

Specification
For
LCD Module
12864A-2

MODULE: 12864A-2

CUSTOMER: _____

REV	DESCRIPTION	DATE
1	FIRST ISSUE	2008.05.17

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APREPARED BY		2008.05.17
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CUSTOMER	INITIAL	DATE
APPROVED BY		

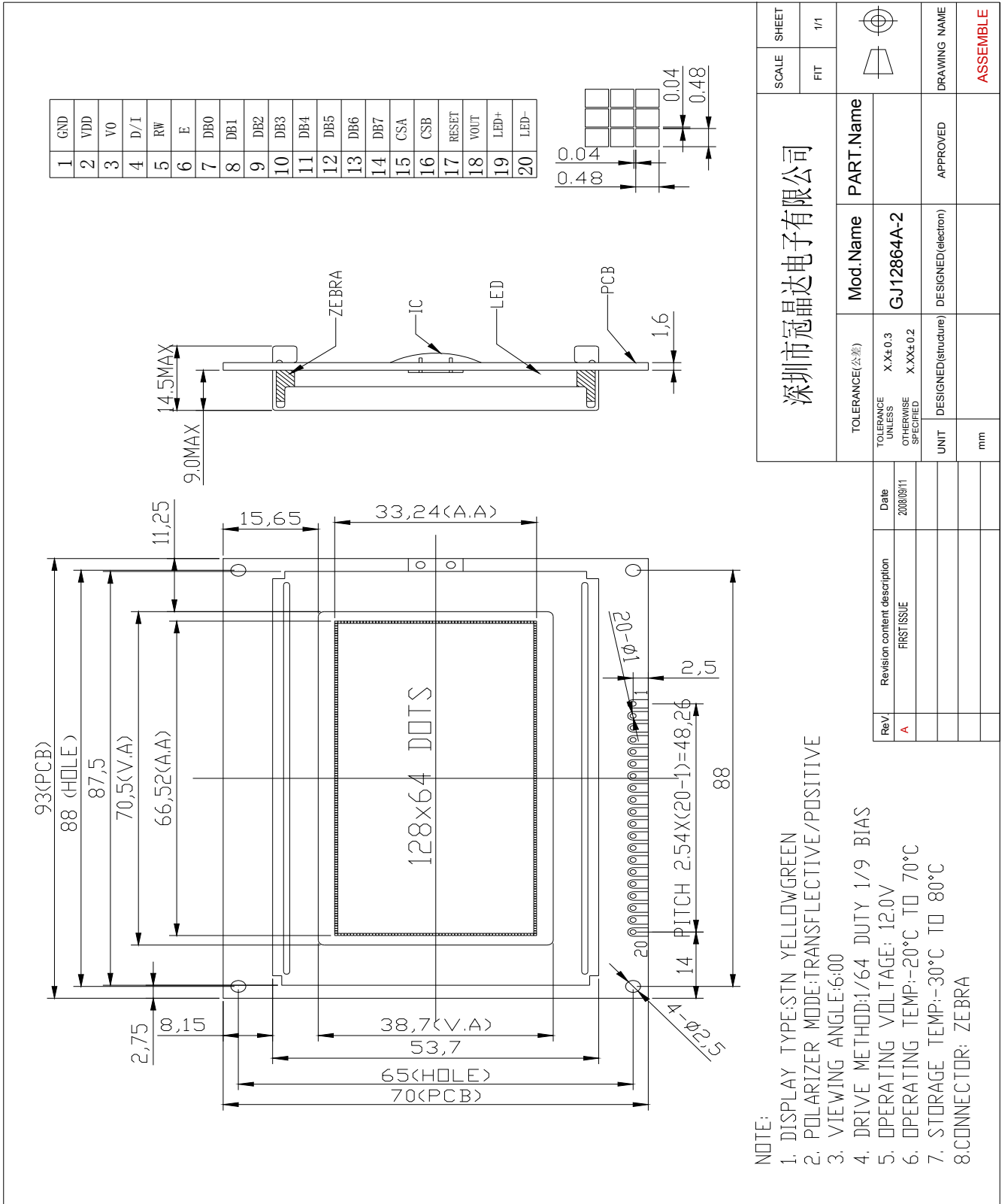
1.0 INTRODUCTION

This USER'S MANUAL is introduced the outside dimensions, optical characteristics, electrical characteristics, interface, controller commands, etc. of the custom design LCD module.

