

PCAP Touch panel Controller Board

PTPW05

DATA SHEET

DOD-PP-3184 (2nd edition)

**This DATA SHEET is updated document from
DOD-PP-2050(1)**

**All information is subject to change without notice.
Please confirm the sales representative before
starting to design your system.**

INTRODUCTION

The Copyright to this document belongs to Tianma Japan, Ltd. (hereinafter called "TMJ"). No part of this document will be used, reproduced or copied without prior written consent of TMJ.

TMJ does and will not assume any liability for infringement of patents, copyrights or other intellectual property rights of any third party arising out of or in connection with application of the products described herein except for that directly attributable to mechanisms and workmanship thereof. No license, express or implied, is granted under any patent, copyright or other intellectual property right of TMJ.

Some electronic products would fail or malfunction at a certain rate. In spite of every effort to enhance reliability of products by TMJ, the possibility of failures and malfunction might not be avoided entirely. To prevent the risks of damage to death, human bodily injury or other property arising out thereof or in connection therewith, each customer is required to take sufficient measures in its safety designs and plans including, but not limited to, redundant system, fire-containment and anti-failure.

The products are classified into three grades: "**Standard**", "**Special**", and "**Specific**".

Each quality grade is designed for applications described below. Any customer who intends to use a product for application other than that of Standard is required to contact TMJ sales representative in advance.

The **Standard**: Applications as any failure, malfunction or error of the products are free from any damage to death, human bodily injury or other property (Products Safety Issue) and not related the safety of the public (Social Issues), like general electric devices.

Examples: Office equipment, audio and visual equipment, communication equipment, test and measurement equipment, personal electronic equipment, home electronic appliances, car navigation system (with no vehicle control functions), seat entertainment monitor for vehicles and airplanes, fish finder (except marine radar integrated type), PDA, etc.

The **Special**: Applications as any failure, malfunction or error of the products might directly cause any damage to death, human bodily injury or other property (Products Safety Issue) and the safety of the public (Social Issues) and required high level reliability by conventional wisdom.

Examples: Vehicle/train/ship control system, traffic signals system, traffic information control system, air traffic control system, surgery/operation equipment monitor, disaster/crime prevention system, etc.

The **Specific**: Applications as any failure, malfunction or error of the products might severe cause any damage to death, human bodily injury or other property (Products Safety Issue) and the safety of the public (Social Issues) and developed, designed and manufactured in accordance with the standards or quality assurance program designated by the customer who requires extremely high level reliability and quality.

Examples: Aerospace system (except seat entertainment monitor), nuclear control system, life support system, etc.

The quality grade of this product is the "**Standard**" unless otherwise specified in this document.

CONTENTS

INTRODUCTION	2
1. OUTLINE.....	4
2. SPECIFICATIONS.....	4
2.1 GENERAL SPECIFICATIONS.....	4
2.2 ABSOLUTE MAXIMUM RATINGS	4
2.3 ELECTRICAL CHARACTERISTICS	5
2.4 POWER SUPPLY VOLTAGE SEQUENCE	5
2.5 TOUCH PANEL SPECIFICATIONS	6
2.6 CONNECTIONS	7
2.7 TOUCH PANEL POSITIONS	8
2.8 INTERFACE TIMING CHART (I ² C)	9
2.8.1 Communications Protocol.....	9
2.8.2 I ² C-compatible Addresses	9
2.8.3 Write to the Device.....	9
2.8.4 Reading from the device	10
2.8.5 Reading Status Messages with DMA.....	11
2.8.6 Message Address.....	12
2.8.7 /CHG Line.....	13
3. RELIABILITY TEST.....	13
4. PRECAUTIONS	14
4.1 MEANING OF CAUTION SIGNS.....	14
4.2 CAUTIONS	14
4.3 ATTENTIONS	14
4.3.1 Handling of the product.....	14
4.3.2 Environment.....	14
4.3.3 Others	15
5. OUTLINE DRAWINGS	16

1. OUTLINE

PTPW05 is PCAP Touch panel Controller Board for LCD module with PCAP touch panel. ☆
 In addition, this PTPW05 is compliant with the European RoHS directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU).

