
PRODUCT SPECIFICATIONS

C-1602A-1YN

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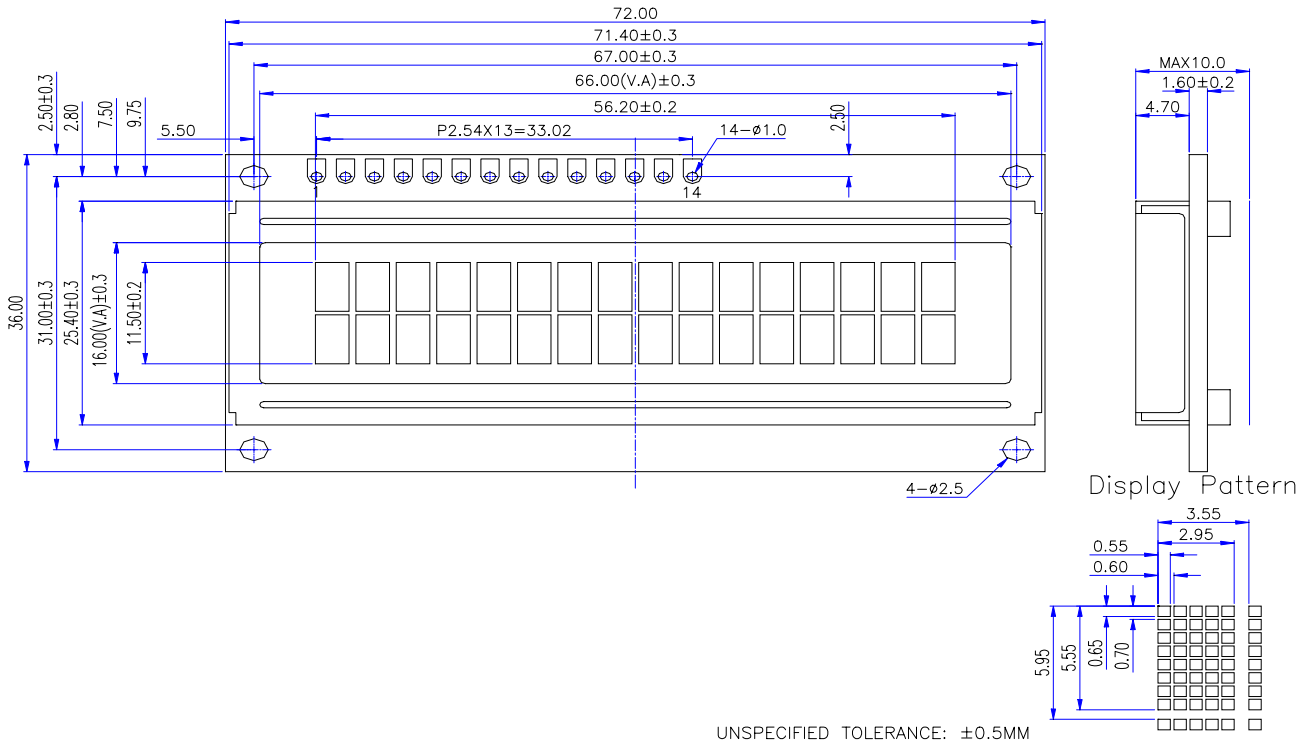
1 COMPOSITION

Display type: 16 CHARACTERS × 2 LINES DOT Matrix LCD Module
Driving method: 1/16 DUTY 1/5 BIAS
View direction: 6 O'clock
Controller/driver: KS0066UP00CC/KS0065B

2 MECHANICAL SPECIFICATION

ITEM	STANDARD VALUES	UNIT
LCD type	STN, Yellow-Green mode, Reflective	
Dot arrangement	16 Characters × 2 Lines	Character
Module size	72.00 (W) × 36.00 (H) × 10.00 (Dmax.)	mm
View area	66.00 (W) × 16.00 (H)	mm
Active area	56.20 (W) × 11.50 (H)	mm
Dot size	0.55 (W) × 0.65 (H)	mm
Dot pitch	0.60 (W) × 0.70 (H)	mm
Viewing direction	6 O'clock	
Weight	-	g

3 DIMENSION DIAGRAM



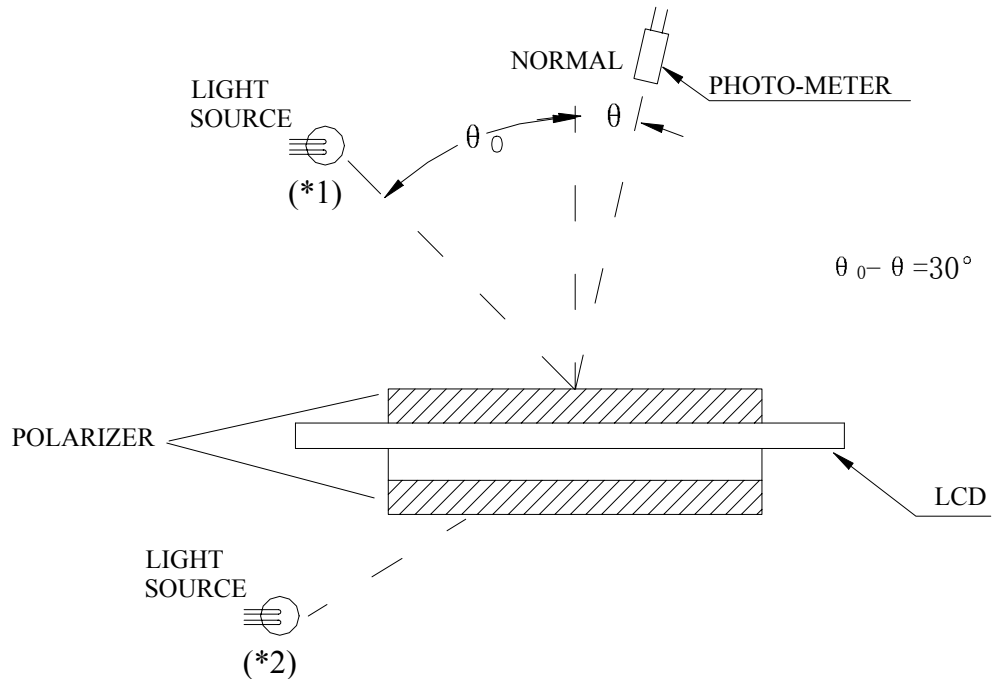
4 OPTICAL CHARACTERISTICS

($V_{op}=4.2V$, $T_a=25^\circ C$)

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	
Viewing Angle	θ	$C_r \geq 2.0$	$\Phi=0^\circ$	-	40	-	Deg
			$\Phi=180^\circ$	-	30	-	
			$\Phi=90^\circ$	-	30	-	
			$\Phi=270^\circ$	-	30	-	
Contrast Ratio	C_r	$\theta_2=10, \Phi=0^\circ$	-	3	-		
Response Time	T_R	$\theta_2=10, \Phi=0^\circ$	-	200	300	ms	
	T_F		-	250	350		

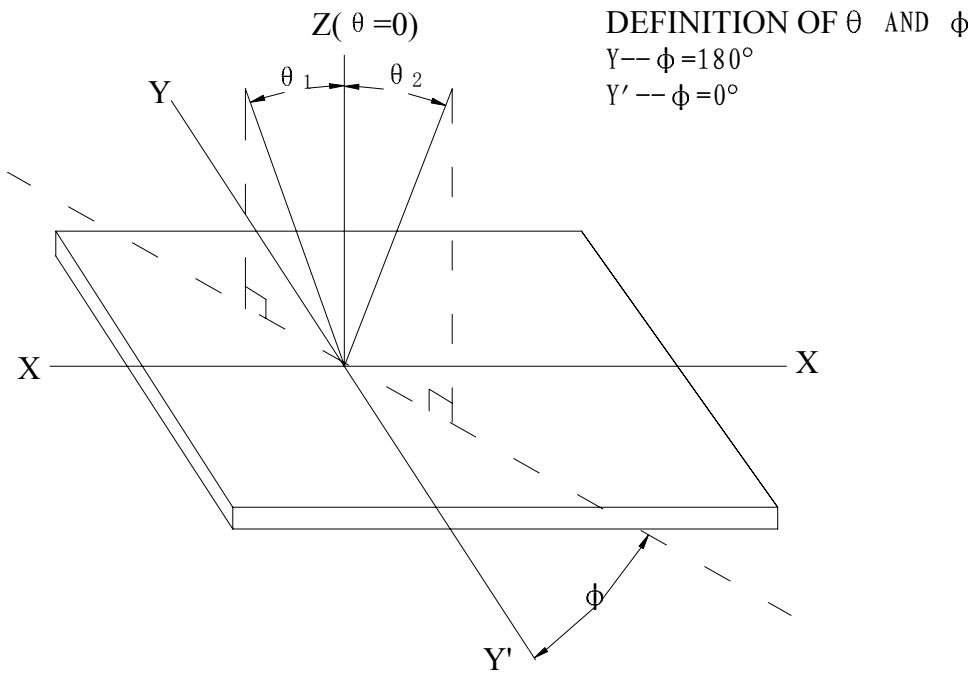
4.1 OPTICAL MEASUREMENT SYSTEM

MEASURING INSTRUMENTS FOR ELECTRO-OPTICAL CHARACTERISTICS

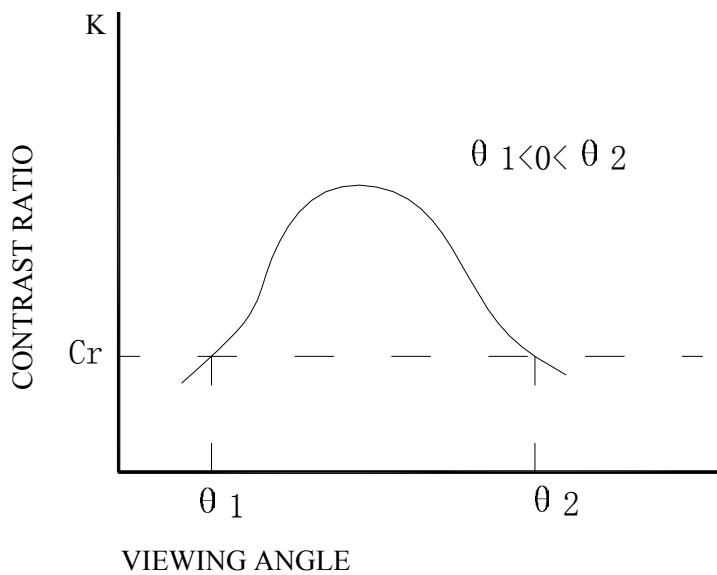


*1: LIGHT SOURCE POSITION FOR MEASURING OF REFLECTIVE

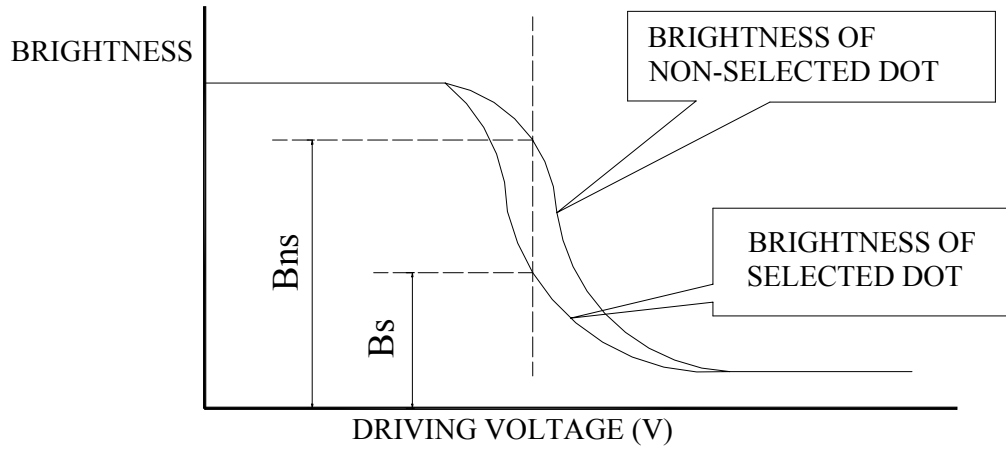
*2: LIGHT SOURCE POSITION FOR MEASURING OF TRANSFLECTIVE/TRANSPARENT



DEFINITION OF VIEWING ANGLE

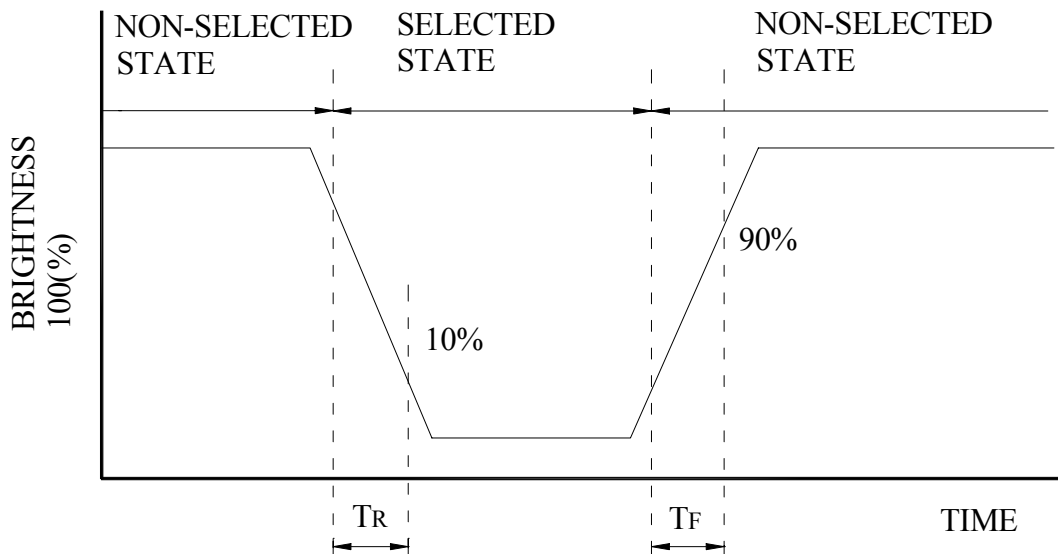


4.2 CONTRAST RATIO C_r



$$\text{CONTRAST RATIO: } C_r = B_{ns}/B_s$$

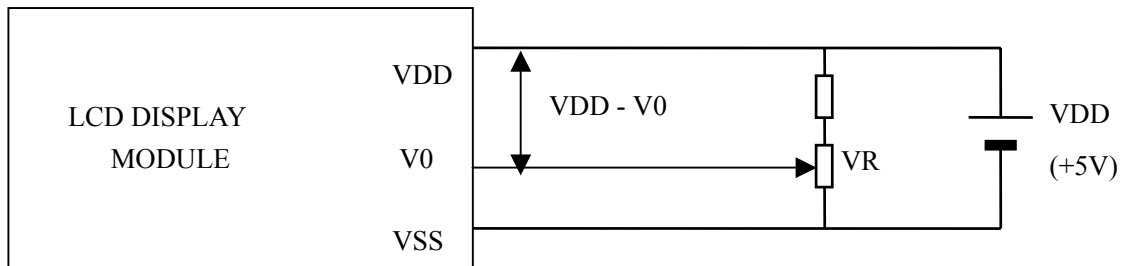
4.3 RESPONSE TIMES T_R AND T_F



5 ELECTRONICAL SPECIFICATIONS

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Power-supply voltage	V_{DD}	4.5	5.0	5.5	V
Power-supply current (without Backlight)	I_{DD} ($V_{DD}=5V$)	-	1.0	3.0	mA
Vop output voltage	$V_{DD}-V_0$	-	4.2	-	V
Input voltage	V_{IH}	2.2	-	-	V
	V_{IL}	-	-	0.6	

5.1 POWER SUPPLY CIRCUIT DIAGRAM



VDD - V0: LCD DRIVING VOLTAGE

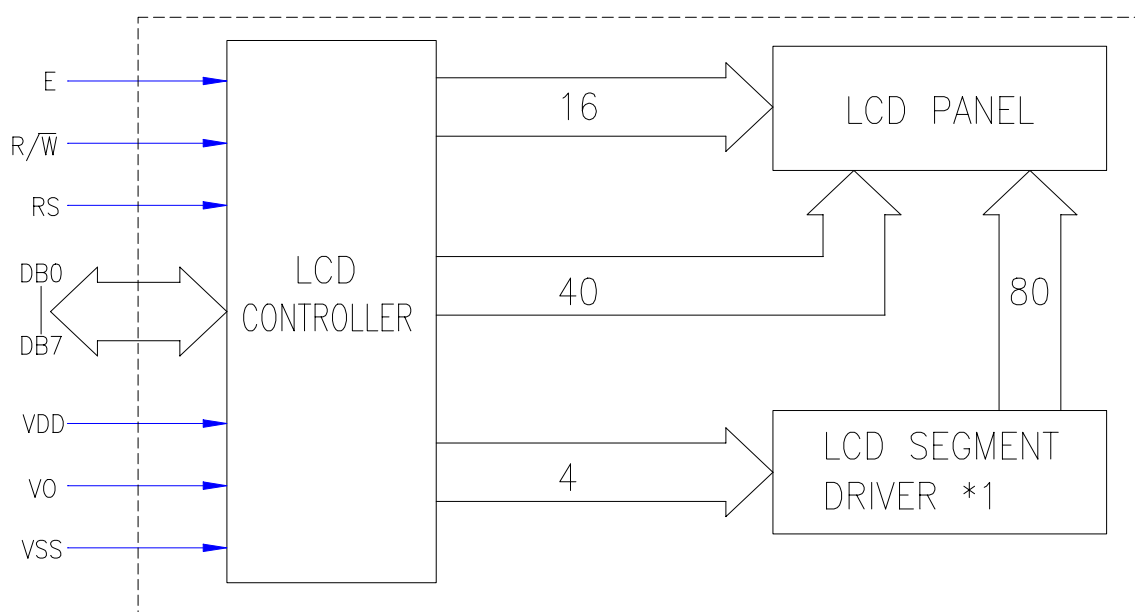
VR: 10K ~ 20K

RECOMMENDED RESISTOR R: $V_{DD} - V_0 \geq 1.5V$

6 INTERFACE PIN DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION	FUNCTION
1	VSS		0V
2	VDD	POWER SUPPLY FOR LOGIC CIRCUIT	+5V
3	V0	LCD CONTRAST ADJUSTMENT	
4	RS	INSTRUCTION / DATA REGISTER SELECTION	RS=0: INSTRUCTION REGISTER RS=1: DATA REGISTER
5	R/W	READ / WRITE SELECTION	R/W=0: REGISTER WRITE R/W=1: REGISTER READ
6	E	ENABLE INPUT	
7	DB0	DATA INPUT / OUTPUT LINES	4 BIT / 8 BIT SELECTABLE 4 BIT: DB4 - DB7 8 BIT: DB0 - DB7
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		

7 BLOCK DIAGRAM



8 AC CHARACTERISTICS

8.1 INTERFACE TIMING

Read Cycle (Ta=25°C, Vdd=5.0V)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
t _C	Enable Cycle time	500	--	--	ns	Figure 1
t _w	Enable Pulse Width (H/L)	230	--	--		
t _R /t _F	Enable Rise/Fall Time	--	--	20		
t _{SU}	RS,R/W Setup time	40	--	--		
t _H	RS,R/W Hold Time	10	--	--		
t _D	Data Delay Output	--	--	120		
t _{DH}	Data Hold Time	5	--	--		

Read Operation

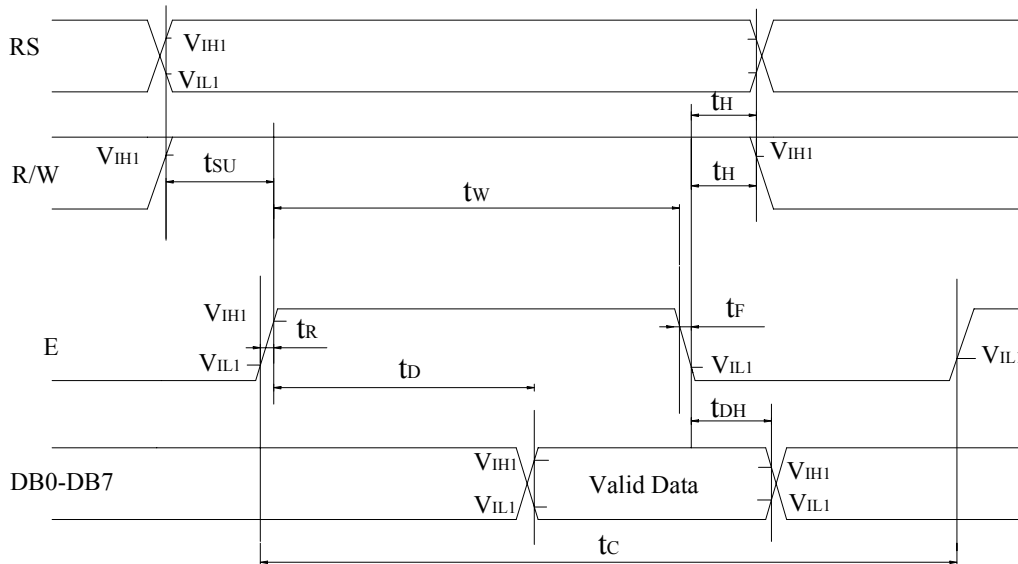


Figure 1. Bus Read Operation Sequence

Write Cycle (Ta=25°C, Vdd=5V)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
t _C	Enable Cycle Time	500	-	-	ns	Figure 2
t _w	Enable Pulse Width(H/L)	230	-	-		
t _R /t _F	Enable Rise/Fall Time	-	-	20		
t _{SU1}	RS,R/W Setup Time	40	-	-		
t _{H1}	RS,R/W Hold Time	10	-	-		
t _{SU2}	Data Setup Time	80	-	-		
t _{H2}	Data Hold Time	10	-	-		

Write Operation

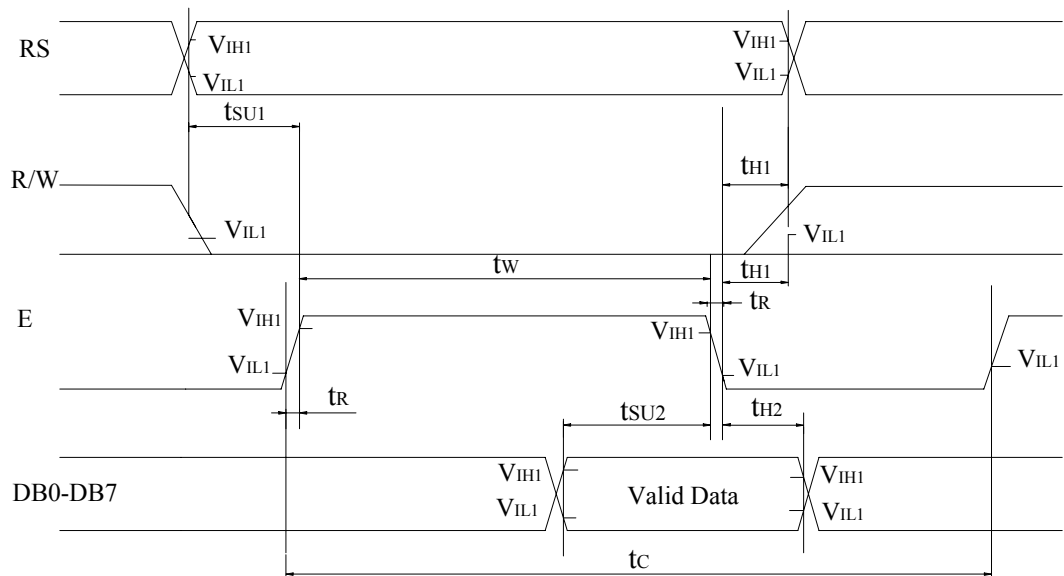


Figure 2. Bus Write Operation Sequence

Timing Characteristics of Interface Signals with Segment Driver

($T_a=25^{\circ}\text{C}$, $V_{dd}=5\text{V}$)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
t_C	Clock Pulse Width (H/L)	800	-	-	ns	Figure 3
t_R/t_F	Clock Rise/Fall Time	-	-	25		
t_{SU1}	Data Setup Time	300	-	-		
t_{DH}	Data Hold Time	300	-	-		
t_{SU2}	Clock Setup Time	500	-	-		
t_{DM}	M Delay Time	-1000	-	1000		

Interface Signals with Segment Driver

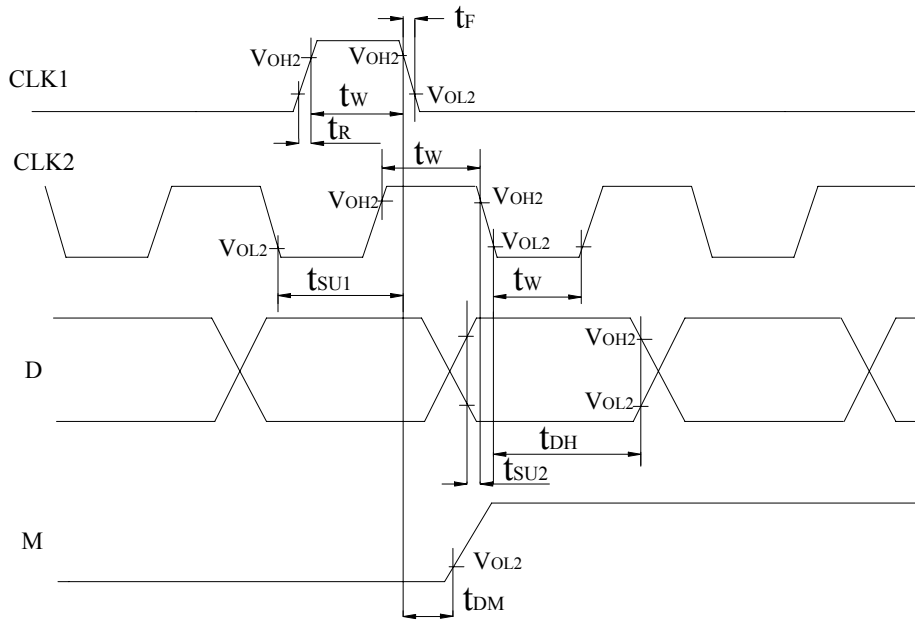


Figure 3. Sending Data to Segment Driver

Power Supply Conditions Using Reset Circuit

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	CONDITION
t_{RON}	Clock Pulse Width High	0.1	-	10	ms	Figure 4
t_{OFF}	Clock Pulse Width Low	1	-	-	ms	Figure 4

Interface Signals with Segment Driver

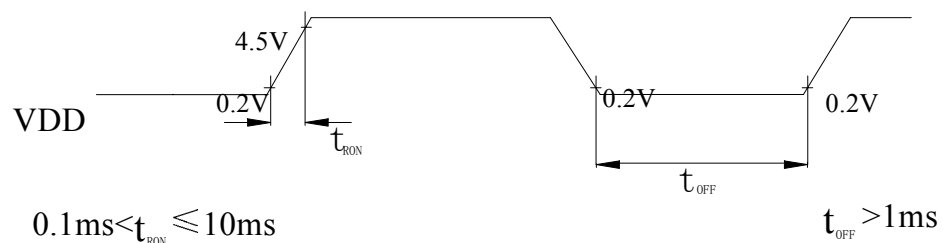


Figure 4. t_{OFF} stipulates the time of power OFF for instantaneous power supply to or when power supply repeats ON and OFF

8.2 CGROM CHARACTER CODE TABLE

CHARACTER GENERATOR ROM (KS0066UP00CC)

9 MAXIMUM ABSOLUTE VALUES

ITEM	SYMBOL	MIN	MAX	UNIT
Operation temperature	T_{OP}	0	50	°C
Storage temperature	T_{ST}	-20	60	
Supply voltage for logic	$V_{DD}-V_{SS}$	-0.3	7.0	V
Supply voltage for LCD driving	$V_{DD}-V_O$	-0.3	$V_{DD}+0.3$	
Logic input voltage	V_I	$V_{SS}-0.3$	$V_{DD}+0.3$	

10 RELIABILITY

ITEM	CONDITIONS	CRITERIA
High temperature operation	50°C for 200 hours	
Low temperature operation	0°C for 200 hours	
High humidity storage	40°C,90%RH for 96 hours	
High temperature storage	60°C for 200 hours	
Low temperature storage	-20°C for 200 hours	
Temperature cycling	-20°C (30 min) ↓ ↑ 25°C (5 min) ↓ ↑ 60°C (30 min) CYCLES: 10	
Vibration	Random Wave: 40 ~ 50 Hz Acceleration: 5g Each Direction (x,y,z): 50 sec	
Shock	Operating:3.0g(max.), Storage:50g(max.), x,y,z Directions	

11 COSMETIC CRITERIA OF LCD SCREEN

DEFECT	JUDGEMENT CRITERION		
Spots	Size d (mm)	Acceptable quantity in active area	
	$d \leq 0.1$	Disregard	
	$0.1 < d \leq 0.2$	$0.1 < d \leq 0.2$	
	$0.2 < d \leq 0.3$	$0.2 < d \leq 0$	
	$d > 0.3$	2	
Note: $d = (\text{Length} + \text{Width})/2$			
Polarizer Bubbles	Size d (mm)	Acceptable quantity in active area	
	$d \leq 0.3$	Disregard	
	$0.3 < d \leq 1.0$	3	
	$1.0 < d \leq 1.5$	1	
	$d > 1.5$	0	
Note: $d = (\text{Length} + \text{Width})/2$			
Lines	Width W (mm) Length L (mm)	Acceptable quantity in active area	
	$W \leq 0.02$	Disregard	
	$0.02 < W \leq 0.05$	$L \leq 5.0$	6
		$L > 5.0$	0
	$0.05 < W \leq 0.1$	$L \leq 2.0$	6
		$L > 2.0$	0
$W > 0.1$	See criteria for spots		
Testing conditions: 20W fluorescent lamp at 30 cm distance at normal viewing angle			

12 PRECAUTIONS

12.1 STATIC CHARGE

Since this LCD module contains CMOS LSIs that are sensitive to static charge, care must be taken when handling it.

12.2 POWER ON SEQUENCE

1. Input signals should not be applied to the LCD module before the logic system voltage has reached the specified voltage. If the above sequence is not kept, the LCD module might be permanently damaged.
2. When connecting the power supply, connect the LCD bias voltage after connecting the logic system voltage.
3. When disconnecting the power supply, disconnect the logic system voltage after the LCD bias voltage.
4. It is recommended to connect a serial resistor or fuse to the LCD bias power supply of the system as a current limiter. The value of the resistor depends on the kind of LCD used, but is typically 50~100 Ω

12.3 OPERATION

1. It is essential to drive the LCD within the specified voltage limits, since a higher driving voltage than allowed causes a shorter LCD lifetime. Under these circumstances, electrochemical reactions will result in undesirable deterioration of the LCD.
2. The response time of the LCD is considerably longer at low temperature than in the normal operating temperature range. On the other hand, the LCD will show a dark blue color at high temperatures. Those phenomena do not indicate a malfunction or defect of the LCD. Back at normal temperatures, the LCD will return to its original behavior.
3. If the display area is pressed hard during operation, some abnormal display patterns might appear. However, the display will resume normal operation after turning the module off and on.
4. Moisture on the terminals cause an electrochemical reaction resulting in an open terminal connection.
5. If the environmental temperature is higher than 40°C, it is required that the relative humidity is 50% or less.

12.4 PACKAGING

1. Do not leave the product in a place of high humidity for a long period. For storage in a location where the temperature is 35°C or higher, special care to protect the product from high humidity is required. A combination of high temperature and high humidity may cause polarization degradation and damage as well. Please keep the temperature and humidity within the specified range for storing.
2. Since LCD panels tend to be easily damaged, they should be handled with full care. Avoid any contact with materials that have a hardness of more than 2H.
3. Adhesive used for adhering upper/lower polarizers and aluminum plates are made of organic substances that will deteriorate by chemical reactions with for examples chemicals such as acetone, toluene, ethanol and isopropylalcohol. Please prevent the use of these chemicals and contact us when

it is necessary for you to use other chemicals.

4. Immediately wipe off saliva or water drops from the display area with an absorbent cotton cloth without scrubbing it. If adhered for a long period, such particles might cause deformation or faded color.
5. Moisture deposited on the display surface and contact terminals due to low temperatures will be a cause for polarizer damage, stains and dirt. Before use, such panels should be slowly warmed up to a temperature that is higher than room temperature.
6. Touching the display area and contact terminals with bare hands is harmful to polarizer and may lead to poor contact at the terminals.
7. The glass is fragile and can be cracked or chipped easily by handling, in particular on near its edge. Please prevent sudden shocks or exposing the glass to other sorts of stress.

12.5 LONG-TERM STORAGE

For long-term storage the following methods are highly recommended:

1. Store the product in a polyethylene bag with a sealed opening to prevent fresh air entering from the outside. Placing it with a desiccant is not necessary.
2. Store the product in a dark place, with the temperature in the range from 0°C to 35°C.
3. Keep the sensitive polarizer surface of the LCD panels clear of any contact. We recommend using the container that was used by Hai Jing to deliver the products.

12.6 CLEANING OF PRODUCT

To clean the product make sure to use absorbent cotton cloth or other soft material like chamois. Make sure to rub it gently and do not use chemicals when cleaning.