NHD-C128128BZ-FSW-GBW

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

NHD-	Newhaven Display
C128128-	128 x 128 pixels
BZ-	Model
F-	Transflective
SW-	Side White LED Backlight
G-	STN-Gray
B-	6:00 view
W-	Wide Temp (-20°C ~ +70°C)
	RoHS Compliant

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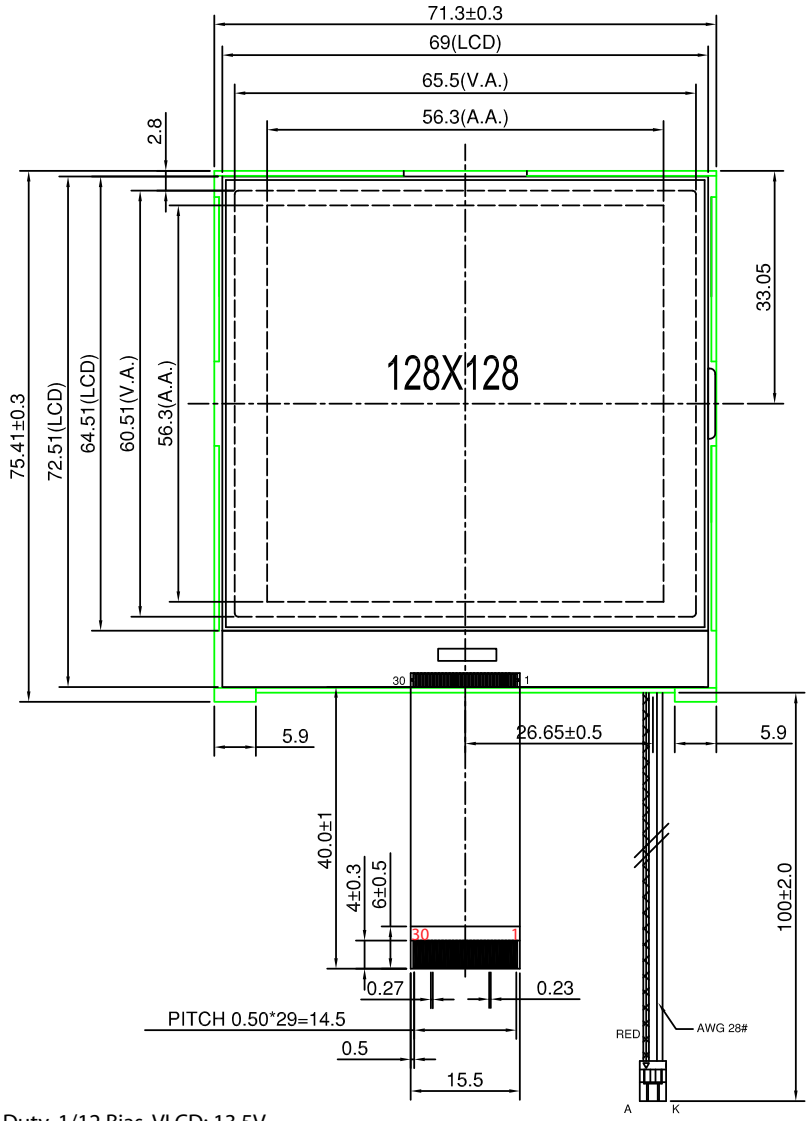
Document Revision History

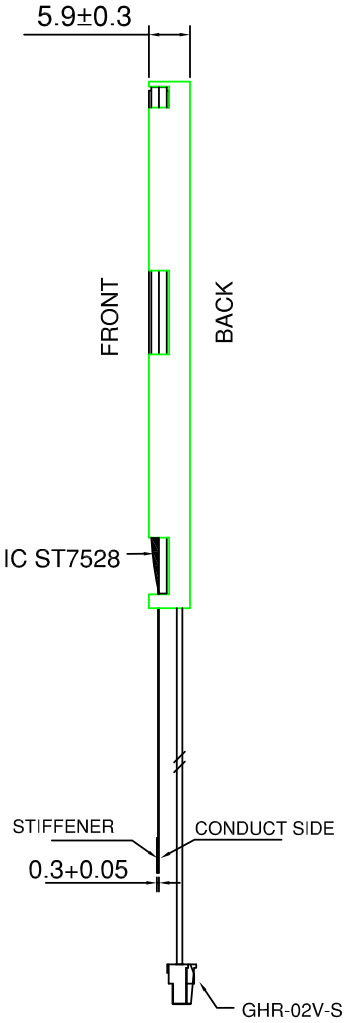
Revision	Date	Description	Changed by
0	6/17/2007	Initial Release	-
1	9/23/2009	User guide reformat	BE
2	10/14/2009	Updated Electrical Characteristic	MC
3	11/20/2009	Updated backlight supply current	MC
4	3/4/2011	Updated table of commands	AK

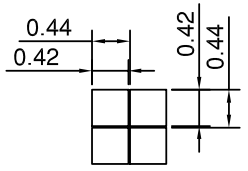
Functions and Features

- **128 x 128 pixels**
- **Built-in ST7528 controller**
- **+3.0V power supply**
- **1/128 duty cycle; 1/12 bias**
- **RoHS Compliant**

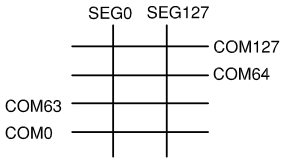
REV	DESCRIPTION:	DATE
1.1	Change VLCD to 13.5V from 11.5V	
1.2	B/L connector is reversed.	2006.09.18
1.3	B/L connector line spec	2008.07.09





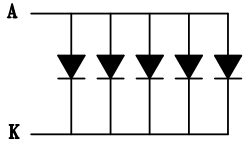


DOTS SCALE:1/10



COM & SEG LAYOUT

WHITE LED BACKLIGHT



PIN ASSIGNMENT

NO.	SIGNAL
1	PS0
2	PS1
3	PS2
4	CSB
5	RST
6	A0
7	RW
8	E
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	VDD
18	VDD
19	VSS
20	VSS
21	VOUT-OUT
22	VOUT-IN
23	V4
24	V3
25	V2
26	V1
27	V0
28	VR
29	INTRS
30	NC

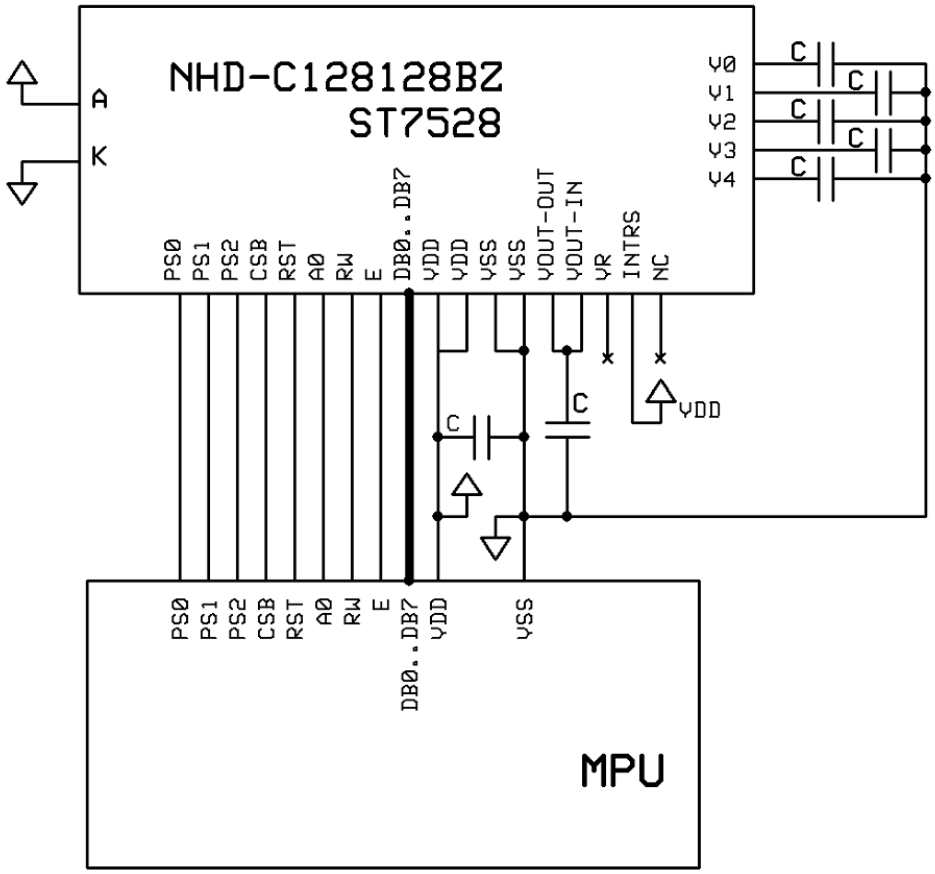
Specification:
1). Driving: 1/128 Duty, 1/12 Bias, VLCD: 13.5V
2). Viewing Direction: 6 o'clock
3). Display mode: STN/Positive/Transflective/Gray mode
4). Operating temp. : -20°c~+70°C
Storage temp. : -30°C ~ +80°C
5). Driver: ST7528 Vdd:3V
6). Edge Backlight: White color, 3~3.3V, Current: 75~90mA
7). RoHS Compliant

Model Name: NHD-C128128BZ-FSW-GBW		Newhaven Display	
GENERAL TOL: ± 0.2			
APPROVALS	DATE	DRAWN NO.	SCALE: 1:1
DWN: Qiqei Qiu			
CHK:		SIZE: A4	UNIT: mm / Page: 1-1
APP: Guoxiang Ye			

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	PS0	Input	Parallel/serial data input select input
2	PS1	Input	(see Parallel/Serial Select table)
3	PS2	Input	IIC not available (tie low)
4	CSB	MPU	Active LOW Chip select
5	RST	MPU	Active LOW Reset signal
6	A0	MPU	Register select signal. A0=1: Data, A0=0: Command
7	RW(WR)	MPU	Read/Write select signal, R/W=1: Read R/W=0: Write
8	E(RD)	MPU	Operation enable signal. Falling edge triggered.
9-16	DB0-DB7	MPU	Bi-directional, three-state data bus lines
17,18	VDD	Power Supply	Supply Voltage for logic (3.0V)
19,20	Vss	Power Supply	Ground
21	VOUT	Power Supply	Voltage booster circuit – connect to 1uF cap to Vss or VDD
22	VIN	Power Supply	Tie to VOUT
23	V4	Power Supply	1.0uF-2.2uF cap to VSS
24	V3	Power Supply	1.0uF-2.2uF cap to VSS
25	V2	Power Supply	1.0uF-2.2uF cap to VSS
26	V1	Power Supply	1.0uF-2.2uF cap to VSS
27	V0	Power Supply	1.0uF-2.2uF cap to VSS
28	VR	-	No Connect
29	INTRS	Input	Internal resistor select pin: VDD=Enabled
30	NC	-	No Connect

Recommended LCD connector: 0.5mm pitch, 30 pin FFC. Molex p/n: 52892-3095
Backlight connector: GHR-02V-S **Mates with**: BM02B-GHS-T



Parallel/Serial Select Table

PS2	PS1	PS0	Interface mode	Data/ Command	Data	Read/ Write	Serial clock
L	L	H	Parallel 80	A0	DB0 to DB7	RD/WR	-
L	H	H	Parallel 68	A0	DB0 to DB7	E/RW	-
L	L	L	3Line Serial	-	SID (DB7)	Write only	SCLK (DB6)
L	H	L	4Line Serial	A0	SID (DB7)	Write only	SCLK (DB6)

*Cannot read data from RAM in 4-line, 3-line, or IIC interface.
*In 4-line or 3-line interface, DB0-DB5, E, and RW must be tied High or Low
*In IIC or 3-line interface, A0 must be tied High or Low

Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	ºC
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	ºC
Supply Voltage	VDD		-	3.0	-	V
Supply Current	IDD	Ta=25°, VDD=3.0V	-	1.5	2.5	mA
Supply for LCD (contrast)	VDD-V0	Ta =25℃	-	13.5	-	V
"H" Level input	Vih		2.2	-	VDD	V
"L" Level input	Vil		0	-	0.6	V
"H" Level output	Voh		2.4	-	-	V
"L" Level output	Vol		-	-	0.4	V
Backlight supply voltage	VLED		-	3.0	-	V
Backlight supply current	ILED	VLED=3.0V	-	60	75	mA

