TFT LCD Display Datasheet

PS817-070WS-C-IPS-46

EVE4 IPS 7.0’’ LCD DATASHEET

REV.1.0

2024-01-04

ITEM	CONTENTS	UNIT
LCD Type	TFT / Transmissive / Normally Black	/
Size	7.0	Inch
Viewing Direction	All	O'Clock
Display Mode	Normally Black	/
Outside Dimension	179.96 × 119.00	mm^2
Active Area (W × H)	154.21 × 85.92	mm^2
Dot Pitch (W × H)	0.1506 × 0.1432	mm^2
Number of Dots (Pixels)	1024 (RGB) × 600	/
Driver IC	HX8282, HX8696-	/
Brightness	850	Cd/m^2
Driver IC of board	BT817Q	/
Interface Type	SPI/QSPI	/
Colour Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
Supply Voltage	3.3	V
With/Without TP	With Capacitive Touch	/
Weight	-	g

Note 1: RoHS compliant

Note 2: LCD weight tolerance: ± 5%.

TFT LCD Display Datasheet

Revision History

REVISION	DATE	COMMENT	REMARKS
1.0	04/01/2024	Initial Draft	Initial Draft Version

Table of Contents

TFT LCD Display Datasheet

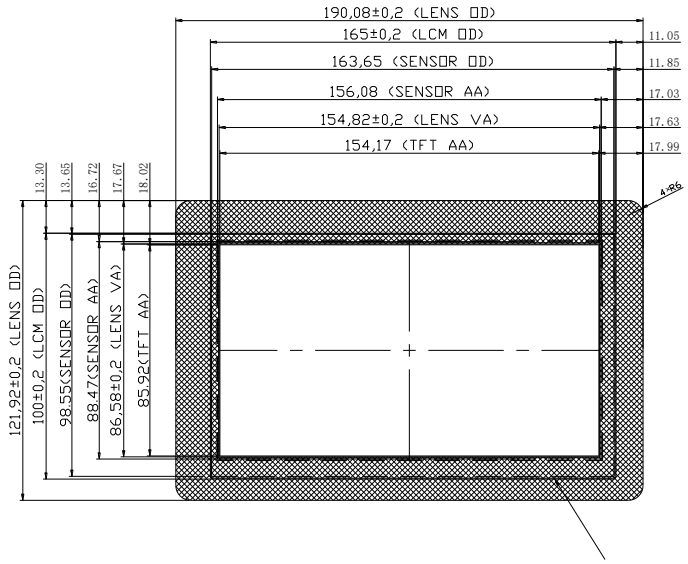
1. Module Classification Information

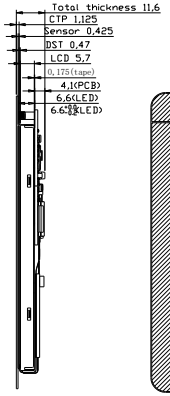
PS	HDMI	070	W	C	T
1	2	3	4	5	6

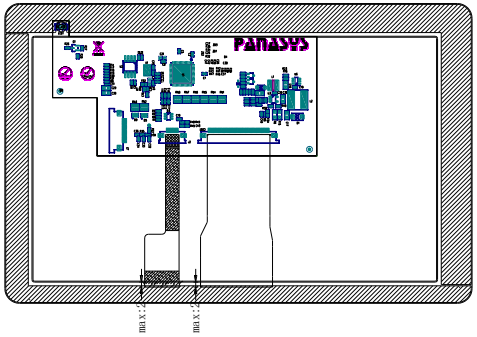
No.	PARAMETER	SYMBOL
1	Brand	PS - PANADISPLAY
2	Driver IC Solution	817 - Bridgetek BT817Q
3	Display Size	070WS – 7 inch IPS Display 1024x600
4	Touch Panel	CTP – Capacitive Touch Panel
5	LCD Type	IPS – Normally Black All View Angle

