



AMP DISPLAY INC.

*A Brighter Solution*

### SPECIFICATIONS

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMP PART NO.</b>	AT-128128HWI-H
<b>APPROVED BY</b>	
<b>DATE</b>	

**Approved For Specifications**

**Approved For Specifications & Sample**

### **AMP DISPLAY INC**

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Date : 2001/12/11

## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2001/12/10	--	New Release	Eric



## 1 FEATURES

- (1) Display format : 128×128 dots, 1/128 duty.
- (2) Construction : LCD panel and TAB IC.
- (3) Display type : Paper white no reverse FSTN, Transflective, Positive , 6 o'clock view
- (4) Controller : HD66750STB0
- (5) Extend temperature type.

## 2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.199(W) × 0.219(H)	mm
Dot pitch	0.213(W) × 0.233(H)	mm
Viewing area	30.5(W) × 32.0 (H)	mm
Module size	36.9(W) × 56.65(H) × 1.4 max.(T)	mm

## 3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	
Logic Circuit Supply Voltage	VDD-VSS	-0.3	+4.6	V	
LCD Driving Voltage	VLCD-VSS	-0.3	16.5	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Extend temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

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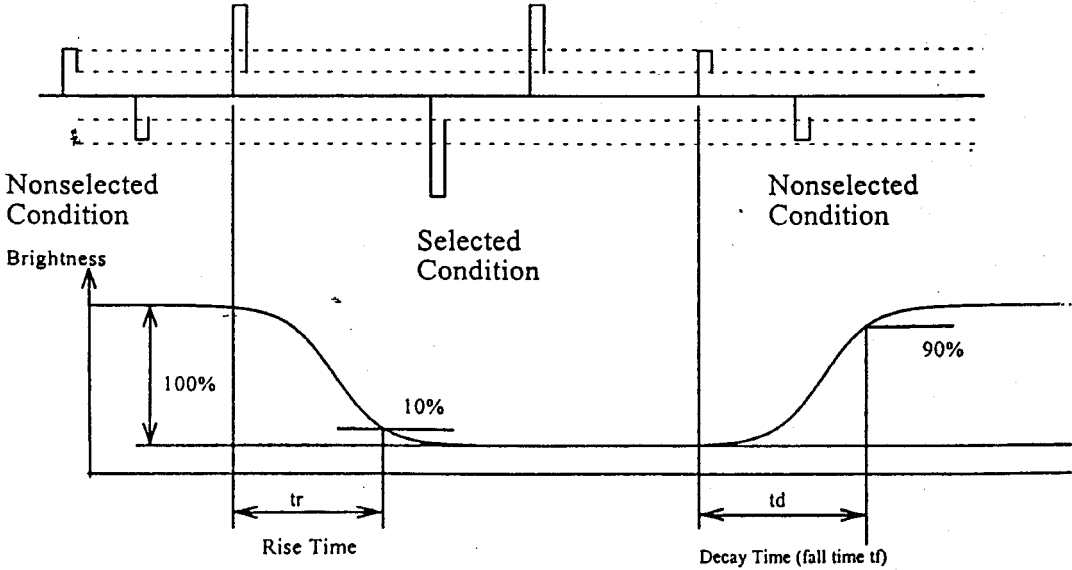
## 4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.565	2.85	3.135	V	
LCD Driving Voltage (FSTN )	VO-VSS	-20 °C	--	13.55	--	V	
		25 °C	--	12.8	--		
		70 °C	--	12.13	--		
Input Voltage	VIH	--	0.7VDD	--	VDD	V	
	VIL	--	-0.3	--	0.15 VDD	V	
Logic Supply Current	IDD	VDD=2.85V	--	0.2	0.4	mA	
----- Optical Characteristics ( FSTN ) -----							
Contrast	CR	25°C	--	7	--		Note 1
Rise Time	Tr	25°C	--	200	--	ms	Note 2
Fall Time	Tf	25°C	--	200	--	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	30	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	FF	25°C	--	70	--	Hz	

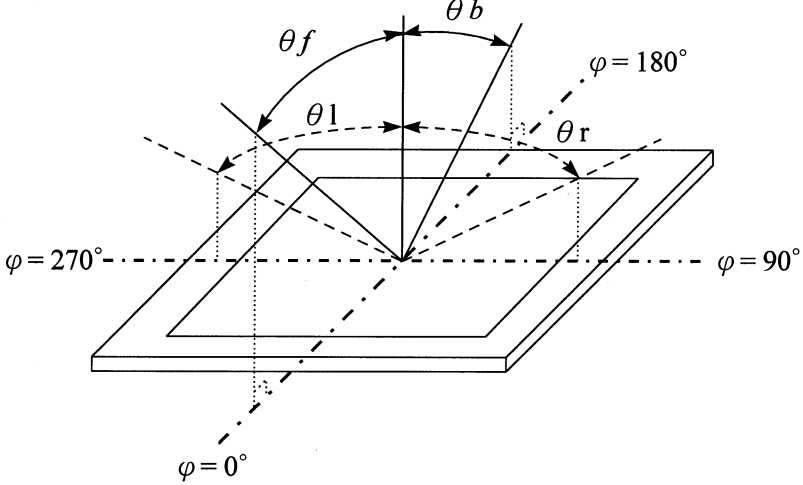
(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

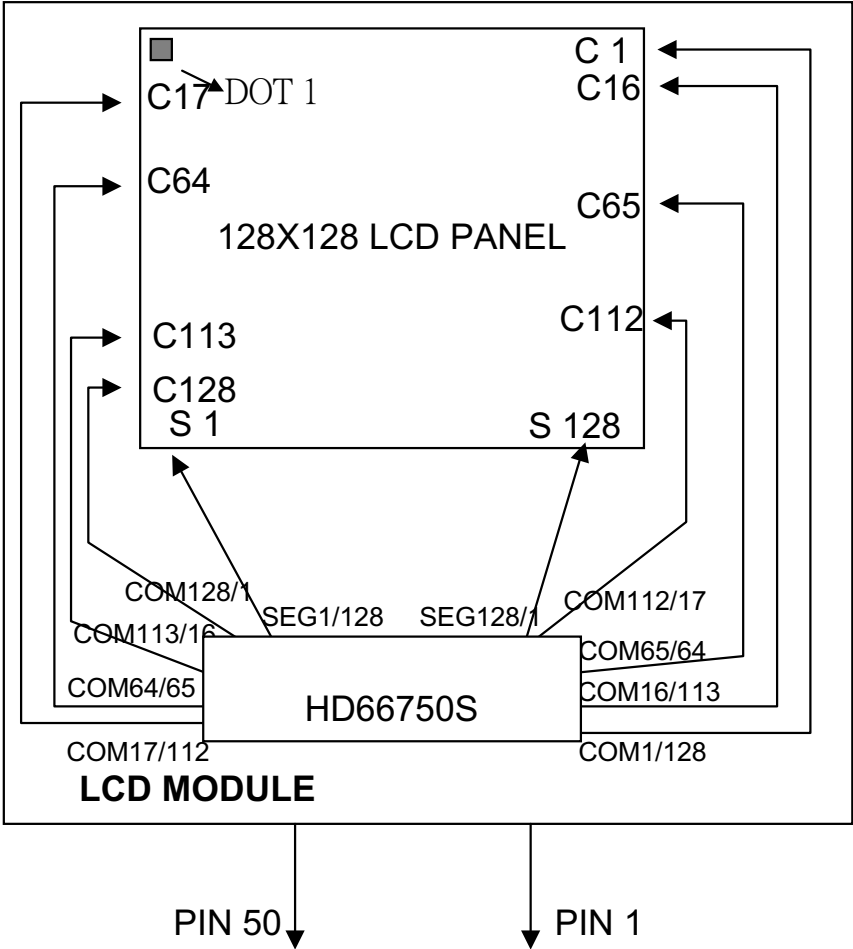
( NOTE 2 ) Response time :



(NOTE 3) Viewing angle



**5 BLOCK DIAGRAM**



## 6 INTERFACE

No.	Symbol	I/O	Function
1	IM1	I	Selects the MPU interface mode: 68 System 16bit= IM1: GND, IM0: GND 68 System 8 bit =IM1:GND, IM0: Vcc 80 System 16bit=IM1:Vcc, IM0: GND 80 System 8 bit=IM1:Vcc, IM0: Vcc
2	IM0		
3	OPOFF	I	Turn the internal operational amplifier off when OPOFF=Vcc, and turns it on when OPOFF=GND. If the amplifier is turned off (OPOFF=Vcc), V1 to V5 must be supplied to the V1OUT to V5OUT pins.
4	TEST	I	Test pin. Must be fixed at GND level.
5	DB15	I/O	Serves as a 16-bit bi-directional data bus. For an 8-bit bus interface, data transfer uses DB15-DB8; fix unused DB7-DB0 to the Vcc or GND level.
6	DB14		
- 19	- DB1-		
20	DB0		
21	RESET*	I	Reset pin. Initializes the LSI when low. Must be reset after power-on.
22	CS*	I	Low: Selects the HD66750 and can be accessed.
23	RS	I	Selects the register. Low: Index/status, High: Control.
24	E/WR*	I	For a 68-system bus interface, serves as an enable signal activate data read/write operation. For a 80-system bus interface, serves as a write strobe signal and writes data at the low level.
25	RW/RD*	I	For a 68-system bus interface, serves as a signal to select data read/write operation. Low: Write High: Read For an 80-system bus interface, serves as a read strobe signal and reads data at the low level.
26	GND		GND (logic): 0V
27	OSC2	I/O	For R-C oscillation using an external resistor, connect an external resistor. For external clock supply, input clock pulses to OSC1.
28	OSC1		
29	Vcc		Vcc:+1.8V to 5.5V
30	Vci	I	Inputs a reference voltage and supplies power to the booster; generates the Liquid crystal display drive voltage from the operating voltage. Must be left disconnected when the booster is not used.
31	C6+	--	External capacitance should be connected here for boosting.
32	C6-		
33	C5+	--	External capacitance should be connected here for boosting.
34	C5-		

35	C4+	--	External capacitance should be connected here for boosting.
36	C4-		
37	C3+	--	External capacitance should be connected here for boosting.
38	C3-		
39	C2+	--	External capacitance should be connected here for boosting.
40	C2-		
41	C1+	--	External capacitance should be connected here for boosting.
42	C1-		
43	VLOUT	O	Potential difference between Vci and GND is two-to seven-times boosted and then output magnitude of boost is selected by instruction.
44	VLCD		Power supply for LCD drive. VLCD-GND = 17V max.
45	V1OUT	I/O	Used for output from the internal operational amplifiers when they are used (OPOFF=GND); attach a capacitor to stabilize the output. When the amplifiers are not used (OPOFF=Vcc), V1 to V5 voltages can be supplied to these pins externally.
46	V2OUT		
47	V3OUT		
48	V4OUT		
49	V5OUT		
50	VTEST	--	Test pin. Must be left disconnected.

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## 7 TIMING CHARACTERISTICS

### 80-SYSTEM

Item	Symbol	VDD=1.8to2.4V		VDD=2.4to3.6V		Unit
		Min	Max	Min	Max	
Bus cycle time	tcycW	Write 600	--	380	--	Ns
	tcycR	Read 800		500		
Lo level plusw width	PWLW	Write120	--	70	--	
	PWLR	Read 350		250		
Hi-level pulse width	PWHW	Write300	--	150	--	
	PWHRL	Read 300		150		
Enable rise/fall time	tWRr,WRf	--	25	--	25	
Address set-up time (RS, R/W to E)	tAS	50	--	50	--	
Address hold time	tAH	20	--	20	--	
Write Data set-up time	tDSW	60	--	60	--	
Write Data hold time	tH	20	--	20	--	
Read Data delay time	tDDR	--	300	--	200	
Read Data hold time	tDHR	5	--	5	--	

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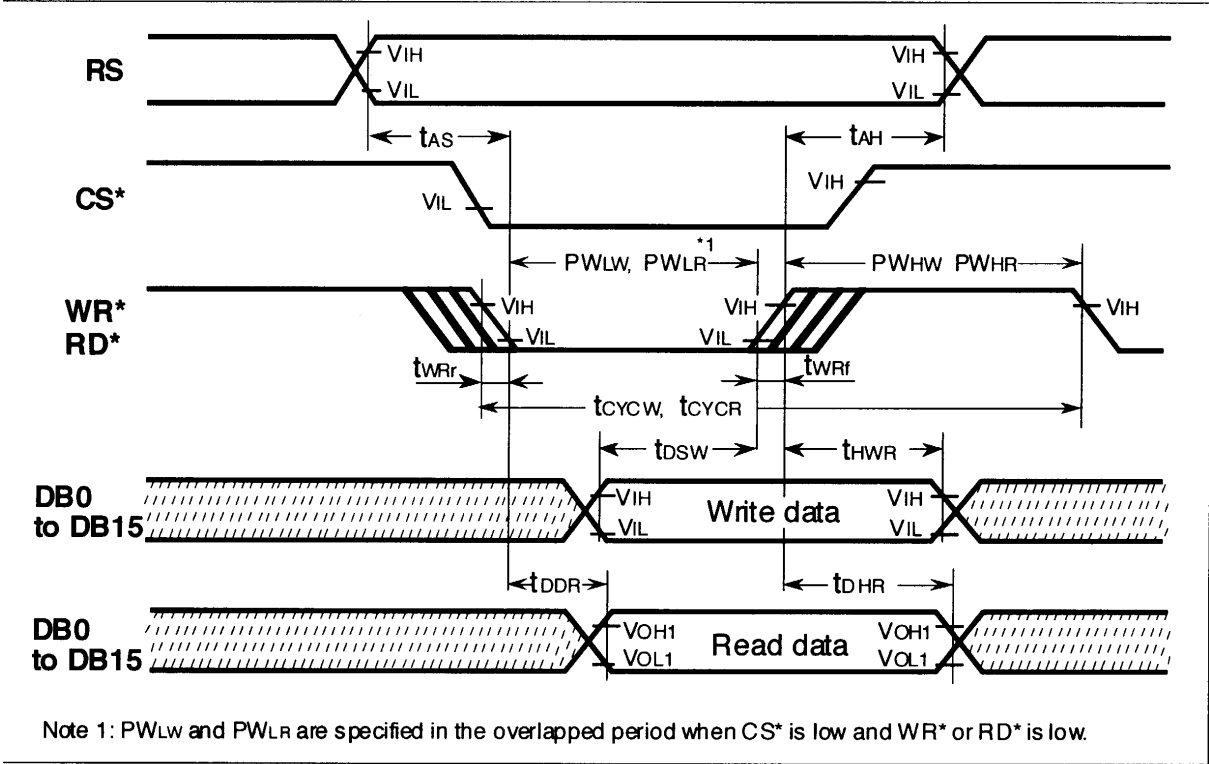
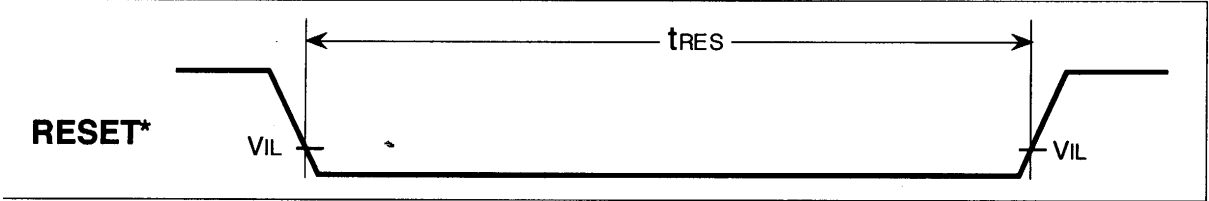


Figure 63 80-system Bus Timing

Reset Operation



## **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.

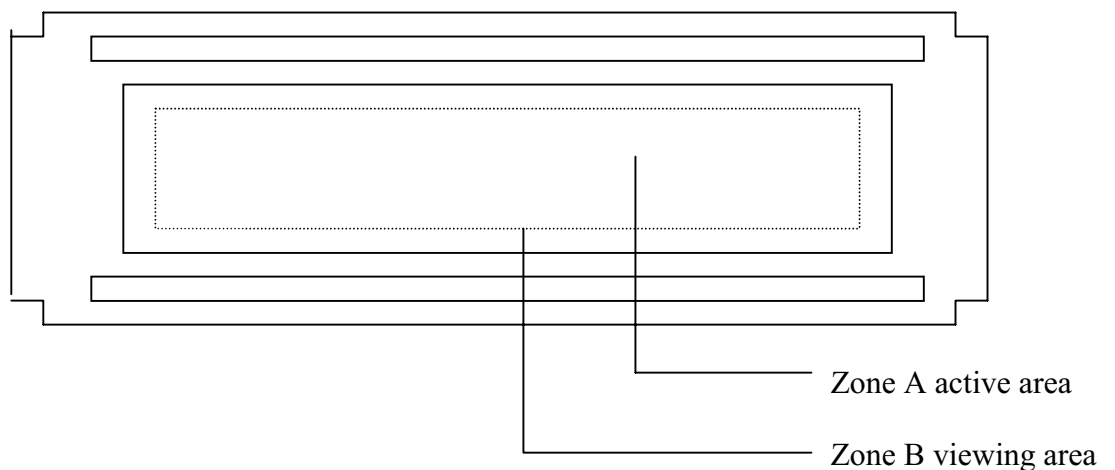
### **8.4 APPEARANCE**

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.

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## 8.5 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



## 8.6 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.
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## **9 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, ketone 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.
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# 10 OUTLINE DIMENSION

