

Application note for DS2760 module # 28022

Precision 1-wire Thermocouple interface

Features

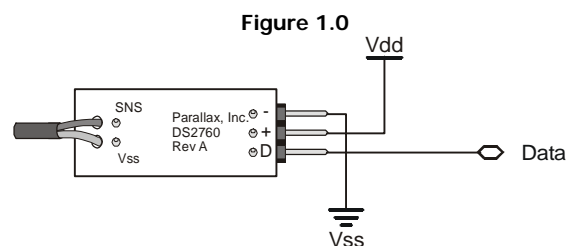
- 1-wire interface
- Temperature range: 0C to +127C, Resolution: 0.125°C
- 16 bytes of general purpose SRAM
- Active Current: normal operation 60uA sleep typical 1uA
- Type K, Chrome/Alumel thermocouple min/max temperature = 0C to +1000C (+32F to +1832F)
- Type J, Iron/Constantan thermocouple min/max temperature = 0C to +1010C (+32F to +1850F)
- Type T, Copper/Constantan thermocouple min/max temperature = 0C to +400C (+32F to +752F)

Parts list

- This manual
- Ds2760 module (Part# 28022)
- Qt. 1 Chrome/Alumel thermocouple 18" (red/yellow leads) (Part# 800-00011)
- Qt. 1 Iron/Constantan thermocouple 18" (red/white leads) (Part# 800-00012)
- Qt. 1 Copper/Constantan thermocouple 18" (red/blue leads) (Part# 800-00010)

Connections

To connect the Ds2760 to your stamp use the setup in figure 1.0



When connecting the thermocouple wires to the unit you will want to do the following. Strip the outer shielding down about 1000mils (1 inch). Then strip the inner shielding down to 500mils (1/2 inch). Do

this on both side of the thermocouple.¹ Then loop one side of the thermocouple leads through the strain relief holes and then plug the bare wires in to the female connectors. See figure 1.1 ²

Figure 1.1



On the other side of the thermocouple take a pair of pliers and twist the bare wires together. Please see figure 1.2

Figure 1.2



BASIC Stamp Application

The following codes will only work for the BS2pe, BS2p24, and the BS2p40. Need the tables for the Chrome/Alumel, Iron/Constantan, and Copper/Constantan which can be downloaded from www.parallax.com. If you have new tables you have made and would like to submit them to us. Please send them to support@parallax.com. In the subject please include 'DS2760 module # 28022' and what type of thermocouple it is and where it can be obtained. If we use your table we will offer you Parallax, Inc. credit. ³

```
' -----[ Title ]-----  
' Ds2760 ver 1.bsp  
' Program for a Dallas DS2760 module with a Chromel/Alumel or  
' Iron/Constantan or Copper/Constantan. This code will read temperatures  
' from 0c to  
' {$STAMP BS2p,ktab,jtab,ttab}  
' {$PBASIC 2.5}  
' -----[ Declarations ]-----  
temp          VAR      Byte  
r              VAR      Word  
rhi           VAR      Byte  
rlo           VAR      Byte  
tj            VAR      Byte  
x             VAR      Word  
v             VAR      Word  
y             VAR      Word
```

1 Note: To make a better connection to the board you may want to lightly sand the bare wires before inserting them in to the connectors.

2 Note: The thermocouples that are included in this kit all use their red lead for ground. If you plan on using a different type of thermocouple please refer to the data sheet for it.

3 This offer may expire at any time without notice and store credit only refers to non 3rd party products.

```

s          VAR      Word
rn         VAR      Byte
y0         VAR      y.BIT0
y1         VAR      y.BIT1
y2         VAR      y.BIT2
y3         VAR      y.BIT3
y4         VAR      y.BIT4
y5         VAR      y.BIT5
y6         VAR      y.BIT6
y7         VAR      y.BIT7
y8         VAR      y.BIT8
y9         VAR      y.BIT9
y10        VAR      y.BIT10
y11        VAR      y.BIT11
y12        VAR      y.BIT12
y13        VAR      y.BIT13
y14        VAR      y.BIT14
y15        VAR      y.BIT15
z          VAR      Bit
w          VAR      Nib
tc         VAR      Nib
p          VAR      Nib
Owpin     PIN      15

' -----[ Initialization ]-----
' Each number relates to a different type of thermocouple
' 1 =                                     'C/A = Chromel/Alumel thermo
' 2 =                                     'I/C = Iron/Constantan thermo
' 3 =                                     'C/C = Copper/Constantan thermo
Int:
  tc = 0                                     'to change type of thermocouple

' sets up display for thermocouple
  DEBUG 0,"Please pick type",CR
  DEBUG "1 = C/A = Chromel/Alumel thermocouple",CR
  DEBUG "2 = I/C = Iron/Constantan thermocouple",CR
  DEBUG "3 = C/C = Copper/Constantan thermocouple",CR,8
  DEBUGIN tc

IF tc = 1 THEN
  DEBUG 0,"You have picked Chromel/Alumel",CR
GOTO start
  ELSEIF tc = 2 THEN
  DEBUG 0,"You have picked Iron/Constantan thermocouple",CR
GOTO start
  ELSEIF tc = 3 THEN
  DEBUG 0,"You have picked Copper/Constantan thermocouple",CR
GOTO start

ENDIF

GOTO Int

' -----[ Main Routine ]-----
Start:

'turn on DS2760
  OWOUT Owpin,%0011,[$cc,$6c,$31,%00000000]
'get the serial number
  OWOUT Owpin,%0001,[$33]

```

```

OWIN Owpin,%0010,[SPSTR 8]
DEBUG "Serial Number "
FOR x = 0 TO 7
  GET x,v
  DEBUG HEX2 v
  temp = V + V
NEXT
IF temp = 0 THEN xx
PAUSE 500
DEBUG CR
aa:
  p = 7+tc
  y = 0
  OWOUT Owpin,%0001,[$cc,$69,$18]
  OWIN Owpin,%0110,[y3,y4,y5,y6,y7,y8,y9,z,z,z,z,z,z,y0,y1,y2]
  y = (y*127)/1024
  tj=y
  STORE tc          'point to table location
  s = 2*y
  READ s,rhi        'read table
  READ s+1,rlo
'get the input voltage
  y = 0
  OWOUT Owpin,%0001,[$cc,$69,$0c]
  OWIN Owpin,%0110,[y3,y4,y5,y6,y7,y8,y9,z,z,z,z,z,z,y0,y1,y2]
  y = ((y*10)/102)*50
  DEBUG 2,0,8,"input voltage = ",DEC y," mv",CR
'get the TC output voltage
  y = 0
  OWOUT Owpin,%0001,[$cc,$69,$0e]
  OWIN Owpin,%0110,[y5,y6,y7,y8,y9,y10,y11,z,z,z,z,z,y0,y1,y2,y3,y4]
  DEBUG ? y
  IF y<4060 THEN over
  y = 0
over:
  s = y*16
  DEBUG "tc voltage = ",DEC s," uv",CR
  r = s+(rhi*256)+rlo
  rhi = r.HIGHBYTE:rlo=r.LOWBYTE
  FOR x=0 TO 2000 STEP 2
  READ x,y
  IF y=rhi THEN over2
  NEXT
over2:
  FOR s=x+1 TO 2000 STEP 2
  READ s,y
  READ s-1,rn
  IF rhi<rn THEN over3
  IF y>= rlo THEN over3
  NEXT
over3:
  s = s/2
  DEBUG "TC = ",DEC s," deg C",CR
  v = ((s*18)/10)+32
  DEBUG "TC = ",DEC v," deg F",CR

GOTO aa

xx:

```

```
DEBUG 0,CR,CR,"No Thermocouple found"  
STOP
```

Useful resources

Thermocouple technical data: <http://instserv.com/rmocoupl.htm>

General article: <http://www.sensorsmag.com/articles/0102/29/main.shtml>