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CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

32F12(WHITE LED TYPES)

(RoHS)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

EMERGING DISPLAY
TECHNOLOGIES CORPORATION

MODEL NO . 32F12(WHITE LED TYPES) (RoHS)	VERSION 1	PAGE 0-1
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RECORDS OF REVISION	DOC . FIRST ISSUE JAN.17,2006
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DATE	REVISED PAGE NO.	SUMMARY

NUMBERING SYSTEM

Polarizer Mode	Backlight	Code value
Transflective	LED	L
Transmissive	LED	M

Backlight Color	Code Value
White	W

E	W	3	2	F	1	2	B	M	W	R
---	---	---	---	---	---	---	---	---	---	---

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

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

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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU - 002B

1.2 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

1.3 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(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 ----- LED , 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	6.0	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)
POWER SUPPLY FOR LED	VLED – VLSS	—	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	- 2 0 °C	7 0 °C	- 3 0 °C	8 0 °C	NOTE (1) ,(3)
HUMIDITY	NOTE (2)		NOTE (2)		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 (5 0 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 , 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 = 5.0 V

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	4.75	5.0	5.25	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	—	70	85	mA
RECOMMENDED LCD DRIVING VOLTAGE	VDD - VO ** DUTY =1/240	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
FLM FREQUENCY	f FLM	—	70	75	80	Hz
LED FORWARD VOLTAGE	VLED - VLSS	—	—	5.0	—	V
LED FORWARD CURRENT	IF	VLED-VLSS=5.0V	—	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

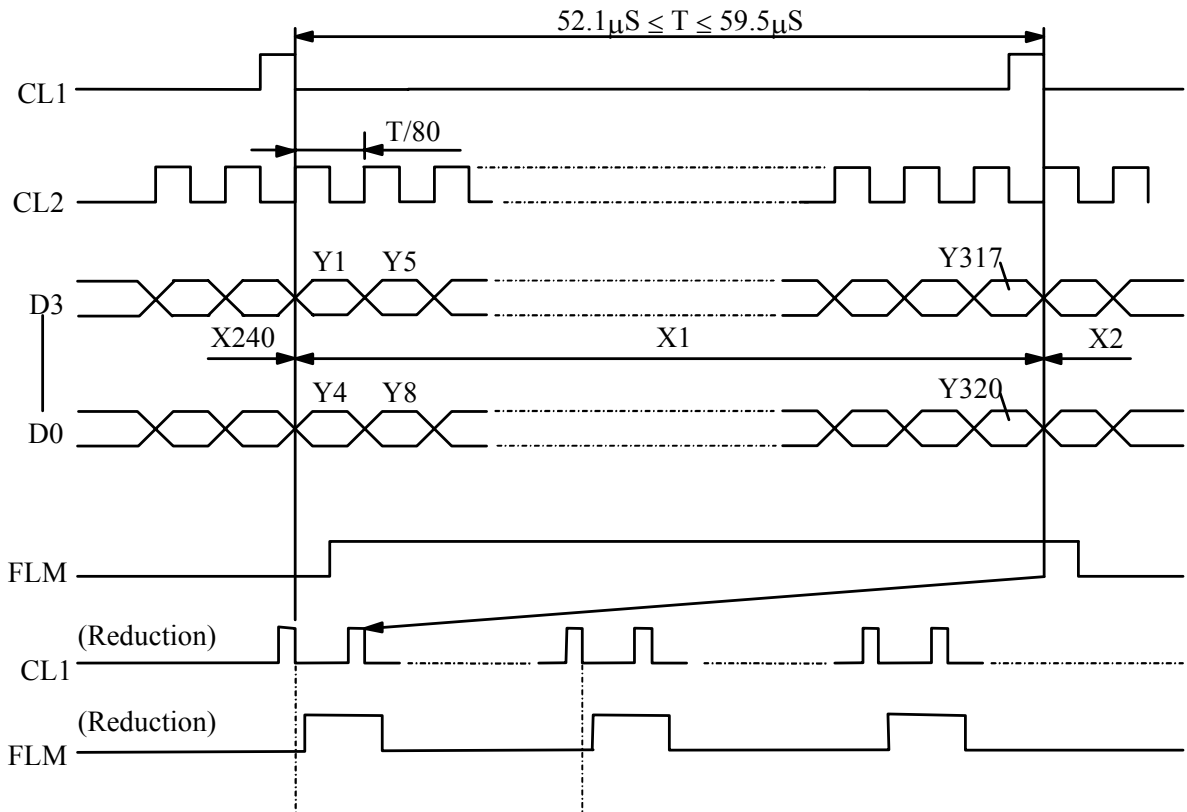
NOTE (1): APPLIED TO TERMINALS FLM, CL1, CL2, D0-D3, DISPOFF.

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

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

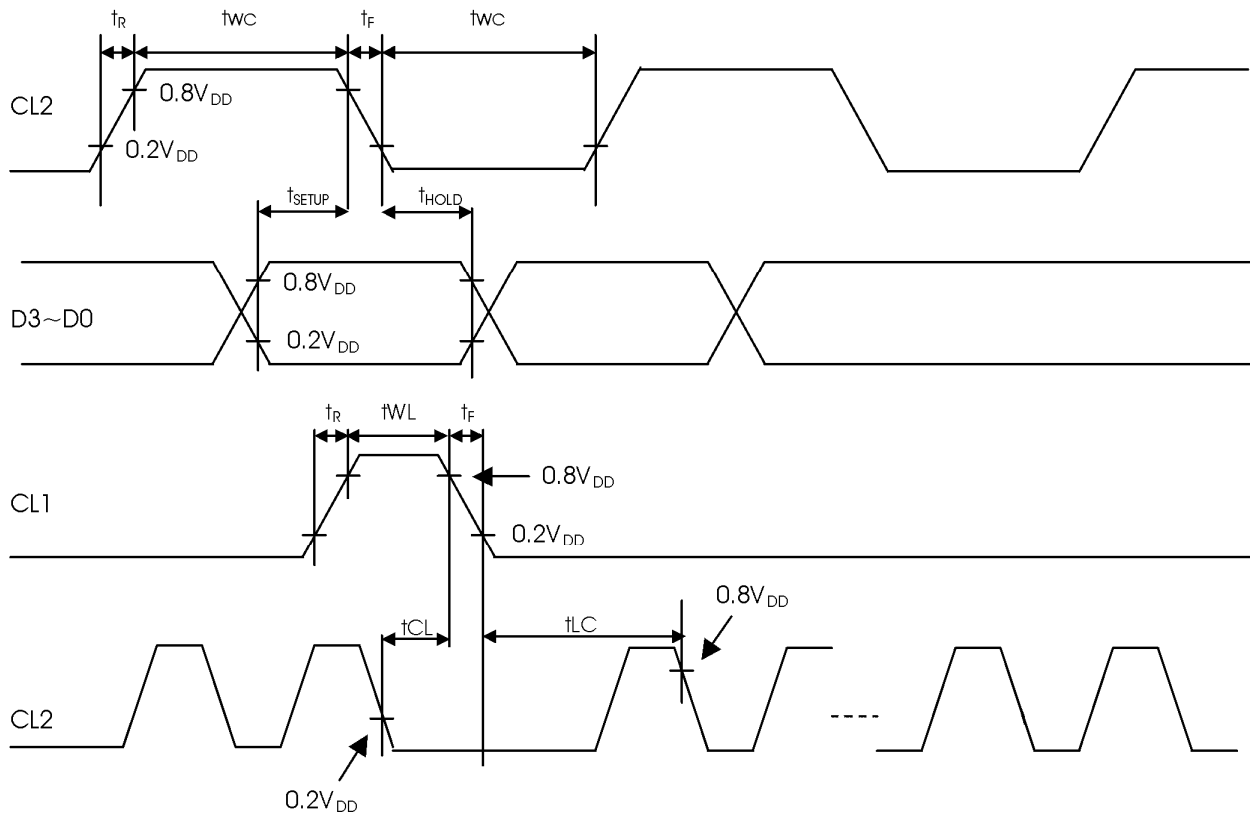
NOTE (4): THE DISPLAY PATTERN IS ALL "BAR" (ONLY Ta=-20°C)

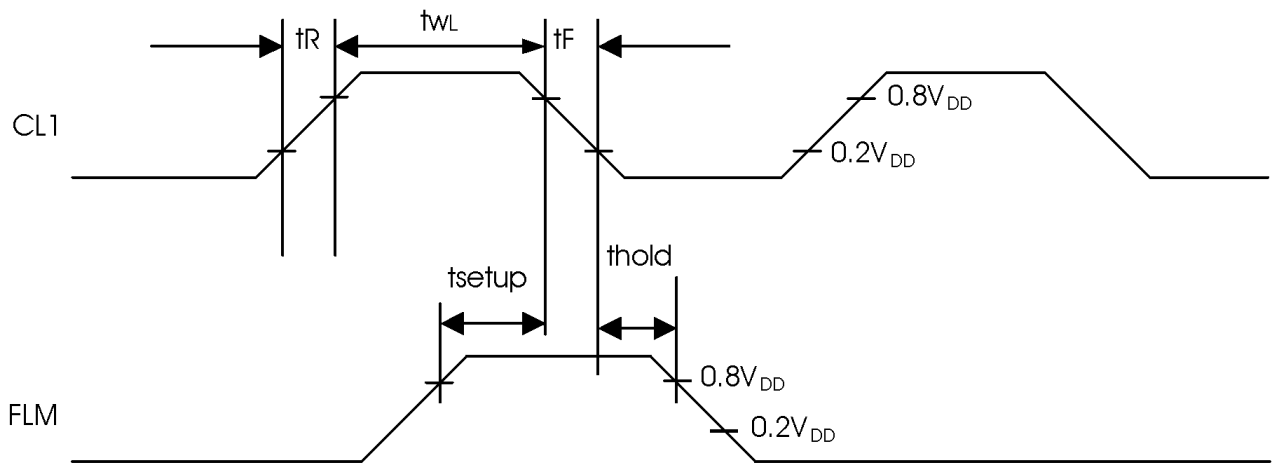
5. TIMING CHARACTERISTICS
5.1 INTERFACE TIMING



5.2 SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
CL1	f_{cp1}	—	—	1.0	MHz
CL2	f_{cp2}	—	—	6.0	MHz
CL1 pulse width	t_{WL}	63	—	—	ns
CL2 pulse width	t_{WC}	50	—	—	ns
CL1 and CL2 rise time	t_R	—	—	*	ns
CL1 and CL2 fall time	t_F	—	—	*	ns
Data setup time	t_{SETUP}	30	—	—	ns
Data hold time	t_{HOLD}	30	—	—	ns
CL2→CL1	t_{CL}	80	—	—	ns
CL1→CL2	t_{LC}	110	—	—	ns
Setup time	t_{setup}	100	—	—	ns
Hold time	t_{hold}	100	—	—	ns





* THE CL1 AND CL2 RISE TIME(t_R) AND THE CL1 AND CL2 FALL TIME(t_F) MUST SATISFY EQUATIONS (1) AND (2) BELOW AT THE SAME TIME

$$(1) t_R, t_F < \frac{1}{2f_{cp2}} - t_{wc}$$

$$(2) t_R, t_F < 50ns$$

6. OPTICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	
VIEWING ANGLE		θ_{y+}	K *	$\theta_{x=0^{\circ}}$	(35)	(40)	—	deg.	1
		θ_{y-}			(35)	(40)	—		
		θ_{x+}	K *	$\theta_{y=0^{\circ}}$	(30)	(35)	—		
		θ_{x-}			(40)	(45)	—		
CONTRAST RATIO	STN	K	**	1.5	3	—	—	1	
	FSTN			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 ²	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.

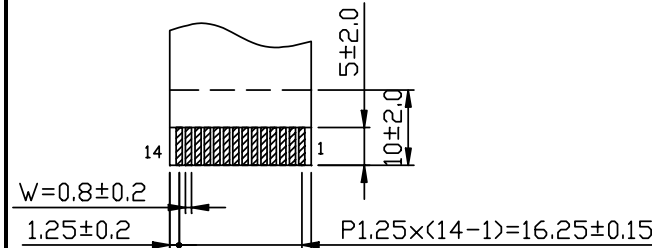
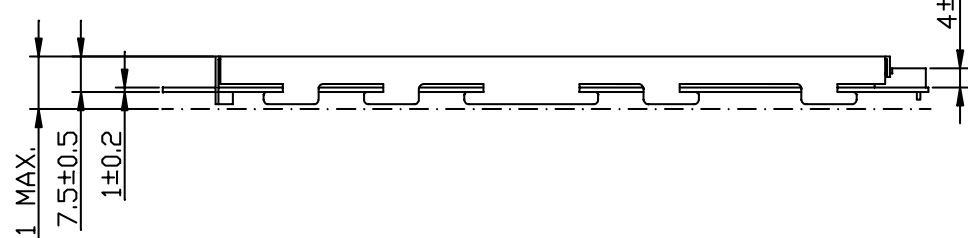
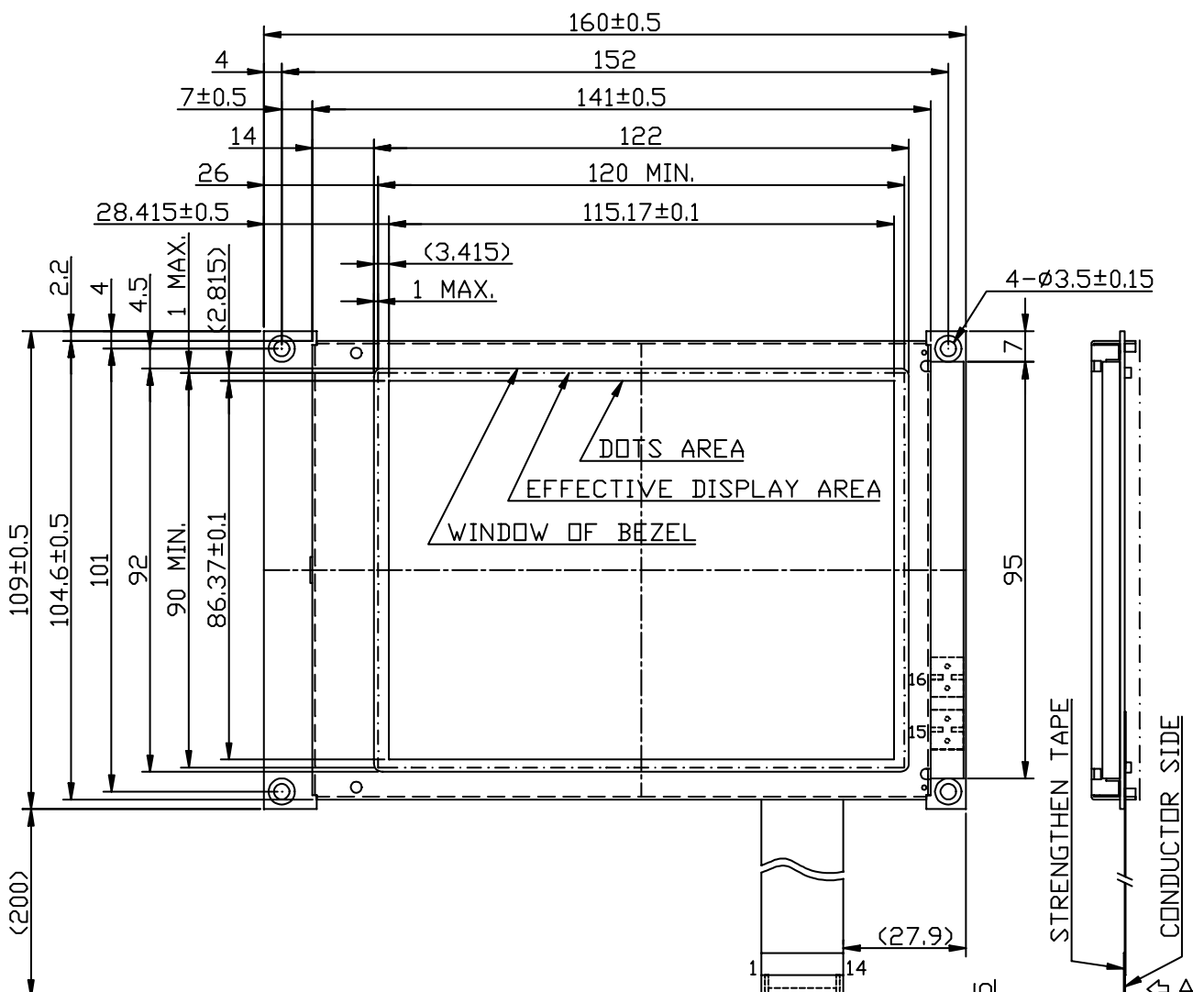
NOTE (1) : PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002B)

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

NOTE (3) : POLARIZER MODE : TRANSFLECTIVE

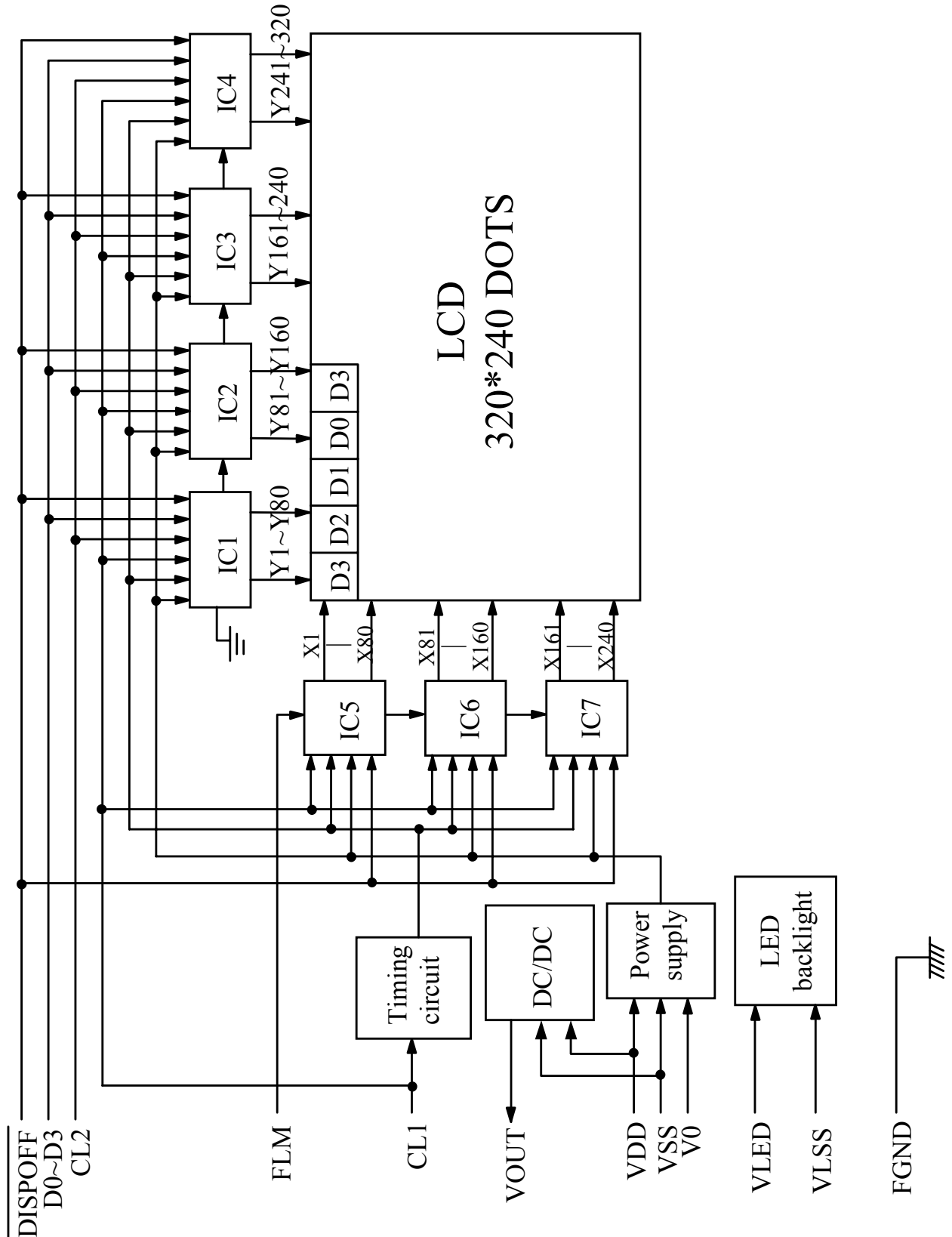
7. OUTLINE DIMENSIONS



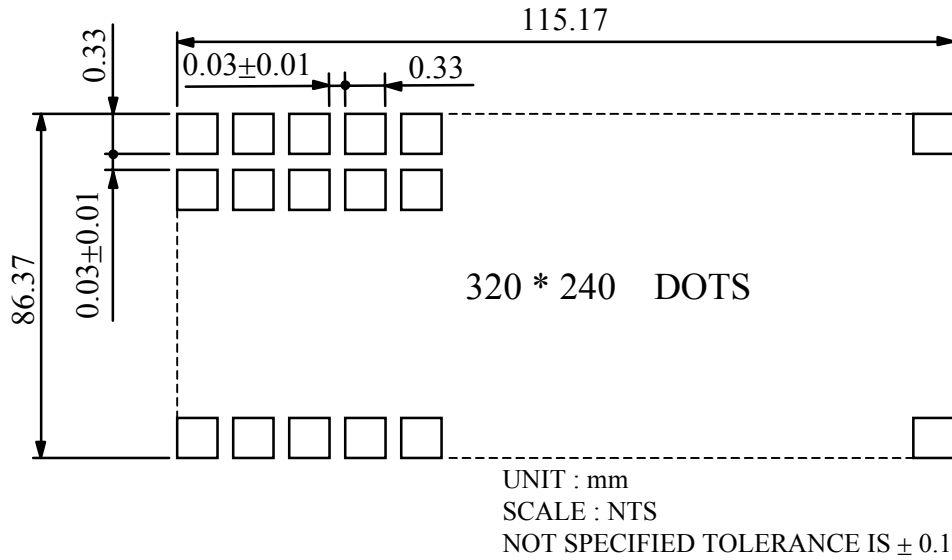
VIEW "A"

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

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX

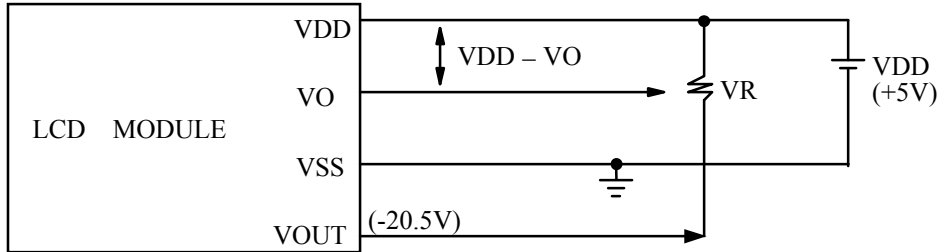


10. INTERFACE SIGNALS

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	VOUT	—	POWER SUPPLY FOR LCD DRIVING (OUTPUT)
13	VO	—	OPERATING VOLTAGE FOR LCD DRIVING
14	FGND	—	FRONT PANEL GROUND
15	VLED	—	POWER SUPPLY FOR LED BACKLIGHT (A)
16	VLSS	—	POWER SUPPLY FOR LED BACKLIGHT (K)

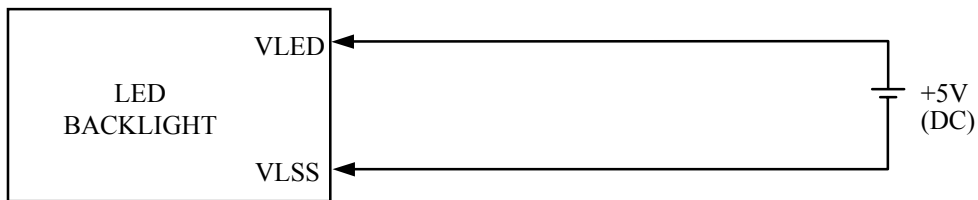
1.1. POWER SUPPLY

1.1.1 POWER SUPPLY FOR LCM



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

1.1.2 POWER SUPPLY FOR LED BACK - LIGHT



1.1.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

