

| Specification |      |                   |      |      |
|---------------|------|-------------------|------|------|
| Part Number:  |      | MC128064B6W-FPTLR |      |      |
| Version:      |      | 1                 |      |      |
| Date:         |      | 01/04/2012        |      |      |
| Revision      |      |                   |      |      |
| No.           | Date | Description       | Item | Page |
|               |      |                   |      |      |

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  - 4.1: providing quick reference when you are judging whether or not the product meets your requirements.
  - 4.2: listing out definitely the tolerance.

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5. The sequence of the icons is random and doesn't indicate the importance grade.
6. Icons explanation

Midas 2006 version logo. Midas is an integrated manufacturer of flat panel display (FPD). Midas supplies TN, HTN, STN, FSTN monochrome LCD panel; COB, COG, TAB LCD module; and all kinds of LED backlight.



#### FAST RESPONSE TIME

This icon on the cover indicates the product is with high response speed; Otherwise not.



#### PROTECTION CIRCUIT

This icon on the cover indicates the product is with protection circuit; Otherwise not.



#### HIGH CONTRAST

This icon on the cover indicates the product is with high contrast; Otherwise not.



#### LONG LIFE VERSION

This icon on the cover indicates the product is long life version (over 9K hours guaranteed); Otherwise not.



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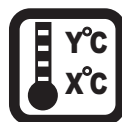
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#### RoHS COMPLIANCE

This icon on the cover indicates the product meets ROHS requirements; Otherwise not.



#### OPERATION TEMPERATURE RANGE

This icon on the cover indicates the operating temperature range (X-Y).



#### 3TIMES 100% QC EXAMINATION

This icon on the cover indicates the product has passed Midas thrice 100% QC. Otherwise not.



#### TWICE SELECTION OF LED MATERIALS

This icon on the cover indicates the LED had passed Midas twice strict selection which promises the product's identical color and brightness; Otherwise not.



#### V1cm = 3.0V

This icon on the cover indicates the product can work at 3.0V exactly; otherwise not.



#### N SERIES TECHNOLOGY (2008 developed)

New structure, new craft, new technology and new materials inside both LCD module and LCD panel to improve the "RainBow"

# Midas LCD Part Number System

| MC | COG | 132033 | A | * | 6 | W | * | * | - | S  | N  | T  | L  | W  | *  | *  |
|----|-----|--------|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| 1  | 2   | 3      | 4 | 5 | 6 | 7 | 8 | 9 | - | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

1 = **MC:** Midas Components

2 = **Blank:** COB (chip on board) **COG:** chip on glass

3 = **No of dots** (e.g. 240064 = 240 x 64 dots) (e.g. 21605 = 2 x 16 5mm C.H.)

4 = **Series**

5 = **Series Variant:** A to Z – see addendum

6 = **3:** 3 o'clock **6:** 6 o'clock **9:** 9 o'clock **12:** 12 o'clock

7 = **S:** Normal (0 to + 50 deg C) **W:** Wide temp. (-20 to + 70 deg C) **X:** Extended temp (-30 + 80 Deg C)

8 = **Character Set**

**Blank:** Standard (English/Japanese)

**C:** Chinese Simplified (Graphic Displays only)

**CB:** Chinese Big 5 (Graphic Displays only)

**H:** Hebrew

**K:** European (std) (English/German/French/Greek)

**L:** English/Japanese (special)

**M:** European (English/Scandinavian)

**R:** Cyrillic

**W:** European (English/Greek)

**U:** European (English/Scandinavian/Icelandic)

9 = **Bezel Height** (where applicable /available)

|              | Top of Bezel to Top of PCB | LED Connection Common (via pins 1 and 2)<br>via pins 15+ 16- | Array or Edge Lit |
|--------------|----------------------------|--|-------------------|
| <b>Blank</b> | 9.5mm / not applicable     |  | Array             |
| <b>2</b>     | 8.9 mm                     | Common   | Array             |
| <b>3</b>     | 7.8 mm                     | Separate   | Array             |
| <b>4</b>     | 7.8 mm                     | Common   | Array             |
| <b>5</b>     | 9.5 mm                     | Separate   | Array             |
| <b>6</b>     | 7 mm                       | Common   | Array             |
| <b>7</b>     | 7 mm                       | Separate   | Array             |
| <b>8</b>     | 6.4 mm                     | Common   | Edge              |
| <b>9</b>     | 6.4 mm                     | Separate   | Edge              |
| <b>A</b>     | 5.5 mm                     | Common   | Edge              |
| <b>B</b>     | 5.5 mm                     | Separate   | Edge              |
| <b>D</b>     | 6.0mm                      | Separate   | Edge              |
| <b>E</b>     | 5.0mm                      | Separate   | Edge              |
| <b>F</b>     | 4.7mm                      | Common   | Edge              |
| <b>G</b>     | 3.7mm                      | Separate   | EL                |
| <b>H</b>     | 7 mm                       | Separate   | Edge              |

10 = **T:** TN **S:** STN **B:** STN Blue **G:** STN Grey **F:** FSTN **F2:** FFSTN **V:** VA (Vertically Aligned)

11 = **P:** Positive **N:** Negative

12 = **R:** Reflective **M:** Transmissive **T:** Transflective

13 = **Backlight:** **Blank:** Reflective **L:** LED

14 = **Backlight Colour:** **Y:** Yellow-Green **W:** White **B:** Blue **R:** Red **A:** Amber **O:** Orange **G:** Green **RGB:** R.G.B.

15 = **Driver Chip:** **Blank:** Standard **I:** I<sup>2</sup>C **S:** SPI **T:** Toshiba T6963C **A:** Avant SAP1024B **R:** Raio RA6963

16 = **Voltage Variant:** e.g. **3** = 3v

|                                      |         |
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## 1. GENERAL SPECIFICATIONS

| ITEM                      | NOMINAL DIMENSIONS / AVAILABLE OPTIONS |
|---------------------------|--|
| DISPLAY FORMAT            | 128 X 64 DOT MATRIX                    |
| LCD PANEL OPTIONS         | FSTN (Silver-gray color)               |
| POLARIZER OPTIONS         | Positive, Transflective                |
| BACKLIGHT OPTIONS         | Array type LED backlight (Red color)   |
| VIEWING ANGLE OPTIONS     | 6:00 ( Bottom )                        |
| TEMPERATURE RANGE OPTIONS | Wide temp. range ( -20°C ~ 70°C )      |
| CONTROLLER IC             | NT7107C+NT7108C                        |
| NEGATIVE IC               | Built in                               |
| DISPLAY DUTY              | 1/64                                   |
| DRIVING BIAS              | 1/9                                    |

## 2. MECHANICAL SPECIFICATIONS

|                  |  |    |                  |               |    |
|------------------|--|----|------------------|---------------|----|
| OVERALL SIZE     | LED backlight version : 78.0 x 70.0 x max 15.0 |    |                  |               | mm |
| VIEWING AREA     | 62.0W x 44.0H                                  | mm | HOLE-HOLE        | 68.0W x 65.0H | mm |
| DOT SIZE         | 0.40W x 0.56H                                  | mm | DOT PITCH        | 0.04W x 0.04H | mm |
| WEIGHT (W/O BKL) | 55.0   | g  | WEIGHT (LED BKL) | 78.0          | g  |

