

Specification for Mono LCD Display module

128 x 64 STN Monochrome Display module

Manufacturer	Yes Optoelectronics Co., Ltd
Part n°	YMS12864-01AEDYDCL
Ordering n°	YMS12864-01AEDYDCL
Customer Part n°	n/a
Revision n°	1.0
Issue Date	2015/11/19

Customer's Approval

Company name	
Printed name	
Job title	
Signature	
Approval Stage:	<p>This product is approved for the following production stage: -</p> <p><input type="checkbox"/> Sample / Prototype</p> <p><input type="checkbox"/> Pre-Production</p> <p><input type="checkbox"/> Mass Production</p>
Approval Date	

Supplied by Anders Electronics plc
 Manufactured by Yes Optoelectronics Co., Ltd



YES OPTOELECTRONICS CO.,LTD

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY MODULE

MODEL NO.: YMS12864-01AEDYDCL

DATE: NOV.19.2015

Approved	Checked	Department

CUSTOMER:

MODEL NO.:

DATE:

Approved	Checked	Department

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REVISION HISTORY

Rev	Date	Item	Page	Remark
1.0	NOV.19.2015	New Creation	ALL	

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I . General Specifications

1.Features

Item	Contents	Unit
Drive Method	1/64 Duty ,1/9 Bias	/
Operating voltage	5	V
Viewing direction	6:00	O' Clock
Operating Temperature	-20~70	°C
Storage Temperature	-30~85	°C
Display type	STN mode, Transflective, Positive type display	/
Module Size	93.0*70.0	mm
View Area	70.7*38.8	mm
Dot Size	0.48*0.48	mm

2.Pin Connections:

Pin No.	Symbol	Function
1	Vss	Ground
2	Vdd	Logic Supply Voltage(+5.0v)
3	V0	LCD Driver Voltage Input(+13.5v)
4	RS	Data Or Instruction
5	R/W	Read/Write Select
6	E	Enable Signal
7~14	DB0~DB7	Data Bus Line
15	CS1	Chip Selection(Segment Driver 1)
16	CS2	Chip Selection(Segment Driver 2)
17	RSTB	Reset Signal
18	Vout	Dc-Dc-Converter Output
19-20	LED +,-	LED Backlight

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3. Absolute Maximum Ratings

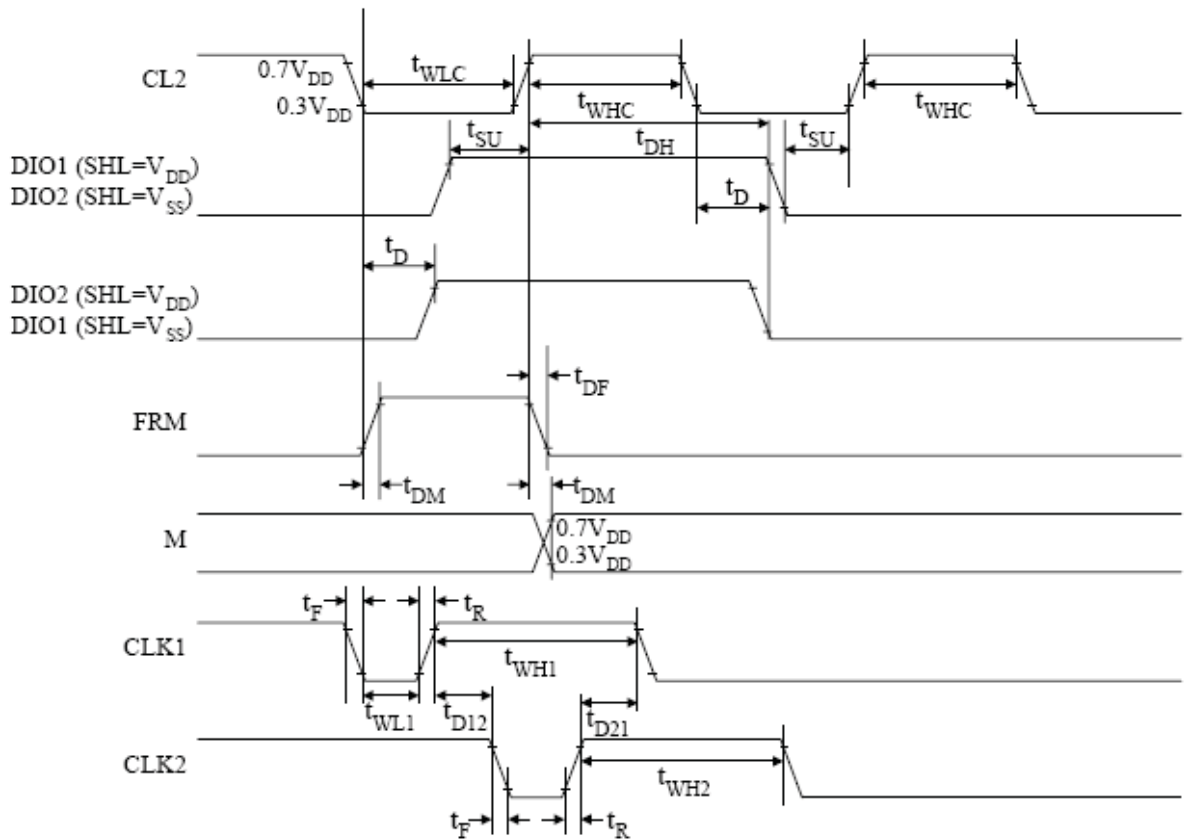
Characteristic	Symbol	Value	Unit	Note
Operating voltage	V _{DD}	-0.3 to +7.0	V	(1)
Supply voltage	V _{EE}	V _{DD} -19.0 to V _{DD} +0.3		(4)
Driver supply voltage	V _B	-0.3 to V _{DD} +0.3		(1),(3)
	V _{LCD}	V _{EE} -0.3 to V _{DD} +0.3		(2)

NOTES:

1. Based on V_{SS}=0V
 2. Applies the same supply voltage to V_{EE1} and V_{EE2}. V_{LCD}=V_{DD}-V_{EE}.
 3. Applies to M, FRM, CL, RSTB, ADC, CLK1, CLK2, CS1B, CS2B, CS3, E, R/W, RS and DB0-DB7.
 4. Applies to V0L(R), V2L(R), V3L(R) and V5L(R).
- Voltage level: V_{DD} ≥ V0L=V0R ≥ V2L=V2R ≥ V3L=V3R ≥ V5L=V5R ≥ V_{EE}.

