

CUSTOMER	:	
MODEL	:	MOC-24216D-4-A1A01
DESCRIPTION	:	LCD MODULE

◆ CUSTOMER APPROVAL

	CHECKED	CHECKED	APPROVAL
APPROVAL			
REMARK			

◆ SUPPLIER APPROVAL

PREPARED	CHECKED		APPROVAL

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I .General Specifications

1.Features

- A. Low power consumption 5.0V power supply
- B. 1/16 duty,1/5 bias
- C. Viewing direction:6:00
- D. Operating tempration: 0~50°C
- E. Storage tempration: -20~70°C
- F. Display mode: STN-YELLOW mode, positive type display

2.Mechanical Data and Conditions:

- (1) Number of Characters----- 24 Characters * 2 Line
- (2) Module Size-----118.0 w * 36.0 h mm
- (3) Viewing Area ----- 93.5 w * 15.8 h mm
- (4) Dot Size -----0.60 w * 0.65 h mm
- (5) Character Size -----3.2 w * 5.55 h mm
- (6) Outline Dimensions-----See Attached Drawing

3.Pin Connections:

Pin No.	Symbol	Function
1	Vss	Ground(0v)
2	Vdd	Logic Supply Voltage(+5.0v)
3	Vee	LCD Driver Voltage Input
4	RS	Data/Instruction Register Select
5	R/W	Read/Write Select
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15-16	A,K	LED Backlight

4. Absolute Maximum Ratings

Characteristics	Symbol	Ratings
Operating Voltage	VDD	-0.3V to +7.0V
Driver Supply Voltage	V _{LCD}	-0.3V to +13.5V
Input Voltage Range	V _{IN}	-0.3V to VDD+0.3V

5. Timing Characteristics: (VDD=4.5 to 5.5V)

Write Operation

Item	Symbol	Min.	Typ.	Max.	Unit
Enable Cycle Time	T _{CYCLE}	400	--	--	nS
Enable Pulse Width	P _{WEH}	150	--	--	nS
Enable Rise & Fall Time	T _{ER,TEF}	--	--	25	nS
Address Set-Up Time	T _{AS}	30	--	--	nS
Address Hold Time	T _{AH}	10	--	--	nS
Data Set-Up Time	T _{DSW}	40	--	--	nS
Data Hold Time	T _H	10	--	--	nS

Read Operation

Item	Symbol	Min.	Typ.	Max.	Unit
Enable Cycle Time	T _{CYCLE}	400	--	--	nS
Enable Pulse Width	P _{WEH}	150	--	--	nS
Enable Rise & Fall Time	T _{ER,TEF}	-	--	25	nS
Address Set-Up Time	T _{AS}	30	--	--	nS
Address Hold Time	T _{AH}	10	--	--	nS
Data Output Delay Time	T _{DSW}	-	--	100	nS
Data Hold Time	T _H	20	--	--	nS

II.The Characteristics and Reliability Test

1.Electro-Optic Characteristics(module unit):

Condition:TEMP=(23±3)°C

NO	Item	Symbol	Min.	Typ.	Max.	Unit	Condition
1	Supply Voltage(Logic)	Vdd-Vss	4.5	5.0	5.5	V	
2	Supply Current (Logic)	Idd		1.10		mA	Vdd=5V
3	LCD Operating Voltage	Vdd-V ₀		4.9		V	0°C
				4.7		V	25°C
				4.5		V	50°C
4	Response Time	Ton		158		ms	
		Toff		121		ms	
5	Contrast	CR	3				
6	Viewing Angel	12H	θ 1		45	Deg.	(CR≥3.0)
		6H	θ 2		71		
		3H	θ 3		60		
		9H	θ 4		60		
7	LCD Threshold Voltage	Vth		3.66		V	25°C

2. Characteristics of backlight (LED unit)

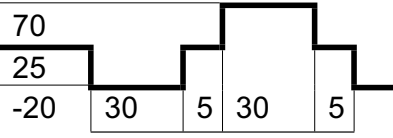
(1).Absolute Maximum Ratings:

Item	Symbol	Typ.	Max.	Unit	Condition
Forward Current	IFM	150	300	mA	Ta=25°C
Reverse Voltage	VR	10		V	Ta=25°C
Power Dissipation	PD	630		mW	Ta=25°C

(2).Electrical-optical Characteristics:

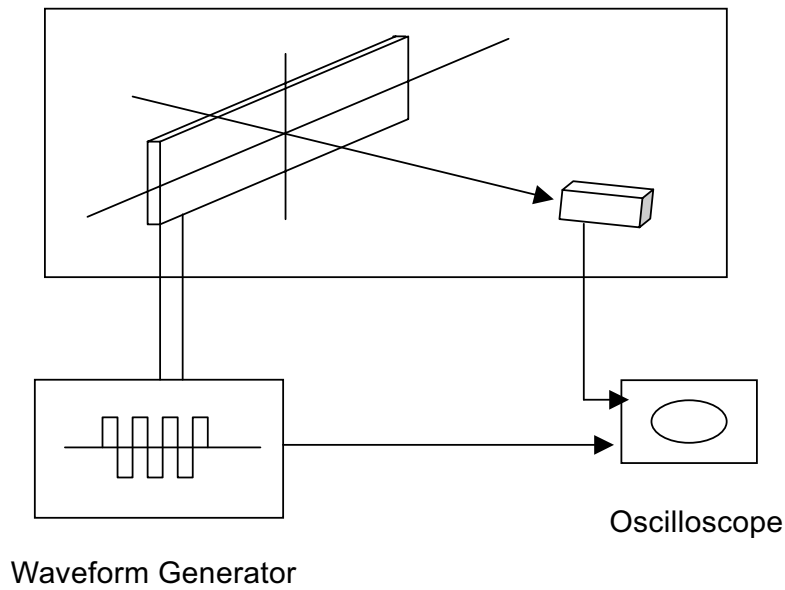
Ltem	Symbol	Min	Typ	Max	Unit	Condition
Forward Voltage	VF		4.2	4.6	V	
Reverse current	IR		0.2		mA	
Color	YELLOW-GREEN					

3. Reliability Test

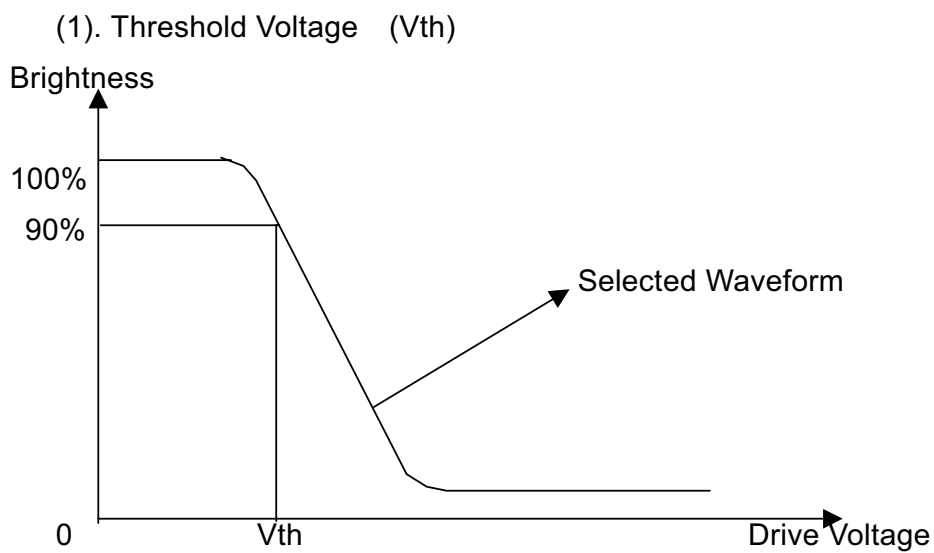
No	Items	Test Condition	Equipment	Test Result
1	High Temp Storage	Temp: $70 \pm 2^{\circ}\text{C}$ Time: 96h Restore: 24h	Tenny	Passed
2	Low Temp Storage	Temp: $-20 \pm 3^{\circ}\text{C}$ Time: 96h Restore: 24h	Tenny	Passed
3	High Temp Static drive	Temp: $50 \pm 2^{\circ}\text{C}$ Vop: 5V Time: 24h Restore: 24h	Tenny	Passed
4	Low Temp Static drive	Temp: $0 \pm 3^{\circ}\text{C}$ Vop: 5V Time: 24h Restore: 24h	Tenny	Passed
5	High Temp High Hum Storage	Temp: $40 \pm 2^{\circ}\text{C}$ Hum: 95%Rh Time: 96h Restore: 24h	Tenny	Passed
6	Thermal Shock	Temp: ($^{\circ}\text{C}$)  5 Cycles Restore: 24h	Tenny	Passed

III. The Equipment and LCD Measuring Method

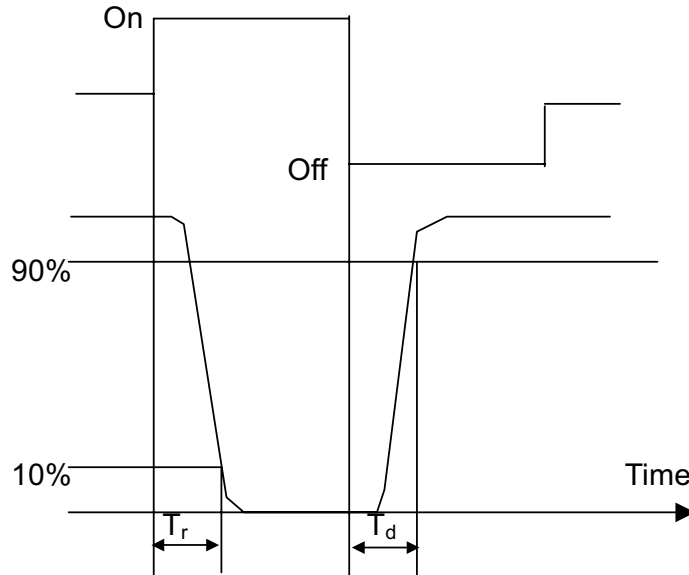
1. Equipment



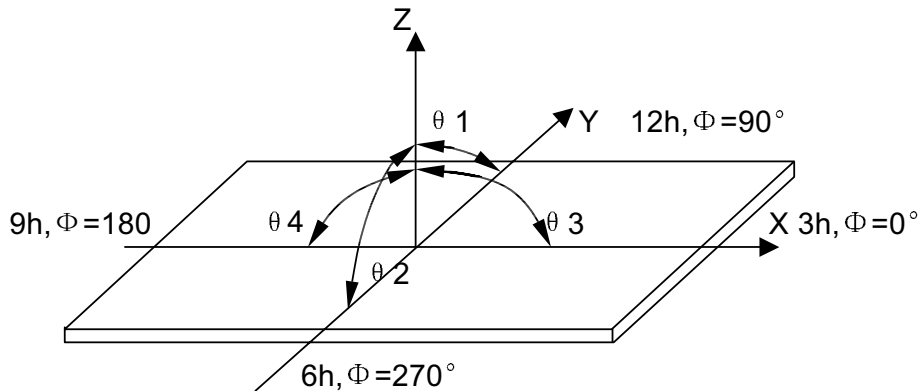
2. Definition



(2). Response Time



(3). Viewing Angle:



(4). Contrast Ratio (Positive)

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

3. Reliability Test:

Equipment : TENNY

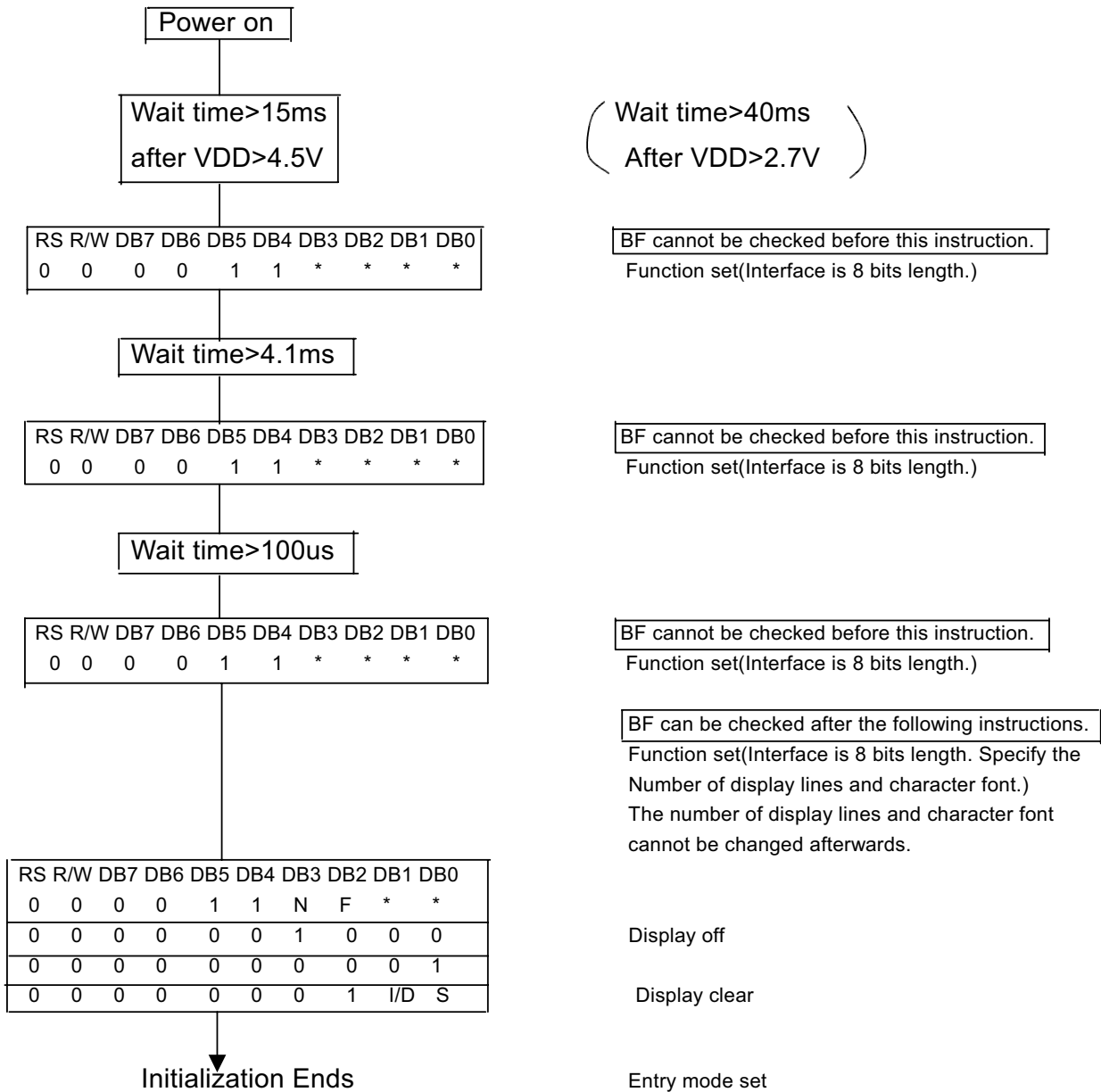
IV. Instruction Sets

1. Instruction Table

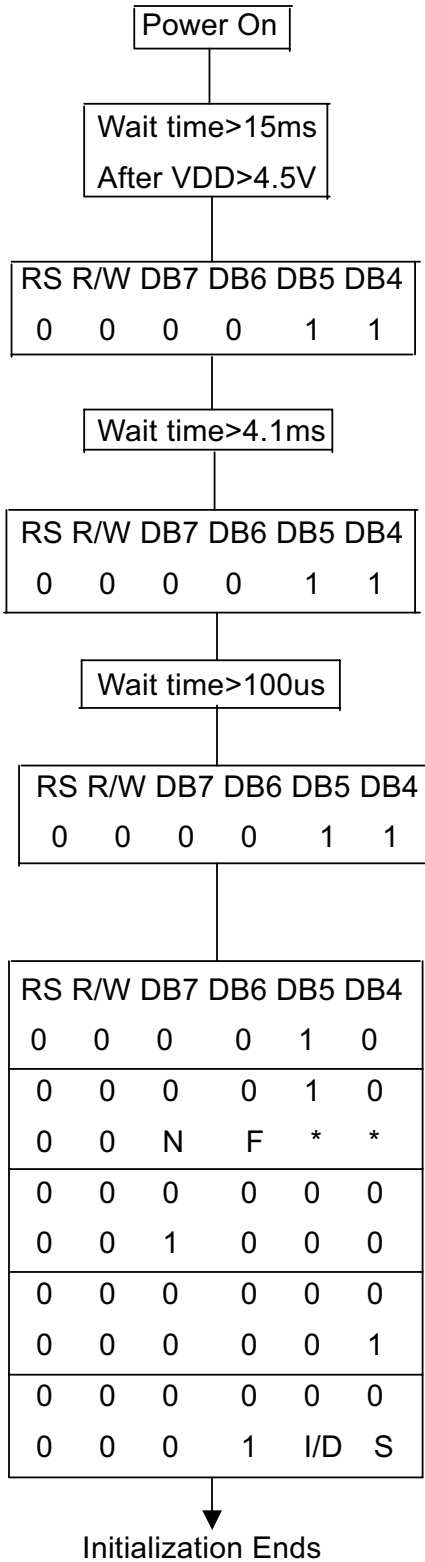
Instruction	Instruction Code										Description	Execution time(fosc=270kHz)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRM and set DDRAM address to "00H" from AC	1.52mS
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52mS
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Assign cursor moving direction and enable the shift of entire display	38uS
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor (C), and blinking of cursor(B) on/off control bit.	38uS
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	38uS
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length(DL:8-bit/4bit), numbers of display line (N:2-line/1line) and display font type (F:5*10dots/5*8dot)	38uS
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	38uS
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in counter	38uS
Read Busy Flag and Address Counter	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRM/CGRAM).	38uS
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	38uS

2.Reset Function

(1).8-Bit Interface



(2).4-Bit Interface



(Wait time > 40ms
after VDD > 2.7V)

BF cannot be checked before this instruction.
Function set (Interface is 8 bits length.)

BF cannot be checked before this instruction.
Function set (Interface is 8 bits length.)

BF cannot be checked before this instruction.
Function set (Interface is 8 bits length.)

BF can be checked after the following instructions.

Function set (Set interface to be 4 bits length) Interface is 8 bits length.

Function set (Interface is 4 bits length. Specify the number of the display lines and character font.)

The number of display lines and character font cannot be changed afterwards.

Display off

Display clear

Entry mode set

V. Standard Specifications for Product Quality

1. 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 15° - 45° Of Vertical Line.

2. Definition Of Defects

2.1 Major Defects

A: Non-Display

B: Segment Missing

C: Over Current

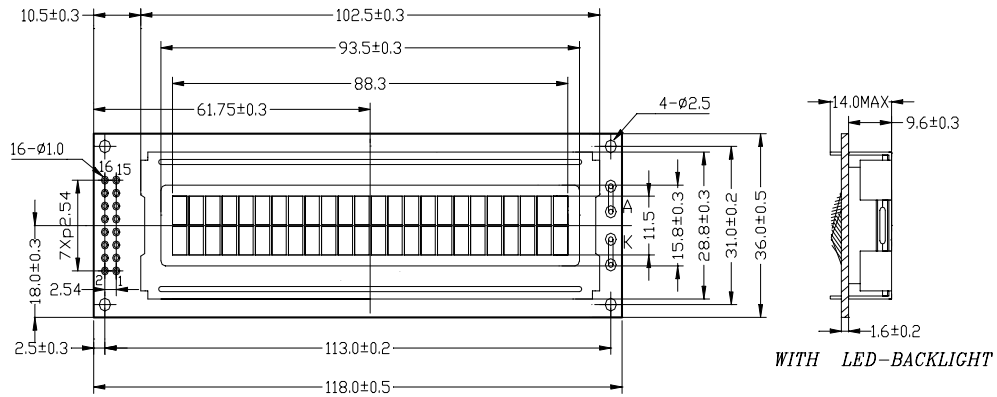
D: Segment Short

E: Sealant Dishardexn

F: Wrong Polarizer Direction

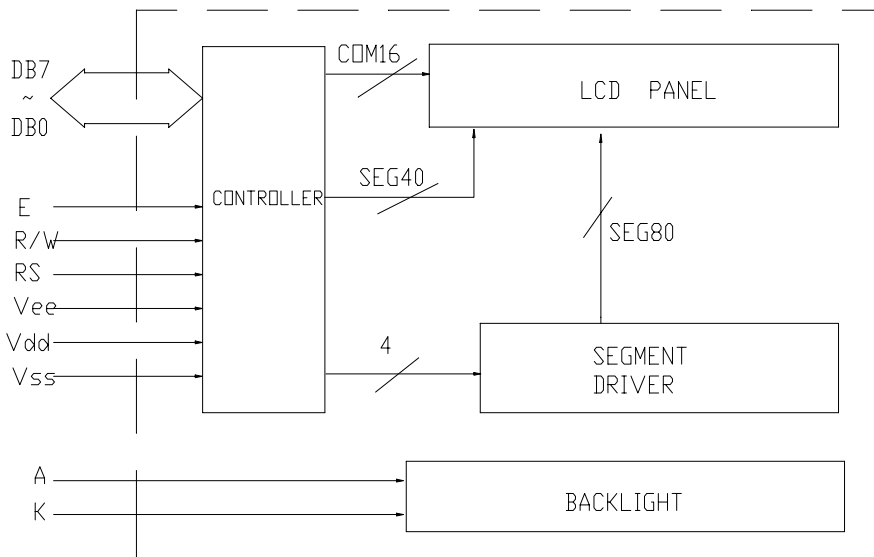
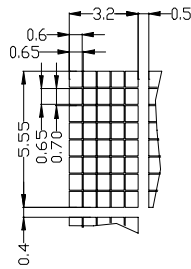
2.2 minor Defects: The Others.

3. Major Defects Should Be In AQL 0.25, and The Minor In AQL 1.00



Note:

1. Operating Voltage: 5V
2. Drive method: 1/16Duty, 1/5 Bias
3. Viewing Direction: 6:00
4. Operating Temp: 0°C~50°C
5. Storage Temp: -20°C~70°C
6. Display type: STN, Positive



TERMINAL:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vss	Vdd	Vee	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	A	K