

SPECIFICATIONS

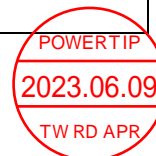
CUSTOMER	:	
SAMPLE CODE	:	SH128800T006-ZFC05
MASS PRODUCTION CODE	:	PH128800T006-ZFC05
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	001
DRAWING NO. (Ver.)	:	LMD-PH128800T006-ZFC05 (Ver.001)
PACKAGING NO. (Ver.)	:	

Customer Approved

Date:

Approved	Checked	Designer
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- ☒ Preliminary specification for design input
☐ Specification for sample approval



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NO.PT-A-005-8

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1. SPECIFICATIONS

1.1 Features

<u>Item</u>	<u>Standard Value</u>
Display Resolution	1280 *3 (RGB) * 800 Dots
LCD Type	Full Viewing Angle 、Transmissive 、Normally Black
Screen Size(inch)	10.1 inch
Color Configuration	16.7M
Touch Driver	FT5726
Weight	TBD
Interface	HDMI
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website: http://www.powertip.com.tw/news_detail.php?Key=1&clD=1

1.2 Mechanical Specifications

<u>Item</u>	<u>Standard Value</u>	<u>Unit</u>
Outline Dimension	254.96(W) * 173.6 (L) * 26.2 (H)	mm

LCD Panel

<u>Item</u>	<u>Standard Value</u>	<u>Unit</u>
Active Area	216.96 (W) * 135.60 (L)	mm

Note : For detailed information please refer to LCM drawing.

1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	VCC	-	-0.3	+18.0	V
	V _{Bus}	-	-0.3	+6.0	V
Logic Voltage	BL_PWM	-	-0.3	+5.5	V
Operating Temperature	T _{OP} (Ts)	Note 1	-20	+70	°C
Storage Temperature	T _{ST} (Ta)	Note 2	-30	+80	°C
Storage Humidity	H _D	Ta < 60 °C	-	90	%RH

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 1 : Ts is the temperature of panel's surface.

Note 2 : Ta is the ambient temperature of samples.

1.4 DC Electrical Characteristics

Item	Symbol	Status	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	VCC	I	VCC-GND	11.5	12.0	12.5	V
	V _{Bus}	I	V _{Bus} -GND	4.75	5.0	5.25	V
Power Supply Current	ICC	I	VCC=12.0v	-	TBD	TBD	mA
	I _{Bus}	I	V _{Bus} =5.0v	-	50	100	mA
Logic Voltage	BL_PWM	-	BL_EN=5.0v	0	-	5.0	V
PWM Frequency	F _{PWM}	-	-	100	-	20K	HZ
PWM Duty Ratio	PWM	-	-	5	-	100	%

Note: Maximum current from RGB full-display

1.5 Optical Characteristics

Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	-
Response Time	Tr + Tf	-	-	25	50	ms	Note2
Viewing Angle	Top	ΘY+	-	85	-	Deg.	Note4
	Bottom	ΘY-	-	85	-		
	Left	ΘX-	-	85	-		
	Right	ΘX+	-	85	-		
Contrast Ratio	CR	-	600	800	-	-	Note3
Color of CIE Coordinate (With B/L)	White	X	-	(0.32)	-	-	Note1
		Y	-	(0.33)	-		
	Red	X	-	(0.58)	-		
		Y	-	(0.35)	-		
	Green	X	-	(0.34)	-		
		Y	-	(0.57)	-		
	Blue	X	-	(0.17)	-		
		Y	-	(0.13)	-		
Average Brightness Pattern=White Display (With LCD&TP)*1	IV	LVCC=12.0V BL_PWM="High"	(350)	(450)	-	cd/m2	Note1
Luminance Uniformity (With LCD&TP)*2	YU	Duty=100%	70	-	-	%	Note1

Note1:

1 : $\Delta B = B(\min) / B(\max) \times 100\%$

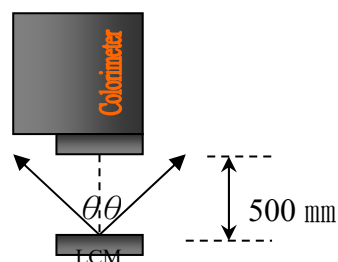
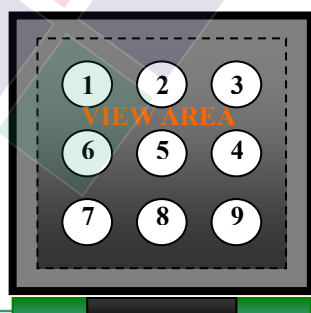
2 : Measurement Condition for Optical Characteristics:

a : Environment: 25°C±5°C / 60±20%R.H , no wind , dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: 500 ± 50 mm , (θ= 0°)

c : Equipment: TOPCON BM-7 fast , (field 1°) , after 10 minutes operation.

d : The uncertainty of the C.I.E coordinate measurement ±0.01 , Average Brightness ± 4%

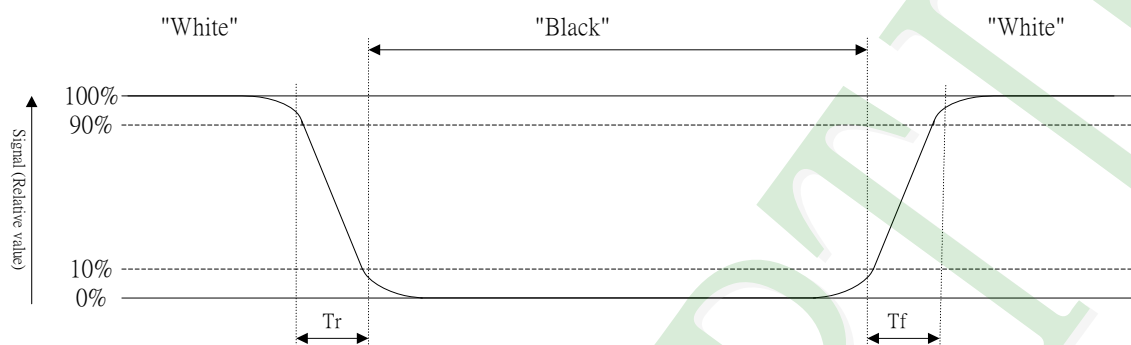


Colorimeter=BM-7 fast

Note2: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:



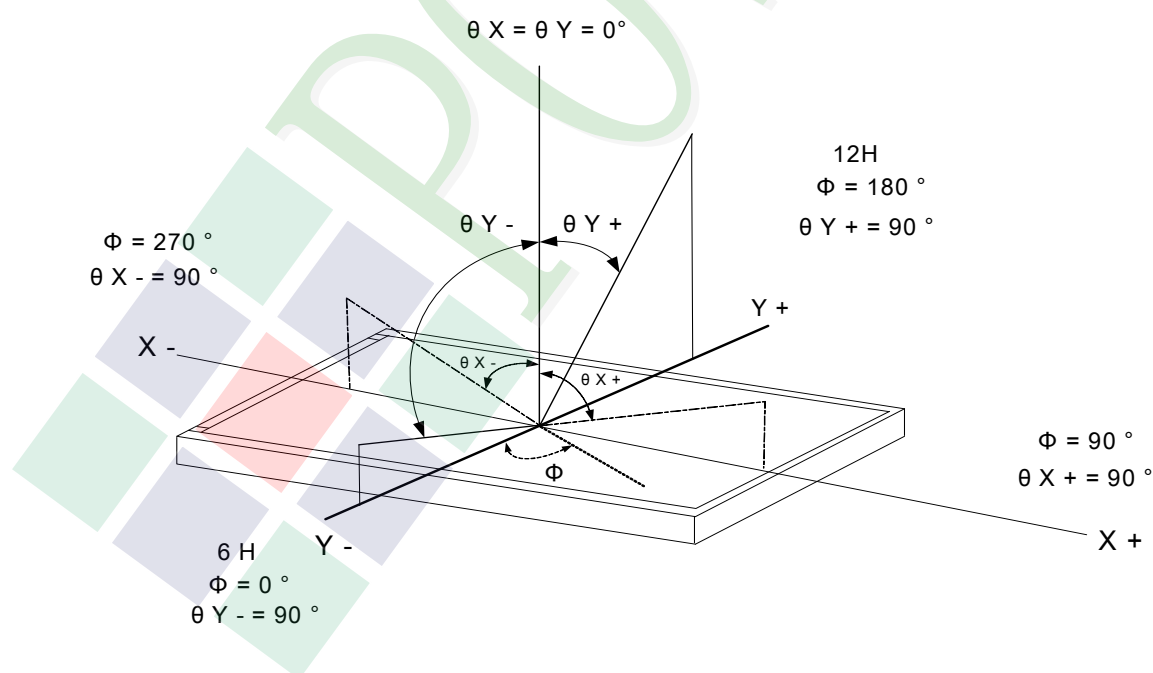
Note3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note4: Definition of viewing angle:

Refer to figure as below:



1.6 Backlight Unit Characteristics

Maximum Ratings

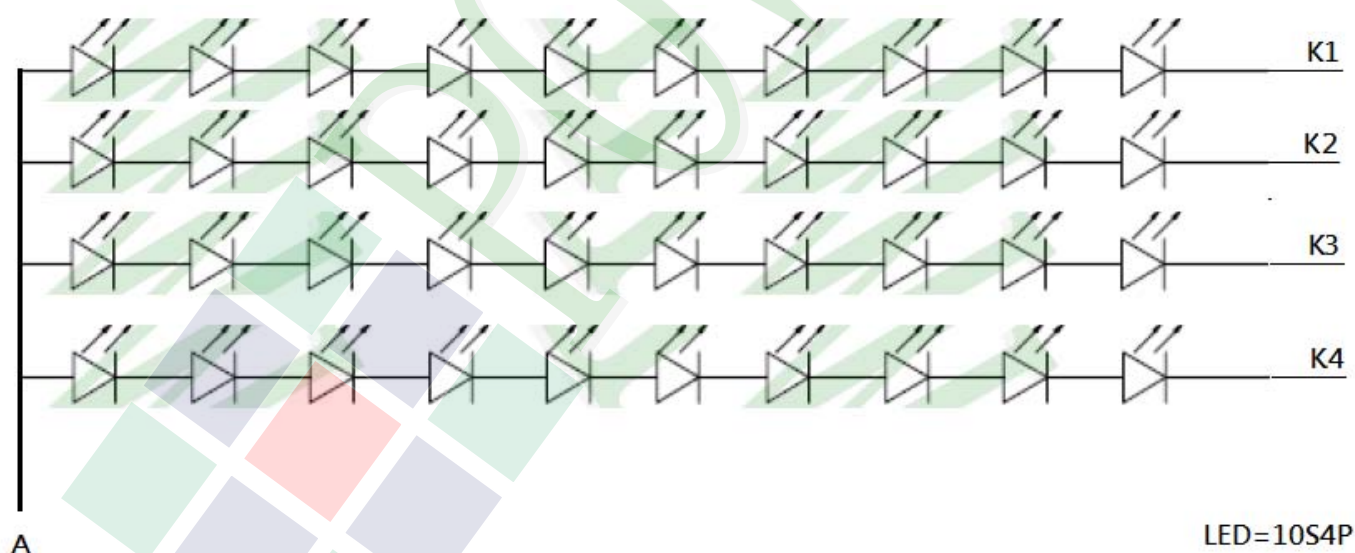
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Dissipation	Pd	-	-	-	100	mW
LED Forward Current	IF	1 LED	-	-	30	mA
LED Reverse Voltage	VR	1 LED	-	-	1.0	V

Electrical / Optical Characteristics

<u>Item</u>	<u>Symbol</u>	<u>Conditions</u>	<u>Min.</u>	<u>Typ.</u>	<u>Max.</u>	<u>Unit</u>
Voltage for LED Backlight	VF	If=80mA	28	30	32	V
Current for LED Backlight	IF		-	80	-	mA
Color	White					

Other Description

Item	Conditions	Description
Life Time	Ta =25℃ If= 80 mA	50000 hrs



1.7 Touch Panel Characteristics

Features

<u>Item</u>	<u>Standard Value</u>
Touch Panel Size	10.1"
Touch Type	Projective Capacitive Touch Panel
Input Method	Finger
Support Operation	5 Points touch
Output Interface	USB
Firmware Ver.	TBD
IC	FT5726

Mechanical Specifications

<u>Item</u>	<u>Standard Value</u>	<u>Unit</u>
Viewing Area	217.96 (W) * 136.60 (L)	mm

Absolute Maximum Ratings

<u>Item</u>	<u>Symbol</u>	<u>Condition</u>	<u>Min.</u>	<u>Max.</u>	<u>Unit</u>
Supply Voltage	VDD_5.0	-	-0.3	+6.0	V
Operating Temperature	T _{OP}	-	-20	+70	°C
Storage Temperature	T _{ST}	-	-30	+80	°C

DC Electrical Characteristics

<u>Item</u>	<u>Symbol</u>	<u>Condition</u>	<u>Min.</u>	<u>Typ.</u>	<u>Max.</u>	<u>Unit</u>
Power Supply Voltage	VDD_5.0	-	-	5.0	-	V

Optical Characteristics

<u>Item</u>	<u>Standard Value</u>	<u>unit</u>
Total Light Transmittance	>85%	-

PCAP Firmware Information

File:

SHA-256:

Remark: None

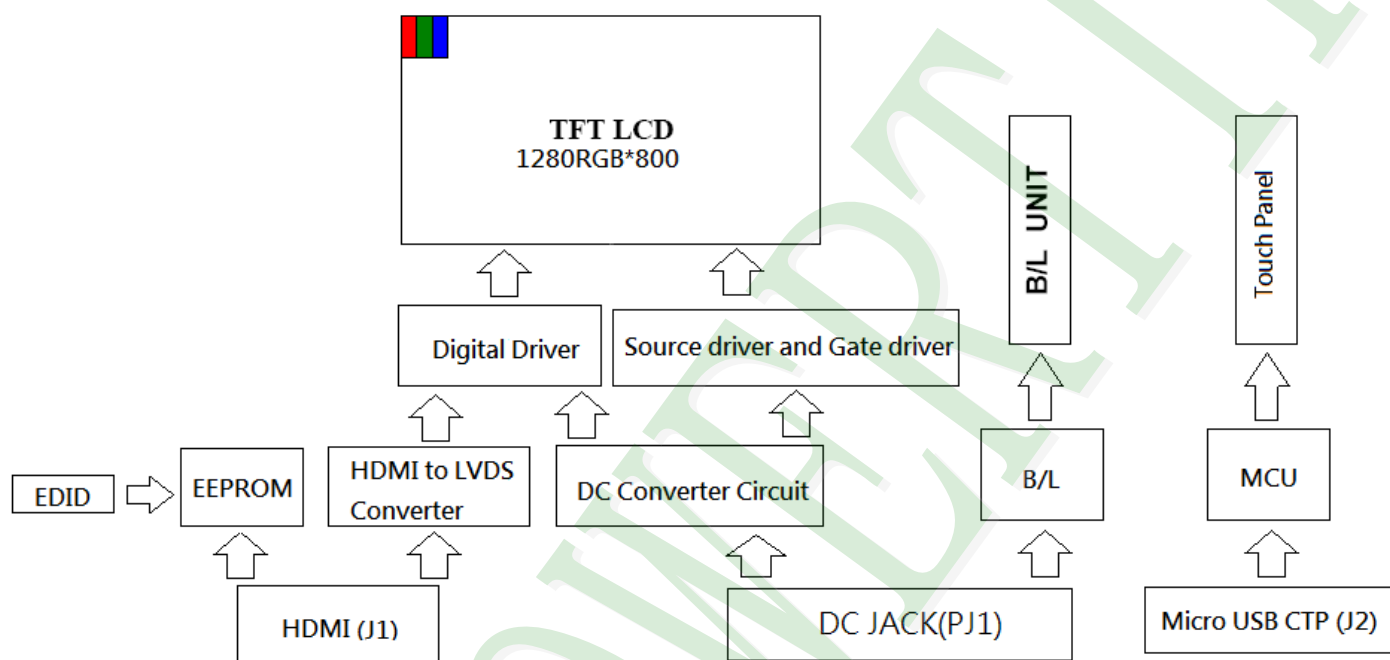
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



2.2 Interface Pin Description(CN1)

2.2.1 (J1: HDMI 1.3 A type Interface)

Pin#	Name	Description
1	TX2+	TMDS Data 2+
2	TX2 Shield	TMDS Data 2 Shield
3	TX2-	TMDS Data 2-
4	TX1+	TMDS Data 1+
5	TX1 Shield	TMDS Data 1 Shield
6	TX1-	TMDS Data 1-
7	TX0+	TMDS Data 0+
8	TX0 Shield	TMDS Data 0 Shield
9	TX0-	TMDS Data 0-
10	TXC+	TMDS Clock+
11	TXC Shield	TMDS Clock Shield
12	TXC-	TMDS Clock-
13	CEC	CEC
14	NC	No connection
15	SCL	Serial Clock for DDC
16	SDA	Serial Data for DDC
17	GND	Power Ground
18	V5V	+5V Power for HDMI
19	Hot Plug Detect	Hot Plug Detect

2.2.2 (J2: Micro USB Capacitive Touch Panel Interface)

Pin#	Name	Description
1	VBus	VBus 4.75V-5.25V
2	D-	Data-
3	D+	Data+
4	ID	No connection
5	GND	Power Ground.

2.2.3 (PJ1: POWER DC JACK Interface)

PJ1



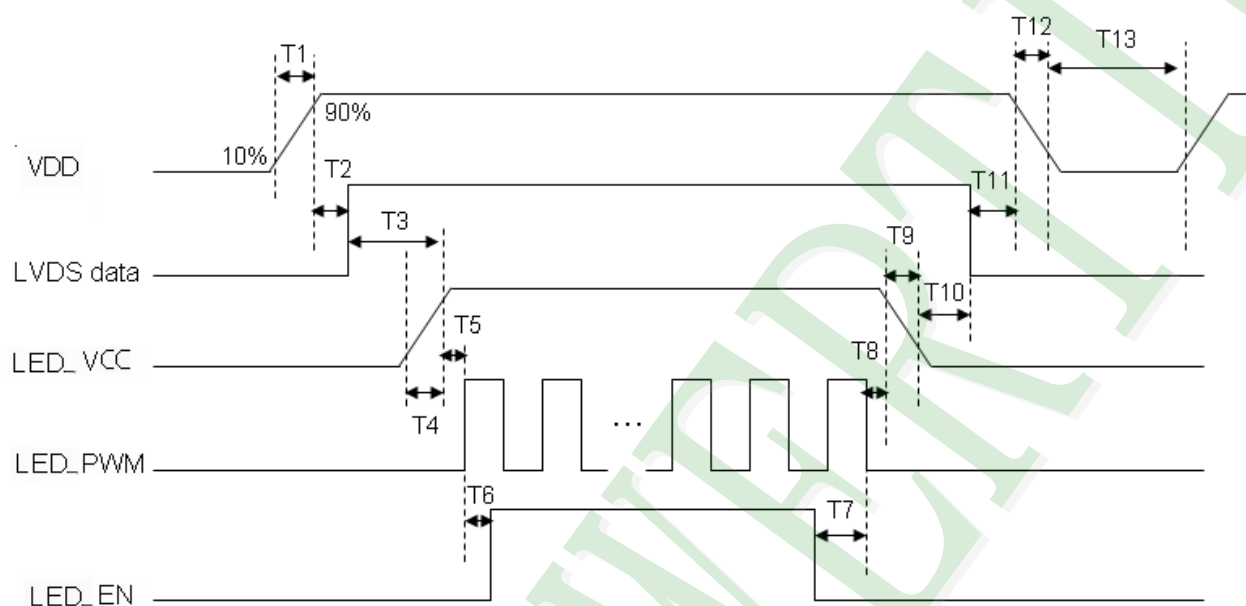
Hold $\Phi 6.4\text{mm}$ / Center Pin $\Phi 2.0\text{mm}$

Pin#	Name	Description
1	VCC	+12V Power
2	GND	Power Ground

2.3 Power Supply Characteristics

2.3.1 Power ON/OFF Sequence

- Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VDD voltage is off.
- Please set timing according to the following figures, otherwise it may cause image sticking



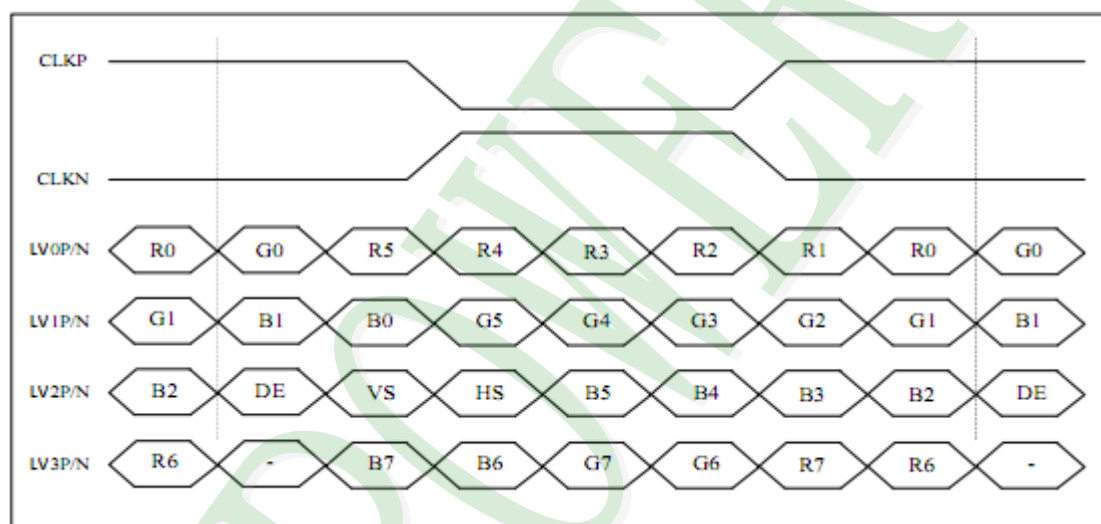
Parameter	Symbol	Unit	Min	Typ.	Max
VDD Rise Time (10% to 90%)	T1	ms	0.5	--	10
VDD Good to Signal Valid	T2	ms	30	--	90
Signal Valid to Backlight On	T3	ms	200	--	--
Backlight Power On Time	T4	ms	0.5	--	--
Backlight LED_VCC Good to System PWM On	T5	ms	10	--	--
System PWM On to Backlight LED_EN On	T6	ms	10	--	--
Backlight LED_EN Off to System PWM Off	T7	ms	0	--	--
System PWM Off to B/L Power Disable	T8	ms	10	--	--
Backlight Power Off Time	T9	ms	0.5	10	30
Backlight Off to Signal Disable	T10	ms	200	--	--
Signal Disable to Power Down	T11	ms	0	--	50
VDD Fall Time	T12	ms	0.5	10	30
Power Off	T13	ms	500	--	--

2.3.2 Input Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	70.0	72.4	76.6	MHz
H Total Time	HT	1410	1440	1470	Clocks
H Active Time	HA	1280			
V Total Time	VT	828	838	868	Lines
V Active Time	VA	800			
Frame Rate	FV	-	60	-	Hz

Note1: $HT * VT * \text{Frame Frequency} \leq (76.6) \text{ MHz}$

Note2: All reliabilities are specified for timing specification based on refresh rate of 60Hz.



2.4 HDMI Characteristics

2.4.1 Signal DC&AC Characteristics

DC ELECTRICAL CHARACTERISTICS

over operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{ID} Analog input differential voltage ⁽¹⁾		75		1200	mV
V_{IC} Analog input common-mode voltage ⁽¹⁾		$AV_{DD} - 300$		$AV_{DD} - 37$	mV
$V_{I(OC)}$ Open-circuit analog input voltage		$AV_{DD} - 10$		$AV_{DD} + 10$	mV
$I_{DD(2PIX)}$ Normal 2-pix/clock power supply current ⁽²⁾	ODCK = 82.5 MHz, 2-pix/clock			370	mA
I_{PD} Power-down current ⁽³⁾	\overline{PD} = low			10	mA
I_{PDO} Output drive power-down current ⁽³⁾	\overline{PDO} = low		35		mA

(1) Specified as dc characteristic with no overshoot or undershoot

(2) Alternating 2-pixel black/2-pixel white pattern. ST = high, \overline{STAG} = high, QE[23:0] and QO[23:0] C_L = 10 pF.

(3) Analog inputs are open circuit (transmitter is disconnected from TFP401/401A).

AC ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{ID(2)}$ Differential input sensitivity ⁽¹⁾		150		1560	mV _{p-p}
t_{ps} Analog input intra-pair (+ to -) differential skew ⁽²⁾				0.4	$t_{bit}^{(3)}$
t_{ccs} Analog input inter-pair or channel-to-channel skew ⁽²⁾				1	$t_{pix}^{(4)}$
t_{jit} Worst-case differential input clock jitter tolerance ⁽²⁾⁽⁵⁾		50			ps
t_{f1} Fall time of data and control signals ⁽⁶⁾⁽⁷⁾	ST = low, C_L = 5 pF			2.4	ns
	ST = high, C_L = 10 pF			1.9	
t_{r1} Rise time of data and control signals ⁽⁶⁾⁽⁷⁾	ST = low, C_L = 5 pF			2.4	ns
	ST = high, C_L = 10 pF			1.9	
t_{r2} Rise time of ODCK clock ⁽⁶⁾	ST = low, C_L = 5 pF			2.4	ns
	ST = high, C_L = 10 pF			1.9	
t_{f2} Fall time of ODCK clock ⁽⁶⁾	ST = low, C_L = 5 pF			2.4	ns
	ST = high, C_L = 10 pF			1.9	
t_{su1} Setup time, data and control signal to falling edge of ODCK	1 pixel/clock, PIXS = low, OCK_INV = low	1.8			ns
	2 pixel/clock, PIXS = high, \overline{STAG} = high, OCK_INV = low	3.8			
	2 pixel and \overline{STAG} , PIXS = high, \overline{STAG} = low, OCK_INV = low	0.7			
t_{h1} Hold time, data and control signal to falling edge of ODCK	1 pixel/clock, PIXS = low, OCK_INV = low	0.6			ns
	2 pixel and \overline{STAG} , PIXS = high, \overline{STAG} = low, OCK_INV = low	2.5			
	2 pixel/clock, PIXS = high, \overline{STAG} = high, OCK_INV = low	2.9			

(1) Specified as ac parameter to include sensitivity to overshoot, undershoot and reflection.

(2) By characterization

(3) t_{bit} is 1/10 the pixel time, t_{pix}

(4) t_{pix} is the pixel time defined as the period of the RxC input clock. The period of ODCK is equal to t_{pix} in 1-pixel/clock mode or $2t_{pix}$ when in 2-pixel/clock mode.

(5) Measured differentially at 50% crossing using ODCK output clock as trigger

(6) Rise and fall times measured as time between 20% and 80% of signal amplitude.

(7) Data and control signals are QE[23:0], QO[23:0], DE, HSYNC, VSYNC. and CTL[3:1].

AC ELECTRICAL CHARACTERISTICS (continued)

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{su2}	Setup time, data and control signal to rising edge of ODCK	1 pixel/clock, PIXS = low, OCK_INV = high	2.1			ns
		2 pixel/clock, PIXS = high, STAG = high, OCK_INV = high	4			
		2 pixel and STAG, PIXS = high, STAG = low, OCK_INV = high	1.5			
t_{h2}	Hold time, data and control signal to rising edge of ODCK	1 pixel/clock, PIXS = low, OCK_INV = high	0.5			ns
		2 pixel and STAG, PIXS = high, STAG = low, OCK_INV = high	2.4			
		2 pixel/clock, PIXS = high, STAG = high, OCK_INV = high	2.1			
f_{ODCK}	ODCK frequency	PIX = low (1-PIX/CLK)	25		165	MHz
		PIX = high (2-PIX/CLK)	12.5		82.5	
	ODCK duty-cycle		40%	50%	60%	
$t_{pd(PDL)}$	Propagation delay time from \overline{PD} low to Hi-Z outputs				9	ns
$t_{pd(PDOL)}$	Propagation delay time from \overline{PDO} low to Hi-Z outputs				9	ns
$t_{l(HSC)}$	Transition time between DE transition to SCDT low ⁽⁸⁾			1e6		t_{pix}
$t_{l(FSC)}$	Transition time between DE transition to SCDT high ⁽⁸⁾			1600		t_{pix}
$t_{d(st)}$	Delay time, ODCK latching edge to QE[23:0] data output	STAG = low, PIXS = high		0.25		t_{pix}

(8) Link active or inactive is determined by amount of time detected between DE transitions. SCDT indicates link activity.

2.4.2 Parameter Measurement Information

PARAMETER MEASUREMENT INFORMATION

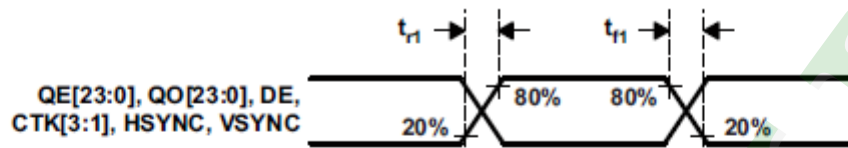


Figure 1. Rise and Fall Times of Data and Control Signals

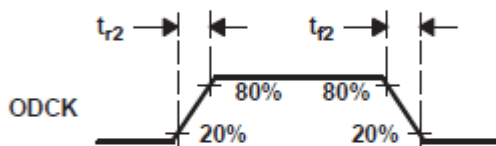


Figure 2. Rise and Fall Times of ODCCK

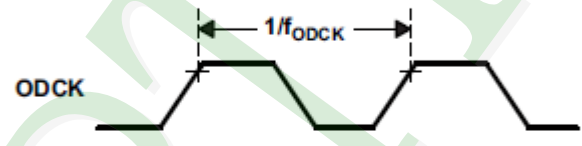


Figure 3. ODCCK Frequency

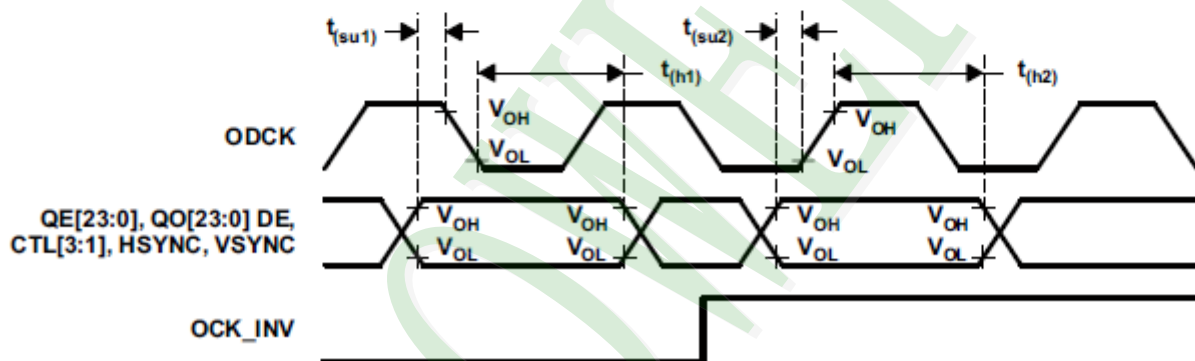


Figure 4. Data Setup and Hold Times to Rising and Falling Edges of ODCCK

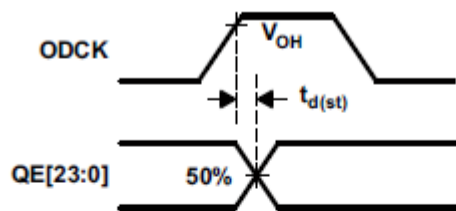


Figure 5. ODCK High to QE[23:0]
Staggered Data Output

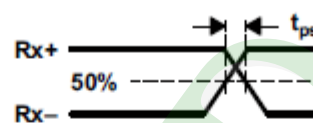


Figure 6. Analog Input Intra-Pair
Differential Skew

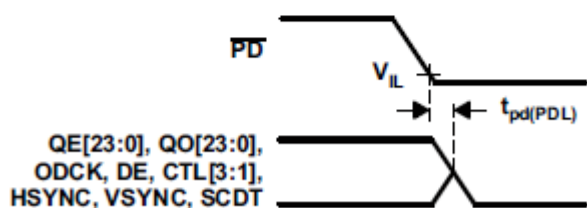


Figure 7. Delay From $\overline{\text{PD}}$ Low to Hi-Z Outputs

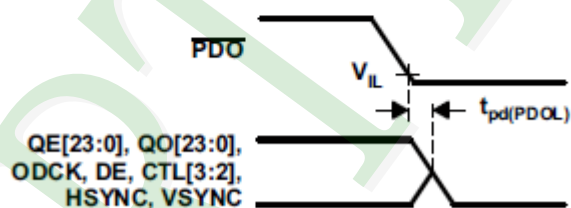


Figure 8. Delay From $\overline{\text{PDL}}$ Low to Hi-Z Outputs

PARAMETER MEASUREMENT INFORMATION (continued)

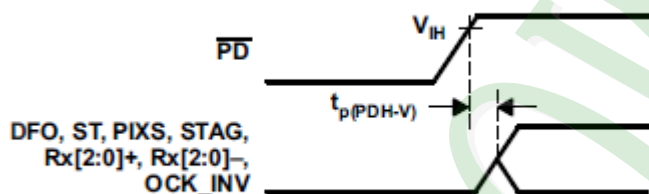


Figure 9. Delay From $\overline{\text{PD}}$ Low to High
Before Inputs Are Active

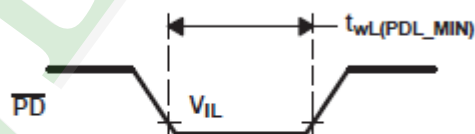


Figure 10. Minimum Time $\overline{\text{PD}}$ Low

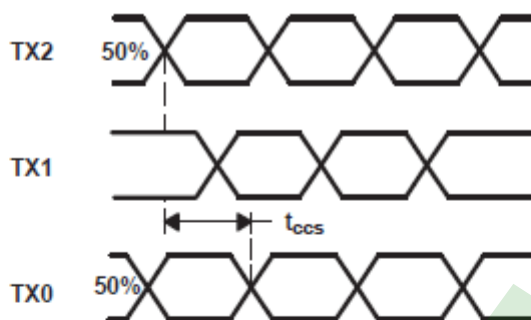


Figure 11. Analog Input Channel-to-Channel Skew

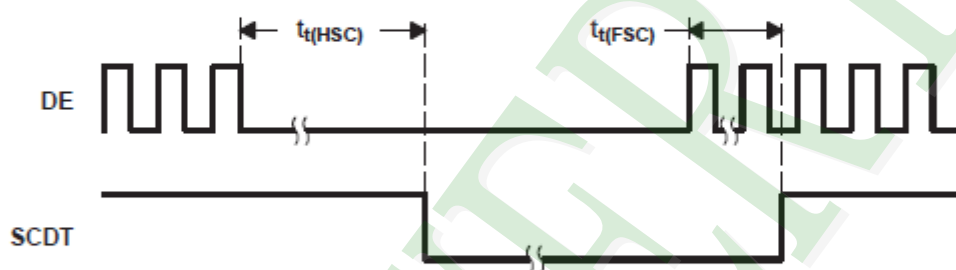


Figure 12. Time Between DE Transitions to SCDT Low and SCDT High

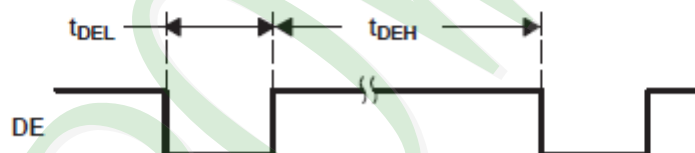
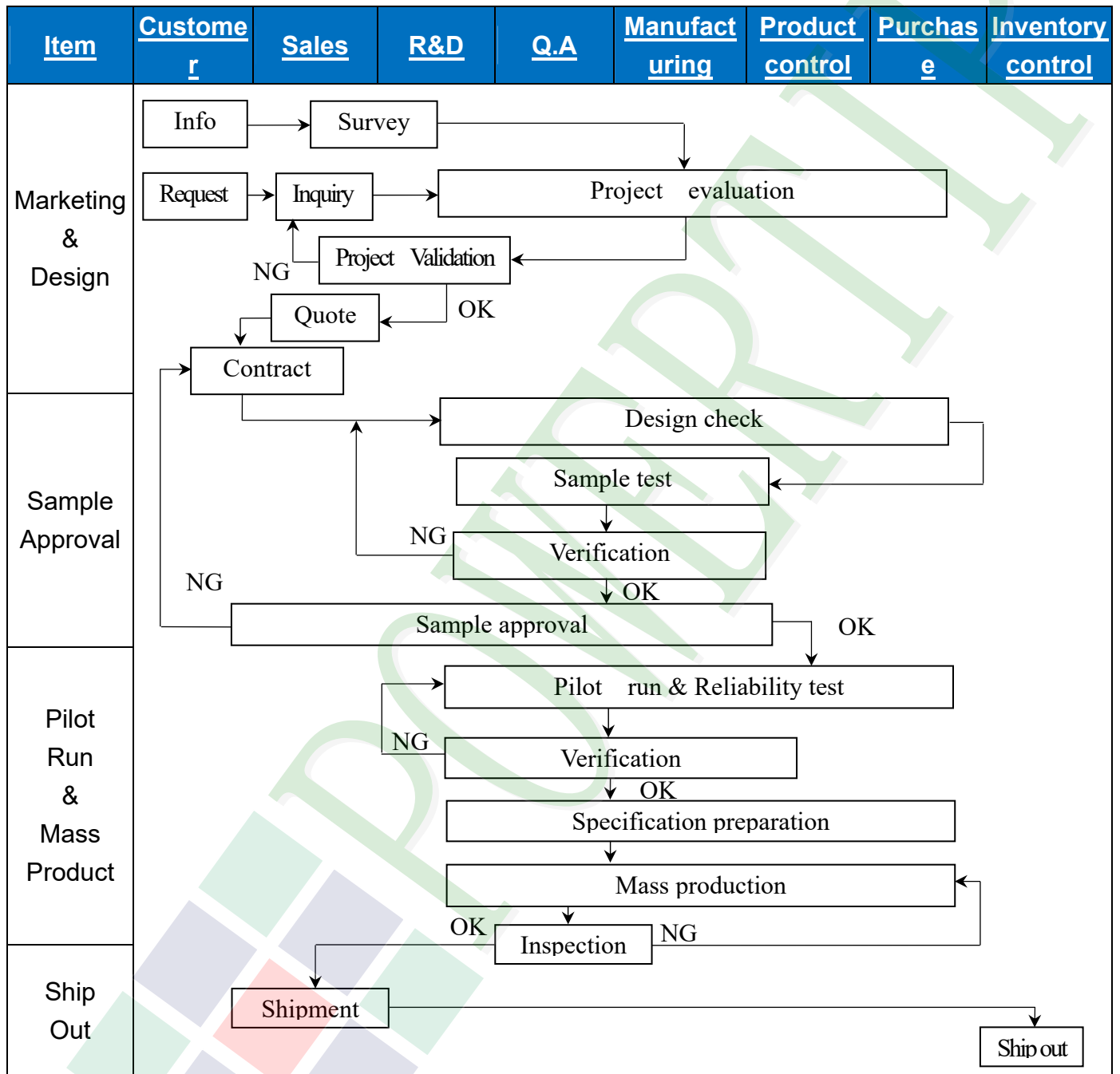


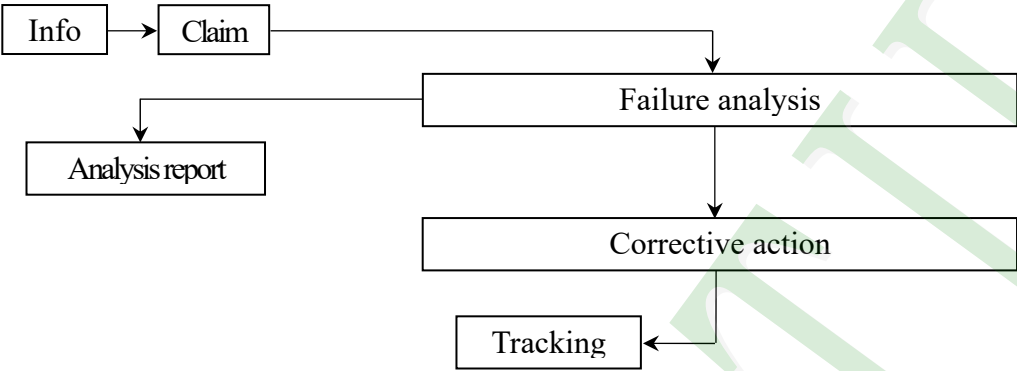
Figure 13. Minimum DE Low and Maximum DE High

DETAILED DESCRIPTION

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	 <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Claim --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

3.2. Inspection Specification

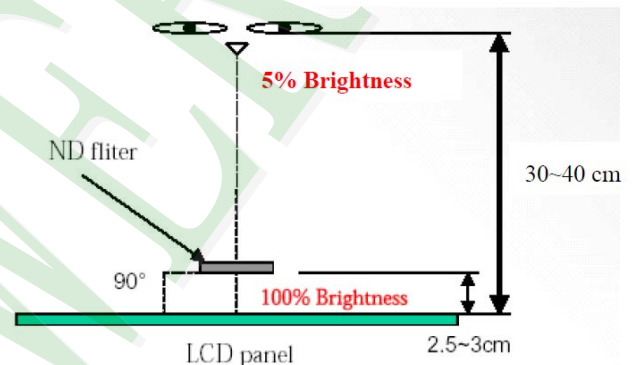
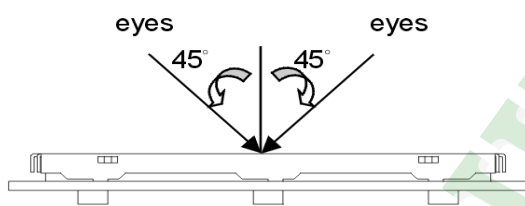
- ◆ Scope: The document shall be applied to TFT-LCD Module for 3.5" ~15" (Ver.B01).
- ◆ Inspection Standard: MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆ Equipment: Gauge, MIL-STD, Powertip Tester, Sample
- ◆ Defect Level: Major Defect AQL: 0.4; Minor Defect AQL: 1.5
- ◆ OUT Going Defect Level: Sampling.
- ◆ Standard of the product appearance test:

a. Manner of appearance test:

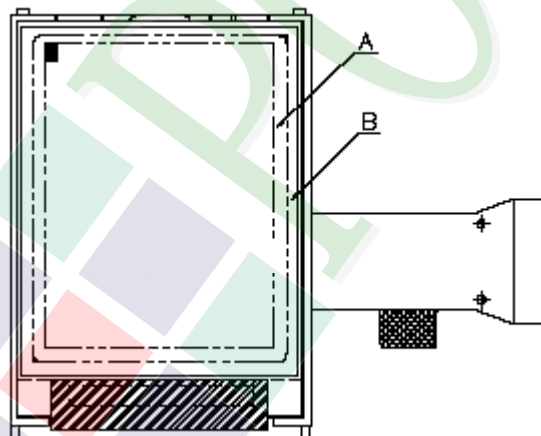
(1). The test best be under 20W×2 fluorescent light(about 300lux ~500lux)

, and distance of view must be at 30~40 cm.

(2). The test direction is base on about around 45° of vertical line.



(3). Definition of area.



A area: viewing area

B area: Outside of viewing area

(4). Standard of inspection : (Unit : mm)

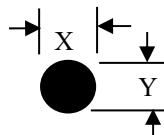
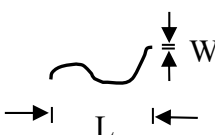
◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

NO	Item	Criterion	Level												
01	Product condition	1. 1 The part number is inconsistent with work order of production.	Major												
		1. 2 Mixed product types.	Major												
		1. 3 Assembled in inverse direction.	Major												
02	Quantity	2. 1 The quantity is inconsistent with work order of production.	Major												
03	Outline dimension	3. 1 Product dimension and structure must conform to structure diagram.	Major												
04	Electrical Testing	4. 1 Missing line character and icon.	Major												
		4. 2 No function or no display.	Major												
		4. 3 Display malfunction.	Major												
		4. 4 LCD viewing angle defect.	Major												
		4. 5 Current consumption exceeds product specifications.	Major												
		4. 6 Mura cannot be seen through 5% ND filter at 50% Gray , should be judged by the viewing angle of 90 degree.	Minor												
05	Dot defect (Bright dot, Dark dot) On -display	<table><tr><th colspan="2">Item</th><th>Acceptance (Q'ty)</th></tr><tr><td rowspan="4">Dot Defect</td><td>Bright Dot</td><td>≤ 4</td></tr><tr><td>Dark Dot</td><td>≤ 5</td></tr><tr><td>Joint Dot</td><td>≤ 3</td></tr><tr><td>Total</td><td>≤ 7</td></tr></table> 5.1 Inspection pattern: full white, full black, Red, Green and blue screens. 5.2 It is defined as dot defect if defect area > 1/2 dot. 5.3 The distance between two dot defect ≥ 5 mm. 5.4 Bright dot : Dots appear bright and unchanged in visible with 5% ND filter is defined. 5.5 Tiny bright dot: bright dot area ≤ 1/2 dot. a. Dots appear bright and unchanged in visible with 5% ND filter is defined defect and is judged in accordance with 6.1 b. Dots invisible with 5% ND Filter is Ignored.	Item		Acceptance (Q'ty)	Dot Defect	Bright Dot	≤ 4	Dark Dot	≤ 5	Joint Dot	≤ 3	Total	≤ 7	Minor
		Item		Acceptance (Q'ty)											
Dot Defect	Bright Dot	≤ 4													
	Dark Dot	≤ 5													
	Joint Dot	≤ 3													
	Total	≤ 7													

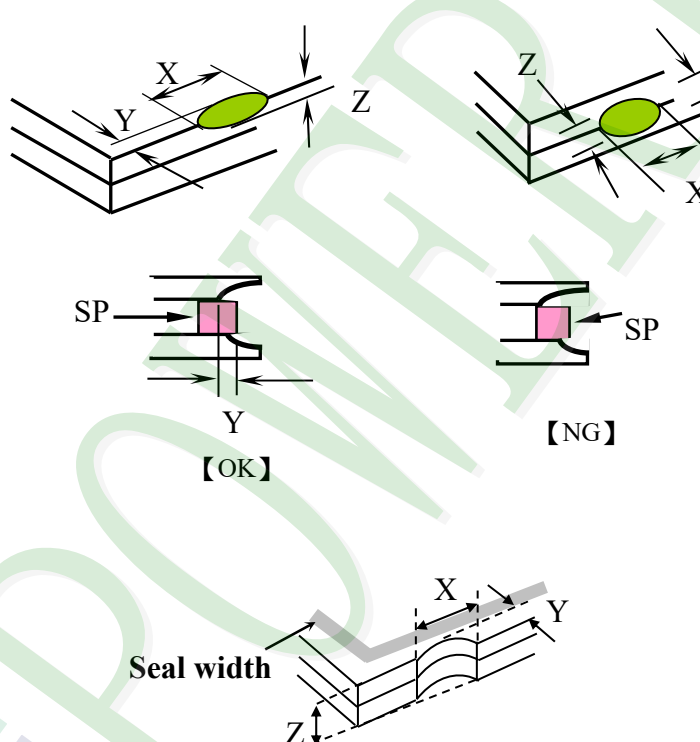
◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

NO	Item	Criterion	Level																																																				
06	<div>Black or white Dot, scratch, contamination</div> <div>Round type</div>  <div>Φ = (x + y) / 2</div> <div>Line type</div> 	<div>6. 1 Round type (Non-display or display):</div> <table> <tr> <th rowspan="2">Dimension (diameter: Φ)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> <tr> <td>Φ ≤ 0.25</td> <td>Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>0.25 < Φ ≤ 0.50</td> <td>5</td> </tr> <tr> <td>Φ > 0.50</td> <td>0</td> </tr> <tr> <td>Total</td> <td>5</td> </tr> </table> <div>6. 2 Line type(Non-display or display):</div> <table> <tr> <th rowspan="2">module size</th> <th rowspan="2">Length (L)</th> <th rowspan="2">Width (W)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> <tr> <td rowspan="5">3.5" to less 9"</td> <td>---</td> <td>W ≤ 0.03</td> <td>Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>L ≤ 10.0</td> <td>0.03 < W ≤ 0.05</td> <td>4</td> </tr> <tr> <td>L ≤ 5.0</td> <td>0.05 < W ≤ 0.10</td> <td>2</td> </tr> <tr> <td>---</td> <td>W > 0.10</td> <td>As round type</td> </tr> <tr> <td colspan="2">Total</td> <td>5</td> </tr> <tr> <td rowspan="4">9" to 15"</td> <td>---</td> <td>W ≤ 0.05</td> <td>Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>L ≤ 10.0</td> <td>0.05 < W ≤ 0.10</td> <td>5</td> </tr> <tr> <td>---</td> <td>W > 0.10</td> <td>As round type</td> </tr> <tr> <td colspan="2">Total</td> <td>5</td> </tr> </table>	Dimension (diameter: Φ)	Acceptance (Q'ty)		A area	B area	Φ ≤ 0.25	Ignore	Ignore	0.25 < Φ ≤ 0.50	5	Φ > 0.50	0	Total	5	module size	Length (L)	Width (W)	Acceptance (Q'ty)		A area	B area	3.5" to less 9"	---	W ≤ 0.03	Ignore	Ignore	L ≤ 10.0	0.03 < W ≤ 0.05	4	L ≤ 5.0	0.05 < W ≤ 0.10	2	---	W > 0.10	As round type	Total		5	9" to 15"	---	W ≤ 0.05	Ignore	Ignore	L ≤ 10.0	0.05 < W ≤ 0.10	5	---	W > 0.10	As round type	Total		5	Minor
Dimension (diameter: Φ)	Acceptance (Q'ty)																																																						
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07	<div>Polarizer Bubble</div>	<table> <tr> <th rowspan="2">Dimension (diameter: Φ)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> <tr> <td>Φ ≤ 0.25</td> <td>Ignore</td> <td rowspan="5">Ignore</td> </tr> <tr> <td>0.25 < Φ ≤ 0.50</td> <td>4</td> </tr> <tr> <td>0.50 < Φ ≤ 0.80</td> <td>1</td> </tr> <tr> <td>Φ > 0.80</td> <td>0</td> </tr> <tr> <td>Total</td> <td>5</td> </tr> </table>	Dimension (diameter: Φ)	Acceptance (Q'ty)		A area	B area	Φ ≤ 0.25	Ignore	Ignore	0.25 < Φ ≤ 0.50	4	0.50 < Φ ≤ 0.80	1	Φ > 0.80	0	Total	5	Minor																																				
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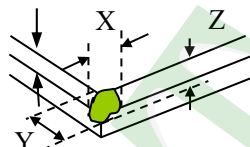
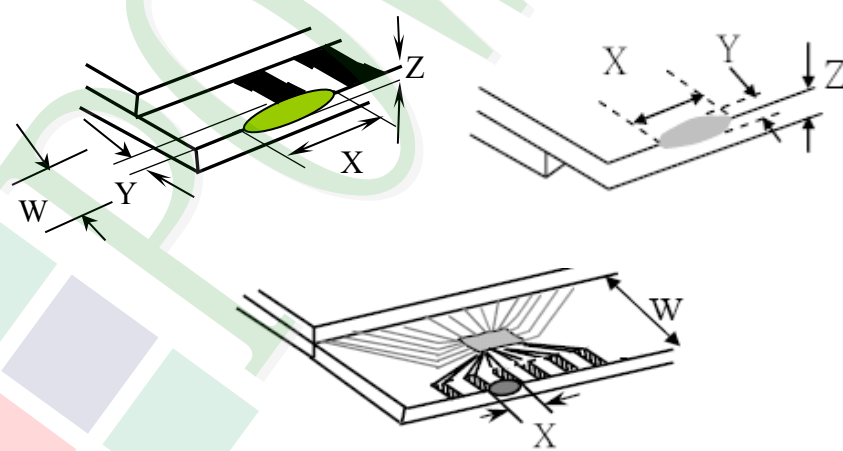
◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

NO	Item	Criterion	Level									
08	The crack of glass	<p>Symbols :</p> <div> <div> <p>X: The length of crack</p> <p>Z: The thickness of crack</p> <p>T: The thickness of glass</p> </div> <div> <p>Y: The width of crack.</p> <p>W: terminal length</p> <p>a : LCD side length</p> </div> </div>										
		<p>8.1 General glass chip:</p> <p>8.1.1 Chip on panel surface and crack between panels:</p> <div>  </div>	Minor									
		<table> <tr> <th><u>X</u></th> <th><u>Y</u></th> <th><u>Z</u></th> </tr> <tr> <td>$\leq a$</td> <td>Crack can't enter viewing area</td> <td>$\leq 1/2 t$</td> </tr> <tr> <td>$\leq a$</td> <td>Crack can't exceed the half of SP width.</td> <td>$1/2 t < Z \leq 2 t$</td> </tr> </table>	<u>X</u>	<u>Y</u>	<u>Z</u>	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$	$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$	
<u>X</u>	<u>Y</u>	<u>Z</u>										
$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$										
$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$										

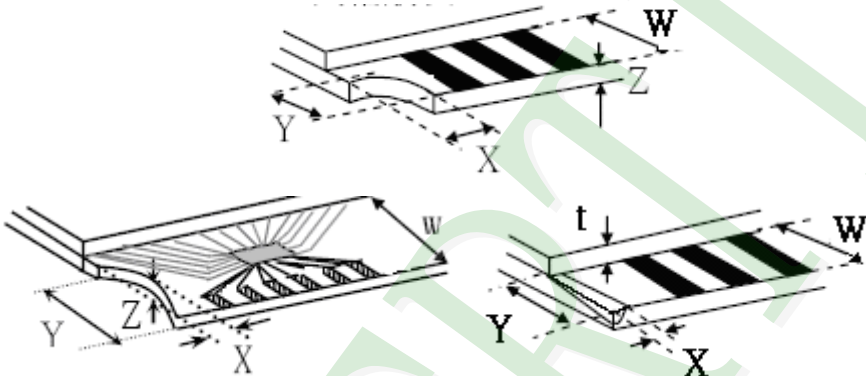
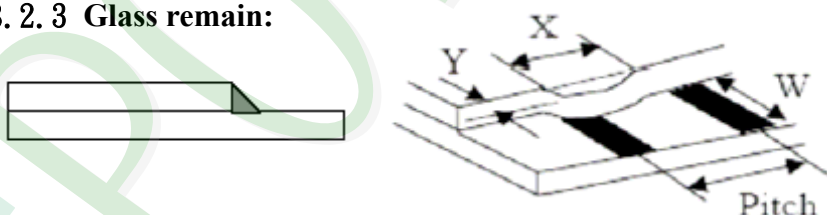

◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

NO	Item	Criterion	Level									
08	The crack of glass	<p>Symbols :</p> <p>X: The length of crack Z: The thickness of crack t: The thickness of glass</p> <p>Y: The width of crack. W: terminal length a: LCD side length</p> <p>8.1.2 Corner crack:</p>  <table><thead><tr><th><u>X</u></th><th><u>Y</u></th><th><u>Z</u></th></tr></thead><tbody><tr><td>$\leq 1/5 a$</td><td>Crack can't enter viewing area</td><td>$Z \leq 1/2 t$</td></tr><tr><td>$\leq 1/5 a$</td><td>Crack can't exceed the half of SP width.</td><td>$1/2 t < Z \leq 2 t$</td></tr></tbody></table>	<u>X</u>	<u>Y</u>	<u>Z</u>	$\leq 1/5 a$	Crack can't enter viewing area	$Z \leq 1/2 t$	$\leq 1/5 a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$	Minor
		<u>X</u>	<u>Y</u>	<u>Z</u>								
$\leq 1/5 a$	Crack can't enter viewing area	$Z \leq 1/2 t$										
$\leq 1/5 a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$										
<p>8.2 Protrusion over terminal:</p> <p>8.2.1 Chip on electrode pad:</p>  <table><thead><tr><th></th><th><u>X</u></th><th><u>Y</u></th><th><u>Z</u></th></tr></thead><tbody><tr><td><u>Front</u></td><td>$\leq a$</td><td>$\leq 1/2 W$</td><td>$\leq t$</td></tr><tr><td><u>Back</u></td><td>$\leq a$</td><td>$\leq W$</td><td>$\leq 1/2 t$</td></tr></tbody></table>		<u>X</u>	<u>Y</u>	<u>Z</u>	<u>Front</u>	$\leq a$	$\leq 1/2 W$	$\leq t$	<u>Back</u>	$\leq a$	$\leq W$	$\leq 1/2 t$
	<u>X</u>	<u>Y</u>	<u>Z</u>									
<u>Front</u>	$\leq a$	$\leq 1/2 W$	$\leq t$									
<u>Back</u>	$\leq a$	$\leq W$	$\leq 1/2 t$									

◆Specification For TFT-LCD Module 3. 5" ~15" :

(Ver.B01)

NO	Item	Criterion	Level						
08	The crack of glass	<p>Symbols:</p> <p>X: The length of crack Z: The thickness of crack t: The thickness of glass</p> <p>Y: The width of crack. W: terminal length a: LCD side length</p>	Minor						
		<p>8.2.2 Non-conductive portion:</p>  <table><thead><tr><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>≤ 1/3 a</td><td>≤ W</td><td>≤ t</td></tr></tbody></table>		X	Y	Z	≤ 1/3 a	≤ W	≤ t
		X		Y	Z				
		≤ 1/3 a		≤ W	≤ t				
<p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications</p> <p>8.2.3 Glass remain:</p>  <table><thead><tr><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>≤ a</td><td>≤ 1/3 W</td><td>≤ t</td></tr></tbody></table>	X	Y	Z	≤ a	≤ 1/3 W	≤ t			
X	Y	Z							
≤ a	≤ 1/3 W	≤ t							
<p>8.2.4 Cracking:</p>  <p>Not Allowed</p>									

◆Specification For TFT-LCD Module 3.5" ~15" :

(Ver.B01)

<u>NO</u>	<u>Item</u>	<u>Criterion</u>	<u>Level</u>
09	Backlight elements	9. 1 Backlight can't work normally.	Major
		9. 2 Backlight doesn't light or color is wrong.	Major
		9. 3 Illumination source flickers when lit.	Major
10	General appearance	10. 1 Pin type, quantity, dimension must match type in structure diagram.	Major
		10. 2 No short circuits in components on PCB or FPC.	Major
		10. 3 Parts on PCB or FPC must be: no wrong parts, missing parts or excess parts.	Major
		10. 4 Product packaging must the same as specified on packaging specification sheet.	Minor
		10. 5 The folding and peeled off in polarizer are not acceptable.	Minor
		10. 6 The PCB or FPC between B/L assembled distance(PCB or FPC) is ≤ 1.5 mm.	Minor

4. RELIABILITY TEST

4.1 Reliability Test Condition

(Ver.B01)

NO.	TEST ITEM	TEST CONDITION											
1	High Temperature Storage Test	Keep in 80 ±5℃ 240 hrs											
2	Low Temperature Storage Test	Keep in -30 ±5℃ 240 hrs											
3	High Temperature / High Humidity Storage Test	Keep in 60 ℃ / 90% R.H duration for 240 hrs (Excluding the polarizer)											
4	Temperature Cycling Storage Test	<div><div>-30℃ → +25℃ → 80℃ → +25℃</div><div>(30mins) (5mins) (30mins) (5mins)</div><div>← 20 Cycle →</div></div>											
5	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-										
6	Vibration Test (Packaged)	1.Sine wave 10~55 Hz frequency (1 min/sweep) 2.The amplitude of vibration :1.5 mm 3.Each direction (X、Y、Z) duration for 2 Hrs											
7	Drop Test (Packaged)	<table><tr><th>Packing Weight (Kg)</th><th>Drop Height (cm)</th></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table> Drop Direction :※1 corner / 3 edges / 6 sides each 1time		Packing Weight (Kg)	Drop Height (cm)	0 ~ 45.4	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
Packing Weight (Kg)	Drop Height (cm)												
0 ~ 45.4	122												
45.4 ~ 90.8	76												
90.8 ~ 454	61												
Over 454	46												

◎Result Evaluation Criteria :

Under the display quality test conditions with normal operations with normal operation state.
Do not change these conditions as such changes may affect practical display function.

(Normal operation state)

Temperature : +20~30℃

Humidity : 50~70%

Atmospheric pressure : 86~106Kpa

5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

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

5.2 HANDLING

- 5.2.1 Avoid any strong mechanical shock which can break the glass.
- 5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.
- 5.2.3 Do not remove the panel or frame from the module.
- 5.2.4 The polarizing plate of the display is very fragile. So, please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)
- 5.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- 5.2.6 Do not touch the display area with bare hands, this will stain the display area.
- 5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.
- 5.2.8 To control temperature and time of soldering is $320 \pm 10^{\circ}\text{C}$ and 3-5 sec.
- 5.2.9 To avoid liquid (include organic solvent) stained on LCM
- 5.2.10 Caution!(LCM products with Capacitive Touch Panel)
Strong EMI-sources such as switch-mode power supplies (SMPS) can lead to touch malfunction (e.g. ghost-touches).
Therefore, the touch needs to be thoroughly tested inside the target application.
- 5.2.11 CAUTION: Continuously displaying same static image will result in high possibility of image sticking/image burn-in effect due to TFT panel characteristic.
- 5.2.12 Double-sided tape designed to be attach with the customer's mechanical device, please follow up the rules and regulations published by the original manufacturer of double-sided tape for the attachment operation.

5.3 STORAGE

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

5.4 TERMS OF WARRANTY

- 5.4.1 Applicable warrant period The period is within thirteen months since the date of shipping out under normal using and storage conditions.
- 5.4.2 Unaccepted responsibility
This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment, fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.

