



Colour TFT Display Modules

Product Specification

Part No. FG210500DSSWNG01

21.5" Colour TFT Display

For more information, please visit www.andersdx.com
or email info@andersdx.com

Version 1



Confidential Document

DATA IMAGE CORPORATION

TFT Module Specification

Preliminary

ITEM NO.: FG210500DSSWNG01

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	ALEX	PRETTY	DAVID	KEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	1	02/JUL/15'		26

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	02/JUL/15'			Initial Preliminary	ESR0405026

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	21.5 (diagonal)	inch
Display Format	1920(H) x (R,G,B) x 1080(V)	dot
Driver Element	a-si TFT active matrix	
Pixel Pitch	0.24825(H) x 0.24825(V)	mm
Active Area	476.64(W) x 268.11(H)	
Outline Dimension	495.6(W) x 292.2(H) x 11(D)	mm
Pixel Arrangement	RGB vertical stripe	
Surface treatment	AG type, 3H hard coating	
Display mode	Normally white	
Weight	1910(Typ.) / 2100(Max.)	g

4. ABSOLUTE MAXIMUM RATINGS

4.1 Absolute Ratings of Environment

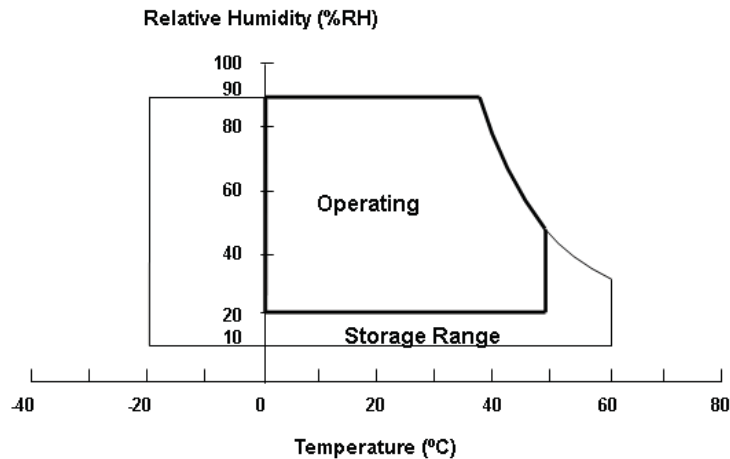
Parameter	Symbol	Min.	Max.	Unit	Remark
Storage temperature	Tst	-20	60	°C	Note1
Operating temperature	Top	0	50	°C	Note1,2

Note 1 : (a) 90 %RH Max. (Ta <= 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note 2 : The temperature of panel surface should be 0°C min. and 65°C max under Vcc=5.0V, fr =60Hz, typical LED string current, 25°C ambient temperature, and no humidity control . Any condition of ambient operating temperature ,the surface of active area should be keeping not higher than 65°C



4.2 Electrical Absolute Ratings

4.2.1 TFT-LCD MODULE

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VCCS	-0.3	+6.0	V	Note1
	VIN	-0.3	+3.6	V	

4.2.2 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Forward Current Per Input Pin	IF	-	65	69	mA	Note1, 2 Duty=100%
LED Pulse Forward Current Per Input Pin	IP	-	-	150	mA	Note1, 2 Pulse Width \leq 10msec. and Duty \leq 0%

Note 1 : Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note 2 : Specified values are for input pin of LED light bar at $T_a=25\pm 2^\circ\text{C}$

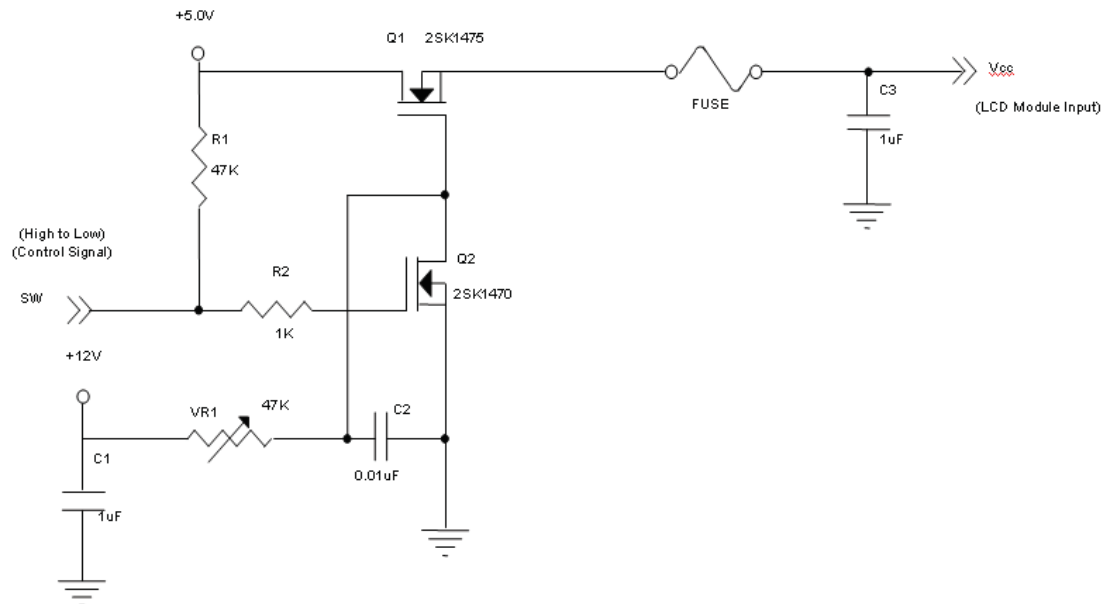
5. ELECTRICAL CHARACTERISTICS

5.1 Operating Conditions

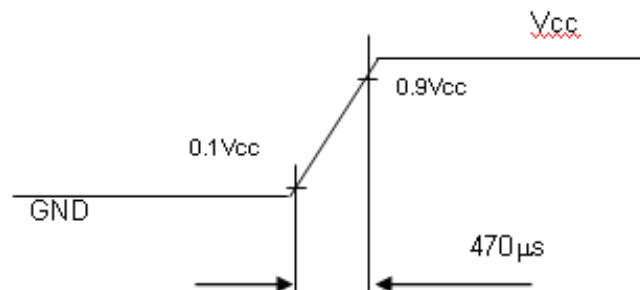
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VCC	4.5	5.0	5.5	V	-
Ripple Voltage	VRP	-	-	300	mV	-
Rush Current	IRUSH	-	-	3	A	Note2
AC off Rush Current	Ioff_RUSH	-	-	4	A	Note5
Power Supply Current	White	-	0.39	0.45	A	Note3(a)
	Black	-	1.17	1.45	A	Note3(b)
	Vertical Stripe	-	0.75	1.00	A	Note3(c)
Power Consumption	PLCD	-	5.85	7.97	Watt	Note4
LVDS differential input voltage	Vid	100	-	600	Mv	
LVDS common input voltage	vic	0.05	-	2.35	V	

Note 1: The ambient temperature is $T_a = 25 \pm 2^\circ\text{C}$.

