



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-640480ETMQW-00H(R)
APPROVED BY	
DATE	

- Approved For Specifications
 Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2011/07/07	--	New Release	Rober

1. INTRODUCTION

This is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device. This model is composed of a 10.4 inch TFT-LCD panel, a driving circuit and LED backlight system. This TFT-LCD has a high resolution (640(R.G.B) X 480) and can display up to 262,144 colors.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Display area	211.2 (W) x 158.4 (H)	mm
Pixel pitch	0.33(H) x 0.33 (V)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	225.5(W)x176.3(H)x9.34(D)	mm
Brightness	500	cd/m ²
Contrast ratio	1200 : 1	
Backlight unit	LED	
Display color	262,144	colors

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	Vcc	4.75	5	V	
Signal Input Voltage	DCLK , DE R0~R5 G0~G5 B0~B5	0.7Vcc	Vcc	V	
Operation Temperature	Top	-30	80	°C	(1)
Storage Temperature	Tstg	-30	80	°C	(1)

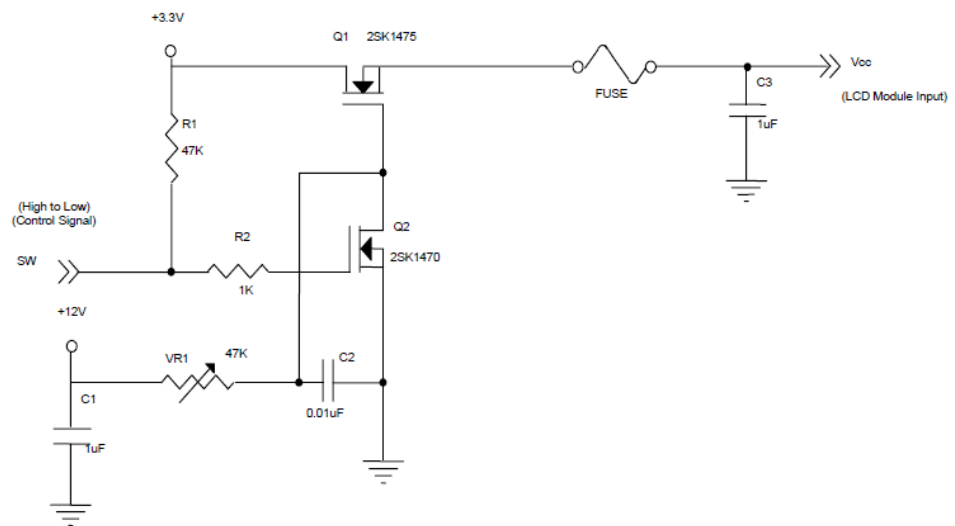
4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module voltage

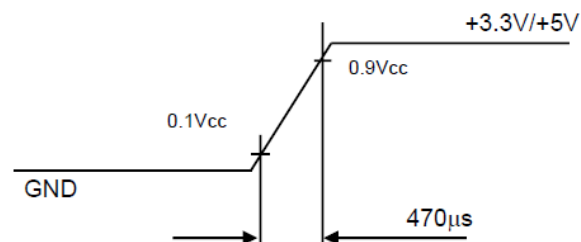
Parameter	Symbol	Value			Unit	Note	
		Min.	Typ.	Max.			
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	at V _{CC} =3.3V	
		4.75	5.0	5.25	V	at V _{CC} =5.0V	
Power Supply Current	White	---	---	257	280	mA	(3)a, at V _{CC} =3.3V, 60Hz
			---	181	200	mA	(3)a, at V _{CC} =5.0V, 60Hz
	Black	---	---	231	255	mA	(3)b, at V _{CC} =3.3V, 60Hz
			---	162	180	mA	(3)b, at V _{CC} =5.0V, 60Hz
Power Consumption	P _L	---	0.848	---	W	V _{CC} =3.3V, 60Hz	
Logic input voltage	V _{IH}	0.7V _{CC}	-	V _{CC}	V		
	V _{IL}	0	-	0.3V _{CC}	V		

Note (1) The module is recommended to operate within specification ranges listed above for normal function.

Note (2) Measurement Conditions:

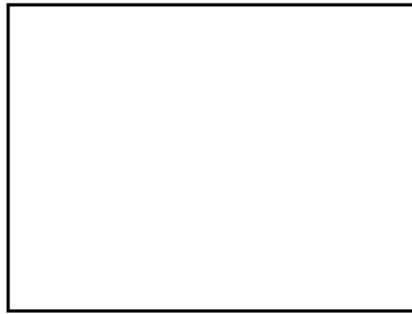


V_{cc} rising time is 470μs



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

a. White Pattern



Active Area

b. Black Pattern



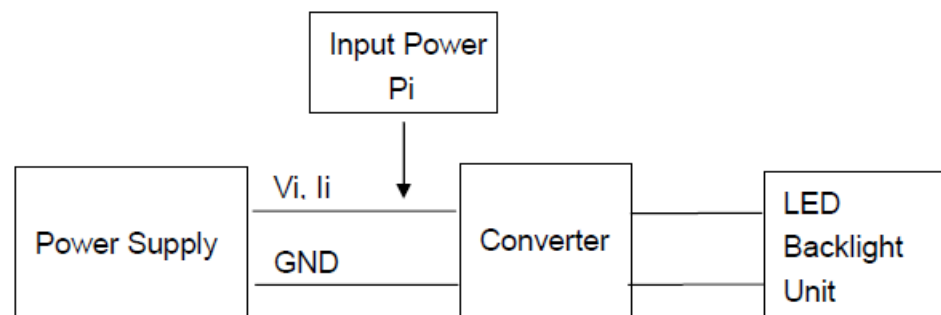
Active Area

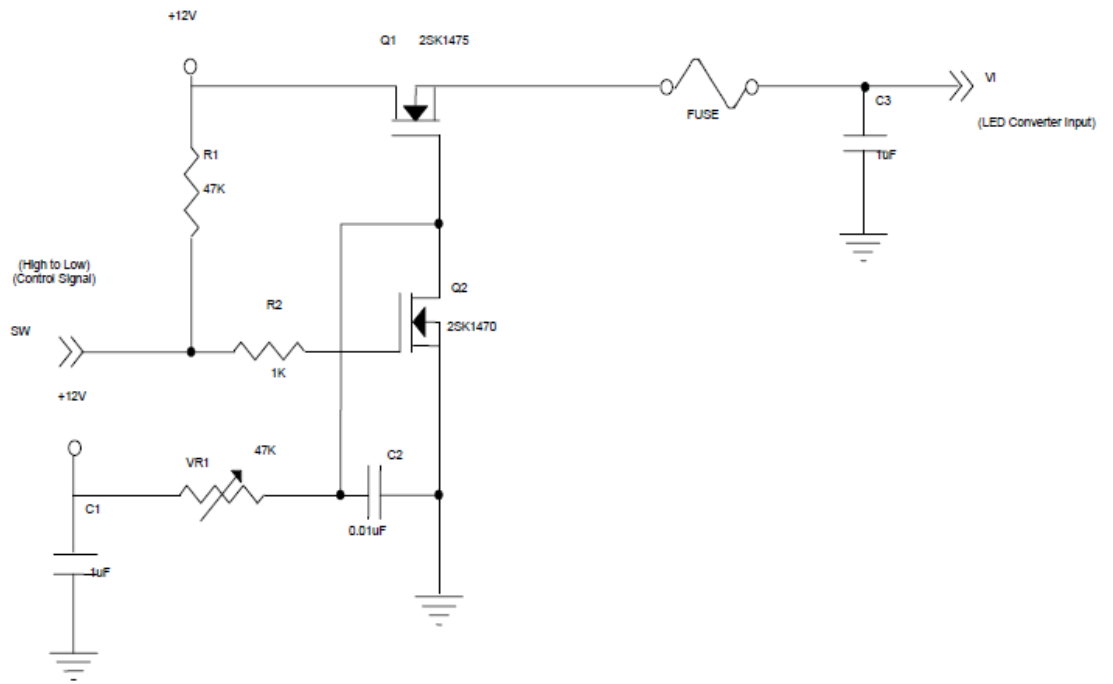
4-2 TFT LCD current consumption

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Converter Power Supply Voltage	V_i	(10.8)	12.0	(12.6)	V	(Duty 100%)
Converter Power Supply Current	I_i	---	(0.69)	---	A	(1) $V_i = 12\text{V}$ (Duty 100%)
Converter Power Consumption	P_i	---	(8.3)	---		(1) $V_i = 12\text{V}$ (Duty 100%)
EN Control Level	Backlight on	2.0	3.3	5.0	V	
	Backlight off	0	---	0.8	V	
PWM Control Level	PWM High Level	2.0	3.3	5.0	V	
	PWM Low Level	0	---	0.8	V	
PWM Control Duty Ratio		(20)		100	%	
PWM Control Frequency	f_{PWM}	(190)	(200)	(210)	Hz	
LED Life Time	L_L	50,000			Hrs	(2)

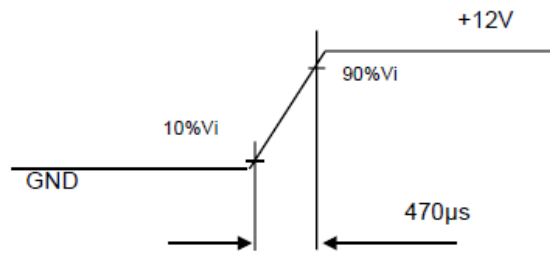
Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ and $I_{\text{LED}} = 80\text{mA}_{\text{DC}}$ (LED forward current) until the brightness becomes $\leq 50\%$ of its original value. And minimum LED lifetime is estimated and provided by Nichia in Japan.

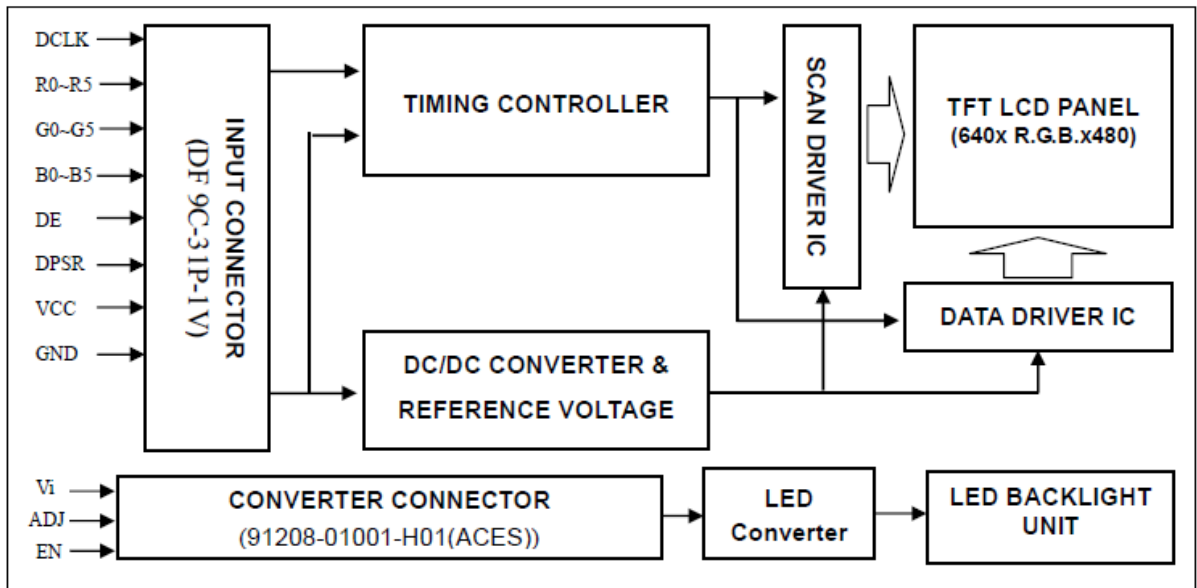




Vi rising time is 470us



5. BLOCK DIAGRAM



6. INTERFACE

CN1:

Pin	Name	Description
1	GND	Ground
2	DCLK	Dot clock
3	N.C.	N.C.
4	N.C.	N.C.
5	GND	Ground
6	R0	Red data (LSB)
7	R1	Red data
8	R2	Red data
9	R3	Red data
10	R4	Red data
11	R5	Red data (MSB)
12	GND	Ground
13	G0	Green data (LSB)
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data (MSB)
19	GND	Ground
20	B0	Blue data (LSB)
21	B1	Blue data
22	B2	Blue data
23	B3	Blue data
24	B4	Blue data
25	B5	Blue data (MSB)
26	GND	Ground
27	DE	Data enable signal
28	VCC	Power supply
29	VCC	Power supply
30	N.C.	Reserved, please keep it floating.
31	DPSR	Selection of scan direction

Note (1) Connector Part No.: DF 9C-31P-1V or equivalent.

CN2:

Pin	Symbol	Description	Remark
1	V_i	Converter input voltage	12V
2	V_{GND}	Converter ground	Ground
3	EN	Enable pin	
4	ADJ	Backlight Adjust	PWM Dimming
5	NC	Not Connect	

Note (1) Connector Part No.: 91208-01001-H01(ACES) or equivalent

Note (2) User's connector Part No.: 91209-01011(ACES) or equivalent

7. INPUT SIGNAL :

7-1 Timing Specification.

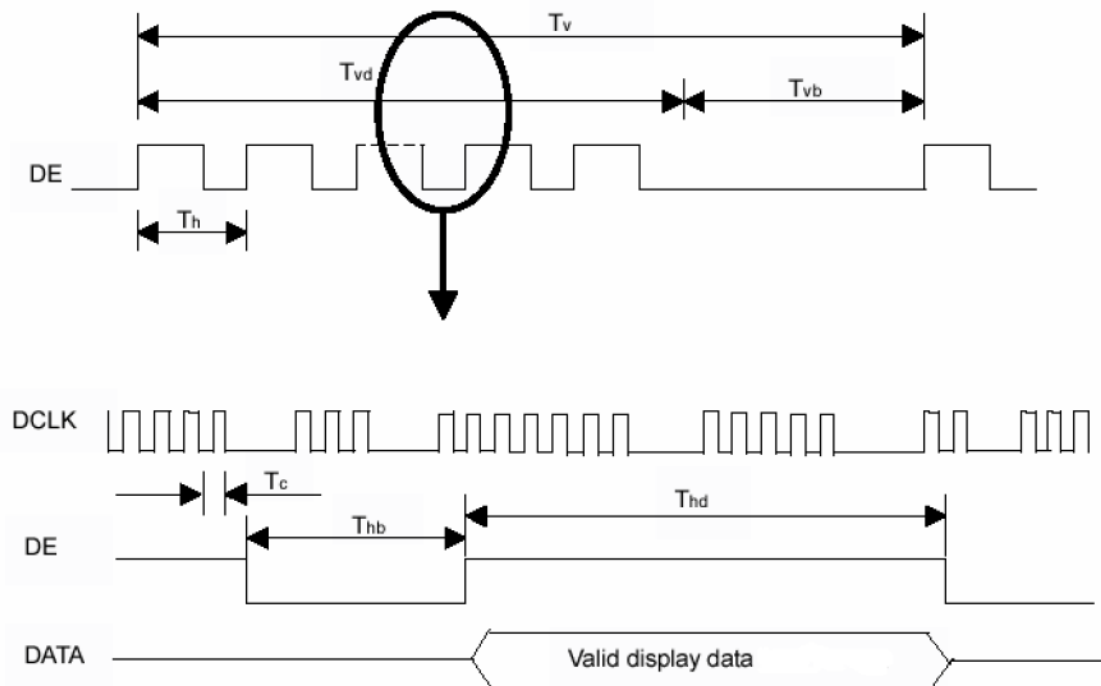
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Dot Clock	Frequency	Fc	21	25.175	29	MHz	-
	Duty		0.4	0.5	0.6		
Dot Data	Setup Time	Tlvs	8	-	-	ns	-
	Hold Time	Tlvh	12	-	-	ns	-
Horizontal Active Display Term	Frame Rate	Fr	-	60	-	Hz	$T_v = T_{vd} + T_{vb}$
	Total	Tv	730	800	900	Th	-
	Display	Tvd		640		Th	-
	Blank	Tvb	90	160	260	Th	-
Vertical Active Display Term	Total	Th	485	525	800	Tc	$T_h = T_{hd} + T_{hb}$
	Display	Thd		480		Tc	-
	Blank	Thb	5	45	320	Tc	-

