

bq246103/113/123/133 Comparison

Wang Li

PMP-BMS-Battery Charge

ABSTRACT

This application report presents an overview of the differences among the bq24103, bq24113, bq24123 and bq24133. It assists design engineers in selecting the most suitable charger for their applications.

bq24103/113/123/133 Comparison

Table 1 compares the parameters of the bq24103, bq24113, bq24123 and bq24133.

Table 1. bq24103/113/123/133 Comparison

	bq24103/123	bq24113	bq24133
Control Scheme	Standalone	Host Control	Standalone
Package	QFN-20, 3.5 × 4.5	QFN-20, 3.5 × 4.5	QFN-24, 3.5 × 5.5
Maximum Current	2A	2A	2.5A
Input Voltage Range	4.35 V-16 V	4.35 V-16 V	4.5 V-17 V
Output Voltage	1,2 cell, 4.2 V/cell ±1% (0°C-85°C)	1,2 cell, 4.2V/cell ±1% (0°C-85°C)	1,2,3 cell, 4.2V/cell ±5% (0°C-85°C)
Switching Frequency	1.1 MHz	1.1 MHz	1.6 MHz
Power Path Management	No	No	NMOS ACFET PMOS BATFET
Input Current Regulation	No	No	Yes, ±7%
Charge Current Regulation	±10%	±10%	±5%
Switching MOSFETs R _{ds(on)} (typ)	High Side PMOS 250 mΩ Low Side NMOS 90 mΩ	High Side PMOS 250 mΩ Low Side NMOS 90 mΩ	High Side PMOS 80 mΩ Low Side NMOS 90 mΩ
Battery Detection	NTC + load Capacitor detection	NTC + load Capacitor detection	NTC + load Capacitor detection
Programmable Input OVP	No	No	Yes
Integrated BTST Schottky Diode	No	No	Yes
Thermal Regulation	No	No	Yes

bq24103/113/123/133 Feature Descriptions

The bq24133 is the second generation standalone 2.5A Li-Ion/Li-polymer battery charger. On top of all bqSWITCHER™ (bq24103/113/123) features, bq24133 adds Dynamic Power Management (DPM) with input current regulation. It enhances operation safety by programmed input OVP, 30V maximum input rating and thermal regulation.

The bqSWITCHER™ series are highly integrated Li-ion and Li-polymer switch-mode charge management devices targeted at a wide range of portable applications. The bqSWITCHER™ series offers integrated synchronous PWM controller and power FETs, high-accuracy current and voltage regulation, charge preconditioning, charge status, and charge termination, in a small, thermally enhanced QFN package.

The bqSWITCHER charges the battery in three phases: conditioning, constant current and constant voltage. Charge is terminated based on user-selectable minimum current level. A programmable charge timer provides a safety backup for charge termination. The bqSWITCHER automatically restarts the charge cycle if the battery voltage falls below an internal threshold. The bqSWITCHER automatically enters sleep mode when VCC supply is removed.

bqSWITCHER is a trademark of Texas Instruments.

Beside bqSWITCHER functions, the bq24133 also features Dynamic Power Management (DPM) to reduce the charge current when the input power limit is reached to avoid over-loading the adapter. A highly-accurate current-sense amplifier enables precise measurement of input current from adapter to monitor overall system power.

The bq24133 also provides power path selector gate drives to control three FETs. Two are NMOS FETs: ACFET (Q1) and RBFET (Q2). ACFET (Q1) provides a limited di/dt when connecting the adapter to the system by controlling the FET turn-on time. RBFET (Q2) provides a reverse battery discharge protection. One is a PMOS FET, Q3, that is used to connect or disconnect the battery from the system voltage. When the qualified adapter is present, Q1 and Q2 turn on and connect the system directly to the input adapter. Otherwise, Q1 and Q2 are off and Q3 turns on to connect the system directly to the battery. In addition, the power path prevents the switching charger from boosting the battery voltage back to the input.

The bq24133 charges a battery from a DC source as high as 17V, including a car battery. The Input over-voltage limit is adjustable through the OVPSET pin. The AVCC, ACP, and ACN pins have a 30V rating. When a high voltage DC source is inserted, Q1/Q2 remain off to avoid high voltage damage to the system.

The bq24133 also provides the thermal regulation. If necessary, the thermal regulation loop reduces charge current to maintain the bq24133 junction temperature of 120°C during operation. This feature allows maximum charging current while maintaining a safe junction temperature.

References

1. *bq24103 and bq24113, Synchronous Switchmode, LI-Ion and LI-Polymer Charge-Management IC with Integrated Power FETs (bqSWITCHER™)* ([SLUS606](#))
2. *bq24123, Single-Chip Switchmode, LI-Ion and LI-Polymer Charge-Management IC with Enhanced EMI Performance(bqSWITCHER™)* ([SLUS688](#))
3. *bq24133, 1.6-MHz Synchronous Switch-Mode Li-Ion and Li-Polymer Stand-Alone Battery Charger with Integrated MOSFETs and Power Path Selector* ([SLUSAF7](#))

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Transportation and Automotive	www.ti.com/automotive
Video and Imaging	www.ti.com/video
Wireless	www.ti.com/wireless-apps

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated