	DOC.	DATASHEET STATEMENT

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No one else is allowed to adopt these icons without Midas approval.

2. The ISO9001 logo used in this document is authorized by SGS (www.sgs.com). Midas had already successfully passed the strict and professional ISO9001:2000 Quality Management System Certification and got the certificate (No.: CN07/00404)

3. The technologies/techniques/crafts which denoted by the following icons are not exclusively owned by Midas, but also shared by Midas LCD strategic cooperators, however all these technologies/techniques/crafts have been finally confirmed by Midas professional engineers and QC department.

4. As the difference in test standard and test conditions, also Midas insufficient familiarity with the actual LCD using environment, all the referred information in this DATASHEET (including the icons) only have two functions:
4.1: providing quick reference when you are judging whether or not the product meets your requirements.
4.2: listing out definitely the tolerance.

SAMPLE APPROVAL document rather than consider this DATASHEET as the standard for judging whether or not the LCD meets your requirements. Once you instruct Midas to a mass-production without definite demand for providing sample before, Midas will disclaim all responsibility if the mass-production is proved not meeting with your requirements.

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.

WIDE VIEWING SCOPE
This icon on the cover indicates the product is with wide viewing scope; Otherwise not.

Anti UV VERSION
This icon on the cover indicates the product is against UV line. Otherwise not.

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.

VIcm = 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

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	Common (via pins 1 and 2)	Array or Edge Lit
Blank	9.5mm / not applicable	Common	Array
2	8.9 mm	Common	Array
3	7.8 mm	Separate	Array
4	7.8 mm	Common	Array
5	9.5 mm	Separate	Array
6	7 mm	Common	Array
7	7 mm	Separate	Array
8	6.4 mm	Common	Edge
9	6.4 mm	Separate	Edge
A	5.5 mm	Common	Edge
B	5.5 mm	Separate	Edge

10 = **T:** TN **S:** STN **B:** STN Blue **G:** STN Grey **F:** FSTN **F2:** FFSTN

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:** I²C

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

STANDARD DOC.	REVISION RECORD	PAGE	1/16

NO.	DATE	DESCRIPTION	ITEM	PAGE	APPROVED
1	2011.02	INITIAL ISSUED	ALL	ALL	

	STANDARD DOC.	CONTENTS	PAGE	2/16

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	Edge type LED backlight (White color)
VIEWING DIRECTION 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 :		75.0 x 52.7 x max 13.0		mm
VIEWING AREA	60.0W x 32.5H	mm	HOLE-HOLE	70.0W x 49.7H	mm
DOT SIZE	0.39W x 0.39H	mm	DOT PITCH	0.04W x 0.04H	mm
WEIGHT (EL BKL)	———	g	WEIGHT (LED BKL)	65.0	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	$^\circ$C
STORAGE TEMPERATURE	Vstg	———	-30	80	$^\circ$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	8.20	———	9.00	V
		0°C	8.10	———	8.70	
		25°C	8.00	8.30	8.60	
		50°C	7.80	———	8.50	
		70°C	7.65	———	8.30	
LED forward voltage	Vf	25°C	2.9	———	3.4	V
LED forward current	If	25°C	———	30	40	mA
LED reverse Current	Ir	25°C	———	10	———	µA
LED color range	X coordinate	25°C If = 30mA	0.25	———	0.28	———
	Y coordinate	25°C If = 30mA	0.26	———	0.29	———
LED illuminance (Without LCD)	Lv	25°C If = 30mA	120	———	190	cd/m^2
LED life time	———	25°C If = 30mA	9K**	———	———	Hours

* The above data are for reference only.

** The warranty period of FORDATA LCD module is 1YEAR counted from the date shown on the label of products.
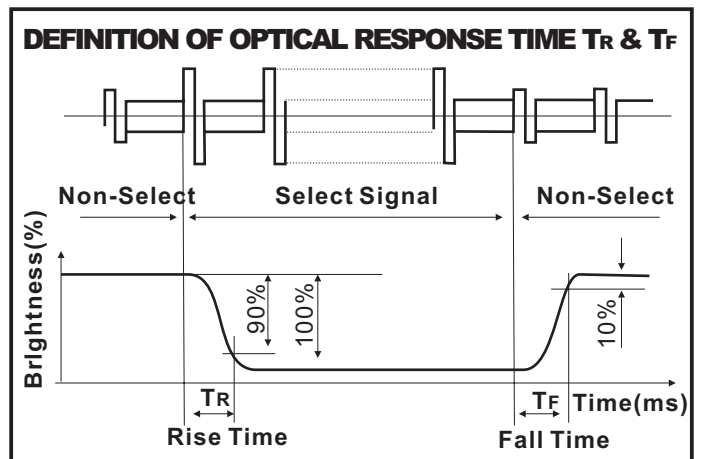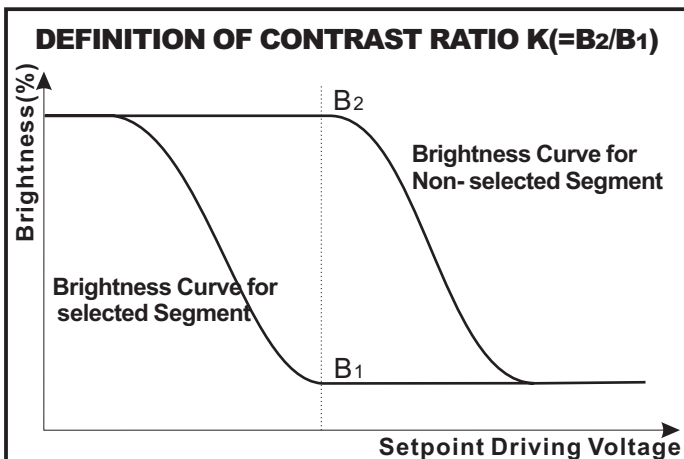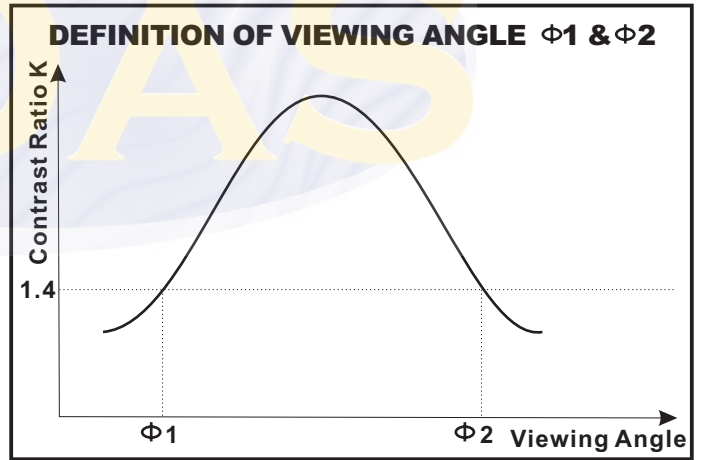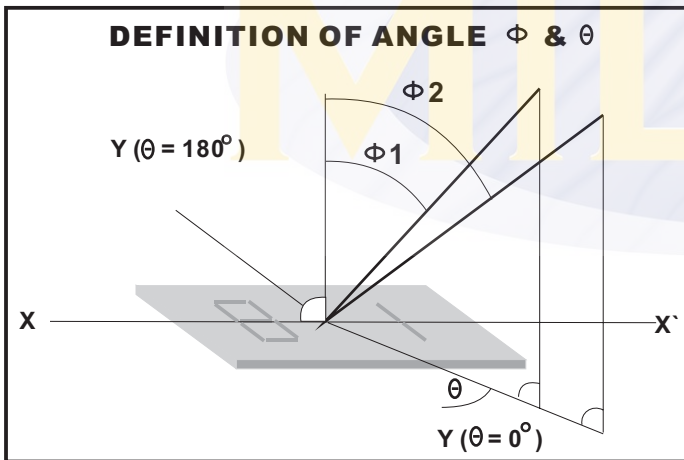
** If you wanted to drive the LED BKL uninterruptedly exceed 12hours/day, you are not suggested this version

5. OPTICAL CHARACTERISTIC

FOR TN TYPE LCD MODULE (T$_A$=25 ^{O}C, Vdd=5.0V ± 0.25V)

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
VIEWING ANGLE	$\Phi 2 - \Phi 1$	K=4	30	——	——	deg
	θ		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 ^{O}C, Vdd=5.0V ± 0.25V)

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
VIEWING ANGLE	$\Phi 2 - \Phi 1$	K=4	40	——	——	deg
	θ		60			
CONTRAST RATIO	K	——	——	6	——	——
RESPONSE TIME(RISE)	T$_R$	——	——	150	250	ms
RESPONSE TIME(FALL)	T$_F$	——	——	150	250	ms

DEFINITION OF ANGLE Φ & θ

$\Phi 2$
$\Phi 1$
Y ($\theta = 180^o$)
X
X`
θ
Y ($\theta = 0^o$)

DEFINITION OF VIEWING ANGLE $\Phi 1$ & $\Phi 2$

Contrast Ratio K
1.4
$\Phi 1$
$\Phi 2$ Viewing Angle

DEFINITION OF CONTRAST RATIO K(=B$_2$/B$_1$)

Brightness(%)
B$_2$
Brightness Curve for Non- selected Segment
Brightness Curve for selected Segment
B$_1$
Setpoint Driving Voltage

DEFINITION OF OPTICAL RESPONSE TIME T$_R$ & T$_F$

Non-Select
Select Signal
Non-Select
Brightness(%)
90%
100%
10%
T$_R$
Rise Time
T$_F$ Time(ms)
Fall Time

6. DC CHARACTERISTIC

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

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 = - 200μA	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	μA
Three-State (OFF) Input Current	ITSL	VIN = VDD to VSS	-5.0	---	5.0	μA
Operating Current	IDD1	During Display	---	---	100	μA
	IDD2	During Access, Access Cycle = 1MHz	---	---	500	μA

7. AC CHARACTERISTIC

Characteristic	Symbol	Min	Typ	Max	Unit
E Cycle	t_C	1000	—	—	ns
E High Level Width	t_{WH}	450	—	—	ns
E Low Level Width	t_{WL}	450	—	—	ns
E Rise Time	t_R	—	—	25	ns
E Fall Time	t_F	—	—	25	ns
Address Setup Time	t_{ASU}	140	—	—	ns
Address Hold Time	t_{AH}	10	—	—	ns
Data Setup Time	t_{DSU}	200	—	—	ns
Data Delay Time	t_D	—	—	320	ns
Data Hold Time (Write)	t_{DHW}	10	—	—	ns
Data Hold Time (Read)	t_{DHR}	20	—	—	ns

7.1 WRITE MODE TIMING DIAGRAM

E

$0.8V_{DD}$
$0.2V_{DD}$

t_C

t_{WL}

t_{WH}

t_R

t_F

R/W

t_{ASU}

t_{AH}

t_{ASU}

t_{AH}

CS1 CS2

$0.8V_{DD}$

t_{DSU}

t_{DHW}

DB0-DB7
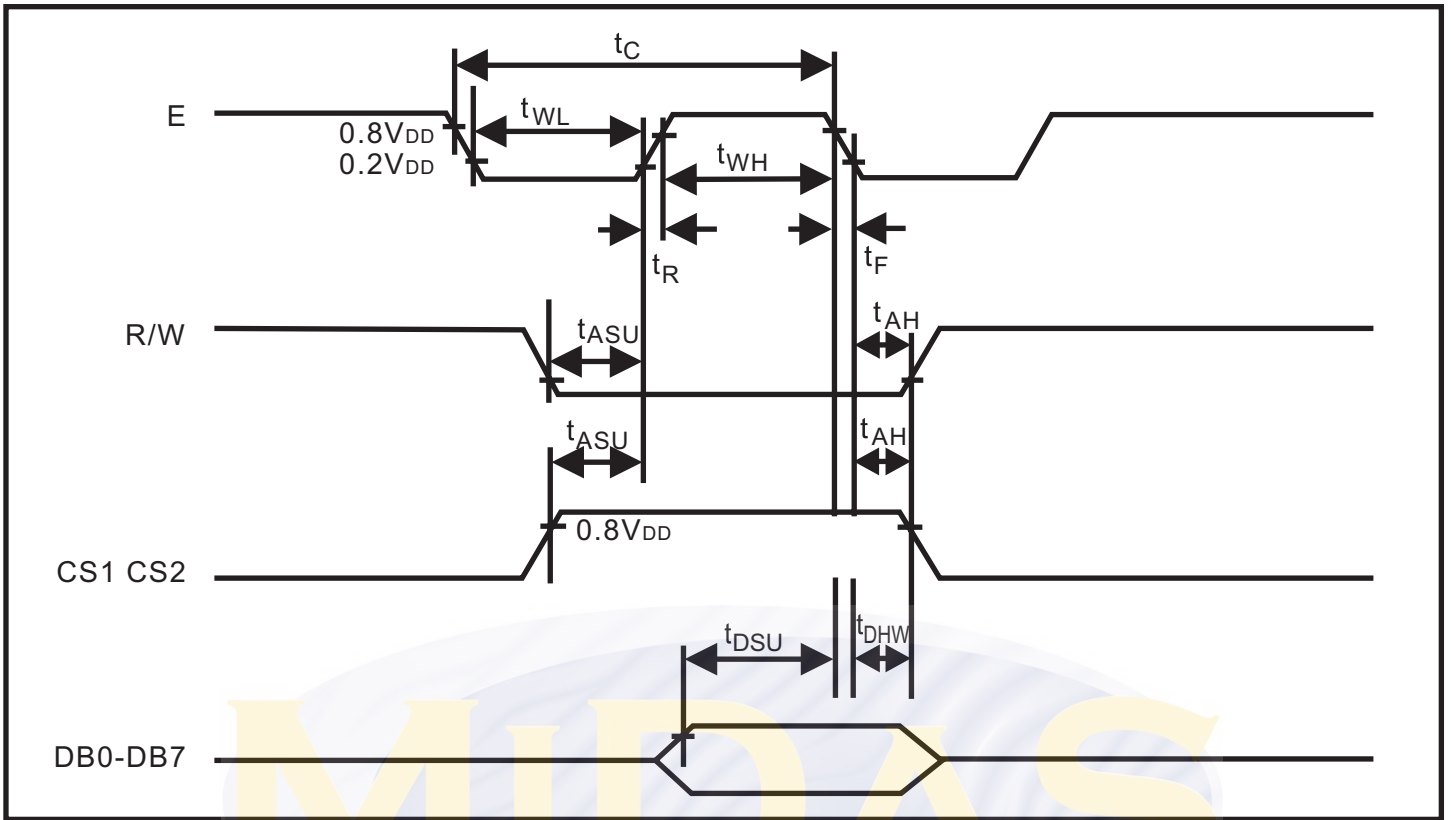
7.2 READ MODE TIMING DIAGRAM

E

$0.8V_{DD}$
$0.2V_{DD}$

t_C

t_{WL}

t_{WH}

t_R

t_F

R/W

t_{ASU}

t_{AH}

t_{ASU}

t_{AH}

CS1,CS2
RS

$0.8V_{DD}$
$0.2V_{DD}$

t_D

t_{DHR}

DB0-DB7

8.EXTERNAL DIMENSIONS

128 X 64 DOTS

2.5

2.5

20

1

60 ± 0.2 (V.A.)
70.0 ± 0.2 (H.H.)
74.4 ± 0.2
75.0 ± 0.5 (O.S.)

55.0

Ø1.00 20PL.PAD Ø1.7
P2.54 X 19

0.39
0.04
0.04
0.39

27.48
32.5 (V.A.)
44.7 ± 0.2
49.7 ± 0.2 (H.H.)
52.7 ± 0.5 (O.S.)

5.0
13.4
Ø2.5 4PL
2.5
2.5

A K

1.0
T1
T2

ITEM		T1	T2	UNIT
LED backlight		8.8	13.0	mm
EL or without backlight		5.4	9.0	mm
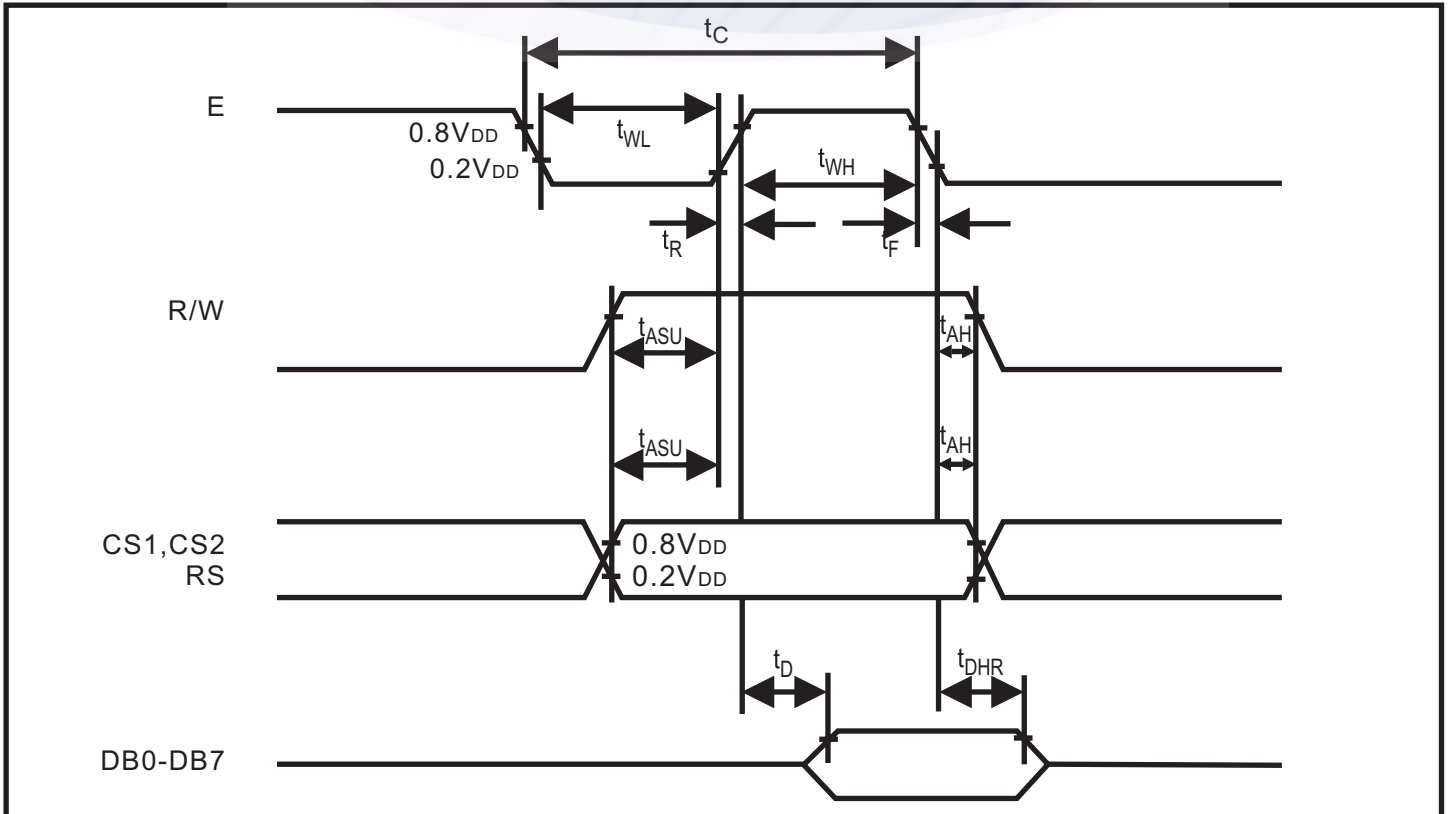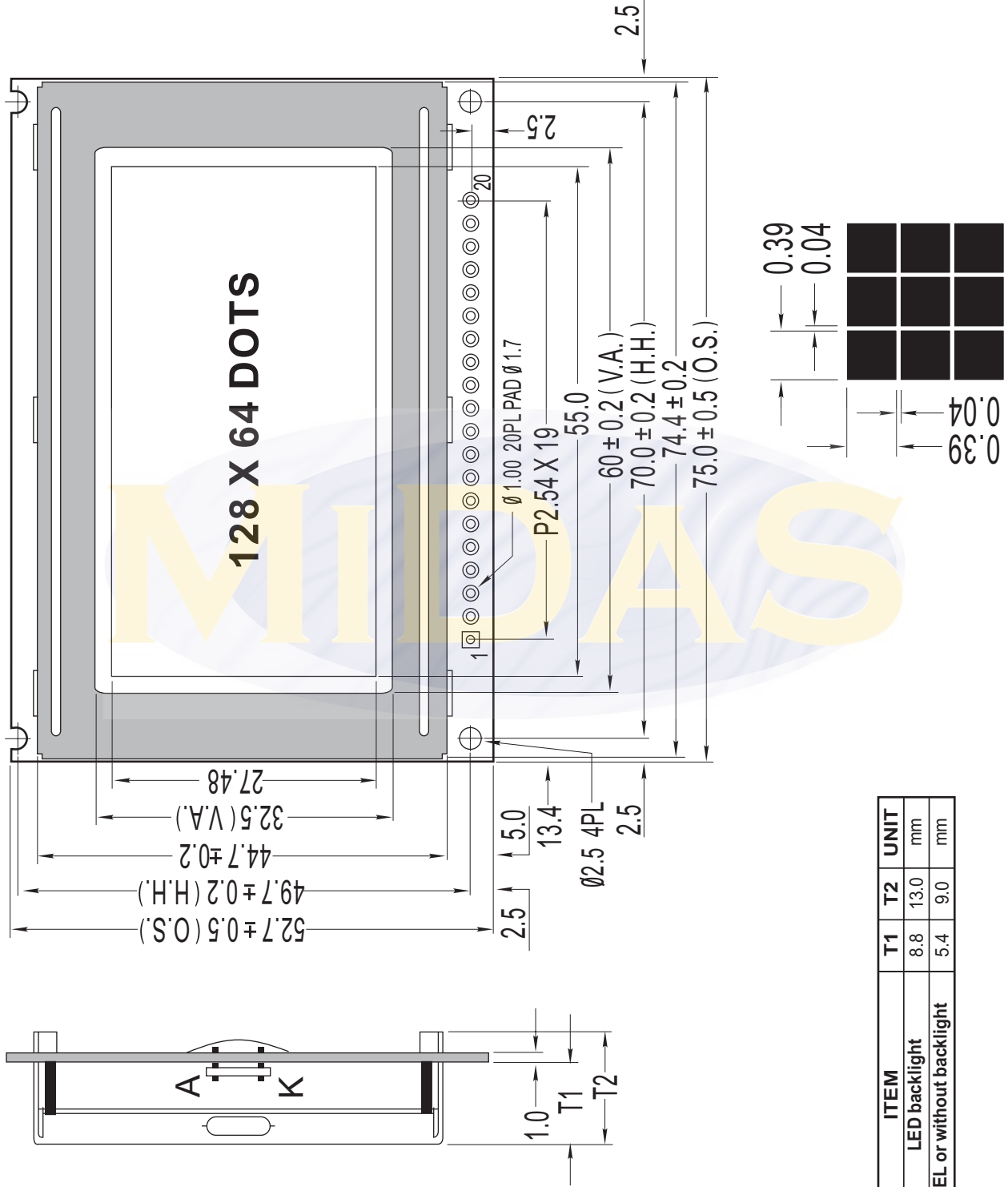
9. PIN ASSIGNMENT

PIN NO.	SYMBOL	FUNCTION		REMARK
1	Vdd	Power Supply	+5V	
2	Vss		0V	
3	V0		Contrast Adjust	
4	DB0	Data Bit 0		
5	DB1	Data Bit 1		
6	DB2	Data Bit 2		
7	DB3	Data Bit 3		
8	DB4	Data Bit 4		
9	DB5	Data Bit 5		
10	DB6	Data Bit 6		
11	DB7	Data Bit 7		
12	CS1	When CS1=H,CS2=L, select U2		
13	CS2	When CS1=L,CS2=H, select U3		
14	RSTB	Reset signal		
15	R/W	Read / Write		
16	D/I	H/L H: Data, L: Instruction code		
17	E	Chip Enable 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

SINGLE SUPPLY TYPES

V_{EE} V_0 V_{SS} V_{DD}

R_{POT}

+5V

RPOT: 10K-20K
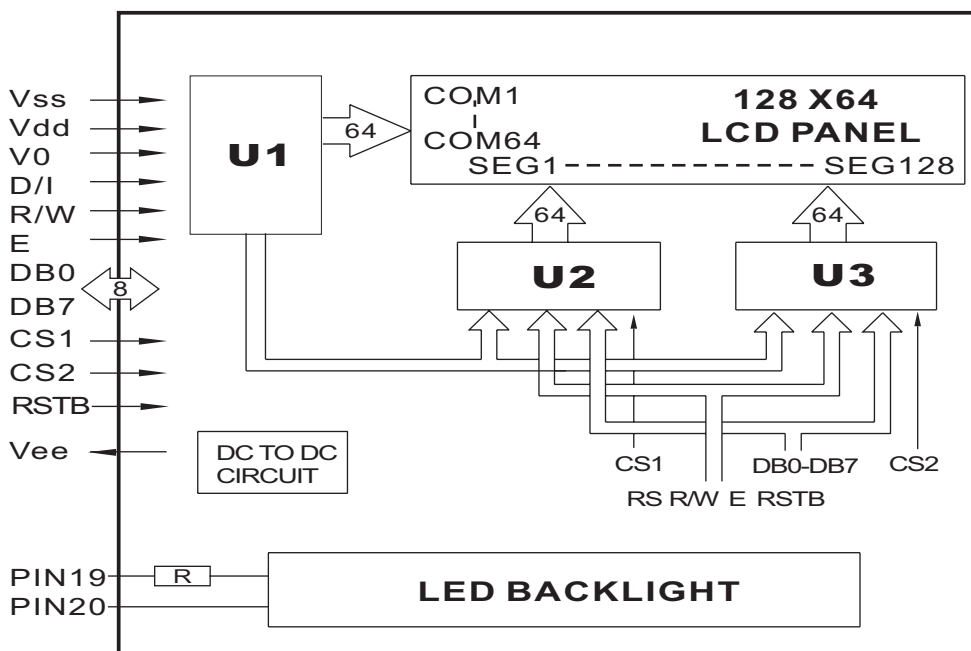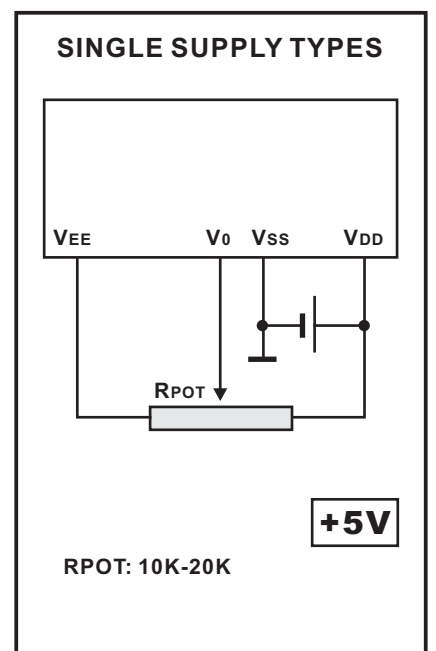
12. FUNCTIONAL DESCRIPTION

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 in order to execute other instructions, the RSTB must be cleared by setting DB4 to 0 and the DB7 set to 0 by status read instruction.

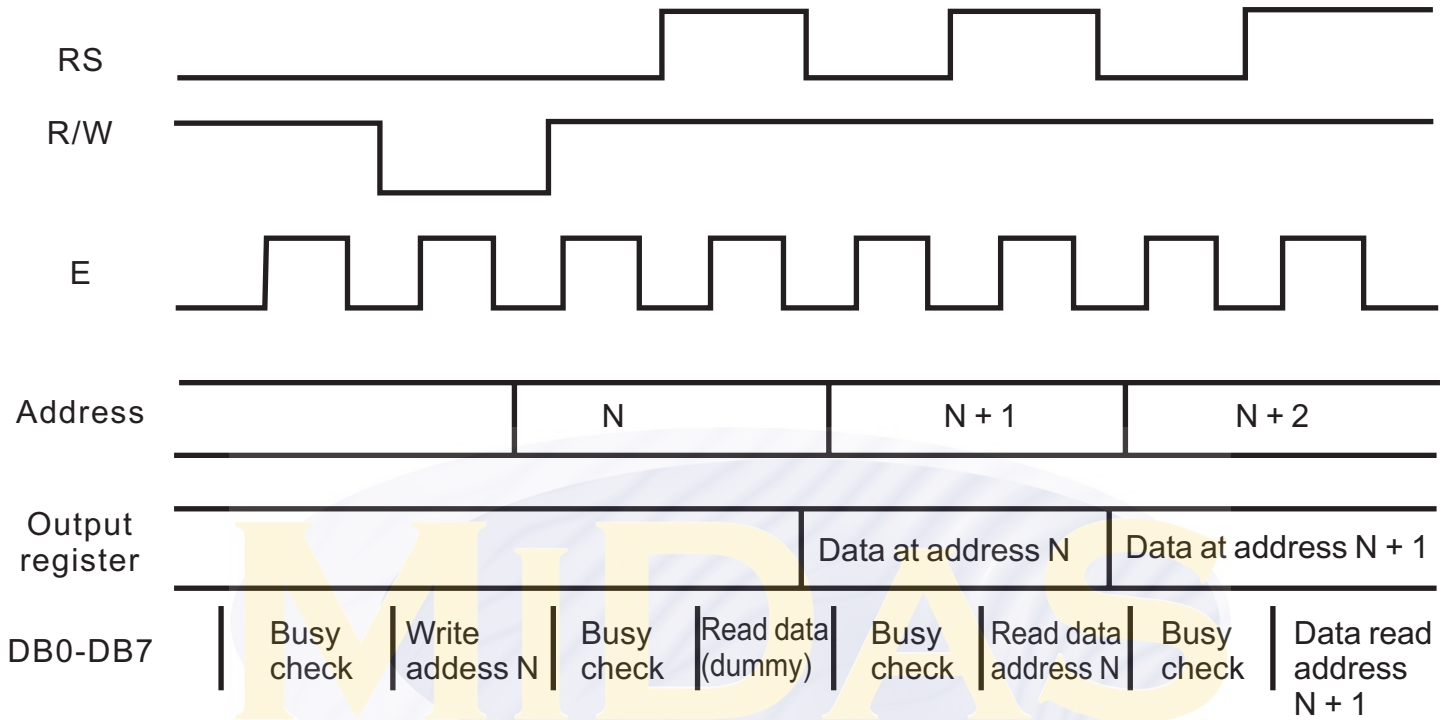The table below shows the power supply initial conditions.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Reset Time	tRS	1.0	-	-	uS
Rise Time	tR	-	-	200	nS
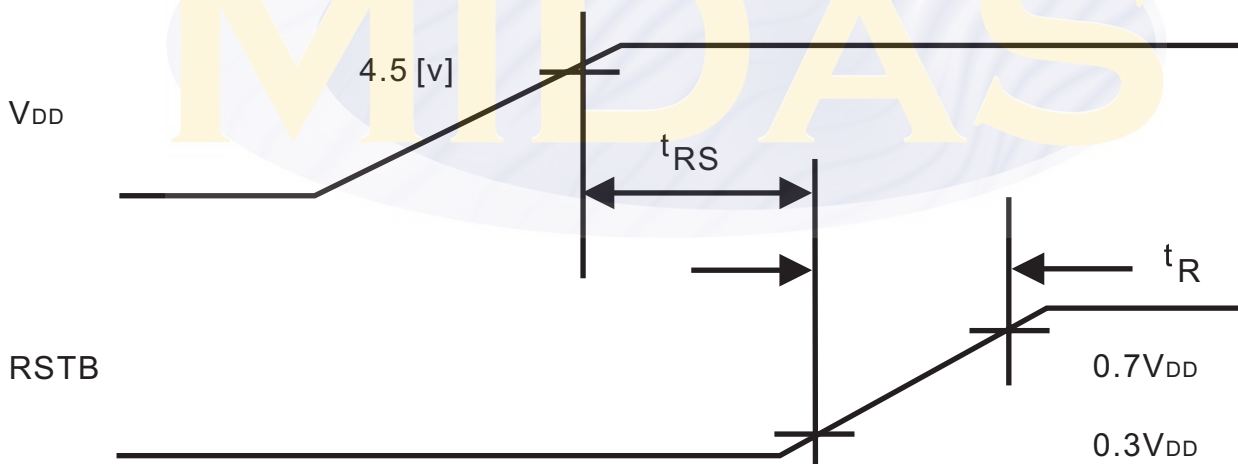
12.2 BUSY FLAG

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.
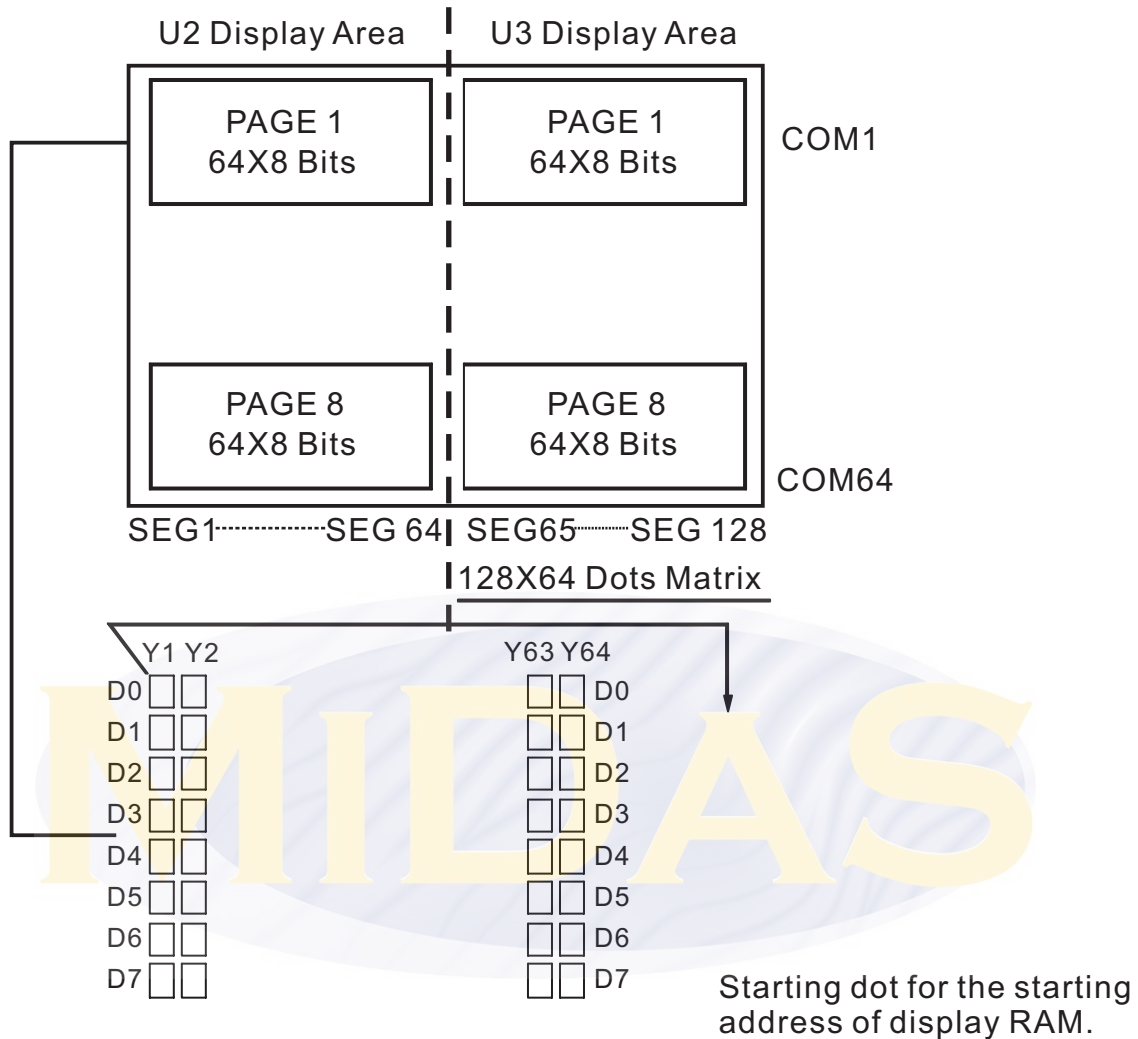

The busy flag diagram is shown below.

$1/f_{CLK} \leqslant T\,Busy \leqslant 3/f_{CLK}$

f_{CLK} is CLK1,CLK2 frequency
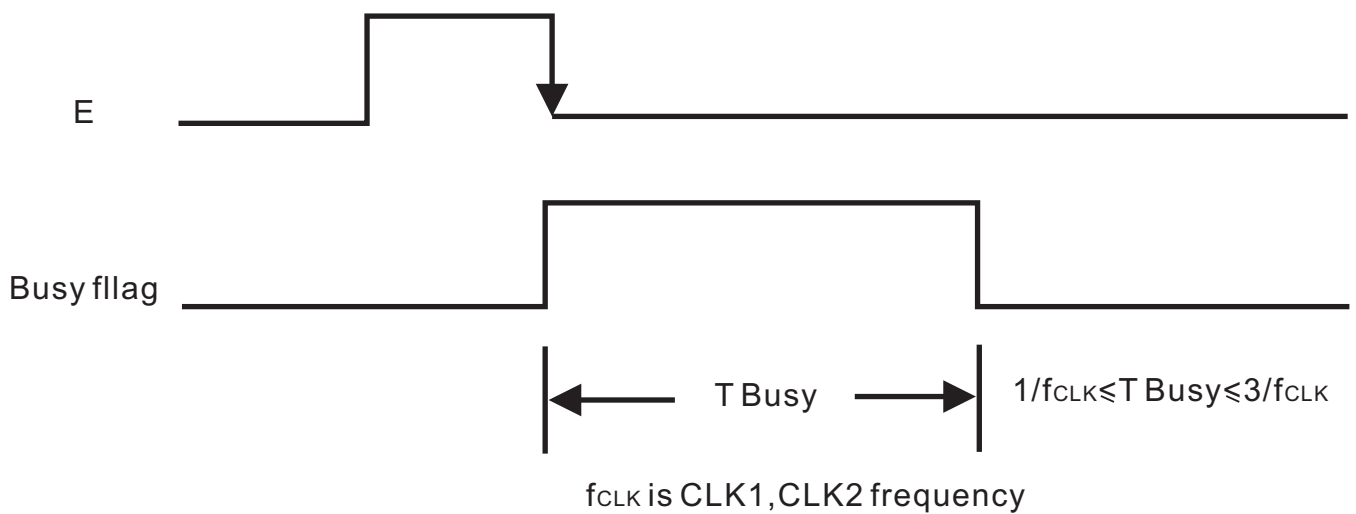
12.3 RELATION BETWEEN DISPLAY PATTERN AND DRIVERS

U2 Display Area | U3 Display Area

| PAGE 1 64X8 Bits | PAGE 1 64X8 Bits | COM1

| PAGE 8 64X8 Bits | PAGE 8 64X8 Bits | COM64

SEG1--------SEG 64 | SEG65--------SEG 128

128X64 Dots Matrix

Y1 Y2   Y63 Y64

D0   D0
D1   D1
D2   D2
D3   D3
D4   D4
D5   D5
D6   D6
D7   D7

Starting dot for the starting address of display RAM.

Each segment driver has 8 pages RAM, and each page has 64x8 bits RAM.
D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.

12.4 DISPLAY DATA RAM

The Display Data RAM is used to store the display data for the liquid crystal display. Write data 1 is 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

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. 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	BUSY	L	ON/OFF	RESET	L	L	L	L	BUSY L:Ready H:In operation ON/OFF L:Display ON H:Display OFF RESET L:Normal 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.

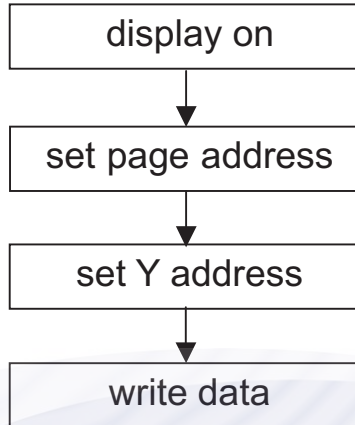After writing instruction, Y address is increased by 1 automatically.

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

```
┌─────────────────────┐
│     display on      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  set page address   │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│    set Y address    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│     write data      │
└─────────────────────┘
```

Application Circuit

LCD MODULE	8031
E	P3.2
CS1	P3.3
CS2	P3.4
R/W	P3.1
RS	P3.0
RSTB	P3.5
DB0~DB7	P1.0~P1.7
Vdd	Vdd
Vss	Vss
	(6M Hz)
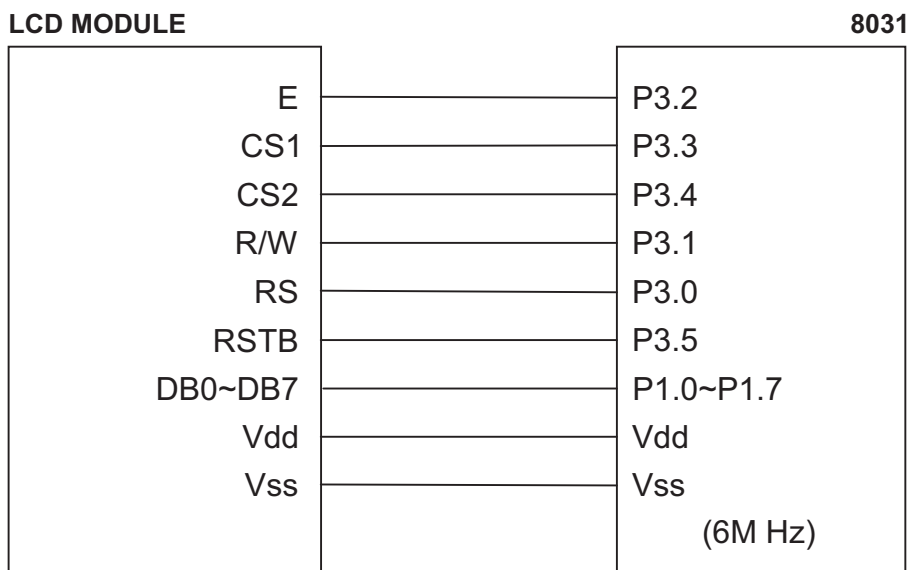
16. PACKING DETAIL

WITH LED BKL	WITHOUT LED BKL	NOTE
30 PCS/BOX	30 PCS/BOX	1. The weight is estimated for reference only.
8 BOXES/CARTON	8 BOXES/CARTON	2. Packing detail may be changed without notice.
240 PCS/CARTON	240 PCS/CARTON	
19.00 KGS/CTN(G.W.)	17.00 KGS/CTN(G.W.)	
0.07 M^3/CARTON	0.07 M^3/CARTON	

Anti - static Bag

FORDATA
LCD Module
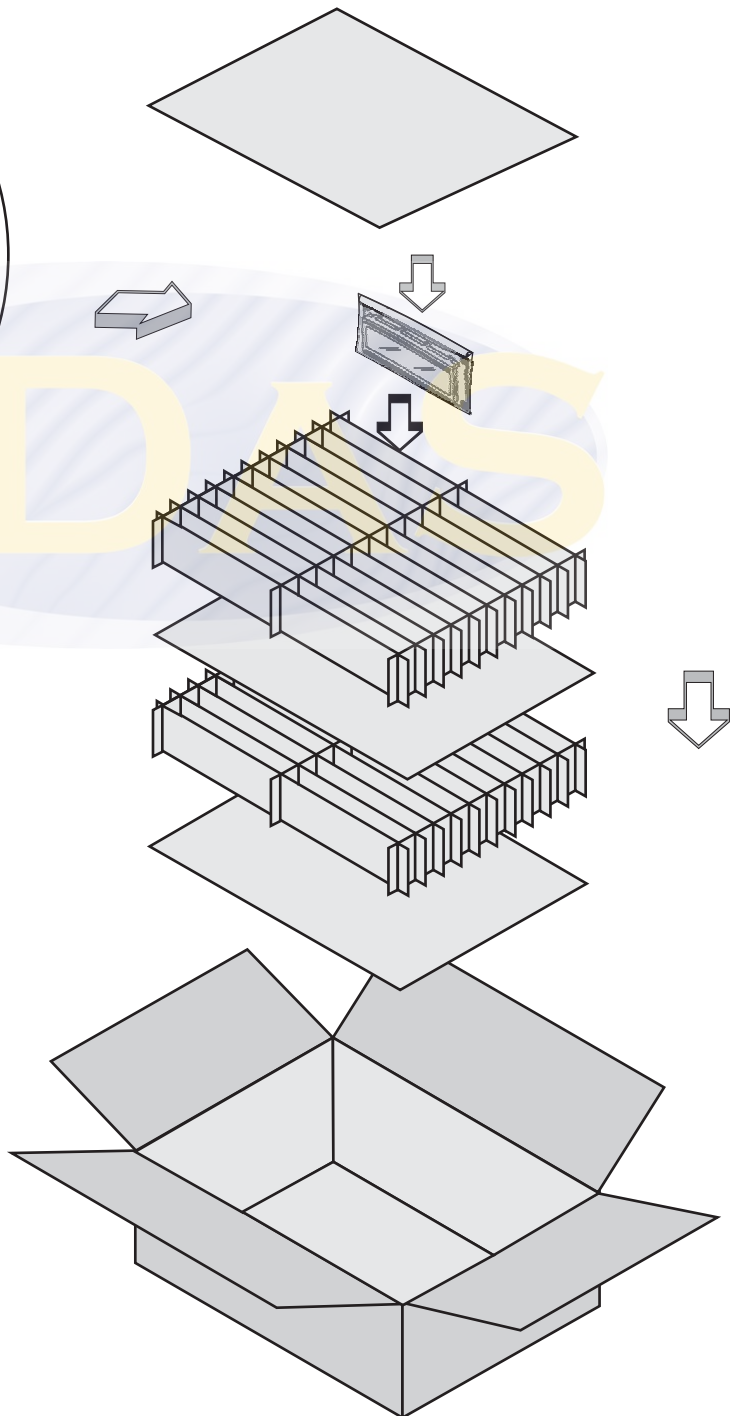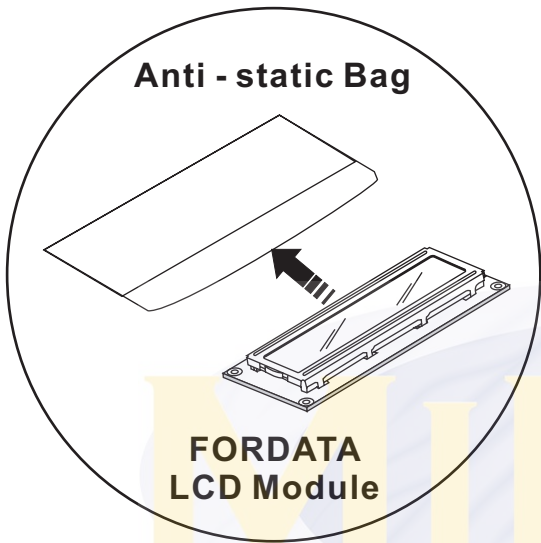
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