IoT Programming with Basic for iOS

Sensors and B4i

October 26, 2017

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DesignNews

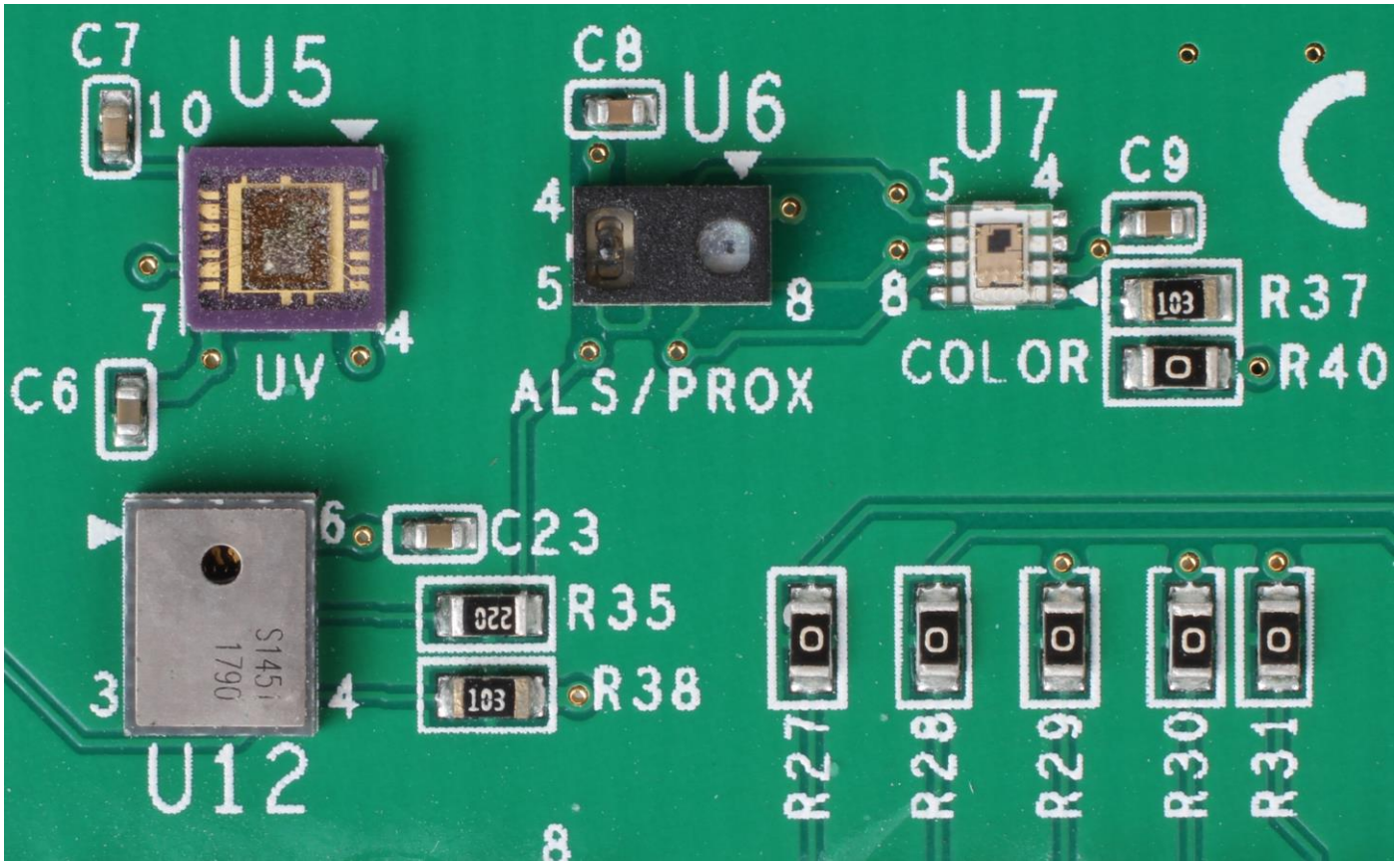
CEC CONTINUING EDUCATION CENTER

Presented by: Digi-Key ELECTRONICS

IoT Programming with Basic for iOS

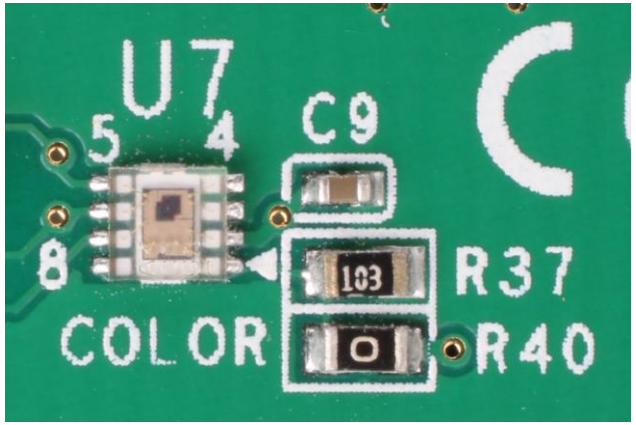
AGENDA

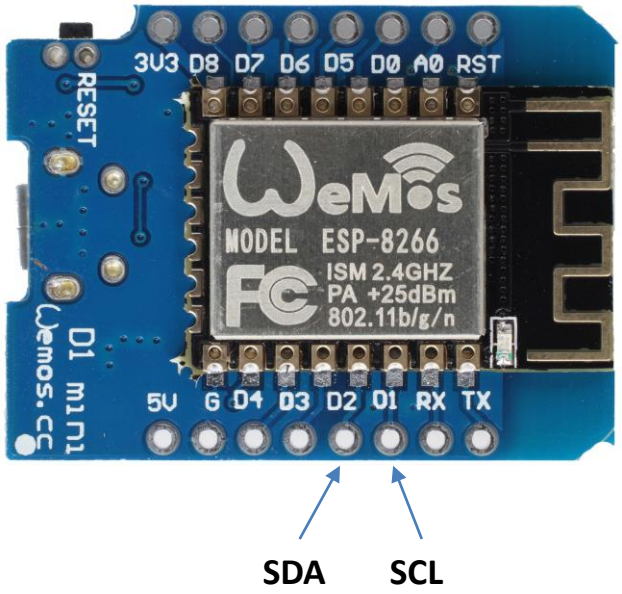
- Coding a B4i/B4R UDP Color Monitor
- Coding a B4i/B4R Proximity Monitor
- Day 4's Done



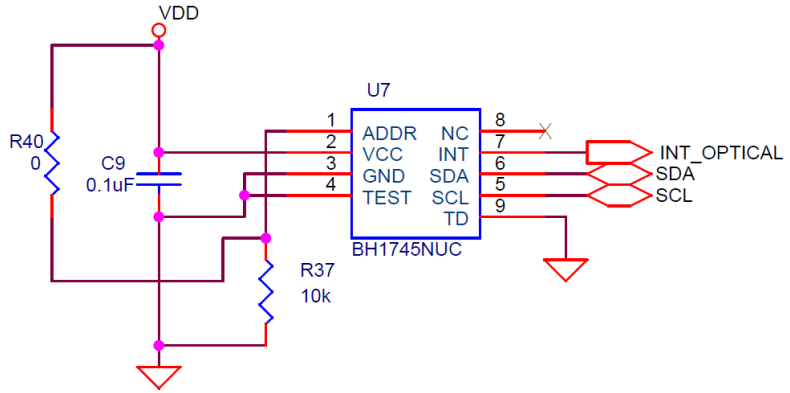
IoT Programming with Basic for iOS

Coding a B4i/B4R UDP Color Monitor – Sensor



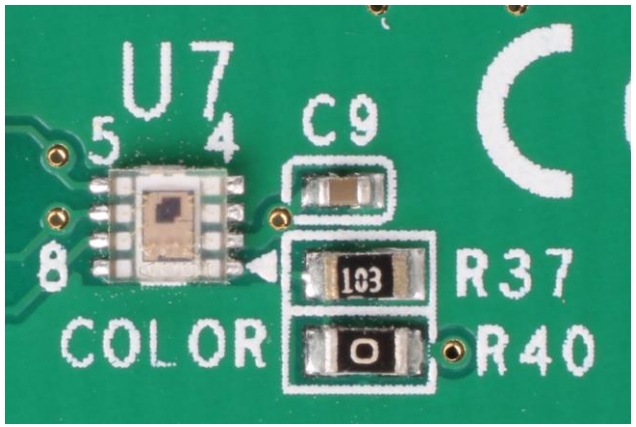


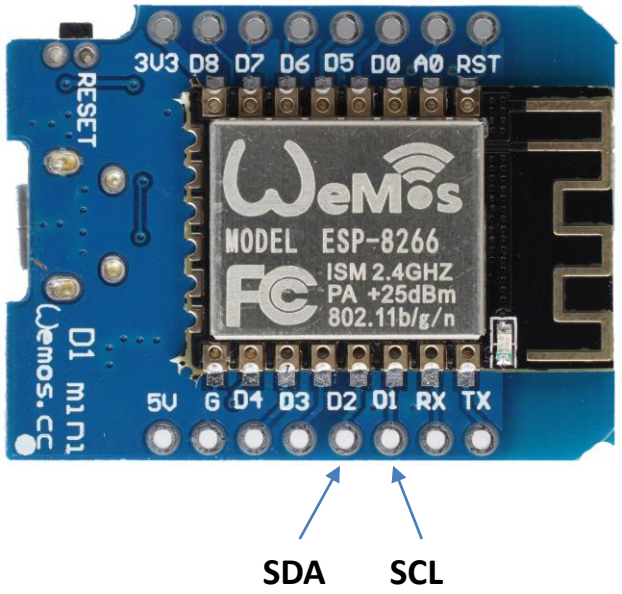

```
8   Sub Process_Globals
9       'These global variables will be declared once when the application starts.
10      'Public variables can be accessed from all modules.
11      Public Serial1 As Serial
12      Private i2cMaster As WireMaster
13      Private udpSocket As WiFiUDP
14      Private Timer1 As Timer
15      Private espwifi As ESP8266WiFi
16      Private ip() As Byte = Array As Byte(192, 168, 1, 255)
17      Private port As UInt = 51042
18      Private udpBuffer(8) As Byte
19      Private const BH1745Addr As Byte = 0x39
20      Private const sumMax As Byte = 21
21      Private tolerance As Byte = 1
22      Private sumIndex As Byte
23      Private rawR, rawG, rawB, rawC As Byte
24      Private filterFlag As Short
25      Private rgb_s1R, rgb_s1G, rgb_s1B, rgb_s1C As Short
26      Private rgbcRaw(8) As Byte
27      Private rgb_s1_R(sumMax) As Short
28      Private rgb_s1_G(sumMax) As Short
29      Private rgb_s1_B(sumMax) As Short
30      Private rgb_s1_C(sumMax) As Short
31  End Sub
```



IoT Programming with Basic for iOS

Coding a B4i/B4R UDP Color Monitor – Sensor

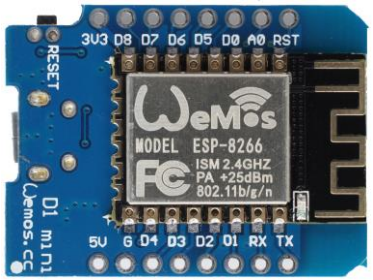


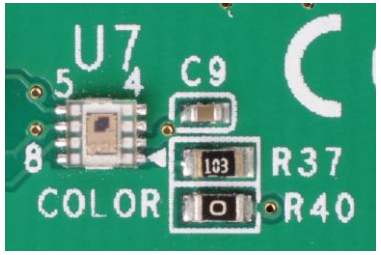



```
33  Private Sub AppStart
34      Serial1.Initialize(115200)
35      Log("AppStart")
36      If espwifi.Connect2("MySpectrumWiFi1a-2G","password") = False Then
37          Log("Error connecting to network")
38          Return
39      Else
40          Log("Connected to network")
41      End If
42      i2cMaster.Initialize
43      i2cMaster.WriteTo(BH1745Addr, Array As Byte (0x92))
44      Dim b() As Byte = i2cMaster.RequestFrom(BH1745Addr,1)
45      If b(0) <> 0xE0 Then
46          Log("Color Sensor Not Found")
47          Log(b(0))
48          Return
49      Else
50          Log("Color Sensor Found")
51          Log(b(0))
52          'write 0x01 to Persistance Register (Update)
53          i2cMaster.WriteTo(BH1745Addr, Array As Byte(0x61,0x01))
54          'write 0x00 to MODE CONTROL1 Register (160ms)
55          i2cMaster.WriteTo(BH1745Addr, Array As Byte(0x41,0x00))
56          'write 0x10 to MODE CONTROL2 Register (Enable with X1 gain)
57          i2cMaster.WriteTo(BH1745Addr, Array As Byte(0x42,0x10))
58          'write default MODE CONTROL3 Register Val (0x02)
59          i2cMaster.WriteTo(BH1745Addr, Array As Byte(0x43,0x02))
60
61      End If
62      udpSocket.Initialize(51042, "udpSocket_PacketArrived")
63      Timer1.Initialize("Timer1_Tick", 500)
64      Timer1.Enabled = True
65  End Sub
```

IoT Programming with Basic for iOS

Coding a B4i/B4R UDP Color Monitor – Sensor






```
67  Private Sub Timer1_Tick
68      RGB_dataAcq
69      udpBuffer(0) = Bit.HighByte(rgb_s1R)
70      udpBuffer(1) = Bit.LowByte(rgb_s1R)
71      udpBuffer(2) = Bit.HighByte(rgb_s1G)
72      udpBuffer(3) = Bit.LowByte(rgb_s1G)
73      udpBuffer(4) = Bit.HighByte(rgb_s1B)
74      udpBuffer(5) = Bit.LowByte(rgb_s1B)
75      udpBuffer(6) = Bit.HighByte(rgb_s1C)
76      udpBuffer(7) = Bit.LowByte(rgb_s1C)
77      udpSocket.BeginPacket(ip, port)
78      udpSocket.Write(udpBuffer)
79      udpSocket.SendPacket
80  End Sub
```

```
98  Private Sub RGB_dataAcq
99      filterFlag = 0
100     Do While filterFlag <> sumMax-1
101         rgb_s1R = 0
102         rgb_s1G = 0
103         rgb_s1B = 0
104         rgb_s1C = 0
105         For sumIndex = 0 To sumMax-1
106             rgb_s1_R(sumIndex) = 0
107             rgb_s1_G(sumIndex) = 0
108             rgb_s1_B(sumIndex) = 0
109             rgb_s1_C(sumIndex) = 0
110         Next
111         For sumIndex = 0 To sumMax-1
112             readRGBC
113             rawR = (rgbcRaw(1) * 256) + rgbcRaw(0)
114             rawG = (rgbcRaw(3) * 256) + rgbcRaw(2)
115             rawB = (rgbcRaw(5) * 256) + rgbcRaw(4)
116             rawC = (rgbcRaw(7) * 256) + rgbcRaw(6)
```

```
87  Private Sub readRGBC
88      Dim i As Byte
89      'write begin of color data address (0x50)
90      i2cMaster.WriteTo2(BH1745Addr, False, Array As Byte(0x50))
91      'read 8 bytes of color data
92      Dim b() As Byte = i2cMaster.RequestFrom(BH1745Addr, 8)
93      For i = 0 To 7
94          rgbcRaw(i) = b(i)
95      Next
96  End Sub
```

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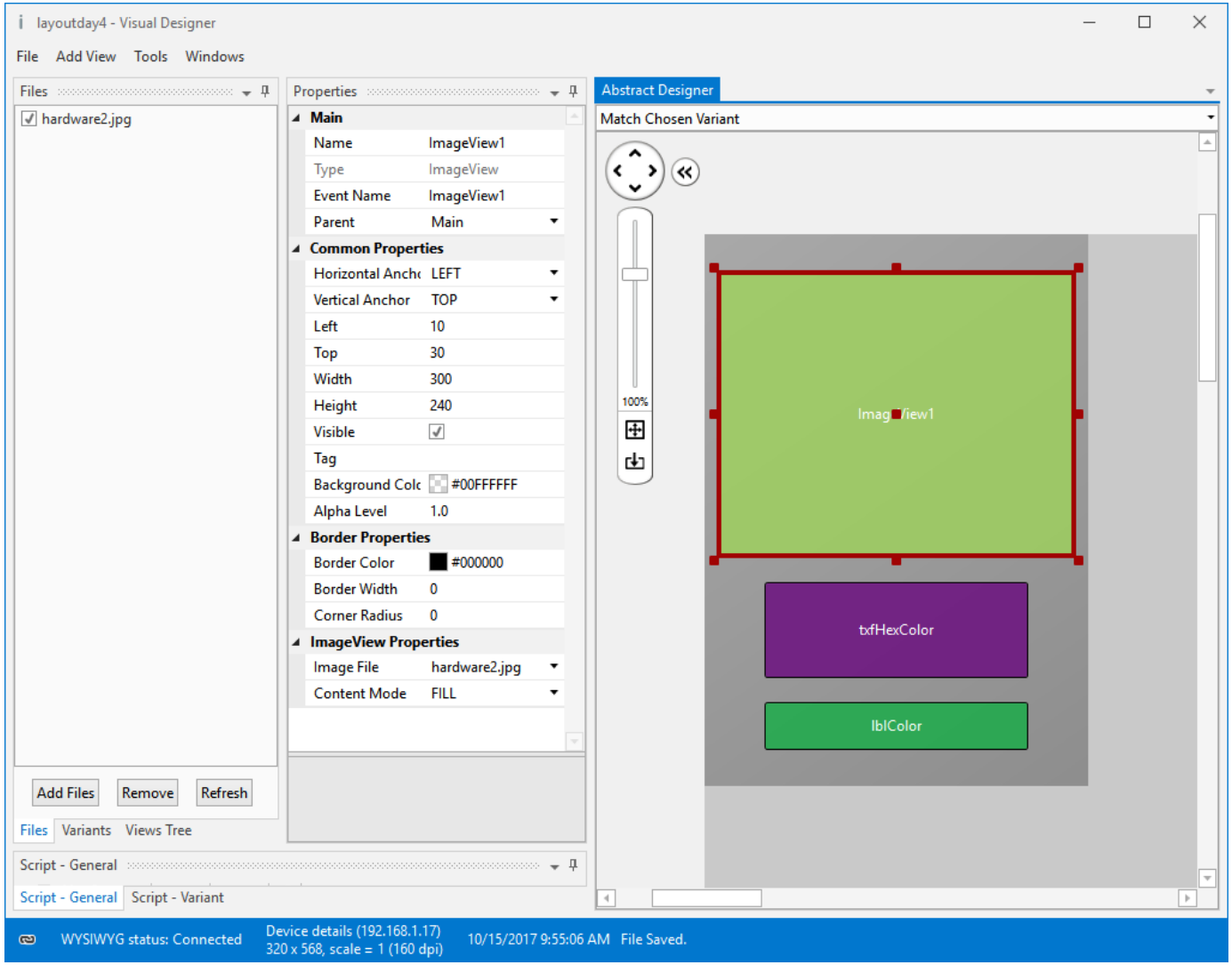
Coding a B4i/B4R UDP Color Monitor – iPhone



IoT Programming with Basic for iOS

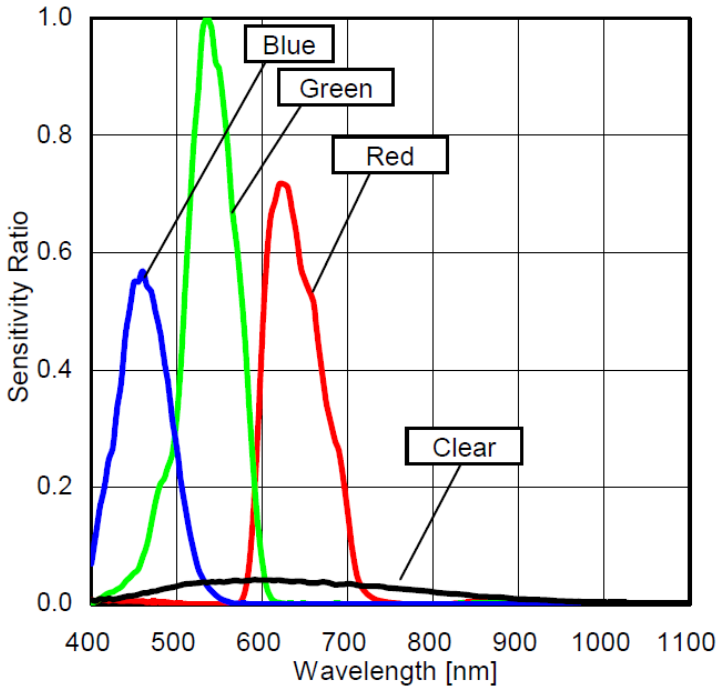
Coding a B4i/B4R UDP Color Monitor – iPhone

```
13  Sub Process_Globals
14      'These global variables will be declared once when the application starts.
15      'Public variables can be accessed from all modules.
16      Public App As Application
17      Public NavControl As NavigationController
18      Private Page1 As Page
19      Private bc As ByteConverter
20      Private socket As UDPSocket
21      Private port As Int = 51042
22      Private buffSize As Int = 8
23      Private rgb_s1R As Short
24      Private rgb_s1B As Short
25      Private rgb_s1G As Short
26      Private rgb_s1C As Short
27      Private redIntensity As Float
28      Private grnIntensity As Float
29      Private bluIntensity As Float
30      Private maxIntensity As Float
31      Private redScaled As Byte
32      Private grnScaled As Byte
33      Private bluScaled As Byte
34      Private scaledColors(3) As Byte
35      Private lblColor As Label
36      Private txfHexColor As TextField
37  End Sub
38
39  Private Sub Application_Start (Nav As NavigationController)
40      'SetDebugAutoFlushLogs(True) 'Uncomment if program crashes before all logs are printed.
41      socket.Initialize("colorData",port,buffSize)
42      NavControl = Nav
43      Page1.Initialize("Page1")
44      Page1.RootPanel.Color = Colors.White
45      Page1.RootPanel.LoadLayout("layoutDay4")
46      NavControl.ShowPage(Page1)
47  End Sub
```

IoT Programming with Basic for iOS

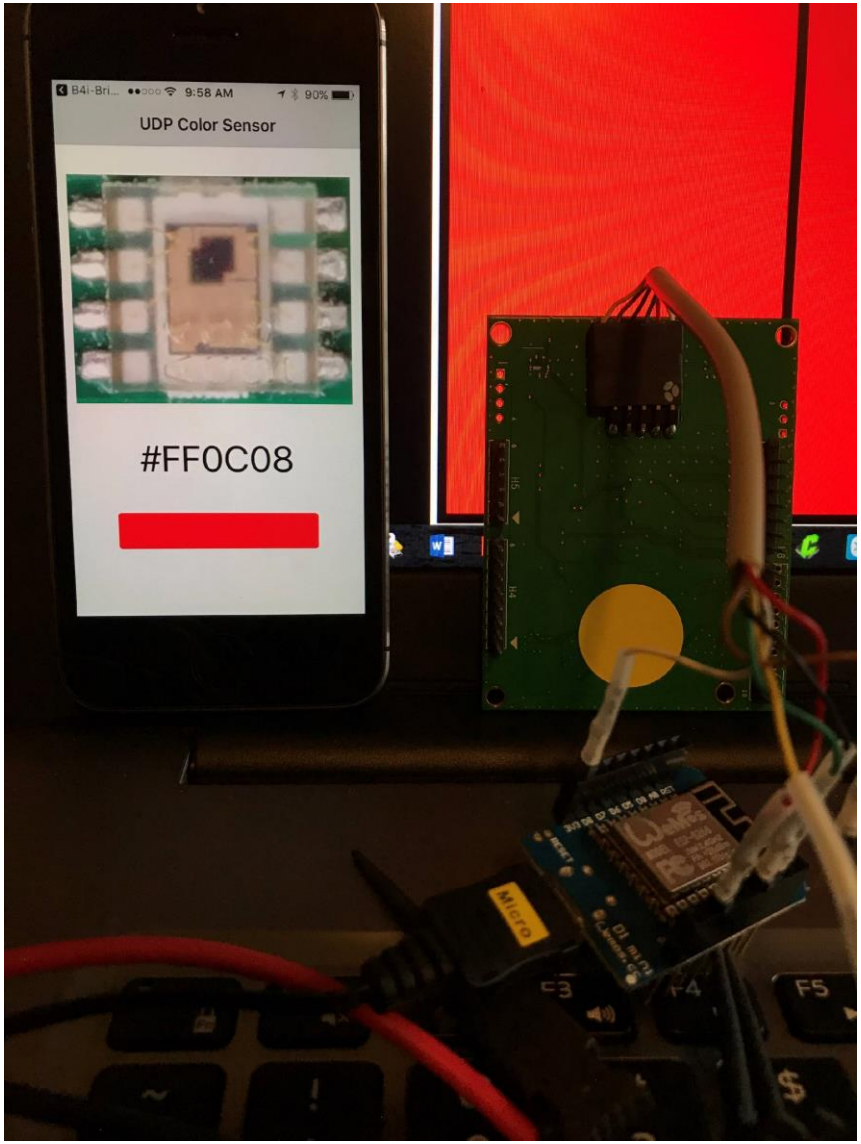
Coding a B4i/B4R UDP Color Monitor – iPhone

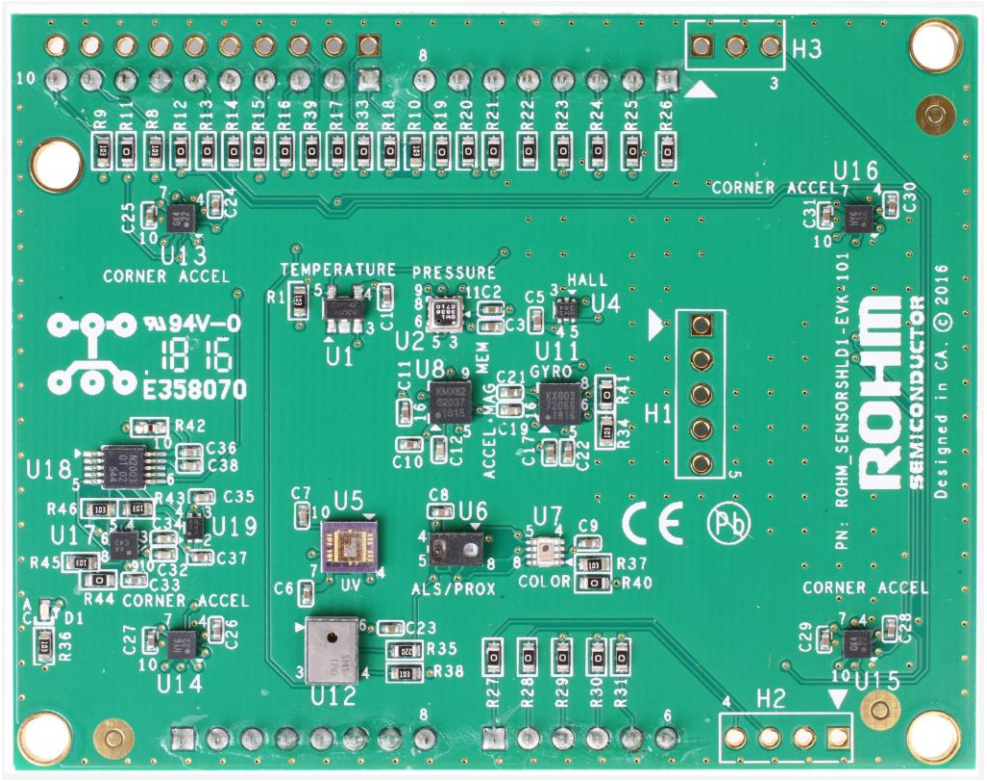
```
57  Private Sub colorData_PacketArrived (packet As UDPPacket)
58      Dim x As Byte
59      rgb_s1R = (packet.Data(0) * 256) + packet.Data(1)
60      rgb_s1G = (packet.Data(2) * 256) + packet.Data(3)
61      rgb_s1B = (packet.Data(4) * 256) + packet.Data(5)
62      rgb_s1C = (packet.Data(6) * 256) + packet.Data(7)
63
64      redIntensity = rgb_s1R * 1.39
65      grnIntensity = rgb_s1G * 1
66      bluIntensity = rgb_s1B * 1.79
67
68      If redIntensity >= grnIntensity And redIntensity >= bluIntensity Then
69          maxIntensity = redIntensity
70      Else If grnIntensity >= redIntensity And grnIntensity >= bluIntensity Then
71          maxIntensity = grnIntensity
72      Else
73          maxIntensity = bluIntensity
74      End If
75
76      redScaled = (redIntensity/maxIntensity) * 255
77      grnScaled = (grnIntensity/maxIntensity) * 255
78      bluScaled = (bluIntensity/maxIntensity) * 255
79      scaledColors(0) = redScaled
80      scaledColors(1) = grnScaled
81      scaledColors(2) = bluScaled
82      txfHexColor.Text = "#" & bc.HexFromBytes(scaledColors)
83      lblColor.Color = Colors.RGB(redScaled,grnScaled,bluScaled)
84      x = x + 1
85  End Sub
```



IoT Programming with Basic for iOS

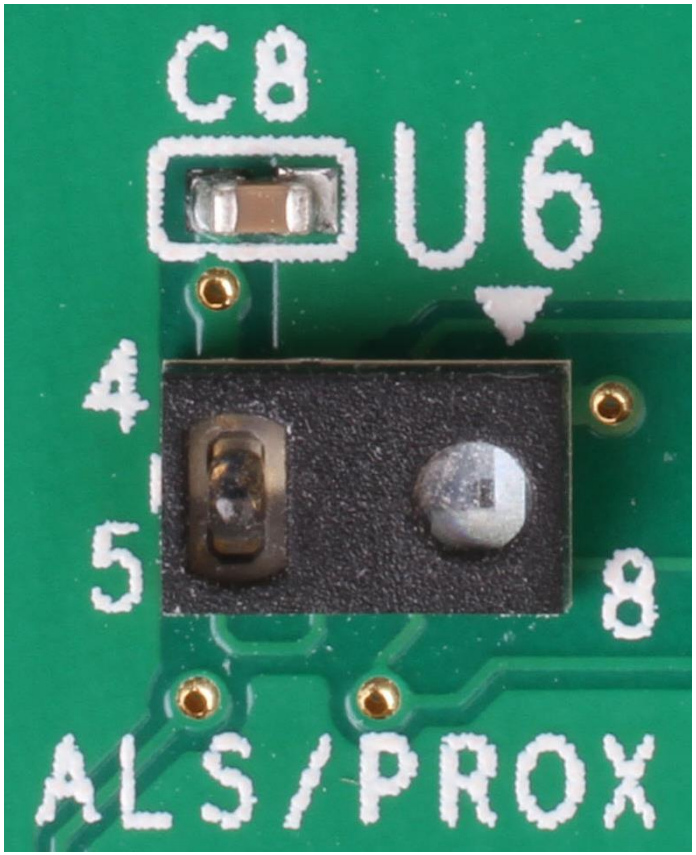
Coding a B4i/B4R UDP Color Monitor – iPhone



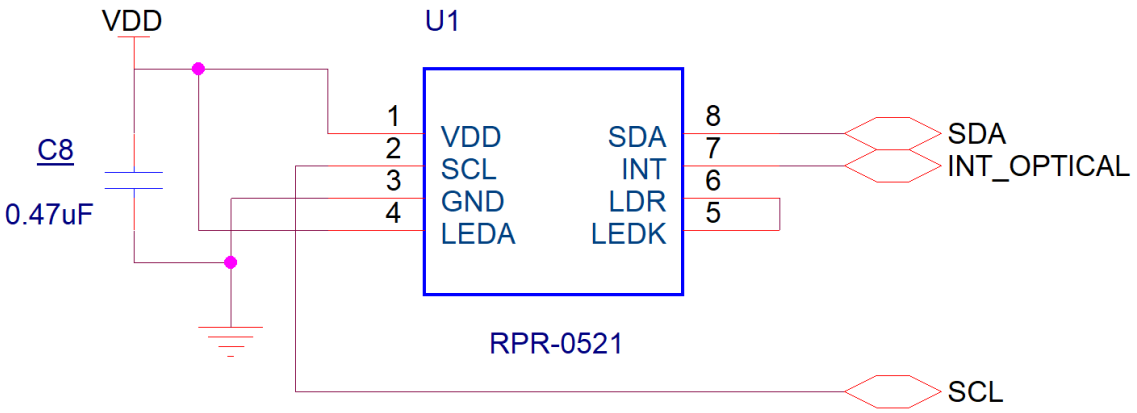


IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - Sensor




```
Sub Process_Globals
    'These global variables will be declared once when the application starts.
    'Public variables can be accessed from all modules. **
    Public Serial1 As Serial
    Private i2cMaster As WireMaster
    Private udpSocket As WiFiUDP
    Private Timer1 As Timer
    Private espwifi As ESP8266WiFi
    Private ip() As Byte = Array As Byte(192, 168, 1, 255)
    Private port As UInt = 51042
    Private udpBuffer(2) As Byte
    Private const RPR0521Addr As Byte = 0x38
    Private alsProxRaw(2) As Byte
End Sub
```

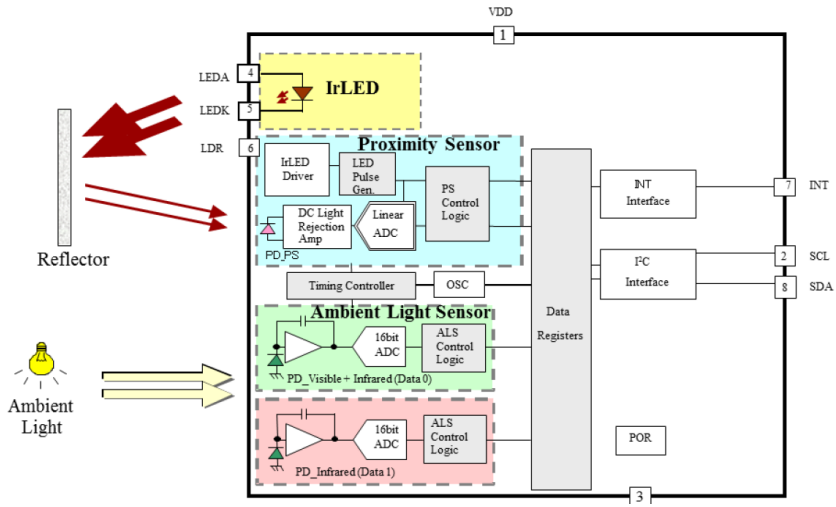


IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - Sensor

```
Private Sub AppStart
    Serial1.Initialize(115200)
    Log("AppStart")
    If espwifi.Connect2("MySpectrumWiFi1a-2G","password") = False Then
        Log("Error connecting to network")
        Return
    Else
        Log("Connected to network")
    End If
    i2cMaster.Initialize
    i2cMaster.WriteTo(RPR0521Addr, Array As Byte (0x92))
    Dim b() As Byte = i2cMaster.RequestFrom(RPR0521Addr,1)
    If b(0) <> 0xE0 Then
        Log("ALS/PROX Sensor Not Found")
        Log(b(0))
        Return
    Else
        Log("ALS/PROX Sensor Found")
        Log(b(0))
    End If
    'write 0xC6 to MODE CONTROL Register (ALS EN, PS EN, 100mS measurement ALS/PS, PS_PULSE=1)
    i2cMaster.WriteTo(RPR0521Addr, Array As Byte(0x41,0xE6))
    'write 0x03 to ALS_PS_CONTROL Register (LED current = 200mA)
    i2cMaster.WriteTo(RPR0521Addr, Array As Byte(0x42,0x03))
    'write 0x20 to PERSIST Register (X4 gain)
    i2cMaster.WriteTo(RPR0521Addr, Array As Byte(0x43,0x20))

    udpSocket.Initialize(51042, "udpSocket_PacketArrived")
    Timer1.Initialize("Timer1_Tick", 500)
    Timer1.Enabled = True
End Sub
```



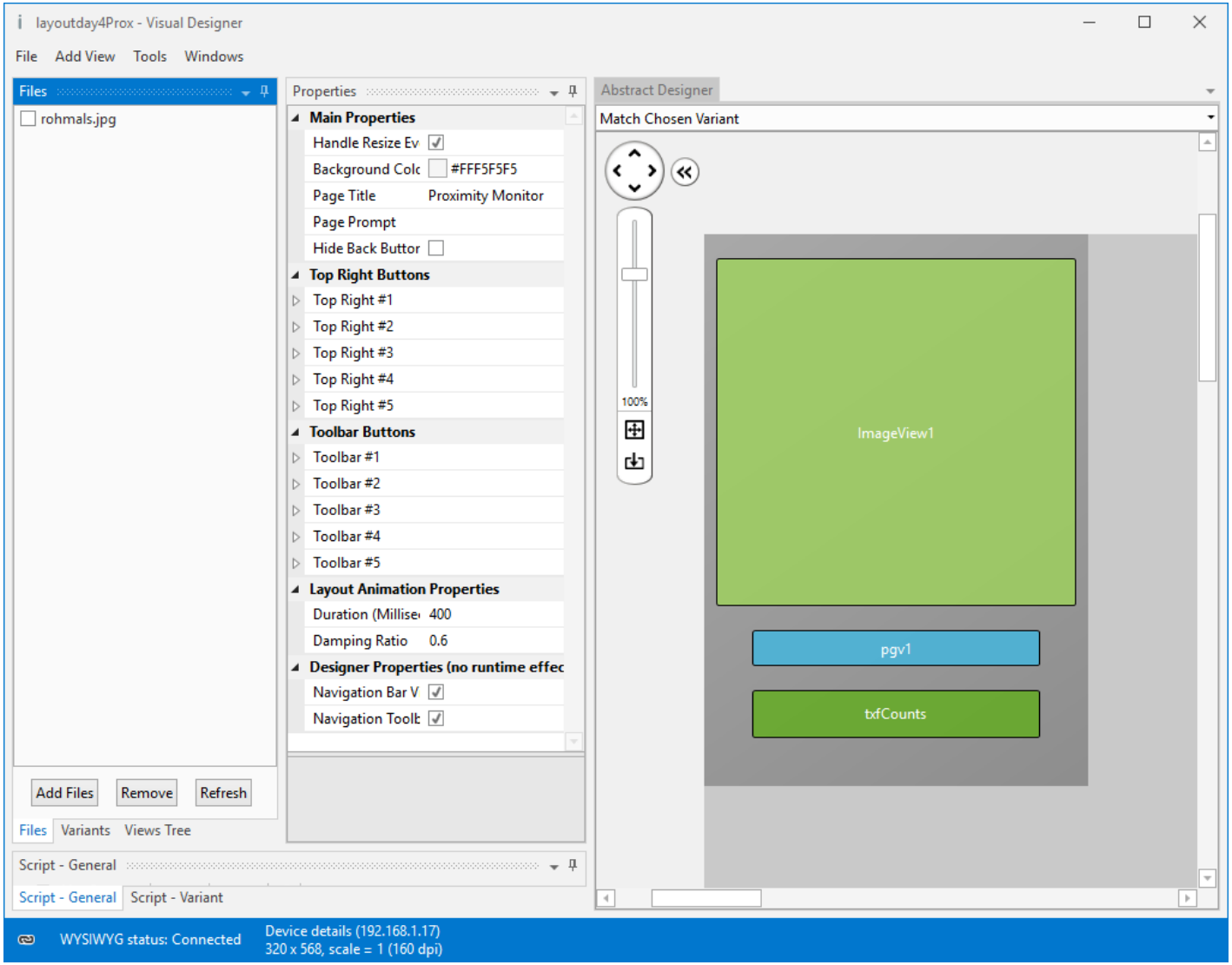
IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - Sensor

```
55  Private Sub Timer1_Tick
56      readALS_PROX
57      udpBuffer(0) = alsProxRaw(1)
58      udpBuffer(1) = alsProxRaw(0)
59      udpSocket.BeginPacket(ip, port)
60      udpSocket.Write(udpBuffer)
61      udpSocket.SendPacket
62  End Sub
63
64  Private Sub readALS_PROX
65      Dim i As Byte
66      'write begin of color data address (0x44)
67      i2cMaster.WriteTo2(RPR0521Addr, False, Array As Byte(0x44))
68      'read 2 bytes of ALS/PROX data
69      Dim b() As Byte = i2cMaster.RequestFrom(RPR0521Addr, 2)
70      For i = 0 To 1
71          alsProxRaw(i) = b(i)
72      Next
73      Log(alsProxRaw(0))
74      Log(alsProxRaw(1))
75  End Sub
```

IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - iPhone



IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - iPhone

```
13  Sub Process_Globals
14      'These global variables will be declared once when the application starts.
15      'Public variables can be accessed from all modules.
16      Public App As Application
17      Public NavControl As NavigationController
18      Private Page1 As Page
19      Private socket As UDPSocket
20      Private port As Int = 51042
21      Private buffSize As Int = 2
22      Private proxData As Short
23      Private pgv1 As ProgressView
24      Private txfCounts As TextField
25  End Sub
26
27  Private Sub Application_Start (Nav As NavigationController)
28      'SetDebugAutoFlushLogs(True) 'Uncomment if program crashes before all logs are printed.
29      socket.Initialize("proxData",port,buffSize)
30      NavControl = Nav
31      Page1.Initialize("Page1")
32      Page1.RootPanel.LoadLayout("layoutDay4prox")
33      NavControl.ShowPage(Page1)
34  End Sub
35
36  Private Sub proxData_PacketArrived (packet As UDPPacket)
37      proxData = (packet.Data(0) * 256) + packet.Data(1)
38      Log(proxData)
39      pgv1.Progress = 0.000244200 * proxData
40      txfCounts.Text = proxData
41  End Sub
```

IoT Programming with Basic for iOS

Coding a B4i/B4R Proximity Monitor - iPhone

IoT Programming with Basic for iOS

Day 4's Done

- We IoT'ed Our Original B4i Color Calculator App
- We Closed In On An RPR-0521 Proximity Sensor