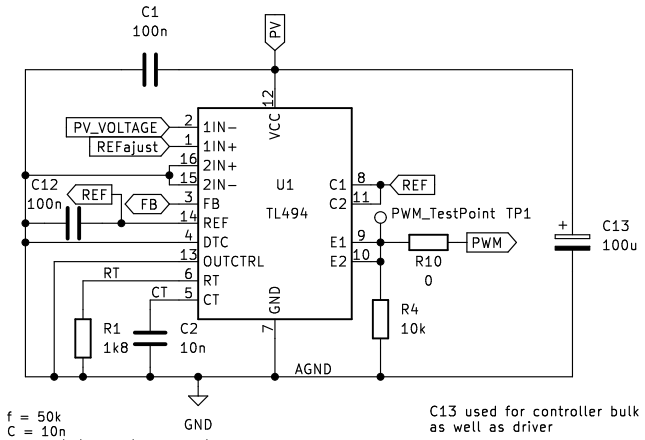
TL494 PWM @ 50kHz



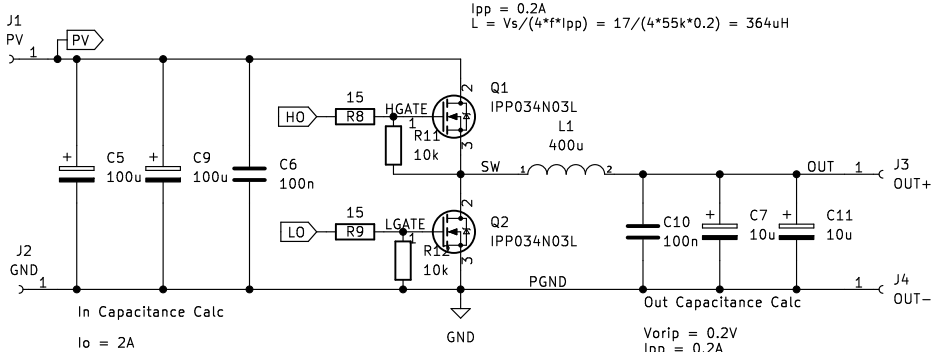
f = 50k
C = 10n
R = 1/(fC) = 1/(50k * 10n) = 2k
Closest is 1k8 or 2k2
Gives f of ~55kHz with 1k8

C13 used for controller bulk as well as driver

POWER STAGE

Inductor Calc

Vs = 17V peak power from PV characterisation
Io = 1.5A − 2A using largest value
f = 55kHz due to slelected RT
Ipp = 0.2A
L = Vs/(4*f*Ipp) = 17/(4*55k*0.2) = 364uH



In Capacitance Calc

Io = 2A
Virip = 0.2V
f = 55kHz

Cin = Io/(4*f*Virip) = 2/(4*55k*0.2) = 45u5
Closest value that is > than 45u5 = 47uf
More Cap on input is better

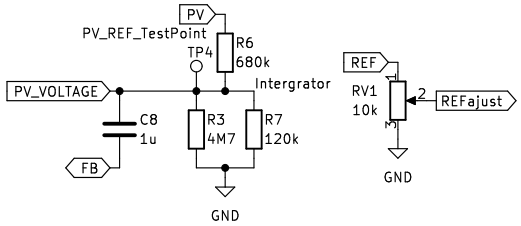
Out Capacitance Calc

Vorip = 0.2V
Ipp = 0.2A
f = 55kHz

Co = Ipp/(8*f*Vorip) = 0.2/(8*55k*0.2) = 2u3
Closest value that is > than 2u3 = 3u3
Cap cant be too big if we want fast responce

Gate resistors
gate driver can source about 1.9A typical
more current means faster switch on. However too fast switch on can result in overshoot causing ringing.
Using gate resistor can stop this.
The internal R of the fet is 1.6
to get ~ 1.9A @ 17V
17/1.9 = ~8.95
12 − 1.6 = ~7.35
Chossing 10ohm will be about 1.7Apk

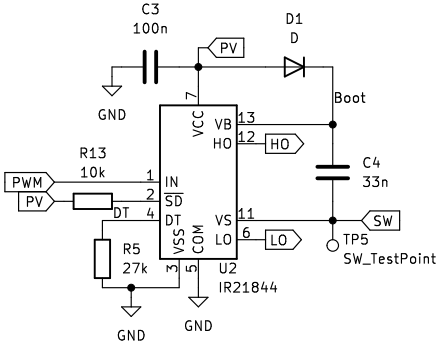
Intergrator Controller



Vdiv = 2.5V
Vmp = 17V
t = 100m
C = 1u
R = t/C = 100m/1u = 100k
Thev equivlent is Ru//Rl = 1/(1/Ru + 1/Rl)
voltage divider Rl/(Ru+Rl) * 17 = 2.5
Solving for Rl & Ru
Ru = 680k Rl = 117.241k

~117k Can be made with 120k//4M7

SYNC Driver



R13 used to make sure SD does not interfere with pwm

P = 10W
Iav = 1.5A
Vin = 17V
Vo = 10/1.5 = 6.67V
D = 6.67/17 ~= 0.4
Will say max Duty is 0.6 as max current as current will vary

On time 20u * D = 12u
Off time 20u * (1 − D) = 8u
Dont have to wory about this

Rise Time
C = 4nF
Rgate = 10
Cg = 5n3 worst
Rginternal = 1.6
t = 5n3 * 11.6 = 61.48n
Get dead time of 70ns for safty
Using graph from data sheet 200k = 600ns
60n/(600n/200k) = 23.3 closests that give sufitcent dead time is 27k

Cb VALUE

Ib = 150uA worst
Qg = 25nC
V = 17V
Vrip% = 5%
tLmax = D/f + tdt 0.6/50k + 70n = 12us
Qcb = Qg + (tlmax * IB) = 25n + (12u * 150u) = 26.8nC
Vcb = V * Vrip%
Cb >= Qcb/Vcb = 26.8/(17 * 0.05) = 31.5nF
Use 33nF
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