bq4847/bq4847Y

RTC Module With CPU Supervisor

Features

- Real-Time Clock counts seconds through years in BCD format
- Integrated battery and crystal
- On-chip battery-backup switchover circuit with nonvolatile control for an external SRAM
- 130mAh battery capacity
- ±1 minute per month clock accuracy
- Less than 500nA of clock operation current in backup mode
- Microprocessor reset valid to $V_{CC} = V_{SS}$
- Independent watchdog timer with a programmable time-out period
- Power-fail interrupt warning
- Programmable clock alarm interrupt active in battery-backup mode
- Programmable periodic interrupt
- Battery-low warning

General Description

The bq4847 Real-Time Clock Module is a low-power microprocessor peripheral that integrates a time-of-day clock, a 100-year calendar, a CPU supervisor, a battery, and a crystal in a 28-pin DIP module. The part is ideal for fax machines, copiers, industrial control systems, point-of-sale terminals, data loggers, and computers.

The bq4847 contains an internal battery and crystal. Through the use of the conditional chip enable output ($\overline{CE}_{OUT}$) and battery voltage output (V_{OUT}) pins, the bq4847 can write-protect and make nonvolatile an external SRAM. The backup cell powers the real-time clock and maintains SRAM information in the absence of system voltage.

The bq4847 contains a temperature-compensated reference and comparator circuit that monitors the status of its voltage supply. When an out-of-tolerance condition is detected, the bq4847 generates an interrupt warning and subsequently a microprocessor reset. The reset stays active for 200ms after V_{CC} rises within tolerance to allow for power supply and processor stabilization.

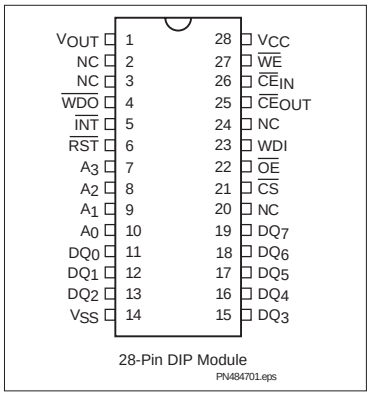
The bq4847 also has a built-in watchdog timer to monitor processor operation. If the microprocessor does not toggle the watchdog input (WDI) within the programmed time-out, the bq4847 asserts $\overline{WDO}$ and $\overline{RST}$. WDI unconnected disables the watchdog timer.

The bq4847 can generate other interrupts based on a clock alarm condition or a periodic setting. The alarm interrupt can be set to occur from once per second to once per month. The alarm can be made active in the battery-backup mode to serve as a system wake-up call. For interrupts at a rate beyond once per second, the periodic interrupt can be programmed with periods of 30.5µs to 500ms.

Caution:

Take care to avoid inadvertent discharge through V_{OUT} and $\overline{CE}_{OUT}$ after battery isolation has been broken.

Pin Connections



28-Pin DIP Module

PN484701.eps

Pin Names

A_0–A_3	Clock/Control address inputs
DQ_0–DQ_7	Data inputs/outputs
$\overline{WE}$	Write enable
$\overline{OE}$	Output enable
$\overline{CS}$	Chip select input
$\overline{CE}_{IN}$	External RAM chip enable
$\overline{CE}_{OUT}$	Conditional RAM chip enable
NC	No connect
V_{OUT}	Back-up battery output
$\overline{INT}$	Interrupt output
$\overline{RST}$	Microprocessor reset
WDI	Watchdog input
$\overline{WDO}$	Watchdog output
V_{CC}	+5V supply
V_{SS}	Ground

Sept. 1996

Functional Description

Figure 1 is a block diagram of the bq4847. The bq4847 is functionally equivalent to the bq4845 except that the battery (20, 24) and crystal (2, 3) pins are not accessible. The pins are connected internally to a coin cell and quartz crystal. The coin cell provides 130mAh of capacity. It is internally isolated from V_{OUT} and $\overline{CE}_{OUT}$ until the initial application of V_{CC}. Once V_{CC} rises above V_{PFD}, this isolation is broken, and the backup cell provides power to V_{OUT} and $\overline{CE}_{OUT}$ for the external SRAM. The real-time clock keeps time to within one minute per month at room temperature. For a complete description of features, operating conditions, electrical characteristics, bus timing, and pin descriptions, see the bq4845 data sheet. Valid part types for ordering are bq4847MT (5%) and bq4847YMT (10%).

Figure 2 illustrates the address map for the bq4847. Table 1 is a map of the bq4847 registers, and Table 2 describes the register bits.

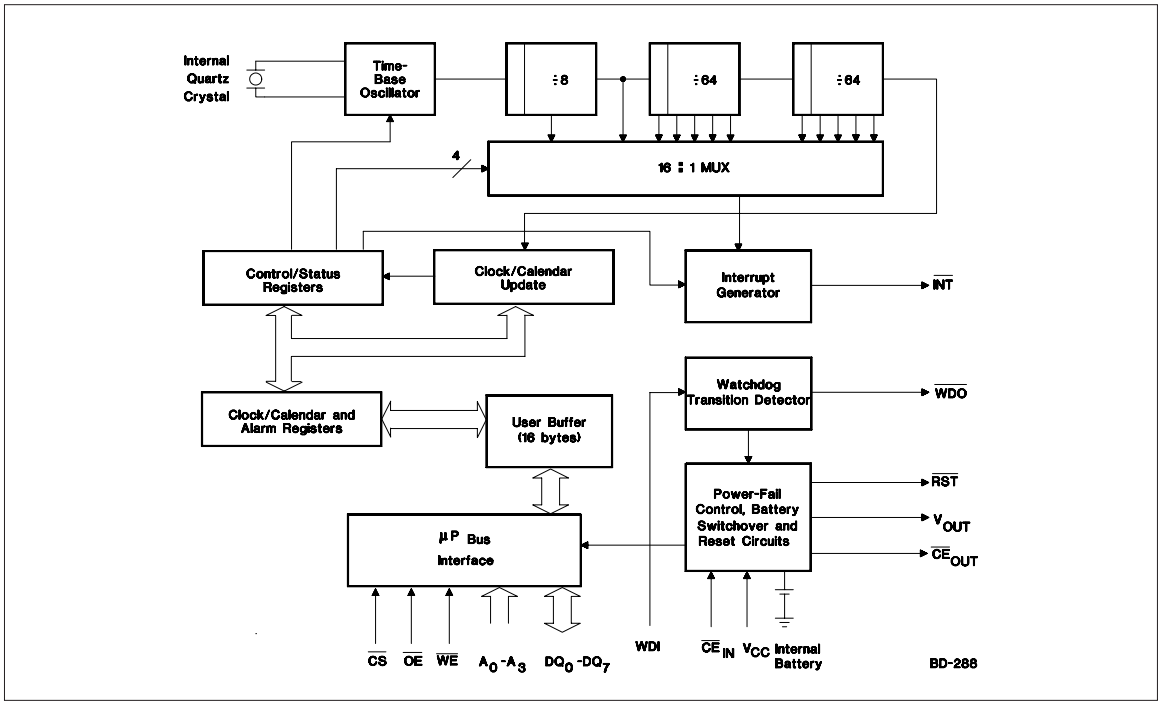
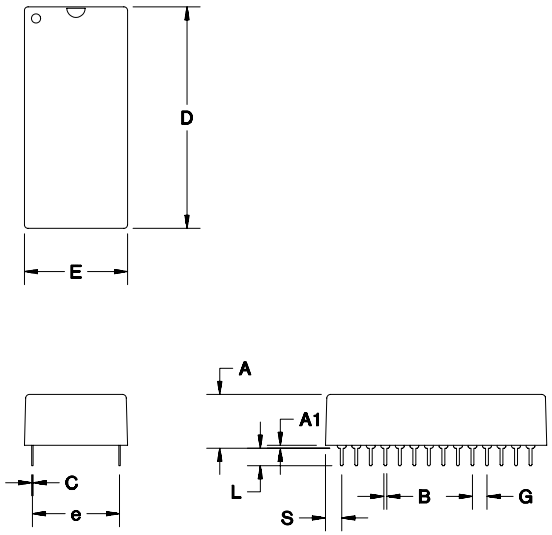


Figure 1. Block Diagram

Truth Table

V_{CC}	$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	$\overline{CE}_{OUT}$	V_{OUT}	Mode	DQ	Power
< V_{CC} (max.)	V_{IH}	X	X	$\overline{CE}_{IN}$	V_{OUT1}	Deselect	High Z	Standby
> V_{CC} (min.)	V_{IL}	X	V_{IL}	$\overline{CE}_{IN}$	V_{OUT1}	Write	D_{IN}	Active
	V_{IL}	V_{IL}	V_{IH}	$\overline{CE}_{IN}$	V_{OUT1}	Read	D_{OUT}	Active
	V_{IL}	V_{IH}	V_{IH}	$\overline{CE}_{IN}$	V_{OUT1}	Read	High Z	Active
< V_{PFD} (min.) > V_{SO}	X	X	X	V_{OH}	V_{OUT1}	Deselect	High Z	CMOS standby
≤ V_{SO}	X	X	X	V_{OHB}	V_{OUT2}	Deselect	High Z	Battery-backup mode

