



LCD Module TFT Specification

MODULE NO.: ASI-X-48027A43Q-CC-VWH/X

APPROVED BY: (FOR CUSTOMER USE ONLY)	PCB VERSION:	DATA:
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VERSION	DATE	REVISED PAGE NO.	SUMMARY
B	2010.02.25	21	Add LED life time



P/N ASI-X-48027A43Q-CC-VWH/X

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2009/9/9		First issue
A	2010.01.18	18	Modify contour drawing
B	2010.02.25	21	Add LED life time



P/N ASI-X-48027A43Q-CC-VWH/X

Contents

1. Block Diagram
2. Electrical Characteristics
3. Absolute Maximum Ratings
4. Interface Pin Function
5. DC CHARACTERISTICS
6. AC Characteristics
7. Data transfer order Setting
8. Register Depiction
9. Optical Characteristics
10. Contour Drawing
11. Touch Screen Panel Specifications
12. LED driving conditions
14. RELIABILITY TEST



P/N ASI-X-48027A43Q-CC-VWH/X

This product is composed of a TFT LCD panel, driver ICs, FPC, Control Board and a backlight unit. The following table described the features

Item	Dimension	Unit
Dot Matrix	480 x RGBx 272(TFT)	dots
Module dimension	105.5x 67.2 x 6.2 (max)	mm
View area	95.04x 53.856	mm
Dot pitch	0.198 x 0.198	mm
Driving IC package	COG	
LCD type	TFT, Negative, Transmissive	
View direction	6 o'clock	
Backlight Type	LED, Normally White	
Controller IC	SSD1963	

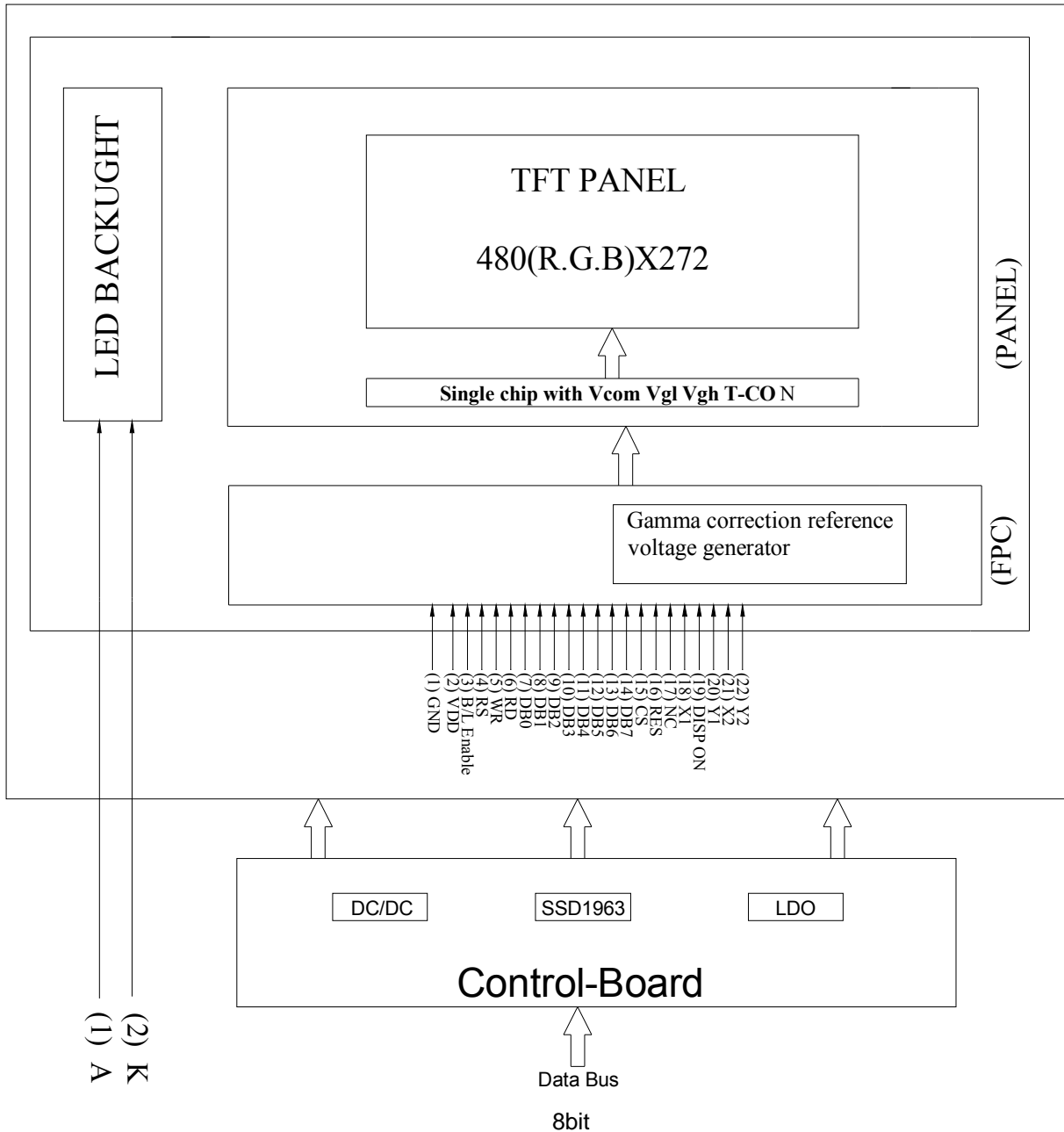
*Expose the IC number blaze (Luminosity over than 1 cd) when using the LCM may cause IC operating failure.

*Color tone slight changed by temperature and driving voltage.



