



89-F-PMC-101-MDL-01

Specification for Standard Multi-Touch Projected Capacitive Developer Kit

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1.0 General Specifications

1.1 Introduction

Touch International's 89-F-PMC-101-MDL-01 Multi-Touch projected capacitive kit is equipped with a general purpose projected capacitive controller and touch screen mounted to a 10.1" LCD.

Designed to interface with computer systems through a wide variety of standard interfaces, the 89-B-PMC-01 projected capacitive controller is compatible with USB, I2C and Serial communications. Standard being USB. 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 up to 10 finger input capabilities, the 89-B-PMC-01 controller and 89-F-PMC-101-002 sensor can help take your application to the next level.

1.2 Package Contents

- (1) 10.1" Multi-Touch P-Capacitive Touch Screen (89-F-PMC-101-002)
- (1) Controller Package (89-B-PMC-101-002)
- (1) 10.1" LCD (8700186)
- (1) VGA Drive Kit (13B0110)
- (1) OSD Board (1500180)
- (1) Power Adapter (1500179)
- (1) VGA Cable (1300277)
- (1) USB Cable (1300264)

1.3 Features

Motion Detection Method	Capacitive Sensing
X/Y Position Reporting	Absolute Position
Touch Force	No Contact Pressure Required
Interface	HID Compliant
Calibration	No Need for Calibration
Chip Set Solution	Available
Touch	Standard: 4-Fingers, Optional: 10 Fingers
RoHS	Compliant
REACH	Compliant

1.4 Controller Specifications

Controller Size	2.19" x 2.15" (55.63mm x 51.61mm)
Power Requirements	5 ~ 9V DC unregulated power, typical 42mA.
Operating Temperature	-15 to 85°C
Storage Temperature	-40 to 85°C
Relative Humidity	35°C at 95% RH non-condensing.

1.0 General Specifications

1.4 Controller Specifications

Interface	USB 2.0, 1.1 compliant (Standard) Optional: USB – UART. RS-232 serial communication. Protocol: No parity, 8 data bits, 1 stop bit, 115200 baud, no flow control. I2C
Communication Cables	A Plug/5-Pin Mini-B Plug (USB & USB - UART): TI# 1300264 RS232: TI# 1300210 (Optional).
Resolution	Standard: 1024 X 1024, Max 4095 X 4095
Report Rate	Approx. 50 - 75 points/sec
Mean Time Between Failure	> 5,600,000 hrs.
Maximum Screen Size	10.1”
Supported Operating Systems	Standard: Windows 7 Optional: Windows 2000, XP, Vista and 7, Linux Ubuntu, Mac OSX 10.x (Leopard), Android

NOTE: Customers need to write their own driver in order to use the controller with optional OS.

1.5 Touch Screen Specifications

Operating Temperature	-15°C to 70°C
Storage Specification	-40°C to 80°C
MTBF	> 100 Million Touches
Relative Humidity	10%° to 90% RH Non-Condensing

1.6 LCD Specifications

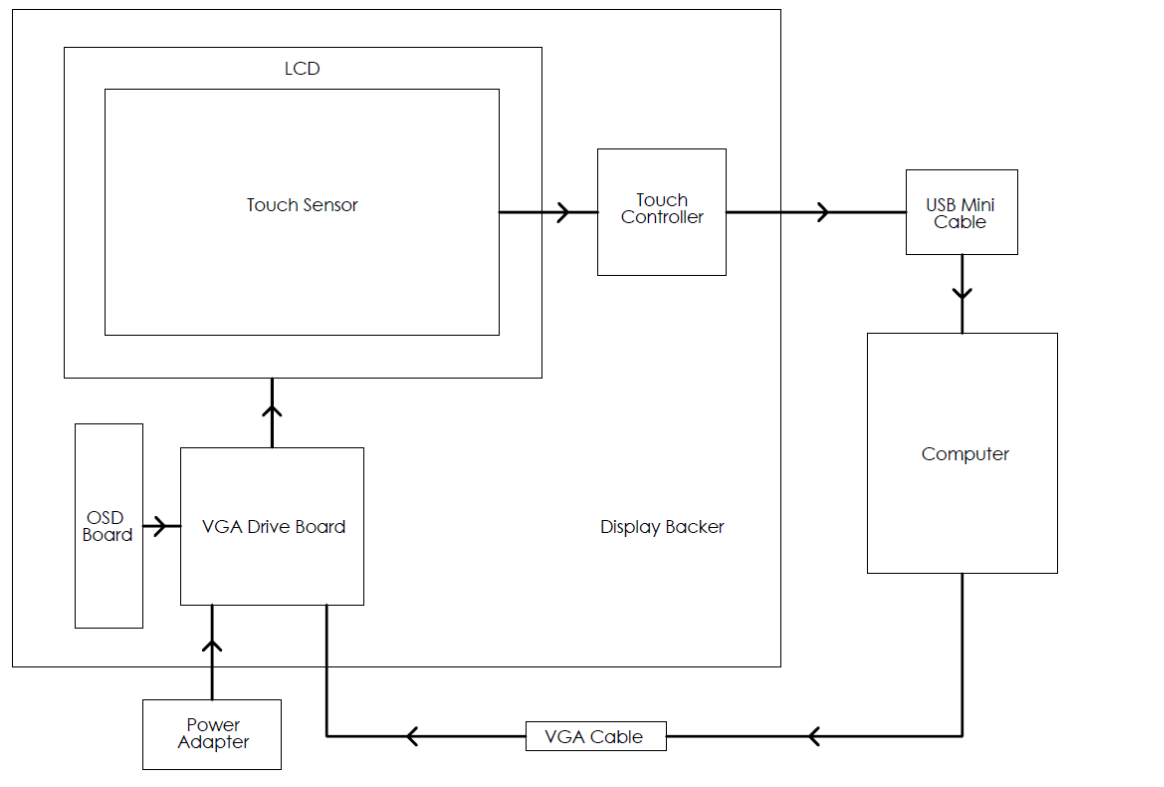
LCD Screen Size	10.06” Diagonal
Aspect Ratio	Standard 16:9
Brightness	200 cd/m ²
Contrast Ratio	650:1
Viewing Angle	Horizontal: +/- 45°, Vertical: Y+ = 20°, Y- = 45°
Response Time	3ms Rise / 7ms Fall
Pixel Pitch	0.2175 (H) x 0.2088 (V)
Outline Dimension	235mm (W) × 143mm (H) × 4.9mm (D)
Backlight	LED

