

SPECIFICATIONS

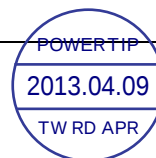
CUSTOMER	:	CTW821
SAMPLE CODE	:	SH320240T-025-L-Q
MASS PRODUCTION CODE	:	PH320240T-025-L-Q
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	002
DRAWING NO. (Ver.)	:	LMD-PH320240T-025-L-Q (Ver:002)
PACKAGING NO. (Ver.)	:	PKG-PH320240T-025-L-Q (Ver:001)

Customer Approved

Date:

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



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History of Version

[illegible]

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Note : For detailed information please refer to IC data sheet :
Primacy(TFT LCD): ILITEK: ILI9488

1. SPECIFICATIONS

1.1 Features

Main LCD panel

Item	Standard Value
Display Type	320(R、G、B) * 240 Dots
LCD Type	Normally white , Transmissive type
Screen size(inch)	2.36 inch
Viewing Direction	12 O'clock
Color configuration	RGB-Strip
Backlight	LED Backlight
Interface	SPI & RGB interface
Other(controller/driver IC)	ILITEK: ILI9488
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer web side : http://www.powertip.com.tw/news.php?area_id_view=1085560481/

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	53.24 (W) * 48.16 (L) * 2.3 (H)	mm

LCD panel

Item	Standard Value	Unit
Active Area	48.0 (W) * 36.0 (L)	mm

1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	AVDD	-	-0.3	+3.3	V
	DVDDIO	-	-0.3	+3.3	V
	VGH-GND	-	-0.3	+25	V
	VGL-GND	-	0	-16.0	V
Input Voltage	V _{IN}	-	-0.3	AVDD +0.3	V
Operating Temperature	T _{OP}	-	-20	+70	°C
Storage Temperature	T _{ST}	-	-30	+80	°C
Storage Humidity	H _D	Ta 40 °C	20	90	%RH

1.4 DC Electrical Characteristics

Module

GND = 0V, Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	AVDD	-	-	2.8	-	V
	DVDDIO	-	-	1.8	-	
Input High Voltage	V _{IH}	-	0.7 VCC	-	VCC	V
Input Low Voltage	V _{IL}	-	GND	-	0.3 VCC	V
Output High Voltage	V _{OH}	I _{OH} =-0.1mA	0.8*VDD	-	VDD	V
Output Low Voltage	V _{OL}	I _{OL} =0.1mA	GND	-	0.2*VDD	V
Supply Current	ICC	VCC = 2.8V Pattern=full display *1	-	15	20	mA

Note1:Maximum current display

1.5 Optical Characteristics

TFT LCD Module

VCC = 2.8V, Ta=25°C

Item		Symbol	Condition	Min.	Typ.	Max.	unit	-
Response time		Tr+ Tf	Ta = 25°C θX, θY = 0°	-	55		ms	Note2
Viewing angle	Top	θY+	CR ≥ 10	-	50	-	Deg.	Note4
	Bottom	θY-		-	45	-		
	Left	θX-		-	50	-		
	Right	θX+		-	50	-		
Contrast ratio		CR	Ta = 25°C θX,θY =180°	200	250	-	-	Note3
Color of CIE Coordinate (With B/L)	White	X	-	0.26	0.31	0.36	-	Note1
		Y		0.29	0.34	0.39		
	Red	X		0.56	0.61	0.66		
		Y		0.29	0.34	0.39		
	Green	X		0.28	0.33	0.38		
		Y		0.57	0.62	0.67		
	Blue	X		0.09	0.14	0.19		
		Y		0.01	0.06	0.11		
Average Brightness Pattern=white display (With B/L) *1		IV	IF=20 mA	275	300	-	cd/m ²	
Uniformity (With B/L)*2		△B	IF=20mA	70	-	-	%	

Note 1:

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

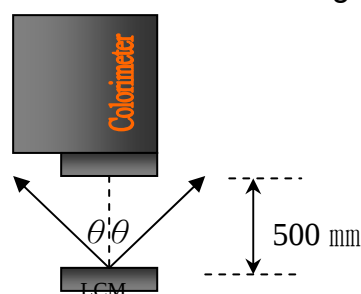
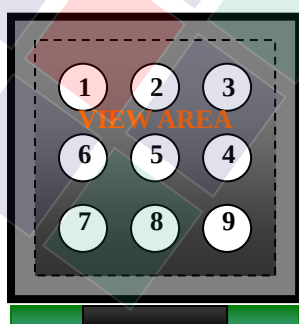
*2 : Measurement Condition for Optical Characteristics:

a : Environment: 25 ±5 / 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%



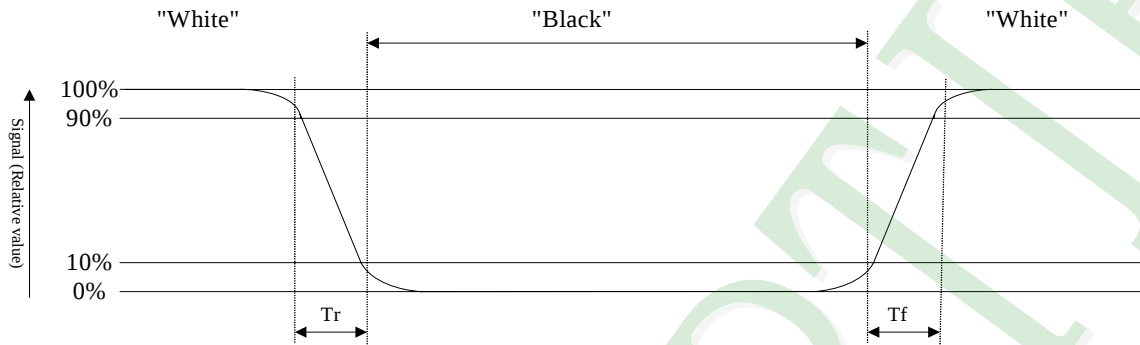
Colorimeter=BM-7 fast

To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module)

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:



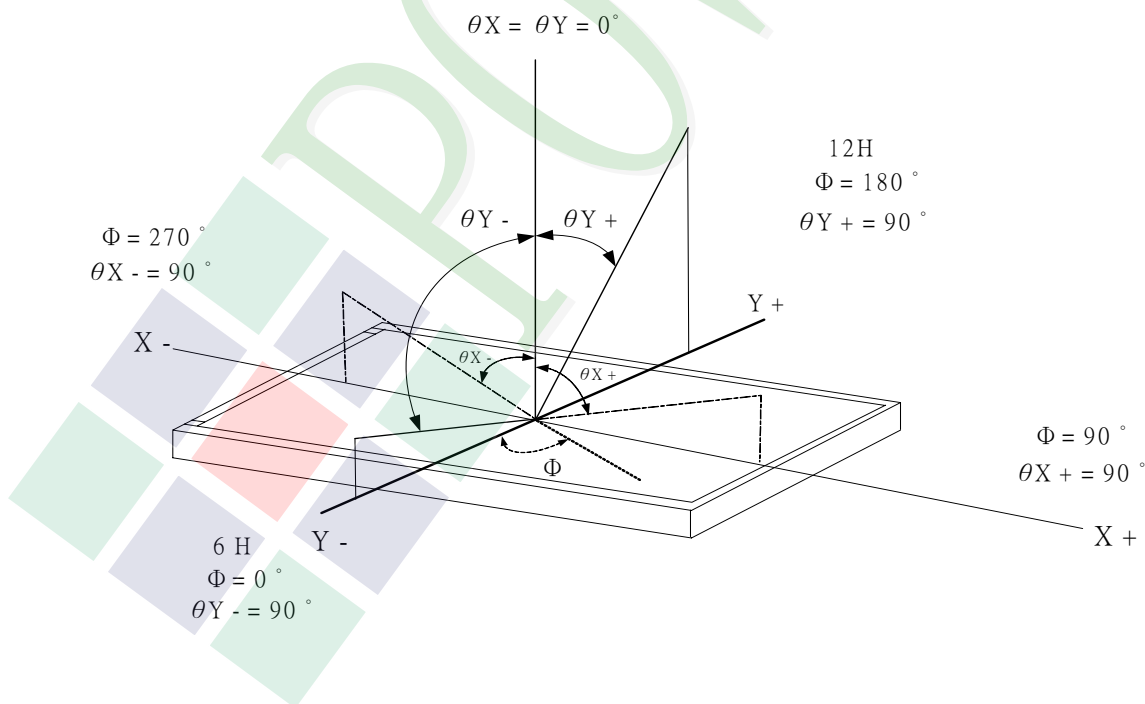
Note3: Definition of contrast ratio:

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 Characteristics

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25°C	-	30	mA
Reverse Voltage	VR	Ta =25°C	-	1.0	V
Power Dissipation	Pd	Ta =25°C	-	180	mW

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=20mA	15.5	16.5	17.5	V
Average Brightness (without LCD)	IV		4600	5000	-	cd/m ²
CIE Color Coordinate (Without LCD)	X		0.27	0.30	0.33	-
	Y		0.27	0.30	0.33	
Color	White					

Circuit Diagram:

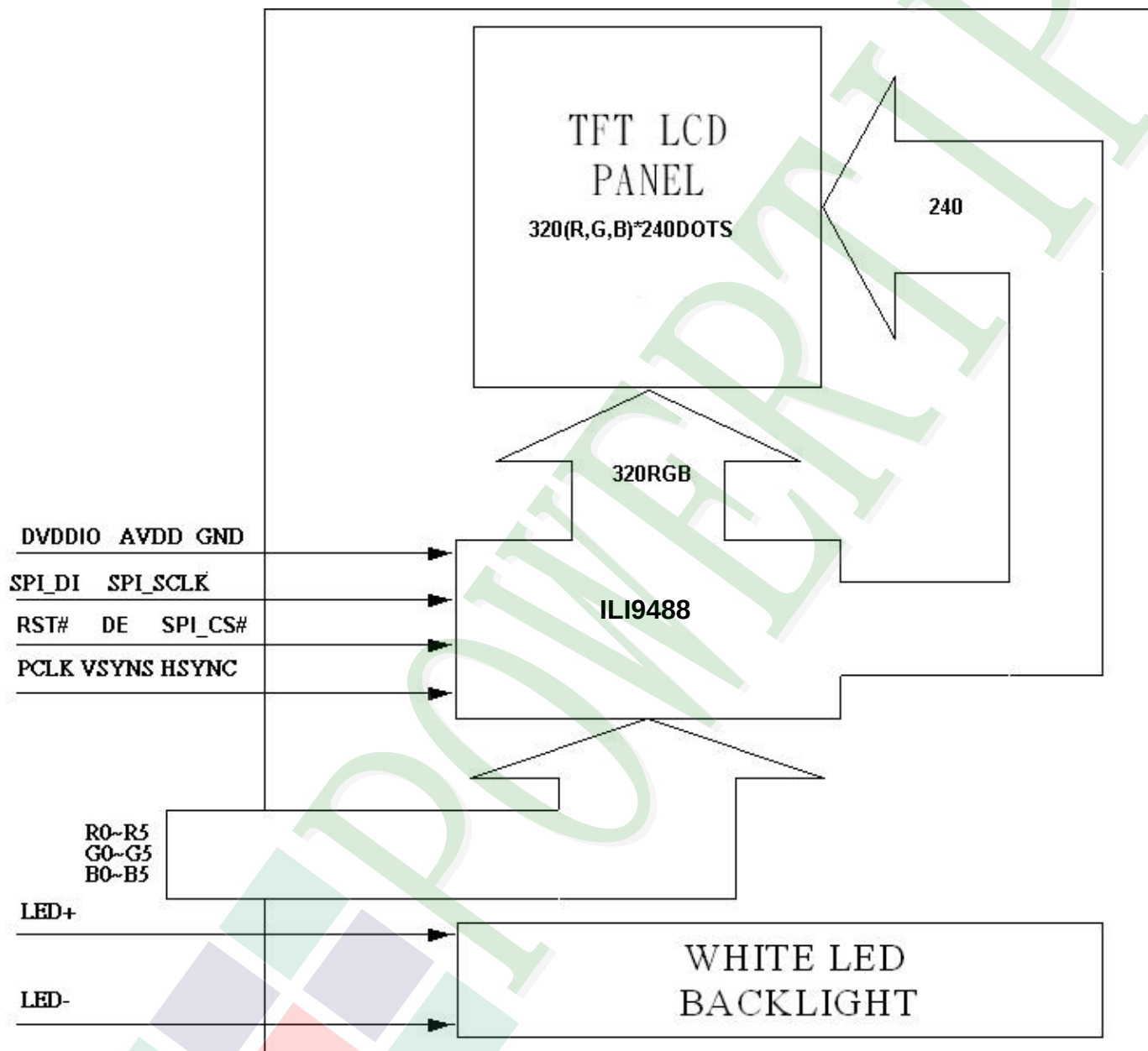


2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



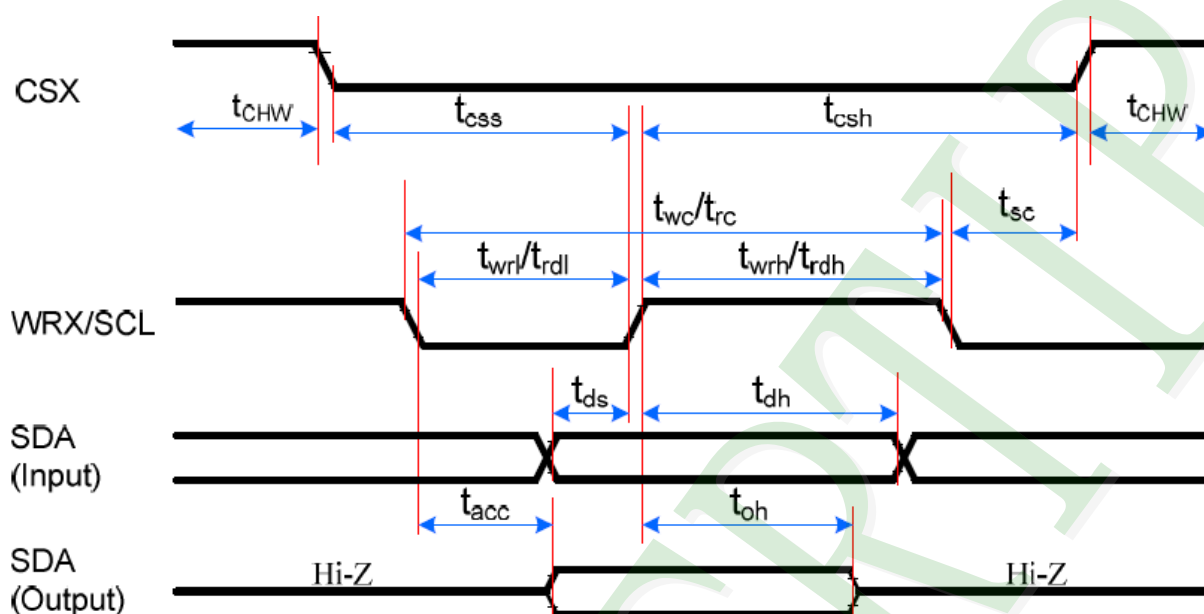
2.2 Interface Pin Description

Pin NO	Symbol	Function
1	LED+	Power supply for LED Backlight anode input
2	LED-	Power supply for LED Backlight cathode input
3	DVDDIO	Power supply for the digital I/O circuit. (+1.8V)
4	AVDD	Power supply for the analog circuit.(+2.8V)
5	GND	System ground. (0V)
6	NC	No Connect
7	NC	No Connect
8	NC	No Connect
9	NC	No Connect
10	SPI_CS#	Chip select signal , Active "L".
11	SPI_DI	Serial data input pin.
12	NC	No Connect
13	SPI_SCLK	Serial bus interface clock pin.
14	NC	No Connect
15	RST#	Reset input pin. When RESET is "L", initialization is executed.
16	B0	Blue data bit 0
17	B1	Blue data bit 1
18	B2	Blue data bit 2
19	B3	Blue data bit 3
20	B4	Blue data bit 4
21	B5	Blue data bit 5
22	G0	Green data bit 0
23	G1	Green data bit 1
24	G2	Green data bit 2

Pin NO	Symbol	Function
25	G3	Green data bit 3
26	G4	Green data bit 4
27	G5	Green data bit 5
28	R0	Red data bit 0
29	R1	Red data bit 1
30	R2	Red data bit 2
31	R3	Red data bit 3
32	R4	Red data bit 4
33	R5	Red data bit 5
34	GND	System Ground.(0V)
35	PCLK	Dot clock signal input is used in the RGB interface .
36	GND	System ground. (0V)
37	VSYNC	Vertical synchronization signal input pin.
38	HSYNC	Horizontal synchronization signal input pin.
39	DE	A data enable signal in RGB interface mode.

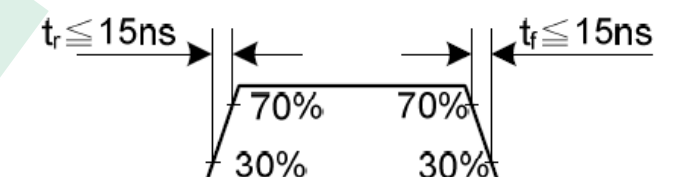
2.3 Timing Characteristics

3-Line SPI System Timing Characteristics

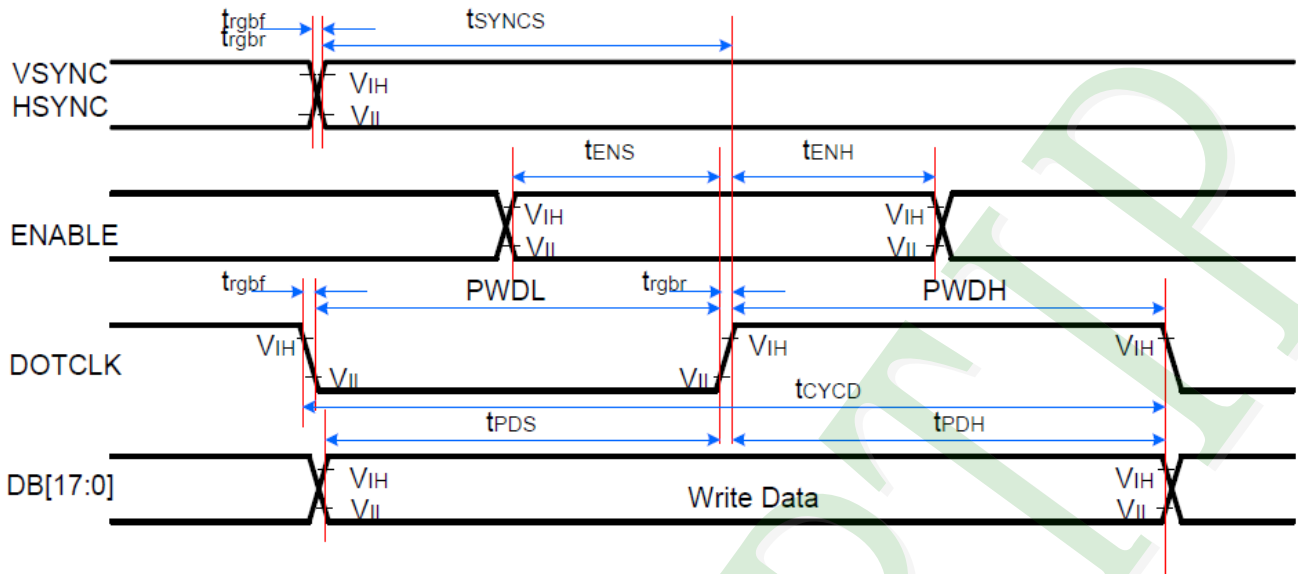


Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchwh	CSX H Pulse Width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcsh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial Clock Cycle (Write)	66	-	ns	
	twrh	SCL H Pulse Width (Write)	15	-	ns	
	twrl	SCL L Pulse Width (Write)	15	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL H Pulse Width (Read)	60	-	ns	
	trdl	SCL L Pulse Width (Read)	60	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Note: $T_a = -30$ to 70 °C, $IOVCC = 1.65V$ to $3.6V$, $V_{CI} = 2.5V$ to $3.6V$, $AGND = DGND = 0V$, $T = 10 \pm 0.5ns$

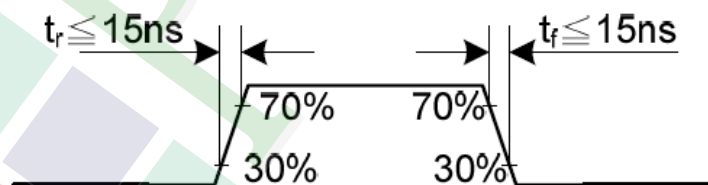


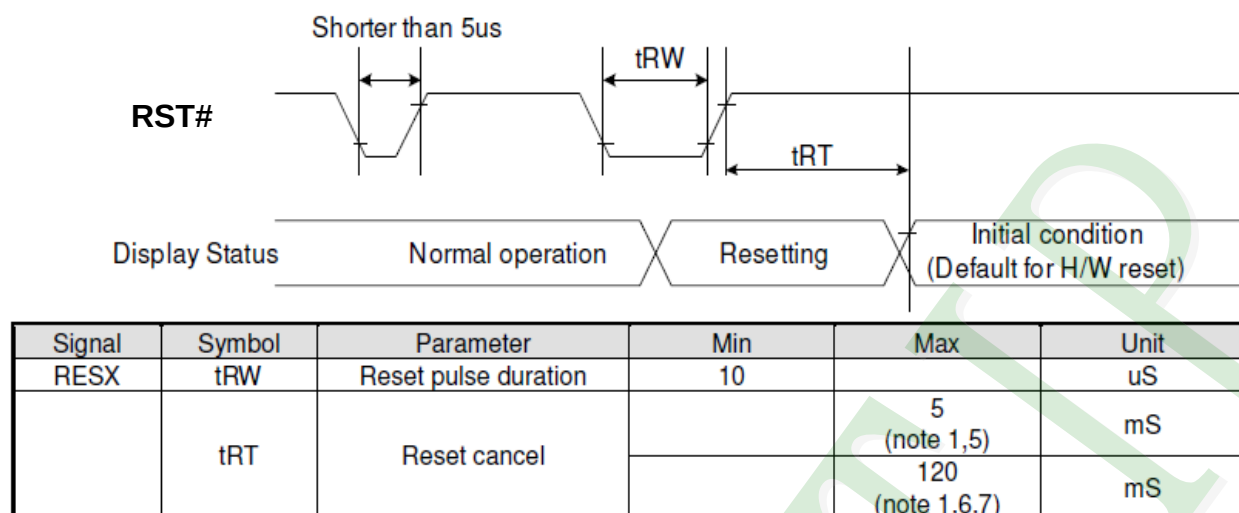
18-bit RGB interface Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC/ HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	16-/18-/24-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	15	-	ns	
	t_{ENH}	ENABLE hold time	15	-	ns	
DB [23:0]	t_{POS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	20	-	ns	
	PWDL	DOTCLK low-level period	20	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	$t_{\text{rgbr}}, t_{\text{rgbf}}$	DOTCLK, HSYNC, VSYNC rise/fall time	-	15	ns	

Note: $T_a = -30$ to 70°C , $\text{IOVCC} = 1.65\text{V}$ to 3.3V , $\text{VCI} = 2.5\text{V}$ to 3.3V , $\text{AGND} = \text{DGND} = 0\text{V}$





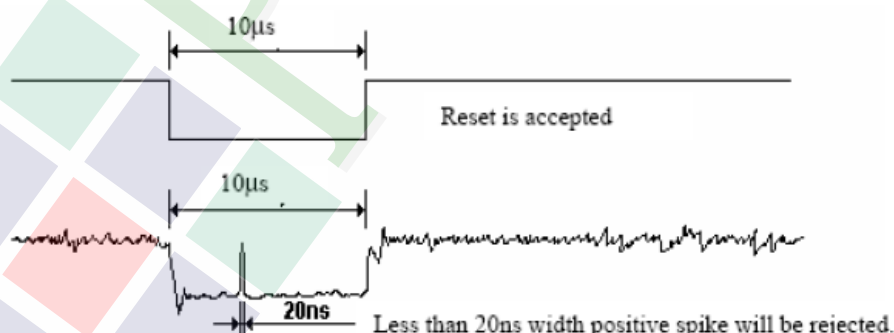
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

Note 3: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

2.4 Reference Initial code

```
MOV    DPL,#BEH
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#20H
CALL   SPI_DAT
CALL   DELAY
CALL   DELAY
```

```
MOV    DPL,#BEH
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#0AH
CALL   SPI_DAT
```

```
MOV    DPL,#BEH
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#20H
CALL   SPI_DAT
```

```
MOV    DPL,#BEH
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#00H
CALL   SPI_DAT
```

```
MOV    DPL,#C0H    ;power control
CALL   SPI_COM
MOV    DPL,#15H    ;Vreg1out
CALL   SPI_DAT
MOV    DPL,#12H    ;vreg2out
CALL   SPI_DAT
```

```
MOV    DPL,#C1H    ;power control
CALL   SPI_COM
MOV    DPL,#41H    ;VGH/VGL
CALL   SPI_DAT
```

```
MOV    DPL,#C5H    ;power control
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#5AH    ;VCOM
CALL   SPI_DAT
MOV    DPL,#80H
CALL   SPI_DAT
```

```
MOV    DPL,#36H    ;menory access
CALL   SPI_COM
MOV    DPL,#48H
CALL   SPI_DAT
```

```

MOV    DPL,#3AH      ;interface pixel format
CALL   SPI_COM
MOV    DPL,#66H
CALL   SPI_DAT

MOV    DPL,#B0H      ;interface mode control
CALL   SPI_COM
MOV    DPL,#02H
CALL   SPI_DAT

MOV    DPL,#B4H      ;display inversion control
CALL   SPI_COM
MOV    DPL,#02H      ;2-dot
CALL   SPI_DAT

MOV    DPL,#B6H      ;RGB/MCU interface
CALL   SPI_COM
MOV    DPL,#22H      ;MCU 02
CALL   SPI_DAT
MOV    DPL,#02H      ;source/Gate direction
CALL   SPI_DAT

MOV    DPL,#BEH
CALL   SPI_COM
MOV    DPL,#00H
CALL   SPI_DAT
MOV    DPL,#04H
CALL   SPI_DAT

MOV    DPL,#E9H      ;set image function
CALL   SPI_COM
MOV    DPL,#00H      ;disable 24 bit data input
CALL   SPI_DAT

MOV    DPL,#F7H;adjust control
CALL   SPI_COM
MOV    DPL,#A9H
CALL   SPI_DAT
MOV    DPL,#52H
CALL   SPI_DAT
MOV    DPL,#2CH
CALL   SPI_DAT
MOV    DPL,#82H
CALL   SPI_DAT

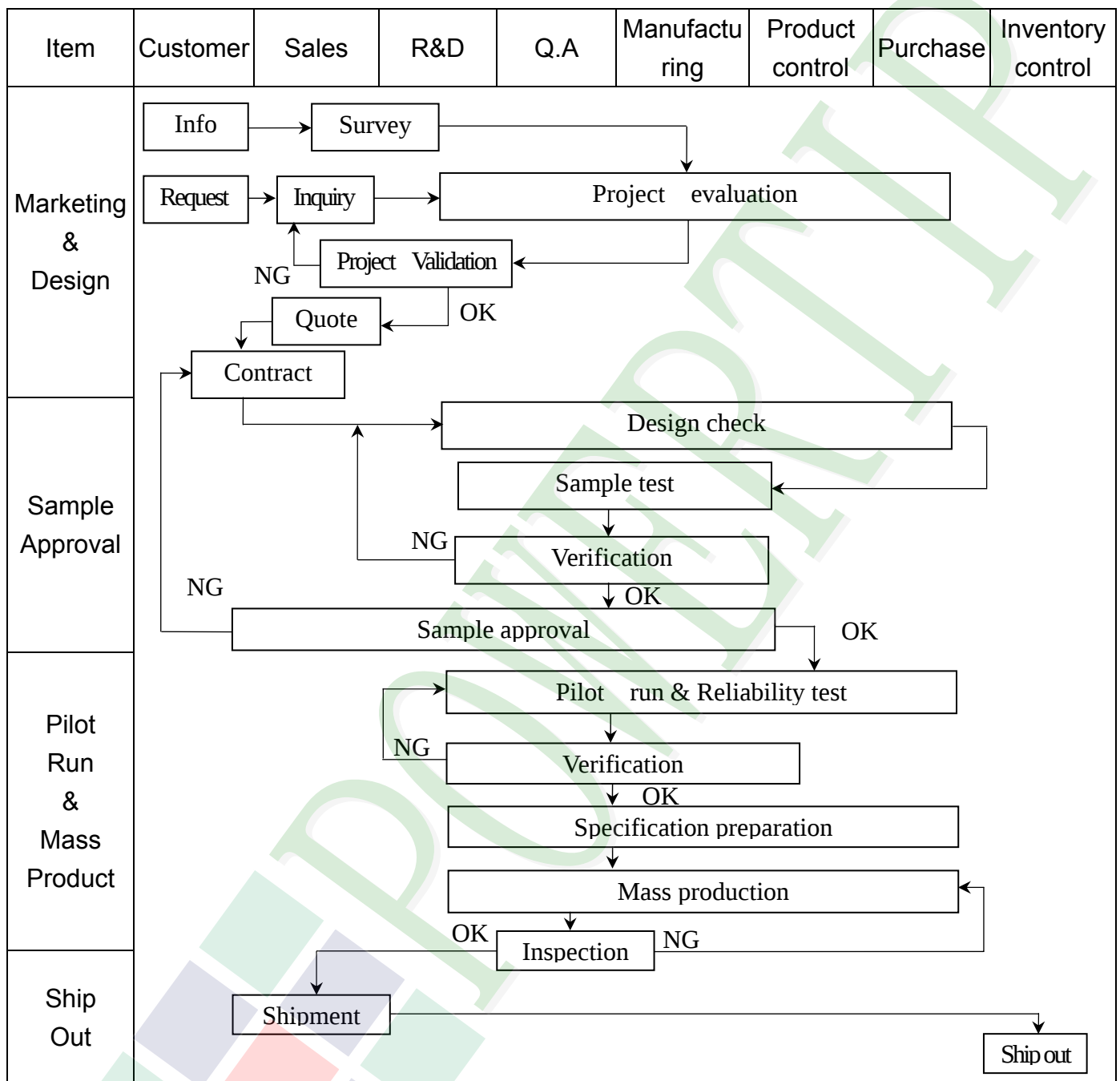
MOV    DPL,#11H;sleep out
CALL   SPI_COM
CALL   DELAY
CALL   DELAY
CALL   DELAY
CALL   DELAY

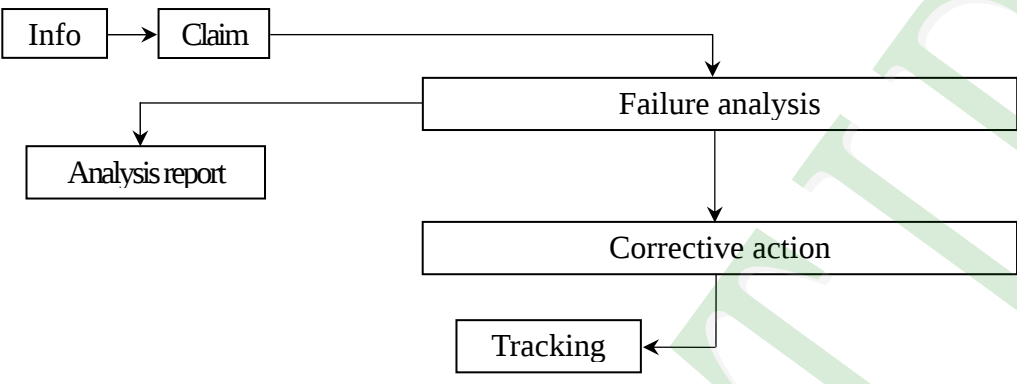
MOV    DPL,#29H      ;display on
CALL   SPI_COM

```

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



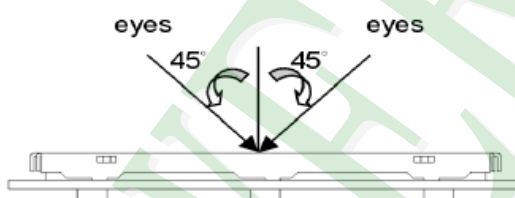
Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	 <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Corrective[Corrective action] Corrective --> Tracking[Tracking] Claim --> Report[Analysis report] </pre>							
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

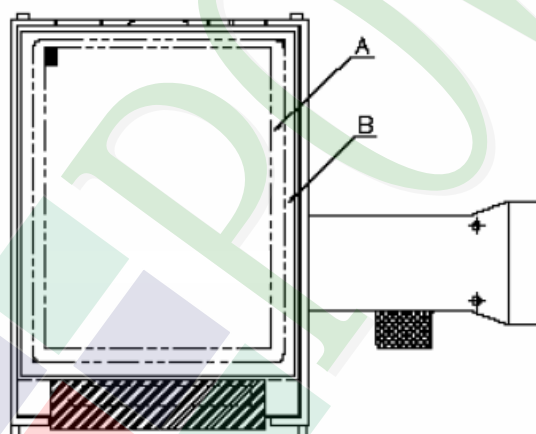
- ◆Scope : The document shall be applied to TFT-LCD Module for less than 3.5" (Ver.B01).
- ◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆Equipment : Gauge 、MIL-STD 、Powertip Tester 、Sample
- ◆Defect Level : Major Defect AQL : 0.4 ; Minor Defect AQL : 1.5
- ◆OUT 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 , and distance of view must be at 30 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)

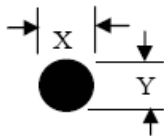
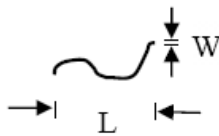
◆ Specification For TFT-LCD Module Less Than 3.5" :

(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												
05	Dot defect (Bright dot 、 Dark dot) On -display	<table><thead><tr><th colspan="2">Item</th><th>Acceptance (Q'ty)</th></tr></thead><tbody><tr><td rowspan="4">Dot Defect</td><td>Bright Dot</td><td>≤ 2</td></tr><tr><td>Dark Dot</td><td>≤ 3</td></tr><tr><td>Joint Dot</td><td>≤ 2</td></tr><tr><td>Total</td><td>≤ 3</td></tr></tbody></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.	Item		Acceptance (Q'ty)	Dot Defect	Bright Dot	≤ 2	Dark Dot	≤ 3	Joint Dot	≤ 2	Total	≤ 3	Minor
Item		Acceptance (Q'ty)													
Dot Defect	Bright Dot	≤ 2													
	Dark Dot	≤ 3													
	Joint Dot	≤ 2													
	Total	≤ 3													

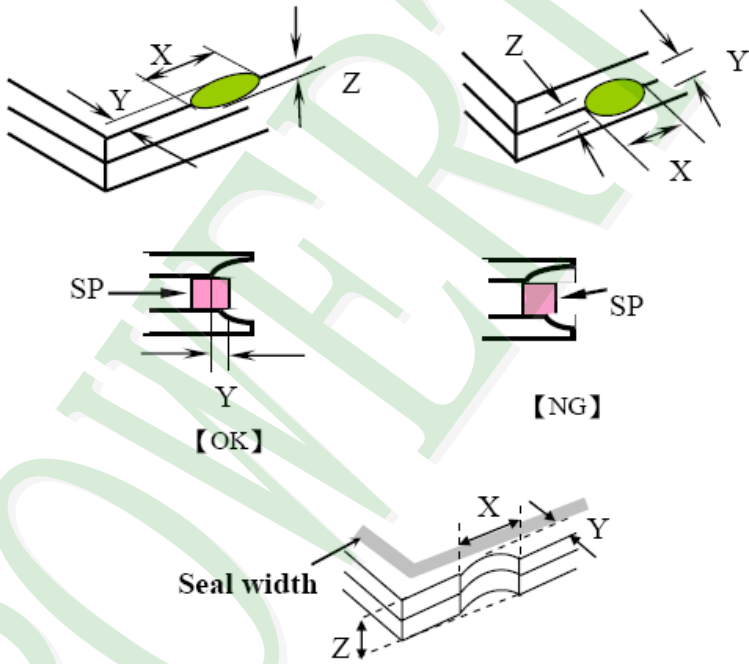
◆ Specification For TFT-LCD Module Less Than 3.5" :

(Ver.B01)

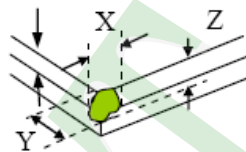
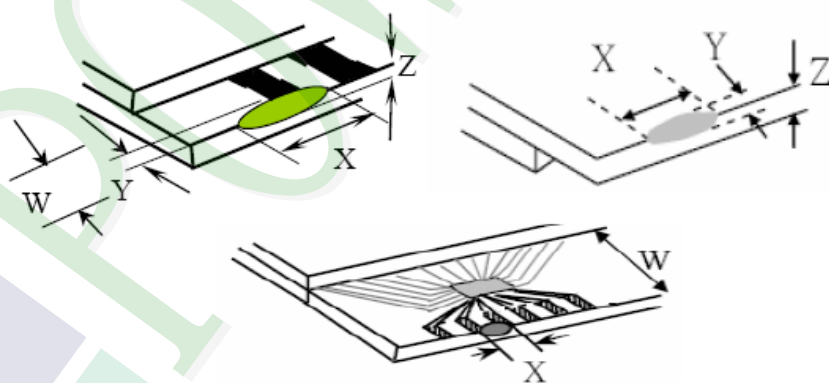
NO	Item	Criterion	Level																																							
06	Black or white dot、scratch、contamination Round type  $\Phi=(x+y) / 2$ Line type 	6. 1 Round type (Non-display or display) : <table> <tr> <th rowspan="2">Dimension (diameter : Φ)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> <tr> <td>$\Phi \leq 0.15$</td> <td>Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.20$</td> <td>2</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>3</td> <td></td> </tr> </table> 6. 2 Line type(Non-display or display) : <table> <tr> <th colspan="2">Dimension</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>Length (L)</th> <th>Width (W)</th> <th>A area</th> <th>B area</th> </tr> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>---</td> <td>$W > 0.05$</td> <td>As round type</td> </tr> <tr> <td colspan="2">Total</td> <td>3</td> <td></td> </tr> </table>	Dimension (diameter : Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.15$	Ignore	Ignore	$0.15 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.30$	2	$\Phi > 0.30$	0	Total	3		Dimension		Acceptance (Q'ty)		Length (L)	Width (W)	A area	B area	---	$W \leq 0.03$	Ignore	Ignore	$L \leq 5.0$	$0.03 < W \leq 0.05$	3	---	$W > 0.05$	As round type	Total		3		Minor
Dimension (diameter : Φ)	Acceptance (Q'ty)																																									
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07	Polarizer Bubble	<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>$\Phi \leq 0.20$</td> <td>Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$\Phi > 0.50$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>3</td> </tr> </table>	Dimension (diameter : Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.20$	Ignore	Ignore	$0.20 < \Phi \leq 0.50$	3	$\Phi > 0.50$	0	Total	3	Minor																									
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◆ Specification For TFT-LCD Module Less Than 3.5" :

(Ver.B01)

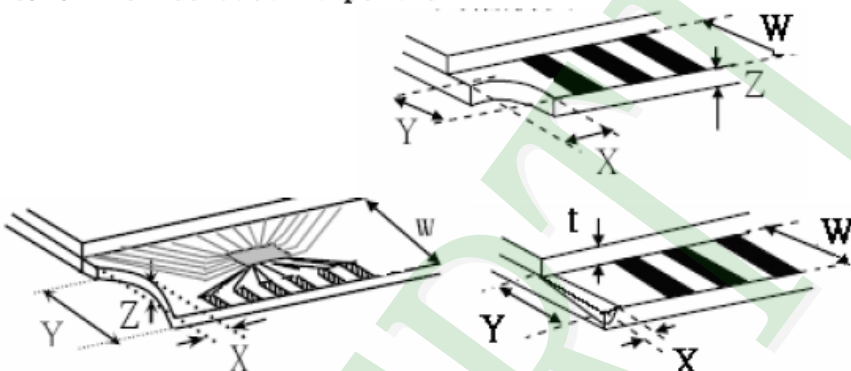
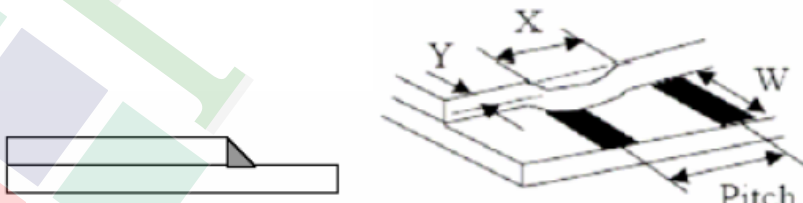
NO	Item	Criterion	Level									
08	The crack of glass	Symbols : X : The length of crack Z : The thickness of crack t : The thickness of glass Y : The width of crack. W : terminal length a : LCD side length 8.1 General glass chip : 8.1.1 Chip on panel surface and crack between panels:  <table><tr><th>X</th><th>Y</th><th>Z</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>	X	Y	Z	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$	$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$	Minor
		X	Y	Z								
$\leq a$	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 Less Than 3.5" :
(Ver.B01)

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

◆ Specification For TFT-LCD Module Less Than 3.5" :

(Ver.B01)

NO	Item	Criterion	Level												
08	The crack of glass	Symbols : X : The length of crack Z : The thickness of crack t : The thickness of glass Y : The width of crack. W : terminal length a : LCD side length 8.2.2 Non-conductive portion :  <table> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$\leq 1/3 a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </table> ☉ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. 8.2.3 Glass remain :  <table> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$\leq a$</td> <td>$\leq 1/3 W$</td> <td>$\leq t$</td> </tr> </table>	X	Y	Z	$\leq 1/3 a$	$\leq W$	$\leq t$	X	Y	Z	$\leq a$	$\leq 1/3 W$	$\leq t$	Minor
		X	Y	Z											
$\leq 1/3 a$	$\leq W$	$\leq t$													
X	Y	Z													
$\leq a$	$\leq 1/3 W$	$\leq t$													

◆Specification For TFT-LCD Module Less Than 3.5" :
(Ver.B01)

NO	Item	Criterion	Level
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 the same as on the production characteristic chart .There should 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 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs.											
2	Low Temperature Storage Test	Keep in -30 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs.											
3	High Temperature / High Humidity Storage Test	Keep in +60 °C / 90% R.H duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)											
4	Temperature Cycling Storage Test	-30℃ → +25℃ → +80℃ → +25℃ (30mins) (5mins) (30mins) (5mins) ← → 10 Cycle Surrounding temperature, then storage at normal condition 4hrs.											
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 +/-										
		1. Temperature ambience : 15℃ ~35℃ 2. Humidity relative : 30% ~60% 3. Energy Storage Capacitance(Cs+Cd) : 150pF±10% 4. Discharge Resistance(Rd) : 330Ω±10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)											
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>		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												
		Drop Direction :※1 corner / 3 edges / 6 sides each 1time											

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 .

5.3 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.

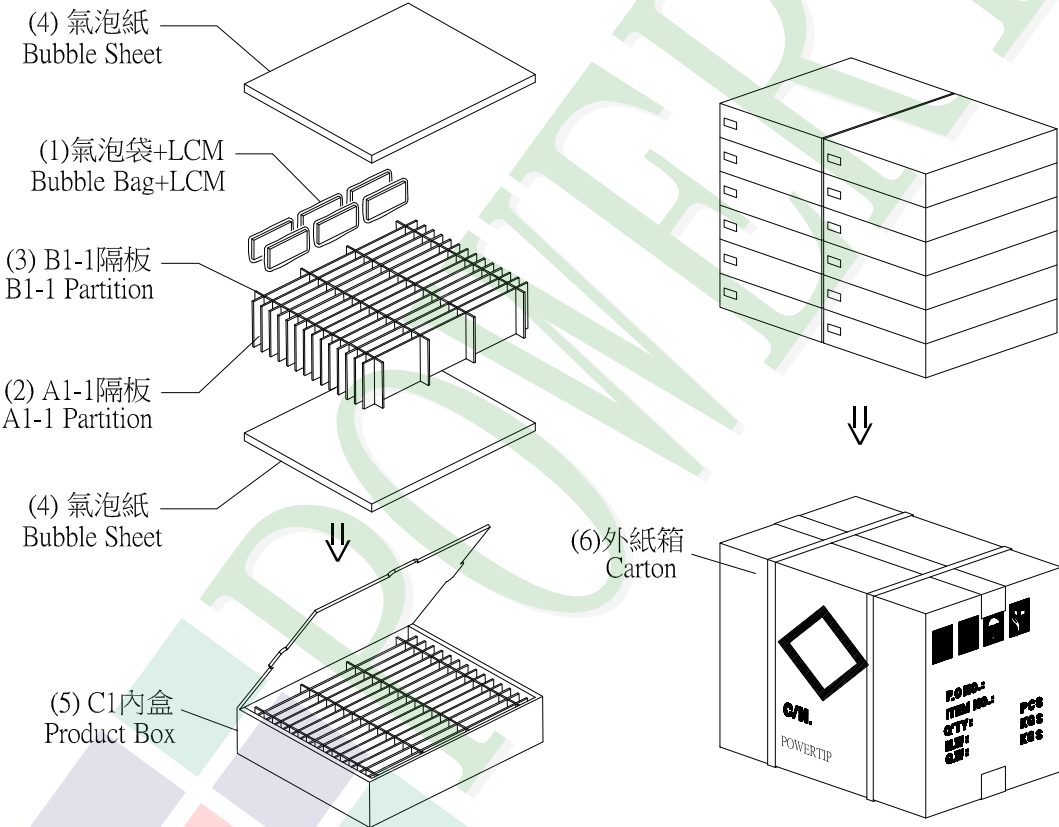
[illegible]

PT-A-054-01

1.包裝材料規格表 (Packaging Material) : (per carton)

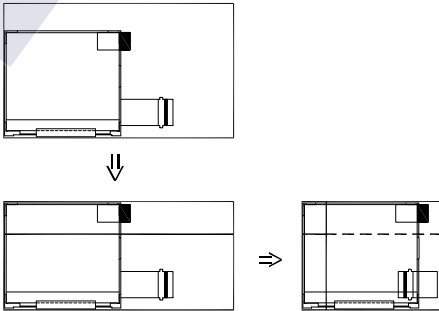
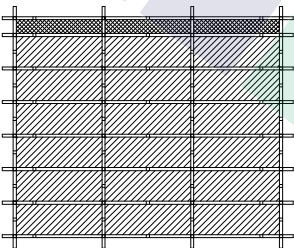
No.	Item	Model	Dimensions (mm)	1Pcs Weight	Quantity	Total Weight
1	成品 (LCM)	PH320240T-025-L-Q	53.24 X 48.16	0.01	684	6.84
2	氣泡袋(1)Bubble Bag	BAG100080BWABA	100 X 80	0.0012	684	0.8208
3	A1-1隔板(2)A1-1 Partition	BX29500047BZBA	295 X 47 X 3	0.0078	96	0.7488
4	B1-1隔板(3)B1-1 Partition	BX24500047BZBA	245 X 47 X 3	0.0065	48	0.312
5	氣泡紙(4)Bubble Sheet	BAG280240BWABA	280 X 240	0.006	24	0.144
6	C1內盒(5)Product Box	BX31025555AABA	310 X 255 X 55	0.13	12	1.56
7	外紙箱(6)Carton	BX52732536CCBA	527 X 325 X 360	0.83	1	0.83
8						
9						

- 2.一 整箱總重量 (Total LCD Weight in carton) : 11.26 Kg±10%
- 3.單箱數量規格表 (Packaging Specifications and Quantity) :
- (1)Quantity Of Spacer : A1-1隔板 X 8 , B1-1隔板 X 4
- (2)Total LCM quantity in carton : quantity per box 57 x no of boxes 12 = 684



特 記 事 項 (REMARK)

4. LCM排放示意圖(前後間隔不放置):
4. LCM placed as figure showing:
(First and last slot should be empty)
5. 模組放進氣泡袋時, FPC長度彎折1/2
5.Module into a bubble bag,FPC bending length 1/2
6. 模組出PIN端朝上&交錯擺放
6. Module the pin end up & staggered placed



▨ 模組(LCM) X 3pcs. ■ 模組(LCM) X 1pcs.