

NAN YA PLASTICS CORP.
ELEC. MATERIALS DIV.
LCD DEPARTMENT

SPECIFICATION

SPEC. NO. : LM128-0
DATE : Sep. 24, 1998
SHEET NO. : 1/18

U.S. MARKETING ARM:

MARK PRODUCTS CORPORATION
800 N. EDGEWOOD AVENUE
WOOD DALE, IL 60191
TEL: 630-787-9089
FAX: 630-787-9015

SPECIFICATION OF
128x64 LCD MODULE
PRODUCT NO.: LM_55_128____

SPEC. NO.: LM128-0

CUSTOMER
APPROVED BY
DATE:

EDITED ON : Sep.24.1998

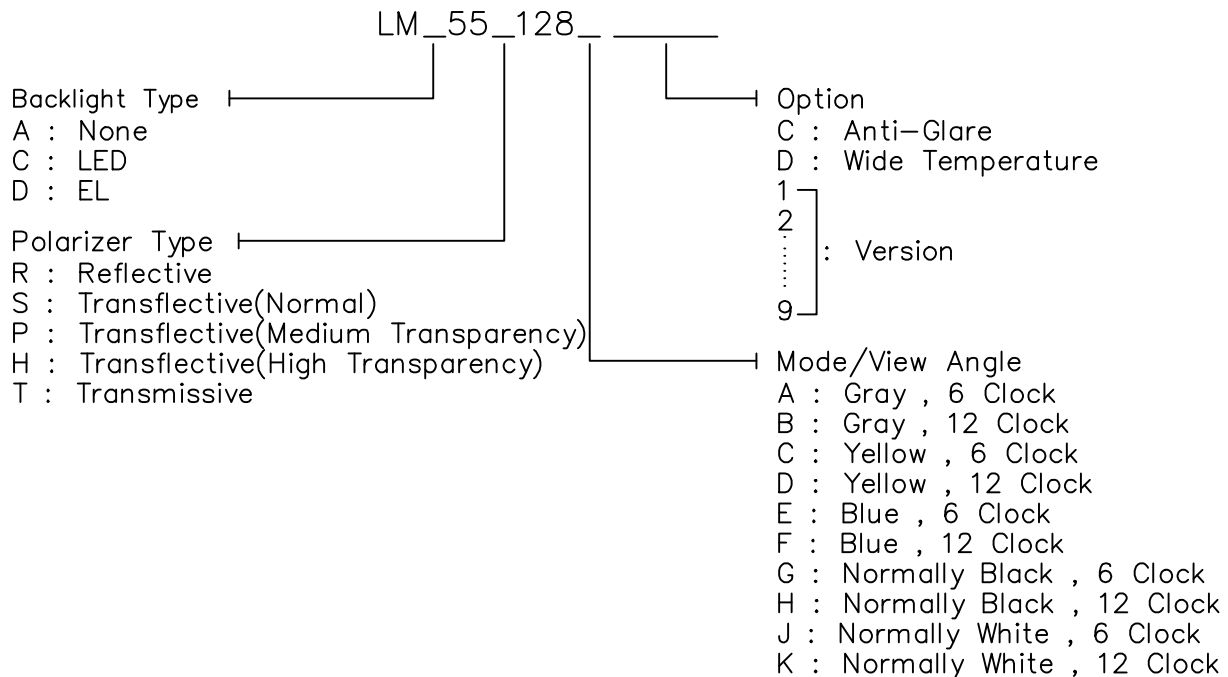
SALE MANAGER	TECHNICAL APPROVE	DESIGN MANAGER	DESIGN CHECK	DESIGNER

REV/DATE	RO/ 11.07.97'	R1/ 09.24.98'				APP	CHK	BY
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1. MECHANICAL DATA

- (1) Product No. LM_55_128_
- (2) Module Size 54.0 (W)mm x 54.5 (H)mm x MAX10.0 (D)mm
(W/O,LED B.L.)
- (3) Dot Size 0.29 (W)mm x 0.39 (H)mm
- (4) Dot Pitch 0.33 (W)mm x 0.43 (H)mm
- (5) Number of Dots 128 (W) x 64 (H)Dots
- (6) Duty 1/64
- (7) LCD Display Mode STN: Gray Mode Yellow Mode Blue Mode
FSTN: Black and White(Normal White/Positive Image)
 Black and White(Normal Black/Negative Image)
Rear Polarizer: Reflective Transflective Transmissive
 Transflective(High Transmissive)
- (8) Viewing Direction 6 O'clock 12 O'clock ___O'clock
- (9) Backlight W/O LED EL CCFT
- (10) Weight W/O B/L: about 25 g
LED B/L: about 31 g

Note :



REV/DATE	R0/ 11.07.97'	R1/ 09.24.98'				APP	CHK	BY
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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

V_{SS}=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	-0.3	6.5	V	
Input Voltage	V _I	-0.3	VDD+0.3	V	
Static Electricity	-	-	-	-	Note 1

Note 1 LCM should be grounded during handling LCM.

