TI2 - TI STELLARIS CORTEX-M4F BASED MCUs IMPLEMENTATION

This course covers all MCUs belonging to the Stellaris Cortex-M4F family, LM4F100 and LM4F200 SERIES.

Objectives

- *This course has 5 main objectives:*
  - *Describing the hardware implementation and highlighting the pitfalls*
  - *Describing the ARM Cortex-M4F core architecture*
  - *Becoming familiar with CCS or Keil IDE and low level programming*
  - *Describing the units which are interconnected to other modules, such as clocking, interrupt controller and DMA controller, because the boot program generally has to modify the setting of these units*
  - *Describing independent I/O modules and the implementation of the TI Driver Lib.*
- *Note that this course has been designed from the architecture of the most complex STELLARIS Cortex-M4 based device, the LM4F232.*
- *Consequently, a chapter has been designed by Acsys for each possible integrated IP.*
- *ACSYS is able to assist the customer by providing consultancies*
  - *Typical expertises are done during board bringup, hardware schematics review, software debugging, performance tuning.*
  - *ACSYS has also an expertise in FreeRTOS porting and uIP /LWIP or Interniche stack integration.*
- *According to the actual reference chosen by the customer, some chapters may be removed*

This document is necessary to tailor the course to specific customer needs and to define the exact schedule.

Prerequisites and related courses

- *This course provides an overview of the ARM Cortex-M4F core. Our course reference cours RM3 - Cortex-M4 / Cortex-M4F implementation details the operation of this core and particularly details the operation of FPU and DSP instructions.*
- *The following courses could be of interest:*
  - *USB Full Speed High Speed and USB On-The-Go, reference cours IP2 - USB 2.0*
  - *CAN bus, reference cours IA1 - CAN bus*

Environnement du cours

- *Cours théorique*
  - *Support de cours au format PDF (en anglais) et une version imprimée lors des sessions en présentiel*
  - *Cours dispensé via le système de visioconférence Teams (si à distance)*
  - *Le formateur répond aux questions des stagiaires en direct pendant la formation et fournit une assistance technique et pédagogique*
- *Au début de chaque demi-journée une période est réservée à une interaction avec les stagiaires pour s'assurer que le cours répond à leurs attentes et l'adapter si nécessaire*

Audience visée

- *Tout ingénieur ou technicien en systèmes embarqués possédant les prérequis ci-dessus.*

Plan du cours

ARCHITECTURE OF STELLARIS MCUs

- ARM core based architecture
- Description of Series LM4F100 and LM4F200 SoC architecture
- Clarifying the internal data and instruction paths
- Highlighting possible concurrent transactions
- Integrated memories
- SoC mapping

THE ARM CORTEX-M4F CORE

- V7-M core family
- Core architecture
- Programming
- Exception behavior, exception return
- Basic interrupt operation, micro-coded interrupt mechanism
- Memory Protection Unit
- Floating Point unit and DSP instructions

BECOMING FAMILIAR WITH CODE COMPOSER STUDIO OR KEIL IDE

- Getting started with the IDE
- Parameterizing the compiler / linker
- Creating a project from scratch
- C start program

PROGRAMMING AND DEBUGGING

- IEEE 1149.1-1990 compatible Test Access Port (TAP) controller
- Integrated ARM Serial Wire Debug

RESET, POWER AND CLOCKING

- Reset
- Clocking
- Power control

INTERNAL INTERCONNECT

- Bus matrix
- µDMA

HARDWARE IMPLEMENTATION

- Power pins
- Pinout
- GPIO module

INTEGRATED MEMORIES

- Flash memory, this module is not implemented in all STELLARIS devices
- Internal SRAM
- Internal ROM

- Internal EEPROM

TIMERS

- General Purpose Timer Module block
- Capture Compare PWM pins
- Watchdog timers
- Advanced Motion Control

ANALOG MODULES

- 10-bit Analog-to-Digital Converter and Programmable Gain Amplifier
- Analog comparators

CONNECTIVITY AND COMMUNICATION

- SSI
- UART
- I2C
- CAN
- USB Host, Device and OTG