

## AN2005 : Pembuatan Thermometer Digital dengan Development System DST-R8C

Catatan aplikasi ini membahas pembuatan thermometer digital dengan development System DST-R8C. Modul-modul yang diperlukan:

- ① ① **Development System DST-R8C**
- ① ① **LCD karakter 16x2**
- ① ① **Sensor suhu LM35**

Blok diagram sistem bisa dilihat pada gambar-1.



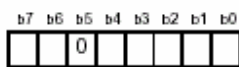
**Gambar 1**

Modul DST-R8C mempunyai 12 kanal ADC yang bisa dihubungkan langsung dengan tegangan analog 0 sampai 5 Volt. Pada aplikasi kita ini LM 35 dipasang pada ADC kanal 6.

Register-register yang harus diatur dalam penggunaan ADC adalah **ADCON0**, **ADCON1** dan **ADCON2**. Keterangan tentang pengaturan register-register ini bisa dilihat pada gambar 2 dan gambar 3.

Hasil konversi ADC ditampung pada register **AD**. ADC mulai bekerja ketika flag **ADST** diberi nilai 1.

AD control register 0<sup>(1)</sup>



Symbol: ADCON0  
Address: 00D6<sub>16</sub>  
After reset: 00000XXX<sub>2</sub>

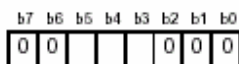
Bit symbol	Bit name	Function	RW
CH0	Analog input pin select bit	See Note 4.	RW
CH1			RW
CH2			RW
MD	AD operation mode select bit <sup>(2)</sup>	0 : One-shot mode 1 : Repeat mode	RW
ADGSEL0	AD input group select bit <sup>(4)</sup>	0 : Port P0 group selected (AN0 to AN7) 1 : Port P1 group selected (AN8 to AN11)	RW
(b5)	Reserved bit	Set to "0"	RW
ADST	A/D conversion start flag	0 : A/D conversion disabled 1 : A/D conversion started	RW
CKS0	Frequency select bit 0 <sup>(3)</sup>	0 : fAD/4 is selected 1 : fAD/2 is selected	RW

NOTES:

1. If the ADCON register is rewritten during A/D conversion, the conversion result is indeterminate.
2. When changing A/D operation mode, set analog input pin again.
3. This bit is valid when the CKS1 bit in the ADCON1 register is set to "0".
4. The analog input pin can be selected by a combination of the CH2 to CH0 bits and ADGSEL0 bit as follows:

CH2 to CH0	ADGSEL0=0	ADGSEL0=1
000 <sub>2</sub>	AN0	Avoid these settings
001 <sub>2</sub>	AN1	
010 <sub>2</sub>	AN2	
011 <sub>2</sub>	AN3	
100 <sub>2</sub>	AN4	AN8
101 <sub>2</sub>	AN5	AN9
110 <sub>2</sub>	AN6	AN10
111 <sub>2</sub>	AN7	AN11

AD control register 1<sup>(1)</sup>



Symbol: ADCON1  
Address: 00D7<sub>16</sub>  
After reset: 00<sub>16</sub>

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Bit symbol	Bit name	Function	RW
(b2-b0)	Reserved bit	Set to "0"	RW
BITS	8/10-bit mode select bit <sup>(2)</sup>	0 : 8-bit mode 1 : 10-bit mode	RW
CKS1	Frequency select bit 1 <sup>(3)</sup>	0 : CKS0 bit in ADCON0 register is valid 1 : fAD is selected	RW
VCUT	Vref connect bit <sup>(4)</sup>	0 : Vref not connected 1 : Vref connected	RW
(b6-b7)	Reserved bit	Set to "0"	RW

NOTES:

1. If the ADCON1 register is rewritten during A/D conversion, the conversion result is indeterminate.
2. In repeat mode, the BITS bit must be set to "0" (8-bit mode).
3. The fAD frequency must be 10 MHz or less.
4. If the VCUT bit is reset from "0" (Vref unconnected) to "1" (Vref connected), wait for 1 μs or more before starting A/D conversion.

Gambar 2

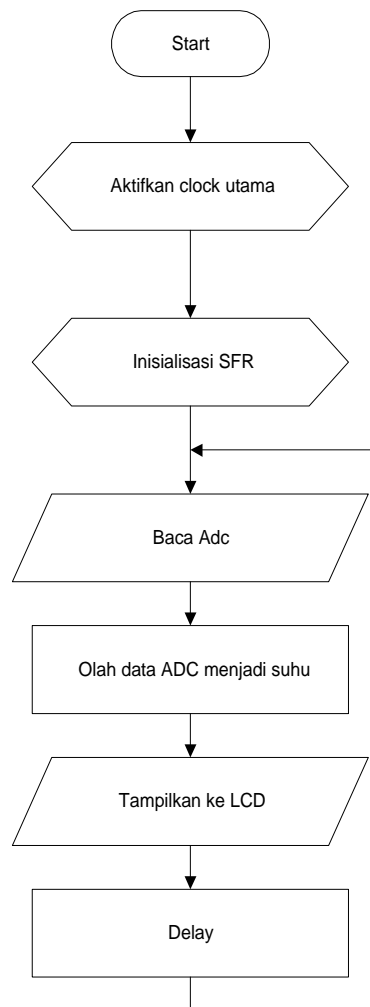
### AD control register 2<sup>(1)</sup>

b7	b6	b5	b4	b3	b2	b1	b0	Symbol ADCON2	Address 00D416	After reset 0016
X	X	X	X	0	0	0				
Bit symbol	Bit name	Function	RW							
SMP	AD conversion method select bit	0 : Without sample and hold 1 : With sample and hold	RW							
— (b3-b1)	Reserved bit	Set to "0"	RW							
— (b7-b4)	Nothing is assigned. When write, write "0". When read, its content is "0".		—							

**NOTES:**

1. If the ADCON2 register is rewritten during A/D conversion, the conversion result is indeterminate.

**Gambar 3**



**Gambar 4**