ChameleonMini RevG Battery Upgrade

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Document History

VERSION	DATE	AUTHOR	COMMENT
1	1.1.2017	TK	RevG Charging Circuitry
2	2.1.2017	TK	New Resistor Values for 150 and 350 mAh Li-Ion batteries

Summary

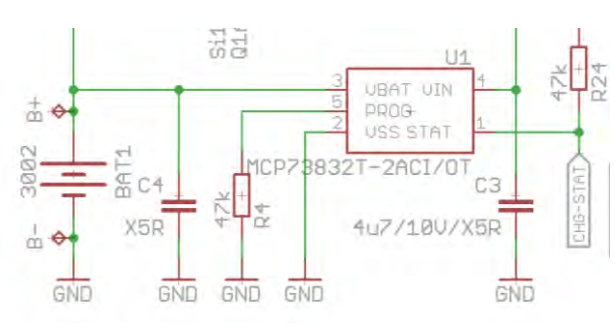
When replacing the battery of ChameleonMini for one with a different nominal capacity, its charging circuit should be modified.

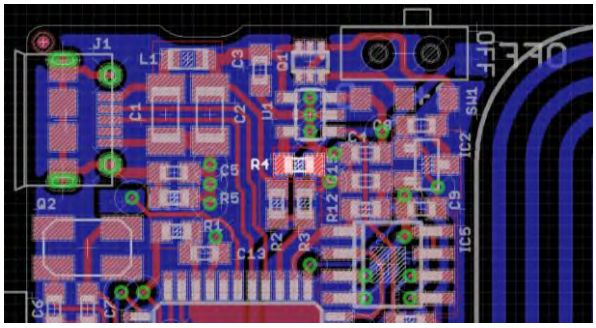
This document details on how to adapt the value of R4, as summarized in the table:

Battery Size	**Recommended Value for R4**
20 mAh	47k
40 mAh (LIR2032)	25k
150 mAh	6.8k
350 mAh	3k

ChameleonMini RevG Charging Circuit

ChameleonMini RevG uses an MCP73832 “Li-Polymer Battery Charge Management Controller” with an adjustable charge current from 15 mA to 500 mA.





The CHARGING? command of Chameleon evaluates the CHG-STAT signal to indicate whether charging is still in process (CHARGING=TRUE) or the battery is fully charged (CHARGING=FALSE).

The Resistor R4, located on the RevG PCB somewhere between USB socket and power switch, determines the maximum charging current (excerpt from the data sheet):

5.1.2 CURRENT REGULATION SET (PROG)

Fast charge current regulation can be scaled by placing a programming resistor (R_{PROG}) from the PROG input to V_{SS}. The program resistor and the charge current are calculated using the following equation:

$$I_{REG} = \frac{1000V}{R_{PROG}}$$

Where:

R_{PROG}	=	kOhms
I_{REG}	=	milliampere

The preconditioning trickle charge current and the charge termination current are ratiometric to the fast charge current based on the selected device options.

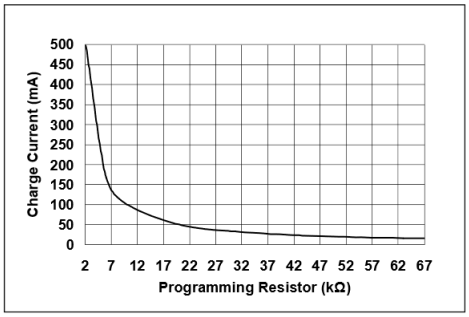


FIGURE 2-4: *Charge Current (I_{OUT}) vs. Programming Resistor (R_{PROG}).*

The preferred maximum fast charge current corresponds to the capacity of the battery, e.g., a battery with a capacity of 40 mAh should be charged with a maximum current of I=40 mA to avoid degradation of the battery performance.

Choosing the optimal value for resistor R4

Originally, the value of R4 on the RevG PCB is 47k, thus limiting the charging current to I=1000V/47k=21 mA, corresponding to about 2 hours charging time.

To decrease the charging time for the supplied LIR2032 battery with a nominal capacity of 40 mAh, the resistor R4 can be adapted to (1000V/40mAh = 25k) **R4=27 kOhm**. Consequently, the charging process should end after approx. 1 hour.

For a 150 mAh battery accordingly we recommend (1000V/150mAh = 6.66k) **R4=6.8 kOhm**.

For a 350 mAh battery we likewise recommend (1000V/350mAh = 2.85k) **R4=3 kOhm**.

Note that for large batteries the required charging current may exceed the absolute maximum ratings of the charging IC with respect to temperature / power dissipation. For further details refer to the data sheet: http://ww1.microchip.com/downloads/en/DeviceDoc/20001984g.pdf