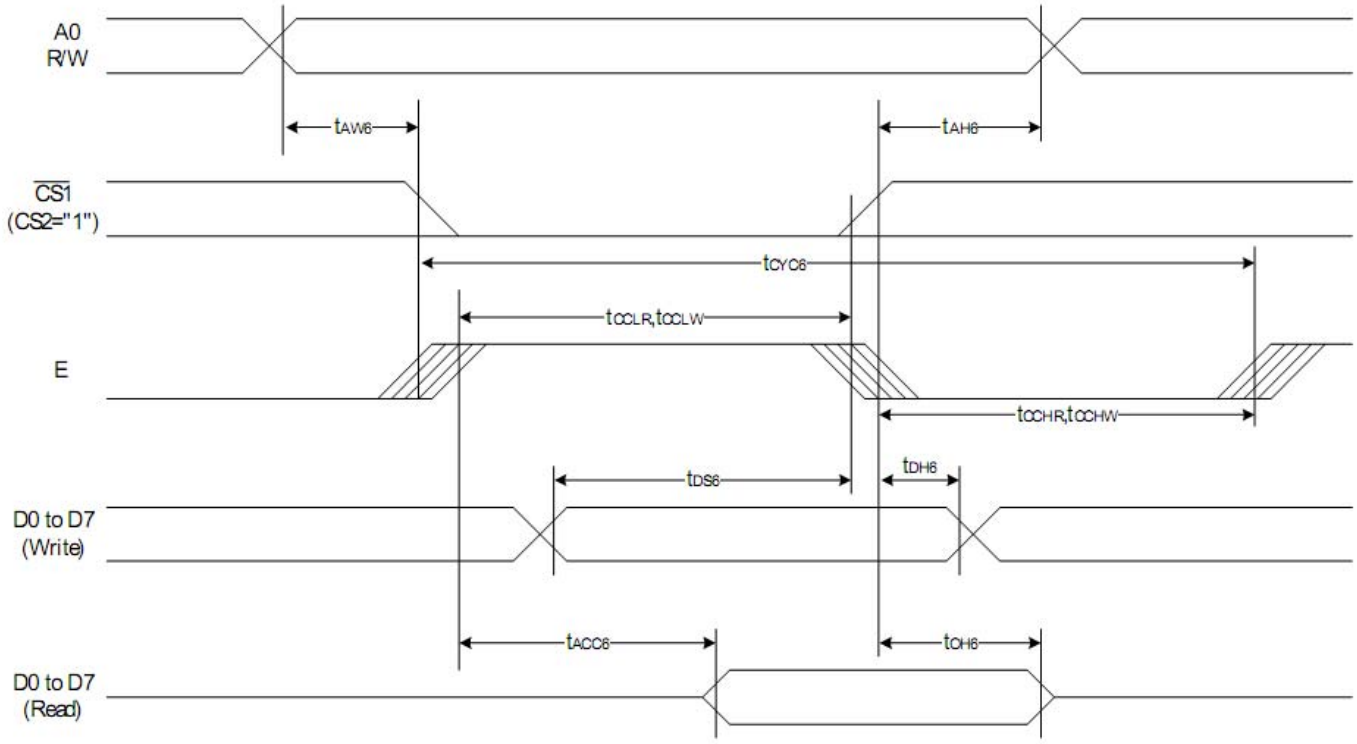
Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical	K	Cr≥2	-60	-	+35	º
Viewing Angle - Horizontal	Φ		-40	-	+40	º
Contrast Ratio	CR		-	6	-	-
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tf	-	-	150	250	ms

Controller Information

Built-in ST7528. Download specification at http://www.newhavendisplay.com/app_notes/ST7528.pdf

Timing Characteristics



Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	tAH6		0	—	ns
Address setup time		tAW6		0	—	
System cycle time		tCYC6		240	—	
Enable L pulse width (WRITE)	WR	tEWLW		80	—	
Enable H pulse width (WRITE)		tEWHW		80	—	
Enable L pulse width (READ)	RD	tEWLR		80	—	
Enable H pulse width (READ)		tEWHR		140		
WRITE Data setup time	D0 to D7	tDS6		40	—	
WRITE Data hold time		tDH6		10	—	
READ access time		tACC6	CL = 100 pF	—	70	
READ Output disable time		tOH6	CL = 100 pF	5	50	