2. TFT LCD Display Drawing

RevNo	Revision note	Date	Signature	Checked
1				
2				
3				



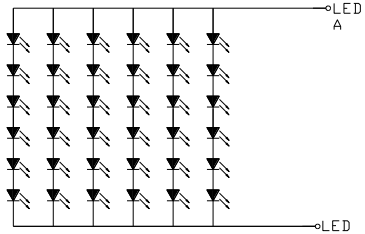




Pin NO.	Name
1	VDD
2	GND
3	SPI_SCLK
4	MISO/IO.1
5	MISO/IO.0
6	CS
7	INT
8	RST/PD
9	GPIO.0
10	DISP_AUDIO
11	GPIO.1/IO.2
12	GPIO.2/IO.3
13	NC
14	NC
15	NC
16	NC
17	BLVDD
18	BLVDD
19	BLVDD
20	BLVDD

NOTES:
1. DISPLAY TYPE: 7.0", 1024*600 IPS TFT LCD
2. DISPLAY MODE: transmissive NormallyBlack
3. VIEWING DIRECTION: FREE
4. DRIVER IC ON THE BOARD: BT817Q, Interface:SPI/QSPI
5. LCM (White 9 AVG 1/9) :
   Brightness: 800cd/m² (TYP)
   Uniformity:80%(MIN)
6. BACK LIGHT: 36 chip white LEDs If=120mA,Vf=19.8V
7. OPERATING TEMP: -20° C TO 70° C,STORAGE TEMP: -30° C TO 80° C
8. * Critical Parameter,( ) ref Parameter,[ ] cpk Parameter
   Unspecified Tolerances:±0.20mm
   Modification mark:
9. Supply voltage for module: 3.3V, Supply voltage for backlight:5.0(TYP)
10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS

Note:
1. COVER Glass+ITO FILM+FPC
   COVER Glass:0.7mm
   ITO FILM:0.425mm
   FPC:(PINCH=0.5mm)
   Thickness：1.125±0.1mm
   Drive IC:FT5446
2. Operating Voltage：2.8V-3.3 V
3. Transmittance：≥86%
4. Hardness：6H
5. Operating TEMP：-20℃~+70℃，≤90%RH
6. Storage TEMP：-30℃~+80℃，≤90%RH
7. General Tolerance:±0.2mm



LED Diagram Circuit

Limits Unless Otherwise Noted					签名	日期	材料		Shenzhen SLS Industrial Co.,Ltd	
Tolerance Grade				设计			单位	mm		
Grade	◯			绘图			比例	1:1	客户图号	
0 - 150	±0.10	±0.15	±0.20	审核					工程图号	PS817-070WS-C-IPS-46
150+	±0.20	±0.25	±0.30	批准			日期	20240402	投影法	版本 1.0
Angle	±0.50°	±0.80°		客户确认						

3. Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for LCD Logic	VDD/VCC	-0.3	5	V
Digital I/O Signal Voltage	-	-0.5	3.3	v
Supply voltage for Backlight	BLVDD	-0.3	7.0	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

4. Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Power Voltage	VDD	3.0	3.3	3.6	V
Input Voltage 'H' Level	VIH	2.0	-	3.3	V
Input Voltage 'L' Level	VIL	-	-	0.8	V
Current drawn from VDD 3.3V	IVDD	-	210	524	mA

5. Electro-Optical Characteristics

ITEM		SYM	CONDITION	MIN	TYP	MAX	UNIT	REMARK
Response Time		Tr+Tf	θ=0° ∅=0° Ta=25 °C	-	35	-	ms	Figure 1 (4)
Contrast Ratio		Cr		-	800	-	-	Figure 2 (1)
Luminance Uniformity		δ WHITE			75	-	%	Figure 2 (3)
Surface Luminance		Lv		-	850	-	cd/m^2	Figure 2 (2)
Viewing Angle Range		θ	Ø = 90°	-	85	-	deg	Figure 3 (6)
			Ø = 270°	-	85	-	deg	
			Ø = 0°	-	85	-	deg	
			Ø = 180°	-	85	-	deg	
CIE (x,y) Chromaticity	Red	x	θ=0° ∅=0° Ta=25 °C	0.578	0.618	0.658	-	Figure 2 (5)
		y		0.489	0.329	0.369	-	
	Green	x		0.376	0.416	0.456	-	
		y		0.493	0.533	0.573	-	
	Blue	x		0.071	0.111	0.151	-	
		y		0.108	0.148	0.188	-	
	White	x		0.270	0.310	0.350	-	
		y		0.290	0.330	0.370	-	

6. Backlight Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED Backlight	Vl	16.8	18	19.8	V
Current for LED Backlight	Il	-	180	-	mA
LED Life Time	-	50000	-	-	Hrs

Note: The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C.

