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CUSTOMER	ACCEPTANCE	SPECIFICATIONS
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MODEL NO. :

ES13BA0FLY*90

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

EMERGING DISPLAY
TECHNOLOGIES CORPORATION

MODEL NO.

ES13BA0FLY*90

VERSION

2

PAGE

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RECORDS OF REVISION

DATE

REVISED
PAGE
NO.

SUMMARY

MAY.03,2004

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4. ELECTRICAL CHARACTERISTICS

POWER SUPPLY VOLTAGE FOR LOGIC : MAX.=3.7 → MAX.=3.6

12

11.1 POWER SUPPLY FOR LCM(VDD=3.3V~3.7V)→

11.1 POWER SUPPLY FOR LCM(VDD=3.3V~3.6V)

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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU-002A

1.2 APPLICATION NOTES FOR CONTROLLER/DRIVER

PLEASE REFER TO :

PLEASE REFER TO : LCD DRIVE / S6B1713

1.3 PACKING

PLEASE REFER TO : 97-13BA0-L

2. MECHANICAL SPECIFICATIONS

- | | | |
|-----------------------|-------|--|
| (1) NUMBER OF DOTS | ----- | 128W * 64H DOTS |
| (2) MODULE SIZE | ----- | 64.0W * 52.0H * 5.9D(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 | ----- | FSTN , POSITIVE , WHITE ,
TRANSFLECTIVE |
| (8) DRIVING METHOD | ----- | 1 / 65 DUTY MULTIPLEX DRIVE , 1/9BIAS |
| (9) VIEWING DIRECTION | ----- | 6 O'CLOCK |
| (10) BACK LIGHT | ----- | LED , COLOR : YELLOW-GREEN |

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	17	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 ² (0.5 G)	—	19.6 m/S ² (2.0 G)	
SHOCK	—	29.4 m/S ² (3 G)	—	490.0 m/S ² (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	VDD – VSS	—	3.3	3.5	3.6	V
BOOSTER OUTPUT VOLTAGE	VO – VSS	—	10.4	10.9	11.4	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.8VDD	—	VDD	V
	VIL	L LEVEL	VSS	—	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD-VSS	—	1.0	2.0	mA
OSCILLATOR FREQUENCY	fosc	INTERNAL	17	22	27	KHz
	fCL	EXTERNAL	4.25	5.5	6.75	KHz
POWER SUPPLY FOR LED B/L	VLED-VLSS	IF = 58mA	—	5.0	—	V

NOTE (1) : APPLIED TO TERMINALS \overline{RES} , \overline{CSIB} , DB0~DB7, \overline{RD} , \overline{WR} , RS.

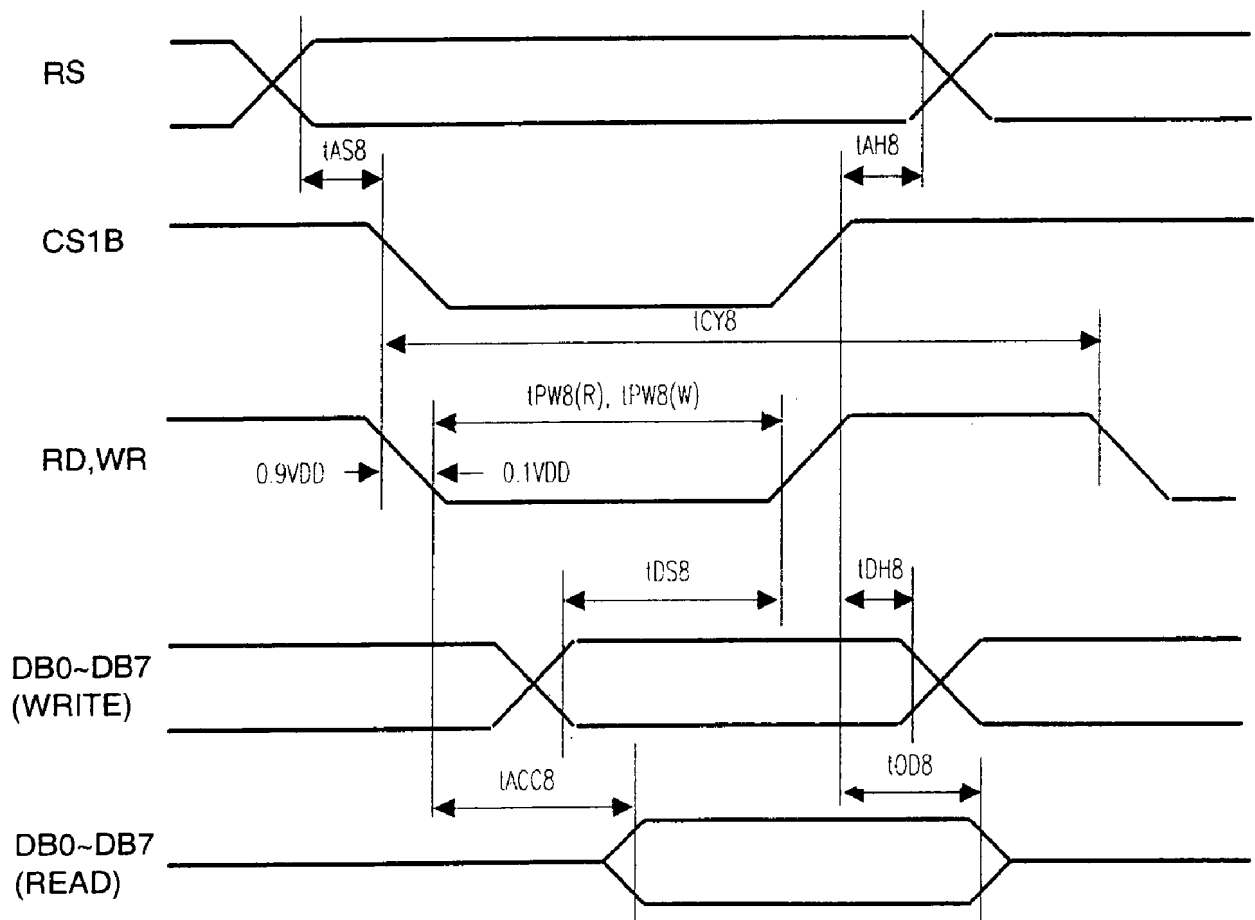
NOTE (2) : THIS DISPLAY PATTERN IS ALL ON OR OFF.

5. TIMING CHARACTERISTICS

5.1 READ/WRITE TIMING CHARACTERISTICS

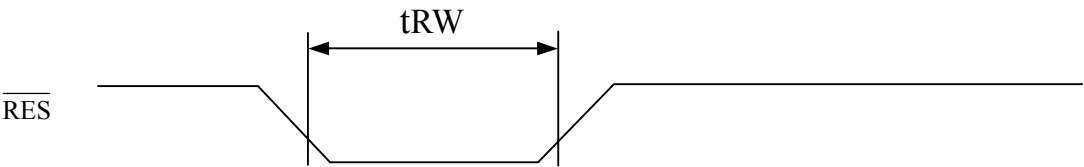
Parameter	Signal	Symbol	Rating		Unit
			Min.	Max.	
Address setup time	RS	Tas8	10	—	ns
Address hold time		tAH8	10	—	ns
System cycle time	RS	tCY8	150	—	ns
Pulse width (WR)	\overline{WR}	tPW8(W)	25	—	ns
Pulse width (RD)	\overline{RD}	tPW8(R)	65	—	ns
Data setup time	DB0~DB7	tDS8	18	—	ns
Data hold time		tDH8	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 V_{DD} as the reference.



5 . 2 RESET TIMING

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

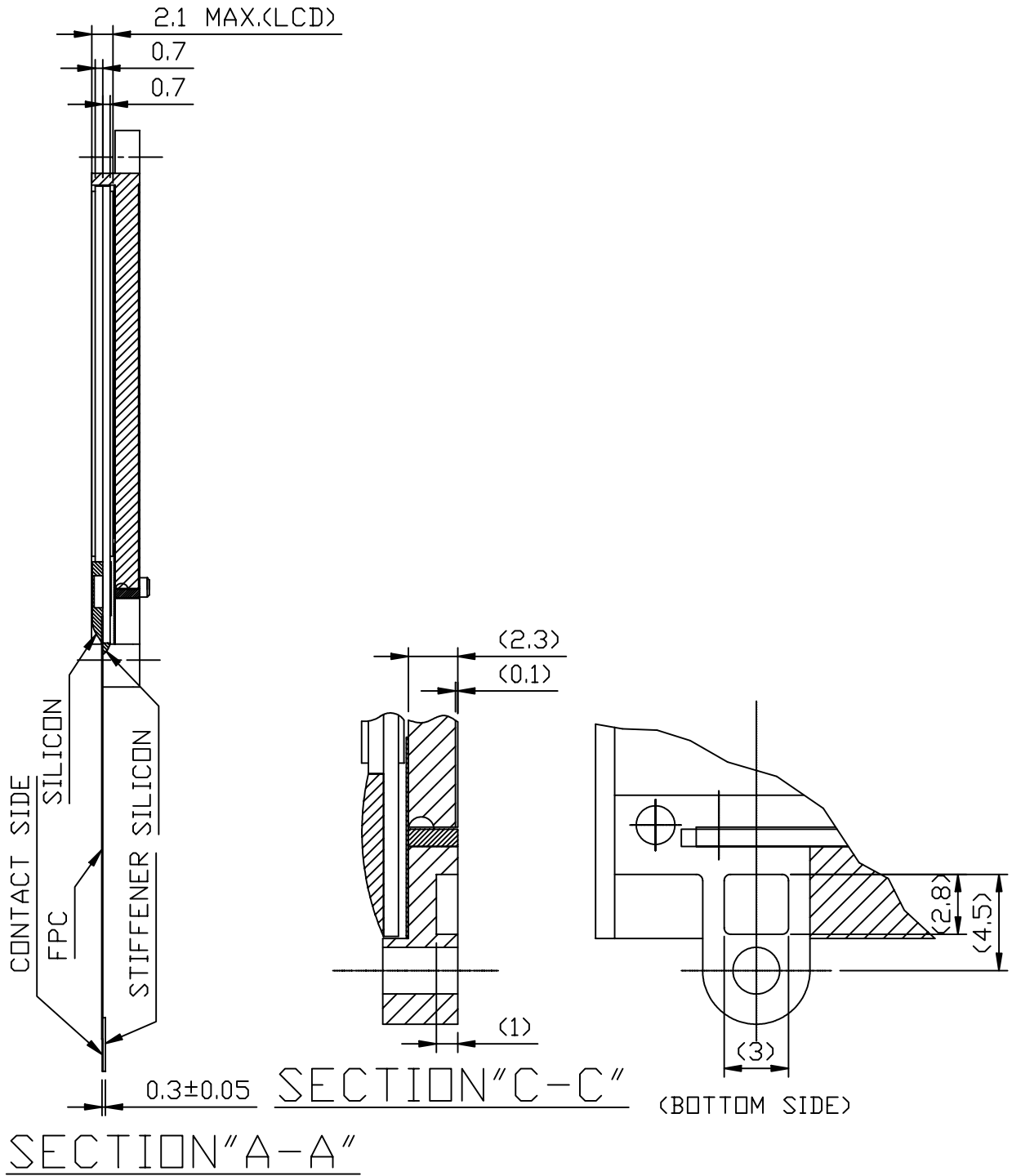


6. OPTICAL CHARACTERISTICS

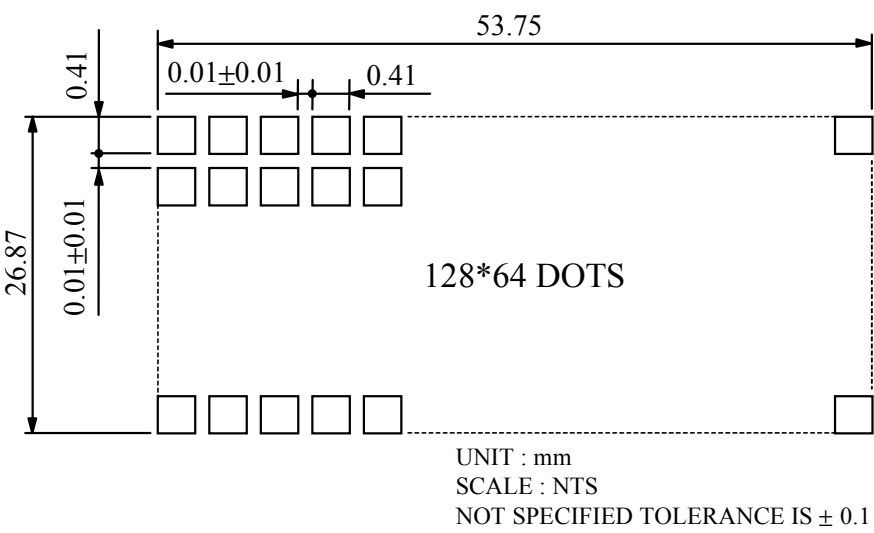
Ta = 25 °C

I T E M	SYMBOL	CONDITION		MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING ANGLE	Ø 2 – Ø 1	K ≥ 1 . 4		40	—	—	deg.	1
CONTRAST RATIO	K	Ø = 1 0 °		2.5	—	—	—	1
RESPONSE TIME	t r (rise)	Ø = 1 0 ° θ = 0 °	Ta=-20°C	—	3700	7400	ms	1
			Ta=25°C		230	460		
			Ta=70°C		110	220		
	t f (fall)		Ta=-20°C	—	2000	4000		
			Ta=25°C		140	280		
			Ta=70°C		90	180		
THE BRIGHTNESS OF MODULE	L	VLED-VLSS =5.0V		3	4	—	cd/m ²	1

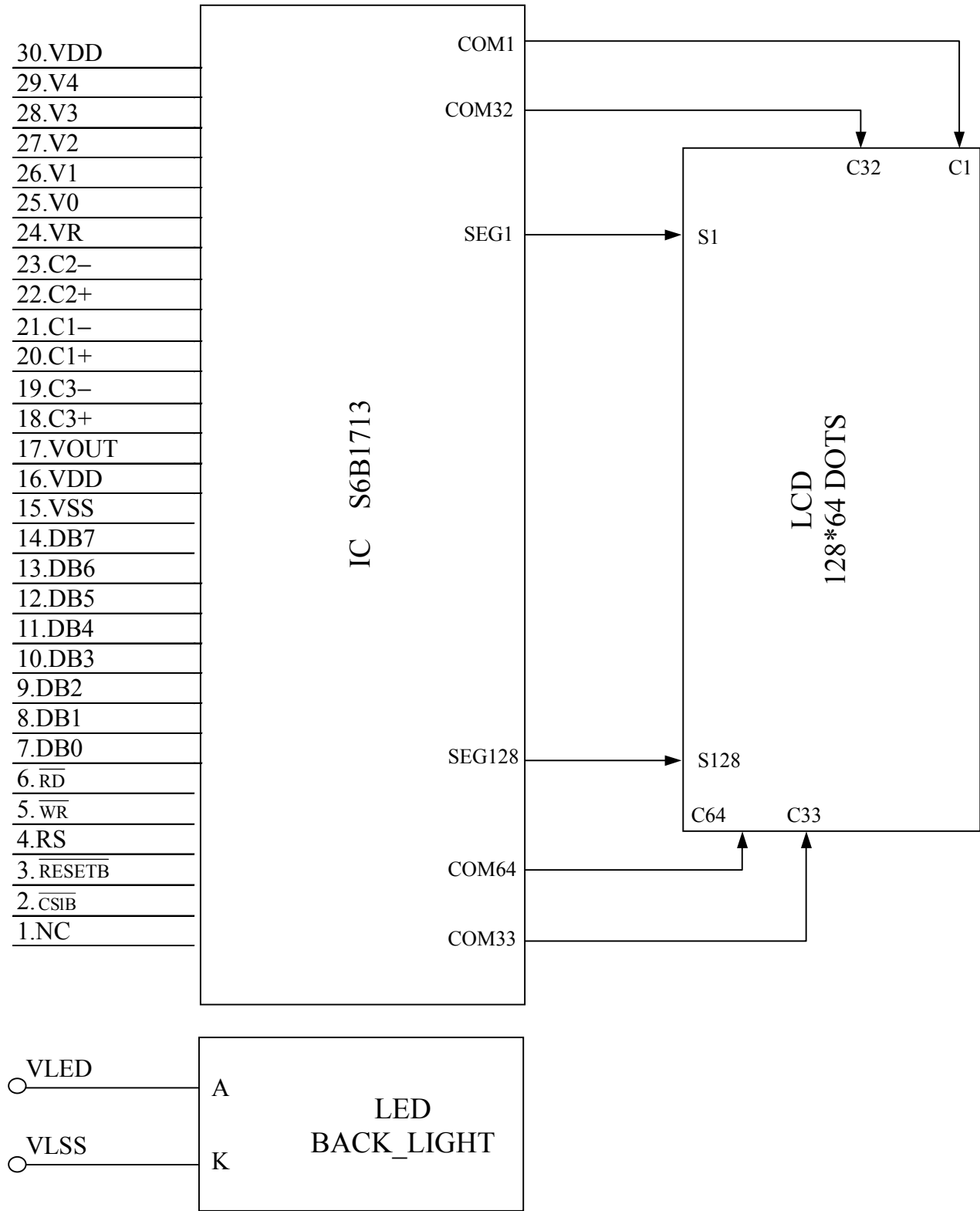
NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002A)



8. DETAIL DRAWING OF DOT MATRIX



9 . BLOCK DIAGRAM

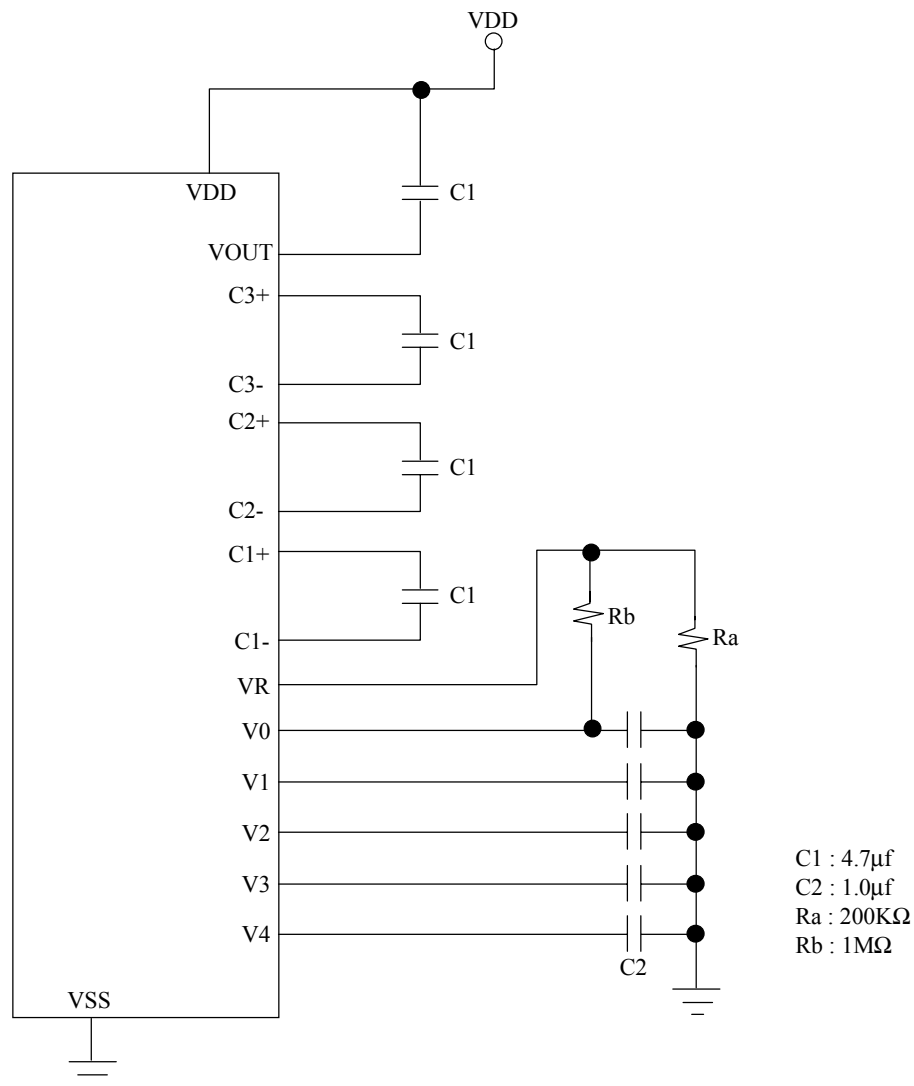


10. INTERFACE SIGNALS

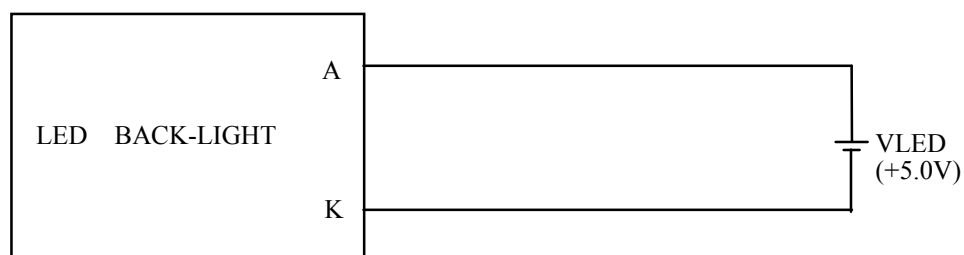
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	NC	—	NO CONNECTION
2	$\overline{\text{CSIB}}$	H/L	CHIP SELECT INPUTS
3	$\overline{\text{RESETB}}$	—	HARDWARE RESET INPUT
4	RS	—	REGISTER SELECT INPUTS RS = "H" DB0~DB7 ARE DISPLAY DATA RS = "L" DB0~DB7 ARE CONTROL DATA
5	$\overline{\text{WR}}$	H/L	READ/WRITE EXECUTION CONTROL PIN WHEN 80 TYPE MPU IS USED WRITE ENABLE CLOCK INPUT PIN
6	$\overline{\text{RD}}$	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 . WHEN PS = " L " DB0~DB5 : HIGH IMPEDANCE ; DB6:SERIAL INPUT CLOCK (SCLK) ; DB7 : INPUT DATA (SIK)
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
—	VLED(A)	—	POWER SUPPLY FOR LED BACK-LIGHT (RED WIRE)
—	VLSS(K)	—	POWER SUPPLY FOR LED BACK-LIGHT (WHITE WIRE)

1.1. POWER SUPPLY

1.1.1 POWER SUPPLY FOR LCM (VDD = 3.3V~3.6V)



1.1.2 POWER SUPPLY FOR LED BACK-LIGHT



12. INITIAL PROGRAM

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MOV    A,#E2H           ;RESET
CALL   PutIR_1
MOV    A,#A3H           ;LCD BIAS SELECT
CALL   PutIR_1
MOV    A,#A0H           ;ADC SELECT
CALL   PutIR_1
MOV    A,#C0H           ;SHL SELECT
CALL   PutIR_1
MOV    A,#81H           ;SET REFERENCE VOLTAGE MODE
CALL   PutIR_1
MOV    A,#21H           ;SET REFERENCE VOLTAGE REGISTER
CALL   PutIR_1
MOV    A,#2FH           ;POWER CONTROL
CALL   PutIR_1
MOV    A,#AFH           ;DISPLAY ON
CALL   PutIR_1

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