2.0 FEATURE

- (1) Display mode: STN ,YELLOWGREEN, TRANSMISSIVE,POSITIVE.
- (2) Display format: 128*64 Dots
- (3) Driving method: 1/64 Duty, 1/9 Bias
- (4)VLCD Voltage: 10.5V
- (5)Viewing Direction: 6 o'clock
- (6)Control IC: AIP31107/AIP31108
- (7) Input Voltage : +5.0V
- (8)Interface Input Data : 8-Bit
- (9)Back light: LED (YELLOWGREEN)
- (10)Operating Temperature: -20°C - 70°C
- (11) Storage Temperature:-30°C - 80°C
- (12)Module Outline: 93.0mmX73.0mm
- (13)Viewing Area: 70.50mmX38.70mm
- (14)Active Area:66.52mmX32.24mm

3.0 DIMENSION DIAGRAM



NOTE:

1. DISPLAY TYPE:STN YELLOWGREEN
2. POLARIZER MODE:TRANSFLECTIVE/POSITIVE
3. VIEWING ANGLE:6:00
4. DRIVE METHOD:1/64 DUTY 1/9 BIAS
5. OPERATING VOLTAGE: 12.0V
6. OPERATING TEMP:-20°C TO 70°C
7. STORAGE TEMP:-30°C TO 80°C
- 8.CONNECTOR: ZEBRA

深圳市冠晶达电子有限公司		SCALE	FIT	SHEET	1/1
TOLERANCE(公差)	Mod. Name	PART. Name			
TOLERANCE UNLESS OTHERWISE SPECIFIED	GJ12864A-2				
UNIT	DESIGNED(structure)	DESIGNED(electron)	APPROVED	DRAWING NAME	ASSEMBLE
mm					

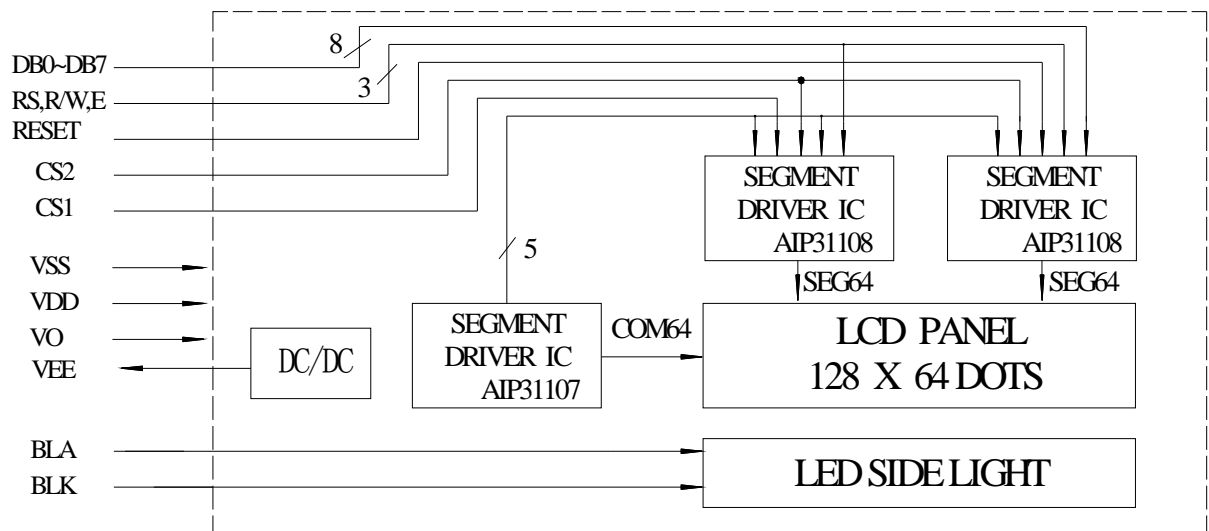
Rev	Revision content description	Date
A	FIRST ISSUE	200809/11

