

**Product Specification**

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# NHD-24064WG-AYYH-VZ#

## Graphic Liquid Crystal Display Module

<b>NHD-</b>	Newhaven Display
<b>24064-</b>	240 x 64 Pixels
<b>WG-</b>	Display Type: Graphic
<b>A-</b>	Model
<b>Y-</b>	Yellow/Green LED Backlight
<b>Y-</b>	STN (+), Yellow/Green
<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:** <http://www.nhdforum.newhavendisplay.com>
- **Github:** <https://github.com/newhavendisplay>
- **Example Code:** [https://www.newhavendisplay.com/example\\_code.html](https://www.newhavendisplay.com/example_code.html)
- **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

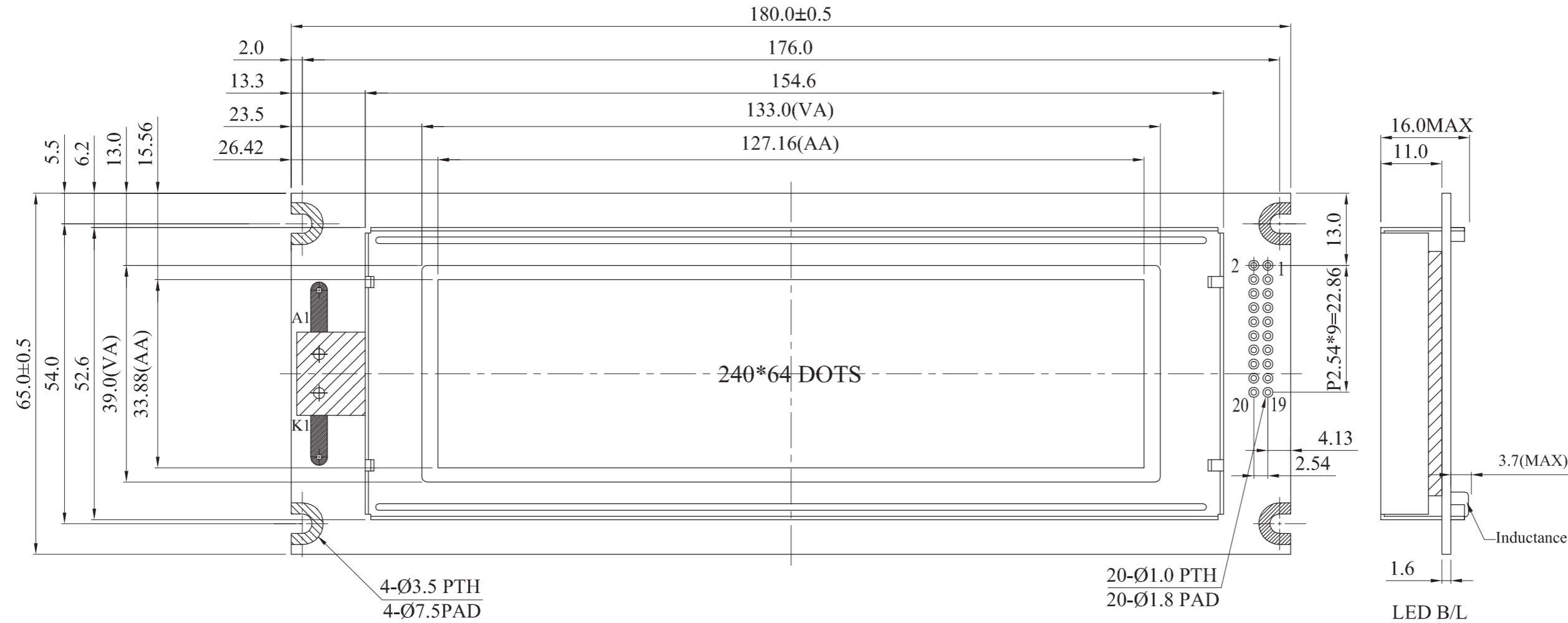
Revision	Date	Description	Changed By
0	2/28/08	Initial Release	-
1	4/19/10	User guide reformat	BE
2	5/13/10	Updated Backlight Current Min/Max- New Mechanical Drawing: Backlight Connector Cable is not on this display	MC
3	5/14/10	Mechanical drawing update	MP
4	5/14/10	Drawing update	MP
5	11/16/10	Pin description update	AK
6	9/20/11	Mechanical Drawing Updated	TJ
7	5/16/12	Optical characteristics updated	AK
8	2/28/13	Electrical characteristics updated	AK
9	5/7/13	Wiring diagram and font table updated.	JN
10	8/21/17	Mechanical, Electrical & Optical Characteristics Updated	SB
11	8/23/19	PCB Redesign	SB
12	05/18/21	Electrical, Optical & IC Updated	ZP
13	08/23/21	Updated Mechanical Drawing	ZP

## Functions and Features

- 240 x 64 pixels
- Built-in RA6963N1 controller
- +5.0V Power Supply
- 1/64 duty

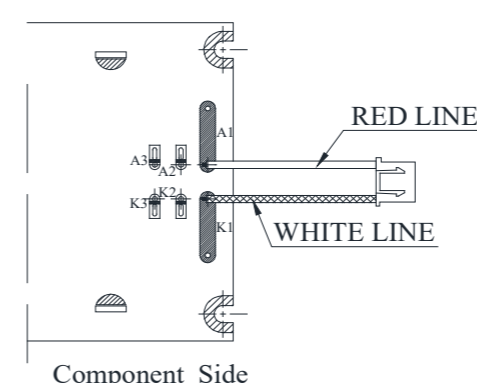
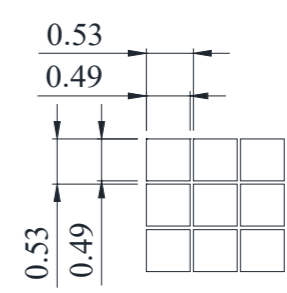
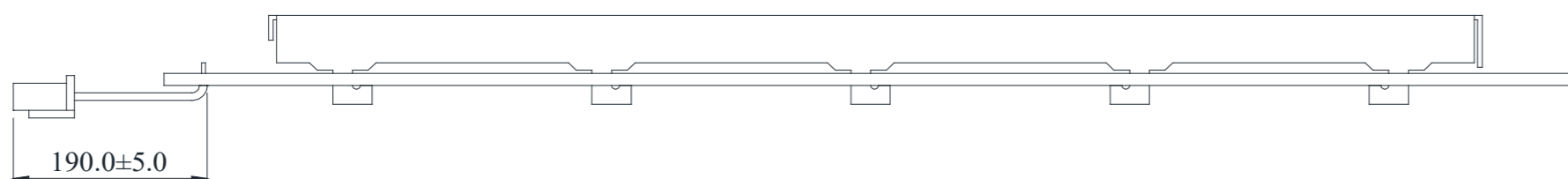
# Mechanical Drawing

SYMBOL	REVISION	DATE



## Pin Assignment

PIN NO.	SYMBOL
1	FG
2	V <sub>SS</sub>
3	V <sub>DD</sub>
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: STN Positive/ Yellow-Green / Transflective
4. Optimal View: 6:00
5. Backlight: Yellow-Green LED
6. Driver IC: RA6963N1

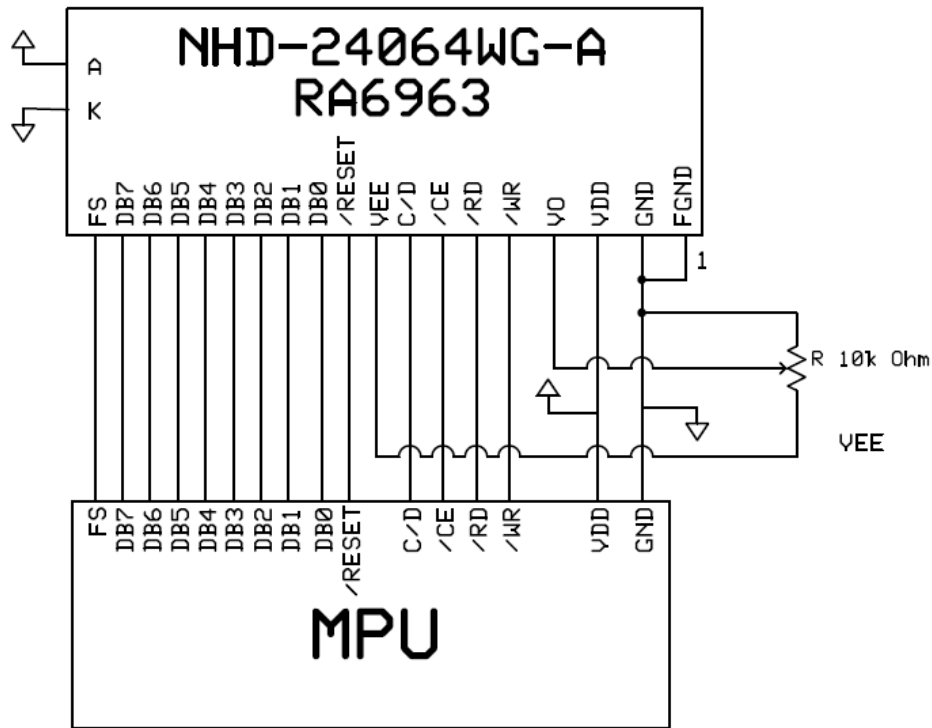
STANDARD TOLERANCE: (UNLESS OTHERWISE SPECIFIED)	NEWHAVEN DISPLAY INTERNATIONAL	
LINEAR: ±0.3mm	DRAWING/PART NUMBER: NHD-24064WG-AYYH-VZ#	REVISION: 1A
UNLESS OTHERWISE SPECIFIED: - DIMENSIONS ARE IN MILLIMETERS - THIRD ANGLE PROJECTION	DRAWN BY: Z.Palrang	APPROVED BY: Z.Palrang
	DRAWN DATE: 08/23/2021	APPROVED DATE: 08/23/2021
	DO NOT SCALE DRAWING	
	SHEET 1 OF 1	
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## Pin Description and Wiring Diagram

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. -7.5V)
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	VEE	Power Supply	Negative voltage output (-10V)
10	/RST	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 (4.2V)
K	LED-	Power Supply	Backlight Cathode (Ground)

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

**Backlight connector:** --- **Mates with:** ---



## 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>	-	528	660	792	mA
Backlight Supply Voltage	V <sub>LED</sub>	I <sub>LED</sub> = 660mA	4.0	4.2	4.4	V
Lifetime*	-	T <sub>OP</sub> = 25°C	-	100,000	-	Hrs.

\*The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

## Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	0	-	20	°
	Bottom	φY-		0	-	40	°
	Left	θX-		0	-	30	°
	Right	θX+		0	-	30	°
Contrast Ratio		CR	-	2	3	-	-
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.

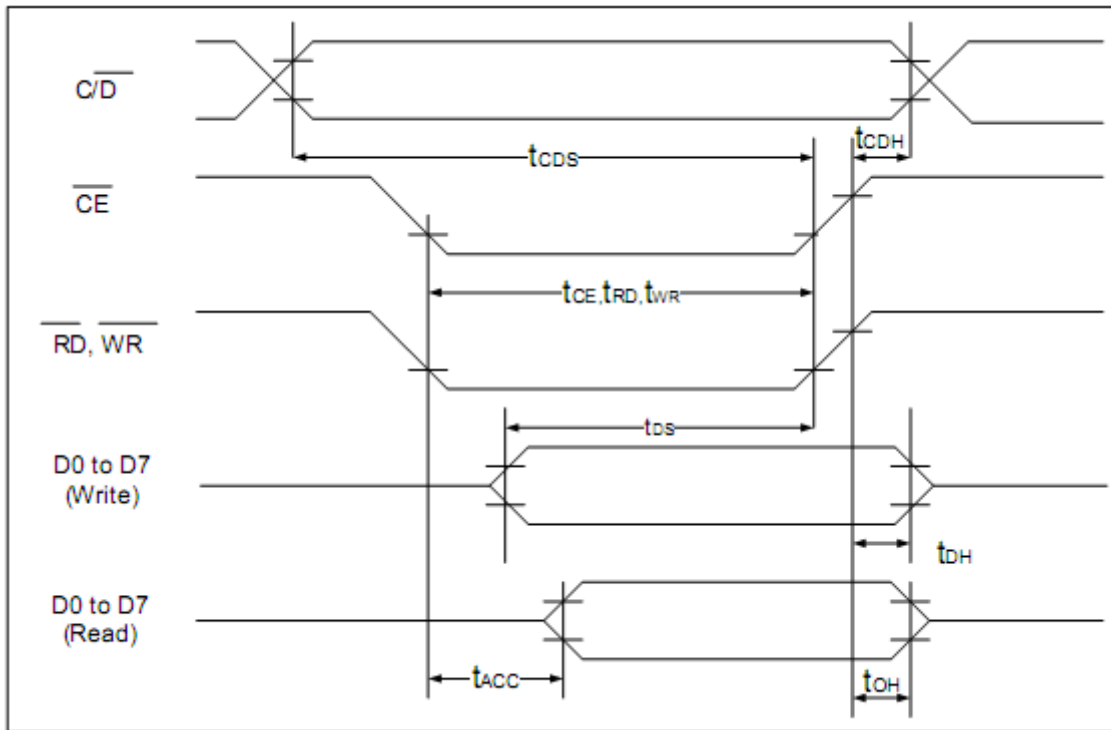
Please download specification at [https://www.newhavendisplay.com/resources\\_dataFiles/datasheets/LCDs/RA6963.pdf](https://www.newhavendisplay.com/resources_dataFiles/datasheets/LCDs/RA6963.pdf)



## 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
$\overline{C/D}$ Set Up Time	$t_{CDS}$	--	100	--	ns
$\overline{C/D}$ 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	U	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	á	â	ã	ä	å	q	è	ë	ê	ì	í	î	ä	å
7	é	æ	Æ	ö	ö	ö	ü	ü	ü	ö	ö	€	£	¥	℞	ƒ	

## Example Program Code

```
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 Areaa
    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, 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C, 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 200hrs	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, 96hrs	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.	Air: ±800V 150pF/330Ω, 5 Times	
		Contact: ±600V 150pF/330Ω, 5 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.