Evaluation-Kit

Nμ701.65

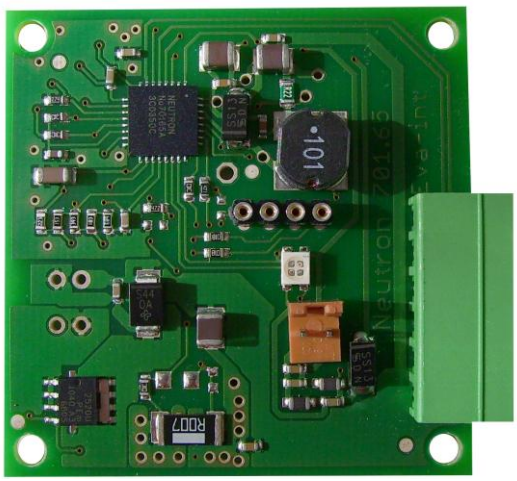
LI-Ion Charge-IC with balancing und load-management

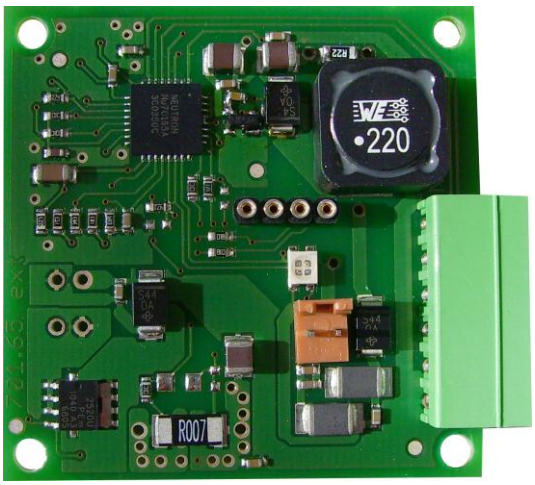
1 to 5 cells

0,5 / 2 Ampere charge current

Eva-Boards EVA701.65int and -ext

Rev. 0.1





Inhalt

1 Description

The evaluation Boards “EVA701.65int“ and “EVA701.65ext“ are designed to get you in touch and let you test the functions of the Nµ701.65 Lithium-Charge IC. The “int” Version uses the Nµ701.65 internal P-MOSFET for the DC-DC-converter, allowing 0.5 Ampere max. charge current. The “ext” Version is fitted with an external P-MOSFET, allowing higher charge-currents up to 2 Amperes.

1.1 Connections

The EVA-Boards has all connections enabling every function of the Nµ701.65:

1.1.1 Battery-connector BU5:

The rechargeable battery with 1 to 5 cells in series is connected to the green pin header.
Unused cell-terminals have to be tied to the positive battery terminal VBAT. (See example in chapter 2.2).
Batteries with cells connected in parallel are also possible.

1.1.2 DC input BU7:

Connect a DC power supply of min. 8V to BU7. Input voltage must be at least 3V higher than the maximum battery-voltage.

1.1.3 Load-connector BU4:

A load, e.g. a motor or a signal-lamp can be connected here. If the load is activated by the switch it is supplied with the battery-voltage.

1.1.4 Switch-connector BU6:

A switch to activate the load can be connected here. It is connected in series with the load and the shunt R10, so the load-current goes through the switch. It is possible for applications without safety-regulations to configure the switch load-free, see Data-sheet of the Nµ701.65.

