Application Note 2833
Interfacing an SPI RTC with a Motorola DSP

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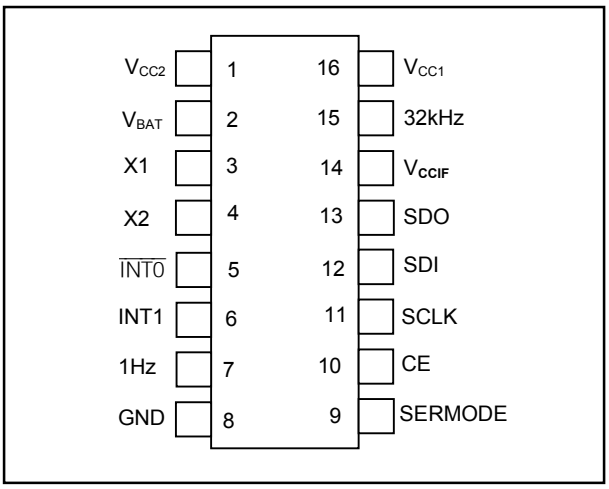
DS1306 Pin Configuration



Description

The DS1306 real-time clock (RTC) can be interfaced with a microcontroller (µC) or digital signal processing (DSP) unit using a 3-wire or an SPI™ interface. This application note shows how to connect a DS1306 to a Motorola DSP that has a built-in SPI interface module. The DS1305 could also be used in this application. This circuit uses the Motorola DSP56F800DEMO Demonstration Board and CodeWarrior IDE.

Using the Example Software

The example software was developed by starting with a blank project. Follow the instructions in the Motorola Kit Installation Guide (Tutorial: Creating a CodeWarrior Project) for details. Add the code included in this application note in main.c.

Operation

The program uses a GPIO port to control CE on the DS1306. The software initializes the SPI controller module in the DSP writes the time and date to the DS1306. The software then loops reading the time and date. The DS1305 and DS1306 support SPI modes 1and 3.

Figure 1 shows a schematic of the circuit. This circuit comprises a daughter card that is attached to the Motorola demo board. Please note that the circuit in Figure 1 includes several RTCs with SPI interfaces. Only one RTC may be used at a time, and the software only supports the DS1306. The software is shown in Figure 2.

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REV: 111203

Figure 1. Daughter Card for the DSP56F800DEMO Board

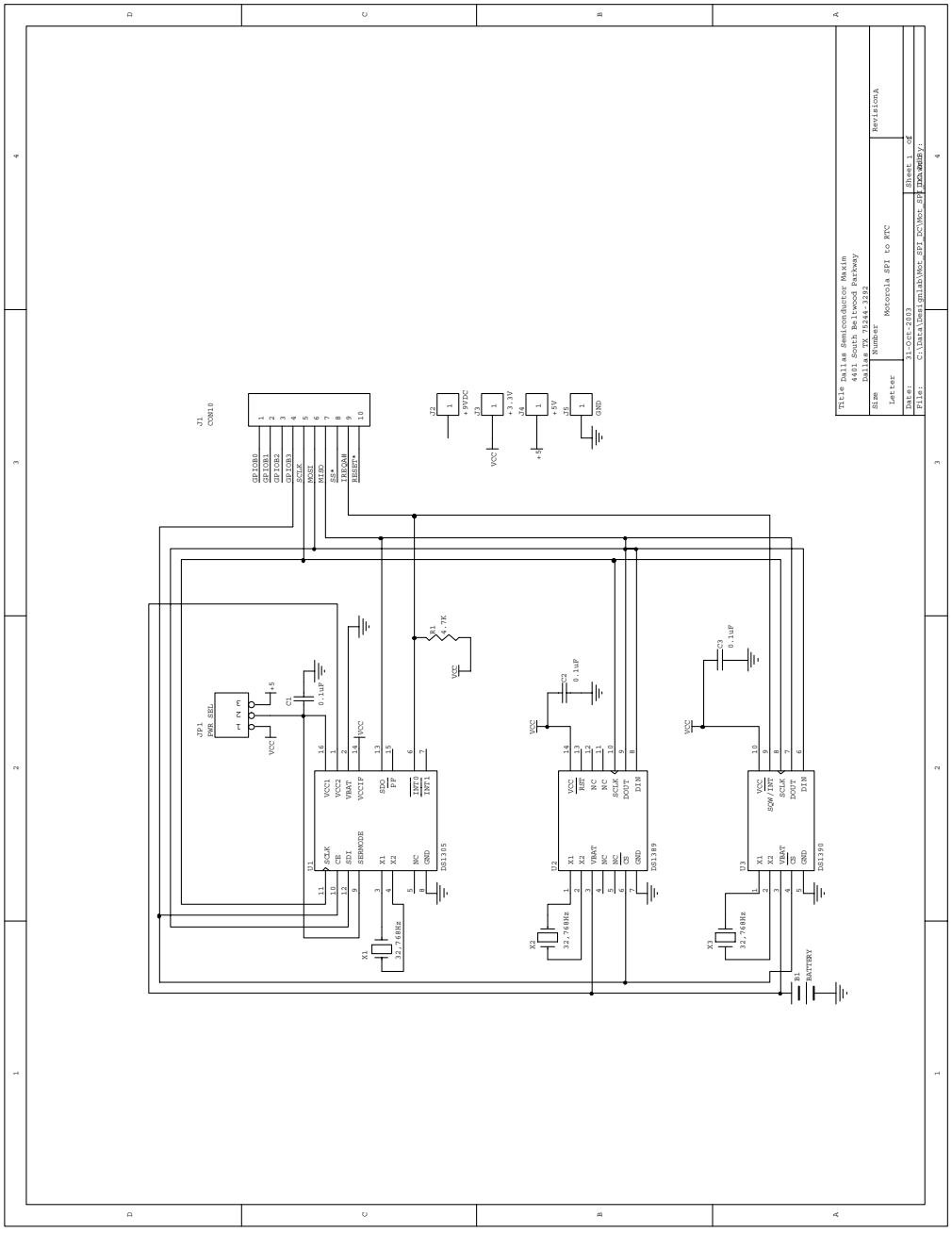

Figure 2. Code for demo

```
/* File: main.c */
/* This example program was developed using the Motorola
56F800 Demo Board Kit.  Follow the kit instalation guide
for creating a CodeWarrior Project.  Use the shell of the
new project for this example.  Note: This program is for
example only and is not supported by Dallas Semiconductor
Maxim. */

#include "port.h"
#include "stdio.h"
#include "stdlib.h"

/*****************************************************
* Main program for use with Embedded SDK
*****************************************************/

extern sampleASM (void);

void reset_spi(void);
void wbyte_spi(unsigned char);
unsigned char  rbyte_spi(void);

#define     REG_BASE 0x0000
#define     SPI_BASE 0x0F20
#define     GPIOB_BASE 0x0FC0

#define     SPSCR *(volatile UWord16 *)(SPI_BASE + 0)
#define     SPDSR *(volatile UWord16 *)(SPI_BASE + 1)
#define     SPDRR *(volatile UWord16 *)(SPI_BASE + 2)
#define     SPDTR *(volatile UWord16 *)(SPI_BASE + 3)

#define     GPIO_B_PUR *(volatile UWord16 *)(GPIOB_BASE + 0)
#define     GPIO_B_DR *(volatile UWord16 *)(GPIOB_BASE + 1)
#define     GPIO_B_DDR *(volatile UWord16 *)(GPIOB_BASE + 2)
#define     GPIO_B_PER *(volatile UWord16 *)(GPIOB_BASE + 3)

void main (void)
{
unsigned char     min=0x58, sec=0x59, hr=0x09, dow=0x04, date=0x23,
                        mon=0x10, yr=0x03;

      reset_spi();

      GPIO_B_DR = 0;                // disble RTC - CS low

      GPIO_B_DR = 0x0008;           // enable RTC - CS high
      wbyte_spi(0x8f);        // control register write address
      rbyte_spi();                  // dummy read
      wbyte_spi(0);                 // disable write protect
      rbyte_spi();
      GPIO_B_DR = 0;                // disble RTC - CS low

      GPIO_B_DR = 0x0008;           // enable RTC - CS high
      wbyte_spi(0x80);        // select seconds register write address
      rbyte_spi();                  // dummy read
      wbyte_spi(sec);               // seconds register data
```

```
	rbyte_spi();
	wbyte_spi(min);			// minutes register
	rbyte_spi();
	wbyte_spi(hr);			// hours register
	rbyte_spi();
	wbyte_spi(dow);			// day of week register
	rbyte_spi();
	wbyte_spi(date);		// date register
	rbyte_spi();
	wbyte_spi(mon);			// month register
	rbyte_spi();
	wbyte_spi(yr);			// year register
	rbyte_spi();
	GPIO_B_DR = 0;			// disble RTC - CS low

	while(1)
	{
		GPIO_B_DR = 0x0008;		// enable RTC - CS high

		wbyte_spi(0);			// seconds register read address
		rbyte_spi();			// dummy read
		wbyte_spi(0);
		sec = rbyte_spi();		// read seconds register
		wbyte_spi(0);
		min = rbyte_spi();		// ditto minutes
		wbyte_spi(0);
		hr = rbyte_spi();		// and so on
		wbyte_spi(0);
		dow = rbyte_spi();
		wbyte_spi(0);
		date = rbyte_spi();
		wbyte_spi(0);
		mon = rbyte_spi();
		wbyte_spi(0);
		yr = rbyte_spi();

		GPIO_B_DR = 0;			// disable RTC - CS low
	}

	return;
}

//SPSCR
//15 14  13   12     11   10    9     8    7       6       5    4        3    2    1
0
// r MSB SPRF ERRIE  ovrf modf spte modfen spr1    spr0    sprie spmstr    cpol cpha
spe  spite

void reset_spi()
{
int   val;
	SPSCR = 0x0096;   // SPR0, SPMSTR, CPHA, SPE
	SPDSR = 0x0007;   // 8-bit size

	SPSCR &= 0xfffd;  // clear spe, resets SPI (partial)
	SPSCR |= 0x0002;  // set spe, new values take effect

	GPIO_B_PER = 0x00f3;    // use GPIOB3 as CS for RTC
	GPIO_B_DDR = 0x000c;    // direction is output
```

```
}

void  wbyte_spi( unsigned char  wbyte)    // ------ write one byte -------
{
      while (!(SPSCR & 0x0200));    // wait for transmitter empty flag

      SPDTR = wbyte;
}

unsigned char rbyte_spi(void) // -------- read one byte ----------
{
      while (!(SPSCR & 0x2000));    // wait for receiver full flag

      return(SPDRR);

}
```