



SPECIFICATION APPROVAL SHEET

Open Frame 6.5" Digital TFT LCD

MODEL: FCOP0650HB-V1



1. General Description

1.1 Features

- 6.5" (640x480) Digital TFT LCD
- Aspect Ratio: 4:3
- Ultra Compact
- NTSC / PAL Video Auto Switch
- Input Signal CVBS / S-Video (Option) / Analog RGB (VGA)
- All Functions can be controlled by UART
- Support Touch Screen Function (Option)
- Built-in EDID Function
- 4 Wires Resistive Touch Panel
- 5 Key Buttons Controls
- 9 Language OSD Menu
- LED Backlight
- Single Operation Voltage +12V

1.2 Applications

- Industrial
- Medical Environment
- Instrument Display
- Kiosk
- Security
- Signage
- Office Electronics
- Home Application
- Educate Application

2. Contents

Contents	Page
1. General Description.....	1
1.1 Features	1
1.2 Applications	1
2. Contents.....	2-3
3. Specifications.....	4
4. Block Diagram.....	4
5. Order Information.....	5
5.1 Unit	5
5.2 Customized	5
6. Accessories (Option).....	6
7. Operation manual / Connection.....	7
7.1 Driver Board Manual	7
8. Pin Description.....	8-11
8.1 J302 : LCD Panel I/O Terminals (20 Pin LVDS Connector Pitch 1.25mm Side Entry Type)	8
8.2 J109 : Pin Assignment of Analog RGB Input (D-Sub 15Pin)	9
8.3 J105 : Pin Assignment of UART (Pitch 1.25mm 4Pin, Top Entry Type)	9
8.4 J601: Pin Assignment of Signal Input (Pitch 1.25mm 6Pin, Side Entry Type)	10
8.5 DC JACK : Pin Assignment of Power Input (DC-Jack Inside Diameter:2.1 ϕ Outside Diameter:5.5 ϕ Side Entry Type)	10
8.6 RCA: Pin Assignment of Video Input (RCA JACK Yellow, Side Entry Type)	10
8.7 J404 : Pin Assignment of Touch USB (USB A Type - Female 2.0mm, Side Entry Type)(Option)	10
8.8 J401B : Pin Assignment of Touch RS232 (D-SUB 9 FEMALE)(Option)	11
9. Absolute Maximum Ratings.....	11
9.1 Absolute Maximum Ratings	11
10. Recommended Operating Conditions.....	12
10.1 Electrical Characteristics	12
10.2 Support Display Mode Characteristics	12
11. 4W Resistive Touch Panel Characteristics.....	12-16
11.1 Electrical Performance	12
11.2 Optical Performance	12
11.3 Mechanical Performance	12
11.4 Durability Performance	13
11.5 Pin Assignment (Pitch: 1.0 mm)	13
11.6 Environmental	13
11.7 Reliability test procedure	13
11.8 Resistive Touch Panel Integration Design Guide	14
11.9 Mechanical Design Notice For Resistive Touch Panel	15

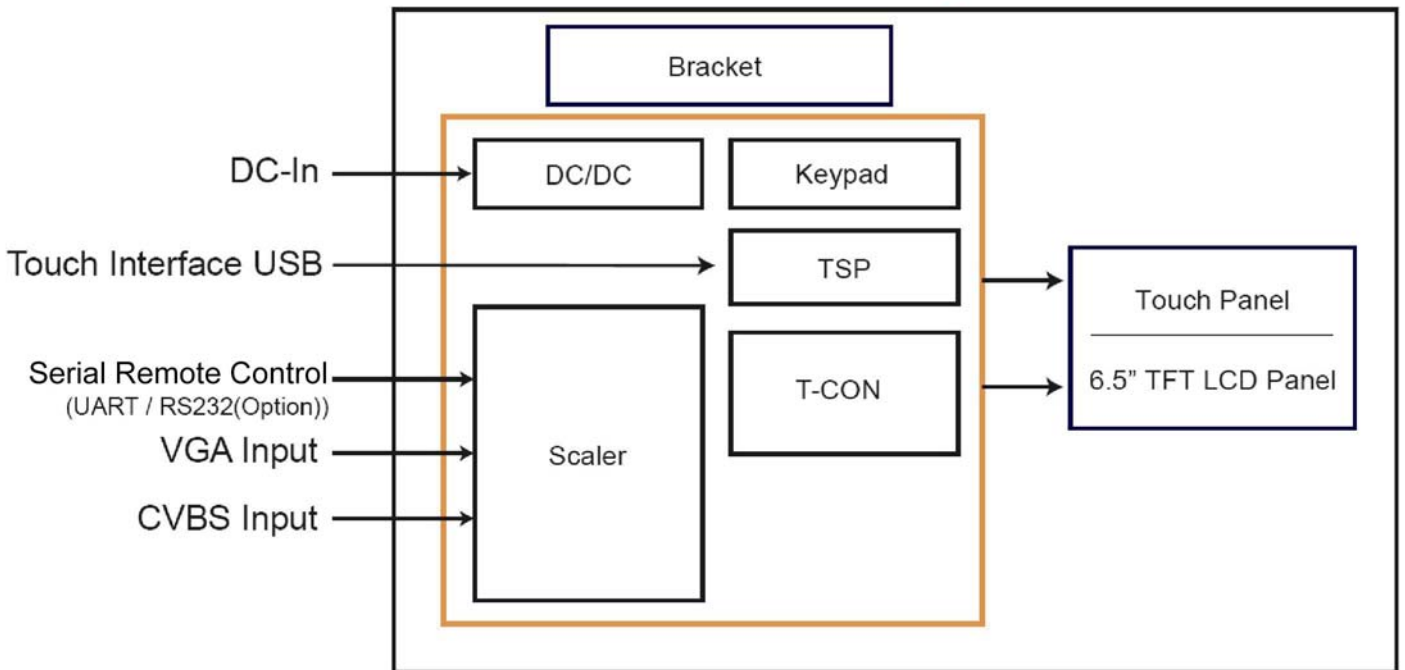
11.10 Resistance Touch Panel Operation System Support	16
12. Key Function by OSD.....	17-21
12.1 Menu Operation	17-21
13. Dimension Information.....	22-24
13.1 Unit (FCOP0650HB-V1)	22
14. Appendix.....	23
14.1 TFT-LCD Mechanical Specifications	23
14.2 TFT-LCD Optical Characteristics	23
15. Revision History.....	24
15.1 Record of Revision	24

