AMP DISPLAY INC.

A Brighter Solution

SPECIFICATIONS

5.7-in COLOR TFT MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M 3 2 0 2 4 0 N 6 T M Q W - 0 2 H
APPROVED BY:	
DATE:	

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2007/11/19	-	New Release	Norman
2007/11/19	22	Add Guarantee Declaration (NO.3)	Norman

1 Features

5.7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 5.7" TFT-LCD panel, a driver circuit and backlight unit.

(1) Construction: 5.7" a-Si color TFT-LCD, White LED Backlight, and FPC.
(2) Resolution (pixel): 320(R.G.B) X240
(3) Number of the Colors : 16777K colors (R , G , B 8 bit digital each)
(4) LCD type : Transmissive Color TFT LCD (normally White)
(5) Interface: 54 pin
(6) Viewing Direction: 6 O'clock (The direction it's hard to be discolored)

2 Physical specifications

Item	Specifications	Unit	
Display resolution(dot)	960 (W) x 240(H)	mm	
Active area	115.2 (W) x 86.4 (H)	mm	
Screen size	5.7(Diagonal)	mm	
Pixel size	120 (W) x 360 (H)	um	
Color configuration	R.G.B stripe		
Overall dimension	126.0(W)x139.3(H)x5.4(D)	mm	
Weight	T.B.D	mg	
Backlight unit	LED		

3 Electrical specification

3.1 Absolute max. ratings

3.1.1 Electrical Absolute max. ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDD	VSS=0	-0.3	7.0	V	
Power voltage	VCC	VSS=0	-0.3	5.5	V	
Power voltage	VGH	VSS=0	-0.3	+32.0	V	
Power voltage	VGL	VSS=0	-22.0	+0.3	V	
Input voltege	V_{in}		-0.3	VDD+0.3	V	Note 1

Note1:Hsync, Vsync, DEN, DCLK, R0~R5, G0~G5, B0~B5

3.1.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	-20	70	-30	80	Note2,3,4,5,6,7
Humidity	Note1		Note1		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note1 : Ta <= 40　: 85% RH max
　　　　Ta > 40　 : Absolute humidity must be lower than the humidity of
　　　　85%RH at 40
Note2 : For storage condition Ta at -30　< 48h , at 80　< 100h
　　　　For operating condition Ta at -20　< 100h
Note3 : Background color changes slightly depending on ambient
　　　　temperature. This phenomenon is reversible.
Note4 : The response time will be slower at low temperature.
Note5 : Only operation is guarantied at operating temperature. Contrast ,
　　　　response time, another display quality are evaluated at +25
Note6 : When LCM is operated over 60　ambient temperature, the I_{LED}
　　　　of the LED back-light should be adjusted to 100mA max
Note7 : This is panel surface temperature, not ambient temperature.

3.1.3 LED back-light Unit Absolute max. ratings

Item	Symbol	Ratings	Unit	Remark
Peak forward Current	IF	350	mA	
Reverse Voltage	VR	30	V	
Power Dissipation	Po	1.2	W	

3.2　Electrical characteristics

3.2.1　DC Electrical characteristic of the LCD

Typical operting conditions (VSS=0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage1		VCC	3.0	3.3	3.6	V	
Power supply voltage2		VDD	3.8	5.0	5.5	v	
Gate driver ON voltage		VGH	+14	+15	+16		
Gate driver OFF voltage		VGL	-9	-10	-11		
Input Voltage for logic	H Level	V_{IH}	0.7 VCC	-	VCC	V	Note 1
	L Level	V_{IL}	0	-	0.3 VCC	V	
Power Supply current1		ICC	--	30	--	mA	Note 2
Power Supply current2		IDD	--	20	--	mA	Note 2

Note1: Hsync, Vsync, DEN, DCLK, R0~R5, G0~G5, B0~B5

Note2: fv =60Hz , Ta=25   , Display pattern : All Black

3.2.2 Electrical characteristic of LED Back-light

Paramenter	Symbol	Min.	Typ.	Max.	Unit	Condiction
LED voltage	V_{AK}	--	10.5	12	V	I_{LED}=126mA,Ta=25
LED forward current	I_{LED}	--	126	140	mA	Ta=25
	I_{LED}	--	84	105	mA	Ta=60
Lamp life time		10,000	-	-	Hr	I_{LED}=126mA,Ta=25
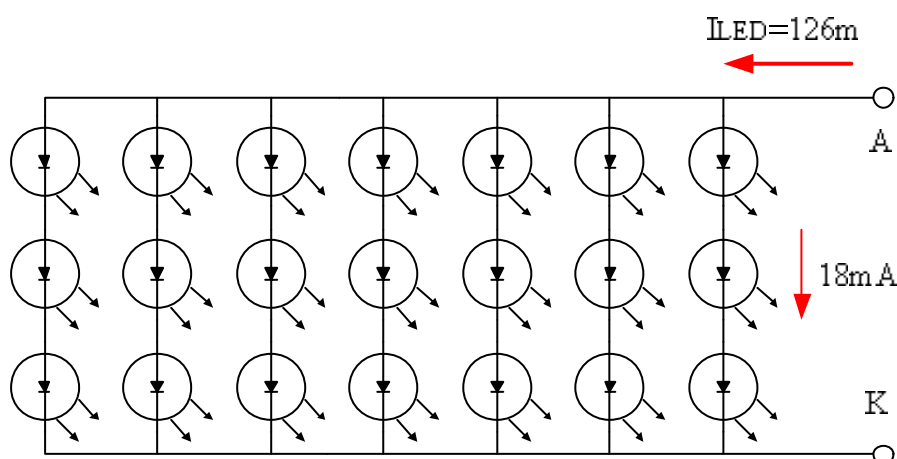
■   The constant current source is needed for white LED back-light driving. When LCM is operated over 60   ambient temperature, the I_{LED} of the LED back-light should be adjusted to 105mA max
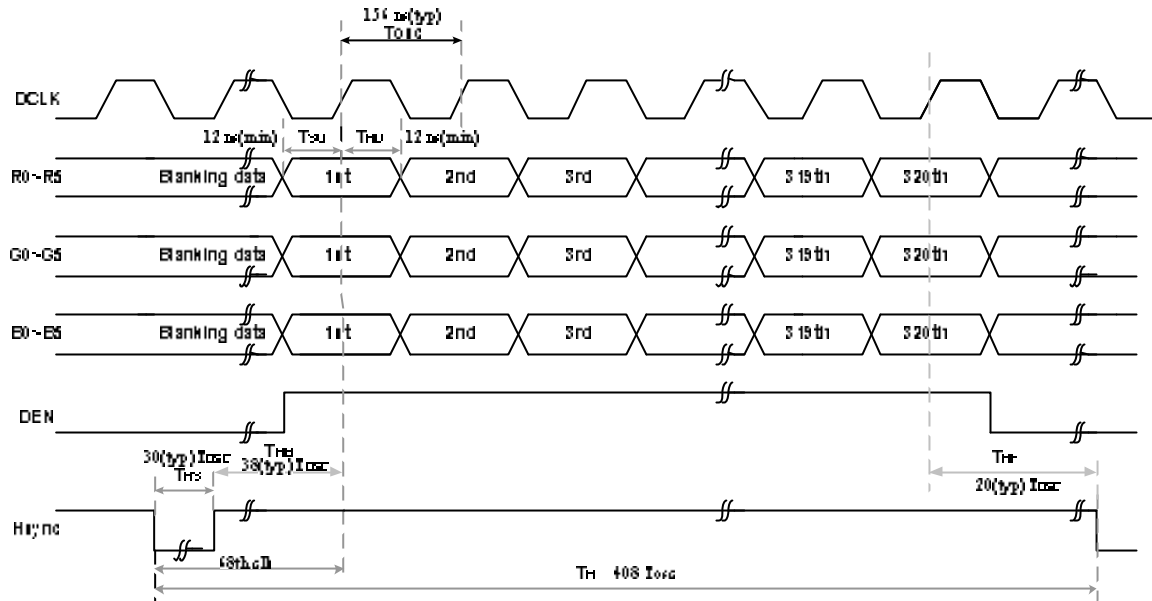
3.3 AC Timing characteristic of the LCD

a. Timing condition

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	DCLK period		T_{OSC}	-	156	-	ns	
	Frequency		F_{OSC}	-	6.4	-	MHz	
	DCLK High plus width		T_{CH}	-	78	-	ns	
	DCLK Low plus width		T_{CL}	-	78	-	ns	
RGB DATA	Data setup time		T_{SU}	12	-	-	ns	
	Data hold time		T_{HD}	12	-	-	ns	
Hsync	Hsync period		T_H	-	408	-	T_{OSC}	
	Hsync pulse width		T_{HS}	5	30	-	T_{OSC}	
	Back-Parch		T_{HB}		38		T_{OSC}	
	Front-Parch		T_{HF}		20		T_{OSC}	
	Hsync rising time		T_{Cr}	-	-	700	ns	
	Hsync falling time		T_{Cf}	-	-	300	ns	
Vsync	Vsync period	NTSC			262.5	-	T_H	
		PAL		-	312.5	-	T_H	
	Vsync pulse width		T_{VS}	1	3	5	T_H	
	Back-Porch	NTSC	T_{VB}		15		T_H	
		PAL			23		T_H	
	Display Period		T_{VD}		240		T_H	
	Front Porch	NTSC	T_{VF}		4.5		T_H	
		PAL			46.5		T_H	
	Vsync rising time		T_{Vr}	-	-	700	ns	
	Vsync falling time		T_{Vf}	-	-	1.5	μs	
	Vsync falling to Hsync rising time for odd field		T_{HVO}	1	-	-	T_{OSC}	
	Vsync falling to Hsync falling time for even field		T_{HVE}	1	-	-	T_{OSC}	
DEN	Vsync-DEN time	NTSC	T_{VSE}	-	18	-	T_H	
		PAL	T_{VSE}	-	26	-	T_H	
	Hsync-DEN time		T_{HE}	36	68	88	T_{OSC}	
	DEN plus width		T_{EP}	-	320	-	T_{OSC}	

Note : If DEN is fixed to low, the SYNC mode is used. Otherwise DE mode is used. When SYNC mode is used, 1st data start from 68th CLK after Hsync falling
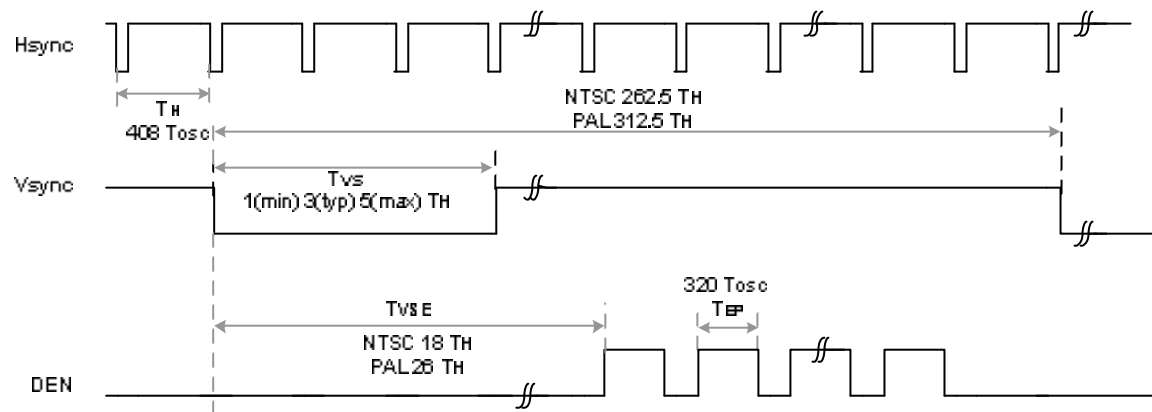
● Horizontal display timing

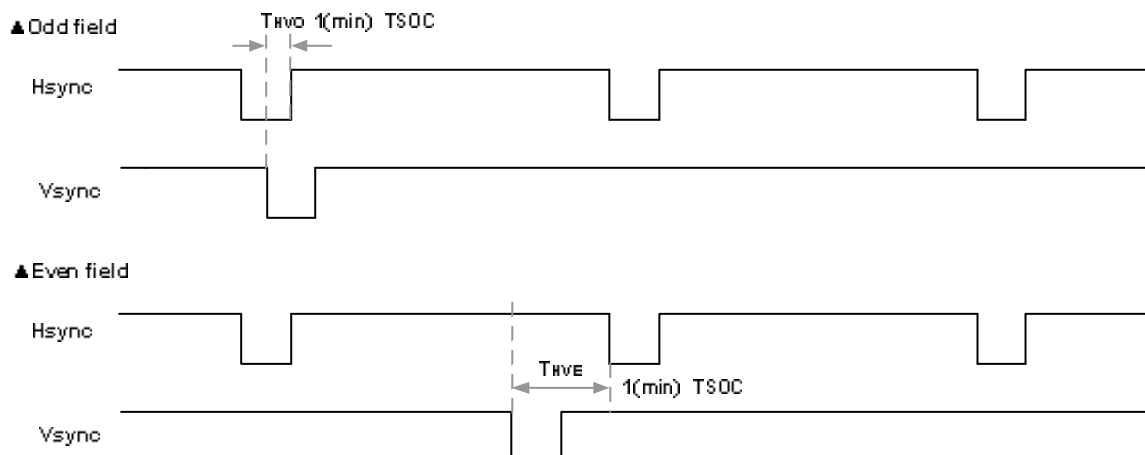Note : Data is latched rising edge trigger of CLK.

154 ns(typ)
Tclc

DCLK

12 ns(min) | Tsu | Thd | 12 ns(min)

R0~R5   Blanking data   1st   2nd   3rd   319th   320th

G0~G5   Blanking data   1st   2nd   3rd   319th   320th

B0~B5   Blanking data   1st   2nd   3rd   319th   320th

DEN

30(typ)Tosc   Thd   38(typ)Tosc   Thr
Ths   20(typ)Tosc

Hsync

68th clk   TH   408 Tosc

If DEN is fixed to low, the SYNC mode is used. Otherwise DE mode is used.
When SYNC mode is used, 1st data start from 68th CLK after Hsync falling

● Vertical display timing

Hsync

TH   NTSC 262.5 TH
408 Tosc   PAL 312.5 TH

Vsync

Tvs
1(min) 3(typ) 5(max) TH

Tvse   320 Tosc
Tep
NTSC 18 TH
PAL 26 TH

DEN

● Hsync and Vsync timing

▲Odd field

Thvo 1(min) TSOC

Hsync

Vsync

▲Even field

Hsync

Thve
1(min) TSOC

Vsync

4 Optical specification

4.1 Optical characteristic of the LCD

Item		Symbol	Conditon	Min.	Typ.	Max.	Unit	Remark
Response Time	Rise	T_r	=0°	-	15	30	ms	Note 1,2,3,5
	Fall	T_f		-	35	50	ms	
Contrast ratio		CR	At optimized viewing angle	200	350	-		Note 1,2,4,5
Viewing Angle	Top		CR 10	-	35	-	deg.	Note1,2, 5,6
	Bottom			-	15	-		
	Left			-	45	-		
	Right			-	45	-		
Brightness		Y_L	I_{LED}=126mA, 25	280	300	-	cd/m^2	Note 7
Red chromaticity	X_R			0.610	0.640	0.670		Note 7 For reference only. These data should be update according the prototype.
	Y_R			0.314	0.344	0.374		
Green chromaticity	X_G		=0° =0°	0.268	0.298	0.328		
	Y_G			0.553	0.583	0.613		
Blue chromaticity	X_B			0.102	0.132	0.162		
	Y_B			0.107	0.137	0.167		
White chromaticity	X_W			0.282	0.312	0.342		
	Y_W			0.299	0.329	0.359		

( )For reference only. These data should be update according the prototype.

Note 1:Ambient temperature=25 ,and lamp current I_{LED}=126mA.To be measured in the dark room.

Note 2:To be measured on the center area of panel with a viewing cone of 1°by Topcon luminance meter BM-7,after 10 minutes operation.

Note 3.Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from"white" to "black" (rising time),respectively.The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.
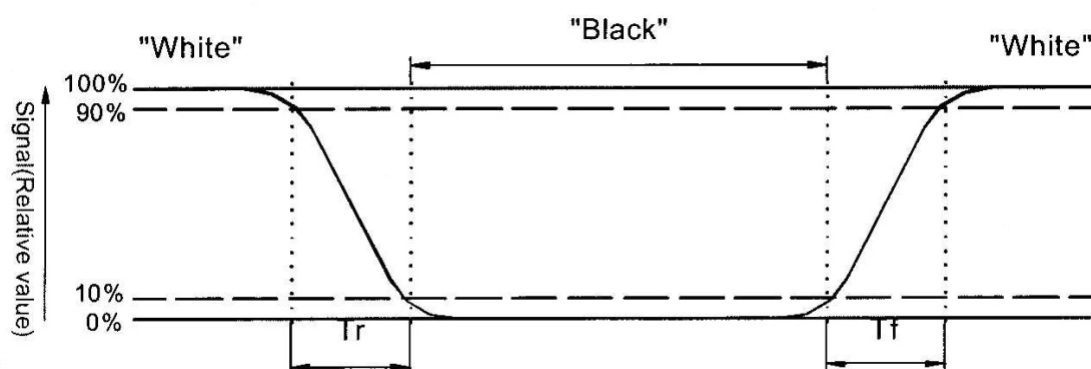
Note 4.Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note 5:White $V_i = V_{i50} + 1.5V$

Black $V_i = V_{i50} + 2.0V$

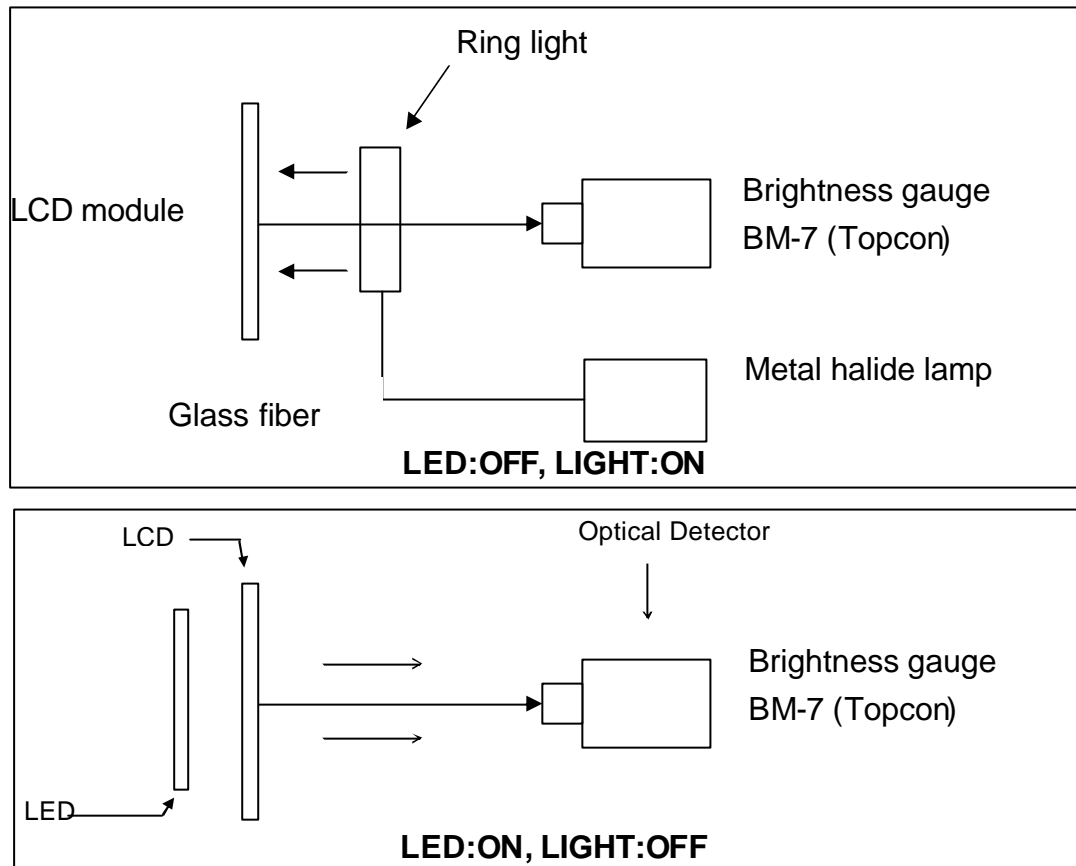"$\pm$" means that the analog input signal swings in phase with V_{COM} signal.

"$\frac{-}{+}$" means that the analog input signal swings out of phase with V_{COM} signal.

V_{i50} : The analog input voltage when transmission is 50%.The 100%

Transmission is defined as the transmission of LCD panel when all the

Input terminals of module are electrically opened.

Note 6.Definition of viewing angle,Refer to figure as below.
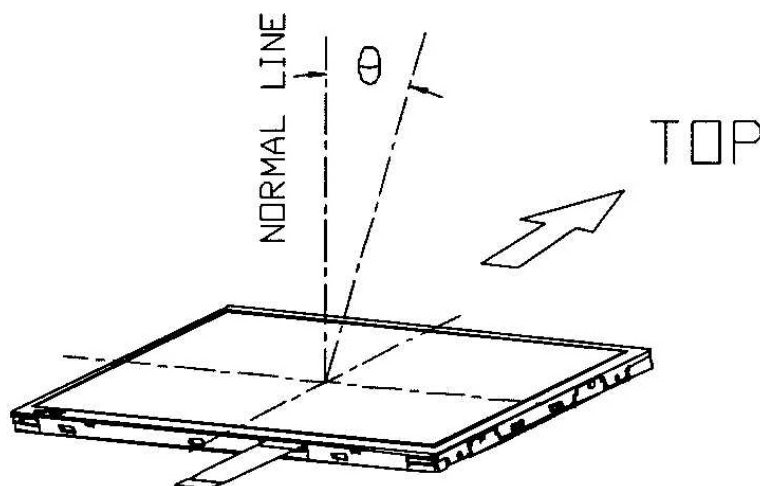
Note 7.Measured at the center area of the panel when all the input terminals of
LCD panel are electrically opened.

Ring light

LCD module

Brightness gauge
BM-7 (Topcon)

Metal halide lamp

Glass fiber

LED:OFF, LIGHT:ON

LCD

Optical Detector

Brightness gauge
BM-7 (Topcon)

LED

LED:ON, LIGHT:OFF

4.2 Optical characteristic of the LED Back-light

ITEM	MIN	TYP	MAX	UNIT	Condition
Bare Brightness	4000	--	--	Cd/m2	I_{LED} =126mA,Ta=25
AVG. X of 1931 C.I.E.	0.26	0.28	0.31	--	I_{LED} =126mA,Ta=25
AVG. X of 1931 C.I.E.	0.27	0.29	0.32	--	I_{LED} =126mA,Ta=25
Brightness Uniformity	80	--	--	%	I_{LED} =126mA,Ta=25

( )For reference only. These data should be update according the prototype.

Note1 : Measurement after 10 minutes from LED operating.

Note2 : Measurement of the following 9 places on the display.
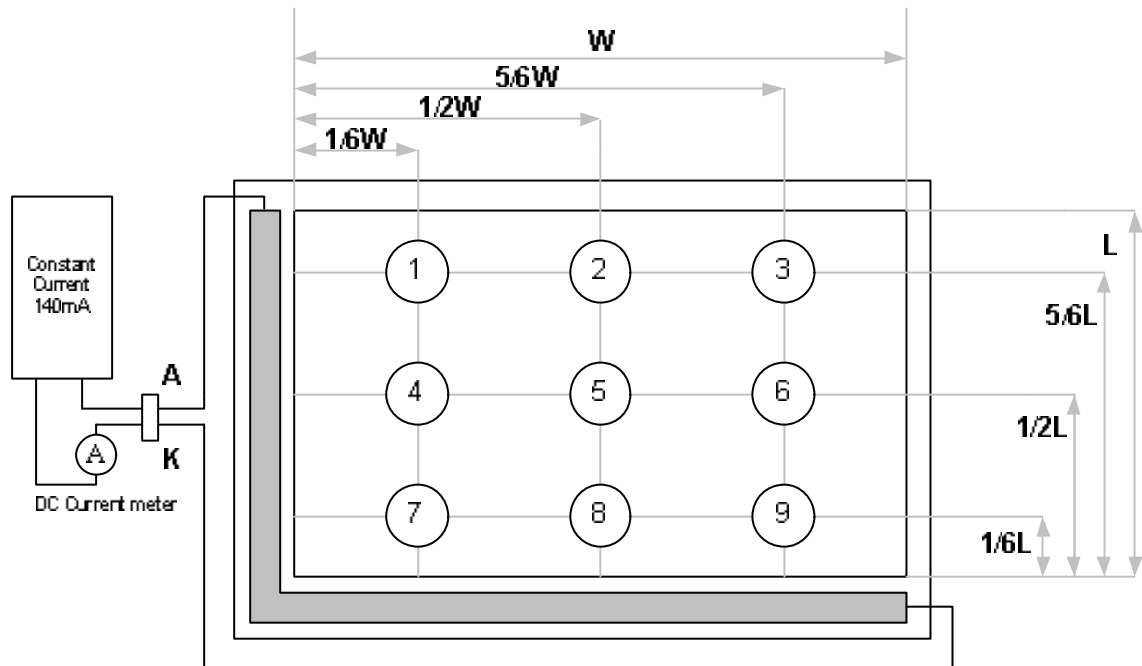
5 Interface specifications

5.1 Driving signals for the TFT panel

Pin no	Symbol	I/O	Description	Remark
1~6	NC		No connection	
7	POL	O	Polarity select for the line inversion control signal. When POL=L, output voltage is negative polarity. When POL=H, output voltage is positive polarity.	
8	/RESET	I	/RESET signal for the HX8218 T-COM	
9	SPENA	I	Serial port Data Enable Signal. Normally pull high.	
10	SPECLK	I	Serial port Clock. Normally pull high.	
11	SPDAT	I/O	Serial port Data input/output.	
12	B0	I	Blue data bus	
13	B1	I		
14	B2	I		
15	B3	I		
16	B4	I		
17	B5	I		
18	B6	I		
19	B7	I		
20	G0	I	Green data bus	
21	G1	I		
22	G2	I		
23	G3	I		
24	G4	I		
25	G5	I		
26	G6	I		
27	G7	I		
28	R0	I	Red data bus	
29	R1	I		
30	R2	I		
31	R3	I		
32	R4	I		
33	R5	I		
34	R6	I		
35	R7	I		
36	Hsync	I	Horizontal sync input in digital RGB mode	
37	Vsync	I	Vertical sync input in digital RGB mode.	
38	DCLK	I	Clock signal. Latching data at the rising edge.	
39	VDD	P	Power supply for the logic (5.0V)	
40	VDD	P	Power supply for the logic (5.0V)	
41	VDD	P	Power supply for the logic (3.3V)	
42	VDD	P	Power supply for the logic (3.3V)	
43	NC		No connection	
44	NC		No connection	
45	VGL	P	Gate driver OFF Voltage (-10.0V)	

Pin no	Symbol	I/O	Description	Remark
46	NC		No connection	

47	VGH	P	Gate driver ON Voltage (+15.0V)	
48	NC		No connection	
49	NC		No connection	
50	NC		No connection	
51	VCOM	I	COMMON plane reference voltage.	
52	ENB	I	Input data enable control	
53	GND		Digital ground	
54	AVSS		Analog ground	

5.2 Driving signals for the LED back-light

J

Pin no	Symbol	Level	Description	Remark
1	A	-	LED Anode	
2	K	-	LED Cathode	

6 BLOCK DIAGRAM
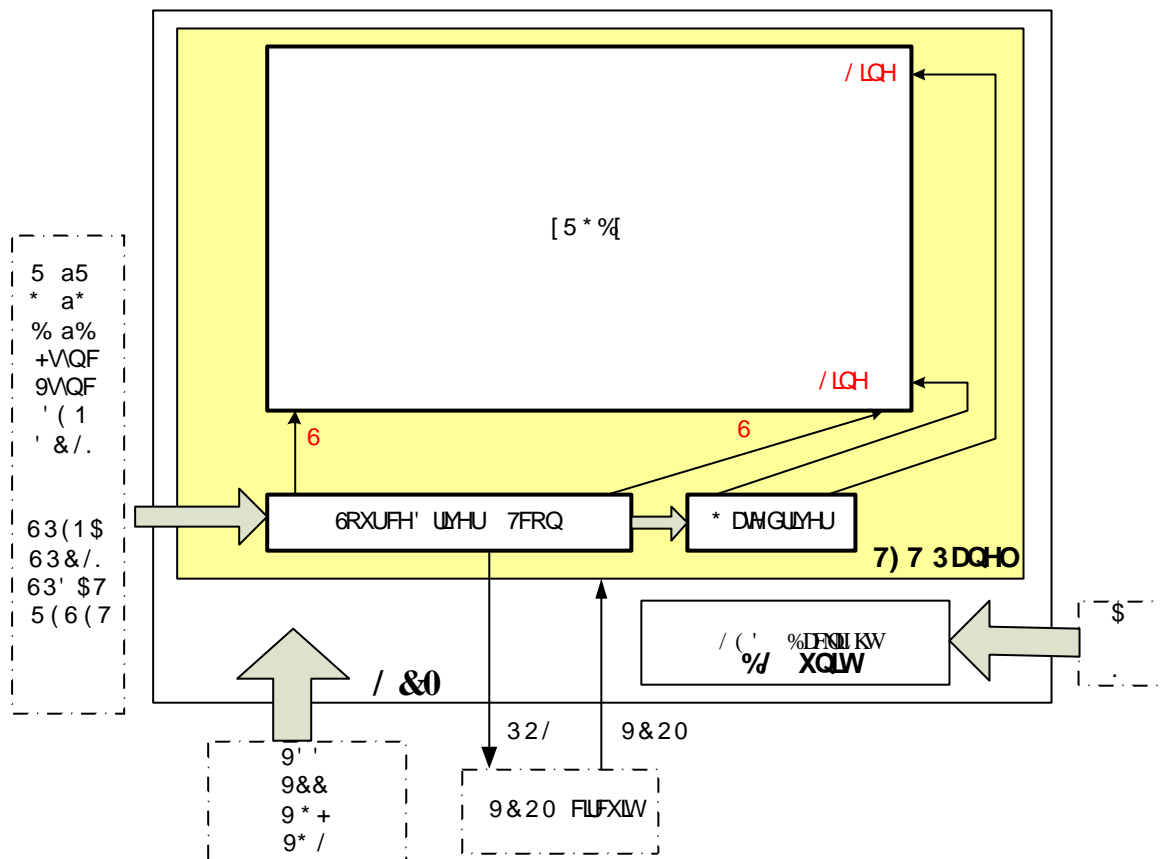
VCOM circuit is needed

7 DISPLAYED COLOR AND INPUT DATA

	Color & Gray Scale	R7	R6	~~	R1	R0	G7	G6	~~	G1	G0	B7	B6	~~	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Cyan	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Red(61)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(1)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(1)	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(1)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1

8 QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

Tests should be conducted under the following conditions :
Ambient temperature : $25 \pm 5°C$
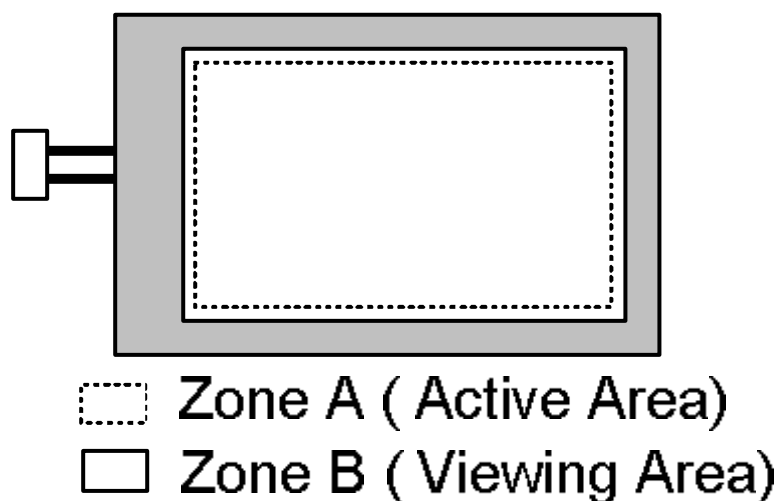Humidity   : $60 \pm 25\%$ RH.

8.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .
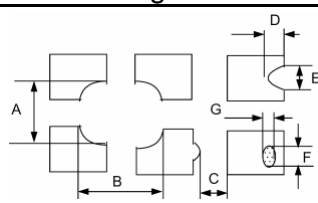
8.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

8.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.

Zone A (Active Area)
Zone B (Viewing Area)

8.5 INSPECTION QUALITY CRITERIA

No.	Item	Criterion for defects	Defect type
1	Non display	No non display is allowed	Major
2	Irregular operation	No irregular operation is allowed	Major
3	Short	No short are allowed	Major
4	Open	Any segments or common patterns that don't activate are rejectable.	Major
5	Black/White spot (I)	<table><tr><td>Size D (mm)</td><td>Acceptable number</td></tr><tr><td>D ≤ 0.15</td><td>Ignore</td></tr><tr><td>0.15 < D ≤ 0.20</td><td>3</td></tr><tr><td>0.20 < D ≤ 0.30</td><td>2</td></tr><tr><td>0.30 < D</td><td>0</td></tr></table>	Minor
6	Black/White line (I)	<table><tr><td>Length(mm)</td><td></td><td>Acceptable number</td></tr><tr><td>10 < L</td><td>0.03 < W ≤ 0.04</td><td>5</td></tr><tr><td>5.0 < L ≤10</td><td>0.04 < W ≤ 0.06</td><td>3</td></tr><tr><td>1.0 < L ≤ 5.0</td><td>0.06 < W ≤ 0.07</td><td>2</td></tr><tr><td>L ≤ 1.0</td><td>0.07 < W ≤ 0.09</td><td>1</td></tr></table>	Minor
7	Black/White sport (II)	<table><tr><td>Size D (mm)</td><td>Acceptable number</td></tr><tr><td>D ≤ 0.30</td><td>Ignore</td></tr><tr><td>0.30 < D ≤ 0.50</td><td>5</td></tr><tr><td>0.50 < D ≤ 1.20</td><td>3</td></tr><tr><td>1.20 < D</td><td>0</td></tr></table>	Minor
8	Black/White line (II)	<table><tr><td>Length (mm)</td><td>Width (mm)</td><td>Acceptable number</td></tr><tr><td>20 < L</td><td>0.05 < W ≤ 0.07</td><td>5</td></tr><tr><td>10 < L ≤ 20</td><td>0.07 < W ≤ 0.09</td><td>3</td></tr><tr><td>5.0 < L ≤ 10</td><td>0.09 < W ≤ 0.10</td><td>2</td></tr><tr><td>L ≤ 5.0</td><td>0.10 < W ≤ 0.15</td><td>1</td></tr></table>	Minor
9	Back Light	1. No Lighting is rejectable 2. Flickering and abnormal lighting are rejectable	Major
10	Display pattern	Unit:mm $\dfrac{A+B}{2} \le 0.30$ | $0 < C$ | $\dfrac{D+E}{2} \le 0.25$ | $\dfrac{F+G}{2} \le 0.25$ Note: 1. Acceptable up to 3 damages 2. NG if there're to two or more pinholes per dot	Minor

	Blemish & Foreign matters Size: $D = \dfrac{A+B}{2}$				Minor
11		Size D (mm)		Acceptable number	
		D ≤ 0.15		Ignore	
		0.15 < D ≤ 0.20		3	
		0.20 < D ≤ 0.30		2	
		0.30 < D		0	

	Scratch on Polarizer	Width (mm)	Length (mm)	Acceptable number	Minor
12		W≤0.03	Ignore	Ignore	
		0.03<W≤0.05	L ≤ 2.0	Ignore	
			L > 2.0	1	
		0.05<W≤0.08	L > 1.0	1	
			L ≤ 1.0	Ignore	
		0.08<W	Note (1)	Note(1)	
		Note(1) Regard as a blemish			

	Bubble in polarizer	Size D (mm)		Acceptable number	Minor
13		D ≤ 0.20		Ignore	
		0.20 < D ≤ 0.50		3	
		0.50 < D ≤ 0.80		2	
		0.80 < D		0	

14	Stains on LCD panel surface	Stains that cannot be removed even when wiped lightly with a soft cloth or similar cleaning too are rejectable.	Minor
15	Rust in Bezel	Rust which is visible in the bezel is rejectable.	Minor
16	Defect of land surface contact (poor soldering)	Evident crevices which is visible are rejectable.	Minor
17	Parts mounting	1. Failure to mount parts 2. Parts not in the specifications are mounted 3. Polarity, for example, is reversed	Major Major Major
18	Parts alignment	1. LSI, IC lead width is more than 50% beyond pad outline. 2. Chip component is off center and more than 50% of the leads is off the pad outline.	Minor Minor
19	Conductive foreign matter (Solder ball, Solder chips)	1. 0.45<　　　　,N　1 2. 0.30<　≤0.45 ,N　1 　　　:Average diameter of solder ball (unit: mm) 3. 0.50<L　　　　,N　1 　　L: Average length of solder chip (unit: mm)	Major Minor Minor
20	Faulty PCB correction	1. Due to PCB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair; 2 or more places are corrected per PCB. 2. Short circuited part is cut, and no resist coating has been performed.	Minor Minor

21	Defect Dot	The TFT panel may have bright dot or Dark dot. The acceptable number defection:				Minor

Bright dot	Dark dot	Total dot	Distance between Dark-- dark
2	3	4	L 5mm

9 Reliability test items (Note2):

No.	Test items	Conditions	Remark
1	High temperature storage	Ta=80 240Hrs	
2	Low temperature storage	Ta=-30 240Hrs	
3	High temperature operation	Ta=70 240Hrs	
4	Low temperature operation	Ta=-20 240Hrs	
5	High temperature and high humidity	Ta=40 ,85% RH 240Hrs	Operation
6	Heat shock	-30 ~80 /200 cycles 1Hrs/cycle	Non-operation
7	Electrostatic discharge	±200V,200Pf(0),once for each terminal	Non-operation
8	Vibration	Frequency range :8~33.3Hz Stoke :1.3mm Sweep :2.9G,33.3~400Hz Cycle :15 minutes 2 hours for each direction of X,Z 4 hours for Y direction	JIS C7021, A-10 Condition A
9	Mechanical shock	100G, 6ms,±X, ±Y,±Z 3 times for each direction	JIS C7021, A-7 Condition C
10	Vibration (With carton)	Random vibration: 0.015G^2/Hz from 5~200Hz -6dB/octave from 200~500Hz	IEC 68~34
11	Drop (with carton)	Height:60cm 1 corner,3 edges,6 surfaces	JIS Z0202

10 USE PRECAUTIONS

10.1 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.

10.2 Installing precautions

1) The PCB has many Cs 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. 1MO 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.

10.3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 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.

10.4 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 dive 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: 0.2Vdd or less and H level: 0.8Vdd 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. Design the contents of the display, considering crosstalk.

10.5 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 year warrantee for all products and three months warrantee for all repairing products.

11 OUTLINE DIMENSION