# Test Data
# For PMP9478
# 8/20/2014

## Power Specification

Vin range: 20V – 32V

Nominal Vin = 24V

Quad Isolated Outputs: ±15V@50mA, ±5V@50mA

Fsw = 350kHz

## Board Photos

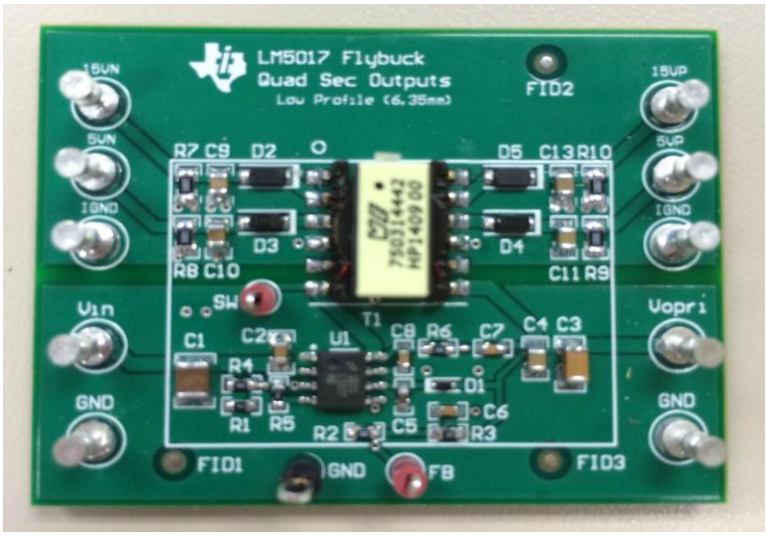


**Figure 1. Board Front**

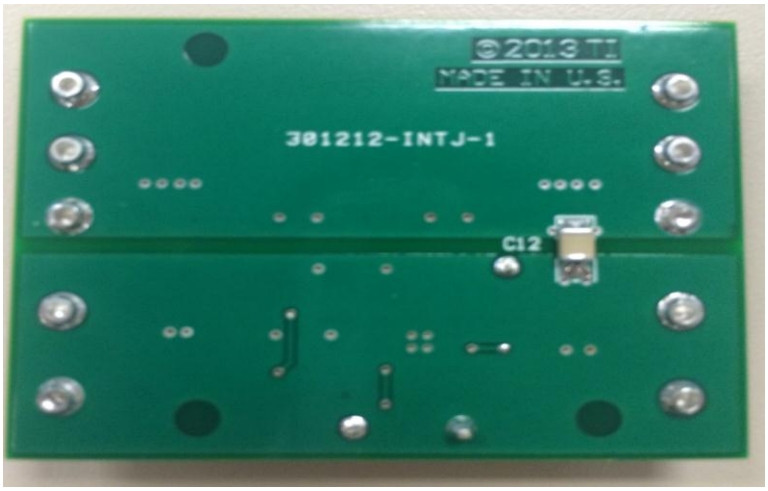


**Figure 2. Board Back**

Size: 36x20mm

5VP: +5V output, 5VN: -5V output

15VP: +15V output, 15VN: -15V output

## Efficiency

The efficiency is calculated for all outputs; the load current is incremented at 10mA interval.

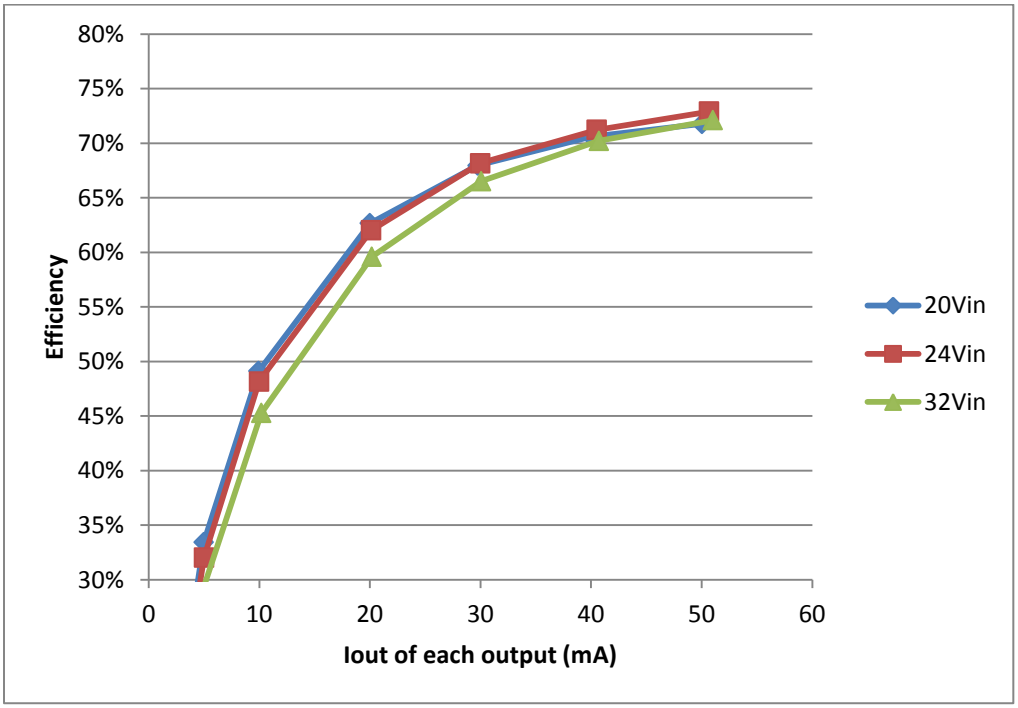


**Figure 3. Quad Output Efficiency**

## Cross Regulation

The cross regulation was tested by sweeping different load condition on 15VP, 15VN, 5VP, and 5VN at various input voltage.

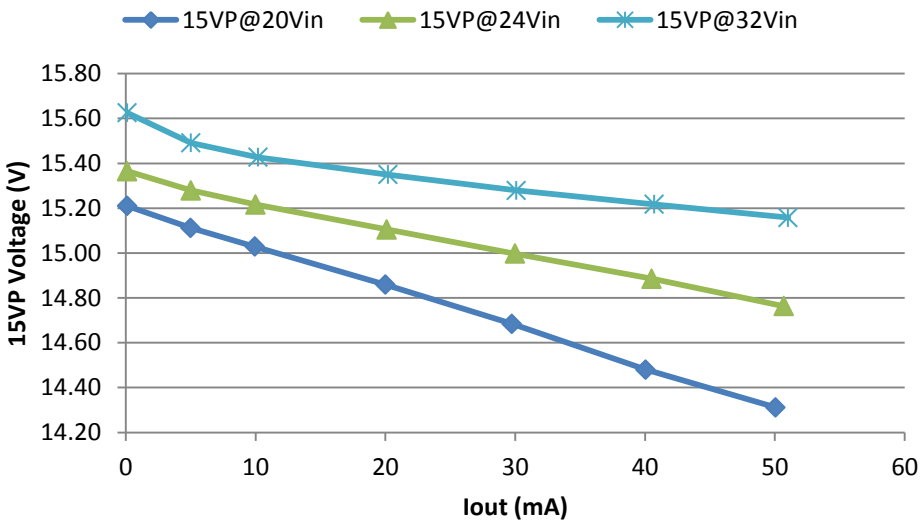


**Figure 4. Positive 15V Vout at Different Load**

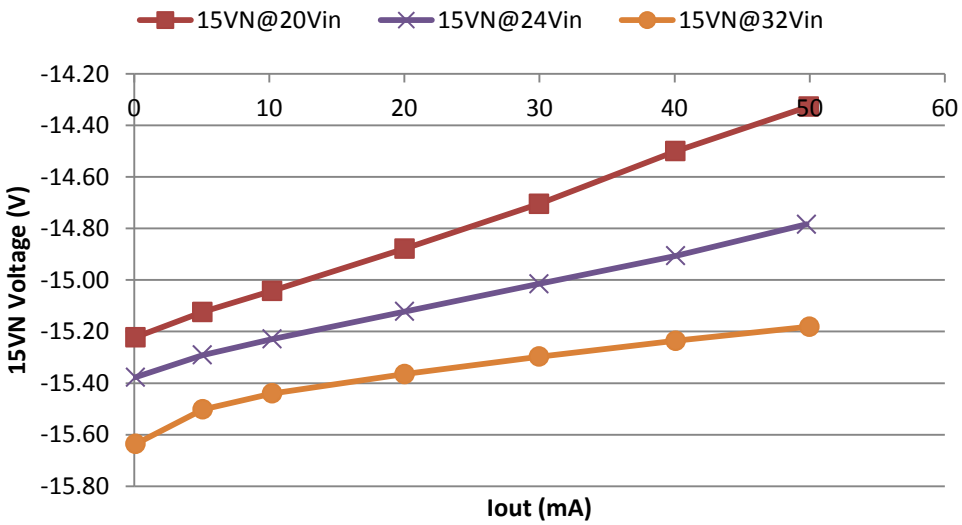


**Figure 5. Negative 15V Vout at Different Load**

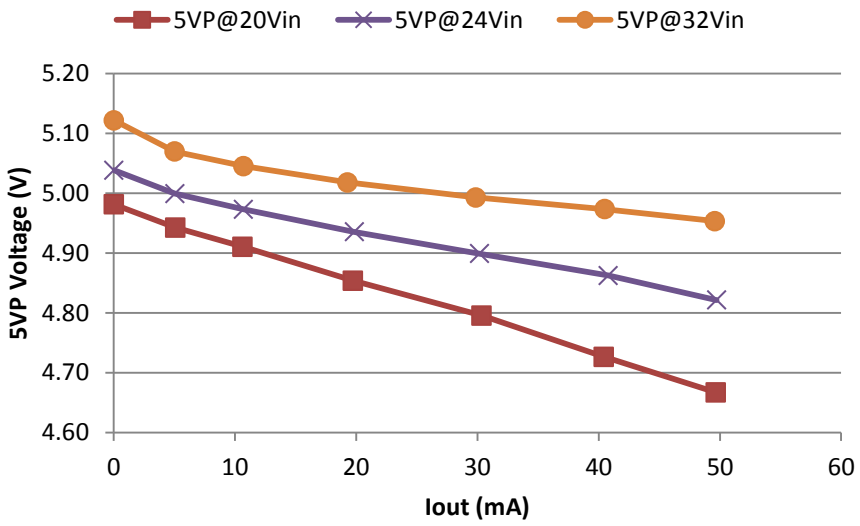


**Figure 6. Positive 5V Vout at Different Load**

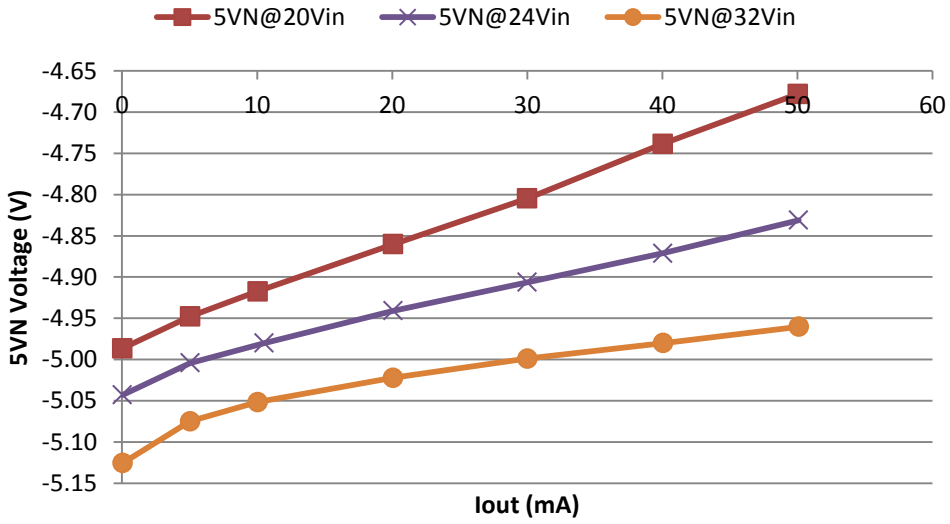


**Figure 7. Negative 5V Vout at Different Load**

For more data at different Vin, see the Appendix.

## Start Up

Test condition 1: The input voltage was set at 24V, and all four outputs were set at full load.
Ch1 - Vin, Ch2 – 5VP (5V), Ch3 – 5VN (-5V)

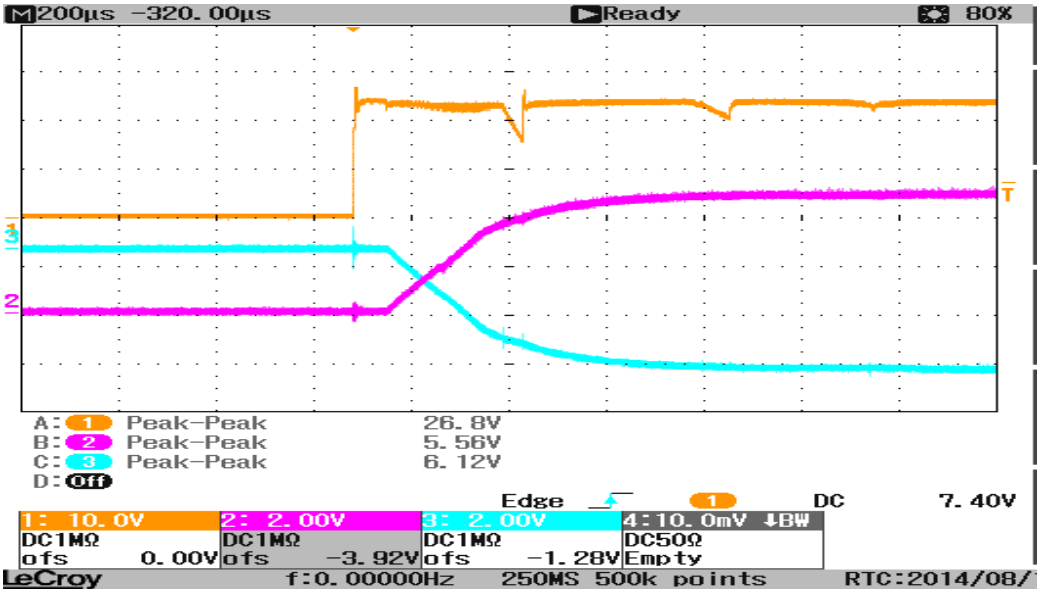


**Figure 8. ±5V Start Up at Full Load**

Test condition 2: The input voltage was set at 24V, and all four outputs were set at full load.
Ch1 - Vin, Ch2 – 15VP (+15V), Ch3 – 15VN (-15V)

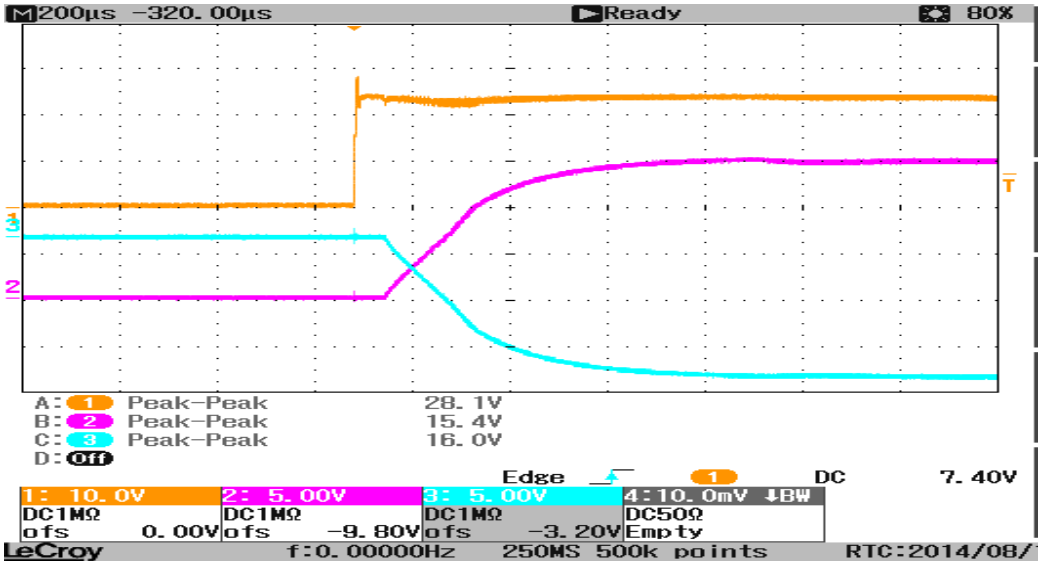


**Figure 9. ±15V Start Up at Full Load**

## Switching Waveforms

1. Test condition: The input voltage was set at 24V, and all four outputs were set at full load.
   Ch1 – Vsw (switch node voltage)

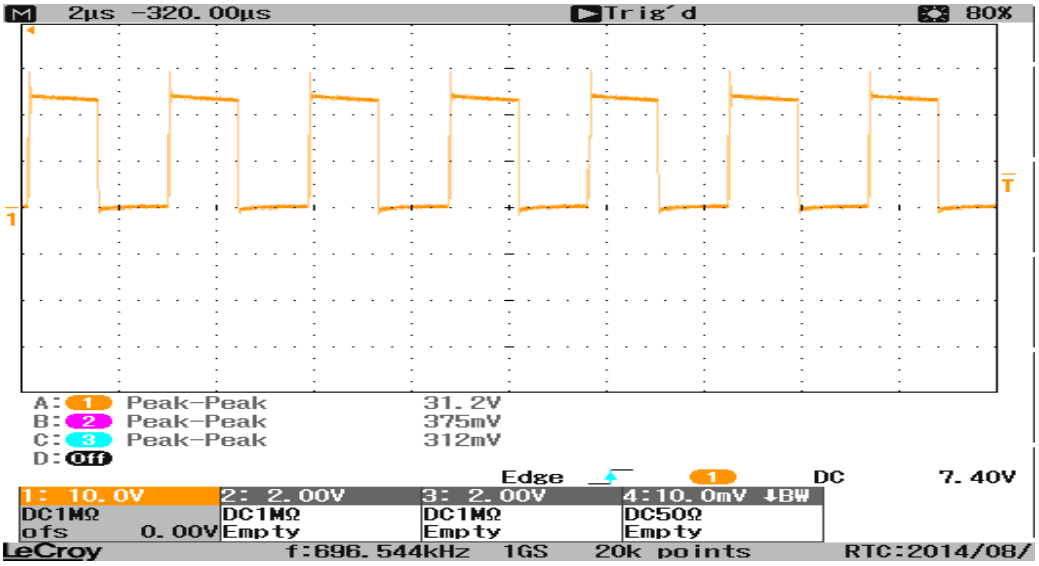


**Figure 10. Switch Node Waveform at Full Load**

2. Test condition: The input voltage was set at 24V, and all four outputs were set at no load.
   Ch1 – Vsw (switch node voltage)

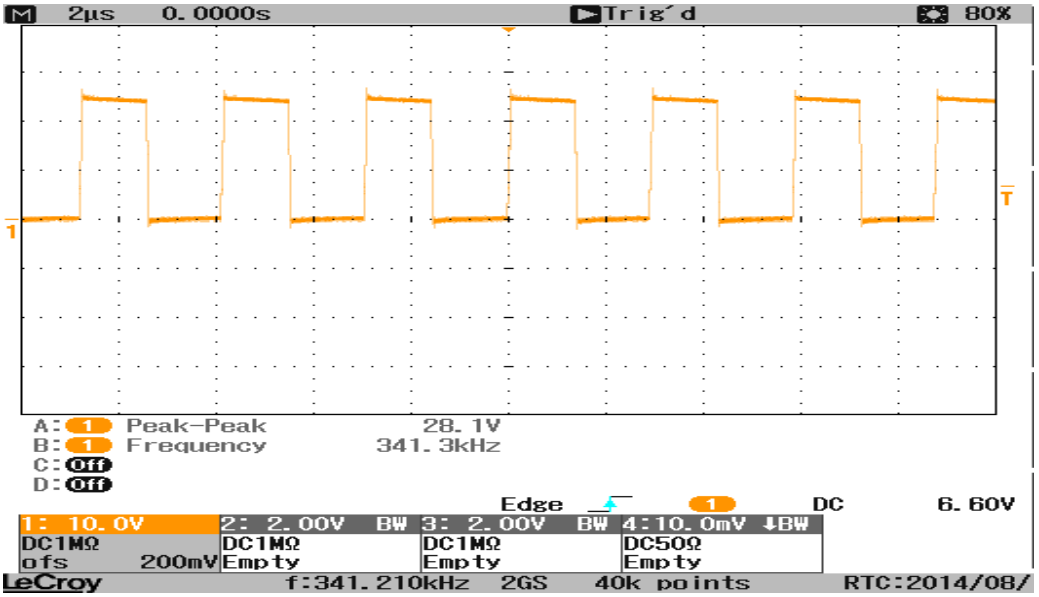


**Figure 11. Switch Node Waveform at No Load**

3. Test condition: The input voltage was set at 32V, and all four outputs were set at full load. Ch1 – Vd5 (+5V output diode voltage stress from cathode (-) to anode (+))

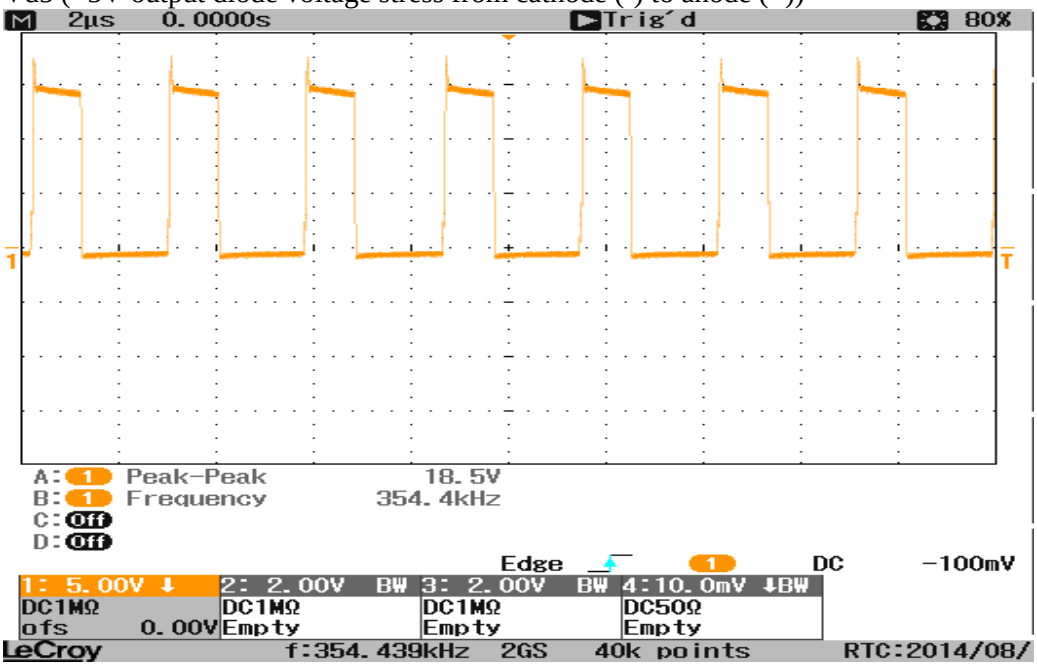


**Figure 12. +5V Diode Voltage Stress Waveform at Full Load**

4. Test condition: The input voltage was set at 32V, and all four outputs were set at full load. Ch1 – Vd5 (-5V output diode voltage stress from cathode (-) to anode (+))

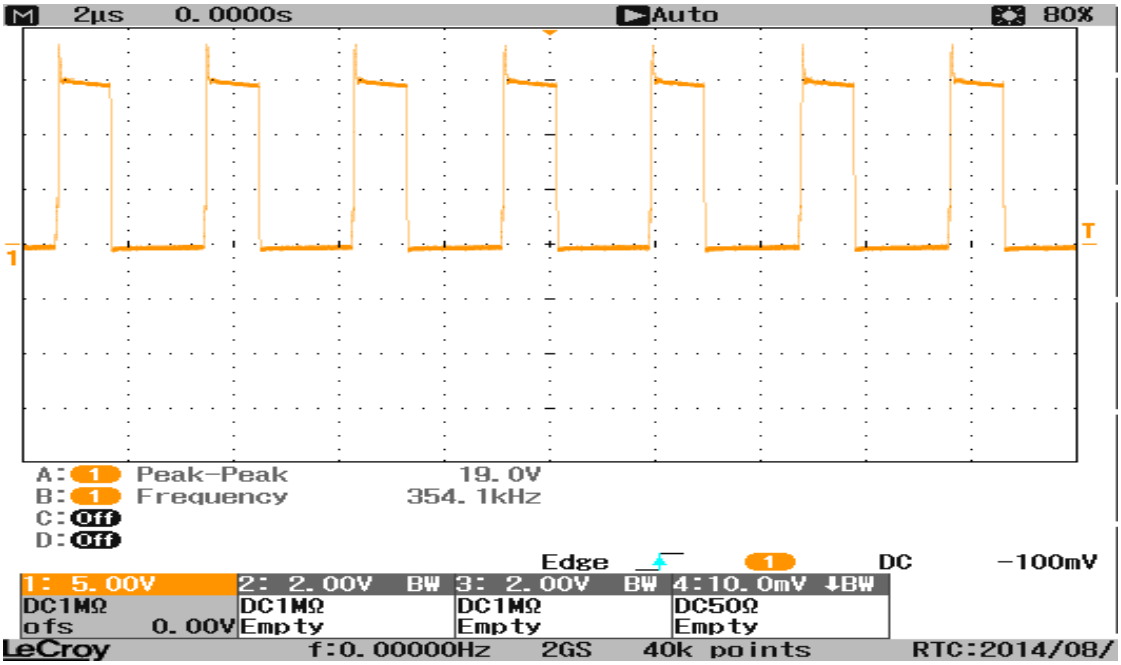


**Figure 13. -5V Diode Voltage Stress Waveform at Full Load**

5. Test condition: The input voltage was set at 32V, and all four outputs were set at full load. Ch1 – Vd15 (+15V output diode voltage stress from cathode (-) to anode (+))

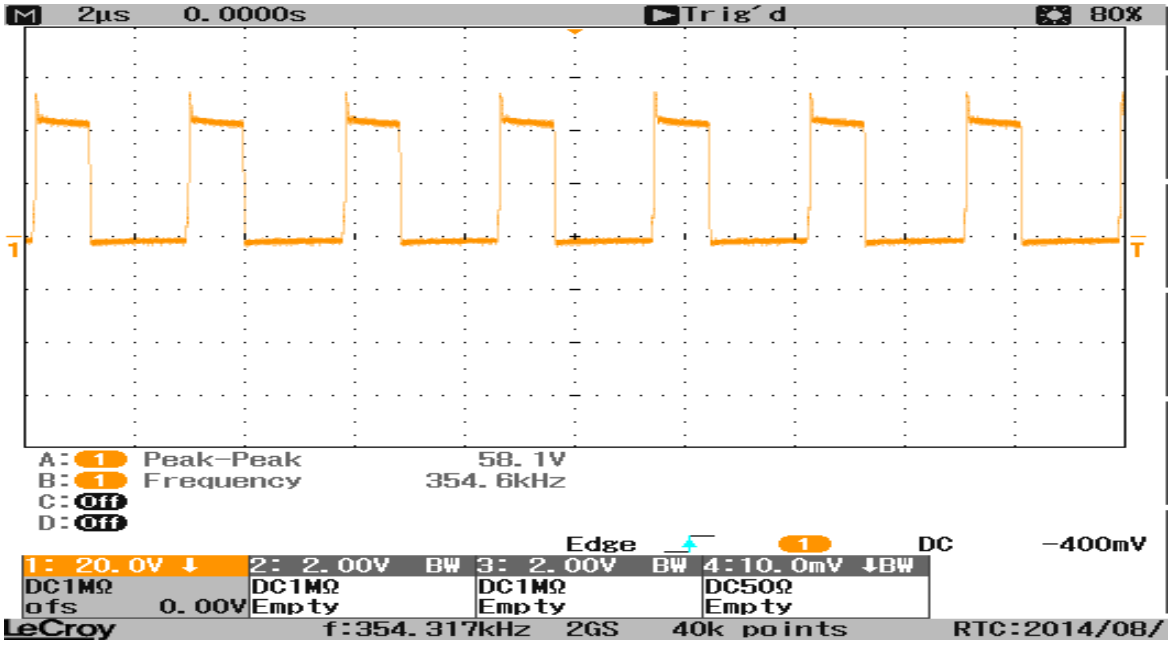


**Figure 14. +15V Diode Voltage Stress Waveform at Full Load**

6. Test condition: The input voltage was set at 32V, and all four outputs were set at full load. Ch1 – Vd15 (-15V output diode voltage stress from cathode (-) to anode (+))

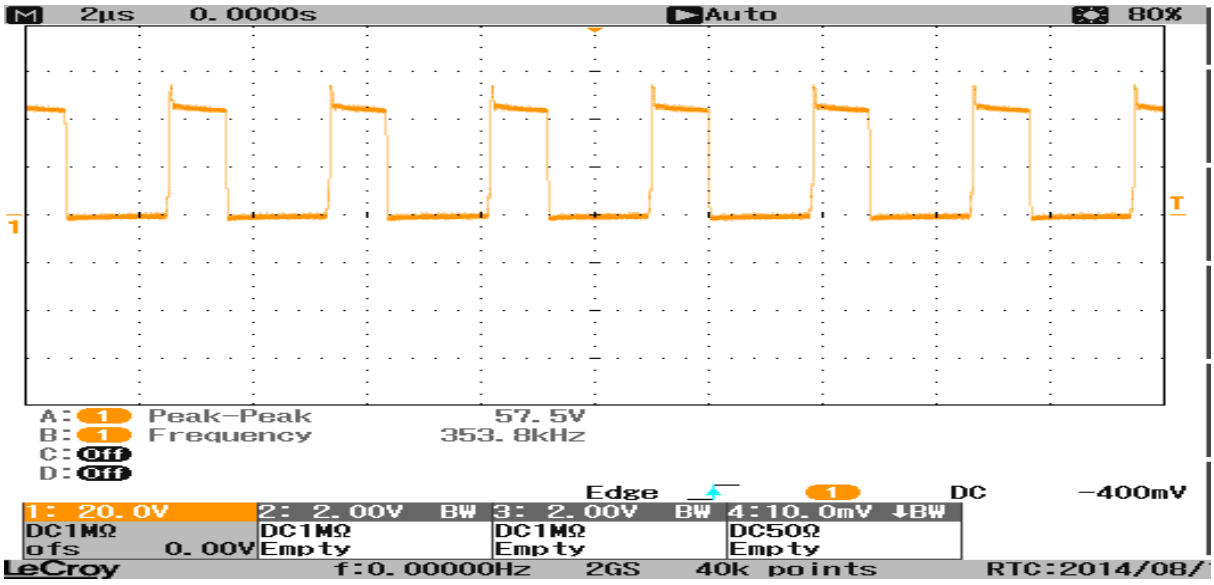


**Figure 15. -15V Diode Voltage Stress Waveform at Full Load**

# Load Transients

## +5V Output Load Step

Test condition: Vin = 24V, 5VP (+5V) load from 0A to 50mA, no load the other outputs.
Ch1- 5VP (+5V) (AC mode), Ch2- 5VN (-5V) (AC mode), Ch4- Io (+5V output current)

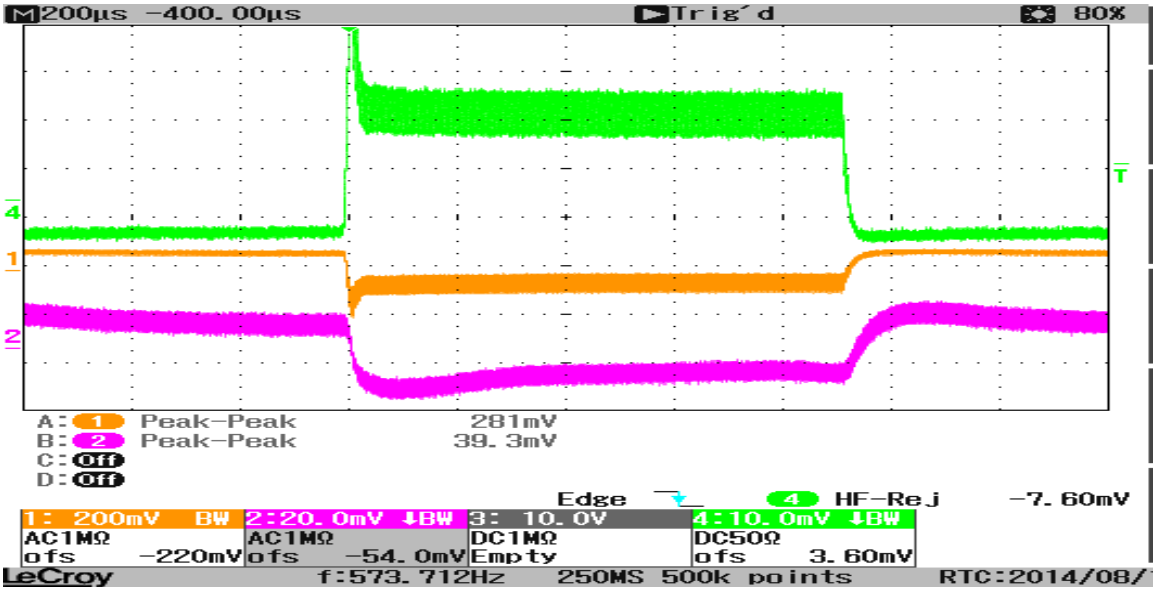


**Figure 16. +5V Load Transients**

## +15V Output Load Step

Test condition: Vin = 24V, 15VP (+15V) load from 0A to 50mA, no load the other outputs.
Ch1- 15VP (+15V) (AC mode), Ch2- 15VN (-15V) (AC mode), Ch4- Io (+15V output current)

