



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-480640BTGQW-A0H
Approved by	
Date	

Approved For Specifications

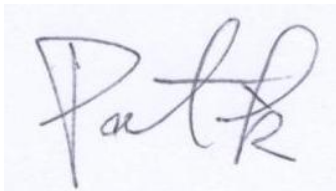


Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2016/1/26	-	New Release	Jessica

1. PHYSICAL SPECIFICATIONS

Item	Specifications	Remark
LCD size	3.5 inch(Diagonal)	
Driver IC	HX8363A	
Display resolution	480 (W) × 3(RGB) × 640(H) dots	
Interface	LVDS	
Pixel pitch	0.1116 x0.1116 mm	
Active area	53.568 (W) x 71.424 (H) mm	
Module size	61.8 (W) x 88.5 (H) × 9.6 (D) mm	
Display Mode	AIFF/Transflective/Normally Black	
Color arrangement	RGB vertical stripe	
Viewing Direction	Wide viewing	
Luminance	400	
Weight	TBD	

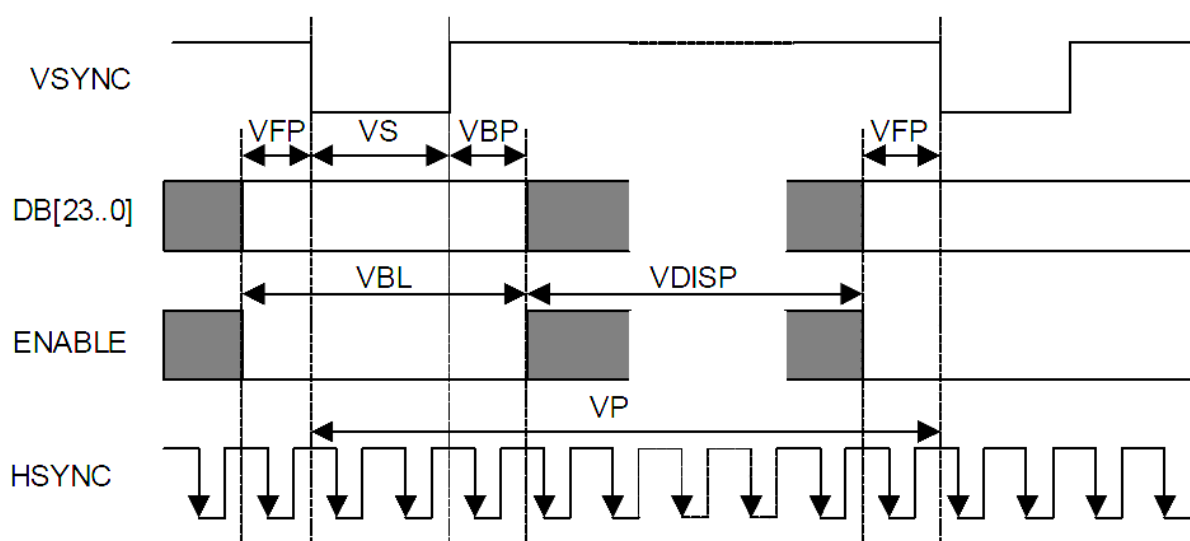
2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	4.6	V
Operating Temperature	TOP	-20	60	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

3. Timing Characteristics

3.1 RGB Interface Timing Characteristics

Vertical Timings for RGB I/F



Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	646	-	650	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area	-	VDISP	-	640	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

