

Product Specification

NHD-C0216AZ-FN-GBW

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

NHD-	Newhaven Display
C0216-	COG, 2 Lines x 16 Characters
AZ-	Model
F-	Transflective
N-	No Backlight
G-	STN (+) Gray
B-	6:00 Optimal View
W-	Wide Temperature

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Additional Resources

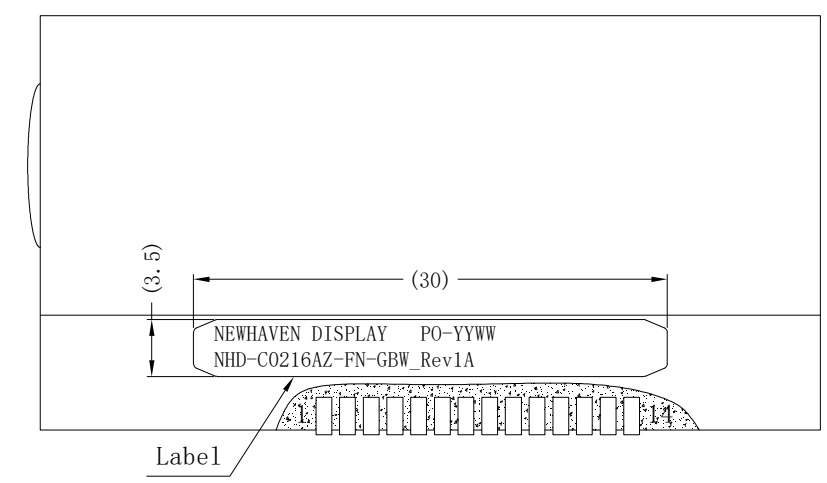
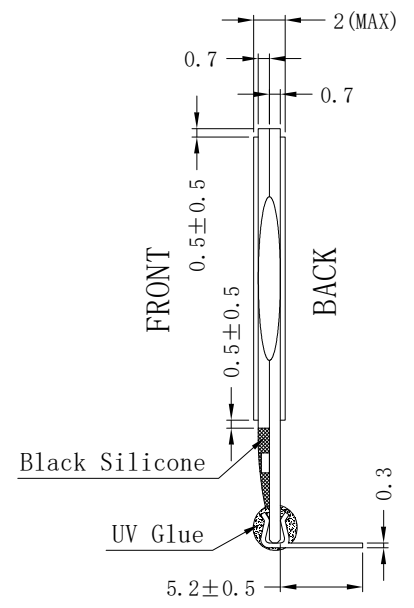
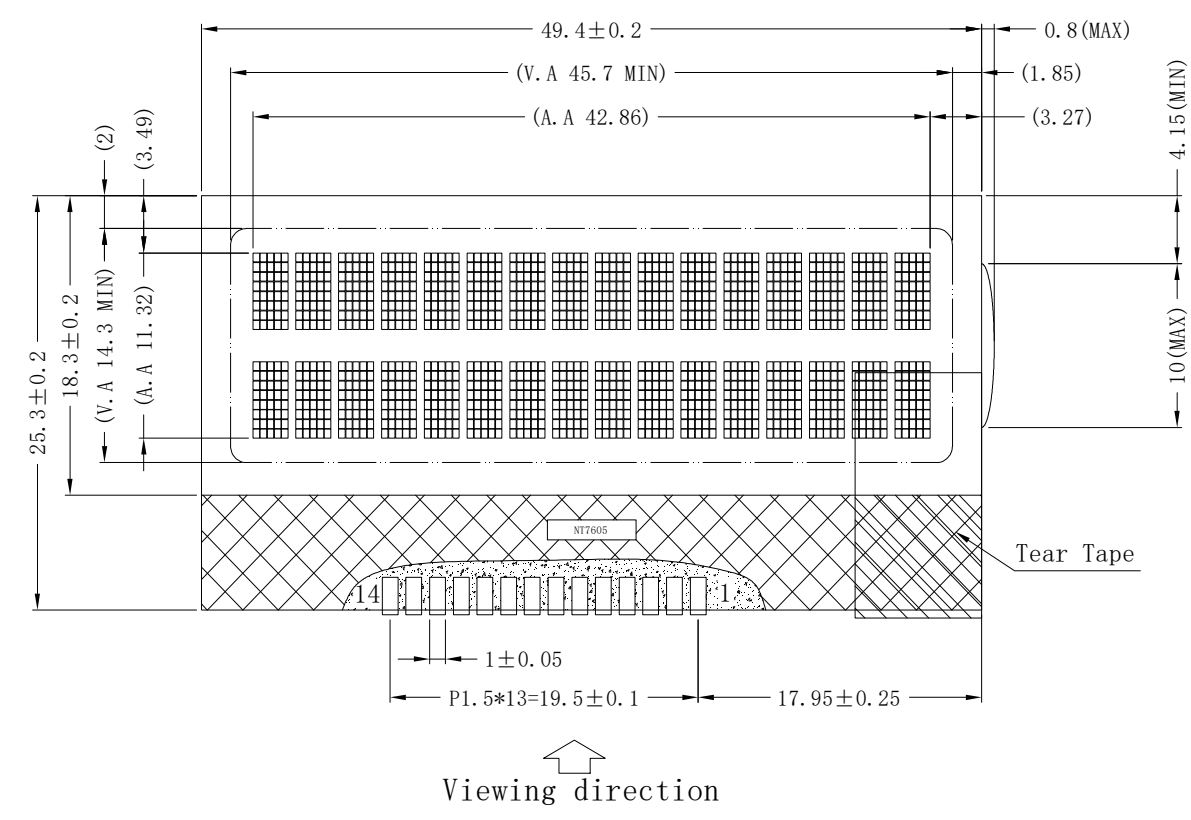
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** 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>



