

SPECIFICATIONS

CUSTOMER	:	PTC
SAMPLE CODE	:	SH480272T015-IAC
MASS PRODUCTION CODE	:	PH480272T015-IAC
SAMPLE VERSION	:	01
SPECIFICATIONS EDITION	:	001
DRAWING NO. (Ver.)	:	JLMD-PH480272T015-IAC_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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Note: For detailed information please refer to IC data sheet: Sitronix --- ST7282-G4

1. SPECIFICATIONS

1.1 Features

Item	Standard Value
Display Type	480 * 3(RGB) * 272 Dots
LCD Type	a-Si TFT, Positive/Normally white TN, Transmissive Type
Screen size(inch)	4.3"(Diagonal)
Viewing Direction	6 O'clock (Gray scale Inversion)*1
	12 O'clock (*2)
Color configuration	R,G,B vertical stripe
Display Interface	Digital 24-bits RGB
Driver IC	ST7282-G4
ROHS	THIS PRODUCT CONFORMS THE ROHS OF PTC Detail information please refer website : http://www.powertip.com.tw/news.php?area_id_view=1085560481/

*1. For saturated color display content (e.g. pure-red, pure-green, pure-blue or pure-colors -combinations).

*2. "For display content based upon multicolor images e.g. photos, RGB defined user interfaces".

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	115.1 (W) x 78.94 (L) x 4.8 (H)	mm

LCD panel

Item	Standard Value	Unit
Active Area	95.04 (W) x 53.85 (L)	mm
Pixel Size	0.198 (W) * 0.198 (H)	mm

Note: For detailed information please refer to LCM drawing

1.3 Absolute Maximum Ratings

Module

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	V_{DD}	GND=0	-0.3	+4.6	V
Input Voltage Range	V_{IN}	-	-0.3	$V_{DD}+0.3$	V
Operating Temperature	T_{OP}	-	-20	+70	°C
Storage Temperature	T_{ST}	-	-30	+80	°C
Storage Humidity	H_D	$T_a \leq 60^\circ\text{C}$	10	90	%RH

1.4 DC Electrical Characteristics

Module

GND = 0V, $T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply Voltage	V_{DD}	-	3.0	3.3	3.6	V
“H” Input Voltage	V_{IH}	-	$0.7 \cdot V_{DD}$	-	V_{DD}	V
“L” Input Voltage	V_{IL}	-	GND	-	$0.3 \cdot V_{DD}$	V
“H” Output Voltage	V_{OH}	-	$V_{DD}-0.4$	-	V_{DD}	V
“L” Output Voltage	V_{OL}	-	GND	-	$\text{GND}+0.4$	V
Supply Current	I_{DD}	$V_{DD}=3.3\text{V}$	-	(35)	(50)	mA

1.5 Optical Characteristics

TFT LCD Panel

$V_{DD}=3.3V$, $T_a=25^{\circ}C$

Item	Symbol	Condition	Min.	Typ.	Max.	unit		
Response time	$T_r + T_f$	-	-	29	44	ms	Note2	
Viewing angle	Top	θ_{Y+}	CR ≥ 10	-	60	-	Deg.	Note4
	Bottom	θ_{Y-}		-	60	-		
	Left	θ_{X-}		-	60	-		
	Right	θ_{X+}		-	60	-		
Contrast ratio	CR	-	500	600	-	-	-	
Color of CIE Coordinate (With B/L&T/P)	White	X	IF= 20 mA	-	(0.28)	-	-	Note1
		Y		-	(0.30)	-		
	Red	X		-	(0.58)	-		
		Y		-	(0.36)	-		
	Green	X		-	(0.32)	-		
		Y		-	(0.57)	-		
	Blue	X		-	(0.14)	-		
		Y		-	(0.05)	-		
Average Brightness Pattern=white display (With LCD&T/P) *1	IV	IF= 20 mA	(260)	(280)	-	cd/m ²	Note1	
Uniformity (With LCD&T/P) *2	ΔB	IF= 20mA	70	-	-	%	Note1	

Note1:

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

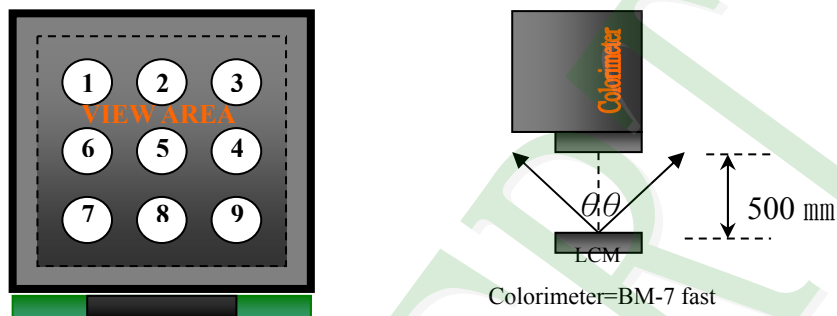
2 : Measurement Condition for Optical Characteristics:

a : Environment: $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ / $60 \pm 20\% \text{R.H}$, no wind , dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: $500 \pm 50 \text{ mm}$, ($\theta = 0^{\circ}$)

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 $\pm 4\%$



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:

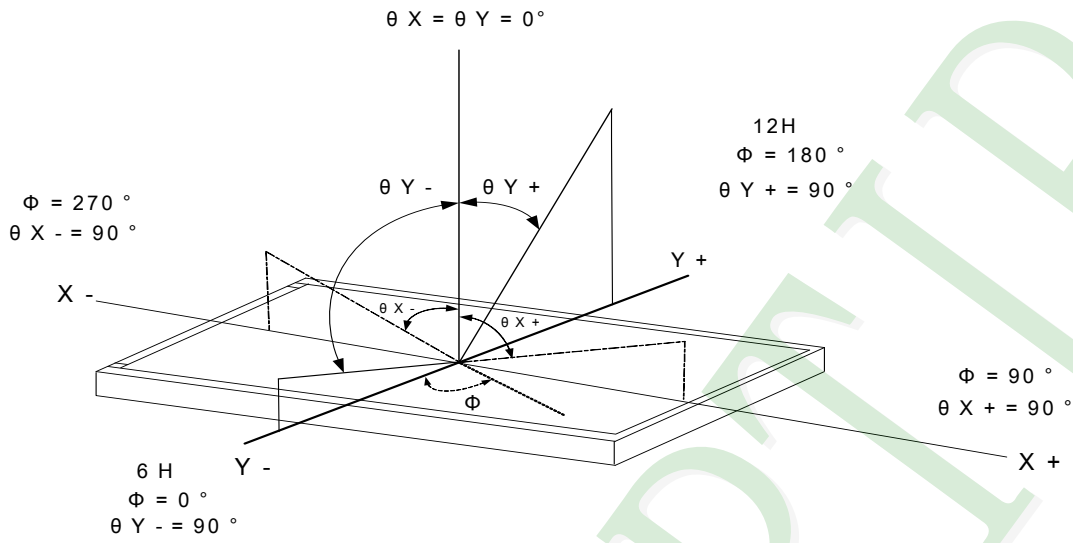


Note3: Definition of contrast ratio:

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

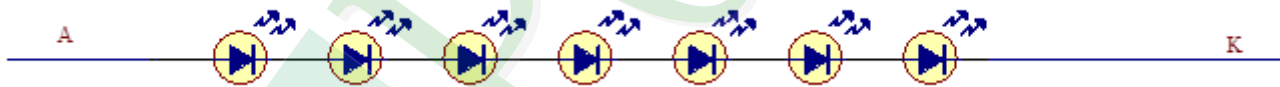
Item	Symbol	Conditions	Min.	Max.	Unit
LED Forward Current	IF	Ta =25°C	-	30	mA
LED Reverse Voltage (Each one)	VR	Ta =25°C	-	5	V
Power Dissipation	PD	Ta =25°C	-	735	mW

Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=20mA	19.6	22.4	24.5	V
Average Brightness (Without LCD & T/P)	IV		5500	6000	-	cd/m ²
CIE Color Coordinate (Without LCD & T/P)	X		0.24	0.27	0.30	-
	Y		0.24	0.27	0.30	
Color	White					

*1: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =20mA. The LED lifetime could be decreased if operating IL is larger than 20 mA.

