89-PCB-PMC-35

Projected Capacitive Controller Specification

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Document Revision History

Revision	Page	Content	Revised By	Date
1.0	1-10	Initial Release per DCO#1402007	W Guan	2/24/14

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Product Overview

89-PCB-PMC-35

Touch International's projected capacitive controllers offer the latest in ultra-thin microcontroller technology. Designed to interface with computer systems through a wide variety of standard interfaces, the controller is compatible with USB and I2C communications. Combined with Touch International's proprietary firmware, the controller can easily be tuned to your custom design, as well as a range of different applications. Featuring multi-touch and complete gesture capabilities, our controllers can help take your product application to the next level.

1.0 Features

Motion Detection Method	Capacitive sensing using a Sigma-Delta modulator.
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required.
Calibration	No need for calibration.
Chip Set Solution	Available
Touch	Multi Touch(16 concurrent)
Interface	HID Compliant
RoHS	Compliant
REACH	Compliant

2.0 Controller Specifications

Controller Size	2.15" x 3.64" (54.61mm x 92.46mm)
Power Requirements	5 ~ 9V DC unregulated power, typical 60mA
Operating Temperature	-15 to 85°C
Storage Temperature	-40 to 85°C
Relative Humidity	35°C at 95% RH Non-Condensing
Interface	USB 2.0, 1.1 Compliant (Standard) I2C Communication
Communication Cables	A Plug/5-Pin Mini-B Plug (USB) TI# 1300264
Resolution	Standard: 1024 X 1024, Max 4095 X 4095
Report Rate	>100 Hz
Mean Time Between Failure	> 5,600,000 Hrs.
Maximum Screen Size Supported	14" Diagonal
Supported Operating Systems	Standard: Windows 7, Windows 8 Optional: Windows 2000, XP, Vista and 7, Linux Ubuntu, Mac OSX 10.x (Leopard)

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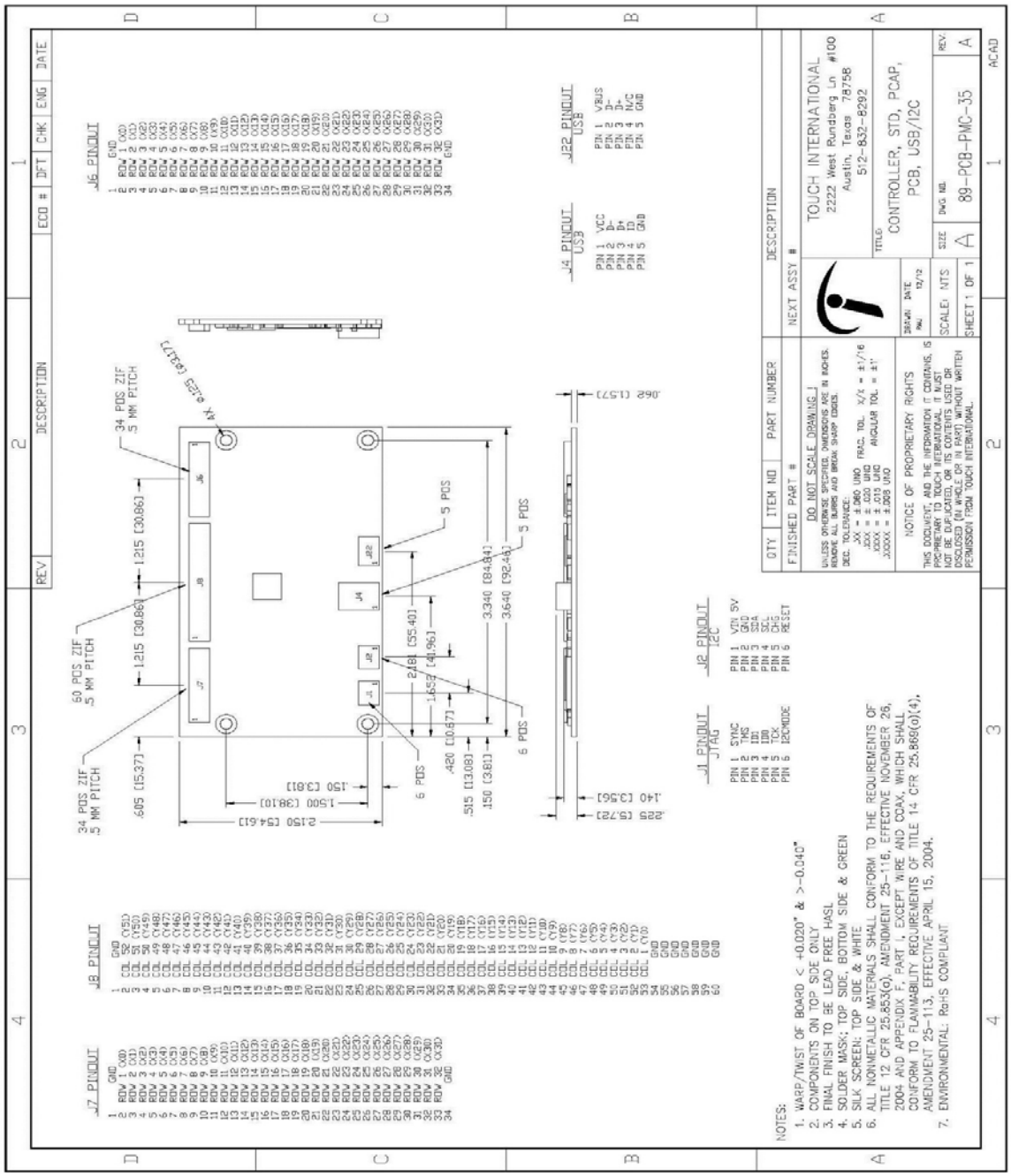
2.0 Controller Specifications (89-PCB-PMC-35)

2.1 Controller Drawing



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2.0 Controller Specifications (89-PCB-PMC-35)

2.2 Interface Specifications

2.2.1 USB Protocol for Single Finger Touch

USB Communication	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

Windows supports three modes of reporting multi-touch data to the system. Touch International uses Hybrid mode.

Hybrid Mode

In hybrid mode, the numbers of contacts that can be reported in one packet is less than the maximum that the device supports. For example, a device that supports a maximum of 48 contacts can set up its top-level collection to report a maximum of 12 contacts in one packet. If it must report 48 contacts, it can break these down into 4 serial packets that report 12 contacts each.

When a device chooses to report data in this manner, the actual contact usage value in the first packet should reflect the total number of contacts that are being reported in the hybrid packets. The other serial packets should have an actual count of 0. Using the preceding example, the actual count usage in the first packet has a value of 48, whereas the subsequent three packets have an actual usage count of 0.

Null Values

Null values should be specified as outlined in the HID Specification. The null bit must be set on all main items in the report descriptor. Note that a device can use either the actual count usage or null values to notify the host of the actual number of valid contacts in a packet.

***Sample** Report Descriptor (Parallel/Hybrid Mode)*

This sample report descriptor could easily be turned into a parallel or hybrid report, depending on the relationship between the maximum count and the actual count:

```
0x05, 0x0d,                          // USAGE_PAGE (Digitizers)
0x09, 0x04,                          // USAGE (Touch Screen)
0xa1, 0x01,                          // COLLECTION (Application)
0x85, REPORTID_MTOUCH,                  //   REPORT_ID (Touch)
0x09, 0x22,                          //   USAGE (Finger)
0xa1, 0x02,                          //     COLLECTION (Logical)
0x09, 0x42,                          //       USAGE (Tip Switch)
0x15, 0x00,                          //       LOGICAL_MINIMUM (0)
0x25, 0x01,                          //       LOGICAL_MAXIMUM (1)
0x75, 0x01,                          //       REPORT_SIZE (1)
0x95, 0x01,                          //       REPORT_COUNT (1)
0x81, 0x02,                          //       INPUT (Data,Var,Abs)
0x09, 0x32,                          //       USAGE (In Range)
0x81, 0x02,                          //       INPUT (Data,Var,Abs)
0x09, 0x47,                          //       USAGE (Touch Valid)
0x81, 0x02,                          //       INPUT (Data,Var,Abs)
0x95, 0x05,                          //       REPORT_COUNT (5)
0x81, 0x03,                          //       INPUT (Cnst,Ary,Abs)
0x75, 0x08,                          //       REPORT_SIZE (8)
0x09, 0x51,                          //       USAGE (Contact Identifier)
0x95, 0x01,                          //       REPORT_COUNT (1)
0x81, 0x02,                          //       INPUT (Data,Var,Abs)
```

[Continued]

```
0x09, 0x32,                     //      USAGE (In Range)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x09, 0x47,                     //      USAGE (Touch Valid)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x95, 0x05,                     //      REPORT_COUNT (5)
0x81, 0x03,                     //      INPUT (Cnst,Ary,Abs)
0x75, 0x08,                     //      REPORT_SIZE (8)
0x09, 0x51,                     //      USAGE (Contact Identifier)
0x95, 0x01,                     //      REPORT_COUNT (1)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x05, 0x01,                     //      USAGE_PAGE (Generic Desk..
0x26, 0xff, 0x7f,               //      LOGICAL_MAXIMUM (32767)
0x75, 0x10,                     //      REPORT_SIZE (16)
0x55, 0x00,                     //      UNIT_EXPONENT (0)
0x65, 0x00,                     //      UNIT (None)
0x09, 0x30,                     //      USAGE (X)
0x35, 0x00,                     //      PHYSICAL_MINIMUM (0)
0x46, 0x00, 0x00,               //      PHYSICAL_MAXIMUM (0)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x09, 0x31,                     //      USAGE (Y)
0x46, 0x00, 0x00,               //      PHYSICAL_MAXIMUM (0)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0xc0,                           //      END_COLLECTION
0xa1, 0x02,                     //      INPUT (Data,Var,Abs)
0x05, 0x0d,                     //      USAGE_PAGE (Digitizers)
0x09, 0x42,                     //      USAGE (Tip Switch)
0x15, 0x00,                     //      LOGICAL_MINIMUM (0)
0x25, 0x01,                     //      LOGICAL_MAXIMUM (1)
0x75, 0x01,                     //      REPORT_SIZE (1)
0x95, 0x01,                     //      REPORT_COUNT (1)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x09, 0x32,                     //      USAGE (In Range)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x09, 0x47,                     //      USAGE (Touch Valid)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x95, 0x05,                     //      REPORT_COUNT (5)
0x81, 0x03,                     //      INPUT (Cnst,Ary,Abs)
0x75, 0x08,                     //      REPORT_SIZE (8)
0x09, 0x51,                     //      USAGE ( Cotact Identifier)
0x95, 0x01,                     //      REPORT_COUNT (1)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x05, 0x01,                     //      USAGE_PAGE (Generic Desk..
0x26, 0xff, 0x7f,               //      LOGICAL_MAXIMUM (32767)
0x75, 0x10,                     //      REPORT_SIZE (16)
0x55, 0x00,                     //      UNIT_EXPONENT (0)
0x65, 0x00,                     //      UNIT (None)
0x09, 0x30,                     //      USAGE (X)
0x35, 0x00,                     //      PHYSICAL_MINIMUM (0)
0x46, 0x00, 0x00,               //      PHYSICAL_MAXIMUM (0)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0x09, 0x31,                     //      USAGE (Y)
0x46, 0x00, 0x00,               //      PHYSICAL_MAXIMUM (0)
0x81, 0x02,                     //      INPUT (Data,Var,Abs)
0xc0,                           //      END_COLLECTION
0x05, 0x0d,                     //      USAGE_PAGE (Digitizers)
0x09, 0x54,                     //      USAGE (Contact Count)
0x95, 0x01,                     //      REPORT_COUNT (1)
0x75, 0x08,                     //      REPORT_SIZE (8)
```

[Continued]

```
    0x15, 0x00,                         //        LOGICAL_MINIMUM (0)
    0x25, 0x08,                         //        LOGICAL_MAXIMUM (8)
    0x81, 0x02,                         //        INPUT (Data,Var,Abs)
    0x09, 0x55,                         //        USAGE(Contact Count Maximum)
    0xb1, 0x02,                         //        FEATURE (Data,Var,Abs)
    0xc0,                               // END_COLLECTION
```

The report descriptor has a top-level collection with two embedded logical collections. Each one represents data that can be received from each contact detected. Note that the actual count usage is not in either logical collection. This report descriptor lets the device report all contact information (in this case, a maximum of two) in one packet.

The presence of an actual count that is greater than the number of contacts that fit into one packet indicates to the client application that the device is using the hybrid data reporting format.

Source: Microsoft Digitizer Drivers for Windows Touch and Pen-Based Computer
http://www.microsoft.com/whdc/device/input/DigitizerDrvs_touch.mspx

2.0 Controller Specifications (89-PCB-PMC-35)

2.2.2 I2C Protocol

I2C Mode: I2C Slave

I2C Address:
0x4B if ADDR_SEL = 1
0x4A if ADDR_SEL = 0

I2C Interrupt:
CHG pin; active LOW when data packet is available

TOUCH DATA
(8-BYTE PACKET)

BYTE	Field	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	Finger ID	CURRENT TOUCH-FINGER NUMBER							x
1	Status	Detect	Press	Release	Move	Vector	Amp	Suppress	Reserved
2	Xpos MSB	X_9	X_8	X_7	X_6	X_5	X_4	X_3	X_2
3	Ypos MSB	Y_9	Y_8	Y_7	Y_6	Y_5	Y_4	Y_3	Y_2
4	XYpos LSB	X_1	X_0	N/A	N/A	Y_1	Y_0	N/A	N/A
5	TCHArea	Size of Touch							
6	TCHAmpl	Touch Amplitude (Sum of measured deltas)							
7	Reserved	NA							

Note: For detailed I2C communication protocol, contact Touch International.

3.0 Ordering Information

Part Number	Description
89-PCB-PMC-35	Projected Capacitive Controller

Contact TI sales representative for a complete list of TI's OEM and retail products.

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