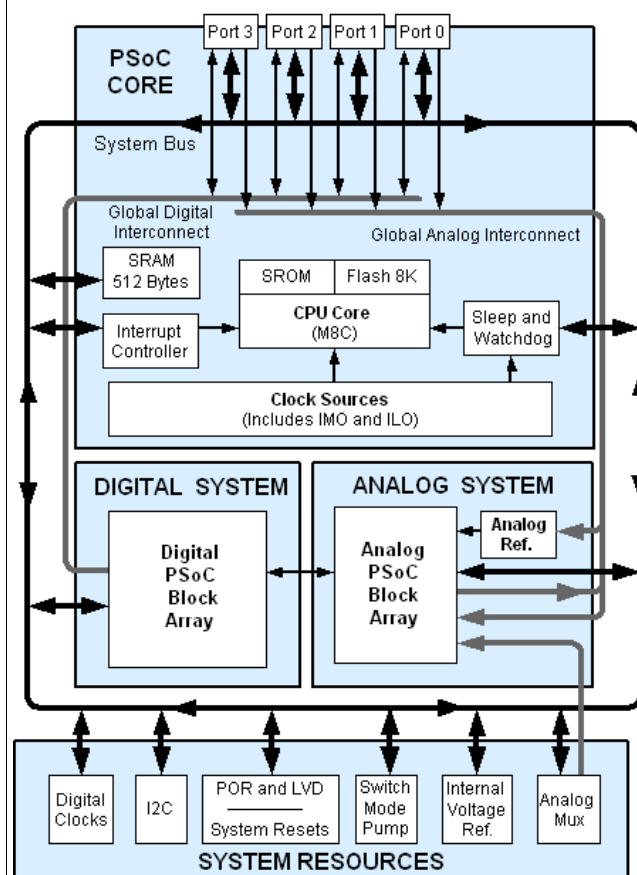


## Features

- **Powerful Harvard Architecture Processor**
  - M8C Processor Speeds to 24 MHz
  - Low power at high speed
  - 2.4V to 5.25V Operating Voltage
  - Operating Voltages Down to 1.0V using On-Chip Switch Mode Pump (SMP)
  - Industrial Temperature Range: -40°C to +85°C
- **Advanced Peripherals (PSoC® Blocks)**
  - 4 Analog Type "E" PSoC Blocks provide:
    - 2 Comparators with DAC Refs
    - Single or Dual 8-Bit 28 Channel ADC
  - 4 Digital PSoC Blocks provide:
    - 8 to 32-Bit Timers, Counters, and PWMs
    - CRC and PRS Modules
    - Full-Duplex UART, SPI™ Master or Slave
    - Connectable to All GPIO Pins
  - Complex Peripherals by Combining Blocks
- **Flexible On-Chip Memory**
  - 8K Flash Program Storage 50,000 Erase/Write Cycles
  - 512 Bytes SRAM Data Storage
  - In-System Serial Programming (ISSP)
  - Partial Flash Updates
  - Flexible Protection Modes
  - EEPROM Emulation in Flash
- **Complete Development Tools**
  - Free Development Software (PSoC Designer™)
  - Full-Featured, In-Circuit Emulator and Programmer
  - Full Speed Emulation
  - Complex Breakpoint Structure
  - 128K Trace Memory
- **Precision, Programmable Clocking**
  - Internal ±2.5% 24/48 MHz Oscillator
  - Internal Oscillator for Watchdog and Sleep
- **Programmable Pin Configurations**
  - 25 mA Sink, 10 mA Drive on All GPIO
  - Pull Up, Pull Down, High Z, Strong, or Open Drain Drive Modes on All GPIO
  - Up to 8 Analog Inputs on GPIO
  - Configurable Interrupt on All GPIO

- **Versatile Analog Mux**
  - Common Internal Analog Bus
  - Simultaneous Connection of IO Combinations
  - Capacitive Sensing Application Capability
- **Additional System Resources**
  - I²C Master, Slave and Multi-Master to 400 kHz
  - Watchdog and Sleep Timers
  - User-Configurable Low Voltage Detection
  - Integrated Supervisory Circuit
  - On-Chip Precision Voltage Reference

## Logic Block Diagram



## PSoC Functional Overview

The PSoC family consists of many Mixed-Signal Array with On-Chip Controller devices. These devices are designed to replace multiple traditional MCU-based system components with one low cost single-chip programmable component. A PSoC device includes configurable blocks of analog and digital logic, and programmable interconnect. This architecture enables the user to create customized peripheral configurations, to match the requirements of each individual application. Additionally, a fast CPU, Flash program memory, SRAM data memory, and configurable I/O are included in a range of convenient pinouts.

The PSoC architecture, shown in [Figure 1](#), consists of four main areas: the Core, the System Resources, the Digital System, and the Analog System. Configurable global bus resources allow combining all the device resources into a complete custom system. Each CY8C21x34 PSoC device includes four digital blocks and four analog blocks. Depending on the PSoC package, up to 28 general purpose IO (GPIO) are also included. The GPIO provide access to the global digital and analog interconnects.

### The PSoC Core

The PSoC Core is a powerful engine that supports a rich instruction set. It encompasses SRAM for data storage, an interrupt controller, sleep and watchdog timers, and IMO (internal main oscillator) and ILO (internal low speed oscillator). The CPU core, called the M8C, is a powerful processor with speeds up to 24 MHz. The M8C is a four MIPS 8-bit Harvard architecture microprocessor.

System Resources provide the following additional capabilities:

- Digital clocks to increase the flexibility of the PSoC mixed-signal arrays.
- I2C functionality to implement an I2C master and slave.
- An internal voltage reference, MultiMaster, that provides an absolute value of 1.3V to a number of PSoC subsystems.
- A switch mode pump (SMP) that generates normal operating voltages off a single battery cell.
- Various system resets supported by the M8C.

The Digital System consists of an array of digital PSoC blocks that may be configured into any number of digital peripherals. The digital blocks are connected to the GPIO through a series of global buses that can route any signal to any pin, freeing designs from the constraints of a fixed peripheral controller.

The Analog System consists of four analog PSoC blocks, supporting comparators and analog-to-digital conversion up to 8 bits in precision.

## The Digital System

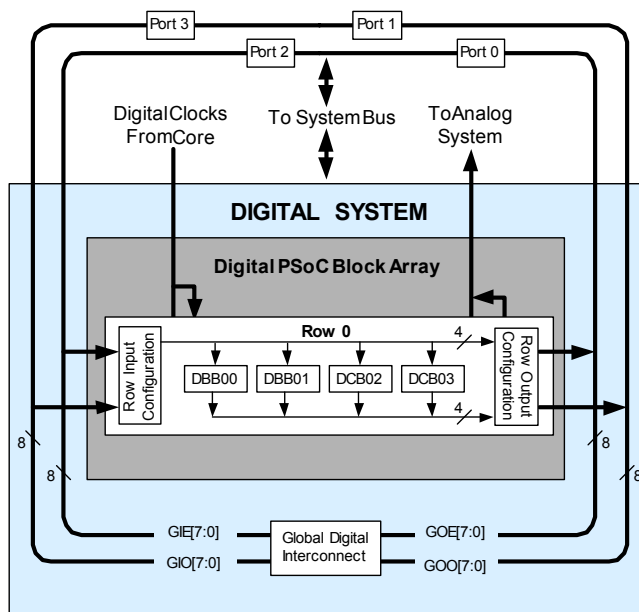
The Digital System consists of 4 digital PSoC blocks. Each block is an 8-bit resource that is used alone or combined with other blocks to form 8, 16, 24, and 32-bit peripherals, which are called user module references. Digital peripheral configurations include the following.

- PWMs (8 to 32 bit)
- PWMs with Dead band (8 to 32 bit)
- Counters (8 to 32 bit)
- Timers (8 to 32 bit)
- UART 8 bit with selectable parity
- SPI master and slave
- I2C slave and multi-master
- Cyclical Redundancy Checker/Generator (8 to 32 bit)
- IrDA
- Pseudo Random Sequence Generators (8 to 32 bit)

The digital blocks are connected to any GPIO through a series of global buses that can route any signal to any pin. The buses also allow for signal multiplexing and for performing logic operations. This configurability frees your designs from the constraints of a fixed peripheral controller.

Digital blocks are provided in rows of four, where the number of blocks varies by PSoC device family. This allows the optimum choice of system resources for your application. Family resources are shown in [Table 1](#) on page 4.

**Figure 1. Digital System Block Diagram**



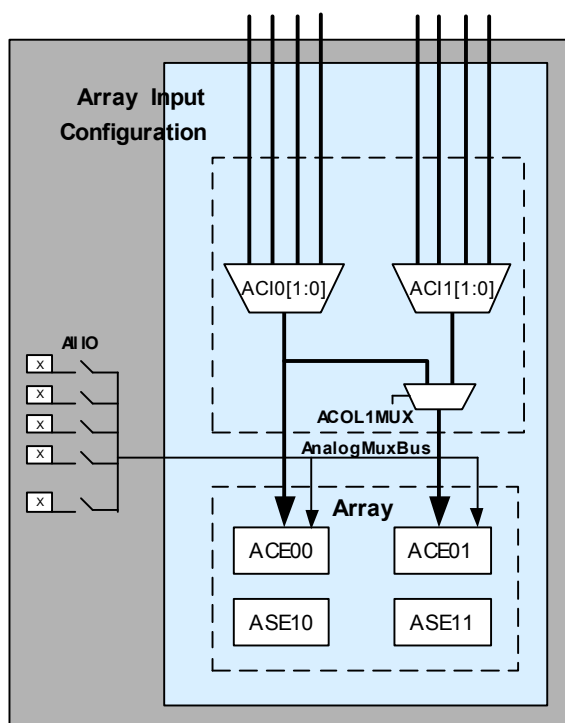
## The Analog System

The Analog System consists of 4 configurable blocks that allow the creation of complex analog signal flows. Analog peripherals are very flexible and may be customized to support specific application requirements. Some of the common PSoC analog functions for this device (most available as user modules) are:

- Analog-to-digital converters (single or dual, with 8-bit or 10-bit resolution)
- Pin-to-pin comparator
- Single-ended comparators (up to 2) with absolute (1.3V) reference or 8-bit DAC reference
- 1.3V reference (as a System Resource)

In most PSoC devices, analog blocks are provided in columns of three, which includes one CT (Continuous Time) and two SC (Switched Capacitor) blocks. The CY8C21x34 devices provide limited functionality Type "E" analog blocks. Each column contains one CT Type E block and one SC Type E block. Refer to the *PSoC Programmable System-on-Chip™ Technical Reference Manual* for detailed information on the CY8C21x34's Type E analog blocks.

**Figure 2. Analog System Block Diagram**



## The Analog Multiplexer System

The Analog Mux Bus can connect to every GPIO pin. Pins may be connected to the bus individually or in any combination. The bus also connects to the analog system for analysis with comparators and analog-to-digital converters. An additional 8:1 analog input multiplexer provides a second path to bring Port 0 pins to the analog array.

Switch control logic enables selected pins to precharge continuously under hardware control. This enables capacitive measurement for applications such as touch sensing. Other multiplexer applications include:

- Track pad, finger sensing.
- Chip-wide mux that allows analog input from any I/O pin.
- Crosspoint connection between any I/O pin combinations.

When designing capacitive sensing applications, refer to the signal-to-noise system level requirement found in Application Note [AN2403](http://www.cypress.com) on the Cypress web site at <http://www.cypress.com>.

## Additional System Resources

System Resources, some of which are listed in the previous sections, provide additional capability useful to complete systems. Additional resources include a switch mode pump, low voltage detection, and power on reset. Brief statements describing the merits of each system resource follow.

- Digital clock dividers provide three customizable clock frequencies for use in applications. The clocks may be routed to both the digital and analog systems. Additional clocks can be generated using digital PSoC blocks as clock dividers.
- The I2C module provides 100 and 400 kHz communication over two wires. Slave, master, and multi-master modes are all supported.
- Low Voltage Detection (LVD) interrupts can signal the application of falling voltage levels, while the advanced POR (Power On Reset) circuit eliminates the need for a system supervisor.
- An internal 1.3 voltage reference provides an absolute reference for the analog system, including ADCs and DACs.
- An integrated switch mode pump (SMP) generates normal operating voltages from a single 1.2V battery cell, providing a low cost boost converter.
- Versatile analog multiplexer system.

## PSoC Device Characteristics

Depending on your PSoC device characteristics, the digital and analog systems can have 16, 8, or 4 digital blocks and 12, 6, or 4 analog blocks. Table 1 lists the resources available for specific PSoC device groups. The PSoC device covered by this data sheet is highlighted in this table.

**Table 1. PSoC Device Characteristics**

| PSoC Part Number | Digital I/O | Digital Rows | Digital Blocks | Analog Inputs | Analog Outputs | Analog Columns | Analog Blocks    | SRAM Size | Flash Size |
|------------------|-------------|--------------|----------------|---------------|----------------|----------------|------------------|-----------|------------|
| CY8C29x66        | up to 64    | 4            | 16             | 12            | 4              | 4              | 12               | 2K        | 32K        |
| CY8C27x43        | up to 44    | 2            | 8              | 12            | 4              | 4              | 12               | 256 Bytes | 16K        |
| CY8C24x94        | 56          | 1            | 4              | 48            | 2              | 2              | 6                | 1K        | 16K        |
| CY8C24x23A       | up to 24    | 1            | 4              | 12            | 2              | 2              | 6                | 256 Bytes | 4K         |
| CY8C21x34        | up to 28    | 1            | 4              | 28            | 0              | 2              | 4 <sup>[1]</sup> | 512 Bytes | 8K         |
| CY8C21x23        | 16          | 1            | 4              | 8             | 0              | 2              | 4 <sup>[1]</sup> | 256 Bytes | 4K         |
| CY8C20x34        | up to 28    | 0            | 0              | 28            | 0              | 0              | 3 <sup>[2]</sup> | 512 Bytes | 8K         |

## Getting Started

The quickest way to understand PSoC silicon is to read this data sheet and then use the PSoC Designer Integrated Development Environment (IDE). This data sheet is an overview of the PSoC integrated circuit and presents specific pin, register, and electrical specifications.

For in depth information, along with detailed programming information, see the PSoC Programmable System-on-Chip Technical Reference Manual for CY8C28xxx PSoC devices.

For up-to-date ordering, packaging, and electrical specification information, see the latest PSoC device data sheets on the web at [www.cypress.com/psoc](http://www.cypress.com/psoc).

## Application Notes

Application notes are an excellent introduction to the wide variety of possible PSoC designs. They are located here: [www.cypress.com/psoc](http://www.cypress.com/psoc). Select Application Notes under the Documentation tab.

## Development Kits

PSoC Development Kits are available online from Cypress at [www.cypress.com/shop](http://www.cypress.com/shop) and through a growing number of regional and global distributors, which include Arrow, Avnet, Digi-Key, Farnell, Future Electronics, and Newark.

## Training

Free PSoC technical training (on demand, webinars, and workshops) is available online at [www.cypress.com/training](http://www.cypress.com/training). The training covers a wide variety of topics and skill levels to assist you in your designs.

## Cypros Consultants

Certified PSoC Consultants offer everything from technical assistance to completed PSoC designs. To contact or become a PSoC Consultant go to [www.cypress.com/cypros](http://www.cypress.com/cypros).

## Solutions Library

Visit our growing library of solution focused designs at [www.cypress.com/solutions](http://www.cypress.com/solutions). Here you can find various application designs that include firmware and hardware design files that enable you to complete your designs quickly.

## Technical Support

For assistance with technical issues, search KnowledgeBase articles and forums at [www.cypress.com/support](http://www.cypress.com/support). If you cannot find an answer to your question, call technical support at 1-800-541-4736.

### Notes

1. Limited analog functionality.
2. Two analog blocks and one CapSense.

## Development Tools

PSoC Designer is a Microsoft® Windows-based, integrated development environment for the Programmable System-on-Chip (PSoC) devices. The PSoC Designer IDE runs on Windows XP or Windows Vista.

This system provides design database management by project, an integrated debugger with In-Circuit Emulator, in-system programming support, and built-in support for third-party assemblers and C compilers.

PSoC Designer also supports C language compilers developed specifically for the devices in the PSoC family.

### PSoC Designer Software Subsystems

#### *System-Level View*

A drag-and-drop visual embedded system design environment based on PSoC Express. In the system level view you create a model of your system inputs, outputs, and communication interfaces. You define when and how an output device changes state based upon any or all other system devices. Based upon the design, PSoC Designer automatically selects one or more PSoC Mixed-Signal Controllers that match your system requirements.

PSoC Designer generates all embedded code, then compiles and links it into a programming file for a specific PSoC device.

#### *Chip-Level View*

The chip-level view is a more traditional Integrated Development Environment (IDE) based on PSoC Designer 4.4. Choose a base device to work with and then select different onboard analog and digital components called user modules that use the PSoC blocks. Examples of user modules are ADCs, DACs, Amplifiers, and Filters. Configure the user modules for your chosen application and connect them to each other and to the proper pins. Then generate your project. This prepopulates your project with APIs and libraries that you can use to program your application.

The device editor also supports easy development of multiple configurations and dynamic reconfiguration. Dynamic configuration allows for changing configurations at run time.

#### *Hybrid Designs*

You can begin in the system-level view, allow it to choose and configure your user modules, routing, and generate code, then switch to the chip-level view to gain complete control over on-chip resources. All views of the project share a common code editor, builder, and common debug, emulation, and programming tools.

#### *Code Generation Tools*

PSoC Designer supports multiple third party C compilers and assemblers. The code generation tools work seamlessly within the PSoC Designer interface and have been tested with a full range of debugging tools. The choice is yours.

**Assemblers.** The assemblers allow assembly code to merge seamlessly with C code. Link libraries automatically use absolute addressing or are compiled in relative mode, and linked with other software modules to get absolute addressing.

**C Language Compilers.** C language compilers are available that support the PSoC family of devices. The products allow you to create complete C programs for the PSoC family devices.

The optimizing C compilers provide all the features of C tailored to the PSoC architecture. They come complete with embedded libraries providing port and bus operations, standard keypad and display support, and extended math functionality.

#### *Debugger*

The PSoC Designer Debugger subsystem provides hardware in-circuit emulation, allowing you to test the program in a physical system while providing an internal view of the PSoC device. Debugger commands allow the designer to read and program and read and write data memory, read and write I/O registers, read and write CPU registers, set and clear breakpoints, and provide program run, halt, and step control. The debugger also allows the designer to create a trace buffer of registers and memory locations of interest.

#### *Online Help System*

The online help system displays online, context-sensitive help for the user. Designed for procedural and quick reference, each functional subsystem has its own context-sensitive help. This system also provides tutorials and links to FAQs and an Online Support Forum to aid the designer in getting started.

### In-Circuit Emulator

A low cost, high functionality In-Circuit Emulator (ICE) is available for development support. This hardware has the capability to program single devices.

The emulator consists of a base unit that connects to the PC by way of a USB port. The base unit is universal and operates with all PSoC devices. Emulation pods for each device family are available separately. The emulation pod takes the place of the PSoC device in the target board and performs full speed (24 MHz) operation.

## Designing with PSoC Designer

The development process for the PSoC device differs from that of a traditional fixed function microprocessor. The configurable analog and digital hardware blocks give the PSoC architecture a unique flexibility that pays dividends in managing specification change during development and by lowering inventory costs. These configurable resources, called PSoC Blocks, have the ability to implement a wide variety of user-selectable functions.

The PSoC development process can be summarized in the following four steps:

1. Select components
2. Configure components
3. Organize and Connect
4. Generate, Verify, and Debug

### Select Components

Both the system-level and chip-level views provide a library of prebuilt, pretested hardware peripheral components. In the system-level view, these components are called “drivers” and correspond to inputs (a thermistor, for example), outputs (a brushless DC fan, for example), communication interfaces (I<sup>2</sup>C-bus, for example), and the logic to control how they interact with one another (called valuator).

In the chip-level view, the components are called “user modules”. User modules make selecting and implementing peripheral devices simple, and come in analog, digital, and mixed signal varieties.

### Configure Components

Each of the components you select establishes the basic register settings that implement the selected function. They also provide parameters and properties that allow you to tailor their precise configuration to your particular application. For example, a Pulse Width Modulator (PWM) User Module configures one or more digital PSoC blocks, one for each 8 bits of resolution. The user module parameters permit you to establish the pulse width and duty cycle. Configure the parameters and properties to correspond to your chosen application. Enter values directly or by selecting values from drop-down menus.

Both the system-level drivers and chip-level user modules are documented in data sheets that are viewed directly in PSoC Designer. These data sheets explain the internal operation of the component and provide performance specifications. Each data sheet describes the use of each user module parameter or driver

property, and other information you may need to successfully implement your design.

### Organize and Connect

You can build signal chains at the chip level by interconnecting user modules to each other and the I/O pins, or connect system level inputs, outputs, and communication interfaces to each other with valuator functions.

