

Product Specification

NHD-C0420AZ-NSW-BBW-3V3

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

NHD-	Newhaven Display
C0420-	COG, 4 Lines x 20 Characters
AZ-	Model
N-	Transmissive
SW-	Side white LED Backlight
B-	STN (-) Blue
B-	6:00 Optimal View
W-	Wide Temperature
3V3-	3.0V LCD, 3.0V Backlight

Table of Contents

Document Revision History.....	2
Mechanical Drawing	3
Pin Description	4
Interface Selection.....	4
DDRAM address	4
Wiring Diagram	5
Electrical Characteristics	7
Optical Characteristics	7
Controller Information.....	7
Table of Commands.....	8
Timing Characteristics.....	10
Built-in Font Table	16
Example Initialization Code.....	17
Quality Information.....	19

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
-	01/11/2026	Initial Release	KL

F



F

F

FF

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	V _{SS}	Power Supply	Ground
2	V _{DD}	Power Supply	Supply voltage for logic (3.3V)
3	CSB	MPU	Active LOW Chip Select signal
4	RESB	MPU	Active LOW Reset signal
5	A0	MPU	Register Select Signal. A0=0: Command, A0=1: Data
6	R/W /WR	MPU	6800 Mode: Read/Write select signal, R/W=1: Read R/W=0: Write 8080 Mode: Active LOW Write signal
7	E /RD	MPU	6800 Mode: Operation Enable signal. Falling edge triggered. 8080 Mode: Active LOW Read signal
8-15	DB0-DB7	MPU	Parallel Interface: DB0-DB7: Bi-direction 8-bit data bus Serial Interface: DB6: Serial Clock (SCL) DB7: Serial Data (SDA)
16	C68	MPU	Select MPU interface pin. C86=H: 6800; C86=L: 8080
17	PS	MPU	Parallel/Serial Select. PS= H: Parallel; PS=L: Serial (IIC=H)
18	IIC	MPU	I ² C mode select. IIC=H: I ² C mode disabled; IIC=L: I ² C mode enabled
19	LED-A	Power Supply	Backlight Anode (3.0V)
20	LEK-K	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 20pin 0.5mm pitch

Interface Selection

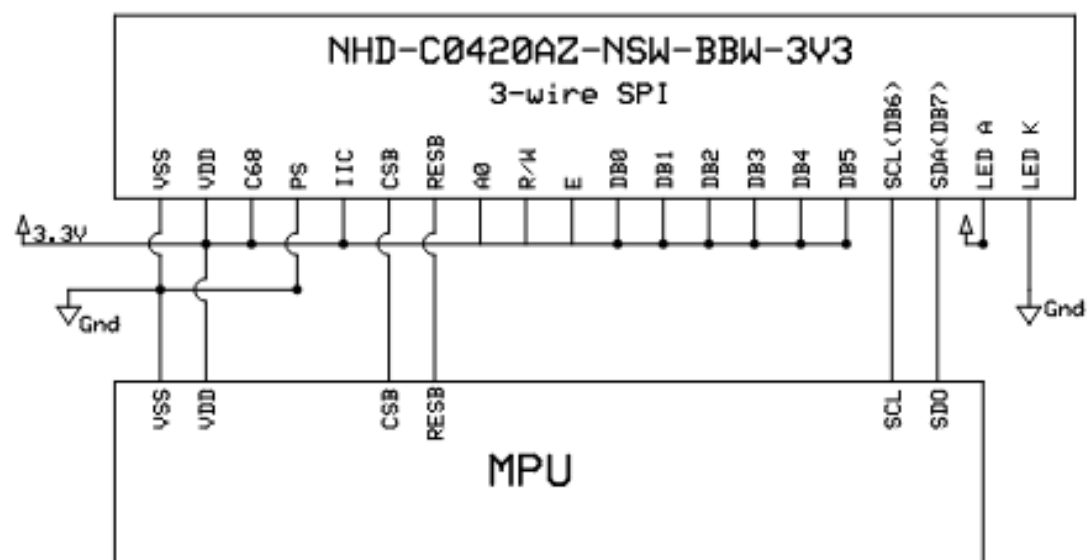
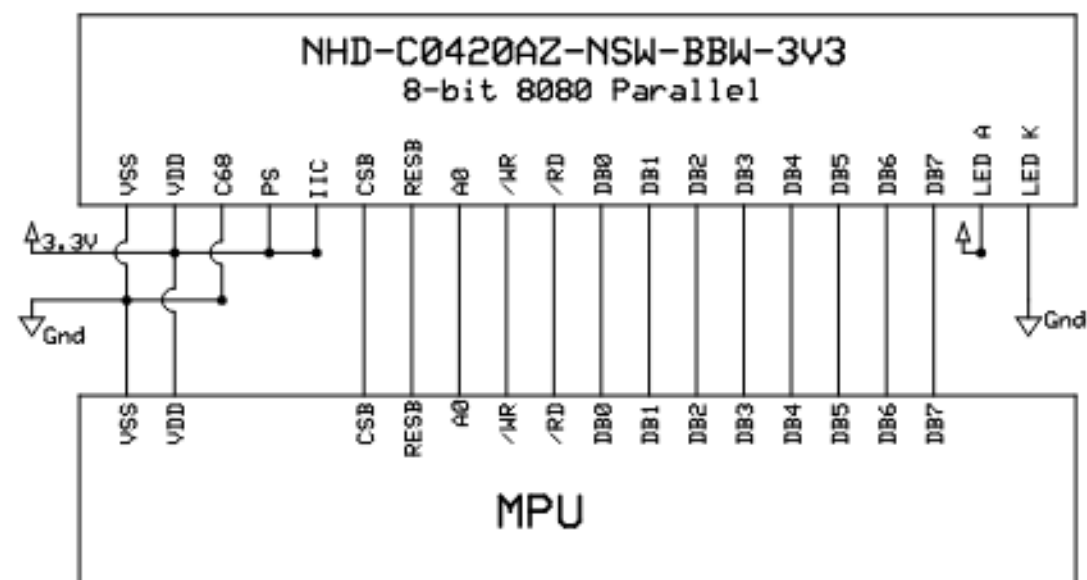
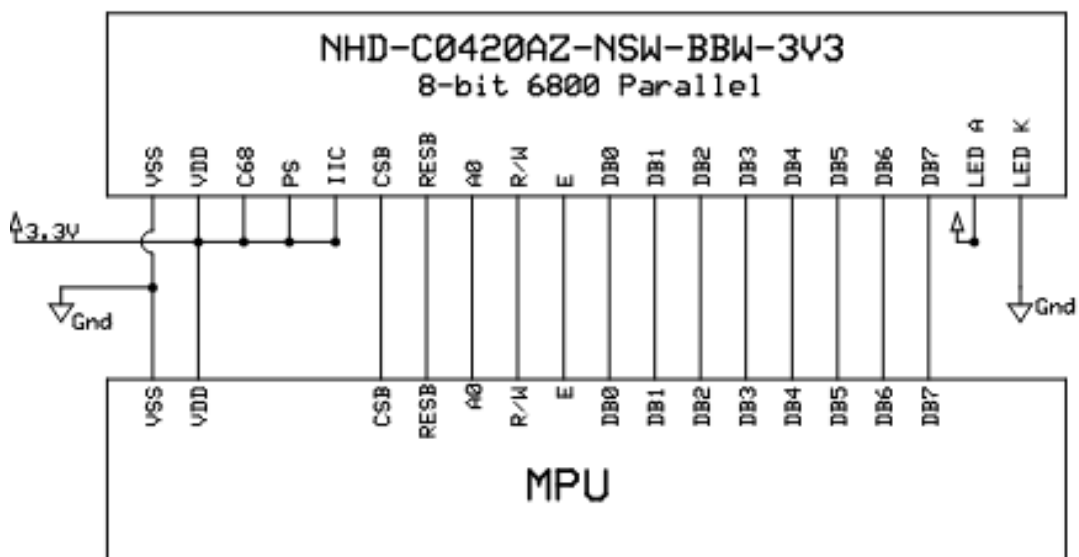
Pin Name	IIC	PS	C68
8-bit 6800 Parallel	H	H	H
8-bit 8080 Parallel	H	H	L
3-wire SPI	H	L	H
4-wire SPI	H	L	L
I ² C	L	ID1	ID0

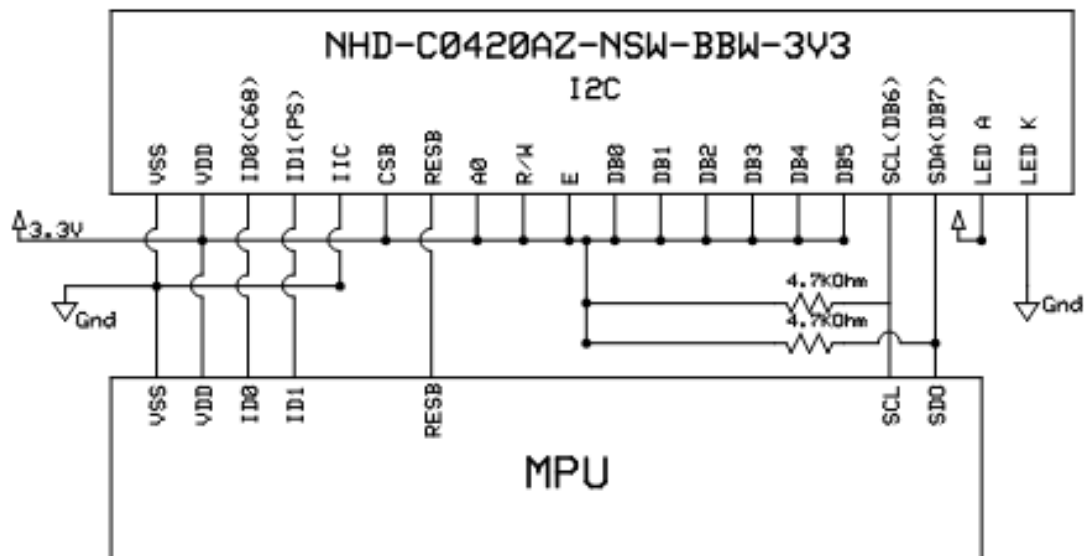
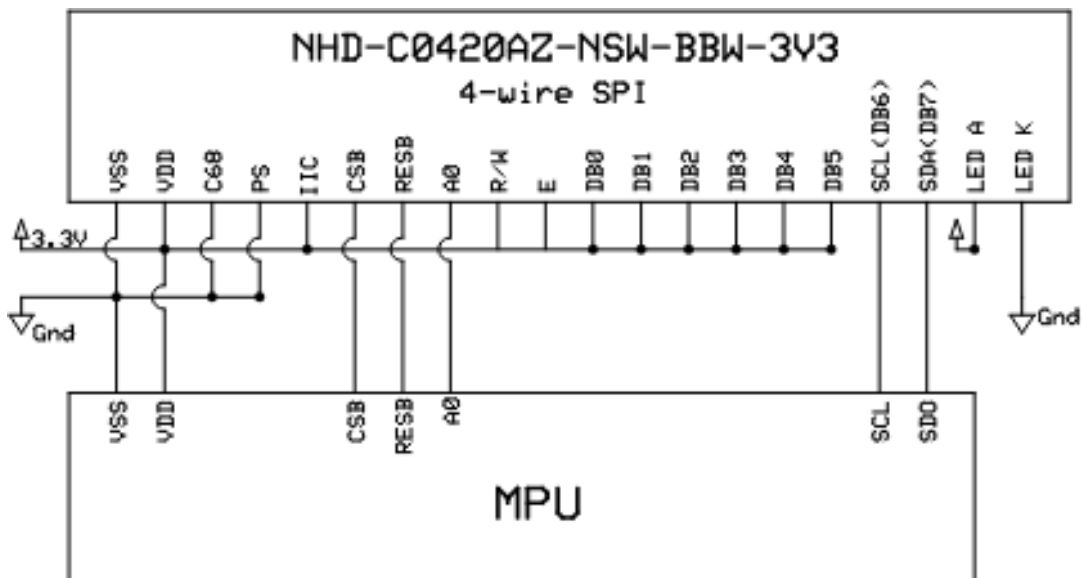
The PS and C68 pins configure the least significant bits of the I²C slave address (ID1 and ID0), allowing four options: 0111100 (C68=0, PS=0), 0111101 (C68=0, PS=1), 0111110 (C68=1, PS=0), and 0111111 (C68=1, PS=1).

