

EXAMINED BY :	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-10392
<i>Kevin Kuo</i>		ISSUE : OCT.03,2005
APPROVED BY:		TOTAL PAGE : 8
<i>[Signature]</i>		VERSION : 2

CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

32FX0(LED TYPE)  
(RoHS)

FOR MESSRS :

\_\_\_\_\_

CUSTOMER'S APPROVAL

DATE :

\_\_\_\_\_

BY :

\_\_\_\_\_

RECORDS OF REVISION

DOC. FIRST ISSUE

APR.07,2005

DATE

REVISED  
PAGE  
NO.

SUMMARY

OCT.03,2005

1

1. GENERAL SPECIFICATIONS  
EU-002A → EU-002B

2

3. ABSOLUTE MAXIMUM RATINGS

I T E M	OPERATING		STORAGE		REMARK
	MIN	MAX	MIN	MAX	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	NOTE (2), (3) →
HUMIDITY	—	85 % RH	—	85 % RH	WITHOUT CONDENSATION

I T E M	OPERATING		STORAGE		REMARK
	MIN	MAX	MIN	MAX	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	NOTE (1), (3)
HUMIDITY	—	NOTE (2)	—	NOTE (2)	WITHOUT CONDENSATION

ADD NOTE (1)

NOTE (2) : Ta AT -30°C : 48HR MAX.

80°C : 168HR MAX. →

NOTE (2) : Ta ≤ 60°C , 90%RH MAX.(96hr MAX.)

Ta > 60°C ABSOLUTE HUMIDITY MUST BE

LOWER THAN THE HUMIDITY OF 90%RH AT 60°C.(96hr MAX.)

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

NOTE (3) : Ta AT -30°C : WILL BE < 48hr

80°C : WILL BE < 168hr

3

4. ELECTRICAL CHARACTERISTICS

POWER SUPPLY VOLTAGE FOR LOGIC : MIN. 4.5 → 3.3

RECOMMENDED LCD DRIVING VOLTAGE :

∅ = 10° θ = \*\* 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

I T E M	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE	
VIEWING ANGLE	FSTN	∅ 2-∅ 1	—	50	—	deg	1	
CONTRAST RATIO	STN	K	∅ = 1.0°	1.5	3	—	1	
	FSTN		θ = 0°	5	10	—	1	
RESPONSE TIME	tr (rise)	∅ = 10° θ = **	Ta = -20°C	—	4200	5400	ms	1
			Ta = 25°C	—	300	600		
			Ta = 70°C	—	150	300		
			Ta = -20°C	—	2900	5800		
tf (fall)	θ = **	Ta = 25°C	—	190	380	ms	1	
		Ta = 70°C	—	80	160			
		Ta = -20°C	—	400	800			
		Ta = 70°C	—	80	160			
CHROMATICITY COORDINATES	x	IF = 140 mA	0.26	0.315	0.33	—	—	
	y		0.29	0.305	0.32	—	—	

I T E M	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE	
VIEWING ANGLE	θy+	K*	θx=0°	(35)	(40)	—	deg	1
	θy-		(35)	(40)	—			
	θx+		(30)	(35)	—			
	θx-		(40)	(45)	—			
CONTRAST RATIO	K	**	∅ = 1.0°	1.5	3	—	1	
			θ = 0°	5	10	—	1	
RESPONSE TIME	tr (rise)	**	Ta = -20°C	—	4200	5460	ms	1
			Ta = 25°C	—	300	390		
			Ta = 70°C	—	150	195		
			Ta = -20°C	—	2900	3770		
tf (fall)	θ = **	Ta = 25°C	—	190	247	ms	1	
		Ta = 70°C	—	80	104			
		Ta = -20°C	—	400	514			
		Ta = 70°C	—	80	104			
CHROMATICITY COORDINATES	x	IF = 140 mA	0.287	0.325	0.360	—	—	
	y		0.290	0.325	0.360	—	—	

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)

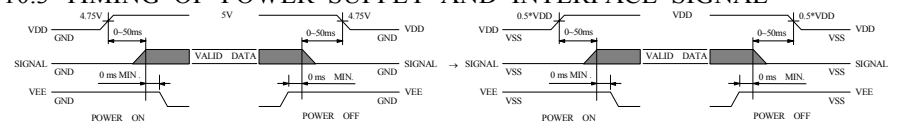
6

7. BLOCK DIAGRAM

DB0~DB7 → D0~D7

8

10.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL



NUMBERING SYSTEM

Polarizer Mode	Backlight	Code value
Transflective	LED	L
Transmissive	LED	M

Backlight Color	Code Value
White	W

E W 3 2 F X0 B M W R

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

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

TABLE OF CONTENTS

NO.	ITEM	PAGE
1.	GENERAL SPECIFICATIONS -----	1
2.	MECHANICAL SPECIFICATIONS -----	1
3.	ABSOLUTE MAXIMUM RATINGS -----	2
4.	ELECTRICAL CHARACTERISTICS -----	3
5.	OPTICAL CHARACTERISTICS -----	4
6.	OUTLINE DIMENSIONS -----	5
7.	BLOCK DIAGRAM -----	6
8.	DETAIL DRAWING OF DOT MATRIX -----	7
9.	INTERFACE SIGNALS -----	7
10.	POWER SUPPLY -----	8

## 1. GENERAL SPECIFICATIONS

### 1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - 0 0 2 B

### 1.2 APPLICATION NOTES FOR CONTROLLER / DRIVER :

PLEASE REFER TO :

E P S O N S 1 D 1 3 7 0 0

### 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    | ----- | 160.0W * 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*     |       |                              |

\* 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)
LED POWER VOLTAGE	VLED	—	6	V	

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	-20 °C	70 °C	-30 °C	80 °C	NOTE (1), (3)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s <sup>2</sup> (0.25 G)	—	11.76 m/s <sup>2</sup> (1.2 G)	10~100 HZ XYZ DIRECTIONS 1 Hr . EACH
SHOCK	—	29.4 m/s <sup>2</sup> (3 G)	—	490.0 m/s <sup>2</sup> (50 G)	1 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 , 90%RH MAX.(96hr MAX.)

Ta > 60°C ABSOLUTE HUMIDITY MUST BE

LOWER THAN THE HUMIDITY OF 90%RH AT 60°C.(96hr MAX.)

NOTE (3) : Ta AT -30°C : WILL BE < 48hr

80°C : WILL BE < 168hr

#### 4. ELECTRICAL CHARACTERISTICS

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

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 NOTE ( 1 )	VIH	H LEVEL	0.5*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	—	22	40	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE ( 2 )	IEE	VDD – VO = 2.3.0V	—	6	8	mA
RECOMMENDED LCD DRIVING VOLTAGE	VDD – VO ** DUTY =1/242	Ta = -20 °C NOTE ( 4 )	22.7	23.7	24.7	V
		Ta = 25 °C NOTE ( 3 )	22.0	23.0	24.0	V
		Ta = 70 °C NOTE ( 3 )	20.2	21.2	22.2	V
CLOCK OSCILLATION FREQUENCY	f OSC	—	—	8	—	MHz
LED FORWAD VOLTAGE	VLED – VLSS	—	—	5.0	—	V
LED FORWAD VOLTAGE	IF	VLED-VLSS	—	140	—	mA

\*\*  $\theta_y = -10^\circ$ ,  $\theta_x = 0^\circ$  WHEN VIEWING DIRECTION IS 6 O’CLOCK

$\theta_y = 0^\circ$ ,  $\theta_x = +10^\circ$  WHEN VIEWING DIRECTION IS 3 O’CLOCK

$\theta_y = 10^\circ$ ,  $\theta_x = 0^\circ$  WHEN VIEWING DIRECTION IS 12 O’CLOCK

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

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

NOTE ( 3 ) : THE DISPLAY PATTERN IS ALL “Q”.

NOTE ( 4 ) : THE DISPLAY PATTERN IS ALL “BAR” (ONLY Ta=-20°C)

5. OPTICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

VDD-V0 = 23.0V

I T E M	SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE	
VIEWING ANGLE	$\theta_{y+}$	K *	$\theta_{x=0^\circ}$	(35)	(40)	—	deg .	1
	$\theta_{y-}$			(35)	(40)	—		
	$\theta_{x+}$	$\theta_{y=0^\circ}$	(30)	(35)	—			
	$\theta_{x-}$		(40)	(45)	—			
CONTRAST RATIO	K	**	1.5	3	—	—	1	
			5	10	—	—	1	
RESPONSE TIME	tr ( rise )	**	Ta = -20 °C	—	4200	5460	ms	1
			Ta = 25 °C	—	300	390		
			Ta = 70 °C	—	150	195		
	tf ( fall )		Ta = -20 °C	—	2900	3770		
			Ta = 25 °C	—	190	247		
			Ta = 70 °C	—	80	104		
BRIGHTNESS OF MODULE	L	VLED – VLSS = 5.0 V	10	13	—	cd / m <sup>2</sup>	1 , 2	
			6.5	8.5	—		1 , 3	
CHROMATICITY COORDINATES	x	IF = 140 mA	0.287	0.325	0.360	—	—	
	y		0.290	0.325	0.360			

K\* : STN K≥1.5, FSTN K≥2.0

\*\*  $\theta_{y-}=10^\circ, \theta_{x=0^\circ}$  WHEN VIEWING DIRECTION IS 6 O'CLOCK .

$\theta_{y=0^\circ}, \theta_{x+}=10^\circ$  WHEN VIEWING DIRECTION IS 3 O'CLOCK .

$\theta_{y=10^\circ}, \theta_{x=0^\circ}$  WHEN VIEWING DIRECTION IS 12 O'CLOCK .

NOTE (1) : PLEASE REFER TO :

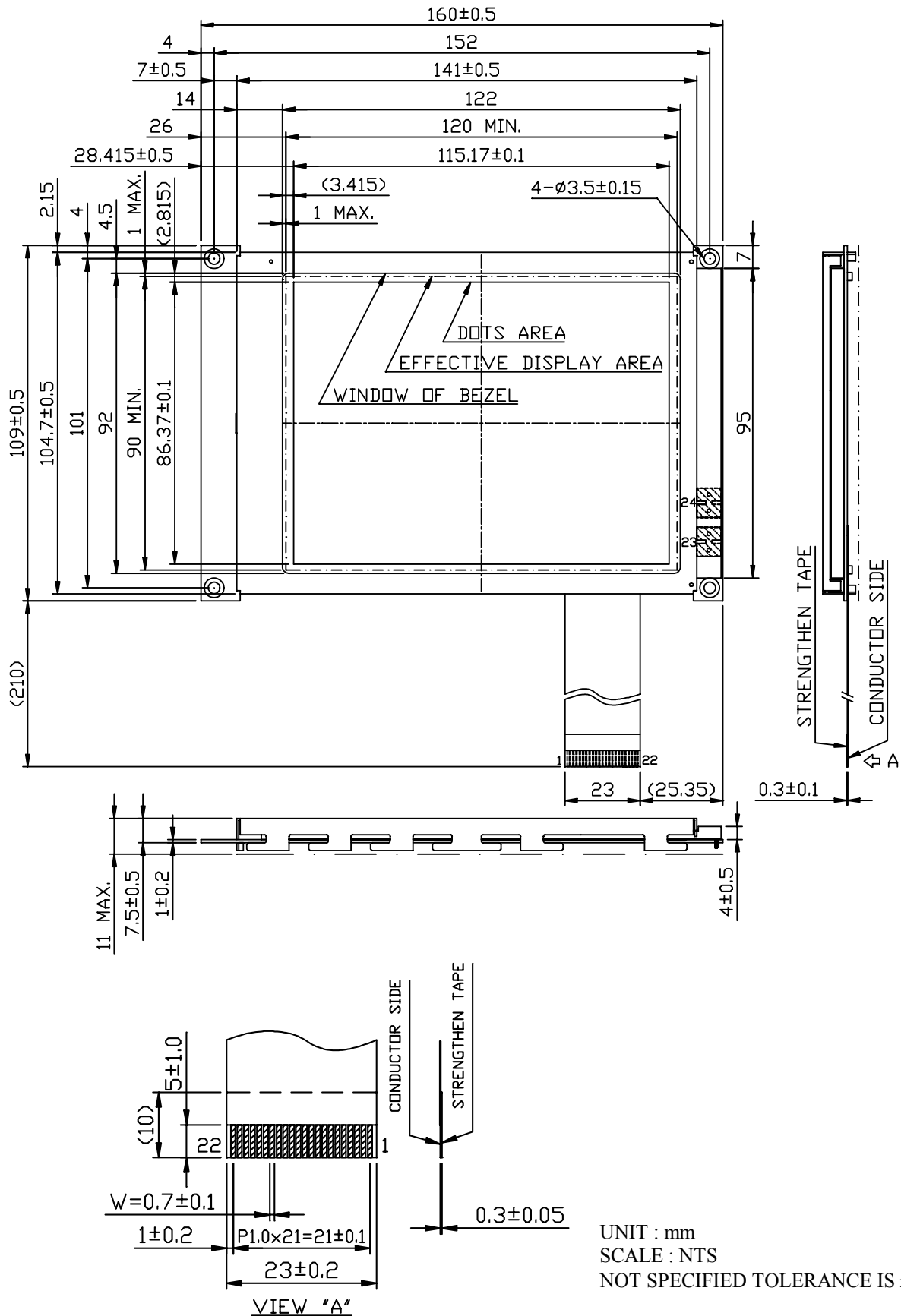
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU – 002B)

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

NOTE (3) : POLARIZER MODE : TRANSFLECTIVE

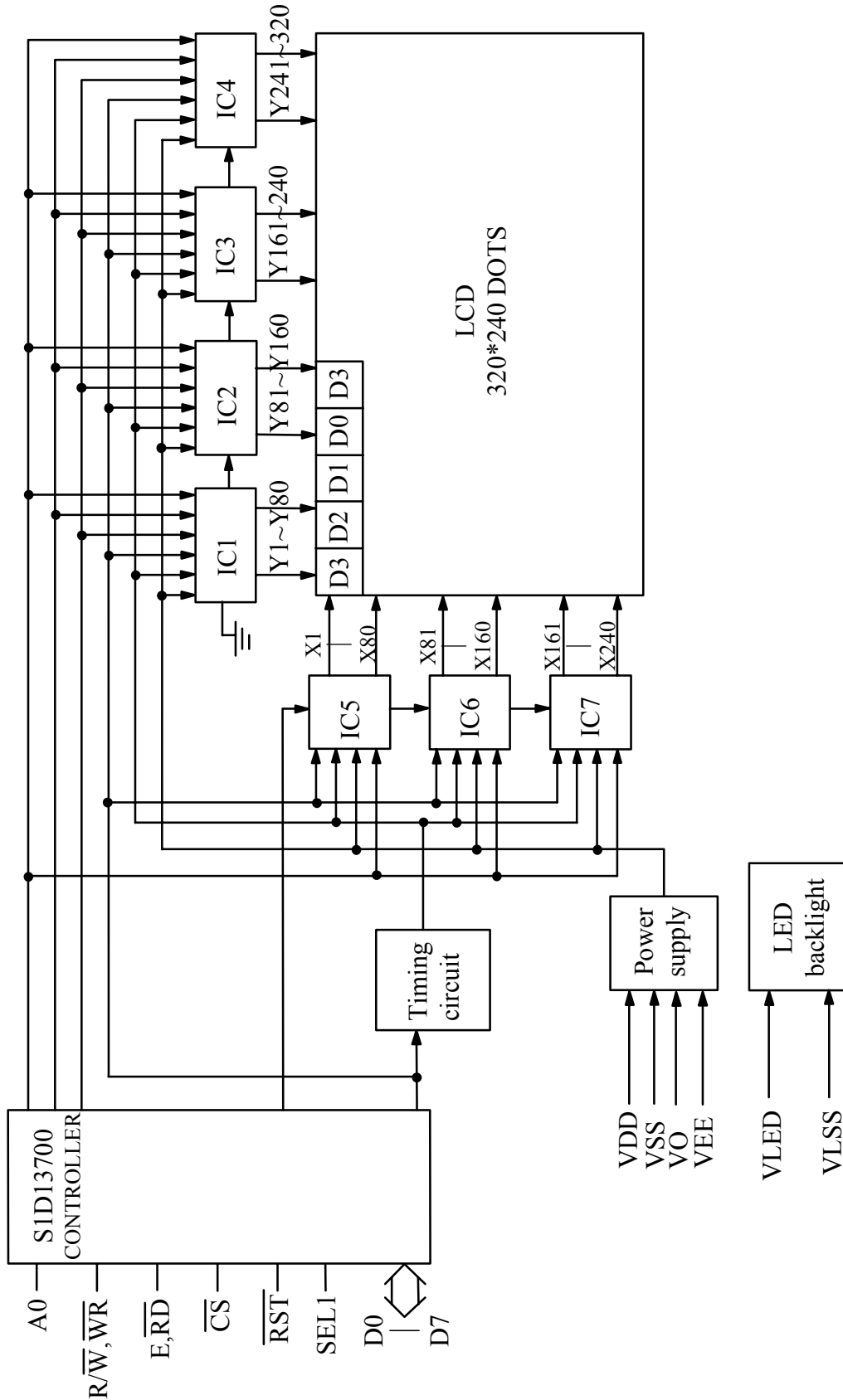


6. OUTLINE DIMENSIONS

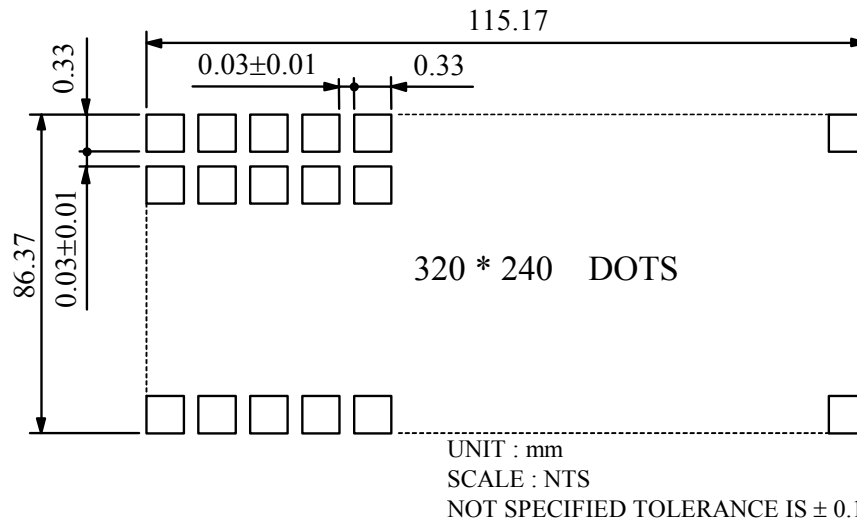


UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS  $\pm 0.5$

7. BLOCK DIAGRAM



8. DETAIL DRAWING OF DOT MATRIX

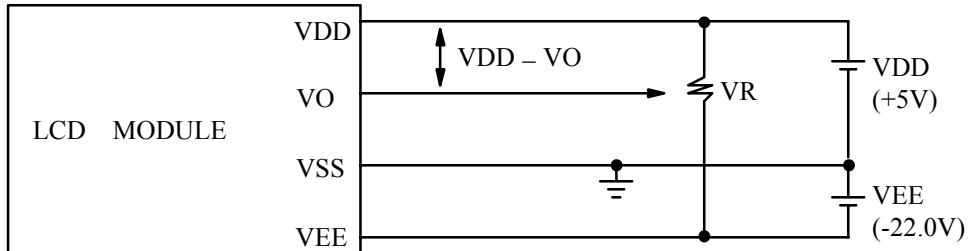


9. INTERFACE SIGNALS

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																				
			<table border="1" style="width: 100%;"> <thead> <tr> <th>AO</th> <th><math>\overline{RD}</math></th> <th><math>\overline{WR}</math></th> <th>FUNCTION</th> </tr> </thead> <tbody> <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> </tbody> </table>	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
			AO	$\overline{RD}$	$\overline{WR}$	FUNCTION																	
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			0	1	0	DISPLAY DATA AND PARAMETER WRITE																	
			1	1	0	COMMAND WRITE																	
			6800 FAMILY INTERFACE																				
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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   20	NC	—	NOT USE																				
21,23	VLED	—	POWER SUPPLY FOR LED BACKLIGHT ( A )																				
22,24	VLSS	—	POWER SUPPLY FOR LED BACKLIGHT ( K )																				

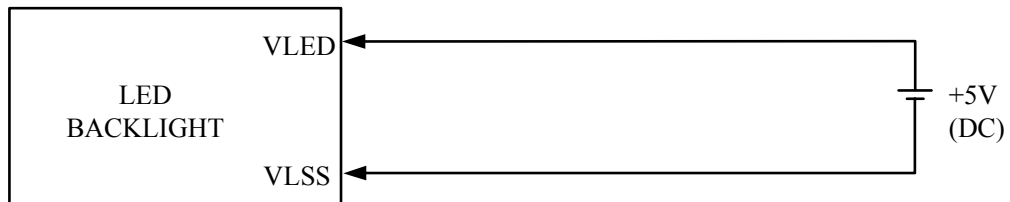
10. POWER SUPPLY

10.1 POWER SUPPLY FOR LCM



VDD - VO : LCD DRIVING VOLTAGE  
VR : 20K $\Omega$

10.2 POWER SUPPLY FOR LED BACK - LIGHT



10.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

