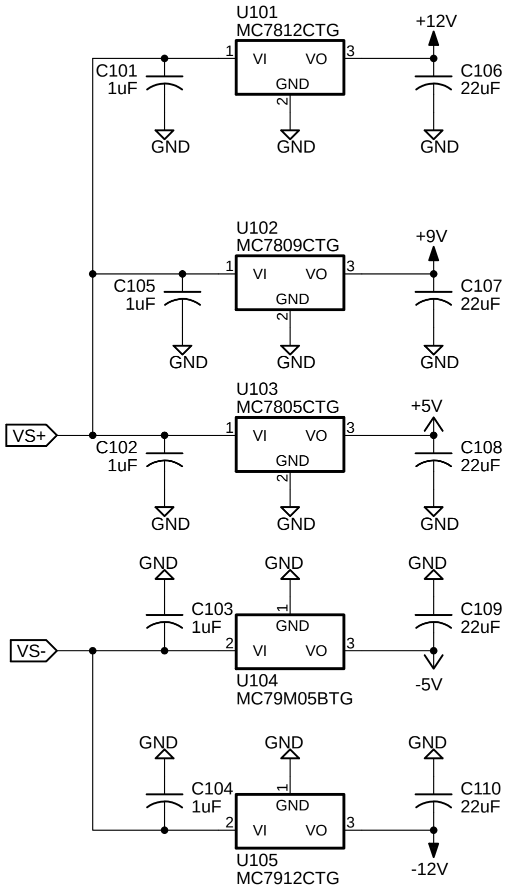
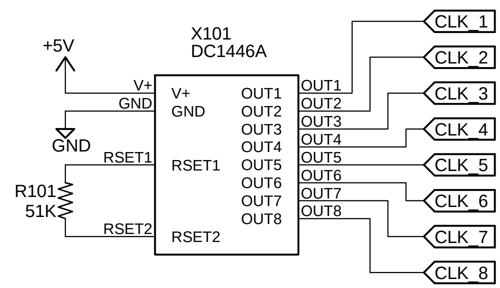
Regulated supplies for control circuitry

Generates +/-12V for LA 130-P current sensor
+5V for LTC6909
+9V/-5V for opamps/comparators
Use +/-15V split DC supply for input



Interleaved clock generator
Use LTC6909 demo board
(DC1446A from Linear Technology)



PCB comes with an RSET already soldered
Must be removed to adjust frequency below 250kHz
Replacing with a 51K resistor gives 50kHZ out

Voltage regulators and Clock generator	
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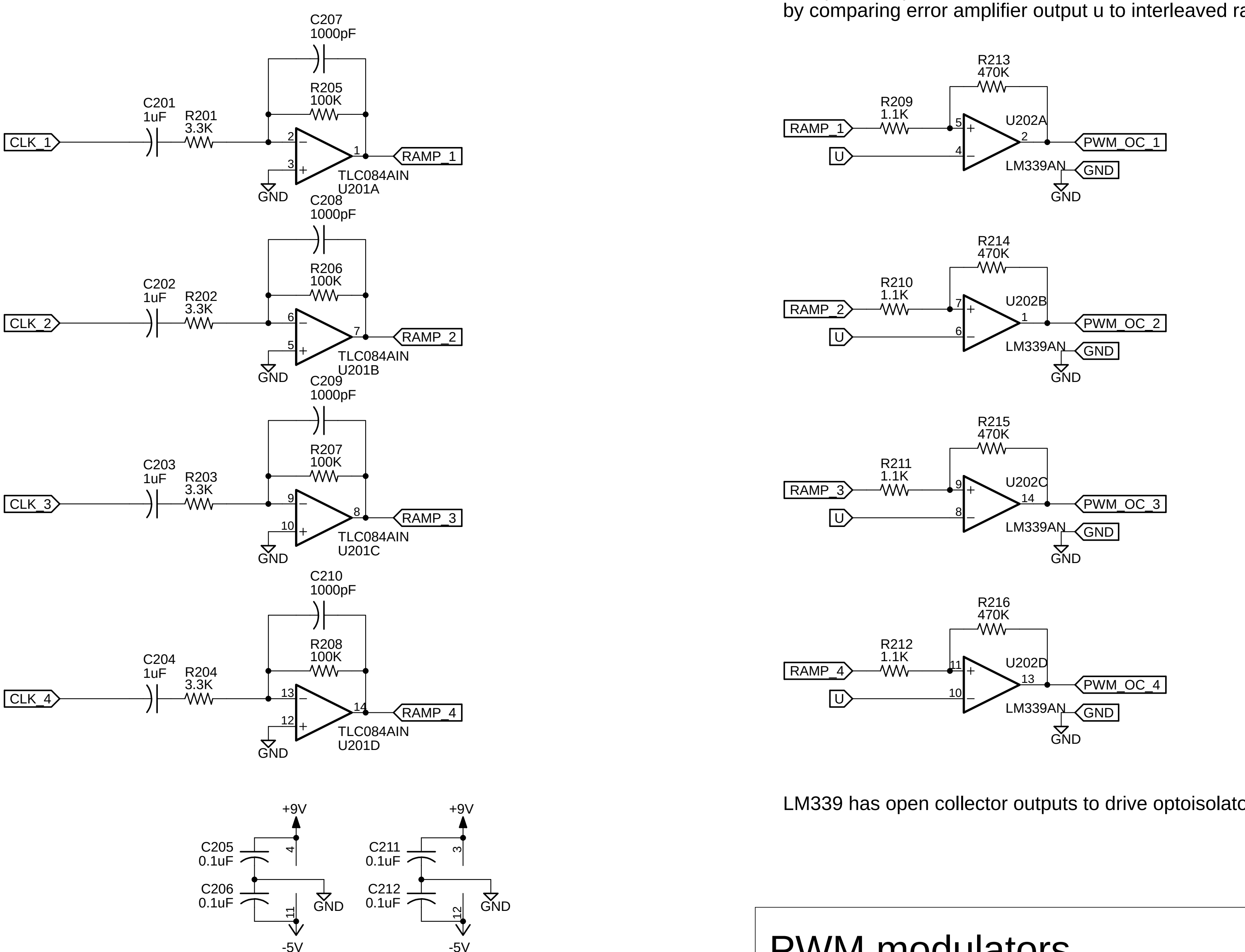
Integrators convert interleaved clocks into
interleaved triangular ramp waveforms

Comparators produce interleaved PWM waveforms
by comparing error amplifier output u to interleaved ramps



LM339 has open collector outputs to drive optoisolators

PWM modulators

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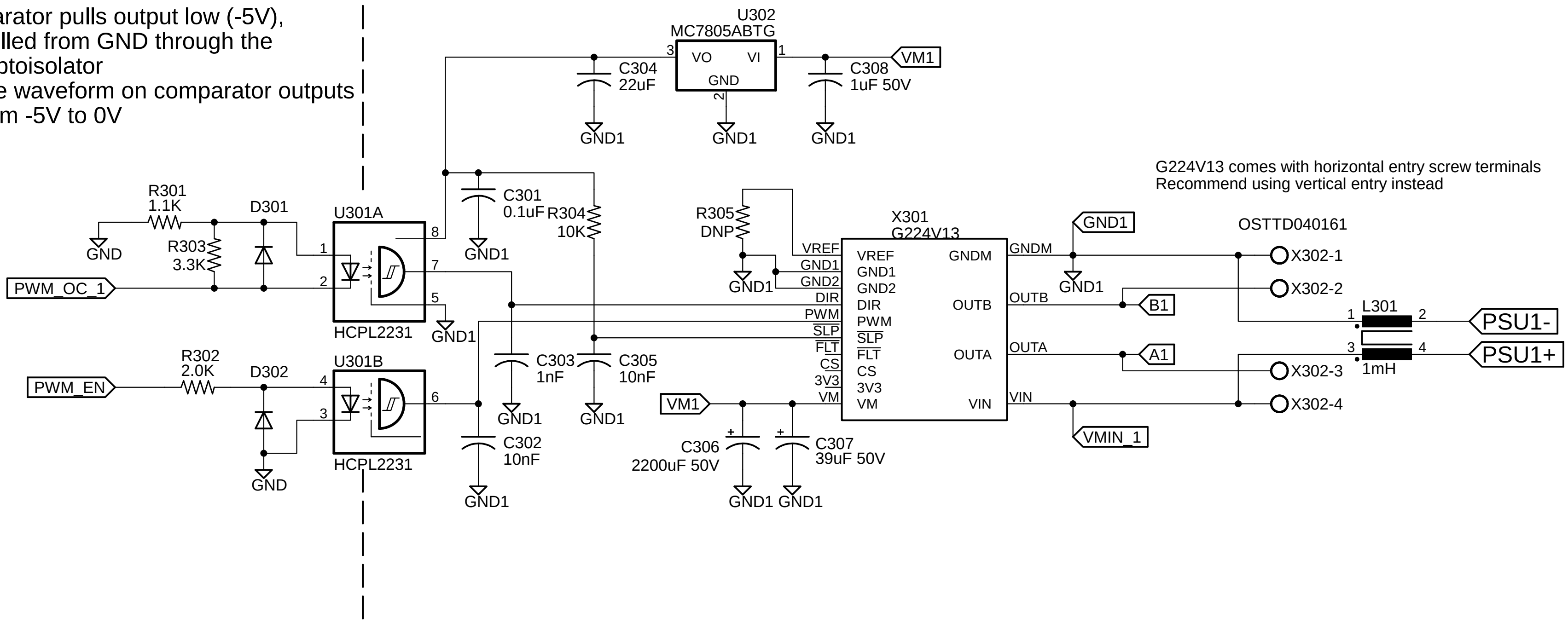
Isolated H-bridge

Remember to respect capacitor voltage ratings!

When comparator pulls output low (-5V),
Current is pulled from GND through the
LED in the optoisolator
Therefore the waveform on comparator outputs
will swing from -5V to 0V



H-bridge state stable

PWM	DIR	OUTA	OUTB
H	H	H	L
H	L	L	H
L	DC	L	L

When PWM_EN is low, both A and B outputs of
the H bridge will be forced low

H-bridge unit

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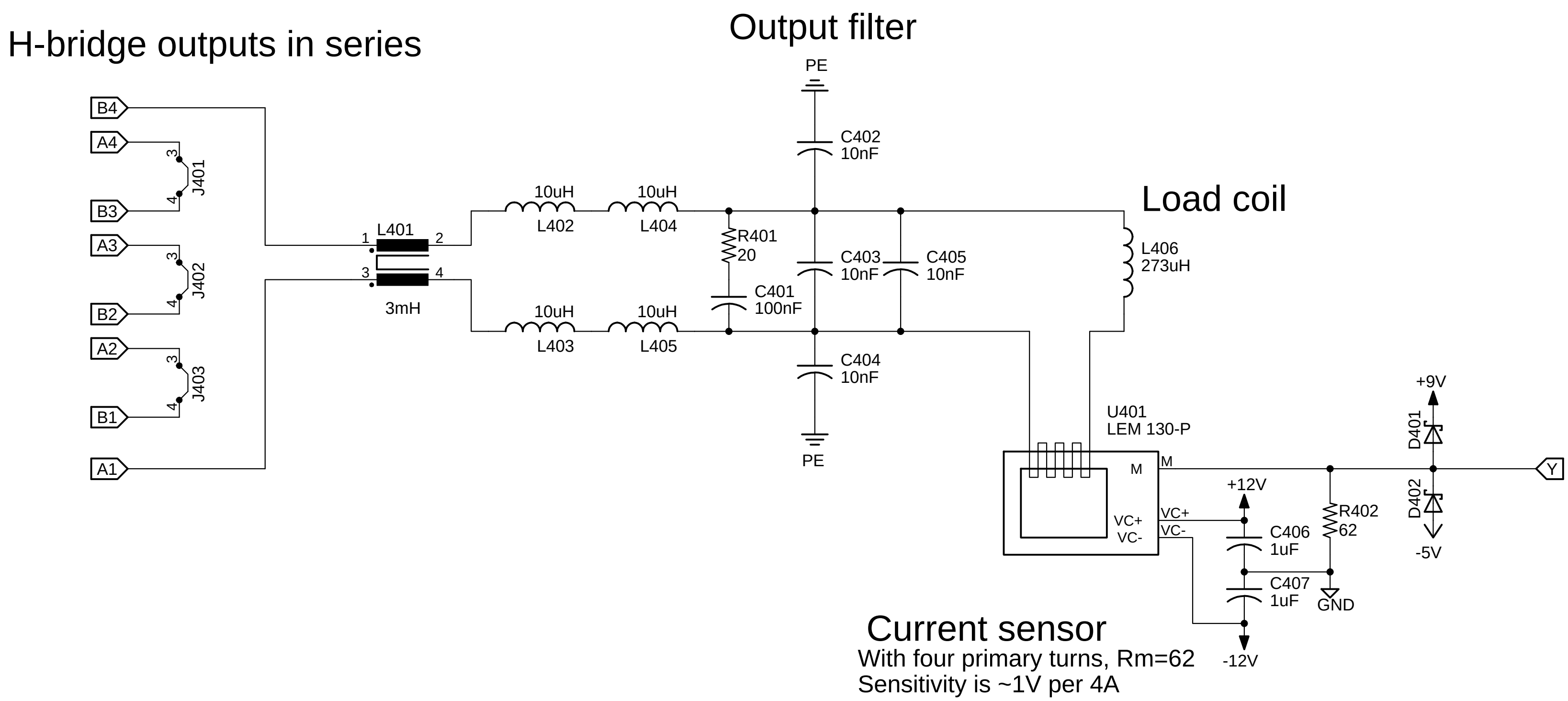

Filter, coil, and current sensor

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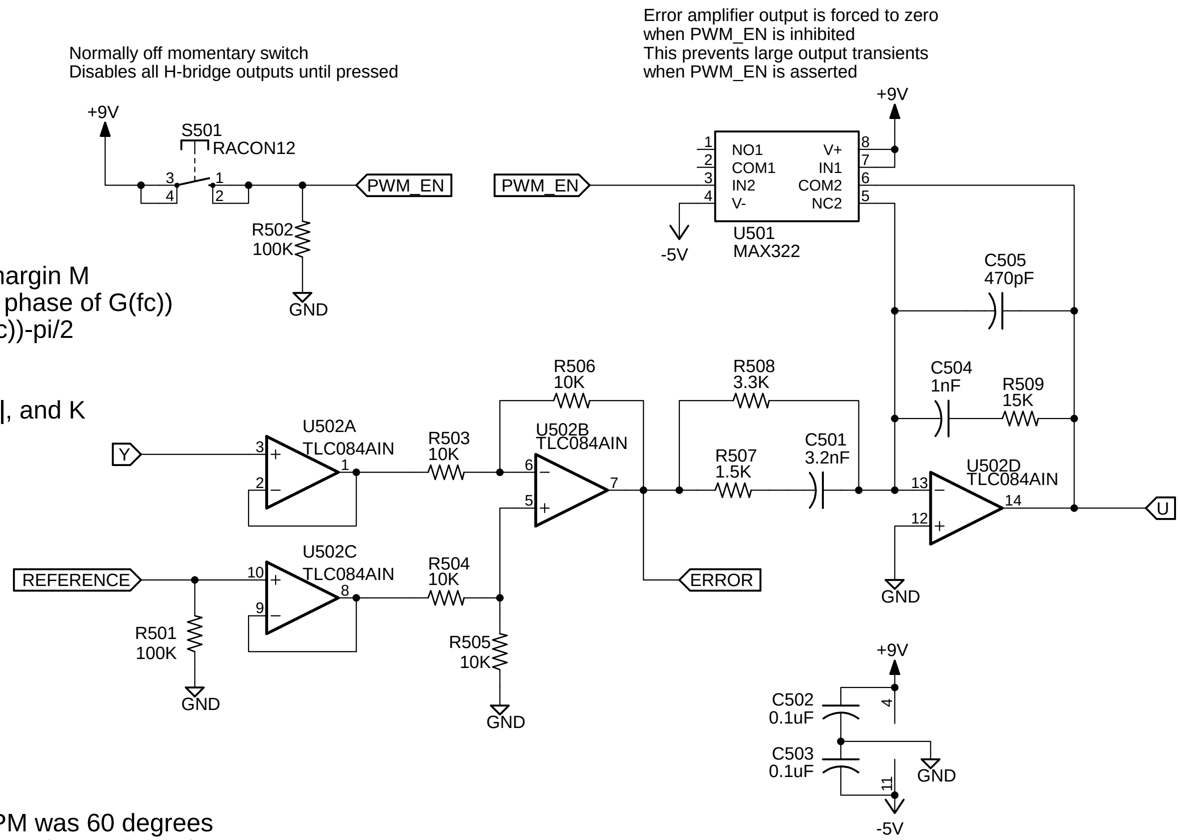
K-factor method steps (type III compensator)
1. Pick loop crossover frequency fc and phase margin M
2. Measure plant response at fc (magnitude and phase of G(fc))
3. Calculate required phase boost=M-phase(G(fc))-pi/2
4. Calculate K factor from phaseboost
5. Select arbitrary R1
6. Calculate R2, R3, C1, C2, C3, from R1, |G(fc)|, and K

For type III compensation:
K=[tan(phaseboost/4+pi/8)]^2
C2=G(fc)/(2*pi*fc*R1)
C1=C2*(K-1)
R2=sqrt(K)/(2*pi*fc*C1)
R3=R1/(K-1)
C3=1/(2*pi*fc*R3*sqrt(K))



For this design, target fc was 20kHz and target PM was 60 degrees
Measured G(fc) at 20kHZ had magnitude of 0.184, phase of -92 degrees
So required phase boost is 62 degrees
For type III compensator, need K=3.124
Choose R1 arbitrarily as 3300 ohms
Equations yield R2=14924, R3=1553,
C1=9.42e-10, C2=4.44e-10, and C3=2.90e-9
Approximated with R2=15K, R3=1.5K,
C1=1nF, C2=470pF, C3=1nF+2.2nF

Feedback controller

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