



# ATtiny214/414/814

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## AVR® Microcontroller with Core Independent Peripherals and picoPower® Technology

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### Introduction

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The ATtiny214/414/814 microcontrollers are using the high-performance low-power AVR® RISC architecture, and is capable of running at up to 20MHz, with up to 2/4/8KB Flash, 128/256/512bytes of SRAM and 64/128bytes of EEPROM in a 14- 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. Capacitive touch interfaces with driven shield are supported with the integrated QTouch® peripheral touch controller.

### Features

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- CPU
  - AVR® 8-bit CPU
  - Running at up to 20MHz
  - Single Cycle I/O Access
  - Two-level Interrupt Controller
  - Two-cycle Hardware Multiplier
- Memories
  - 2/4/8KB In-system self-programmable Flash Memory
  - 64/128B EEPROM
  - 128/256/512B 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
  - Peripheral Touch Controller (PTC)<sup>(1)</sup>
    - Capacitive Touch Buttons, Sliders and Wheels
    - Wake-up on Touch
    - Driven Shield for Improved Moisture and Noise Handling Performance
    - Six Self-capacitance and Nine Mutual-capacitance Channels
  - External Interrupt on All General Purpose Pins
- I/O and Packages:
  - 12 Programmable I/O Lines
  - 14-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

**Note:**

1. Only Available in Devices with 8KB Flash.

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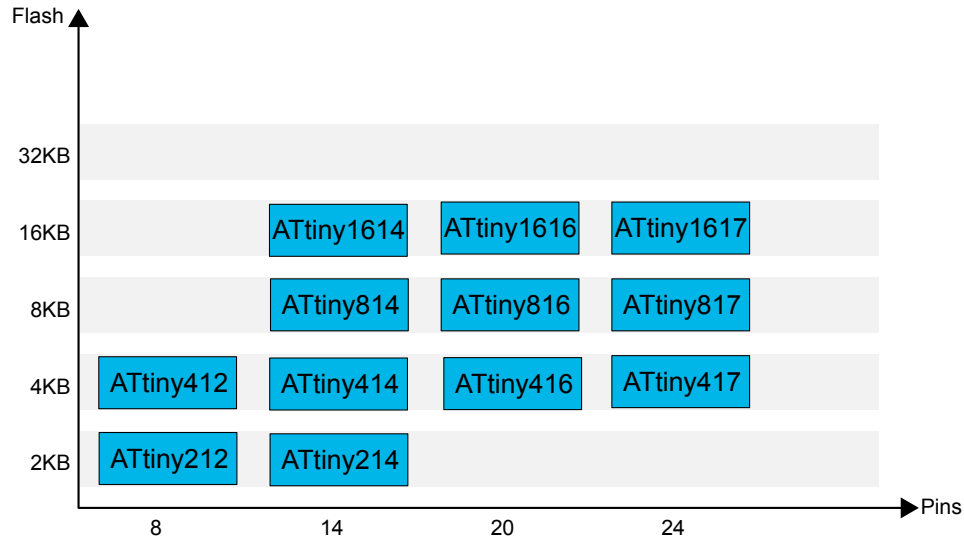
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## 1. tinyAVR® 1-Series Overview

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.

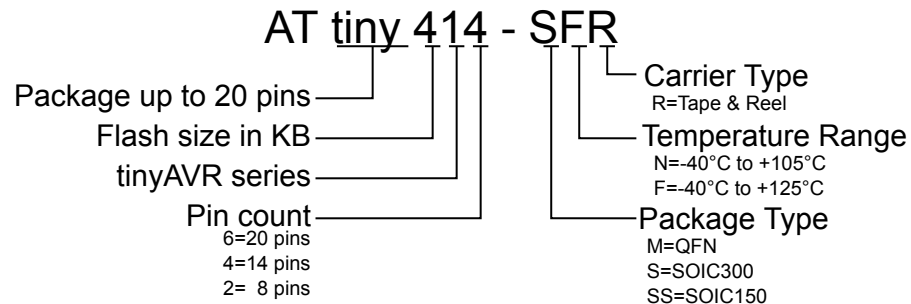
**Figure 1-1. tinyAVR®1-Series Overview**



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

	ATtiny214	ATtiny414	ATtiny814
Pins	14	14	14
SRAM	128B	256B	512B
Flash	2KB	4KB	8KB
EEPROM	64B	128B	128B
Max. frequency (MHz)	20	20	20
16-bit Timer/Counter type A (TCA)	1	1	1
16-bit Timer/Counter type B (TCB)	1	1	1
12-bit Timer/Counter type D (TCD)	1	1	1
Real Time Counter (RTC)	1	1	1
USART	1	1	1
SPI	1	1	1
TWI (I <sup>2</sup> C)	1	1	1
ADC	1	1	1
ADC channels	10	10	10
DAC	1	1	1
AC	1	1	1
Peripheral Touch Controller (PTC) <sup>(1)</sup>	No	No	1
PTC number of self-capacitance channels <sup>(1)</sup>	-	-	6
PTC number of mutual-capacitance channels <sup>(1)</sup>	-	-	9
Custom Logic/Configurable Lookup Tables	1	1	1
Window Watchdog	1	1	1
Event System channels	6	6	6
General purpose I/O	12	12	12
External interrupts	12	12	12
CRCSCAN	1	1	1

**Note:**

1. The PTC takes control over the ADC while the PTC is used.

## 2. Ordering Information

### 2.1 ATtiny214

**Table 2-1. ATtiny214 Ordering Codes**

Ordering Code <sup>(1)</sup>	Flash	Package Type (GPC)	Leads	Power Supply	Operational Range	Carrier Type
ATtiny214-SSNR	2KB	SOIC150 (SVQ)	14	1.8V - 5.5V	Industrial (-40°C +105°C)	Tape & Reel
ATtiny214-SSFR	2KB	SOIC150 (SVQ)	14	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 ATtiny414

**Table 2-2. ATtiny414 Ordering Codes**

Ordering Code <sup>(1)</sup>	Flash	Package Type (GPC)	Leads	Power Supply	Operational Range	Carrier Type
ATtiny414-SSNR	4KB	SOIC150 (SVQ)	14	1.8V - 5.5V	Industrial (-40°C +105°C)	Tape & Reel
ATtiny414-SSFR	4KB	SOIC150 (SVQ)	14	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.

### 2.3 ATtiny814

**Table 2-3. ATtiny814 Ordering Codes**

Ordering Code <sup>(1)</sup>	Flash	Package Type (GPC)	Leads	Power Supply	Operational Range	Carrier Type
ATtiny814-SSNR	8KB	SOIC150 (SVQ)	14	1.8V - 5.5V	Industrial (-40°C +105°C)	Tape & Reel
ATtiny814-SSFR	8KB	SOIC150 (SVQ)	14	1.8V - 5.5V	Industrial (-40°C +125°C)	Tape & Reel

**Note:**

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. ATtiny214 / ATtiny414 Block Diagram

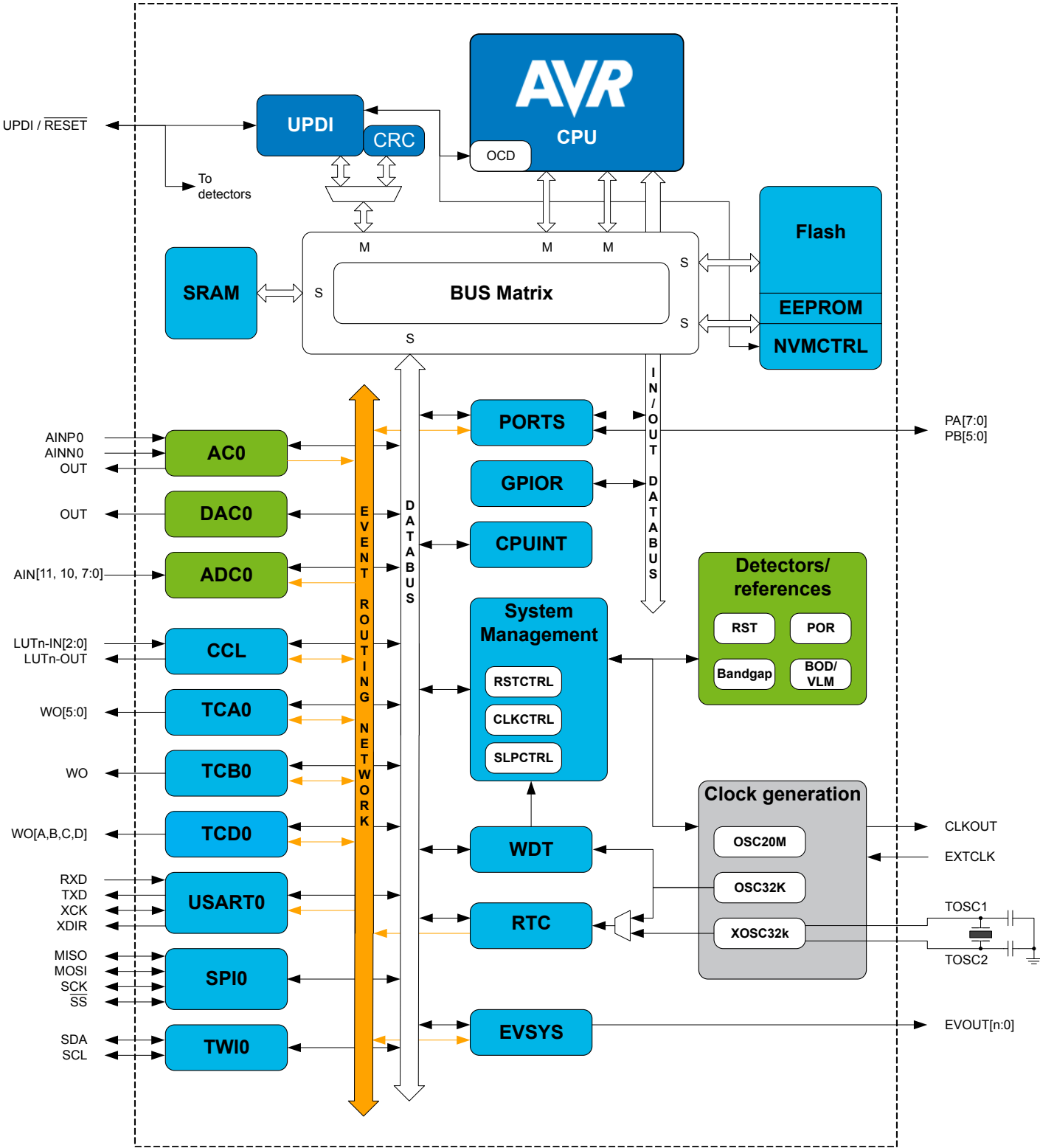
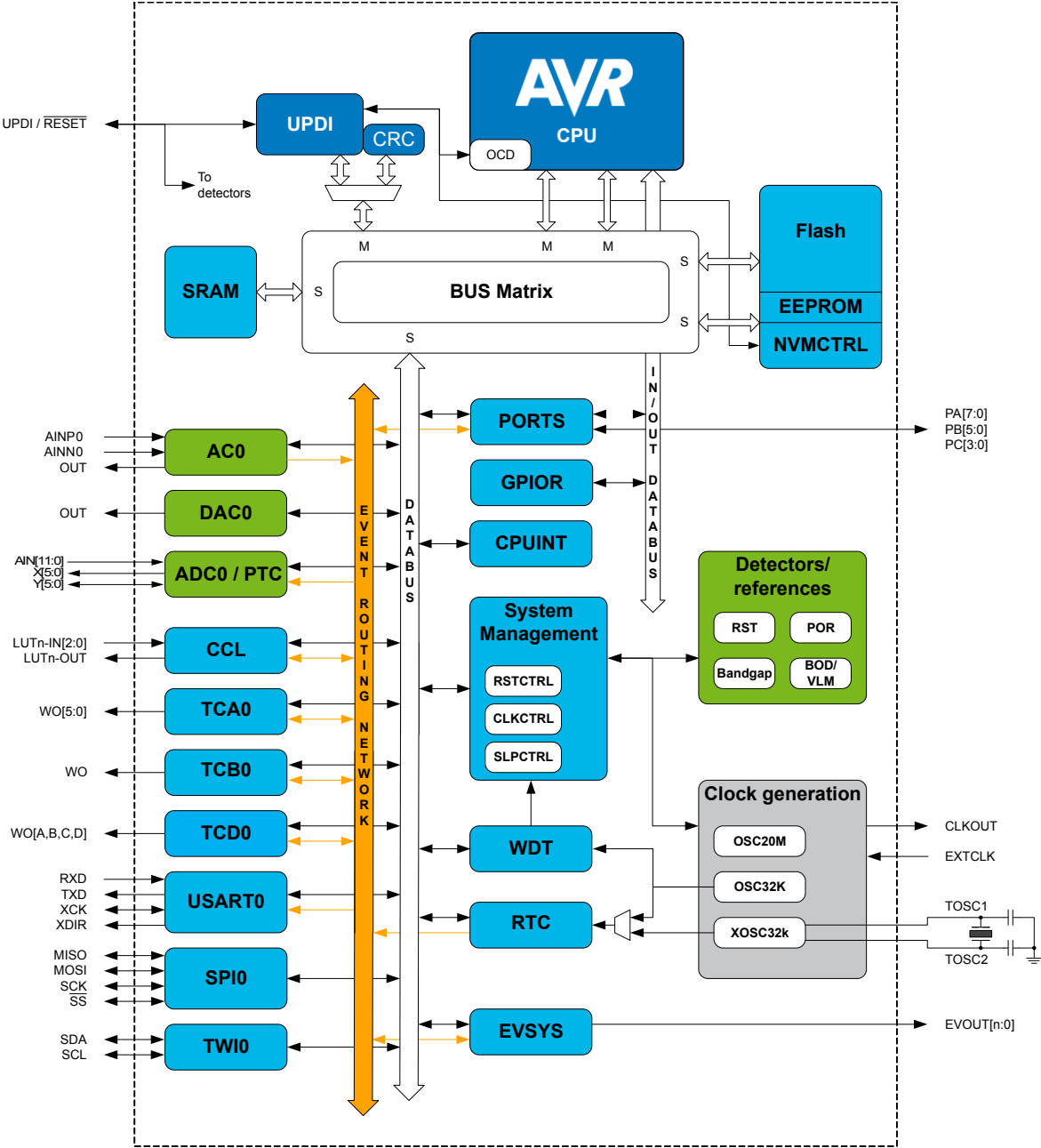


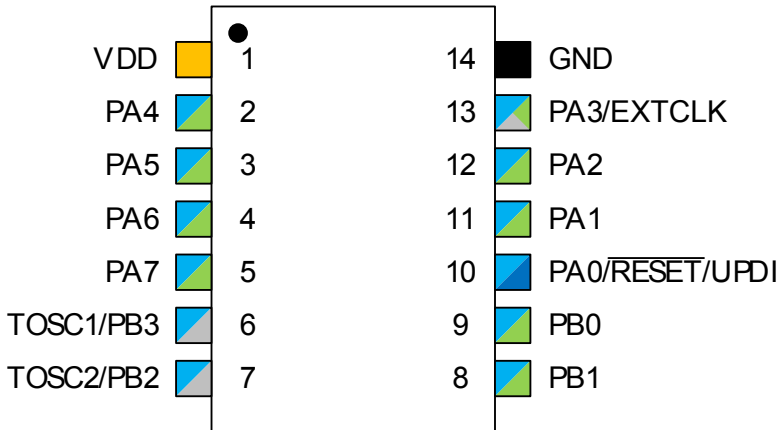
Figure 3-2. ATtiny814 Block Diagram





## 4. Pinout

### 4.1 14-pin SOIC



- |                       |                           |
|-----------------------|---------------------------|
| Input supply          | Programming, Debug, Reset |
| Ground                | Clock, crystal            |
| GPIO VDD power domain | Digital function only     |
|                       | Analog function           |

## 5. I/O Multiplexing and Considerations

### 5.1 Multiplexed Signals

Table 5-1. PORT Function Multiplexing

SOIC 14-pin	Pin Name <sup>(1,2)</sup>	Other/Special	ADC0	PTC <sup>(3)</sup>	AC0	DAC0	USART0	SPI0	TWI0	TCA0	TCB0	TCD0	CCL
10	PA0	RESET UPDI	AIN0										LUT0-IN0
11	PA1	BREAK	AIN1				TXD	MOSI	SDA				LUT0-IN1
12	PA2	EVOUT0	AIN2				RxD	MISO	SCL				LUT0-IN2
13	PA3	EXTCLK	AIN3				XCK	SCK		WO3			
14	GND												
1	VDD												
2	PA4		AIN4	X0/Y0			XDIR	SS		WO4		WOA	LUT0-OUT
3	PA5		AIN5	X1/Y1	OUT					WO5	WO	WOB	
4	PA6		AIN6	X2/Y2	AINN0	OUT							
5	PA7		AIN7	X3/Y3	AINP0								LUT1-OUT
6	PB3	TOSC1					RxD			WO0			
7	PB2	TOSC2, EVOUT1					TxD			WO2			
8	PB1		AIN10	X4/Y4			XCK		SDA	WO1			
9	PB0		AIN11	X5/Y5			XDIR		SCL	WO0			

**Note:**

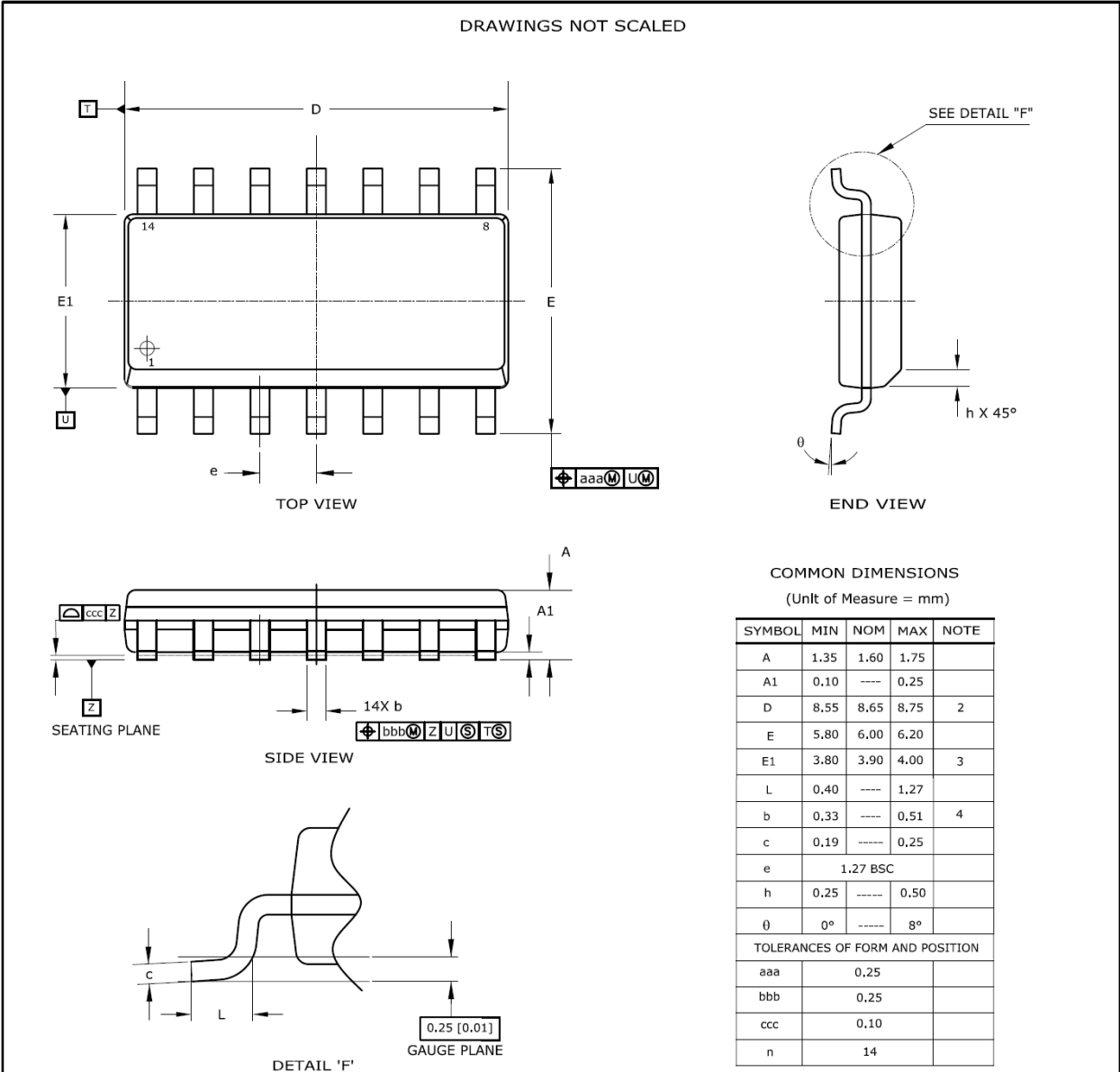
1. Pins names are of type P<sub>xn</sub>, with *x* being the PORT instance (A,B) and *n* the pin number. Notation for signals is PORT<sub>x</sub>\_PIN<sub>n</sub>. All pins can be used as event input.
2. All pins can be used for external interrupt, where pins P<sub>x2</sub> and P<sub>x6</sub> of each port have full asynchronous detection.
3. PTC is only available in devices with 8KB Flash (ATtiny814). Every PTC line can be configured as X-line or Y-line.



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

6. Package Drawings

6.1 14-pin SOIC150



Notes : 1. This drawing is for general information only. Refer to JEDEC Drawing MS-012, Variation AB.  
 2. Dimensions D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions and gate burrs shall not exceed 0.15mm (0.006 in) per side.  
 3. Dimensions E1 does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 0.25mm (0.010 in) per side.  
 4. Dimensions b does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.10mm total in excess of the b dimension at maximum material condition. Dambar cannot be located on the lower radius of the foot.

01/31/2014

<p><b>Package Drawing Contact:</b>  <a href="mailto:packagedrawings@atmel.com">packagedrawings@atmel.com</a></p>	<p>TITLE</p> <p>TU, 14 Lds - 1.27mm Pltch, 8.65X3.90x1.60mm Body Size                  Plastic Small Outline Package (SOIC)</p>	<p>GPC</p> <p>SVQ</p>	<p>DRAWING NO.</p> <p>TU</p>	<p>REV.</p> <p>D</p>
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## 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	$\theta_{JA}$ [°C/W]	$\theta_{JC}$ [°C/W]
14-pin SOIC150 (SVQ)	58	26

#### 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:

- $\theta_{JA}$  = Package thermal resistance, Junction-to-ambient (°C/W), see Thermal Resistance Data
- $\theta_{JC}$  = 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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