

Product Specification

NHD-12864WG-BTFH-V#N

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 Pixels
WG-	Display Type: Graphic
B-	Model
T-	White LED Backlight
F-	FSTN (+)
H-	Transflective, Wide Temperature, 6:00 Optimal View
V#N-	Built-in Negative Voltage

Table of Contents

Document Revision History.....	2
Mechanical Drawing	3
Pin Description	4
Wiring Diagram	4
Electrical Characteristics	5
Optical Characteristics	5
Controller Information.....	5
Table of Commands.....	6
Timing Characteristics.....	7
Example Initialization Program	8
Quality Information.....	9

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>



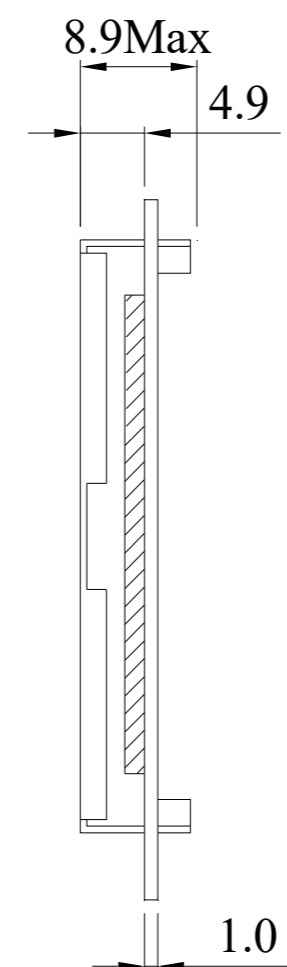
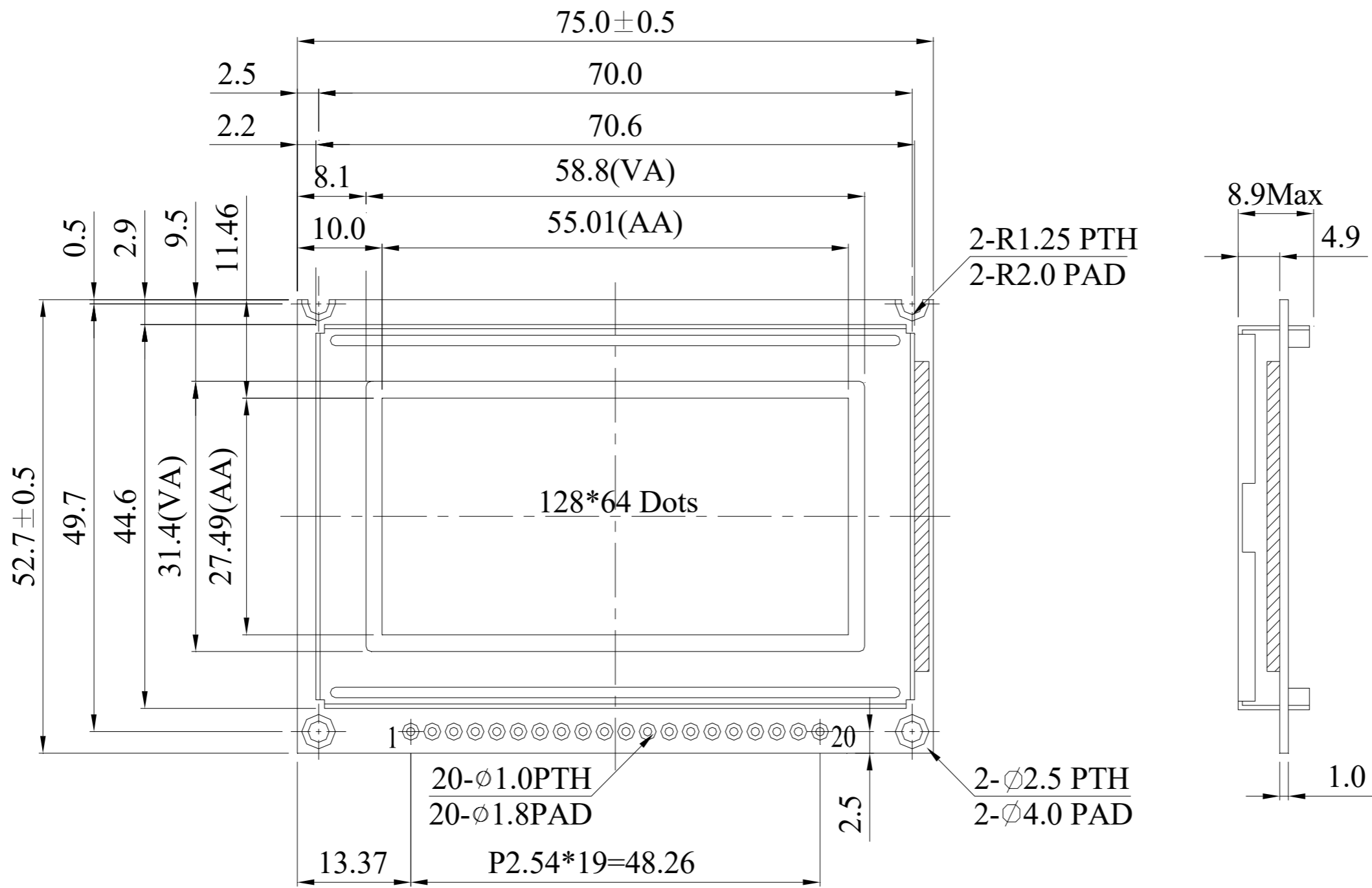
Document Revision History

Revision	Date	Description	Changed By
0	03/07/2007	Initial Release	-
1	05/21/2008	Backlight Info Modification	-
2	03/22/2010	User Guide Reformat	BE
3	04/14/2010	Block Diagram/Initialization Updated	BE
4	02/16/2011	Mechanical Drawing Updated	AK
5	12/19/2012	Controller information Updated	AK
6	03/28/2013	Electrical & Timing Characteristics Updated	JN
7	07/22/2016	Mechanical Drawing, Electrical & Optical Char. Updated	SB
8	09/07/2016	Fixed Contrast Voltage	SB
9	04/11/2017	IDD & ILED Updated	SB
10	05/30/2017	Pinout Table & Backlight Characteristics Updated	SB
11	04/04/2019	Wiring Diagram, Backlight Voltage, Drawing Updated	SB
12	06/06/2019	Quality Information Updated	AS
13	04/29/2021	Supply Current Ratings Updated	ZP
14	04/21/2023	Updated Backlight Driven Condition in Electrical Characteristics	KL
15	07/10/2023	IC Changed to NT7108T	KL

Mechanical Drawing

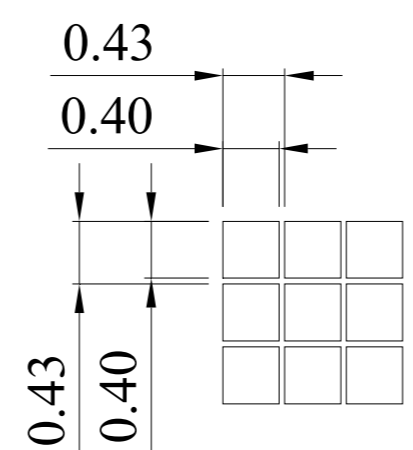
Newhaven Display
NHD-12864WG-BTFH-V#N
Date Code

Part Label (type/format may vary)



Pin Assignment

PIN NO.	SYMBOL
1	VDD
2	VSS
3	V0
4	DB0
5	DB1
6	DB2
7	DB3
8	DB4
9	DB5
10	DB6
11	DB7
12	CS1
13	CS2
14	RST
15	R/W
16	D/I
17	E
18	VEE
19	A
20	K



Product Description: 128x64 Graphic LCD

1. Driver IC: NT7108T
2. Driving Mode: 1/64 Duty
3. Interface: 6800 Parallel
4. Power Requirement: 5.0V LCD
5. Optical Features: FSTN (+), Transflective, 6:00 View, White Backlight
6. Recommended Pin Header: 1x20pin 2.54mm pitch

Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm		
	Drawing/Part Number: NHD-12864WG-BTFH-V#N	Revision: -
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 07/10/2023	Approved Date: 07/10/2023
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.		

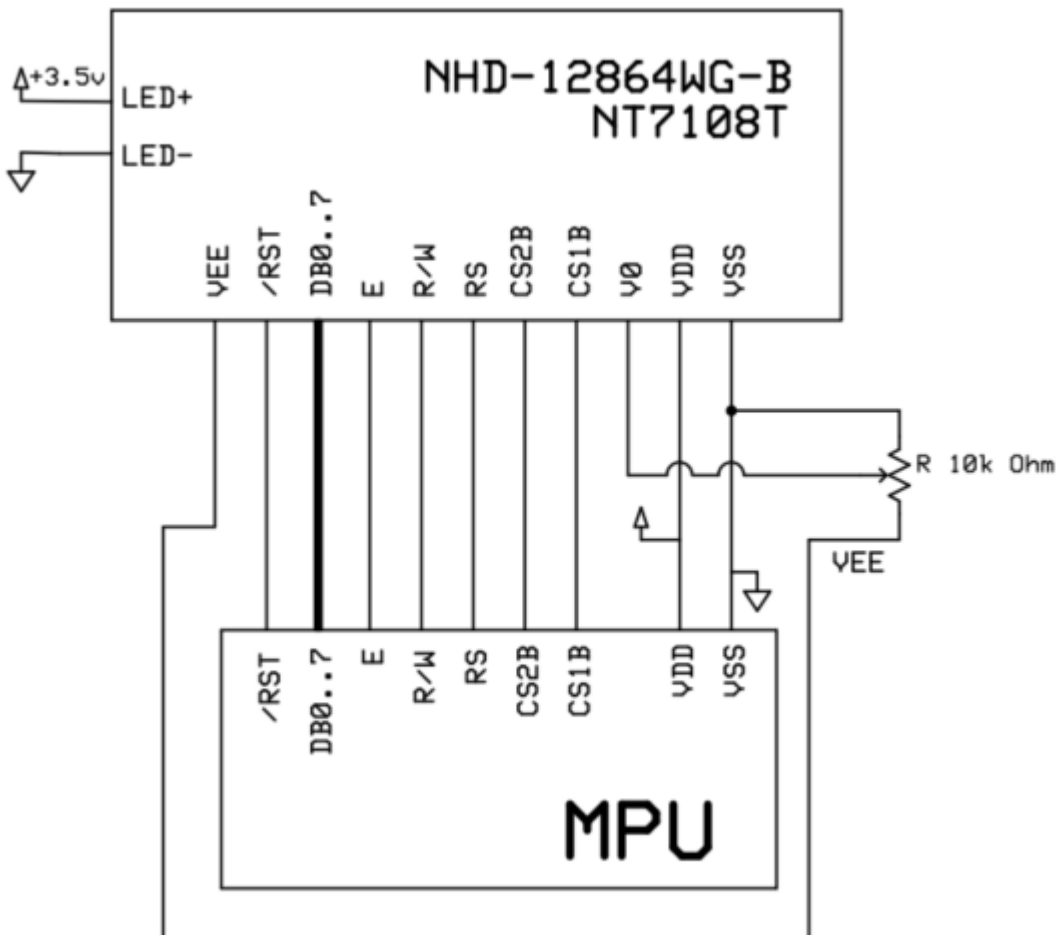
Pin Description

Pin No.	Symbol	External Connection	Function Description
1	V _{DD}	Power Supply	Supply Voltage for logic (+5.0V)
2	V _{SS}	Power Supply	Ground
3	V ₀	Power Supply	Supply Voltage for contrast (approx.. -3.0V)
4-11	DB0-DB7	MPU	Bi-directional 8-bit data bus
12	CS1B	MPU	Chip Selection: CS1=H, CS2=L : select IC1 (left side) CS1=L, CS2=H : select IC2 (right side)
13	CS2B	MPU	
14	/RST	MPU	Active LOW Reset signal
15	R/W	MPU	Read/Write select signal. R/W=1: Read R/W: =0: Write
16	RS	MPU	Register Select: 1=Data, 0= Instruction
17	E	MPU	Operation Enable signal. Falling edge triggered.
18	V _{EE}	Power Supply	Negative voltage output (- 5V)
19	LED+	Power Supply	Backlight Anode(50 mA @ 3.5V)
20	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: - Mates with: -

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}	V _{DD} = 5.0V	1.5	3.2	6.0	mA
Supply for LCD (contrast)	V _{DD-V0}	T _{OP} = 25°	7.8	8.0	8.2	V
"H" Level input	V _{IH}	-	0.7 * V _{DD}	-	V _{DD}	V
"L" Level input	V _{IL}	-	V _{SS}	-	0.8	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}	-	3.3	3.5	3.7	V
Backlight Supply Current	I _{LED}	V _{LED} = 3.5V	15	48	60	mA
Backlight Lifetime	-	I _{LED} = 48mA T _{OP} = 25°C	-	50,000	-	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	-	30	-	°
	Bottom	φY-		-	60	-	°
	Left	θX-		-	45	-	°
	Right	θX+		-	45	-	°
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	200	300	ms
	Fall	T _F		-	250	350	ms

Controller Information

Built-in NT7108T Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414581839895-NT7108>

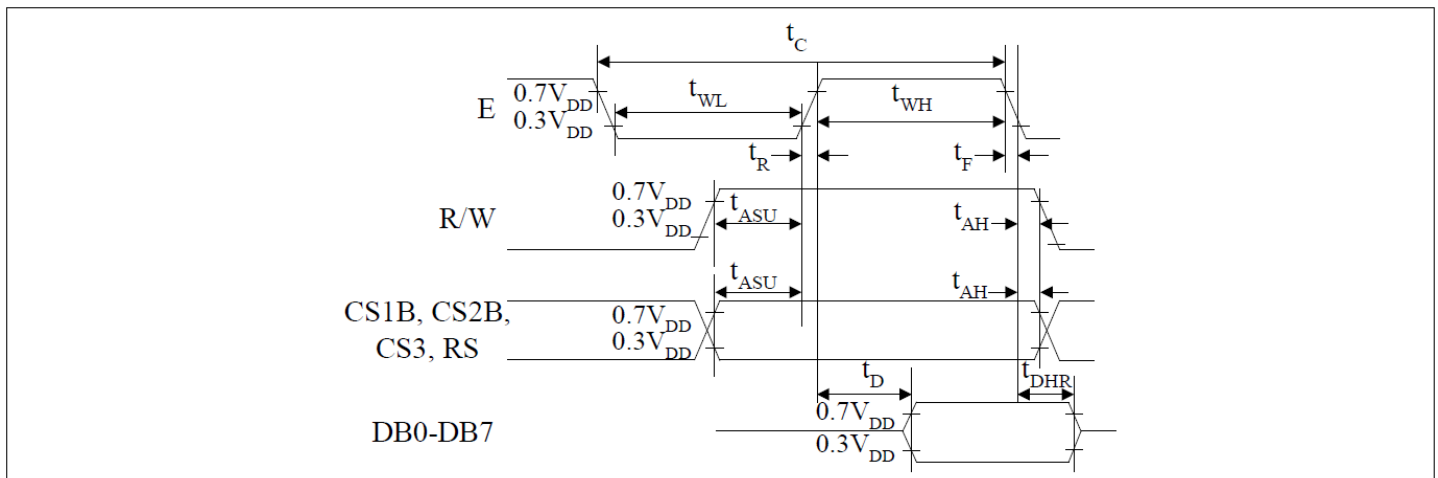
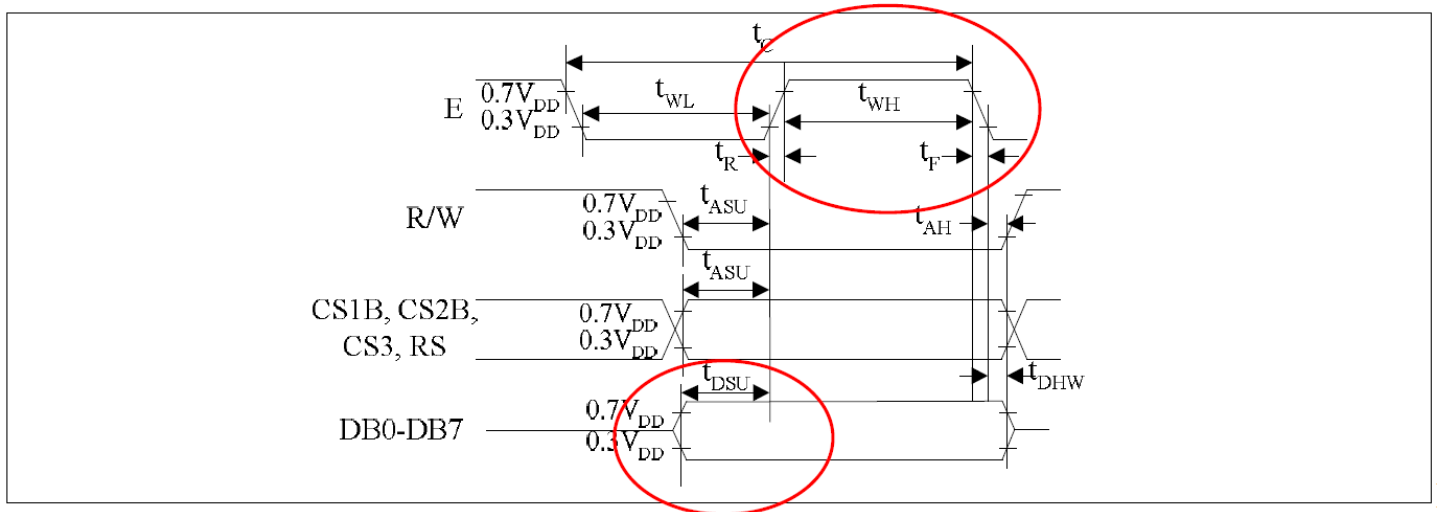


Table of Commands

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	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	-	-	ns
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	-	-	
Address hold time	t_{AH}	10	-	-	
Data set-up time	t_{DSU}	140	-	-	
Data delay time	t_D	-	-	320	
Data hold time (write)	t_{DHW}	10	-	-	
Data hold time (read)	t_{DHR}	20	-	-	



Example Initialization Program

```

-----
'DB0-DB7   7-14           P1
'CS2B      16            P3.6
'CS1B      15            P3.1
'/RST      17            P3.2
'R/W       5             P3.7
'RS        4             P3.0
'E         6             P3.4
-----

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 Writerright
  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 , 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.	VS=800V, RS=330Ω, CS=150pF 10 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.

