```
MPASM  4.02 Released                       LAP_TIM_IR_TX.ASM   10-1-2005  6:13:52         PAGE  1
LOC  OBJECT CODE     LINE SOURCE TEXT
  VALUE
                     00001         LIST            p=pic12f675     ; 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 ;               October  1, 2005
                     00013 ;               September 18, 2005 Change CPU / PIC12F629
                     00014 ;               July    11, 2004 1st test version completed and worked
                     00015 ;               July    10, 2004 Start first coding By Kenji
                     00016 ;
                     00017 ;       Programmed by Kenji Arai/JH1PJL
                     00018 ;               E-mail:     kenjia@sannet.ne.jp  jh1pjl@arrl.net
                     00019 ;                       URL:        http://www.page.sannet.ne.jp/kenjia/
                     00020 ;
                     00021 ;       Copyright (C) 2004,'05  Kenji Arai / JH1PJL
                     00022 ;       All rights reserved. Permission is granted to use, modify,
                     00023 ;       or redistribute this software so long as it is not sold or
                     00024 ;       exploited for profit.
                     00025 ;
                     00026 ;       THIS SOFTWARE IS PROVIDED AS IS AND WITHOUT
                     00027 ;       WARRANTY OF ANY KIND,
                     00028 ;       EITHER EXPRESSED OR IMPLIED.
                     00029 ;            _________         _______
                     00030 ;           |         |       |       |
                     00031 ;           |         |       |       |
                     00032 ;       ____|         |_____  |       |_____
                     00033 ;               600uS    600uS     f=38KHz
                     00034 ;
                     00035 ;
*********************************************************************************
                     00036
                     00037 #include        P12F675.inc
                     00001         LIST
                     00002 ; P12F675.INC  Standard Header File, Version 1.04    Microchip Technology,
Inc.
                     00284         LIST
                     00038
                     00039 ;
*********************************************************************************
                     00040 ;       HARDWARE SETUP
                     00041 ;
*********************************************************************************
                     00042 ;       System Clock base = 4MHz (Xtal selection = XT)
                     00043 ;                       1uS/Instruction cycle
                     00044
2007   3FF1          00045         __config  _MCLRE_ON & _XT_OSC & _WDT_OFF & _BODEN_ON
                     00046
                     00047 ;*************** GPIO
```

```
*****************************************************************
                     00048 ;
  00000000           00049 IR_LED          EQU     0       ; GP0(pin7) = Infra-Red LED Drive
                     00050
                     00051 ;
*******************************************************************************
                     00052 ;       ONSTANT VALUE EQUATION
                     00053 ;
*******************************************************************************
                     00054 ;
  00000017           00055 DLY600uS        EQU     .23     ; 600us/26us=23.07, 26uS*23=598uS
                     00056
  00000001           00057 Same            EQU     1       ; same register
                     00058
  0000003E           00059 GPIO_INT        EQU     0x3e    ; Port   xx111110=38h  0=Out 1=In
  0000003E           00060 IO_PU_INT       EQU     0x3e    ; Pull-up register 0=disable 1=enable
  00000007           00061 CMP_OFF EQU     0x07    ; Comparater off and low power mode
                     00062
                     00063 ;
*******************************************************************************
                     00064 ;       DATA ASSIGN
                     00065 ;
*******************************************************************************
                     00066 ;
                     00067 ;*************** Data RAM Assignments
*****************************************
                     00068 ;
0020                 00069                 ORG    20h
0020                 00070 OutSig          RES     1               ; Output Signal Level
0021                 00071 Cnt600uS        RES     1               ; Counter for 600uS time base
                     00072
                     00073 ;***************  EEPROM Assignments
*****************************************
                     00074 ;None           EQU     0               ; Not use in EEPROM
                     00075
                     00076 ;
*******************************************************************************
                     00077 ;       CONTROL PROGRAM
                     00078 ;
*******************************************************************************
                     00079 ;
0000                 00080         org     0                               ; RESET vector location
0000   2805          00081         goto    Start
                     00082 ;
0004                 00083         org     4                               ; InterruptVector
0004   283B          00084         goto    ServiceInterrupt
                     00085 ;
                     00086
                     00087 ;
*******************************************************************************
                     00088 ;       Start from here, when Power-On Reset is occurred.
                     00089
0005                 00090 Start                           ; power_on reset (beginning of program)
0005   1283          00091         bcf     STATUS,RP0      ; bank 0
                     00092 ;
0006                 00093 Mclr_reset                      ; a master clear reset
0006   0183          00094         clrf    STATUS  ; do initialization (bank 0)
0007   018B          00095         clrf    INTCON          ; all interrupt disable
```

```
                    00096 ;
0008   1283         00097         bcf     STATUS,RP0      ; bank 0
0009   3000         00098         movlw   0x00            ; set data for GPIO
000A   0085         00099         movwf   GPIO
000B   3007         00100         movlw   CMP_OFF ; comparater off
000C   0099         00101         movwf   CMCON
000D   1683         00102         bsf     STATUS,RP0      ; select bank 1
000E   019F         00103         clrf    ANSEL           ; digital I/O
000F   303E         00104         movlw   GPIO_INT
0010   0085         00105         movwf   TRISIO          ; GPIO  -  0=outputs 1=inputs
0011   1381         00106         bcf     OPTION_REG, NOT_GPPU    ; enable pull-ups
0012   303E         00107         movlw   IO_PU_INT       ; each port pull-ups
0013   0095         00108         movwf   WPU
0014   1283         00109         bcf     STATUS,RP0      ; select bank 0
0015   018B         00110         clrf    INTCON          ; all interrupt disable
                    00111
                    00112 ;
                    00113 ;
********************************************************************************
                    00114 ;       Main Flow
                    00115
0016                00116 Infinite_loop
                    00117 ;       ----------- Output low during 600uS -------------
0016   3000         00118         movlw   0x00            ; output is low (LED does not flash)
0017   00A0         00119         movwf   OutSig          ; save it in the RAM
0018   201D         00120         call    Out600uS        ; otput 600uS 38kHz Modulated Pulse
                    00121 ;       ----------- Output high during 600uS ------------
0019   30FF         00122         movlw   0xFF            ; output is high (LED flash)
001A   00A0         00123         movwf   OutSig          ; save it in the RAM
001B   201D         00124         call    Out600uS        ; otput 600uS 38kHz Modulated Pulse
001C   2816         00125         goto    Infinite_loop   ; continue to make pulse
                    00126 ;
                    00127
                    00128 ;*************** Subroutines
************************************************************
                    00129 ;       600uS Pulse Output
                    00130
001D                00131 Out600uS
001D   3017         00132         movlw   DLY600uS        ; set 600uS time base
001E   00A1         00133         movwf   Cnt600uS        ; save into the RAM
001F                00134 Pulse38kHz                      ; 38kHz Pulse output
                    00135 ;       ------  38kHz = 26uS = 26 instruction / 2 = 13
001F   0820         00136         movfw   OutSig          ; read signal level     ; +1(a,b)
0020   39FF         00137         andlw   0xFF            ; bit check             ; +1(a,b)
0021   1D03         00138         btfss   STATUS, Z                               ; +1(a) or +2(b)
0022   2825         00139         goto    N38k_0H                         ; +2    (a)
                    00140 ;
0023   1005         00141         bcf     GPIO,IR_LED     ; LED is OFF            ; +1(b)
0024   2827         00142         goto    N38k_1H                         ; +2(b)
                    00143 ;
0025                00144 N38k_0H
0025   1405         00145         bsf     GPIO,IR_LED     ; LED is ON             ; +1(a)
0026   0000         00146         nop                                             ; +1(a)
0027                00147 N38k_1H
0027   0000         00148         nop     ; 1                                     ; +1(a,b)
0028   0000         00149         nop     ; 2                                     ; +1(a,b)
0029   0000         00150         nop     ; 3                                     ; +1(a,b)
002A   0000         00151         nop     ; 4                                     ; +1(a,b)
```

```
002B   0000           00152         nop     ; 5                                   ; +1(a,b)
002C   0000           00153         nop     ; 6                                   ; +1(a,b)
                      00154 ;                               ; Total instruction        = 13(a), 13(b)
002D   3000           00155         movlw   0x00            ; set low level       ; +1(a,b)
002E   39FF           00156         andlw   0xFF            ; bit check           ; +1(a,b)
002F   1D03           00157         btfss   STATUS, Z                             ; +1(a) or +2(b)
0030   2833           00158         goto    N38k_0L                       ; +2    (a)
                      00159 ;
0031   1005           00160         bcf     GPIO,IR_LED     ; LED is OFF          ; +1(b)
0032   2835           00161         goto    N38k_1L                       ; +2(b)
                      00162 ;
0033                  00163 N38k_0L
0033   1405           00164         bsf     GPIO,IR_LED     ; LED is ON           ; +1(a)
0034   0000           00165         nop                                           ; +1(a)
0035                  00166 N38k_1L
0035   0000           00167         nop     ; 1                                   ; +1(a,b)
0036   0000           00168         nop     ; 2                                   ; +1(a,b)
0037   0000           00169         nop     ; 3                                   ; +1(a,b)
0038   0BA1           00170         decfsz  Cnt600uS,Same   ; check time up       ; +1(a,b)
0039   281F           00171         goto    Pulse38kHz      ; not yet             ; +2(a,b)
                      00172 ;                               ; Total instruction        = 13(a), 13(b)
003A   0008           00173         return
                      00174
                      00175 ;
*********************************************************************************
                      00176 ;       Interrupt Routine
                      00177 ;               NOT USE AT THIS APPLICATION
003B                  00178 ServiceInterrupt
003B   0009           00179         retfie
                      00180 ;
                      00181
                      00182 ;
*********************************************************************************
003C   344A 3448 3431 00183         DT      "JH1PJL / Kenji Arai (c) 2004,'05  -- 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 342C 3427
       3430 3435 3420
       3420 342D 342D
       3420 3420 346B
       3465 346E 346A
       3469 3461 3440
       3473 3461 346E
       346E 346
                      00184 ;
*********************************************************************************
                      00185         END
SYMBOL TABLE
  LABEL                               VALUE

ADCON0                            0000001F
ADCS0                             00000004
```

ADCS1	00000005
ADCS2	00000006
ADFM	00000007
ADIE	00000006
ADIF	00000006
ADON	00000000
ADRESH	0000001E
ADRESL	0000009E
ANS0	00000000
ANS1	00000001
ANS2	00000002
ANS3	00000003
ANSEL	0000009F
C	00000000
CAL0	00000002
CAL1	00000003
CAL2	00000004
CAL3	00000005
CAL4	00000006
CAL5	00000007
CHS0	00000002
CHS1	00000003
CINV	00000004
CIS	00000003
CM0	00000000
CM1	00000001
CM2	00000002
CMCON	00000019
CMIE	00000003
CMIF	00000003
CMP_OFF	00000007
COUT	00000006
Cnt600uS	00000021
DC	00000001
DLY600uS	00000017
EEADR	0000009B
EECON1	0000009C
EECON2	0000009D
EEDAT	0000009A
EEDATA	0000009A
EEIE	00000007
EEIF	00000007
F	00000001
FSR	00000004
GIE	00000007
GO	00000001
GO_DONE	00000001
GP0	00000000
GP1	00000001
GP2	00000002
GP3	00000003
GP4	00000004
GP5	00000005
GPIE	00000003
GPIF	00000000
GPIO	00000005
GPIO0	00000000
GPIO1	00000001

GPIO2	00000002
GPIO3	00000003
GPIO4	00000004
GPIO5	00000005
GPIO_INT	0000003E
INDF	00000000
INTCON	0000000B
INTE	00000004
INTEDG	00000006
INTF	00000001
IOC	00000096
IOC0	00000000
IOC1	00000001
IOC2	00000002
IOC3	00000003
IOC4	00000004
IOC5	00000005
IOCB	00000096
IOCB0	00000000
IOCB1	00000001
IOCB2	00000002
IOCB3	00000003
IOCB4	00000004
IOCB5	00000005
IO_PU_INT	0000003E
IRP	00000007
IR_LED	00000000
Infinite_loop	00000016
Mclr_reset	00000006
N38k_0H	00000025
N38k_0L	00000033
N38k_1H	00000027
N38k_1L	00000035
NOT_BOD	00000000
NOT_DONE	00000001
NOT_GPPU	00000007
NOT_PD	00000003
NOT_POR	00000001
NOT_T1SYNC	00000002
NOT_TO	00000004
OPTION_REG	00000081
OSCCAL	00000090
Out600uS	0000001D
OutSig	00000020
PCL	00000002
PCLATH	0000000A
PCON	0000008E
PEIE	00000006
PIE1	0000008C
PIR1	0000000C
PS0	00000000
PS1	00000001
PS2	00000002
PSA	00000003
Pulse38kHz	0000001F
RD	00000000
RP0	00000005
RP1	00000006

```
STATUS                          00000003
Same                            00000001
ServiceInterrupt                0000003B
Start                           00000005
T0CS                            00000005
T0IE                            00000005
T0IF                            00000002
T0SE                            00000004
T1CKPS0                         00000004
T1CKPS1                         00000005
T1CON                           00000010
T1IE                            00000000
T1IF                            00000000
T1OSCEN                         00000003
TMR0                            00000001
TMR1CS                          00000001
TMR1GE                          00000006
TMR1H                           0000000F
TMR1IE                          00000000
TMR1IF                          00000000
TMR1L                           0000000E
TMR1ON                          00000000
TRISIO                          00000085
VCFG                            00000006
VR0                             00000000
VR1                             00000001
VR2                             00000002
VR3                             00000003
VRCON                           00000099
VREN                            00000007
VRR                             00000005
W                               00000000
WPU                             00000095
WR                              00000001
WREN                            00000002
WRERR                           00000003
Z                               00000002
_BODEN_OFF                      00003FBF
_BODEN_ON                       00003FFF
_CPD_OFF                        00003FFF
_CPD_ON                         00003EFF
_CP_OFF                         00003FFF
_CP_ON                          00003F7F
_EC_OSC                         00003FFB
_EXTRC_OSC_CLKOUT               00003FFF
_EXTRC_OSC_NOCLKOUT             00003FFE
_HS_OSC                         00003FFA
_INTRC_OSC_CLKOUT               00003FFD
_INTRC_OSC_NOCLKOUT             00003FFC
_LP_OSC                         00003FF8
_MCLRE_OFF                      00003FDF
_MCLRE_ON                       00003FFF
_PWRTE_OFF                      00003FFF
_PWRTE_ON                       00003FEF
_WDT_OFF                        00003FF7
_WDT_ON                         00003FFF
_XT_OSC                         00003FF9
__12F675                        00000001
```

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

0000 : X---XXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX
0040 : XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX XXXXX-----------
2000 :  ------X-------- ---------------- ---------------- ----------------

All other memory blocks unused.

Program Memory Words Used:   114
Program Memory Words Free:   910


Errors   :     0
Warnings :     0 reported,     0 suppressed
Messages :     0 reported,     4 suppressed
```