

**Product Specification**

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# NHD-24064WG-ATFH-VZ#

## Graphic Liquid Crystal Display Module

<b>NHD-</b>	Newhaven Display
<b>24064-</b>	240 x 64 Pixels
<b>WG-</b>	Display: Graphic
<b>A-</b>	Model
<b>T-</b>	White LED Backlight
<b>F-</b>	FSTN (+)
<b>H-</b>	Transflective, 6:00 Optimal View, Wide Temperature
<b>VZ#-</b>	Built-in Negative Voltage Supply

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## Additional Resources

- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** [https://www.newhavendisplay.com/knowledge\\_center.html](https://www.newhavendisplay.com/knowledge_center.html)
- **Quality Center:** [https://www.newhavendisplay.com/quality\\_center.html](https://www.newhavendisplay.com/quality_center.html)
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>

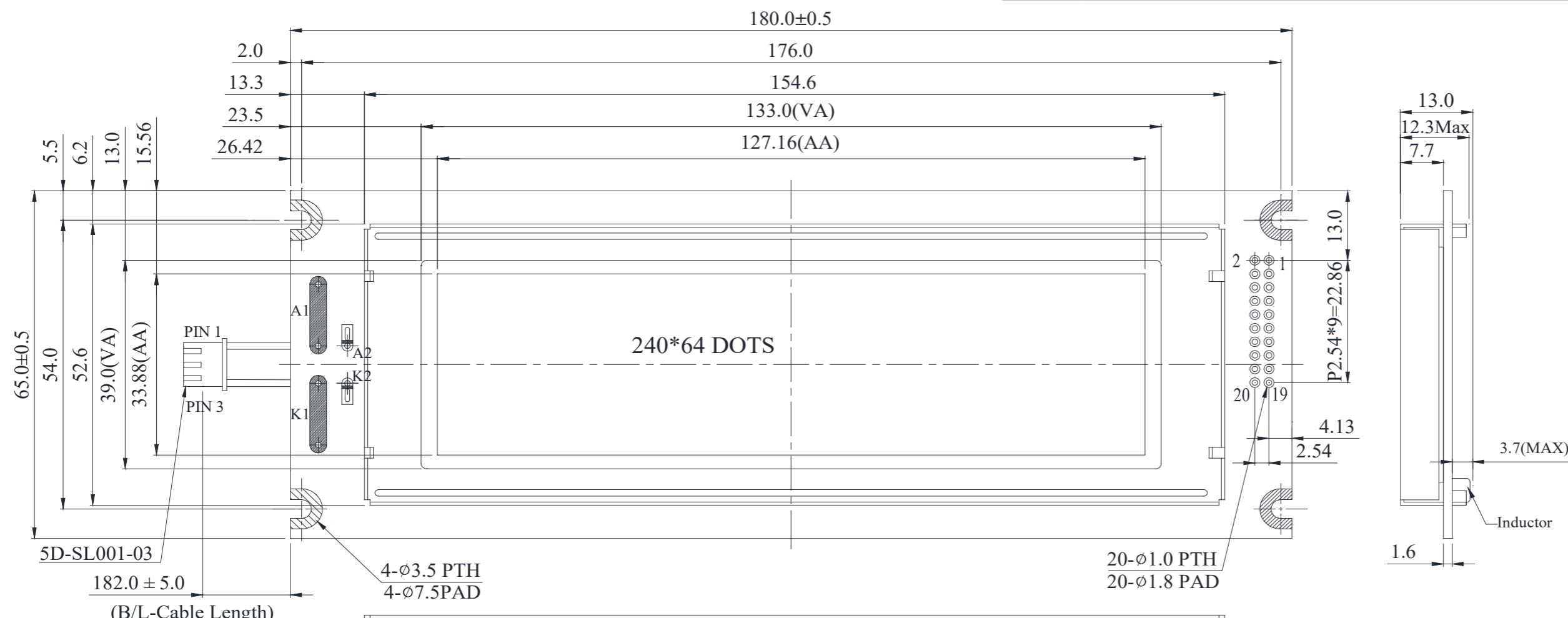


## Document Revision History

Revision	Date	Description	Changed By
0	02/28/2008	Initial Release	-
1	04/19/2010	User guide reformat	BE
2	05/13/2010	Updated Backlight Supply Voltage and Current	MC
3	11/16/2010	Pin description update	AK
4	05/04/2012	Optical characteristics updated	AK