Note 2: Measurement Conditions:



Vcc rising time is 470μs



Note 3: The specified power supply current is under the conditions at $V_{CC} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $F_r = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



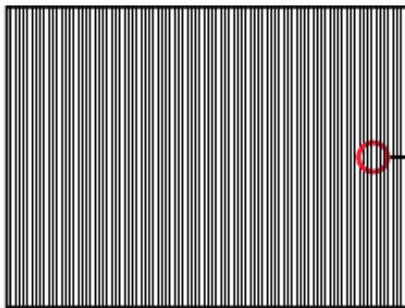
Active Area

b. Black Pattern

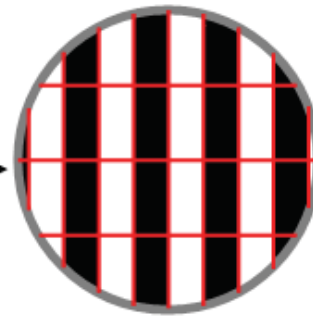


Active Area

c. Vertical Stripe Pattern



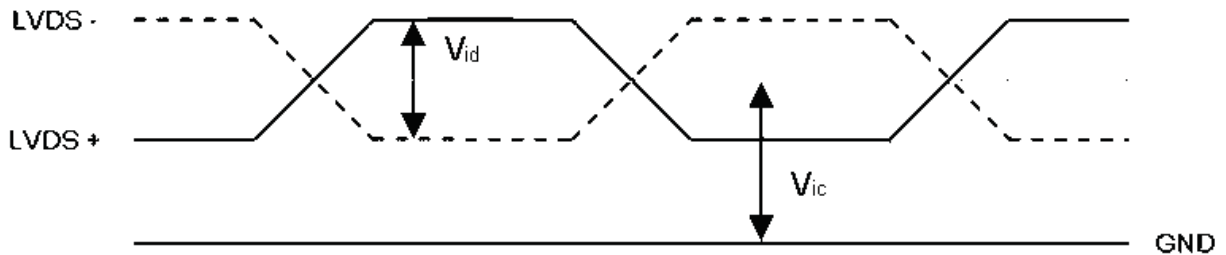
Active Area



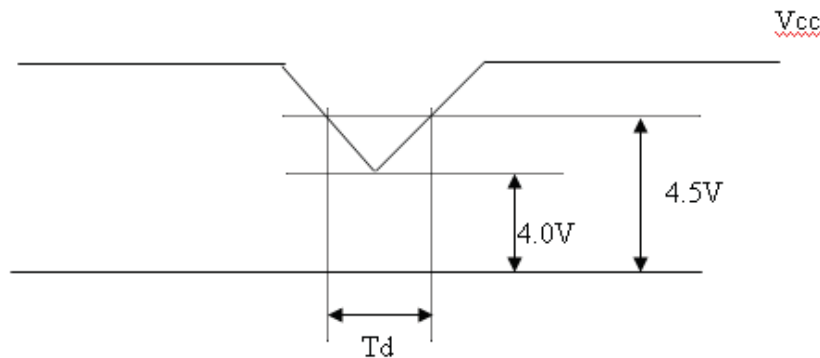
Note 4: The power consumption is specified at the black pattern with the maximum current.

Note 5: The Rush current would be happened when system doesn't follow Power sequence in AC off status.

Note 6: VID waveform condition.



5.2 VCC Dip Condition



5.2 Backlight Unit

 $T_a = 25 \pm 2 \text{ }^\circ\text{C}$

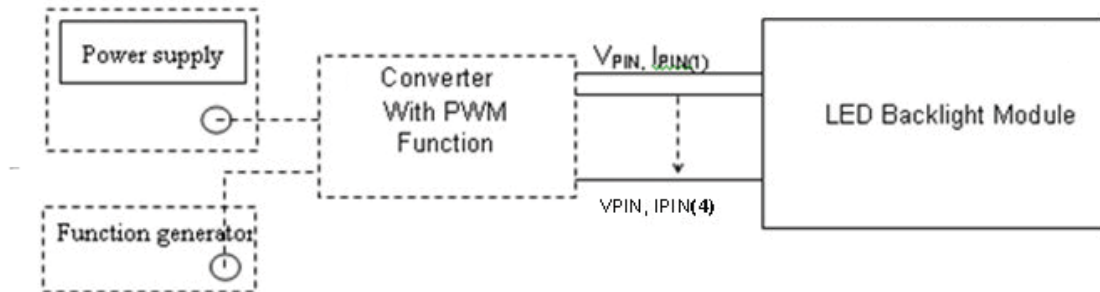
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Light Bar Input Voltage Per Input Pin	V_{PIN}	-	34.1	37.4	V	Note1 Duty=100%, $I_{PIN}=(65\text{mA})$
LED Light Bar Current Per Input Pin	I_{PIN}	-	65	69	mA	Note1,2 Duty=100%
Power Consumption	P_L	-	8.87	10.32	W	Note1 Duty=100%, $I_{PIN}=(65\text{mA})$
LED Dice Life Time	L_{BL}	40000	-	-	Hrs	Note3

Note 1 : LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note 2 : $P_{BL} = I_{PIN} \times V_{PIN} \times (4) \text{ input pins}$,

Note 3 : The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ and $I = (65)\text{mA}$ (per chip) until the brightness becomes $\pm 50\%$ of its original value.

Note 4 : The max ΔV_f is 3.3V between each string.



