NHD-C0220AZ-FSW-FTW

COG (Chip-on-Glass) Liquid Crystal Display Module

NHD-	Newhaven Display
C0220-	COG, 2 Lines x 20 Characters
AZ-	Model
F-	Transflective
SW-	Side White LED Backlight
F-	FSTN(+)
T-	12:00 Optimum Viewing Angle
W-	Wide Temp
	RoHS Compliant

Newhaven Display International, Inc.

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795 Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com nhsales@newhavendisplay.com

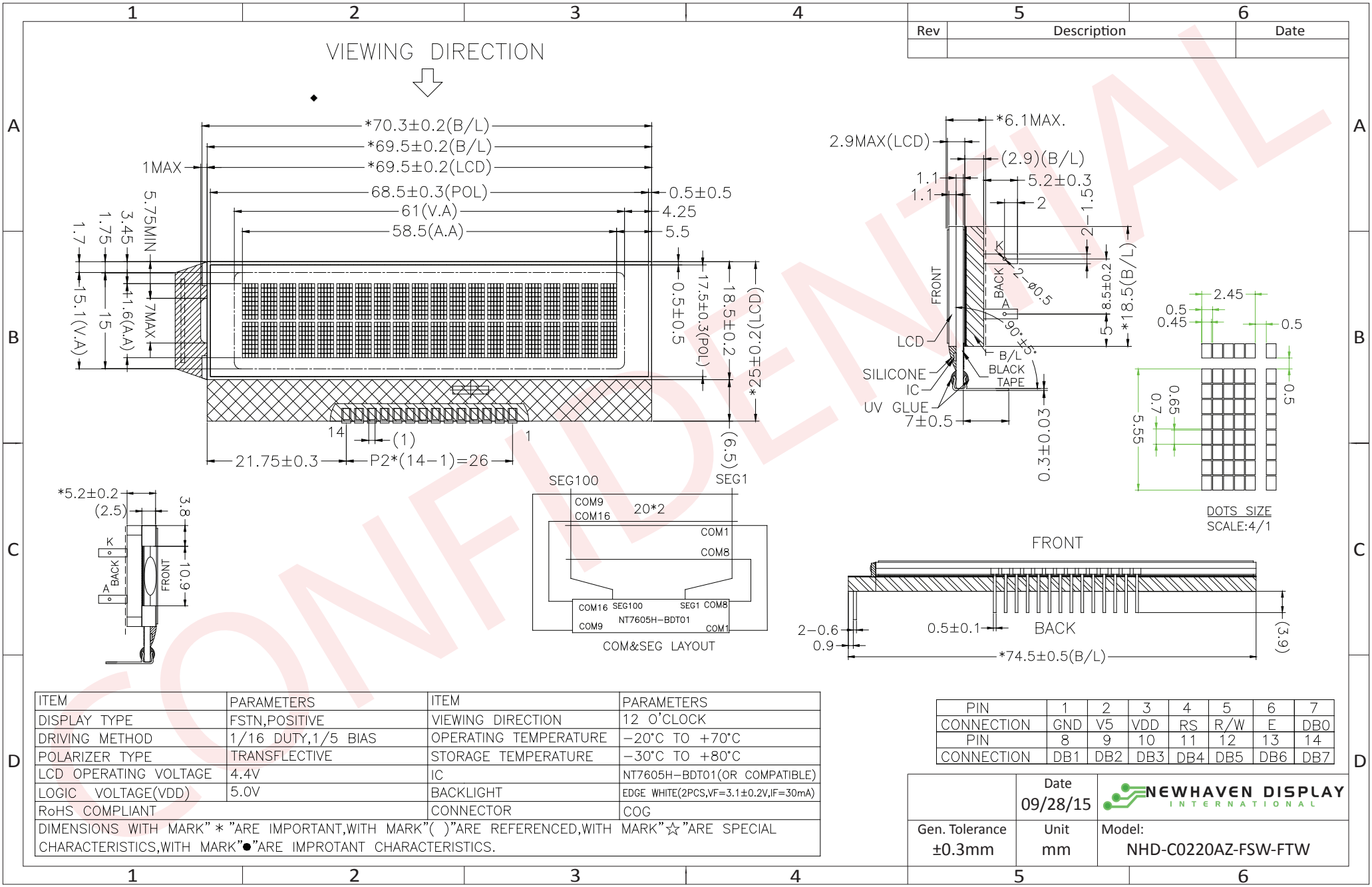
Document Revision History

Revision	Date	Description	Changed by
0	7/20/2008	Initial Release	
1	6/29/2009	User guide reformat	BE
2	10/9/2009	Updated Electrical Characteristics	MC
3	11/16/2009	Min Supply Voltage = 3.3V, Max VLCD = 5.0V	CL
4	11/19/2009	Updated backlight supply current	MC
5	5/14/2010	Controller Note	MP
6	3/14/2011	Update VLCD	CL
7	5/27/2011	Display character address code updated	AK
8	6/2/2011	Timing characteristics updated	AK
9	8/1/2011	Improve backlight, add orientation tabs	CL
