

54-B-PMC-07
Projected Capacitive Controller
1 PSoC
Specification Guide

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Document Revision History

Revision	Page	Content	Revised By	Date

Product Overview

54-B-PMC-07

Touch International's Extreme Touch Products is based on the projected capacitive technology. The 54-B-PMC-07 is a general purpose controller designed to interface with computer systems through a wide variety of standard interfaces; USB, I2C, or Serial. With Touch International's proprietary firmware, the controller can easily be tuned to all types of custom designs as well as different applications. Gestures and multi-touch are some of the unique product offerings that are supported.

Features

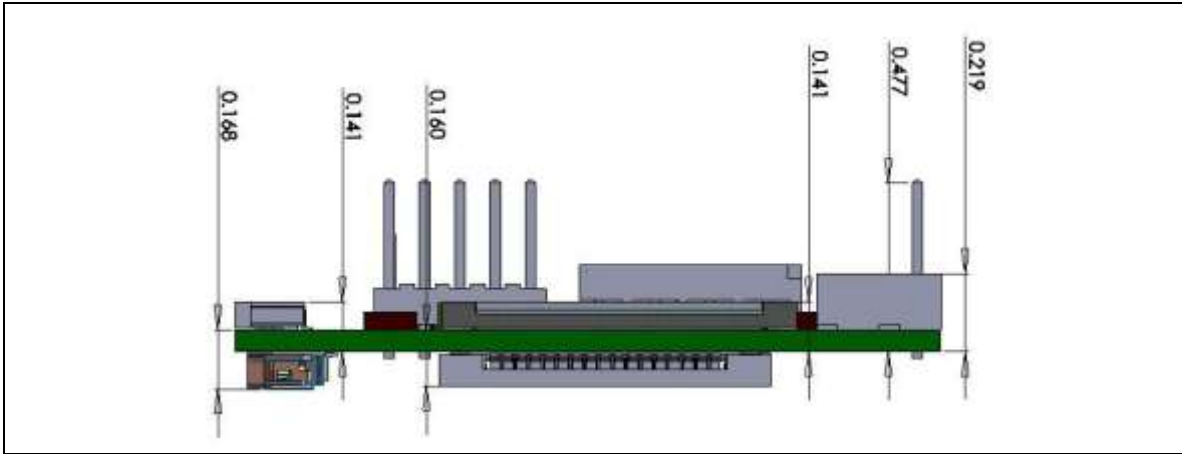
Motion Detection Method	Capacitive sensing using a Sigma-Delta modulator.
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required.
HID	Controller is an HID compliant device.
Calibration	No need for calibration.
Chip Set Solution	Available

Specifications

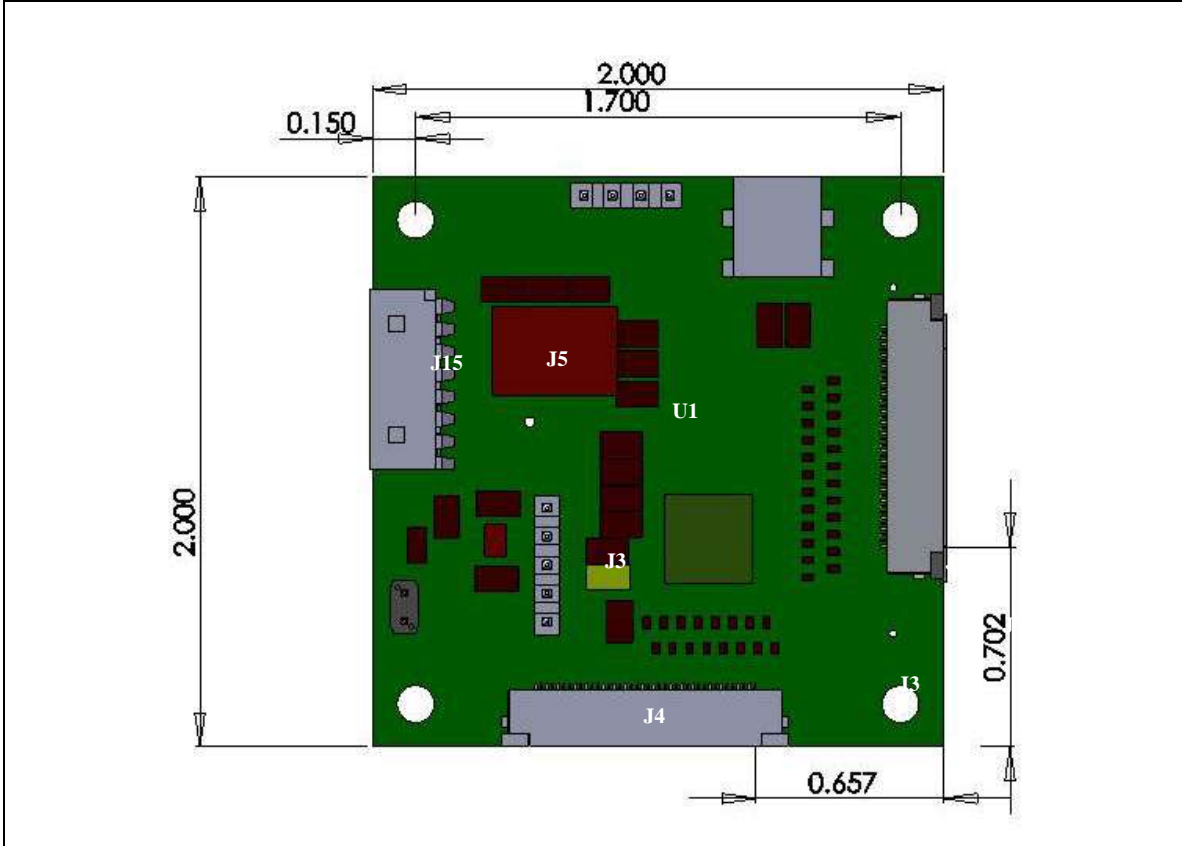
Controller Size	2.0" x 2.0" (50.80mm x 50.80mm)
Power Requirements	4.7 ~ 9V unregulated power, typical 60mA.
Operating Temperature	-40 to 85°C
Storage Temperature	-40 to 90°C
Relative Humidity	<35°C 0% - 85% RH
Interface	Bi-directional RS-232 serial communication Protocol: No parity, 8 data bits, 1 stop bit, 115200 baud, no flow control USB: 2.0, 1.1 compliant USBAURT I2C
Communication Cables	RS232: TI# 1300210 A Plug/5-Pin Mini-B Plug (USB & USBART): TI# 1300264
Resolution	1024x1024
Report Rate	Approx. 45 points/sec
Mean Time Between Failure	> 5,600,000 hrs.
Supported Operating Systems	Windows, Linux, and Mac OSX 10.x

Controller Drawings

Side View



Top View



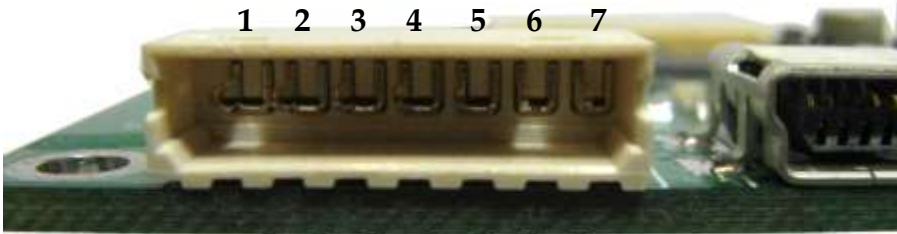
Jumper Configuration

Header J5	Connect the Cypress PSoC MiniProg device into J5 to program the "rows" PSoC (U1)
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Interface Specifications - Connection to the Host Computer

RS232 Communication (TI# 1300210)

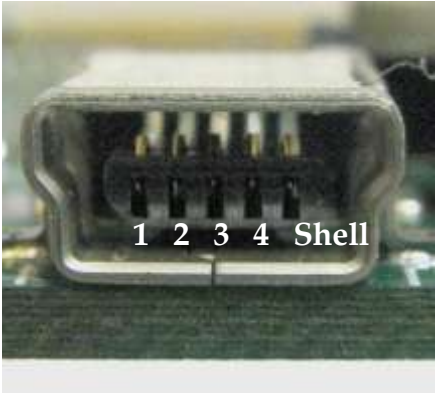
The cable is 8 feet long, has a DB-9 female connector at one end and a 1x7 header female connector at the other end.

