PSoC® Creator™
Project Datasheet for
CapSense_CSD_P4_Proximity_Design01

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Table of Contents

1 Overview

The Cypress PSoC 4 is a family of 32-bit devices with the following characteristics:

- Digital system that includes configurable Universal Digital Blocks (UDBs) and specific function peripherals such as PWM, UART, SPI and I2C
- Analog subsystem that includes 12-bit SAR ADC, comparators, op amps, CapSense, LCD drive and more
- Several types of memory elements, including SRAM and flash
- Programming and debug system through Serial Wire Debug (SWD)
- High-performance 32-bit ARM Cortex-M0 core with a nested vectored interrupt controller (NVIC)
- Flexible routing to all pins

Figure 1 shows the major components of a typical PSoC 4200M series member PSoC 4 device. For details on all the systems listed above, please refer to the PSoC 4 Technical Reference Manual .

Figure 1. PSoC 4200M Device Series Block Diagram

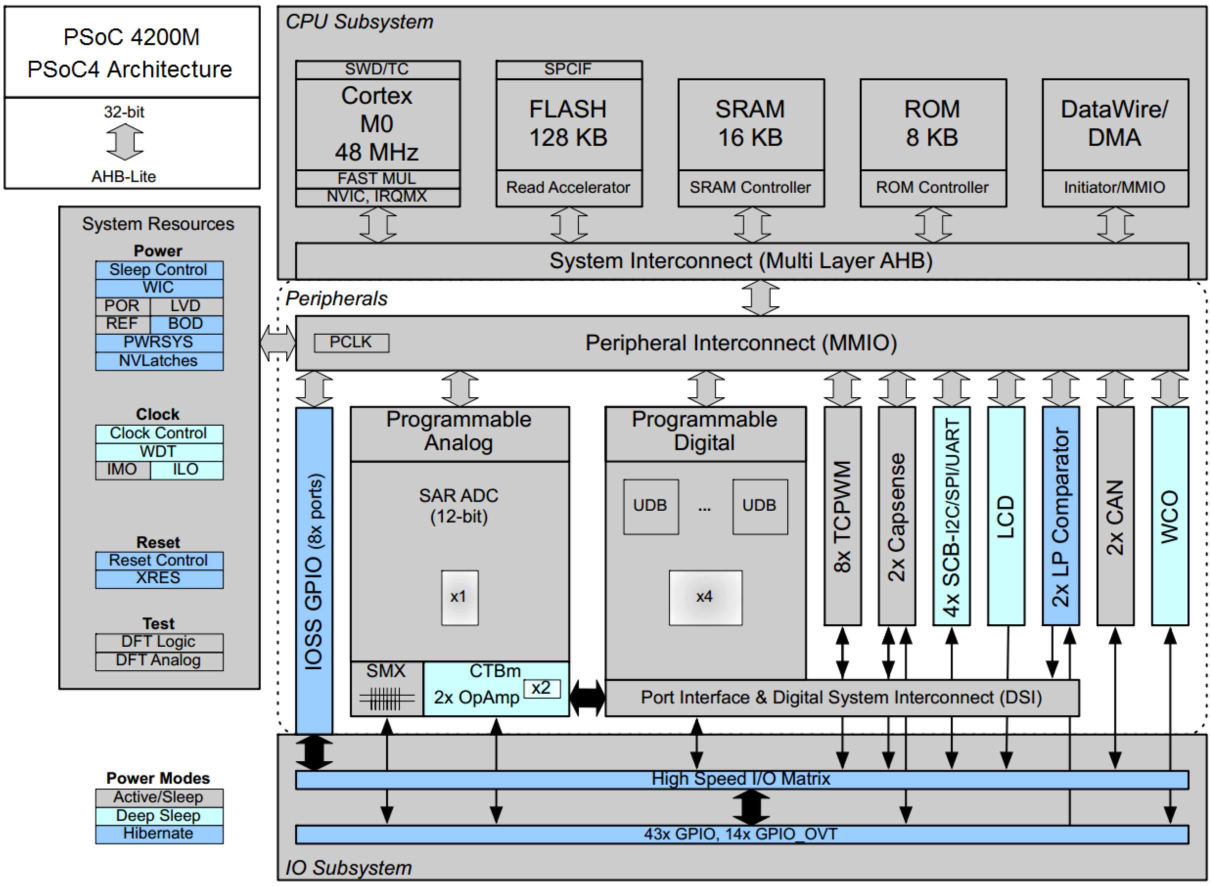


Table 1 lists the key characteristics of this device.

Table 1. Device Characteristics

Name	Value
Part Number	CY8C4247AZI-M485
Package Name	64-TQFP
Family	PSoC 4
Series	PSoC 4200M
Max CPU speed (MHz)	48
Flash size (kB)	128
SRAM size (kB)	16
Vdd range (V)	1.71 to 5.5
Automotive qualified	No (Industrial Grade Only)
Temp range (Celsius)	-40 to 85

NOTE: The CPU speed noted above is the maximum available speed. The CPU is clocked by HFCLK, listed in the System Clocks section below.

Table 2 lists the device resources that this design uses:

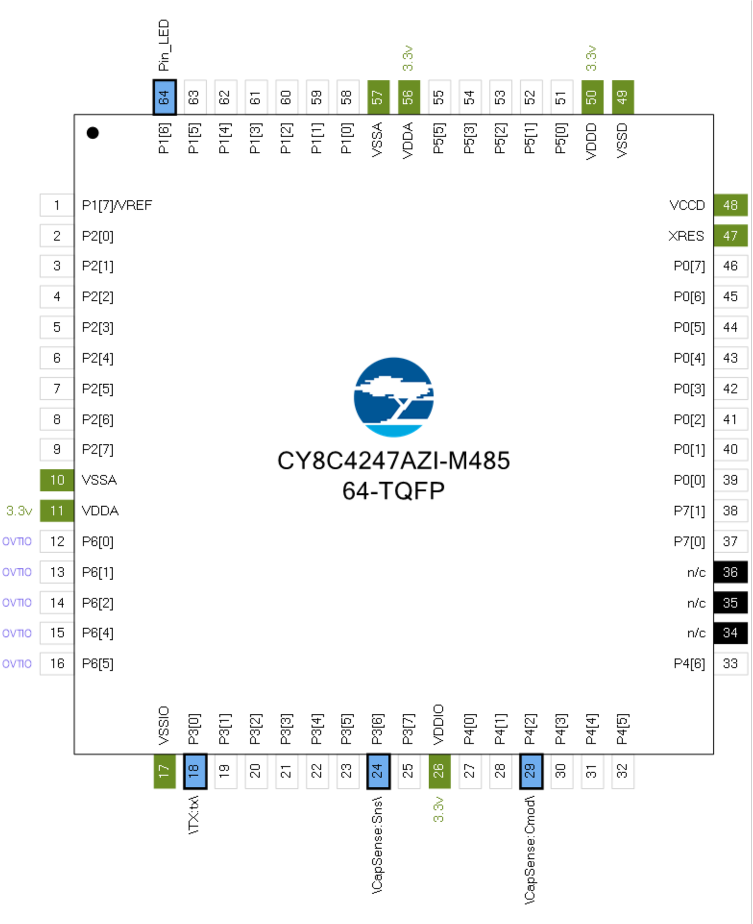
Table 2. Device Resources

Resource Type	Used	Free	Max	% Used
Digital Clocks	0	4	4	0.00 %
Interrupts	2	30	32	6.25 %
IO	4	47	51	7.84 %
Segment LCD	0	1	1	0.00 %
CapSense	1	1	2	50.00 %
Die Temp	0	1	1	0.00 %
CAN 2.0b	0	2	2	0.00 %
Serial Communication (SCB)	0	4	4	0.00 %
DMA Channels	0	8	8	0.00 %
Timer/Counter/PWM	1	7	8	12.50 %
UDB				
Macrocells	1	31	32	3.13 %
Unique P-terms	0	64	64	0.00 %
Total P-terms	0			
Datapath Cells	0	4	4	0.00 %
Status Cells	0	4	4	0.00 %
Control Cells	0	4	4	0.00 %
Comparator/Opamp	0	4	4	0.00 %
LP Comparator	0	2	2	0.00 %
SAR ADC	0	1	1	0.00 %
DAC				
7-bit IDAC	1	1	2	50.00 %
8-bit IDAC	1	1	2	50.00 %

2 Pins

Figure 2 shows the pin layout of this device.

Figure 2. Device Pin Layout



2.1 Hardware Pins

Table 3 contains information about the pins on this device in device pin order. (No connection ["n/c"] pins have been omitted.)

Table 3. Device Pins

Pin	Port	Name	Type	Drive Mode
1	P1[7]/VREF	GPIO [unused], Dedicated		
2	P2[0]	GPIO [unused]		
3	P2[1]	GPIO [unused]		
4	P2[2]	GPIO [unused]		
5	P2[3]	GPIO [unused]		
6	P2[4]	GPIO [unused]		
7	P2[5]	GPIO [unused]		
8	P2[6]	GPIO [unused]		
9	P2[7]	GPIO [unused]		
10	VSSA	VSSA	Power	
11	VDDA	VDDA	Power	
12	P6[0]	OVT IO [unused]		
13	P6[1]	OVT IO [unused]		
14	P6[2]	OVT IO [unused]		
15	P6[4]	OVT IO [unused]		
16	P6[5]	OVT IO [unused]		
17	VSSIO	VSSIO	Power	
18	P3[0]	\TX:tx\	Software In/Out	Strong drive
19	P3[1]	GPIO [unused]		
20	P3[2]	GPIO [unused]		
21	P3[3]	GPIO [unused]		
22	P3[4]	GPIO [unused]		
23	P3[5]	GPIO [unused]		
24	P3[6]	\CapSense:Sns\	Analog	HiZ analog
25	P3[7]	GPIO [unused]		
26	VDDIO	VDDIO	Power	
27	P4[0]	GPIO [unused]		
28	P4[1]	GPIO [unused]		
29	P4[2]	\CapSense:Cmod\	Analog	HiZ analog
30	P4[3]	GPIO [unused]		
31	P4[4]	GPIO [unused]		
32	P4[5]	GPIO [unused]		
33	P4[6]	GPIO [unused]		
37	P7[0]	GPIO [unused]		
38	P7[1]	GPIO [unused]		
39	P0[0]	GPIO [unused]		
40	P0[1]	GPIO [unused]		
41	P0[2]	GPIO [unused]		
42	P0[3]	GPIO [unused]		
43	P0[4]	GPIO [unused]		
44	P0[5]	GPIO [unused]		
45	P0[6]	GPIO [unused]		
46	P0[7]	GPIO [unused]		
47	XRES	XRES	Dedicated	
48	VCCD	VCCD	Power	

Pin	Port	Name	Type	Drive Mode
49	VSSD	VSSD	Power	
50	VDDD	VDDD	Power	
51	P5[0]	GPIO [unused]		
52	P5[1]	GPIO [unused]		
53	P5[2]	GPIO [unused]		
54	P5[3]	GPIO [unused]		
55	P5[5]	GPIO [unused]		
56	VDDA	VDDA	Power	
57	VSSA	VSSA	Power	
58	P1[0]	GPIO [unused]		
59	P1[1]	GPIO [unused]		
60	P1[2]	GPIO [unused]		
61	P1[3]	GPIO [unused]		
62	P1[4]	GPIO [unused]		
63	P1[5]	GPIO [unused]		
64	P1[6]	Pin_LED	Dgtl Out	Strong drive

Abbreviations used in Table 3 have the following meanings:

- HiZ analog = High impedance analog
- Dgtl Out = Digital Output

2.2 Hardware Ports

Table 4 contains information about the pins on this device in device port order. (No connection ["n/c"], power and dedicated pins have been omitted.)

Table 4. Device Ports

Port	Pin	Name	Type	Drive Mode
P0[0]	39	GPIO [unused]		
P0[1]	40	GPIO [unused]		
P0[2]	41	GPIO [unused]		
P0[3]	42	GPIO [unused]		
P0[4]	43	GPIO [unused]		
P0[5]	44	GPIO [unused]		
P0[6]	45	GPIO [unused]		
P0[7]	46	GPIO [unused]		
P1[0]	58	GPIO [unused]		
P1[1]	59	GPIO [unused]		
P1[2]	60	GPIO [unused]		
P1[3]	61	GPIO [unused]		
P1[4]	62	GPIO [unused]		
P1[5]	63	GPIO [unused]		
P1[6]	64	Pin_LED	Dgtl Out	Strong drive
P1[7]/VREF	1	GPIO [unused], Dedicated		
P2[0]	2	GPIO [unused]		
P2[1]	3	GPIO [unused]		
P2[2]	4	GPIO [unused]		
P2[3]	5	GPIO [unused]		
P2[4]	6	GPIO [unused]		
P2[5]	7	GPIO [unused]		
P2[6]	8	GPIO [unused]		
P2[7]	9	GPIO [unused]		
P3[0]	18	\TX:tx\	Software In/Out	Strong drive
P3[1]	19	GPIO [unused]		
P3[2]	20	GPIO [unused]		
P3[3]	21	GPIO [unused]		
P3[4]	22	GPIO [unused]		
P3[5]	23	GPIO [unused]		
P3[6]	24	\CapSense:Sns\	Analog	HiZ analog
P3[7]	25	GPIO [unused]		
P4[0]	27	GPIO [unused]		
P4[1]	28	GPIO [unused]		
P4[2]	29	\CapSense:Cmod\	Analog	HiZ analog
P4[3]	30	GPIO [unused]		
P4[4]	31	GPIO [unused]		
P4[5]	32	GPIO [unused]		
P4[6]	33	GPIO [unused]		
P5[0]	51	GPIO [unused]		
P5[1]	52	GPIO [unused]		
P5[2]	53	GPIO [unused]		
P5[3]	54	GPIO [unused]		
P5[5]	55	GPIO [unused]		
P6[0]	12	OVT IO [unused]		

Port	Pin	Name	Type	Drive Mode
P6[1]	13	OVT IO [unused]		
P6[2]	14	OVT IO [unused]		
P6[4]	15	OVT IO [unused]		
P6[5]	16	OVT IO [unused]		
P7[0]	37	GPIO [unused]		
P7[1]	38	GPIO [unused]		

Abbreviations used in Table 4 have the following meanings:

- Dgtl Out = Digital Output
- HiZ analog = High impedance analog

2.3 Software Pins

Table 5 contains information about the software pins on this device in alphabetical order. (Only software-accessible pins are shown.)

Table 5. Software Pins

Name	Port	Type
\CapSense:Cmod\	P4[2]	Analog
\CapSense:Sns\	P3[6]	Analog
\TX:tx\	P3[0]	Software In/Out
GPIO [unused]	P4[6]	
GPIO [unused]	P4[3]	
GPIO [unused]	P5[2]	
GPIO [unused]	P4[4]	
GPIO [unused]	P4[0]	
GPIO [unused]	P4[1]	
GPIO [unused]	P5[1]	
GPIO [unused]	P0[5]	
GPIO [unused]	P0[4]	
GPIO [unused]	P0[6]	
GPIO [unused]	P5[0]	
GPIO [unused]	P0[7]	
GPIO [unused]	P0[3]	
GPIO [unused]	P7[1]	
GPIO [unused]	P7[0]	
GPIO [unused]	P0[0]	
GPIO [unused]	P0[2]	
GPIO [unused]	P0[1]	
GPIO [unused]	P2[7]	
GPIO [unused]	P2[6]	
GPIO [unused]	P1[5]	
GPIO [unused]	P1[3]	
GPIO [unused]	P1[4]	
GPIO [unused]	P2[5]	
GPIO [unused]	P2[1]	
GPIO [unused]	P2[0]	
GPIO [unused]	P2[2]	
GPIO [unused]	P2[4]	
GPIO [unused]	P2[3]	
GPIO [unused]	P1[2]	
GPIO [unused]	P3[4]	
GPIO [unused]	P3[3]	
GPIO [unused]	P3[5]	
GPIO [unused]	P3[7]	
GPIO [unused]	P4[5]	
GPIO [unused]	P3[2]	
GPIO [unused]	P1[0]	
GPIO [unused]	P1[1]	
GPIO [unused]	P5[5]	
GPIO [unused]	P3[1]	
GPIO [unused]	P5[3]	
GPIO [unused], Dedicated	P1[7]/VREF	

Name	Port	Type
OVT IO [unused]	P6[0]	
OVT IO [unused]	P6[5]	
OVT IO [unused]	P6[4]	
OVT IO [unused]	P6[2]	
OVT IO [unused]	P6[1]	
Pin_LED	P1[6]	Dgtl Out

Abbreviations used in Table 5 have the following meanings:

- Dgtl Out = Digital Output

For more information on reading, writing and configuring pins, please refer to:

- Pins chapter in the System Reference Guide
  - CyPins API routines
- Programming Application Interface section in the cy_pins component datasheet

3 System Settings

3.1 System Configuration

Table 6. System Configuration Settings

Name	Value
Device Configuration Mode	Compressed
Unused Bonded IO	Allow but warn
Heap Size (bytes)	0x0080
Stack Size (bytes)	0x0200
Include CMSIS Core Peripheral Library Files	True

3.2 System Debug Settings

Table 7. System Debug Settings

Name	Value
Debug Select	GPIO
Chip Protection	Open

3.3 System Operating Conditions

Table 8. System Operating Conditions

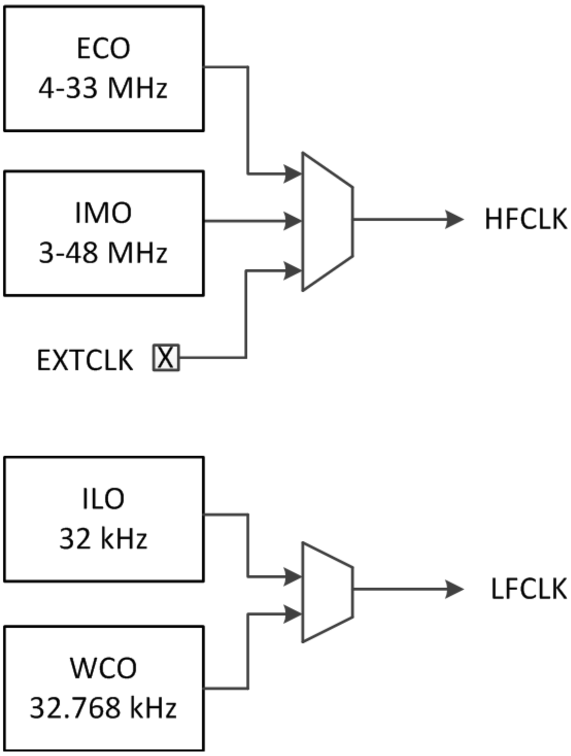
Name	Value
VDDA (V)	3.3
VDDD (V)	3.3
VDDIO (V)	3.3
Variable VDDA	True

4 Clocks

The clock system includes these clock resources:

- Two internal clock sources:
  - 3 to 48 MHz Internal Main Oscillator (IMO) ±2% at 3 MHz
  - 32 kHz Internal Low Speed Oscillator (ILO) output
- HFCLK can be generated using an external signal from EXTCLK pin
- Twenty clock dividers, each with 16-bit divide capability, 4 with fractional capability:
  - Any can be used for fixed-function blocks
  - Four can be used for the UDBs

Figure 3. System Clock Configuration



4.1 System Clocks

Table 9 lists the system clocks used in this design.

Table 9. System Clocks

Name	Domain	Source	Desired Freq	Nominal Freq	Accuracy (%)	Start at Reset	Enabled
DPLL_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
SYSCLK	NONE	HFCLK	? MHz	24 MHz	±2	True	True
Direct_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
PLL1_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
PLL0_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
HFCLK	NONE	Direct_Sel	24 MHz	24 MHz	±2	True	True
IMO	NONE		24 MHz	24 MHz	±2	True	True
ILO	NONE		32 kHz	32 kHz	±60	True	True
LFCLK	NONE	ILO	? MHz	32 kHz	±60	True	True
RTC_Sel	NONE	None	? MHz	? MHz	±0	True	True
Timer2 (WDT2)	NONE	LFClk	? MHz	? MHz	±0	False	False
DigSig3	NONE		? MHz	? MHz	±0	False	False
EXTCLK	NONE		24 MHz	? MHz	±0	False	False
DigSig1	NONE		? MHz	? MHz	±0	False	False
DigSig2	NONE		? MHz	? MHz	±0	False	False
DigSig4	NONE		? MHz	? MHz	±0	False	False
Timer1 (WDT1)	NONE	LFClk	? MHz	? MHz	±0	False	False
Timer0 (WDT0)	NONE	LFClk	? MHz	? MHz	±0	False	False
WCO	NONE		32.768 kHz	? MHz	±0.015	False	False

4.2 Local and Design Wide Clocks

Local clocks drive individual analog and digital blocks. Design wide clocks are a user-defined optimization, where two or more analog or digital blocks that share a common clock profile (frequency, etc) can be driven from the same clock divider output source.

Figure 4. Local and Design Wide Clock Configuration

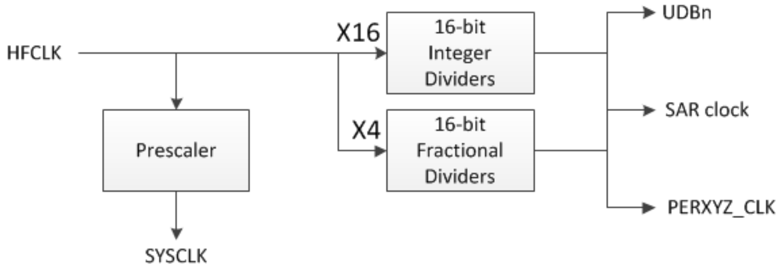


Table 10 lists the local clocks used in this design.

Table 10. Local Clocks

Name	Domain	Source	Desired Freq	Nominal Freq	Accuracy (%)	Start at Reset	Enabled
Clock_PWM	FIXED_-FUNCT-ION	HFCLK	12 MHz	12 MHz	±2	True	True
CapSense_-SampleClk	FIXED_-FUNCT-ION	HFCLK	? MHz	94.118 kHz	±2	True	True
CapSense_-SenseClk	FIXED_-FUNCT-ION	HFCLK	? MHz	94.118 kHz	±2	True	True

For more information on clocking resources, please refer to:

- Clocking System chapter in the PSoC 4 Technical Reference Manual
- Clocking chapter in the System Reference Guide
  - CySysClkImo API routines
  - CySysClkIlo API routines
  - CySysClkWco API routines
  - CySysClkWrite API routines

5 Interrupts and DMAs

5.1 Interrupts

This design contains the following interrupt components: (0 is the highest priority)

Table 11. Interrupts

Name	Intr Num	Vector	Priority
WDT_ISR	7	7	3
CapSense_ISR	17	17	3

For more information on interrupts, please refer to:

- Interrupt Controller chapter in the PSoC 4 Technical Reference Manual
- Interrupts chapter in the System Reference Guide
    - CyInt API routines and related registers
- Datasheet for cy_isr component

5.2 DMAs

This design contains no DMA components.

6 Flash Memory

PSoC 4 devices offer a host of Flash protection options and device security features that you can leverage to meet the security and protection requirements of an application. These requirements range from protecting configuration settings or Flash data to locking the entire device from external access.

Table 12 lists the Flash protection settings for your design.

Table 12. Flash Protection Settings

Start Address	End Address	Protection Level
0x0	0x1FFFF	U - Unprotected

Flash memory is organized as rows with each row of flash having 128 bytes. Each flash row can be assigned one of four protection levels:

- U - Unprotected
- W - Full Protection

For more information on Flash memory and protection, please refer to:

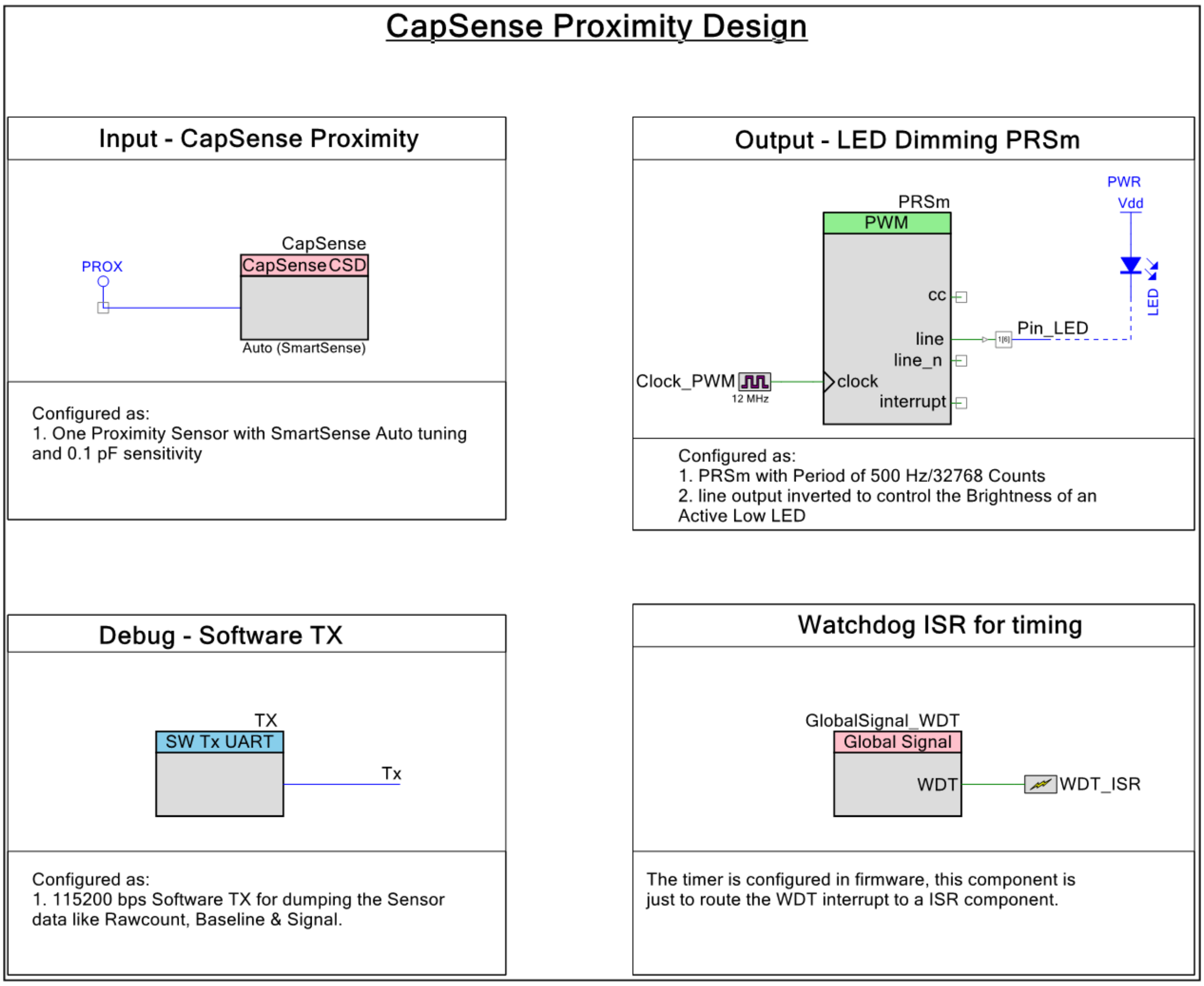
- Flash Protection chapter in the PSoC 4 Technical Reference Manual
- Flash and EEPROM chapter in the System Reference Guide
  - CySysFlash API routines

7 Design Contents

This design's schematic content consists of the following schematic sheet:

7.1 Schematic Sheet: CapSense_Proximity_Design

Figure 5. Schematic Sheet: CapSense_Proximity_Design



Configured as:
1. One Proximity Sensor with SmartSense Auto tuning and 0.1 pF sensitivity

Configured as:
1. PRSm with Period of 500 Hz/32768 Counts
2. line output inverted to control the Brightness of an Active Low LED

Configured as:
1. 115200 bps Software TX for dumping the Sensor data like Rawcount, Baseline & Signal.

The timer is configured in firmware, this component is just to route the WDT interrupt to a ISR component.

This schematic sheet contains the following component instances:

- Instance CapSense (type: CapSense_CSD_P4_v2_60)
- Instance PRSm (type: TCPWM_P4_v2_10)
- Instance TX (type: SW_Tx_UART_v1_50)

8 Components

8.1 Component type: CapSense_CSD_P4 [v2.60]

8.1.1 Instance CapSense

Description: The CapSense CSD component provides capacitive buttons, sliders, touch pads, matrix buttons and proximity sensors.
Instance type: CapSense_CSD_P4 [v2.60]
Datasheet: online component datasheet for CapSense_CSD_P4

Table 13. Component Parameters for CapSense

Parameter Name	Value	Description
AdvCrossCouplingThreshold	5	This value must be equal to the value of a sensor when a finger is near the sensor, but it is not touching the sensor. This can be determined by slowly dragging a finger across the panel and finding the inflection point of the difference counts at the base of the curve. The difference value at this point should be the Cross Coupling Threshold. The default value is 0x5.
AdvPenultimateThreshold	100	This value is the threshold for determining an arrival at the edge. This value may have to be increased for small diamonds, so that the edge handling is initiated sooner. If this number is too high, there is jumping at the edge with a smaller finger. If this number is too low, there is jumping at the edge with a larger finger. The default value is 0x5.
AdvVirtualSensorThreshold	100	This value must be set to the value of any sensor when a middle sized finger is placed directly over it. If this value is too low, the finger is followed by the resolved location. If this value is too high, the finger is led by the resolved location. The default value is 0x64.
AnalogSwitchDivider	12	Defines the clock divider for an analog switch source.
AvgSamplesNumber	1	Defines the number of samples for averaging during the calibration procedure.
BallisticMultiplierEnabled	false	A ballistic multiplier is used to provide better pointer movement experience for the user.

Parameter Name	Value	Description
CalibrationResolution	7	Defines the scanning resolution setting during the calibration procedure.
CmodPrecharge	Precharge byVref buffer	Defines the pre-charge option for the Cmod capacitor.
ConnectInactiveSensors	Ground	Defines the sensor inactive state.
CshTankPrecharge	Precharge byVref buffer	Defines the pre-charge option for the Csh_tank capacitor.
CurrentSource	IDAC Sourcing	Defines the IDAC mode.
CustomEzI2CInstanceName	SCB	Default instance name of the Tuner communication component.
DbPwmMode	OFF	This parameter sets the dead mand PWM modulator mode.
DbPwmPeriod	0	This parameter sets the period of the dead band PWM modulator.
DfbEnable	false	Enables the digital filter on the CSD comparator.
DynamicButtonNumber	5	The number of buttons that can be created from the slider segments.
EmcSensorNumber	10	Defines the number of channels that can support the HIGH immunity mode.
EnableAutoCalibration	false	Enables the Auto Calibration in the manual tuning mode.
EnableBIST	false	Indicates whether a Built-in self-test is enabled.
EnableTuneHelper	false	Allows generation of tuner APIs.
Gestures_-ActiveEdgeSwipeThreshold	10	This parameter sets the minimum active step distance (in pixels) from the point of a touch-down, near the edge, that has to be exceeded before the gesture is triggered.
Gestures_-BottomAngleThreshold	45	This parameter defines the maximum angle (in degrees) that the path of a finger can subtend on the point of a touch-down, near the edge.
Gestures_ClicksEnabled	true	Indicates whether click gestures enabled.
Gestures_ClickXRadiusPixels	30	This parameter sets the maximum X-Axis displacement for click gestures.
Gestures_ClickYRadiusPixels	30	This parameter sets the maximum Y-Axis displacement for click gestures.
Gestures_-DebounceTwoFingerScrollToZoomCount	5	This parameter sets the number of zoom gestures to be triggered for a valid zoom after a scroll gesture has been observed without removing the fingers from the trackpad.

Parameter Name	Value	Description
Gestures_-DebounceZoomCount	3	This parameter sets the number of sequential zoom gestures in a particular direction (in or out) that have to be observed before the zoom gesture is deemed valid.
Gestures_-DoubleClickMaxRadius	20	This parameter sets the maximum pixel radius that the second click in a double click sequence can extend.
Gestures_-DoubleClickMaxTimeout	1000	This parameter is the maximum time allowed between two sequential clicks so that a double click gesture is reported.
Gestures_-DoubleClickMinTimeout	10	This parameter sets the minimum duration between two sequential clicks before a double click operation is considered valid.
Gestures_-EdgeSwipeCompleteTimeout	2000	Defines time when Edge Swipe Gesture is complete. After that time the other gestures are allowed to detect.
Gestures_EdgeSwipesEnabled	true	Indicates whether the edge swipe gestures have been enabled.
Gestures_EdgeSwipeTime	100	For edge swipe a detection finger should exceed Edge Swipe Active Distance within Edge Swipe Timeout.
Gestures_FlickActiveDistance-ThresholdX	30	This parameter sets the minimum active step distance (in pixels) that has to be exceeded before motion is considered active.
Gestures_FlickActiveDistance-ThresholdY	30	This parameter sets the minimum active step distance (in pixels) that has to be exceeded before motion is considered active.
Gestures_FlickSampleTime	3	This parameter sets the number of similar, sequential flick gestures that should be performed before the flick motion is considered valid.
Gestures_FlicksEnabled	false	Indicates whether flick gestures have been enabled.
Gestures_OneFingerInertialScrollActiveDistanceThresholdX	5	This parameter sets the active distance in X direction that has to be exceeded before a lift-off event to trigger inertial scroll.
Gestures_OneFingerInertialScrollActiveDistanceThresholdY	5	This parameter sets the active distance in Y direction that has to be exceeded before a lift-off event to trigger inertial scroll.
Gestures_OneFingerInertialScrollCountLevel	Low	This use can select Low or High levels of inertial count.

Parameter Name	Value	Description
Gestures_-OneFingerScrollDebounceCount	3	This parameter sets the number of similar, sequential scroll gestures that should be performed before the scroll motion is considered valid.
Gestures_-OneFingerScrollsEnabled	true	Indicates whether one finger scroll gestures have been enabled.
Gestures_OneFingerScrollStep-1	1	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 1 X/Y.
Gestures_OneFingerScrollStep-2	3	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 2 X/Y.
Gestures_OneFingerScrollStep-3	5	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 3 X/Y.
Gestures_OneFingerScrollStep-4	7	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 4 X/Y.
Gestures_OneFingerScrollThreshold1X	5	This parameter sets the active distance in X direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 1.
Gestures_OneFingerScrollThreshold1Y	5	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 1.
Gestures_OneFingerScrollThreshold2X	7	This parameter sets the active distance in X direction that has to be exceeded to trigger second level scroll and update scroll step value parameter to scroll step 2.
Gestures_OneFingerScrollThreshold2Y	7	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 2.
Gestures_OneFingerScrollThreshold3X	8	This parameter sets the active distance in X direction that has to be exceeded to trigger third level scroll and updates scroll step value parameter to scroll step 3.

Parameter Name	Value	Description
Gestures_OneFingerScrollThreshold3Y	9	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 3.
Gestures_OneFingerScrollThreshold4X	11	This parameter sets the active distance in X direction that has to be exceeded to trigger fourth level scroll and updates scroll step value parameter to scroll step 4.
Gestures_OneFingerScrollThreshold4Y	11	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 4.
Gestures_RotateActiveAngleThreshold	90	This parameter sets the minimum angle that should be made from the start of the gesture, before rotate gesture is reported.
Gestures_RotateDebounceLimit	20	This parameter sets the number of sequential pan gestures in a particular direction that have to be observed before the rotate gesture is deemed invalid.
Gestures_RotateEnabled	false	Indicates whether rotate gestures have been enabled.
Gestures_-SingleClickMaxTimeout	1000	This parameter sets the maximum time during which a finger can be on the trackpad for a single click event to be considered valid.
Gestures_SingleClickMinTimeout	20	This parameter sets the minimum time during which a finger can be on the trackpad for a single click event to be considered valid.
Gestures_TopAngleThreshold	45	This parameter defines the maximum angle (in degrees) that the path of a finger can subtend on the point of touch-down, near the edge.
Gestures_-TwoFingerClickMaxTimeout	1000	This parameter sets the maximum time during which two fingers can be placed on the trackpad before being disqualified as a two finger click event.
Gestures_TwoFingerClickMinTimeout	100	This parameter sets the minimum duration two fingers need to be on the trackpad before a two finger click event is registered.

Parameter Name	Value	Description
Gestures_TwoFingerInertialScrollActiveDistanceThresholdX	5	This parameter sets the active distance in X direction that has to be exceeded before a lift-off event to trigger inertial scroll.
Gestures_TwoFingerInertialScrollActiveDistanceThresholdY	5	This parameter sets the active distance in Y direction that has to be exceeded before a lift-off event to trigger inertial scroll.
Gestures_TwoFingerInertialScrollCountLevel	High	This use can select Low or High levels of inertial count.
Gestures_-TwoFingerScrollDebounceCount	3	This parameter sets the number of similar, sequential scroll gestures that should be performed before the scroll motion is considered valid.
Gestures_-TwoFingerScrollsEnabled	true	Indicates whether two fingers scroll gestures have been enabled.
Gestures_TwoFingerScrollStep-1	1	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 1 X/Y.
Gestures_TwoFingerScrollStep-2	3	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 2 X/Y.
Gestures_TwoFingerScrollStep-3	5	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 3 X/Y.
Gestures_TwoFingerScrollStep-4	7	This parameter sets number of scrolls to be reported when finger exceeds Scroll Threshold 4 X/Y.
Gestures_TwoFingerScrollThreshold1X	5	This parameter sets the active distance in X direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 1.
Gestures_TwoFingerScrollThreshold1Y	5	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 1.
Gestures_TwoFingerScrollThreshold2X	7	This parameter sets the active distance in X direction that has to be exceeded to trigger second level scroll and update scroll step value parameter to scroll step 2.
Gestures_TwoFingerScrollThreshold2Y	7	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 2.

Parameter Name	Value	Description
Gestures_TwoFingerScrollThreshold3X	8	This parameter sets the active distance in X direction that has to be exceeded to trigger third level scroll and updates scroll step value parameter to scroll step 3.
Gestures_TwoFingerScrollThreshold3Y	9	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 3.
Gestures_TwoFingerScrollThreshold4X	11	This parameter sets the active distance in X direction that has to be exceeded to trigger fourth level scroll and updates scroll step value parameter to scroll step 4.
Gestures_TwoFingerScrollThreshold4Y	11	This parameter sets the active distance in Y direction that has to be exceeded to trigger first level scroll and updates scroll step value parameter to scroll step 4.
Gestures_TwoFingerSettlingCount	3	This parameter sets a delay threshold must be met before two finger gestures are computed.
Gestures_WidthOfDisambiguationRegion	5	This parameter sets the edge area for the edge swipe gestures. A valid edge swipe gesture should start within the width of disambiguation region.
Gestures_-ZoomActiveDistanceThresholdX	8	This parameter sets the minimum active step distance (in pixels) that has to be cleared before a motion is considered an active zoom (in or out).
Gestures_-ZoomActiveDistanceThresholdY	8	This parameter sets the minimum active step distance (in pixels) that has to be cleared before a motion is considered an active zoom (in or out).
Gestures_ZoomEnabled	true	Indicates whether zoom gestures have been enabled.
GlitchEliminateTimeout	0	Eliminates the glitch before scanning
GuardSensorEnable	false	Enables the Guard sensor. This type of sensor is typically required for water proof applications.
I2cCommunication	Internal I2C Communication	Defines whether the internal or external I2C communication component will be used.
IDACRange	4x	Defines Idac Range for all sensors.
IDACsCount	2	Sets IDACs count.
ImmunityLevel	Low	Defines the noise immunity level.

Parameter Name	Value	Description
InputClkFreq	3	Defines the signal frequency used to drive the comparator latch and period counter.
IsStreetFighter	false	Defines whether the component is used for the StreeTFighter firmware.
IsTrackpadSupported	false	Defines whether the component supports the trackpad with gestures.
KValueScalingFactor	8	Defines the scaling factor of the K value for proximity sensors.
LowBaselineReset	5	Defines the number of samples with raw counts less than the baseline needed to make baseline snap down to the raw count level.
ModulatorClkDivider	12	Defines the modulator clock divider.
NegativeNoiseThreshold	20	Defines the negative difference between the raw count and baseline levels for baseline resting to the raw count level.
OversamplingEn	true	Enables the oversampling functionality.
PrechargeClkDivider	12	Defines the clock divider for an analog switch source.
PrechargeClkFreq	3	Defines the precharge signal frequency
PrsOptions	12bits	Defines the source of the sensors switching controlling signal
RawDataFilterType	First Order IIR 1/4	Defines the filter applied to raw data values.
SensorAutoReset	false	Enabling the auto reset causes baseline to always update regardless of whether the difference counts are above or below the noise threshold. When auto reset is disabled, Baseline only updates when difference counts are within the plus/minus noise threshold (the noise threshold is mirrored.)
SensorNumber	1	Total sensors count
SensorsFreqSettingsInd	true	Select individual frequency settings for each sensor or common for all sensors.
ShieldDelay	None	Defines a shield signal delay relative to the switches controlling signal.
ShieldEnable	false	Defines using the shield output.
ShieldTankEnable	false	Enables the external shield tank capacitor.
SliderThresholdsUpdateManual	false	This variable is intended to define the thresholds updating mods for sliders.
SnsAlias	ProximitySensor0_0__PROX	Contains all aliases for sensors.

Parameter Name	Value	Description
ThresholdMode	false	Enables the Flexible Thresholds in the Auto Tuning mode.
TrackpadApiResolutionCol	100	This parameter specifies the column API resolution of the trackpad with a gesture widget.
TrackpadApiResolutionRow	100	This parameter specifies the row API resolution of the trackpad with a gesture widget.
TrackpadExists	false	Indicates whether the trackpad with a gesture widget was added.
TunerIntfAddress	8	This parameter specifies the I2C 7-bits slave address (MSB ignored).
TunerIntfDataRate	400	This parameter specifies the I2C Data rate in kbps. The standard data rates are: 50, 100, 400 kbps.
TunerProperties		Contains additional parameters required for the tuner.
TuningMethod	Auto	Defines the tuning method for the CapSense system.
User Comments		Instance-specific comments.
WaterProofingEnabled	false	Enables special capsense system settings to use in water proof designs.
WidgetResolution	8	Defines the Signal resolution as uint8 or uint16. The valid values are 8 and 16.

8.2 Component type: SW_Tx_UART [v1.50]

8.2.1 Instance TX

Description: Software Transmit UART
Instance type: SW_Tx_UART [v1.50]
Datasheet: online component datasheet for SW_Tx_UART

Table 14. Component Parameters for TX

Parameter Name	Value	Description
BaudRate	115200	This parameter specifies the baud rate of the component in bps.
PinAssignmentMethod	Static	This parameter specifies the method by which the component’s output pin is assigned. Static indicates that the component will contain a buried pin that will be assigned in the cydwr file. Dynamic requires that the pin be specified via the StartEx() API.
User Comments		Instance-specific comments.

8.3 Component type: TCPWM_P4 [v2.10]

8.3.1 Instance PRSm

Description: 16-bit Timer Counter PWM (TCPWM)
Instance type: TCPWM_P4 [v2.10]
Datasheet: online component datasheet for TCPWM_P4

Table 15. Component Parameters for PRSm

Parameter Name	Value	Description
PWMCompare	1	The initial value for the comparison register when in the PWM mode
PWMCompareBuf	65535	The initial value for the second comparison register when in the PWM mode
PWMCompareSwap	Disable swap	Determines whether the PWM swap check box is enabled or disabled
PWMCountMode	Level	Determines whether the PWM counter counts at level detection or in various modes of edge detection
PWMCountPresent	false	Determines if the PWM count signal is present and controls the visibility of the count pin
PWMDeadTimeCycle	0	Sets the number of cycles of dead time insertion
PWMInterruptMask	None	The mask used for enabling the interrupt bit in the PWM mode
PWMKillEvent	Asynchronous	Selects whether a PWM kill event is synchronous or asynchronous to the input clock
PWMLinenSignal	Direct Output	Selects whether the PWM line_n signal is inverted or is directly output
PWMLineSignal	Inverse Output	Selects whether the PWM line signal is inverted or is directly output
PWMMode	Pseudo random PWM	Selects one of the three PWM modes - PWM, PWM with dead time insertion, or Pseudo random PWM
PWMPeriod	32767	The initial value for the period register when in the PWM mode
PWMPeriodBuf	65535	The initial value for the second period register when in the PWM mode
PWMPeriodSwap	Disable swap	Enables swap between the PWM period and period_buf registers
PWMPrescaler	0	Defines the prescaler used to divide the TCPWM clock to create the counter clock
PWMReloadMode	Rising edge	Determines whether the PWM reload signal is accepted at level detection or in various modes of edge detection
PWMReloadPresent	false	Determines whether the PWM reload signal is present and controls its pin visibility

Parameter Name	Value	Description
PWMRunMode	Continuous	Selects between continuous and one shot run mode for the PWM
PWMSetAlign	Left align	Selects the alignment of the PWM waveform to be either left, right, center or asymmetrically aligned
PWMStartMode	Rising edge	Determines whether the PWM start signal is accepted at level detection or in various modes of edge detection
PWMStartPresent	false	Determines whether the PWM start signal is present and controls its pin visibility
PWMStopEvent	Don't stop on Kill	Selects whether to kill the PWM on a stop signal or not
PWMStopMode	Rising edge	Determines whether the PWM stop signal is accepted at level detection or in various modes of edge detection
PWMStopPresent	false	Determines whether the PWM stop signal is present and controls its pin visibility
PWMSwitchMode	Rising edge	Determines whether the PWM switch signal is accepted at level detection or in various modes of edge detection
PWMSwitchPresent	false	Determines whether the PWM switch signal is present and controls its pin visibility
QuadEncodingModes	x1 Encoding mode	Selects one of the three quadrature decoder modes – x1, x2, or x4 encoding mode
QuadIndexMode	Rising edge	Determines whether the Quadrature Decoder index signal is accepted at level detection or in various modes of edge detection
QuadIndexPresent	false	Determines whether the Quadrature Decoder index signal is present and controls its pin visibility
QuadInterruptMask	Terminal count mask	The mask used to configure which Quadrature Decoder event causes an interrupt
QuadPhiAMode	Level	Determines whether the Quadrature Decoder PhiA signal is accepted at level detection or in various modes of edge detection
QuadPhiBMode	Level	Determines whether the Quadrature Decoder PhiB signal is accepted at level detection or in various modes of edge detection

Parameter Name	Value	Description
QuadStopMode	Rising edge	Determines whether the Quadrature Decoder stop signal is accepted at level detection or in various modes of edge detection
QuadStopPresent	false	Determines whether the Quadrature Decoder stop signal is present and controls its pin visibility
TCCaptureMode	Rising edge	Determines whether the Timer/Counter capture signal is accepted at level detection or in various modes of edge detection
TCCapturePresent	false	Determines whether the Timer/Counter capture signal is present and controls its pin visibility
TCCompare	65535	The initial value for the comparison register when in the Timer/Counter mode
TCCompareBuf	65535	The initial value for the second comparison register when in the Timer/Counter mode
TCCompareSwap	Disable swap	Determines whether the Timer/Counter swap check box is enabled or disabled
TCCompCapMode	Capture Mode	Selects whether the Timer/Counter capture or the compare mode is enabled
TCCountingModes	Counts up	Selects the count direction of the counter
TCCountMode	Level	Determines whether the Timer/Counter count signal is accepted at a level detect or at various modes of edge detection
TCCountPresent	false	Determines whether the Timer/Counter count signal is present and controls its pin visibility
TCInterruptMask	Terminal count mask	The mask used to determine which Timer/Counter event causes an interrupt
TCPeriod	65535	The initial value for the Timer/Counter period register
TCPrescaler	0	Selects the prescaler value to apply to the Timer/Counter clock
TCPWMCapturePresent	false	Determines whether the Unconfigured capture signal is present and controls its pin visibility
TCPWMConfig	PWM	Selects the TCPWM mode - Unconfigured, Timer/Counter, PWM, or Quadrature Decoder

Parameter Name	Value	Description
TCPWMCountPresent	false	Determines whether the Unconfigured count signal is present and controls its pin visibility
TCPWMReloadPresent	false	Determines whether the Unconfigured reload signal is present and controls its pin visibility
TCPWMStartPresent	false	Determines whether the Unconfigured start signal is present and controls its pin visibility
TCPWMStopPresent	false	Determines whether the Unconfigured stop signal is present and controls its pin visibility
TCReloadMode	Rising edge	Determines whether the Timer/Counter reload signal is accepted at level detection or in various modes of edge detection
TCReloadPresent	false	Determines whether the Timer/Counter reload signal is present and controls its pin visibility
TCRunMode	Continuous	Selects whether the counter runs continuously or one shot
TCStartMode	Rising edge	Determines whether the start signal is accepted at level detection or in various modes of edge detection
TCStartPresent	false	Determines whether the Timer/Counter start signal is present and controls its pin visibility
TCStopMode	Rising edge	Determines whether the Timer/Counter stop signal is accepted at level detection or in various modes of edge detection
TCStopPresent	false	Determines whether the Timer/Counter stop signal is present and controls its pin visibility
User Comments		Instance-specific comments.

9 Other Resources

The following documents contain important information on Cypress software APIs that might be relevant to this design:

- Standard Types and Defines chapter in the System Reference Guide
    - Software base types
    - Hardware register types
    - Compiler defines
    - Cypress API return codes
    - Interrupt types and macros
- Registers
    - The full PSoC 4 register map is covered in the PSoC 4 Registers Technical Reference Manual
    - Register Access chapter in the System Reference Guide
        - CY_GET API routines
        - CY_SET API routines
- System Functions chapter in the System Reference Guide
    - General API routines
    - CyDelay API routines
    - CyVd Voltage Detect API routines
- Power Management
    - Power Supply and Monitoring chapter in the PSoC 4 Technical Reference Manual
    - Low Power Modes chapter in the PSoC 4 Technical Reference Manual
    - Power Management chapter in the System Reference Guide
        - CyPm API routines
- Watchdog Timer chapter in the System Reference Guide
    - CyWdt API routines