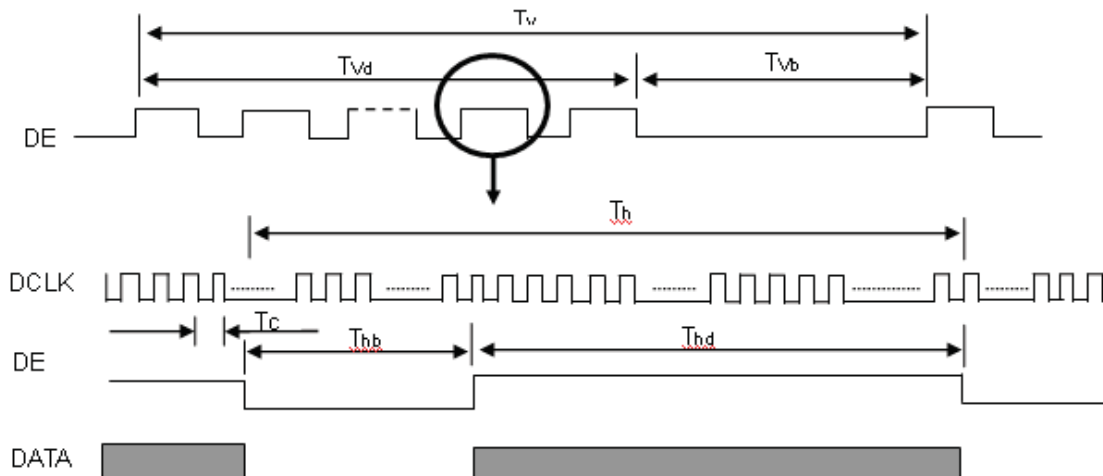
6. INPUT SIGNAL CHARACTERISTICS

6.1 Signal Timing

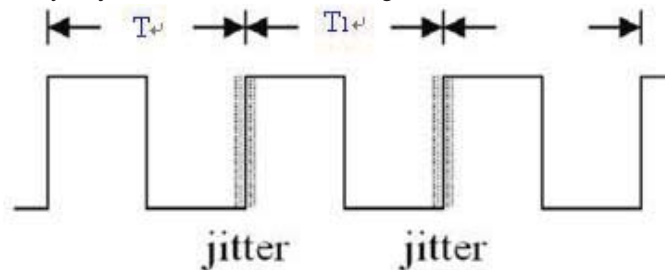
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	58.54	74.25	97.98	MHZ	
	Period	Tc	-	13.47	-	ns	
	Input cycle to cycle jitter	Trcl	-	-	200	ns	Note1
	Input Clock to data skew	TLVCCS		-	400	ps	Note2
	Spread spectrum Modulation range	Fclkin_mod	Fc*98%	-	Fc*102%	MHZ	Note3
	Spread spectrum Modulation frequency	FSSM		-	200	KHZ	
Vertical Display Term	Frame Rate	Fr	50	60	75	HZ	
	Total	Tv	1115	1125	1136	Th	Tv=Tvd+Tvb
	Active Display	Tvd	1080	1080	1080	Th	
	Blank	Tvb	Tv-Tvd	45	Tv-Tvd	Th	
Horizontal Display Term	Total	Th	1050	1100	1150	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	
	Blank	Thb	Th-Thd	140	Th-Thd	Tc	

Note : Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored

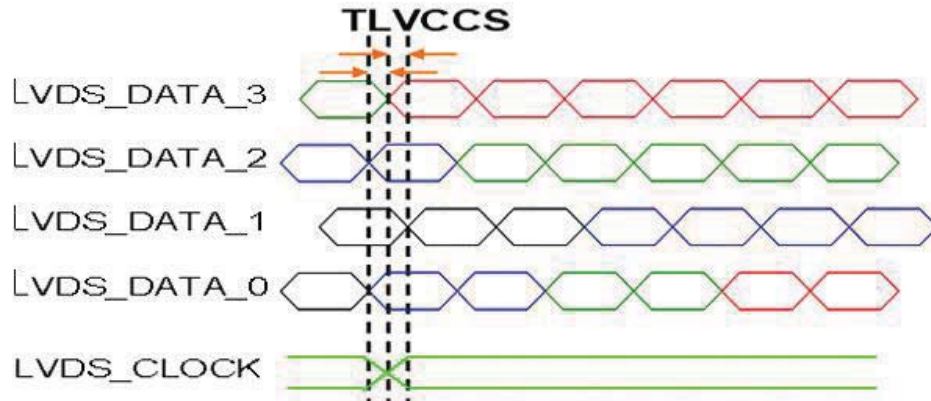
INPUT SIGNAL TIMING DIAGRAM



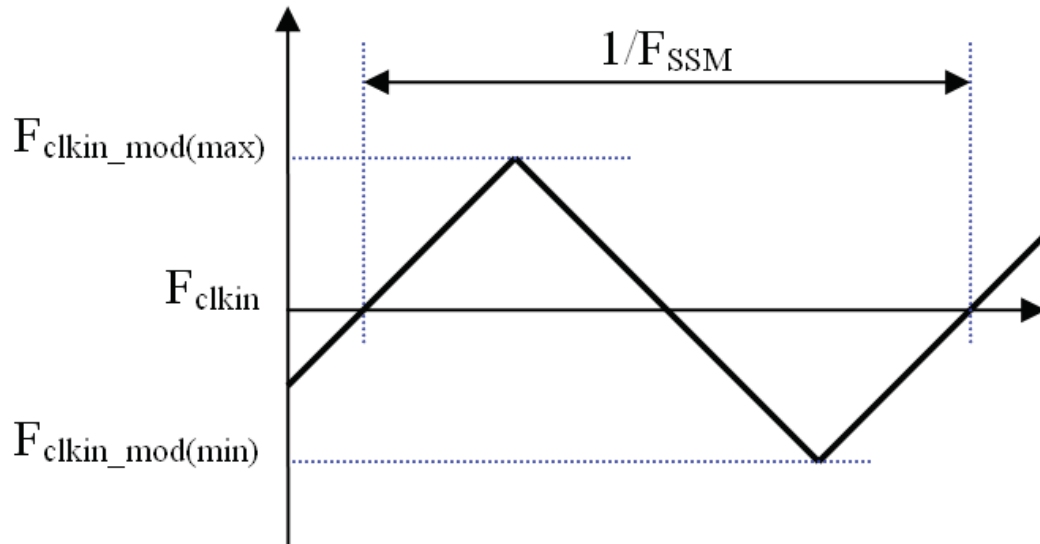
Note 1 : The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_2|$



Note 2 : Input Clock to data skew is defined as below figures.



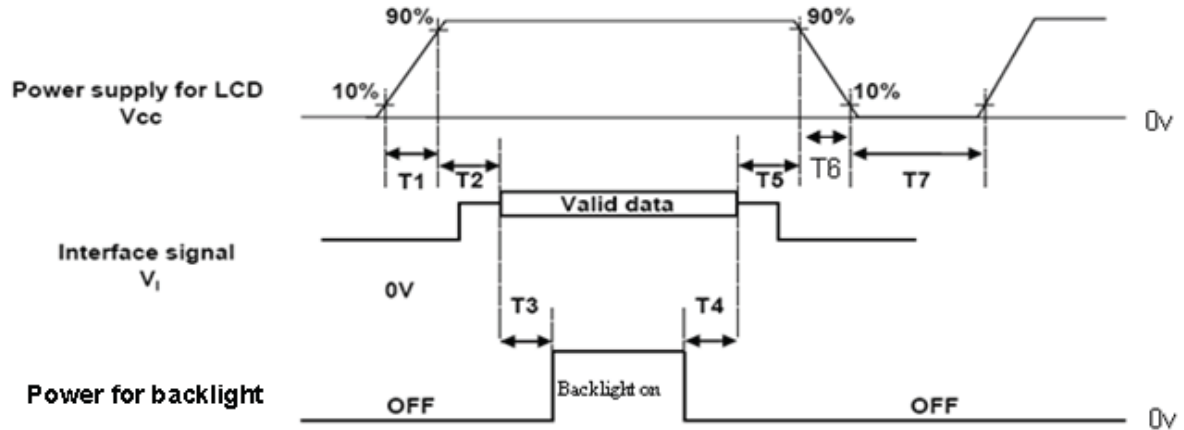
Note 3 : The SSCG (Spread spectrum clock generator) is defined as below figures.



Note 4 The DCLK range at last line of V-blanking should be set in 0 to Hdisplay/2

6.2 Power On/Off Sequence

The power sequence specifications are shown as the following table and diagram.



