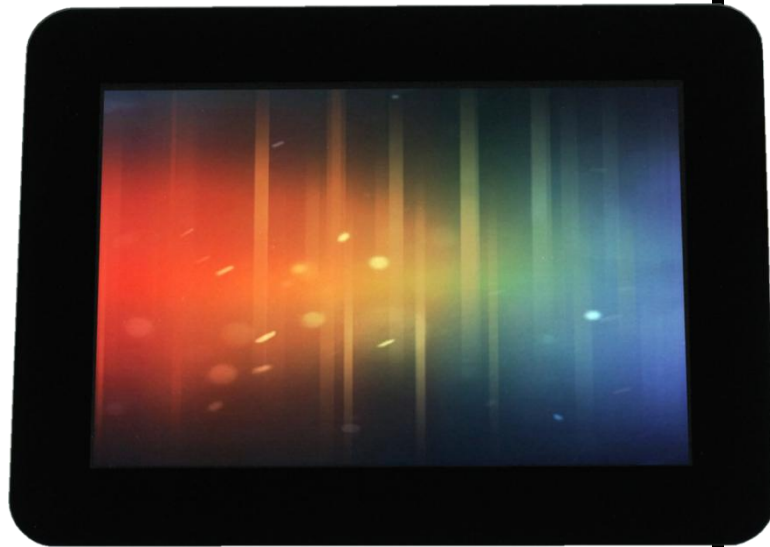


Features

- Touch Sensor and Display:
 - Projected Capacitive Multi Touch Controller
 - 3.5in LCD
- Touch:
 - Designed for Atmel maXTouch™ mXT112S Touch Controller
 - Supports up to 4 touches
- Display:
 - 320x480 resolution
 - ILI9488 driver IC
 - 30 ms max response time
 - White LED backlight
 - 3-Line/4-Line SPI, RGB 8-/9-/16-/18-bit MCU parallel interface
- Cover Panel:
 - 1.1mm Soda Lime Glass



PDA TD3500: 3.5in PCAP Touch Display



Visit <http://www.pdaatl.com/td3500>
for the latest information on the TD3500

1410-1-1

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1 Module Overview

1.1 Module Connections

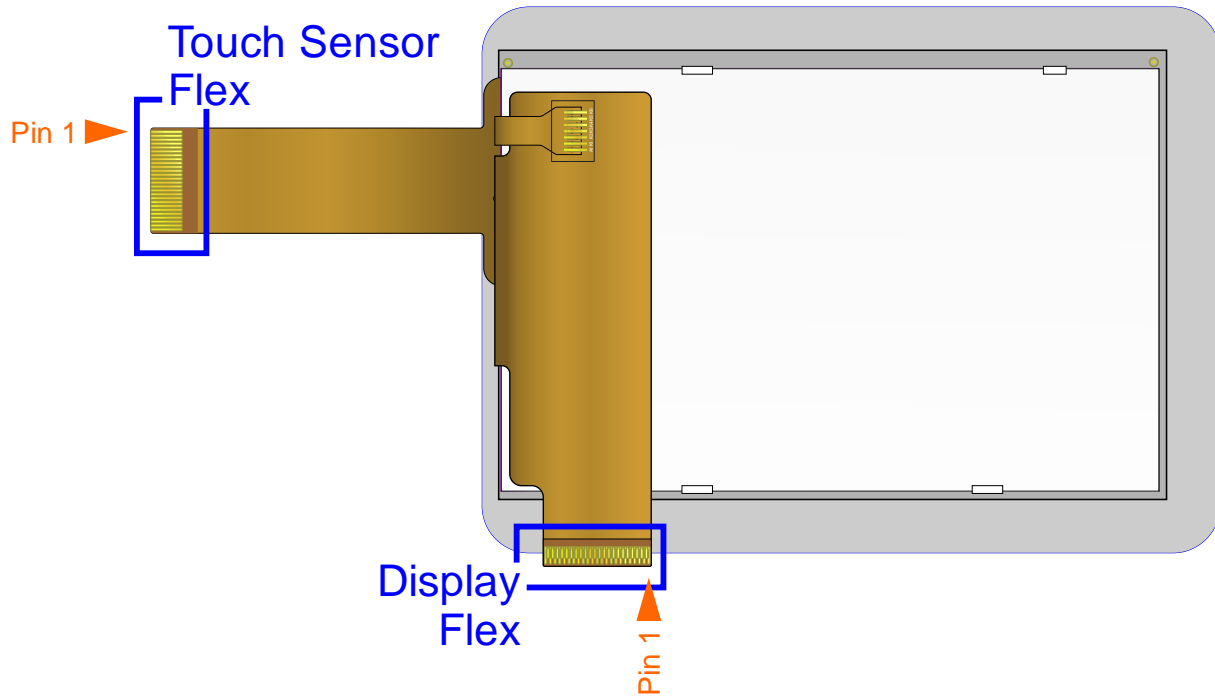


Figure 1 – Host Connections

The following notations are used for pin descriptions:

I	Input only	OD	Open drain output
O	Output only, push-pull	P	Ground or power
MXT	maXTouch touchscreen	LCD	LCD Panel

NOTE: Inputs and output are defined from the standpoint of the Touch Display.

1.2 Display Flex

Connects to the LCD panel and carries signals between the Host and the LCD Panel. The recommended mating connector is:

Manufacturer: Hirose

Part Number: FH35-45S-0.3SHW(50)

Description: 0.3mm pitch, 45 Position

Pin	Type	Description
1	P	GND
2	O	MISO
3	I	MOSI
4	I	SCK/WRX
5	I	D/CX
6	I	~CS
7	I	PCLK
8	I	~RESET
9	I	DE
10	I	RDX
11	I	TE
12	I	HSYNC
13	I	VSYNC
14	P	VDD
15	I	LCD_DATA_0
16	I	LCD_DATA_1
17	I	LCD_DATA_2
18	I	LCD_DATA_3
19	I	LCD_DATA_4
20	I	LCD_DATA_5
21	I	LCD_DATA_6
22	I	LCD_DATA_7
23	I	LCD_DATA_8

Pin	Type	Description
24	I	LCD_DATA_9
25	I	LCD_DATA_10
26	I	LCD_DATA_11
27	I	LCD_DATA_12
28	I	LCD_DATA_13
29	I	LCD_DATA_14
30	I	LCD_DATA_15
31	I	LCD_DATA_16
32	I	LCD_DATA_17
33	P	GND
34	P	VDD_IO
35	I	IM0
36	I	IM1
37	I	IM2
38	P	LED/A
39	P	LED/K1
40	P	LED/K2
41	P	LED/K3
42	P	LED/K4
43	P	LED/K5
44	P	LED/K6
45	P	GND

1.3 Touch Sensor Flex

Connects to the touch sensor and carries signals used by an Atmel maXTouch controller to detect user input on the touch sensor. The recommended mating connector is:

Manufacturer: Tyco / Amp

Part Number: 2-1734592-6

Description: 0.5mm pitch, Bottom contact, 26-position

Pin	Type	Description
1	P	GND
2	I/O	X13
3	I/O	X12
4	I/O	X11
5	I/O	X10
6	I/O	X9
7	I/O	X8
8	I/O	X7
9	I/O	X6
10	I/O	X5
11	I/O	X4
12	I/O	X3
13	I/O	X2

Pin	Type	Description
14	I/O	X1
15	I/O	X0
16	P	GND
17	P	GND
18	I/O	Y0
19	I/O	Y1
20	I/O	Y2
21	I/O	Y3
22	I/O	Y4
23	I/O	Y5
24	I/O	Y6
25	I/O	Y7
26	P	GND

2 Overview of the 3.5in PCAP Touch Display

2.1 Introduction

The TD3500 3.5in PCAP Touch Display is a 3.5in LCD panel bonded to a touchscreen sensor. The module is intended for off-the-shelf integration into a design requiring a proven touch interface solution. It offers best-in-class projected capacitance multi-touch functionality when interfaced to an Atmel maXTouch touch controller such as the mXT112S.

As shown in Figure 2 below, the module provides the system host direct access to the LCD and touch sensor components for maximum host system flexibility.

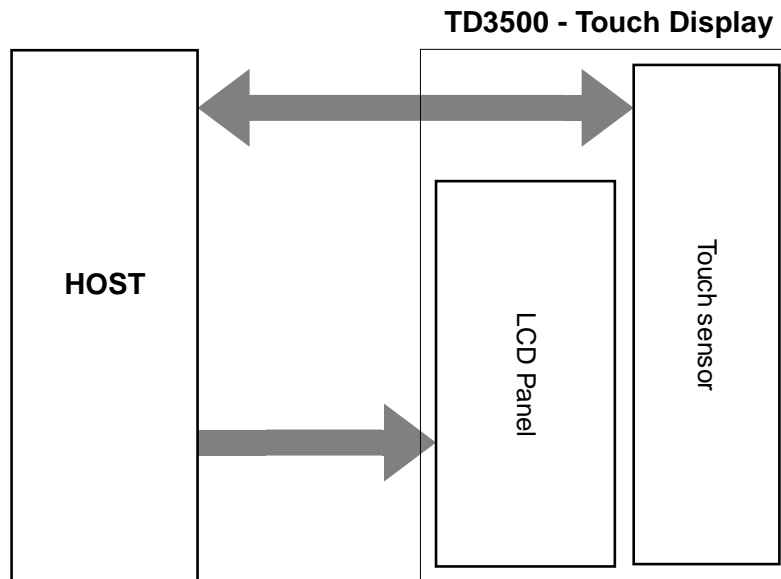


Figure 2 - Functional Block Diagram

2.2 Background Concepts

Throughout this document, the functionality of the module sub-system will be outlined and summarized. However, the user is encouraged to refer to the resources and documents below in order to gain a more thorough understanding of each sub-system.

- Atmel maXTouch mXT112S Datasheet (www.atmel.com)
- ILI Technology Corp ILI9488 Driver IC (www.ilitek.com)

In addition, when developing for the TD3500, the user is *strongly* encouraged to leverage resources outlined in Section 3.2

Visit www.pdaatl.com/td3500 for the latest information on this module.

2.3 LCD Panel

The module provides the host with a direct connection to the LCD panel interface ([Display Flex Tail](#)). Aside from generating supply voltages for the LED backlight and providing backlight control to the host, no display panel control is performed by the module.

The TD3500 display features an ILI 9488 internal driver IC and supports several of the ILI9488's interface modes which can be selected using the IM0, IM1 and IM2 on the [Display Flex Tail](#) according to Table 2-1 below.

Table 2-1 – Interface Mode Selection

IM2	IM1	IM0	ILI9488 Interface Mode
0	0	0	Not supported: DBI-B: 24-bit (DB_EN = 1)
0	0	0	DBI-B: 18-bit (DB_EN = 0)
0	0	1	DBI-B: 9-bit bus
0	1	0	DBI-B: 16-bit
0	1	1	DBI-B: 8-bit
1	0	1	DBI-C: 3-line SPI
1	1	0	Not supported: DSI
1	1	1	DBI-C: 4-line SPI

For further details on interfacing to the ILI9488 contact ILITEK (www.ilitek.com). Also, refer to Section 3.2 below for additional resources.

2.4 Touch Sensor

The touch display's sensor design is based on the Atmel maXTouch family of touch controllers. It uses a matrix of 14X and 8Y lines for a total of 112 nodes. The mXT112S Touch Controller (or better) is recommended for this design.

Contact Precision Design Associates (www.pdaatl.com) if you require assistance with designing a touch sensor interface.

3 Getting Started

The TD3500 is intended for use with a customer system design. Therefore, many details of interfacing the module will be unique to each design.

The following sections provide basic information related to using the Touch Display. Visit the Precision Design Associates website (www.pdaatl.com/td3500) for more information related to this touch module or contact Precision Design Associates for guidance appropriate for your specific design.

3.1 Hardware Connections

The module interfaces with the host system via the flex tails described in Section 1.



