DATA IMAGE CORPORATION

TFT Module Specification
Preliminary

ITEM NO.: FG1001P2DSSWMG01

Table of Contents

Customer Companies	QA Approved	DQA Check	R&D Approved	R&D Check
	(signature)	*Huang*	*Alex*	*Tomo*
Customer Approved by	Version:	Issued Date:	Total Pages:	Prepared
	2	19/OCT/16'	25	*(signature)*

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	26/APR/16'			Initial Preliminary	ESR S1604004
2	19/OCT/16'	9	11	Modify Power ON/OFF Sequence	ECR110-GA0013

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	10.1 (diagonal)	inch
Display Format	1280(H) x (R,G,B) x 800(V)	dot
Active Area	216.96(W) × 135.6(H)	mm
Pixel Pitch	0.1695(W) × 0.1695(H)	mm
Pixel Configuration	RGB-Stripe	
Outline Dimension	231 (W) ×153.8 (H) ×9.9$_{MAX}$ (D)	mm
Surface treatment	Glare , Hard -Coating	
Display Mode	Normally Black	
Interface	LVDS	
Viewing Direction	All	
Weight	TBD	g
Display mode	Normally Black, Transmissive	
Our components and processes are compliant to RoHS standard		

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit	Remark
Power voltage	VDD	-0.3	7	V	Note2
Logic input signal voltage	VSignal	3.0	3.6		
Power voltage for LED	LED_VCCS	-0.3	30	V	
Operating temperature	TOP	-20	70	°C	
Storage temperature	TST	-30	80	°C	

Note 1: Permanent damage may occur to the LCD module if beyond this specification. Functional
operation should be restricted to the conditions described under normal operating conditions.
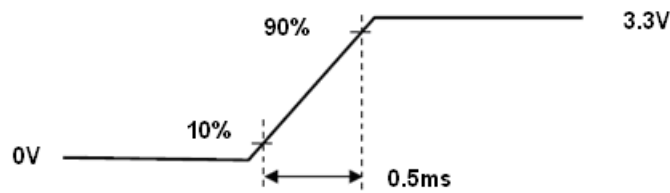Note 2: Operating temperature 25°C, humidity 55%RH.

5. ELECTRICAL CHARACTERISTICS
5.1 Typical Operation Conditions

| Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Power voltage		VDD	3.0	3.3	3.6	V	Note 2,4
VDD Current	White Pattern	IDD	-	0.27	-	A	Note 3,4
VDD Power Consumption	White Pattern	PDD	-	-	1.0	W	
Rush Current		IRush	-	-	1.5	A	Note 1,4,5
Allowable Logic/LCD Drive Ripple Voltage		VVDD-RP	-	-	300	mV	Note 4
Power voltage for LED		LED_VCCS	10.8	12	13.2	V	
Power current for LED		ILED_VCCS		620	800	mA	LED_VCCS=12V
LED_PWM Signal Logic Voltage	High	VPWM	2	-	LED_VCCS	V	
	Low		0	-	0.8	V	
LED_PWM Frequency		FPWM	100	-	1000	Hz	
LED_PWM duty			1		100	%	
LED Life Time			50000			hrs	Note 6

Note 1：Measure Condition

VDD Rising Time

Note 2：VDD Power Dip Condition

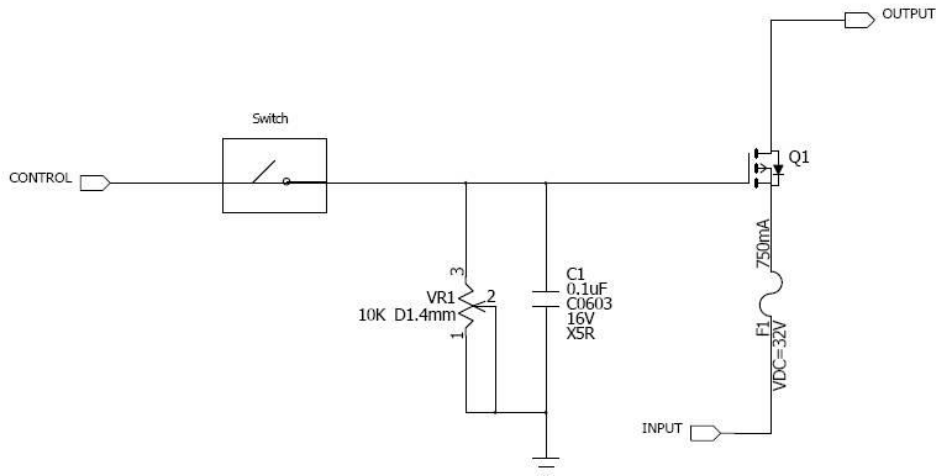VTH < VDD ≤ Vmin, td ≤10ms(a time of the voltage return to normal), our panel can revive automatically.
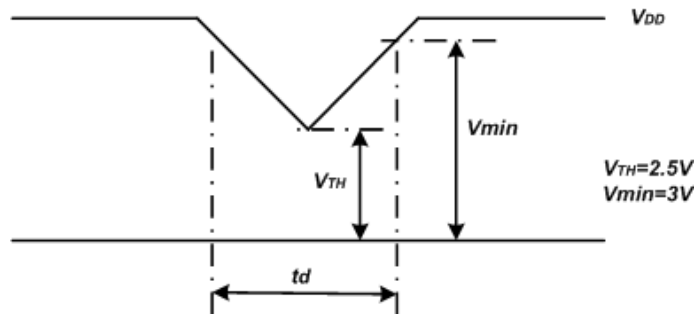
VDD Power Dip

Note 3：Frame Rate=60Hz, VDD=3.3V, DC Current.

Note 4：Operating temperature 25°C, humidity 55%RH.

Note 5：The reference measurement circuit of rush current.

Note 6: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C.

6. INPUT SIGNAL CHARACTERISTICS
6.1 LVDS Receiver

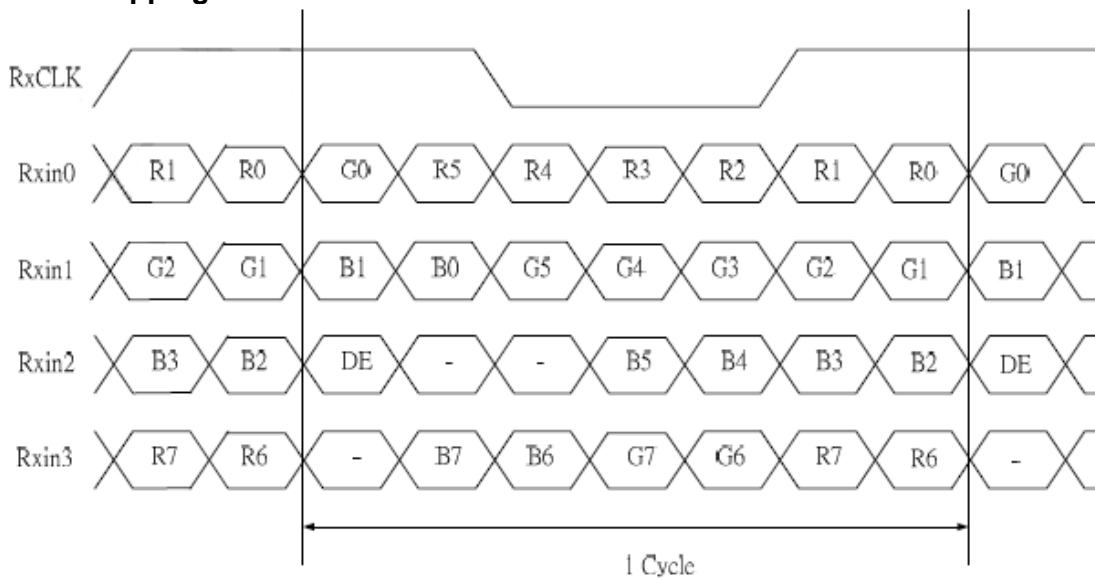| Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential input high Threshold voltage	RXVTH	-	-	+100	mV	VCM=1.2V
Differential input low Threshold voltage	RXVTL	-100	-	-	mV	
Differential voltage	│VID│	200	-	400	mV	
Common Mode Voltage	V_{CM}	0.3+(VID/2)	-	VDD-1.2-(VID/2)	V	
Common Mode Voltage	ΔV_{CM}	-	-	50	mV	VCM=1.2V

Note 1 : Input signals shall be low or Hi- resistance state when VDD is off.

Note 2 : All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

Voltage Definitions
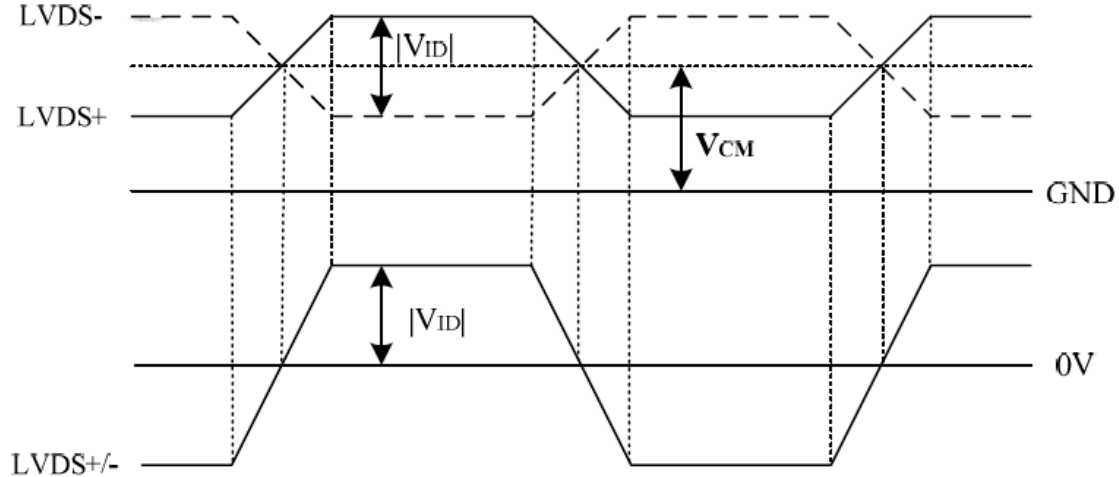
LVDS Data Mapping

6.2 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Frame Rate	-	-	60	-	Hz	
Frame Period	tv	815	823	1023	line	
Vertical display area	tvd		800		line	
Vertical Blanking Time	tVW+tvBP+tvFP	15	23	33	line	
1 Line Scanning Time	tH	1410	1440	1470	clock	
Horizontal Display Time	tHD		1280		clock	
Horizontal Blanking Time	tHW+tHBP+tHFP	60	160	190	clock	
Clock Rate	1/Tc	68.9	71.1	73.4	MHz	

7. OPTICAL CHARACTERISTIC

| Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing Angle (CR≥10)	θ_L	Φ=180°(9 o'clock)	75	85	-	deg	Note 1
	θ_R	Φ=0°(3 o'clock)	75	85	-		
	θ_T	Φ=90°(12 o'clock)	75	85	-		
	θ_B	Φ=270°(6 o'clock)	75	85	-		
Contrast Ratio	CR		600	800	-		Note 4
Response time	Rising +Falling		-	25	50	ms	Note 3
Color chromaticity	Rx	Normal θ=Φ=0°	Typ. -0.05	0.569	Typ. +0.05	-	Note 5
	RY			0.335		-	
	Gx			0.339		-	
	Gy			0.568		-	
	Bx			0.160		-	
	By			0.127		-	
	Wx			0.313		-	
	Wy			0.329		-	
Luminance	L		900	1000	-	cd/㎡	
Luminance uniformity	YU		70	75	-	%	Note 6

Test Conditions:
1. VDD=3.3V, LED_VCCS=12V, LED_PWM=100%Duty, the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range