4. Timing Characteristics:

Master Mode (MS=V_{DD}, PCLK2=V_{DD})

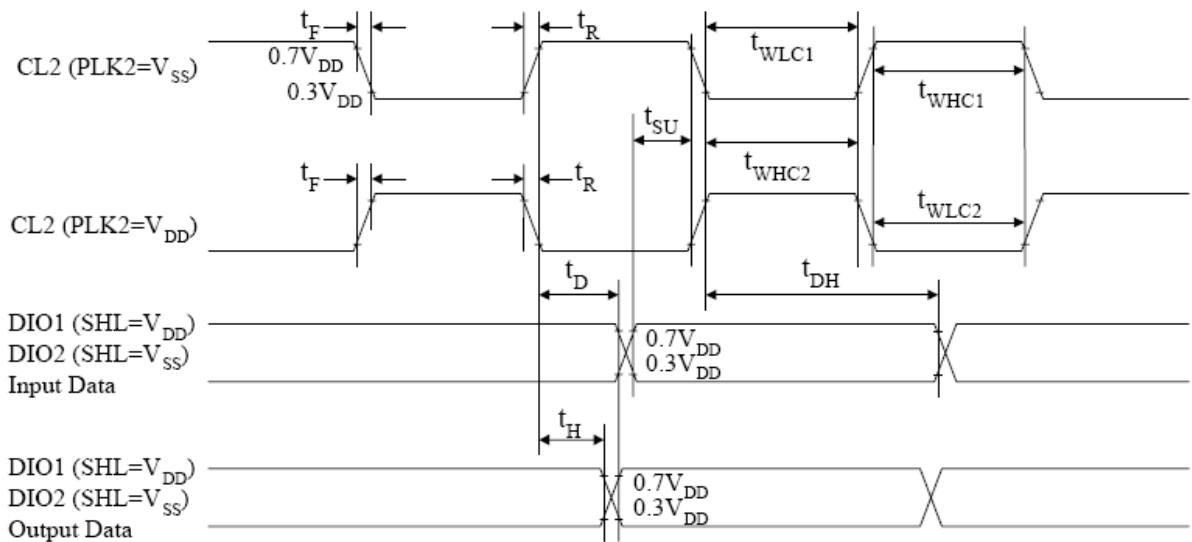


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Master Mode

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Data setup time	t_{SU}	20	-	-	μs
Data hold time	t_{DH}	40	-	-	
Data delay time	t_D	5	-	-	
FRM delay time	t_{DF}	-2	-	2	
M delay time	t_{DM}	-2	-	2	
CL2 low level width	t_{WLC}	35	-	-	
CL2 high level width	t_{WHC}	35	-	-	ns
CLK1 low level width	t_{WL1}	700	-	-	
CLK2 low level width	t_{WL2}	700	-	-	
CLK1 high level width	t_{WH1}	2100	-	-	
CLK2 high level width	t_{WH2}	2100	-	-	
CLK1-CLK2 phase difference	t_{D12}	700	-	-	
CLK2-CLK1 phase difference	t_{D21}	700	-	-	
CLK1,CLK2 rise/fall time	t_R/ t_F	-	-	150	

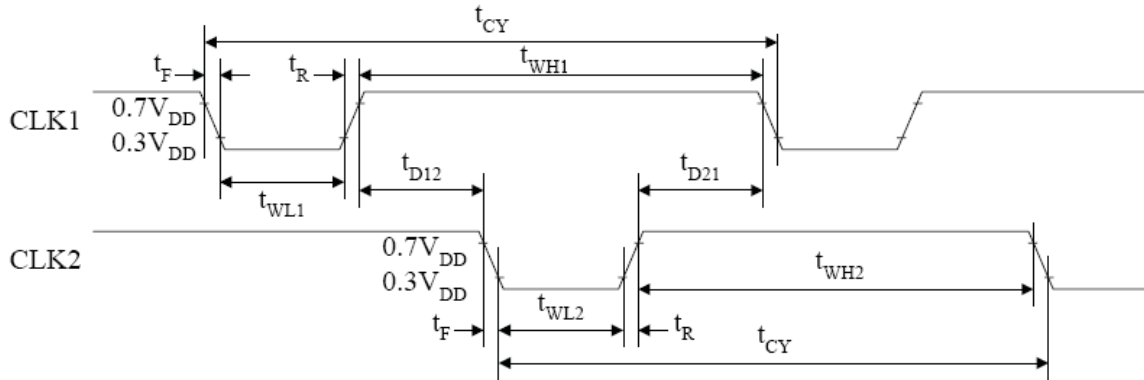
Slave Mode (MS= V_{SS})



Characteristic	Symbol	Min.	Typ.	Max.	Unit	Note
CL2 low level width	t_{WLC1}	450	-	-	ns	PCLK2= V_{SS}
CL2 high level width	t_{WHC1}	150	-	-		PCLK2= V_{SS}
CL2 low level width	t_{WLC2}	150	-	-		PCLK2= V_{DD}
CL2 high level width	t_{WHC2}	450	-	-		PCLK2= V_{DD}
Data setup time	t_{SU}	100	-	-		
Date hold time	t_{DH}	100	-	-		
Data delay time	t_D	-	-	200		(NOTE)
Output data hold time	t_H	10	-	-		
CL2 rise/fall time	t_R/ t_F	-	-	30		

