KEEN SIDE electronics

DATASHEET

LCD MODULE

MODULE NO. :

KSEGB320240H-XXX SERIES

Customer:
Approved by:

Approved by	Checked by	Prepared by

RECORDS OF REVISION

Part Number	Revision	Revision Content	Revised on
KSEGB320240H-XXX	1.0	First issue	Oct. 19th, 2022

CONTENTS

1. MODULE CLASSIFICATION INFORMATION

KSE G B 320240 H - X X X - V

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① KSE: KEEN SIDE electronics

② C: Character Type, G: Graphic Type

③ B: COB, G: COG

④ Display Font: 320 * 240

⑤ Model serials no. :

⑥ LCD Mode: B→ STN-Blue Negative F→ FSTN Positive
G→ STN Gray Positive Y→ STN Yellow Green Positive

⑦ Backlight Type: N→ Without backlight A→ Amber LED backlight
B→ Blue LED backlight G→ Green LED backlight
R→ Red LED backlight W→ Withe LED backlight
Y→ Yellow-Green LED backlight

⑧ LCD Polarizer Type/Temperature range/View direction :
D→ Transflective, W.T, 12:00 E→ Transmissive, W.T, 6:00
P→ Reflective, W. T, 6:00 Q→ Transmissive, W.T, 12:00
Z→ Transflective, W.T, 6:00

