

# 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
	<b>RoHS Compliant</b>

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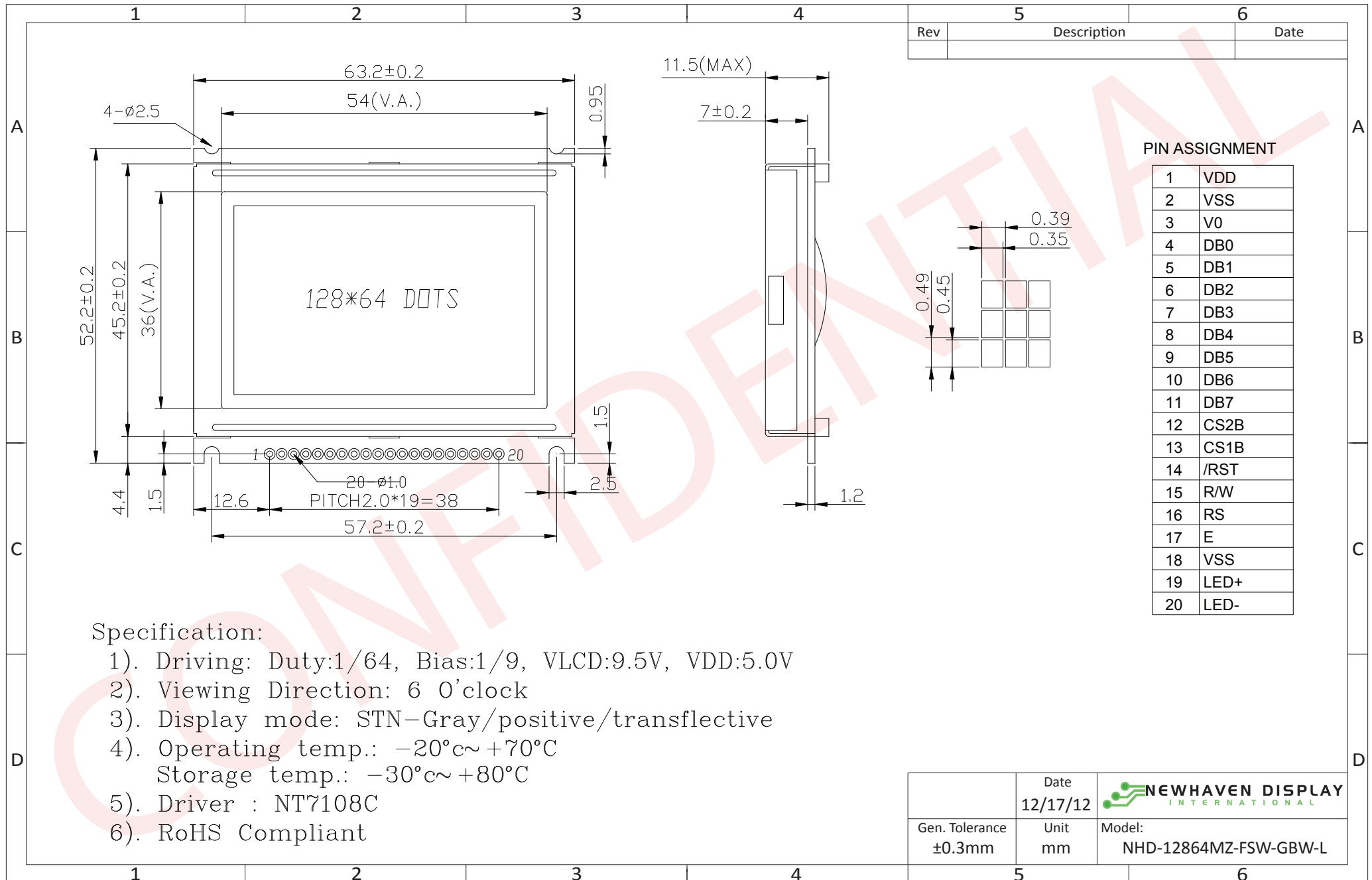
## Document Revision History

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
5	12/17/12	Controller information updated	AK

## Functions and Features

- 128 x 64 pixels
- Built-in NT7108C controller
- +5.0V power supply
- 1/64 duty cycle, 1/9 bias
- RoHS Compliant

# Mechanical Drawing



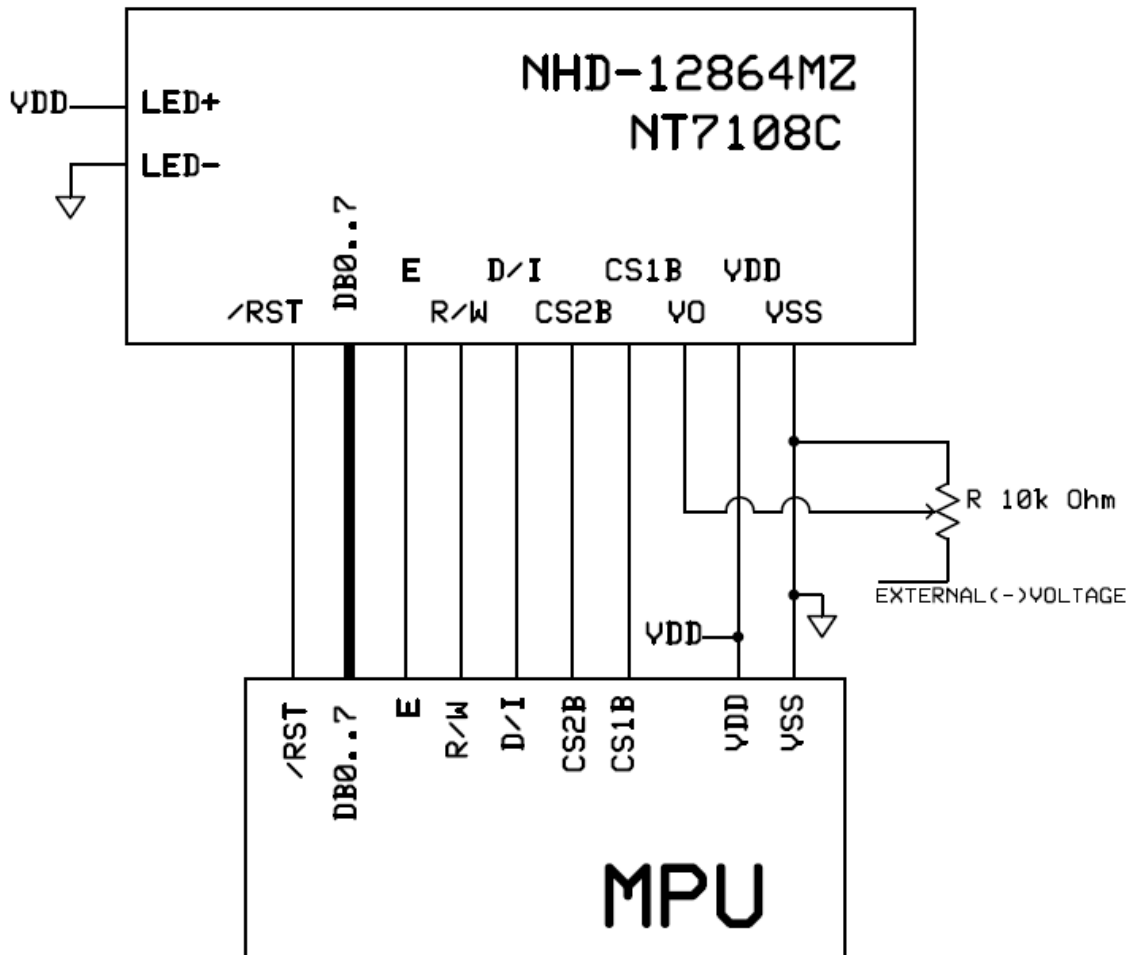
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## Pin Description and Wiring Diagram

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	CS2B	MPU	Active LOW Chip Select Signal for RIGHT half of LCD
13	CS1B	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	RS	MPU	Register select: 1=Data, 0=Instruction
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: -



## 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	-	2.5	3.5	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°	-	9.5	9.8	V
"H" Level input	VIH		0.7*VDD	-	VDD	V
"L" Level input	VIL	-	0	-	0.3*VDD	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 – Top		Cr ≥ 2	-	35	-	°
Viewing Angle – Bottom			-	60	-	°
Viewing Angle – Left			-	40	-	°
Viewing Angle – Right			-	40	-	°
Contrast Ratio	Cr		3	5	-	-
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tf	-	-	200	300	ms

## Controller Information

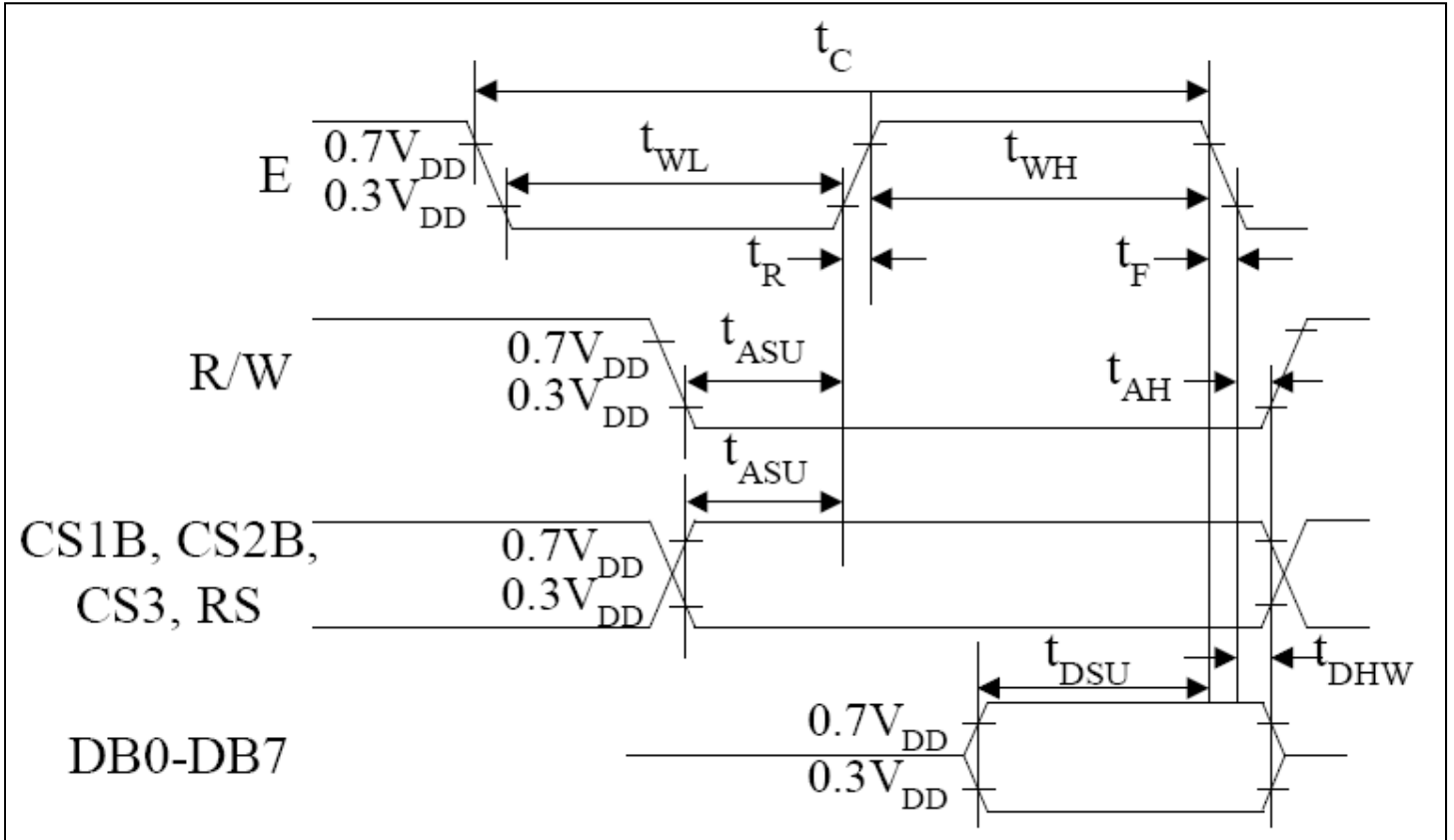
Built-in NT7108C controller.

Please download specification at [http://www.newhavendisplay.com/app\\_notes/NT7108.pdf](http://www.newhavendisplay.com/app_notes/NT7108.pdf)

## 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	$t_{DSU}$	200	-	-	
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  
'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 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 , 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.newhavendisply.com/specs/precautions.pdf](http://www.newhavendisply.com/specs/precautions.pdf)

## Warranty Information and Terms & Conditions

[http://www.newhavendisply.com/index.php?main\\_page=terms](http://www.newhavendisply.com/index.php?main_page=terms)

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