

Introduction

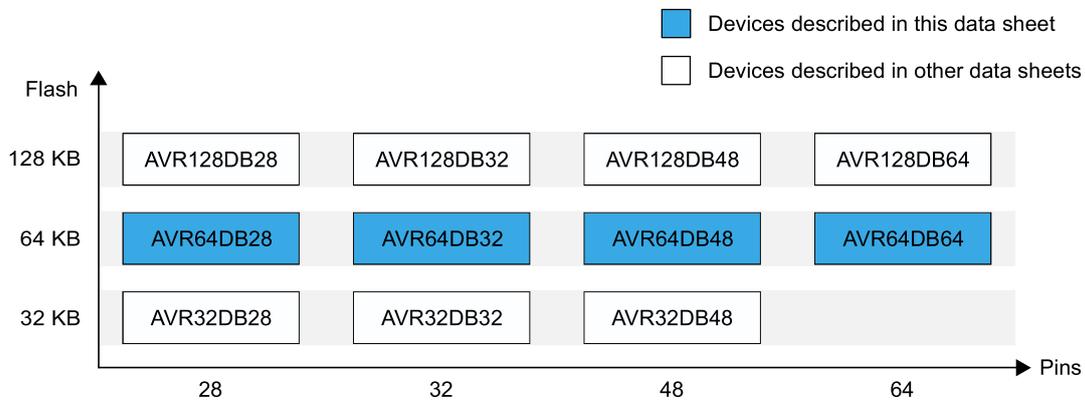
The AVR64DB28/32/48/64 microcontrollers of the AVR® DB microcontroller family use the AVR® CPU with a hardware multiplier running at clock speeds up to 24 MHz. They come with 64 KB of Flash, 8 KB of SRAM, and 512 bytes of EEPROM. The microcontrollers are available in 28-, 32-, 48- and 64- pin packages. The AVR® DB family uses the latest technologies from Microchip with a flexible and low-power architecture, including an Event System, accurate analog subsystems, and advanced digital peripherals.

AVR® DB Family Overview

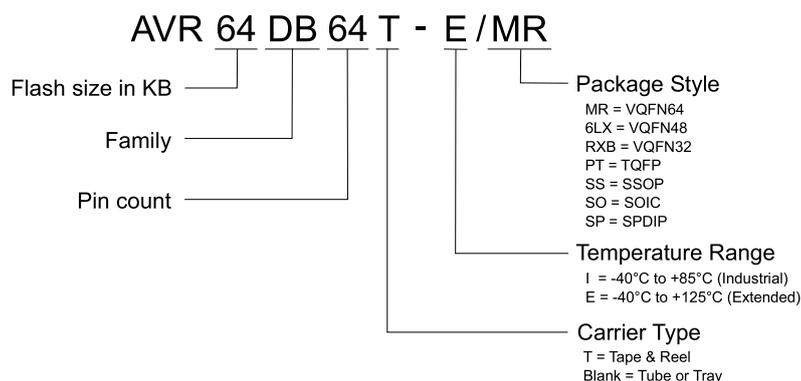
The figure below shows the AVR® DB devices, laying out pin count variants and memory sizes:

- 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® DB Family Overview



The name of a device in the AVR® DB family is decoded as follows:

Figure 2. AVR® DB Device Designations

Memory Overview

The following table shows the memory overview of the entire family, but the further documentation describes only the AVR64DB28/32/48/64 devices.

Table 1. Memory Overview

Devices	AVR32DB28 AVR32DB32 AVR32DB48	AVR64DB28 AVR64DB32 AVR64DB48 AVR64DB64	AVR128DB28 AVR128DB32 AVR128DB48 AVR128DB64
Flash memory	32 KB	64 KB	128 KB
SRAM	4 KB	8 KB	16 KB
EEPROM	512B	512B	512B
User row	32B	32B	32B

Peripheral Overview

The following table shows the peripheral overview of the entire AVR® DB family, but the further documentation describes only the AVR64DB28/32/48/64 devices.

Table 2. Peripheral Overview

Feature	AVR32DB28 AVR64DB28 AVR128DB28	AVR32DB32 AVR64DB32 AVR128DB32	AVR32DB48 AVR64DB48 AVR128DB48	AVR64DB64 AVR128DB64
Pins	28	32	48	64
Max. frequency (MHz)	24	24	24	24
16-bit Timer/Counter type A (TCA)	1	1	2	2
16-bit Timer/Counter type B (TCB)	3	3	4	5
12-bit Timer/Counter type D (TCD)	1	1	1	1
Real-Time Counter (RTC)	1	1	1	1
USART	3	3	5	6
SPI	2	2	2	2
I ² C	1 ⁽¹⁾	2 ⁽¹⁾	2 ⁽¹⁾	2 ⁽¹⁾
12-bit differential ADC (channels)	1 (9)	1 (13)	1 (18)	1 (22)
10-bit DAC (outputs)	1 (1)	1 (1)	1 (1)	1 (1)
Analog Comparator (AC)	3	3	3	3
Zero-Cross Detector (ZCD)	1	1	2	3

.....continued

Feature	AVR32DB28 AVR64DB28 AVR128DB28	AVR32DB32 AVR64DB32 AVR128DB32	AVR32DB48 AVR64DB48 AVR128DB48	AVR64DB64 AVR128DB64
Pins	28	32	48	64
Peripheral Touch Controller (PTC)	-	-	-	-
Op amp (OP)	2	2	3	3
Configurable Custom Logic Look-up Table (CCL LUT)	4	4	6	6
Watchdog Timer (WDT)	1	1	1	1
Event System channels (EVSYS)	8	8	10	10
General Purpose I/O ⁽²⁾	22/21 ⁽²⁾	26/25 ⁽²⁾	41/40 ⁽²⁾	55/54 ⁽²⁾
PORT	PA[7:0], PC[3:0], PD[7:1], PF[6,1,0]	PA[7:0], PC[3:0], PD[7:1], PF[6:0]	PA[7:0], PB[5:0], PC[7:0], PD[7:0], PE[3:0], PF[6:0]	PA[7:0], PB[7:0], PC[7:0], PD[7:0], PE[7:0], PF[6:0], PG[7:0]
External Interrupts	22	26	41	55
CRCSCAN	1	1	1	1
Unified Program and Debug Interface (UPDI)	1	1	1	1

Notes:

1. The TWI/I²C can operate simultaneously as host and client on different pins.
2. PF6/ $\overline{\text{RESET}}$ pin is input only.

Features

- AVR® CPU
 - Running at up to 24 MHz
 - Single-cycle I/O register access
 - Two-level interrupt controller
 - Two-cycle hardware multiplier
 - Supply voltage range: 1.8V to 5.5V
- Memories
 - 64 KB In-System self-programmable Flash memory
 - 512B EEPROM
 - 8 KB SRAM
 - 32B 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: 1000 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
 - Clock options
 - High-precision internal oscillator with selectable frequency up to 24 MHz (OSCHF)
 - Auto-tuning for improved internal oscillator accuracy
 - Internal PLL up to 48 MHz for high-frequency operation of Timer/Counter type D (PLL)
 - Internal ultra-low power 32.768 kHz oscillator (OSC32K)
 - External 32.768 kHz crystal oscillator (XOSC32K)
 - External clock input
 - External high-frequency crystal oscillator (XOSCHF) with clock failure detection
 - 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
 - Up to two 16-bit Timer/Counters type A (TCA) with three compare channels for PWM and waveform generation
 - Up to five 16-bit Timer/Counters type B (TCB) with input capture for capture and signal measurements
 - One 12-bit PWM Timer/Counter type D (TCD) optimized for power control
 - One 16-bit Real-Time Counter (RTC) that can run from external crystal or internal oscillator

- Up to six USARTs
 - Operation modes: RS-485, LIN client, host SPI, and IrDA
 - Fractional baud rate generator, auto-baud, and start-of-frame detection
- Two SPIs with host/client operation modes
- Up to two Two-Wire Interface (TWI) with dual address match
 - Independent host and client operation Dual mode)
 - Phillips I²C compatible
 - Standard mode (Sm, 100 kHz)
 - Fast mode (Fm, 400 kHz)
 - Fast mode plus (Fm+, 1 MHz)⁽¹⁾
- Event System for CPU-independent and predictable inter-peripherals signaling
- Configurable Custom Logic (CCL) with up to six programmable Look-up Tables (LUTs)
- One 12-bit 130 ksps differential Analog-to-Digital Converter (ADC)
- Three Analog Comparators (ACs) with window compare functions
- One 10-bit Digital-to-Analog Converter (DAC)
- Up to three Zero-Cross Detectors (ZCDs)
- Analog Signal Conditioning (OPAMP) peripheral with up to three op amps, each with an internal resistor ladder that allows for many useful configurations with no external components
- Multiple voltage references (VREF)
 - 1.024V
 - 2.048V
 - 2.500V
 - 4.096V
 - External Voltage Reference (VREFA)
 - Supply Voltage (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
 - Multi-Voltage I/O (MVIO) on I/O port C
 - Selectable input voltage threshold
 - Up to 55/54 programmable I/O pins
 - 28-pin SSOP, SOIC and SPDIP
 - 32-pin VQFN 5x5 mm and TQFP 7x7 mm
 - 48-pin VQFN 5x5 mm and TQFP 7x7 mm
 - 64-pin VQFN 9x9 mm and TQFP 10x10 mm
- Temperature Ranges
 - Industrial: -40°C to 85°C
 - Extended: -40°C to 125°C

Note:

1. I²C Fm+ is only supported for supply voltage V_{DD} above 2.7 VDC.