4.0 PIN ASSIGNMENT

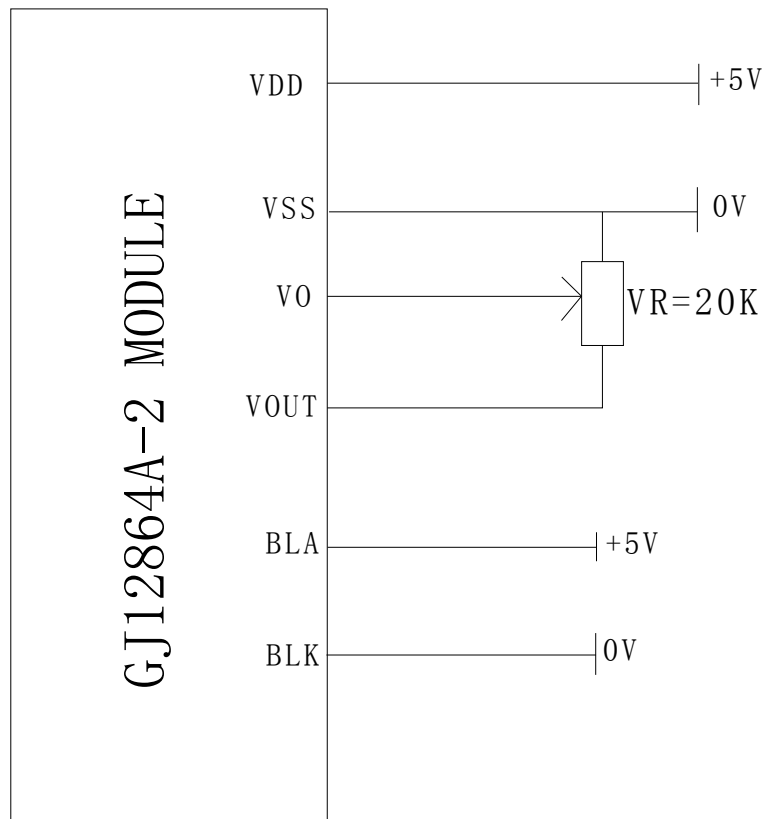
Pin NO.	Symbol	Function
1	VSS	Power Ground
2	VDD	Power supply
3	VO	For LCD drive voltage(variable)
4	D/I(RS)	Data or Instruction. RS = H DB<0:7>: Display RAM data RS = L DB<0:7>: Instruction data
5	R/W	Read or Write. R/W =H Data appears at DB<0:7> and can be read by the CPU while E =H, CS1B=L, CS2B = L and CS3 = H . R/W= L Display data DB<0:7> can be written at falling of E when CS1B = L, CS2B = L and CS3 = H.
6	E	Enable signal. Write mode(R/W=L)data of DB<0:7>is latched at the falling edge of E. Read mode (R/W=H) DB<0:7> appears the reading data while E is at high level.
7-14	DB0-DB7	Data bus. Three state I/O common terminal.
15	CSA	Chip selection
16	CSB	Chip selection

17	/RES	Reset signal. When RSTB=L,- ON / OFF register becomes set by 0. (display off) Display start line register becomes set by 0 (Z-address 0set, display from line 0) After releasing reset, this condition can be changed only by instruction.
18	VEE	Negative voltage output.
19	LED(+)	Power (+)for LED Backlight
20	LED(-)	Power (-)for LED Backlight

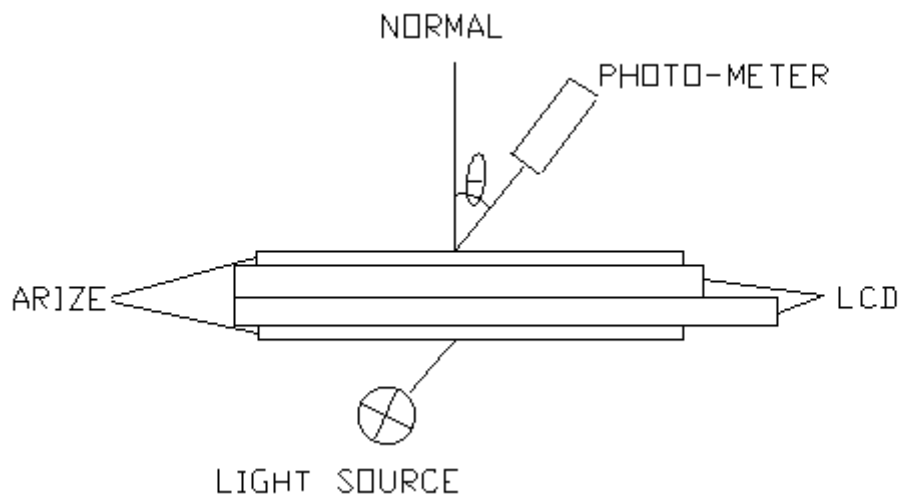
5.0 BLOCK DIAGRAM



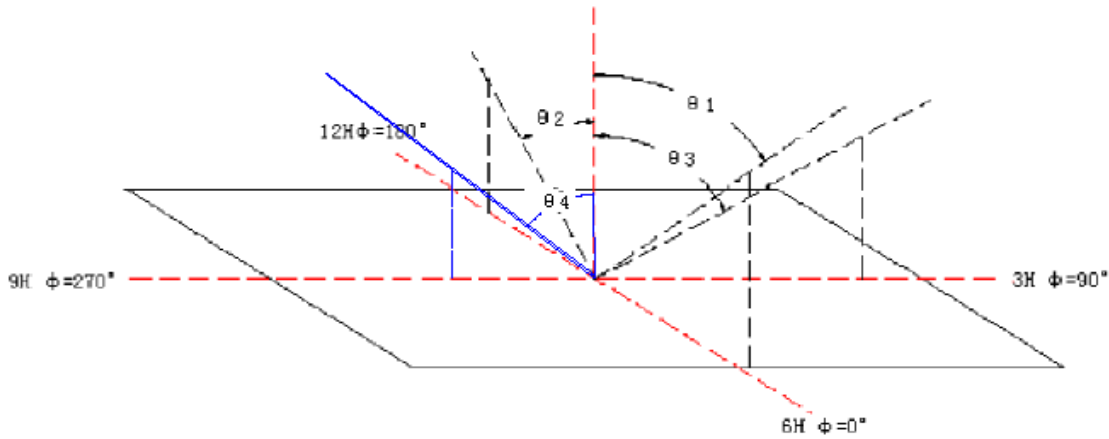
6.0 POWER SUPPLY BLOCK DIAGRAM



7.0 OPTICAL MEASUREMENT SYSTEM



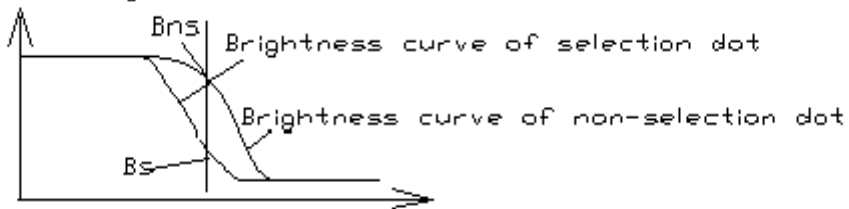
8.0 DEFINITION OF θ AND ϕ



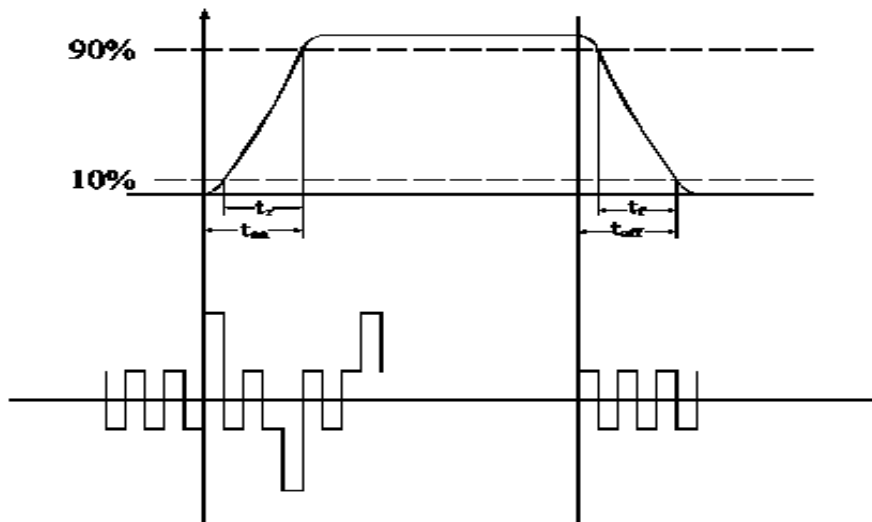
9.0 DEFINITION OF CONTRAST RATIO Cr

DEFINITION:

$$Cr = \frac{\text{Brightness of non-selection dot (bns)}}{\text{Brightness of selection dot (bs)}}$$



10.0 DEFINITION OF OPTICAL RESPONSE TIME



11.0 ABSOLUTE MAXIMUM RATING(VSS=0V)

Characteristics	Symbol	Value	Unit	Note
Operating voltage	V _{DD}	-0.3 to+7.0	V	1
Supply voltage	VEE	VDD-19.0 toVDD+0.3	V	4
Driver supply voltage	VB	-0.3 to VDD+0.3	V	1,3
	VEE	VEE-0.3 to VDD+0.3	V	2
Operating temperature	T _{OP}	-20 to +70	°C	--
Storage temperature	T _{ST}	-30 to +80	°C	--

NOTES:

1.Based on VSS = 0.

2.Applies the same supply voltage to VEE1 and VEE2. VLCD=VDD-VEE.

3.Applies to M, FRM, CL, RSTB, ADC, CLK1, CLK2, CS1B, CS2B, CS3, E, R/W, RS and DB0 - DB7.

4.Applies to V0L(R), V2L(R), V3L(R) and V5L(R).Voltage level: VDD V0L = V0R V2L = V2R V3L =

V3R V5L = V5R VEE.

12.0 DC ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Condition	Min.	Typ.	Max	Unit	Note
Supply voltage for Logic	V _{DD}	--	2.7	5.0	7.0	V	--
Current consumption	I _{DD}	--	--	7.0	--	mA	--
Input low voltage	V _{IL1}	--	0		0.3VDD	V	
	V _{IL2}	--	0		0.8	V	
Level output voltage	V _{OH}	IOH = -200A	2.4	--	--	V	--
	V _{OL}	IOL = 1.6mA	--	--	0.4	V	--

13.0 BACK LIGHT ELECTRICAL CHARACTERISTICS

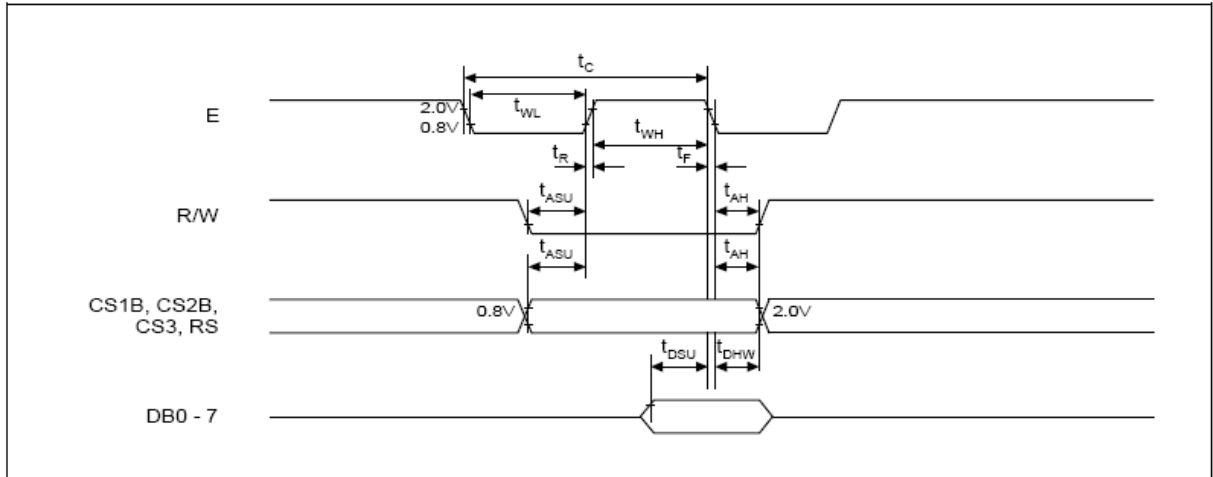
The back-light system is edge-lighting type with 72 chips YELLOWGreen LED in parallel

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	360	--	mA	--
Forward Voltage	V_F	4.0	4.1	4.2	V	--
Luminance	L_V	--	80	--	cd/m ²	$I_F=360mA$
Uniformity	A_{Vg}	75	--	--	%	--

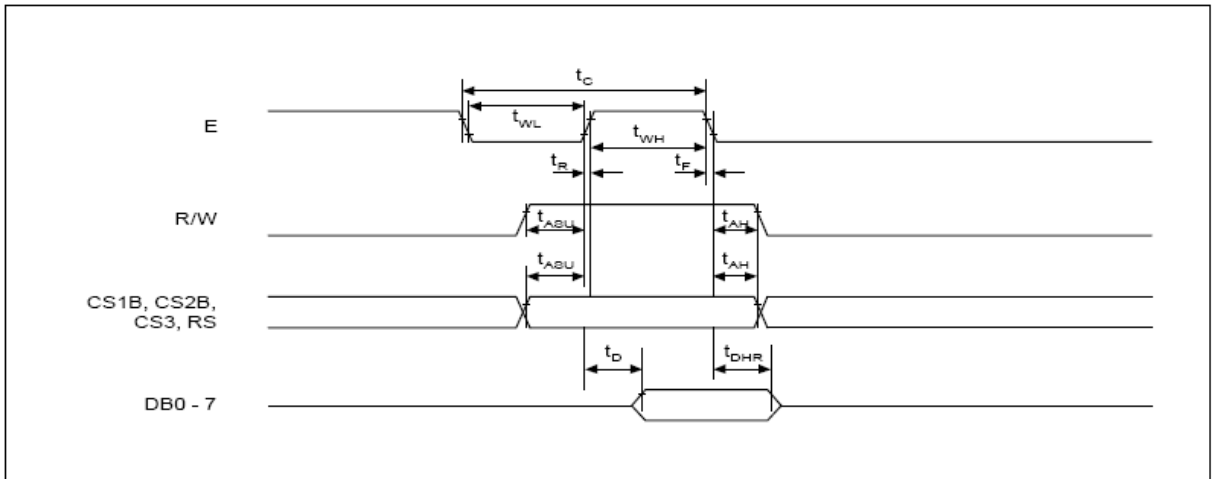
14.0 AC ELECTRICAL CHARACTERISTIC

- MPU Interface

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	t_C	1000	-	-	ns
E high level width	t_{WH}	450	-	-	ns
E low level width	t_{WL}	450	-	-	ns
E rise time	t_R	-	-	25	ns
E fall time	t_F	-	-	25	ns
Address set-up time	t_{ASU}	140	-	-	ns
Address hold time	t_{AH}	10	-	-	ns
Data set-up time	t_{DSU}	200	-	-	ns
Data delay time	t_D	-	-	320	ns
Data hold time (write)	t_{DHW}	10	-	-	ns
Data hold time (read)	t_{DHR}	20	-	-	ns



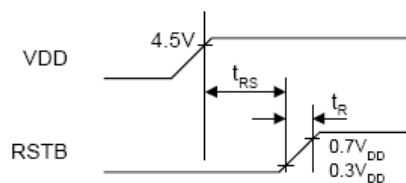
• MPU Write Timing



• MPU Read Timing

• RESET

Item	Symbol	Min	Typ	Max	Unit
Reset time	t_{RS}	1.0	-	-	us
Rise time	t_R	-	-	200	ns



15.0 CONTROL AND DISPLAY COMMAND

The display control instructions control the internal state of the AIP31108. Instruction is received from MPU to AIP31107 for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function	
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON	
Set address (Y address)	L	L	L	H	Y address (0 - 63)						Sets the Y address in the Y address counter.	
Set page (X address)	L	L	H	L	H	H	H	Page (0 - 7)			Sets the X address at the X address register.	
Display start line (Z address)	L	L	H	H	Display start line (0 - 63)						Indicates the display data RAM displayed at the top of the screen.	
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset	
Write display data	H	L	Write data									Writes data (DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data									Reads data (DB0:7) from display data RAM to the data bus.

DISPLAY ON/OFF

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	1	1	1	D

The display data appears when D is 1 and disappears when D is 0. Though the data is not on the screen with D = 0, it remains in the display data RAM. Therefore, you can make it appear by changing D = 0 into D = 1.

SET ADDRESS (Y ADDRESS)

S	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Y address (AC0 - AC5) of the display data RAM is set in the Y address counter. An address is set by instruction and increased by 1 automatically by read or write operations of display data.

SET PAGE (X ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	0	1	1	1	AC2	AC1	AC0

X address(AC0 - AC2) of the display data RAM is set in the X address register. Writing or reading to or from MPU is executed in this specified page until the next page is set.

DISPLAY START LINE (Z ADDRESS)

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	AC5	AC4	AC3	AC2	AC1	AC0

Z address (AC0 - AC5) of the display data RAM is set in the display start line register and displayed at the top of the screen. When the display duty cycle is 1/64 or others(1/32 - 1/64), the data of total line number of LCD screen, from the line specified by display start line instruction, is displayed.

STATUS READ

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BUSY	0	ON/OFF	RESET	0	0	0	0

- **BUSY**
When BUSY is 1, the Chip is executing internal operation and no instructions are accepted.
When BUSY is 0, the Chip is ready to accept any instructions.
- **ON/OFF**
When ON/OFF is 1, the display is off.
When ON/OFF is 0, the display is on.
- **RESET**
When RESET is 1, the system is being initialized.
In this condition, no instructions except status read can be accepted.
When RESET is 0, initializing has finished and the system is in the usual operation condition.

WRITE DISPLAY DATA

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Writes data (D0 - D7) into the display data RAM. After writing instruction, Y address is increased by 1 automatically.

READ DISPLAY DATA

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

Reads data (D0 - D7) from the display data RAM. After reading instruction, Y address is increased by 1 automatically.

液晶显示屏使用注意事项:

亲爱的客户, 在您使用液晶显示屏前, 请先阅读以下注意事项:

一、处理保护膜: 在模块成品表面贴有一层保护膜, 是为了避免客户在装配时沾污了显示表面, 故请您在整机装配结束前不要揭去, 以免弄脏或损坏显示面。

二、加装衬垫: 在模块与前面板之间最好加装一块约 0.1 毫米左右的衬垫。面板还应保持平整, 以免在装配后产生扭曲, 并可提高其抗振性能。

三、严防静电: 模块中的控制、驱动电路是低压、低功耗的 CMOS 电路, 极易被静电击穿, 静电击穿是一种不可修复的损坏, 而人体有时会产生高达几十伏或上百伏的高压静电, 所以, 在操作、装配以及使用中都应极其小心, 严防静电。为此: 1. 不要用手随意去摸外引线、电路板上的电路及金属框; 2. 如必须直接接触时, 应使人体与模块保持在同一电位, 或将人体良好接地; 3. 焊接使用的烙铁和操作用的电动工具必须良好接地, 没有漏电; 4. 不得使用真空吸尘器进行清洁处理, 因为它会产生很强的静电; 5. 空气干燥, 也会产生静电, 因此, 工作间湿度应在 RH60%以上; 6. 取出或放回包装袋或移动位置时, 也需小心, 防止产生静电。不要随意更换包装或舍弃原包装。

四、装配操作时的注意事项: 1. 模块是经过精心设计组装而成的, 请勿随意自行加工、修整; 2. 金属框爪不得随意扭动、拆卸; 3. 不要随意修改加工 PCB 板外形、装配孔、线路极其部件; 4. 不得修改导电胶条; 5. 不得修改任何内部支架; 6. 不要碰、摔、折曲、扭动模块。

五、焊接: 在焊接模块外引线、接口电路时, 应按如下规程进行操作。 1. 烙铁头温度小于 280°C; 2. 焊接时间小于 3-4s; 3. 焊接材料: 共晶型、低熔点; 4. 不要使用酸性助焊剂; 5. 重复焊接不要超过 3 次, 且每次重复需间隔 5 分钟。

六、模块的使用与保养: 1. 模块的外引线决不允许接错, 在您想调试液晶模块时, 请注意正确接线, 尤其是正、负电源的接线不能有错, 否则可能造成过流、过压、烧毁电路上的芯片等对液晶模块元器件有损的现象; 2. 模块在使用时, 接入电源及断开电源, 必须在正电源稳定接入以后, 才能输入信号电平。如在电源稳定前或断开后输入信号电平, 有可能损坏模块中的 IC 及电路; 3. 模块使用时,

接入逻辑电源和驱动电源的顺序应是先逻辑电源，后驱动电源；断电时，应先驱动电源，后逻辑电源。这样做有助于保持屏的良好显示效果和避免在上电、断电时的电压冲击损坏。所以推荐使用带控制的 DC-DC 电源做为模块的驱动电源。

4. 点阵液晶模块显示时的对比度、视角与温度、驱动电压关系很大，所以，如果 VEE 调整过高，不仅会影响显示，还会缩短模块的使用寿命；

5. 因为液晶材料的物理特性，液晶的对比度会随着温度的变化而相应变化，所以，您加的负电压值应该随温度作相应的调整，大致是温度变化 10℃，电压变化 1 伏。为满足这一要求，您可做一个温度补偿电路，或者安排一个电位器，随温度调整负电压值；

6. 不应在规定工作温度范围以外使用，并且不应在超过存储极限温度的范围外存储，如果温度低于结晶温度，液晶就会结晶，如果温度过高，液晶将变成各向同性的液体，破坏分子取向，使器件报废；

7. 用力按压显示部分，会产生异常显示。这时切断电源，稍待片刻，重新上电，即恢复正常；

8. 液晶显示器件或模块表面结雾时，不要通电工作，因为这将引起电极化学反应，产生断线；

9. 长期用于阳光及强光下时，被遮部分会产生残留影像。

七、模块的存储：若长期（如几年以上）存储，我们推荐以下方式：

1. 装入聚乙烯口袋（最好有防静电涂层）并将口封住；

2. 在-10℃~ +35℃ 之间存储；

3. 放暗处，避强光；

4. 决不能在表面压放任何物品；

5. 严格避免在极限温/湿度条件下存放。