



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-1024600D5TZQW-T00H
Approved by	
Date	

Preliminary Specification

Formal Specification

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Approved by	Checked by	Organized by
Kokai	Jessica	Simon

*This specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/12/14 2020/02/17	-	New release Add Backlight Driving Conditions	Jessica Simon

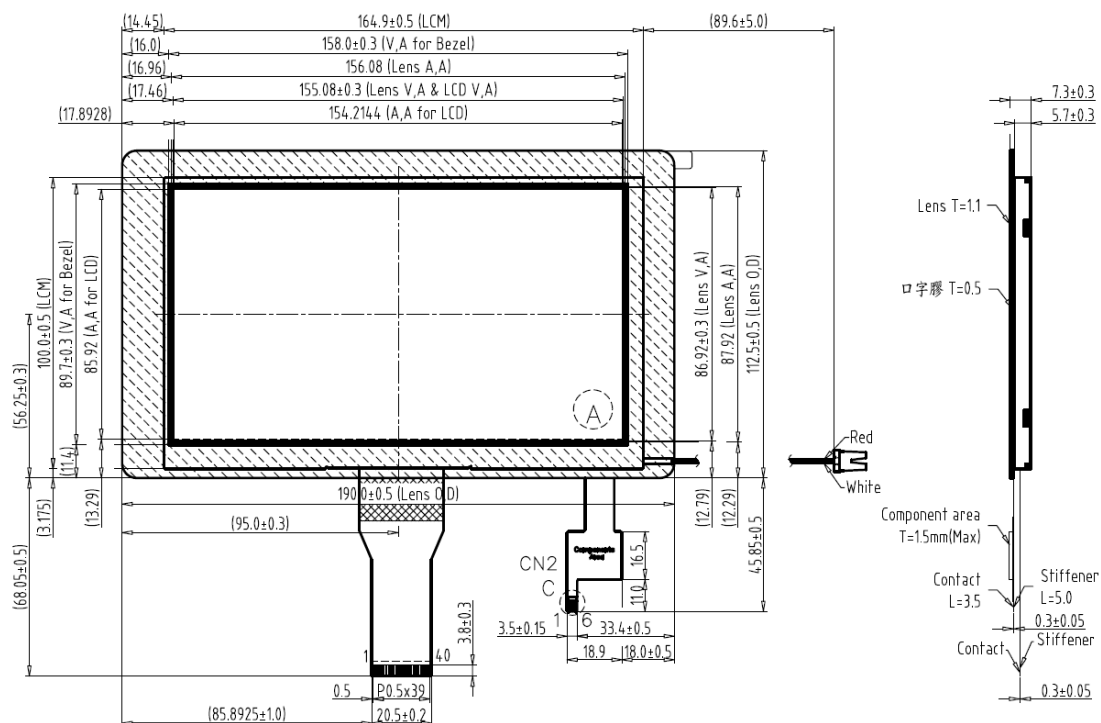
1. Features

It's a 7 inches Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 7" TFT-LCD panel, LED backlight, and touch panel.

- (1) Construction: 7" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 1024 RGB (H) x 600 (V)
- (3) Number of the Colors : 16.7M colors (R , G , B 8 bit digital each)
- (4) LCD type : Normally Black
- (5) Interface: LVDS
- (6) Touch panel
 - ✧ IC: ILI2117A
 - ✧ Interface: I2C

2. Physical Specifications

Item	Specifications	unit
LCD size	7 inch (Diagonal)	
Resolution	1024 x (RGB) x 600	dot
Pixel pitch	0.1506(W) x 0.1432(H)	mm
Color arrangement	RGB-stripe	



3. Absolute Max. Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	VDD	-0.3	4	V	
	AVDD	-0.5	14.85	V	
	VGH	-0.3	42.0	V	
	VGL	-0.3	7.0	V	
	VCOM	TBD	TBD	V	
Operation Temperature	TOP	-20	70	°C	
Storage Temperature	TST	-30	80	°C	

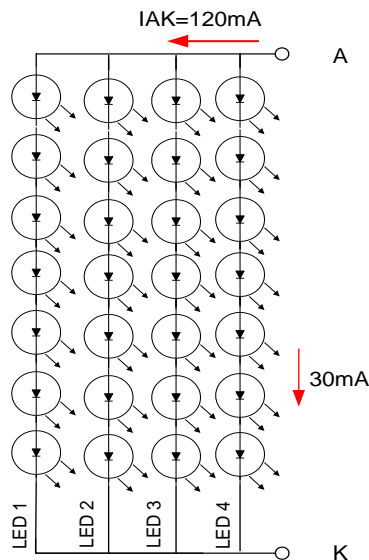
Note (1) The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

4. Backlight Driving Conditions

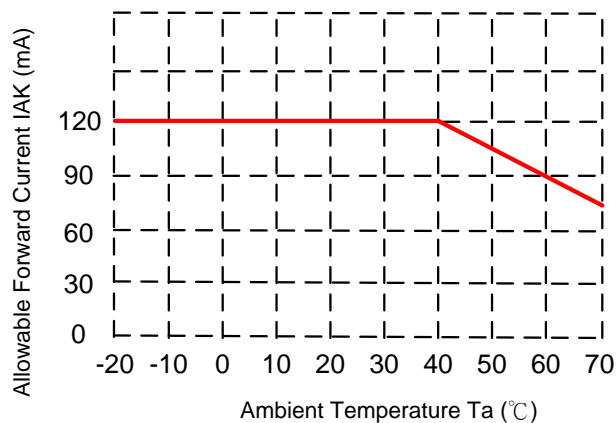
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED voltage	VAK	--	23.1	25.2	V	Note(1)
LED current	IAK	--	120	--	mA	Note(1)
LED life time	--	--	30	--	kHrs	Note(2)

Note (1) The LED Supply Voltage is defined by the number of LED at $T_a=25^{\circ}\text{C}$ and $I_{AK}=120\text{ mA}$.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_{AK}=120\text{mA}$. The LED lifetime could be decreased if operating I_F is larger than 120mA.



Note (3) When LCM is operated over 40°C ambient temperature, the I_{AK} should be follow :



5. Optical Specifications

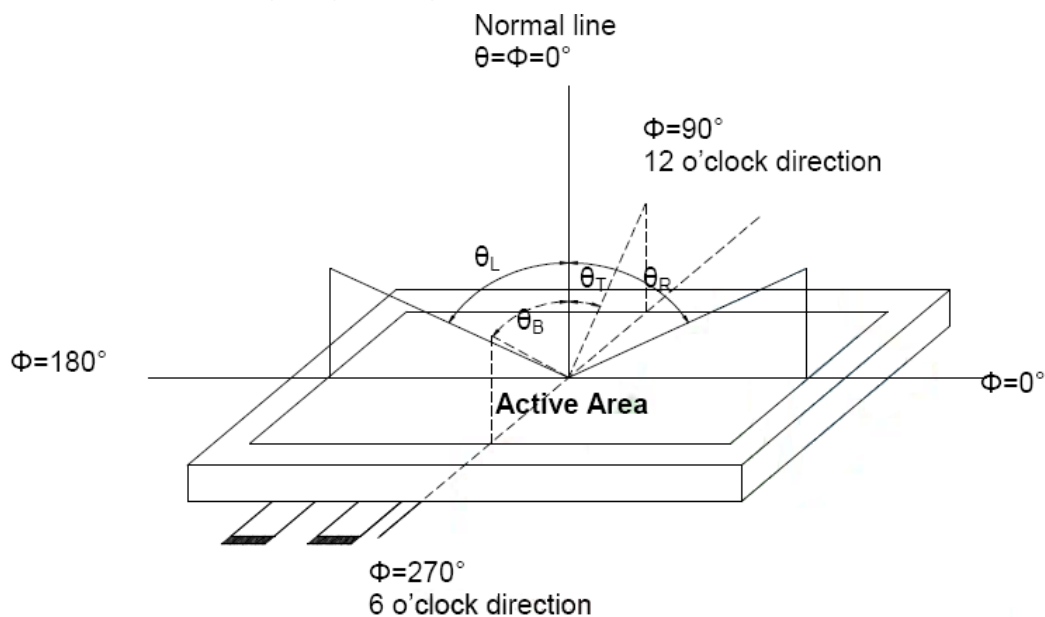
Item	Symbol	Condition	Values			Unit	Note	
			Min.	Typ.	Max.			
Viewing angle (CR \geq 10)	θ_L	$\Phi = 180^\circ$ (9 o'clock)	80	85	--	degree	Note(1)	
	θ_R	$\Phi = 0^\circ$ (3 o'clock)	80	85	--			
	θ_T	$\Phi = 90^\circ$ (12 o'clock)	80	85	--			
	θ_B	$\Phi = 270^\circ$ (6 o'clock)	80	85	--			
Response time	TON	Normal $\theta = \Phi = 0^\circ$	--	13	20	msec	Note(3)	
	TOFF		--	15	25	msec		
Contrast ratio	CR		600	800	--	--	Note(4)	
Color chromaticity	WX		Normal $\theta = \Phi = 0^\circ$	Typ. -0.05	0.31	Typ. +0.05	--	Note(5) Note(6)
	WY				0.36		--	
	RX				0.61		--	
	RY				0.34		--	
	GX				0.36		--	
	GY	0.57			--			
	BX	0.10			--			
BY	0.08	--						
Luminance (central point)	L		340	425	--	cd/m ²	Note(6)	
Luminance uniformity	YU		70	75	--	%	Note(6)	

Test Conditions:

VDD = 3.3V, IAK = 120 mA (Backlight current), the ambient temperature is 25°C.

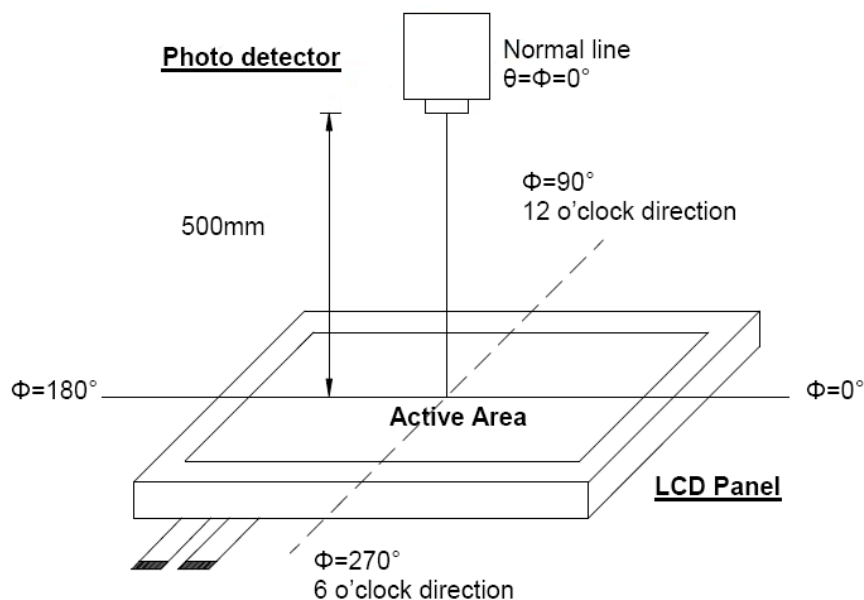
The test systems refer to Note (2).

