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PART NO. : GG3224P3FUC1S

FOR MESSRS. :_____

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Accepted by :_____ Proposed by :_____

Date : 12,30,2002

RECORD OF REVISION

DATE	PAGE	SUMMARY
2002.12.30	5	5. LOGIC CIRCUIT POWER SUPPLY CURRENT NOTE(2) → TYP 27.0 MAX----- → 30.0 LCD DRIVER CIRCUIT POWER SUPPLY CURRENT → NOTE(2) MAX 4.0 → 12.0
	6	~~6.~~ → 5. CONTRAST RATIO MIN 15 → TYP 25 THE BRIGHTNESS OF BRIGHTNESS SOURCE → DOTS-ON TYP MIN 1300 → DOTS-OFF TYP MIN 5.0
	9	~~9.~~ → 6.

3. GENERAL SPECIFICATIONS AND MECHANICAL DATA

3.1 GENERAL SPECIFICATIONS

PLEASE REFER TO:

"CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (SP-10-000)".

3.2 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS.

3.3 MECHANICAL DATA

(1) NUMBER OF DOTS ---------- 320W*240H DOTS
(2) MODULE SIZE ---------- 167.1W*109.0H*11.0T (MAX) mm
(3) VIEWING AREA ---------- 122.0W*92.0H mm
(4) DISPLAY AREA ---------- 115.17W*86.37H mm
(5) DOT SIZE ---------- 0.33W*0.33H mm
(6) DOT PITCH ---------- 0.36W*0.36H mm
(7) VIEWING DIRECTION ---------- 6 O′CLOCK
(8) LCD TYPE ---------- FSTN, NEGATIVE, TRANSMISSIVE BLACK/WHITE
(9) BACK LIGHT ---------- CCFL

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	-0.3	7.0	V	
POWER SUPPLY FOR LCD DRIVING	VDD-VEE	0	35.0	V	
INPUT VOLTAGE	VI	-0.3	VDD+0.3	V	
STATIC ELECTRICITY	------	------	100	V	NOTE (1)

NOTE (1): TEST METHOD AND CONDITIONS: AFTER CHARGING UP 200PF CAPACITOR BY STATED VOLTAGE, THE CAPACITOR IS CONNECTED WITH INTERFACE-PINS OF THE MODULE.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0℃	50℃	-20℃	60℃	NOTE (2)
HUMIDITY	NOTE (3)		NOTE (3)		WITHOUT CONDENSATION
VIBRATION	------	4.9 m/s^2 (0.5G)	------	19.6 m/s^2 (2G)	10~300HZ XYZ DIRECTIONS 1 Hr.EACH
SHOCK	------	29.4 m/s^2 (3G)	------	49.0 m/s^2 (5G)	10 ms XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2): Ta AT -20℃ : 48HR MAX.
60℃ : 168HR MAX.

NOTE (3): Ta ≦ 40℃ : 85% RH MAX.
Ta ＞ 40℃ : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85%RH AT 40℃. (50%RH AT 50°C)

5. ELECTRICAL CHARACTERISTICS

VDD = 5.0 ± 0.5V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
LOGIC CIRCUIT POWER SUPPLY VOLTAGE	VDD-VSS	------	4.5	5.0	5.5	V
LCD DRIVER CIRCUIT POWER SUPPLY VOLTAGE	VDD-VEE	------	12	------	32	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.8VDD	--------	VDD	V
	VIL	L LEVEL	0	--------	0.2VDD	V
LOGIC CIRCUIT POWER SUPPLY CURRENT NOTE (2)	IDD	VDD-VSS=5.0V VEE-VSS =-16.0V	--------	25.0	30.0	mA
LCD DRIVER CIRCUIT POWER SUPPLY CURRENT NOTE (2)	IEE	VDD-VSS=5.0V VEE-VSS =-16.0V	--------	10.0	12.0	mA
RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD - VO Φ=10° θ=0° DUTY = 1/240	Ta = 0℃	--------	--------	--------	V
		Ta = 25℃	--------	21.0	--------	V
		Ta = 50℃	--------	--------	--------	V
FLM FREQUENCY	fFLM	------	70.0	75.0	80.0	Hz
THE POWER SUPPLY FOR CCFL	VCCFL	fCCFL = 30 KHz	-------	300.0	-------	Vrms
	ICCFL	----------	-------	5.0	-------	mA

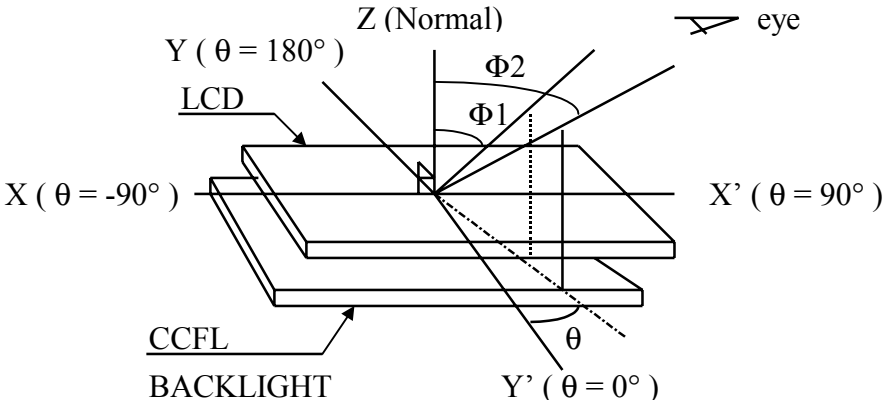
NOTE (1): APPEND TO TERMINALS: FLM, CL1, CL2, D0~D3
NOTE (2): THE DISPLAY PATTERN IS ALL "Q"
NOTE (3): RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ± 0.5V BY EACH MODULE.

6. OPTICAL CHARACTERISTICS

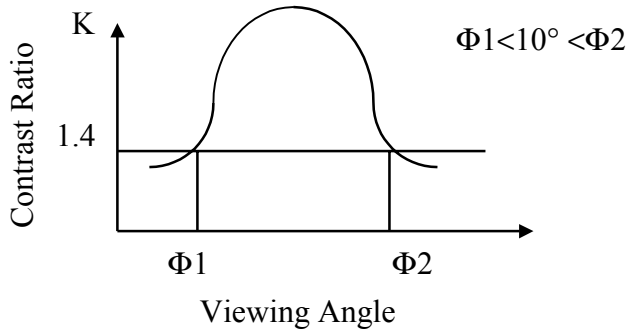
Ta = 25℃

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	Φ2-Φ1	K≧ 1.4	------	40	------	deg.	1,2
CONTRAST RATIO	K	Φ = 10° θ = 0°	------	15	------	------	3
RESPONSE TIME	tr (rise)	Φ = 10° θ = 0°	------	250	400	ms	4
	tf (fall)	Φ = 10° θ = 0°	------	350	450	ms	4
THE BRIGHTNESS OF BRIGHTNESS SOURCE	B	DOTS ON Φ = 10° θ = 0°	------	80	------	------	5
		DOTS OFF Φ = 10° θ = 0°	------	5.0	------	------	5

NOTE (1): DEFINITION OF θ AND Φ

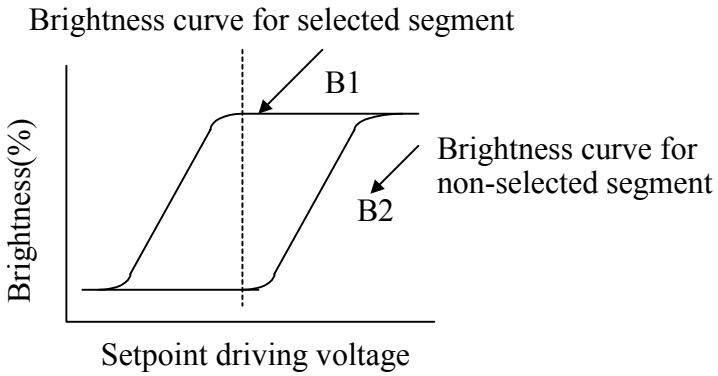


NOTE (2): DEFINITION OF VIEWING ANGLE Φ1 AND Φ2

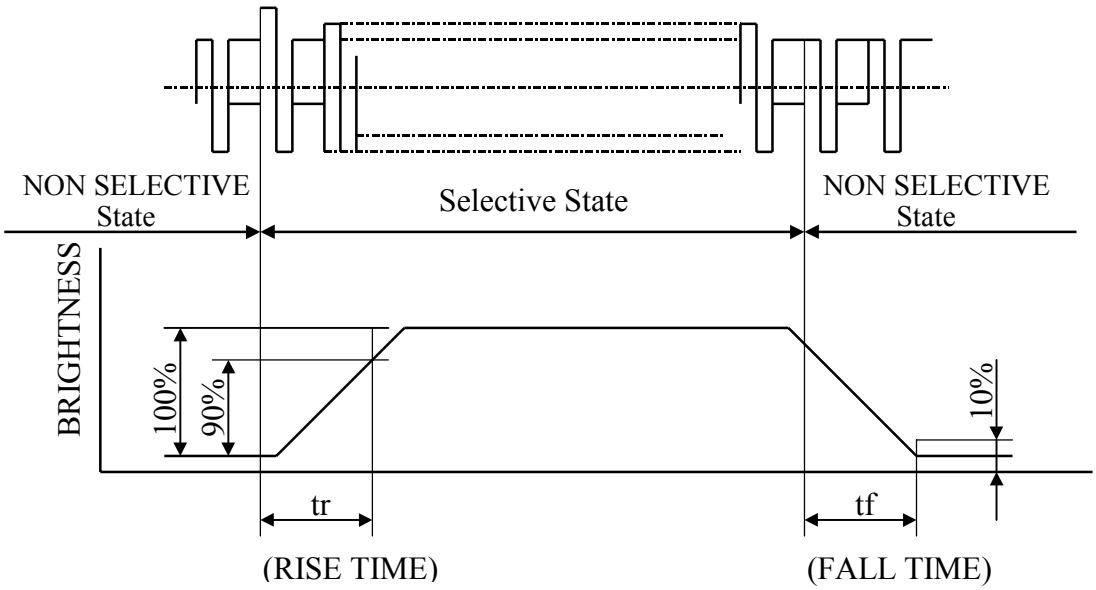


NOTE (3): DEFINITION OF CONTRAST RATIO "K"

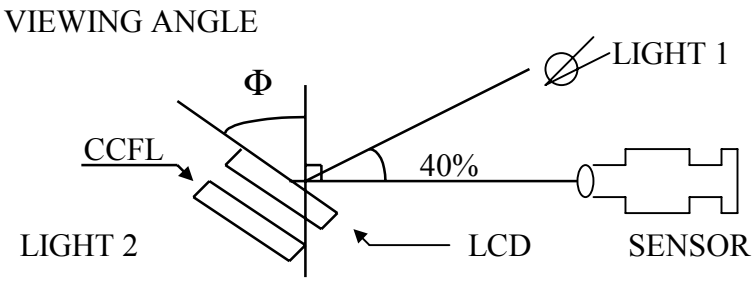
$$K=\frac{\text{Brightness of selected segment(B1)}}{\text{Brightness of non-selected segment (B2)}}$$



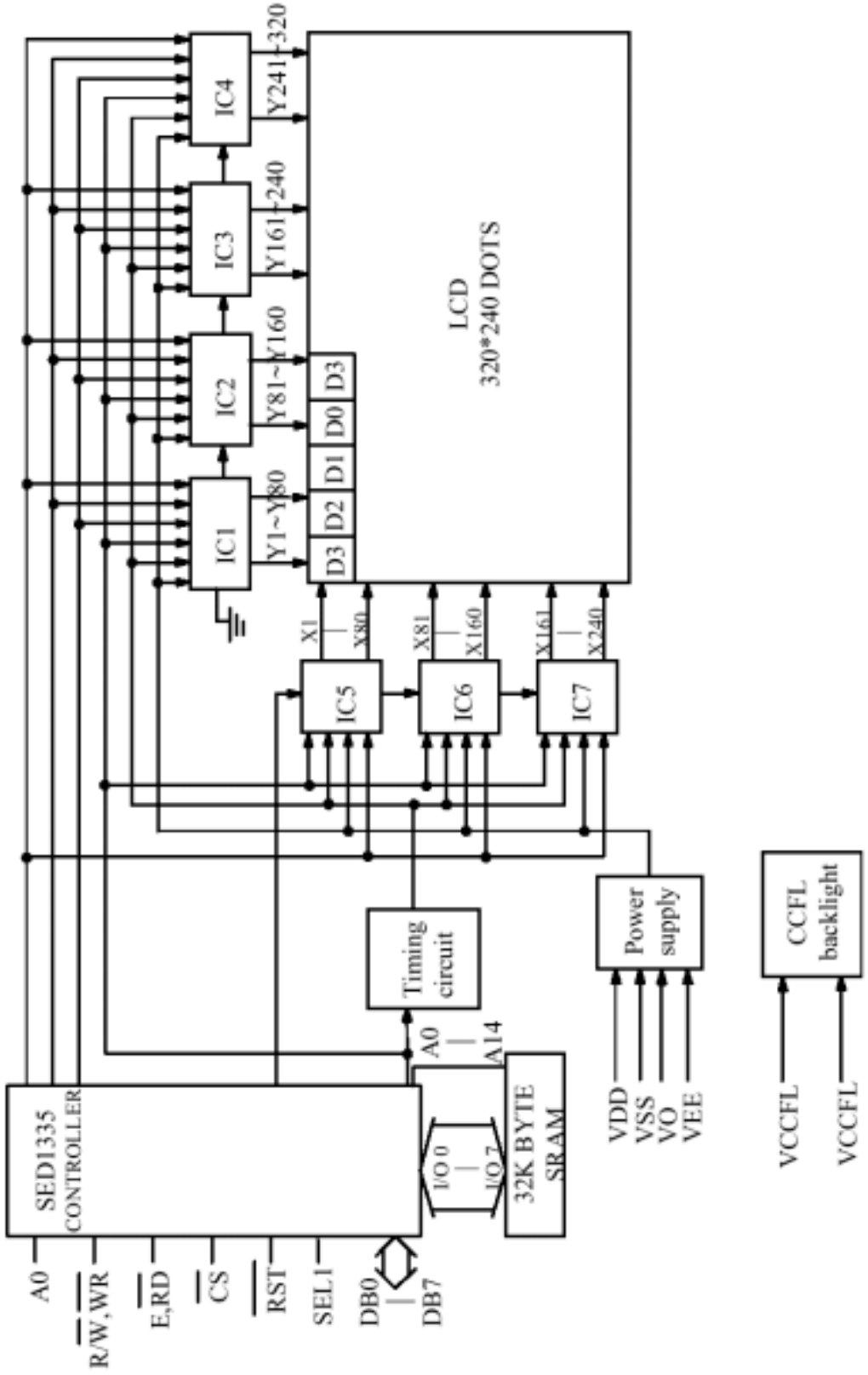
NOTE (4): DEFINITION OF OPTICAL RESPONSE



NOTE (5): OPTICAL OF LIGHT

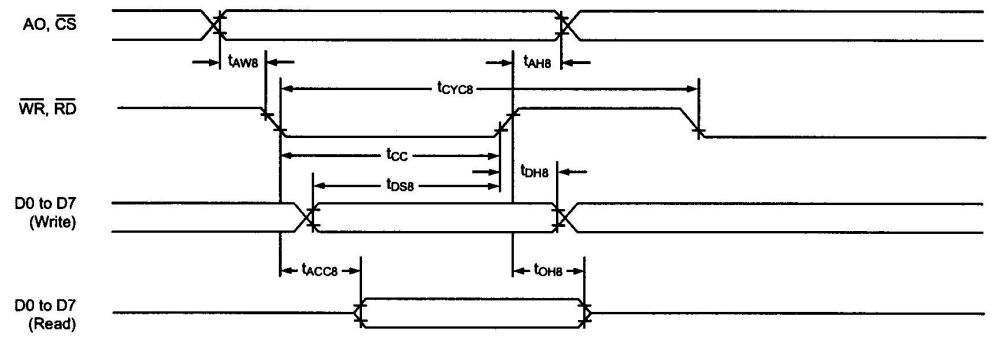


7. BLOCK DIAGRAM



8. TIMING CHARACTERISTICS

8.1 8080 FAMILY INTERFACE TIMING



Ta = –20 to 75°C

Signal	Symbol	Parameter	VDD = 4.5 to 5.5V		VDD = 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	See note.	—	See note.	—	ns	
	t_{CC}	Strobe pulsewidth	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	

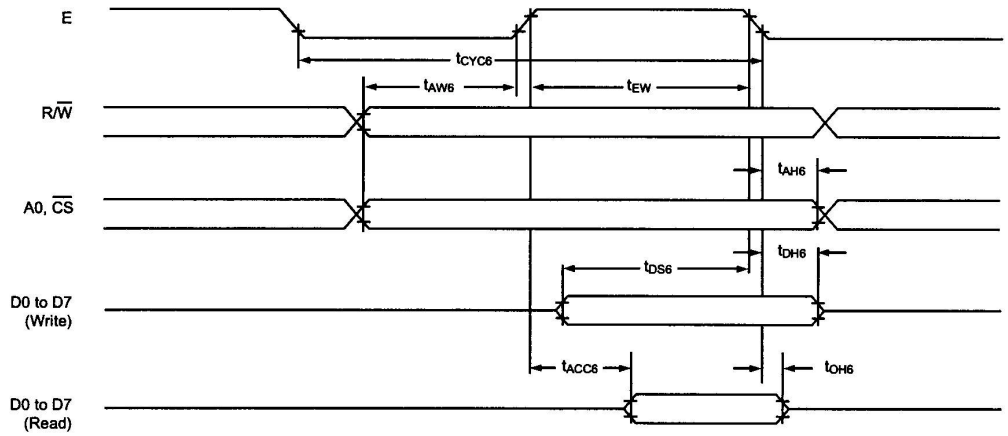
Note: For memory control and system control commands:

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

For all other commands:

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

8.2 6800 FAMILY INTERFACE TIMING



Note: t_{CYC6} indicates the interval during which CS is LOW and E is HIGH.

Ta = –20 to 75°C

Signal	Symbol	Parameter	VDD = 4.5 to 5.5V		VDD = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, CS, R/W	tCYC6	System cycle time	See note.	—	See note.	—	ns	CL = 100 pF
	tAW6	Address setup time	0	—	10	—	ns	
	tAH6	Address hold time	0	—	0	—	ns	
D0 to D7	tDS6	Data setup time	100	—	120	—	ns	
	tDH6	Data hold time	0	—	0	—	ns	
	tOH6	Output disable time	10	50	10	75	ns	
	tACC6	Access time	—	85	—	130	ns	
E	tEW	Enable pulsewidth	120	—	150	—	ns	

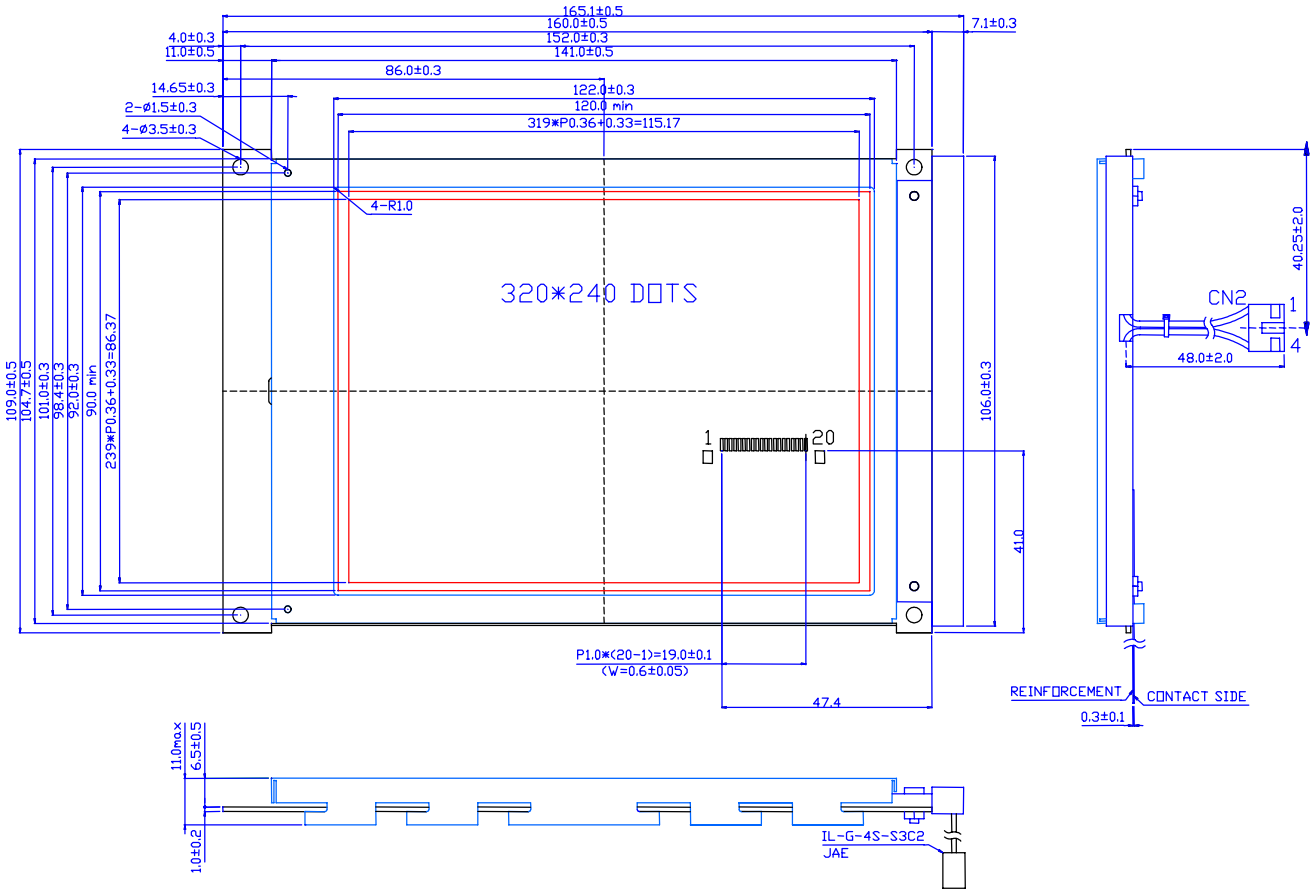
Note: For memory control and system control commands:

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

For all other commands:

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

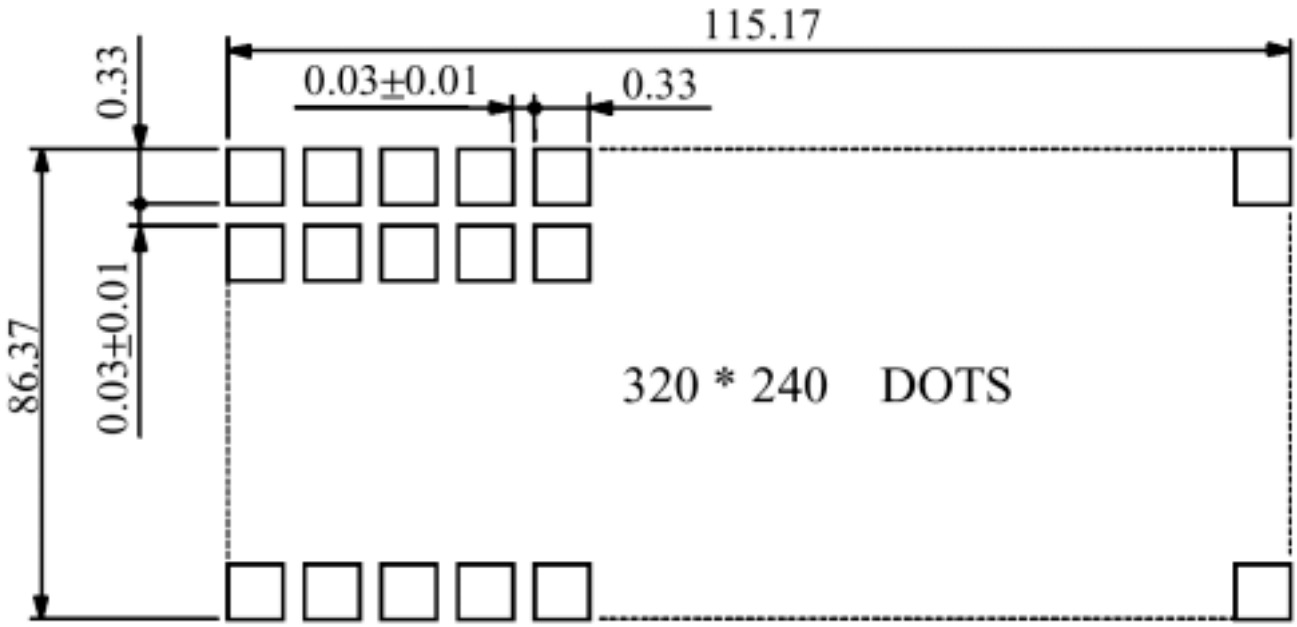
9. OUTLINE DIMENSION



UNIT: mm

NON-SPECIFIED TOLERANCE: ± 0.3 mm

9.1 DTAILED DRAWING OF DOTS MATRIX



UNIT: mm

NON-SPECIFIED TOLERANCE: ± 0.1 mm

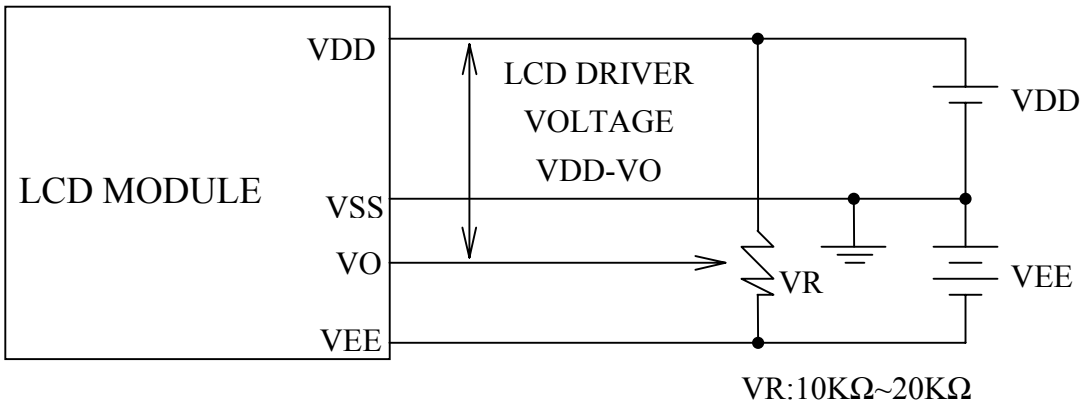
9.2 INTERFACE PIN CONNECTION

<table>
<tr><th>PIN NO</th><th>SYMBOL</th><th>LEVEL</th><th>FUNCTION</th></tr>
<tr><td>1</td><td>VSS</td><td>—</td><td>GROUND</td></tr>
<tr><td>2</td><td>VDD</td><td>—</td><td>POWER SUPPLY FOR LOGIC CIRCUIT</td></tr>
<tr><td>3</td><td>VO</td><td>—</td><td>OPERATING VOLTAGE FOR LCD DRIVING</td></tr>
<tr><td>4</td><td>A0</td><td>—</td><td>8080 FAMILY INTERFACE
<table>
<tr><th>AO</th><th>$\overline{RD}$</th><th>$\overline{WR}$</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>STATUS FLAG READ</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>DISPLAY DATA AND CURSOR ADDRESS READ</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>DISPLAY DATA AND PARAMETER WRITE</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>COMMAND WRITE</td></tr>
</table>
6800 FAMILY INTERFACE
<table>
<tr><th>AO</th><th>R/W</th><th>E</th><th>FUNCTION</th></tr>
<tr><td>0</td><td>1</td><td>1</td><td>STATUS FLAG READ</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>DISPLAY DATA AND CURSOR ADDRESS READ</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>DISPLAY DATA AND PARAMETER WRITE</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>COMMAND WRITE</td></tr>
</table></td></tr>
<tr><td>5</td><td>$\overline{WR}$,R/$\overline{W}$</td><td>H/L</td><td>8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE .
6800 FAMILY INTERFACE ACTS AS THE READ/ WRITE CONTROL SIGNAL .</td></tr>
<tr><td>6</td><td>$\overline{RD}$,E</td><td>H/L</td><td>8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE .
6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK .</td></tr>
<tr><td>7
≀
14</td><td>DB0
≀
DB7</td><td>H/L</td><td>DISPLAY DATA</td></tr>
<tr><td>15</td><td>$\overline{CS}$</td><td>H/L</td><td>CHIP SELECT</td></tr>
<tr><td>16</td><td>$\overline{RES}$</td><td>H/L</td><td>RESET</td></tr>
<tr><td>17</td><td>VEE</td><td>—</td><td>POWER SUPPLY FOR LCD DRIVING</td></tr>
<tr><td>18</td><td>SEL1</td><td>H/L</td><td>8080 OR 6800 FAMILY INTERFACE SELECT , H:6800 , L:8080</td></tr>
<tr><td>19</td><td>FGND</td><td>—</td><td>FRAME GROUND</td></tr>
<tr><td>20</td><td>NC</td><td>—</td><td>NON-CONNECTION</td></tr>
</table>

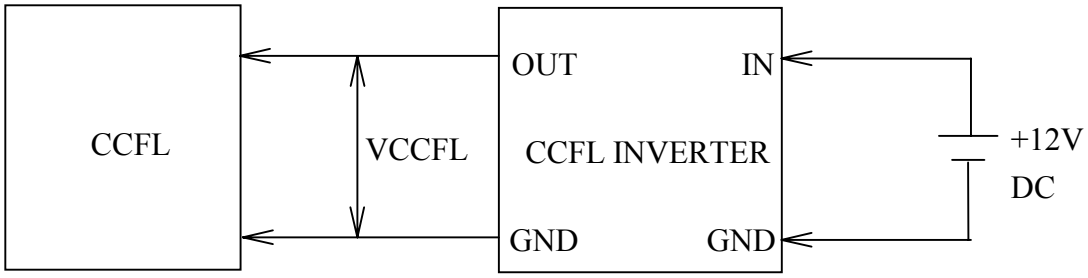
INTERFACE PIN CONNECTION OF CCFL BACKLIGHT				
PIN NO	1	2	3	4
SYMBOL	VCCFL	NC	NC	VCCFL

10.POWER SUPPLY FOR LCD MODULE

10.1POWER SUPPLY FOR LCM



10.2 POWER SUPPLY FOR CCFL



10.3 POWER AND INTERFACE TIMING SEQUENCE