Parameters	Min.	Typ.	Max.	Units
T1	0.5	-	10	ms
T2	0	-	50	
T3	450	-	-	
T4	90	-	-	
T5	0	-	50	
T6	5	-	150	
T7	500	-	-	

- Note 1 : The supply voltage of the external system for the module input should be the same as the definition of Vcc.
- Note 2 : When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.
- Note 3 : In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.
- Note 4 : T4 should be measured after the module has been fully discharged between power off and on period.
- Note 5 : Interface signal shall not be kept at high impedance when the power is on.
- Note 6 : DI won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- Note 7 : There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

6.3 LVDS Input Signal Specifications

6.3.1 LVDS Data Mapping Table

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB60	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

6.3.2 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

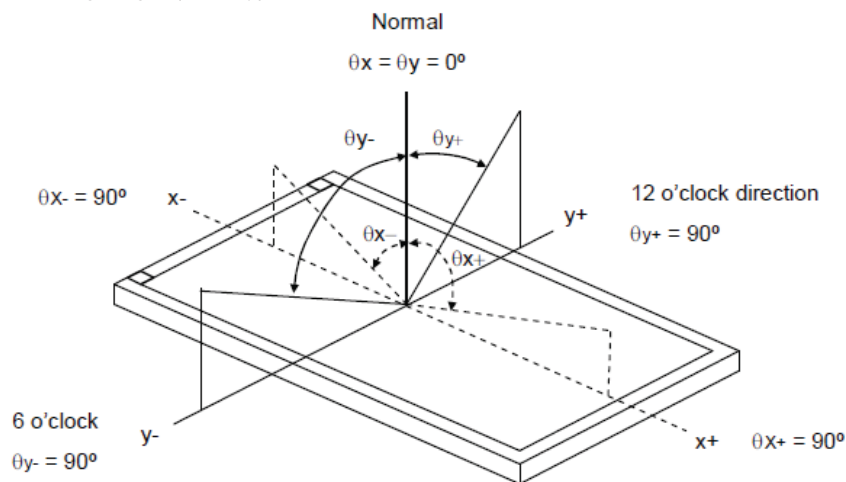
Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
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	Green(253)	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	
	Green(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
Green(255)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	
Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1		

Note : 0: Low Level Voltage, 1: High Level Voltage

7. OPTICAL CHARACTERISTIC

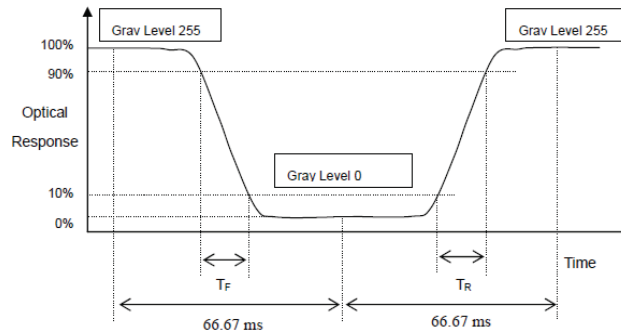
Parameter	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	5	V
Input Signal	According to typical value in "5. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	IPIN	65 ± 1.95	mADC
PWM Duty Ratio	D	100	%

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks	
Viewing Angle	Horizontal	Θ_{x-} - $+\Theta_{x+}$	(CR≥10)	150	170	-	deg	Note 1,5
	Vertical	Θ_{y-} - $+\Theta_{y+}$		140	160	-		
	Horizontal	Θ_{x-} - $+\Theta_{x+}$	(CR≥5)	160	178	-		
	Vertical	Θ_{y-} - $+\Theta_{y+}$		150	170	-		
Contrast Ratio	CR	$\theta_x = \theta_y = 0^\circ$	700	1000	-	-	Note 2,5	
Response time	Tr		-	1.5	2.5	ms	Note 3	
	Tf		-	3.5	5.5			
Uniformity	B-uni		75	-	-	%	Note 5,6	
Brightness	L		200	250	-	cd/m ²	Note 4,5	
Chromaticity		Center $\theta_x = \theta_y = 0^\circ$	Typ. -0.03	0.635	Typ. +0.03	-	Note 1,5	
				0.352				
				0.321				
				0.633				
				0.151				
				0.052				
				0.313				
	0.329							

 Note 1 : Definition of Viewing Angle (Θ_x , Θ_y) :


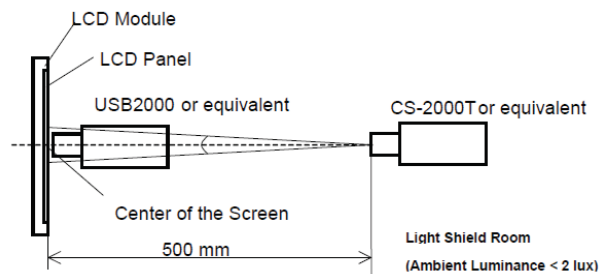
Note 2 : Definition of Contrast Ratio (CR) :
 The contrast ratio can be calculated by the following expression :
 Contrast Ratio (CR) = L255 / L0
 L255: Luminance of gray level 255
 L 0: Luminance of gray level 0
 CR = CR (5)
 CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 6.

Note 3 : Definition of Response Time (TR, TF) :

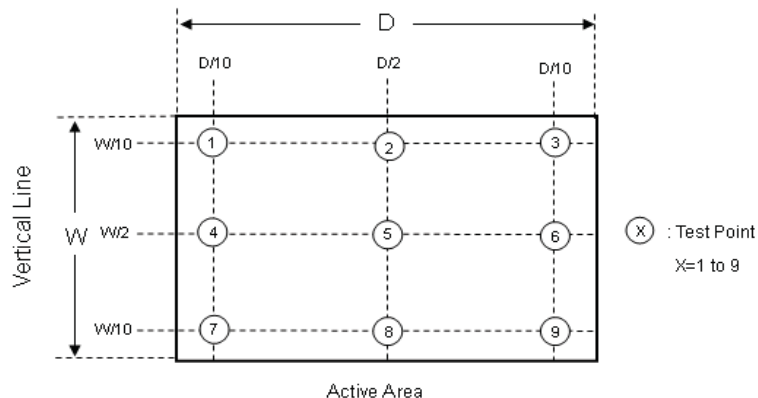


Note 4 : Definition of Center Point Luminance of White (LCP) :
 Measure the luminance of gray level 255 at center point
 $L_{CP} = L(5)$
 L (x) is corresponding to the luminance of the point X at Figure in Note 6.

Note 5 : Measurement Setup :
 The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note 6 : Definition of White Variation (δW) :
 Measure the luminance of gray level 255 at 9 points
 $\delta W_{9p} = \{ \text{Minimum} [L(1) \sim L(9)] / \text{Maximum} [L(1) \sim L(9)] \} * 100\%$
 Horizontal Line



8. PIN CONNECTIONS

8.1 TFT-LCD

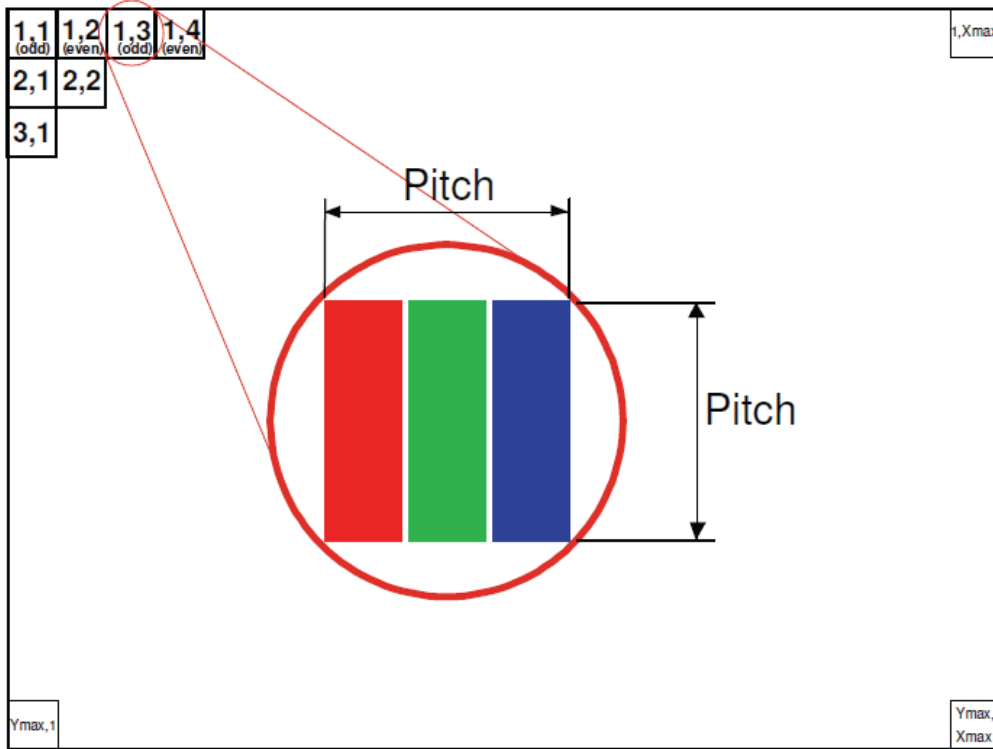
Pin No	Symbol	Function	Remark
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)	
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)	
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)	
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)	
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)	
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)	
7	GND	Ground	
8	RXOC-	Negative LVDS differential clock input. (odd)	
9	RXOC+	Positive LVDS differential clock input. (odd)	
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)	
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)	
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)	
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)	
14	GND	Ground	
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)	
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)	
17	GND	Ground	
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)	
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)	
20	RXEC-	Negative LVDS differential clock input. (even)	
21	RXEC+	Positive LVDS differential clock input. (even)	
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)	
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)	
24	GND	Ground	
25	NC	For LCD internal use only, Do not connect	
26	NC		
27	NC		
28	Vcc	+5.0V power supply	
29	Vcc		
30	Vcc		

Note 1 : Connector Part No.:
Fullconn WF13-422-3033 or P-Two 187098-30091 or Foxconn GS23302-0311R-7H or equivalent

Note 2 : User's connector Part No:
Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)
Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

Note 3 : The first pixel is odd.

Note 4 : Input signal of even and odd clock should be the same timing.



8.2 LIGHTBAR Connector Pin Assignment

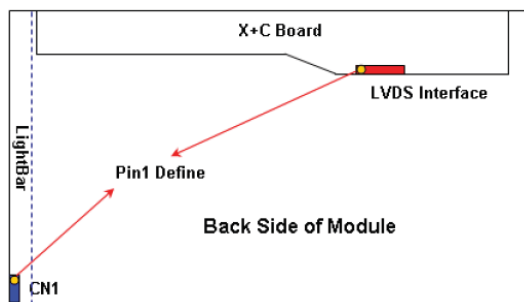
CN1

Pin No	Symbol
1	Cathode of LED string
2	Cathode of LED string
3	VLED
4	VLED
5	Cathode of LED string
6	Cathode of LED string

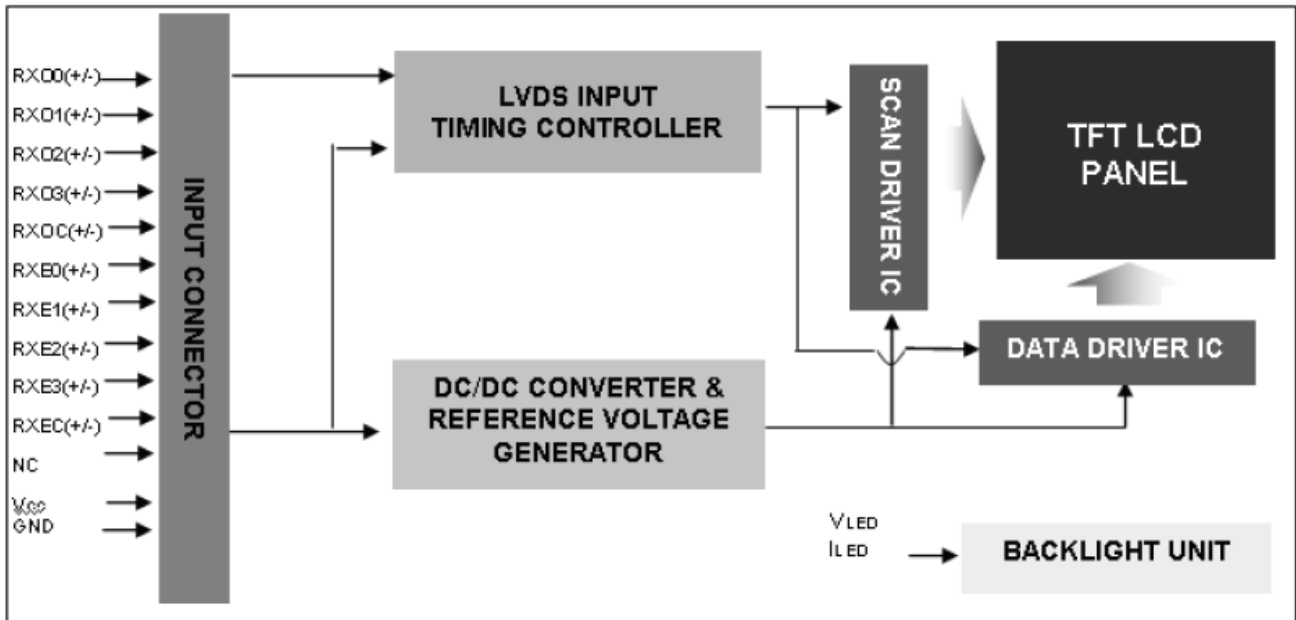
Note 1 : Connector(wire type):FCN(WM13-406-063N) or Entery(3707K-Q06N-08L) or CviLux(CI1406M1HRK-NH) or equivalent.

Note 2 : User's mating connector part No.:

FCN(WF1300106-B) or Entery(H112K-P06N-01B or M001-E11N-00R) or CviLux(CI1406SL000-NH) and hook width must be less than 4.5mm.



9. BLOCK DIAGRAM



10. QUALITY ASSURANCE

10.1 Test Condition

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

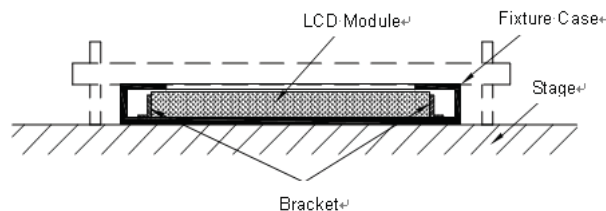
Reliability Test Item & Level		Test Level	Remark
No.	Test Item		
1	High Temperature Storage Test	Ta=60°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	Ta=-20°C,240hrs	IEC68-2-1
3	High Temperature Operation Test	Ta=50°C,240hrs	IEC68-2-2
4	Low Temperature Operation Test	Ta=0°C,240hrs	IEC68-2-1
5	Thermal Cycling Test (No operation)	-20°C, 0.5hour→25°C/5 min →60°C, 0.5hour; 100cycles	IEC68-2-14
6	High Temperature and High Humidity Operation Test	T=50°C,80% RH,240hrs	IEC68-2-3
7	ESD TEST	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 8kV Air +/-15kV Criteria: Class C	IEC-61000-4-2
8	Vibration Test (No operation)	1.5G / 10-300 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	IEC60068-2-32
9	Shock Test (non-operating)	Acceleration: 50 G Wave: Half-sine Active time: 11ms Direction: one time for each Axis (X, Y, Z)	IEC68-2-6

Note 1 : Criteria : Normal display image with no obvious non-uniformity and no line defect.

