

# NHD-12232KZ-NSW-BBW-P

## Graphic Liquid Crystal Display Module

NHD- Newhaven Display  
12232- 122 x 32 Pixels  
KZ- Model  
N- Transmissive  
SW- Side White LED Backlight  
B- STN- Blue (-)  
B- 6:00 Optimal View  
W- Wide Temperature  
P- 2x10 Pin Header Soldered  
**RoHS Compliant**

**Newhaven Display International, Inc.**

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

[www.newhavendisplay.com](http://www.newhavendisplay.com)

[nhtech@newhavendisplay.com](mailto:nhtech@newhavendisplay.com)

[nhsales@newhavendisplay.com](mailto:nhsales@newhavendisplay.com)

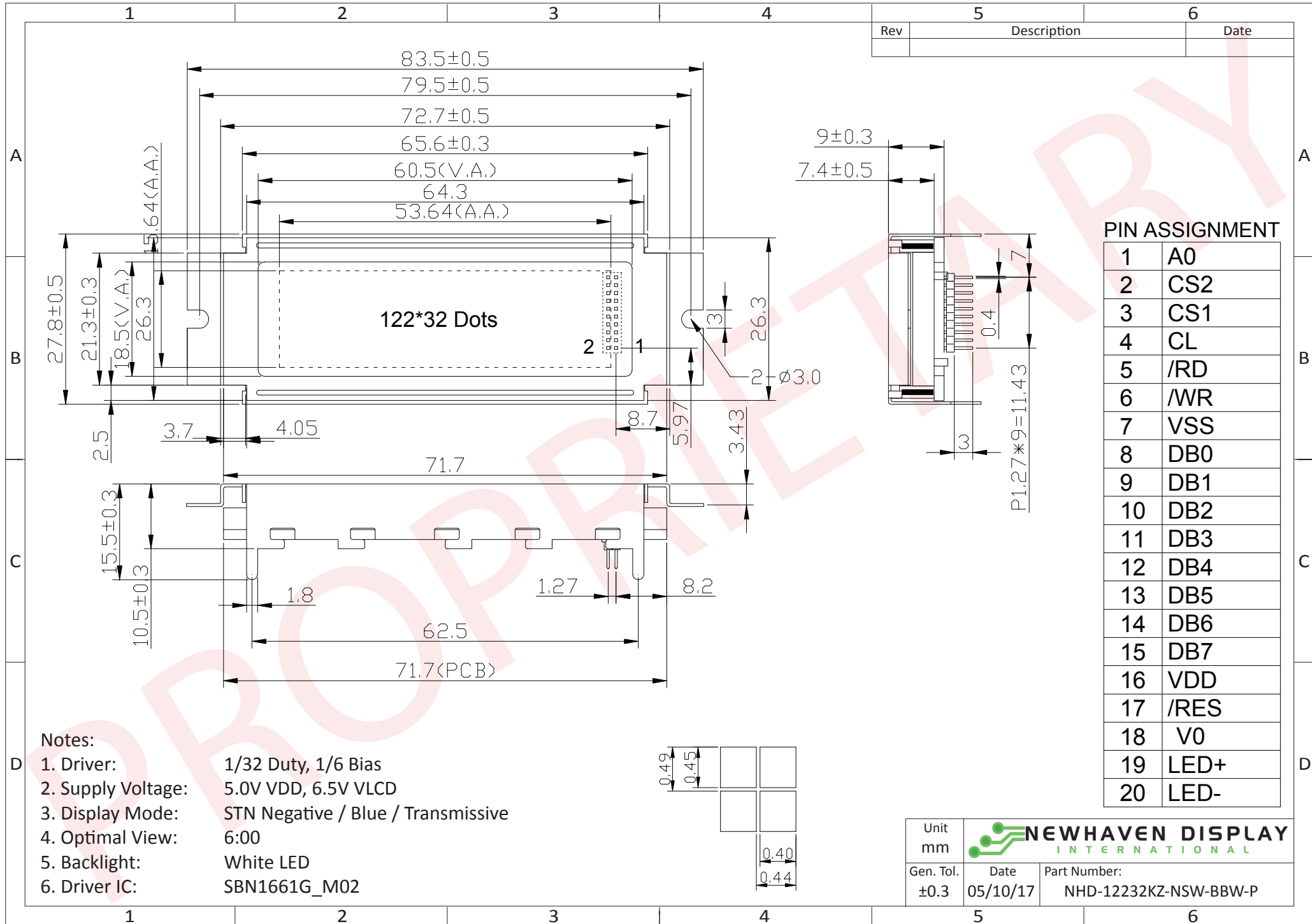
## Document Revision History

Revision	Date	Description	Changed by
0	6/7/2007	Initial Release	-
1	9/25/2009	User guide reformat	BE
2	3/15/2010	Pin description, electrical, optical, drawing updated	BE
3	5/10/2010	Initialization updated	BE
4	3/16/2015	Pin description & Example code updated	RM
5	12/2/16	Mechanical Drawing, Electrical & Optical Char. Updated	SB
6	5/10/17	Mechanical & Electrical Characteristics Updated	SB
7	9/1/17	Backlight Characteristics Updated	SB

## Functions and Features

- 122 x 32 pixels
- Built-in SBN1661G\_M02 Controller
- +5.0V power supply
- 1/32 duty cycle; 1/6 bias
- RoHS Compliant

# Mechanical Drawing



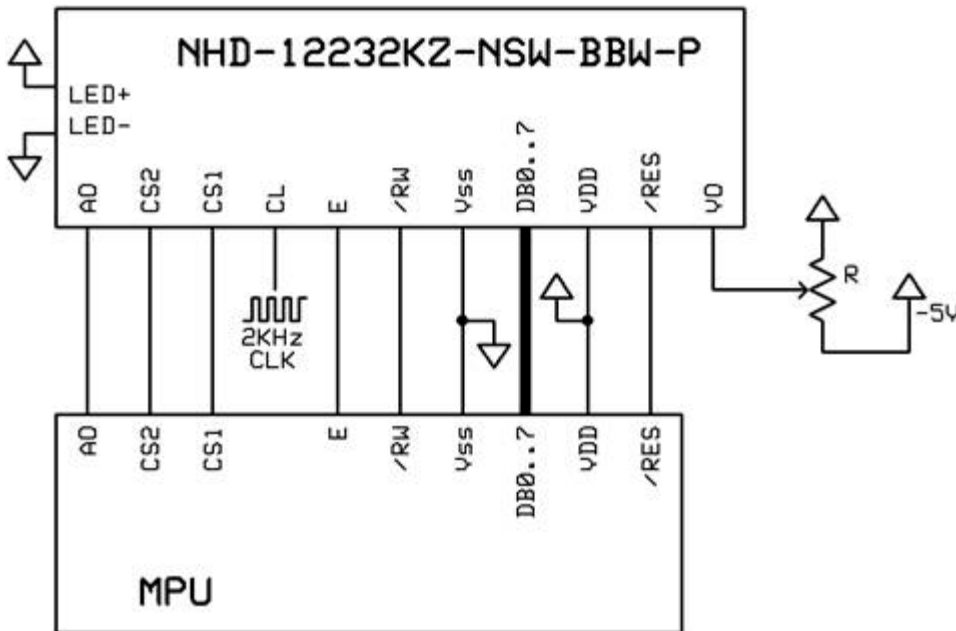
The information contained herein is the exclusive property of Newhaven Display International, Inc. and shall not be copied, reproduced, and/or disclosed in any format without permission.

## Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	A0	MPU	Register Select. 0: instruction; 1: data
2	/CS2	MPU	Active LOW Chip Select Signal for LEFT half of LCD
3	/CS1	MPU	Active LOW Chip Select Signal for RIGHT half of LCD
4	CL	-	Clock signal; Requires 2KHz external clock.
5	E /RD	MPU	6800 Mode: Active HIGH Enable Signal 8080 Mode: Active LOW Read Signal
6	R/W /WR	MPU	6800 Mode: Read/Write select signal. R/W=1: Read R/W: =0: Write 8080 Mode: Active LOW Write Signal
7	V <sub>SS</sub>	Power Supply	Ground
8-15	DB0-DB7	MPU	This is an 8-bit Bi-directional data bus
16	V <sub>DD</sub>	Power Supply	Supply Voltage for logic (+5.0V)
17	RESET/IF	MPU	Hardware RESET (edge-sensitive) and interface type selection: Positive Reset: 8080 mode Negative Reset: 6800 mode
18	V <sub>0</sub>	Adj. Power Supply	Supply Voltage for contrast; requires external negative voltage (~1.5V)
19	LED+	Power Supply	Backlight Anode (+5.0V via on-board resistor)
20	LED-	Power Supply	Backlight Cathode (Ground)

**Recommended LCD connector:** 1.27mm pitch pins

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



## Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	$T_{OP}$	Absolute Max	-20	-	+70	°C
Storage Temperature Range	$T_{ST}$	Absolute Max	-30	-	+80	°C
Supply Voltage	$V_{DD}$	-	4.8	5.0	5.2	V
Supply Current	$I_{DD}$	$V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}C$	1.0	2.0	3.0	mA
Supply for LCD (Contrast)	$V_{LCD}$		6.3	6.5	6.7	V
"H" Level input	$V_{IH}$	-	2.7	-	$V_{DD}$	V
"L" Level input	$V_{IL}$	-	$V_{SS}$	-	1.2	V
"H" Level output	$V_{OH}$	-	$V_{DD} - 0.3$	-	$V_{DD}$	V
"L" Level output	$V_{OL}$	-	$V_{SS}$	-	0.3	V
Backlight Supply Voltage	$V_{LED}$	-	4.8	5.0	5.2	V
Backlight Supply Current	$I_{LED}$	$V_{LED} = 5.0V$	40	60	80	mA

## Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Optimal Viewing Angles	Top	$\phi Y+$	$CR \geq 2$	-	40	-	°
	Bottom	$\phi Y-$		-	60	-	°
	Left	$\theta X-$		-	45	-	°
	Right	$\theta X+$		-	45	-	°
Contrast Ratio	CR	-	2	5	-	-	
Response Time	Rise	$T_R$	$T_{OP} = 25^{\circ}C$	-	150	250	ms
	Fall	$T_F$		-	200	300	ms

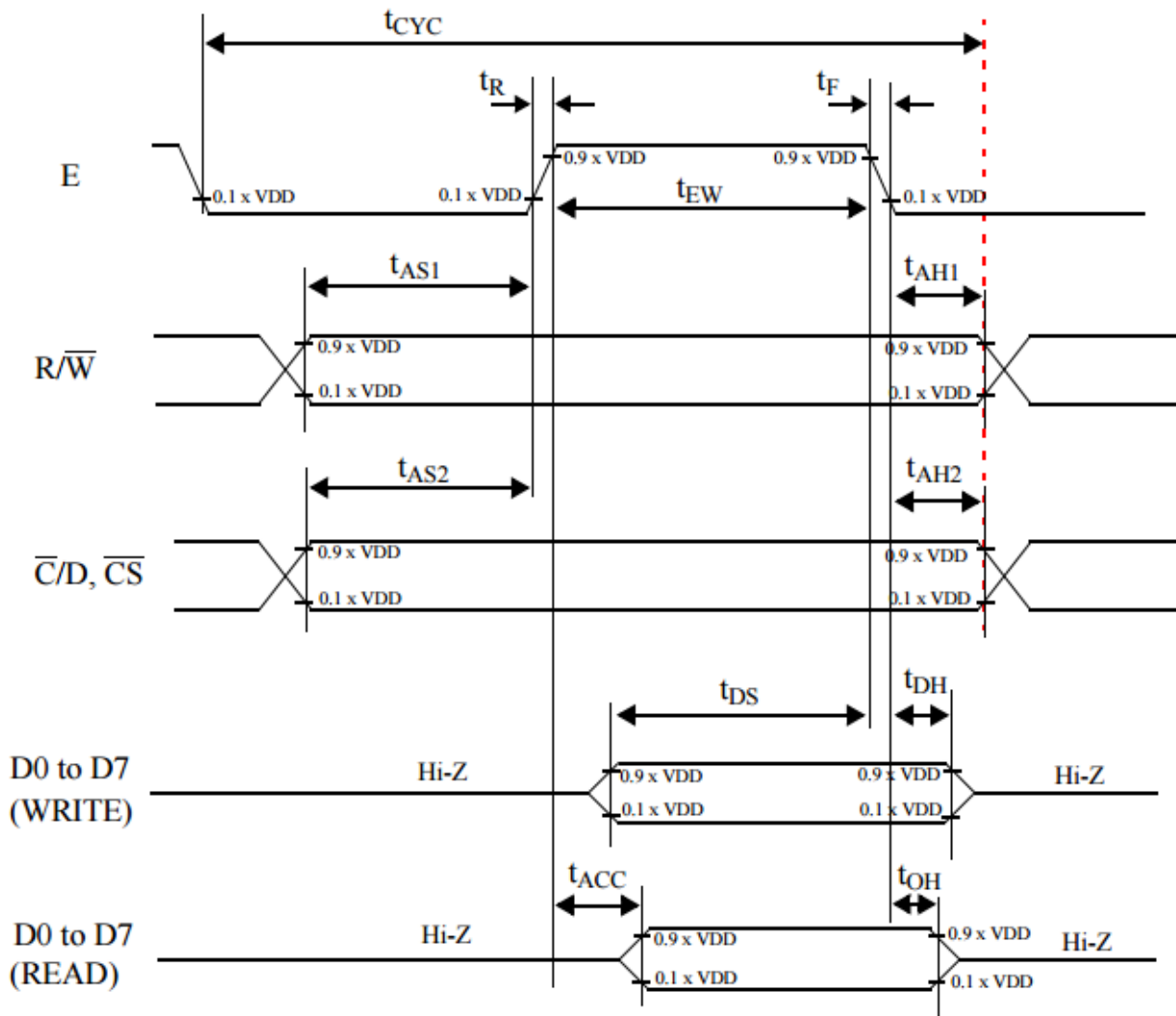
## Controller Information

Built-in SBN1661G\_M02 controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/SBN1661G.pdf](http://www.newhavendisplay.com/app_notes/SBN1661G.pdf)

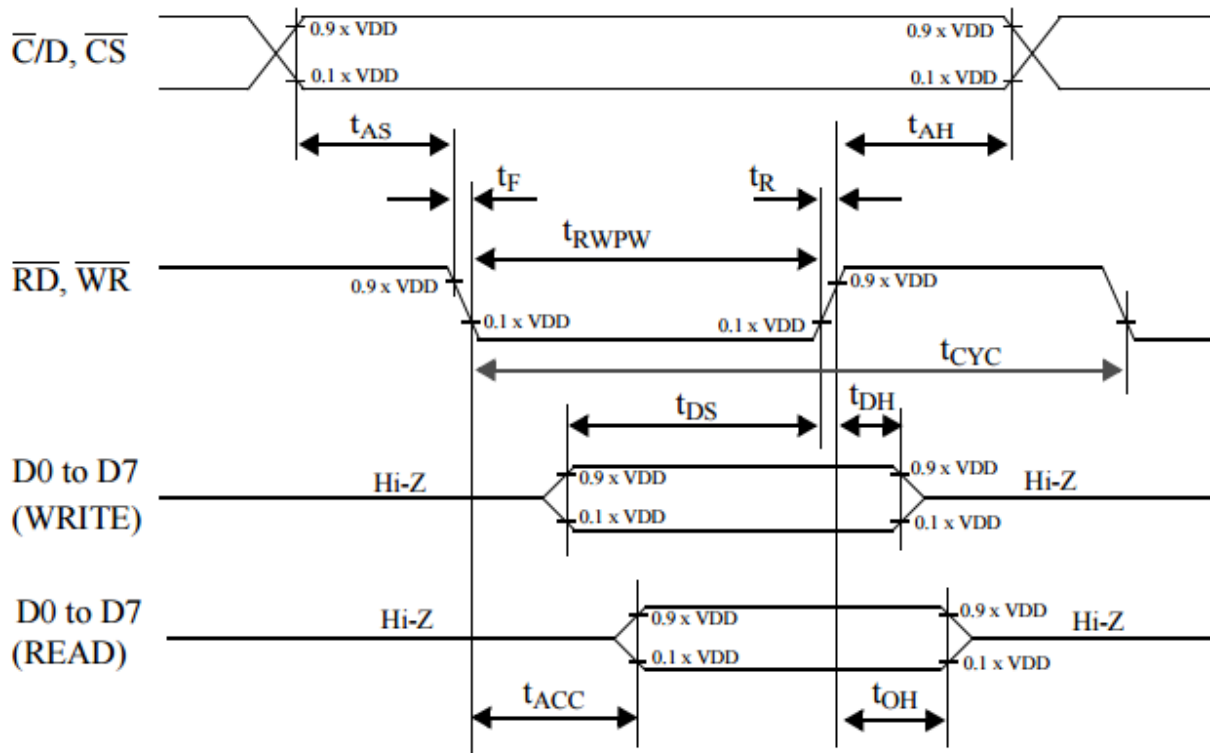
# Timing Characteristics

## AC timing for interface with a 68-type microcontroller



symbol	parameter	min.	max.	test conditons	unit
$t_{AS1}$	Address set-up time with respect to R/W	20			ns
$t_{AS2}$	Address set-up time with respect to C/D, CS	20			ns
$t_{AH1}$	Address hold time with respect to R/W	10			ns
$t_{AH2}$	Address hold time respect with to C/D, CS	10			ns
$t_{F}, t_{R}$	Enable (E) pulse falling/rising time		15		ns
$t_{CYC}$	System cycle time	1000		Note 1	ns
$t_{EWR}$	Enable pulse width for READ	100			ns
$t_{EWW}$	Enable pulse width for WRITE	80			ns
$t_{DS}$	Data setup time	80			ns
$t_{DH}$	Data hold time	10			ns
$t_{ACC}$	Data access time		90	CL= 100 pF.	ns
$t_{OH}$	Data output hold time	10	60	Refer to Fig. 23.	ns

## AC timing for interface with an 80-type microcontroller



symbol	parameter	min.	max.	test conditons	unit
$t_{AS}$	Address set-up time	20			ns
$t_{AH}$	Address hold time	10			ns
$t_F, t_R$	Read/Write pulse falling/rising time		15		ns
$t_{RWPW}$	Read/Write pulse width	200			ns
$t_{CYC}$	System cycle time	1000			ns
$t_{DS}$	Data setup time	80			ns
$t_{DH}$	Data hold time	10			ns
$t_{ACC}$	Data READ access time		90	CL= 100 pF.	ns
$t_{OH}$	Data READ output hold time	10	60	Refer to Fig. 23.	ns

## Table of Commands

COMMAND	COMMAND CODE								FUNCTION
	D7	D6	D5	D4	D3	D2	D1	D0	
Write Display Data	Data to be written into the Display Data Memory.								Write a byte of data to the Display Data Memory.
Read Display Data	Data read from the Display Data Memory.								Read a byte of data from the Display Data Memory.
Read-Modify-Write	1	1	1	0	0	0	0	0	Start Read-Modify-Write operation.
END	1	1	1	0	1	1	1	0	Stop Read-Modify-Write operation.
Software Reset	1	1	1	0	0	0	1	0	Software Reset.

## Example Initialization Program:

```

/*****/
void Comleft(char i)
{
    CS2 = 0;
    P1 = i;
    R_W = 0;
    D_I = 0;
    E = 1;
    delay(2);
    E = 0;
    CS2 = 1;
}

void Comright(char i)
{
    CS1 = 0;
    P1 = i;
    R_W = 0;
    D_I = 0;
    E = 1;
    delay(2);
    E = 0;
    CS1 = 1;
}

void Writeleft(char i)
{
    CS2 = 0;
    P1 = i;
    R_W = 0;
    D_I = 1;
    E = 1;
    delay(2);
    E = 0;
}

```



```

CS2 = 1;
}

void Writerright(char i)
{
CS1 = 0;
P1 = i;
R_W = 0;
D_I = 1;
E = 1;
delay(2);
E= 0;
CS1 = 1;
}
/*****/
void bothSides(char i)
{
Comleft(i);
Comright(i);
}
/*****/

void init()
{
P1 = 0;
P3 = 0;
RST = 0; //      Reset RST
delay(1);
RST = 1; //      Reset RST= M68 Interface
delay(10);
D_I = 0;
E = 1;
CS1 = 0;
CS2 = 0;
R_W = 1;

bothSides(0xE2);
delay(10);
bothSides(0xA4);
bothSides(0xA9);
bothSides(0xA0);
bothSides(0xEE);
bothSides(0xC0);
bothSides(0xAF);
}
/*****/

```

## 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 , 15mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	VS=800V, RS=1.5kΩ, CS=100pF One time	

**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.

## Precautions for using LCDs/LCMs

See Precautions at [www.newhavendisplay.com/specs/precautions.pdf](http://www.newhavendisplay.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisplay.com/index.php?main\\_page=terms](http://www.newhavendisplay.com/index.php?main_page=terms)