

The **Vortex86EX3** system-on-chip (SoC) is designed to meet the rigorous demands of modern embedded industrial applications. This compact and energy-efficient SoC is a fully static 32-bit x86 processor with independent two-core architecture, ensuring broad compatibility with a variety of operating systems including Windows, Linux, DOS, QNX, VxWorks, and a wide range of 32-bit real-time operating systems (RTOS).

At the heart of the Vortex86EX3 lies its independent two-core design, featuring a master and a slave core. This architecture permits simultaneous operation of two distinct operating systems, facilitating internal FIFO COM communication to segregate I/O tasks from user interface and data operations. This separation is critical for maintaining hard real-time performance across different operational domains. The shared LPDDR4 memory is intelligently allocated and free assigned between the two cores, which also independently house their own L1 and L2 cache, optimizing the processing efficiency and speed.

The Vortex86EX3 is tailored for embedded solutions, incorporating a various of built-in I/O

interfaces and buses. The integration of UART, I2C, SPI, GPIO, Printer, CAN, USB, ADC, Ethernet, HD Audio, MCM PWM, SD/eMMC, LCD, and even legacy ISA, PCI, and PCIe buses, all within a single 17x17mm FCBGA package. This array of interfaces ensures that the Vortex86EX3 can cater to a wide range of industrial needs without the clutter of additional components.

Flexibility is further enhanced by the SoC's 20-port x 8-bit, 160-pin, I/O CrossBar interface, which allow the full customization of the SoC's functionality to match specific application requirements. The CrossBar interface makes it possible to design compact PCB without compromising on the system's capabilities or performance. Moreover, the Vortex86EX3's I/O interfaces can be freely assigned to either the master or slave core through firmware.

The Vortex86EX3 SoC presents an ideal solution for developers looking to create cost-effective, compact, and power-efficient embedded systems. Its unique two-core design and extensive I/O options make it a versatile and robust choice for industrial applications.

## Features

- **X86 Processor**
  - **two independent Master & Slave cores.**
    - 6-stage pipeline
    - Clock support from 1.2 up to 1.6GHz
- **Floating Point Unit Support**
- **Branch Prediction Unit**
  - Branch target buffer
- **Translation Lookaside Buffer**
  - 32 I/D translation lookaside buffer
- **Embedded I/D Separated L1 Cache**
  - 32-KByte I-Cache, 32-KByte D-Cache
- **Embedded L2 Cache**
  - 4-way 256KB L2 Cache
  - Write through or write back policy
- **LPDDR4 Control Interface**
  - 32 bits data bus
  - 2 ranks
  - Support inline ECC
  - DRAM size from 256MB up to 8GB
- **LCD Interface**
  - 24-bit DVO Digital Interface
- **SD Interface x2**
  - Support SDSC, SDHC and SDXC
  - Support eMMC v5.X
- **Fast Ethernet MAC and PHY x2**
- **PCIE Host/Target Gen 2 x2 Interface**
- **USB 2.0 Host Interface x2**
- **USB Device Interface**
- **HDA Controller**
- **12bit ADC Interface x 2**
  - 8 channels
  - Support DMA Controller
- **I<sup>2</sup>C bus x8**
  - Compliant with V2.1
- **Boot SPI Interface**
  - Support flash size up to 128 MB
  - Support 4 IO mode
- **General Purpose SPI Controller x8**
  - Support SPI Device x2 (SPI\_CS# x2)
  - Support DMA Controller
- **CAN Bus Interface x3**
  - Compatible with CAN 2.0A/2.0B
  - Support CAN FD
- **Motion Control Interface x6**
  - Configurable to PWM/Servo/Sensor Interface mode
  - Controller interconnect to the other with routing network in the same group

- **CrossBar Interface**
  - 20 CrossBar ports for digital function select. (each port is 8 pins, total 160 pins)
- **ISA Bus Interface**
  - AT clock programmable
  - 8/16 Bit ISA device with Zero-Wait-State
  - Support Max ISA Clock 33MHz
- **DMA Controller x2**
- **Programmable Interrupt Controller**
- **Advanced Programmable Interrupt Controller (APIC)**
- **MTBF Counter**
- **Counter / Timers**
  - 1 set of 8254 timer controller
- **Real Time Clock**
  - Less than 2.5uA (1.8V) power consumption while chip is power-off.
- **FIFO UART Port x 10 ( 10 sets COM Port )**
  - Compatible with 16C550 / 16C552
  - Support programmable baud rate generator with data rate from 50 to 20M bps
  - Support TXD\_En Signal on COM1-10
- **Parallel Port**
  - Support SPP/EPP/ECP mode
- **General Programmable I/O**
  - Support 160 programmable I / O pins
  - Support GPIO Interrupt Controller (input/output) x2
- **PS / 2 Keyboard and Mouse Interface**
  - Compatible with 8042 controller
- **Speaker out**
- **General Shift Interface Support**
  - 3 channels
- **JTAG Interface**
- **Input Clock**
  - 25 MHz
  - 32.768 KHz
- **Output Clock**
  - one clock output selects from 14.318MHz /24MHz /25MHz /50MHz /ISA Clock
- **Operating Voltage Range**
  - Core voltage: 0.9 V ± 5%
  - I/O voltage: 1.1V ± 5%, 1.8V ± 5 %, .3 V ± 10 %
- **Operating Temperature**
  - -20°C ~ 70°C
  - -40°C ~ 85°C
- **Package Type**
  - 17x17mm FCBGA

## Vortex86EX3 System Block Diagram

