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# AT94K, Field Programmable System Level Integration Chip (FPSLIC), Timer Macros

## Features

- Clearing Input Capture Flag
- Clearing Overflow Flags
- Clearing Output Compare Flags
- Clearing Timer/Counter on Compare Match
- Clock Select/Source
- Force Output Compare
- Input Capture
- Output Compare Mode
- Prescaler Resets
- Pulse Width Modulator (PWM) Enable
- PWM Compare Select
- Watchdog Timer

## Introduction

Atmel's AT94K Timer Macros are provided to familiarize and assist customers in programming the AVR<sup>®</sup> micro-controller as part of the AT94K FPSLIC<sup>™</sup> product offering. The Timer Macros provide customers with a simple method for using the timers of the AT94K device.

## Application

Atmel's AT94K Timer Macros are implemented in such a way that they can be used interchangeably between embedded C compilers, assuming that the proper register definitions have been made in the ioat94k.h file. The ioat94k.h file must declare the register names corresponding to the names found in the Atmel AT94K device datasheet. These macros have been extensively tested with ImageCraft ICCAVR v6.13a and above and IAR Systems IAR Embedded Workbench AT90S v1.50B/WIN compilers.

A software macro is essentially a name with a corresponding text string, which is commonly referred to as the body. When a macro is called, the compiler replaces the name with the corresponding macro body.

To use the AT94K Timer Macros, the user must include the at94k\_timers.h file available from the AT94K page at the Atmel web site. Furthermore, some of the AT94K Timer Macros require a parameter, either ENABLE/DISABLE, or a value. The AT94K Timer Macros are used in the following manner:

- System feature without a parameter: `TIMER_MACRO();`
- System feature with a value parameter: `TIMER_MACRO(PARAMETER);`



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AT94K

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Application  
Note

Rev. 2286A-04/01





## Description

**Macro Name:** TIMER1\_CLEAR\_INPUT\_CAPTURE

**Parameter:** None

**Description:** The Timer/Counter1 Input Capture Flag is set (one) on an input capture event, indicating that the Timer/Counter1 value has been transferred to the input capture register. This flag is cleared by the hardware when executing the corresponding ISR, or by writing a logic. When the Global Interrupt, Timer/Counter1 Input Capture Interrupt Enable, and the Input Capture Flag are set, the Timer/Counter1 Input Capture Interrupt is executed.

**Macro Name:** TIMER2\_CLEAR\_OVERFLOW  
TIMER1\_CLEAR\_OVERFLOW  
TIMER0\_CLEAR\_OVERFLOW

**Parameter:** None

**Description:** When set (one) an overflow has occurred in the corresponding Timer/Counter. The Overflow Flag is cleared by the hardware when executing the appropriate ISR or when writing a logic. When the Global Interrupt, Overflow Interrupt and Overflow Flag are set, an interrupt is executed.

**Macro Name:** TIMER2\_CLEAR\_OUTPUT\_COMPARE  
TIMER1\_CLEAR\_OUTPUT\_COMPAREA  
TIMER1\_CLEAR\_OUTPUT\_COMPAREB  
TIMER0\_CLEAR\_OUTPUT\_COMPARE

**Parameter:** None

**Description:** When set (one) a compare match occurs between the Timer/Counter and the data in the corresponding OCR - Output Compare Register. This flag is cleared by the hardware when executing the ISR or writing a logic one to the flag. When the Global Interrupt, Timer/Counter Compare Interrupt, and Output Compare Flag are set (one), the Timer/Counter Output Compare Interrupt is executed.

**Macro Name:** TIMER2\_CLEAR\_COMPARE\_MATCH  
TIMER1\_CLEAR\_COMPAREA\_MATCH  
TIMER0\_CLEAR\_COMPARE\_MATCH

**Parameter:** ENABLE or DISABLE

**Description:** When enabled (one) the Timer/Counter is reset to \$00 in the CPU clock-cycle after a compare match. If disabled (zero), the Timer/Counter continues counting and is unaffected by a compare match.

- Macro Name:** TIMER2\_CLOCK\_SELECT  
 TIMER1\_CLOCK\_SELECT  
 TIMER0\_CLOCK\_SELECT
- Parameter:** Timer0: STOP, CK, CK\_DIV\_8, CK\_DIV\_64, CK\_DIV\_256, CK\_DIV\_1024,  
 EXT\_PIN\_NEG\_EDGE, or EXT\_PIN\_POS\_EDGE  
 Timer1: STOP, PCK2, PCK2\_DIV\_8, PCK2\_DIV\_32, PCK2\_DIV\_64, PCK2\_DIV\_128,  
 PCK2\_DIV\_256, or PCK2\_DIV\_1024  
 Timer2: STOP, CK, CK\_DIV\_8, CK\_DIV\_64, CK\_DIV\_256, CK\_DIV\_1024,  
 EXT\_PIN\_NEG\_EDGE, or EXT\_PIN\_POS\_EDGE
- Description:** This macro defines the prescaling source of the Timer/Counter.
- Macro Name:** TIMER2\_EXT\_CLOCK
- Parameter:** ENABLE or DISABLE
- Description:** When disabled (zero) Timer/Counter2 is clocked from the internal system clock, CK. If enabled (one), the Timer/Counter2 is clocked from the TOSC1 pin.
- Macro Name:** TIMER2\_FORCE\_OUTPUT\_COMPARE  
 TIMER1\_FORCE\_OUTPUT\_COMPARE1A  
 TIMER1\_FORCE\_OUTPUT\_COMPARE1B  
 TIMER0\_FORCE\_OUTPUT\_COMPARE
- Parameter:** None
- Description:** This macro forces a change in the compare match output pin according to the values set in COMn1 and COMn0. The Force Output Compare bit can be used to change the output pin without waiting for a compare match in the timer. The automatic action programmed in COMn1 and COMn0 will occur as if a Compare Match occurred, but no interrupt will be generated.
- Macro Name:** TIMER1\_INPUT\_CANCEL\_NOISE
- Parameter:** ENABLE or DISABLE
- Description:** When enabled (one), the Input Capture Pin (ICP) samples four successive measures on PE7, while set the Timer/Counter1 contents are transferred to the Input Capture Register on the rising edge of the ICP.



**Macro Name:** TIMER1\_INPUT\_RISING\_EDGE

**Parameter:** ENABLE or DISABLE

**Description:** When enabled (one), the Timer/Counter1 contents are transferred to the Input Capture Register on the rising edge of the ICP. When disabled, the contents are transferred on the falling edge.

**Macro Name:** TIMER1\_INPUT\_CAPTIVE\_PIN

**Parameter:** ENABLE or DISABLE

**Description:** This must be enabled (one) to enable the Input Capture Function of Timer/Counter1. Disabling prevents necessary register copies during normal use of the PE7 port.

**Macro Name:** TIMER2\_OUTPUT\_COMPARE  
TIMER1\_OUTPUT\_COMPARE1A  
TIMER1\_OUTPUT\_COMPARE1B  
TIMER0\_OUTPUT\_COMPARE

**Parameter:** DISCONNECT, TOGGLE, CLEAR or SET

**Description:** Determines the output pin action based on a Compare Match in the Timer/Counter. Any output pin actions affect the corresponding OCn Pin. This is an alternative function to an I/O port, and the corresponding direction control bit must be set (one) to control an output pin.

**Macro Name:** TIMER2\_PRESCALER\_RESET  
TIMER1\_PRESCALER\_RESET  
TIMER0\_PRESCALER\_RESET

**Parameter:** None

**Description:** When called, the Timer/Counter will be reset. The signal will be cleared by the hardware after the operation has been performed.

Note: Timer/Counter1 and Timer/Counter0 share the same prescaler and a reset of this prescaler will affect both timers.

**Macro Name:** TIMER2\_PWM\_OUTPUT\_COMPARE  
TIMER1\_PWM\_OUTPUT\_COMPARE1A  
TIMER1\_PWM\_OUTPUT\_COMPARE1B  
TIMER0\_PWM\_OUTPUT\_COMPARE

**Parameter:** NON\_INVERTED\_PWM, INVERTED\_PWM, SET\_ON\_OVERFLOW, or CLEAR\_ON\_OVERFLOW

**Description:** Same as TIMERn\_OUTPUT\_COMPARE except for PWM Mode, see the T94K device datasheet for further information.

**Macro Name:** WATCHDOG\_CLEAR\_RESET

**Parameter:** None

**Description:** When called, this macro clears the previously set Watchdog Reset Flag, if a reset occurred.

**Macro Name:** WATCHDOG\_TIMER\_ENABLE

**Parameter:** ENABLE or DISABLE

**Description:** When enabled (one) the Watchdog Timer is enabled, and if cleared (zero) the Watchdog function is disabled. The Watchdog Enable can only be disabled if WDTOE is set (one). To disable an enabled Watchdog Timer, the following procedure must be followed:

1. In the same operation, write a logical one to WDTOE and WDE
2. Within the next four clock-cycles, write a logical zero to WDE.

**Macro Name:** WATCHDOG\_TIMER\_PRESCALE

**Parameter:** CYC\_16K, CYC\_32K, CYC\_64K, CYC\_128K, CYC\_256K, CYC\_512K, CYC\_1024K, or CYC\_2048K

**Description:** The Watchdog Clock Selects defines the prescaling source of the Watchdog Timer.

**Sample Code Snippet** The following sample C code demonstrates the usage of the AT94K Timer Macros.

```
void initTimer0 (void)
{
    TIMER0_CLOCK_SELECT(CLK_DIV_1024);
}

void initWatchDog (void)
{
    WATCHDOG_TIMER_PRESCALE(CYC_2048K);
    WATCHDOG_TIMER_ENABLE(ENABLE);
}
```



## Atmel Headquarters

### *Corporate Headquarters*

2325 Orchard Parkway  
San Jose, CA 95131  
TEL (408) 441-0311  
FAX (408) 487-2600

### *Europe*

Atmel SarL  
Route des Arsenaux 41  
Casa Postale 80  
CH-1705 Fribourg  
Switzerland  
TEL (41) 26-426-5555  
FAX (41) 26-426-5500

### *Asia*

Atmel Asia, Ltd.  
Room 1219  
Chinachem Golden Plaza  
77 Mody Road Tsimhatsui  
East Kowloon  
Hong Kong  
TEL (852) 2721-9778  
FAX (852) 2722-1369

### *Japan*

Atmel Japan K.K.  
9F, Tonetsu Shinkawa Bldg.  
1-24-8 Shinkawa  
Chuo-ku, Tokyo 104-0033  
Japan  
TEL (81) 3-3523-3551  
FAX (81) 3-3523-7581

## Atmel Operations

### *Atmel Colorado Springs*

1150 E. Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906  
TEL (719) 576-3300  
FAX (719) 540-1759

### *Atmel Rousset*

Zone Industrielle  
13106 Rousset Cedex  
France  
TEL (33) 4-4253-6000  
FAX (33) 4-4253-6001

### *Atmel Smart Card ICs*

Scottish Enterprise Technology Park  
East Kilbride, Scotland G75 0QR  
TEL (44) 1355-357-000  
FAX (44) 1355-242-743

### *Atmel Grenoble*

Avenue de Rochepleine  
BP 123  
38521 Saint-Egreve Cedex  
France  
TEL (33) 4-7658-3000  
FAX (33) 4-7658-3480

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### *Atmel FPSLIC Hotline*

(408) 436-4119

### *Atmel FPSLIC e-mail*

[fpslic@atmel.com](mailto:fpslic@atmel.com)

### *FAQ*

Available on web site

### *Fax-on-Demand*

North America:  
1-(800) 292-8635  
International:  
1-(408) 441-0732

### *e-mail*

[literature@atmel.com](mailto:literature@atmel.com)

### *Web Site*

<http://www.atmel.com>

### *BBS*

1-(408) 436-4309

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