(2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	NORMAL TEMP.				WIDE TEMP.			
	OPERATING		STORAGE		OPERATING		STORAGE	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	-20	70	-20	70	-30	80
Humidity (Without Condensation)	Note 2,4		Note 3,4		Note 4,5		Note 4,6	

Note 2 Ta ≤ 50°C : 85%RH max
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

Note 3 Ta at -20°C will be < 48hrs, at 70°C will be < 120hrs

Note 4 Background color will change slightly depending on ambient temperature. That phenomenon is reversible.

Note 5 Ta ≤ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 6 Ta at -30°C will be < 48hrs, at 80°C will be < 120hrs

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3. ELECTRICAL CHARACTERISTICS

(VDD= 5V ± 5%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Power Supply for Voltage	VDD-VSS	-	4.75	5.0	5.25	V	
Input Voltage	VIH	H level	0.8VDD	-	VDD	V	
	VIO	L level	0	-	0.2VDD	V	
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-V0	Duty= 1/64	0°C	8.4	8.9	9.4	V
			25°C	8.0	8.6	9.2	
		Bias= 1/6.1	50°C	7.4	7.9	8.4	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-V0	Duty= 1/64	-20°C	11.7	12.1	12.5	V
			0°C	11.6	12.0	12.4	
		Bias= 1/6.1	25°C	11.5	11.9	12.3	
			50°C	11.4	11.8	12.2	
			70°C	11.3	11.7	12.1	
Power Supply Current	IDD	FLM=70 Hz VDD=5.0 V VDD-V0=8.6V PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	-	2.0	-	mA	
LED Power Supply Current	ILED	V _{BL} = 5Vdc (R _{BL} = 16Ω)	-	50.0	-	mA	

4-1.OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT V_{OP}

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A	-	-	-	-	-	-
	C	-	-	-	-	-	-
	J	-	-	-	-	-	-
S	A	-	-	-	-	-	-
	C	-	6.5	40	70	20	30
	J	-	-	-	-	-	-
note		NOTE6		NOTE5			

note:

- R: REFLECTIVE
- S: TRANSFLECTIVE
- A: GRAY
- C: YELLOW
- J: NORMALLY WHITE

AT $\phi=0^\circ$ $\theta=0^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	-	335	750	ms	NOTE 2
		25℃	-	135	270		
		50℃	-	60	120		
Response Time (fall)	Tf	0℃	-	1170	1500	ms	NOTE 2
		25℃	-	265	400		
		50℃	-	140	200		

4-2.OPTICAL CHARACTERISTICS

(For Wide Temperature Mode LCM)

AT V_{OP}

ITEM MODE		Cr(Contrast Ratio)						φ(Viewing Angle)		φ(Viewing Angle)	
		0℃		25℃		50℃		25℃		25℃	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
R	A										
	C										
	J										
S	A										
	C		6.5		6.5		6.0		56		64
	J										
note		NOTE6						NOTE5			

note:

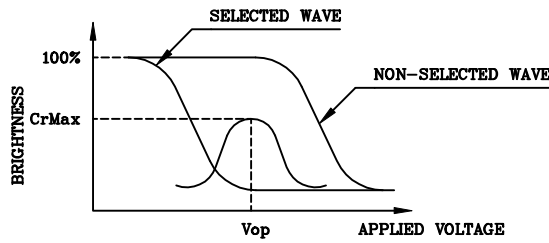
R: REFLECTIVE
S: TRANSFLECTIVE
A: GRAY
C: YELLOW
J: NORMALLY WHITE

AT φ=0° θ=0°

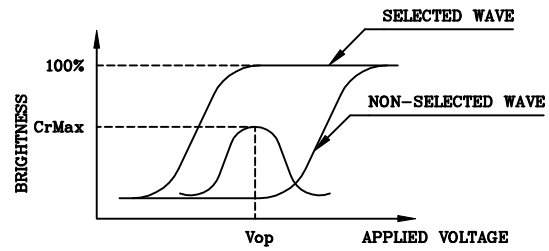
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	-	2100	3200	ms	NOTE 2
		0℃	-	450	680		
		25℃	-	150	250		
		50℃	-	110	170		
		70℃	-	70	90		
Response Time (fall)	Tf	-20℃	-	2100	3200	ms	NOTE 2
		0℃	-	400	600		
		25℃	-	120	180		
		50℃	-	60	100		
		70℃	-	30	50		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



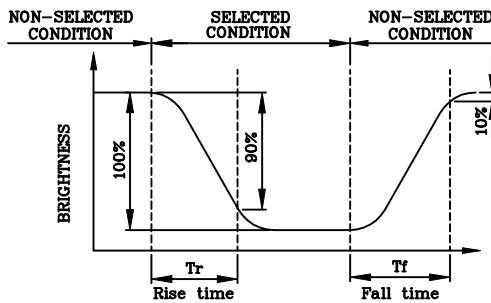
(negative type)

*Conditions

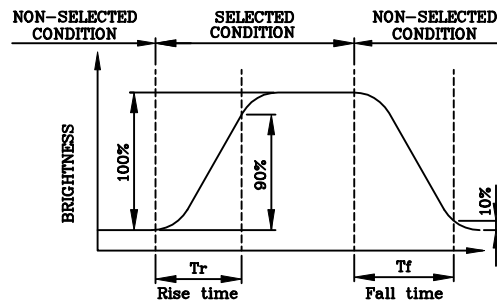
Viewing Angle : 0
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



