



# CONTENT

<b>1. General description</b> .....	<b>3</b>
<b>2. Maximum absolute limit</b> .....	<b>3</b>
<b>3. Mechanical characteristics</b> .....	<b>3</b>
a) Physical data	
b) External dimensions	
<b>4. Electrical characteristics</b> .....	<b>4</b>
a) DC characteristics	
b) AC characteristics	
c) EL backlight	
d) LED backlight	
<b>5. Operating Principles</b> .....	<b>6</b>
a) Pin description	
b) Block diagram	
c) Instruction description	
<b>6. Operating Methods</b> .....	<b>9</b>
a) Power supply	
b) Interface with MPU	
c) Operating example	



## 1. General description

SG12864I3C1GY6N, a dot-matrix graphic LCD module, it includes row driver/line driver, 128×64 pixels LCD .It can display graphic picture and English text ,also can show 8×4 (16×16 pixels)Chinese words. The SG12864I3C1GY6N provides one types of interfaces to MPU: 8-bit interfaces. SG12864I3C1GY6N can includes EL backlight for custom design. The custom can design for color of EL backlight, viewing angle and LCD type.

## 2. Maximum absolute limit

Characteristics	Symbol	Ratings	Remark
Operating Voltage	VDD	-0.3V to +7.0V	
Driver Supply Voltage	VLCD	VDD - 10V to VDD + 0.3V	
Input Voltage Range	VIN	-0.3V to VDD + 0.3V	
Operating Temperature	Ta1	-10°C to+60°C	Normal temperature LCM
Storage Temperature	TSTO	-30°C to+75°C	

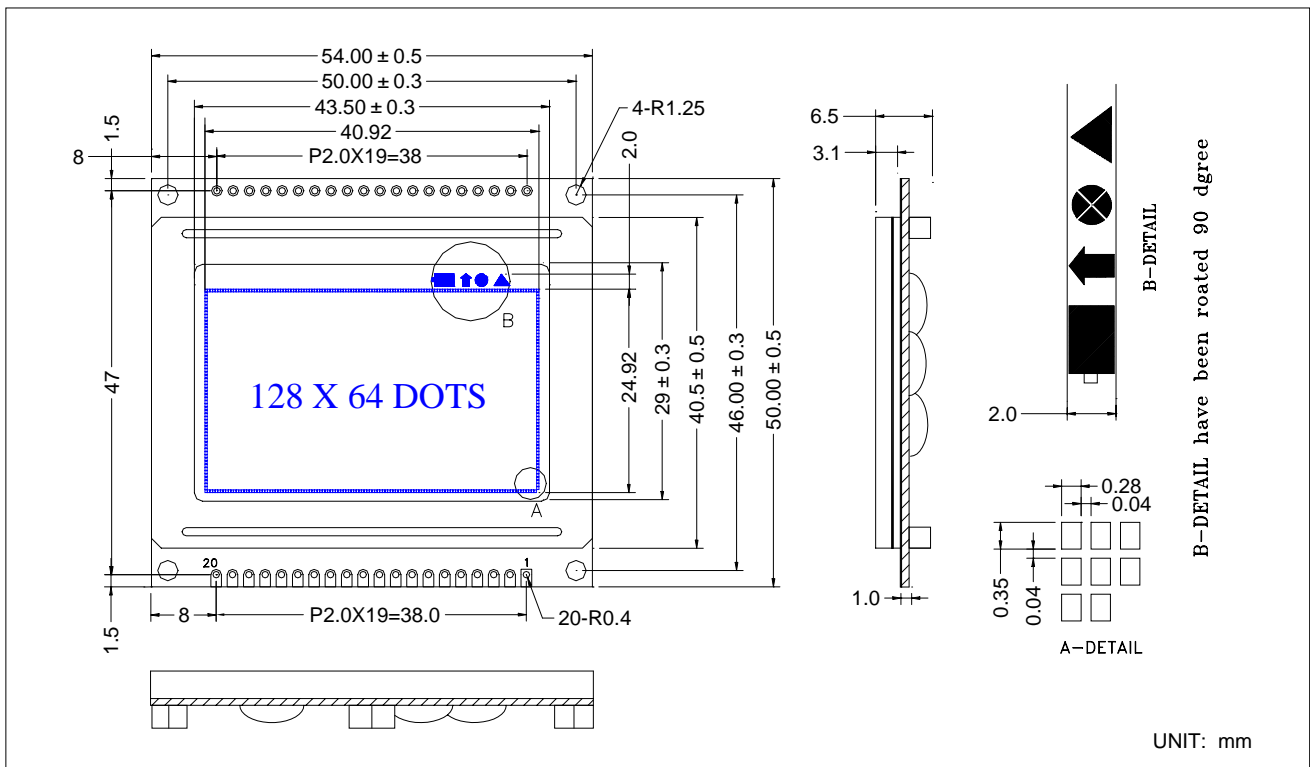
Note: Stresses beyond those given in the Absolute Maximum Rating table may cause operational errors or damage to the device.

## 3. Mechanical characteristics

### a) Physical data

ITEM	Standard value	Unit	Remark
Module size	54.0x50.0x6.5	mm	
Viewing area	50.0x29.0	mm	
Active area	40.92x24.92	mm	
Dot size	0.28x0.35	mm	
Dot pith	0.32x0.39	mm	
Approx. weight	22.5	g	
Drive method	8-bit parallel		

### b) External dimensions





## 4. Electrical characteristics

### a) DC characteristics

#### a.1) DC CHARACTERISTICS (TA = 25 °C, VDD = 2.7 to 4.5V)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Input High Voltage	VIH1	0.7VDD	-	VDD	V	VDD = 3.0V
Input Low Voltage	VIL1	-0.3		0.55	V	
Input High Current	IIH	-1.0		1.0	uA	
Input Low Current	IIL	-5.0	-15	-30	uA	
Output High Voltage	VOH	0.75VDD	-	-	V	IOH = - 0.1mA Pins: DB7-0
Output Low Voltage	VOL	-	-	0.2VDD	V	IOL= 0.1mA Pins: DB7-0
LCD Voltage	VLCD		9	13	V	
Operating Current	IDD		3.5	5.5	mA	

Note: VDD = 3V

#### a.2) DC CHARACTERISTICS (TA = 25°C, VDD = 4.5 to 5.5V)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Input High Voltage	VIH1	2.2		VDD	V	VDD = 5.0V
Input Low Voltage	VIL1	-0.3		0.6	V	
Input High Current	IIH	-2.0		2.0	uA	
Input Low Current	IIL	-20	-50	-100	uA	
Output High Voltage	VOH	2.4	-	VDD	V	IOH = - 0.1mA Pins: DB7-0
Output Low Voltage	VOL	-	-	0.4	V	IOL= 1.6mA Pins: DB7-0
LCD Voltage	VLCD		9	13	V	
Operating Current	IDD		4.0	6.3	mA	

Note: VDD = 5V

### b) AC characteristics

#### AC CHARACTERISTICS (TA = 25°C, VDD = 2.7 to 5.5V)

Write Mode (Writing data from MPU to LCD module)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	tc	1000			ns	PinE
E Pulse Width	tpw	450	-	-	ns	PinE
E Rise/Fall Time	tR,tF	-	-	25	ns	PinE
Address Setup Time	tsp-i	140			ns	Pins: RS, R/W
Address Hold Time	tHD1	10			ns	Pins: RS, R/W
Data Setup Time	tsP2	200			ns	Pins: DB7-0
Data Hold Time	tHD2	10	-	-	ns	Pins: DB7-0

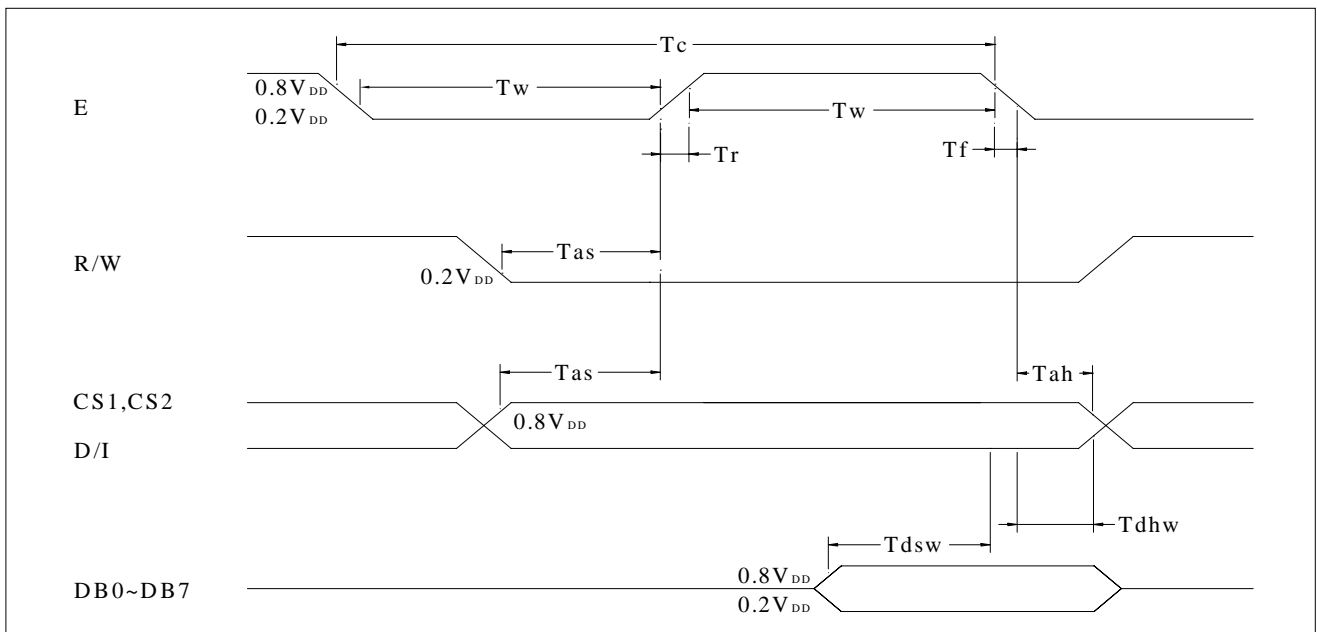


## MPU Interface

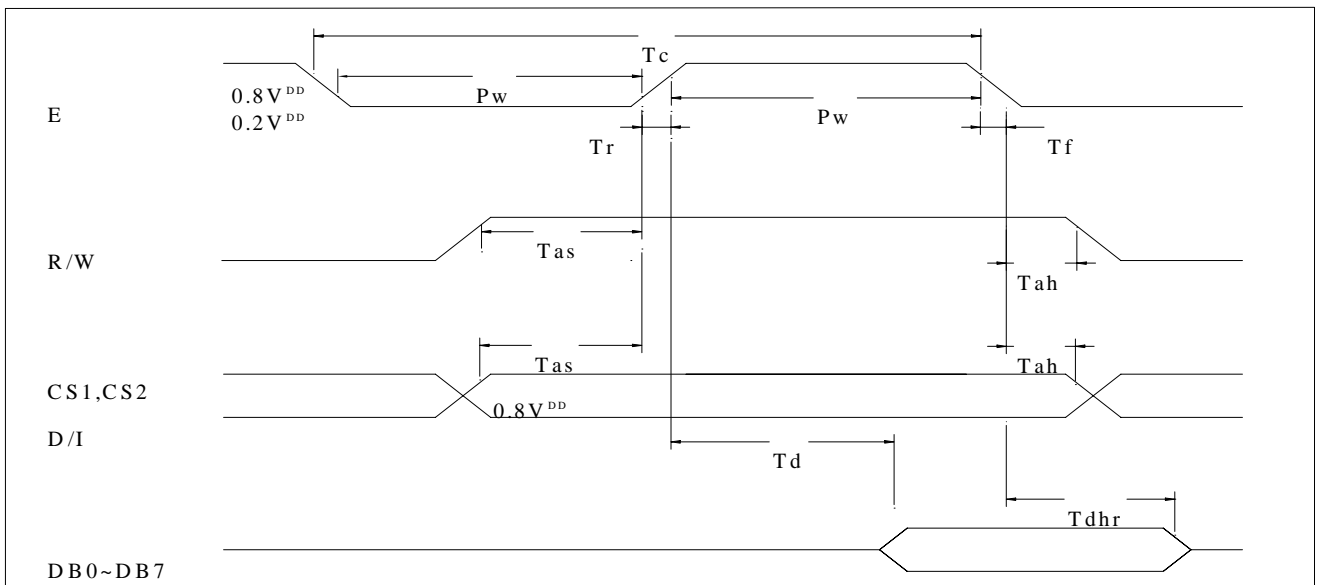
Read Mode (Reading data from LCD module to MPU)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	$t_c$	1000			ns	PinE
E Pulse Width	$t_w$	450			ns	PinE
E Rise/Fall Time	$t_R, t_F$			25	ns	PinE
Address Setup Time	$t_{sp-i}$	140			ns	Pins: RS, R/W
Address Hold Time	$t_{HD1}$	10			ns	Pins: RS, R/W
Data Output Delay Time	$t_D$			320	ns	Pins: DB7-0
Data hold time	$t_{HD2}$	20	-	-	ns	Pin DB7- 0

### TIMING GRAPHICTERISICS



Write Timing



Read Timing



## C) EL backlight

Item	Unit	Standard value			Condition
		Min.	Typ	Max.	
Supply voltage	VAC				
Lamp frequency	Hz	350	380	420	
Initial brightness	cd/cm <sup>2</sup>		20		50Vrms,380Hz.Dark room
Life time	Hours	1000			Note 1)
Current	mA		1.5		
Luminous color	—				
Operating Temp.		-15		70	50Vrms,380Hz,Dark room
Storage Temp.		-25		80	

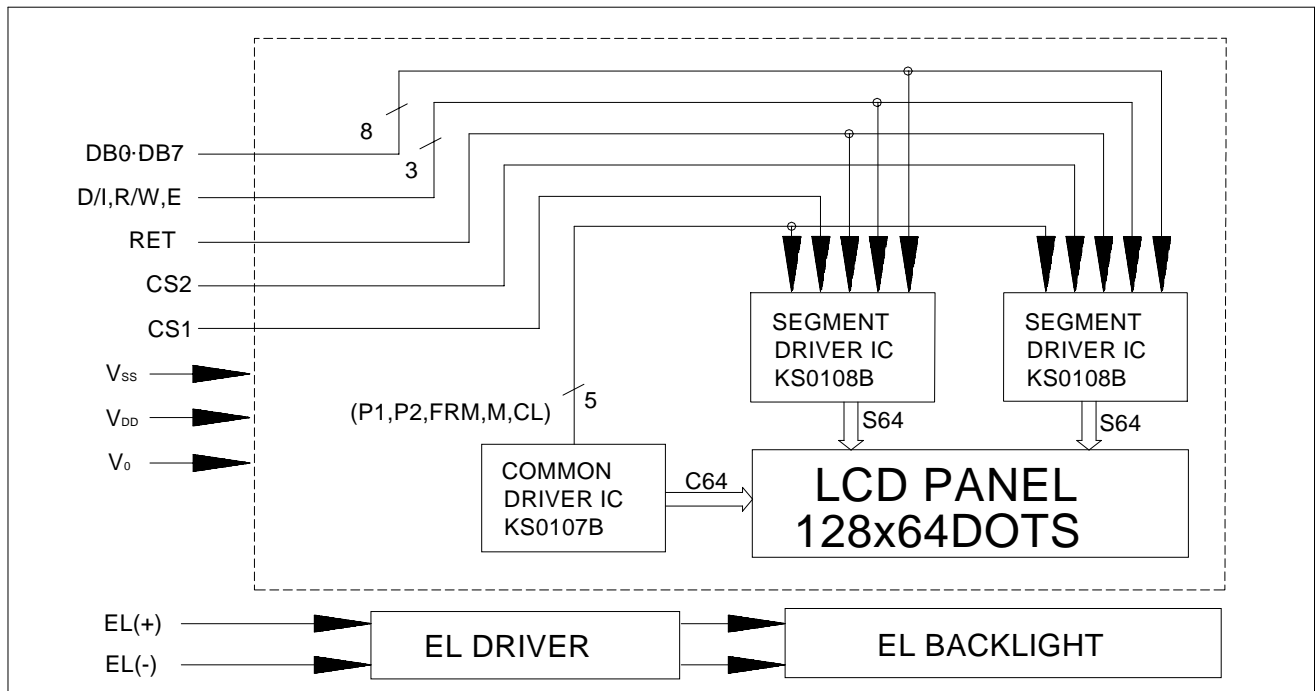
Note 1) Half value of initial brightness at 20±60% RH.  
 2) The measurement is performed at EL, VCC and Ground.

## 5. Operating Principles

### a) Pin description

Pin NO.	Symbol	Level	Function
1	VSS	0V	Ground
2	VDD	2.7V~5.5V	Supply voltage for logic
3	VO		Variable voltage for LCD
4	D/I	H/L	H: Instruction code L: Data
5	R/W	H/L	H: Read signal L: Write signal
6	E	H/L	enable signal
7~14	DB0~DB7	H/L	8 bits Data bus
15	CS1	H/L	Chip selected1
16	CS2	H/L	Chip selected2
17	RET		Reset signal
18	VEE		Supply voltage for LCD
19	BL(+)	5V	Supply voltage for EL-DRIVER
20	BL(-)	0V	

### b) Block Diagram





**c) IC Instruction description**

Instruction table :

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)						Set the Y address in the Y address counter.	
Set Page (X address)	L	L	H	L	H	H	H	Page (0~7)			Set the X address at the X address register	
Set 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~DB7) into display data RAM. After writing instruction, Y address is increased by 1 automatically
Read Display Data	H	H	Read Data									Reads data (DB0~DB7) from display data RAM. To the data BUS

**1. DISPLAY ON/OFF**

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	1	1	1	D

The display data appears when D is 1 and disappears when D is 0. Though the data is not on the screen with D=0, It remains in the display data RAM. Therefore, you can make it appear by changing D=0 into D=1.

**2. DISPLAY START LINE**

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	A5	A4	A3	A2	A1	A0

Z address (AC0~AC5) of the display data RAM is set in the display start line register and displayed at the top of the screen. When the display duty cycle is 1/64 or others (1/32~ 1/64), the data of total line number of LCD screen, from the line specified by display start line instruction, is displayed.

**3. SET PAGE X ADDRESS**

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	0	1	1	1	A2	A1	A0

X address (AC0 - AC2) of the display data RAM is set in the X address register, Writing or reading to or from MPU is executed in this specified page until the next page is set.

**4. Set Address (Y Address)**



# SG12864I3C1GY6N

VER2.1

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	A5	A4	A3	A2	A1	A0

Y address (AC0 - AC5) of the display data RAM is set in the Y address counter, An address is set by Instruction and Increased by 1 automatically by read or write operations of display data.

DDRAM ADDRESS Table :

CS2=1						CS1=1					
Y=	0	1	.....	62	63	0	1	.....	62	63	
X=	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	0
0	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	7
	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	8
	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	55
X=7	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	DB0	56
	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	DB7	63

## 5. Status Read

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BUSY	0	ON/OFF	RET	0	0	0	0

### BUSY

When BUSY is 1, the Chip is executing internal operation and no instructions are accepted.  
When BUSY is 0, the Chip is ready to accept any instructions.

### ON/OFF

When ON/OFF is 1, the display is on.  
When ON/OFF is 0, the display is off,

### RESET

When RESET is 1, the system is being initialized,  
In this condition, no instructions except status read can be accepted.  
When RESET is 0, initializing has finished and the system is in the usual operation condition.

## 6. Write Display Data

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	D7	D6	D5	D4	D3	D2	D1	D0

Write data (D7~D0) into the display data RAM .  
After writing instruction , Y address is increased by 1 automatically .

## 7. Read Display Data

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

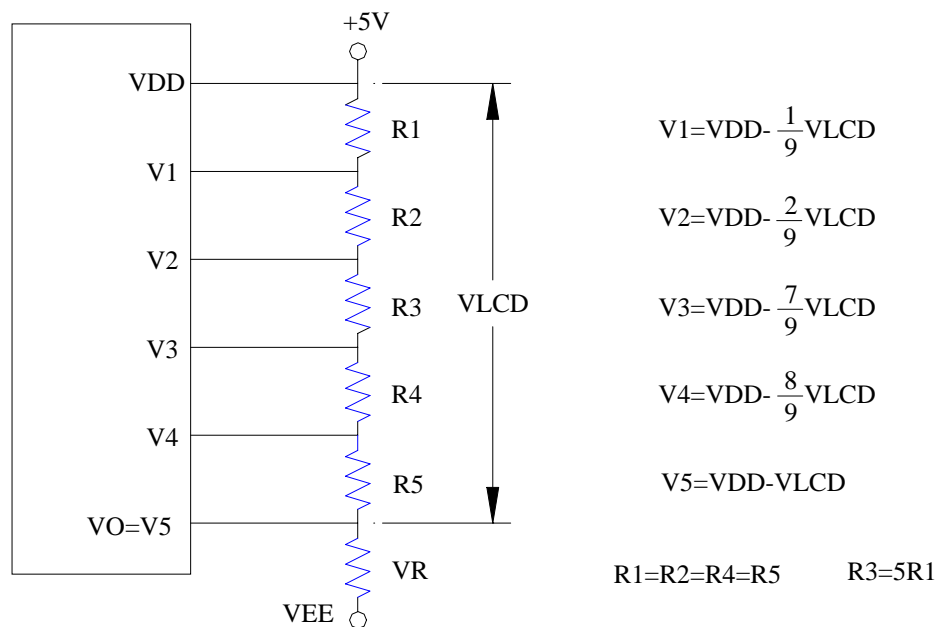
Read data (D7~D0) into the display data RAM .  
After reading instruction , Y address is increased by 1 automatically .



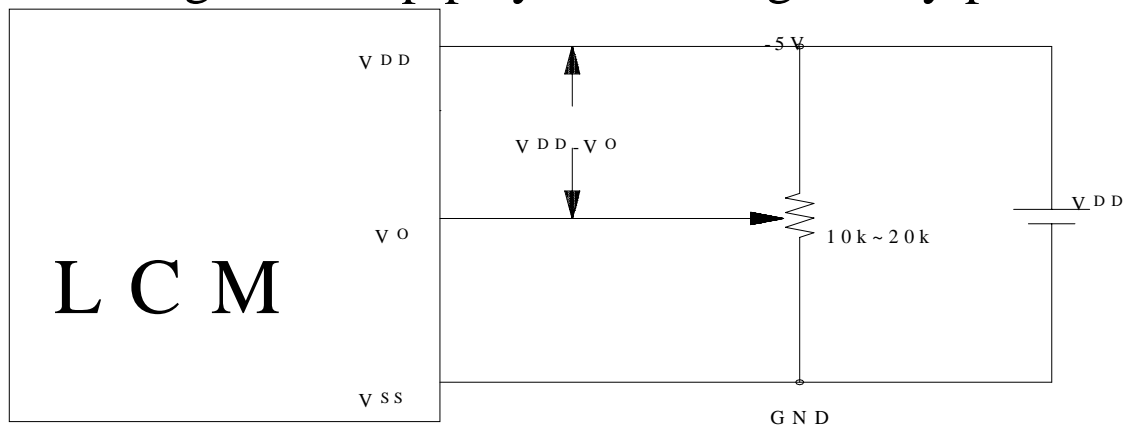
6. Operating Methods

a). Power Supply for LCD Module

LCD Driving Source (1/9Bias)



Single Supply Voltage Types

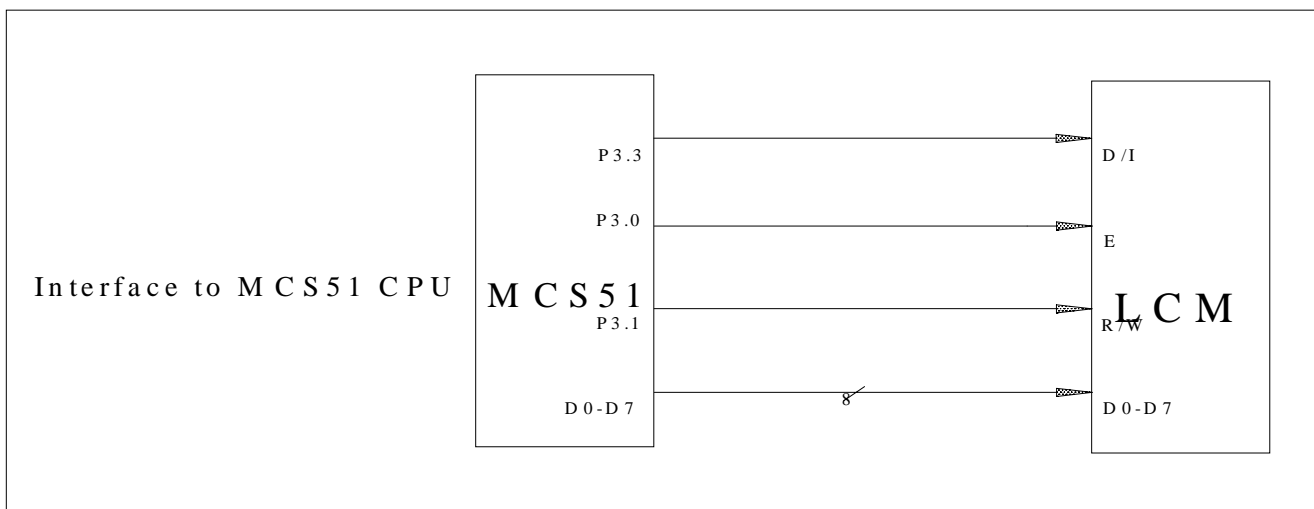
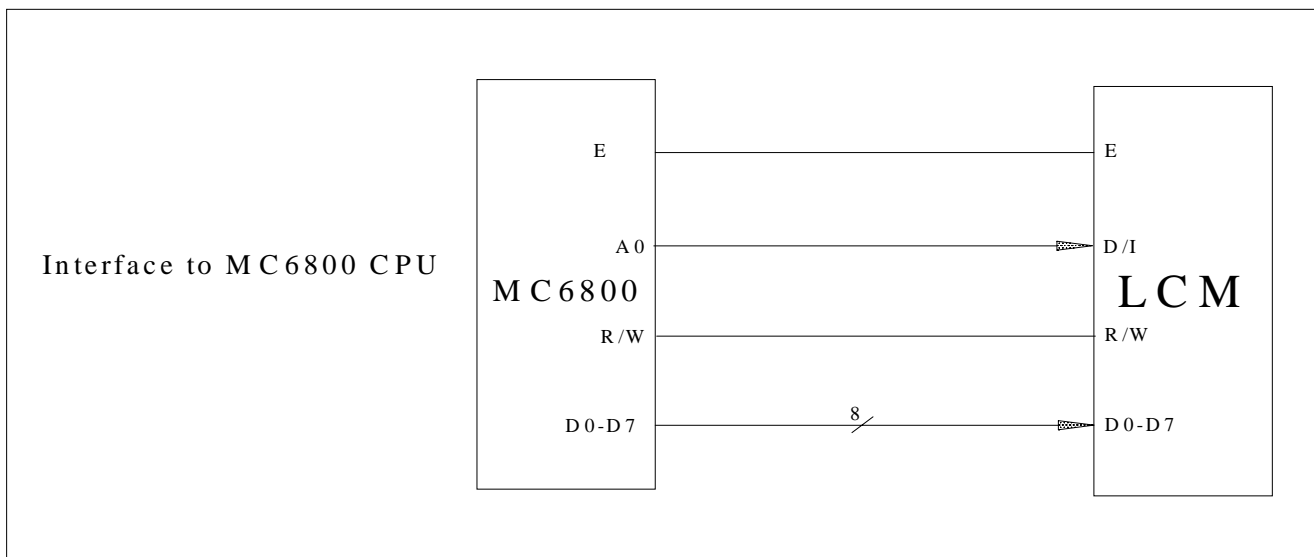


$V_{DD} - V_{O}$ : LCD driving voltage



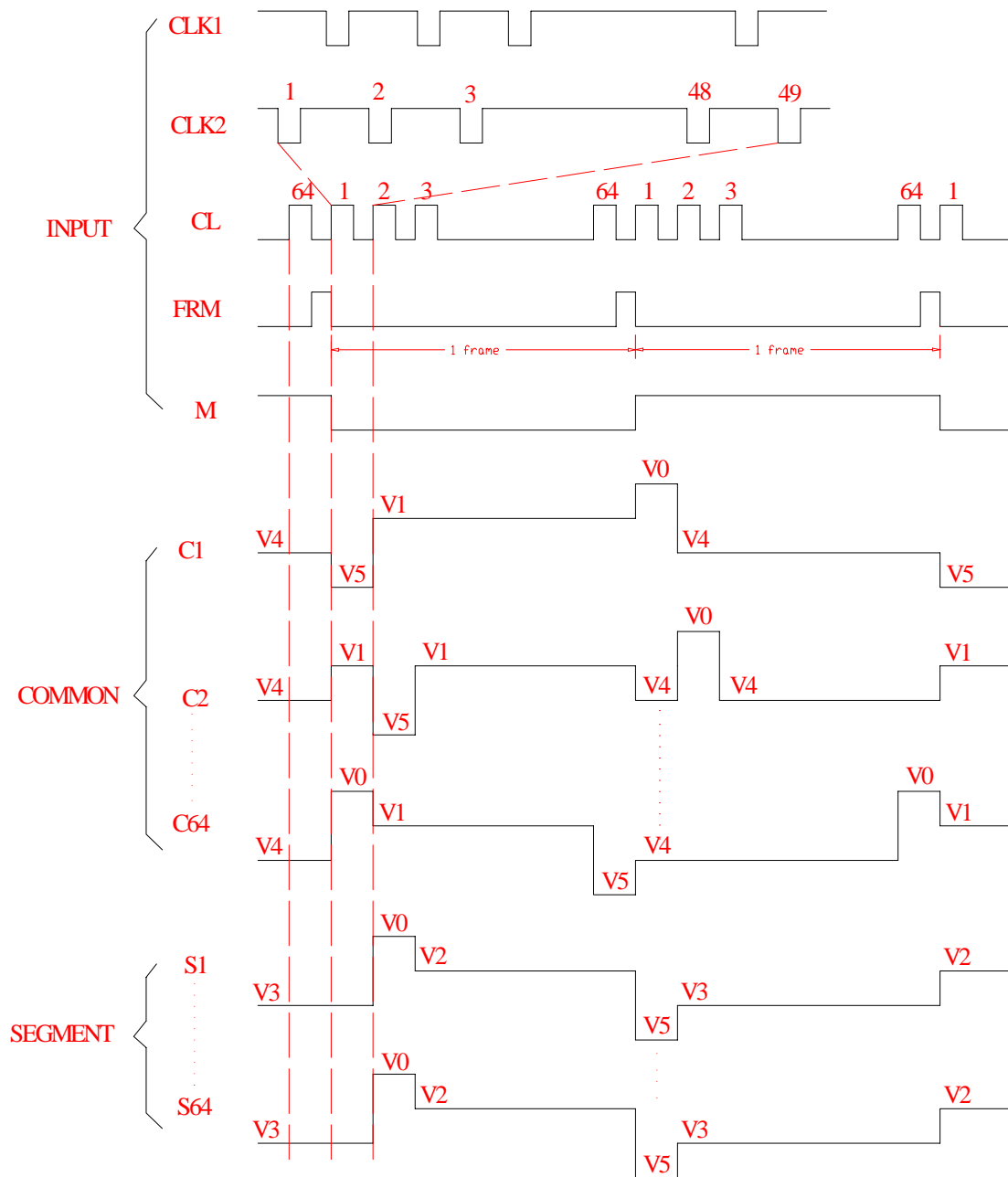


## b). Interface with MPU





## c).Timing diagram (1/64 duty)

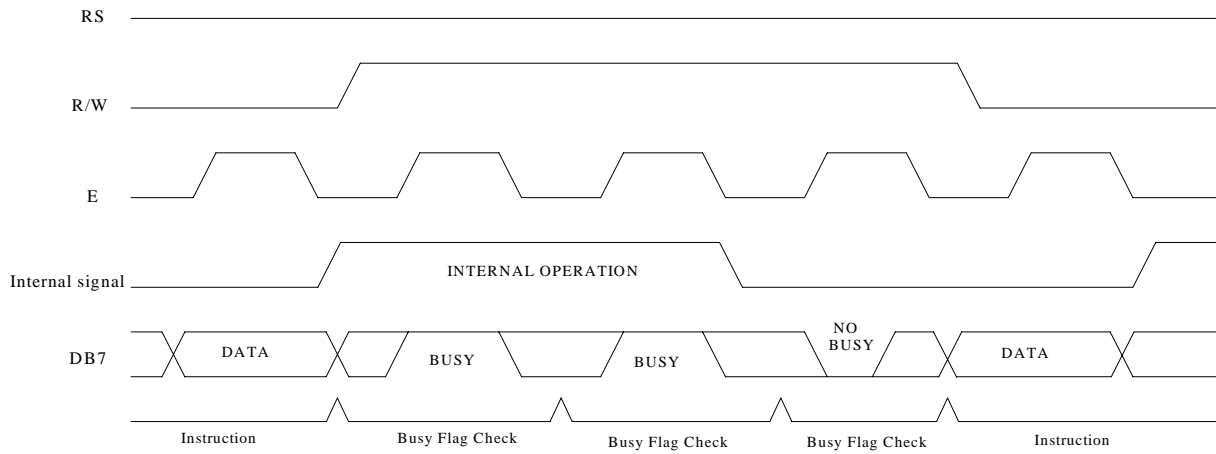




### d). Interface with 8-bit MPU

When interfacing data length are 8-bit ,transfer is performed is at a time through 8 ports ,from DB0 to DB7.

Example of timing sequence is show below.



Example of 8-bit Bus Timing Diagram