AZ DISPLAYS

SPECIFICATIONS FOR

LIQUID CRYSTAL DISPLAY

CUSTOMER APPROVAL

※ **PART NO. :** ATM0700L47(AZ DISPLAYS) VER1.0

APPROVAL		COMPANY CHOP	
CUSTOMER COMMENTS			

AZ DISPLAYS ENGINEERING APPROVAL		
DESIGNED BY	CHECKED BY	APPROVED BY

DOCUMENT REVISION HISTORY

Change No.	Date	Subject And Reason	Version No.	Responser
1	2017.04.15	NEW	1.0	

CONTENTS

1. OVERVIEW

ATM0700L47 is 7" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 1024×600 images are displayed on the 7" diagonal screen. Display 16.7Mcolors by R.G.B signal input.

General specification are summarized in the following table:

ITEM	SPECIFICATION		
Display Area (mm)	154.2144(H) x 85.92(V)		
Number of Pixels	1024(H) × 3 (RGB) × 600(V)		
Pixel Pitch (mm)	0.1506(H) x 0.1432(V)		
Color Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally white		
Number of Colors	16.7M		
Brightness (cd/m^2)	500nit(typ)		
Response Time (ms)	25ms(typ.)		
Contrast Ratio	800:1		
Viewing Angle (CR≧10)	160degree (Horizontal.)		
	130degree (Vertical)		
Power Consumption (W)	TBD		
Interface connection	LVDS 40pin		
Module Size (mm)		Min.	Typ.	Max.
	Horizontal (H)	164.6	164.9	165.2
	Vertical (V)	99.7	100	100.3
	Depth (D) w/o FPC	5.2	5.5	5.8
Assembly size(mm)	164.9(H)x100.0(V)x7.1(D)		
Module Weight (g)	TBD		
Backlight Unit	LED		
Surface Treatment	Anti-Glare		

2. ABSOLUTE MAXIMUM RATINGS

The following are maximun values which, if exceeded, may cause faulty operation ordamage to the unit.

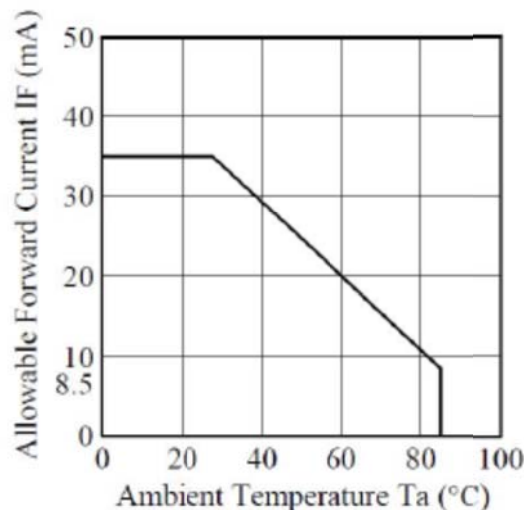| Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VDD VDD_LVDS	-0.3	3.96	V	
Analog Supply Voltage	AVDD	-0.5	14.85	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	12	40	V	
Signal Input Voltage	NIN0 ~ NIN3 PIN0 ~ PIN3 NINC,PINC	-0.5	5	V	
Forward Current (per LED)	If	-	30	mA	
Reverse Voltage (per LED)	VR	-	5	V	
Pulse forward current (per LED)	Ifp	-	100	mA	Note *2)
Operation Temperature	Top	-20	70	℃	Note *1)
Storage Temperature	Tstg	-30	80	℃	Note *1)

Note:

*1) If users use the product out of the operation and storage range,it will have quality is sue.

*2) Ifp Conditions ： Pulse Width≦10msec, Duty≦1/10

*3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.

■ Ambient Temperature vs. Allowable Forward Current

*4) If users use the product out off the environmemtal operation range（temperature and humidity）, it will have visual quality concerns.

3. ELECTRICAL CHARACTERISTICS
3.1. Typical Operation Conditions

Item	Symbol	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD DVDD_LVDS	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\dfrac{\mid VID \mid}{2}$	-	$2.4 - \dfrac{\mid VID \mid}{2}$	V	Note 1
	$\mid VID \mid$	200	-	600	mV	Note 1
	VTH	-	-	100	mV	VCM=1.2V Note 1
	VTL	-100	-	-	mV	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM	3.7	3.9	4.1	V	Note 2
Logic Input Voltage	VIH	0.7*DVDD	-	DVDD	V	
	VIL	GND	-	0.3*DVDD	V	

Note1：LVDS signal
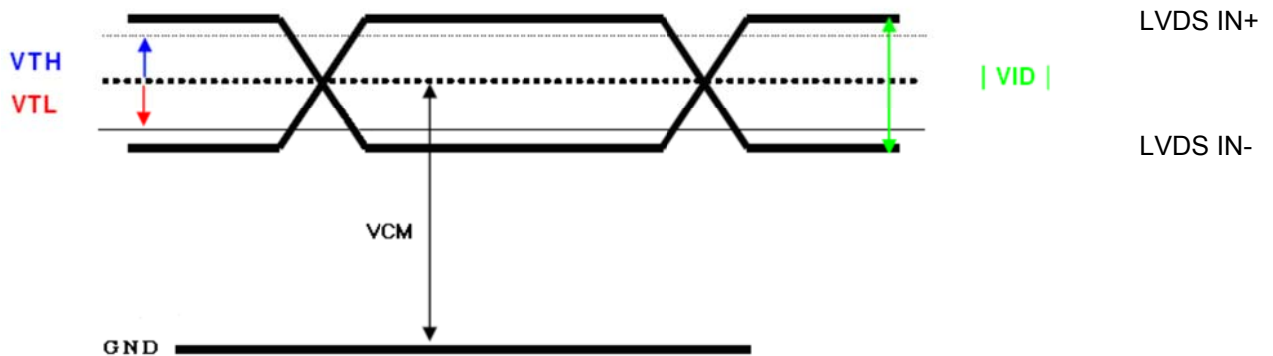
Note2：Please adjust VCOM to make the flicker level be minimum.

3.2.　Current Consumption

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Gate on power current	IVGH	VGH =18V	-	0.5	1	mA	Note 1
Gate off power current	IVGL	VGL= -6V	-	0.5	1	mA	Note 1
Digital power current	IVDD	VDD = 3.3V	-	30	40	mA	Note 1
Analog power current	IAVDD	AVDD = 9.6V	-	35	50	mA	Note 1
Total Power Consumption	PC		-	447	604	mW	Note 1

Note 1: Typical: Under 256 gray pattern

Maximum: Under black pattern

256 gray pattern
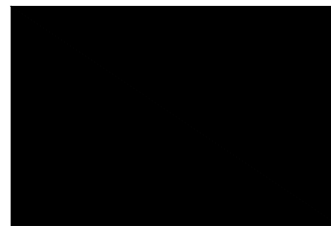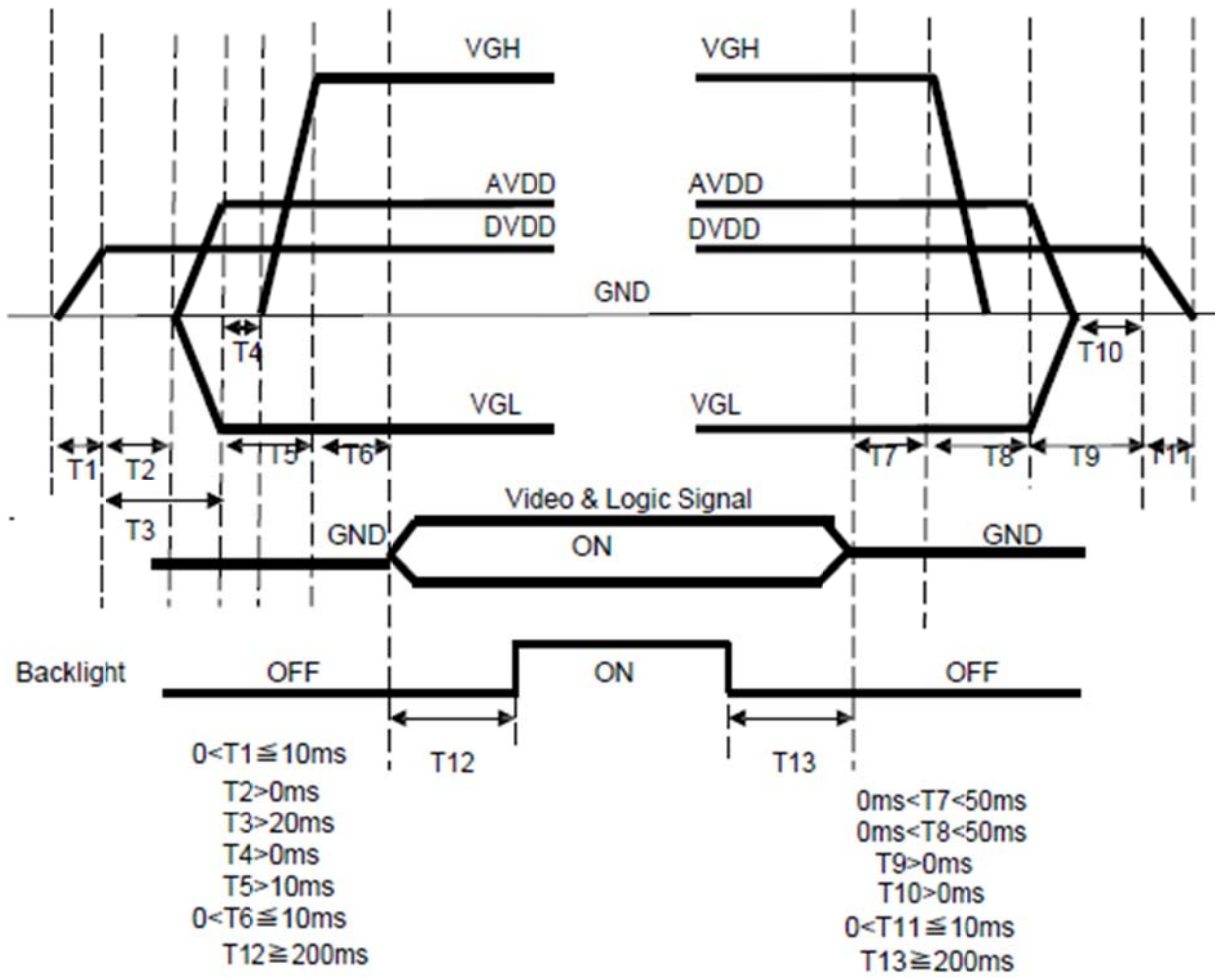
Black pattern

3.3.　Power、Signal sequence

Power On：DVDD→AVDD/VGL→VGH→Video &Logic Signal→Backlight

Power Off：Backlight→Video &Logic Signal→VGH→AVDD/VGL→DVDD

$0 < T1 \leqq 10ms$
$T2 > 0ms$
$T3 > 20ms$
$T4 > 0ms$
$T5 > 10ms$
$0 < T6 \leqq 10ms$
$T12 \geqq 200ms$

$0ms < T7 < 50ms$
$0ms < T8 < 50ms$
$T9 > 0ms$
$T10 > 0ms$
$0 < T11 \leqq 10ms$
$T13 \geqq 200ms$

3.4. Backlight

Ta=25℃

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED current	IL	Ta=25℃ (25mA/series)	--	225	--	mA	
LED voltage	VL	Ta=25℃ (25mA/series)	8.2	8.6	9.2	V	
Power consumption	WL	Ta=25℃ (25mA/series)	--	1.935	--	W	
LED Lifetime	-	Ta=25℃ IF=25mA	30000	--	--	Hr	

Remarks:

 *1) LED Circuit Diagram
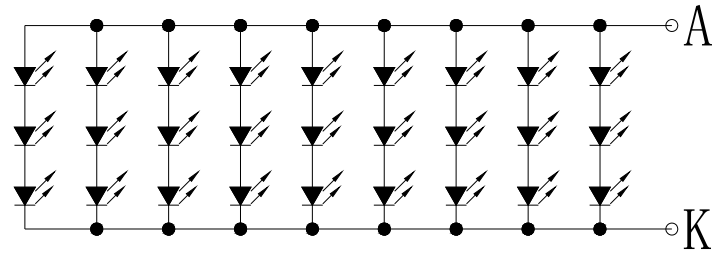
LED电路图
（3S9P=27LED）

*2) A:Anode(＋),K:Cathode(－)
*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.
*4) Definition of Led lifetime:Luminance < Initial luminance 50%.

4. INTERFACE CONNECTION
4.1. CN1 (Input Signal)

PIN NO.	SYMBOL	DESCRIPTION	REMARKS
1	VCOM	Common voltage	
2	DVDD	Digital power	
3	DVDD	Digital power	
4	NC	Not connect	
5	RESET	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ，C=1μF)	
6	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0",timing control, source driver will turn off, all output are high-Z	
7	GND	Ground	
8	RXIN0-	Negative LVDS differential data inputs	
9	RXIN0+	Positive LVDS differential data inputs	
10	GND	Ground	
11	RXIN1-	Negative LVDS differential data inputs	
12	RXIN1+	Positive LVDS differential data inputs	
13	GND	Ground	
14	RXIN2-	Negative LVDS differential data inputs	
15	RXIN2+	Positive LVDS differential data inputs	
16	GND	Ground	
17	RXCLKIN-	Negative LVDS differential clock inputs	
18	RXCLKIN+	Positive LVDS differential clock inputs	
19	GND	Ground	
20	RXIN3-	Negative LVDS differential data inputs	
21	RXIN3+	Positive LVDS differential data inputs	
22	GND	Ground	
23	NC	Not connect	
24	NC	Not connect	
25	GND	Ground	
26	NC	Not connect	
27	NC	Not connect	
28	SELB	6bit/8bit mode select	*1)
29	AVDD	Power for Analog Circuit	
30	GND	Ground	
31	LED-	LED Cathode	
32	LED-	LED Cathode	
33	L/R	Horizontal inversion	*2)
34	U/D	Vertical inversion	*2)
35	VGL	Negative power for TFT	
36	NC	Not connect	
37	NC	Not connect	
38	VGH	Positive power for TFT	

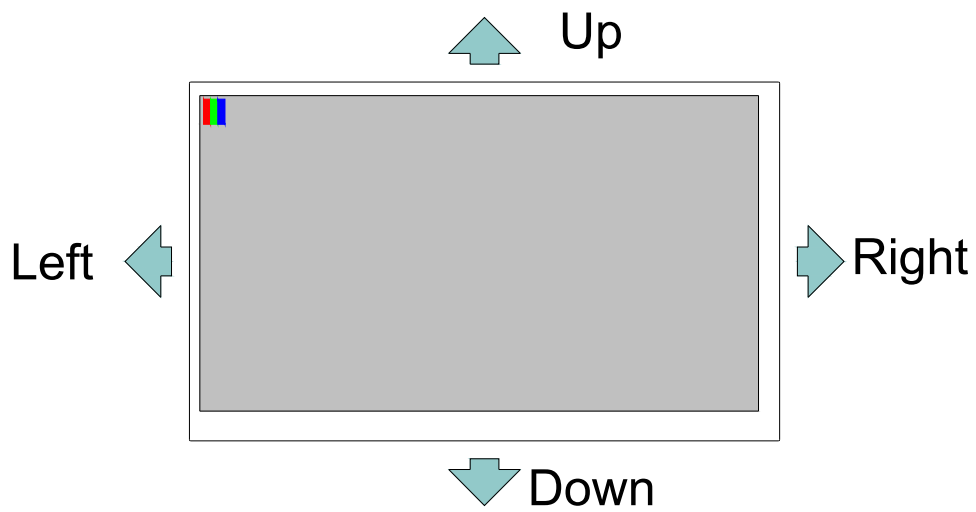| 39	LED+	LED Anode	
40	LED+	LED Anode	

Remarks:

*1) if LVDS input data is 6bits,SELB must be set to High

If LVDS input data is 8bits,SELB must be set to Low

*2)U/D and L/R control function

UD	LR	FUNCTION
0	1	Normal display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down

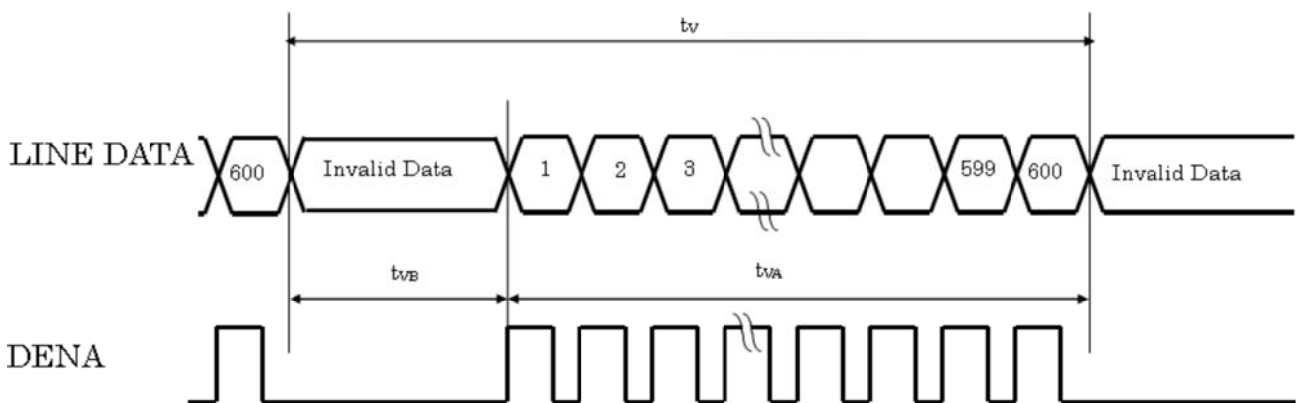# 5. INPUT SIGNAL(DE ONLY MODE)
5.1. Timing Specification

ITEM			SYMBOL	MIN	TYP	MAX	UNIT
LVDS input signal sequence	CLK Frequency		tclk	45	51.2	57	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	tH	1324	1344	1364	tCLK
			Horizontal effective Time	tHA	1024			tCLK
			Horizontal Blank Time	tHB	300	320	340	tCLK
		Vertical	Vertical total Time	tV	625	635	645	tH
			Vertical effective Time	tVA	600			tH
			Vertical Blank Time	tVB	25	35	45	tH

5.2. Timing sequence(Timing chart)
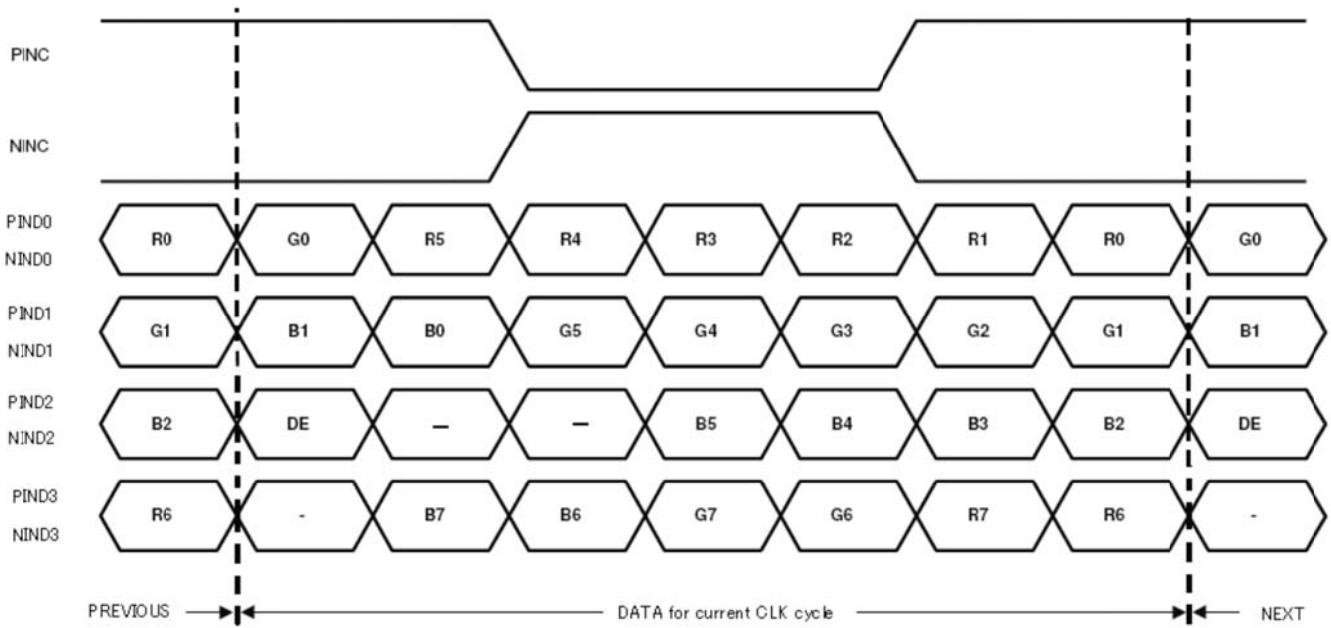### 5.2.1. Horizontal Timing Sequence:
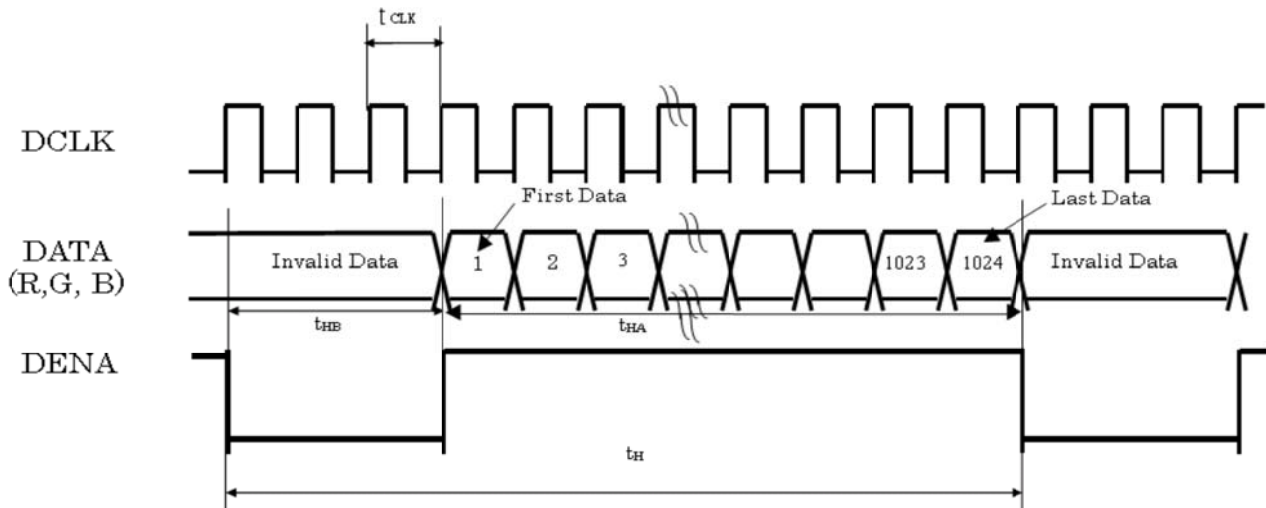
5.2.2. Vertical Timing Sequence:

5.2.3. LVDS Input Data mapping

6 Bit LVDS input

PINC									
NINC									
PIND0 NIND0	R0	G0	R5	R4	R3	R2	R1	R0	G0
PIND1 NIND1	G1	B1	B0	G5	G4	G3	G2	G1	B1
PIND2 NIND2	B2	DE	—	—	B5	B4	B3	B2	DE

PREVIOUS → |◄———— DATA for current CLK cycle ————►| ← NEXT

8 Bit LVDS input

PINC									
NINC									
PIND0 NIND0	R0	G0	R5	R4	R3	R2	R1	R0	G0
PIND1 NIND1	G1	B1	B0	G5	G4	G3	G2	G1	B1
PIND2 NIND2	B2	DE	—	—	B5	B4	B3	B2	DE
PIND3 NIND3	R6	-	B7	B6	G7	G6	R7	R6	-
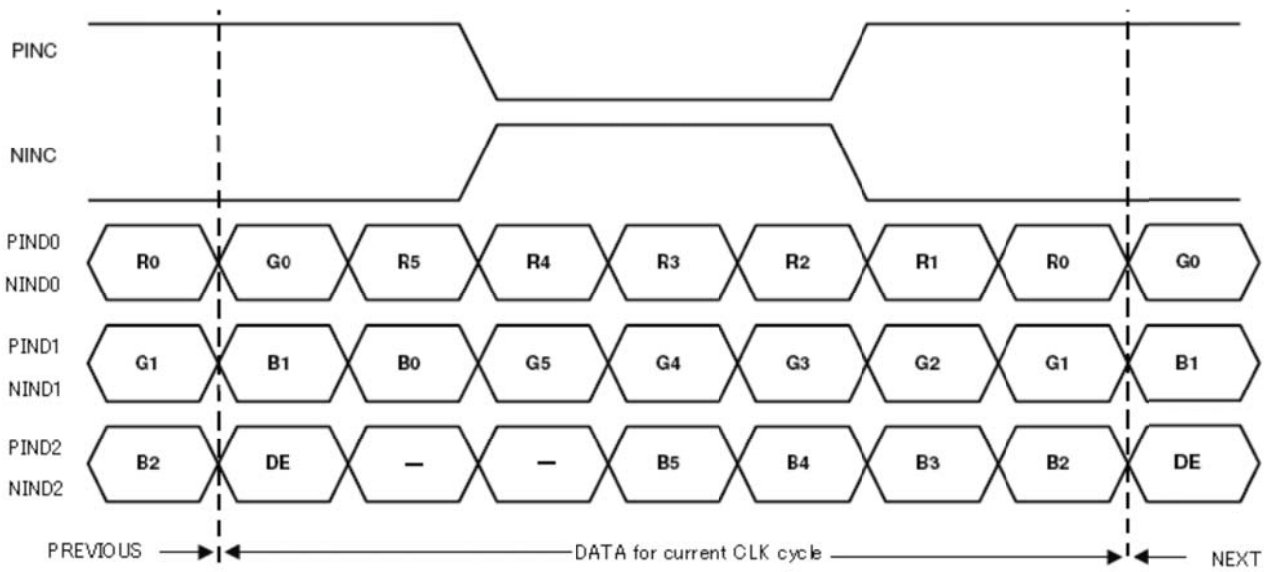
PREVIOUS →|◄———— DATA for current CLK cycle ————►|← NEXT

6. OPTICAL CHARACTERISTICS

Ta = 25℃, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Panel Transmittance		T		3.9	4.2	--	%	
Contrast Ratio		CR	Point-5	600	800		--	1,2,3
Luminance(CEN)		LW	Point-5	480	500		cd/m^2	1,3
Luminance Uniformity		ΔL		70	80		%	1,3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	40	ms	1,3,5
NTSC		-	Point-5	45	50	-	%	1,3
Viewing Angle	Horizontal	Left(ψ)	CR≧10 Point-5	70	80	--	°	1,3
		Right(ψ)		70	80	--	°	
	Vertical	Upper(θ)		50	60	--	°	1,2,4
		Down(θ)		60	70	--	°	
Color Coordinate	White	Wx Wy	Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	1,3
	Red	Rx Ry		0.573 0.315	0.593 0.335	0.613 0.355		
	Green	Gx Gy		0.322 0.580	0.342 0.600	0.362 0.620		
	Blue	Bx By		0.138 0.091	0.158 0.111	0.178 0.131		

Note1： Measure condition: 25℃±2℃, 60±10%RH, under10 Lux in the dark room.BM-5A (TOPCON), viewing angle2°, IL=225 mA （Backlight current）, measurement after lighting on 10 mins.
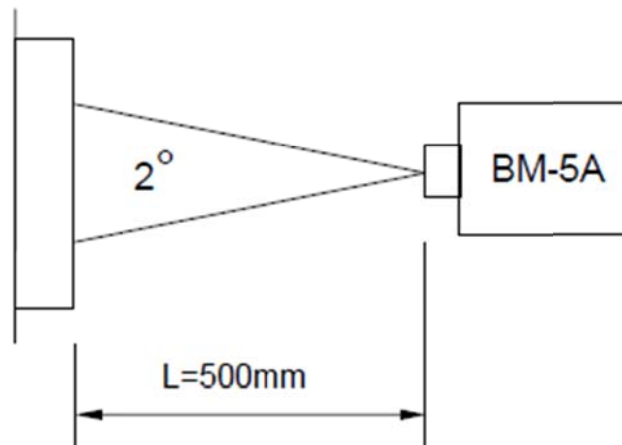
Note2：Definition of contrast ratio：

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

Note3： Definition of luminance：Measure white lu minance on the point 5 as figure.6-1

Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.6-1

$$\triangle L = [L(MIN)/L(MAX)] \times 100$$
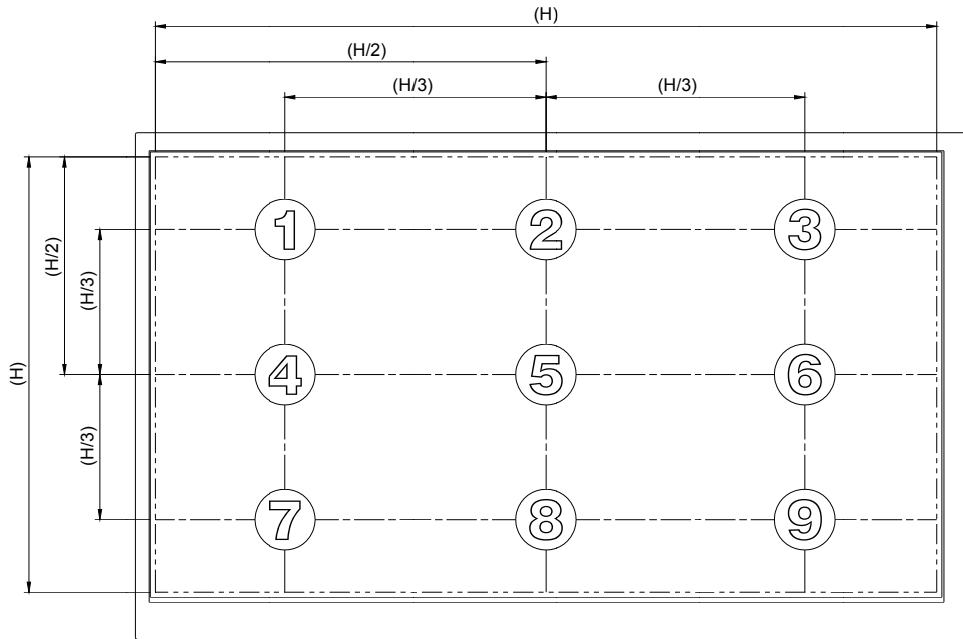

Fig.6-1 Measuring point

Note 4：Definition of Viewing Angle(θ , ψ),refer to Fig.6-2 as below：
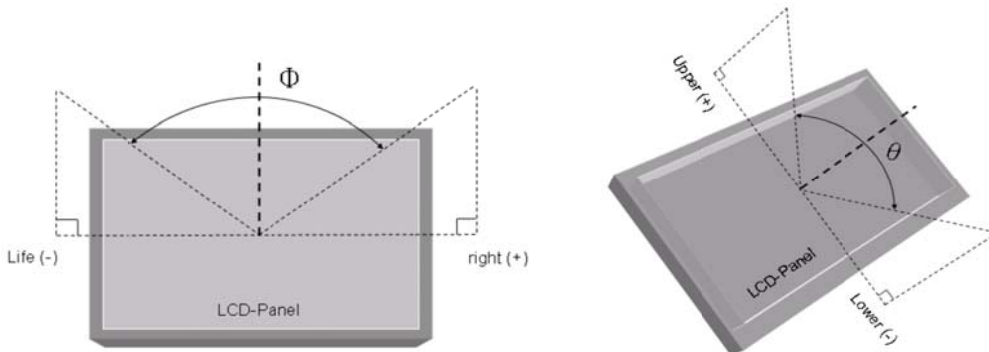

Fig.6-2 Definition of Viewing Angle

Note5：Definition of Response Time.(White-Black)

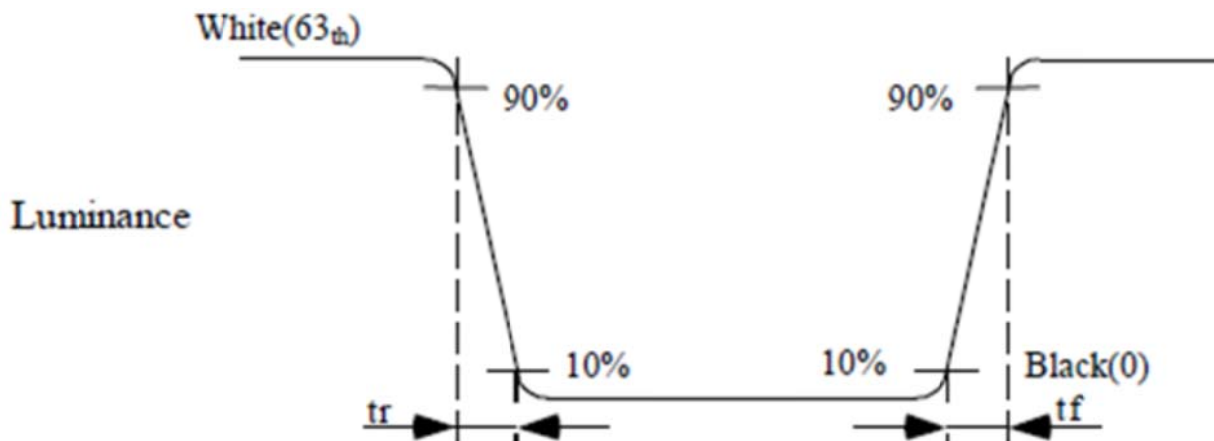Fig.6-3 Definition of Response Time(White-Black)

7. RELIABILITY TEST

7.1. Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70℃ ;240hrs	
High Temperature Storage	80℃ ; 240hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ;240hrs	No condensation
Low Temperature Operation	-20℃ ; 240hrs	Backlight unit always turn on
Low Temperature Storage	-30℃ ; 240hrs	
Thermal Shock	−20℃(0.5hr) ~ 70℃(0.5hr) ; 100 Cycles	
Image Sticking	25℃ ; 4hrs	
MTBF	200,00hrs	

Note 1：

Condition of Image Sticking test：25℃± 2℃

Operation with test pattern sustained for 4 hrs, then change to mid-gray pattern immediately.

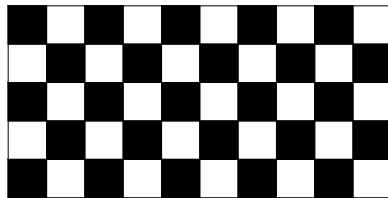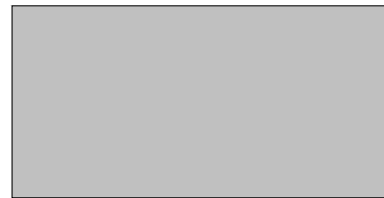After 5 mins, the mura must be disappeared completely .

Image Sticking -pattern   Mid-Gray pattern

7.2. Shock and Vibration

ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level: 980m/s^2(equal to 100G). ● Waveform:1/2 Sine wave,6msec. ● ±X,±Y,±Z,each axis 1 times
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stoke：1.3 mm ● Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2Hrs,y axis 4Hrs). ● Sweep: 2.9G,33.3 Hz -400 Hz ● Cycle: 15 min

7.3. Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF，330Ω，±8kV&±15kV air& contact test	1
	200pF，0Ω，±200V contact test	2

Note： Measure

   1: LCD glass and metal bezel

   2: IF connector pins

7.4. Judgment standard

The Judgment of the above test should be made as follow:

Pass: Normal display image and no line defect.

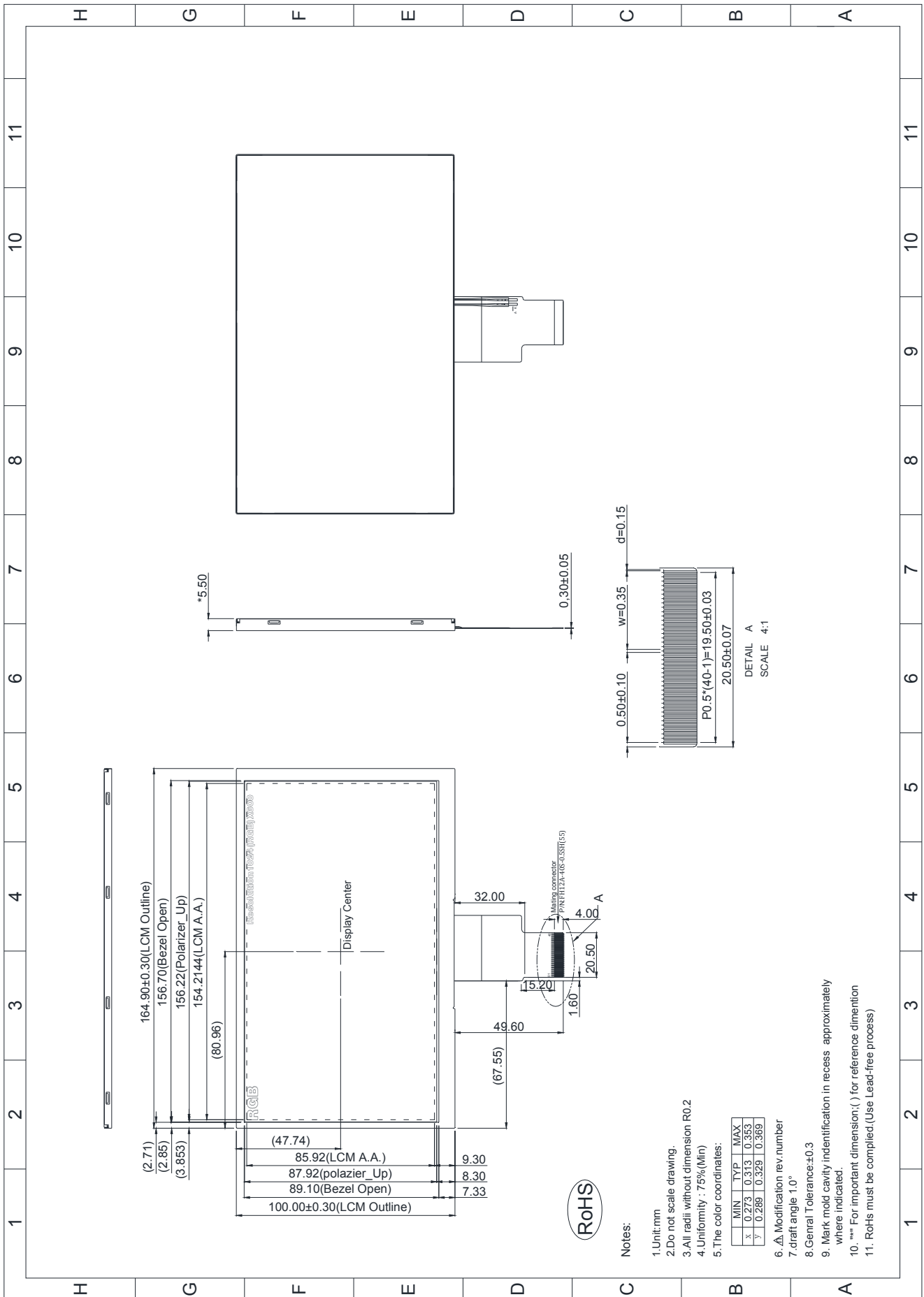Partial transformation of the module parts should be ignored.

Fail: No display image, Function NG, or line defects.

8. MECHANICAL DIMENSION
8.1. LCD Module

DETAIL A
SCALE 4:1

d=0.15
w=0.35
P0.5*(40-1)=19.50±0.03
20.50±0.07
0.50±0.10
0.30±0.05
*5.50

164.90±0.30(LCM Outline)
156.70(Bezel Open)
156.22(Polarizer_Up)
154.2144(LCM A.A.)
(80.96)
(67.55)

Display Center

32.00
4.00
20.50
15.20
1.60
49.60

Mating connector
P/N:FH12k-40S-0.5SH(55)

(2.71)
(2.85)
(3.853)
(47.74)
85.92(LCM A.A.)
87.92(polazier_Up)
89.10(Bezel Open)
100.00±0.30(LCM Outline)
9.30
8.30
7.33

RoHS

Notes:

1. Unit:mm
2. Do not scale drawing.
3. All radii without dimension R0.2
4. Uniformity : 75%(Min)
5. The color coordinates:

	MIN	TYP	MAX
x	0.273	0.313	0.353
y	0.289	0.329	0.369

6. △ Modification rev.number
7. draft angle 1.0°
8. Genral Tolerance:±0.3
9. Mark mold cavity indentification in recess approximately where indicated.
10. "*" For important dimension;( ) for reference dimention
11. RoHs must be complied.(Use Lead-free process)

9. Packing form

TBD

10. WARRANTY

10.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

10.2 The warranty will be avoided in case of defect induced by customer