Note (1) Definition of viewing angle range



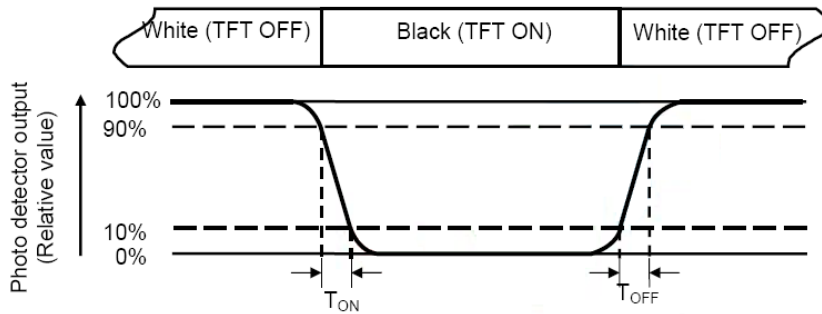
Note (2) Definition of optical measurement system

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° / Height: 500mm.)



Note (3) Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note (4) Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note (5) Definition of color chromaticity (CIE1931)

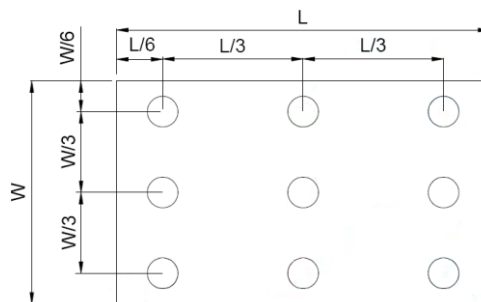
Color coordinated measured at center point of LCD.
All input terminals LCD panel must be ground when measuring the center area of the panel.

Note (6) Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure).
Every measuring point is placed at the center of each measuring area.

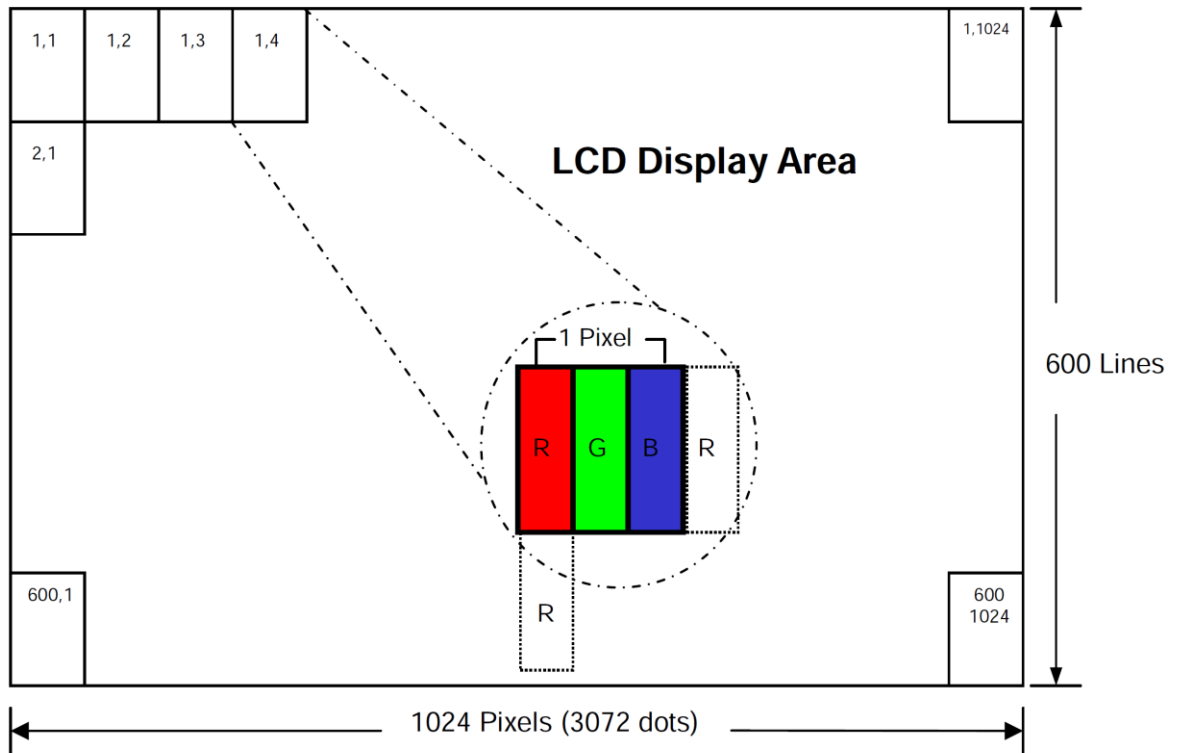
$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

L ----- Active area length W ----- Active area width



Bmax : The measured maximum luminance of all measurement position.
Bmin : The measured minimum luminance of all measurement position.