Internal Circuit Diagram



Other Description

Item	Conditions	Description
Life Time*1	Ta =25°C IF= 20mA	20,000 hrs

1.7 Touch Panel Characteristics

Features

Item	Standard Value
Touch Panel Size	4.3"
Touch type	Projective capacitive touch panel True Multi-touch with up to 5 Points of Absolution
Output Interface	I ² C
IC	FT5426(Focal IC)

I²C Address

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	1	1	0	0	0	R/W

Bit 0: 0 for Write / 1 for Read

Mechanical Specifications

Item	Standard Value	Unit
Viewing Area	97.10 mm (W) x 55.90 mm (H)	mm
Number of sensing channel	16 (W) x 11 (H)	mm

Absolute Maximum Ratings

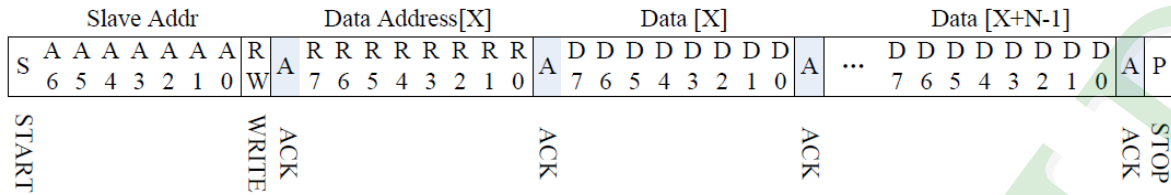
Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	VDD	-	-0.3	3.6	V
Operating Temperature	T _{OP}	-	-20	+70	°C
Storage Temperature	T _{ST}	-	-30	+80	°C

DC Electrical Characteristics

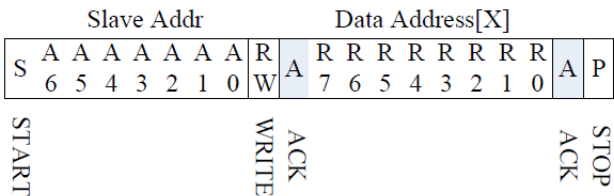
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD	-	2.8	3.3	3.6	V

I²C Read/Write Interface description

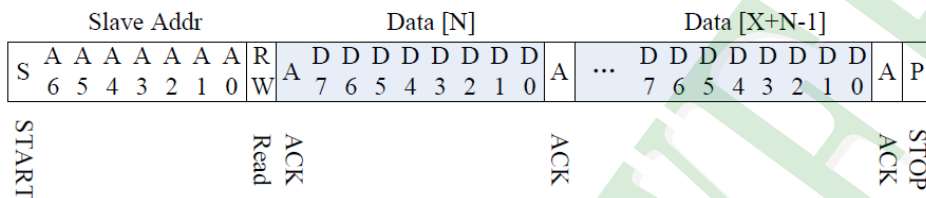
Write N bytes to I2C slave



Set Data Address



Read X bytes from I2C Slave

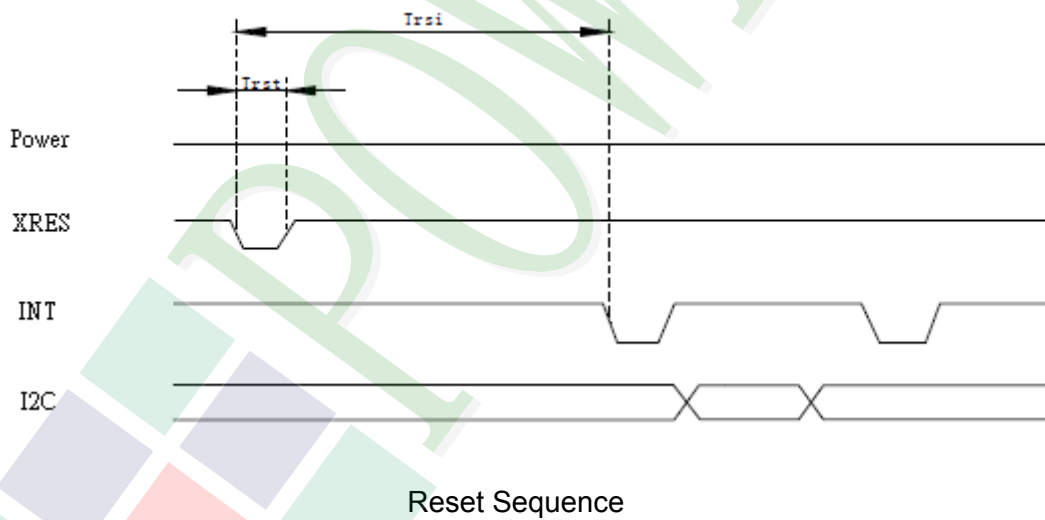
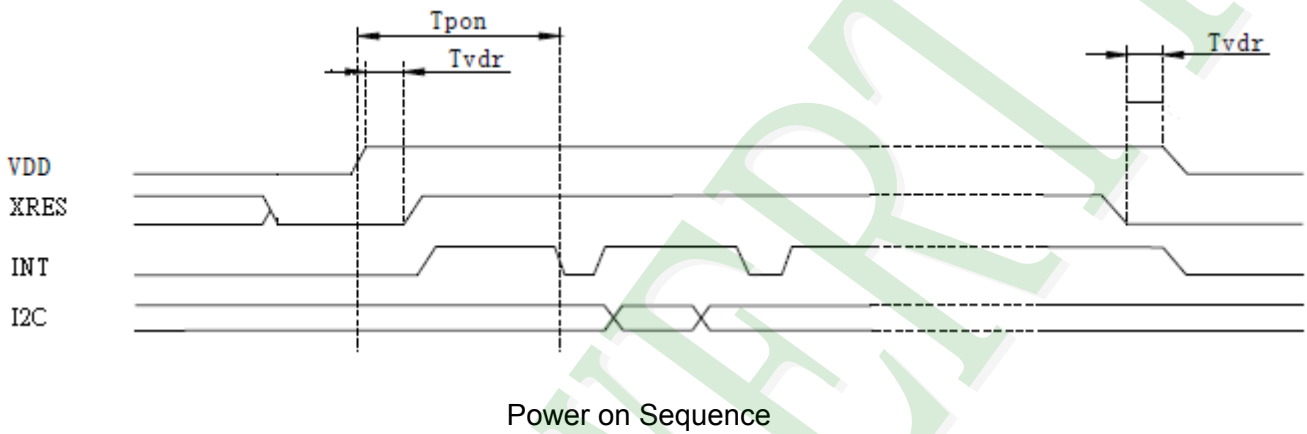
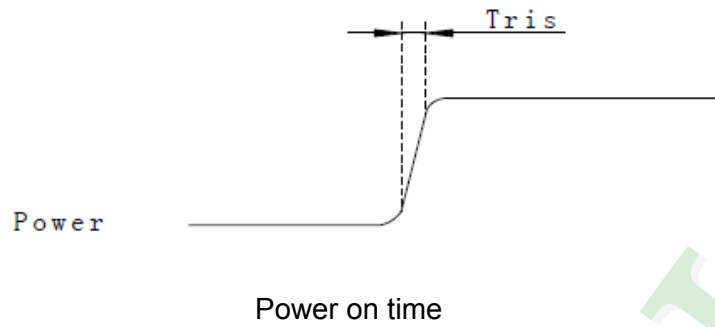


Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:0]:0111000b
R/ W	'1' for read, '0'for write
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

