Application Report
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Selecting the Best bq2425x Single Cell I2C, Standalone Switch-Mode Battery Charger for your Application

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ABSTRACT

The bq2425x series of devices are highly integrated Li-Ion, Li-Pol, and LiFePO4 linear chargers devices targeted at space limited portable applications. The devices operate from either a USB port or AC adapter. This application note provides a selection table that highlights different specification and feature of these bq2425x chargers. In application where both Standalone and I2C devices are needed, the bq24250, bq24251, and bq24257 can be used. If a power path is required, consider using the bq24250, bq24251 and bq24253.

Table 1. Selection Table

Specification or Feature (19)	bq24250	bq24251	bq24253	bq24253H	bq24257	bq24258
Default Battery Regulation Voltage (V)	4.2	4.2	4.2	4.34	4.2	4.2
Minimum Vin (V) (1)	4.35	4.35	4.35	4.35	4.35	4.35
Maximum Vin (V) (2)	10.5	10.5	10.5	10.5	6.5	10.5
EN1/EN2 (2)	YES	NO	YES	YES	NO	YES
D+/D- Detection (3)	NO	YES	YES	YES	YES	NO
Battery Chemistry	Li-Ion/Li-Po	Li-Ion/Li-Po	Li-Ion/Li-Po	Li-Ion/Li-Po	Li-Ion/Li-Po	LiFePO4
USB/AC	YES	YES	YES	YES	YES	YES
Status Indicator	INT(4)/STAT(5)	PG(6)/STAT(5)	PG(6)/CHG(7)	PG(6)/CHG(7)	PG(6)/STAT(5)	PG(6)/STAT(5)
Voltage based TS (8)	YES	YES	YES	YES	YES	YES
Max Input Charge Current (A)	2A	2A	2A	2A	2A	2A
Operation Mode	I2C / Standalone	I2C / Standalone	Standalone	Standalone	I2C / Standalone	Standalone
JEITA Compatible (9)	YES	YES	YES	YES	YES	YES
Production Test Mode (10)	YES	YES	NO	NO	YES	NO
SYS/CIN Bypass Cap (min)	20µF	20µF	20µF	20µF	1µF	1µF
Safety Timer (11)	YES	YES	YES	YES	YES	YES
Watchdog Timer (12)	YES	YES	NO	NO	YES	NO
Power-Path MGMT (13)	YES	YES	YES	YES	NO	NO
Input OVP (14)	YES	YES	YES	YES	YES	YES
MINSYS (15)	3.5V	3.5V	3.5V	3.5V	N/A	N/A
Thermal Regulation/Shutdown (16)	YES	YES	YES	YES	YES	YES
VIN DPM (17)	YES	YES	YES	YES	YES	YES
Package (18)	WCSP-30 /QFN - 24					

(1) Recommended Min/Max input voltage in which IC is operational. The IC also have input over voltage protect that can be set from 6V to 10.5V using I2C commands.

(2) Input Current Limit Configuration Inputs: Controls input current and USB compliance. Selectable Input Current Limit include; 100mA, 150mA, 500mA, 900mA, 1.5A, and 2A. For the bq24258, the EN3 is also available to support USB 3.0 compliance.

(3) BC1.2 detection: D+ and D- can detect types of USB adaptors and adjust the maximum input current accordingly

(4) INT Charge Status Indication and Fault Interrupts: Low (FET on) indicates charging and Open Drain (FET off) indicates no Charging or Charge complete. When a fault occurs, a 256µs pulse is sent as an indication to the external host. Also indicates recharge cycles.

(5) Similar function as INT pin (4). The only difference is it can be disabled via I2C on EN_STAT bit on register 2.

(6) PG or Power Good: Low (FET on) indicates the input voltage is above UVLO and the OUT (battery) voltage.

(7) $\overline{\text{CHG}}$ is a Charge Status Indication: Low (FET on) indicates charging and Open Drain (FET off) indicates no Charging or absence of a supply. This status pin does not indicate recharge cycles.

(8) Voltage based NTC: The TS function provides 4 thresholds for JEITA compatibility (PSE also available upon request). The voltage based NTC monitor allows for the use of any NTC resistor with adding external resistors.

(9) The IC includes the integration of an NTC monitor pin that complies with the JEITA specification (PSE also available upon request).

(10) PTM or Product Test Mode: In this mode the input current limit to the charger is disabled and the output current limit is limited only by the inductor cycle-by-cycle current. This feature is useful for device product manufacturing testing. This feature is disabled by default for SA spins.

(11) Safety Timer: The main purpose of this function is to prevent continuous charging of a defective battery. The safety timer time is selectable using the I2C interface to 45min, 6hrs, or 9hrs. It set by default to 6 hours non-adjustable for SA devices.

(12) Watchdog Timer: it is an optional dynamic safety timer that monitors host through the I2C interface. If the watchdog timer expires, the IC enters DEFAULT mode where the default charge parameters are loaded and charging continues.

(13) Power Path management: Allows IC to power the system from a high efficiency DC/DC converter while simultaneously and independently charging the battery. Also permits the battery to supplement the system current requirements when the adapter cannot deliver the peak system and battery load requirements.

(14) Input OVP: Input over-voltage protection is built to protect the IC against damage from over voltage on the input supply. When VIN > VOVP, the bq2425x turns off the PWM converter, turns on the battery FET. The OVP threshold is programmable from 6 V to 10.5 V using VOVP bits in register #7 on the I2C devices. For the SA devices, the default OVP is applied.

(15) MINSYS: Minimum system voltage regulation.

(16) Thermal Regulation: The bq2425x will taper down the charge current in order to protect itself when the junction temperature of the die exceeds 125°C. Thermal Shutdown Protection: The bq2425x will completely cut off the charge current and disables the buck converter in order to protect the IC when the junction temperature of the die exceeds 150°C.

(17) VINDPM or input voltage based dynamic power management: If the input power supply reaches its current limit, the voltage decreases. This feature monitors the input voltage, and once it drops below VIN_DPM threshold, the input current limit is reduced to prevent further drop in the VIN. The VIN_DPM can be set externally or using I2C.

(18) Package Type

(19) If other features and specs are needed from this family, contact local TI sales office for more information. Note that the bq24258 and 24253H are in product preview devices.

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