearance.

PINMUX

Output CPU pin functions are not the only possible. Here, they are called as well as in BSP. If necessary, you can change them, reassign PINMUX as you need. For assign purpose use utility IOMux.exe, which allows graphically designate functions for processor outputs and shows potential conflicts.



EFUSE

The module comes with an unprogrammed eFuse processor. In the final stage of development you can program their configuration using utility BitBurner.

OUTPUT-INPUT PORTS

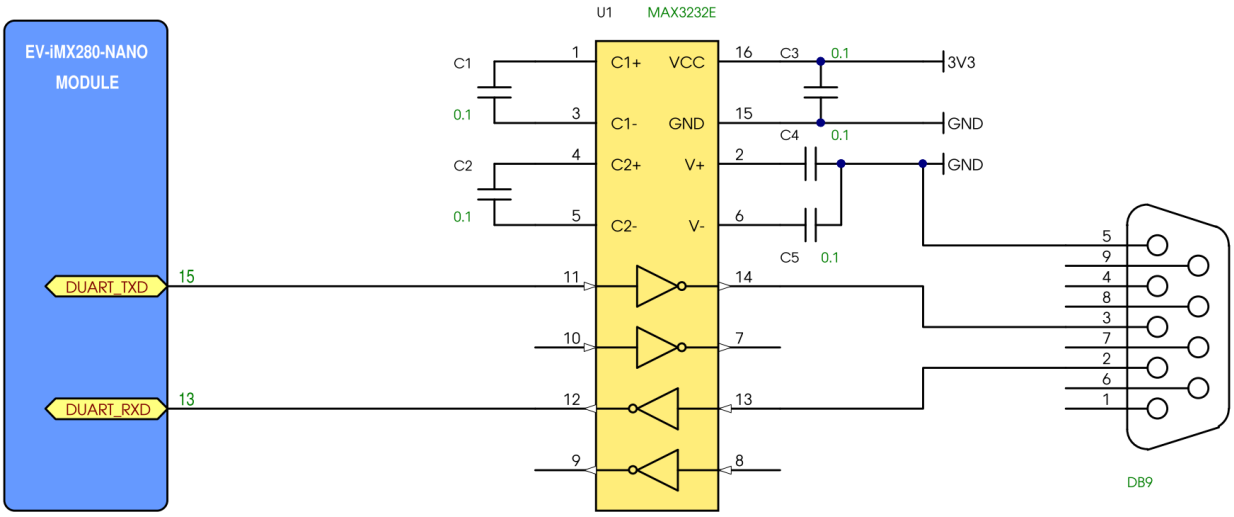
All signals of the module (except for the differential pairs) have 3.3V levels. To connect to 1.8V/5.0V peripheral use the level translator.

POWER

To power the module 5V is used. On the module pins 49,51,52 you need 5V. Ground pin 1,2 must be connected to the ground. The board has LDO (linear stabilizer with low dropout) with an output voltage 3.3V, which is used to power the chip Ethernet of PHY module. This voltage is present at the pin of module 39 and can be used to power low-power chips of your board. Mounting holes of the module are also connected to ground. It is recommended to support the motherboard with installation of threaded brass struts 2mm to fix the module to the motherboard.

DUART INTERFACE

For debugging the port DUART is used. Output DUART_TXD (the pin of 15 module) and input DUART_RXD (pin of 13 module) can be connected to the chip MAX3232 (or equivalent) in the typical application. Also, you can use any UART-USB chip (FT232, PL2303 etc.).



SDMMC INTERFACE

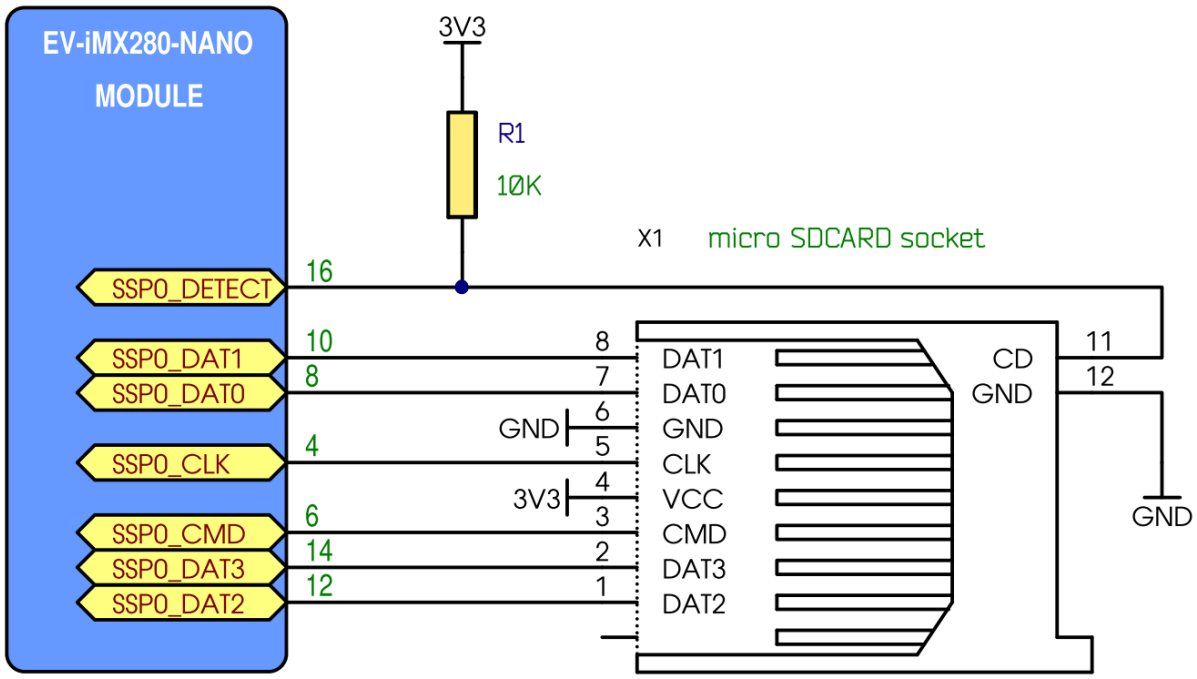
SD/MMC card holder can be connected to the port SSP0. Signals fit of SD и microSD cards is shown in the table :

Table 3. Connection of SD/uSD cards

Module pin	SD card pin	microSD card pin	Pin name
4	5	5	SSP0_CLK
6	2	3	SSP0_CMD
8	7	7	SSP0_DAT0
10	8	8	SSP0_DAT1
12	9	1	SSP0_DAT2
14	1	2	SSP0_DAT3
16			SSP0_DETECT (SD card detect signal)
1,2	3,6	6	GND
39	4	4	Power 3.3B

Attention! It is necessary to pull-up SSP0_DETECT to 3.3V through a resistor 10K.

EV-iMX280-NANO Module



ETHERNET CONNECTION

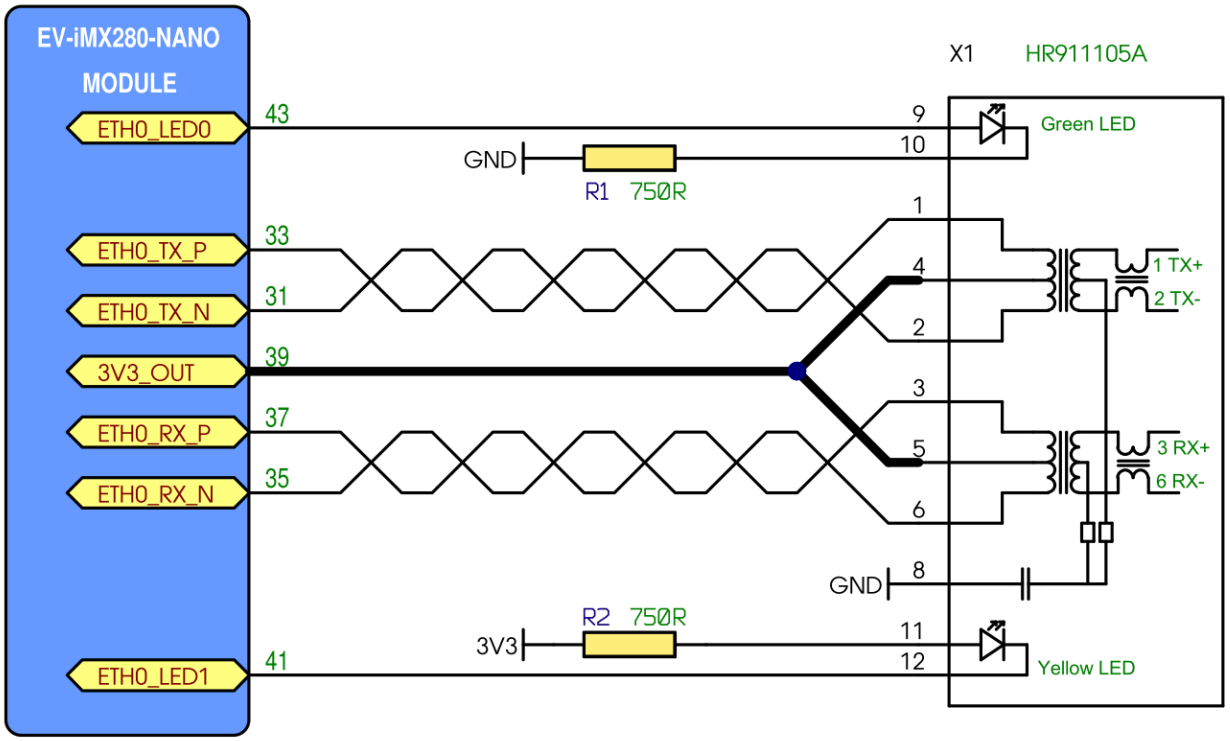
A chip of physical layer (Ethernet PHY) LAN8720AI is installed on the module board. Differential pairs RX/TX are output to the module pin. To reduce the occupied space use the slots RJ-45 with integrated transformers, for example HR911105A. You can also use a set of transformer, for example H1102 and RJ-45 connector.

Table 4.

Module pin	HR911105A pin	Signal
33	1	TX+
31	2	TX-
37	3	RX+
35	6	RX-
1	8	GND
39	4,5	3.3V
41	9	ETH0_LED1
43	11	ETH0_LED0

Signal ETH0_LED0 must be connected to the anode of the LED in the slot RJ-45, the cathode of the LED via the resistor 560R connected to the ground. Signal ETH0_LED1 must be connected to the cathode of the LED in the slot, the anode of the LED via resistor 750R connected to 3.3V. If the LED indicator mode Ethernet is not required, signal ETH0_LED0 to be dragged to the ground via resistor 1K, signal ETH0_LED1 must be pulled up to 3.3V via resistor 750R.