Timing Characteristics

Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\



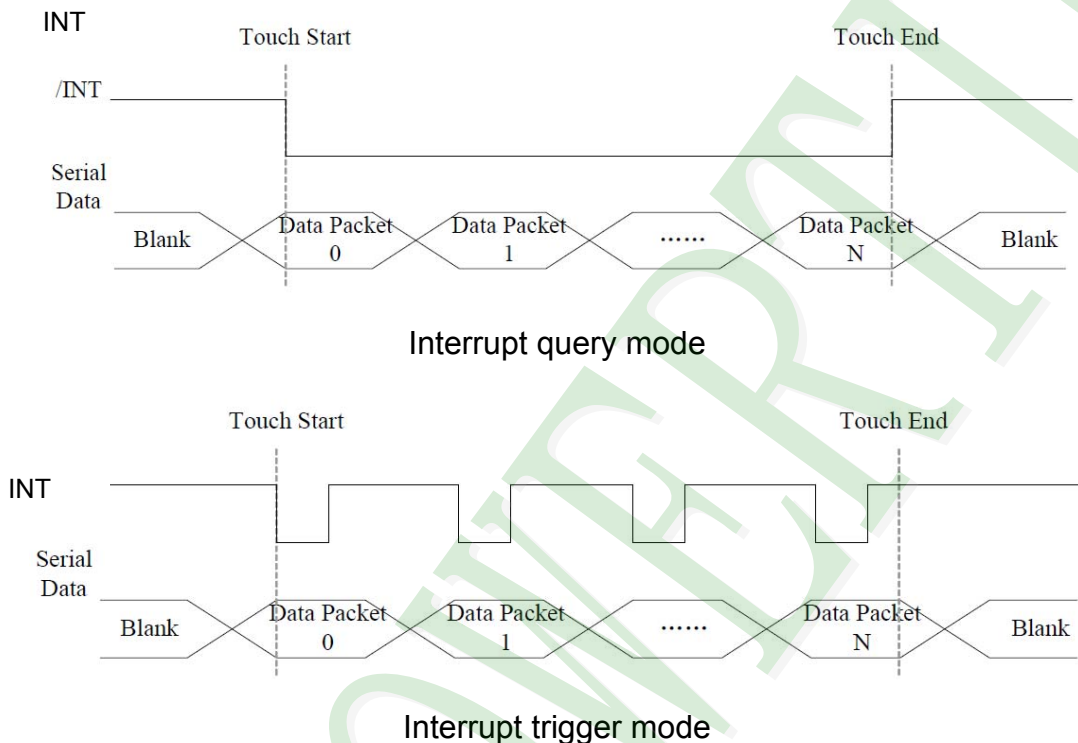
Power on / Reset Sequence Parameters

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tpon	Time of starting to report point after powering on	200	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	200	--	ms
Trst	Reset time	1	--	ms

Interrupt signal from CTP to Host

As for standard CTP, host need to use both interrupt control signal and serial data interface to get the touch data. There are two kind of method to use interrupt: interrupt trigger and interrupt query.

Here is the timing to get touch data.



Host use general I2C protocol to read the touch data or the information from CTP. CTP will send host a interrupt signal when there is a valid touch. Then host can use the serial data interface to get the touch data. If there is no valid touch detected, the INT will not be pulled up, the host do not need to read the touch data.

NOTE: “valid touch” may have different definition in various systems. For example, in some systems, the valid touch is defined as there is one more valid touch point. But in some other systems, the valid touch is defined as one more valid touch with valid gestures. In usual, INT will be pulled up when there is a valid touch point, and to be low when a touch finishes.

As for interrupt trigger mode, INT signal will be low if there is a touch detected. But for per update of valid touch data, CTP will produce a valid pulse for INT signal, host can read the touch data periodically according to the frequency of this pulse. In this mode, the pulse frequency is the touch data update frequency.

CTP Register Mapping

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Host Access
00h	DEVIDE_MODE	-	Device Mode[2:0]			-	-	-	-	WR
01h	TD_STATUS	-	-	-	-	Number of touch points[3:0]				R
02h	TOUCH1_XH	1st Event Flag		-	-	1st Touch X Position[11:8]				R
03h	TOUCH1_XL	1st Touch X Position[7:0]								R
04h	TOUCH1_YH	1st Touch ID[3:0]			1st Touch Y Position[11:8]					R
05h	TOUCH1_YL	1st Touch Y Position[7:0]								R
06h	-	-								R
07h	-	-								R
08h	TOUCH2_XH	2st Event Flag	-	-	2st Touch X Position[11:8]				R	
09h	TOUCH2_XL	2st Touch X Position[7:0]								R
0Ah	TOUCH2_YH	2st Touch ID[3:0]			2st Touch Y Position[11:8]					R
0Bh	TOUCH2_YL	2st Touch Y Position[7:0]								R
0Ch	-	-								R
0Dh	-	-								R
0Eh	TOUCH3_XH	3st Event Flag	-	-	3st Touch X Position[11:8]				R	
0Fh	TOUCH3_XL	3st Touch X Position[7:0]								R
10h	TOUCH3_YH	3st Touch ID[3:0]			3st Touch Y Position[11:8]					R
11h	TOUCH3_YL	3st Touch Y Position[7:0]								R
12h	-	-								R
13h	-	-								R
14h	TOUCH4_XH	4st Event Flag	-	-	4st Touch X Position[11:8]				R	
15h	TOUCH4_XL	4st Touch X Position[7:0]								R
16h	TOUCH4_YH	4st Touch ID[3:0]			4st Touch Y Position[11:8]					R
17h	TOUCH4_YL	4st Touch Y Position[7:0]								R
18h	-	-								R
19h	-	-								R
1Ah	TOUCH5_XH	5st Event Flag	-	-	5st Touch X Position[11:8]				R	
1Bh	TOUCH5_XL	5st Touch X Position[7:0]								R
1Ch	TOUCH5_YH	5st Touch ID[3:0]			5st Touch Y Position[11:8]					R
1Dh	TOUCH5_YL	5st Touch Y Position[7:0]								R
1Eh	-	-								R
1Fh	-	-								R

DEVICE_MODE

This register is the device mode register, configure it to determine the current mode of the chip.

Address	Bit Address	Register Name	Description
00h	6 : 4	Device Mode [2:0]	000b Work Mode 100b Factory Mode – read raw data

TD_STATUS

This register is the Touch Data status register.

Address	Bit Address	Register Name	Description
01h	7 : 4	Reserved	
	3 : 0	Number of touch points[3:0]	How many points detected. 1-5 is valid.

TOUCHn_XH

This register describes MSB of the X coordinate of the nth touch point and the corresponding event flag.

Address	Bit Address	Register Name	Description
02h	7 : 6	Event Flag	00b: Put Down 01b: Put Up 10b: Contact 11b: Reserved
	5 : 4		Reserved
	3 : 0	Touch X Position [11:8]	MSB of Touch X Position in pixels

TOUCHn_XL

This register describes LSB of the X coordinate of the nth touch point

Address	Bit Address	Register Name	Description
03h	7 : 0	Touch X Position [7:0]	LSB of the Touch X Position in pixels

TOUCHn_YH

This register describes MSB of the Y coordinate of the nth touch point and corresponding touch ID.

Address	Bit Address	Register Name	Description
04h	7 : 4	Touch ID[3:0]	Touch ID of Touch Point
	3 : 0	Touch Y Position [11:8]	MSB of Touch Y Position in pixels

TOUCHn_YL

This register describes LSB of the Y coordinate of the nth touch point.

Address	Bit Address	Register Name	Description
05h~	7:0	Touch Y Position[7:0]	LSB of The Touch Y Position in pixels

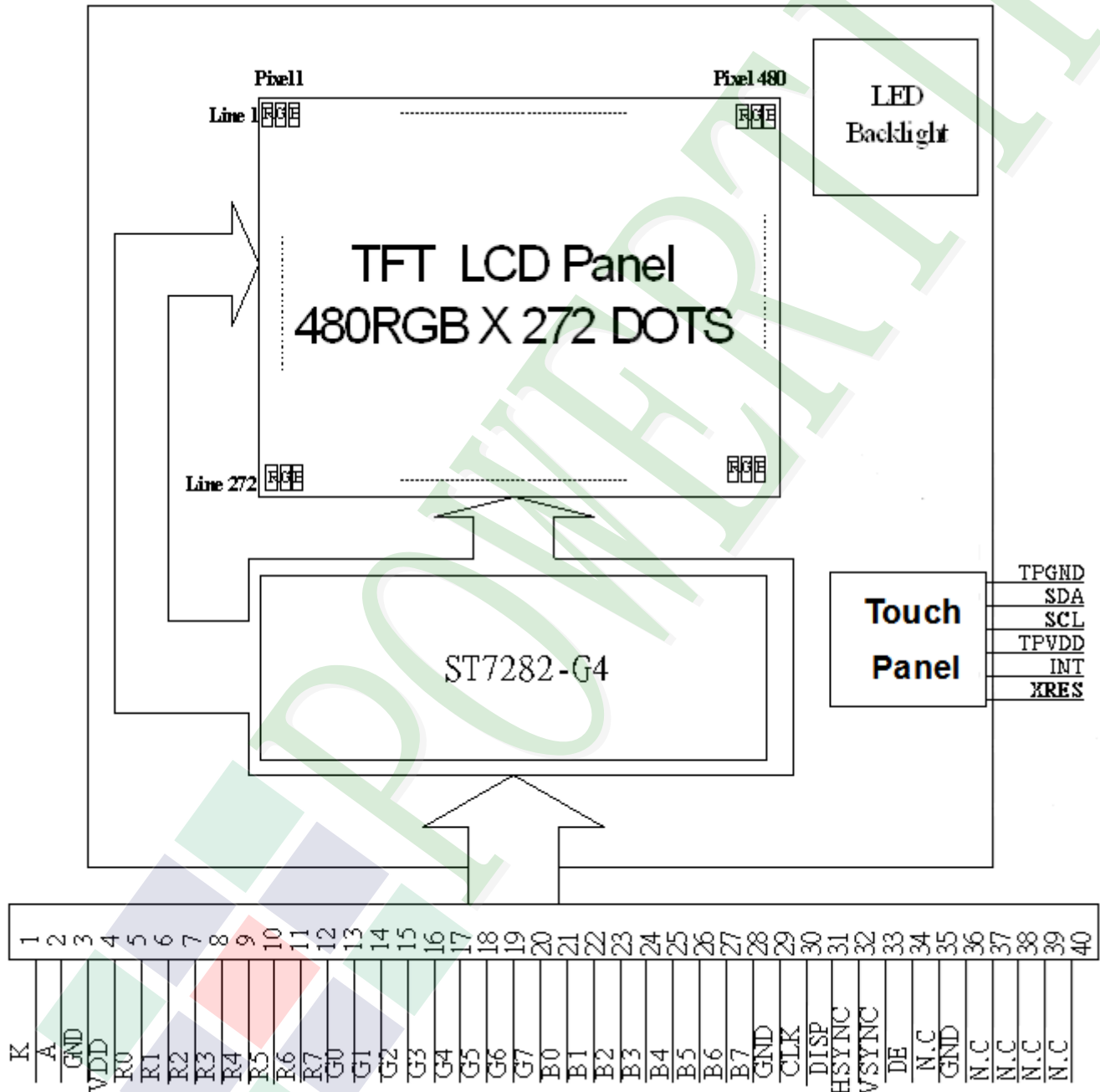
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



