



晶采光電科技股份有限公司
AMPIRE CO., LTD

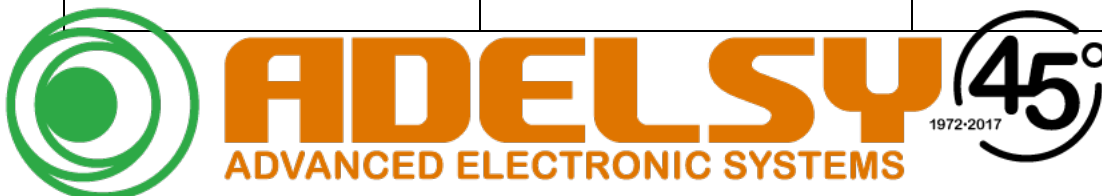
SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-480800D1TZQW-00H
APPROVED BY	
DATE	

- Approved For Specifications
 Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2015/05/21	-	New Release	Kokai

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1 Features

LCD 4.3 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) for mobile-phone or handy electrical equipments.

- (1) Construction : Amorphous silicon TFT-LCD with driving system, Bezel and White LED Backlight.
- (2) LCD type : Transmissive , Normally Black.
- (3) Interface : 24BIT RGB + SPI Interface.
- (4) Driver IC : ILI9806C
- (5) Power Supply Voltage : 3.3V power input for TFT, built-in power supply circuit.
- (6) RoHS Compliance.

2 Mechanical specifications

Dimensions and weight

Item		Specifications	Unit
Active Display Size		4.3 inch diagonal	mm
Main LCD	Outline Dimension	61.96 (H) x 104.5(V) x 1.9 (T)	mm
	Pixel pitch	0.117 (H) x 0.117(V)	mm
	Active area	56.16 (H) x 93.6(V)	mm
	Number of Pixels	480(H)x800(V) pixels	mm

*1. This specification is about External shape on shipment from AMPIRE.

Ta=25°C GND=0V

Item	Symbol	Min.	Max.	Unit	Remarks
Power supply voltage1 (I/O)	IOVCC	-0.3	+4.6	V	
Power supply voltage2 (Analog)	VCC				

3-2 Environment

Item	Specifications	Remarks
Storage temperature	Max. +80 °C Min. -30 °C	Note 1: Non-condensing
Operating temperature	Max. +70 °C Min. -20 °C	Note 1: Non-condensing

Note 1 : Ta ≤ +40 °C Max.85%RH

Ta > +40 °C The max. humidity should not exceed the humidity with 40 °C 85%RH.

4 Electrical specifications

4-1 Electrical characteristics of LCM

(GND=0V, Ta=25 °C)

Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Logic operation Voltage	IOVCC	1.65	1.8/2.8	3.3	V	
Analog operation Voltage	VCC	2.6	2.8	3.2	V	
High-level input voltage	V _{IH}	0.7* IOVCC		IOVCC	V	
Low-level input voltage	V _{IL}	-0.3		0.2* IOVCC	V	
High-level output voltage	V _{OH}	0.8* IOVCC		IOVCC	V	IOH=-1mA
Low-level output voltage	V _{OL}	0		0.2* IOVCC	V	IOH=1mA
Power Consumption		-	99	150	mA	

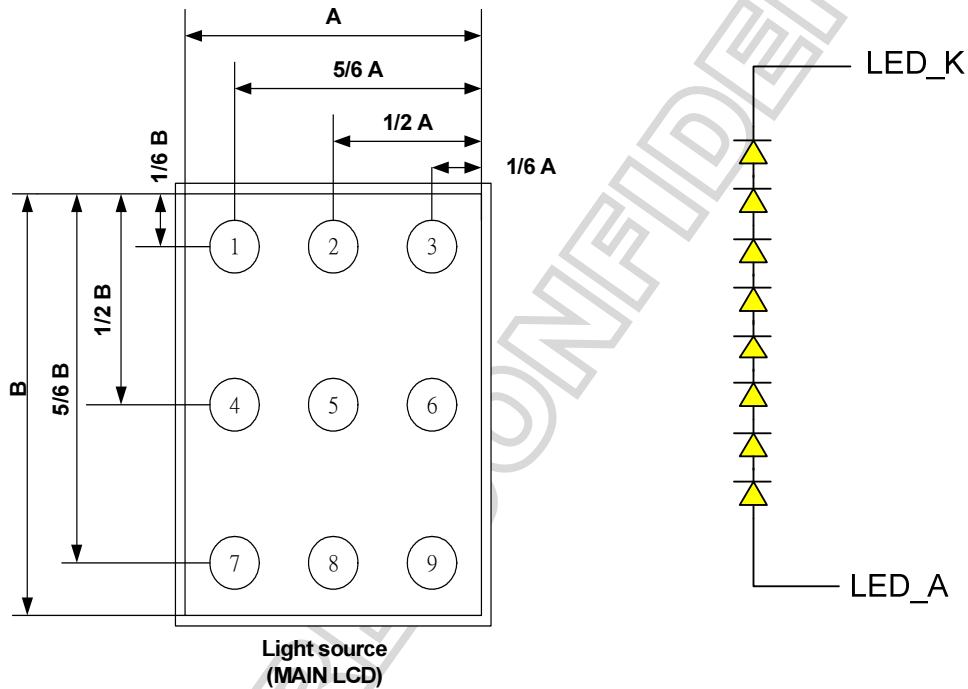
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4-2 LED back light specification

Item	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Forward voltage	V_f	$I_f = 20\text{mA}$	-	(25.6)	-	V
Forward current	I_f		-	20	--	mA
Uniformity (with L/G)	-	$I_f = 20\text{mA}$	70%	-	-	
Luminous color	White					
Chip connection	8 chip serial connection					

Note: (value), value=estimate value.