10	9/28/2015	Electrical characteristics updated, mechanical drawing reformatted	SB

Functions and Features

- **2 lines x 20 characters**
- **Built-in NT7605 controller**
- **5V power supply**
- **1/16 duty, 1/5 bias**

Mechanical Drawing



Rev	Description	Date

ITEM	PARAMETERS	ITEM	PARAMETERS
DISPLAY TYPE	FSTN,POSITIVE	VIEWING DIRECTION	12 O'CLOCK
DRIVING METHOD	1/16 DUTY,1/5 BIAS	OPERATING TEMPERATURE	−20°C TO +70°C
POLARIZER TYPE	TRANSFLECTIVE	STORAGE TEMPERATURE	−30°C TO +80°C
LCD OPERATING VOLTAGE	4.4V	IC	NT7605H−BDT01(OR COMPATIBLE)
LOGIC VOLTAGE(VDD)	5.0V	BACKLIGHT	EDGE WHITE(2PCS,VF=3.1±0.2V,IF=30mA)
RoHS COMPLIANT		CONNECTOR	COG
DIMENSIONS WITH MARK" * "ARE IMPORTANT,WITH MARK"( )"ARE REFERENCED,WITH MARK"☆"ARE SPECIAL CHARACTERISTICS,WITH MARK"●"ARE IMPROTANT CHARACTERISTICS.			

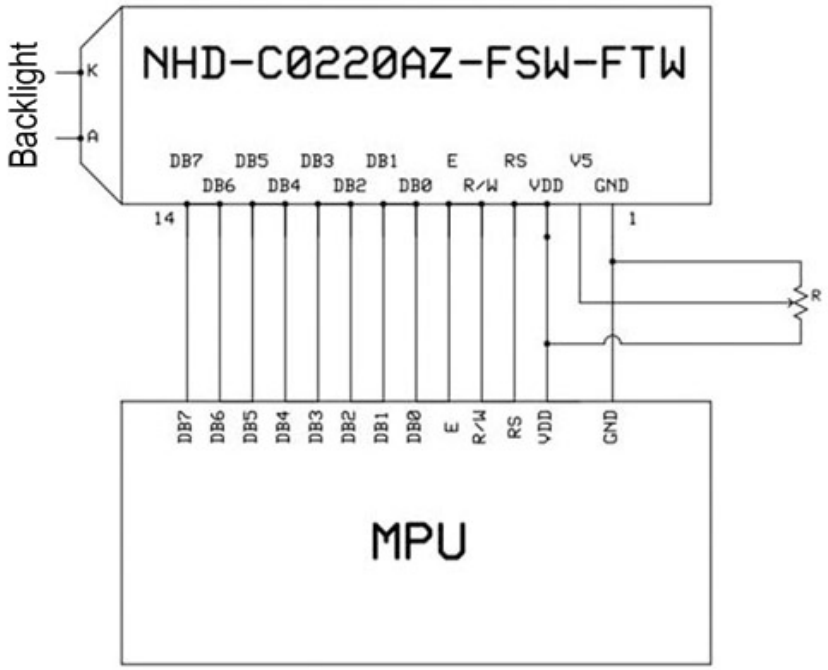
PIN	1	2	3	4	5	6	7
CONNECTION	GND	V5	VDD	RS	R/W	E	DB0
PIN	8	9	10	11	12	13	14
CONNECTION	DB1	DB2	DB3	DB4	DB5	DB6	DB7

