AMP DISPLAY INC.

A Brighter Solution

SPECIFICATIONS

7.0-in Color LCD TFT MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M - 8 0 0 4 8 0 R 3 T M Q W - T D 1 H
APPROVED BY:	
DATE:	

☐　　APPROVED FOR SPECIFICATIONS

☐　　APPROVED FOR SPECIFICATION AND PROTOTYPES

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2010/9/23	-	New Release	Kevin

1. Features

7 inch module is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit , Touch panel and a back light system. This TFT LCD has a 7.0 (16:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

(1) Construction: 7" a-Si TFT active matrix, White LED Backlight.
(2) Resolution (pixel): 800(R.G.B) X 480
(3) Number of the Colors : 262K colors (R , G , B 6 bit digital each)
(4) LCD type : Transmissive , normally White
(5) Viewing Direction: 6 O'clock (The direction it's hard to be discolored)
(6) Interface : LVDS interface
(7) Touch Panel

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Outline Dimension (Include connecter)	165.0 x 104.44 x 8.32 (typ.)	mm
Number of Pixel	800 RGB (H) x 480 (V)	pixels
Pixel pitch	0.1905 (H) x 0.1905 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
Back-light	Single LED (Side-Light type)	
Brightness	400 nit	cd/m^2
Contrast ratio	400 : 1	

3. ABSOLUTE MAX. RATINGS

3-1 Electrical Absolute Rating

3-1-1 TFT LCD Module

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Power voltage	Vcc	-0.3	6.0	V	GND=0V
	AVDD	6.5	13.5	V	GND=0V
	V_{GH}	7	V_{GL}+40	V	GND=0V
	V_{GL}	-20	-5	V	GND=0V
	V_{GH}-V_{GL}	12	40	V	GND=0V
Input Signal Voltage	V_i	-0.3	Vcc+0.3	V	Note1
	V_1-V_5	0.4AVDD	AVDD-0.1	V	
	V_6-V_{10}	0.1	0.6AVDD	V	
	V_{COM}	-	-	V	

Note1 : DCLK , DE , R0~R5 , G0~G5 , B0~B5.

3-2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	Topa	-20	70	℃	
Storage Temperature	Tstg	-30	80	℃	

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module

Item	Symbol	Values			UNIT	Note
		Min.	Typ.	Max.		
Power Supply Voltage	Vcc	3.0	3.3	3.6	V	
	AVDD	11.5	12	12.5	V	
	V_{GH}	17	18	19	V	
	V_{GL}	-8	-7	-6	V	
Input Signal Voltage	$V_1 \sim V_5$	0.4AVDD	-	AVDD-0.1	V	
	$V_6 \sim V_{10}$	0.1	-	0.6AVDD	V	
	V_{COM}	-	4.3	-	V	Black Pattern
Digital Input Voltage	V_{IH}	0.7Vcc	-	Vcc	V	Note1
	V_{IL}	0	-	0.3Vcc	V	

Note1 : DCLK , DE , R0~R5 , G0~G5 , B0~B5.

4-2 Backlight Unit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V_{BL}	8.4	--	10.8	V	For reference
LED Backlight Current	I_{BL}	-	250	-	mA	Ta=25℃
LED Life Time			30K		Hr	Note*

Note* : Brightness to be decreased to 50% of the initial value.

ILED=250mA

25mA

?

LED1 LED2 LED3 LED9 LED10

A

K
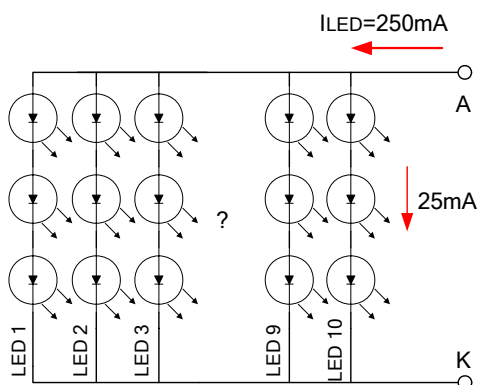
5. Optical Specifications

5-1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Front	θf	CR≧10	55	60	--	deg.	(1)(2)(3)
	Back	θb		55	70	--		
	Left	θl		65	70	--		
	Right	θr		65	70	--		
Contrast ratio		CR	$\Theta=\Phi=0°$	250	400	--	--	(1)(3)
Response Time		T_r	$\Theta=\Phi=0°$	--	5	10	ms	(1)(4)
		T_f		--	11	16	ms	(1)(4)
Color chromaticity	White	Wx		0.239	0.299	0.359	--	(1)
		Wy		0.268	0.328	0.388		
Luminance		L	$\Theta=\Phi=0°$	--	400	--	cd/m^2	(1)(5)
Luminance Uniformity		ΔL	$\Theta=\Phi=0°$	70	--	--	%	(1)(5)(6)

Note 1: Ta=25°C. To be measured on the center area of panel after 10 minutes operation.

Note 2: Definition of Viewing Angle
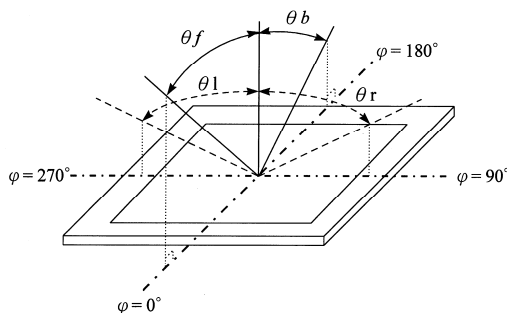
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)}= \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 4: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black" (rising time) respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.
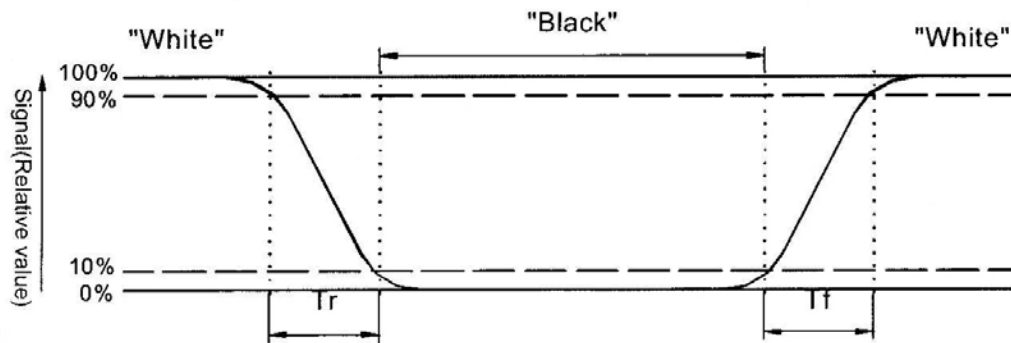
Note 5 : Luminance is measured at point 5 of the display.
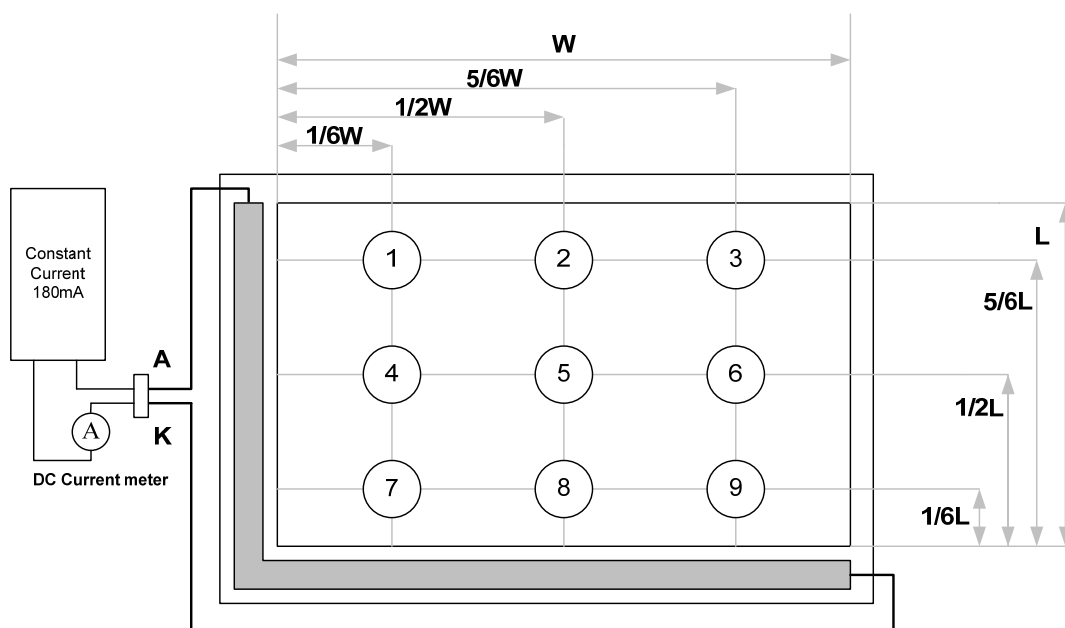
Note 6 : Definition of Luminance Uniformity

$\Delta L = [\ L(min.)$ of 9 points $/\ L(max.)$ of 9 points] X 100%

6. INTERFACE

Pin No.	Symbol	Function
1	VDD	POWER SUPPLY:3.3V
2	VDD	POWER SUPPLY:3.3V
3	GND	Power Ground
4	GND	Power Ground
5	IN0-	Transmission Data of Pixels
6	IN0+	Transmission Data of Pixels
7	GND	Power Ground
8	IN1-	Transmission Data of Pixels 1
9	IN1+	Transmission Data of Pixels 1
10	GND	Power Ground
11	IN2-	Transmission Data of Pixels 2
12	IN2+	Transmission Data of Pixels 2
13	GND	Power Ground
14	CLK-	Sampling Clock
15	CLK+	Sampling Clock
16	GND	Power Ground
17	NC	No Connection
18	NC	No Connection
19	GND	Power Ground
20	NC	No Connection

7. Touch Panel ELECTRICAL SPECIFICATION

Parameter	Condition	Standard Value
Terminal Resistance	X Axis	200 ~ 900 Ω
	Y Axis	160 ~ 640 Ω
Insulating Resistance	DC 25 V	More than 20MΩ
Linearity	--	≦1.5 %
Notes life by Pen	Note a	100,000 times(min)
Input life by finger	Note b	1,000,000 times (min)

Note A .

Notes area for pen notes life test is 10 x 9 mm.

Size of word is 7.5 x 6.75

Shape of pen end : R0.8mm

Load : 250 g

Note B

By Silicon rubber tapping at same point

Shape of rubber end : R8mm

Load : 250gf

Frequency : 5 Hz

Interface

No.	Symbol	Function
1	Y2	Touch Panel Top Signal in Y Axis
2	X2	Touch Panel Right Signal in X Axis
3	Y1	Touch Panel Bottom Signal in Y Axis
4	X1	Touch Panel Left Signal in X Axis

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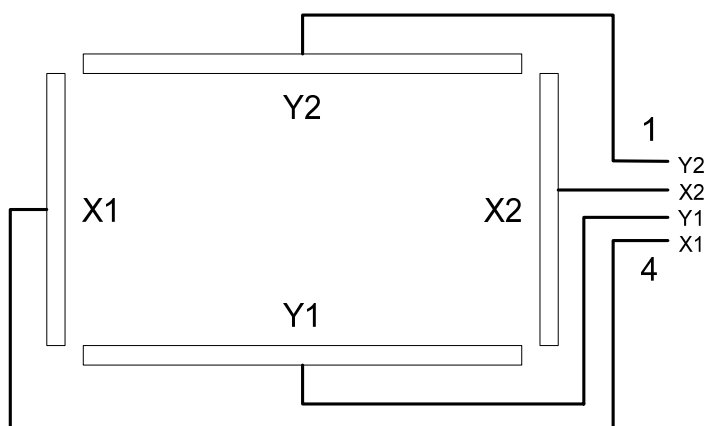
8. Block Diagram
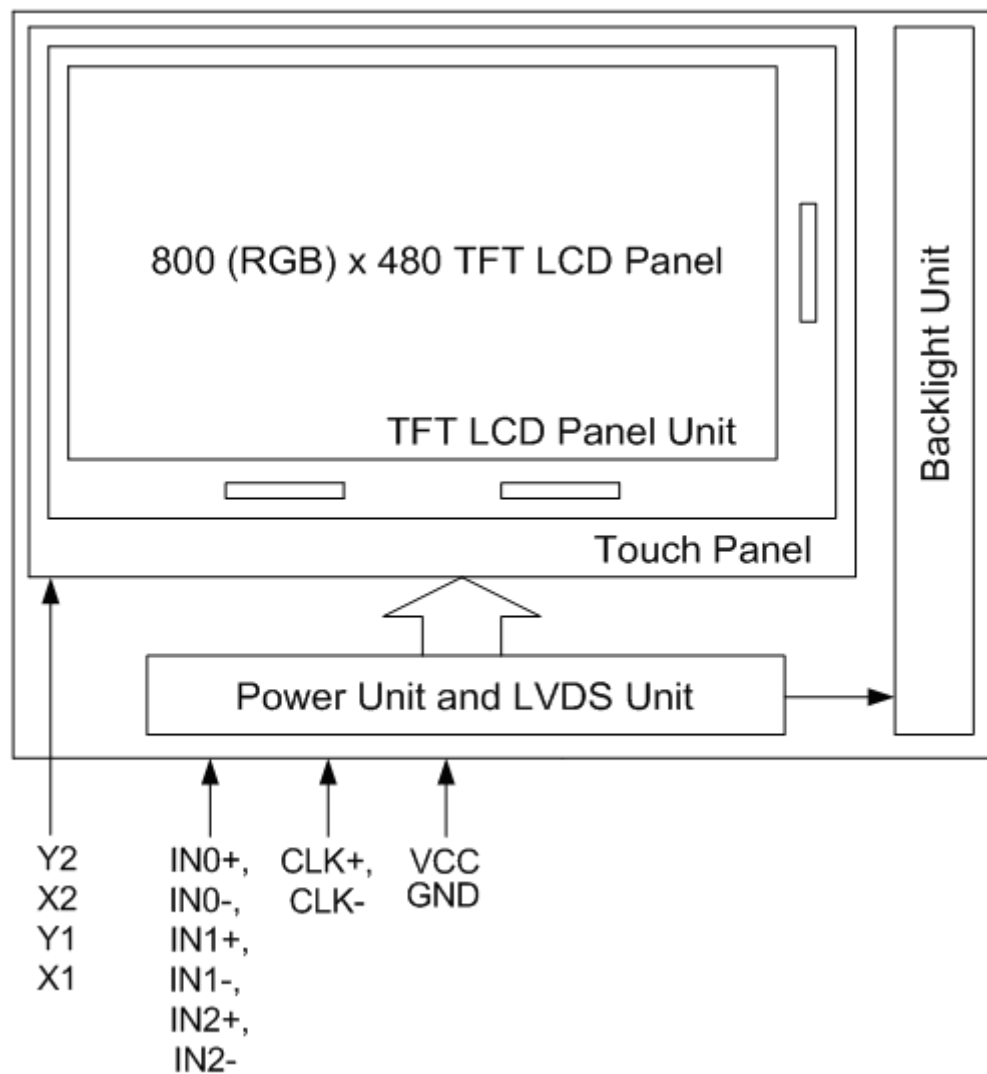
9. INPUT SIGNAL :

9-1 LVDS Signal

switching characteristics over recommended operating conditions (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{su}	Setup time, D0–D20 to CLKOUT↓	C_L = 8 pF, See Figure 5	5			ns
t_h	Data hold time, CLKOUT↓ to D0–D20		5			ns
$t_{(RSKM)}$	Receiver input skew margin§ (see Figure 7)	t_c = 15.38 ns (±0.2%), |Input clock jitter| < 50 ps¶,	550	700		ps
t_d	Delay time, CLKIN↑ to CLKOUT↓ (see Figure 7)	V_{CC} = 3.3 V, t_c = 15.38 ns (±0.2%), T_A = 25°C	3	5	7	ns
t_{en}	Enable time, $\overline{SHTDN}$ to phase lock	See Figure 7		1		ms
t_{dis}	Disable time, $\overline{SHTDN}$ to off state	See Figure 8		400		ns
t_t	Transition time, output (10% to 90% t_r or t_f) (data only)	C_L = 8 pF		3		ns
t_t	Transition time, output (10% to 90% t_r or t_f) (clock only)	C_L = 8 pF		1.5		ns
t_W	Pulse duration, output clock			0.50 t_c		ns

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

§ The parameter $t_{(RSKM)}$ is the timing margin available to allocate to the transmitter and interconnection skews and clock jitter. The value of this parameter at clock periods other than 15.38 ns can be calculated from t_{RSKM} = tc/14 – 550 ps.

¶ |Input clock jitter| is the magnitude of the change in input clock period.
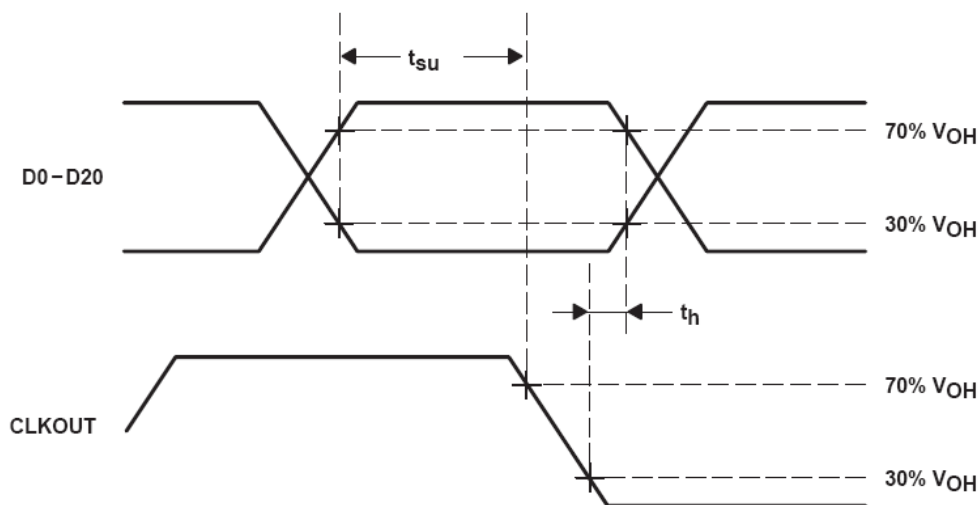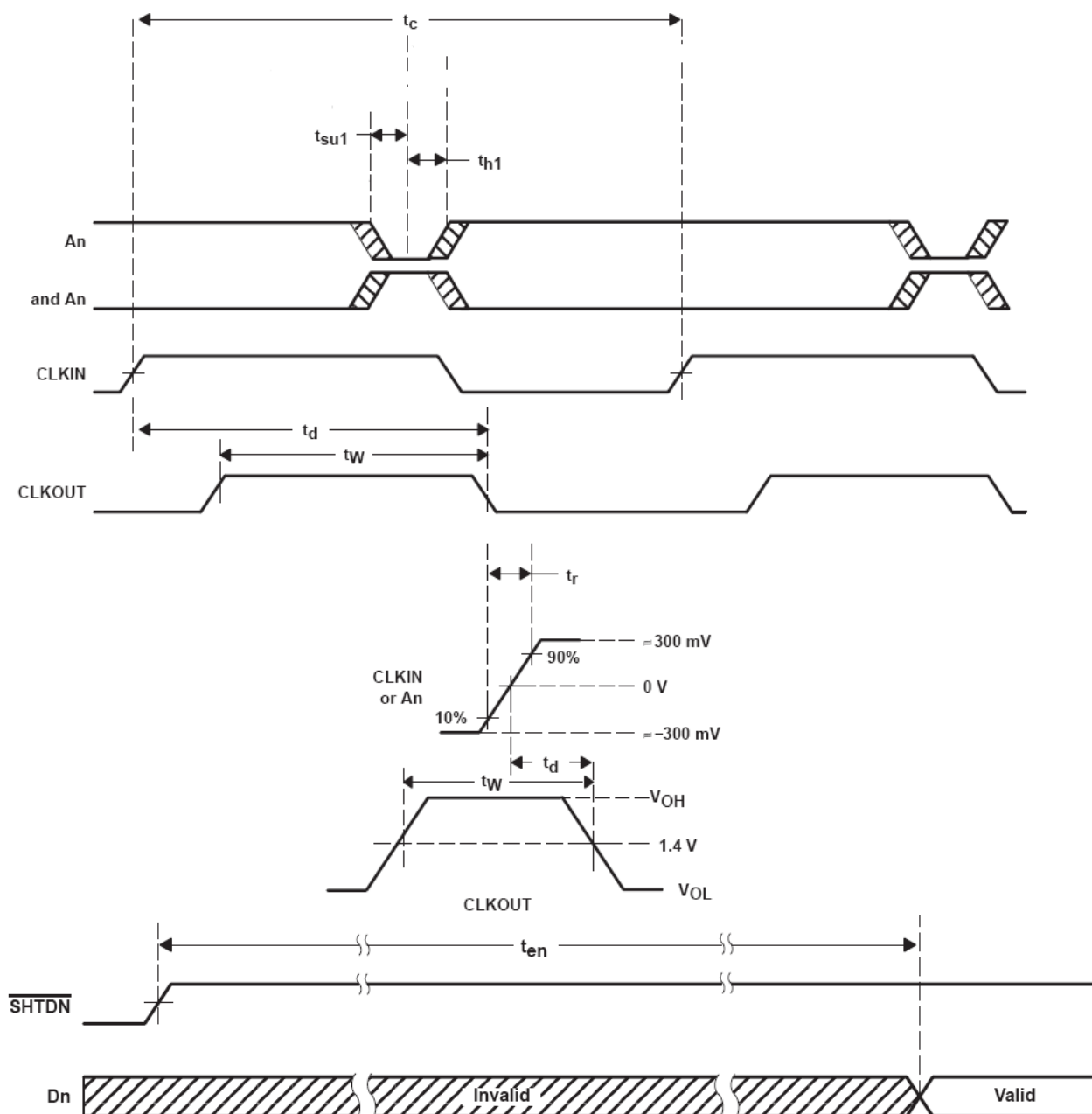
PARAMETER MEASUREMENT INFORMATION

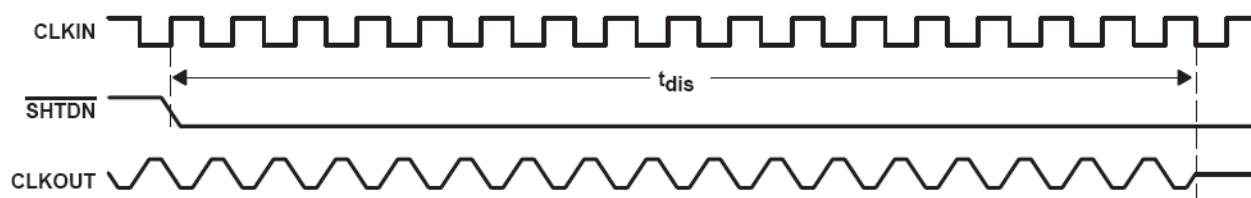Figure 5. Setup and Hold Time Waveforms

Figure 7. Enable Time Waveforms

Figure 8. Disable Time Waveforms

10. DISPLAYED COLOR AND INPUT DATA

		Color & Gray Scale	DATA SIGNAL																	
			R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color		Black	0	0	0	0	0	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
		Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
		Blue(63)	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
Red		Black	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(31)	0	1	1	1	1	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
Green		Black	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	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	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
		Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue		Black	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
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(62)	0	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	0	1	1	1	1	1	1

11. RELIABILITY TEST CONDITIONS

11.1 Test Conditions

Tests should be conducted under the following conditions :

Ambient temperature   :   25 ± 5°C

Humidity   :   60 ± 25% RH.

11.2 Sampling Plan

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

11.3 Acceptable Quality Level

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

11.4 Appearance

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.

ZONE A active area

ZONE B viewing area
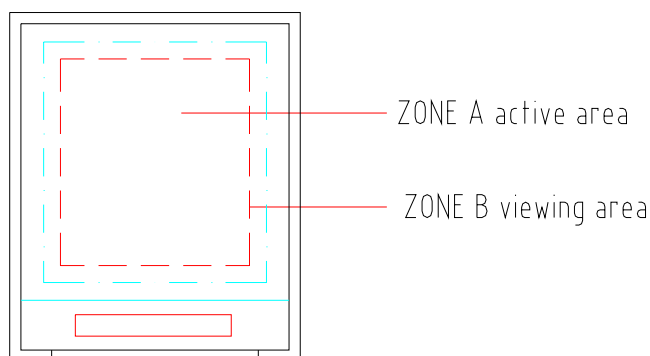
11.5 Incoming Inspection Standard

Defect Type			Limit						Note
Visual Defect	Internal	Spot	$\varphi < 0.15mm$					Ignore	(1)
			$0.15mm \leqq \varphi \leqq 0.5mm$					$N \leqq 4$	
			$0.5mm < \varphi$					N=0	
		Fiber	$0.1mm < W \leqq 0.5mm$, $L \leqq 1.5mm$					$N \leqq 4$	(1)
			$1.0mm < W$, $1.5mm < L$					N=0	
		Polarizer Bubble	$\varphi < 0.15mm$					Ignore	(1)
			$0.15mm \leqq \varphi \leqq 0.5mm$					$N \leqq 4$	
			$0.5mm < \varphi$					N=0	
		Mura	It' OK if mura is slight visible through 6%ND filter						
Electrical Defect		Bright Dot	A Grade			B Grade			(3)
			C Area	O Area	Total	C Area	O Area	Total	
			$N \leqq 0$	$N \leqq 2$	$N \leqq 2$	$N \leqq 2$	$N \leqq 3$	$N \leqq 5$	(2)
		Dark Dot	$N \leqq 2$	$N \leqq 4$	$N \leqq 4$	$N \leqq 3$	$N \leqq 5$	$N \leqq 8$	
		Total Dot	$N \leqq 4$			$N \leqq 5$	$N \leqq 6$	$N \leqq 8$	(2)
		Two Adjacent Dot	$N \leqq 0$	$N \leqq 1$ pair	$N \leqq 1$ pair	$N \leqq 1$ pair	$N \leqq 1$ pair	$N \leqq 1$ pair	(4)
		Three or More Adjacent Dot	Not Allowed						
		Line Defect	Not Allowed						

(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT acceptable under 6% ND-Filter

[Note1] W : Width[mm], L : Length[mm], N : Number, φ: Average Diameter

$$\phi = (a + b) / 2$$
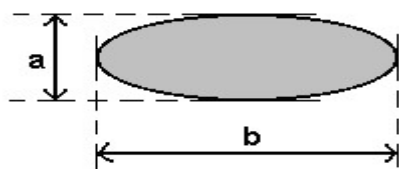
1. (White, black) Spot
2. Polarizer Bubble

1. fiber
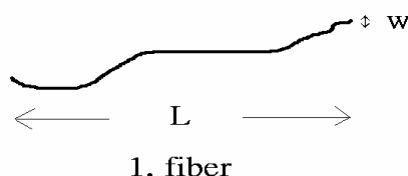
[Note2] Bright dot is defined through 6% transmission ND Filter as following.
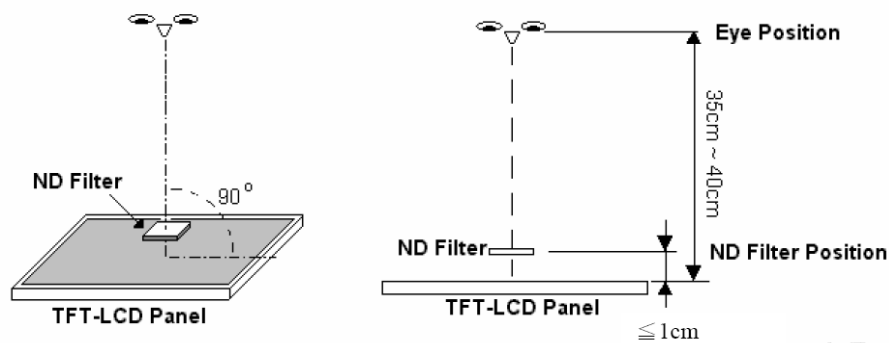
[Note3]
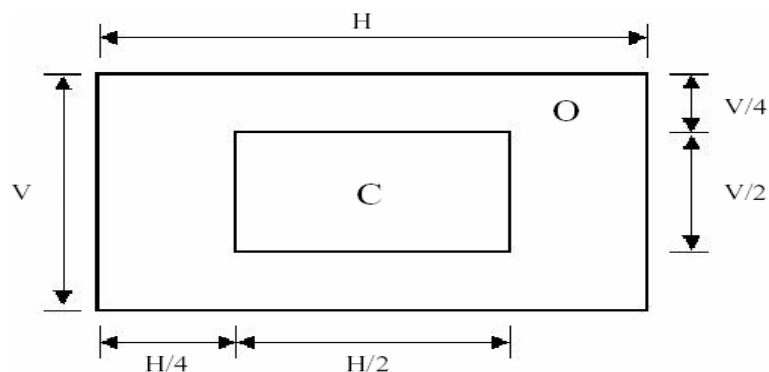
C Area: Center of display area

C Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2

defect dots in total quantity.
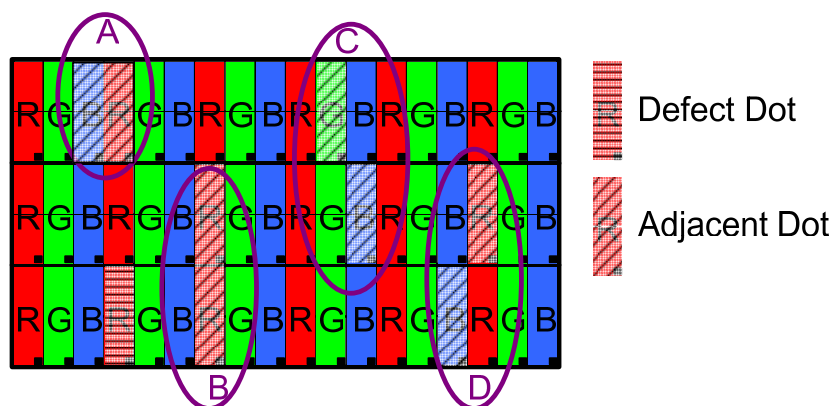
(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

11.6 Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Thermal Shock Test	-20°C ~ 70°C 30 m in. ~ 30 min. (1 cycle) Total 100cycle	1,2
Humidity Test	60 °C, Humidity 90%, 240 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 500 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions

(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

11. USE PRECAUTIONS

11.1 Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.

2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.

3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.

4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

11.2 Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.

2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.

3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.

4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

11.3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.

2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.

3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

11.4 Operating precautions

1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.

2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.

3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.

4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.

5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.

6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.

7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.

8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

11.5 Other

1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

12. OUTLINE DIMENSION

Note:
1. Unless indicated, Tolerance
2. UV Glue For OLB Protection.
3. CN1:BHSR-02VS-1 or Equivalent.
4. CN2:DF-19G-20P-1H or Equivalent
5. CN3&CN4:E&T 6701 P0.5 30Pin or Equivalent
6. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

CN2

1	Y2	11	IN2-
2	X2	12	IN2+
3	Y1	13	GND
4	X1	14	GND
5	IN0-	15	CLK+
6	IN0+	16	CLK-
7	GND	17	NC
8	IN1-	18	NC
9	IN1+	19	GND
10	GND	20	NC

A Block

R	G	B

TOLERANCE GRADE(±)

DIM.	A	B	IE
~6	0.05	0.1	
6~18	0.08	0.18	
18~50	0.1	0.25	
50~180	0.2	0.4	
180~	0.3	0.5	

MM

Viewing Direction

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

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-21-10	EMILY

NO.	PARTS NO. LCM			
	800480R3-TD1			

DWN.	CHK.	APPD.	DATE
EMILY			
DATE	DATE	DATE	
09-21-10'			

TITLE 800480R3-TD1
(7.0"+LVDS+T/P)

DWG. NO. *10096 4MA

SHEET 1 OF 1

A Block

R	G	B

0.1905
0.0635
0.1905

CN2

1	VDD	11	IN2-
2	VDD	12	IN2+
3	GND	13	GND
4	GND	14	CLK-
5	IN0-	15	CLK+
6	IN0+	16	GND
7	GND	17	NC
8	IN1-	18	NC
9	IN1+	19	GND
10	GND	20	NC

1	Y2
2	X2
3	Y1
4	X1

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:BHSR-02VS-1 or Equivalent
4. CN2:DF-19G-20P-1H or Equivalent
5. CN3&CN4:E&T 6701 P0.5 30Pin or Equivalent
6. LCD 800X3(R.G.B)x480=> 7.0" Digital TFT LCD

Back View

Capton tape

(39.44±1.0)　(50.0±0.3 PCB)

(38.09±1.0)

(119.5±3.0)

(11.0)

(90.0±0.5)

(144.5±0.3 PCB)

84.8±0.3

(80.2±0.3)

(55.57±0.3)　(48.87±0.3)

55.0±0.5

CN4

CN3

CN2

CN1

TOLERANCE GRADE(±)	A	B
~6	0.05	0.1
6~18	0.08	0.18
18~50	0.1	0.25
50~180	0.2	0.4
180~	0.3	0.5

DIM.	MM
IE NO.	
PARTS NO.LCM-1	800480R3-TD1
DWN.	EMILY
CHK.	
APPD.	
DATE	09-21-10'

TITLE 800480R3-TD1
(7.0"+LVDS+T/P)
DWG. NO. *10096 5MA
SHEET 1 OF 1

AMPIRE 晶采光電科技

REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-21-10	EMILY