

MISE EN ŒUVRE CAN CNA I2C

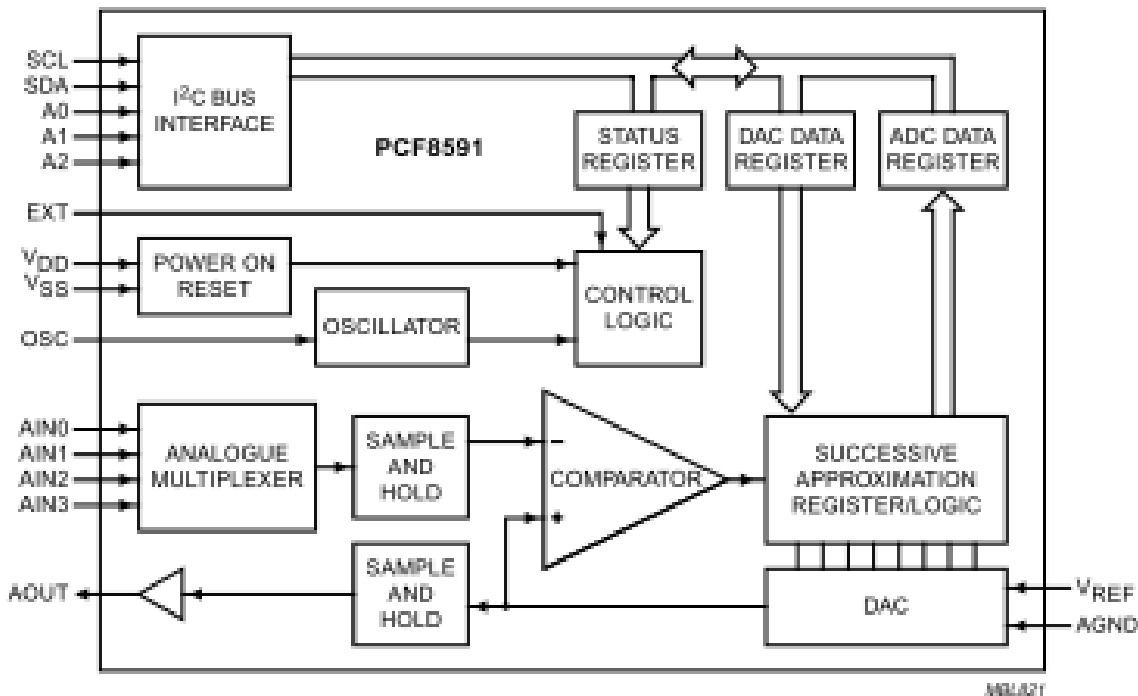
Présentation du PCF8591 8-bit convertisseur A/D D/A

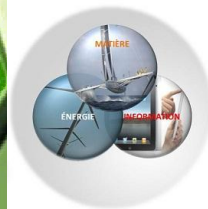
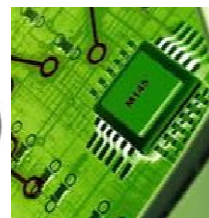
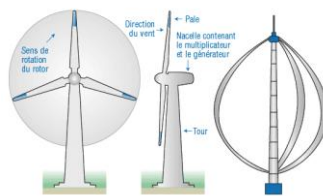
Caractéristiques générales



- Single power supply
- Operating supply voltage 2.5 V to 6 V
- Low standby current
- Serial input/output via I2C-bus
- Address by 3 hardware address pins
- Sampling rate given by I2C-bus speed
- 4 analog inputs programmable as single-ended or differential inputs
- Auto-incremented channel selection
- Analog voltage range from VSS to VDD
- On-chip track and hold circuit
- 8-bit successive approximation A/D conversion
- Multiplying DAC with one analog output.

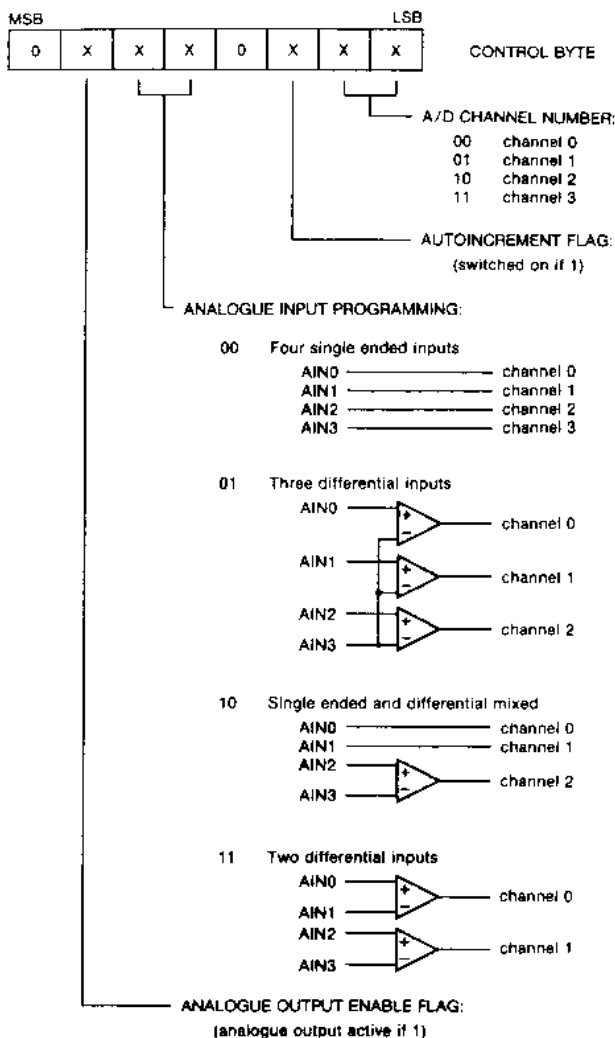
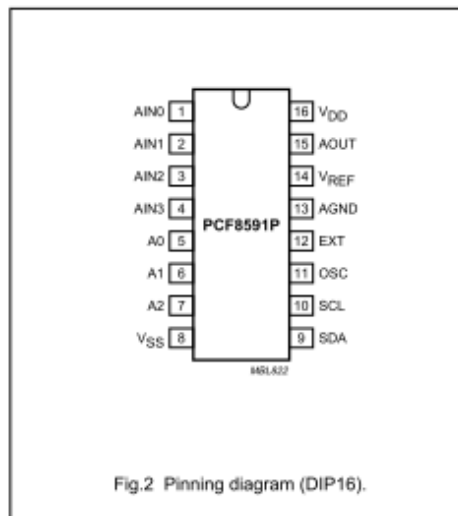
Bloc diagram