Bare LED measure position:



Light source
(MAIN LCD)

*1 Uniformity (LT): $\frac{\text{Min}(P1 \sim P9)}{\text{Max}(P1 \sim P9)} \times 100 \geq 80\%$

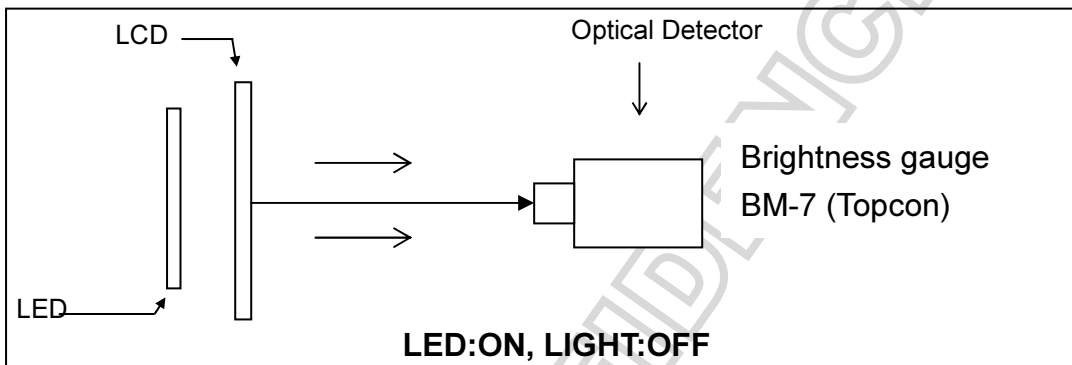
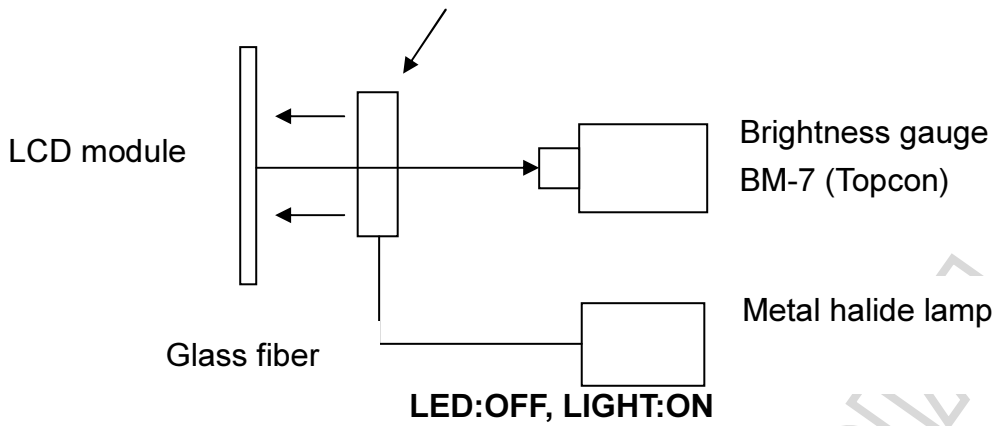
5 Main LCD

5-1 Optical characteristics

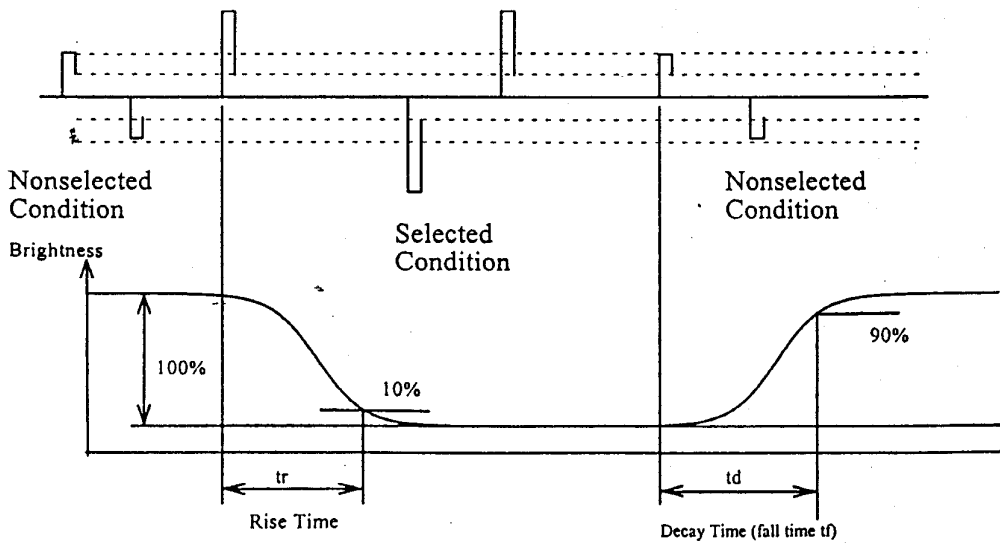
($I_F=22\text{mA}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Min.	Std.	Max.	Unit	Conditions	
Contrast ratio	CR	600	800	-	-	$\theta=0^\circ$ $\Phi=0^\circ$ Normal viewing angle	
Response time	Rising	Tr	-	15	-		ms
	Faling	Tf	-	20	-		
White luminance (center of screen)	YL	200	250	-	cd/m2		
Color chromaticity (CIE1931)	Red	Rx	0.587	0.637	0.687		Normal viewing angle
		Ry	0.308	0.358	0.408		
	Green	Gx	0.264	0.314	0.364		
		Gy	0.540	0.590	0.640		
	Blue	Bx	0.102	0.152	0.202		
		By	0.015	0.065	0.115		
White	Wx	0.253	0.303	0.353			
	Wy	0.275	0.325	0.375			
Visual angle	Hor.	θ_L	75	80	-	Degree	
		θ_R	75	80	-		
	Ver.	θ_f	75	80	-		
		θ_b	75	80	-		
						CR>10	

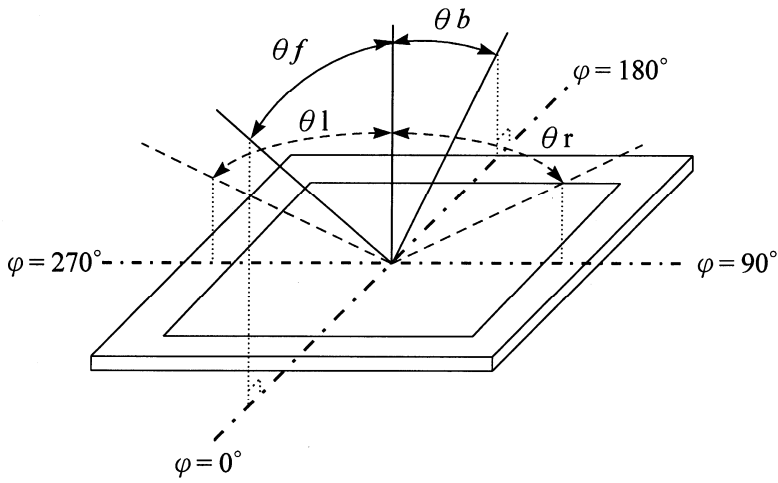
Note: (value), value=estimate value.



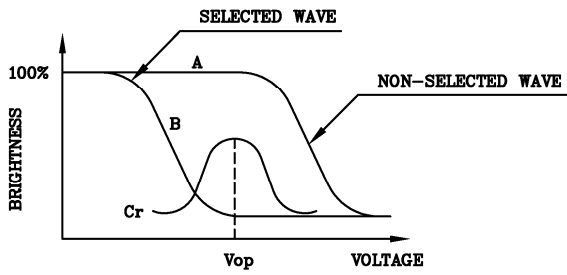
NOTE 2: Response time definition



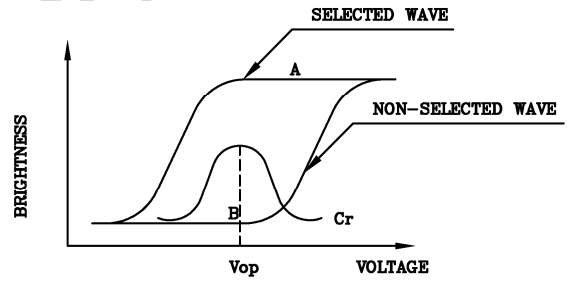
NOTE 3: φ , θ definition



NOTE 4: Contrast definition



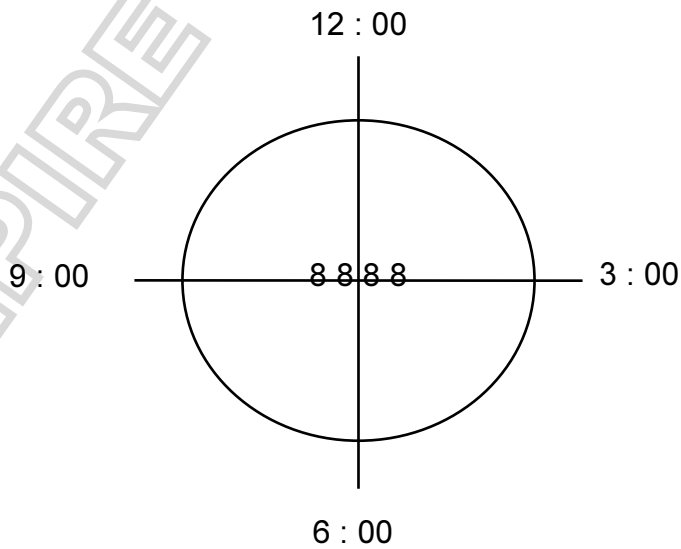
(positive type)



(negative type)

