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Displays & Touch Screens

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DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FX0500ACDUSWMGL1

Table of Contents

Customer Companies	QA Approval	QA Check	R&D Approval	R&D Check
	pretty	Seven	Gomer	Terry
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
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2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	14/AUG/15’			Initial PRELIMINARY	ESR0407029
A	03/MAR/16’	14	20	1. Modify OUTLINE DRAWING from Rev 1 to A. 2. Release Rev A for production	NPPR-0768

3. GENERAL SPECIFICATIONS

No.	Item		Specification	Unit
1	LCD size		5.0 (15：9 Diagonal)	inch
2	Outline Dimension		118.5 × 77.55 × 3.4(Typ.)	mm
3	Display Area		108.0 (H) × 64.8(V)	mm
4	Number of Pixel		800(H) × (RGB) × 480 (V)	dot
5	Pixel pitch		0.135(H) × 0.135(V)	mm
6	Pixel arrangement		RGB Vertical stripe	
7	Display mode		Normally white	
8	Surface treatment		Anti-glare	
9	Weight		66(Typ.)	g
10	Back-light		LED Side-light type	
11	View direction		All	
12	Power Consumption	Logic System	0.7(Max.)	W
		B/L System	1.152(typ.)	W
Our components and processes are compliant to RoHS and REACH standard				

Remark：Our components and processes are compliant to RoHS standard.

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	VDD	-0.5	5.0	V	GND = 0V
Input signal voltage	Logic input	-0.3	VDD+0.3	V	
Operating temperature	Topa	-20	70	℃	
Storage temperature	T stg	-30	80	℃	

5. ELECTRICAL CHARACTERISTICS

5.1 Typical operation conditions

Ta= 25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	VDD	3.0	3.3	3.6	V	
Input signal voltage	V_{IH}	0.7*VDD	--	VDD	V	Note 1
	V_{IL}	GND	--	0.3*VDD	V	
Current of Power Supply	IDD	--	--	220	mA	VDD =3.3V

Note: (1) HSYNC, VSYNC, DE, R/G/B Data (2) GND = 0V

5.2 Backlight Unit

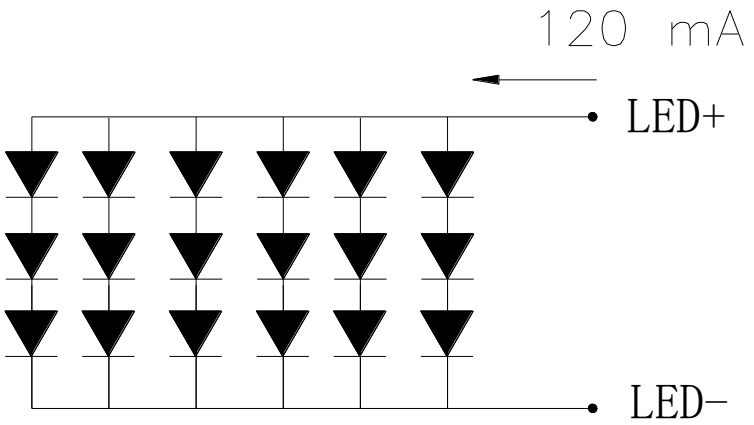
The backlight system is an edge-lighting type with 18 LED

The characteristics of the LED are shown in the following tables.

Ta= 25 ℃

Parameter	Symbol	Min	Typ.	Max.	Unit	Remark
LED voltage	V_L	9	9.6	10..2	V	
LED current	I_L	--	120	--	mA	
Operating LED Life Time		30000	--	--	Hour	Note1

Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃and IL=120mA. The LED lifetime could be decreased if operating IL is larger than 120mA.
The constant current driving method is suggested.



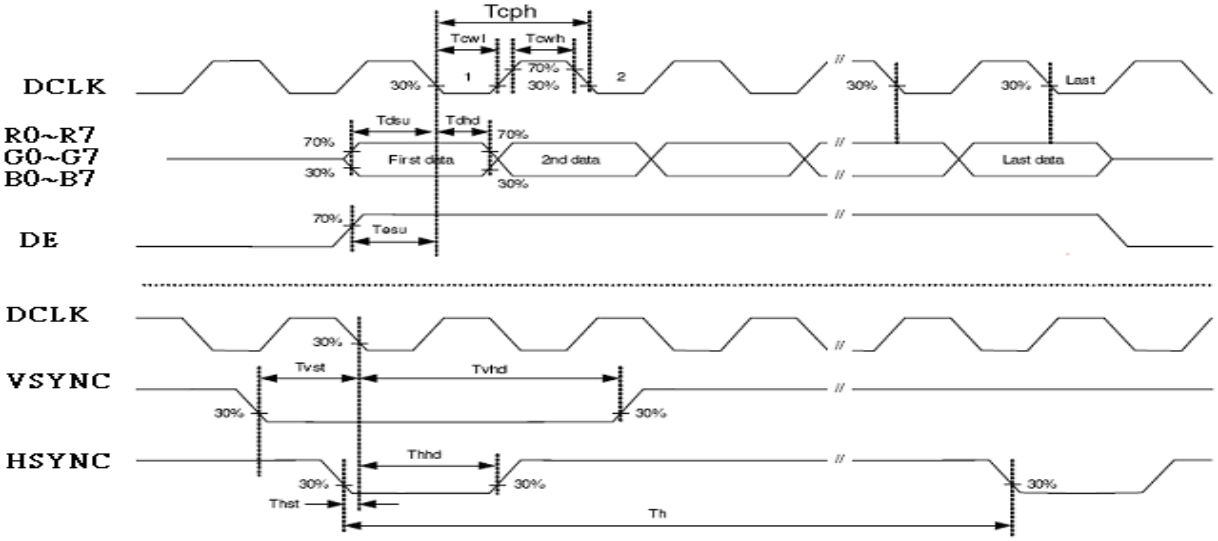
IF=120mA, VF= 9 ~ 10.2 V

backlight circuit

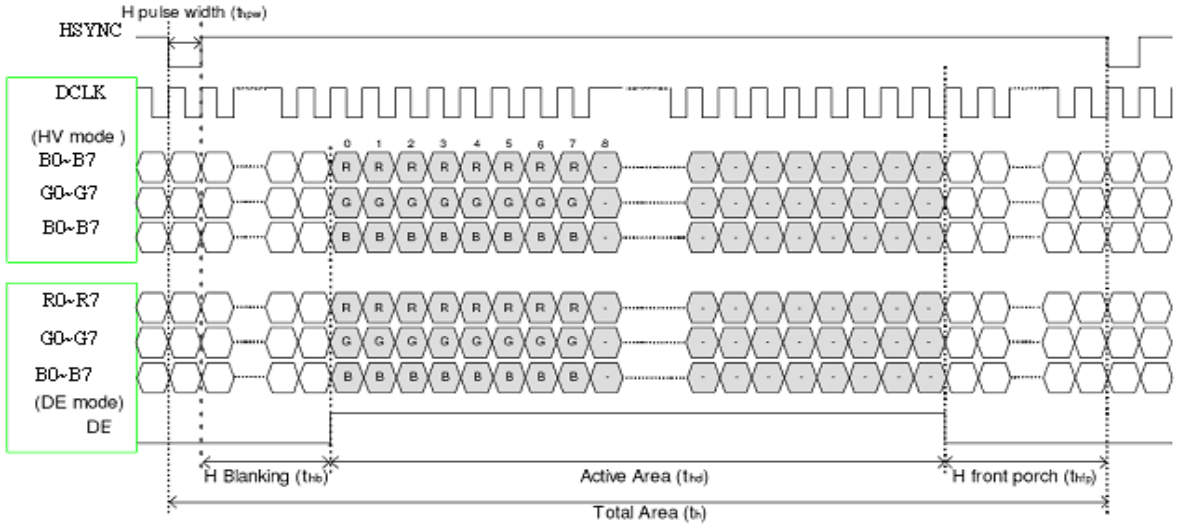
6. TIMING CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tclk	25			ns	
DCLK frequency	fclk		33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8			ns	
HSYNC setup time	Thst	8			ns	
HSYNC hold time	Thhd	8			ns	
Data setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd		800		Tcph	
HSYNC period time	Th		928		Tcph	
HSYNC width	Thwh	1	48		Tcph	
HSYNC back porch	Thbp		40		Tcph	
HSYNC front porch	Thfp		40		Tcph	
Vertical display area	Tvd		480		th	
VSYNC period time	Tv		525		th	
VSYNC width	Tvwh		3		th	
VSYNC back porch	Tvbp		29		th	
VSYNC front porch	Tvfp		13		th	