P/N ASI-X-48027A43Q-CC-VWH/X

2. Block Diagram





P/N ASI-X-48027A43Q-CC-VWH/X

3. Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min	TYP	max		
Operating voltage	VDD	3.0	3.3	3.6	V	
Input high voltage	VIH	0.8*VDD	-	VDD	V	
Input low voltage	VIL	0	-	0.2*VDD	V	
Output high voltage	VOH	VDD-0.3		VDD	V	
Output low voltage	VOL	0	-	0.3	V	
Current Consumption	IVCI	-	285	-	mA	
Power Consumption	PLCD	-	940.5	-	mW	

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T _{OP}	-20	—	+70	°C
Storage Temperature	T _{ST}	-30	—	+80	°C
Power Supply Voltage	VDD	-0.3	—	6.0	V



P/N ASI-X-48027A43Q-CC-VWH/X

5.Interface Pin Function

5-1 Pins Connection To Control Board

P/N	Symbol	8 B IT Function
1	GND	Ground
2	VDD	Power supply for Logic
3	BVL Enable	Backlight control
4	RS	Command/Data select
5	WR	8080 family MPU interface : Write signal
6	RD	8080 family MPU interface: Read signal
7	DB0	Data bus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	CS	Chip select
16	RES	REST
17	NC	No connection
18	X1	Touch screen
19	DISP ON	Display on
20	Y1	Touch screen
21	X2	Touch screen
22	Y2	Touch screen



P/N ASI-X-48027A43Q-CC-VWH/X

6. DC CHARATERISTICS

Conditions:

Voltage referenced to VSS

VDDD, VDDPLL = 1.2V

VDDIO, VDDLCD = 3.3V

TA = 25°C

DC Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
PSTY	Quiescent Power			300		uW
IIZ	Input leakage current		-1		1	uA
IOZ	Output leakage current		-1		1	uA
VOH	Output high voltage		0.8VDDIO			V
VOL	Output low voltage				0.2VDDIO	V
VIH	Input high voltage		0.8VDDIO		VDDIO + 0.5	V
VIL	Input low voltage				0.2VDDIO	V



P/N ASI-X-48027A43Q-CC-VWH/X

7. AC Characteristics

Conditions:

Voltage referenced to V_{SS}

$V_{DD}, V_{DDPLL} = 1.2V$

$V_{DDIO}, V_{DDLCD} = 3.3V$

$T_A = 25^\circ C$

$C_L = 50pF$ (Bus/CPU Interface)

$C_L = 0pF$ (LCD Panel Interface)

7.1 Clock Timing

Clock Input Requirements for CLK (PLL-bypass)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)		120	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

Clock Input Requirements for CLK (Using PLL)

Symbol	Parameter	Min	Max	Units
FCLK	Input Clock Frequency (CLK)	2.5	50	MHz
TCLK	Input Clock period (CLK)	1/fCLK		ns

Clock Input Requirements for crystal oscillator XTAL (Using PLL)

Symbol	Parameter	Min	Max	Units
FXTAL	Input Clock Frequency	2.5	10	MHz
TXTAL	Input Clock period	1/fXTAL		ns

7.2 MCU Interface Timing

7.2.1 6800 Mode

Table 7-4: 6800 Mode Timing

Symbol	Parameter	Min	Typ	Max	Unit
t _{cy}	Reference Clock Cycle Time	9	-	-	ns
t _{PWCSL}	Pulse width CS# or E low	1	-	-	t _{CYC}
t _{PWCSH}	Pulse width CS# or E high	1	-	-	t _{CYC}
t _{FDRD}	First Data Read Delay	5	-	-	t _{CYC}
t _{AS}	Address Setup Time	1	-	-	ns
t _{AH}	Address Hold Time	1	-	-	ns
t _{DSW}	Data Setup Time	4	-	-	ns
t _{DHW}	Data Hold Time	1	-	-	ns
t _{DSR}	Data Access Time	-	-	5	ns
t _{DHR}	Output Hold time	1	-	-	ns



P/N ASI-X-48027A43Q-CC-VWH/X

Figure 7-1: 6800 Mode Timing Diagram (Use CS# as Clock)

