

PRODUCT SPECIFICATION

1.77” TN TFT LCD MODULE
MODEL: YDP LCD TN 6 177 M



- < ◇ > Preliminary Specification
- < ◆ > Finally Specification

CUSTOMER’S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED	PM	PD	PREPARED
BY	REVIEWED	REVIEWED	BY
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Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2013.11.08		Initial Release	
1.1	2014.08.13		Modify Viewing Angle Modify Inspection Specification Modify Reliability Specification	P6 P23,P25 P27
1.2	2014.08.18		Modify the IC	P4
1.3	2014.11.06	HXM	Add Weight Add Current Modify Chromaticity Transmissive	P4 P5 P6
1.4	2015.06.06	TQ	Modify Standard for Quality Test	P21
1.5	2018.03.31	ZDT	Modify Backlight Characteristic Add LED working life Modify many details	P5 P5 P28-P29
1.6	2023.07.24	LQ	Modify Driver IC Modify AC Characteristics Modify Outline Drawing(B)	P4 P11-13 P24

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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)	1.77"	
LCD type	TN TFT	
Display Mode	Transmissive /Normally white	
Resolution	128 RGB x 160	Pixels
View Direction	6 O'clock	Best Image
Gray Scale Inversion Direction	12 O'clock	
Module Outline	34.7(H) x 46.75 (V) x 2.25 (T) (Note1)	mm
Active Area	28.03 (H) x 35.04 (V)	mm
Pixel Size	219 (H) x 219 (V)	um
Pixel Arrangement	Stripe	
Polarizer Surface Treatment	Anti-glare	
Display Colors	262K	
Interface	MCU 8bit	
With or without touch panel	Without	
Driver IC	ST7735V3	-
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	5	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	Logic	IOVCC	-0.3	4.6	V
	Analog	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	Logic	IOVCC	1.65	2.8	3.3	V
	Analog	VCC	2.5	2.8	3.3	V
Logic Low input voltage		V_{IL}	GND	-	$0.3 \cdot IOVCC$	V
Logic High input voltage		V_{IH}	$0.7 \cdot IOVCC$	-	$IOVCC$	V
Logic Low output voltage		V_{OL}	GND	-	$0.2 \cdot IOVCC$	V
Logic High output voltage		V_{OH}	$0.8 \cdot IOVCC$	-	$IOVCC$	V
Current Consumption All Black	Logic	$I_{CC} + I_{IN}$	-	TBD	-	mA
	Analog					

5. Backlight Characteristic

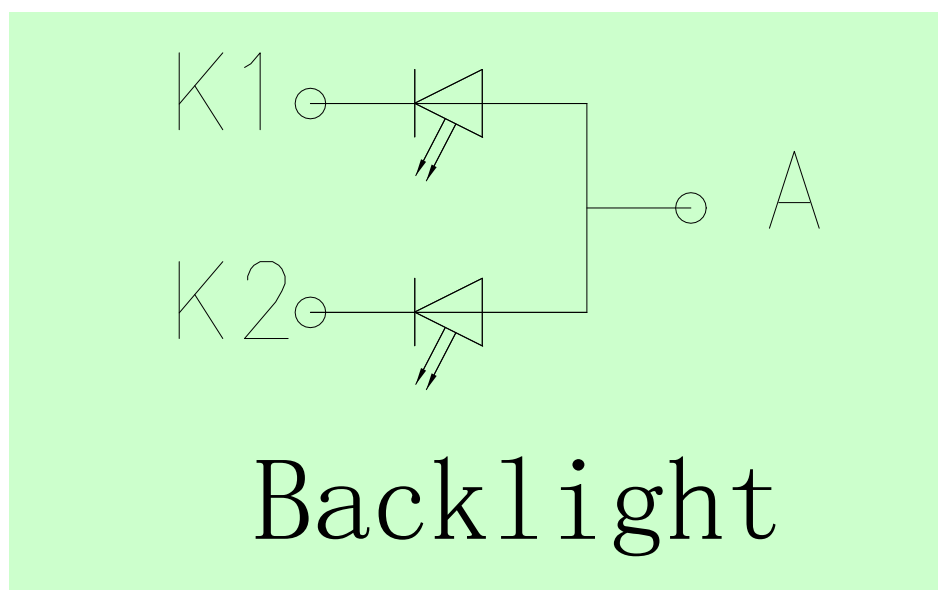
5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$T_a = 25^\circ\text{C}$, $I_F = 15\text{mA/LED}$	2.8	3.2	3.4	V
Forward Current	I_F	$T_a = 25^\circ\text{C}$, $V_F = 3.2\text{V/LED}$	-	30	40	mA
Power dissipation	P_D		-	96	136	mW
Uniformity	Avg		80	-	-	%
LED working life(25°C)	-		-	30,000	-	Hrs
Drive method	Constant current					
LED Configuration	2 White LEDs in parallel					

Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at $T_a = 25 \pm 2^\circ\text{C}$, $60\%RH \pm 5\%$, $I_F = 20\text{mA}$