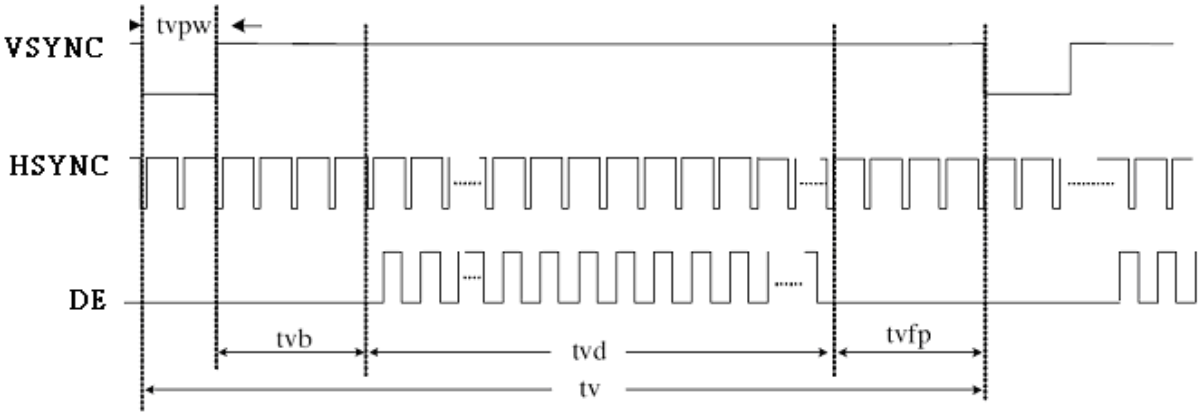
Timing Diagram of Interface Signal



Sampling clock timing

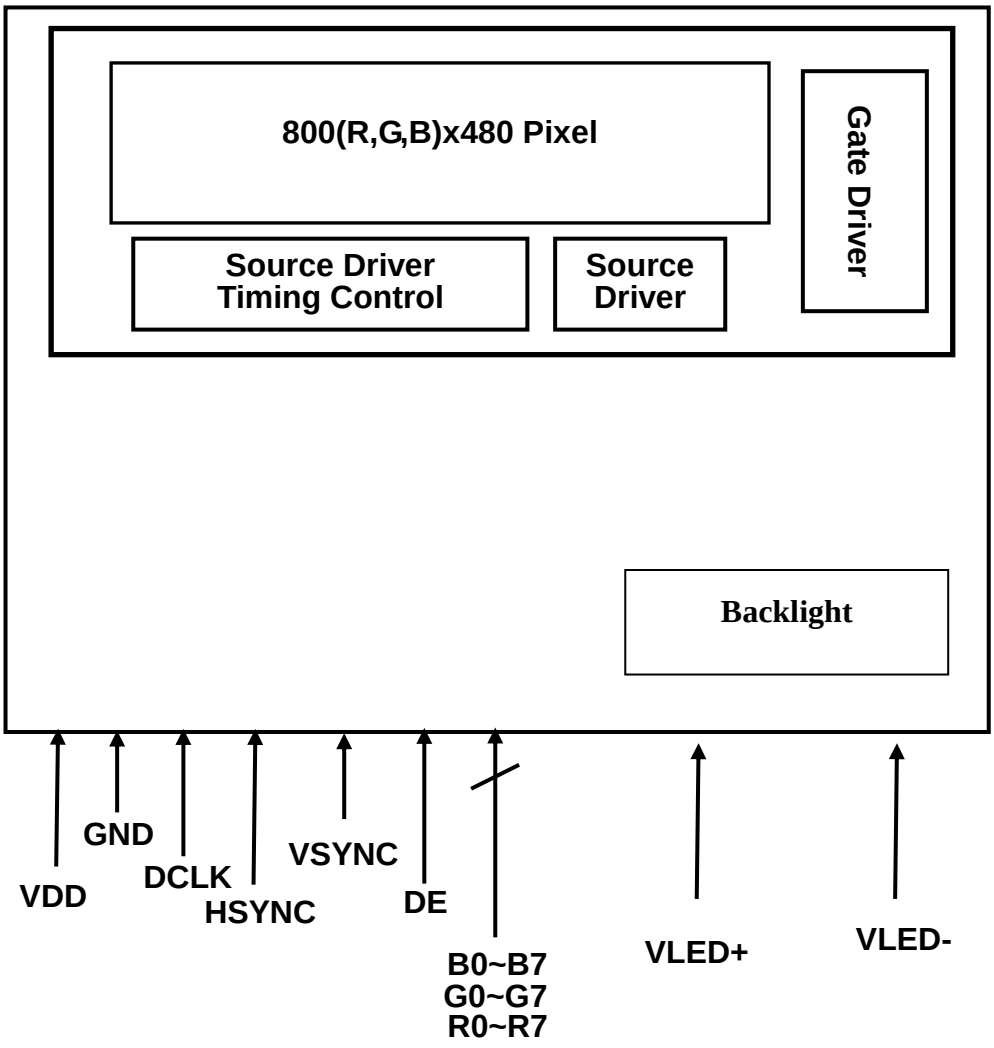


Horizontal display timing range



Vertical timing

7. BLOCK DIAGRAM



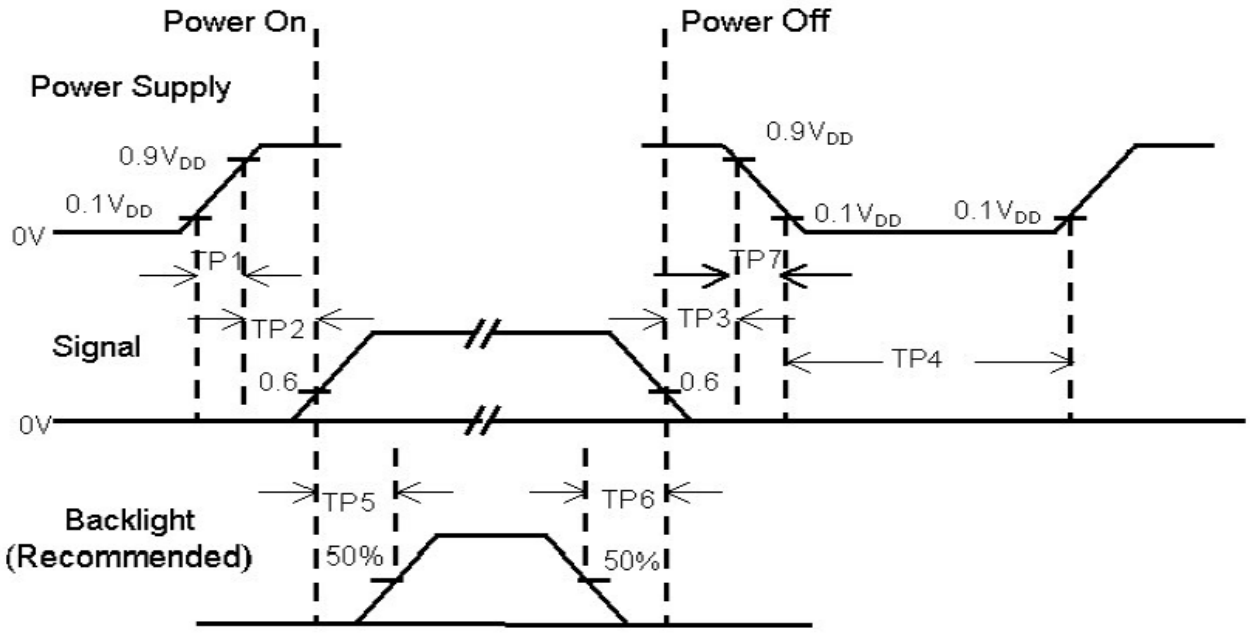
8. PIN CONNECTIONS

8.1 Input Pins Function

Pin No.	Symbol	I/O	Function
1	VLED-	P	Power for LED backlight cathode
2	VLED+	P	Power for LED backlight anode
3	GND	P	Power ground
4	VDD	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	DGND	P	Digital ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSYNC	I	Vertical sync signal
34	DE	I	Data enable
35	Vcc	-	NC
36	SCL	I	NC
37	SDA	I/O	NC
38	/TP_INT	O	NC
39	/TP_RST	I	NC
40	GND	-	Ground

I/O:I: input, O: output, P: Power

8.2 Power Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

Note:

(1) The supply voltage of the external system for the module input should be the same as the definition of VDD.

(2) Apply the lamp volatge within the LCD operation range. When the back-light turns on before the LCD operation or the LCD truns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

9. OPTICAL CHARACTERISTIC

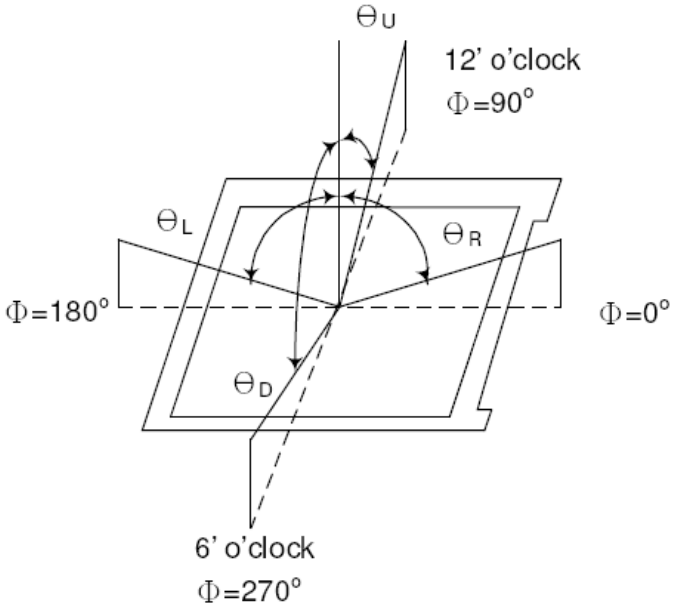
Specification:

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	TON	Normal θ=Φ=0°	-	2	4	ms	Note3，4
	Fall	TOFF		-	6	12	ms	
Contrast ratio		CR		300	400			Note 2，4
Viewing angle	θ L	Φ=180°(9 o' clock)		70	80	-	Deg.	Note 1，4
	θ R	Φ=0°(3 o' clock)		70	80	-		
	θ U	Φ=90°(12 o' clock)		70	80	-		
	θ D	Φ=270°(6 o' clock)		70	80	-		
Brightness (Center)			Normal θ=Φ=0°	360	450	--	cd/㎡	Note 4，6
Uniformity				70	80	--	%	Note 4，5，6
Color chromaticity (CIE1931)	White	X		0.26	0.31	0.36		Note 4，6
		y		0.28	0.33	0.38		

Test Conditions:

Measuring surrounding: dark room
LED current IL: 120mA
Ambient temperature: 25±2°C
15 min. warm-up time.

