



FM1 - MPC5XX implementation

This course covers MPC55X and MPC56X NXP MCUs

Objectives

- This training highlights differences between MPC55X and MPC56X.
- The hardware implementation is fully described, especially burst transfers.
- A boot program has been developed.
- The course focusses on PowerPC EABI, which is fundamental for low level programmers.
- A generic interrupt handler supporting nesting is introduced.
- TPU3 functions are studied with the help of a logic analyser.
- QADC operating modes are described.
- The course details the internal debug facilities particularly the MPC56X nexus port.

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

- They have been developed with Diab Data compiler and are executed under Lauterbach debugger.

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

Prerequisites and related course

- Experience of a 32-bit processor or DSP is mandatory.
- The following course could be of interest:
 - CAN bus, reference cours [IA1 - Bus CAN](#)

Environnement du cours

- Cours théorique
 - Support PDF (en anglais), imprimé en présentiel ; à distance via Teams.
 - Assistance du formateur tout au long de la formation.
- Chaque session débute par un point avec les stagiaires.

Audience visée

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

Plan du cours

MPC5XX overview

- MPC5XX block diagram
- Internal resources base address definition
- Pinout and pad types
- PDMCR register programming

The rcpu

- History buffer
- Propagation of instructions through the pipeline
- Compliance of the RCPU with the programming environment
- Branch unit, static prediction, MPC56X branch target buffer

- Load / store instructions
- Integer arithmetic and logic instructions
- IEEE754 basics
- Float load / store instructions
- Float arithmetic instructions
- The EABI
- Code and data sections, small data areas benefits
- Exception management : handler table, MSR update, automatic interrupt masking
- Requirements to support exception nesting
- Handler table relocation
- Program regions definition and determination of their attributes in the IMPU
- Data regions definition and determination of their attributes in the DMPU

The usiu module

- Interrupt controller
- IMB peripheral interrupt requests control
- Reset cause enumeration
- Hardware configuration at reset
- Clock synthesizer
- PLL multiplier selection
- System timers : decrementer, time base, RTC, PIT

Hardware implementation

- Endian modes clarification
- External bus interface, arbitration, read and write timing diagrams
- Dynamic bus sizing
- External decode logic design
- Non wrapping burst transfers
- Memory controller, boot chip select, address decode by means of BRx/ORx registers
- Glueless interface with SRAM and FEPRM

Internal memories

- CDR3 Flash EPROM, read page buffers, programming and erasing sequences
- Margin reads
- CALRAM: overlay mode operation
- DPTRAM: TPU emulation mode

Qadce modules

- Analog inputs multiplexing
- Conversion queue priority scheme
- External trigger
- Programming model
- Result formats

Qsmcm modules

- UART controller, differences between SC1 and SC2
- Transmit and receive sequences
- SPI protocol explanation
- Command queue
- Transmit and receive sequences

DLCM2 module

- Transceiver interface
- Block and 4x transfers
- J1850 frame format

MIOS14 module

- Counter prescaler submodule
- Counter submodules
- Double action submodules
- PWM submodules
- Real Time clock submodules

TouCAN 2.0B MODULES

- TouCAN organization
- Label filters configuration through the mask registers
- Bit time phases initialization
- Automatique reply

TPU3 modules

- Real time hardware events processing
- Channel priority scheme
- Interchannel communication
- QOM and NITC functions introduction
- SPI port emulation

Debug facilities

- BDM restrictions : no trace memory
- Watchpoints vs breakpoints
- MPC56X Readi module
- Windriver nexus solution