

Specifications for LCD module

Customer	
Customer part no.	507644363
Ampire part no.	AM-640480GWTNQW-T16H-M (For Marelcom)
Approved by	
Date	

☐ Preliminary Specification

☒ Formal Specification

Approved by	Checked by	Organized by
Patrick	Jessica	Mantle

This Specification is subject to change without notice.

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2021/05/25	--	New Release	Mantle
2021/08/17	3	Add FW	Mantle

1. Introduction

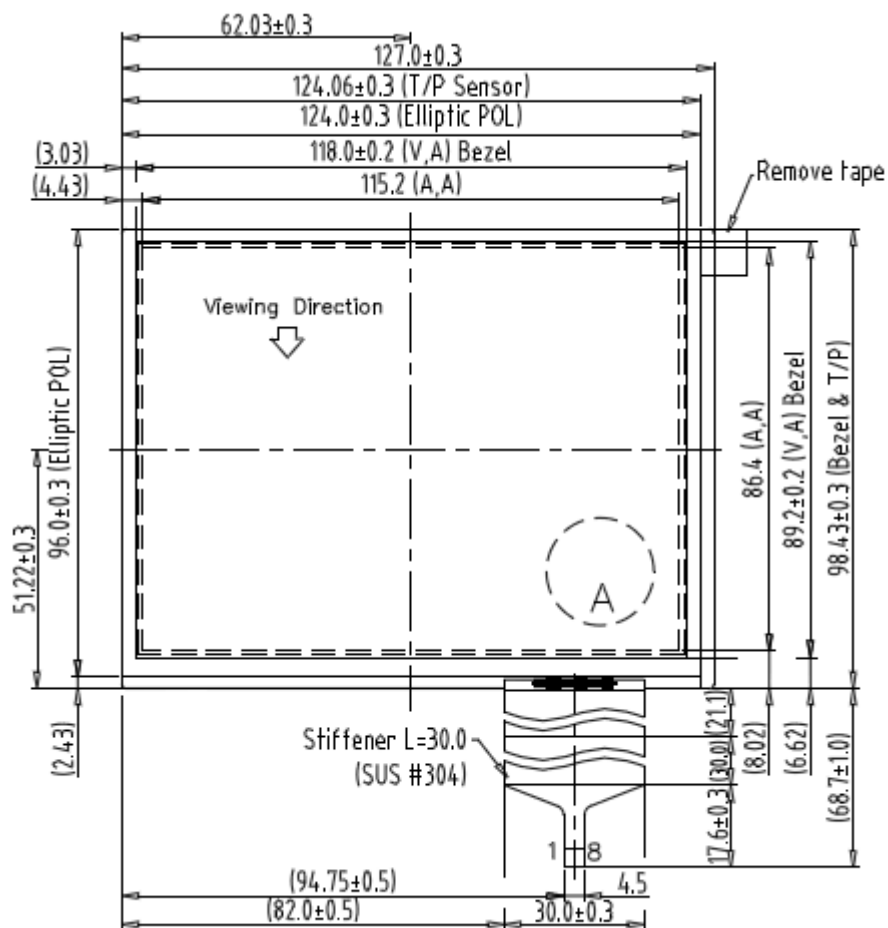
This is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device. This model is composed of a 5.7inch TFT-LCD panel, a driving circuit, LED backlight system and touch panel. This TFT-LCD has a high resolution (640(R.G.B) X 480) and can display up to 262,144 colors.

