Annexes Devoir BSE Session 2 – 2017 »

ANALYSE de CODE
Devoir BSE Session 2
03-2017
Page 1
Code Bargraph_UART

```
//*****************************************************************************************
// Devoir BSE - Session 2 - Février 2017
//
//*****************************************************************************************
#include "C8051F020.h"

sbit Flag_Int = P3^4;

//*****************************************************************************************
void Reset_Sources_Init()
{
    WDTCN     = 0xFF;
    WDTCN     = 0x07;
    RSTSRC    = 0x02;
}
//*****************************************************************************************
void ADC_Init()
{
    AMX0CF    = 0;
    AMX0SL    = 0x06;
    ADC0CF    = 0x51;
    ADC0CN    = 0x81;
}
//*****************************************************************************************
void Voltage_Reference_Init()
{
    REF0CN    = 0x00;
}
//*****************************************************************************************
void Port_IO_Init()
{
    P0MDOUT   = 0x15;
    XBR0      = 0x04;
    XBR1      = 0x80;
    XBR2      = 0x44;
    P2MDOUT   = 0xFF;
    P3MDOUT   |= 0x1F;
}
//*****************************************************************************************
void Timers_Init()
{
    TMR3CN    = 0x05;
    TMR3RLH   = 0x94;
    TMR3RLL   = 0x00;
    T2CON     = 0x34;
    RCAP2L    = 0xEE;
    RCAP2H    = 0xFF;
}
//*****************************************************************************************
void Interrupts_Init()
{
    EIE2      = 0x03;
}
//*****************************************************************************************
void Oscillator_Init()
{
    int i = 0;
    OSCXCN    = 0x77;
    for (i = 0; i < 3000; i++);
    while ((OSCXCN & 0x80) == 0);
    OSCICN    = 0x0C;
}
//*****************************************************************************************
void CFG_uart(void)
{
    PCON  |= 0x80;
    PCON &= 0xBF;
    SCON0 = 0x72;
}
//*******************************************************************************
char  Putchar(char c)
{
  while (!TI0);
  SBUF0 = c;
  TI0 = 0;
  return c;
}
//*******************************************************************************
```

```
void Init_Device(void)
{

    Reset_Sources_Init();
    Oscillator_Init();
    Port_IO_Init();
}
//*******************************************************************************
main()
{
  Init_Device();
  Timers_Init();
  Voltage_Reference_Init();
  ADC_Init();
  CFG_uart();
  Interrupts_Init();

  Flag_Int = 0;

  while(1)
  {
     WDTCN     = 0xA5;
  }
}
//*******************************************************************************
void ISR_Global (void) interrupt 14
{
  unsigned char result;

  Flag_Int = 1;
  TMR3CN &= ~0x80;    // Raz Flag Interruption TF3

  while(AD0INT == 0);
  AD0INT = 0;

  result=ADC0H; // Lecture résultat conversion N-1
  result = (result & 0xE0)/32;
  Putchar(result + '0');
  P2 = (0x01<<result)-1;

  AD0BUSY = 1;
  Flag_Int = 1;
}
```

GP2Y1010AU0F

Compact Optical Dust Sensor

■ Description

GP2Y1010AU0F is a dust sensor by optical sensing system.
An infrared emitting diode (IRED) and an phototransistor are diagonally arranged into this device.
It detects the reflected light of dust in air.
Especially, it is effective to detect very fine particle like the cigarette smoke.
In addition it can distinguish smoke from house dust by pulse pattern of output voltage.

■ Compliance

1. Compliant with RoHS directive (2002/95/EC)

■ Applications

1. Detecting of dust in the air.
2. Example: Air purifier, Air conditioner, Air monitor

■ Features

1. Compact, thin package (46.0 × 30.0 × 17.6 mm)
2. Low consumption current (Icc: MAX. 20 mA)
3. The presence of dust can be detected by the photometry of only one pulse
4. Enable to distinguish smoke from house dust
5. Lead-free and RoHS directive compliant

Sheet No.: E4-A01501EN
Date Dec. 1. 2006

■ Absolute Maximum Ratings

(T_a=25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	–0.3 to +7	V
*1 Input terminal voltage	V_{LED}	–0.3 to V_{CC}	V
Operating temperature	T_{opr}	–10 to +65	°C
Soldering temperature	T_{sol}	–20 to +80	°C