5.2. Backlight Characteristic



6. Optical Characteristics

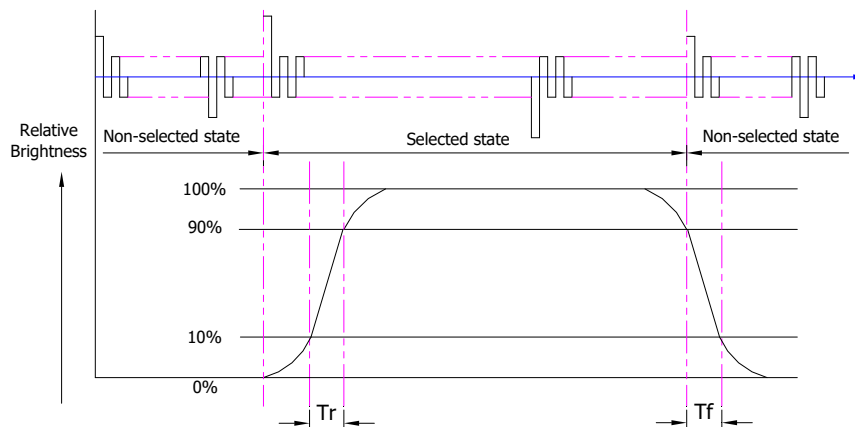
6.1. Optical Characteristics

Ta=25°C, VCC=2.8V

Backlight On (Transmissive Mode)	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
	Luminance on TFT(I_f =15mA/LED)		Lv	Normally viewing angle $\theta_X = \varphi_Y = 0^\circ$	290	350	-	cd/m ²
	Contrast ratio(See 6.3)		CR		400	500	-	
	Response time (See 6.2)		T _R +T _F		-	8	16	ms
	Chromaticity Transmissive (See 6.5)	Red	X _R		0.560	0.610	0.660	
			Y _R		0.306	0.356	0.406	
		Green	X _G		0.244	0.294	0.344	
			Y _G		0.565	0.615	0.665	
		Blue	X _B		0.095	0.145	0.195	
			Y _B		0.032	0.082	0.132	
		White	X _W		0.232	0.282	0.332	
			Y _W		0.272	0.322	0.372	
	Viewing Angle (See 6.4)	Horizontal	θ _X +	Center CR≥10	50	60	-	Deg.
			θ _X -		50	60	-	
Vertical		φ _Y +	50		60	-		
		φ _Y -	30		40	-		
NTSC Ratio(Gamut)				-	60	-	%	

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

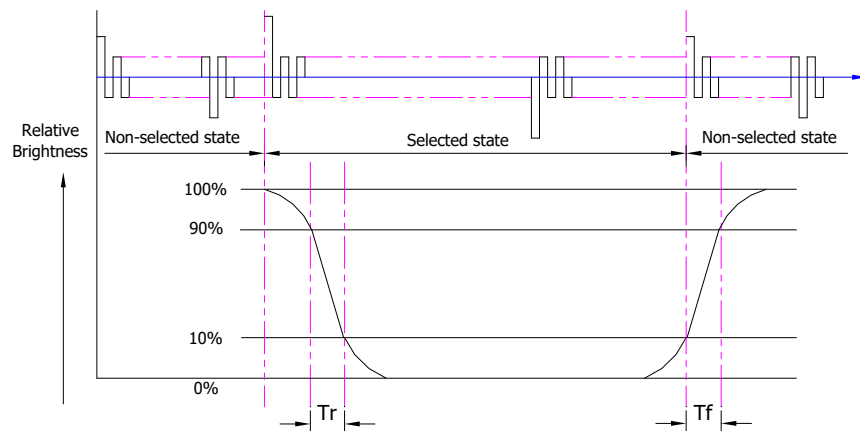


T_r is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

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

6.2.2. Normally White Type (Positive)



T_r is the time it takes to change from non-selected state 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

6.3. Definition of Contrast Ratio

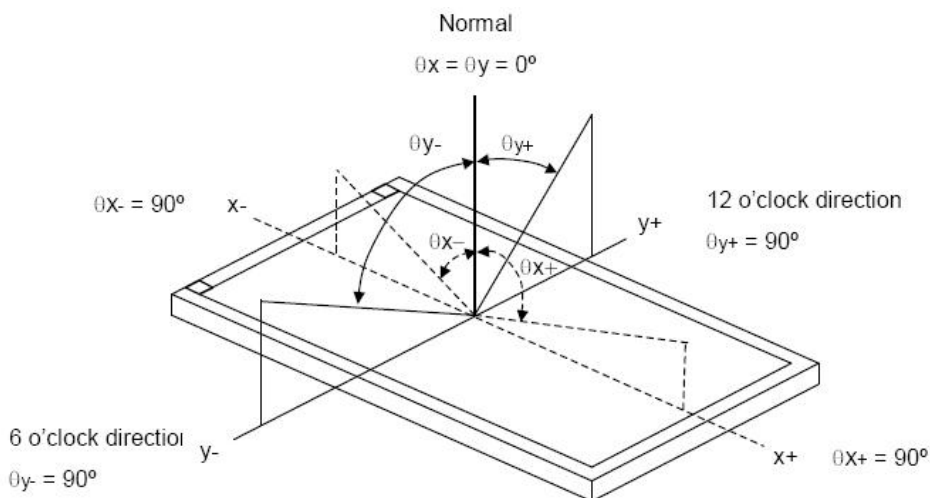
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

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

6.4. Definition of Viewing Angles



Measuring machine: LCD-5100 or EQUI

6.5. 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)



6.6. Definition of Surface Luminance, Uniformity and Transmittance

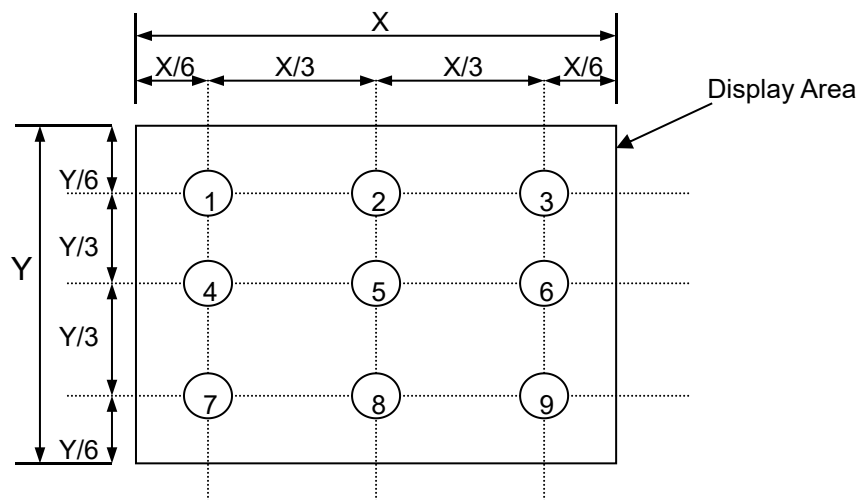
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

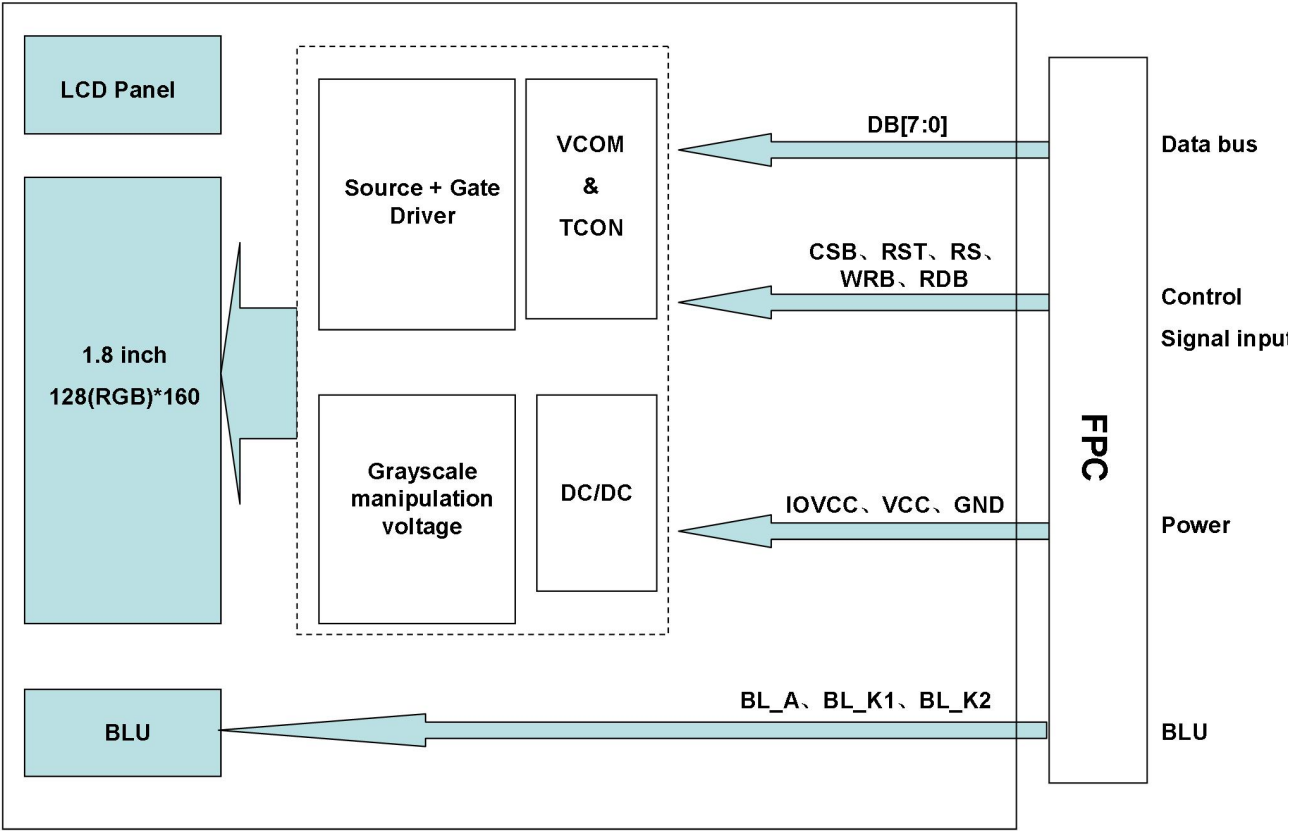
6.6.2. Uniformity = $\text{Minimal } (L_{P1}:L_{P9}) / \text{Maximal } (L_{P1}:L_{P9}) * 100\%$

6.6.3. 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	GND	Ground	
2	IOVCC	Logic Power(1.8V)	
3	VCC	Analog Power(2.8V)	
4	CSB	Chip Select Signal	
5	RST	Reset Signal	
6	RS	Data/Command Signal	
7	WRB	Write signal	
8	RDB	Read signal	
9	DB0	Data bus	
10	DB1	Data bus	
11	DB2	Data bus	
12	DB3	Data bus	
13	DB4	Data bus	
14	DB5	Data bus	
15	DB6	Data bus	
16	DB7	Data bus	
17	BL_A	Led anode	
18	BL_K1	Led cathode	
19	BL_K2	Led cathode	
20	GND	Ground	

9. AC Characteristics

9.1. Power ON/OFF Sequence

VDDI and VDD can be applied in any order

VDD and VDDI can be powered down in any order

During power off, if LCD is in the Sleep Out mode, VDD and VDDI must be powered down minimum 120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, VDDI or VDD can be powered down minimum 0msec after RESX has been released.

CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

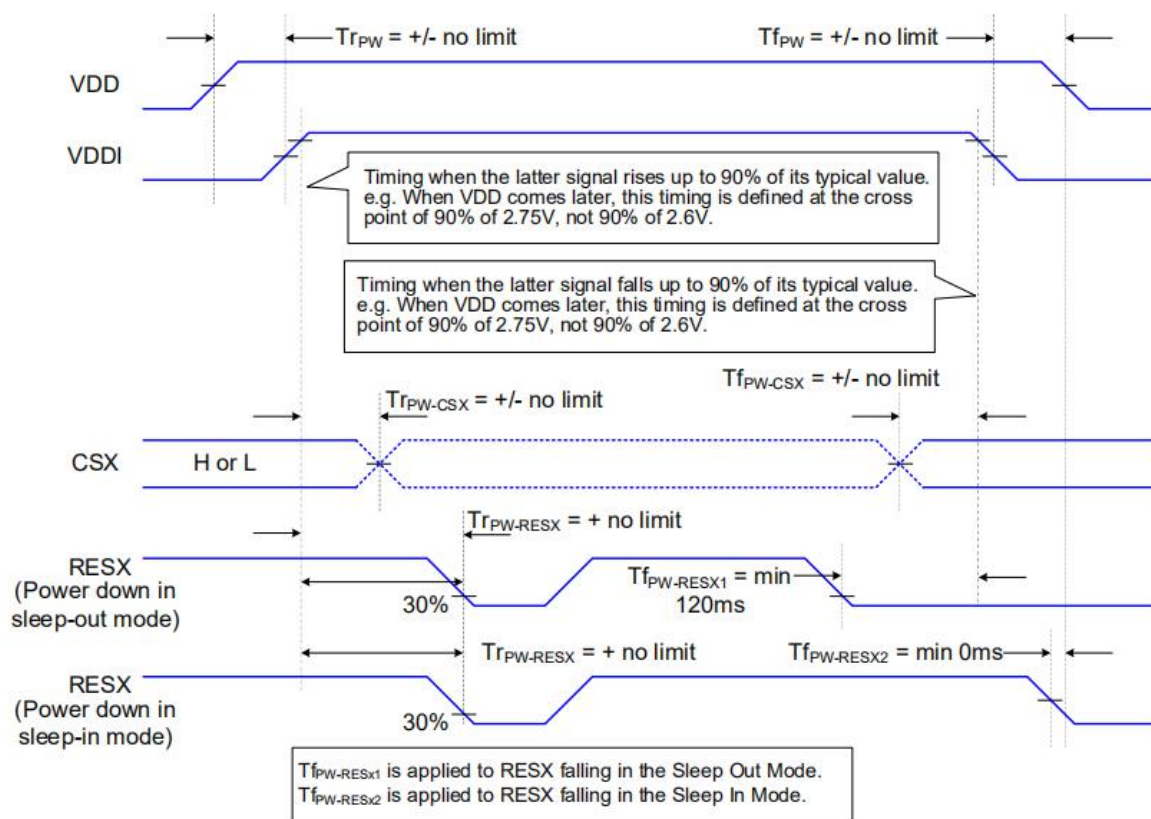
Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.

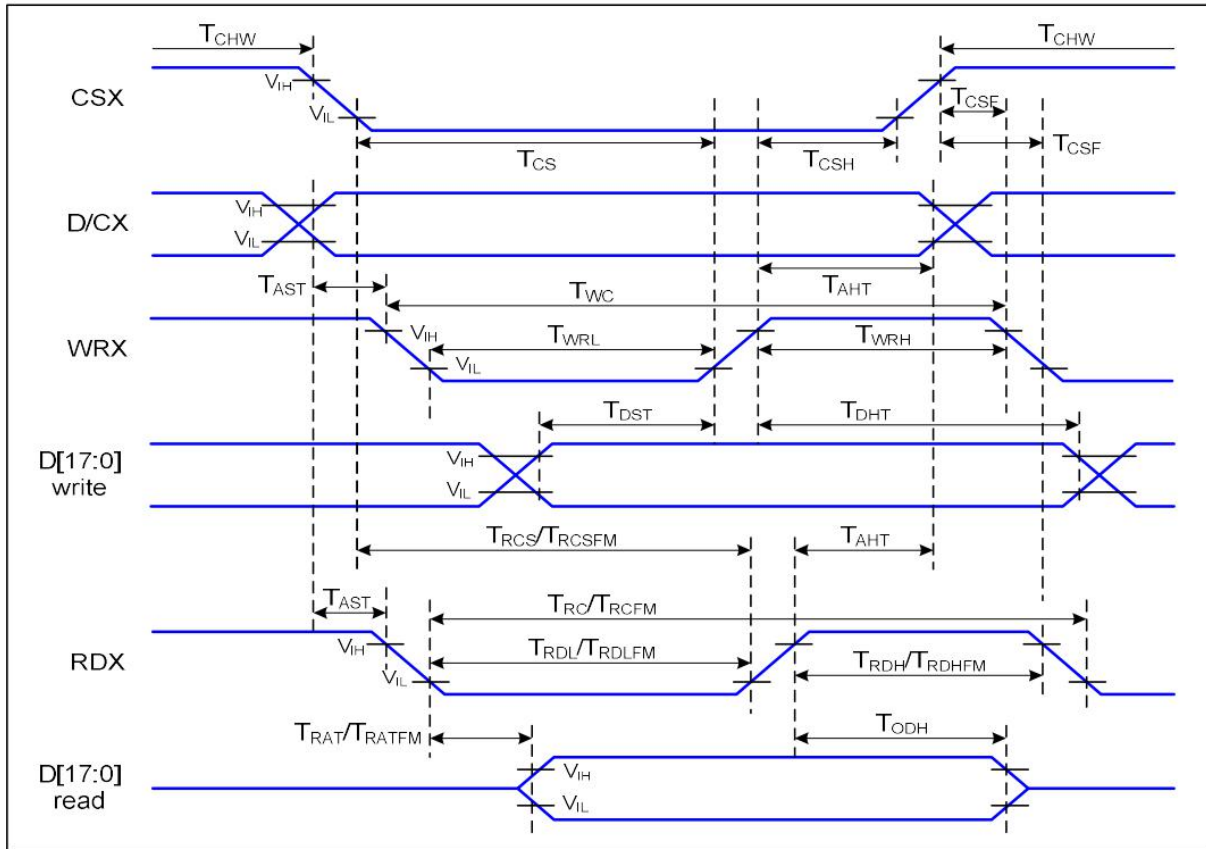
Note 4: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

The power on/off sequence is illustrated below



9.2. Interface timing

Display Module Parallel 8-bit Bus

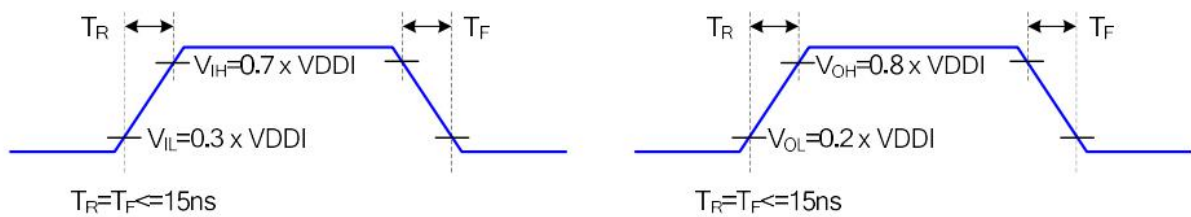


Parallel Interface Timing Characteristics (8080 Series MCU Interface)

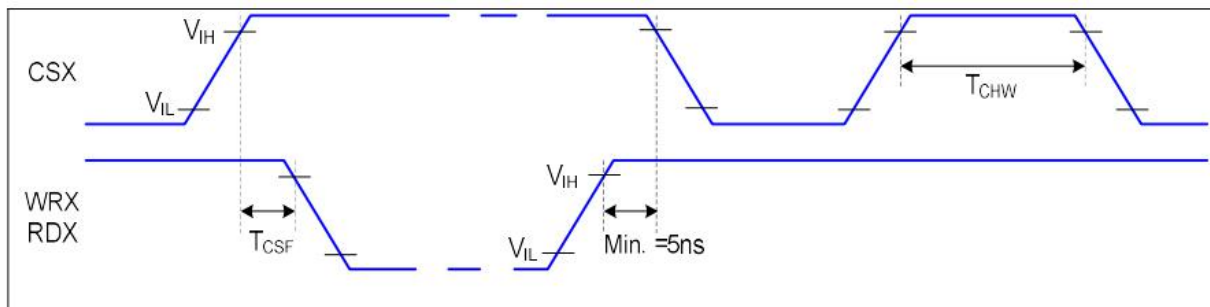
Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	TAST	Address Setup Time	0		ns	-
	®	Address Hold Time (Write/Read)	10		ns	
CSX	TCHW	Chip Select "H" Pulse Width	0		ns	-
	TCS	Chip Select Setup Time (Write)	15		ns	
	TRCS	Chip Select Setup Time (Read ID)	45		ns	
	TRCSFM	Chip Select Setup time (Read FM)	355		ns	
	TCSF	Chip Select Wait Time (Write/Read)	10		ns	
	TCSH	Chip Select Hold Time	10		ns	
WRX	TWC	Write Cycle	66		ns	
	TWRH	Control Pulse "H" Duration	15		ns	
	TWRL	Control Pulse "L" Duration	15		ns	
RDX (ID)	TRC	Read Cycle (ID)	160		ns	When Read ID Data
	TRDH	Control Pulse "H" Duration (ID)	90		ns	
	TRDL	Control Pulse "L" Duration (ID)	45		ns	

RDX (FM)	TRCFM	Read Cycle (FM)	450		ns	When Read from Frame Memory
	TRDHFM	Control Pulse "H" Duration (FM)	90		ns	
	TRDLFM	Control Pulse "L" Duration (FM)	355		ns	
D[17:0]	TDST	Data Setup Time	10		ns	For CL=30pF
	TDHT	Data Hold Time	10		ns	
	TRAT	Read Access Time (ID)		40	ns	
	TRATFM	Read Access Time (FM)		340	ns	
	TODH	Output Disable Time	20	80	ns	

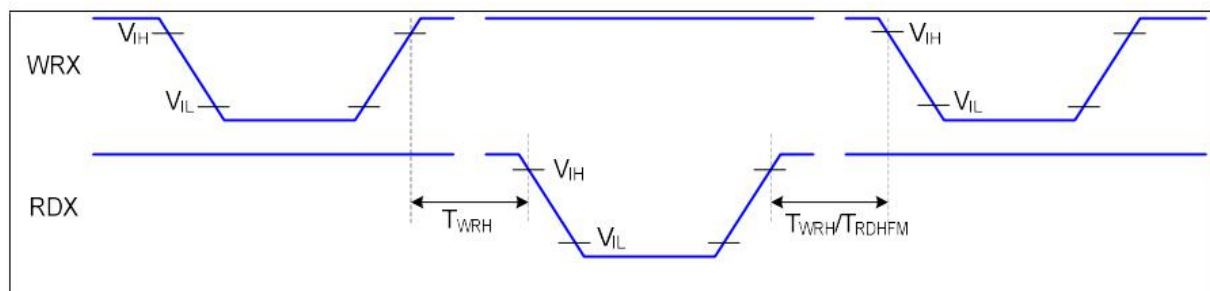
8080 Parallel Interface Characteristics



Rising And Falling Timing for Input And Output Signal



Chip Selection(CSX)Timing



Write-to-Read And Read-to-Write Timing

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

12.2.1 Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

12.2.2 Sampling Criteria:

Visual inspection: AQL 1.5

Electrical functional: AQL 0.65.

12.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

10.3.Nonconforming Analysis & Disposition

12.3.1 Nonconforming analysis:

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

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

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

12.3.2 Disposition of nonconforming:

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

12.3.2.2 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:

12.4.1 There is any discrepancy in standard of quality assurance.

12.4.2 Additional requirement to be added in product specification.

12.4.3 Any other special problem.

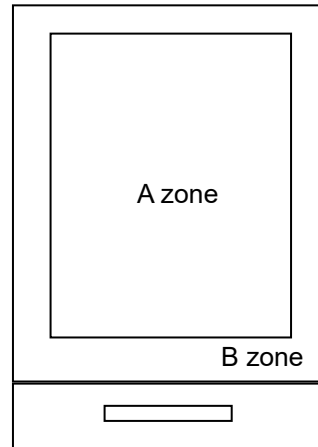
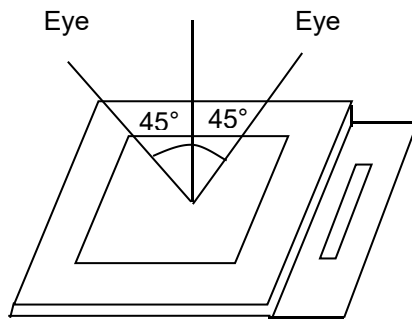
10.5.Standard of the Product Visual Inspection

12.5.1 Appearance inspection:

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

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

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

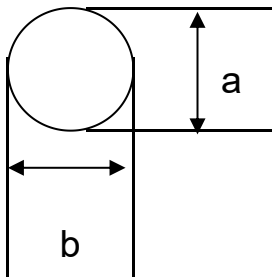


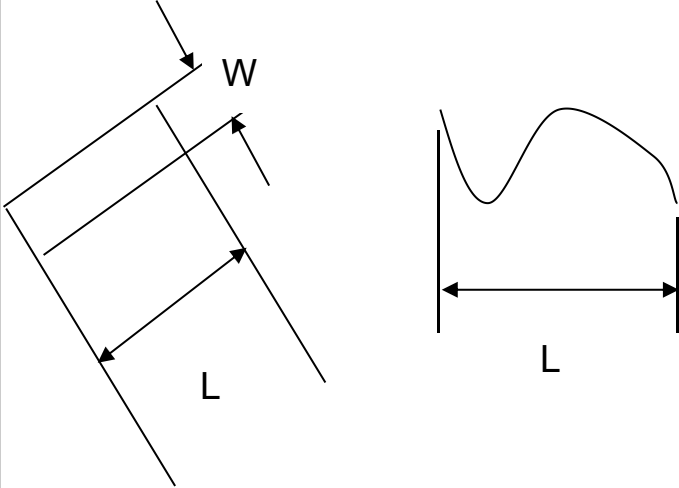
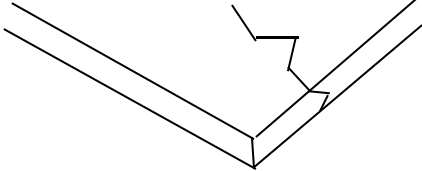
12.5.2 Basic principle:

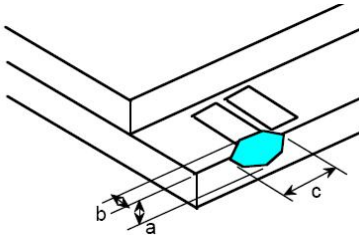
12.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

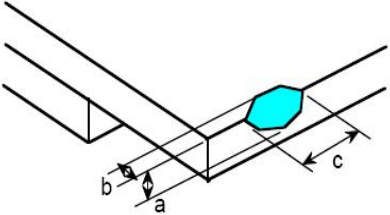
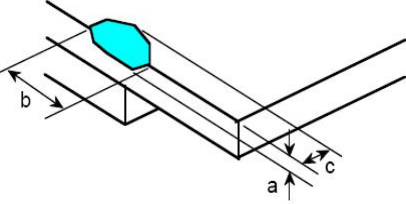
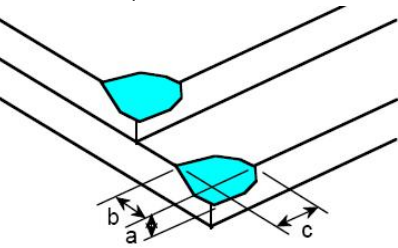
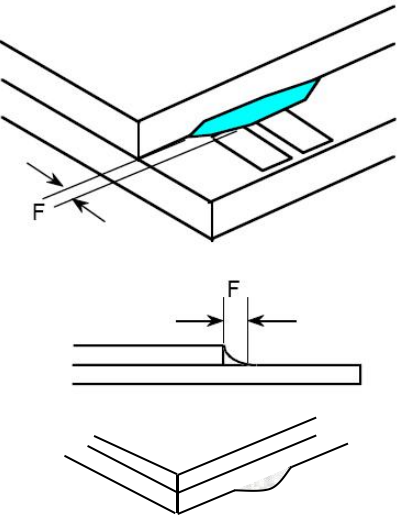
12.5.2.2 New item must be added on time when it is necessary.

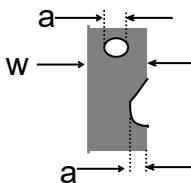
10.6. Inspection Specification

No.	Item	Criteria (Unit: mm)																			
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b) / 2$	<table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.10$</td><td>Ignore</td></tr><tr><td>$0.10 < \varphi \leq 0.15$</td><td>2</td></tr><tr><td>$0.15 < \varphi \leq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \varphi$</td><td>0</td></tr><tr><td>Total</td><td>2 no include $\varphi \leq 0.10$</td></tr></table>	Size \ Area	Acc. Qty	$\varphi \leq 0.10$	Ignore	$0.10 < \varphi \leq 0.15$	2	$0.15 < \varphi \leq 0.25$	1	$0.25 < \varphi$	0	Total	2 no include $\varphi \leq 0.10$						
	Size \ Area	Acc. Qty																			
$\varphi \leq 0.10$	Ignore																				
$0.10 < \varphi \leq 0.15$	2																				
$0.15 < \varphi \leq 0.25$	1																				
$0.25 < \varphi$	0																				
Total	2 no include $\varphi \leq 0.10$																				
		Distance between 2 defects should more than 3mm apart.																			
02	Electrical Defect (Minor defect)	<table><tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr><tr><td>Bright dot</td><td>0</td><td>0</td></tr><tr><td>Dark dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td>Total dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td></td><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note 2</td></tr></table>			Display Area	Total	Note1	Bright dot	0	0	Dark dot	$N \leq 2$	$N \leq 2$	Total dot	$N \leq 2$	$N \leq 2$		Mura	Not visible through 5% ND filters.		Note 2
			Display Area	Total	Note1																
Bright dot	0	0																			
Dark dot	$N \leq 2$	$N \leq 2$																			
Total dot	$N \leq 2$	$N \leq 2$																			
	Mura	Not visible through 5% ND filters.		Note 2																	
		Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.																			

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1"> <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>$L \leq .5$</td><td>$0.03 < W \leq 0.5$</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> Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq .5$	$0.03 < W \leq 0.5$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq .5$	$0.03 < W \leq 0.5$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
Total		3																		
04	Glass Crack (Minor defect)	 Crack is potential to enlarge, any type is not allowed.																		

05	Glass Chipping Pad Area: (Minor defect)		<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><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></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	Glass Chipping Rear of Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><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">$a < \text{Glass Thickness}$</td></tr></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	Glass Chipping Except Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><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">$a < \text{Glass Thickness}$</td></tr></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	Glass Corner Chipping: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c < 3.0, b < 3.0$</td><td>Ignore</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></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	Glass Burr: (Minor defect) 	<table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td>$F < 1.0$</td><td>Ignore</td></tr></table> Glass burr don't affect assemble and module dimension.	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width $a < w/3$. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.										
11	Bubble on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><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></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											
12	Dent on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><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></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	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.										
14	PCB	14.1 No distortion or contamination on PCB terminals. 14.2 All components on PCB must same as documented on the BOM/component layout. 14.3 Follow IPC-A-600F.										
15	Soldering	Follow IPC-A-610C standard										
16	Electrical Defect (Major defect)	The below defects must be rejected. 16.1 Missing vertical / horizontal segment, 16.2 Abnormal Display. 16.3 No function or no display. 16.4 Current exceeds product specifications. 16.5 LCD viewing angle defect. 16.6 No Backlight. 16.7 Dark Backlight. 16.8 Touch Panel no function.										

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

10.7. Classification of Defects

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

12.7.2 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.

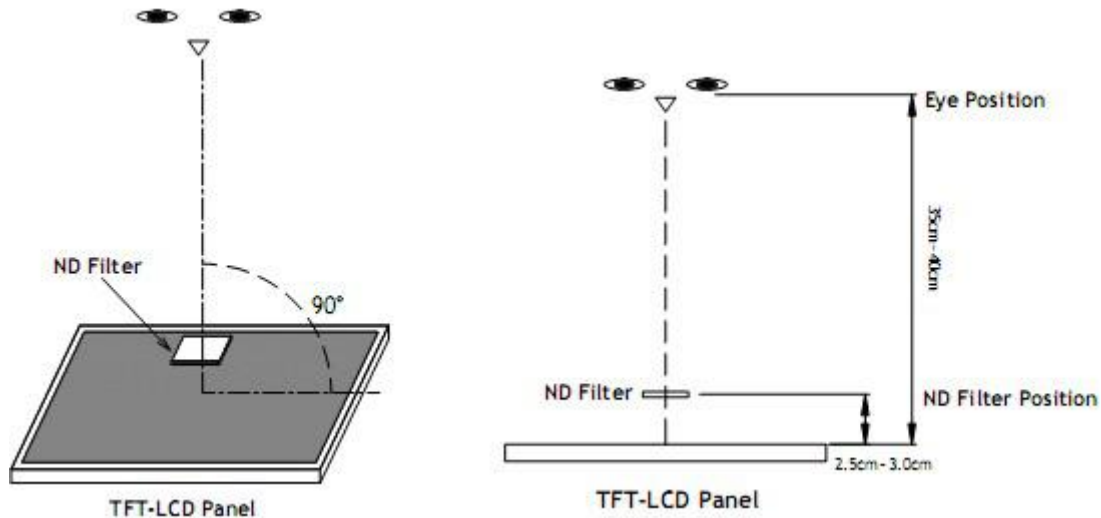
10.9. Packaging

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

12.9.2 Modules inside package box should have compliant mark.

12.9.3 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 $350\text{mm} \pm 50\text{mm}$.

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 $350\text{mm} \pm 50\text{mm}$.

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℃, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20℃, 96Hrs	2	GB/T2423.1-2008
3	High Humidity Storage	50℃, 90%RH, 96Hrs	2	GB/T2423.3-2016
4	High Temperature Storage	80℃, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30℃, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test Storage	-20℃, 60min~70℃, 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.	-	GB/T5170.14-2009
8	Electrical Static Discharge	Air:±8KV 150pF/330Ω 5 times Contact:±4KV 150pF/330Ω 5 times	2	GB/T17626.2-2018
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	-	GB/T2423.8-1995

Note1. No defection cosmetic and operational function allowable.

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

12. Precautions and Warranty

13.1 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

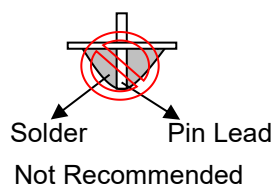
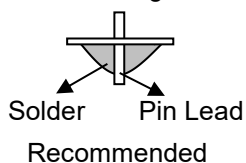
Maximum Solder Temperature: 370°C

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

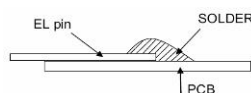
Typical Soldering Time: ≤2s

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

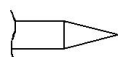


Recommended

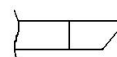


Not Recommended

12.4.2.7. The type of the solder iron:

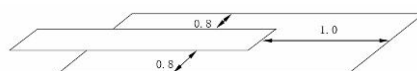


Recommended



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 will 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

