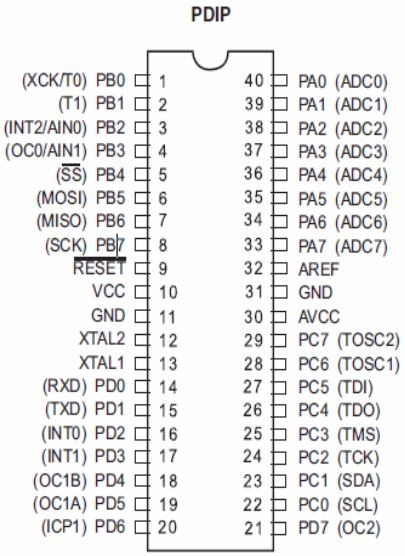
Appendix A: Microcontroller Atmega16

Microcontrollers are designed to be low cost solutions; therefore using them can drastically reduce part and design costs for a project. Physically, a microcontroller is an integrated circuit with pins along each side. The pins presented by a microcontroller are used for power, ground, oscillator, I/O ports, interrupt request signals, reset and control. In contrast, the pins exposed by a microprocessor are most often memory bus signals (rather than I/O ports).

Pin Configurations:



Features

* High-performance, Low-power Atmel® AVR® 8-bit Microcontroller

*Advanced RISC Architecture

– 131 Powerful Instructions – Most Single-clock Cycle Execution

– 32 x 8 General Purpose Working Registers

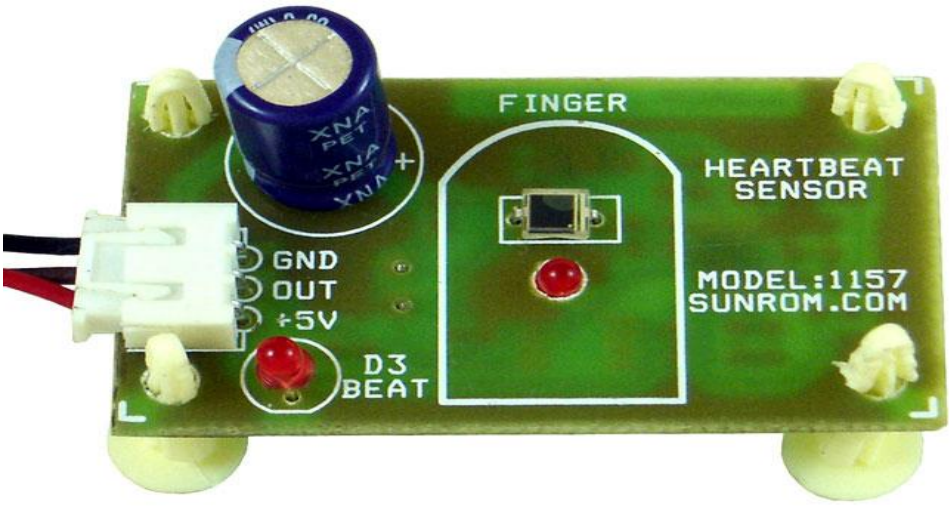
– Fully Static Operation

– Up to 16 MIPS Throughput at 16 MHz.

Appendix B: Heartbeat and Temperature Sensor

Heart beat sensor:

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector s working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.



Pin Details:

Board has 3-pin connector for using the sensor.

Pin	Name	Details
1	+5V	Power supply Positive input
2	OUT	Active High output
3	GND	Power supply Ground

Appendix C: Temperature LM35 sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

Typical Applications

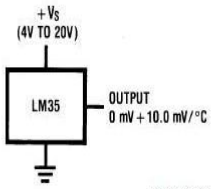
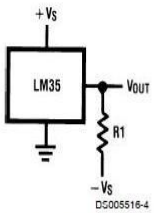


FIGURE 1. Basic Centigrade Temperature Sensor (+2°C to +150°C)

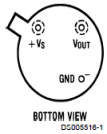


Choose $R_1 = -V_S/50\ \mu A$
V_{OUT} = +1,500 mV at +150°C
= +250 mV at +25°C
= −550 mV at −55°C

FIGURE 2. Full-Range Centigrade Temperature Sensor

Connection Diagrams

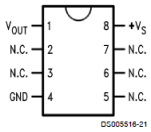
TO-46
Metal Can Package*



*Case is connected to negative pin (GND)

Order Number LM35H, LM35AH, LM35CH, LM35CAH or LM35DH
See NS Package Number H03H

SO-8
Small Outline Molded Package



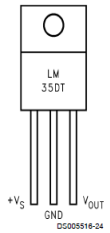
N.C. = No Connection

Top View
Order Number LM35DM
See NS Package Number M08A

TO-92
Plastic Package

Order Number LM35CZ, LM35CAZ or LM35DZ
See NS Package Number Z03A

TO-220
Plastic Package*



*Tab is connected to the negative pin (GND).
Note: The LM35DT pinout is different than the discontinued LM35DP.