Definition of viewing angle
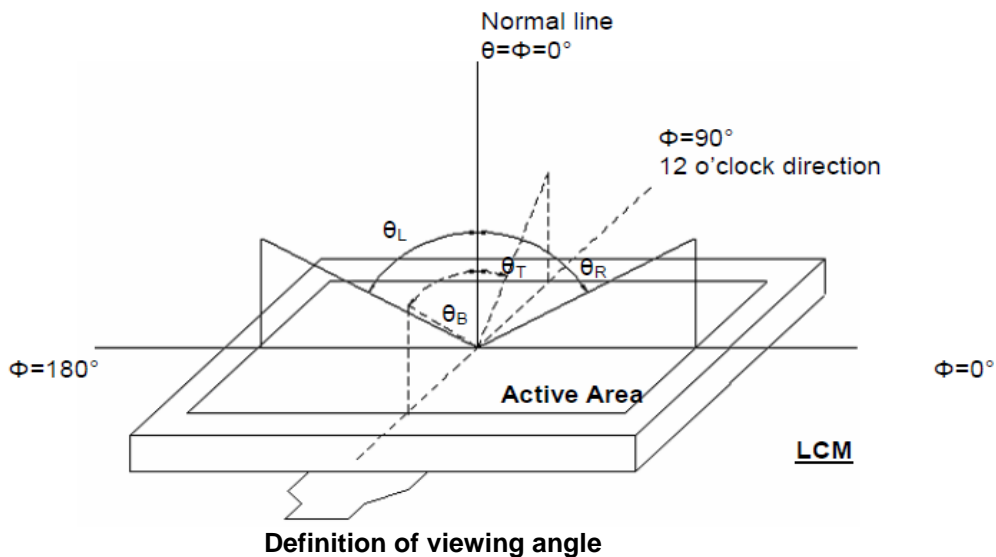
Note 2: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 2 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, other items are measured by BM-7A/ Field of view: 1° /Height: 500mm.)
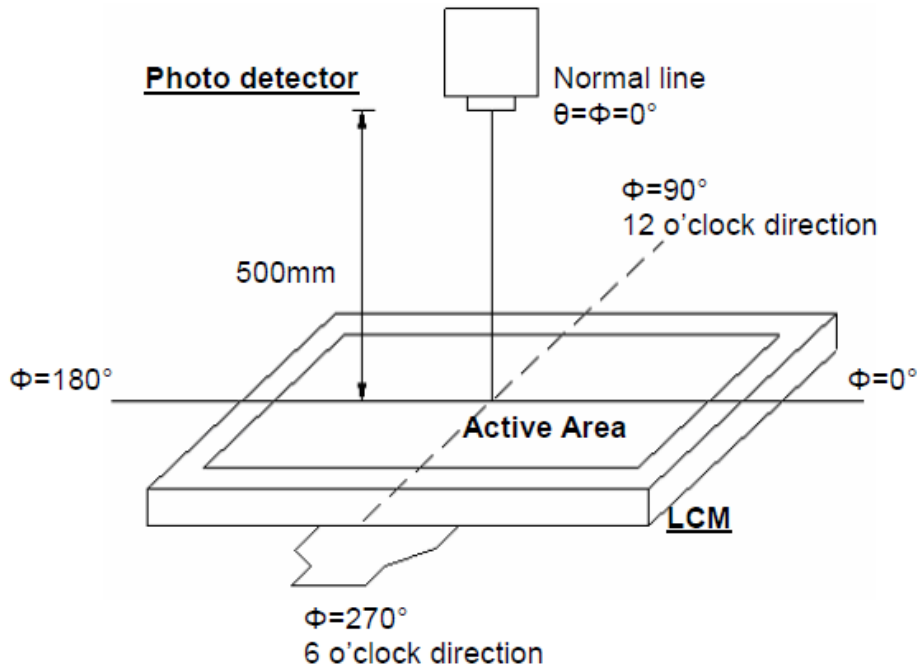
Optical measurement system setup