Note 1: Contrast Ratio (CR) is defined mathematically as below, for more information see Figure 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2: Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information, see Figure 2.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3: The uniformity in surface luminance δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information, see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4: Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers ConoScope series.

Note 5: CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6: Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information, see Figure3.

Note 7: For viewing angle and response time testing, the testing data is based on Autronic-Melchers ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCONs BM-5 photo detector.

Figure 1. The definition of response time.

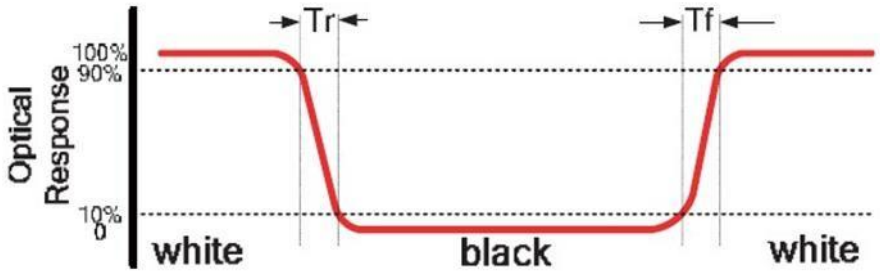


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity.

A : 5 mm
B : 5 mm
H, V : Active Area
Light spot size ∅=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

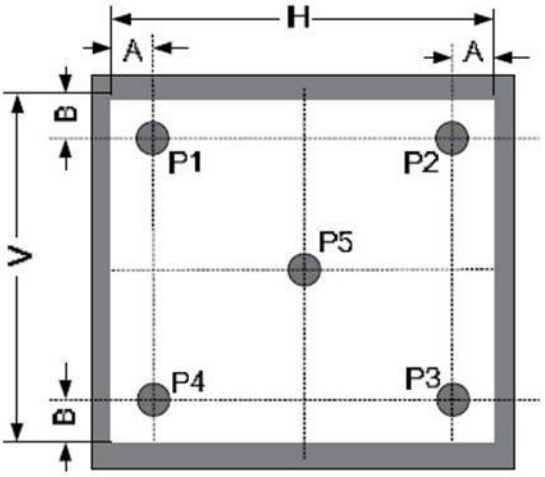
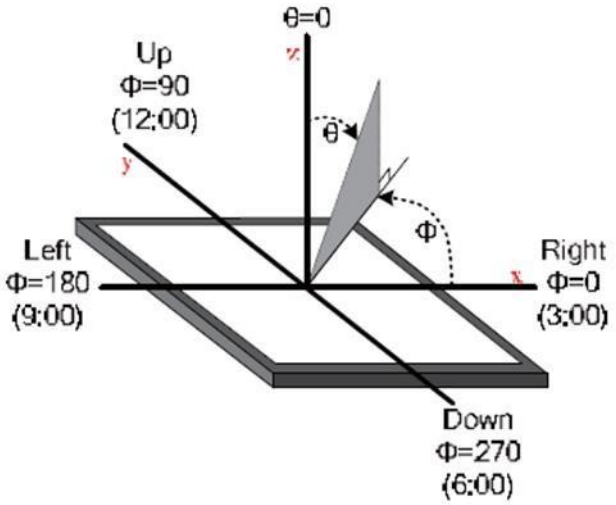


Figure 3. The definition of viewing angle.



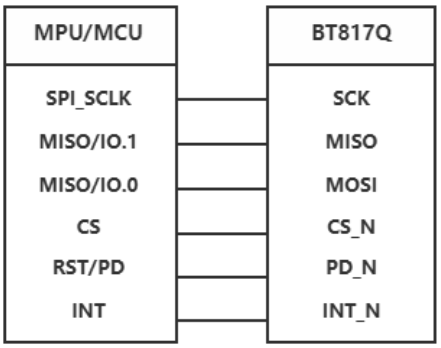
7. Interface Descriptions

No.	NAME	DESCRIPTION	NOTE
1	VDD	Supply voltage for module; TYP 3.3 V	
2	GND	Ground	
3	SPI_SCLK	SPI SCK signal	
4	MISO/ IO.1	SPI MISO signal / SPI Quad mode: SPI data line 1	
5	MOSI/ IO.0	SPI MOSI signal / SPI Quad mode: SPI data line 0	
6	CS	SPI chip select signal	
7	INT	Interrupt signal from device to the system, Active Low, internally 47k Pull UP	
8	RST/PD	Reset / Power down signal, Active Low, Internally Pulled UP 47k	
9	GPIO.0	GPIO.0	
10	DISP_AUDIO	Display audio in/out	
11	GPIO.1/IO.2	SPI Single/Dual mode: General purpose IO0. QSPI mode: SPI data line 2	
12	GPIO.2/IO.3	SPI Single/Dual mode: General purpose IO1. QSPI mode: SPI data line 3	
13	NC	Not connected	
14	NC	Not connected	
15	NC	Not connected	
16	NC	Not connected	
17	BLVDD	Supply voltage for backlight	
18	BLVDD	Supply voltage for backlight	
19	BLGND	Backlight Ground, internally connected to GND	
20	BLGND	Backlight Ground, internally connected to GND	

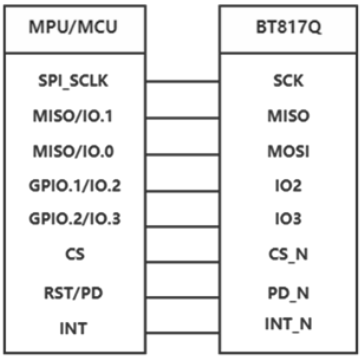
8. BT817Q Controller Specification

BT817Q or EVE4 (Embedded Video Engine 4) simplifies the system architecture for advanced human machine interfaces (HMIs) by providing functionality for display, audio, and touch as well as an object-oriented architecture approach that extends from display creation to the rendering of the graphics.

8.1. Serial Host Interface



SPI single /dual interface connection



QSPI interface connection

SPI Interface – the SPI slave interface operates up to 30MHz.

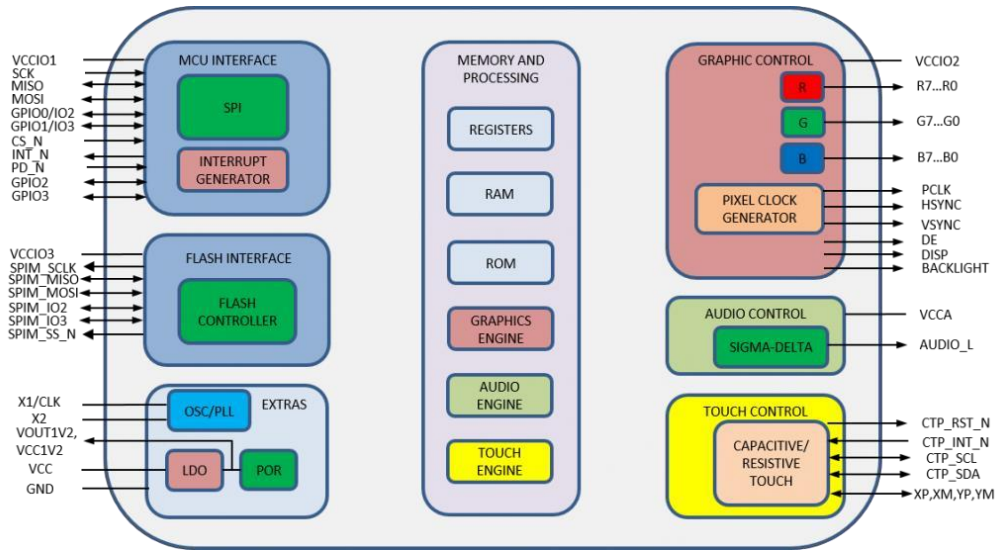
Only SPI mode 0 is supported. The SPI interface is selected by default.

QSPI Interface – the QSPI slave interface operates up to 30MHz. Only SPI mode 0 is supported.

The QSPI can be configured as a SPI slave in SINGLE, DUAL or QUAD channel modes.

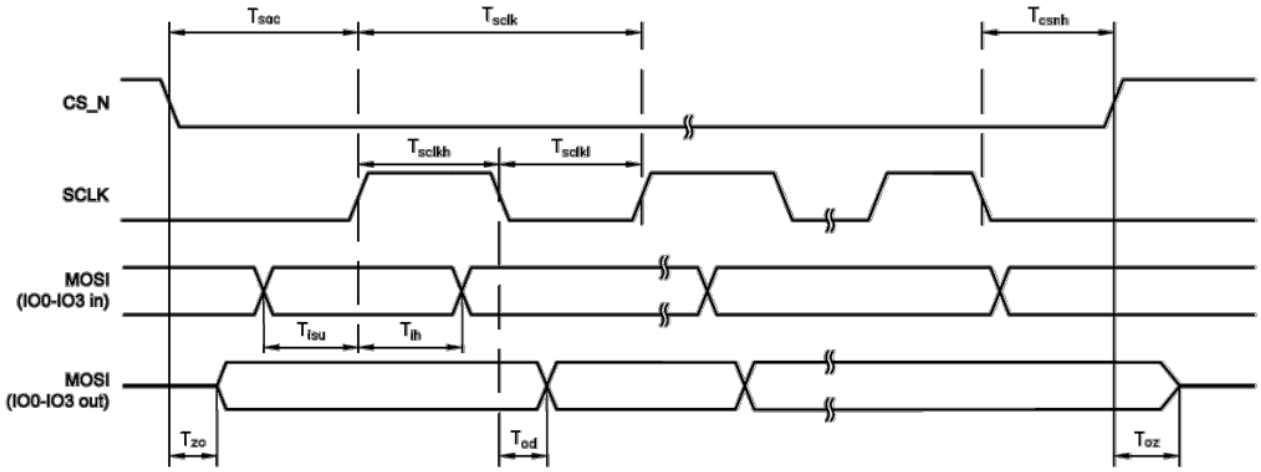
By default, the SPI slave operates in the SINGLE channel mode with MOSI as input from the master and MISO as output to the master. DUAL and QUAD channel modes can be configured through the SPI slave itself. To change the channel modes, write to register REG_SPI_WIDTH.

8.2. Block Diagram



BT817Q Block diagram

8.3. Host interface SPI mode 0



SPI timing diagram

SIGNAL	SYMBOL	PARAMETER	MIN	MAX	UNIT	DESCRIPTION
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	

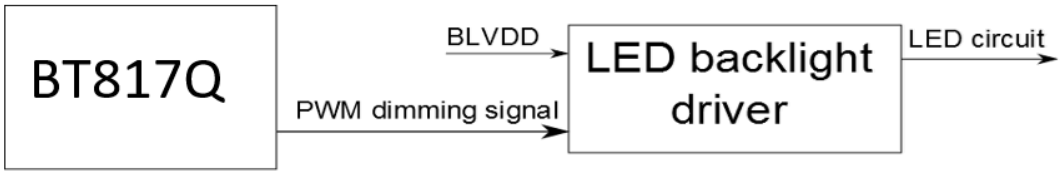
PARAMETER	DESCRIPTION	VCCIO=1.8V		VCCIO=2.5V		VCCIO=3.3V		UNIT
		Min	Max	Min	Max	Min	Max	
T_{sclk}	SPI clock period	33.3	-	33.3	-	33.3	-	ns
T_{sclkl}	SPI clock low duration	13	-	13	-	13	-	
T_{sclkh}	SPI clock high duration	13	-	13	-	13	-	
T_{sac}	SPI access time	4	-	3.5	-	3	-	
T_{isu}	Input Setup	4	-	3.5	-	3	-	
T_{ih}	Input Hold	0	-	0	-	0	-	
T_{zo}	Output enable delay	-	16	-	13	11	-	
T_{oz}	Output disable delay	-	13	-	11	10	-	
T_{od}	Output data delay	-	15	-	12	11	-	
T_{csnh}	CSN hold time	0	-	0	-	0	-	

For more information about BT817Q controller please go to official BT81x website.