*1 Open drain drive input

■Electro-optical Characteristics

(T_a=25°C, V_{CC}=5V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Sensitivity	K	*1 *2 *3	0.35	0.5	0.65	V/(0.1mg/m^3)
Output voltage at no dust	V_{OC}	*2 *3	0	0.9	1.5	V
Output voltage range	V_{OH}	*2 *3 R_L =4.7kΩ	3.4	–	–	V
LED terminal current	I_{LED}	*2 LED terminal voltage = 0	–	10	20	mA
Consumption current	I_{CC}	*2 R_L =∞	–	11	20	mA

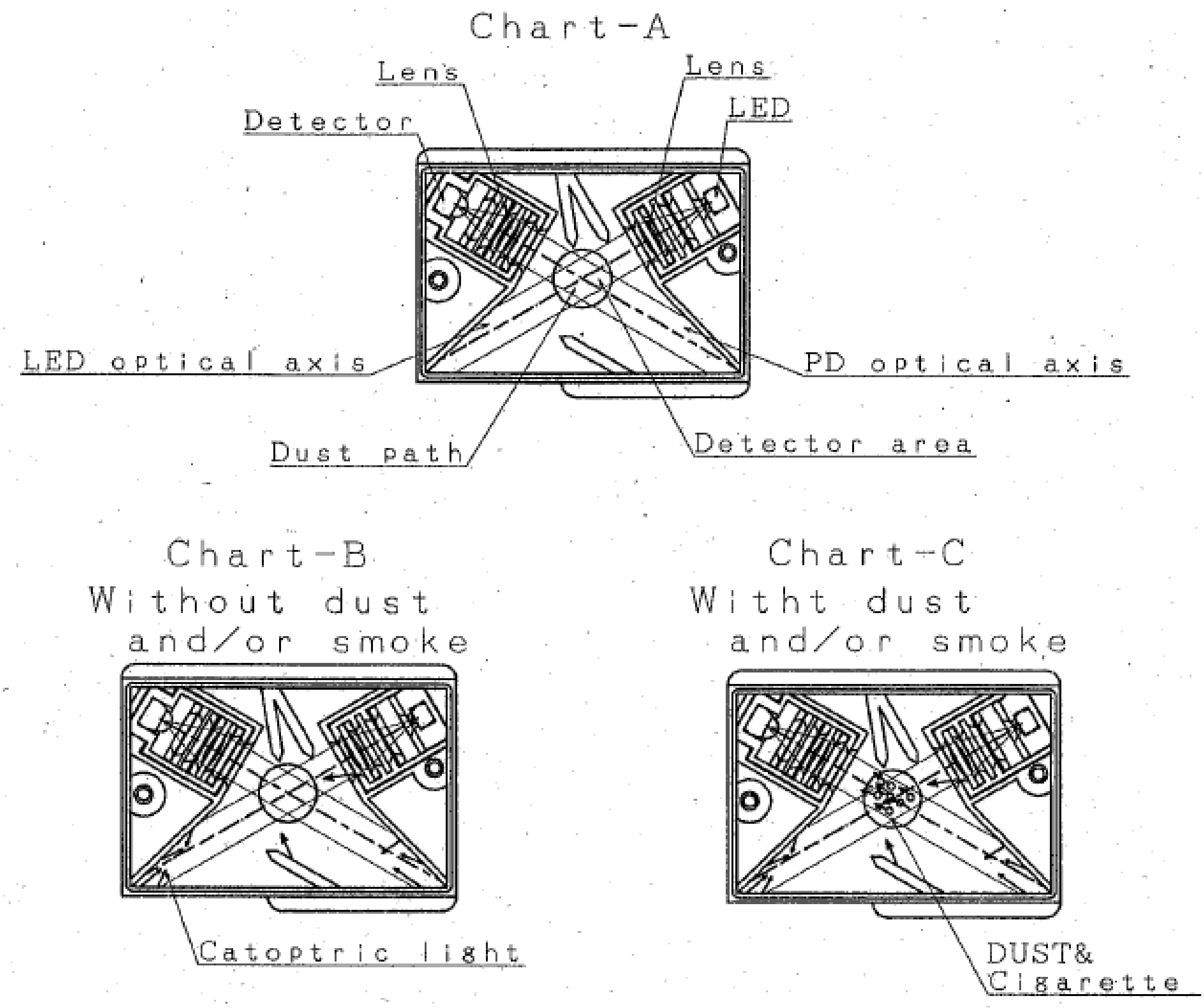
*1 Sensitivity is specified by the amount of output voltage change when dust density changes by 0.1 mg/m^3.
And the dust density for detection is a value of the density of cigarette (MILD SEVEN®) smoke measured by the digital dust monitor (P-5L2: manufactured by SHIBATA SCIENTIFIC TECHNOLOGY LTD.).
*2 Input condition is shown in Fig. 1
*3 Output sampling timing is shown in Fig. 2

■Recommended input condition for LED input terminal

Parameter	Symbol	Value	Unit
Pulse Cycle	T	10 ± 1	ms
Pulse Width	P_W	0.32 ± 0.02	ms
Operating Supply voltage	V_{CC}	5 ± 0.5	V

5. Principles of dust detection

This dust sensor “GP2Y1010AU0F” is the device to detect house dust, cigarette smoke, etc. and designed as a sensor for automatic running of application like air purifier and air conditioner with air purifier function.

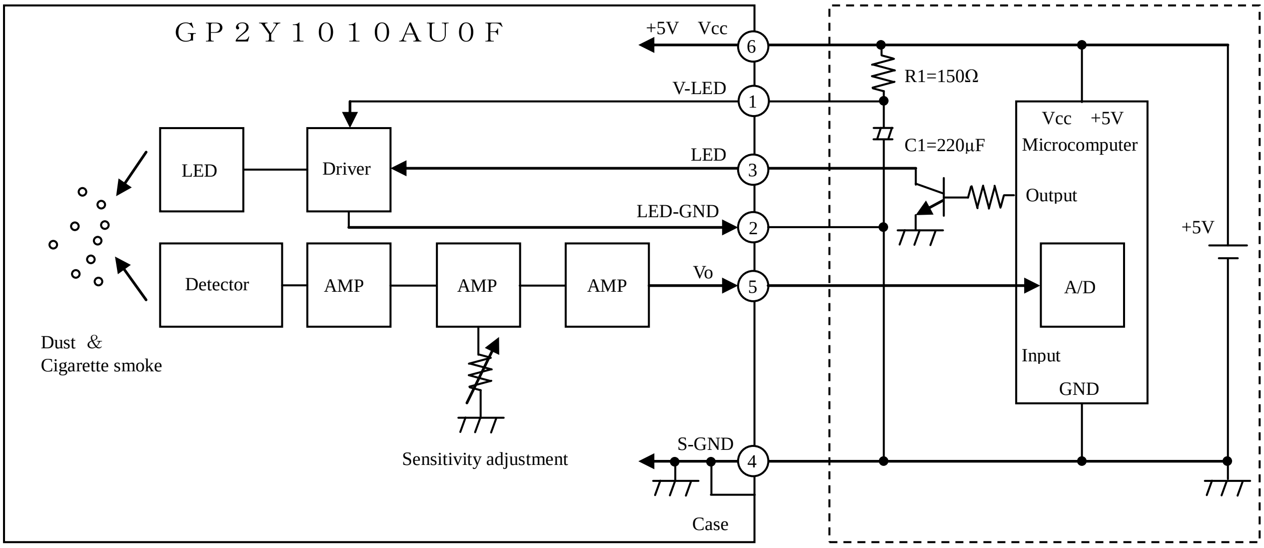


Light from the light emitter (Light Emitting Diode) is spotted with a lens and a slit as shown on the chart-A. Also for the light detector (Photodiode), a lens and a slit is positioned in front of it to cut disturbance light and to detect light reflection (when detecting dust) efficiently. Area where those two optical axis cross is detection area of the device.
Chart-B shows what is ongoing inside of the device when no dust exists and Chart-C shows that when dust exists.
The device makes voltage output even when dust is not being detected. This output voltage at no dust condition is specified as Voc on the specification. This is because light emitted from the LED reflects at case of the device ＆ some part of it gets to the detector.
Chart-C shows how the device works when dust and/or cigarette smoke exists inside of it. In this case, the detector detects the light reflected from the dust and/or a particle of the cigarette smoke. Current in proportion to amount of the detected light comes out from the detector and the device makes analog voltage output (Pulse output) after the amplifier circuit amplifies the current from the detector.

6. Application guidance

6-1 Example of system connection

<Example>



・Resister, R1=150Ω and capacitor, C1=220uF mentioned above is required for pulse drive of the LED of GP2Y1010AU0F. Please use the ones with the above mentioned constants. Without these cmponents, the device does not work.

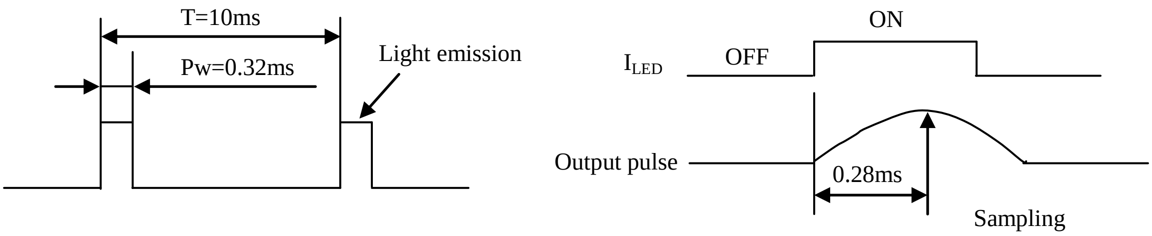
・As input conditions of the LED terminal, please apply LED drive conditions mentioned in Electro-optical characteristics chart of the specification. When it is impossible to apply those conditions, please make it within the recommended input conditions mentioned in the specification. When the LED is driven under the condition beyond the specification, characteristics of the device will be affected.

Parameter	Symbol	Specified condition	Recommended condition	Unit
Pulse cycle	T	10	10±1	ms
Pulse width	Pw	0.32	0.32±0.02	ms

・The LED emits pulse light. Detected signal is amplified by the amplifier circuit and goes out as the output synchronized to the pulse mission of the LED.

・The specified output value is the one that is measured 0.28ms after the LED is turned on. Therefore, it is recommended that microcomputer to read the output 0.28ms after the LED emission also.

Sampling timing of output pulse



・Time required for the device to be ready to detect dust from when the system is turned on is less than 1 sec.

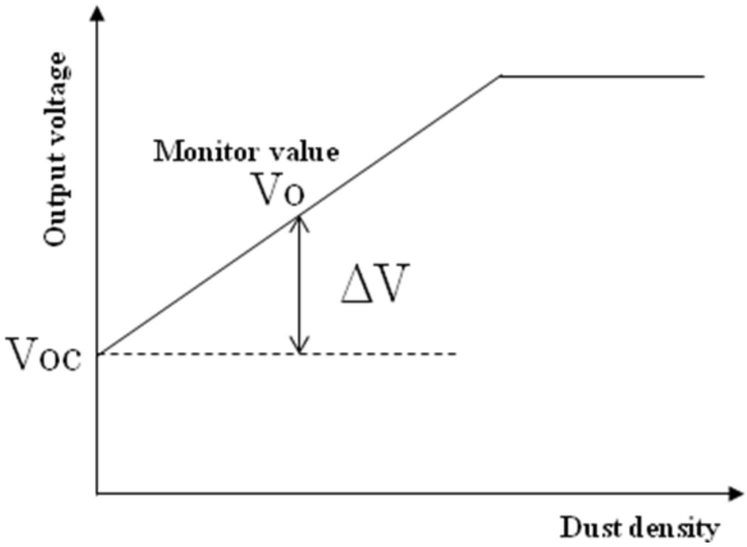
6-3 Basic output handling

・The output voltage Vo of this sensor is the sum of output voltage at no dust Voc and output proportional to dust density ΔV.
Output proportional to dust density ΔV is shown as follows.
ΔV = Vo - Voc (Vo : monitor value)

・Output voltage at no dust Voc is caused by the stray light ocuurring in this sensor.
This sensor makes Voc voltage even at dust density 0mg/m^3.
If dust attached within this sensor increases, Voc becomes bigger. On the other hand, if dust attached within this sensor decreases, Voc becomes smaller.

・To store Voc in the memory of application is necessary to calculate ΔV from monitor value Vo.
If monitor value Vo lower than the memorized Voc appears, this monitor value Vo should be stored in the memory of application as a new Voc.

・If monitor value Vo maintains a bigger value than the memorized Voc for a certain period of time, this monitor value Vo should be stored in the memory of application as a new Voc.



6-4 Other cautions

・Please do not clean the device since cleaning may affect characteristics of the devive and it may result in operation failure of the device.

・VR for sensivity adjustment is adjusted in accordance to the specification at the time of shipment from Sharp. Therefore, please do not change value of it, or the value may become out of the specifications.

・Please do not disassemble the device. Once disassembled, the device may not have the same characteristics that it has had before the disassembly even if it is assembled again.

・Vibration may affect the characteristics of the device. Therefore, please make sure that the device works properly under actual usage conditions.

・The device does not work properly if bedewing occurs inside of it. Please design products so that the bedewing does not occur inside of the device.

・If the device is placed close to a noise generator (Electric dust collector, etc.), the sensor output may fluctuate due to inductive noise from the noise generator. Please consider the effect of the noise generator to the device when designing products.

7. Dust density characteristics (Example)

Test condition : According to "Electro-optical characteristics" of the specification of GP2Y1010AU0F.