

FZ3 Card Overview

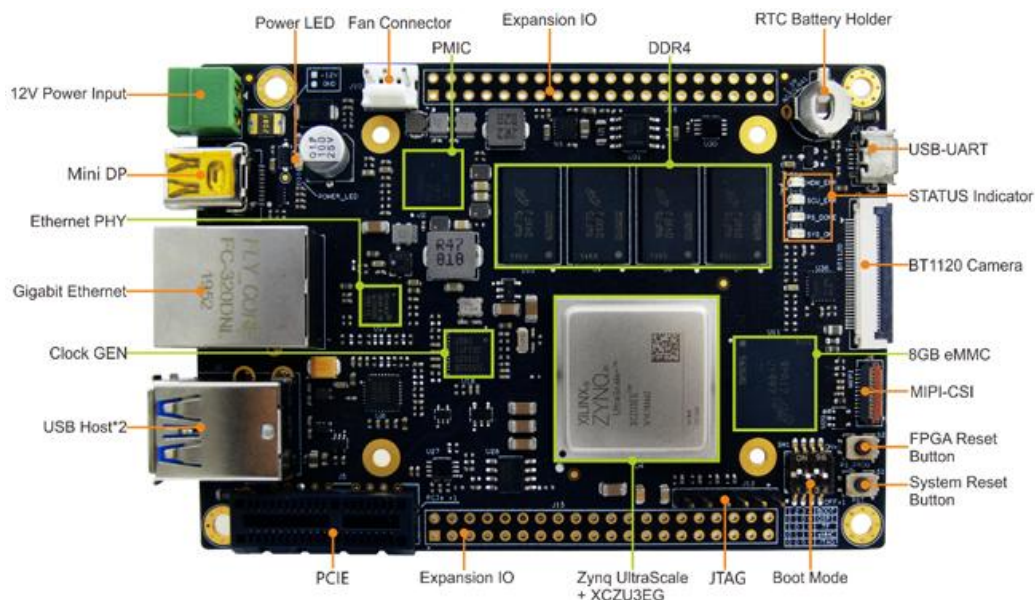


- ✓ Xilinx Zynq UltraScale+ ZU3EG MPSoC based on 1.2 GHz Quad Arm Cortex-A53 and 600MHz Dual Cortex-R5 Cores
- ✓ 4GB DDR4 SDRAM (64-bit, 2400MHz)
- ✓ 8GB eMMC Flash, 32MB QSPI Flash, 32KB EEPROM
- ✓ USB 2.0, USB 3.0, Gigabit Ethernet, TF, DisplayPort (DP), PCIe, MIPI-CSI, BT1120, USB-UART, JTAG...
- ✓ Computing Power up to 1.2TOPS, MobileNet up to 100FPS
- ✓ Ready-to-Run PetaLinux 2020.1
- ✓ Supports Xilinx Vitis Software Development Platform
- ✓ Supports Baidu's PaddlePaddle Deep Learning AI Framework

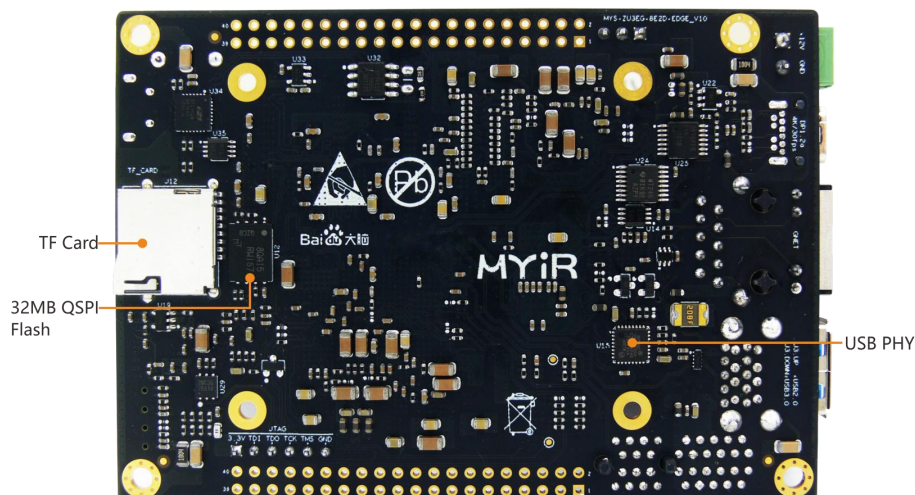
The **FZ3 Card** is a powerful deep learning accelerator card based on [Xilinx Zynq UltraScale+ ZU3EG MPSoC](#) which features a 1.2 GHz quad-core ARM Cortex-A53 64-bit application processor, a 600MHz dual-core real-time ARM Cortex-R5 processor, a Mali400 embedded GPU and rich FPGA fabric. Besides, it integrates **4GB DDR4, 8GB eMMC, 32MB QSPI Flash and 32KB EEPROM** as well as many peripherals including **USB 2.0, USB 3.0, Gigabit Ethernet, TF, DisplayPort (DP), PCIe interface, MIPI-CSI, BT1120 camera, USB-UART, JTAG, IO expansion interfaces, etc.** The rich resources enable users to integrate intelligent hardware easily.

