



PRODUCT SPECIFICATION

MONO LCD MODULE
MODEL: NLCMG5527

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1. Features

The features of LCD are as follows

- * Display mode : STN/Blue/Transmissive/Negative
- * IC : RA8808
- * Interface Input Data : 6800 Series
- * Driving Method : 1/64 Duty, 1/9 Bias
- * Viewing Direction : 6 O'clock
- * Backlight : LED/White

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	75(W) x 52.7(H) x 9 Max(D)	mm
Number of Dots	128 x 64 Dots	
Viewing Area	60 (W) x32.6 (H)	mm
Activity Area	55.01(W) x27.49(H)	mm
Dot Size	0.4(W) x 0.4(H)	mm
Dot Pitch	0.43(W) x 0.43(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1 ABSOLUTR MAZIMUM RATINGS (Ta = 25 °C)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	$V_{DD}-V_{SS}$	-0.3	-	7.0	V
Supply Voltage For LCD Drive	$V_{OP}=V_0-V_{SS}$	VDD-19.0	-	VDD+0.3	V
Input Voltage	V_{in}	-0.3	-	VDD+0.3	V
Operating Temp.	Top	-20	-	+70	°C
Storage Temp.	Tst	-30	-	+80	°C

*. NOTE: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

3-2 ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Logic supply Voltage	$V_{DD}-V_{SS}$	$T_a = 25\text{ }^\circ\text{C}$ $V_{DD}=5V\pm 10\%$	4.5	5	5.5	V	
LCD Drive	$V_{OP}=V_0-V_{SS}$		7.2	7.5	7.8	V	
Input Voltage	"H" Level		V_{IH}	$0.7V_{DD}$	-	V_{DD}	V
	"L" Level		V_{IL}	V_{SS}	-	$0.3V_{DD}$	V
Frame Frequency	f_{FLM}		50	-	600	kHz	
Current Consumption	I_{DD}		-	1.73	-	mA	

3-3. BACKLIGHT

3-3-1. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	IF	$T_a = 25\text{ }^\circ\text{C}$	-	-	90	mA
Reverse Voltage	VR		-	-	5	V
Power Dissipation	PD		-	-	288	mW

3-3-2. Electrical-optical Characteristics

Item	Symbol	Condition	Min.		Typ.		Max.		Unit
Forward Voltage	VF	$T_a = 25\text{ }^\circ\text{C}$ $I_f=90\text{mA}$	2.8		3.0		3.2		V
Average Luminous Intensity	I_v		350		500		-		cd/m^2
Colour coordinates	-		X	Y	X	Y	X	Y	-
			0.25	0.25	0.28	0.28	0.31	0.31	

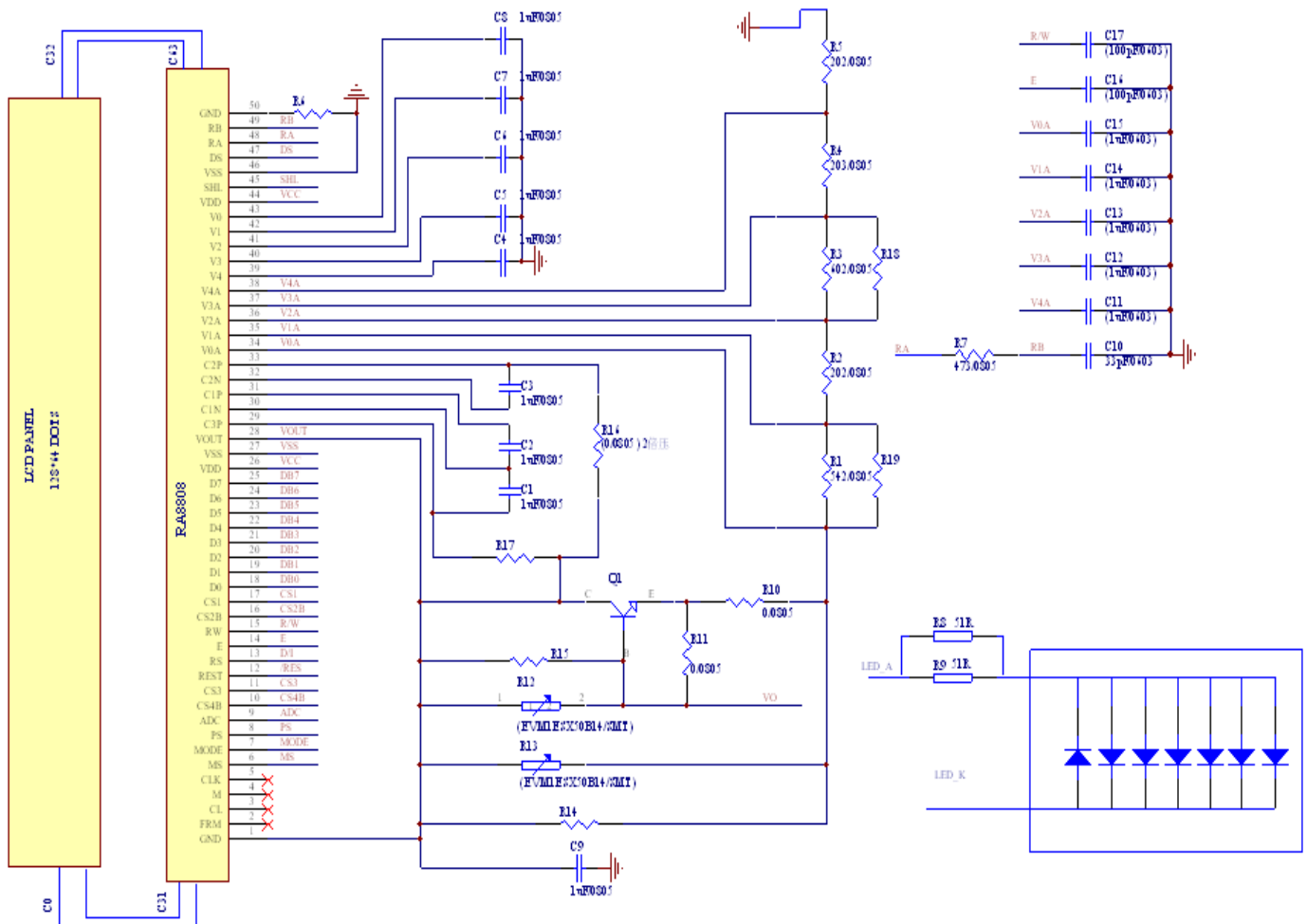
The brightness is measured without LCD panel

4. TERMINAL FUNCTIONS AND BLOCK DIAGRAM

4-1. INTERFACE PIN FUNCTION DESCRIPTION

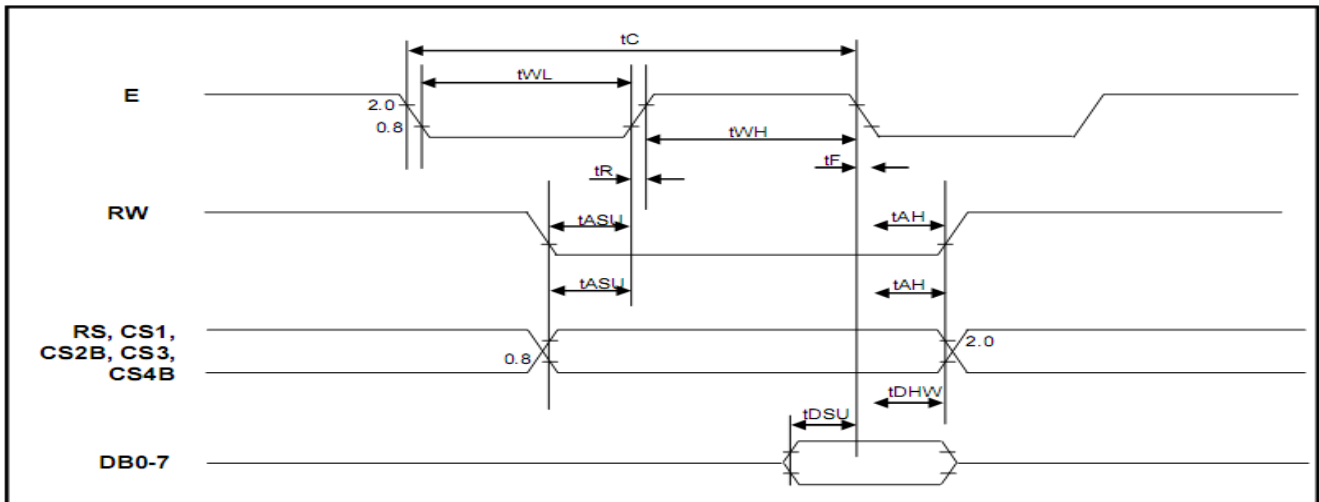
Pin No.	Pin Name	Function
1	VDD	Logic power supply voltage
2	GND	Ground
3	V0	Supply voltage for LCD driving
4-11	DB0-DB7	8-Bit data bus
12	/CS1	Chip selection
13	/CS2	Chip selection
14	/RES	Reset signal
15	R/W	Read or Write signal
16	D/I	Register select input pin
17	E	Enable signal
18	VEE	Voltage converter input
19	LED_A	Backlight unit anode(+5.0V)
20	LED_K	Backlight unit cathode

4-2. BLOCK DIAGRAM

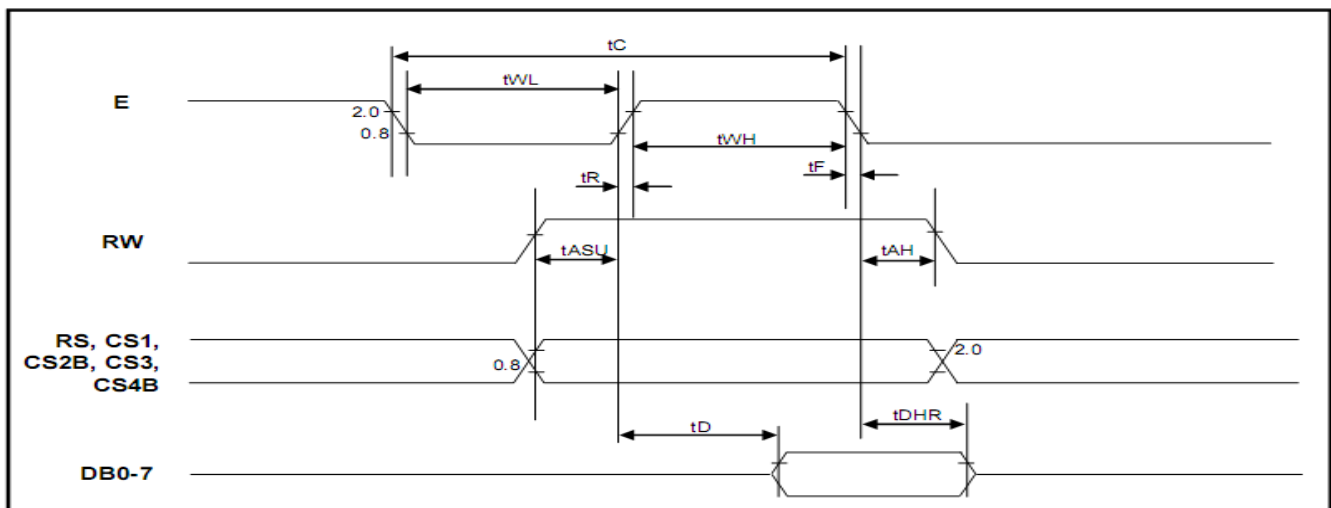


5. TIMING CHARACTERISTICS

MPU 6800 Write Timing



MPU 6800 Read Timing



Characteristic	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_{DSU}	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

6. INSTRUCTION SET

Instruction	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	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	H	Y address (0 ~ 63)						Sets the Y address in the Y address counter.
Set page (X address)	H	L	H	H	H	Page (0 ~ 7)			Sets the X address at the X address register.
Display start line (Z address)	H	H	Display start line (0 ~ 63)						Indicates the display data RAM displayed at the top of the screen.
Status Read	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Status read	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
Data Write	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Write display data	Write data								Writes data(DB7~0) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Data Read	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Read display data	Read data								Reads data(DB7~0) from display data RAM to the data bus. After reading instruction, Y address is increased by 1 automatically.

7. HANDLING PRECAUTION

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichloro trifluro thane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40°C, 50%RH or less is reequired.

(6) Storage

In the case of storing for a long period of time (for instance.) For years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol. Which should be burned up later.

When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

8. OUTLINE DIMENSION