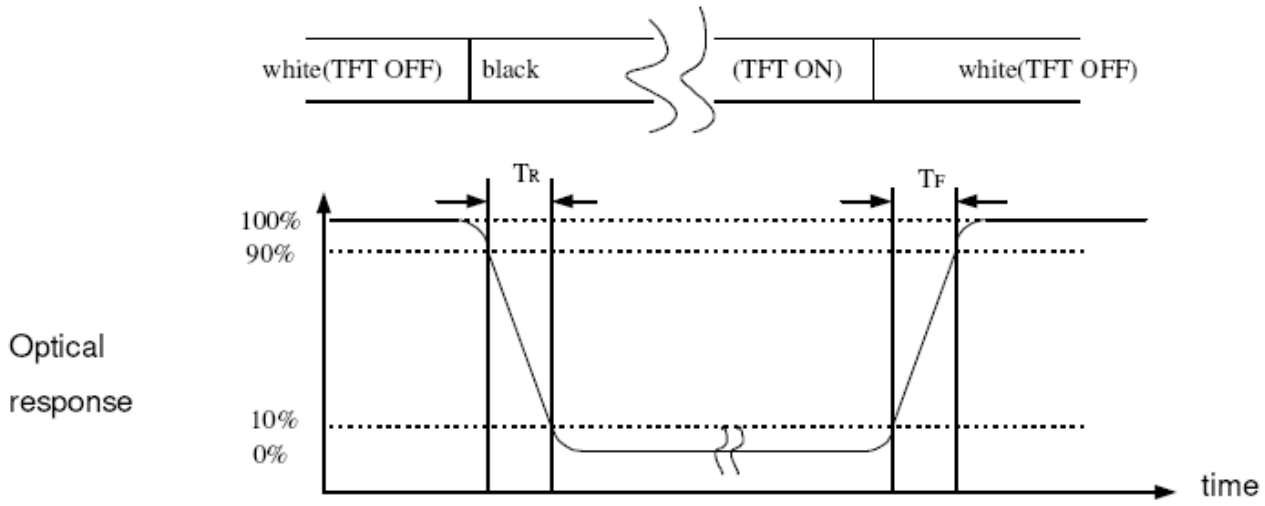
Note (1): Definition of viewing angle range



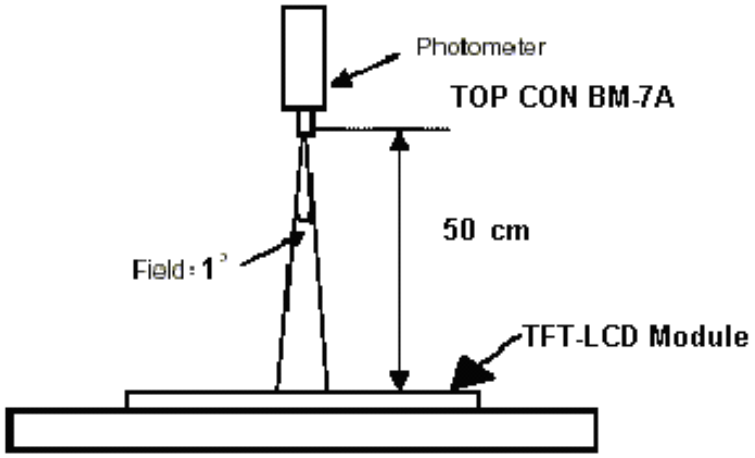
Note (2) Definition of Contrast Ratio (CR):
Measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

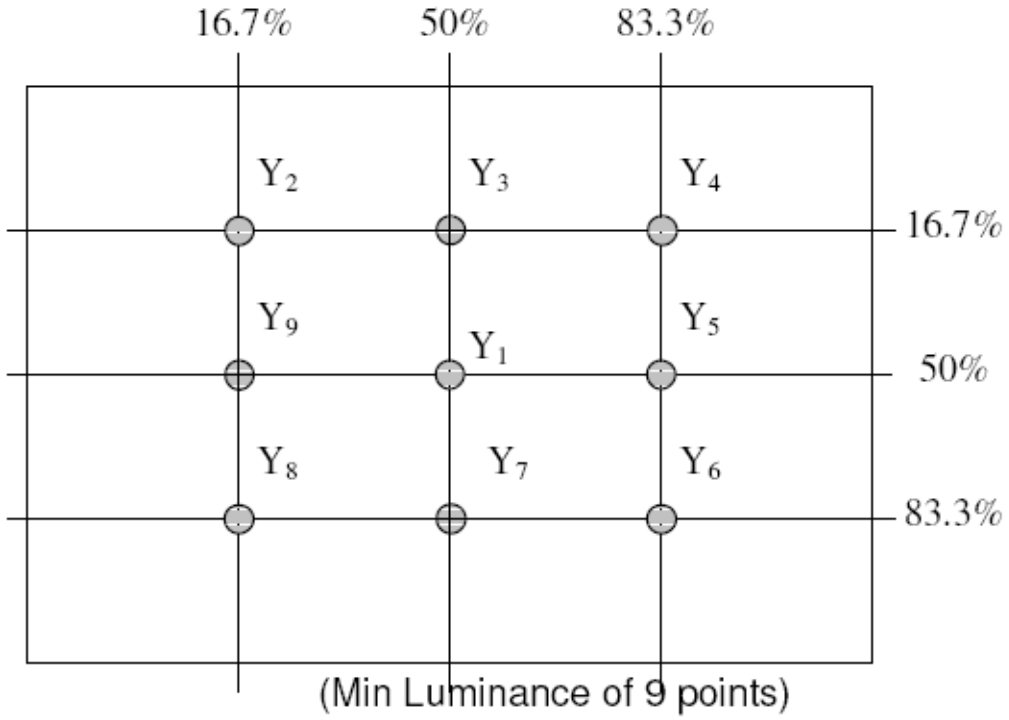
Note (3) Definition of Response Time: Sum of TOFF and TON



Note (4) The method of optical measurement:



Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

Note (6) Measured at the center area of the panel when all terminals of LCD panel are electrically open.

