NAN YA PLASTICS CORPORATION

SPECIFICATION OF
LCD MODULE
PRODUCT NO.: LMM83S018C2N_

SPEC. NO.: LM018-2- △0

CUSTOMER
APPROVED BY
DATE:

LCD DEPARTMENT
ELECTRONIC MATERIALS DIVISION
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EDITED ON : JUL. 06, 2001

DESIGN MANAGER	DESIGN CHECK	DESIGNER
		T.M.CHEN

RECORDS OF REVISION

SPEC. NO.:
LM018-2

DATE	REVISED NO.	REF. PAGE	SUMMARY	DESIGN	CHECK
07.06.2001	0	23	First Issue	T.M.CHEN	

NANYA PLASTICS CORP. ELEC. MATERIALS DIV. LCD DEPARTMENT	SPECIFICATION	SPEC. NO. : LM018-2 DATE : JUL. 06,2001 SHEET NO. : 1

1. MECHANICAL DATA

(1) Product No.	LMM83S018C2N_	
(2) Module Size	80.0 (W)mm x 36.0 (H)mm	x MAX14.5 (D)mm
(3) Dot Size	0.55 (W)mm x 0.75 (H)mm	
(4) Dot Pitch	0.63 (W)mm x 0.83 (H)mm	
(5) Number of Dots	16 (W) x 1 (H)Dots	
(6) Duty	1/16	
(7) LCD Display Mode	STN: Yellow Mode	
	Rear Polarizer: Transflective	
(8) Viewing Direction	6 O'clock	
(9) Backlight	LED	
(10) Controller	Excluded	
(11) DC/DC Converter	Excluded	
(12) Weight	36.8 g(approx.)	

Note :

LMM83S018C2N

Back Light

K : Without Backlight
L : CCLF Backlight
M : LED Backlight
N : EL Backlight

Reflective/Transmissive

R : Reflective
S : Transflective(Normal)
P : Transflective(Medium Transparency)
H : Transflective(High Transparency)
T : Transmission

Option

2: Module Version Number
N: 240° twist LC

Mode/View Angle

A: Gray , 6 O'clock
B: Gray , 12 O'clock
C: Yellow , 6 O'clock
D: Yellow , 12 O'clock
E: Blue , 6 O'clock
F: Blue , 12 O'clock
G: Normally Black , 6 O'clock
H: Normally Black , 12 O'clock
J: Normally White , 6 O'clock
K: Normally White , 12 O'clock

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2. ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0 V Standard

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	6.5	V	
Input Voltage	VI	−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.			
	OPERATION		STORAGE	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0	50	−20	70
Humidity (Without Condensation)	Note 2,4		Note 3,4	
Vibration(Note ※)	−		49m/s² (5G)	

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 < 48 hrs, at 70°C will be < 120 hrs

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

3. ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply for Logic		VDD−VSS	−	4.75	5.0	5.25	V
Recommended LC Driving Voltage		VDD−VO	0°C	4.5	4.8	5.1	V
			25°C	4.2	4.5	4.8	
			50°C	4.0	4.3	4.6	
Input Voltage		VIH	H level	0.8VDD	−	VDD	V
		VIL	L level	0	−	0.2VDD	V
Power Supply Current		IDD	FLM = 70 Hz VDD = 5.0 V VDD−V0 = 4.5V PATTERN : □ ■ □ ■ □ ■ ■ □ ■ □ ■ □	−	1.6	2.4	mA
LED Power Supply Current		I_{LED}	V_{BL} = 5.0 V_{DC} R_{BL} = 8.2Ω	−	110	165	mA
LCM	Surface Luminance	L	ALL ON	−	13.9	−	cd/m²
			ALL OFF	−	30.5	−	

NOTE 1: The life is defined by the time when the brightness gets down to 50% of the initial brightness.

4. OPTICAL CHARACTERISTICS

(For Normal Temperature Mode LCM)

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio)						θ(Viewing Angle)		φ(Viewing Angle)	
		0°C		25°C		50°C		25°C		25°C	
		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
S	A	4.0	5.0	4.0	5.0	4.0	5.5	35	60	20	32
Note		NOTE 6						NOTE 5			

NOTE :

S : Transflective(Normal)

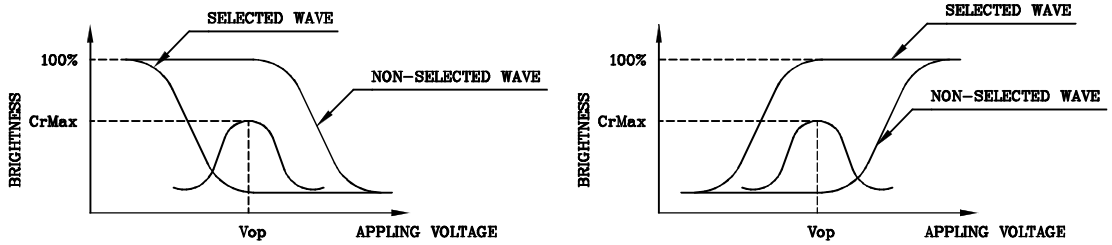
A: Gray , 6 O'clock

AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0℃	500	1000	1500	ms	NOTE 2
		25℃	100	200	300		
		50℃	30	60	90		
Response Time (fall)	Tf	0℃	100	200	300	ms	NOTE 2
		25℃	40	80	120		
		50℃	20	40	60		

(NOTE 1)

Definition of Operation Voltage(Vop)



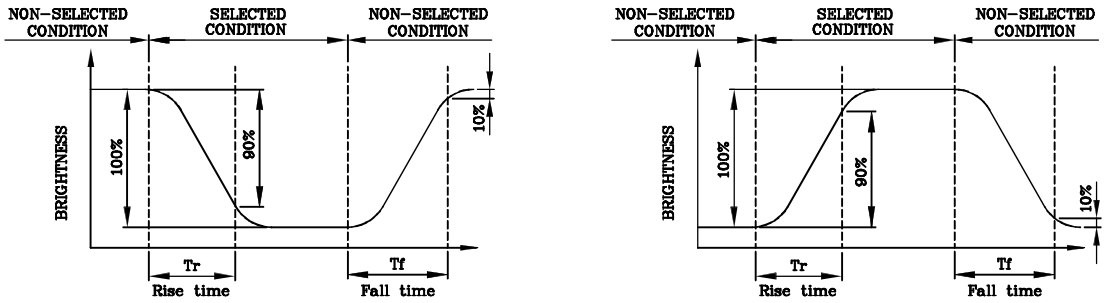
(positive type) (negative type)

*Conditions

Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



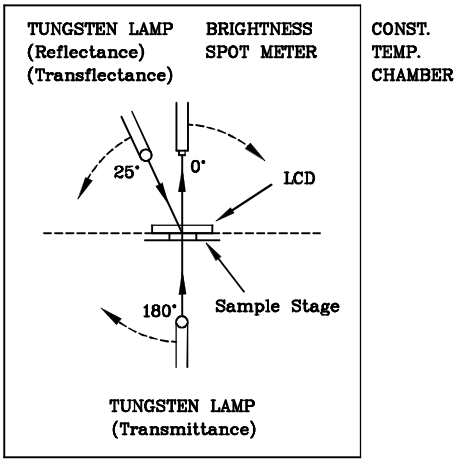
(positive type) (negative type)

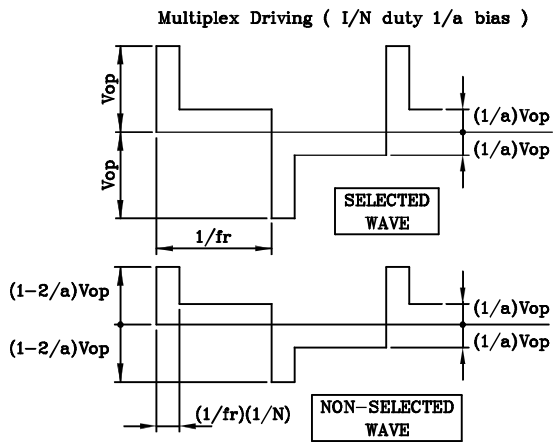
*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms





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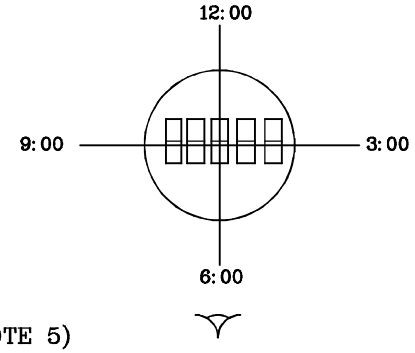
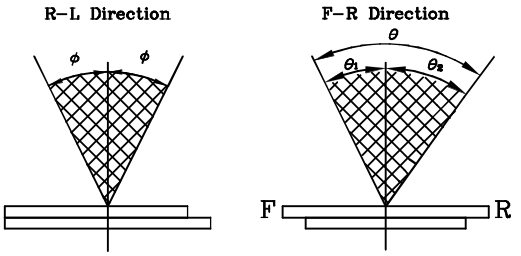
(NOTE 4)

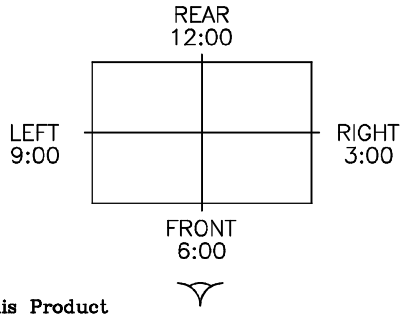
Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle





*For This Product

The Viewing Direction Is 6 O'clock

So $\theta_1 > \theta_2$

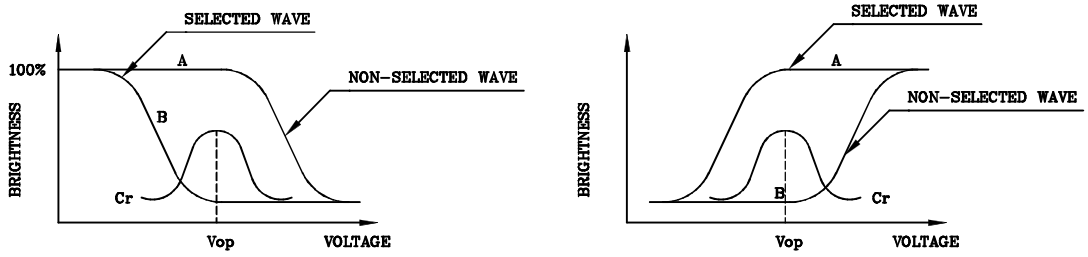
$\theta = \theta_1 + \theta_2$

*Conditions

Operating Voltage : Vop
Frame Frequency : 70Hz
Appling Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



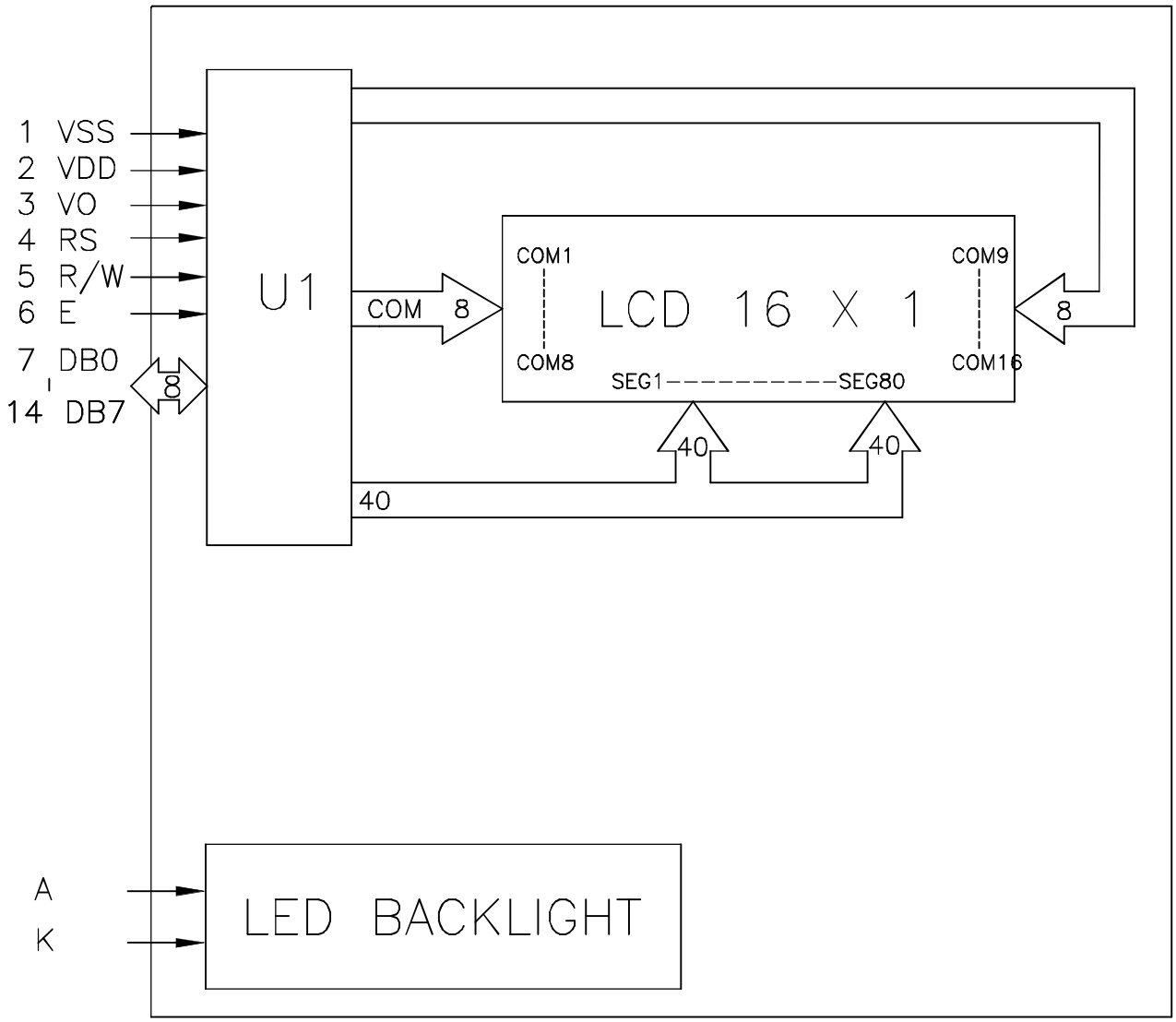
(positive type) (negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

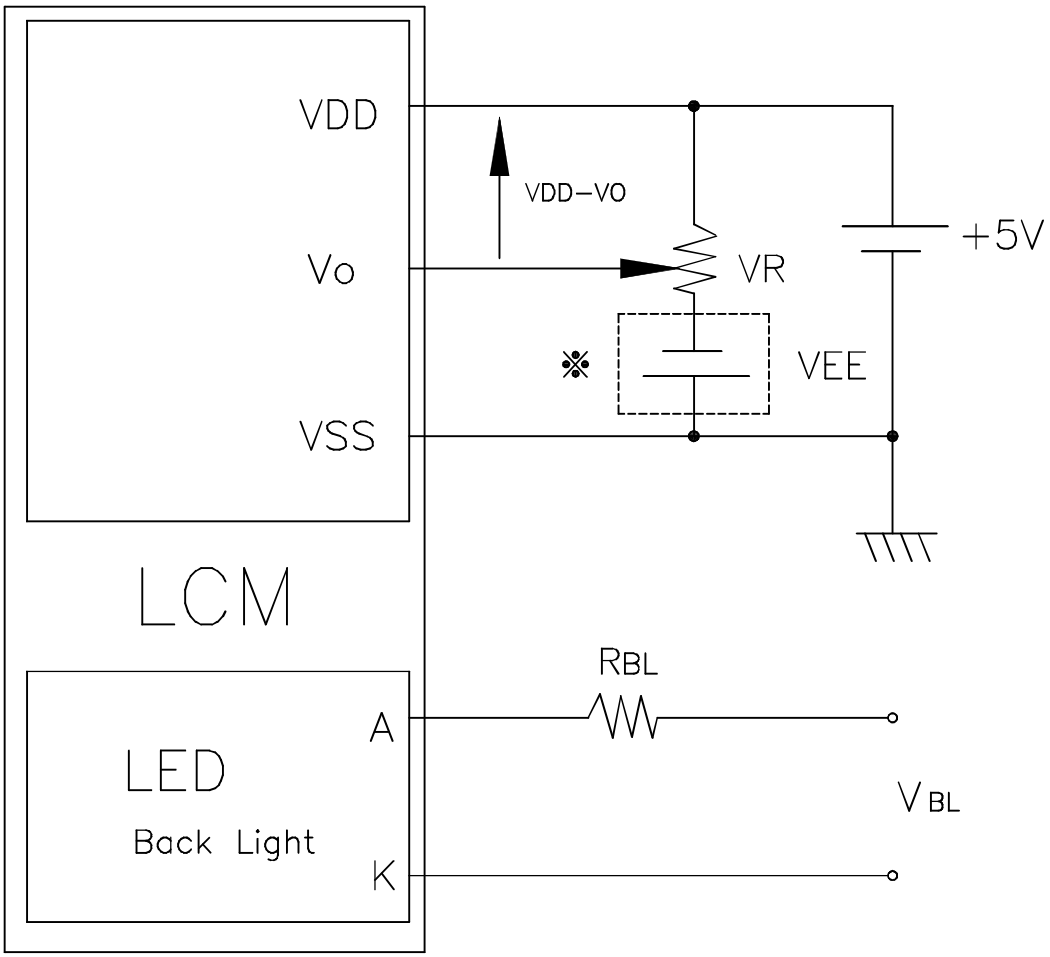
5. BLOCK DIAGRAM



6. INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	—	0V	POWER SUPPLY
2	V_{DD}	—	+5V	
3	V_O	—	—	
4	RS	H/L	L:INSTRUCTION CODE INPUT H:DATA 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		

7.POWER SUPPLY



VR = 20KΩ
VEE = 0V
RBL = 8.2Ω

8. TIMING CHARACTERISTICS

Write Cycle (VDD=5.0V,GND=VEE=0V,Ta=25℃)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable Cycle Time	t_{cyce}	Fig.a	500	-	-	ns
Enable "H"Level Pulse Width	t_{WHE}	Fig.a	300	-	-	ns
Enable Rise/Fall Time	t_{ER} , t_{EF}	Fig.a	-	-	25	ns
RS,R/W Setup Time	t_{AS}	Fig.a	60 (Note 1) 100 (Note 2)	-	-	ns
RS,R/W Address Hold Time	t_{AH}	Fig.a	10	-	-	ns
Data output delay	t_{DS}	Fig.a	100	-	-	ns
Data Hold Time	t_{DHW}	Fig.a	10	-	-	ns

Read Cycle (VDD=5.0V,GND=VEE=0V,Ta=25℃)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Enable Cycle Time	t_{cyce}	Fig.b	500	-	-	ns
Enable "H"Level Pulse Width	t_{WHE}	Fig.b	300	-	-	ns
Enable Rise/Fall Time	t_{ER} , t_{EF}	Fig.b	-	-	25	ns
RS,R/W Setup Time	t_{AS}	Fig.b	60 (Note 1) 100 (Note 2)	-	-	ns
RS,R/W Address Hold Time	t_{AH}	Fig.b	10	-	-	ns
Data output delay	t_{RD}	Fig.b	-	-	190	ns
Data Hold Time	t_{DHR}	Fig.b	20	-	-	ns

(Note 1): 8-bit operation mode (Note 2): 4-bit operation mode

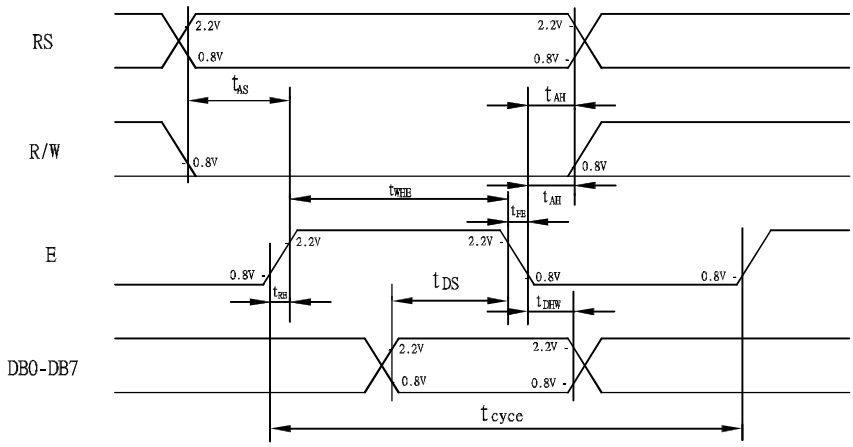


Fig. a Interface timing (data write)

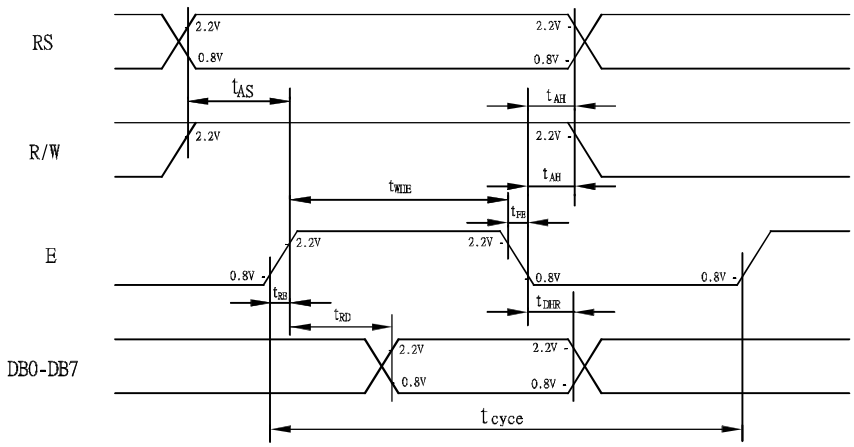


Fig. b Interface timing (data read)

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9. RELIABILITY TEST

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

Inspection Provision

1.Purpose

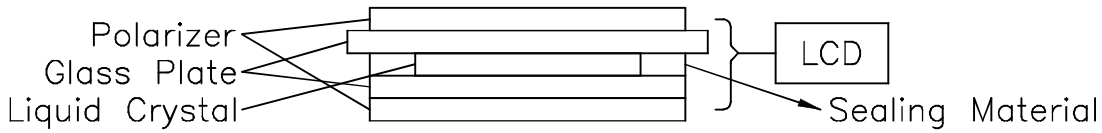
The NAN YA inspection provision provides outgoing inspection provision and its expected quality level based on our outgoing inspection of NAN YA LCD produces.

2.Applicable Scope

The NAN YA inspection provision is applicable to the arrangement in regard to outgoing inspection and quality assurance after outgoing.

3.Technical Terms

3-1 NAN YA Technical Terms



4.Outgoing Inspection Provision

Outgoing inspection is according to the product inspection manual (per 1-1 , 1-2 & 1-3).

4-1 Ispection Method

MIL-STD-105D Level Ⅱ Regular inspection

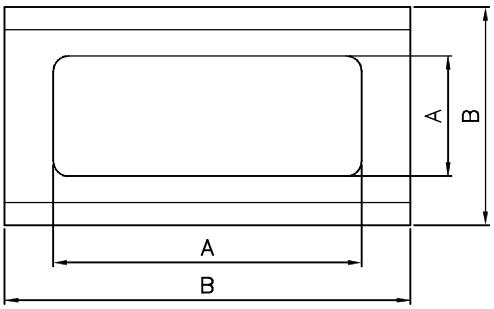
4-2 Inspection Standard

	Item		AQL(%)	Remarks
Major Defect	Dots	Opens Shorts Erroneous operation	0.4	faults which substantially lower the practicality and the initial purpose difficult to achieve.
	Solder appearance	Shorts Loose		
	Cracks	Display surface cracks		

