



FF3 - MCF532X implementation

This course covers MCF532X ColdFire MCUs, for instance the MCF5329

Objectives

- The course details the low level programming of the V3 core.
- An example of SDRAM controller initialization is provided.
- Interfacing with external devices is explained.
- The interrupt controller is viewed in detail.
- DMA transfers terminated by interrupt is studied.
- A programming example has been developed for each internal peripheral (USB, CAN, serial, I2C, timer).
- The course details the various operating modes supported by the Fast Ethernet Controller, particularly the frame filtering logic.
- This course has been delivered several times to companies developing industrial and medical equipments.

A lot of programming examples have been developed by ACSYS to explain the boot sequence and the operation of complex peripherals, such as Fast Ethernet.

- They have been developed with CodeWarrior compiler and are executed under CodeWarrior debugger.

A more detailed course description is available on request at formation@ac6-formation.com

Prerequisites

- Experience of a 32 bit processor or DSP is mandatory.

Related courses

- Ethernet and switching, reference [N1 - Ethernet and switching](#) course
- USB 2.0, reference [IP2 - USB 2.0](#) course
- CAN bus, reference [IA1 - CAN bus](#) course

Course Environment

- Theoretical course
 - PDF course material (in English) supplemented by a printed version for face-to-face courses.
 - Online courses are dispensed using the Teams video-conferencing system.
 - The trainer answers trainees' questions during the training and provide technical and pedagogical assistance.
- At the start of each session the trainer will interact with the trainees to ensure the course fits their expectations and correct if needed

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

INTRODUCTION TO MCF532X

Overview

- Differences between ColdFires and 68K processors
- 5329 block diagram, differences between 5327, 5328 and 5329
- Internal data paths
- Crossbar switch module
- Memory mapped I/O organization

PROCESSOR CORE

V3 CORE

- V3 core pipeline
- Addressing modes
- Branch instructions
- Data transfer instructions
- Mac instructions
- Control instructions
- Stack management, subroutine call and return
- C to assembly interface, organization of the stack frame
- Exception management : vector table, priority, masking
- Internal SRAM
- Cache basics
- Cache operation, software control
- V3 core pipeline
- Addressing modes
- Branch instructions
- Data transfer instructions
- Mac instructions
- Control instructions
- Stack management, subroutine call and return
- C to assembly interface, organization of the stack frame
- Exception management : vector table, priority, masking
- Internal SRAM
- Cache basics
- Cache operation, software control
- Debug facilities

PLATFORM

HARDWARE IMPLEMENTATION

- Clocking, power management
- Chip configuration module
- Reset control module
- System control module
- Real Time Clock
- Flexbus
- Data transfer sequence

- Burst cycles
- Bus error management
- General Purpose Input / Output module
- DRAM / SDRAM basics
- The 532X SDRAM controller

INTERRUPT CONTROLLERS AND TIMER MODULES

- Vectorized vs auto-vectorized mode
- Interrupt processing sequence
- Prioritization between interrupt controllers
- Low power wake-up operation
- The software watchdog
- Edge port module
- PWM module
- Programmable interrupt timer modules
- DMA timers

THE eDMA CONTROLLER

- EDMA microarchitecture
- Initialization
- Channel linking
- Transfer error management

INTEGRATED I/Os

LIQUID CRYSTAL DISPLAY CONTROLLER

- LCD screen format
- Graphic window on screen
- Display data mapping
- Black-and-White operation
- Color generation
- Frame Rate modulation control

COMMUNICATION CONTROLLERS

- The UART Module
- The SSI,
- The QSPI,
- The I2C controller
- The FlexCAN controller
- The Fast Ethernet Controller, Ethernet basics, addressing, frame format, clock recovery, MII hardware interface, auto-negotiation, buffer management, buffer chaining, address filtering, use of hash tables, full duplex operation, flow control, receive and transmit sequences, error management
- The USB Host module, USB basics, EHCI specification, functional description
- The USB On-The-Go module, ULPI interface, connection of an external PHY, device data structures, device operational model, deviations from the EHCI specification

CRYPTOGRAPHY MODULES

- Message Digest Hardware Accelerator
- Random Number Generation
- Symmetric key hardware accelerator, introduction to data encryption standards
- Data flow, management of input and output FIFOs
- Algorithms : AES, DES, 3DES

- Cipher modes : ECB, CBC, CTR