NEWHAVEN DISPLAY INTERNATIONAL

Product Specification

NHD-1.8-128160EF-CSXN#

TFT (Thin-Film Transistor) Liquid Crystal Display Module

NHD-	Newhaven Display
1.8-	1.8" Diagonal Size
128160-	128x160 Pixels (Portrait Mode)
EF-	Model
C-	Built-in Controller
S-	Sunlight Readable
X-	TFT
N-	TN, 6:00 Optimal View, Wide Temperature
#-	RoHS Compliant

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REACH Compliant

RoHS Compliant

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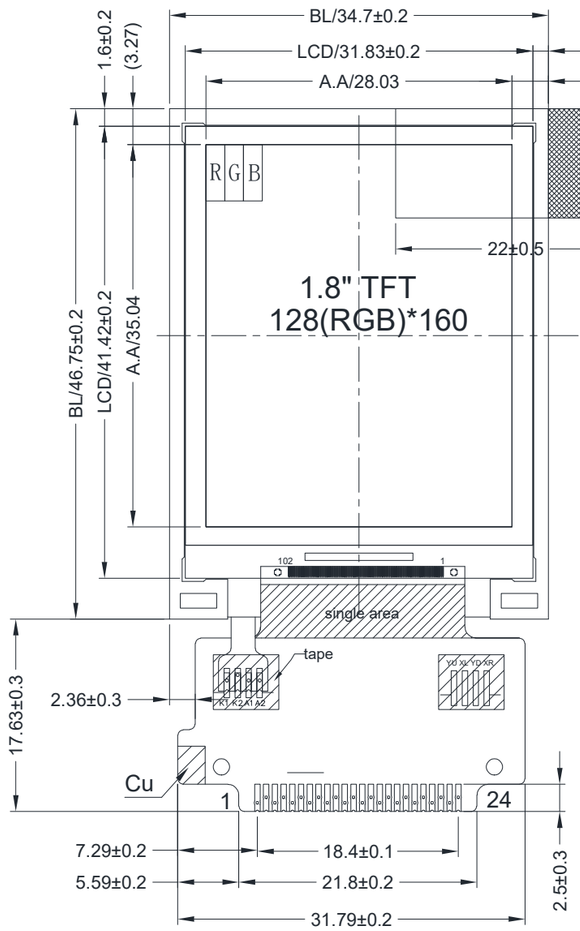
Additional Resources

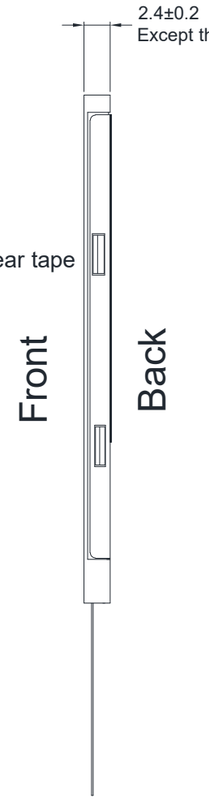
- **Support Forum:** https://support.newhavendisplay.com/hc/en-us/community/topics
- **GitHub:** https://github.com/newhavendisplay
- **Example Code:** https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **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

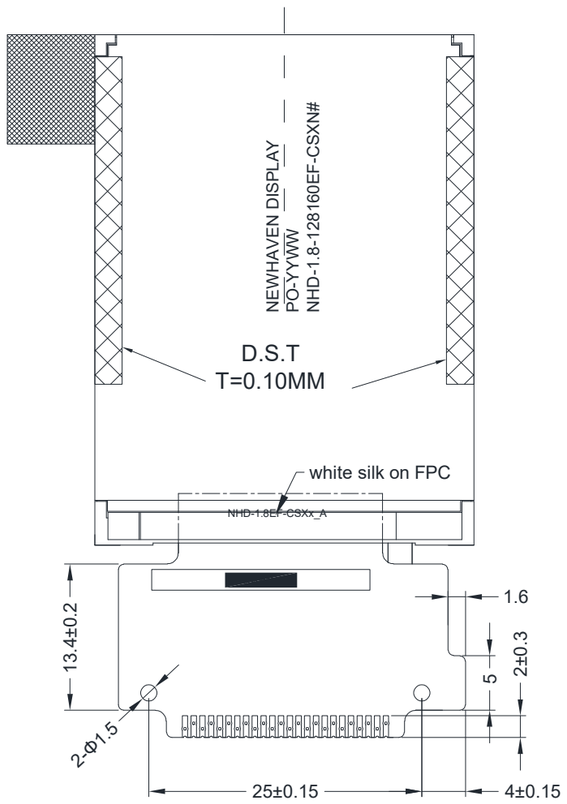
Document Revision History

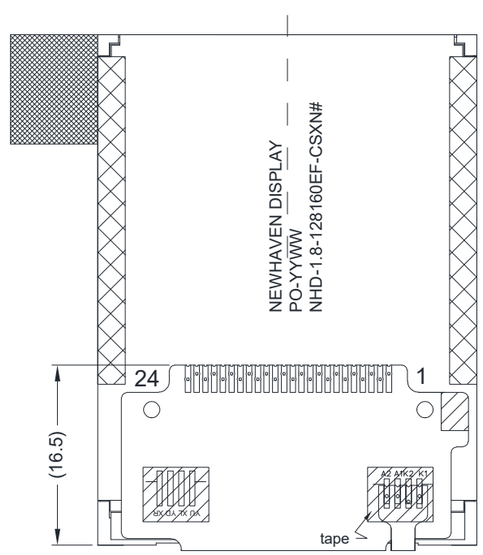
Revision	Date	Description	Changed By
0	10/23/2015	Initial Release	SB
1	02/26/2016	Supply Current and Brightness Updated, Added Backlight Lifetime	SB
2	03/23/2016	Modified Viewing Angles	SB
3	12/30/2016	Modified Viewing Angles	SB
4	03/08/2021	Updated Silkscreen on FPC, Footnote for Backlight Drive Conditions, Optical Characteristics & Quality Information	AS
5	08/03/2023	Mechanical Drawing, Timing Characteristics, and Table of Commands Updated	KL
6	09/05/2023	V_{DD}/IOV_{DD} Supply Voltage Updated from 2.8V to 3.0V (Typ.) Mechanical Drawing Updated	KL

Mechanical Drawing

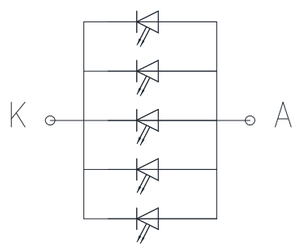








No:	PIN NAME
1	GND
2	IOVCC 1.8V
3	VCC 2.8V
4	CSB
5	RST
6	RS
7	WRB
8	RDB
9	DB0
10	DB1
11	DB2
12	DB3
13	DB4
14	DB5
15	DB6
16	DB7
17	BL_A
18	BL_K
19	BL_K
20	GND
21	NC(YU)
22	NC(XL)
23	NC(YD)
24	NC(XR)



Circuit Diagram:

Product Description: 1.8 128x160 Sunlight Readable TFT

1. Driver IC: ILI9163V
2. Interface: 8-bit Parallel
3. Power Requirement: 3.0V TFT, 3.2V/100mA Backlight
4. Optical Features: Normally White, Transmissive, Anti-Glare, 1000cd/m²

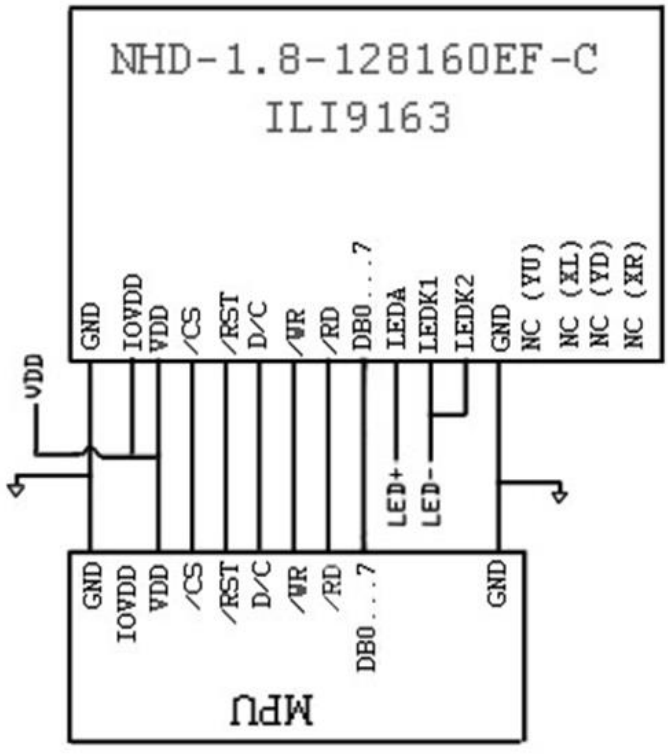
Standard Tolerance: (Unless otherwise specified) Linear: ±0.3mm	NEWHAVEN DISPLAY INTERNATIONAL	
	Drawing/Part Number: NHD-1.8-128160EF-CSXN#	Revision: -
Unless otherwise specified: • Dimensions are in Millimeters • Third Angle Projection	Drawn By: K. Lewis	Approved By: K. Lewis
	Drawn Date: 09/05/2023	Approved Date: 09/05/2023

Pin Description

Pin No.	Symbol	External Connection	Function Description
1	GND	Power Supply	Ground
2	IOV_{DD}	Power Supply	Supply Voltage for Logic (3.0V) – Can be tied to VDD
3	V_{DD}	Power Supply	Supply Voltage for LCD (3.0V)
4	/CS	MPU	Active LOW Chip Select signal
5	/RST	MPU	Active LOW Reset signal
6	D/C	MPU	Data / Command selection: '1' = Data ; '0' = Command
7	/WR	MPU	Active LOW Write signal
8	/RD	MPU	Active LOW Read signal
9	DB0	MPU	8-bit bi-directional data bus
10	DB1	MPU	
11	DB2	MPU	
12	DB3	MPU	
13	DB4	MPU	
14	DB5	MPU	
15	DB6	MPU	
16	DB7	MPU	
17	LED-A	Power Supply	Backlight Anode (3.2V)
18	LED-K1	Power Supply	Backlight Cathode (GND)
19	LED-K2	Power Supply	Backlight Cathode (GND)
20	GND	Power Supply	Ground
21	NC	-	No Connect
22	NC	-	No Connect
23	NC	-	No Connect
24	NC	-	No Connect

LCD connector: Hot-bar solder directly to PCB

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 for Logic	IOV_{DD}	-	1.65	3.0	3.3	V
Supply Voltage for LCD	V_{DD}	-	2.5	3.0	3.3	V
Supply Current	I_{DD}	V_{DD} = 3.0V	1	3	5	mA
"H" Level input	V_{IH}	-	0.7*IOV_{DD}	-	IOV_{DD}	V
"L" Level input	V_{IL}	-	GND	-	0.3*IOV_{DD}	V
"H" Level output	V_{OH}	-	0.8*IOV_{DD}	-	IOV_{DD}	V
"L" Level output	V_{OL}	-	GND	-	0.2*IOV_{DD}	V
Backlight Supply Voltage	V_{LED}	I_{LED} = 100mA	3.0	3.2	3.4	V
Backlight Supply Current	I_{LED}	-	80	100	110	mA
Backlight Lifetime*	-	I_{LED} = 100mA T_{OP} = 25°C	20,000	50,000	-	Hrs.

*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions. 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 ≥ 10	-	60	-	o
	Bottom	φY-		-	40	-	o
	Left	θX-		-	60	-	o
	Right	θX+		-	60	-	o
Contrast Ratio		Cr	-	400	500	-	-
Luminance		L_V	I_{LED}=100mA	800	1000	-	cd/m^2
Response Time	Rise + Fall	T_R+T_F	T_{OP} = 25°C	-	8	16	ms

Controller Information

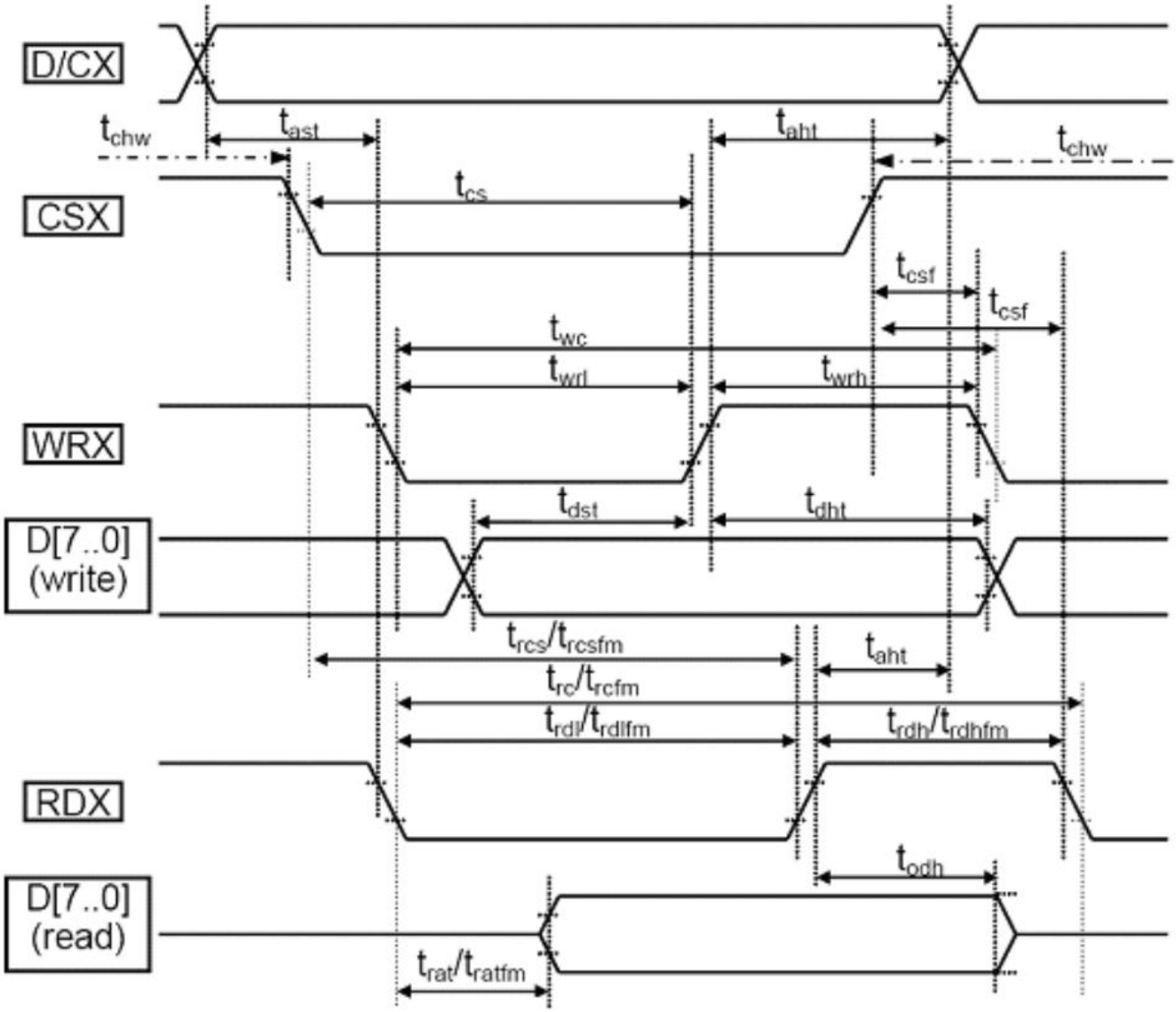
Built-in ILI9163V Controller: https://support.newhavendisplay.com/hc/en-us/articles/4414575853079--ILI9163V

Table of commands

For Command Table and Descriptions, please see:
https://support.newhavendisplay.com/hc/en-us/article_attachments/4414532035607/ILI9163V.pdf

Timing Characteristics

Parallel 8-bit Bus



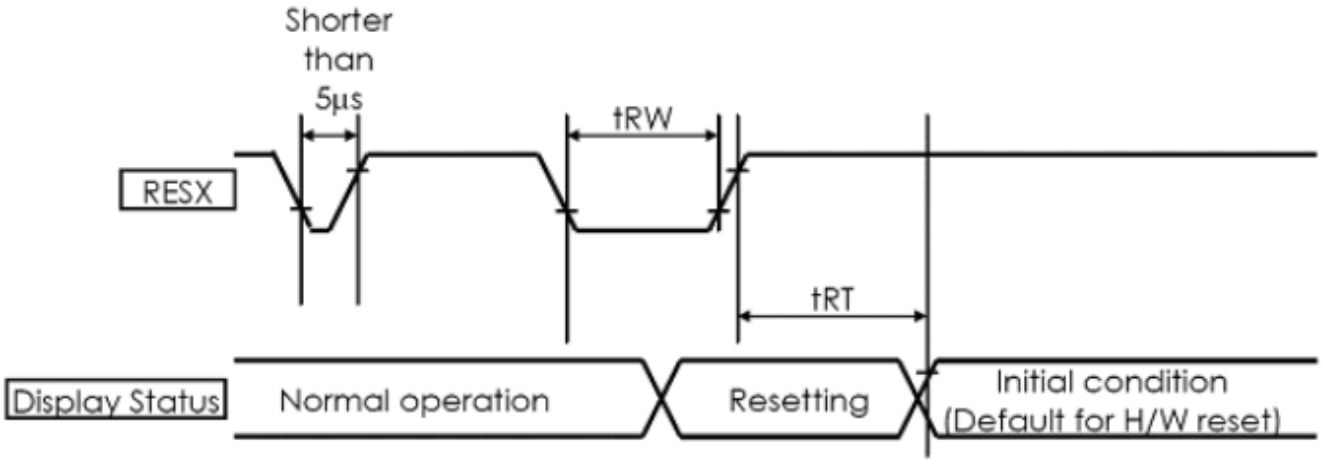
Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Signal	Symbol	Parameter	min	max	unit	description
D/CX	tast	Address setup time	0		ns	
	taht	Address hold time(Write/Read)	10		ns	
CSX	tchw	"S""H" Pulse Widtch	0		ns	
	tcs	Chip Select setup time (Write)	10		ns	
	trcs	Chip Select setup time (Read ID)	45		ns	
	trcsfm	Chip Select setup time (Read FM)	355		ns	
	tcsf	Chip Select Wait time(Write/read)	10		ns	
WRX	twc	Write cycle	66		ns	
	twrh	Controlpulse H duration	15		ns	
	twrl	Control pulse L duration	15		ns	
RDX	trc	Read cycle (ID)	160		ns	When read ID data
	trdh	Control pulse H duration(ID)	90		ns	
	trdl	Control pulse L duration(ID)	45		ns	
RDX	trcfm	Read cycle (FM)	450		ns	When read from frame memory
	trdhfm	Control pulse H duration (FM)	90		ns	
	trdlfm	Control pulse L duration (FM)	355		ns	
D[17..0]	tdst	Data setup time	10		ns	For maximum CL = 30pF For minimum CL = 8pF
	tdht	Data hold time	10		ns	
	trat	Read access time (ID)		40	ns	
	tratfm	Read access time (FM)		340	ns	
	todh	Output disable time	20	80	ns	

Note 1: VDDI 1.65 to 3.3V, VDD=2.6 to 3.3V, AGND=GND=0V, Ta=-30 to 70 °C (to +85°C no damage)

Note 2: This input signal rise time and fall time (tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for input signals

Reset Timing



(VSS=0V, VDDI=1.65V to 1.95V, VCI=2.6V to 2.9V, Ta = -30 to 70℃)

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
tRESW	*1) Reset low pulse width	RESX	10	-	-	-	µs
tREST	*2) Reset complete width	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Example Program Code

```
void TFT_18E_Init(void)
{
	GPIO_ResetBits(GPIOC, CS1);
	GPIO_SetBits(GPIOC, nRD);
	GPIO_ResetBits(GPIOC, nWR);
	GPIO_WriteBit(GPIOC, RES, Bit_RESET);
	delay(5);
	TFT_delay(10);
	GPIO_WriteBit(GPIOC, RES, Bit_SET);
	delay(100);
	TFT_delay(10);
	TFT_18E_Write_Command(0x11);
	TFT_delay(100);
	TFT_18E_Write_Command(0x26);TFT_18E_Write_Data(0x04);
	TFT_18E_Write_Command(0xF2);TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Command(0xB1);TFT_18E_Write_Data(0x0A);TFT_18E_Write_Data(0x14);
	TFT_18E_Write_Command(0xC0);TFT_18E_Write_Data(0x0A);TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Command(0xC1);TFT_18E_Write_Data(0x02);
	TFT_18E_Write_Command(0xC5);TFT_18E_Write_Data(0x2F);TFT_18E_Write_Data(0x3E);
	TFT_18E_Write_Command(0xC7);TFT_18E_Write_Data(0x40);
	TFT_18E_Write_Command(0x2A);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x7F);
	TFT_18E_Write_Command(0x2B);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x00);
	TFT_18E_Write_Data(0x9F);
	TFT_18E_Write_Command(0x36);TFT_18E_Write_Data(0x48);
	TFT_18E_Write_Command(0x3A);TFT_18E_Write_Data(0xC5);
	TFT_18E_Write_Command(0x29);
	TFT_18E_Write_Command(0x2C);
}
/*****************************************************************************/
void TFT_18E_Write_Command(unsigned char command)
{
	GPIO_ResetBits(GPIOC, RS);
	GPIO_Write(GPIOB, command);
	GPIO_ResetBits(GPIOC, nWR);
	GPIO_SetBits(GPIOC, nWR);
}
/*****************************************************************************/
void TFT_18E_Write_Data(unsigned char data1)
{
	GPIO_SetBits(GPIOC, RS);
	GPIO_Write(GPIOB, data1);
	GPIO_ResetBits(GPIOC, nWR);
	GPIO_SetBits(GPIOC, nWR);
}
/*****************************************************************************/
```

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 Storage	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 60 min ~ +70°C 60 min, 20 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-50Hz, 1.5G amplitude. 30 min in each of 3 directions X,Y,Z	3
Static electricity test	Endurance test applying electric static discharge.	Air: ±8kV 150pF/330Ω, 5 Times Contact: ±4kV 150pF/330Ω, 5 Times	

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.