

EE4800-03

Embedded Control Systems

Lesson 1

Course Overview, 68HC12 Overview

Overview

- Course objectives
- Course overview
- Course policies
- 68HC12 and HCS12 Overview

Course Objectives

- Provide you:
 - fundamental microcontroller programming skills in C, assembly, and mixed language applications
 - functional understanding of microprocessor subsystems
 - Review: ATD, TIM, SCI
 - New: PWM, CAN, RTOS

Course Objectives - continued

- skills to interface to a wide variety of external devices
- methodical procedures for designing complex embedded control systems
- exposure to the most complex embedded control systems
 - multi-processor distributed system
 - single processor, multi-task systems - RTOS

Course Overview

- Structured Design Techniques
- Review C Programming Skills
- Microcontroller Systems Review
- Interrupts
- Input/Output Interfacing Concepts
- Logic Analyzers
- Real World Design Issues
- Real Time Operating Systems
- Distributed Processing Systems - msCAN
- Case Studies

Laboratory Work

- Integral part of course
- Develop:
 - Programming Skills
 - Design Skills
 - Team work skills
 - Team exercise skills
 - Troubleshooting skills

Laboratory Exercises

- Introduction Lab
- Measure Gravitational Constant with TIM System and Interrupt Driven System
- Interrupts: IRQ and RTI
- Multiple Interrupts: Output Compare
- Logic Analyzers
- Weather Station - multi-system laboratory
- Motor Speed Control - multi-system, team exercise

Course Policies

- Review Syllabus
- Key reminders:
 - Must attend and complete all lab assignments
 - Ensure you understand all aspects of lab, you will be tested on lab material
 - Don't allow yourself to be carried through lab assignments by strong lab partner

68HC12 Overview

- Introduced by Motorola 1997
- Instruction Set
 - 209 instructions, multiple addressing modes
- CPU12
 - 16 bit processor
 - variants:
 - “A4” : expanded mode, 8 MHz
 - “B32”: single chip mode, 8 MHz
 - HCS12 series: larger onboard memory, 25 MHz
- Clock speed: 16 MHz crystal, divide by 2 for 8 MHz system clock
 - clock generated by crystal or ceramic resonator

68HC12 Overview (cont)

- Memory: 1K-byte RAM, 4K-bytes EEPROM, expandable to 5M-bytes
- Serial communications: SCI and SPI
 - asynchronous vs. synchronous communication
 - SCI: communications - asynchronous
 - SPI: extend features of 68HC12 - synchronous
- 8 channel analog-to-digital converter
- 8 channel timer
 - input capture, output compare, pulse accumulation
- Background Debug Mode (BDM) - troubleshooting
- Memory-mapped input/output

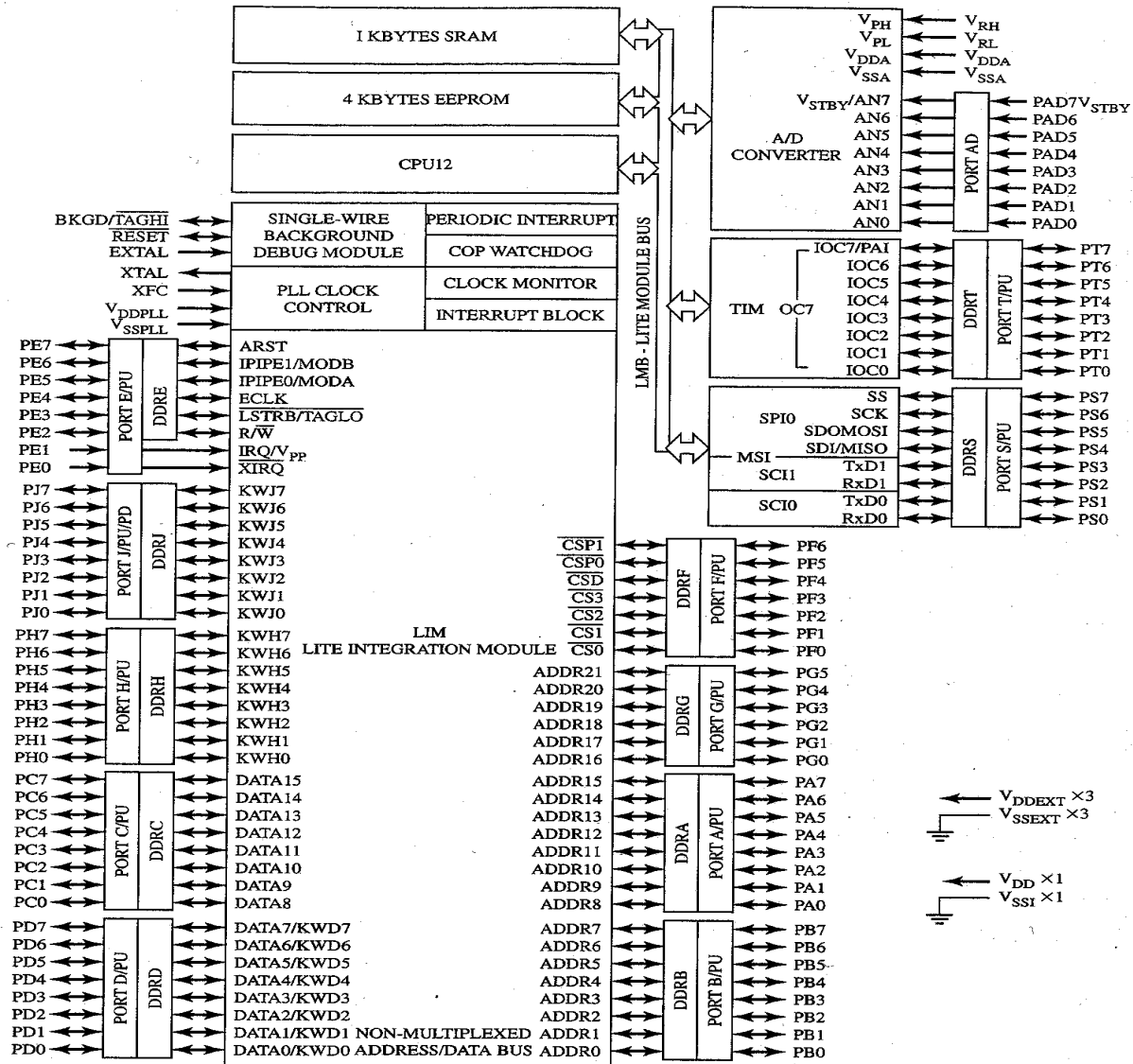


Figure 1.3 The block diagram of the MC68HC812A4 (Motorola).

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1.6 Block Diagrams

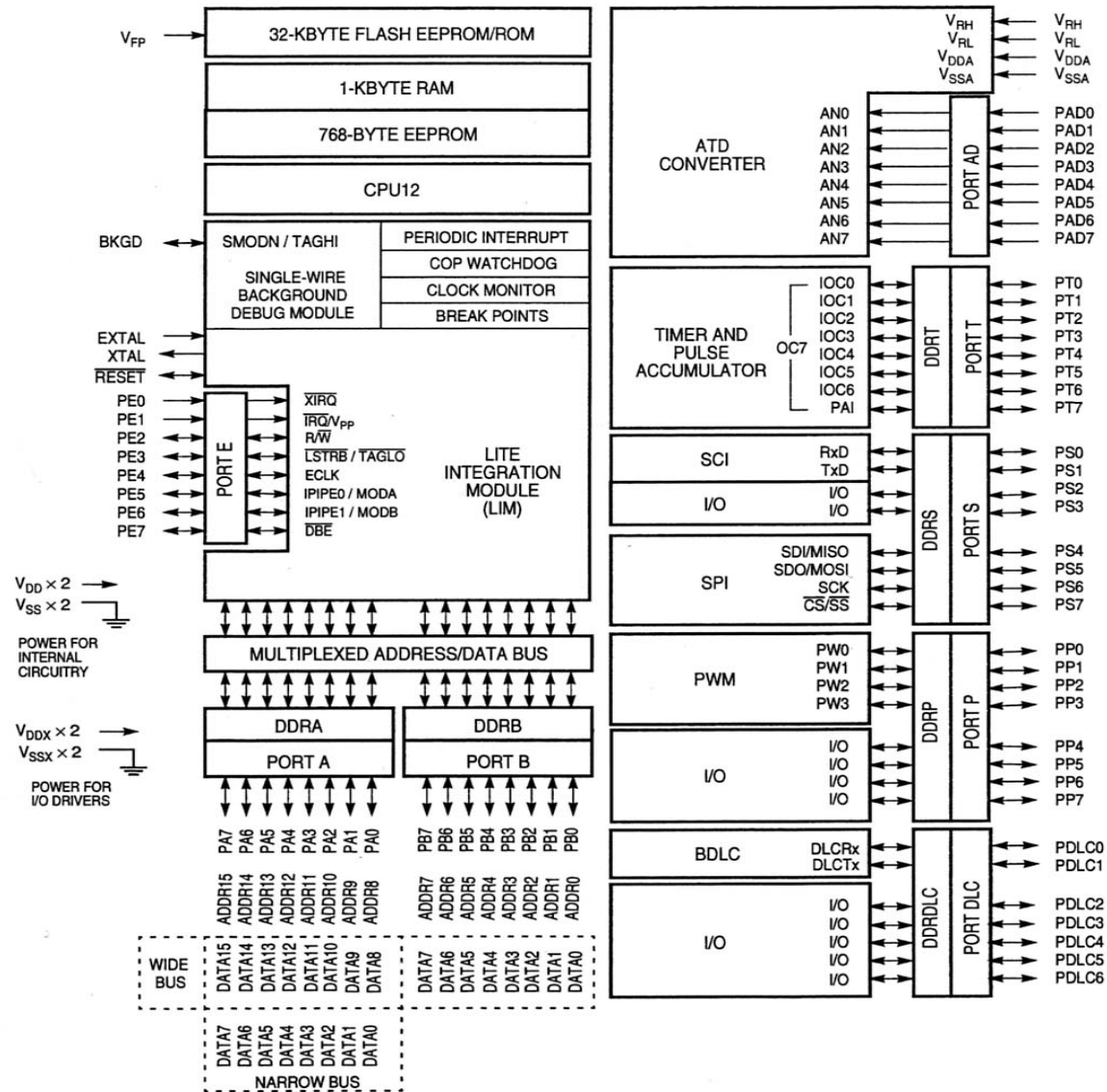


Figure 1-1. Block Diagram for MC68HC912B32 and MC68HC12BE32