3. Specifications

LCD	
Panel Size	6.5"
Resolution (Pixels)	640 x 480
Color	16.2M
Luminance without TP	800 cd/m ²
Luminance (RTP)	640 cd/m ²
Contrast Ratio	600
View Angle	80(L) / 80(R) / 70(T) / 70(B)
LED Life Time (Min.)	50K hours
Power Requirement	
Power Input (DC Jack 2.1 φ)	+12 Vdc
PowerConsumption@+12V	4.56W
Touch Screen	
Resistive	USB / RS232 (Option) Interface
Resistive Type Support OS	Windows / Linux /Android / Mac / QNX

Input Signal		
CVBS	RCA JACK	
VGA	D-Sub15	
Controls		
Key	5 Buttons	
Serial Remote Control	UART / RS232 (Option)	
Environment		
Temperature Range	Without TP	With 4W RTP
	Operating	-20 ~ +70°C
High Temperature &High Humidity (Non-condensing)	Storage	-20 ~ +70°C
	Operating	+40°C / 90%

4. Block Diagram



5. Order Information

5.1 *Unit*

Item	
CVBS	⊙
VGA	⊙
Touch Panel Type	-
Touch Screen Interface	-
5 Keys	⊙
Serial Remote Control	UART
Dimensions	119.73 x 166.6 x 29.45
Weight	375
Condition	Standard

Note: 1. The assembling of panel and bracket is aimed for delivery, packaging and experiment. If the demand of shockproof and long-term fix, pls. have it into consideration of mechanism design.

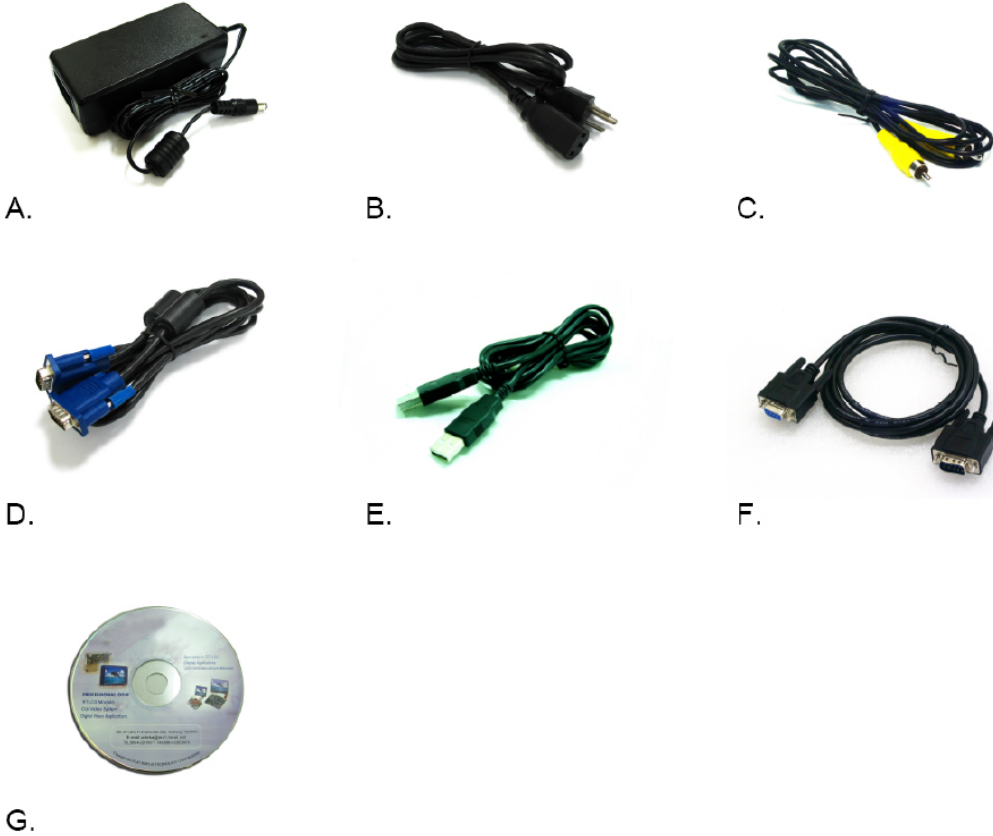
5.2 *Customized*

Function	Item
Serial Remote Control	RS232 (DB9)
External Key	5 keys

Note: Special order condition will apply to non-standard items and pls. contact salespersons in iTech.

6. Accessories (Option)

Before you begin installing the KIT, please make sure that the following materials have been shipped:



