

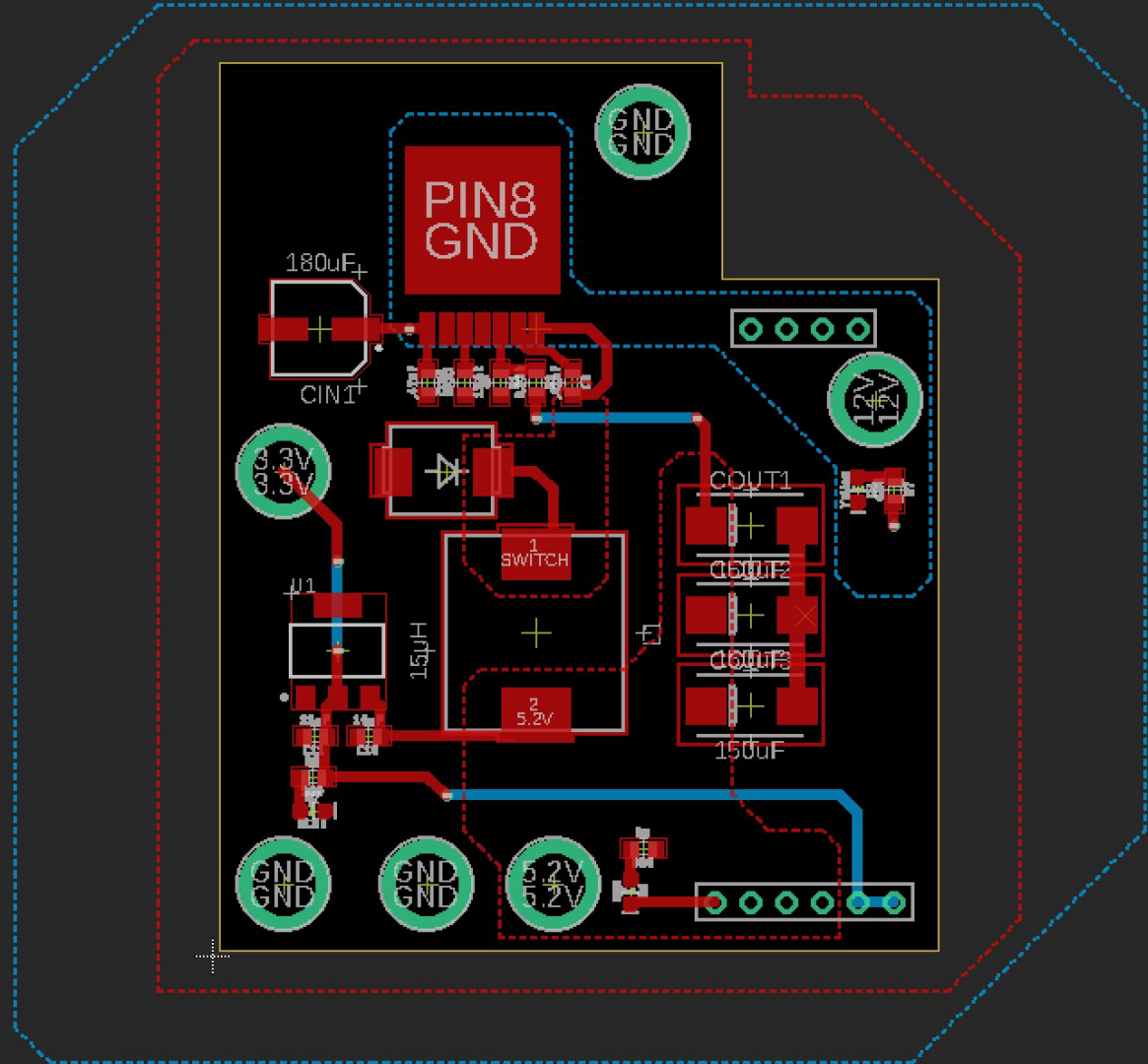
X15-Power Conversion

Vivek Matta

Name on github: 'X15-Power-Conversion'

Power Conversion Overview

- Takes 12V as input from Brickstrubution
- Converts down to 5V for Pi shield
- Converts down to 3.3V for the microcontrollers
- Uses Buck Converter and Linear Regulator to complete this task