<p>J15</p> 	Pin #	J15
	1	N/C
	2	TxD
	3	RxD
	4	N/C
	5	GND
	6	N/C
7	GND	

Interface Specifications - Connection to the Host Computer

USB Communication (TI# 1300264)

The USB cable is also 6 ft long, has a USB4P (A) male connector at one end and a Mini USB5P (B) to connect to the controller.

<p>J3</p> 	Pin #	J3
	1	VBUS
	2	D-
	3	D+
	4	GND
	Shell	N/C

Interface Specifications - Connection to the Host Computer

USBUART Communication (TI# 1300264)

This protocol emulates RS-232 over the USB bus. The primary advantage of this method is that PC applications will use the USB connection as an RS-232 COM connection, making it very simple to debug. This method uses a standard Windows® driver that is included with all versions Microsoft® Windows from Windows 98SE through Windows XP.

For more information, either contact the TI support team or look up the Cypress USBUART protocol on their web page www.cypress.com

The USB cable is also 6 ft long, has a USB4P (A) male connector at one end and a Mini USB5P (B) to connect to the controller.

J3



Pin #	J3
1	VBUS
2	D-
3	D+
4	GND
Shell	N/C

Interface Specifications - Connection to the Host Computer

I2C Communication

The I²C bus is an industry standard, two wire hardware interface developed by Philips®.

If this protocol is chosen, the host computer will initiate all communication on the I²C bus and supply the clock for all slave devices, including the TI controller. In the PSoC, the EzI2C's User Module implements an I2C register-based slave device. The EzI2C's User Module supports the standard mode with speeds up to 400 kbps.

For more information, either contact the TI support team or look up the Cypress User Module Datasheet for Digital Comm. / EzI2C's at www.cypress.com.

Pin #	Name
1	+3.3V
2	GND
3	N/A
4	SCL
5	SDA

Note: The I2C connector is labeled J5 on the PC board.

Interface Specifications (Continued)

Communication with the Host Computer

RS232 Communication	<p>Internal to the PSoC ASIC chip, the TX8 User Module is an 8-bit RS-232 data-format compliant serial transmitter with programmable clocking and selectable interrupt or polling style operation.</p> <p>The data transmitted is framed with a leading start bit, an optional parity bit, and a stop bit.</p> <p>Transmitter firmware is used to initialize, start, stop, read status, and write data to the TX8.</p> <p>The Controller Assembly communicates with the host computer using a 4-byte communication protocol.</p> <p>The data packet format is shown in Table 1A and Table 1B.</p>
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Table 1A: 54-B-PMC-07 RS232 Data Byte Format (With Touch on the screen)

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	0	0	0	X9	X8
BYTE 2	X7	X6	X5	X4	X3	X2	X1	X0
BYTE 3	0	0	0	0	0	0	Y9	Y8
BYTE 4	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

Table 1B: 54-B-PMC-07 RS232 Data Byte Format (Without Touch on the screen)

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	1	1	1	1	1	1	1	1
BYTE 2	1	1	1	1	1	1	1	1
BYTE 3	1	1	1	1	1	1	1	1
BYTE 4	1	1	1	1	1	1	1	1

Interface Specifications (Continued)
Communication with the Host Computer

USB Communication	<p>USB Communication between the controller and the host computer is based upon USB HID class protocols as presented in “Universal Serial Bus Revision 2.0 specification” and “USB Class Definition for Human Interface Devices (HID)” version 1.11.</p> <p>The controller transmits 5 bytes of data per packet and is displayed in Table 2a and 2b.</p>
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Table 2a: 54-B-PMC-07 USB Data Byte Format (With touch on the screen)