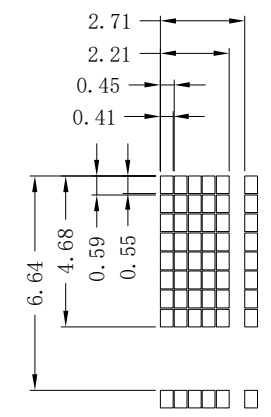
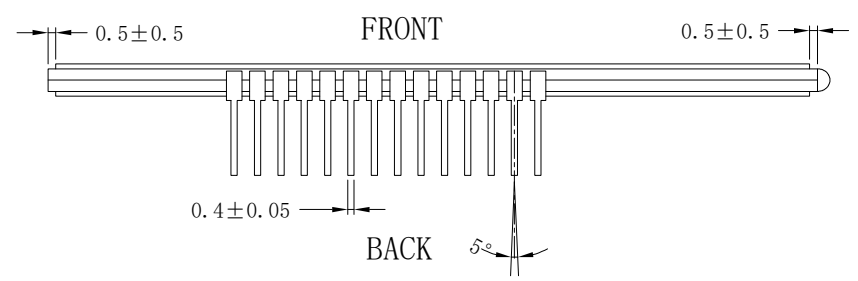
Document Revision History

Revision	Date	Description	Changed By
0	07/20/2007	Initial Release	-
1	08/01/2007	Edit Temp. Range Errors	CL
2	06/04/2008	Edit Incorrect Pinout	CL
3	09/09/2009	User Guide Reformat	BE
4	10/09/2009	Updated Electrical Characteristics Information	MC
5	10/15/2009	Updated Block Diagram	MC
6	06/02/2011	Timing Characteristics Updated	AK
7	04/14/2017	Updated Mechanical Drawing	TM
8	07/05/2019	Added PCB Footprint Drawing	AS
9	01/30/2020	Glass Panel Updated	SB
10	06/20/2024	Date Code Updated on Mechanical Drawing	KL

Mechanical Drawing



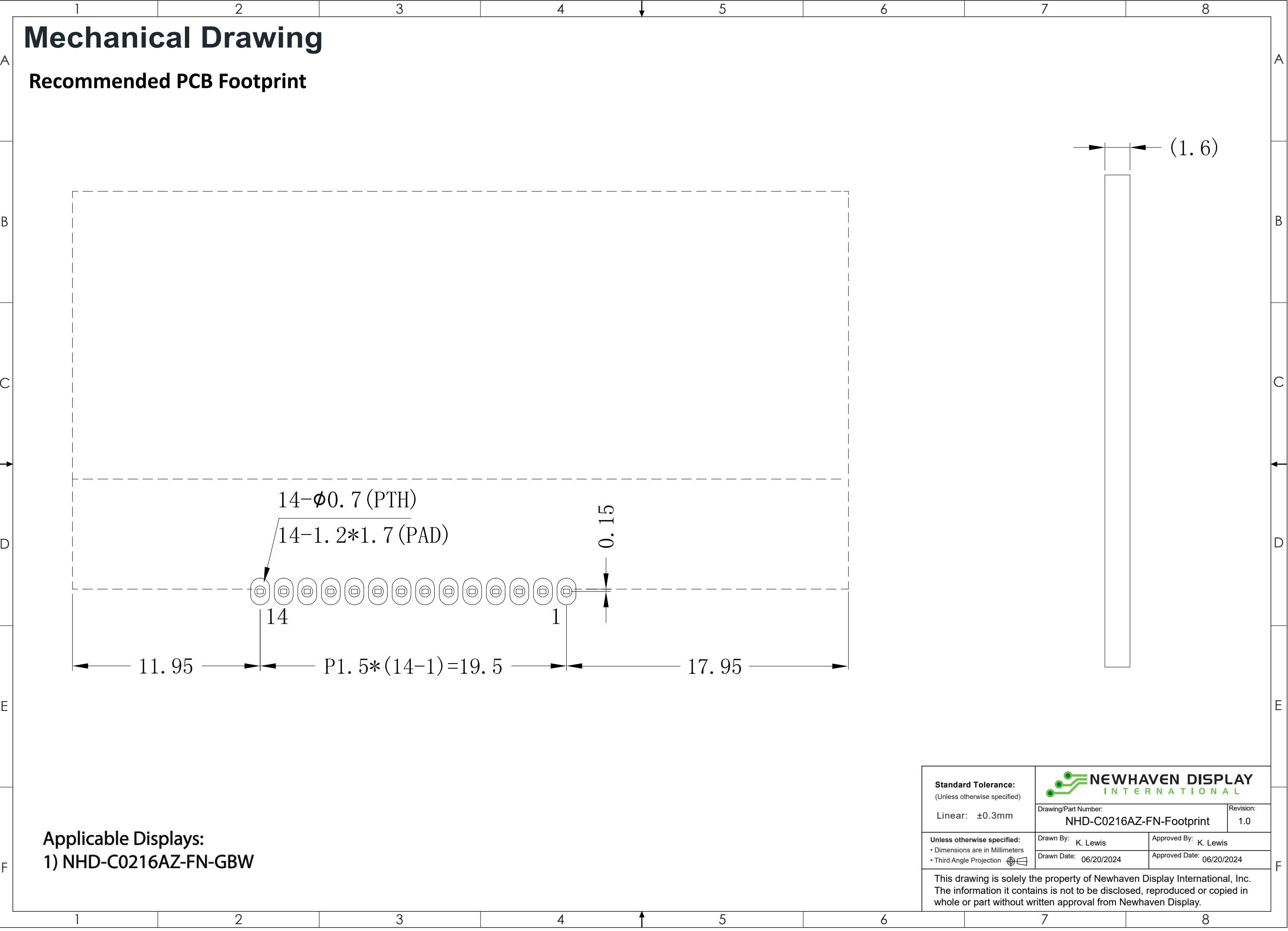
Pin assignment	
NO.	Symbol
1	VSS
2	V0
3	VDD
4	RS
5	R/W
6	E
7	D0
8	D1
9	D2
10	D3
11	D4
12	D5
13	D6
14	D7



Dots Detail
Scale 2:1

- Product Description: 2x16 Character COG LCD
1. Driver IC: NT7605
 2. Driving Mode: 1/16 Duty, 1/5 Bias
 3. Interface: 4/8-bit 6800 Parallel
 4. Power Requirement: 5.0V LCD
 5. Optical Features: STN (+) Gray, Transflective, 6:00 View, White Backlight

Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	 NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-C0216AZ-FN-GBW	Revision: 1A
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection 	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 06/20/2024	Approved Date: 06/20/2024
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.		



Applicable Displays:
1) NHD-C0216AZ-FN-GBW

Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	 NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-C0216AZ-FN-Footprint	Revision: 1.0
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection 	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 06/20/2024	Approved Date: 06/20/2024
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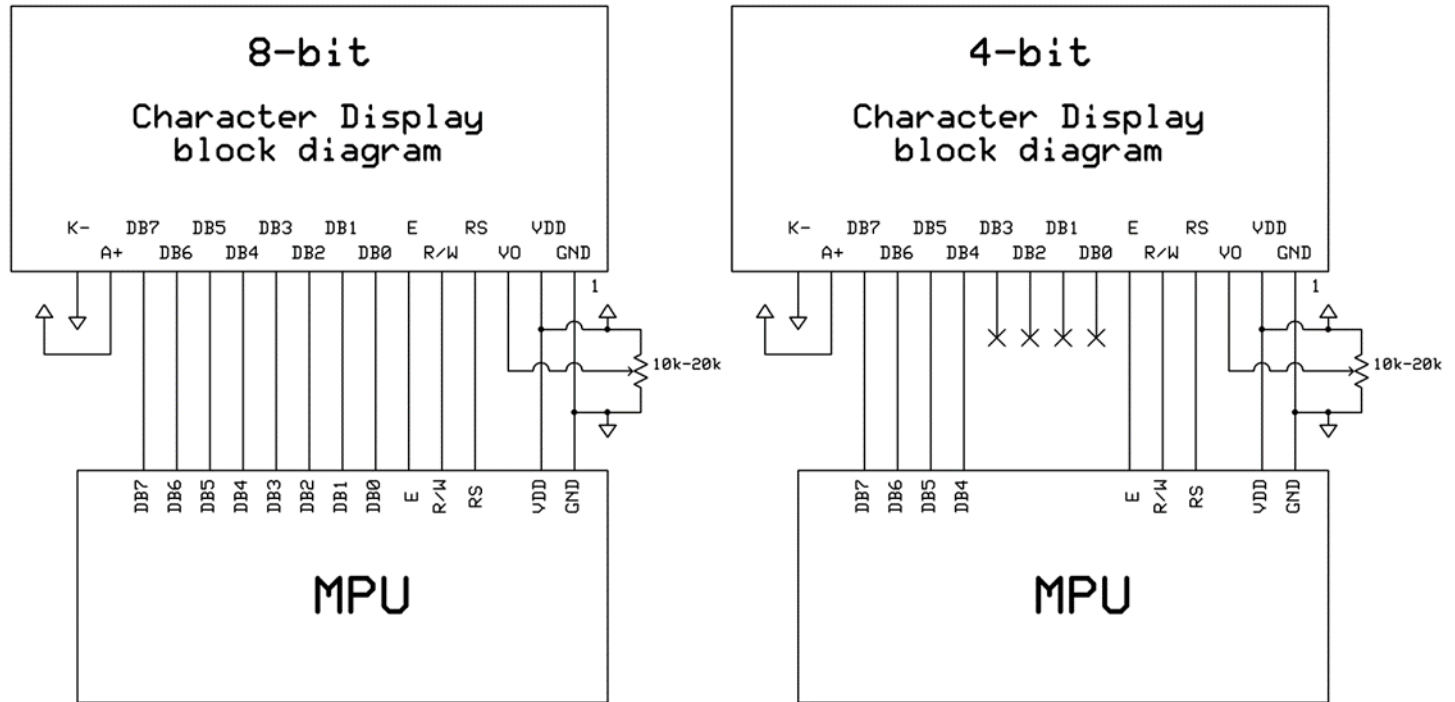
Pin Description

Pin No.	Symbol	External Connection	Function Description
1	V _{SS}	Power Supply	Ground
2	V ₀	Adj. Power supply	Power supply for contrast (approx. 0.3V)
3	V _{DD}	Power Supply	Supply voltage for logic (5.0V)
4	RS	MPU	Register select signal. RS=0: Command, RS=1: Data
5	R/W	MPU	Read/Write select signal, R/W=1: Read R/W=0: Write
6	E	MPU	Operation enable signal. Falling edge triggered.
7-10	DB0-DB3		Four low order bi-directional three state data bus lines. These four are not used during 4-bit operation.
11-14	DB4-DB7		Four high order bi-directional three state data bus lines.

Recommended LCD connector: 1.5 mm pitch, 14 pins Soldered to PCB

Recommended Breakout Board: [NHD-PCB40](#)

Wiring Diagram



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}	-	4.5	5.0	5.5	V
Supply Current	I _{DD}	T _{OP} = 25°C, V _{DD} = 5.0V	0.6	1.83	2.8	mA
Supply for LCD (contrast)	V _{LCD}		4.4	4.7	5.0	V
"H" Level input	V _{IH}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	V _{SS}	-	0.2 * V _{DD}	V
"H" Level output	V _{OH}	-	V _{DD} - 0.8	-	V _{DD}	V
"L" Level output	V _{OL}	-	V _{SS}	-	V _{SS} + 0.4	V

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	-	35	-	°
	Bottom	φY-		-	60	-	°
	Left	θX-		-	40	-	°
	Right	θX+		-	40	-	°
				-	40	-	°
Contrast Ratio		CR	-	2	4	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	150	250	ms
	Fall	T _F		-	150	250	ms

Controller Information

Built-in NT7605 Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414582003223-NT7605>

DDRAM address location

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

Table of Commands

Instruction	Code										Function	Execution time (max) (fosc = 250KHz)			
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0					
Display Clear	0	0	0	0	0	0	0	0	0	1	Clear entire display area, Restore display from shift, and load address counter with DD RAM address 00H.	1.64ms			
Display/ Cursor Home	0	0	0	0	0	0	0	0	0	1	*	Restore display from shift and load address counter with DD RAM address 00H.	1.64ms		
Entry Mode Set	0	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	0	0	0	0	0	0	0	1	D	C	B	Specify activation of display (D) cursor (C) and blinking of character at cursor position (B).	40μs		
Display/ Cursor Shift	0	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 display line (N), and character font (F).	40μs		
RAM Address Set	0	0	0	1	ACG						Load the address counter with a CG RAM address. Subsequent data access is for CG RAM data.	40μs			
DD RAM Address Set	0	0	1	ADD						Load the address counter with a DD RAM address. Subsequent data access is for DD RAM data.	40μs				
Busy Flag/ Address Counter Read	0	1	BF	AC						Read Busy Flag (BF) and contents of Address Counter (AC).	1μs				
CG RAM/ DD RAM Data Write	1	0	Write data						Write data to CG RAM or DD RAM.			40μs			
CG RAM/ DD RAM Data Read	1	1	Read data						Read data from CG RAM or DD RAM.			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		DD RAM : Display Data RAM CG RAM : Character Generator RAM ACG : Character Generator RAM Address ADD : Display Data RAM Address AC : Address Counter	

Timing Characteristics

Read Operation

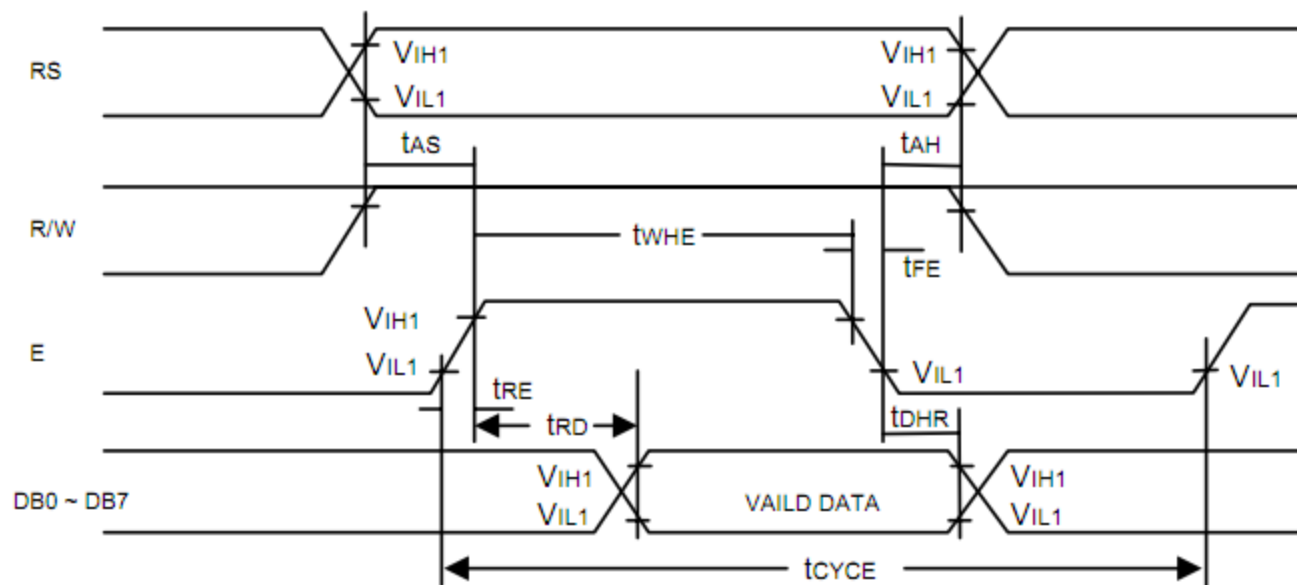


Figure 1. Bus Read Operation Sequence
(Reading out data from NT7605 to MPU)

Read Cycle ($V_{DD} = 5.0V$, $GND = 0V$, $T_A = 25^{\circ}C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
tCYCE	Enable Cycle Time	500	-	-	ns	Figure 1
tWHE	Enable "H" Level Pulse Width	300	-	-	ns	Figure 1
tRE, tFE	Enable Rise/Fall Time	-	-	25	ns	Figure 1
tAS	RS, R/W Setup Time	60 ¹	-	-	ns	Figure 1
		100 ²				
tAH	RS, R/W Address Hold Time	10	-	-	ns	Figure 1
tRD	Read Data Output Delay	-	-	190	ns	Figure 1
tDHR	Read Data Hold Time	20	-	-	ns	Figure 1

Notes: 1: 8-bit operation mode

2: 4-bit operation mode

Write Operation

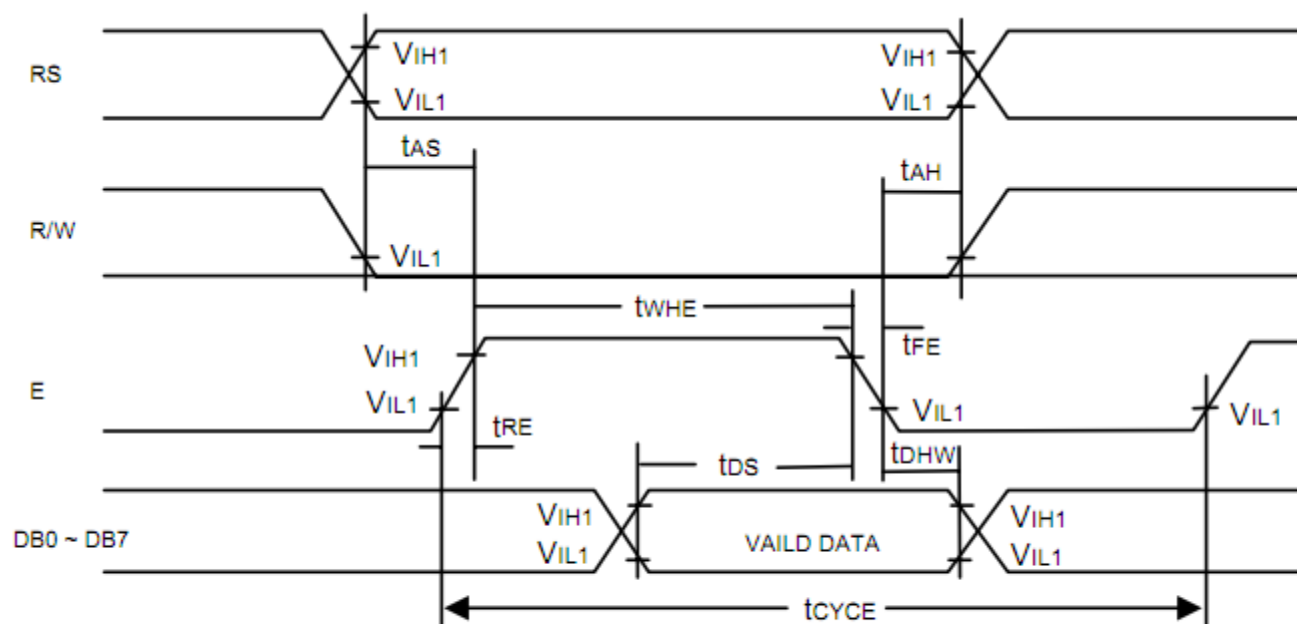


Figure 2. Bus Write Operation Sequence
(Writing data from MPU to NT7605)

Write Cycle ($V_{DD} = 5.0V$, $GND = 0V$, $T_A = 25^\circ C$)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
tCYCE	Enable Cycle Time	500	-	-	ns	Figure 2
tWHE	Enable "H" Level Pulse Width	300	-	-	ns	Figure 2
tRE, tFE	Enable Rise/Fall Time	-	-	25	ns	Figure 2
tAS	RS, R/W Setup Time	60 ¹	-	-	ns	Figure 2
		100 ²				
tAH	RS, R/W Address Hold Time	10	-	-	ns	Figure 2
tDS	Data Output Delay	100	-	-	ns	Figure 2
tDHW	Data Hold Time	10	-	-	ns	Figure 2

Notes: 1: 8-bit operation mode

2: 4-bit operation mode

Built-in Font Table

Upper 4 Bits Lower 4 Bits	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)			0	a	P	`	P				-	9	3	α	p
xxxx0001	(2)		!	1	A	Q	a	9			。	ア	チ	△	ä	q
xxxx0010	(3)		"	2	B	R	b	r			「	イ	ツ	×	ß	θ
xxxx0011	(4)		#	3	C	S	c	s			」	ウ	テ	モ	ε	∞
xxxx0100	(5)		\$	4	D	T	d	t			、	エ	ト	ホ	μ	Ω
xxxx0101	(6)		%	5	E	U	e	u			・	オ	ナ	ユ	σ	ü
xxxx0110	(7)		&	6	F	V	f	v			ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)		'	7	G	W	g	w			フ	キ	ヌ	ラ	g	π
xxxx1000	(1)		(	8	H	X	h	x			イ	ク	ネ	リ	フ	Σ
xxxx1001	(2)		)	9	I	Y	i	y			ウ	ケ	ル	ル	´	y
xxxx1010	(3)		*	:	J	Z	j	z			エ	コ	ハ	レ	j	チ
xxxx1011	(4)		+	;	K	[	k	{			オ	サ	ヒ	ロ	×	斤
xxxx1100	(5)		,	<	L	¥	l	l			ハ	シ	フ	ワ	Φ	円
xxxx1101	(6)		-	=	M	]	m	}			ユ	ズ	ハ	ン	も	÷
xxxx1110	(7)		.	>	N	^	n	→			ヨ	セ	ホ	°	ん	
xxxx1111	(8)		/	?	O	_	o	+			ッ	リ	マ	°	ö	■

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                                         'functio
n 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                                         'instructi
on
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, 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.	+50°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.	0°C, 30min -> 25°C, 5min -> 50°C, 30min = 1 cycle For 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. (5 Times)	Air: ±8KV	C: 150pF	
		Contact: ±4KV	R: 330Ω	

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.