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-640480G5TNQW-T00H
APPROVED BY	
DATE	

AMPIRE CO., LTD.
2F., No.88, Sec. 1, Sintai 5th Rd., Sijhih City, Taipei County 221, Taiwan (R.O.C.)台北縣汐止市新台五路一段 88 號 2 樓(東方科學園區 D 棟)
TEL:886-2-26967269 , FAX:886-2-26967196 or 26967270

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2010/10/22	--	New Release	Patrick
2010/10/26	11	Update I2C data format	Patrick
2010/11/1	18, 19	Update TP interface sequence	Patrick

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 5.7inch TFT-LCD panel, a driving circuit, LED backlight system and touch panel. This TFT-LCD has a high resolution (640(R.G.B) X 480) and can display up to 262,144 colors.

1-1. Features

- VGA Resolution
- 6 Bits color driver with 1 channel TTL interface
- Wide range operation temperature
- Improved inner FPC material to better reliability
- Projected capacitive-type touch panel

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Display area	115.2 (W) x 86.4 (H)	mm
Pixel pitch	0.18 (W) x 0.18 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	127.0(W)x98.43(H)x9.063(D)---(Typ)	mm
Surface treatment	Glare , Hard-Coating(3H)	
Brightness	430	cd/m^2
Contrast ratio	250 : 1	
Backlight unit	LED	
Display color	262,144	colors
Viewing Direction (Gray inversion)	12 o'clock	
Display Mode	Normally White	

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	Vcc	-0.5	5	V	
Signal Input Voltage	DCLK , DE R0~R5 G0~G5 B0~B5	-0.5	Vcc + 0.5	V	
Operation Temperature	Top	-20	70	℃	(1)
Storage Temperature	Tstg	-30	80	℃	(1)

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module voltage

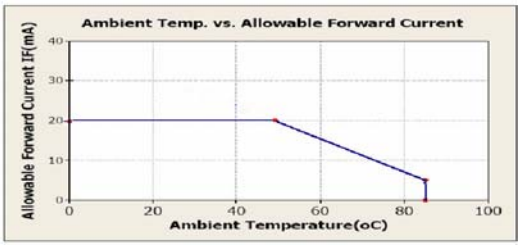
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	V_{CC}	3.0	3.3	3.6	V	(1)
Power Voltage For VLED	V_{DD}	--	5.0	--	V	
Logic Input Voltage	VIH	V_{CC}*0.7	--	V_{CC}	V	
	VIL	0	--	V_{CC}*0.3	V	
ADJ Input Voltage	VIH	3.0	--	5.0	V	
	VIL	GND	--	0.3	V	

4-2 TFT LCD current comsumption

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Current	Icc	-	82	-	mA	(1)
LED Power Current	I_{LED}(VLED=5V)	-	290	-	mA	(2)

NOTE : (1) Typ : under 64 gray pattern Max : under black pattern

(2) One LED dice

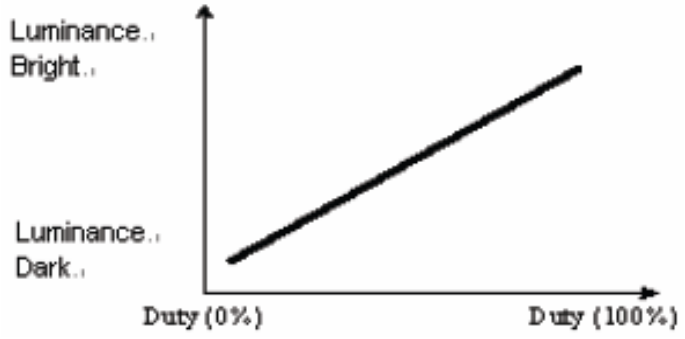


5. TFT INTERFACE

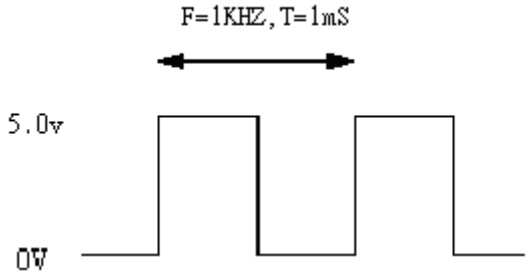
Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Honizontal SYNC. (Sync mode used)
4	VLED	Power Supply for LED
5	VLED	Power Supply for LED
6	VLED	Power Supply for LED
7	Vcc	Power Supply for LCD
8	Vsync(NC)	Vertical SYNC. (Sync mode used)
9	DE	Data Enable
10	Vss	Power Ground
11	Vss	Power Ground
12	ADJ	Adjust for LED Brightness
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0 (LSB)
36	Vss	Power Ground
37	Vss	Power Ground
38	DCLK	Clock Signals
39	Vss	Power Ground
40	L/R	Left or Right Display Control

NOTE :

1. ADJ adjust brightness to control Pin , Pulse duty the bigger the brighter.



2. ADJ signal = 0 ~ 5.0V , operation frequency : 300Hz~1KHz



3. VSS Pin must ground contact , can not be floating.

4. U/D and L/R are controlled function

L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite , Up and Down opposite

6. TFT LCD INPUT SIGNAL :

6-1 Timing Specification.

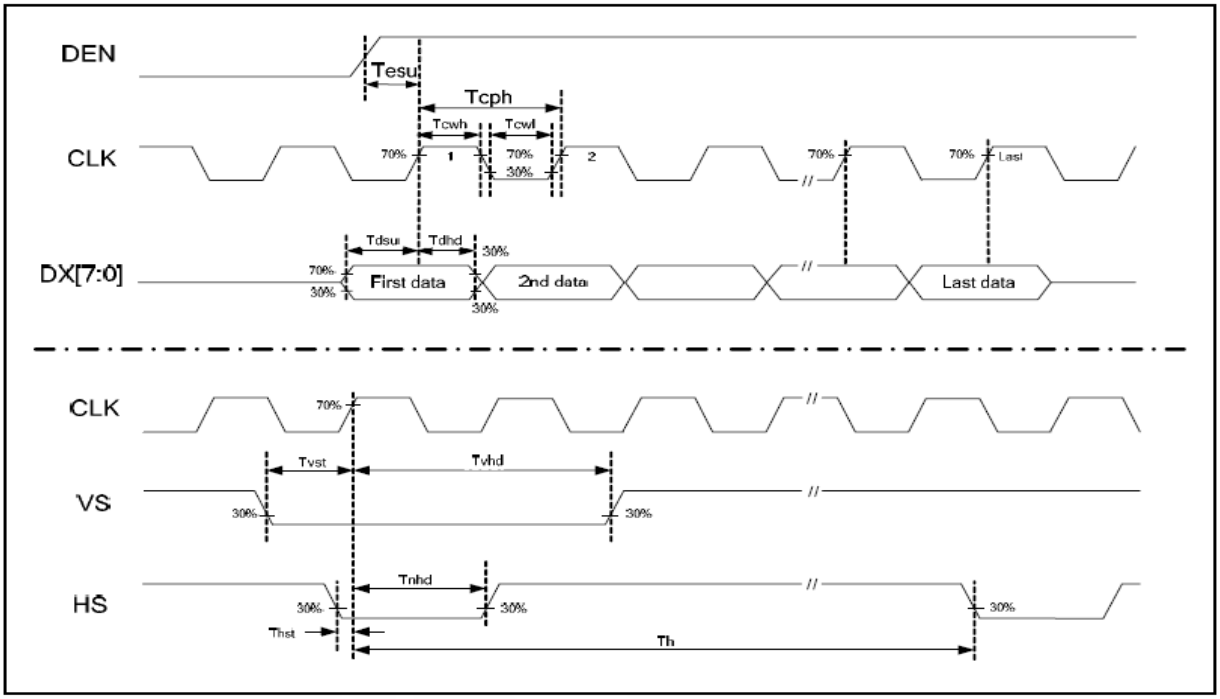
PARAMETER	Symbol	Min.	Typ.	Max	Unit
CLK frequency	FCPH		25.175		MHz
CLK period	TCPH	-	39.7	-	ns
CLK pulse duty	TCWH	40	50	60	%
HS period	TH	-	800	-	TCPH
HS pulse width	TWH	5	30	-	TCPH
HS-first horizontal data time	THS	112	144	175	TCPH
DEN pulse width	TEP	-	640	-	TCPH
VS pulse width	TWV	1	3	5	TH
VS-DEN time	TSTV	-	35	-	TH
VS period	TV	-	525	-	TH

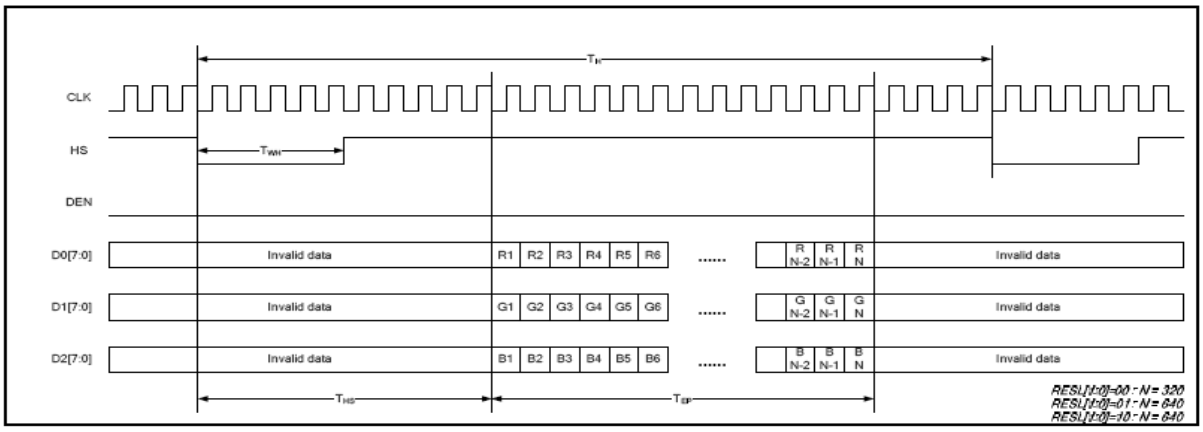
Note: When SYNC mode is used, 1st data start from 144th CLK after HS falling (when STHD[5:0]=00000)

PARAMETER	Symbol	Min.	Typ.	Max	Unit
OEV pulse width	TOEV		100	-	TCPH
CKV pulse width	TCKV	-	96	-	TCPH
HS-CKV time	T1	-	52	-	TCPH
HS-OEV time	T2	-	8	-	TCPH
HS-POL time	T3	-	72	-	TCPH
STV setup time	TSUV	-	46	-	TCPH
STV pulse width	TWSTV	-	1	-	TH

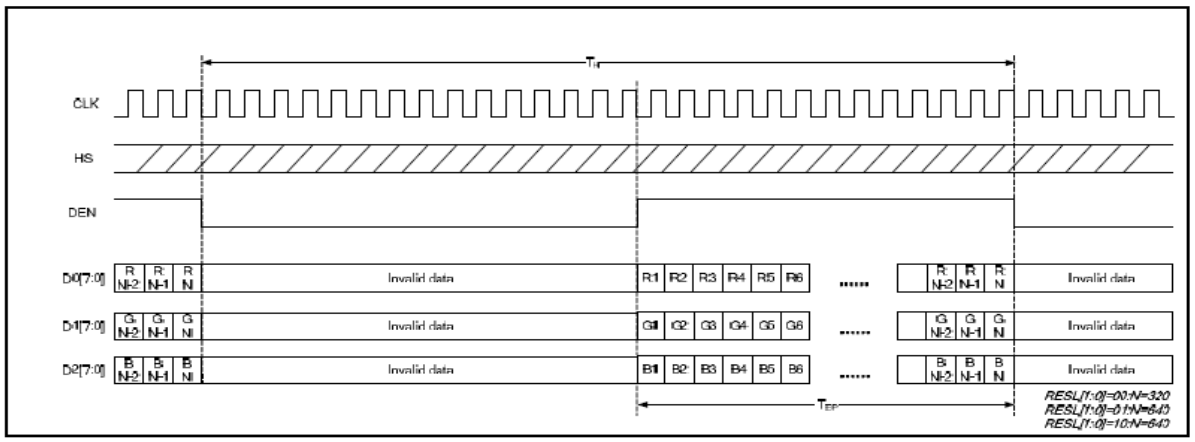
6-2 Timing chart

Clock and Data input waveforms





Parallel RGB SYNC Mode Horizontal Data Format



Parallel RGB DE Mode Horizontal Data Format

6-3 Color Data Assignment

COLOR	Input Data	R DATA						G DATA						B DATA					
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB
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	RED(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	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(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	GREEN (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	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 (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	BLUE (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	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

NOTE : (1) Definition of Gray Scale , Color(n) : n is series of Gray Scale
The more n value is the bright Gray Scale
(2) Data : 1-High , 0-Low

7. Projected capacitive-type touch panel

Pin No	Symbol	Function
1	VCC	Power Supply for TP controller
2	SDA / MOSI	I2C Data / MOSI for SPI interface
3	GPIO 11 / MISO	Mode select / MISO for SPI interface
4	GND	Ground
5	SCL	Clock
6	GPIO 10 / CS	Mode select / CS for SPI interface
7	INT	Interrupt
8	RES	Reset TP controller

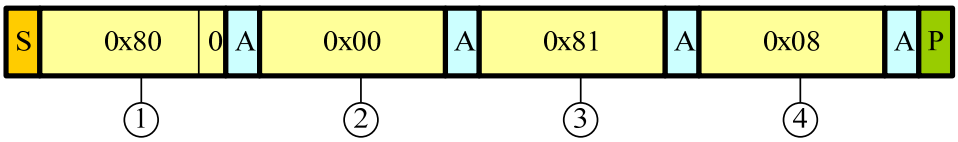
ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Power Voltage For TP controller	VCC	3.0	3.3	3.6	V

GPIO10	GPIO11	Function
0	0	I2C address=0x80
0	1	I2C address=0xC0
1	1	SPI

I2C mode:

Connect PIN3 and PIN6 to GND. Then I2C Address = 0x80.

The complete I2C data format:

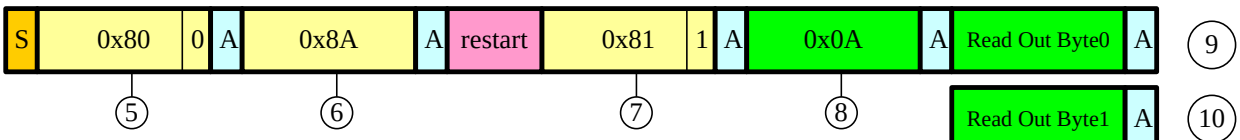


① // 0x80: Send I2C Slave address 0x80 Bit0=0 for:write

② // 0x00: Send TS3510 Command 0x00 for set address

③ //0x81: Write TS3510 Address, Hi Byte with 0x81

④ //0x08: Write TS3510 Address, Hi Byte with 0x08



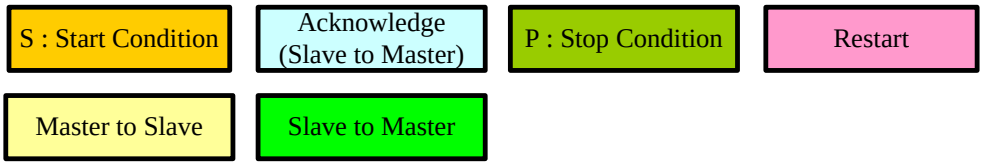
⑤ // 0x80 Send I2C Slave address 0x80 Bit0=0 for:write

⑥ // This Byte = Command [Block read 0x80] + Byte count [0x0A] = 0x8A

⑦ // 0x81 Send I2C Slave address 0x80 Bit0=1 for:Read

⑧ // Read byte__ This byte will returen 0x0A (byte count)

⑨ ~ ⑲



* Byte [0] = X1 coordinate [15:8]

* Byte [1] = X1 coordinate [7:0]

* Byte [2] = Y1 coordinate [15:8]

* Byte [3] = Y1 coordinate [7:0]

* Byte [4] = X2 coordinate [15:8]

* Byte [5] = X2 coordinate [7:0]

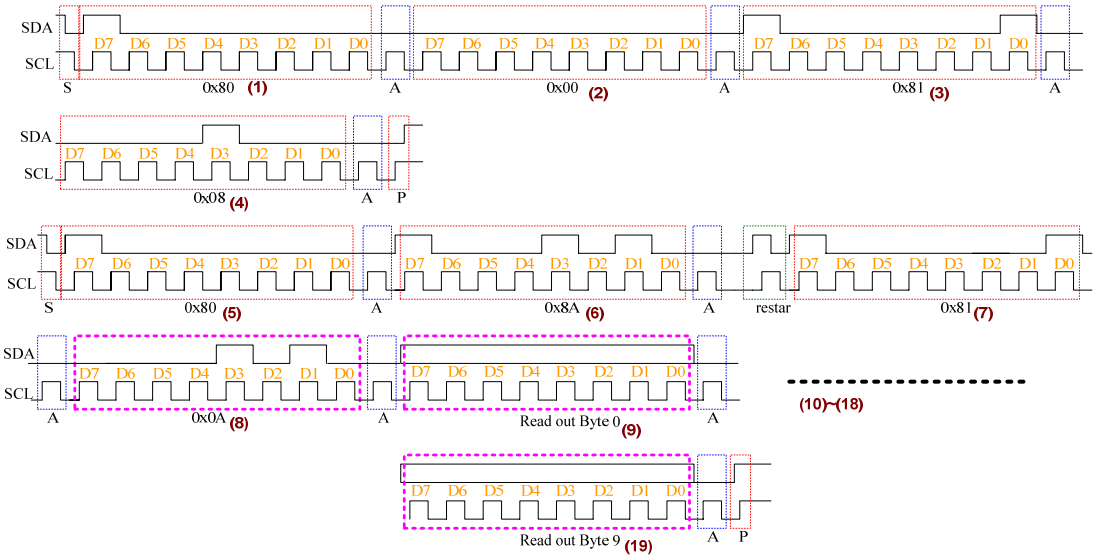
* Byte [6] = Y2 coordinate [15:8]

* Byte [7] = Y2 coordinate [7:0]

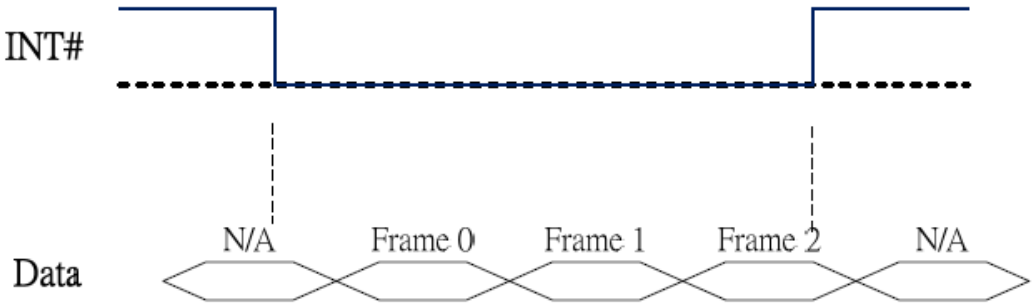
* Byte [8] = Gesture CMD, 01=Zoom in, 02=Zoom out

* Byte [9] = T.B.D;

The detail Timing

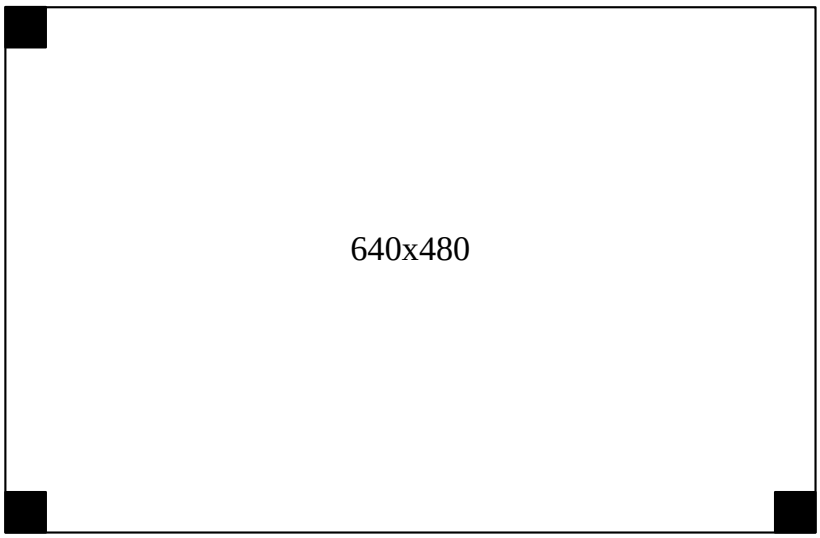


Interrupt starts at touch-down event and ends at touch-lift event. During the period, coordinate report rate is related to the rate which host issues read-coordinate command.



