

Product Specification

NHD-C12864FA-RN-FTW-3V

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

NHD-	Newhaven Display
C12864-	128 x 64 Pixels
FA-	Model
R-	Reflective
N-	No Backlight
F-	FSTN (+)
T-	12:00 View
W-	Wide Temperature
3V-	3.0V LCD

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
Timing Characteristics.....	6
Example Initialization Program	10
Quality Information.....	11

Additional Resources

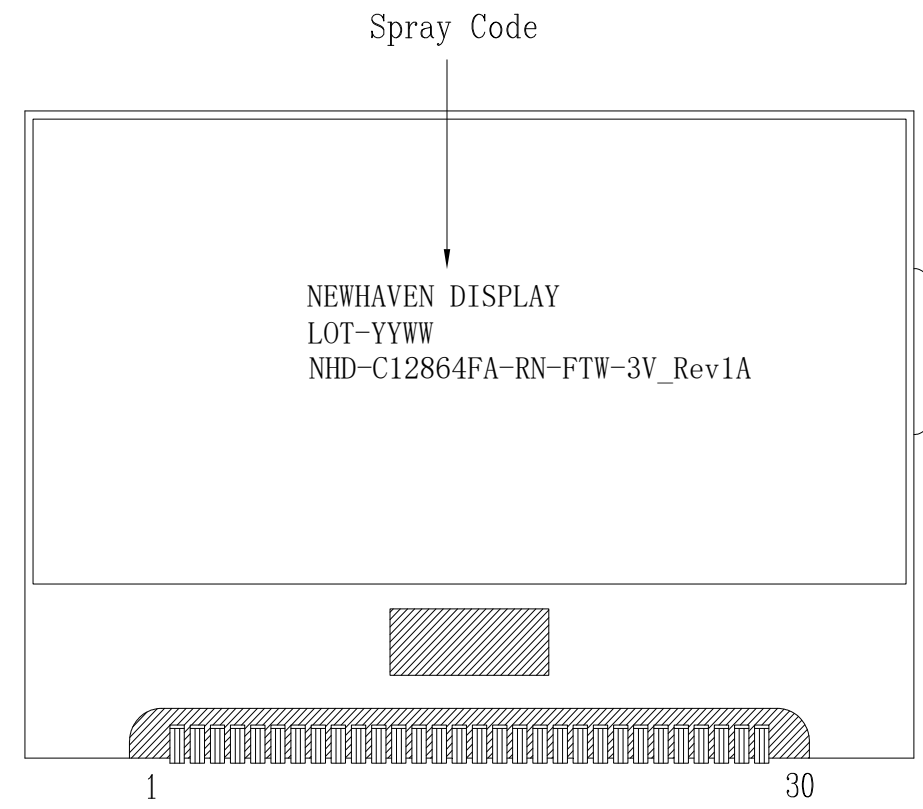
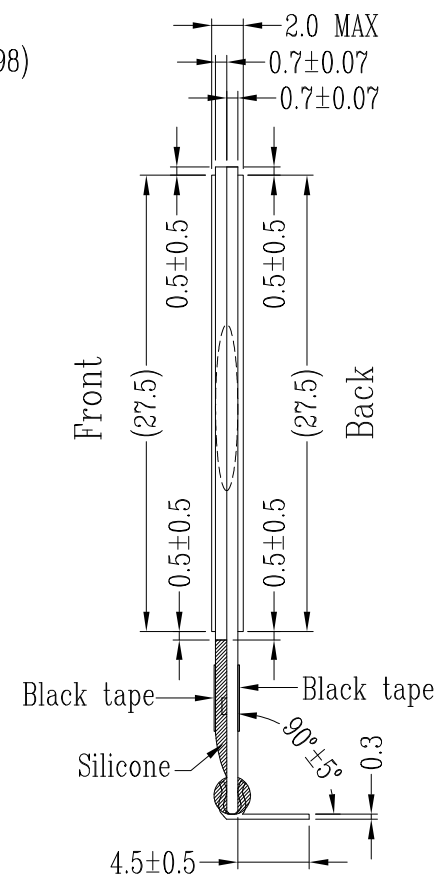
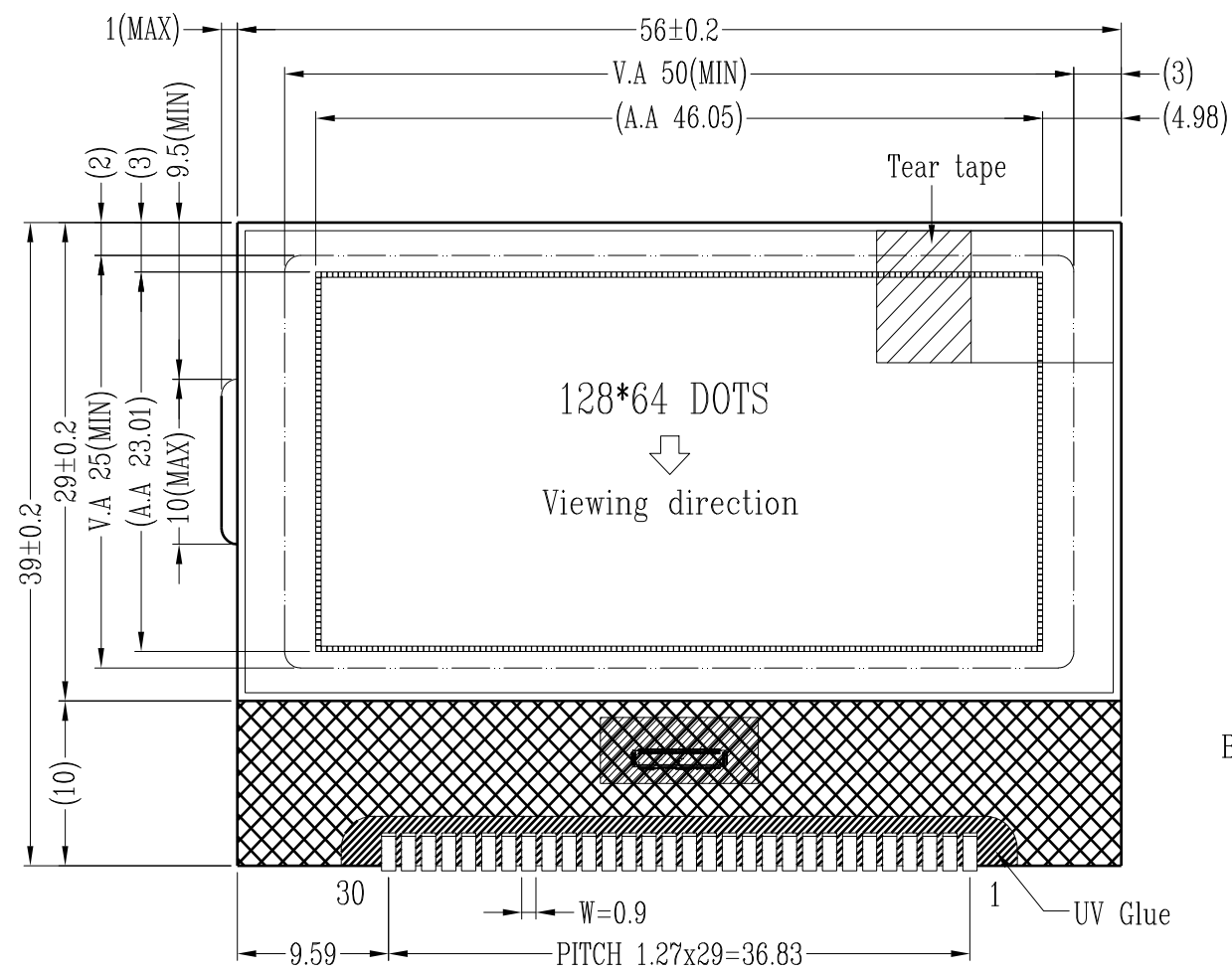
- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html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