The **FZ3 Card** is able to run **PetaLinux 2020.1** and provided complete BSP. It can support **Xilinx Vitis Software development platform**. It can also support [PaddlePaddle](#) deep learning AI framework which is fully compatible to use **Baidu Brain's AI development tools like EasyDL, AI Studio and EasyEdge** to enable developers and engineers to quickly leverage Baidu-proven technology or deploy self-defined models, enabling faster deployment. Typical applications are AI camera, AI computing device, robotics, intelligent car, intelligent electronic scale, patrol UAV and other embedded intelligent applications.

MYiR provides **FZ3 Kit** which contains the **FZ3 Card** with installed radiator and some necessary accessories including one power adaptor, one 16GB TF card, one mini USB cable and one mini DP to HDMI cable. It helps users start their development rapidly when getting the kit out-of-box right away.



FZ3 Card Top-View



FZ3 Card Bottom-View



FZ3 Kit

Hardware Specification

Zynq® UltraScale+™ MPSoC devices provide 64-bit processor scalability while combining real-time control with soft and hard engines for graphics, video, waveform, and packet processing. Built on a common real-time processor and programmable logic equipped platform, three distinct variants include dual application processor (CG) devices, quad application processor and GPU (EG) devices, and video codec (EV) devices.

| | CG Devices | EG Devices | EV Devices |
|-----------------------|---|---|--|
| Application Processor | Dual-core ARM® Cortex™-A53 MPCore™ up to 1.3GHz | Quad-core ARM Cortex-A53 MPCore up to 1.5GHz | Quad-core ARM Cortex-A53 MPCore up to 1.5GHz |
| Real-Time Processor | Dual-core ARM Cortex-R5 MPCore up to 533MHz | Dual-core ARM Cortex-R5 MPCore up to 600MHz | Dual-core ARM Cortex-R5 MPCore up to 600MHz |
| Graphics Processor | | Mali™-400 MP2 | Mali™-400 MP2 |
| Video Codec | | | H.264 / H.265 |
| Programmable Logic | 103K–600K System Logic Cells | 103K–1143K System Logic Cells | 192K–504K System Logic Cells |
| Applications | <ul style="list-style-type: none"> • Sensor Processing & Fusion • Motor Control • Low-cost Ultrasound • Traffic Engineering | <ul style="list-style-type: none"> • Flight Navigation • Missile & Munitions • Military Construction • Secure Solutions • Networking • Cloud Computing Security • Data Center • Machine Vision • Medical Endoscopy | <ul style="list-style-type: none"> • Situational Awareness • Surveillance/Reconnaissance • Smart Vision • Image Manipulation • Graphic Overlay • Human Machine Interface • Automotive ADAS • Video Processing • Interactive Display |

Zynq UltraScale+ MPSoCs

The Zynq UltraScale+ family provides footprint compatibility to enable users to migrate designs from one device to another. Any two packages with the same footprint identifier code (last letter and number sequence) are footprint compatible. MYiR is using the **XCZU3EG-1SFVC784I** MPSoC for FZ3 CARD by default, the C784 package covers the widest footprint compatibilities that enable users to select devices among CG, EG and EV.



| Pkg | mm | Zynq® UltraScale+™ | | | | | | | | | | | | | | | | | | | | |
|-------|------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|------------|-------|-------|-------|-------|--------|--------|--------|--------|------------|-------|-------|
| | | CG Devices | | | | | | | | | EG Devices | | | | | | | | | EV Devices | | |
| | | ZU2CG | ZU3CG | ZU4CG | ZU5CG | ZU6CG | ZU7CG | ZU9CG | ZU2EG | ZU3EG | ZU4EG | ZU5EG | ZU6EG | ZU7EG | ZU9EG | ZU11EG | ZU15EG | ZU17EG | ZU19EG | ZU4EV | ZU5EV | ZU7EV |
| A484 | 19 | ■ | ■ | | | | | | ■ | ■ | | | | | | | | | | | | |
| A625 | 21 | ■ | ■ | | | | | | ■ | ■ | | | | | | | | | | | | |
| C784 | 23 | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ | | | | | | | | ■ | ■ | |
| B900 | 31 | | ■ | ■ | | ■ | | | | | ■ | ■ | | ■ | | | | | | ■ | ■ | ■ |
| C900 | 31 | | | | ■ | | ■ | | | | | ■ | | | ■ | | | | | | | |
| B1156 | 35 | | | | ■ | | ■ | | | | | ■ | | | ■ | | | | | | | |
| C1156 | 35 | | | | | ■ | | | | | | | | ■ | | | | | | | | ■ |
| B1517 | 40 | | | | | | | | | | | | | | ■ | | | ■ | ■ | | | |
| F1517 | 40 | | | | | | | | | | | | | | ■ | | | ■ | ■ | | | ■ |
| C1760 | 42.5 | | | | | | | | | | | | | | | ■ | | ■ | ■ | | | |
| D1760 | 42.5 | | | | | | | | | | | | | | | | ■ | ■ | ■ | | | |
| E1924 | 45 | | | | | | | | | | | | | | | | | ■ | ■ | | | |

Zynq® UltraScale+™ MPSoC Device Migration Table

The main features for the XCZU2CG, XCZU3CG, XCZU3EG, XCZU4EV and XCZU5EV MPSoC devices are summarized as below.

| Device | XCZU2CG | XCZU3CG | XCZU3EG | XCZU4EV | XCZU5EV |
|---|--|---------------------|---|---------------------------------------|---------------------------------------|
| Logic cells (k) | 103 | 154 | 154 | 192 | 256 |
| CLB Flip-Flops (K) | 94 | 141 | 141 | 176 | 234 |
| CLB LUTs (K) | 47 | 71 | 71 | 88 | 117 |
| Block RAM (Mb) | 5.3 | 7.6 | 7.6 | 4.5 | 5.1 |
| UltraRAM (Mb) | - | - | - | 13.5 | 18.0 |
| DSP Slices | 240 | 360 | 360 | 728 | 1,248 |
| GTX transceivers | PS-GTR4x (6Gb/s) | PS-GTR4x (6Gb/s) | PS-GTR4x (6Gb/s) | PS-GTR4x (6Gb/s), GTH4x (16.3Gb/s) | PS-GTR4x (6Gb/s), GTH4x (16.3Gb/s) |
| Processor Units | | | | | |
| Application Processor Unit | Dual-core ARM® Cortex™-A53 MPCore™ up to 1.3GHz | | Quad-core ARM® Cortex™-A53 MPCore™ up to 1.5GHz | | |
| Memory w/ECC | L1 Cache 32KB I / D per core, L2 Cache 1MB, on-chip Memory 256KB | | | | |
| Real-Time Processor Unit | Dual-core ARM Cortex-R5 MPCore™ up to 600MHz | | | | |
| Memory w/ECC | L1 Cache 32KB I / D per core, Tightly Coupled Memory 128KB per core | | | | |
| Graphics Processing Unit | - | - | Mali™-400 MP2 up to 667MHz | | |
| Video Codec | - | - | - | H.264 / H.265 | |
| Memory L2 Cache | 64KB | | | | |
| External Memory, Connectivity, Integrated Block Functionality | | | | | |
| Dynamic Memory Interface | x32/x64: DDR4, LPDDR4, DDR3, DDR3L, LPDDR3 with ECC | | | | |
| Static Memory Interfaces | NAND, 2x Quad-SPI | | | | |
| High-Speed Connectivity | PCIe® Gen2 x4, 2x USB3.0, SATA 3.1, DisplayPort, 4x Tri-mode Gigabit Ethernet | | | | |
| General Connectivity | 2 x USB 2.0, 2 x SD/SDIO, 2 x UART, 2 x CAN 2.0B, 2 x I2C, 2 x SPI, 4 x 32b GPIO | | | | |
| Power Management | Full / Low / PL / Battery Power Domains | | | | |
| Security | RSA, AES, and SHA | | | | |
| AMS - System Monitor | 10-bit, 1MSPS – Temperature and Voltage Monitor | | | | |

MPSoC device selection guide

The FZ3 Deep Learning Accelerator Card takes full advantages of the Xilinx Zynq UltraScale+ ZU3EG MPSoC. The main features are listed in below table.

