

48-F-MARS-104-MDL-01D

Multi-Analog Resistive LCD Module

The information provided in this document is intended as a guide only and is subject to change without notice. Touch International is committed to continually advancing product designs; therefore,

product specifications may be subject to change without notification. Please contact your Touch International Sales Representative for the most recent specification.

– COPYRIGHT –

This document is the sole property of Touch International. The information contained within is Proprietary and may not be reproduced or disclosed to third parties without the prior written consent of Touch International. Touch International may have patents or pending patent applications, trademarks, copyrights or other intellectual property rights covering subject matter in this document.

– IMPORTANT NOTICE –

A variety of factors can affect the performance and use of Touch International products. The customer is responsible for evaluating the product and software to insure it is suitable for the intended application. Touch International statements, engineering/technical information and recommendations are provided for the user's convenience, but their accuracy or completeness is not warranted.

Specifications are subject to change without notice. Touch International products and software are warranted to meet their published specifications from the date of shipment and for the period stated in the specification.

The customer is responsible for determining whether the Touch International products and software are applicable to the application and is suitable for its production process. In the event of a defective product, Touch International is only obligated to cover failures due to defects in materials or workmanship that occur in normal use. Touch International is not obligated to cover damage that occurs in shipment, failures that are caused by products not supplied by Touch International, failures that result from accident, misuse, abuse, neglect, water damage, mishandling, misapplication, faulty installation, set-up adjustments, improper maintenance, alteration, line power surge, external product damage including field damage, modification or service not approved by Touch International or damage that is attributable to acts of God.

Copyright © 2009 - Touch International - All Rights Reserved

Last Revision Date: 06/09/2010

Document Number: 6500452

Revision: 1.1

Document Revision History				
Revision	Page	Content	Revised By	Date

Revision	Page	Content	Revised By	Date
----------	------	---------	------------	------

1.0	1-37	Technical Specification	Bhushan Vaidya	10/05/2009
1.1	11-14	New Information and Updated Controller Drawing	Jamie Sewell	6/9/2010

Document Designed By Engineering Department		
Prepared	Checked	Approved
Bhushan Vaidya	Liem Do	Kelly Leff

Table of Contents

1.0 General Specifications	6
1.1 Introduction	6
1.2 Package Contents	6
1.3 Features	6
1.4 Controller Specifications	6
1.5 Touch Screen Specifications	7
1.6 LCD Specifications	7
1.7 LCD Drive Board Specifications	7
1.8 Block Diagram and Operating Procedure	8
2.0 Touch Screen Specifications	9
2.1 Product Applicable	9
2.2 Structure	9
2.3 Environmental Specifications	9
2.4 Mechanical Characteristics	9
2.5 Electrical Characteristics	9
2.6 Sensor Drawing	10
2.7 General Touch Screen Information	11
3.0 Controller Specifications	13
3.1 General Specifications	13
3.2 Controller Drawing	14
4.0 LCD Drive Board Specifications	15
4.1 Introduction	15
4.2 General Specifications	15
4.2.1 Video Input	15
4.2.2 Color System	15
4.2.3 Input Voltage	15
4.2.4 Temperature	15
4.3 Electrical Characteristics	15
4.3.1 Electrical Table	15
4.3.2 Electrical Characteristics	15
4.4 OSD Function	16
4.4.1 OSD Language	16
4.4.2 Picture	16
4.4.3 Other Function	16
4.5 Circuit Panel Diagram	16
4.6 Connector Specifications	16
4.6.1 J1 Connector	17
4.6.2 J5 Connector	17
4.6.3 J6 Connector	17
4.6.4 J12 LCD Connector	17
4.6.5 J13 LCD Connector	18
4.6.6 J2 Connector	19

5.0 LCD Specifications	21
5.1 General Description	21
5.2 General Specifications	21
5.3 Environmental Specifications	21
5.4 Electrical Characteristics	22
5.4.1 Operating Conditions	22
5.4.2 Backlight Driving for Power Consumption	22
5.5 DC Characteristics	22
5.5.1 Parameters	22
5.5.2 Power Sequence	23
5.6 AC Characteristics	23
5.6.1 Data Timing	24
5.6.2 AC Electrical Characteristics	25
5.7 Optical Characteristics	25
5.8 Interface LMC PIN Definition	26
5.9 Block Diagram	29
5.10 Quality Assurance	29
5.11 Outline Drawing	30
6.0 Handling and Caution for Complete Module	32
6.1 Cautions When Unpacking the Module	32
6.2 Cautions For Handling the Module	32
6.3 Cautions For Operation	32
6.4 Cautions For Operating Environment	32
6.5 Cautions For the Module Characteristics	32
6.6 Other Cautions	32
6.7 Cautions For Maintaining Module	32
7.0 Ordering Information	32

1.0 General Specifications

1.1 Introduction

Touch International's 48-F-MARS-104-MDL-01D Module is equipped with a Multi-Analog Resistive Touch screen and a controller integrated to a LCD plug and play unit.

Designed to interface with computer systems through USB-UART interfaces, the 48-B-MARS-01D controller is compatible with USB and Serial interface. This product allows users to understand the functionality of MARS product and its versatility in different applications. Featuring up to 10-finger input capabilities, the 48-F-MARS-104-MDL-01D MARS module can help take your product application to the next level.

1.2 Package Contents

(Includes One of Each)

10.4" MARS Touch screen (48-F-MARS-104-01D)
Controller Package (48-B-MARS-01D)
USB interface cable 1300212D
RS232 interface cable 1300235D
10.4" LCD (8700177)
VGA Drive Kit (13B0107)
OSD Board (1500189)
Power Adapter (1500188)
VGA Cable (1300277)
Display Backer Components (1900566)

1.3 Features

X/Y Position Reporting	Absolute Position
Touch Force	Contact Pressure Required
Inputs	Regular touch, Glove and Pen
Gesture	Yes
Palm Rejection	Yes (Possible)
Touch Inputs	1 to 10 finger input

1.4 Controller Specifications

CPU	24MHz
Power Requirements	5[V]: USB by bus power or AC adapter (5[V],1[A])(RS232C operation only) Supply voltage: 4.75[V] / 5.25[V] 3.3[V]: RS232C operation only
Response Time	4x4 division 1 point detection: 7ms, 2 point detection: 32ms 8x10 division 1 point detection: 13ms, 2 point detection: 38ms
Connector Distance	Distance between CN1 and CN2: 20.0 [mm] Distance between CN1 and the edge of Substrate: 25.0[mm] Distance between CN2 and the edge of Substrate: 15.0[mm]
Power Consumption	42mA

1.0 General Specifications

1.5 Touch Screen Specifications

Operating Temperature	-20°C to 70°C (No Condensation)	
Storage Specification	-40°C to 80°C (No Condensation)	
Light Transmittance	Over 80% (Typical Value at Full Wavelength)	
Activation Force	0.05N to 0.8N	
Operating Life	Input (Finger)	10,000,000 Hits
	Character Input (Pen)	100,000 Characters

1.6 LCD Specifications

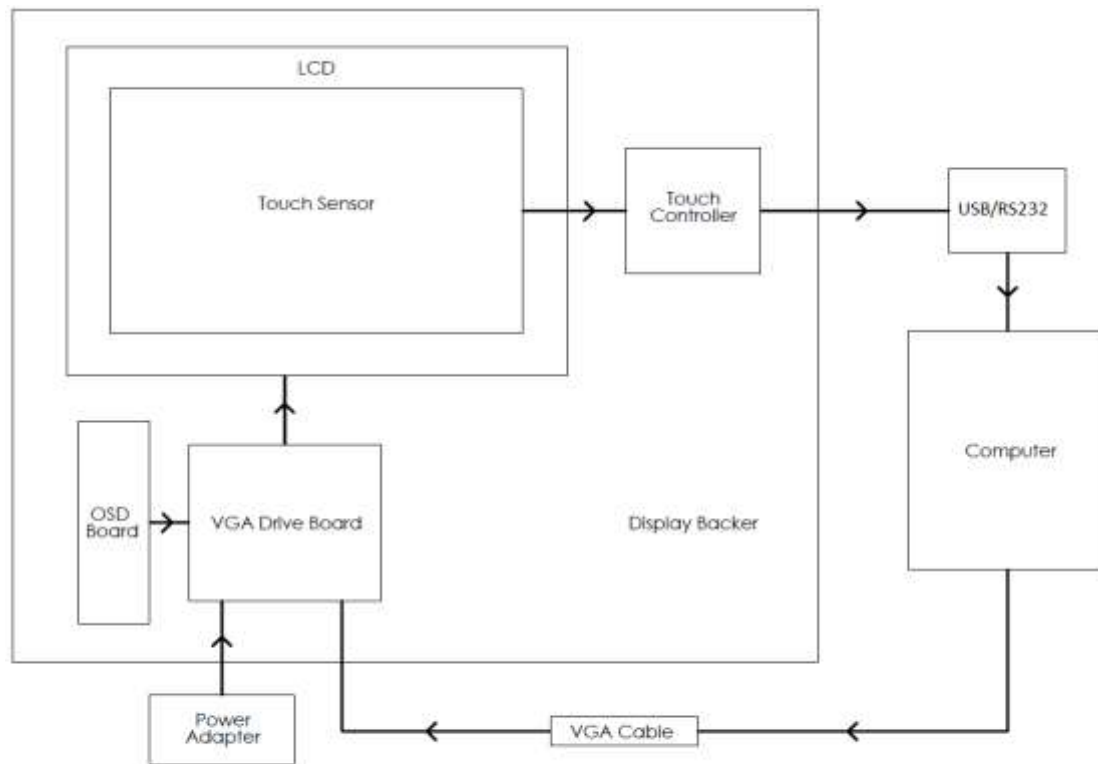
LCD Screen Size	10.4" Diagonal
Aspect Ratio	Widescreen 4:3
Brightness	200-250 cd/m ²
Contrast Ratio	500:1
Viewing Angle	140° Horizontal / 110° Vertical
Response Time	5ms Rise / 15ms Fall
Pixel Pitch	0.088mm × 0.264mm
Outline Dimension	228.4mm (W) x 175.4mm (H) x 5.9mm (D)
Backlight	LED

1.7 LCD Drive Board Specifications

Video Input	Composite Signal Input and VGA Signal Input
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 and Operating Procedure



Operating Procedure:

1. Connect all the cables as shown above.
2. Plug Power Supply to the module.
3. Adjust screen resolution to 800 X 600 (60Hz).
4. If display does not turn ON automatically, press the power button on the OSD board.
5. Run MARS CD and copy all the contents of the CD onto your desktop
6. Go to: Application\MAR_Sample01.
7. Open MAR_Sample-1 in notepad and select the Com Port, Serial Port as it shows in your device manager. E.g.: PORT = 7. Save and exit.
8. Run the MARS CD and go to Application\MARS_Sample01.
9. Double click MARS_Sample01
10. Touch will be enabled.
11. On the left bottom corner of task bar, click on TI/DMC icon. Single click the icon to see various features/options. Use Multiline and other applications to see features of MARS.

*For detailed serial and USB-UART operating instructions, please refer to the MARS User Guide, Document# 6500423.

2.0 Touch Screen Specification (48-F-MARS-104-MDL-01D)

2.1 Product Applicable

This specification guide applies to the Multi-Touch Analog Resistive Touch screen (MARS) Series.

2.2 Structure

See drawing for dimensions, structure and shape.

2.3 Environmental Specifications

Specification	Value
Operating Temperature	-20°C to 70°C (No Condensation)
Operating Humidity	-20°C to 60°C Less than 90%RH (No Condensation) Exceeding 60°C 133.8g/m ³ (No Condensation)
Storage Temperature	-40°C to 80°C (No Condensation)
Storage Humidity	-40°C to 60°C Less than 95%RH (No Condensation) Exceeding 60°C 142.9g/m ³ (No Condensation)
Chemical Resistance (Top Surface)	Toluene, Trichloroethylene, Athetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.

2.4 Mechanical Characteristics

Specification	Value	
Activation Force	0.05N to 0.8N	
Operating Life	Input (Finger)	10,000,000 hits
	Character Input (pen)	100,000 characters
Light Transmittance	Over 80% (Typical Value at Full Wavelength)	
Surface Hardness	Over 2H (by JIS pencil hardness)	

2.5 Electrical Characteristics

Specification	Value	
Maximum Voltage	DC6V	
Maximum Current	Top Electrode	100mA
	Bottom Electrode	100mA
	Between the Top and Bottom	0.5mA
Linearity	Under ±2% (Under ±1% (Typical Value)	
Terminal Resistance	Top Electrode	Less than 3kΩ
	Bottom Electrode	Less than 3kΩ
Insulation Resistance	Neighboring Terminals	Over 100MΩ at 25V
	Active Area Electrodes	Over 100MΩ at 25V
Chattering	Less than 10msec at ON/OFF.	