Brochage et Configuration du circuit

SYMBOL	PIN	DESCRIPTION
AIN0	1	analog inputs (A/D converter)
AIN1	2	
AIN2	3	
AIN3	4	
A0	5	hardware address
A1	6	
A2	7	
V _{SS}	8	negative supply voltage
SDA	9	I ² C-bus data input/output
SCL	10	I ² C-bus clock input
OSC	11	oscillator input/output
EXT	12	external/internal switch for oscillator input
AGND	13	analog ground
V _{REF}	14	voltage reference input
AOUT	15	analog output (D/A converter)
V _{DD}	16	positive supply voltage



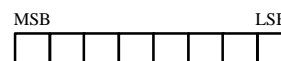
Configuration n° 1

Conversion A/D du canal 3
 Auto Increment OFF
 Quatre canaux
 en entrées analogiques
 Analogue output OFF



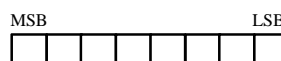
Configuration n° 2

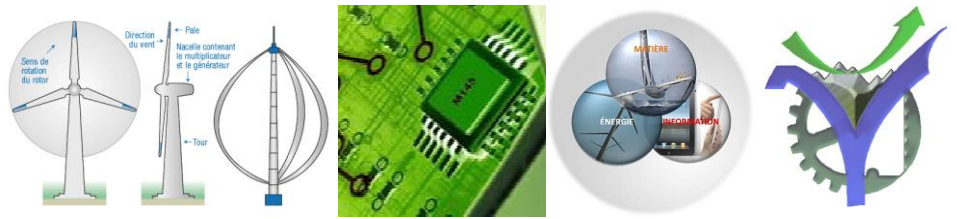
Conversion A/D du canal 1
 Auto Increment ON
 Deux canaux différentiels
 en entrées analogiques
 Analogue output OFF



Configuration n° 3

Conversion A/D du canal 2
 Auto Increment OFF
 Trois canaux différentiels
 en entrées analogiques
 Analogue output OFF

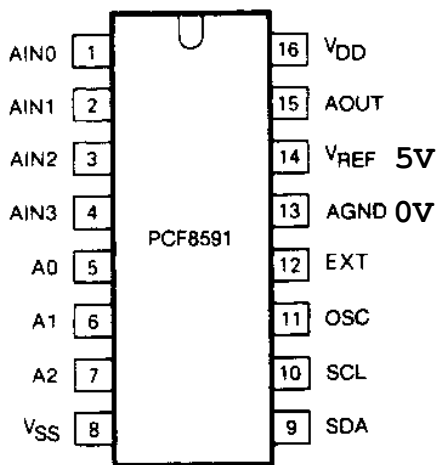




Conversion D/A ou N/A

☞ Calculer la valeur de V_{out} dans les conditions indiquées.

$$V_{AOUT} = V_{AGND} + \frac{V_{REF} - V_{AGND}}{256} \sum_{i=0}^7 D_i \times 2^i$$



MSB LSB

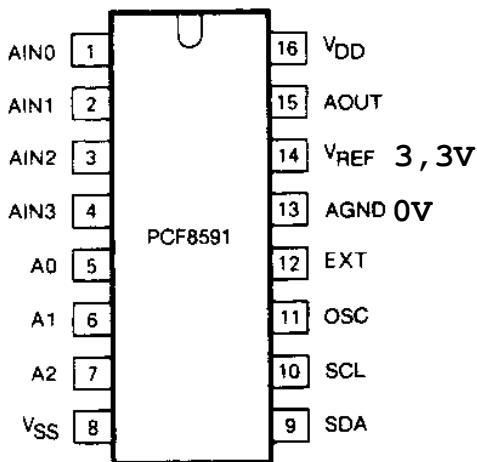
0	1	1	1	0	0	1	1
---	---	---	---	---	---	---	---

VAOUT =

MSB LSB

1	0	0	1	0	1	0	0
---	---	---	---	---	---	---	---

VAOUT =



MSB LSB

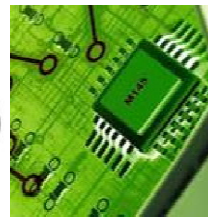
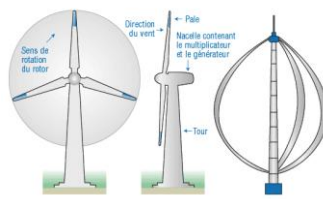
0	0	0	1	1	0	0	1
---	---	---	---	---	---	---	---

VAOUT =

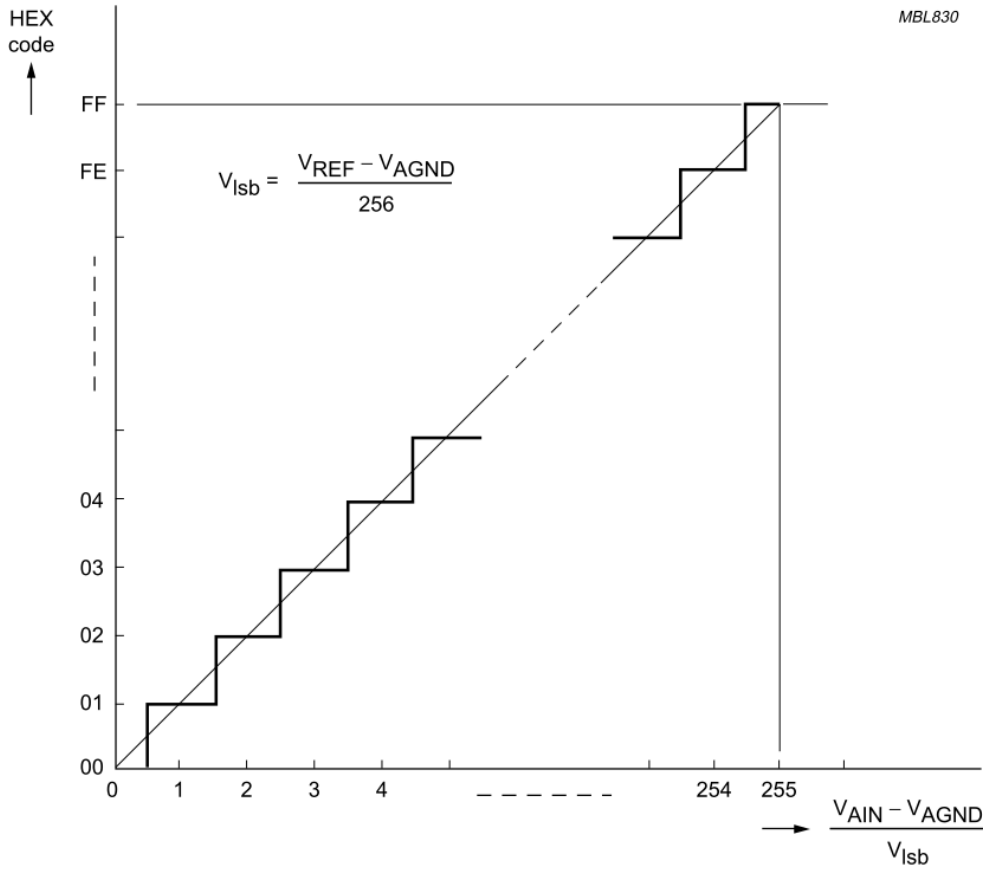
MSB LSB

1	1	1	0	1	0	1	0
---	---	---	---	---	---	---	---

VAOUT =

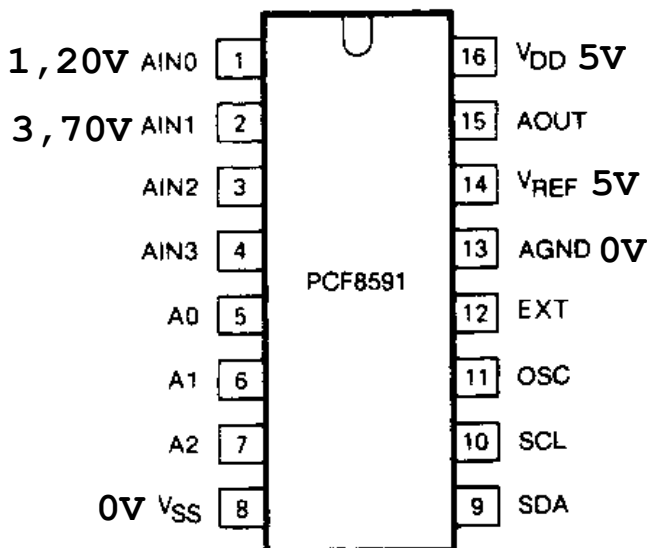


Conversion A / N



Configuration du circuit

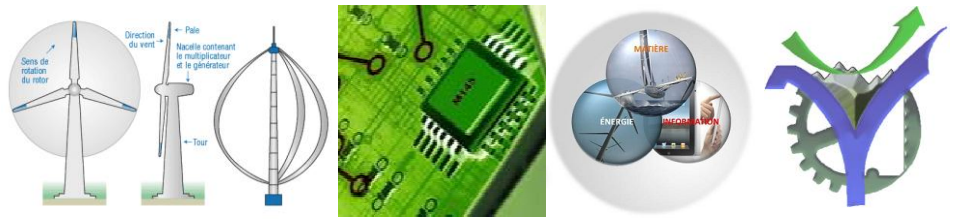
☞ Calculer les codes numériques obtenus.



Codes numériques de :

AIN0 :

AIN1 :



Echange sur le bus I2C

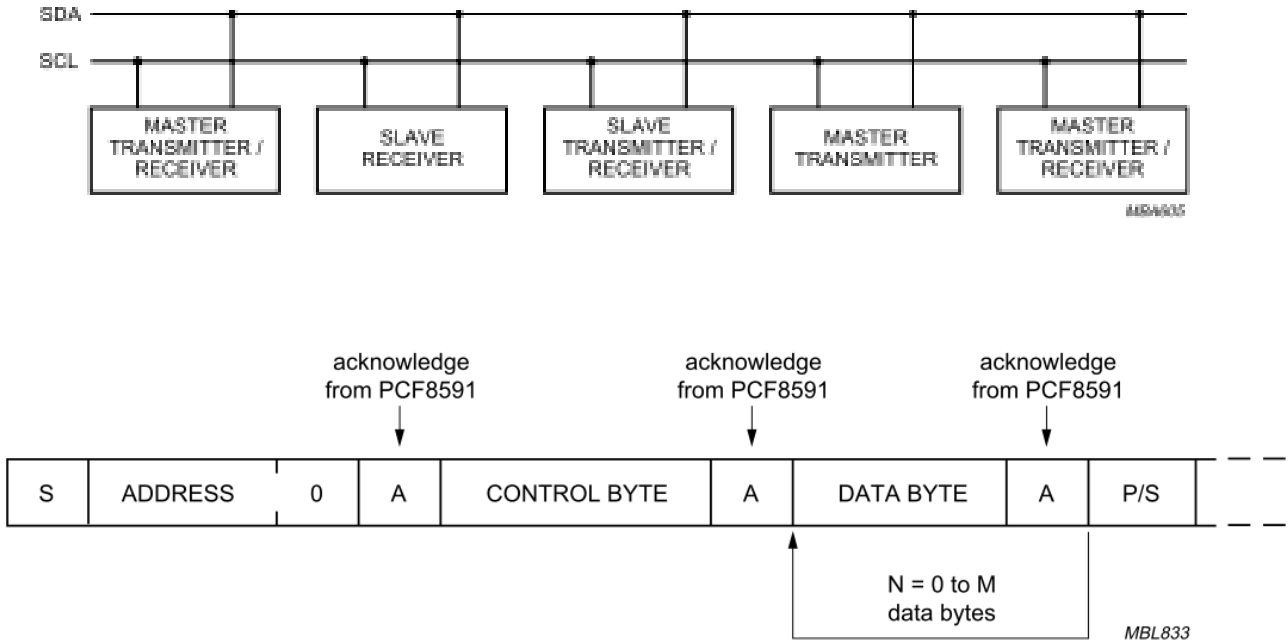
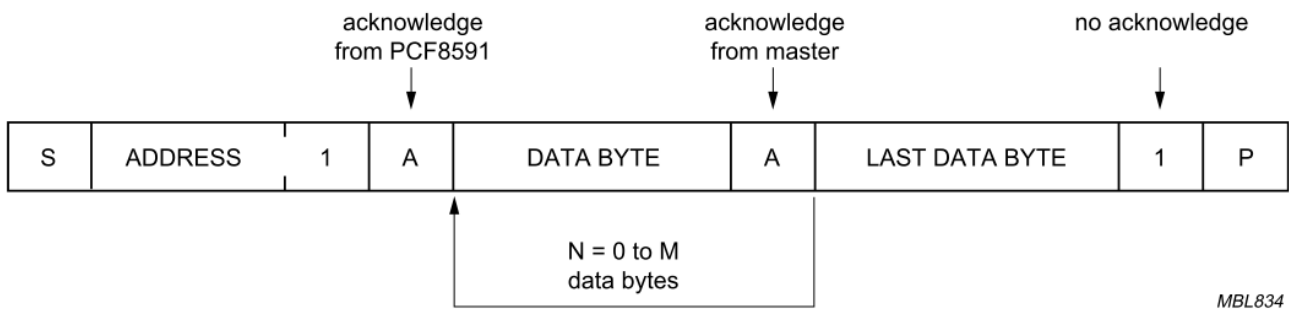
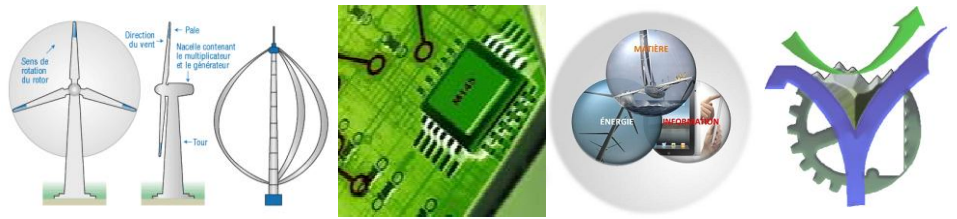


Fig.16 Bus protocol for write mode, D/A conversion.

