

AMP DISPLAY INC.

*A Brighter Solution*

### SPECIFICATIONS

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMP PART NO.</b>	AO-12864AEFIQW-00H(R)
<b>APPROVED BY</b>	
<b>DATE</b>	

**Approved For Specifications**

**Approved For Specifications & Sample**

### **AMP DISPLAY INC**

9856 SIXTH STREET RANCHO CUCAMONGA CA 91730

TEL: 909-980-13410 FAX: 909-980-1419

WWW.AMPDISPLAY.COM

APPROVED BY	CHECKED BY	ORGANIZED BY

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## RECORD OF REVISION

<b>Revision Date</b>	<b>Page</b>	<b>Contents</b>	<b>Editor</b>
2009/2/27	--	New Release.	Eric
2009/3/30	4,14	Modify LED characteristics and revised final drawing.	Eric
2009/4/28	15	Added the A,K mark on top view of drawing	Eric
2009/6/23	4	Modify LCD VOP and response time.	Eric

## 1 FEATURES

- (1) Display format : 128×64 dots, 1/65 duty, 1/9 bias.
- (2) Construction : LCD panel , COG and FPC.
- (3) Display type : FSTN, Transflective, White LED BLU, 6 o'clock view
- (4) Controller : ST7567
- (5) Extend temperature type.
- (6) ROHS compliant.

## 2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.28(W) × 0.34(H)	mm
Dot pitch	0.32(W) × 0.38(H)	mm
Active area	40.92(W) × 24.28 (H)	mm
Viewing area	45.2 (W) × 27.0 (H)	mm
Module size	55.2(W) × 61.8(H) × 6.0(T)	mm

## 3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	-0.3	+7.0	V
LCD Driving Voltage	VLCD	-18.0	+0.3	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	TOP	-20	70	°C
Storage Temp.	TSTG	-30	80	°C

## 4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
<b>----- Electronic Characteristics -----</b>							
Logic Circuit Supply Voltage	VDD-VSS	--	2.4	3.0	3.3	V	
LCD Driving Voltage (STN)	VLCD	-20 °C	8.9	9.2	9.5	V	
		25 °C	8.7	9.0	9.3		
		70 °C	8.3	8.6	8.9		
Input Voltage	VIH	--	0.7VDD	--	VDD	V	
	VIL	--	-0	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD=3.3V	--	0.3	0.5	mA	
<b>----- Optical Characteristics ( FSTN ) -----</b>							
Contrast	CR	--	2	5			Note 1
Rise Time	tr	25°C	--	170	--	ms	Note 2
Fall Time	tf	25°C	--	195	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	35	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	
<b>----- White LED Back-light Characteristics -----</b>							
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Forward Current	IF	--	--	45	60	mA	Note 4 & 7
LCM Luminous intensity		IF=60mA	--	100	--	cd/m <sup>2</sup>	Note 4
Forward Voltage	VF	IF=60mA	3.2	3.5	3.8	V	Note 5
LED C.I.E	X	IF=60mA	0.30	0.34	0.39		Note 6
	Y	IF=60mA	0.30	0.34	0.39		

Note 4: Luminous intensity is decided by forward current of White LED.

Note 5: White LEDs are with voltage tolerance under the same current.

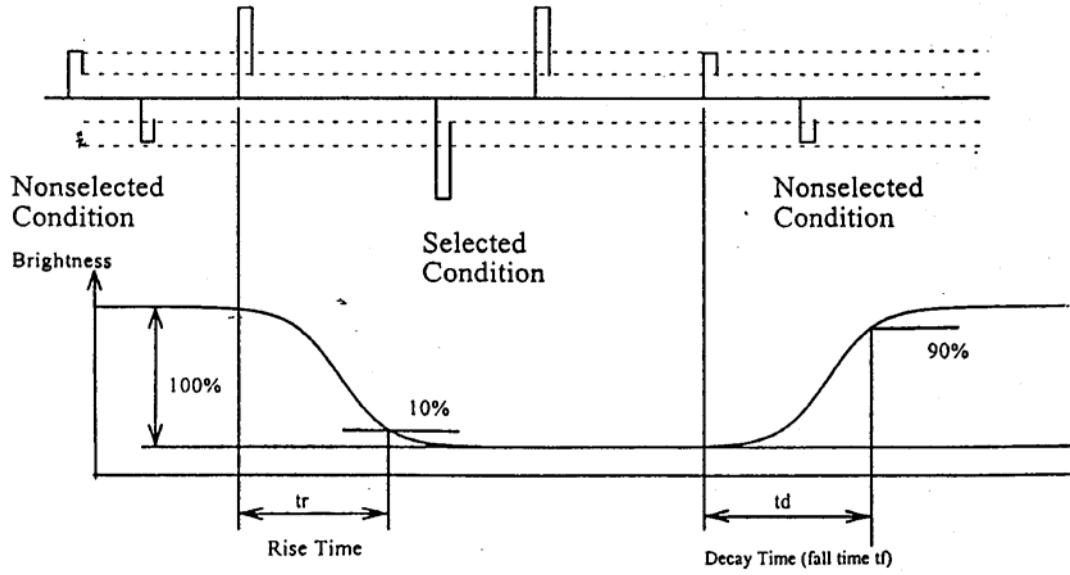
Note 6: White LEDs are with color tolerance under the same current.

\* LED Dice number =4

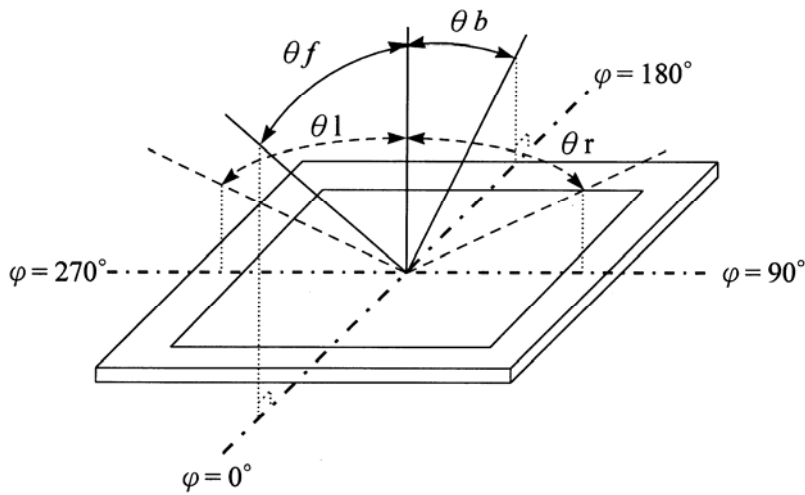
(NOTE 1) Contrast ratio :

$$CR = (\text{Brightness in OFF state}) / (\text{Brightness in ON state})$$

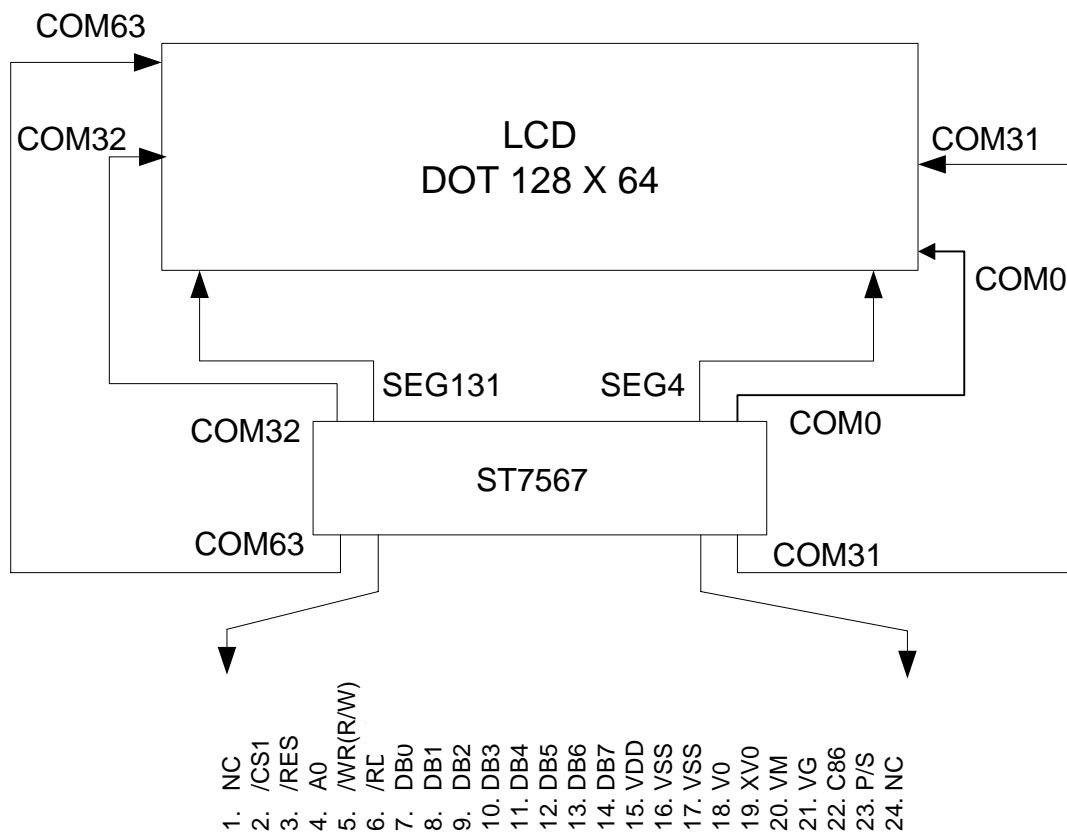
(NOTE 2) Response time :



(NOTE 3) Viewing angle



## 5 BLOCK DIAGRAM & POWER SUPPLY



## INTERFACE

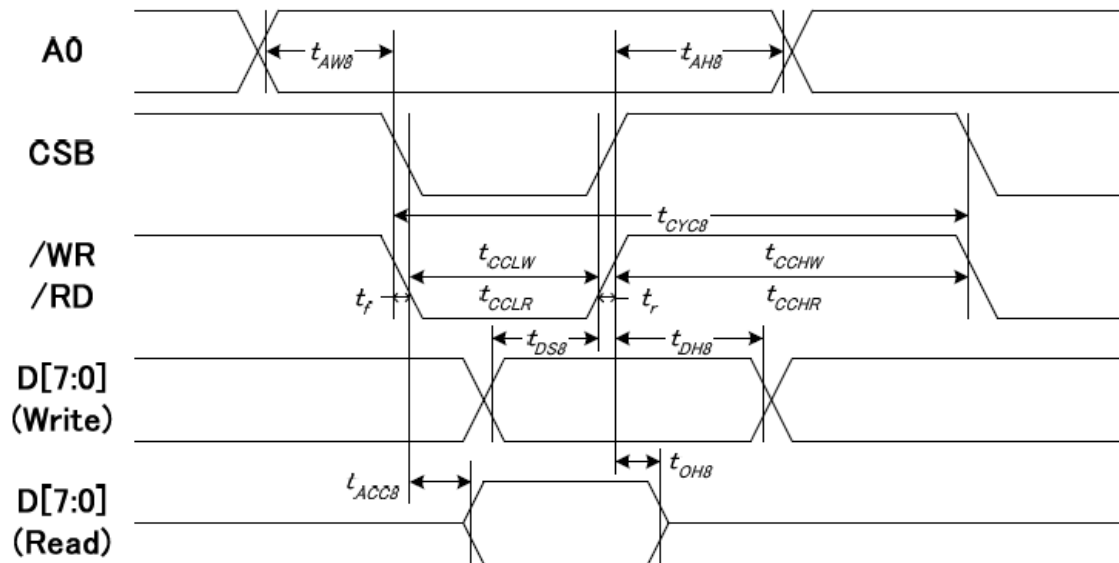
No.	Symbol	Function
1	NC	No Connect
2	/CS1	This is the chip select signal. When /CS1 = "L", then the chip select becomes active, and data/command I/O is enabled.
3	/RES	When /RES is set to "L", the settings are initialized.
4	A0	This is connect to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or a command.  A0 = "H": Indicates that D0 to D7 are display data. A0 = "L": Indicates that D0 to D7 are control data.
5	/WR(R/W)	When connected to an 8080 MPU, this is active LOW. (R/W) This terminal connects to the 8080 MPU /WR signal. The signals on the data bus are latched at the rising edge of the /WR signal. When connected to a 6800 Series MPU: This is the read/write control signal input terminal. When R/W = "H": Read. When R/W = "L": Write.
6	/RD(E)	When connected to an 8080 MPU, this is active LOW. (E) This pin is connected to the /RD signal of the 8080 MPU, and the ST7567 series data bus is in an output status when this signal is "L". When connected to a 6800 Series MPU, this is active HIGH. This is the 6800 Series MPU enable clock input terminal.
7	D0	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface is selected (P/S = "L") : D7 : serial data input (SI) ; D6 : the serial clock input (SCL). D0 to D5 are set to high impedance. When the chip select is not active, D0 to D7 are set to high impedance.
8	D1	
9	D2	
10	D3	
11	D4	
12	D5	
13	D6	
14	D7	
15	VDD	Shared with the MPU power supply terminal VDD. ( 3.3 V )
16	VSS	This is a 0V terminal connected to the system GND.
17	VSS	This is a 0V terminal connected to the system GND.
18	V0	DC/DC voltage converter. Connect a capacitor between this terminal and the C1-terminal.
19	XV0	DC/DC voltage converter. Connect a capacitor between this terminal and the C1+ terminal.
20	VM	$V0 \geq VG > VM > VSS \geq XV0$ (under operation).
21	VG	VG is the LCD driving voltage for segment circuits.

<b>22</b>	C86	This is the MPU interface switch terminal. C86 = "H": 6800 Series MPU interface. C86 = "L": 8080 MPU interface.
<b>23</b>	P/S	This is the parallel data input/serial data input switch terminal. P/S = "H": Parallel data input. P/S = "L": Serial data input. The following applies depending on the P/S status:  When P/S = "L", D0 to D5 may be "H", "L" or Open. RD (E) and WR (R/W) are fixed to either "H" or "L". With serial data input, It is impossible read data from RAM .
<b>24</b>	NC	No Connect



## .7 TIMING CHARACTERISTICS

### 8080-SYSTEM



Parameter	Symbol	Min.	Typ.	Max.	Unit
<b>8080 Series(VDD=3.3V)</b>					
Address Hold Time(A0)	tAW8	0		-	ns
Address Setup Time(A0)	tAH8	10		-	ns
System Cycle Time((A0))	Tcyc8	240			ns
Control L Pulse Width(/WR)	tCCLW	80			ns
Control L Pulse Width(/RD)	tCCLR	140			ns
Control H Pulse Width(/WR)	tCCHW	80			ns
Control H Pulse Width(/RD)	tCCHR	80			ns
Data Setup Time(D0~7)	tDS8	40			ns
Address Hold Time	tDH8	20			ns
/RD access time	tACC8	-		70	ns
Output Disable Time	tOH8	5		50	ns

## 8. QUALITY AND RELIABILITY

### 8.1 TEST CONDITIONS

Tests should be conducted under the following conditions:

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

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

### 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

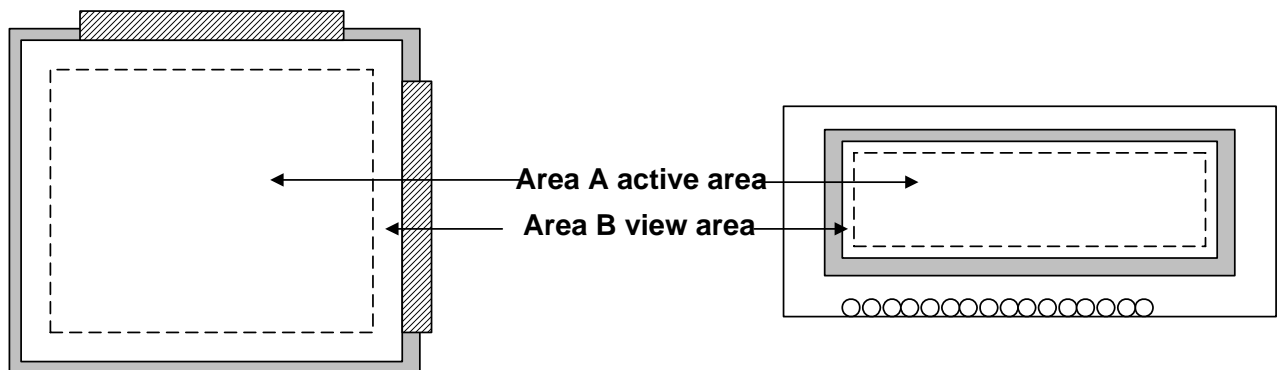
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant 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 fluorescent light. The inspection area of LCD panel shall be within the range of following limits.

## 9. INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)	
Function	Short circuit or Pattern cut			Major	0.65	
Dimension	Deviation from drawings			Major	1.5	
Black spots	Ave . dia . D	area A	area B	Minor	2.5	
	$D \leq 0.2$	Disregard				
	$0.2 < D \leq 0.3$	3	4			
	$0.3 < D \leq 0.4$	2	3			
	$0.4 < D$	0	1			
Black lines	Width W, Length L		A	B	Minor	2.5
	$W \leq 0.03$		disregard			
	$0.03 < W \leq 0.05$		3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$		1	1		
	See line criteria					
Bubbles in polarizer	Average diameter D $0.2 < D < 0.5$ mm for N = 4, $D > 0.5$ for N = 1			Minor	2.5	
Color uniformity	Rainbow color or Newton ring.			Minor	2.5	
Glass Scratches	Obvious visible damage.			Minor	2.5	
Contrast ratio	See note 1			Minor	2.5	
Response time	See note 2			Minor	2.5	
Viewing angle	See note 3			Minor	2.5	



## 10 RELIABILITY

Test Item	Test Conditions	Note
	Extend Temp. type	
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 m in. 5 min. 30 min. ( 1 cycle ) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	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 inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

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 the initial value.

## **11 HANDLING PRECAUTIONS**

- (1) A LCD module is a fragile item and should not be subjected to strong mechanical shocks.
- (2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.
- (3) Under no circumstances should the position of the bezel tabs or their shape be modified.
- (4) Do not modify the display PCB in either shape or positioning of components.
- (5) Do not modify or move location of the zebra or heat seal connectors.
- (6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.
- (7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.
- (8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketene or aromatic is not permitted.
- (9) Prior to initial power up input signals should not be applied.
- (10) Protect the module against static electricity and observe appropriate anti-static precautions.
- (11) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products



# 12 OUTLINE DIMENSION

