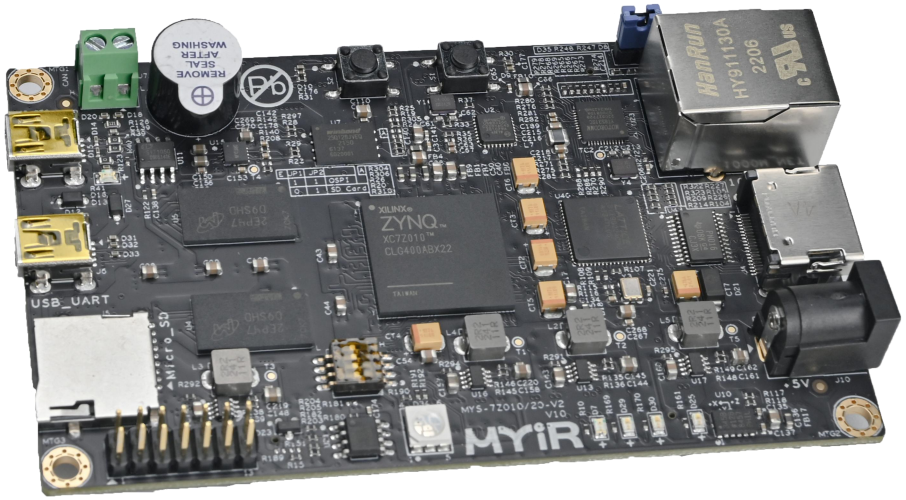
MYiR 米尔电子
Make Your Idea Real

# Z-turn Board V2
# Overview

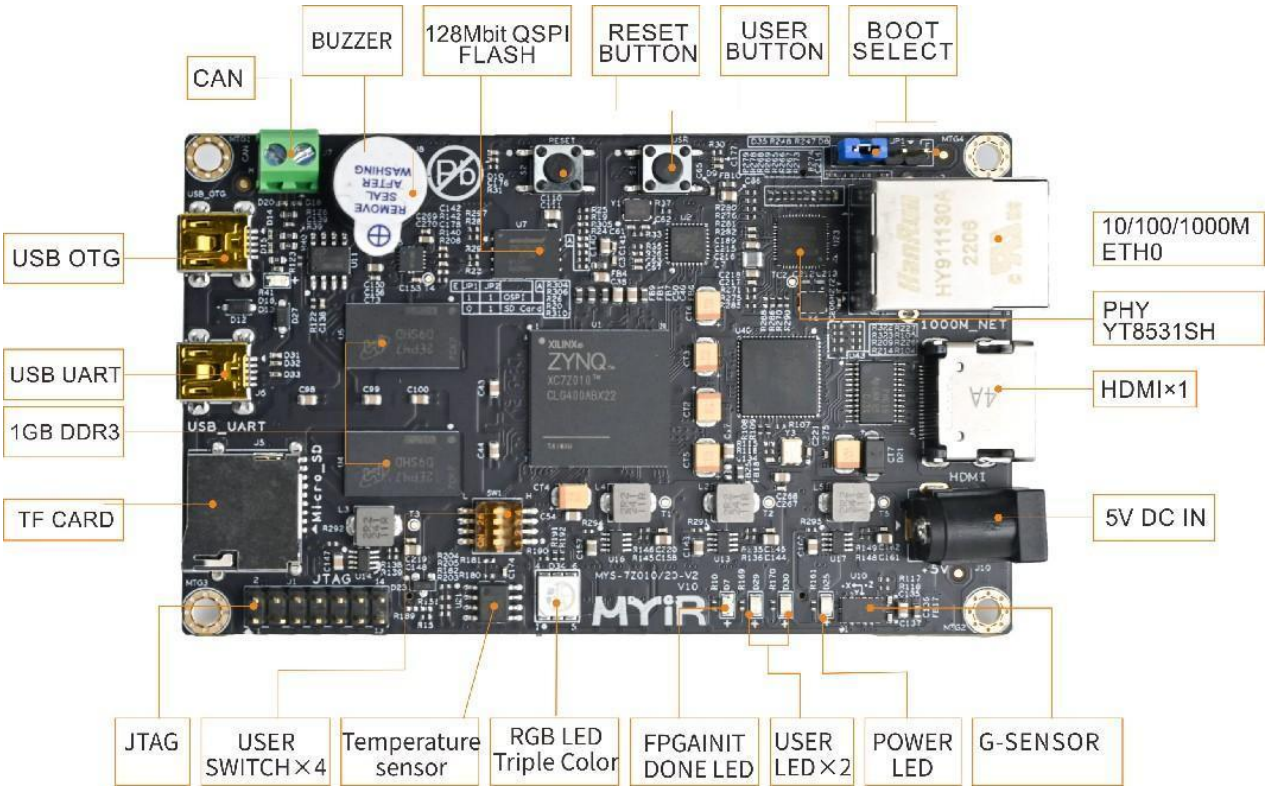




- ✓ *667MHz/766MHz Xilinx XC7Z010/20 Dual-core ARM Cortex-A9 Processor with Xilinx 7-series FPGA logic*
- ✓ *1GB DDR3 SDRAM (2 x 512MB, 32-bit), 16MB QSPI Flash, 64Kbit EEPROM*
- ✓ *USB_UART, USB2.0 OTG, 1 x 10/100/1000Mbps Ethernet, CAN, HDMI, TF, …*
- ✓ *Onboard Three-axis Acceleration Sensor and Temperature Sensor*
- ✓ *Supports Optional Camera Module and Z-turn IO Cape*
- ✓ *Ready-to-Run Linux Single Board Computer*
- ✓ *Supports Python Development*

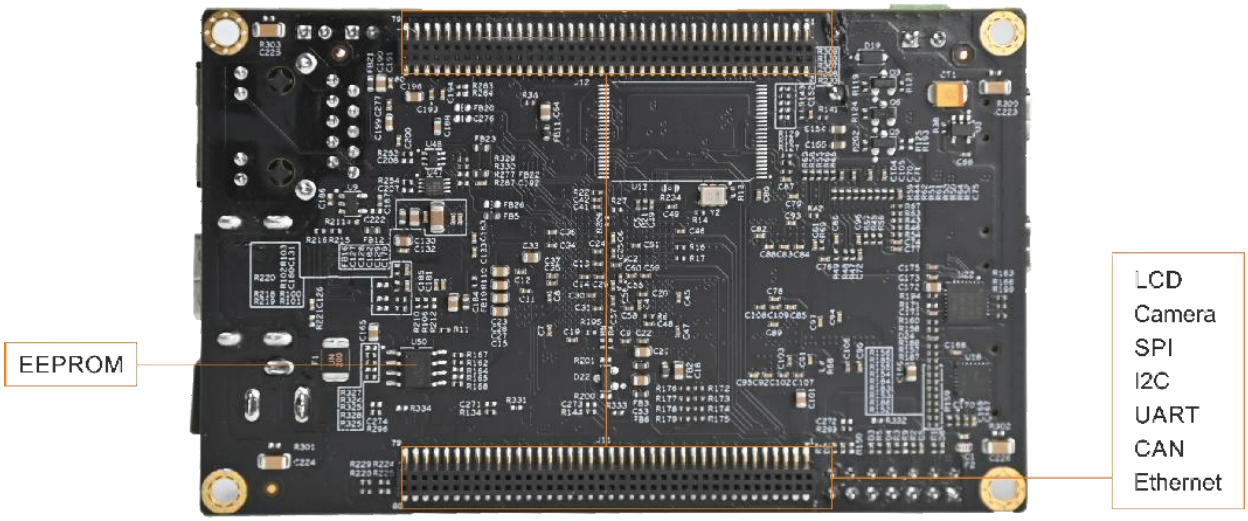
The **Z-turn Board V2** is a cost-optimized version for MYIR's popular Z-turn Board. It is a high-performance Single Board Computer (SBC) built around the Xilinx Zynq-7010 (XC7Z010) or Zynq-7020 (XC7Z020) All Programmable System-on-Chip (SoC) which is among the Xilinx Zynq-7000 family, featuring integrated dual-core ARM Cortex-A9 processor with Xilinx 7-series Field Programmable Gate Array (FPGA) logic. Compared with the former version, the main differences are the IC parts as below:

| IC on board | Z-turn Board | Z-turn Board V2 |
|---|---|---|
| Gigabit Ethernet PHY | KSZ9031RNX | YT8531SH |
| Power IC | TLV62130RGTR | MP2143DJ-LF-Z |
| EEPROM | / | BL24C64A-PARC |
| DDR3 | MT41K256M16HA-125:E | NT5CC256M16ER-EK |

The Z-turn Board V2 takes full features of the Zynq-7010 or 7020 SoC, it has 1GB DDR3, 16MB QSPI Flash and 64Kbit EEPROM on board and a set of rich peripherals including USB-to-UART, Mini USB OTG, 10/100/1000Mbps Ethernet, CAN, HDMI, TF, JTAG, Buzzer, G-sensor and Temperature sensor. On the rear of the board, there are two 1.27mm pitch 80-pin SMT female connectors to allow the availability of 96 (for 7010) or 106 (for 7020) user I/O and configurable as up to 39 LVDS pairs I/O.

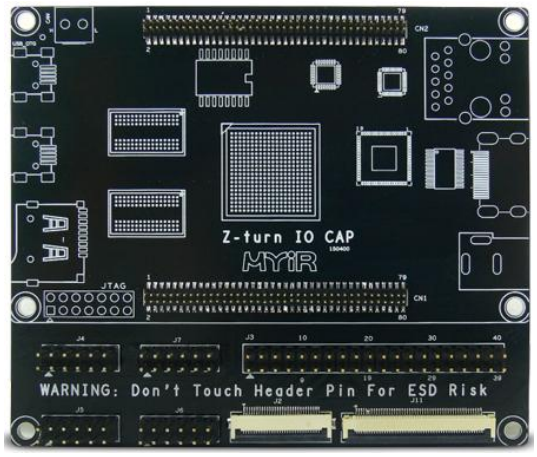



*Z-turn Board V2 (Top-view)*

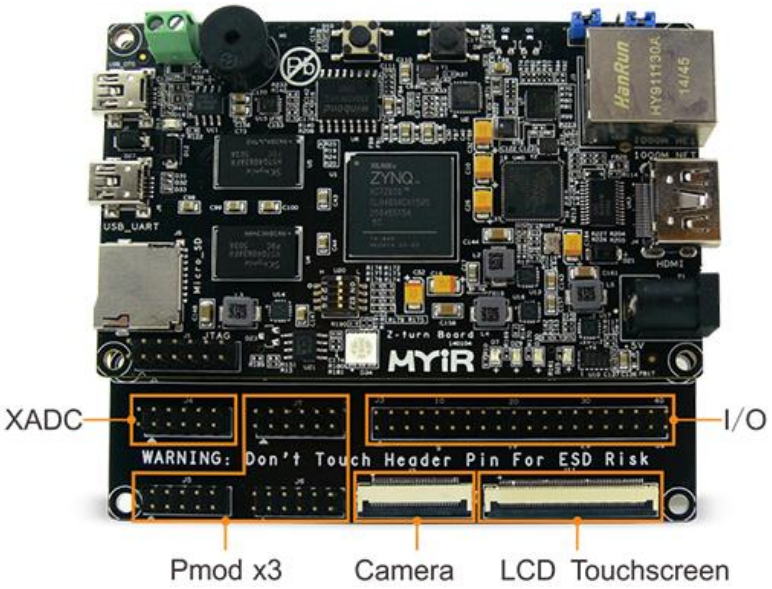



*Z-turn Board V2 (Bottom-view)*

The Z-turn Board V2 is capable of running Linux operating system. MYIR has provided Linux 4.14.0 SDK, the kernel and many drivers are in source code. MYIR also provides a MYIR-PYNQ project to support Python development on the Z-turn Board V2. The board is delivered with complete accessory kit including two USB cables, one Ethernet cable, one HDMI cable, one 16GB TF card and one 5V power adapter which enables you to start the development quickly when getting the board out-of-the-box. MYIR also offers optional USB camera module and an IO extension board Z-turn IO Cape, which brings out many peripherals and signals like ADC, GPIO, LCD and camera interfaces to help you explore more functions from the Z-turn Board V2.




Z-turn IO Cape

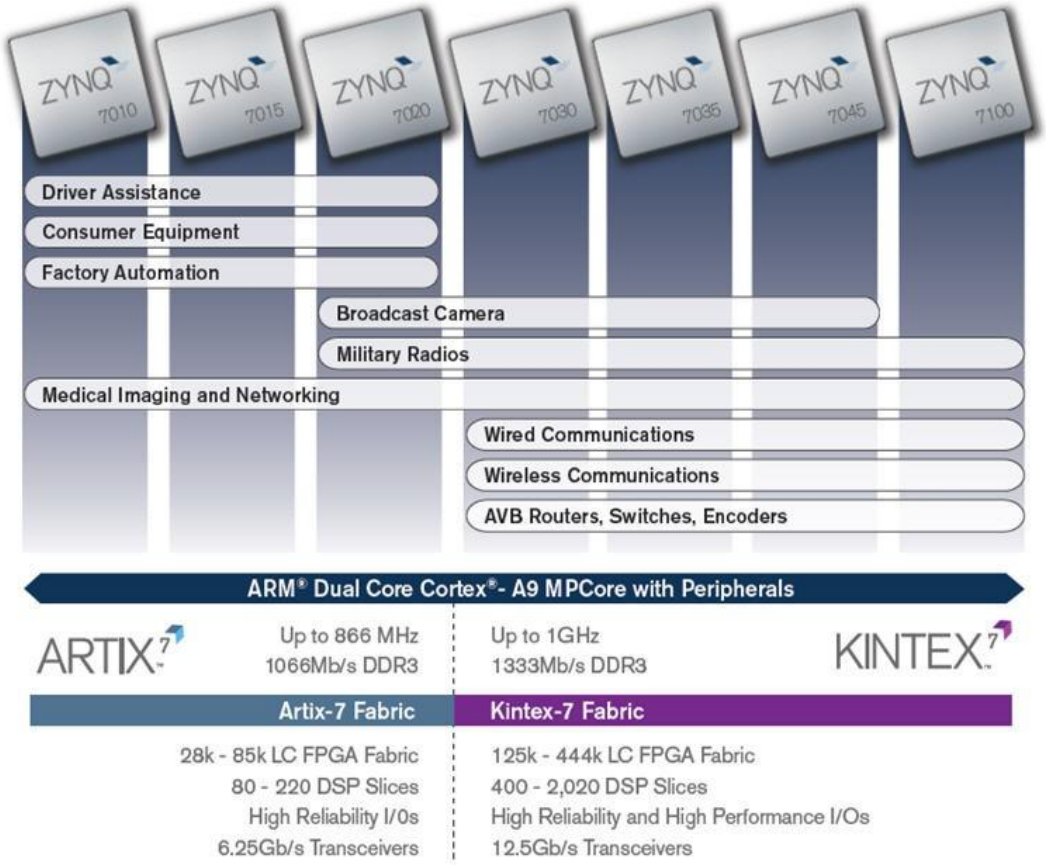



Z-turn Board V2 Mounted on Z-turn IO Cape

The Z-turn Board V2 is an excellent development platform for evaluating and prototyping for Zynq-7000 SoC. It can also be used as a System-on-Module (SOM) for your next embedded design; typical applications are Industrial Automation, Test & measurement, Medical Equipment, Intelligent Video Surveillance, Aerospace and military, etc.

**Hardware Specification**

The Zynq-7000 AP SoC leverages the 28nm scalable optimized programmable logic used in Xilinx's 7 series FPGAs. Each device is designed to meet unique requirements across many use cases and applications. The Z-7010, Z-7015, and Z-7020 leverage the Artix®-7 FPGA programmable logic and offer lower power and lower cost for high-volume applications. The Z-7030, Z-7035, Z-7045, and Z-7100 are based on the Kintex®-7 FPGA programmable logic for higher-end applications that require higher performance and high I/O throughput.




*ZYNQ-7000 Device Family*

The Z-turn Board V2 is based on the Xilinx Zynq-7010 or 7020 SoC and the hardware specification is as listed in following table:

| Item | Features |
|---|---|
| SoC | Xilinx XC7Z010-1CLG400 (Zynq-7010) or XC7Z020-2CLG400 (Zynq-7020)<br>- Up to 667MHz ARM® dual-core Cortex™-A9 MPCore processor<br>- Integrated Artix-7 class FPGA subsystem<br>with 28K logic cells, 17,600 LUTs, 80 DSP slices (for XC7Z010)<br>with 85K logic cells, 53,200 LUTs, 220 DSP slices (for XC7Z020)<br>- NEON™ & Single / Double Precision Floating Point for each processor<br>- Supports a Variety of Static and Dynamic Memory Interfaces |
| Memory | 1GB DDR3 SDRAM (2 x 512MB, 32-bit) |
| Storage | 16MB QSPI Flash<br>64Kbit EEPROM<br>TF card interface |
| Communications | 1 x 10/100/1000M Ethernet<br>1 x CAN<br>1 x Mini USB2.0 OTG<br>1 x USB-UART debug interface |
| Display | 1 x HDMI (supports 1080p resolution, MYIR offers reference design for HDMI and LCD display functions without limitation for its. The IP cores in the design are provided by Xilinx. MYIR will provide Vivado project and SDK testing programs.) |
| User I/O | Brought out via two 1.27mm pitch 80-pin SMT female connectors<br>- 90/106 user I/O (7010/7020)<br>- Configurable 33/ 39 LVDS pairs I/O (7010/7020) |
| Dimensions | 63mm x 102mm x 1.6mm (8-layer PCB design) |
| Power supply | USB power supply or DC 5V/2A |
| Others | Onboard three-axis acceleration sensor and temperature sensor<br>1 x 2.54mm pitch 14-pin JTAG interface<br>2 x Buttons (1x Reset, 1 x User)<br>4-channel toggle switch<br>5 x LEDs (3 x User LEDs, 1 x Power indicator, 1 RGB LED)<br>1 x Buzzer |

*Z-turn Board V2 Hardware Specification*

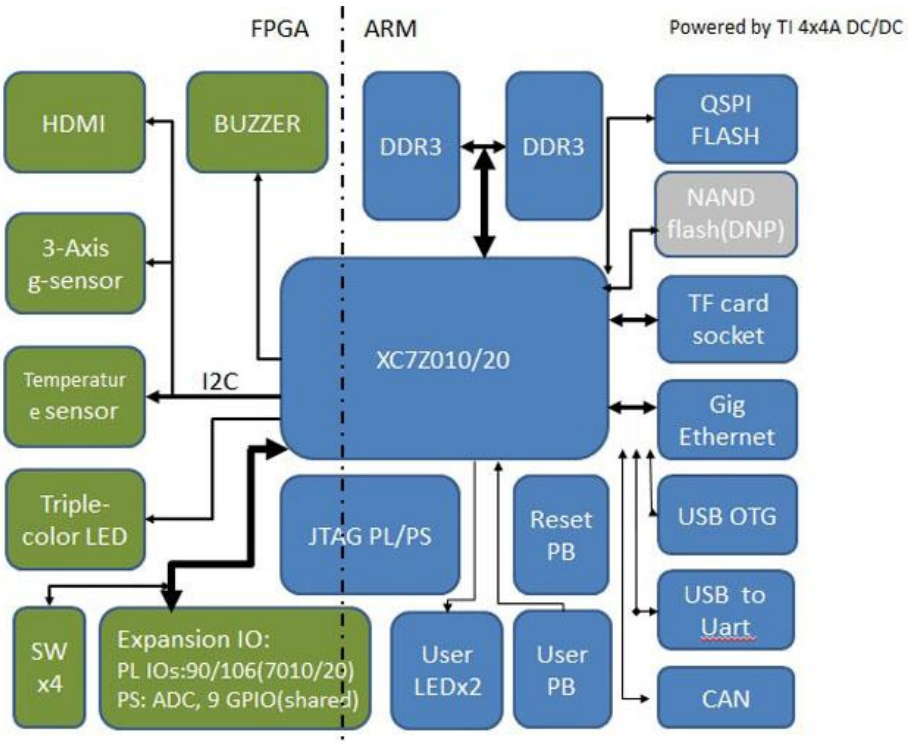
On the rear of the board, there are two 1.27mm pitch 80-pin SMT female connectors to allow the availability of 96 (for 7010) or 106 (for 7020) user I/O and configurable as up to 39 LVDS pairs I/O. The Pinouts information is as below:

| Default Function | BGA | Pin Name | CN1 | | Pin Name | BGA | Default Function |
|---|---|---|---|---|---|---|---|
| | | VDD_5V | 1 | 2 | GND | | |
| | | VDD_3.3V | 3 | 4 | GND | | |
| | | VDD18_KEY_BACKUP | 5 | 6 | JTAG_TCK | F9 | |
| | U7 | IO_L11P_T1_13 | 7 | 8 | JTAG_TMS | J6 | |
| | V7 | IO_L11N_T1_13 | 9 | 10 | JTAG_TDI | G6 | |
| | T9 | IO_L12P_T1_13 | 11 | 12 | JTAG_TDO | F6 | |
| | U10 | IO_L12N_T1_13 | 13 | 14 | JTAG_NTRST | | |
| | | VDDIO_13_PL | 15 | 16 | IO_L14P_T2_13 | Y9 | |
| | Y7 | IO_L13P_T2_13 | 17 | 18 | IO_L14N_T2_13 | Y8 | |
| | Y6 | IO_L13N_T2_13 | 19 | 20 | IO_L21P_T3_13 | V11 | |
| | V8 | IO_L15P_T2_13 | 21 | 22 | IO_L21N_T3_13 | V10 | |
| | W8 | IO_L15N_T2_13 | 23 | 24 | GND | | |
| | | GND | 25 | 26 | IO_L1P_T0_34 | T11 | |
| | T12 | IO_L2P_T0_34 | 27 | 28 | IO_L1N_T0_34 | T10 | |
| | U12 | IO_L2N_T0_34 | 29 | 30 | IO_L3P_T0_34 | U13 | |
| | V12 | IO_L4P_T0_34 | 31 | 32 | IO_L3N_T0_34 | V13 | |
| | W13 | IO_L4N_T0_34 | 33 | 34 | GND | | |
| | | GND | 35 | 36 | IO_L5P_T0_34 | T14 | |
| | P14 | IO_L6P_T0_34 | 37 | 38 | IO_L5N_T0_34 | T15 | |
| RGB LED | R14 | IO_L6N_T0_34 | 39 | 40 | IO_L7P_T1_34 | Y16 | RGB LED |
| | W14 | IO_L8P_T1_34 | 41 | 42 | IO_L7N_T1_34 | Y17 | RGB LED |
| | Y14 | IO_L8N_T1_34 | 43 | 44 | GND | | |
| 12M | U14 | IO_L11P_T1_34 | 45 | 46 | IO_L10P_T1_34 | V15 | LCD_DATA2 |
| | U15 | IO_L11N_T1_34 | 47 | 48 | IO_L10N_T1_34 | W15 | LCD_DATA3 |
| | | VDDIO_34_PL | 49 | 50 | IO_L13P_T2_34 | N18 | LCD_DATA6 |
| LCD_DATA0 | T16 | IO_L9P_T1_34 | 51 | 52 | IO_L13N_T2_34 | P19 | LCD_DATA7 |
| LCD_DATA1 | T20 | IO_L15P_T2_34 | 53 | 54 | GND | | |
| LCD_DATA4 | U18 | IO_L12P_T1_34 | 55 | 56 | IO_L15P_T2_34 | T20 | LCD_DATA10 |
| LCD_DATA5 | U19 | IO_L12N_T1_34 | 57 | 58 | IO_L15N_T2_34 | U20 | LCD_DATA11 |
| LCD_DATA8 | N20 | IO_L14P_T2_34 | 59 | 60 | IO_L17P_T2_34 | Y18 | LCD_DATA14 |
| LCD_DATA9 | P20 | IO_L14N_T2_34 | 61 | 62 | IO_L17N_T2_34 | Y19 | LCD_DATA15 |
| LCD_DATA12 | V20 | IO_L16P_T2_34 | 63 | 64 | IO_L19P_T3_34 | R16 | LCD_DE |
| LCD_DATA13 | W20 | IO_L16N_T2_34 | 65 | 66 | IO_L19N_T3_34 | R17 | LCD_PCLK |
| | | GND | 67 | 68 | GND | | |
| LCD_HSYNC | W16 | IO_L18N_T2_34 | 69 | 70 | IO_L18P_T2_34 | V16 | LCD_VSYNC |
| I2S_SCLK | T17 | IO_L20P_T3_34 | 71 | 72 | IO_L20N_T3_34 | R18 | I2S_FSYNC_OUT |
| I2S_FSYNC_IN | V18 | IO_L21N_T3_34 | 73 | 74 | IO_L21P_T3_34 | V17 | I2S_Dout |
| I2S_Din | W18 | IO_L22P_T3_34 | 75 | 76 | IO_L24P_T3_34 | P15 | I2C0_SDA |
| HDMI_INT | W19 | IO_L22N_T3_34 | 77 | 78 | IO_L24N_T3_34 | P16 | I2C0_SCL |
| MEMS_INTn | N17 | IO_L23P_T3_34 | 79 | 80 | IO_L23N_T3_34 | P18 | BP |

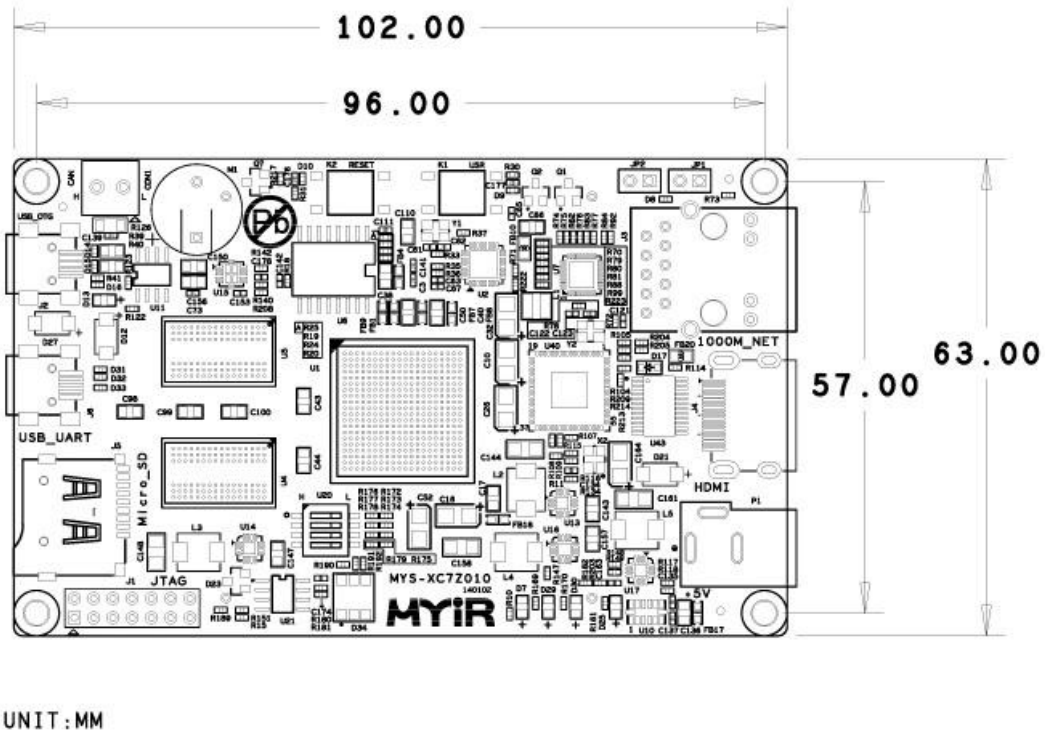
*Pinouts of CN1*

| Default Function | BGA | Pin Name | CN2 | | Pin Name | BGA | Default Function |
|---|---|---|---|---|---|---|---|
| | | VDD_5V | 1 | 2 | GND | | |
| | | VDD_3.3V | 3 | 4 | GND | | |
| | K9 | XADC_INP0 | 5 | 6 | DXP_0 | M9 | |
| | L10 | XADC_INN0 | 7 | 8 | DXN_0 | M10 | |
| | | XADC_VCC | 9 | 10 | GND | | |
| PS_USER_LED1 | E6 | PS_MIO0_500 | 11 | 12 | PS_MIO10_500 | E9 | UART0_RX |
| NAND_REn | D5 | PS_MIO8_500 | 13 | 14 | PS_MIO11_500 | C6 | UART0_TX |
| PS_USER_LED2 | B5 | PS_MIO9_500 | 15 | 16 | PS_MIO14_500 | C5 | CAN0_RX |
| I2C1_CLK | D9 | PS_MIO12_500 | 17 | 18 | PS_MIO15_500 | C8 | CAN0_TX |
| I2C1_SDA | E8 | PS_MIO13_500 | 19 | 20 | GND | | |
| | | GND | 21 | 22 | IO_L2P_T0_35 | B19 | |
| | C20 | IO_L1P_T0_35 | 23 | 24 | IO_L2N_T0_35 | A20 | |
| | G20 | IO_L18N_T2_35 | 25 | 26 | IO_L4P_T0_35 | D19 | |
| | E17 | IO_L3P_T0_35 | 27 | 28 | IO_L4N_T0_35 | D20 | |
| | D18 | IO_L3N_T0_35 | 29 | 30 | GND | | |
| | | GND | 31 | 32 | IO_L6P_T0_35 | F16 | |
| | E18 | IO_L5P_T0_35 | 33 | 34 | IO_L6N_T0_35 | F17 | |
| | E19 | IO_L5N_T0_35 | 35 | 36 | IO_L8P_T1_35 | M17 | |
| | M19 | IO_L7P_T1_35 | 37 | 38 | IO_L8N_T1_35 | M18 | |
| | M20 | IO_L7N_T1_35 | 39 | 40 | GND | | |
| | | GND | 41 | 42 | IO_L10P_T1_35 | K19 | |
| | L19 | IO_L9P_T1_35 | 43 | 44 | IO_L10N_T1_35 | J19 | |
| | L20 | IO_L9N_T1_35 | 45 | 46 | IO_L12P_T1_35 | K17 | |
| | L16 | IO_L11P_T1_35 | 47 | 48 | IO_L12N_T1_35 | K18 | |
| | L17 | IO_L11N_T1_35 | 49 | 50 | GND | | |
| | | VDDIO_35_PL | 51 | 52 | IO_L14P_T2_35 | J18 | |
| | H16 | IO_L13P_35 | 53 | 54 | IO_L14N_T2_35 | H18 | |
| | H17 | IO_L13N_35 | 55 | 56 | IO_L16P_T2_35 | G17 | |
| | F19 | IO_L15P_T2_35 | 57 | 58 | IO_L16N_T2_35 | G18 | |
| | F20 | IO_L15N_T2_35 | 59 | 60 | GND | | |
| | | GND | 61 | 62 | IO_L18P_T2_35 | G19 | |
| | J20 | IO_L17P_T2_35 | 63 | 64 | IO_L18N_T2_35 | G20 | |
| | H20 | IO_L17N_T2_35 | 65 | 66 | IO_L20P_T3_35 | K14 | |
| | H15 | IO_L19P_T3_35 | 67 | 68 | IO_L20N_T3_35 | J14 | |
| | G15 | IO_L19N_T3_35 | 69 | 70 | GND | | |
| | | GND | 71 | 72 | IO_L22P_T3_35 | L14 | |
| | N15 | IO_L21P_T3_35 | 73 | 74 | IO_L22N_T3_35 | L15 | |
| | N16 | IO_L21N_T3_35 | 75 | 76 | IO_L24P_T3_35 | K16 | |
| | M14 | IO_L23P_T3_35 | 77 | 78 | IO_L24N_T3_35 | J16 | |
| | M15 | IO_L23N_T3_35 | 79 | 80 | GND | | |

*Pinouts of CN2*




*Z-turn Board V2 Function Block Diagram*




*Z-turn Board V2 Dimension Chart*

**Software Features**

| Item | Features | Description | Remark |
|---|---|---|---|
| Cross compiler | gcc 6.2.1 | gcc version 6.2.1 (Linaro GCC Snapshot 6.2-2016.11) | |
| Boot program | BOOT.BIN | First boot program including FSBL, bitstream and u-boot | Source code provided |
| Linux Kernel | Linux 4.14.0 | Customized kernel for Z-turn Board V2 | Source code provided |
| Drivers | USB OTG | USB OTG driver | Source code provided |
| | Ethernet | Gigabit Ethernet driver | Source code provided |
| | MMC/SD/TF | MMC/SD/TF card driver | Source code provided |
| | CAN | CAN driver | Source code provided |
| | LCD Controller | LCD driver | Source code provided |
| | HDMI | HDMI driver | Source code provided |
| | Button | Button driver | Source code provided |
| | UART | UART driver | Source code provided |
| | LED | LED driver | Source code provided |
| | GPIO | GPIO driver | Source code provided |
| | Buzzer | Buzzer driver | Source code provided |
| | G-Sensor | Three-axis acceleration sensor driver | Source code provided |
| | Temperature Sensor | Temperature sensor driver | Source code provided |
| File System | Ramdisk | Ramdisk system image | |
| | Ubuntu Desktop 18.04 | Tar file and TF card image file | |

*Z-turn Board V2 Software Features*

**Order Information**

| Item | Part No. | Packing List |
|---|---|---|
| Z-turn Board V2 | MYS-7Z010-V2-0E1D-667-C-S | ✓ One Z-turn Board V2 (for Zynq-7010)<br>✓ One 16GB TF card |
| | MYS-7Z020-V2-0E1D-766-C-S | ✓ One Z-turn Board V2 (for Zynq-7020)<br>✓ One 16GB TF card |
| Z-turn Kit V2 | MYS-7Z010-V2-0E1D-667-C | ✓ One Z-turn Board V2 (for Z-7010 or 7020)<br>✓ One 1.5m cross Ethernet cable<br>✓ One 1.5m Mini USB2.0 cable<br>✓ One Mini USB OTG Data cable<br>✓ One HDMI cable<br>✓ One 16GB TF card<br>✓ One 5V/2A Power adapter |
| | MYS-7Z020-V2-0E1D-766-C | |
| MY-CAM002U Camera Module | MY-CAM002U | USB Camera Module |
| Z-turn IO Cape | MY-CAPE001 | IO Extension Board for Z-turn Board V2 |
| MY-TFT070CV2 7-inch LCD Module | MY-TFT070CV2 | Support through Z-turn IO Cape with capacitive touch screen) |

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