| Item | Features |
|---------------------|---|
| SoC | Xilinx Zynq UltraScale+ XCZU3EG-1SFVC784I (ZU3EG, 784 Pin Package) MPSoC - 1.2 GHz 64 bit Quad-core ARM® Cortex™-A53 - 600MHz Dual-core ARM® Cortex™-R5 processor - ARM Mali™-400MP Graphics Processor - 16nm FinFET+ FPGA fabric |
| Memory | 4GB DDR4 SDRAM (64bit, 2400MHz) |
| Storage | 8GB eMMC 32MB QSPI Flash 32KB EEPROM TF card interface |
| Communications | 1 x PCIe 2.1 interface (1-lane) 1 x 10/100/1000Mbps Ethernet 1 x USB 3.0 Host, 1 x USB 2.0 Host 1 x USB-UART debug interface |
| Display | 1 x Mini DisplayPort (DP), 4K/30fps, 2-lane |
| Camera | 1 x MIPI-CSI, FPC_25PIN 4-lane 1 x BT1120, FPC_32PIN 16-bit |
| User I/O | Brought out via two 2.54mm pitch 2x20-pin IO Expansion Interfaces 2 x USB2.0 Host, 1 x CAN, 1 x RS485, 4 x PS_MIO, PL_IO (12 pairs x HD_IO, 8 pairs x HP_IO) |
| Dimensions | 100mm x 70mm (12-layer PCB design) |
| Power supply | DC 12V/2A |
| Working Temp. | -45~85 Celsius |
| Others | 1 x 2.54mm pitch 6-pin JTAG interface 2 x Buttons (1x FPGA Reset, 1 x System Reset) 5 x LEDs (1 x Power LED, Status_LED: 2 x RED, 2 x Green) |
| Software | Supports PetaLinux, Provided with PaddlePaddle deep learning AI framework |
| Target Applications | Evaluation and Prototyping for XCZU3EG Zynq UltraScale+ MPSoC AI Camera AI Computing Box AI Robot Smart car Intelligent electronic scale Patrol UAV |

Features of FZ3 Card



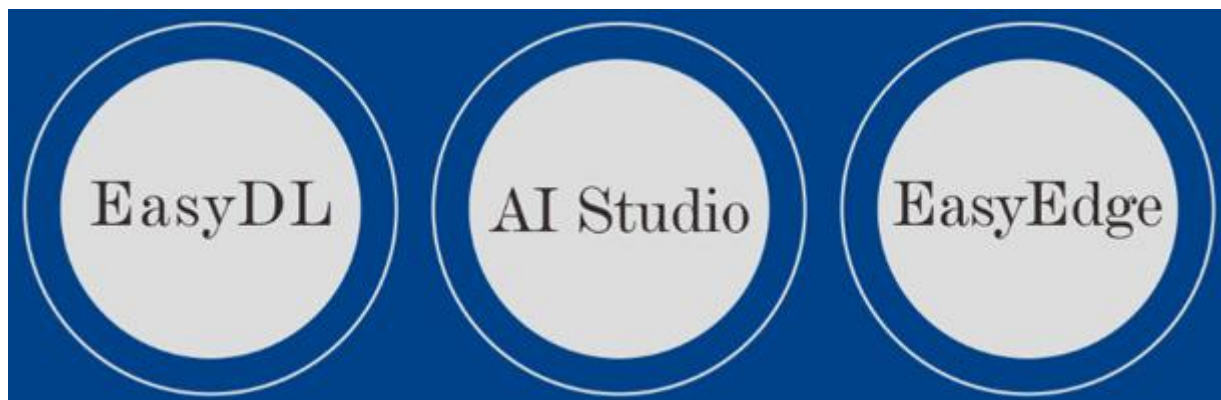
Software Features

The **FZ3 Card** is able to run **PetaLinux 2020.1** and provided with complete BSP. The features are as following:

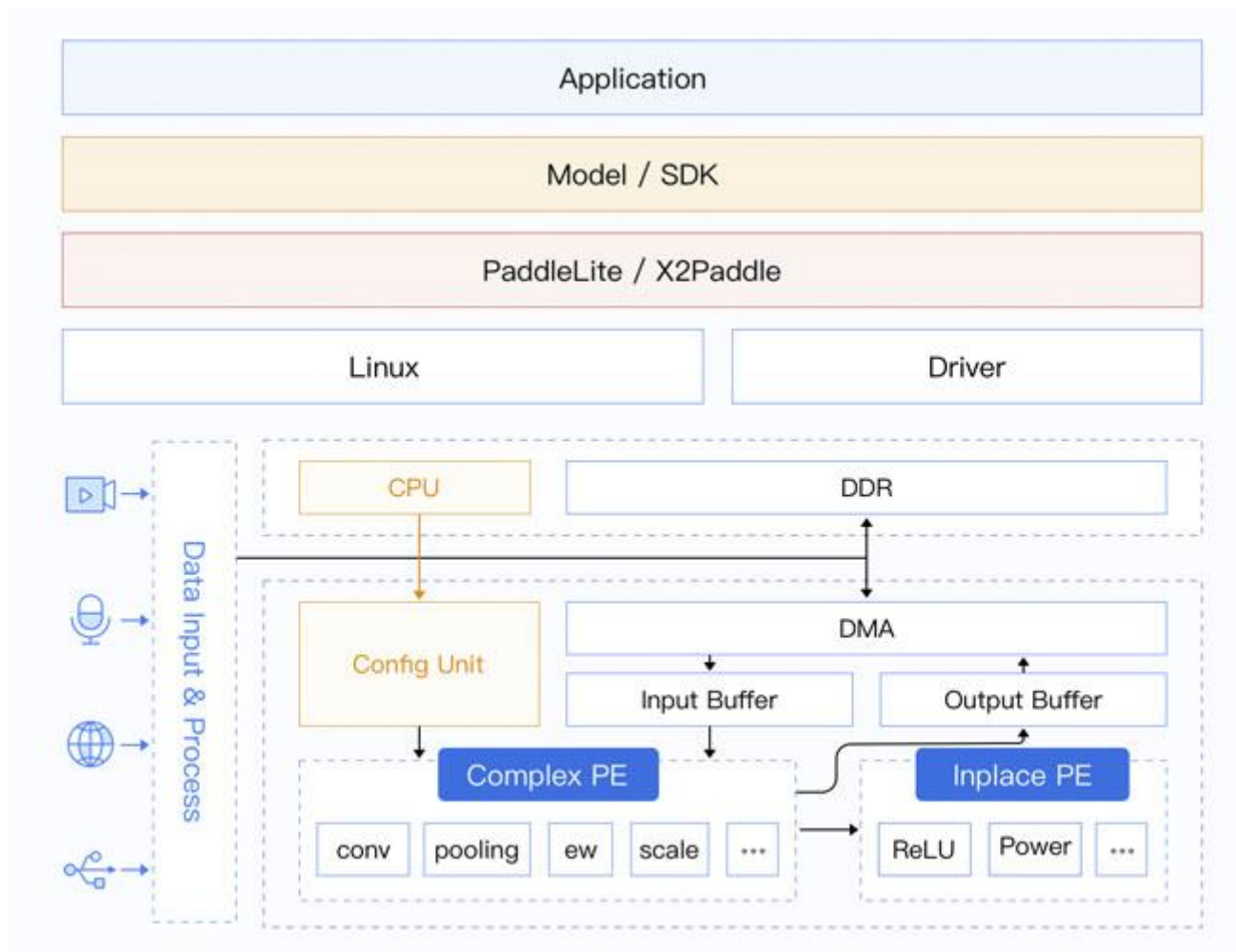
| Item | Features | Description | Source code provided |
|---------------------|-----------------|--|----------------------|
| Tool chains | gcc8.3.0 | gcc version 8.3.0 | |
| | gcc 9.2.0 | aarch64-none-elf-gcc version 9.2.0 | |
| Bootloader | boot.bin | First boot program including FSBL and u-boot2020.01 | Yes |
| Linux Kernel | Linux 5.4.0 | Customized kernel for FZ3 Card | Yes |
| | USB2.0/3.0 Host | USB2.0/3.0 Host driver | Yes |
| | Ethernet | Gigabit Ethernet driver | Yes |
| | MMC/SD/TF | MMC/SD/TF card driver | Yes |
| | Qspi flash | Qspi flash driver | Yes |
| | CAN | CAN driver | Yes |
| | DP | DP driver | Yes |
| | I2C | I2C driver | Yes |
| | UART | UART driver | Yes |
| | Watchdog | Watchdog driver | Yes |
| | GPIO | GPIO driver | Yes |
| | LED | LED driver | Yes |
| | Button | Button driver | Yes |
| | MIPI | MIPI camera driver | Yes |
| Application | LED | LED example | Yes |
| | CAN | CAN example | Yes |
| | Net | Socket example | Yes |
| | QT-Camera | MIPI Camera example | Yes |
| File system | Ramdisk | Ramdisk system image | |
| | Rootfs | Buildroot making including Qt | Yes |
| Petalinux | Petalinux2020.1 | Supports Xilinx Petalinux2020.1 development tool. MYIR provides complete BSP for the FZ3 card. Supports Xilinx Vitis Software Development Platform | |

Features of Linux BSP of FZ3 Card

The **FZ3 Card** supports **PaddlePaddle** deep learning AI framework which is fully compatible to use **Baidu Brain's AI development tools like EasyDL, AI Studio and EasyEdge** to enable developers and engineers to quickly leverage Baidu-proven technology or deploy self-defined models, enabling faster deployment.



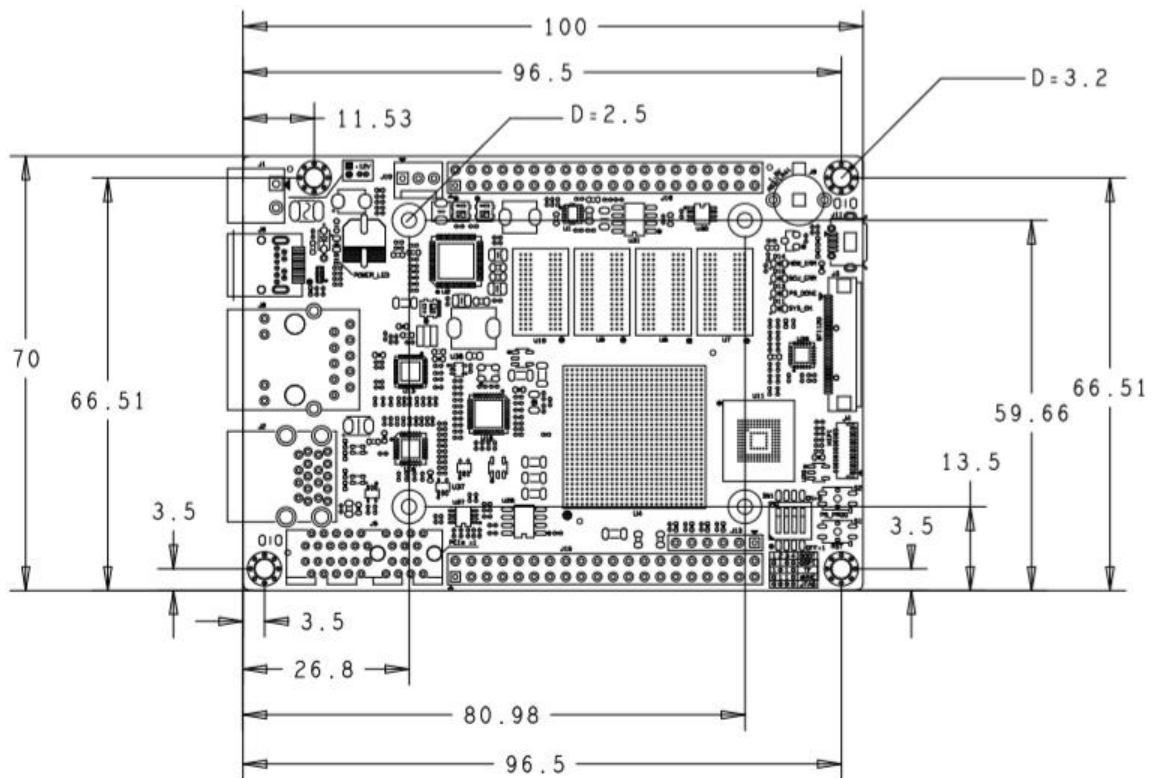
Baidu Brain's AI Development Tools



Software Architecture of FZ3 Card



Dimension Chart



Dimension Chart of FZ3 Card



Order Information

| Item | Packing List |
|--|--|
| FZ3 Card (Part No.: MYS-ZU3EG-8E4D-EDGE) | ✓ FZ3 Deep Learning Accelerator Card (without any accessories, only production recommended) |
| FZ3 Kit (Part No.: MYS-ZU3EG-8E4D-EDGE-K2) | <ul style="list-style-type: none"> ✓ One FZ3 Card (Installed with active heatsink) ✓ One 12V/2A Power Adapter ✓ One Mini USB Cable ✓ One 16GB TF Card ✓ One Mini DP to HDMI Cable |
| Note: Please contact MYIR to get development resources (including documentations and software BSP) download link after placing your order. | |



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