In the system-level view, selecting a potentiometer driver to control a variable speed fan driver and setting up the valuator to control the fan speed based on input from the pot selects, places, routes, and configures a programmable gain amplifier (PGA) to buffer the input from the potentiometer, an analog to digital converter (ADC) to convert the potentiometer's output to a digital signal, and a PWM to control the fan.

In the chip-level view, perform the selection, configuration, and routing so that you have complete control over the use of all on-chip resources.

### Generate, Verify, and Debug

When you are ready to test the hardware configuration or move on to developing code for the project, perform the “Generate Application” step. This causes PSoC Designer to generate source code that automatically configures the device to your specification and provides the software for the system.

Both system-level and chip-level designs generate software based on your design. The chip-level design provides application programming interfaces (APIs) with high level functions to control and respond to hardware events at run-time and interrupt service routines that you can adapt as needed. The system-level design also generates a C main() program that completely controls the chosen application and contains placeholders for custom code at strategic positions allowing you to further refine the software without disrupting the generated code.

A complete code development environment allows you to develop and customize your applications in C, assembly language, or both.

The last step in the development process takes place inside PSoC Designer's Debugger subsystem. The Debugger downloads the HEX image to the ICE where it runs at full speed. Debugger capabilities rival those of systems costing many times more. In addition to traditional single-step, run-to-breakpoint and watch-variable features, the Debugger provides a large trace buffer and allows you define complex breakpoint events that include monitoring address and data bus values, memory locations and external signals.

## Document Conventions

### Acronyms Used

The following table lists the acronyms that are used in this document.

**Table 2. Acronyms Used**

| Acronym | Description                                         |
|---------|-----------------------------------------------------|
| AC      | alternating current                                 |
| ADC     | analog-to-digital converter                         |
| API     | application programming interface                   |
| CPU     | central processing unit                             |
| CT      | continuous time                                     |
| DAC     | digital-to-analog converter                         |
| DC      | direct current                                      |
| ECO     | external crystal oscillator                         |
| EEPROM  | electrically erasable programmable read-only memory |
| FSR     | full scale range                                    |
| GPIO    | general purpose IO                                  |
| GUI     | graphical user interface                            |
| HBM     | human body model                                    |
| ICE     | in-circuit emulator                                 |
| ILO     | internal low speed oscillator                       |
| IMO     | internal main oscillator                            |
| I/O     | input/output                                        |
| IPOR    | imprecise power on reset                            |
| LSb     | least-significant bit                               |
| LVD     | low voltage detect                                  |
| MSb     | most-significant bit                                |
| PC      | program counter                                     |
| PLL     | phase-locked loop                                   |
| POR     | power on reset                                      |
| PPOR    | precision power on reset                            |
| PSoC®   | Programmable System-on-Chip™                        |
| PWM     | pulse width modulator                               |
| SC      | switched capacitor                                  |
| SLIMO   | slow IMO                                            |
| SMP     | switch mode pump                                    |
| SRAM    | static random access memory                         |

### Units of Measure

A units of measure table is located in the Electrical Specifications section. [Table 2](#) on page 7 lists all the abbreviations used to measure the PSoC devices.

### Numeric Naming

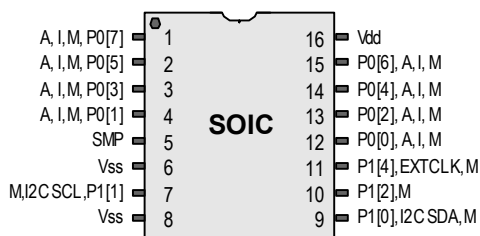
Hexadecimal numbers are represented with all letters in uppercase with an appended lowercase 'h' (for example, '14h' or '3Ah'). Hexadecimal numbers may also be represented by a '0x' prefix, the C coding convention. Binary numbers have an appended lowercase 'b' (for example, '01010100b' or '01000011b'). Numbers not indicated by an 'h', 'b', or 0x are decimal.

## Pin Information

The CY8C21x34 PSoC device is available in a variety of packages which are listed in the following tables. Every port pin (labeled with a "P") is capable of Digital I/O and connection to the common analog bus. However, Vss, Vdd, SMP, and XRES are not capable of Digital I/O.

### 16-Pin Part Pinout

**Figure 3. CY8C21234 16-Pin PSoC Device**



**Table 3. Pin Definitions - CY8C21234 16-Pin (SOIC)**

| Pin No. | Type    |        | Name  | Description                                                        |
|---------|---------|--------|-------|--------------------------------------------------------------------|
|         | Digital | Analog |       |                                                                    |
| 1       | I/O     | I, M   | P0[7] | Analog column mux input.                                           |
| 2       | I/O     | I, M   | P0[5] | Analog column mux input.                                           |
| 3       | I/O     | I, M   | P0[3] | Analog column mux input, integrating input.                        |
| 4       | I/O     | I, M   | P0[1] | Analog column mux input, integrating input.                        |
| 5       | Power   |        | SMP   | Switch Mode Pump (SMP) connection to required external components. |
| 6       | Power   |        | Vss   | Ground connection.                                                 |
| 7       | I/O     | M      | P1[1] | I2C Serial Clock (SCL), ISSP-SCLK <sup>[3]</sup> .                 |
| 8       | Power   |        | Vss   | Ground connection.                                                 |
| 9       | I/O     | M      | P1[0] | I2C Serial Data (SDA), ISSP-SDATA <sup>[3]</sup> .                 |
| 10      | I/O     | M      | P1[2] |                                                                    |
| 11      | I/O     | M      | P1[4] | Optional External Clock Input (EXTCLK).                            |
| 12      | I/O     | I, M   | P0[0] | Analog column mux input.                                           |
| 13      | I/O     | I, M   | P0[2] | Analog column mux input.                                           |
| 14      | I/O     | I, M   | P0[4] | Analog column mux input.                                           |
| 15      | I/O     | I, M   | P0[6] | Analog column mux input.                                           |
| 16      | Power   |        | Vdd   | Supply voltage.                                                    |

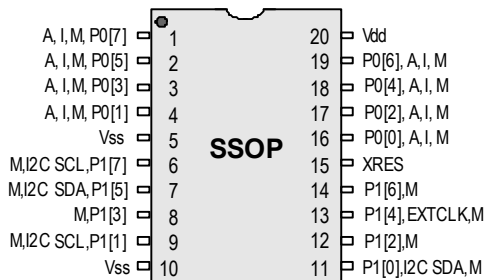
**LEGEND** A = Analog, I = Input, O = Output, and M = Analog Mux Input.

#### Note

3. These are the ISSP pins, which are not High Z at POR (Power On Reset). See the PSoC Programmable System-on-Chip Technical Reference Manual for details.

## 20-Pin Part Pinout

**Figure 4. CY8C21334 20-Pin PSoC Device**



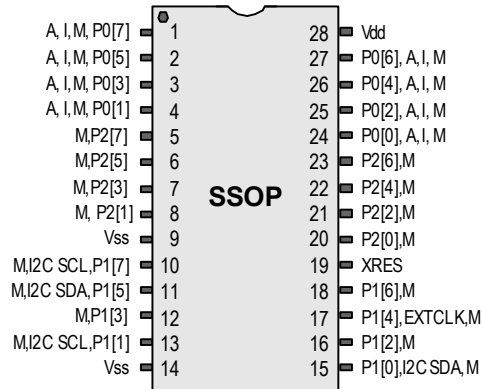
**Table 4. Pin Definitions - CY8C21334 20-Pin (SSOP)**

| Pin No. | Type    |        | Name  | Description                                         |
|---------|---------|--------|-------|-----------------------------------------------------|
|         | Digital | Analog |       |                                                     |
| 1       | I/O     | I, M   | P0[7] | Analog column mux input.                            |
| 2       | I/O     | I, M   | P0[5] | Analog column mux input.                            |
| 3       | I/O     | I, M   | P0[3] | Analog column mux input, integrating input.         |
| 4       | I/O     | I, M   | P0[1] | Analog column mux input, integrating input.         |
| 5       | Power   |        | Vss   | Ground connection.                                  |
| 6       | I/O     | M      | P1[7] | I2C Serial Clock (SCL).                             |
| 7       | I/O     | M      | P1[5] | I2C Serial Data (SDA).                              |
| 8       | I/O     | M      | P1[3] |                                                     |
| 9       | I/O     | M      | P1[1] | I2C Serial Clock (SCL), ISSP-SCLK <sup>[3]</sup> .  |
| 10      | Power   |        | Vss   | Ground connection.                                  |
| 11      | I/O     | M      | P1[0] | I2C Serial Data (SDA), ISSP-SDATA <sup>[3]</sup> .  |
| 12      | I/O     | M      | P1[2] |                                                     |
| 13      | I/O     | M      | P1[4] | Optional External Clock Input (EXTCLK).             |
| 14      | I/O     | M      | P1[6] |                                                     |
| 15      | Input   |        | XRES  | Active high external reset with internal pull down. |
| 16      | I/O     | I, M   | P0[0] | Analog column mux input.                            |
| 17      | I/O     | I, M   | P0[2] | Analog column mux input.                            |
| 18      | I/O     | I, M   | P0[4] | Analog column mux input.                            |
| 19      | I/O     | I, M   | P0[6] | Analog column mux input.                            |
| 20      | Power   |        | Vdd   | Supply voltage.                                     |

**LEGEND** A = Analog, I = Input, O = Output, and M = Analog Mux Input.

## 28-Pin Part Pinout

**Figure 5. CY8C21534 28-Pin PSoC Device**



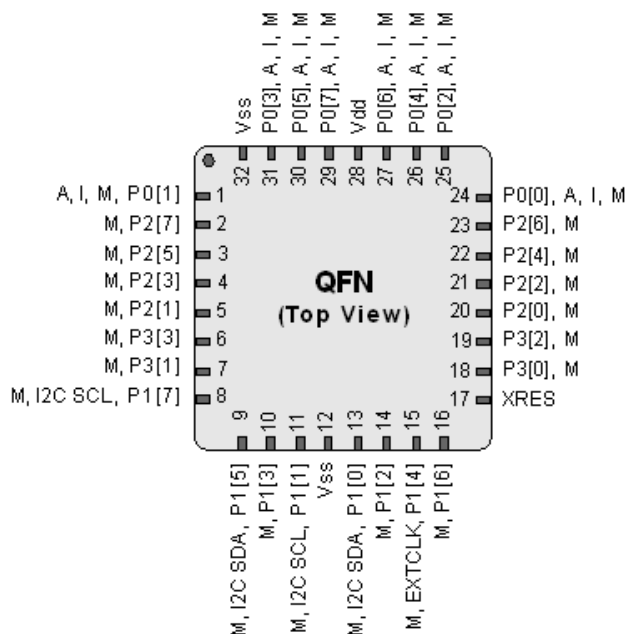
**Table 5. Pin Definitions - CY8C21534 28-Pin (SSOP)**

| Pin No. | Type    |        | Name  | Description                                                   |
|---------|---------|--------|-------|---------------------------------------------------------------|
|         | Digital | Analog |       |                                                               |
| 1       | I/O     | I, M   | P0[7] | Analog column mux input.                                      |
| 2       | I/O     | I, M   | P0[5] | Analog column mux input and column output.                    |
| 3       | I/O     | I, M   | P0[3] | Analog column mux input and column output, integrating input. |
| 4       | I/O     | I, M   | P0[1] | Analog column mux input, integrating input.                   |
| 5       | I/O     | M      | P2[7] |                                                               |
| 6       | I/O     | M      | P2[5] |                                                               |
| 7       | I/O     | I, M   | P2[3] | Direct switched capacitor block input.                        |
| 8       | I/O     | I, M   | P2[1] | Direct switched capacitor block input.                        |
| 9       | Power   |        | Vss   | Ground connection.                                            |
| 10      | I/O     | M      | P1[7] | I2C Serial Clock (SCL).                                       |
| 11      | I/O     | M      | P1[5] | I2C Serial Data (SDA).                                        |
| 12      | I/O     | M      | P1[3] |                                                               |
| 13      | I/O     | M      | P1[1] | I2C Serial Clock (SCL), ISSP-SCLK <sup>[3]</sup> .            |
| 14      | Power   |        | Vss   | Ground connection.                                            |
| 15      | I/O     | M      | P1[0] | I2C Serial Data (SDA), ISSP-SDATA <sup>[3]</sup> .            |
| 16      | I/O     | M      | P1[2] |                                                               |
| 17      | I/O     | M      | P1[4] | Optional External Clock Input (EXTCLK).                       |
| 18      | I/O     | M      | P1[6] |                                                               |
| 19      | Input   |        | XRES  | Active high external reset with internal pull down.           |
| 20      | I/O     | I, M   | P2[0] | Direct switched capacitor block input.                        |
| 21      | I/O     | I, M   | P2[2] | Direct switched capacitor block input.                        |
| 22      | I/O     | M      | P2[4] |                                                               |
| 23      | I/O     | M      | P2[6] |                                                               |
| 24      | I/O     | I, M   | P0[0] | Analog column mux input.                                      |
| 25      | I/O     | I, M   | P0[2] | Analog column mux input.                                      |
| 26      | I/O     | I, M   | P0[4] | Analog column mux input.                                      |
| 27      | I/O     | I, M   | P0[6] | Analog column mux input.                                      |
| 28      | Power   |        | Vdd   | Supply voltage.                                               |

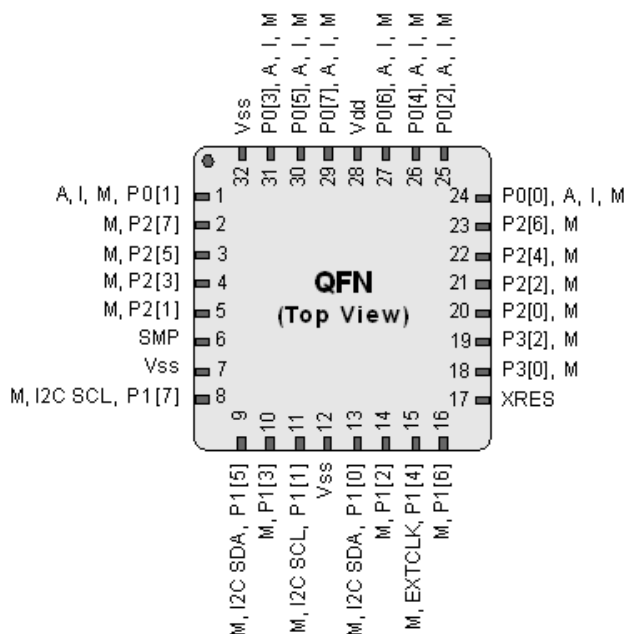
**LEGEND** A: Analog, I: Input, O = Output, and M = Analog Mux Input.

## 32-Pin Part Pinout

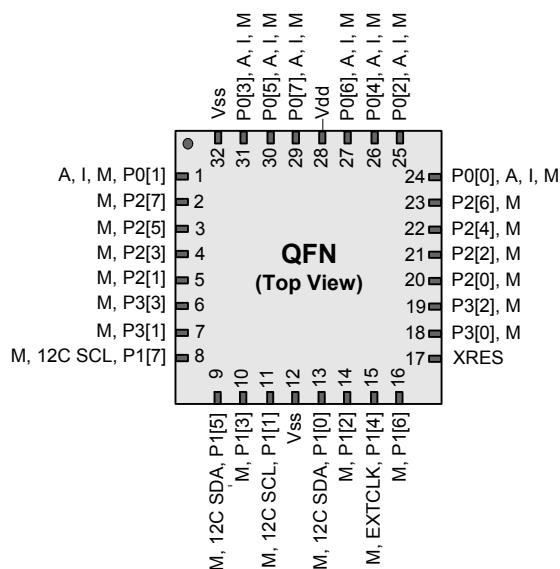
**Figure 6. CY8C21434 32-Pin PSoC Device**



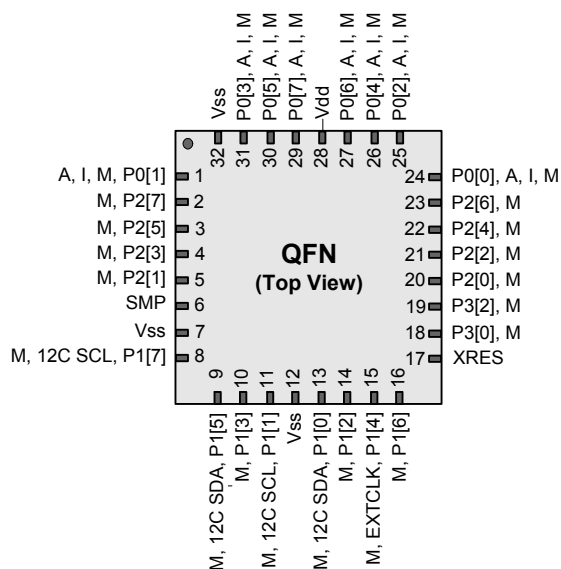
**Figure 9. CY8C21634 32-Pin PSoC Device**



**Figure 10. CY8C21434 32-Pin Sawn PSoC Device**



**Figure 11. CY8C21634 32-Pin Sawn PSoC Device**



**Table 6. Pin Definitions - CY8C21434/CY8C21634 32-Pin (QFN)<sup>[4]</sup>**

| Pin No. | Type    |        | Name  | Description                                                                          |
|---------|---------|--------|-------|--------------------------------------------------------------------------------------|
|         | Digital | Analog |       |                                                                                      |
| 1       | I/O     | I, M   | P0[1] | Analog column mux input, integrating input.                                          |
| 2       | I/O     | M      | P2[7] |                                                                                      |
| 3       | I/O     | M      | P2[5] |                                                                                      |
| 4       | I/O     | M      | P2[3] |                                                                                      |
| 5       | I/O     | M      | P2[1] |                                                                                      |
| 6       | I/O     | M      | P3[3] | In CY8C21434 part.                                                                   |
| 6       | Power   |        | SMP   | Switch Mode Pump (SMP) connection to required external components in CY8C21634 part. |
| 7       | I/O     | M      | P3[1] | In CY8C21434 part.                                                                   |
| 7       | Power   |        | Vss   | Ground connection in CY8C21634 part.                                                 |
| 8       | I/O     | M      | P1[7] | I2C Serial Clock (SCL).                                                              |
| 9       | I/O     | M      | P1[5] | I2C Serial Data (SDA).                                                               |
| 10      | I/O     | M      | P1[3] |                                                                                      |
| 11      | I/O     | M      | P1[1] | I2C Serial Clock (SCL), ISSP-SCLK <sup>[3]</sup> .                                   |
| 12      | Power   |        | Vss   | Ground connection.                                                                   |
| 13      | I/O     | M      | P1[0] | I2C Serial Data (SDA), ISSP-SDATA <sup>[3]</sup>                                     |
| 14      | I/O     | M      | P1[2] |                                                                                      |
| 15      | I/O     | M      | P1[4] | Optional External Clock Input (EXTCLK).                                              |
| 16      | I/O     | M      | P1[6] |                                                                                      |
| 17      | Input   |        | XRES  | Active high external reset with internal pull down.                                  |
| 18      | I/O     | M      | P3[0] |                                                                                      |
| 19      | I/O     | M      | P3[2] |                                                                                      |
| 20      | I/O     | M      | P2[0] |                                                                                      |
| 21      | I/O     | M      | P2[2] |                                                                                      |
| 22      | I/O     | M      | P2[4] |                                                                                      |
| 23      | I/O     | M      | P2[6] |                                                                                      |
| 24      | I/O     | I, M   | P0[0] | Analog column mux input.                                                             |
| 25      | I/O     | I, M   | P0[2] | Analog column mux input.                                                             |
| 26      | I/O     | I, M   | P0[4] | Analog column mux input.                                                             |
| 27      | I/O     | I, M   | P0[6] | Analog column mux input.                                                             |
| 28      | Power   |        | Vdd   | Supply voltage.                                                                      |
| 29      | I/O     | I, M   | P0[7] | Analog column mux input.                                                             |
| 30      | I/O     | I, M   | P0[5] | Analog column mux input.                                                             |
| 31      | I/O     | I, M   | P0[3] | Analog column mux input, integrating input.                                          |
| 32      | Power   |        | Vss   | Ground connection.                                                                   |

**LEGEND** A = Analog, I = Input, O = Output, and M = Analog Mux Input.

**Note**

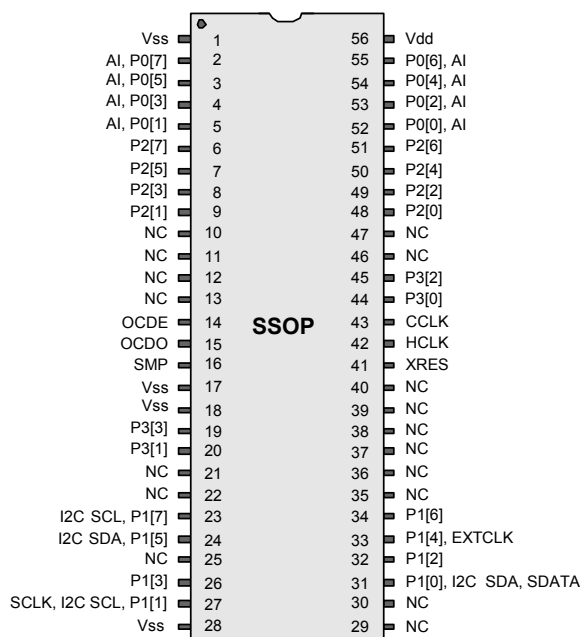
4. The center pad on the QFN package must be connected to ground (Vss) for best mechanical, thermal, and electrical performance. If not connected to ground, it must be electrically floated and not connected to any other signal.

