



## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AO-12864ZFI-00H</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

- Approved For Specifications  
 Approved For Specifications & Sample

APPROVED BY	CHECKED BY	ORGANIZED BY

## RECORD OF REVISION

<b>Revision Date</b>	<b>Contents</b>	<b>Editor</b>
2004/12/31	New Release	Rosaline

## 1 FEATURES

- (1) Display format : 128 × 64 dot-matrix, 1/65 duty.
- (2) Construction : LCD panel ,COG and FPC.
- (3) Display type : FSTN, Transflective, Positive, 6 o'clock view
- (4) LCD driver : S6B1713 (KS0713)
- (5) Interface selectable for 68 / 80 series family MPU
- (6) 3.3V single power input.
- (7) Extended temperature type.

## 2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.42(W) × 0.44(H)	mm
Dot pitch	0.46(W) × 0.48(H)	mm
Viewing area	63.84(W) × 35.68(H)	mm
Module size	68.0(W) × 82.0(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	V0-VSS	0.3	17	V	
Input Voltage	VI	VSS	VDD	V	
Extended temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

## 4 ELECTRO-OPTICAL CHARACTERISTICS

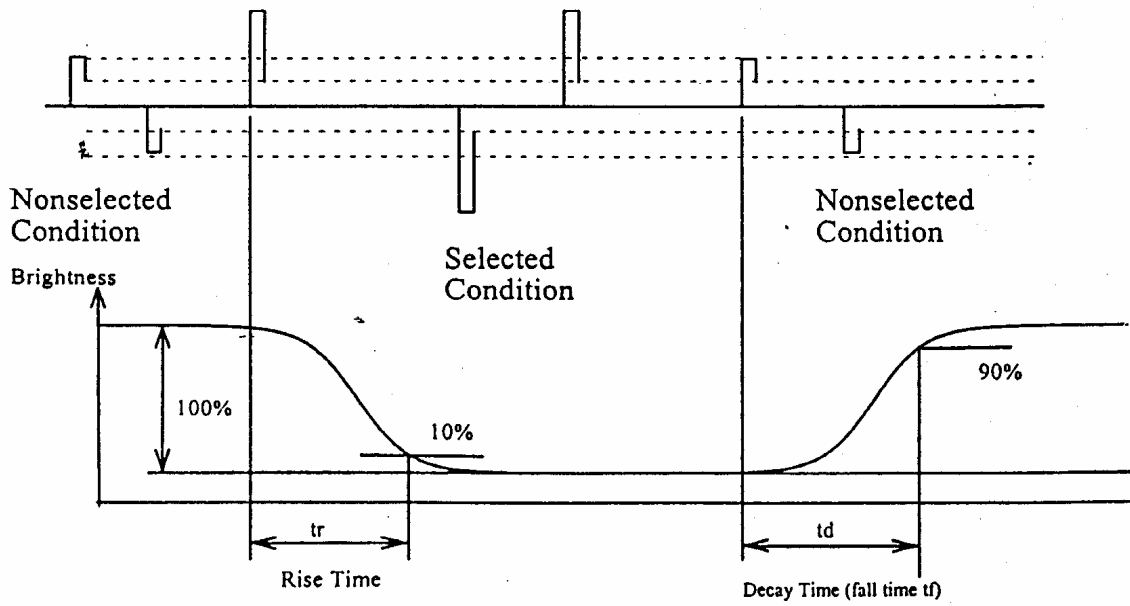
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
<b>----- Electronic Characteristics -----</b>							
Logic Circuit Supply Voltage	VDD-VSS	--	--	3.3	--	V	
LCD Driving Voltage	V0-VSS	-20 °C	--	--	--	V	
		25 °C	--	10*	--		
		70 °C	--	--	--		
Input Voltage	VIH	--	0.8 VDD	--	VDD	V	
	VIL	--	VSS	--	0.2VDD	V	
Logic Supply Current	IDD	VDD = 3.3V	--	0.5*	1.0*	mA	
<b>----- Optical Characteristics -----</b>							
Contrast	CR	FSTN type	--	5*	--		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		--	35*	--		
	θ l		--	40*	--		
	θ r		--	40*	--		
Frame Frequency	fF	25°C	--	70	--	Hz	

\* Reference only, Decided by real design.

