

AMP DISPLAY INC.

SPECIFICATIONS

7 C ; !Hmd Y @7 8 MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	5C!%*&NM5!'\$<
APPROVED BY:	
DATE:	

APPROVED FOR SPECIFICATIONS

APPROVED FOR SPECIFICATION AND PROTOTYPES

AMP DISPLAY INC

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2002/1/25	-	New Release	Kokai
2002/1/28	-	Modify the VDD to 2.7V~3.3V	
		Change to Extend temperature type OP: $-20 \sim 70$	
2002/1/30		Modify Block diagram	
2002/2/1		Modify the ICON address, drawing, LCD type	
2002/2/5		Modify Drawing ; Rename to AO-162ZYA00H	
2002/2/7		Modify the interface direction. Page 6,15	
2002/2/25		Modify outline dimension drawing	
2002/3/8	10	Modify DDRAM address	
2002/3/22		Modify the Outline dimension drawing	
		The Contact lead of the FPC plate with gold.	
2002/6/5		Add the package drawing	
2003/4/8		Modify Outline dimension drawing	
2003/4/9		Modify Outline dimension drawing	
2003/6/12		Modify Outline dimension drawing	
2004/12/13		Modify the packing drawing	
2006/3/3		Change the LCD panel.	
2006/5/29		Change IC part number	
2006/7/4		Change M1-0555IEG-1 to M1-0555IAG-2	
2006/7/20		Modify INSPECTION QUALITY CRITERIA	
2006/7/21		Add packing drawing	

1 FEATURES

- (1) Display format : 16 characters \times 2 lines with ICON.
- (2) Construction : LCD panel, FPC and COG.
- (3) Display type: STN Yellow-green mode, Reflective, 6 o'clock view.
- (4) Controller : SPLC0093 or Equivalent.
- (5) 2.7V~3.3V single power input.
- (6) Extend temperature type.

Parameter	Stand Value	Unit
Dot size	0.5(W) ×0.5(H)	mm
Dot pitch	$0.55(W) \times 0.55(H)$	mm
Character size	2.70(W) × 3.80(H)	mm
Viewing area	56.0(W) ×24.0(H)	mm
Module size	60.0(W) ×66.0(H) ×3.0 max (T)	mm

2 MECHANICAL DATA

3 ABSOLUTE MAXIMUM RATINGS

Para	meter	Symbol	Min	Max	Unit
Logic Circuit	Supply Voltage	VDD-VSS	-0.3	7.0	V
LCD Driv	ing Voltage	VDD-VO	-0.3	10.0	V
Input	Voltage	VI	-0.3	VDD+0.3	V
Extend temp. type	Operating Temp.	Тор	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Тур	Max	Unit	Note
		Electro	nic Chara	cteristics			
Logic Circuit Supply Voltage	VDD-VSS		2.7		3.3	V	
LCD Driving Voltage	VDD-VO	25 °C		4.4		V	
Input Voltage	VIH		0.7VDD		VDD	V	
	VIL		VSS		0.3VDD	V	
Logic Supply Current	IDD			0.25	0.5	mA	ALL Pixel ON
				0.25	0.5	mA	All Pixel OFF
				0.35	0.5	mA	Checker
		- Optical Cl	haracteris	tics (STN	N)		
Contrast	CR	25°C		5			Note 1
Rise Time	Tr	25°C		200	300	ms	Note 2
Fall Time	Tf	25°C		200	300	ms	
Viewing Angle	θf	25°C &		40			
Range	θb	CR≥2		35		Deg.	Note 3
	θ1			35			
	θr			35			
Frame Frequency	FF	25°C		64		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 & INTERFACE



the capacitors = 1uF/10V.

• Vo= $(1+Rb/Ra)*VEV=(1+Rb/Ra)*(VREF-n\alpha); \alpha = VREF/150; n=0,1,....31$ (Software)



The contrast is adjustable by software and Rb/Ra. If you don't need the hardware adjustment, the Rb/Ra should be followed the real design. If you need the hardware adjustment, we recommend Ra=100K ohm; Rb=1M potentiometer.

All

No.	Symbol	Function
1	RS	Data/Instruction Select
2	CSB	Chip select. The Chip is selected while CSB is Low
3	SI	Serial data input
4	SCL	Serial Clock
5	VDD	Supply Voltage for Logic (+3.0V)
6	VSS	Ground (0V)
7	V4	Bias LCD driving voltage level, Connect a capacitor to VSS
8	V3	Bias LCD driving voltage level, Connect a capacitor to VSS
9	V2	Bias LCD driving voltage level, Connect a capacitor to VSS
10	V1	Bias LCD driving voltage level, Connect a capacitor to VSS
11	V0	Bias LCD driving voltage level, Connect a capacitor to VSS
12	VR	Contrast adjustment
13	VOUT	Internal DC/DC output, Connect a capacitor to VDD
14	CAP2-	Capictor2- connect pin for internal voltage converter
15	CAP2+	Capictor2+ connect pin for internal voltage converter
16	CAP1-	Capictor1- connect pin for internal voltage converter
17	CAP1+	Capictor1+ connect pin for internal voltage converter
18	RESTB	RESET signal. Active Low

Please see the detail connection of the interface as BLACK DIAGRAM (Page 6).

6 TIMING CHARACTERISTICS



СЅВ
SI(D <u>B7) ////X </u>
SCL(DB6) 1 2 3 4 5 6 7 8 9
RS

Clock Synchronized Serial Mode

(VDD = 2.4V to 3.6V, Ta = - 30 to + 85°C)

Characteristic	Symbol	Min.	Тур.	Max.	Unit
SCL clock cycle time	tc	1000	-	-	
Pulse rise / fall time	t _R , t _F	-	-	25	
SCL clock width (High, Low)	t _{vv}	300	-	-	
CSB setup time	t _{SU1}	150	-	-	
CSB hold time	t _{H1}	700	-	-	ns
RS data setup time	t _{SU2}	50	-	-	
RS data hold time	t _{H2}	300	-	-	
SI data setup time	t _{SU3}	50	-	-	
SI data hold time	t _{H3}	50	-	-	

(V_{DD} = 3.6V to 5.5V, Ta = - 30 to + 85°C)

Characteristic	Symbol	Min.	Тур.	Max.	Unit
SCL clock cycle time	t _c	600	-	-	
Pulse rise / fall time	t _R , t _F	-	-	25	1
SCL clock width (High, Low)	tw	200	-	-	
CSB setup time	t _{SU1}	100	-	-	1
CSB hold time	t _{H1}	400	-	-	ns
RS data setup time	t _{SU2}	40	-	-	
RS data hold time	t _{H2}	200	-	-	1
SI data setup time	t _{SU3}	40	-	-	
SI data hold time	t _{H3}	40	-	-	



7 DD RAM ADDRESS

DIGIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 LINE	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
2 LINE	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F

DD RAM Address

8 FONT TABLE

Upper 4bit Lower	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	ւատւ	LHHH	HLLL	HLLH	HLHL	вгнн	HHLL	ингн	HHHL	нннн
LLLL																
LLLH																
LLBL																
LLHH																
LHLL																
LHLH																
LHHL																
гнин																
HLLL																
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9 QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions : Ambient temperature : $25 \pm 5^{\circ}$ C Humidity : $60 \pm 25\%$ RH.

9.2 SAMPLING PLAN

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

9.3 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.

9.4 APPEARANCE

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

9.5 INSPECTION QUALITY CRITERIA

Item	Description of d	efects				Class of	Acceoptable
	_					Defects	level (%)
Function	1. No display, re	ject				Major	0.65
	2. display abnor	mal, rejec					
	3. missing line, 1	reject					
	4. LC leakage, r	eject					
	5. B/L was no w	ork, rejec	t 				
	0. Contrast delet	ci, refer to	sample	for t	a compla		
Dimension	1 Over spec r	aiect	ation, iei		5 sample	Major	0.65
Dimension	2 Refer BOM	Incorrest	ond wit	h R(DM reject	Iviajoi	0.05
Black spots	Ave dia D	meenesp	Area	A	Area B	Minor	2.5
Diack spots	$D \le 0.2$		Γιίου	Disre	egard		2.0
	$D \equiv 0.2$ 0.2 < D ≤ 0.3		3	- 101 0	4		
	$0.3 < D \le 0.4$		2		3	-	
	$0.5 < D \equiv 0.4$		0		1	-	
Glass Scratch	Width W Lengt	h I.	Area	Δ	Area B	Minor	25
Glubb Seluten	$W \le 0.03$		Ι	Disre	gard		2.0
	$0.03 < D \le 0.05$		3		4	-	
	$0.05 < D \le 0.07$.	L≤3.0	1		1	-	
凹凸 Spots	Ave. dia. D	Area	ı A		Area B	Minor	2.5
	D≦0.2		Disre	gard		1	
	$0.2 < D \le 0.3$	3			4	1	
	$0.3 < D \le 0.4$	1			2		
	0.4 <d< td=""><td>0</td><td></td><td></td><td>1</td><td></td><td></td></d<>	0			1		
(—)Poor crack or						Minor	2.5
cutting							
		<u></u>					
	X7 X7 1	1 /0 /1	1				
	X Y reacting	1/2 the sea	al	C	OK		
()Poor crack or	Not corner				7	Minor	2.5
cutting			Y				
				K			
			\frown				
		$\langle \rangle$			· · · · · · · · · · · · · · · · · · ·		
				7	W		
	V	*	XX	L _.			
	ľ		\searrow	Cor	nor		
		V	1 1 7 4	COL			
	1. Surface dam	age, X and	I Y not e	enter	ing the		
	enective vie	wing area		•			
	2. Surface dam	age, Y not	> 1/2L)。			

	3. Surface damage, X not $>1/8$ Length \circ		
	4. Surface damage, $Z \leq T \circ$		
(三)Poor crack or cutting	1. Surface damage, X and Y not entering the effective viewing area or ITO e^{-1}	Minor	2.5
	2 Surface damage X not $>1/8$ Length \circ		
	3. Surface damage, $Z \leq T \circ$		
(四)Poor crack or			
cutting	L B D	Minor	2.5
	1. $B \leq 1/3D$, Ingore length of L \circ		
	2. $B > 1/3D$, reject \circ		
Black (white) line	Use 21 Level Gray Scale to see. It's OK under 18 Level Gray Scale.	Minor	2.5
Bubbles (between	Average diameter D $0.2 < D < 0.5$ for N = 4,	Minor	2.5
glass & polarize)	$0.5 \le D < 0.8$ for N = 1		
Color uniformity	Rainbow color or Newtonring not more than two color changes across the viewing area.	Minor	2.5



9.6 RELIABILITY

	Test Conditions	
Test Item	Extended Temp. type	
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Temperature Cycle	-30°C ~ 25°C ~ 80°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	60 °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.

10 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.

11 OUTLINE DIMENSION



Packing drawing