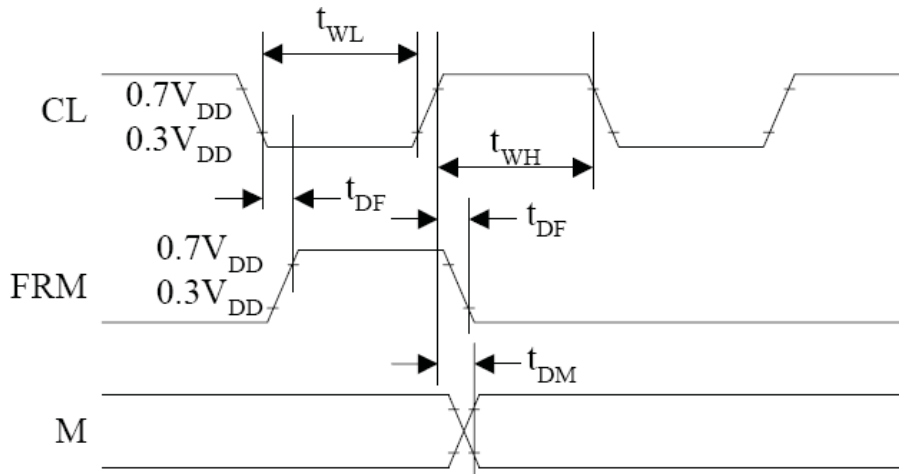
Clock Timing

Characteristic	Symbol	Min	Type	Max	Unit
CLK1, CLK2 cycle time	t _{cy}	2.5	-	20	μs
CLK1 "low" level width	t _{wl1}	625	-	-	ns
CLK2 "low" level width	t _{wl2}	625	-	-	
CLK1 "high" level width	t _{wh1}	1875	-	-	
CLK2 "high" level width	t _{wh2}	1875	-	-	
CLK1-CLK2 phase difference	t _{d12}	625	-	-	
CLK2-CLK1 phase difference	t _{d21}	625	-	-	
CLK1, CLK2 rise time	t _r	-	-	150	
CLK1, CLK2 fall time	t _f	-	-	150	



Display Control Timing

Characteristic	Symbol	Min	Type	Max	Unit
FRM delay time	t _{df}	-2	-	2	μs
M delay time	t _{dm}	-2	-	2	
CL "low" level width	t _{wl}	35	-	-	
CL "high" level width	t _{wh}	35	-	-	



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YES

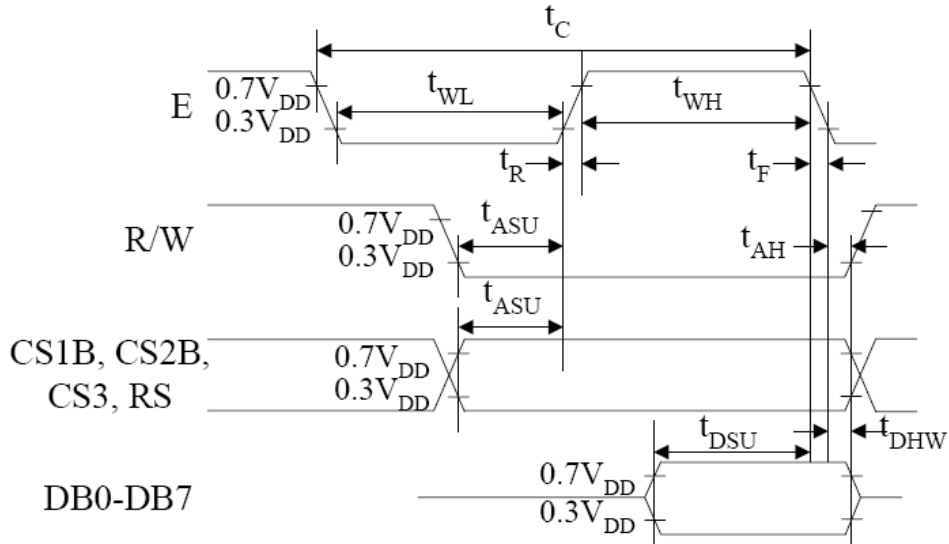
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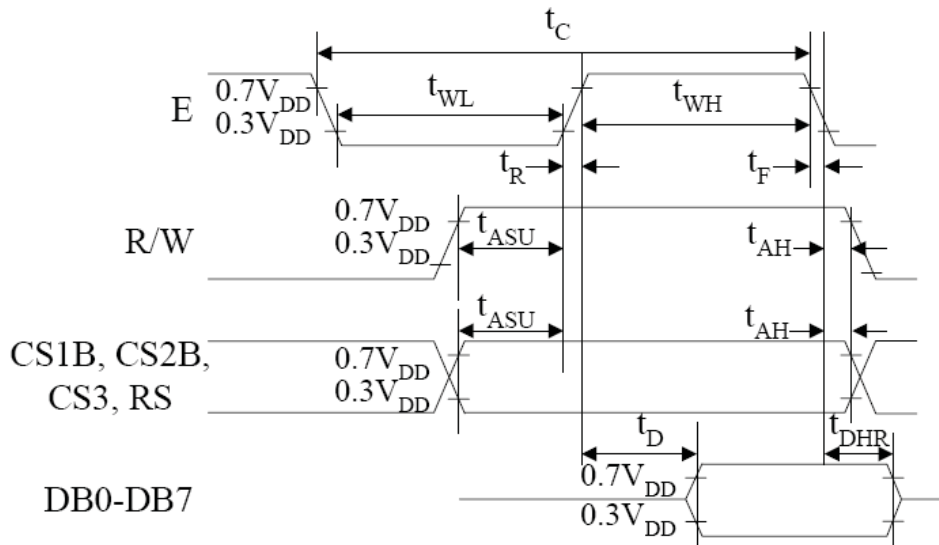
MPU Interface

Characteristic	Symbol	Min	Type	Max	Unit
E cycle	t_c	1000	-	-	ns
E high level width	t_{WH}	450	-	-	
E low level width	t_{WL}	450	-	-	
E rise time	t_R	-	-	25	
E fall time	t_F	-	-	25	
Address set-up time	t_{ASU}	140	-	-	
Address hold time	t_{AH}	10	-	-	
Data set-up time	t_{DSU}	200	-	-	
Data delay time	t_D	-	-	320	
Data hold time (write)	t_{DHW}	10	-	-	
Data hold time (read)	t_{DHR}	20	-	-	

