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EtherCAT Slave Controller with Dual-Core MCU



The AX58400 EtherCAT Slave Controller w/ Dual-Core MCU is a System-in-Package (SiP) product based on the STM32H755 microcontroller from STMicroelectronics. AX58400 is equipped with Dual-Core 32-bit ARM® Cortex®-M7 core with DSP extension runs up to 480 MHz, 32-bit ARM® Cortex®-M4 core with Adaptive Real-Time Accelerator (ST ART Accelerator™) runs up to 240 MHz and EtherCAT Slave Controller (ESC) with two integrated Fast Ethernet PHYs. AX58400 supports AES/TDES/HASH/HMAC hardware cryptographic accelerators, ROP/PCROP/Anti-tamper security techniques, true random number generator, and additional communication interfaces such as 10/100Mbps Ethernet MAC, USB OTG, Camera I/F, TFT-LCD Controller, JPEG Codec, SPI/UART/I2C/I2S/SAI/CAN/SDMMC/ADC/DAC/HDMI-CEC/PWM/DFSDM, etc.

The AX58400 is interoperable with all EtherCAT systems with standard EtherCAT protocols such as CoE, FoE, VoE, etc. and is suitable for motor/motion control, digital I/O control, sensors data acquisition, robotics, EtherCAT IO-Link master, EtherCAT Junction slave module, EtherCAT communication module, etc. industrial automation fieldbus applications.

Key Features

- **A System-in-Package (SiP) product based on ST STM32H755 microcontroller and ASIX EtherCAT slave controller**
- **STM32H755 Microcontroller**
 - **Dual-Core ARM® Cortex®-M7 & Cortex®-M4 RISC Cores**
 - ARM® Cortex®-M7 core with double-precision FPU and L1 cache: 16 Kbytes of data and 16 Kbytes of instruction cache, running up to 480 MHz
 - ARM® Cortex®-M4 core with FPU, Adaptive Real-Time Accelerator (ST ART Accelerator™) for internal Flash and external memories, running up to 240 MHz
 - Dual bank 2 Mbytes Flash memory and 1 Mbyte SRAM
 - Dual mode Quad-SPI memory interface up to 133 MHz
- **Communication/Analog Interfaces**
 - 1x 10/100Mbps Ethernet MAC with IEEE 1588
 - 2x USB OTG interfaces
 - 1x Digital Camera interface
 - 4x I2C, 6x SPI, 3x I2S, 4x SAI, 2x CAN
 - 4x UART, 4x USART and 1x LPUART
 - 1x SPDIFRX interface, 1x SWPMI
 - 2x SDMMC host interfaces (SD/SDIO/MMC)
 - 1x HDMI-CEC
 - 3x 16-bit ADC, 2x 12-bit DAC
 - 1x Die Temperature Sensor (DTS)
 - 2x Ultra-low-power Analog Comparators
 - 2x Operational Amplifiers
 - 1x DFSDM (Digital Filters for Sigma Delta Modulator)
 - Up to 97 GPIOs with interrupt capability
- **Graphics**
 - TFT-LCD controller up to XGA resolution
 - Hardware JPEG Codec
 - ST Chrom-ART graphical hardware Accelerator™ (DMA2D) to reduce CPU loading

Block Diagram



EtherCAT®

■ Timers and Watchdog

- 1x high-resolution timer (2.1 ns max resolution)
- 2x 32-bit timers with up to 4 IC/OC/PWM or pulse counter and quadrature (incremental) encoder input (up to 240 MHz)
- 2x 16-bit advanced motor control timers (up to 240 MHz)
- 10x 16-bit general-purpose timers (up to 240 MHz)
- 5x 16-bit low-power timers (up to 240 MHz)
- 4x watchdogs (independent and window)
- 2x SysTick timers
- RTC with sub-second accuracy and hardware calendar

■ Clock Management

- Internal oscillators: 64 MHz HSI, 48 MHz HSI48, 4 MHz CSI, 32 KHz LSI
- External oscillators: 4~48 MHz HSE, 32.768 KHz LSE
- 3x PLLs with Fractional mode

■ Low-power Consumption

- VBAT battery operating mode with charging capability
- CPU and domain power state monitoring pins
- 2.95 μ A in Standby mode (Backup SRAM OFF, RTC/LSE ON)
- High power-efficiency SMPS step-down converter regulator

to directly supply VCORE and/or external circuitry

- Low-power modes: Sleep, Stop, Standby and VBAT supporting battery charging

■ Security

- Return-Oriented Programming (ROP), Proprietary Code Read-Out Protection (PC-ROP), active anti-tamper

■ Cryptographic Accelerator

- AES-128/192/256, Triple-DES, HASH (MD5/SHA-1/SHA-2), HMAC hardware cryptographic accelerators
- True Random Number Generator (RNG)

■ 96-bit Unique Identifier (UID)

● EtherCAT Slave Controller (ESC) Sub-system

- 2 Integrated Fast Ethernet PHYs
- 3rd Fast Ethernet MII Port for flexible EtherCAT network configuration
- 9KB DPRAM, 8 FMMUs and 8 Sync Managers
- 64-bit Distributed Clock

● 225LD EHS-TFBGA 13x13 mm, 0.8-mm pitch, RoHS Compliant Package

● Operating Temperature Range: -40 to +85°C

Target Applications

- Motor/Motion Control
- Digital I/O Control
- Robotics
- Sensors Data Acquisition
- EtherCAT IO-Link Master
- EtherCAT Junction Slave Module
- Communication Module
- Operator HMI Interfaces