## 56-Pin Part Pinout

The 56-pin SSOP part is for the CY8C21001 On-Chip Debug (OCD) PSoC device.

**Note** This part is only used for in-circuit debugging. It is NOT available for production.

**Figure 12. CY8C21001 56-Pin PSoC Device**



**Table 7. Pin Definitions - CY8C21001 56-Pin (SSOP)**

| Pin No. | Type    |        | Pin Name | Description                                                        |
|---------|---------|--------|----------|--------------------------------------------------------------------|
|         | Digital | Analog |          |                                                                    |
| 1       | Power   |        | Vss      | Ground connection.                                                 |
| 2       | I/O     | I      | P0[7]    | Analog column mux input.                                           |
| 3       | I/O     | I      | P0[5]    | Analog column mux input and column output.                         |
| 4       | I/O     | I      | P0[3]    | Analog column mux input and column output.                         |
| 5       | I/O     | I      | P0[1]    | Analog column mux input.                                           |
| 6       | I/O     |        | P2[7]    |                                                                    |
| 7       | I/O     |        | P2[5]    |                                                                    |
| 8       | I/O     | I      | P2[3]    | Direct switched capacitor block input.                             |
| 9       | I/O     | I      | P2[1]    | Direct switched capacitor block input.                             |
| 10      |         |        | NC       | No connection.                                                     |
| 11      |         |        | NC       | No connection.                                                     |
| 12      |         |        | NC       | No connection.                                                     |
| 13      |         |        | NC       | No connection.                                                     |
| 14      | OCD     |        | OCDE     | OCD even data I/O.                                                 |
| 15      | OCD     |        | OCDO     | OCD odd data output.                                               |
| 16      | Power   |        | SMP      | Switch Mode Pump (SMP) connection to required external components. |
| 17      | Power   |        | Vss      | Ground connection.                                                 |
| 18      | Power   |        | Vss      | Ground connection.                                                 |

**Table 7. Pin Definitions - CY8C21001 56-Pin (SSOP) (continued)**

| Pin No. | Type    |        | Pin Name | Description                                                                   |
|---------|---------|--------|----------|-------------------------------------------------------------------------------|
|         | Digital | Analog |          |                                                                               |
| 19      | I/O     |        | P3[3]    |                                                                               |
| 20      | I/O     |        | P3[1]    |                                                                               |
| 21      |         |        | NC       | No connection.                                                                |
| 22      |         |        | NC       | No connection.                                                                |
| 23      | I/O     |        | P1[7]    | I2C Serial Clock (SCL).                                                       |
| 24      | I/O     |        | P1[5]    | I2C Serial Data (SDA).                                                        |
| 25      |         |        | NC       | No connection.                                                                |
| 26      | I/O     |        | P1[3]    | I <sub>FMTEST</sub> .                                                         |
| 27      | I/O     |        | P1[1]    | Crystal Input (XTALin), I2C Serial Clock (SCL), ISSP-SCLK <sup>[3]</sup> ..   |
| 28      | Power   |        | Vss      | Ground connection.                                                            |
| 29      |         |        | NC       | No connection.                                                                |
| 30      |         |        | NC       | No connection.                                                                |
| 31      | I/O     |        | P1[0]    | Crystal Output (XTALout), I2C Serial Data (SDA), ISSP-SDATA <sup>[3]</sup> .. |
| 32      | I/O     |        | P1[2]    | V <sub>FMTEST</sub> .                                                         |
| 33      | I/O     |        | P1[4]    | Optional External Clock Input (EXTCLK).                                       |
| 34      | I/O     |        | P1[6]    |                                                                               |
| 35      |         |        | NC       | No connection.                                                                |
| 36      |         |        | NC       | No connection.                                                                |
| 37      |         |        | NC       | No connection.                                                                |
| 38      |         |        | NC       | No connection.                                                                |
| 39      |         |        | NC       | No connection.                                                                |
| 40      |         |        | NC       | No connection.                                                                |
| 41      | Input   |        | XRES     | Active high external reset with internal pull down.                           |
| 42      | OCD     |        | HCLK     | OCD high-speed clock output.                                                  |
| 43      | OCD     |        | CCLK     | OCD CPU clock output.                                                         |
| 44      | I/O     |        | P3[0]    |                                                                               |
| 45      | I/O     |        | P3[2]    |                                                                               |
| 46      |         |        | NC       | No connection.                                                                |
| 47      |         |        | NC       | No connection.                                                                |
| 48      | I/O     | I      | P2[0]    |                                                                               |
| 49      | I/O     | I      | P2[2]    |                                                                               |
| 50      | I/O     |        | P2[4]    |                                                                               |
| 51      | I/O     |        | P2[6]    |                                                                               |
| 52      | I/O     | I      | P0[0]    | Analog column mux input.                                                      |
| 53      | I/O     | I      | P0[2]    | Analog column mux input and column output.                                    |
| 54      | I/O     | I      | P0[4]    | Analog column mux input and column output.                                    |
| 55      | I/O     | I      | P0[6]    | Analog column mux input.                                                      |
| 56      | Power   |        | Vdd      | Supply voltage.                                                               |

**LEGEND:** A = Analog, I = Input, O = Output, and OCD = On-Chip Debug.

## Register Reference

This chapter lists the registers of the CY8C21x34 PSoC device. For detailed register information, refer the *PSoC Programmable System-on-Chip Technical Reference Manual*.

### Register Conventions

The register conventions specific to this section are listed in [Table 8](#).

**Table 8. Register Conventions**

| Convention | Description                  |
|------------|------------------------------|
| R          | Read register or bit(s)      |
| W          | Write register or bit(s)     |
| L          | Logical register or bit(s)   |
| C          | Clearable register or bit(s) |
| #          | Access is bit specific       |

### Register Mapping Tables

The PSoC device has a total register address space of 512 bytes. The register space is referred to as I/O space and is divided into two banks. The XO1 bit in the Flag register (CPU\_F) determines which bank the user is currently in. When the XO1 bit is set the user is in Bank 1.

**Note** In the following register mapping tables, blank fields are Reserved and must not be accessed.

**Table 9. Register Map 0 Table: User Space**

| Name    | Addr (0,Hex) | Access | Name | Addr (0,Hex) | Access | Name     | Addr (0,Hex) | Access | Name     | Addr (0,Hex) | Access |
|---------|--------------|--------|------|--------------|--------|----------|--------------|--------|----------|--------------|--------|
| PRT0DR  | 00           | RW     |      | 40           |        | ASE10CR0 | 80           | RW     |          | C0           |        |
| PRT0IE  | 01           | RW     |      | 41           |        |          | 81           |        |          | C1           |        |
| PRT0GS  | 02           | RW     |      | 42           |        |          | 82           |        |          | C2           |        |
| PRT0DM2 | 03           | RW     |      | 43           |        |          | 83           |        |          | C3           |        |
| PRT1DR  | 04           | RW     |      | 44           |        | ASE11CR0 | 84           | RW     |          | C4           |        |
| PRT1IE  | 05           | RW     |      | 45           |        |          | 85           |        |          | C5           |        |
| PRT1GS  | 06           | RW     |      | 46           |        |          | 86           |        |          | C6           |        |
| PRT1DM2 | 07           | RW     |      | 47           |        |          | 87           |        |          | C7           |        |
| PRT2DR  | 08           | RW     |      | 48           |        |          | 88           |        |          | C8           |        |
| PRT2IE  | 09           | RW     |      | 49           |        |          | 89           |        |          | C9           |        |
| PRT2GS  | 0A           | RW     |      | 4A           |        |          | 8A           |        |          | CA           |        |
| PRT2DM2 | 0B           | RW     |      | 4B           |        |          | 8B           |        |          | CB           |        |
| PRT3DR  | 0C           | RW     |      | 4C           |        |          | 8C           |        |          | CC           |        |
| PRT3IE  | 0D           | RW     |      | 4D           |        |          | 8D           |        |          | CD           |        |
| PRT3GS  | 0E           | RW     |      | 4E           |        |          | 8E           |        |          | CE           |        |
| PRT3DM2 | 0F           | RW     |      | 4F           |        |          | 8F           |        |          | CF           |        |
|         | 10           |        |      | 50           |        |          | 90           |        | CUR_PP   | D0           | RW     |
|         | 11           |        |      | 51           |        |          | 91           |        | STK_PP   | D1           | RW     |
|         | 12           |        |      | 52           |        |          | 92           |        |          | D2           |        |
|         | 13           |        |      | 53           |        |          | 93           |        | IDX_PP   | D3           | RW     |
|         | 14           |        |      | 54           |        |          | 94           |        | MVR_PP   | D4           | RW     |
|         | 15           |        |      | 55           |        |          | 95           |        | MVW_PP   | D5           | RW     |
|         | 16           |        |      | 56           |        |          | 96           |        | I2C_CFG  | D6           | RW     |
|         | 17           |        |      | 57           |        |          | 97           |        | I2C_SCR  | D7           | #      |
|         | 18           |        |      | 58           |        |          | 98           |        | I2C_DR   | D8           | RW     |
|         | 19           |        |      | 59           |        |          | 99           |        | I2C_MSCR | D9           | #      |
|         | 1A           |        |      | 5A           |        |          | 9A           |        | INT_CLR0 | DA           | RW     |
|         | 1B           |        |      | 5B           |        |          | 9B           |        | INT_CLR1 | DB           | RW     |
|         | 1C           |        |      | 5C           |        |          | 9C           |        |          | DC           |        |
|         | 1D           |        |      | 5D           |        |          | 9D           |        | INT_CLR3 | DD           | RW     |
|         | 1E           |        |      | 5E           |        |          | 9E           |        | INT_MSK3 | DE           | RW     |
|         | 1F           |        |      | 5F           |        |          | 9F           |        |          | DF           |        |

Blank fields are Reserved and must not be accessed.

# Access is bit specific.

**Table 9. Register Map 0 Table: User Space (continued)**

| Name     | Addr (0,Hex) | Access | Name     | Addr (0,Hex) | Access | Name     | Addr (0,Hex) | Access | Name     | Addr (0,Hex) | Access |
|----------|--------------|--------|----------|--------------|--------|----------|--------------|--------|----------|--------------|--------|
| DBB00DR0 | 20           | #      | AMX_IN   | 60           | RW     |          | A0           |        | INT_MSK0 | E0           | RW     |
| DBB00DR1 | 21           | W      | AMUXCFG  | 61           | RW     |          | A1           |        | INT_MSK1 | E1           | RW     |
| DBB00DR2 | 22           | RW     | PWM_CR   | 62           | RW     |          | A2           |        | INT_VC   | E2           | RC     |
| DBB00CR0 | 23           | #      |          | 63           |        |          | A3           |        | RES_WDT  | E3           | W      |
| DBB01DR0 | 24           | #      | CMP_CR0  | 64           | #      |          | A4           |        |          | E4           |        |
| DBB01DR1 | 25           | W      |          | 65           |        |          | A5           |        |          | E5           |        |
| DBB01DR2 | 26           | RW     | CMP_CR1  | 66           | RW     |          | A6           |        | DEC_CR0  | E6           | RW     |
| DBB01CR0 | 27           | #      |          | 67           |        |          | A7           |        | DEC_CR1  | E7           | RW     |
| DCB02DR0 | 28           | #      | ADC0_CR  | 68           | #      |          | A8           |        |          | E8           |        |
| DCB02DR1 | 29           | W      | ADC1_CR  | 69           | #      |          | A9           |        |          | E9           |        |
| DCB02DR2 | 2A           | RW     |          | 6A           |        |          | AA           |        |          | EA           |        |
| DCB02CR0 | 2B           | #      |          | 6B           |        |          | AB           |        |          | EB           |        |
| DCB03DR0 | 2C           | #      | TMP_DR0  | 6C           | RW     |          | AC           |        |          | EC           |        |
| DCB03DR1 | 2D           | W      | TMP_DR1  | 6D           | RW     |          | AD           |        |          | ED           |        |
| DCB03DR2 | 2E           | RW     | TMP_DR2  | 6E           | RW     |          | AE           |        |          | EE           |        |
| DCB03CR0 | 2F           | #      | TMP_DR3  | 6F           | RW     |          | AF           |        |          | EF           |        |
|          | 30           |        |          | 70           |        | RDIOI0R1 | B0           | RW     |          | F0           |        |
|          | 31           |        |          | 71           |        | RDIOISYN | B1           | RW     |          | F1           |        |
|          | 32           |        | ACE00CR1 | 72           | RW     | RDIOIS   | B2           | RW     |          | F2           |        |
|          | 33           |        | ACE00CR2 | 73           | RW     | RDIOILT0 | B3           | RW     |          | F3           |        |
|          | 34           |        |          | 74           |        | RDIOILT1 | B4           | RW     |          | F4           |        |
|          | 35           |        |          | 75           |        | RDIORO0  | B5           | RW     |          | F5           |        |
|          | 36           |        | ACE01CR1 | 76           | RW     | RDIORO1  | B6           | RW     |          | F6           |        |
|          | 37           |        | ACE01CR2 | 77           | RW     |          | B7           |        | CPU_F    | F7           | RL     |
|          | 38           |        |          | 78           |        |          | B8           |        |          | F8           |        |
|          | 39           |        |          | 79           |        |          | B9           |        |          | F9           |        |
|          | 3A           |        |          | 7A           |        |          | BA           |        |          | FA           |        |
|          | 3B           |        |          | 7B           |        |          | BB           |        |          | FB           |        |
|          | 3C           |        |          | 7C           |        |          | BC           |        |          | FC           |        |
|          | 3D           |        |          | 7D           |        |          | BD           |        | DAC_D    | FD           | RW     |
|          | 3E           |        |          | 7E           |        |          | BE           |        | CPU_SCR1 | FE           | #      |
|          | 3F           |        |          | 7F           |        |          | BF           |        | CPU_SCR0 | FF           | #      |

Blank fields are Reserved and must not be accessed.

# Access is bit specific.

**Table 10. Register Map 1 Table: Configuration Space**

| Name    | Addr (1,Hex) | Access | Name | Addr (1,Hex) | Access | Name     | Addr (1,Hex) | Access | Name     | Addr (1,Hex) | Access |
|---------|--------------|--------|------|--------------|--------|----------|--------------|--------|----------|--------------|--------|
| PRT0DM0 | 00           | RW     |      | 40           |        | ASE10CR0 | 80           | RW     |          | C0           |        |
| PRT0DM1 | 01           | RW     |      | 41           |        |          | 81           |        |          | C1           |        |
| PRT0IC0 | 02           | RW     |      | 42           |        |          | 82           |        |          | C2           |        |
| PRT0IC1 | 03           | RW     |      | 43           |        |          | 83           |        |          | C3           |        |
| PRT1DM0 | 04           | RW     |      | 44           |        | ASE11CR0 | 84           | RW     |          | C4           |        |
| PRT1DM1 | 05           | RW     |      | 45           |        |          | 85           |        |          | C5           |        |
| PRT1IC0 | 06           | RW     |      | 46           |        |          | 86           |        |          | C6           |        |
| PRT1IC1 | 07           | RW     |      | 47           |        |          | 87           |        |          | C7           |        |
| PRT2DM0 | 08           | RW     |      | 48           |        |          | 88           |        |          | C8           |        |
| PRT2DM1 | 09           | RW     |      | 49           |        |          | 89           |        |          | C9           |        |
| PRT2IC0 | 0A           | RW     |      | 4A           |        |          | 8A           |        |          | CA           |        |
| PRT2IC1 | 0B           | RW     |      | 4B           |        |          | 8B           |        |          | CB           |        |
| PRT3DM0 | 0C           | RW     |      | 4C           |        |          | 8C           |        |          | CC           |        |
| PRT3DM1 | 0D           | RW     |      | 4D           |        |          | 8D           |        |          | CD           |        |
| PRT3IC0 | 0E           | RW     |      | 4E           |        |          | 8E           |        |          | CE           |        |
| PRT3IC1 | 0F           | RW     |      | 4F           |        |          | 8F           |        |          | CF           |        |
|         | 10           |        |      | 50           |        |          | 90           |        | GDI_O_IN | D0           | RW     |
|         | 11           |        |      | 51           |        |          | 91           |        | GDI_E_IN | D1           | RW     |
|         | 12           |        |      | 52           |        |          | 92           |        | GDI_O_OU | D2           | RW     |
|         | 13           |        |      | 53           |        |          | 93           |        | GDI_E_OU | D3           | RW     |
|         | 14           |        |      | 54           |        |          | 94           |        |          | D4           |        |

Blank fields are Reserved and must not be accessed.

# Access is bit specific.

**Table 10. Register Map 1 Table: Configuration Space (continued)**

| Name    | Addr<br>(1,Hex) | Access | Name      | Addr<br>(1,Hex) | Access | Name    | Addr<br>(1,Hex) | Access | Name      | Addr<br>(1,Hex) | Access |
|---------|-----------------|--------|-----------|-----------------|--------|---------|-----------------|--------|-----------|-----------------|--------|
|         | 15              |        |           | 55              |        |         | 95              |        |           | D5              |        |
|         | 16              |        |           | 56              |        |         | 96              |        |           | D6              |        |
|         | 17              |        |           | 57              |        |         | 97              |        |           | D7              |        |
|         | 18              |        |           | 58              |        |         | 98              |        | MUX_CR0   | D8              | RW     |
|         | 19              |        |           | 59              |        |         | 99              |        | MUX_CR1   | D9              | RW     |
|         | 1A              |        |           | 5A              |        |         | 9A              |        | MUX_CR2   | DA              | RW     |
|         | 1B              |        |           | 5B              |        |         | 9B              |        | MUX_CR3   | DB              | RW     |
|         | 1C              |        |           | 5C              |        |         | 9C              |        |           | DC              |        |
|         | 1D              |        |           | 5D              |        |         | 9D              |        | OSC_GO_EN | DD              | RW     |
|         | 1E              |        |           | 5E              |        |         | 9E              |        | OSC_CR4   | DE              | RW     |
|         | 1F              |        |           | 5F              |        |         | 9F              |        | OSC_CR3   | DF              | RW     |
| DBB00FN | 20              | RW     | CLK_CR0   | 60              | RW     |         | A0              |        | OSC_CR0   | E0              | RW     |
| DBB00IN | 21              | RW     | CLK_CR1   | 61              | RW     |         | A1              |        | OSC_CR1   | E1              | RW     |
| DBB00OU | 22              | RW     | ABF_CR0   | 62              | RW     |         | A2              |        | OSC_CR2   | E2              | RW     |
|         | 23              |        | AMD_CR0   | 63              | RW     |         | A3              |        | VLT_CR    | E3              | RW     |
| DBB01FN | 24              | RW     | CMP_GO_EN | 64              | RW     |         | A4              |        | VLT_CMP   | E4              | R      |
| DBB01IN | 25              | RW     |           | 65              |        |         | A5              |        | ADC0_TR   | E5              | RW     |
| DBB01OU | 26              | RW     | AMD_CR1   | 66              | RW     |         | A6              |        | ADC1_TR   | E6              | RW     |
|         | 27              |        | ALT_CR0   | 67              | RW     |         | A7              |        |           | E7              |        |
| DCB02FN | 28              | RW     |           | 68              |        |         | A8              |        | IMO_TR    | E8              | W      |
| DCB02IN | 29              | RW     |           | 69              |        |         | A9              |        | ILO_TR    | E9              | W      |
| DCB02OU | 2A              | RW     |           | 6A              |        |         | AA              |        | BDG_TR    | EA              | RW     |
|         | 2B              |        | CLK_CR3   | 6B              | RW     |         | AB              |        | ECO_TR    | EB              | W      |
| DCB03FN | 2C              | RW     | TMP_DR0   | 6C              | RW     |         | AC              |        |           | EC              |        |
| DCB03IN | 2D              | RW     | TMP_DR1   | 6D              | RW     |         | AD              |        |           | ED              |        |
| DCB03OU | 2E              | RW     | TMP_DR2   | 6E              | RW     |         | AE              |        |           | EE              |        |
|         | 2F              |        | TMP_DR3   | 6F              | RW     |         | AF              |        |           | EF              |        |
|         | 30              |        |           | 70              |        | RD10RI  | B0              | RW     |           | F0              |        |
|         | 31              |        |           | 71              |        | RD10SYN | B1              | RW     |           | F1              |        |
|         | 32              |        | ACE00CR1  | 72              | RW     | RD10IS  | B2              | RW     |           | F2              |        |
|         | 33              |        | ACE00CR2  | 73              | RW     | RD10LT0 | B3              | RW     |           | F3              |        |
|         | 34              |        |           | 74              |        | RD10LT1 | B4              | RW     |           | F4              |        |
|         | 35              |        |           | 75              |        | RD10RO0 | B5              | RW     |           | F5              |        |
|         | 36              |        | ACE01CR1  | 76              | RW     | RD10RO1 | B6              | RW     |           | F6              |        |
|         | 37              |        | ACE01CR2  | 77              | RW     |         | B7              |        | CPU_F     | F7              | RL     |
|         | 38              |        |           | 78              |        |         | B8              |        |           | F8              |        |
|         | 39              |        |           | 79              |        |         | B9              |        |           | F9              |        |
|         | 3A              |        |           | 7A              |        |         | BA              |        | FLS_PR1   | FA              | RW     |
|         | 3B              |        |           | 7B              |        |         | BB              |        |           | FB              |        |
|         | 3C              |        |           | 7C              |        |         | BC              |        |           | FC              |        |
|         | 3D              |        |           | 7D              |        |         | BD              |        | DAC_CR    | FD              | RW     |
|         | 3E              |        |           | 7E              |        |         | BE              |        | CPU_SCR1  | FE              | #      |
|         | 3F              |        |           | 7F              |        |         | BF              |        | CPU_SCR0  | FF              | #      |

Blank fields are Reserved and must not be accessed.

# Access is bit specific.

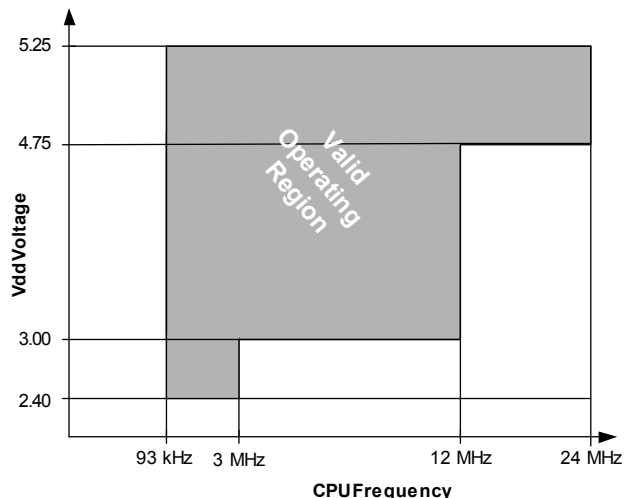
## Electrical Specifications

This section presents the DC and AC electrical specifications of the CY8C21x34 PSoC device. For up to date electrical specifications, visit the web site <http://www.cypress.com/psoc>.

Specifications are valid for  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$  and  $T_J \leq 100^{\circ}\text{C}$  as specified, except where noted.

Refer Table 25 on page 26 for the electrical specifications on the internal main oscillator (IMO) using SLIMO mode.

**Figure 13. Voltage versus CPU Frequency**



**Figure 14. IMO Frequency Trim Options**

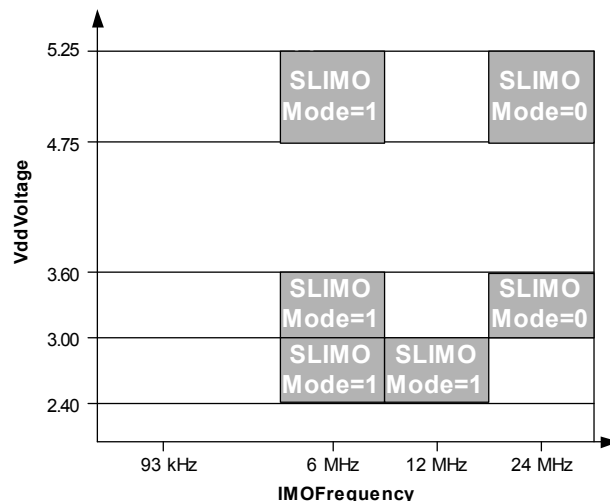


Table 11 lists the units of measure that are used in this section.

**Table 11. Units of Measure**

| Symbol                     | Unit of Measure             | Symbol        | Unit of Measure               |
|----------------------------|-----------------------------|---------------|-------------------------------|
| $^{\circ}\text{C}$         | degree Celsius              | $\mu\text{W}$ | microwatts                    |
| dB                         | decibels                    | mA            | milli-ampere                  |
| fF                         | femto farad                 | ms            | milli-second                  |
| Hz                         | hertz                       | mV            | milli-volts                   |
| KB                         | 1024 bytes                  | nA            | nanoampere                    |
| Kbit                       | 1024 bits                   | ns            | nanosecond                    |
| kHz                        | kilohertz                   | nV            | nanovolts                     |
| k $\Omega$                 | kilohm                      | W             | ohm                           |
| MHz                        | megahertz                   | pA            | picoampere                    |
| M $\Omega$                 | megaohm                     | pF            | picofarad                     |
| $\mu\text{A}$              | microampere                 | pp            | peak-to-peak                  |
| $\mu\text{F}$              | microfarad                  | ppm           | parts per million             |
| $\mu\text{H}$              | microhenry                  | ps            | picosecond                    |
| $\mu\text{s}$              | microsecond                 | sps           | samples per second            |
| $\mu\text{V}$              | microvolts                  | s             | sigma: one standard deviation |
| $\mu\text{V}_{\text{rms}}$ | microvolts root-mean-square | V             | volts                         |

## Absolute Maximum Ratings

**Table 12. Absolute Maximum Ratings**

| Symbol           | Description                            | Min                   | Typ | Max                   | Units | Notes                                                                                                                                                                           |
|------------------|----------------------------------------|-----------------------|-----|-----------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T <sub>STG</sub> | Storage Temperature                    | -55                   | 25  | +100                  | °C    | Higher storage temperatures reduce data retention time. Recommended storage temperature is +25°C ± 25°C. Extended duration storage temperatures above 65°C degrade reliability. |
| T <sub>A</sub>   | Ambient Temperature with Power Applied | -40                   | —   | +85                   | °C    |                                                                                                                                                                                 |
| V <sub>DD</sub>  | Supply Voltage on Vdd Relative to Vss  | -0.5                  | —   | +6.0                  | V     |                                                                                                                                                                                 |
| V <sub>IO</sub>  | DC Input Voltage                       | V <sub>SS</sub> - 0.5 | —   | V <sub>DD</sub> + 0.5 | V     |                                                                                                                                                                                 |
| V <sub>IOZ</sub> | DC Voltage Applied to Tri-state        | V <sub>SS</sub> - 0.5 | —   | V <sub>DD</sub> + 0.5 | V     |                                                                                                                                                                                 |
| I <sub>MIO</sub> | Maximum Current into any Port Pin      | -25                   | —   | +50                   | mA    |                                                                                                                                                                                 |
| ESD              | Electro Static Discharge Voltage       | 2000                  | —   | —                     | V     | Human Body Model ESD.                                                                                                                                                           |
| LU               | Latch-up Current                       | —                     | —   | 200                   | mA    |                                                                                                                                                                                 |

## Operating Temperature

**Table 13. Operating Temperature**

| Symbol         | Description          | Min | Typ | Max  | Units | Notes                                                                                                                                                                                  |
|----------------|----------------------|-----|-----|------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T <sub>A</sub> | Ambient Temperature  | -40 | —   | +85  | °C    |                                                                                                                                                                                        |
| T <sub>J</sub> | Junction Temperature | -40 | —   | +100 | °C    | The temperature rise from ambient to junction is package specific. See <a href="#">Table 40</a> on page 38. The user must limit the power consumption to comply with this requirement. |

## DC Electrical Characteristics

### DC Chip-Level Specifications

[Table 14](#) lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and -40°C ≤ T<sub>A</sub> ≤ 85°C, 3.0V to 3.6V and -40°C ≤ T<sub>A</sub> ≤ 85°C, or 2.4V to 3.0V and -40°C ≤ T<sub>A</sub> ≤ 85°C, respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at 25°C and are for design guidance only.

**Table 14. DC Chip-Level Specifications**

| Symbol            | Description                                   | Min  | Typ | Max  | Units | Notes                                                                                                                                               |
|-------------------|-----------------------------------------------|------|-----|------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| V <sub>DD</sub>   | Supply Voltage                                | 2.40 | —   | 5.25 | V     | See <a href="#">Table 23</a> on page 24.                                                                                                            |
| I <sub>DD</sub>   | Supply Current, IMO = 24 MHz                  | —    | 3   | 4    | mA    | Conditions are V <sub>DD</sub> = 5.0V, T <sub>A</sub> = 25°C, CPU = 3 MHz, 48 MHz disabled. VC1 = 1.5 MHz, VC2 = 93.75 kHz, VC3 = 0.366 kHz.        |
| I <sub>DD3</sub>  | Supply Current, IMO = 6 MHz using SLIMO mode. | —    | 1.2 | 2    | mA    | Conditions are V <sub>DD</sub> = 3.3V, T <sub>A</sub> = 25°C, CPU = 3 MHz, clock doubler disabled. VC1 = 375 kHz, VC2 = 23.4 kHz, VC3 = 0.091 kHz.  |
| I <sub>DD27</sub> | Supply Current, IMO = 6 MHz using SLIMO mode. | —    | 1.1 | 1.5  | mA    | Conditions are V <sub>DD</sub> = 2.55V, T <sub>A</sub> = 25°C, CPU = 3 MHz, clock doubler disabled. VC1 = 375 kHz, VC2 = 23.4 kHz, VC3 = 0.091 kHz. |

**Table 14. DC Chip-Level Specifications (continued)**

| Symbol      | Description                                                                                                       | Min               | Typ       | Max               | Units         | Notes                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-------------------|---------------|-------------------------------------------------------------------------------|
| $I_{SB27}$  | Sleep (Mode) Current with POR, LVD, Sleep Timer, WDT, and internal slow oscillator active. Mid temperature range. | –                 | 2.6       | 4.                | $\mu\text{A}$ | $V_{DD} = 2.55\text{V}$ , $0^\circ\text{C} \leq T_A \leq 40^\circ\text{C}$ .  |
| $I_{SB}$    | Sleep (Mode) Current with POR, LVD, Sleep Timer, WDT, and internal slow oscillator active.                        | –                 | 2.8       | 5                 | $\mu\text{A}$ | $V_{DD} = 3.3\text{V}$ , $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ . |
| $V_{REF}$   | Reference Voltage (Bandgap)                                                                                       | 1.28              | 1.30      | 1.32              | V             | Trimmed for appropriate $V_{DD}$ . $V_{DD} = 3.0\text{V}$ to $5.25\text{V}$ . |
| $V_{REF27}$ | Reference Voltage (Bandgap)                                                                                       | 1.16              | 1.30      | 1.33              | V             | Trimmed for appropriate $V_{DD}$ . $V_{DD} = 2.4\text{V}$ to $3.0\text{V}$ .  |
| AGND        | Analog Ground                                                                                                     | $V_{REF} - 0.003$ | $V_{REF}$ | $V_{REF} + 0.003$ | V             |                                                                               |

#### DC General Purpose IO Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges:  $4.75\text{V}$  to  $5.25\text{V}$  and  $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ ,  $3.0\text{V}$  to  $3.6\text{V}$  and  $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ , or  $2.4\text{V}$  to  $3.0\text{V}$  and  $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ , respectively. Typical parameters apply to  $5\text{V}$ ,  $3.3\text{V}$ , and  $2.7\text{V}$  at  $25^\circ\text{C}$  and are for design guidance only.

**Table 15. 5V and 3.3V DC GPIO Specifications**

| Symbol    | Description                       | Min            | Typ | Max  | Units     | Notes                                                                                                                                                                         |
|-----------|-----------------------------------|----------------|-----|------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $R_{PU}$  | Pull up Resistor                  | 4              | 5.6 | 8    | $k\Omega$ |                                                                                                                                                                               |
| $R_{PD}$  | Pull down Resistor                | 4              | 5.6 | 8    | $k\Omega$ |                                                                                                                                                                               |
| $V_{OH}$  | High Output Level                 | $V_{DD} - 1.0$ | –   | –    | V         | $I_{OH} = 10\text{ mA}$ , $V_{DD} = 4.75$ to $5.25\text{V}$ (8 total loads, 4 on even port pins (for example, P0[2], P1[4]), 4 on odd port pins (for example, P0[3], P1[5])). |
| $V_{OL}$  | Low Output Level                  | –              | –   | 0.75 | V         | $I_{OL} = 25\text{ mA}$ , $V_{DD} = 4.75$ to $5.25\text{V}$ (8 total loads, 4 on even port pins (for example, P0[2], P1[4]), 4 on odd port pins (for example, P0[3], P1[5])). |
| $V_{IL}$  | Input Low Level                   | –              | –   | 0.8  | V         | $V_{DD} = 3.0$ to $5.25$ .                                                                                                                                                    |
| $V_{IH}$  | Input High Level                  | 2.1            | –   | –    | V         | $V_{DD} = 3.0$ to $5.25$ .                                                                                                                                                    |
| $V_H$     | Input Hysteresis                  | –              | 60  | –    | mV        |                                                                                                                                                                               |
| $I_{IL}$  | Input Leakage (Absolute Value)    | –              | 1   | –    | nA        | Gross tested to $1\text{ }\mu\text{A}$ .                                                                                                                                      |
| $C_{IN}$  | Capacitive Load on Pins as Input  | –              | 3.5 | 10   | pF        | Package and pin dependent. Temp = $25^\circ\text{C}$ .                                                                                                                        |
| $C_{OUT}$ | Capacitive Load on Pins as Output | –              | 3.5 | 10   | pF        | Package and pin dependent. Temp = $25^\circ\text{C}$ .                                                                                                                        |

**Table 16. 2.7V DC GPIO Specifications**

| Symbol   | Description        | Min            | Typ | Max  | Units     | Notes                                                                                                                     |
|----------|--------------------|----------------|-----|------|-----------|---------------------------------------------------------------------------------------------------------------------------|
| $R_{PU}$ | Pull up Resistor   | 4              | 5.6 | 8    | $k\Omega$ |                                                                                                                           |
| $R_{PD}$ | Pull down Resistor | 4              | 5.6 | 8    | $k\Omega$ |                                                                                                                           |
| $V_{OH}$ | High Output Level  | $V_{DD} - 0.4$ | –   | –    | V         | $I_{OH} = 2.5\text{ mA}$ (6.25 Typ), $V_{DD} = 2.4$ to $3.0\text{V}$ (16 mA maximum, 50 mA Typ combined $I_{OH}$ budget). |
| $V_{OL}$ | Low Output Level   | –              | –   | 0.75 | V         | $I_{OL} = 10\text{ mA}$ , $V_{DD} = 2.4$ to $3.0\text{V}$ (90 mA maximum combined $I_{OL}$ budget).                       |
| $V_{IL}$ | Input Low Level    | –              | –   | 0.75 | V         | $V_{DD} = 2.4$ to $3.0$ .                                                                                                 |

**Table 16. 2.7V DC GPIO Specifications (continued)**

| Symbol    | Description                       | Min | Typ | Max | Units | Notes                                                |
|-----------|-----------------------------------|-----|-----|-----|-------|------------------------------------------------------|
| $V_{IH}$  | Input High Level                  | 2.0 | –   | –   | V     | $V_{DD} = 2.4$ to $3.0$ .                            |
| $V_H$     | Input Hysteresis                  | –   | 90  | –   | mV    |                                                      |
| $I_{IL}$  | Input Leakage (Absolute Value)    | –   | 1   | –   | nA    | Gross tested to $1\ \mu A$ .                         |
| $C_{IN}$  | Capacitive Load on Pins as Input  | –   | 3.5 | 10  | pF    | Package and pin dependent.<br>Temp = $25^{\circ}C$ . |
| $C_{OUT}$ | Capacitive Load on Pins as Output | –   | 3.5 | 10  | pF    | Package and pin dependent.<br>Temp = $25^{\circ}C$ . |

#### DC Operational Amplifier Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges:  $4.75V$  to  $5.25V$  and  $-40^{\circ}C \leq T_A \leq 85^{\circ}C$ ,  $3.0V$  to  $3.6V$  and  $-40^{\circ}C \leq T_A \leq 85^{\circ}C$ , or  $2.4V$  to  $3.0V$  and  $-40^{\circ}C \leq T_A \leq 85^{\circ}C$ , respectively. Typical parameters apply to  $5V$ ,  $3.3V$ , or  $2.7V$  at  $25^{\circ}C$  and are for design guidance only.

**Table 17. 5V DC Operational Amplifier Specifications**

| Symbol           | Description                                | Min | Typ | Max          | Units             | Notes                                                |
|------------------|--------------------------------------------|-----|-----|--------------|-------------------|------------------------------------------------------|
| $V_{OSOA}$       | Input Offset Voltage (absolute value)      | –   | 2.5 | 15           | mV                |                                                      |
| $TCV_{OSOA}$     | Average Input Offset Voltage Drift         | –   | 10  | –            | $\mu V/^{\circ}C$ |                                                      |
| $I_{EBOA}^{[5]}$ | Input Leakage Current (Port 0 Analog Pins) | –   | 200 | –            | pA                | Gross tested to $1\ \mu A$ .                         |
| $C_{INOA}$       | Input Capacitance (Port 0 Analog Pins)     | –   | 4.5 | 9.5          | pF                | Package and pin dependent.<br>Temp = $25^{\circ}C$ . |
| $V_{CMOA}$       | Common Mode Voltage Range                  | 0.0 | –   | $V_{DD} - 1$ | V                 |                                                      |
| $G_{OLOA}$       | Open Loop Gain                             | –   | 80  | –            | dB                |                                                      |
| $I_{SOA}$        | Amplifier Supply Current                   | –   | 10  | 30           | $\mu A$           |                                                      |

**Table 18. 3.3V DC Operational Amplifier Specifications**

| Symbol           | Description                                | Min | Typ | Max          | Units             | Notes                                                |
|------------------|--------------------------------------------|-----|-----|--------------|-------------------|------------------------------------------------------|
| $V_{OSOA}$       | Input Offset Voltage (absolute value)      | –   | 2.5 | 15           | mV                |                                                      |
| $TCV_{OSOA}$     | Average Input Offset Voltage Drift         | –   | 10  | –            | $\mu V/^{\circ}C$ |                                                      |
| $I_{EBOA}^{[5]}$ | Input Leakage Current (Port 0 Analog Pins) | –   | 200 | –            | pA                | Gross tested to $1\ \mu A$ .                         |
| $C_{INOA}$       | Input Capacitance (Port 0 Analog Pins)     | –   | 4.5 | 9.5          | pF                | Package and pin dependent.<br>Temp = $25^{\circ}C$ . |
| $V_{CMOA}$       | Common Mode Voltage Range                  | 0   | –   | $V_{DD} - 1$ | V                 |                                                      |
| $G_{OLOA}$       | Open Loop Gain                             | –   | 80  | –            | dB                |                                                      |
| $I_{SOA}$        | Amplifier Supply Current                   | –   | 10  | 30           | $\mu A$           |                                                      |

#### Note

5. Atypical behavior:  $I_{EBOA}$  of Port 0 Pin 0 is below  $1\ nA$  at  $25^{\circ}C$ ;  $50\ nA$  over temperature. Use Port 0 Pins 1-7 for the lowest leakage of  $200\ nA$ .

**Table 19. 2.7V DC Operational Amplifier Specifications**

| Symbol                           | Description                                | Min | Typ | Max                 | Units | Notes                                      |
|----------------------------------|--------------------------------------------|-----|-----|---------------------|-------|--------------------------------------------|
| V <sub>OSOA</sub>                | Input Offset Voltage (absolute value)      | –   | 2.5 | 15                  | mV    |                                            |
| TCV <sub>OSOA</sub>              | Average Input Offset Voltage Drift         | –   | 10  | –                   | μV/°C |                                            |
| I <sub>EBOA</sub> <sup>[5]</sup> | Input Leakage Current (Port 0 Analog Pins) | –   | 200 | –                   | pA    | Gross tested to 1 μA.                      |
| C <sub>INOA</sub>                | Input Capacitance (Port 0 Analog Pins)     | –   | 4.5 | 9.5                 | pF    | Package and pin dependent.<br>Temp = 25°C. |
| V <sub>CMOA</sub>                | Common Mode Voltage Range                  | 0   | –   | V <sub>dd</sub> - 1 | V     |                                            |
| G <sub>OLOA</sub>                | Open Loop Gain                             | –   | 80  | –                   | dB    |                                            |
| I <sub>SOA</sub>                 | Amplifier Supply Current                   | –   | 10  | 30                  | μA    |                                            |

#### DC Low Power Comparator Specifications

Table 20 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and -40°C ≤ T<sub>A</sub> ≤ 85°C, 3.0V to 3.6V and -40°C ≤ T<sub>A</sub> ≤ 85°C, or 2.4V to 3.0V and -40°C ≤ T<sub>A</sub> ≤ 85°C, respectively. Typical parameters apply to 5V at 25°C and are for design guidance only.

**Table 20. DC Low Power Comparator Specifications**

| Symbol              | Description                                        | Min | Typ | Max                 | Units | Notes |
|---------------------|----------------------------------------------------|-----|-----|---------------------|-------|-------|
| V <sub>REFLPC</sub> | Low power comparator (LPC) reference voltage range | 0.2 | –   | V <sub>dd</sub> - 1 | V     |       |
| I <sub>SLPC</sub>   | LPC supply current                                 | –   | 10  | 40                  | μA    |       |
| V <sub>OSLPC</sub>  | LPC voltage offset                                 | –   | 2.5 | 30                  | mV    |       |

#### DC Switch Mode Pump Specifications

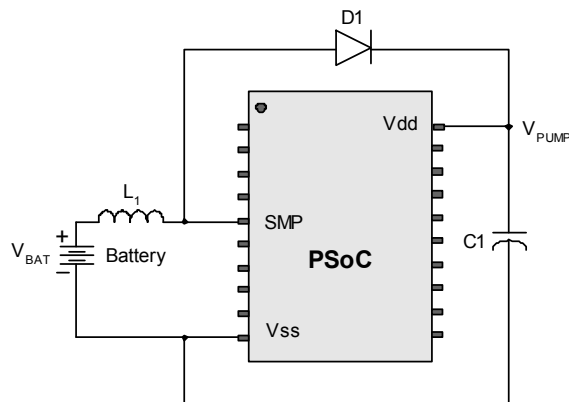
Table 21 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and -40°C ≤ T<sub>A</sub> ≤ 85°C, 3.0V to 3.6V and -40°C ≤ T<sub>A</sub> ≤ 85°C, or 2.4V to 3.0V and -40°C ≤ T<sub>A</sub> ≤ 85°C, respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at 25°C and are for design guidance only.

**Table 21. DC Switch Mode Pump (SMP) Specifications**

| Symbol                | Description                                                                                                                                                                               | Min         | Typ         | Max         | Units          | Notes                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| V <sub>PUMP5V</sub>   | 5V Output Voltage from Pump                                                                                                                                                               | 4.75        | 5.0         | 5.25        | V              | Configuration of footnote. <sup>[6]</sup><br>Average, neglecting ripple.<br>SMP trip voltage is set to 5.0V.                                            |
| V <sub>PUMP3V</sub>   | 3.3V Output Voltage from Pump                                                                                                                                                             | 3.00        | 3.25        | 3.60        | V              | Configuration of footnote. <sup>[6]</sup><br>Average, neglecting ripple.<br>SMP trip voltage is set to 3.25V.                                           |
| V <sub>PUMP2V</sub>   | 2.6V Output Voltage from Pump                                                                                                                                                             | 2.45        | 2.55        | 2.80        | V              | Configuration of footnote. <sup>[6]</sup><br>Average, neglecting ripple.<br>SMP trip voltage is set to 2.55V.                                           |
| I <sub>PUMP</sub>     | Available Output Current<br>V <sub>BAT</sub> = 1.8V, V <sub>PUMP</sub> = 5.0V<br>V <sub>BAT</sub> = 1.5V, V <sub>PUMP</sub> = 3.25V<br>V <sub>BAT</sub> = 1.3V, V <sub>PUMP</sub> = 2.55V | 5<br>8<br>8 | –<br>–<br>– | –<br>–<br>– | mA<br>mA<br>mA | Configuration of footnote. <sup>[6]</sup><br>SMP trip voltage is set to 5.0V.<br>SMP trip voltage is set to 3.25V.<br>SMP trip voltage is set to 2.55V. |
| V <sub>BAT5V</sub>    | Input Voltage Range from Battery                                                                                                                                                          | 1.8         | –           | 5.0         | V              | Configuration of footnote. <sup>[6]</sup><br>SMP trip voltage is set to 5.0V.                                                                           |
| V <sub>BAT3V</sub>    | Input Voltage Range from Battery                                                                                                                                                          | 1.0         | –           | 3.3         | V              | Configuration of footnote. <sup>[6]</sup><br>SMP trip voltage is set to 3.25V.                                                                          |
| V <sub>BAT2V</sub>    | Input Voltage Range from Battery                                                                                                                                                          | 1.0         | –           | 2.8         | V              | Configuration of footnote. <sup>[6]</sup><br>SMP trip voltage is set to 2.55V.                                                                          |
| V <sub>BATSTART</sub> | Minimum Input Voltage from Battery to Start Pump                                                                                                                                          | 1.2         | –           | –           | V              | Configuration of footnote. <sup>[6]</sup><br>0°C ≤ T <sub>A</sub> ≤ 100. 1.25V at T <sub>A</sub> = -40°C.                                               |

**Table 21. DC Switch Mode Pump (SMP) Specifications** (continued)

| Symbol                    | Description                                 | Min | Typ | Max | Units   | Notes                                                                                                                                                                                       |
|---------------------------|---------------------------------------------|-----|-----|-----|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\Delta V_{PUMP\_Line}$   | Line Regulation (over $V_i$ range)          | –   | 5   | –   | % $V_O$ | Configuration of footnote. <sup>[6]</sup> $V_O$ is the “Vdd Value for PUMP Trip” specified by the VM[2:0] setting in the DC POR and LVD Specification, <a href="#">Table 23</a> on page 24. |
| $\Delta V_{PUMP\_Load}$   | Load Regulation                             | –   | 5   | –   | % $V_O$ | Configuration of footnote. <sup>[6]</sup> $V_O$ is the “Vdd Value for PUMP Trip” specified by the VM[2:0] setting in the DC POR and LVD Specification, <a href="#">Table 23</a> on page 24. |
| $\Delta V_{PUMP\_Ripple}$ | Output Voltage Ripple (depends on cap/load) | –   | 100 | –   | mVpp    | Configuration of footnote. <sup>[6]</sup> Load is 5 mA.                                                                                                                                     |
| $E_3$                     | Efficiency                                  | 35  | 50  | –   | %       | Configuration of footnote. <sup>[6]</sup> Load is 5 mA. SMP trip voltage is set to 3.25V.                                                                                                   |
| $E_2$                     | Efficiency                                  | 35  | 80  | –   | %       | For $I_{load} = 1\text{mA}$ , $V_{PUMP} = 2.55\text{V}$ , $V_{BAT} = 1.3\text{V}$ , 10 $\mu\text{H}$ inductor, 1 $\mu\text{F}$ capacitor, and Schottky diode.                               |
| $F_{PUMP}$                | Switching Frequency                         | –   | 1.3 | –   | MHz     |                                                                                                                                                                                             |
| $DC_{PUMP}$               | Switching Duty Cycle                        | –   | 50  | –   | %       |                                                                                                                                                                                             |

**Figure 15. Basic Switch Mode Pump Circuit**

**Note**

6.  $L_1 = 2\text{ mH}$  inductor,  $C_1 = 10\text{ mF}$  capacitor,  $D_1 = \text{Schottky diode}$ . See Figure 15.

### DC Analog Mux Bus Specifications

Table 22 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 22. DC Analog Mux Bus Specifications**

| Symbol           | Description                                | Min | Typ | Max        | Units  | Notes                                                                                 |
|------------------|--------------------------------------------|-----|-----|------------|--------|---------------------------------------------------------------------------------------|
| $R_{\text{SW}}$  | Switch Resistance to Common Analog Bus     | —   | —   | 400<br>800 | W<br>W | $V_{\text{DD}} \geq 2.7\text{V}$<br>$2.4\text{V} \leq V_{\text{DD}} \leq 2.7\text{V}$ |
| $R_{\text{VDD}}$ | Resistance of Initialization Switch to Vdd | —   | —   | 800        | W      |                                                                                       |

### DC POR and LVD Specifications

Table 23 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 23. DC POR and LVD Specifications**

| Symbol                                                                                                                                                                       | Description                                                                                                                                                             | Min                                                          | Typ                                                          | Max                                                                                         | Units                                | Notes                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------|
| $V_{\text{PPOR0}}$<br>$V_{\text{PPOR1}}$<br>$V_{\text{PPOR2}}$                                                                                                               | Vdd Value for PPOR Trip<br>PORLEV[1:0] = 00b<br>PORLEV[1:0] = 01b<br>PORLEV[1:0] = 10b                                                                                  | —                                                            | 2.36<br>2.82<br>4.55                                         | 2.40<br>2.95<br>4.70                                                                        | V<br>V<br>V                          | Vdd must be greater than or equal to 2.5V during startup, reset from the XRES pin, or reset from Watchdog. |
| $V_{\text{LVD0}}$<br>$V_{\text{LVD1}}$<br>$V_{\text{LVD2}}$<br>$V_{\text{LVD3}}$<br>$V_{\text{LVD4}}$<br>$V_{\text{LVD5}}$<br>$V_{\text{LVD6}}$<br>$V_{\text{LVD7}}$         | Vdd Value for LVD Trip<br>VM[2:0] = 000b<br>VM[2:0] = 001b<br>VM[2:0] = 010b<br>VM[2:0] = 011b<br>VM[2:0] = 100b<br>VM[2:0] = 101b<br>VM[2:0] = 110b<br>VM[2:0] = 111b  | 2.40<br>2.85<br>2.95<br>3.06<br>4.37<br>4.50<br>4.62<br>4.71 | 2.45<br>2.92<br>3.02<br>3.13<br>4.48<br>4.64<br>4.73<br>4.81 | 2.51 <sup>[7]</sup><br>2.99 <sup>[8]</sup><br>3.09<br>3.20<br>4.55<br>4.75<br>4.83<br>4.95  | V<br>V<br>V<br>V<br>V<br>V<br>V<br>V |                                                                                                            |
| $V_{\text{PUMP0}}$<br>$V_{\text{PUMP1}}$<br>$V_{\text{PUMP2}}$<br>$V_{\text{PUMP3}}$<br>$V_{\text{PUMP4}}$<br>$V_{\text{PUMP5}}$<br>$V_{\text{PUMP6}}$<br>$V_{\text{PUMP7}}$ | Vdd Value for PUMP Trip<br>VM[2:0] = 000b<br>VM[2:0] = 001b<br>VM[2:0] = 010b<br>VM[2:0] = 011b<br>VM[2:0] = 100b<br>VM[2:0] = 101b<br>VM[2:0] = 110b<br>VM[2:0] = 111b | 2.45<br>2.96<br>3.03<br>3.18<br>4.54<br>4.62<br>4.71<br>4.89 | 2.55<br>3.02<br>3.10<br>3.25<br>4.64<br>4.73<br>4.82<br>5.00 | 2.62 <sup>[9]</sup><br>3.09<br>3.16<br>3.32 <sup>[10]</sup><br>4.74<br>4.83<br>4.92<br>5.12 | V<br>V<br>V<br>V<br>V<br>V<br>V<br>V |                                                                                                            |

#### Notes

7. Always greater than 50 mV above  $V_{\text{PPOR}}$  (PORLEV = 00) for falling supply.
8. Always greater than 50 mV above  $V_{\text{PPOR}}$  (PORLEV = 01) for falling supply.
9. Always greater than 50 mV above  $V_{\text{LVD0}}$ .
10. Always greater than 50 mV above  $V_{\text{LVD3}}$ .

### DC Programming Specifications

Table 24 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 24. DC Programming Specifications**

| Symbol                | Description                                                                          | Min            | Typ | Max             | Units | Notes                                |
|-----------------------|--------------------------------------------------------------------------------------|----------------|-----|-----------------|-------|--------------------------------------|
| $V_{dd_{IWRITE}}$     | Supply Voltage for Flash Write Operations                                            | 2.70           | —   | —               | V     |                                      |
| $I_{DDP}$             | Supply Current During Programming or Verify                                          | —              | 5   | 25              | mA    |                                      |
| $V_{ILP}$             | Input Low Voltage During Programming or Verify                                       | —              | —   | 0.8             | V     |                                      |
| $V_{IHP}$             | Input High Voltage During Programming or Verify                                      | 2.2            | —   | —               | V     |                                      |
| $I_{ILP}$             | Input Current when Applying $V_{ilp}$ to P1[0] or P1[1] During Programming or Verify | —              | —   | 0.2             | mA    | Driving internal pull down resistor. |
| $I_{IHP}$             | Input Current when Applying $V_{ihp}$ to P1[0] or P1[1] During Programming or Verify | —              | —   | 1.5             | mA    | Driving internal pull down resistor. |
| $V_{OLV}$             | Output Low Voltage During Programming or Verify                                      | —              | —   | $V_{ss} + 0.75$ | V     |                                      |
| $V_{OHV}$             | Output High Voltage During Programming or Verify                                     | $V_{dd} - 1.0$ | —   | $V_{dd}$        | V     |                                      |
| Flash <sub>ENPB</sub> | Flash Endurance (per block)                                                          | 50,000         | —   | —               | —     | Erase/write cycles per block.        |
| Flash <sub>ENT</sub>  | Flash Endurance (total) <sup>[11]</sup>                                              | 1,800,000      | —   | —               | —     | Erase/write cycles.                  |
| Flash <sub>DR</sub>   | Flash Data Retention                                                                 | 10             | —   | —               | Years |                                      |

#### Note

11. A maximum of 36 x 50,000 block endurance cycles is allowed. This may be balanced between operations on 36x1 blocks of 50,000 maximum cycles each, 36x2 blocks of 25,000 maximum cycles each, or 36x4 blocks of 12,500 maximum cycles each (to limit the total number of cycles to 36x50,000 and that no single block ever sees more than 50,000 cycles). For the full industrial range, the user must employ a temperature sensor user module (FlashTemp) and feed the result to the temperature argument before writing. Refer to the Flash APIs Application Note AN2015 at <http://www.cypress.com> under Application Notes for more information.

## AC Electrical Characteristics

### AC Chip-Level Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 25. 5V and 3.3V AC Chip-Level Specifications**

| Symbol              | Description                                             | Min  | Typ  | Max                        | Units | Notes                                                                                                 |
|---------------------|---------------------------------------------------------|------|------|----------------------------|-------|-------------------------------------------------------------------------------------------------------|
| F <sub>IMO24</sub>  | Internal Main Oscillator Frequency for 24 MHz           | 23.4 | 24   | 24.6 <sup>[12,13,14]</sup> | MHz   | Trimmed for 5V or 3.3V operation using factory trim values. See Figure 14 on page 18. SLIMO mode = 0. |
| F <sub>IMO6</sub>   | Internal Main Oscillator Frequency for 6 MHz            | 5.75 | 6    | 6.35 <sup>[12,13,14]</sup> | MHz   | Trimmed for 5V or 3.3V operation using factory trim values. See Figure 14 on page 18. SLIMO mode = 1. |
| F <sub>CPU1</sub>   | CPU Frequency (5V Nominal)                              | 0.93 | 24   | 24.6 <sup>[12,13]</sup>    | MHz   | 24 MHz only for SLIMO mode = 0.                                                                       |
| F <sub>CPU2</sub>   | CPU Frequency (3.3V Nominal)                            | 0.93 | 12   | 12.3 <sup>[13,14]</sup>    | MHz   |                                                                                                       |
| F <sub>BLK5</sub>   | Digital PSoC Block Frequency (5V Nominal)               | 0    | 48   | 49.2 <sup>[12,13,15]</sup> | MHz   | Refer to the AC Digital Block Specifications.                                                         |
| F <sub>BLK33</sub>  | Digital PSoC Block Frequency (3.3V Nominal)             | 0    | 24   | 24.6 <sup>[13,15]</sup>    | MHz   |                                                                                                       |
| F <sub>32K1</sub>   | Internal Low Speed Oscillator Frequency                 | 15   | 32   | 64                         | kHz   |                                                                                                       |
| Jitter32k           | 32 kHz RMS Period Jitter                                | —    | 100  | 200                        | ns    |                                                                                                       |
| Jitter32k           | 32 kHz Peak-to-Peak Period Jitter                       | —    | 1400 | —                          |       |                                                                                                       |
| T <sub>XRST</sub>   | External Reset Pulse Width                              | 10   | —    | —                          | μs    |                                                                                                       |
| DC24M               | 24 MHz Duty Cycle                                       | 40   | 50   | 60                         | %     |                                                                                                       |
| Step24M             | 24 MHz Trim Step Size                                   | —    | 50   | —                          | kHz   |                                                                                                       |
| F <sub>out48M</sub> | 48 MHz Output Frequency                                 | 46.8 | 48.0 | 49.2 <sup>[12,14]</sup>    | MHz   | Trimmed. Using factory trim values.                                                                   |
| Jitter24M1          | 24 MHz Peak-to-Peak Period Jitter (IMO)                 | —    | 600  | —                          | ps    |                                                                                                       |
| F <sub>MAX</sub>    | Maximum frequency of signal on row input or row output. | —    | —    | 12.3                       | MHz   |                                                                                                       |
| T <sub>RAMP</sub>   | Supply Ramp Time                                        | 0    | —    | —                          | μs    |                                                                                                       |

#### Notes

12. 4.75V < V<sub>dd</sub> < 5.25V.

13. Accuracy derived from Internal Main Oscillator with appropriate trim for V<sub>dd</sub> range.

14. 3.0V < V<sub>dd</sub> < 3.6V. See Application Note [AN2012](#) "Adjusting PSoC Microcontroller Trims for Dual Voltage-Range Operation" for information on trimming for operation at 3.3V.

15. See the individual user module data sheets for information on maximum frequencies for user modules.

**Table 26. 2.7V AC Chip-Level Specifications**

| Symbol             | Description                                             | Min   | Typ  | Max                        | Units | Notes                                                                                           |
|--------------------|---------------------------------------------------------|-------|------|----------------------------|-------|-------------------------------------------------------------------------------------------------|
| F <sub>IMO12</sub> | Internal Main Oscillator Frequency for 12 MHz           | 11.5  | 12   | 12.7 <sup>[16,17,18]</sup> | MHz   | Trimmed for 2.7V operation using factory trim values. See Figure 14 on page 18. SLIMO mode = 1. |
| F <sub>IMO6</sub>  | Internal Main Oscillator Frequency for 6 MHz            | 5.75  | 6    | 6.35 <sup>[16,17,18]</sup> | MHz   | Trimmed for 2.7V operation using factory trim values. See Figure 14 on page 18. SLIMO mode = 1. |
| F <sub>CPU1</sub>  | CPU Frequency (2.7V Nominal)                            | 0.093 | 3    | 3.15 <sup>[16,17]</sup>    | MHz   | 24 MHz only for SLIMO mode = 0.                                                                 |
| F <sub>BLK27</sub> | Digital PSoC Block Frequency (2.7V Nominal)             | 0     | 12   | 12.5 <sup>[16,17,18]</sup> | MHz   | Refer to the AC Digital Block Specifications.                                                   |
| F <sub>32K1</sub>  | Internal Low Speed Oscillator Frequency                 | 8     | 32   | 96                         | kHz   |                                                                                                 |
| Jitter32k          | 32 kHz RMS Period Jitter                                | –     | 150  | 200                        | ns    |                                                                                                 |
| Jitter32k          | 32 kHz Peak-to-Peak Period Jitter                       | –     | 1400 | –                          |       |                                                                                                 |
| T <sub>XRST</sub>  | External Reset Pulse Width                              | 10    | –    | –                          | μs    |                                                                                                 |
| F <sub>MAX</sub>   | Maximum frequency of signal on row input or row output. | –     | –    | 12.3                       | MHz   |                                                                                                 |
| T <sub>RAMP</sub>  | Supply Ramp Time                                        | 0     | –    | –                          | μs    |                                                                                                 |

**Figure 16. 24 MHz Period Jitter (IMO) Timing Diagram**



**Figure 17. 32 kHz Period Jitter (ILO) Timing Diagram**



**Notes**

16. 2.4V < V<sub>dd</sub> < 3.0V.
17. Accuracy derived from Internal Main Oscillator with appropriate trim for V<sub>dd</sub> range.
18. See Application Note [AN2012](#) "Adjusting PSoC Microcontroller Trims for Dual Voltage-Range Operation" for information on maximum frequency for user modules.