Note : (1) This module is operated by DE only mode

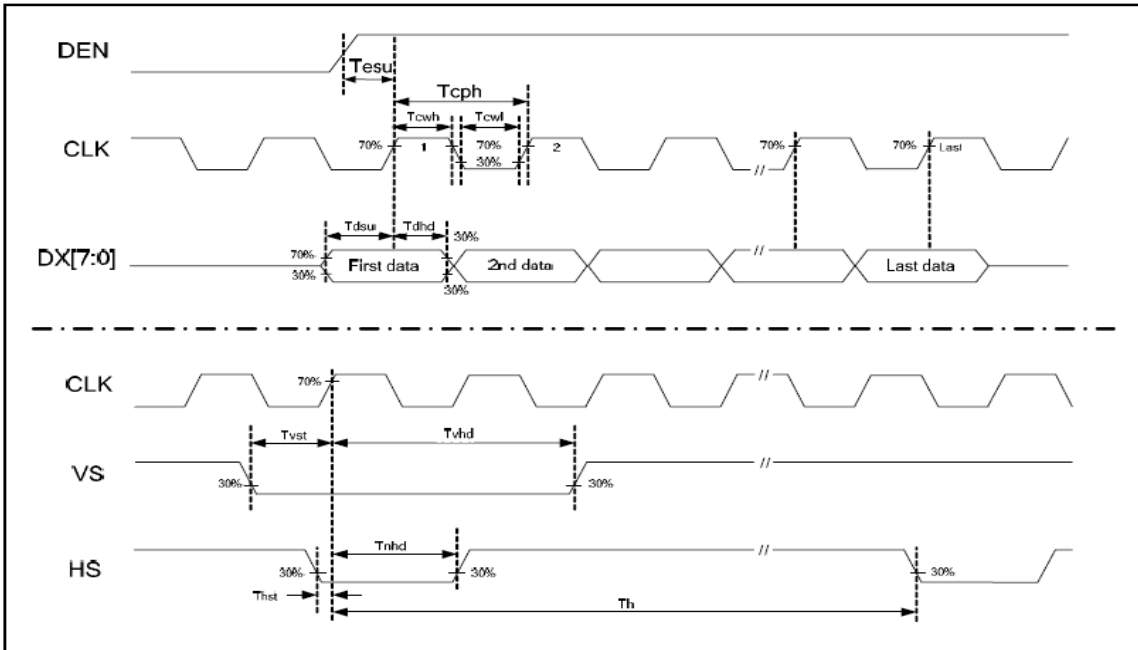
(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM

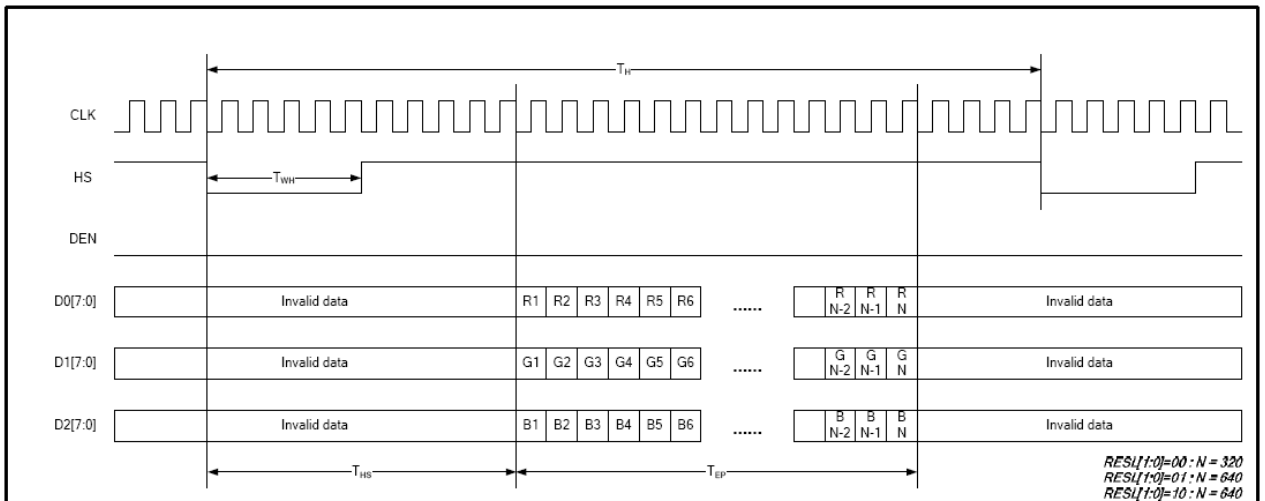


7-2 Timing chart

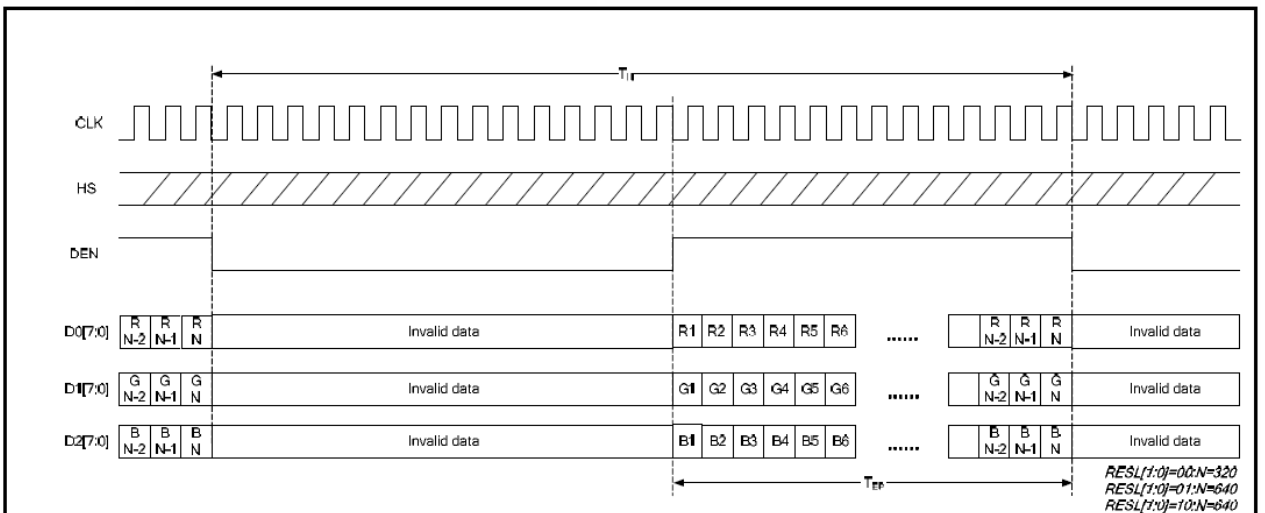
Clock and Data input waveforms



Parallel RGB SYNC Mode Horizontal Data Format



Parallel RGB DE Mode Horizontal Data Format



7-3 Color Data Assignment

The brightness of each primary color (red, green and blue) is based on the 6-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					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
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
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Red(63)	1	1	1	1	1	1	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
Green(63)	0	0	0	0	0	0	1	1	1	1	1	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
	Blue(1)	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	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
Blue(63)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1		

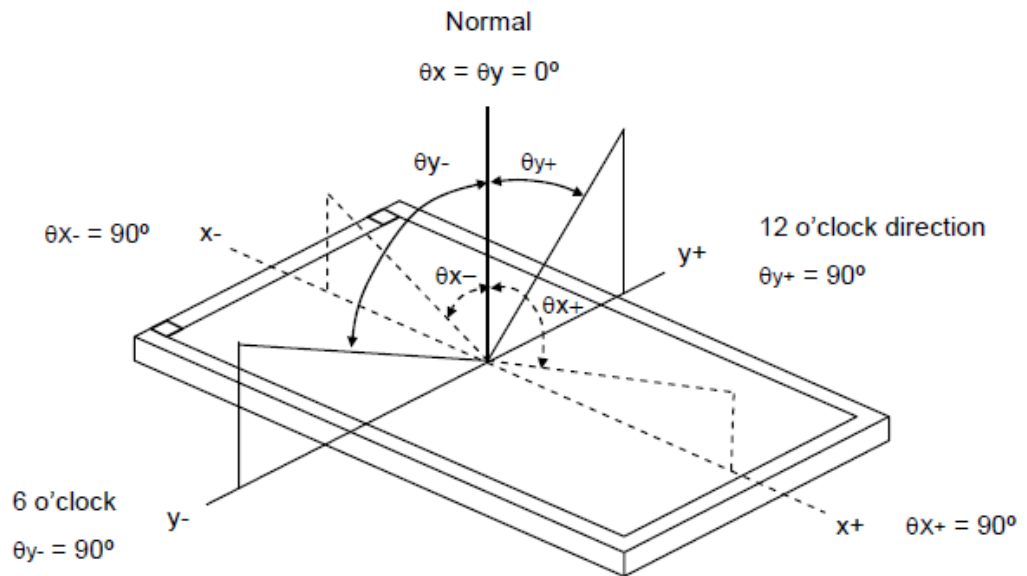
Note (1) 0: Low Level Voltage, 1: High Level Voltage

8. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Color Chromaticity	Red	Rx	Typ - 0.05	0.619	Typ + 0.05	-	(1), (5)	
		Ry		0.357		-		
	Green	Gx		0.333		-		
		Gy		0.562		-		
	Blue	Bx		0.145		-		
		By		0.092		-		
	White	Wx		0.313		-		
		Wy		0.329		-		
Center Luminance of White	L_C		450	500	-	-	(4), (5)	
Contrast Ratio	CR		1000	1200	-	-	(2), (5)	
Response Time	T_R	$\theta_x=0^\circ, \theta_y=0^\circ$	-	14	19	ms	(3)	
	T_F		-	9	14	ms		
White Variation	δW	$\theta_x=0^\circ, \theta_y=0^\circ$	-	-	1.4	-	(5), (6)	
Viewing Angle	Horizontal	θ_{x+}	CR \geq 10	80	88	-	Deg.	(1), (5)
		θ_{x-}		80	88	-		
	Vertical	θ_{y+}		80	88	-		
		θ_{y-}		80	88	-		

NOTE :

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.

$$\text{Contrast Ratio, CR} = L_{63} / L_0$$

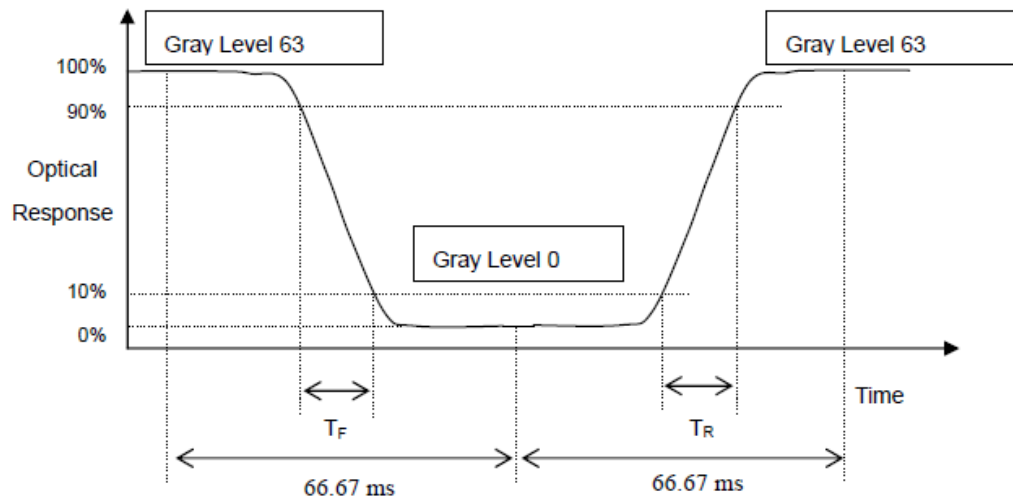
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time (T_R , T_F) and measurement method:



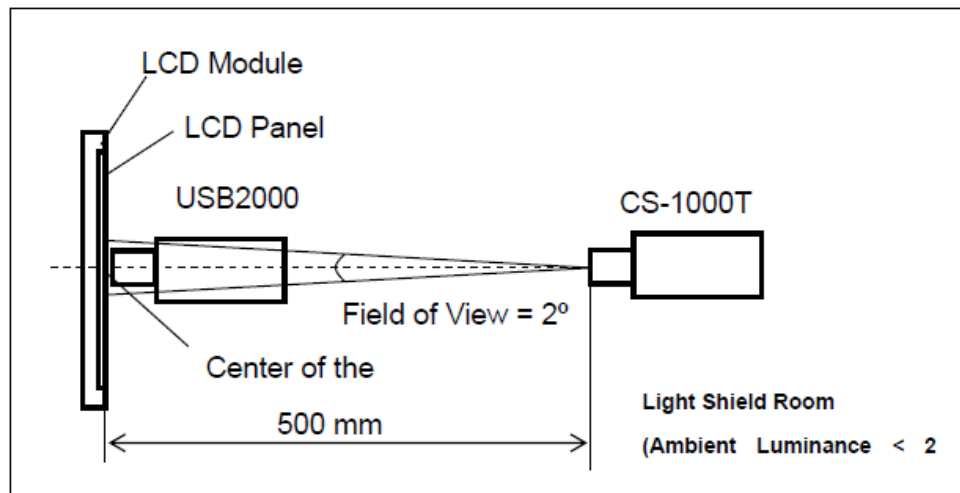
Note (4) Definition of Luminance of White (L_C):

Measure the luminance of gray level 63 at center point and 5 points

$L_C = L(5)$, where $L(X)$ is corresponding to the luminance of the point X at the figure in Note (7).

Note (5) Measurement Setup:

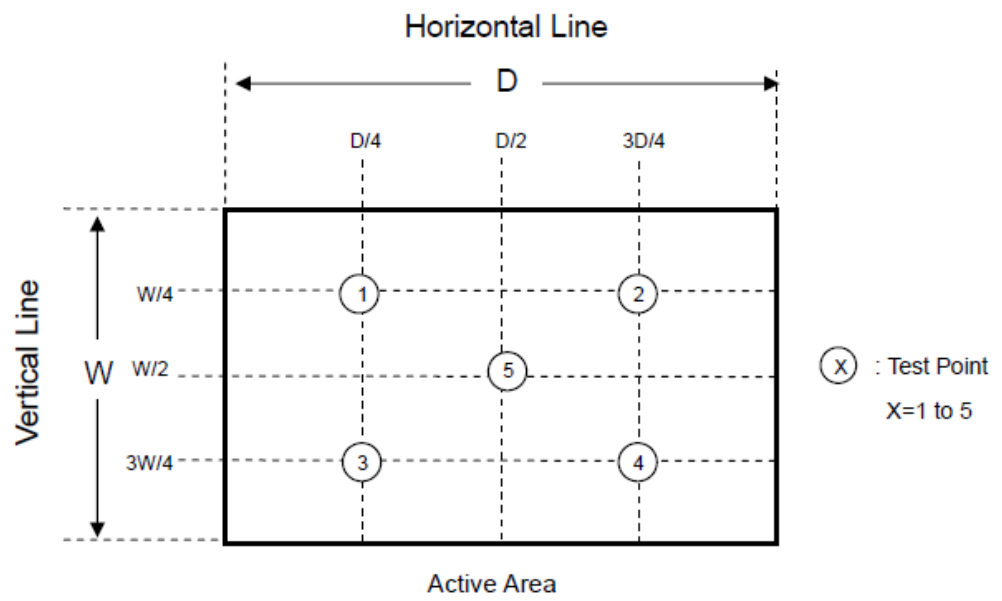
The LCD assembly should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

$$\delta W = \text{Maximum} [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum} [L(1), L(2), L(3), L(4), L(5)]$$



9 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

9.1. Scope

Specifications contain

9.1.1 Display Quality Evaluation

9.1.2 Mechanics Specification

9.2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II.

9.2.1 Lot size: Quantity per shipment as one lot (different model as different lot).

9.2.2 Sampling type: Normal inspection, single sampling.

9.2.3 Sampling level: Level II.

9.2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

9.3. Panel Inspection Condition

9.3.1 Environment:

Room Temperature: $25\pm 5^{\circ}\text{C}$.

Humidity: $65\pm 5\%$ RH.

Illumination: 300 ~ 700 Lux.

9.3.2 Inspection Distance:

35-40 cm

9.3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

9.3.4 Inspection time :

Perceptibility Test Time: 20 seconds max.

9.4. Display Quality

9.4.1 Function Related:

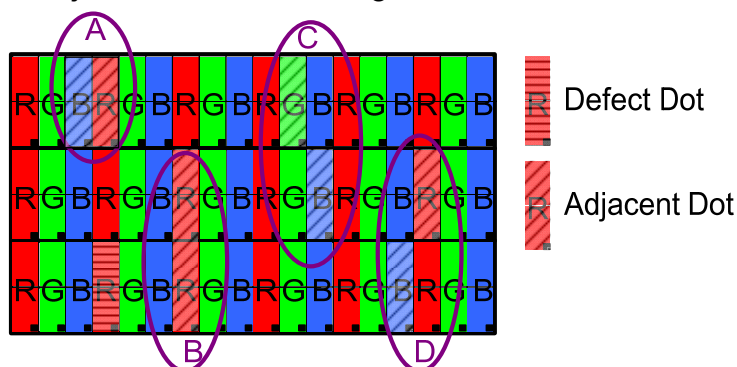
The function defects of line defect, abnormal display, and no display are considered Major defects.

9.4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	$N \leq 3$
Dark Dots	0	$N \leq 4$
Total Bright and Dark Dots	0	$N \leq 6$

[Note 1]

Judge defect dot and adjacent dot as following.

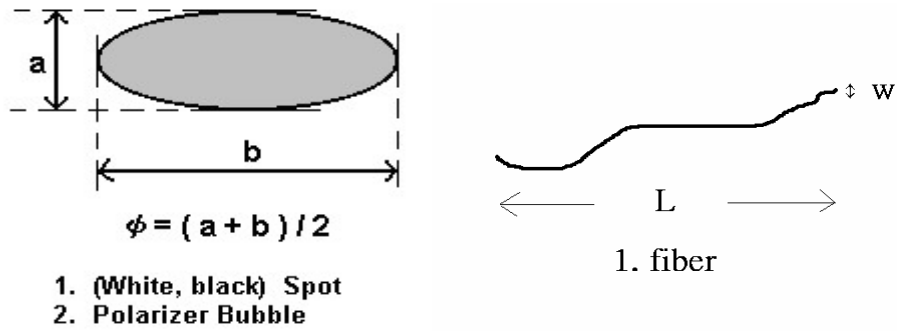


- (1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)
- (2) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
- (3) Allow above (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted 2 defect dots in total quantity.
- (4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
- (5) There should be no distinct non-uniformity visible through 3% ND Filter within 2 sec inspection times.