MPU Write Timing



MPU Read Timing



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II .The Characteristics and The Reliability Test

1. Electro-Optic Characteristics:

Measuring Condition: TEMP=(23±3)°C, HUM= (55±10)%RH

NO.	Item	Symbol	Min	Type	Max	Unit
1	Operating Voltage	V _{lcd}	13.3	13.5	13.7	V
2	Operating Frequency	F		64		Hz
3	Response Time	Rising Time	Tr		103	mS
		Decay Time	Td		60	
4	Contrast Ratio	CR	3			
5	Viewing Angle (CR≥2)	12H φ=90°	θ 1		44	deg
		6H φ=270°	θ 2		57	
		3H φ=0°	θ 3		55	
		9H φ=180°	θ 4		55	

2. Characteristics of backlight (LED unit)

Color:Yellow-Green

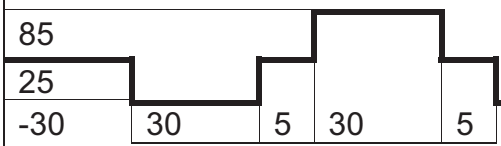
Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Forward Voltage	V _f	3.90	4.10	4.30	V	I _f = 180 mA
Dominant Wave length	λ _D		568		nm	
Uniformity	Avg	58	66		%	
Luminance	L _v	35	44		cd/m ²	
Reverse Current (Per LED)	I _r			15	μA	V _r = 3 V

WARNING:

A BACKLIGHT IS A KIND OF CURRENT DEVICE,IT MUST CONNECT WITH A RESISTOR FOR LIMITING CURRENT ,OR IT WILL BE DAMAGED.

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3. Reliability Test

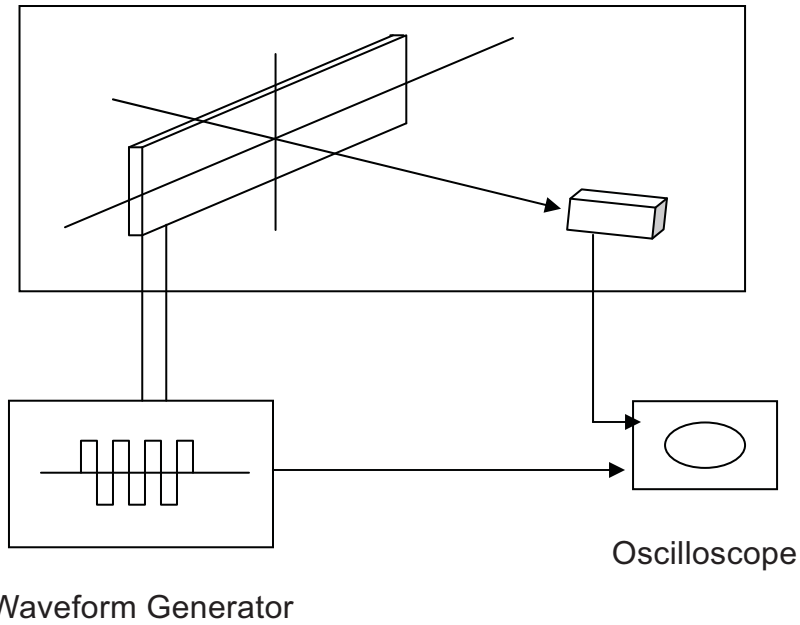
No	Items	Test Condition	Test Result
1	High Temp Storage	Temp:85±2℃ Time:96h Restore:24h	Passed
2	Low Temp Storage	Temp:-30±3℃ Time:96h Restore:24h	Passed
3	HIGH TEMP OPERATING	Temp:70±2℃ Vop:5.0V Time:24h Restore:24h	Passed
4	LOW TEMP OPERATING	Temp:-20±3℃ Vop:5.0V Time:24h Restore:24h	Passed
5	High Temp High Hum Storage	Temp:40±2℃ Hum:90%Rh Time:96h Restore:24h	Passed
6	Thermal Shock	Temp:(℃)  5 Cycles Restore:24h	Passed

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III.The LCD Measuring Method and Equipment

