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| | | |
|----------|------------|----------------|
| CUSTOMER | ACCEPTANCE | SPECIFICATIONS |
|----------|------------|----------------|

MODEL NO . :

32F40(LED TYPE)
(RoHS)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

EMERGING DISPLAY
TECHNOLOGIES CORPORATION

| | | |
|------------------------|---------|------|
| MODEL NO . | VERSION | PAGE |
| 32F40(LED TYPES)(RoHS) | 1 | 0-1 |

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| RECORDS OF REVISION | DOC . FIRST ISSUE | NOV.23,2005 |
|---------------------|-------------------|-------------|

| 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 4 0 B M W R

Viewing direction
NIL : 6 o'clock
R : 3 o'clock
U:12 o'clock

| LCD type + 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 B

1.2 APPLICATION NOTES FOR CONTROLLER / DRIVER :

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - S E D 1 3 3 5

1.3 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

1.4 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 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*

* 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 | 7.0 | V | |
| POWER SUPPLY FOR LCD DRIVING | VDD - VEE | 0 | 30.0 | V | |
| INPUT VOLTAGE | VI | VSS | VDD | V | |
| STATIC ELECTRICITY | — | — | 100 | V | NOTE (1) |
| LED POWER VOLTAGE | VLED | — | 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 | -20 °C | 70 °C | -30 °C | 80 °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 (50 G) | 1 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-VSS = 5.0 V VEE-VSS = -22.0V

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|-------------------------------|-------------------------|---------|-------|---------|------|
| POWER SUPPLY VOLTAGE FOR LOGIC | VDD – VSS | — | 3.3 | 5.0 | 5.5 | V |
| POWER SUPPLY VOLTAGE FOR LCD DRIVE | VEE – VSS | — | -21.5 | -22.0 | -22.5 | V |
| INPUT VOLTAGE NOTE (1) | VIH | H LEVEL | 0.5*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 | — | 22 | 40 | mA |
| POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2) | IEE | VDD – VO = 2.3.0V | — | 6 | 8 | 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 |
| CLOCK OSCILLATION FREQUENCY | f OSC | — | — | 8 | — | MHz |
| LED FORWAD VOLTAGE | VLED – VLSS | — | — | 5.0 | — | V |
| LED FORWAD VOLTAGE | IF | VLED-VLSS | — | 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

$\theta_y = 10^\circ$, $\theta_x = 0^\circ$ WHEN VIEWING DIRECTION IS 12 O’CLOCK

NOTE (1): APPLIED TO TERMINALS D0 TO D7, A0, \overline{CS} , R / \overline{W} (\overline{WR}), E(\overline{RD}).

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. OPTICAL CHARACTERISTICS

| I T E M | | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|--------------------------|-------------|---------------------|----------------------|-------|-------|---------------------|------|------|
| VIEWING ANGLE | | θ_{y+} | $\theta_{x=0^\circ}$ | (35) | (40) | — | deg. | 1 |
| | | θ_{y-} | | (35) | (40) | — | | |
| | | θ_{x+} | $\theta_{y=0^\circ}$ | (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 | 2 | |
| | | | 6.5 | 8.5 | — | | 3 | |
| CHROMATICITY COORDINATES | x | IF = 140 mA | 0.287 | 0.325 | 0.360 | — | — | |
| | y | | 0.290 | 0.325 | 0.360 | | | |

K* : STN $K \geq 1.5$, FSTN $K \geq 2.0$

** $\theta_{y-} = 10^\circ$, $\theta_{x=0^\circ}$ WHEN VIEWING DIRECTION IS 6 O'CLOCK .

$\theta_{y=0^\circ}$, $\theta_{x+} = 10^\circ$ WHEN VIEWING DIRECTION IS 3 O'CLOCK .

$\theta_{y=10^\circ}$, $\theta_{x=0^\circ}$ WHEN VIEWING DIRECTION IS 12 O'CLOCK .

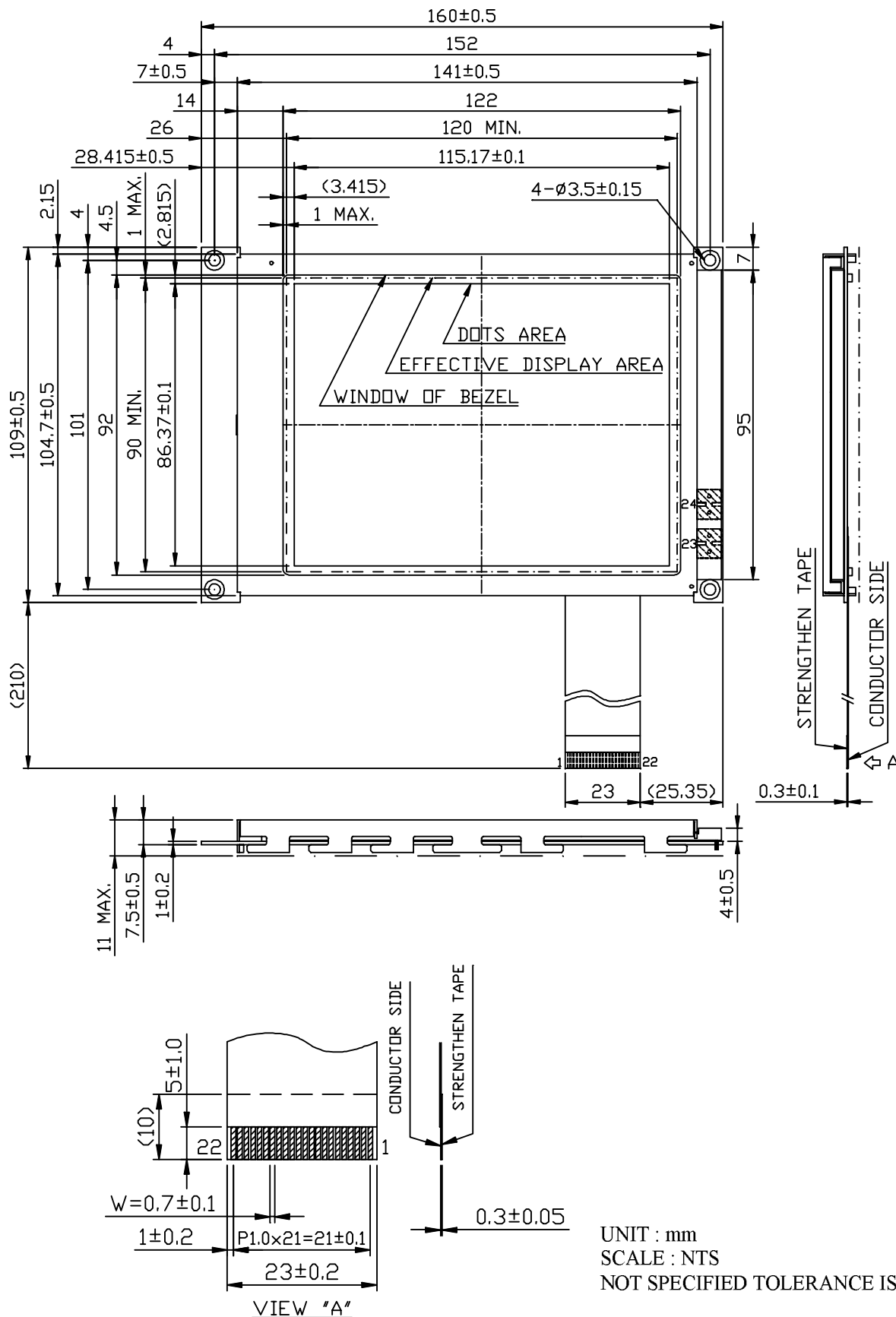
NOTE (1) : PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. (EU - 002B)

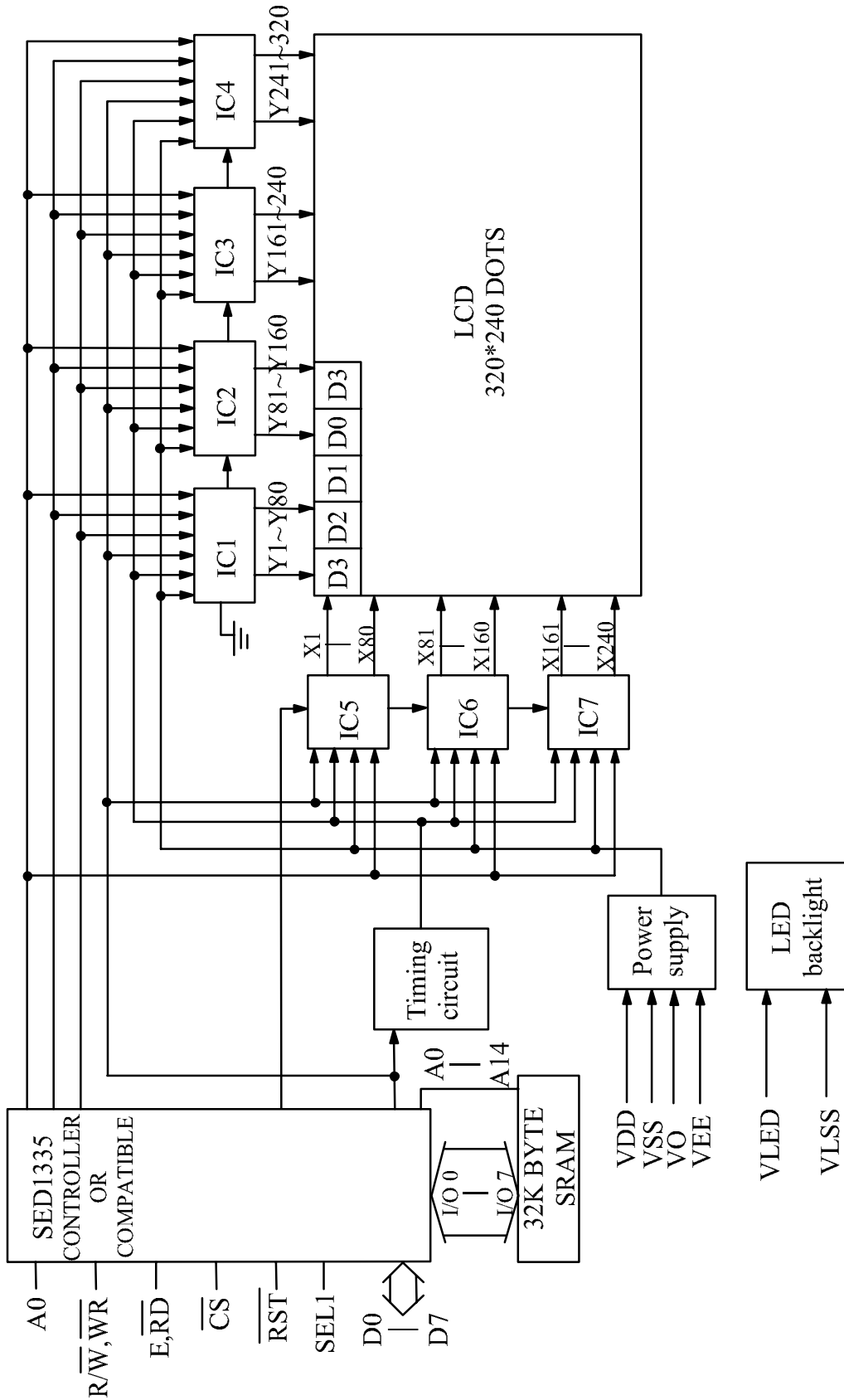
NOTE (2) : POLARIZER MODE : TRANSMISSIVE

NOTE (3) : POLARIZER MODE : TRANSFLECTIVE

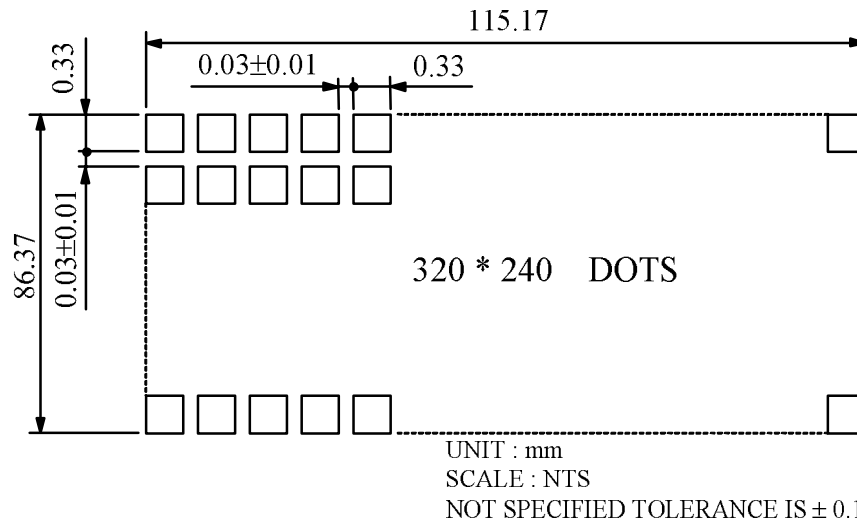
6. OUTLINE DIMENSIONS



7. BLOCK DIAGRAM



8. DETAIL DRAWING OF DOT MATRIX

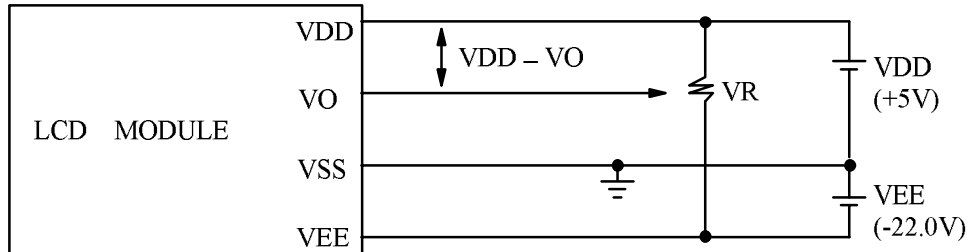


9. INTERFACE SIGNALS

| PIN NO | SYMBOL | LEVEL | FUNCTION | | | | | | | | | | | | | | | | | | | | |
|---------------|-----------------------------------|-------|---|--------------------|--------------------|--------------------------------------|----------|---|---|---|------------------|---|---|---|--------------------------------------|---|---|---|----------------------------------|---|---|---|---------------|
| 1 | VSS | — | GROUND | | | | | | | | | | | | | | | | | | | | |
| 2 | VDD | — | POWER SUPPLY FOR LOGIC CIRCUIT | | | | | | | | | | | | | | | | | | | | |
| 3 | VO | — | OPERATING VOLTAGE FOR LCD DRIVING | | | | | | | | | | | | | | | | | | | | |
| 4 | A0 | — | 8080 FAMILY INTERFACE | | | | | | | | | | | | | | | | | | | | |
| | | | <table border="1"> <thead> <tr> <th>AO</th> <th>\overline{RD}</th> <th>\overline{WR}</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>1</td> <td>STATUS FLAG READ</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>DISPLAY DATA AND CURSOR ADDRESS READ</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>DISPLAY DATA AND PARAMETER WRITE</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>COMMAND WRITE</td> </tr> </tbody> </table> | AO | \overline{RD} | \overline{WR} | FUNCTION | 0 | 0 | 1 | STATUS FLAG READ | 1 | 0 | 1 | DISPLAY DATA AND CURSOR ADDRESS READ | 0 | 1 | 0 | DISPLAY DATA AND PARAMETER WRITE | 1 | 1 | 0 | COMMAND WRITE |
| | | | AO | \overline{RD} | \overline{WR} | FUNCTION | | | | | | | | | | | | | | | | | |
| | | | 0 | 0 | 1 | STATUS FLAG READ | | | | | | | | | | | | | | | | | |
| | | | 1 | 0 | 1 | DISPLAY DATA AND CURSOR ADDRESS READ | | | | | | | | | | | | | | | | | |
| | | | 0 | 1 | 0 | DISPLAY DATA AND PARAMETER WRITE | | | | | | | | | | | | | | | | | |
| | | | 1 | 1 | 0 | COMMAND WRITE | | | | | | | | | | | | | | | | | |
| | | | 6800 FAMILY INTERFACE | | | | | | | | | | | | | | | | | | | | |
| | | | <table border="1"> <thead> <tr> <th>AO</th> <th>R / \overline{W}</th> <th>E</th> <th>FUNCTION</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>1</td> <td>STATUS FLAG READ</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>DISPLAY DATA AND CURSOR ADDRESS READ</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>DISPLAY DATA AND PARAMETER WRITE</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>COMMAND WRITE</td> </tr> </tbody> </table> | AO | R / \overline{W} | E | FUNCTION | 0 | 1 | 1 | STATUS FLAG READ | 1 | 1 | 1 | DISPLAY DATA AND CURSOR ADDRESS READ | 0 | 0 | 1 | DISPLAY DATA AND PARAMETER WRITE | 1 | 0 | 1 | COMMAND WRITE |
| | | | AO | R / \overline{W} | E | FUNCTION | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | STATUS FLAG READ | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | DISPLAY DATA AND CURSOR ADDRESS READ | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | DISPLAY DATA AND PARAMETER WRITE | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | COMMAND WRITE | | | | | | | | | | | | | | | | | | | | |
| 5 | $\overline{WR}, R / \overline{W}$ | H/L | 8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW WRITE STROBE . 6800 FAMILY INTERFACE ACTS AS THE READ/ WRITE CONTROL SIGNAL . | | | | | | | | | | | | | | | | | | | | |
| 6 | \overline{RD}, E | H/L | 8080 FAMILY INTERFACE ACTS AS THE ACTIVE-LOW READ STROBE . 6800 FAMILY INTERFACE ACTS AS THE ACTIVE-HIGH ENABLE CLOCK . | | | | | | | | | | | | | | | | | | | | |
| 7 ∧ 14 | D0 ∧ D7 | H/L | DISPLAY DATA | | | | | | | | | | | | | | | | | | | | |
| 15 | \overline{CS} | H/L | CHIP SELECT | | | | | | | | | | | | | | | | | | | | |
| 16 | \overline{RST} | H/L | RESET | | | | | | | | | | | | | | | | | | | | |
| 17 | VEE | — | POWER SUPPLY FOR LCD DRIVING | | | | | | | | | | | | | | | | | | | | |
| 18 | SEL1 | H/L | 8080 OR 6800 FAMILY INTERFACE SELECT , H:6800 , L:8080 | | | | | | | | | | | | | | | | | | | | |
| 19 20 | NC | — | NOT USE | | | | | | | | | | | | | | | | | | | | |
| 21,23 | VLED | — | POWER SUPPLY FOR LED BACKLIGHT (A) | | | | | | | | | | | | | | | | | | | | |
| 22,24 | VLSS | — | POWER SUPPLY FOR LED BACKLIGHT (K) | | | | | | | | | | | | | | | | | | | | |

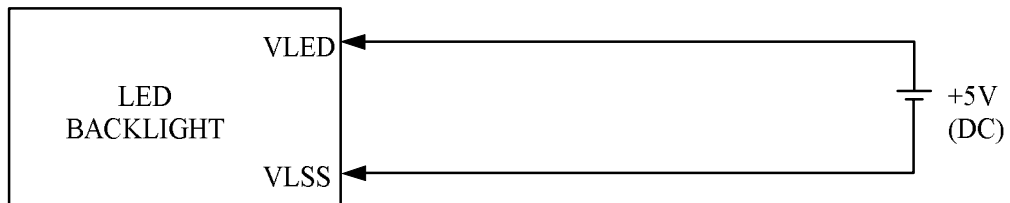
10. POWER SUPPLY

10.1 POWER SUPPLY FOR LCM



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

10.2 POWER SUPPLY FOR LED BACK - LIGHT



10.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

