

OVERVIEW

The DS1340-33 serial-access real-time clock (RTC) provides a clock/calendar that is pin compatible and functionally equivalent to the ST Microelectronics M41T00, including the software clock calibration function.

If used as a drop-in replacement, no PC board or software changes are required. In fact, the DS1340-33 is an enhancement because it provides a lower timekeeping voltage (1.3V compared to 2.0V), 2-wire operation down to 1.8V, 2-wire bus speeds up to 400kHz, and a smaller package option. It also provides trickle-charge capability on the V_{BACKUP} pin and an oscillator-stop-flag bit, which requires two additional registers.

This application note describes the differences between these two parts.

PACKAGE

The DS1340 provides two packaging options. The first option is an 8-pin SO (150-mils wide), which is identical to the M41T00M6. This would be the package selected if the DS1340 is being used as a second-source device. The second option is a smaller 8-pin μ SOP. This package's dimensions are detailed in the following link: http://pdfserv.maxim-ic.com/arpdf/Packages/g2018_001.pdf.

ELECTRICAL CHARACTERISTICS

The following chart details the electrical characteristics for the DS1340-33 and the M41T00.

PARAMETER	DS1340-33			M41T00			UNITS
	MIN	TYP	MAX	MIN	TYP	MAX	
Supply Voltage	2.97	3.3	5.5	2.0		5.5	V
Backup Supply Voltage	1.3		5.5	2.0	3.0	3.5	V
Power-Fail Voltage	2.70	2.88	2.97	$V_{BAT} - 0.70$	$V_{BAT} - 0.50$	$V_{BAT} - 0.20$	V
Operating Current		120	200			300	μ A
Standby Current		85	125			70	μ A
Timekeeping Current, 2.97 to 5.5V, -40°C to +85°C		0.85	1.25		Not Specified	Not Specified	μ A
Timekeeping Current, 3.3V, +25°C		0.8	1.0		0.8	1.0	μ A

By examining the table, it becomes obvious that the DS1340-33 provides several enhancements over the M41T00.

The DS1340-33 supply voltage range is smaller, but lower operating voltages are available for the DS1340 with the -3 and -18 options. Overall, the DS1340 provides three operating ranges of 1.71V to 1.89V, 2.7V to 3.3V, and 2.97V to 5.5V.

One of the major advantages of the DS1340-33 is a much wider backup supply-voltage range. Timekeeping remains valid all the way down to 1.3V. When using a super cap with the integrated trickle charger, the backup supply can be charged to the supply voltage.

The DS1340-33 provides a fixed trip point, which is the voltage where power is switched between the supply voltage and the back-up supply. The M41T00 trip point is dependent on the backup supply voltage.

The typical timekeeping current values for the DS1340-33 and M41T00, as specified at 3.3V and +25°C, are identical. Dallas Semiconductor has verified that the DS1340-33 timekeeping current is less sensitive to voltage and temperature than the M41T00. As a result, the user can expect the DS1340-33 timekeeping current to be lower over the entire operating voltage and temperature ranges.

REGISTER MAP

The register map of the DS1340 is identical to the M41T00 so no firmware changes are required for existing sockets. Two additional registers are required for the trickle charger and status (shaded). These are designed to be transparent to any system that does not use them.

Figure 1. Register Map

ADDRESS	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	FUNCTION	RANGE	
00H	$\overline{\text{EOSC}}$	10 Seconds			Seconds			Seconds	00–59		
01H	R/W	10 Minutes			Minutes			Minutes	00–59		
02H	CEB	CB	10 Hours			Hours			Century/ Hours	0–1; 00–23	
03H	R/W	R/W	R/W	R/W	R/W	Day			Day	01–07	
04H	R/W	R/W	10 Date			Date			Date	00–31	
05H	R/W	R/W	R/W	10 Month			Month			Month	01–12
06H	10 Year				Year			Year	00–99		
07H	OUT	FT	S	CAL4	CAL3	CAL2	CAL1	CAL0	Control		
08H	TCS3	TCS2	TCS1	TCS0	DS1	DS0	ROUT1	ROUT0	Trickle Charger		
09H	OSF	0	0	0	0	0	0	0	Flag		

For more detail on each register, refer to the DS1340 data sheet (www.maxim-ic.com/DS1340).

Block access of the register map is identical to the ST device. During a multibyte access of the timekeeping registers, when the address pointer reaches 07h, the end of the RTC and control register space, it wraps around to location 00h.

The additional registers at address locations 08h and 09h are accessed by writing the address pointer to the corresponding location. In block mode, the address sequence is 08h, 09h, and then the address pointer wraps around to location 00h. The sequence then is identical to the M41T00.

If firmware is written to use either RTC, the additional registers can be used to identify the device in use. The M41T00 aliases the register set every eight addresses. That is, Register 0 can be accessed at addresses 0H, 8H, 10H, 18H, ... The DS1340-33 does not repeat this pattern because it has unique registers at address 8H and 9H. A flow chart for identifying the RTC being used is included at the end of this application note.

2-WIRE INTERFACE

The DS1340-33 supports both standard and fast modes of the 2-wire interface. This means the SCL clock frequency can go to a maximum of 400kHz. The M41T00 only supports the standard mode, which has a maximum frequency of 100kHz.

SUMMARY

As demonstrated, the DS1340-33 is not only an adequate second source for the ST M41T00, but it provides many improvements. These include a wider operating range for the primary and backup supplies, a smaller package, and a faster interface speed. In addition it also provides an integrated trickle charger and a flag that indicates when the oscillator may have stopped.

FLOWCHART FOR IDENTIFYING RTC

