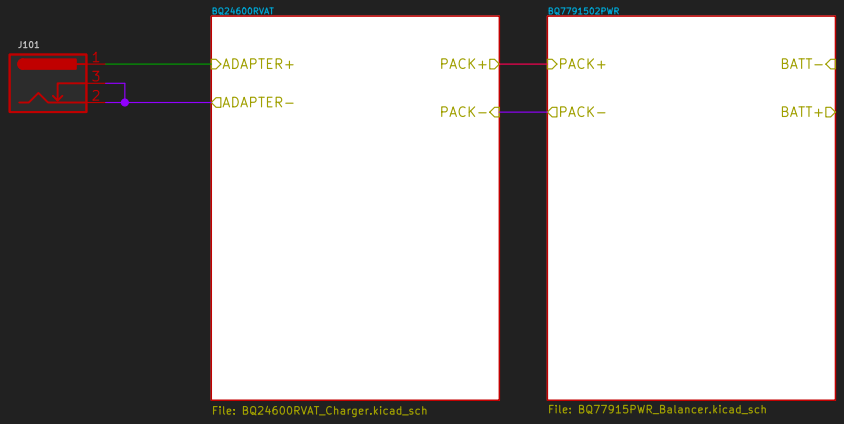
Smart Charger. Project for Mr. Wladzio



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QUASI PEAK

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File: Smart_Charger.kicad_sch

Title: Smart Charger – Device for Mr.Wladziu

Size: A4	Date: 2022-02-04	**Rev: ED A0**
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu20.04.1		Id: 1/3

BQ24600 Stand-Alone Synchronous Switch-Mode Li-Ion or Li-Polymer Battery Charger with Low Iq

Main IC circuit

Portable Equipment Handle Terminals
Industrial and Medical Equipment
Power Tools Appliance
Mobile Internet Device, and Ultra-Mobile PC

Features
1.2-MHz NMOS-NMOS Synchronous Buck Converter
Stand-Alone Charger Support for Li-Ion or Li-Polymer
5-V - 28-V VCC Input Voltage Range and Supports 1S-6S Battery Cells
Up to 10-A Charge Current and Adapter Current
High-Accuracy Voltage and Current Regulation
- ±0.5% Charge-Voltage Accuracy
- ±3% Charge-Current Accuracy
Integration
- Internal Loop Compensation
- Internal Soft Start
Safety
- Input Overvoltage Protection
- Battery Thermistor Sense Hot/Cold Charge Suspend
- Battery Detection
- Built-In Safety Timer
- Charge Overcurrent Protection
- Battery Short Protection
- Battery Overvoltage Protection
- Thermal Shutdown
Status Outputs
- Adapter Present
- Charger Operation Status
Charge Enable Pin
6-V Gate Drive for Synchronous Power Converter
30-ns Driver Dead-Time and 99.5% Max. Effective Duty Cycle
16-Pin 3.5-mm × 3.5-mm QFN package
Energy Star Low Quiescent Current I q
- < 15-µA Off-State Battery Discharge Current
- < 1.5-mA Off-State Input Quiescent Current

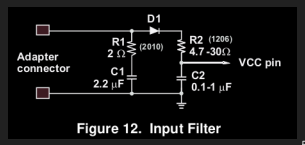
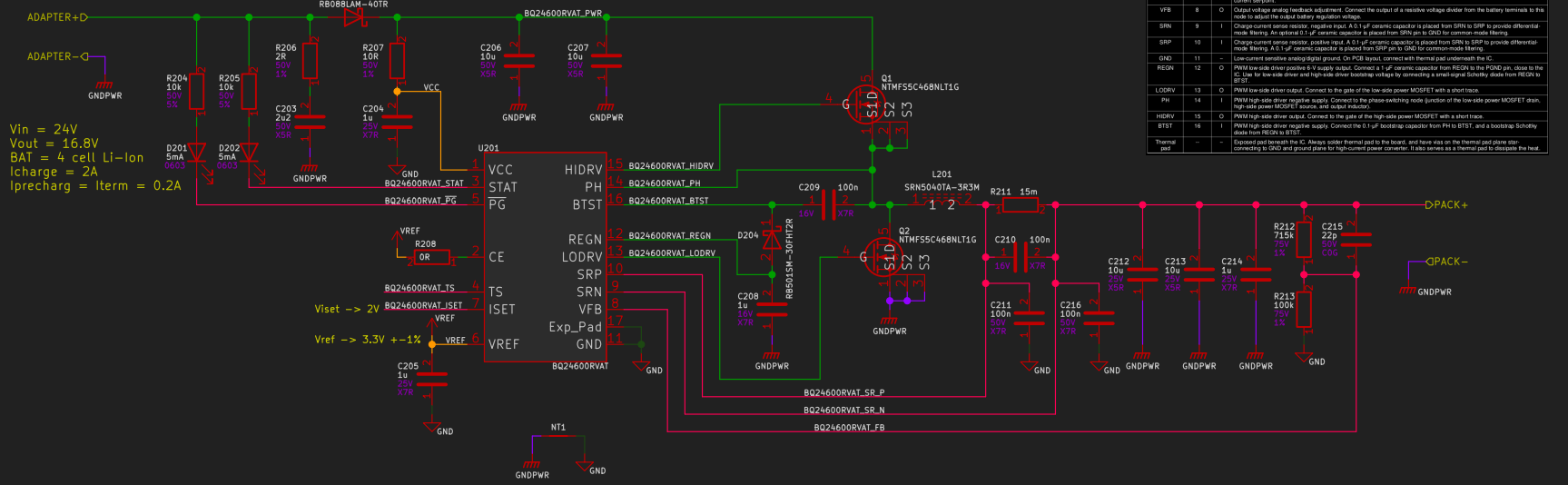