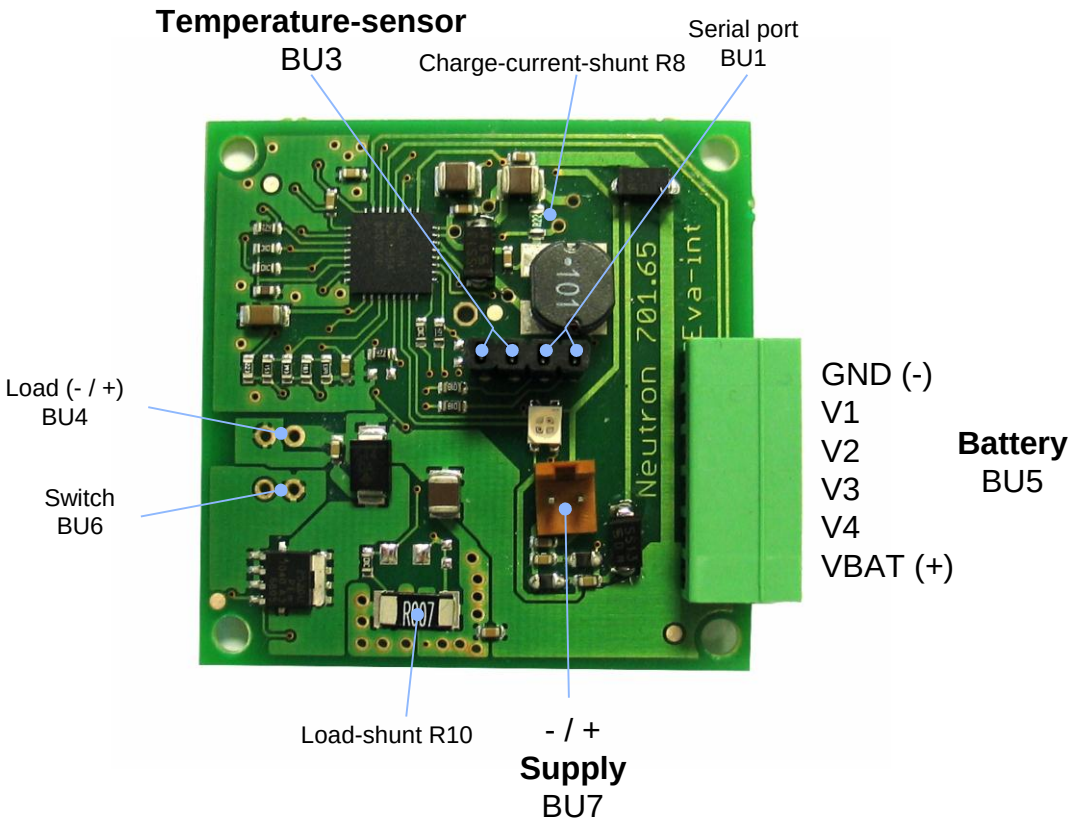
1.1.5 Temperature-sensor-connector BU3:

The Nµ701.65 provides temperature monitoring for either battery or load with an NTC connected to BU3.
IF you don´t want to use temperature monitoring, connect a 6k8-resistor to BU3, simulating a valid temperature.
There are also SMD-Pads for an NTC or resistor on board (see floorplan).

1.1.6 Serial port BU1:

Use the serial port to read the Nµ701.65´s status-registers or to take over the control of the Nµ701.65´s charge-process and load-management. See the Application Note AN701.65-115.

1.2 Picture and connection-diagram



2 First time setup

- Apply an NTC or a 6k8 resistor to BU3
- Connect the battery. Tie unused cell-terminals to VBAT (see chapter 2.2).
- Connect a load (motor / lamp) to BU4. Mind polarity!
- Connect a switch capable of carrying the load-current to BU6.
- Closing the switch activates the load.
- Releasing the switch lets the status-LED signal the battery-gauge
- Connect a DC power supply of at least 8V and at least VBAT + 3V to BU7. The LED will flash green to signal the “charge”-status.

2.1 User-determinable parameters

2.1.1 Charge current:

The value of R8 determines the charge current. The “int”-version is equipped with a 220 milliohm resistor resulting in a maximum charge current of 0.5 Ampere. The “ext”-version has a 47 milliohm resistor and a maximum charge-current of 2 Amperes.
The PCBs have pads for THT-resistors (R8b) which can be equipped with higher values resulting in lower charge currents.

2.1.2 Overload-current:

The safety circuit for overload and short-circuits has a threshold which is defined by R10. The Eva-boards are equipped with a 7 milliohm resistor, resulting in 8 Amperes overload-threshold. This value can also be altered by THT or SMD resistors with different values.

2.1.3 Overload response time:

The response time for overload and short circuit protection can be extended by adding the capacitor C15.

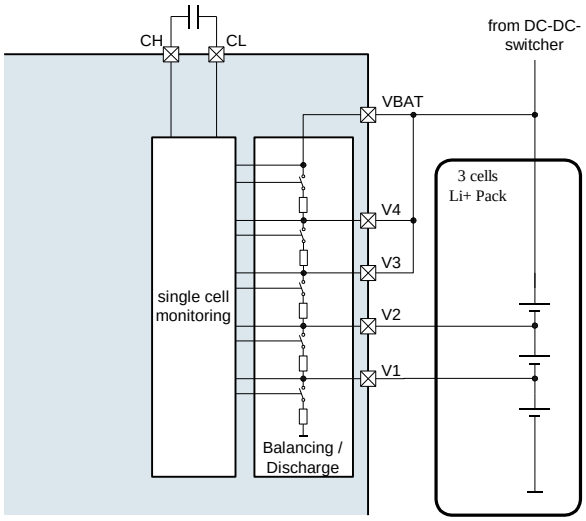
2.1.4 Temperature-thresholds:

The temperature ranges for load-mode and charge-mode can be altered by choosing different types of NTC and R5. See Datasheet Nµ701.65.

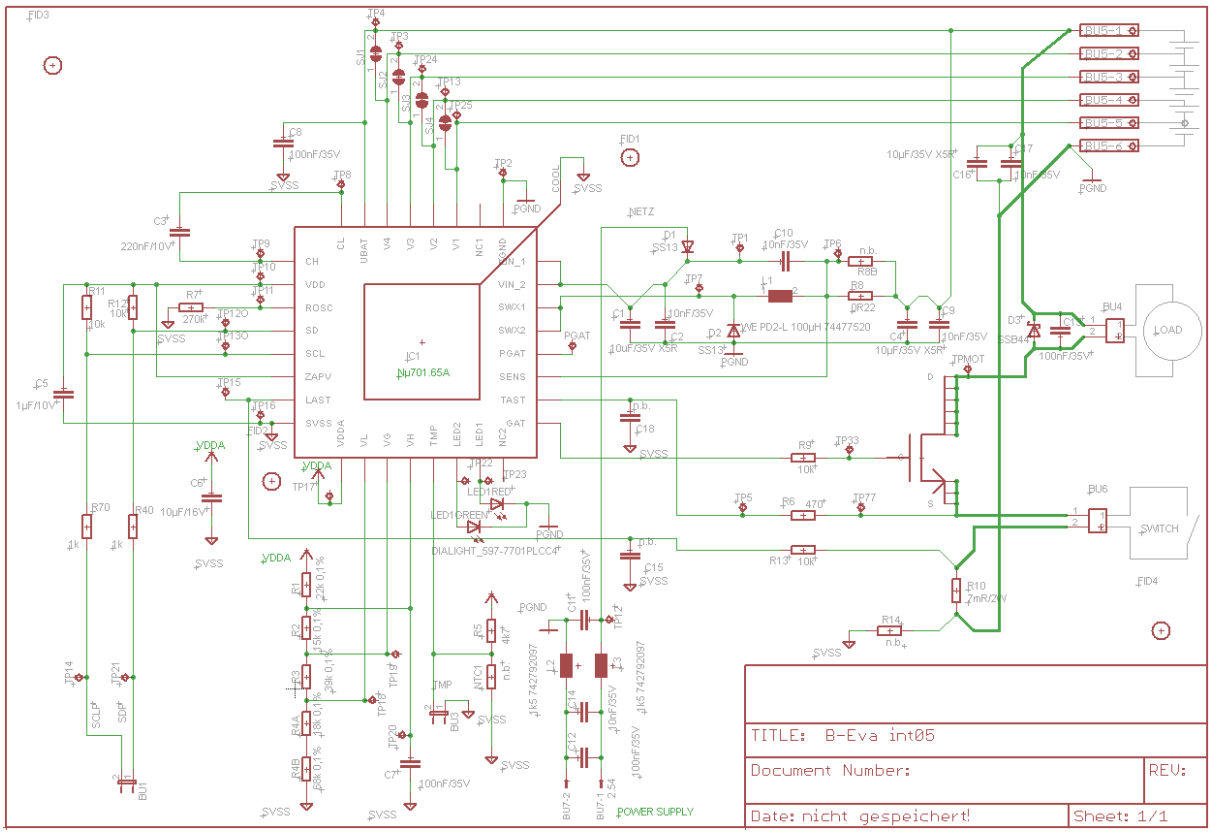
2.2 Connecting batteries with less than 5 cells

When connecting less than 5 cells, the unused sense-pins of the Nµ701.65 have to be tied to VBAT starting with V4. This can be achieved with Jumpers at BU5 or on the PCBs solder-side, where solder-jumpers are prepared.

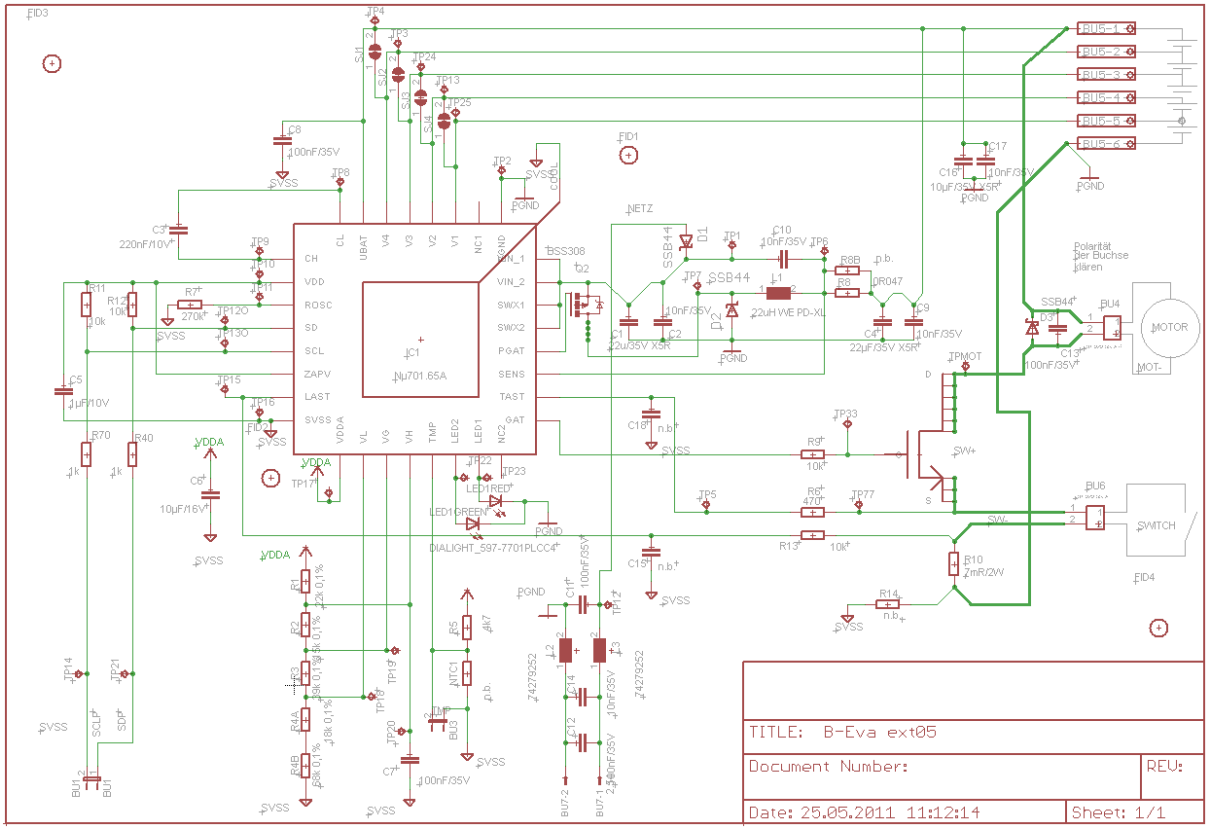
Example: Batteries with 3 cells, V3 and V4 tied to VBAT.



3 Circuits

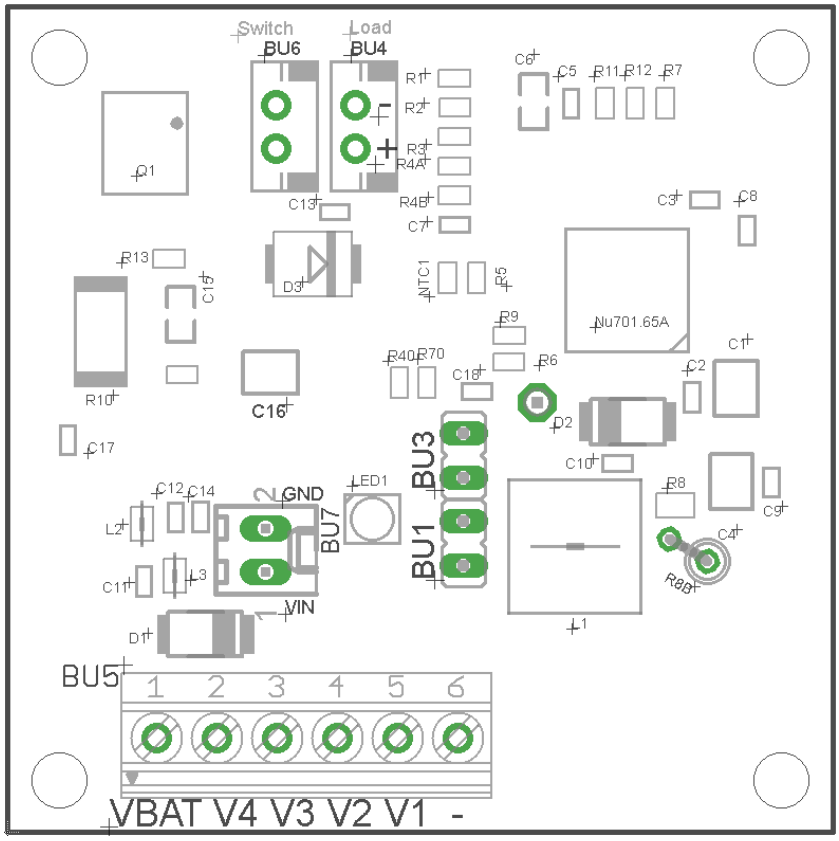


EVA701.65int

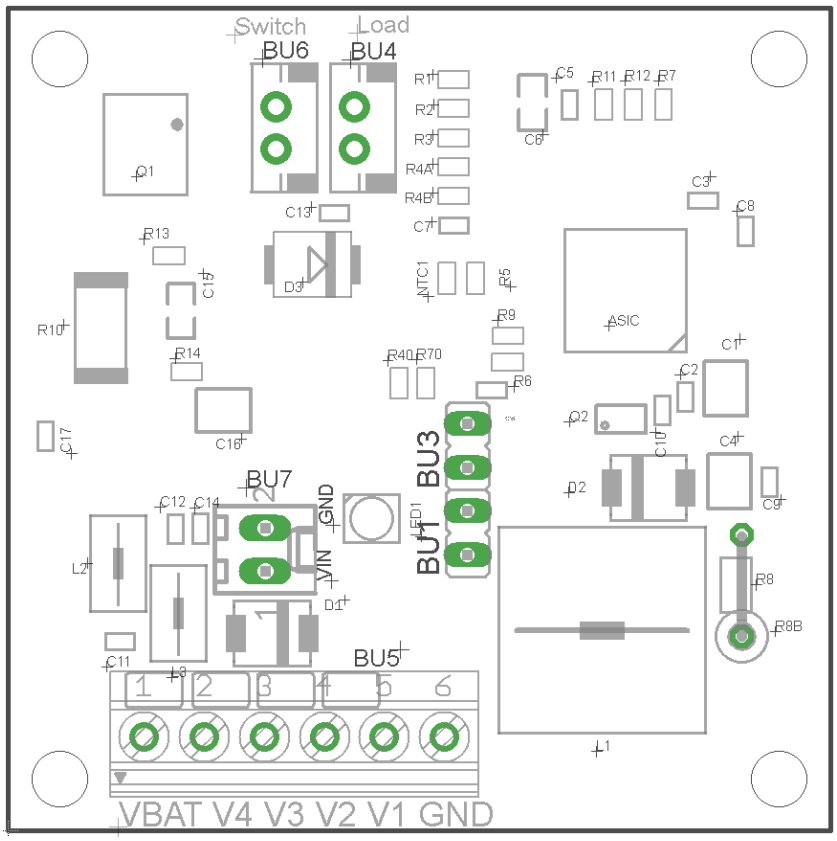


EVA701.65ext

4 Floor-plan



EVA701.65int



EVA701.65ext

5 Status-displays and error-codes

#	Status	Colour	Style	Remark
1	Charging	Green	Flashing	Small pulsewidth: PreC, CC, Dis.-phase Large pulsewidth: CV-Phase
2	Charge terminated (Battery full)	Green	Cont.	Until unplugging power supply
3	Battery full (after releasing switch)	Green	Cont.	~ 20 Seconds
4	Battery half (after releasing switch)	Yellow	Cont.	~ 20 Seconds
5	Battery empty (while/after pressing switch)	Red	Cont.	~ 20 Seconds
6	Time-error	Red	Flashing	fast
7	Battery-error	Red	Flashing	slowly
8	Temperature error <4 seconds after releasing the switch	Yellow	Cont.	
9	Temperature error > 4 Seconds	Yellow	Flashing	slowly
10	Load-error (Overload / Short circuit)	Yellow	Flashing	fast

A Battery Error is displayed, when one cell in the battery has a voltage below V_{MIN} and another has reached V_{MAX}, or if one cell-voltage is below V_{SHORT}.

6 Electrical characteristics

Reference = SVSS; Supply V_{BAT}=20V, V_{VIN}=25V; Temperature = 27°C

Parameter	Bedingung	Symbol	min	typ	max	Einheit
Battery-Voltage pin VBAT		V_{BAT}	0		30	V
Supply Voltage VIN	V_{VIN} > V_{BAT}+3V	V_{VIN}	8V		30	V
Charge-current	CC-Phases, R8=0R22 (int) CC-Phases, R8=0R047 (ext)	I_{CC}			0,5 2,0	A
Precharge-current	Precharge-Phase and end of charge	I_{PRE}		0,2*I_{CC}		
Balancing-current	CC- and Discharge-Phases V(VBAT)-V(V4)=3V V(V4)-V(V3)=3V V(V3)-V(V2)=3V V(V2)-V(V1)=3V V(V1)=3V	I_{DIS}	30	50	70	mA
Charge-termination voltage	CV-Phase	V_{MAX}		4,15	4,20	V
Threshold to start charging	Applying power supply	V_{VOLL}		3,9		V
Threshold recharge	Power supply remains applied	V_{NL}		3,7		V
Battery „half“: Yellow LED	Releasing the switch	V_{GELB}		3,3		V
load-termination voltage	Switch pressed > 4 Sec	V_{MIN}	2,50	2,55		V
Overload-threshold	Switch pressed, R10=7mR	$V_{LASTMAX}$		8		A
Short circuit threshold	Switch pressed, R10=7mR	$V_{LASTSHORT}$		38		A
Cell detection voltage		$\|V_{SHORT}\|$	0,8	1,15	1,6	V
Logical Output SD: Output voltage High: Output voltage Low:	 Output current 1 mA Output current -1mA	 V_{SD_H} V_{SD_L}	 2,3 0,0		 2,4 0,1	V
Standby current	VDDA disabled	I_{STBY}	0	1	3	µA
Lower operating temperature threshold	 NTC = 6k8	V_{T1} T1	2,19	2,23 -20	2,27	V °C
Lower charging temperature threshold	 NTC = 6k8	V_{T2} T2	1,97	2,06 -5	2,13	V °C
Upper charging temperature threshold	 NTC = 6k8	V_{T3} T3	0,82	0,93 45	1,04	V °C
Upper operating temperature threshold	 NTC = 6k8	V_{T4} T4	0,48	0,55 65	0,63	V °C