

AMP DISPLAY INC.

A Brighter Solution

SPECIFICATIONS

| | |
|--------------------------|---------------|
| CUSTOMER | |
| CUSTOMER PART NO. | |
| AMP PART NO. | AT-12864IFI-H |
| APPROVED BY | |
| DATE | |

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 |
|-------------|------------|--------------|
| | | |

Date : 2001/12/11

RECORD OF REVISION

| Revision Date | Contents |
|----------------------|-----------------|
| 2002/1/2 | New Release |

1 FEATURES

- (1) Display format :128× 64 dot-matrix.
- (2) Construction : LCD panel, and TAB IC.
- (3) Display type : FSTN, Positive, Transflective, 6 o'clock view
- (4) Driver : IC SED1565T04
- (5) On-chip LCD booster.
- (6) Extended temperature type.

2 MECHANICAL DATA

| Parameter | Stand Value | Unit |
|--------------|-----------------------------|------|
| Dot size | 0.34(W) × 0.38(H) | mm |
| Dot pitch | 0.37(W) × 0.41(H) | mm |
| Viewing area | 54.0(W) × 31.0(H) | mm |
| Module size | 58.0(W) × 54.5(H) × 1.9 (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 | VDD-V5 | 0 | 16.0 | V |
| Input Voltage | VI | -0.3 | VDD+0.3 | V |
| Operating Temp. | TOP | -20 | 70 | °C |
| Storage Temp. | TSTG | -30 | 80 | °C |

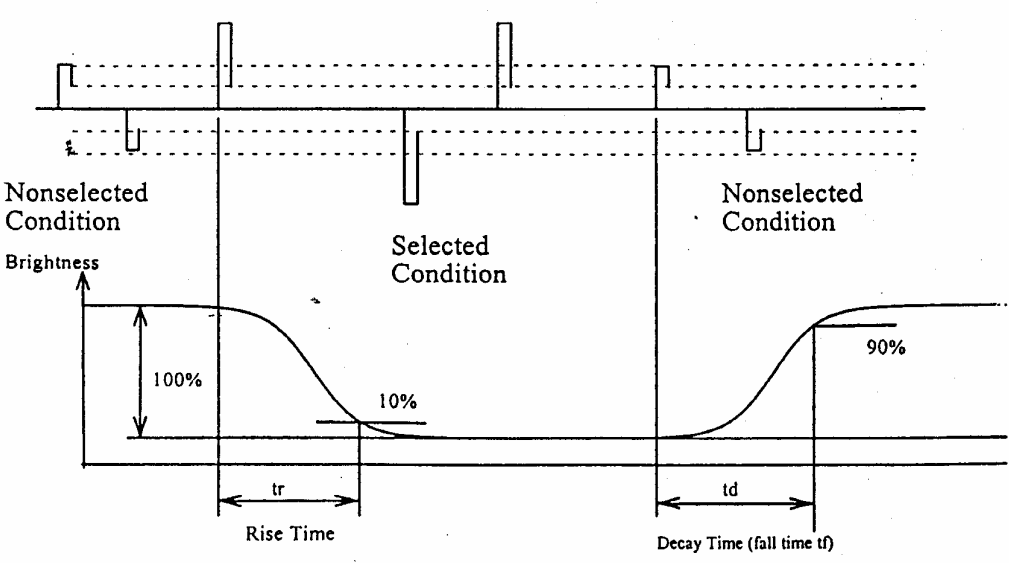
4 ELECTRO-OPTICAL CHARACTERISTICS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---------|----------------|---------|-----|---------|------|--------|
| ----- Electronic Characteristics ----- | | | | | | | |
| Logic Circuit Supply Voltage | VDD-VSS | -- | -- | 3.3 | -- | V | |
| LCD Driving Voltage | V0-VSS | 25°C | -- | 9.0 | -- | V | |
| Input Voltage | VIH | -- | 0.8 VDD | -- | VDD | V | |
| | VIL | -- | VSS | -- | 0.2 VDD | V | |
| Logic Supply Current | IDD | VDD = 3V | -- | 0.5 | 1.0 | mA | |
| ----- Optical Characteristics ----- | | | | | | | |
| 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 | -- | 64 | -- | Hz | |

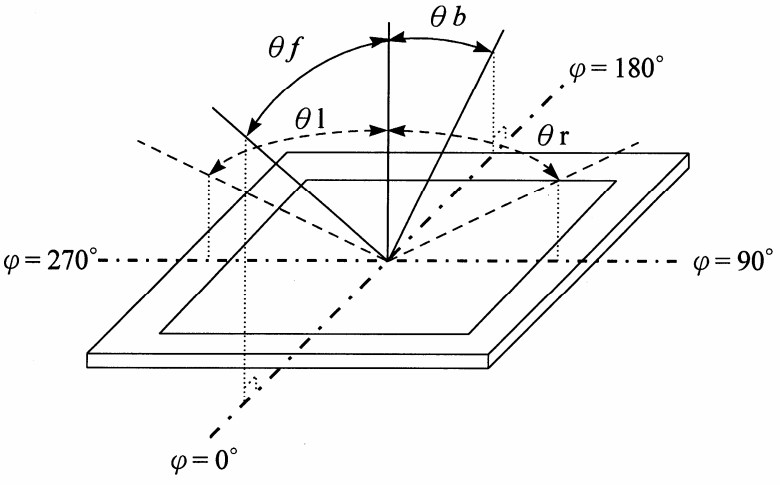
(NOTE 1) Contrast ratio :

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

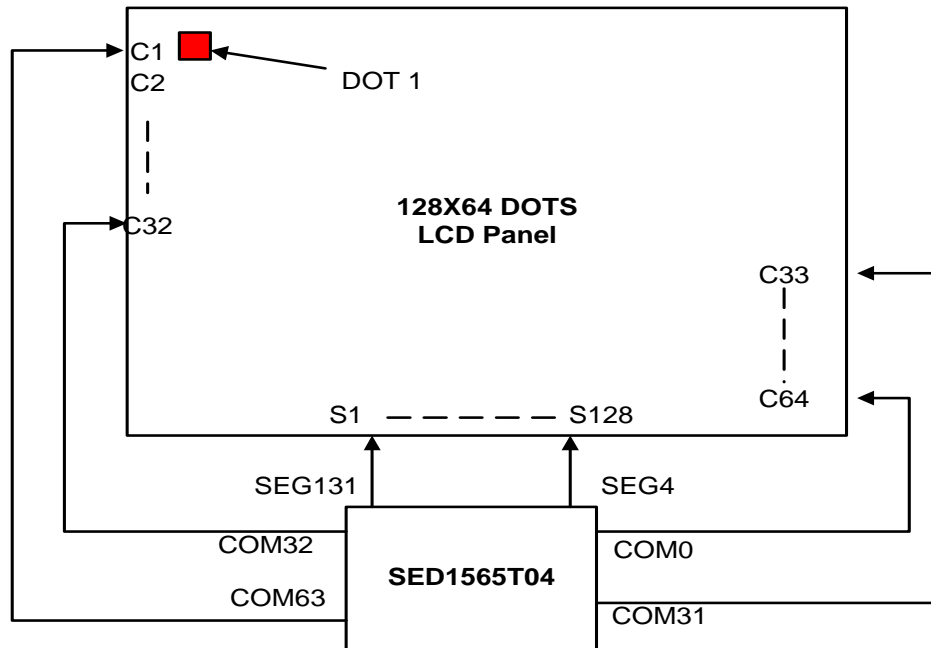
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM



Note: 1.Using Reverse Common Output Mode Selection
2.Set ADC=1 to Reverse Segment Output/ Address

6 PIN CONNECTIONS

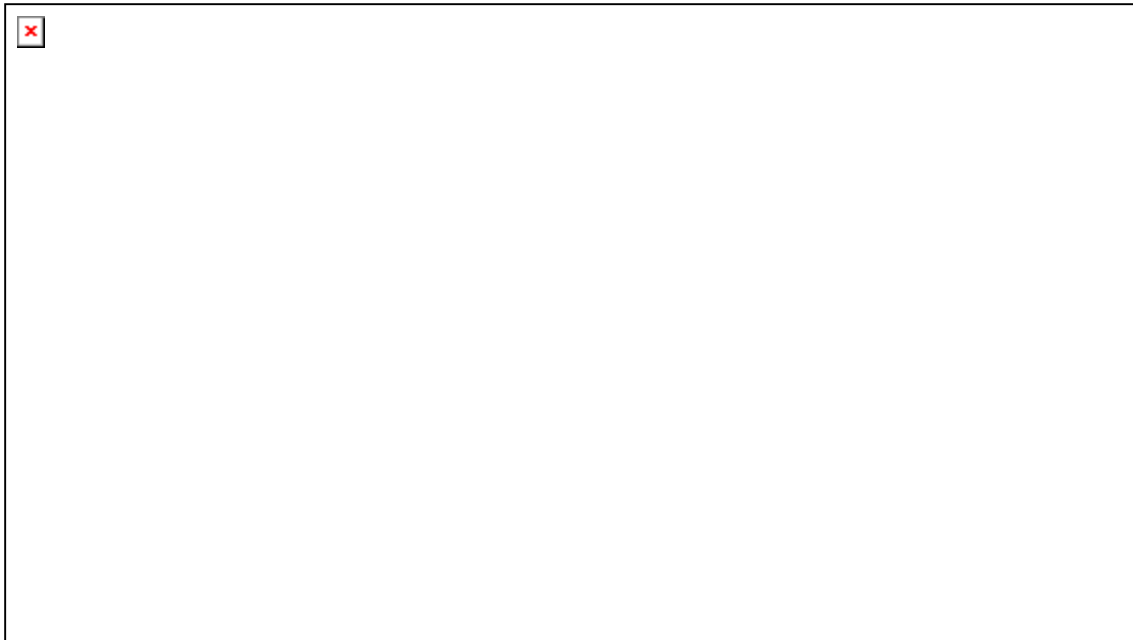
| No. | Signal | Level | Function |
|-----|--------|-------|-----------------------------------|
| 1 | NC | - | Dummy |
| 2 | FR | H/L | Alternative Signal |
| 3 | CL | H/L | Display Clock Input |
| 4 | /DOF | H/L | Display Off Control Signal |
| 5 | /CS1 | H/L | Chip Select Signal1 |
| 6 | CS2 | H/L | Chip Select Signal2 |
| 7 | /RES | H/L | Reset Signal |
| 8 | A0 | H/L | Data/Instruction Selection Signal |
| 9 | WR.R/W | H/L | Write Signal |
| 10 | RD.E | H/L | Read Signal |

(Continued)

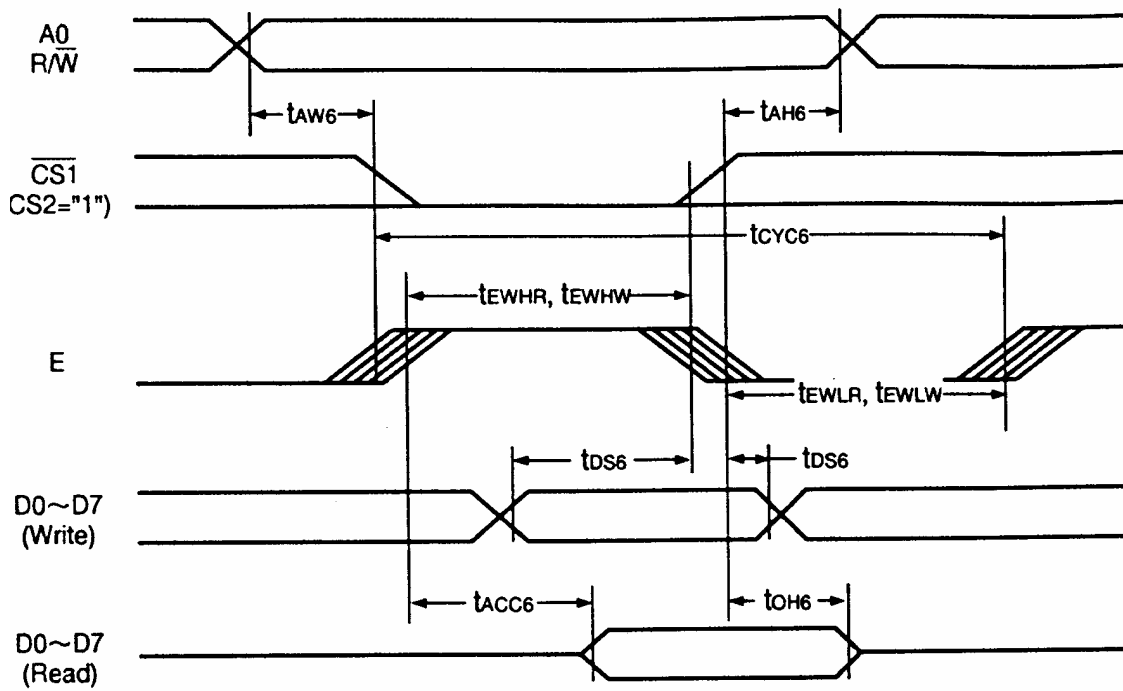
| | | | | | |
|----|---------|-----|--|--|-------------------|
| 11 | D0 | H/L | Data Bus(8bit) | | |
| 12 | D1 | H/L | | | |
| 13 | D2 | H/L | | | |
| 14 | D3 | H/L | | | |
| 15 | D4 | H/L | | | |
| 16 | D5 | H/L | | | |
| 17 | D6(SCL) | H/L | | | Serial Clock |
| 18 | D7(SI) | H/L | | | Serial Data Input |
| 19 | VDD | - | Power Supply | | |
| 20 | VSS | - | Ground | | |
| 21 | VSS2 | - | Reference Power Supply for Setup Voltage Circuit | | |
| 22 | VOUT | H/L | DC/DC Voltage Converter Output | | |
| 23 | CAP3- | H/L | DC/DC Voltage Converter Capacitor3- | | |
| 24 | CAP1+ | H/L | DC/DC Voltage Converter Capacitor1+ | | |
| 25 | CAP1- | H/L | DC/DC Voltage Converter Capacitor1- | | |
| 26 | CAP2- | H/L | DC/DC Voltage Converter Capacitor2- | | |
| 27 | CAP2+ | H/L | DC/DC Voltage Converter Capacitor2+ | | |
| 28 | VRS | H/L | Output Voltage Regulator | | |
| 29 | VDD | - | Power Supply | | |
| 30 | V1 | H/L | Multi Level Voltage Output1 | | |
| 31 | V2 | H/L | Multi Level Voltage Output2 | | |
| 32 | V3 | H/L | Multi Level Voltage Output3 | | |
| 33 | V4 | H/L | Multi Level Voltage Output4 | | |
| 34 | V5 | H/L | Multi Level Voltage Output5 | | |
| 35 | VR | H/L | Output Voltage Regulator Terminal | | |
| 36 | VDD | - | Power Supply | | |
| 37 | M/S | H/L | Master/Slave Selection | | |
| 38 | CLS | H/L | Clear Signal | | |
| 39 | C86 | H/L | MPU Interface Switch terminal | | |
| 40 | P/S | H/L | Parallel/Serial Input Data Selection | | |
| 41 | HPM | H/L | Power Control Terminal | | |
| 42 | IRS | H/L | Select Resistors for V5 Voltage Adjust | | |
| 43 | NC | - | Dummy | | |

7 TIMING CHARACTERISTICS

7.1 8080 Series MPU



6800 Series MPU



| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|--------|-------|------|------|------|
| 8080 Series(VDD=2.7~4.5V) | | | | | |
| Address Hold Time(A0) | tAH8 | 0 | | - | ns |
| Address Setup Time(A0) | tAW8 | 0 | | - | ns |
| System Cycle Time((A0) | Tcyc8 | 300 | | | ns |
| Control L Pulse Width(/WR) | tCCLW | 60 | | | ns |
| Control L Pulse Width(/RD) | tCCLR | 120 | | | ns |
| Control H Pulse Width(/WR) | tCCHW | 60 | | | ns |
| Control H Pulse Width(/RD) | tCCHR | 60 | | | ns |
| Data Setup Time(D0~7) | tDS8 | 40 | | | ns |
| Address Hold Time | tDH8 | 15 | | | ns |
| /RD access time | tACC8 | - | | 140 | ns |
| Output Disable Time | tOH8 | 10 | | 100 | ns |
| 6800 Series(VDD=2.7 V to 4.5 V) | | | | | |
| Address Hold Time(A0) | tAH6 | 0 | | - | ns |
| Address Setup Time(A0) | tAW6 | 0 | | - | ns |
| System Cycle Time(A0) | tCYC6 | 300 | | - | ns |
| Data Setup Time | tDS6 | 40 | | - | ns |
| Data Hold Time | tDH6 | 15 | | - | ns |
| Data Access Time | tACC6 | - | | 140 | ns |
| Output Disable Time | tOH6 | 10 | | 100 | ns |
| Enable H Pulse Time | Read | tCCHW | 120 | - | ns |
| | Write | tCCHR | 60 | - | ns |
| Enable L Pulse Time | Read | tCCLW | 60 | - | ns |
| | Write | tCCLR | 60 | - | 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

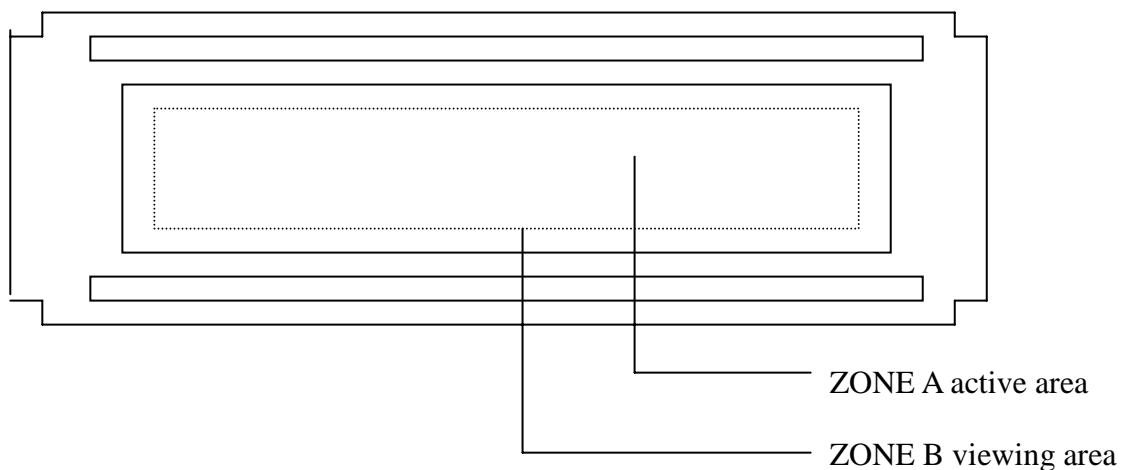
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

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 |
|----------------------------|---|------|
| 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 |
| Humidity Test | 40°C , Humidity 90%, 96 hrs | 1,2 |
| Temperature Cycle | -30°C (30 min.) ~ 25°C (5 min.) ~ 80°C (30 min.) (1 cycle) Total 5 cycle | 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.

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.

10 OUTLINE DIMENSION

| REV. | REVISION RECORD | DATE | NAME |
|------|----------------------------|----------|-------|
| 1 | NEW RELEASE | 02-21-00 | EMILY |
| 2 | Change Outline Dimensions. | 03-23-00 | EMILY |
| 3 | Delete ICON | 03-31-00 | EMILY |

Note: RTV Glue for OLB Protection.

| | | | |
|----|------|----|-------|
| 1 | NC. | 22 | VOUT |
| 2 | FR | 23 | CAP3- |
| 3 | CL | 24 | CAP1+ |
| 4 | DOF | 25 | CAP1- |
| 5 | CS1 | 26 | CAP2- |
| 6 | CS2 | 27 | CAP2+ |
| 7 | RES | 28 | VRS |
| 8 | AO | 29 | VDD |
| 9 | WR | 30 | V1 |
| 10 | RD | 31 | V2 |
| 11 | D0 | 32 | V3 |
| 12 | D1 | 33 | V4 |
| 13 | D2 | 34 | V5 |
| 14 | D3 | 35 | VR |
| 15 | D4 | 36 | VDD |
| 16 | D5 | 37 | M/S |
| 17 | D6 | 38 | CLS |
| 18 | D7 | 39 | C86 |
| 19 | VDD | 40 | P/S |
| 20 | VSS | 41 | HPM |
| 21 | VSS2 | 42 | IRS |
| | | 43 | NC. |

| TOLERANCE GRADE | "A" | "B" | TOLERANCE GRADE(%) | SCALE | MODULE LCM |
|-----------------|------|------|--------------------|-------|------------|
| 7 | 0.05 | 0.1 | ~6 | 0.18 | 1:1 |
| 8 | 0.08 | 0.18 | 6~18 | 0.25 | LCM |
| 9 | 0.1 | 0.25 | 18~50 | 0.4 | LCM |
| 10 | 0.2 | 0.4 | 50~180 | 0.5 | LCM |
| 11 | 0.3 | 0.5 | 180~ | | |
| 12 | | | | | |

晶采光电科技
TITLE 12864I
DWG. NO. *000224MA
SHEET 1 OF 1