800mA, Single-Input, Single Cell Li-Ion Battery Solar Charger

Check for Samples: bq24212

FEATURES

- **Input Voltage Dynamic Power Management Feature (VBUS_DPM)**
- **Selectable Battery Tracking Mode to Maximize the Charge Rate from Solar Panel Using DPM Feature**
- **Load Mode to Support Loads Connected at VBUS Pin**
- **20V Input Rating, with Over-Voltage Protection (OVP)**
- **1% Battery Voltage Regulation Accuracy**
- **Up to 800mA Charge Current with 10% Charge Current Accuracy**
- **Thermal Regulation Protection for Output Current Control**
- **Low Battery Leakage Current**
- **BAT Short-Circuit Protection**
- **NTC Input Monitoring**
- **Built-In Safety Timer With Reset Control**
- **Status Indication – Charging/Power Present**
- **Available in Small 2mm × 3mm SON-10 Package**

APPLICATIONS

- **Smart Phones**
- **PDAs**
- **MP3 Players**
- **Low-Power Handheld Devices**
- **Auxiliary Solar Chargers**

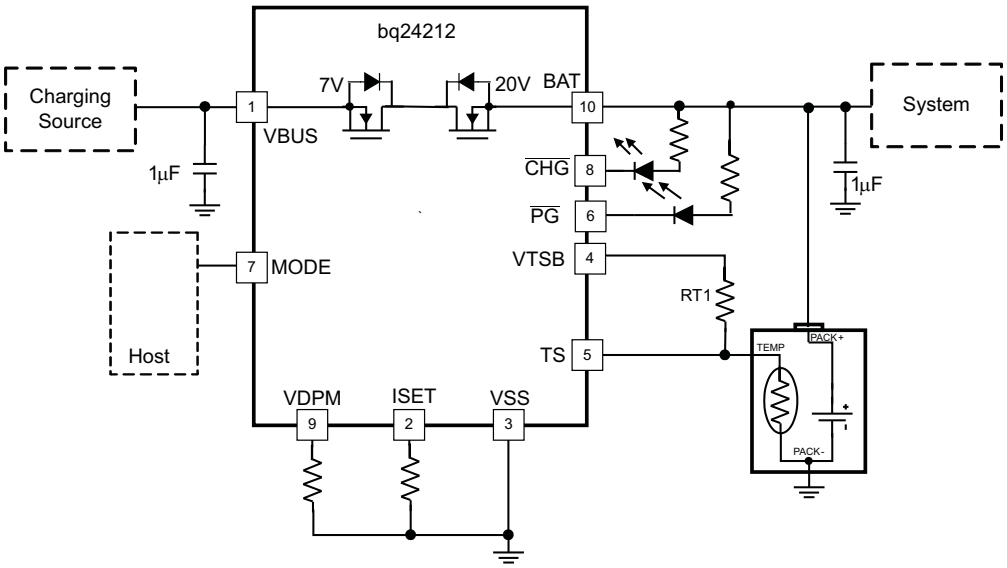
DESCRIPTION

The bq24212 is a highly integrated Li-ion linear charger targeted at space-limited portable applications. The high input voltage range with input over-voltage protection supports low-cost unregulated adapters. The input voltage regulation loop with programmable input voltage regulation threshold make it suitable for charging from alternative power sources, such as solar panel or inductive charging pad.

The IC has a single power output that charges the battery. A system load can be placed in parallel with the battery as long as the average system load does not keep the battery from charging fully during the 10 hour safety timer.

The battery is charged in three phases: conditioning, constant current and constant voltage. In all charge phases, an internal control loop monitors the IC junction temperature and reduces the charge current if an internal temperature threshold is exceeded.

PRODUCT PREVIEW



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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

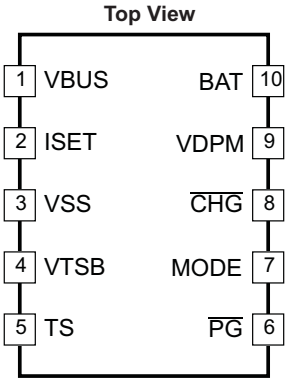
DESCRIPTION (CONTINUED)

The charger power stage and charge current sense functions are fully integrated. The charger function has high accuracy current and voltage regulation loops, charge status display, and charge termination function. The charge current value is programmable via an external resistor.

Furthermore, the IC has a Load Mode that connects the battery to VBUS pin with current limiting function to prevent over load. To use Load Mode, the charging source would be removed from the VBUS pin. Then a load can be placed on VBUS pin and it will be near the VBAT pin voltage.

PIN CONFIGURATION

Figure 1. DQC PACKAGE



PIN FUNCTIONS

PIN		I/O	DESCRIPTION
NAME	NO.		
VBUS	1	I/O	For Charging Mode, input for charging source, connect to external DC supply (ie Solar Panel, Inductive charging PAD, or Wall Adapter) For Load Mode, output for current limited battery voltage. Expected range of bypass capacitors 1µF to 10µF, connected from VBUS to VSS.
BAT	10	I/O	Battery Connection. System Load may be connected. Expected range of bypass capacitors 1µF to 10µF, connected from BAT to VSS.
VDPM	9	I	Programs the input voltage regulation threshold. Expected range of programming resistor is 1k to 10kΩ, connected from VDPM to VSS. When VDPM is floating, the VIN DPM loop operates in battery tracking mode, and the VIN DPM threshold is BAT+100mV (BAT>3.6V) or 3.7V (BAT≤3.6V) in this case. VIN DPM threshold should be programmed higher than battery voltage to ensure proper operation.
ISET	2	I	Programs the Fast-charge current setting. External resistor from ISET to VSS defines fast charge current value.
$\overline{PG}$	6	O	Power Present indication. LOW (FET ON) When input voltage is in normal range (VBUS>BAT & VBUS>UVLO), High impedance (open drain FET OFF) in other cases.
TS	5	I	Temperature sense pin, connected to NTC Thermistor in the battery pack. Pulling High puts part in Limited Power charging mode. Must not be left floating.
VSS	3	–	Ground terminal
$\overline{CHG}$	8	O	Charge Status indication, Low (FET ON) indicates charging, and High impedance (open drain FET OFF) in other cases
MODE	7	I	Mode control. Low to enable Charge Mode or High to enable Load mode.
VTSB	4	O	TS bias reference voltage pin, regulated output. No external capacitor is required from VTSB to VSS. Only enabled during charge.
Thermal PAD and Package	–	–	There is an internal electrical connection between the exposed thermal pad and the VSS pin of the device. The thermal pad must be connected to the same potential as the VSS pin on the printed circuit board. Do not use the thermal pad as the primary ground input for the device. VSS pin must be connected to ground at all times.

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TYPICAL SOLAR APPLICATION CIRCUIT

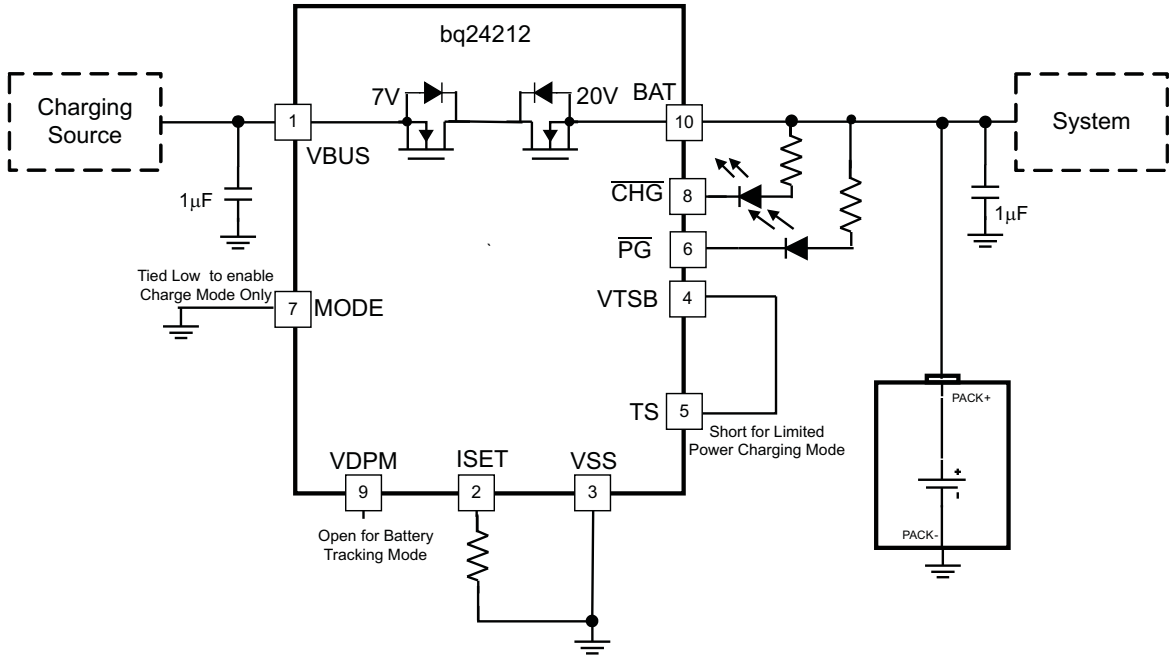


Figure 2. Typical System Schematic for Solar Charger Application

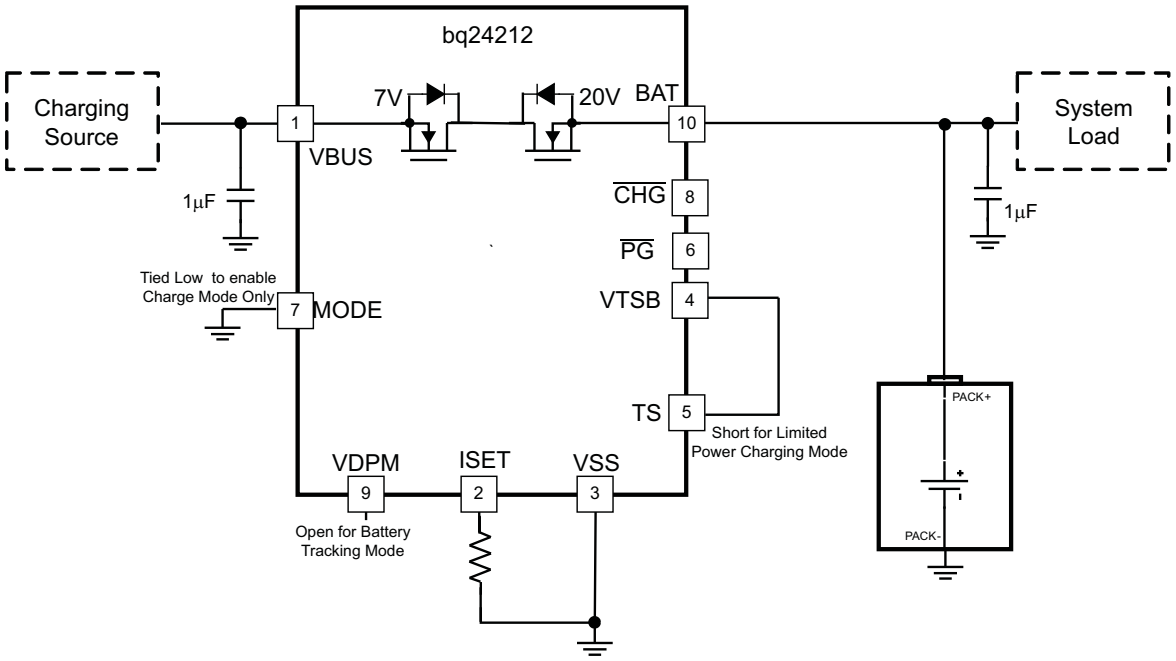


Figure 3. System Schematic for Solar Charger Application with Minimum Components

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To request a full data sheet, please send an email to:
contact_bq24212@list.ti.com.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
BQ24212DQCR	PREVIEW	WSON	DQC	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	
BQ24212DQCT	PREVIEW	WSON	DQC	10	250	TBD	Call TI	Call TI	

(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.

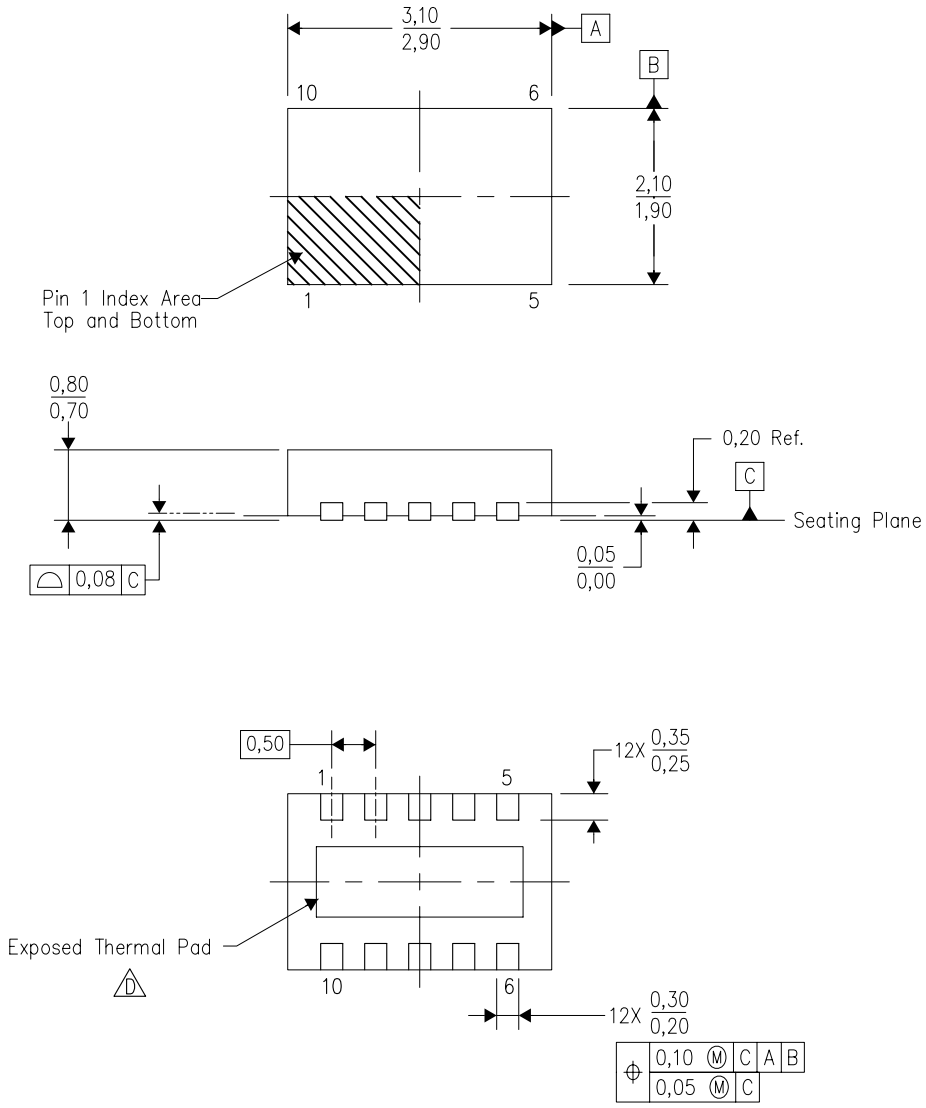
(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been 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.

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DQC (R–PWSON–N10) PLASTIC SMALL OUTLINE NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. SON (Small Outline No–Lead) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.

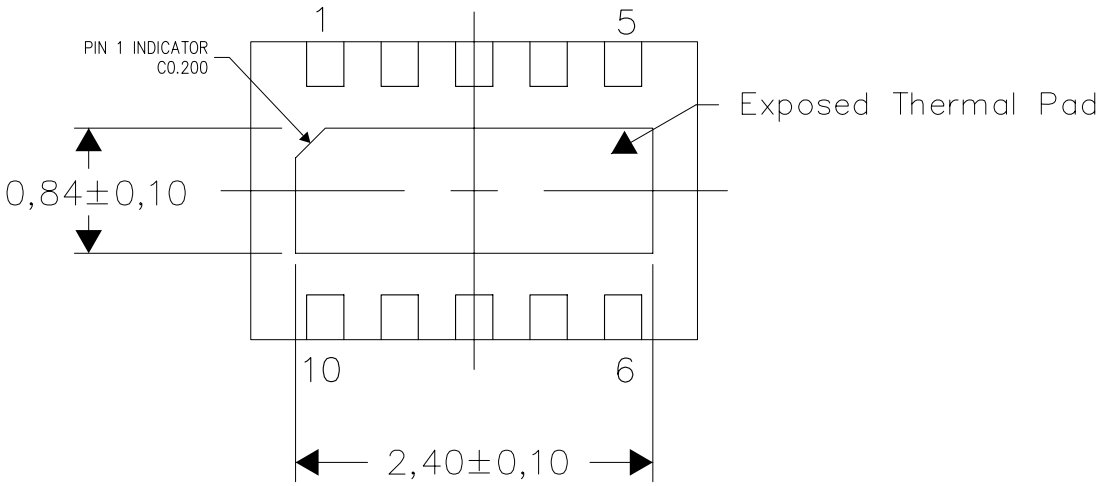
DQC (R–PWSON–N10) PLASTIC SAMLL OUTLINE NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

4209909/C 12/11

NOTE: A. All linear dimensions are in millimeters

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