ATmega48A/PA/88A/PA/168A/PA/328/P

megaAVR® Data Sheet

Introduction

The ATmega48A/PA/88A/PA/168A/PA/328/P is a low power, CMOS 8-bit microcontrollers based on the AVR® enhanced RISC architecture. By executing instructions in a single clock cycle, the devices achieve CPU throughput approaching one million instructions per second (MIPS) per megahertz, allowing the system designer to optimize power consumption versus processing speed.

Features

- High Performance, Low Power AVR® 8-Bit Microcontroller Family
- Advanced RISC Architecture
    - 131 Powerful Instructions – Most Single Clock Cycle Execution
    - 32 x 8 General Purpose Working Registers
    - Fully Static Operation
    - Up to 20 MIPS Throughput at 20MHz
    - On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory Segments
    - 4/8/16/32KBytes of In-System Self-Programmable Flash program memory
    - 256/512/512/1KBytes EEPROM
    - 512/1K/1K/2KBytes Internal SRAM
    - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
    - Data retention: 20 years at 85°C/100 years at 25°C[1]
    - Optional Boot Code Section with Independent Lock Bits
        - In-System Programming by On-chip Boot Program
        - True Read-While-Write Operation
    - Programming Lock for Software Security
- QTouch® library support
    - Capacitive touch buttons, sliders and wheels
    - QTouch and QMatrix™ acquisition
    - Up to 64 sense channels
- Peripheral Features
    - Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
    - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode

- – Real Time Counter with Separate Oscillator
- – Six PWM Channels
- – 8-channel 10-bit ADC in TQFP and QFN/MLF package
  - Temperature Measurement
- – 6-channel 10-bit ADC in PDIP Package
  - Temperature Measurement
- – Programmable Serial USART
- – Master/Slave SPI Serial Interface
- – Byte-oriented 2-wire Serial Interface (Philips I^{2}C compatible)
- – Programmable Watchdog Timer with Separate On-chip Oscillator
- – On-chip Analog Comparator
- – Interrupt and Wake-up on Pin Change
- Special Microcontroller Features
  - – Power-on Reset and Programmable Brown-out Detection
  - – Internal Calibrated Oscillator
  - – External and Internal Interrupt Sources
  - – Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- I/O and Packages
  - – 23 Programmable I/O Lines
  - – 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF
- Operating Voltage:
  - – 1.8 - 5.5V
- Temperature Range:
  - – -40°C to 85°C
- Speed Grade:
  - – 0 - 4MHz@1.8 - 5.5V, 0 - 10MHz@2.7 - 5.5.V, 0 - 20MHz @ 4.5 - 5.5V
- Power Consumption at 1MHz, 1.8V, 25°C
  - – Active Mode: 0.2mA
  - – Power-down Mode: 0.1µA
    - Power-save Mode: 0.75µA (Including 32kHz RTC)