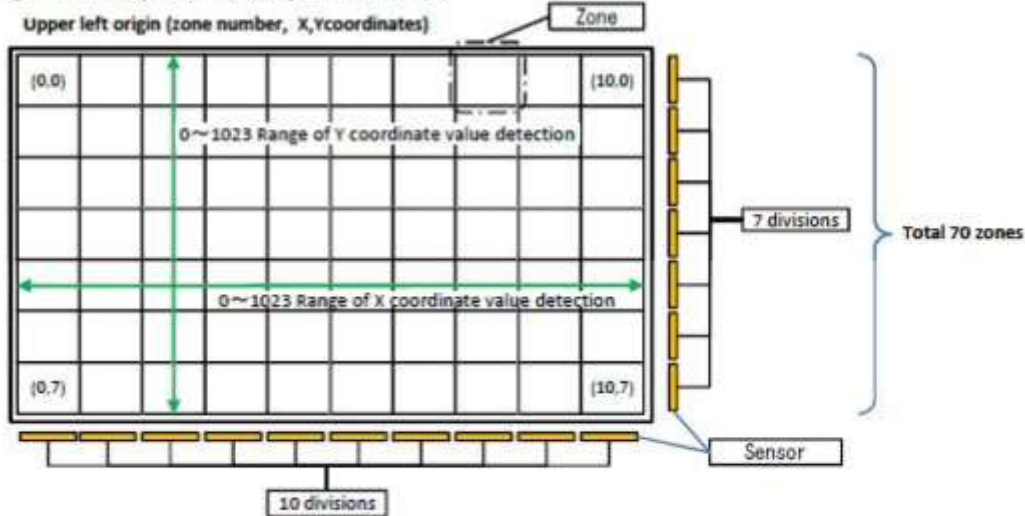


2.0 Touch Screen Specification (48-F-MARS-104-MDL-01D)

2.6 General Touch Screen Information

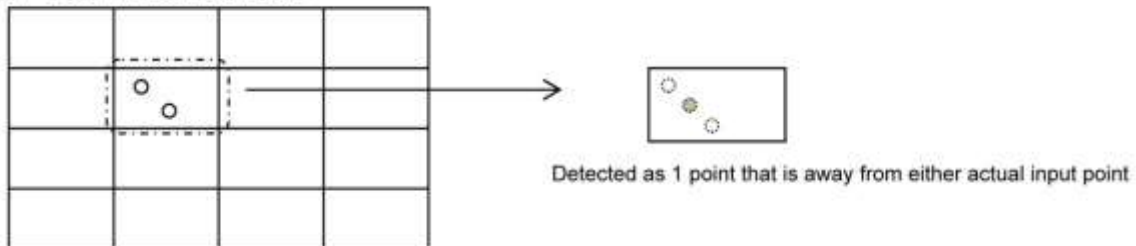
The MARS touch screen is divided into “zones” in X and Y directions. The coordinate values of multiple touched points are acquired by detecting touch (input) information on each individual zones. The number of zones can be customized in X and Y directions at customer’s choice with maximum 17 electrodes per IC. For example, MARS will have 70 zones if the division pattern is 7x10 (fig 1-1). With 4 supplemental electrodes, no calibration is needed except for the alignment correction before shipment.

Fig.1-1 (Example of division pattern: 7 x 10)



Two input points in the same zone cannot be detected accurately (fig.3-1-a)
(If multiple points are touched on the same zone, an intermediate point will be detected).

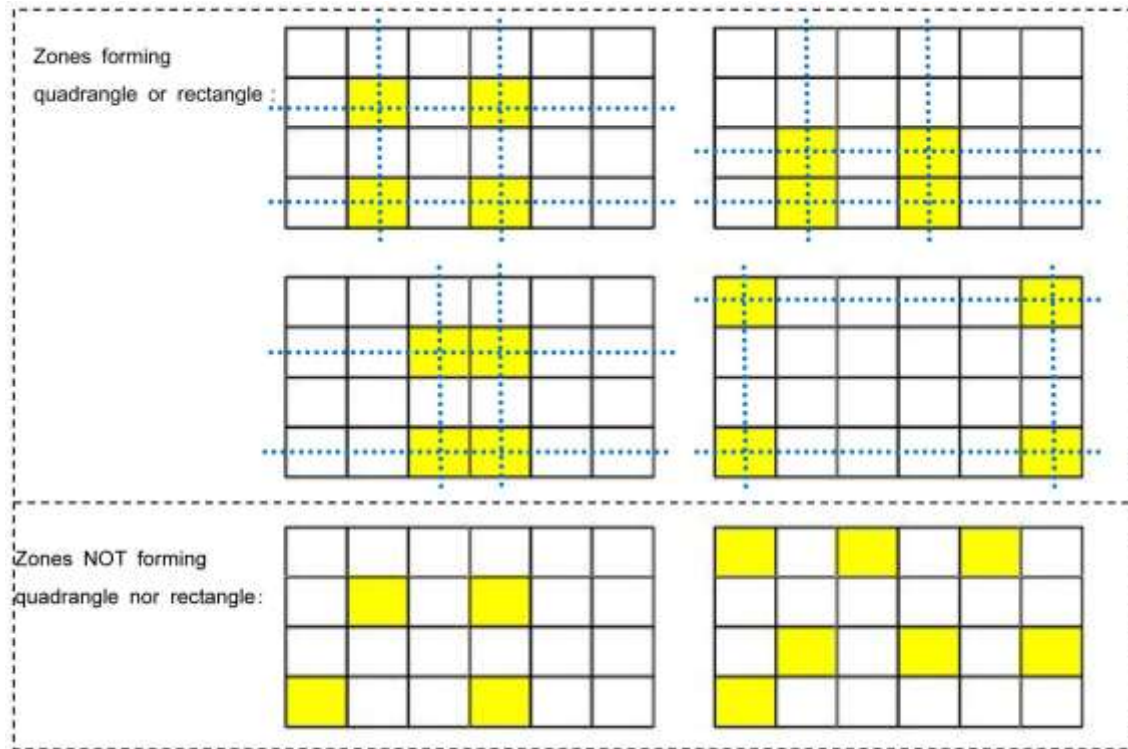
fig.3-1 two point touches on the same zone



2.0 Touch Screen Specification (48-F-MARS-104-MDL-01D)

2.6 General Touch Screen Information

When more than 4 zones are touched and these zones form a quadrangle or rectangle, the MARS controller cannot detect the coordinate information accurately on any touched zone.



If these touch inputs are performed, the MARS controller will not output correct coordinate points. It will output coordinate values closer to the center of the formed quadrangle/rectangle or will not output any coordinate values at all.

3.0 Controller Specifications (48-B-MARS-01D)

3.1 General Specifications

CPU	24MHz
Power Requirements	5[V] : USB by bus power or,AC adapter(5[V],1[A])(RS232C operation only) Supply voltage : 4.75[V] / 5.25[V] 3.3[V] : RS232C operation only
Response Time	4x4 division 1 point detection : 7ms, 2 point detection : 32ms 8x10 division 1 point detection : 13ms, 2 point detection : 38ms
Connector Distance	Distance between CN1 and CN2 : 20.0 [mm] Distance between CN1 and the edge of Substrate : 25.0[mm] Distance between CN2 and the edge of Substrate : 15.0[mm]
Power Consumption	42mA

4.0 LCD Drive Board Specifications (13B0107)

4.1 Introduction

10.4" Color TFT LCD Module includes a drive board (TI# 13B0107) and a 10.4" digital TFT LCD panel (TI# 8700177) and supports both PAL & NTSC. This module 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

1. (1) NTSC Composite Signal Input (H=15.734KHz±0.1KHz V=60Hz±1%)
(2) PAL Composite Signal Input (H=15.625KHz±0.1KHz V=50Hz±1%)
1.0Vp-p/75Ω
2. VGA 800*480/60Hz 1.0Vp-p/75Ω
VGA 640*480/60Hz 1.0Vp-p/75Ω

4.2.2 Color System

NTSC, PAL, AUTO Selection

4.2.3 Input Voltage

DC12.0V±4.0V (350mA±30mA)

4.2.4 Temperature

Operating Temperature	-10°C ~ +50°C
-----------------------	---------------

Storage Temperature	-20°C ~ +70°C
---------------------	---------------

4.3 Electrical Characteristics

4.3.1 Electrical Table

1	Input Voltage	DC12.0V±4V
2	Video Input	1. Composite Signal Input 1.0Vp-p/75Ω 2. VGA Signal Input 1.0Vp-p/75Ω
3	OSD Language	English
4	User OSD Control	Brightness, Color, Contrast, Up/Down, Left/Right, AV/VGA, Sleep Time Set, etc.
5	OSD Mode	Key
6	Other Control	No Signal Auto Blue Screen, VGA Color Auto Adjustment
7	Brightness	>250 cd/m ²
8	Operating Temperature	-10°C ~ +50°C
9	Storage Temperature	-20°C ~ +70°C