MT: 28-Pin T-Type Module



28-Pin MT (T-Type Module)

Dimension	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.360	0.390	9.14	9.91
A1	0.015	-	0.38	-
B	0.015	0.022	0.38	0.56
C	0.008	0.013	0.20	0.33
D	1.520	1.535	38.61	38.99
E	0.710	0.740	18.03	18.80
e	0.590	0.620	14.99	15.75
G	0.090	0.110	2.29	2.79
L	0.110	0.130	2.79	3.30
S	0.100	0.120	2.54	3.05

Ordering Information

bq4847 ___ - MT

Package Option:
MT = 28-pin T-type Module

Voltage Tolerance:
Blank = 5%
Y = 10%

Device:
bq4847 Real-Time Clock Module With CPU Supervisor

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
BQ4847MT	ACTIVE	DIP MODULE	MT	28	10	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
BQ4847YMT	ACTIVE	DIP MODULE	MT	28	10	Pb-Free (RoHS)	CU SN	N / A for Pkg Type

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

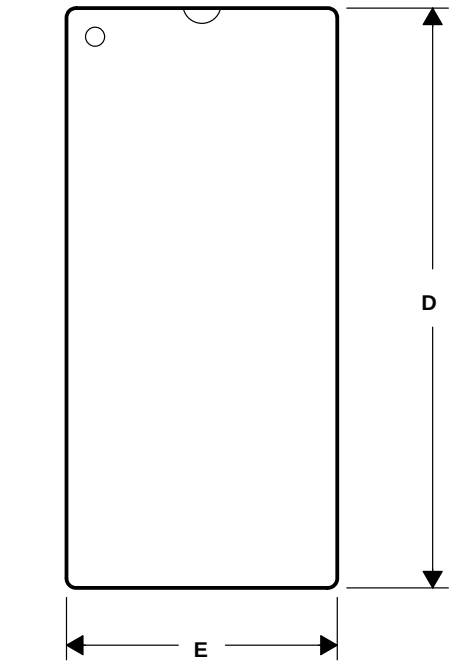
(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

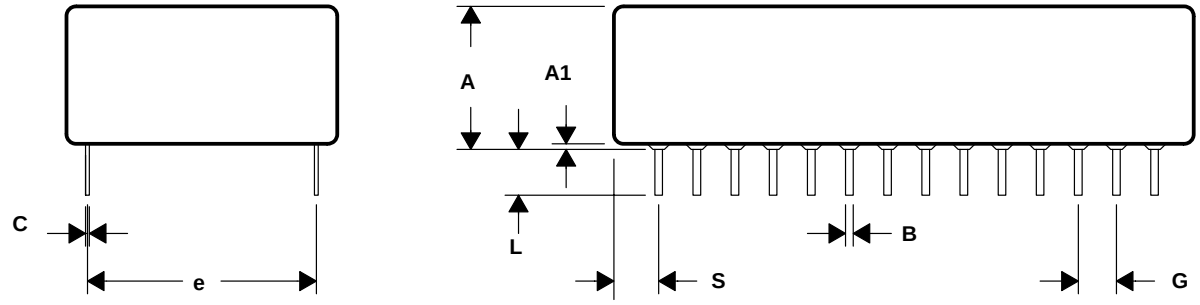
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

MPDI064 – MAY 2001

MT (R-PDIP-T)** **PLASTIC DUAL-IN-LINE**

28 PINS SHOWN





Dimension	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.360	0.390	9.14	9.91
A1	0.015	–	0.38	–
B	0.015	0.022	0.38	0.56
C	0.008	0.013	0.20	0.33
D/24 PIN	1.320	1.335	33.53	33.91
D/28 PIN	1.520	1.535	38.61	38.99
E	0.710	0.740	18.03	18.80
e	0.590	0.630	14.99	16.00
G	0.090	0.110	2.29	2.79
L	0.110	0.130	2.79	3.30
S	0.100	0.120	2.54	3.05

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NOTES: A. All linear dimensions are in inches (mm).
B. This drawing is subject to change without notice.

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