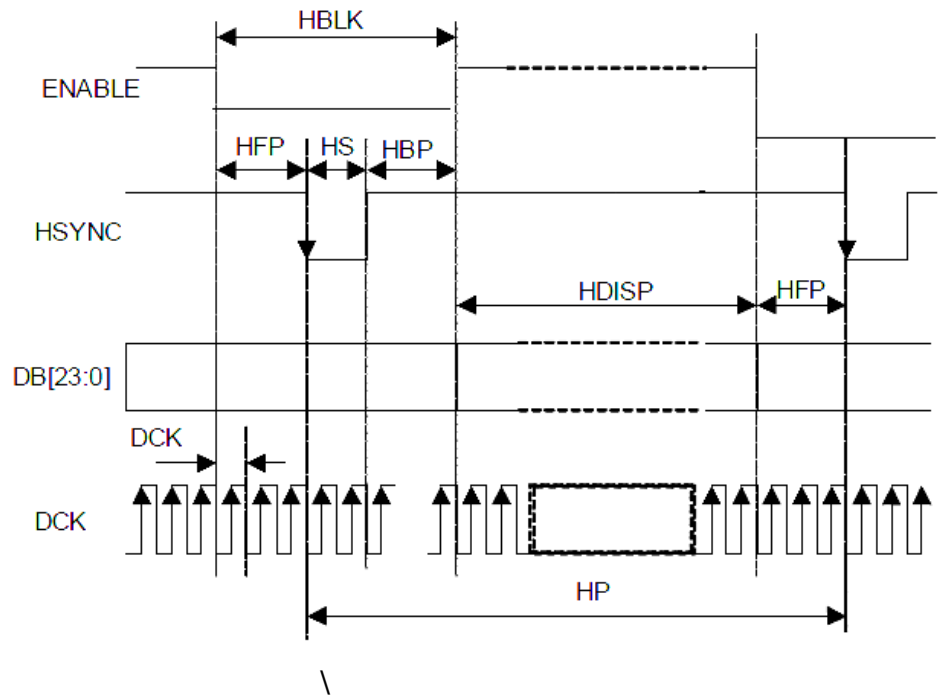
Note: (1) Signal rise and fall times are equal to or less than 20 ns.

(2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.

(3) Data lines can be set to "High" or "Low" during blanking time – Don't care.

(4) VRR must keep from 50Hz to 70Hz when adjust other items

Horizontal Timings for RGB I/F



Item	Sym bol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note 3	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency	DCK	VRR = Min. 50 Hz	21.6	-	34.3	MHz
When RGB I/F is running		- Max. 70 Hz	29.1	-	46.2	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.

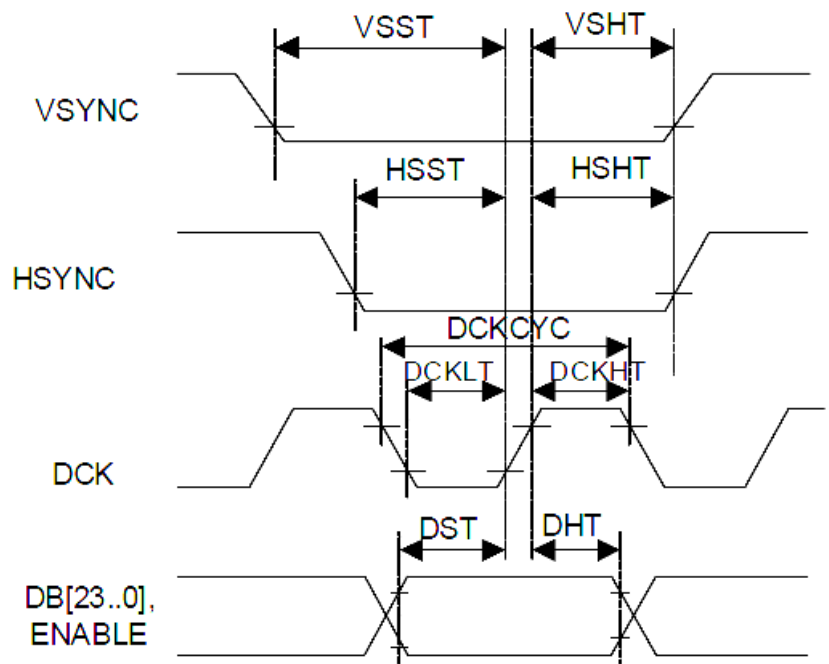
(2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.

(3) HP is multiples of eight DCK.

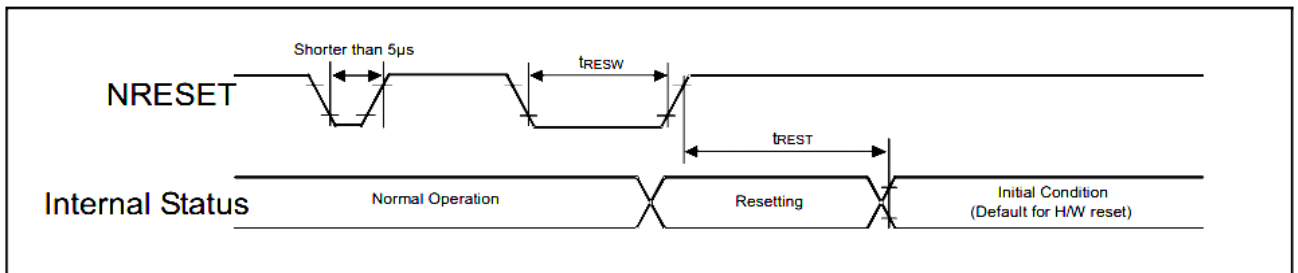
(4) Data lines can be set to "High" or "Low" during blanking time – Don't care.