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
18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43
48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B

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}	-	3.0	3.3	3.6	V
Supply Current	I _{DD}	T _{OP} = 25°C, V _{DD} = 3.3V	0.5	1.25	2.5	mA
Supply for LCD (contrast)	V _{LCD}		8.30	8.50	8.70	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 _{SS}	V
"L" Level output	V _{OL}	-	V _{SS}	-	0.2 V _{DD}	V
Backlight Supply Current	I _{LED}	-	30	60	90	mA
Backlight Supply Voltage	V _{LED}	I _{LED} = 60mA	2.7	3.0	3.3	V

*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-		-	40	-	°
	Left	θX-		-	30	-	°
	Right	θX+		-	30	-	°
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T _R	T _{OP} = 25°C	-	50	200	ms
	Fall	T _F		-	120	350	ms

Controller Information

Built-in IST3602 Controller: <https://support.newhavendisplay.com/hc/en-us/articles/33466233169175-IST3602>



Table of Commands

Default Instruction Table

IS[1:0]=Don't Care

No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	Display Clear	0	0	0	0	0	0	0	0	0	1	Display clear and set AC to "00H". Set AC to "00H". It will return cursor	1ms
2	AC Return Zero	0	0	0	0	0	0	0	0	1	X	Return to the original position if shifted. The contents in DDRAM are not changed.	20us
3	Set Entry Mode	0	0	0	0	0	0	0	1	I/D	0	Set cursor move direction. The effects are performed after each data access (write or read).	20us
4	Display Control	0	0	0	0	0	0	1	D	C	B	D=1: Entire display on; C=1: Cursor on; B=1: Cursor position blinks.	20us
5	Function Set	0	0	0	0	1	0	0	0	IS1	IS0	DL: Interface data is 8/4 bits; IS[1:0]: select instruction table.	20us
6	Set DDRAM Address	0	0	1	0	0	1	0	0	0	0	Set DDRAM address into AC (address counter).	20us
		0	0	0	AC6	AC5	AC4	AC3	AC2	AC1	AC0		
7	Read Status	0	1	0	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Read the content of AC (address counter)	20us
8	Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/ CGRAM/ ICONRAM)	20us
9	Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/ CGRAM/ ICONRAM)	20us

IS[1:0]=(0,0)

No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	Cursor Shift or Display Shift	0	0	0	0	0	1	S/C	R/L	0	0	S/C and R/L: Immediately move cursor or shift display by 1.	20us
2	Set CGRAM Address	0	0	1	0	0	1	0	0	0	1	Set CGRAM address into AC (address counter)	20us
		0	0	0	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address into AC (address counter)	

IS[1:0]=(0,1)

No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	Follows Control	0	0	0	0	0	1	0	0	BS1	BS0	BS[1:0]: Bias select	20us
2	Set ICON RAM Address	0	0	0	1	0	AC4	AC3	AC2	AC1	AC0	Set ICON address into AC (address counter).	20us
3	Power Control 1	0	0	0	0	1	1	0	0	0	SLEEP	Enter sleep mode	20us
4	ICON/Power Control2	0	0	0	1	1	0	Icon	Bon	Ron	Fon	Ion: ICON display on/off Bon: Set booster circuit on/off Ron: Set regulator circuit on/off Fon: Set follower circuit on/off.	1ms
5	V0 Control 2	0	0	0	1	1	1	0	0	BT[1:0]		Set booster	20us

IS[1:0]=(1,0)

No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	Set Display Mode	0	0	0	0	0	1	DH1	DH0	N2	N1	DH[2:1]:Set n-Line height N[2:1]: Display line number	20us
2	Set Display pattern	0	0	0	1	1	0	0	0	INV	AP	INV: reverse display AP : Pixel all on	20us
3	Select CGRAM & COM/SEG direction	0	0	0	1	0	0	OPR 2	OPR 1	SHLS	SHLC	OPR[2:1]: Set CGRAM mapping SHLS: Set SEG scan direction SHLC: Set COM scan direction	20us

IS[1:0]=(1,1)

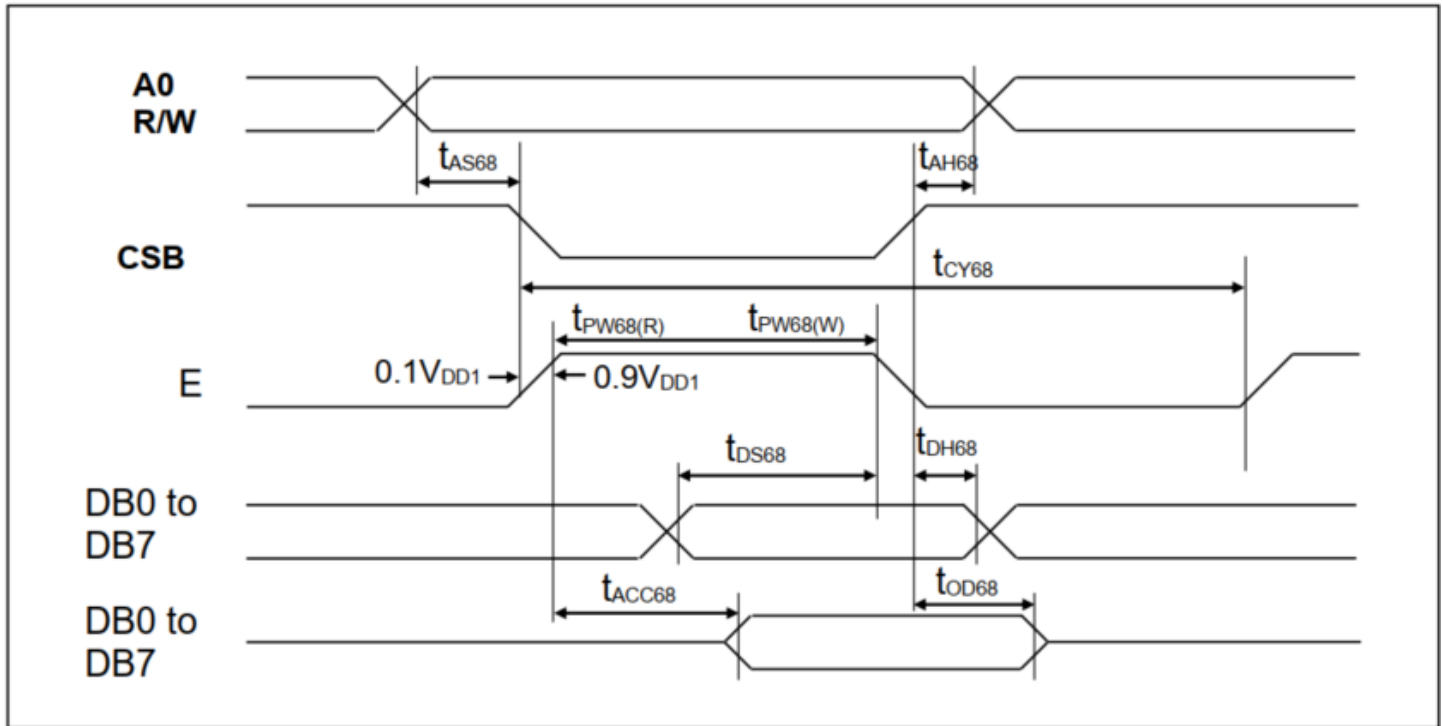
No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	Power Loss Detection	0	0	0	0	0	1	0	0	0	1	PLD: Set the function of power loss detection	20us
		0	0	0	0	1	0	0	VBO N	0	0		
2	Start line	0	0	1	0	0	0	0	0	1	0	start line setting	20us
		0	0	0	0	ST[5:0]							
3	Contrast	0	0	1	0	0	0	0	0	0	1	CT setting	20us
		0	0	CT[7:0]									
4	Rgain set	0	0	1	0	1	0	RGR[3:0]				Rgain set	20us
5	Soft reset	0	0	1	1	1	0	0	0	1	0	soft reset	20us
6	spi3&spi4 read ram command	0	0	0	0	1	1	0	1	1	1	spi read ram data command	20us
7	spi3&spi4 read status command	0	0	0	0	1	1	0	1	1	0	spi3&spi4&iic read status command	20us

IST Test Mode

No	Instruction	A0	W/R	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Instruction Time
1	IST command entry	0	0	1	0	0	0	1	0	0	0	Test command entry	20us
2	Frame rate adjusting enable	0	0	0	0	1	0	FME N	0	0	0	Frame rate adjusting enable	20us
3	Frame rate control(3B)	0	0	1	0	1	1	0	0	1	0	Set frame rate control	20us
				LN7	LN6	LN5	LN4	LN3	LN2	LN1	LN0		
				LN15	LN14	LN13	LN12	LN11	LN10	LN9	LN8		
4	OSC clock select	0	0	1	0	0	1	0	0	VCK_SEL [1:0]		DCDC pump clock select	20us
5	OSC Divide Select	0	0	1	0	0	1	1	OSC_DIV[2:0]			Select 1,1/2,1/4,1/8 Oscillator frequency for display operation	20us
6	Exit entry	0	0	1	1	1	0	0	0	1		Exit test entry	20us

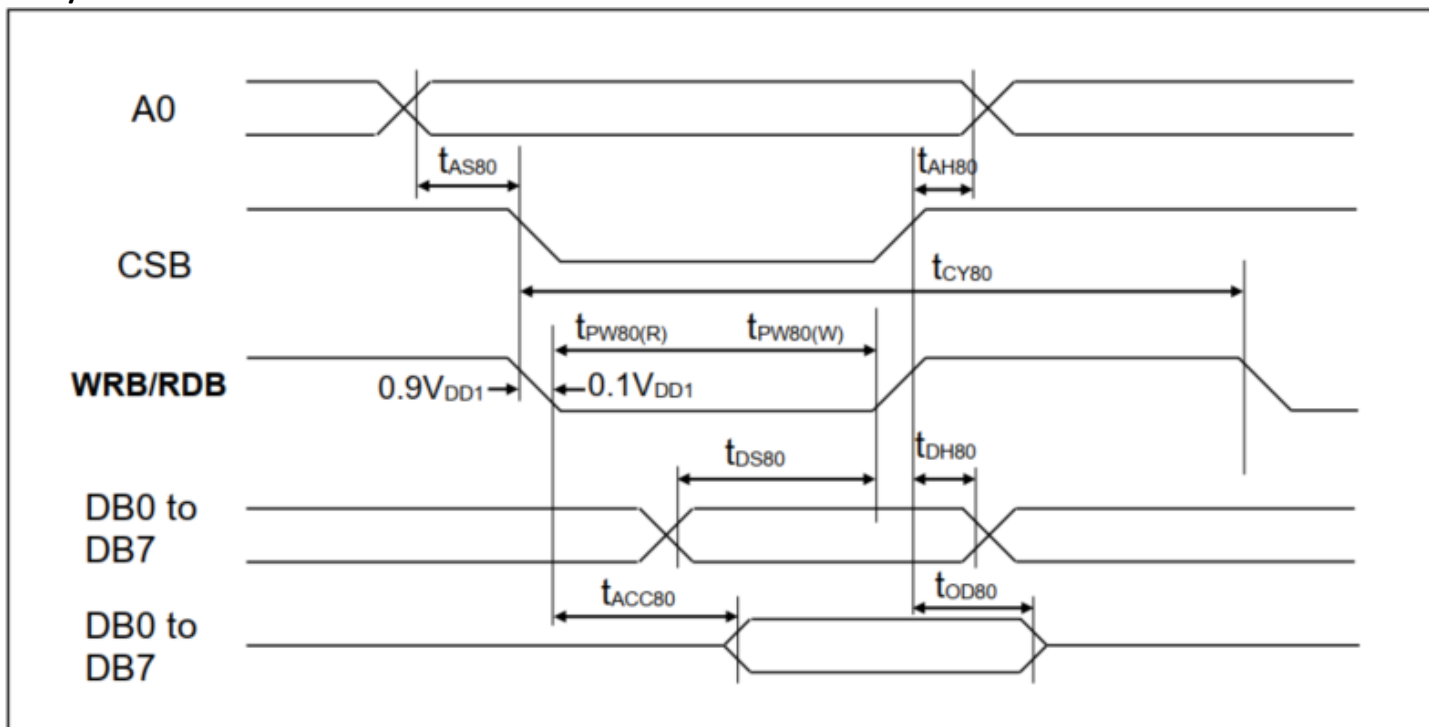
Timing Characteristics

Read/write 8-bit 6800 Parallel



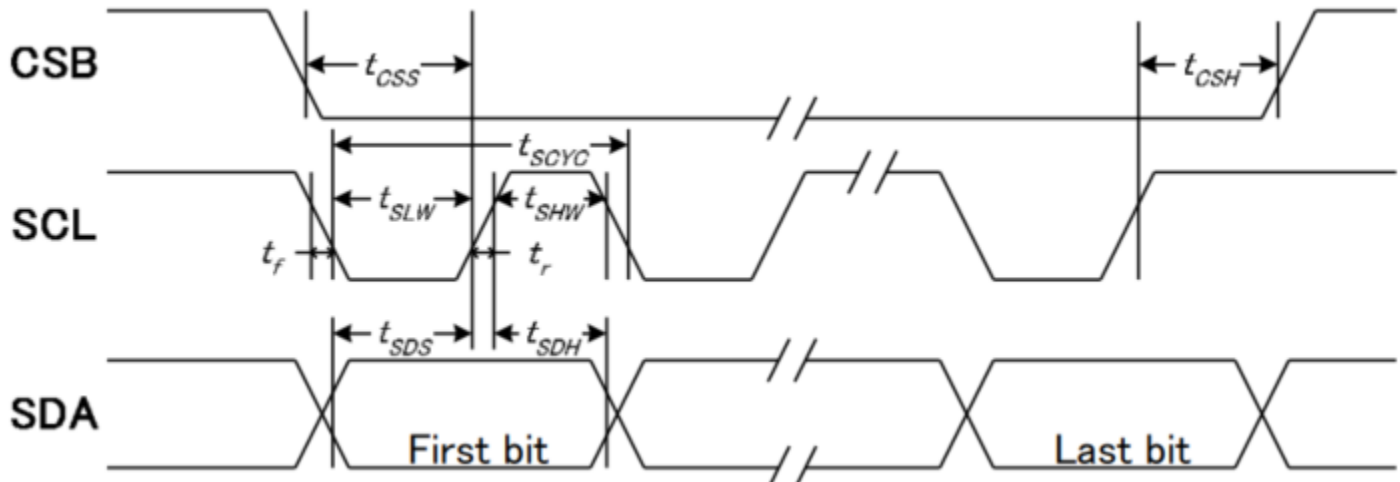
Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Address setup time	A0	t_{AS68}	0	-	-	ns	
Address hold time	A0	t_{AH68}	0	-	-	ns	
System cycle time		t_{CY68}	300	-	-	ns	
Pulse width (E)	RW_WRB	$t_{PW68(W)}$	150	-	-	ns	
Pulse width (E)	E_RDB	$t_{PW68(R)}$	150	-	-	ns	
Data setup time	DB7 to DB0	t_{DS68}	60	-	-	ns	
Data hold time		t_{DH68}	0	-	-	ns	
Read access time		t_{ACC68}	140	-	-	ns	(No load)
Output disable time		t_{OD68}	-	-	10	ns	

Read/write 8-bit 8080 Parallel



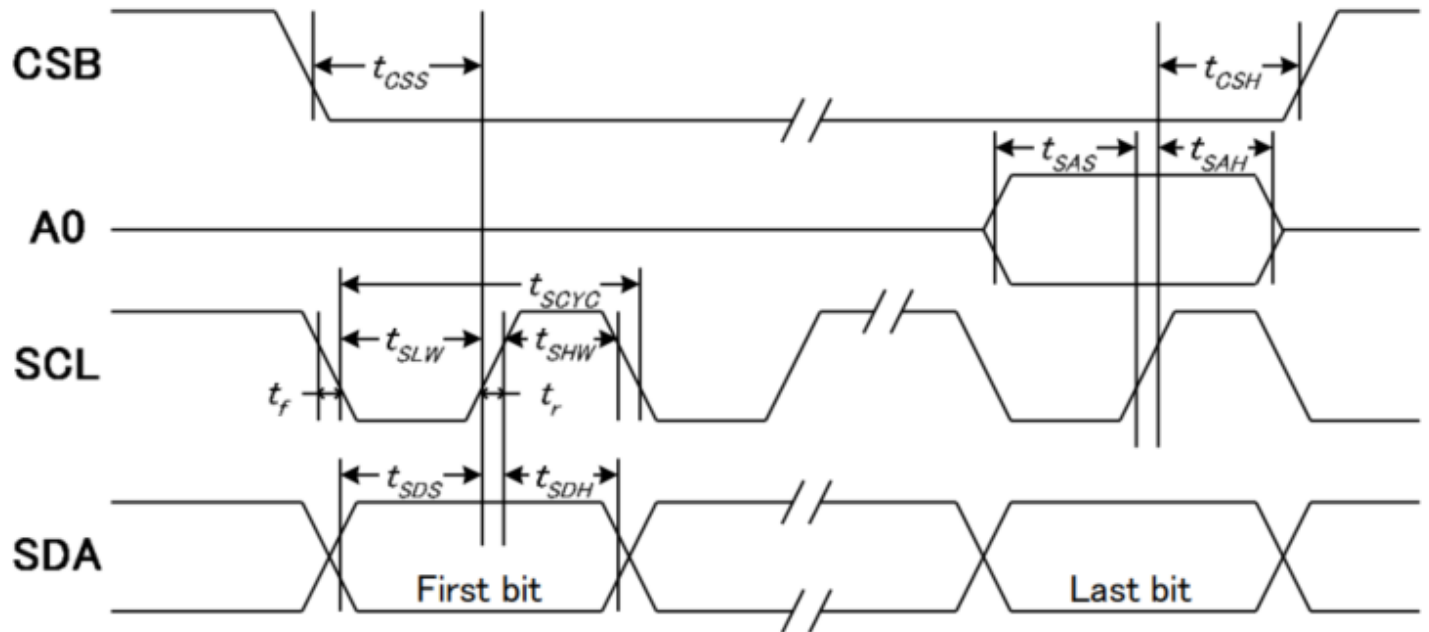
Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Address setup time	A0	t_{AS80}	0	-	-	ns	
Address hold time		t_{AH80}	0	-	-	ns	
System cycle time		t_{CY80}	300	-	-	ns	
Pulse width (WRB)	RW_WRB	$t_{PW80(W)}$	150	-	-	ns	
Pulse width (RDB)	E_RDB	$t_{PW80(R)}$	150	-	-	ns	
Data setup time	DB7 to DB0	t_{DS80}	60	-	-	ns	
Data hold time		t_{DH80}	0	-	-	ns	
Read access time		t_{ACC80}	140	-	-	ns	(No load)
Output disable time		t_{OD80}	-	-	10	ns	

3-wire SPI Interface



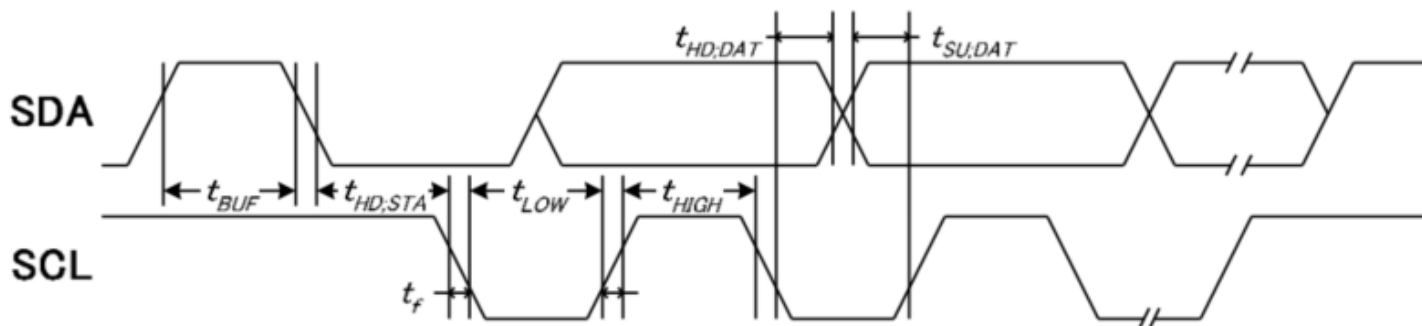
Item	Signal	Symbol	VDD1=1.8V		VDD1=2.8V		VDD1=3.3V		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	
Serial Clock Period	SCL	tSCYC	200	-	200	-	200	-	ns
SCL "H" pulse width		tSHW	90	-	90	-	90	-	
SCL "L" pulse width		tSLW	90	-	90	-	90	-	
Data setup time	SDA	tSDS	45	-	45	-	45	-	ns
Data hold time		tSDH	45	-	45	-	45	-	
Chip select setup time	CSB	tCSS	90	-	90	-	90	-	ns
Chip select hold time		tCSH	90	-	90	-	90	-	