1. Threshold Voltage and Response Time Measuring

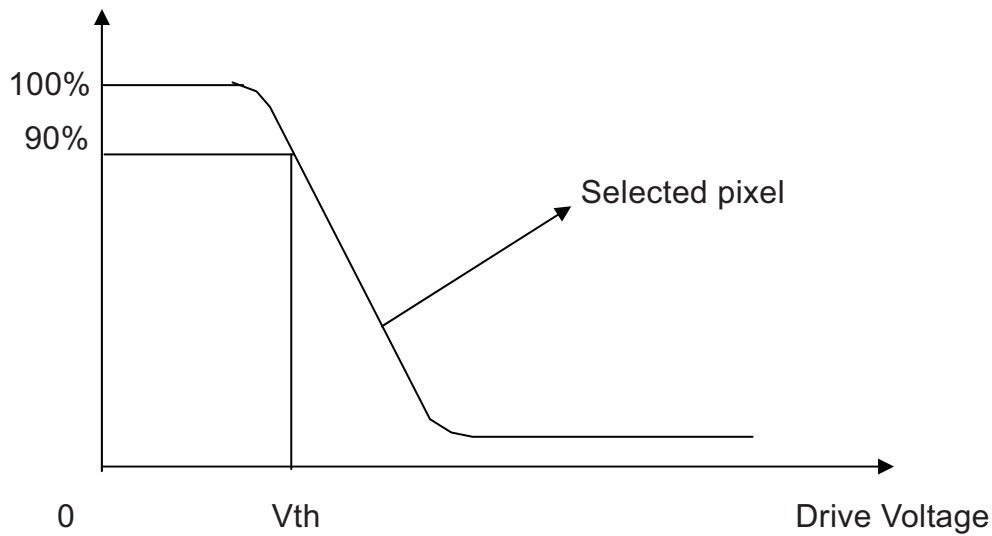
(1) Equipment



(2) Definition

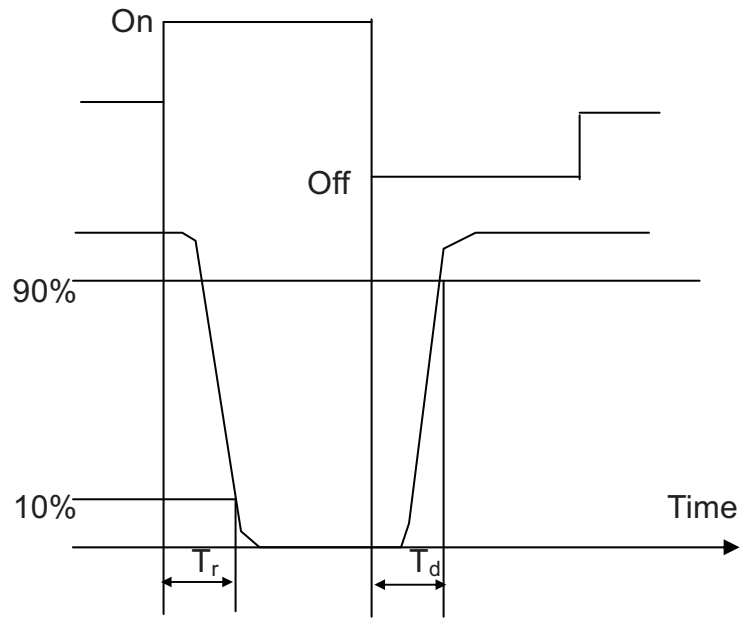
A. Threshold Voltage (V_{th})

Brightness

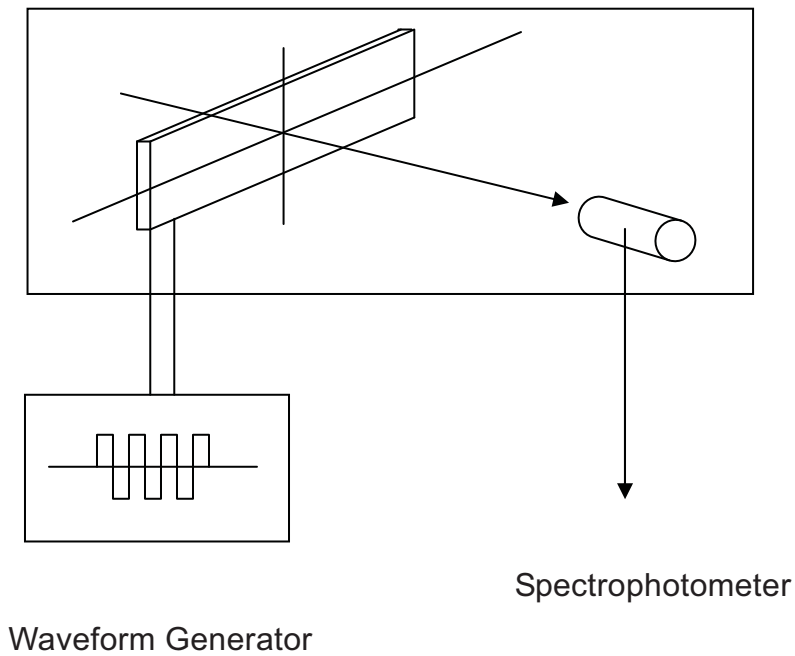


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B. Response Time



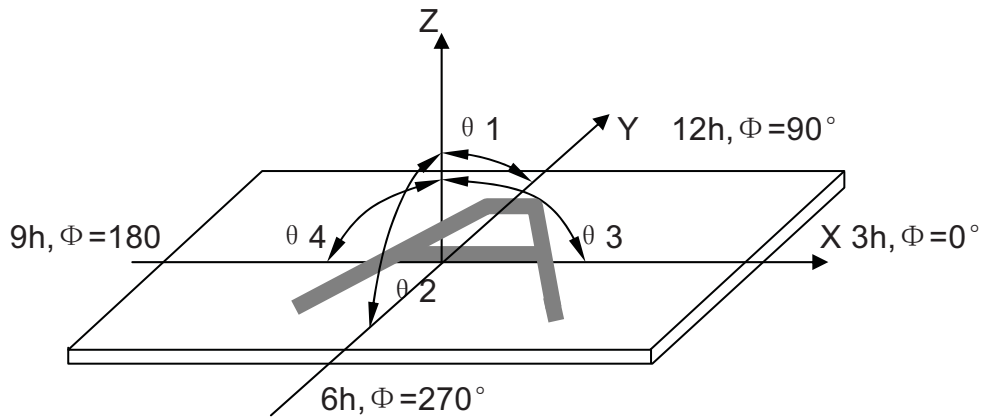
2. Contrast Measuring
(1) Equipment



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(2)Definition:

A.Viewing Angle:



B. Contrast Ratio (Positive)

$$CR = \frac{\text{Brightness of non-selected pixel}}{\text{Brightness of selected pixel}}$$

3. Reliability Test:

Equipment : TENNY

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IV. Standard Specifications for Product Quality

1. Warranty time: one year

2. MTBF

More than 50,000 hours.

3. Manner of test::

1.1 The test must be under 40W fluorescent light, and the distance of view must be at 30cm.

1.2 The test direction is based on around -10°- 30° of Vertical line.

4. Quality specification

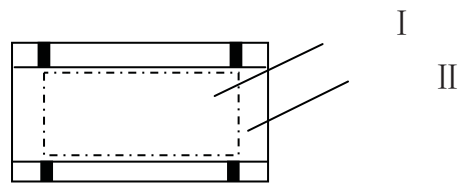
It shall be based on GB2828-87, Apply level II, Normal inspection by single sampling.

	IETM	CHECK LEVEL	AQL
MAJOR (MA)	1.LIQUID CRYSTAL LEAKAGE 2.WRONG POLARIZER 3.OUTSIDE DIMENSION 4.SEGMENT MISSING 5.SEGMENT SHORT	II	0.25
MINOR (MI)	1.BLACK SPOTS OR WHITE SPOTS. 2.FOREIGN SUBSTANCE, 3.WHITE SPOTS, 4.PINHOLE,SEGMENT 5.DEFORMATION SCRATCHS(GLASS & POLARIZER), 6.SEGMENT DEFECT, 7.AIR BUBBLES BETWEEN GLASS & POLARIZER, 8.COLOR VARIATION, GLASS CHIPS, 9.OTHER VISUAL DEFECTS.	II	1.0

5. Definition of area:

3.1 I area: viewing area

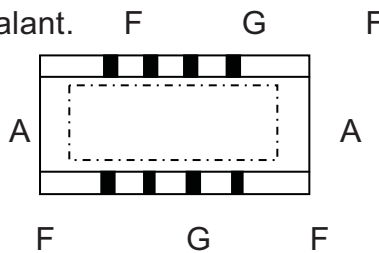
II area: outside viewing area



3.2 A area: The glass area outside sealant.

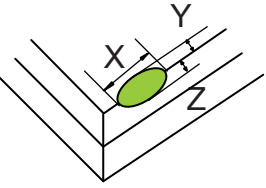
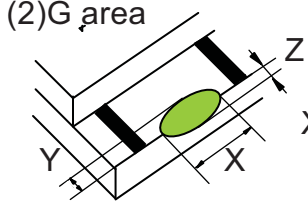
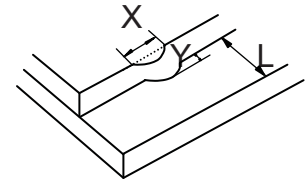
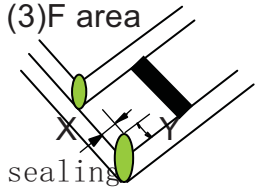
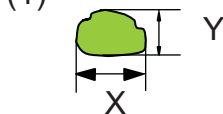
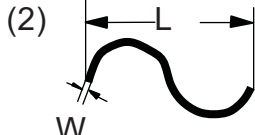
G area: Electrode pad area.

F area: Without electrode pad area.



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6. Standard of appearance test: (unit: mm)

No	Items	Criterion	Checking manner
1	Substrate crack X: defect Length Y: defect Width Z: defect Depth T: glass Thickness N: defect QTY L: Connector Width	<p>(1) A area</p>  <p>$X \leq 3.0$ Y: Don't allowed hurt sealing $Z \geq T/2$ $N \leq 3$ $X \leq 5.0$ Y: Don't allowed hurt sealing $Z \leq T/2$ $N \leq 3$ $X \leq 1.0$ $Y \leq 0.5$ $Z \leq T/3$ No check</p> <p>(2) G area</p>  <p>$X \leq 3.0$ $Y \leq 0.5$ $Z \leq T/2$ $N \leq 2$</p>  <p>$X \leq \text{total length}$ $Y \leq 1/4L$ $N \leq 1$ Over the drawing tolerance is not allowed</p> <p>(3) F area</p>  <p>$X \leq 2.0$ $Y \leq 3$ $Z \leq T$ $N \leq 3$ Don't allowed hurt</p>	checking with eyes
2	Black spot white spot $D = (X+Y)/2$ Line	<p>(1)</p>  <p>$0.2 < D \leq 0.25$ $N \leq 1$ $0.1 < D \leq 0.2$ $N \leq 3$ $D \leq 0.1$ No check</p> <p>(2)</p>  <p>$L \leq 2.0$ $W \leq 0.03$ $N \leq 2$ $L \leq 1.0$ $W \leq 0.05$ $N \leq 1$</p>	Checking on the table with light and polarizer and checking with eyes directly.

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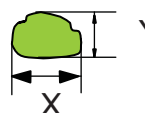
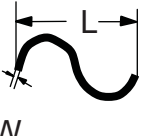
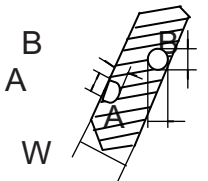
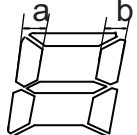
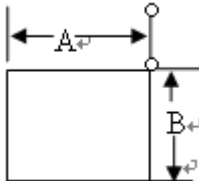
YES

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No	Items	Criterion	Checking manner
3	Polarizer Bubble	$D \leq 0.15$ No check $0.15 < D \leq 0.4$ $N \leq 2$	Checking on the table with light and polarizer, and checking with eyes directly
4	Rainbow Color	Allow tiny rainbow Allow 5% color contrast or accord limitative sample	Checking on the table with light and polarizer, And checking with eyes directly
5	END Seal	1. Dimension accord design require 2. Inject depth (d): $1/5D \leq d \leq D$ (D: seal design depth)	Checking with eyes
6	Polarizer or pad appearance	No dirty	Checking with eyes

7 Standard of display test

No	Items	Criterion	Checking manner
1	Black spot white spot $D = (X+Y)/2$ Line	(1)  Y X $0.2 < D \leq 0.25$ $N \leq 1$ $0.1 < D \leq 0.2$ $N \leq 3$ $D \leq 0.1$ No check (2)  L W $L \leq 2.0$ $W \leq 0.03$ $N \leq 2$ $L \leq 1.0$ $W \leq 0.05$ $N \leq 1$	Checking at the display state
2	Pin hole $D = (A+B)/2$ W: segment width	 B A W $W \leq 0.4$ $D \leq 0.20$ And $D \leq 1/2W$ $N \leq 1$ $W > 0.4$ $D \leq 0.25$ And $D \leq 1/3W$ $N \leq 2$ $D \leq 0.05$ No check	Checking at the display state
3	Different width of segment	 a b $ a-b < 0.25$ or $ a-b \leq 1/4W$ No check	Checking at the display state
4	Different width	 A B A: distortion $\leq 10\%$ B: distortion $\leq 10\%$ Superfluous Electrode lines display is not allowed	

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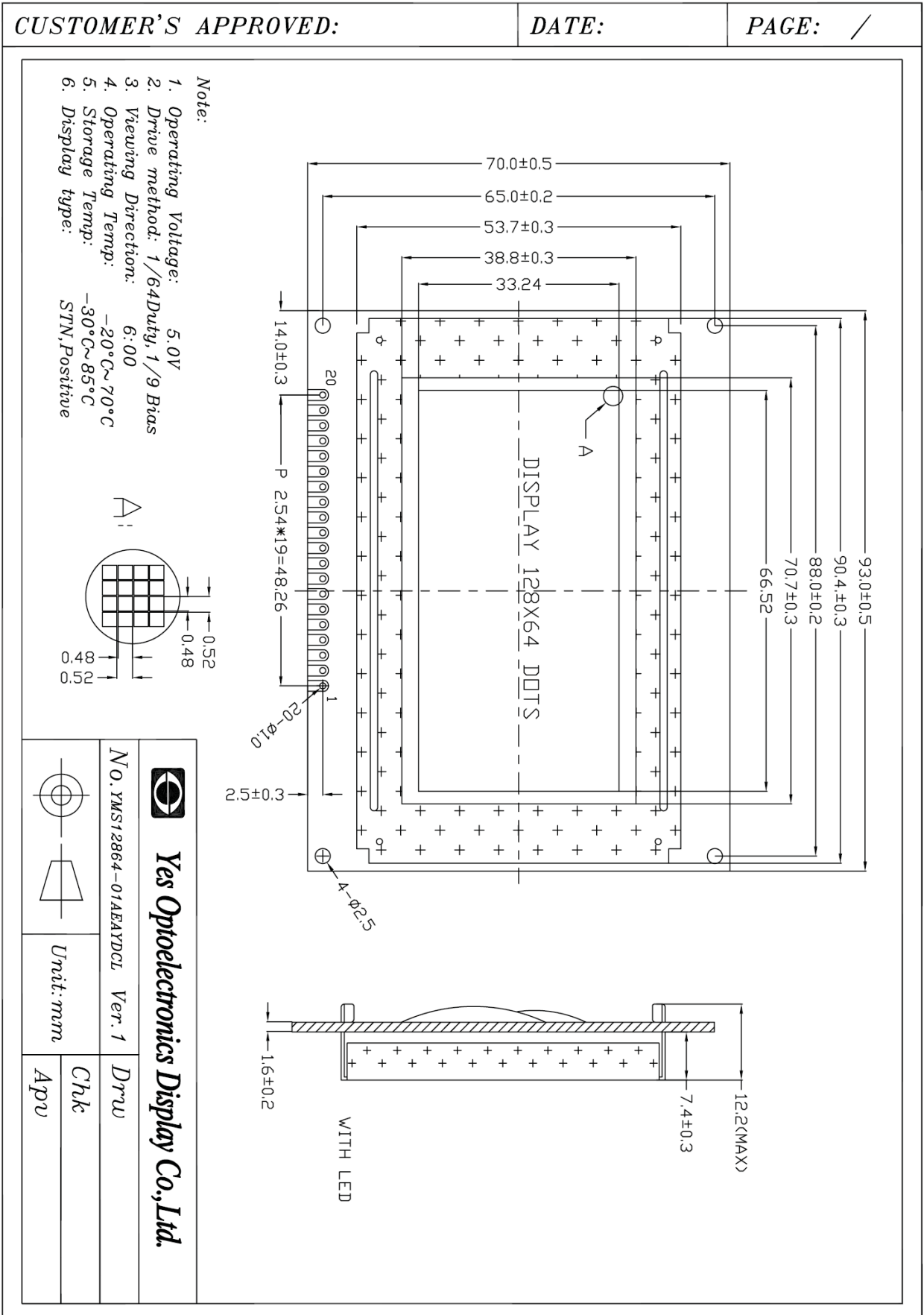
5	Pinhole	$\Phi = (A+B) / 2$	$0.15 < \Phi \leq 0.2 \quad N \leq 1$ $0.05 < \Phi \leq 0.15 \quad N \leq 3$ $\Phi \leq 0.05 \quad \text{Any number}$ Note: Distance between two spots $\geq 10\text{mm}$, $\Phi < 1/3$ pixels
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7. Inspection Item

Item	The Standard Of Quality Inspection	Checking Method	Quantity Ratio
Frame	Smooth and even surface, no crack, no scratch, no rusty, and not be wrenched out of shape. the range between convex and concave is: $d \leq 0.35\text{mm}$, and the frame must be connected with the ground pad.	Checking With Eyes And Using Vernier Caliper, Multimeter	100%
The Relative Position of LCD and Frame	The end seal of the LCD must be at the same side with the frame's opening.	Checking With Eyes	100%
The Relative Position of PCB/Panel /Frame	The frame installing direction must be correct. the twisted angle of the leg is from 45° to 60° , the leg is vertical to PCB panel and it must be in the middle position of the installing holes.	Checking With Eyes	100%
LED	1. The LED must be Yellow-Green. 2. The LED must be uniform.	Checking With Eyes	100%
Function Test	1. The major defects must be reject. 2. Background changes evenly and no disorderly displaying phenomenon. 3. Display no shortage.	Check It When Displaying	100%

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V.Attached Drawing



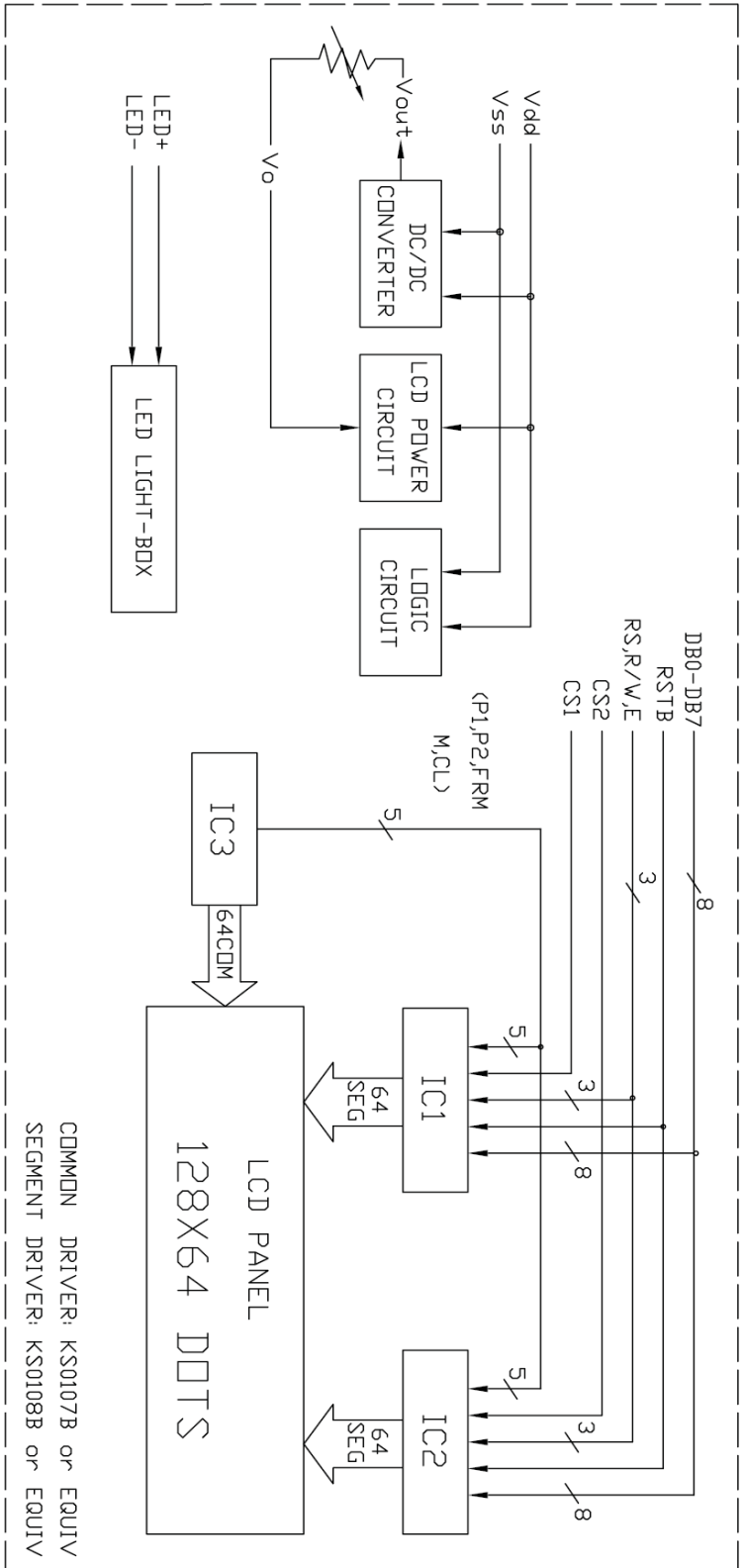
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CUSTOMER'S APPROVED:


DATE:

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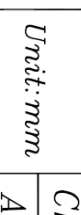
PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SYMBOL	VSS	Vdd	Vo	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	CS1	CS2	RSTB	Vout	LED+	LED-



COMMON DRIVER: KS0107B or EQUIV
SEGMENT DRIVER: KS0108B or EQUIV


Yes Optoelectronics Display Co., Ltd.

NO. YMS12864-01AEDYDCL Ver. 1

	Unit: mm	Drw	Chk
	Unit: mm	Aprv	Aprv

DATE NOV.19.2015

TECHNICAL SPECIFICATION

LCM

YES

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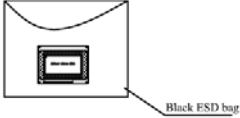
VI.Packing

<i>CUSTOMER'S APPROVED:</i>	<i>DATE: 2015.11.19</i>	<i>PAGE: 1/1</i>
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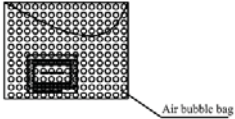
PRODUCT PART NO.:YMS12864-01AEAYDCL

Packing Process:

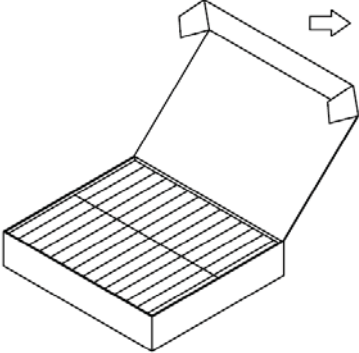
- 1) Putting Modules into each black ESD bag
- 2) Putting Modules with black ESD bag into the air bubble bag
- 3) Putting 50pcs Modules into the inner box (TYPE:H82) and space filled filling piece



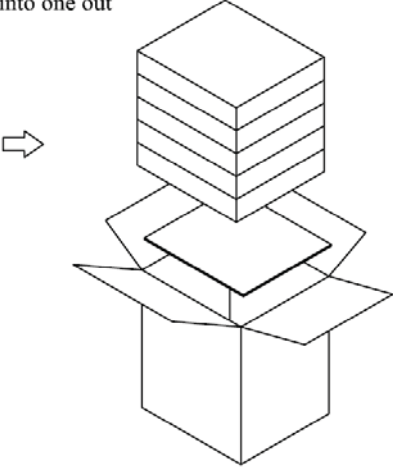
Black ESD bag

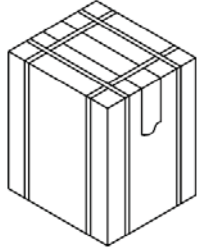


Air bubble bag



- 4) Putting 5 small inner boxes into one out carton
- 5) Packing finished





Note: 50x5=250pcs/Outcarton
 Dimension (Small carton): 385*325*87mm Dimension (Out carton): 394*344*470mm

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VII. Precautions For Use

1. Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

2. Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is $25\pm 5^{\circ}\text{C}$ and the humidity is $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

3. Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements.

4. Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage (V_o). Adjust V_o to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

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(4) When turning the power on, input each signal after the positive/negative voltage becomes stable.

(5) Do not apply water or any liquid on product which composed of T/P.

5.Handling Precautions

(1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.

(2) The polarizing plate of the display is very fragile. so, please handle it very carefully.

(3) Do not give external shock.

(4) Do not apply excessive force on the surface; it may cause display abnormal .

(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

(7) Do not operate it above the absolute maximum rating.

(8) Do not remove the panel or frame from the module.

(9) Do not apply water or any liquid on product which composed of T/P.

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