NHD-12864MZ-FSW-GBW-L

Graphic Liquid Crystal Display Module

NHD-	Newhaven Display
12864-	128 x 64 pixels
MZ-	Model
F-	Transflective
SW-	Side White LED Backlight
G-	STN- Gray
B-	6:00 view
W-	Wide Temperature (-20°C ~ +70°C)
L-	Low Power
	RoHS Compliant

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Document Revision History

Revision	Date	Description	Changed by
0	12/8/2008	Initial Release	-
1	3/17/2010	User guide reformat	BE
2	3/19/2010	Mechanical Drawing updated	BE
3	4/14/2010	Block diagram/initialization updated	BE
4	5/13/2010	Pin Description updated	BE

Functions and Features

- **128 x 64 pixels**
- **Built-in KS0108B Controller**
- **+5.0V power supply**
- **1/64 duty cycle, 1/9 bias**
- **RoHS Compliant**

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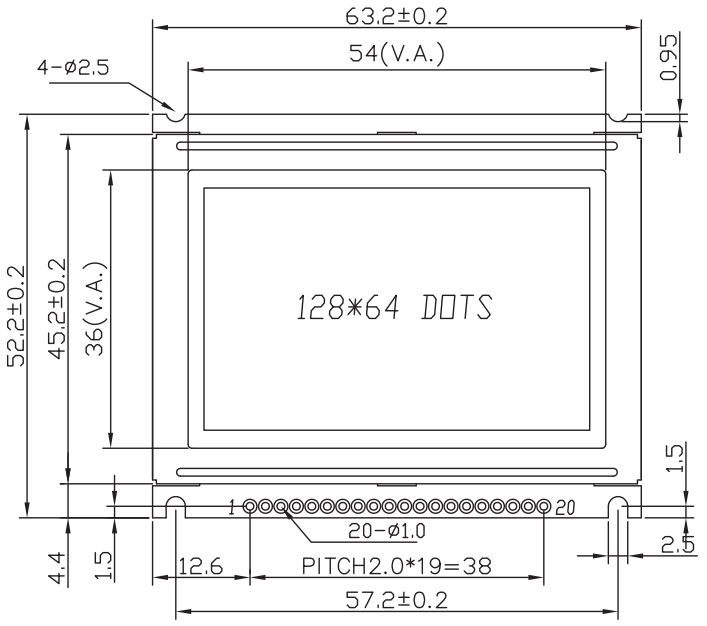
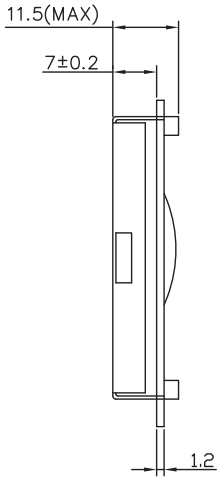
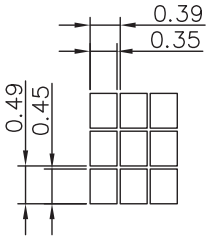
Mechanical Drawing







PIN ASSIGNMENT

1	VDD
2	VSS
3	V0
4	DB0
5	DB1
6	DB2
7	DB3
8	DB4
9	DB5
10	DB6
11	DB7
12	CS2
13	CS1
14	RST
15	R/W
16	D/I
17	E
18	VSS
19	LED+
20	LED-

Specification:

1). Driving: Duty:1/64, Bias:1/9, VLCD:9.5V, VDD:5.0V
2). Viewing Direction: 6 O'clock
3). Display mode: STN-Gray/positive/transflective
4). Operating temp.: −20°c~+70°C
Storage temp.: −30°c~+80°C
5). Driver : KS0108B
6). RoHS Compliant

Newhaven Display	
Part No.	NHD-12864MZ-FSW-GBW-L

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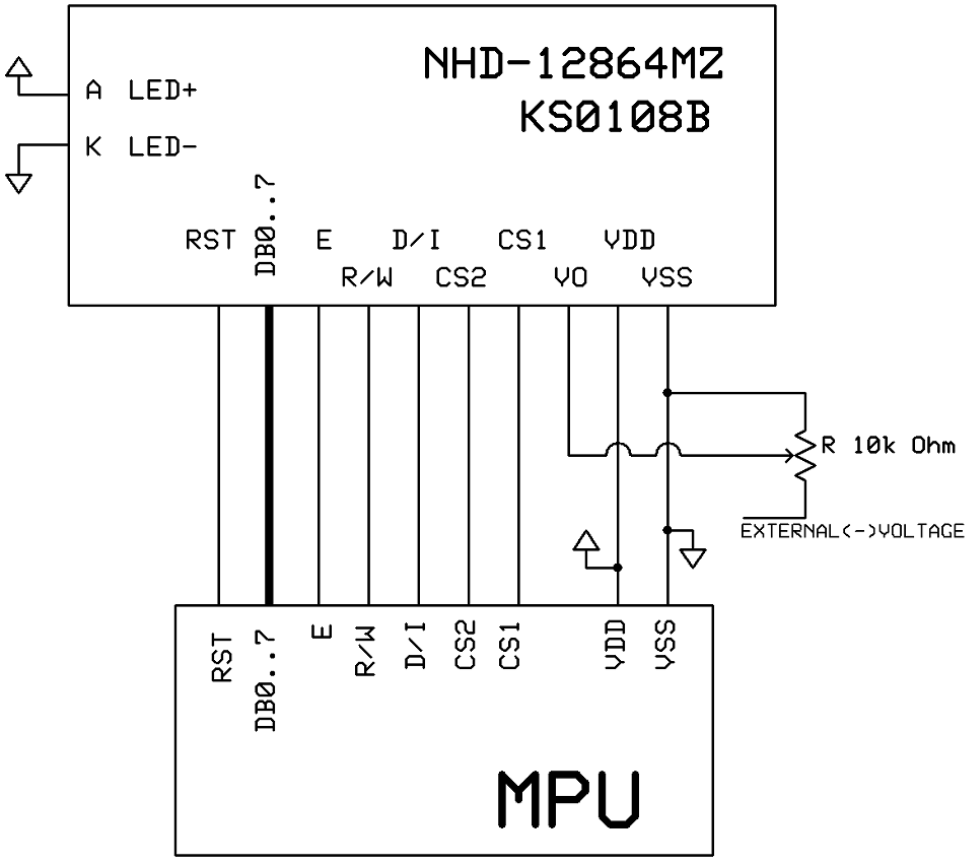
Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VDD	Power Supply	Power supply for logic (+5.0V)
2	VSS	Power Supply	Ground
3	V0	Adj. Power Supply	Power supply for contrast (approx. -4.5V)
4-11	DB0-DB7	MPU	Bi-directional 8-bit data bus
12	CS2	MPU	Active LOW Chip Select Signal for RIGHT half of LCD
13	CS1	MPU	Active LOW Chip Select Signal for LEFT half of LCD
14	RST	MPU	Active Low Reset signal
15	R/W	MPU	Read/Write select signal. R/W=1: Read R/W: =0: Write
16	D/I	MPU	Register select signal
17	E	MPU	Operation enable signal. Falling edge triggered.
18	VSS	Power Supply	Ground
19	LED+	Power Supply	Power supply for LED Backlight (+5.0V via on-board resistor)
20	LED-	Power Supply	Ground for Backlight

Recommended LCD connector: 2.0mm pitch pins
Backlight connector: - **Mates with**: -



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Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		4.7	5.0	5.5	V
Supply Current	IDD	VDD=5.0V	-	0.41	-	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°	-	9.5	-	V
"H" Level input	VIH		2.2	-	VDD	V
"L" Level input	VIL	-	0	-	0.8	V
"H" Level output	VOH	-	2.4	-	-	V
"L" Level output	VOL	-	-	-	0.4	V
Backlight Supply Voltage	VLED	-	-	5.0	-	V
Backlight Supply Current	ILED	VLED=5.0V	-	30	-	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical (top)	AV	Cr ≥ 2	-	35	-	º
Viewing Angle - Vertical (bottom)	AV	Cr ≥ 2	-	60	-	º
Viewing Angle - Horizontal (left)	AH	Cr ≥ 2	-	40	-	º
Viewing Angle - Horizontal (right)	AH	Cr ≥ 2	-	40	-	º
Contrast Ratio	Cr		-	6	-	-
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tf	-	-	150	250	ms

Controller Information

Built-in KS0108B. Download specification at http://www.newhavendisplay.com/app_notes/KS0108.pdf

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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.

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Timing Characteristics

(3) MPU Interface

Chatacteristic	Symbol	Min	Typ	Max	Unit
E Cycle	t_C	1000	-	-	ns
E High Level Width	t_{WH}	450	-	-	ns
E Low Level Width	t_{WL}	450	-	-	ns
E Rise Time	t_R	-	-	25	ns
E Fall Time	t_F	-	-	25	ns
Address Set-Up Time	t_{ASU}	140	-	-	ns
Address Hold Time	t_{AH}	10	-	-	ns
Data Set-Up Time	t_{SU}	200	-	-	ns
Data Delay Time	t_D	-	-	320	ns
Data Hold Time (Write)	t_{DHW}	10	-	-	ns
Data Hold Time (Read)	t_{DHR}	20	-	-	ns

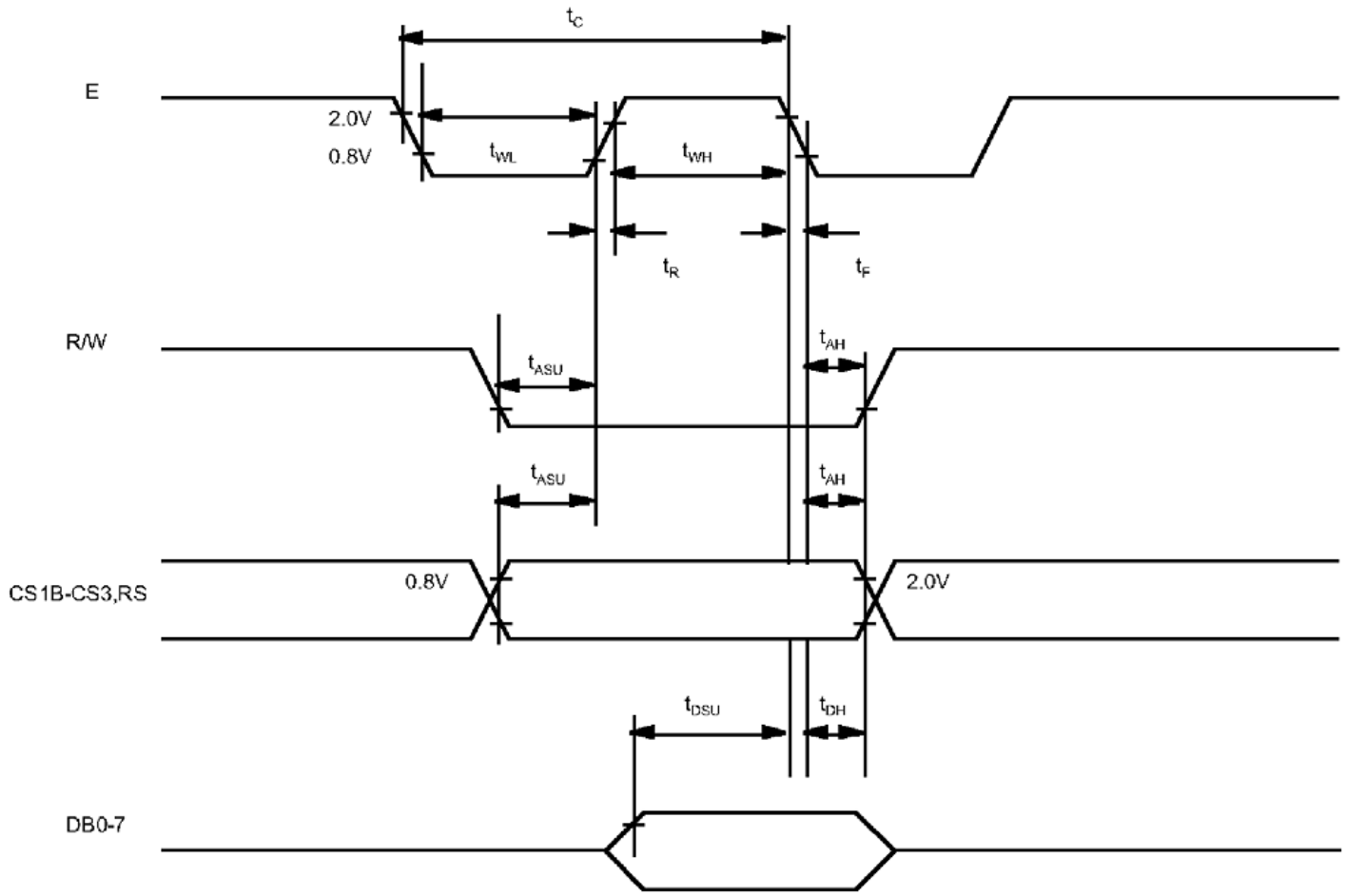

Fig 3. MPU write timing

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Example Initialization Program

```
'--------------------------------------------------------------------------------
'DB0-DB7   7-14              P1
'CS2       16                P3.6
'CS1       15                P3.1
'RST       17                P3.2
'R/W       5                 P3.7
'D/I       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 Writeright
 P1 = A
 Set P3.1
 Set P3.0
 Set P3.4
 Reset P3.4
 Reset P3.1
End Sub
'--------------------------------------------------------------------------------
```


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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 , 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.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms

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