Sensor-less 3-phase BLDC Drive, TIDA-00274

This sensor-less drive design works on the principle of integrating the back-emf of the unexcited motor phase to determine commutation. To demonstrate the effectiveness of the sensor-less control scheme used in this design, the following parameters were verified in this test report. The first two were done with 3 different motors at different speeds at 24V.

- Commutation accuracy: This is a measure of how accurately phase voltage transitions match Hall signals transitions.
- Flutter: This is a measure of rotational speed jitter, and it measures the edge variation of a periodic signal generated by the motor. It is measured from Hall signals as the ratio of the max-to-min vs mean frequency of one Hall signal.
- Power handling capacity: This is performed at 48V, to test maximum power of the design.

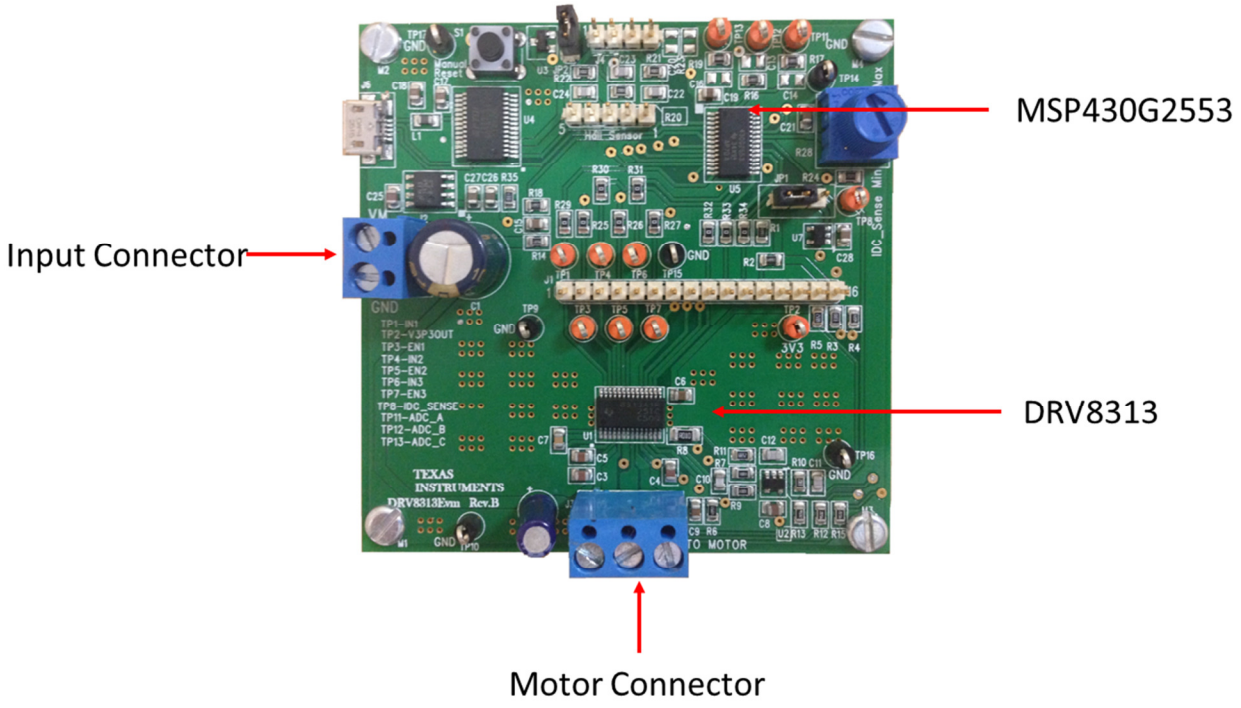

Figure 1: DRV8313 Reference design Circuit Card Assembly

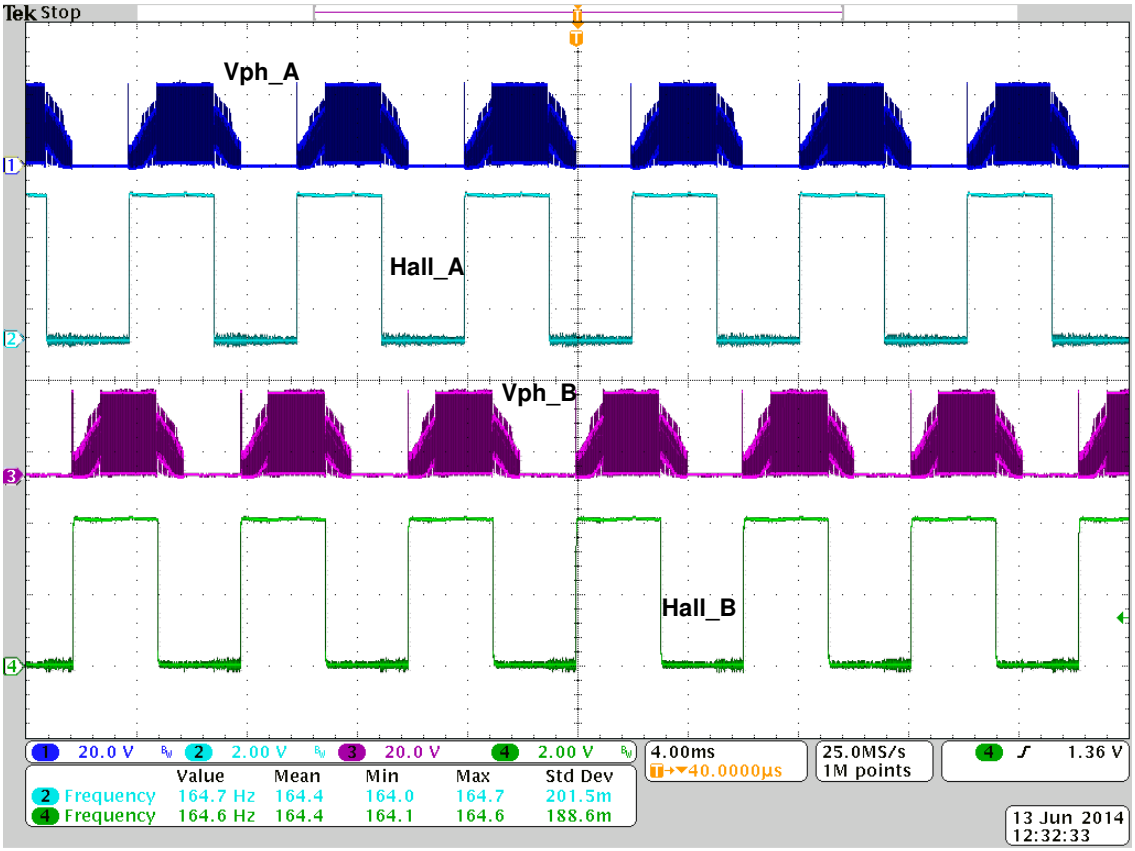

Figure 2: Motor Phase Voltage with respect to Hall-sensor for Test Motor-1

- Motor poles-8
- Average speed during test: 164.4*120/8 = 2466rpm[1]
- % flutter as per Hall-A: (164.7 – 164)/164.4*100= 0.43%
- % flutter as per Hall-B: (164.6-164.1)/ 164.4*100 = 0.3%
- Average flutter: 0.37 %

[1] Speed in Rpm = (120*Hz/motor-pole)

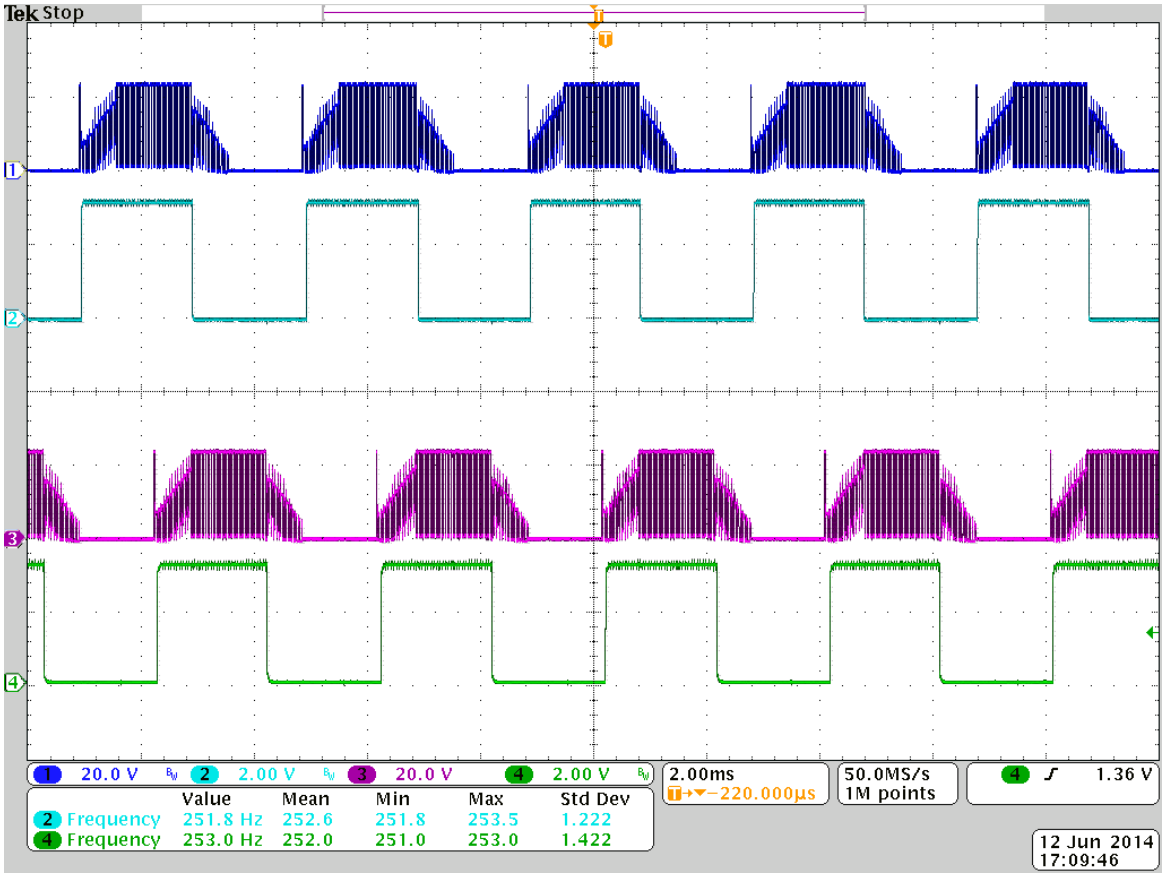

Figure 3: Motor Phase Voltage with respect to Hall-sensor for Test Motor-2

- Motor poles-8
- Average speed during test: 252.3*120/8 = 3780rpm
- % flutter as per Hall-A: (253.5 – 252.6)/251.8*100= 0.67%
- % flutter as per Hall-B: (253.0-250.0)/252*100 = 0.79%
- Average flutter: 0.73%

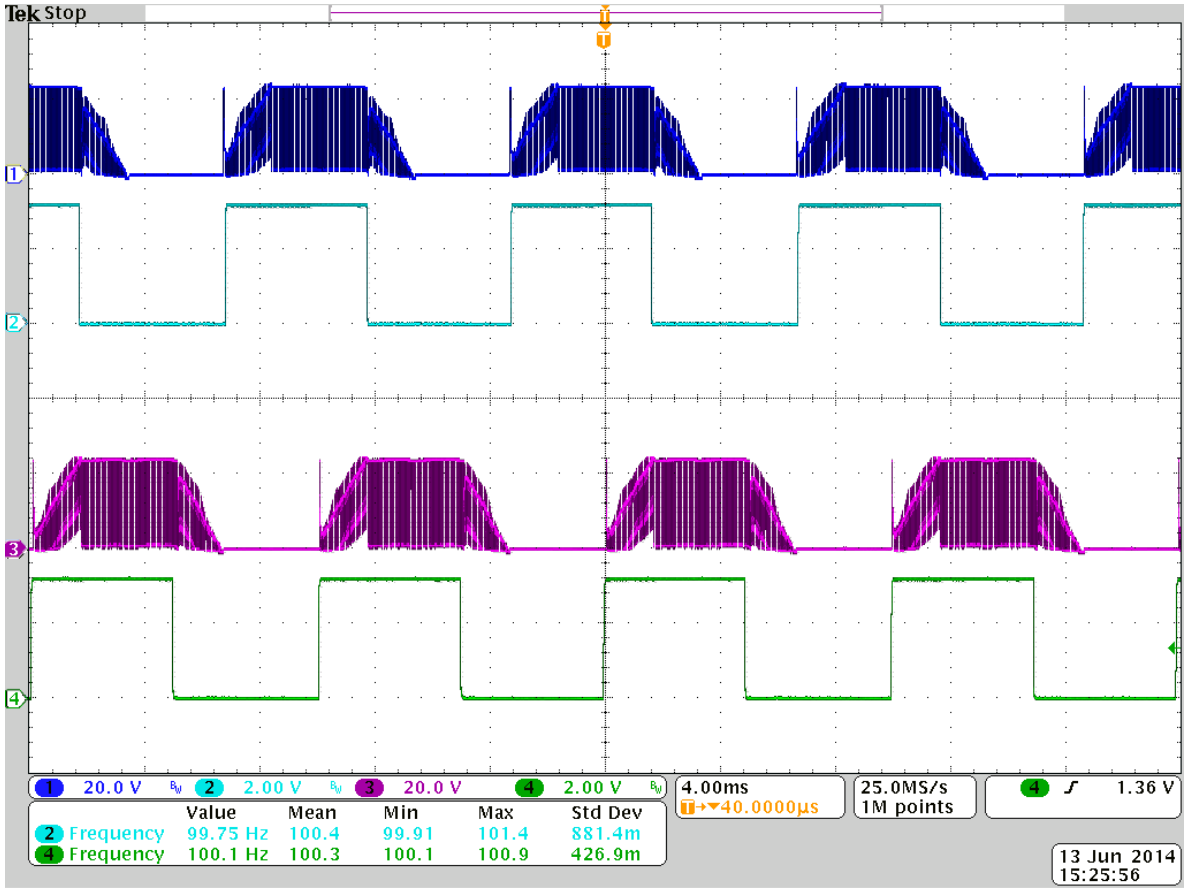

Figure 4: Motor Phase Voltage with respect to Hall-sensor for Test Motor-3

- Motor poles-8
- Average speed during test: 100.35*120/8 = 1505rpm
- % flutter as per Hall-A: (101.4 – 99.91)/100.4*100= 1.48%
- % flutter as per Hall-B: (100.9-100.1)/100.3*100 = 0.8%
- Average flutter: 1.1 %

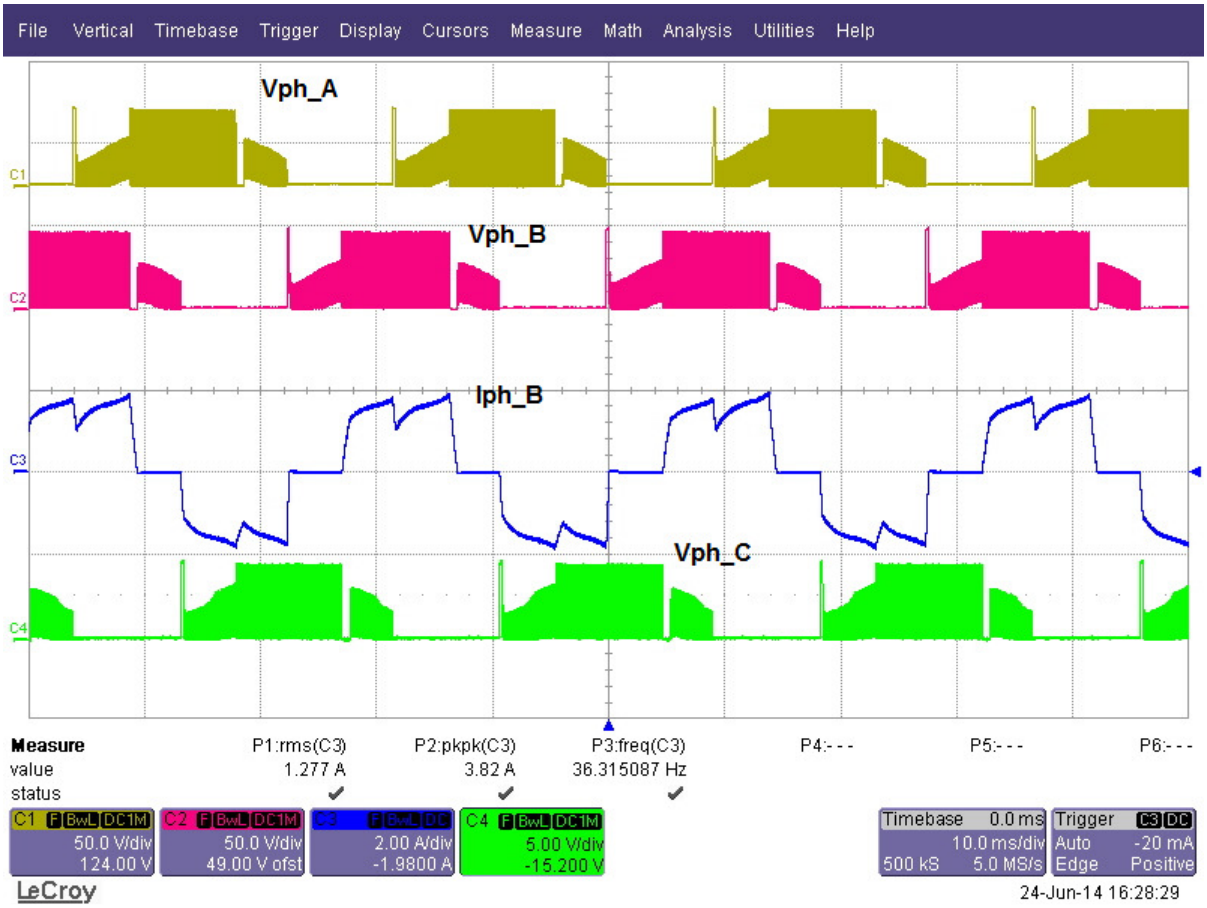

Figure 5: 3-Phase output voltages and phase current at 48Vdc/0.75Adc input

- Motor poles-16
- Average speed during test: 36.3*120/16 = 272rpm
- Motor phase current – 1.27Arms/1.9Apk
- Power Input = 36 watt

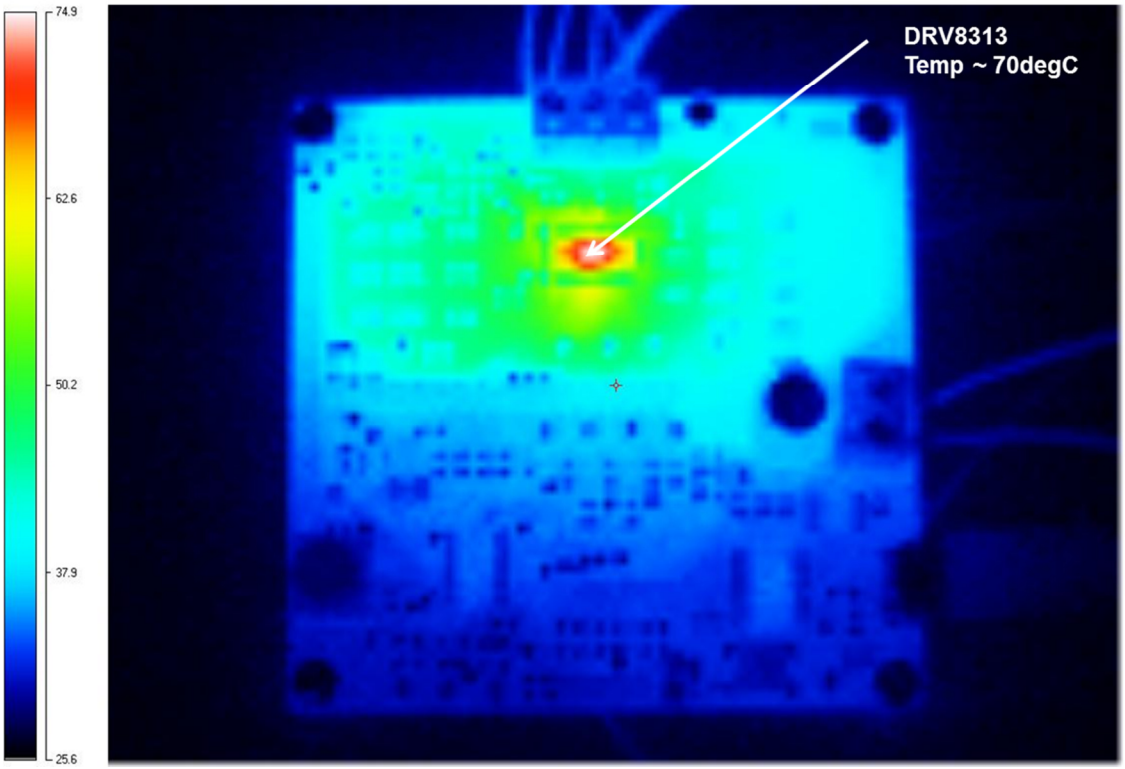

Figure 6: Thermal image at 48Vdc/0.75Adc, Pin =36Watts

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