1.7 LCD Drive Board Specifications

Video Input	PC-RGB
Input Voltage	DC 12V+/-4V (350mA+/-30mA)
Operating Temperature	-10°C ~ +50°C
Storage Temperature	-20°C ~ +70°C

1.0 General Specifications

1.8 Block Diagram



Note: While touching any electronic components, please make sure to wear ESD strap.

Functional layout and connection procedure:

- Connect all of the cables as shown above except for the USB mini cable.
- Plug the power supply into the kit.
- Turn on your laptop/computer and adjust the screen resolution to 800 x 600 (Freq = 60Hz).
- If the display doesn't turn on automatically, press the power button on the OSD board.
- You should see an image on the LCD and the touch will be active.
- Connect the USB mini cable to the touch controller and then to computers USB port.
- This kit will work with Win 7 OS only.

2.0 Touch Screen Specification (89-F-PMC-101-002)

2.1 Optical

Light Transmission	Up to 89% , +/- 3% (Dependent on the Surface Finish)
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2.2 Electrical

Input Method	Standard: Finger, Optional: Gloved Hand or Stylus
Insulation Resistance	Exceeds 20 Mega Ohms, @ 10KV
Operational Voltage	3.3V to 5V DC

2.3 Mechanical

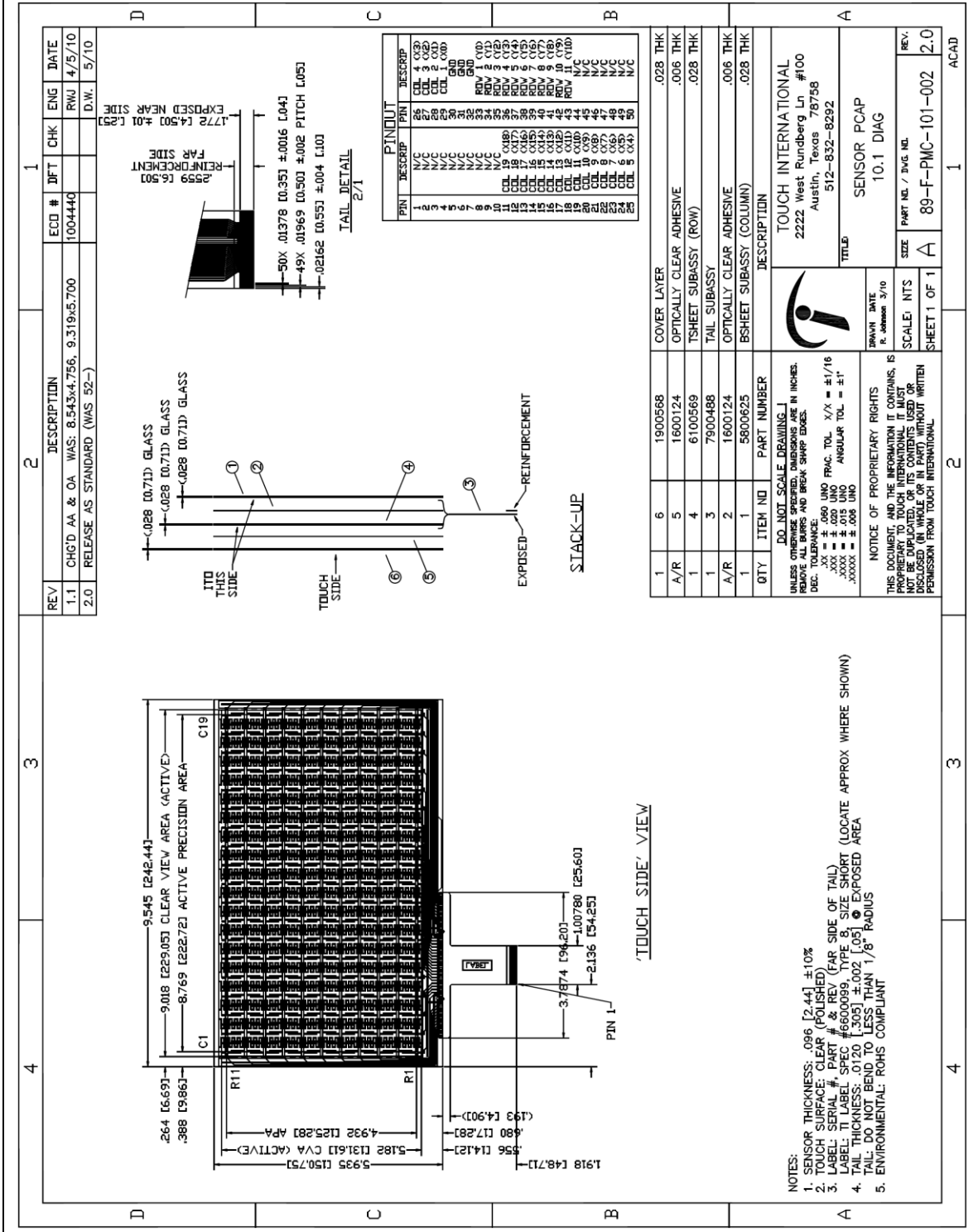
Surface Hardness	Depends upon first surface substrate
Touch Activation Force	25 ~50Grams Typical