Order Number LM35DT
See NS Package Number TA03F

Appendix D: Software Code (Bascom)

```
$regfile = "m16def.dat"
$crystal = 8000000
Config Lcd = 16 * 2
Config Lcdpin = Pin , Db4 = Portc.4 , Db5 = Portc.5 , Db6 = Portc.6 , Db7 =
Portc.7 , E = Portc.2 , Rs = Portc.0
Config Adc = Single , Prescaler = Auto
Config Timer1 = Timer , Prescale = 1024
Dim W As Word
Dim V As Single
Dim E As Word
Dim P As Word
Dim Ppg As Single
Dim Temp As Single
Dim Count As Word
Dim Z As Single
Dim Tim1 As Single
Dim Tim2 As Single
Dim Timeall As Single
Dim Hrsec As Single
Dim Hrmin As Single
Dim Ppgmax As Single
Dim Ppgmin As Single
Dim Sys As Single
Dim Dis As Single
```

```
Dim Map As Single
Dim Pp As Single
Dim Calc As Word
Config Portb.0 = Input
'Config Portb.7 = Output
Cursor Off
Start Timer1
Count = 0
Z = 0
Calc = 1
Locate 1 , 1
Do
If Timer1 > 15625 Then
Timer1 = 0
If Calc = 1 Then
Locate 1 , 1
Lcd "HR="
Lcd Hrmin
Locate 1 , 10
Lcd " BPM"
Lcd "    "
Locate 2 , 1
Lcd "               "
If Hrmin > 170 Or Hrmin < 115 Then
Locate 2 , 1
Lcd "UP Normal HR"
```

```
'Portb.7 = 1
Else
'Portb.7 = 0
End If
Elseif Calc = 2 Then
Locate 1 , 1
Lcd "temp="
Lcd Temp
Lcd "^*"
Lcd "    "
Locate 2 , 1
Lcd "               "
If Temp > 37 Or Temp < 25 Then
Locate 2 , 1
Lcd "UP Normal temp"
'Portb.7 = 1
Else
'Portb.7 = 0
End If
Elseif Calc = 3 Then
Locate 1 , 1
Lcd "Map="
Lcd Map
Lcd "      "
Locate 2 , 1
Lcd "               "
```

```
If Map > 105 Or Map < 93 Then
Locate 2 , 1
Lcd "UP Normal MAP"
'Portb.7 = 1
Else
'Portb.7 = 0
End If
Elseif Calc = 4 Then
Calc = 1
End If
Calc = Calc + 1
Ppgmax = 0
Ppgmin = 100
End If
If Calc = 1 Then
If Pinb.0 = 0 And Z = 0 Then
Z = 1
End If
If Pinb.0 = 1 And Z = 1 Then
Z = 0
Count = Count + 1
If Count = 1 Then
Tim1 = Tcnt1 * 2
Tim1 = Tim1 / 15625
Else
Tim2 = Tcnt1 * 2
```

```
Tim2 = Tim2 / 15625
Timeall = Tim2 - Tim1
Hrsec = 1 / Timeall
Hrmin = Hrsec * 60
Tim1 = 0
Tim2 = 0
Count = 0
End If
End If
Elseif Calc = 2 Then
W = Getadc(0)
V = 5 * W
V = V / 1024
Temp = V * 100
Elseif Calc = 3 Then
E = Getadc(1)
Ppg = 5 * E
Ppg = Ppg / 1024
If Ppg > Ppgmax Then
Ppgmax = Ppg
End If
If Ppg < Ppgmin Then
Ppgmin = Ppg
End If
Sys = 240 * Ppgmax
Sys = Sys / 5
```

```
Dis = 240 * Ppgmin
Dis = Dis / 5
Pp = Sys - Dis
Map = Pp / 3
Map = Map + Dis
Map = Map + .1
Elseif Calc = 4 Then
Bhrmin = Hrmin
Btemp = Temp
Bmap = Map
Printbin 134
Printbin Bhrmin
Printbin Btemp
Printbin Bmap
Print "AT+CMGF=1"
Print "AT+CMGS=" + 249916555115 ""
'If Hrmin > 100 Or Hrmin < 60 Then
Print Hrmin
'Print ">UP Normal HR .+CMGS: 198"
'End If
'If Temp > 39Or Temp < 36 Then
Print Temp
'Print ">UP Normal temp. +CMGS: 198"
'End If
'If Map > 105 or Map < 93 Then
Print Map
```

```
'Print ">UP Normal MAP. +CMGS: 198"
'End If
Calc = 1
End If
Loop
```