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
- ✧ Capacitive-type touch panel (New IC 80W32)
For normal operation, there must be a cover lens of 0.7~4mm thickness to be put on the top of touch panel.
- ✧ USB interface for touch control.
- ✧ Sunlight readable solution by ATR + circular polarize
- ✧ **Zero Pixel defect**
- ✧ New circular polarizer - Its thickness is from 276um to 295um.
- ✧ FW : PCAP80H32_2909_v00_T2_00_C002_AMPIRE_TPM_E2.H32

2. Physical Specifications

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Pixel pitch	0.18 (W) x 0.18 (H)	mm
Color configuration	R.G.B Vertical stripe	
Brightness	350	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	°C	(1)
Storage Temperature	Tstg	-30	80	°C	(1)

4. Electrical Characteristics

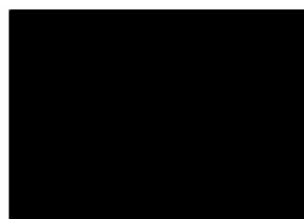
4.1 TFT LCD Module Voltage

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Voltage For LCD	VCC	3.0	3.3	3.6	V	(1)
Power Voltage For VLED	VDD	--	5.0	--	V	
Logic Input Voltage	VIH	VCC*0.7	--	VCC	V	
	VIL	0	--	VCC*0.3	V	
ADJ Input Voltage	VIH	3.0	--	5.0	V	
	VIL	GND	--	0.3	V	

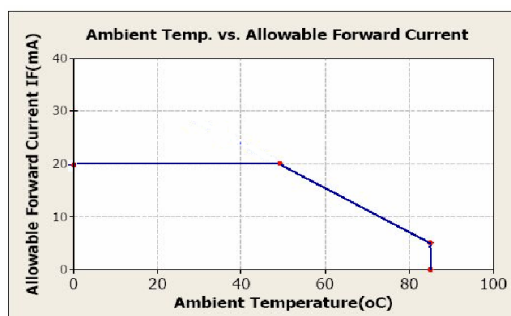
4.2 TFT LCD current consumption

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LCD Power Current	ICC	-	82	-	mA	(1)
LED Power Current	ILED(VLED=5V)	-	290	-	mA	(2)

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



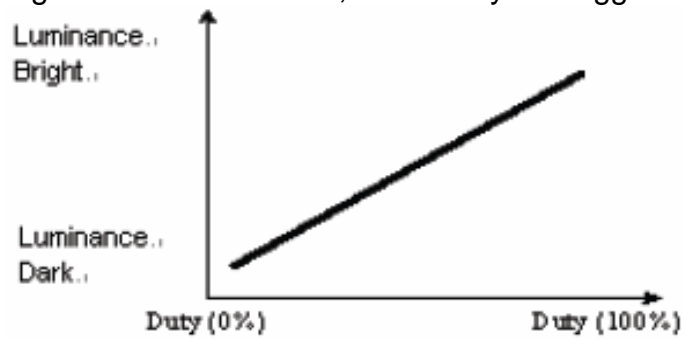
Note(2) One LED dice



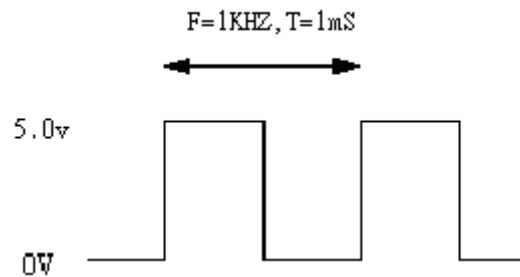
5. Interface

Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Horizontal 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 adjusts brightness to control Pin, Pulse duty the bigger the brighter.



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



Note(3) VSS Pin must ground contact, cannot be floating.

Note(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

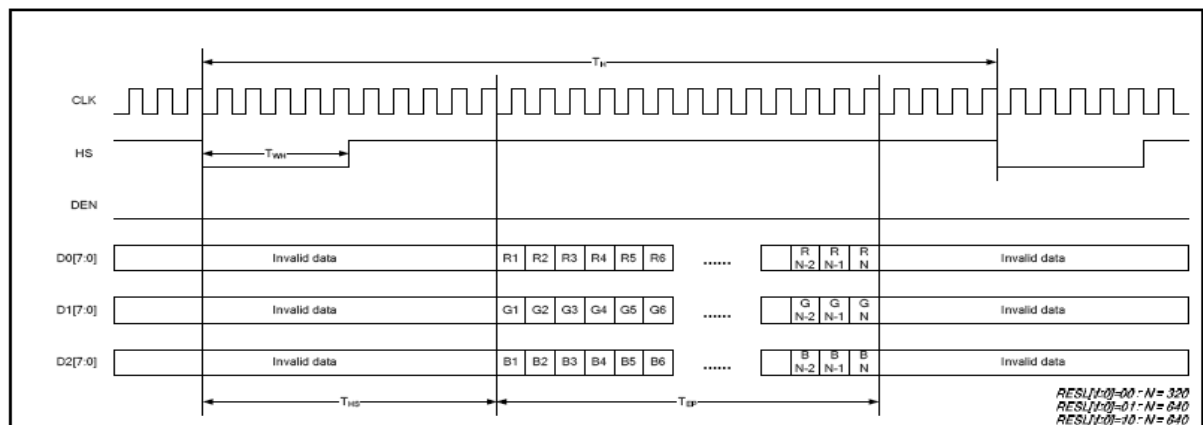
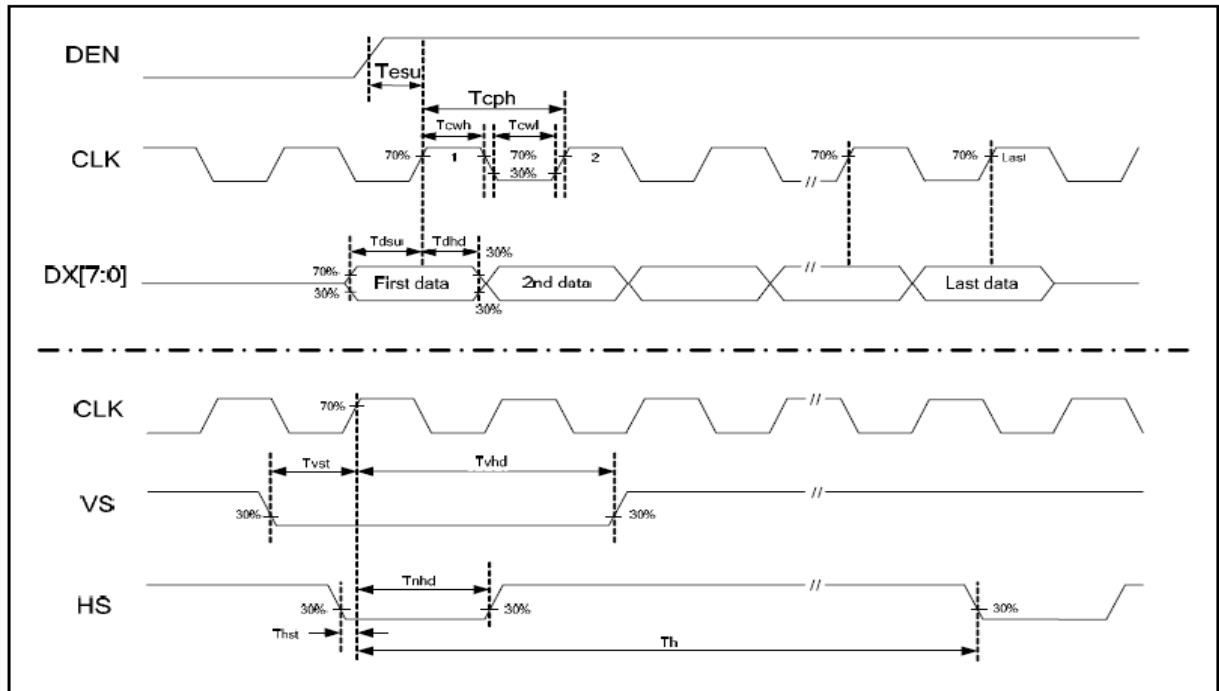
Parameter	Symbol	Min.	Typ.	Max	Unit
CLK frequency	FCPH		25.175		MHz
CLK period	TCPH	-	39.7	-	ns
CLK pulse duty	TCWH	40	50	60	%
HS period	TH	-	800	-	TCPH
HS pulse width	TWH	5	30	-	TCPH
HS-first horizontal data time	THS	112	144	175	TCPH
DEN pulse width	TEP	-	640	-	TCPH
VS pulse width	TWV	1	3	5	TH
VS-DEN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

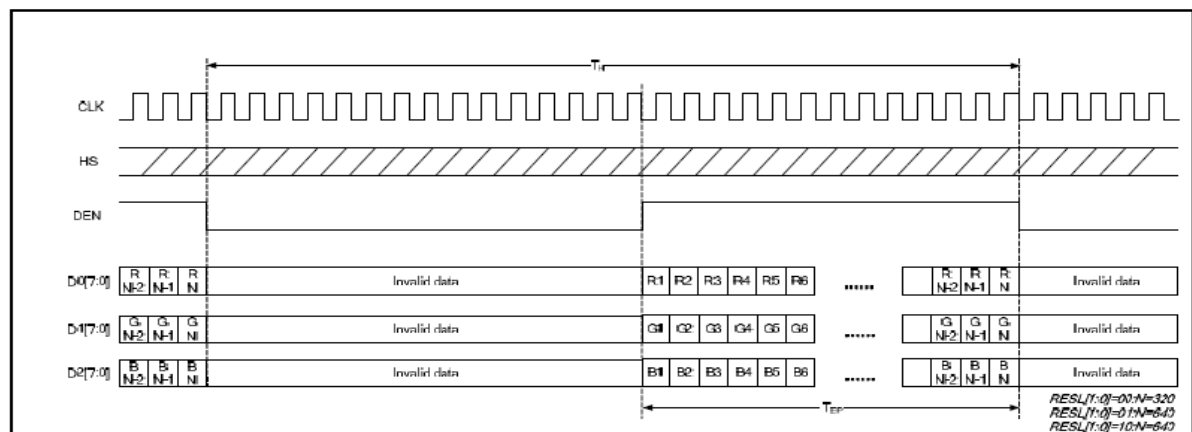
Parameter	Symbol	Min.	Typ.	Max	Unit
OEV pulse width	TOEV		100	-	TCPH
CKV pulse width	TCKV	-	96	-	TCPH
HS-CKV time	T1	-	52	-	TCPH
HS-OEV time	T2	-	8	-	TCPH
HS-POL time	T3	-	72	-	TCPH
STV setup time	TSUV	-	46	-	TCPH
STV pulse width	TWSTV	-	1	-	TH

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

Note(2) Data : 1-High , 0-Low

7. Projected Capacitive-type Touch Panel

7.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	5-fingers or Signal-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	USB
Control IC	EXC80W32
Note	For normal operation, there must be a cover lens of 0.7~4mm thickness to be put on the top of touch panel.

Specify the normal operating condition
(GND=0V)

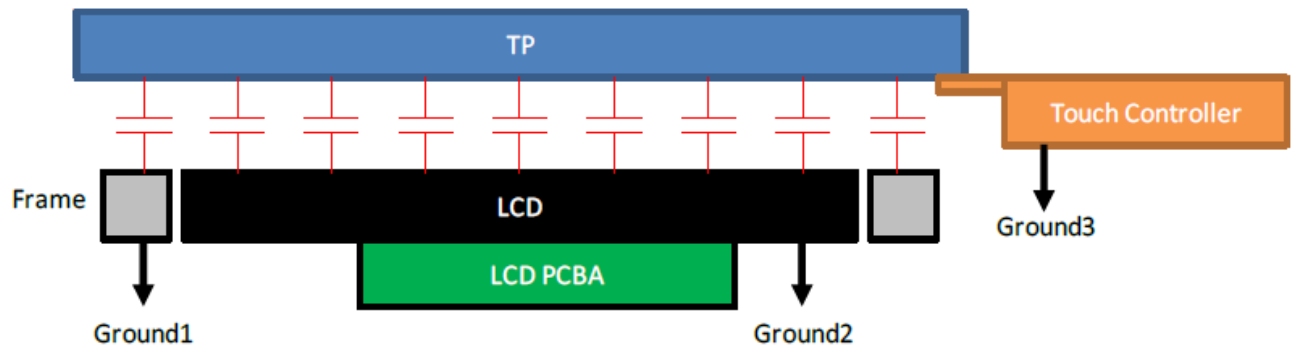
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	VCC	4.75	5.0	5.25	V	
Power Consumption	Ivcc	-	T.B.D	-	mA	

7.2 Interface

Pin No.	Symbol	Function
1	VCC	USB Power 5V
2	D+	USB Data+
3	D+	USB Data+
4	GND	USB Power Ground
5	D-	USB Data-
6	D-	USB Data-
7	NC	No connection
8	NC	No connection

7.3 Grounding

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.

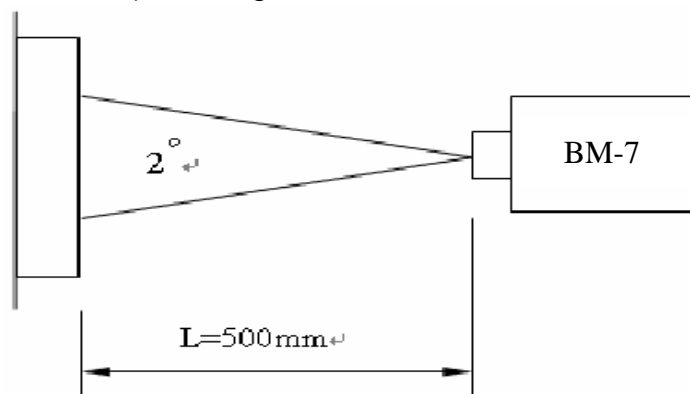


GND1, GND2 and GND3 should be connected together to have the same ground

8. Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast ratio		CR	Point - 5 $\Theta = \Phi = 0^\circ$	200	250	--	--	(1)(2)(3)	
Luminance		L _w		280	350	-	cd/m ²	(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	R _x	Point - 5 $\Theta = \Phi = 0^\circ$	0.553	0.603	0.653	--	(1)(3)
			R _y		0.322	0.372	0.422		
		Green	G _x		0.315	0.365	0.415		
			G _y		0.524	0.574	0.624		
		Blue	B _x		0.098	0.148	0.198		
			B _y		0.062	0.112	0.162		
		White	W _x		0.278	0.328	0.378		
			W _y		0.305	0.355	0.405		

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



Note(2) Definition of Contrast Ratio :

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

Note(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

$$\Delta L = [L(\text{MIN}) / L(\text{MAX})] \times 100\%$$

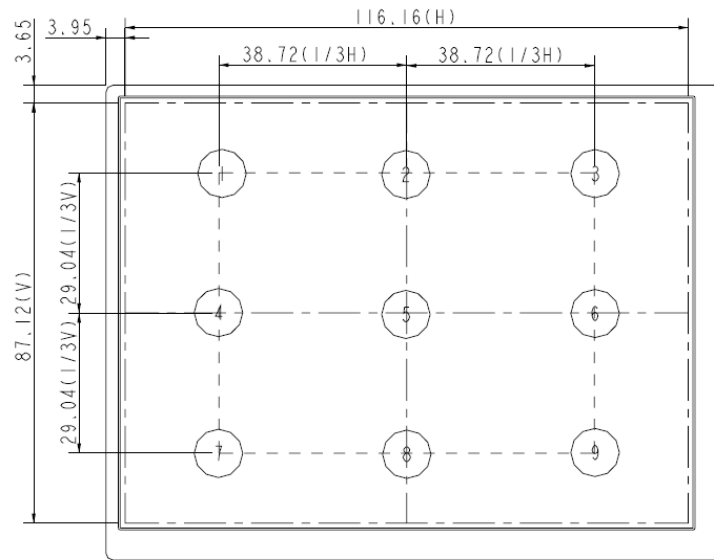


Fig9-1 Measuring point

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

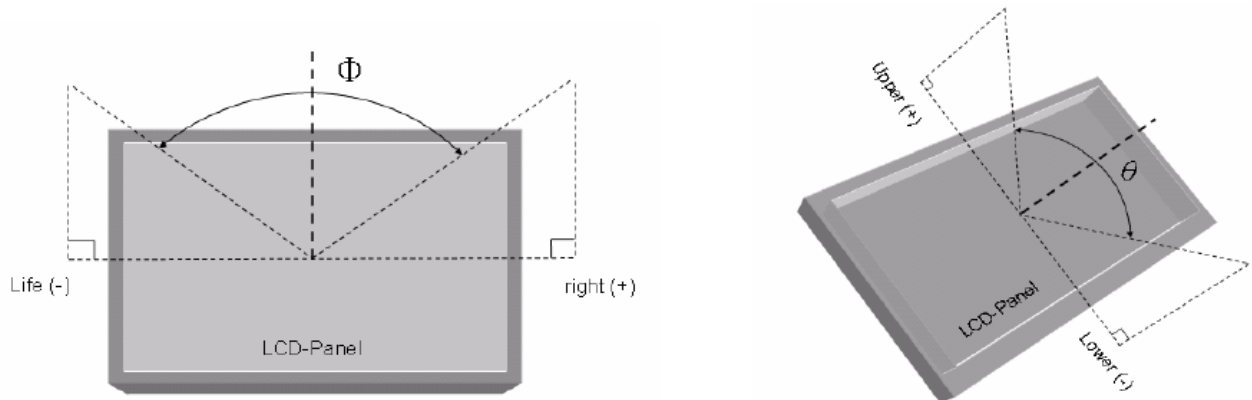


Fig9-2 Definition of Viewing Angle

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

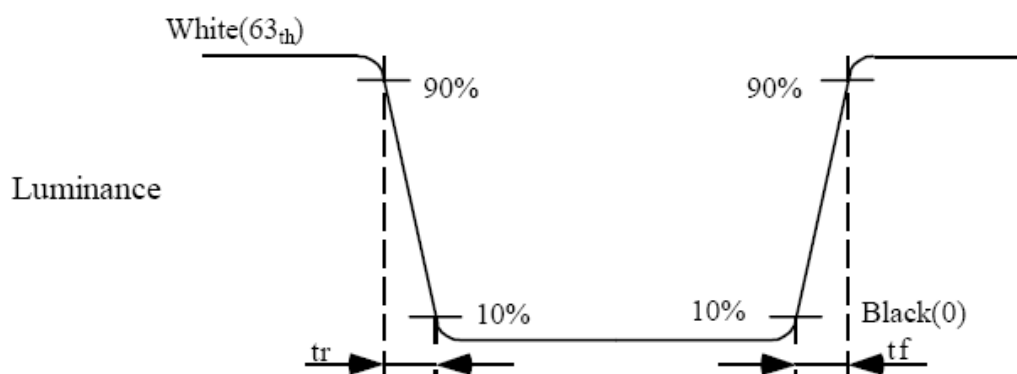


Fig9-3 Definition of Response Time(White-Black)

9. General Precautions

9.1 Safety

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

9.2 Handling

- (1) The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- (2) The polarizer 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 cover board such as acrylic board 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.

9.3 Static Electricity

- (1) Be sure to ground module before turning on power or operation module.
- (2) Do not apply voltage which exceeds the absolute maximum rating value.
- (3) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (4) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.4 Storage

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

9.5 Cleaning

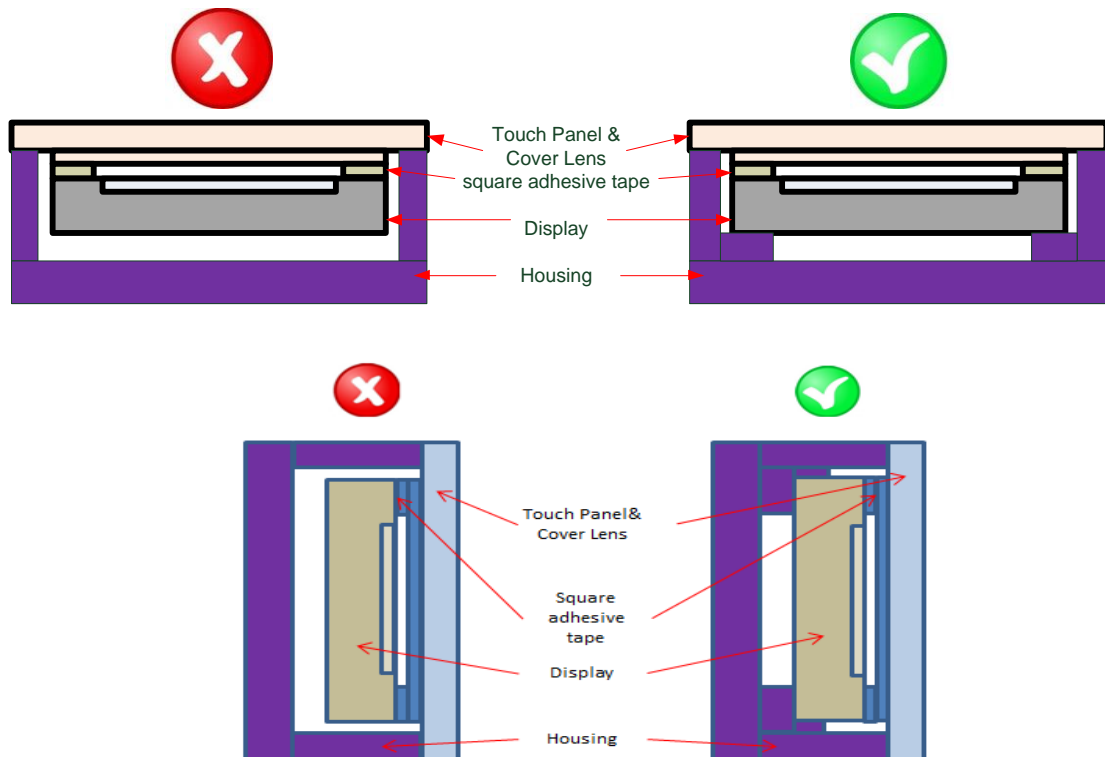
- (1) Do not wipe the polarizer with dry cloth. It might cause scratch.
- (2) Only use a soft cloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

9.6 Others

- (1) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
- (2) 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.

9.7 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.



9.8 Strong Light Exposure

- (1) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.9 Disposal

- (1) When disposing LCD module, obey the local environmental regulations.

10. Reliability Test Items

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , Dry t=240 hrs	
Low Temperature Operation	-20±3°C , Dry t=240 hrs	
High Temperature Storage	80±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C , Dry t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min) ~ 70°C (30min) 100 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 inspired after 1 hour storage in normal conditions (15~35 °C , 45~65%RH).

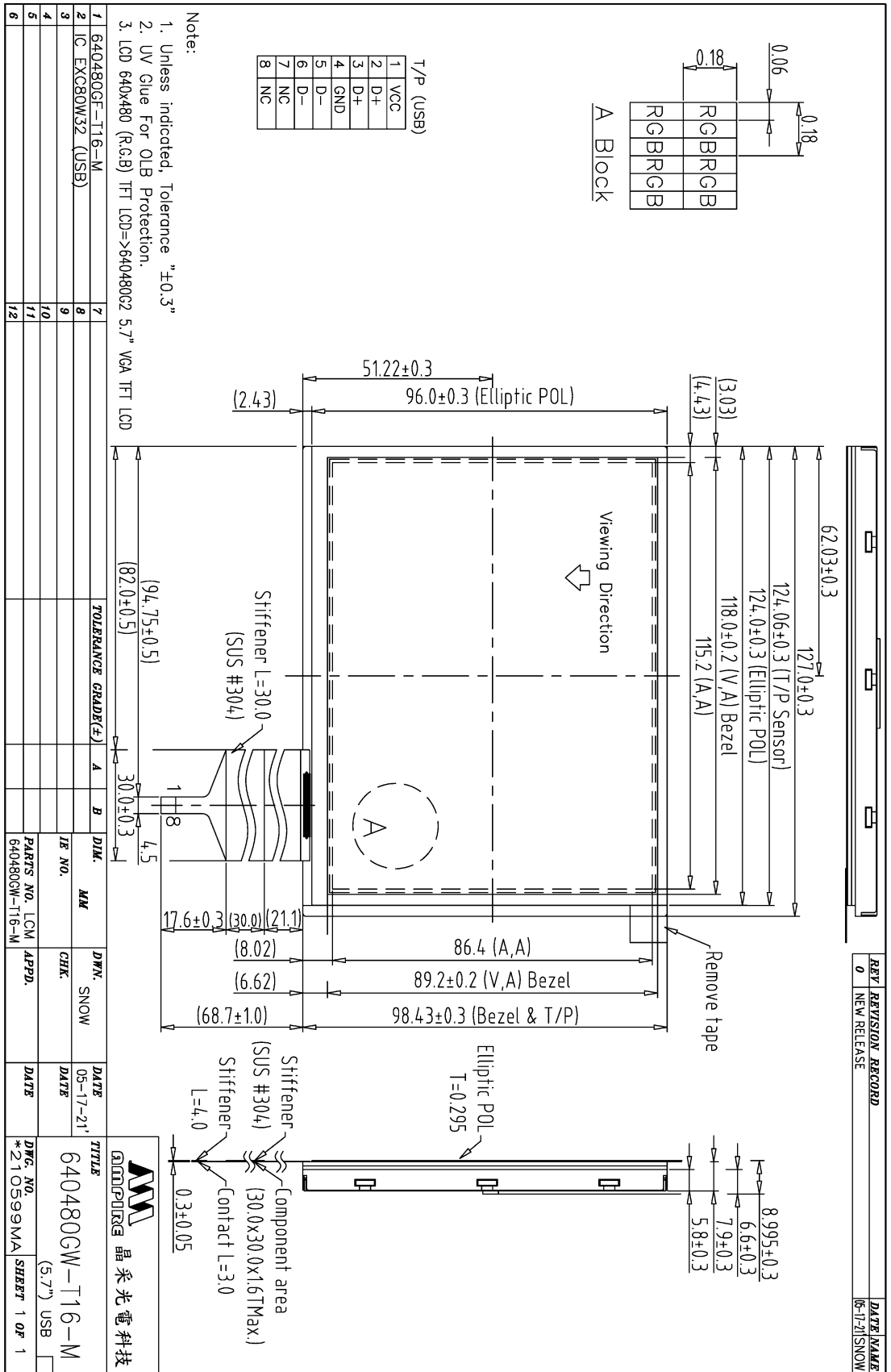
Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

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.

11. Outline Dimension



Date: 2021/08/17

Note:

- 1 Tray = 1x2 = 2Pcs.
- 2 Small Box = 5xTray = 10Pcs. (5 Tray)
- 3 Big Box = 4xSmall Box = 40Pcs.

Small Box
Size: LxWxH (267.0x224.0x124.0mm)

Big Box
Size: LxWxH (491.0x300.0x295.0mm)

Assembly Steps:

1. Place EPE PROTECT SHEET 1 into the box.
2. Place bubble bags or metal bags into the box.
3. Place the product into the box.
4. Place the product into the box.
5. Place the product into the box.
6. Place the product into the box.
7. Place the product into the box.
8. Place the product into the box.
9. Place the product into the box.
10. Place the product into the box.
11. Place the product into the box.
12. Place the product into the box.