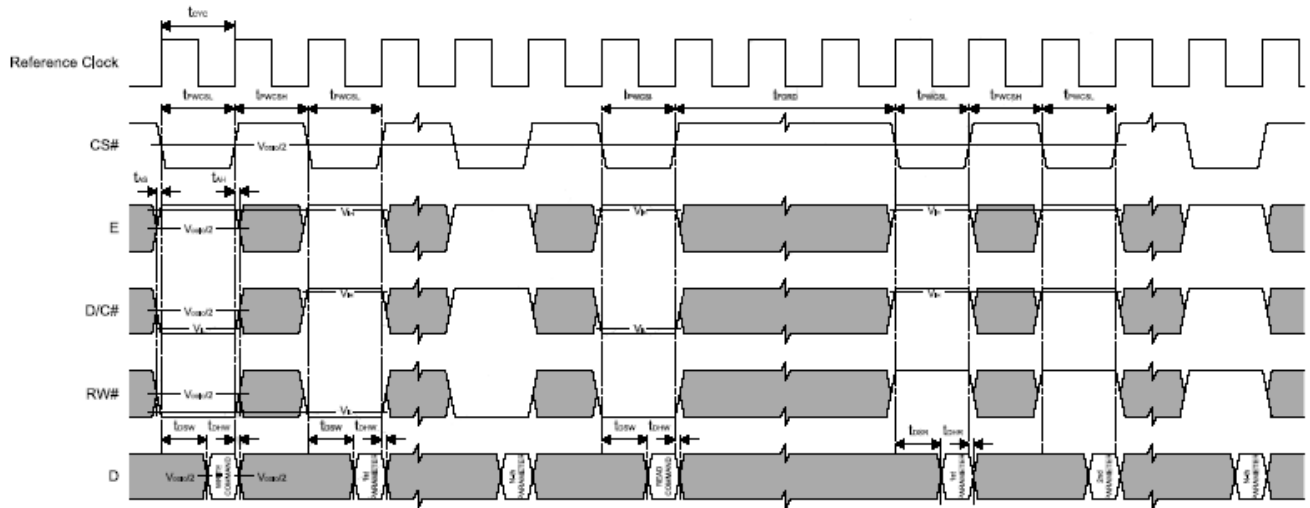
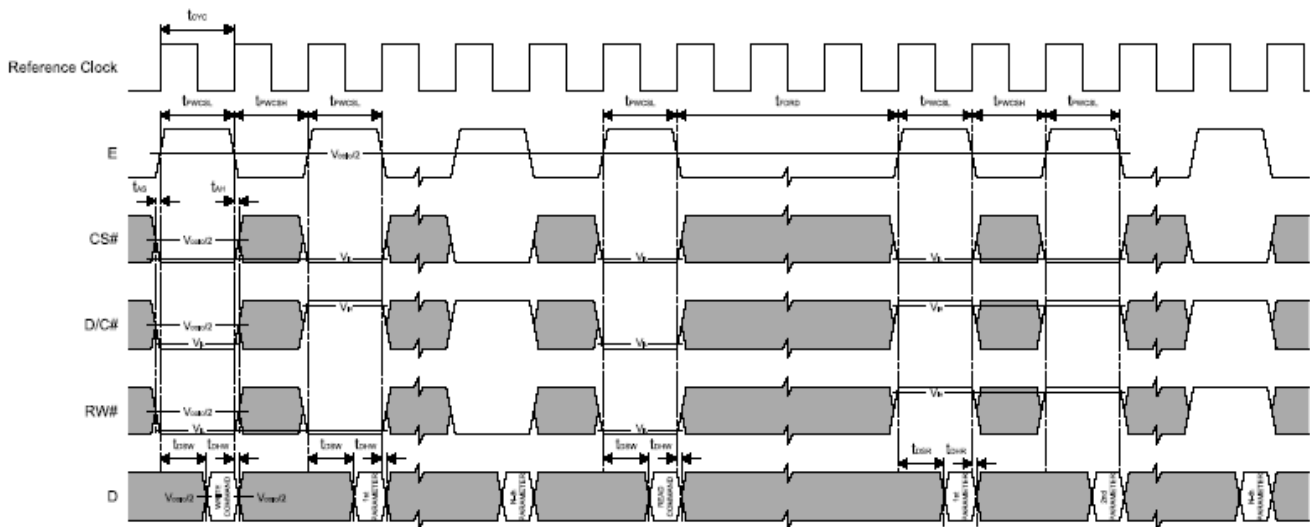


Figure 7-2: 6800 Mode Timing Diagram (Use E as Clock)





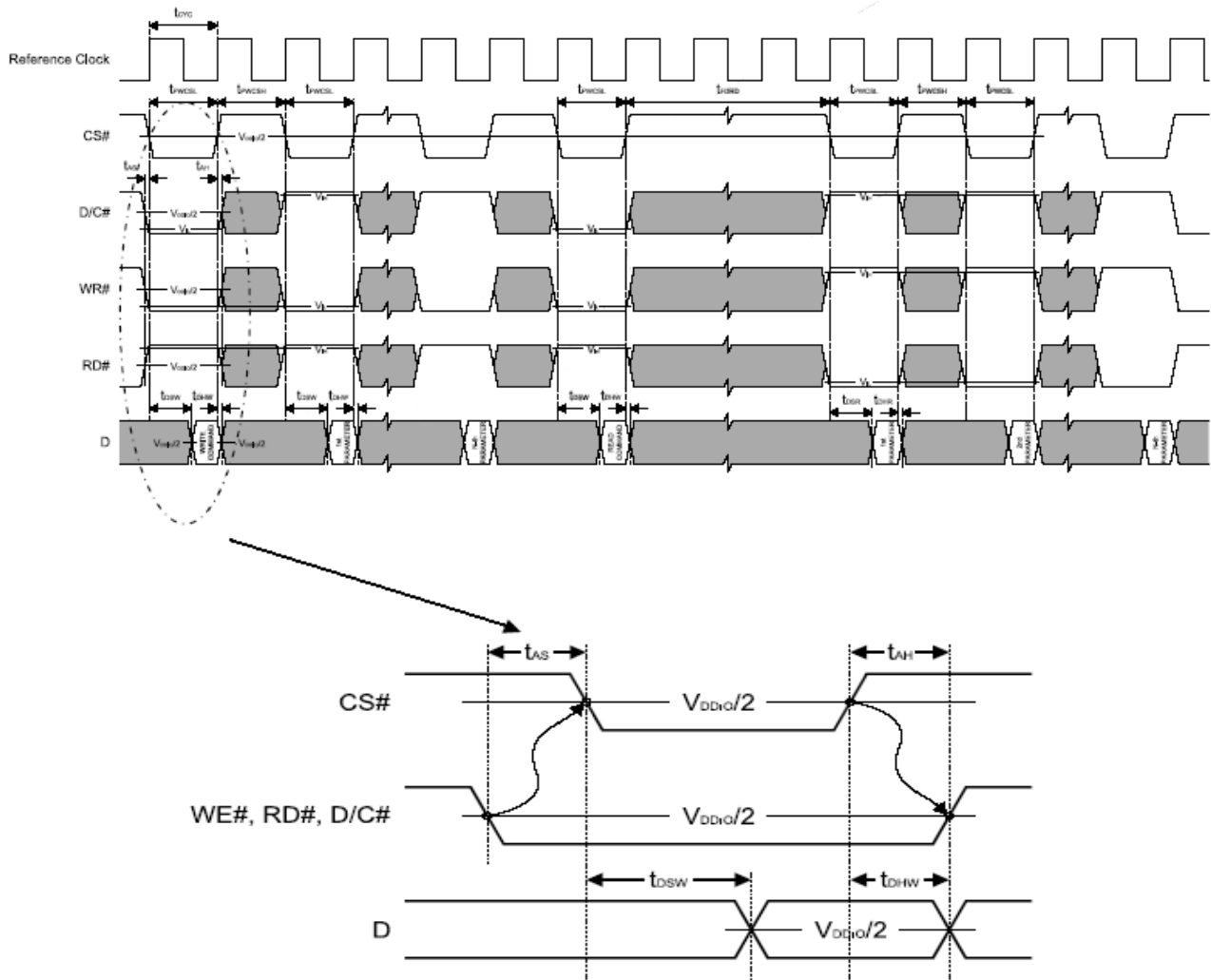
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7.2.2 8080 Mode Write Cycle

Table 7-5: 8080 Mode Timing

Symbol	Parameter	Min	Typ	Max	Unit
t _{cy}	Reference Clock Cycle Time	9	-	-	ns
t _{PWCSL}	Pulse width CS# low	1	-	-	t _{CYC}
t _{PWCSH}	Pulse width CS# high	1	-	-	t _{CYC}
t _{FDRD}	First Read Data Delay	5	-	-	t _{CYC}
t _{AS}	Address Setup Time	1	-	-	ns
t _{AH}	Address Hold Time	1	-	-	ns
t _{DSW}	Data Setup Time	4	-	-	ns
t _{DHW}	Data Hold Time	1	-	-	ns
t _{DSR}	Data Access Time	-	-	5	ns
t _{DHR}	Output Hold time	1	-	-	ns

Figure 7-3: 8080 Mode Timing Diagram





P/N ASI-X-48027A43Q-CC-VWH/X

8. Data transfer order Setting

Pixel Data Format

Both 6800 and 8080 support 8-bit, 9-bit, 16-bit, 18-bit and 24-bit data bus. Depending on the width of the data bus, the display data are packed into the data bus in different ways.

Pixel Data Format :

Interface	Cycle	D[23]	D[22]	D[21]	D[20]	D[19]	D[18]	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]	
24 bits	1 st	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
18 bits	1 st							R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	
16 bits (565 format)	1 st									R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	
16 bits	1 st									R5	R4	R3	R2	R1	R0	X	X	G5	G4	G3	G2	G1	G0	X	X	
	2 nd									B5	B4	B3	B2	B1	B0	X	X	R5	R4	R3	R2	R1	R0	X	X	
	3 rd									G5	G4	G3	G2	G1	G0	X	X	B5	B4	B3	B2	B1	B0	X	X	
9 bits	1 st																	R5	R4	R3	R2	R1	R0	G5	G4	G3
	2 nd																	G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1 st																		R5	R4	R3	R2	R1	R0	X	X
	2 nd																		G5	G4	G3	G2	G1	G0	X	X
	3 rd																		B5	B4	B3	B2	B1	B0	X	X

X: Don't Care



P/N ASI-X-48027A43Q-CC-VWH/X

9 Register Depiction

Please consult the spec of SSD1963



P/N ASI-X-48027A43Q-CC-VWH/X

10. OPTICAL CHARACTERISTIC

Ta=25±2 , ILED=20mA

Item	Symbol	Condition	Min	Typ	Max	Unit	Note	
Brightness			250	300	-	Cd/m ²		
Response time	TR	θ=0	-	15	-	Ms	(3)(5)	
	TF		-	15	-	ms		
Contrast ratio	CR	At optimized viewing angle	300	400	-	-	(4)	
Color Chromaticity	White	Wx	θ=0	0.26	0.31	0.36	-	(2)(6)(7)
		Wy		0.28	0.33	0.38	-	
Viewing angle	Hor.	θR	CR≥10	50	70	-	-	(1)
		θL		50	70	-		
	Ver.	ΦH		45	55	-		
		ΦL		50	70	-		
Uniformity				80		%	(8)	

Note 1: Definition of viewing angle range

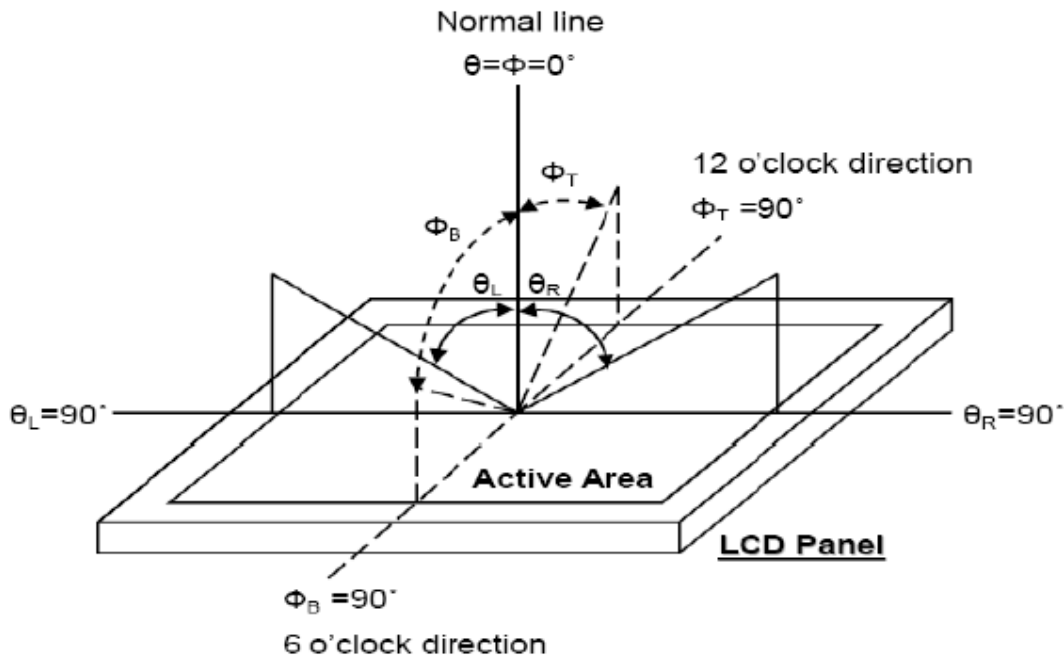


Fig. 10-1 Definition of viewing angle



P/N ASI-X-48027A43Q-CC-VWH/X

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

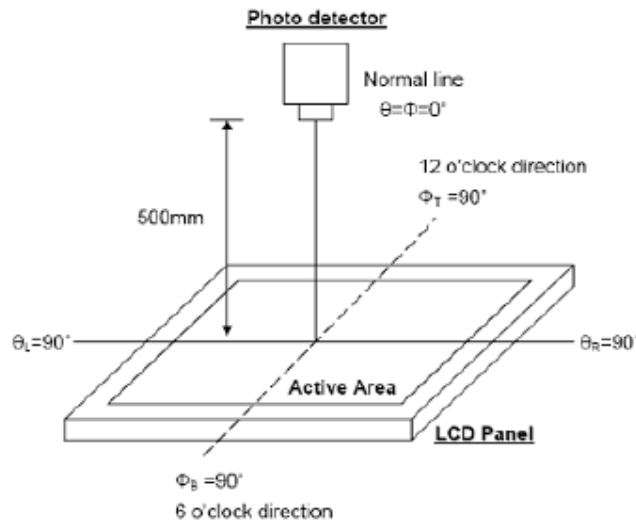


Fig. 10-2 Optical measurement system setup

Note 3: Definition of 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 between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%.

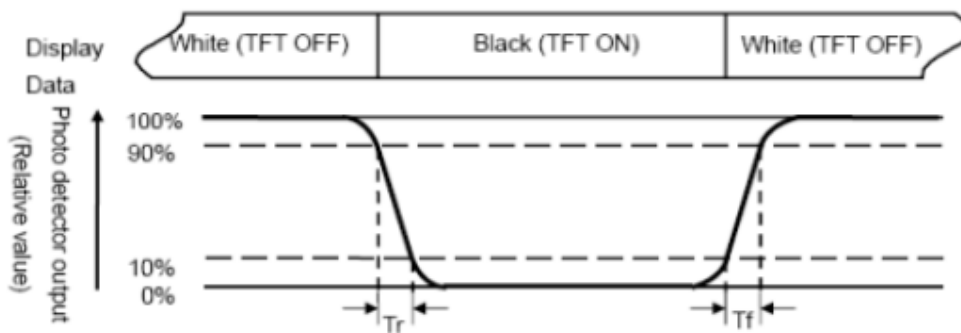


Fig.10-3 Definition of response time



P/N ASI-X-48027A43Q-CC-VWH/X

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

Contrast ratio (CR)=Luminance measured when LCD on the “White” state/Luminance measured when LCD on the “Black” state

Note 5: 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 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

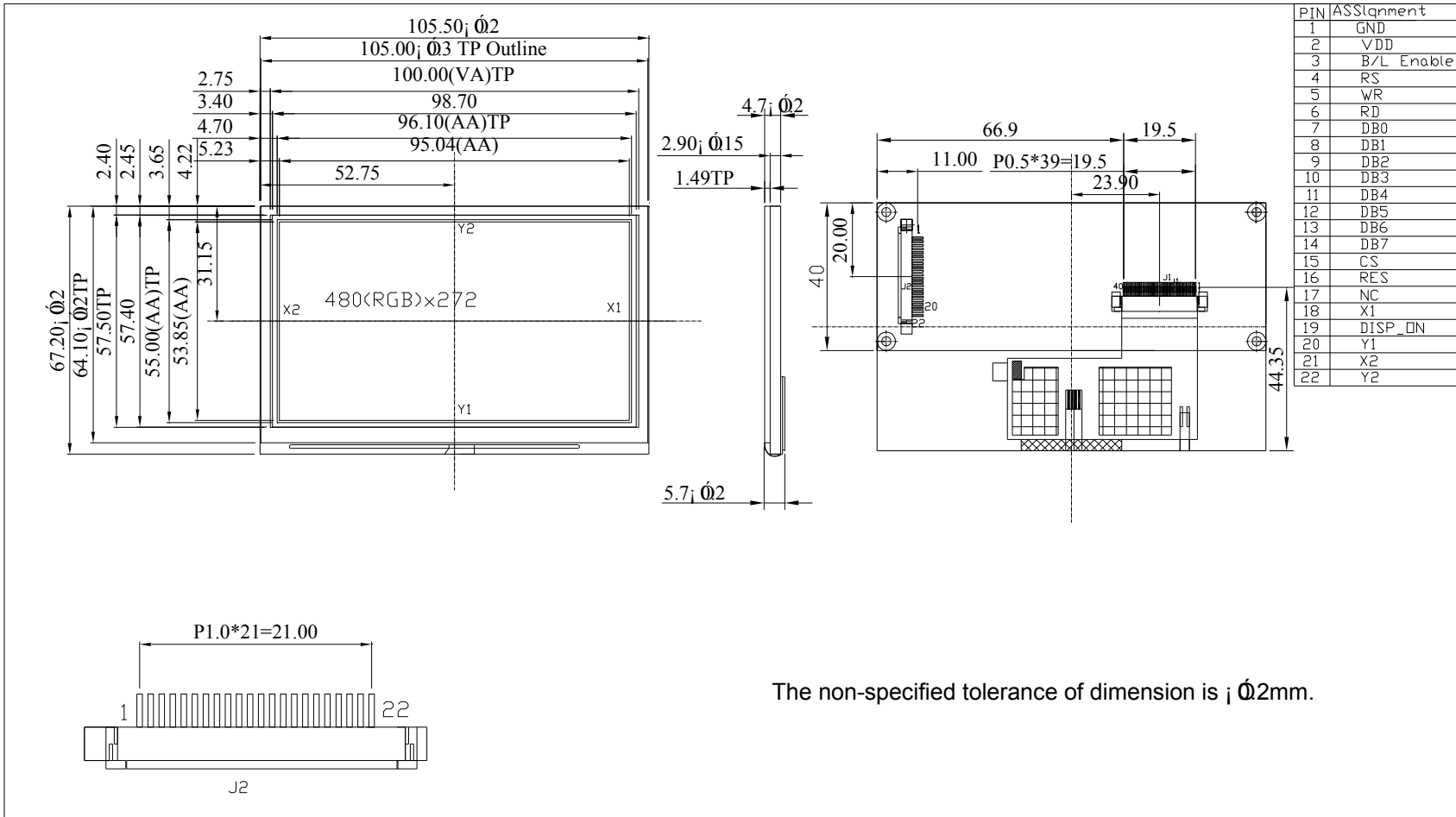
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8 : Uniformity (U) = Brightness (min) /Brightness (max) x 100%