Table of Commands

Instruction	A0	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
EXT=0 or 1											
Mode Set	0	0	0	0	1	1	1	0	0	0	2-byte instruction to set Mode and FR(Frame frequency control) BE(Booster efficiency control)
	0	0	FR3	FR2	FR1	FR0	0	BE	x'	EXT	
EXT=0											
Read display data	1	1	Read data								Read data into DDRAM
Write display data	1	0	Write data								Write data into DDRAM
Read status	0	1	BUSY	ON	RES	MF2	MF1	MF0	DS1	DS0	Read the internal status
ICON control register ON/OFF	0	0	1	0	1	0	0	0	1	ICON	ICON=0: ICON disable(default) ICON=1: ICON enable & set the page address to 16
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	Y9	Y8	Y7	Y6	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y5	Y4	Y3	Y2	Set column address LSB
Set modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode
Reset modify-read	0	0	1	1	1	0	1	1	1	0	release modify-read mode
Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=0: Display OFF D=1: Display ON
Set initial display line register	0	0	0	1	0	0	0	0	x'	x'	2-byte instruction to specify the initial display line to realize vertical scrolling
	0	0	x'	S6	S5	S4	S3	S2	S1	S0	
Set initial COM0 register	0	0	0	1	0	0	0	1	x'	x'	2-byte instruction to specify the initial COM0 to realize window scrolling
	0	0	x'	C6	C5	C4	C3	C2	C1	C0	
Set partial display duty ration	0	0	0	1	0	0	1	0	x'	x'	2-byte instruction to set partial display duty ratio
	0	0	D7	D6	D5	D4	D3	D2	D1	D0	
Set N-line inversion	0	0	0	1	0	0	1	1	x'	x'	2-byte instruction to set N-line inversion register
	0	0	x'	x'	x'	N4	N3	N2	N1	N0	
Release N-line inversion	0	0	1	1	1	0	0	1	0	0	Release N-line inversion mode
Reverse display ON/OFF	0	0	1	0	1	0	0	1	1	REV	REV=0: normal display REV=1: reverse display
Entire display ON/OFF	0	0	1	0	1	0	0	1	0	EON	EON=0: normal display EON=1: entire display ON

Instruction	A0	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Ext=0											
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Select DC-DC step-up	0	0	0	1	1	0	0	1	DC1	DC0	Select the step-up of internal voltage converter
Select regulator register	0	0	0	0	1	0	0	R2	R1	R0	Select the internal resistance ratio of the regulator resistor
Select electronic volumn register	0	0	1	0	0	0	0	0	0	1	2-byte instruction to specify the reference voltage
	0	0	x'	x'	EV5	EV4	EV3	EV2	EV1	EV0	
Select LCD bias	0	0	0	1	0	1	0	B2	B1	B0	Select LCD bias
Bias Power Save	0	0	1	1	1	1	0	0	1	1	Bias Power save Save the Bias current consumption
	0	0	0	0	0	0	0	0	0	0	
SHL select	0	0	1	1	0	0	SHL	x'	x'	x'	COM bi-directional selection SHL=0: normal direction SHL=1: reverse direction
ADC select	0	0	1	0	1	0	0	0	0	ADC	SEG bi-direction selection ADC=0: normal direction ADC=1: reverse direction
Oscillator on start	0	0	1	0	1	0	1	0	1	1	Start the built-in oscillator
Set power save mode	0	0	1	0	1	0	1	0	0	P	P=0: normal mode P=1: sleep mode
Release power save mode	0	0	1	1	1	0	0	0	0	1	release power save mode
Reset	0	0	1	1	1	0	0	0	1	0	initial the internal function
Set data direction & display data length(DDL)	x'	x'	1	1	1	0	1	0	0	0	2-byte instruction to specify the number of data bytes. (SPI mode)
	x'	x'	D7	D6	D5	D4	D3	D2	D1	D0	
Select FRC and PWM mode	0	0	1	0	0	1	0	FRC	PWM1	PWM0	FRC(1:3FRC, 0:4FRC) PWM1 PWM0 0 0 45PWM 0 1 45 PWM 1 0 60PWM 1 1 ---
NOP	0	0	1	1	1	0	0	0	1	1	*No operation*
Test Instruction	0	0	1	1	1	1	x'	x'	x'	x'	*Don't use this instruction*

Example Initialization Program

```
/*************************************************************/
/*************************************************************/
void write_command(unsigned char datum)
{
 A0=0;                                          /*Instruction register*/
 E=1;                                           /*Read inactive*/
 bus=datum;                                     /*put data on port 1*/
 CSB=0;                                         /*Chip select active*/
 RW=0;                                          /*Write active*/
 RW=1;                                          /*Write inactive; latch in data*/
 CSB=1;                                         /*Chip select inactive*/
}
/*************************************************************/
void write_data(unsigned char datum)
{
 A0=1;                                          /*DDRAM data register*/
 E=1;
 bus=datum;
 CSB=0;
 RW=0;
 RW=1;
 CSB=1;
}
/*************************************************************/
void lcd_init(void){
      write_command(0xA2);      //ICON  OFF;
      write_command(0xAE);      //Display OFF

      write_command(0x48);      //Set Duty ratio
      write_command(0x80);      //No operation
      write_command(0xa0);      //Set scan direction
      write_command(0xc8);      //SHL  select
      write_command(0x40);      //Set START LINE
      write_command(0x00);
      write_command(0xab);      //OSC on

      write_command(0x64);      //3x
      delay(2000);
      write_command(0x65);      //4x
      delay(2000);
      write_command(0x66);      //5x
      delay(2000);
      write_command(0x67);      //6x
      delay(2000);

      write_command(Ra_Rb);      //RESISTER SET
      write_command(0x81);      //Set electronic volume register
      write_command(vopcode);    //n=0~3f


      write_command(0x57);      //1/12bias
      write_command(0x92);      //FRC and pwm


      write_command(0x2C);
      delay(20000);//200ms
      write_command(0x2E);
      delay(20000);//200ms
      write_command(0x2F);
```

```
delay(20000);//200ms


write_command(0x92);       //frc and pwm
write_command(0x38);       //external  mode
write_command(0x75);

      /*** start settings for 16-level grayscale ***/

write_command(0x97);       //3frc,45pwm

write_command(0x80);
write_command(0x00);
write_command(0x81);
write_command(0x00);
write_command(0x82);
write_command(0x00);
write_command(0x83);
write_command(0x00);

write_command(0x84);
write_command(0x06);
write_command(0x85);
write_command(0x06);
write_command(0x86);
write_command(0x06);
write_command(0x87);
write_command(0x06);

write_command(0x88);
write_command(0x0b);
write_command(0x89);
write_command(0x0b);
write_command(0x8a);
write_command(0x0b);
write_command(0x8b);
write_command(0x0b);

write_command(0x8c);
write_command(0x10);
write_command(0x8d);
write_command(0x10);
write_command(0x8e);
write_command(0x10);
write_command(0x8f);
write_command(0x10);

write_command(0x90);
write_command(0x15);
write_command(0x91);
write_command(0x15);
write_command(0x92);
write_command(0x15);
write_command(0x93);
write_command(0x15);

write_command(0x94);
write_command(0x1a);
write_command(0x95);
write_command(0x1a);
write_command(0x96);
write_command(0x1a);
write_command(0x97);
```

```
write_command(0x1a);

write_command(0x98);
write_command(0x1e);
write_command(0x99);
write_command(0x1e);
write_command(0x9a);
write_command(0x1e);
write_command(0x9b);
write_command(0x1e);

write_command(0x9c);
write_command(0x23);
write_command(0x9d);
write_command(0x23);
write_command(0x9e);
write_command(0x23);
write_command(0x9f);
write_command(0x23);

write_command(0xa0);
write_command(0x27);
write_command(0xa1);
write_command(0x27);
write_command(0xa2);
write_command(0x27);
write_command(0xa3);
write_command(0x27);

write_command(0xa4);
write_command(0x2b);
write_command(0xa5);
write_command(0x2b);
write_command(0xa6);
write_command(0x2b);
write_command(0xa7);
write_command(0x2b);

write_command(0xa8);
write_command(0x2f);
write_command(0xa9);
write_command(0x2f);
write_command(0xaa);
write_command(0x2f);
write_command(0xab);
write_command(0x2f);

write_command(0xac);
write_command(0x32);
write_command(0xad);
write_command(0x32);
write_command(0xae);
write_command(0x32);
write_command(0xaf);
write_command(0x32);

write_command(0xb0);
write_command(0x35);
write_command(0xb1);
write_command(0x35);
write_command(0xb2);
write_command(0x35);
write_command(0xb3);
```

```
    write_command(0x35);

    write_command(0xb4);
    write_command(0x38);
    write_command(0xb5);
    write_command(0x38);
    write_command(0xb6);
    write_command(0x38);
    write_command(0xb7);
    write_command(0x38);

    write_command(0xb8);
    write_command(0x3a);
    write_command(0xb9);
    write_command(0x3a);
    write_command(0xba);
    write_command(0x3a);
    write_command(0xbb);
    write_command(0x3a);

    write_command(0xbc);
    write_command(0x3c);
    write_command(0xbd);
    write_command(0x3c);
    write_command(0xbe);
    write_command(0x3c);
    write_command(0xbf);
    write_command(0x3c);
        //end settings for 16-level grayscale
    write_command(0x38);
    write_command(0x74);
    write_command(0xaf);    //Display ON
}
/*************************************************************/
/*************************************************************/
```

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 , 48hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 48hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 48hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 48hrs	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.	+40°C , 90% RH , 48hrs	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-0°C,30min -> 25°C,5min -> 50°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

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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