19-5339; Rev 3; 7/10

DALLAS SEMICONDUCTOR MAXIM

Extremely Accurate SPI Bus RTC with Integrated Crystal and SRAM

参考資料

DS3234

General Description

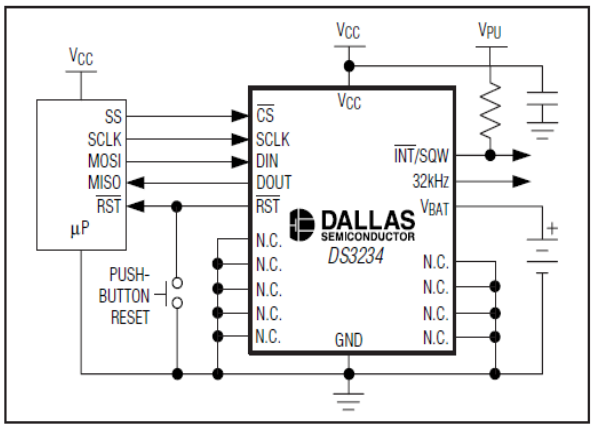
The DS3234 is a low-cost, extremely accurate SPI™ bus real-time clock (RTC) with an integrated temperature-compensated crystal oscillator (TCXO) and crystal. The DS3234 incorporates a precision, temperature-compensated voltage reference and comparator circuit to monitor V_{CC}. When V_{CC} drops below the power-fail voltage (V_{PF}), the device asserts the $\overline{RST}$ output and also disables read and write access to the part when V_{CC} drops below both V_{PF} and V_{BAT}. The $\overline{RST}$ pin is monitored as a pushbutton input for generating a µP reset. The device switches to the backup supply input and maintains accurate timekeeping when main power to the device is interrupted. The integration of the crystal resonator enhances the long-term accuracy of the device as well as reduces the piece-part count in a manufacturing line. The DS3234 is available in commercial and industrial temperature ranges, and is offered in an industry-standard 300-mil, 20-pin SO package.

The DS3234 also integrates 256 bytes of battery-backed SRAM. In the event of main power loss, the contents of the memory are maintained by the power source connected to the V_{BAT} pin. The RTC maintains seconds, minutes, hours, day, date, month, and year information. The date at the end of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. Two programmable time-of-day alarms and a programmable square-wave output are provided. Address and data are transferred serially by an SPI bidirectional bus.

Applications

Servers
Telematics
Utility Power Meters
GPS

Typical Operating Circuit



SPI is a trademark of Motorola, Inc.

Features

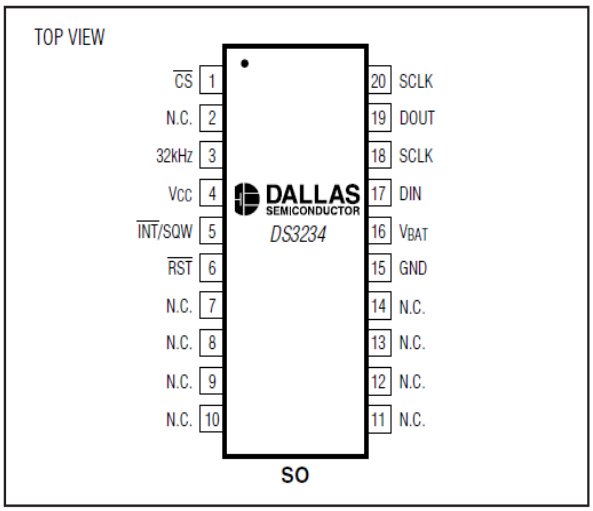
- Accuracy ±2ppm from 0°C to +40°C
- Accuracy ±3.5ppm from -40°C to +85°C
- Battery Backup Input for Continuous Timekeeping
- Operating Temperature Ranges
  Commercial: 0°C to +70°C
  Industrial: -40°C to +85°C
- Low-Power Consumption
- Real-Time Clock Counts Seconds, Minutes, Hours, Day, Date, Month, and Year with Leap Year Compensation Valid Up to 2099
- Two Time-of-Day Alarms
- Programmable Square-Wave Output
- 4MHz SPI Bus Supports Modes 1 and 3
- Digital Temp Sensor Output: ±3°C Accuracy
- Register for Aging Trim
- $\overline{RST}$ Input/Output
- 300-Mil, 20-Pin SO Package
- Underwriters Laboratories Recognized

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	TOP MARK
DS3234S#	0°C to +70°C	20 SO	DS3234S
DS3234SN#	-40°C to +85°C	20 SO	DS3234SN

#Denotes a RoHS-compliant device that may include lead that is exempt under the RoHS requirements. Lead finish is JESD97 Category e3, and is compatible with both lead-based and lead-free soldering processes. A "#" anywhere on the top mark denotes a RoHS-compliant device.

Pin Configuration



ABSOLUTE MAXIMUM RATINGS

Voltage Range on Any Pin Relative to Ground.....-0.3V to +6.0V
Junction-to-Ambient Thermal Resistance (θ_{JA}) (Note 1) ...55°C/W
Junction-to-Case Thermal Resistance (θ_{JC}) (Note 1).....24°C/W
Operating Temperature Range
(noncondensing) .....-40°C to +85°C
Junction Temperature .....+125°C
Storage Temperature Range .....-40°C to +85°C
Lead Temperature (soldering, 10s) .....+260°C
Soldering Temperature (reflow, 2 times max) .....+260°C
(See the *Handling, PC Board Layout, and Assembly* section.)

Note 1: Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to **www.maxim-ic.com/thermal-tutorial**.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

(T_A = -40°C to +85°C, unless otherwise noted.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		2.0	3.3	5.5	V
	V_{BAT}		2.0	3.0	3.8	
Logic 1 Input $\overline{CS}$, SCLK, DIN	V_{IH}		0.7 x V_{CC}		V_{CC} + 0.3	V
Logic 0 Input $\overline{CS}$, SCLK, DIN, $\overline{RST}$	V_{IL}	2.0V ≤ V_{CC} ≤ 3.63V	-0.3		+0.2 x V_{CC}	V
		3.63V < V_{CC} ≤ 5.5V	-0.3		+0.7	

ELECTRICAL CHARACTERISTICS

(V_{CC} = 2.0V to 5.5V, V_{CC} = active supply (see Table 1), T_A = -40°C to +85°C, unless otherwise noted.) (Typical values are at **V_{CC} = 3.3V, V_{BAT} = 3.0V**, and T_A = +25°C, unless otherwise noted. TCXO operation guaranteed from 2.3V to 5.5V on V_{CC} and 2.3V to 3.8V on V_{BAT}.) (Notes 2, 3)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Active Supply Current	I_{CCA}	SCLK = 4MHz, BSY = 0 (Notes 4, 5)	V_{CC} = 3.63V			400	µA
			V_{CC} = 5.5V			700	
Standby Supply Current	I_{CCS}	$\overline{CS}$ = V_{IH}, 32kHz output off, SQW output off (Note 5)	V_{CC} = 3.63V			120	µA
			V_{CC} = 5.5V			160	
Temperature Conversion Current	$I_{CCSCONV}$	SPI bus inactive, 32kHz output off, SQW output off	V_{CC} = 3.63V			500	µA
			V_{CC} = 5.5V			600	
Power-Fail Voltage	V_{PF}			2.45	2.575	2.70	V
V_{BAT} Leakage Current	I_{BATLKG}				25	100	nA
(V_{CC} = 2.0V to 5.5V, T_A = -40°C to +85°C, unless otherwise noted.) (Notes 2 and 3)							
Logic 1 Output, 32kHz I_{OH} = -500µA I_{OH} = -250µA I_{OH} = -125µA	V_{OH}	V_{CC} > 3.63V, 3.63V > V_{CC} > 2.7V, 2.7V > (V_{CC} or V_{BAT}) > 2.0V (BB32kHz = 1)		0.85 x V_{CC}			V