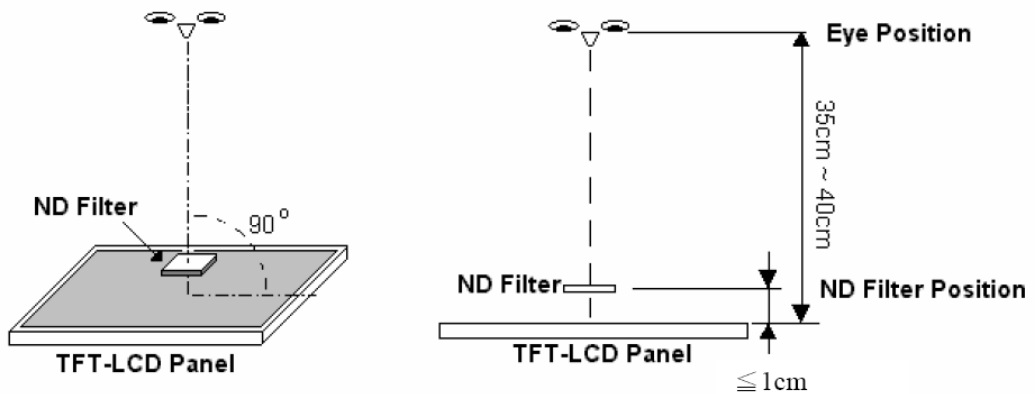
9.4.3 Visual Inspection specifications:

Defect Type	Specification	Count(N)
Dot Shape (Particle, Scratch and Bubbles in display area)	$D \leq 0.25\text{mm}$	Ignored
	$0.25\text{mm} < D \leq 0.5\text{mm}$	$N \leq 3$
	$D > 0.5\text{mm}$	$N=0$
Line Shape (Particles, Scratch, Lint and Bubbles in display area)	$W \leq 0.07\text{mm}$	Ignored
	$0.07\text{mm} < W \leq 0.1\text{mm}$, $L \leq 5\text{mm}$	$N \leq 3$
	$W > 0.1\text{mm}$, $L > 5\text{mm}$	$N=0$

[Note 2] W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter



[Note 3] Bright dot is defined through 3% transmission ND Filter as following.

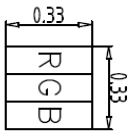


10.1 OTHERS

AMIPRE will provide one year warranty for all products and three months warrantee for all repairing products.

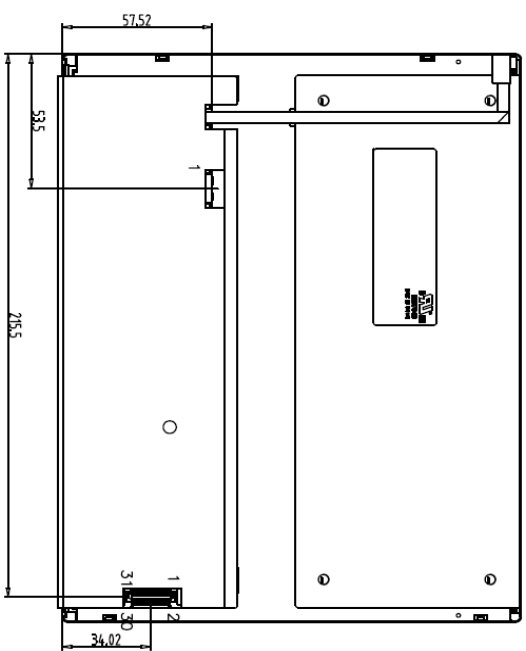
11. OUTLINE DIMENSION

REV	REVISION RECORD	DATE/NAME
0	NEW RELEASE	09-09-10/EMILY



1	GND	17	G4
2	DCLK	18	G5
3	NC	19	GND
4	NC	20	B0
5	GND	21	B1
6	R0	22	B2
7	R1	23	B3
8	R2	24	B4
9	R3	25	B5
10	R4	26	GND
11	R5	27	DE
12	GND	28	VCC
13	G0	29	VCC
14	G1	30	NC
15	G2	31	DPSR
16	G3		

1	V1
2	VGND
3	EN
4	ADJ
5	NC




Back View

- Note:
1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. CN1:DF 9C-31P-1V or Equivalent
 4. CN2:91208-01001-H01(ACES) or Equivalent
 5. LCD 640X3(R.G:B)X480=> 10.4" TFT LCD

1		7																	
2		8																	
3		9																	
4		10																	
5		11																	
6		12																	

TOLERANCE GRAD(F)	A	B	DIM.	MM	DWN.	EMILY	DATE
~6	0.05	0.1					09-09-10
6~18	0.08	0.18	TE NO.		CHEK		DATE
18~50	0.1	0.25					
50~180	0.2	0.4	PARTS NO.	LCM-1	APPD.		DATE
180~	0.3	0.5		640480E-QW			


晶采光電科技
 AMPIRE
 TITLE
 640480E-QW
 DWG. NO.
 *100933MA
 SHEET 1 OF 1