EV-iMX280-NANO Module

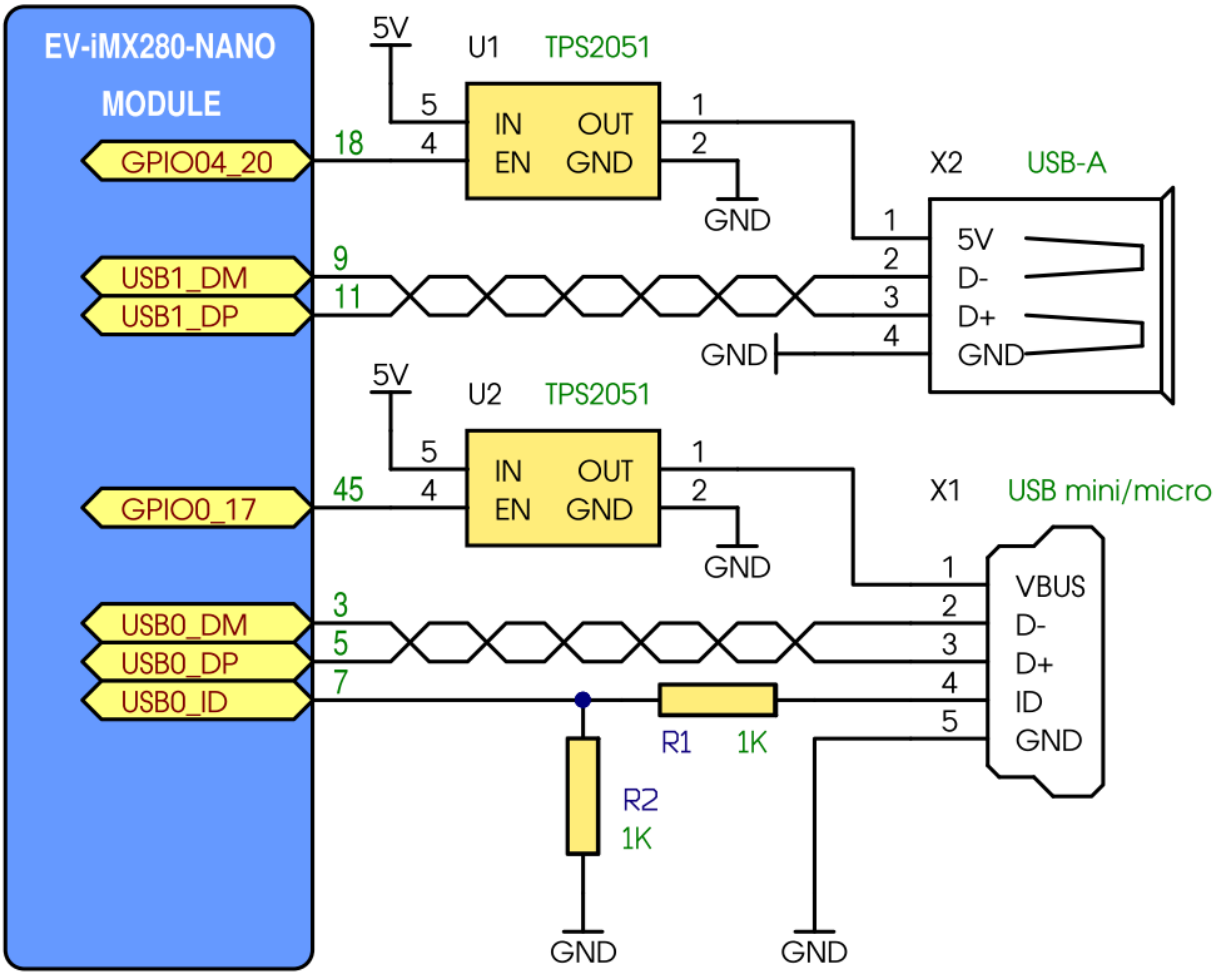


USB INTERFACE

Two USB2.0 High Speed interfaces are available on the EV-iMX280-NANO. USB0 can be used as Host/Device, USB1 only as HOST. The 5V power supply for USB ports has to be implemented on the motherboard.

Table 5.

Module pin	Signal	Desription
5	USB0_D+	
3	USB0_D-	
7	USB0_ID	Connect USB_ID to 3V3 via 1K resistor to set Device Mode. Connect USB_ID to GND via 1K resistor to set HOST Mode.
11	USB1_D+	
9	USB1_D-	

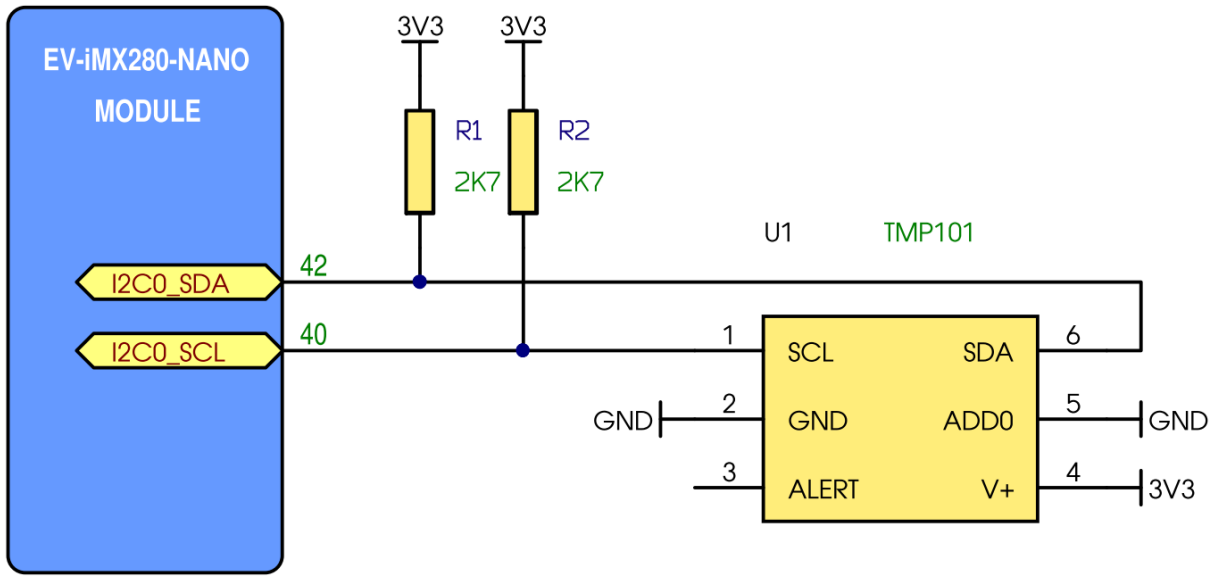


I2C INTERFACE

Interface signals I2C0 are displayed on the contacts of the module EV-iMX280-NANO. The motherboard is necessary to provide with the pull-up to power via resistors 2K7 of lines SDA and SCL.

Table 6.

Module pin	Signal
40	I2C0_SCL
42	I2C0_SDA



UART INTERFACE

5 UART interfaces are displayed on the main module connector.

Table 7.

Module Pin Number	Signal
17	UART0_RXD
19	UART0_TXD
21	UART1_RXD
23	UART1_TXD
28	UART2_RXD
30	UART2_TXD
32	UART3_RXD
34	UART3_TXD
36	UART4_RXD
38	UART4_TXD

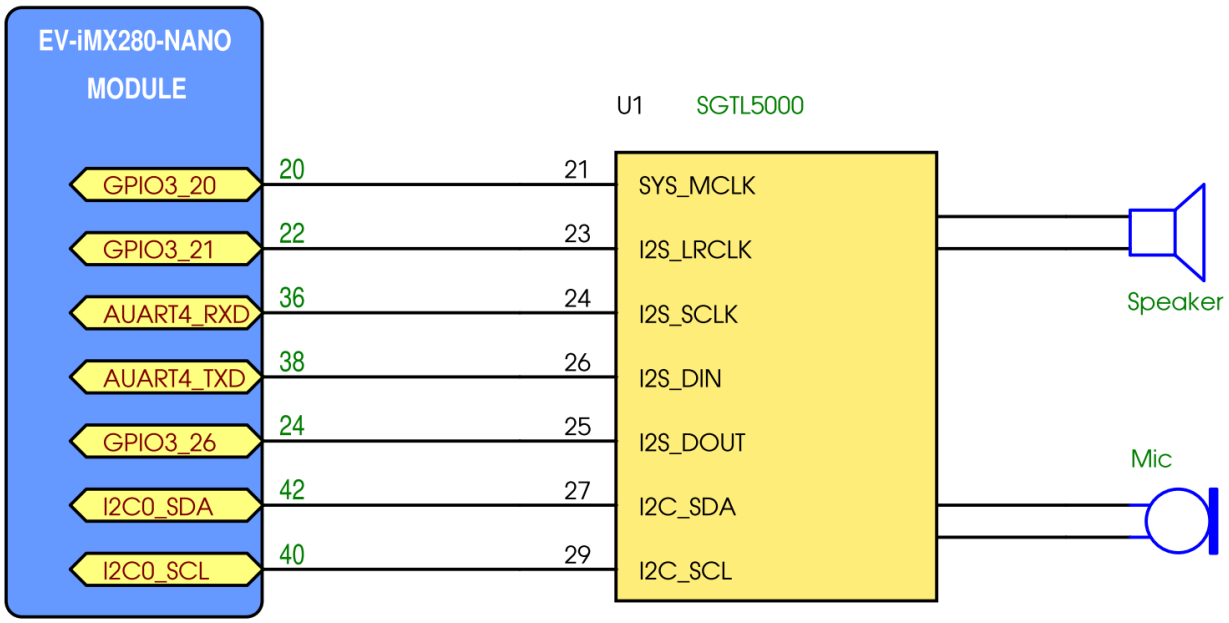
SAIF INTERFACE

To connect an audio codec via I2S use next signals

Table 8.

Module Pin	Signal	I2S Function
20	GPIO3_20	SYS_MCLK
22	GPIO3_21	I2S_LRCLK
24	GPIO3_26	I2S_DOUT
36	AUART4_RXD	I2S_SCLK
38	AUART4_TXD	I2S_DIN
40	I2C0_SCL	I2C0_SCL
42	I2C0_SDA	I2C0_SDA

EV-iMX280-NANO Module



Remark. User must define ENABLE_SAIF_EV280_NANO and rebuild kernel dts (imx28-evk.dts) file to enable SAIF pins!

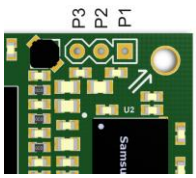
```
//#define CONFIG_EVIMX287NANO
//#define CONFIG_EVIMX287SODIMM_NAND
//#define CONFIG_EVIMX287MICRO
//#define CONFIG_EVIMX287SODIMM_EMMC
#define CONFIG_EVIMX280NANO

/*
 * Enable SAIF audio interface in EV-iMX280-NANO module ( AUART4 + GPIO3_20/3_21/3_22/3_23/3_26)
 */

#define ENABLE_SAIF_EV280_NANO
```

LI-ION BATTERY CONNECTOR

3-pin connector for Li-ION battery connection.

Table 9.

Module pin	Signal
P1	LI-ION
P2	VCC4P2
P3	GND

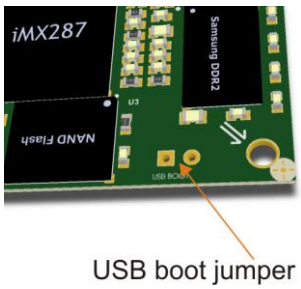


SOFTWARE SOURCE CODE

A VMware virtual machine provided with installed compiler, u-boot2014, Linux 3.10.20 and Buildroot source code.

KERNEL AND ROOT FILE SYSTEM RESTORING

The operation is performed on the computer with OS Windows. Unzip Ev-iMX2xx. Connect the USB cable to the computer and to the upper USB socket connector (USB0 OTG),set the boot from USB, connect the power to the board. Windows should determine the board as HID device. Run MfgTool.exe. In the drop list select MX28 Linux Update. Go to the Options-Configurations and choose EV-iMX280-NANO, click Ok. Now click Start button and wait for the reports of successful programming.



Close USB boot jumper (with tweezers) and apply power to set USB Boot mode.

REFERENCES

Table 10.

Reference	Description
IMX287CEC	i.MX28 Datasheet
IMX28CE	i.MX28 Errata
MCIMX28RM	Processor Reference Manual
K4T1G164 DDR2	DDR2 Datasheet
S34ML04G100 NAND Flash	NAND Flash Datasheet
LAN8720A Ethernet PHY	Ethernet PHY
Altium Designer motherboard project	
Schematic of motherboard (pdf)	

DIFFERENCES FROM THE MODULE EV-IMX287-NANO

- One Ethernet interface
- On the slot signals of LED control of Ethernet mode are displayed
- One I2C interface
- No SPI interface
- Increased number of GPIO put into slot
- No CAN interface

WEB

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If you need to change the design of this board, please contact pcb@evodbg.com

IMPROVEMENTS OF THE DOCUMENT

26/06/2015 – The initial revision of a document 1.0
The list of add-ons: