ATtiny212/412

AVR® Microcontroller with Core Independent Peripherals and picoPower® Technology

Introduction

The ATtiny212/412 microcontrollers are using the high-performance low-power AVR® RISC architecture, and is capable of running at up to 20MHz, with up to 2/4KB Flash, 128/256bytes of SRAM and 64/128bytes of EEPROM in a 8- pin package. The series uses the latest technologies with a flexible and low power architecture including Event System and SleepWalking, accurate analog features and advanced peripherals.

Features

- CPU
  - AVR® 8-bit CPU
  - Running at up to 20MHz
  - Single Cycle I/O Access
  - Two-level Interrupt Controller
  - Two-cycle Hardware Multiplier
- Memories
  - 2/4KB In-system self-programmable Flash Memory
  - 64/128B EEPROM
  - 128/256B SRAM
- System
  - Power-on Reset (POR)
  - Brown-out Detection (BOD)
  - Clock Options:
    - 16/20MHz Low Power Internal RC Oscillator
    - 32.768kHz Ultra Low Power (ULP) Internal RC Oscillator
    - 32.768kHz External Crystal Oscillator
    - External Clock Input
  - Single Pin Unified Program Debug Interface (UPDI)
  - Three Sleep Modes:
    - Idle with All Peripherals Running and Mode for Immediate Wake Up Time
    - Standby
      - Configurable Operation of Selected Peripherals
      - SleepWalking Peripherals
    - Power Down with Wake-up Functionality
- Peripherals

  - 6-channel Event System
  - One 16-bit Timer/Counter Type A with Dedicated Period Register, Three Compare Channels (TCA)
  - One 16-bit Timer/Counter type B with Input Capture (TCB)
  - One 12-bit Timer/Counter type D Optimized for Control Applications (TCD)
  - One 16-bit Real Time Counter (RTC) Running from External Crystal or Internal RC Oscillator
  - One USART with Fractional Baud Rate Generator, Auto-baud, and Start-of-frame Detection
  - Master/Slave Serial Peripheral Interface (SPI)
  - Master/Slave TWI with Dual Address Match
    - Standard Mode (Sm, 100kHz)
    - Fast Mode (Fm, 400kHz)
    - Fast Mode Plus (Fm+, 1MHz)
  - Configurable Custom Logic (CCL) with Two Programmable Lookup Tables (LUT)
  - Analog Comparator (AC) with Low Propagation Delay
  - 10-bit 115ksps Analog to Digital Converter (ADC)
  - 8-bit Digital to Analog Converter (DAC)
  - Five Selectable Internal Voltage References: 0.55V, 1.1V, 1.5V, 2.5V and 4.3V
  - Automated CRC Memory Scan
  - Watchdog Timer (WDT) with Window Mode, with Separate On-chip Oscillator
  - External Interrupt on All General Purpose Pins
- I/O and Packages:
  - 6 Programmable I/O Lines
  - 8-pin SOIC150
- Temperature Ranges:
  - -40°C to 105°C
  - -40°C to 125°C Temperature Graded Device Options Available
- Speed Grades:
  - 0-5MHz @ 1.8V – 5.5V
  - 0-10MHz @ 2.7V – 5.5V
  - 0-20MHz @ 4.5V – 5.5V

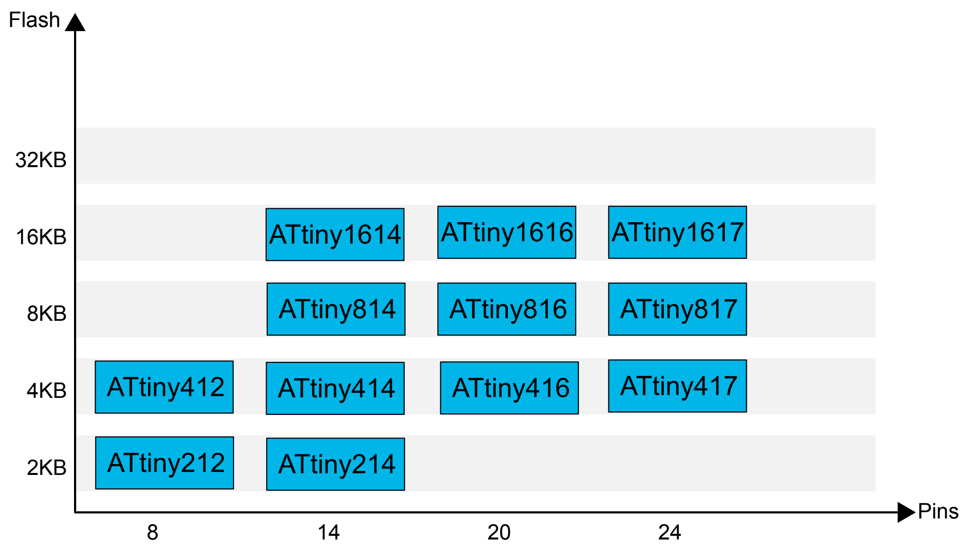
Table of Contents

1. tinyAVR® 1-Series Overview

The figure below shows the tinyAVR 1-series, laying out pin count variants and memory sizes:

- Vertical migration can be done upwards without code modification, since these devices are pin compatible and provide the same or even more features. Downward migration may require code modification due to fewer available instances of some peripherals.
- Horizontal migration to the left reduces the pin count and therefore also the available features.

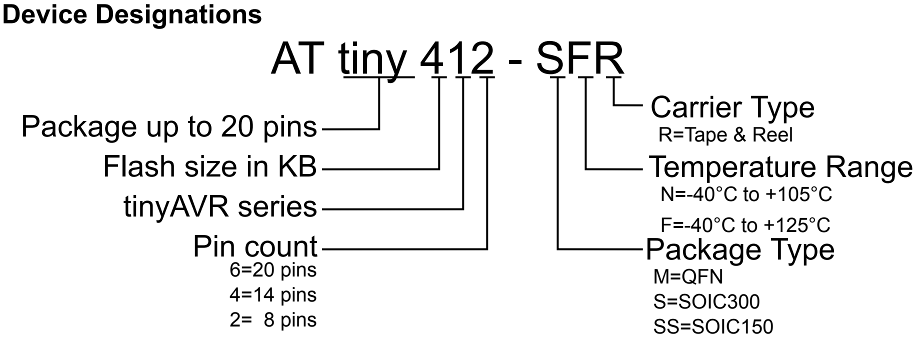
Figure 1-1. tinyAVR®1-Series Overview



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

The name of a device of the series contains information as depicted below:

Figure 1-2. Device Designations



1.1 Configuration Summary

1.1.1 Peripheral Summary

Table 1-1. Peripheral Summary

	ATtiny212	ATtiny412
Pins	8	8
SRAM	128B	256B
Flash	2KB	4KB
EEPROM	64B	128B
Max. frequency (MHz)	20	20
16-bit Timer/Counter type A (TCA)	1	1
16-bit Timer/Counter type B (TCB)	1	1
12-bit Timer/Counter type D (TCD)	1	1
Real Time Counter (RTC)	1	1
USART	1	1
SPI	1	1
TWI (I^2C)	1	1
ADC	1	1
ADC channels	6	6
DAC	1	1
AC	1	1
Custom Logic/Configurable Lookup Tables	1	1
Window Watchdog	1	1
Event System channels	6	6
General purpose I/O	6	6
External interrupts	6	6
CRCSCAN	1	1

2. Ordering Information

2.1 ATtiny212

Table 2-1. ATtiny212 Ordering Codes

Ordering Code[(1)]	Flash	Package Type (GPC)	Leads	Power Supply	Operational Range	Carrier Type
ATtiny212-SSNR	2KB	SOIC150 (SWB)	8	1.8V - 5.5V	Industrial (-40°C +105°C)	Tape & Reel
ATtiny212-SSFR	2KB	SOIC150 (SWB)	8	1.8V - 5.5V	Industrial (-40°C +125°C)	Tape & Reel

1. Pb-free packaging complies to the European Directive for Restriction of Hazardous Substances (RoHS directive). Also Halide free and fully Green.

2.2 ATtiny412

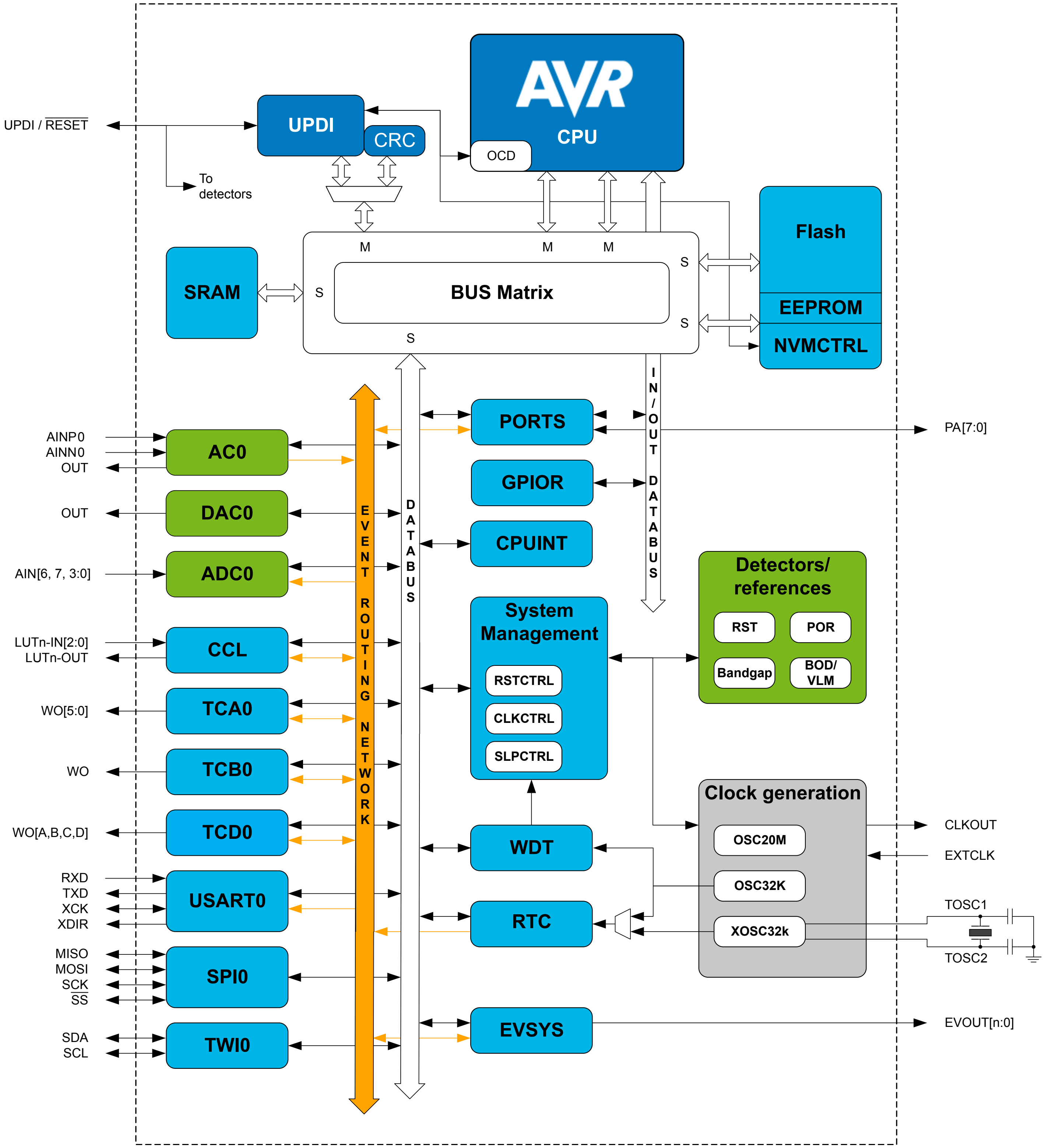
Table 2-2. ATtiny412 Ordering Codes

Ordering Code[(1)]	Flash	Package Type (GPC)	Leads	Power Supply	Operational Range	Carrier Type
ATtiny412-SSNR	4KB	SOIC150 (SWB)	8	1.8V - 5.5V	Industrial (-40°C +105°C)	Tape & Reel
ATtiny412-SSFR	4KB	SOIC150 (SWB)	8	1.8V - 5.5V	Industrial (-40°C +125°C)	Tape & Reel

1. Pb-free packaging complies to the European Directive for Restriction of Hazardous Substances (RoHS directive). Also Halide free and fully Green.

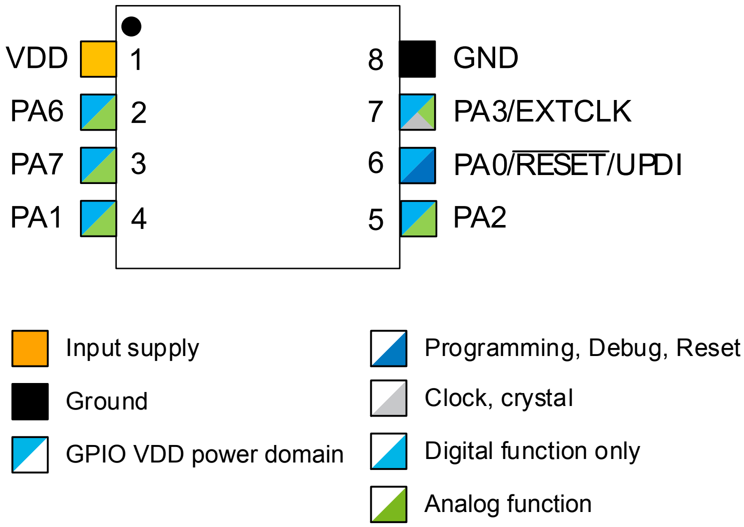
3. Block Diagram

Figure 3-1. ATtiny212 / ATtiny412 Block Diagram



4. Pinout

4.1 8-pin SOIC



5. I/O Multiplexing and Considerations

5.1 Multiplexed Signals

Table 5-1. PORT Function Multiplexing

SOIC 8-pin	Pin Name (1,2)	Other/ Special	ADC0	AC0	DAC0	USART0	SPI0	TWI0	TCA0	TCB0	TCD0	CCL
6	PA0	$\overline{\text{RESET}}$ UPDI	AIN0									LUT0-IN0
4	PA1	BREAK	AIN1			`TXD`	MOSI	`SDA`				LUT0-IN1
5	PA2	EVOUT0	AIN2			`RxD`	MISO	`SCL`				LUT0-IN2
7	PA3	EXTCLK	AIN3			`XCK`	SCK		WO3			
8	GND											
1	VDD											
2	PA6		AIN6	AINN0	OUT							
3	PA7		AIN7	AINP0								LUT1-OUT

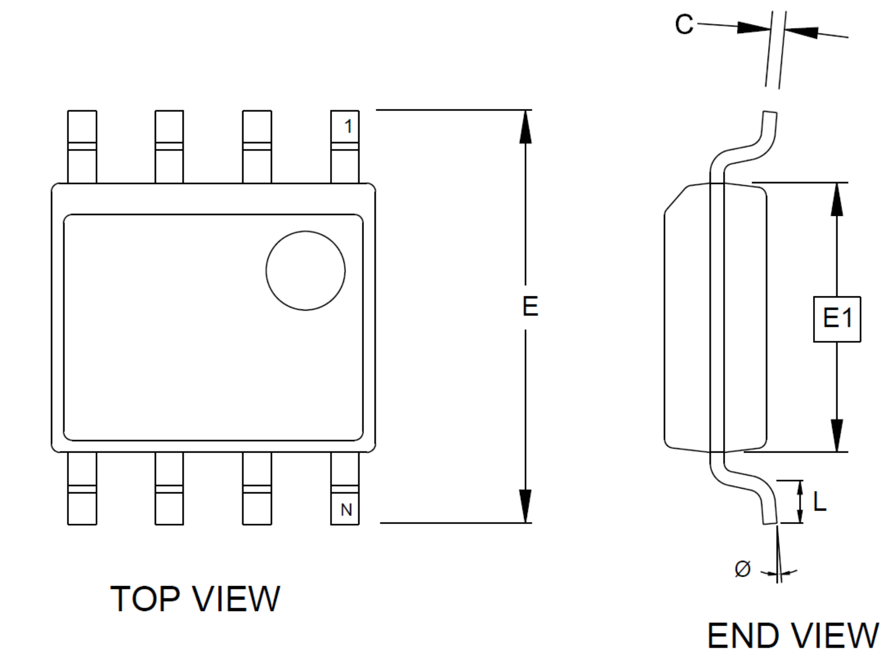
Note:

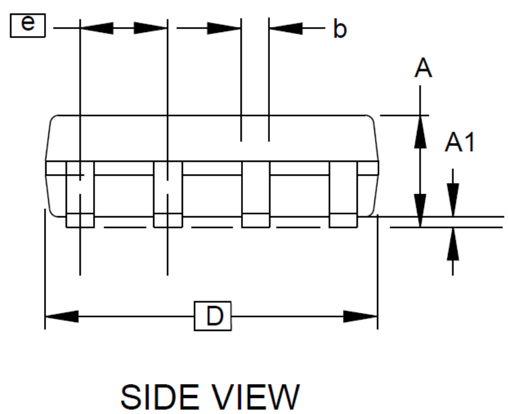
1. Pins names are of type P*xn*, with *x* being the PORT instance (A,B) and *n* the pin number. Notation for signals is PORT*x*_PIN*n*. All pins can be used as event input.
2. All pins can be used for external interrupt, where pins P*x*2 and P*x*6 of each port have full asynchronous detection.

Tip: Signals on alternative pin locations are in `typewriter` font.

6. Package Drawings

6.1 8-pin SOIC150





Notes: This drawing is for general information only. Refer to JEDEC Drawing MS-012, Variation AA for proper dimensions, tolerances, datums, etc.

COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	1.35	–	1.75	
A1	0.10	–	0.25	
b	0.31	–	0.51	
C	0.17	–	0.25	
D	4.80	–	5.05	
E1	3.81	–	3.99	
E	5.79	–	6.20	
e		1.27 BSC		
L	0.40	–	1.27	
Ø	0°	–	8°	

6/22/11

Atmel Package Drawing Contact: packagedrawings@atmel.com	**TITLE** 8S1, 8-lead (0.150" Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC)	**GPC** SWB	**DRAWING NO.** 8S1	**REV.** G

7. Thermal Considerations

7.1 Thermal Resistance Data

The following table summarizes the thermal resistance data depending on the package.

Table 7-1. Thermal Resistance Data

Package Type	θ_{JA} [°C/W]	θ_{JC} [°C/W]
8-pin SOIC150 (SWB)	91.8	21.5

Related Links

Junction Temperature

7.2 Junction Temperature

The average chip-junction temperature, T_J, in °C can be obtained from the following:

1. $T_J = T_A + (P_D \times \theta_{JA})$
2. $T_J = T_A + (P_D \times (\theta_{HEATSINK} + \theta_{JC}))$

where:

- θ_{JA} = Package thermal resistance, Junction-to-ambient (°C/W), see Thermal Resistance Data
- θ_{JC} = Package thermal resistance, Junction-to-case thermal resistance (°C/W), see Thermal Resistance Data
- $\theta_{HEATSINK}$ = Thermal resistance (°C/W) specification of the external cooling device
- P_D = Device power consumption (W)
- T_A = Ambient temperature (°C)

From the first equation, the user can derive the estimated lifetime of the chip and decide if a cooling device is necessary or not. If a cooling device is to be fitted on the chip, the second equation should be used to compute the resulting average chip-junction temperature T_J in °C.

Related Links

Thermal Resistance Data

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