2.4 Environmental

Operating Temperature	Low and High Temperature: -15 °C ~ 70°C, 50% Relative Humidity, Non Condensing**
Storage Specification	Low and High Temperature: -40°C ~ 80°C, 50% Relative Humidity, Non Condensing**
Touch Screen Mean Time between Failures	> 100 Million Touches
Relative Humidity	50°C at 90% RH Non-Condensing
Touch Durability Electrically	300 Million Touches at a Single Location
Touch Durability Cosmetically	250 Million Touches at a Single Location
Chemical Resistance	Tested to Resistance to Methyl Alcohol (50%), Ethyl Alcohol (50%), Acetone, Benzene, etc.

2.0 Touch Screen Specification (89-F-PMC-101-002)

2.5 Touch Screen Drawing



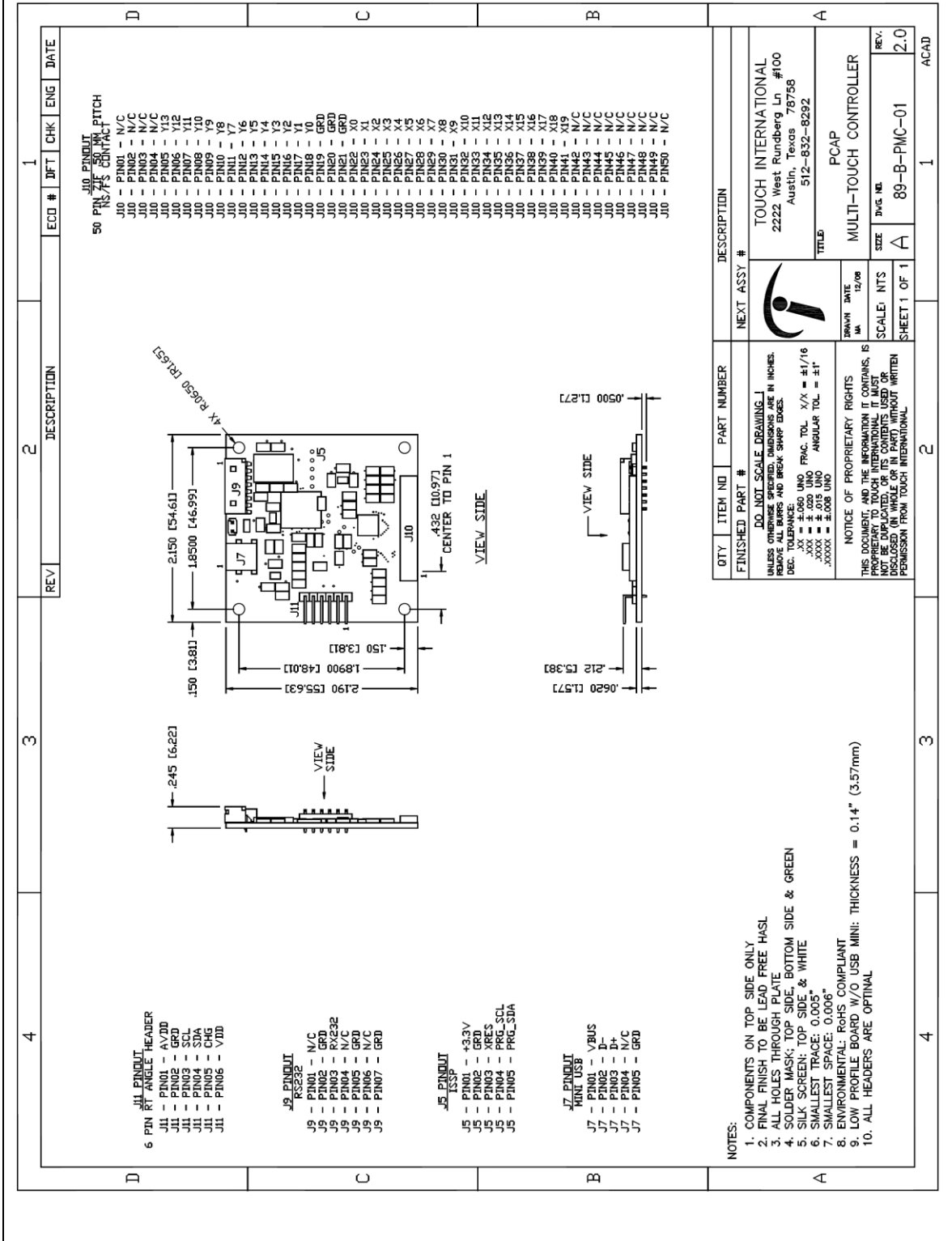
3.0 Controller Specifications (89-B-PMC-01)

3.1 General Specifications

Controller Size	2.19" x 2.15" (55.63mm x 51.61mm)
Power Requirements	5 ~ 9V DC unregulated power, typical 42mA.
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) Optional: USB – UART. RS-232 serial communication. Protocol: No parity, 8 data bits, 1 stop bit, 115200 baud, no flow control. I2C
Communication Cables	A Plug/5-Pin Mini-B Plug (USB & USB - UART): TI# 1300264 RS232: TI# 1300210 (Optional).
Resolution	Standard: 1024 X 1024, Max 4095 X 4095
Report Rate	Approx. 50 - 75 points/sec
Mean Time Between Failure	> 5,600,000 hrs.
Maximum Screen Size Supported	10.1"
Supported Operating Systems	Standard: Windows 7 Optional: Windows 2000, XP, Vista and 7, Linux Ubuntu, Mac OSX 10.x (Leopard)

3.0 Controller Specifications (89-B-PMC-01)

3.2 Controller Drawing



QTY	ITEM NO	PART NUMBER
		FINISHED PART #

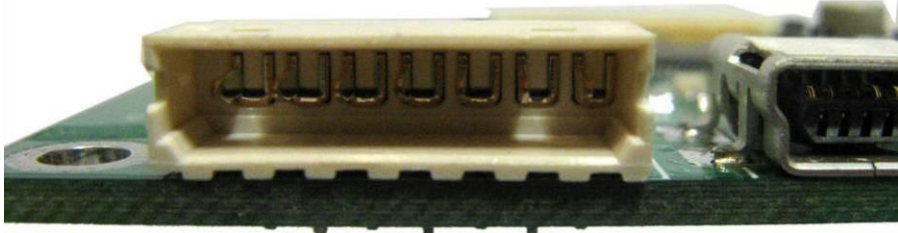
DESCRIPTION	
NEXT ASSY #	TOUCH INTERNATIONAL 2222 West Rundberg Ln #100 Austin, Texas 78758 512-832-8292
TITLE	PCAP MULTI-TOUCH CONTROLLER
SCALE: NTS	SIZE
SHEET 1 OF 1	89-B-PMC-01
	REV. 2.0

3.0 Controller Specifications (89-B-PMC-01)

3.3 Interface Specifications

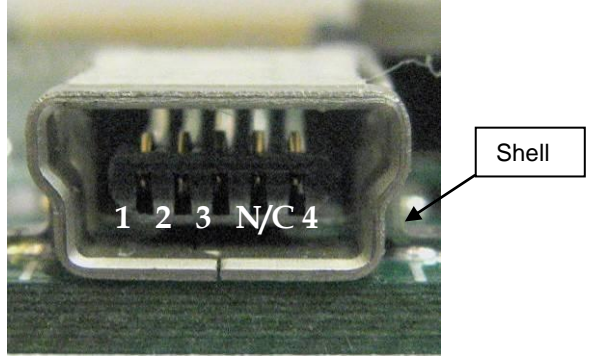
3.3.1 RS232 Communication

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>J9</p> 	Pin #	J15
	1	N/C
	2	TxD
	3	RxD
	4	N/C
	5	GND
	6	N/C
	7	GND

3.4.2 USB Communication

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>J7</p> 	Pin #	J3
	1	VBUS
	2	D-
	3	D+
	4	GND
	Shell	GND

3.0 Controller Specifications (54-B-PMC-07-01 Rev. A)

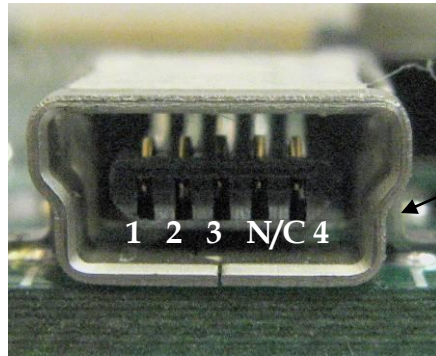
3.4.3 USB-UART Communication

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 USB - UART 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.

J7

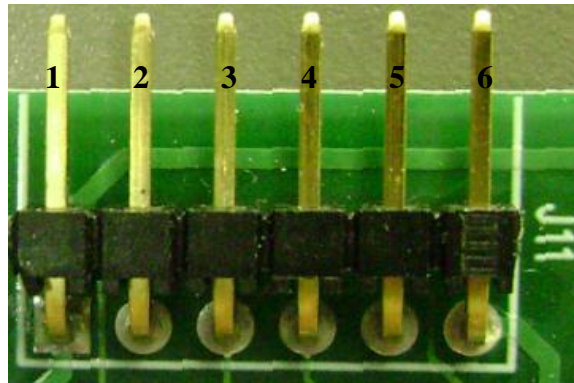


Shell

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

3.4.4 I2C Communication

J5



Pin #	Pin #	J5 Name
1	1	VDDV
2	2	GND GND
3	3	XRES
4	3	SCL SCLK
5	4	SDA SDATA
5		$\overline{\text{CHG}}$
6		+1.8V

I2C connected as slave. Address Select = 1 then 0x4B, Address Select = 0 then 0x4A

$\overline{\text{CHG}}$ Line going active signifies that new data packet is available.

3.0 Controller Specifications (89-B-PMC-01)

3.4.5 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 Devices (HID)”.
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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)
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, // COLLECTION (Logical)
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 (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
0x05, 0x0d, // USAGE_PAGE (Digitizers)
0x09, 0x54, // USAGE (Contact Count)
0x95, 0x01, // REPORT_COUNT (1)
0x75, 0x08, // REPORT_SIZE (8)
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.msp

3.0 Controller Specifications (89-B-PMC-01)

3.4.6 I2C Protocol

I2C connected as slave.

Address Select = 1 then 0x4B,

Address Select = 0 then 0x4A

$\overline{\text{CHG}}$ line going active signifies that new data packet is available.

Data Byte Format

BYTE	Field	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	Finger ID	0	0	0	0	0	0	1	0
1	Status	Detect	Press	Release	Move	Vector	Amp	Suppress	Reserved
2	Xpos MSB	X ₇	X ₆	X ₅	X ₄	X ₃	X ₂	X ₁	X ₀
3	Ypos MSB	Y ₇	Y ₆	Y ₅	Y ₄	Y ₃	Y ₂	Y ₁	Y ₀
4	XYpos LSB	NA	X ₁₀	X ₉	X ₈	NA	Y ₁₀	Y ₉	Y ₈
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.

4.0 13B0102 LCD Drive Board Specifications

4.1 Introduction

10.1" Color TFT LCD Kit includes a drive board (TI# 13B0102) and a 10.1" digital TFT LCD panel (TI# 8700186) and supports both PAL & NTSC. This kit can work with either VGA or Video Signal input and manages the power supply with IC and controls the invariable current for backlight supply.

4.2 General Specifications

4.2.1 Video Input

PC-RGB	Format	Up to 1440 x 900
	H-Frequency	30~80KHz
	V-Frequency	56~75Hz

4.2.2 Audio Input

PC-RGB	Earphone input terminal
--------	-------------------------

4.2.3 Input Voltage

Input	DC12.0V \pm 0.6V
To Panel	3.3V or 5V or 12V
Manage	Low power consumable mode; standby < 1W

4.2.4 Temperature

Operating Temperature	0°C ~ +40°C
Storage Temperature	-10°C ~ +60°C

4.2.5 Audio Output

2X1W (8 Ω)

4.2.6 Panel Resolutions

Up to 1440 x 900

4.2.7 Terminals

Input	PC-RGB Input	1D-Sub 15 Pin terminal blue color
	PC Audio Input	1 earphone terminal black color

4.2.8 OSD Language

English, Chinese, French, German, Spanish, Italian, Japanese, Korean
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4.2.9 Dimensions

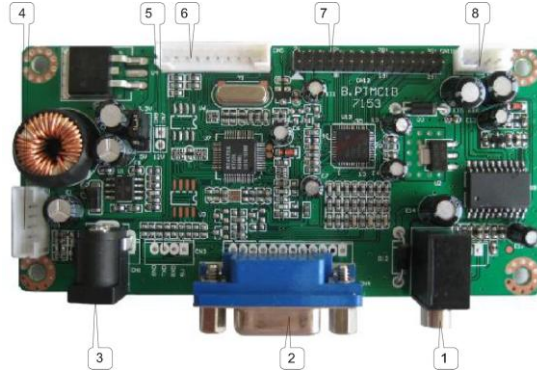
Height = 1.2mm Length = 108mm Width = 51.5mm
The height of the whole controller board is 18.0mm The diameter of screw is 3.5mm

4.0 13B0102 LCD Drive Board Specifications

4.3 Layout and Dimensions

4.3.1 Function Layout

LCD Controller Board

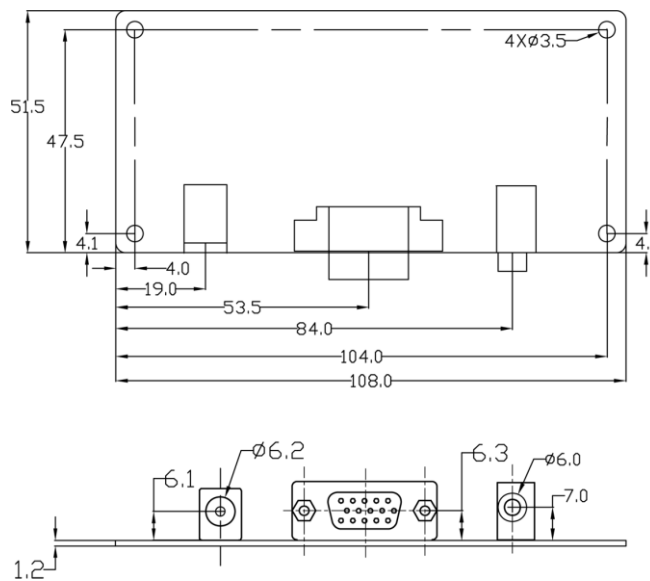


Number	Description	Number	Description
1	PC-Audio Input	5	Debugging Interface1
2	PC-RGB Input	6	Key Board and LED Indicator Jack
3	Main Power Input	7	LVDS Panel Jack
4	Inverter Jack	8	Amplifier Jack

4.3.2 LCD Controller Board Dimensions

Height = 1.2mm
 Length = 108mm
 Width = 51.5mm

The height of the whole controller board is 18.0mm
 The diameter of screw is 3.5mm



For more information about the LCD Specifications used in the 10.1" Multi-Touch Developer Kit, please visit our website.

5.0 LCD Specifications (8700186)

5.1 General Description

8700186 is a transmissive-type color active matrix liquid crystal display (LCD), which uses an amorphous thin film transistor (TFT) as switching devices. This panel has a 10.1" (diagonal) active display area with Wide-SVGA (1024 x 600) resolution.

5.2 General Specifications

Parameter	Specifications
Active Area	222.72 (H) x 125.28 (V) (10.06" diagonal) mm
Bezel Opening Area	226.34 (H) x 128.1 (V) mm
Driver Element	a-si TFT active matrix
Pixel Number	1024 x 600
Pixel Pitch	0.2175mm (H) x 0.2088mm (V)
Pixel Arrangement	RGB Vertical Stripe
Display Colors	262,144
Transmissive Mode	Normally White
Surface Treatment	Hard coating (3H), Glare

5.3 Mechanical Specifications

Item		Min.	Typ.	Max.	Unit	Note
LCD Size	Horizontal	234.5	235.0	235.5	mm	1
	Vertical	142.5	143.0	143.5	mm	
	Thickness	--	4.9	5.2	mm	
Glass Thickness	TFT	0.45	0.5	0.55	mm	
	CF	0.45	0.5	0.55	mm	
Weight		--	180	190	g	

- Please refer to the attached drawings for more information about the front and back outline dimensions.

