

# Selecting the Best bq2416x Device for your Application

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## ABSTRACT

This application note summarizes the differences between the various bq2416x dual-input (that is, USB and adapter IN), single-cell switch mode Li-Ion battery chargers with Power Path Management. If similar performance but only one input is needed, please refer to the bq2427x ICs.

## Selection Table

Part Number (Packages)	USB OVP <sup>(1)</sup>	IN OVP <sup>(1)</sup>	USB Input Current Limit at Startup <sup>(2)</sup>	Timers <sup>(3)</sup> (Safety and Watchdog)	NTC Thermistor Monitoring via TS pin	V <sub>BATSHRT</sub> /I <sub>BATSHRT</sub>	V <sub>SYS(TYP)</sub> / V <sub>MINSYS(TYP)</sub> <sup>(4)</sup>	HOST versus STANDALONE (COMM) <sup>(5)</sup>
bq24160 (YFF and RGE)	6.5 V	10.5 V	D+/D-	Safety and Watchdog	JEITA	3.0 V 50 mA	3.7 V/3.5 V	HOST (I2C)
bq24161 (YFF and RGE)	6.5 V	10.5 V	PSEL (0 = 1.5 A, 1 = 100 mA)	Safety and Watchdog	Standard	2.0 V 50 mA	3.7 V/3.5 V	HOST (I2C)
bq24161B (YFF and RGE)	6.5 V	10.5 V	PSEL (0 = 1.5 A, 1 = 500 mA)	Safety and Watchdog	JEITA	3.0 V 50 mA	3.7 V/3.5 V	HOST (I2C)
bq24163 <sup>(6)</sup> (YFF and RGE)	6.5 V	10.5 V	D+/D-	Safety and Watchdog	JEITA	2.0 V 50 mA	3.4 V/3.2 V	HOST (I2C)
bq24165 (YFF and RGE)	6.5 V	10.5 V	From external device to control IUSBX pins	Safety (6 hr fixed)	No TS pin but JEITA using external device to control /CEX and IUSBx pins	3.0 V 50 mA	3.7 V/3.5 V	STANDALONE (GPIO)
bq24166 (YFF and RGE)	6.5 V	10.5 V	From external device to control IUSBX pins	Safety (6 hr fixed)	Standard	3.0 V 50 mA	3.7 V/3.5 V	STANDALONE (GPIO)
bq24167 (YFF and RGE)	6.5 V	10.5 V	From external device to control IUSBX pins	Safety (6 hr fixed)	JEITA	3.0 V 50 mA	3.7 V/3.5 V	STANDALONE (GPIO)
bq24168 (YFF)	6.5 V	6.5 V	PSEL (0 = 1.5 A, 1 = 100 mA)	None	JEITA	2.0 V 50 mA	3.7 V/3.5 V	HOST (I2C)

- <sup>(1)</sup> The OVP function on the input pins, USB and IN, prevent operation above the thresholds per the table above. The maximum voltage on each input pin must not exceed 20 V.
- <sup>(2)</sup> When using the USB input, the ICs have several options for setting the USB input current limit at startup. For the host controlled ICs with D+/D- input pins, the IC initially sets the input current limit to 100 mA and then uses the BC1.2 standard to determine if the port is SDP (100 mA) or CDP/DCP (1500 mA). The IC does not perform enumeration. For the host controlled ICs with the PSEL pin, the logic level of the PSEL pin determines the input current limit immediately at startup. The host can send I2C commands to change the current limit. For the standalone ICs, an external device (for example., HOST, USB PHY IC, etc.) can control the USB input current through the three IUSBX pins.
- <sup>(3)</sup> Most of the ICs have a safety timer that stops charging after a certain time period. The ICs will automatically suspend or extend the safety timer length in the event that charge current is reduced by environmental conditions. See datasheet for details. The ICs with the watchdog timer require a periodic pulse from the HOST in order to retain register settings and not revert to DEFAULT settings.
- <sup>(4)</sup> For V<sub>BAT</sub> < V<sub>MINSYS</sub> and the input current limit or V<sub>IN(USB/DPM)</sub> control loops protecting the input supplies, the IC automatically lowers the system regulation voltage V<sub>SYS</sub> to V<sub>MINSYS</sub>.
- <sup>(5)</sup> The HOST controlled ICs have registers allowing 27 different charge-current settings between 550 mA and 2.5 A as well as 48 different battery regulation settings between 3.50 V and 4.44 V. In addition, the HOST controlled versions have registers that allow for 6 different input current limit settings between 100 mA and 1.5 A for the USB input, 1.5 A and 2.5 A for the IN input and 8 settings between 4.2 V and 4.76 V for the input dynamic power management (DPM) function on each input. The standalone ICs have an external resistor for setting the charge current between 550 mA and 2.5 A and 4.2-V typical battery regulation setting, that can be adjusted using the two /CEX pins. For the IN input, the standalone ICs have external resistors for setting the current between 1 A and 2.5 A and the DPM function between 4.2 V and 10 V. For the USB input, the standalone ICs have the three IUSBX pins that allow for 6 different input current limit settings between 100 mA and 1.5 A. The USB DPM level is 4.28 V for USB100 and USB150 but increases to 4.44-V typical for the higher input current limit settings.
- <sup>(6)</sup> The bq24163 is intended for use with LiFePO<sub>4</sub> batteries.

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