## 3. ABSOLUTE MAXIMUM RATINGS

| ITEM                  | SYMBOL | CONDITION | MIN       | MAX      | UNIT |
|-----------------------|--------|-----------|-----------|----------|------|
| POWER SUPPLY ( LOGIC) | Vdd    | 25°C      | -0.3      | 7.0      | V    |
| POWER SUPPLY (LCD)    | V0     | 25°C      | Vdd -19.0 | Vdd +0.3 | V    |
| INPUT VOLTAGE         | Vin    | 25°C      | -0.3      | Vdd +0.3 | V    |
| OPERATING TEMPERATURE | Vopr   | —         | -20       | 70       | °C   |
| STORAGE TEMPERATURE   | Vstg   | —         | -30       | 80       | °C   |

## 4. ELECTRONICAL CHARACTERISTIC\*

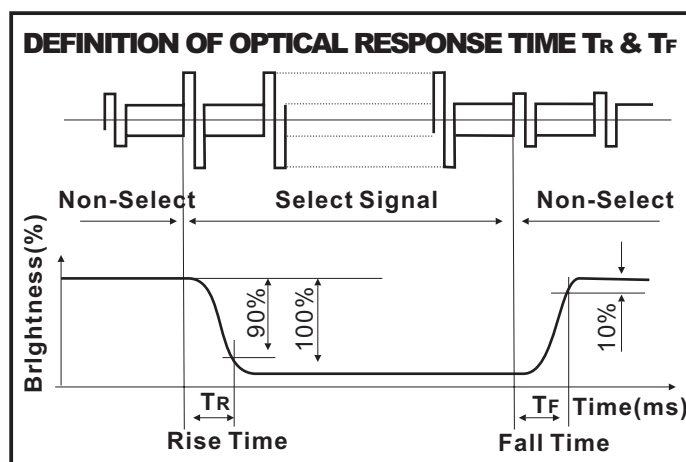
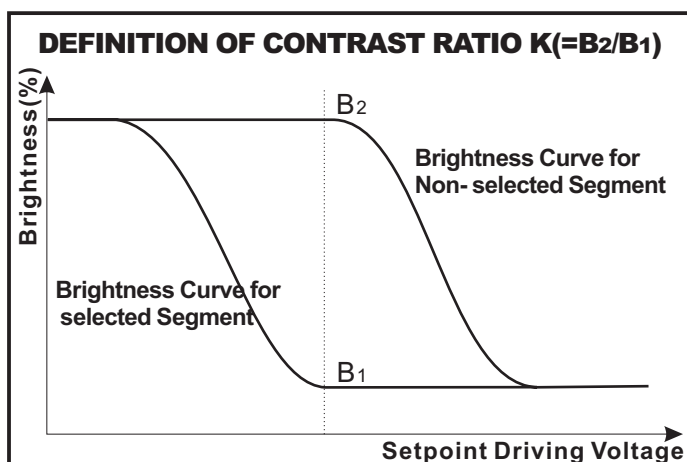
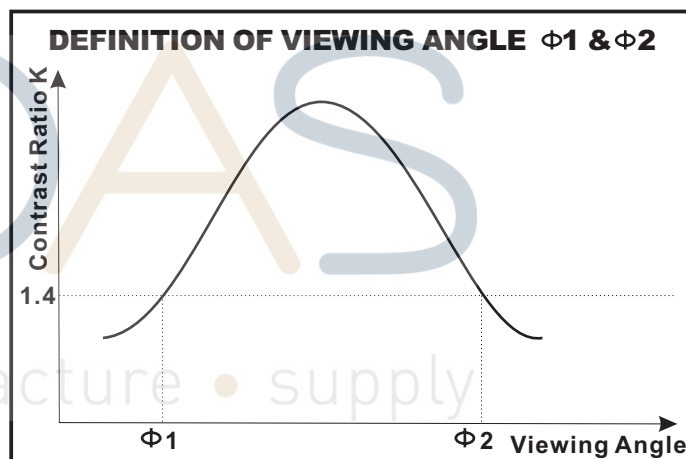
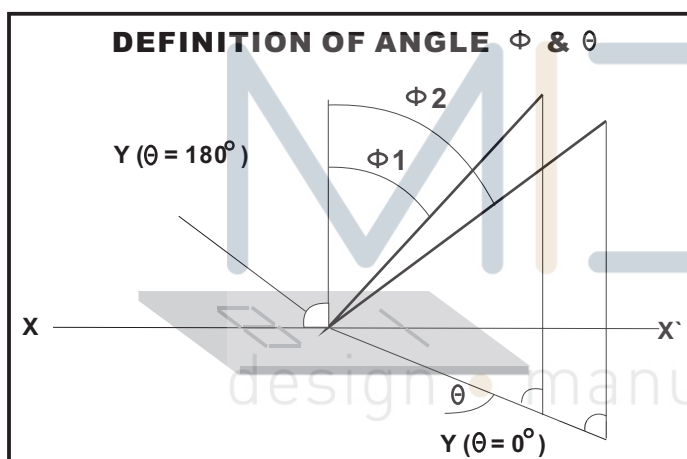
| ITEM  | SYMBOL   | CONDITION       | STANDARD |      |      | UNIT              |
|---|----------|-----------------|----------|------|------|-------------------|
|   |          |                 | MIN      | TYP  | MAX  |                   |
| Input voltage   | Vdd      | +5V             | 2.7      | 5.0  | 5.5  | V                 |
| Supply current  | Idd      | Vdd=5V          | —        | 2.1  | —    | mA                |
| Recommended LCD driving voltage for normal temp. Version module | Vdd - V0 | -20°C           | 8.40     | —    | 8.90 | V                 |
|   |          | 0°C             | 8.10     | —    | 8.55 |                   |
|   |          | 25°C            | 8.00     | 8.20 | 8.40 |                   |
|   |          | 50°C            | 7.90     | —    | 8.30 |                   |
|   |          | 70°C            | 7.75     | —    | 8.10 |                   |
| LED forward voltage   | Vf       | 25°C            | 3.6      | —    | 4.4  | V                 |
| LED forward current   | If       | 25°C            | —        | 240  | —    | mA                |
| LED reverse Current   | Ir       | 25°C            | —        | —    | 240  | μA                |
| LED Peak wave length  | λp       | 25°C If = 240mA | 620      | —    | 630  | nm                |
| LED illuminance (Without LCD)                                   | Lv       | 25°C If = 240mA | —        | —    | —    | cd/m <sup>2</sup> |
| LED life time   | —        | 25°C If = 240mA | 70K**    | —    | —    | Hours             |

\* The above data are for reference only.

## 5. OPTICAL CHARACTERISTIC

| FOR TN TYPE LCD MODULE ( $T_A=25^{\circ}\text{C}$ , $V_{dd}=5.0\text{V} \pm 0.25\text{V}$ ) |                   |           |     |     |     |      |
|---|-------------------|-----------|-----|-----|-----|------|
| ITEM  | SYMBOL            | CONDITION | MIN | TYP | MAX | UNIT |
| VIEWING ANGLE   | $\Phi 2 - \Phi 1$ | K=4       | 30  | —   | —   | deg  |
|   | $\theta$          |           | 25  |     |     |      |
| CONTRAST RATIO  | K                 | —         | —   | 2   | —   | —    |
| RESPONSE TIME(RISE)   | $T_R$             | —         | —   | 120 | 150 | ms   |
| RESPONSE TIME(FALL)   | $T_F$             | —         | —   | 120 | 150 | ms   |

| FOR STN TYPE LCD MODULE ( $T_A=25^{\circ}\text{C}$ , $V_{dd}=5.0\text{V} \pm 0.25\text{V}$ ) |                   |           |     |     |     |      |
|--|-------------------|-----------|-----|-----|-----|------|
| ITEM   | SYMBOL            | CONDITION | MIN | TYP | MAX | UNIT |
| VIEWING ANGLE  | $\Phi 2 - \Phi 1$ | K=4       | 40  | —   | —   | deg  |
|  | $\theta$          |           | 60  |     |     |      |
| CONTRAST RATIO   | K                 | —         | —   | 6   | —   | —    |
| RESPONSE TIME(RISE)  | $T_R$             | —         | —   | 150 | 250 | ms   |
| RESPONSE TIME(FALL)  | $T_F$             | —         | —   | 150 | 250 | ms   |



## 6. DC CHARACTERISTIC

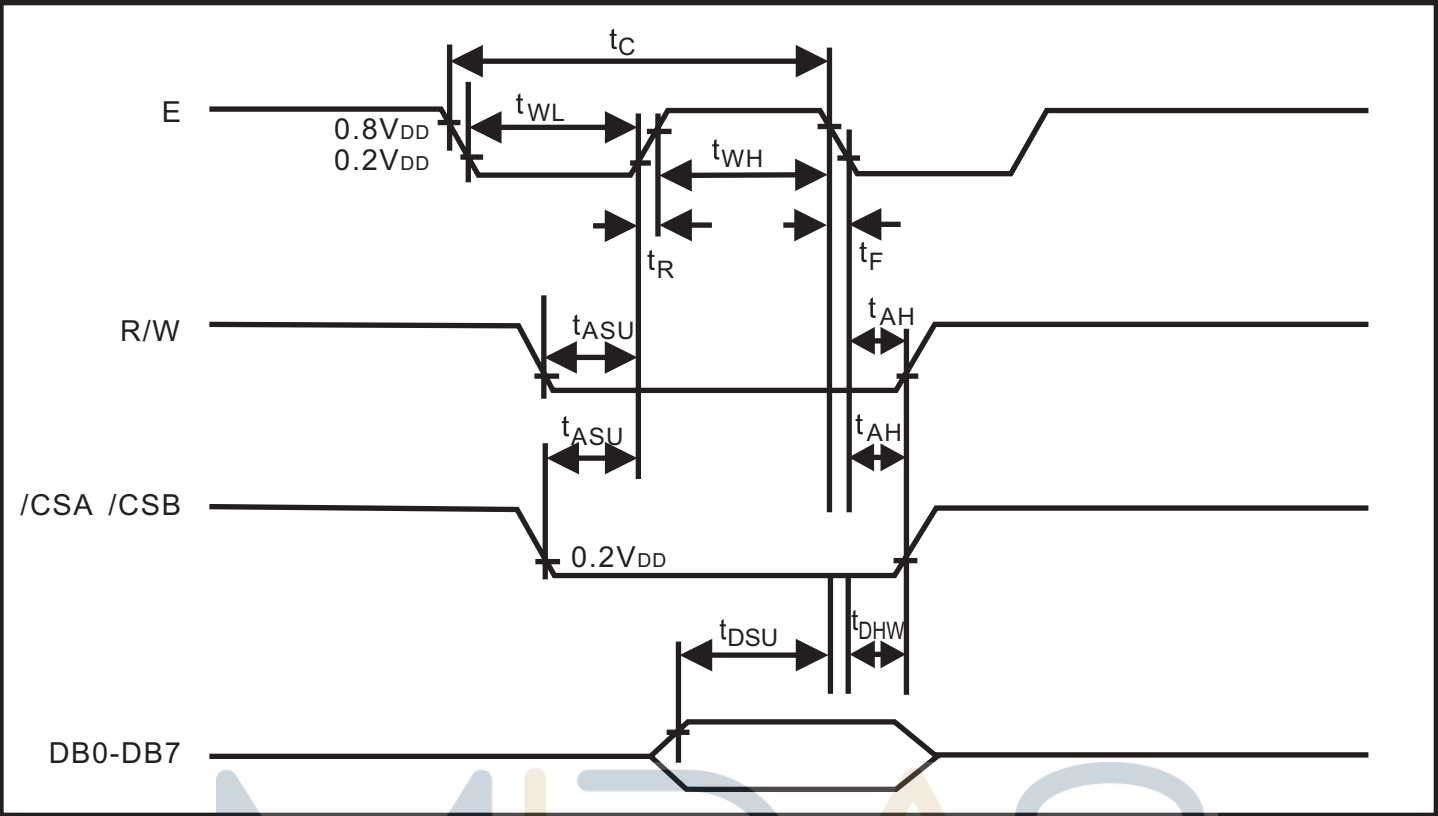
(Unless otherwise stated, VDD= +5V ± 10%, VSS=0V, Ta=25°C)

| Parameter                       | Symbol | Condition                             | Min.   | Typ. | Max.   | Unit    |
|---------------------------------|--------|---------------------------------------|--------|------|--------|---------|
| High Level Input Voltage        | VIH1   | ---                                   | 0.7VDD | ---  | VDD    | V       |
|                                 | VIH2   | ---                                   | 0.7VDD | ---  | VDD    | V       |
| Low Level Input Voltage         | VIL1   | ---                                   | 0      | ---  | 0.3VDD | V       |
|                                 | VIL2   | ---                                   | 0      | ---  | 0.8    | V       |
| High Level Output Voltage       | VOH    | IOH = - 200 $\mu$ A                   | 2.4    | ---  | ---    | V       |
| Low Level Output Voltage        | VOL    | IOL = 1.6 mA                          | ---    | ---  | 0.4    | V       |
| Input Leakage Current           | ILKG   | VIN = VDD to VSS                      | -1.0   | ---  | 1.0    | $\mu$ A |
| Three-State (OFF) Input Current | ITSL   | VIN = VDD to VSS                      | -5.0   | ---  | 5.0    | $\mu$ A |
| Operating Current               | IDD1   | During Display                        | ---    | ---  | 100    | $\mu$ A |
|                                 | IDD2   | During Access,<br>Access Cycle = 1MHz | ---    | ---  | 500    | $\mu$ A |

