

PRODUCT SPECIFICATION

3.5" TFT LCD MODULE

MODEL: T035480640-A1WFN-001 Ver:1.3

ROHS

< ◇ > Preliminary Specification

< ◆ > Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2014.05.31		Initial Release	
1.1	2017.12.09	ZFY	Add weight Modify Backlight Characteristics Modify PIN36&PIN40	P4 P5 P10
1.2	2018.01.17	ZFY	Modify outline drawing (B)	P28
1.3	2018.04.21	ZDT	Add LED working life Modify many details	P5 P25-P26

Table of Contents

No.	Item	Page
1.	General Description.....	4
2.	Module Parameter.....	4
3.	Absolute Maximum Ratings.....	4
4.	DC Characteristics.....	5
5.	Backlight Characteristic.....	5
	5.1. Backlight Characteristics.....	5
	5.2. Backlighting circuit.....	5
6.	Optical Characteristics.....	6
	6.1. Transmissive mode.....	6
	6.2. Reflective mode (Not driving the back light condition).....	6
	6.3. Definition of Response Time.....	7
	6.4. Definition of Contrast Ratio.....	8
	6.5. Definition of Viewing Angles.....	8
	6.6. Definition of Color Appearance.....	8
	6.7. Definition of Surface Luminance, Uniformity and Transmittance.....	9
7.	Block Diagram and Power Supply.....	10
8.	Interface Pins Definition.....	11
9.	AC Characteristics.....	12
	9.1. Recommended Input Timing of SPI-3 Transmitter.....	12
	9.2. RGB Interface Timing.....	15
	9.3. Power On/Off sequence diagram.....	17
10.	Quality Assurance.....	18
	10.1 Purpose.....	18
	10.2 Standard for Quality Test.....	18
	10.3 Nonconforming Analysis & Disposition.....	18
	10.4 Agreement Items.....	18
	10.5 Standard of the Product Visual Inspection.....	18
	10.6 Inspection Specification.....	19
	10.7 Classification of Defects.....	23
	10.8 Identification/marketing criteria.....	23
	10.9 Packaging.....	23
11.	Reliability Specification.....	24
12.	Precautions and Warranty.....	25
	12.1 Safety.....	25
	12.2 Handling.....	25
	12.3 Storage.....	25
	12.4 Metal Pin (Apply to Products with Metal Pins).....	25
	12.5 Operation.....	26
	12.6 Static Electricity.....	26
	12.7 Limited Warranty.....	26
13.	Packaging.....	27
14.	Outline Drawing.....	28

1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	3.5"	
LCD type	A1FF TFT	
Display Mode	Transflective /Normally Black	
Resolution	480 RGB x 640	Pixels
View Direction	FULL VIEW	Best Image
Module Outline	64 (H) x85 (V) x 3.1 (T) (Note1)	mm
Active Area	53.568 (H) x 71.424 (V)	mm
Pixel Size	111.6 (H) x 111.6 (V)	um
Pixel Arrangement	Stripe	
Polarizer Surface Treatment	Anti-glare	
Display Colors	262K	
Interface	18-bit RGB interface+3 wire SPI	
Driver IC	HX8363-A	-
With or Without Touch Panel	Without	
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	34	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	4.6	V
Storage temperature	T _{STG}	-30	+80	°C
Operating temperature	T _{OP}	-20	+70	°C

Note 1: If Ta below 50°C, the maximal humidity is 90%RH, if Ta over 50°C, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	
Supply Voltage	VCC	2.5	2.8	3.3	V	
Logic Low input voltage	V _{IL}	0	-	0.3* VCC	V	
Logic High input voltage	V _{IH}	0.7*VCC	-	VCC	V	
Logic Low output voltage	V _{OL}	0	-	0.2* VCC	V	
Logic High output voltage	V _{OH}	0.8* VCC	-	VCC	V	
Current Consumption All White	Logic	I _{CC} + I _{IN}	-	(30)	-	mA
	Analog					

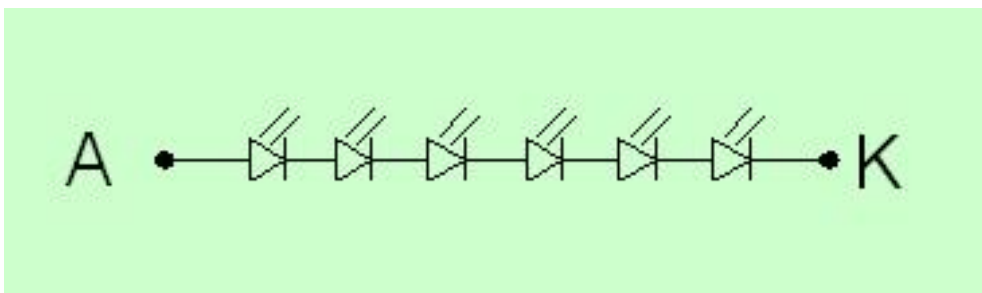
5. Backlight Characteristic

5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	T _a =25 °C, I _F =20mA/LED	16.8	19.2	20.4	V
Forward Current	I _F	T _a =25 °C, V _F =3.2V/LED	-	20	-	mA
Power dissipation	P _D		-	384	-	mW
Uniformity	Avg		-	80	-	%
LED working life(25°C)	-		-	30,000	-	Hrs
Drive method	Constant current					
LED Configuration	6 White LEDs in Serial					

Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.
The environmental conducted under ambient air flow, at T_a=25 ± 2 °C, 60%RH ± 5%, I_F=20mA

5.2. Backlighting circuit



6. Optical Characteristics

6.1. Transmissive mode

Ta=25°C, VCC=2.8V

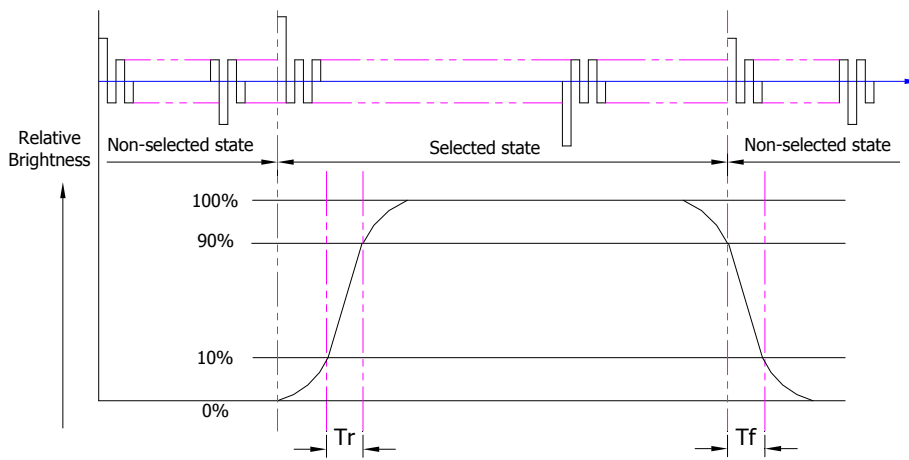
	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT($I_f=20\text{mA/LED}$)	Lv	Normally viewing angle	80	100	-	cd/m ²	
	Contrast ratio(See 7.3)	CR		(300)	(500)	-		
	Response time (See 7.2)	T _R	$\theta_x = \phi_y = 0^\circ$	-	30	50	ms	
		T _F						
	Chromaticity Transmissive (See 7.5)	Red	X _R	Center CR≥10	0.460	0.510	0.560	-
			Y _R		0.282	0.332	0.382	
		Green	X _G		0.251	0.301	0.351	
			Y _G		0.505	0.555	0.605	
		Blue	X _B		0.103	0.153	0.203	
			Y _B		0.047	0.097	0.147	
	White	X _W	0.223	0.273	0.323			
		Y _W	0.269	0.319	0.369			
	Viewing Angle (See 7.4)	Horizontal	θ_{x+}	Center CR≥10	60	80	-	Deg.
			θ_{x-}		60	80	-	
Vertical		ϕ_{y+}	60		80	-		
		ϕ_{y-}	60		80	-		
NTSC Ratio(Gamut)				-	55	-	%	

6.2. Reflective mode (Not driving the back light condition)

Item	Symbol	Specifications			Unit	Note
		Min.	Typ.	Max.		
Reflection Ratio (With Polarizer)	R ($\theta = \phi = 0^\circ$)	-	7	-	%	Here the data are design value.
Reflective Contrast Ratio	Cr ($\theta = 0^\circ$)	-	5	-		Note1
Viewing angle (Cr≥2)*	θ_{21}	-	45	-	deg	
	θ_{22}	-	45	-		
	θ_{12}	-	45	-		
	θ_{11}	-	45	-		

6.3. Definition of Response Time

6.3.1. Normally Black Type (Negative)

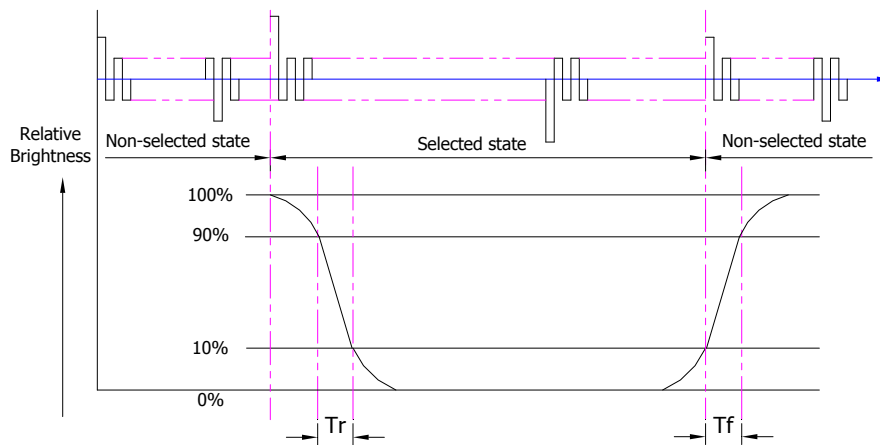


T_r is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

T_f is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

6.3.2. Normally White Type (Positive)



T_r is the time it takes to change from non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

T_f is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

6.4. Definition of Contrast Ratio

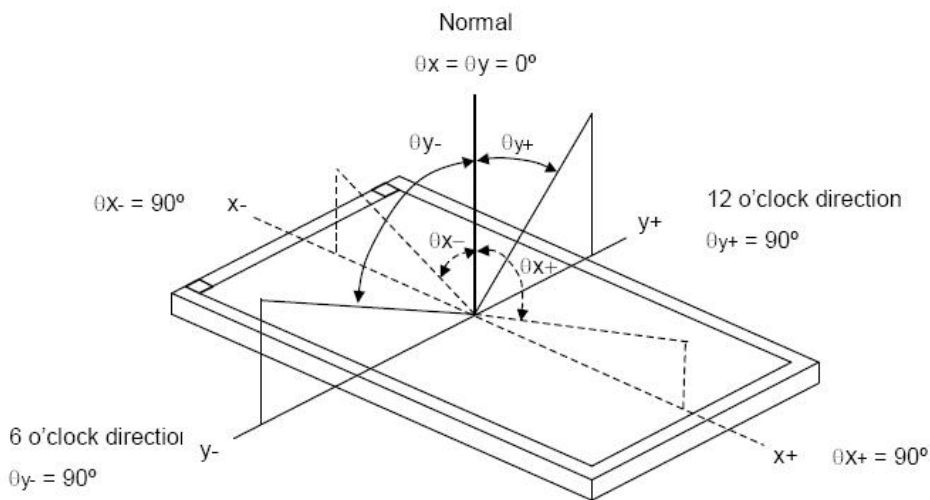
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

6.5. Definition of Viewing Angles



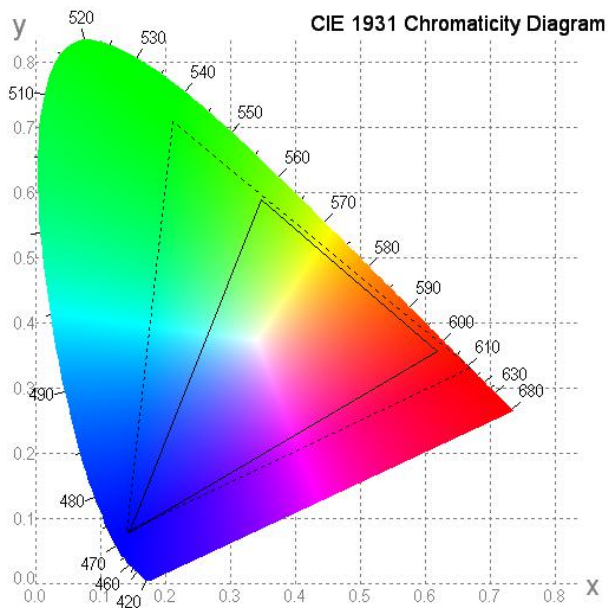
Measuring machine: LCD-5100 or EQUI

6.6. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



6.7. Definition of Surface Luminance, Uniformity and Transmittance

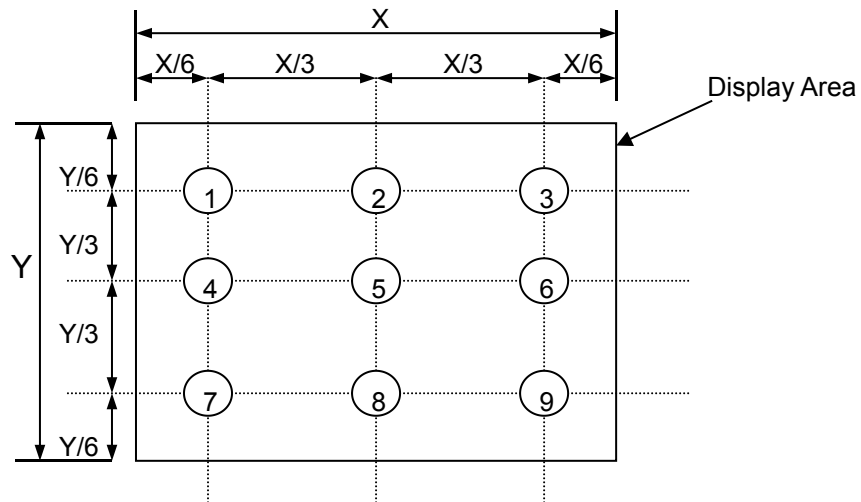
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.7.1. Surface Luminance: $L_V = \text{average} (L_{P1}:L_{P9})$

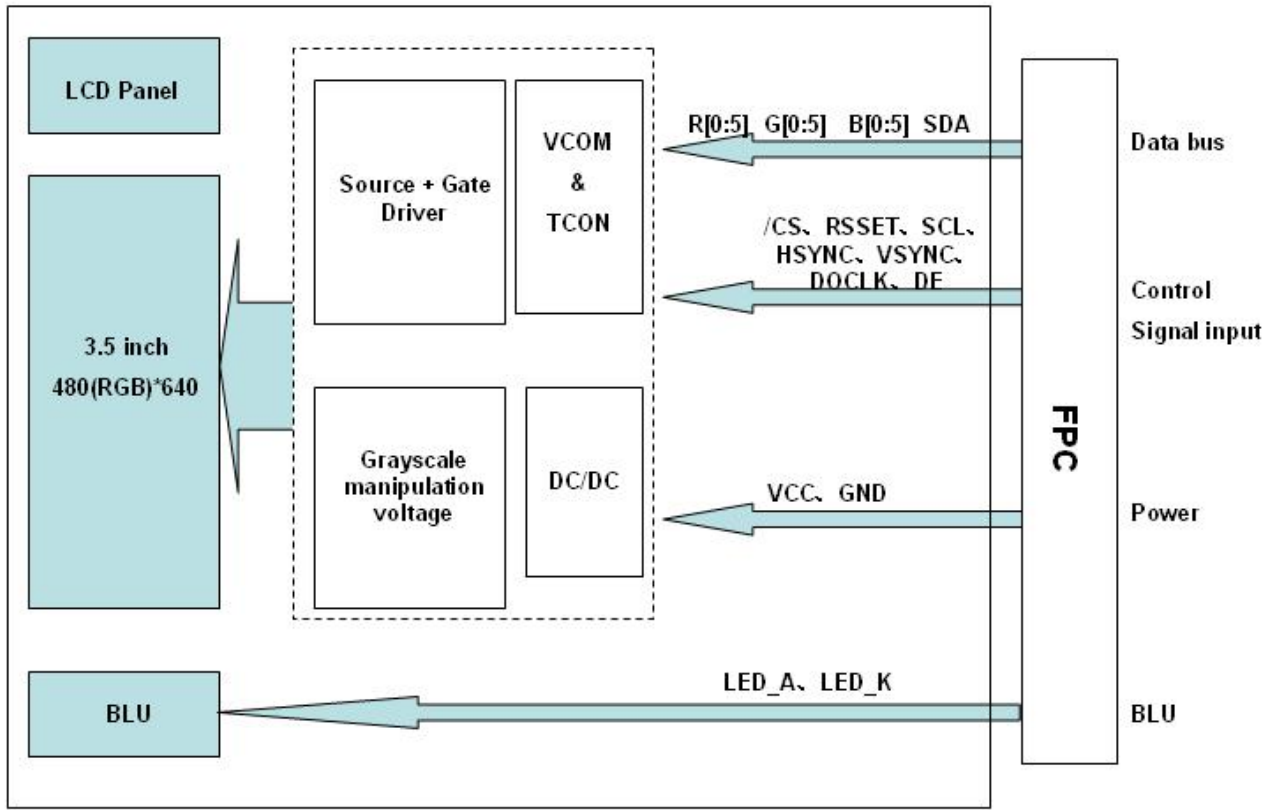
6.7.2. Uniformity = $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$

6.7.3. Transmittance = $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$

Note: Measuring machine: BM-7



7. Block Diagram and Power Supply



8. Interface Pins Definition

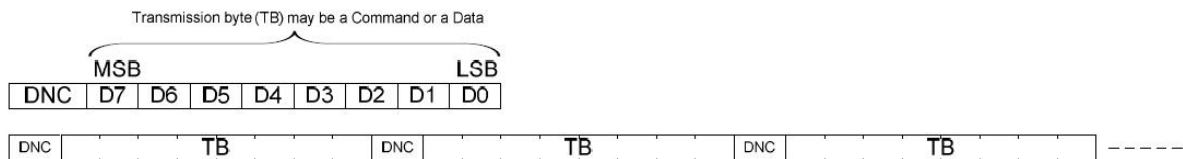
No.	Symbol	Function	Remark
1	DE	Display enable pin from controller	
2	GND	Ground	
3	GND-	Ground	
4	GND	Ground	
5	NC	Not connected	
6	R0	Red data(LSB)	
7	R1	Red data	
8	R2	Red data	
9	R3	Red data	
10	R4	Red data	
11	R5	Red data(MSB)	
12	G0	Green data(LSB)	
13	G1	Green data	
14	G2	Green data	
15	G3	Green data	
16	G4	Green data	
17	G5	Green data(MSB)	
18	B0	Blue data(LSB)	
19	B1	Blue data	
20	B2	Blue data	
21	B3	Blue data	
22	B4	Blue data	
23	B5	Blue data(MSB)	
24	SCL	Clock input pin in serial mode	
25	SDA	Data pin in serial mode	
26	/CS	Chip select signal.	
27	DOTCLK	Dot clock signal	
28	/RESET	Reset pin	
29	HSYNC	Line synchronization signal	
30	VSYNC	Frame synchronization signal	
31	VCC	Power supply	
32	VCC	Power supply	
33	GND	Ground	
34	LED_A	Power supply for backlight anode input terminals.	
35	LED_K	Power supply for backlight cathode input terminals	
36	GND	Ground	
37	NC	Not connected	
38	NC	Not connected	
39	NC	Not connected	
40	NC	Not connected	

9. AC Characteristics

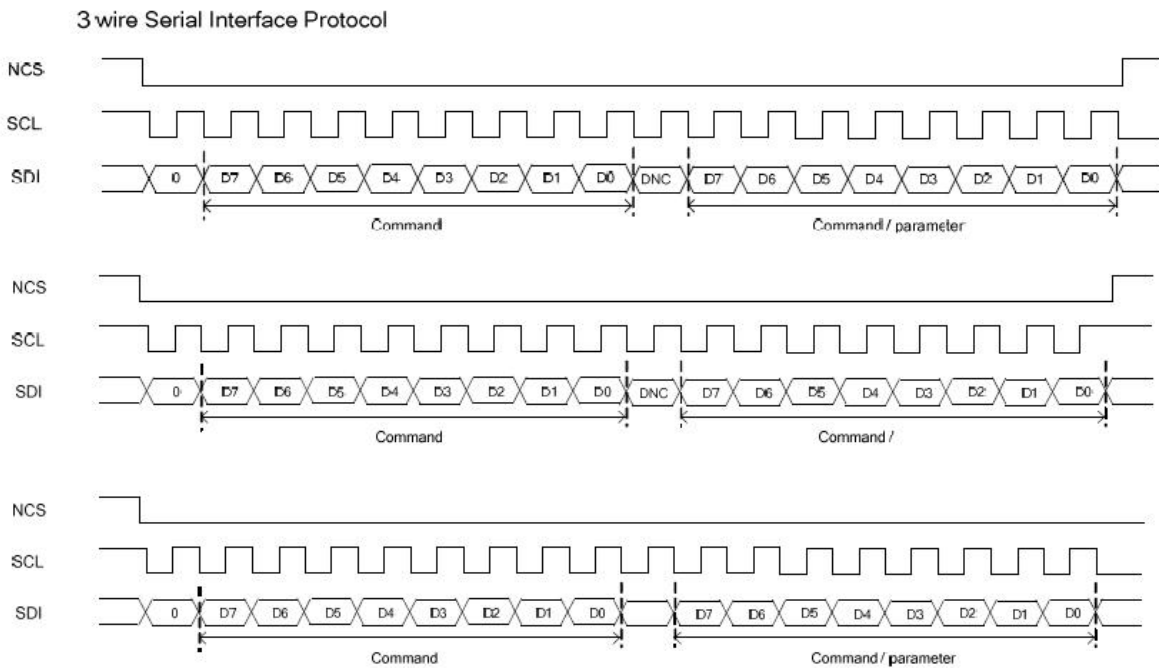
9.1. Recommended Input Timing of SPI-3 Transmitter

The 3-Pin serial data packet contains a control bit DNC and a transmission byte. If DNC is low, the transmission byte is command byte. If DNC is high, the transmission byte is stored to command register. The MSB is transmitted first. The serial interface is initialized when NCS is high. In this state, SCL clock pulse or SDI/SDO data have no effect. A falling edge on NCS enables the serial interface and indicates the start of data transmission.

3 wire Serial Data Stream Format



Serial Data stream, write mode

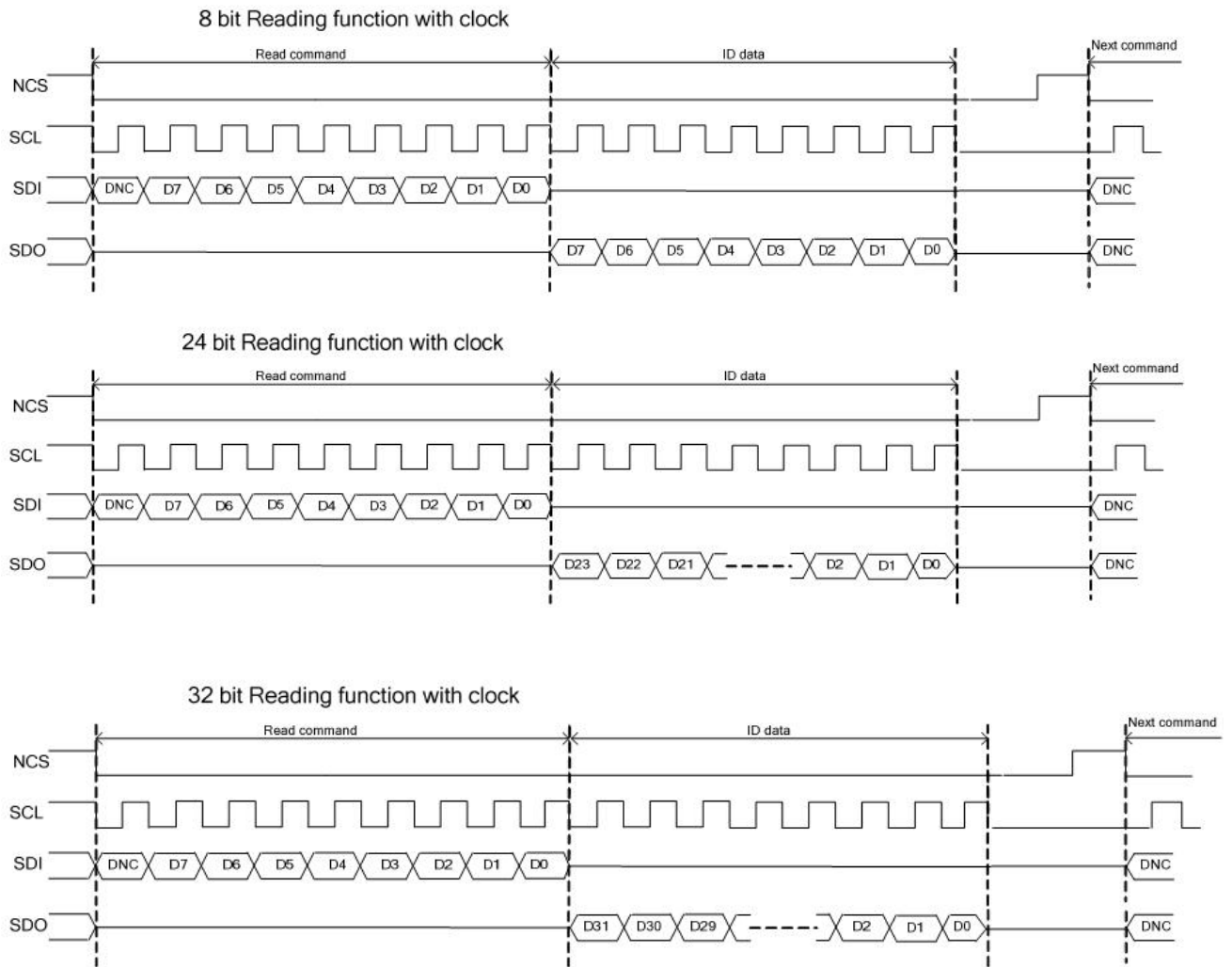


Serial Interface Protocol 3 wire serial interface (write mode)

Serial Data Read Mode

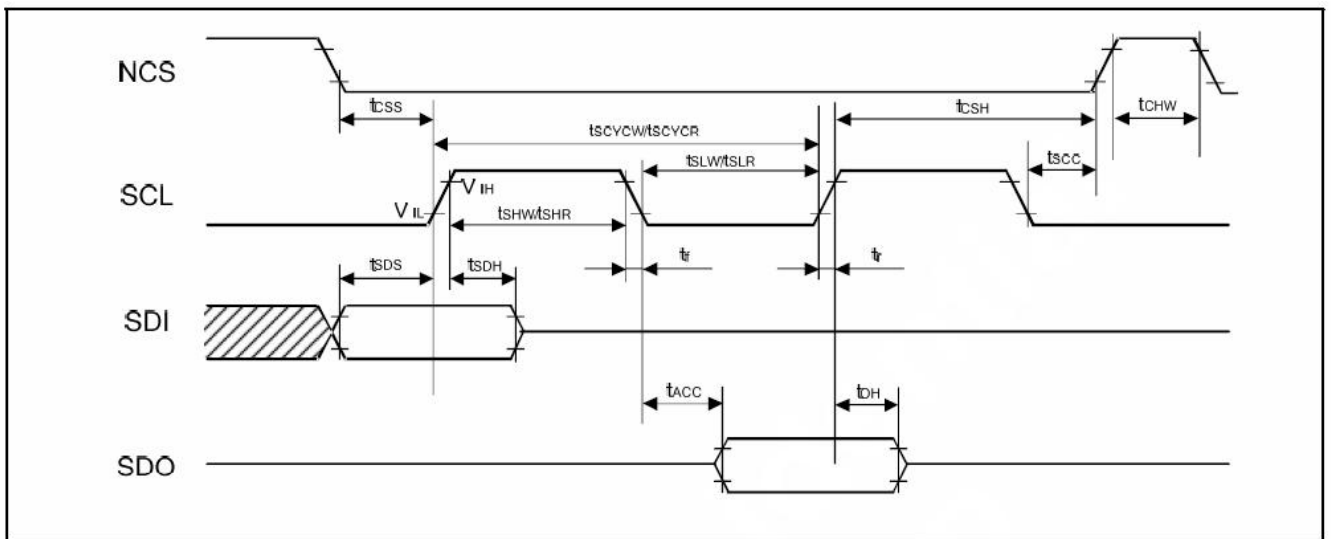
The micro controller firstly has to send a command and then the following byte is transmitted in the opposite direction. The read mode has three types of command data transmitted (8-/24- /32-bit) according command code.

3 wire Serial Interface Protocol



3 wire Serial Interface protocol, read mode

Serial Interface Characteristics (3-Pin Serial)



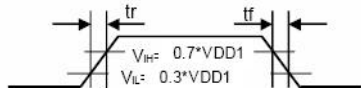
(VSSA=VSSD=0V, VDD1=1.95V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Serial clock cycle (Write)	t _{SCYCW}		80	-	-	
SCL "H" pulse width (Write)	t _{SHW}	SCL	30	-	-	ns
SCL "L" pulse width (Write)	t _{SLW}		30	-	-	
Data setup time (Write)	t _{SDS}	SDI	10	-	-	ns
Data hold time (Write)	t _{SDH}		10	-	-	
Serial clock cycle (Read)	t _{SCYCR}		150	-	-	
SCL "H" pulse width (Read)	t _{SHR}	SCL	60	-	-	ns
SCL "L" pulse width (Read)	t _{SLR}		60	-	-	
Access rime	t _{ACC}	SDO For maximum C _L =30pF For maximum C _L =8pF	5	-	60	ns
Output disable time	t _{OH}	SDO For maximum C _L =30pF For maximum C _L =8pF	8	-	100	ns
SCL to Chip select	t _{SCC}	NCS	30	-	-	ns
NCS "H" pulse width	t _{CHW}	NCS	60	-	-	ns
NCS-SCL time (write)	t _{CSS}	NCS	30	-	-	ns
NCS-SCL time (write)	t _{CSH}		30	-	-	
NCS-SCL time (Read)	t _{CSS}	NCS	60	-	-	ns
NCS-SCL time (Read)	t _{CSH}		65	-	-	

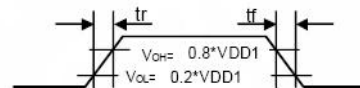
Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of VDD1 for Input signals.

Input Signal Slope

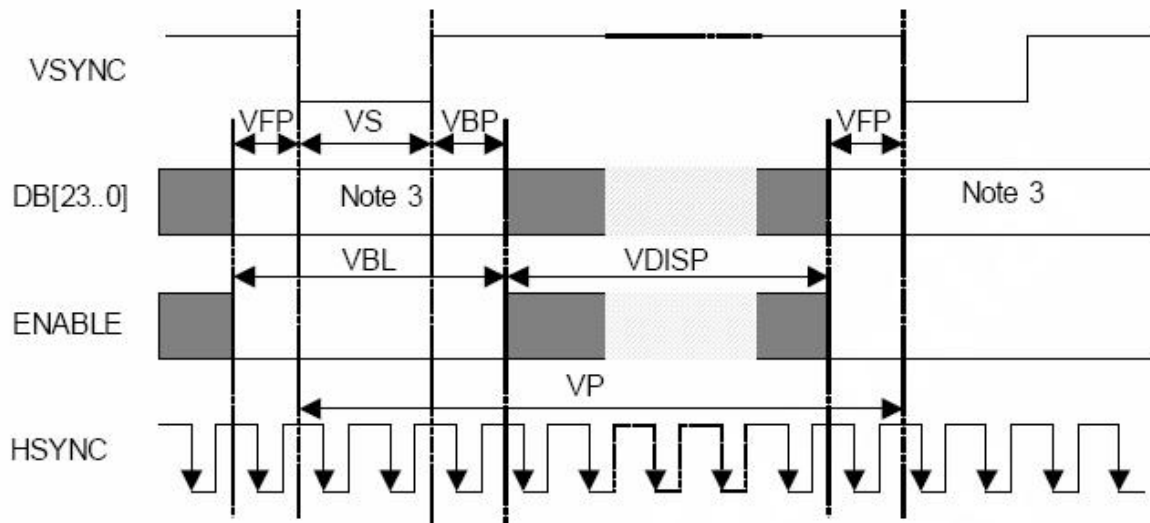


Output Signal Slope



9.2. RGB Interface Timing

Vertical Timings for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	-	649	-	Line
Vertical low pulse width	VS	-	-	3	-	Line
Vertical front porch	VFP	-	-	3	-	Line
Vertical back porch	VBP	-	-	3	-	Line
Vertical data start point	-	VS+HBP	-	6	-	Line
Vertical blanking period	VBL	VS+VBP+VFP	-	9	-	Line
Vertical active area	-	VDISP	-	640	-	Line
Vertical Refresh rate	VRR	-	50	-	70	HZ

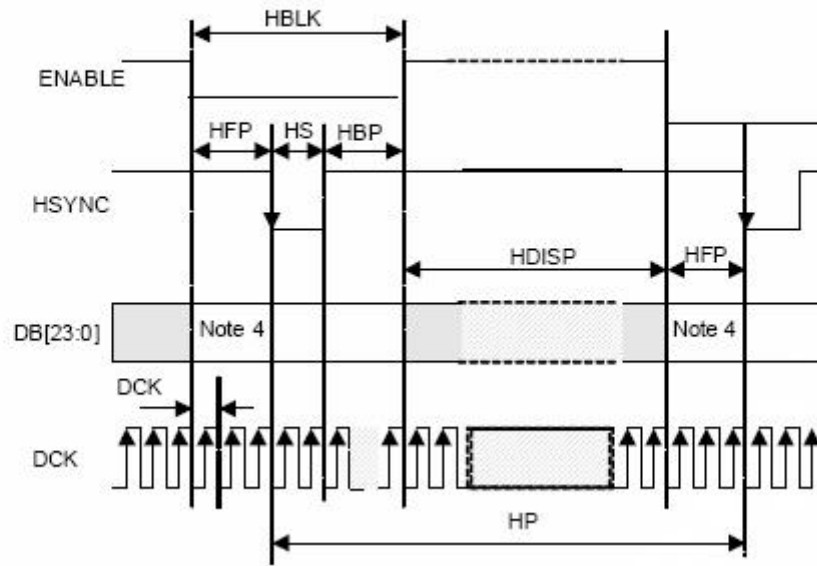
Note: (1) Signal rise and fall times are equal to or less than 20ns.

(2) Input signals are measured by $0.30 \cdot VDD1$ for low state and $0.7 \cdot VDD1$ for high state.

(3) Data lines can be set to "High" to "Low" during blanking time-Don't care.

(4) VRR must keep from 50 Hz to 70Hz when adjust other items.

Horizontal Timings for RGB I/F

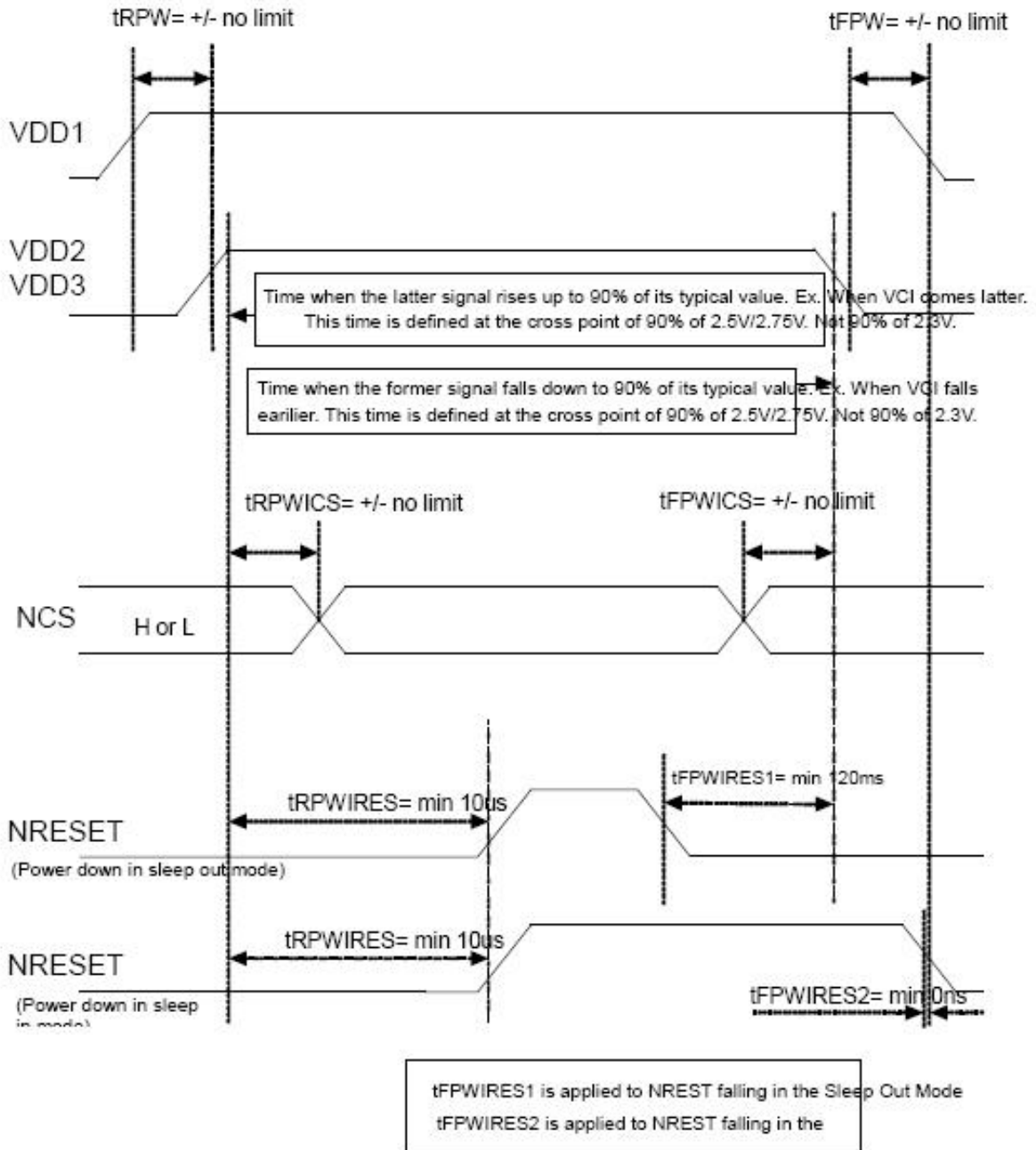


Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note ⁽³⁾	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR=Min. 50Hz	21.6	-	34.3	MHZ
		-Max. 70Hz	29.1	-	46.2	ns

- Note:** (1) Signal rise and fall times are equal to or less than 20ns.
(2) Input signals are measured by 0.30*VDD1 for low state and 0.7*VDD1 for high state.
(3) HP is multiples of eight DCK.
(3) Data lines can be set to "High" to "Low" during blanking time-Don't care.
(4) VRR must keep from 50 Hz to 70Hz when adjust other items.

9.3. Power On/Off sequence diagram

If NRESET line is held low (and stable) by the host during power on, then the NRESET must be held low for minimum 10µsec after both VDD1, VDD2 and VDD3 have been applied.



Power Off Sequence

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for the display module or the display module will not cause any damages for the host or lines of the interface. At an uncontrolled power off the display will go blank and there will not be any visible effects within 1 second on the display (blank display) and remains blank until "Power On Sequence" powers it up.

10. Quality Assurance

10.1 Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

10.2 Standard for Quality Test

10.2.1 Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

10.2.2 Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

10.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

10.3 Nonconforming Analysis & Disposition

10.3.1 Nonconforming analysis:

10.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.

10.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

10.3.1.3 If cannot finish the analysis on time, customer will be notified with the progress status.

10.3.2 Disposition of nonconforming:

10.3.2.1 Non-conforming product over PPM level will be replaced.

10.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

10.4 Agreement Items

Shall negotiate with customer if the following situation occurs:

10.4.1 There is any discrepancy in standard of quality assurance.

10.4.2 Additional requirement to be added in product specification.

10.4.3 Any other special problem.

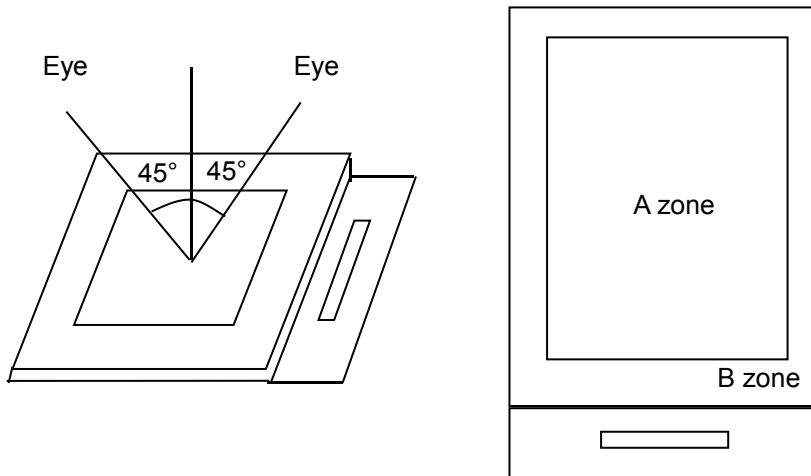
10.5 Standard of the Product Visual Inspection

10.5.1 Appearance inspection:

10.5.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

10.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

10.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,

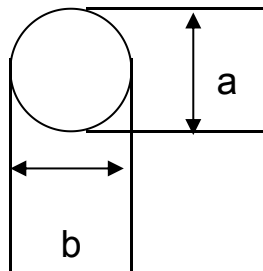


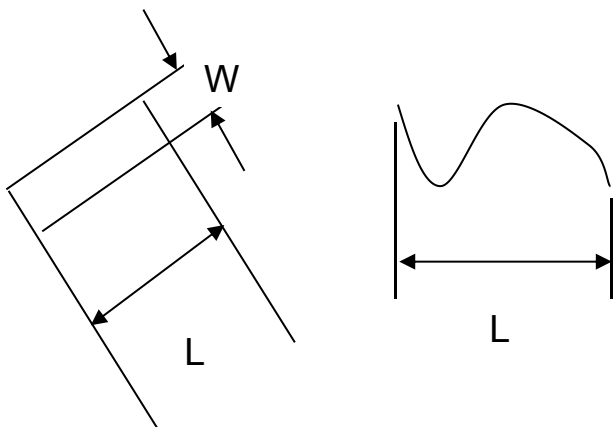
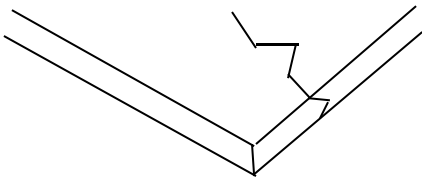
10.5.2 Basic principle:

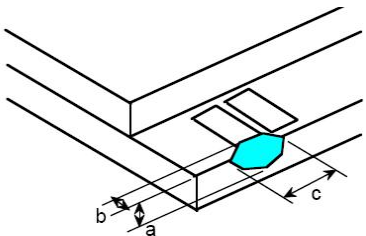
10.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

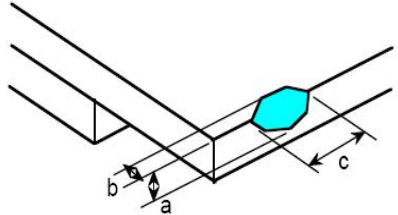
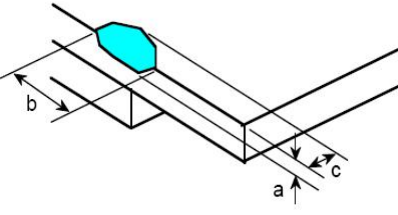
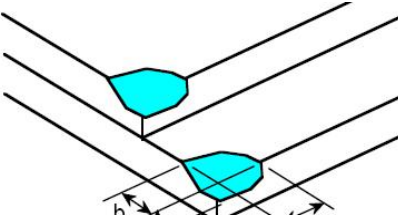
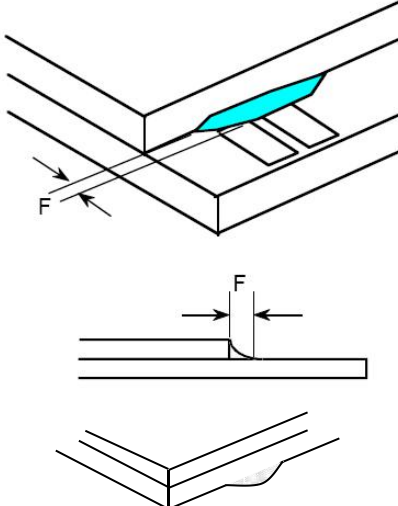
10.5.2.2 New item must be added on time when it is necessary.

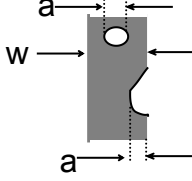
10.6 Inspection Specification

No.	Item	Criteria (Unit: mm)																			
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\phi = (a + b) / 2$	<table border="1"> <thead> <tr> <th>Size \ Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.10$</td> <td>Ignore</td> </tr> <tr> <td>$0.10 < \phi \leq 0.15$</td> <td>2</td> </tr> <tr> <td>$0.15 < \phi \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \phi$</td> <td>0</td> </tr> <tr> <td>Total</td> <td>2 no include $\phi \leq 0.10$</td> </tr> </tbody> </table>	Size \ Area	Acc. Qty	$\phi \leq 0.10$	Ignore	$0.10 < \phi \leq 0.15$	2	$0.15 < \phi \leq 0.25$	1	$0.25 < \phi$	0	Total	2 no include $\phi \leq 0.10$						
Size \ Area	Acc. Qty																				
$\phi \leq 0.10$	Ignore																				
$0.10 < \phi \leq 0.15$	2																				
$0.15 < \phi \leq 0.25$	1																				
$0.25 < \phi$	0																				
Total	2 no include $\phi \leq 0.10$																				
		Distance between 2 defects should more than 3mm apart.																			
02	Electrical Defect (Minor defect)	<table border="1"> <thead> <tr> <th></th> <th>Display Area</th> <th>Total</th> <th></th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>0</td> <td>0</td> <td rowspan="3">Note1</td> </tr> <tr> <td>Dark dot</td> <td>N ≤ 2</td> <td>N ≤ 2</td> </tr> <tr> <td>Total dot</td> <td>N ≤ 2</td> <td>N ≤ 2</td> </tr> <tr> <td>Mura</td> <td colspan="2">Not visible through 5% ND filters.</td> <td>Note 2</td> </tr> </tbody> </table>		Display Area	Total		Bright dot	0	0	Note1	Dark dot	N ≤ 2	N ≤ 2	Total dot	N ≤ 2	N ≤ 2	Mura	Not visible through 5% ND filters.		Note 2	Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.
	Display Area	Total																			
Bright dot	0	0	Note1																		
Dark dot	N ≤ 2	N ≤ 2																			
Total dot	N ≤ 2	N ≤ 2																			
Mura	Not visible through 5% ND filters.		Note 2																		

03	<p>Black and White line Scratch Foreign material (Line type) (Minor defect)</p>	 <table border="1" data-bbox="614 750 1236 1052"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.05 < W \leq 0.10$</td> <td>2</td> </tr> <tr> <td>/</td> <td>$0.1 < W$</td> <td>0</td> </tr> <tr> <td colspan="2">Total</td> <td>3</td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
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/	$0.1 < W$	0																		
Total		3																		
04	<p>Glass Crack (Minor defect)</p>	 <p>Crack is potential to enlarge, any type is not allowed.</p>																		

05	<p>Glass Chipping Pad Area: (Minor defect)</p> 	<table border="1" data-bbox="869 1724 1340 1892"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>3</td> </tr> <tr> <td colspan="2">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty									
$c > 3.0, b < 1.0$	1									
$c < 3.0, b < 1.0$	3									
$a < \text{Glass Thickness}$										

06	<p>Glass Chipping Rear of Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
07	<p>Glass Chipping Except Pad Area: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>2</td> </tr> <tr> <td>$c < 3.0, b < 0.5$</td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
08	<p>Glass Corner Chipping: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$c < 3.0, b < 3.0$</td> <td>Ignore</td> </tr> <tr> <td colspan="2" style="text-align: center;">$a < \text{Glass Thickness}$</td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												
09	<p>Glass Burr: (Minor defect)</p> 	<table border="1"> <thead> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$F < 1.0$</td> <td>Ignore</td> </tr> </tbody> </table> <p>Glass burr don't affect assemble and module dimension.</p>	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

10	<p>FPC Defect: (Minor defect)</p> 	<p>10.1 Dent, pinhole width $a < w/3$. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.</p>										
11	Bubble on Polarizer (Minor defect)	<table border="1" data-bbox="743 577 1214 790"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi \leq 0.50$</td> <td>1</td> </tr> <tr> <td>$0.50 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
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12	Dent on Polarizer (Minor defect)	<table border="1" data-bbox="743 851 1214 1064"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.20$</td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \varphi \leq 0.30$</td> <td>4</td> </tr> <tr> <td>$0.30 < \varphi \leq 0.50$</td> <td>1</td> </tr> <tr> <td>$0.50 < \varphi$</td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
13	Bezel	<p>13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.</p>										
14	Touch Panel	<p>D: Diameter W: width L: length 14.1 Spot: $D < 0.25$ is acceptable $0.25 \leq D \leq 0.4$ 2dots are acceptable and the distance between defects should more than 10 mm. $D > 0.4$ is unacceptable 14.2 Dent: $D > 0.40$ is unacceptable 14.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$ is acceptable Distance between 2 defects should more than 10 mm. $W > 0.10$ is unacceptable.</p>										
15	PCB	<p>15.1 No distortion or contamination on PCB terminals. 15.2 All components on PCB must same as documented on the BOM/component layout. 15.3 Follow IPC-A-600F.</p>										
16	Soldering	Follow IPC-A-610C standard										

17	Electrical Defect (Major defect)	<p>The below defects must be rejected.</p> <p>17.1 Missing vertical / horizontal segment, 17.2 Abnormal Display. 17.3 No function or no display. 17.4 Current exceeds product specifications. 17.5 LCD viewing angle defect. 17.6 No Backlight. 17.7 Dark Backlight. 17.8 Touch Panel no function.</p>
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Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

10.7 Classification of Defects

10.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

10.7.2 Two minor defects are equal to one major in lot sampling inspection.

10.8 Identification/marketing criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

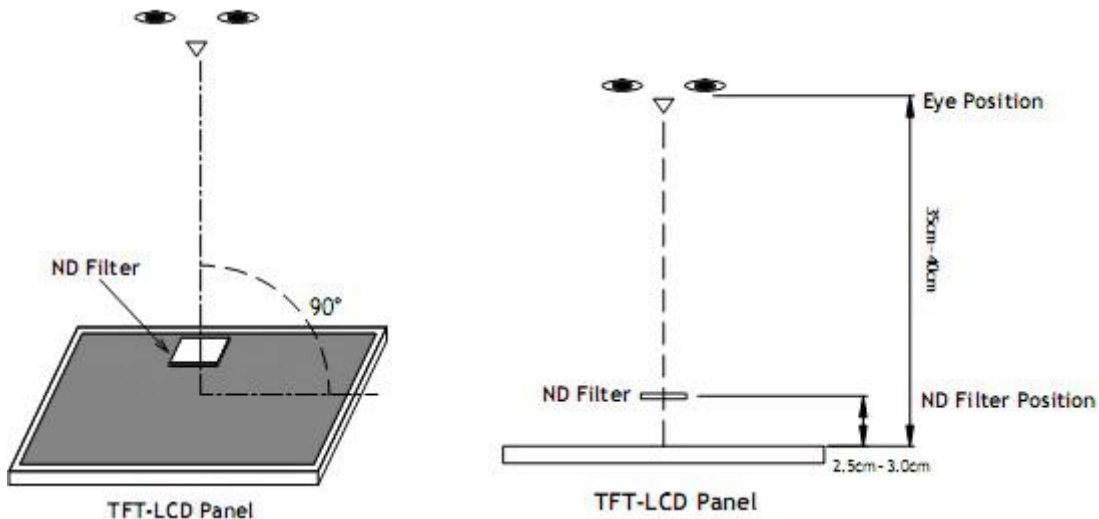
10.9 Packaging

10.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

10.9.2 Modules inside package box should have compliant mark.

10.9.3 All direct package materials shall offer ESD protection.

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm ± 50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm ± 50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area

11. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	70°C, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20°C, 96Hrs	2	GB/T2423.1-2008
3	High Humidity	50°C, 90%RH, 96Hrs	2	GB/T2423.3-2006
4	High Temperature Storage	80°C, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30°C, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test	-20°C, 60min~70°C, 60min, 20 cycles.	2	GB/T2423.22-2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X,Y,Z 30 min for each direction.	2	GB/T5170.14-2009
8	Electrical Static Discharge	Air: ±4KV 150pF/330 Ω 5 times Contact: ±2KV 150pF/330 Ω 5 times	2	GB/T17626.2-2006
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8-1995

Note1. No deflection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

12. Precautions and Warranty

12.1 Safety

12.1.1 The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

12.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

12.2 Handling

12.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

12.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

12.3 Storage

12.3.1 Do not store the LCD module beyond the specified temperature ranges.

12.3.2 Strong light exposure causes degradation of polarizer and color filter.

12.4 Metal Pin (Apply to Products with Metal Pins)

12.4.1 Pins of LCD and Backlight

12.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

12.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

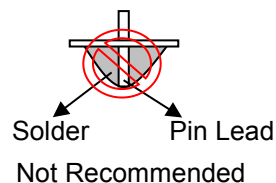
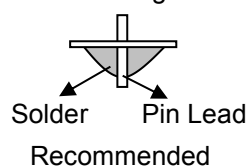
Maximum Solder Temperature: 370 °C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20 °C

Typical Soldering Time: ≤3s

12.4.1.3 Solder Wetting



12.4.2 Pins of EL

12.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

12.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

12.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290 °C

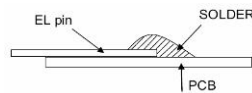
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

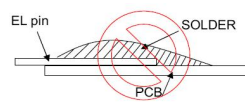
12.4.2.4 No horizontal press on the EL leads during soldering.

12.4.2.5 180° bend EL leads three times is not allowed.

12.4.2.6 Solder Wetting

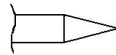


Recommended

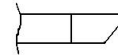


Not Recommended

12.4.2.7 The type of the solder iron:

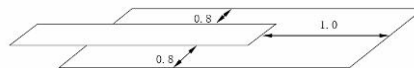


Recommended



Not Recommended

12.4.2.8 Solder Pad



12.5 Operation

12.5.1 Do not drive LCD with DC voltage

12.5.2 Response time will increase below lower temperature

12.5.3 Display may change color with different temperature

12.5.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

12.5.5 Do not connect or disconnect the LCM to or from the system when power is on.

12.5.6 Never use the LCM under abnormal condition of high temperature and high humidity.

12.5.7 Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

12.5.8 Do not display the fixed pattern for long time (we suggest the time not longer than one hour) because it may develop image sticking due to the TFT structure.

12.6 Static Electricity

12.6.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

12.6.2 The normal static prevention measures should be observed for work clothes and benches.

12.6.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

12.7 Limited Warranty

12.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

12.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

12.7.3 After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

13. Packaging

TBD

14. Outline Drawing

