



AVR64EA28/32/48

Preliminary Data Sheet

Introduction

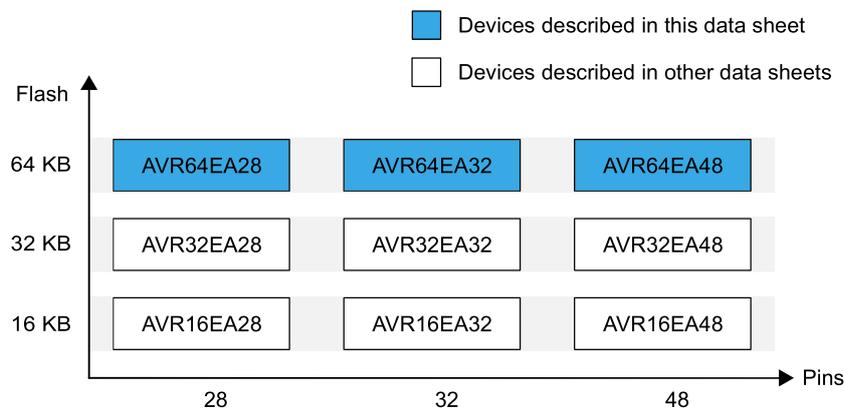
The AVR64EA28/32/48 microcontrollers of the AVR® EA Family are using the AVR® CPU with hardware multiplier running at clock speeds up to 20 MHz. They come with 64 KB of Flash, 6 KB of SRAM, and 512 bytes of EEPROM. The microcontrollers are available in 28-, 32- and 48- pin packages. The AVR® EA Family uses the latest technologies from Microchip with a flexible and low-power architecture, including Event System, accurate analog subsystems, and advanced digital peripherals.

Family Overview

The figure below shows the AVR® EA Family devices, laying out pin count variants and memory sizes:

- Vertical migration is possible without code modification, as these devices are fully pin and feature compatible
- Horizontal migration to the left reduces the pin count and, therefore, the available features

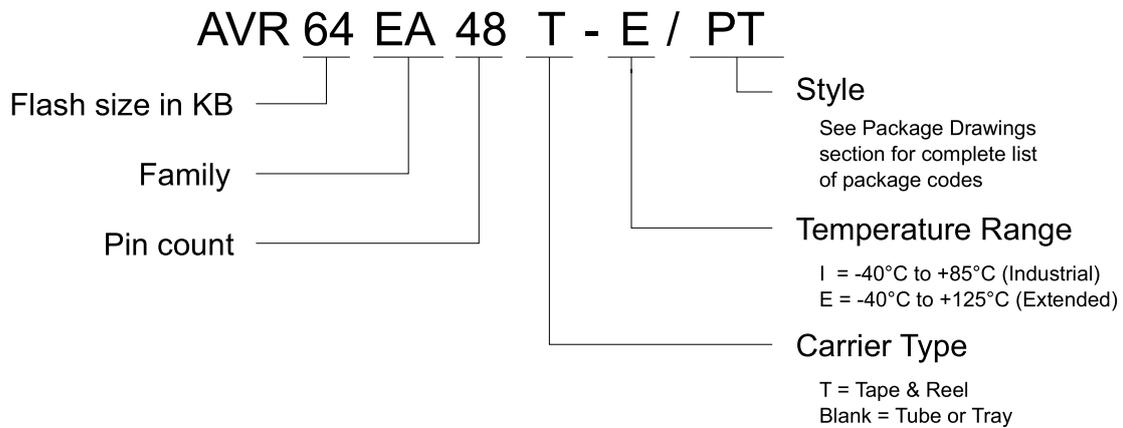
Figure 1. AVR® EA Family Overview



Devices with different Flash memory sizes typically also have different SRAM sizes.

The name of a device in the AVR® EA Family is decoded as follows:

Figure 2. AVR® EA Family Device Designations



Memory Overview

The following table shows the memory overview of the entire family, but further documentation describes only the AVR64EA28/32/48 devices.

Table 1. Memory Overview

Devices	AVR16EA28 AVR16EA32 AVR16EA48	AVR32EA28 AVR32EA32 AVR32EA48	AVR64EA28 AVR64EA32 AVR64EA48
Flash memory (Read-while-write section)	16 KB (12 KB)	32 KB (28 KB)	64 KB (56 KB)
SRAM	2 KB	4 KB	6 KB
EEPROM	512B	512B	512B
User row	64B	64B	64B

Peripheral Overview

The following table shows the peripheral overview of the entire AVR® EA Family, but further documentation describes only the AVR64EA28/32/48 devices.

Table 2. Peripheral Overview

Feature	AVR16EA28 AVR32EA28 AVR64EA28	AVR16EA32 AVR32EA32 AVR64EA32	AVR16EA48 AVR32EA48 AVR64EA48
Pins	28	32	48
Max. frequency (MHz)	20	20	20
16-bit Timer/Counter type A (TCA)	2	2	2
16-bit Timer/Counter type B (TCB)	4	4	4
Real-Time Counter (RTC)	1	1	1
USART/SPI host	3	3	3
SPI host/client	1	1	1

.....continued			
Feature	AVR16EA28 AVR32EA28 AVR64EA28	AVR16EA32 AVR32EA32 AVR64EA32	AVR16EA48 AVR32EA48 AVR64EA48
Pins	28	32	48
TWI/I ² C	1 ⁽¹⁾	1 ⁽¹⁾	1 ⁽¹⁾
12-bit differential ADC (channels)	1 (20)	1 (24)	1 (28)
10-bit DAC	1	1	1
Analog Comparator (AC)	2	2	2
Configurable Custom Logic Look-up Table (CCL LUT)	4	4	4
Watchdog Timer	1	1	1
Event System channels	6	6	6
General Purpose I/O pins (input/output ⁽²⁾)	24/23	28/27	42/41
PORT	PA[7:0] PC[3:0] PD[7:0] PF[7,6,1,0]	PA[7:0] PC[3:0] PD[7:0] PF[7:0]	PA[7:0] PB[5:0] PC[7:0] PD[7:0] PE[3:0] PF[7:0]
External interrupts	24	28	42
CRCSCAN	1	1	1
Unified Program and Debug Interface (UPDI)	1	1	1

Notes:

1. The TWI/I²C can operate simultaneously as a host and client on different pins.
2. PF6/RESET pin is input only.

Features

- AVR® CPU
 - Running at up to 20 MHz
 - Single-cycle I/O register access
 - Two-level interrupt controller
 - Two-cycle hardware multiplier
 - Supply voltage range: 1.8-5.5V
- Memories
 - 64 KB In-system-programmable Flash memory with a true read-while-write operation
 - 6 KB SRAM
 - 512 EEPROM
 - 64B of user row in nonvolatile memory that can keep data during chip-erase and be programmed while the device is locked
 - Write/erase endurance
 - Flash: 10,000 cycles
 - EEPROM: 100,000 cycles
 - Data retention: 40 Years at 55°C
- System
 - Power-on Reset (POR) circuit
 - Brown-out Detector (BOD) with user-programmable levels
 - Voltage Level Monitor (VLM) with interrupt at a programmable level above the BOD level
 - Clock Failure Detection (CFD)
 - Clock options:
 - High-precision internal oscillator with selectable frequency up to 20 MHz (OSCHF)
 - Auto-tuning for improved internal oscillator accuracy
 - Internal ultra-low power 32.768 kHz oscillator (OSC32K)
 - External 32.768 kHz crystal oscillator (XOSC32K)
 - External clock input
 - External high-frequency crystal oscillator with clock failure detection (XOSCHF)
 - Single pin Unified Program and Debug Interface (UPDI)
 - Three sleep modes
 - Idle with all peripherals running for immediate wake-up
 - Standby with a configurable operation of selected peripherals
 - Power-Down with full data retention
- Peripherals
 - Two 16-bit Timer/Counters type A (TCA) with three compare channels for PWM and waveform generation
 - Four 16-bit Timer/Counters type B (TCB) with input capture for capture and signal measurements
 - One 16-bit Real-Time Counter (RTC) that can run from an external crystal or internal oscillator
 - Three USARTs with fractional baud rate generator, auto-baud, and start-of-frame detection
 - One host/client Serial Peripheral Interface (SPI)
 - One Two-Wire Interface (TWI) with dual address match
 - Independent host and client operation (Dual mode)
 - Philips I²C compatible
 - Standard-mode (Sm, 100 kHz)
 - Fast-mode (Fm, 400 kHz)
 - Fast-mode Plus (Fm+, 1 MHz)
 - Event System for CPU-independent and predictable inter-peripheral signaling
 - Configurable Custom Logic (CCL) with up to four programmable Look-up Tables (LUTs)
 - One 12-bit, 375 ksps, differential Analog-to-Digital Converter (ADC)

- Includes a Programmable Gain Amplifier (PGA), 1x to 16x gain on the input signal
- One 10-bit Digital-to-Analog Converter (DAC)
- Two Analog Comparators (ACs) with window compare functions
- Multiple voltage references (VREF)
 - 1.024V
 - 2.048V
 - 2.500V
 - 4.096V
 - VREFA
 - V_{DD}
- Automated Cyclic Redundancy Check (CRC) Flash program memory scan
- Watchdog Timer (WDT) with Window mode and separate on-chip oscillator
- External interrupt on all general purpose pins
- I/O and Packages:
 - 24 to 42 programmable I/O pins
 - 28-pin VQFN 4x4, SPDIP and SSOP
 - 32-pin VQFN 5x5 and TQFP 7x7
 - 48-pin VQFN 6x6 and TQFP 7x7
- Temperature Ranges
 - Industrial: -40°C to 85°C ambient
 - Extended: -40°C to 125°C ambient