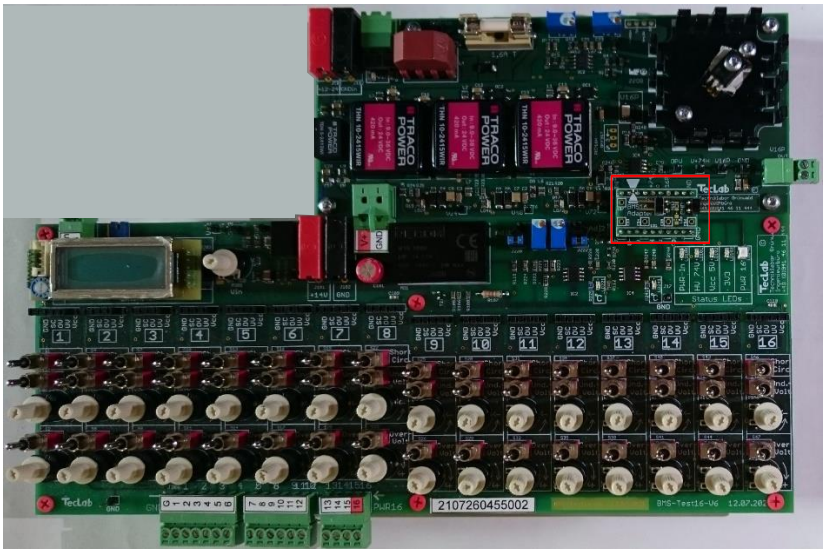
General Description

The **BMS16-Power-Option** enlarges the power output from the **BMS-Test16-Borads** up to **300mA** at a maximum voltage of **71V** by a separate terminal to drive a BMS circuit. The Power-Option-Board has to be clipped side by side on the BMS-Test16-Board using the 2 pin power connection terminal. Additionally a small PCB unit (red rectangle) with double 10 pin headers is used to connect both boards voltage test pins.

Picture1: BMS-Test16-Board with BMS-Power-Option-Board



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Power Input and Output

To input power to the BMS16-Power-Option board the removable power connector of the BMS-Test16-Board can be used. I**nput voltage** should be in **22 V up to 32 V range** with input current of **0.3 up to 1.6 A**.
The high current output of the BMS-Option-Board has to be taken from a several 2 pin connector terminal at the side of the board near the heat sink. The voltage of that terminal is regulated to the same voltage like the output cell16 of the BMS-Test16-Board. Every changing the number of cells or variation of the cell voltages on the BMS-Test16-Board will couse the Power-Option-Board to regulate to the same output voltage at a very low difference of maximum **2 mV** over the range of **8V** (2 cells) **up to 71V** (16 cells with over voltage). After power on a waittime of 3 minutes is recommended to reach the low voltage difference under 2mV (Table 5).

Output Cell Voltages

All cell connectors of the BMS-Test16-Board go on delivering their trimmed voltages. Only the high power output to drive a BMS cell management circuit will be taken from the side terminal of the BMS-Power-Option board.

Power supply

To supply high power output at high voltage enough current has to be delivered to the boards. The current depends on the input voltage and increases when lower input voltages are used. The input current **must not exceed 1.6 A**. To support 300 mA output current on cell 16 with a high voltage of more than 47 V the input power supply voltage has to be at **minimum of 22 V** to limit input current below 1.6 A (Table 2).

Electrical Isolation

The BMS16-Power-Option-Board transfers the input power twice. One small DC/DC module delivers a **fixed 15 V power line** to supply the BMS16-Test-Board using the BMS16-Test-Board power terminal. The other power line supports 3 DC/DC modules delivering a **high voltage of 74.7 V** to support the high power output of the board. All DC/DC modules do not have connections between the input power ground and the power grounds of the BMS-Test16-Board and the output of the BMS-Power-Option board. So the input power line is **electrically isolated** from both BMS boards.

Saving power loss and heating (Table 4)

To reduse power loss and heating the BMS-Power-Option board has a built in automatic shut down of the DC/DC power modules to lower voltage. Switch down happens from 74V down to 50V and down to 25V due to the used cell voltage. The voltage switching thresholds are 47 V and 22 V with a small hysteresis. Three onboard LEDs show the activity of the DC/DC modules (yellow 25 V, amber 50 V, red 74 V).

Parameters

Table1: Absolut maximum ratings

Maximum power input voltage	32	V
Minimum power input voltage **(*1)**	10	V
Maximum power input current @ maximum load	1.6	A
Maximum operating voltage on board	74.7	V

(*1) Attention: Input voltage below 22V may increase input current over maximum of 1.6 A

Table2: Power supply voltage and current

Power supply input voltage	10	12	15	18	22	24	30	V
Maximum BMS-Power-Option output current (Cell16 voltage > 47 V)	100	150	200	250	300			mA
Power supply current	1.5				1.4	1.3	1.0	A

Table3: Recommended operating conditions

Power input voltage	>= 22	V
Number of cells	3 up to 16	
Nominal operating temperature	0 to 50	°C

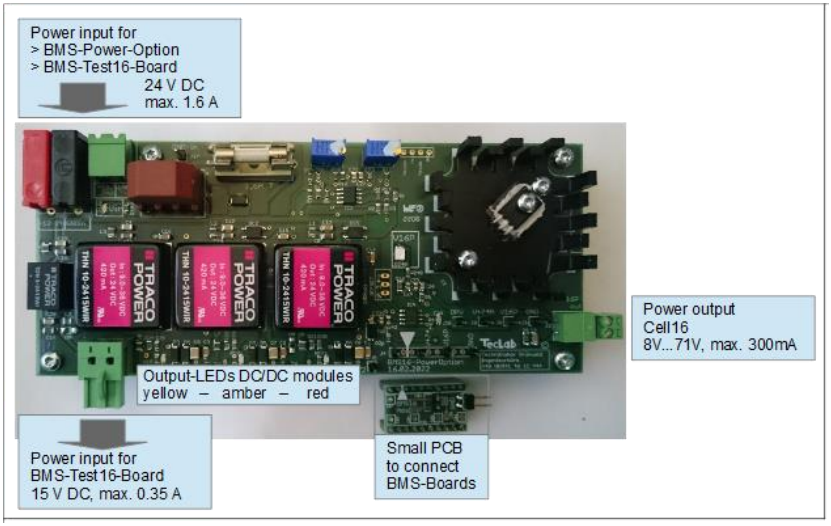
Table4: Shut down DC/DC modules by lower cell voltages

DC/DC modul 3: Switch down to 50V Switch up to 74V	@ V Cell16 =	46.9	 47	V
DC/DC modul 2: Switch down to 25V Switch up to 50V	@ V Cell16 =	21.9	 22	V

Table5: Operating values. Input voltage 22V, measured @ 20°C :

Parameter	**Condition**	**min**	**max**	**Unit**
Voltage difference between outputs on BMS-Test16 board and BMS-Power-Option board	Cell voltage = 4 V 3 up to 16 cells	0.22	2	mV
Output ripple voltage (depends on output cell voltage)	full range	7	25	mV
	50mA output current	9	18	
	100mA output current	8	16	
	200mA output current	7	15	
	300mA output current	8	23	
Output drift by OPAmp drift voltage	3 up to 16 cells	2	4	mV
Switch on time for stable output voltage	dV = 150mV → dV = 2mV	3		Min.

Picture2: BMS-Power-Option Board Connectors



Picture3: BMS - PCB Board to Board Connector