⑨ Special Code: V : Built in negative voltage& Temperature Compensation

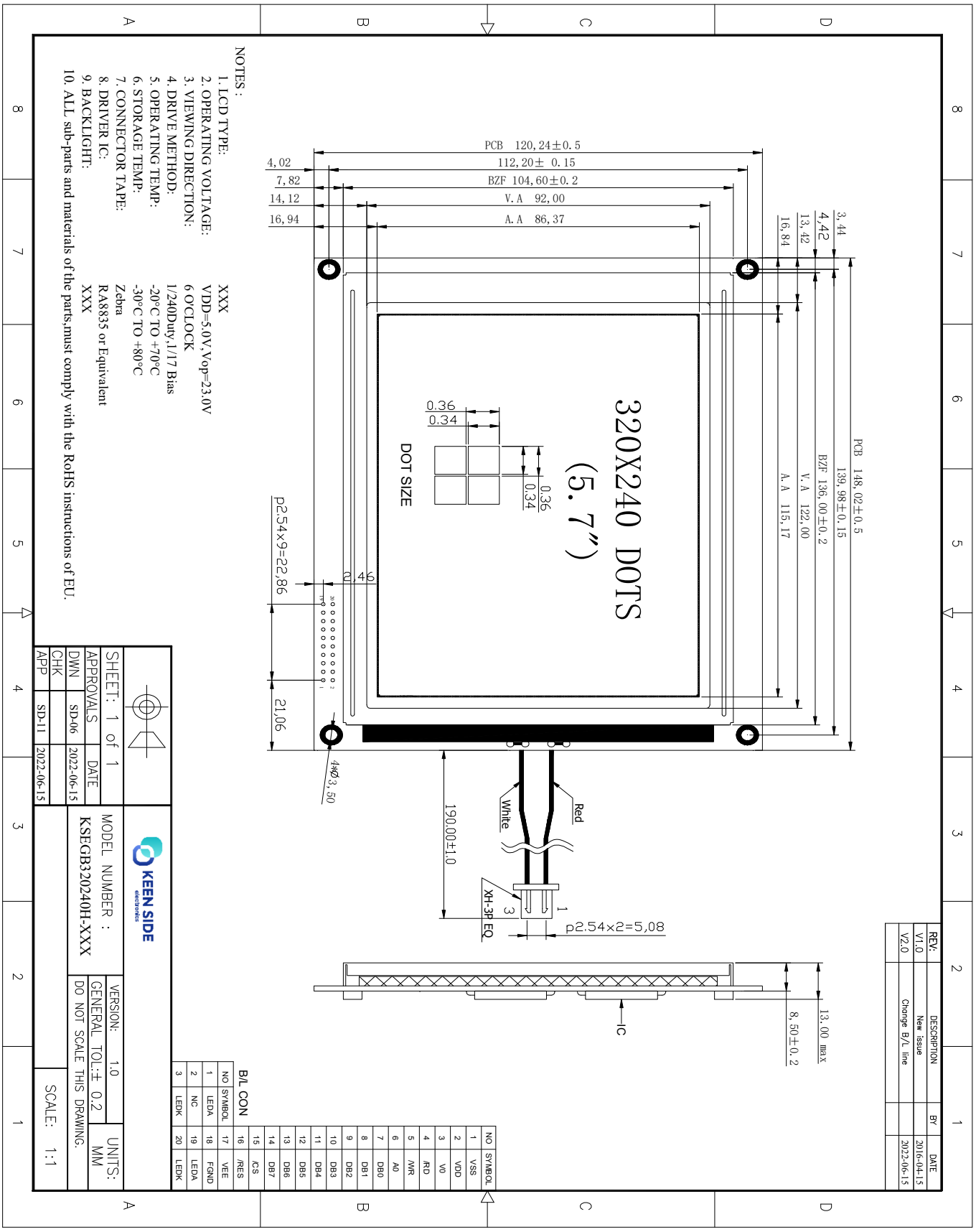
2. FUNCTIONS & FEATURES

- LCD TYPE: KSECB320240H-XXX-V Series LCD type:
- Driving Scheme : 1/240Duty, 1/17 Bias
- Power Supply for logic : 5.0V
- V_{LCD} : 23.0V
- Driver IC : NT7086
- Controller IC : RA8835
- RoHS Conformed

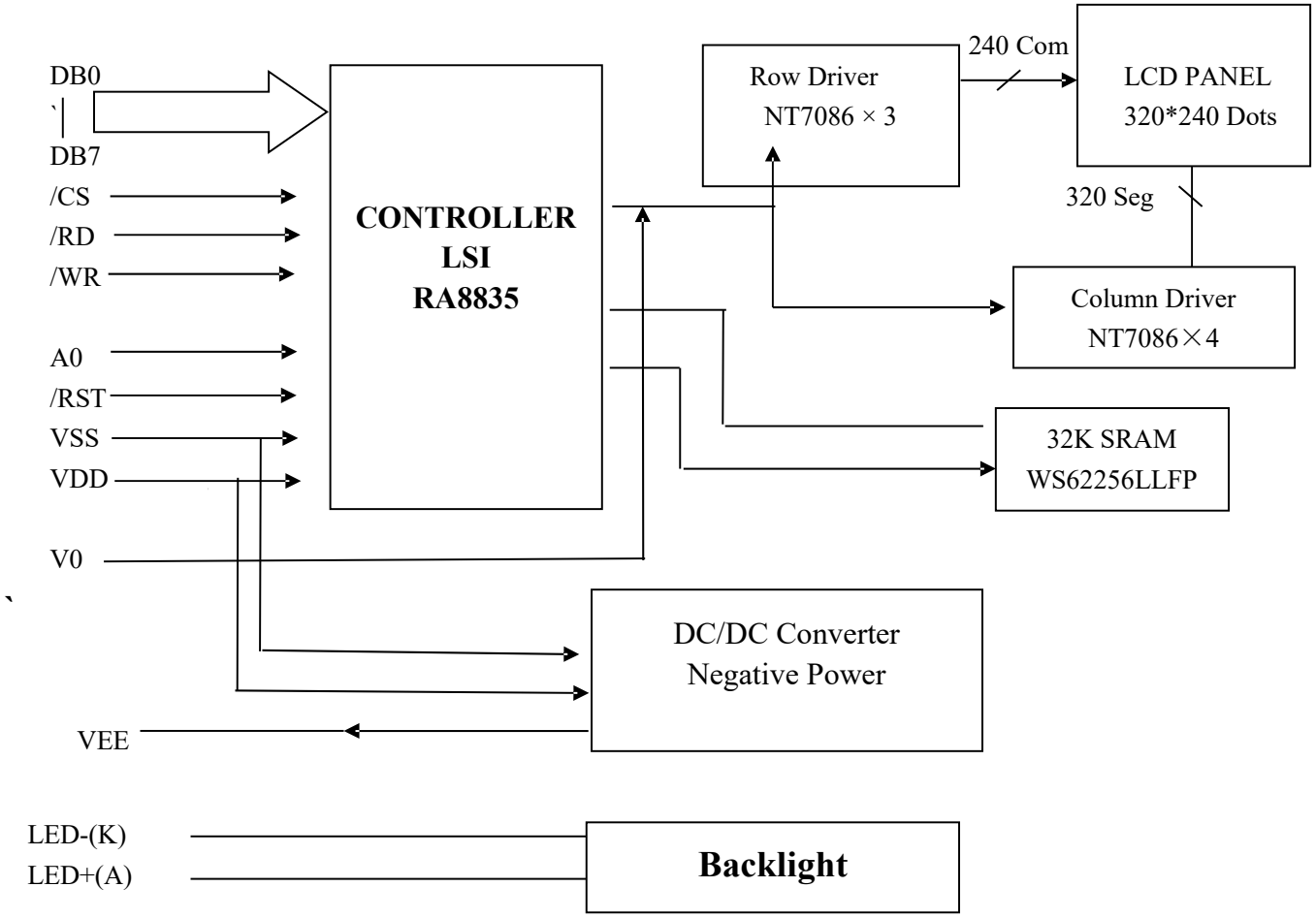
3. MECHANICAL SPECIFICATIONS

- Module Size : 148.02(L) x 120.24(W) x 13.00(H)MAX mm
- Viewing Area : 122.00(L)mm x 92.00 (W)mm
- Active Area : 115.17(L)mm x 86.37(W)mm
- Dot Pitch : 0.36 (W)mm x 0.36 (H)mm
- Dot Size : 0.34 (W)mm x 0.34 (H)mm
- Dot Gap : 0.02 mm

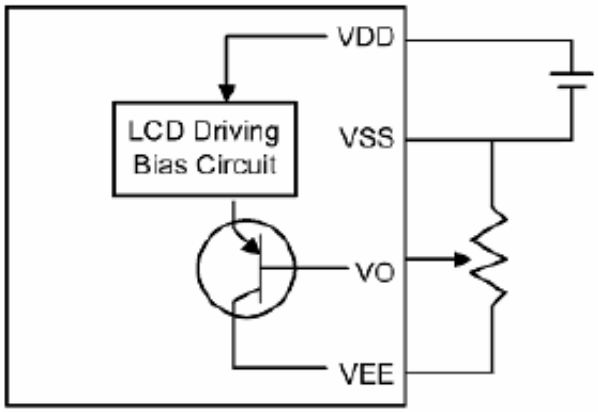
4. EXTERNAL DIMENSIONS



5. BLOCK DIAGRAM



Voltage Generator Circuit



$V_{DD} - V_0$: LCD Driving Voltage
V_R : 10K~20K Ohms

6. PIN ASSIGNMENT

Pin No	Symbol	Description	
1	VSS	Power Supply(VSS=0)	
2	VDD	Supply voltage for logic(VDD>VSS)	
3	V0	Operating voltage for LCD;Not connecting	
4	RD\	Read Signal	
5	WR\	Write Signal	
6	A0	Data Type Selection	
7	DB0	Data BUS	
8	DB1	Data BUS	
9	DB2	Data BUS	
10	DB3	Data BUS	
11	DB4	Data BUS	
12	DB5	Data BUS	
13	DB6	Data BUS	
14	DB7	Data BUS	
15	CS\	Chip select Signal	
16	RES\	Reset Signal	
17	VEE	Negative voltage supply;Not connection	
18	FG	Frame ground	
19	LED+	LED Back light Power +5V	
20	LED-	LED Back light Power 0V	

Backlight CON

NO	Symbol	Description
1	LEDA	LED Backlight Anode
2	NC	No Connector
3	LEDK	LED Backlight Cathode

7. ABSOLUTE MAXIMUM RATINGS(Vss=0V, Ta=25℃)

Parameter	Symbol	Rating	Unit
Supply voltage range	V_{DD}	–0.3 to 7.0	V
Input voltage range	V_{IN}	–0.3 to VDD+ 0.3	V
Power dissipation	P_D	300	mW

Notes:

1. The humidity resistance of the flat package may be reduced if the package is immersed in solder. Use a soldering technique that does not heatstress the package.
2. If the power supply has a high impedance, a large voltage differential can occur between the input and supply voltages. Take appropriate care with the power supply and the layout of the supply lines.

