EXAMINED BY : Bob Hu	EMERGING DISPLAY	FILE NO . CAS-10391
		ISSUE : NOV.17,2005
APPROVED BY: Roger Yang	TECHNOLOGIES CORPORATION	TOTAL PAGE : 8
		VERSION : 3

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO . :

32FX0(CCFLTYPES)
(RoHS)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

EMERGING DISPLAY TECHNOLOGIES CORPORATION	MODEL NO. 32FX0(CCFL TYPES)(RoHS)	VERSION 3	PAGE 0-1

RECORDS OF REVISION

DOC. FIRST ISSUE APR.07,2005

DATE	REVISED PAGE NO.	SUMMARY
OCT.04,2005	1	1. GENERAL SPECIFICATIONS EU-002A → EU-002B
	2	3. ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-10℃	60℃	-20℃	70℃	NOTE (2),(3),(4) →
HUMIDITY	—	85 % RH	—	85 % RH	WITHOUT CONDENSATION

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-10℃	60℃	-20℃	70℃	NOTE (1),(3),(4)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION

ADD NOTE (1) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

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

NOTE (2) : Ta ≤ 60°C : 85%RH (96HR MAX.)
Ta > 60°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85%RH AT 60°C(96HR MAX.)

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

NOTE (3) : Ta AT -20°C: WILL BE < 48hrs
70°C: WILL BE < 168hrs

	3	4. ELECTRICAL CHARACTERISTICS POWER SUPPLY VOLTAGE FOR LOGIC : MIN. 4.5 → 3.3 RECOMMENDED LCD DRIVING VOLTAGE : ∅ = 10° θ = 0° DUTY =1/240 → ** DUTY =1/242 **θ=0° → θy-=10°, θx=0° WHEN VIEWING DIRECTION IS 6 O'CLOCK θ=90° → θy=0°, θx+=10° WHEN VIEWING DIRECTION IS 3 O'CLOCK θ=180° →θy=10°, θx=0° WHEN VIEWING DIRECTION IS 12 O'CLOCK
	4	5. OPTICAL CHARACTERISTICS

ITEM		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=0°		1.5	3	—	—	1
	FSTN				5	10	—	—	1
RESPONSE TIME		tr (rise)	∅=10° θ=0°	Ta=-10℃	—	2050	4100	ms	1 →
				Ta=25℃	—	270	540		
				Ta=60℃	—	140	280		
		tf (fall)		Ta=-10℃	—	1450	2900		
				Ta=25℃	—	180	360		
				Ta=60℃	—	120	240		
BRIGHTNESS UNIFORMITY		—	—		—	—	20	%	4, 5

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING ANGLE	θy+	K*	θx=0°	(35)	(40)	—	deg.	1
	θy-			(35)	(40)	—		
	θx+		θy=0°	(30)	(35)	—		
	θx-			(40)	(45)	—		
CONTRAST RATIO	K	**		1.5	3	—	—	1
				5	10	—	—	1
RESPONSE TIME	tr (rise)	**	Ta=-10℃	—	2050	2665	ms	1
			Ta=25℃	—	270	351		
			Ta=60℃	—	140	182		
	tf (fall)		Ta=-10℃	—	1450	1885		
			Ta=25℃	—	180	234		
			Ta=60℃	—	120	156		
BRIGHTNESS UNIFORMITY	—	—		80	85	—	%	4, 5

ADD K* : STN K≥1.5, FSTN K≥2.0

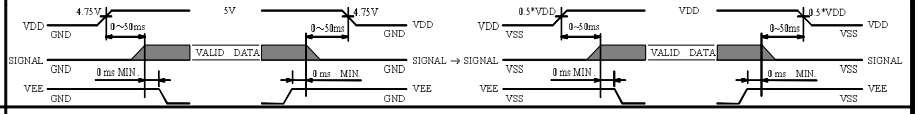
** θ=0°→θy-=10°, θx=0° WHEN VIEWING DIRECTION IS 6 O'CLOCK.
θ=90°→θy=0°, θx+=10° WHEN VIEWING DIRECTION IS 3 O'CLOCK.
θ=180°→θy=10°, θx=0° WHEN VIEWING DIRECTION IS 12 O'CLOCK.

NOTE (1) : (EU-002A) → (EU-002B)

RECORDS OF REVISION

DOC. FIRST ISSUE

APR.07,2005

DATE	REVISED PAGE NO.	SUMMARY
OCT.04,2005	6	7. BLOCK DIAGRAM DB0~DB7 → D0~D7
	8	10.2 POWER SUPPLY FOR CCFL BACK - LIGHT RECOMMENDED INVERTER : IA-EM02A → RECOMMENDED INVERTER : IA-EM02A1 10.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL 
NOV.17,2005	4	5. OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
CONTRAST RATIO	K	**	1.5	3	—	—	1
			5	10	—	—	1

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
CONTRAST RATIO	STN	K	**	1.5	3	—	—	1
	FSTN			5	10	—	—	1

NUMBERING SYSTEM

Polarizer Mode	Backlight	Code value
Transflective	CCFL	D
Transmissive	CCFL	C

Viewing direction
NIL : 6 o'clock
R :3 o'clock
U :12 o'clock

E	W	32	F	X0	B	C	W	R

LCD type + LCD color	Code Value
STN + Gray	G
STN + Blue	B
FSTN + White	F
FSTN + Black	N

TABLE OF CONTENTS

1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS
PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU-002B

1.2 APPLICATION NOTES FOR CONTROLLER / DRIVER :
PLEASE REFER TO :

EPSON S1D13700

1.3 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

1.4 MATERIAL SAFETY DESCRIPTION
ASSEMBLIES SHALL COMPLY WITH EUROPEAN ROHS REQUIREMENTS, INCLUDING PROHIBITED MATERIALS/COMPONENTS CONTAINING LEAD,MERCURY, CADMIUM, HEXAVALENT CHROMIUM, POLYBROMINATED BIPHENYLS (PBB) AND POLYBROMINATED DIPHENYL ETHERS (PBDE)

2. MECHANICAL SPECIFICATIONS

(1)	NUMBER OF DOTS	320W * 240H DOTS
(2)	MODULE SIZE	167.1W * 109.0H * 11.0D 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 / 242 DUTY MULTIPLEX DRIVE
(9)	BACKLIGHT	CCFL , COLOR : WHITE

* 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	7.0	V	
POWER SUPPLY FOR LCD DRIVING	VDD – VEE	0	30.0	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.

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-10 °C	60 °C	-20 °C	70 °C	NOTE (1), (3), (4)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s2 (0.25 G)	—	11.76 m/s2 (1.2 G)	10~100 HZ XYZ DIRECTIONS 1 Hr. EACH
SHOCK	—	29.4 m/s2 (3 G)	—	490.0 m/s2 (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

NOTE (2) : Ta ≤ 60°C : 85%RH (96HR MAX.)
Ta > 60°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85%RH AT 60°C(96HR MAX.)

NOTE (3) : Ta AT -20°C: WILL BE < 48hrs
70°C: WILL BE < 168hrs

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

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C VDD–VSS = 5.0 V VEE–VSS = -22.0

PARAMETER		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC		VDD – VSS	—	3.3	5.0	5.5	V
POWER SUPPLY VOLTAGE FOR LCD DRIVE		VEE – VSS	—	-21.5	-22.0	-22.5	V
INPUT VOLTAGE		VIH	H LEVEL	0.5*VDD	—	—	V
NOTE (1)		VIL	L LEVEL	—	—	0.2*VDD	V
OUTPUT VOLTAGE		VOH	H LEVEL	2.4	—	—	V
NOTE (1)		VOL	L LEVEL	—	—	VSS+0.4	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)		IDD	VDD – VSS = 5.0 V VDD – VO = 23.0 V	—	22.0	40.0	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)		IEE	VDD – VSS = 5.0 V VDD – VO = 23.0 V	—	6.0	8.0	mA
RECOMMENDED LCD DRIVING VOLTAGE		VDD – VO ** DUTY =1/242	Ta =- 10 °C	22.5	23.5	24.5	V
			Ta = 25 °C	22	23.0	24	V
			Ta = 60 °C	21.2	22.2	23.2	V
CLOCK OSCILLATION FREQUENCY		f OSC	—	—	8	—	MHz
POWER SUPPLY FOR CCFL	VOLTAGE	VCCFL	—	—	300	—	Vrms
	FREQUENCY	f CCFL	—	—	30K	—	Hz
	CURRENT	IL	—	—	5	—	mA

**θy-=10°, θx=0° WHEN VIEWING DIRECTION IS 6 O'CLOCK

θy=0°, θx+=10° WHEN VIEWING DIRECTION IS 3 O'CLOCK

θy=10°, θx=0° WHEN VIEWING DIRECTION IS 12 O'CLOCK

NOTE (1): APPLIED TO TERMINALS D0 TO D7, A0, $\overline{CS}$, $\overline{RD}$, $\overline{WR}$.

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

5. OPTICAL CHARACTERISTICS

Ta = 25 °C VDD = 5.0 V VDD-V0 = 23.0V

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING ANGLE		θy+	K *	θx=0°	(35)	(40)	—	deg.	1
		θy-			(35)	(40)	—		
		θx+		θy=0°	(30)	(35)	—		
		θx-			(40)	(45)	—		
CONTRAST RATIO	STN	K	**		1.5	3	—	—	1
	FSTN				5	10	—	—	1
RESPONSE TIME		tr (rise)	**	Ta = -10 °C	—	2050	2665	ms	1
				Ta = 25 °C	—	270	351		
				Ta = 60 °C	—	140	182		
		tf (fall)		Ta = -10 °C	—	1450	1885		
				Ta = 25 °C	—	180	234		
				Ta = 60 °C	—	120	156		
BRIGHTNESS OF MODULE		L	—		50	68	—	cd / m^2	1 , 2
					75	102			1 , 3
RISE TIME OF BACKLIGHT		TC	—		—	5	—	MINUTE	
BRIGHTNESS UNIFORMITY		—	—		80	85	—	%	4 , 5

K* : STN K≥1.5, FSTN K≥2.0

**θy-=10°, θx=0° WHEN VIEWING DIRECTION IS 6 O'CLOCK

θy=0°, θx+=10° WHEN VIEWING DIRECTION IS 3 O'CLOCK

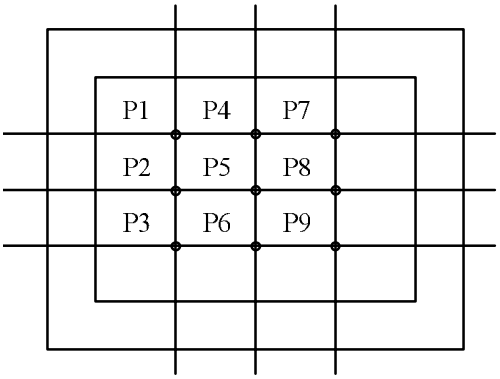
θy=10°, θx=0° WHEN VIEWING DIRECTION IS 12 O'CLOCK

NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU – 002B)

NOTE (2) : POLARIZER MODE : TRANSFLECTIVE.

NOTE (3) : POLARIZER MODE : TRANSMISSIVE.

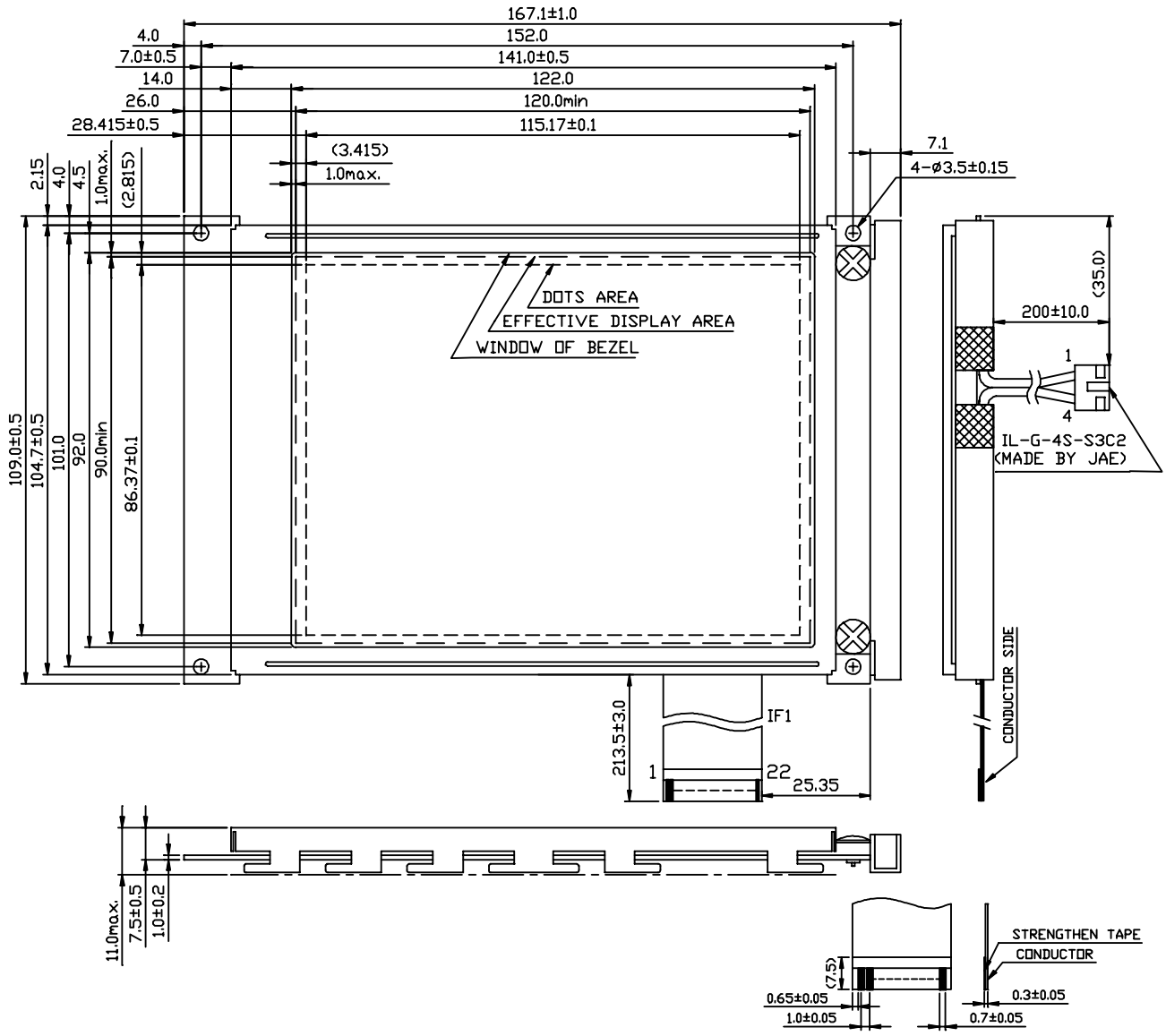
NOTE (4) : MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.
DEFINITION OF THE BRIGHTNESS TOLERANCE .



NOTE (5) : BRIGHTNESS UNIFORMITY IS DEFINED AS FOLLOWING

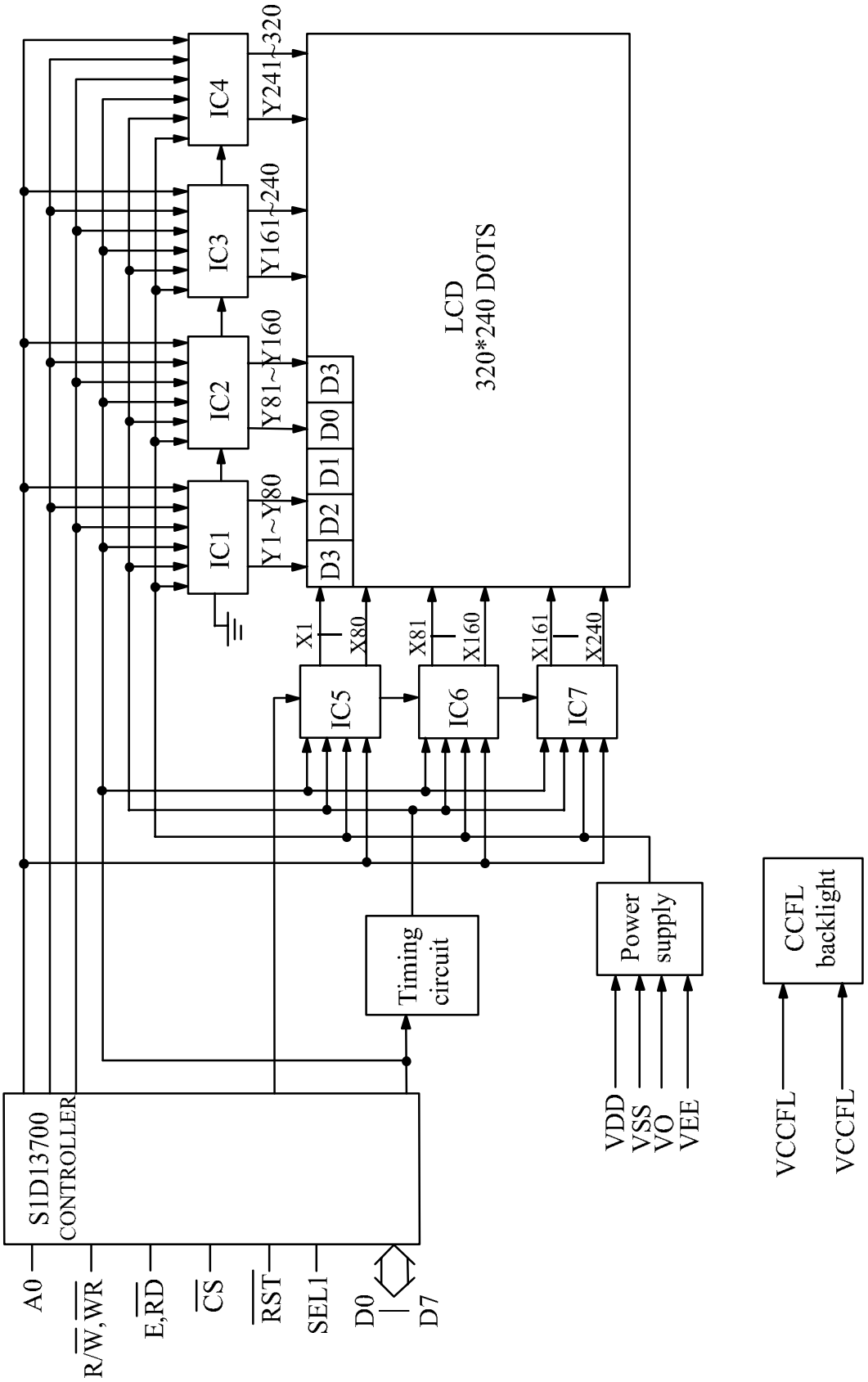
$$(\text{MIN.}/\text{MAX.})\times 100\%$$

6. OUTLINE DIMENSION

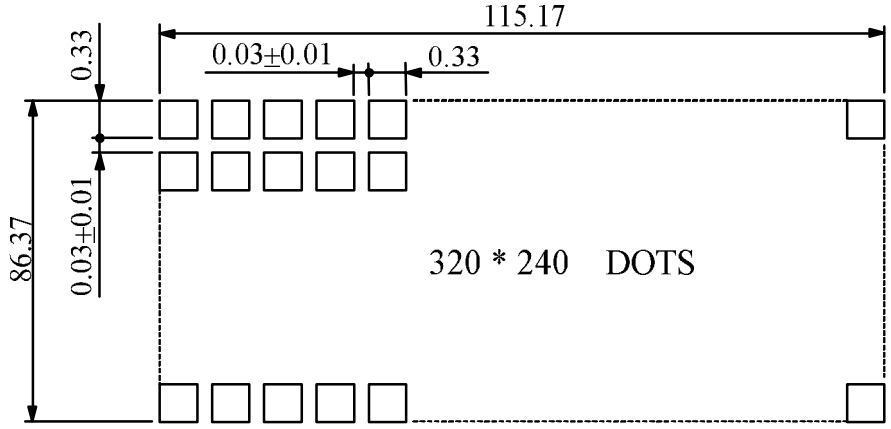


UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.5

7. BLOCK DIAGRAM



8. DETAIL DRAWING OF DOT MATRIX



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

9. INTERFACE SIGNALS

IF1 :

PIN NO	SYMBOL	LEVEL	FUNCTION
1	VSS	—	GROUND
2	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
3	VO	—	OPERATING VOLTAGE FOR LCD DRIVING
4	A0	—	8080 FAMILY INTERFACE AO, $\overline{RD}$, $\overline{WR}$, FUNCTION 0, 0, 1, STATUS FLAG READ 1, 0, 1, DISPLAY DATA AND CURSOR ADDRESS READ 0, 1, 0, DISPLAY DATA AND PARAMETER WRITE 1, 1, 0, COMMAND WRITE 6800 FAMILY INTERFACE AO, R/$\overline{W}$, E, FUNCTION 0, 1, 1, STATUS FLAG READ 1, 1, 1, DISPLAY DATA AND CURSOR ADDRESS READ 0, 0, 1, DISPLAY DATA AND PARAMETER WRITE 1, 0, 1, COMMAND WRITE
5	$\overline{WR}$,R/$\overline{W}$	H/L	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE . 6800 FAMILY INTERFACE ACTS AS THE READ/ WRITE CONTROL SIGNAL .
6	$\overline{RD}$,E	H/L	8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE . 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK .
7 ~ 14	D0 ~ D7	H/L	DISPLAY DATA
15	$\overline{CS}$	H/L	CHIP SELECT
16	$\overline{RST}$	H/L	RESET
17	VEE	—	POWER SUPPLY FOR LCD DRIVING
18	SEL1	H/L	8080 OR 6800 FAMILY INTERFACE SELECT , H:6800 , L:8080
19 ~ 22	NC	—	NOT USE

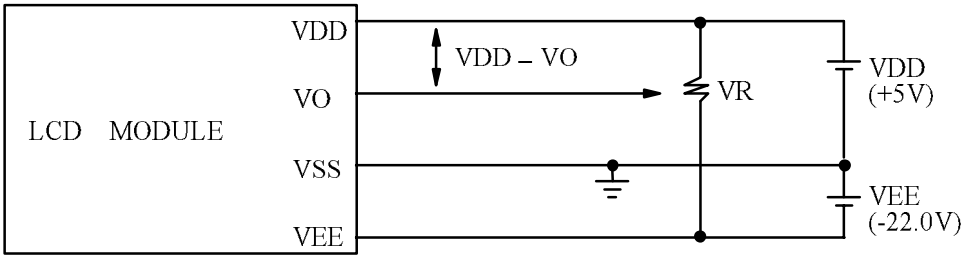
9. INTERFACE SIGNALS

IF2 :

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

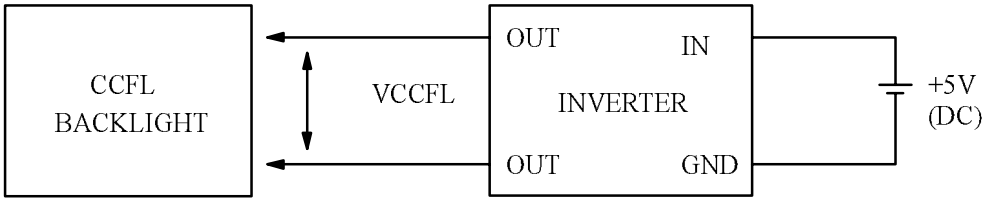
10. POWER SUPPLY

10.1 POWER SUPPLY FOR LCM



VDD – VO : LCD DRIVING VOLTAGE
VR: 20KΩ

10.2 POWER SUPPLY FOR CCFL BACK - LIGHT



RECOMMENDED INVERTER : IA-EM02A1

10.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL