

# CTM External Battery Pack

Version 4.0

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This document describes individual components of external battery pack for Medtronic RC+S CTM module and its assembly. Sharing of this document is allowed with sincere permissions of Dr. Worrell research group within Open Mind RC+S group.

If you are using this in your research, please, consider acknowledge our publications (Kremen et al., 2018).

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FULL Assembly:



1. Battery cradle - **Battery Pack Cradle Case Charging Port Bank OEM for Samsung Galaxy s4 Mini**

<https://www.ebay.com/itm/Battery-Pack-Cradle-Case-Charging-Port-Bank-OEM-for-Samsung-Galaxy-s4-Mini/162841662061?epid=1523953758&hash=item25ea1e926d:g:HkQAAOSwYGFUzem>



2. Batteries - **Acevan Galaxy S4 Battery 2900mAh Li-ion Battery Replacement for Samsung Galaxy S4, AT&T I337, Verizon I545, Sprint L720, T-Mobile M919, R970, I9500, I9505, Galaxy S4 LTE I9506 [3 Year Warranty]**

[https://www.amazon.com/Acevan-Galaxy-S4-Replacement-Warranty/dp/B0742MJXFM/ref=sr\\_1\\_4?keywords=S4+battery&qid=1557172339&s=gateway&sr=8-4](https://www.amazon.com/Acevan-Galaxy-S4-Replacement-Warranty/dp/B0742MJXFM/ref=sr_1_4?keywords=S4+battery&qid=1557172339&s=gateway&sr=8-4)



3. External charger - **YN4L Wall Home AC Desktop Dock Battery Charger For Samsung Galaxy S III S3 i9300; i535; L710; T999; i747; Samsung Galaxy S4 Active i537; i337 AT&T; L720 Sprint; M919 T-Mobile; R970 US Cellular; i545 Verizon; Samsung Galaxy Stellar SCH-i200**

[https://www.amazon.com/Desktop-Battery-T-Mobile-Cellular-SCH-i200/dp/B00O3MLQ72/ref=sr\\_1\\_5?keywords=S4+battery+charger&qid=1557172371&s=gateway&sr=8-5](https://www.amazon.com/Desktop-Battery-T-Mobile-Cellular-SCH-i200/dp/B00O3MLQ72/ref=sr_1_5?keywords=S4+battery+charger&qid=1557172371&s=gateway&sr=8-5)



4. AAA battery connector (as a part) - **Everlasting Glow 93976 AAA Battery Convertor Christmas 5InL x 2InW x 7.5InH Black**

We disassembled it and use a AAA Battery Convertor with flat cable only (red oval in picture).

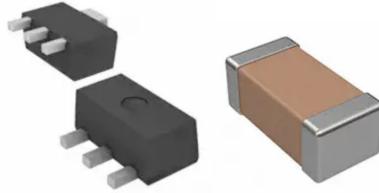
[https://www.amazon.com/Everlasting-Glow-93976-Convertor-Christmas/dp/B076MZQ42P/ref=sr\\_1\\_4?keywords=AAA+battery+converter&qid=1557172208&s=gateway&sr=8-4](https://www.amazon.com/Everlasting-Glow-93976-Convertor-Christmas/dp/B076MZQ42P/ref=sr_1_4?keywords=AAA+battery+converter&qid=1557172208&s=gateway&sr=8-4)



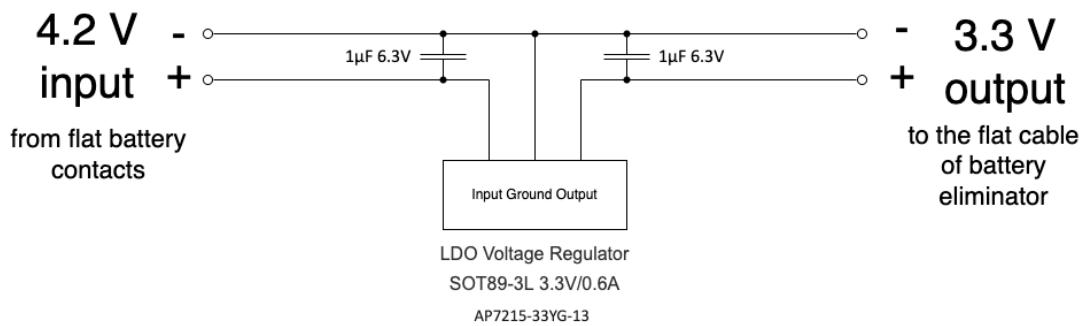
5. Voltage converter and capacitor – Linear Voltage Regulator IC Positive Fixed 1 Output 600mA SOT-89-3, and KEMET C1206C105K9RAC7800 1µF ±10% 6.3V Ceramic Capacitor X7R 1206 (3216 Metric)

<https://www.digikey.com/en/products/detail/diodes-incorporated/AP7215-33YG-13/2179743>

<https://www.digikey.com/product-detail/en/kemet/C1206C105K9RAC7800/399-14648-1-ND/7103940>

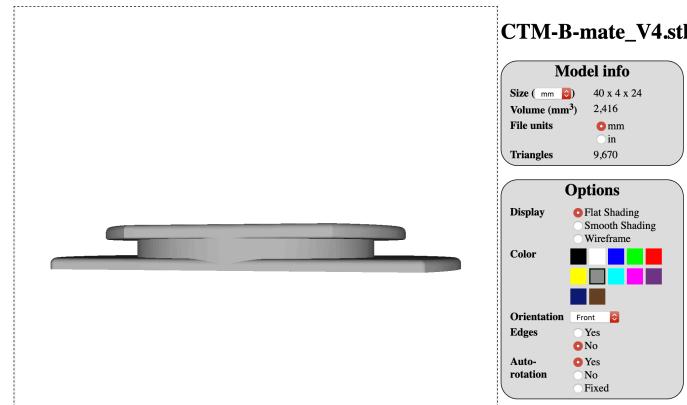


6. The electronic connections for the battery charger unit were bypassed and the voltage converter was inserted (A) to allow the battery to supply power through a flat cable to the AAA battery eliminator unit (B), which is placed with the AAA battery blank in the battery compartment of the CTM (C). The system delivers 3.3V to the CTM, which is within voltage supply specifications. The example of opened cradle with bypass and the electric circuit diagram are shown below.



A) Input of the circuit is 4.2V from battery contacts (take it in the back of cradle – electric board). B and C) The stabilizer is just placed in the corner of the cradle and stucked. The output is connected to flat black battery eliminator cable. The AAA end of battery eliminator cable can be then plugged to Medtronic CTM battery slot.

- To connect the cradle with CTM we use a twist lock that is glued by epoxy to the cradle and twists in to Medtronic CTM twist lock docking. Attached CTM-B-mate\_V4.stl can be opened in any CAD software to be 3D printed.



## References:

Kremen, V., Brinkmann, B. H., Kim, I., Guragain, H., Nasseri, M., Magee, A. L., ... Worrell, G. A. (2018). Integrating Brain Implants With Local and Distributed Computing Devices: A Next Generation Epilepsy Management System. *IEEE Journal of Translational Engineering in Health and Medicine*, 6, 1–12. <https://doi.org/10.1109/JTEHM.2018.2869398>