### AC General Purpose IO Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

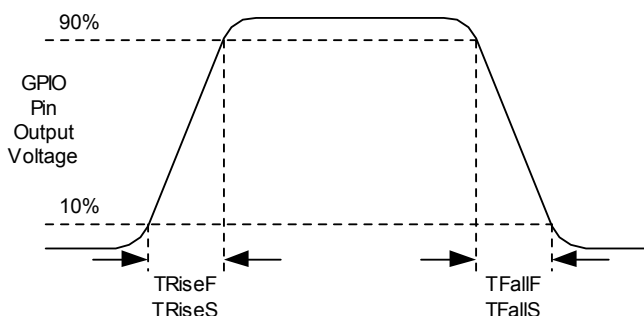
**Table 27. 5V and 3.3V AC GPIO Specifications**

| Symbol             | Description                                  | Min | Typ | Max | Units | Notes                         |
|--------------------|----------------------------------------------|-----|-----|-----|-------|-------------------------------|
| $F_{\text{GPIO}}$  | GPIO Operating Frequency                     | 0   | —   | 12  | MHz   | Normal Strong Mode            |
| $T_{\text{RiseF}}$ | Rise Time, Normal Strong Mode, Cload = 50 pF | 3   | —   | 18  | ns    | Vdd = 4.5 to 5.25V, 10% - 90% |
| $T_{\text{FallF}}$ | Fall Time, Normal Strong Mode, Cload = 50 pF | 2   | —   | 18  | ns    | Vdd = 4.5 to 5.25V, 10% - 90% |
| $T_{\text{RiseS}}$ | Rise Time, Slow Strong Mode, Cload = 50 pF   | 7   | 27  | —   | ns    | Vdd = 3 to 5.25V, 10% - 90%   |
| $T_{\text{FallS}}$ | Fall Time, Slow Strong Mode, Cload = 50 pF   | 7   | 22  | —   | ns    | Vdd = 3 to 5.25V, 10% - 90%   |

**Table 28. 2.7V AC GPIO Specifications**

| Symbol             | Description                                  | Min | Typ | Max | Units | Notes                        |
|--------------------|----------------------------------------------|-----|-----|-----|-------|------------------------------|
| $F_{\text{GPIO}}$  | GPIO Operating Frequency                     | 0   | —   | 3   | MHz   | Normal Strong Mode           |
| $T_{\text{RiseF}}$ | Rise Time, Normal Strong Mode, Cload = 50 pF | 6   | —   | 50  | ns    | Vdd = 2.4 to 3.0V, 10% - 90% |
| $T_{\text{FallF}}$ | Fall Time, Normal Strong Mode, Cload = 50 pF | 6   | —   | 50  | ns    | Vdd = 2.4 to 3.0V, 10% - 90% |
| $T_{\text{RiseS}}$ | Rise Time, Slow Strong Mode, Cload = 50 pF   | 18  | 40  | 120 | ns    | Vdd = 2.4 to 3.0V, 10% - 90% |
| $T_{\text{FallS}}$ | Fall Time, Slow Strong Mode, Cload = 50 pF   | 18  | 40  | 120 | ns    | Vdd = 2.4 to 3.0V, 10% - 90% |

**Figure 18. GPIO Timing Diagram**



### AC Operational Amplifier Specifications

**Table 29** lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 29. AC Operational Amplifier Specifications**

| Symbol            | Description                                    | Min | Typ | Max        | Units    | Notes                             |
|-------------------|------------------------------------------------|-----|-----|------------|----------|-----------------------------------|
| $T_{\text{COMP}}$ | Comparator Mode Response Time, 50 mV Overdrive |     |     | 100<br>200 | ns<br>ns | Vdd ≥ 3.0V.<br>2.4V < Vcc < 3.0V. |

### AC Low Power Comparator Specifications

**Table 30** lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 30. AC Low Power Comparator Specifications**

| Symbol            | Description       | Min | Typ | Max | Units | Notes                                                                   |
|-------------------|-------------------|-----|-----|-----|-------|-------------------------------------------------------------------------|
| $T_{\text{RLPC}}$ | LPC response time | —   | —   | 50  | μs    | ≥ 50 mV overdrive comparator reference set within $V_{\text{REFLPC}}$ . |

### AC Analog Mux Bus Specifications

Table 31 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 31. AC Analog Mux Bus Specifications**

| Symbol          | Description | Min | Typ | Max  | Units | Notes |
|-----------------|-------------|-----|-----|------|-------|-------|
| F <sub>SW</sub> | Switch Rate | –   | –   | 3.17 | MHz   |       |

### AC Digital Block Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 2.4V to 3.0V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at  $25^{\circ}\text{C}$  and are for design guidance only.

**Table 32. 5V and 3.3V AC Digital Block Specifications**

| Function          | Description                                                             | Min                | Typ | Max  | Units | Notes                                                   |
|-------------------|-------------------------------------------------------------------------|--------------------|-----|------|-------|---------------------------------------------------------|
| All Functions     | Maximum Block Clocking Frequency (> 4.75V)                              |                    |     | 49.2 | MHz   | 4.75V < V <sub>dd</sub> < 5.25V.                        |
|                   | Maximum Block Clocking Frequency (< 4.75V)                              |                    |     | 24.6 | MHz   | 3.0V < V <sub>dd</sub> < 4.75V.                         |
| Timer             | Capture Pulse Width                                                     | 50 <sup>[19]</sup> | –   | –    | ns    |                                                         |
|                   | Maximum Frequency, No Capture                                           | –                  | –   | 49.2 | MHz   | 4.75V < V <sub>dd</sub> < 5.25V.                        |
|                   | Maximum Frequency, With or Without Capture                              | –                  | –   | 24.6 | MHz   |                                                         |
| Counter           | Enable Pulse Width                                                      | 50                 | –   | –    | ns    |                                                         |
|                   | Maximum Frequency, No Enable Input                                      | –                  | –   | 49.2 | MHz   | 4.75V < V <sub>dd</sub> < 5.25V.                        |
|                   | Maximum Frequency, Enable Input                                         | –                  | –   | 24.6 | MHz   |                                                         |
| Dead Band         | Kill Pulse Width:                                                       |                    |     |      |       |                                                         |
|                   | Asynchronous Restart Mode                                               | 20                 | –   | –    | ns    |                                                         |
|                   | Synchronous Restart Mode                                                | 50                 | –   | –    | ns    |                                                         |
|                   | Disable Mode                                                            | 50                 | –   | –    | ns    |                                                         |
|                   | Maximum Frequency                                                       | –                  | –   | 49.2 | MHz   | 4.75V < V <sub>dd</sub> < 5.25V.                        |
| CRCPRS (PRS Mode) | Maximum Input Clock Frequency                                           | –                  | –   | 49.2 | MHz   | 4.75V < V <sub>dd</sub> < 5.25V.                        |
| CRCPRS (CRC Mode) | Maximum Input Clock Frequency                                           | –                  | –   | 24.6 | MHz   |                                                         |
| SPIM              | Maximum Input Clock Frequency                                           | –                  | –   | 8.2  | MHz   | Maximum data rate at 4.1 MHz due to 2 x over clocking.  |
| SPIS              | Maximum Input Clock Frequency                                           | –                  | –   | 4.1  | MHz   |                                                         |
|                   | Width of SS_ Negated Between Transmissions                              | 50                 | –   | –    | ns    |                                                         |
| Transmitter       | Maximum Input Clock Frequency                                           | –                  | –   | 24.6 | MHz   | Maximum data rate at 3.08 MHz due to 8 x over clocking. |
|                   | Maximum Input Clock Frequency with V <sub>dd</sub> ≥ 4.75V, 2 Stop Bits | –                  | –   | 49.2 | MHz   | Maximum data rate at 6.15 MHz due to 8 x over clocking. |
| Receiver          | Maximum Input Clock Frequency                                           | –                  | –   | 24.6 | MHz   | Maximum data rate at 3.08 MHz due to 8 x over clocking. |
|                   | Maximum Input Clock Frequency with V <sub>dd</sub> ≥ 4.75V, 2 Stop Bits | –                  | –   | 49.2 | MHz   | Maximum data rate at 6.15 MHz due to 8 x over clocking. |

**Note**

19. 50 ns minimum input pulse width is based on the input synchronizers running at 12 MHz (84 ns nominal period).

**Table 33. 2.7V AC Digital Block Specifications**

| Function          | Description                                | Min                 | Typ | Max  | Units | Notes                                                   |
|-------------------|--------------------------------------------|---------------------|-----|------|-------|---------------------------------------------------------|
| All Functions     | Maximum Block Clocking Frequency           |                     |     | 12.7 | MHz   | 2.4V < Vdd < 3.0V.                                      |
| Timer             | Capture Pulse Width                        | 100 <sup>[20]</sup> | –   | –    | ns    |                                                         |
|                   | Maximum Frequency, With or Without Capture | –                   | –   | 12.7 | MHz   |                                                         |
| Counter           | Enable Pulse Width                         | 100                 | –   | –    | ns    |                                                         |
|                   | Maximum Frequency, No Enable Input         | –                   | –   | 12.7 | MHz   |                                                         |
|                   | Maximum Frequency, Enable Input            | –                   | –   | 12.7 | MHz   |                                                         |
| Dead Band         | Kill Pulse Width:                          |                     |     |      |       |                                                         |
|                   | Asynchronous Restart Mode                  | 20                  | –   | –    | ns    |                                                         |
|                   | Synchronous Restart Mode                   | 100                 | –   | –    | ns    |                                                         |
|                   | Disable Mode                               | 100                 | –   | –    | ns    |                                                         |
|                   | Maximum Frequency                          | –                   | –   | 12.7 | MHz   |                                                         |
| CRCPRS (PRS Mode) | Maximum Input Clock Frequency              | –                   | –   | 12.7 | MHz   |                                                         |
| CRCPRS (CRC Mode) | Maximum Input Clock Frequency              | –                   | –   | 12.7 | MHz   |                                                         |
| SPIM              | Maximum Input Clock Frequency              | –                   | –   | 6.35 | MHz   | Maximum data rate at 3.17 MHz due to 2 x over clocking. |
| SPIS              | Maximum Input Clock Frequency              | –                   | –   | 4.1  | MHz   |                                                         |
|                   | Width of SS_ Negated Between Transmissions | 100                 | –   | –    | ns    |                                                         |
| Transmitter       | Maximum Input Clock Frequency              | –                   | –   | 12.7 | MHz   | Maximum data rate at 1.59 MHz due to 8 x over clocking. |
| Receiver          | Maximum Input Clock Frequency              | –                   | –   | 12.7 | MHz   | Maximum data rate at 1.59 MHz due to 8 x over clocking. |

#### AC External Clock Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , or 3.0V to 3.6V and  $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$ , respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at 25°C and are for design guidance only.

**Table 34. 5V AC External Clock Specifications**

| Symbol              | Description            | Min   | Typ | Max  | Units |
|---------------------|------------------------|-------|-----|------|-------|
| F <sub>OSCEXT</sub> | Frequency              | 0.093 | –   | 24.6 | MHz   |
| –                   | High Period            | 20.6  | –   | 5300 | ns    |
| –                   | Low Period             | 20.6  | –   | –    | ns    |
| –                   | Power Up IMO to Switch | 150   | –   | –    | μs    |

#### Note

20. 100 ns minimum input pulse width is based on the input synchronizers running at 12 MHz (84 ns nominal period).

**Table 35. 3.3V AC External Clock Specifications**

| Symbol              | Description                                     | Min   | Typ | Max  | Units | Notes                                                                                                                                                                                                               |
|---------------------|-------------------------------------------------|-------|-----|------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F <sub>OSCEXT</sub> | Frequency with CPU Clock divide by 1            | 0.093 | –   | 12.3 | MHz   | Maximum CPU frequency is 12 MHz at 3.3V. With the CPU clock divider set to 1, the external clock must adhere to the maximum frequency and duty cycle requirements.                                                  |
| F <sub>OSCEXT</sub> | Frequency with CPU Clock divide by 2 or greater | 0.186 | –   | 24.6 | MHz   | If the frequency of the external clock is greater than 12 MHz, the CPU clock divider must be set to 2 or greater. In this case, the CPU clock divider ensures that the fifty percent duty cycle requirement is met. |
| –                   | High Period with CPU Clock divide by 1          | 41.7  | –   | 5300 | ns    |                                                                                                                                                                                                                     |
| –                   | Low Period with CPU Clock divide by 1           | 41.7  | –   | –    | ns    |                                                                                                                                                                                                                     |
| –                   | Power Up IMO to Switch                          | 150   | –   | –    | μs    |                                                                                                                                                                                                                     |

**Table 36. 2.7V AC External Clock Specifications**

| Symbol              | Description                                     | Min   | Typ | Max  | Units | Notes                                                                                                                                                                                                              |
|---------------------|-------------------------------------------------|-------|-----|------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F <sub>OSCEXT</sub> | Frequency with CPU Clock divide by 1            | 0.093 | –   | 3.08 | MHz   | Maximum CPU frequency is 3 MHz at 2.7V. With the CPU clock divider set to 1, the external clock must adhere to the maximum frequency and duty cycle requirements.                                                  |
| F <sub>OSCEXT</sub> | Frequency with CPU Clock divide by 2 or greater | 0.186 | –   | 6.35 | MHz   | If the frequency of the external clock is greater than 3 MHz, the CPU clock divider must be set to 2 or greater. In this case, the CPU clock divider ensures that the fifty percent duty cycle requirement is met. |
| –                   | High Period with CPU Clock divide by 1          | 160   | –   | 5300 | ns    |                                                                                                                                                                                                                    |
| –                   | Low Period with CPU Clock divide by 1           | 160   | –   | –    | ns    |                                                                                                                                                                                                                    |
| –                   | Power Up IMO to Switch                          | 150   | –   | –    | μs    |                                                                                                                                                                                                                    |

#### AC Programming Specifications

Table 37 lists the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and -40°C ≤ T<sub>A</sub> ≤ 85°C, or 3.0V to 3.6V and -40°C ≤ T<sub>A</sub> ≤ 85°C, respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at 25°C and are for design guidance only.

**Table 37. AC Programming Specifications**

| Symbol              | Description                              | Min | Typ | Max | Units | Notes |
|---------------------|------------------------------------------|-----|-----|-----|-------|-------|
| T <sub>RSCLK</sub>  | Rise Time of SCLK                        | 1   | –   | 20  | ns    |       |
| T <sub>FSCLK</sub>  | Fall Time of SCLK                        | 1   | –   | 20  | ns    |       |
| T <sub>SSCLK</sub>  | Data Set up Time to Falling Edge of SCLK | 40  | –   | –   | ns    |       |
| T <sub>HSCLK</sub>  | Data Hold Time from Falling Edge of SCLK | 40  | –   | –   | ns    |       |
| F <sub>SCLK</sub>   | Frequency of SCLK                        | 0   | –   | 8   | MHz   |       |
| T <sub>ERASEB</sub> | Flash Erase Time (Block)                 | –   | 15  | –   | ms    |       |

**Table 37. AC Programming Specifications** (continued)

| Symbol              | Description                              | Min | Typ | Max | Units | Notes                       |
|---------------------|------------------------------------------|-----|-----|-----|-------|-----------------------------|
| T <sub>WRITE</sub>  | Flash Block Write Time                   | –   | 30  | –   | ms    |                             |
| T <sub>DSCLK</sub>  | Data Out Delay from Falling Edge of SCLK | –   | –   | 45  | ns    | 3.6 < V <sub>dd</sub>       |
| T <sub>DSCLK3</sub> | Data Out Delay from Falling Edge of SCLK | –   | –   | 50  | ns    | 3.0 ≤ V <sub>dd</sub> ≤ 3.6 |
| T <sub>DSCLK2</sub> | Data Out Delay from Falling Edge of SCLK | –   | –   | 70  | ns    | 2.4 ≤ V <sub>dd</sub> ≤ 3.0 |

### AC I<sup>2</sup>C Specifications

The following tables list the guaranteed maximum and minimum specifications for the voltage and temperature ranges: 4.75V to 5.25V and -40°C ≤ T<sub>A</sub> ≤ 85°C, 3.0V to 3.6V and -40°C ≤ T<sub>A</sub> ≤ 85°C, or 2.4V to 3.0V and -40°C ≤ T<sub>A</sub> ≤ 85°C, respectively. Typical parameters apply to 5V, 3.3V, or 2.7V at 25°C and are for design guidance only.

**Table 38. AC Characteristics of the I<sup>2</sup>C SDA and SCL Pins for V<sub>dd</sub> ≥ 3.0V**

| Symbol                 | Description                                                                                  | Standard Mode |     | Fast Mode           |     | Units |
|------------------------|----------------------------------------------------------------------------------------------|---------------|-----|---------------------|-----|-------|
|                        |                                                                                              | Min           | Max | Min                 | Max |       |
| F <sub>SCL I2C</sub>   | SCL Clock Frequency                                                                          | 0             | 100 | 0                   | 400 | kHz   |
| T <sub>HDSTA I2C</sub> | Hold Time (repeated) START Condition. After this period, the first clock pulse is generated. | 4.0           | –   | 0.6                 | –   | μs    |
| T <sub>LOW I2C</sub>   | LOW Period of the SCL Clock                                                                  | 4.7           | –   | 1.3                 | –   | μs    |
| T <sub>HIGH I2C</sub>  | HIGH Period of the SCL Clock                                                                 | 4.0           | –   | 0.6                 | –   | μs    |
| T <sub>SUSTA I2C</sub> | Set-up Time for a Repeated START Condition                                                   | 4.7           | –   | 0.6                 | –   | μs    |
| T <sub>HDDAT I2C</sub> | Data Hold Time                                                                               | 0             | –   | 0                   | –   | μs    |
| T <sub>SUDAT I2C</sub> | Data Set-up Time                                                                             | 250           | –   | 100 <sup>[21]</sup> | –   | ns    |
| T <sub>SUSTOI2C</sub>  | Set-up Time for STOP Condition                                                               | 4.0           | –   | 0.6                 | –   | μs    |
| T <sub>BUFI2C</sub>    | Bus Free Time Between a STOP and START Condition                                             | 4.7           | –   | 1.3                 | –   | μs    |
| T <sub>SPI2C</sub>     | Pulse Width of spikes are suppressed by the input filter.                                    | –             | –   | 0                   | 50  | ns    |

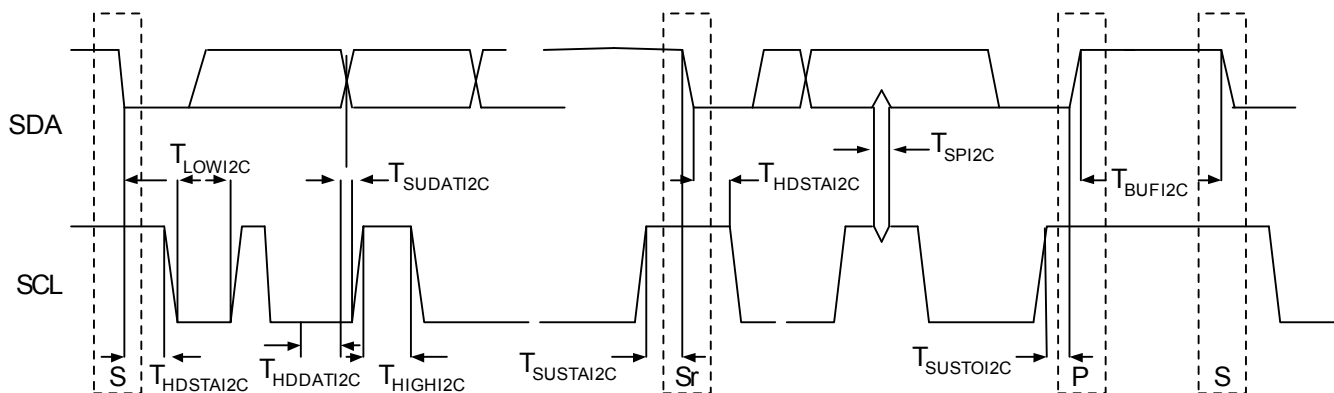
### Note

21. A Fast-Mode I<sup>2</sup>C-bus device may be used in a Standard-Mode I<sup>2</sup>C-bus system, but the requirement t<sub>SU, DAT</sub> ≥ 250 ns must then be met. This is automatically the case if the device does not stretch the LOW period of the SCL signal. If such device does stretch the LOW period of the SCL signal, it must output the next data bit to the SDA line t<sub>max</sub> + t<sub>SU, DAT</sub> = 1000 + 250 = 1250 ns (according to the Standard-Mode I<sup>2</sup>C-bus specification) before the SCL line is released.

