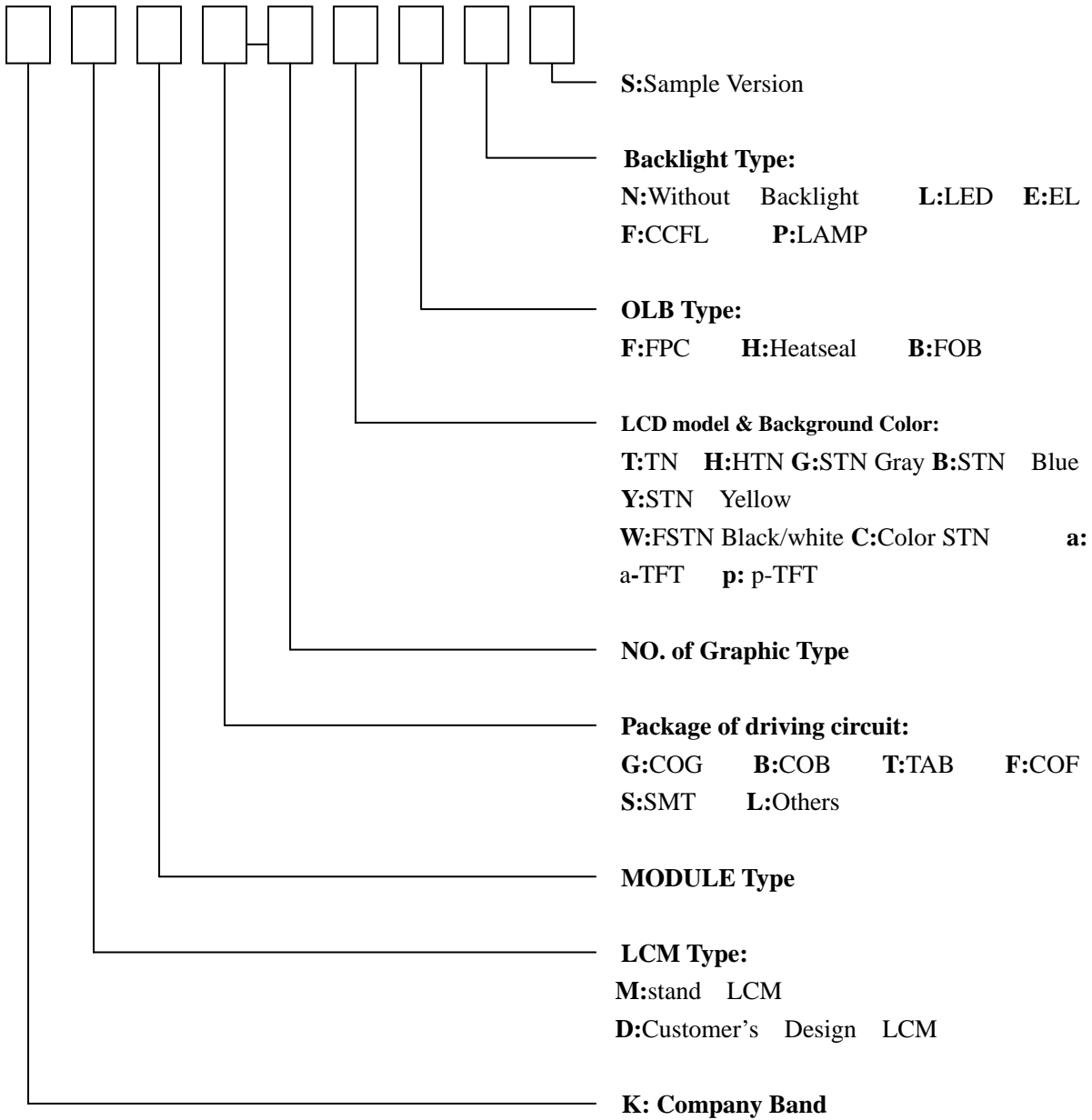
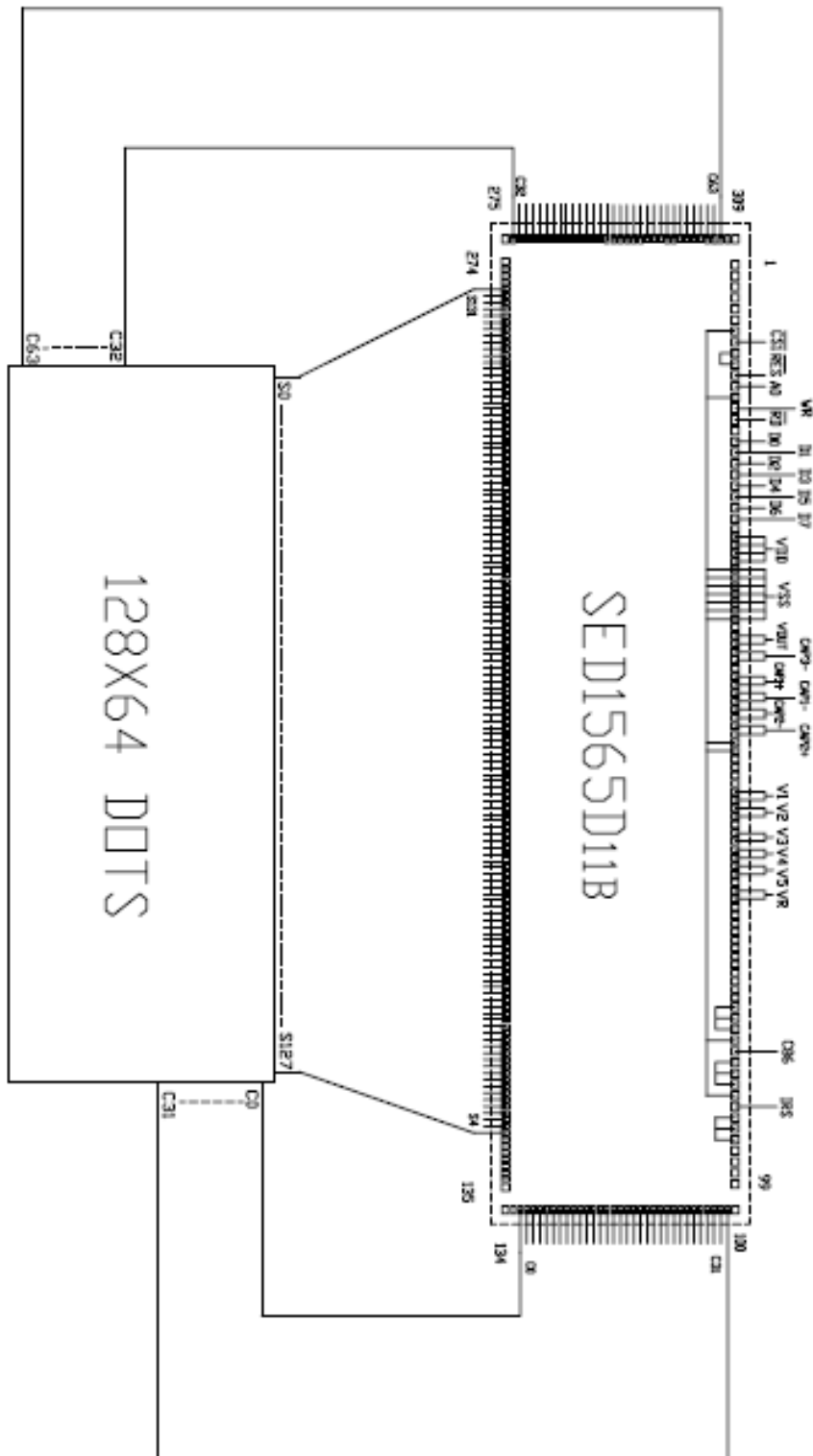


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3.0 LCD Module Part Numbering System



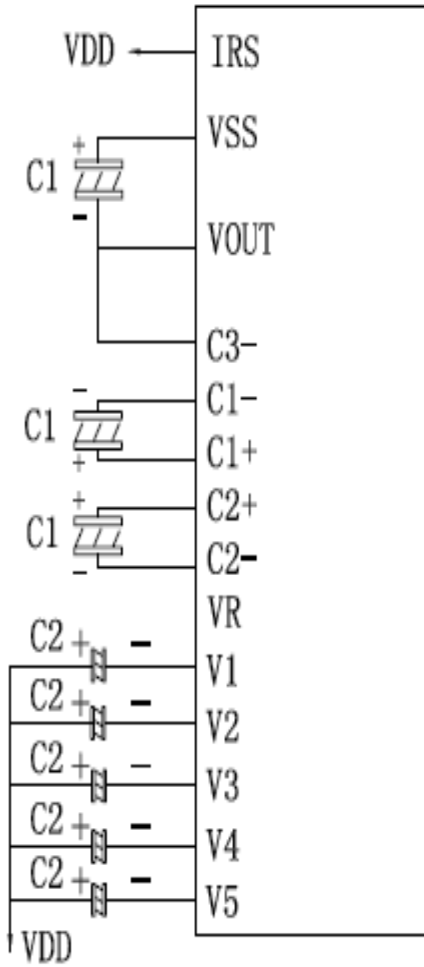
4 Electronic Character 4.1 Circuit Block Diagram



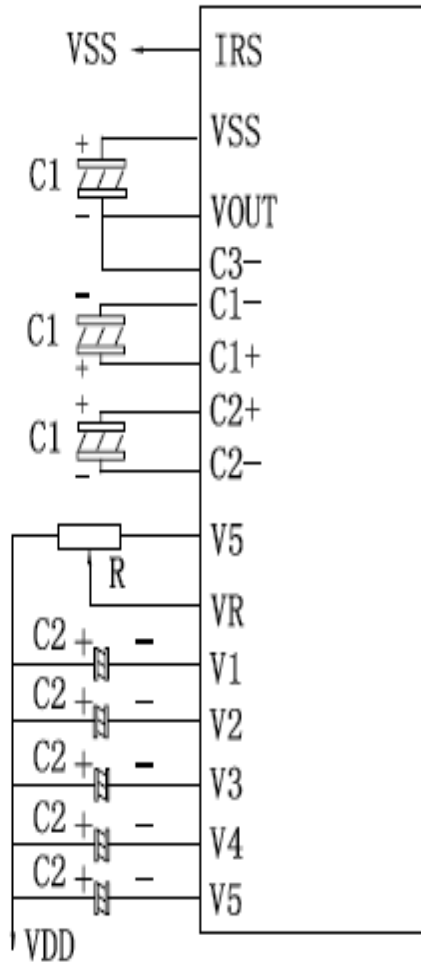
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4.2 Power supply circuit

When the voltage regulator internal resistor is used



When the voltage regulator internal resistor is not used



VALUE OF EXTERNAL CAPACITANCE

ITEM	VALUE	UNIT
C1	1.0 to 4.7	uF
C2	0.01 to 1.0	

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5.0 Electro-optical characteristics

5.1 Electrical characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	
Supply Voltage (Logic)	$V_{DD}-V_{SS}$	4.5	5.0	5.5	V	
Supply Voltage (LCD Drive)	V_{LCD}	-	8.9	25.0	V	
Input Signal Voltage	High	V_{IH} ($V_{DD}=5.0$)	0.8 V_{DD}	-	$V_{DD}+0.3$	V
	Low	V_{IL} ($V_{DD}=5.0$)	0	-	0.2 V_{DD}	V
Supply current (Logic)	I_{DD} ($V_{DD}-V_{SS}=3.0V$)	-	-	300	μA	
Supply current (LCD Driver)	I_{DD} ($V_{DD}-V_{SS}=3.0V$)	-	-	500	μA	
Supply current (LED)	I_{LED}	-	-	90	mA	
Supply Voltage (LED)	V_{LCD}	-	5.0	-	V	

