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CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

32F62(LED TYPES)

FOR MESSRS :

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CUSTOMER'S APPROVAL

DATE :

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BY :

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EMERGING DISPLAY  
TECHNOLOGIES CORPORATION

MODEL NO . 32F62(LED TYPES)	VERSION 1
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RECORDS OF REVISION	DOC . FIRST ISSUE AUG.29,2002
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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 6 2 B M W R

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

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

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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    | ----- | 160W * 109.0H * 13.0D(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) BACKLIGHT      | ----- | LED , 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	
POWER SUPPLY FOR LCD DRIVING	VDD – VEE	0	27.0	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	-10 °C	60 °C	-20 °C	70 °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 .  
70 °C : 168HR MAX .

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

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

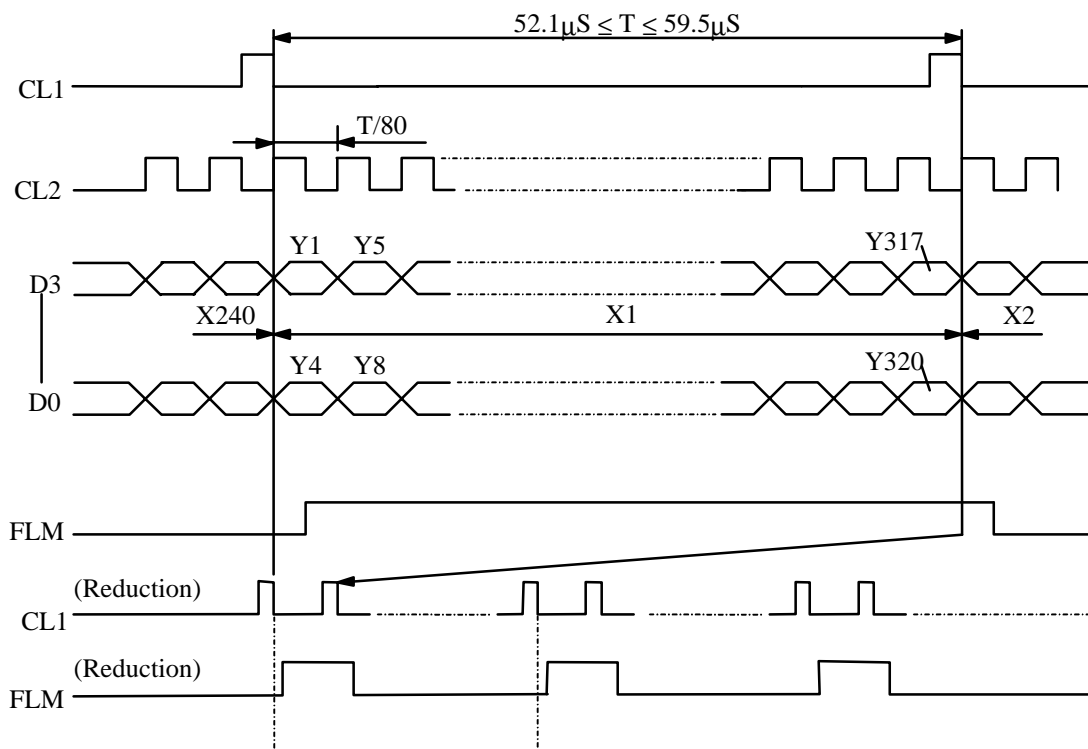
VDD = 5.0 V

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	—	3	—	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VO = 23.0 V	—	2.8	—	mA
RECOMMENDED LCD DRIVING VOLTAGE	VDD - VO ∅ = 10°, θ = 0° DUTY = 1/240	Ta = -10 °C	24.4	25.4	26.4	V
		Ta = 25 °C	22	23	24	V
		Ta = 60 °C	19.2	20.2	21.2	V
CLOCK OSCILLATION FREQUENCY	f FLM	—	70	75	80	Hz
LED FORWARD VOLTAGE	VLED - VLSS	—	—	5.0	—	V
LED FORWARD VOLTAGE	IF	VLED-VLSS=5.0V	—	140	—	mA

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

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

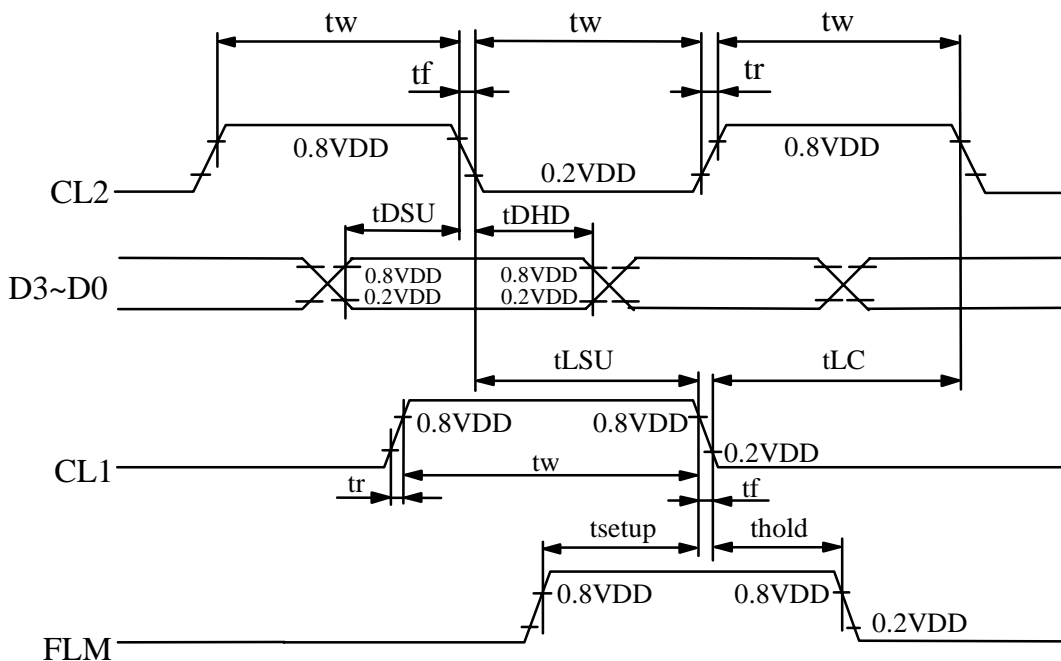
5. TIMING CHARACTERISTICS  
5.1 INTERFACE TIMING





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



6. OPTICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

I T E M	SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE	
VIEWING AREA	Ø2 - Ø1	K ≥ 2.0	—	50	—	deg.	1	
CONTRAST RATIO	K	Ø = 10° θ = 0°	—	20	—	—	1	
RESPONSE TIME	tr ( rise )	Ø=10° θ = **	Ta = -10 °C	—	2149	—	ms	1
			Ta = 25 °C	—	310	—		
			Ta = 60 °C	—	124	—		
	tf ( fall )		Ta = -10 °C	—	1709	—		
			Ta = 25 °C	—	158	—		
			Ta = 60 °C	—	96	—		
BRIGHTNESS OF BACKLIGHT	B	VLED - VLSS = 5.0 V	18	20	22	cd / m <sup>2</sup>	1, 2	
			16	18	20		1, 3	
CHROMATICITY COORDINATES	X	IF = 140 mA	0.267	0.322	0.337	—	—	
	Y		0.324	0.339	0.354			

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

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

NOTE (1) : PLEASE REFER TO :

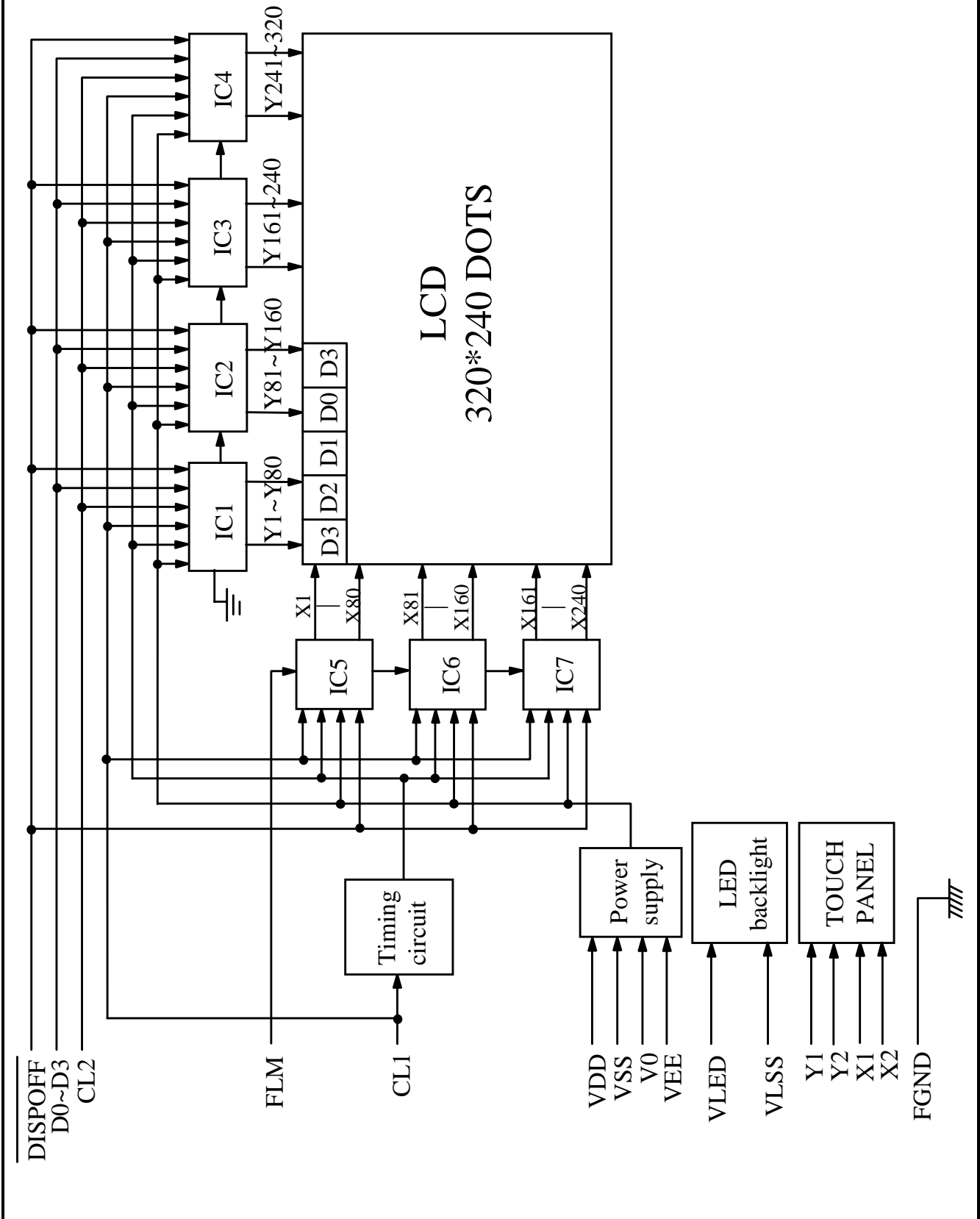
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002A)

NOTE (2) : POLARIZER MODE : TRANSMISSIVE

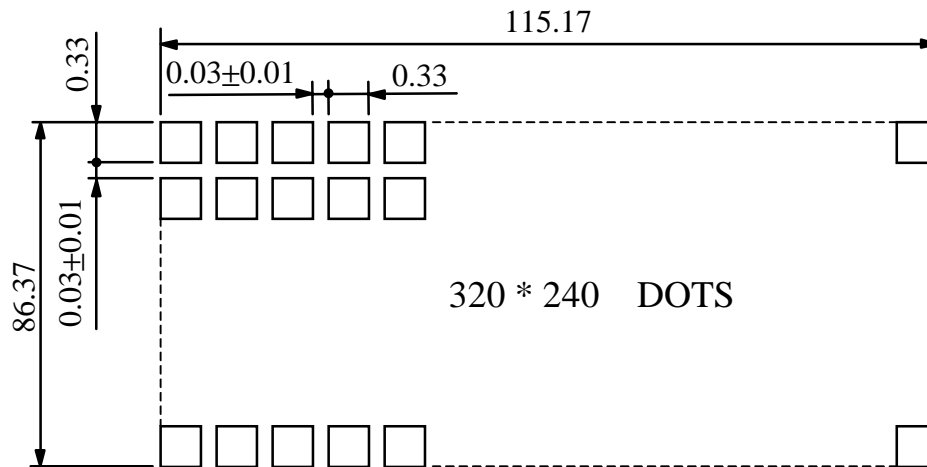
NOTE (3) : POLARIZER MODE : TRANSFLECTIVE



8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS  $\pm 0.1$

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 $\rightarrow$ L	DISPLAY DATA LATCH
9	CL2	H $\rightarrow$ 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
15	VLED	—	POWER SUPPLY FOR LED BACKLIGHT ( A )
16	VLSS	—	POWER SUPPLY FOR LED BACKLIGHT ( K )

IF2 :

PIN NO	SYMBOL	FUNCTION
1	X2	RIGHT OF PANE
2	X1	LEFT OF PANE
3	Y2	BOTTOM OF PANE
4	Y1	TOP OF PANE

## 1 1 . SPECIFICATIONS FOR TOUCH PANEL

### 1 1 . 1 INPUT METHOD AND ACTIVATION FORCE

INPUT METHOD	AVERAGE ACTIVATION FORCE
STYLUS	> 30 GRAMS
FINGER	> 80 GRAMS

### 1 1 . 2 TYPICAL OPTICAL CHARACTERISTICS

1 1 . 2 . 1 VISIBLE LIGHT TRANSMISSION : > 80 % @ 550 nm

1 1 . 2 . 2 HAZE : 5 %  $\pm$  2 % THROUGH HARD COATED PET ONLY

### 1 1 . 3 ELECTRICAL SPECIFICATIONS

1 1 . 3 . 1 OPERATING VOLTAGE : 5.5 V OR LESS

1 1 . 3 . 2 CONTACT CURRENT : 20 mA ( maximum )

1 1 . 3 . 3 CIRCUIT CLOSE RESISTANCE : X :  $650 \pm 200 \Omega$   
Y :  $500 \pm 200 \Omega$

1 1 . 3 . 4 CIRCUIT OPEN RESISTANCE : >  $20M\Omega$  at 25VDC

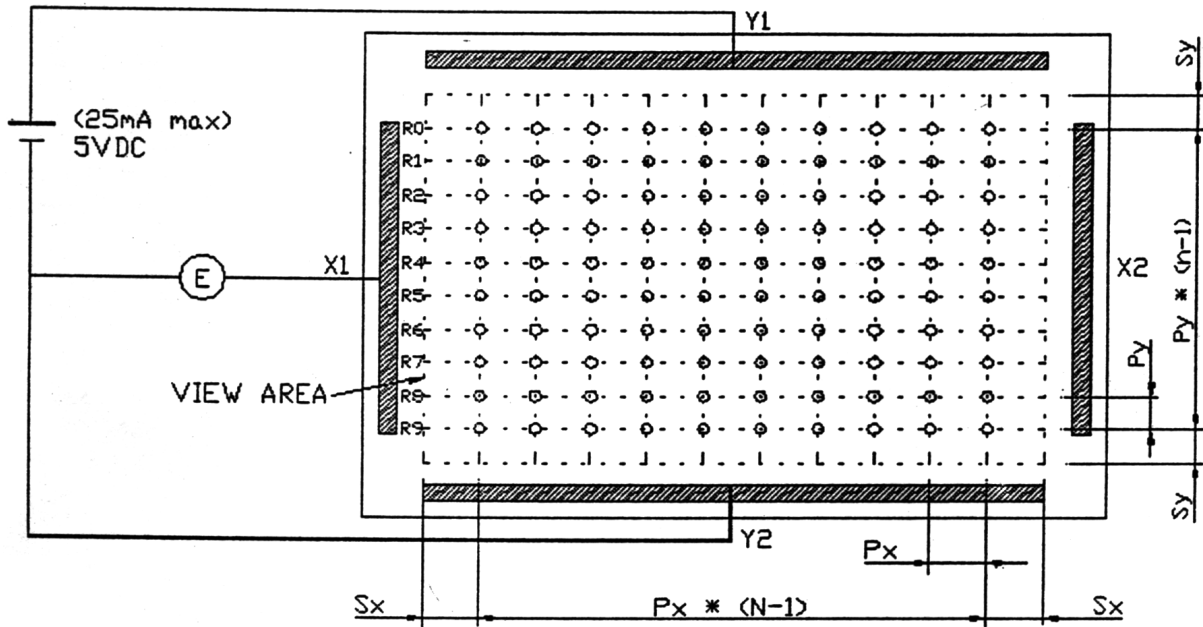
1 1 . 3 . 5 CONTACT BOUNCE : < 15 ms

1 0 . 3 . 6 LINEAR TEST :  $\pm$  1.5 % or LESS

### 1 1 . 4 LINEARITY

1 1 . 4 . 1 LINEAR TEST SPECIFICATION  
DIRECTION X :  $\pm$  1.5 % or LESS  
DIRECTION X :  $\pm$  1.5 % or LESS

1 1 . 4 . 2 LINE TEST CIRCUIT FOR Y COORDINATE  
ADD 5V BETWEEN Y1 AND Y2 TOUCH THE POINT C0R0 TO C9R9  
SEPARATELY , AND MEASURE THE VOLTAGE FROM X1 AS THE  
FOLLOWING DRAWING .



**11.4.3 Calculate Linearity : For the First Row  $\phi$**

$$R\phi_{avg} = ( VC\phi + VC1 + VC2 + \dots + VC9 ) \div 10$$

$R\phi_{max}$  = The maximum voltage in Row  $\phi$

$R\phi_{min}$  = The minimum voltage in Row  $\phi$

$$R\phi_{linear1} = | R\phi_{max} - R\phi_{avg} | \div R\phi_{avg} * 100\%$$

$$R\phi_{linear2} = | R\phi_{min} - R\phi_{avg} | \div R\phi_{avg} * 100\%$$

$$R\phi_{linear} = \max (R\phi_{linear1}, R\phi_{linear2})$$

**11.4.4 For Y Coordinate Test**

Add 5 voltage between X1 and X2 touch the point  $C\phi R\phi$  to  $C9R9$  separately and measure the voltage from Y1 as the above drawing

**11.4.5 Calculate Linearity : For the First Column $\phi$**

$$C\phi_{avg} = ( VR\phi + \bar{VR}1 + VR2 + \dots + VR9 ) \div 10$$

$C\phi_{max}$  = The maximum voltage in Column  $\phi$

$C\phi_{min}$  = The minimum voltage in Column  $\phi$

$$C\phi_{linear1} = | C\phi_{max} - C\phi_{avg.} | \div C\phi_{avg.} * 100\%$$

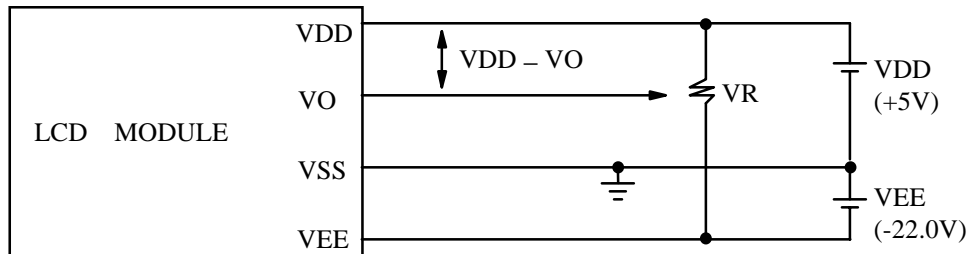
$$C\phi_{linear2} = | C\phi_{min} - C\phi_{avg.} | \div C\phi_{avg.} * 100\%$$

$$C\phi_{linear} = \max ( C\phi_{linear1} , C\phi_{linear2} )$$



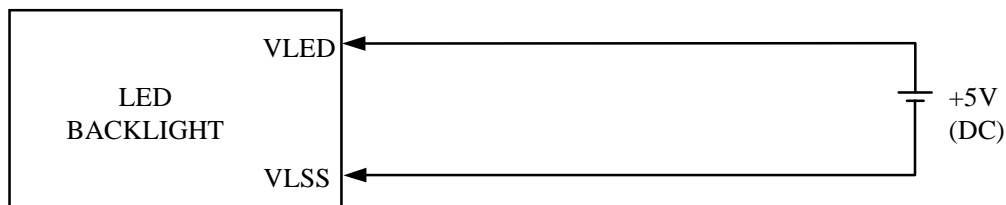
1 2 . POWER SUPPLY

1 2 . 1 POWER SUPPLY FOR LCM



VDD - VO : LCD DRIVING VOLTAGE  
VR : 20KΩ

1 2 . 2 POWER SUPPLY FOR LED BACK - LIGHT



1 2 . 3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