2. SPECIFICATIONS
2.1 GENERAL SPECIFICATIONS

Item	Specification	Unit
Size	See "5. OUTLINE DRAWINGS".	mm
Weight	7 (typ.)	g
Interface	I ² C	-

2.2 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit	Remarks
Power supply voltage	VDD	-0.3 to +6.0	V	Ta= 25°C
Input voltage	VI	-0.3 to +3.5		
Storage temperature	Tst	-30 to +80	°C	-
Operating temperature	Top	-30 to +80		-
Relative humidity Note1	RH	≤ 95	%	Ta ≤ 40°C
		≤ 85		40°C < Ta ≤ 50°C
		≤ 55		50°C < Ta ≤ 60°C
		≤ 36		60°C < Ta ≤ 70°C
		≤ 24		70°C < Ta ≤ 80°C
Absolute humidity Note1	AH	≤ 70 Note2	g/m ³	Ta= 80°C

Note1: No condensation

Note2: Water amount at Ta= 80°C and RH= 24%

☆

2.3 ELECTRICAL CHARACTERISTICS

(Ta= 25°C, Note1)



Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage	VDD	4.5	5.0	5.5	V	Note2
Power supply current	Active	IDD	-	110	mA	at 15 inch touch panel, Scan speed 100Hz Note3
	Idle	IDDi	-	40		
Input voltage	High	VIH	2.5	-	V	/RESET, SDA, SCL
	Low	VIL	-0.3	-		
Input leakage current	Iil	-	-	1	μA	-
Output voltage	High	VOH	2.8	-	V	/CHG
	Low	VOL	-	-		
Permissible ripple voltage	VRP	-	-	100	mVp-p	For VDD

Note1: When designing of the power supply, take the measures for the prevention of surge voltage.

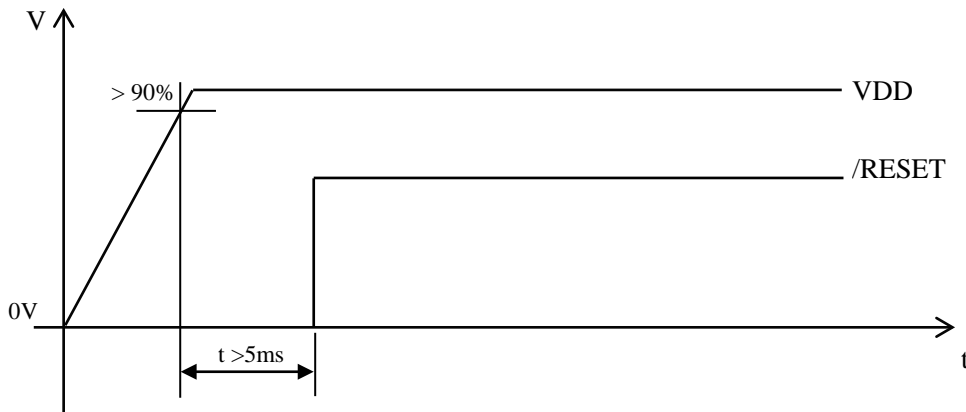
Note2: VDD must be supplied after connecting the controller board to the LCD module. Otherwise the board may be broken due to electrical stress to the board.

Note3: The number of touch is 10.



2.4 POWER SUPPLY VOLTAGE SEQUENCE

(1) Power On Sequence



2.5 TOUCH PANEL SPECIFICATIONS

(Ta= 25°C)

Parameter	Symbol	min.	typ.	max.	Unit	Remarks	
Accuracy	Center	Arc	-	-	1.5	mm Note1	
	Boarder	Acrb	-	-	2.5		
Number of touch	NUM	1	-	16	Point	-	
Scan speed	Active	Sspd A	-	100	-	Hz	-
	Idle	Sspd I	-	30	-		
Resolution	Horizontal	-	-	-	4,096	-	-
	Vertical	-	-	-	4,096		

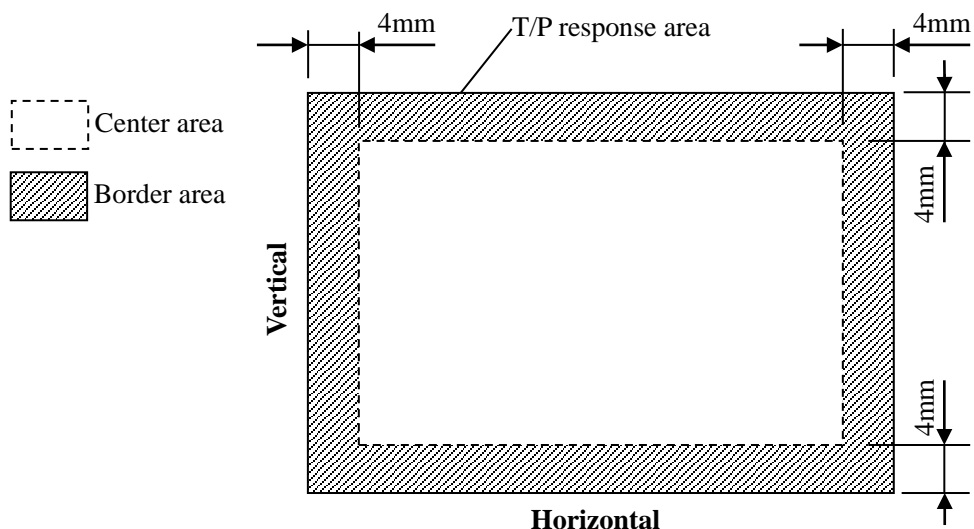


Note1: Definition of accuracy

Accuracy shows a difference between an ideal position and an actual position.

Arc: Accuracy at center area

Acrb: Accuracy at border area



Input method is $\phi 8\text{mm}$ conductive stylus.

2.6 CONNECTIONS

CN1 socket (Controller board side): 53261-0871 (Molex)
 Adaptable plug: 51021-0800 (Molex)

Pin No.	Symbol	Function	Remarks
1	VDD	Power supply	Note1
2	N.C.	-	Keep this pin open.
3	N.C.	-	Keep this pin open.
4	GND	Ground	Note1
5	/RESET	Reset	-
6	SDA	I ² C data	-
7	SCL	I ² C clock	-
8	/CHG	Interrupt signal output	-

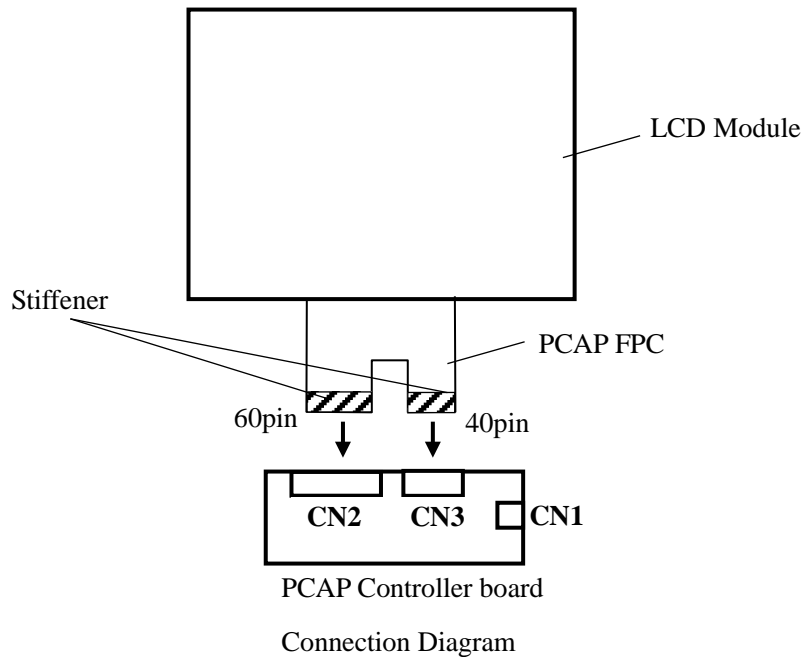
Note1: All GND and VDD terminals must be connected to appropriate terminals.

CN2 socket (Controller board side): FH28-60S-0.5SH(05) (Hirose Electric Co., Ltd.(HRS))

Please connect to the PCAP FPC (60pin) of the LCD module.
 (Refer to below diagram.)

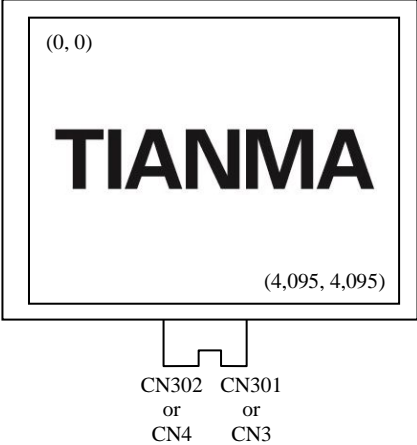
CN3 socket (Controller board side): FH28-40S-0.5SH(05) (Hirose Electric Co., Ltd.(HRS))

Please connect to the PCAP FPC (40pin) of the LCD module.
 (Refer to below diagram.)



2.7 TOUCH PANEL POSITIONS

The following figure is the coordinates of the T/P from the front view.



2.8 INTERFACE TIMING CHART (I²C)

2.8.1 Communications Protocol

The device can use an I²C-compatible interface for communication.

The I²C-compatible interface is used in conjunction with /CHG line. The /CHG line going active signifies that a new data packet is available. This provides an interrupt-style interface and allows the device to present data packets when internal changes have occurred.

2.8.2 I²C-compatible Addresses

The I²C-compatible device addresses are 0x4B. These are shifted left to form the SLA+W or SLA+R address when transmitted over the I²C-compatible interface, as shown in Figure 1.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Address: 0x4B							Read= 1 Write= 0

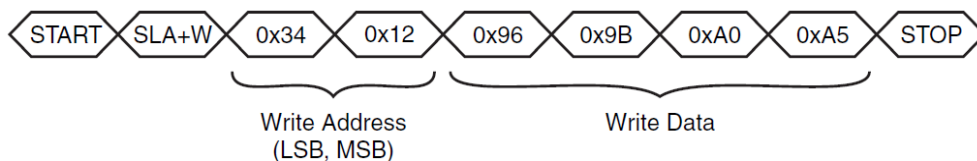
2.8.3 Write to the Device

A WRITE cycle to the device consists of a START condition followed by the I²C-compatible address of the device (SLA+W). The next two bytes are the address of the location into which the writing starts. The first byte is the Least Significant Byte (LSByte) of the address, and the second byte is the Most Significant Byte (MSByte). This Address is then stored as the address pointer.

Subsequent bytes in a multi-byte transfer from the actual data. These are written to the location of the address pointer, location of the address pointer +1, location of the address pointer +2, and so on. The address pointer returns to its starting value when the WRITE cycle's STOP condition is detected.

Figure 1 shows an example of writing four bytes of data to contiguous addresses starting at 0x1234.

Figure1. Example of a Four-byte Write Starting at Address 0x1234



2.8.4 Reading from the device

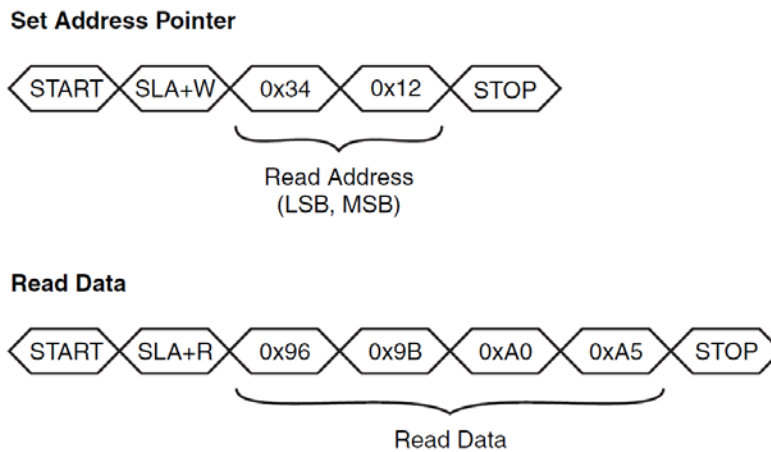
Two I²C-compatible bus activities must take place to read from the device. The first activity is an I²C-compatible write to set the address pointer (LSByte then MSByte). The second activity is the actual I²C-compatible read to receive the data. The address pointer returns to its starting value when the read cycle’s NACK is detected.

It is not necessary to set the address pointer before every read. The address pointer is updated automatically after every read operation. The address pointer will be correct if the reads occur in order. In particular, when reading multiple messages from the Message Processor object, the address pointer is automatically reset to allow continuous reads (See “2.8.5 Reading Status Messages with DMA”).

The WRITE and READ cycles consist of a START condition followed by the I²C-compatible address of the device (SLA+W or SLA+R respectively).

Figure 2 shows an example of reading four bytes of data to continuous addresses starting at 0x1234.

Figure2. Example of a Four-byte Read Starting at Address 0x1234



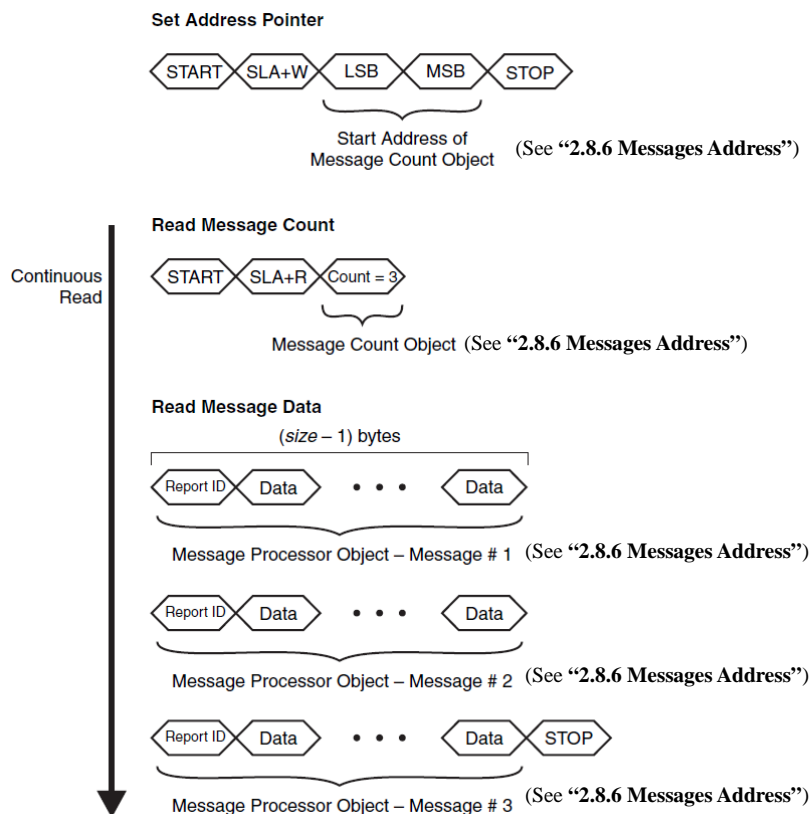
2.8.5 Reading Status Messages with DMA

The device facilitates the easy reading of multiple messages using a single continuous read operation. This allows the host hardware to use a direct memory access (DMA) controller for the fast reading of messages, as follows:

1. The host uses a write operation to set the address pointer to the start of the Message Count object, if necessary (Note1).
2. The host starts the read operation of the message by sending a START condition.
3. The host reads the Message Count object (one byte) to retrieve a count of the pending messages.
4. The host calculates the number of bytes to read by multiplying the message count by the size of the Message Processor object (Note2).
5. The host reads the calculated number of message bytes. It is important that the host does not send a STOP condition during the message reads, as this will terminate the continuous read operation and reset the address pointer. No START and STOP conditions must be sent between the messages.
6. The host sends a STOP condition at the end of the read operation after the last message has been read. The NACK condition immediately before the STOP condition resets the address pointer to the start of Message Count object.

Figure 3 shows an example of using a continuous read operation to read three messages from the device.

Figure3. Continuous Message Read Example



An alternative method of reading messages using the /CHG line is given in "2.8.7 /CHG line".

Note1: The STOP condition at the end of the read resets the address pointer to its initial location, so it may already be pointing at the Message Count object following a previous message read.

Note2: The host should have already read the size of the Message Processor object in its initialization code.

2.8.6 Message Address

Message count object:

Address :0x012E

Byte	Field	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Count	Message count							

Message processor object:

Address :0x012F

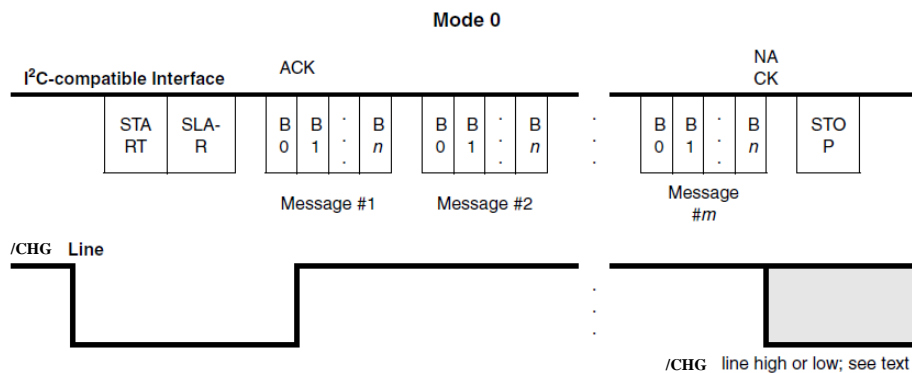
Byte	Field	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Report ID	Report ID (03h=Touch1 04h=Touch2 ... 12h=Touch16)							
1	STATUS	DETECT	PRESS	RELEASE	MOVE	Reserved	Reserved	Reserved	Reserved
2	XPOSMSB	X position MSByte							
3	YPOSMSB	Y position MSByte							
4	XYPOSMSB	X position lsbyte				Y position lsbyte			
5	TCHAREA	Size of touch area							
6	Reserved	-							
7	Reserved	-							

2.8.7 /CHG Line

The /CHG line is an active-low, open-drain output that is used to alert the host that a new message is available in the Message Processor object. This provides the host with an interrupt-style interface with the potential for fast response times. It reduces the need for wasteful I²C-compatible communications.

The /CHG line remains low as long as there are messages to be read. The host should be configured so that the /CHG line is connected to an interrupt line that is level-triggered. The host should not use an edge-triggered interrupt as this means adding extra software precautions.

The /CHG line should be allowed to float during normal usage. This is particularly important after power-up or reset.



1. The /CHG line goes low to indicate that a message is present.
2. The /CHG line goes high when the first byte of the first message (that is, its report ID) has been sent and acknowledged (ACK sent) and the next byte has been prepared in the buffer.
3. The STOP condition at the end of an I²C-compatible transfer causes the /CHG line to stay high if there are no more messages. Otherwise the /CHG line goes low to indicate a further message.

Mode 0 allows the host to continually read messages. Messaging reading ends when a report ID of 255 (“invalid message”) is received. Alternatively the host ends the transfer by sending a NACK after receiving the last byte of a message, followed by a STOP condition. If and when there is another message present, the /CHG line goes low, as in step 1. In this mode the state of the /CHG line does not need to be checked during the I²C-compatible read.

Note: The state of the /CHG line should be checked only between messages and not between the bytes of a message. The precise point at which the /CHG line changes state cannot be predicted and so the state of the /CHG line cannot be guaranteed between bytes.

The /CHG line operation modes described above, this object allows the use of edge-based interrupts, as well as direct control over the state of the /CHG line.

3. RELIABILITY TEST

This test is in accordance with the Reliability Test of the adaptable LCD module. Refer to Reliability Test of the adaptable LCD module.

4. PRECAUTIONS

4.1 MEANING OF CAUTION SIGNS

The following caution signs have very important meaning. **Be sure to read "4.2 CAUTIONS" and "4.3 ATTENTIONS"!**



This sign has the meaning that a customer will be injured or the product will sustain damage if the customer practices wrong operations.



This sign has the meaning that a customer will be injured if the customer practices wrong operations.

4.2 CAUTIONS



*** Do not apply mechanical shock. It may damage products.**

4.3 ATTENTIONS



4.3.1 Handling of the product

- ① Do not touch or apply stress to exposed electronic parts. Doing so may cause damage or malfunctioning of products. Only hold the edge of the circuit board when unpacking.
- ② When handling the product, take measures of electrostatic discharge with such as earth band, ionic shower and so on, because the product may be damaged by electrostatic.
- ③ Do not plug or unplug the interface connectors while the product is operating.
- ④ Do not hook or pull cables such as lamp cable, and so on, in order to avoid any damage.

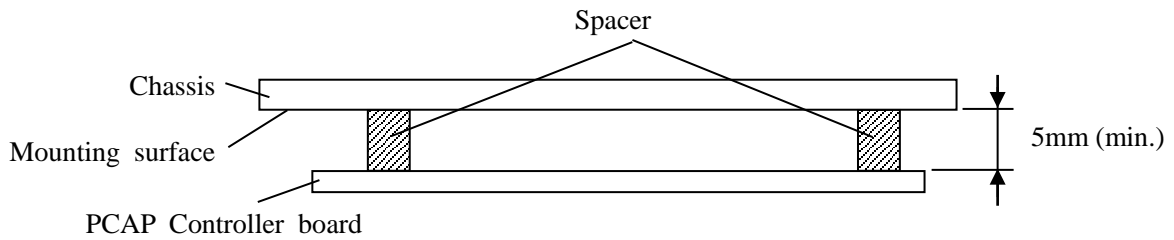
4.3.2 Environment

- ① Do not operate or store in high temperature, high humidity, dewdrop atmosphere or corrosive gases. Keep the product in packing box with antistatic pouch in room temperature to avoid dusts and sunlight, when storing the product.
- ② In order to prevent dew condensation occurred by temperature difference, the product packing box must be opened after enough time being left under the environment of an unpacking room. Evaluate the storage time sufficiently because dew condensation is affected by the environmental temperature and humidity. (Recommended leaving time: 6 hours or more with the original packing state after a customer receives the package)
- ③ Do not operate in high magnetic field. If not, circuit boards may be broken.
- ④ This product is not designed as radiation hardened.

4.3.3 Others

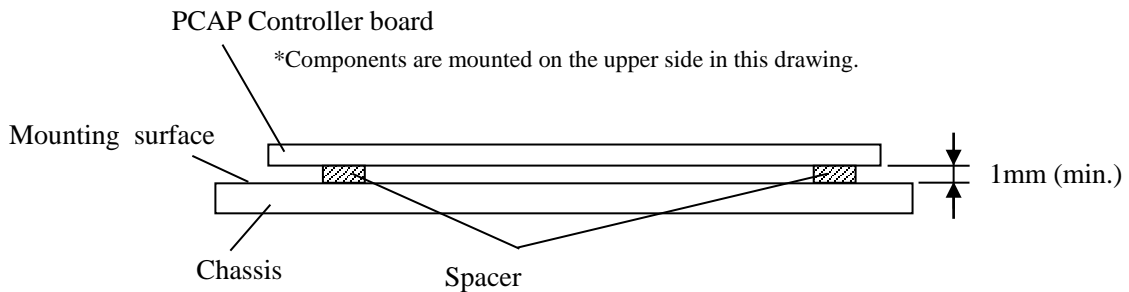
- ① All GND and VDD terminals should be used without any non-connected lines.
- ② Do not disassemble a product.
- ③ Pack the product with the original shipping package, in order to avoid any damages during transportation, when returning the product to TMJ.
- ④ Insert spacers between the PCAP Controller board and the chassis to secure spatial distance.

Mounting method example 1



*Components are mounted on the upper side in this drawing.

Mounting method example 2



*Components are mounted on the upper side in this drawing.

- ⑤ The information of China RoHS (II) six hazardous substances or elements in this product is as follows.

China RoHS (II) six hazardous substances or elements					
Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr VI)	Polybrominated Biphenyls (PBB)	Polybrominated Biphenyl Ethers (PBDE)
×	○	○	○	○	○

Note1: ○: This indicates that the poisonous or harmful material in all the homogeneous materials for this part is equal or below the limitation level of GB/T26572-2011 standard regulation.

×: This indicates that the poisonous or harmful material in all the homogeneous materials for this part is above the limitation level of GB/T26572-2011 standard regulation.

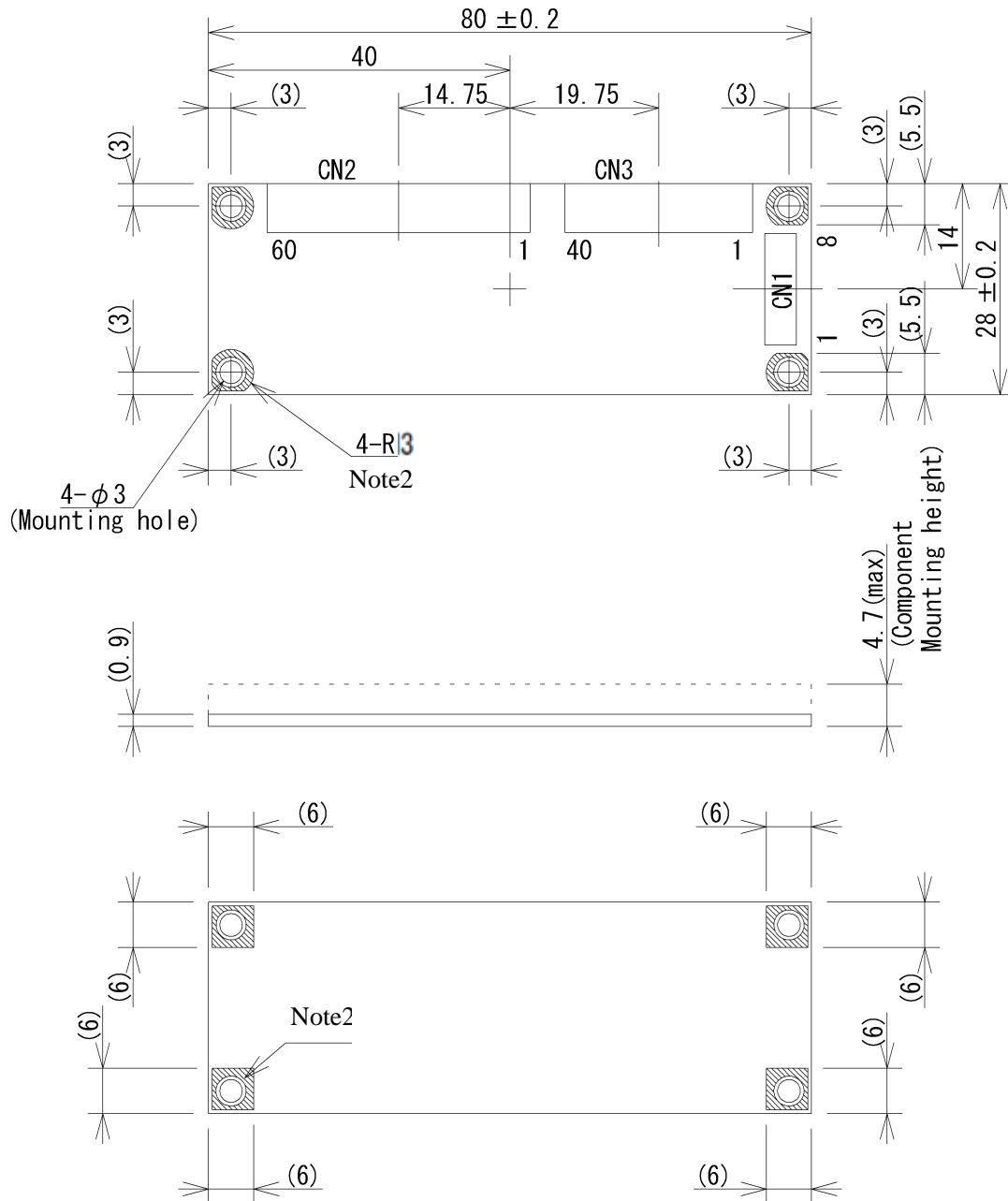
☆

☆

☆

☆

5. OUTLINE DRAWINGS



(Unit: mm)

Note1: The values in parentheses are for reference.
 Note2: Four mounting holes are connected to GND in the product.