(5) DCK must keep from 21.6Hz to 34.3Hz when adjust other items.

General Timings for RGB I/F



3.2 Reset Timing Characteristics

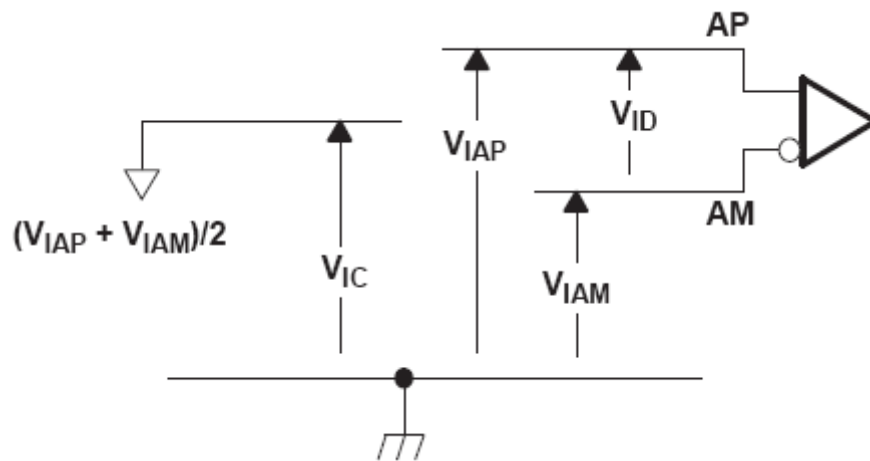


Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t_{RESW}	Reset low pulse width ⁽¹⁾	NRESET	10	-	-	-	µs
t_{REST}	Reset complete time ⁽²⁾	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

4. ELECTRICAL CHARACTERISTICS

4.1 LVDS input

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	3	3.3	3.6	V
I_{CC}	Current of Supply voltage		100		mA
V_{IH}	High-level input voltage (SHTDN)	2			V
V_{IL}	Low-level input voltage (SHTDN)			0.8	V
$ V_{ID} $	Magnitude differential input voltage	0.1		0.6	V
V_{IC}	Common-mode input voltage	$\frac{ V_{ID} }{2}$		$2.4 - \frac{ V_{ID} }{2}$	V

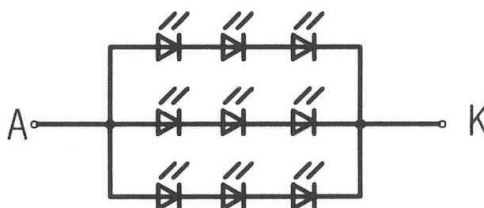


5. Backlight Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Driver Power Voltage	V_{LED}	5	--	7.5	V	
LED Driver Current Consumption	I_{LED}	378	--	486	mA	$V_{LED}=5V$ $V_{ADJ}=3.3V$ (duty 100%)
		252	--	324	mA	$V_{LED}=7.5V$ $V_{ADJ}=3.3V$ (duty 100%)
ADJ signal frequency	f_{PWM}	10	--	100	kHz	
ADJ signal logic level High	V_{IH}	2V	--	V_{LED}	V	
ADJ signal logic level Low	V_{IL}	0	--	0.4	V	
LED voltage	V_{AK}	8.4	--	10.8	V	I_{LED} 180mA $T_a=25^{\circ}C$
LED current	I_{AK}	--	180	--	mA	$T_a=25^{\circ}C$
LED Life Time	-	--	50K	--	Hour	Note (1)

Note (1) Brightness to be decreased to 50% of the initial value.