4-wire SPI Interface



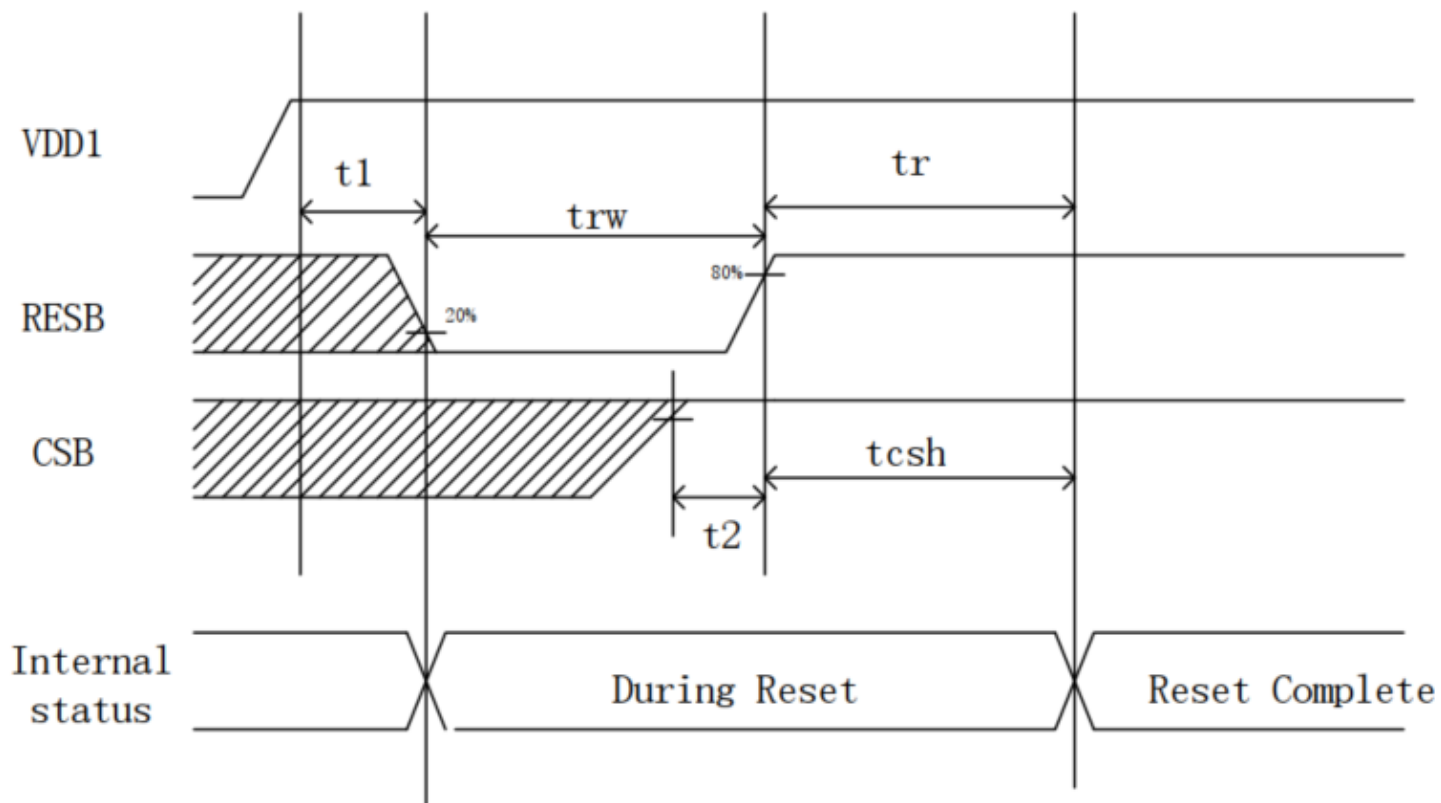
Item	Signal	Symbol	VDD1=2.8V		VDD1=3.3V		Unit
			Min.	Max.	Min.	Max.	
Serial Clock Period	SCL	tSCYC	200	-	200	-	ns
SCL "H" pulse width		tSHW	90	-	90	-	
SCL "L" pulse width		tSLW	90	-	90	-	
Address setup time	A0	tSAS	45	-	45	-	ns
Address hold time		tSAH	45	-	45	-	
Data setup time	SI	tSDS	45	-	45	-	ns
Data hold time		tSDH	45	-	45	-	
Chip select setup time	CSB	tCSS	90	-	90	-	ns
Chip select hold time		tCSH	90	-	90	-	

I²C Interface



Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
SCL clock frequency		fSCL	0	-	400	kHz	
Set-up time for START condition		tSU/STA	600	-	-	ns	
Hold time for START condition		tHD/STA	600	-	-	ns	
Low period of the SCL clock		tLow	1300	-	-	ns	
High period of the SCL clock		tHIGH	600	-	-	ns	
Data set-up time		tSU/DAT	100	-	-	ns	
Data hold time		tHD/DAT	-	-	900	ns	
Rise time of both SDA and SCL signals		tr	-	-	30	ns	
Fall time of both SDA and SCL signals		tf	-	-	30	ns	
Set-up time for STOP condition		tSU/STO	600	-	-	ns	

Reset Input Timing



Item	Signal	Symbol	Min.	Typ.	Max.	Unit	Remark
Reset low pulse width	RESB	trw	50	-	-	us	
Reset time	-	tr	50	-		us	
Reset after VDD stable	RESB	$t1$	0	-	-	us	
CSB to RESB pull High	CSB	$t2$	0			us	
CSB hold	CSB	tcs	50			us	



Example Initialization Code

```

void LCD_Cmd(unsigned char command)
{
    digitalWrite(CSB, LOW);
    digitalWrite(A0, LOW);
    digitalWrite(RD, HIGH);
    PORTD = command;
    digitalWrite(WR, LOW);
    digitalWrite(WR, HIGH);
    digitalWrite(CSB, HIGH);
    delay(100);
}

void LCD_data(unsigned char data)
{
    digitalWrite(CSB, LOW);
    digitalWrite(A0, HIGH);
    digitalWrite(RD, HIGH);
    PORTD = data;
    digitalWrite(WR, LOW);
    digitalWrite(WR, HIGH);
    digitalWrite(CSB, HIGH);
}

void LCD_Initialize()
{
    delay(50);
    digitalWrite(RESB, LOW);
    delay(50);
    digitalWrite(RESB, HIGH);
    delay(50);

    // =====

    // IS Instruction Table 2
    LCD_Cmd(0x22); //Function Set
    LCD_Cmd(0x13); //Set Display Mode : Normal font, 4-line
    LCD_Cmd(0x60); //Set Display pattern : Normal mode, All Pixels on Function not enable.
    LCD_Cmd(0x44); //Select CGRAM & COM/SEG direction (8, Column address 119~0, Row address 31~0 (Invert))
    //LCD_Cmd(0x47);
    delay(10);

    // =====

    // IS Instruction Table 3
    LCD_Cmd(0x23); //Function Set : 0 0 1 0 0 0 IS2 IS1
    LCD_Cmd(0x82); //start line setting
    LCD_Cmd(0x00); //start line setting : 0 0 ST[5:0]
    // LCD_Cmd(0xab); //Regulator Set: RGR[3:0]=1011(RGR=7.5)
    LCD_Cmd(0xA7); //Rgain set : 1 0 1 0 RR[3:0]
    LCD_Cmd(0x81); //Contrast: VOP SET
    LCD_Cmd(0x4B); // VOP SET contrast value 142 (//132=84)//75 = 4B
    delay(10);
    LCD_Cmd(0x21); //Function set: Table IS[1:0]=01
    LCD_Cmd(0x13); //Follow Control: BS[2:1]=(1,1):1/7 BIAS
    LCD_Cmd(0x30); //Power Save: Sleep=0(Out Sleep Mode)
    LCD_Cmd(0x71); //V0 Control 2: BT[1:0]=01(Booster Will Be 6X)
    delay(100);
  
```



```
LCD_Cmd(0x61); //ICON/Power Control: ICON OFF, VB OFF, VR OFF, VF ON
delay(20);
LCD_Cmd(0x63); //ICON/Power Control: ICON OFF, VB OFF, VR ON, VF ON
delay(20);
LCD_Cmd(0x67); //ICON/Power Control: ICON OFF, VB ON, VR ON, VF ON
delay(20);
LCD_Cmd(0x6F); //ICON/Power Control: ICON ON, VB ON, VR ON, VF ON
delay(20);
```

```
// =====
```

```
// IS Instruction Table 4
```

```
LCD_Cmd(0x23); //Function Set
LCD_Cmd(0x88); // Set 88H 4 times to entry IST test command mode
LCD_Cmd(0x88);
LCD_Cmd(0x88);
LCD_Cmd(0x88);
LCD_Cmd(0x28); //Frame rate adjusting enable
delay(20);
LCD_Cmd(0xB2); //1st Frame rate control
LCD_Cmd(0x71); //FR=Fdck/(LN[15:0]+1)/Duty (FR=200Hz,Duty=33, LN[15:0]=0x0071)
LCD_Cmd(0x00);
LCD_Cmd(0x93); //OSC Clock Select :Fdck= 750KHz/1=750KHz
LCD_Cmd(0x99); //OSC Divide Select :750KHz
LCD_Cmd(0xE3); //Exit IST test command
delay(20);
LCD_Cmd(0x20); //Function Set
LCD_Cmd(0x01); //Clear Display
delay(20);
LCD_Cmd(0x90); //Set DDRAM address
LCD_Cmd(0x00); //Set DDRAM address
LCD_Cmd(0x06); //Set Entry Mode (I/D = "1", cursor moves right and DDRAM addressn increased by 1)
LCD_Cmd(0x0C); //Display Control(Entire display on, cursor off, blink off)
delay(100);
LCM_Write_CGRAM();
delay(100);
}
```

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, 200 Hrs.	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C, 200 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, 200 Hrs.	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C, 200 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.	+60°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.	-20°C, 30min -> 25°C, 5min -> 70°C, 30min = 1 cycle For 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz, 1.5mm amplitude. 2g Acceleration. 60 sec in each of 3 directions X, Y, Z For 30 minutes	3
Static electricity test	Endurance test applying electric static discharge. (5 Times)	Air: ±8KV	
		Contact: ±4KV	

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.