	Date	NEWHAVEN DISPLAY INTERNATIONAL
Gen. Tolerance ±0.3mm	Unit mm	Model: NHD-C0220AZ-FSW-FTW

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	GND	Power Supply	Ground
2	V5	Adj Power Supply	Supply voltage for contrast (approx. 0.6V)
3	VDD	Power Supply	Supply voltage for LCD and logic
4	RS	MPU	Register Select: 0=Instruction, 1=Data
5	R/W	MPU	Read / Write select: 0=Write, 1=Read
6	E	MPU	Operation Enable Signal.
7-10	DB0 – DB3	MPU	Four low order bi-directional three-state data bus lines. These four are not used during 4-bit operation.
11-14	DB4 – DB7	MPU	Four high order bi-directional three-state data bus lines.
A	LED +	Power Supply	Backlight Anode (+3.0 V)
K	LED -	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.0mm pitch, 14pins Soldered to PCB, or JST p/n: PHR-14
Backlight connector: A and K pins **Mates with**: Solder to wires or PCB



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD	Ta =25°	4.5	5.0	5.5	V
Supply Current	IDD	VDD=5.0V	-	-	2	mA
Supply for LCD (contrast)		Ta =25°	4.1	4.4	4.7	V
"H" Level input	Vih		0.8*VDD	-	VDD	V
"L" Level input	Vil		0	-	0.2*VDD	V
"H" Level output	Voh		VDD-0.6	-	VDD	V
"L" Level output	Vol		GND	-	GND+0.6	V
Backlight Supply Voltage	VLED		2.9	3.0	3.2	V
Backlight Supply Current	Iled	VLED=3.0V	-	30	-	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical	AV	Cr ≥ 2	-30	-	30	º
Viewing Angle - Horizontal	AH		-20	-	+20	º
Contrast Ratio	Cr		-	6	-	
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tr	-	-	150	250	ms

Controller Information

Built-in NT7605N-BDT01 controller.
Please download specification at http://www.newhavendisplay.com/app_notes/NT7605.pdf

NOTE: The Busy Flag of the NT7605 controller may not always be responsive. Add sufficient delays and/or a time-out check routine to continue operation if busy flag is not cleared.

Note: during internal operation, busy flag (DB7) is read "High".
Busy flag check must be preceded by the next instruction.

DDRAM Address

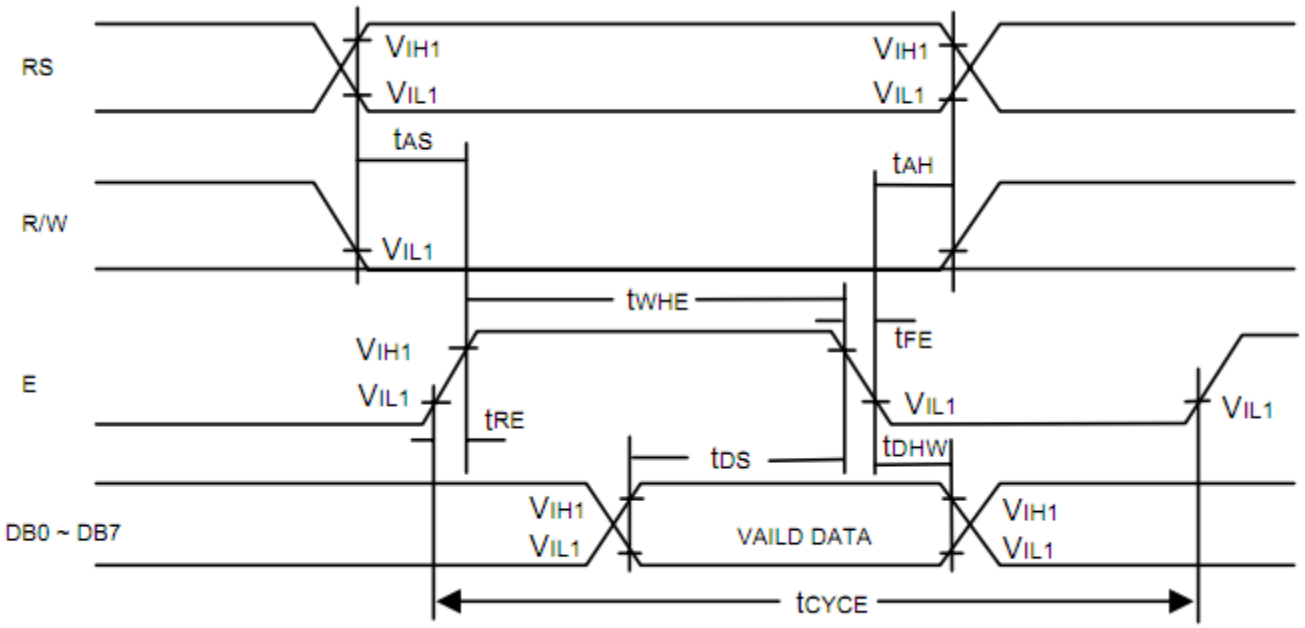
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

Table of Commands

Instruction	INSTRUCTION CODE										Description	Execution Time (Max) (fosc = 540KHZ)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear entire display area. Restore display from shift, and load address counter with DDRAM address 00H	1.64ms
Display/ Cursor Home	0	0	0	0	0	0	0	0	1	-	Restore display from shift and load address counter with DDRAM address 00H	1.64ms
Entry mode Set	0	0	0	0	0	0	0	1	I/D	S	Specify direction of cursor movement and display shift mode. This operation takes place after each data transfer (read/write)	40µs
Display ON/ OFF control	0	0	0	0	0	0	1	D	C	B	Set activation of display (D), cursor (C), and Blinking of cursor (B)	40µs
Display/ Cursor	0	0	0	0	0	1	S/C	R/L	-	-	Shift display or move cursor	40µs
Function set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL) number of the display line (N), and character font (F)	40µs
RAM Address Set	0	0	0	1	ACG						Set CGRAM address in address counter.	40µs
DDRAM Address Set	0	0	1	ADD							Set DDRAM address in address counter.	40µs
Busy Flag/ Address Counter Read	0	1	BF	AC							Read Busy Flag (BF) and contents of Address Counter (AC)	1µs
CGRAM/ DDRAM Data Write	1	0	Write Data								Write data into internal RAM (DDRAM/CGRAM).	40µs
CGRAM/ DDRAM Data Read	1	1	Read Data								Read data from internal RAM (DDRAM/CGRAM).	40µs
	I/D = 1 : Increment S = 1 : Display Shift On D = 1 : Display On C = 1 : Cursor Display On B = 1 : Cursor Blink On S/C = 1 : Shift Display R/L = 1 : Shift Right DL = 1 : 8-Bit N = 1 : Dual Line F = 1 : 5x10 dots BF = 1 : Internal Operation BF = 0 : Ready for Instruction										I/D = 0 : Decrement S/C = 0 : Move Cursor R/L = 0 : Shift Left DL = 0 : 4-Bit N = 0 : Single Line F = 0 : 5x8 dots	DDRAM : Display Data Ram CGRAM : Character Generator RAM ACG : Character Generator RAM Address ADD : Display Data RAM Address AC : Address Counter	

