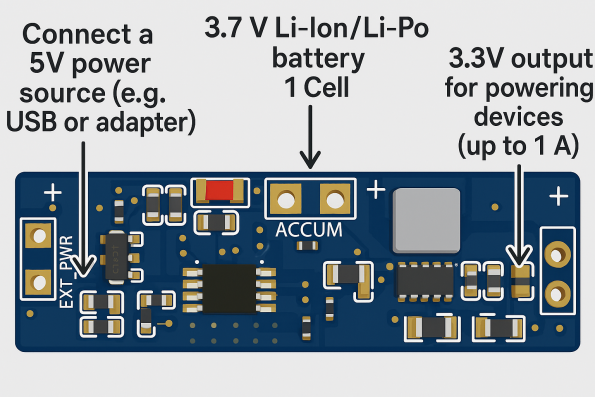
Micropowercore v1.2
82049, Pullach im Isartal, Germany
1326181@email.com

Micropowercore : TECHNICAL SPECIFICATION

Product Title:	Micropowercore v. 1.2	**Document Status:**	ver 1.1
Prepared by:		**Date Issued:**	April 014, 2025

PRODUCT SPECIFICATION			
PCB size:	33mm x 12mm	**PCB Type:**	2-layer
Cells:	1	**Cell chemistry:**	Li-Po, Li-Ion
Input VIN:	4.5-5.5 V	**Output VOUT:**	3.3 V

ELECTRICAL CHARACTERISTICS				
Parameter	Min	Type	Max	Unit
Input voltage (VIN)	4.5	5.0	5.5	V
Output voltage (VOUT)	3.2	3.3	3.35	V
Output current	-	-	1000	mA
Charging current	300	300	500	mA
Quiescent current (no load)	-	17	18	µA
Battery voltage range	3.0	3.7	4.2	V



Components on board

Integrated Buck-Boost Converter Features

The onboard buck-boost converter from Texas Instruments offers a robust and flexible power architecture designed for low-voltage, battery-powered applications. Its core capabilities include:

- **Peak current mode control** with defined transition thresholds between buck, buck-boost, and boost modes
- **Bidirectional current handling**: supports both forward and reverse current flow
- **Safe start-up** into pre-biased outputs, enabling reliable power-up behavior
- **Integrated soft-start mechanism** to minimize inrush current
- **Comprehensive protection features**, including overtemperature and output overvoltage protection
- **True shutdown mode** with complete load disconnect, minimizing standby power
- **Forward and reverse current limiting** to ensure safe operation under dynamic load conditions

Integrated Battery Charger Features

The onboard linear charger from Texas Instruments is optimized for safe, accurate, and efficient single-cell Li-Ion/Li-Poly battery charging. Key features include:

Charging Performance

- ±1% charge voltage accuracy for reliable battery protection
- ±10% charge current accuracy for consistent performance
- Selectable input current limit: **300 mA** or **500 mA**, USB-compliant
- Programmable or fixed charging profile with automatic phase transitions

Protection and Safety

- Overvoltage protection at 6.6 V on the input supply
- Dynamic power management to prevent USB overcurrent conditions
- Thermal regulation at 125 °C with thermal shutdown at 150 °C
- Cold and hot battery temperature compensation (e.g., reduced current at cold, 4.06 V limit at high temps)
- Integrated 10-hour safety timer to prevent prolonged charging

System Interface

- **Charging status indication**: outputs for “charging” and “charge complete”
- Compatible with autonomous systems — no host controller required

The charger from Texas Instruments is a family of compact, highly integrated linear chargers designed for single-cell Li-Ion and Li-Polymer batteries, ideally suited for space-constrained portable applications. These devices can operate from either a USB port or an AC adapter, and support high input voltages with integrated overvoltage protection, making them compatible with low-cost, unregulated power sources.

The charger provides a single regulated output for battery charging, and allows a system load to be connected in parallel with the battery — provided that the average system current does not prevent the battery from completing a full charge within the built-in 10-hour safety window.

Charging is performed in three phases: **pre-conditioning**, **constant current**, and **constant voltage**. Throughout all phases, an internal thermal regulation loop actively monitors the IC junction temperature and dynamically reduces the charge current if thermal limits are approached.

LED Status Indicators

The module features two onboard LEDs to provide clear visual feedback during operation:

- **Red1 LED** — Indicates the presence of external power (USB or VIN). It turns on when an external power source is connected.
- **Red2 LED** — Indicates the battery charging status.
- **ON**: The battery is currently charging.
- **OFF**: Charging is complete and the battery is fully charged.

⚠ Note:

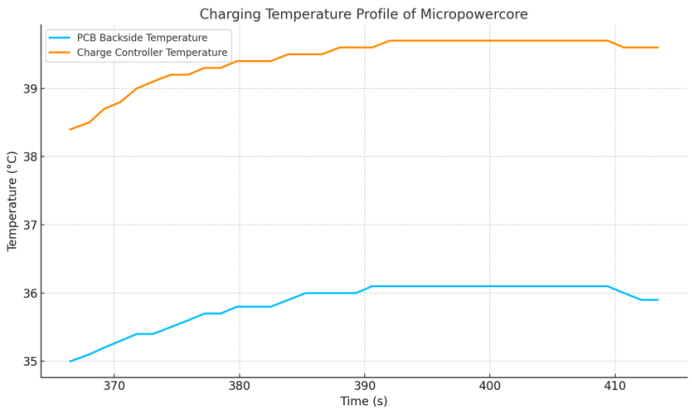
The charging IC includes a fixed 10-hour safety timer. For batteries with large capacities (e.g. 4000 mAh or more), this may result in an incomplete charge cycle if the full charge cannot be completed within that time limit — especially when the system load draws significant current, reducing the available charging current for the battery.

Charge Current Configuration

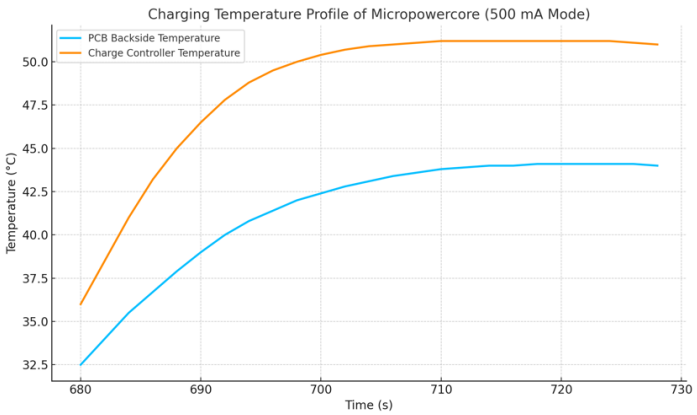
The battery charging current directly affects both the charging speed and the temperature of the charge controller. Heat is generated due to the voltage difference between the power source (typically USB 5V) and the battery (4.2–3.7V). When the battery is deeply discharged, this voltage difference is at its maximum. The charge controller reduces the input voltage and current to charge the battery efficiently. The excess voltage is converted into heat and dissipated.

For compact boards like *Micropowercore*, the trade-off between charging speed, current, and thermal performance is a key design consideration. By default, the charge current is set to **300 mA**, which offers a balanced compromise—charging the battery efficiently within a reasonable time while keeping heat generation within safe limits.

The board features a switch that allows increasing the charging current to **500 mA**, which speeds up the charging process at the cost of slightly increased thermal output.



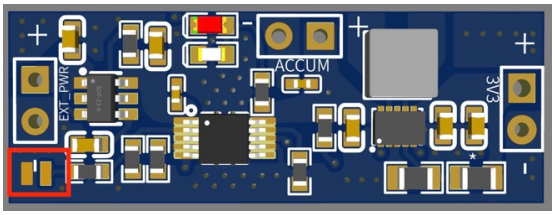
300 mA backside max – 36.3 C, Chip controller max – 39.6 C



500 mA backside max – 43.1 C, Chip controller max – 51.4 C

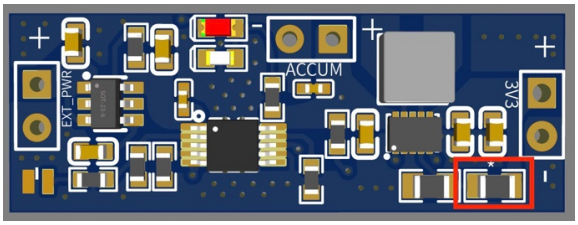
Customization

The board supports basic customization of both charge current and output voltage. A jumper allows selecting between **300 mA** and **500 mA** charge current modes. Additionally, the output voltage can be adjusted by replacing a specific onboard resistor.



Charge current adjustment

By default, the board is configured for a **300 mA** charge current. To switch to **500 mA mode**, close the jumper marked with a **red square**. Opening the jumper will revert the board back to **300 mA mode**.



Output Voltage Adjustment

The output voltage can be modified by replacing the resistor marked with a **red square**. Refer to the table below to select the appropriate resistor value for the desired output voltage.

VO [V]	R [kΩ]
2.5	365
3.3	511
3.6	562
5	806

Sizes