NHD-12864AZ-NSW-BBW-TR

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 Pixels
AZ-	Model
N-	Transmissive
SW-	Side White LED Backlight
B-	STN Negative, Blue
B-	6:00 Optimal View
W-	Wide Temperature

REACH Compliant

RoHS Compliant

Table of Contents

Additional Resources

- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics

- **GitHub:** https://github.com/newhavendisplay
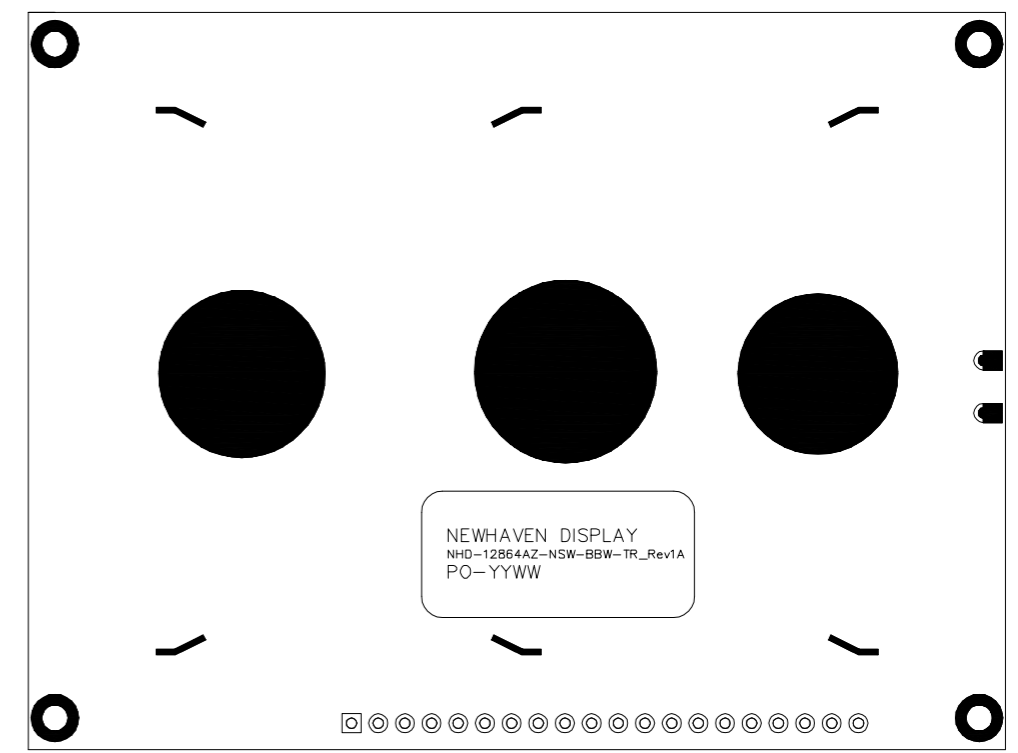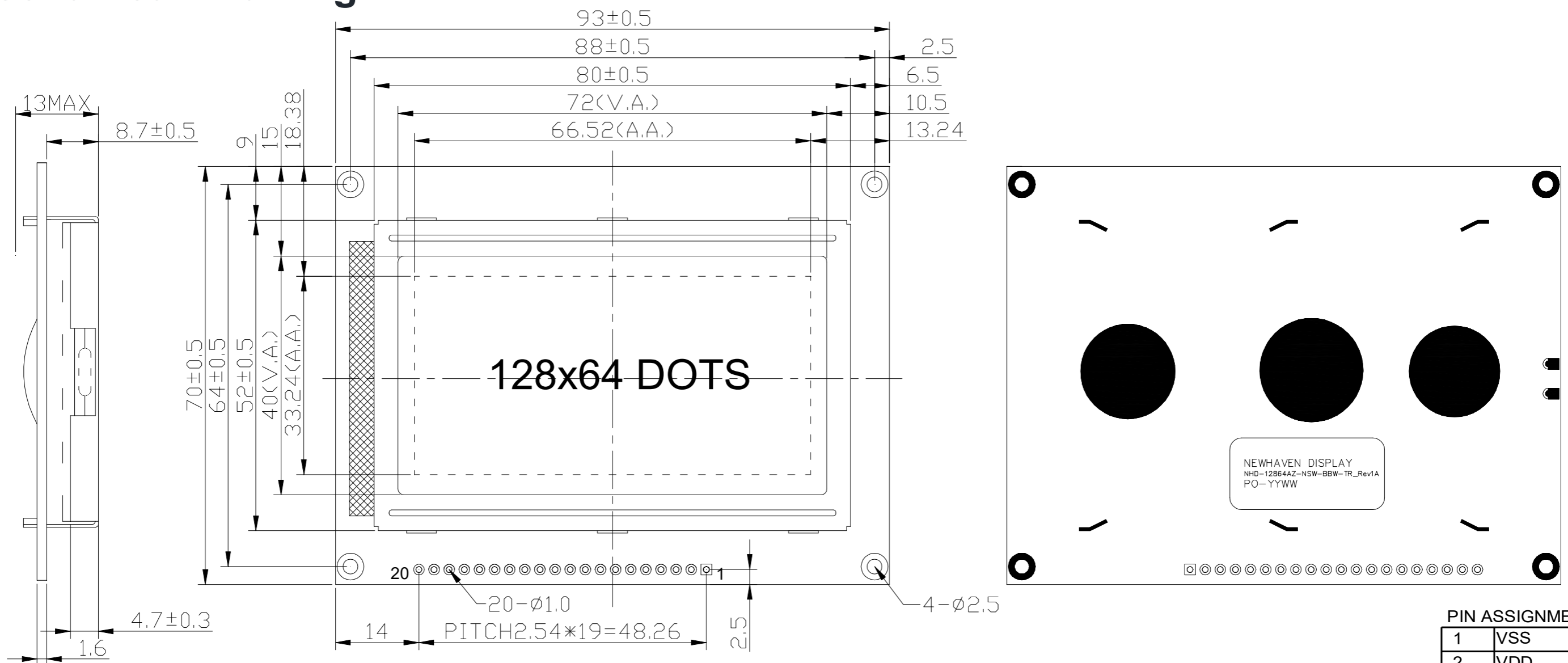
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/

- **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	11/15/2008	Initial Release	-
1	08/25/2009	User Guide Reformat	BE
2	03/24/2010	Mechanical Drawing/Pin Description Updated	BE
3	05/20/2010	Updated Pin Description and Electrical Characteristics	MC
4	12/14/2012	Controller Information Updated	AK
5	04/17/2013	Temperature Compensation Circuit Information Removed	AK
6	10/25/2016	Electrical & Optical Characteristics Updated	SB
7	10/19/2018	Driver IC, Backlight Current, & Mechanical Drawing Updated	SB
8	05/20/2020	Updated Supply Current for Display & Backlight & Logic Voltages Part Revision Updated to Rev1A	AS
9	05/27/2021	Updated Supply Current and Mechanical Drawing	JT
10	11/18/2021	Updated Mechanical Drawing	ZP
11	01/26/2023	Document Format Updated	KL
12	05/15/2023	Date Code Format Updated on Mechanical Drawing	KL

Mechanical Drawing

128x64 DOTS

93±0.5
88±0.5
80±0.5
72(V.A.)
66.52(A.A.)

2.5
6.5
10.5
13.24

13MAX
8.7±0.5

9
15
18.38

70±0.5
64±0.5
52±0.5
40(V.A.)
33.24(A.A.)

4.7±0.3
1.6

20
1

20-Ø1.0
PITCH2.54*19=48.26

14
2.5

4-Ø2.5

NEWHAVEN DISPLAY
NHD-12864AZ-NSW-BBW-TR_Rev1A
PO-YYWW

0.48
0.04
0.48
0.04

Product Description: 128x64 Graphic LCD

1. Driver IC: AiP31108U
2. Driving Mode: 1/64 Duty, 1/9 Bias
3. Interface: 8-Bit Parallel
4. Power Requirement: 5.0V
5. Optical Features: STN (-) Blue, Transmissive, 6:00 View, White Backlight
6. Recommended Pin Header: 1x20pin 2.54mm pitch

PIN ASSIGNMENT

1	VSS
2	VDD
3	V0
4	RS
5	R/W
6	E
7~14	DB0~DB7
15	CS1
16	CS2
17	RST
18	VEE
19	LED+
20	LED-

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	V_{SS}	Power Supply	Ground
2	V_{DD}	Power Supply	Supply Voltage for Logic (+5.0V)
3	V_0	Adj. Power Supply	Supply Voltage for contrast (approx. -4.5V)
4	RS	MPU	Register Select: 1=Data, 0=Instruction
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.
7-14	DB0-DB7	MPU	This is an 8-bit-directional data bus
15	CS1	MPU	Chip Selection: CS1=H, CS2=L → select IC1 (left side)
16	CS2	MPU	CS1=L, CS2=H → select IC2 (right side)
17	/RST	MPU	Active LOW Reset signal
18	VEE	Power Supply	Negative voltage output (-5.0V)
19	LED+	Power Supply	Backlight Anode (+5.0V via on-board resistor)
20	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins
Backlight connector: on LCD connector

Wiring Diagram
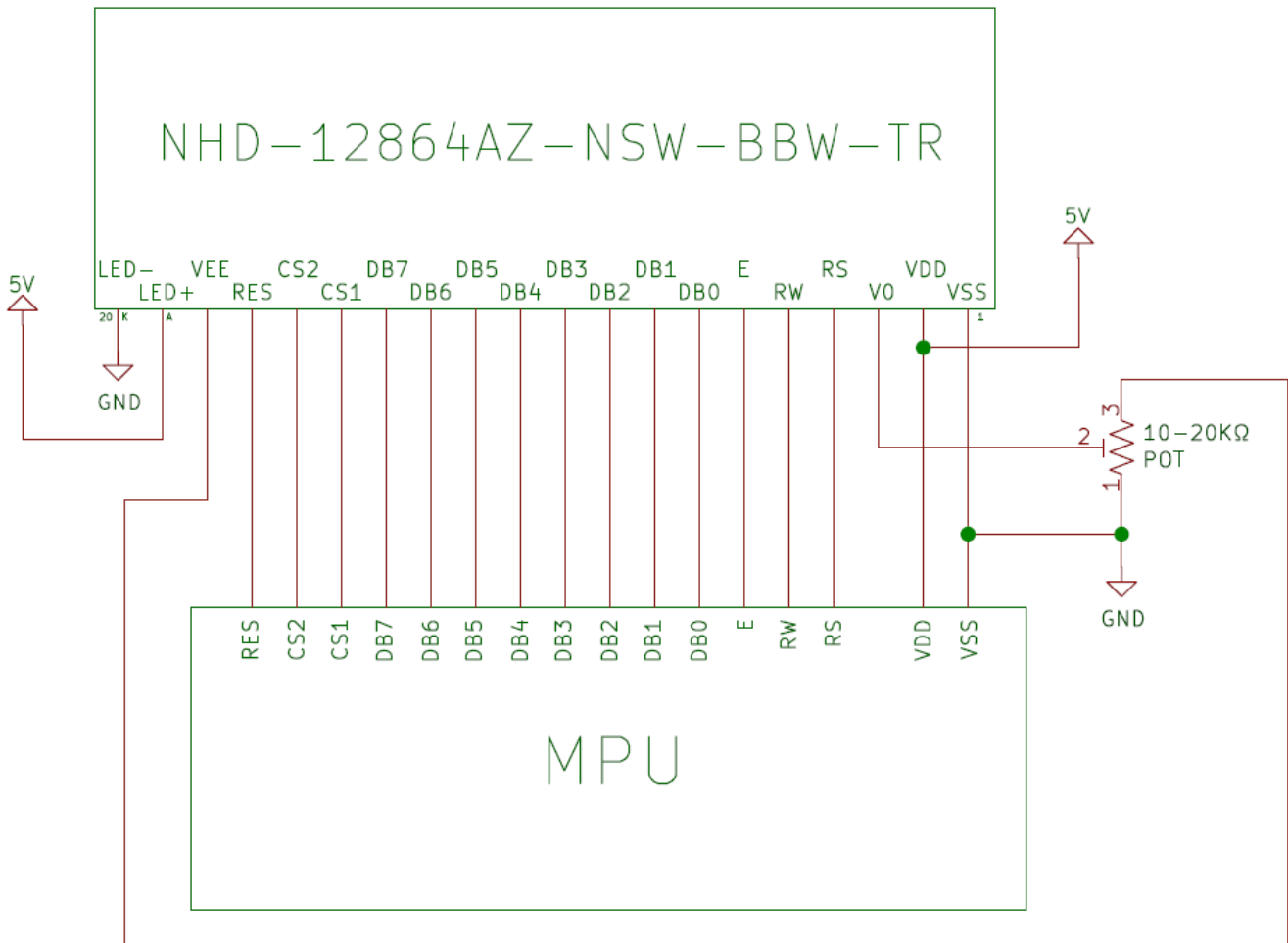
Electrical Characteristics

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}	-	4.8	5.0	5.2	V
Supply Current	I_{DD}	V_{DD} = 5.0V	1.0	2.5	4.5	mA
Supply for LCD (contrast)	V_{LCD}	T_{OP} = 25°C	9.3	9.5	9.7	V
"H" Level input	V_{IH}	-	2.2	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	0.6	V
"H" Level output	V_{OH}	-	2.4	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.4	V
Backlight Supply Voltage	V_{LED}	-	4.8	5.0	5.2	V
Backlight Supply Current	I_{LED}	V_{LED} = 5.0V	20	40	60	mA

*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	30	40	-	°
	Bottom	φY-		50	60	-	°
	Left	θX-		50	60	-	°
	Right	θX+		50	60	-	°
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T_R	T_{OP} = 25°C	-	150	250	ms
	Fall	T_F		-	200	300	ms

Controller Information

Built-in AiP31108U Controller: https://support.newhavendisplay.com/hc/en-us/articles/4414490987415-AiP31108

Table of Commands

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON
Set address (Y address)	L	L	L	H	\multicolumn{4}{Y address (0-63)}				Sets the Y address in the Y address counter.
Set page (X address)	L	L	H	L	H	H	H	Page (0-7)			Sets the X address at the X address register.
Display Start line (Z address)	L	L	H	H	Display start line (0-63)						Indicates the display data RAM displayed at the top of the screen.
Status read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write display data	H	L	Write data								Writes data (DB0: 7) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Read display data	H	H	Read data								Reads data (DB0: 7) from display data RAM to the data bus.

Timing Characteristics
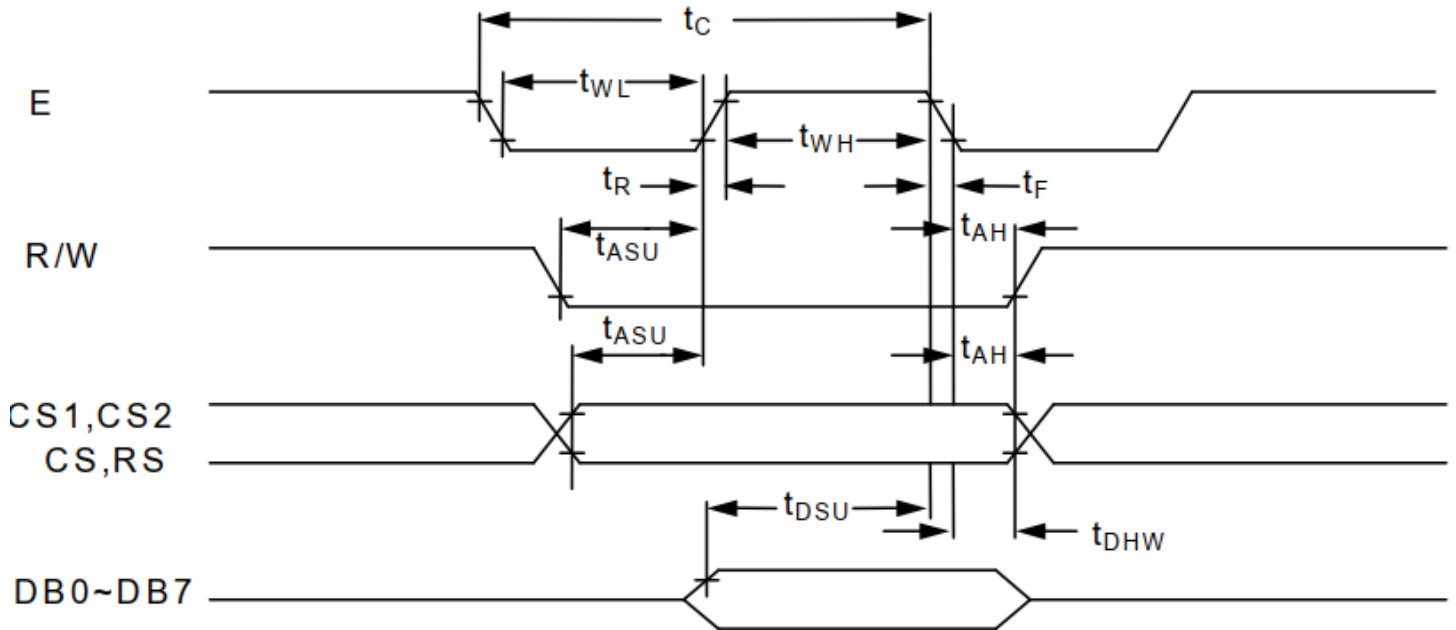
Characteristic	Symbol	Min	Type	Max	Unit
E cycle	t_C	1000	-	-	
E high level width	t_{WH}	450	-	-	
E low level width	t_{WL}	450	-	-	
E rise time	t_R	-	-	25	
E fall time	t_F	-	-	25	
Address set-up time	t_{ASU}	140	-	-	ns
Address hold time	t_{AH}	10	-	-	
Data set-up time	t_{DSU}	200	-	-	
Data delay time	t_D	-	-	320	
Data hold time (write)	t_{DHW}	10	-	-	
Data hold time (read)	t_{DHR}	20	-	-	

Example Initialization Program

```
Sub Init
 Reset P3.2
 Set P3.2
 Reset P3.4
 Reset P3.0
 Reset P3.7
 Reset P3.6
 Reset P3.1
 A = &H3F
 Call Comleft                                          'display on
 Call Comright                                         'display on
End Sub
'-------------------------------------------------------------------------
Sub Comleft
 P1 = A
 Set P3.6
 Reset P3.0
 Set P3.4
 Reset P3.4
 Reset P3.6
End Sub

Sub Comright
 P1 = A
 Set P3.1
 Reset P3.0
 Set P3.4
 Reset P3.4
 Reset P3.1
End Sub

Sub Writeleft
 P1 = A
 Set P3.6
 Set P3.0
 Set P3.4
 Reset P3.4
 Reset P3.6
End Sub

Sub Writeright
 P1 = A
 Set P3.1
 Set P3.0
 Set P3.4
 Reset P3.4
 Reset P3.1
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 , 48hrs	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 , 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.