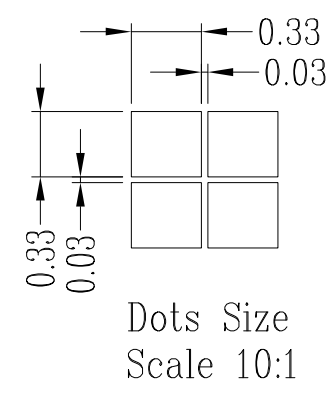
Document Revision History

Revision	Date	Description	Changed By
-	03/06/2025	Initial Release	KL

Mechanical Drawing



Pin Assignment	
PIN	NAME
1	CS1B
2	RESB
3	RS/AO
4	WR/RW
5	E/RD
6	DB0
7	DB1
8	DB2
9	DB3
10	DB4
11	DB5
12	DB6
13	DB7
14	VDD
15	VSS
16	VOUT
17	C1N
18	C3P
19	C1N
20	C1P
21	C2P
22	C2N
23	V4
24	V3
25	V2
26	V1
27	V0
28	C86
29	P/S
30	VSS



- Product Description: 128x64 Graphic COG LCD
1. Driver IC: ST7565R
 2. Driving Mode: 1/65 Duty, 1/9 Bias
 3. Interface: 8-bit 6800/8080 Parallel, 4-wire SPI
 4. Power Requirement: 3.0V LCD
 5. Optical Features: FSTN (+), Reflective, 12:00 View

Standard Tolerance: (Unless otherwise specified)		
	Drawing/Part Number: NHD-C12864FA-RN-FTW-3V	Revision: 1A
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection 	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 03/06/2025	Approved Date: 03/06/2025
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.		

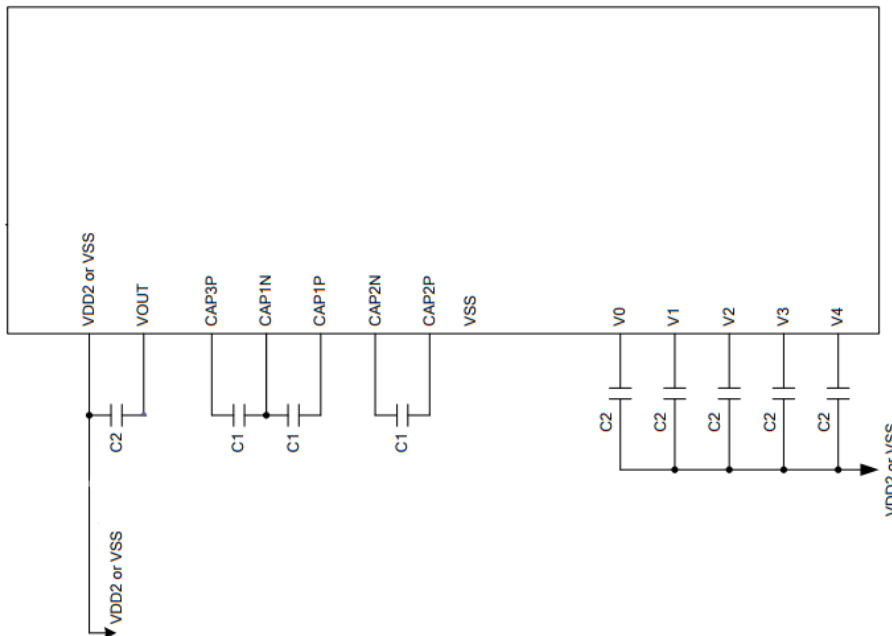
Pin Description

Pin No.	Symbol	External Connection	Function Description
1	CS1B	MPU	Active LOW Chip select
2	/RES	MPU	Active LOW Reset signal
3	A0	MPU	Register select signal. A0=1: Data; A0=0: Command
4	R/W /WR	MPU	6800 Mode: Read/Write select signal. R/W=1: Read R/W=0: Write 8080 Mode: Active LOW Write signal
5	E RD	MPU	6800 Mode: Active High Enable signal 8080 Mode: Active LOW Read signal
6-13	D0-D7	MPU	Parallel interface: 8-bit directional data bus Serial interface: DB0-DB5 = No Connect D6=Serial clock (SCL) D7= Serial Data (SI)
14	VDD	Power Supply	Supply voltage for LCD and logic (+3.0V)
15	VSS	Power Supply	Ground
16	VOUT	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to VDD or VSS
17	CAP1-	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1+ (pin 20) and CAP3+ (pin 18)
18	CAP3+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1- (pin 19)
19	CAP1-	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1+ (pin 20) and CAP3+ (pin 18)
20	CAP1+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP1- (pin 19)
21	CAP2+	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP2- (pin 22)
22	CAP2-	Power Supply	Connect 1 μ F – 2.2 μ F Capacitor to CAP2+ (pin 21)
23-27	V4-V0	Power Supply	0.1 μ F – 1 μ F Capacitor to VDD or VSS
28	C86	MPU	MPU Interface select signal. C86=1: 6800; C86=0: 8080
29	P/S	MPU	Interface Mode select signal. P/S=1: Parallel; P/S=0: Serial
30	VSS	-	Ground

Recommended LCD connector: 1.27mm pitch pins, solder directly into 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}	-	2.8	3.0	3.3	V
Supply Current	I _{DD}	T _{OP} = 25°C, V _{DD} = 3.0V	0.15	0.37	1.0	mA
Supply for LCD (contrast)	V _{LCD}	T _{OP} = 25°C	8.8	9.0	9.2	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}	-	0.8 * V _{DD}	-	V _{DD}	V
"L" Level output	V _{OL}	-	V _{SS}	-	0.2 * V _{DD}	V

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	φY+	CR ≥ 2	-	42	-	°
	Bottom	φY-		-	42	-	°
	Left	θX-		-	38	-	°
	Right	θX+		-	40	-	°
Contrast Ratio		CR	-	5.2	7	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	170	255	ms
	Fall	T _F		-	280	420	ms

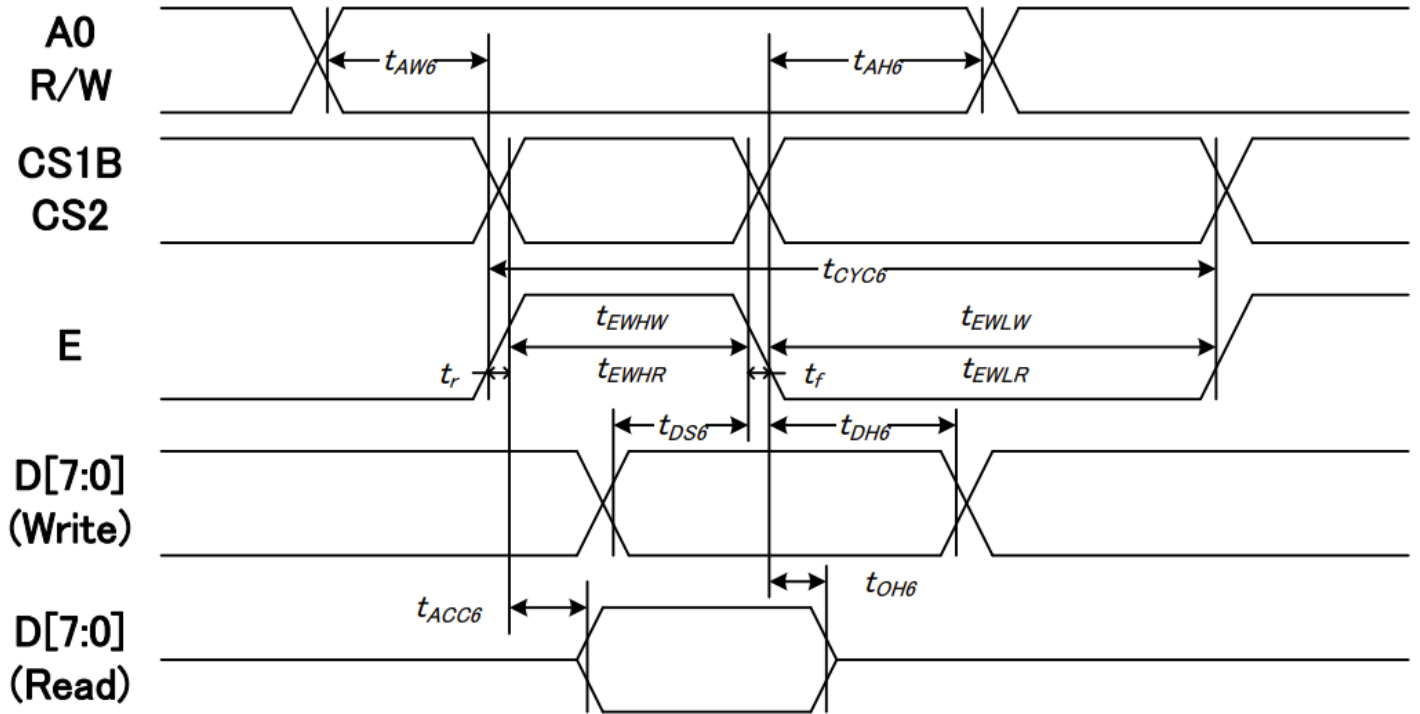
Controller Information

Built-in ST7565R Controller: <https://support.newhavendisplay.com/hc/en-us/articles/4414899357591-ST7565R>



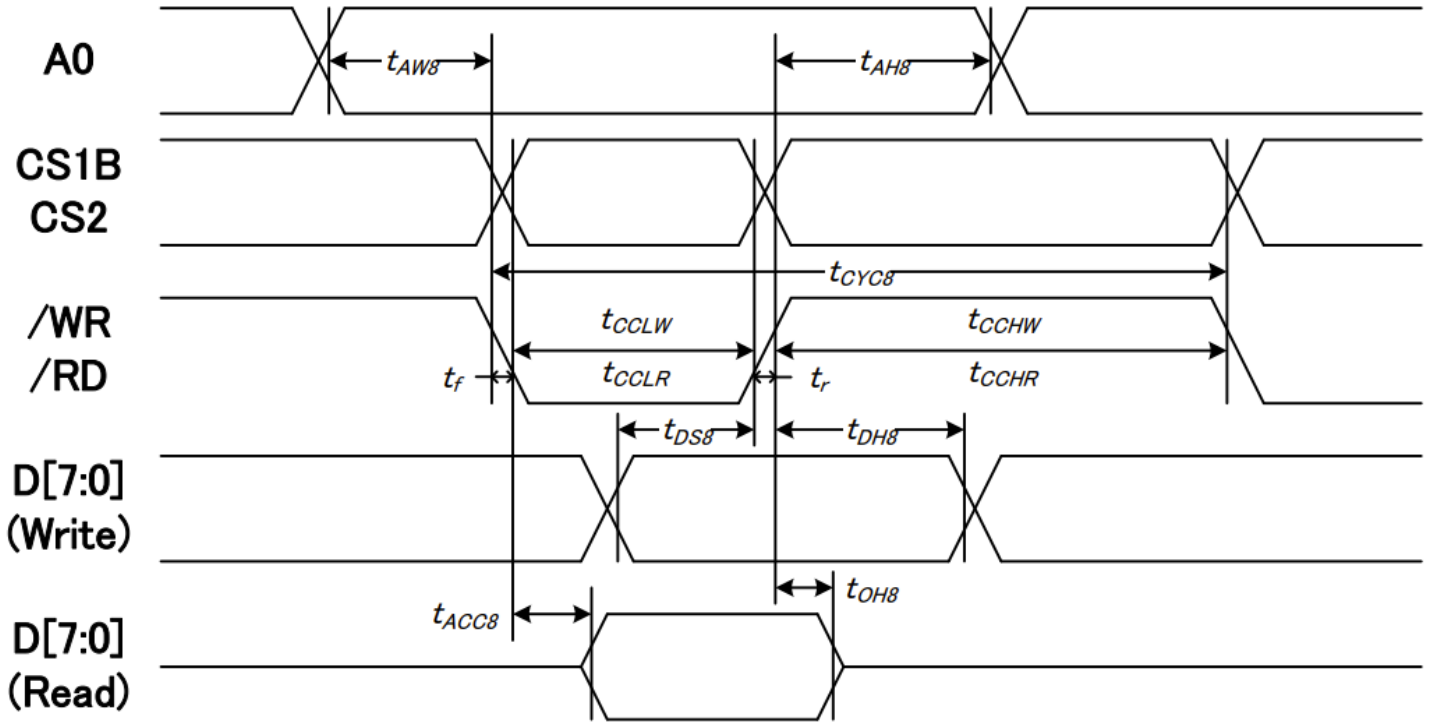
Timing Characteristics

System Bus Timing for 6800 Series MPU



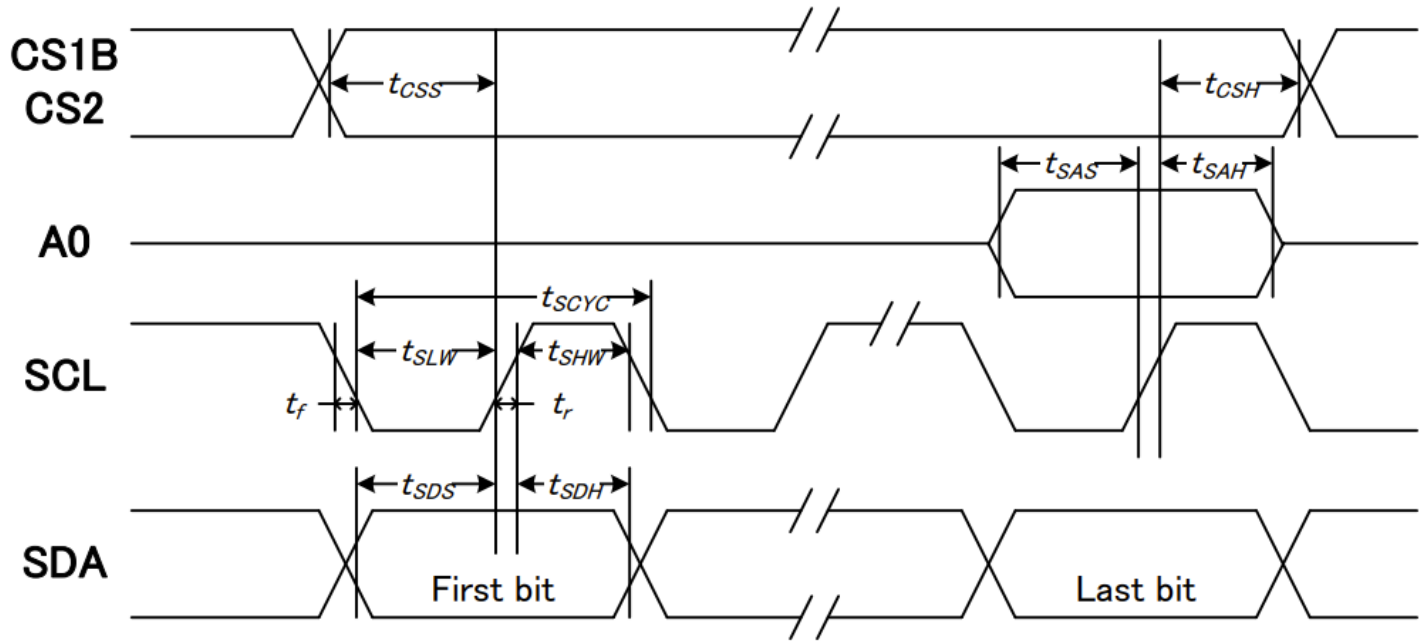
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t_{AW6}		0	—	ns
Address hold time		t_{AH6}		0	—	
System cycle time	E	t_{CYC6}		240	—	
Enable L pulse width (WRITE)		t_{EHLW}		80	—	
Enable H pulse width (WRITE)		t_{EHLH}		80	—	
Enable L pulse width (READ)		t_{EHLR}		80	—	
Enable H pulse width (READ)	D[7:0]	t_{EHLH}		140	—	
Write data setup time		t_{DS6}		40	—	
Write data hold time		t_{DH6}		10	—	
Read data access time		t_{ACC6}	CL = 100 pF	—	70	
Read data output disable time		t_{OH6}	CL = 100 pF	5	50	

System Bus Timing for 8080 Series MPU



Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW8		0	—	ns
Address hold time		tAH8		0	—	
System cycle time	/WR	tCYC8		240	—	
/WR L pulse width (WRITE)		tCCLW		80	—	
/WR H pulse width (WRITE)		tCCHW		80	—	
/RD L pulse width (READ)	RD	tCCLR		140	—	
/RD H pulse width (READ)		tCCHR		80	—	
WRITE Data setup time	D[7:0]	tDS8		40	—	
WRITE Data hold time		tDH8		20	—	
READ access time		tACC8	CL = 100 pF	—	70	
READ Output disable time		tOH8	CL = 100 pF	5	50	

System Bus Timing for 4-Wire SPI

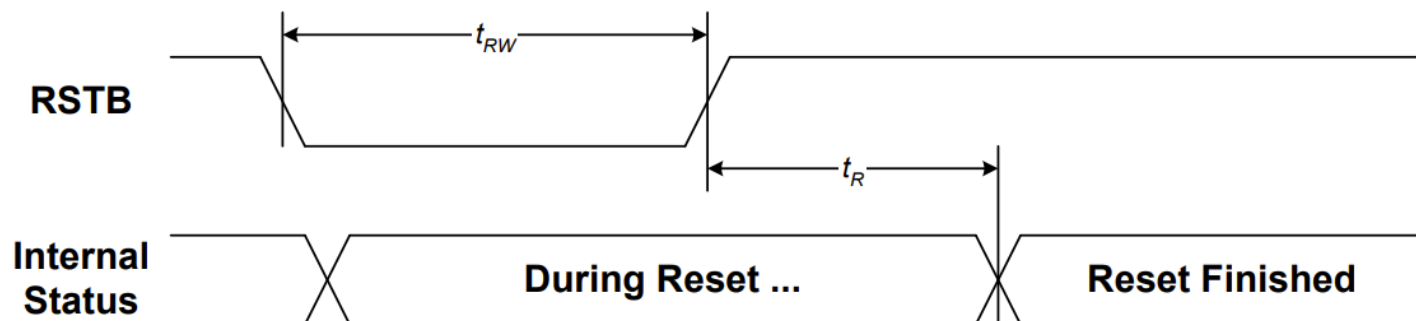


Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK "H" pulse width		tSHW		25	—	
SCLK "L" pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CS-SCLK time	CS1B	tCSS		20	—	
CS-SCLK time	CS2	tCSH		40	—	

*1 The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.

*2 All timing is specified using 20% and 80% of V_{DD} as the standard.

Reset Timing



Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset “L” pulse width	tRW		1.0	—	

Example Initialization Program

```
void data_out(unsigned char i) //Data Output Serial Interface
{
    unsigned int n;
    CS = 0;
    A0 = 1;
    for(n=0; n<8; n++){
        i <<=1;
        SCL = 0;
        P1 = i;
        delay(2);
        SCL = 1;
    }
    CS = 1;
}

void comm_out(unsigned char j) //Command Output Serial Interface
{
    unsigned int n;
    CS = 0;
    A0 = 0;
    for(n=0; n<8; n++){
        j <<=1;
        SCL = 0;
        P1 = j;
        delay(2);
        SCL = 1;
    }
    CS = 1;
}

/*****
*      Initialization For controller      *
*****/
void init_LCD()
{
    comm_out(0xA0);
    comm_out(0xAE);
    comm_out(0xC0);
    comm_out(0xA2);
    comm_out(0x2F);
    comm_out(0x21);
    comm_out(0x81);
    comm_out(0x3F);
}
/*****/
```

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, 200hrs	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-20°C, 60min -> 70°C, 60 min, 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz, 1.5mm amplitude. 5g Acceleration. X, Y, Z for 30 minutes	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±8kV 150 pF/330Ω 5 times	
		Contact: ±4kV 150pF/330Ω 5 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.