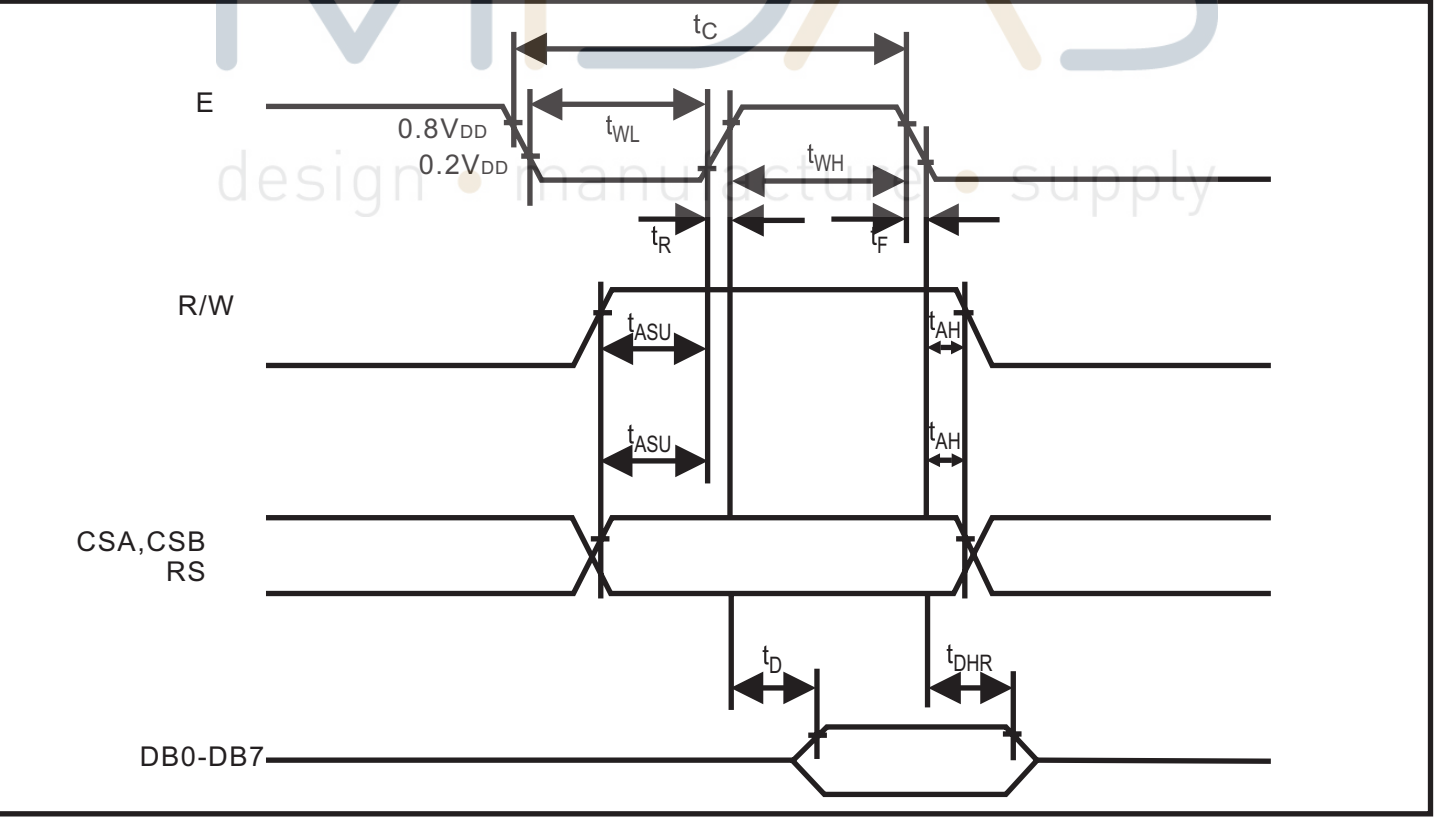
## 7. AC CHARACTERISTIC

| Characteristic         | Symbol           | Min  | Typ | Max | Unit |
|------------------------|------------------|------|-----|-----|------|
| E Cycle                | t <sub>C</sub>   | 1000 | —   | —   | ns   |
| E High Level Width     | t <sub>WH</sub>  | 450  | —   | —   | ns   |
| E Low Level Width      | t <sub>WL</sub>  | 450  | —   | —   | ns   |
| E Rise Time            | t <sub>R</sub>   | —    | —   | 25  | ns   |
| E Fall Time            | t <sub>F</sub>   | —    | —   | 25  | ns   |
| Address Setup Time     | t <sub>ASU</sub> | 140  | —   | —   | ns   |
| Address Hold Time      | t <sub>AH</sub>  | 10   | —   | —   | ns   |
| Data Setup Time        | t <sub>DSU</sub> | 200  | —   | —   | ns   |
| Data Delay Time        | t <sub>D</sub>   | —    | —   | 320 | ns   |
| Data Hold Time (Write) | t <sub>DHW</sub> | 10   | —   | —   | ns   |
| Data Hold Time (Read)  | t <sub>DHR</sub> | 20   | —   | —   | ns   |

7.1 WRITE MODE TIMING DIAGRAM

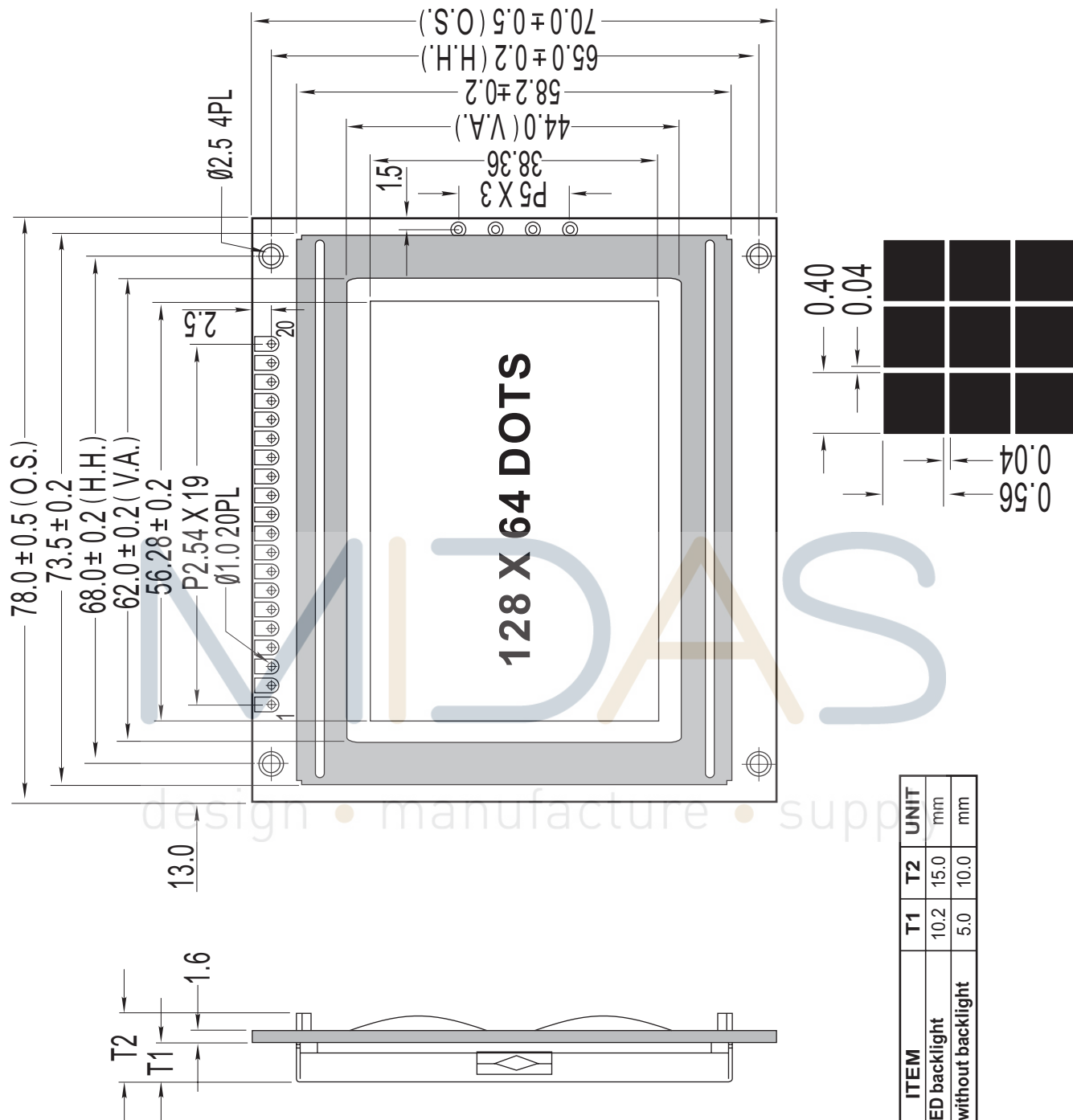


7.2 READ MODE TIMING DIAGRAM





8.EXTERNAL DIMENSIONS

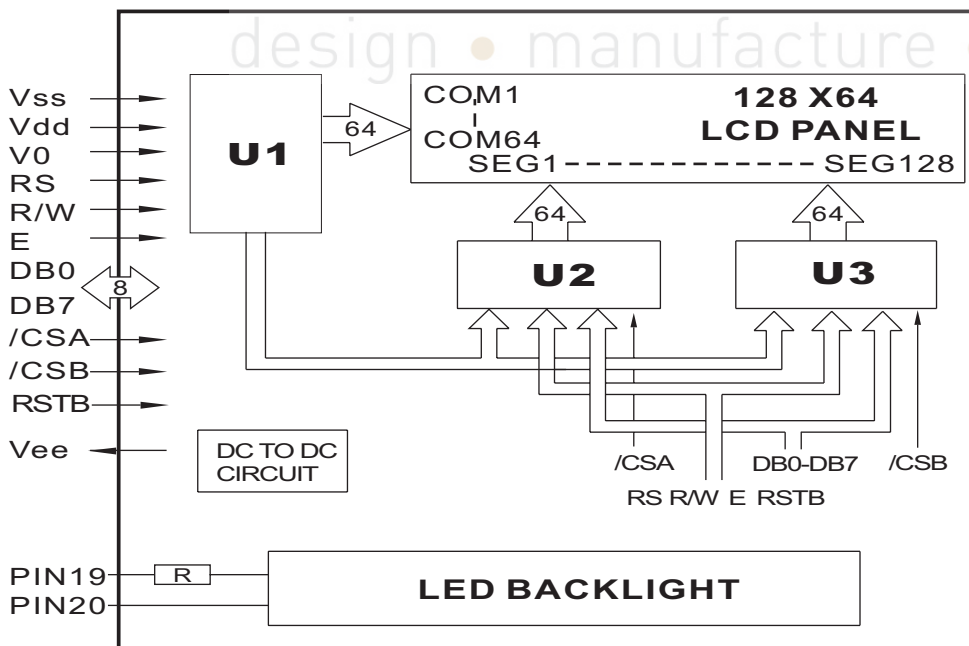


| ITEM                    | T1   | T2   | UNIT |
|-------------------------|------|------|------|
| LED backlight           | 10.2 | 15.0 | mm   |
| EL or without backlight | 5.0  | 10.0 | mm   |

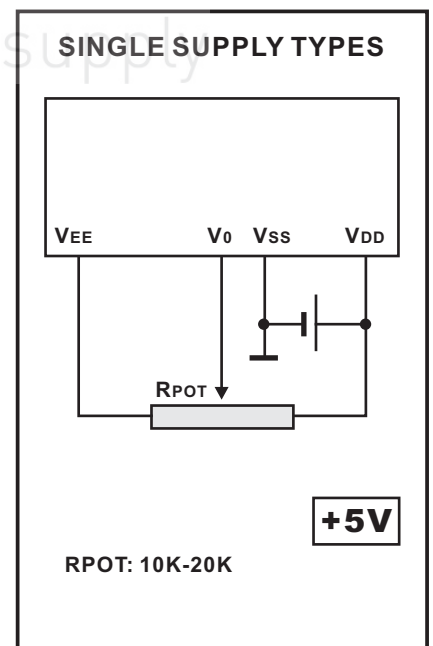
## 9. PIN ASSIGNMENT

| PIN NO. | SYMBOL | FUNCTION                      | REMARK          |
|---------|--------|-------------------------------|-----------------|
| 1       | /CSA   | When /CSA=L,/CSB=H, select U2 |                 |
| 2       | /CSB   | When /CSB=L,/CSA=H, select U3 |                 |
| 3       | Vss    | Power Supply                  | 0V              |
| 4       | Vdd    |                               | +5V             |
| 5       | V0     |                               | Contrast Adjust |
| 6       | RS     | Register select signal        |                 |
| 7       | R/W    | Read / Write                  |                 |
| 8       | E      | Chip Enable signal            |                 |
| 9       | DB0    | Data Bit 0                    |                 |
| 10      | DB1    | Data Bit 1                    |                 |
| 11      | DB2    | Data Bit 2                    |                 |
| 12      | DB3    | Data Bit 3                    |                 |
| 13      | DB4    | Data Bit 4                    |                 |
| 14      | DB5    | Data Bit 5                    |                 |
| 15      | DB6    | Data Bit 6                    |                 |
| 16      | DB7    | Data Bit 7                    |                 |
| 17      | RSTB   | Reset signal                  |                 |
| 18      | Vee    | Negative voltage output       |                 |
| 19      | LED+   | Anode of LED Unit             | 5.0V            |
| 20      | LED-   | Cathode of LED Unit           | 0V              |

## 10. BLOCK DIAGRAM



## 11. POWER SUPPLY



## 12. FUNCTIONAL DESCRIPTION

### 12.1 RESET

The system can be initialized by setting the RSTB to LOW when turning the power ON or by instruction from the MPU. When the RSTB is set to LOW, the following condition occurs:

1. The Display is turned OFF.
2. The Display Start Line register is set to 0 (Z-Address 0).

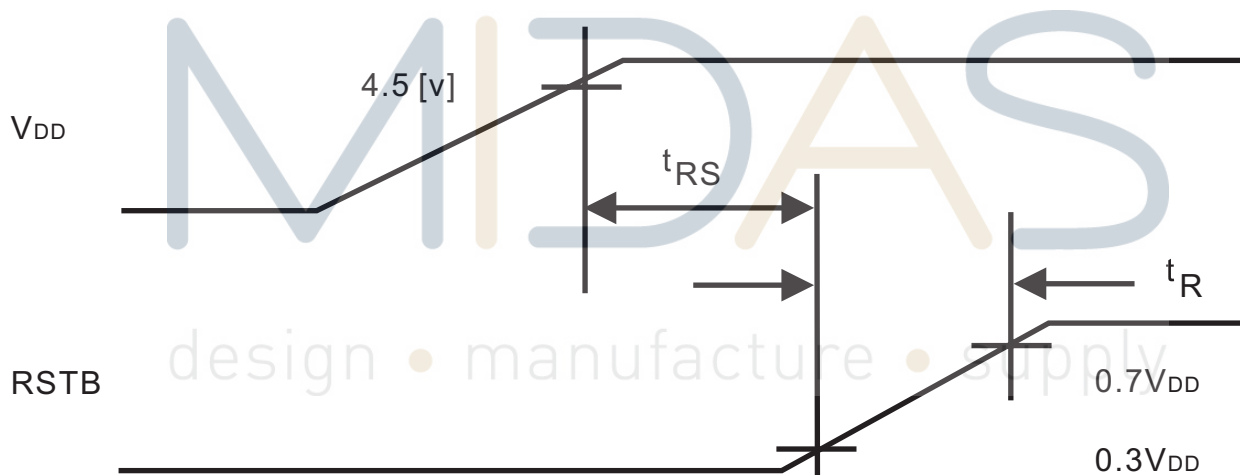
No instructions except the status read can be executed when the RSTB is LOW. This means that order to execute other instructions, the RSTB must be cleared by setting DB4 to 0 and the DB7 status read instruction.

The table below shows the power supply initial conditions.

in  
set to 0

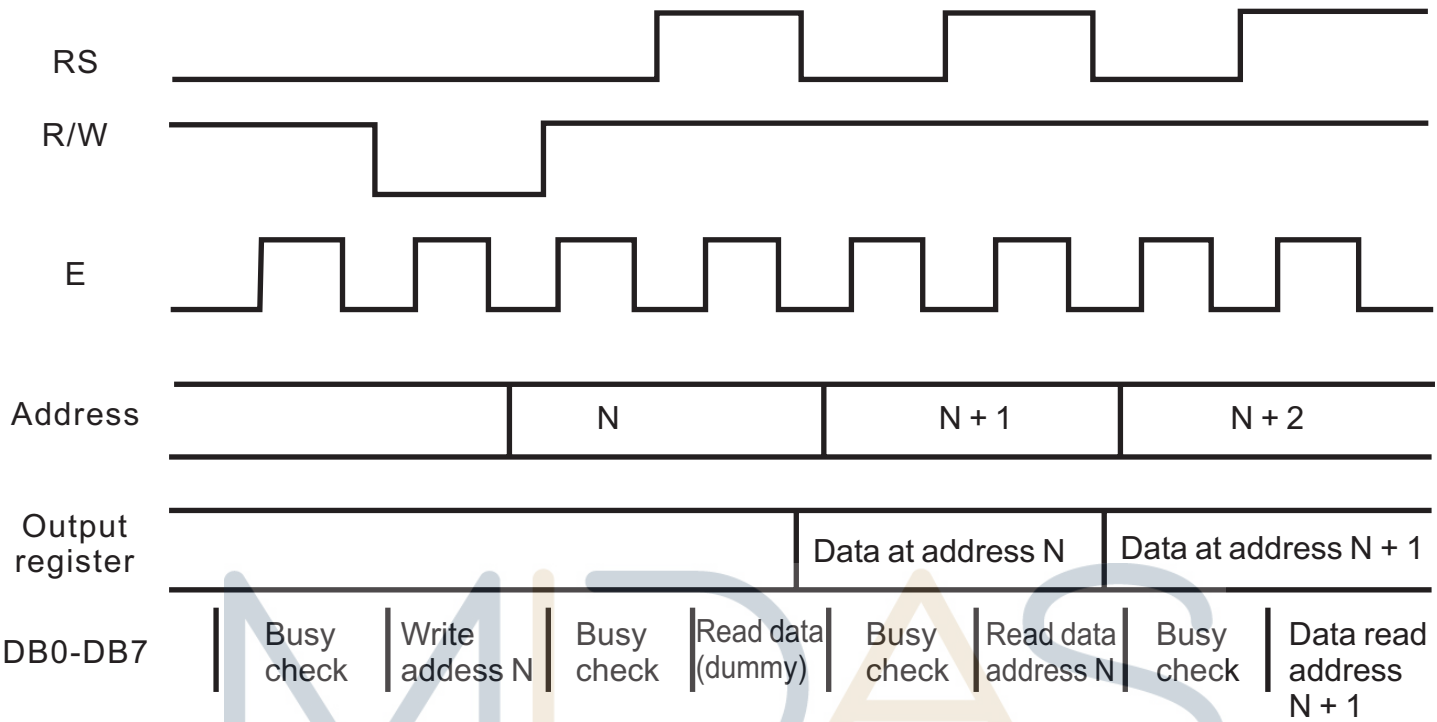
by

| Parameter  | Symbol   | Min. | Typ. | Max. | Unit    |
|------------|----------|------|------|------|---------|
| Reset Time | $t_{RS}$ | 1.0  | -    | -    | $\mu S$ |
| Rise Time  | $t_R$    | -    | -    | 200  | nS      |

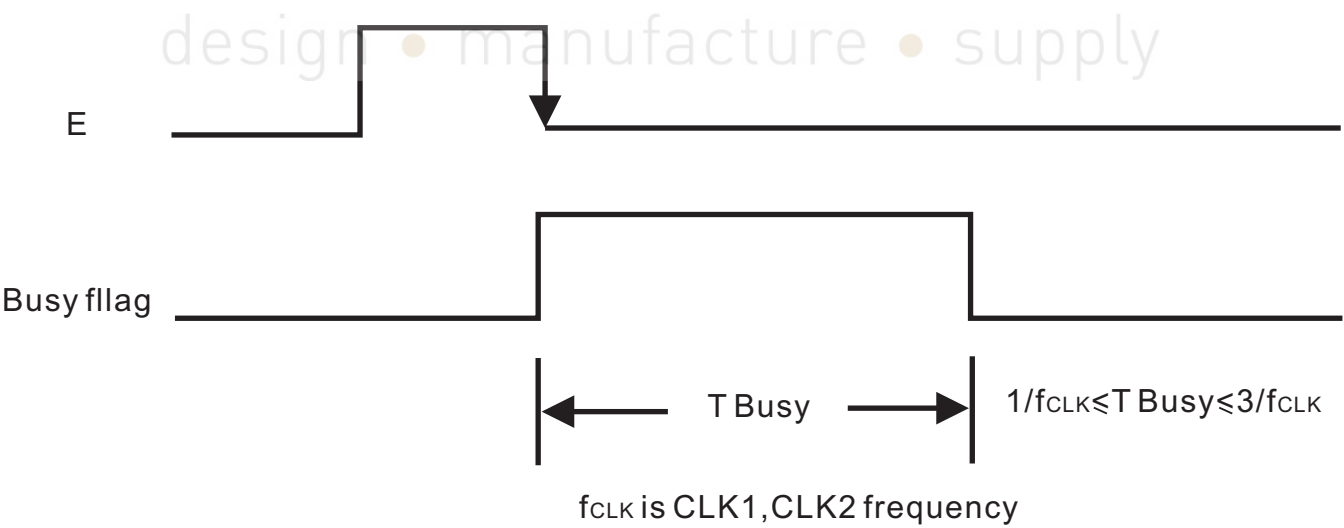


12.2 BUSY FLAG

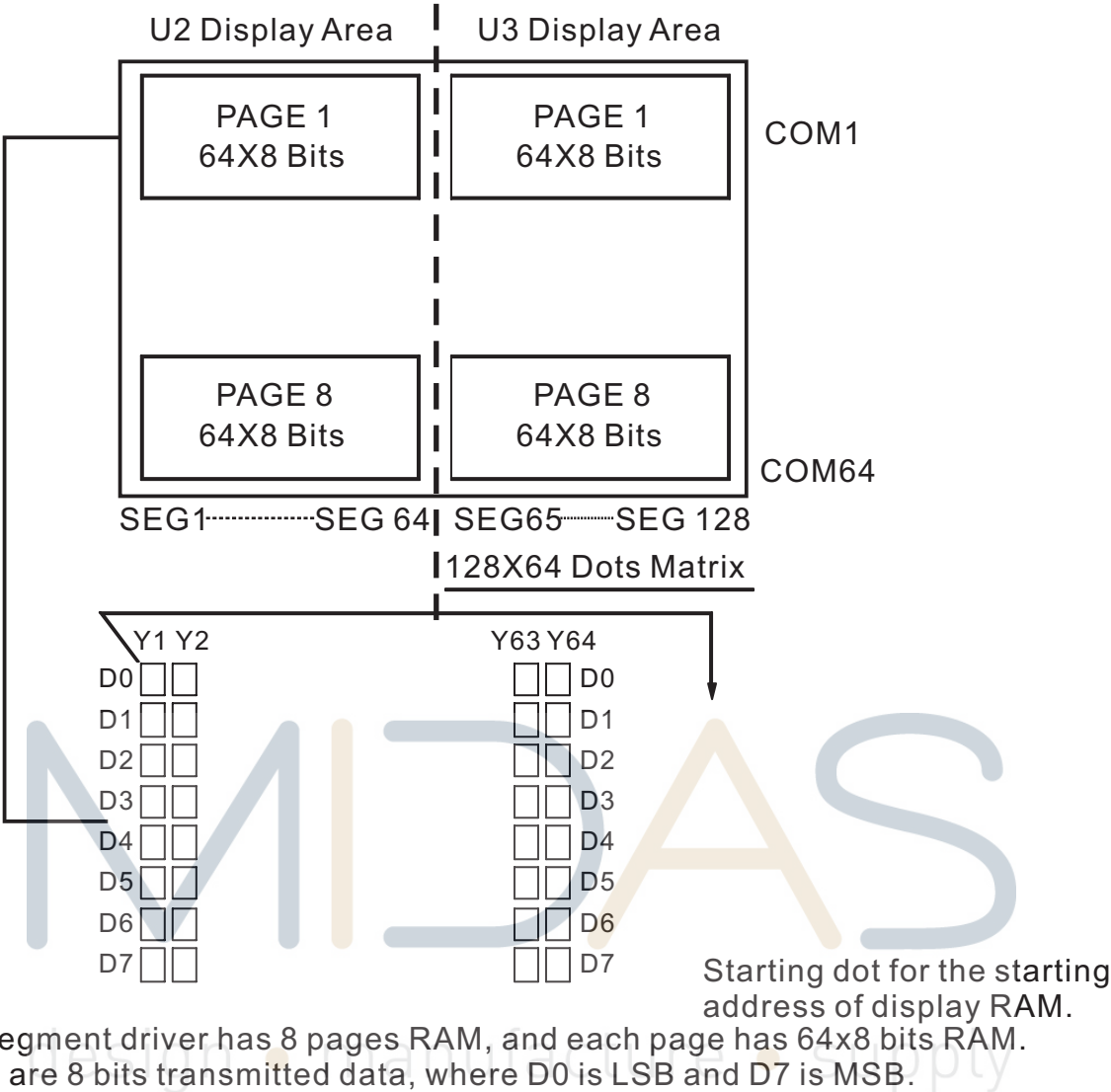
The busy flag (DB7) is used to determine whether Nt7108 is operating or not. When the busy flag is HIGH, internal operation is taking place. When the busy flag is LOW, Nt7108 can accept data or instructions. The busy check diagram is shown below.



The busy flag diagram is shown below.



12.3 RELATION BETWEEN DISPLAY PATTERN AND DRIVERS



12.4 DISPLAY DATA RAM

The Display Data RAM is used to store the display data for the liquid crystal display. Write data 1 indicates an ON State of the LCDs dot matrix while the OFF State is written as 0. ADC Signal can control the Display Data RAM and the segment output. Please refer to the table below.

| ADC * | Display Data                       |
|-------|------------------------------------|
| H     | Y-Address 0:S1 to Y-Address 63:S64 |

is

### 13. INSTRUCTION

| Instruction                    | RS | R/W | DB7              | DB6 | DB5                        | DB4                   | DB3 | DB2        | DB1 | DB0 | Function   |
|--------------------------------|----|-----|------------------|-----|----------------------------|-----------------------|-----|------------|-----|-----|--|
| Display ON/OFF                 | L  | L   | L                | L   | H                          | H                     | H   | H          | H   | L/H | Controls the display on or off. Internal status and display RAM data is not affected.<br>L:OFF H:ON            |
| Set address (Y address)        | L  | L   | L                | H   | Y address (0~63)           |                       |     |            |     |     | Sets the Y address in the Y address counter.   |
| Set Page (X address)           | L  | L   | H                | L   | H                          | H                     | H   | Page (0~7) |     |     | Sets the X address at the X address register.  |
| Display Start Line (Z address) | L  | L   | H                | H   | Display start line (0~63)  |                       |     |            |     |     | Indicates the display data RAM displayed at the top of the screen.   |
| Status Read                    | L  | H   | B<br>U<br>S<br>Y | L   | O<br>N<br>/<br>O<br>F<br>F | R<br>E<br>S<br>E<br>T | L   | L          | L   | L   | BUSY<br>L:Ready<br>H:In operation<br>ON/OFF<br>L:Display ON<br>H:Display OFF<br>RESET<br>L:Normal<br>H:Reset   |
| Write Display Data             | H  | L   | Write Data       |     |                            |                       |     |            |     |     | Writes data (DB0:7) into display data RAM,After writing instruction,Y address is increased by 1 automatically. |
| Read Display Data              | H  | H   | Read Data        |     |                            |                       |     |            |     |     | Reads data (DB0:7) from display data RAM to the data bus.  |

## 14. DESCRIPTION OF COMMAND

### Display On/Off

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0   | 0   | 0   | 1   | 1   | 1   | 1   | 1   | D   |

The display data appears when D is 1 and disappears when D is 0.

Though the data is not on the screen with D=0, it remains in the display data RAM.

Therefore, you can make it appear by changing D=0 into D=1.

### Set Address(Y Address)

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0   | 0   | 1   | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |

Y address (AC0-AC5) of the display data RAM is set in the Y address counter.

An address is set by instruction and increased by 1 automatically by read or write operations of display data.

### Set Page(X Address)

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0   | 1   | 0   | 1   | 1   | 1   | AC2 | AC1 | AC0 |

X address (AC0-AC2) of the display data RAM is set in the X address register.

Writing or reading to or from MPU is executed in this specified page until the next page is set.

### Display Start Line(Z Address)

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | 0   | 1   | 1   | AC5 | AC4 | AC3 | AC2 | AC1 | AC0 |

Z address (AC0-AC5) of the display data RAM is set in the display start line register and displayed at the top of the screen.

When the display duty cycle is 1/64 or others(1/32-1/64), the data of total line number of LCD screen, from the line specified by display start line instruction, is displayed.

## Status Read

| RS | R/W | DB7  | DB6 | DB5    | DB4   | DB3 | DB2 | DB1 | DB0 |
|----|-----|------|-----|--------|-------|-----|-----|-----|-----|
| 0  | 1   | BUSY | 0   | ON/OFF | RESET | 0   | 0   | 0   | 0   |

- **BUSY**

When BUSY is 1, the Chip is executing internal operation and no instructions are accepted.

When BUSY is 0, the Chip is ready to accept any instructions.

- **ON/OFF**

When ON/OFF is 1, the display is off.

When ON/OFF is 0, the display is on.

- **RESET**

When RESET is 1, the system is being initialized.

In this condition, no instructions except status read can be accepted.

When RESET is 0, initializing has finished and the system is in the usual operation condition.

## Write Display Data

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1  | 0   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  |

Writes data (D0-D7) into the display data RAM.

After writing instruction, Y address is increased by 1 automatically.

## Read Display Data

| RS | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1  | 1   | D7  | D6  | D5  | D4  | D3  | D2  | D1  | D0  |

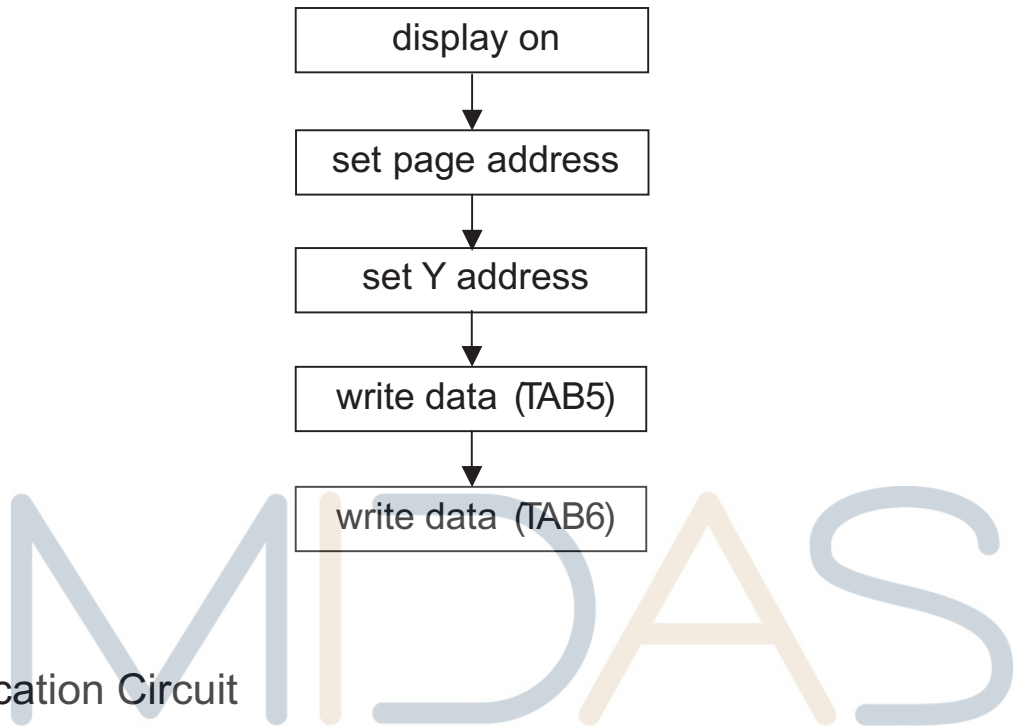
Reads data (D0-D7) from the display data RAM.

After reading instruction, Y address is increased by 1 automatically.

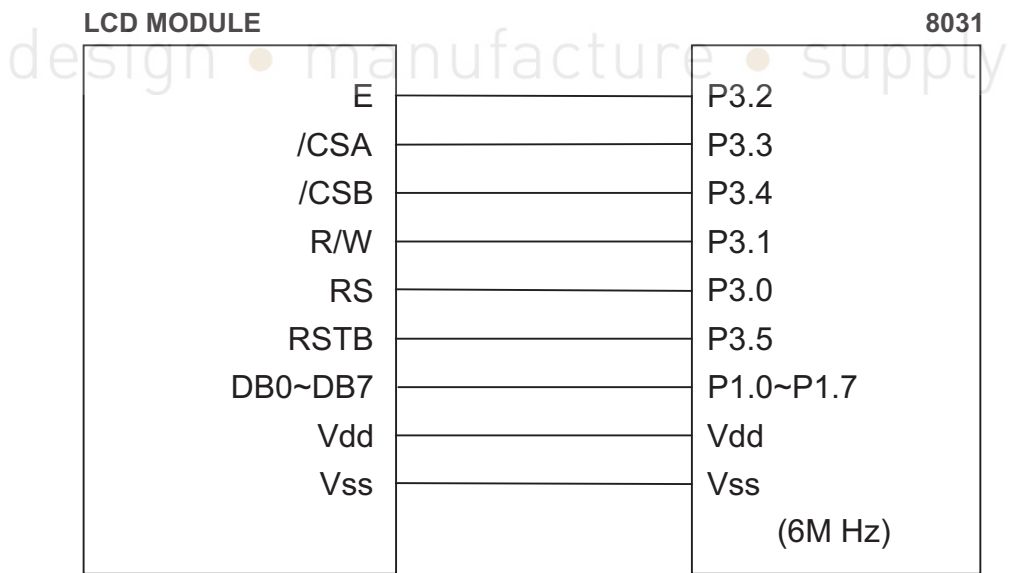


15. APPLICATION EXAMPLE

Application Flowchart



Application Circuit



16. PACKING DETAIL

| WITH LED BKL                | WITHOUT LED BKL             |
|-----------------------------|-----------------------------|
| 30 PCS/BOX                  | 30 PCS/BOX                  |
| 8 BOXES/CARTON              | 8 BOXES/CARTON              |
| 240 PCS/CARTON              | 240 PCS/CARTON              |
| 19.00 KGS/CTN(G.W.)         | 17.00 KGS/CTN(G.W.)         |
| 0.07 M <sup>3</sup> /CARTON | 0.07 M <sup>3</sup> /CARTON |

| NOTE   |
|--|
| 1. The weight is estimated for reference only.   |
| 2. Packing detail may be changed without notice. |
|  |
|  |
|  |

