# Components selection doc

28 NOV 2023 Dennis Yaskevich

This document provides background on some components selection for the project to be available for future reference and understanding of decision making.

Headings in this documents are numbered by the Electrical block diagram numbers.   
The latest version of the Block diagram should be available under the following path:  
<repository root>\Electronics\2\_Block-diagram

## General guidelines

When selecting components for this project the following guidelines have to be followed:

1. Use hand-solder friendly packages
   1. use 0603 SMD packages for passive components
2. Select components that require software based on libraries availability to avoid writing them
3. Select components for Analog section not looking at the cost (it will be optimized later)
4. When possible use “jelly beans parts” => pick general components (like power supplies) that support multiple manufacturers parts on the same footprint.
5. Components should be available in LSCS stock and be suitable for JLCPCB SMT serivce

## Block P6. Selecting 5V LDO

#### Requirements for 5V LDO:

1. Expected values of current to be sinked from the LDO is 147mA based on  
   <repository root>\Electronics\3\_Calculations&Simulations\Power Table.xlsx
2. Fixed 5.0V output voltage 1% precision
3. Maximum input voltage should be above 10V (supplied from x2 4.2V li-ion batteries)
4. 5V LDO must have EN pin to be able to turn off all downstream devices with single GPIO
5. Low quiescent current is desired feature to not drain the battery as much when disabled.
6. Relative modern IC is desired to have improved PSSR speak and control loop stability

Component used in Hardware rev2 HT7550-1 is rejected because of missing EN pin. -> ~~SOT-89, SOT23-3~~

Based on guideline 4 industry standard package must be selected.  
Based on requirement 1, it would be good to pick LDO with at least 300mA maximum output current. 500mA is best. -> ~~SOT23-5~~

#### Investigation of LDOs available in SOIC8 & HVSOP8 packages

TI selector search filter: [https://www.ti.com](https://www.ti.com/power-management/linear-regulators-ldo/products.html#1154=5%3B5&2192=Enable&2954=HVSSOP%3BSOIC%3BHSOIC&2955=8&238max=10%3B100&451max=0.3%3B7.5&)

Onsemi selector search filter: [https://www.onsemi.com](https://www.onsemi.com/products/power-management/linear-regulators-ldo#products=fi0xMX52YWx1ZX4zfk1pY3JvOH5TT0lDLTh+U09JQy04IEVQfnN0YXR1c352YWx1ZX4zfiF+TGFzdCBTaGlwbWVudHN+IX5MaWZldGltZX4hfk9ic29sZXRlfjcwNzgzfnZhbHVlfjF+WWVzfjI1MDIzNjJ+cmFuZ2V+Mn4wLjN+MC41fg==)

Diodes search filter: [https://www.diodes.com/](https://www.diodes.com/products/power-management/linear-and-low-dropout-ldo-regulators/#collection-9699=~(Packages~(~'MSOP-8EP~'SO-8~'SO-8EP)~VIN*20*28Max*29*20*28V*29~(~8~100)))

LCSC search filter: [https://www.lcsc.com](https://www.lcsc.com/products/Linear-Voltage-Regulators-LDO_387.html) (see as per 29 Nov P6\_5VLDO\_selection\_www.lcsc.com.jpeg)

|  |  |  |  |
| --- | --- | --- | --- |
| Pinout | Available MPNs (datasheet) | Key specs | Comment |
|  | [tps7b82-q1](https://www.ti.com/lit/ds/symlink/tps7b82-q1.pdf?ts=1701173973833&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252FTPS7B82-Q1%252Fpart-details%252FTPS7B8250QDGNRQ1) |  | Not available LCSC |
| [AP7583Q\_AQ](https://www.diodes.com/assets/Datasheets/AP7583Q_AQ.pdf) |  | Not available LCSC |
|  | [MIC49150](https://ww1.microchip.com/downloads/en/DeviceDoc/mic49150.pdf)  [MIC5219](https://ww1.microchip.com/downloads/en/DeviceDoc/MIC5219-500mA-Peak-Output-LDO-Regulator-DS20006021A.pdf)  [MIC39101](https://datasheet.lcsc.com/lcsc/2304140030_Microchip-Tech-MIC39101-5-0YM_C148027.pdf) | Other options from Microchip, just for reference | Not available LCSC |
| [MIC5209](https://ww1.microchip.com/downloads/en/DeviceDoc/20005720A.pdf) | 1% at 25,  Fixed output V | 144 pcs stock, 1.37$ |
| [spx3819](https://assets.maxlinear.com/web/documents/spx3819.pdf) | 1% at 25,  Fixed output V | No stock |
| [TL5209DR](https://datasheet.lcsc.com/lcsc/2001050532_Texas-Instruments-TL5209DR_C478073.pdf) | 1% | EOL part in stock just for reference |
| [AP2213](https://www.diodes.com/assets/Datasheets/AP2213.pdf) | Only available in 3V3 output V |  |
|  | [TLV767](https://www.ti.com/lit/ds/symlink/tlv767.pdf?ts=1701182486065) |  | No stock |
| [KFXX](https://datasheet.lcsc.com/lcsc/2304140030_STMicroelectronics-KF50BD-TR_C222151.pdf) | 2% tolerance |  |
| [ADP7104](https://datasheet.lcsc.com/lcsc/2304140030_Analog-Devices-ADP7104ARDZ-5-0-R7_C132278.pdf) |  | High cost |
| [L4931CD50](https://www.lcsc.com/product-detail/Linear-Voltage-Regulators-LDO_STMicroelectronics-L4931CD50-TR_C283394.html) | 2% tolerance |  |
|  | [TPS767](https://www.ti.com/lit/ds/symlink/tps767.pdf?ts=1701210948468&ref_url=https%253A%252F%252Fwww.ti.com%252Fpower-management%252Flinear-regulators-ldo%252Fproducts.html) | 2% tolerance | No stock |
| [NCP3334](https://www.onsemi.com/download/data-sheet/pdf/ncp3334-d.pdf) | **0.9% tol**, **only adjustible is available** | 1773 stock 0.8$ |
| [TPS7350QDR](https://datasheet.lcsc.com/lcsc/2304140030_Texas-Instruments-TPS7350QDR_C12102.pdf) | 2% tolerance | 263 in stock 3$ |
|  |  |  |  |

**MIC5209-5.0YM-TR** has been selected ([lcsc](https://www.lcsc.com/product-detail/Linear-Voltage-Regulators-LDO_Microchip-Tech-MIC5209-5-0YM-TR_C71226.html)).

## Block P5. Selecting 5.3V LDO

#### Requirements for 5V LDO:

1. Expected values of current to be supplied is below 50mA, any package is fine
2. EN feature is required to be able to disable negative supply

This part is very generic and easy to pick.

Diodes search filter: [https://www.diodes.com/](https://www.diodes.com/products/power-management/linear-and-low-dropout-ldo-regulators/#collection-9699=~(VIN*20*28Max*29*20*28V*29~(~8~100)~Packages~(~'SOT25~'SOT25*20*28Type*20A1*29)))

LCSC search filter: [www.lcsc.com](https://www.lcsc.com/products/Linear-Voltage-Regulators-LDO_387.html)

|  |  |  |  |
| --- | --- | --- | --- |
| Pinout | Available MPNs (datasheet) | Key specs | Comment |
|  | [AP2202](https://datasheet.lcsc.com/lcsc/2004082232_Diodes-Incorporated-AP2202K-ADJTRG1_C507873.pdf) | 1%, 150mA, En | 0.14$ 3k in stock |
| [AP2210](https://www.diodes.com/assets/Datasheets/AP2210.pdf) | 1%, 300mA, En | 0.12$ 2k in stock |
| [SPX3819M5](https://datasheet.lcsc.com/lcsc/1806151814_MaxLinear-SPX3819M5-L-TR_C9056.pdf) | 1%, 500mA, En | In stock |
| [TPS76301DBVR](https://datasheet.lcsc.com/lcsc/1809151115_Texas-Instruments-TPS76301DBVR_C7727.pdf) | 1%, 150mA, En | In stock |

AP2210 is selected.

## Block P7. Selecting the load resistor for negative voltage gen

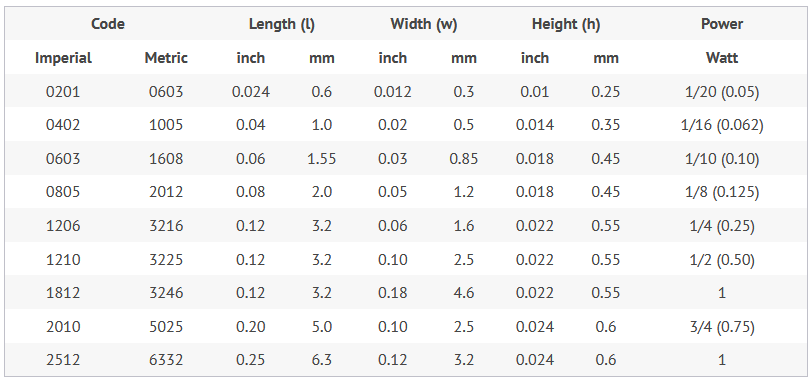
According to testing documented in the bring up report, the negative voltage generator features some additional noise caused by Pulse skipping mode that is enabled at light load.

Changing the component is too big of a change for the minor revision and it’s not target of MVP. Quick workaround is adding 220 Ohm resistor as “dummy load” to consume additional current and avoid enabling the light load mode.

*V*OUT = -5 *V*

*R* = 220 *Ω*

*P* = *V*OUT2*R* = (-5 *V*)2220 *Ω* = 0.114 *W*



It would be safe to have at least 2 times power rating compared to the calculated power.

I would go with 1206 resistor