2.2 Interface Pin Description

Pin No.	Symbol	Function
1	K	Power supply for LED Backlight cathode input
2	A	Power supply for LED Backlight anode input
3	GND	Ground
4	V _{DD}	Digital power
5	R0	Red data bit 0
6	R1	Red data bit 1
7	R2	Red data bit 2
8	R3	Red data bit 3
9	R4	Red data bit 4
10	R5	Red data bit 5
11	R6	Red data bit 6
12	R7	Red data bit 7
13	G0	Green data bit 0
14	G1	Green data bit 1
15	G2	Green data bit 2
16	G3	Green data bit 3
17	G4	Green data bit 4
18	G5	Green data bit 5
19	G6	Green data bit 6
20	G7	Green data bit 7
21	B0	Blue data bit 0
22	B1	Blue data bit 1

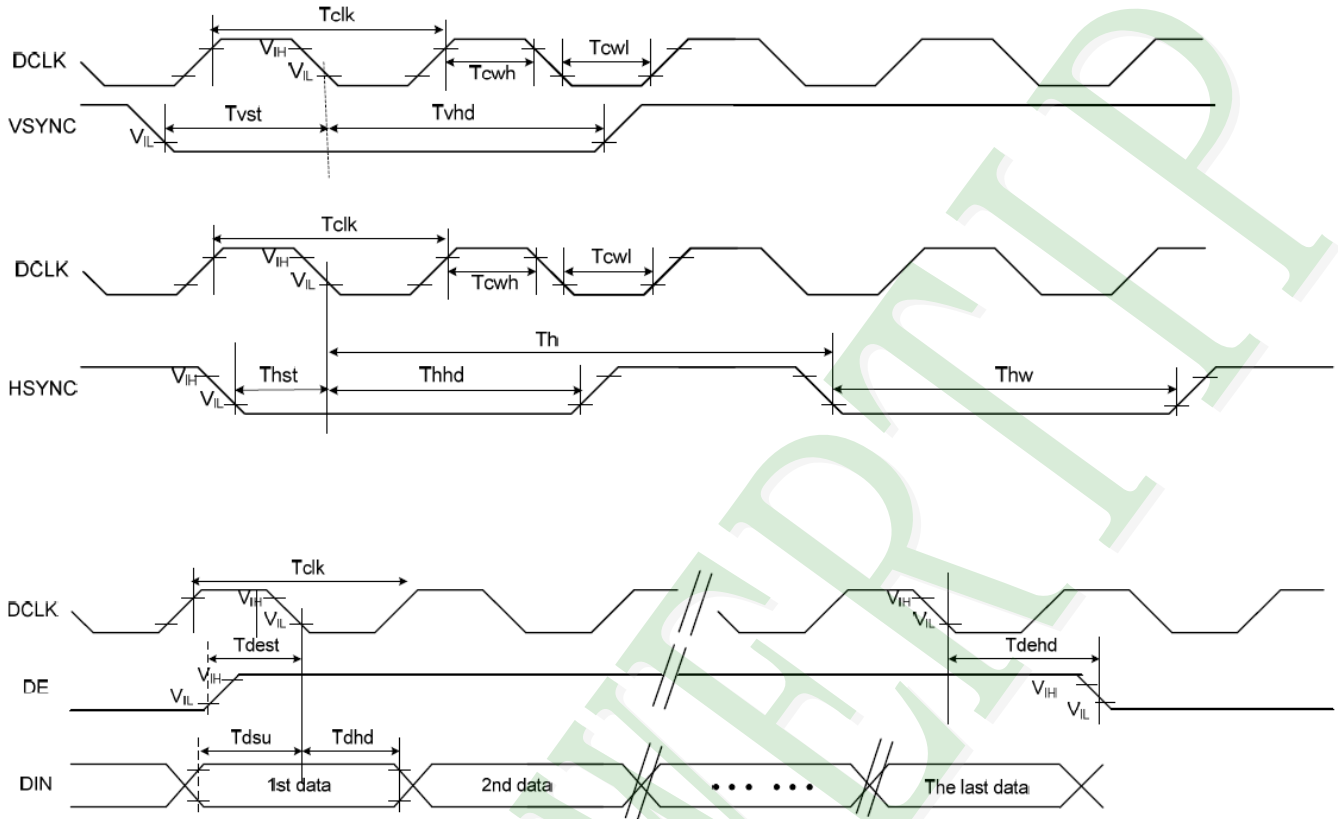
Pin No.	Symbol	Function
23	B2	Blue data bit 2
24	B3	Blue data bit 3
25	B4	Blue data bit 4
26	B5	Blue data bit 5
27	B6	Blue data bit 6
28	B7	Blue data bit 7
29	GND	Ground
30	CLK	Dot data clock
31	DISP	Display control / standby mode selection “High”: Normal display
32	HSYNC	Horizontal sync input
33	VSYNC	Vertical sync input
34	DE	Data input enable. Active High to enable the data input
35	N.C	Not Connect
36	GND	Ground
37	N.C	Not Connect
38	N.C	Not Connect
39	N.C	Not Connect
40	N.C	Not Connect

Capacitive Touch Panel (CTP) Interface

Pin No.	Symbol	Function
1	TPGND	TP Ground.
2	SDA	I2C Data
3	SCL	I2C Clock
4	TPVDD	TP VDD
5	INT	Interrupt Output
6	XRES	Chip Reset Input, Negative Edge Trigger