Block Diagram

What does this board take as input

12V from the Brickstribution

What does this board output

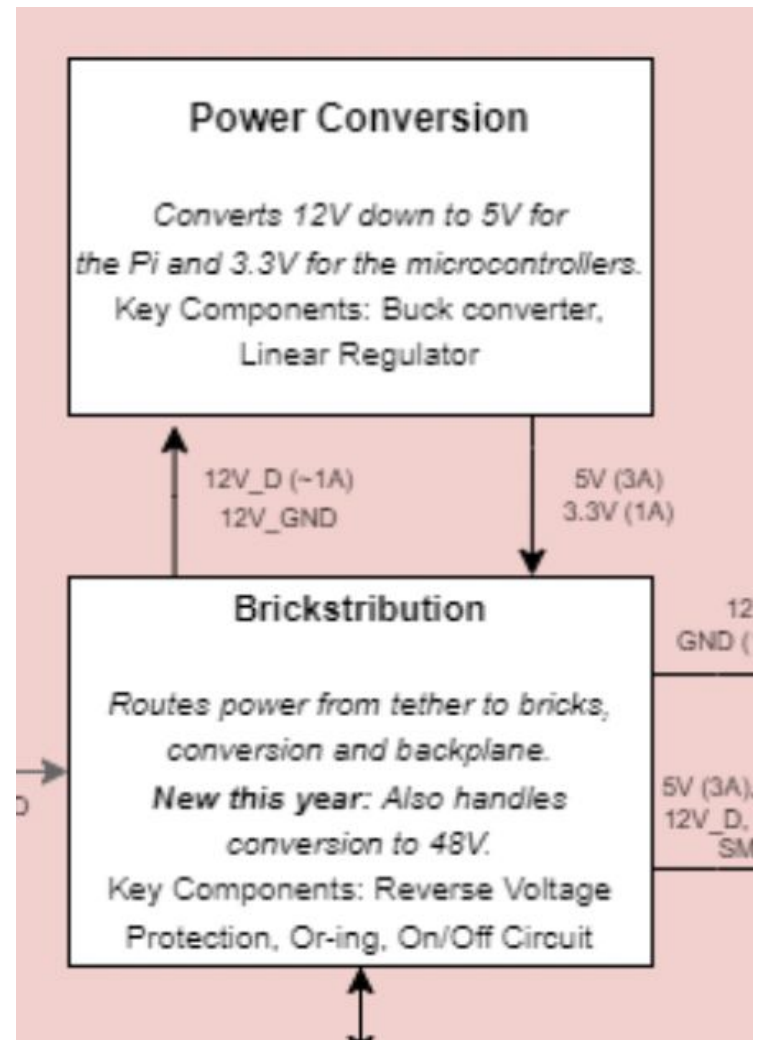
3.3V to the Microcontrollers, 5V for the Pi

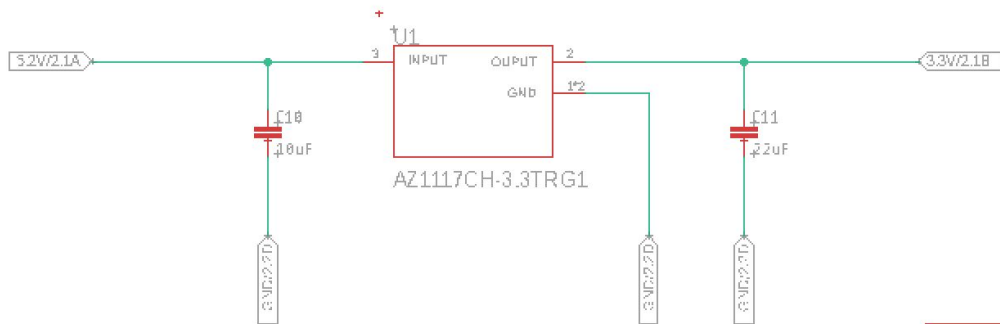
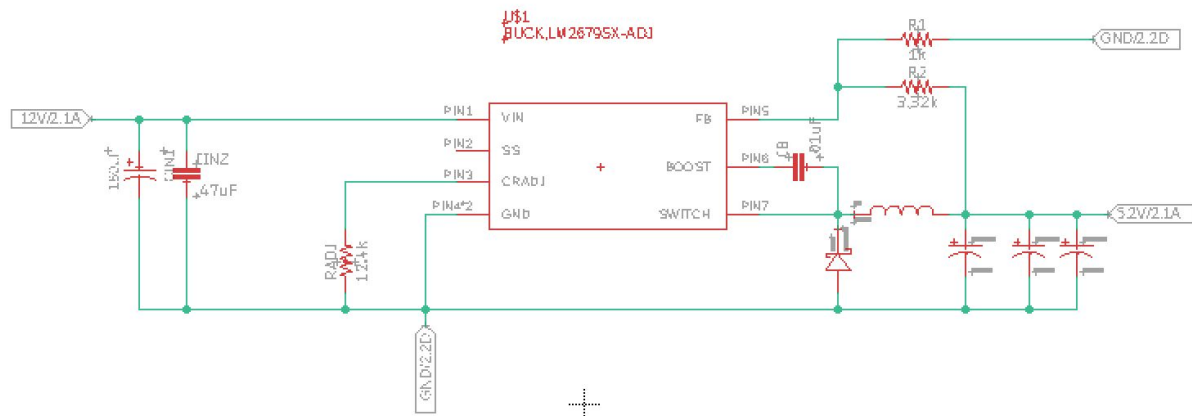
How does it perform its functions

12V->5V through Buck Converter

5V->3.3V through Linear Regulator

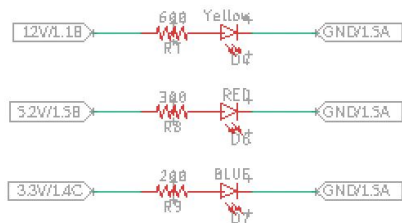
Expected current draw 5.2V at 3A and 3.3V at 1A.



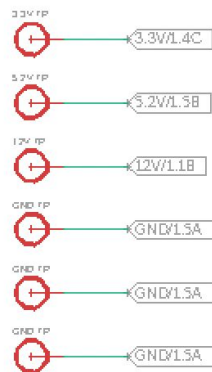


Fb Resistors Calculation:
 $V_{out} = 5.2V$; $V_{fb} = 1.21V$; $R_{fb1} = 1k\Omega$
 $R_{fb2} = R_{fb1} * (V_{out} / V_{fb} - 1)$
 $R_{fb2} = \sim 3.298k\Omega = 3.32k\Omega$
 $C_{ss} = \text{Open-Circuit (no value)}$
 $R_{(adj)} = 37,125 / (3A) = \sim 12,375\Omega = 12.4k\Omega$

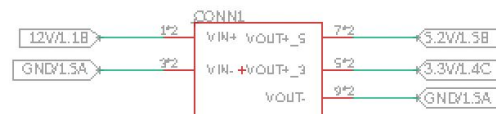
Shottcky Diode
 SK32 - 20V @ 3A



Test Points



Connectors to Power Distribution



Calculations

Fb Resistors Calculation:

Vout = 5.2V; Vfb = 1.21V; Rfb1 = 1kΩ

Rfb2 = Rfb1 * (Vout / Vfb - 1)

Rfb2 = ~3.298kΩ = 3.32kΩ

Css = Open-Circuit (no value)

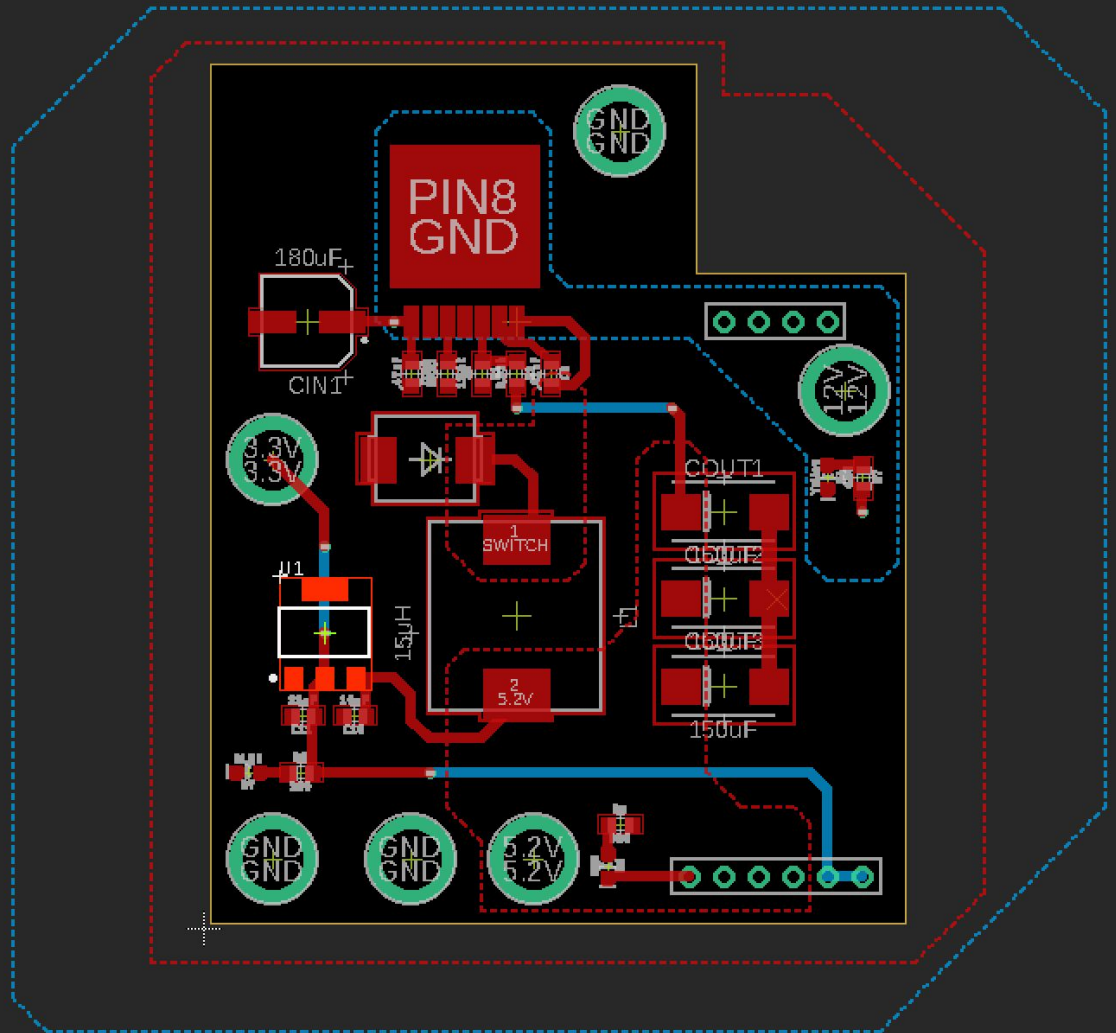
R(adj) = 37,125/(3A) = ~12,375Ω = 12.4kΩ

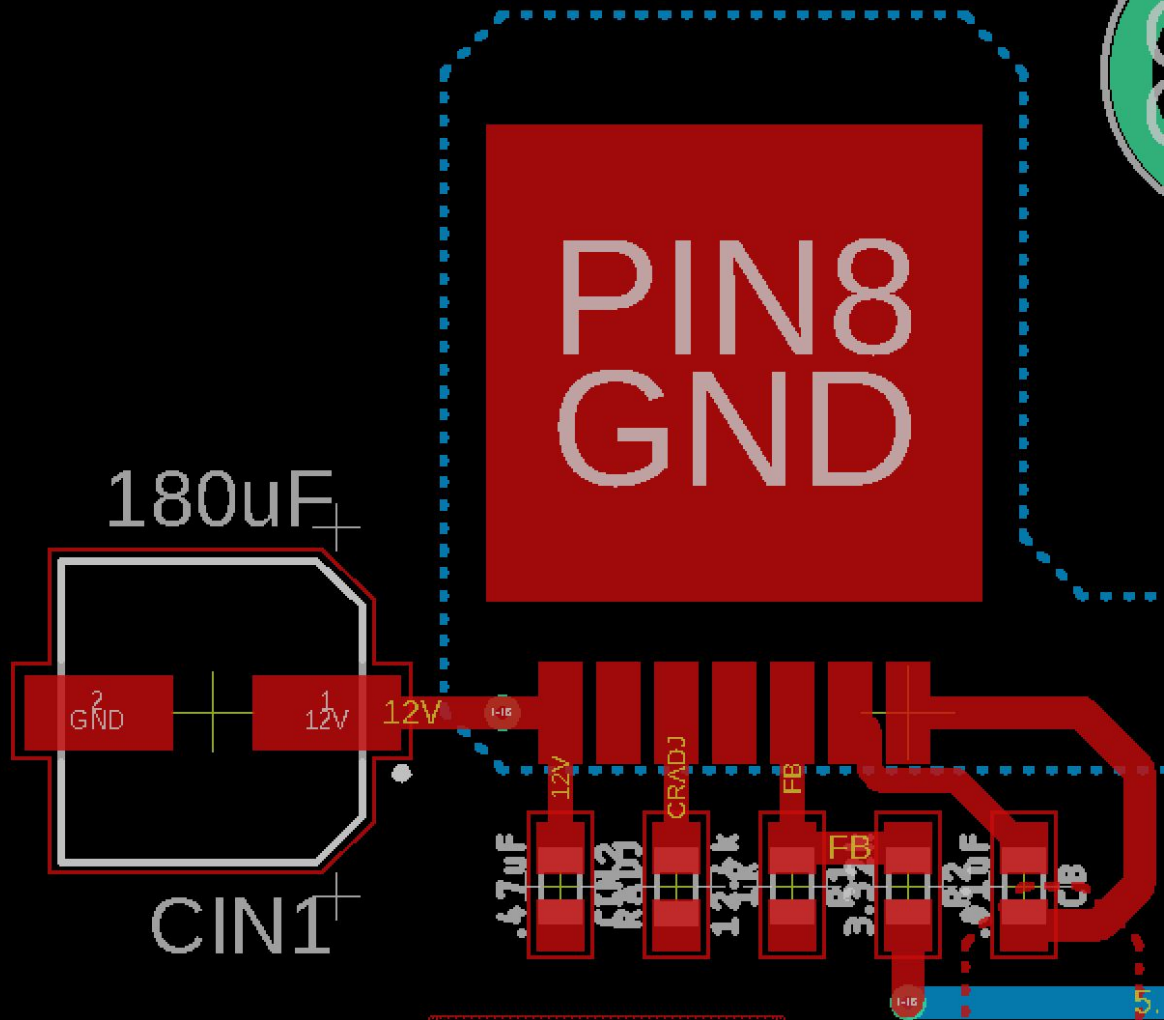
Shottcky Diode

SK32 - 20V @ 3A

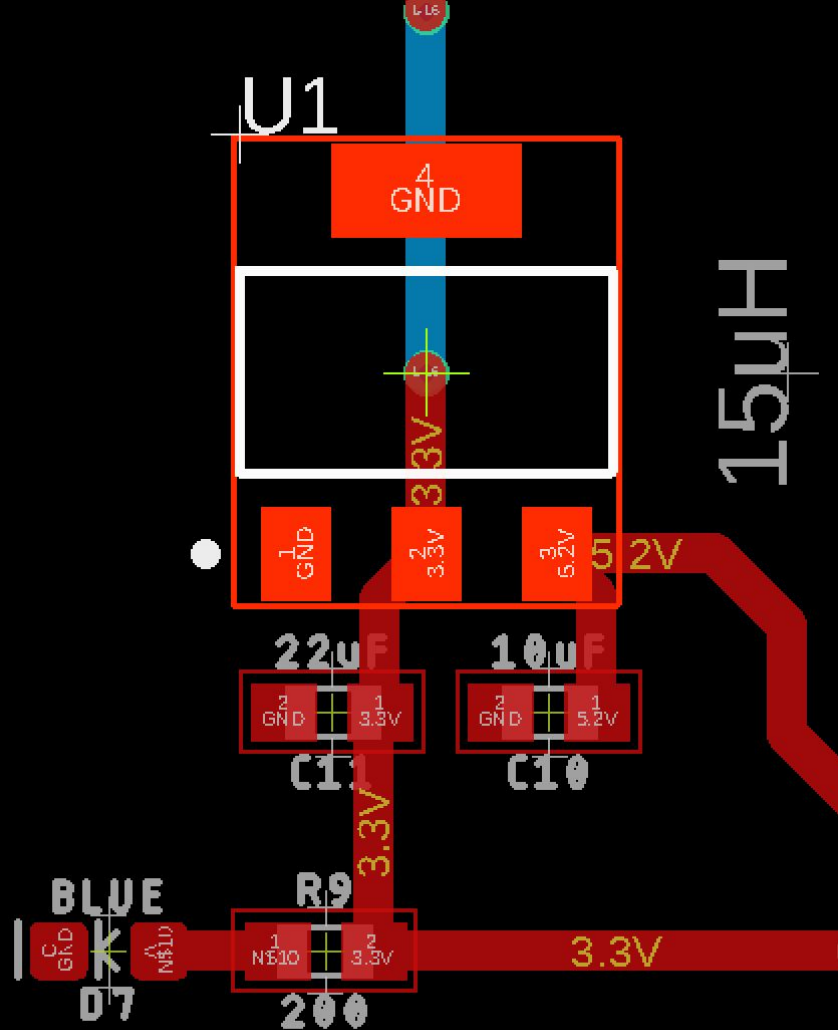
$$V_{OUT} = V_{FB} \left(1 + \frac{R_2}{R_1} \right)$$

Full Board

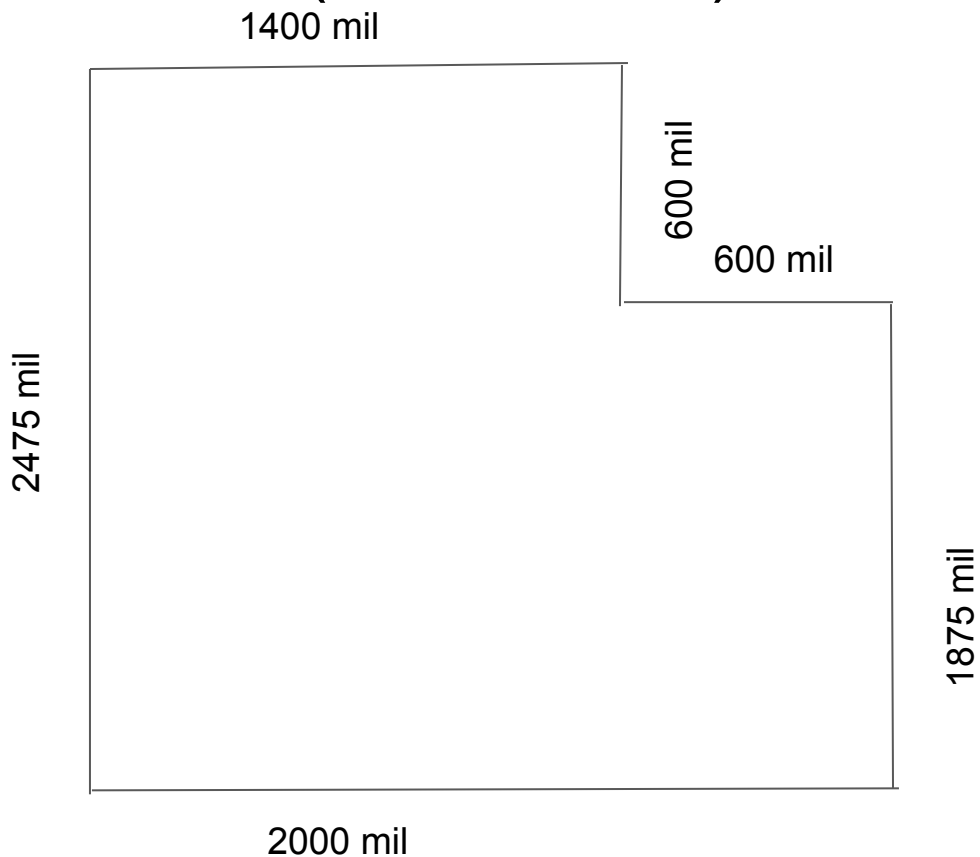




Linear Regulator



Dimensions (not to scale)



New Added Items

- Added LEDs for test (3.3V, 5.2V, 12V)
- New Buck Converter (X14 Out of Stock)
- New Linear Regulator (Out of Stock)

Remaining work

- Try to decrease work area on board
- Organize my routing in the board
- Finish up BOM

Datasheets

- Link to BOM Power Conversion
 - <https://docs.google.com/spreadsheets/d/1YjEY9bAJEb0PoGRAcnfj0FLB-mZe7RkFWpsVSmxgWXU/edit?usp=sharing>
- Link to Buck Converter Datasheet
 - https://www.ti.com/lit/ds/symlink/lm2679.pdf?ts=1624370319812&ref_url=https%253A%252F%252Fwww.ti.com%252Fproduct%252FLM2679%253FkeyMatch%253DLM2679%2526tisearch%253Dsearch-everything%2526usecase%253DGPN
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