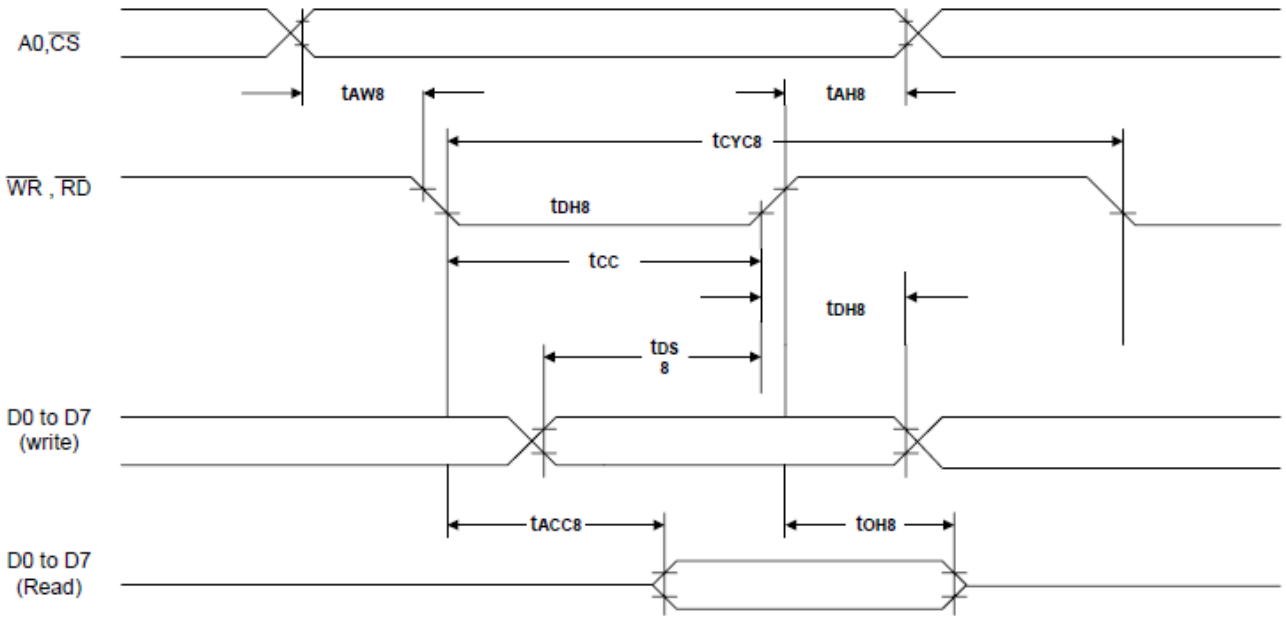
8. ELECTRICAL CHARATERISTICS

1). DC Characteristics

Parameter	Symbol	Condition	Rating			Unit
			Min.	Typ.	Max.	V
Supply voltage	V_{DD}		4.5	5.0	5.5	V
Register data retention voltage	V_{OH}		2.0	—	6.0	V
Input leakage current	I_{LI}	VI= VDD. See note 5.	—	0.05	2.0	μA
Output leakage current	I_{LO}	VI= VSS. See note 5.	—	0.10	5.0	μA
Operating supply current	Iopr	See note 4.	—	3.5	8	mA
Quiescent supply current	I_Q	Sleep mode, VOSC1= V($\overline{CS}$)= V($\overline{RD}$)= VDD	—	0.05	20.0	μA
Oscillator frequency	f_{OSC}	Measured at crystal, 47.5% duty cycle. See note 6.	1.0	—	18.0	MHz
External clock frequency	f_{CL}		1.0	—	18.0	MHz
Oscillator feedback resistance	Rf		0.5	1.0	3.0	MΩ

2). AC Characteristics

8080 Family Interface Timing



Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, $\overline{CS}$	t_{AH8}	Address hold time	10	—	10	—	ns	CL = 100pF
	t_{AW8}	Address setup time	0	—	0	—	ns	
$\overline{WR}$, $\overline{RD}$	t_{CYC8}	System cycle time	note.	—	note.	—	ns	
	t_{CC}	Strobe pulse width	120	—	150	—	ns	
D0 to D7	t_{DS8}	Data setup time	120	—	120	—	ns	
	t_{DH8}	Data hold time	5	—	5	—	ns	
	t_{ACC8}	$\overline{RD}$ access time	—	50	—	80	ns	
	t_{OH8}	Output disable time	10	50	10	55	ns	

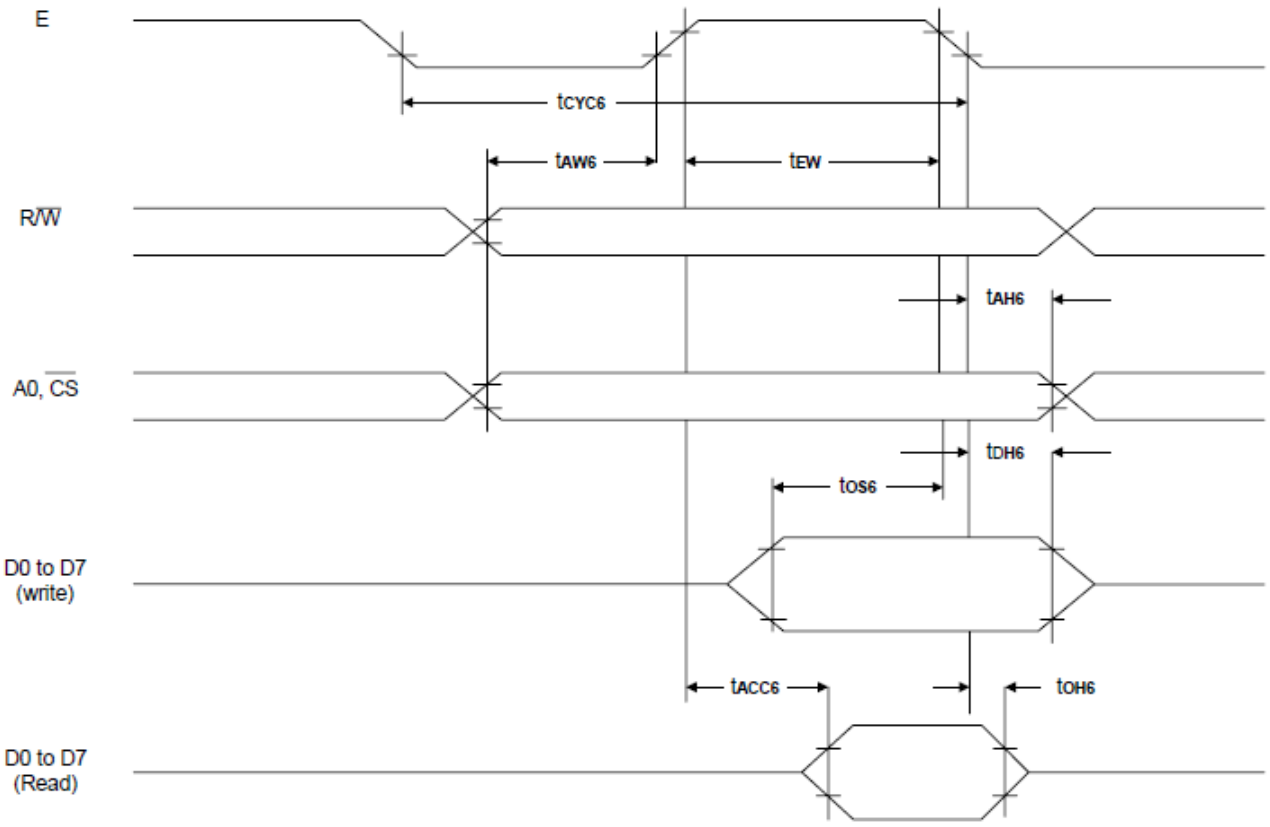
Note: For memory control and system control commands:

$t_{CYC8} = 2t_C + t_{CC} + t_{CEA} + 75 > t_{ACV} + 245$

For all other commands:

$t_{CYC8} = 4t_C + t_{CC} + 30$

6800 Family Interface Timing



Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, $\overline{CS}$, R/($\overline{W}$)	t_{CYC6}	System cycle time	note.	—	note.	—	ns	CL = 100 pF
	t_{AW6}	Address setup time	0	—	10	—	ns	
	t_{AH6}	Address hold time	0	—	0	—	ns	
D0 to D7	t_{DS6}	Data setup time	100	—	120	—	ns	
	t_{DH6}	Data hold time	0	—	0	—	ns	
	t_{OH6}	Output disable time	10	50	10	75	ns	
	t_{ACC6}	Access time	—	85	—	130	ns	
E	t_{EW}	Enable pulse width	120	—	150	—	ns	

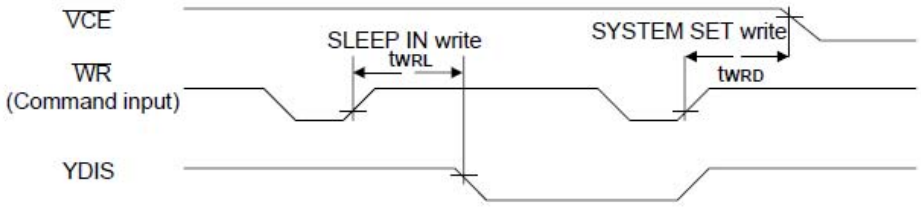
Note: For memory control and system control commands:

$t_{CYC6} = 2t_C + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$

For all other commands:

$t_{CYC6} = 4t_C + t_{EW} + 30$

Sleep In Command Timing



Ta = –20 to 75°C

Signal	Symbol	Parameter	V_{DD} = 4.5 to 5.5V		V_{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
$\overline{WR}$	t_{WRD}	$\overline{VCE}$ falling-edge delay time	note 1.	—	note 1.	—	ns	CL = 100 pF
	t_{WRL}	YDIS falling-edge delay time	—	note 2.	—	note 2.	ns	

Notes:

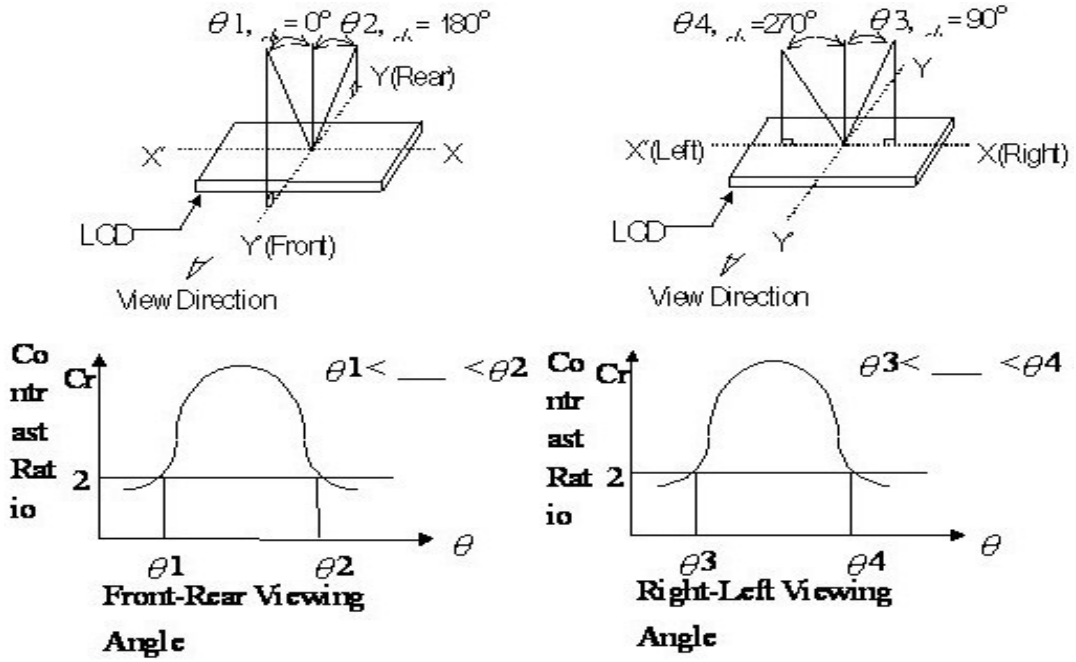
1. $t_{WRD} = 18t_C + t_{OSS} + 40$ (t_{OSS} is the time delay from the sleep state until stable operation)
2. $t_{WRL} = 36t_C \times [TC/R] \times [L/F] + 70$

9. COMMAND DEFINITIONS

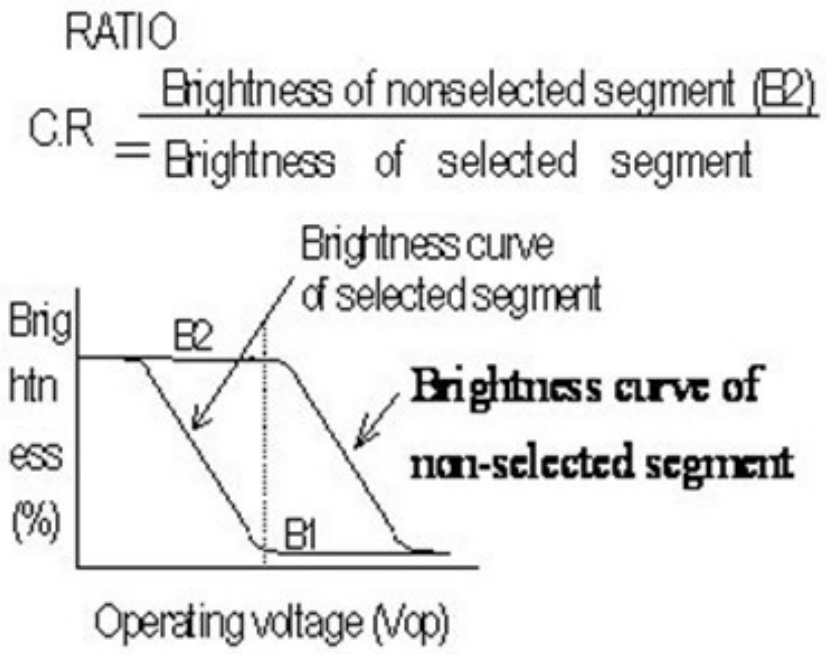
Class	Command	Code										Command Description
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0	
System control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	Initialize device and display
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	Enter standby mode
Display control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	Enable and disable display and display flashing
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	Set display start address and display regions
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	Set start address of character generator RAM
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	Set direction of cursor movement
	CSRDIR	1	0	1	0	1	0	0	1	1	CD1	CD0	Set direction of cursor movement
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	Set horizontal scroll position
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	Set display overlay format
Drawing control	CSRW	1	0	1	0	1	0	0	0	1	1	0	Set cursor address
	CSRR	1	0	1	0	1	0	0	0	1	1	1	Read cursor address
Memory control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	Write to display memory
	MREAD	1	0	1	0	1	0	0	0	0	1	1	Read from display memory

10. OPTICAL CHARACTERISTICS

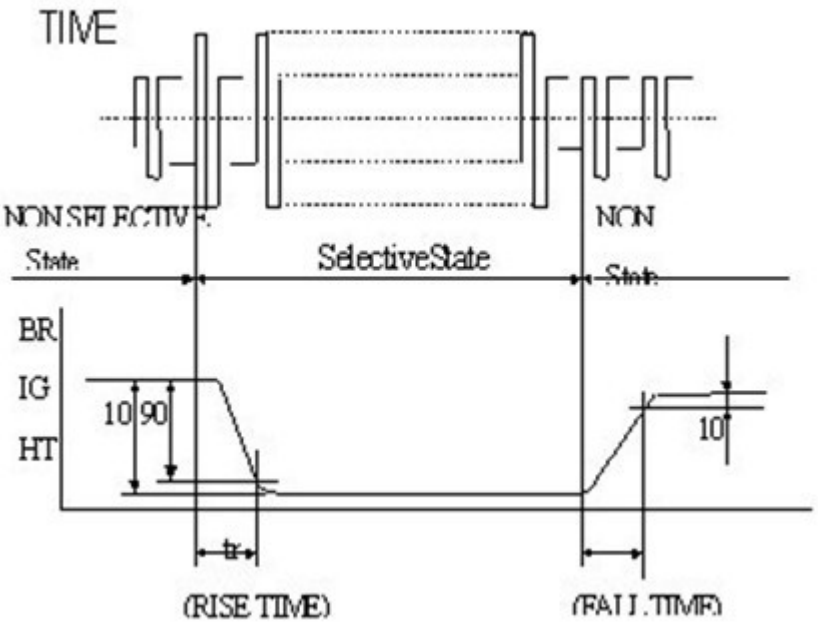
10.1 Definition of Viewing Angle



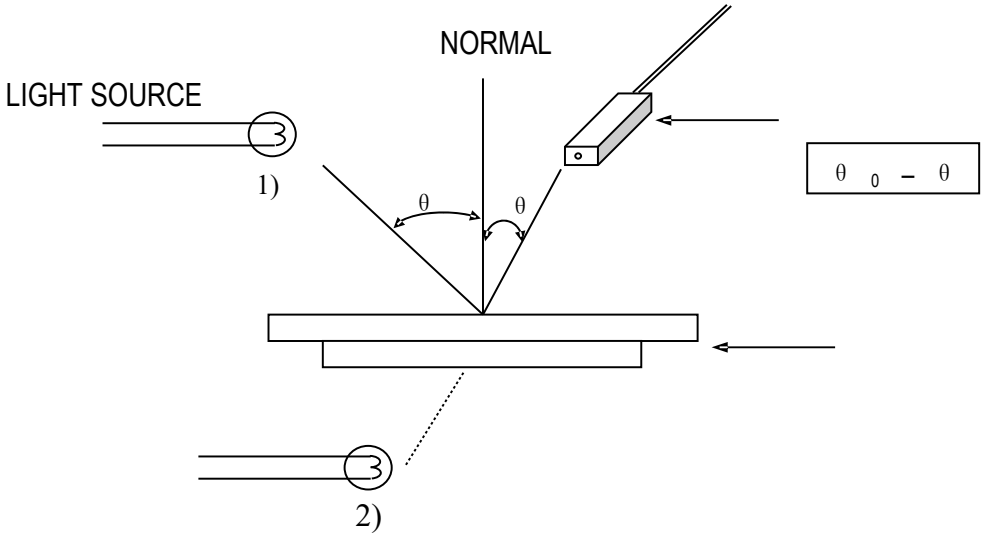
10.2 Definition of Contrast



10.3 Definition of Response



10.4 Measuring Instruments For Elector-optical Characteristics



*** Note:**

1) Light source position for measuring the reflective type of LCD panel;
2) Light source position for measuring the transflective / transmissive types of LCD panel.

11. RELIABILITY TEST

Operating life time: Longer than 75,000 hours

(at room temperature without direct irradiation of sunlight)

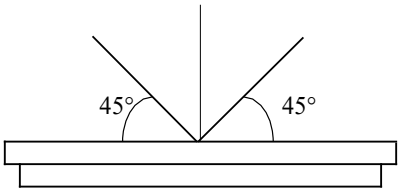
Reliability characteristics shall meet following requirements.

No.	Test Item	Content of Test	Test Condition
1	High Temperature Storage	Endurance test applying the high storage temperature for a long time	+80°C 96H
2	Low Temperature Storage	Endurance test applying the low storage temperature for a long time	−30°C 96H
3	High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the thermal stress to the element for a long time	+70°C 96H
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time	−20°C 96H
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and humidity storage for a long time	40°C 90%RH 96H
6	Temperature Cycle	Endurance test applying the low and high temperature cycle −20°C ⟷ 25°C ⟷ 70°C ⟷ 25°C 30min 5min 30min 5min ⟷ 1 cycle ⟷	−20°C/70°C 5 cycles
7	Vibration Test (Package State)	Endurance test applying the vibration during transportation	10Hz ~ 55Hz, 50m/s, 15min
8	Shock Test (Package State)	Endurance test applying the shock during transportation	Half-sinewave, 100m/s, 11ms
9	Atmospheric Pressure Test	Endurance test applying the atmospheric pressure during transportation by air	40 kPa 16 H

12. Inspection specification

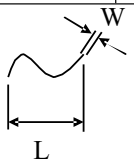
12.1 Visual Inspection

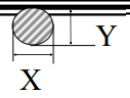
1) Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
2) Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
3) Inspect the module at 45° right and left, top and bottom.
4) Use the optimum viewing angle during the contrast inspection.



12.2 Standard of Appearance Inspection

<table>
<tr><th>No.</th><th>Item</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black spot
White spot
Dust</td><td>
Round type: as per following drawing
Φ = (X+Y)/2

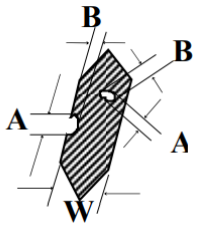
<table>
<tr><td colspan="3">Acceptable quantity</td></tr>
<tr><td>Size</td><td>Zone A</td><td>Zone B</td></tr>
<tr><td>Φ <0.1</td><td>Any number</td><td rowspan="4">Any number</td></tr>
<tr><td>0.1< Φ <0.2</td><td>2</td></tr>
<tr><td>0.2< Φ <0.25</td><td>1</td></tr>
<tr><td>0.25< Φ</td><td>0</td></tr>
</table>
Line type: as per following drawing
<table>
<tr><td colspan="4">Acceptable quantity</td></tr>
<tr><td>Length</td><td>Width</td><td>Zone A</td><td>Zone B</td></tr>
<tr><td>—</td><td>W≤0.02</td><td>Any number</td><td rowspan="4">Any number</td></tr>
<tr><td>L≤3.0</td><td>0.02<W≤0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≤2.5</td><td>0.03<W≤0.05</td></tr>
<tr><td>—</td><td>0.05<W</td><td>As round type</td></tr>
</table>

Total acceptable quantity: 3
</td></tr>
<tr><td>2</td><td>Polariser scratch</td><td>Scratch on protective film is permitted
Scratch on polariser: same as No. 1</td></tr>
<tr><td>3</td><td>Polariser bubble</td><td>Φ = (X+Y)/2</td></tr>
</table>



Acceptable quantity		
Size	Zone A	Zone B
Φ <0.2	Any number	Any number
0.2< Φ <0.5	2	
0.5< Φ <1.0	1	
1.0< Φ	0	

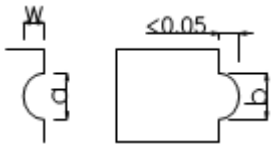
Total acceptable quantity: 3

4.1 Pin hole on segmented display
W: segment width
Φ = (A+B)/2



Acceptable quantity	
Width	Quantity
W≤0.4	Φ ≤0.2 and Φ ≤1/2W
W>0.4	Φ ≤0.25 and Φ ≤1/3W
Total acceptable quantity: 1 defect per segment Pin holes with Φ under 0.10 mm are acceptable	

4.2 Pin hole on dot matrix display

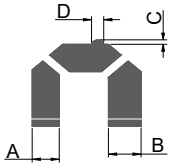


Acceptable quantity	
Size	
a, b<0.1	Any number
(a+b)/2≤0.1	Any number
0.5< Φ <1.0	3

Total acceptable quantity: 7

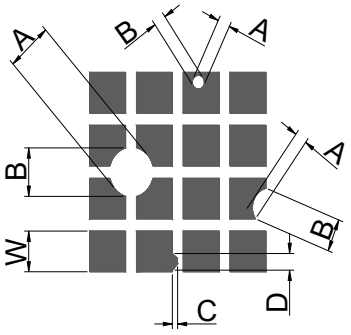
4 Segment deformation

4.3 Segments / dots with different width



Acceptable	
a≥b	a/b≤4/3
a<b	a/b>4/3

4.4 Alignment layer defect
Φ = (A+B)/2



Acceptable quantity	
Size	
Φ ≤0.4	Any number
0.4< Φ ≤1.0	5
1.0< Φ ≤1.5	3
1.5< Φ ≤2.0	2

Total acceptable quantity: 7

5	Colour	Level of sample for approval set as limit sample

<table>
<tr><td></td><td>uniformity</td><td></td></tr>
<tr><td>6</td><td>Backlight</td><td>The backlight colour should correspond to the product specification
Flashing and or unlit backlight is not allowed
Dust larger than 0.25 mm is not allowed</td></tr>
<tr><td>7</td><td>COB</td><td>Exposed wire bond pad is not allowed
Insufficient covering with resin is not allowed (wire bond line exposed) Dust or bubble on the resin are not allowed</td></tr>
<tr><td>8</td><td>PCB</td><td>No unmelted solder paste should be present on PCB
Cold solder joints, missing solder connections, or oxidation are not allowed
No residue or solder balls on PCB are allowed
Short circuits on components are not allowed</td></tr>
<tr><td>9</td><td>Tray particles</td><td>
<table>
<tr><td colspan="3">Acceptable quantity</td></tr>
<tr><td></td><td>Size</td><td>Quantity</td></tr>
<tr><td rowspan="2">On tray</td><td>Φ <0.2</td><td>Any number</td></tr>
<tr><td>Φ >0.25</td><td>4</td></tr>
<tr><td rowspan="2">On display</td><td>Φ ≥0.25</td><td>2</td></tr>
<tr><td>L = 3</td><td>1</td></tr>
</table>
</td></tr>
</table>

13. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protection foil of polarizer before using.
- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.

- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C).Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

14. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections