

# CDH HW1

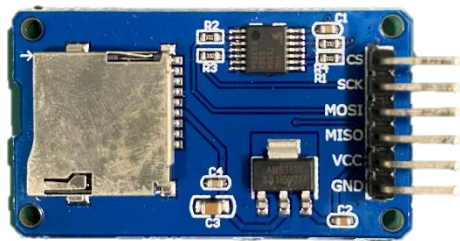
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兩組一起完成今日作業!

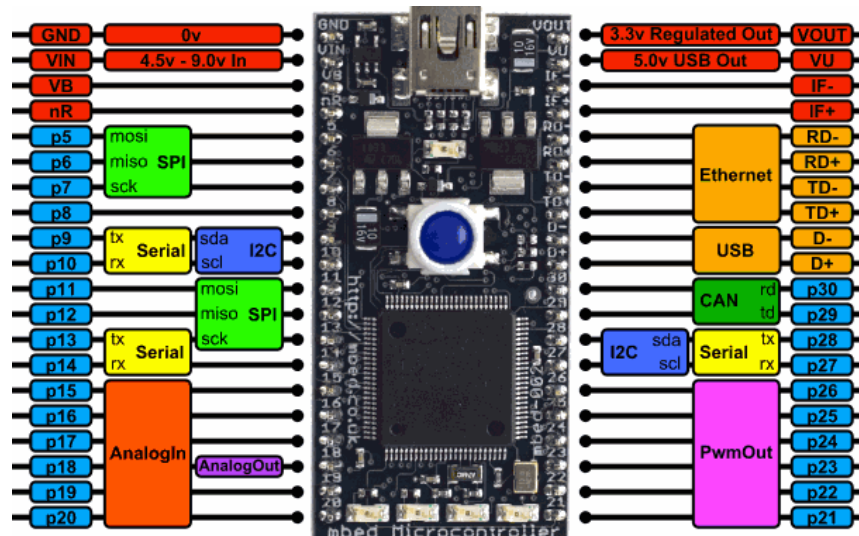
- 程式:<https://reurl.cc/DZXR4E>
- [SDFileSystem: https://reurl.cc/YjdKQo](https://reurl.cc/YjdKQo) 加入專案裡

# SD card 模組連接

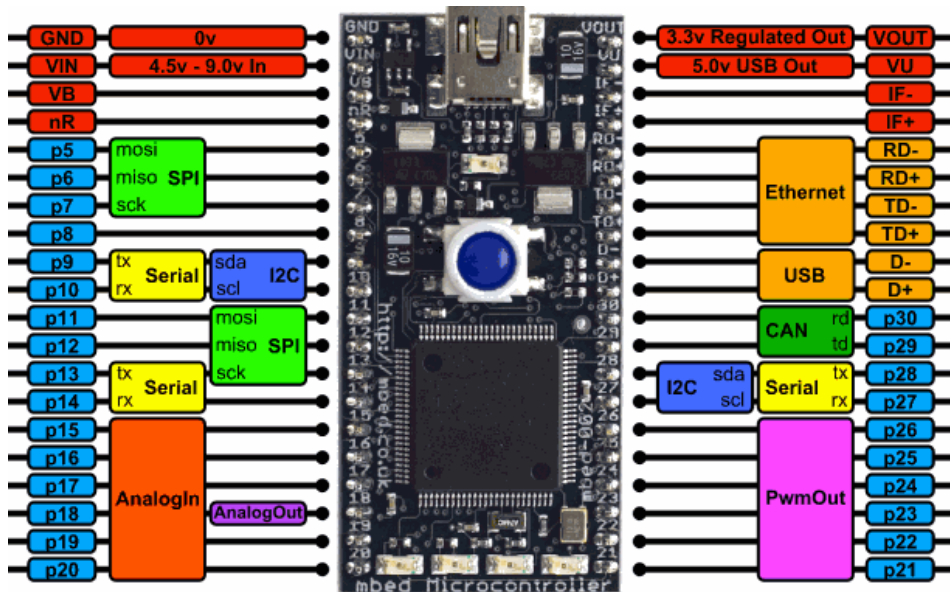
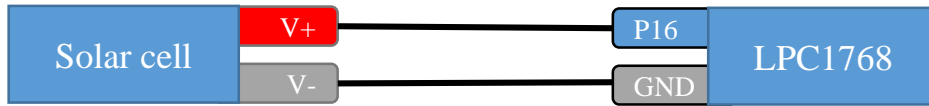


\*注意:

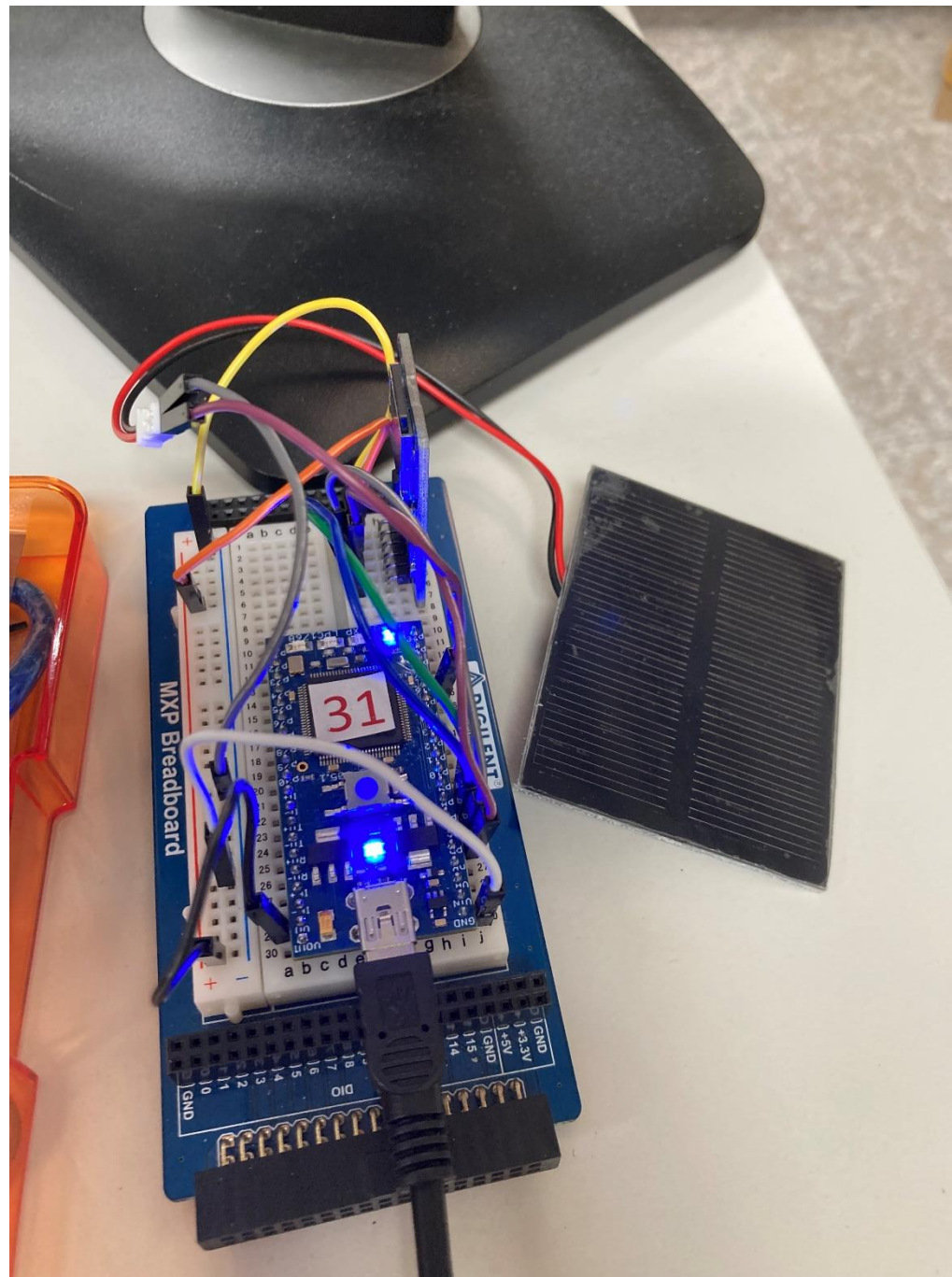
拿出micro SD 卡  
請用【推】的!



# Solar cell 連接



完成組裝



# HW1-1 偵測太陽能板電壓，當電壓不足時， 切換為Power saving mode 並顯示出來

```
COM13 - Tera Term VT
File Edit Setup Control Window Help
Power saving mode ON
HEPTASAT::Condition = 1, Time = 5.000000 [s], BatVol = 3.27 [V],Temp = 28.50 [C]
Power saving mode ON
HEPTASAT::Condition = 1, Time = 6.000000 [s], BatVol = 3.52 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 7.000000 [s], BatVol = 3.26 [V],Temp = 28.50 [C]
Power saving mode ON
HEPTASAT::Condition = 1, Time = 8.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 9.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 10.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 11.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 12.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 13.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 14.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 15.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 16.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 17.000000 [s], BatVol = 3.62 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 18.000000 [s], BatVol = 3.09 [V],Temp = 28.50 [C]
Power saving mode ON
HEPTASAT::Condition = 1, Time = 19.000000 [s], BatVol = 3.32 [V],Temp = 28.50 [C]
Power saving mode ON
HEPTASAT::Condition = 1, Time = 20.000000 [s], BatVol = 3.41 [V],Temp = 28.50 [C]
Power saving mode ON
HEPTASAT::Condition = 1, Time = 21.000000 [s], BatVol = 3.60 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 22.000000 [s], BatVol = 3.56 [V],Temp = 28.50 [C]
```

# HW1-2 按下b進行儲存10筆電壓資料，並從SD卡讀出顯示在螢幕上

```
COM13 - Tera Term VT
File Edit Setup Control Window Help
HEPTASAT::Condition = 0, Time = 25.000000 [s], BatVol = 4.72 [V],Temp = 28.50 [C]
HEPTASAT::Condition = 0, Time = 26.000000 [s], BatVol = 3.54 [V],Temp = 28.50 [C]
3.551816
3.610628
3.652143
3.738632
3.873555
3.542590
3.767462
4.054605
4.044227
4.085741
HEPTASAT::Condition = 0, Time = 27.000000 [s], BatVol = 3.31 [V],Temp = 28.50 [C]
Power saving mode ON
```

# 解答

```
1
2 #include "mbed.h"
3 #include "HEPTA_CDH.h"
4 #include "HEPTA_EPS.h"
5 DigitalOut cond[]={LED1,LED2,LED3,LED4};
6 Serial gs(USBTX,USBRX); // for ground station
7 HEPTA_CDH cdh(p5, p6, p7, p8, "sd");
8 HEPTA_EPS eps(p16,p26);
9 int rcmd = 0,cmdflag = 0; //command variable
10
11 /* Battery Voltage is calculate by 1.431*3.3V */
12
13 //getting command and flag
14 void commandget()
15 {
16     rcmd=gs.getc();
17     cmdflag = 1;
18 }
19 //interrupting
20 void receive(int rcmd, int cmdflag)
21 {
22     gs.attach(commandget, Serial::RxIrq);
23 }
24 //initialzing
25 void initialize()
26 {
27     rcmd = 0;
28     cmdflag = 0;
29     cond[0] = 0;
30 }
```

```
32 int main() {
33     gs.baud(9600);
34     gs.printf("From Sat : Operation Start...\r\n");
35     int flag = 0; // condition
36     float sattime=0.0,btvol,temp; //Voltage, Temerature
37     receive(rcmd,cmdflag); //interrupting by ground station command
38
39     for(int i = 0; i < 100; i++) {
40         //Sensing and Transmitting HK data
41         eps.vol(&btvol);
42         temp = 28.5;
43         gs.printf("HEPTASAT:Condition = %d, Time = %f [s], BatVol = %.2f [V],Temp = %.2f [C]\r\n",flag,sattime,btvol,temp);
44         //Condition
45         cond[0] = 1;
46         //Power Saving Mode
47         if(btvol <= 3.5) {
48             //
49             eps.shut_down_regulator();
50             flag = 1;
51         } else {
52             //
53             eps.turn_on_regulator();
54             flag = 0;
55         }
56         if(flag == 1) {
57             gs.printf("Power saving mode ON\r\n");
58         }
59     }
60 }
```



```

57 //Contents of command
58 if (cmdflag == 1) {
59     if (rcmd == 'a') {
60         for(int j=0;j<5;j++){
61             gs.printf("HEPTASAT::Hello World!\r\n");
62             cond[0] = 0;
63             wait(1);
64             cond[0] = 1;
65         }
66     }
67     if (rcmd == 'b') {
68         char str[100];
69         mkdir("/sd/mydir", 0777);
70         FILE *fp = fopen("/sd/mydir/test.txt", "w");
71         if(fp == NULL) {
72             error("Could not open file for write\r\n");
73         }
74         else
75         {
76             for(int i = 0; i < 10; i++) {
77                 eps.vol(&btvol);
78                 fprintf(fp, "Solar Vol: %f\r\n", btvol);
79                 wait(1.0);
80             }
81             fclose(fp);
82             fp = fopen("/sd/mydir/test.txt", "r");
83             for(int j = 0; j < 10; j++) {
84                 fgets(str, 100, fp);
85                 puts(str);
86             }
87             fclose(fp);
88         }
89         cond[0] = 0;
90         wait(1);
91         cond[0] = 1;
92     }
93     initialize();
94 }
95

```

```

89         cond[0] = 0;
90         wait(1);
91         cond[0] = 1;
92     }
93     initialize();
94 }
95
96     //Operation Interval
97     wait(1.0);
98     sattime = sattime+1.0;
99 }
100 gs.printf("From Sat : Operation Stop...\r\n");
101 }
---

```

# 解答

# 加分題 CRC8

(HEX) 11 => (BIN) 0001 0001

$X^8+X^2+X^1+1$  => (BIN) 1000 0011 1

```
0001 0001 0000 0000
 1 0000 0111
-----
          1 0111 0000
          1 0000 0111
          -----
                0111 0111
```

CRC8 => (Hex) 77

printf Hex 用 %x  
int 或 char A=0x00  
互斥或閘位元運算子符號 (^)

XOR 真值表

輸入		輸出
X	Y	X XOR Y
0	0	0
0	1	1
1	0	1
1	1	0

互斥或閘 (Exclusive-OR gate, 簡稱XOR gate, 又稱EOR gate、EXOR gate) 是數位邏輯中實現邏輯互斥或的邏輯閘。若兩個輸入的電平相異, 則輸出為高電平 (1); 若兩個輸入的電平相同, 則輸出為低電平 (0)。

# 加分題 CRC8

循環冗餘校驗（Cyclic redundancy check，通稱「CRC」）是一種根據網路數據封包或電腦檔案等數據產生簡短固定位數驗證碼的一種雜湊函式，主要用來檢測或校驗數據傳輸或者儲存後可能出現的錯誤。(From 維基百科)

請用Mbed LPC1768 做一個CRC8( $X^8+X^2+X^1+1$ )計算器，並計算自己的學號末2碼(16進位)，存在micro SD卡內。

學號  
末2碼

0107  
020E  
0309

CRC8

1. 用手算(如果程式做不出來)
2. 完成題目
3. 程式算出學號末四碼(挑戰題)

```

106 #include "mbed.h"
107 #include "HEPTA_CDH.h"
108
109 Serial pc(USBTX, USBRX);
110 HEPTA_CDH cdh(p5, p6, p7, p8, "sd");
111
112 typedef unsigned char uint8_t;
113 uint8_t crc8_calculate(uint8_t data, uint8_t crc);
114
115
116 int main()
117 {
118     pc.baud(9600);
119     pc.printf("CRC8 : initializing...\r\n");
120
121     uint8_t crc8_snum;
122     uint8_t snum = 86;
123
124     char crc8_data[128];
125
126     mkdir("/sd/crc8", 0777);
127     FILE *fp = fopen("/sd/crc8/crc8_num.txt", "w");
128
129     if(fp == NULL) {
130         error("Could not open file for write\r\n");
131     }
132
133     crc8_snum = crc8_calculate(snum, 0x00);
134
135     for(int i = 0; i < 5; i++) {
136         fprintf(fp, "Answer : %x%x\r\n", snum, crc8_snum);
137     }
138     fclose(fp);
139

```

```

140     fp = fopen("/sd/crc8/crc8_num.txt", "r");
141     for(int j = 0; j < 5; j++) {
142         fgets(crc8_data, sizeof(crc8_data), fp);
143         pc.printf("%s", crc8_data);
144     }
145
146     fclose(fp);
147     pc.printf("Goodbye!!\r\n");
148 }
149
150
151 uint8_t crc8_calculate(uint8_t data, uint8_t crc)
152 {
153
154     int i = 0;
155     uint8_t crc_poly = 0x07;
156     crc ^= data;
157
158     for(i = 0; i < 8; i++) {
159
160         if(crc & 0x80) {
161             crc <<= 1;
162             crc ^= crc_poly;
163         } else
164             crc <<= 1;
165     }
166     return (crc & 0xFF);
167 }
168

```

# 解答