



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	元利
CUSTOMER PART NO.	
AMPIRE PART NO.	AO-12864YFIEB-00H
APPROVED BY	
DATE	

- Approved For Specifications
 Approved For Specifications & Sample

AMPIRE CO., LTD.

**TOWER A, 4F, No.114, Sec. 1, HSIN-TAI 5th RD., HIS-CHIH,
TAIPEI HSIEN, TAIWAN(R.O.C.)**

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APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Contents	Editor
2004/9/23	New Release	Johnny

1 FEATURES

- (1) Display format: 128×64 dots, 1/64 duty, 1/9 bias.
- (2) Construction: LCD panel, COG and FPC, EL.
- (3) Display type: FSTN, Transflective, B/W, 6 o'clock view.
- (4) Controller: NT7532.
- (5) Extend temperature type.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.2(W) × 0.2(H)	mm
Dot pitch	0.22(W) × 0.22(H)	mm
Active area	28.14(W) × 14.06 (H)	mm
Viewing area	31.0 (W) × 16.5 (H)	mm
Module size	44.0(W) × 50.5(H) × 2.6 Max(T)	mm

3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Logic Circuit Supply Voltage	VDD-VSS	-0.3	+5.0	V
LCD Driving Voltage	VLCD	-16	+0.3	V
Input Voltage	VI	-0.3	VDD+0.3	V
Operating Temp.	TOP	-20	70	°C
Storage Temp.	TSTG	-30	80	°C

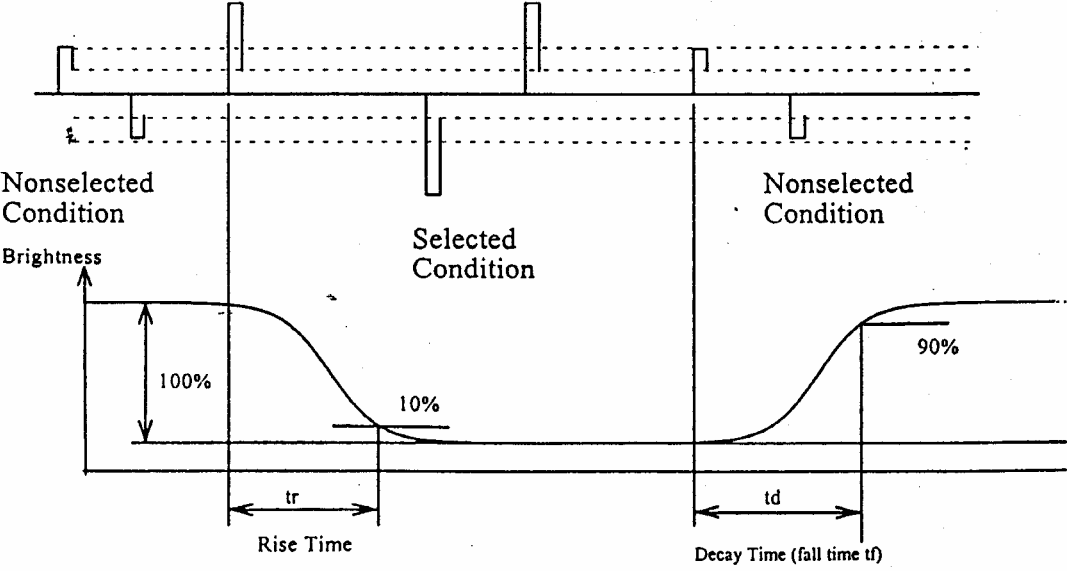
4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.4	2.8	3.5	V	
LCD Driving Voltage (FSTN)	VLCD	-20 °C	--		--	V	
		25 °C	9.8	10	10.2		
		70 °C	--		--		
Input Voltage	VIH	--	0.8VDD	--	VDD	V	
	VIL	--	-0	--	0.2 VDD	V	
Logic Supply Current	IDD	VDD=2.8V	--	0.23	0.45	mA	
----- Optical Characteristics (FSTN) -----							
Contrast	CR	25°C	--	8	--		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	

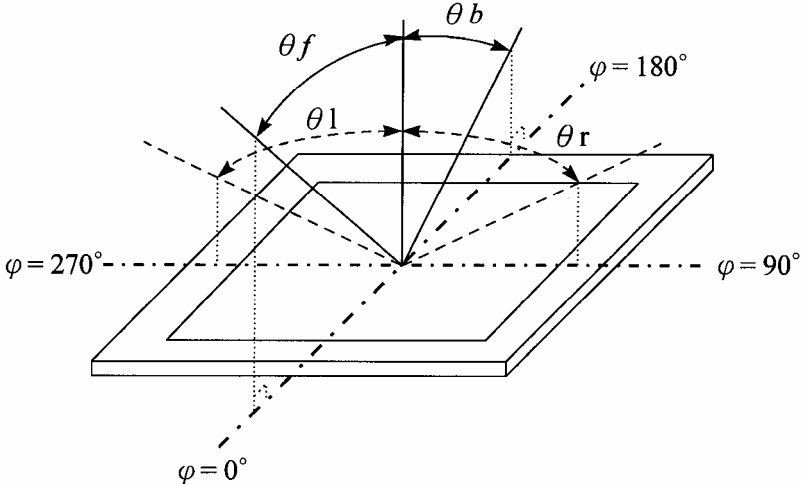
(NOTE 1) Contrast ratio :

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

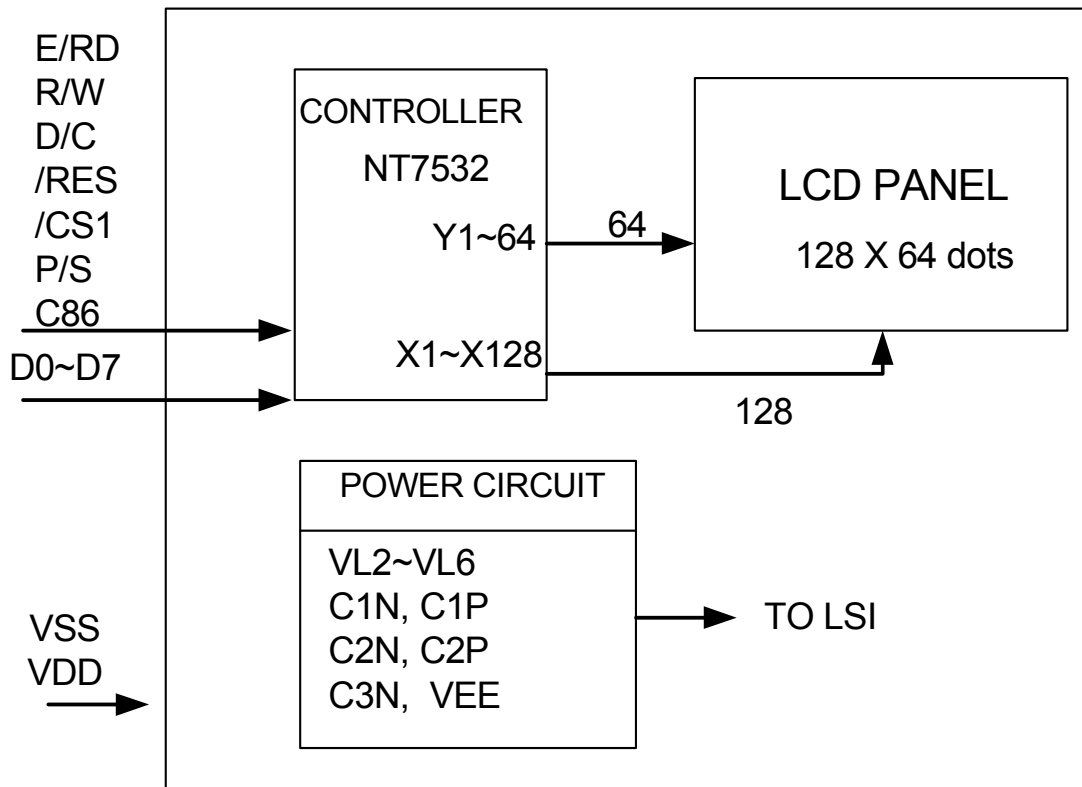
(NOTE 2) Response time :



(NOTE 3) Viewing angle



5 BLOCK DIAGRAM & POWER SUPPLY



6 INTERFACE

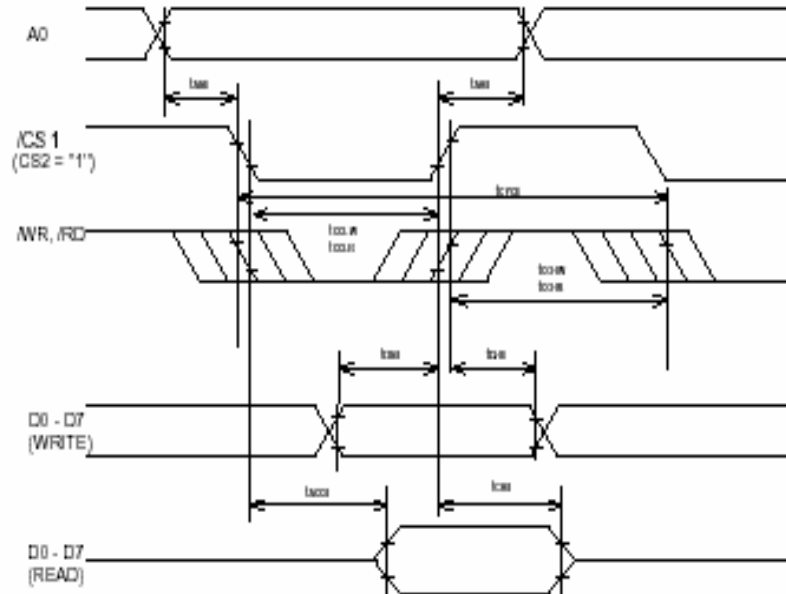
No.	Symbol	Function	
1	/CS1	Chip select signal (L: select; H: Non select)	
2	/RES	When /RES is set to "L", the settings are initialized The reset operation is performed by the /RES signal level	
3	AO	A0 = "H": Indicates that D0 to D7 are display data A0 = "L": Indicates that D0 to D7 are control data	
4	/WR	Read / Write execution control pin 68 series: "H": read "L": write 80 series: "L": data write operation	
5	/RD	Enable / Read execution control pin 68 series: "H": read/write data operation 80 series: "L": data read operation	
6	DB0	8-bit data bus	When the serial interface selected (P/S="L"), DB0~DB5 : high impedance
7	DB1		
8	DB2		
9	DB3		
10	DB4		Serial input clock (SCL)
11	DB5		
12	DB6		
13	DB7		
14	VDD	Power supply for logic	
15	VSS	Ground (0V)	
16	VOUT	Voltage converter output	
17	CAP3+	Used to voltage booster according to the boosting ratio.	
18	CAP1-		
19	CAP1+		
20	CAP2+		
21	CAP2-		
22	V1	LCD driver supply voltage $VDD (=V0) \geq V1 \geq V2 \geq V3 \geq V4 \geq VSS$	
23	V2		
24	V3		
25	V4		
26	V0		
27	VR	Voltage adjustment pad. Applies voltage between V0 and V _{SS} using a resistive divider.	
28	C86	This is the MPU interface switch terminal C86 = "H": 6800 Series MPU interface	

		C86 = "L": 8080 MPU interface
29	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
30	IRS	This terminal selects the resistors for the V0 voltage level adjustment. IRS = "H", Use the internal resistors IRS = "L", Do not use the internal resistors

7 TIMING CHARACTERISTICS

8080-SYSTEM

System buses Read / Write characteristics 1 (For the 8080 Series MPU)



($V_{DD} = 2.4 - 3.5V$, $T_A = -40 - 85^{\circ}C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
tAH8	Address hold time	0			ns	
tAS8	Address setup time	0			ns	
tCYC8	System cycle time	300			ns	
tCCLW	Control L pulse width (/WR)	90			ns	
tCCLR	Control L pulse width (/RD)	120			ns	
tCCHW	Control H pulse width (/WR)	120			ns	
tCCHR	Control H pulse width (/RD)	60			ns	
tDS8	Data setup time	40			ns	
tDH8	Data hold time	15			ns	
tACC8	/RD access time			140	ns	$C_L = 100pF$
tCH8	Output disable time	10		100	ns	$C_L = 100pF$

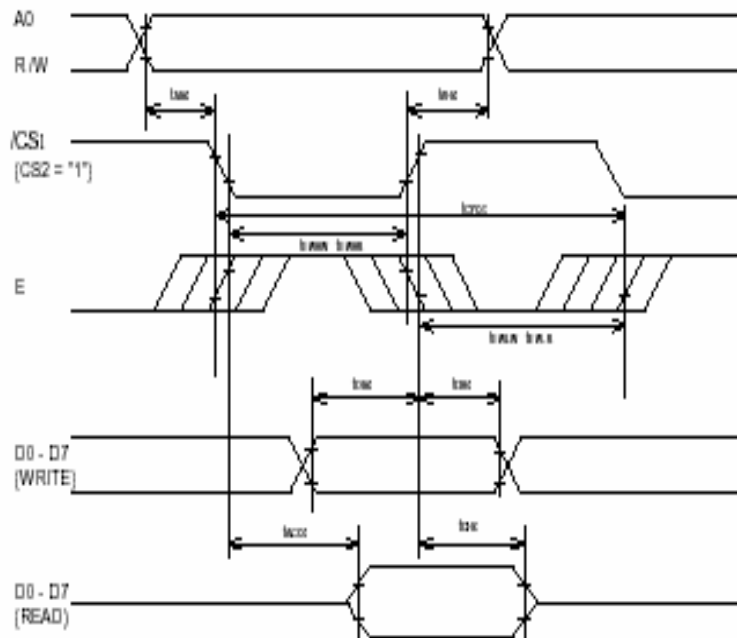
*1. The input signal rise time and fall time (t_r , t_f) is specified at 15ns or less. When the system cycle time is extremely fast, $(t_r+t_f) \leq (t_{CYC8}-t_{CCLW}-t_{CCHW})$ for $(t_r+t_f) \leq (t_{CYC8}-t_{CCLR}-t_{CCHR})$ are specified.

*2. All timing is specified using 20% and 80% of V_{DD} as the reference.

*3. tCCLW and tCCLR are specified as the overlap between CS1 being "L" (CS2 = "H") and /WR and /RD being at the "L" level.

6800-SYSTEM

System buses Read/Write Characteristics 2 (6800 Series MPU)



($V_{DD} = 2.4 - 3.5V$, $T_A = -40 - 85^\circ C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
tCYC6	System cycle time	300			ns	
tAS6	Address setup time	0			ns	
tAH6	Address hold time	0			ns	
tDS6	Data setup time	40			ns	
tDH6	Data hold time	15			ns	
tOH6	Output disable time	10		100	ns	$C_L = 100pF$
tACC6	Access time			140	ns	$C_L = 100pF$
tEWHR	Enable H pulse width (Read)	120			ns	
tEWHW	Enable H pulse width (Write)	90			ns	
tEWLR	Enable L pulse width (Read)	60			ns	
tEWLW	Enable L pulse width (Write)	120			ns	

*1. The input signal rise time and fall time (t_r , t_f) is specified at 15ns or less. When the system cycle time is extremely fast, $(t_r+t_f) \leq (t_{CYC6}-t_{EWLW}-t_{EWHW})$ for $(t_r+t_f) \leq (t_{CYC6}-t_{EWLR}-t_{EWHR})$ are specified.

*2. All timing is specified using 20% and 80% of V_{DD} as the reference.

*3. tEWLW and tEWLR are specified as the overlap between /CS1 being "L" (CS2 = "H") and E.

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

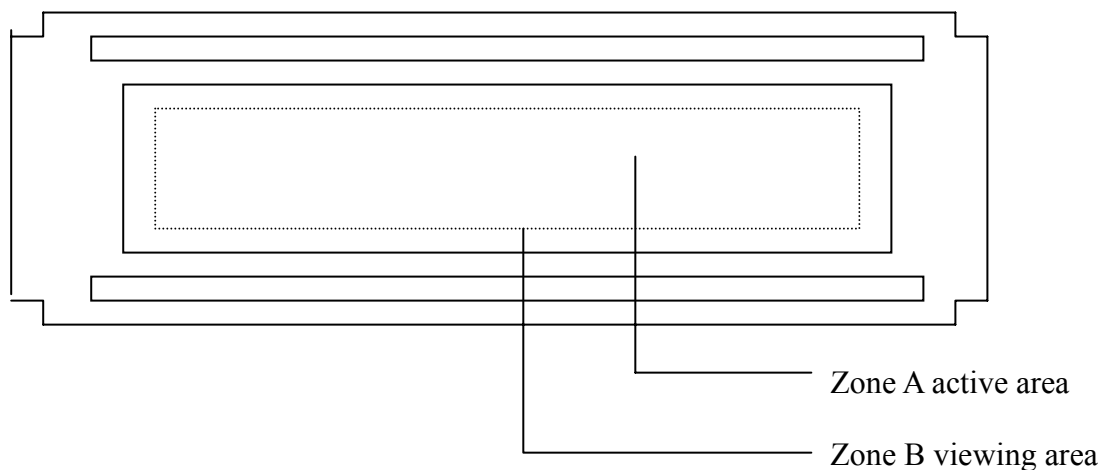
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant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



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).

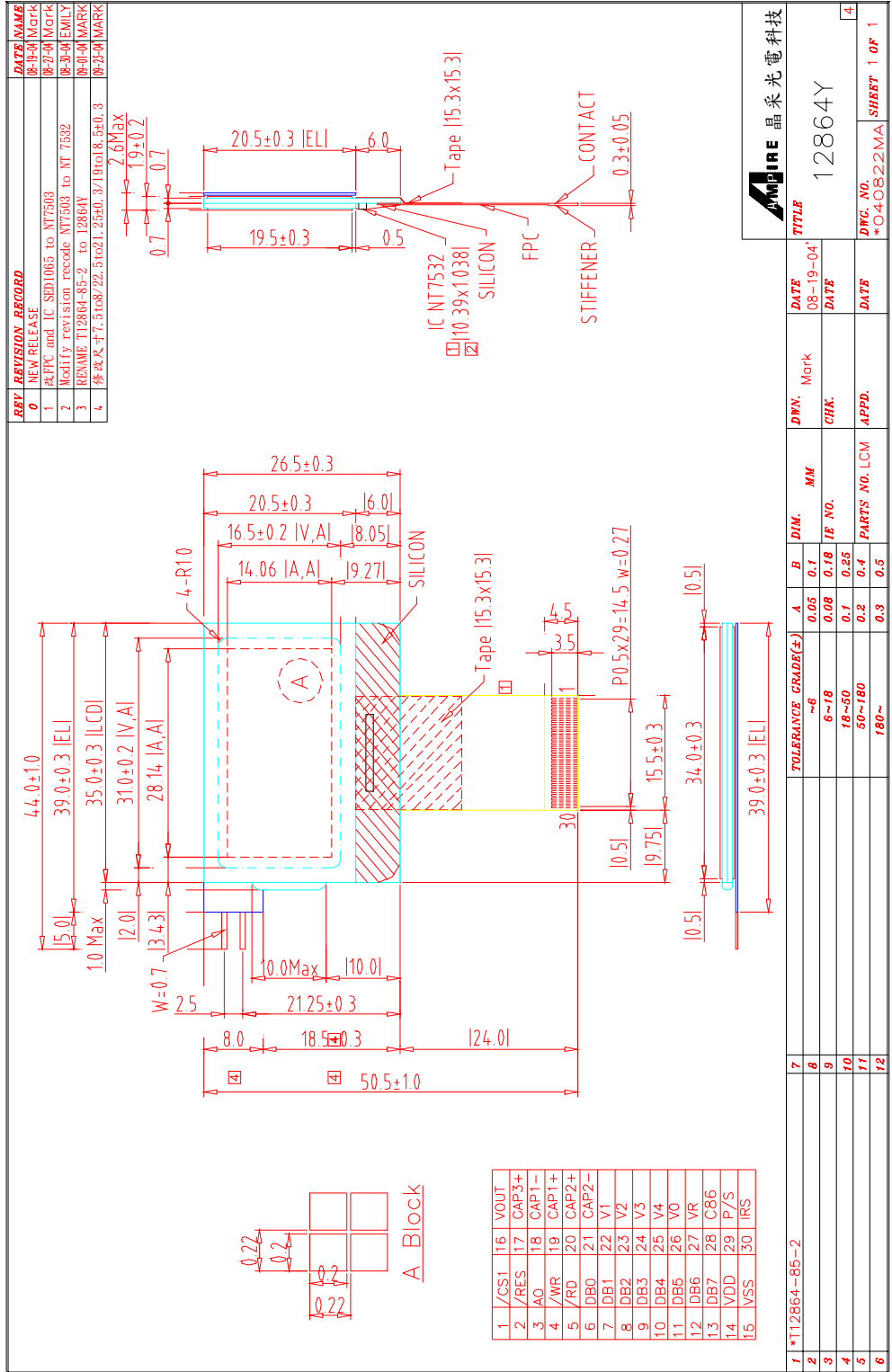
Definitions of life end point :

- 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.

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



AMPIRE 晶采光電科技		TITLE	
7	TOLERANCE GRADE(%)	A	B
8		0.05	0.1
9		0.08	0.18
10		0.1	0.25
11		0.2	0.4
12		0.3	0.5
13		180~	
14		50~180	
15		6~78	
16		-6	
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