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Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Contact us

NHD-C12832A1Z-FS(RGB)-FBW-3V

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

NHD-	Newhaven Display
C12832-	128 x 32 Pixels
A1Z-	Model
F-	Transflective
SRGB-	Side Red/Green/Blue LED Backlight
F-	FSTN Positive
B-	6:00 Optimal View
W-	Wide Temp
3V-	3VDD
	RoHS Compliant

Newhaven Display International, Inc.
2661 Galvin Ct.
Elgin IL, 60124
Ph: 847-844-8795   Fax: 847-844-8796

www.newhavendisplay.com
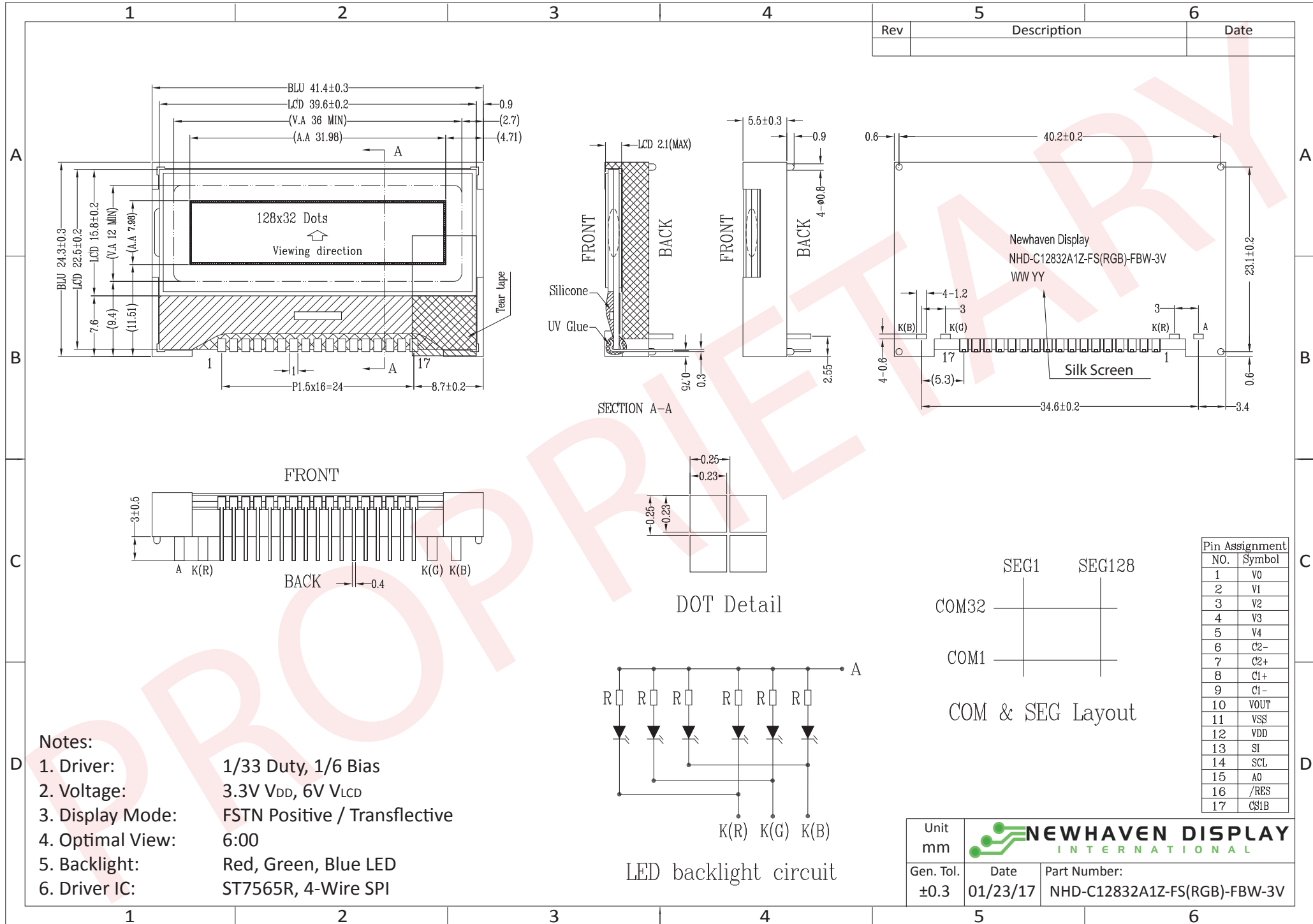nhtech@newhavendisplay.com   nhsales@newhavendisplay.com