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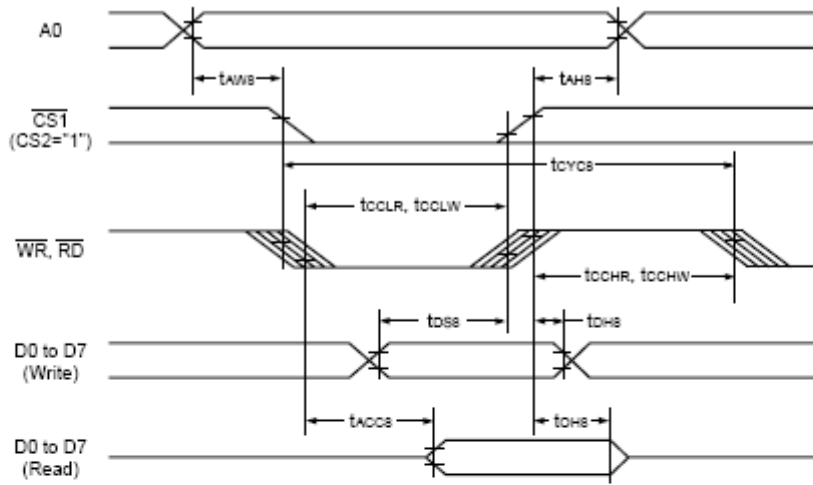
5.2 Interface Signals

Pin No.	Symbol	Level	Description
1	NC	-	No connection
2	/CS1	H/L	Chip select input pin (active at low)
3	/RES	H/L	Reset input pin (active at low)
4	A0	H/L	Register select input pin (H: Data, L: control)
5	/WR	H/L	Write enable clock input pin
6	/RD	H/L	Read enable clock input pin
7	DB0	H/L	8-bit bi-directional data bus that is connected to the standard 8-bit microprocessor data bus.
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	VDD	5.0V	Power supply
16	VSS	0V	Ground
17	VOUT	-	Voltage converter input / output pin
18	C3-	-	Capacitor connection pin for voltage converter
19	C1+	-	
20	C1-	-	
21	C2+	-	
22	C2-	-	
23	V1	-	LCD driver supply voltages $V1 = (1/7) \times V5$ $V2 = (2/7) \times V5$ $V3 = (5/7) \times V5$ $V4 = (6/7) \times V5$
24	V2	-	
25	V3	-	
26	V4	-	
27	V5	-	
28	VR	-	Output voltage regulator terminal
29	C86	H/L	MPU interface switch terminal (H: 6800 Series MPU interface. L: 8080 MPU interface)
30	IRS	H/L	Terminal selects the resistors for the V5 voltage level adjustment

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5.3 Interface Timing Chart

5.3.1 System Bus Read/Write Characteristics (for the 8080 Series MPU)



Figure

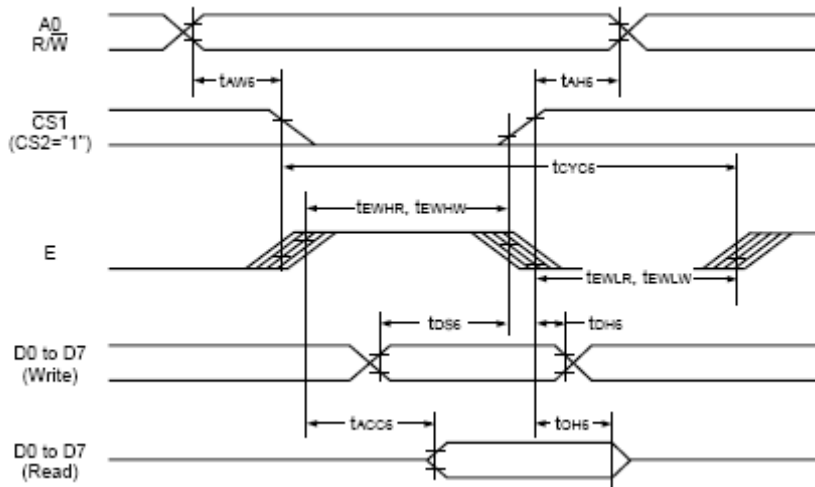
Table

(VDD = 4.5 V to 5.5 V, Ta = -40 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAHS		0	—	ns
Address setup time	A0	tAWS		0	—	ns
System cycle time	A0	tCYCS		186	—	ns
Control LOW pulse width (WR)	WR	tCCLW		30	—	ns
Control LOW pulse width (RD)	RD	tCCLR		70	—	ns
Control HIGH pulse width (WR)	WR	tCCHW		30	—	ns
Control HIGH pulse width (RD)	RD	tCCHR		30	—	ns
Data setup time	D0 to D7	tDS		30	—	ns
Address hold time	D0 to D7	tDHS		10	—	ns
RD access time		tACS	CL = 100 pF	—	70	ns
Output disable time		tOHS		5	60	ns

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5.3.2 System Bus Read/Write Characteristics (for the 6800 Series MPU)



Figure

Table

(VDD = 4.5 V to 5.5 V, Ta = -40 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time	A0	tAW6		0	—	ns
System cycle time	A0	tCYC6		186	—	ns
Data setup time	D0 to D7	tDS6	CL = 100 pF	30	—	ns
Data hold time		tDH6		10	—	ns
Access time		tACC6		—	70	ns
Output disable time		tOD6		10	50	ns
Enable HIGH pulse time	Read	E	tEWHR	70	—	ns
	Write	E	tEWHW	30	—	ns
Enable LOW pulse time	Read	E	tEWLR	30	—	ns
	Write	E	tEWLW	30	—	ns

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5.4 Instruction Code

Table of SED1565 Series Commands

Command	Command Code										Function			
	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1		D0		
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF, 1: ON	
(2) Display start line set	0	1	0	0	1	Display start address					1	Sets the display RAM display start line address		
(3) Page address set	0	1	0	1	0	1	1	Page address				1	Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				1	Sets the most significant 4 bits of the display RAM column address.	
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				1	Sets the least significant 4 bits of the display RAM column address.	
(5) Status read	0	0	1	Status				0	0	0	0	0	Reads the status data	
(6) Display data write	1	1	0	Write data								0	Writes to the display RAM	
(7) Display data read	1	0	1	Read data								0	Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse	
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	1	Sets the LCD display normal/reverse 0: normal, 1: reverse	
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON	
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio SED1565** 0: 1/9, 1: 1/7 SED1566** /SED1568** /SED1569** 0: 1/8, 1: 1/6 SED1567** 0: 1/8, 1: 1/5	
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	0	Column address increment At write: +1 At read: 0	
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	Clear read/modify/write	
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	0	Internal reset	
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	*	Select COM output scan direction 0: normal direction, 1: reverse direction	
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			0	Select internal power supply operating mode	
(17) Vs voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			0	Select internal resistor ratio (Rb/Ra) mode	
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	0	1	Set the Vs output voltage electronic volume register	
Electronic volume register set	0	1	0	*	*	Electronic volume value					0			
(19) Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	1	0: OFF, 1: ON	
Static indicator register set	0	1	0	*	*	*	*	*	*	Mode			1	Set the flashing mode
(20) Power saver													Display OFF and display all points ON compound command	
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	1	Command for non-operation	
(22) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command	

Note*:disabled date

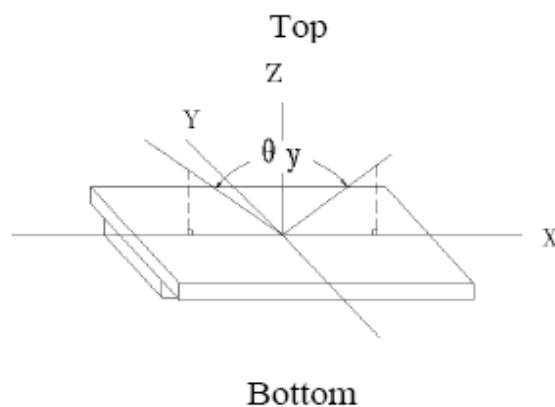
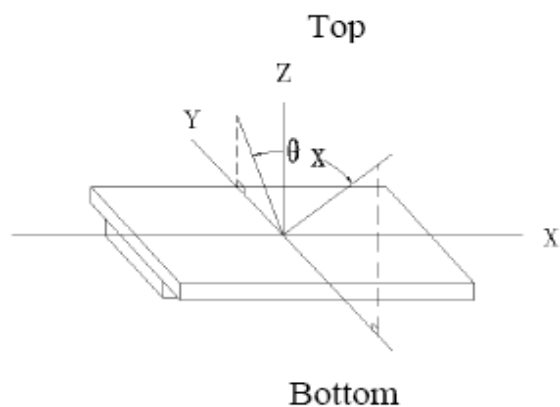
6.0 Optical Characteristics

Ta=25

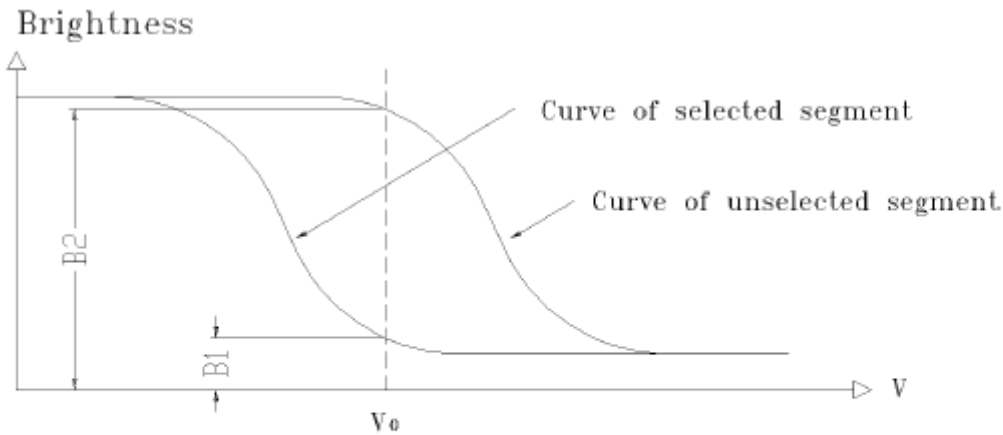
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle	θ_k	$Cr \geq 2$	-30	--	20	Deg
	θ_y					
Contrast Ratio	Cr	$\theta_k = 0^\circ$ $\theta_y = 0^\circ$	3.0	-	-	
Response Time	Turn on	T_{on}	-	-	300	ms
	Turn off	T_{off}				

7.0 Definition of Optical Characteristics

7.1 Definition of Viewing Angle



7.2 Definition of Contrast Ratio

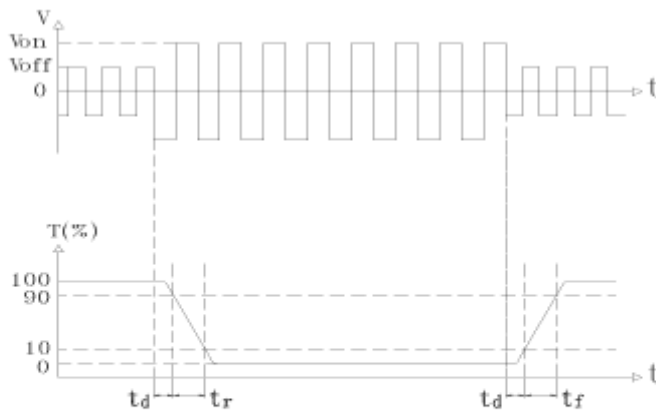


$$\text{Contrast Ratio} = B2/B1 = \frac{\text{unselected state brightness}}{\text{selected state brightness}}$$

Measuring Conditions:

- 1) Ambient Temperature: 25°C ; 2) Frame frequency: 84Hz

7.3 Definition of Response Time



Turn on time: $t_{on} = t_d + t_r$ Turn off time: $t_{off} = t_d + t_f$

Measuring Condition:

- 1) Operating Voltage: 8.9V 2) Frame frequency: 84Hz

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8 Reliability

8.1 Content of Reliability Test

Ta=25°C

No.	Test Item	Content of Test	Test condition
1	High Temperature Storage	Endurance test applying the high storage temperature for a long time	60°C 96H Restore 4H at 25°C
2	Low Temperature Storage	Endurance test applying the low storage temperature for a long time	-20°C 96H Restore 4H at 25°C
3	High Temperature /Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time	40°C 90%RH 96H Restore 4H at 25°C
4	Temperature Cycle	Endurance test applying the low and high temperature cycle $-20^{\circ}\text{C} \longleftrightarrow 25^{\circ}\text{C} \longleftrightarrow 60^{\circ}\text{C} \longleftrightarrow 25^{\circ}\text{C}$ 30min 5min 30min 5min 1 cycle	-20°C/60°C 10 cycles Restore 4H at 25°C
5	Vibration Test (package state)	Endurance test applying the vibration during transportation	10Hz~150Hz, 50m/s ² , 40min
6	Shock Test (package state)	Endurance test applying the shock during transportation	Half- sine wave, 100m/s ² , 11ms
7	Atmospheric Pressure Test	Endurance test applying the atmospheric pressure during transportation by air	40kPa 16H Restore 2H

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8.2 Failure Judgment Criterion

Criterion Item	Test Item No.							Failure Judgement Criterion
	1	2	3	4	5	6	7	
Basic Specification	√	√	√	√	√	√	√	Out of the basic Specification
Electrical specification	√	√	√					Out of the electrical specification
Mechanical Specification					√	√		Out of the mechanical specification
Optical Characteristic	√	√	√	√			√	Out of the optical specification
Note	For test item refer to 8.1							
Remark	Basic specification = Optical specification + Mechanical specification							

9 QUALITY LEVEL

Examination or Test	At T _a =25°C (unless otherwise stated)	Inspection				
		Min.	Max.	Unit	IL	AQL
External Visual Inspection	Under normal illumination and eyesight condition, the distance between eyes and LCD is 25cm.	See Appendix A			II	Major 0.65 Minor 1.5
Display Defects	Under normal illumination and eyesight condition, display on inspection.	See Appendix B			II	Major 0.65 Minor 1.5
Note: Major defects: Open segment or common, Short, Serious damages, Leakage Miner defects: Others Sampling standard conforms to GB2828						

10.0 Inspection conditions

10.1 Environmental Conditions The environmental conditions for inspection shall be as follows:

Room temperature:20±3 Humidity:65±20%RH

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10.2 The external visual inspection The inspection shall be performed by using a single 20W fluorescent lamp for illumination and the distance from LCD to eyes of the inspector should be 30cm or more.

10.3 Classification of defects.

10.3.1 A major defect A major defect refers to A defect which may substantially degrade usability for product applications.

10.3.2 Minor defect A Minor defect refers to A defect which is not considered to substantially degrade product application or A defect which deviates from existing standards almost unrelated to the effective use of the product or its operation

11 Cosmetic criteria of LCD screen

DEFECT	JUDGEMENT CRITERION		
Spots	Size d (mm)	Acceptable quantity in active area	
	$d \leq 0.1$	Disregard	
	$0.1 < d \leq 0.2$	6	
	$0.2 < d \leq 0.3$	2	
	$d > 0.3$	0	
	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)	Acceptable quantity in active area	
	Length L (mm)		
	$W \leq 0.02$		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.

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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 50~100Ω

12.2.1 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 LC fluid 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 could cause an electrochemical reaction resulting in an open terminal connection. If the environmental temperature is higher than 50 °C, it is required that the relative humidity is 50% or less.

12.2.2Packaging

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 60 °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 for 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 insulation at the terminals.

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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.

12.2.3 Long-time 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 -10 °C to 60 °C.

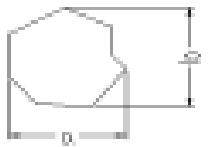

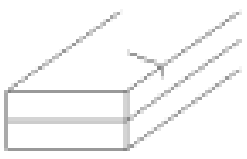
3. Keep the sensitive polarizer surface of the LCD panels clear of any contact. We recommend using the container that was used by Hai Jing to deliver the products.

12.3 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.

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Appendix A

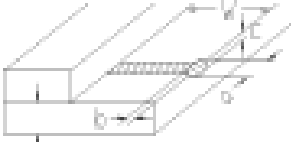
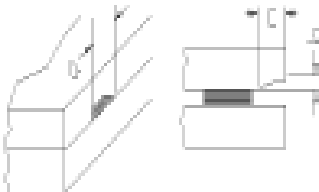
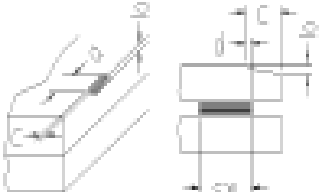
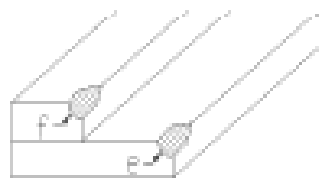
Inspection items and criteria for appearance defects

Items	Contents	Criteria		
Leakage		Not permitted		
Rainbow		According to the limit specimen		
Polarizer	Wrong polarizer attachment	Not permitted		
	Bubble between polarizer and glass	Not counted	Max. 3 defects allowed	
		$\phi < 0.3\text{mm}$	$0.3\text{mm} \leq \phi \leq 0.5\text{mm}$	
Scratches of polarizer	According to the limit specimen			
Black spot (in viewing area)		Not counted	Max. 3 spots allowed	Max. 3 spots (lines) allowed
		$X < 0.2\text{mm}$	$0.2\text{mm} \leq X \leq 0.5\text{mm}$	
		$X = (a+b)/2$		
Black line (in viewing area)		Not counted	Max. 3 lines allowed	
		$a < 0.02\text{mm}$	$0.02\text{mm} \leq a \leq 0.05\text{mm}$	
		$b \leq 2.0\text{mm}$		
Progressive cracks		Not permitted		

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Appendix A

Inspection item and criteria for appearance defects (continued)

Items	Contents	Criteria				
Glass Cracks	Cracks on pads 	a	b	c	Max. 2 cracks allowed	Max. 5 cracks allowed
	$\leq 3\text{mm}$	$\leq W/5$	$\leq T/2$			
	$\leq 2\text{mm}$	$\leq W/5$	$T/2 < C < T$			
	Cracks on contact side 	a	b	Max. 2 cracks allowed		
	$\leq 3\text{mm}$	$\leq T/2$				
	$\leq 2\text{mm}$	$T/2 < b < T$				
	C shall be not reach the seal area					
	Cracks on non-contact side 	a	b	Max. 2 cracks allowed		
	$\leq 3\text{mm}$	$\leq T/2$				
	$\leq 2\text{mm}$	$T/2 < b < T$				
	$C \leq 0.5\text{mm}$					
	$d \leq SW/3$					
	Corner cracks 	$e < 2.0\text{mm}^2$		Max. 3 cracks allowed		
	$f < 2.0\text{mm}^2$					