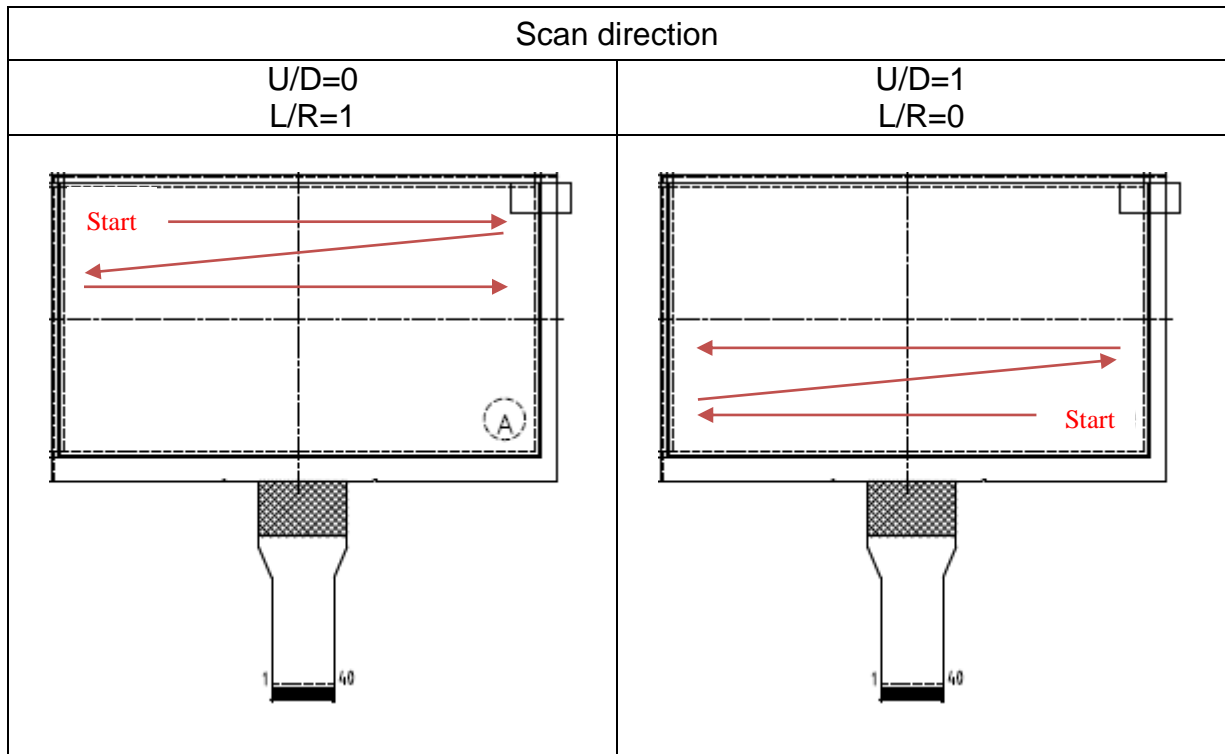
Note (7) Pixel format



6. Interface

Pin No.	Symbol	Function
1	GND	Power Ground
2	VCOM	Common voltage
3	GND	Power Ground
4	AVDD	Power for Analog circuit
5	GND	Power Ground
6	GND	Power Ground
7	VDD	Power Supply
8	VDD	Power Supply
9	GND	Power Ground
10	U/D	Up/down scan setting H: reverse scan L: normal scan
11	L/R	Left/right scan setting H: normal scan L: reverse scan
12	RESET	Reset pin Keep high voltage during operation
13	STBYB	Standby mode H: all the functions on L: all the functions off
14	BIST	BIST mode H: BIST (CLK input is no needed) L: normal operation
15	REV	Data control H: data inversion L: normal operation
16	GND	Power Ground
17	CLK-	Sampling Clock
18	CLK+	Sampling Clock
19	GND	Power Ground
20	D0-	Transmission Data of Pixels
21	D0+	Transmission Data of Pixels
22	GND	Power Ground
23	D1-	Transmission Data of Pixels 1

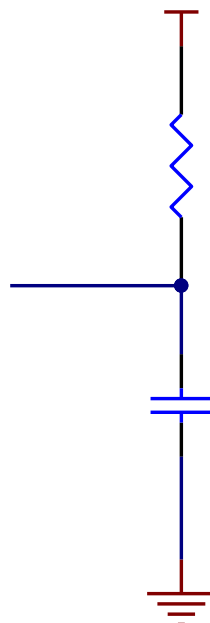
24	D1+	Transmission Data of Pixels 1
25	GND	Power Ground
26	D2-	Transmission Data of Pixels 2
27	D2+	Transmission Data of Pixels 2
28	GND	Power Ground
29	IN3-	Transmission Data of Pixels 3
30	IN3+	Transmission Data of Pixels 3
31	GND	Power Ground
32	HSD	H: 6-bit L: 8-bit
33	HFRC	H-FRC selection H: HFRC enable L: FRC enable If DITHER=L, HFRC and FRC are disable.
34	DITHER	Dithering function H: enable L: disable
35	XON	H: Disable (it's not used) Remark: Internal normal pull high.
36	GND	Power Ground
37	VGH	Gate ON voltage
38	GND	Power Ground
39	VGL	Gate OFF voltage
40	GND	Power Ground



Reset function

Keep reset pin to high voltage during operation. When entering reset state, it'll active low.

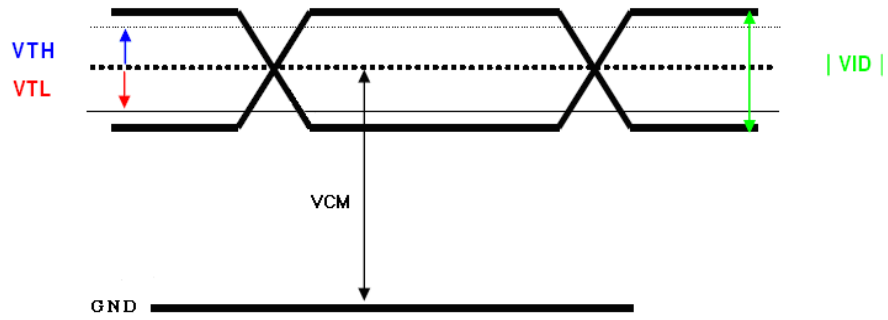
Recommend circuit:



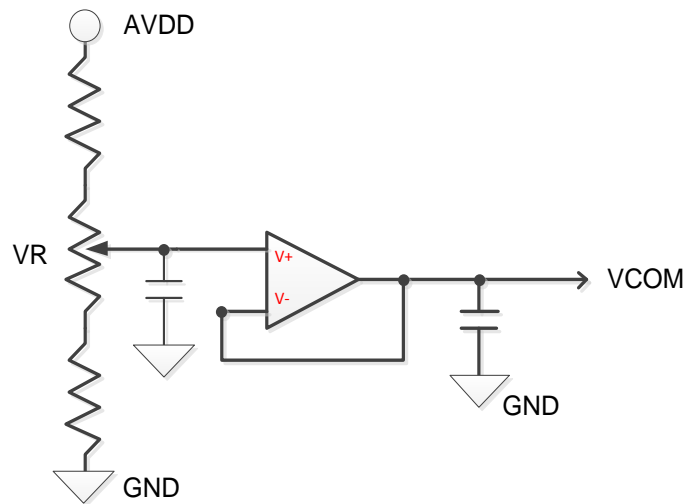
7. Electrical Characteristics

7.1 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply Voltage	VDD	3.0	3.3	3.6	V	
	AVDD	8.9	9.0	9.1	V	
	VGH	17	18	19	V	
	VGL	-6.5	-6.0	-5.5	V	
	VCOM	3.0	3.15	3.3	V	Note (1)
Current of power supply	IDD		55		mA	VDD =3.3V
	IVDD		TBD		mA	
	IVGH		TBD		mA	
	IVGL		TBD		mA	
	IVCOM		TBD		mA	
Differential Input High Threshold	VTH	--	--	100	mV	VCM=1.2V
Differential Input Low Threshold	VTL	-100	--	--	mV	
Input current	IIN	-10	--	+10	uA	
Differential input Voltage	VID	0.2	--	0.6	V	
Common Mode Voltage Offset	VCM	$\frac{ VID }{2}$	1.25	$2.4 - \frac{ VID }{2}$	V	



Note(1) TYP VCOM is only reference value. It must be optimized according to each LCM. Be sure to use VR and OP buffer on VCOM output. Please adjust VCOM to make the flicker level minimum for getting excellent image.

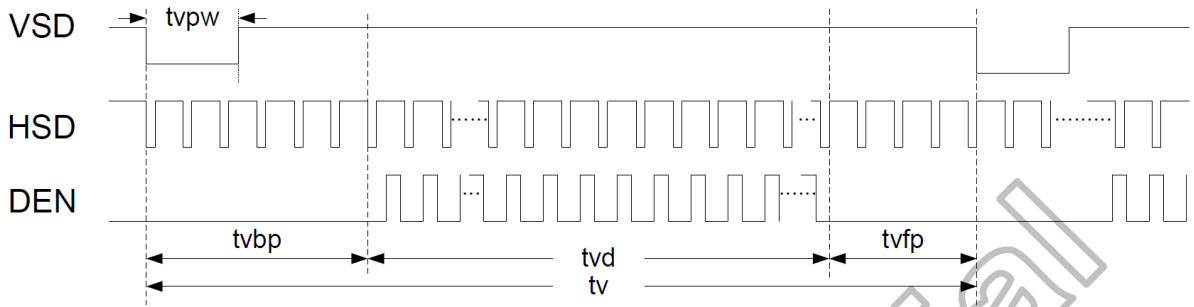


7.2 AC Characteristics

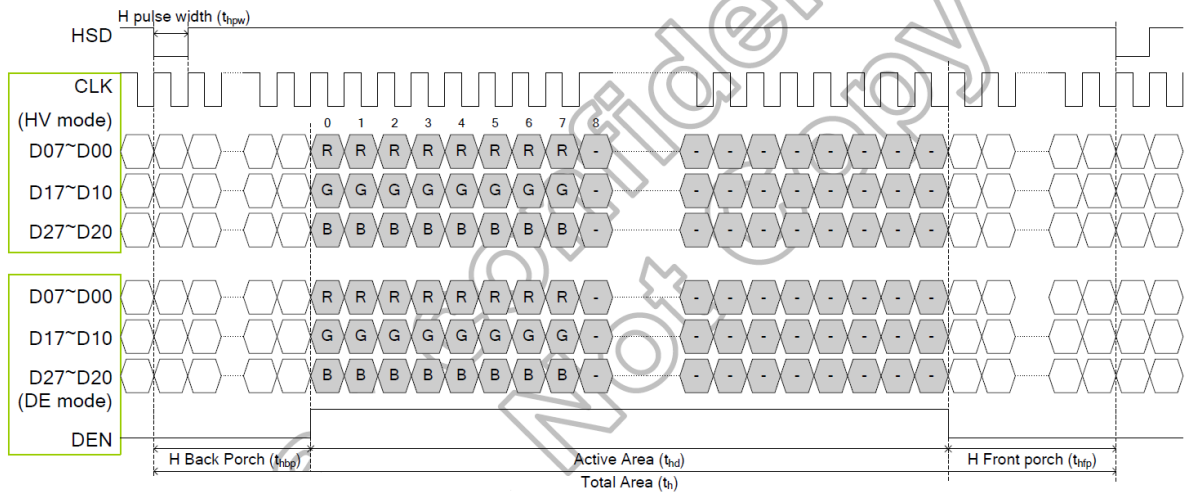
TTL

DE mode					
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+ thfp	90	320	376	DCLK
Vertical display area	tvd		600		TH
VSD period	tvbp	610	635	800	TH
VSD blanking	tvbp+ tvfp	10	35	200	TH
HV mode					
DCLK frequency	fclk	44.9	51.2	63	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1200	1344	1400	DCLK
HSD pulse Width	thpw	1	-	140	DCLK
HSD back porch	thbp		160		DCLK
HSD front porch	thfp	16	160	216	DCLK
Vertical display area	tvd		600		TH
VSD period	tv	624	635	750	TH
VSD pulse Width	tvpw	1	-	20	TH
VSD back porch	tvbp		23		TH
VSD front porch	tvfp	1	12	127	TH

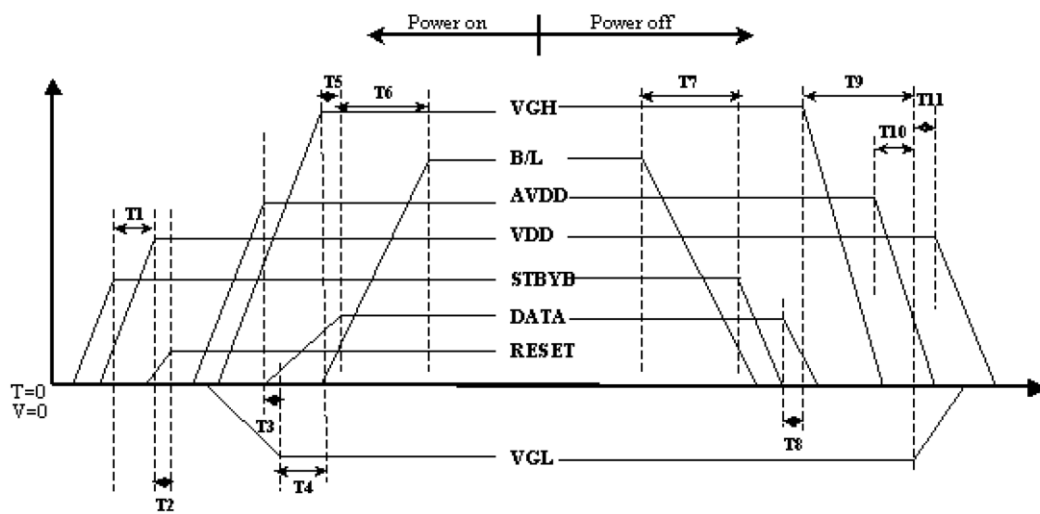
Horizontal timing



Vertical timing

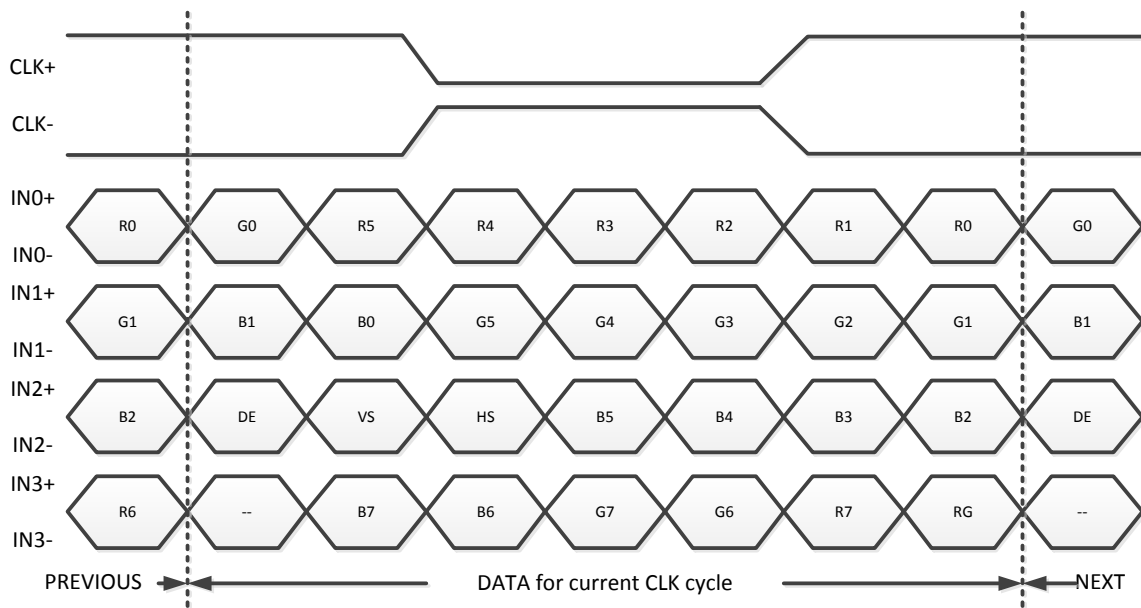


7.3 Power ON/OFF sequence



Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

7.4 24-BIT LVDS Input Data Format



Note: R/G/B data 7: MSB, R/G/B data 0: LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Date 7 (MSB) Green Date 6 Green Date 5 Green Date 4 Green Date 3 Green Date 2 Green Date 1 Green Date 0 (LSB)	
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	
CLK+ CLK-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync Signal	
HS	Horizontal Sync Signal	

8. Touch Panel Electrical Specification

8.1 Basic Characteristic

Item	Specification
Interface Type	Projective Capacitive Multi-Touch Panel
Activation	Multi-fingers or Single-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx. 100 points/sec
Interface	I2C
Control IC	ILI2117A

8.2 Optical Characteristic

Item	Specification
Transmittance	80% (min)

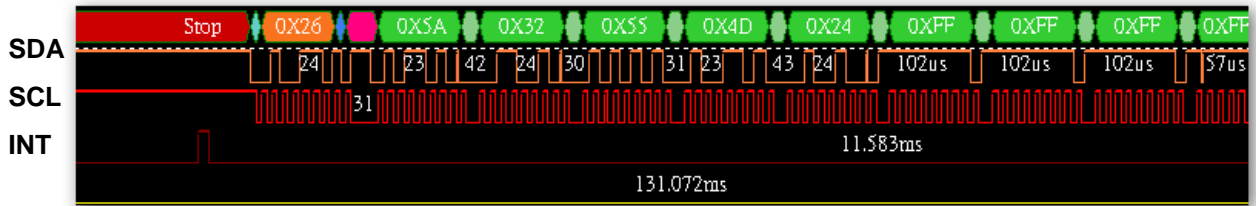
8.3 Electrical Characteristic

Item	Specification
I2C Interface	Power & signal Input 3.3V

8.4 Interface Pin Assign

Pin	Name	Description
1	VDD	Power 3.3V
2	RESET	Active "Low"
3	INT	Active "Low"
4	SCL	I2C Clock
5	SDA	I2C Data
6	GND	Power GND

8.5 I2C AC Waveform

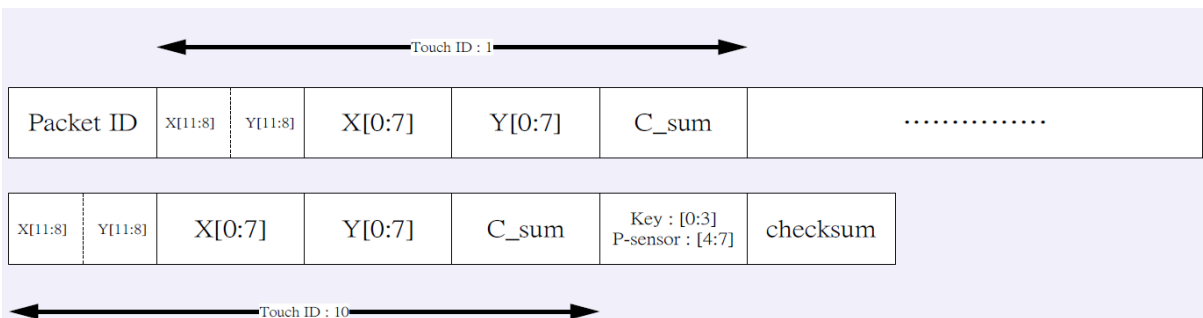


8.6 I2C Characteristics

1. Slave address: 0x26
2. Clock: up to 400 kHz
3. Packet length : 43 byte
4. Finger_i touch end: The data which belongs to finger_i is 0xFF
5. Position_X[11:0] and Position_Y[11:0] are ranging from 0~2047
6. Touch end: all data is 0xFF except for packet ID (0x5A) and checksum.
7. C_sum : total delta_C of each finger touch

8.7 Data Format

Slave Address	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x26(r)	Packet ID (0x5A)	X00[11:8] Y00[11:8]	X00[7:0]	Y00[7:0]	C_sum	X01[11:8] Y01[11:8]	X01[7:0]	Y01[7:0]
	C_sum	X02[11:8] Y02[11:8]	X02[7:0]	Y02[7:0]	C_sum	X03[11:8] Y03[11:8]	X03[7:0]	Y03[7:0]
	C_sum	X04[11:8] Y04[11:8]	X04[7:0]	Y04[7:0]	C_sum	X05[11:8] Y05[11:8]	X05[7:0]	Y05[7:0]
	C_sum	X06[11:8] Y06[11:8]	X06[7:0]	Y06[7:0]	C_sum	X07[11:8] Y07[11:8]	X07[7:0]	Y07[7:0]
	C_sum	X08[11:8] Y08[11:8]	X08[7:0]	Y08[7:0]	C_sum	X09[11:8] Y09[11:8]	X09[7:0]	Y09[7:0]
	C_sum	Key[3:0]	Checksum					



9. Reliability Test Conditions

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
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2

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

Note(2) The module should be inspired after 1 hour storage in normal conditions (15~35°C , 45~65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

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 initial value.

10. General Precautions

10.1 Safety

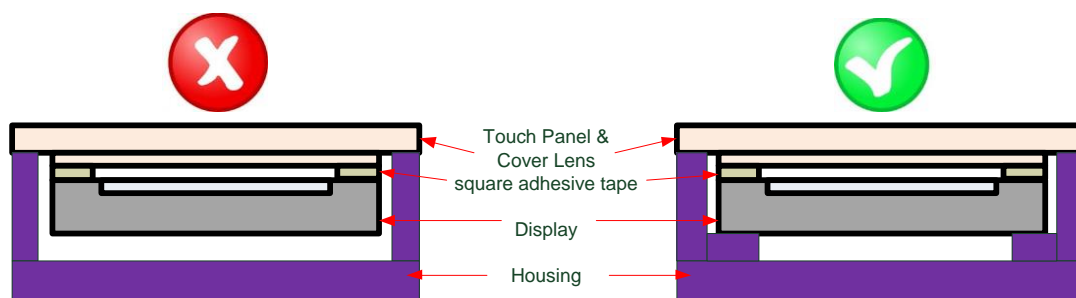
- (1) Liquid crystal is poisonous. Do not put it your mouth. If the liquid crystal touches you skin or clothes, you need to wash it off immediately with the soap and water.

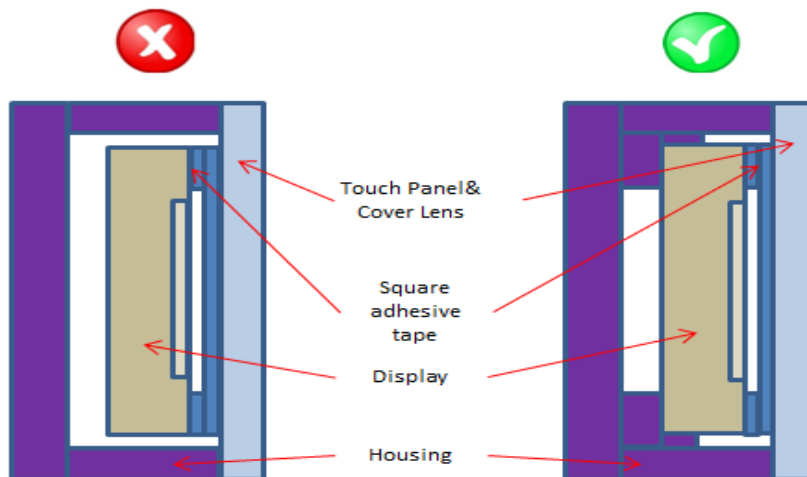
10.2 Handling

- (1) The LCD panel is plate glass. Do not subject the panel to mechanical shock or excessive force on its surface.
- (2) The polarizer which attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- (3) To avoid contamination on the display surface, do not touch the module surface with bare hands.
- (4) Keep a space so that the LCD panels do not touch other components.
- (5) Put on cover board such as acrylic board, which covers on the surface of LCD panel to protect panel from damages.
- (6) Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
- (7) Do not leave module in direct sunlight to avoid malfunction of the ICs.

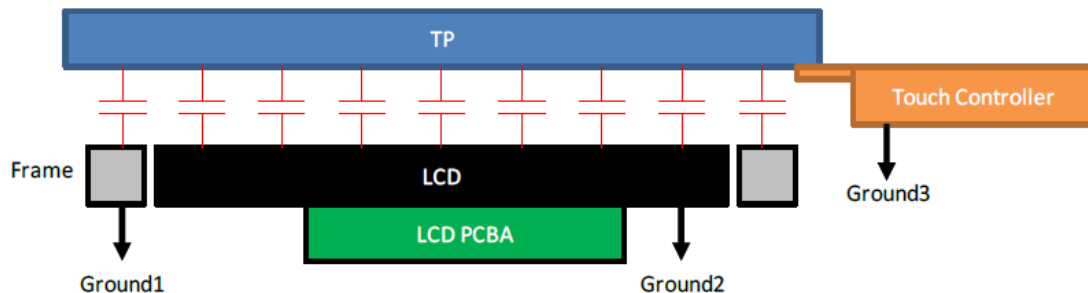
10.3 Mechanism

- (1) Please mount LCD module by using mounting holes arranged in four corners tightly.
- (2) Please hold the LCD module properly when you use or store it.
- (3) The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.





- (4) TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.



GND1, GND2 and GND3 should be connected together to have the same ground

10.4 Static Electricity

- (1) Be sure to ground module before you turn on power or operation module.
- (2) Do not apply voltage which exceeds the absolute maximum rating value.

10.5 Storage

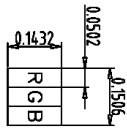
- (1) Store the module in a dark room where it must keep at $+25\pm 10^{\circ}\text{C}$ and 65%RH or less.
- (2) Do not store the module in surroundings which are containing organic solvent or corrosive gas.
- (3) Store the module in an anti-electrostatic container or bag.

10.6 Cleaning

- (1) Do not wipe the polarizer with dry cloth. It might cause scratch.
- (2) Only use a soft cloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

10.7 Others

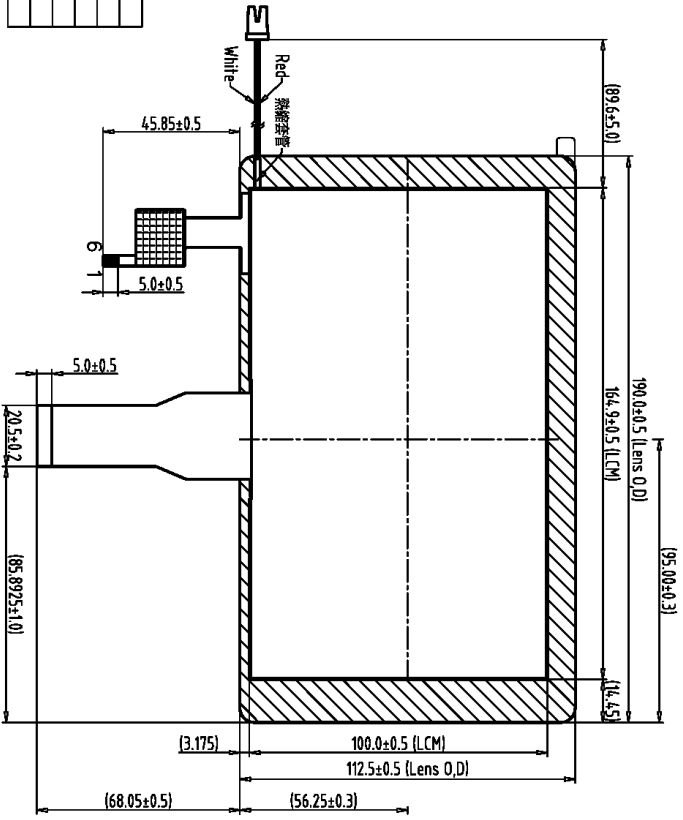
- (1) AMIPRE will provide one year warranty for all products and three months warranty for all repairing products.
- (2) Do not apply fixed pattern data signal to the LCD module as you are using the product.
- (3) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.



A Block

1	GND	21	DO+
2	VCOM	22	GND
3	GND	23	D1-
4	AVDD	24	D1+
5	GND	25	GND
6	GND	26	D2-
7	VDD	27	D2+
8	VDD	28	GND
9	GND	29	D3-
10	U/D	30	D3+
11	L/R	31	GND
12	RESET	32	HSD
13	STEYB	33	HFRG
14	BI-ST	34	DITHER
15	REV	35	XON
16	GND	36	GND
17	CLK+	37	VGH
18	GND	38	GND
19	GND	39	VGL
20	DO-	40	GND

1	VDD
2	RESET
3	INT
4	SCL
5	SDA
6	GND



Back View

- Note:
1. Unless indicated, Tolerance "±0.3"
 2. UV Glue For OLB Protection.
 3. CN1:P0.5 40Pin/CS050-40ZST-H12-U or Equivalent
 4. CN2 Matching Connector:SFV6R-2STE1HLF or Equivalent
 5. LCD 1024X3(R,G,B)x600=> 7.0" Digital TFT LCD

1	1024600D7ZQW-0QH LCM	7		TOLERANCE GRAD(E)	A	B	DIM.	MM	DWN.	EMILY	DATE	12-10-18	TITLE	1024600D5-T	DWG. NO.	*181230NMA	SHEET	1 OF 1
2	800480H2-T OGS (1798048701)	8					IF NO.		CHK.		DATE							
3	IL217A/2C	9																
4	口字膠 (181024620)	10																
5		11																
6		12																