Note 3: Definition of Response time

Definition of response time
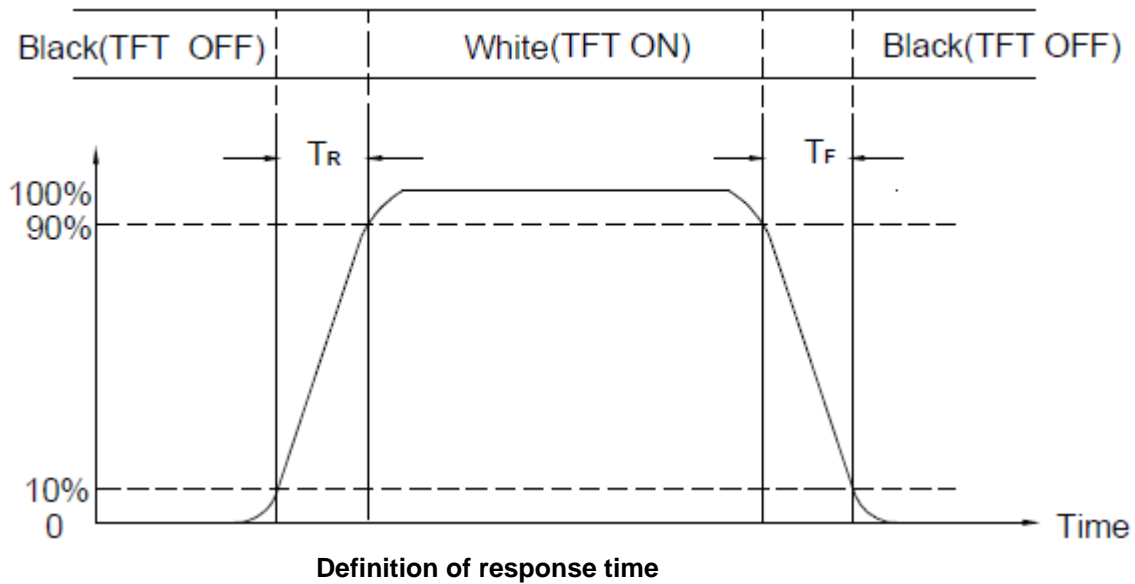
Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 6: Measuring the center area of the panel. The LED driving condition is LED_VCCS=12V
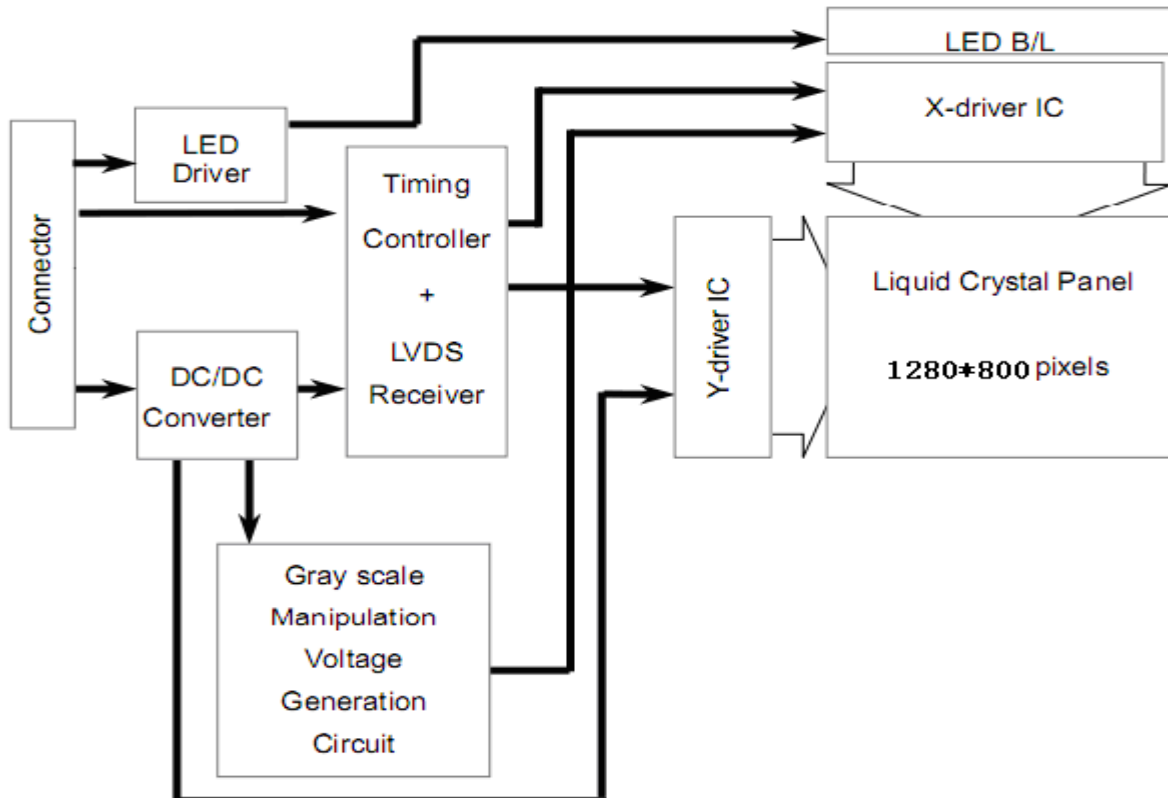
Note 7: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L--------Active area length   W------ Active area width
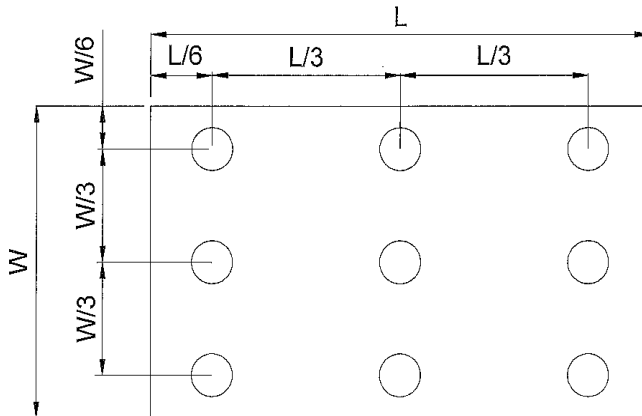
8. BLOCK DIAGRAM

9. PIN CONNECTIONS

Pin No.	Symbol	Function	Remark
1	NC	No Connection	
2	VDD(3.3V)	Power Supply 3.3V	
3	VDD(3.3V)	Power Supply	
4	NC	No Connection	
5	NC	No Connection	
6	NC	No Connection	
7	NC	No Connection	
8	RXIN0-	-LVDS Differential Data Input	
9	RXIN0+	+LVDS Differential Data Input	
10	VSS	Ground	
11	RXIN1-	-LVDS Differential Data Input	
12	RXIN1+	+LVDS Differential Data Input	
13	VSS	Ground	
14	RXIN2-	-LVDS Differential Data Input	
15	RXIN2+	+LVDS Differential Data Input	
16	VSS	Ground	
17	RXCLK-	-LVDS Differential Clock Input	
18	RXCLK+	+LVDS Differential Clock Input	
19	VSS	Ground	
20	RXIN3-	-LVDS Differential Data Input	
21	RXIN3+	+LVDS Differential Data Input	
22	VSS	Ground	
23	VSS	Ground	
24	VSS	Ground	
25	VSS	Ground	
26	NC	No Connection	
27	LED_PWM	PWM Input Signal for LED Driver	
28	NC	No Connection	
29	NC	No Connection	
30	NC	No Connection	
31	LED_VCCS(+12V)	LED Power Supply (+12V)	
32	LED_VCCS(+12V)	LED Power Supply (+12V)	
33	LED_VCCS(+12V)	LED Power Supply (+12V)	
34	NC	No Connection	
35	NC	No Connection	
36	NC	No Connection	
37	NC	No Connection	
38	NC	No Connection	
39	NC	No Connection	
40	NC	No Connection	

Power ON/OFF Sequence
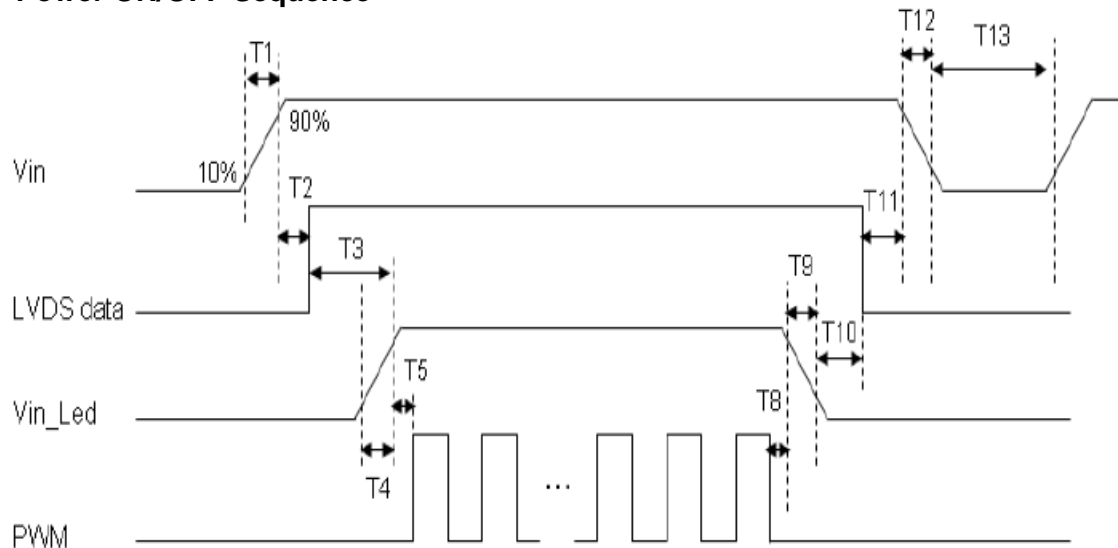
Power Sequencing Requirements

Parameter	Symbol	Min.	Typ.	Max.	Unit
VIN Rise Time	T1	0.5	--	10	ms
VIN Good to Signal Valid	T2	30	--	90	ms
Signal Valid to Backlight On	T3	200	--	--	ms
Backlight Power on Time	T4	0.5	--	--	ms
Backlight VDD Good to System PWM on	T5	10	--	--	ms
System PWM off to B/L Power Disable	T8	10	--	--	ms
Backlight Power off Time	T9	0.5	10	30	
Backlight Off to Signal Disable	T10	200	--	--	ms
Signal Disable to Power Down	T11	0	--	50	ms
VIN Fall Time	T12	0.5	10	30	ms
Power Off	T13	500	--	--	ms

10. QUALITY ASSURANCE

10.1. Test Conditions

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

10.1.2 Operation

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

10.1.3 Container

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

10.1.4 Test Frequency

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

10.1.5 Test Method

| No.	Item	Test Conditions	Remark
1	High Temperature Storage Test	Ta=80°C, 240hrs	IEC68-2-2
2	Low Temperature Storage Test	Ta=-30°C, 240hrs	IEC68-2-1
3	High Temperature Operation Test	Ts=70°C, 240hrs	IEC68-2-2
4	Low Temperature Operation Test	Ta=--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 storage test	-30°C ----25°C ------80°C ,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	Drop test	Height :60cm 1 conner,3edges,6surfaces	IEC68-2-32
9	Shock test	100G,6ms,Direction:±X±Y±Z Cycle:3times	IEC68-2-27
10	ESD test	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 8kV Air +/-15kV Criteria: Class C	IEC61000-4-2

10.2 Inspection condition

10.2.1 Inspection conditions
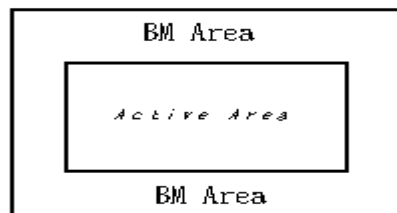
10.2.1.1 Inspection Distance : 35 ± 5 cm

10.2.1.2 View Angle :

(1)　Inspection under operating condition : ±5°

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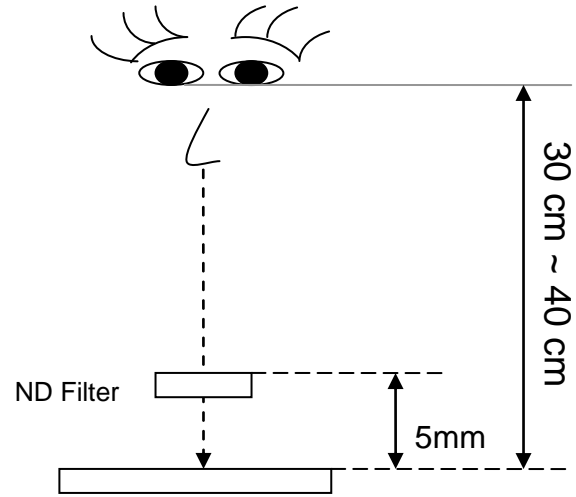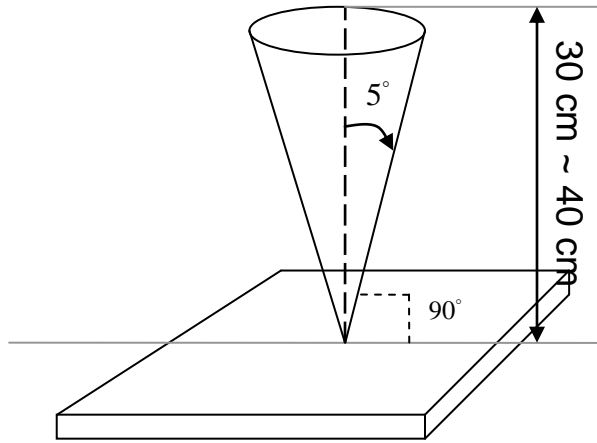
10.2.2 Environment conditions :

Ambient Temperature :		25±5°C
Ambient Humidity :		65±5%
Ambient Illumination	Cosmetic Inspection	400 ~ 600lux
	Functional Inspection	300 ~ 500lux

10.2.3 Definition of applicable Zones

10.3 Inspection Parameters

No.	Parameter	Criteria
1	Operating	Display function: No Display malfunction (Major)

Point Defect (Red, green, blue, dark): Active area ≤8dots (Minor)(Note:1)

Item	Acceptable number	Total	Class Of Defects	AQL Level
Bright	4	8	Minor	1.5
Dark	4			
Adjacent Bright	1	1		
Adjacent Dark	1	1		

Non-uniformity:
Visible through 2%ND filter white, R, G, B and gray 50%pattern. (Minor)

Foreign material in Black or White spots shape (W>1/4L) (Note: 5)

Dimension	Acceptable number	Class Of Defects	AQL Level
$D \leq 0.3$	*	Minor	1.5
$0.3 < D \leq 0.5$	4		
$D > 0.5$	0		

D = (Long + Short) / 2   ∗ : Disregard

Foreign Material in Line or spiral shape (W≤1/4L) (Note: 4)

Dimension	Acceptable number	Class Of Defects	AQL Level
W>0.1mm,L>5mm	0	Minor	1.5
L≦5mm,0.07mm<W≦0.1mm	4		
L≦5mm,W<0.07mm	*		

L : Length   W : Width   ∗ : Disregard

No.	Parameter	Criteria
2	External Inspection (non-operating)	Dimension: Outline (Major)

Bezel appearance: uneven (Minor)

Scratch on the Polarize & Touch Panel : (Note:2)

Dimension	Acceptable number	Class Of Defects	AQL Level
W>0.1mm,L>5mm	0	Minor	1.5
L≦5mm,0.07mm<W≦0.1mm	4		
L≦5mm,W<0.07mm	*		

L : Length   W : Width   ∗ : Disregard

Additional criteria for No. 1 Operating:

Contrast ratio (Black, White):
Does not meet specified range in the spec. (Major) (Note:3)

Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)

Dent and spots shape on the polarize (Note:2): (Note: 5)			
Dimension	Acceptable number	Class Of Defects	AQL Level
D ≤ 0.3	*		
0.3 < D ≤0.5	4	Minor	1.5
D> 0.5	0		
D = (Long + Short) / 2 ∗ : Disregard			

		Definition
Class of defects	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.
	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.
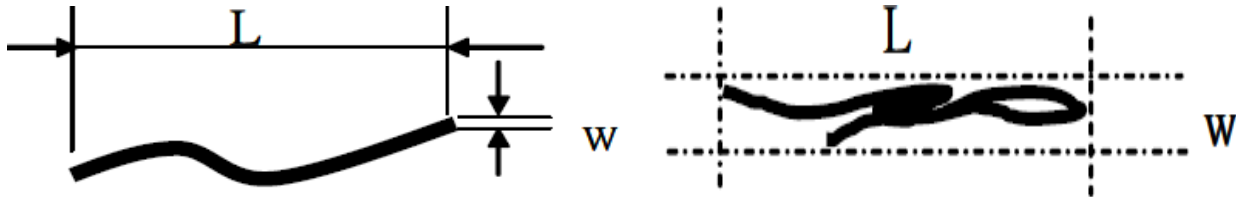
Note:5 Spot Foreign Material (W≧L/4)

$$D = \frac{(L+W)}{2}$$
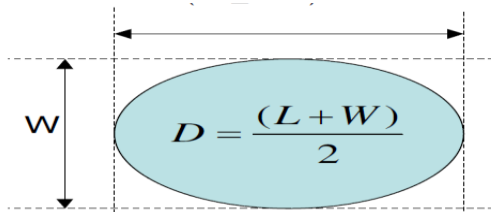
10.4 Sampling Condition
Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Sampling table: ISO 2859

Inspection level: Level II

Product Name Define:

FG 1001P2 D S S W M G 01

VERSION : 01

RoHS

View direction & Temp. Range

A‑ Bottom view 6H & Normal temp.

B‑ Bottom view 6H & Wide temp.

C–Top View & Normal temp.

N–All View Angle & Normal temp.

M–All View Angle& Wide temp.

Backlight Color

W –White   Y – Yellow Green

G - Green

Backlight

S –edge light LED B/L

C–CCFL B/L

LCD Polarize type

N–Normal view   **S – Super wide view or Excellent W.V.**

M–transmissive   W– Sunlight readable

LCD type

A –TFT analog

D –TFT digital

Series code

1001P2–, **10.1 inch**

Model type

FG–Standard TFT Module
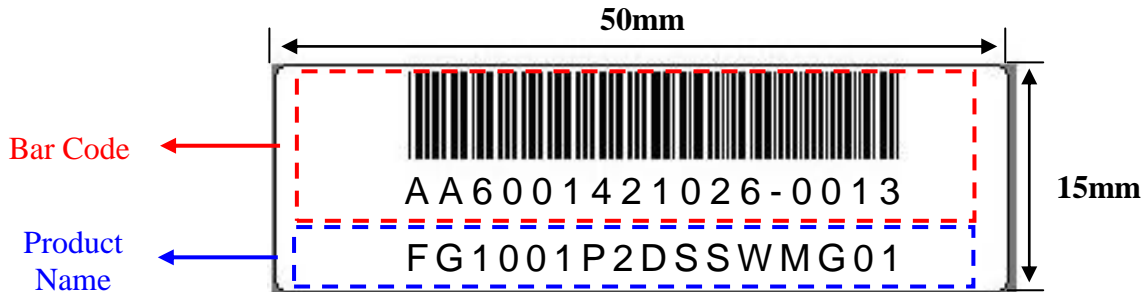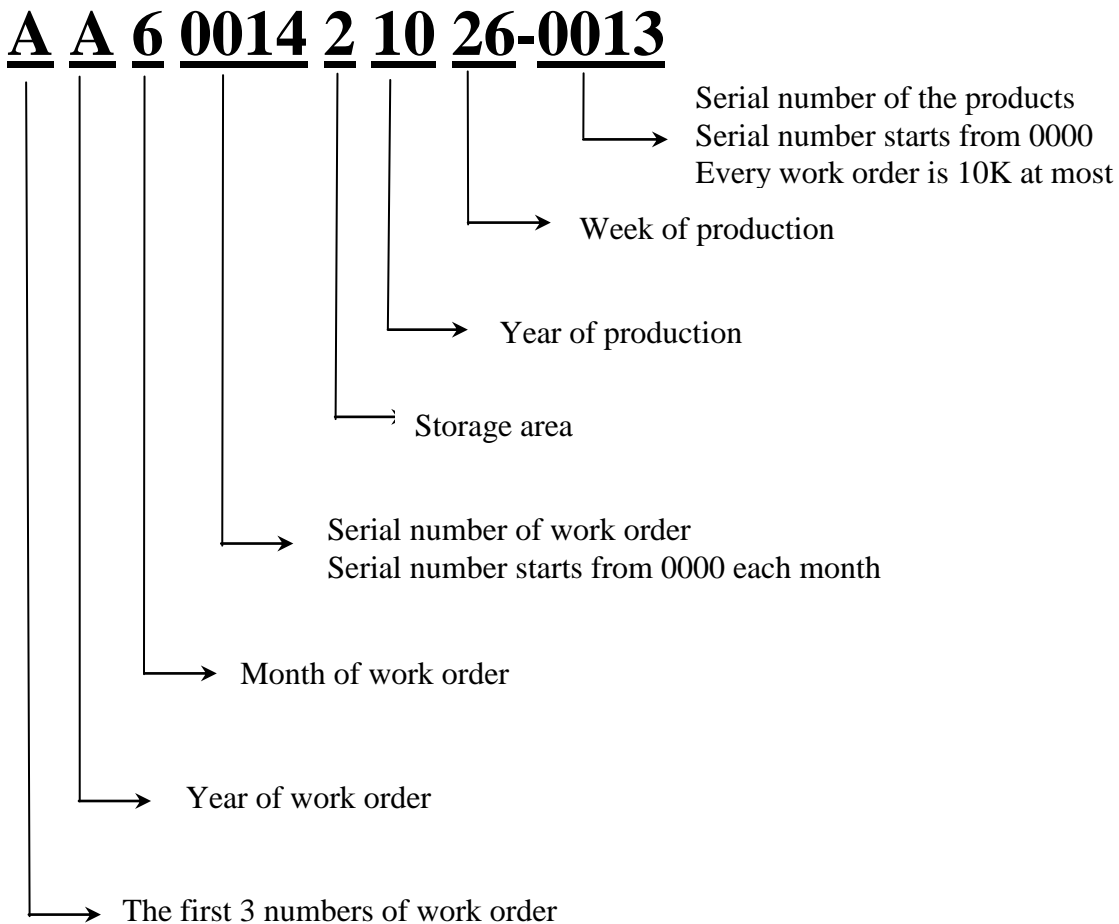
FX–Custom TFT Module
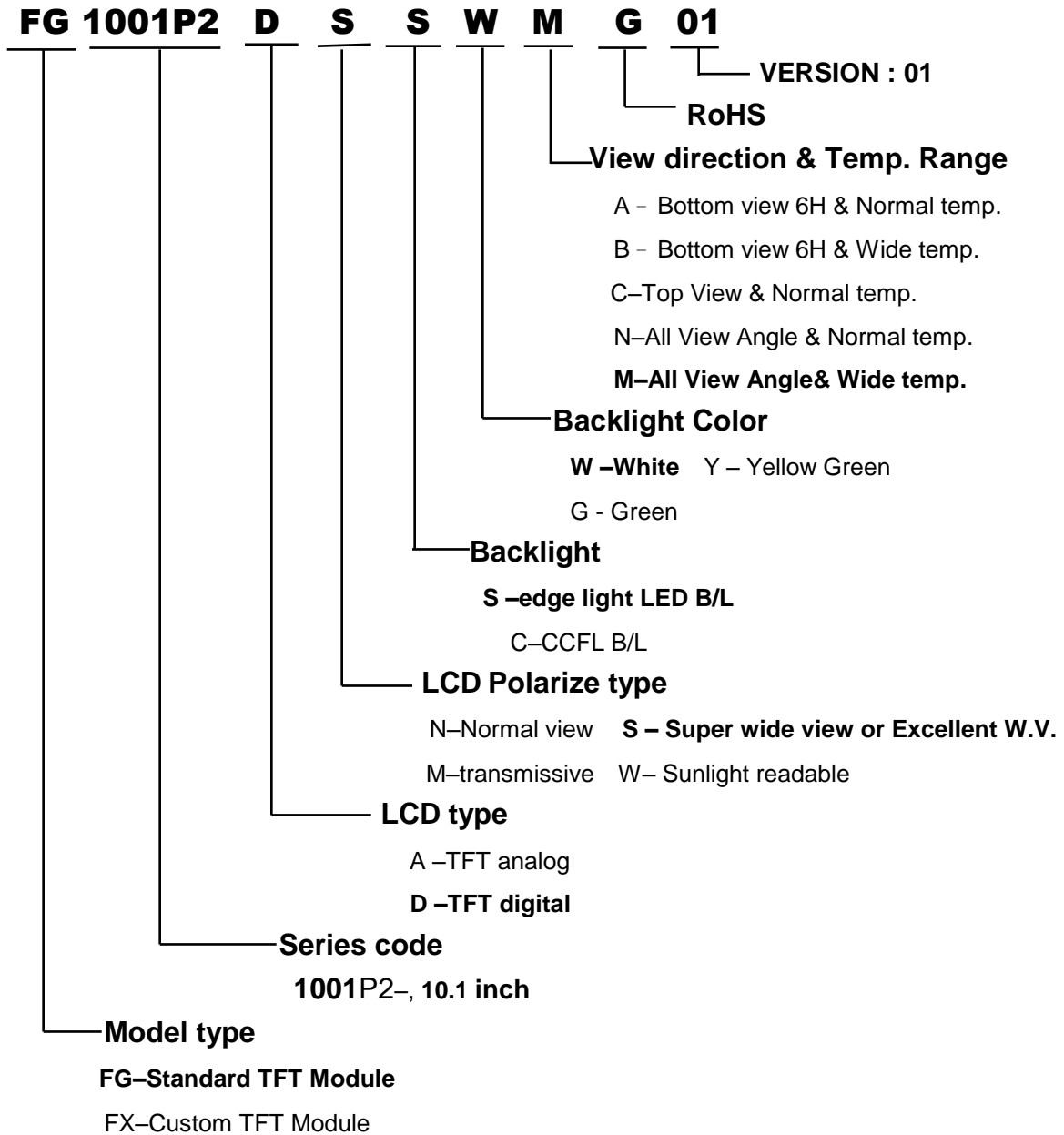
12. PRECAUTIONS IN USE LCM

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°C-40°C 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°C 90%RH
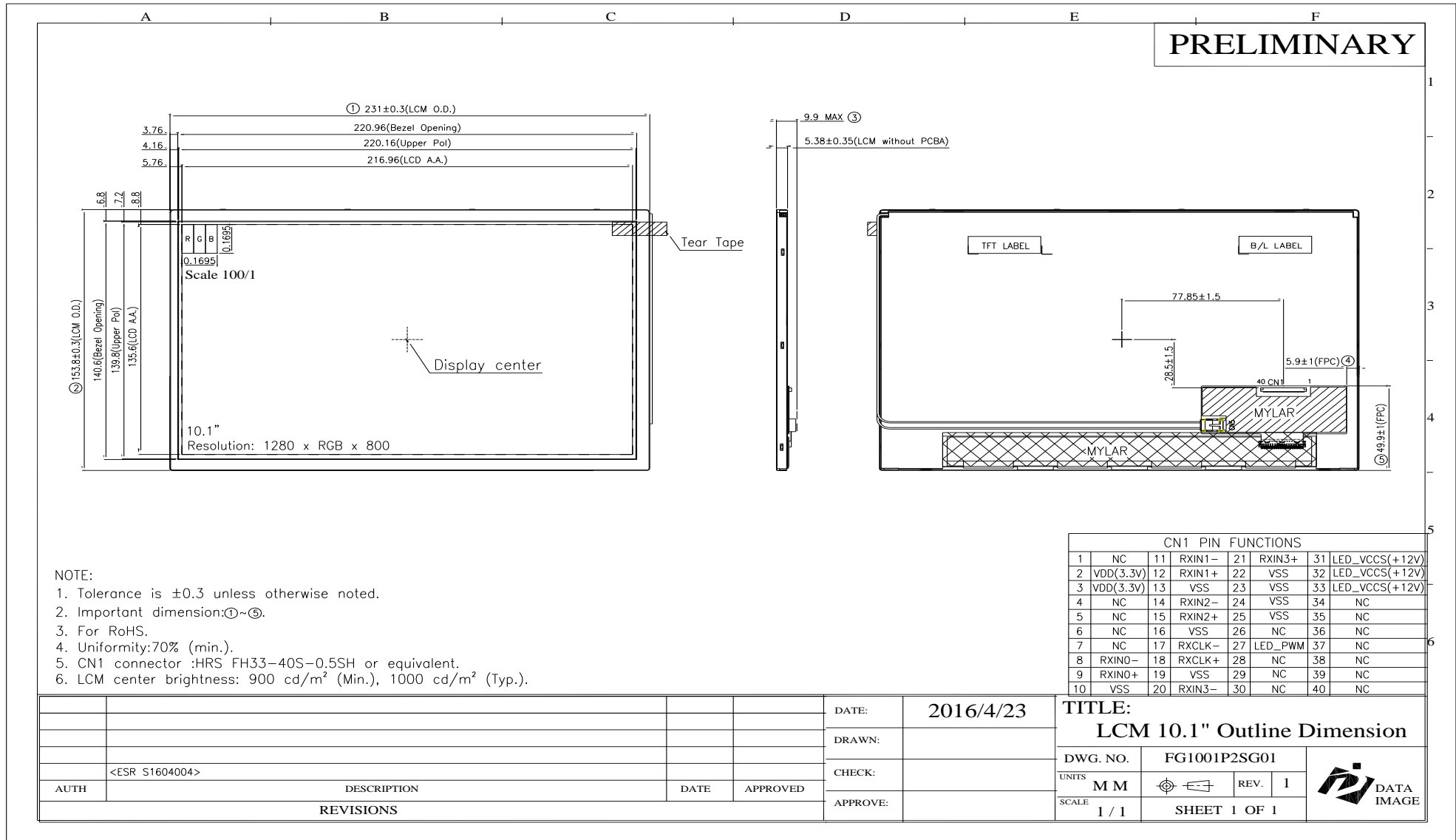   (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

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.)
   (4) Waste
    Liquid crystal module products shall not be arbitrarily discarded, the water and soil have a negative impact on the environment, the need to be handled by a qualified unit.

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.

13. OUTLINE DRAWING

PRELIMINARY

① 231±0.3(LCM O.D.)
220.96(Bezel Opening)
220.16(Upper Pol)
216.96(LCD A.A.)

3.76
4.16
5.76

6.8
7.2
8.8

9.9 MAX ③
5.38±0.35(LCM without PCBA)

R G B
0.1695
0.1695
Scale 100/1

② 153.8±0.3(LCM O.D.)
140.6(Bezel Opening)
139.8(Upper Pol)
135.6(LCD A.A.)

Tear Tape

Display center

10.1"
Resolution: 1280 x RGB x 800

TFT LABEL
B/L LABEL

77.85±1.5
28.5±1.5
5.9±1(FPC) ④
40 CN1   1
MYLAR
MYLAR
⑤ 49.9±1(FPC)

NOTE:
1. Tolerance is ±0.3 unless otherwise noted.
2. Important dimension: ①~⑤.
3. For RoHS.
4. Uniformity: 70% (min.).
5. CN1 connector : HRS FH33-40S-0.5SH or equivalent.
6. LCM center brightness: 900 cd/m² (Min.), 1000 cd/m² (Typ.).

CN1 PIN FUNCTIONS

1	NC	11	RXIN1−	21	RXIN3+	31	LED_VCCS(+12V)
2	VDD(3.3V)	12	RXIN1+	22	VSS	32	LED_VCCS(+12V)
3	VDD(3.3V)	13	VSS	23	VSS	33	LED_VCCS(+12V)
4	NC	14	RXIN2−	24	VSS	34	NC
5	NC	15	RXIN2+	25	VSS	35	NC
6	NC	16	VSS	26	NC	36	NC
7	NC	17	RXCLK−	27	LED_PWM	37	NC
8	RXIN0−	18	RXCLK+	28	NC	38	NC
9	RXIN0+	19	VSS	29	NC	39	NC
10	VSS	20	RXIN3−	30	NC	40	NC

AUTH		DESCRIPTION		DATE	APPROVED
	<ESR S1604004>				
		REVISIONS			

DATE: 2016/4/23
DRAWN:
CHECK:
APPROVE:

TITLE:
LCM 10.1" Outline Dimension

DWG. NO. FG1001P2SG01
UNITS M M   REV. 1
SCALE 1 / 1   SHEET 1 OF 1

DATA IMAGE

14. PACKAGE INFORMATION
TBD