Contrast Ratio : $Cr = A/B$

NOTE 5: Visual angle direction priority



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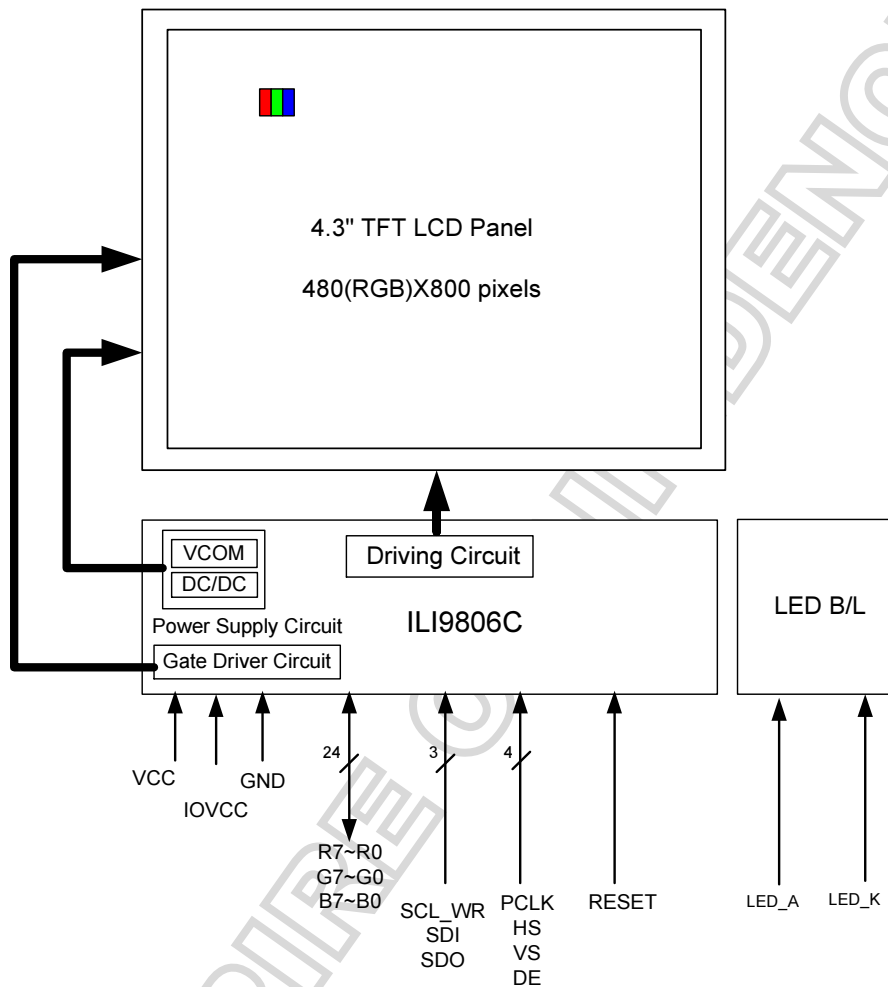
6 Block Diagram

Block diagram (Main LCD)

Display format: A-Si TFT transmissive, Normally Black type.

Display composition: 480 x RGB x 800 dots

LCD Driver: RM68050 or equivalent.

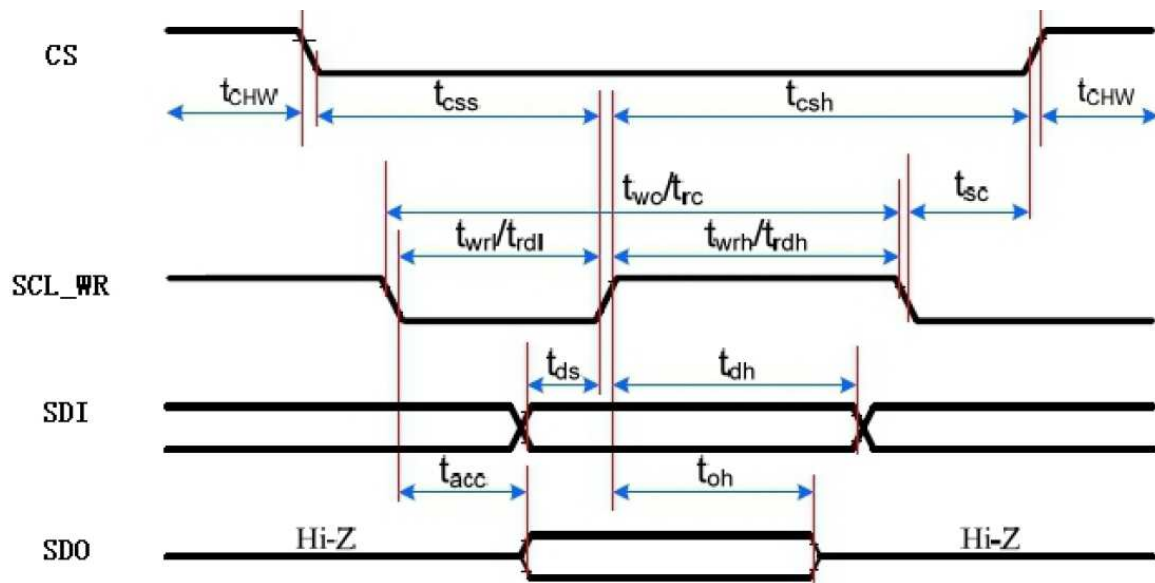


7 Interface specifications

Pin No.	Terminal	Functions
1	GND	Ground
2	LEDA	Power supply for LED (Anode).
3	LEDK	Power supply for LED (Cathode).
4	VCC	Power supply for Step-up circuit. (Typ=2.8V).
5	IOVCC	Power supply for I/O circuit. (Typ=1.8V or 2.8V).
6	SDO	Serial data output pin for SPI interface
7	SDI	Serial data input pin for SPI interface
8	GND	Ground
9	SCL_WR	Serial clock input
10	CS	Chip select input. Low: select and accessible High: not select and not accessible
11	IM3	No Connection
12	RESET	Switching to "L" initializes internally. Must be reset after the power is supplied.
13~20	R0~R7	RGB interface Red Data
21~28	G0~G7	RGB interface Green Data
29~36	B0~B7	RGB interface Blue Data
37	DE	Data Enable signal Low: access enabled High: access inhibited
38	GND	Ground
39	PCLK	Pixel clock signal
40	GND	Ground
41	HS	Line synchronizing signal
42	VS	Frame synchronizing signal
43	IC_ID	No Connection
44	LED_PWM	LED PWM frequency output for LED driver control Leave it open when not in use
45	GND	Ground

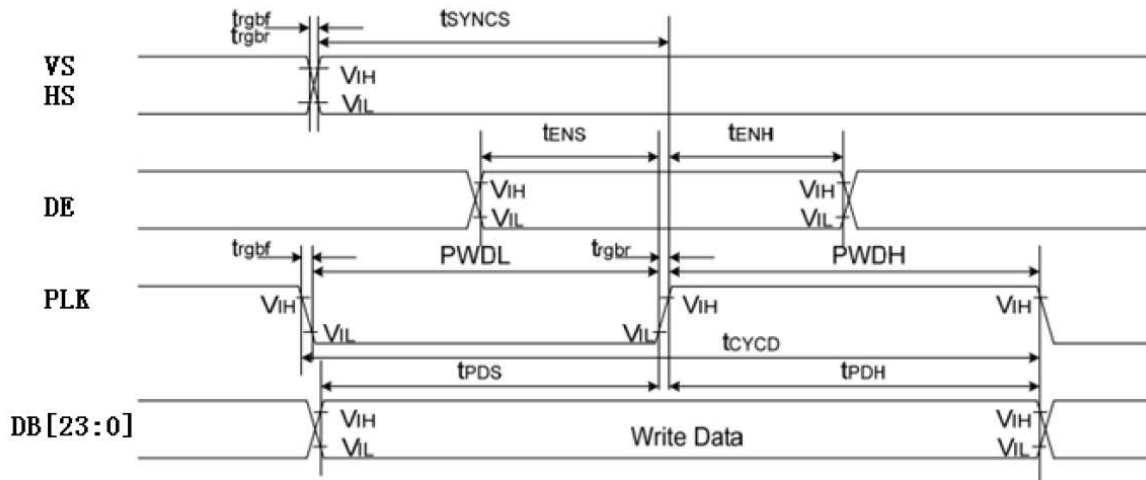
8 Timing Chart

8.1 Serial Interface

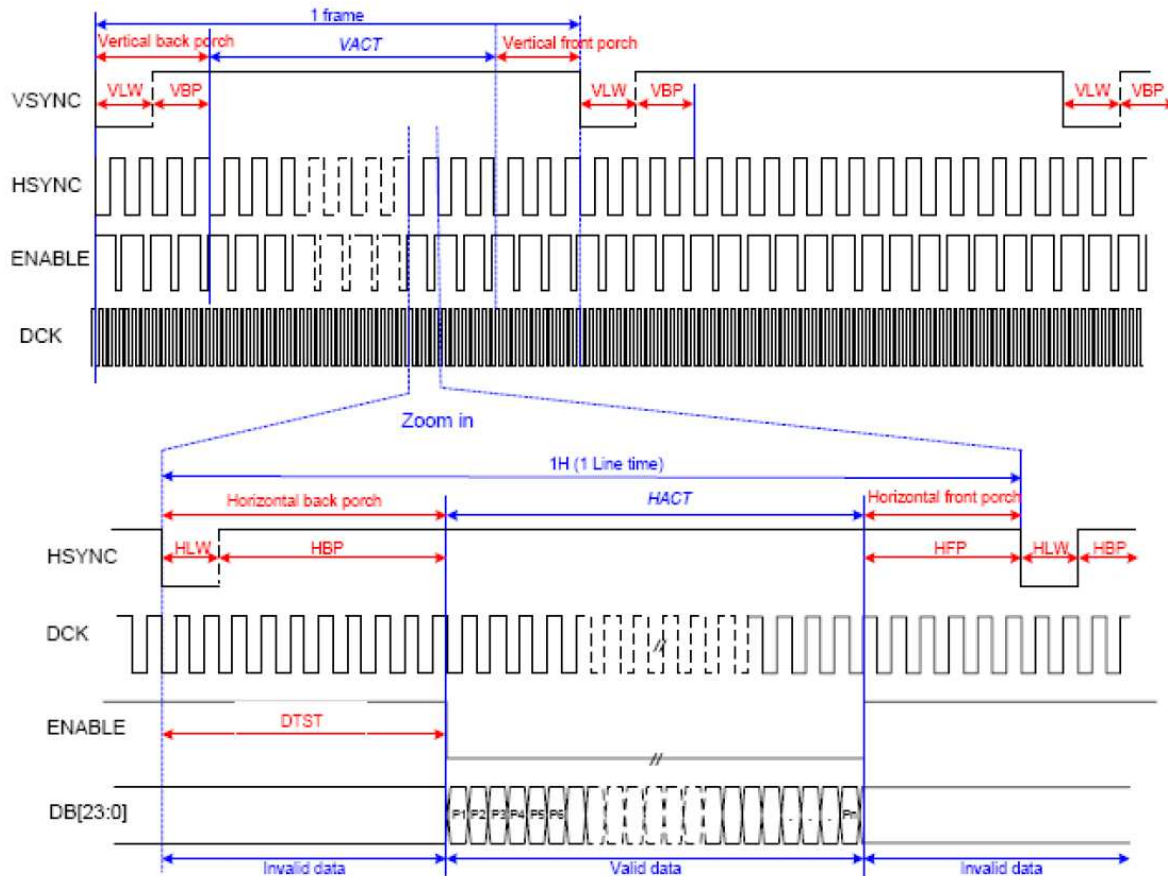


Signal	Symbol	Parameter	min	max	Unit	Description
CS	t_{cSS}	Chip select time(Write)	15	-	ns	
	t_{cSH}	Chip select hold time(Read)	15	-	ns	
	t_{CHW}	CS "H" pulse width	40	-	ns	
SCL_WR	t_{wc}	Serial clock cycle(Write)	30	-	ns	
	t_{wrh}	SCL "H" pulse width(Write)	10	-	ns	
	t_{wrl}	SCL "L" pulse width(Write)	10	-	ns	
	t_{rc}	Serial clock cycle(Read)	150	-	ns	
	t_{rdh}	SCL "H" pulse width(Read)	60	-	ns	
	t_{rdl}	SCL "L" pulse width(Read)	60	-	ns	
SDO	t_{acc}	Access time(Read)	10	50	ns	For maximum CL=30pF For minimum CL=8pF
	t_{oh}	Output disable time(Read)	15	50	ns	
SDI	t_{ds}	Data setup time(Write)	10	-	ns	
	t_{dh}	Data hold time(Write)	10	-	ns	

8.2 RGB Interface



Signal	Symbol	Parameter	min	max	Unit	Description
VS/HS	tSYNCS	VS/HS setup time	5	-	ns	24/18/16-bit bus RGB interface mode
	tSYNCH	VS/HS hold time	5	-	ns	
DE	tENS	DE setup time	5	-	ns	
	tENH	DE hold time	5	-	ns	
DB[23:0]	tPOS	Data setup time	5	-	ns	
	tPDH	Data hold time	5	-	ns	
PLK	PWDH	PLK high-level period	13	-	ns	
	PWDL	PLK low-level period	13	-	ns	
	tCYCD	PLK cycle time	28	-	ns	
	trgbr, trgbf	PLK, HS, VS rise/fall time	-	15	ns	

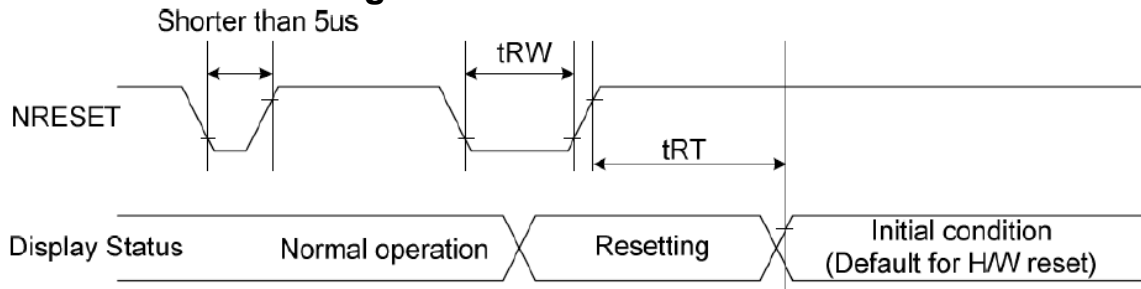


VLW : VSYNC Low pulse Width
 HLW : HSYNC Low pulse Width
 DTST : Data Transfer Startup Time
 Pn : pixel 1, pixel 2..., pixel n.

Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
Frame Rate	FR		50	-	70	fps
Horizontal Low Pulse Width	HLW		5	-	80	DOTCLK
Horizontal Back Porch	HBP		10	-	85	DOTCLK
Horizontal Address	HACT		-	480	-	DOTCLK
Horizontal Front Porch	HFP		5	-	80	DOTCLK
Horizontal Blanking Period	HBP + HFP		60	-	90	DOTCLK
Vertical Low Pulse Width	VLW		2	-	4	Line
Vertical Back Porch*	VBP		4	-	-	Line
Vertical Address	VACT		-	800	-	Line
Vertical Front Porch	VFP		2	-	-	Line
Vertical Blanking Period	VBP + VFP		6	-	-	Line
Data Clock	DCLK		23.5	-	34.9	MHz

AML

8.3 Reset Timing



Signal	Symbol	Parameter	min	max	Unit
RESET	tRW	Reset pulse duration	10		us
	tRT	Reset cancel		5(note 1,5) 120(note 1,6,7)	ms

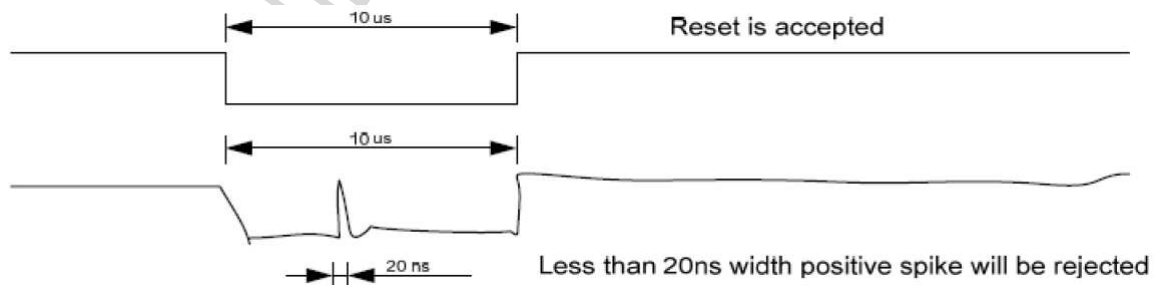
Note:

- 1.The reset cancel includes also required time for loading ID bytes,VCOM setting and other settings from OTP to registers.This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESET.
- 2.Spike due to an electrostatic discharge on RESET line does not cause irregular system reset according to following table.

RESET Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset stars

3.During the Resetting period, the display will be blanked(The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out mode. The display remains the blank state in Sleep In mode.) and then return to Default condition for Hardware Reset.

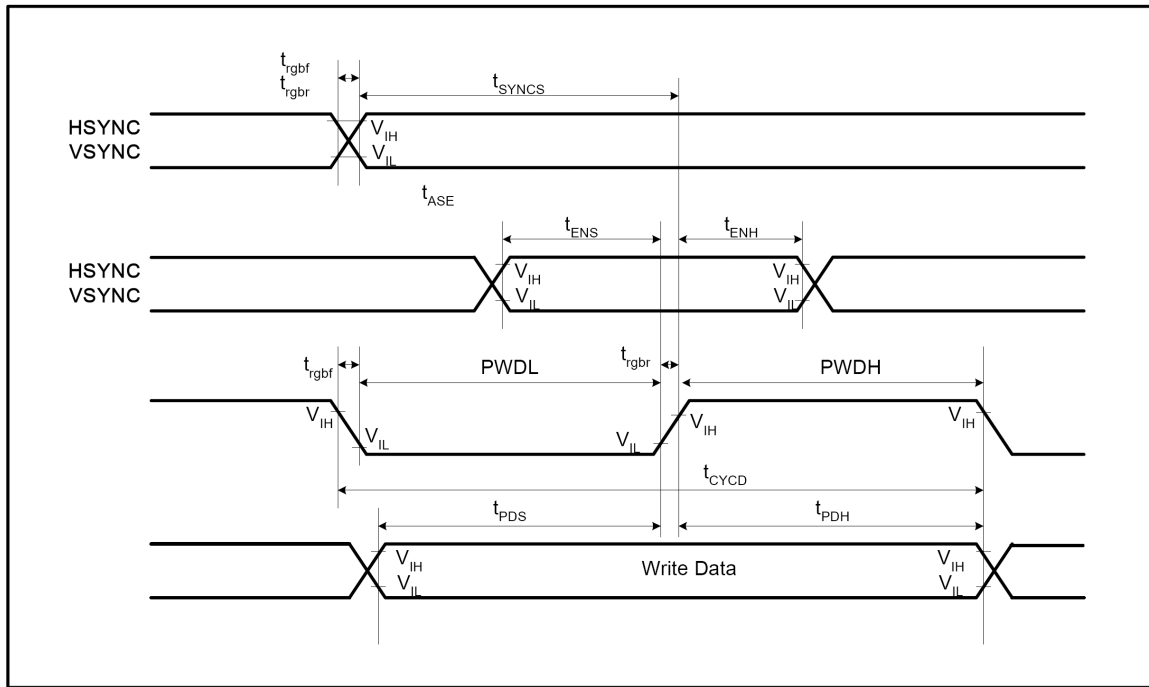
4.Spike Rejection also applies during a valid reset pulse as shown below:



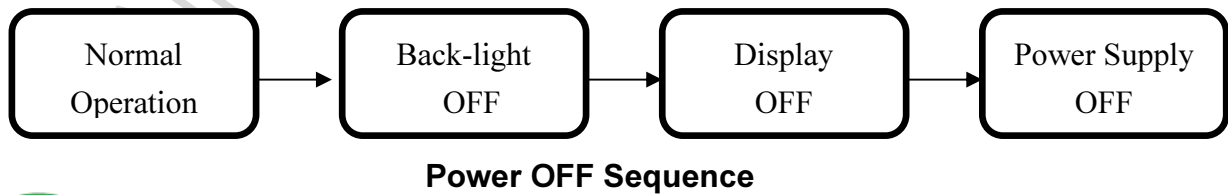
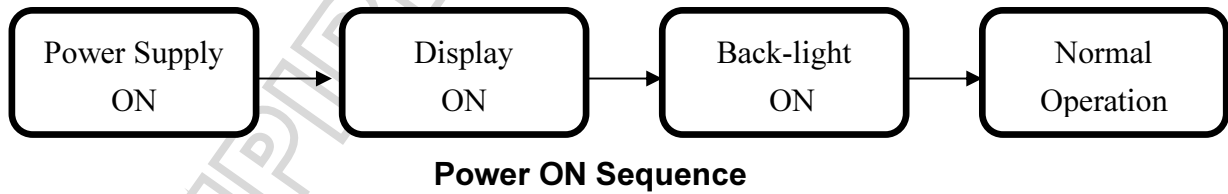
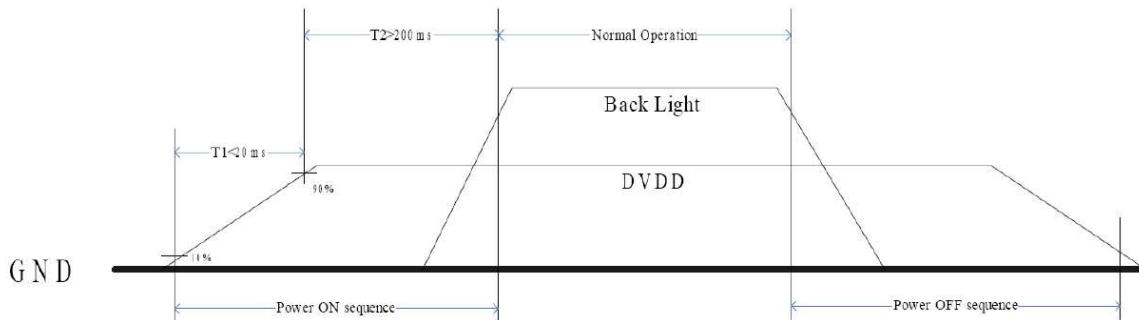
5.When Reset applied during Sleep In Mode.

6 When Reset applied during Sleep Out Mode.

7 It is necessary wait 5ms after releasing RESET before sending commands. So the Out command cannot be sent for 5ms.



8.4 Power ON/OFF Timing



9 QUALITY AND RELIABILITY

1. Scope

Specifications contain

- 1.1 Display Quality Evaluation
- 1.2 Mechanics Specification

2. Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall

follow MIL-STD-105E LEVEL II.

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

2.2 Sampling type: Normal inspection, single sampling.

2.3 Sampling level: Level II.

2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

3. Panel Inspection Condition

3.1 Environment:

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

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

Illumination: 300 ~ 700 Lux.

3.2 Inspection Distance:

35-40 cm

3.3 Inspection Angle:

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

3.4 Inspection time :

Perceptibility Test Time: 20 seconds max.

10 RELIABILITY

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=72 hrs	
Low Temperature Operation	-10±3°C , t=72 hrs	
High Temperature Storage	80±3°C , t=72hrs	1,2
Low Temperature Storage	-30±3°C , t=72 hrs	1,2
Temperature /Humidity Storage Test	60°C, Humidity 90%, 72 hrs	1,2
Temperature /Humidity Operation Test	40°C, Humidity 90%, 72 hrs	1,2
Thermal Shock Test	-20°C ~ 70°C 60 min ~ 60 min. (1 cycle) Total 20 cycle	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).

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. $1M\Omega$ 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

Avoid a long time in a high temperature and humidity area. Keep the temperature between



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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 drive 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: 0.2V_{dd} or less and H level: 0.8V_{dd} 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. When driving the elements of the display, considering crosstalk.

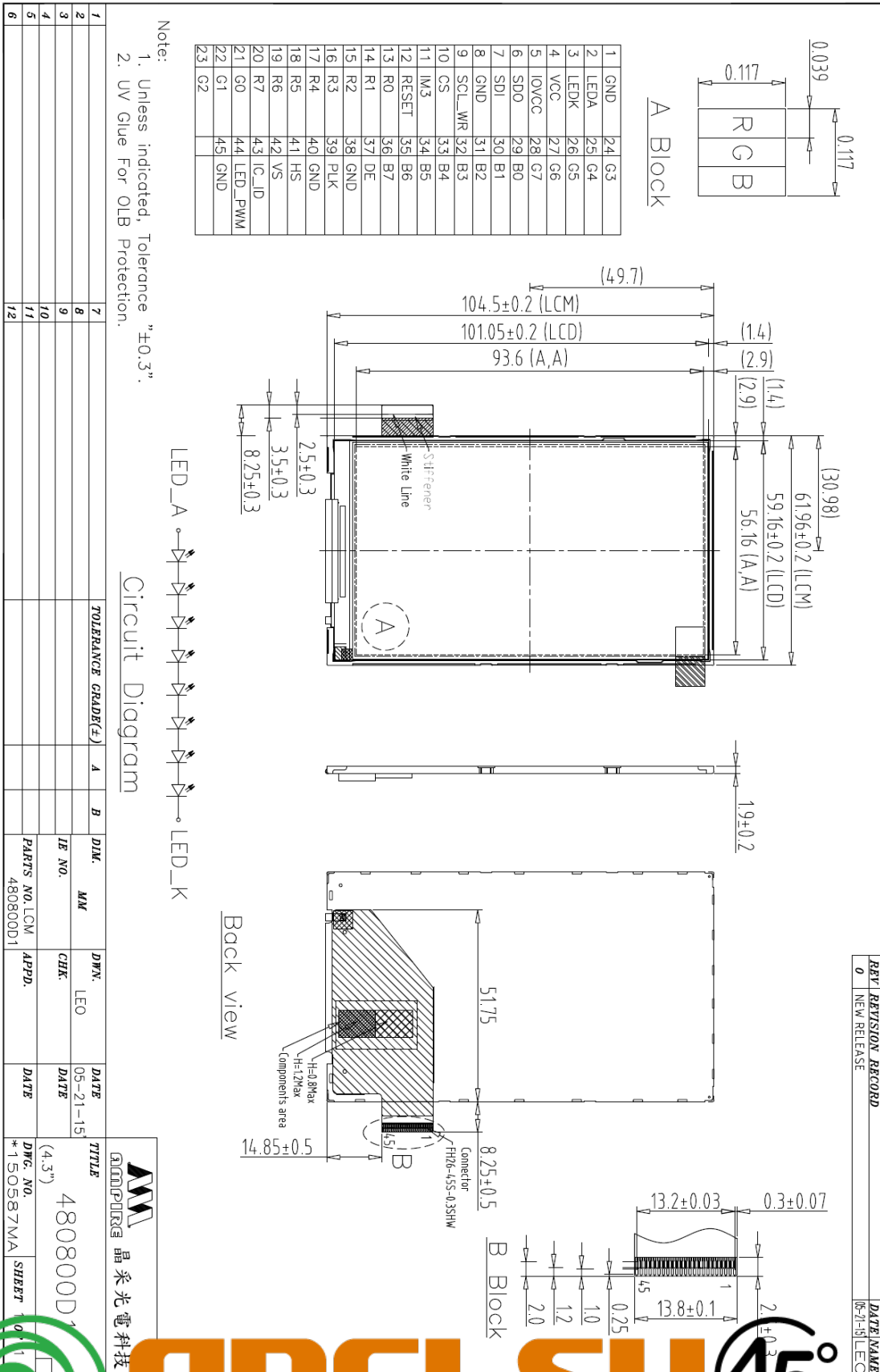


11-5 Other

- 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 years warrantee for all products and three months warrantee for all repairing products.

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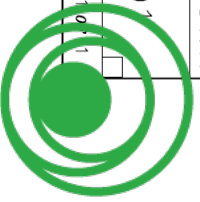
12 MECHANICAL DRAWING



REV	REVISION RECORD	DATE NAME
0	NEW RELEASE	05-21-15 LEO

TOLERANCE GRADE(±)	A	B	DIM.	DWG.	DATE
			MM	LEO	05-21-15
PARTS NO. LCM			CHK. <td>DATE</td> <td></td>	DATE	
480800D1			APPD.	DATE	

TITLE	480800D1
DWG. NO.	(4.3")
SHEET	10/11



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