A. AC to DC Adapter (L:1500mm,100-240V_{AC} 50-60Hz to +12V_{DC} @ 3.3A, ϕ 2.1)

B. D Type AC Power Cord (L:1800mm, Plug Type B for USA)

C. Video Cable (L:1800mm)

D. VGA Cable DB-15 male to male (L:1800mm)

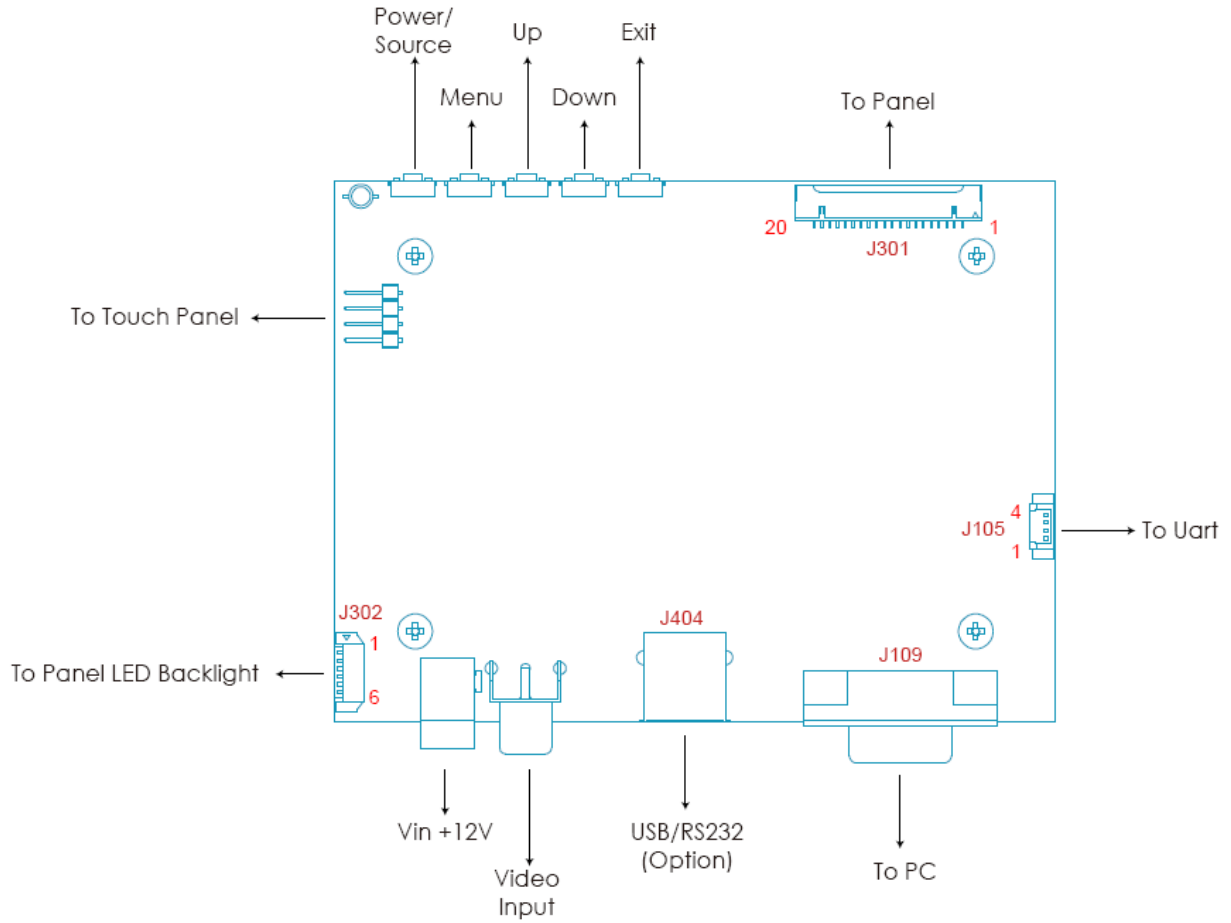
E. USB Cable USB Type A male to male (L:1800mm)

F. RS-232 Cable Straight Line Cable DB-9 female to male (L:1800mm)

G. Touch Screen Driver CD Disk / User Manual

7. Operation manual / Connection

7.1 Driver Board Manual



8. Pin Description

8.1 J301 : LCD Panel I/O Terminals (20 Pin LVDS Connector Pitch 1.25mm Side Entry Type)

※ Connector Part No.: MS240420G (STM) [Same as FI-SEB20P-HF13E (JAE)];

Matching Connector Part No.: P240420 (STM) [Same as FI-S20S (JAE)].

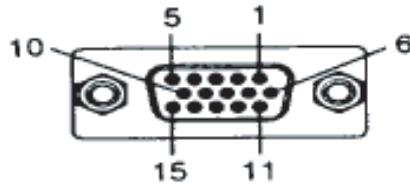
Pin No.	Symbol	I/O	Description	Remark
1	VDD	I	Power supply, 3.3V (typical)	
2	VDD	I	Power supply, 3.3V (typical)	
3	GND	-	Ground	
4	SEL68	I	Selection for either 6bit or 8bit LVDS input: SEL68 = "Low" or "NC", accepts 6bit LVDS data input; SEL68 = "High", accepts 8bit LVDS data input.	
5	RxIN1-	I	Negative LVDS differential input (R0-R5, G0)	
6	RxIN1+	I	Positive LVDS differential input (R0-R5, G0)	
7	GND	-	Ground	
8	RxIN2-	I	Negative LVDS differential input (G1-G5, B0-B1)	
9	RxIN2+	I	Positive LVDS differential input (G1-G5, B0-B1)	
10	GND	-	Ground	
11	RxIN3-	I	Negative LVDS differential input (B2-B5, DE)	
12	RxIN3+	I	Positive LVDS differential input (B2-B5, DE)	
13	GND	-	Ground	
14	RxCLKIN-	I	Negative LVDS differential clock input	
15	RxCLKIN+	I	Positive LVDS differential clock input	
16	GND	-	Ground	
17	U/D	I	Vertical Reverse ("Low" or NC: Normal, "High": Reverse)	
18	R/L	I	Horizontal Reverse ("Low" or NC: Normal, "High": Reverse)	
19	RxIN4-	I	Negative LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input.	
20	RxIN1+	I	RxIN4+ Positive LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input	

Note: "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".

8.2 J109 : Pin Assignment of Analog RGB Input (D-Sub 15Pin)

Pin No.	Symbol	I/O	Description	Remark
1	RI+	I	Analog Red Signal	
2	GI+	I	Analog Green Signal	
3	BI+	I	Analog Blue Signal	
4	NC	-	No Connection	
5	GND	-	Ground	
6	AGND	-	Analog Ground	
7	AGND	-	Analog Ground	
8	AGND	-	Analog Ground	
9	VGA5V	-	VGA +5Vdc Input	
10	NC	-	No Connection	
11	NC	-	No Connection	
12	DDC_SDA	-	DDC2 Data	
13	HS_IN	I	TTL Horizontal sync.	
14	VS_IN	I	TTL Vertical sync.	
15	DDC_SCL	-	DDC2 Clock	

Note: Window 7/8/10 won't support resolution format 640*480. If users needs format 640*480, please check if graphic card can support 640*480 and then go to advanced setting to configure the resolution. Should users have questions still, pls contact sales representatives for assistance.



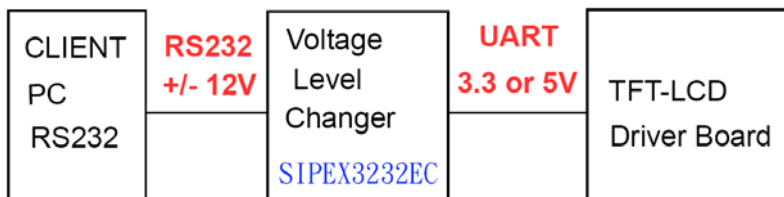
8.3 J105 : Pin Assignment of UART (Pitch 1.25mm 4Pin, Top Entry Type)

※ Connector Part No.: MS24014 (STM) [Same as 53398-0471 (MOLEX)] ;

※ Matching Connector Part No.: P24014 (STM) [Same as 51021-0400 (MOLEX)].

Pin No.	Symbol	I/O	Description	Remark
1	TX / RS232 TX (Option)	O	UART / RS232 (Option) Transmission Data	
2	RX / RS232 RX (Option)	I	UART / RS232 (Option) Receive Data	
3	GND	-	Ground	
4	+3.3Vdc	O	+3.3Vdc Output Voltage	

Note: All Functions can be controlled by UART , About UART command list please contact iTech sales.



8.4 J302: Pin Assignment of Signal Input (Pitch 1.25mm 6Pin, Side Entry Type)

※ Connector Part No.: MS24016R (STM) [Same as 53261-0619 (MOLEX)];

Matching Connector Part No.: P24016 (STM) [Same as 51021-0600 (MOLEX)].

Pin No.	Symbol	I/O	Description	Remark
1	VLED	-	+12V Input Voltage	
2	VLED	-	+12V Input Voltage	
3	PWM DIM	I	1~100%	
4	LED On/Off	I	3.3V-On; 0V/NC-Off	
5	GND_D	-	Ground	
6	GND_D	-	Ground	

8.5 DC JACK : Pin Assignment of Power Input (DC-Jack Inside Diameter:2.1 φ Outside Diameter:5.5 φ Side Entry Type)

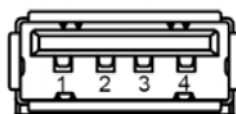
Pin No.	Symbol	I/O	Description	Remark
1	DC-In	I	+12Vdc Input Voltage	
2	GND	-	Power Ground	

8.6 RCA: Pin Assignment of Video Input (RCA JACK Yellow, Side Entry Type)

Pin No.	Symbol	I/O	Description	Remark
1	Video	I	Video Input	
2	AGND	-	Analog Ground	

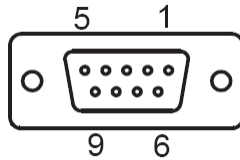
8.7 J404 : Pin Assignment of Touch USB (USB A Type - Female 2.0mm, Side Entry Type)(Option)

Pin No.	Symbol	I/O	Description	Remark
1	VBUS	-	USB VCC	
2	D-	-	DATA (-)	
3	D+	-	DATA (+)	
4	DGND	-	Digital Ground	



8.8 J401B : Pin Assignment of Touch RS232 (D-SUB 9 FEMALE)(Option)

Pin No.	Symbol	I/O	Description	Remark
1	-	-	Don't Connect	
2	TXD	-	Transmit Data	
3	RXD	-	Receive Data	
4	-	-	Don't Connect	
5	GND	-	Ground	
6	NC	-	No Connection	
7	-	-	Don't Connect	
8	-	-	Don't Connect	
9	NC	-	No Connection	



9. Absolute Maximum Ratings

9.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Remark
Input Voltage	Vin	+9	+15	V	
Video Input Signal	Video in	0.5	2.0	Vp-p	@75Ω
S-Video Input Signal	S-Video in	0.5	2.0	Vp-p	@75Ω
Analog RGB Input Signal	Analog RGB in	0.5	2.0	V	
Digital Input Signal	TTL	+0.3	+3.6	℃	
Operating Temp. without TP		-20	+70	℃	
Storage Temp. without TP		-20	+70	℃	
Operating Temp. with 4W RTP		-20	+70	℃	
Storage Temp. with 4W RTP		-20	+70	℃	
High Temperature & High Humidity (Non-condensing) without TP		-	+40 / 90	℃ / %	
High Temperature & High Humidity (Non-condensing) with 4W RTP		-	+40 / 90	℃ / %	

10. Recommended Operating Conditions

10.1 Electrical Characteristics

Parameter	Symbol		I/O	Min	Typ	Max	Unit	Note
Input Voltage	DC-in		I	+10	+12	+14	V	
Total Current	Iin (+12V)		I	-	-	-	mA	±15%
Total Current with RTP	Iin (+12V)		I	-	380	-	mA	±15%
Power Consumption with RTP			I	-	4.56	-	W	@+12V Note
Output Voltage	VDD		O	+3.2	+3.3	+3.4	V	I=10mA
Video Input Signal	Video in		I	-	1.0	-	Vp-p	@75Ω
Analog RGB Input Signal	Analog RGB in RGB	RGB	I	-	0.7	-	Vp-p	@75Ω

Note: Test Condition

1. CVBS : NTSC & color bar · Dimmer(default)=9
2. VGA: Resolution 640x480 @ input = PC desktop screen @ Dimmer(default)=9

10.2 Support Display Mode Characteristics

Dots per inch	Standard	H	Unit	Polarity	V	Unit	Polarity	Note
640 × 480	VGA	31.5	KHz	Negative	59.9	Hz	Negative	
800 × 600	VESA	37.9	KHz	Positive	60.3	Hz	Positive	
1024 × 768	VESA	48.4	KHz	Negative	60.0	Hz	Negative	

Note: Polarity & standard only for VGA mode

11. 4W Resistance Touch Panel Characteristics

11.1 Electrical Performance

Parameter	Symbol	Min	Typ	Max	Unit	Note
Loop Resistance	X	200	-	900	Ω	
	Y	200	-	900	Ω	
Linearity		-	-	1.5	%	
Insulation Impedance		20	-	-	MΩ	DC 25V
Response Time		-	-	20	ms	

11.2 Optical Performance

Parameter	Specifications
Transparency	≥ 78%
Haze	8%±2%

11.3 Mechanical Performance

Parameter	Specifications
Input Method	Finger or stylus pen
Operating Force	≅ 40g ~ 110g
Surface Hardness	≅ 3H

11.4 Durability Performance

Parameter	Specifications
Expected Life Performance	Operation tested to greater than 1 million touches in one location without failure, with a head of R6.5 and hardness Hs 60 stylus.

11.5 Pin Assignment (Pitch: 1.0 mm)

Pin No.	Symbol	Description
1	Y1	Upper electrode Y (Upper side)
2	X1	Lower electrode X (Right side)
3	Y2	Upper electrode Y (Down side)
4	X2	Lower electrode X (Left side)

11.6 Environmental

Parameter	Specifications
Operating Temp.	-25°C ~ 75°C (Except dew condensation)
Storage Temp.	-30°C ~ 80°C (Except dew condensation)
Operating Humidity (Non Condensing)	20% RH ~ 80%RH
Storage Humidity (Non Condensing)	10% RH ~ 90%RH

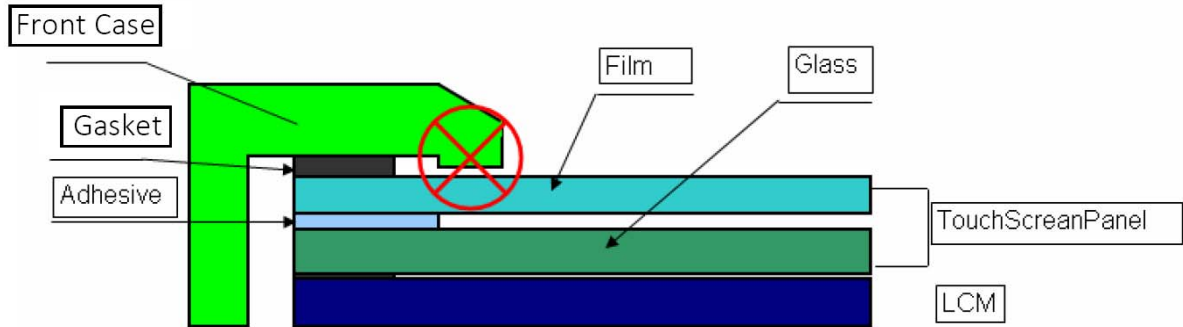
11.7 Reliability test procedure

Parameter	Specifications
High temperature storage test	70°C for 240 hours.
Low temperature storage test	-40°C for 240 hours.
Thermal Cycling	-40°C (1 hr each) ~ 70°C (1 hr each) for 10 cycles.
High temperature and high humidity	35°C, 90%RH for 240 hours.

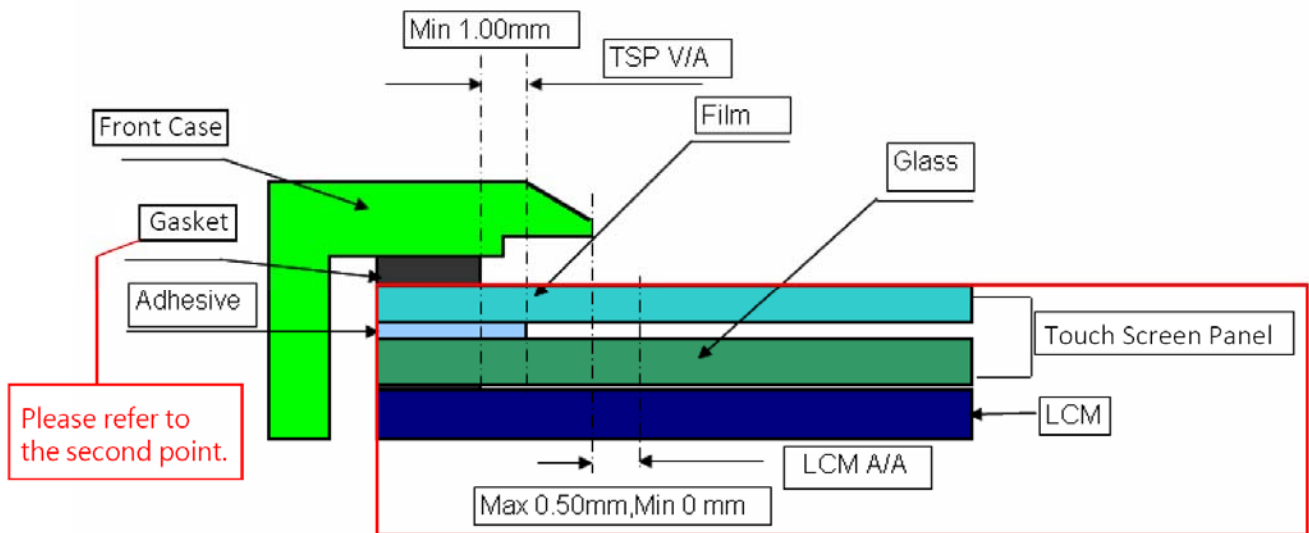
11.8 Resistive Touch Panel Integration Design Guide

Front case design follow as below

1. Avoid the design that front case overlap and press on the active area of the LCM.
2. Give enough gap(over 0.5mm at compressed) between the front case and TSP to protect wrong operating.

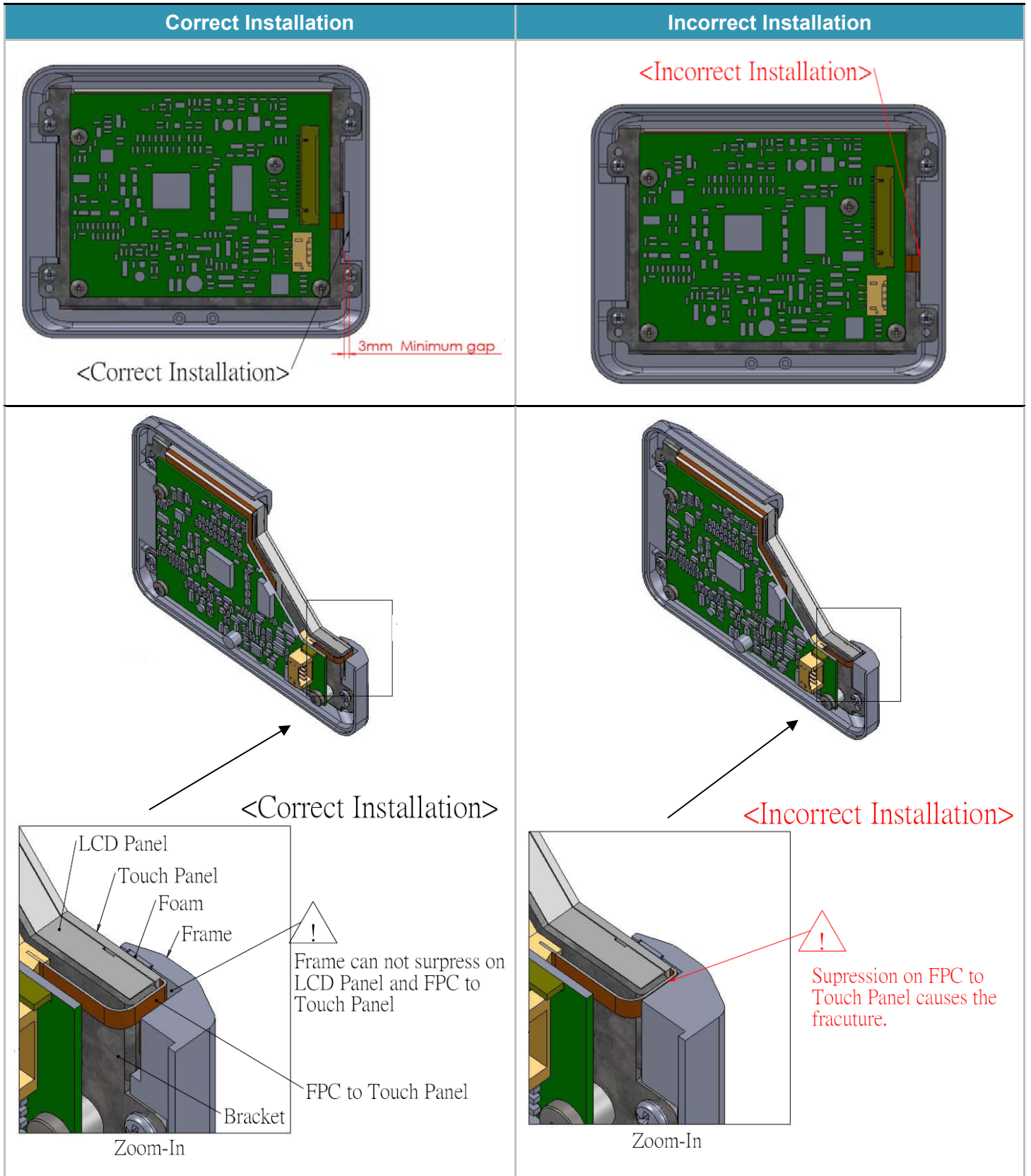


3. Use a buffer material(Gasket) between the TSP and front case to protect damage and wrong operating.
4. Avoid the design that buffer material overlap and press on the inside of TSP view area.



FDT Module

11.9 Mechanical Design Notice for Resistive Touch Panel



11.10 Resistive Touch Panel Operation System Support

Driver Vender : EETI (eGalax_eMPIA Technology Inc.)

OS	Version	Interface
Windows	Windows 7, 8, 8.1, 10	USB/RS232
	Windows Embedded 7, 8	
	Windows Embedded POSReady 2009, POSReady 7	
	Embedded Standard 7	
	Embedded Enterprise 7	
	Embedded 8 Standard	
	Embedded 8.1 Pro/ Embedded 8.1 Industry	
	Windows , XP, 2000	
Windows XP Embedded		
Windows CE	Windows Embedded Compact 2013, 7	USB/RS232
	Windows CE 6.0	
	Windows CE.Net (4.x / 5.0)	
Linux	Kernel 2.6.24 Upward and 3.x.x / 4.x.x / 5.x.x (X86 / ARM / MIPS)	USB
	Kernel 2.6.23 Downward (X86)	
	Kernel 2.4.x (x86)	
Android	Android Version 2.3.x upwards (X86 / ARM / MIPS)	USB
Mac OS	Mac OS X 10.5.3 Leopard (Power PC)	USB
	Mac OS X 10.7.4 Earlier (32Bit / 64Bit) (Intel CPU)	
	Mac OS X 10.7.5 (32Bit / 64Bit) (Intel CPU)	
	Mac OS X 10.8.x Mountain Lion (Intel CPU)	
	Mac OS X 10.9.x Mavericks (Intel CPU)	
	Mac OS X 10.10.x Yosemite (Intel CPU)	
	Mac OS X 10.11 El Capitan (Intel CPU)	
	Mac OS 10.12 Sierra (Intel CPU)	
	Mac OS 10.13 High Sierra (Intel CPU)	
	Mac OS 10.14 Mojave (Intel CPU)	
	Mac OS 10.15 Catalina (Intel CPU)	
QNX	QNX Neutrino RTOS V6.5/6.4	USB/RS232
	QNX Neutrino RTOS V6.3	

Note: 1. Please refer to the iTech website for the driver installation and support operating system.

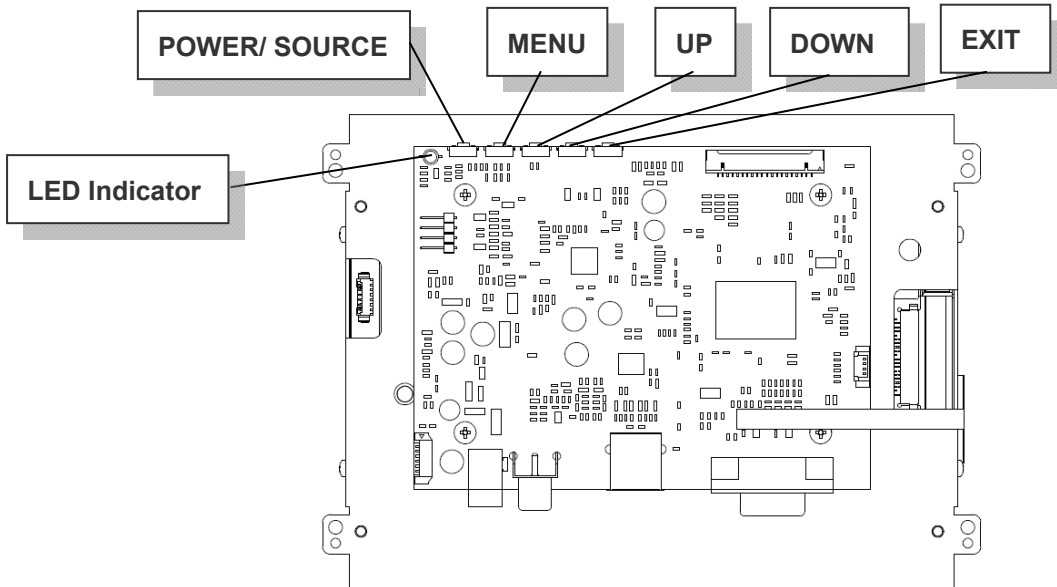
iTech website: www.itechlcd.com

2. How to use Touch Driver, please refer to Readme of Touch Screen Driver CD Disk.

3. Please refer to the iTech website for the latest driver version and support operating system.

12. Key Function by OSD

12.1 Menu Operation

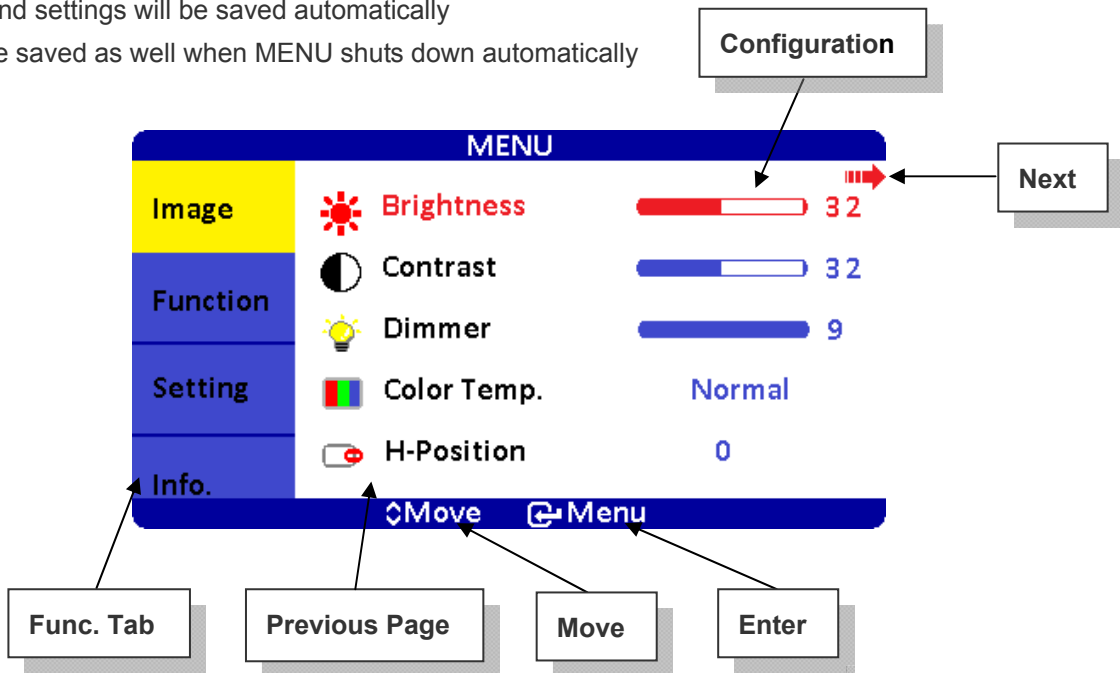


OSD ICON Instructions :

1. POWER/SOURCE : Power On/Off (※Press for 3 secs to turn off)
2. MENU / ENTER : (After turning on MENU, only ENTER is available)
3. UP : Move Upward / Increase Value / Option Switch
4. DOWN : Move Downward / Decrease Value / Option Switch
5. EXIT : Return to Previous Page
6. LED Indicator
 - Waiting : Flickering Green
 - Power ON : Green
 - Power OFF : Red

Save OSD Setting:

1. EXIT MENU and settings will be saved automatically
2. Settings will be saved as well when MENU shuts down automatically



Overview of the Menu :

 **Image (VGA)**











Indicator	Meaning	Default	Adjustable range	Remark
	Brightness	13	0~63	Adjust-Bar
	Contrast	32	0~63	Adjust-Bar
	Dimmer	9	0~9	Adjust-Bar
	Color Temp.	Normal	Normal / Warm / sRGB / Cool	
	H-Position	0	The adjusting value range depends on each resolution mode	
	V-Position	0	The adjusting value range depends on each resolution mode	
	Clock	0	-49~+49	
	Phase	0	0~63	
	Auto	Depend on the Signal		
	Exit			



Image (Video)

Indicator	Meaning	Default	Adjustable range	Remark
	Brightness	26	0~63	Adjust-Bar
	Contrast	40	0~63	Adjust-Bar
	Color	42	0~63	Adjust-Bar
	Tint	16	0~31	for NTSC System Only
	Sharpness	8	0~15	Adjust-Bar
	Dimmer	9	0~9	Adjust-Bar
	Exit			



Function

ICON	Meaning	Function	Default	Status	Description	Remark
	Show Status	Information of input source	On	On	Show input source	
				Off	Hide input source	
	Blue Screen	Select blue/ black screen when no input signal is detected.	On	On	Show blue screen when no input.	
				Off	Show black screen when no input.	
	Auto Power On	Modules turns on automatically without power key input.	On	On	Auto	
				Off	Manual	
				Auto Save	Power off , the last state	
	Detect Source	Auto detect input source.	On	On	Auto-detect signal source	
				Off	Manual switch signal source	
	Auto Power Saving	Modules go standby when no input source is detected.	Off	6s / 15s / 30s	Go standby by settings when no input	LED indicator: Flickering Green
				Off	Show no signal when no input	LED indicator: Green
	Auto Sleep	Modules go off when set timing is out.	Off	15M / 30M / 60M	Go off by time setting	LED indicator: Red Press Power Key back to life.
				Off	Turn off sleep mode	
	Exit					

Note : After configuration is set, RESET won't restore to default setting.



Setting

Indicator	Meaning	Default	Adjustable range	Remark
	Mirror	Off	On / Off	Left-right reversal
	Upside down	Off	On / Off	Upside down
	Scan	Over Scan	Over Scan/Under Scan	CVBS Only, Note 1
	Language	English	English / 中文 / 日本語 / 한국의 / Française / Deutsch / Italiano / Española / Português	Note 1
	OSD Transparent	0	0~7	Menu Transparent
	Reset			Restore to default
	Exit			

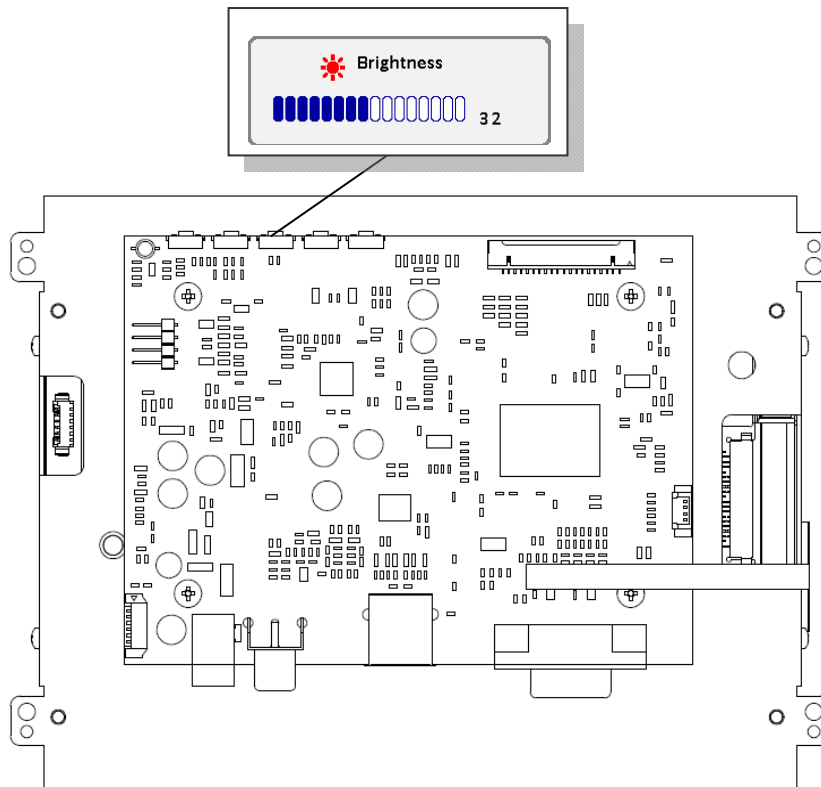
Note 1: Press MENU to store changes when OSD adjustment is done.



Info.

MENU	
Image	Source : VGA
Function	Resolution : 1024x768
Setting	H.Freq : 48.2KHz V.Freq : 59.8Hz
Info.	Program Ver : 2.00 Command Ver : 2.00
◀Move Menu▶	

Hot Key When OSD Menu is Off :



Information of Input Source and Functionality :

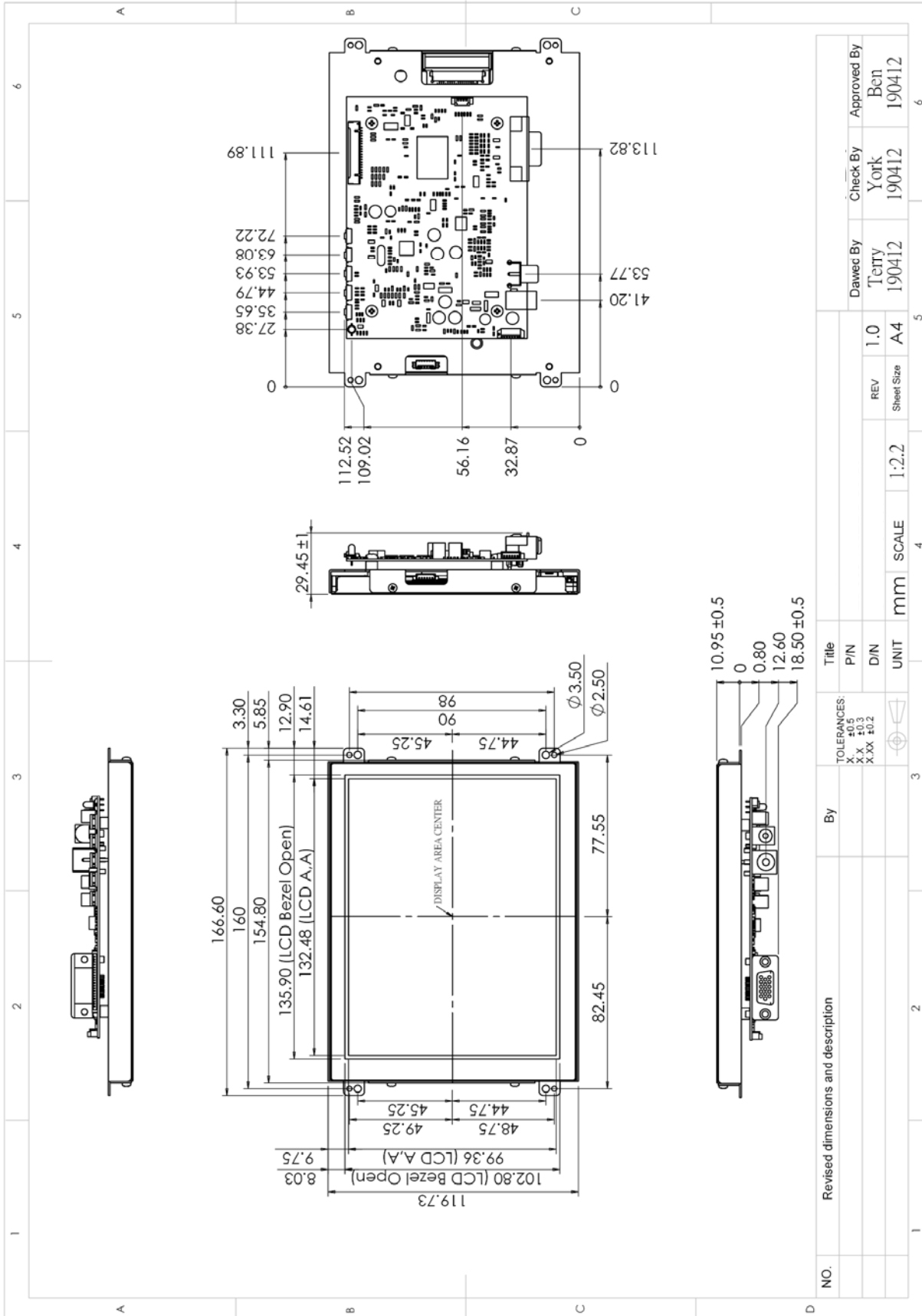
[Source] : Input Signal Switch

Overview of Input Signals :

Indicator	Interface
	AV1
	VGA

13. Dimension Information

13.1 Unit



NO.	Revised dimensions and description	By	Title	UNIT	SCALE	REV	Sheet Size	Dawec By	Check By	Approved By
			P/N	mm	1:2.2	1.0	A4	Teity	York	Ben
			D/N					190412	190412	190412
			TOLERANCES:							
			X: ±0.5							
			X.X: ±0.3							
			X.XX: ±0.2							

14. Appendix

14.1 TFT-LCD Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	6.5 (diagonal)	Inch
Display Format	640 x (R.G.B) x 480	Dot
Active Area	132.48 (H)× 99.36 (V)	mm
Pixel Pitch	0.207(H) x 0.207(V)	mm
Pixel Arrangement	RGB stripe	

14.2 TFT-LCD Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Left	70	80	---	deg	
		Right	70	80	---	deg	
	Vertical	Top	60	70	---	deg	
		Bottom	60	70	---	deg	
Contrast Ratio	CR	At optimized Viewing angle	400	600	---	---	
Luminance without RTP	L		600	800	---	cd/m ²	
LED Life Time		25°C	50000	---	---	hours	Note

Note: The "LED Life Time" is defined as the module brightness decrease to 50% original.

15. Revision History

15.1 Record of Revision

NO	Date	Description	Page	Note
0.1	January 10, 2020	· Modify 10.2 Support Display Mode Characteristics	12	
		· Modify 11.1 Electrical Performance	12	
		· Modify 12. Key Function by OSD	17-18	
1.0	February 7, 2020	· Modify 10.2 Support Display Mode Characteristics	12	
		· Redefine RTP Response Time and RTP driver IC Response Time as RTP Response Time	12	
1.1	November 23, 2020	· Update 11.2 Transmittance $\geq 80 \rightarrow 78\%$, Haze $\leq 10\% \rightarrow 8 \pm 2\%$	12	
1.2	December 31, 2020	· Modify 4. Block Diagram	4	
		· Update 11.10 Resistive Touch Panel Operation System Support	16	
1.3	February 24, 2021	· Modify 11.10 Resistive Touch Panel Operation System Support Note	16	