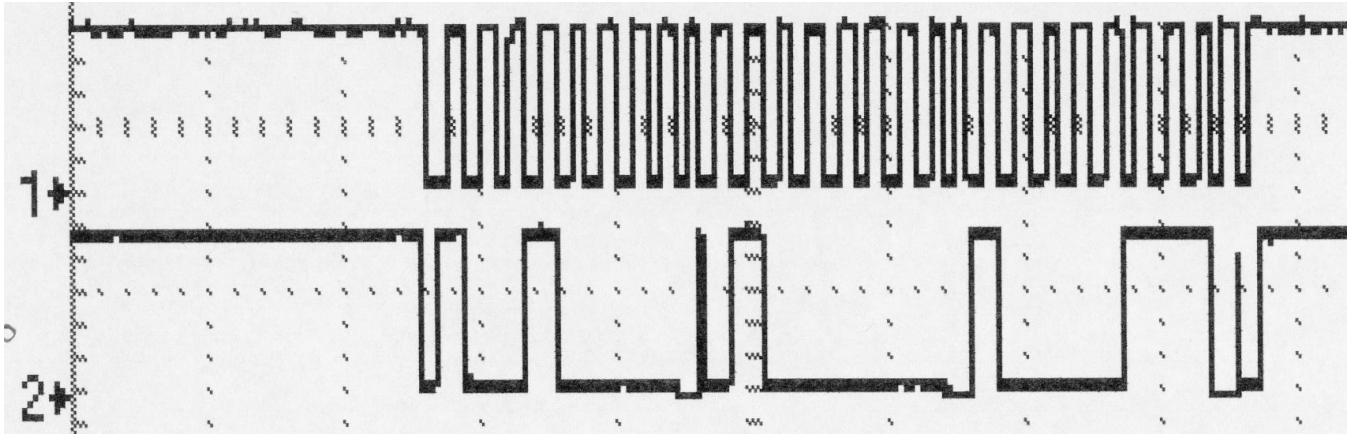




Analyse de trames

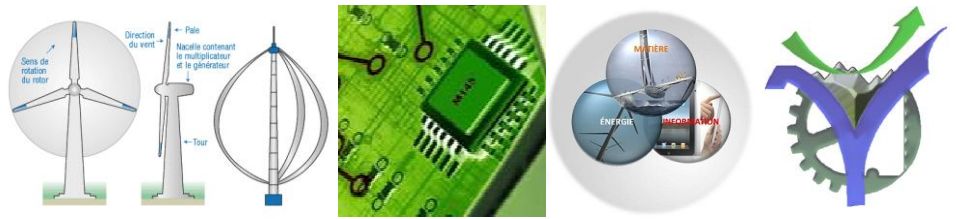
☞ Analyser les trames

Chronologie Bus I2C échange complet

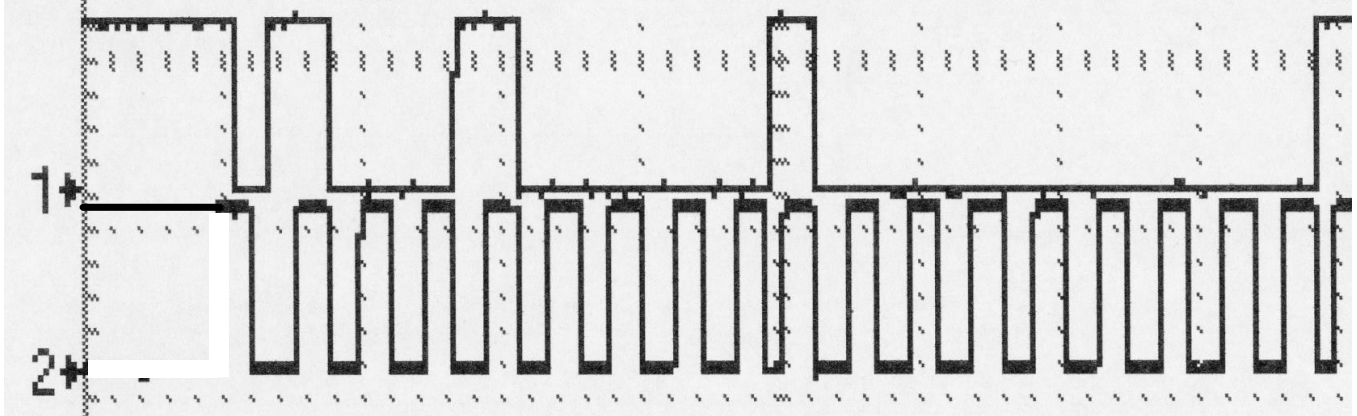


Quel est le périphérique adressé par le Bus I2C :

- => adresse ?
- => type de périphérique ?
- => l'échange est t'il correct ?
- => donner la signification précise des trois octets envoyés



Chronologie Bus I2C vue partielle du début d'un échange



Quel est le périphérique adressé par le Bus I2C :

- => adresse ?
- => type de périphérique ?
- => l'échange est t'il correct ?

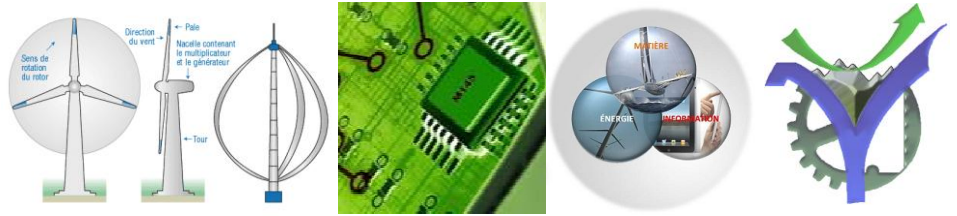
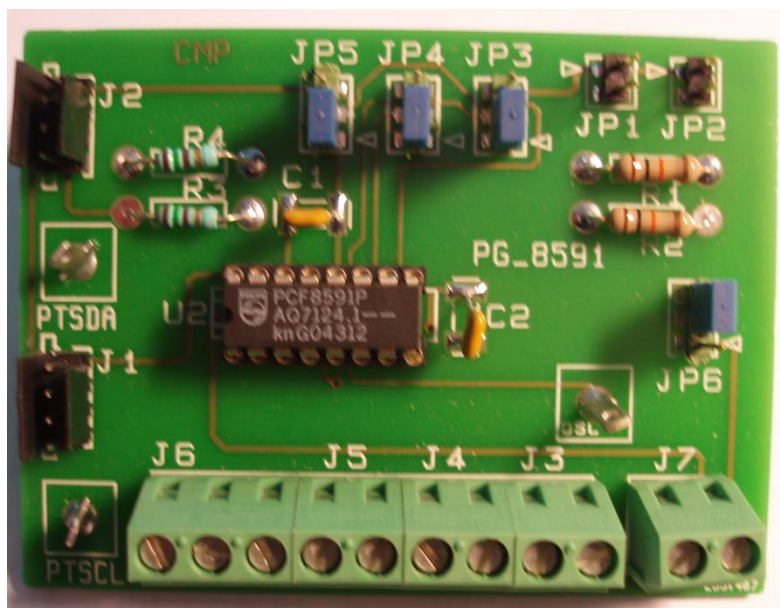
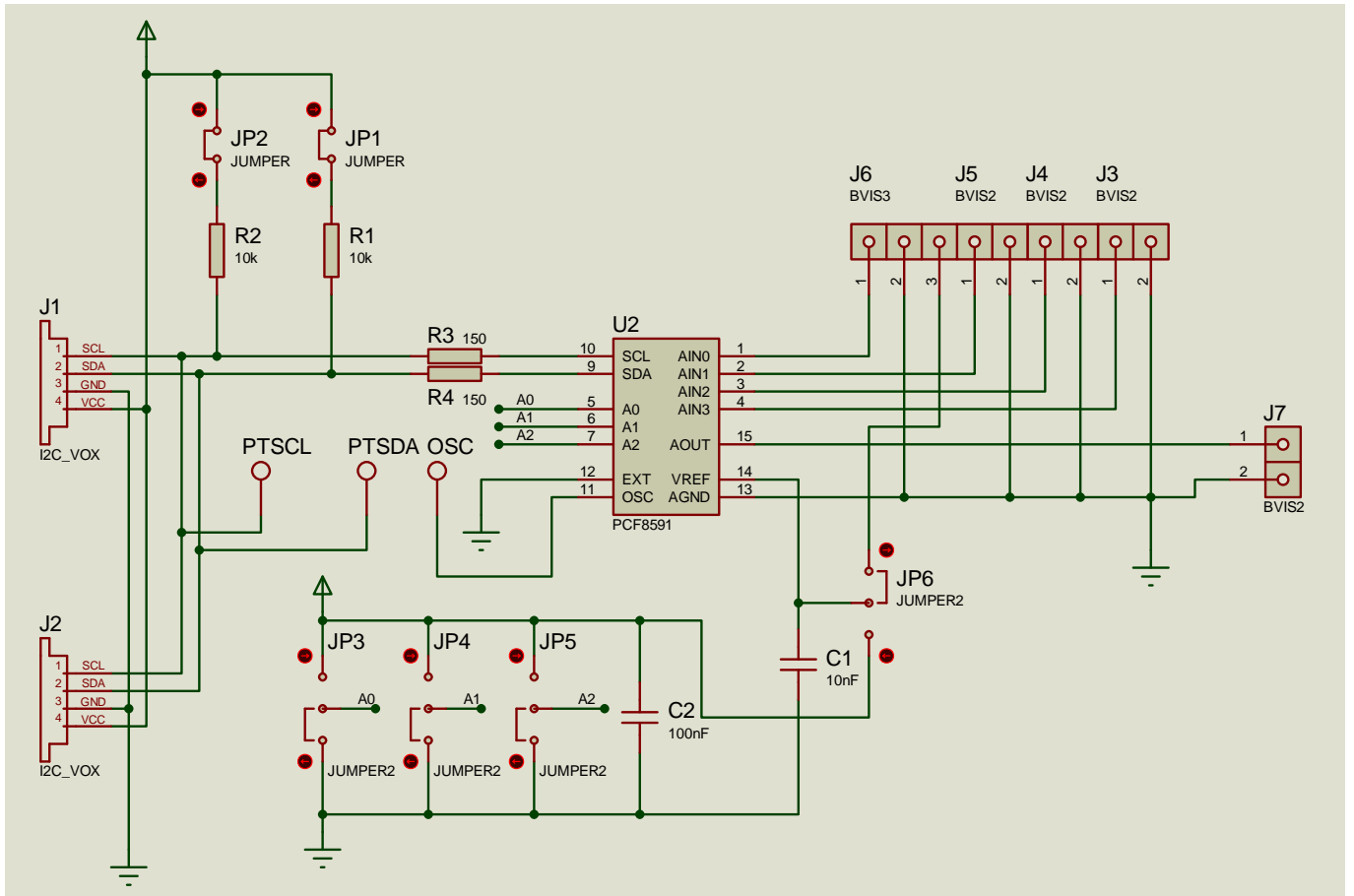
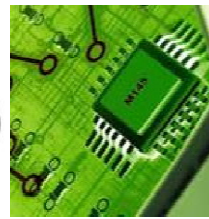
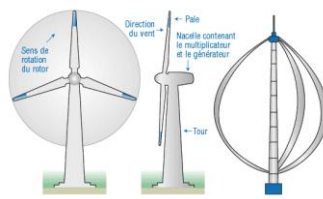


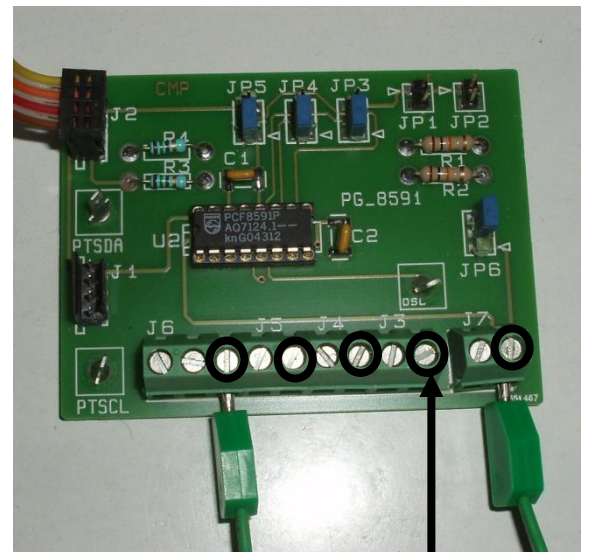
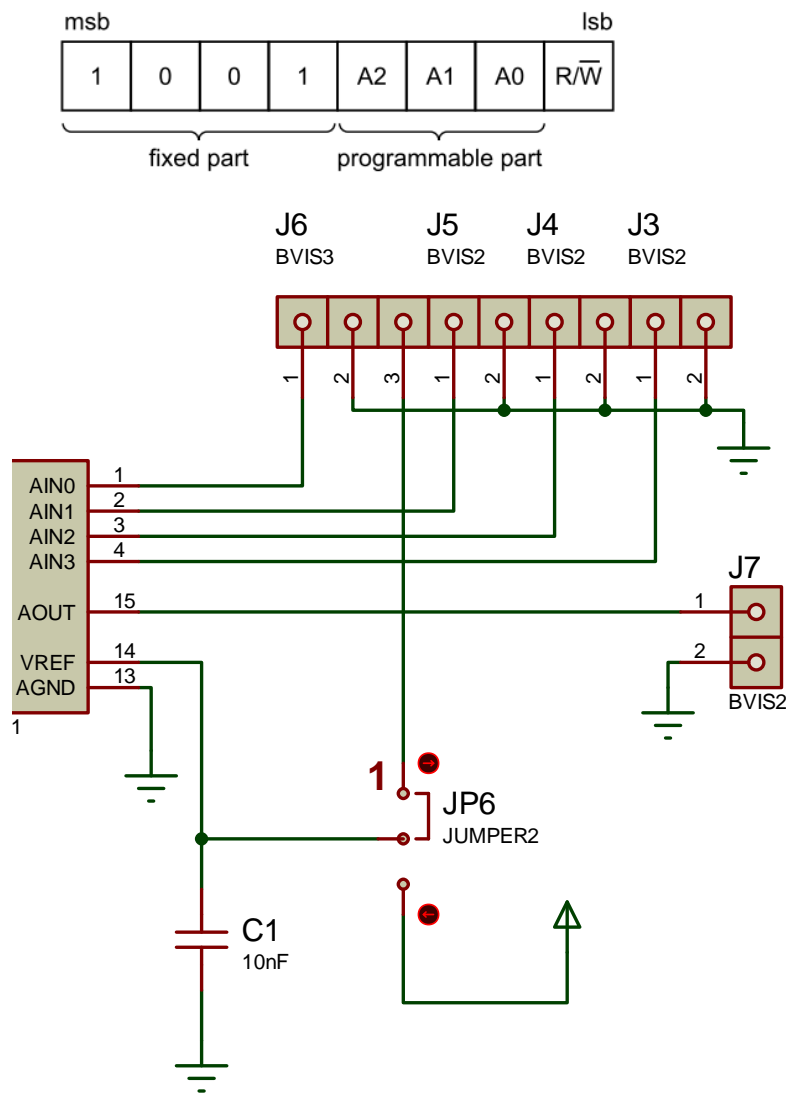
Schéma de la carte VOX



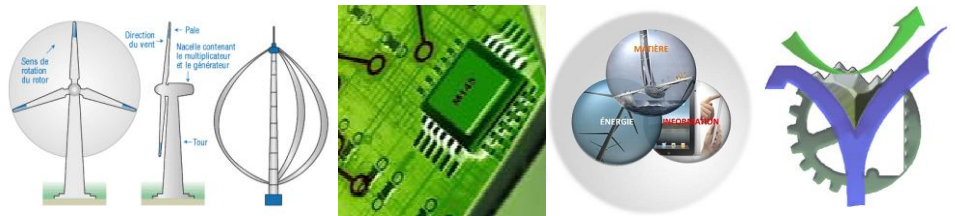


Mise en œuvre avec PSoC Creator

En examinant le câblage proposé sur la photo ci-dessous déterminer la configuration de la carte en particulier indiquer quelle la tension V_{ref} utilisée par le convertisseur. Que met en liaison le câblage avec le fil vert ? Donner l'adresse du convertisseur.

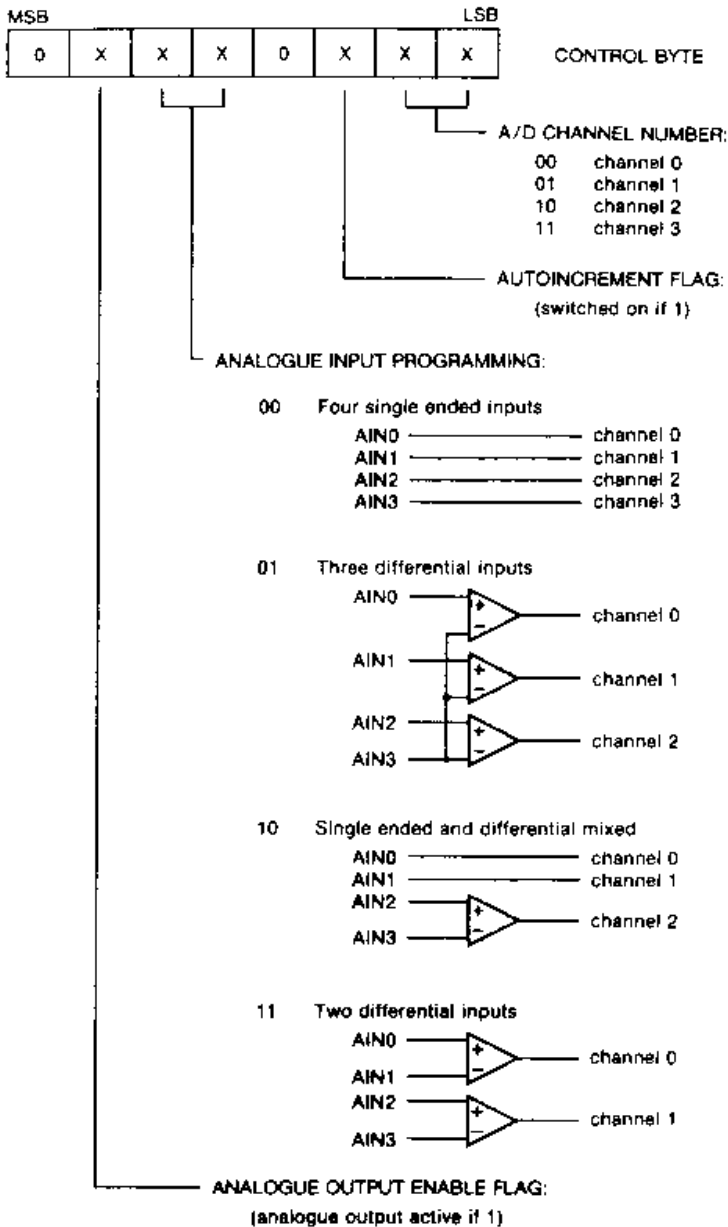


Borne 1



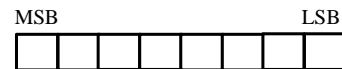
☞ L'octet de configuration du convertisseur est donnée ci-dessous déduire la configuration retenue.

```
19 #define CONF_PCF8591 0b01000000
```



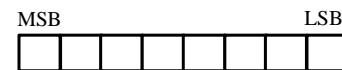
Configuration n° 1

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Quatre canaux
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Analogue output OFF



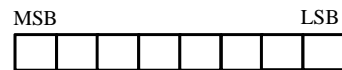
Configuration n° 2

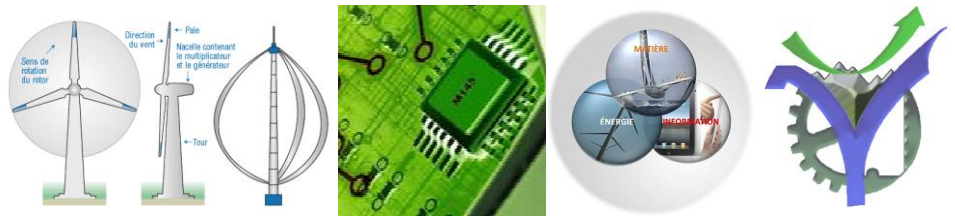
Conversion A/D du canal 1
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Configuration n° 3

Conversion A/D du canal 2
Auto Increment OFF
Trois canaux différentiels
en entrées analogiques
Analogue output OFF





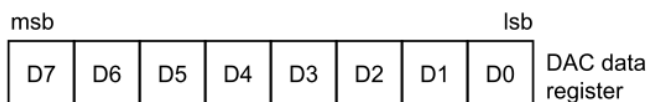
Rappel du texte de la fonction d'écriture sur le CNA :

Écriture sur le convertisseur CNA CAN :

```

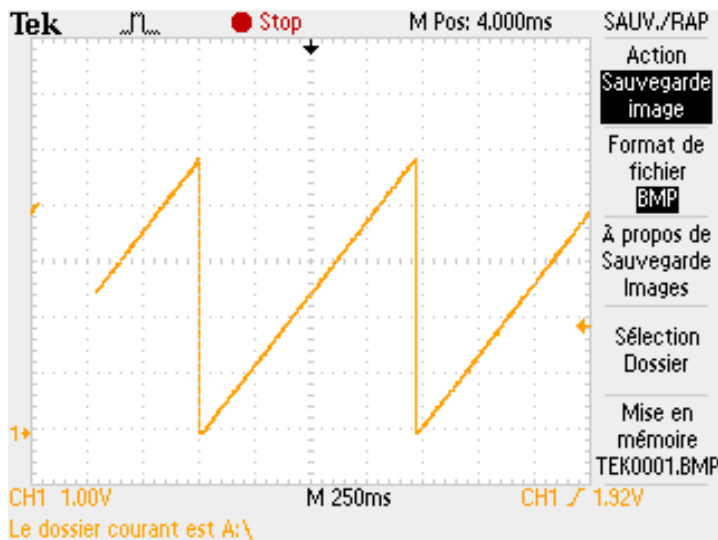
58 void WriteI2C_PCF8591(uint8 Adresse, uint8 Configuration, uint8 Donnee)
59 {
60     uint8 wbuffer[2];
61     wbuffer[0]=Configuration;
62     wbuffer[1]=Donnee;
63     I2C_MasterClearStatus();
64     status=I2C_MasterWriteBuf(Adresse,wbuffer,2,I2C_MODE_COMPLETE_XFER);
65     while(Du == (I2C_MasterStatus() & I2C_MSTAT_WR_CMPLT)){ }
66 }
    
```

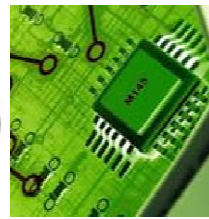
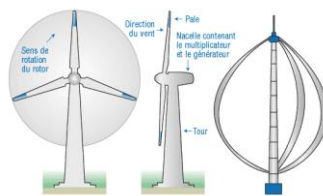
L'octet Donnee est converti la relation ci-dessous donne le résultat de la conversion :



$$V_{AOUT} = V_{AGND} + \frac{V_{REF} - V_{AGND}}{256} \sum_{i=0}^7 D_i \times 2^i$$

☞ Réaliser la génération d'une rampe sur la sortie du convertisseur :





☞ On peut relire la sortie du convertisseur CNA



Lecture du convertisseur CNA CAN :

```

68 uint8 ReadI2C_PCF8591(uint8 Adresse)
69 {
70     uint8 rbuffer[2];
71     I2C_MasterReadBuf(Adresse, rbuffer, 2, I2C_MODE_COMPLETE_XFER );
72     //wait until Transfer is complete
73     while((I2C_MasterStatus() & I2C_MSTAT_RD_CMPLT )==0);
74     return rbuffer[1];
75 }
    
```

Exemple (incomplet) de mise en œuvre :

```

// Gestion du CNA avec relecture sur le CAN et affichage
// Pour bloquer le défilement appuyer sur BP2
if ( (BP3_Read() == APPUYE) )
{
    AfficheTitre();
    WriteI2C_PCF8591(Adresse_PCF8591, CONF_PCF8591, rampe);

    PCF8591_CAN=ReadI2C_PCF8591(Adresse_PCF8591);

    CharLCD_Position(2,0);
    CharLCD_PrintString("CNA => ");
    sprintf(tstr, "%+5.3f", 5.0/256*rampenm1 );
    CharLCD_PrintString(tstr);
    CharLCD_PrintString(" ");
    CharLCD_PrintInt8(rampenm1);

    CharLCD_Position(3,0);
    CharLCD_PrintString("CAN => ");
    sprintf(tstr, "%+5.3f", 5.0/256*PCF8591_CAN );
    CharLCD_PrintString(tstr);

    CyDelay(500);
    rampenm1=rampe;
    rampe = rampe + 1;
}
    
```