

## 2.5A, Dual-Input, Single Cell Switchmode Li-Ion BATTERY CHARGER with Power Path Management

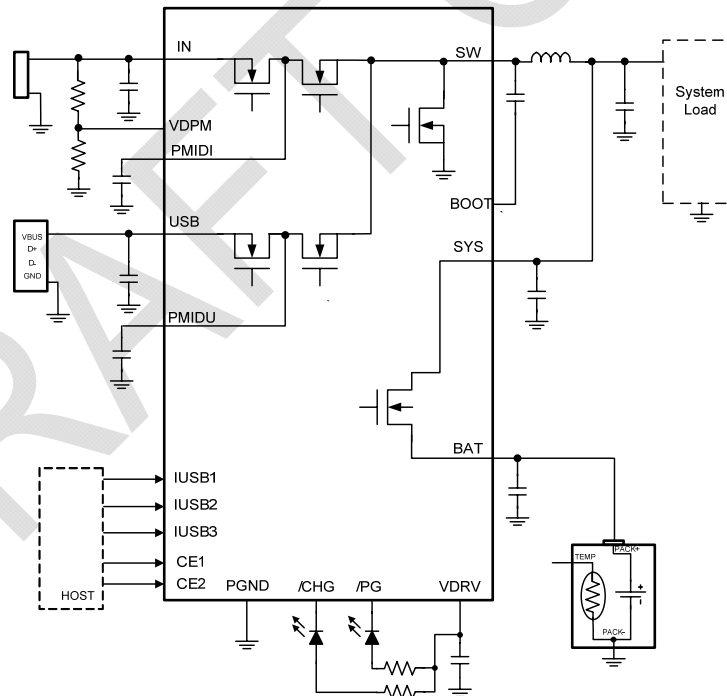
### MAIN FEATURES

- High-Efficiency Switch Mode Charger with Separate Power Path Control
  - Make a GSM Call with a Deeply Discharged Battery or No Battery
  - Instantly Startup System from a Deeply Discharged Battery or No Battery
- Dual Input Charger
  - 20V input rating, with Over-Voltage Protection (OVP)
    - 6.5V for USB Input
    - 10.5V for IN Input
  - Integrated FETs for Up to 2.5A Charge Rate
    - Up to 2.5A from IN Input
    - Up to 1.5A from USB Input
- Highly Integrated Battery N-Channel MOSFET Controller for Power Path Management
- Safe and accurate Battery Management Functions
  - 0.5% Battery Regulation Accuracy
  - 5% Charge Current Accuracy
- Adjustable Charge Current, Input Current Limit, and  $V_{INDPM}$  threshold (for IN input)
- Easy JEITA Implementation
  - Charge Parameter Selector Inputs (CE1, CE2) for (bq24165)
- Voltage-based, NTC Monitoring Input (TS)
  - Standard Temp Range (bq24166)
  - JEITA Compatible (bq24167)
- Thermal Regulation Protection for Output Current Control
- Low Battery Leakage Current, BAT Short-Circuit Protection
- Soft-Start feature to reduce inrush current
- Thermal Shutdown and Protection
- Available in small 2.8mm x 2.8mm 49-ball WQFN or 4mm x 4mm QFN-24 packages

### APPLICATIONS

- Handheld Products
- Portable Media Players
- Portable Equipment
- Netbook and Portable Internet Devices

### APPLICATION SCHEMATIC



### DESCRIPTION

The bq24165, bq24166 and bq24167 are highly integrated single cell Li-Ion battery charger and system power path management devices targeted for space-limited, portable applications with high capacity batteries. The single cell charger has dual inputs which allow operation from either a USB port or higher power input supply (i.e. AC adapter or wireless charging input) for a versatile solution. The two inputs are fully isolated from each other and are managed by the bq24165/166/167 with the IN input having precedence.

The power path management feature allows the bq24165/166/167 to power the system from a high efficiency DC to DC converter while simultaneously and independently charging the battery. The charger monitors the battery current at all times

and reduces the charge current when the system load requires current above the input current limit. This allows for proper charge termination and timer operation. The system voltage is regulated to the battery voltage but will not drop below 3.5V. This minimum system voltage support enables the system to run with a defective or absent battery pack and enables instant system turn-on even with a totally discharged battery or no battery. The power-path management architecture also permits the battery to supplement the system current requirements when the adapter cannot deliver the peak system currents. This enables the use of a smaller adapter. The 2.5A input current capability allows for GSM phone calls as soon as the adapter is plugged in regardless of the battery voltage.

The battery is charged in four phases: 50mA precharge, minimum system output, fast charge constant current and constant voltage. In all charge phases, an internal control loop monitors the IC junction temperature and reduces the charge current if the internal temperature threshold is exceeded. Additionally, a voltage-based battery pack thermistor monitoring input (TS) is included that monitors battery temperature for safe charging. The TS function for bq24166 is JEITA compatible.

## ORDERING INFORMATION

PART NUMBER	USB OVP	IN OVP	NTC Monitoring (TS)	JEITA Compatible	Minimum System Voltage	
bq24165YFFR	6.5V	10.5V	No	Yes	3.5V	
bq24165YFFT	6.5V	10.5V	No	Yes	3.5V	
bq24166YFFR	6.5V	10.5V	Yes	No	3.5V	
bq24166YFFT	6.5V	10.5V	Yes	No	3.5V	
bq24167YFFR	6.5V	10.5V	Yes	Yes	3.5V	
bq24167YFFT	6.5V	10.5V	Yes	Yes	3.5V	

## PACKAGE DISSIPATION RATING TABLE<sup>(2)</sup>

Package	R <sub>θJA</sub>	T <sub>A</sub> ≤ 25°C POWER RATING	Derating Factor T <sub>A</sub> > 25°C
24 Pin 4mm x 4mm QFN	29.4°C/W		
49 Ball 2.8mm x 2.8mm WCSP	45°C/W		

- 1) This data is based on using the JEDEC High-K board and the exposed die pad is connected to a Cu pad on the board. The pad is connected to the ground plane by a 2x3 via matrix.