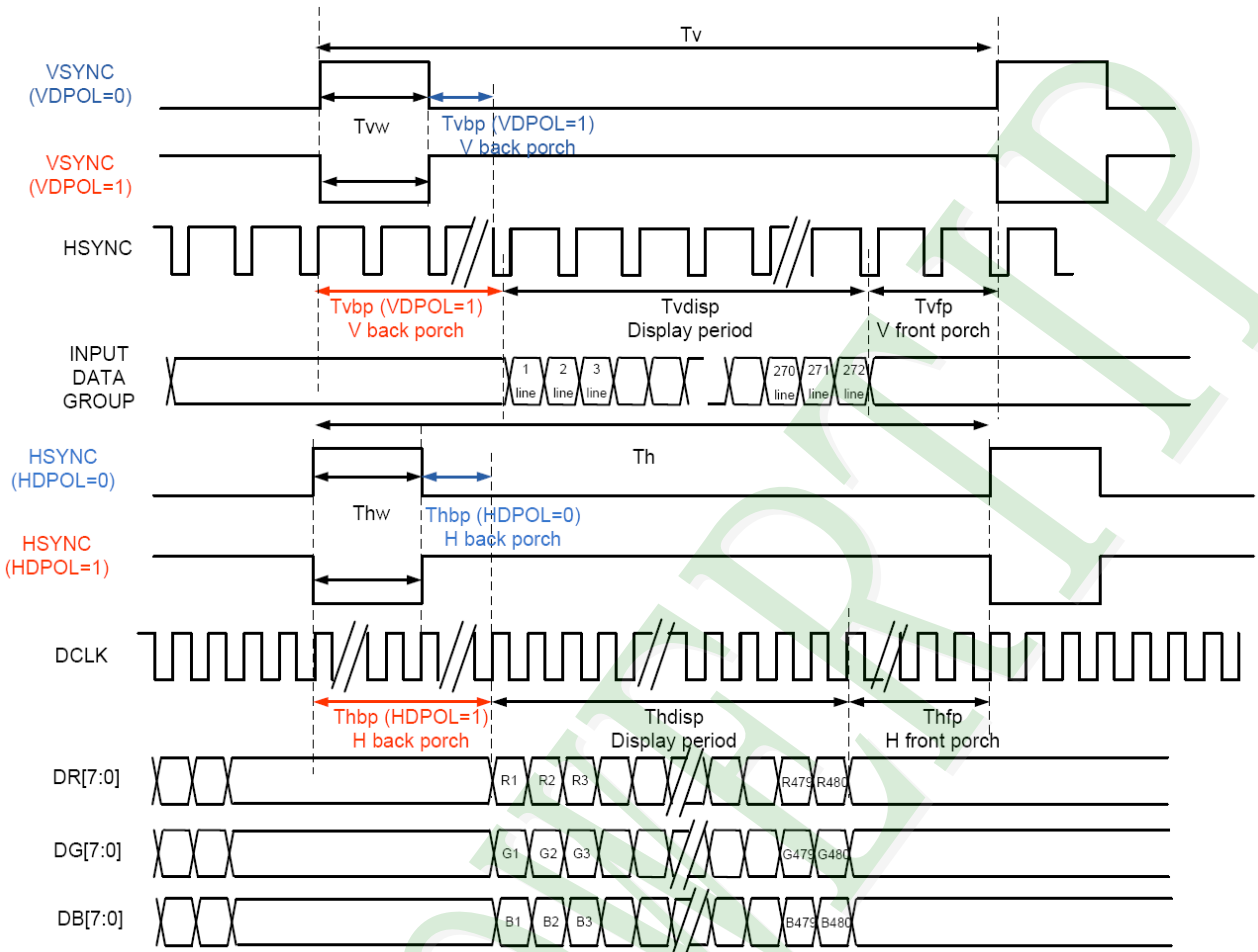
2.3 Timing Characteristics

2.3.1 Clock and Data Input Timing Diagram

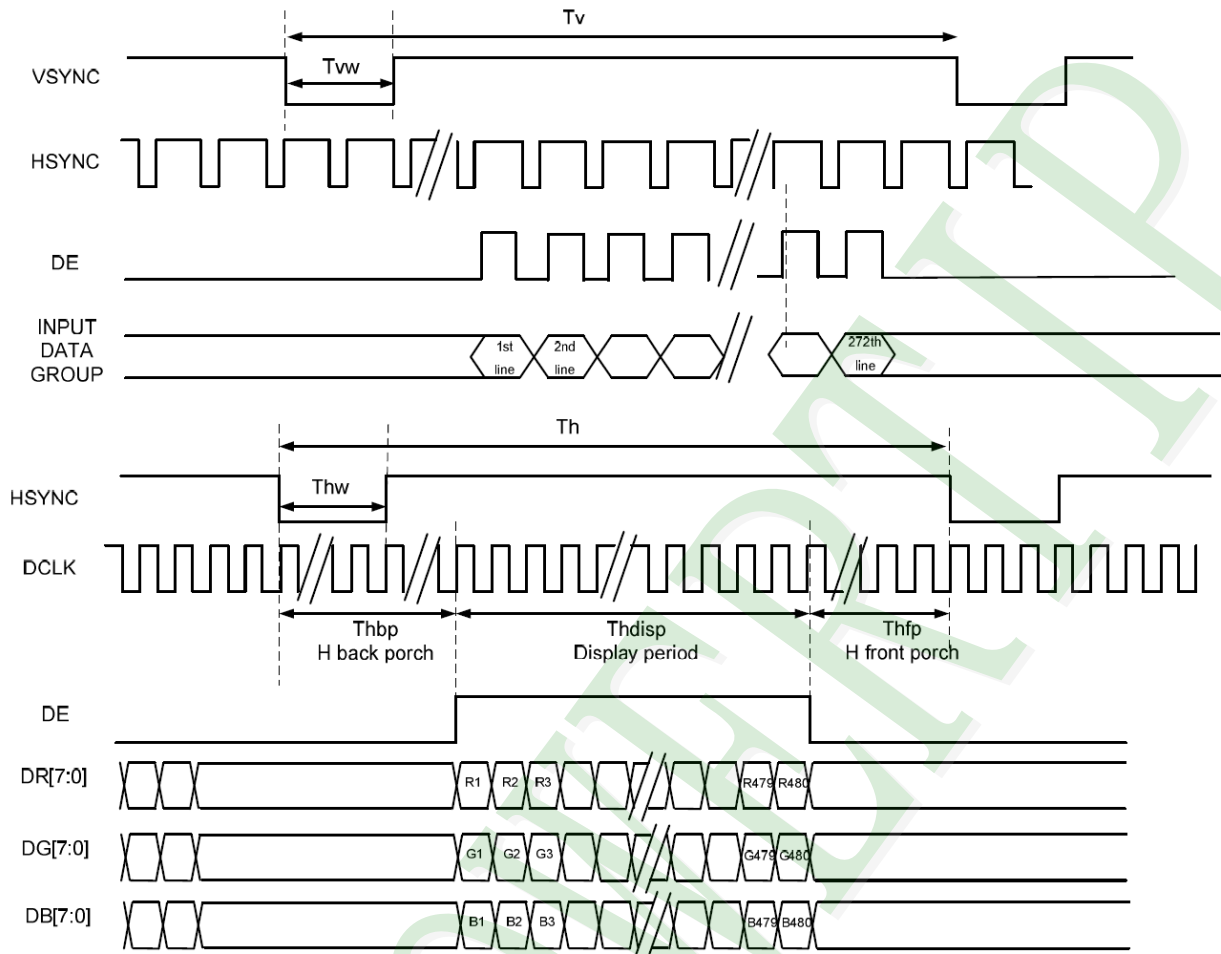


Parameters	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
System operation timing						
VDD power source slew time	T _{POR}	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	t _{RSTw}	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	T _{cw}	40	50	60	%	-
Hsync width	T _{hw}	2	-	-	DCLK	-
HSYNC period	T _h	55	60	65	us	-
VSYNC setup time	T _{vst}	12	-	-	ns	-
VSYNC hold time	T _{vhd}	12	-	-	ns	-
HSYNC setup time	T _{hst}	12	-	-	ns	-
HSYNC hold time	T _{hhd}	12	-	-	ns	-
Data setup time	T _{dsu}	12	-	-	ns	-
Data hold time	T _{dhd}	12	-	-	ns	-
DE setup time	T _{dest}	10	-	-	ns	-
DE hold time	T _{dehd}	10	-	-	ns	-
SD output stable time	T _{st}	-	-	12	us	Output settled within +20mV Loading = .6.8k+28.2pF
GD output rise and fall time	T _{gst}	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