Note the location of Pin 1 on all flex cables as identified in Figure 1 when designing and connecting to a host system. Depending on the PCB orientation and connector mounting side, pin 1 location of the flex cable(s) may not correspond to the pin 1 location of the connector footprint used for a given PCB layout.

3.2 Software

Design integration with host system software is highly specific to each case. However, several options exist to act as references. Check the Precision Design Associates website (www.pdaatl.com/td3500) for updates and links to demo binaries for use with the TD3500.

3.2.1.1 Atmel Studio and Atmel Software Framework

Atmel Studio (www.atmel.com/atmelstudio) is Atmel's free IDE and tool chain. It includes support for a variety of Atmel's MCUs devices and provides a means to start developing "bare-metal" software for the TD3500.

The Atmel Software Framework (asf.atmel.com) contains examples of code for interfacing with devices in the maXTouch family of touch controllers. The capabilities of various maXTouch devices may differ, but the basic communication protocol is common and can be applied to this module.

The ASF also includes drivers for ILI driver ICs, with support for the ILI9488 being prepared for upcoming release.

3.2.1.2 Linux Kernel / Android

The Linux Kernel (www.kernel.org) has included basic support for maXTouch touch devices since version 2.6.36. The mainline driver has since undergone considerable evolution.

Atmel hosts the AT91 ARM community website with resources dedicated to developing their EKs for Android (www.at91.com/android4sam) and Linux (www.at91.com/linux4sam)

In addition, Atmel's touch group maintains patches (www.github.com/atmel-maxtouch/linux) which provide numerous out-of-cycle improvements to the mainline Linux Kernel driver for maXTouch devices.

4 Specifications

For complete specifications, refer to the resources listed in section 2.2 for the various sub-system components outlined in Sections 2.3 and 2.4 or contact PDA.

4.1 Mechanical Specifications

Drawings and CAD models are available upon request.

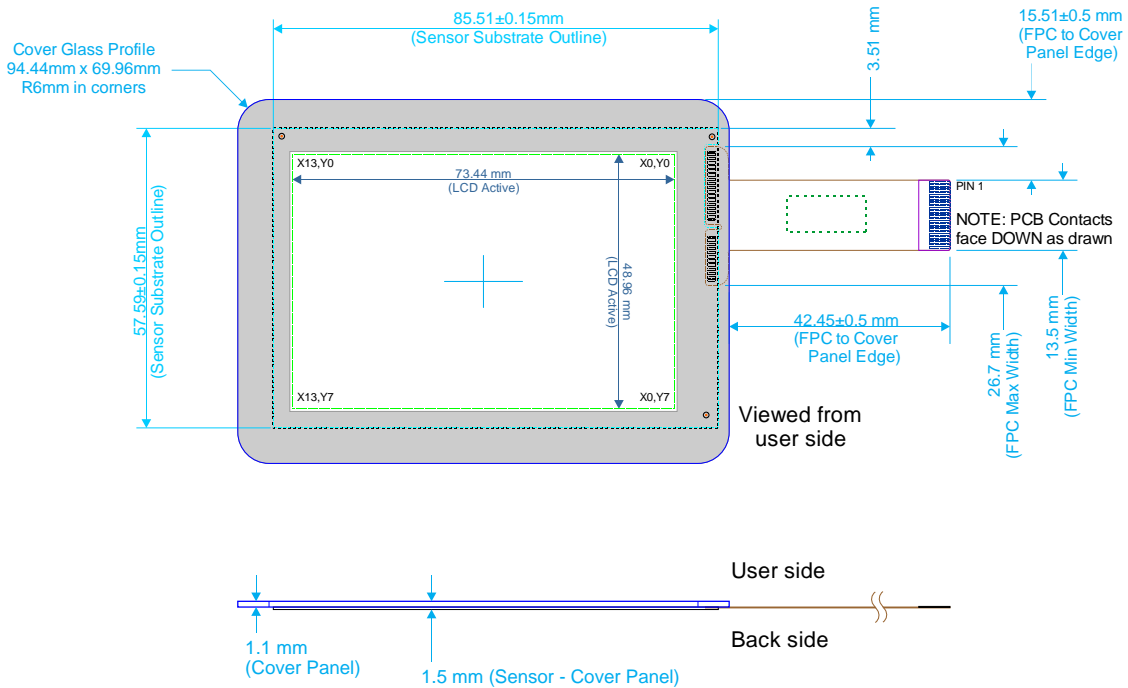


Figure 3 - Sensor Only Dimensions

Sensor (P/N: 90-00023-A1) may be purchased individually.
Minimum order quantities apply. Contact PDA for details.

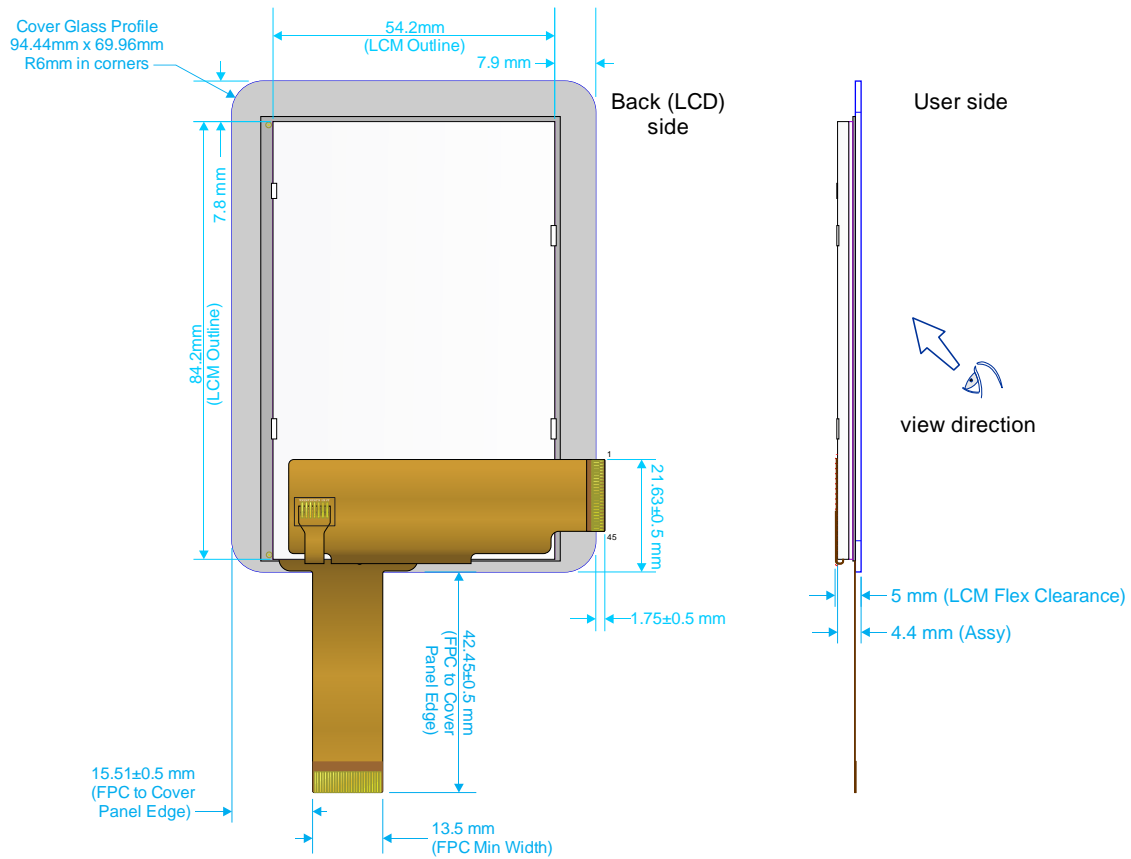


Figure 4 – Module Dimensions

4.2 Module Parameters


Parameter	Value
Module Size	3.5in
Overall Dimensions	69.96mm (H) x 94.44mm (W) x 4.4mm (T)
Overall Weight	36.5g

4.3 LCM Parameters

Parameter	Value
Display Size	3.5in
LCD Type	α -Si TFT
Display Mode	TN / Transmissive
Resolution	320 x RGB x 480
View Direction (Best Image)	6 O'clock (Portrait, LCD flex end at bottom)
Dimensions	54.16mm (H) x 84.21mm (W) x 2.15mm (T)
Active Area	48.96mm x 73.44mm
Pixel Size	0.153mm x 0.153mm
Pixel Arrangement	Stripe
Display Colors	262K
Interface	Configurable by IM0, IM1 and IM2. See section 2.3.
Driver IC	ILI9488
Weight	15.5g

4.4 LCM Absolute Maximum Specifications

Parameter	Description	Min	Max	Units
V_{CC}	Supply Voltage	-0.3	4.6	V
IOV_{CC}	IO Supply	-0.3	4.6	V
V_I	Input Voltage	-0.3	$IOV_{CC} + 0.3$	V
T_{STG}	Storage temperature	-30	+80	$^{\circ}C$
T_{OP}	Operating temperature	-20	+70	$^{\circ}C$
H_{STG}	Storage humidity ($T_a < 50^{\circ}C$)	10	90	%RH
	Storage humidity ($T_a > 60^{\circ}C$)	10	60	%RH
H_{OP}	Operating humidity ($T_a < 50^{\circ}C$)	10	90	%RH
	Operating humidity ($T_a > 60^{\circ}C$)	10	60	%RH

 **CAUTION:** Stresses beyond those listed under *Absolute Maximum Specifications* may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or other conditions beyond those indicated in the operational sections of this specification are not implied. Exposure to absolute maximum specification conditions for extended periods may affect device reliability.

4.5 LCM DC Specifications

Parameter	Description	Min	Typ	Max	Units
V _{CC}	Power Supply	2.4	2.8	3.3	V
IOV _{CC}	IO Supply	1.65	1.8	3.3	V
V _{IL}	Low input logic level	- 0.3 IOV _{CC}	–	0.3 IOV _{CC}	V
V _{HL}	High input logic level	0.7 IOV _{CC}	–	IOV _{CC}	V
V _{OL}	Low output voltage	–	–	0.2 IOV _{CC}	V
V _{OH}	High output voltage	0.8 IOV _{CC}	–	–	V

4.6 LCM Backlight Specifications

Parameter	Description	Min	Typ	Max	Units
V _f	Forward Voltage (Ta=25°C, I _f =15mA)	–	3.2	3.5	V
I _f	Forward Current (Ta=25°C, V _f =3.2A), per LED	–	20	–	mA
	LED Configuration	6x White LED in parallel			
	Drive method	Constant current			
L _v	Luminance	280	300	–	cd/m ²
Avg	Uniformity	80	85	–	%
CIE _x	CIE (X)	0.26	0.28	0.3	
CIE _y	CIE (Y)	0.26	0.28	0.3	
P _d	Power Dissipation	–	384	–	mW
V _{AK}	Backlight Driving Voltage	–	3.3	3.5	V

4.7 LCM Optical Characteristics

Backlight On (Transmissive Mode).

Parameter	Description	Min	Typ	Max	Units
L _V	Luminance	280	300	–	cd/m ²
CR	Contrast Ratio	–	300	–	
T _R	Response Time (rise: 10% to 90%)	–	10	20	ms
T _F	Response Time (fall: 90% to 10%)	–	20	30	ms
X _R	Chromaticity: Red	0.586	0.636	0.706	–
Y _R		0.281	0.339	0.401	–
X _G	Chromaticity: Green	0.251	0.290	0.371	–
Y _G		0.569	0.603	0.689	–
X _B	Chromaticity: Blue	0.083	0.142	0.203	–
Y _B		0.014	0.053	0.134	–
X _W	Chromaticity: White	0.2600	0.2900	0.3200	–
Y _W		0.2800	0.3100	0.3400	–
-	NTSC Ratio (Gamut)	–	60	–	–

4.8 TD3500 Part Number

Part Number	Description
90-00024-A1	TD3500: 3.5" Touchscreen Display

5 Revision History

Revision No.	History
Rev1410-1-1b	Initial release

6 Notes



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