**Table 39. 2.7V AC Characteristics of the I<sup>2</sup>C SDA and SCL Pins (Fast Mode not Supported)**

| Symbol                | Description                                                                                  | Standard Mode |     | Fast Mode |     | Units |
|-----------------------|----------------------------------------------------------------------------------------------|---------------|-----|-----------|-----|-------|
|                       |                                                                                              | Min           | Max | Min       | Max |       |
| F <sub>SCL I2C</sub>  | SCL Clock Frequency                                                                          | 0             | 100 | —         | —   | kHz   |
| T <sub>HDSTAI2C</sub> | Hold Time (repeated) START Condition. After this period, the first clock pulse is generated. | 4.0           | —   | —         | —   | μs    |
| T <sub>LOWI2C</sub>   | LOW Period of the SCL Clock                                                                  | 4.7           | —   | —         | —   | μs    |
| T <sub>HIGHI2C</sub>  | HIGH Period of the SCL Clock                                                                 | 4.0           | —   | —         | —   | μs    |
| T <sub>SUSTAI2C</sub> | Set up Time for a Repeated START Condition                                                   | 4.7           | —   | —         | —   | μs    |
| T <sub>HDDATI2C</sub> | Data Hold Time                                                                               | 0             | —   | —         | —   | μs    |
| T <sub>SUDATI2C</sub> | Data Set-up Time                                                                             | 250           | —   | —         | —   | ns    |
| T <sub>SUSTOI2C</sub> | Set up Time for STOP Condition                                                               | 4.0           | —   | —         | —   | μs    |
| T <sub>BUFI2C</sub>   | Bus Free Time Between a STOP and START Condition                                             | 4.7           | —   | —         | —   | μs    |
| T <sub>SPI2C</sub>    | Pulse Width of spikes are suppressed by the input filter.                                    | —             | —   | —         | —   | ns    |

**Figure 19. Definition for Timing for Fast/Standard Mode on the I<sup>2</sup>C Bus**



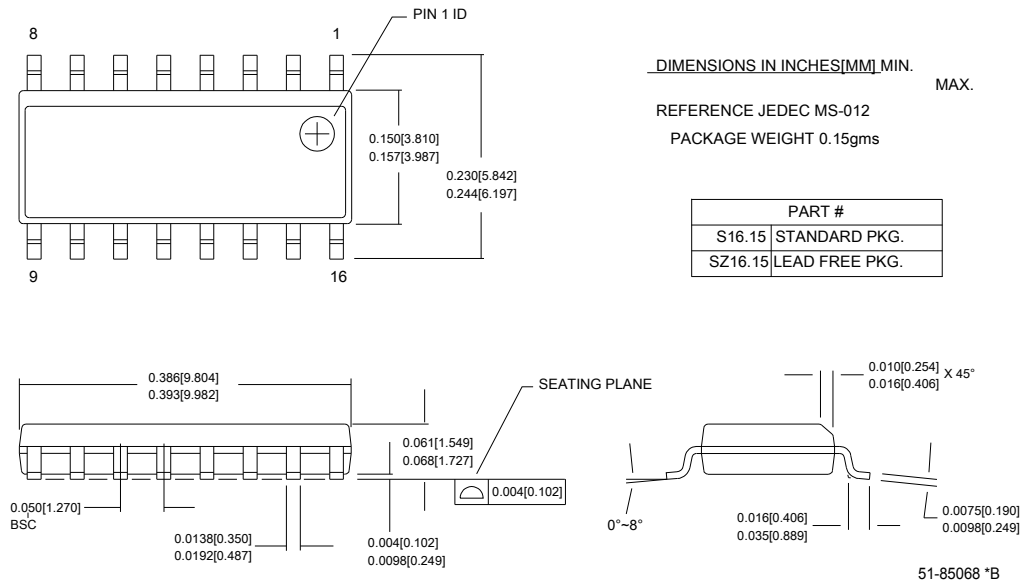
## Packaging Information

This section shows the packaging specifications for the CY8C21x34 PSoC device with the thermal impedances for each package.

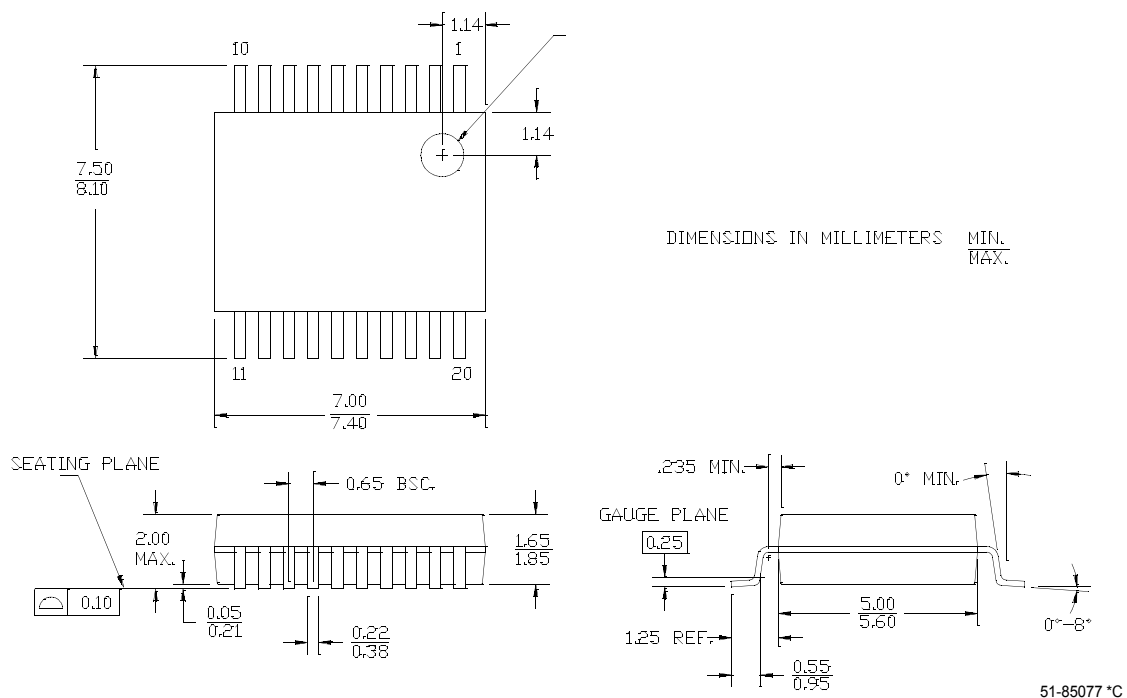
**Important Note** Emulation tools may require a larger area on the target PCB than the chip's footprint. For a detailed description of the emulation tools' dimensions, refer to the document titled *PSoC Emulator Pod Dimensions* at <http://www.cypress.com/design/MR10161>.

### Packaging Dimensions

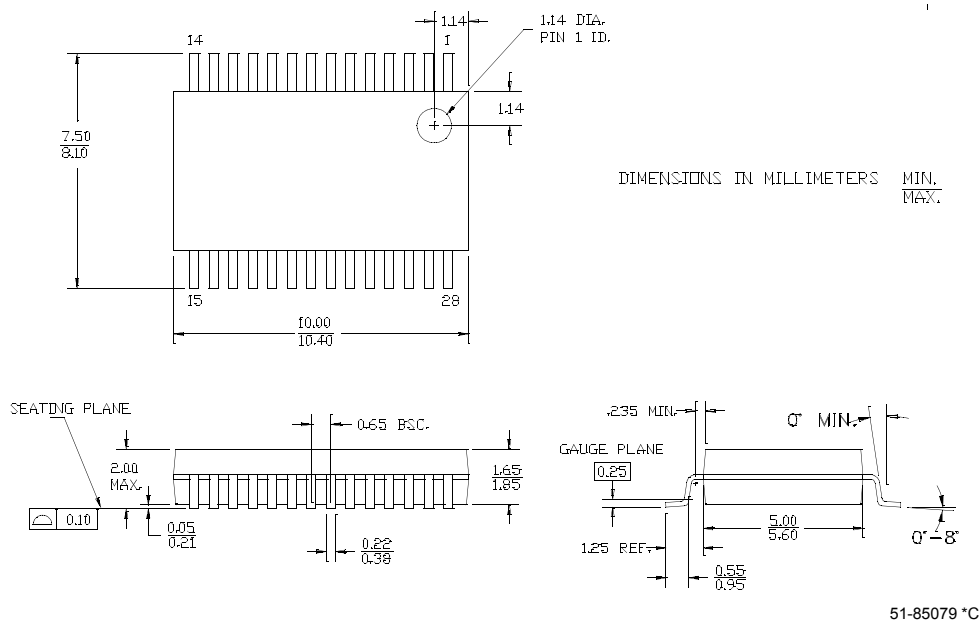
**Figure 20. 16-Pin (150-Mil) SOIC**



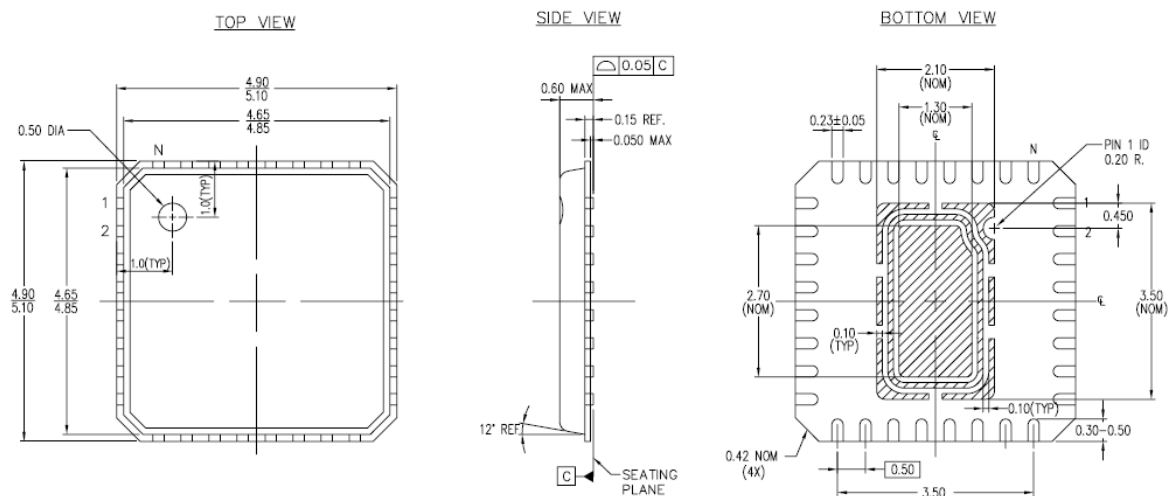
**Figure 21. 20-Pin (210-MIL) SSOP**



**Figure 22. 28-Pin (210-Mil) SSOP**



**Figure 23. 32-Pin (5x5 mm 0.60 MAX) QFN**



NOTES :

 HATCH AREA IS EXPOSED METAL

JEDEC # MO-220

DIMENSIONS IN mm MIN. MAX.

UNIT PACKAGE WEIGHT : 0.0354 Grams

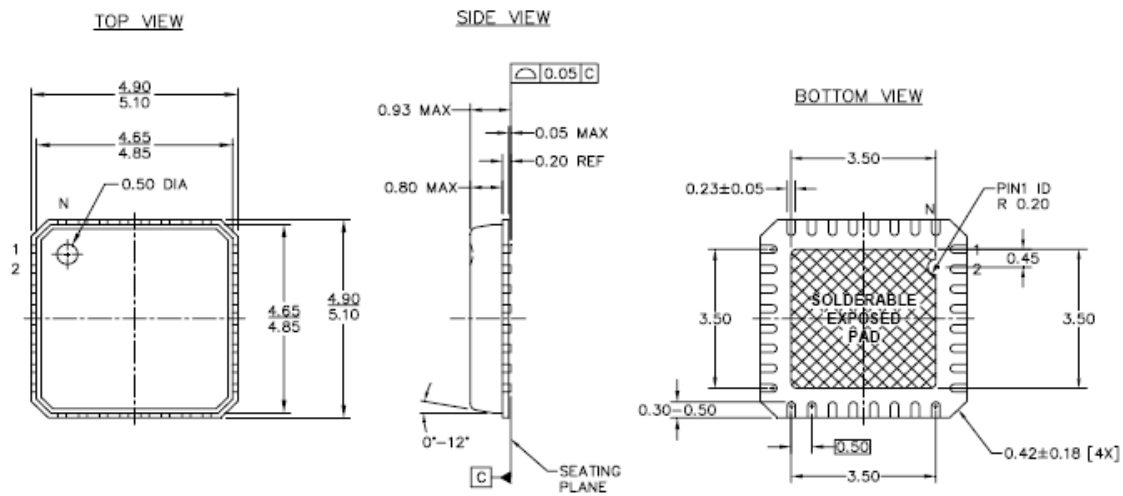
—PACKAGE CODE

| PART NO. | DESCRIPTION |
|----------|-------------|
| LJ32B    | STANDARD    |
| LK32B    | PB-FREE     |

E-PAD X, Y for this product is 3.53 mm, 3.53 mm (+/-0.11 mm)

001-06392 \*A

**Figure 24. 32-Pin (5x5 mm) QFN**



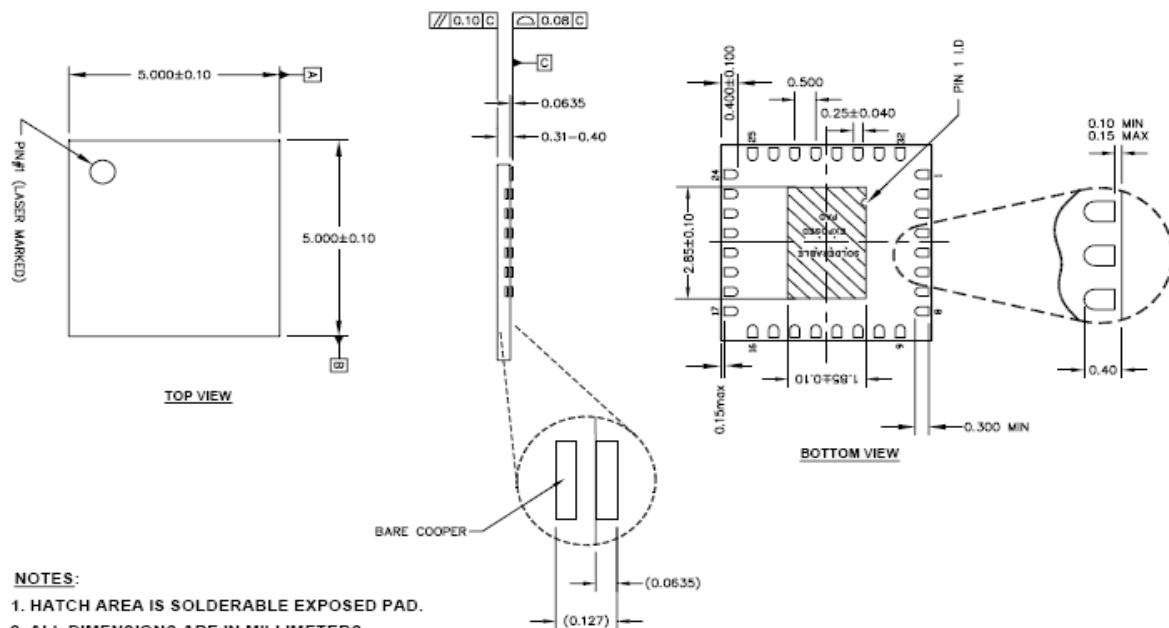
**NOTES:**

1.  HATCH AREA IS SOLDERABLE EXPOSED PAD.
2. REFERENCE JEDEC#: MO-220
3. PACKAGE WEIGHT: 0.054g
4. ALL DIMENSIONS ARE IN MM [MIN/MAX]
5. PACKAGE CODE

| PART # | DESCRIPTION |
|--------|-------------|
| LF32   | STANDARD    |
| LY32   | PB-FREE     |

51-85188 °C

**Figure 25. 32-Pin (5 X 5 X 0.4MM) QFN (SAWN 1.85 X 2.85 EPAD)**

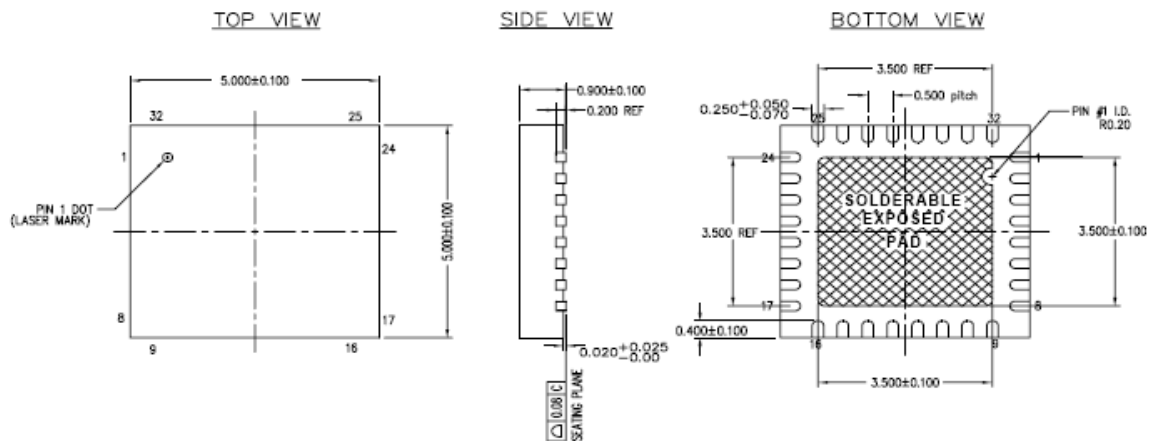


**NOTES:**

1. HATCH AREA IS SOLDERABLE EXPOSED PAD.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. REFERENCE JEDEC #: MO-220
4. MAXIMUM ALLOWABLE METAL IS 0.0508mm
5. PACKAGE WEIGHT: 0.029 grams

001-44368 \*A

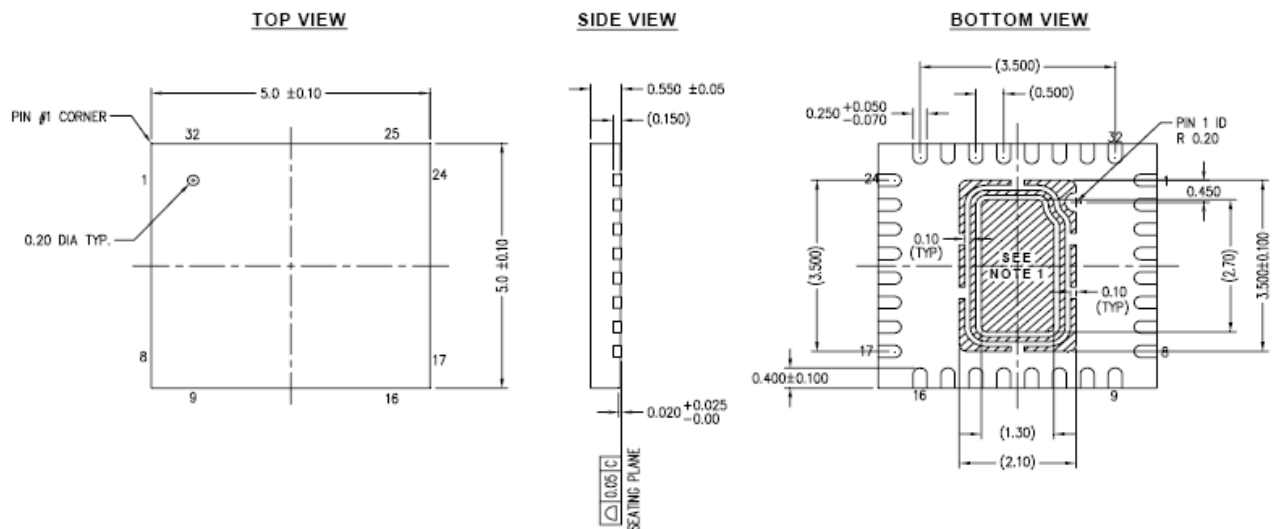
**Figure 26. 32-Pin Sawn QFN Package**



- NOTES:**
1. HATCH AREA IS SOLDERABLE EXPOSED PAD
  2. BASED ON REF JEDEC # MO-220
  3. PACKAGE WEIGHT: 0.068g
  4. DIMENSIONS ARE IN MILLIMETERS

001-30999 \*A

**Figure 27. 32-Pin Thin Sawn QFN Package**

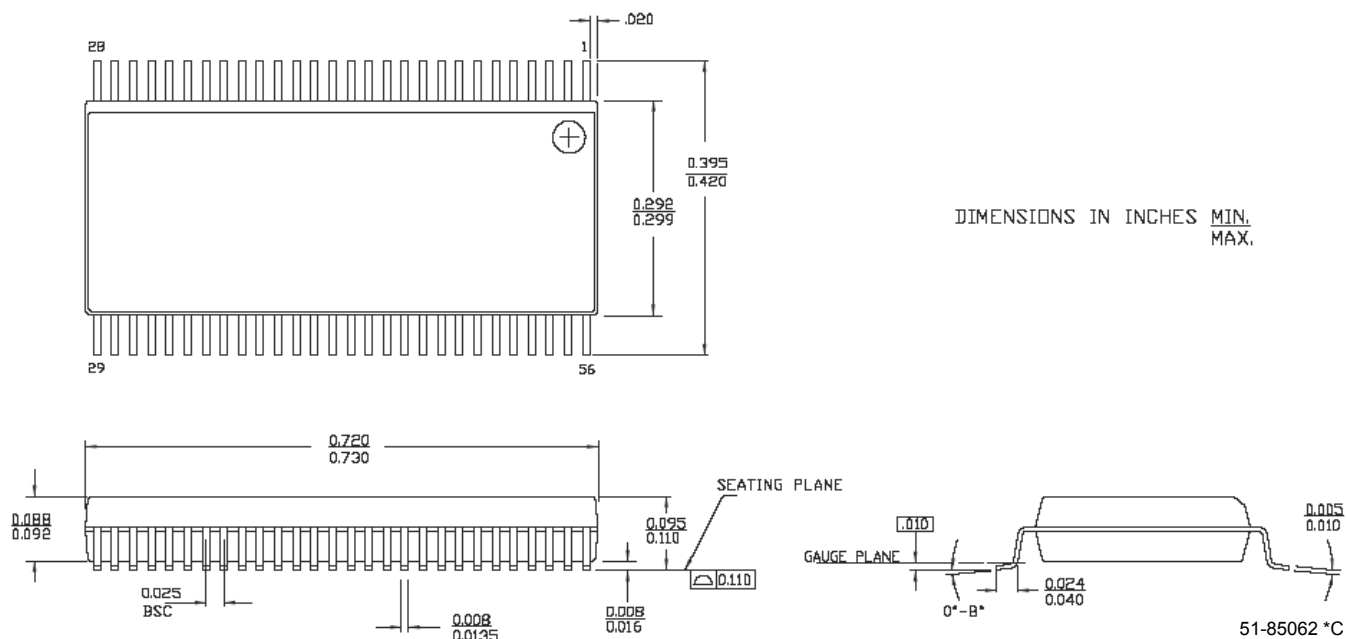


- NOTES:**
1. HATCH AREA IS SOLDERABLE EXPOSED PAD
  2. BASED ON REF JEDEC # MO-248
  3. PACKAGE WEIGHT: 0.0388g
  4. ALL DIMENSIONS ARE IN MILLIMETERS

001-48913 \*A

**Important Note** For information on the preferred dimensions for mounting QFN packages, see the following Application Note at [http://www.amkor.com/products/notes\\_papers/MLFAppNote.pdf](http://www.amkor.com/products/notes_papers/MLFAppNote.pdf).

**Figure 28. 56-Pin (300-Mil) SSOP**



## Thermal Impedances

**Table 40. Thermal Impedances per Package**

| Package                                | Typical $\theta_{JA}$ <sup>[22]</sup> | Typical $\theta_{JC}$ |
|----------------------------------------|---------------------------------------|-----------------------|
| 16 SOIC                                | 123 °C/W                              | 55 °C/W               |
| 20 SSOP                                | 117 °C/W                              | 41 °C/W               |
| 28 SSOP                                | 96 °C/W                               | 39 °C/W               |
| 32 QFN <sup>[23]</sup> 5x5 mm 0.60 MAX | 27 °C/W                               | 15 °C/W               |
| 32 QFN <sup>[23]</sup> 5x5 mm 0.93 MAX | 22 °C/W                               | 12 °C/W               |

### Solder Reflow Peak Temperature

Following is the minimum solder reflow peak temperature to achieve good solderability.

**Table 41. Solder Reflow Peak Temperature**

| Package | Minimum Peak Temperature <sup>[24]</sup> | Maximum Peak Temperature |
|---------|------------------------------------------|--------------------------|
| 16 SOIC | 240°C                                    | 260°C                    |
| 20 SSOP | 240°C                                    | 260°C                    |
| 28 SSOP | 240°C                                    | 260°C                    |
| 32 QFN  | 240°C                                    | 260°C                    |

#### Notes

22.  $T_J = T_A + \text{Power} \times \theta_{JA}$

23. To achieve the thermal impedance specified for the QFN package, the center thermal pad must be soldered to the PCB ground plane

24. Higher temperatures may be required based on the solder melting point. Typical temperatures for solder are 220 ± 5°C with Sn-Pb or 245 ± 5°C with Sn-Ag-Cu paste. Refer to the solder manufacturer specifications.

## Development Tool Selection

This section presents the development tools available for all current PSoC device families including the CY8C21x34 family.

### Software

#### *PSoC Designer™*

At the core of the PSoC development software suite is PSoC Designer. Used by thousands of PSoC developers, this robust software has been facilitating PSoC designs for half a decade. PSoC Designer is available free of charge at <http://www.cypress.com> under DESIGN RESOURCES >> Software and Drivers.

#### *PSoC Programmer*

Flexible enough to be used on the bench in development, yet suitable for factory programming, PSoC Programmer works either as a standalone programming application or operates directly from PSoC Designer or PSoC Express. PSoC Programmer software is compatible with both PSoC ICE-Cube In-Circuit Emulator and PSoC MiniProg. PSoC programmer is available free of charge at <http://www.cypress.com/psocprogrammer>.

#### *C Compilers*

PSoC Designer comes with a free HI-TECH C Lite C compiler. The HI-TECH C Lite compiler is free, supports all PSoC devices, integrates fully with PSoC Designer and PSoC Express, and runs on Windows versions up to 32-bit Vista. Compilers with additional features are available at additional cost from their manufactures.

- HI-TECH C PRO for the PSoC is available from <http://www.htsoft.com>.
- ImageCraft Cypress Edition Compiler is available from <http://www.imagecraft.com>.

### Development Kits

All development kits can be purchased from the Cypress Online Store.

#### *CY3215-DK Basic Development Kit*

The CY3215-DK is for prototyping and development with PSoC Designer. This kit supports in-circuit emulation and the software interface allows users to run, halt, and single step the processor and view the content of specific memory locations. Advance emulation features also supported through PSoC Designer. The kit includes:

- PSoC Designer Software CD
- ICE-Cube In-Circuit Emulator
- ICE Flex-Pod for CY8C29x66 Family
- Cat-5 Adapter
- Mini-Eval Programming Board

- 110 ~ 240V Power Supply, Euro-Plug Adapter
- iMAGEcraft C Compiler (Registration Required)
- ISSP Cable
- USB 2.0 Cable and Blue Cat-5 Cable
- 2 CY8C29466-24PXI 28-PDIP Chip Samples

#### *CY3210-ExpressDK PSoC Express Development Kit*

The CY3210-ExpressDK is for advanced prototyping and development with PSoC Express (may be used with ICE-Cube In-Circuit Emulator). It provides access to I<sup>2</sup>C buses, voltage reference, switches, upgradeable modules and more. The kit includes:

- PSoC Express Software CD
- Express Development Board
- 4 Fan Modules
- 2 Proto Modules
- MiniProg In-System Serial Programmer
- MiniEval PCB Evaluation Board
- Jumper Wire Kit
- USB 2.0 Cable
- Serial Cable (DB9)
- 110 ~ 240V Power Supply, Euro-Plug Adapter
- 2 CY8C24423A-24PXI 28-PDIP Chip Samples
- 2 CY8C27443-24PXI 28-PDIP Chip Samples
- 2 CY8C29466-24PXI 28-PDIP Chip Samples

### Evaluation Tools

All evaluation tools can be purchased from the Cypress Online Store.

#### *CY3210-MiniProg1*

The CY3210-MiniProg1 kit allows a user to program PSoC devices through the MiniProg1 programming unit. The MiniProg is a small, compact prototyping programmer that connects to the PC through a provided USB 2.0 cable. The kit includes:

- MiniProg Programming Unit
- MiniEval Socket Programming and Evaluation Board
- 28-Pin CY8C29466-24PXI PDIP PSoC Device Sample
- 28-Pin CY8C27443-24PXI PDIP PSoC Device Sample
- PSoC Designer Software CD
- Getting Started Guide
- USB 2.0 Cable

#### CY3210-PSoCEval1

The CY3210-PSoCEval1 kit features an evaluation board and the MiniProg1 programming unit. The evaluation board includes an LCD module, potentiometer, LEDs, and plenty of bread-boarding space to meet all of your evaluation needs. The kit includes:

- Evaluation Board with LCD Module
- MiniProg Programming Unit
- 28-Pin CY8C29466-24PXI PDIP PSoC Device Sample (2)
- PSoC Designer Software CD
- Getting Started Guide
- USB 2.0 Cable

#### CY3214-PSoCEvalUSB

The CY3214-PSoCEvalUSB evaluation kit features a development board for the CY8C24794-24LFXI PSoC device. Special features of the board include both USB and capacitive sensing development and debugging support. This evaluation board also includes an LCD module, potentiometer, LEDs, an enunciator and plenty of bread boarding space to meet all of your evaluation needs. The kit includes:

- PSoCEvalUSB Board
- LCD Module
- MiniProg Programming Unit
- Mini USB Cable
- PSoC Designer and Example Projects CD
- Getting Started Guide
- Wire Pack

#### Accessories (Emulation and Programming)

**Table 42. Emulation and Programming Accessories**

| Part #           | Pin Package | Flex-Pod Kit <sup>[25]</sup> | Foot Kit <sup>[26]</sup> | Adapter                                                                                                                                                                                                             |
|------------------|-------------|------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CY8C21234-24S    | 16 SOIC     | CY3250-21X34                 | CY3250-16SOIC-FK         | Programming adapter converts non-DIP package to DIP footprint. Specific details and ordering information for each of the adapters can be found at <a href="http://www.emulation.com">http://www.emulation.com</a> . |
| CY8C21334-24PVXI | 20 SSOP     | CY3250-21X34                 | CY3250-20SSOP-FK         |                                                                                                                                                                                                                     |
| CY8C21434-24LFXI | 32 QFN      | CY3250-21X34QFN              | CY3250-32QFN-FK          |                                                                                                                                                                                                                     |
| CY8C21534-24PVXI | 28 SSOP     | CY3250-21X34                 | CY3250-28SSOP-FK         |                                                                                                                                                                                                                     |
| CY8C21634-24LFXI | 32 QFN      | CY3250-21X34QFN              | CY3250-32QFN-FK          |                                                                                                                                                                                                                     |

#### Third-Party Tools

Several tools have been specially designed by the following 3rd-party vendors to accompany PSoC devices during development and production. Specific details for each of these tools can be found at <http://www.cypress.com> under DESIGN RESOURCES >> Evaluation Boards.

#### Device Programmers

All device programmers can be purchased from the Cypress Online Store.

##### CY3216 Modular Programmer

The CY3216 Modular Programmer kit features a modular programmer and the MiniProg1 programming unit. The modular programmer includes three programming module cards and supports multiple Cypress products. The kit includes:

- Modular Programmer Base
- 3 Programming Module Cards
- MiniProg Programming Unit
- PSoC Designer Software CD
- Getting Started Guide
- USB 2.0 Cable

##### CY3207ISSP In-System Serial Programmer (ISSP)

The CY3207ISSP is a production programmer. It includes protection circuitry and an industrial case that is more robust than the MiniProg in a production-programming environment.

**Note** CY3207ISSP needs special software and is not compatible with PSoC Programmer. The kit includes:

- CY3207 Programmer Unit
- PSoC ISSP Software CD
- 110 ~ 240V Power Supply, Euro-Plug Adapter
- USB 2.0 Cable

#### Build a PSoC Emulator into Your Board

For details on how to emulate your circuit before going to volume production using an on-chip debug (OCD) non-production PSoC device, see Application Note [AN2323](#) "Debugging - Build a PSoC Emulator into Your Board".

#### Notes

25. Flex-Pod kit includes a practice flex-pod and a practice PCB, in addition to two flex-pods.

26. Foot kit includes surface mount feet that can be soldered to the target PCB.

## Ordering Information

| Package                                                           | Ordering Code     | Flash (Bytes) | SRAM (Bytes) | Switch Mode Pump | Temperature Range | Digital Blocks | Analog Blocks | Digital IO Pins | Analog Inputs <sup>a</sup> | Analog Outputs | XRES Pin |
|-------------------------------------------------------------------|-------------------|---------------|--------------|------------------|-------------------|----------------|---------------|-----------------|----------------------------|----------------|----------|
| 16 Pin (150-Mil) SOIC                                             | CY8C21234-24SXI   | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 12              | 12 <sup>[27]</sup>         | 0              | No       |
| 16 Pin (150-Mil) SOIC (Tape and Reel)                             | CY8C21234-24SXIT  | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 12              | 12 <sup>[27]</sup>         | 0              | No       |
| 20 Pin (210-Mil) SSOP                                             | CY8C21334-24PVXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 16              | 16 <sup>[27]</sup>         | 0              | Yes      |
| 20 Pin (210-Mil) SSOP (Tape and Reel)                             | CY8C21334-24PVXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 16              | 16 <sup>[27]</sup>         | 0              | Yes      |
| 28 Pin (210-Mil) SSOP                                             | CY8C21534-24PVXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 24              | 24 <sup>[27]</sup>         | 0              | Yes      |
| 28 Pin (210-Mil) SSOP (Tape and Reel)                             | CY8C21534-24PVXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 24              | 24 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) QFN <sup>[27]</sup>                      | CY8C21434-24LFXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) QFN b (Tape and Reel)                    | CY8C21434-24LFXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.60 MAX) QFN <sup>[28]</sup>                      | CY8C21434-24LKXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.60 MAX) QFN <sup>[28]</sup> (Tape and Reel)      | CY8C21434-24LKXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) QFN <sup>[28]</sup>                      | CY8C21634-24LFXI  | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 26              | 26 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) QFN <sup>[28]</sup> (Tape and Reel)      | CY8C21634-24LFXIT | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 26              | 26 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 1.00 MAX) SAWN QFN                                 | CY8C21434-24LTXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 1.00 MAX) SAWN QFN <sup>[28]</sup> (Tape and Reel) | CY8C21434-24LTXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.40 MAX) SAWN QFN <sup>[28]</sup>                 | CY8C21434-24LCXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>a</sup>            | 0              | Yes      |
| 32 Pin (5x5 mm 0.40 MAX) SAWN QFN <sup>[28]</sup> (Tape and Reel) | CY8C21434-24LCXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>a</sup>            | 0              | Yes      |
| 32 Pin (5x5 mm 0.60 MAX) THIN SAWN QFN                            | CY8C21434-24LQXI  | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.60 MAX) THIN SAWN QFN (Tape and Reel)            | CY8C21434-24LQXIT | 8K            | 512          | No               | -40°C to +85°C    | 4              | 4             | 28              | 28 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) SAWN QFN <sup>[28]</sup>                 | CY8C21634-24LTXI  | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 26              | 26 <sup>[27]</sup>         | 0              | Yes      |
| 32 Pin (5x5 mm 0.93 MAX) SAWN QFN <sup>[28]</sup> (Tape and Reel) | CY8C21634-24LTXIT | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 26              | 26 <sup>[27]</sup>         | 0              | Yes      |
| 56 Pin OCD SSOP                                                   | CY8C21001-24PVXI  | 8K            | 512          | Yes              | -40°C to +85°C    | 4              | 4             | 26              | 26 <sup>[27]</sup>         | 0              | Yes      |

**Note** For Die sales information, contact a local Cypress sales office or Field Applications Engineer (FAE).

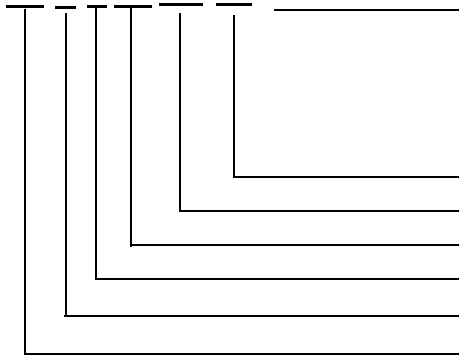
### Notes

27. All Digital IO Pins also connect to the common analog mux.

28. Refer to the section [32-Pin Part Pinout](#) on page 11 for pin differences.

## Ordering Code Definitions

CY 8 C 21 xxx-24xx



### Package Type:

PX = PDIP Pb-Free  
SX = SOIC Pb-Free  
PVX = SSOP Pb-Free  
LFX/LKX = QFN Pb-Free  
AX = TQFP Pb-Free

### Thermal Rating:

C = Commercial  
I = Industrial  
E = Extended

Speed: 24 MHz

Part Number

Family Code

Technology Code: C = CMOS

Marketing Code: 8 = Cypress PSoC

Company ID: CY = Cypress

## Document History Page

| Document Title: CY8C21234/CY8C21334/CY8C21434/CY8C21534/CY8C21634 PSoC® Programmable System-on-Chip™<br>Document Number: 38-12025 |         |                 |                 |                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------|---------|-----------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Revision                                                                                                                          | ECN No. | Orig. of Change | Submission Date | Description of Change                                                                                                                                                                                                                                                                          |
| **                                                                                                                                | 227340  | HMT             | See ECN         | New silicon and document (Revision **).                                                                                                                                                                                                                                                        |
| *A                                                                                                                                | 235992  | SFV             | See ECN         | Updated Overview and Electrical Spec. chapters, along with revisions to the 24-pin pinout part. Revised the register mapping tables. Added a SSOP 28-pin part.                                                                                                                                 |
| *B                                                                                                                                | 248572  | SFV             | See ECN         | Changed title to include all part #s. Changed 28-pin SSOP from CY8C21434 to CY8C21534. Changed pin 9 on the 28-pin SSOP from SMP pin to Vss pin. Added SMP block to architecture diagram. Update Electrical Specifications. Added another 32-pin MLF part: CY8C21634.                          |
| *C                                                                                                                                | 277832  | HMT             | See ECN         | Verify data sheet standards from SFV memo. Add Analog Input Mux to applicable pin outs. Update PSoC Characteristics table. Update diagrams and specs. Final.                                                                                                                                   |
| *D                                                                                                                                | 285293  | HMT             | See ECN         | Update 2.7V DC GPIO spec. Add Reflow Peak Temp. table.                                                                                                                                                                                                                                         |
| *E                                                                                                                                | 301739  | HMT             | See ECN         | DC Chip-Level Specification changes. Update links to new CY.com Portal.                                                                                                                                                                                                                        |
| *F                                                                                                                                | 329104  | HMT             | See ECN         | Re-add pinout ISSP notation. Fix TMP register names. Clarify ADC feature. Update Electrical Specifications. Update Reflow Peak Temp. table. Add 32 MLF E-PAD dimensions. Add ThetaJC to Thermal Impedance table. Fix 20-pin package order number. Add CY logo. Update CY copyright.            |
| *G                                                                                                                                | 352736  | HMT             | See ECN         | Add new color and logo. Add URL to preferred dimensions for mounting MLF packages. Update Transmitter and Receiver AC Digital Block Electrical Specifications.                                                                                                                                 |
| *H                                                                                                                                | 390152  | HMT             | See ECN         | Clarify MLF thermal pad connection info. Replace 16-pin 300-MIL SOIC with correct 150-MIL.                                                                                                                                                                                                     |
| *I                                                                                                                                | 413404  | HMT             | See ECN         | Update 32-pin QFN E-Pad dimensions and rev. *A. Update CY branding and QFN convention.                                                                                                                                                                                                         |
| *J                                                                                                                                | 430185  | HMT             | See ECN         | Add new 32-pin 5x5 mm 0.60 thickness QFN package and diagram, CY8C21434-24LKXI. Update thermal resistance data. Add 56-pin SSOP on-chip debug non-production part, CY8C21001-24PVXI. Update typical and recommended Storage Temperature per industrial specs. Update copyright and trademarks. |
| *K                                                                                                                                | 677717  | HMT             | See ECN         | Add CapSense SNR requirement reference. Add new Dev. Tool section. Add CY8C20x34 to PSoC Device Characteristics table. Add Low Power Comparator (LPC) AC/DC electrical spec. tables. Update rev. of 32-Lead (5x5 mm 0.60 MAX) QFN package diagram.                                             |
| *L                                                                                                                                | 2147847 | UVS/PYRS        | 02/27/08        | Added 32-Pin QFN Sawn pin diagram, package diagram, and ordering information.                                                                                                                                                                                                                  |
| *M                                                                                                                                | 2273246 | UVS/AESA        | 04/01/08        | Added 32 pin thin sawn package diagram.                                                                                                                                                                                                                                                        |
| *N                                                                                                                                | 2618124 | OGNE/PYRS       | 12/09/08        | Added Note in Ordering Information section. Changed title from PSoC Mixed-Signal Array to PSoC Programmable System-on-Chip                                                                                                                                                                     |
| *O                                                                                                                                | 2684145 | SNV/AESA        | 04/06/2009      | Updated 32-Pin Sawn QFN package dimension for CY8C21434-24LTXIT<br>Updated Getting Started, Development Tools, and Designing with PSoC Designer Sections                                                                                                                                       |
| *P                                                                                                                                | 2693024 | DPT/PYRS        | 04/16/2009      | Updated 32-Pin Sawn QFN package diagram                                                                                                                                                                                                                                                        |

## Sales, Solutions, and Legal Information

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|                  |                                                                |
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|                       |                                                                                          |
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| USB                   | <a href="http://psoc.cypress.com/usb">psoc.cypress.com/usb</a>                           |

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