

5. AVR Memories

5.1 Overview

This section describes the different memories in the ATmega48P/88P/168P/328P. The AVR architecture has two main memory spaces, the Data Memory and the Program Memory space. In addition, the ATmega48P/88P/168P/328P features an EEPROM Memory for data storage. All three memory spaces are linear and regular.

5.2 In-System Reprogrammable Flash Program Memory

The ATmega48P/88P/168P/328P contains 4/8/16/32K bytes On-chip In-System Reprogrammable Flash memory for program storage. Since all AVR instructions are 16 or 32 bits wide, the Flash is organized as 2/4/8/16K x 16. For software security, the Flash Program memory space is divided into two sections, Boot Loader Section and Application Program Section in ATmega88P and ATmega168P. ATmega48P does not have separate Boot Loader and Application Program sections, and the SPM instruction can be executed from the entire Flash. See SELFPRGEN description in section ["SPMCSR – Store Program Memory Control and Status Register" on page 275](#) and [page 292](#) for more details.

The Flash memory has an endurance of at least 10,000 write/erase cycles. The ATmega48P/88P/168P/328P Program Counter (PC) is 11/12/13/14 bits wide, thus addressing the 2/4/8/16K program memory locations. The operation of Boot Program section and associated Boot Lock bits for software protection are described in detail in ["Self-Programming the Flash, ATmega48P" on page 269](#) and ["Boot Loader Support – Read-While-Write Self-Programming, ATmega88P, ATmega168P and ATmega328P" on page 277](#). ["Memory Programming" on page 294](#) contains a detailed description on Flash Programming in SPI- or Parallel Programming mode.

Constant tables can be allocated within the entire program memory address space (see the LPM – Load Program Memory instruction description).

Timing diagrams for instruction fetch and execution are presented in ["Instruction Execution Timing" on page 13](#).