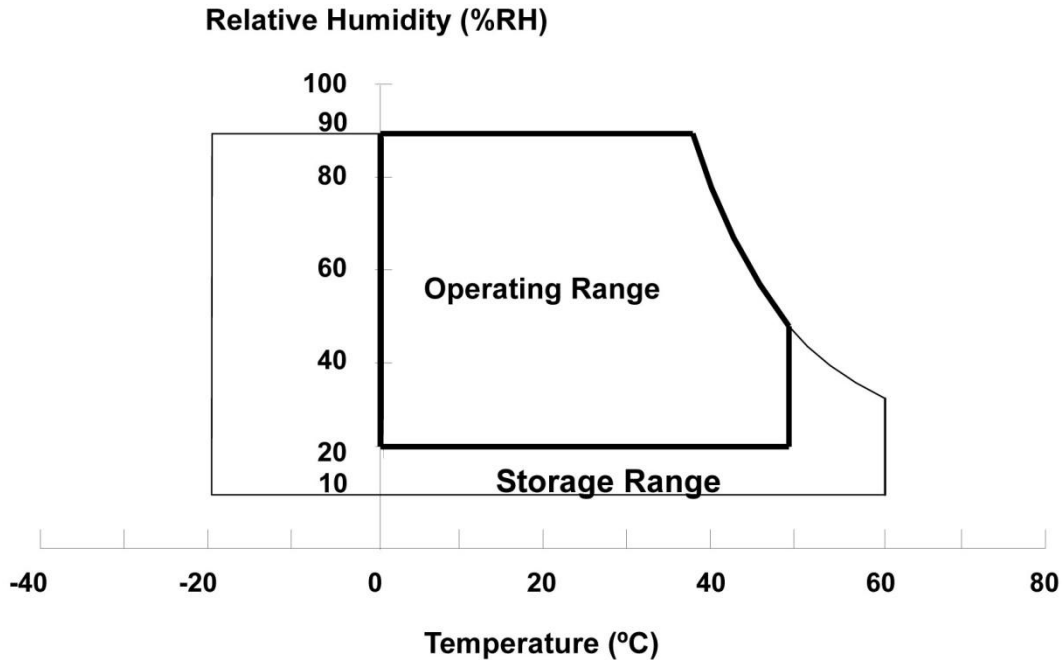
5.4 Absolute Maximum Ratings

Item	Symbol	Value		Unit	Note
		Min.	Max		
Storage Temperature	TST	-20	60	°C	(1)
Operating Ambient Temperature	TOP	0	50	°C	(1), (2)
Shock (Non-Operating)	SNOP	--	220/2	G/ms	(3), (5)
Vibration (Non-Operating)	VNOP	--	1.5	G	(4), (5)

- Temperature and relative humidity range is shown in the figure below:
 - 90 %RH Max. ($T_a \leq 40^\circ\text{C}$)
 - Wet-bulb temperature should be 39°C Max. ($T_a > 40^\circ\text{C}$)
 - No condensation
- The temperature of panel surface area should be between 0°C min and 60°C max

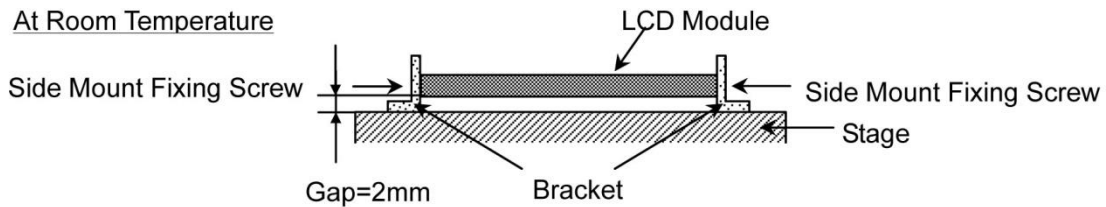
5.0 LCD Specifications (8700186)

5.4 Absolute Maximum Ratings (Continued)



3. 1 time for $\pm X$, $\pm Y$, $\pm Z$. for Condition (220G / 2ms) is half Sine Wave.
4. 10~500 Hz, 30 min/cycle, 1cycle for X,Y,Z-axis.
5. When testing Vibration and Shock, the fixture holding the LCD has to be hard and rigid enough so that the LCD is not twisted or bent by the fixture. The mounting illustration is shown below:

At Room Temperature



5.5 Electrical Absolute Ratings

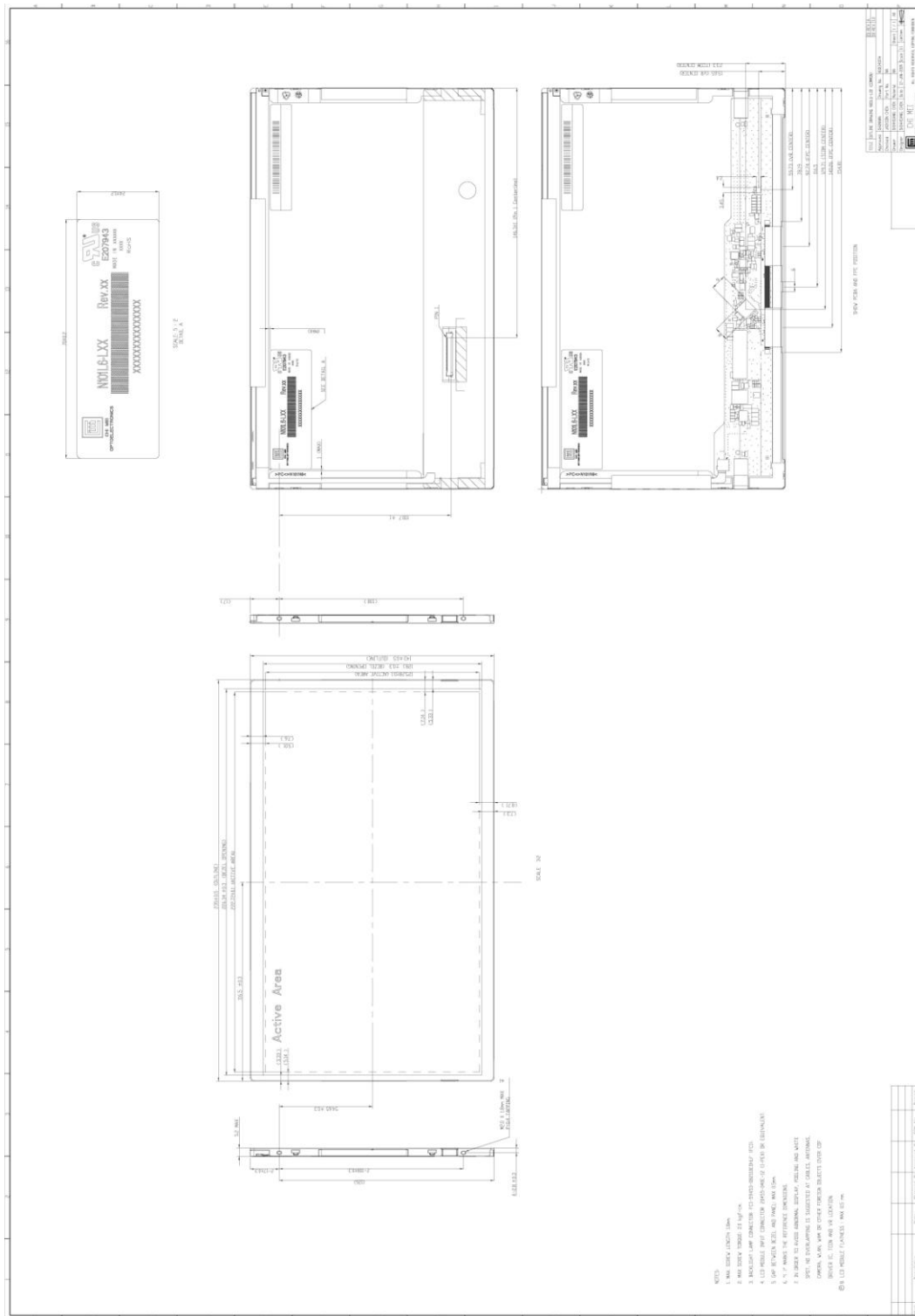
Item	Symbol	Min.	Max.	Unit	Note
Power Voltage	VCC	-0.3	4.0	V	(1)
Logic Voltage	VIN	-0.3	3.0	V	
LED Light Bar Power Voltage	--	-5 * 9	3.4 * 9	VDC	(1), (2)
LED Light Bar Power Current	--	0	25 * 2	mADC	

Note:

1. Permanent damage to the device may occur if maximum values are exceeded. Function operations should be restricted to the conditions described under Normal Operating Conditions.
2. Specified values are for LED.

5.0 LCD Specifications (8700186)

5.6 LCD Drawing



For more information about the LCD Specifications used in the 10.1" Multi-Touch Developer Kit, please visit our website.

6.0 Handling and Caution for Complete Developer Kit

6.1 Unpacking the Kit

- Carefully take out the package and place it on a surface that is static free.

6.2 Handling the Kit

- Electrostatic discharges may damage the electronic components, hence wear electrostatic straps at all times and handle the unit with care.
- The touch screen, LCD panel and backlight elements are made from fragile glass material, applying forces to the developer kit should be avoided.
- Handle connectors and cables with care.
- The FPC tail of the touch screen is extremely fragile, please handle with care.

6.3 Operation

- Do not pull the interface connector between the LCD and VGA drive board in or out while the kit is in operation.
- Only use the power adapter that is shipped along with this kit. Use of other power adapters is highly discouraged. Wrong input voltages can damage the developer kit permanently.

6.4 Operating Environment

- Do not store and/or operate the developer kit in extreme temperatures and/or humid environments. Check specification for further information.
- Store the kit in the ESD bag to protect the electronic components from any static damage.

6.5 Developer Kit Characteristics

- Do not apply a fixed pattern data signal to the kit. Applying a fixed pattern signal for an extended period of time can cause the image to stick.

6.6 Other Cautions

- Do not disassemble and/or re-assemble LCD kit. Doing so will void the warranty of the unit.

6.7 Maintaining Kit

- Use a rubbing alcohol solution to clean the touch screen surface if it gets dirty. Do not use chemicals that can corrode or permanently damage the touch surface. Damage to the glass surface can reduce the performance of the touch screen.

7.0 Ordering Information

Part Number	Description
89-F-PMC-101-MDL-01	10.1" Multi-Touch Projected Capacitive Kit

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

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