

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

```

00001 LIST p=pic16f84 ; list directive to define processor
00002 ERRORLEVEL -302
00003 ;
00004 ;

```

```

00005 ; Infra-Red LED Transmitter for Lap Timer
00006 ;
00007 ; Function
00008 ; 38kHz pulsed drive for Ir-LED
00009 ; 600uS Pluse output and 600uS interval
00010 ;
00011 ; History
00012 ; July 11, 2004 1st test version completed and worked
00013 ; July 10, 2004 Start first coding By Kenji
00014 ;
00015 ; Programmed by Kenji Arai/JH1PJL
00016 ; E-mail: kenjia@sannet.ne.jp jh1pj1@arrl.net
00017 ; URL: http://www.page.sannet.ne.jp/kenjia/
00018 ;
00019 ; Copyright (C) 2004 Kenji Arai / JH1PJL
00020 ; All rights reserved. Permission is granted to use, modify,
00021 ; or redistribute this software so long as it is not sold or
00022 ; exploited for profit.
00023 ;
00024 ; THIS SOFTWARE IS PROVIDED AS IS AND WITHOUT
00025 ; WARRANTY OF ANY KIND,
00026 ; EITHER EXPRESSED OR IMPLIED.
00027 ;
00028 ;

```

```

00029
00030 INCLUDE <F84_Reg.h>
00119 LIST
00120
00031
00032 ;

```

```

00033 ; HARDWARE SETUP
00034 ;

```

```

00035
00036 ;***** System Clock

```

```

00037 ; Clock base = 4MHz (Xtal selection = XT)
00038 ; 1uS/Instruction cycle
00039
00040 ;***** PORT A

```

```

00000000 00041 ;
00000000 00042 IR_LED EQU 0 ; RA0(17) = Infra-Red LED Drive
00000001 00043 IND_LED EQU 1 ; RA1(18) = Indicator LED
00044
00000000 00045 PA_INT EQU 0x00 ; Port A xxx00000=00h 0=Out 1=In
00046
00047 ;***** PORT B

```

```

00048 ;

```

00000000 00049 SW0 EQU 0 ; RB0(6) = Switch input

00050

000000FF 00051 PB_INT EQU 0xFF ; Port B 11111111=FFh

LOC OBJECT CODE LINE SOURCE TEXT
VALUE

00052

00053 ;

00054 ; CONSTANT VALUE EQUATION

00055 ;

00056 ;

00000017 00057 ;DLY38kHz EQU .26 ; 38kHz=26.3uS, 26uS=38.4kHz

00058 DLY600uS EQU .23 ; 600us/26us=23.07, 26uS*23=598uS

00059

00060 ;

00061 ; DATA ASSIGN

00062 ;

00063 ;

00064 ;***** Data RAM Assignments *****

00065 ;

000C 00066 ORG 0Ch

000C 00067 OutSig RES 1 ; Output Signal Level

000D 00068 Cnt600uS RES 1 ; Counter for 600uS time base

00069 ;Cnt38kHz RES 1 ; Counter for 38KHz pulse

00070 ;Work1 RES 1 ; Temporary work area

00071

00072 ;***** EEPROM Assignments *****

00073 ;None EQU 0 ; Not use in EEPROM

00074

00075 ;

00076 ; CONTROL PROGRAM

00077 ;

00078 ;

0000 00079 org 0 ; RESET vector location

0000 2805 00080 goto Start

00081 ;

0004 00082 org 4 ; InterruptVector

0004 286F 00083 goto ServiceInterrupt

00084 ;

00085

00086 ;

00087 ; Start from here, when Power-On Reset is occurred.

00088

0005 00089 Start ; power_on reset (beginning of program)

0005 1283 00090 bcf STATUS,RP0 ; bank 0

00091 ;

0006 00092 Mclr_reset ; a master clear reset

0006 0183 00093 clrf STATUS ; do initialization (bank 0)

0007 018B 00094 clrf INTCON ; all interrupt disable

00095 ;

0008 1283 00096 bcf STATUS,RP0 ; bank 0

```

0009 3000      00097      movlw 0x00      ; set data for RA
000A 0085      00098      movwf PORTA
000B 3000      00099      movlw 0x00      ; set data for RB
000C 0086      00100      movwf PORTB
000D 1683      00101      bsf STATUS,RPO ; select bank 1
000E 3000      00102      movlw PA_INT
000F 0085      00103      movwf TRISA     ; RAX - 0=outputs 1=inputs
0010 30FF      00104      movlw PB_INT

```

LOC OBJECT CODE LINE SOURCE TEXT
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0011 0086      00105      movwf TRISB     ; RBX - 0=outputs 1=inputs
0012 1381      00106      bcf OPTION_R, RBPU ; enable PORTB pull-ups
0013 1283      00107      bcf STATUS,RPO ; select bank 0
0014 018B      00108      clrf INTCON     ; all interrupt disable
00109 ;      movf PORTB,W   ; read port
00110 ;      bcf INTCON,RBIF ; clear flag
00111 ;      bsf INTCON,RBIE ; enable mask
00112 ;      bsf INTCON,GIE ; interrupt enable
00113
00114 ;
00115 ;
*****
00116 ;      Main Flow
00117
0015      00118 Infinite_loop
00119 ;      ----- Output low during 600uS -----
0015 3000      00120      movlw 0x00     ; output is low (LED does not flash)
0016 008C      00121      movwf OutSig   ; save it in the RAM
0017 201C      00122      call Out600uS ; output 600uS 38kHz Modulated Pulse
00123 ;      ----- Output high during 600uS -----
0018 30FF      00124      movlw 0xFF     ; output is high (LED flash)
0019 008C      00125      movwf OutSig   ; save it in the RAM
001A 201C      00126      call Out600uS ; output 600uS 38kHz Modulated Pulse
001B 2815      00127      goto Infinite_loop ; continue to make pulse
00128 ;
00129
00130 ;***** Subroutines
*****
00131 ;
00132 ;      600uS Pulse Output
00133
001C      00134 Out600uS
001C 3017      00135      movlw DLY600uS ; set 600uS time base
001D 008D      00136      movwf Cnt600uS ; save into the RAM
001E      00137 Pulse38kHz ; 38kHz Pulse output
00138 ;      ----- 38kHz = 26uS = 26 instruction / 2 = 13
001E 080C      00139      movfw OutSig   ; read signal level ; +1(a,b)
001F 39FF      00140      andlw 0xFF     ; bit check ; +1(a,b)
0020 1D03      00141      btfsz STATUS, Z ; ; +1
(a) or +2(b)
0021 2824      00142      goto N38k_0H   ; +2 (a)
00143 ;
0022 1005      00144      bcf PORTA,IR_LED ; LED is OFF ; +1(b)
0023 2826      00145      goto N38k_1H   ; +2(b)
00146 ;
0024      00147 N38k_0H
0024 1405      00148      bsf PORTA,IR_LED ; LED is ON ; +1(a)
0025 0000      00149      nop

```

```

; +1(a)
0026          00150 N38k_1H
0026 0000    00151      nop      ; 1
; +1(a,b)
0027 0000    00152      nop      ; 2
; +1(a,b)
0028 0000    00153      nop      ; 3
; +1(a,b)
0029 0000    00154      nop      ; 4
; +1(a,b)
002A 0000    00155      nop      ; 5
; +1(a,b)
002B 0000    00156      nop      ; 6
; +1(a,b)
          00157 ;
13(b)
; Total instruction = 13(a),

```

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LOC OBJECT CODE      LINE SOURCE TEXT
VALUE
002C 3000          00158      movlw  0x00      ; set low level      ; +1(a,b)
002D 39FF          00159      andlw  0xFF      ; bit check          ; +1(a,b)
002E 1D03          00160      btfss  STATUS, Z          ; +1
(a) or +2(b)
002F 2832          00161      goto   N38k_0L          ; +2 (a)
          00162 ;
0030 1005          00163      bcf    PORTA,IR_LED      ; LED is OFF          ; +1(b)
0031 2834          00164      goto   N38k_1L          ; +2(b)
          00165 ;
0032          00166 N38k_0L
0032 1405          00167      bsf    PORTA,IR_LED      ; LED is ON          ; +1(a)
0033 0000          00168      nop
; +1(a)
0034          00169 N38k_1L
0034 0000          00170      nop      ; 1
; +1(a,b)
0035 0000          00171      nop      ; 2
; +1(a,b)
0036 0000          00172      nop      ; 3
; +1(a,b)
0037 0B8D          00173      decfsz Cnt600uS,Same      ; check time up      ; +1(a,b)
0038 281E          00174      goto   Pulse38kHz          ; not yet          ; +2(a,b)
          00175 ;
          ; Total instruction = 13(a),
13(b)
0039 0008          00176      return
          00177
          00178 ;

```

```

*****
003A 344A 3448 3431 00179      DT      "JH1PJL / Kenji Arai (c) 2004 -- kenjia@sannet.ne.jp"
      3450 344A 344C
      3420 342F 3420
      344B 3465 346E
      346A 3469 3420
      3441 3472 3461
      3469 3420 3428
      3463 3429 3420
      3432 3430 3430
      3434 3420 3420
      342D 342D 3420
      3420 346B 3465

```

346E 346A 3469
 3461 3440 3473
 3461 346E 346E
 3465 3474 342E
 346E 346

00180 ;

00181

00182

00183 ;

00184 ; Interrupt Routine

00185 ; NOT USE AT THIS APPLICATION

006F 00186 ServiceInterrupt

006F 118B 00187 bcf INTCON,RBIE ; clear mask

0070 0906 00188 comf PORTB,W ; read PORTB

0071 100B 00189 bcf INTCON,RBIF ; clear flag

0072 158B 00190 bsf INTCON,RBIE ; enable mask

0073 0009 00191 retfie

00192 ;

00193

00194 END

SYMBOL TABLE

LABEL	VALUE
C	00000000
CARRY	00000000
Cnt600uS	0000000D
DC	00000001
DCARRY	00000001
DLY600uS	00000017
EEADR	00000009
EECON1	00000088
EECON2	00000089
EEDATA	00000008
EEIE	00000006
EEIF	00000004
F	00000001
FALSE	00000000
FSR	00000004
GIE	00000007
INDF	00000000
IND_LED	00000001
INTCON	0000000B
INTE	00000004
INTEDG	00000006
INTF	00000001
IRP	00000007
IR_LED	00000000
Infinite_loop	00000015
LSB	00000000
MSB	00000007
Mclr_reset	00000006
N38k_OH	00000024
N38k_OL	00000032
N38k_1H	00000026
N38k_1L	00000034
NO	00000000
OPTION_R	00000081

Out600uS	0000001C
OutSig	0000000C
PA0	00000005
PA1	00000006
PA2	00000007
PA_INT	00000000
PB_INT	000000FF
PCL	00000002
PCLATH	0000000A
PD	00000003
PORTA	00000005
PORTB	00000006
PS0	00000000
PS1	00000001
PS2	00000002
PSA	00000003
P_DOWN	00000003
Pulse38kHz	0000001E
RBIE	00000003

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SYMBOL TABLE

LABEL	VALUE
RBIF	00000000
RBP	00000007
RD	00000000
RESET_V	00000000
RPO	00000005
RP1	00000006
RTCC	00000001
STATUS	00000003
SW0	00000000
Same	00000001
ServiceInterrupt	0000006F
Start	00000005
TOCS	00000005
TOIE	00000005
TOIF	00000002
TOSE	00000004
TO	00000004
TRISA	00000085
TRISB	00000086
TRUE	00000001
T_OUT	00000004
W	00000000
WR	00000001
WREN	00000002
WRERR	00000003
YES	00000001
Z	00000002
Z_bit	00000002
__16F84	00000001

MEMORY USAGE MAP ('X' = Used, '-' = Unused)

```

0000 : X --XXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX
0040 : XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXX -----

```

All other memory blocks unused.

Program Memory Words Used: 113

Program Memory Words Free: 911

Errors : 0

Warnings : 0 reported, 0 suppressed

Messages : 0 reported, 3 suppressed