4.3.2 Electrical Characteristics (Ta=25°C)

Power Input (VIN)	Current (IIN)		
	MIN	Initial	MIN
+9.0V	360 mA	+9.0V	360 mA
+12.0V	290 mA	+12.0V	290 mA
+15.0V 2	20 mA	+15.0V 2	20 mA

4.0 LCD Drive Board Specifications (13B0107)

4.4 OSD Function

4.4.1 OSD Language

English/Chinese

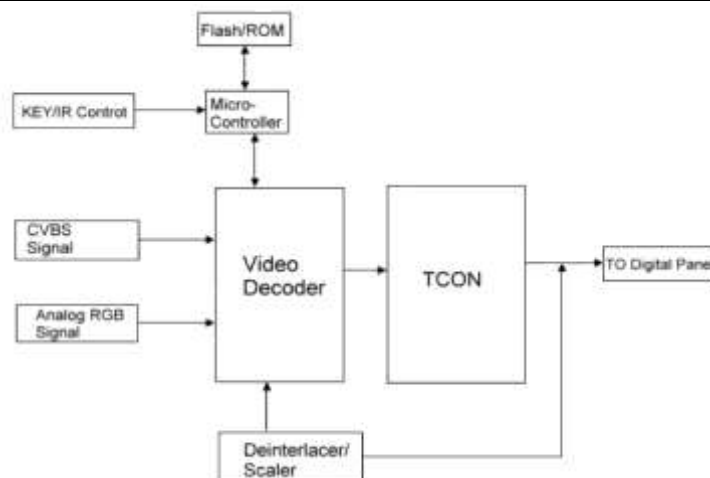
4.4.2 Picture

Picture Module	STAND	USER
Brightness	50	0 <----> 100
Color	50	0 <----> 100
Contrast	50	0 <----> 100

4.4.3 Other Function

Up/Down Control, Left/Right Control, AV/VGA, Sleep Time Set

4.5 Circuit Panel Diagram

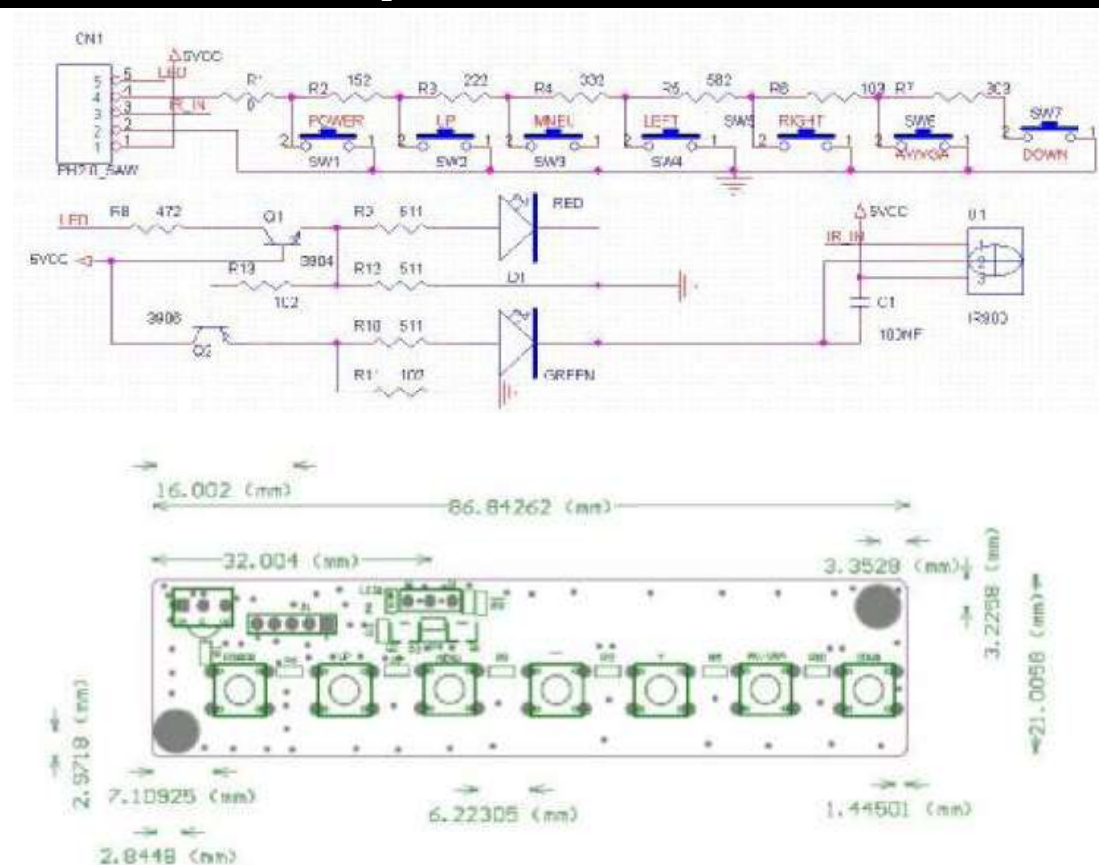


4.6 Connector Specifications

4.6.1 J1 (4P-2.0) Connector

Pin No.	Symbol	Function
1	VCC5V	5V Out
2	GND	Ground
3	KEY_IN	Key Input
4	AV/VGA	AV/VGA Switch

4.0 LCD Drive Board Specifications (13B0107)



4.6.2 J5 Connector

Pin No.	Symbol	Function
1	POWER_IN	+12V Input
2	PGND	Power Ground
3	PGND	Power Ground

4.6.3 J6 Connector

Pin No.	Symbol	Function
1	CVBS	AV Input
2	AGND	Analog Ground

4.6.4 J12 (30 Pin 0.5mm) LCD Connector

Pin No.	Symbol	Function
1	POL	Polarity Selection
2	STVD-	Vertical Start Pulse Input when U/D=H
3	OEV	Output Enable
4	CKV	VERTICAL CLOCK
5	STVU	Vertical Start Pulse Input when U/D=L

4.0 LCD Drive Board Specifications (13B0107)

4.6.4 J12 (30 Pin 0.5mm) LCD Connector

Pin No.	Symbol	Function
1	POL	Polarity Selection
2	STVD-	Vertical Start Pulse Input when U/D=H
3	OEV	Output Enable
4	CKV	VERTICAL CLOCK
5	STVU	Vertical Start Pulse Input when U/D=L
6	GND	Power Ground
7	EDGSL	Select Rising Edge or Falling Edge
8	VCC	Power Supply
9	V9	Gamma Voltage Level 9
10	VGL	Gate OFF Voltage
11	V2	Gamma Voltage Level 2
12	VGH	Gate ON Voltage
13	V6	Gamma Voltage Level 6
14	U/D	UP/DOWN Selection
15	VCOM	Common Voltage
16	GND	Power Ground
17	AVDD	Power Supply for Analog
18	V14	Gamma Voltage Level 14
19	V11	Gamma Voltage Level 11
20	V8	Gamma Voltage Level 8
21	V5	Gamma Voltage Level 5
22	V3	Gamma Voltage Level 3
23	GND	Power Ground
24-29	R5 - R0	Red Data
30	GND	Power Ground

4.6.5 J13 (30 Pin 0.5mm) LCD Connector

Pin No.	Symbol	Function
31	GND	Power Ground
32-37	G5~G0	Green Data
38	STHL	Horizontal Start Pulse Input when U/D=H
39	REV	Control Signal is Inverted or Not
40	GND	Power Ground