LED Light Bar Circuit



6. Interface

6.1 LCM interface

PIN NO.	PIN NAME	DESCRIPTION
1	VCC	Power supply
2	VCC	Power supply
3	GND	Ground
4	GND	Ground
5	RXIN0-	-LVDS differential data input
6	RXIN0+	+LVDS differential data input
7	GND	Ground
8	RXIN1-	-LVDS differential data input
9	RXIN1+	+LVDS differential data input
10	GND	Ground
11	RXIN2-	-LVDS differential data input
12	RXIN2+	+LVDS differential data input
13	GND	Ground
14	CLK-	-LVDS differential data input
15	CLK+	+LVDS differential data input
16	GND	Ground
17	VLED	LED Power Supply
18	VLED	LED Power Supply
19	GND	Ground
20	ADJ	PWM Signal for LED Dimming Control

7. Optical Specifications

7.1 Transmissive mode

Item		Symbol	Specifications			Unit	Note
			Min.	Typ.	Max.		
Contrast ratio		Cr ($\theta=0^\circ$)	-	250	-		
Response time (25°C)		Tr + Tf	-	30	50	ms	
Viewing angle (Cr \geq 10)*		θ_{21}	60	80	-	deg	
		θ_{22}	60	80	-		
		θ_{12}	60	80	-		
		θ_{11}	60	80	-		
Chromaticity of CF	Red	x	0.593	0.643	0.693	Chromaticity measuring machine: CFT-01. Reference Only	
		y	0.283	0.333	0.383		
	Green	x	0.254	0.304	0.354		
		y	0.528	0.578	0.628		
	Blue	x	0.091	0.141	0.191		
		y	0.087	0.137	0.187		
	White	x	0.264	0.314	0.364		
		y	0.296	0.346	0.396		
Color gamut of CF (NTSC%)		S		58		%	

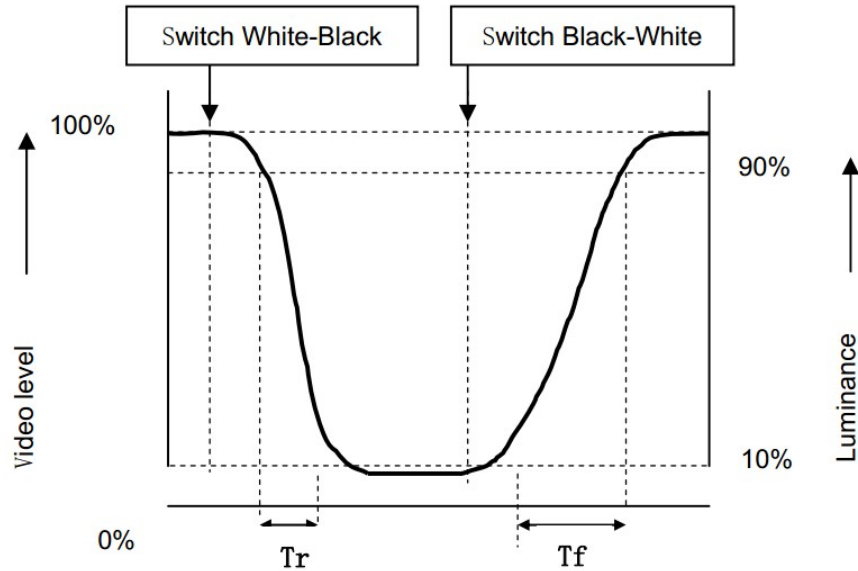
7.2 Reflective mode

Item		Symbol	Specifications			Unit	Note
			Min.	Typ.	Max.		
Reflection Ratio (With Polarizer)		R ($\theta=\phi=0^\circ$)	-	7	-	%	Here the data are design value.
Reflective Contrast Ratio		Cr ($\theta=0^\circ$)	-	15	-		Note1
Viewing angle (Cr \geq 2)*		θ_{21}	-	45	-	deg	
		θ_{22}	-	45	-		
		θ_{12}	-	45	-		
		θ_{11}	-	45	-		

7.3 Definitions and measuring methods

Note (1) Response Time(T_r 、 T_f)

The rise time ' T_r ' is defined as the time for luminance to change from 90% to 10% as a result of the change in electrical condition. The fall time ' T_f ' is defined as the time for luminance to change from 10% to 90% as a result of the change in electrical condition.

