Regulated Multi-Boosted Positive Rail with Single Negative Rail

2007-12-13

Block Out Final = Vin * 4 - loss

Block Out = Vin * 3 - loss

Block Out = Vin * 2 - loss

Vcc 3.5-15v

Boosted Output

Lp 1mH

Dp

Cx4p 100nF

Cx4o2 22uF

Cx4o1 22uF

Rp 2

Dx4b

Dx4a

Cx4p 10uF

Dx3b

Cx3o 22uF

Dx3a

Cx3p 10uF

Dx2b

Cx2o 22uF

Dx2a

Cx2p 10uF

Vcc

Cr1 470uF

Cr2 100nF

Ct 10pF

Cnp 10uF

LT1054

1 FB/SD   Vcc 8
2 Cap+   Osc 7
3 Gnd   Vref 6
4 Cap-   Vout 5

U1

Rfb 60k

VRfb

Cfb 2nF

Cn 10uF

Rload 10k

1meg
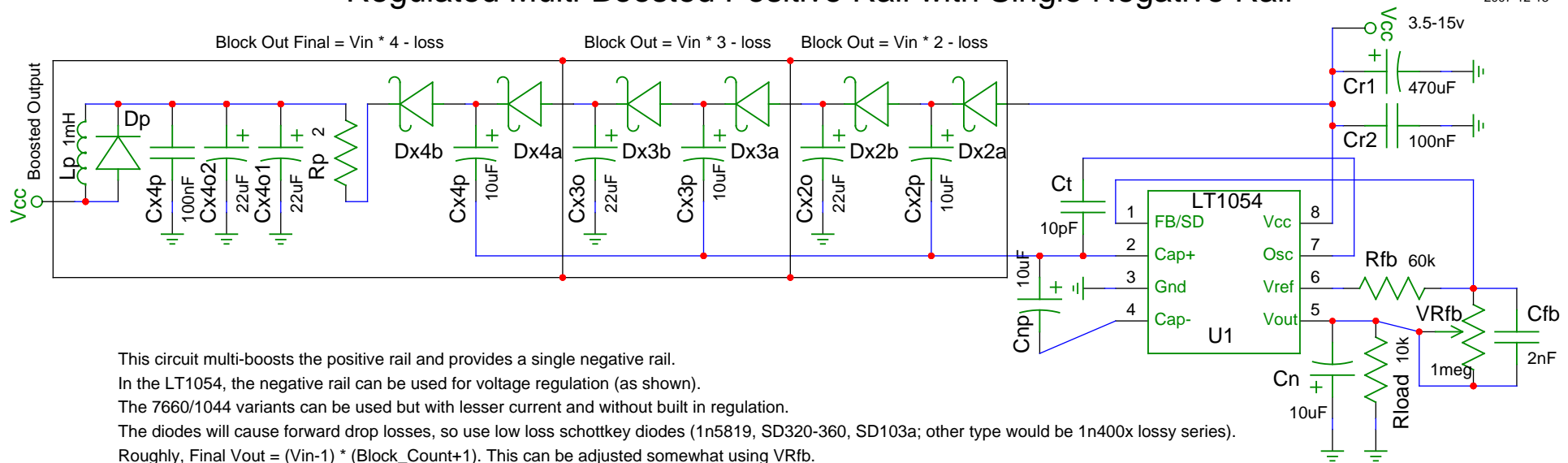
This circuit multi-boosts the positive rail and provides a single negative rail.

In the LT1054, the negative rail can be used for voltage regulation (as shown).

The 7660/1044 variants can be used but with lesser current and without built in regulation.

The diodes will cause forward drop losses, so use low loss schottkey diodes (1n5819, SD320-360, SD103a; other type would be 1n400x lossy series).

Roughly, Final Vout = (Vin-1) * (Block_Count+1). This can be adjusted somewhat using VRfb.

Roughly, Current Output = 100mA / (Block_Count+1). Hidden resistance and capacitor ESR will lower this number a bit.

Watch out for capacitor voltage ratings as each booster block increases the voltage.

"Block Out Final" is an extended regular block to include optional inductor and RC ripple filtering with parallel capacitors to lower ESR and ESL.

Ct increases the oscillator frequency to somewhere above 25kHz.

Rload provides minimal load current to the negative rail so it isn't left floating. Rload may be removed and Cn increased if there is a real load there.

Phantom Power: 9v in will need 5 blocks to get 48v.

Options: Add a SPST on/off switch at Vcc input. Add a power LED and resistor. Add a 15v zener clamp on Vcc input to protect against over voltages.

Add a wall wart connector and diode bridge with capacitor to allow for battery or wall power. Simple transistor floating regulators on the outputs may help reduce ripple at the expense of slightly lower voltage.

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