	Dimensions	External from Dimensions	0.4	
Minor Defect	Inside the glass	Black spots	0.65	faults which appear to pose almost no obstacle to the practicality, effective use, and operation.
	Polarizing plate	Scratches, foreign Matter, air bubbles, and peeling		
	Dots	Pinhole, deformation		
	Color tone	Color unevenness		
	Solder appearance	Cold solder Solder projections		

4-3 Inspection Provisions
*Viewing Area Definition

Fig. 1



A : Zone Viewing Area
B : Zone Glass Plate Out Line

*Inspection place to be 500 to 1000 lux illuminance uniformly without glaring.
The distance between luminous source(daylight fluorescent lamp and cool white fluorescent lamp) and a sample to be 30cm to 50cm.

*Test and measurement are performed under the following conditions, unless otherwise specified.

Otherwise specfied.

Temperature	20± 15°C
Humidity	65± 20%R.H..
Pressure	860~1060hPa(mmbar)

In case of doubtful judgment, it is performed under the following conditions.

Temperature	20± 2°C
Humidity	65± 5%R.H..
Pressure	860~1060hPa(mmbar)

5.Specification for quality check

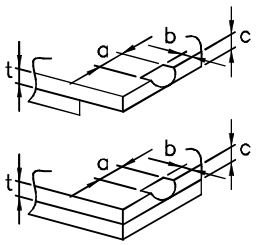
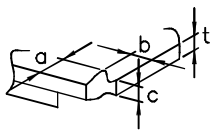
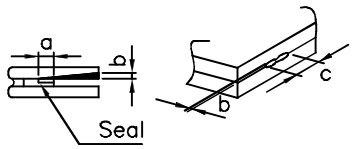
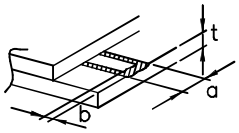
5-1 Electrical characteristics

NO.	Item	Criterion
1.	Non operational	Fail
2.	Miss operating	Fail
3.	Missing dot	Fail
4.	Contrast irregular	Non allowable
5.	Response time	Within Specified value

5-2 External Appearance Defect

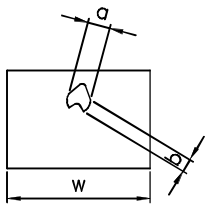
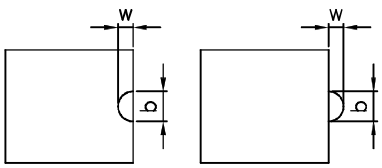
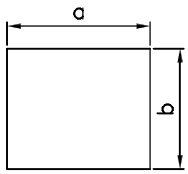
NO.	Item	Criterion
1.	Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)	(1)-1-Spots Average Diameter(mm):D / Number of pieces permitted D≦0.1 — Ignore 0.1<D≦0.2 — 5 0.2<D≦0.3 — 2 0.3<D — 0 Number of total pieces is set to within 5 pieces. Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2 (1)-2-Blurred Spots(At lighting condition) Average Diameter(mm):D / Number of pieces permitted D≦0.3 — Ignore 0.3<D≦0.75 — 5 0.75<D — 0 Number of total pieces is set to within 5 pieces. Note that when there are 2 pieces or more, they are not to be concentrated. Set as: Average diameter = (Long diameter + Short diameter)/2

<table>
<tr><td>1.</td><td>Black spots, foreign matter, and white spots (Including light leakage due to pinholes of polarizing plates, etc.)</td><td>(1)−1 Spots(At non lighting condition)
<table><tr><th>Width(mm):W</th><th>Length(mm):L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03
0.03<W≦0.08
0.08<W≦0.1</td><td>Ignore
L≦4
L≦1</td><td>Ignore
2
1</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.
(1)−2 Spots(At lighting condition)
<table><tr><th>Width(mm):W</th><th>Length(mm):L</th><th>Number of pieces permitted</th></tr><tr><td>W≦0.03
0.03<W≦0.08
0.08<W</td><td>Ignore
L≦3
3<L</td><td>Ignore
6
None</td></tr></table>Object exceeding 0.1mm follow the standards of the spots form.
Note that when there are 2 pieces or more, they are not to be concentrated.</td></tr>
<tr><td>2.</td><td>Scratches(Glass, reflection plates, and polarizing plates)</td><td>In accordance with black spots.
(At non lighting condition)</td></tr>
<tr><td>3.</td><td>Color irregular</td><td>Not remarkable color irregular.</td></tr>
</table>

<table>
<tr><td>4.</td><td>Air bubbles polarizing plates, and reflection plates</td><td colspan="2">
<table>
<tr><th>Average Diameter (mm):D</th><th>Number of pieces permitted</th></tr>
<tr><td>D≦0.3</td><td>Ignore</td></tr>
<tr><td>0.3<D</td><td>0</td></tr>
</table>
Average diameter = (Long diameter + Short diameter)/2
Note that when there are 4 pieces or more, they are not to be concentrated.
</td></tr>
<tr><td rowspan="5">5.</td><td rowspan="5">Cracks</td><td>(1)General crack
 
</td><td>a≦5
b≦2
c≦t
Where, a and b are ignored when less that or equal 0.5. The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(2)Corner crack
 
</td><td>a≦2.5
b≦2.5
c≦t
a+b≦4</td></tr>
<tr><td>(3)Seal portion crack
 
</td><td>a≦The seal widthx1/3
b≦tx2/3
c≦5
The numbers of pieces are set at up to 5 pieces.</td></tr>
<tr><td>(4)ITO Pin crack
 
</td><td>a≦5
b≦1/3 pin length
c≦t</td></tr>
<tr><td>(5)Progressive cracks</td><td>All taken to be unacceptable.</td></tr>
</table>

6.	Outer dimensions	Should be with in the tolerance.
7.	Newton ring	Orbicular of interference fringes. To be non. In case of doubtful judgenemt, agreement shall be reachment.
8.	Soldering	Should be no defective soldering such as shorting, loose terminal cold solder, peeling of printed circuit board pattern, improper mouting position, etc.

5-3 Dot Appearance Defect

NO.	Item	Criteria
1.	Plinhole	 Dot display a and b are each ≦0.2mm The overall total is taken be with in 10 units. Note that they are not to be concentrated.
2.	Missing	 Dot display a and b are each ≦0.2mm The overall total is taken to be with in 10 units.
3.	Thick and thin display	 Taken to be within±1.5% of display character width(a) and height(b).

NOTICE:

- SAFETY
  1.If the LCD panel breaks, be careful not to get 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.Avoid static electricity which can damage the CMOS LSI.
  2.Do not remove the panel or frame from the module.
  3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
  4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
  5.Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

- STORAGE
  1.Store the panel or module in a dark place where the temperature is 25°C±5°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 WARRANT
  1.Acceptance inspection period
  The period is within one month after the arrival of contracted commodity at the buyer's factory site.
  2.Applicable warrant period
  The period is within twelve months since the date of shipping out under normal using and storage conditions.

- THE OPERATING LIFE TIME OF BACK LIGHT
  LED: 40,000hrs for IF=10mA,25℃
  (Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

DISPLAY PATTERN (16X1)

Display Data RAM address

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

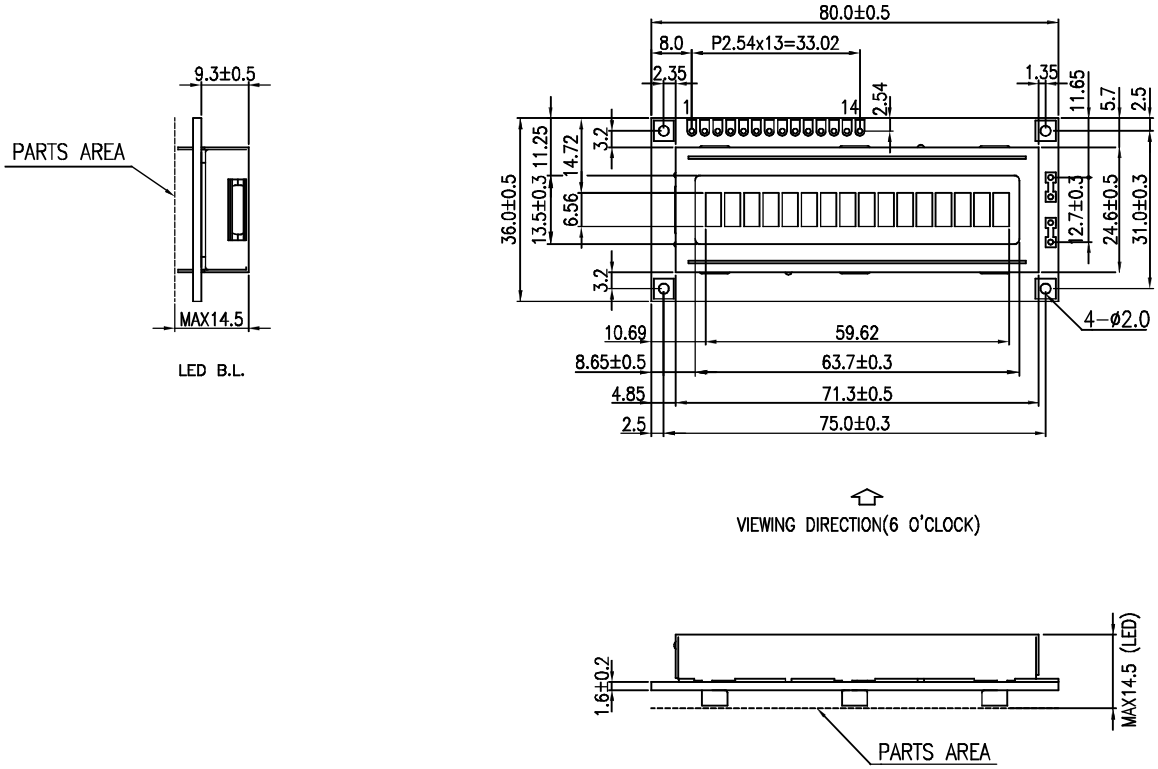
CHARACTER PATTERN

Upper 4dit / lower 4bit	LLLL	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)														
LLLH	(2)														
LLHL	(3)														
LLHH	(4)														
LHLL	(5)														
LHLH	(6)														
LHHL	(7)														
LHHH	(8)														
HLLL	(1)														
HLLH	(2)														
HLHL	(3)														
HLHH	(4)														
HHLL	(5)														
HHLH	(6)														
HHHL	(7)														
HHHH	(8)														

CONTROL and DISPLAY COMMAND

COMMAND	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	EXECUTION TIME(MAX.) (F_{osc} =270kHz)	REMARK
CLEAR DISPLAY	0	0	0	0	0	0	0	0	0	1	1.52ms	
RETURN HOME	0	0	0	0	0	0	0	0	1	X	1.52ms	CURSOR MOVE TO FIRST DIGIT
ENTRY MODE SET	0	0	0	0	0	0	0	1	I/D	S	37μS	•ASSIGN CURSOR MOVING DIRECTION I/D: 1 INCREMENT; 0 DECREMENT •DISPLAY SHIFT ENABLE BIT S: 1 ACCOMPANIES DISPLAY SHIFT; 0 DISPLAY SHIFT DISABLE
DISPLAY ON/OFF CONTROL	0	0	0	0	0	0	1	D	C	B	37μS	•DISPLAY D: 1 DISPLAY ON; 0 DISPLAY OFF •CURSOR C: 1 CURSOR ON; 0 CURSOR OFF •BLINK B: 1 BLINK ON; 0 BLINK OFF
CURSOR OR DISPLAY SHIFT	0	0	0	0	0	1	S/C	R/L	X	X	37μS	SC: 1 DISPLAY SHIFT; 0 CURSOR MOVE R/L: 1 SHIFT TO THE RIGHT; 0 SHIFT TO THE LEFT
FUNCTION SET	0	0	0	0	1	DL	N	F	X	X	37μS	DL: 1 8 BITS; 0 4 BITS N: 1 2 LINE; 0 1 LINE F: 1 5 X 10 DOTS; 0 5 X 8 DOTS
SET CGRAM ADDRESS	0	0	0	1	CGRAM address						37μS	CGRAM Data is sent and received after this setting
SET DDRAM ADDRESS	0	0	1	DDRAM address (corresponds to cursor address)							37μS	DDRAM Data is sent and received after this setting
READ BUSY FLAG(BF) & ADDRESS	0	1	BF	Address Counter used for Both DDRAM & CGRAM address							0μS	BF: 1 INTERNALLY OPERATING; 0 INSTRUCTIONS ACCEPTABLE Reads BF indicating internal operation is being performed and reads address counter contents
WRITE DATA	1	0	Write Data								43μS	Writes data into DDRAM or CGRAM
READ DATA	1	1	Read Data								43μS	Reads data form DDRAM or CGRAM

X : Don't care



Note :
1.RESOLUTION : 16x1 Characters
2.BACKLIGHT : LED

PIN NO	SYMBOL	FUNCTION	PIN NO	SYMBOL	FUNCTION
1	Vss	Power Supply (0V)	7	DB0	DATA BUS LINE
2	V_{DD}	Power Supply (+5V)	8	DB1	
3	V0	Power Supply	9	DB2	
4	RS	L: Instruction Code Input H: Data Input	10	DB3	
			11	DB4	
5	R/W	H: Data Read (From Lcm to mpu) L: Data Write (From mpu to Lcm)	12	DB5	
			13	DB6	
6	E	Enable Signal	14	DB7	

GENERAL TOLERANCE LIST

DIMENSION	TOLERANCE
L ≦ 6	±0.25 (mm)
6 < L ≦ 18	±0.3 (mm)
18 < L ≦ 50	±0.4 (mm)
50 < L ≦ 125	±0.5 (mm)
125 < L	±0.6 (mm)

REV. NO.	DESCRIPTION	DATE	DESIGN	CHECK	APPROVE
5					
4					
3					
2					
1					

南亞塑膠工業股份有限公司
NAN YA PLASTICS CORPORATION

製品圖

LMM83S018C2N_

	NAME	DATE	THIRD ANGLE P.
APPROVE			
CHECK			
DESIGN	J.H SUN	90.06.04	SCALE: 1/1
DRAWN	J.H SUN	90.06.04	UNIT: mm
DWG NO.	M018-D2A		1 / 0