Keywords: DS1318,RTC,Elapsed-Time Counter,ETC

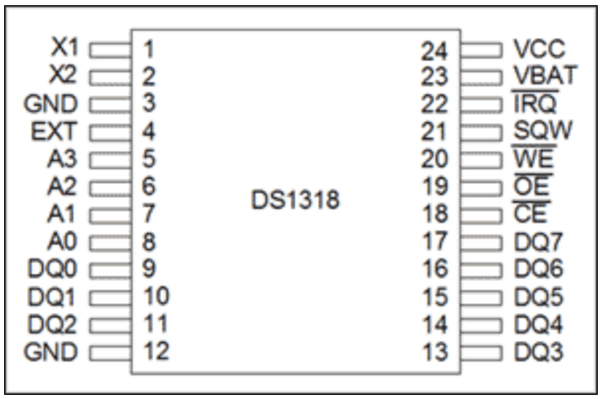
APPLICATION NOTE 3721

Interfacing the DS1318 with an 8051-type Microcontroller

Dec 23, 2005

Abstract: This note demonstrates an application that counts the passage of days using the DS1318 Elapsed-Time Counter. The software example includes basic operating routines. A schematic of the application circuit is included.

DS1318 Pin Assignment



Counter Overview

This application note demonstrates how to use the DS1318 Elapsed-Time Counter. The DS1318 has a 44-bit counter that increments once every 244µs. The 44-bit counter is accessed through six 8-bit registers (**Figure 1**).

ADDRESS	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	FUNCTION	RANGE
00H	SS3	SS2	SS1	SS0	0	0	0	SQWS	Sub-Seconds0	00-F0h
01H	SS11	SS10	SS9	SS8	SS7	SS6	SS5	SS4	Sub-Seconds1	00-FFh
02H	S7	S6	S5	S4	S3	S2	S1	S0	Seconds0	00-FFh
03H	S15	S14	S13	S12	S11	S10	S9	S8	Seconds1	00-FFh
04H	S23	S22	S21	S20	S19	S18	S17	S16	Seconds2	00-FFh
05H	S31	S30	S29	S28	S27	S26	S25	S24	Seconds3	00-FFh

Figure 1. DS1318 44-bit counter configuration.

Conceptually, the 44-bit counter can be broken into a 12-bit sub-second counter and a 32-bit counter that increments once per second (**Figure 2**). If sub-second resolution is not required, only the 32-bit second counter registers can be accessed.

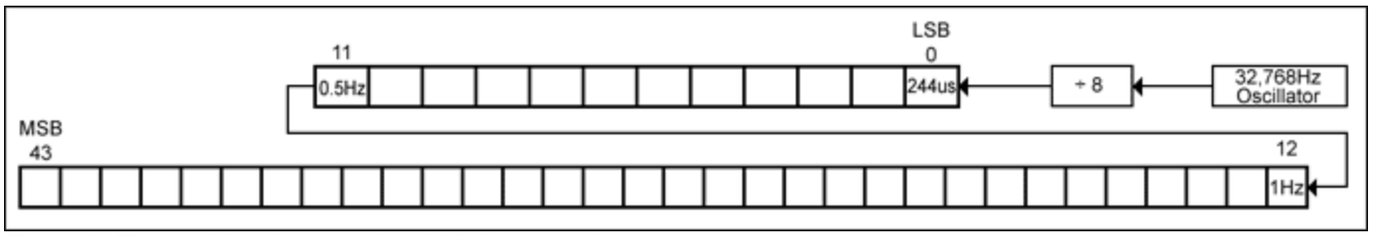


Figure 2. The 12-bit sub-second and 32-bit second counters.

In the example for this application note, a software routine reads the 32-bit seconds counter continuously, and outputs the time and date in ASCII format through a UART on an 8051 microcontroller (µC) on each once-per-second change. The time and date value is based upon the elapsed time, in seconds, from January 1, 1970 00:00:00. A value of 00000000h would be January 1, 1970 00:00:00. A value of 42C924C0h corresponds to 2005/7/4 12:00:00.

Another routine configures the device's periodic interrupt to a 1Hz rate. Each time an interrupt occurs, an interrupt handling routine reads the counter data, converts the data to a time and date format, and outputs the data in ASCII through the UART.

Additional routines are possible. In other examples the DS1318 could: take user inputs to write data to a single register; take time and date information from the user and convert it to elapsed time in seconds from January 1, 1970; write the value to the counter. Another routine reads all the DS1318 registers and outputs them in hexadecimal format.

Operation

The hardware example in this application note places the DS1318 into the µC's data memory space. The µC accesses the DS1318's registers by reading and writing the appropriate data-memory locations.

A low-voltage 8051-compatible microcontroller, the DS80C323, is used in this example. User inputs and data outputs from the program are passed to the µC through an RS-232 interface from a terminal emulator program on a PC. More information about the DS80C323 microcontroller used in this application note can be found on our website.

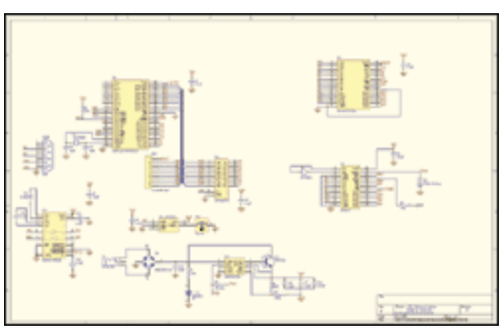
The software is shown in the Program Listing, **Figure 3**. A schematic of the circuit is shown in **Figure 4**.

```
Figure 3. Program Listing /
*****************************************************************************/
/* Ds1314AN.c program, use on the DS1318 app note board                      */
/*****************************************************************************/
#include <stdio.h>              /* Prototypes for I/O functions              */
#include <DS5000.h>             /* Registers declarations for DS5000         */
#include <absacc.h>             /* needed to define xdata addresses          */
/****************************** Defines ************************************/
#define SEC1    XBYTE[0x3000]
#define SEC2    XBYTE[0x3001]
#define SEC0    XBYTE[0x3002]
#define MIC1    XBYTE[0x3003]
#define HRC2    XBYTE[0x3004]
#define HRC1    XBYTE[0x3005]
#define AL0     XBYTE[0x3006]
#define AL1     XBYTE[0x3007]
#define AL2     XBYTE[0x3008]
#define AL3     XBYTE[0x3009]
#define CTLA    XBYTE[0x300A]
#define CTLB    XBYTE[0x300B]
#define STAT    XBYTE[0x300C]
/************************** bit definitions ********************************/
/************************** Global Variables *******************************/
uchar   int_flg = 0;
/************************* Function Prototypes *****************************/
void    init_rtc();
void    writebyte();
void    readregs();
void    disp_clk_regs();
void    disp_clk_regs_int();
void    bin2date();
unsigned long   date2bin(uint, uint, uint, uint, uint, uint);
void    external0_int(void);

void init_rtc() /* ------------ set the time and date ---------------- */
/* Note: NO error checking is done on the user entries! */
{
uint    yrs, mon, dt, hrs, min, sec;
unsigned long y;

        printf("\nEnter the year (1970-2099): ");
        scanf("%d", &yrs);
        printf("Enter the month (1-12): ");
        scanf("%d", &mon);
        printf("Enter the date (1-31): ");
        scanf("%d", &dt);
        printf("Enter the hour (0-23): ");
        scanf("%d", &hrs);
        printf("Enter the minute (0-59): ");
        scanf("%d", &min);
        printf("Enter the second (0-59): ");
```

Download (TXT, 7K)
Figure 3. Program listing.



More Detailed Image (PDF, 30K)
Figure 4. Circuit schematic.

Related Parts		
DS1318	Parallel-Interface Elapsed Time Counter	Free Samples

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