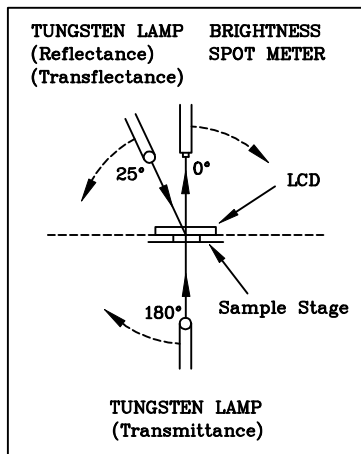
(negative type)

*Conditions

Operating Voltage : Vop
Viewing Angle (θ,φ) : (0,0)
Frame Frequency : 70Hz
Applied Waveform : 1/N duty, 1/a bias

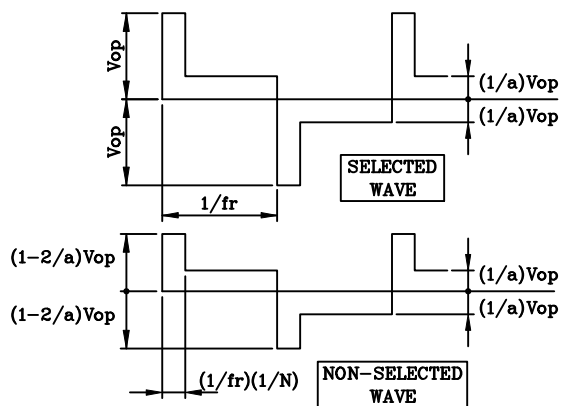
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



CONST.
TEMP.
CHAMBER

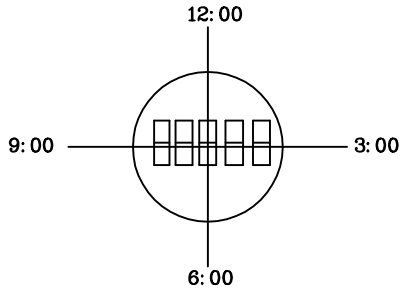
Multiplex Driving (1/N duty, 1/a bias)



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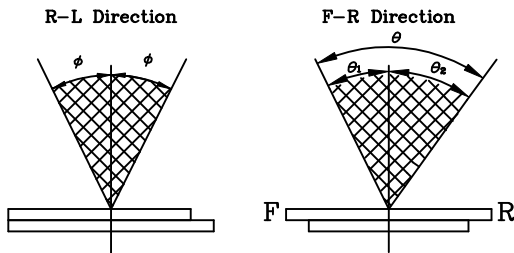
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



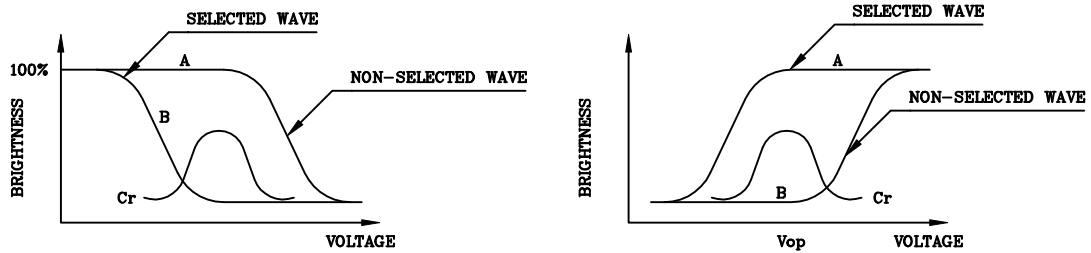
$\theta = \theta_1 + \theta_2$

*Conditions

Operating Voltage : V_{op}
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias
 Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)

(negative type)

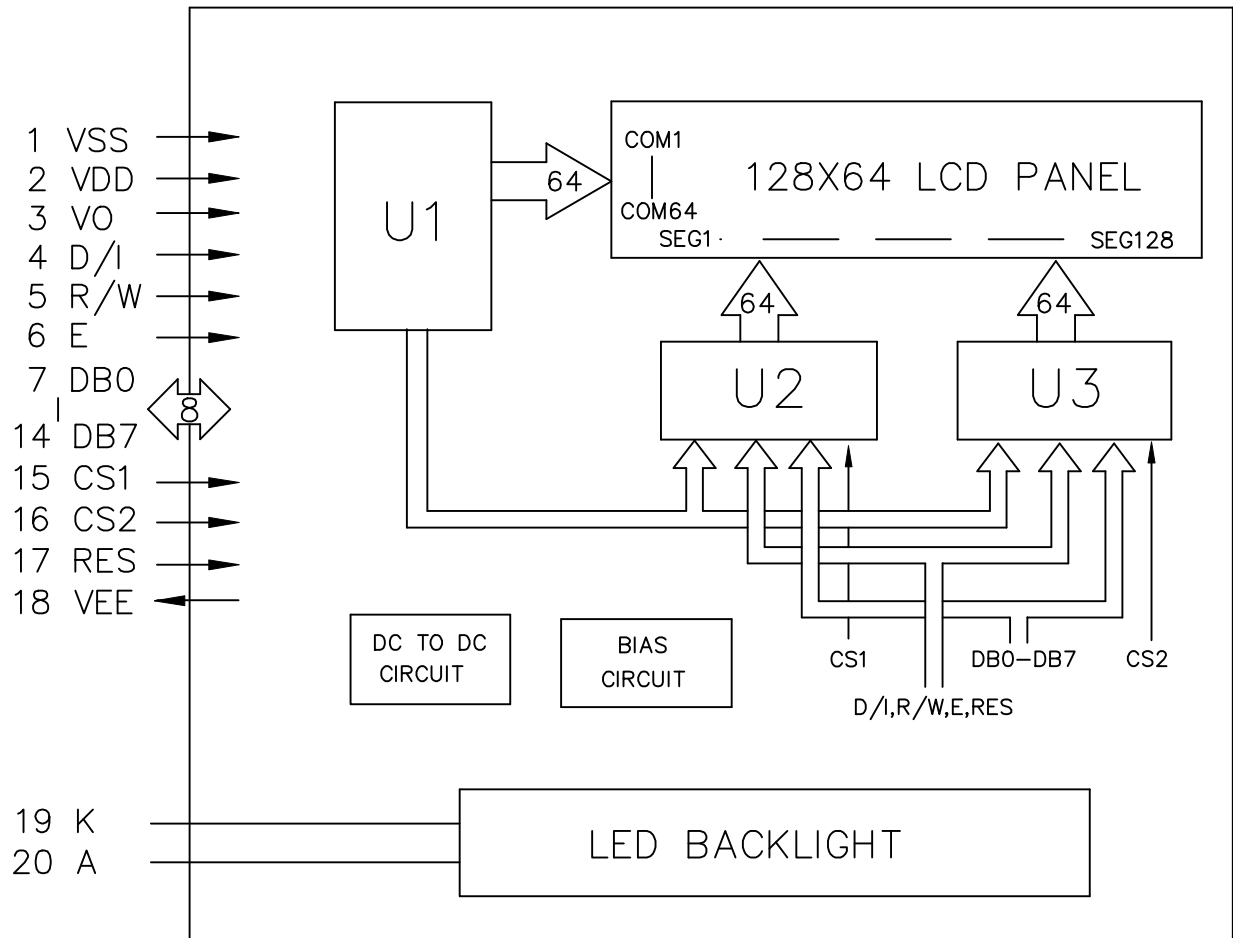
Contrast Ratio : $Cr = A/B$

*Conditions

Viewing Angle : 0
 Frame Frequency : 70Hz
 Applied Waveform : 1/N duty, 1/a bias

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5. BLOCK DIAGRAM

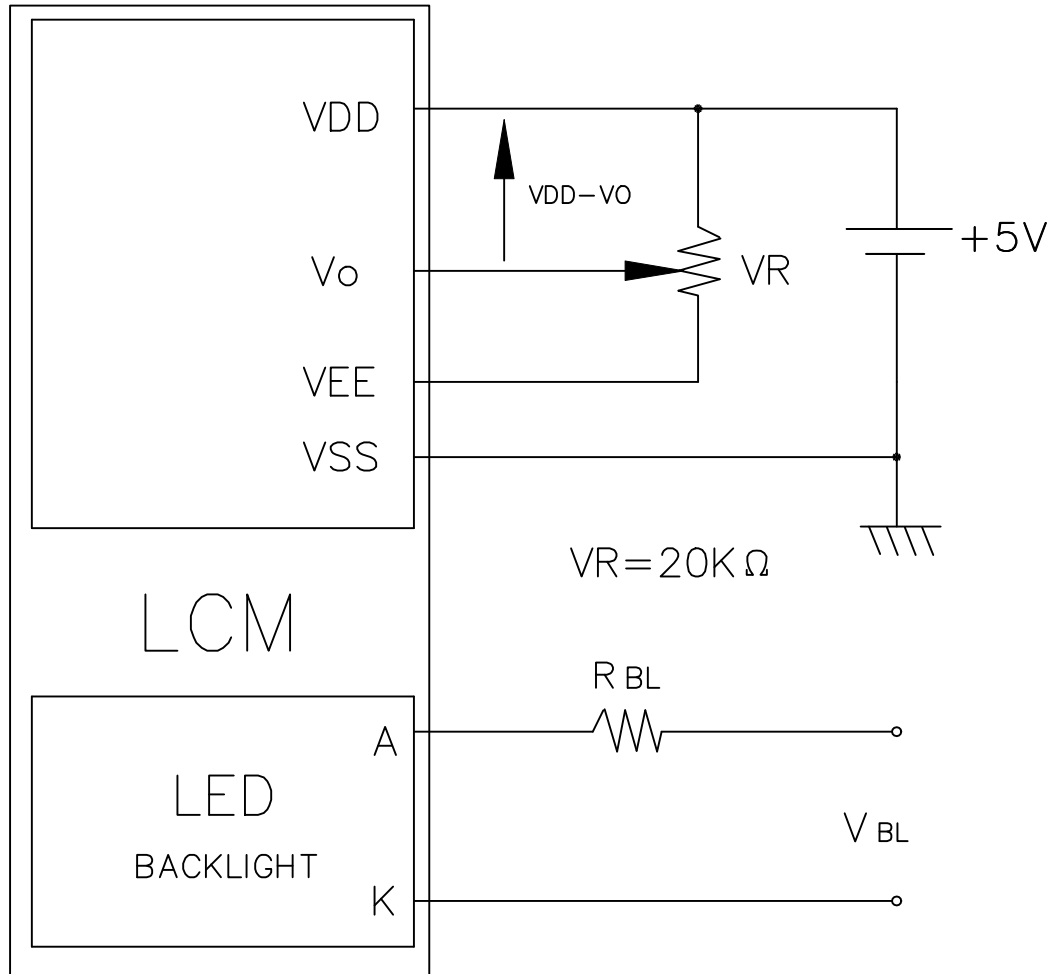


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6. INTERNAL PIN CONNECTION

PinNo.	Symbol	Level	Function	
1	V _{SS}	—	0V	Power supply
2	V _{DD}	—	+5V	
3	V _O	—	OPERATING VOLTAGE FOR LCD DRIVING	
4	D/I	H/L	H: DATA INPUT L: INSTRUCTION CODE INPUT	
5	R/W	H/L	H: DATA READ (FROM LCM TO MPU) L: DATA WRITE (FROM MPU TO LCM)	
6	E	H, H->L	ENABLE SIGNAL	
7	DB0	H/L	DATA BUS LINE	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		
15	CS1	H	CHIP SELECT FOR IC1	
16	CS2	H	CHIP SELECT FOR IC2	
17	RES	L	RESET	
18	VEE	—	POWER SUPPLY FOR LCD DRIVING	
19	K	—	POWER SUPPLY FOR LED B.L.	
20	A	—	POWER SUPPLY FOR LED B.L.	

7. POWER SUPPLY



Recommended Value for RBL and VBL

ITEM	R BL	V BL
Back Light	LED	LED
Interface		
19,20 PIN	16 Ω	5Vdc

8-1. TIMING CHARACTERISTICS

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable cycle time	t_{cyc}	Fig.a , Fig.b	1000	-	-	ns
E high level width	P_{WEH}	Fig.a , Fig.b	450	-	-	ns
E low level width	P_{WEL}	Fig.a , Fig.b	450	-	-	ns
E rise/fall time	t_r, t_f	Fig.a , Fig.b	-	-	25	ns
Address set up time	t_{AS}	Fig.a , Fig.b	140	-	-	ns
Address hold time	t_{AH}	Fig.a , Fig.b	10	-	-	ns
Data delay time	t_{DDR}	Fig.b	-	-	320	ns
Data set up time	t_{DSW}	Fig.a	200	-	-	ns
Data hold time (WR)	t_{DHW}	Fig.a	10	-	-	ns
Data hold time (RD)	t_{DHR}	Fig.b	20	-	-	ns

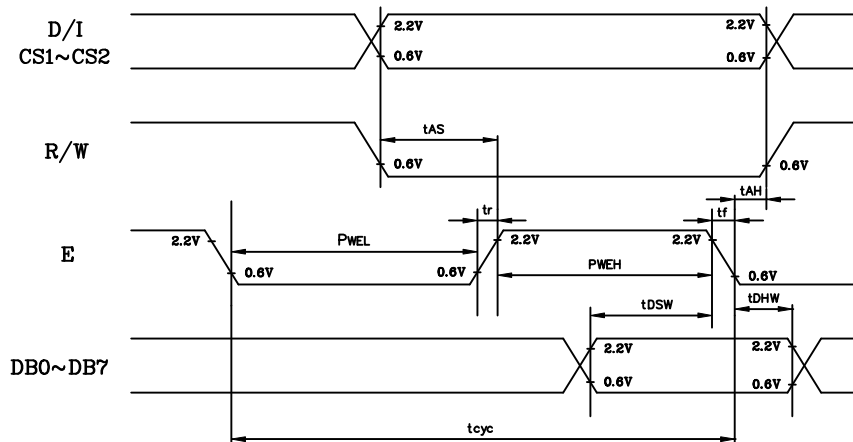


Fig . a Interface timing (data write)

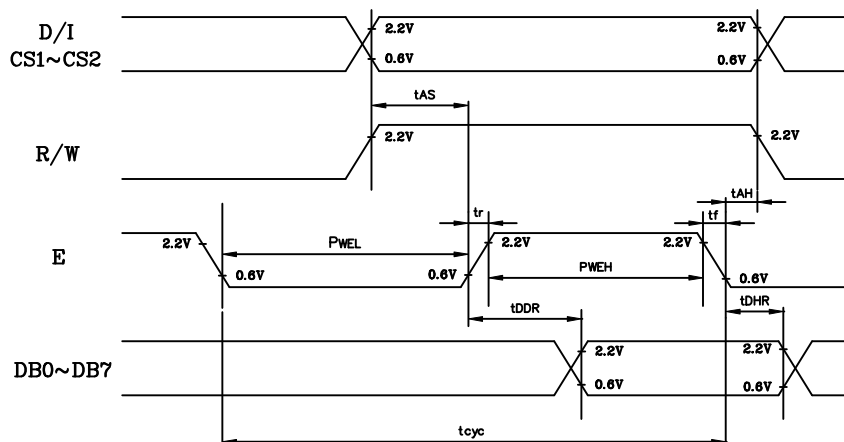
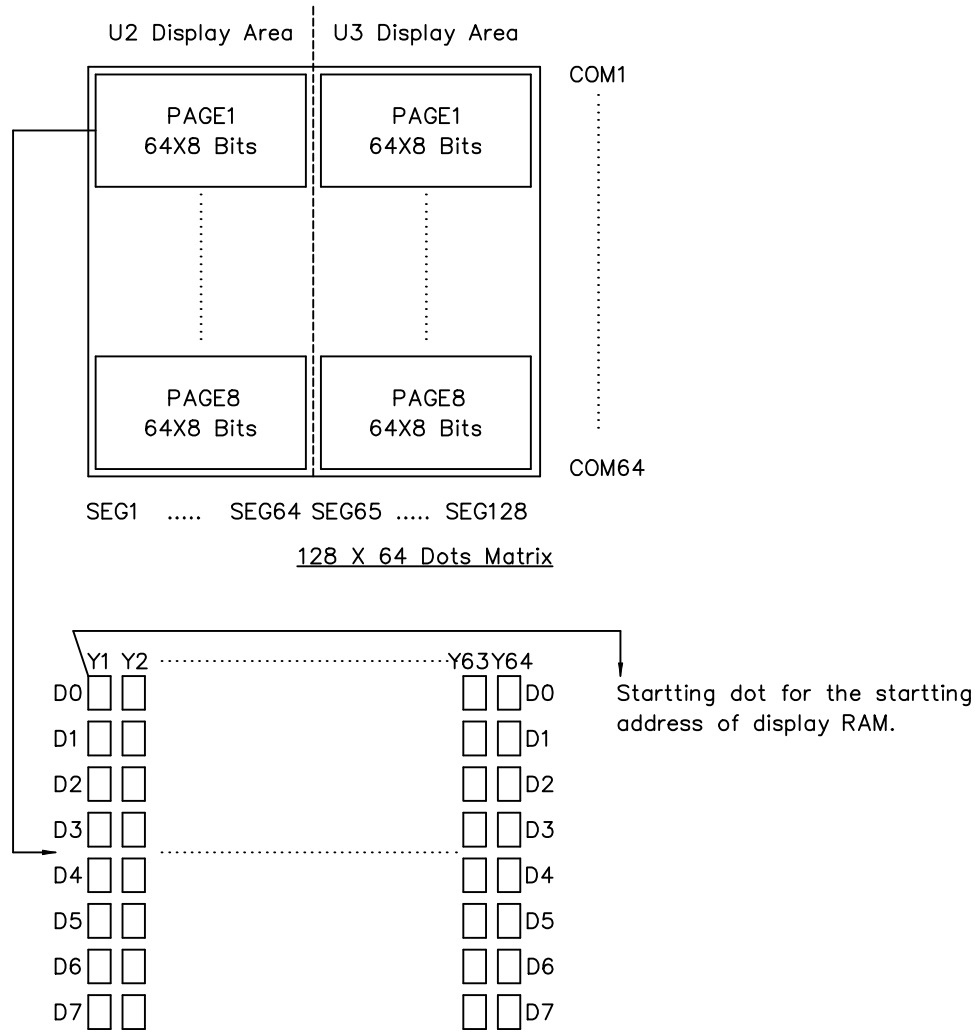


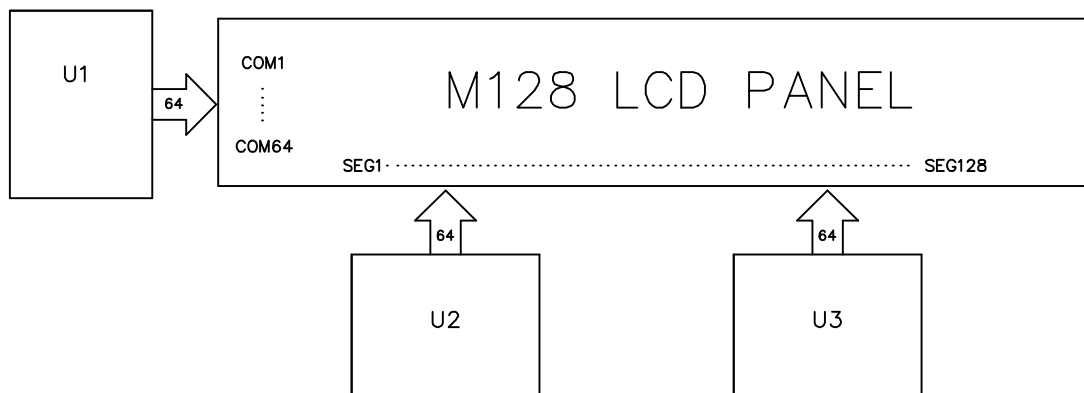
Fig . b Interface timing (data read)

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8-2. RELATION BETWEEN DISPLAY PATTERN AND DRIVERS



Each segment driver has 8 pages RAM , and each page has 64 x 8 bits RAM .
 D0~D7 are 8 bits transmitted data , where D0 is LSB and D7 is MSB .



8-3.DISPLAY CONTROL INSTRUCTIONS

The display control instructions control the internal state of the KS0108B. Instructions is received from MPU to KS0108B for the display control.

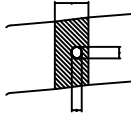
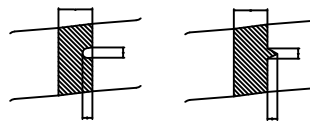
Instruction	D/I	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	FUNCTION	
Display ON/OFF	0	0	0	0	1	1	1	1	1	0/1	Controls the display on or off. Internal status and display RAM data is not affected. 0: OFF , 1: ON	
Set Address	0	0	0	1	Y address(0~63)						Sets the Y address in the Y address counter.	
Set Page (X address)	0	0	1	0	1	1	1	Page(0~7)			Sets the X address at the X address register.	
Display Start Line	0	0	1	1	Display start line(0~63)						Indicates the display data RAM displayed at the top of the the screen.	
Status Read	0	1	BUSY	0	ON/OFF	RESET	0	0	0	0	Read status. BUSY 0: Ready 1: In operation ON/OFF 0: Display ON 1: Display OFF RESET 0: Normal 1: Reset	
Write Display Data	1	0	Write Data									Writes data(DB0:7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read Display Data	1	1	Read Data									Reads data(DB0:7) from display data RAM to the data bus.

9. RELIABILITY TEST

NO	ITEM	CONDITION			STANDARD	NOTE
1	High Temp. Storage	70°C	120HR		Appearance without defect	
2	Low Temp. Storage	-20°C	120HR		Appearance without defect	
3	High Temp. & High Humidity Storage	40°C 90%RH	120HR		Appearance without defect	
4	Thermal Shock	-20°C,30min → 25°C,5min → 60°C,30min → 25°C,5min (= 1 cycle)			Appearance without defect	5 cycles

10.LCD PRODUCT QUALITY STANDARD

(1) DISPLAY APPEARANCE

NO	ITEM	C R I T E R I A													
1.	INCLUSIONS (BLACK SPOT , WHITE SPOT , DUST)	(1) ROUND TYPE													
		<table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>a ≦ 0.20</td> <td>NEGLECT</td> </tr> <tr> <td>0.20 < a ≦ 0.35</td> <td>5 MAX</td> </tr> <tr> <td>0.35 < a</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	a ≦ 0.20	NEGLECT	0.20 < a ≦ 0.35	5 MAX	0.35 < a	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
a ≦ 0.20	NEGLECT														
0.20 < a ≦ 0.35	5 MAX														
0.35 < a	NONE														
		(2) LINEAR TYPE													
		<table border="1"> <thead> <tr> <th>LENGTH mm(L)</th> <th>WIDTH mm(W)</th> <th>NO. OF DEFECT</th> </tr> </thead> <tbody> <tr> <td>N A</td> <td>W ≦ 0.03</td> <td>NEGLECT</td> </tr> <tr> <td>L ≦ 3</td> <td>0.03 < W ≦ 0.08</td> <td>6</td> </tr> <tr> <td>3 < L</td> <td>0.08 < W</td> <td>NONE</td> </tr> </tbody> </table>	LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT	N A	W ≦ 0.03	NEGLECT	L ≦ 3	0.03 < W ≦ 0.08	6	3 < L	0.08 < W	NONE	
LENGTH mm(L)	WIDTH mm(W)	NO. OF DEFECT													
N A	W ≦ 0.03	NEGLECT													
L ≦ 3	0.03 < W ≦ 0.08	6													
3 < L	0.08 < W	NONE													
2.	SCRATCH	1.SCRATCH ON PROTECTIVE FILM IS PERMITTED . 2.SCRATCH ON POLARIZER SHALL BE AS FOLLOW: (1) ROUND TYPE													
		<table border="1"> <thead> <tr> <th>DIAMETER mm (a*)</th> <th>NO. OF DEFECT*</th> </tr> </thead> <tbody> <tr> <td>a ≦ 0.15</td> <td>NEGLECT</td> </tr> <tr> <td>0.15 < a ≦ 0.20</td> <td>2 MAX</td> </tr> <tr> <td>0.20 < a</td> <td>NONE</td> </tr> </tbody> </table>	DIAMETER mm (a*)	NO. OF DEFECT*	a ≦ 0.15	NEGLECT	0.15 < a ≦ 0.20	2 MAX	0.20 < a	NONE					
DIAMETER mm (a*)	NO. OF DEFECT*														
a ≦ 0.15	NEGLECT														
0.15 < a ≦ 0.20	2 MAX														
0.20 < a	NONE														
		(2) LINEAR TYPE BE JUDGED BY 1.-(2) LINEAR TYPE													
3.	DENT	DIAMETER < 1.5mm													
4.	BUBBLE	NOT EXCEEDING 0.5mm AVERAGE DIAMETER IS ACCEPTABLE BETWEEN GLASS AND POLARIZING FILM.													
5.	PIN HOLE	(a+b)/2 ≦ 0.15 mm MAXIMUM NUMBER:IGNORED 0.15 < (a+b)/2 ≦ 0.20 MAXIMUM NUMBER:10													
6.	DOT DEFECT	(a+b)/2 ≦ 0.20 mm MAXIMUM NUMBER:IGNORED 0.20 < (a+b)/2 ≦ 0.30 MAXIMUM NUMBER:5 x = WIDTH													
7.	CONTRAST IRREGULARITY (SPOT)	DIAMETER SPEC. a ≦ 0.50 mm 0.50 < a ≦ 0.75 0.75 < a ≦ 1.00 1.00 < a	NO. OF DEFECT* NEGLECT 5 3 NONE												
8.	DOT WIDTH	DESIGN WIDTH±15%													
9.	COLOR TONE AND UNIFORMITY	OBVIOUS UNEVEN COLOR IS NOT PERMITTED													

NAN YA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM128-0 DATE : Sep. 24, 1998 SHEET NO. : 17/18
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(2) NOTE:

- SAFETY
 - 1.If the LCD panel breaks, be careful not to allow the liquid crystal to touch your skin.
 - 2.If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

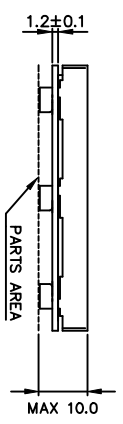
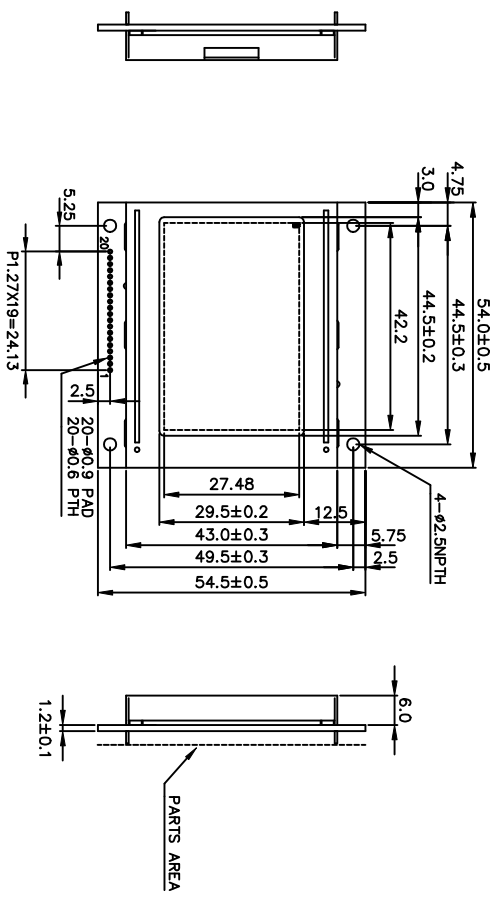
- HANDLING
 - 1.Prevent all contact with static electricity, which can damage the CMOS ICs. The module is packaged in a static-shielding bag to prevent damage during shipment, warehousing and removal from the shipping carton.
 - 2.Do not remove the panel or frame from the module.
 - 3.The polarizing plate on the front surface of the display is very fragile and easily scratched. The module is shipped with a protective liner which must be removed from the polarizing plate prior to assembly.
 - 4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of polarizing plate.
 - 5.Do not use ketonics solvent or aromatic solvent on the polarizing plate. Use a soft cloth soaked with plastic-lens cleaning solution.

- STORAGE
 - 1.Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.
 - 2.Do not place the module near organics solvents or corrosive gases.
 - 3.Do not crush, shake, or jolt the module.

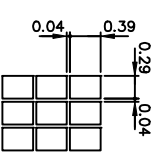
- TERMS OF WARRANTY
 - 1.Acceptance inspection period
The inspection period is within one month after the arrival of the contracted goods at the buyer's factory site.
 - 2.Applicable warranty period
The warranty period is within twelve months from the date of invoice under normal usage and storage conditions.

- TYPICAL OPERATING LIFETIME OF BACKLIGHT
 - LED : 50,000HR
 - EL : 5,000HR
 - CCFT : 10,000HR

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(LED W/O)



DOT AREA(128 X 64)

INTERNAL PIN CONNECTION

PinNo.	Symbol	PinNo.	Symbol
1	VSS	11	DB4
2	VDD	12	DB5
3	VO	13	DB6
4	D/I	14	DB7
5	R/W	15	CS1
6	E	16	CS2
7	DB0	17	RES
8	DB1	18	VFE
9	DB2	19	K
10	DB3	20	A

- NOTE :
1. RESOLUTION : 128 X 64 Dots
 2. CONTROLLER : HD61202U or COMPATIBLE
 3. DC/DC : BUILT-IN

產品編號	LM_55_128_	南亞塑膠工業股份有限公司
NAME		NAN YA PLASTICS CORPORATION
DATE		
TITLE	外觀尺寸圖	
APPROVE		
CHECK		
DESIGN		
DRAW	MAY PING	86.06.10
DWG-NO	M-X128XXX	Rev.A
UNIT	mm	
SCALE		