P/N ASI-X-48027A43Q-CC-VWH/X

11. Contour Drawing



The non-specified tolerance of dimension is ± 0.2 mm.



P/N ASI-X-48027A43Q-CC-VWH/X

12.Touch Screen Panel Specifications

12.1 Electronic characteristics

Item		Min	TYP	max	Unit	Note
Linearity		-	-	1.5	%	
Circuit Resistance	X-axis	450	800	1150	Ω	
	Y-axis	100	350	600	Ω	
Insulation Resistance		20	-	-	M Ω	
Operating Voltage		-	-	5	V	
Chattering		-	-	10	ms	
Transmittance		82	-	-	%	

12.2 Mechanical & Reliability Characteristics

Item	Min	TYP	max	Unit	Note
Activation force			60	g	Note.1
Pen Writing Durability	100,000			Characters	Note.2
Pitting Durability	1,000,000			Touches	Note.3
Surface hardness	3			H	
Haze		7		%	With AR coating

Note.1: Operation force with R8.0mm silicone finger.

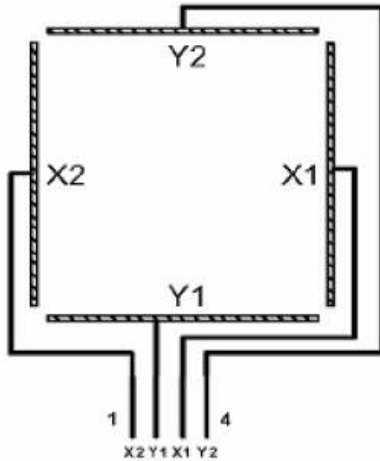
Note.2: Writing with r0.8mm plastic stylus pen; writing force 150g in active area.
(Each direction inside Active area 3mm) Speed is 60mm/sec.

Note.3: With the silicon Rubber R8mm on the same point of the touch panel with 250g force , frequency 240 times/min.



P/N ASI-X-48027A43Q-CC-VWH/X

12.3 Touch Screen Panel



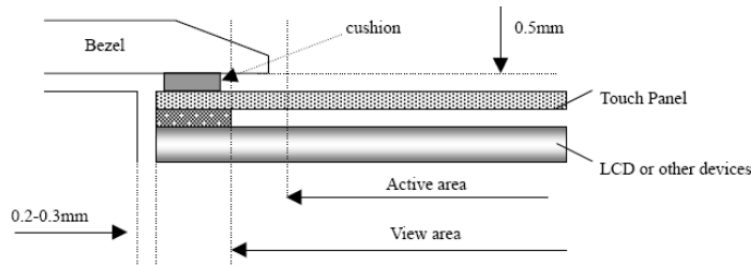
X : Upper electrode
Y : Lower electrode

12.4 Touch Screen Panel pin define

Pin NO.	symbol	I/O	Function
1	X2	Left	Left electrode-differential analog
2	Y1	Bottom	Bottom electrode-differential analog
3	X1	Right	Right electrode-differential analog
4	Y2	Top	Top electrode-differential analog

12.5 Design Guideline For Touch Panel.

Bezel edge must be positioned in the area between the active area and view area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2~0.3mm for the outside dimension of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.





P/N ASI-X-48027A43Q-CC-VWH/X

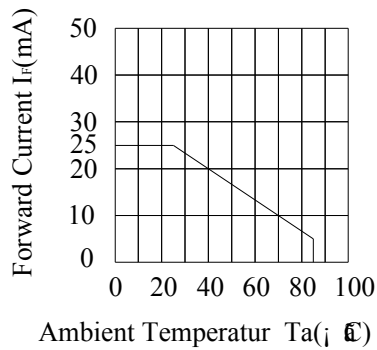
13. LED driving conditions

Backlight Unit(VSS=0v)

Item	Symbol	Values			Unit	Remark
		Min	TYP	max		
LED Voltage	VL	-	25	-	V	
LED Current	IF	-	20	-	MA	
Power Consumption	PLED	-	500	-	MW	
LED Life Time	-	10K	20K	50K	Hr	If=20mA

LED Forward Current

Forward Current Derating Curve





P/N ASI-X-48027A43Q-CC-VWH/X

13. RELIABILITY TEST

WIDE TEMPERATURE RELIABILITY TEST

N O.	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	80°C	240 Hrs		Appearance without defect	
2	Low Temp. Storage	-30°C	240 Hrs		Appearance without defect	
3	High Temp. & High Humi. Storage	60 °C 90%RH	240 Hrs		Appearance without defect	
4	High Temp. Operating Display	70°C	240 Hrs		Appearance without defect	
5	Low Temp. Operating Display	-20°C	240 Hrs		Appearance without defect	
6	Thermal Shock	-20 °C, 30min. → 70°C, 30min. ↑ (1cycle) ↓			Appearance without defect	10 cycles



P/N ASI-X-48027A43Q-CC-VWH/X

Inspection Provision

1. Purpose

The inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of produces.