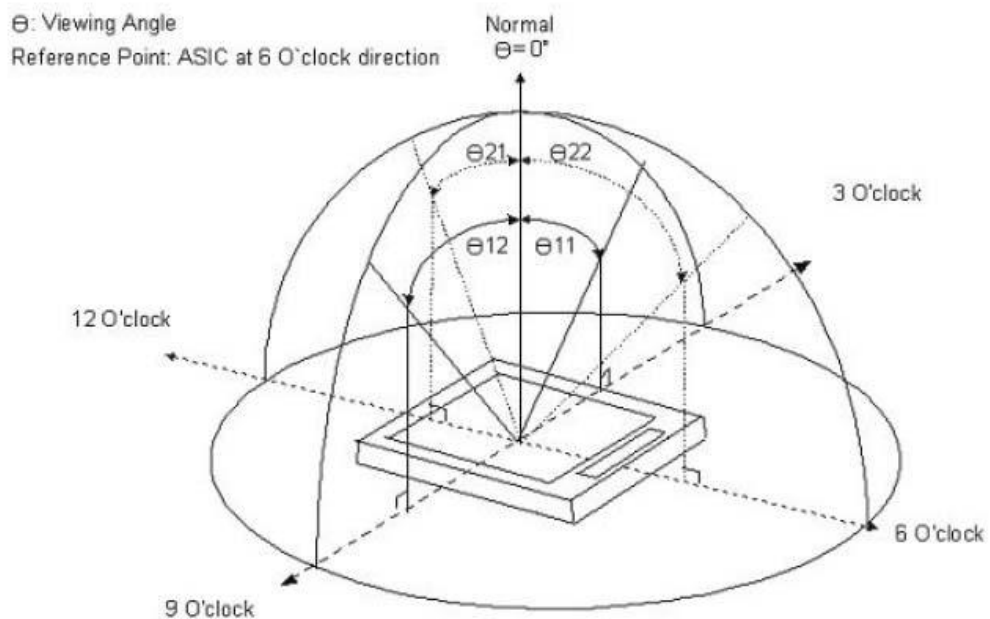


Note (2) Contrast ratio (Cr)

The contrast ratio (Cr), measured on a module, is the ratio of the luminance (L_w) in a full white area ($R=G=B=1$) and the luminance (L_d) in a dark area ($R=G=B=0$):

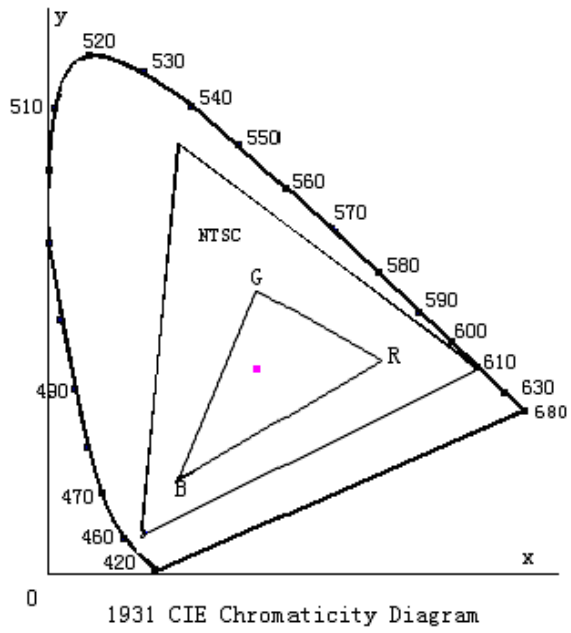
$$Cr = \frac{L_w}{L_d}$$

Note (3) Viewing angle diagram



Note (4) Definition of color gamut

Measuring machine: CFT-01. NTSC'S Primaries: R (x, y), G (x, y), B (x, y).



CIE chromaticity diagram

$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

8. Reliability Test Items

Test Item	Test Conditions	Note
High Temperature Operation	60±3°C , t=120 hrs	
Low Temperature Operation	-20±3°C , t=120 hrs	
High Temperature Storage	80±3°C , t=120 hrs	1,2
Low Temperature Storage	-30±3°C , t=120 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 120 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 70°C (30min) 50 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 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).

9. Handling Precautions

9.1 Mounting method

1. The LCD panel of SC LCD module consists of two thin glass plates with polarizers which easily be damaged. Since the module is so constructed, it needs to be fixed by utilizing fitting holes in the printed circuit board.
2. Extreme care should be needed when handling the LCD modules.

9.2 Caution of LCD handling and cleaning

1. When you are cleaning the display surface, use soft cloth with solvent as recommended below and wipe lightly.
 - Isopropyl alcohol
 - Ethyl alcohol
2. Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.
3. Do not use the following solvent:
 - Water
 - Aromatics
4. Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns
5. Do not use the following solvent on the pad or prevent it from being contaminated:
 - Soldering flux
 - Chlorine (Cl), Sulfur (S)
1. If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes by.
2. If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, the responsibility is on customer.

9.3 Caution against static charge

1. The LCD module uses C-MOS LSI drivers, so we recommend that you:
Connect any unused input terminal to V_{dd} or V_{ss}, and do not input any signals before power is turned on. Besides, ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

9.4 Packing

1. Module employs LCD elements and must be treated as such.
2. Avoid intense shock and falls from the height.
3. To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

9.5 Caution for operation

1. It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit which causes the shorter LCD life.
2. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so the use of direct current drive should be avoided.
3. Response time will be extremely delayed at lower temperature than the operating temperature range. On the other hand, the LCD shows dark color at higher temperature. However those phenomena do not mean malfunction or out of order with LCD, which will come back in the specified operation temperature.
4. If the display area is pushed hard during operation, some font will be abnormally displayed. However, it resumes normal condition after turning off once.
5. Slight dew depositing on terminals is the cause for electro-chemical reaction which results in terminal open circuit. Usage under the maximum operating temperature, 50%Rh or less is required.
6. Do not keep the LCD at the same display pattern continually. The residual image will happen, and it will damage the LCD. Please use screen saver.

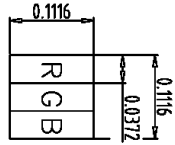
9.6 Storage

1. In the case of storing for a long period of time such as years for the purpose or replacement use, the following ways are recommended.
 1. Storage in a polyethylene bag with the opening sealed so as not to enter fresh air from outside into it and without desiccant.
 2. Placing in a dark place where it's neither exposed to direct sunlight nor light keeping the storage temperature range.
 3. Storing without the anything else touching on polarizer surface.
 4. It is recommended to store them as they have been contained in the inner container at the time of delivery from us

9.7 Safety

1. It is recommended to crash the damaged or unnecessary LCD's into pieces, and wash off liquid crystal with solvents such as acetone and ethanol which should be burned up later.
2. When any liquid leaked out of the damaged glass cell and contact with your hands, please wash it off well with soap and water.

10. OUTLINE DIMENSION

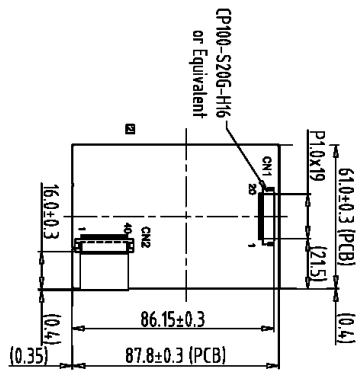
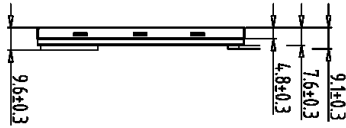
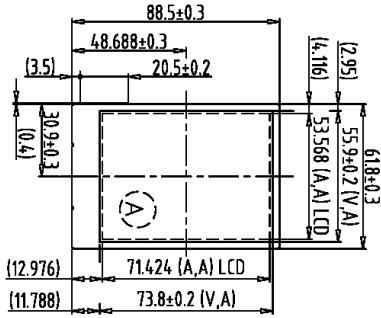


A Block

CN1	11	RXIN2-
	12	RXIN2+
	13	GND
	14	CKIN-
	15	CKIN+
	16	GND
	17	VLED
	18	VLED
	19	GND
	20	ADJ


Note:

1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. LCD 480x640 (R,G,B) TFT LCD =>3.5" TFT LCD (IPS)
4. CN1: CP100-S20G-H16 or Equivalent



Back View

1	TF480640-03A-0	7		TOLERANCE GRAD(F)	A	B	DIAM.	MM	DWN.	SNOW	DATE	DATE	DWG. NO.	DATE
2		8					IE NO.		CHK.		DATE		*1508113MA	SIZE
3		9					PARTS NO. LCM	480640B-A0	APPD.				LVDS IPS (3.5")	OP 1
4		10												
5		11												
6		12												


晶采光电科技
480640B-A0
 LVDS IPS (3.5")

REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	11-17-15(SNOW)
1	Rename TF480640-03A-0 to 480640B-A0	11-17-15(SNOW)
2	Delete A,K (cable to PFC)	11-21-15(SNOW)