Coordinate

Origin (0,0)



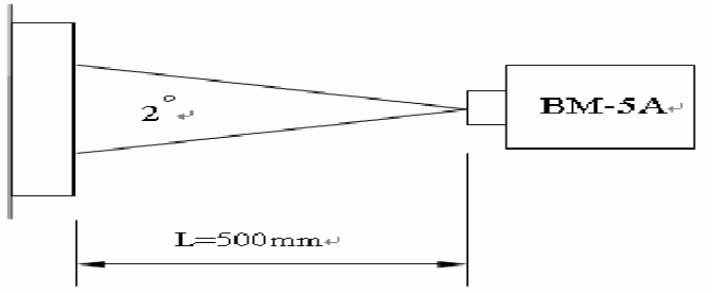
(0, 479) (639,479)

8. OPTICAL CHARACTERISTICS

Item			Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio			CR	Point - 5 Θ=Φ=0°	200	250	--	--	(1)(2)(3)
Luminance			Lw		--	430	-	cd/m²	(1)(3)
Luminance Uniformity			ΔL		70	75	-	%	(1)(3)
Response Time (White – Black)			$T_r + T_f$		--	50	--	ms	(1)(3)(5)
Viewing Angle	Vertical		Θ	CR≧10 Point – 5	-	100	-	Deg.	(1)(2)(4)
	Horizontal		Φ		-	140	-		
Color chromaticity		Red	Rx	Point - 5 Θ=Φ=0°	0.553	0.603	0.653	--	(1)(3)
			Ry		0.322	0.372	0.422		
		Green	Gx		0.315	0.365	0.415		
			Gy		0.524	0.574	0.624		
		Blue	Bx		0.098	0.148	0.198		
			By		0.062	0.112	0.162		
		White	Wx		0.278	0.328	0.378		
			Wy		0.305	0.355	0.405		

NOTE :

(1) Measure conditions : 25℃±2℃ , 60±10%RH under 10Lux , in the dark room by BM-7TOPCON) ,viewing 2° , VCC=3.3V , VDD=3.3V



(2) Definition of Contrast Ratio :

Contrast Ratio (CR) = (White) Luminance of ON ÷ (Black) Luminance of OFF

(3) Definition of Luminance :

Definition of Luminance Uniformity

Measure white luminance on the point 5 as figure9-1

Measure white luminance on the point 1 ~ 9 as figure9-1

ΔL = [L(MIN) / L(MAX)] X 100%

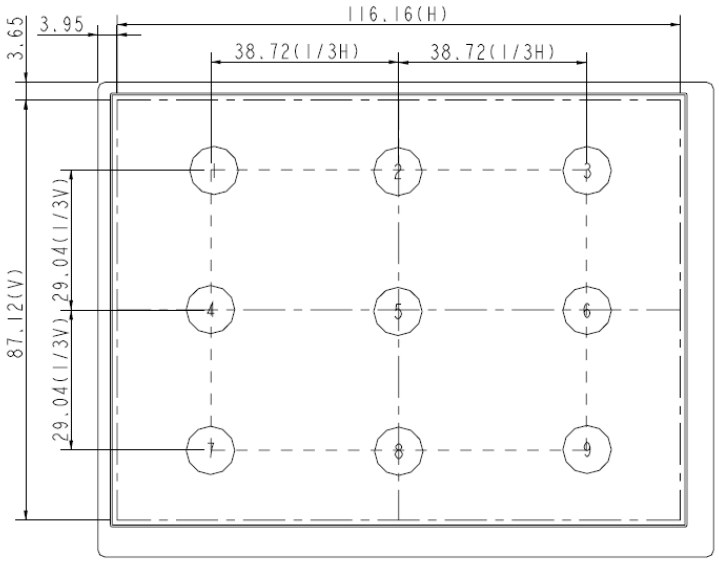


Fig9-1 Measuring point

(4) Definition of Viewing Angle(Θ, Φ), refer to Fig9-2 as below :

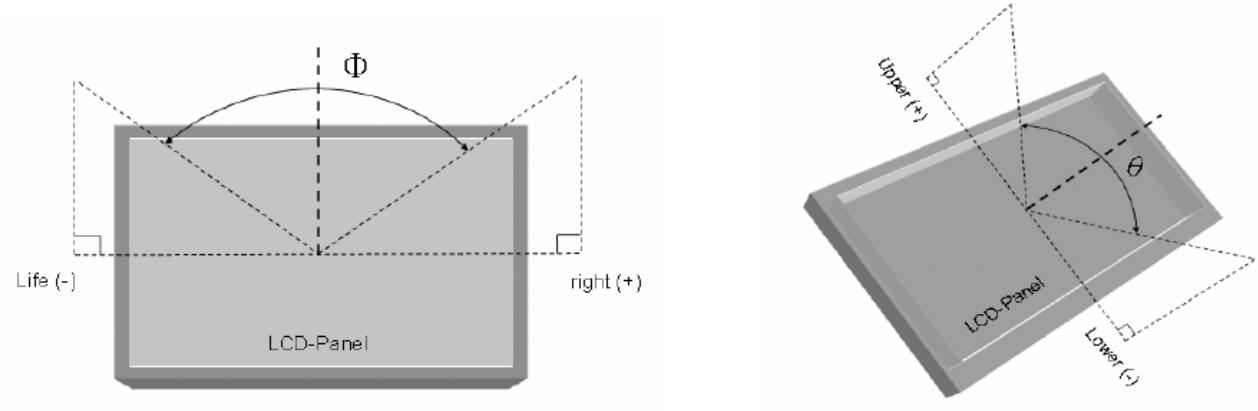


Fig9-2 Definition of Viewing Angle

(5) Definition of Response Time.(White – Black)

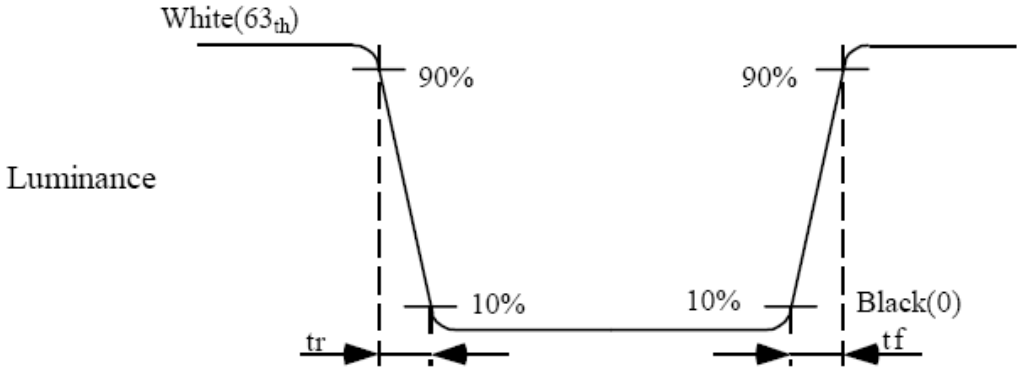


Fig9-3 Definition of Response Time(White-Black)

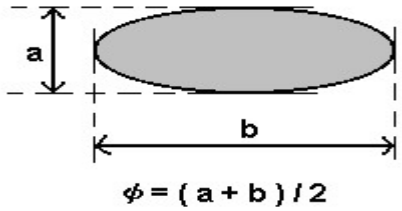
9 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

DEFECT TYPE			LIMIT						Note
VISUAL DEFECT	INTERNAL	SPOT	φ < 0.15mm			Ignore			Note1
			0.15mm ≦ φ ≦ 0.5mm			N≦4			
			0.5mm < φ			N=0			
		FIBER	0.03mm<W≦0.1mm, L≦5mm			N≦3			Note1
			1.0mm < W, 1.5mm < L			N=0			
		POLARIZER BUBBLE	φ < 0.15mm			Ignore			Note1
			0.15mm ≦ φ ≦ 0.5mm			N≦2			
			0.5mm < φ			N=0			
		Mura	It' OK if mura is slight visible through 6%ND filter						
ELECTRICAL DEFECT	BRIGHT DOT		A Grade			B Grade			
			C Area	O Area	Total	C Area	O Area	Total	Note3
			N≦0	N≦2	N≦2	N≦2	N≦3	N≦5	Note2
	DARK DOT		N≦2	N≦3	N≦3	N≦3	N≦5	N≦8	
	TOTAL DOT		N≦4			N≦5	N≦6	N≦8	Note2
	TWO ADJACENT DOT		N≦0	N≦1 pair	N≦1 pair	N≦1 pair	N≦1 pair	N≦1 pair	Note4
	THREE OR MORE ADJACENT DOT		NOT ALLOWED						
	LINE DEFECT		NOT ALLOWED						

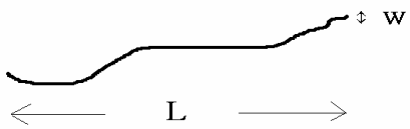
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT ACCEPTITABLE UNDER 6 % ND-Filter

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

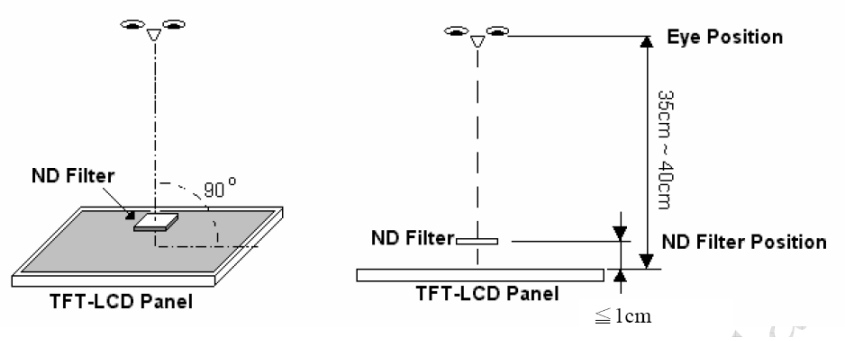


1. (White, black) Spot
2. Polarizer Bubble

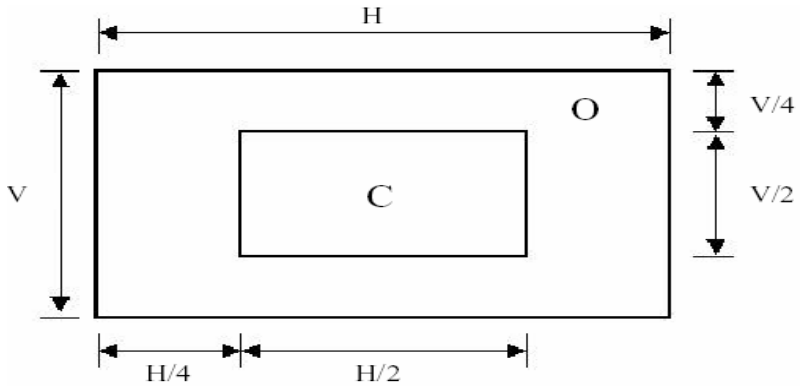


1. fiber

[Note2] Bright dot is defined through 6% transmission ND Filter as following.



[Note3]

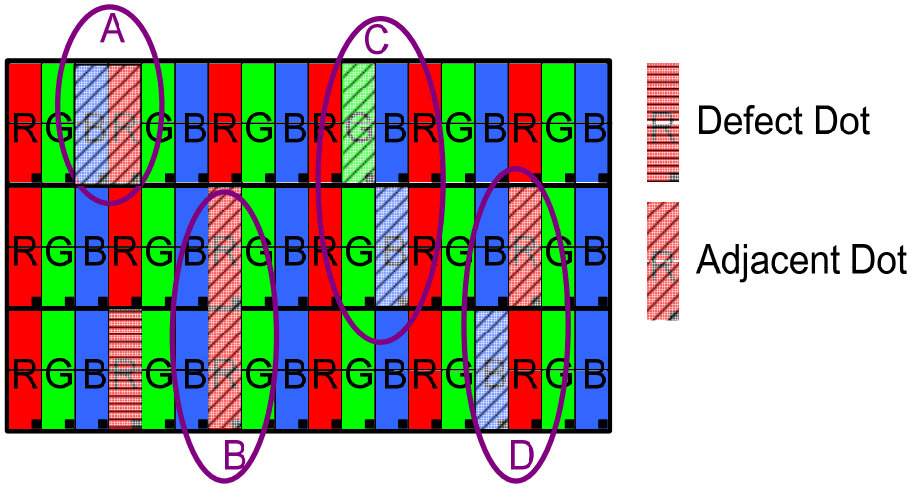


C Area: Center of display area

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.

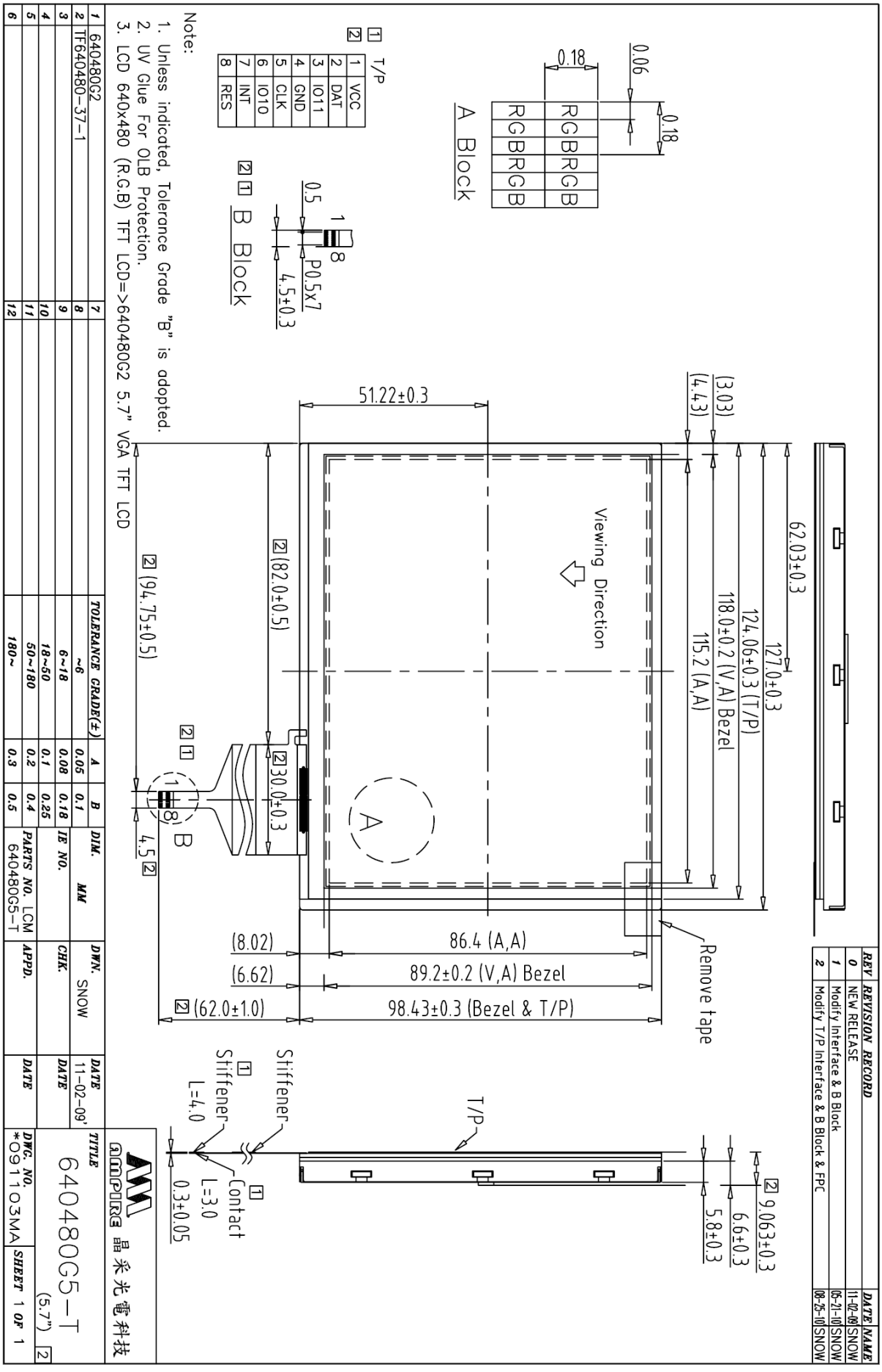
10. RELIABILITY TEST CONDITIONS

ITEM	CONDITIONS
HIGH TEMPERATURE OPERATION	70℃ , 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60℃ , 90%RH , 240Hrs
HIGH TEMPERATURE STORAGE	80℃ , 240Hrs
LOW TEMPERATURE OPERATION	-20℃ , 240Hrs
LOW TEMPERATURE STORAGE	-30℃ , 240Hrs
THERMAL SHOCK	-30℃(0.5Hr) ~80℃(0.5Hr) 200Cycle

10.1 OTHERS

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

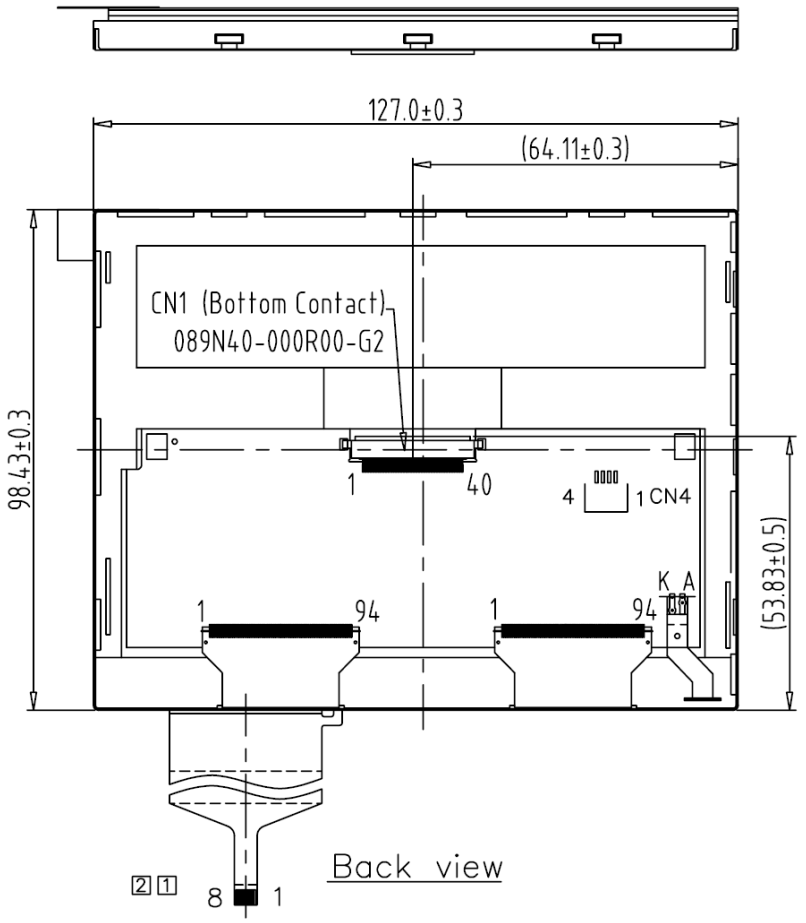
11. OUTLINE DIMENSION

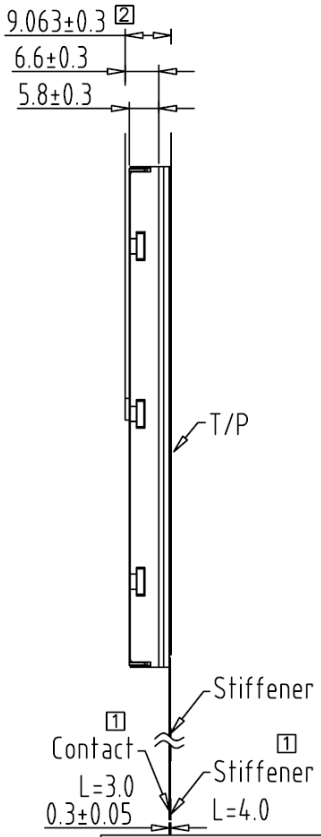


REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	11-02-09	SNOW
1	Modify Interface & B Block	05-21-10	SNOW
2	Modify T/P Interface & B Block & FPC	08-25-10	SNOW

CN1

1	U/D	21	G5
2	DMS(NC)	22	G4
3	HSYNC(NC)	23	G3
4	VLED	24	VSS
5	VLED	25	G2
6	VLED	26	G1
7	VCC	27	G0
8	VSYNC(NC)	28	VSS
9	DE	29	R5
10	VSS	30	R4
11	VSS	31	R3
12	ADJ	32	VSS
13	B5	33	R2
14	B4	34	R1
15	B3	35	R0
16	VSS	36	VSS
17	B2	37	VSS
18	B1	38	DCLK
19	B0	39	VSS
20	VSS	40	L/R





				TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. SNOW	DATE 11-02-09'	TITLE 640480G5-T (5.7") 2
1	TF640480-37-1	7								
2		8		~6	0.05	0.1				
3		9		6~18	0.08	0.18	IE NO.	CHK.	DATE	
4		10		18~50	0.1	0.25				
5		11		50~180	0.2	0.4	PARTS NO. LCM-1 640480G5-T	APPD.	DATE	DWG. NO. *091104MA / SHEET 1 OF 1
6		12		180~	0.3	0.5				

AMPIRE 晶采光電科技

AMPIRE CO., LTD.

Date : 2010/11/1