Figure 12. Input Filter

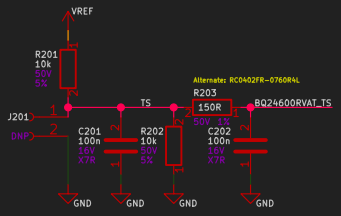
Vin = 24V
Vout = 16.8V
BAT = 4 cell Li-Ion
Icharge = 2A
Iprecharg = Iterm = 0.2A

Pin Functions

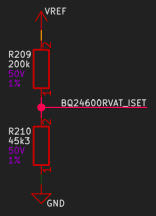
PIN NAME	PIN NO.	I/O	FUNCTION DESCRIPTION
VCC	1	I	IC power positive supply. Connect, through a 10-Ω resistor to the common-source (diode-OR) point: source of high-side P-channel MOSFET and source of reverse-blocking power P-channel MOSFET. Or connect through a 10-Ω resistor to the cathode of the input diode. Place a 1 µF ceramic capacitor from VCC to the GND pin close to the IC.
CE	2	I	Charge-enable active-HIGH logic input. Hi enables charge. LO disables charge. It has an internal 1MΩ pull-down resistor.
STAT	3	I	Open-drain charge status pin to indicate various charger operation (See Table 2)
TS	4	I	Temperature qualification voltage input for battery pack negative temperature coefficient thermistor. Program the hot and cold temperature window with a resistor divider from VREF to TS to GND.
PG	5	O	Open-drain power-good status output. The transistor turns on when a valid VCC is detected. It is turned off in the sleep mode. PG can be used to drive an LED or communicate with a host processor. It can be used to drive ACFET and BATFET.
VREF	6	O	3.3-V regulated voltage output. Place a 1-µF ceramic capacitor from VREF to the GND pin close to the IC. This voltage could be used for programming of voltage and current regulation and for programming the TS threshold.
ISET	7	I	Charge current set input. The voltage of ISET pin programs the charge current regulation, pre-charge current and termination current set-point.
VFB	8	O	Output voltage analog feedback adjustment. Connect the output of a resistive voltage divider from the battery terminals to this node to adjust the output battery regulation voltage.
SRN	9	I	Charge-current sense resistor, negative input. A 0.1-µF ceramic capacitor is placed from SRN to SRP to provide differential-mode filtering. An optional 0.1-µF ceramic capacitor is placed from SRN pin to GND for common-mode filtering.
SRP	10	I	Charge-current sense resistor, positive input. A 0.1-µF ceramic capacitor is placed from SRN to SRP to provide differential-mode filtering. A 0.1-µF ceramic capacitor is placed from SRP pin to GND for common-mode filtering.
GND	11	–	Low-current sensitive analog/digital ground. On PCB layout, connect with thermal pad underneath the IC.
REGN	12	O	PWM low-side driver positive 6-V supply output. Connect a 1-µF ceramic capacitor from REGN to the PGND pin, close to the IC. Use for low-side driver and high-side driver bootstrap voltage by connecting a small-signal Schottky diode from REGN to BTST.
LODRV	13	O	PWM low-side driver output. Connect to the gate of the low-side power MOSFET with a short trace.
PH	14	I	PWM high-side driver negative supply. Connect to the phase-switching node (junction of the low-side power MOSFET drain, high-side power MOSFET source, and output inductor).
HIDRV	15	O	PWM high-side driver output. Connect to the gate of the high-side power MOSFET with a short trace.
BTST	16	I	PWM high-side driver negative supply. Connect the 0.1-µF bootstrap capacitor from PH to BTST, and a bootstrap Schottky diode from REGN to BTST.
Thermal pad	–	–	Exposed pad beneath the IC. Always solder thermal pad to the board, and have vias on the thermal pad plane star-connecting to GND and ground plane for high-current power converter. It also serves as a thermal pad to dissipate the heat.

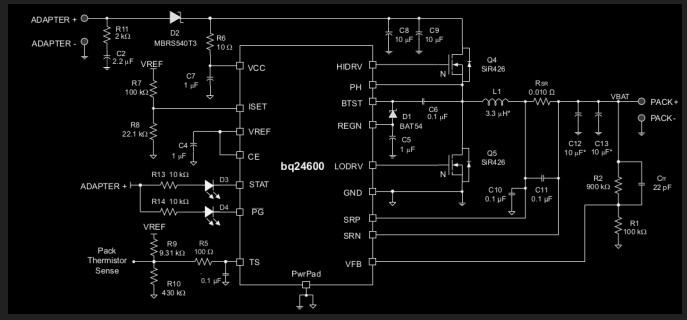


Thermistor circuit



Charging current circuit





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Sheet: /BQ24600RVAT/
File: BQ24600RVAT_Charger.kicad_sch

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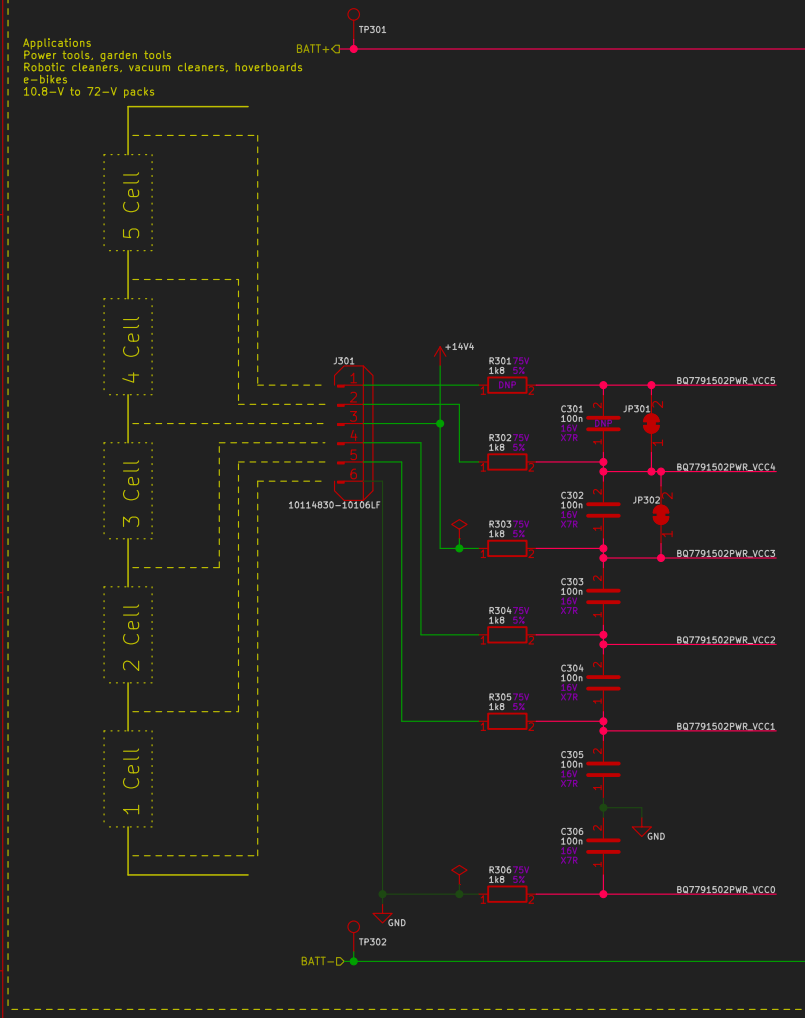
KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu20.04.1		Id: 2/3

BQ77915 3-Series to 5-Series Stackable Ultra-Low Power Primary Protector with Autonomous Cell Balancing and HIBERNATE Mode