4.0 LCD Drive Board Specifications (13B0107)

4.6.5 J13 (30 Pin 0.5mm) LCD Connector

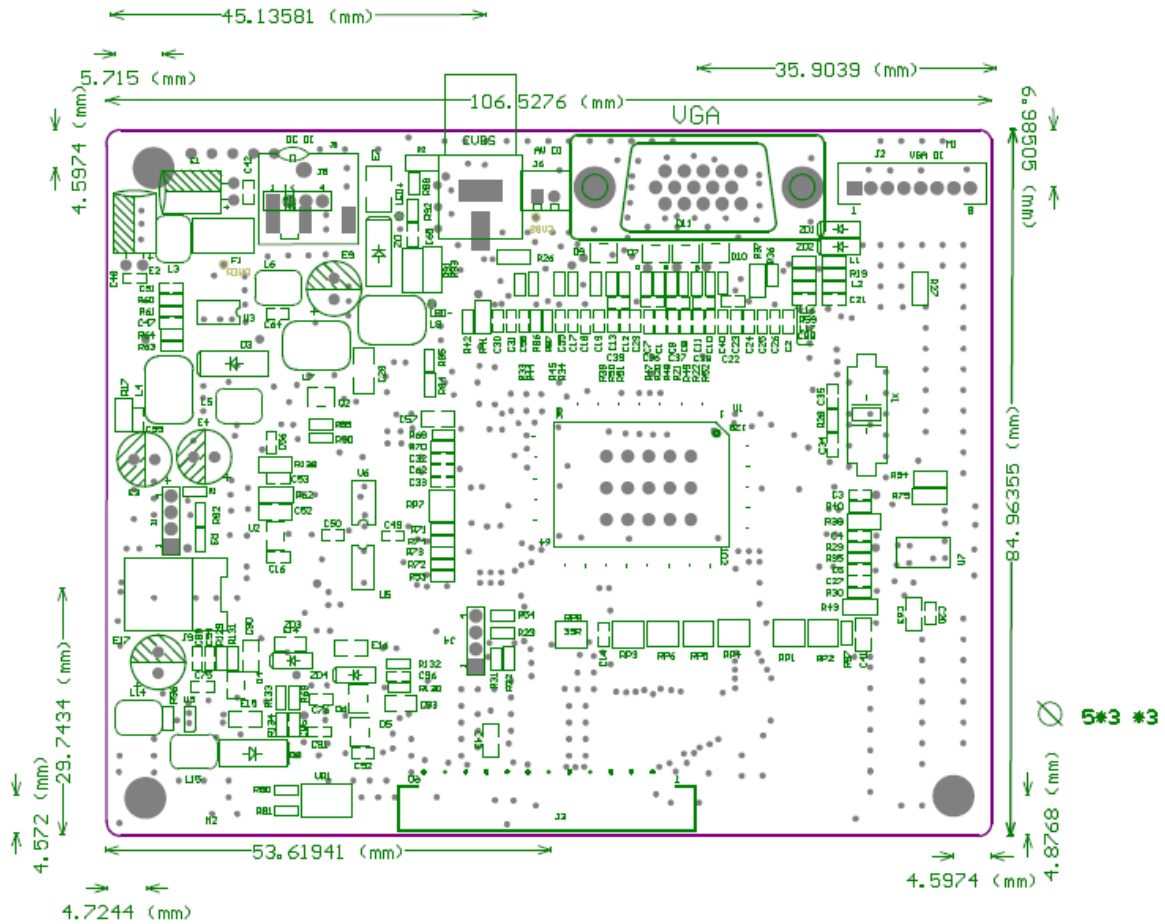
Pin No.	Symbol	Function
41	DCLK	Sample Clock
42	DVDD	Power Supply for Digital Circuit
43	STHR	Horizontal Start Pulse Input when U/D=L
44	LD	Latches the Polarity of Outputs and Switches the New Data to Outputs
45-50	B5~B0	Blue Data
51	R/L	Right/Left
52	V1	Gamma Voltage Level 1
53	V4	Gamma Voltage Level 4
54	V7	Gamma Voltage Level 7
55	V10	Gamma Voltage Level 10
56	V12	Gamma Voltage Level 12
57	V13	Gamma Voltage Level 13
58	AVDD	Power Supply for Analog Circuit
59	GND	Power Ground
60	VCOM	Common Voltage

4.6.6 J2 Connector

Pin No.	Symbol	Function
1,2,7,11,14,15	--	--
3	BIN	VGA Blue Input
4	GIN	VGA Green Input
5	RIN	VGA Red Input
6,8-10	AGND	Analog Ground
12	VSYNC	VGA VSYNC Input
13	HSYNC	VGA HSYNC Input

4.0 LCD Drive Board Specifications (13B0107)

PCB Structural Diagram



Precautions

1. Voltage should not exceed the upper limit.
2. Do not connect the connector in reverse; otherwise it will burn the board.
3. When in operation, do not touch the drive board. High voltage may cause injury.
4. Always use precaution and wear an anti-static strap to avoid ESD damage to the VGA board.
5. 10.4" TFT-LCD Panel is glasswork. Please place carefully.
6. The FPC tail connects the 10.4" TFT LCD Panel to the PCB. Please operate carefully to avoid damage.
7. Do not touch key's pin when adjusting the color brightness through soft key, in order to not affect the image touched.

5.0 LCD Specifications (8700177)

5.1 General Description

8700177 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 10.4" (diagonal) active display area with SVGA (800 x 600) resolution.

5.2 General Specifications

LCD Size	10.4" Diagonal	
Display Mode	Normally White. Transmissive Type.	
Number of Pixels	800 x 600	
Display Color	16.2 Million	
Active Area	211.2mm (H) x 159.4mm (V)	
Pixel Pitch	88mm (H) x 264mm (V)	
Pixel Configuration	RGB	
NTSC	50%	
Interface	Digital 24-bit RGB	
Outline Dimensions	228.4mm (H) x 175.4mm (V) x 5.9mm (D)	
Weight	390g	
Temperature Range	Operation	-20°C - 70°C
	Storage	-30°C - 80°C

5.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Voltage	VCC	GND=0	-0.3	6	V
	AVDD	GND=0	-0.3	13.5	V
	VGH	GND=0	-0.3	+40	V
	VGL	GND=0	VGH-40	+0.3	V

Note:

- All of the voltages listed above are in relation to GND= 0V.
- Device is subject to permanent damage if stressed beyond the absolute maximum ratings listed above.

5.0 LCD Specifications (8700177)

5.4 Electrical Characteristics

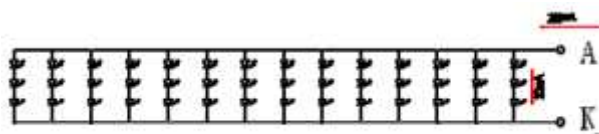
5.4.1 Operating Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltages	VCC	3.0	3.3	3.6	V	-
Digital Supply Current Consumption	IVCC	-	TBD	-	mA	Black Pattern
Analog Power Supply Voltage	AVDD	11.5	12	12.3	V	-
Analog Supply Current Voltage	IAVDD		TBD	-	Ma	Black Pattern
Gate Driver Positive Supply Voltage	VGH	20	24	30	V	-
Gate Driver Positive Supply Current	IVGH	-	TBD	-	mA	Black Pattern
Gate Driver Negative Supply Voltage	VGL	-10	-7	-5	V	-
Gate Driver Negative Supply Current	IVGL	-	TBD	-	mA	Black Pattern
Common Electrode Driving Voltage	VCOM	-	TBD	-	V	Black Pattern

5.4.2 Backlight Driving for Power Consumption

Parameter	Symbol	Min.	Typ.	Max.	Unit
LED Current	ILED	-	280	-	mA
LED Voltage	VLED	9.0	9.9	0	V
LED Life Time	-	10000	-	-	Hours

There are 14 Groups LED shown as below, VLED=9.9V.



5.5 DC Characteristics

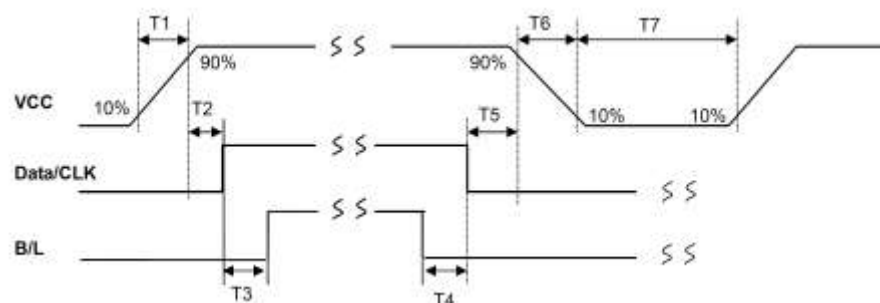
5.5.1 Parameters

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Low Level Input Voltage	V _{IL}	0	-	0.3VCC	V
High Level Input Voltage	V _{IH}	0.7VCC	-	VCC	V

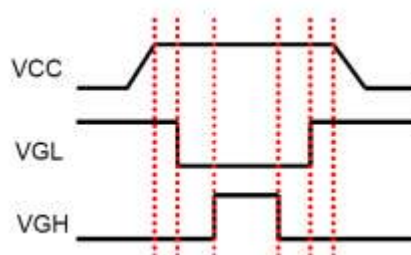
5.0 LCD Specifications (8700177)

5.5.2 Power Sequence

The LCD panel power ON/OFF sequence is as below



	Min.	Typ.	Max.	Unit
T1	1	-	-	ms
T2	2	5	-	ms
T3	10	-	-	ms
T4	10	-	-	ms
T5	1	5	-	ms
T6	1	-	-	ms
T7	100	-	-	ms



5.6 AC Characteristics

5.6.1 Data Timing (Under Frame Rate is Equal to 60Hz)

Horizontal Timing

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	THD	800			CLK
CLK Frequency	FCLK	35	40	45	MHz
One Horizontal Line	TG	880	1056	1190	CLK
HS Pulse Width	THPW	5	-	35	CLK
HS Back Porch	THB	46			CLK
HS Front Porch	THFP	25	210	310	CLK

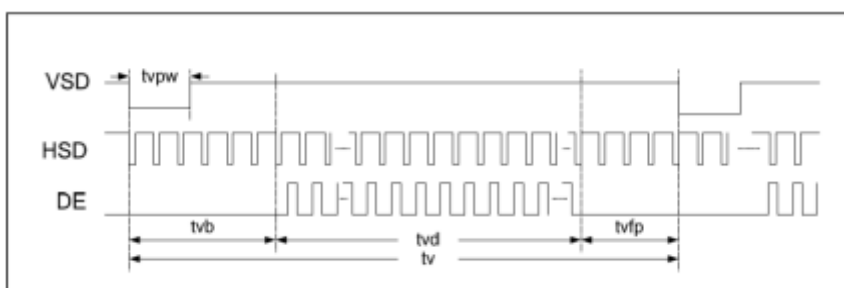
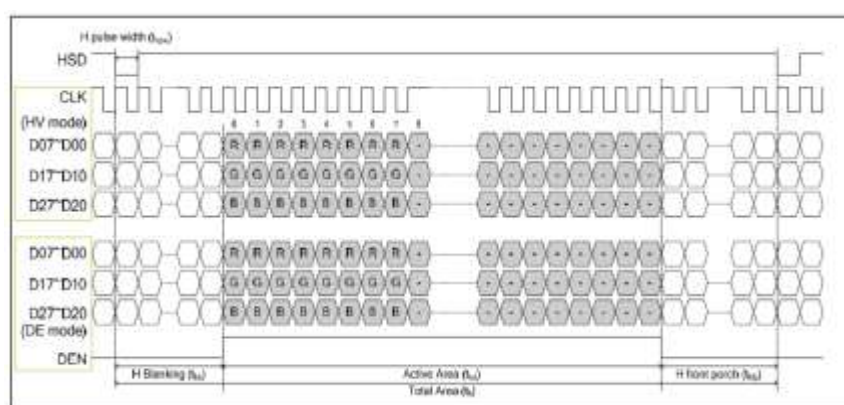
5.0 LCD Specifications (8700177)

5.6 AC Characteristics

5.6.1 Data Timing (Under frame rate is equal to 60Hz)

Vertical Timing

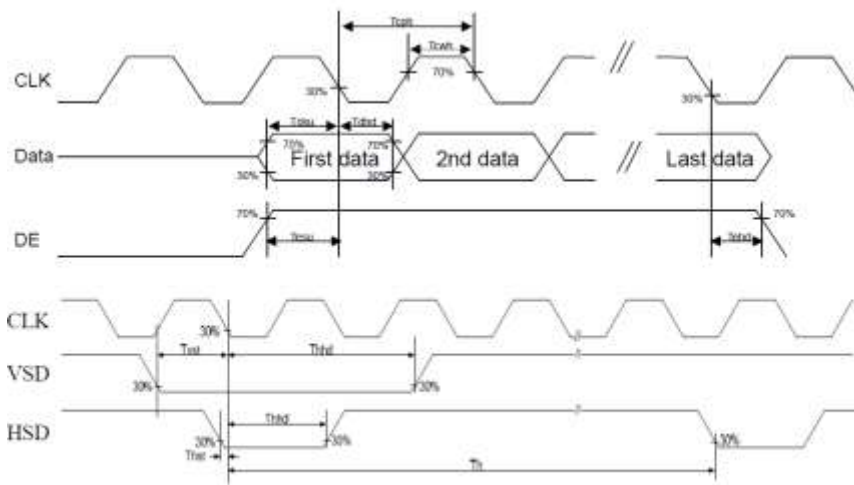
Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Vertical Display Area	TVD	600			TH
VS Period Time	TV	627	635	680	TH
VS Pulse Width	TVPW	2	-	15	TH
VS Back Porch	TVP	23	23	23	TH
VS Front Porch	TVFP	2	2	42	TH



5.0 LCD Specifications (8700177)

5.6.2 AC Electrical Characteristics

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
HSD Setup Time	THST	10	-	-	ns
HSD Hold Time	THHD	10	-	-	ns
VSD Setup Time	TVST	10	-	-	ns
VSD Hold Time	TVHD	10	-	-	ns
Data Setup Time	TDSU	10	-	-	ns
Data Hold Time	TDHD	10	-	-	ns
DE Setup Time	TESU	10	-	-	ns
DE Hold Time	TEDH	10	-	-	ns
CLK Cycle Time	TCPH	23	-	-	ns
CLK Pulse Time	TCWH	40	50	60	%

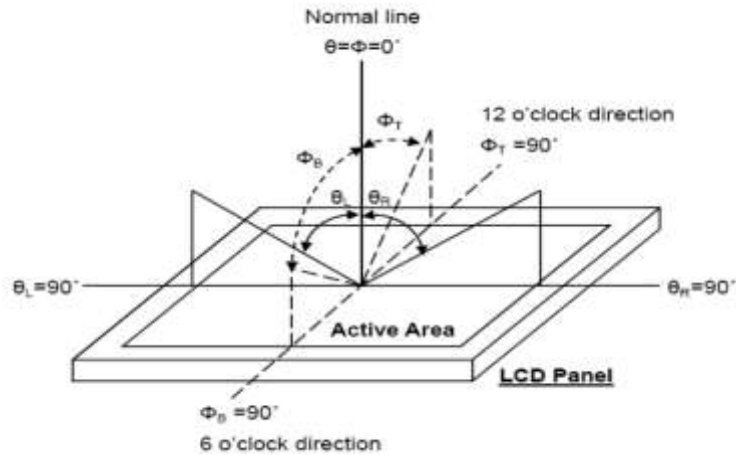
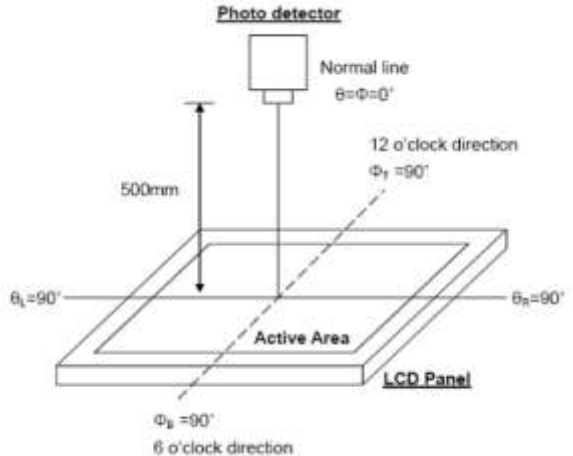
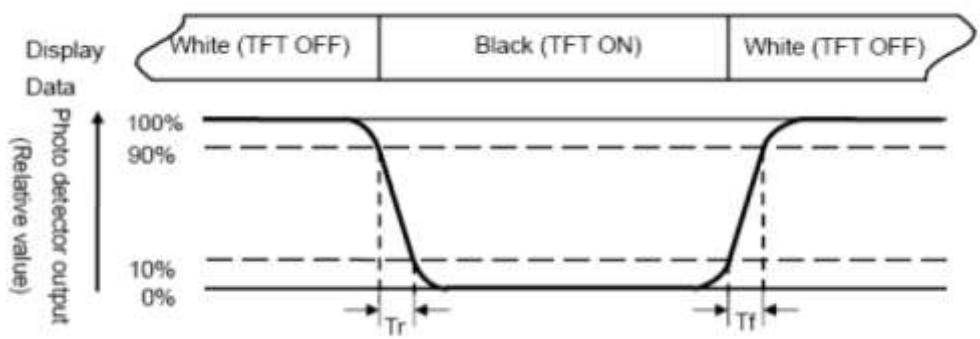


5.7 Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Response Time		TR	Viewing Normal Angle $\theta=\psi=0$	-	5	10	ms	(2)
		TF		-	15	20	ms	
Contrast Ratio		CR		300	500	-	-	(3)
Color Chromaticity	White	Wx		0.26	0.31	0.36	-	(4)
		Wy		0.26	0.33	0.38		
Viewing Angle	Hor.	θR	CR>=10	60	70	-	Degree	(6)
		θL		60	70	-		
	Ver.	ϕT		40	50	-		
		ϕB		50	60	-		
Brightness				200	250	-	cd/m ²	Center of Display

5.0 LCD Specifications (8700177)

5.7 Optical Characteristics

Note 1	Definition of Viewing Angle 
Note 2	Optical Measurement System Setup 
Note 3	Response Time The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise Time, T_r, is the time for the pixel to change from white to black (10% – 90 %) state, T_f is the time for the pixel to change from black to white (90% – 10 %) state. 

5.0 LCD Specifications (8700177)

5.7 Optical Characteristics

Note 4	Definition of Contrast Ratio
	$\text{Contrast Ratio (CR)} = \frac{\text{Luminance measured when the LCD is in the "White" State}}{\text{Luminance measured when the LCD is in the "Black" State}}$ White $V_i = V_{i50} \pm 1.5V$ Black $V_i = V_{i50} \pm 2.0V$ “±” means that the analog input signal swings in phase with VCOM signal. “±” means that the analog input signal swings out of phase with VCOM signal. The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.
Note 5	Definition of Color Chromaticity Color coordinates measured at the center point of LCD.

5.8 Interface LCM PIN Definition

Pin No.	Symbol	I/O	Function
1	GND	G	Power Ground
2	AVDD	P	Analog Input Voltage
3	VCC	P	Digital Input Voltage
4	R0	I	Red Data Input (LSB)
5	R1	I	Red Data Input
6	R2	I	Red Data Input
7	R3	I	Red Data Input
8	R4	I	Red Data Input
9	R5	I	Red Data Input
10	R6	I	Red Data Input
11	R7	I	Red Data Input (MSB)
12	G0	I	Green Data Input (LSB)
13	G1	I	Green Data Input
14	G2	I	Green Data Input
15	G3	I	Green Data Input
16	G4	I	Green Data Input
17	G5	I	Green Data Input
18	G6	I	Green Data Input
19	G7	I	Green Data Input (MSB)
20	B0	I	Blue Data Input (LSB)
21	B1	I	Blue Data Input
22	B2	I	Blue Data Input
23	B3	I	Blue Data Input
24	B4	I	Blue Data Input

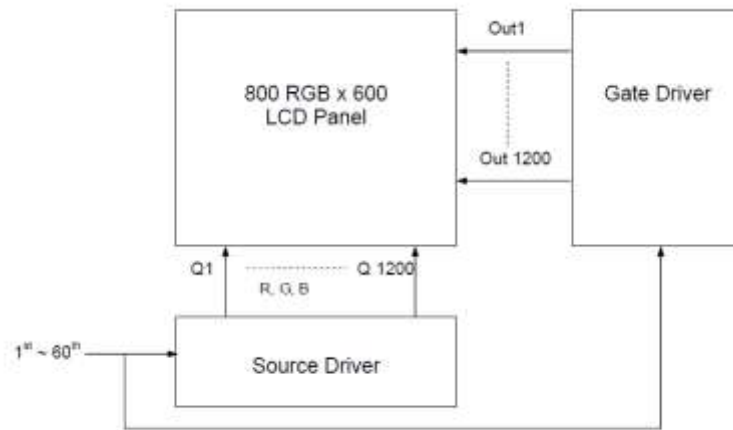
5.0 LCD Specifications (8700177)

5.8 Interface LCM PIN Definition

Pin No.	Symbol	I/O	Function
25	B5	I	Blue Data Input
26	B6	I	Blue Data Input
27	B7	I	Blue Data Input (MSB)
28	CLK	I	Dot Clock Input
29	DE	I	Data Enable Signal
30	HSD	I	HSYNC Signal
31	VSD	I	VSYNC Signal
32	MODE	I	H: DE Mode (Default)
33	NC	I	L: SYNC Mode
34	NC	I	No Connection (Please Leave Open)
35	NC	-	No Connection (Please Leave Open)
36	VCC	P	Digital Input Voltage
37	NC	-	No Connection (Please Leave Open)
38	GND	G	Power Ground
39	GND	G	Power Ground
40	AVDD	P	Analog Input Voltage
41	VCOM	P	VCOM DC Input
42	DITH	I	Dithering Function Setting H: Disable Dithering Function L: Enable Dithering Function
43	NC	1	No Connection (Please Leave Open)
44	VCOM _{out}	-	Connect Capacitor
45	NC	O	No Connection (Please Leave Open)
46	NC	-	No Connection (Please Leave Open)
47	NC	-	No Connection (Please Leave Open)
48	NC	-	No Connection (Please Leave Open)
49	NC	-	No Connection (Please Leave Open)
50	NC	-	No Connection (Please Leave Open)
51	NC	-	No Connection (Please Leave Open)
52	NC	-	No Connection (Please Leave Open)
53	NC	-	No Connection (Please Leave Open)
54	NC	-	No Connection (Please Leave Open)
55	NC	-	No Connection (Please Leave Open)
56	VGH	P	TFT Turn On Voltage
57	VCC	P	Digital Input Voltage
58	VGL	P	TFT Turn Off Voltage
59	GND	G	Power Ground
60	NC	-	No Connection (Please Leave Open)

5.0 LCD Specifications (8700177)

5.9 Block Diagram



5.10 Quality Assurance

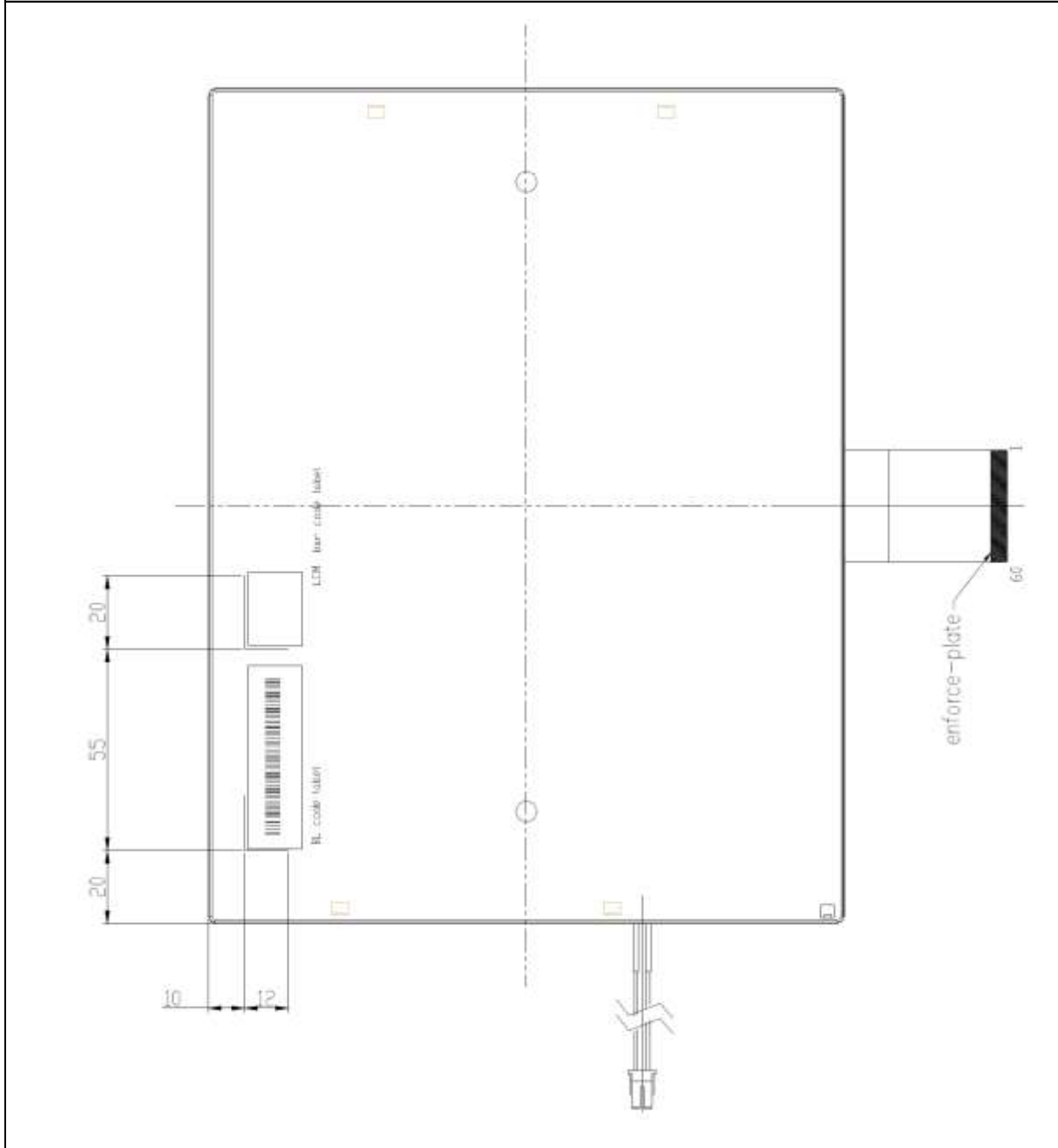
No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T _a =80°C Dry 240h	
2	Low Temperature Storage Test	T _a =-30°C Dry 240h	
3	High Temperature Operation Test	T _a =70°C Dry 240h	
4	Low Temperature Operation Test	T _a =-20°C Dry 240h	
5	High Temperature and High Humidity Operation Test	T _a =60°C 90%RH 240h	
6	Electro Static Discharge Test	150pF, 330Ω, ±8KCV (Contact) / ±15KV(Air), 5 Point/Panel	Non-Operation
7	Thermal Shock Test	-30°C (0.5h) ~ 80°C (0.5h) / 100 Cycles (Dry)	
8	Vibration Test	Sine Wave, 10 ~ 500Hz 1.5G, 0.37 Oct./Min. 3 Axis, 1 Hour/Axis	Non-Operation
9	Mechanical Shock Test	Gravity: 180g Time: 2ms 3 Axis: for all Six Faces Every Face for One Time	Non-Operation
T _a =Ambient Temperature			

5.11 Outline Drawing



5.0 LCD Specifications (8700177)

5.11 Outline Drawing



6.0 Handling and Caution for Complete Module

6.1 Cautions When Unpacking the Module

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

6.2 Cautions for Handling the Module

- Electrostatic discharges may damage the electronic components, hence wear electrostatic straps at all times and handle the LCD module with care.
- The touch screen, LCD panel and backlight elements are made from fragile glass material, applying forces to the LCD module 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 Cautions for Operation

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

6.4 Cautions for Operating Environment

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

6.5 Cautions for the Module Characteristics

- Do not apply a fixed pattern data signal to the LCD module. 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 module. Doing so will void the warranty of the module.

6.7 Cautions for Maintaining Module

- 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
48-F-MARS-104-MDL-01D	10.4" MARS LCD Module
Contact TI sales representative for a complete list of TI's OEM and retail products.	
Touch International 2222 W. Rundberg Ln. Suite 200, Austin, TX 78758 Tel: 512.832.8292 Fax: 512.491.8291 technicalsupport@touchintl.com www.touchinternational.com	