



**P3001-C20/P3001-C10  
P3015-C20/P3015-C10  
Projected Capacitive Touch Solution  
Datasheet**

## Preface

### Disclaimer

The information in this document is subject to change without notice. The manufacturer makes no representations or warranties regarding the contents of this manual and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Moreover, the manufacturer reserves the right to revise this publication or make changes in the specifications of the product described within it at any time without notice and without obligation to notify any person of such revision.

### Trademarks

AMT is the registered trademark of Apex Material Technology. Corp. PenMount is the registered trademark of Salt International Corp. Microsoft, and Windows are registered trademarks of Microsoft Corp. Other product names used in this manual are the properties of their respective owners and are acknowledged.

### Copyright

This publication, including all photographs, illustrations and software, is protected under international copyright laws, with all rights reserved. Neither this manual, nor any of the material contained herein, may be reproduced without the express written consent of the manufacturer.

Copyright 2012 © Apex Material Technology Corp. All rights reserved.

### Revision Table

Date	Revision	Changes
2012/11/02	0.0	Preliminary
2012/11/28	1.0	Interface default

# Table of Content

Preface.....	i
Disclaimer.....	i
Trademarks.....	i
Copyright.....	i
Revision Table.....	i
Table of Content.....	ii
Chapter 1: Scope.....	1
1.1 Products.....	1
1.2 Part no. Definition.....	1
1.3 Serial no. Identification.....	1
Chapter 2: Product Specifications.....	2
2.1 Mechanical Specification.....	2
2.2 Mechanical Dimension.....	3
2.2.1 Touch Panel Mechanical Drawing and Real Product View.....	3
2.2.2 COF Tail Mechanical Drawing and Rear/ Front View.....	7
Chapter 3: COF Tail Hardware Specifications.....	8
3.1 Interface Specifications.....	8
3.2 COF tail System Block Diagram.....	8
3.3 Interface.....	9
3.3.1 UART Interface and Data Communication.....	9
3.3.2 I <sup>2</sup> C.....	9
3.4 Suggested Connectors on System Side for COF tail terminator.....	10
Chapter 4: PenMount PCI Controller IC Specifications.....	11
4.1 General Descriptions.....	11
4.2 Control IC Features.....	11
4.3 Controller IC Pin out and Package Definition.....	12
Chapter 5: Software drivers & PenMount Utility.....	13
5.1 Available Drivers & Where to Download.....	13
5.2 PCIMSet Introduction.....	13
5.3 Firmware Update.....	14
5.3.1 Firmware Interface.....	14
5.3.2 New Firmware Request.....	14
5.3.3 Firmware download and update.....	14
Chapter 6: Product Test.....	15
6.1 Operating Test.....	15
6.2 Environmental Test.....	15
6.3 ESD.....	15
6.4 Linearity Test.....	15
6.5 Optical Inspection.....	15
6.6 Others.....	15
Chapter 7: Warranty.....	16
Chapter 8: Other Documents.....	16
Chapter 9: Contact Information.....	16

## Chapter 1: Scope

### 1.1 Products

The 3.5" and 4.3" projected capacitive touch panels (AMT named it as 'PCI') with COF (Chip on FPC) tails, their part no. are:

- P3001-C20: 3.5" PCI with 1.1mm plain glass on top
- P3001-C10: 3.5" without top glass, this item is only offered to specific partners
- P3015-C20: 4.3" PCI with 1.1mm plain glass on top
- P3015-C10: 4.3" without top glass, this item is only offered to specific partners

The above touch panels are used the same COF tail, the part no. of this COF tail is PM2101.

### 1.2 Part no. Definition

The entire part number of this PCI products is presented as 92-P30nn-xyz, code "nn" is the sequence number of AMT standard stock PCI items and the last 3 codes of the part number represent which types of tail / glass / version are used and they are shown as follows:

92 - P 3 0 nn - x y z

x Code	Description
C	Use COF tail

y Code	Description
1	No top glass on the PCI touch
2	Use AMT defined plain glass
G	Use décor glass

z Code	Description
0	Version

For example, if the product part no. is P3001-C20, the last three codes represent that COF tail, AMT defined plain glass and version 0 are used in this product.

### 1.3 Serial no. Identification

The sticker is on the PCI tail side, it shows the serial no. of this PCI touch panel as the picture below, it contains one letter and 15 digits for projected capacitive touch panels. The example below explains the serial no. representations of AMT's products:



1 Part no. P3001	2 Which types of tail / glass / version are used (refer to section 1.2)	3 Production Year, 2012	4 Production Week, week 29	5 Serial numbers
---------------------	--	----------------------------	-------------------------------	---------------------

## Chapter 2: Product Specifications

### 2.1 Mechanical Specification

**Touch Panel Mechanical Specification:**

Touch Panel Part No.	P3001-C20	P3001-C10	P3015-C20	P3015-C10
Touch Panel Size	3.5"		4.3"	
Total Thickness (mm)	1.50 ± 0.2	0.40 ± 0.1	1.50 ± 0.2	0.40 ± 0.1
Thickness of Top glass (mm)	1.1	n/a	1.1	n/a
Outside Dimension LxW (mm)	87.10 x 71.16	86.1 x 70.16	110.60 x 72.90	109.60 x 71.90
View Area LxW (mm)	76.60 x 57.16		100.10 x 58.90	
Active Area LxW (mm)	75.60 x 56.16		99.10 x 57.90	
Surface Finish	Clear Type	n/a	Clear Type	n/a
Haze	7 ±3%			
Light Transmission rate	91 ± 3%			
Construction	Glass-Film-Film	OCA-Film-Film	Glass-Film-Film	OCA-Film-Film

Note: n/a: Not Available

**COF tail Mechanical Specification:**

COF Part No.	PenMount 2101 Flexible Control Board
Support Touch Screen Size	For 3" to 4.9" PCI
Touch Controller	PenMount P2-02
Connector pins & pitch & contact side	10 pins, pitch is 0.5 mm, contact side is down side
Mechanical Size L*W (mm)	57.6 x 38.5
Max. support Sensing Lines	10
Max. support Driving Lines	17

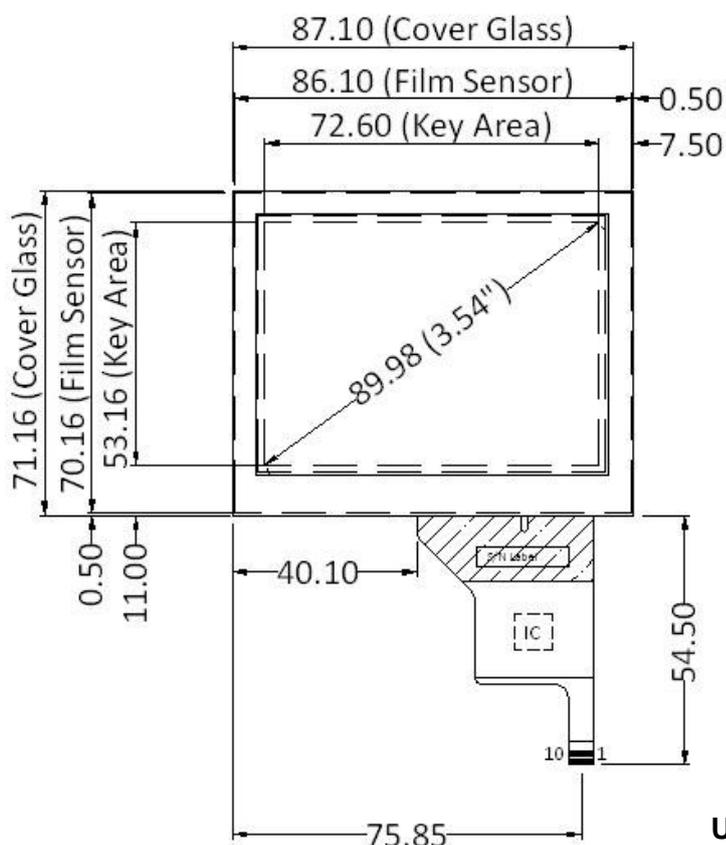
## 2.2 Mechanical Dimension

The followings are the drawings of P3001-C20, P3001-C10, P3015-C20, P3015-C10 and COF tail. If you need more detailed drawings or information, please visit our website and choose "support & download", click on the item you need and then download.

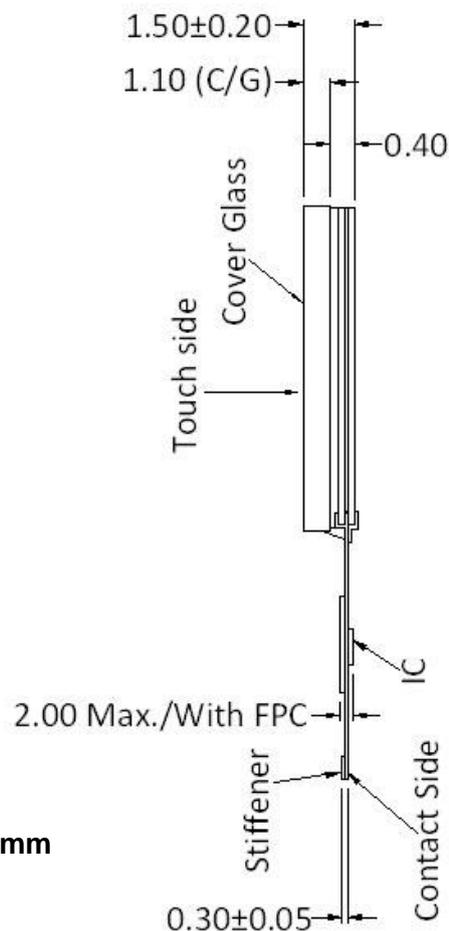
### 2.2.1 Touch Panel Mechanical Drawing and Real Product View

#### P3001-C20 : 3.5" PCI with 1.1mm top glass

Front View

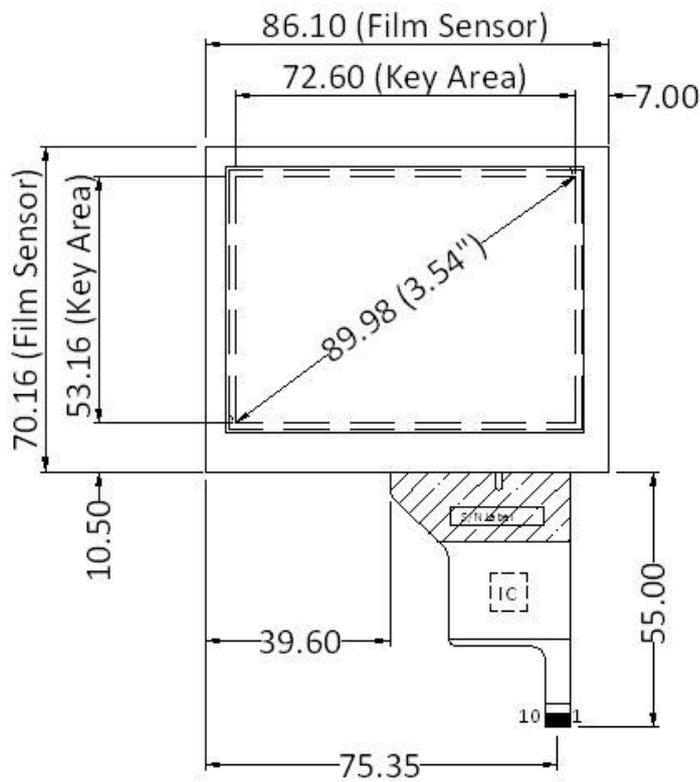
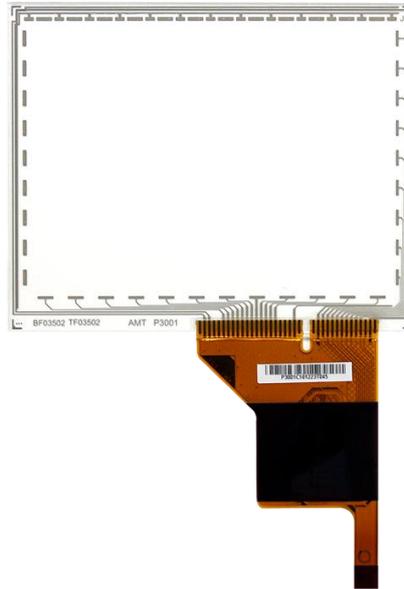


Unit:mm

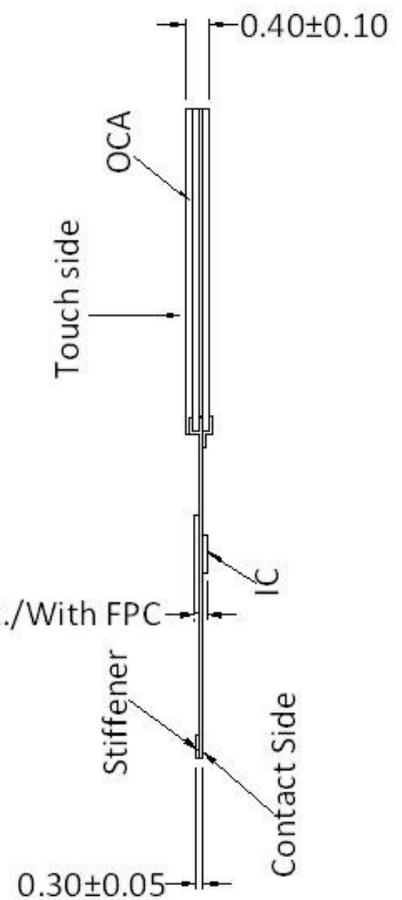


P3001-C10: 3.5" PCI without top glass

Front View



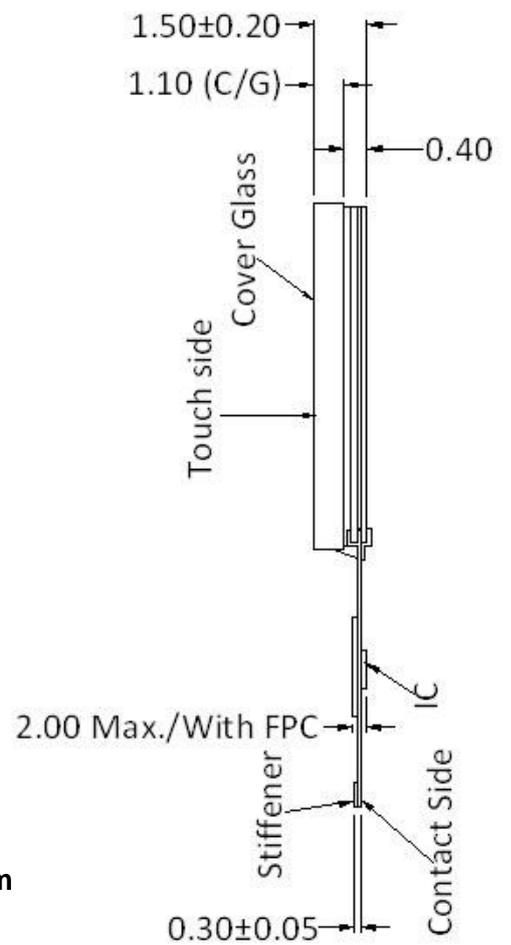
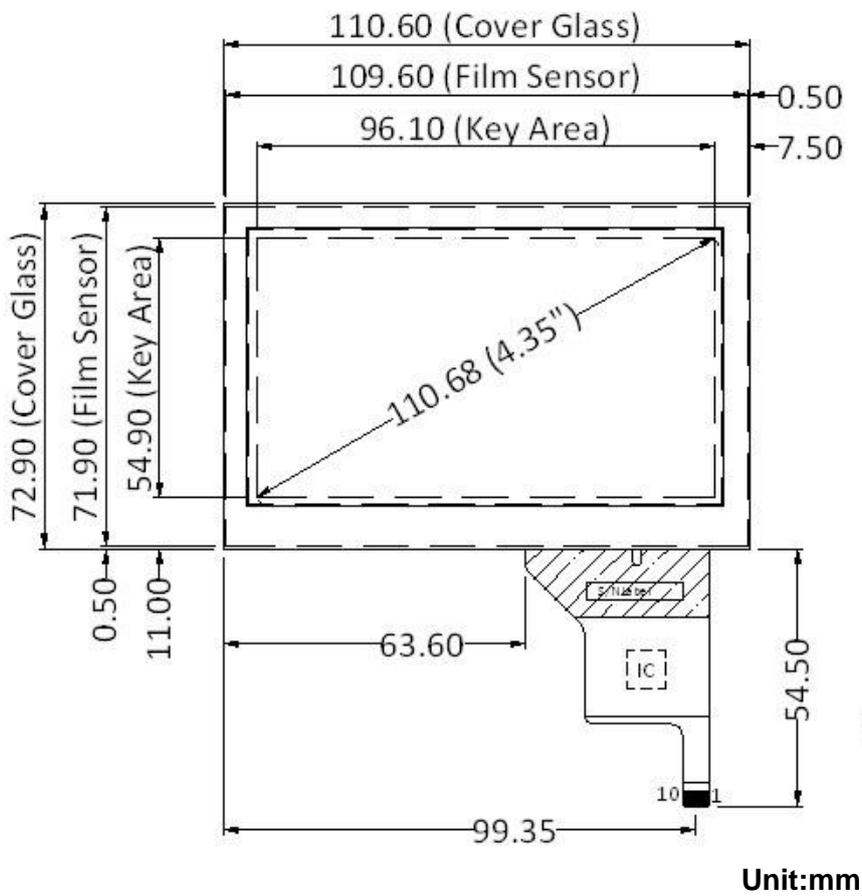
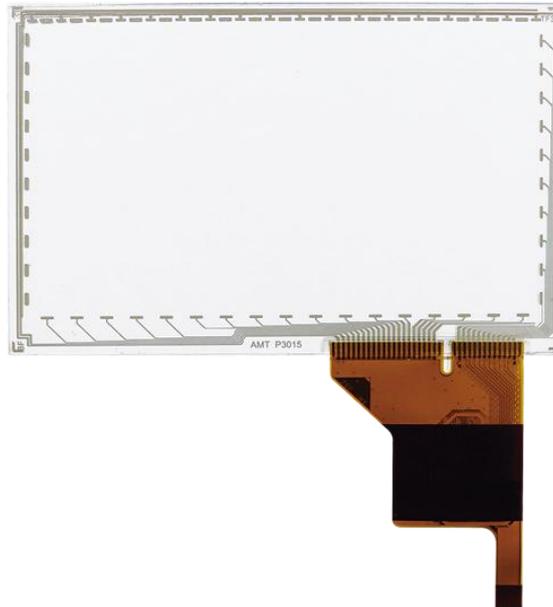
Unit:mm



**Remark:** Item P3001-C10 is only available for AMT's selected partners.

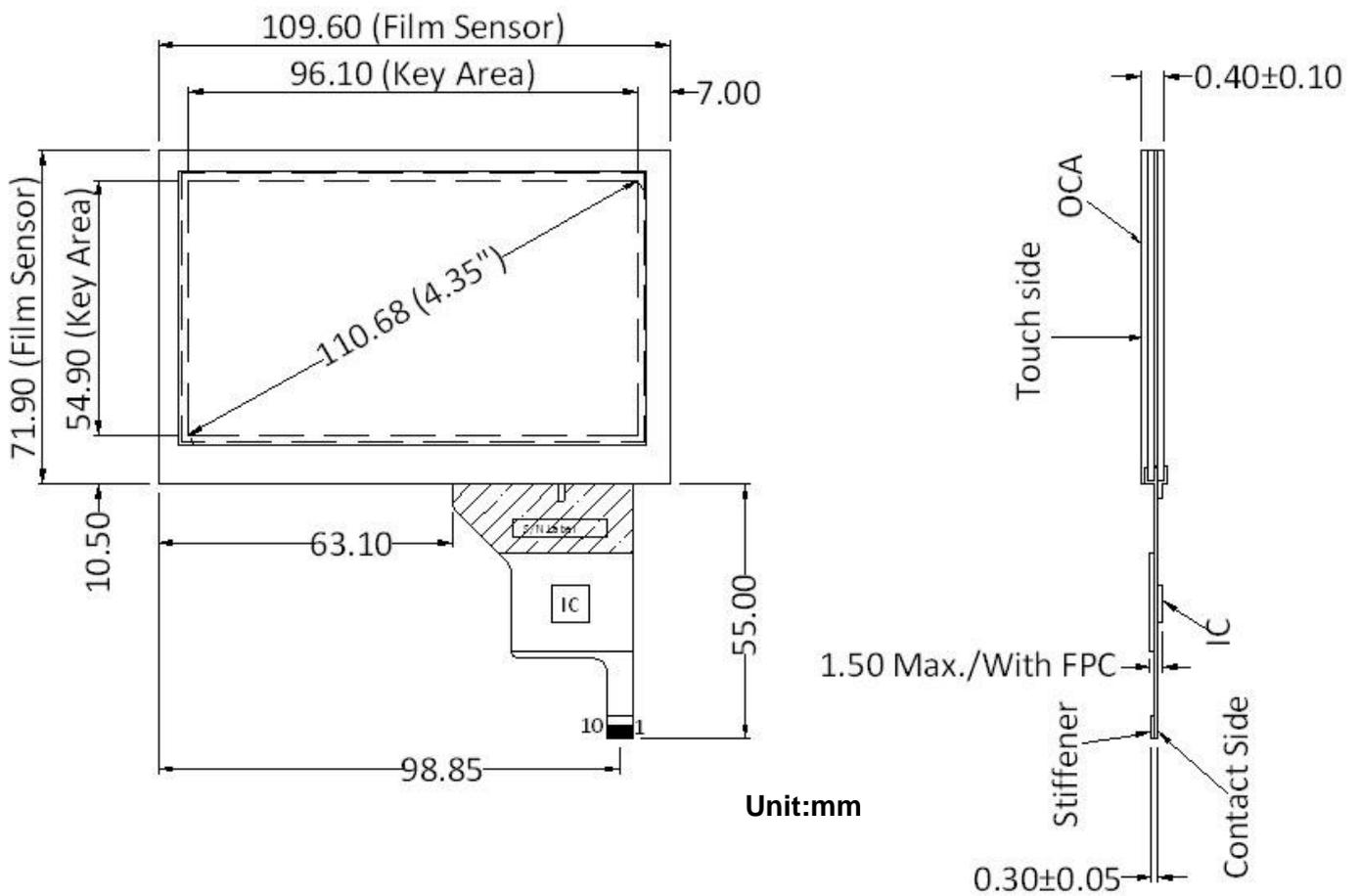
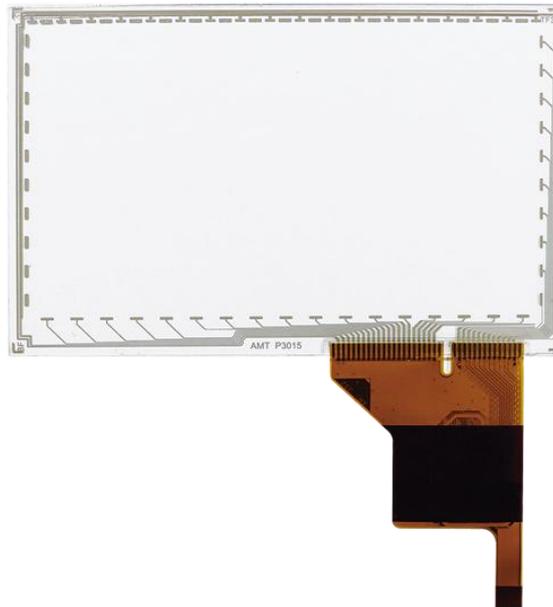
P3015-C20 : 4.3" PCI with 1.1mm top glass

Front View



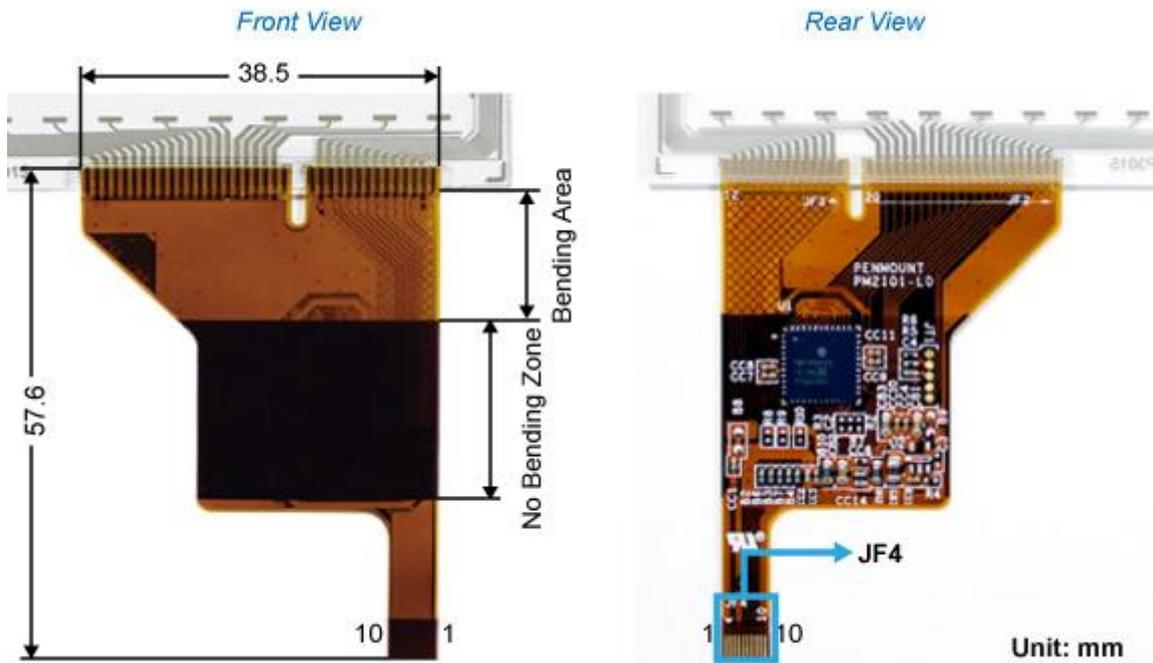
P3015-C10: 4.3" PCI without top glass

Front View



**Remark:** Item P3015-C10 is only available for AMT's selected partners.

2.2.2 COF Tail Mechanical Drawing and Rear/ Front View



Bending radius: R2.5mm

JF4 definition	
Pin	Designation
1	VCC (5V)
2	NC
3	NC
4	GND
5	SCK/RXD
6	SDA/TXD
7	NC
8	NC
9	INTHM
10	NC

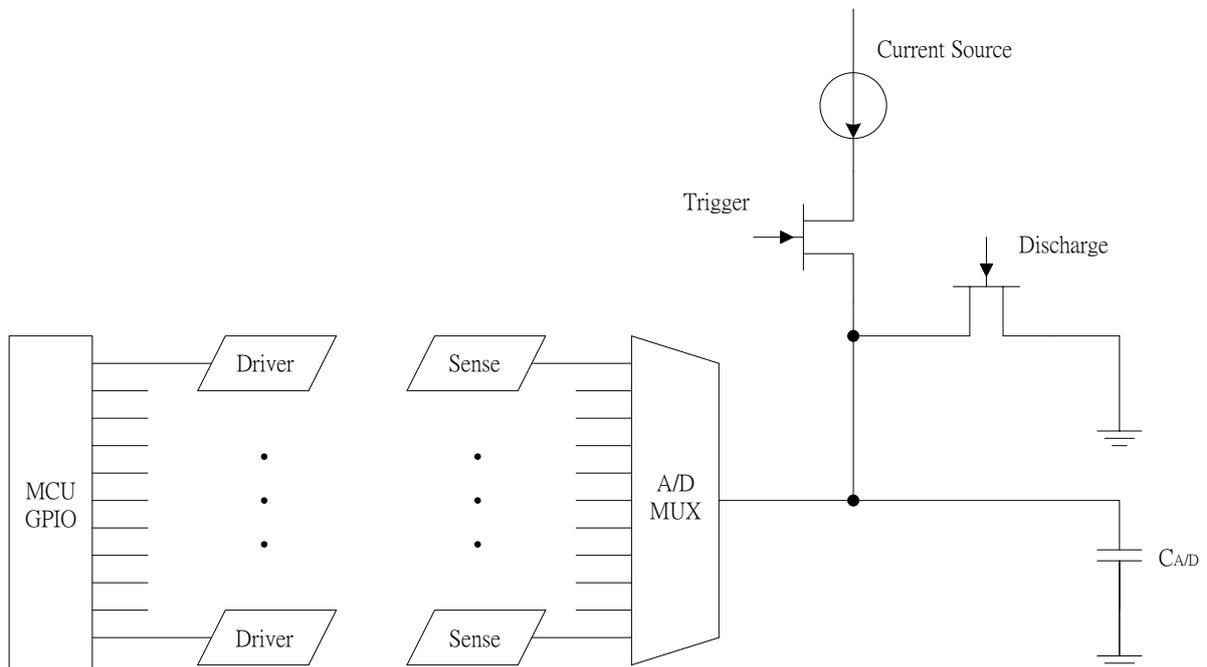
## Chapter 3: COF Tail Hardware Specifications

### 3.1 Interface Specifications

There are 10 pins on PenMount PM2101 COF tail, the terminator is ZIF type, pitch is 0.5mm, contact side is downward, and contact terminator is with gold plate, the pin definition is set as below:

Pin	Designation
1	VCC (5V)
2	NC
3	NC
4	GND
5	SCK/RXD
6	SDA/TXD
7	NC
8	NC
9	INTHM
10	NC

### 3.2 COF tail System Block Diagram



### 3.3 Interface

We provide 10-pin COF tails, you can use UART or I<sup>2</sup>C to connect this COF tail to your system. The followings are the functions, pin numbers and designations for different interfaces.

#### 3.3.1 UART Interface and Data Communication

A UART (Universal Asynchronous Receiver/ Transmitter) is a serial port, it is commonly used in conjunction with communication standards such as RS-232 or others. In COF tail design, PenMount only provide UART interface for connecting to the host. Here is the pin definition for UART interface:

Pin no	Designation
1	VCC
4	GND
5	RXD
6	TXD

#### 3.3.2 I<sup>2</sup>C

The I<sup>2</sup>C (Inter-IC) bus is a bi-directional two-wire serial bus that provides a communication link between integrated circuits (ICs). Typical voltages used are +5 V or +3.3 V.

The I<sup>2</sup>C bus has two roles for nodes: master and slave:

- Master node — node that issues the clock and addresses slaves
- Slave node — node that receives the clock line and address.

The bus is a multi-master bus which means any number of master nodes can be present. Additionally, master and slave roles may be changed between messages (after a STOP is sent).

There are four potential modes of operation for a given bus device, although most devices only use a single role and its two modes:

- master transmit — master node is sending data to a slave
- master receive — master node is receiving data from a slave
- slave transmit — slave node is sending data to the master
- slave receive — slave node is receiving data from the master

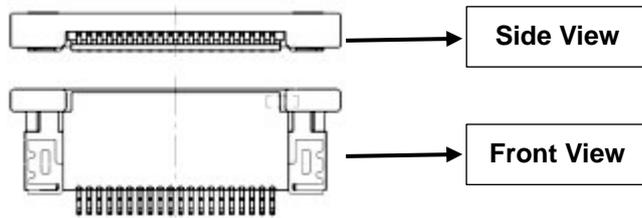
PenMount I<sup>2</sup>C interface provide 'INTHM' pin as an optional. Generally, I<sup>2</sup>C (without INTHM pin) uses polling communication method, master communicates with slave in a period of time. If there is an INTHM pin, slave can "ask" master whether it gets ready or not, so that master no need to keep "asking" slave, thus it becomes more efficient. Here is the pin definition for the I<sup>2</sup>C interface of our COF tail

Pin no	Designation
1	VCC
4	GND
5	SCK
6	SDA
9	INTHM

### 3.4 Suggested Connectors on System Side for COF tail terminator

Flip-lock type connectors with bottom contact points or side entry type connectors with bottom contact points or double side contact connectors can be used to connect COF tail, details of the suggested side entry bottom contact connector is shown in no. 1:

1. Manufacturer: AMP model no. 1-1734844-0



- 0.50 mm pitch
- 10 pins
- Gold contact plating, mating area, material
- Please refer to its detail specification

Please see the suggested flip-lock type connectors with bottom contact points as below:

2. Manufacturer: Hirose model no. FH52-10S-0.5SH
3. Manufacturer: AMP model no. 1-1734242-0

## Chapter 4: PenMount PCI Controller IC Specifications

### 4.1 General Descriptions

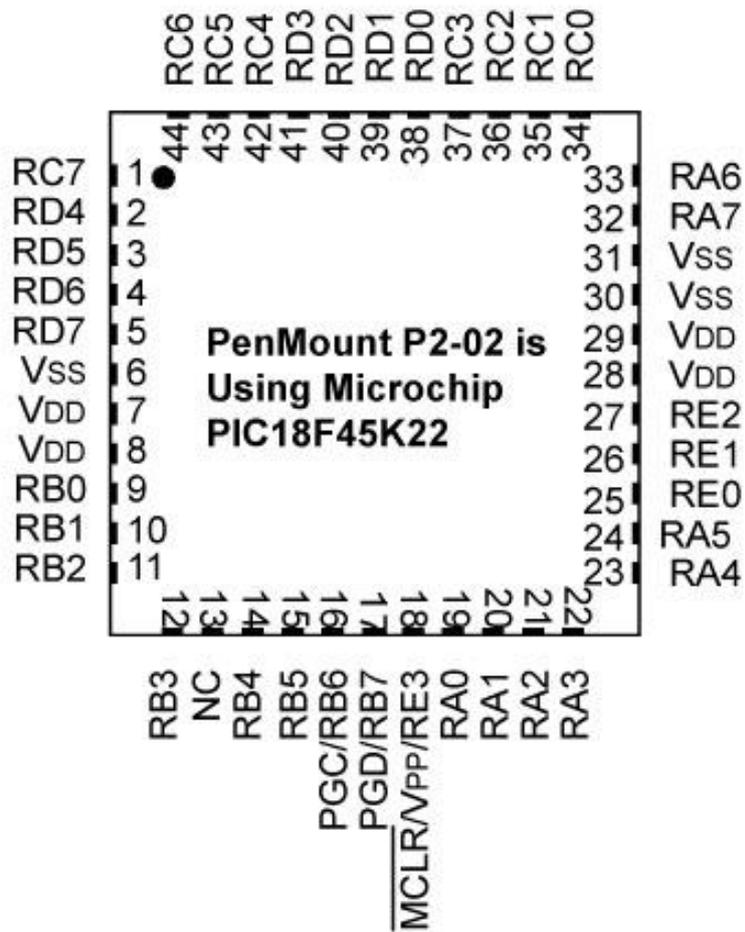
Touch Controller IC	PenMount P2-02, 44-pin QFN package IC
Interface	UART / I <sup>2</sup> C
ADC resolution	10 bits
Operating Voltage	+5V
Storage Temperature	-40°C ~ +85°C
Operating Temperature	-20°C ~ +70°C
Power Consumption	Typical – Standby Mode: 16 mA / 5V; Active Mode: 28.8 mA / 5V; Sleep Mode: 1.4 mA / 5V;
Sample rate/second	Single Point 110 sps / Two Point 90 sps
Touch media	Finger, gloved hand (please contact us for details)
Firmware	Develop by PenMount team
Operation force	Light
Water resistance	Special algorithm to handle water without false function
Top glass thickness supported	Up to 1.8mm
Driver supports	All popular O.S., like Microsoft Windows and Win CE and various Linux distribution

Note: Sample rate/second are varied based on different version of panel and firmware.  
PenMount P2-02 is using Microchip PIC18F45K22 IC.

### 4.2 Control IC Features

- Charge Time Measurement Unit(CTMU)
- 16 MIPS operation at 64MHz CPU
- 32KB program memory
- 10-bit, up to 28 channel Analog-to-Digital converter
- Run mode: 1mA/MIPS, 2.0 Typical
- Sleep mode: Current down to 100nA Typical
- Standby Current with 32 KHz Oscillator: 2.5uA, 2.0V typical
- UART, I<sup>2</sup>C serial bus
- Other details controller specification, please refer to Microchip PIC18F45K22 datasheet

### 4.3 Controller IC Pin out and Package Definition



## Chapter 5: Software drivers & PenMount Utility

### 5.1 Available Drivers & Where to Download

Driver for UART is available in AMT’s website, please go to the link below for downloading the drivers you need. However, drivers for I<sup>2</sup>C are not released in our website, if you are using I<sup>2</sup>C, please contact our sale representatives or distributors in your region for further information.

<http://www.amtouch.com.tw/support-downloads/penmount-drivers-and-utilities/pci-touch-controller/1000-series-linux-and-other-drivers/>

The table below shows which interface and OS can be used to load the drivers. Please note that if you use RS-232 (UART) interface and Windows Vista/7/8, you need to download and install the drivers from our website. The drivers will be modified and updated from time to time, the most updated drivers are available in AMT and PenMount website. Drivers’ versions are subject to change without notice.

OS \ Interface		UART	I <sup>2</sup> C
Windows	WindowsCE 5.0/6.0/ 7.0	●	Please contact us for further information.
	Windows XP	●	
	Window Vista/ 7/8	●	
Linux	Ubuntu 10.04	●	
	Ubuntu 10.10	●	
	Ubuntu 11.04/11.10	●	
	Ubuntu 12.04	●	
Others	Fedora 16	●	
	Fedora 17	●	
	OpenSuse 12.1	●	
	RHEL 6.0-6.2	●	

### 5.2 PCIMSet Introduction

PCIMSet is a utility software developed by PenMount for users to adjust the touch screen’s accuracy, sensitivity... and others features. When you have AMT PCI touch kits, we provide you this utility program, so you can choose the appropriate interface through PCIMSet setting. If you need more detailed information, please see chapter 3 “PenMount PCIMSet” of PenMount Projected Capacitive Input (PCI) User Guide.



### 5.3 Firmware Update

#### 5.3.1 Firmware Interface

We provide UART and I<sup>2</sup>C interface in firmware, the shipping default is set at I<sup>2</sup>C interface, if the I<sup>2</sup>C interface is not required by your system, please contact our sale representatives or distributors in your region for further information on changing interface. There will be new firmware to be updated, details are all described in our PenMount Projected Capacitive Input (PCI) User Guide, please read it carefully before making the firmware update.

#### 5.3.2 New Firmware Request

The latest PenMount controller firmware version is programmed inside the chip. PenMount controller firmware is able to be renewed in customer side, PenMount will release the new firmware with new features or modification, the new updated firmware is available in AMT or PenMount customer services team. As the new updated firmware is sent by request, if you need to update the new firmware, please follow the updated firmware request procedures as below:

- a. First, please fill in the 'PenMount PCI Firmware Update Request' (FUR) form. The FUR form is sent by request, so please contact our sale representatives, customer services team or distributors in your region for requesting the FUR form.
- b. Sent back the FUR form to AMT or PenMount sale representatives, customer services team or distributors in your region.
- c. After checking and confirmed by AMT or PenMount team, we will send the updated firmware for customers to do on field update.

#### 5.3.3 Firmware download and update

The PenMount field update utility (Pmfu) is developed for users to update the latest firmware version. Please note that only our standard firmware offers a free update service, if it is a special developed firmware in accordance with the requests of the client, or any adjustment has been made for the firmware due to the requests of the client, these are regarded as a special firmware, and they won't have a free firmware update. The firmware update will be provided once we have a new firmware ready. If you need any further information about this, please contact our sale representatives or distributors in your region. And if you want to get more information about the operation steps of PenMount Pmfu, you can read chapter 4.1 & 4.2 of the PenMount Projected Capacitive Input (PCI) User Guide.

## Chapter 6: Product Test

The following test has been done by AMT Projected Capacitive Touch and PenMount controller or Control board.

### 6.1 Operating Test

PCI Touch panels were tested under the temperatures range at -20°C and +70°C, the PCI touch panels can operate normally under the above temperature.

### 6.2 Environmental Test

PCI touch panels were tested under the temperature:

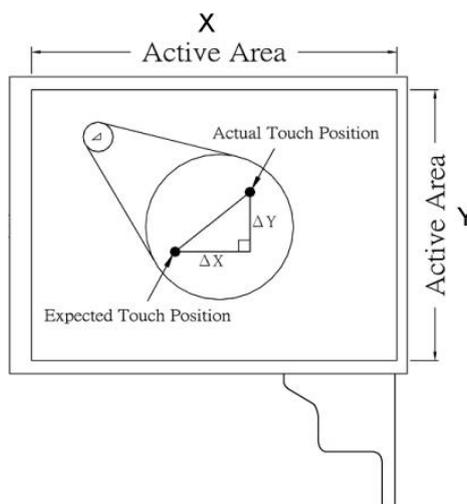
- -40°C for 288H,
- 60 °C with 90RH for 288H,
- 80°C for 288H,
- -40°C ~ +80°C for 20 cycles.

Touch panels can operate normally after the test, please see the PCI approval sheet for details.

### 6.3 ESD

PCI touch solution can withstand 15KV air discharge and 8KV contact discharge. However, the PCI touch has to be integrated properly with good grounding.

### 6.4 Linearity Test



This test is to calculate the difference between the actual touch position and the expected touch position, which

$$\frac{\Delta X}{X}\% < 2.5\% \quad \text{and} \quad \frac{\Delta Y}{Y}\% < 2.5\%$$

### 6.5 Optical Inspection

AMT PCI has its optical specification, please refer to AMT PCI optical specification A003-1 and A003-2.

### 6.6 Others

For other test, please contact to our sale representatives or distributors for detailed information.

### Chapter 7: Warranty

We provide one year limited liability warranty. We shall not be held responsible for any damage, destroy or defect caused by accident, misinstallation, misunderstanding of the instructions, customer modification, misuse of software or their use in a defective or deficient environment or any misuse during their operation of the touch panels.

### Chapter 8: Other Documents

The following documents can be provided to our clients for guiding our customers how to install and operate our products:

- AMT PCI Integration Guide—AMT PCI Integration guide is the guide that to instruct you how to install the touch panel into your products, and what you should aware of.
- AMT PCI Design Guide—AMT PCI Design Guide describes the general design rules and requirements for AMT projective capacitive input (PCI) touch panels, such as their structure, size, pattern and lines.
- PCI PenMount 1000 Device Driver Development Guide—it provides necessary information about the protocols for PenMount and guide you to operate the UART and I<sup>2</sup>C protocols of PenMount 1000.
- PenMount Projected Capacitive Input (PCI) User Guide—PenMount Projected Capacitive Input (PCI) User Guide contains detailed information of our touch panels, such as what software you need, how to install drivers, what is PenMount PCIMSet and firmware update instructions and etc. You can go to the link below to download the manual/ PenMount Projected Capacitive Input (PCI) User Guide.

<http://www.amtouch.com.tw/support-downloads/manuals-downloads/>

Note: AMT PCI Integration Guide, AMT PCI Design Guide and PCI PenMount 1000 Device Driver Development Guide are sent by request, so please feel free to contact our sale representatives or distributors in your region for request if you need these guides. Document versions are subject to change without notice.

### Chapter 9: Contact Information

#### Headquarter

#### Apex Material Technology Corp.

No. 84, WuXun Street, Anle District,

Keelung City 20446, Taiwan R.O.C.

Tel : + 886-2-2430 2666

Fox: + 886-2-2430 3255

Email: [amt1@amtouch.com.tw](mailto:amt1@amtouch.com.tw)

Web : [www.amtouch.com.tw](http://www.amtouch.com.tw)

#### The North American Sales Office

#### AMTouch USA, Inc.

5050 W. State Street

Milwaukee, WI 53208, USA

Tel : + 1-414-847-1814/15

Fax : + 1-414-445-1968

Website: [www.amtouchusa.com](http://www.amtouchusa.com)

Email: [sales@amtouchusa.com](mailto:sales@amtouchusa.com)