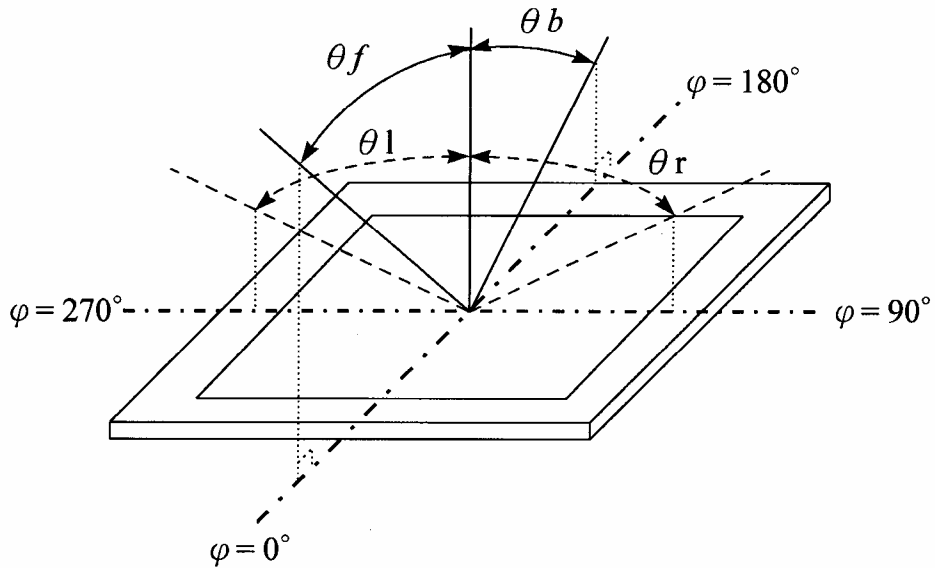
(NOTE 1) Contrast ratio :

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

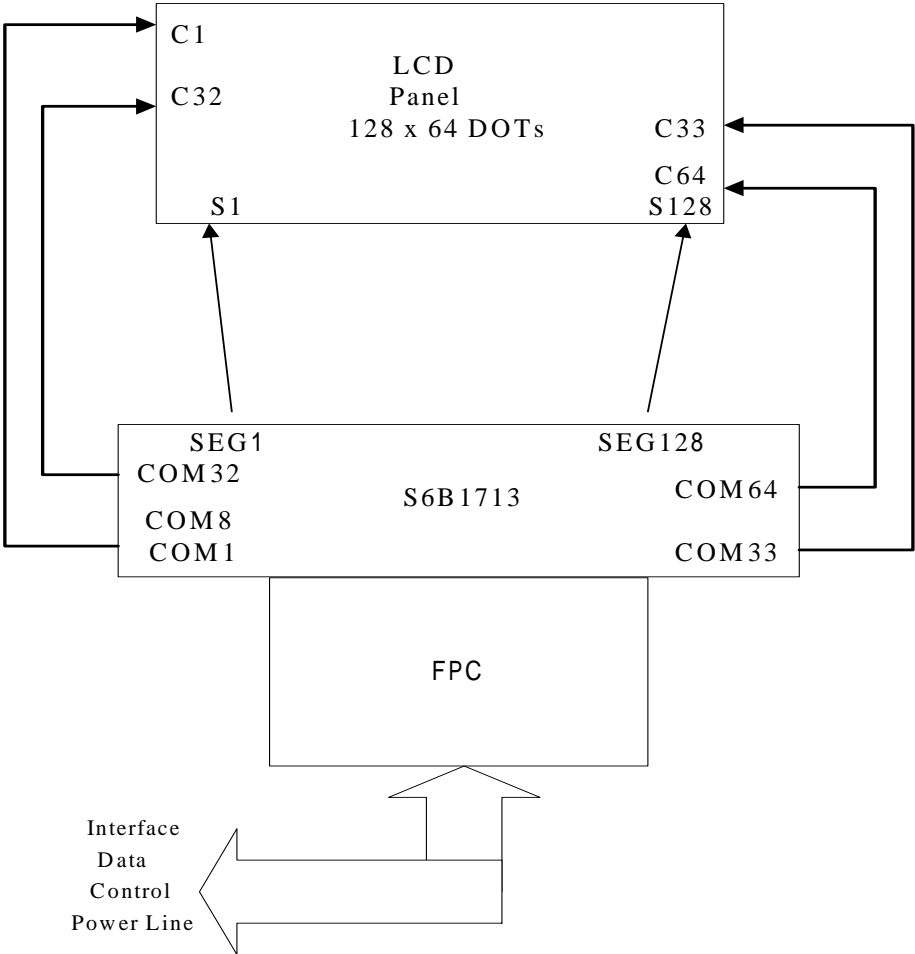
( NOTE 2 ) Response time :



(NOTE 3) Viewing angle



# 5 BLOCK DIAGRAM

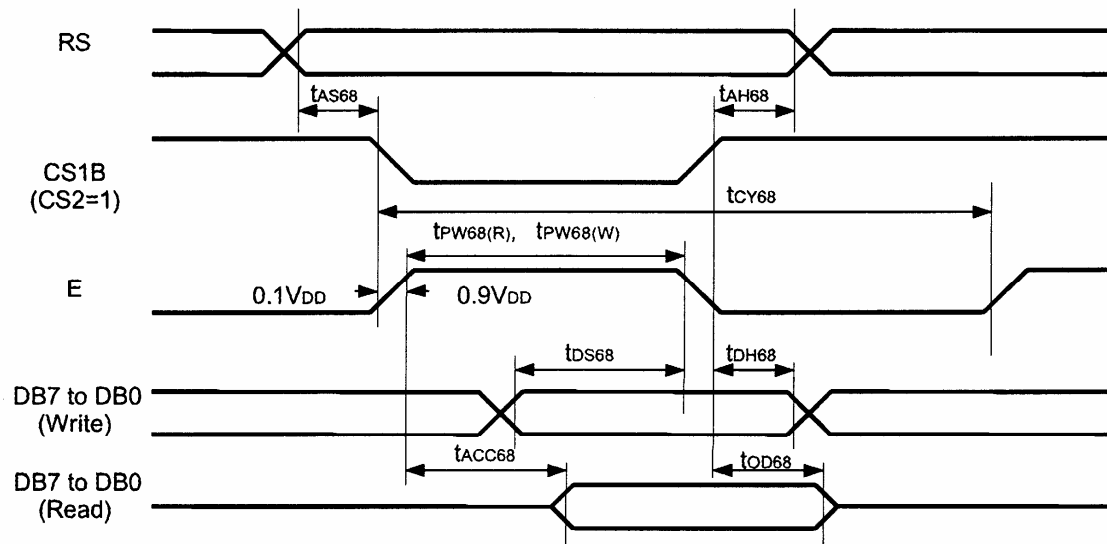


## 6 INTERFACE

No.	Symbol	Function
1	/CS1B	Chip Select input pins
2	CS2	Chip Select input pins
3	/RST	Hardware reset input
4	RS	RS="H": Indicates that DB0 to DB7 are Display Data RS="L": Indicates that DB0 to DB7 are Control Data
5	R/W	68 type MPU Read/Write Signal input Pin
6	E	Read / Write execution control pin
7	DB0	Data Bus
8	DB1	Data Bus
9	DB2	Data Bus
10	DB3	Data Bus
11	DB4	Data Bus
12	DB5	Data Bus
13	DB6	Data Bus
14	DB7	Data Bus
15	MI	Microprocessor interface selects input pin
16	PS	Parallel/Serial data input select input
17	VSS	Ground (0V)
18	VDD	Power Supply for Logic
19	VOUT	Voltage converter input / output pin
20	C3+	Capacitor 3 positive connection pin for voltage converter
21	C3-	Capacitor 3 negative connection pin for voltage converter
22	C1+	Capacitor 1 positive connection pin for voltage converter
23	C1-	Capacitor 1 negative connection pin for voltage converter
24	C2+	Capacitor 2 positive connection pin for voltage converter
25	C2-	Capacitor 2 negative connection pin for voltage converter
26	VR	V0 voltage adjustment pin
27-31	V0-V4	LCD driver supply voltage
32	BSTS	Selects input voltage of the built-in voltage converter
33	DCDC5B	5 times boosting circuit enable input pin
34	HPM	Power control pin of the power supply circuit for LCD driver
35	INTRS	Internal resistors select pin
36	TEMPS	Selects temperature coefficient of the reference voltage

## 7 TIMING CHARACTERISTICS

### 7.1 Read / Write Characteristics (68-series MPU)



Read / Write Characteristics (68-series MPU)

(VDD = 2.4 to 3.6V, Ta = -40 to +85°C)

Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Address setup time	RS	tAS68	13	-	-	ns	
Address hold time	RS	tAH68	17	-	-	ns	
System cycle	RS	tCY68	400	-	-	ns	
Data setup time	DB7 to DB0	tDS68	35	-	-	ns	
Data hold time		tDH68	13	-	-	ns	
Read access time	DB0	tACC68	-	-	125	ns	CL = 100 pF
Output disable time		tOD68	10	-	90	ns	
Enable pulsewidth	Read Write	E_RD	tPW68(R)	125	-	-	-
		E_RD	tPW68(W)	55	-	-	-



## 8 INSTRUCTION SET

x : Don't care

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Read display data	1	1	Read data								Read data from DDRAM
Write display data	1	0	Write data								Write data into DDRAM
Read status	0	1	BUSY	ADC	ONOFF	RESEB	0	0	0	0	Read the internal status
Display ON / OFF	0	0	1	0	1	0	1	1	1	DON	Turn ON / OFF LCD panel When DON = 0: display OFF When DON = 1: display ON
Initial display line	0	0	0	1	ST5	ST4	ST3	ST2	ST1	ST0	Specify DDRAM line for COM0
Set reference voltage mode	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode
Set reference voltage register	0	0	x	x	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	0	Y6	Y5	Y4	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y3	Y2	Y1	Y0	Set column address LSB
ADC select	0	0	1	0	1	0	0	0	0	ADC	Select SEG output direction When ADC = 0: normal direction (SEG0→SEG99) When ADC = 1: reverse direction (SEG99→SEG0)
Reverse display ON / OFF	0	0	1	0	1	0	0	1	1	REV	Select normal / reverse display When REV = 0: normal display When REV = 1: reverse display
Entire display ON / OFF	0	0	1	0	1	0	0	1	0	EON	Select normal entire display ON When EON = 0: normal display. When EON = 1: entire display ON
LCD bias select	0	0	1	0	1	0	0	0	1	BIAS	Select LCD bias
Set modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode
Reset modify-read	0	0	1	1	1	0	1	1	1	0	release modify-read mode
Reset	0	0	1	1	1	0	0	0	1	0	Initialize the internal functions
SHL select	0	0	1	1	0	0	SHL	x	x	x	Select COM output direction When SHL = 0: normal direction (COM0→COM53) When SHL = 1: reverse direction (COM53→COM0)
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Regulator resistor select	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set static indicator mode	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode
Set static indicator register	0	0	x	x	x	x	x	x	S1	S0	Set static indicator register
Power save	-	-	-	-	-	-	-	-	-	-	Compound instruction of display OFF and entire display ON
Test instruction	0	0	1	1	1	1	x	x	x	x	<b><u>Don't use this instruction.</u></b>

## **9 QUALITY AND RELIABILITY**

### **9.1 TEST CONDITIONS**

Tests should be conducted under the following conditions :

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

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

### **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**

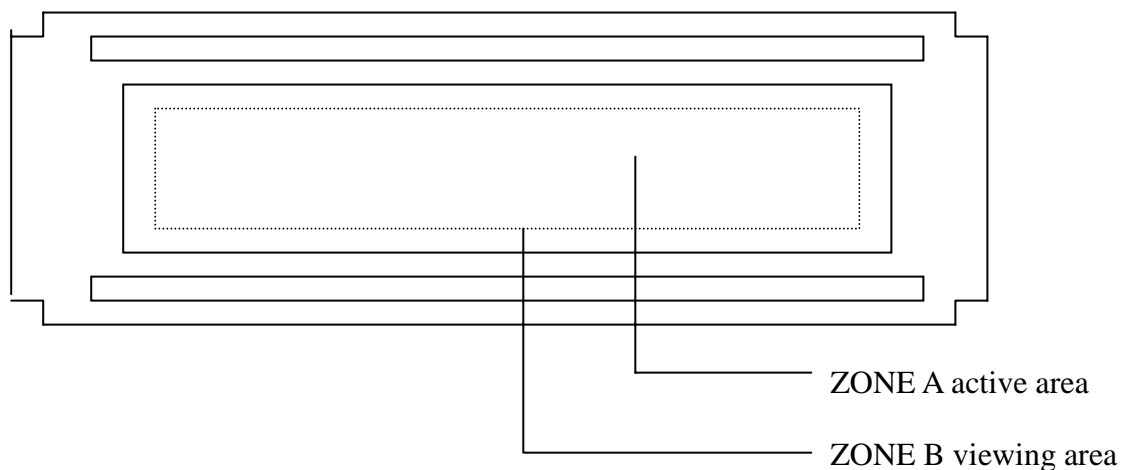
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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

## 9.5 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≤0.2	Disregard				
	0.2<D≤0.3	3	4			
	0.3<D≤0.4	2	3			
	0.4<D	0	1			
Black lines	Width W, Length L		A	B	Minor	2.5
	W≤0.03		disregard			
	0.03<W≤0.05		3	4		
	0.05<W≤0.07 , L≤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	



## 9.6 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
Thermal Shock Test	-30°C ~ 25°C ~ 80°C 30 min. 5 min. 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).

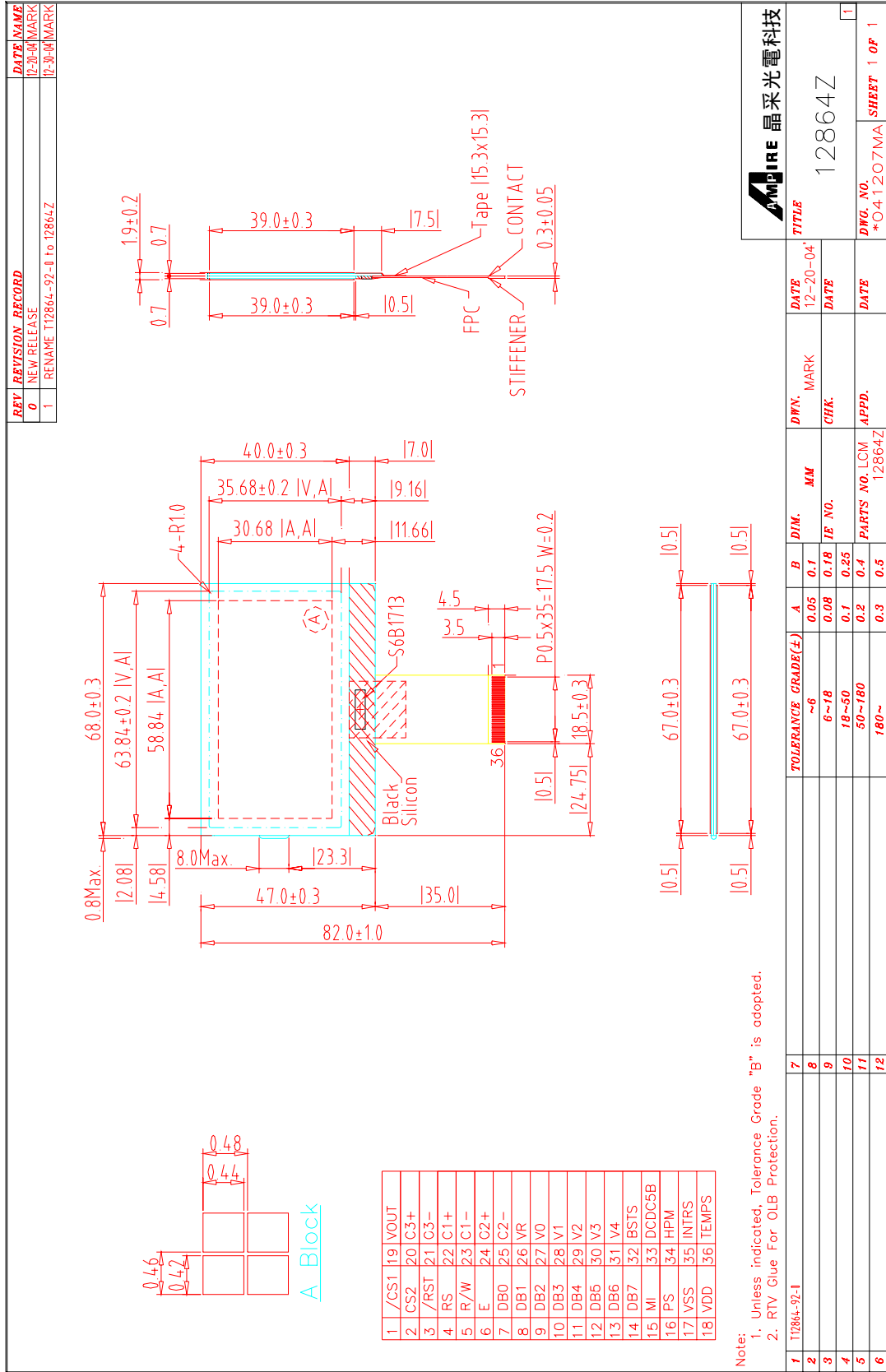
Definitions of life end point :

- 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.

## **10 HANDLING PRECAUTIONS**

- (1) An 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



**晶采光電科技**  
 12864Z  
 DWG. NO. \*O4-1207MA  
 SHEET 1 OF 1