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	0	0	0	0	1
BYTE 2	X2	X1	X0	0	0	0	0	0
BYTE 3	0	X9	X8	X7	X6	X5	X4	X3
BYTE 4	Y2	Y1	Y0	0	0	0	0	0
BYTE 5	0	Y9	Y8	Y7	Y6	Y5	Y4	Y3

Table 2b: 54-B-PMC-07 USB Data Byte Format (Single transaction only when touch is released from the screen)

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	0	0	0	0	0
BYTE 2	X2	X1	X0	0	0	0	0	0
BYTE 3	0	X9	X8	X7	X6	X5	X4	X3
BYTE 4	Y2	Y1	Y0	0	0	0	0	0
BYTE 5	0	Y9	Y8	Y7	Y6	Y5	Y4	Y3

Communication with the Host Device

I2C Communication

I2C Address: 0x9
Speed: 400kbps
IRQ: Active Low (pin #17 on CY8C24894-24LFXI)

Data Format: Table 2a

Table 2a: 54-B-PMC-07 – I2C Data Byte Format

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	0	0	0	X9	X8
BYTE 2	X7	X6	X5	X4	X3	X2	X1	X0
BYTE 3	0	0	0	0	0	0	Y9	Y8
BYTE 4	Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0

Gesture Specifications

USB Data Byte Format	
Single Touch	If one finger is touching, then the data output to the USB will be a 5 bytes packet (Table 1A). The value of bit # 0 of the first byte will be 1, which will activate the selected mouse button.
Two Finger Touch	The data output to the USB will be 2 packets of 5 bytes and the data format will look the same as Table 1B. There is no selected mouse button to press. Bit # 4 is always 1 at both BYTE 1 and BYTE 6. Also, bit # 5 at both BYTE 1 and BYTE 6 is the finger identifier (0 for the first finger, and 1 for the second finger respectively).
No Touch	There will be no data output.

1 Finger Touch

Table 1A: 54-B-PMC-07 - USB Data Byte Format

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	0	0	0	0	1
BYTE 2	X2	X1	X0	0	0	0	0	0
BYTE 3	0	X9	X8	X7	X6	X5	X4	X3
BYTE 4	Y2	Y1	Y0	0	0	0	0	0
BYTE 5	0	Y9	Y8	Y7	Y6	Y5	Y4	Y3

Gesture Specifications (Continued)

2 Finger Touch

Table 1B: 54-B-PMC-07 - USB Data Byte Format

(With 2 fingers touch on the screen)

1st Packet

	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
BYTE 1	0	0	0	1	0	0	0	0
BYTE 2	X2	X1	X0	0	0	0	0	0
BYTE 3	0	X9	X8	X7	X6	X5	X4	X3
BYTE 4	Y2	Y1	Y0	0	0	0	0	0
BYTE 5	0	Y9	Y8	Y7	Y6	Y5	Y4	Y3

2nd Packet

BYTE 6	0	0	1	1	0	0	0	0
BYTE 7	X2	X1	X0	0	0	0	0	0
BYTE 8	0	X9	X8	X7	X6	X5	X4	X3
BYTE 9	Y2	Y1	Y0	0	0	0	0	0
BYTE 10	0	Y9	Y8	Y7	Y6	Y5	Y4	Y3

Note: Touch International's chipset is using the HID Microsoft Compliance mouse driver by default; however, you may use your own driver to control the gesture base using the Table 1B format.

Ordering Information

Part Number	Description
54-B-PMC-07	Projected Capacitive Controller (1 PSoC)
1300210	6 feet RS232 cable, from J4 header to female DB-9
1300234	Power cable, 2-position
1300264	5 feet USB cable, from J3 to Type B Mini connector
<p>Contact TI sales representative for a complete list of TI's OEM and retail products.</p> <p>Touch International 2222 W. Rundberg Ln. Suite 200 Austin, TX 78758 Tel: 512.832.8292 Fax: 512.491.6381 technicalsupport@touchintl.com www.touchinternational.com</p>	