

## Introduction

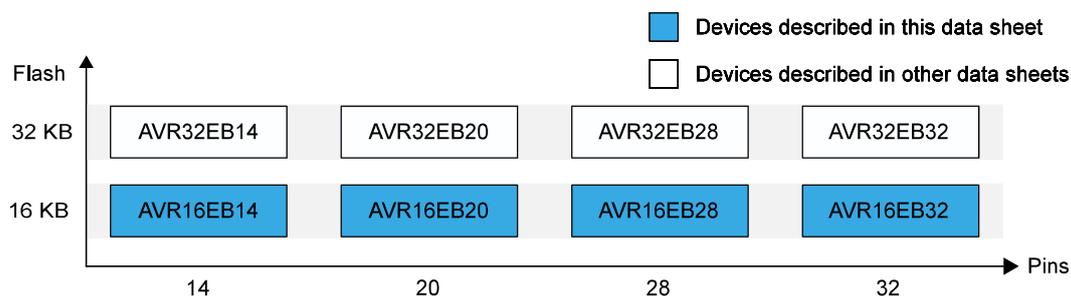
The AVR16EB14/20/28/32 microcontrollers of the AVR® EB Family use the AVR® CPU with hardware multiplier running at clock speeds up to 20 MHz, with 16 KB of Flash, 2 KB of SRAM, and 512 bytes of EEPROM in 14-, 20-, 28- or 32-pin packages. The AVR® EB Family uses the latest technology from Microchip with a flexible and low-power architecture, including an Event System, accurate analog subsystems, and advanced digital peripherals.

## Family Overview

The figure below shows the AVR® EB Family of 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

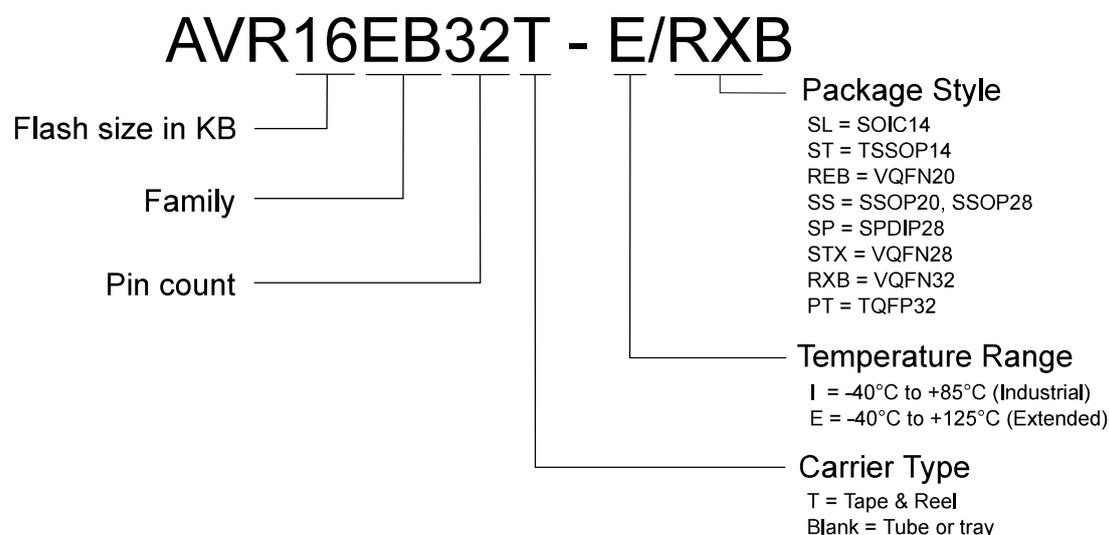
Figure 1. AVR® EB Family Overview



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

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

Figure 2. AVR® EB Family Device Designations



## Memory Overview

Table 1. Memory Overview

Devices	AVR16EB14 AVR16EB20 AVR16EB28 AVR16EB32
Flash memory	16 KB
SRAM	2 KB
EEPROM	512B
User row	64B
Boot row	64B

## Peripheral Overview

Table 2. Peripheral Overview

Feature	AVR16EB14	AVR16EB20	AVR16EB28	AVR16EB32
Pins	14	20	28	32
Max. frequency (MHz)	20	20	20	20
16-bit Timer/Counter type B (TCB)	2	2	2	2
16-bit Timer/Counter type E (TCE)	1	1	1	1
Waveform Extension (WEX)	1	1	1	1
16-bit Timer/Counter type F (TCF)	1	1	1	1
Real-Time Counter (RTC)	1	1	1	1
USART/SPI host	1	1	1	1
SPI host/client	1	1	1	1
TWI/I <sup>2</sup> C <sup>(1)</sup>	1	1	1	1
12-bit differential ADC (channels)	1 (8)	1 (14)	1 (20)	1 (24)
Analog Comparator (AC)	2	2	2	2

.....continued

Feature	AVR16EB14	AVR16EB20	AVR16EB28	AVR16EB32
Configurable Custom Logic Look-up Table (CCL LUT)	4	4	4	4
Watchdog Timer	1	1	1	1
Event System channels	6	6	6	6
General Purpose I/O pins (input/output <sup>(2)</sup> )	12/11	18/17	24/23	28/27
PORT	PA[1:0] PC[3:0] PD[7:4] PF[7:6]	PA[7:0] PC[3:0] PD[7:4] PF[7:6]	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]
External interrupts	12	18	24	28
CRCSCAN	1	1	1	1
Unified Program and Debug Interface (UPDI)	1	1	1	1

**Notes:**

1. The TWI/I<sup>2</sup>C can operate simultaneously as a host and client on different pins.
2. PF6/ $\overline{\text{RESET}}$  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
  - 16 KB In-system-programmable Flash memory with a true read-while-write operation
  - 2 KB SRAM
  - 512B 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: 1,000 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 options:
    - High-precision internal oscillator with selectable frequency up to 20 MHz (OSCHF)
      - Auto-tuning for improved internal oscillator accuracy
    - Internal PLL up to 80 MHz for high-frequency operation of Timer/Counter type E/F
    - Internal ultra-low power 32.768 kHz oscillator (OSC32K)
    - External 32.768 kHz crystal oscillator (XOSC32K)
    - External clock input
  - 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 B (TCB) with input capture for capture and signal measurements
  - One 16-bit Timer/Counter type E (TCE) with four compare channels for PWM generation and Waveform Extension (WEX)
  - One 24-bit Timer/Counter type F (TCF) for frequency generation
  - One 16-bit Real-Time Counter (RTC) that can run from an external crystal or internal oscillator
  - One USART 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)
  - Phillips I<sup>2</sup>C 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, 300 ksp/s, differential Analog-to-Digital Converter (ADC) with a programmable gain amplifier (PGA)
- Two Analog Comparators (ACs) with window compare functions
- Multiple voltage references (VREF)
  - 1.024V
  - 2.048V
  - 2.500V
  - 4.096V
  - VREFA
  - V<sub>DD</sub>
- 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:
  - Up to 28/27 programmable I/O pins
  - 14-pin SOIC and TSSOP
  - 20-pin SSOP and VQFN
  - 28-pin SPDIP, SSOP and VQFN
  - 32-pin VQFN and TQFP
- Temperature Ranges
  - Industrial: -40°C to 85°C ambient
  - Extended: -40°C to 125°C ambient