

EXAMINED BY :  <i>[Signature]</i>	EMERGING DISPLAY  TECHNOLOGIES CORPORATION	FILE NO . CAS-10294
APPROVED BY:  <i>[Signature]</i>		ISSUE : OCT.27,2003
		TOTAL PAGE : 12
		VERSION : 5

CUSTOMER                      ACCEPTANCE                      SPECIFICATIONS

MODEL NO. :

13BA0(REFLECTIVE TYPES)

FOR MESSRS :

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CUSTOMER'S APPROVAL

DATE :

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BY :

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RECORDS OF REVISION	DOC . FIRST ISSUE	AUG.27,2002
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Polarizer Mode	Backlight	Code value
Reflective	—	R

E S 1 3 B A 0 G R

LCD type + LCD color	Code Value
STN + Yellow-Green	Y
STN + Gray	G
FSTN + White	F

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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 APPLICATION NOTES FOR CONTROLLER/DRIVER  
PLEASE REFER TO :

PLEASE REFER TO : LCD DRIVE / S6B1713

2. MECHANICAL SPECIFICATIONS

- |                       |       |                                |
|-----------------------|-------|--------------------------------|
| (1) NUMBER OF DOTS    | ----- | 128W * 64H DOTS                |
| (2) MODULE SIZE       | ----- | 61.8W * 42.7H * 2.1D (max.) mm |
| (3) VIEWING AREA      | ----- | 57W * 30H mm                   |
| (4) ACTIVE AREA       | ----- | 53.75W * 26.87H mm             |
| (5) DOT SIZE          | ----- | 0.41W * 0.41H mm               |
| (6) DOT PITCH         | ----- | 0.42W * 0.42H mm               |
| (7) LCD TYPE *        |       |                                |
| (8) DRIVING METHOD    | ----- | 1 / 65 DUTY MULTIPLEX DRIVE    |
| (9) VIEWING DIRECTION | ----- | 6 O'CLOCK                      |

\* PLEASE REFER TO NUMBERING SYSTEM .

### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS . ( AT Ta = 25 °C )

PARAMETER	SYMBOL	MIN .	MAX .	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD – VSS	- 0.3	+ 7	V	
POWER SUPPLY FOR LCD DRIVE	VO – VSS	+ 0.3	15	V	
INPUT VOLTAGE	VI	- 0.3	VDD + 0.3	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		REMARK
	MIN .	MAX .	MIN .	MAX .	
AMBIENT TEMPERATURE	- 20 °C	70 °C	- 30 °C	80 °C	NOTE (2), (3)
HUMIDITY	—	95 % RH	—	95 % RH	WITHOUT CONDENSATION
VIBRATION	—	4.9 m/S <sup>2</sup> (0.5 G)	—	19.6 m/S <sup>2</sup> (2.0 G)	
SHOCK	—	29.4 m/S <sup>2</sup> (3 G)	—	490.0 m/S <sup>2</sup> (50 G)	XYZ DIRECTIONS
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -30 °C : 48HR MAX .  
80 °C : 168HR MAX .

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

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC ( 1 )	VDD – VSS	—	4.0	—	5.0	V
			3.0	—	3.7	
BOOSTER OUTPUT VOLTAGE	VO – VSS	—	10.4	10.9	11.4	V
INPUT VOLTAGE NOTE ( 2 )	VIH	H LEVEL	0.8VDD	—	VDD	V
	VIL	L LEVEL	VSS	—	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE ( 3 )	IDD	VDD-VSS =5V	—	1.0	2.0	mA
OSCILLATOR FREQUENCY	fosc	INTERNAL	17	22	27	KHz
	fCL	EXTERNAL	4.25	5.5	6.75	KHz

NOTE ( 1 ) : REFER TO SECTION 11. POWER SUPPLY.

NOTE ( 2 ) : APPLIED TO TERMINALS  $\overline{RES}$ ,  $\overline{CS1B}$ , DB0~DB7,  $\overline{(RD)}$ ,  $\overline{(WR)}$ , RS.

NOTE ( 3 ) : THIS DISPLAY PATTERN IS ALL ON OR OFF.



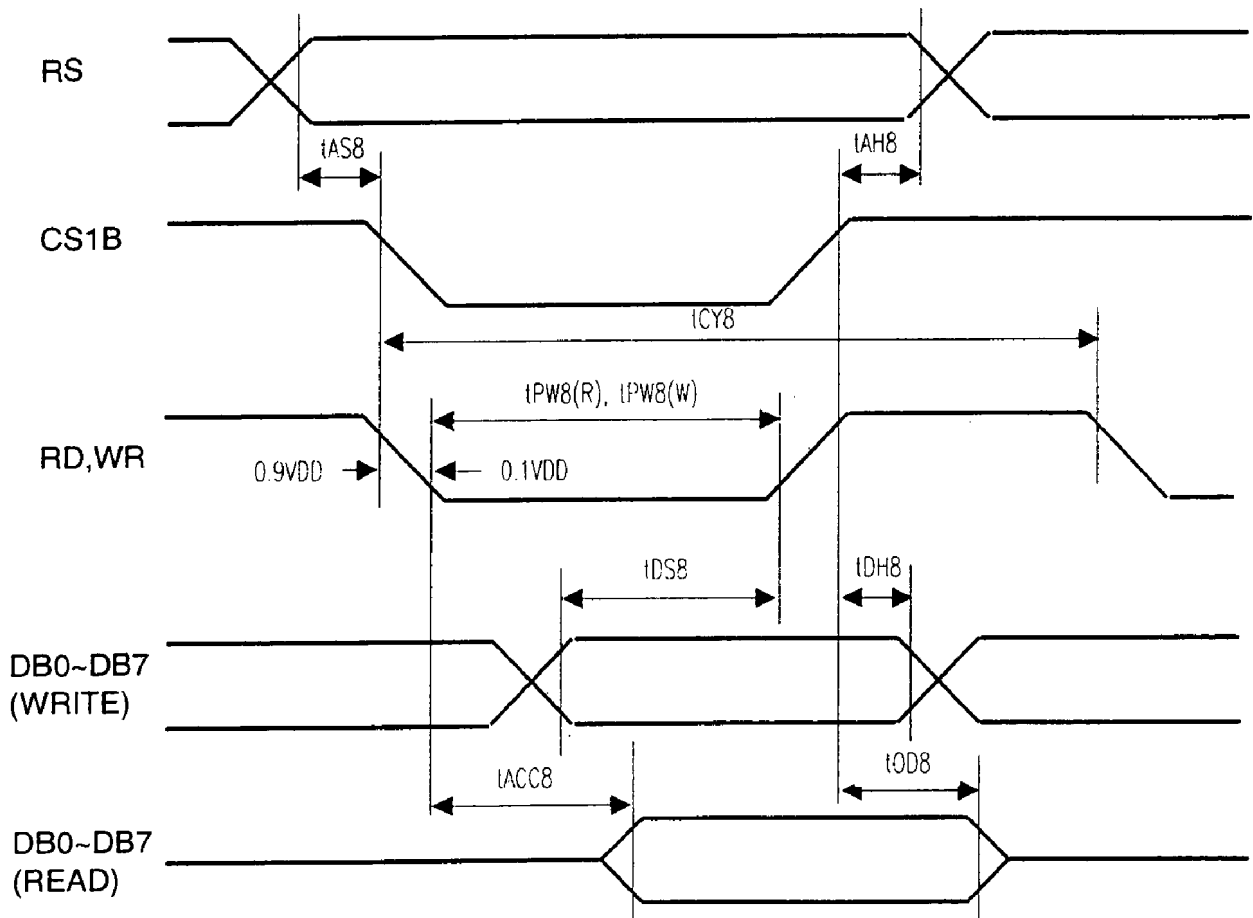
5. TIMING CHARACTERISTICS

5.1 READ/WRITE TIMING CHARACTERISTICS

CONDITION : VDD = 5.0 V

Parameter	Signal	Symbol	Rating		Unit
			Min.	Max.	
Address setup time	RS	Tas8	10	—	ns
Address hold time		tAH8	10	—	ns
System cycle time	RS	tCY8	150	—	ns
Pulse width (WR)	$\overline{WR}$	tPW8(W)	25	—	ns
Pulse width (RD)	$\overline{RD}$	tPW8(R)	65	—	ns
Data setup time	DB0~DB7	tDS8	18	—	ns
Data hold time		tDH8	10	—	ns
/RD access time (CL = 100pF)		tACC8	—	65	ns
Output disable time		tOD8	10	45	ns

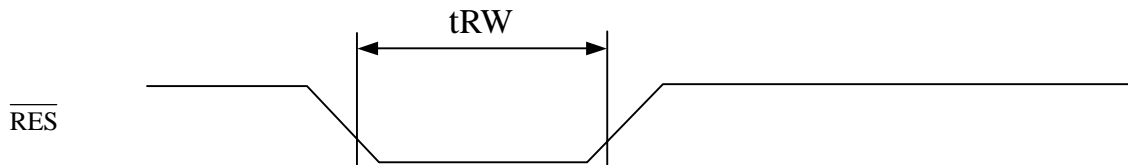
Note All timing is specified using 10 % and 90 % of VDD as the reference.



5.2 RESET TIMING

Condition :  $V_{DD} = 5.0V$

Parameter	Signal	Symbol	Rating		Unit
			Min.	Max.	
Reset "L" pulse width		tRW	450	—	ns



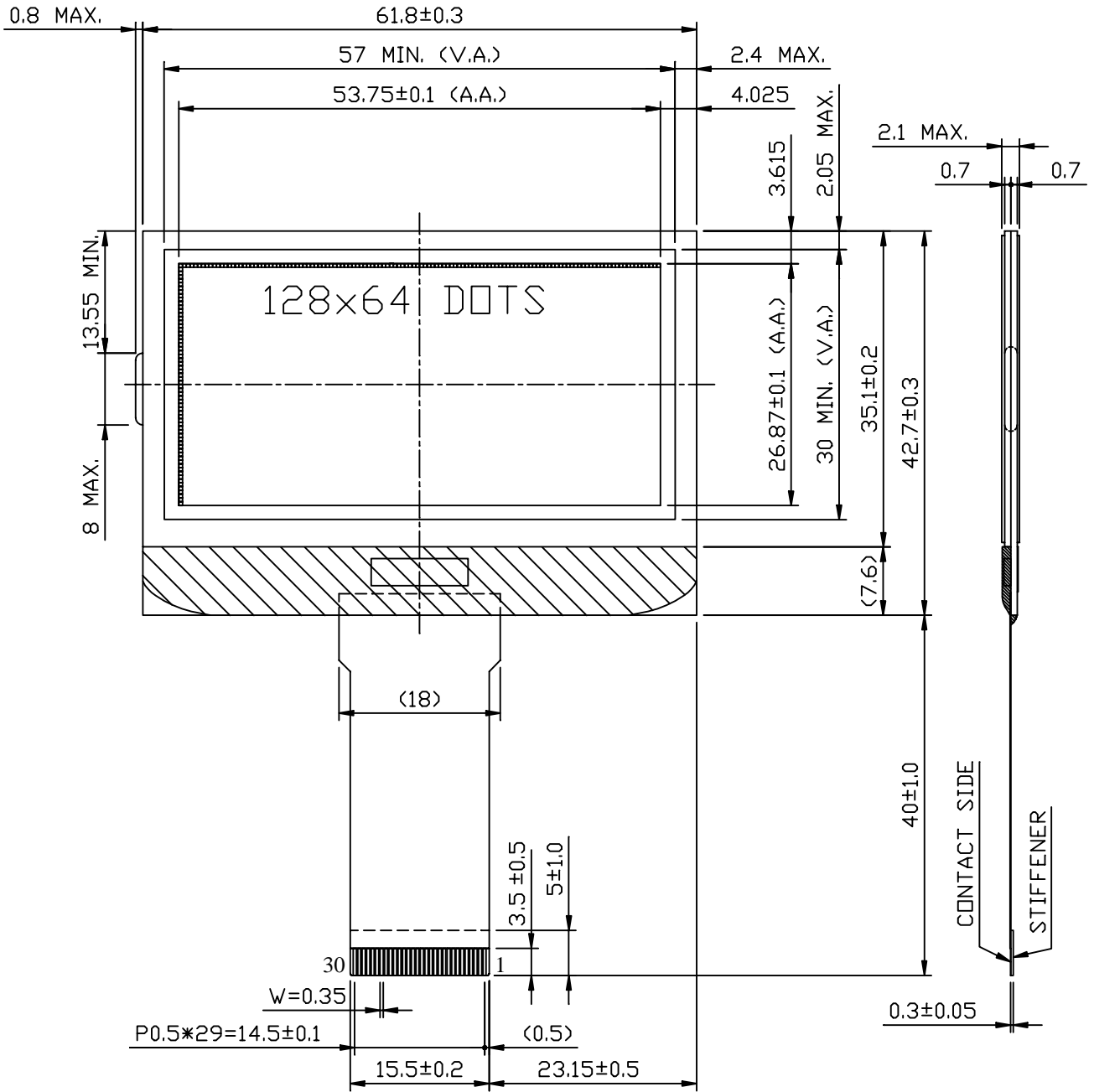
6. OPTICAL CHARACTERISTICS

Ta = 25 °C

I T E M		SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING ANGEL	STN	$\varnothing 2 - \varnothing 1$	$K \geq 2.0$	20	—	—	deg.	1
	FSTN			40	—	—	deg.	1
CONTRAST RATIO	STN	K	$\varnothing = 10^\circ$	5	—	—	—	1
	FSTN			8	—	—	—	1
RESPONSE TIME	t r ( rise )	$\varnothing = 10^\circ$ $\theta = 0^\circ$	—	—	3700	7400	ms	1
				—	230	460		
				—	110	220		
	t f ( fall )			—	2000	4000		
				—	140	280		
				—	90	180		

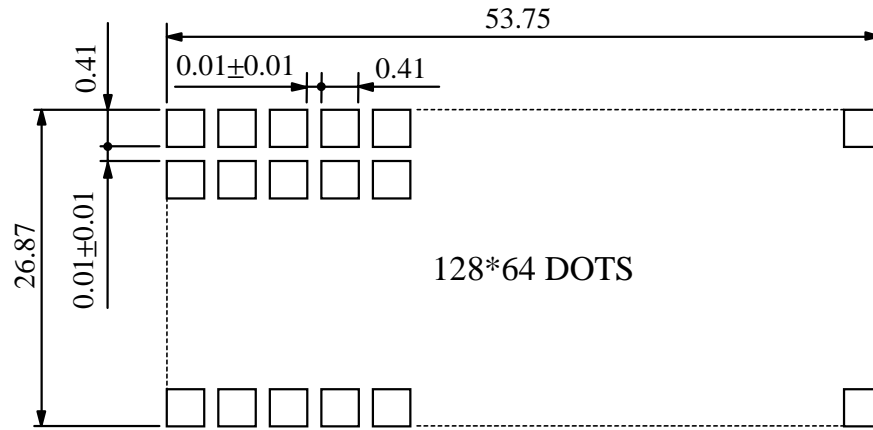
NOTE (1) : PLEASE REFER TO :  
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. ( EU - 002A)

7. OUTLINE DIMENSIONS



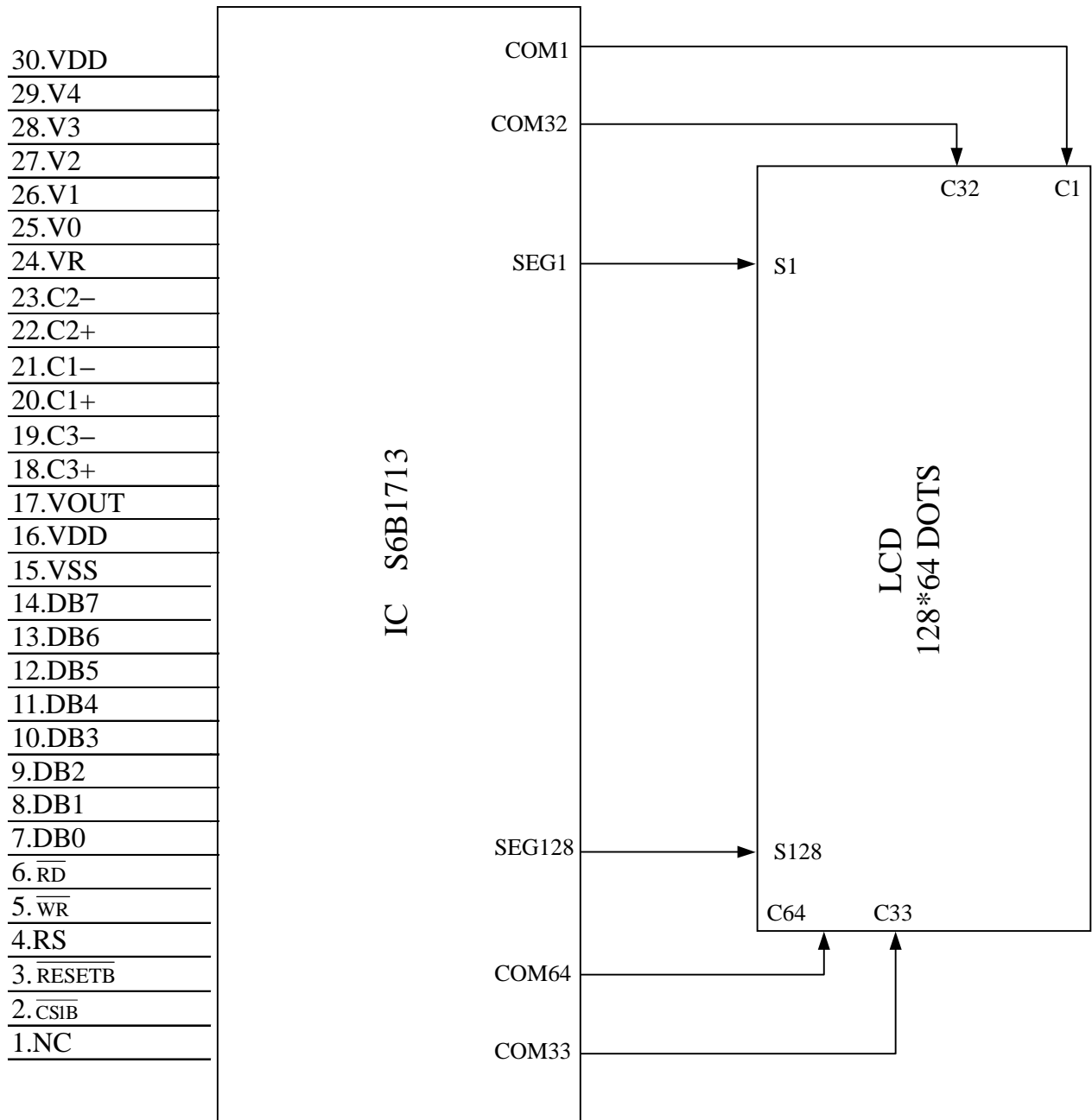
UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS  $\pm 0.5$

8. DETAIL DRAWING OF DOT MATRIX



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

9. BLOCK DIAGRAM



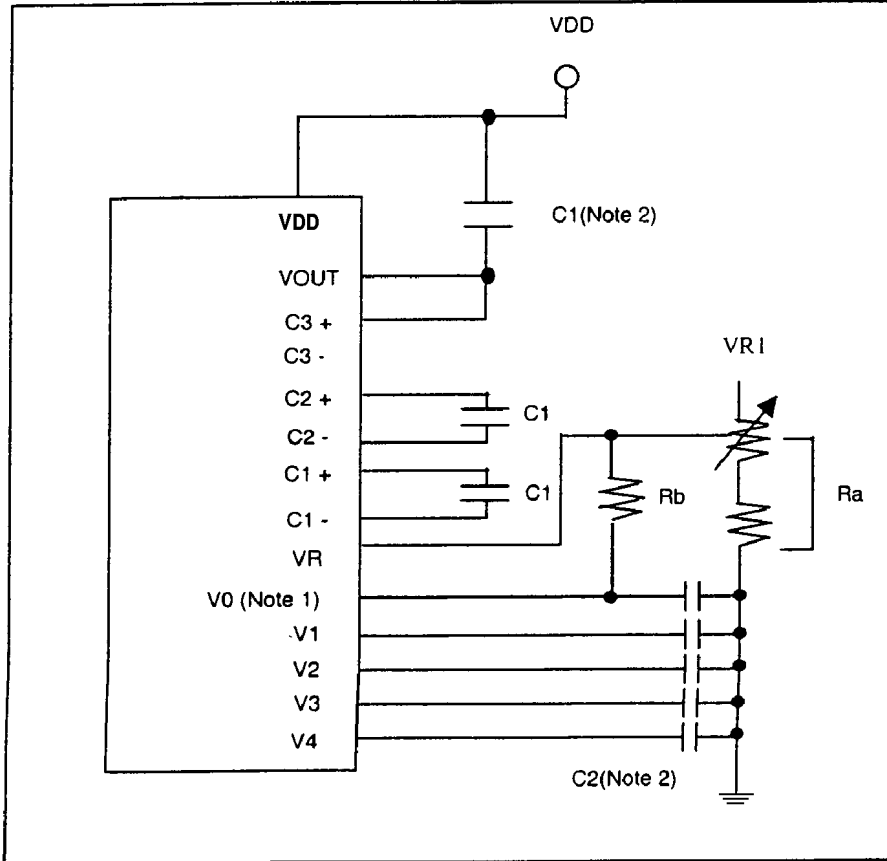
10. INTERFACE SIGNALS

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	NC	—	NO CONNECTION
2	$\overline{CS1B}$	H/L	CHIP SELECT INPUTS
3	$\overline{RESETB}$	—	HARDWARE RESET INPUT
4	RS	—	REGISTER SELECT INPUTS RS = "H" DB0~DB7 ARE DISPLAY DATA RS = "L" DB0~DB7 ARE CONTROL DATA
5	$\overline{WR}$	H/L	READ/WRITE EXECUTION CONTROL PIN WHEN 80 TYPE MPU IS USED WRITE ENABLE CLOCK INPUT PIN
6	$\overline{RD}$	H/L	READ/WRITE EXECUTION CONTROL PIN WHEN 80 TYPE MPU IS USED READ ENABLE CLOCK INPUT PIN
7	DB0	H/L	WHEN RS = "H", DB0~DB7 ARE USED 8 BIT BI-DIRECTIONAL . DATA BUS THAT IS CONNECTED TO THE STANDARD 8-BIT MPU DATA BUS .
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	VSS	—	GROUND
16	VDD	—	POWER SUPPLY FOR LOGIC
17	VOUT	—	VOLTAGE CONVERTER OUTPUT
18	C3+	—	CAPACITOR3+ CONNECT FOR INTERNAL VOLTAGE CONVERTER
19	C3-	—	CAPACITOR3- CONNECT FOR INTERNAL VOLTAGE CONVERTER
20	C1+	—	CAPACITOR1+ CONNECT FOR INTERNAL VOLTAGE CONVERTER
21	C1-	—	CAPACITOR1- CONNECT FOR INTERNAL VOLTAGE CONVERTER
22	C2+	—	CAPACITOR2+ CONNECT FOR INTERNAL VOLTAGE CONVERTER
23	C2-	—	CAPACITOR2- CONNECT FOR INTERNAL VOLTAGE CONVERTER
24	VR	—	V0 VOLTAGE ADJUSTMENT PIN
25	V0	—	LCD DRIVER SUPPLY VOLTAGES
26	V1	—	LCD DRIVER SUPPLY VOLTAGES
27	V2	—	LCD DRIVER SUPPLY VOLTAGES
28	V3	—	LCD DRIVER SUPPLY VOLTAGES
29	V4	—	LCD DRIVER SUPPLY VOLTAGES
30	VDD	—	POWER SUPPLY FOR LOGIC

1 1 . POWER SUPPLY

1 1.1 POWER SUPPLY FOR LCM

( VDD=4.0V~5.0V )



Note 1

V0 =

$$(1+Rb/Ra) * (1-(63-E/V)/300) * 2.0$$

Note 2

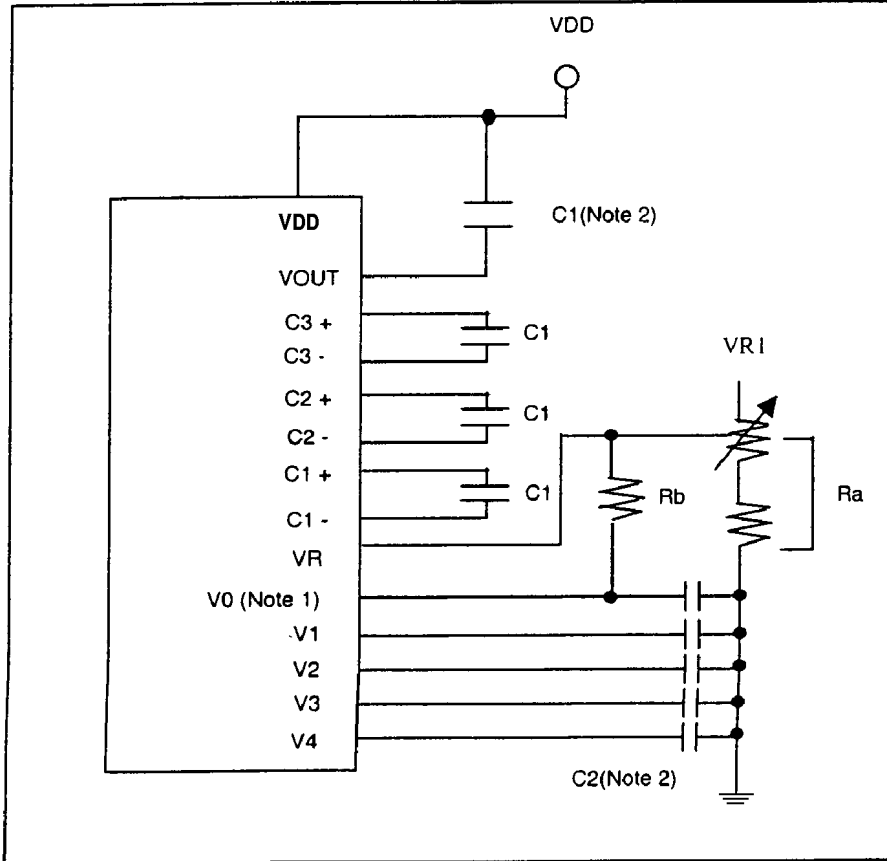
C1 1.0uf - 4.7uf

C2 0.47uf - 1.0uf



1 1.2 POWER SUPPLY FOR LCM

( VDD=3.0V~3.7V )



Note 1

$$V0 = (1+Rb/Ra) * (1-(63-E/V)/300) * 2.0$$

Note 2

- C1 1.0uf - 4.7uf
- C2 0.47uf - 1.0uf