5	05/06/2013	Electrical and optical characteristics updated. Wiring diagram and mechanical drawing updated. Font table added.	JN
6	10/31/2016	Mechanical Drawing, Electrical & Optical Char. Updated	SB
7	01/17/2017	PCB Redesign	SB
8	05/25/2018	V <sub>EE</sub> Reset to -10V	SB
9	08/15/2018	Supply Current & Backlight Voltage Updated	SB
10	02/13/2019	Supply Current Updated	SB
11	05/12/2021	Electrical, Optical & Controller IC Updated	ZP
12	08/12/2021	Updated Mechanical Drawing	ZP
13	06/17/2022	Backlight Drive Method Updated	ZP
14	08/02/2022	Updated Backlight Supply Current	CJ

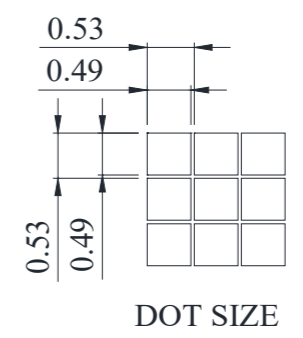
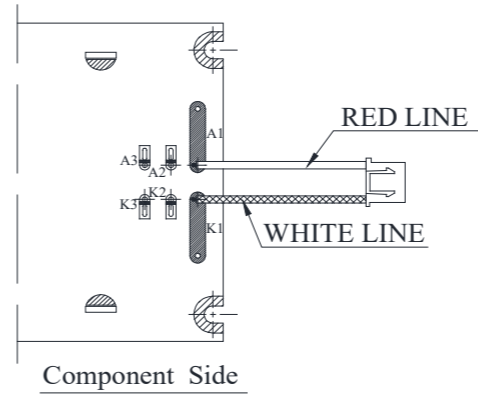
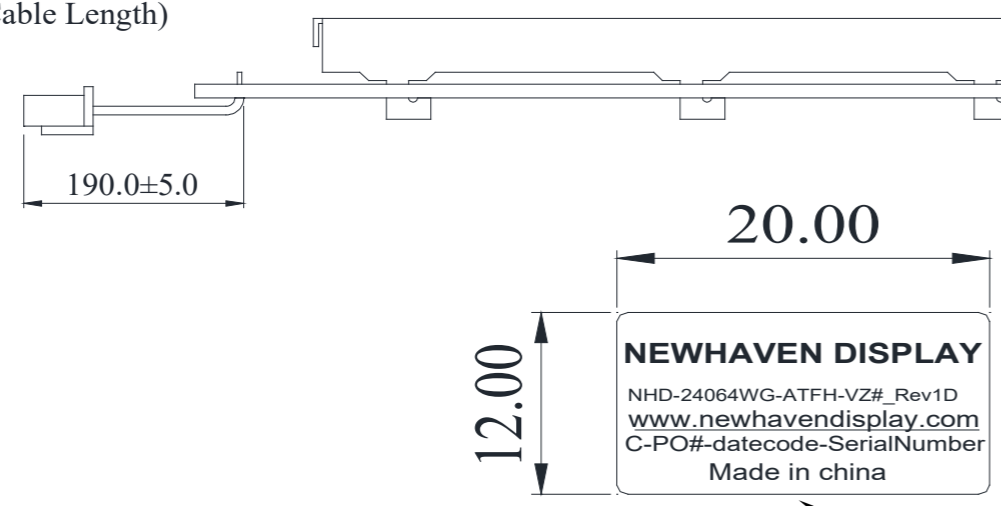
# Mechanical Drawing

SYMBOL	REVISION	DATE



## Pin Assignment

PIN NO.	SYMBOL
1	FG
2	VSS
3	VDD
4	V <sub>0</sub>
5	/WR
6	/RD
7	/CE
8	C/D
9	V <sub>EE</sub> (NC)
10	/RESET
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7
19	FS
20	NC(V <sub>EE</sub> )



- Notes:**
1. Driver: 1/64 Duty, 1/9 Bias
  2. Voltage: 5V V<sub>DD</sub>, 12.5V V<sub>LCD</sub>
  3. Display Mode: FSTN Positive / Transflective
  4. Optimal View: 6:00
  5. Backlight: White LED
  6. Driver IC: RA6963N1

<b>Standard Tolerance:</b> (Unless otherwise specified)  Linear: ±0.3mm		
	Drawing/Part Number: <b>NHD-24064WG-ATFH-VZ#</b>	Revision: 1D
<b>Unless otherwise specified:</b> • Dimensions are in Millimeters • Third Angle Projection	Drawn By: Z.Palrang	Approved By: Z.Palrang
	Drawn Date: 08/12/2021	Approved Date: 08/12/2021
<b>Do Not Scale Drawing</b>		Sheet 1 of 1
This drawing is solely the property of Newhaven Display International, Inc. The information it contains is not to be disclosed, reproduced or copied in whole or part without written approval from Newhaven Display.		

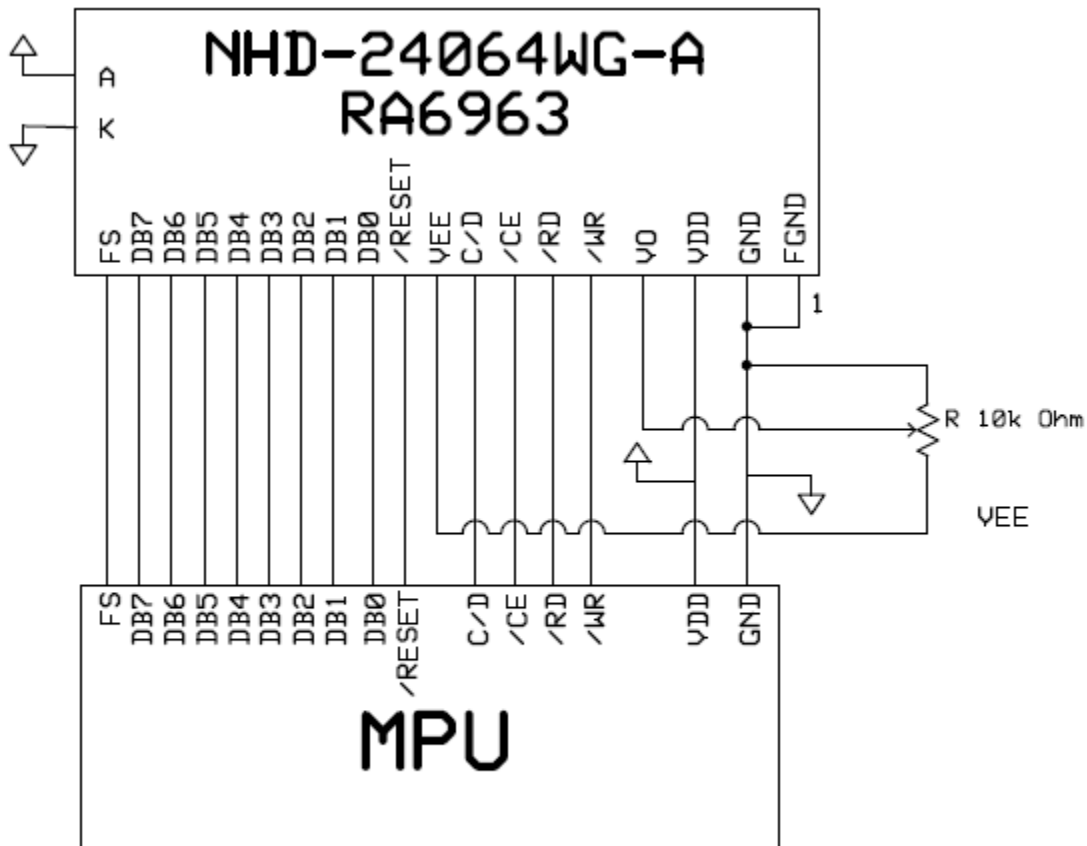
## Pin Description

Pin No.	Symbol	External Connection	Function Description
1	FGND	Power Supply	Frame Ground
2	V <sub>SS</sub>	Power Supply	Ground
3	V <sub>DD</sub>	Power Supply	Power supply for logic (+5.0V)
4	V <sub>0</sub>	Adj. Power Supply	Power supply for contrast (approx. -7V)
5	/WR	MPU	Active LOW Write signal
6	/RD	MPU	Active LOW Read signal
7	/CE	MPU	Active LOW chip enable
8	C/D	MPU	Register Select signal C/D=0: DATA C/D=1: COMMAND
9	V <sub>EE</sub>	Power Supply	Negative voltage output (-10V)
10	RESET	MPU	Active LOW reset signal
11~18	DB0~DB7	MPU	8-bit Bi-directional data bus
19	FS	MPU	Font Select: 1=6x8 fonts, 0=8x8 fonts
20	NC	-	No Connect
A	LED+	Power Supply	Backlight Anode (+3.5V)
K	LED-	Power Supply	Backlight Cathode (Ground)

