

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.	AM800600ATMCW00
APPROVED BY	
DATE	

- Approved For Specifications
 Approved For Specifications & Sample

AMPIRE CO., LTD.

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
	-	New Release	

1 Introduction

Ampire Display Module AM800600ATMCW00 is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device . This model is composed of a TFT-LCD panel , a driving circuit and a backlight system . This TFT-LCD has a 9.6-inch diagonally measured active display area with SVGA resolution(800(R.G.B) X 600) and can display up to 262,144 colors .

1-1. Features

High brightness , High color gamut , fast response time display

1-2. Applications

Portable Multimedia player

OA equipment

Display terminals

Measuring Instrument

New media equipment

2 Physical specifications

Item	Specifications	unit
Display resolution(dot)	2400 (W) x 600(H)	dots
Active area	194.4 (W) x 145.8 (H)	mm
Screen size	9.6(Diagonal)	inch
Pixel pitch	0.243 (W) x 0.243 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	224.0±0.5(W)x169.2±0.5(H)x9.0±0.3(D)	mm
Weight	420±21	g
Surface treatment	Antiglare , Hard-Coating(3H)	
Backlight unit	Two CCFL	
Input signal	1-ch LVDS	
Display color	262,144	colors

3 Electrical specification

3.1 Absolute max. ratings

a.TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	V_{DD}	-0.3	4.0	V	Note 1
Logic input voltage	V_{IN}	-0.3	$V_{DD}+0.3$	V	Note 1

b.Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Remark
Lamp voltage	V_L	0	1800	Vrms	Note 1
Lamp current	I_L	3.0	7.0	mV	Note 1
Lamp frequency	f_L	50	80	kHz	Note 1

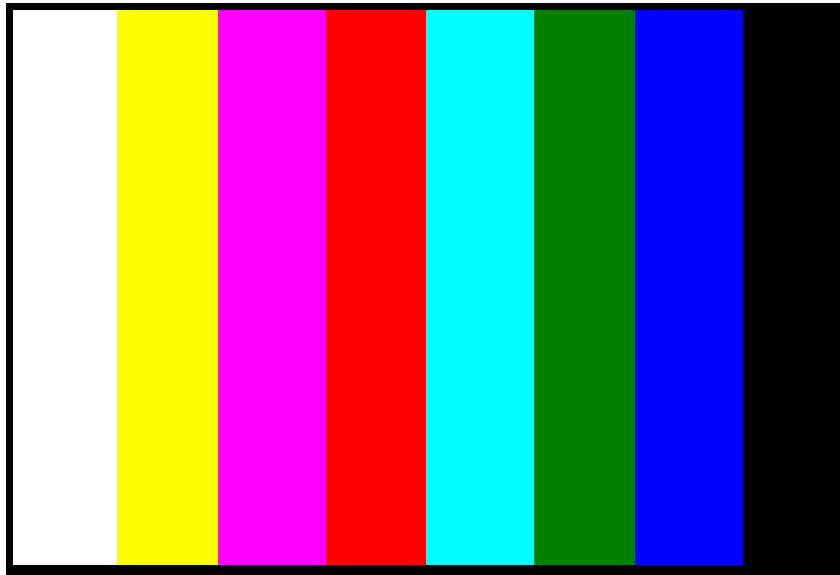
Note1 : Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normally operating conditions

3.2 Electrical characteristics

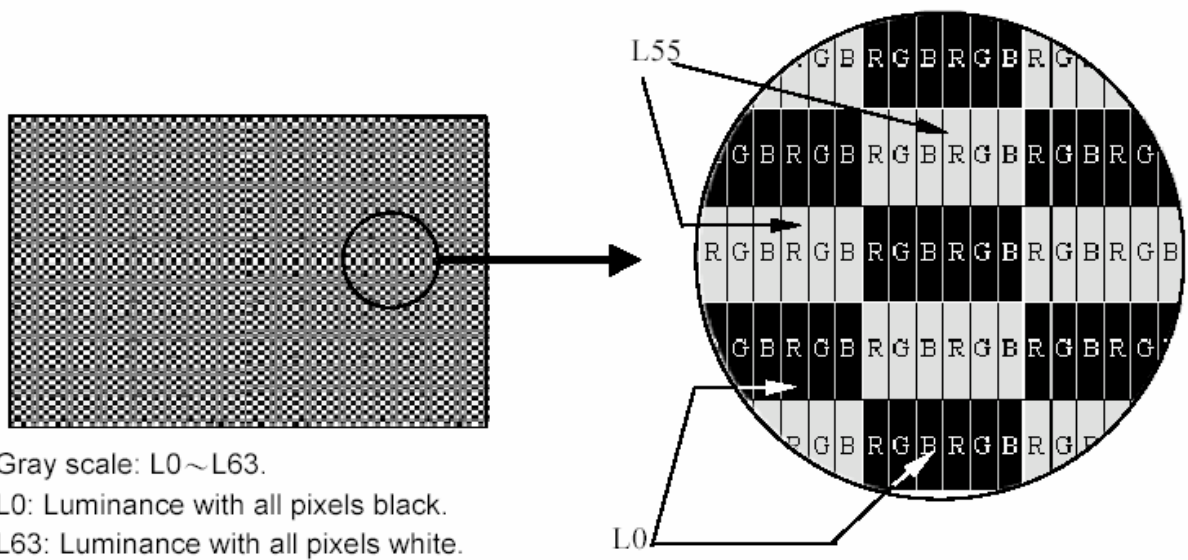
a.TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Power supply	V_{DD}	3.0	3.3	3.6	V		
Differential input threshold voltage	High	V_{IH}	-	-	100	mV	$V_{CM}=1.2V$
	Low	V_{IL}	-100	-	-	mV	
Current of power supply	Color Bar	I_{DD1}	165	225	285	mArms	Note 1
	Mosaic	I_{DD2}	225	285	345	mArms	Note 2
Vsync frequency	f_v	-	60	-	Hz	Note 3	
Hsync frequency	f_H	-	37.9	-	kHz		
Main frequency	f_{DCLK}	38	40	42	MHz		

Note 1 : Color Bar



Note 2 : Mosaic : Dot checker image



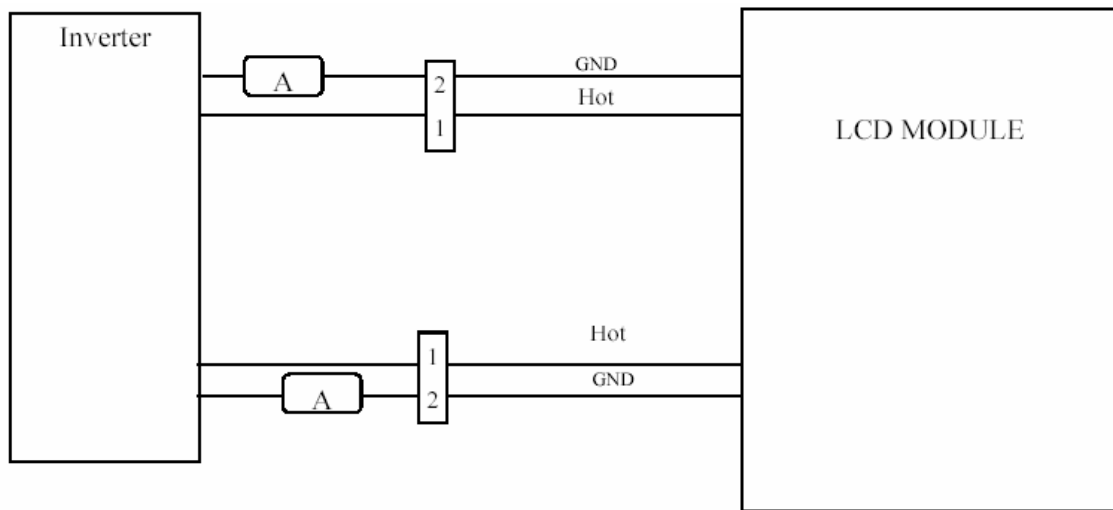
Gray scale: L0~L63.
L0: Luminance with all pixels black.
L63: Luminance with all pixels white.

Note 3 : When fv is too low , a flicker may be occurred on the display .

b.Backlight driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	423	470	517	Vrms	$I_L = 6.0\text{mA}$
Lamp current	I_L	3.0	6.0	7.0	mArms	Note 1
Lamp starting voltage	V_s	-	-	770	Vrms	Note2,5
		-	-	980	Vrms	Note3,5
Frequency	F_L	50	52	80	KHz	Note 4
Lamp life time		30,000	-	-	Hr	Note 6

Note 1 : Lamp current is measured with current meter for high frequency as shown below . Specified values are for a lamp .



Note 2 : $T_a = 25$

Note 3 : $T_a = 0$

Note 4 : The lamp frequency should be selected as different as possible from display horizontal synchronous signal to avoid interference.

Note 5 : For starting the backlight unit, the output voltage of DC/AC's transformer should be larger than the maximum lamp starting voltage.

Note 6 : The "Lamp life time" is defined as the module brightness decrease to 50% Original brightness at $T_a = 25$, $I_L = 6\text{mA}$.

4 Optical specification(Note1,Note2)

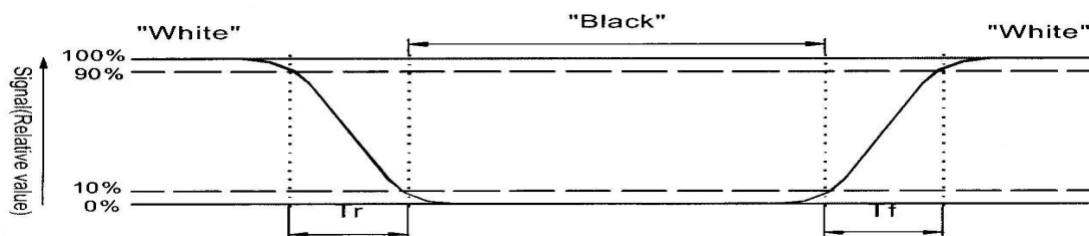
Item	Symbol	Conditon	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	$T=0^\circ$	-	25	35	ms	Note 3,5
	Fall						
Contrast ratio	CR	At optimized viewing angle	350	450	-		Note 4,5
Viewing angle	Top	CR 10	-	45	-	Deg.	Note 5,6
	Bottom		-	65	-		
	Left		-	65	-		
	Right		-	65	-		
White luminance	Y_L	$I_L=6mA, 25$	320	350	-	cd/m ²	Note 8
Color chromaticity	Red	X	0.602	0.632	0.662	Note 7	
		Y	0.308	0.338	0.368		
	Green	X	0.239	0.269	0.299		
		Y	0.564	0.594	0.624		
	Blue	X	0.112	0.142	0.172		
		Y	0.042	0.072	0.102		
	White	X	0.252	0.282	0.312		
		Y	0.274	0.304	0.334		
Brightness uniformity	B_{UNI}		70	-	-	%	Note 9

Note 1: Ambient temperature=25 , lamp current $I_L=6$ mArms and lamp freq $F_L=52k$ HZ. To be measured in the dark room.

Note 2: Measuring Equipment : LCD-7000 of Otsuka Electric Corp., which utilized MCPD-7000 for chromaticity and BM-5A for other optical characteristics . Measuring spot size 10~12mm .

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 $V_i = V_{i50} + 2.0V$

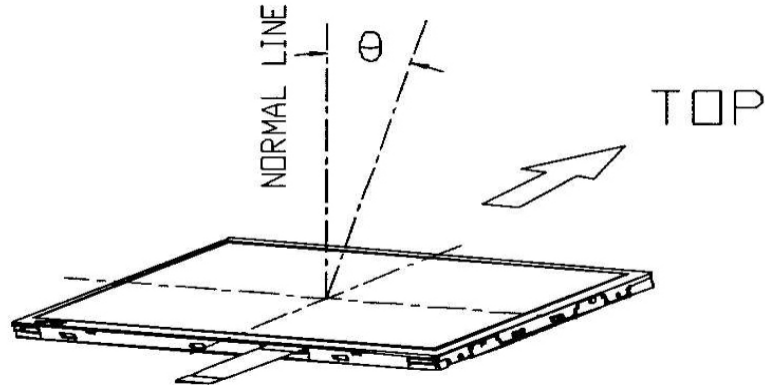
“±” means that the analog input signal swings in phase with V_{COM} signal.

“ \mp ” means that the analog input signal swings out of phase with V_{COM} signal.

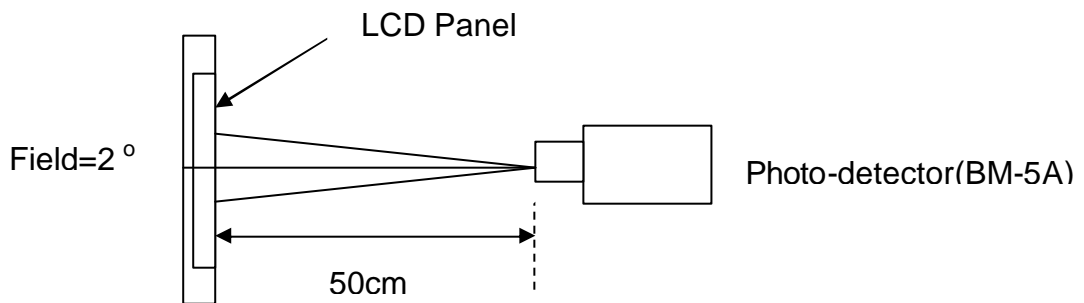
V_{i50} : The analog input voltage when transmission is 50%.The 100

Transmission is defined as the transmission of LCD panel when all the Input terminals of module are electrically opened.

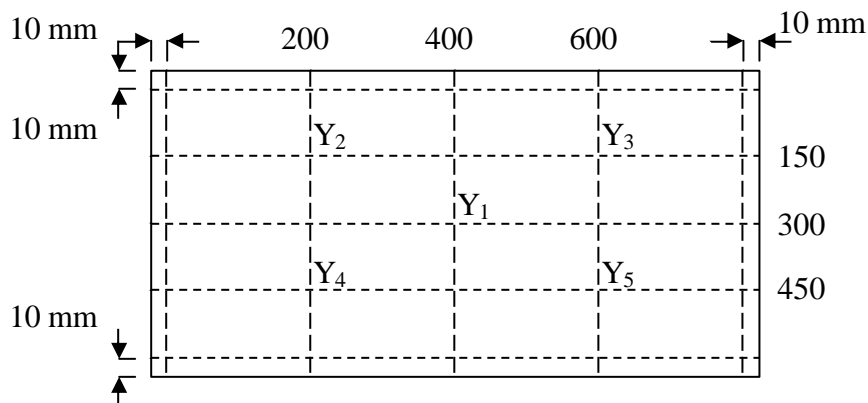
Note 6. Definition of viewing angle, Refer to figure as below.



Note 7. Definition of brightness uniformity.



Note 8. Definition of Luminance of White (center).

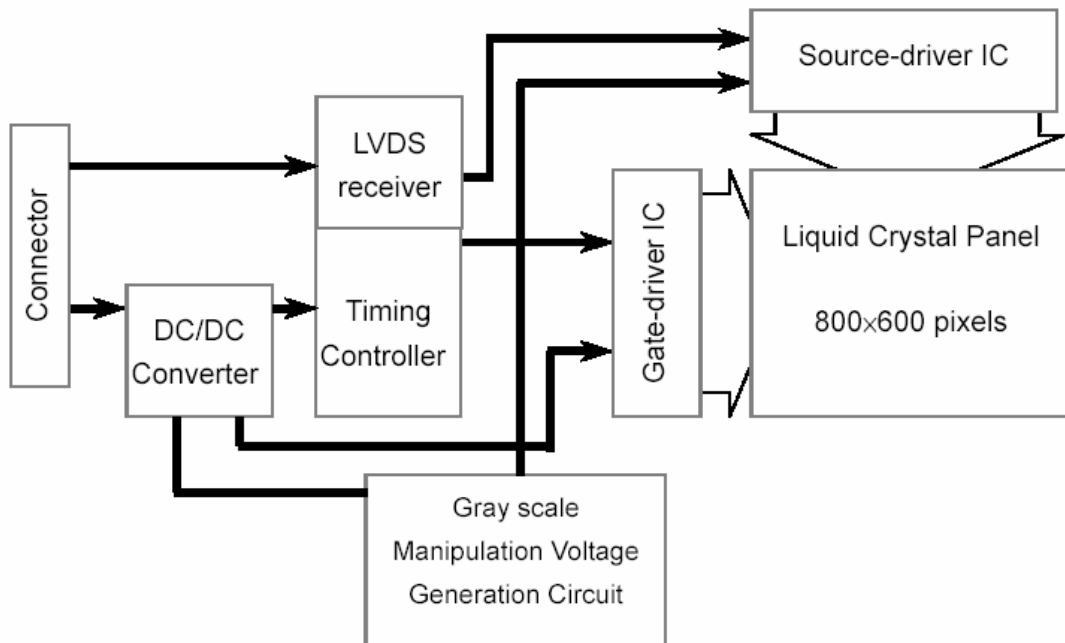


Note 9. Definition of brightness uniformity

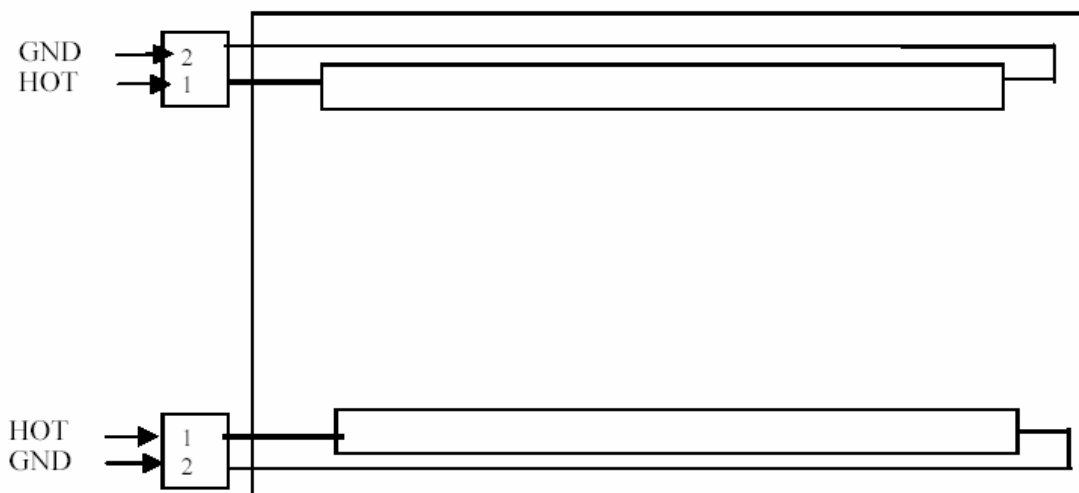
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 13 points})}{(\text{Max Luminance of 13 points})} \quad 100\%$$

5 Block diagram

5.1 TFT LCD MODULE



5.2 Back-light Unit



6 Interface specifications

6.1 Interface pin connection

a. TFT –LCD panel driving section

Connector : HIROSHE DF19L-20P-1H

Matching Socket : HIROSHE /wire : DF19G-20S-1F FPC : DF19G-20S-1F

Pin no	Symbol	Function	Polarity	Remark
1	V _{DD}	Power Supply : +3.3V		
2	V _{DD}	Power Supply : +3.3V		
3	GND	Ground		
4	GND	Ground		
5	IN0-	Transmission Data of Pixels 0	Negative	
6	IN0+	Transmission Data of Pixels 0	Positive	
7	GND	Ground		
8	IN1-	Transmission Data of Pixels 1	Negative	
9	IN1+	Transmission Data of Pixels 1	Positive	
10	GND	Ground		
11	IN2-	Transmission Data of Pixels 2	Negative	
12	IN2+	Transmission Data of Pixels 2	Positive	
13	GND	Ground		
14	CLK-	Sampling Clock	Negative	
15	CLK+	Sampling Clock	Positive	
16	GND	Ground		
17	NC	No Connect		
18	NC	No Connect		
19	GND	Ground		
20	GND	Ground		

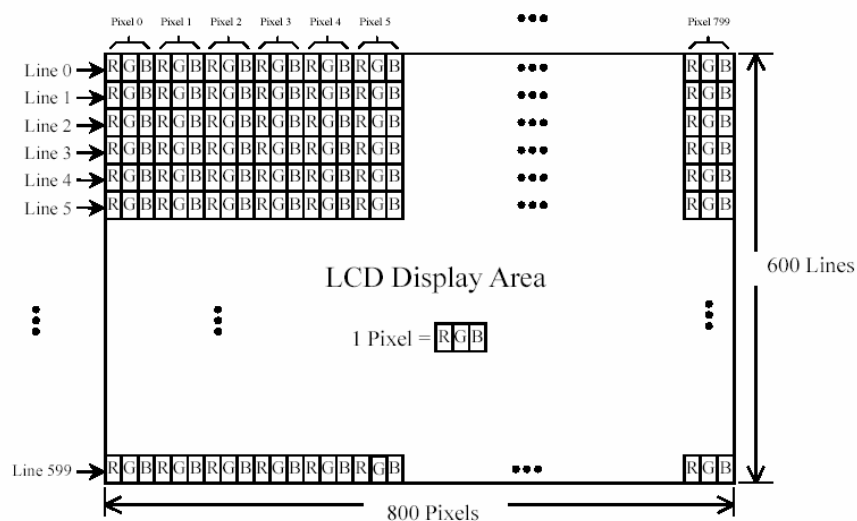
b. Backlight driving section

Connector : BHSR-02-VS-1

Matching Connector : SM02B-BHSS-1-TB

No.	Symbol	Input	Function
1	VL	HOT	Power supply for backlight unit(High voltage)
2	GL	GND	Ground for backlight unit

6.2 Pixel Format



6.3 Relationship Between Display Color and Input

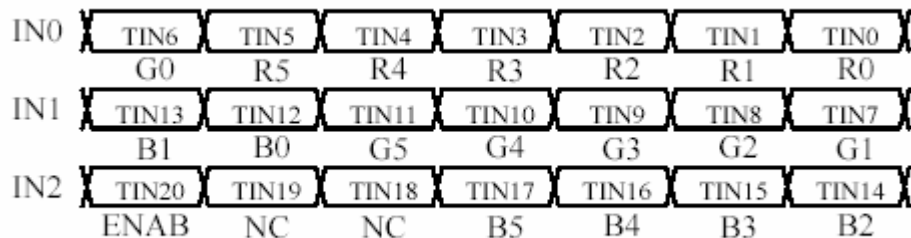
	Display	MSB					LSB					MSB					LSB					Gray scale level
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0			
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-		
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-		
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-		
	Light Blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-		
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-		
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-		
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-		
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-			
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2		
		⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	L3...L60		
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61		
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62		
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63		
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2		
		⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	L3...L60		
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61		
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62		
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63		
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2		
		⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	L3...L60		
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61		
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62		
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63		
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0		
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L1		
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L2		
		⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	L3...L60		
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61		
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62		
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63		

6.4 Recommended transmitter to interface assignment

a. 6bit transmitter

DS90CF363 or equivalent						
Input terminal no.		Input signal (Graphics controller output signal)		Output signal		
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
TIN0	44	R0	RED Pixels Display Data (LSB)	TOUT0- TOUT0+	No. 5 No. 6	IN0- IN0+
TIN1	45	R1	RED Pixels Display Data			
TIN2	47	R2	RED Pixels Display Data			
TIN3	48	R3	RED Pixels Display Data			
TIN4	1	R4	RED Pixels Display Data			
TIN5	3	R5	RED Pixels Display Data (MSB)			
TIN6	4	G0	RED Pixels Display Data (LSB)			
TIN7	6	G1	GREEN Pixels Display Data	TOUT1- TOUT1+	No. 8 No. 9	IN1- IN1+
TIN8	7	G2	GREEN Pixels Display Data			
TIN9	9	G3	GREEN Pixels Display Data			
TIN10	10	G4	GREEN Pixels Display Data			
TIN11	12	G5	GREEN Pixels Display Data (MSB)			
TIN12	13	B0	BLUE Pixels Display Data (LSB)			
TIN13	15	B1	BLUE Pixels Display Data	TOUT2- TOUT2+	No. 11 No. 12	IN2- IN2+
TIN14	16	B2	BLUE Pixels Display Data			
TIN15	18	B3	BLUE Pixels Display Data			
TIN16	19	B4	BLUE Pixels Display Data			
TIN17	20	B5	BLUE Pixels Display Data (MSB)			
TIN18	22	NC	Non Connection (open)			
TIN19	23	NC	Non Connection (open)			
TIN20	25	ENAB	Compound Synchronization Signal			
CLK IN	26	NCLK	Data Sampling Clock	TCLK OUT- TCLK OUT+	No. 14 No. 15	CLK IN- CLK IN+

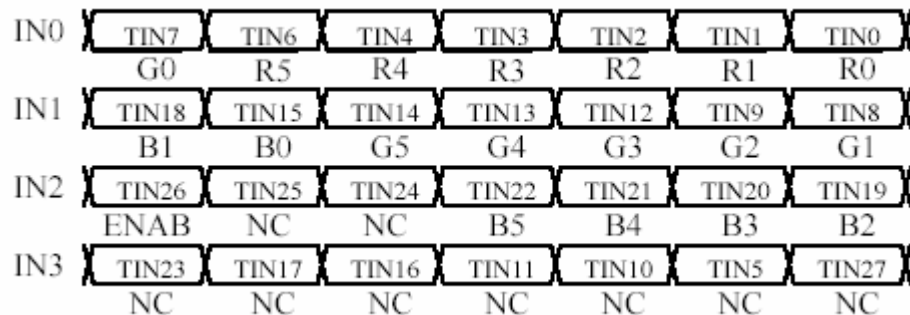
Note : Please connect NC pin to nothing . Don't connect it to ground nor to other signal input .



b. 8bit transmitter

DS90CF383 or equivalent						
Input terminal no.		Input signal (Graphics control output signal)		Output signal		
Symbol	Terminal	Symbol	Function	Symbol	Terminal	Symbol
TIN0	51	R0	RED Pixels Display Data (LSB)	TOUT0- TOUT0+	No. 5 No. 6	IN0- IN0+
TIN1	52	R1	RED Pixels Display Data			
TIN2	54	R2	RED Pixels Display Data			
TIN3	55	R3	RED Pixels Display Data			
TIN4	56	R4	RED Pixels Display Data			
TIN6	3	R5	RED Pixels Display Data (MSB)			
TIN7	4	G0	GREEN Pixels Display Data (LSB)	TOUT1- TOUT1+	NO.8 NO.9	IN1- IN1+
TIN8	6	G1	GREEN Pixels Display Data			
TIN9	7	G2	GREEN Pixels Display Data			
TIN12	11	G3	GREEN Pixels Display Data			
TIN13	12	G4	GREEN Pixels Display Data			
TIN14	14	G5	GREEN Pixels Display Data (MSB)			
TIN15	15	B0	BLUE Pixels Display Data (LSB)	TOUT2- TOUT2+	NO.11 NO.12	IN2- IN2+
TIN18	19	B1	BLUE Pixels Display Data			
TIN19	20	B2	BLUE Pixels Display Data			
TIN20	22	B3	BLUE Pixels Display Data			
TIN21	23	B4	BLUE Pixels Display Data			
TIN22	24	B5	BLUE Pixels Display Data (MSB)			
TIN24	27	NC	Non Connection (open)	TOUT3- TOUT3+	NA	NA
TIN25	28	NC	Non Connection (open)			
TIN26	30	ENAB	Compound Synchronization Signal			
TIN27	50	NC	Non Connection (open)			
TIN5	2	NC	Non Connection (open)			
TIN10	8	NC	Non Connection (open)			
TIN11	10	NC	Non Connection (open)	TCLK OUT- TCLK OUT+	NO. 14 NO. 15	CLK IN- CLK IN+
TIN16	16	NC	Non Connection (open)			
TIN17	18	NC	Non Connection (open)			
TIN23	25	NC	Non Connection (open)			
CLK IN	31	NCLK	DATA SAMPLING CLOCK			

Note : Please connect NC pin to nothing . Don't connect it to ground nor to other signal input .



6.5 Interface Timing

a. Timing Parameters(DE mode)

Item	Symbol	Min.	Typ.	Max.	Unit.	Remark
Frame period	t1	627x t3	628x t3	664x t3	-	Note 1,5
		-	16.58	-	ms	
Vertical display term	t2	600x t3	600x t3	600x t3	-	Note 1
		-	15.84	-	ms	
One Line Scanning time	t3	1020x t5	1056x t5	1100x t5	-	Note 1,5
		-	26.4	-	μs	
Horizontal display team	t4	800x t5	800x t5	800x t5	-	Note 1
		-	20.00	-	μs	
Clock period	t5	21.0	25.0	-	ns	Note 5

Note 1 : Refer to TIMING CHART at page 9 and LVDS specification (DS90CF364MTD) by National Semiconductor Corporation.

Note 2 : When ENAB is fixed to “H” level or “L” level after NCLK is supplied , the panel displays black with some flicker .

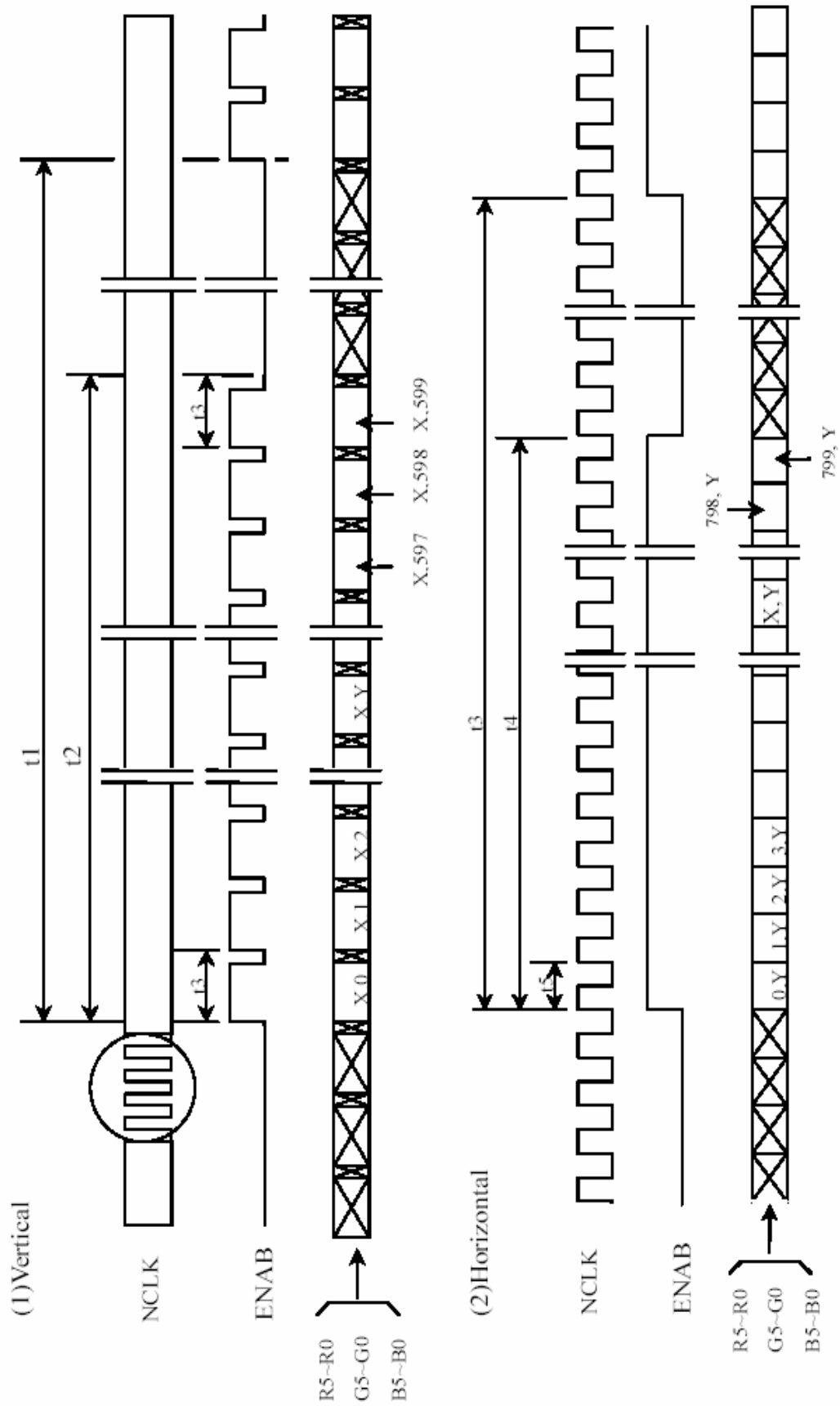
Note 3 : If NCLK is fixed to “H” level or “L” level , for certain period while ENAB is supplied , the panel may be damaged .

Note 4 : DO not make t1 and t3' s fluctuate . If t1 or t3 is fluctuate , the panel displays black .

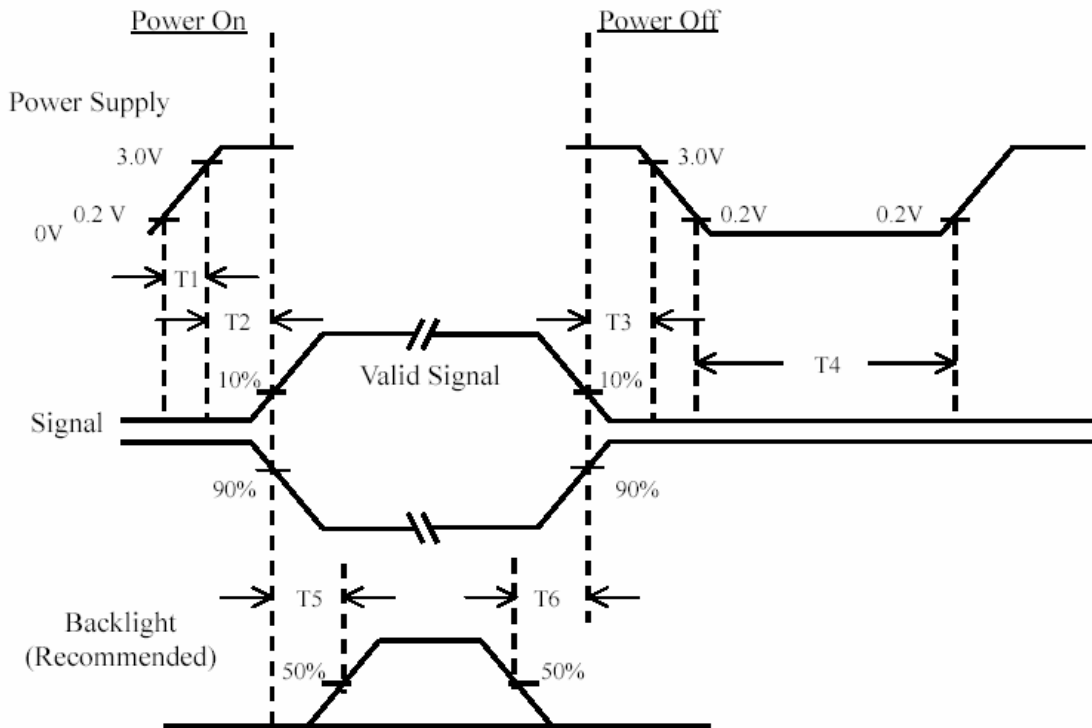
Note 5 : Please adjust LCD operating signal timing and FL driving frequency , to optimize the display quality . There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency).

Note 6 : All input condition (level & timing)refers to SII211 specification .

b. Timing diagram



6.6. Power Sequence



Power ON/OFF Sequence

Item	Min	Max	Unit	Remark
T1	0.5	10	ms	
T2	0	50	ms	
T3	0	50	ms	
T4	500	-	ms	
T5	200	-	ms	
T6	200	-	ms	

Note 1 : The supply voltage of the external system for module input should be the same as the definition of V_{DD} .

Note 2 : Apply the lamp voltage within the LCD operation range . When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off , the display may momentarily become white .

Note 3 : In case of V_{DD} = off level , please keep the level of input signal on the low or keep a high impedance .

Note 4 : T4 should be measured after the module has been fully discharged between power off and on period .

Note 5 : Interface signal shall not be kept at high impedance when the power is on

7 QUALITY AND RELIABILITY

7.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

7.2 SAMPLING PLAN

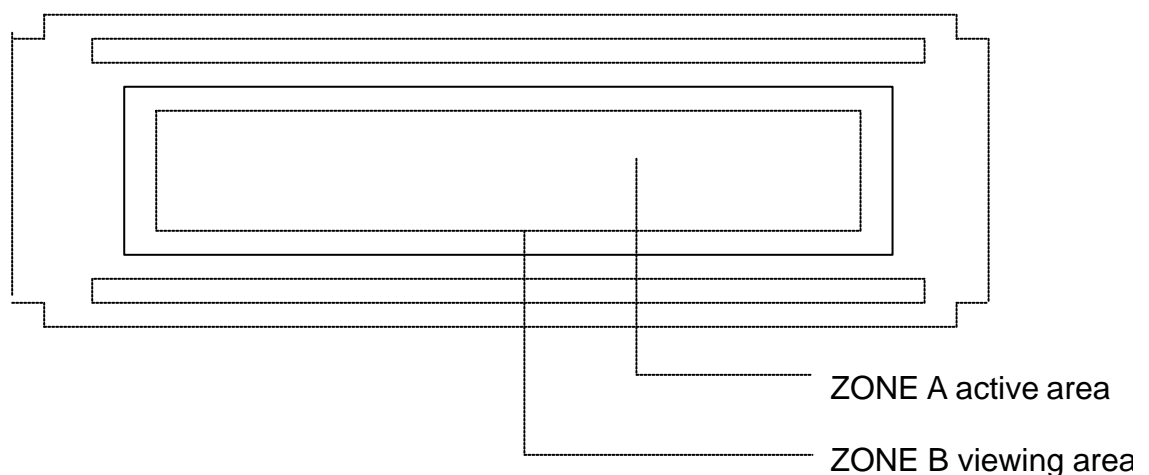
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

7.3 ACCEPTABLE QUALITY LEVEL

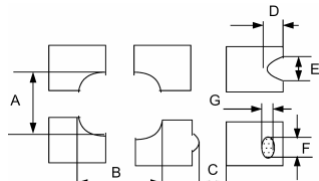
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

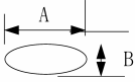
7.4 APPEARANCE

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



7.5 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 border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Size D (mm)</th> <th style="text-align: center;">Acceptable number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$D \leq 0.15$</td> <td style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.15 < D \leq 0.20$</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">$0.20 < D \leq 0.30$</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">$0.30 < D$</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Size D (mm)	Acceptable number	$D \leq 0.15$	Ignore	$0.15 < D \leq 0.20$	3	$0.20 < D \leq 0.30$	2	$0.30 < D$	0	Minor					
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7	Black/White sport (II)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Size D (mm)</th> <th style="text-align: center;">Acceptable number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$D \leq 0.30$</td> <td style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.30 < D \leq 0.50$</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">$0.50 < D \leq 1.20$</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">$1.20 < D$</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Size D (mm)	Acceptable number	$D \leq 0.30$	Ignore	$0.30 < D \leq 0.50$	5	$0.50 < D \leq 1.20$	3	$1.20 < D$	0	Minor					
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$L \leq 5.0$	$0.10 < W \leq 0.15$	1																
9	Back Light	1. No Lighting is rejectable 2. Flickering and abnormal lighting are rejectable	Major															
10	Display pattern	<div style="text-align: center;">  <p style="text-align: center;">Unit:mm</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="text-align: center;">$\frac{A+B}{2} \leq 0.30$</td> <td style="text-align: center;">$0 < C$</td> <td style="text-align: center;">$\frac{D+E}{2} \leq 0.25$</td> <td style="text-align: center;">$\frac{F+G}{2} \leq 0.25$</td> </tr> </tbody> </table> <p style="text-align: center;">Note: 1. Acceptable up to 3 damages 2. NG if there' re to two or more pinholes per dot</p> </div>	$\frac{A+B}{2} \leq 0.30$	$0 < C$	$\frac{D+E}{2} \leq 0.25$	$\frac{F+G}{2} \leq 0.25$	Minor											
$\frac{A+B}{2} \leq 0.30$	$0 < C$	$\frac{D+E}{2} \leq 0.25$	$\frac{F+G}{2} \leq 0.25$															

11	Blemish & Foreign matters Size: $D = \frac{A+B}{2}$	Size D (mm)		Acceptable number	Minor
		$D \leq 0.15$		Ignore	
		$0.15 < D \leq 0.20$		3	
		$0.20 < D \leq 0.30$		2	
		$0.30 < D$		0	
12	Scratch on Polarizer 	Width (mm)	Length (mm)	Acceptable number	Minor
		$W \leq 0.03$	Ignore	Ignore	
		$0.03 < W \leq 0.05$	$L \leq 2.0$	Ignore	
		$0.05 < W \leq 0.08$	$L > 2.0$	1	
		$0.08 < W$	$L > 1.0$	1	
			$L \leq 1.0$	Ignore	
		Note(1) Regard as a blemish			
13	Bubble in polarizer	Size D (mm)		Acceptable number	Minor
		$D \leq 0.20$		Ignore	
		$0.20 < D \leq 0.50$		3	
		$0.50 < D \leq 0.80$		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 tool 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.			Minor
		2. Chip component is off center and more than 50% of the leads is off the pad outline.			Minor
19	Conductive foreign matter (Solder ball, Solder chips)	1. $0.45 < f$, N 1			Major
		2. $0.30 < f \leq 0.45$, N 1 f : Average diameter of solder ball (unit: mm)			Minor
		3. $0.50 < L$, N 1 L: Average length of solder chip (unit: mm)			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.			Minor
		2. Short circuited part is cut, and no resist coating has been performed.			Minor

8 Reliability test items (Note2):

No.	Test items	Conditions	Remark
1	High temperature storage	Ta=95 240Hrs	
2	Low temperature storage	Ta=-40 240Hrs	
3	High temperature operation	Ta=85 240Hrs	
4	High temperature and high humidity	Ta=60 ,90% RH 240Hrs	Operation
5	Heat shock	-30 ~85 /200 cycles 1Hrs/cycle	Non-operation
6	Electrostatic discharge	±200V , 200Pf (00), once for each terminal	Non-operation
7	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
8	Mechanical shock	100G, 6ms,±X, ±Y,±Z 3 times for each direction	JIS C7021, A-7 Condition C
9	Vibration (With carton)	Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/octave from 200~500Hz	IEC 68~34
10	Drop (with carton)	Height:60cm 1 corner,3 edges,6 surfaces	JIS Z0202

9 USE PRECAUTIONS

9.1 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.

9.2 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.

9.3 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.

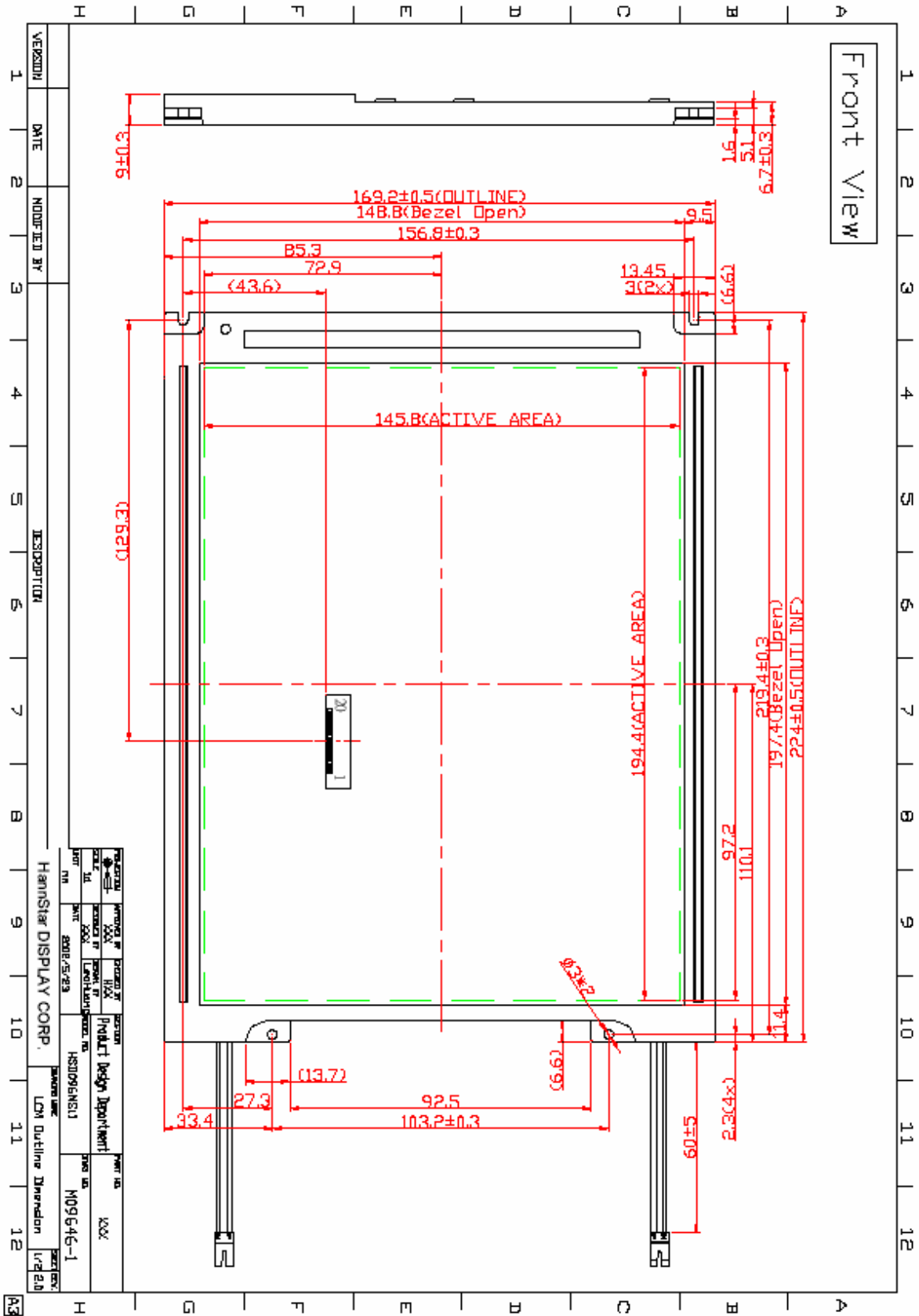
9.4 Operating precautions

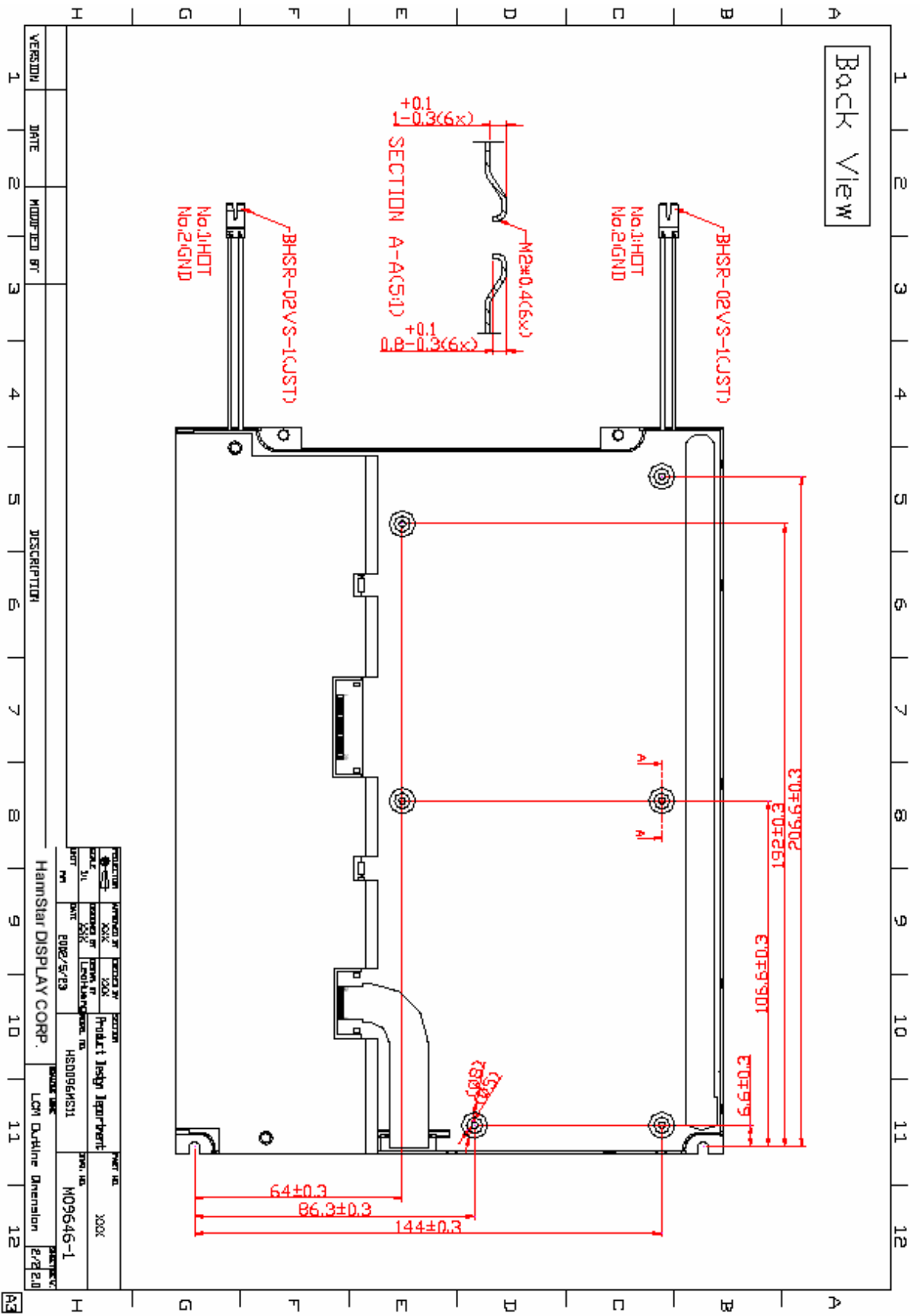
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input 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. Design the contents of the display, considering crosstalk.

9.5 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.

10 OUTLINE DIMENSION





VERSION	DATE	MODIFIED BY	DESCRIPTION																																
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