Timing Characteristics

Write from MPU to NT7605

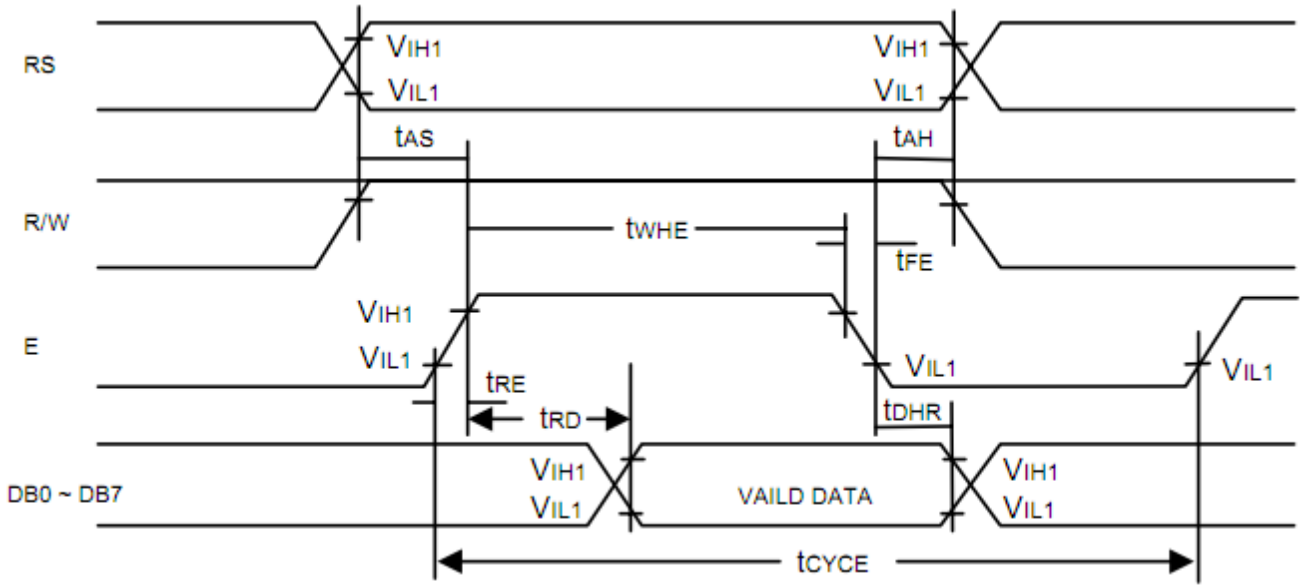


Write Cycle (V_{DD} = 4.5V~5.5V, GND = 0V, T_A = 25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 2
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 2
t_{RE}, t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 2
t_{AS}	RS, R/W Setup Time	60[1]	-	-	ns	Figure 2
		100[2]				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 2
t_{DS}	Data Output Delay	100	-	-	ns	Figure 2
t_{DHW}	Data Hold Time	10	-	-	ns	Figure 2

Notes: 1: 8-bit operation mode
2: 4-bit operation mode

Read from NT7605 to MPU



Read Cycle (V_{DD} = 4.5V~5.5V, GND = 0V, T_A = 25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
t_{CYCE}	Enable Cycle Time	500	-	-	ns	Figure 1
t_{WHE}	Enable "H" Level Pulse Width	300	-	-	ns	Figure 1
t_{RE}, t_{FE}	Enable Rise/Fall Time	-	-	25	ns	Figure 1
t_{AS}	RS, R/W Setup Time	60[1]	-	-	ns	Figure 1
		100[2]				
t_{AH}	RS, R/W Address Hold Time	10	-	-	ns	Figure 1
t_{RD}	Read Data Output Delay	-	-	190	ns	Figure 1
t_{DHR}	Read Data Hold Time	20	-	-	ns	Figure 1

Notes: 1: 8-bit operation mode
2: 4-bit operation mode

Built-in Font Table

Example Initialization Program

```
'INIT-------------------------------------------------------------------------
A = &H30
Call Writecom                                                          'wake up
Waitms 100
Call Writecom                                                          'wake up
Waitms 10
Call Writecom                                                          'wake up
Waitms 10
A = &H38
'function set
Call Writecom
A = &H10
'shift display=no
Call Writecom
A = &H0C
'display on
Call Writecom
A = &H06
'entry mode set
Call Writecom
'-----------------------------------------------------------------------------
Sub Writecom
P1 = A
Reset P3.0
'instruction
Reset P3.7
'RW
Waitms 1
Set P3.4
'E
Waitms 1
Reset P3.4                                                               'E
End Sub
'-----------------------------------------------------------------------------
Sub Writedata
P1 = A
Set P3.0
'data
Reset P3.7
'RW
Waitms 1
Set P3.4
'E
Waitms 1
Reset P3.4                                                               'E
End Sub
'-----------------------------------------------------------------------------
```

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 , 48hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 48hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C , 48hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 48hrs	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.	+40°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.	0°C,30min -> 25°C,5min -> 50°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

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms