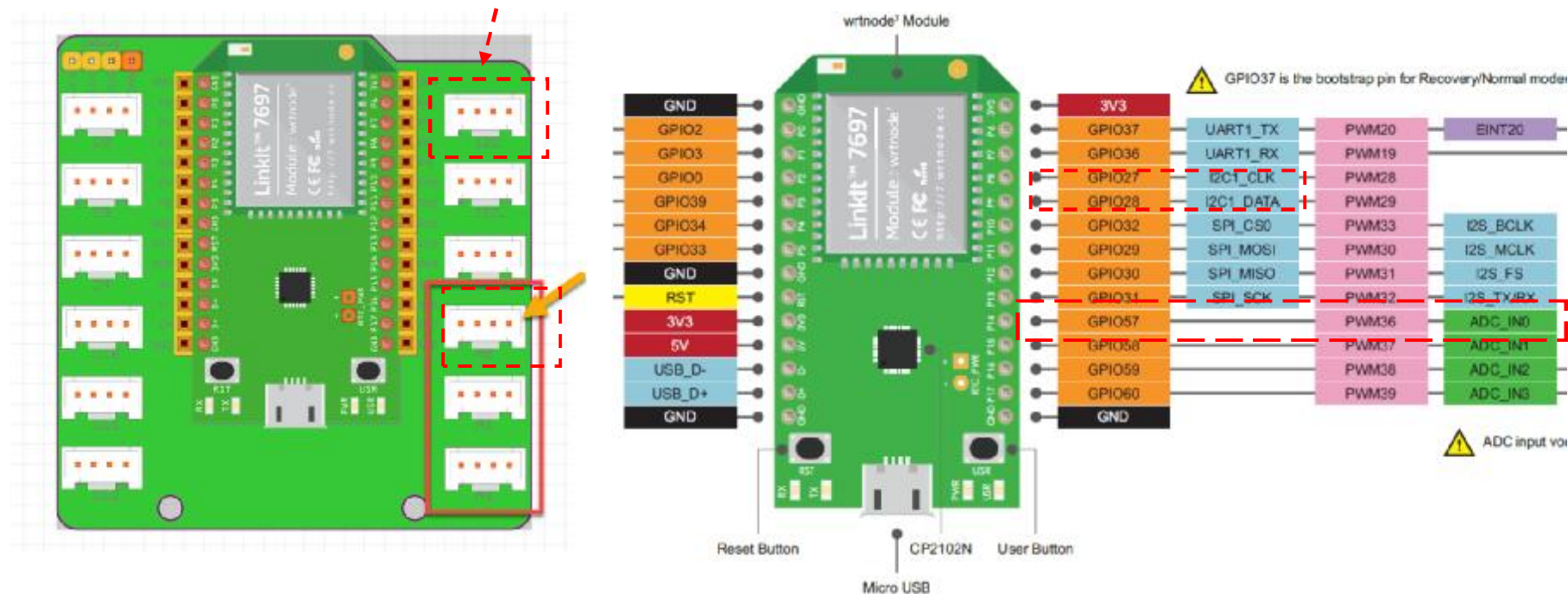# 實習題目-3
OLED光亮度計

溫進坤

james_wen@hotmail.com

題目功能

1. 開機後OLED顯示器全熄滅1秒。
2. 以1Hz速度讀取光感應器之ADC值，並顯示在OLED顯示器上，同時COM Port送出 "Light Value=xxxx \r\n" 字串。(xxxx為ADC的10進制讀值)
3. 遮住/放開光感應器，檢查ADC值是否有正確變化。
4. OLED顯示器之顯示內容　"OLED Light Meter"

    　　　　　　　　　　　　　"Light Value=xxxx"

GPIO Define

p 光感應器插在擴充板A0位置
  A0 -> GPIO57
p OLED顯示器插在I2C位置
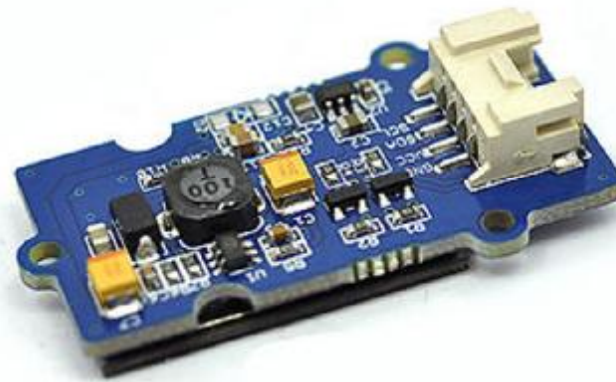 I2C0_CLK -> GPIO27
  I2C0_DATA -> GPIO28

Grove - Light Sensor

- p Operating voltage 3~5V
- p Operating current 0.5~3 mA
- p Response time20-30 milliseconds
- p Peak Wavelength540 nm
- p Analog output

Grove - OLED Display 0.96 inch
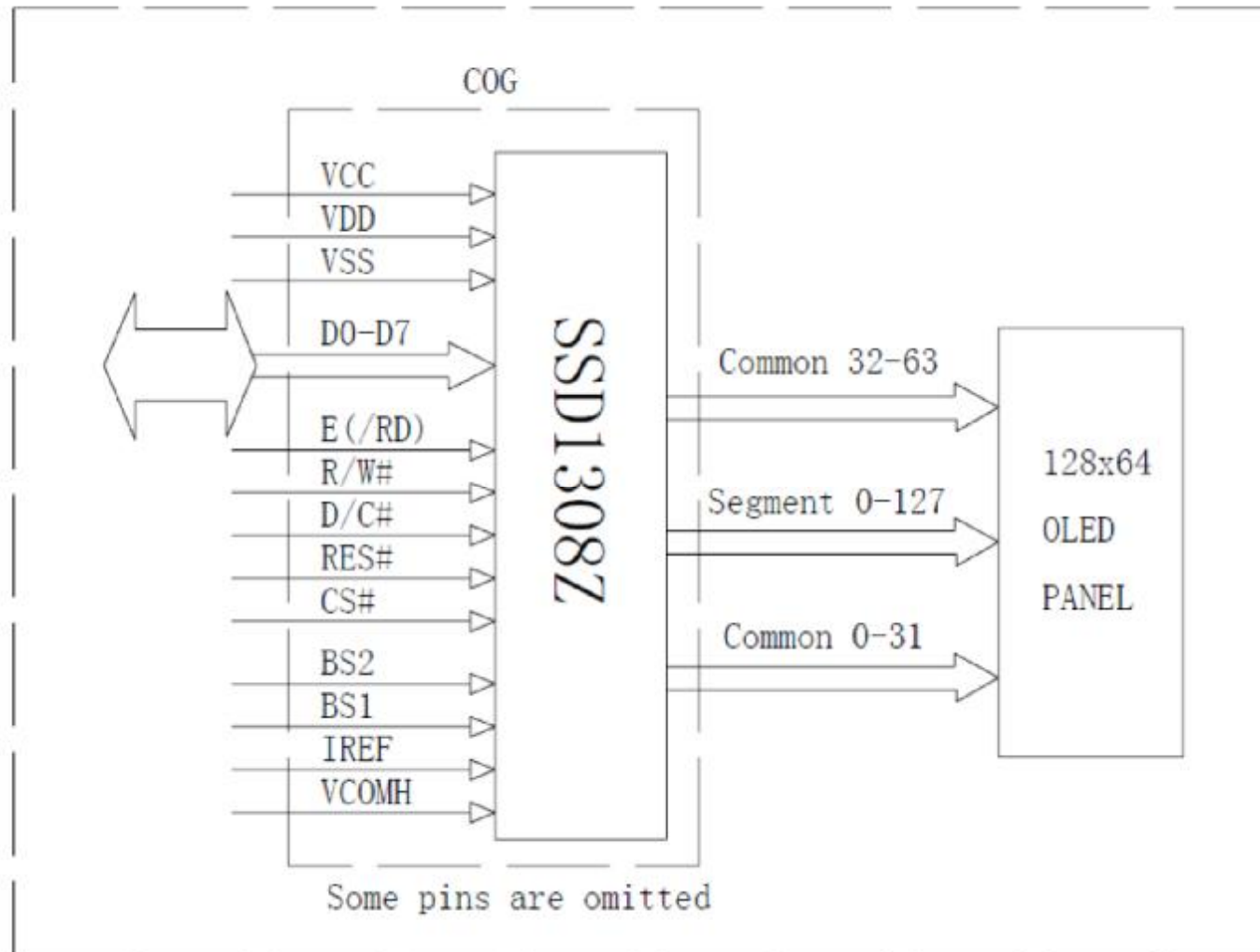
- p 128x64 dot matrix
- p Grove compatible interface
- p Communicate Mode:I2C
- p Low power consumption
- p Display Color: White
- p Wide range of operating temperature:-20℃~70℃

Grove - OLED Display 0.96 inch..

COG

VCC
VDD
VSS

D0-D7

E (/RD)
R/W#
D/C#
RES#
CS#

BS2
BS1
IREF
VCOMH

SSD1308Z

Common 32-63

Segment 0-127

Common 0-31

128x64 OLED PANEL

Some pins are omitted

OLED - SSD1308 Block Diagram

OLED - SSD1308 GDDRAM pages structure

		Row re-mapping
PAGE0 (COM0-COM7)	Page 0	PAGE0 (COM 63-COM56)
PAGE1 (COM8-COM15)	Page 1	PAGE1 (COM 55-COM48)
PAGE2 (COM16-COM23)	Page 2	PAGE2 (COM47-COM40)
PAGE3 (COM24-COM31)	Page 3	PAGE3 (COM39-COM32)
PAGE4 (COM32-COM39)	Page 4	PAGE4 (COM31-COM24)
PAGE5 (COM40-COM47)	Page 5	PAGE5 (COM23-COM16)
PAGE6 (COM48–COM55)	Page 6	PAGE6 (COM15-COM8)
PAGE7 (COM56-COM63)	Page 7	PAGE7 (COM 7-COM0)

SEG0 --SEG127

Column re-mapping   SEG127 --SEG0
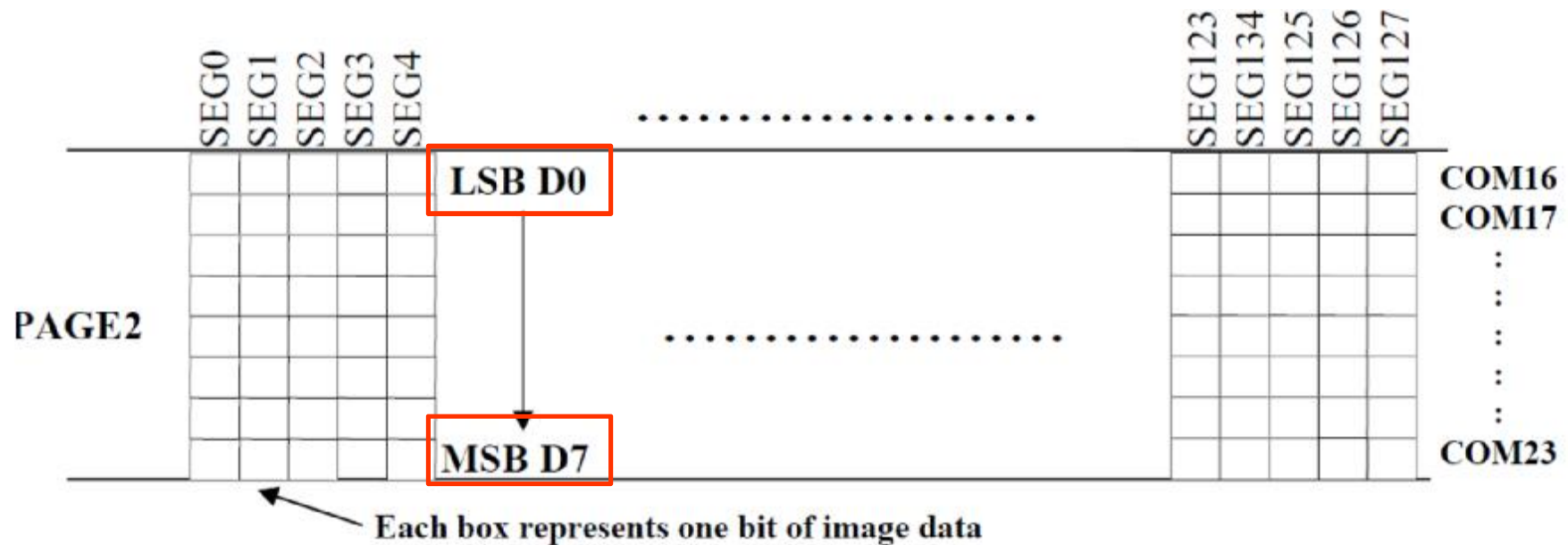
The GDDRAM is a bit mapped static RAM holding the bit pattern to be displayed.
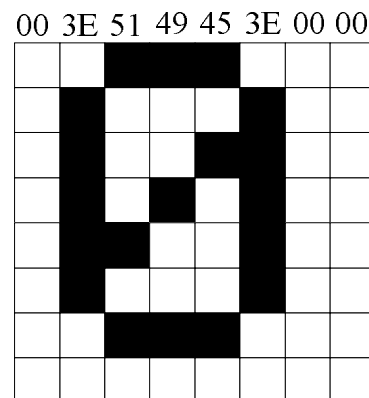The size of the RAM is 128 x 64 bits and the RAM is divided into eight pages, from PAGE0 to PAGE7.

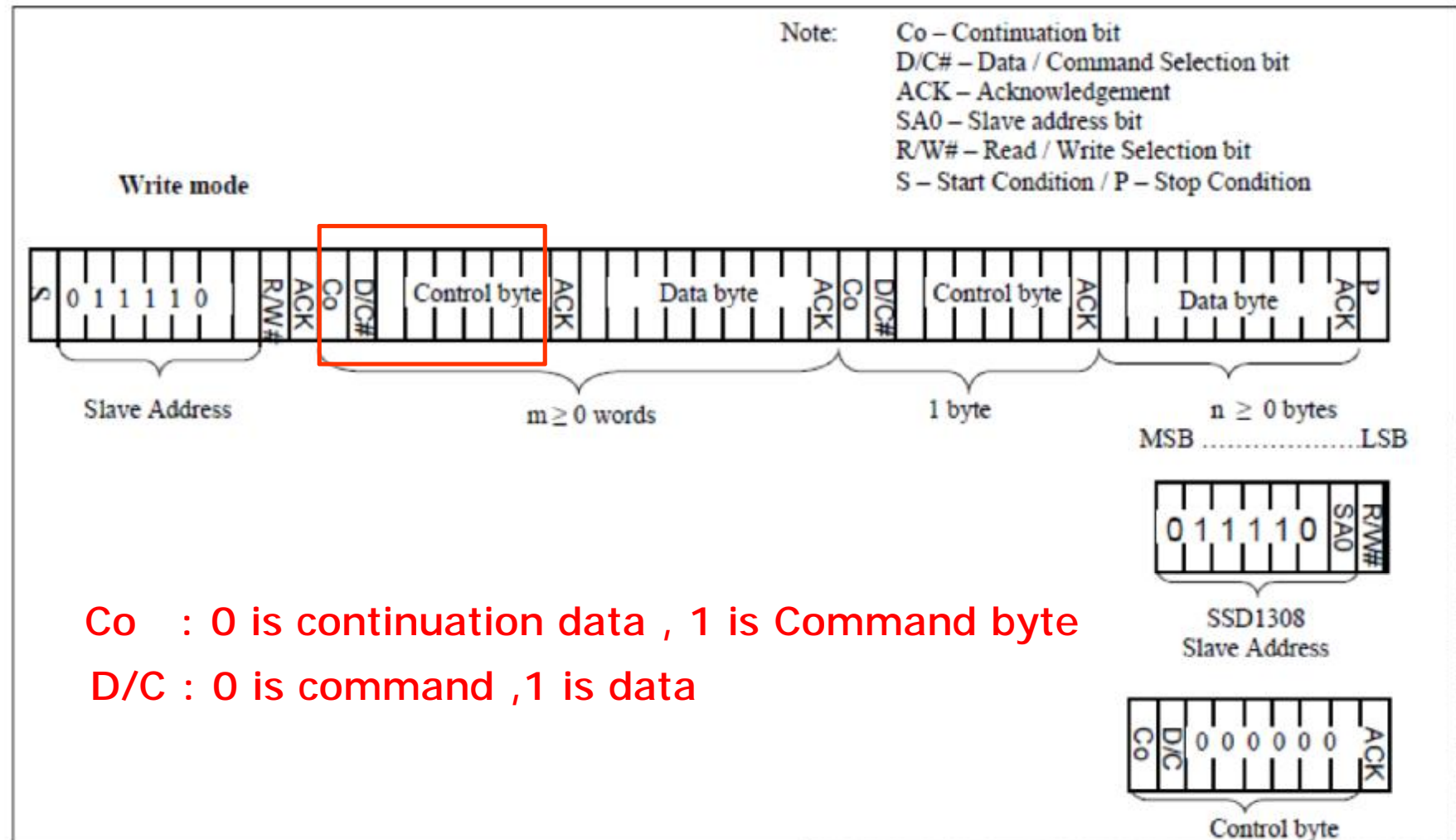# OLED - SSD1308 Enlargement of GDDRAM

Each box represents one bit of image data

Example : {0x00,0x3E,0x51,0x49,0x45,0x3E,0x00,0x00}, // "0"

OLED - SSD1308 I2C Write format

Co   : 0 is continuation data , 1 is Command byte

D/C : 0 is command ,1 is data

OLED - SSD1308 I2C Write mode

p   After the transmission of the slave address, either the control byte or the data byte may be sent across the SDA. A control byte mainly consists of Co and D/C# bits following by six "0" 's.

   n   If the Co bit is set as logic "0", the transmission of the following information will contain data bytes only.

   n   The D/C# bit determines the next data byte is acted as a command or a data. If the D/C# bit is set to logic "0", it defines the following data byte as a command. If the D/C# bit is set to logic "1", it defines the following data byte as a data which will be stored at the GDDRAM.

p   The GDDRAM column address pointer will be increased by one automatically after each data write.

OLED - SSD1308 I2C Write Flow

n Write Command
1. I2C Slave Addr (0x3C)
2. Control Byte (0x80)
3. Command Byte (0xXX)

n Write Data
1. I2C Slave Addr (0x3C)
2. Control Byte (0x40)
3. Data Byte (0xXX)

OLED - SSD1308 Initial Command

1. Set Display OFF (0xAE)
2. Set Display ON (0xAF)
3. Set Normal Display (0xA6)
4. Set Memory Addressing Mode 1(0x20)
5. Set Memory Addressing Mode 2(0x02)
6. Clear Display

OLED - SSD1308 Command Table..

p **SSD1308 I2C ADDRESS is 0x3C**

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
Fundamental Command Table											
0	AE AF	1	0	1	0	1	1	1	X_0	Set Display ON/OFF	AEh, X[0]=0b:Display OFF (sleep mode) (RESET) AFh X[0]=1b:Display ON in normal mode
0	B0~B7	1	0	1	1	0	X_2	X_1	X_0	Set Page Start Address for Page Addressing Mode	Set GDDRAM Page Start Address (PAGE0~PAGE7) for Page Addressing Mode using X[2:0]. Note [1] This command is only for page addressing mode
0	A6/A7	1	0	1	0	0	1	1	X_0	Set Normal/Inverse Display	A6h, X[0]=0b: Normal display (RESET) 0 in RAM: OFF in display panel 1 in RAM: ON in display panel A7h, X[0]=1b: Inverse display 0 in RAM: ON in display panel 1 in RAM: OFF in display panel

OLED - SSD1308 Command Table

D/C#	Hex	D7	D6	D5	D4	D3	D2	D1	D0	Command	Description
Fundamental Command Table											
0	00~0F	0	0	0	0	X_3	X_2	X_1	X_0	Set Lower Column Start Address for Page Addressing Mode	Set the lower nibble of the column start address register for Page Addressing Mode using X[3:0] as data bits. The initial display line register is reset to 0000b after RESET. **Note** [(1)] This command is only for page addressing mode
0	10~1F	0	0	0	1	X_3	X_2	X_1	X_0	Set Higher Column Start Address for Page Addressing Mode	Set the higher nibble of the column start address register for Page Addressing Mode using X[3:0] as data bits. The initial display line register is reset to 0000b after RESET. **Note** [(1)] This command is only for page addressing mode
0 0	20 A[1:0]	0 *	0 *	1 *	0 *	0 *	0 *	0 A_1	0 A_0	Set Memory Addressing Mode	A[1:0] = 00b, Horizontal Addressing Mode A[1:0] = 01b, Vertical Addressing Mode A[1:0] = 10b, Page Addressing Mode (RESET) A[1:0] = 11b, Invalid

OLED - SSD1308 pages addressing mode

p Set the page start address of the target display location by command **B0h** to **B7h**.

p Set the lower start column address of pointer by command **00h~0Fh**.

p Set the upper start column address of pointer by command **10h~1Fh**.

|	COL0	COL 1	…..	COL 126	COL 127
PAGE0					
PAGE1					
:	:	:	:	:	:
PAGE6					
PAGE7					

ASCII Table

Dec	Hex	Name	Char	Ctrl-char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	0	Null	NUL	CTRL-@	32	20	Space	64	40	@	96	60	`
1	1	Start of heading	SOH	CTRL-A	33	21	!	65	41	A	97	61	a
2	2	Start of text	STX	CTRL-B	34	22	"	66	42	B	98	62	b
3	3	End of text	ETX	CTRL-C	35	23	#	67	43	C	99	63	c
4	4	End of xmit	EOT	CTRL-D	36	24	$	68	44	D	100	64	d
5	5	Enquiry	ENQ	CTRL-E	37	25	%	69	45	E	101	65	e
6	6	Acknowledge	ACK	CTRL-F	38	26	&	70	46	F	102	66	f
7	7	Bell	BEL	CTRL-G	39	27	'	71	47	G	103	67	g
8	8	Backspace	BS	CTRL-H	40	28	(	72	48	H	104	68	h
9	9	Horizontal tab	HT	CTRL-I	41	29	)	73	49	I	105	69	i
10	0A	Line feed	LF	CTRL-J	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	VT	CTRL-K	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	FF	CTRL-L	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage feed	CR	CTRL-M	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	SO	CTRL-N	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	SI	CTRL-O	47	2F	/	79	4F	O	111	6F	o
16	10	Data line escape	DLE	CTRL-P	48	30	0	80	50	P	112	70	p
17	11	Device control 1	DC1	CTRL-Q	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	DC2	CTRL-R	50	32	2	82	52	R	114	72	r
19	13	Device control 3	DC3	CTRL-S	51	33	3	83	53	S	115	73	s
20	14	Device control 4	DC4	CTRL-T	52	34	4	84	54	T	116	74	t
21	15	Neg acknowledge	NAK	CTRL-U	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	SYN	CTRL-V	54	36	6	86	56	V	118	76	v
23	17	End of xmit block	ETB	CTRL-W	55	37	7	87	57	W	119	77	w
24	18	Cancel	CAN	CTRL-X	56	38	8	88	58	X	120	78	x
25	19	End of medium	EM	CTRL-Y	57	39	9	89	59	Y	121	79	y
26	1A	Substitute	SUB	CTRL-Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	ESC	CTRL-[	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	FS	CTRL-\	60	3C	<	92	5C	\	124	7C		
29	1D	Group separator	GS	CTRL-]	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	RS	CTRL-^	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	US	CTRL-_	63	3F	?	95	5F	_	127	7F	DEL

Lighter Sensor Circuit
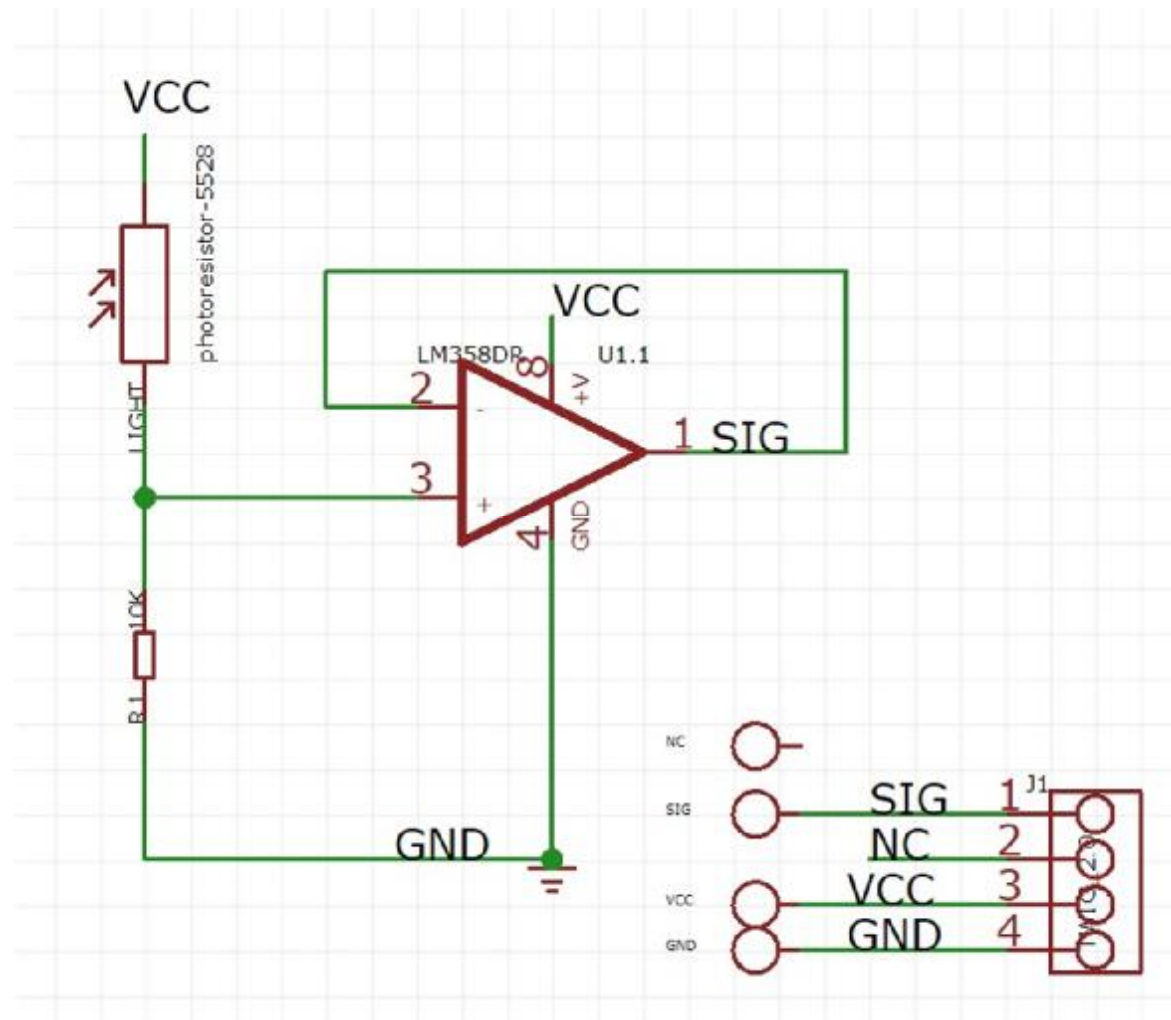
計分方式

1. 程式完成後請助教確認功能是否正確，並給予完成順序號。

2. 檢查後立即將主程式（main.c)上傳至Moodle[繳交作業]，並在檔名依序寫上實習題目號碼、完成順序號。(檔名:main.c.Lab_3_No_xx)

3. 計分標準依完成順序及程式內容給分，<u>若發現程式有互相抄襲狀況，該兩人分數皆為0分。</u>

參考資料

- p http://labs.mediatek.com/api/mt7687/
- p LinkIt SDK for 7697 API Reference Manual.html
- p https://docs.labs.mediatek.com/linkit-7697-blocklyduino/b01-grove-12880096.html
- p https://docs.labs.mediatek.com/linkit-7697-blocklyduino/b06-grove-oled-12880137.html
- p https://docs.labs.mediatek.com/linkit-7697-blocklyduino/b01-grove-12880096.html
- p SSD1308_1.0.pdf
- p font_8x8.h
- p OLED_Display_128X64-master.zip