

EXAMINED BY : <i>Vincent Uh</i>	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-00919
APPROVED BY: <i>MS Huang</i>		ISSUE : MAR.04,2003
		TOTAL PAGE : 9
		VERSION : 4

CUSTOMER
ACCEPTANCE
SPECIFICATIONS

MODEL NO. :

24D00(LED TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

RECORDS OF REVISION

DOC . FIRST ISSUE

SEP.17,1996

DATE	REVISED PAGE NO.	SUMMARY																																																																						
NOV.26,1997	2 ~ 9	THE ENTIRE PAGES REVISED																																																																						
NOV.10,1999	1~3,5	THE ENTIRE PAGES REVISED																																																																						
MAR.04,2003	3	<p>4. ELECTRICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN .</th> <th>TYP .</th> <th>MAX .</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VO = 18.2V</td> <td>—</td> <td>6.0</td> <td>—</td> <td>mA</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)</td> <td>IEE</td> <td>VDD - VSS = 5.0 V VDD - VO = 18.2V</td> <td>—</td> <td>5.0</td> <td>—</td> <td>mA</td> </tr> <tr> <td>RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td>VDD-V0 ∅ = 10° θ = 0°</td> <td>Ta = -20 °C Ta = 25 °C Ta = 70 °C</td> <td>—</td> <td>18.2</td> <td>—</td> <td>V</td> </tr> </tbody> </table> <p>NOTE (3) : RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±1.0V BY EACH MODULE.</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN .</th> <th>TYP .</th> <th>MAX .</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VO = 18.2V</td> <td>—</td> <td>6.0</td> <td>10</td> <td>mA</td> </tr> <tr> <td>POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)</td> <td>IEE</td> <td>VDD - VSS = 5.0 V VDD - VO = 18.2V</td> <td>—</td> <td>5.0</td> <td>8.0</td> <td>mA</td> </tr> <tr> <td>RECOMMENDED LCD DRIVING VOLTAGE</td> <td>VDD-V0 ∅ = 10° θ = 0°</td> <td>Ta = -20 °C Ta = 25 °C Ta = 70 °C</td> <td>17.9</td> <td>18.9</td> <td>19.9</td> <td>V</td> </tr> <tr> <td></td> <td></td> <td></td> <td>17.2</td> <td>18.2</td> <td>19.2</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>16.5</td> <td>17.5</td> <td>18.5</td> <td></td> </tr> </tbody> </table>	PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VO = 18.2V	—	6.0	—	mA	POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VSS = 5.0 V VDD - VO = 18.2V	—	5.0	—	mA	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD-V0 ∅ = 10° θ = 0°	Ta = -20 °C Ta = 25 °C Ta = 70 °C	—	18.2	—	V	PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VO = 18.2V	—	6.0	10	mA	POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD - VSS = 5.0 V VDD - VO = 18.2V	—	5.0	8.0	mA	RECOMMENDED LCD DRIVING VOLTAGE	VDD-V0 ∅ = 10° θ = 0°	Ta = -20 °C Ta = 25 °C Ta = 70 °C	17.9	18.9	19.9	V				17.2	18.2	19.2					16.5	17.5	18.5	
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Polarizer Mode	Backlight	Code value
Transflective	LED	L
Transmissive	LED	M

E W 2 4 D 0 0 G L Y

LCD type + LCD color	Code Value
STN + Yellow-Green	Y
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 :

EU - 002 A

1.2 APPLICATION NOTES FOR CONTROLLER

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU - 110

1.3 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

2. MECHANICAL SPECIFICATIONS

- (1) NUMBER OF DOTS ----- 240W * 128H DOTS
- (2) MODULE SIZE ----- 144.0W * 104.0H * 17.0D(max) mm
- (3) EFFECTIVE AREA ----- 114.0W * 64.0H mm
- (4) ACTIVE AREA ----- 107.97W * 57.57H mm
- (5) DOT SIZE ----- 0.42W * 0.42H mm
- (6) DOT PITCH ----- 0.45W * 0.45H mm
- (7) LCD TYPE *
- (8) DRIVING METHOD ----- 1 / 128 DUTY MULTIPLEX DRIVE
- (9) BACKLIGHT ----- LED , COLOR:YELLOW-GREEN

* 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	6.5	V	
POWER SUPPLY FOR LCD DRIVING	VDD — VEE	0	22.0	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)
LED POWER DISSIPATION	PD	—	10.3	W	
LED FORWARD CURRENT	IF	—	2250	mA	
LED REVERSE VOLTAGE	VR	—	8	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	-20 °C	70 °C	-30 °C	80 °C	NOTE (2) , (3)
HUMIDITY	—	85 % RH	—	85 % RH	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 (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
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

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	—	- 15.5	- 16.0	- 16.5	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	2.2	—	—	V
	VIL	L LEVEL	—	—	0.8	V
OUTPUT VOLTAGE NOTE (1)	VOH	H LEVEL	2.4	—	VCC	V
	VOL	L LEVEL	0	—	0.4	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD — VSS = 5.0 V VDD — VO = 18.2V	—	6.0	10	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)	IEE	VDD — VSS = 5.0 V VDD — VO = 18.2V	—	5.0	8.0	mA
RECOMMENDED LCD DRIVING VOLTAGE	VDD-VO ∅ = 10° θ = 0°	Ta = - 20 °C	17.9	18.9	19.9	V
		Ta = 25 °C	17.2	18.2	19.2	
		Ta = 70 °C	16.5	17.5	18.5	
CLOCK OSCILLATION FREQUENCY	f _{osc}	—	—	2	—	MHZ
LED FORWARD VOLTAGE	VF	IF = 900 mA	—	4.2	4.6	V
LED FORWARD CURRENT	IF	—	—	900	—	mA
LED REVERSE CURRENT	IR	VR = 8V	—	—	200	μA

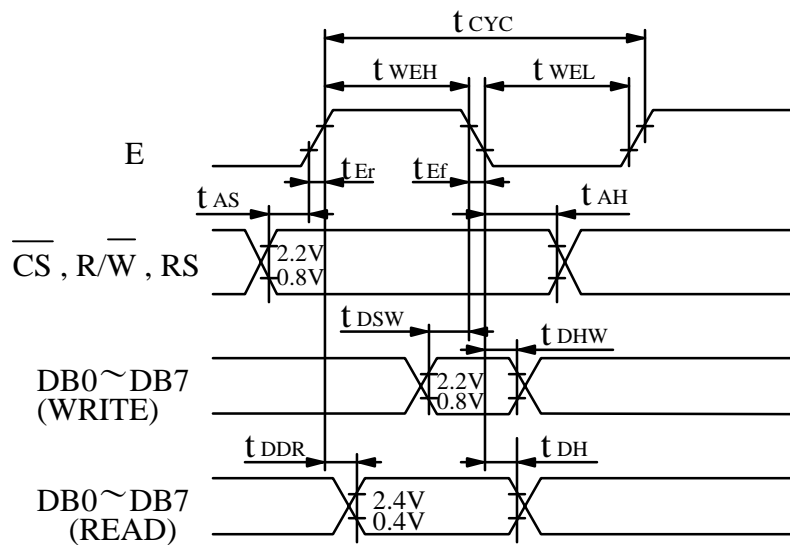
NOTE (1): APPLIED TO TERMINALS E, \overline{CS} , R/ \overline{W} , RS, DB0~DB7, \overline{RES} .

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

5. INTERFACE TIMING CHARACTERISTICS

V_{CC} = 5.0 V, T_a = -20 ~ 70 °C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Enable cycle time	t _{CYC}	1.0	—	—	uS
Enable pulse width	H LEVEL	t _{WEH}	0.45	—	uS
	L LEVEL	t _{WEL}	0.45	—	uS
Enable rise time	t _{Er}	—	—	25	nS
Enable fall time	t _{Ef}	—	—	25	nS
Setup time	t _{AS}	140	—	—	nS
Data setup time	t _{DSW}	225	—	—	nS
Data delay time	t _{DDR}	—	—	225	nS
Data hold time	t _{DHW}	10	—	—	nS
Address hold time	t _{AH}	10	—	—	nS
Data hold time	t _{DH}	20	—	—	nS



6. OPTICAL CHARACTERISTICS

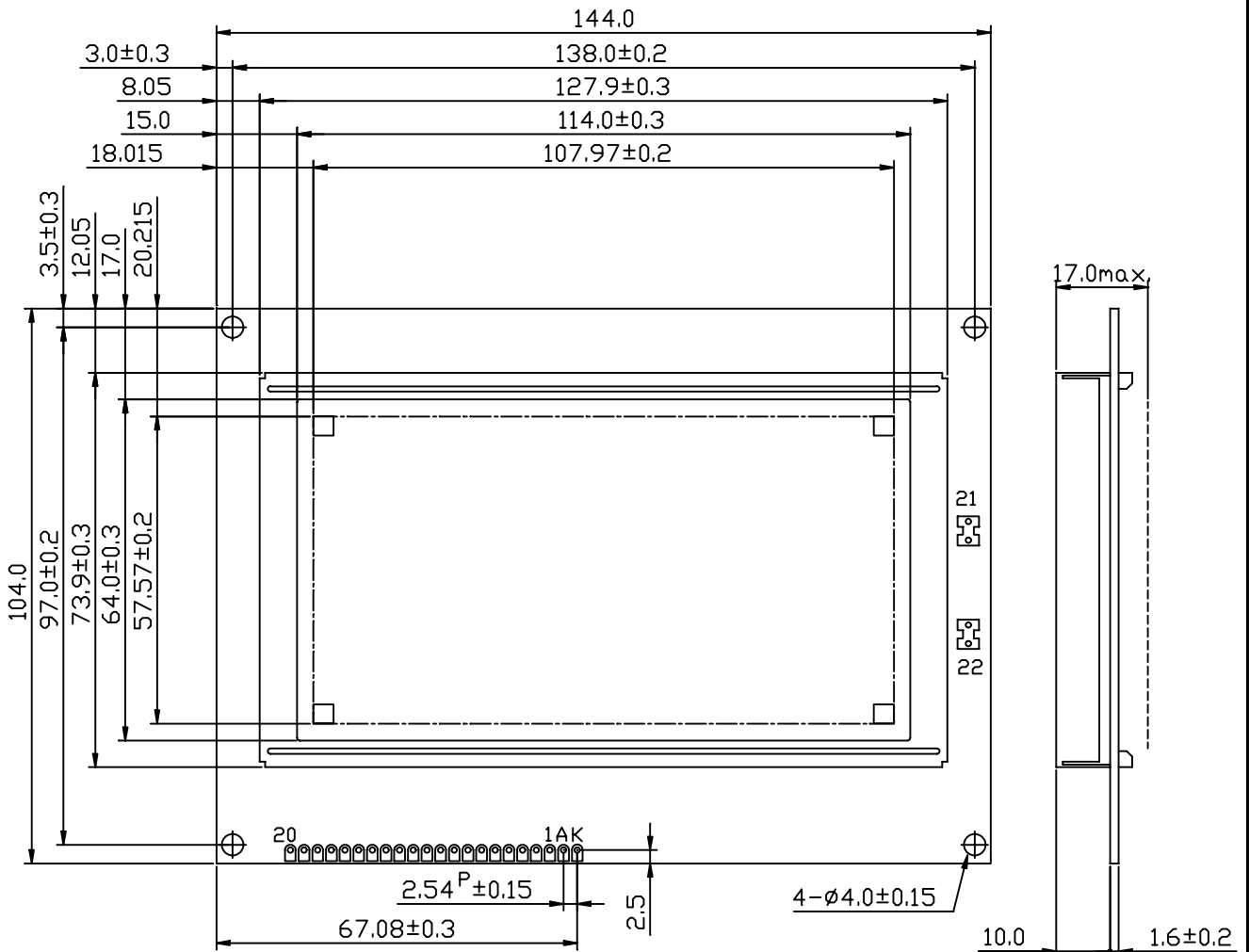
I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	STN	$\varnothing 2 - \varnothing 1$	$K \geq 1.4$	40	—	—	deg.	1
	FSTN			50	—	—	deg.	1
CONTRAST RATIO	STN	K	$\varnothing = 10^\circ$ $\theta = 0^\circ$	—	5	—	—	1
	FSTN			5	—	—	—	1
RESPONSE TIME	tr (rise)	$\varnothing = 10^\circ$ $\theta = 0^\circ$	Ta = -20°C	—	2886	—	ms	1
			Ta = 25°C	—	259	—		
			Ta = 70°C	—	156	—		
	tf (fall)		Ta = -20°C	—	2193	—		
			Ta = 25°C	—	177	—		
			Ta = 70°C	—	84	—		
THE BRIGHTNESS OF BACK-LIGHT	L	IF = 900 mA	—	30	—	cd/m ²	2	
			—	65	—		3	
PEAK EMISSION WAVELENGTH	λP	IF = 900 mA	—	572	—	nm	1	

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

NOTE (2) : POLARIZER MODE : TRANSFLECTIVE

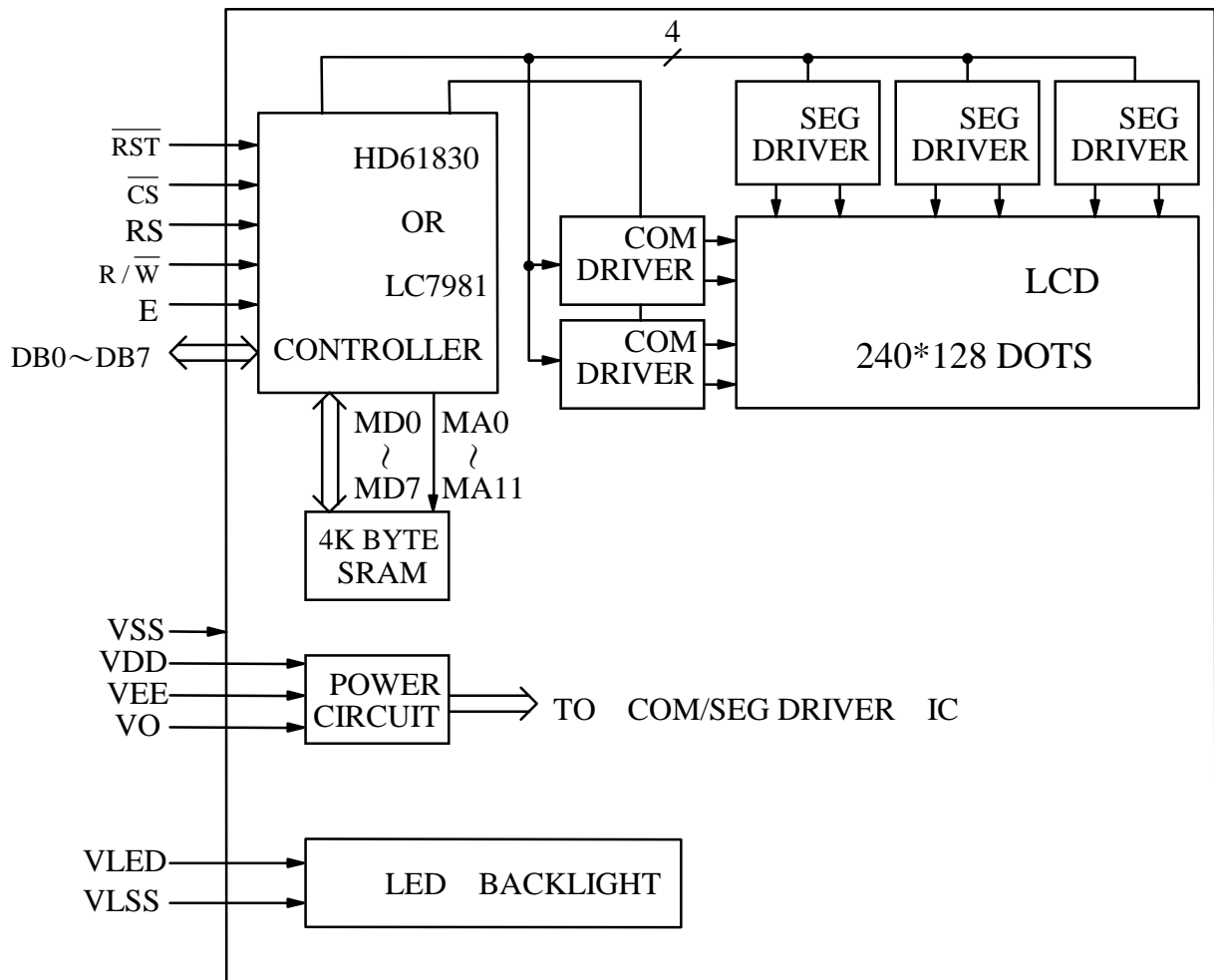
NOTE (3) : POLARIZER MODE : TRANSMISSIVE

7. OUTLINE DIMENSION

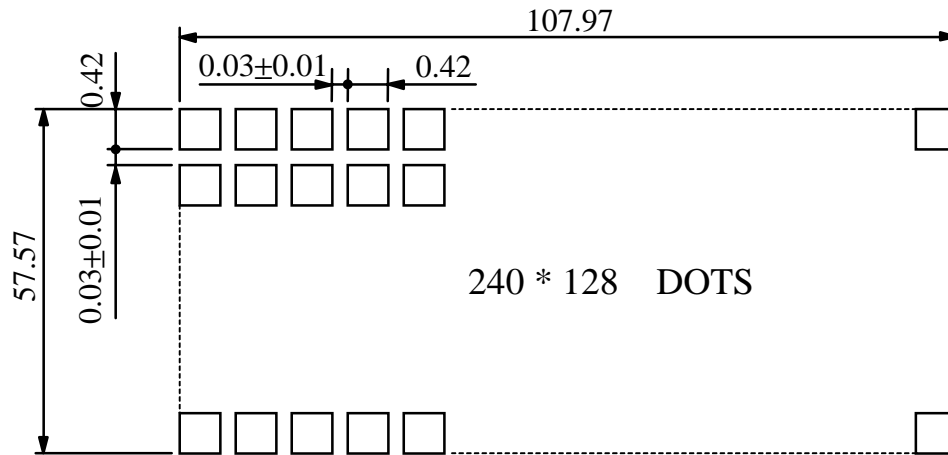


UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.5

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



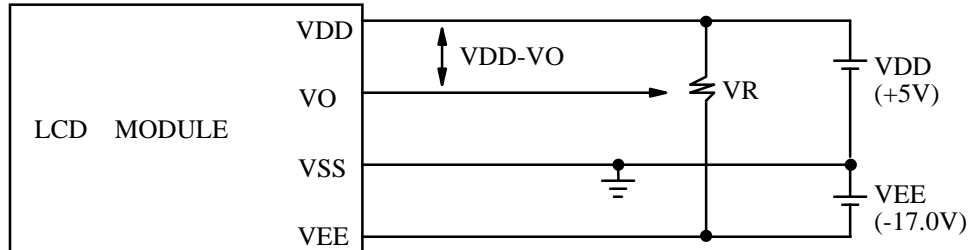
UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ±0.1

10. INTERFACE SIGNALS

PIN NO	SYMBOL	LEVEL	FUNCTION
1	VSS	—	GROUND
2	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
3	V0	—	OPERATING VOLTAGE FOR LCD DRIVE
4	RS	H/L	H : INSTRUCTION REGISTER L : DATA REGISTER
5	R/ \overline{W}	H/L	H : DATA READ (LCD MODULE → MPU) L : DATA WRITE (LCD MODULE ← MPU)
6	E	H,H→L	ENABLE SIGNAL
7 14	DB0 DB7	H/L	DATA BUS LINE
15	\overline{CS}	H→L	CHIP SELECTION
16	\overline{RST}	L	RESET
17	VEE	—	POWER SUPPLY FOR LCD DRIVE
18 20	N.C	—	—
A	VLED	—	POWER SUPPLY FOR LED BACKLIGHT (A)
K	VLSS	—	POWER SUPPLY FOR LED BACKLIGHT (K)
21	VLED	—	POWER SUPPLY FOR LED BACKLIGHT (A)
22	VLSS	—	POWER SUPPLY FOR LED BACKLIGHT (K)

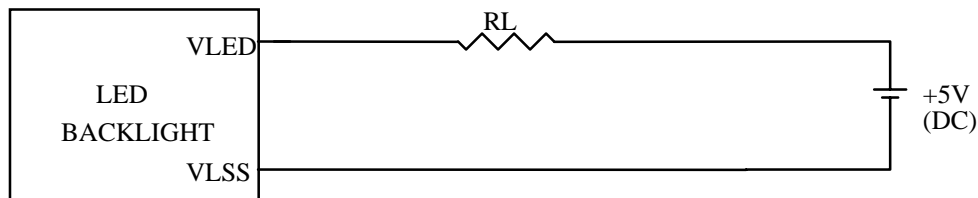
1 1 . POWER SUPPLY

1 1 . 1 POWER SUPPLY FOR LCM



VDD-VO : LCD DRIVING VOLTAGE
VR : 20KΩ

1 1 . 2 POWER SUPPLY FOR LED BACK - LIGHT



RECOMMENDED RESISTOR $RL = 1 \sim 3.3\Omega, 1WATT$ (CONTROLLER BY USER)
* THE BRIGHTNESS WOULD BE ALTERED SUBJECT TO DIFFERENT VALUES OF RL

1 1 . 3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

