Sunglasses at Night:

driving high power LEDs

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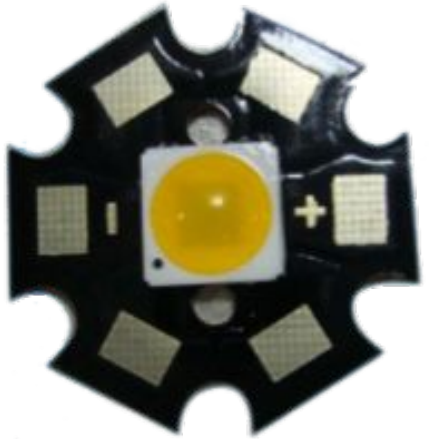
Low power vs high power

(refresher: POWER = VOLTS X AMPS)

1.7V X 20mA

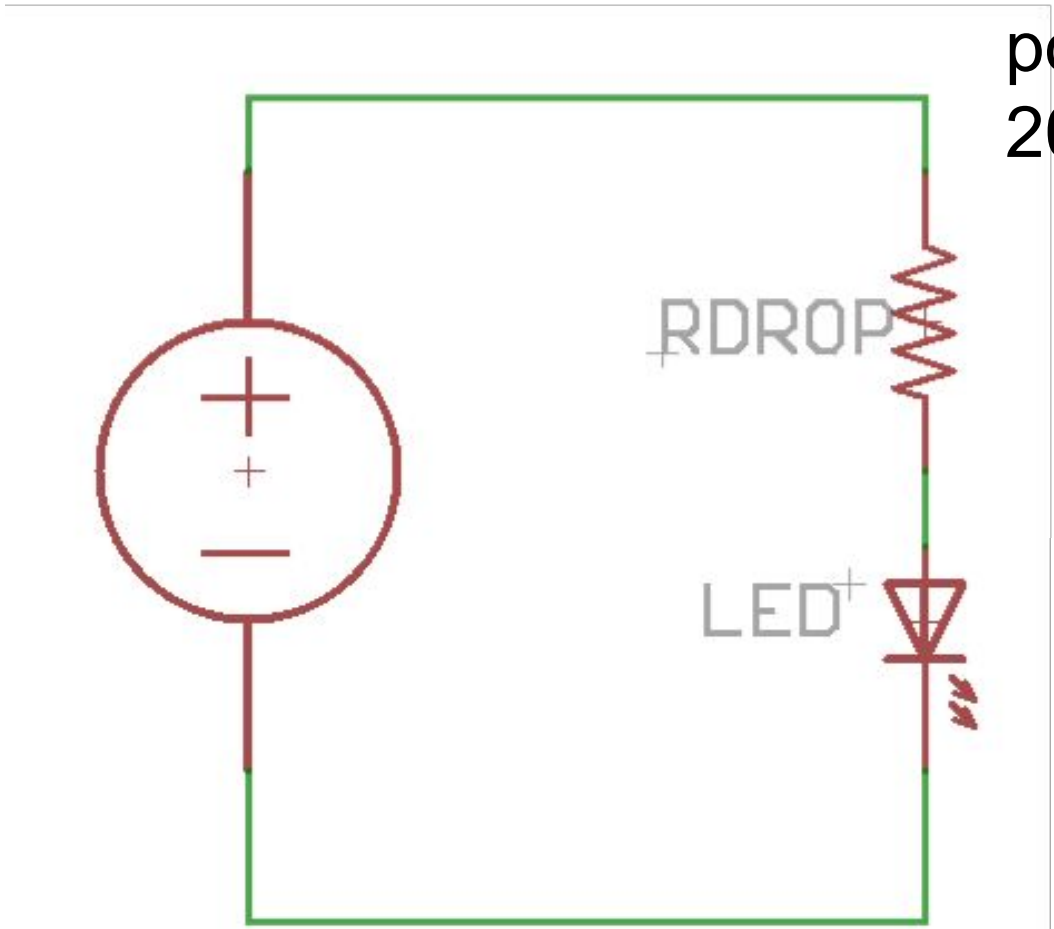
= 34 mW



3V X 1A

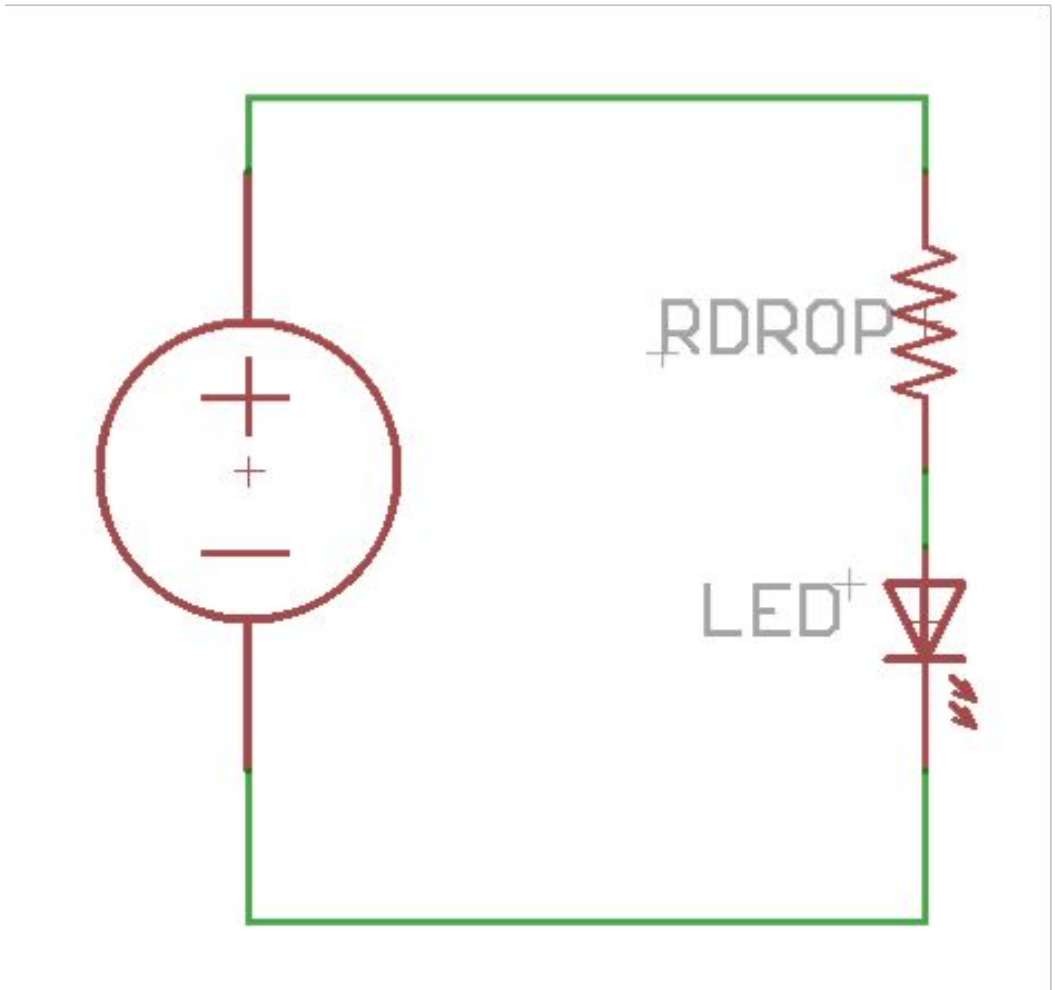
= **3 W**

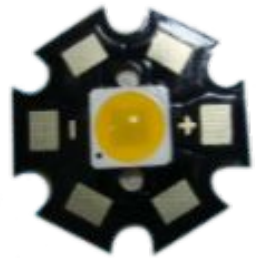
Dropping Resistor



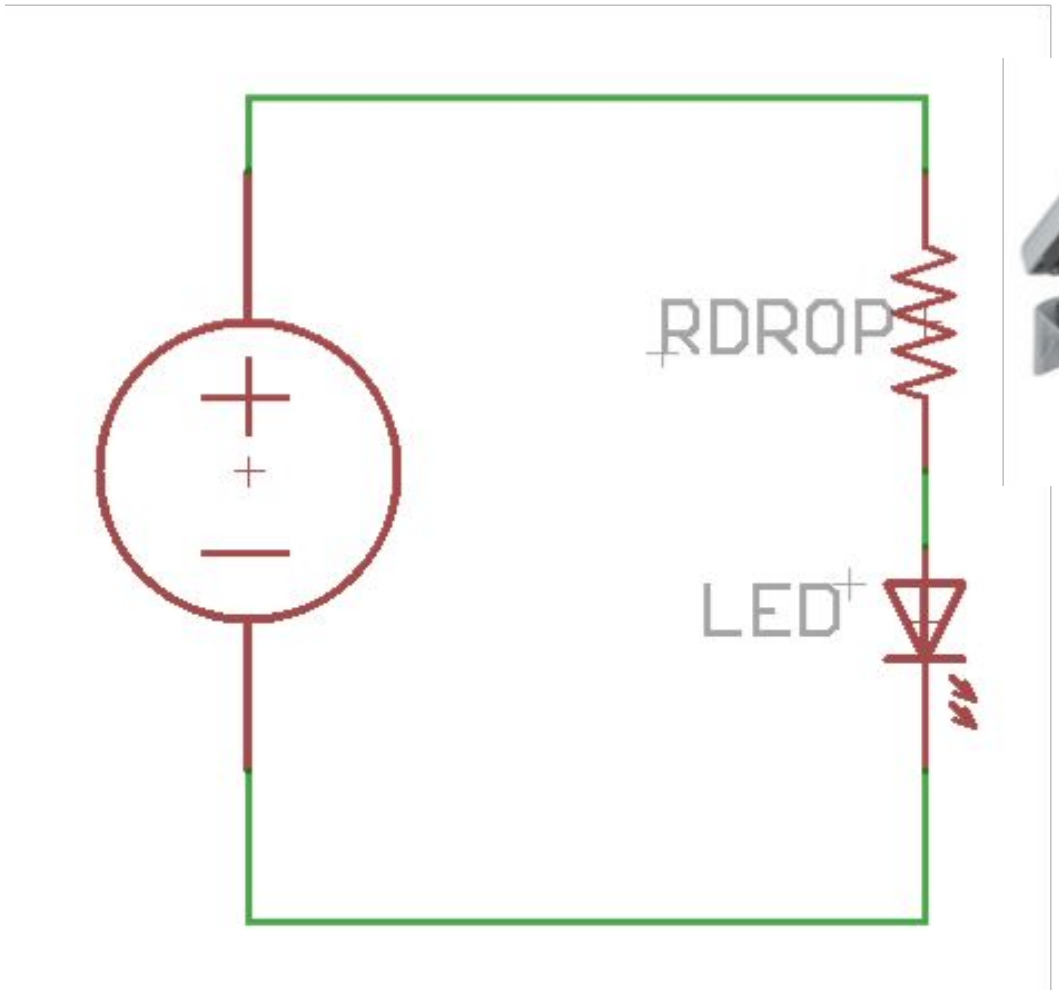
power in rdrop:
20mA x ~5V = 0.1 W

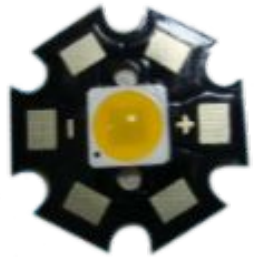
Dropping Resistor: High Power Version





Dropping Resistor: High Power Version

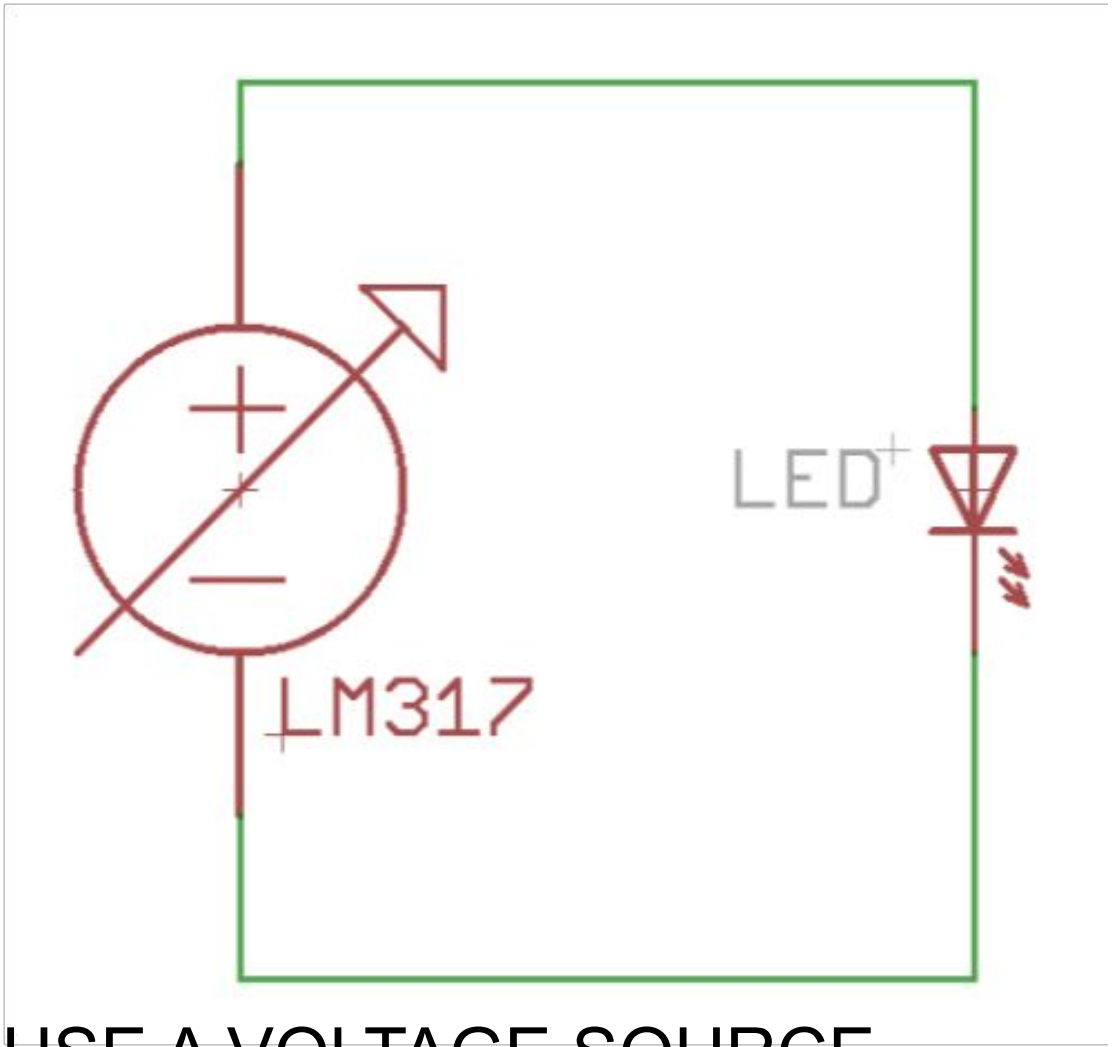




power:

1A x ~5V = 5 watts. That 'll get HOT and waste power

Another howler...

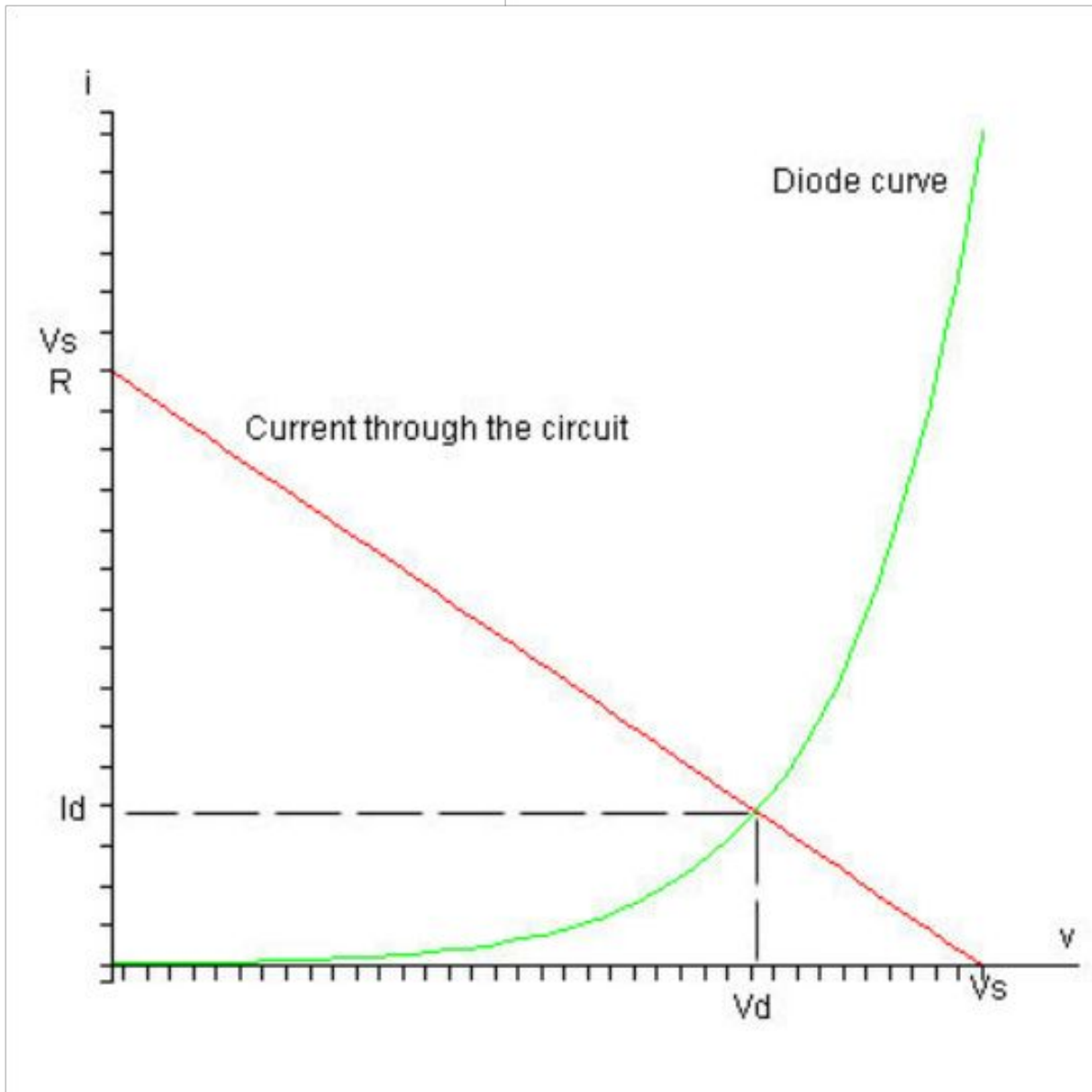


DON'T USE A VOLTAGE SOURCE.

The difference between OK and smoke is TINY.

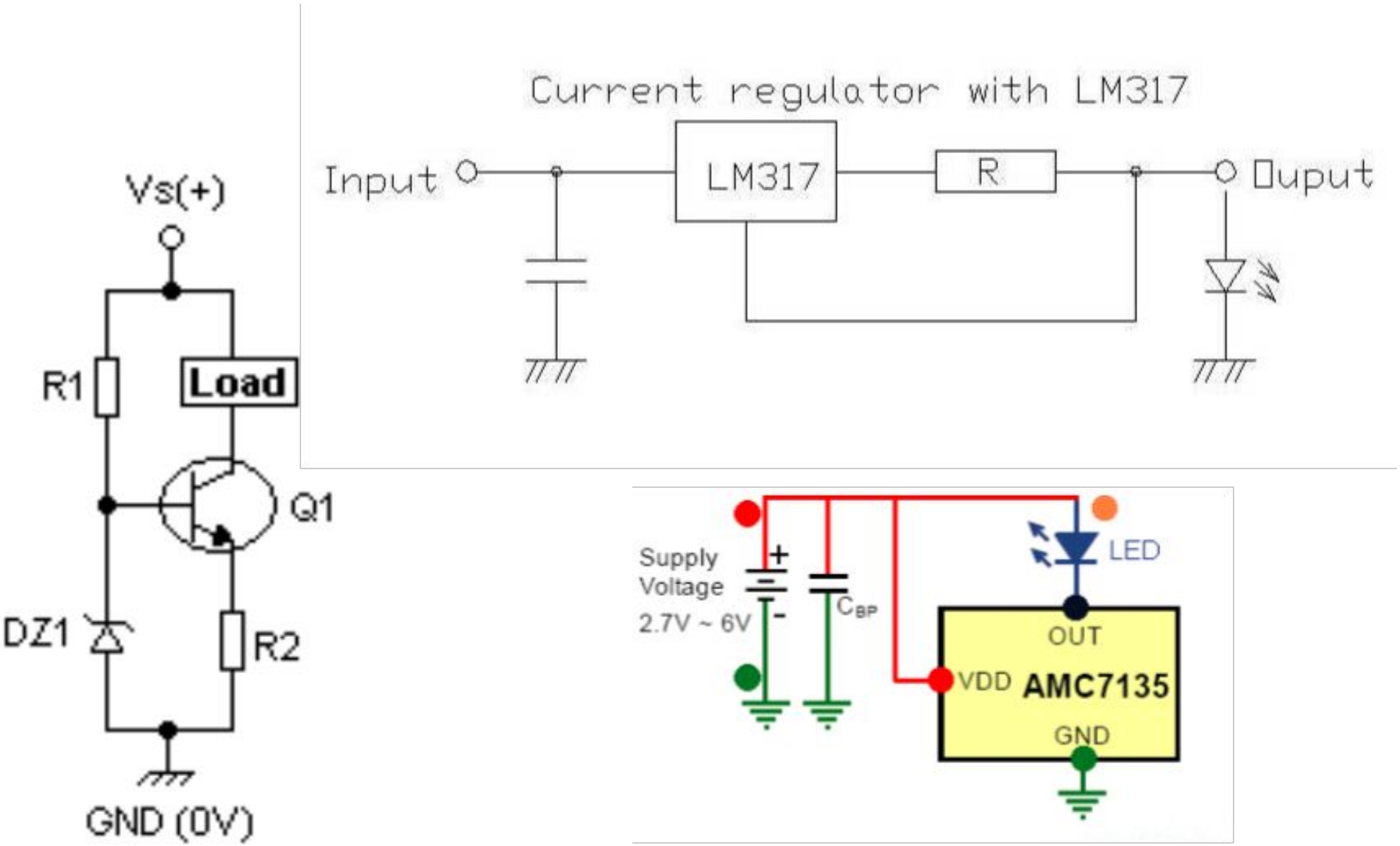
Diode Equation

$$I = I_s e^{qV_f/kT}$$



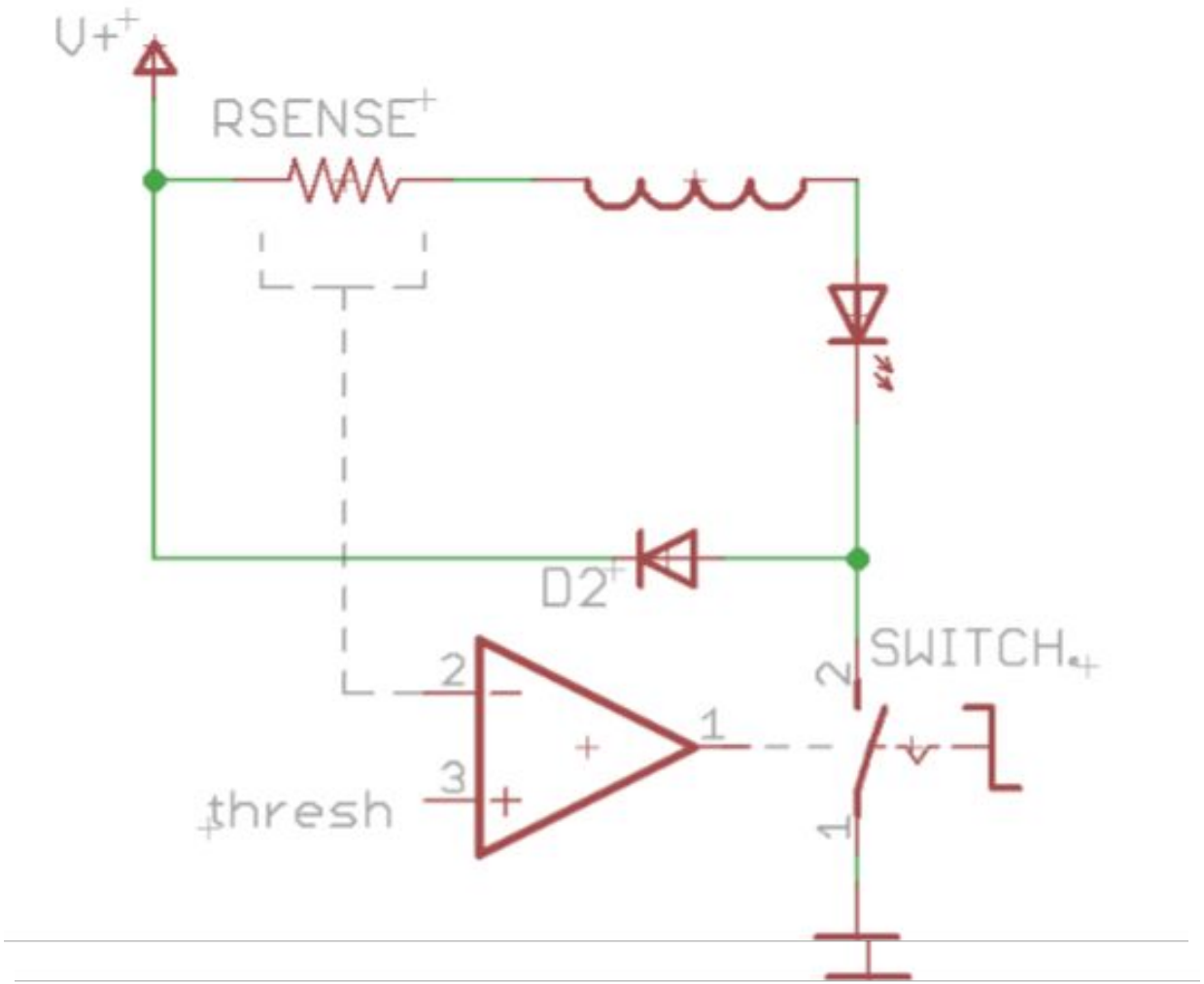
DIODES WANT CURRENT

Linear current sources are easy:



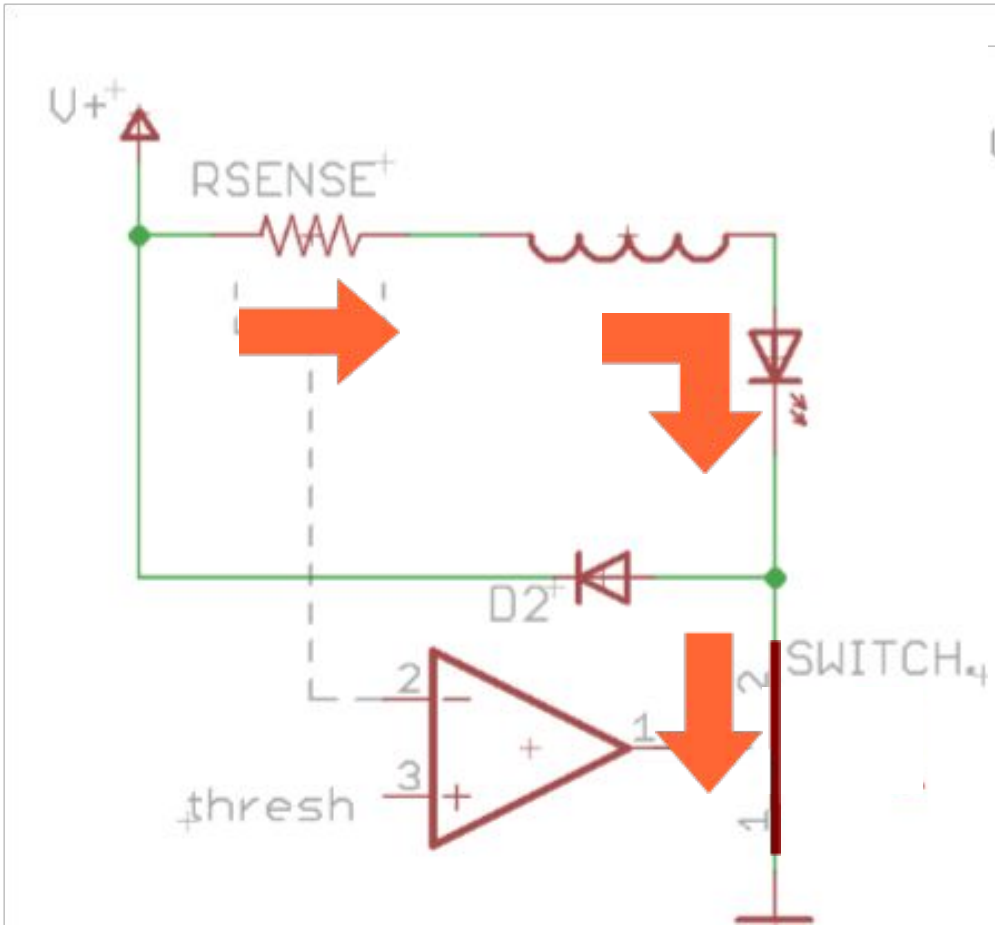
But they also get hot and waste power

Even better: SEPIC* buck converter



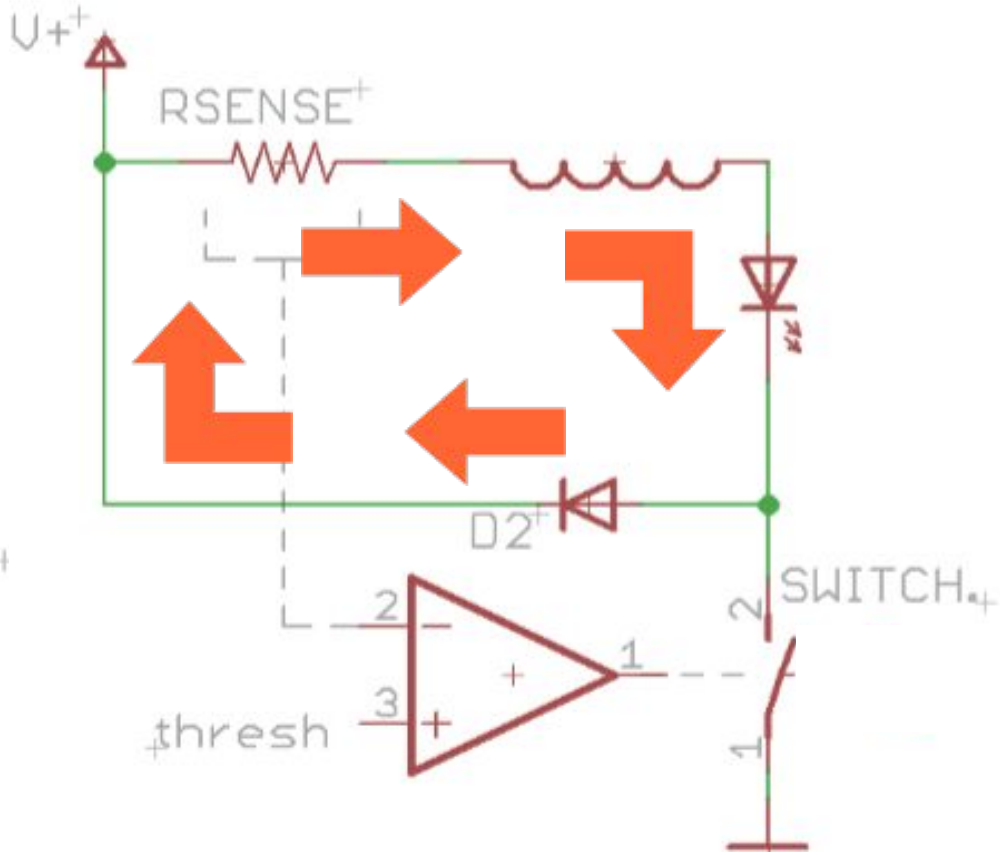
*SEPIC = Single Ended Primary Inductor Converter

How it works:



Switch closed

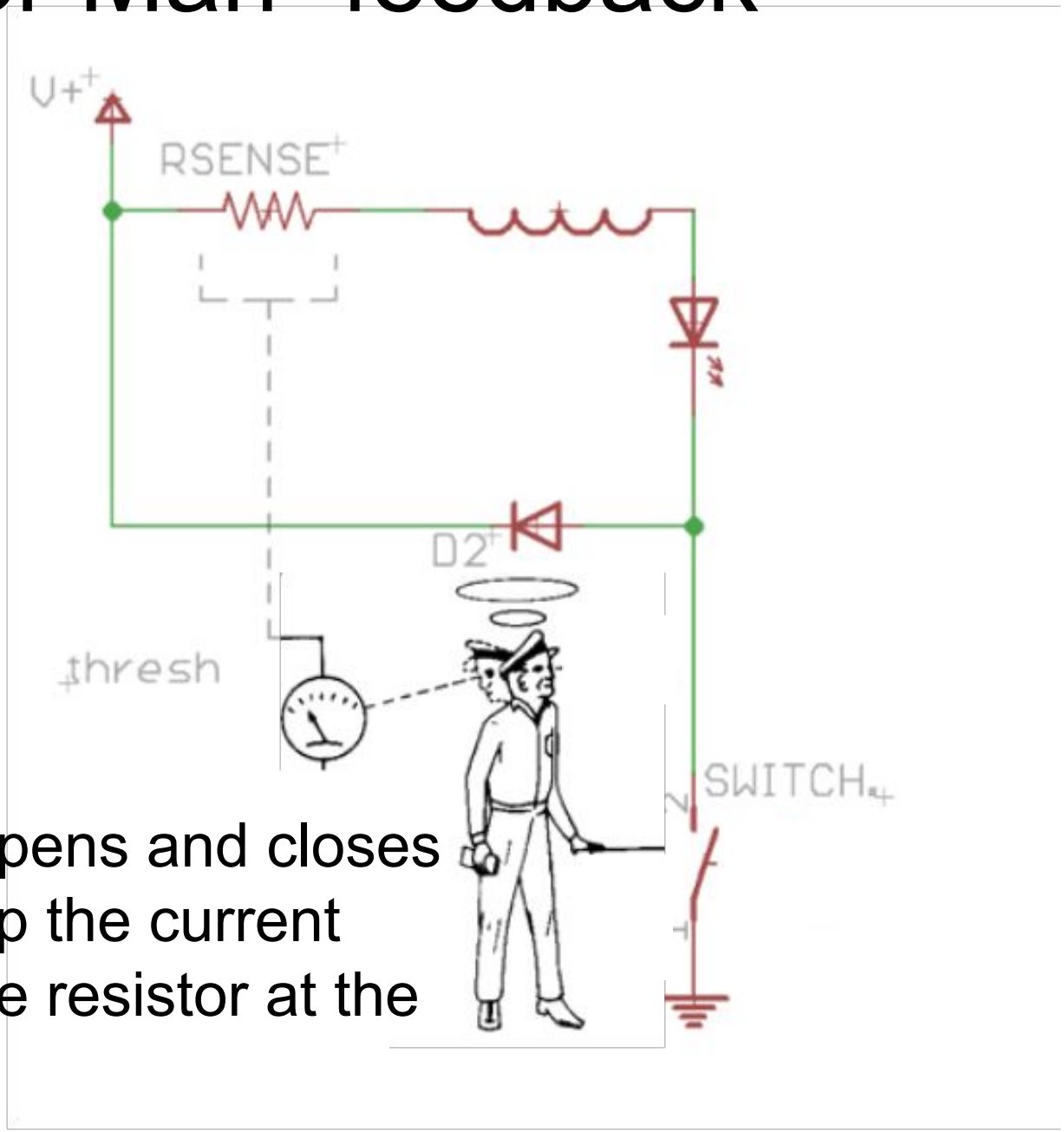
Inductor stores energy



Switch open

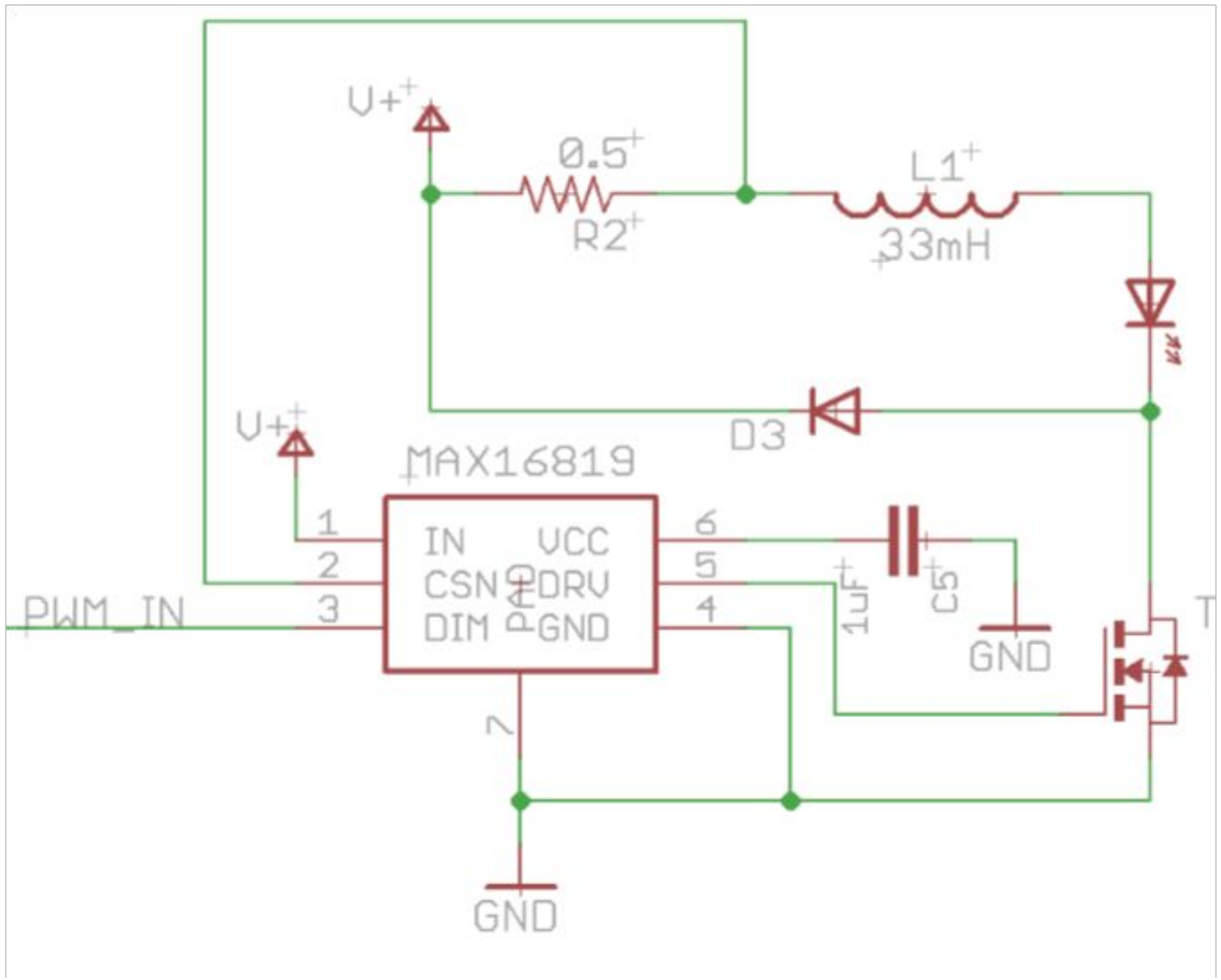
Inductor releases energy as current

“Transistor Man” feedback



Transistor man opens and closes the switch to keep the current through the sense resistor at the right amount

Actual Circuit



The Money Slide

Comparison Table- Widely Input Power LED Driver

VERSION 7

Created on: Jan 19, 2009 11:35 AM by tech1 - Last Modified: Aug 4, 2009 5:48 AM by tech1

Manufacturer	Linear Technology	National Semiconductor		Maxim	Zetex	On Semiconductc
Part No.	LT3474	LM3402 LM3404	LM3406HV	MAX16819	ZXLD1350	NCP3066
Vin(V)min.	4	6	6	4.5	7	3
Vin(V)Max.	36	42	75	28	30	40
Switch Integrated	Yes	Yes	Yes	No	Yes	Yes
Iout(A)max.	1	0.5/1.0/1.5	0.5/1.0/1.5	3	0.35	1.5
Operate Frequency(MHz)	2	1	1	2	1	0.25
Peak Efficiency	92%	95%	95%	97%	95%	93%
Topology	Buck	Buck	Buck	Buck	Buck	Buck/BOOST
Quiescent Current	4mA	N/A	N/A	1.5mA	0.5mA	7mA
Shutdown Current	2uA	N/A	N/A	425uA	20uA	120uA
Dimming	400:1	Yes	Yes	Yes	Yes	Yes
Dimming Interface	PWM	PWM	PWM	PWM	PWM	PWM
Open LED Protection	Yes	Yes	Yes	No	Yes	No
Soft-Start	No	No	No	No	Yes	No
Short-Circuit Protection	Yes	No	No	Yes	Yes	Yes
Thermal Overload Protection	Yes	Yes	Yes	No	No	Yes
Over Voltage Protection	No	Yes	Yes	No	No	No
Ambient Temp(^{0}C)	–40°C to 125°C	–40°C to 125°C	–40°C to 125°C	–40°C to 125°C	-40 to 105°C	–40°C to 85°C
Package	TSSOP-16	MSOP-8 PSOP-8	MSOP-8 PSOP-8	TDFN-6	TSOT23-5	QFN-8 SOIC-8 DIP-8

www.element-14.com/community/docs/DOC-3986

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Thanks!

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