2. Applicable Scope

The inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3. Technical Terms

3-1 Technical Terms



4. Outgoing Inspection

4-1 Inspection Method

MIL-STD-105E Level II Regular inspection

4-2 Inspection Standard

	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	Faults which substantially lower the practicality and the initial purpose difficult to achieve
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

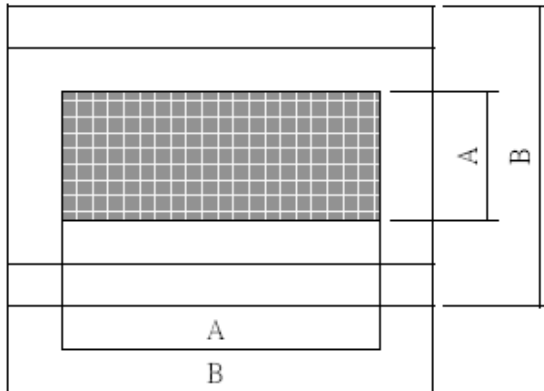
	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	Faults which appear to pose almost no obstacle to the practicality, effective use, and operation
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		



P/N ASI-X-48027A43Q-CC-VWH/X

4-3 Inspection Provisions *Viewing Area Definition

Fig. 1



A : Zone Viewing Area
B : Zone Glass Plate Outline

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.
The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp)
and sample to be 30 cm to 50 cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Temperature $20 \pm 15^{\circ}\text{C}$
Humidity $65 \pm 20\%\text{R.H.}$
Pressure $860\sim 1060\text{hPa(mmbar)}$

In case of doubtful judgment, it is performed under the following conditions.

Temperature $20 \pm 2^{\circ}\text{C}$
Humidity $65 \pm 5\%\text{R.H.}$
Pressure $860\sim 1060\text{hPa(mmbar)}$



P/N ASI-X-48027A43Q-CC-VWH/X

5. Specification for quality check

5-1-1 Electrical characteristics:

NO.	Item	Criterion
1	Non operational	Fail
2	Miss operating	Fail
3	Contrast irregular	Fail
4	Response time	Within Specified value

5-1-2 Components soldering :

Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mounting position, etc.

5-2 Inspection Standard for TFT panel

5-2-1 The environmental condition of inspection :

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature : $25 \pm 5^{\circ}\text{C}$

(2) Humidity : 25~75% RH

(3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.

(4) Visual inspection on the operation condition for cosmetic shall be conducted at the distance 30cm or more between the LCD panels and eyes of inspector. The viewing angle shall be 90 degree to the front surface of display panel.

(5) Ambient Illumination : 300~500 Lux for external appearance inspection.

(6) Ambient Illumination : 100~200 Lux for light on inspection.

5-2-2 Inspection Criteria

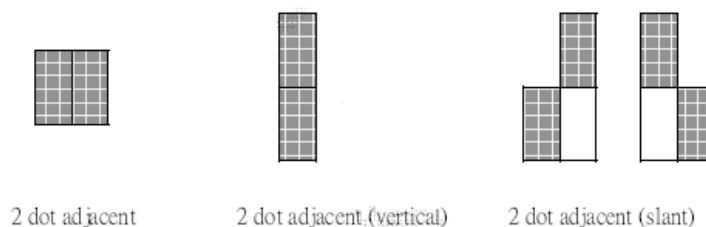
(1) Definition of dot defect induced from the panel inside

a) Definition of dot : Size of a defective dot over 1/2 of whole dot is regarded as 1 defective dot

b) Bright dot : Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

c) Dark dot : Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.

d) 2 dot adjacent = 1 pair = 2 dots Picture :





P/N ASI-X-48027A43Q-CC-VWH/X

(2) Display Inspection

NO.	Item		Acceptable Count	
1	Dot defect	Bright Dot	Random	$N \leq 2$
			2 dots adjacent	$N \leq 0$
		Dark Dot	Random	$N \leq 3$
			2 dots adjacent	$N \leq 1$
	Total bright and dark dot			$N \leq 4$
Functional failure (V-line/ H-line/Cross line etc.)			Not allowable	
	Mura	It's OK if mura is slight visible through 6% ND filter. (Judged by limit sample if it is necessary)		
2	Newton ring (touch panel)	Orbicular of interference fringes is not allowed in the optimum contrast within the active area under viewing angle.		

(3) Appearance inspection

NO.	Item	Standards
1	Panel Crack	Not allow. It is shown in Fig.1.
2	Broken CF Non -lead Side of TFT	The broken in the area of $W > 2\text{mm}$ is ignored, L is ignored. It is shown in Fig.2.
3	Broken Lead Side of TFT	FPC lead, electrical line or alignment mark can't be damaged. It is shown in Fig.3.
4	Broken Corner of TFT at Lead Side	FPC lead. electrical line or alignment mark can't be damaged. It is shown in Fig.4.
5	Burr of TFT / CF Edge	The distance of burr from the edge of TFT / CF, $W \leq 0.3\text{mm}$. It is shown in Fig.5.
6	Foreign Black / White/Bright Spot	(1) $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$; (2) $D \leq 0.15\text{mm}$, Ignore. It is shown in Fig.6.
7	Foreign Black / White/Bright Line	(1) $0.05 < W \leq 0.1 \text{ mm}$, $0.3 < L \leq 2 \text{ mm}$, $N \leq 4$.
		(2) $W \leq 0.05\text{mm}$ and $L \leq 0.3\text{mm}$ Ignore. It is shown in Fig.7.
8	Color irregular	Not remarkable color irregular.

Fig 1.

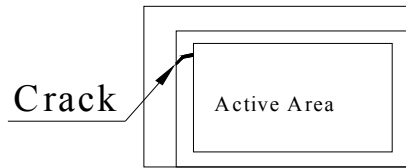


Fig 2.

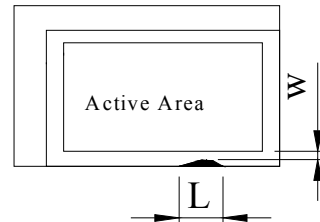


Fig 3.

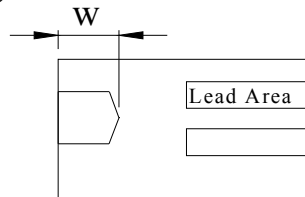


Fig 4.

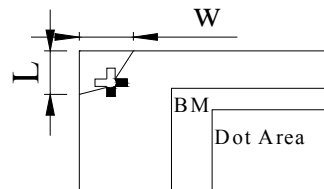


Fig 5.

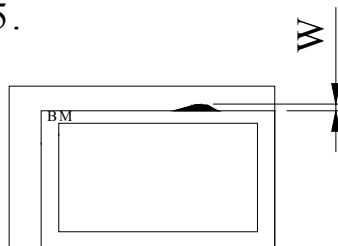
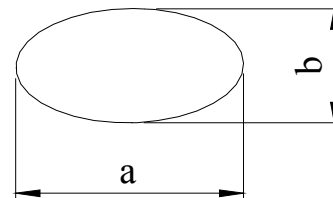


Fig 6.



$$D = (a + b) / 2$$

Fig 7.

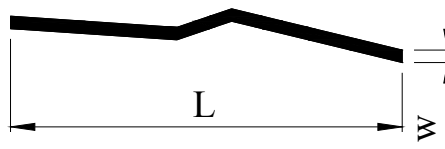
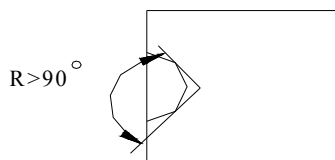


Fig 8.



Notes

1. W: Width
2. Length
3. D: Average Diameter
4. N: Count
5. All the angle of the broken must be larger than 90; it is shown in Fig.8. (R > 90; it is shown in Fig.8.)



P/N ASI-X-48027A43Q-CC-VWH/X

NOTICE:

- SAFETY

1. If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
2. If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

- HANDLING

1. Avoid static electricity which can damage the CMOS LSI.
2. Do not remove the panel or frame from the module.
3. The polarizing plate of the display is very fragile. So, please handle it very carefully.
4. Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
5. Do not use ketonics solvent & Aromatic solvent. Use a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE

1. Store the panel or module in a dark place where the temperature is $25\pm 5^{\circ}\text{C}$ and the humidity is below 65% RH
2. Do not place the module near organics solvents or corrosive gases.
3. Do not crush, shake, or jolt the module.

- TERMS OF WARRANT

1. Acceptance inspection period

The period is within one month after the arrival of contracted commodity at the buyer's factory site.

2. Applicable warrant period

The period is within twelve months since the date of shipping out under normal using and storage conditions.



P/N ASI-X-48027A43Q-CC-VWH/X

LCM Sample Estimate Feedback Sheet

Module Number : _____

Page: 1

1 - Panel Specification :

1. Panel Type : Pass NG ,
2. View Direction : Pass NG ,
3. Numbers of Dots : Pass NG ,
4. View Area : Pass NG ,
5. Active Area : Pass NG ,
6. Operating Temperature : Pass NG ,
7. Storage Temperature : Pass NG ,
8. Others :

2 - Mechanical Specification :

1. PCB Size : Pass NG ,
2. Frame Size : Pass NG ,
3. Material of Frame : Pass NG ,
4. Connector Position : Pass NG ,
5. Fix Hole Position : Pass NG ,
6. Backlight Position : Pass NG ,
7. Thickness of PCB : Pass NG ,
8. Height of Frame to PCB : Pass NG ,
9. Height of Module : Pass NG ,
10. Others : Pass NG ,

3 - Relative Hole Size :

1. Pitch of Connector : Pass NG ,
2. Hole size of Connector : Pass NG ,
3. Mounting Hole size : Pass NG ,
4. Mounting Hole Type : Pass NG ,
5. Others : Pass NG ,



P/N ASI-X-48027A43Q-CC-VWH/X

4、Backlight Specification :

1. B/L Type : Pass NG ,
2. B/L Color : Pass NG ,
3. B/L Driving Voltage (Reference for LED) Pass NG ,
4. B/L Driving Current : Pass NG ,
5. Brightness of B/L : Pass NG ,
6. B/L Solder Method : Pass NG ,
7. Others : Pass NG ,

>> Go to page 2 <<

5、Electronic Characteristics of Module :

1. Input Voltage : Pass NG ,
2. Supply Current : Pass NG ,
3. Driving Voltage for LCD : Pass NG ,
4. Contrast for LCD : Pass NG ,
5. B/L Driving Method : Pass NG ,
6. Negative Voltage Output : Pass NG ,
7. Interface Function : Pass NG ,
8. LCD Uniformity : Pass NG ,
9. ESD test : Pass NG ,
10. Others : Pass NG ,

6、Summary :

Sales signature : _____ Customer Signature : _____ Date : ___ / ___ / ___