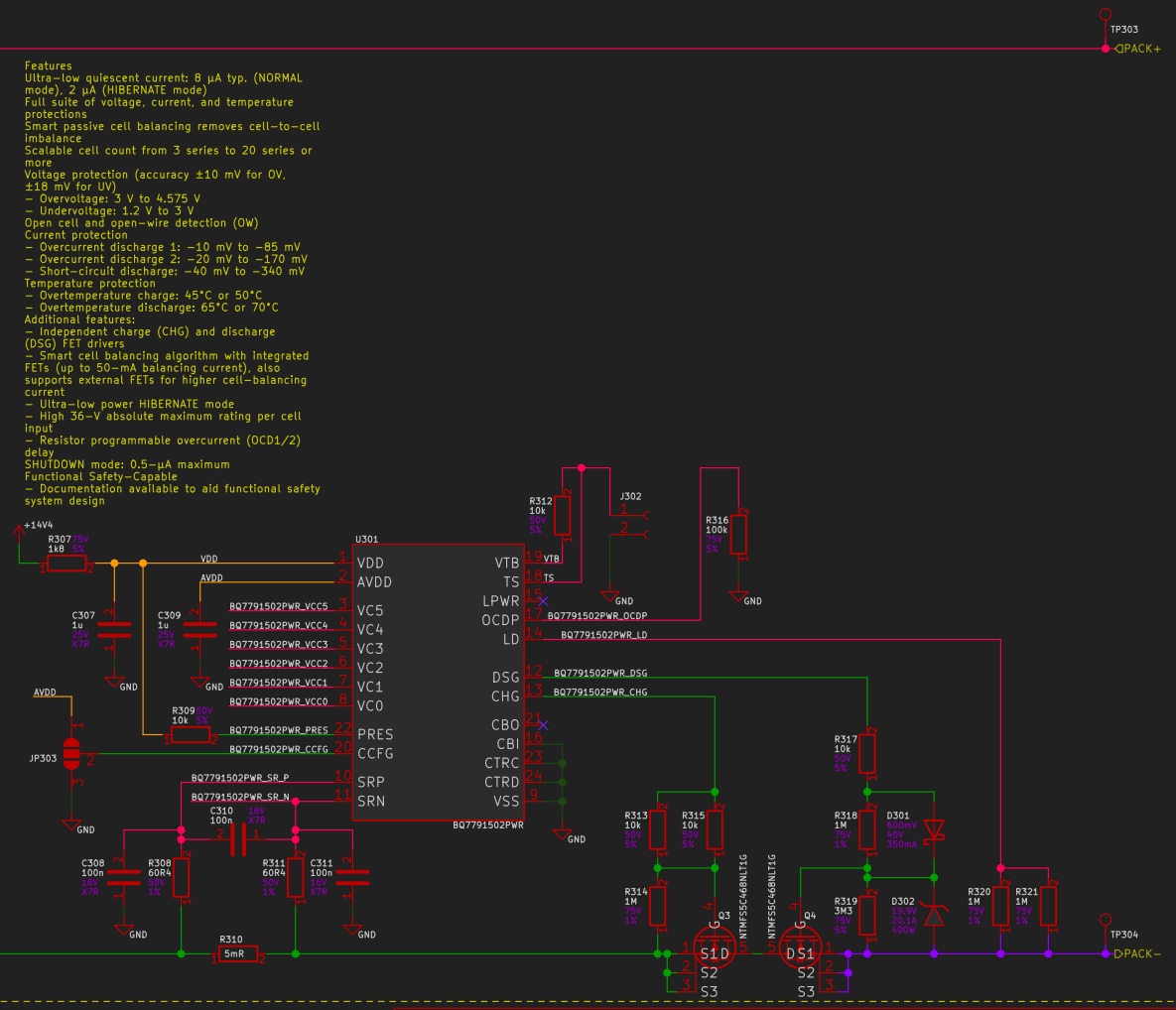
Input connector

Applications
Power tools, garden tools
Robotic cleaners, vacuum cleaners, hoverboards
e-bikes
10.8-V to 72-V packs



Main IC circuit

Features
Ultra-low quiescent current: 8 µA typ. (NORMAL mode), 2 µA (HIBERNATE mode)
Full suite of voltage, current, and temperature protections
Smart passive cell balancing removes cell-to-cell imbalance
Scalable cell count from 3 series to 20 series or more
Voltage protection (accuracy ±10 mV for OV, ±18 mV for UV)
– Overvoltage: 3 V to 4.575 V
– Undervoltage: 1.2 V to 3 V
Open cell and open-wire detection (OW)
Current protection
– Overcurrent discharge 1: –10 mV to –85 mV
– Overcurrent discharge 2: –20 mV to –170 mV
– Short-circuit discharge: –40 mV to –340 mV
Temperature protection
– Overtemperature charge: 45°C or 50°C
– Overtemperature discharge: 65°C or 70°C
Additional features:
– Independent charge (CHG) and discharge (DSG) FET drivers
– Smart cell balancing algorithm with integrated FETs (up to 50-mA balancing current), also supports external FETs for higher cell-balancing current
– Ultra-low power HIBERNATE mode
– High 36-V absolute maximum rating per cell input
– Resistor programmable overcurrent (OCD1/2) delay
SHUTDOWN mode: 0.5-µA maximum
Functional Safety-Capable
– Documentation available to aid functional safety system design



Mounting holes & fiducials

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Sheet: /BQ7791502PWR/
File: BQ77915PWR_Balancer.kicad_sch

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KiCad E.D.A. kicad 6.0.4-6f826c9f35-116-ubuntu20.04.1		Id: 3/3