**Recommended LCD connector:** 2.54mm pitch pins

**Backlight connector:** JST-XHP-3 **Mates with:** B 3B-XH-A

## Wiring Diagram



## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T <sub>OP</sub>	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T <sub>ST</sub>	Absolute Max	-30	-	+80	°C
Supply Voltage	V <sub>DD</sub>	-	4.5	5.0	5.5	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> = 5.0V	8.2	16.5	33	mA
Supply for LCD (contrast)	V <sub>LCD</sub>	T <sub>OP</sub> = 25°C	12.1	12.5	12.9	V
"H" Level input	V <sub>IH</sub>	-	0.8*V <sub>DD</sub>	-	V <sub>DD</sub>	V
"L" Level input	V <sub>IL</sub>	-	V <sub>SS</sub>	-	0.15*V <sub>DD</sub>	V
"H" Level output	V <sub>OH</sub>	-	V <sub>DD</sub> -0.3	-	V <sub>DD</sub>	V
"L" Level output	V <sub>OL</sub>	-	V <sub>SS</sub>	-	0.3	V
Backlight Supply Current*	I <sub>LED</sub>	-	60	80	100	mA
Backlight Supply Voltage	V <sub>LED</sub>	I <sub>LED</sub> = 80mA	3.4	3.5	3.6	V
Backlight Lifetime	-	I <sub>LED</sub> = 80mA	-	50,000	-	Hrs.

\*Backlight is current driven; do not supply more than 100 mA, drive voltage is for reference only.

## Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	0	-	30	°
	Bottom	φY-		0	-	60	°
	Left	θX-		0	-	45	°
	Right	θX+		0	-	45	°
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T <sub>R</sub>	T <sub>OP</sub> = 25°C	-	200	300	ms
	Fall	T <sub>F</sub>		-	250	350	ms

## Controller Information

Built-in RA6963N1 Controller.

Please download specification at <https://support.newhavendisplay.com/hc/en-us/articles/4414786723479-RA6963>



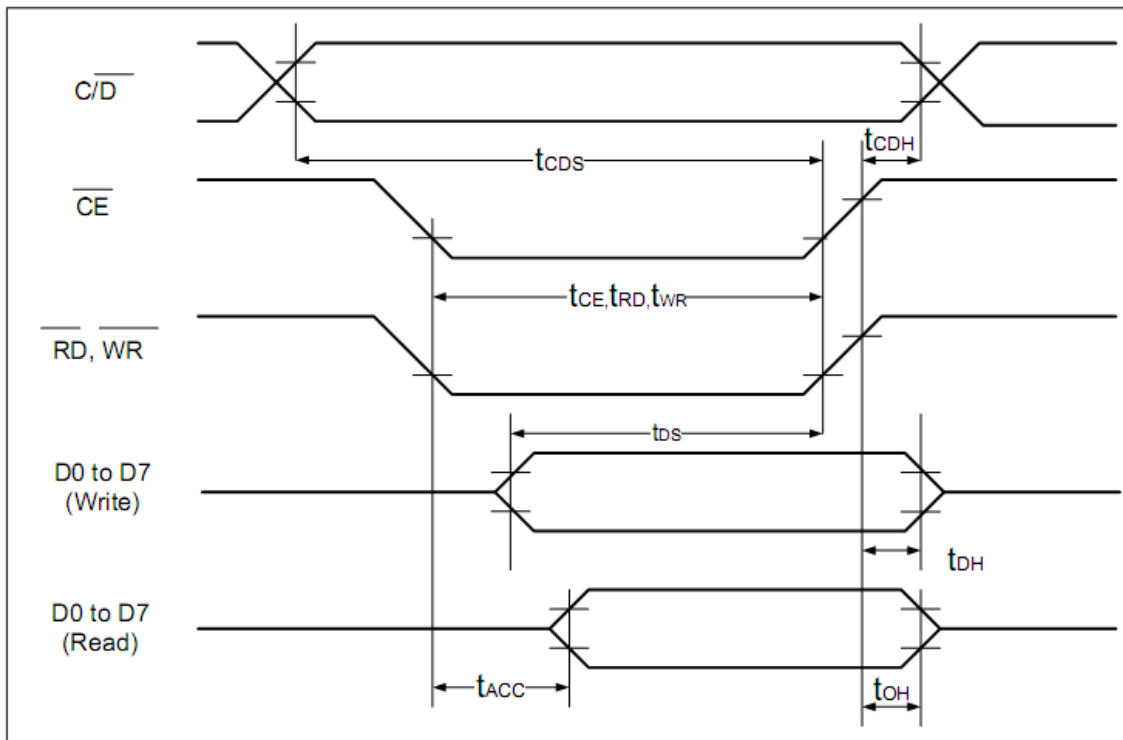
## Table of Commands

Command	Code	D1	D2	Function
<b>Registers Setting</b>	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
<b>Set Control Word</b>	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
<b>Mode Set</b>	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
<b>Display Mode</b>	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
<b>Cursor Pattern Select</b>	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
<b>Data auto Read/Write</b>	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
<b>Data Read/Write</b>	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
<b>Screen Peek</b>	11100000	--	--	Screen Peek
<b>Screen Copy</b>	11101000			Screen Copy
<b>Bit Set/Reset</b>	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)

## Timing Characteristics

( $V_{DD}=+5V\pm 5\%$ ,  $GND=0V$ ,  $T_a = -20$  to  $+70^\circ C$ )

Item	Symbol	Test Conditions	Min.	Max.	Unit
$C/\bar{D}$ Set Up Time	$t_{CDS}$	--	100	--	ns
$C/\bar{D}$ Hold Time	$t_{CDH}$	--	10	--	ns
$\overline{CE}$ , $\overline{RD}$ , $\overline{WR}$ Pulse Width	$t_{CE}$ , $t_{RD}$ , $t_{WR}$	--	80	--	ns
Data Set Up Time	$t_{DS}$	--	80	--	ns
Data Hold Time	$t_{DH}$	--	40	--	ns
Access Time	$t_{ACC}$	--	--	150	ns
Output Hold Time	$t_{OH}$	--	10	50	ns





## Built-in Font Table

LSB MSB	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
1	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
2	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
3	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
4	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
5	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
6	Q	Ü	é	à	á	â	ã	ä	å	ö	è	ë	ì	í	î	ï
7	É	æ	Æ	ö	ø	à	ô	ù	ÿ	ö	ü	ø	£	¥	℞	ƒ

## Example Initialization Program

```
void command(int A)
{
    P1 = A;
    ID = 1;           //Command
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void data(int A)
{
    P1 = A;
    ID = 0;           //Data
    CE = 0;
    WRT = 0;
    WRT = 1;
    CE = 1;
}

void init()
{
    RST = 1;
    RDD = 1;
    F_S = 1;
    data(0x00);
    data(0x00);
    commnd(0x40);     //Set Text Home Address
    data(0x00);       //Low Address Columns
    data(0x40);       //High Address
    command(0x42);    //Set Graphic Home Address
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x41);    //Set Text Area
    data(0x1E);       //Low Address Columns
    data(0x00);       //High Address
    command(0x43);    //Set Graphic Area
    command(0x80);    //Mode Set to 'OR' mode
}
```



## Quality Information

Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	+80°C, 96 Hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 96 Hrs.	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C, 96 Hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 96 Hrs.	1,2
High Temperature / Humidity Operation	Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time.	+60°C, 90% RH, 96 Hrs.	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-20°C,30min -> 25°C,5min -> 70°C,30min = 1 cycle 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz, 1.5mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	V <sub>S</sub> =±800V, R <sub>S</sub> =330Ω, C <sub>S</sub> =150pF 10 Times	

**Note 1:** No condensation to be observed.

**Note 2:** Conducted after 4 hours of storage at 25°C, 0%RH.

**Note 3:** Test performed on product itself, not inside a container.