Document Revision History

Revision	Date	Description	Changed by
0	10/23/2012	Initial Release	AK
1	6/15/16	Mechanical Drawing, Electrical & Optical Char., Quality Information Updated	SB
2	1/23/17	Mechanical Drawing & Electrical Characteristics Updated	SB
3	4/14/17	Backlight Characteristics Updated	SB

Functions and Features

- **128 x 32 pixels**
- **4-line SPI MPU interfaces**
- **Built-in ST7565R controller**
- **+3.0V power supply**
- **1/33 duty cycle; 1/6 bias**
- **RoHS Compliant**

Mechanical Drawing

Rev	Description	Date

BLU 41.4±0.3
LCD 39.6±0.2
(V.A 36 MIN)
(A.A 31.98)
0.9
(2.7)
(4.71)

BLU 24.3±0.3
LCD 22.5±0.2
LCD 15.8±0.2
(V.A 12 MIN)
(A.A 7.98)
7.6
(9.4)
(11.51)

128x32 Dots
⇧ Viewing direction

Tear tape

P1.5x16=24
8.7±0.2

1   17

LCD 2.1(MAX)

FRONT   BACK   FRONT   BACK

Silicone
UV Glue

5.5±0.3
0.9
4-∅0.8

0.6±0.15
0.3
2.55

0.6   40.2±0.2

Newhaven Display
NHD-C12832A1Z-FS(RGB)-FBW-3V
WW YY

23.1±0.2

4-1.2
3
K(B)   K(G)
4-0.6   17   1   K(R)   A
(5.3)   Silk Screen   3   0.6

34.6±0.2   3.4

SECTION A-A

FRONT

3±0.5

A K(R)   **BACK**   K(G) K(B)
0.4

DOT Detail

0.25
0.23
0.25
0.23

SEG1   SEG128

COM32

COM1

COM & SEG Layout

R R R   R R R   A

K(R) K(G) K(B)

LED backlight circuit

Pin Assignment	
NO.	Symbol
1	V0
2	V1
3	V2
4	V3
5	V4
6	C2-
7	C2+
8	C1+
9	C1-
10	VOUT
11	VSS
12	VDD
13	SI
14	SCL
15	A0
16	/RES
17	CS1B

Notes:
1. Driver: 1/33 Duty, 1/6 Bias
2. Voltage: 3.3V V_{DD}, 6V V_{LCD}
3. Display Mode: FSTN Positive / Transflective
4. Optimal View: 6:00
5. Backlight: Red, Green, Blue LED
6. Driver IC: ST7565R, 4-Wire SPI

NEWHAVEN DISPLAY
INTERNATIONAL

Unit mm		
Gen. Tol. ±0.3	Date 01/23/17	Part Number: NHD-C12832A1Z-FS(RGB)-FBW-3V

[3]

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	V_0	Power Supply	0.1μF – 1μF Capacitor to V_{SS}
2	V_1	Power Supply	0.1μF – 1μF Capacitor to V_{SS}
3	V_2	Power Supply	0.1μF – 1μF Capacitor to V_{SS}
4	V_3	Power Supply	0.1μF – 1μF Capacitor to V_{SS}
5	V_4	Power Supply	0.1μF – 1μF Capacitor to V_{SS}
6	C2-	Power Supply	Connect 1μF – 2.2μF Capacitor to C2+ (pin 7)
7	C2+	Power Supply	Connect 1μF – 2.2μF Capacitor to C2- (pin 6)
8	C1+	Power Supply	Connect 1μF – 2.2μF Capacitor to C1- (pin 9)
9	C1-	Power Supply	Connect 1μF – 2.2μF Capacitor to C1+ (pin 8)
10	V_{OUT}	Power Supply	Connect 1μF – 2.2μF Capacitor to VSS (pin 11)
11	VS_S	Power Supply	Ground
12	V_{DD}	Power Supply	Supply Voltage for LCD and Logic (+3V)
13	SDA(SI)	MPU	Serial Data
14	SCL	MPU	Serial Clock
15	A0	MPU	Register Select. A0=0: Instruction, A0=1: Data
16	RST	MPU	Active LOW Reset signal
17	CS1B	MPU	Active LOW Chip Select signal
A	LED+	Power Supply	Backlight Anode
K(R)	(R)LED-	Power Supply	Red Backlight Cathode (Ground)
K(G)	(G)LED-	Power Supply	Green Backlight Cathode (Ground)
K(B)	(B)LED-	Power Supply	Blue Backlight Cathode (Ground)

Recommended LCD connector: 1.5mm pitch pins, solder directly into PCB
Backlight connector: 1.5mm wide pins solder directly into PCB   **Mates with**: ---
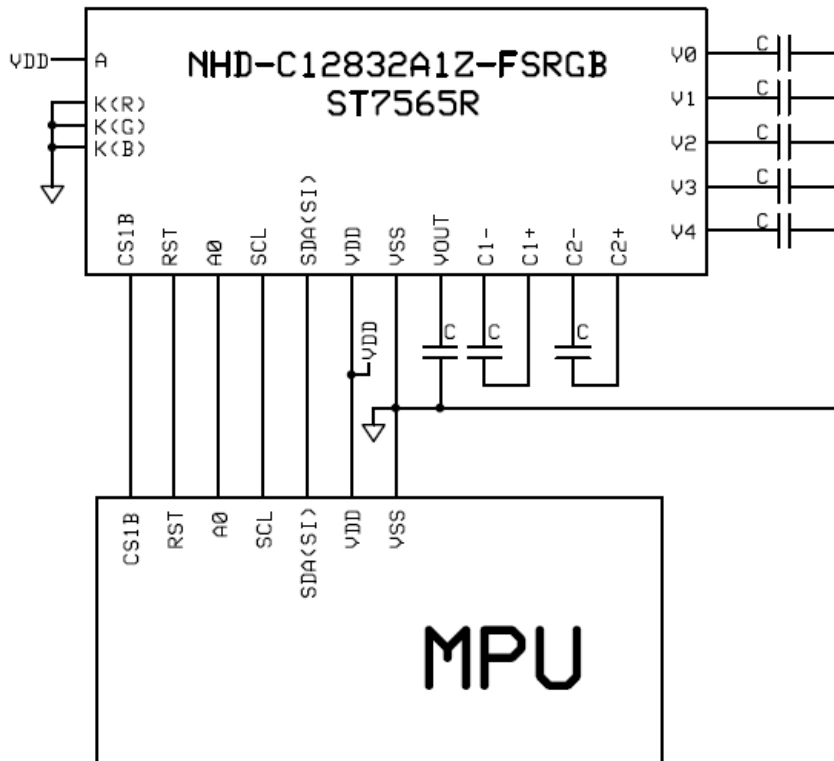
Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	℃
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	℃
Supply Voltage	V_{DD}	-	2.7	3.0	3.3	V
Supply Current	I_{DD}	V_{DD}=3.0V	0.1	0.4	1	mA
Supply for LCD (contrast)	V_{LCD}	T_{OP} =25℃	5.8	6.0	6.2	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
Backlight supply current – Red	I_{LED}	-	3	20	25	mA
Backlight supply voltage – Red	V_{LED}	I_{LED} = 20mA	2.0	2.2	2.4	V
Backlight supply current – Green	I_{LED}	-	5	30	35	mA
Backlight supply voltage – Green	V_{LED}	I_{LED} = 30mA	2.8	3.0	3.2	V
Backlight supply current – Blue	I_{LED}	-	20	30	40	mA
Backlight supply voltage – Blue	V_{LED}	I_{LED} = 30mA	2.8	3.0	3.2	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+		-	20	-	º
	Bottom	φY-	CR≥2	-	40	-	º
	Left	θX-		-	40	-	º
	Right	θX+		-	40	-	º
Contrast Ratio		CR	-	2	6	-	-
Response Time	Rise	T_R	T_{OP} = 25°C	-	200	250	ms
	Fall	T_F		-	250	320	ms

Controller Information

Built-in ST7565R controller.
Please download specification at http://www.newhavendisplay.com/app_notes/ST7565R.pdf

Timing Characteristics

The 4-line SPI Interface
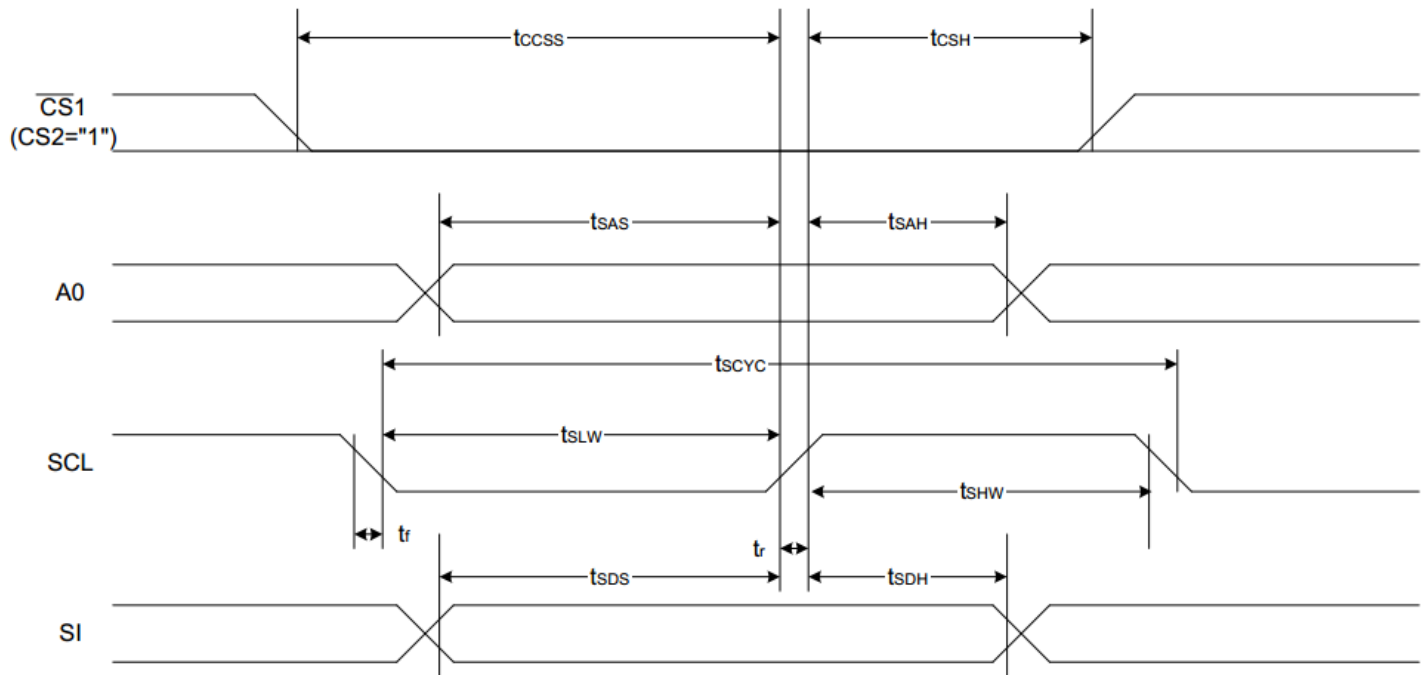
(V_{DD} = 3.3V, Ta = −30 to 85℃)

Item	Signal	Symbol	Condition	Rating Min.	Rating Max.	Units
4-line SPI Clock Period	SCL	T$_{scyc}$		50	—	ns
SCL "H" pulse width		T$_{shw}$		25	—	
SCL "L" pulse width		T$_{SLW}$		25	—	
Address setup time	A0	T$_{SAS}$		20	—	
Address hold time		T$_{sah}$		10	—	
Data setup time	SI	T$_{sds}$		20	—	
Data hold time		T$_{SDH}$		10	—	
CS-SCL time	CS	T$_{css}$		20	—	
CS-SCL time		T$_{csh}$		40	—	

Table of Commands

Command	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0 / 1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.
Column address set lower bit				0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM
(7) Display data read	1	0	1	Read data								Reads from the display RAM
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0 / 1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/ reverse	0	1	0	1	0	1	0	0	1	1	0 / 1	Sets the LCD display normal/ reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0 / 1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0 / 1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)
(12) Read-modify-write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0 / 1	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) V$_0$ voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V$_0$ output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value						
(19) Sleep mode set	0	1	0	1	0	1	0	1	1	0	0 / 1	0: Sleep mode, 1: Normal mode
				*	*	*	*	*	*	0	0	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
				0	0	0	0	0	0	step-up value		
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(22) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

[7]

Example Initialization Program

```c
 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(0x26);
comm_out(0x81);
comm_out(0x2F);
}
/*************************************************/
```

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 , 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 96hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 96hrs	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.	+50°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,60min -> 25°C,5min -> 70°C,60min = 1 cycle 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz 5g Acceleration. 30 min in each of 3 directions X,Y,Z	3
Static electricity test	Endurance test applying electric static discharge.	VS=8kV, RS=330kΩ, CS=150pF 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