

Efficiency and Regulation

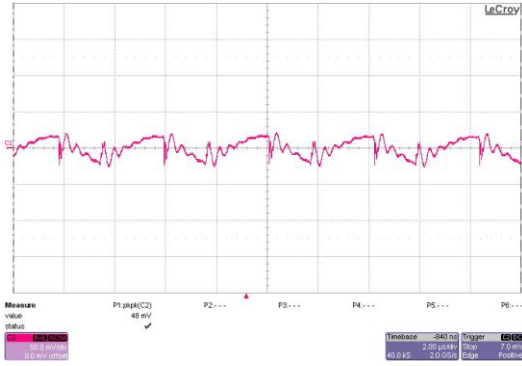
The efficiency and regulation are shown below:

| <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iin</u> | <u>Vin</u> | <u>Eff</u> |
|--|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|
| 0.880 | 3.325 | 0.350 | 5.005 | 0.110 | 9.498 | 0.1784 | 36.0 | 89.1% |
| 0.880 | 3.325 | 0.350 | 5.011 | 0.000 | 10.369 | 0.1464 | 36.0 | 88.8% |
| 0.880 | 3.325 | 0.000 | 5.029 | 0.110 | 9.497 | 0.1247 | 36.0 | 88.4% |
| 0.000 | 3.326 | 0.350 | 4.949 | 0.110 | 9.343 | 0.0878 | 36.0 | 87.3% |
| 0.880 | 3.325 | 0.000 | 5.035 | 0.000 | 10.251 | 0.0930 | 36.0 | 87.4% |
| 0.000 | 3.326 | 0.000 | 4.971 | 0.110 | 9.336 | 0.0361 | 36.0 | 79.0% |
| 0.440 | 3.326 | 0.175 | 4.992 | 0.055 | 9.565 | 0.0897 | 36.0 | 88.7% |
| 0.000 | 3.326 | 0.000 | 4.976 | 0.000 | 10.004 | 0.0053 | 36.0 | 0.0% |
| | | | | | | | | |
| | | | | | | J3 | J3 | J3 |
| <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iin</u> | <u>Vin</u> | <u>Eff</u> |
| 0.880 | 3.325 | 0.350 | 4.999 | 0.110 | 9.501 | 0.1323 | 48.0 | 90.1% |
| 0.880 | 3.325 | 0.350 | 5.005 | 0.000 | 10.326 | 0.1090 | 48.0 | 89.4% |
| 0.880 | 3.325 | 0.000 | 5.021 | 0.110 | 9.504 | 0.0931 | 48.0 | 88.9% |
| 0.000 | 3.326 | 0.350 | 4.952 | 0.110 | 9.372 | 0.0660 | 48.0 | 87.3% |
| 0.880 | 3.325 | 0.000 | 5.025 | 0.000 | 10.220 | 0.0696 | 48.0 | 87.6% |
| 0.000 | 3.326 | 0.000 | 4.972 | 0.110 | 9.370 | 0.0277 | 48.0 | 77.5% |
| 0.440 | 3.326 | 0.175 | 4.989 | 0.055 | 9.568 | 0.0674 | 48.0 | 88.5% |
| 0.000 | 3.326 | 0.000 | 4.976 | 0.000 | 10.011 | 0.0046 | 48.0 | 0.0% |
| | | | | | | | | |
| | | | | | | J3 | J3 | J3 |
| <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | <u>Iin</u> | <u>Vin</u> | <u>Eff</u> |
| 0.880 | 3.325 | 0.350 | 4.997 | 0.110 | 9.511 | 0.1113 | 57.0 | 90.2% |
| 0.880 | 3.325 | 0.350 | 5.002 | 0.000 | 10.306 | 0.0918 | 57.0 | 89.4% |
| 0.880 | 3.325 | 0.000 | 5.017 | 0.110 | 9.508 | 0.0786 | 57.0 | 88.7% |
| 0.000 | 3.326 | 0.350 | 4.954 | 0.110 | 9.387 | 0.0559 | 57.0 | 86.8% |
| 0.880 | 3.325 | 0.000 | 5.021 | 0.000 | 10.208 | 0.0587 | 57.0 | 87.5% |
| 0.000 | 3.326 | 0.000 | 4.972 | 0.110 | 9.385 | 0.0237 | 57.0 | 76.4% |
| 0.440 | 3.326 | 0.175 | 4.987 | 0.055 | 9.570 | 0.0569 | 57.0 | 88.3% |
| 0.000 | 3.326 | 0.000 | 4.975 | 0.000 | 10.020 | 0.0044 | 57.0 | 0.0% |
| | | | | | | | | |
| <u>Max Load Efficiency without bridge</u> | | | | | | | | |
| <u>Iout</u> | <u>Vout</u> | <u>Iout</u> | <u>Vout</u> | | | <u>Iin</u> | <u>Vin</u> | <u>Eff</u> |
| 0.880 | 3.325 | 0.350 | 5.005 | 0.110 | 9.498 | 0.1784 | 35.37 | 90.7% |
| 0.880 | 3.325 | 0.350 | 4.999 | 0.110 | 9.501 | 0.1323 | 47.45 | 91.1% |
| 0.880 | 3.325 | 0.350 | 4.997 | 0.110 | 9.511 | 0.1113 | 56.47 | 91.0% |
| | | | | | | | | |
| Vin measured at FB1/FB2 | | | | | | | | |

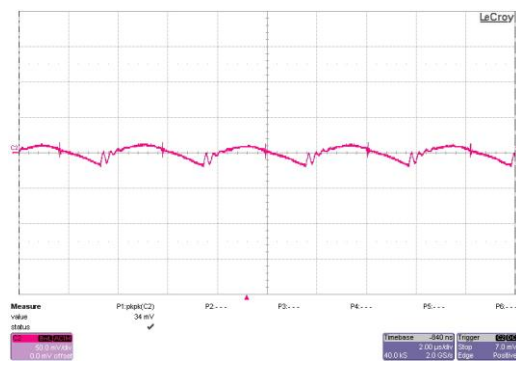
Ripple and Noise

48V input; 3.3V/880mA, 5V/350mA, and 10V/110mA loads; 20MHz BWL.

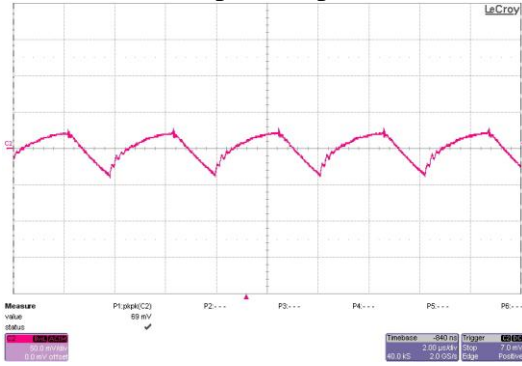
3.3V Output Ripple (C29), 50mV/div
 Measured 48mVpeak to peak:



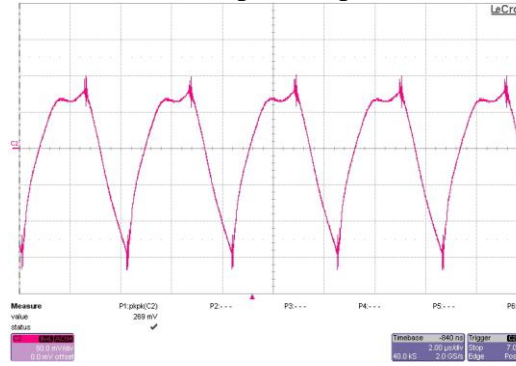
5V Output Ripple (C19), 50mV/div
 Measured 34mV peak to peak:



10V Output Ripple (C13), 50mV/div
 Measured 69mVpeak to peak:

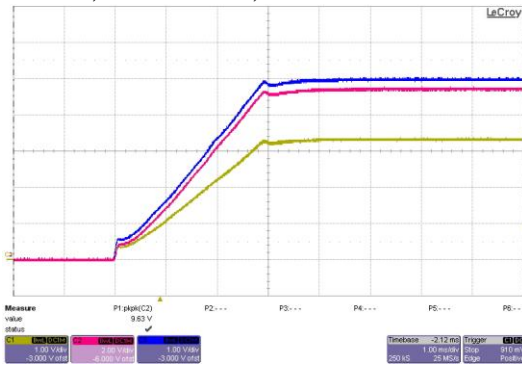


Input Ripple (C21), 50mV/div
 Measured 269mVpeak to peak:

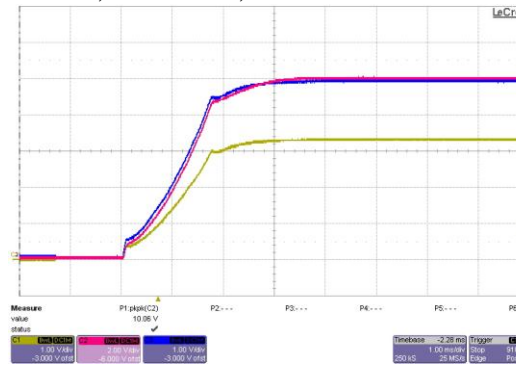


Turn On Response

48VIN, Max Loads, 1msec/div:



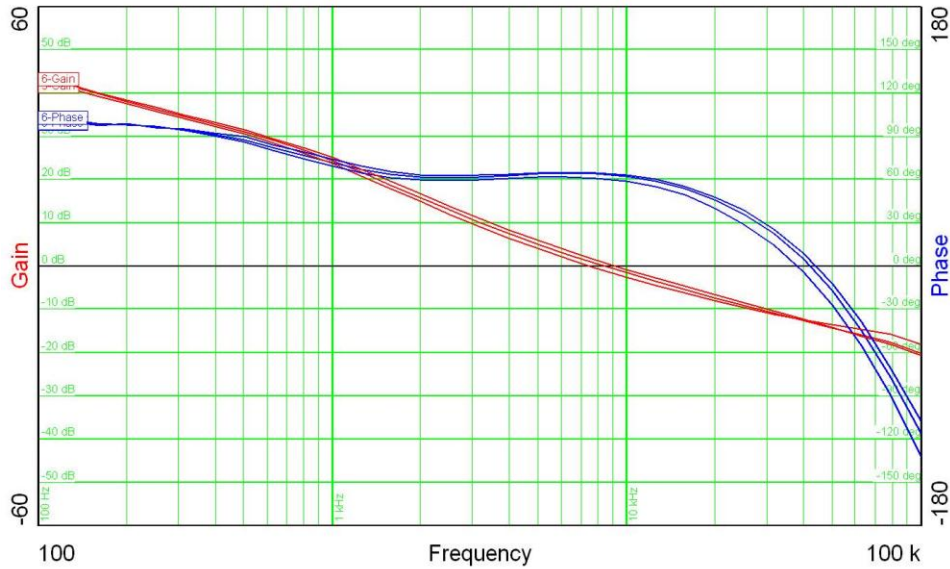
48VIN, 0A Loads, 1msec.div:



Top, 5V output, 1V/div; Middle, 10V output, 2V/div; Bottom, 3.3V output, 1V/div

Loop Stability

The measured Bode plot of the converter is shown below.



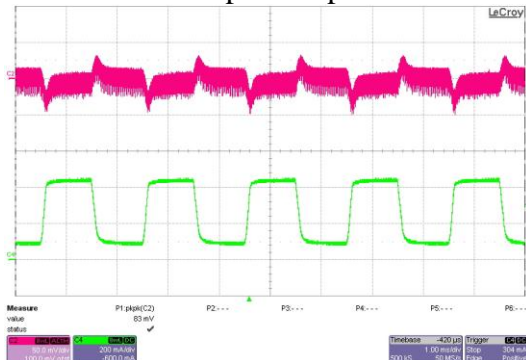
| Volts | KHz | degrees | dB |
|------------|-----------|-----------|-----------|
| <u>Vin</u> | <u>BW</u> | <u>PM</u> | <u>GM</u> |
| 36.0 | 7.5 | 61.0 | 12.0 |
| 48.0 | 8.4 | 63.0 | 13.0 |
| 57.0 | 9.2 | 63.0 | 13.0 |

Dynamic Loading

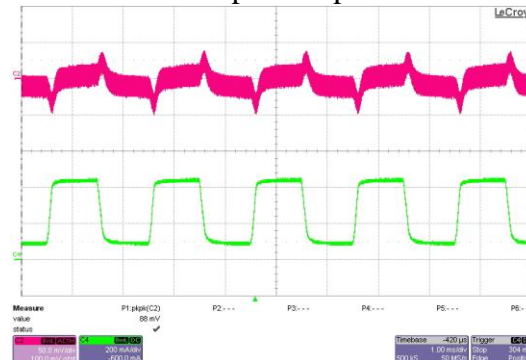
One output at a time was pulsed. The outputs not being pulsed were loaded to their maximum value. The input voltage is 48V at J3.

3.3V load step, 88mA to 440mA:

3.3V Response
 50mV/div, 1msec/div
 Measured 83mV peak to peak:



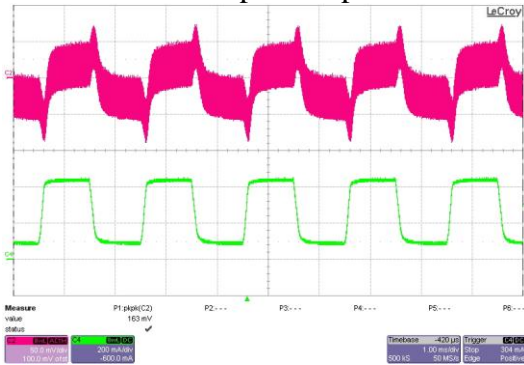
5V Response
 50mV/div
 Measured 88mV peak to peak:



10V Response

100mV/div, 1msec/div

Measured 163mV peak to peak:

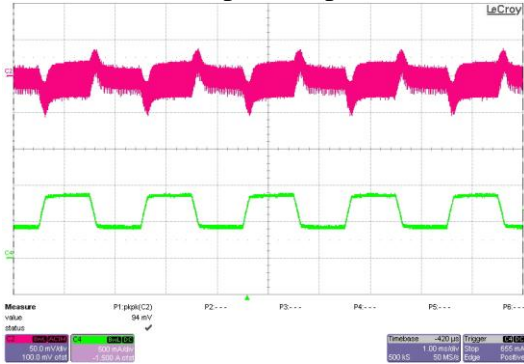


3.3V load step, 440mA to 880mA:

3.3V Response

50mV/div, 1msec/div

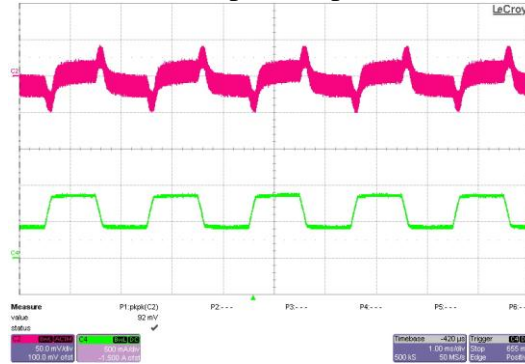
Measured 94mV peak to peak:



5V Response

50mV/div

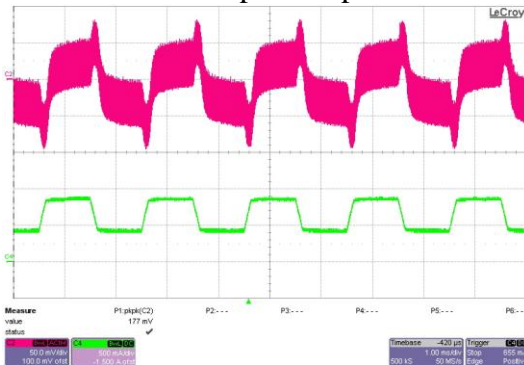
Measured 92mV peak to peak:



10V Response

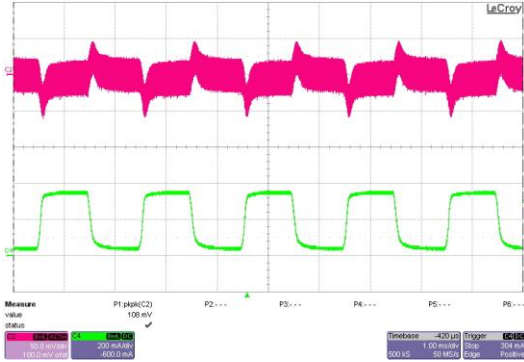
100mV/div, 1msec/div

Measured 177mV peak to peak:

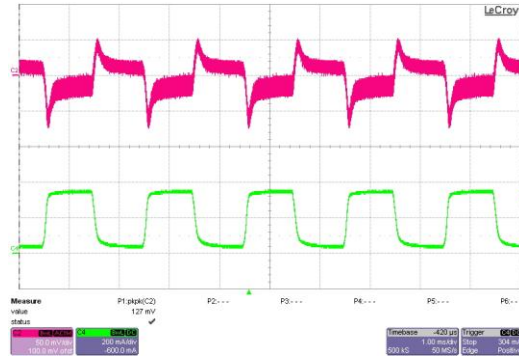


5V load step, 35mA to 350mA:

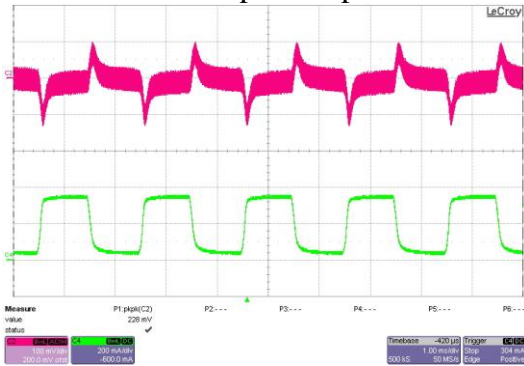
3.3V Response
50mV/div, 1msec/div
Measured 108mV peak to peak:



5V Response
50mV/div
Measured 127mV peak to peak:

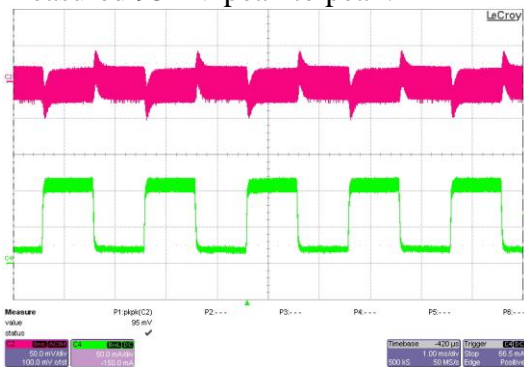


10V Response
50mV/div, 1msec/div
Measured 228mV peak to peak:

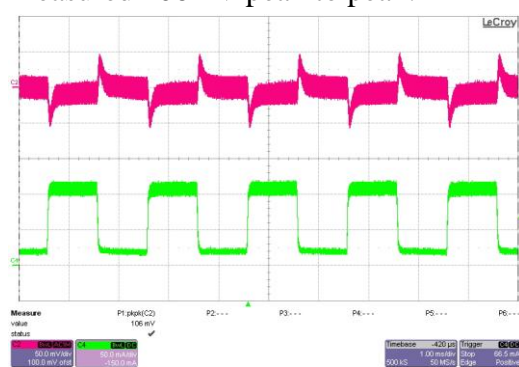


10V load step, 20mA to 110mA:

3.3V Response
50mV/div, 1msec/div
Measured 95mV peak to peak:



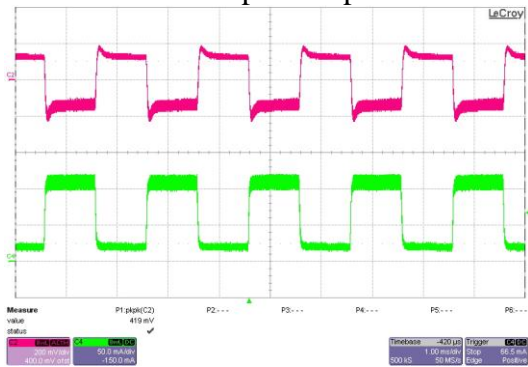
5V Response
50mV/div
Measured 106mV peak to peak:



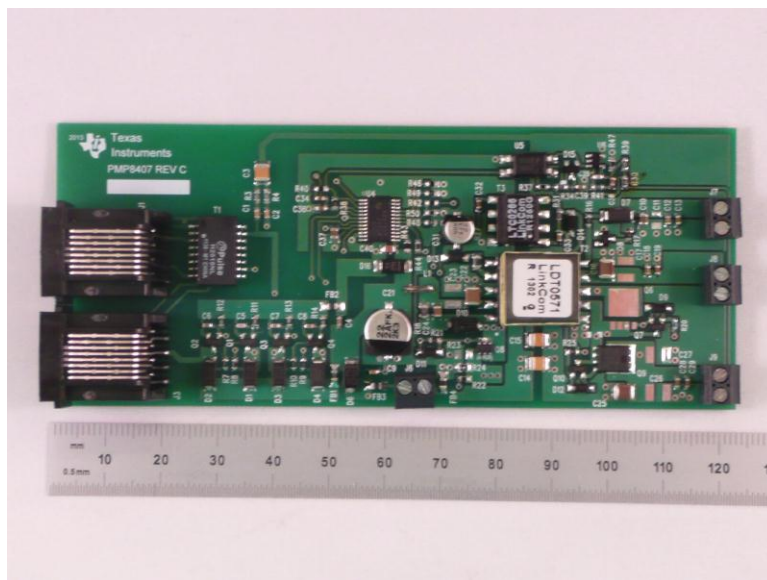
10V Response

200mV/div, 1msec/div

Measured 419mV peak to peak:



Photo



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