Note 2 : Evaluation should be tested after storage at room temperature for more than two hours.

Note 3 : At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:



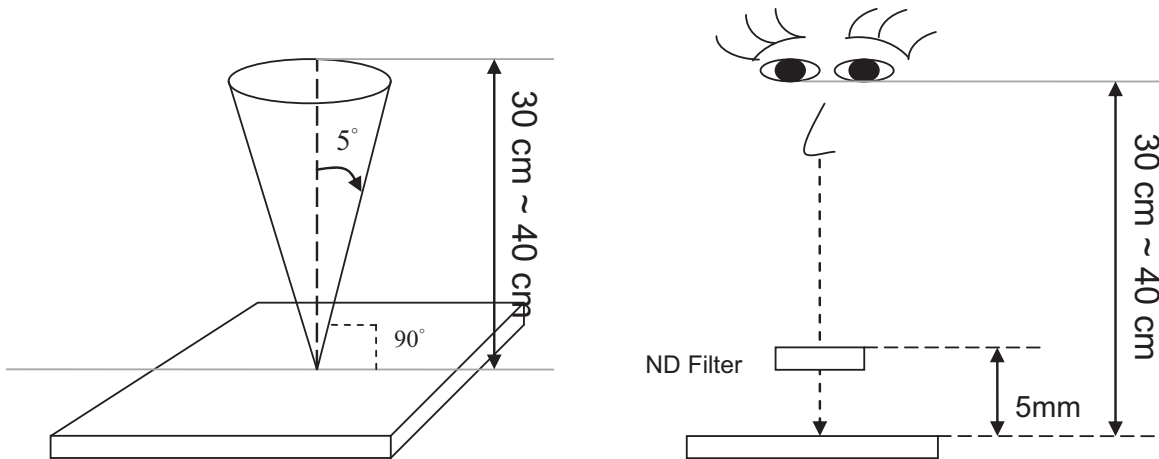
10.2 Inspection condition

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 : $\pm 5^\circ$
- (2) Inspection under non-operating condition : $\pm 45^\circ$



10.2.2 Environment conditions :

Ambient Temperature :		25±5°C
Ambient Humidity :		65±5%
Ambient Illumination	Cosmetic Inspection	more than 600 lux
	Functional Inspection	300 ~ 800 lux

10.2.3 Definition of applicable Zones



10.2.4 Inspection Parameters

No.	Parameter	Criteria																
1	Operating	Display function: No Display malfunction (Major)																
		Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major)																
		Point Defect: Active area ≤ 8 dots (Minor) (Note:1)																
		<table border="1"> <thead> <tr> <th colspan="2" rowspan="2">Item</th> <th>Acceptable number</th> <th rowspan="2">Total</th> </tr> <tr> <th>Active Area</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Bright</td> <td>Random</td> <td>4</td> <td rowspan="4">8</td> </tr> <tr> <td>Two dots adjacent</td> <td>1</td> </tr> <tr> <td rowspan="2">Dark</td> <td>Random</td> <td>4</td> </tr> <tr> <td>Two dots adjacent</td> <td>2</td> </tr> </tbody> </table>	Item		Acceptable number	Total	Active Area	Bright	Random	4	8	Two dots adjacent	1	Dark	Random	4	Two dots adjacent	2
		Item			Acceptable number		Total											
				Active Area														
Bright	Random	4	8															
	Two dots adjacent	1																
Dark	Random	4																
	Two dots adjacent	2																
Non-uniformity: Visible through 2 %ND filter White , R , G ,B and gray 50% pattern. (Minor)																		
Foreign material in Black or White spots shape ($W > 1/4L$)																		
<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th rowspan="4">Class of Defects Minor</th> </tr> </thead> <tbody> <tr> <td>$D > 0.5$</td> <td>0</td> </tr> <tr> <td>$0.3 < D \leq 0.5$</td> <td>5</td> </tr> <tr> <td>$0.3 \leq D$</td> <td>*</td> </tr> </tbody> </table> <p style="text-align: center;">$D = (\text{Long} + \text{Short}) / 2$ *: Disregard</p>	Zone Dimension	Acceptable number	Class of Defects Minor	$D > 0.5$	0	$0.3 < D \leq 0.5$	5	$0.3 \leq D$	*									
Zone Dimension	Acceptable number	Class of Defects Minor																
$D > 0.5$	0																	
$0.3 < D \leq 0.5$	5																	
$0.3 \leq D$	*																	
Foreign Material in Line or spiral shape ($W \leq 1/4L$) (Note: 4)																		
<table border="1"> <thead> <tr> <th>Zone L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th rowspan="4">Class of Defects Minor</th> </tr> </thead> <tbody> <tr> <td>$L > 10$</td> <td>$W > 0.1$</td> <td>0</td> </tr> <tr> <td>$L \leq 10$</td> <td>$0.05 < W \leq 0.1$</td> <td>5</td> </tr> <tr> <td>$L \leq 10$</td> <td>$W \leq 0.05$</td> <td>*</td> </tr> </tbody> </table> <p style="text-align: center;">L : Length W : Width * : Disregard</p>	Zone L (mm)	Zone W(mm)	Acceptable number	Class of Defects Minor	$L > 10$	$W > 0.1$	0	$L \leq 10$	$0.05 < W \leq 0.1$	5	$L \leq 10$	$W \leq 0.05$	*					
Zone L (mm)	Zone W(mm)	Acceptable number	Class of Defects Minor															
$L > 10$	$W > 0.1$	0																
$L \leq 10$	$0.05 < W \leq 0.1$	5																
$L \leq 10$	$W \leq 0.05$	*																
2	External Inspection (non-operating)	Dimension: Outline (Major)																
		Bezel appearance: uneven (Minor)																
		Scratch on the polarize: (Note:2)																
		<table border="1"> <thead> <tr> <th>Zone L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td>$L > 10$</td> <td>$W > 0.1$</td> <td>0</td> <td>Minor</td> </tr> </tbody> </table>	Zone L (mm)	Zone W(mm)	Acceptable number	Class of Defects	$L > 10$	$W > 0.1$	0	Minor								
Zone L (mm)	Zone W(mm)	Acceptable number	Class of Defects															
$L > 10$	$W > 0.1$	0	Minor															

		<table border="1"> <tr> <td>$L \leq 10$</td> <td>$0.05 < W \leq 0.1$</td> <td>5</td> </tr> <tr> <td>$L \leq 10$</td> <td>$W \leq 0.05$</td> <td>*</td> </tr> </table> <p style="text-align: center;">L : Length W : Width * : Disregar</p>	$L \leq 10$	$0.05 < W \leq 0.1$	5	$L \leq 10$	$W \leq 0.05$	*				
$L \leq 10$	$0.05 < W \leq 0.1$	5										
$L \leq 10$	$W \leq 0.05$	*										
		<p>Dent or bubble on the polarize (Note:2)</p> <table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td>$D > 0.5$</td> <td>0</td> <td rowspan="3" style="text-align: center;">Minor</td> </tr> <tr> <td>$0.3 < D \leq 0.5$</td> <td>5</td> </tr> <tr> <td>$0.3 \leq D$</td> <td>*</td> </tr> </tbody> </table> <p style="text-align: center;">$D = (\text{Long} + \text{Short}) / 2$ *: Disregar</p>	Zone Dimension	Acceptable number	Class of Defects	$D > 0.5$	0	Minor	$0.3 < D \leq 0.5$	5	$0.3 \leq D$	*
Zone Dimension	Acceptable number	Class of Defects										
$D > 0.5$	0	Minor										
$0.3 < D \leq 0.5$	5											
$0.3 \leq D$	*											
		Polarizer flaw or leak out resin : Defect is defined as the active area.										
3	Others	Issues which is not defined defect :defect must be visible through 2% ND Filter.										

Class of defects	Definition	
	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 dot respectively

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

(c)Definition of distribution of point defect is as follows:

-minum separation between dark point defects should be larger than 5mm.

-minum separation between bright point defects should be larger than 5mm.

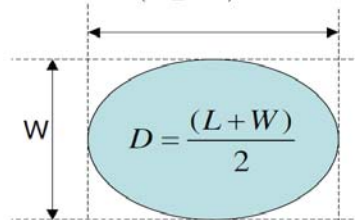
Note:2 The external inspection should be conducted at the distance 35 ± 5 cm between the eyes of inspctor and the panel .

Note:3 Luminance measurement for contrast ratio is at the distance 50 ± 5 cm between the detective head and the panel with ambient illuminance 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 ($W \geq L/4$)



10.2.5 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: MIL-STD-105E

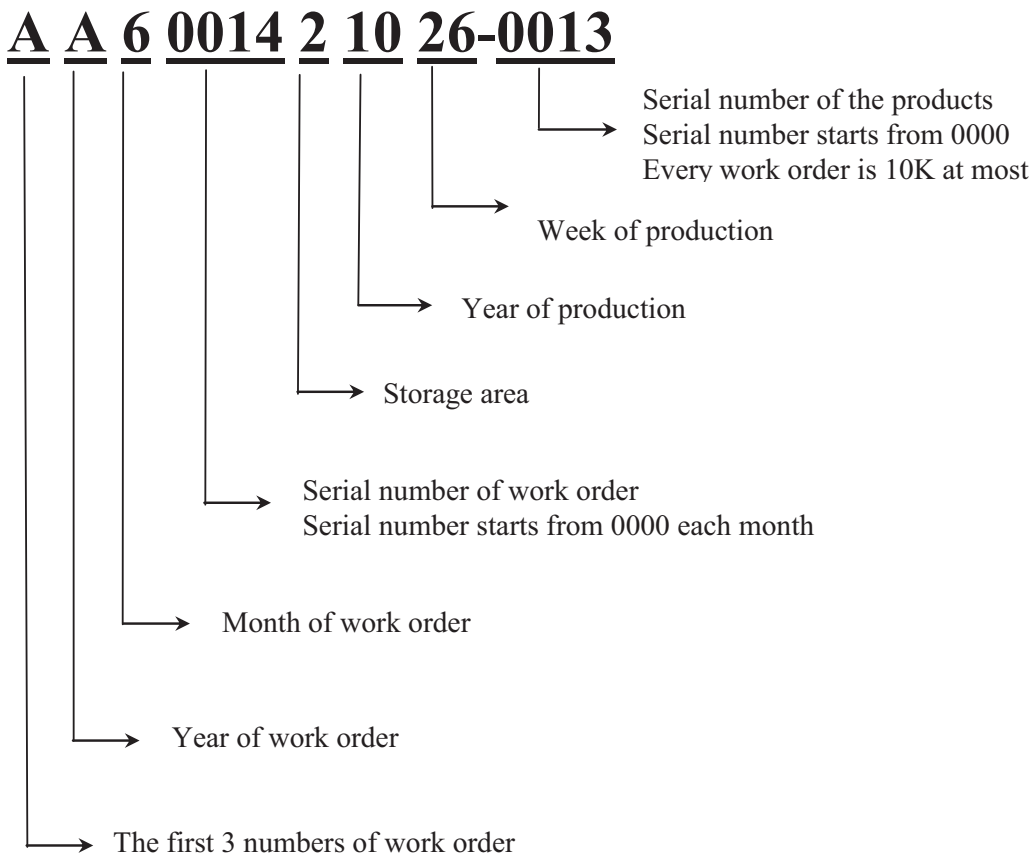
Inspection level: Level II

11. LCM PRODUCT LABEL DEFINE

Product Label style:



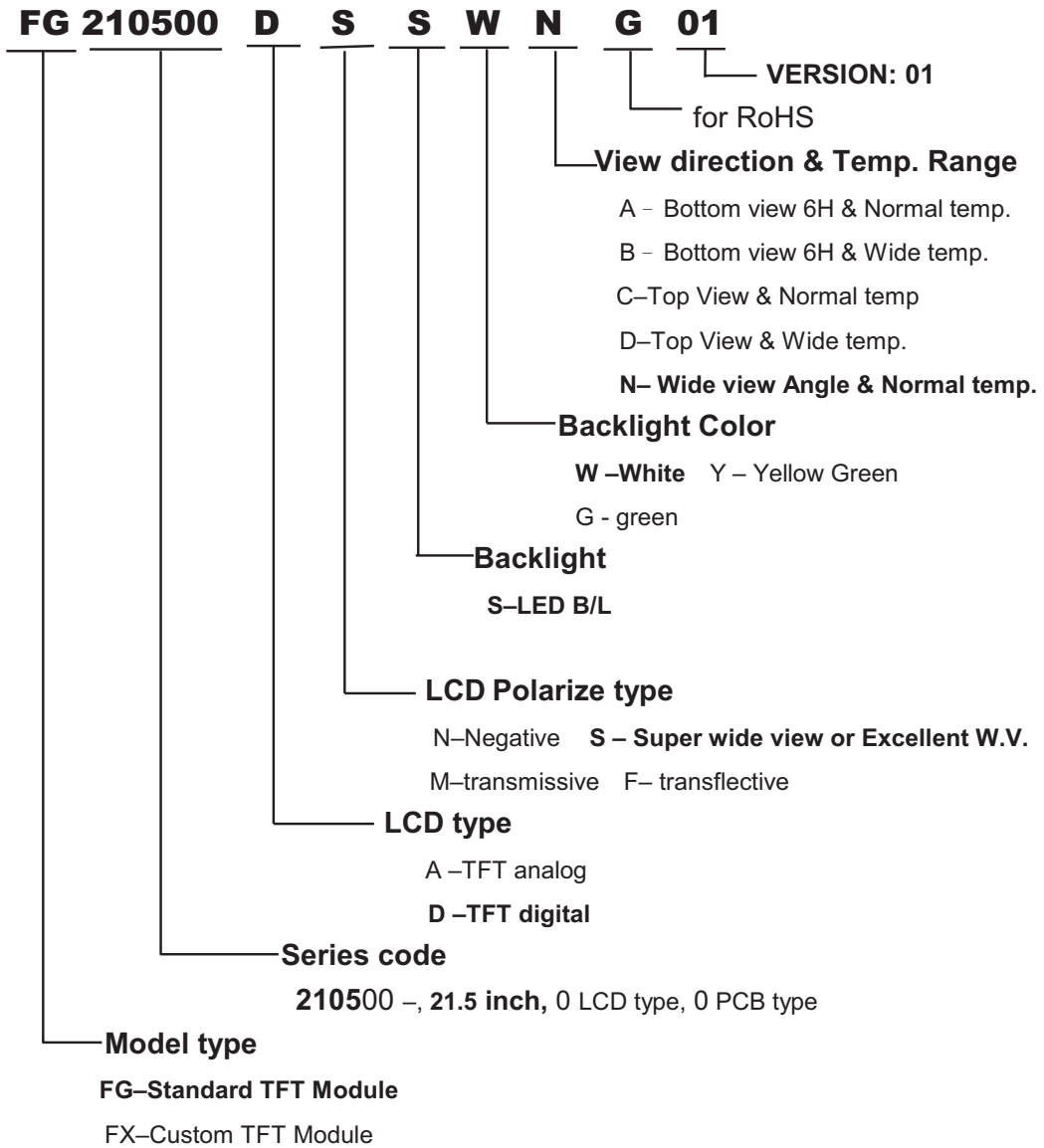
BarCode Define:





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Product Name Define:



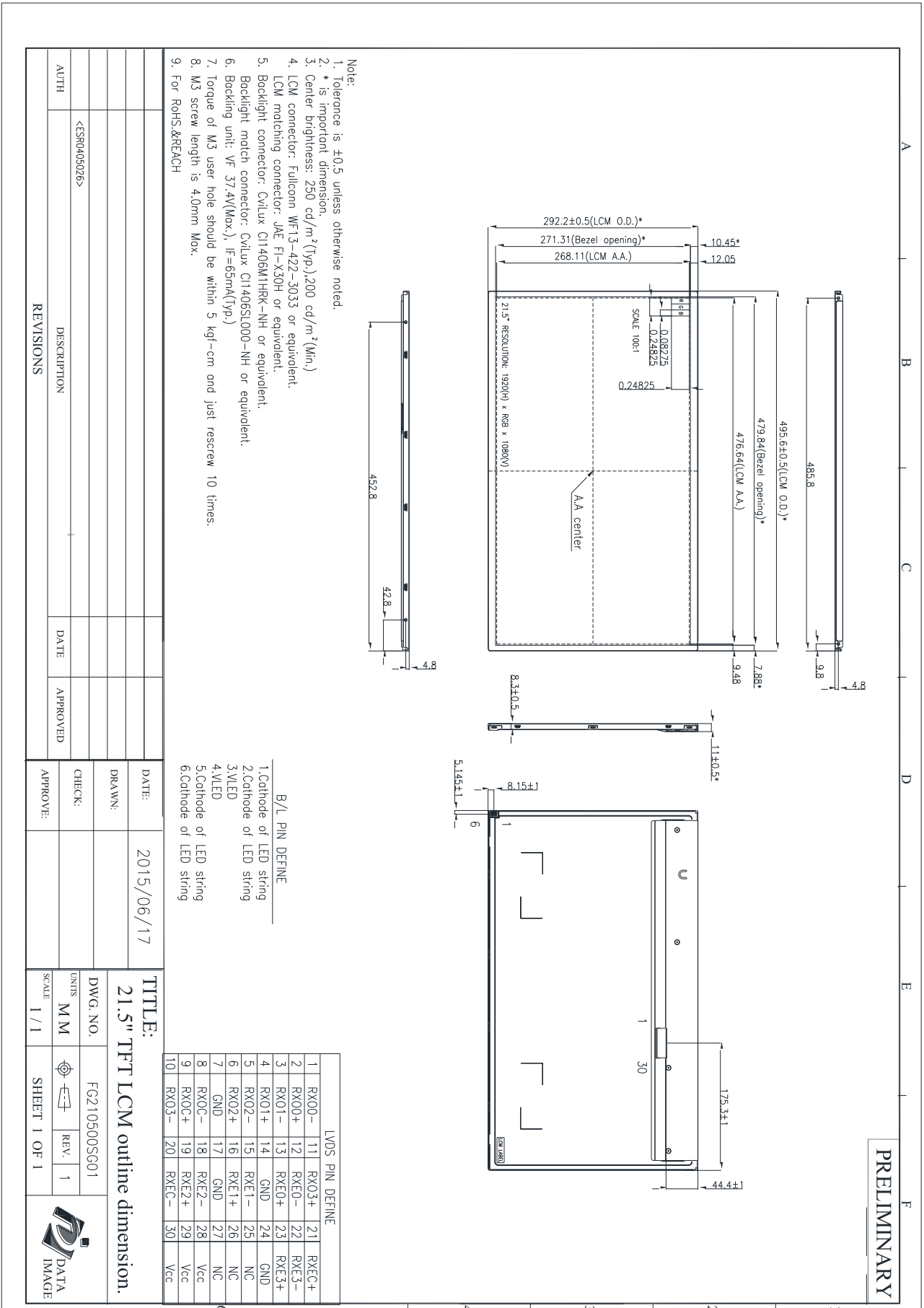


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12. PRECAUTIONS IN USE LCM

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.
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 and 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.



- Note:
1. Tolerance is: ±0.5 unless otherwise noted.
 2. * is important dimension.
 3. Center brightness: 250 cd/m²(Typ.) 200 cd/m²(Min.)
 4. LCM connector: Fullcon WF13-422-3033 or equivalent.
 5. LCM matching connector: JAE F-X30H or equivalent.
 6. Backlight match connector: Cvilux C11406M1HRK-NH or equivalent.
 7. Backlight unit: VF 37.4V(Max.), I=65mA(Typ.)
 8. Torque of M3 user hole should be within 5 kgf-cm and just rescrew 10 times.
 9. M3 screw length is 4.0mm Max.
 9. For ROHS&REACH

- B/L PIN DEFINE
1. Cathode of LED string
 2. Cathode of LED string
 3. VLED
 4. VLED
 5. Cathode of LED string
 6. Cathode of LED string

LVDS PIN DEFINE					
1	RX00-	11	RX03+	21	RXEC+
2	RX00+	12	RXE0-	22	RXE3-
3	RX01-	13	RXE0+	23	RXE3+
4	RX01+	14	GND	24	GND
5	RX02-	15	RXE1-	25	NC
6	RX02+	16	RXE1+	26	NC
7	GND	17	GND	27	NC
8	RX0C-	18	RXE2-	28	Vcc
9	RX0C+	19	RXE2+	29	Vcc
10	RX03-	20	RXE3-	30	Vcc

AUTH		DESCRIPTION		DATE	APPROVED	DATE:	2015/06/17	TITLE:		21.5" TFT LCM outline dimension.
<ESR0405026>						DRAWN:		DWG. NO.		FG210500SG01
						CHECK:		UNITS		MM
						APPROVE:		SCALE		1 / 1
REVISIONS								SHEET		1 OF 1
								DATA IMAGE		



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14. PACKAGE INFORMATION

TBD