# Power Management Board Type (1) (VK-PM1-5V)
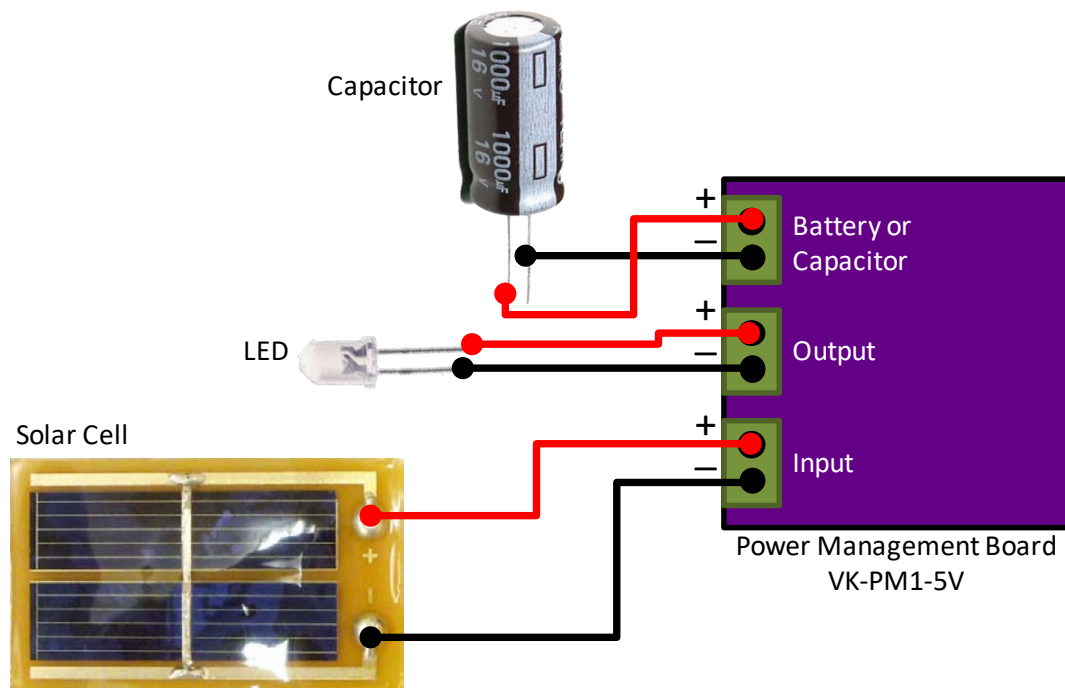
## Instructions for use



Figure 1. Example of wiring diagram for connecting solar cell, capacitor, and LED with the power management board.

Table1. Electrical characteristics of the power management board

| PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|
| **BOOST CONVERTER \ CHARGER STAGE** | | | | |
| DC input voltage | 130 | | 3000 | mV |
| Peak Current flowing from the input | | 200 | 300 | mA |
| Input power range for normal charging | 0.01 | | 300 | mW |
| Cold-start Voltage. Input voltage that will start charging | | 600 | 700 | mV |
| Minimum cold-start input power to start normal charging | | 15 | | µW |
| Voltage when cold start operation ends and normal charger operation begins | 1.6 | 1.77 | 1.95 | V |
| Boost converter mode switching frequency | | | 1 | MHz |
| **BATTERY MANAGEMENT** | | | | |
| Quiescent current charger shutdown in under-voltage (UV) condition | | 330 | 750 | nA |
| Quiescent current charger shutdown in overvoltage (OV) condition | | 570 | 1400 | nA |
| Programmable voltage (VBAT_OV)range for overvoltage threshold (Battery voltage is rising) | 2.5 | 3.1[*] | 5.25 | V |
| Programmable voltage (VBAT_UV)range for under-voltage threshold (Battery voltage is falling) | 2.2 | | VBAT _OV | V |
| **BIAS and MPPT CONTROL STAGE** | | | | |
| Sampling period of VIN_DC open circuit voltage | | 16 | | s |
| Sampling period of VIN_DC open circuit voltage | | 256 | | ms |
| Regulation of VIN_DC during charging | -10% | | +10% | |
| Voltage node which is used as a reference for the programmable voltage thresholds | 1.21 | 1.25 | 1.27 | V |

[*] Default output voltage is set to VBAT_OV = 3.1 V and VBAT_UV = 2.2 V
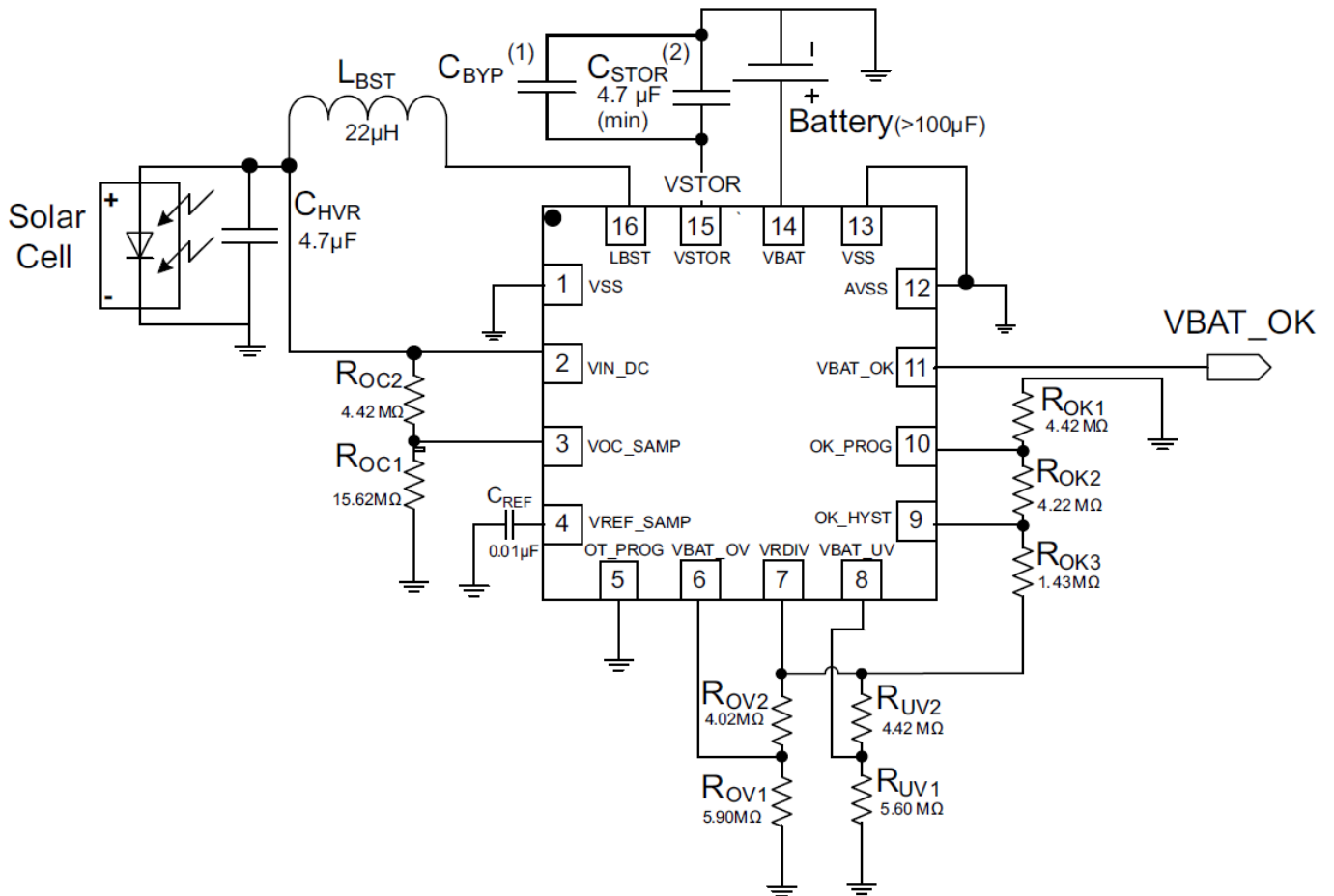
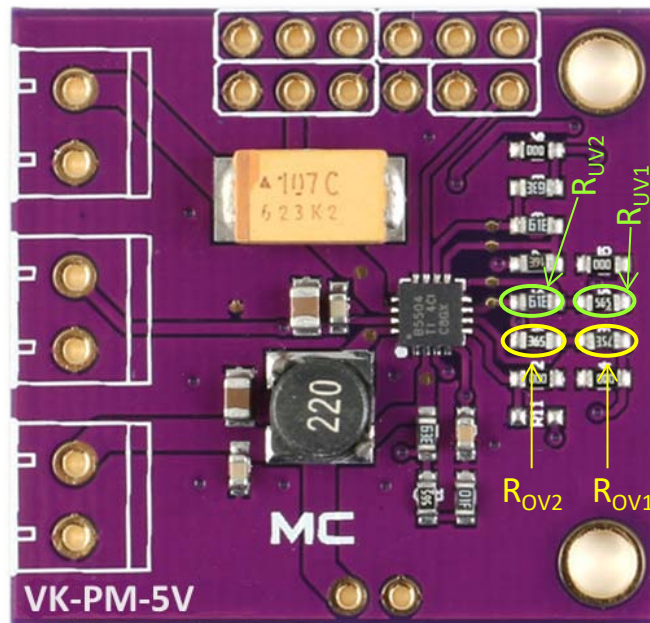Figure 2. Schematic diagram of the circuit board.



Figure 3.  Output voltage VBAT_OV  and VBAT_UV controlling resistor locations.

The factory set output voltage of the power management board is  3.1 V. If you wish to change it to a different value please use Table 2 and Table 3 to calculate new replacement resistor values.

VBAT_OV = maximum charging voltage of the battery.

VBAT_UV = under-voltage threshold voltage.(Automatically stops charging the battery if boost converter output goes below this voltage)

Table 2. Example of $R_{OV1}$ and $R_{OV2}$ resistor values (and codes on SMD part) for the most common output voltages.

| Desired Max Charging Voltage (V) (VBAT_OV) | $R_{OV1}$ | | $R_{OV2}$ | |
|---|---|---|---|---|
| | Value (MΩ) | Code on Resistor | Value (MΩ) | Code on Resistor |
| 2.5 | 7.5 | 85E | 2.49 | 39E |
| 3.3 | 5.62 | 73E | 4.32 | 62E |
| 4.2 | 4.42 | 63E | 5.49 | 72E |
| 5.0 | 3.74 | 56E | 6.19 | 77E |

Table 3. Example of $R_{UV1}$ and $R_{UV2}$ resistor values (and codes on SMD part) for some selected under-voltage threshold voltages.

| Desired Under Voltage Threshold Voltage (V) (VBAT_UV) | $R_{UV1}$ | | $R_{UV2}$ | |
|---|---|---|---|---|
| | Value (MΩ) | Code on Resistor | Value (MΩ) | Code on Resistor |
| 2.2 | 5.62 | 73E | 4.32 | 62E |
| 3.0 | 4.12 | 60E | 5.9 | 75E |
| 3.6 | 3.48 | 53E | 6.49 | 79E |
| 4.5 | 2.8 | 44E | 7.15 | 83E |

# This section only for advanced users.
# Pin names and function of 12 pin connector

The Power Management Board is equipped with a twelve pin connector for control and monitoring purposes. The name of each pin is shown in Figure 4 and an explanation of each pin is given in Table 4.
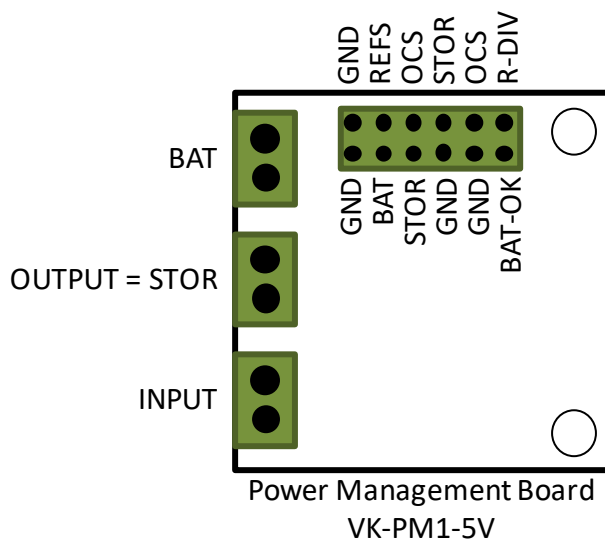


Figure 4. Pin identification of the 12-pin connector.

Table 4. Description of pins in 12 pin connector.

| Pin Name | Function Description |
| --- | --- |
| GND | General ground connection for the device |
| BAT | The positive terminal of rechargeable storage (capacitor or Battery) |
| STOR | Connection for the output of the boost charger, which is typically connected to the system load. |
| BAT-OK | Digital output for battery good indicator. Internally referenced to the VSTOR voltage. |
| R-DIV | The middle point of $R_{OC1}$ and $R_{OC2}$ resistor divider. This pin should connect to OCS pin to enable the MPPT function. |
| OCS | This is the VOC_SAMP pin of the main IC. Sampling pin for MPPT network. Connect to the R-DIV for setting the MPP threshold voltage which will be stored on the REFS pin. To disable the MPPT sampling circuit, connect to STOR pin. |
| REFS | VREF_SAMP pin of the main IC. INPUT voltage will be regulated according to this pin voltage. This voltage is provided by the MPPT sample circuit. When MPPT is disabled, either use an external voltage source to provide this voltage or tie this pin to GND to disable input voltage regulation (i.e. operate from a low impedance power supply). |

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