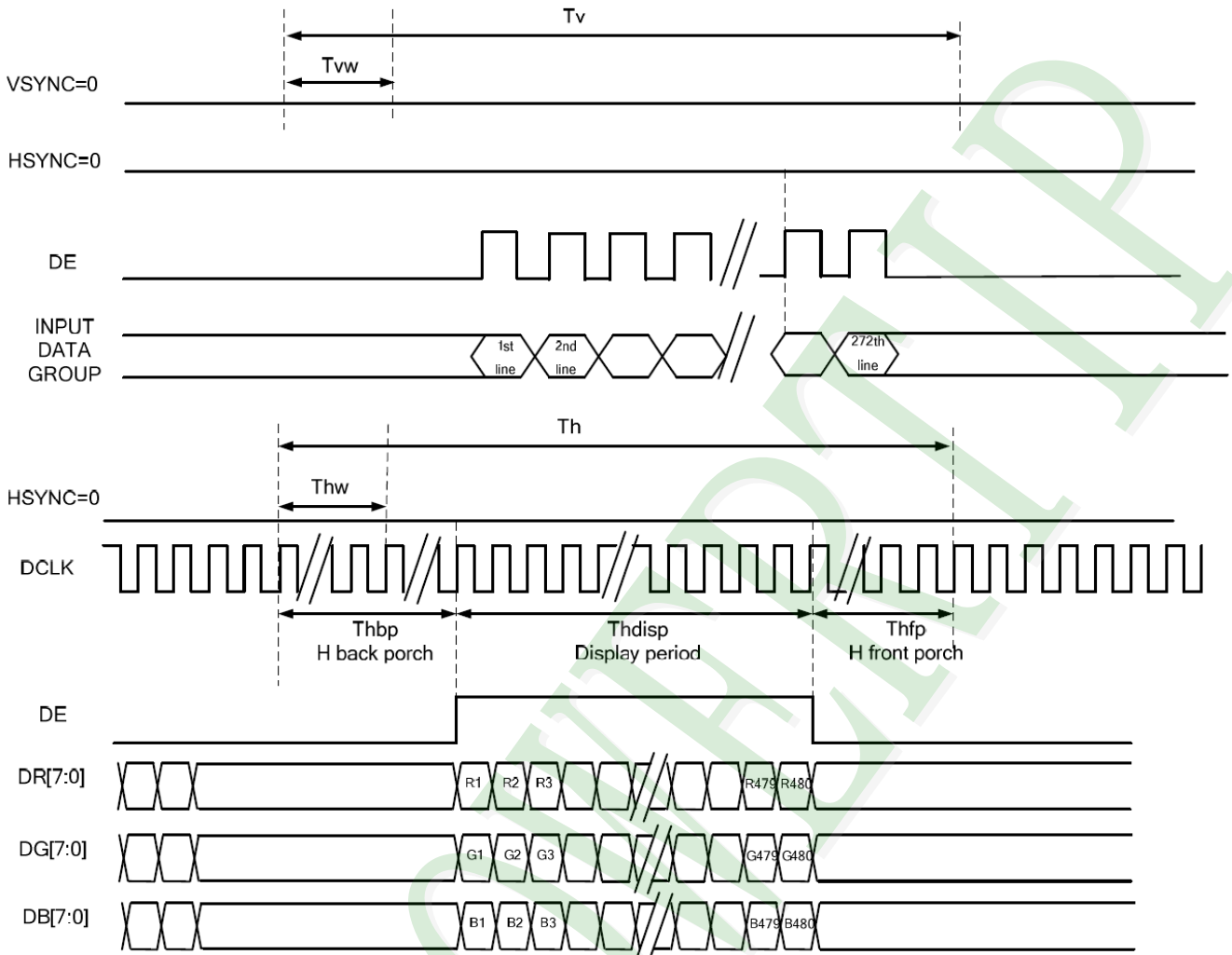
2.3.2 SYNC Mode



2.3.3 SYNC-DE Mode



2.3.4 DE Mode

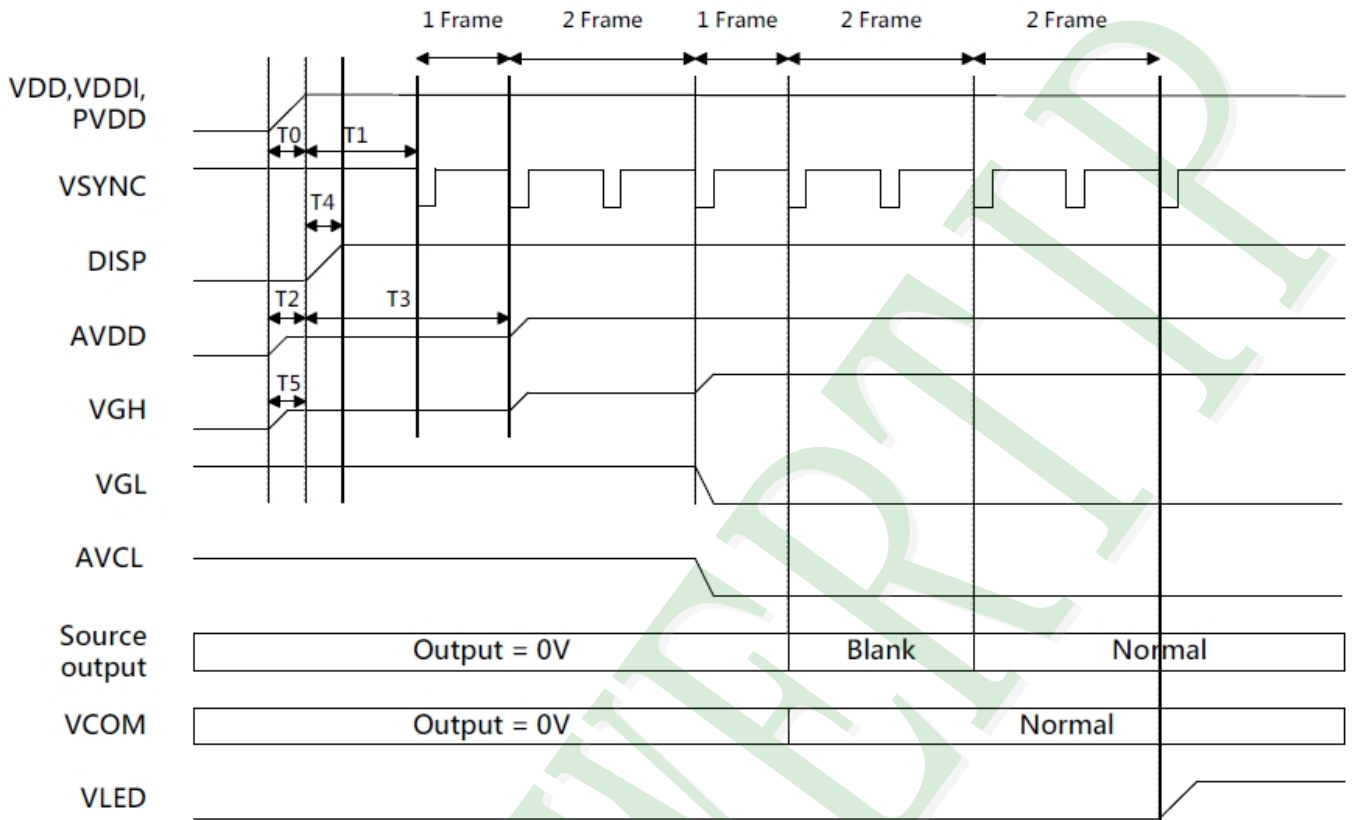


Parallel 24-bit RGB Input Timing Table

Parameters		Symbol	Value			Unit
			Min.	Typ.	Max.	
DCLK frequency		Fclk	8	9	12	MHz
DCLK Period		Tclk	83	111	125	nS
HSYNC	Period Time	Th	485	531	598	DCLK
	Display Period	Thdisp	-	480	-	DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	75	DCLK
VSYNC	Period Time	Tvdisp	276	292	321	H
	Display Period	Tvbp	-	272	-	H
	Back Porch	Tvfp	2	12	12	H
	Front Porch	Tvw	2	8	37	H
	Pulse Width	Tvdisp	2	4	37	H

2.4 POWER ON/OFF SEQUENCE

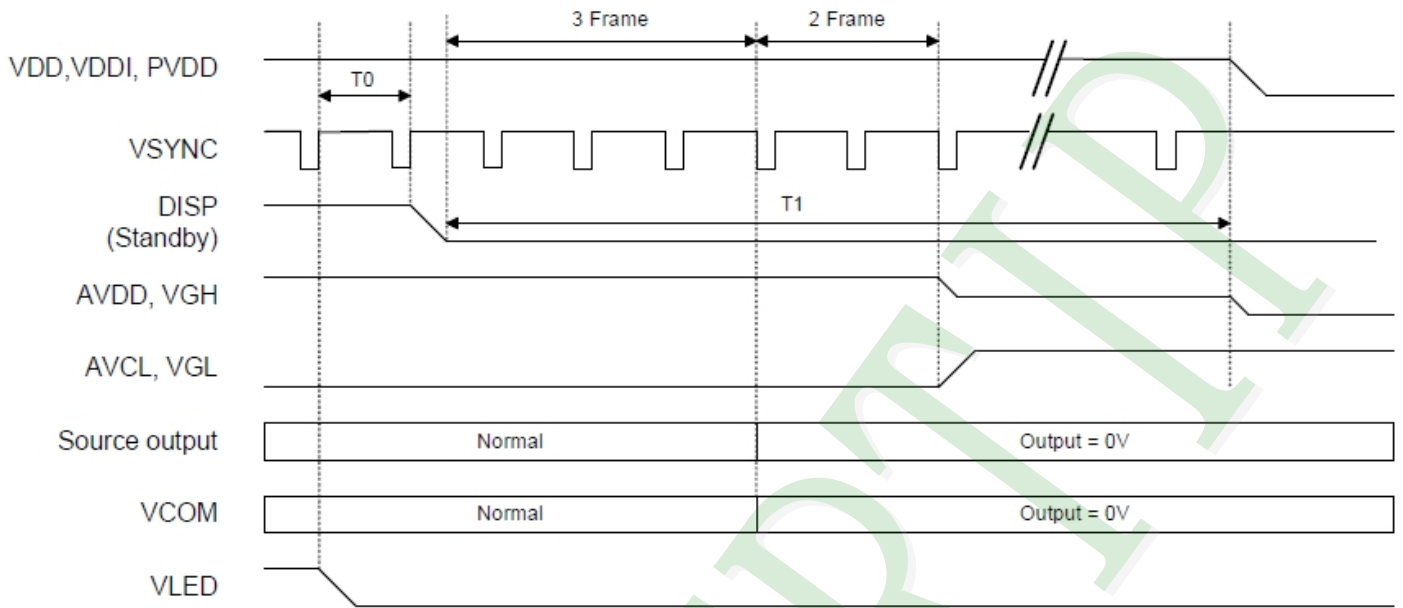
2.4.1 Power On Sequence



Symbol	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	T1=0
T2	Time from AVDD=0V to AVDD=3.3V	T2=T0
T3	Time from AVDD=3.3V to AVDD=6.0V	T3=T1+ (1*Frame)
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	T4=0
T5	Time from VGH=0V to VGH=3.3V	T5=T0

Note: Recommend the LCM power on rise time T0= 0~1ms.

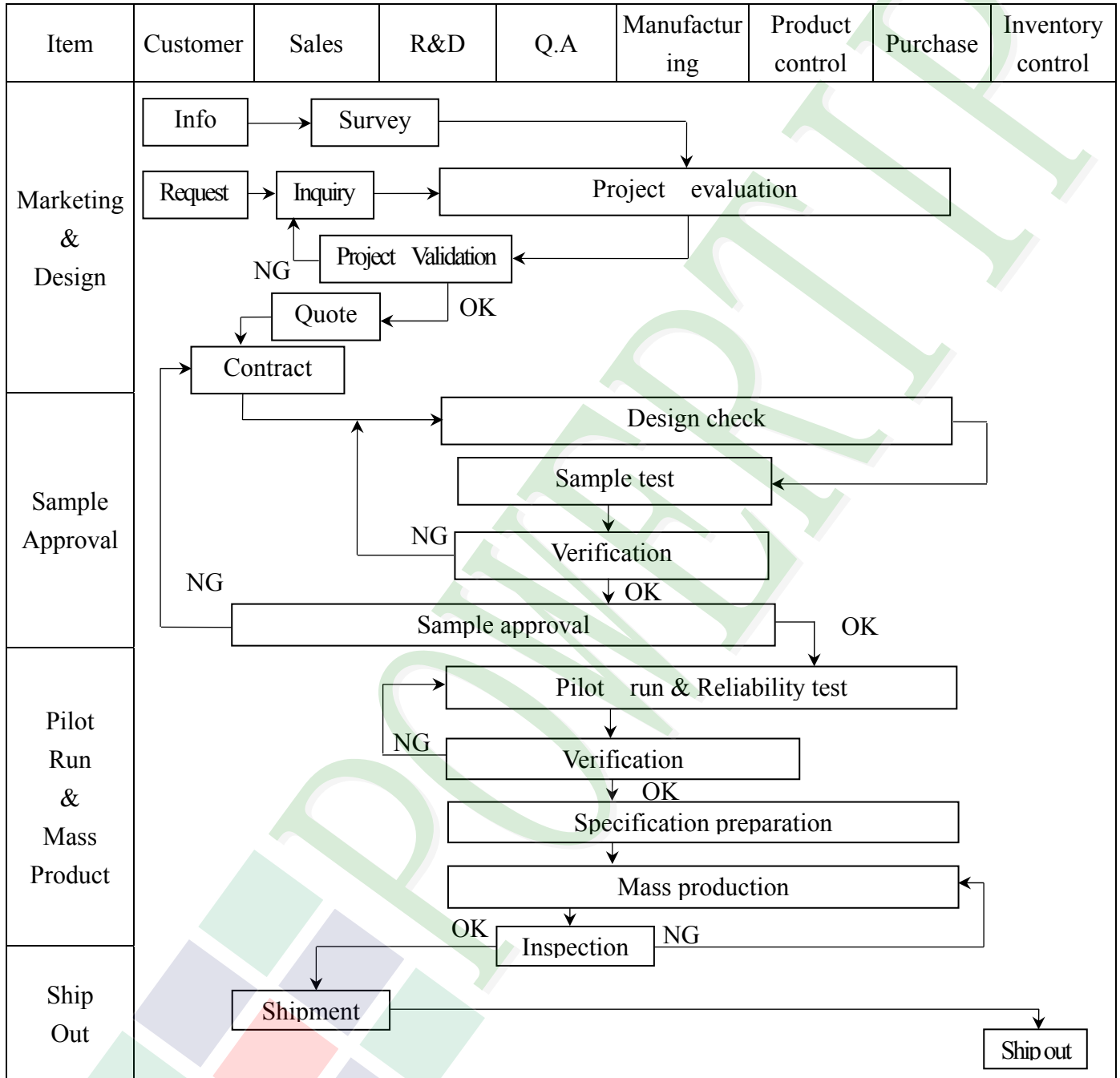
2.4.2 Power Off Sequence

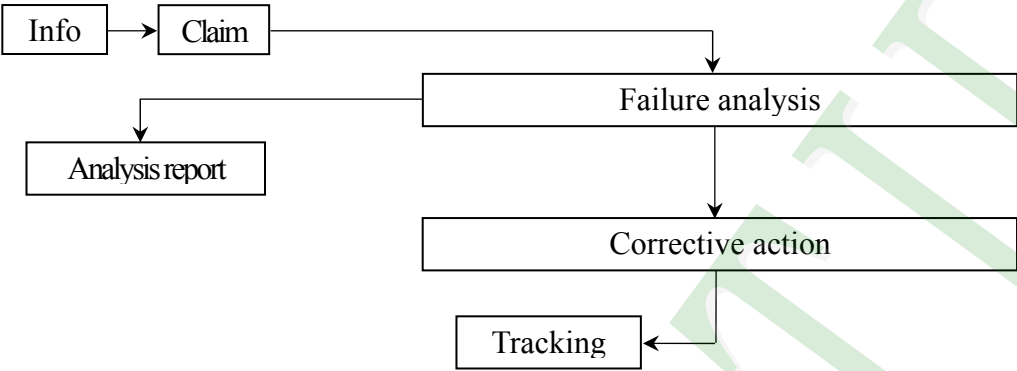


Symbol	Description	Min. Time
T0	Time from backlight power off to DISP="L"	1*Frame
T1	Time from DISP="L" to LCM Power off	5*Frame

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 --> 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.

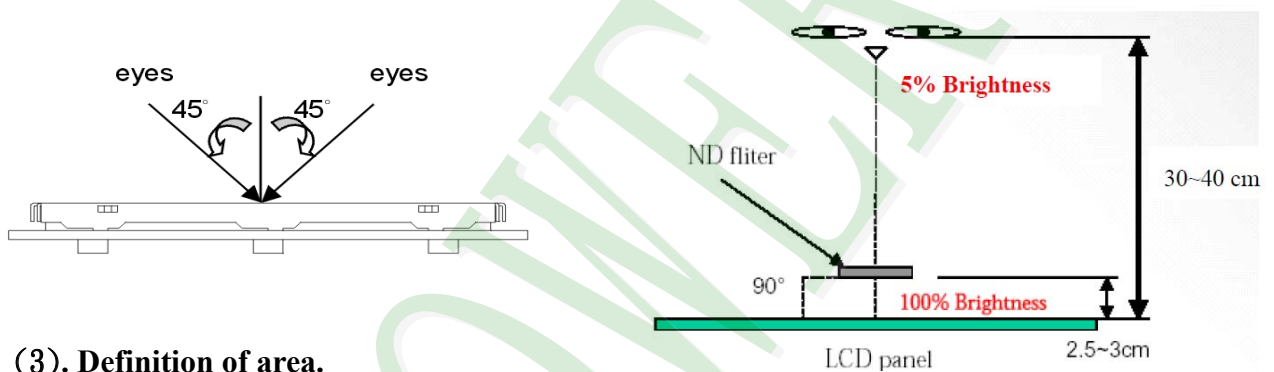
◆Standard of the product appearance test :

a. Manner of appearance test :

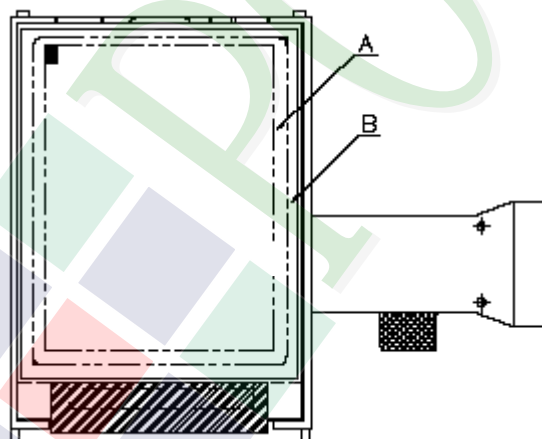
(1). The test best be under 20W×2 fluorescent light(about 300lux ~500lux)

， 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

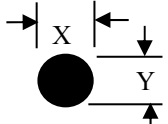
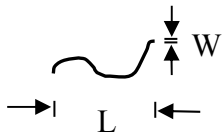
B area : Outside of viewing area

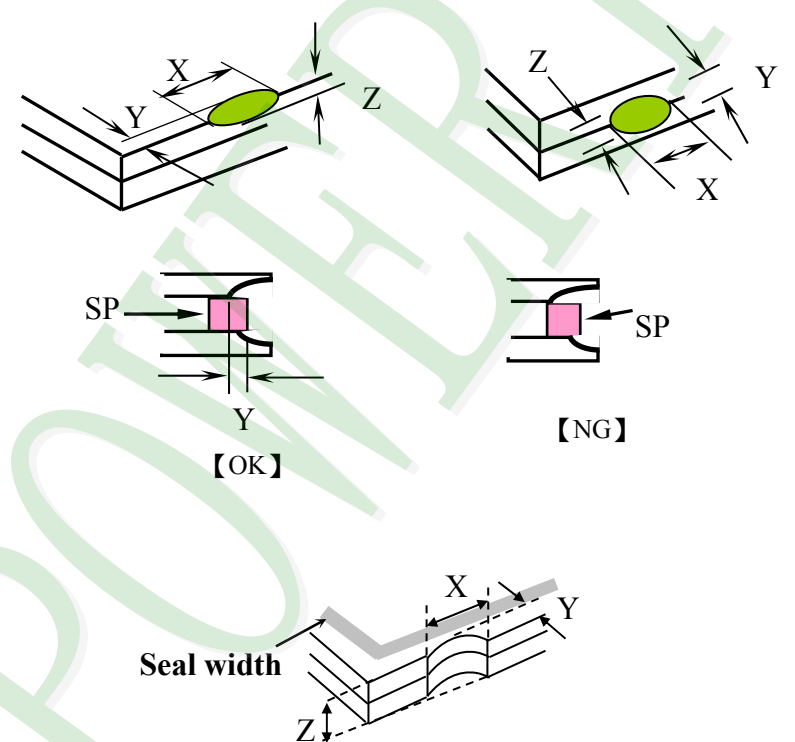
(4). Standard of inspection : (Unit : mm)

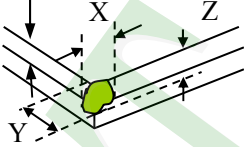
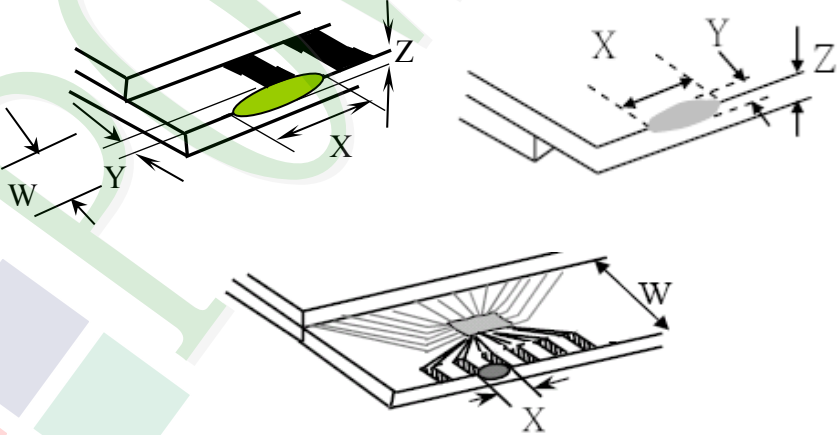
◆Specification For TFT-LCD Module 3.5" ~15" :

(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 can not be seen through 5% ND filter at 50% Gray screen , should be judged by the viewing angle of 90 degree.	Minor												
05	Dot defect (Bright dot 、 Dark dot) On -display	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Item</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="4" style="text-align: center; vertical-align: middle;">Dot Defect</td> <td>Bright Dot</td> <td style="text-align: center;">≤ 4</td> </tr> <tr> <td>Dark Dot</td> <td style="text-align: center;">≤ 5</td> </tr> <tr> <td>Joint Dot</td> <td style="text-align: center;">≤ 3</td> </tr> <tr> <td>Total</td> <td style="text-align: center;">≤ 7</td> </tr> </tbody> </table>		Item	Acceptance (Q'ty)	Dot Defect	Bright Dot	≤ 4	Dark Dot	≤ 5	Joint Dot	≤ 3	Total	≤ 7	Minor
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	Dark Dot	≤ 5													
	Joint Dot	≤ 3													
	Total	≤ 7													
<p>5. 1 Inspection pattern : full white , full black , Red , Green and blue screens.</p> <p>5. 2 It is defined as dot defect if defect area $> 1/2$ dot.</p> <p>5. 3 The distance between two dot defect ≥ 5 mm.</p> <p>5. 4 Bright dot that can not be seen through 5% ND filter.</p>															

NO	Item	Criterion	Level																																																													
06	<p>Black or white dot、scratch、contamination</p> <p>Round type</p>  <p>$\Phi = (x + y) / 2$</p> <p>Line type</p> 	<p>6.1 Round type (Non-display or display) :</p> <table border="1" data-bbox="512 432 1289 712"> <thead> <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> </thead> <tbody> <tr> <td>$\Phi \leq 0.25$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.50$</td> <td>5</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$\Phi > 0.50$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>5</td> </tr> </tbody> </table> <p>6.2 Line type(Non-display or display) :</p> <table border="1" data-bbox="432 831 1366 1368"> <thead> <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> </thead> <tbody> <tr> <td rowspan="4">3.5" to less 9"</td> <td>---</td> <td>$W \leq 0.03$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$L \leq 10.0$</td> <td>$0.03 < W \leq 0.05$</td> <td>4</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.05 < W \leq 0.10$</td> <td>2</td> </tr> <tr> <td>---</td> <td>$W > 0.10$</td> <td colspan="2">As round type</td> </tr> <tr> <td colspan="3">Total</td> <td colspan="2">5</td> </tr> <tr> <td rowspan="4">9" to 15"</td> <td>---</td> <td>$W \leq 0.05$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$L \leq 10.0$</td> <td>$0.05 < W \leq 0.10$</td> <td>5</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>---</td> <td>$W > 0.10$</td> <td colspan="2">As round type</td> </tr> <tr> <td colspan="3">Total</td> <td colspan="2">5</td> </tr> </tbody> </table>	Dimension (diameter : Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.25$	Ignore		$0.25 < \Phi \leq 0.50$	5	Ignore	$\Phi > 0.50$	0	Total	5	module size	Length (L)	Width (W)	Acceptance (Q'ty)		A area	B area	3.5" to less 9"	---	$W \leq 0.03$	Ignore		$L \leq 10.0$	$0.03 < W \leq 0.05$	4	Ignore	$L \leq 5.0$	$0.05 < W \leq 0.10$	2	---	$W > 0.10$	As round type		Total			5		9" to 15"	---	$W \leq 0.05$	Ignore		$L \leq 10.0$	$0.05 < W \leq 0.10$	5	Ignore	---	$W > 0.10$	As round type		Total			5		Minor
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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>8.1 General glass chip :</p> <p>8.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="539 1585 1353 1881"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <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> </tbody> </table>		X	Y	Z	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$
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<p>8.2 Protrusion over terminal :</p> <p>8.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="560 1711 1347 1883"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <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> </tbody> </table>		X	Y	Z	Front	$\leq a$	$\leq 1/2 W$	$\leq t$	Back	$\leq a$	$\leq W$	$\leq 1/2 t$	Minor
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Back	$\leq a$	$\leq W$	$\leq 1/2 t$										

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

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.

5.3 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.

