

EXAMINED BY : <i>[Signature]</i>	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-10069
APPROVED BY: <i>[Signature]</i>		ISSUE : APR.05,2004
		TOTAL PAGE : 10
		VERSION : 7

CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

32F10(CCFL TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

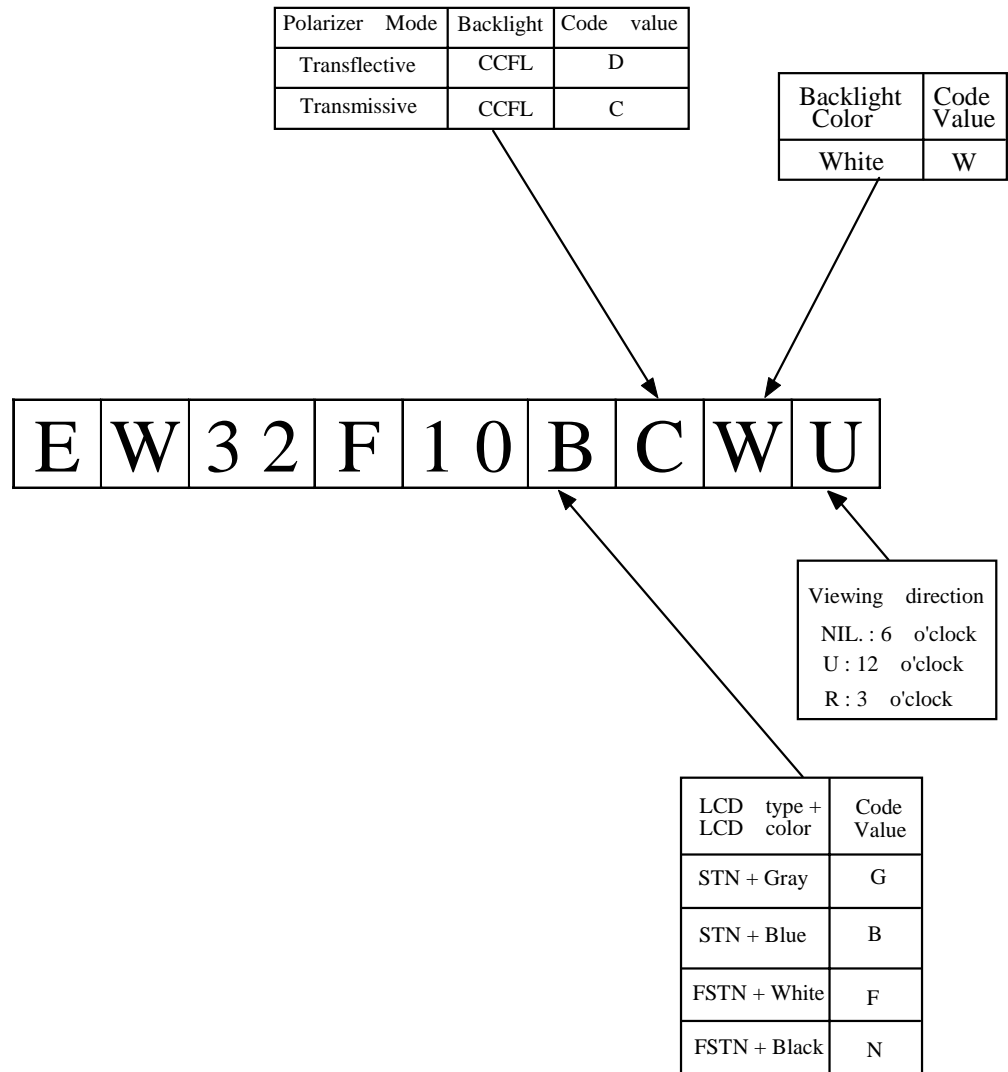
DATE :

BY :

RECORDS OF REVISION	DOC . FIRST ISSUE	FEB.17,1998
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DATE	REVISED PAGE NO.	SUMMARY																																																																																												
NOV.17,1999	1~3,6	THE ENTIRE PAGES REVISED																																																																																												
JUN.04,2002	3	4. ELECTRICAL CHARACTERISTICS POWER SUPPLY FOR CCFL LIFE TIME : TYP. 20000→50000																																																																																												
JUN.20,2002	3	4. ELECTRICAL CHARACTERISTICS CCFL LIFE TIME : MIN. = 15000 → 25000 , TYP. = 5000 → 50000																																																																																												
MAY.28,2003	—	NUMBERING SYSTEM VIEWING DIRECTION ADD R : 3 O'CLOCK																																																																																												
	3	4. ELECTRICAL CHARACTERISTICS REVISED CCFL LIFE TIME 25000 MIN. → 45000 MIN. ADDING $\theta=90^\circ$ WHEN VIEWING DIRECTION IS 3 O'CLOCK																																																																																												
	6	6. ADDING $\theta=90^\circ$ WHEN VIEWING DIRECTION IS 3 O'CLOCK REVISED BRIGHTNESS OF BACKLIGHT 300 MIN. → 400MIN. REVISED NOTE (1) : PLEASE REFER TO : CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.(EU-001A) → CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.(EU-002A)																																																																																												
SEP.09,2003	3	4. ELECTRICAL CHARACTERISTICS <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V</td> <td>—</td> <td>3.0</td> <td>—</td> <td>mA</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)</td> <td>IEE</td> <td>VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V</td> <td>—</td> <td>2.8</td> <td>—</td> <td>mA</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td rowspan="3">VDD - V0 $\varnothing = 10^\circ, \theta = **$ DUTY = 1/240</td> <td>Ta = 10 °C</td> <td>—</td> <td>25.1</td> <td>—</td> <td>V</td> </tr> <tr> <td>Ta = 25 °C</td> <td>—</td> <td>23</td> <td>—</td> <td>V</td> </tr> <tr> <td>Ta = 60 °C</td> <td>—</td> <td>21.3</td> <td>—</td> <td>V</td> </tr> <tr> <td colspan="7" style="text-align:center;">↓</td> </tr> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V</td> <td>—</td> <td>3.0</td> <td>5.0</td> <td>mA</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)</td> <td>IEE</td> <td>VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V</td> <td>—</td> <td>2.8</td> <td>4.8</td> <td>mA</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td rowspan="3">VDD - V0 $\varnothing = 10^\circ, \theta = **$ DUTY = 1/240</td> <td>Ta = 10 °C</td> <td>22.5</td> <td>23.5</td> <td>24.5</td> <td>V</td> </tr> <tr> <td>Ta = 25 °C</td> <td>22</td> <td>23</td> <td>24</td> <td>V</td> </tr> <tr> <td>Ta = 60 °C</td> <td>21.2</td> <td>22.2</td> <td>23.2</td> <td>V</td> </tr> </tbody> </tbody></table>	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V	—	3.0	—	mA	POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V	—	2.8	—	mA	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD - V0 $\varnothing = 10^\circ, \theta = **$ DUTY = 1/240	Ta = 10 °C	—	25.1	—	V	Ta = 25 °C	—	23	—	V	Ta = 60 °C	—	21.3	—	V	↓							PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V	—	3.0	5.0	mA	POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VSS = 5.0 V VDD - VEE = 2.2.0 V	—	2.8	4.8	mA	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD - V0 $\varnothing = 10^\circ, \theta = **$ DUTY = 1/240	Ta = 10 °C	22.5	23.5	24.5	V	Ta = 25 °C	22	23	24	V	Ta = 60 °C	21.2	22.2	23.2	V									
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NUMBERING SYSTEM



MODEL NO .	VERSION	PAGE
32F10(CCFL TYPES)	7	0-3

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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - 0 0 2 A

1.2 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

2. MECHANICAL SPECIFICATIONS

- (1) NUMBER OF DOTS ----- 320W * 240H DOTS
- (2) MODULE SIZE ----- 167.1W * 109.0H * 11.0D(max.) mm
- (3) EFFECTIVE AREA ----- 120.0W * 90.0H mm
- (4) ACTIVE AREA ----- 115.17W * 86.37H mm
- (5) DOT SIZE ----- 0.33W * 0.33H mm
- (6) DOT PITCH ----- 0.36W * 0.36H mm
- (7) LCD TYPE *
- (8) DRIVING METHOD ----- 1 / 240 DUTY MULTIPLEX DRIVE
- (9) VIEWING DIRECTION *
- (10) BACKLIGHT ----- CCFL

* PLEASE REFER TO NUMBERING SYSTEM .

3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS .

PARAMETER	SYMBOL	MIN .	MAX .	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD – VSS	0	6.0	V	
POWER SUPPLY FOR LCD DRIVING	VDD – VEE	0	27.0	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)

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

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS .

I T E M	OPERATING		STORAGE		REMARK
	MIN .	MAX .	MIN .	MAX .	
AMBIENT TEMPERATURE	-10 °C	60 °C	-20 °C	70 °C	NOTE (2),(3),(4)
HUMIDITY	—	85 % RH	—	85 % RH	WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s ² (0.25 G)	—	11.76 m/s ² (1.2 G)	10~100 HZ XYZ DIRECTIONS 1 Hr . EACH
SHOCK	—	29.4 m/s ² (3 G)	—	490.0 m/s ² (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -20 °C : 48HR MAX .
70 °C : 168HR MAX .

NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT
TEMPERATURE THIS PHENOMENON IS REVERSIBLE .

NOTE (4) : CCFL BACKLIGHT IS NOT AVAILABLE TO FUNCTION BELOW 0 °C

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	4.75	5.0	5.25	V
POWER SUPPLY VOLTAGE FOR LCD DRIVE	VEE - VSS	—	-21.5	-22.0	-22.5	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.8*VDD	—	—	V
	VIL	L LEVEL	—	—	0.2*VDD	V
OUTPUT VOLTAGE NOTE (1)	VOH	H LEVEL	2.4	—	—	V
	VOL	L LEVEL	—	—	VSS+0.4	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VEE = 22.0 V	—	3.0	5.0	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VSS = 5.0 V VDD - VEE = 22.0 V	—	2.8	4.8	mA
RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD - V0 ∅ = 10°, θ = ** DUTY = 1/240	Ta = -10 °C	22.5	23.5	24.5	V
		Ta = 25 °C	22	23	24	V
		Ta = 60 °C	21.2	22.2	23.2	V
CLOCK OSCILLATION FREQUENCY	f FLM	—	70	75	80	HZ
POWER SUPPLY FOR CCFL	VOLTAGE	VCCFL	—	—	300	Vrms
	FREQUENCY	f CCFL	—	—	30K	HZ
	CURRENT	IL	—	—	5	mA
	LIFE TIME	L	IL = 5.0mA	45000	50000	—

** θ = 0° WHEN VIEWING DIRECTION IS 6 O'CLOCK .

θ = 90° WHEN VIEWING DIRECTION IS 3 O'CLOCK .

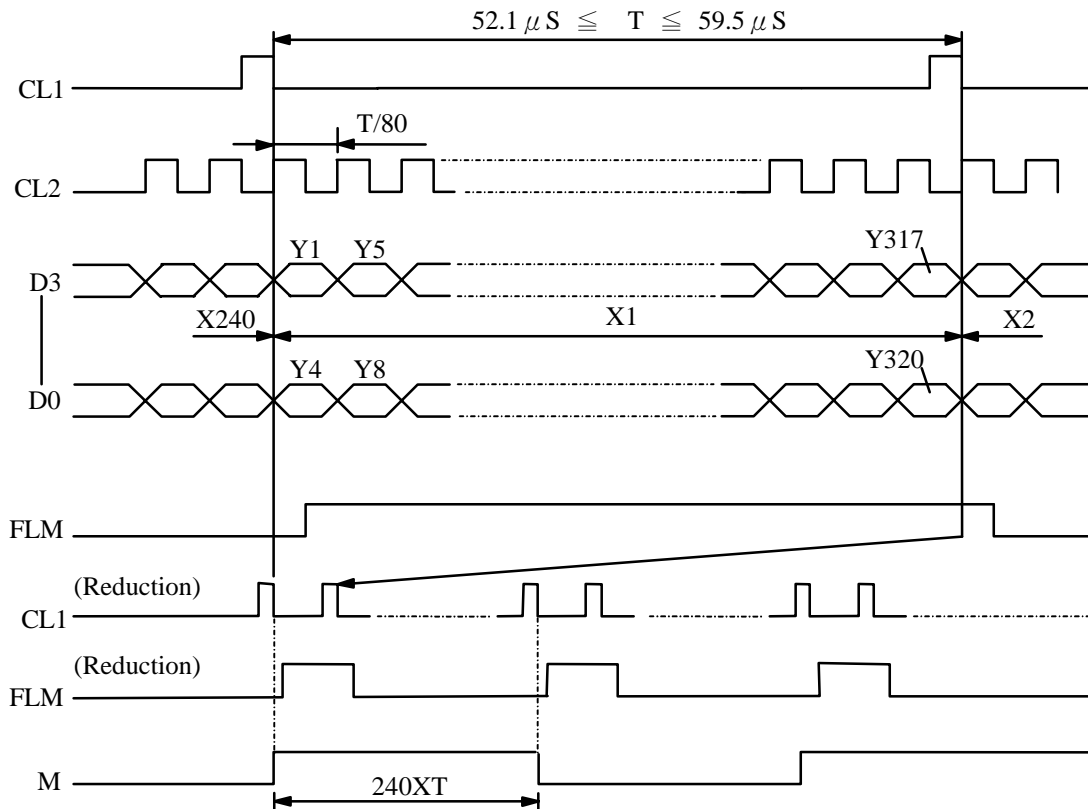
θ = 180° WHEN VIEWING DIRECTION IS 12 O'CLOCK .

NOTE (1): APPLIED TO TERMINALS M, FLM, CL1, CL2, D0-D3, DISPOFF .

NOTE (2): THE DISPLAY PATTERN IS ALL "OFF"/ "ON" .

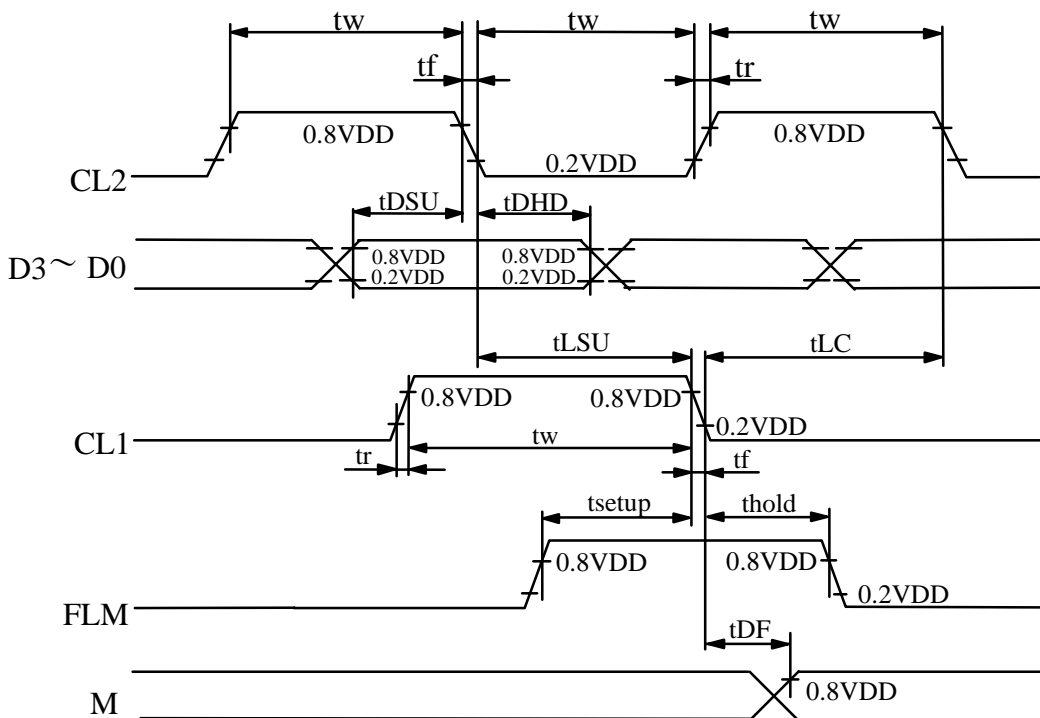
NOTE (3): RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ± 1.0V BY EACH MODULE .

5. TIMING CHARACTERISTICS
5.1 INTERFACE TIMING



5.2 SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Frequency of maximum clock	fcp	—	—	8	MHZ
CL1 , CL2 , pulse width	tw	45	—	—	ns
Rise , fall time	tr,tf	—	—	15	ns
Data setup time	tDSU	20	—	—	ns
Data hold time	tDHD	20	—	—	ns
CL1 setup time	tLSU	80	—	—	ns
CL1 → CL2 time	tLC	80	—	—	ns
FLM setup time	tsetup	100	—	—	ns
FLM hold time	thold	100	—	—	ns
M delay time	tDF	—	—	300	ns



6. OPTICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

I T E M		SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING ANGLE	STN	∅2 - ∅1	K ≥ 2.0	—	40	—	deg.	1
	FSTN			—	50	—	deg.	1
CONTRAST RATIO	STN	K	∅ = 10° θ = **	—	10	—	—	1
	FSTN			—	20	—	—	1
RESPONSE TIME	tr (rise)	∅=10° θ = **	Ta = -10 °C	—	2149	—	ms	1
			Ta = 25 °C	—	228	—		
			Ta = 60 °C	—	124	—		
	tf (fall)		Ta = -10 °C	—	1709	—		
			Ta = 25 °C	—	191	—		
			Ta = 60 °C	—	96	—		
BRIGHTNESS OF MODULE	L	—	60	90	—	cd / m ²	1, 2	
			40	60	—		1, 3	
RISE TIME OF BACKLIGHT	TC	—	—	5	—	MINUTE		
BRIGHTNESS UNIFORMITY	—	—	—	—	20	%	4, 5	

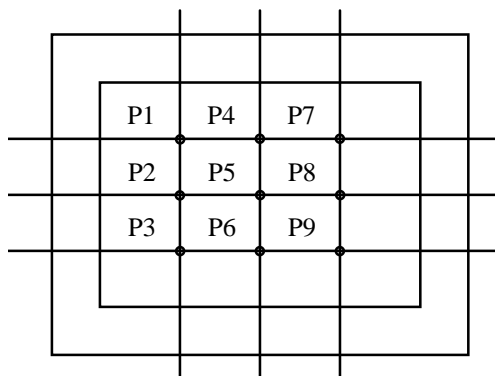
** θ = 0° WHEN VIEWING DIRECTION IS 6 O'CLOCK .
θ = 90° WHEN VIEWING DIRECTION IS 3 O'CLOCK .
θ = 180° WHEN VIEWING DIRECTION IS 12 O'CLOCK .

NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002A)

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

NOTE (3) : POPLARIZER MODE : TRANSFLECTIVE

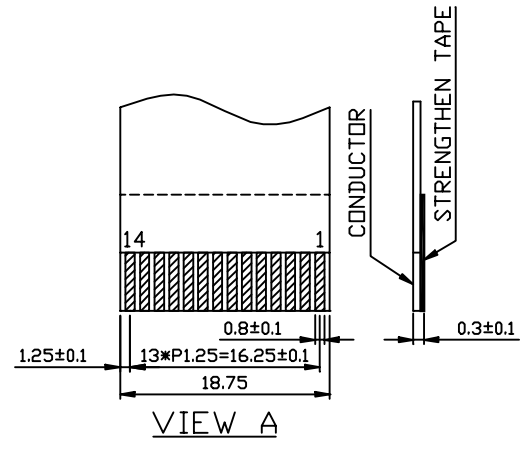
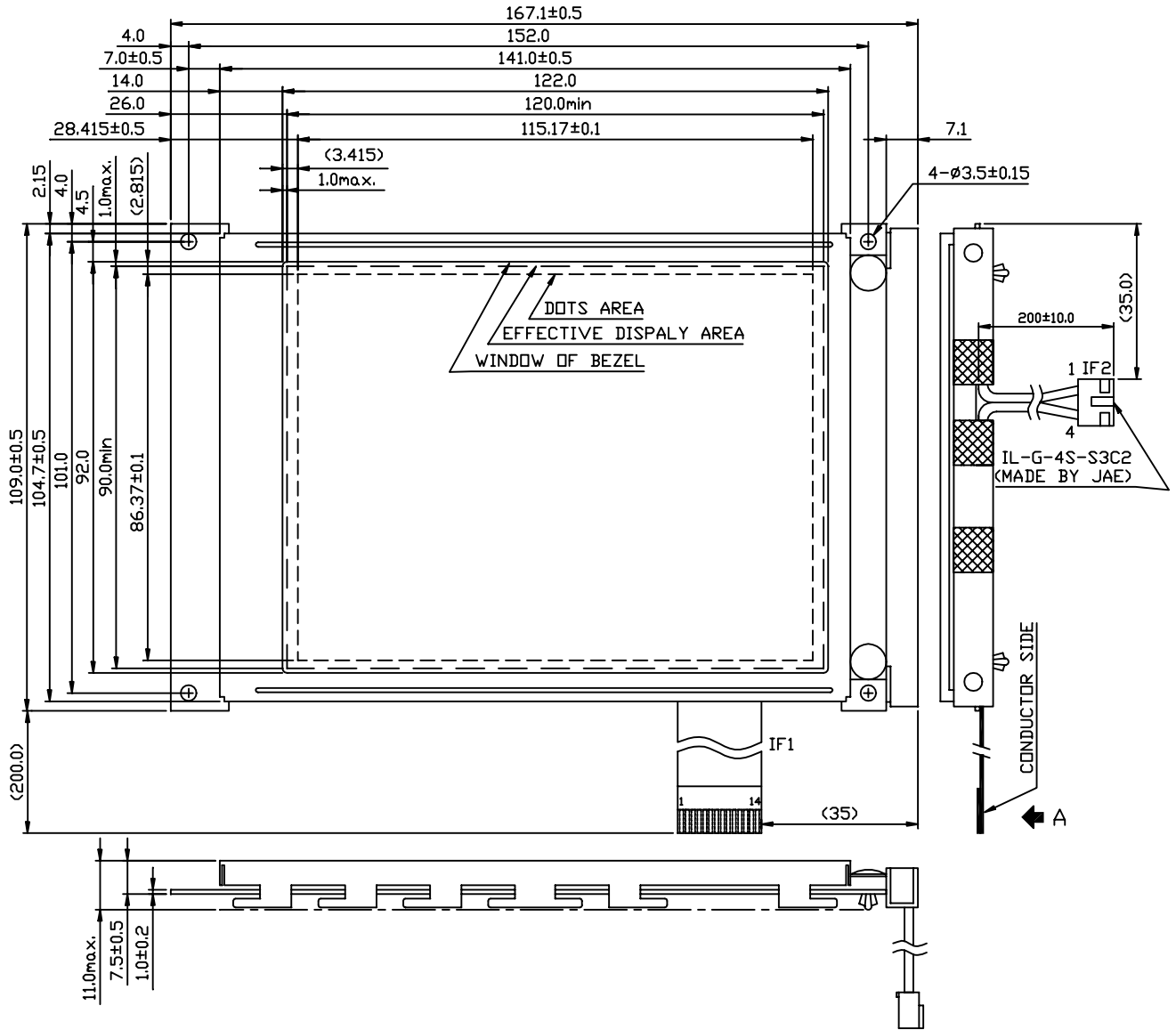
NOTE (4) : MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.
DEFINITION OF THE BRIGHTNESS TOLERANCE .



NOTE (5) : BRIGHTNESS UNIFORMITY IS DEFINED AS FOLLOWING

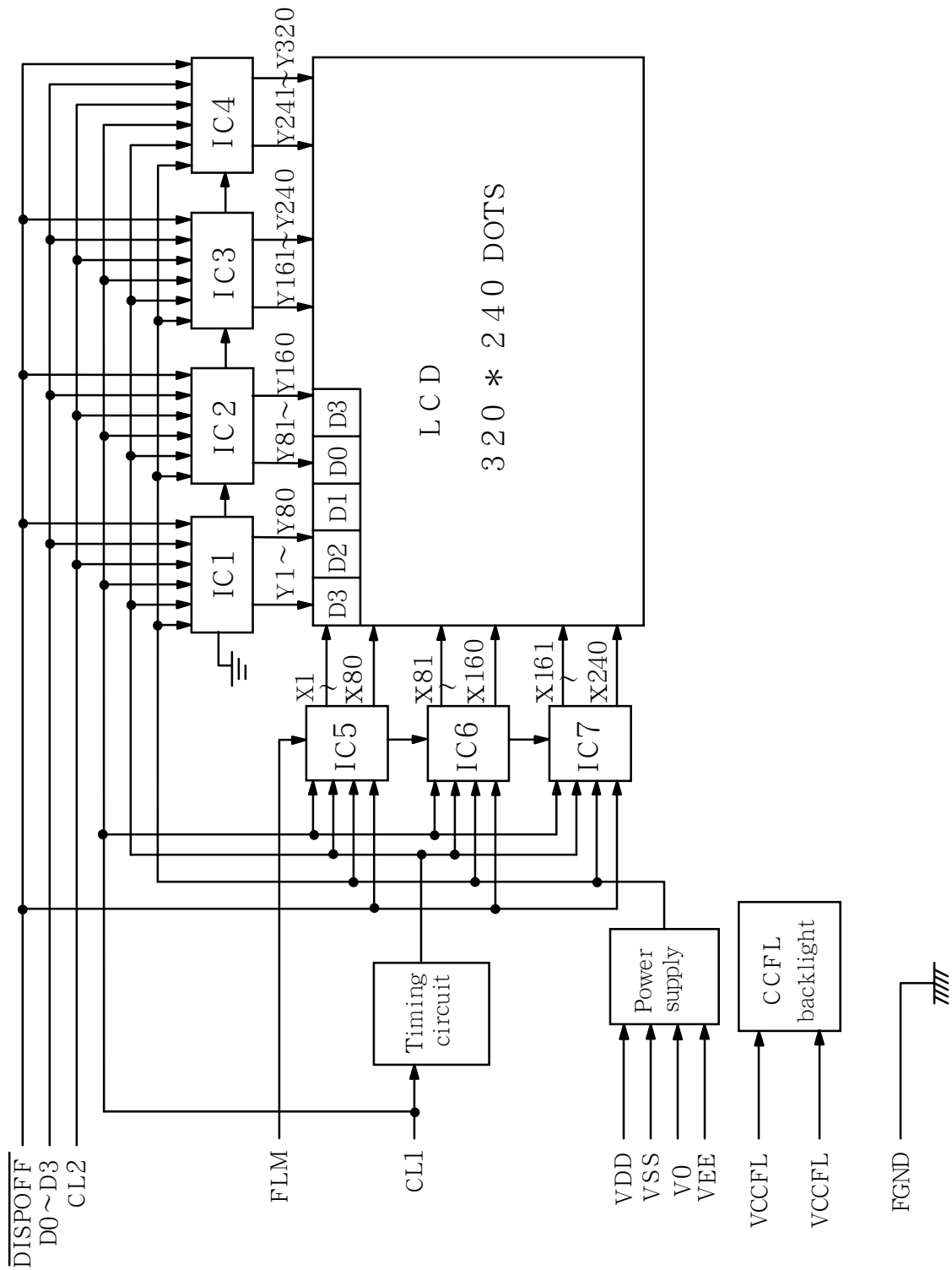
$$\sum_X = \left[\frac{(\text{MAXIMUN BRIGHTNESS OR MINIMUN BRIGHTNESS}) - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right] \times 100\%$$

7. OUTLINE DIMENSIONS

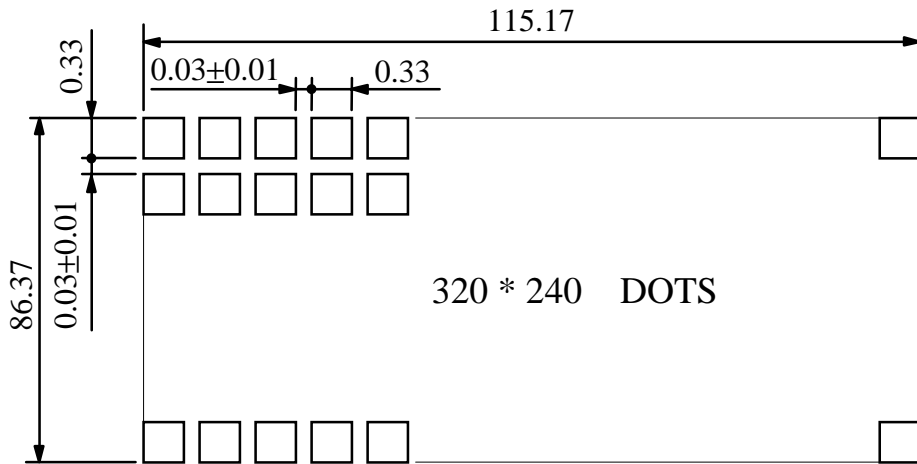


UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.5

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1

10. INTERFACE SIGNALS

IF1 :

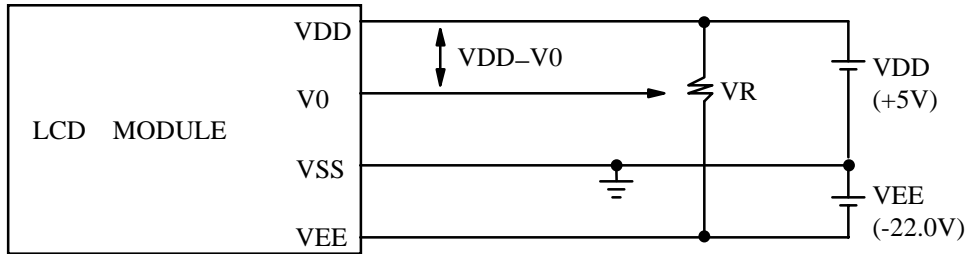
PIN NO	SYMBOL	LEVEL	FUNCTION
1	D0	H / L	DISPLAY DATA
2	D1	H / L	
3	D2	H / L	
4	D3	H / L	
5	$\overline{\text{DISPOFF}}$	H / L	H : DISPLAY ON , L : DISPLAY OFF
6	FLM	H	THE FLM SIGNAL INDICATING THE BEGINNING OF EACH DISPLAY CYCLE
7	NC	—	NO CONNECTION
8	CL1	H → L	DISPLAY DATA LATCH
9	CL2	H → L	DISPLAY DATA SHIFT
10	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
11	VSS	—	GROUND
12	VEE	—	POWER SUPPLY FOR LCD DRIVING
13	VO	—	OPERATING VOLTAGE FOR LCD DRIVING
14	FGND	—	FRONT PANEL GROUND

IF2 :

INTERFACE	PIN	SIGNAL	LEVEL	FUNCTION
CCFL	1	VCCFL	—	POWER SUPPLY FOR CCFL DRIVING
	2~3	NC	—	NO CONNECTION
	4	VCCFL	—	POWER SUPPLY FOR CCFL DRIVING

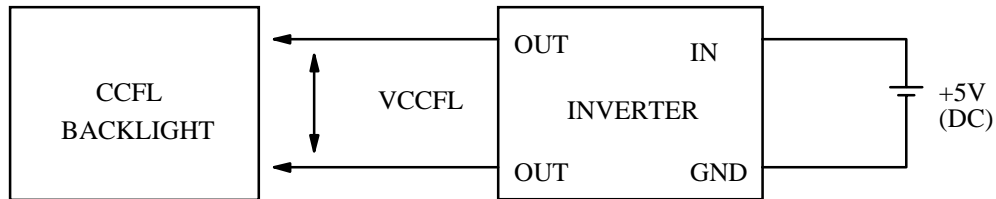
1 1 . POWER SUPPLY

1 1 . 1 POWER SUPPLY FOR LCM



VDD - V0 : LCD DRIVING VOLTAGE
VR : 20K Ω

1 1 . 2 POWER SUPPLY FOR CCFL BACK - LIGHT



RECOMMENDED INVERTER : IA-EM02A1

1 1 . 3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

