

EXAMINED BY :  <i>David Chang</i>	<b>EMERGING DISPLAY</b>  TECHNOLOGIES CORPORATION	FILE NO . CAS-10073
APPROVED BY:  <i>Tessie Chen</i>		ISSUE : AUG.10, 1998
		TOTAL PAGE : 10
		VERSION : 4

CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

32E00(CCFL TYPES)

FOR MESSRS :



CUSTOMER'S APPROVAL

DATE :

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BY :

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**ACDS** 175-177 route de Genas - 69100 VILLEURBANNE - France

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EMERGING DISPLAY  
TECHNOLOGIES CORPORATION

MODEL NO . 32E00(CCFL TYPES)	VERSION 4
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RECORDS OF REVISION	DOC . FIRST ISSUE MAR.10,1998
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DATE	REVISED PAGE NO.	SUMMARY																																																								
MAR.19,1998	7	7. OUTLINE DIMENSION CABLE POSITION REVISED : $50.5 \pm 5.0 \rightarrow 59.5 \pm 5.0$																																																								
JUN. 3,1998	3	4. ELECTRICAL CHARACTERISTICS ORIGINAL RECOMMENDED LCD DRIVING VOLTAGE NOTE (3): <table border="1" data-bbox="770 798 2013 940"> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td>VDD-V0</td> <td>Ta = 0 °C</td> <td>—</td> <td>23.6</td> <td>—</td> <td>V</td> </tr> <tr> <td><math>\phi = 10^\circ, \theta = 0^\circ</math></td> <td>Ta = 25 °C</td> <td>—</td> <td>21.8</td> <td>—</td> <td>V</td> </tr> <tr> <td>DUTY = 1/200</td> <td>Ta = 50 °C</td> <td>—</td> <td>19.0</td> <td>—</td> <td>V</td> </tr> </table> ADDITIONAL ONE: <table border="1" data-bbox="770 1031 2013 1313"> <tr> <td rowspan="6">RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td>VDD-V0</td> <td>Ta = 0 °C</td> <td>—</td> <td>23.6</td> <td>—</td> <td>V</td> </tr> <tr> <td><math>\phi = 10^\circ, \theta = 0^\circ</math></td> <td>Ta = 25 °C</td> <td>—</td> <td>21.8</td> <td>—</td> <td>V</td> </tr> <tr> <td>DUTY = 1/200</td> <td>Ta = 50 °C</td> <td>—</td> <td>19.0</td> <td>—</td> <td>V</td> </tr> <tr> <td>VDD-V0</td> <td>Ta = 0 °C</td> <td>—</td> <td>24.1</td> <td>—</td> <td>V</td> </tr> <tr> <td><math>\phi = 10^\circ, \theta = 180^\circ</math></td> <td>Ta = 25 °C</td> <td>—</td> <td>21.3</td> <td>—</td> <td>V</td> </tr> <tr> <td>DUTY = 1/200</td> <td>Ta = 50 °C</td> <td>—</td> <td>19.5</td> <td>—</td> <td>V</td> </tr> </table>	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD-V0	Ta = 0 °C	—	23.6	—	V	$\phi = 10^\circ, \theta = 0^\circ$	Ta = 25 °C	—	21.8	—	V	DUTY = 1/200	Ta = 50 °C	—	19.0	—	V	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD-V0	Ta = 0 °C	—	23.6	—	V	$\phi = 10^\circ, \theta = 0^\circ$	Ta = 25 °C	—	21.8	—	V	DUTY = 1/200	Ta = 50 °C	—	19.0	—	V	VDD-V0	Ta = 0 °C	—	24.1	—	V	$\phi = 10^\circ, \theta = 180^\circ$	Ta = 25 °C	—	21.3	—	V	DUTY = 1/200	Ta = 50 °C	—	19.5	—	V
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AUG.10,1998	7	7. OUTLINE DIMENSION : CCFL CONNECTOR : (MADE BY JAE) → (MADE BY MOLEX ) IL-G-4S-S3C2                      03 - 06 -1042																																																								
	9	10. INTERFACE SIGNALS :																																																								

IF2 :

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



IF2 :

INTERFACE	PIN	SIGNAL	FUNCTION
CCFL	1	VCCFL	POWER SUPPLY FOR CCFL DRIVING
	2	NC	NO CONNCETION
	3	VCCFL	POWER SUPPLY FOR CCFL DRIVING
	4	NC	NO CONNCETION

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32E00(CCFL TYPES)

VERSION  
4

NUMBERING SYSTEM

E	G	32	E	0	0	N	C	W	U
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Viewing direction

NIL. : 6 o'clock

U : 12 o'clock

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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 * 200H DOTS
(2) MODULE SIZE	-----	180.0W * 141.5MAX * 14.0MAX mm
(3) EFFECTIVE AREA	-----	128.0W * 110.0H mm
(4) ACTIVE AREA	-----	121.56W * 103.96H mm
(5) DOT SIZE	-----	0.34W * 0.48H mm
(6) DOT PITCH	-----	0.38W * 0.52H mm

- (7) LCD TYPE ----- FSTN, BLACK/WHITE, NEGATIVE,  
TRANSMISSIVE
- (8) DRIVING METHOD ----- 1 / 200 DUTY MULTIPLEX DRIVE
- (9) VIEWING DIRECTION \*
- (10) BACKLIGHT ----- CCFL , COLOR : WHITE

\* PLEASE REFER TO NUMBERING SYSTEM .

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### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	COMMENT
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.

I T E M	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0 °	50 °C	-20 °C	60 °C	NOTE (2), (3)
HUMIDITY	—	85 % RH	—	85 % RH	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)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -20°C : 48HR MAX.  
60°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.

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4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

VSS = 0V

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	- 22.5	V	
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.8VDD	—	VDD	V	
	VIL	L LEVEL	0	—	0.2VDD	V	
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD-VSS = 5.0 V VEE-VSS = - 22.0 V	—	5.3	13.5	mA	
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD-VSS = 5.0 V VEE-VSS = - 22.0 V	—	3.0	8.0	mA	
RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD-V0 $\phi = 10^\circ, \theta = 0^\circ$ DUTY = 1/200	Ta = 0 °C	—	23.6	—	V	
		Ta = 25 °C	—	21.8	—	V	
		Ta = 50 °C	—	19.0	—	V	
	VDD-V0 $\phi = 10^\circ, \theta = 180^\circ$ DUTY = 1/200	Ta = 0 °C	—	—	24.1	—	V
		Ta = 25 °C	—	—	21.3	—	V
		Ta = 50 °C	—	—	19.5	—	V

CLOCK OSCILLATION FREQUENCY		fosc	————	70	75	80	HZ
POWER SUPPLY FOR CCFL	VOLTAGE	VCCFL	———	——	300	——	Vrms
	FREQUENCY	fCCFL	———	——	30K	——	HZ
	CURRENT	IL	———	——	5		mA

NOTE (1) : APPLIED TO TERMINALS FLM , CL1 , CL2 , D0~D3 .

NOTE (2) : THE DISPLAY PATTERN IS ALL “Q” .

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

$\theta = 0^{\circ} = 6 \text{ O'CLOCK}$

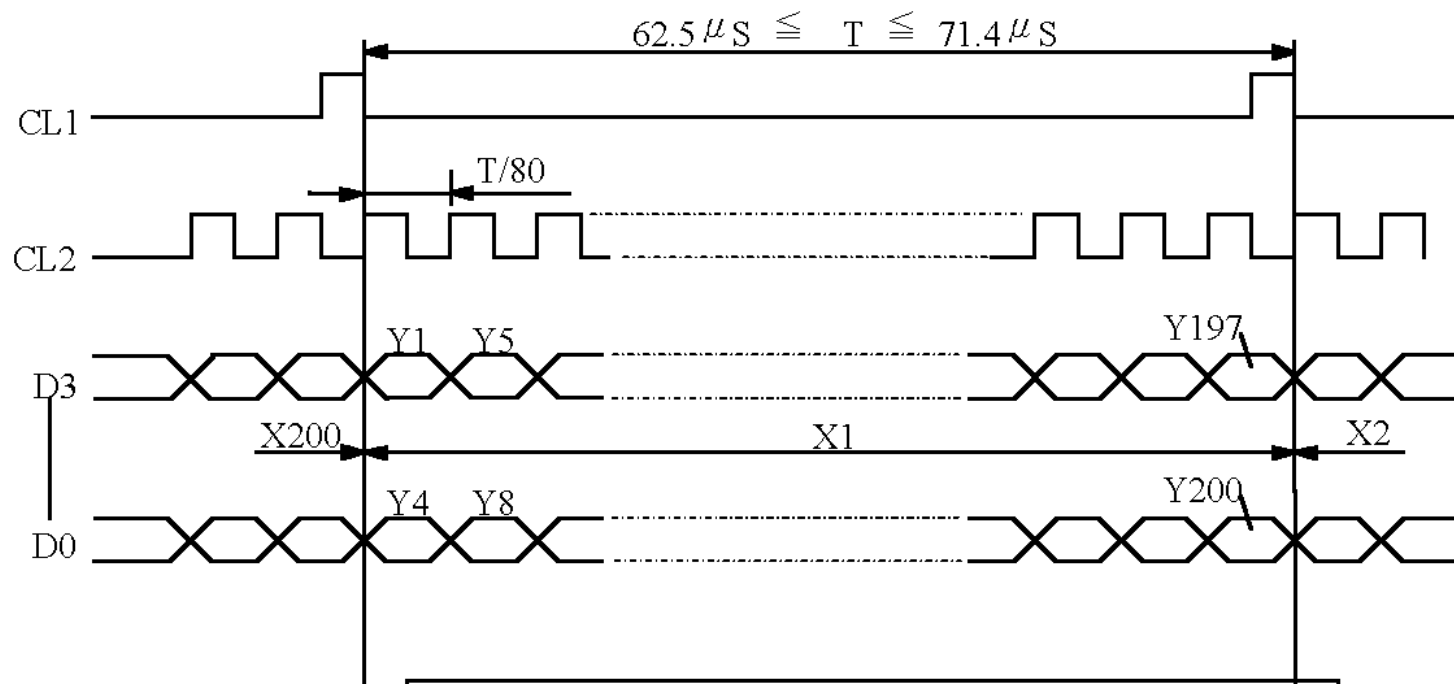
$\theta = 180^{\circ} = 12 \text{ O'CLOCK}$

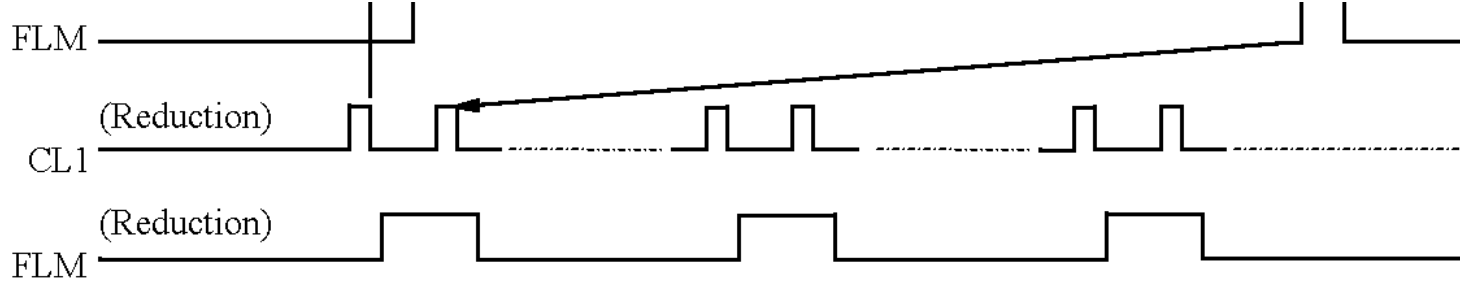
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5. TIMING CHARACTERISTICS  
5.1 INTERFACE TIMING



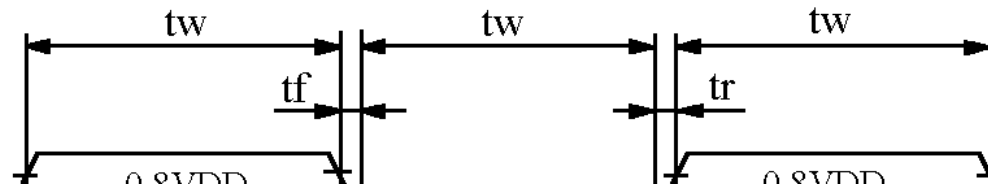


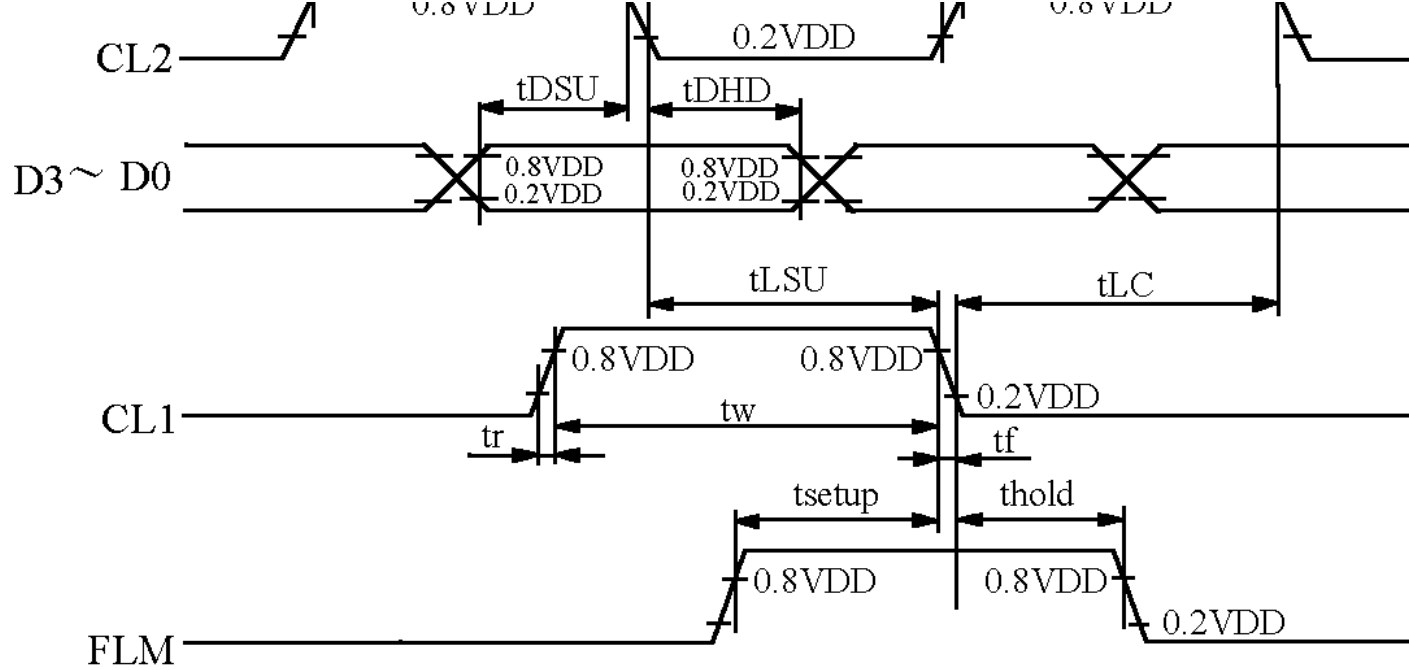
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5.2 SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Frequency of maximum clock	f <sub>cp</sub>	—	—	8	MHZ
CL1, CL2, pulse width	t <sub>w</sub>	45	—	—	nS
Rise, fall time	t <sub>r</sub> , t <sub>f</sub>	—	—	15	nS
Data setup time	t <sub>DSU</sub>	20	—	—	nS
Data hold time	t <sub>DHD</sub>	20	—	—	nS
CL1 setup time	t <sub>LSU</sub>	80	—	—	nS
CL1 → CL2 time	t <sub>LC</sub>	80	—	—	nS
FLM setup time	t <sub>setup</sub>	100	—	—	nS
FLM hold time	t <sub>hold</sub>	100	—	—	nS





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6. OPTICAL CHARACTERISTICS

I T E M	SYMBOL		CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	$\phi 2 - \phi 1$		$K \geq 2.0$	40	—	—	deg.	1
CONTRAST RATIO	K		$\phi = 10^\circ$ $\theta^* = 0^\circ$	—	13	—	—	1
RESPONSE TIME	t r (rise)	0°C	$\phi = 10^\circ$ $\theta^* = 0^\circ$	—	650	1000	ms	1
	t f (fall)	0°C	$\phi = 10^\circ$ $\theta^* = 0^\circ$	—	650	1000	ms	1
	t r (rise)	25°C	$\phi = 10^\circ$ $\theta^* = 0^\circ$	—	350	550	ms	1
	t f (fall)	25°C	$\phi = 10^\circ$ $\theta^* = 0^\circ$	—	150	250	ms	1
AVERAGE BRIGHTNESS OF BACKLIGHT	B	25°C	—	400	600	—	cd/m <sup>2</sup>	2,3,4
RISE TIME OF BACKLIGHT	TC		—	—	5	—	MINUTE	
BRIGHTNESS UNIFORMITY	—		—	—	—	25	%	3, 4

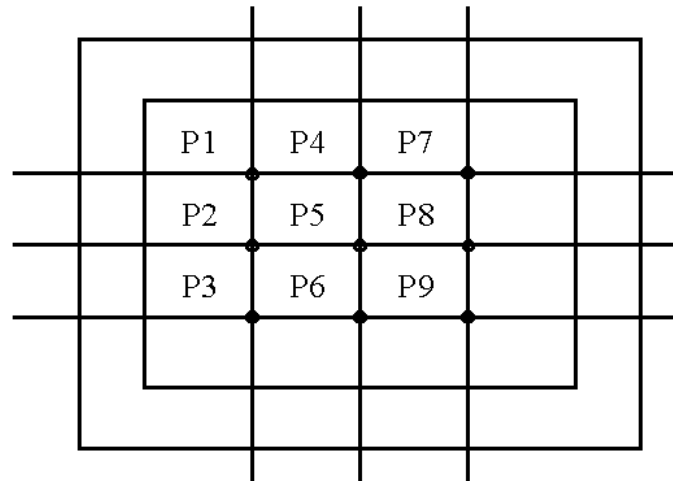
\*  $\theta = 180^\circ$  WHEN VIEWING DIRECTION IS 12 O'CLOCK.

NOTE (1) : PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

NOTE (3) : MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.  
DEFINITION OF THE BRIGHTNESS UNIFORMITY.



NOTE (4) : BRIGHTNESS UNIFORMITY IS DEFINED AS FOLLOWING

$$\sum X = \left[ \frac{(\text{MAXIMUM BRIGHTNESS OR MINIMUM BRIGHTNESS}) - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right] \times 100\%$$

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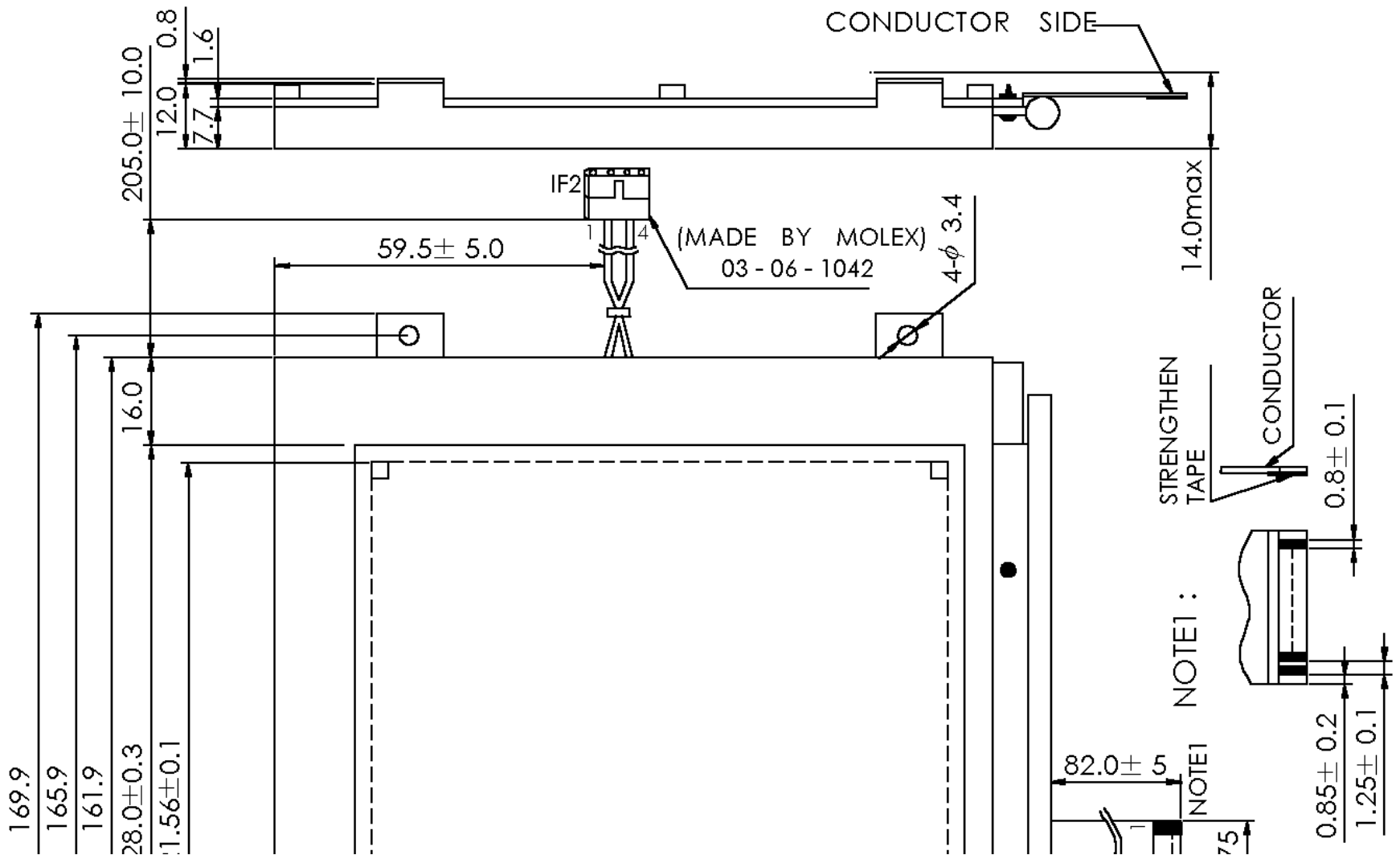
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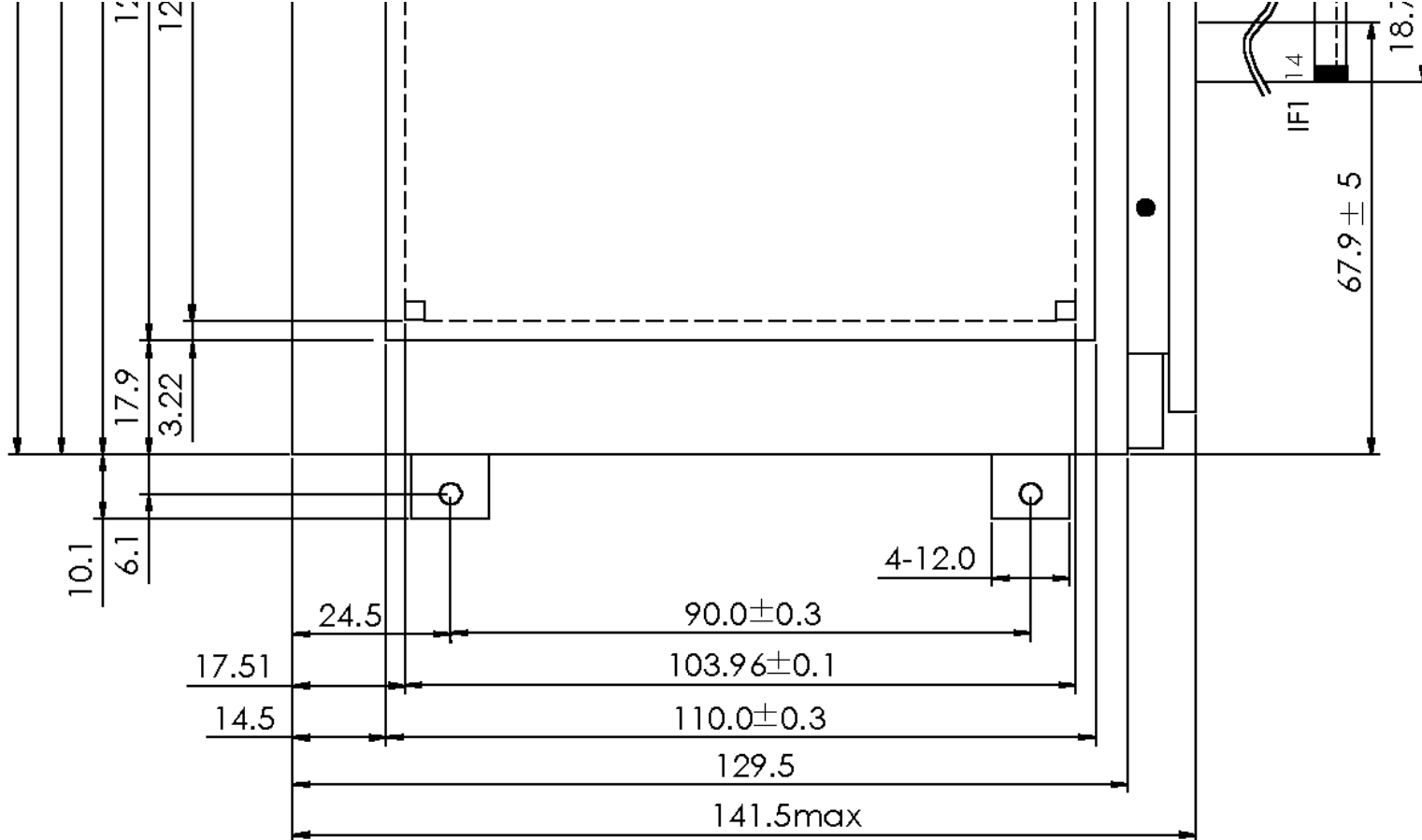
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7. OUTLINE DIMENSION





UNIT : mm

SCALE : NTS

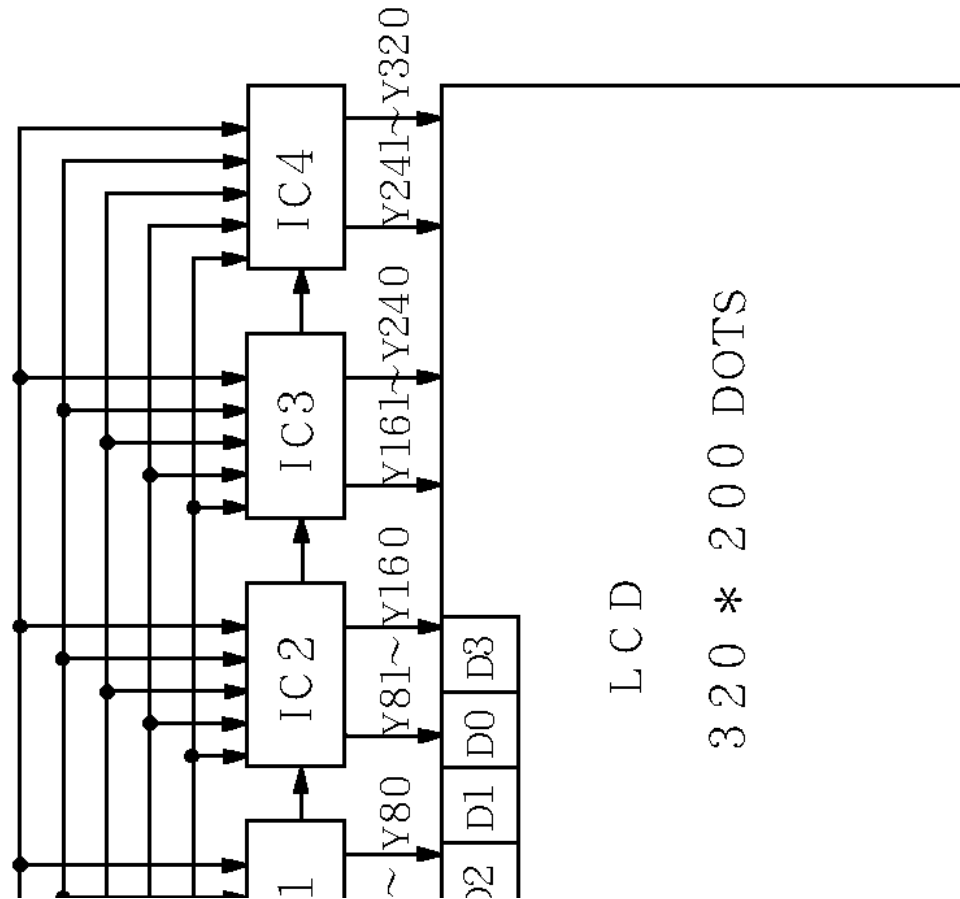
NOT SPECIFIED TOLERANCE IS  $\pm 0.5\text{mm}$

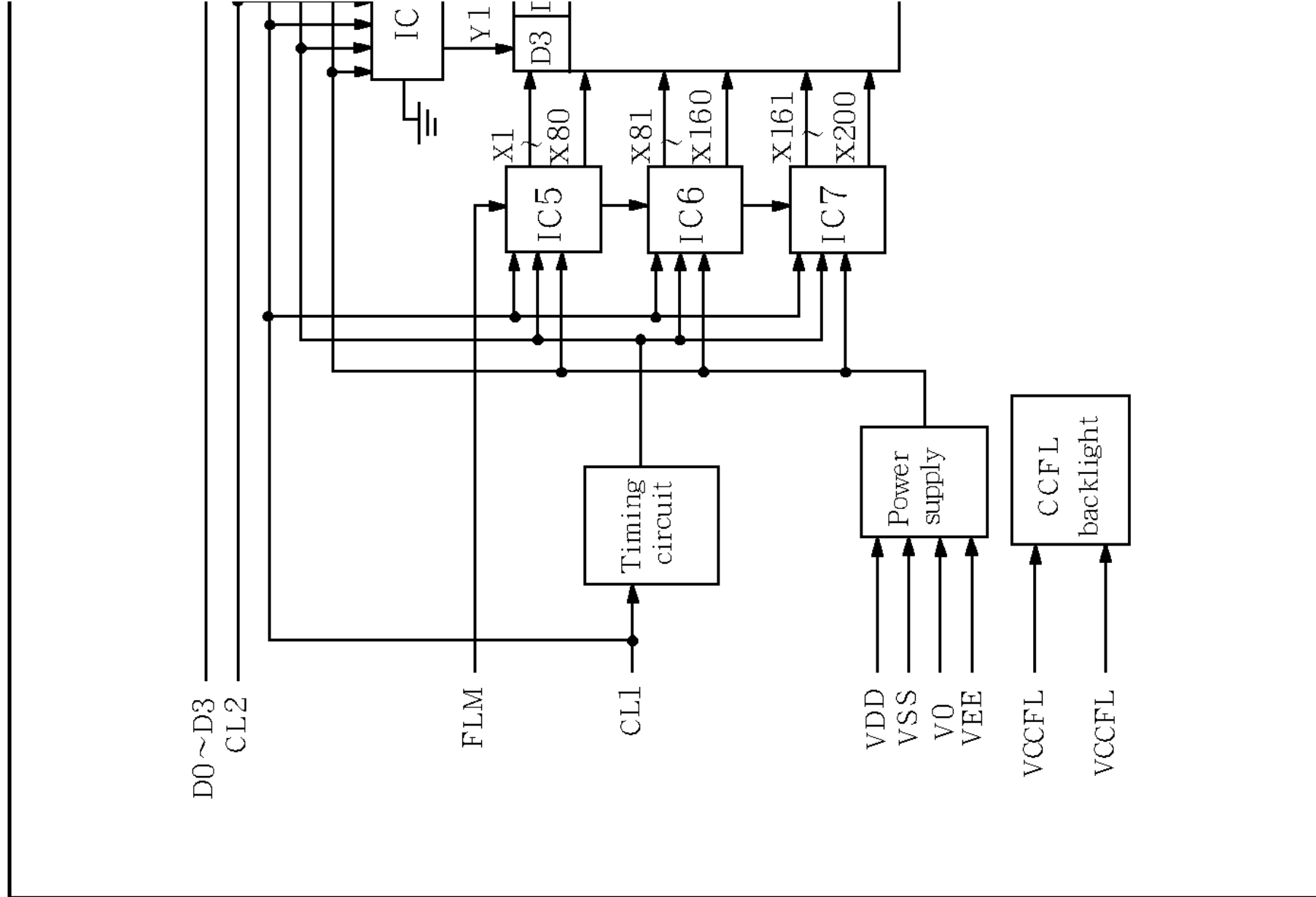
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8. BLOCK DIAGRAM





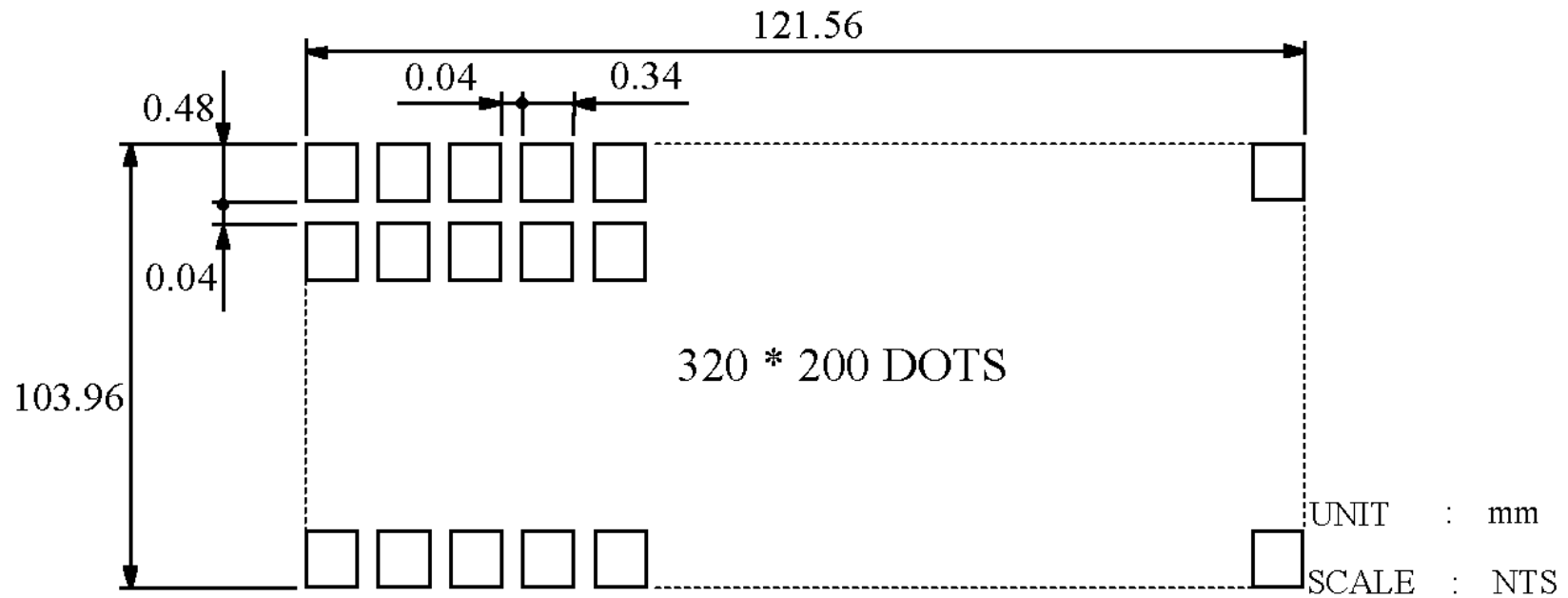
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9. DETAIL DRAWING OF DOT MATRIX



10. INTERFACE SIGNALS

IF1 :

PIN NO	SYMBOL	LEVEL	FUNCTION
1	VDD	—	POWER SUPPLY FOR LOGIC
2	VSS	—	GROUND
3	VDD	—	POWER SUPPLY FOR LCD DRIVE

3	VEE	—	POWER SUPPLY FOR LCD DRIVE
4	VO	—	OPERATING VOLTAGE FOR LCD DRIVE
5	NC	—	NOT USE
6	CL1	H → L	DISPLAY DATA LATCH
7	NC	—	NOT USE
8	NC	—	NOT USE
9	FLM	H / L	SCAN START PULSE INPUT
10	CL2	H / L	DISPLAY DATA SHIFT CLOCK INPUT
11	D0	H / L	DISPLAY DATA
12	D1	H / L	
13	D2	H / L	
14	D3	H / L	

**IF2 :**

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

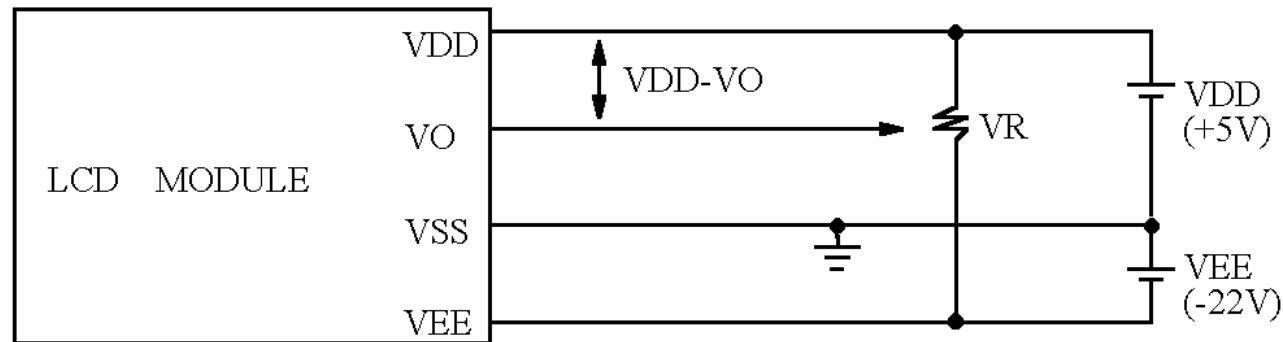
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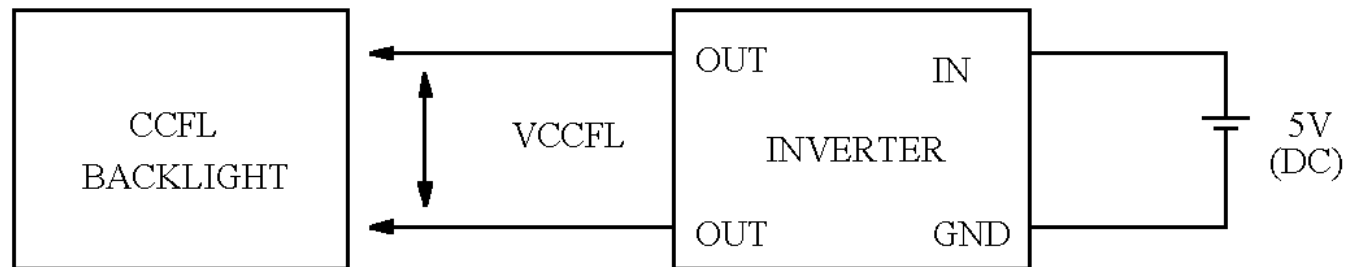
## 1.1. POWER SUPPLY

### 1.1.1 POWER SUPPLY FOR LCM



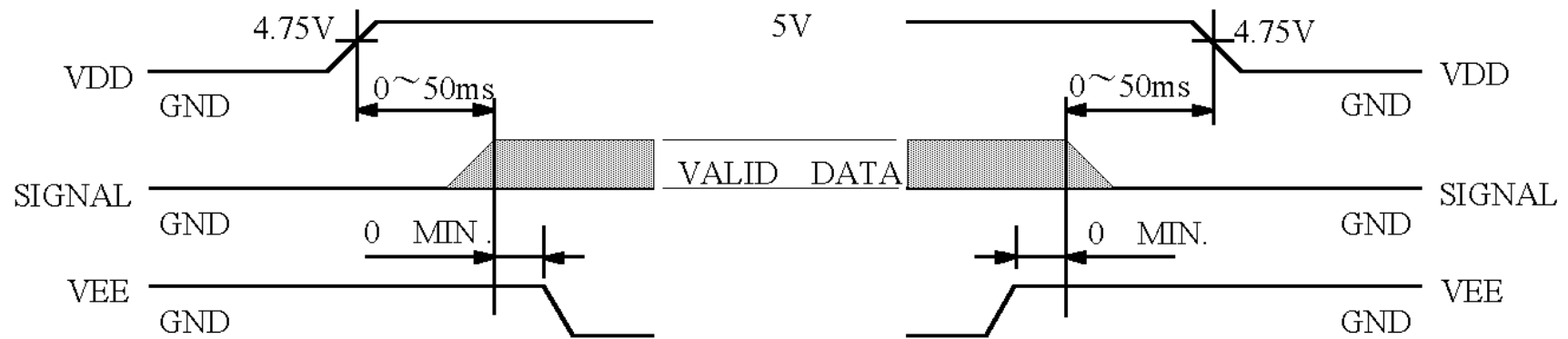
VDD-VO : LCD DRIVING VOLTAGE  
VR : 20K $\Omega$

### 1.1.2 POWER SUPPLY FOR CCFL BACK - LIGHT



RECOMMENDED INVERTER : IA-EM02A

### 1.1.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL



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