8.4. Backlight Driver Block Diagram

Backlight enable signal is internally connected to BT817Q backlight control pin. This pin is controlled by two BT817Q's registers. **REG_PWM_HZ** specifies the PWM output frequency. **REG_PWM_DUTY** specifies the duty cycle.

Refer to BT817Q datasheet for more information.



Backlight driver block diagram

The LED backlight driver used in this module does not burst the LED current. Therefore, it does not generate audible noises on the output capacitor. It is equipped with soft start subsystem, which increases LED lifetime, as LED current peaks are reduced significantly.

9. TFT LCD Timing Characteristics

9.1. Parallel RGB timing characteristics

9.1.1. Horizontal input timing

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Horizontal display area	t_{hd}		1024		DCLK
DCLK frequency (frame rate 60Hz)	f_{clk}	44.9	51.2	63	MHz
1 Horizontal Line	t_h	1200	1344	1400	
HSYNC pulse width	t_{hpw}	1	-	140	DCLK
HSYNC back porch	t_{hbp}	160	160	160	
HSYNC front porch	t_{hfp}	16	160	216	

9.1.2. Vertical input timing

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Vertical display area	t_{vd}		600		H
VSYNC period time	t_v	624	635	750	
VSYNC pulse width	t_{vpw}	1	-	20	
VSYNC back porch	t_{vb}	23	23	23	
VSYNC front porch	t_{vfp}	1	12	127	

10. Capacitive Touch Panel Specifications

10.1. Mechanical Characteristics

DESCRIPTION	SPECIFICATION	REMARK
Touch Panel Size	7.0 inch	
Outline Dimension of CTP	179.96 mm x 119.00 mm	
CTP Thickness	1.525 mm	
Glass Thickness	1.1 mm	
CTP View Area	155.01 mm x 86.72 mm	
Sensor Active Area	156.08 mm x 88.47 mm	
Structure type	Glass + Film+Film	
Surface Hardness	7H	

10.2. Electrical characteristics

DESCRIPTION	SPECIFICATION	REMARK
Power Consumption (IDD)	90 mA	
Linearity	+/- 1.5mm	
Controller	FT5446	
Resolution	1024 x 600	

11. Reliability Test

No.	SYMBOL	TEST CONDITION	REMARK
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	After test cosmetic and electrical defects should not happen.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Power on	
5	High Temperature & Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-20℃←→25℃←→70℃ 30min 5min 30min After 10 cycles, restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s^2, 120min	
8	Shock Test	Half-sinewave, 300m/s^2, 11ms	

12. Precautions for Using LCD Module

12.1. Handing Precautions

(1) The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

(6) Solvents other than those above mentioned may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

(7) Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environment accelerates corrosion of the electrode.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD Module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD Module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling he LCD Module.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

12.2. Storage Precautions

When storing the LCD Module, avoid exposure to direct sunlight of fluorescent lamps. Keep the modules in bags (avoid high temperature/ high humidity and low temperatures below 0ć). Whenever possible, the LCD Module should be stored in the same conditions in which they were shipped from our company.

12.3. Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD Module have been operating for a long time showing the same display patterns the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module resulting from destruction caused by static electricity etc. exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.

13. Legal Information

PANASYS makes no warranty, either expressed or implied with respect to any product, and specifically disclaims all other warranties, including, without limitation, warranties for merchantability, non- infringement and fitness for any particular purpose. Information about device is the property of PANASYS and may be the subject of patents pending or granted. It is not allowed to copy or disclosed this document without prior written permission.

PANASYS endeavours to ensure that the all contained information in this document are correct but does not accept liability for any error or omission. PANASYS products are in developing process and published information may be not up to date. PANASYS reserves the right to update and makes changes to Specifications or written material without prior notice at any time. It is important to check the current position with PANASYS.

PANASYS products are not fault tolerant nor designed, manufactured or intended for use or resale as on line control equipment in hazardous environments requiring fail – safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines or weapons systems in which the failure of the product could lead directly to death, personal injury or severe physical or environmental damage ('High Risk Activities'). PANASYS and its suppliers specifically disclaim any expressed or implied warranty of fitness for High Risk Activities. Using PANASYS products and devices in 'High Risk Activities' and in any other application is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless PANASYS from any and all damages, claims or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any PANASYS intellectual property rights.