10. APPEARANCE SPECIFICATION

10.1 Inspection condition

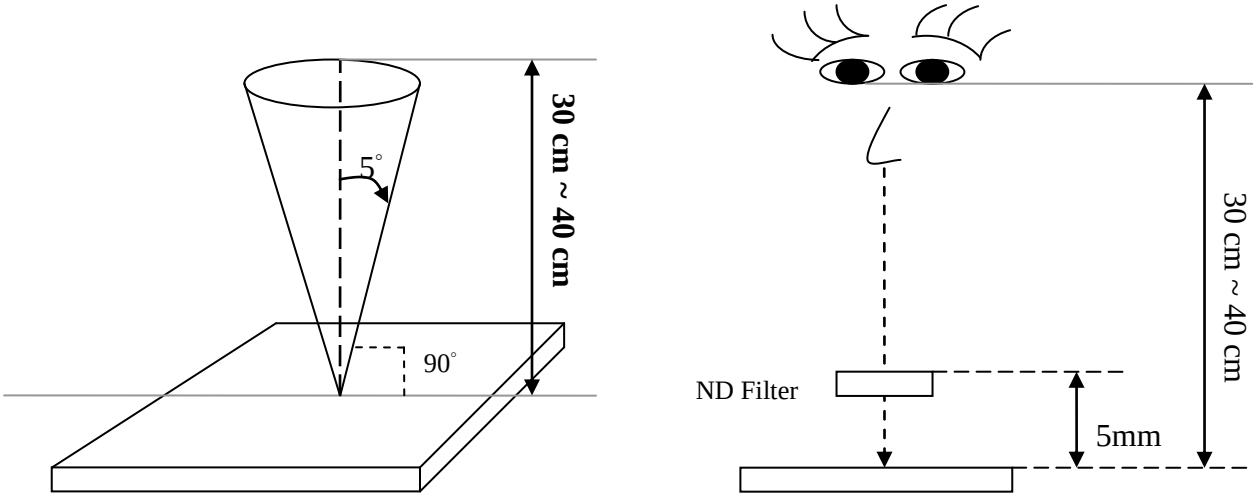
10.1.1 Inspection conditions

10.1.1.1 Inspection Distance : 35 ± 5 cm

10.1.1.2 View Angle :

(1) Inspection under operating condition : ±5°

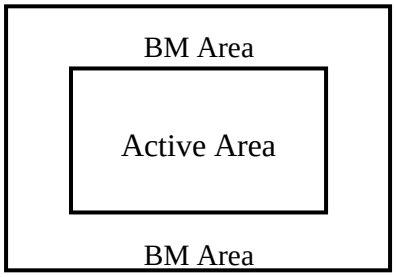
(2) Inspection under non-operating condition : ± 45°



10.1.2 Environment conditions :

Ambient Temperature :		25±5℃
Ambient Humidity :		65±5%
Ambient Illumination	Cosmetic Inspection	More than 600lux
	Functional Inspection	300 ~ 800lux

10.1.3 Definition of applicable Zones



10.1.4 Inspection Parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td rowspan="6">1</td><td rowspan="6">Operating</td><td>Display function: No Display malfunction (Major)</td></tr>
<tr><td>Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)</td></tr>
<tr><td>Point Defect (Red, green, blue, dark): Active area ≤4dots (Minor)(Note:1)
<table>
<tr><th>Item</th><th>Acceptable number</th><th>Total</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>Bright</td><td>2</td><td rowspan="2">4</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>Dark</td><td>3</td></tr>
<tr><td>Adjacent Bright</td><td>1</td><td>1</td></tr>
<tr><td>Adjacent Dark</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>Non-uniformity:
Visible through 2%ND filter white, R, G, B and gray 50%pattern. (Minor)</td></tr>
<tr><td>Foreign material in Black or White spots shape (W>1/4L) (Note: 5)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D ≤ 0.3</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.3 < D ≤0.5</td><td>3</td></tr>
<tr><td>D> 0.5</td><td>0</td></tr>
</table>
D = (Long + Short) / 2 ＊: Disregard</td></tr>
<tr><td>Foreign Material in Line or spiral shape (W≤1/4L) (Note: 4)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>W>0.1mm,L>5mm</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>L≦5mm,0.05mm<W≦0.1mm</td><td>3</td></tr>
<tr><td>L≦5mm,W<0.05mm</td><td>*</td></tr>
</table>
L : Length W : Width ＊: Disregard</td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">External Inspection (non-operating)</td><td>Dimension: Outline (Major)</td></tr>
<tr><td>Bezel appearance: uneven (Minor)</td></tr>
<tr><td>Scratch on the polarize: (Note:2)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>W>0.1mm,L>5mm</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>L≦5mm,0.05mm<W≦0.1mm</td><td>3</td></tr>
<tr><td>L≦5mm,W<0.05mm</td><td>*</td></tr>
</table>
L : Length W : Width ＊: Disregard</td></tr>
<tr><td>Dent and spots shape on the polarize (Note:2): (Note: 5)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D ≤ 0.3</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.3 < D ≤0.5</td><td>3</td></tr>
<tr><td>D> 0.5</td><td>0</td></tr>
</table>
D = (Long + Short) / 2 ＊: Disregard</td></tr>
<tr><td>Polarizer flaw or leak out resin : Defect is defined as the active area.</td></tr>
</table>

Class of defects			**Definition**
	Major	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.

Note:1.(a)Bright point defect is defined as point defect of R,G,B with area >1/2 pixel respectively

(b)Dark point defect is defined as visible in full white pattern.

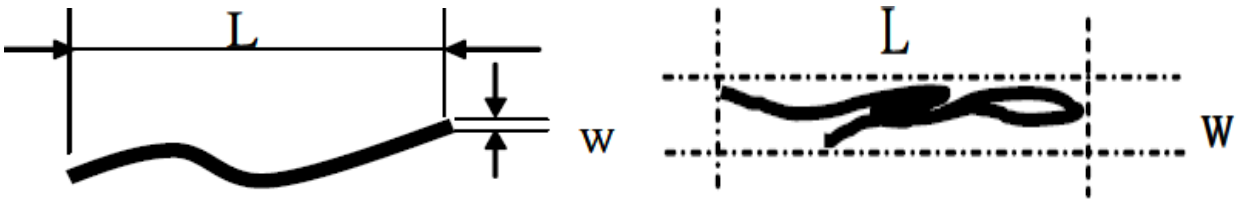
(c)The point defect must under 2% ND Filter visible.

Note:2 The external inspection should be conducted at the distance 30± 5cm between the eyes of inspector and the panel .

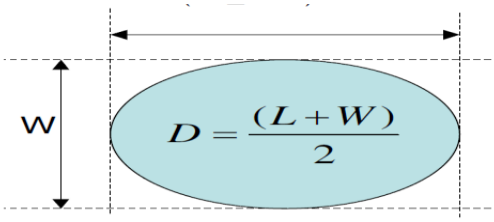
Note:3 Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective

head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note:4 W-Width in mm , L-length of Max.(L1,L2) in mm.



Note:5 Spot Foreign Material (W≧L/4)



10.2 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Sampling table: ISO 2859

Inspection level: Level II

11. QUALITY ASSURANCE

Test Condition

11.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

11.2 Operation

Unless specified otherwise, test will be conducted under function state.

11.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

11.4 Test Frequency

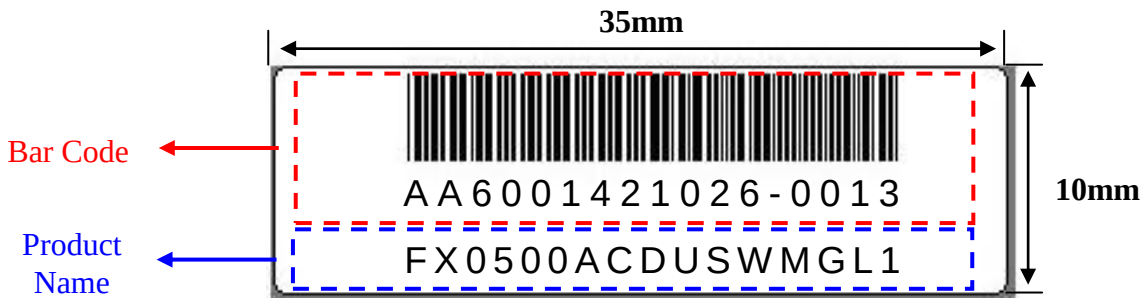
In case of related to deterioration such as shock test. It will be conducted only once.

11.5 Test Method

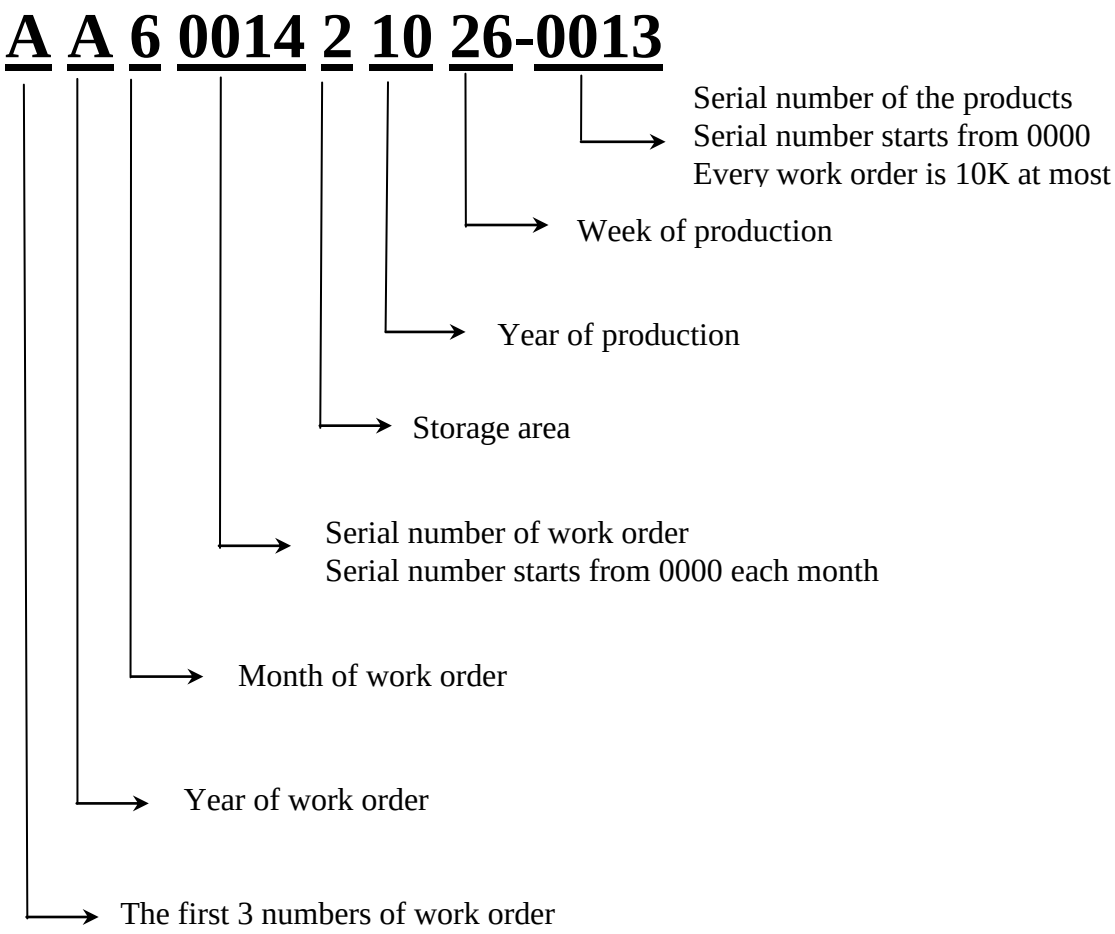
No.	Reliability Test Item & Level	Test Level	Remark
1	High Temperature Storage Test	T=80°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-30°C,240hrs	IEC68-2-1
3	High Temperature Operation Test	T=70°C,240hrs	IEC68-2-2
4	Low Temperature Operation Test	T=-20°C,240hrs	IEC68-2-1
5	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs	IEC68-2-3
6	Thermal Cycling Test (non operation)	-30℃----25℃------80℃ ,200Cycle 30min 5min 30min	IEC68-2-14
7	Vibration Test	Frequency:10~55HZ Amplitude:1.5mm Sweep time:11min Test period:6Cycles for each direction of X,Y,Z	IEC68-2-6
8	Shock test	100G,6ms,direction :±X±Y±Z Cycle:3times	IEC68-2-27
9	Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	I EC68-2-32
10	Electro Static Discharge	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 8kV Air +/-15kV Criteria: Class C	IEC61000-4-2

12. LCM PRODUCT LABEL DEFINE

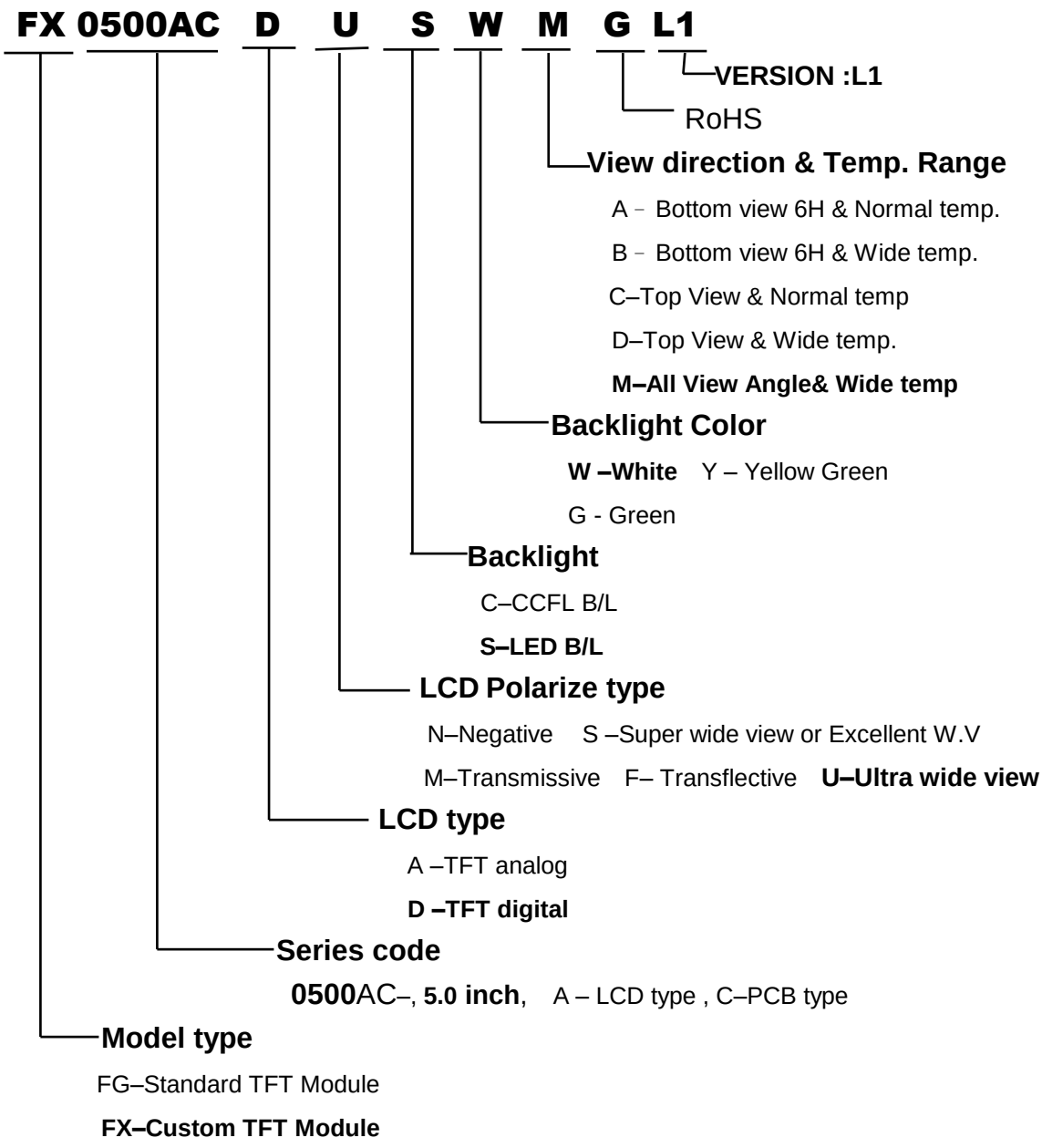
Product Label style:



BarCode Define:



Product Name Define:

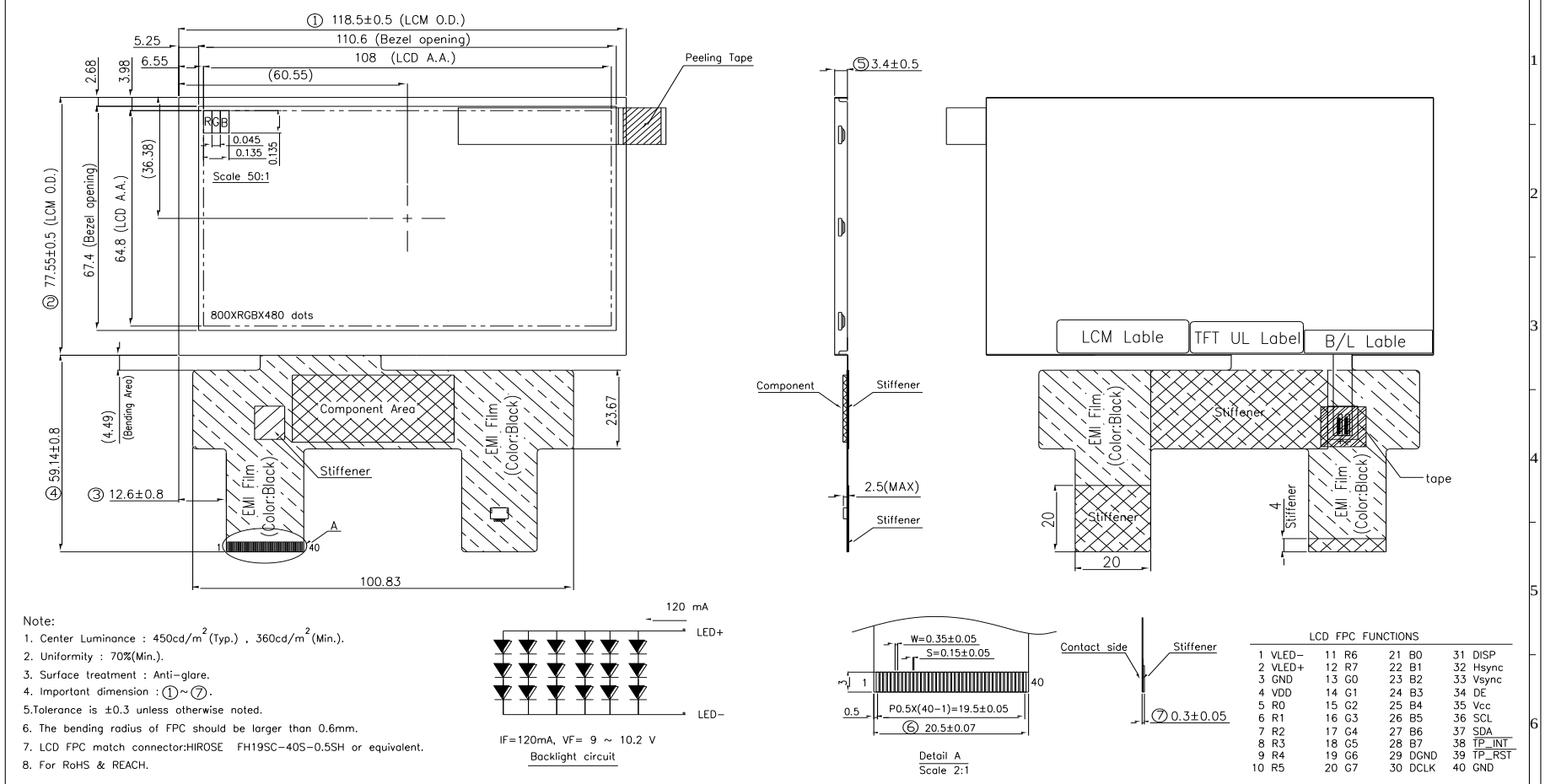


13. PRECAUTIONS IN USE LCM

1. ASSEMBLY PRECAUTIONS
   (1) You must mount a module using holes arranged in four corners or four sides.
   (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
   (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
   (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
   (5) Do not open the case because inside circuits do not have sufficient strength.
   (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
   (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
   (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.
2. OPERATING PRECAUTIONS
   (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
   (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification
   (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
   (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
   (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
   (6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.
3. ELECTROSTATIC DISCHARGE CONTROL
   (1) The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such the copper leads on the PCB and the interface terminals with any parts of the human body.
   (2) The modules should be kept in antistatic bags or other containers resistant to static for storage.
   (3) Only properly grounded soldering irons should be used.
   (4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
   (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
   (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.
4. STORAGE PRECAUTIONS
   (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0℃-40℃ without the exposure of sunlight and to keep the humidity less than 90%RH.
   (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60℃ 90%RH
   (3) Please do not leave the LCDs in the environment of low temperature; below -20℃.
5. OTHERS
   (1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays
   (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
   (3) For the packaging box, please pay attention to the followings:
      a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
      b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
      c. Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)
6. LIMITED WARRANTY

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

14. OUTLINE DRAWING



Note:
1. Center Luminance : 450cd/m^2 (Typ.) , 360cd/m^2 (Min.).
2. Uniformity : 70%(Min.).
3. Surface treatment : Anti-glare.
4. Important dimension : ①~⑦.
5. Tolerance is ±0.3 unless otherwise noted.
6. The bending radius of FPC should be larger than 0.6mm.
7. LCD FPC match connector:HIROSE FH19SC-40S-0.5SH or equivalent.
8. For RoHS & REACH.

LCD FPC FUNCTIONS

1	VLED−	11	R6	21	B0	31	DISP
2	VLED+	12	R7	22	B1	32	Hsync
3	GND	13	G0	23	B2	33	Vsync
4	VDD	14	G1	24	B3	34	DE
5	R0	15	G2	25	B4	35	Vcc
6	R1	16	G3	26	B5	36	SCL
7	R2	17	G4	27	B6	37	SDA
8	R3	18	G5	28	B7	38	TP_INT
9	R4	19	G6	29	DGND	39	TP_RST
10	R5	20	G7	30	DCLK	40	GND

AUTH	DESCRIPTION	DATE	APPROVED
	Change the drawing from Rev.1 to Rev.A NPPR_0768	2016/02/04	

REVISIONS

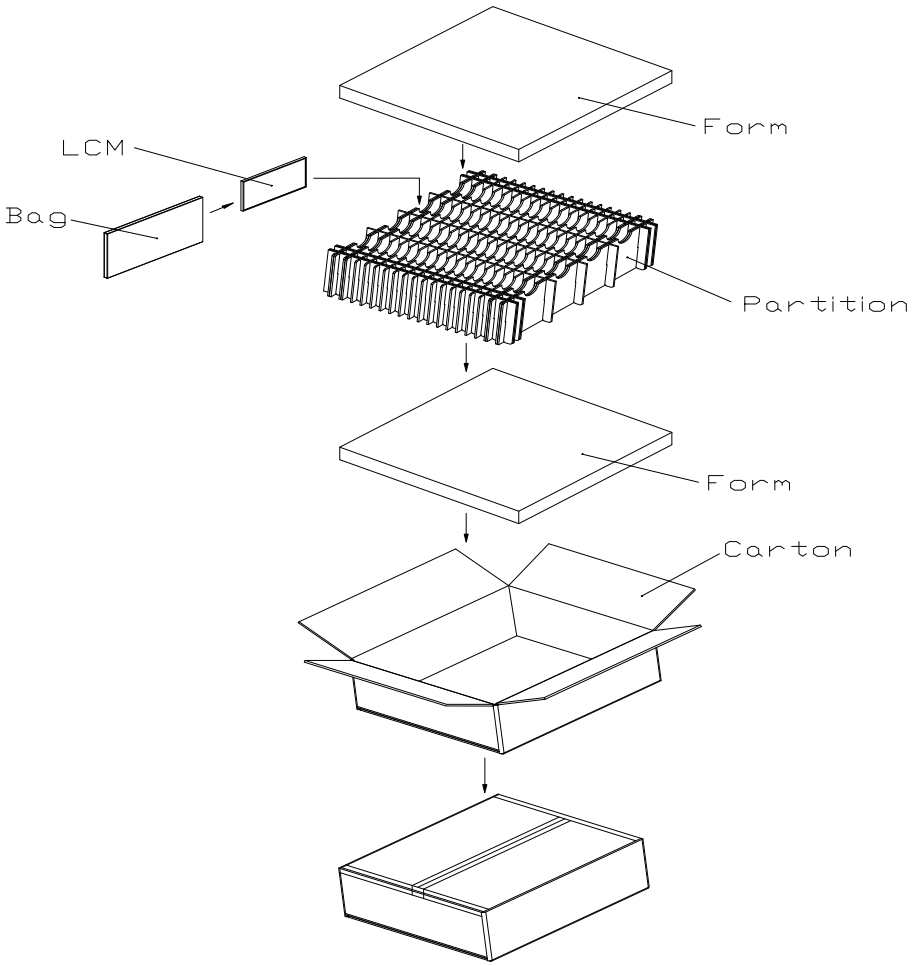
DATE:	2015/08/07
DRAWN:	
CHECK:	
APPROVE:	

TITLE: LCM OUTLINE DIMENSION

DWG. NO.	FX0500ACUGL1		
UNITS M M		REV.	A
SCALE Scale	SHEET 1 OF 1		

DATA IMAGE

15. PACKAGE INFORMATION



1 Carton= 120 pcs
FG0500A0DSSWBGT1 (85g) = 85 x 120 = 10200 g
Carton+Form+Partition = 1500 g
Total Weight = 11.7 kg
Carton size : 440L x 360W x 170H (mm)