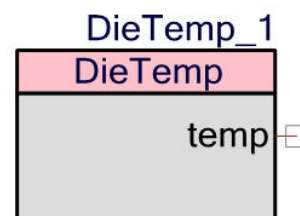


# PSoC 4 Die Temperature (DieTemp)

1.0

## Features

- Accuracy +/- 5 °C
- Range: -40 °C to +85 °C



## General Description

The Die Temperature component provides access to the analog signal whose voltage represents the temperature of the die. It also provides the API needed to convert the digital voltage representation of that analog signal to a temperature. This component does not provide the mechanism to convert the analog voltage to a digital value. That must be done in the design by connecting the signal to the ADC in the device and sampling the voltage.

## When to Use DieTemp

This component can be used to get a rough temperature measurement of the device. This value will also be correlated with the temperature within the enclosure the device is in.

## Input/Output Connections

### temp – Analog

This analog output is the connection of the die temperature to the SAR ADC for conversion.

## Component Parameters

There are no parameters or user interface available for this component.

## Placement

The DieTemp component uses the die temperature sensor, which is a part of SAR block.

## Application Programming Interface

Application Programming Interface (API) routines allow you to configure the component using software. The following table lists and describes the interface to each function. The subsequent sections cover each function in more detail.

By default, PSoC Creator assigns the instance name "DieTemp\_1" to the first instance of a component in a given design. You can rename it to any unique value that follows the syntactic rules for identifiers. The instance name becomes the prefix of every global function name, variable, and constant symbol. For readability, the instance name used in the following table is "DieTemp".

### Functions

Function	Description
int32 DieTemp_CountsTo_Celsius (int32 adcCounts)	Converts the ADC output to degrees Celsius.

### Global Variables

None

#### int32 DieTemp\_CountsTo\_Celsius(int32 adcCounts)

**Description:** Converts the ADC output to degrees Celsius.

**Parameters:** (int32) adcCounts

**Return Value:** Die Temperature in degrees Celsius.



## MISRA Compliance

This section describes the MISRA-C:2004 compliance and deviations for the component. There are two types of deviations defined: project deviations – deviations that are applicable for all PSoC Creator components and specific deviations – deviations that are applicable only for this component. This section provides information on component specific deviations. The project deviations are described in the MISRA Compliance section of the System Reference Guide along with information on the MISRA compliance verification environment.

The Die Temperature component has the following specific deviations:

MISRA-C:2004 Rule	Rule Class (Required/Advisory)	Rule Description	Description of Deviation(s)
10.1	R	<p>The value of an expression of integer type shall not be implicitly converted to a different underlying type if:</p> <ul style="list-style-type: none"> <li>it is not a conversion to a wider integer type of the same signedness, or</li> <li>the expression is not constant and is a function argument, or</li> <li>the expression is not constant and is a return expression</li> </ul>	Deviated to make code more efficient
12.7	R	Bitwise operators shall not be applied to operands whose underlying type is signed	Deviated to make code more efficient

## Sample Firmware Source Code

PSoC Creator provides numerous example projects that include schematics and example code in the Find Example Project dialog. For component-specific examples, open the dialog from the Component Catalog or an instance of the component in a schematic. For general examples, open the dialog from the Start Page or **File** menu. As needed, use the **Filter Options** in the dialog to narrow the list of projects available to select.

Refer to the "Find Example Project" topic in the PSoC Creator Help for more information.

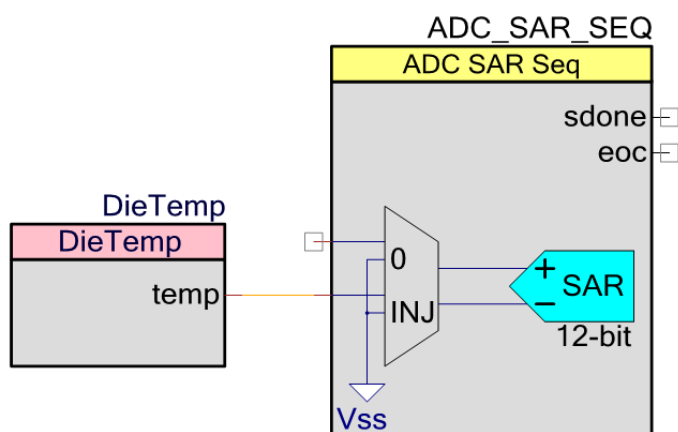


## Functional Description

DieTemp component is always used in conjunction with the ADC SAR Sequencer to sample the analog voltage and produce a digital value. Since the temperature changes slowly, this signal is commonly used with the injection channel to sample the value infrequently compared to other signals being converted by the ADC.

Recommended ADC SAR Sequencer settings for a die temperature measurement:

**Figure 1. Component Connection**



**Figure 2. ADC SAR Sequencer Settings – General Tab**

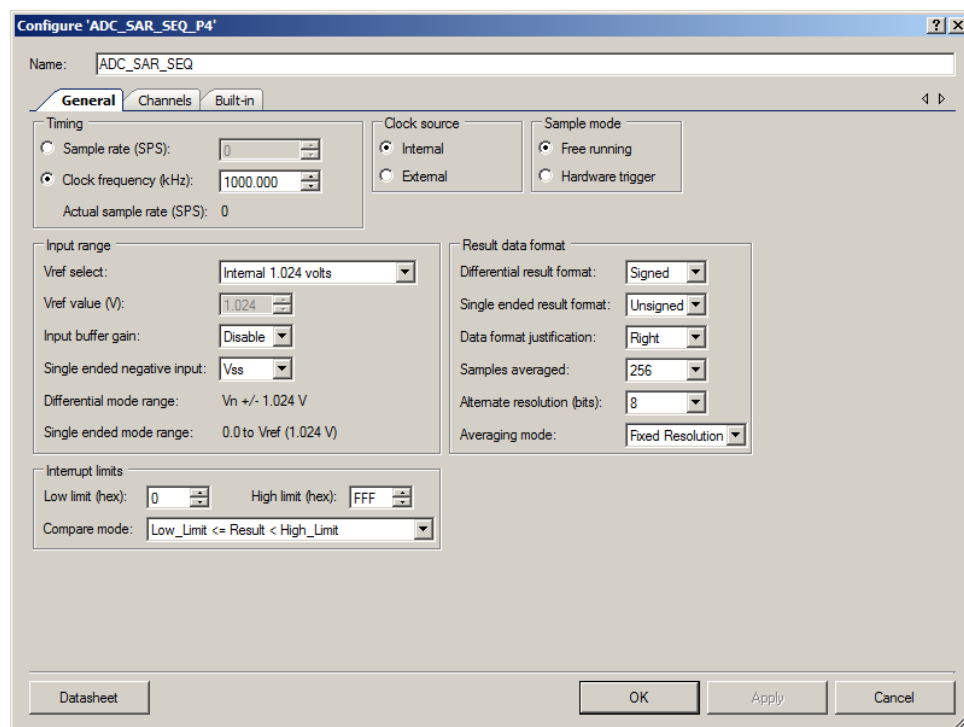


Figure 3. ADC SAR Sequencer Settings – Channels Tab

Configure 'ADC\_SAR\_SEQ\_P4'

Name:

General

**Channels**

Built-in

Acquisition times (ADC clocks)

A clks:  4 us

B clks:  4 us

C clks:  4 us

D clks:  4 us

Sequenced channels:

Channel	Enable	Resolution	Mode	AVG	Acq time	Conversion time	Limit detect	Saturation
0	<input type="checkbox"/>	12	Single	<input type="checkbox"/>	4 clks	18 us	<input type="checkbox"/>	<input type="checkbox"/>
INJ	<input checked="" type="checkbox"/>	12	Single	<input type="checkbox"/>	4 clks	18 us	<input type="checkbox"/>	<input type="checkbox"/>

Datasheet

OK

Apply

Cancel

Resources

Configuration	Resource Type
	Die tempersture sensor of the SAR block
Default	1

API Memory Usage

The component memory usage varies significantly, depending on the compiler, device, number of APIs used and component configuration. The following table provides the memory usage for all APIs available in the given component configuration.

The measurements have been done with the associated compiler configured in Release mode with optimization set for Size. For a specific design, the map file generated by the compiler can be analyzed to determine the memory usage.

Configuration	PSoC 4 (GCC)	
	Flash Bytes	SRAM Bytes
Default	80	0



## DC and AC Electrical Characteristics

Parameter	Description	Min	Typ	Max	Units	Details/Conditions
T <sub>SENSACC</sub>	Temperature sensor accuracy	-5	±1	+5	°C	-40 to +85 °C

## Component Changes

This section lists the major changes in the component from the previous version.

Version	Description of Changes	Reason for Changes / Impact
1.0.a	Updated datasheet.	Updated MISRA Compliance section.
1.0	First release	

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