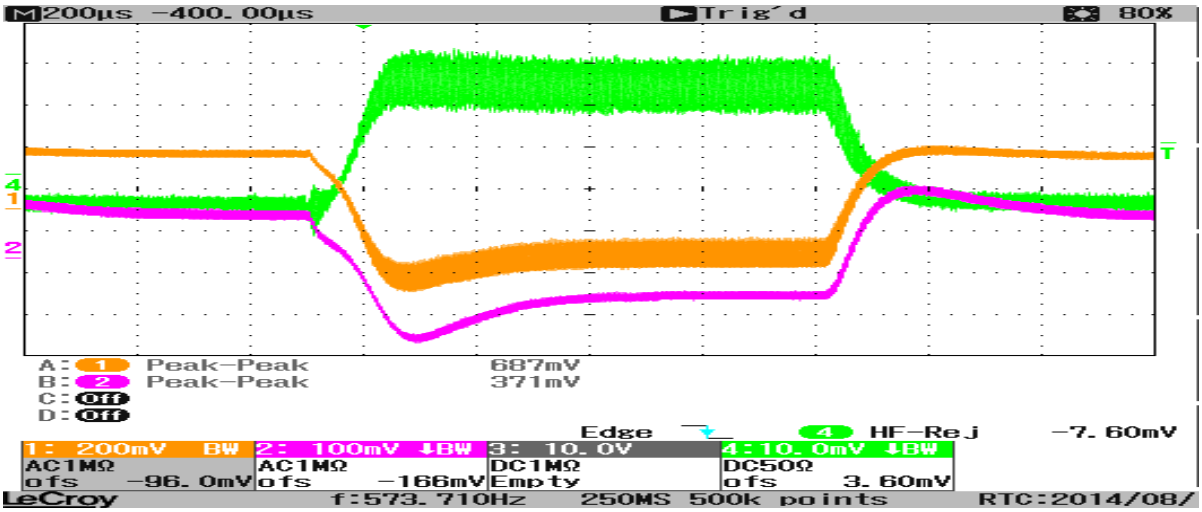


**Figure 17. +15V Load Transients**

## Output Voltage Ripples

Test condition: The input voltage was set at 24V, and all four outputs were set at full load.
Ch2 – 5VP (+5V) (AC coupled)

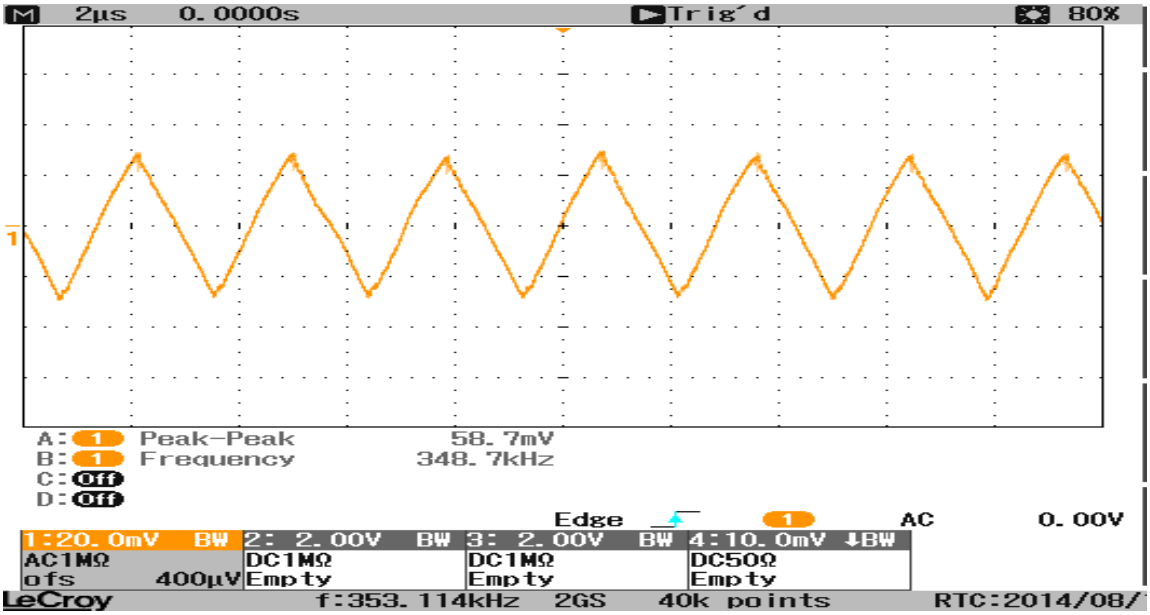


**Figure 18. +5V AC Output Ripple at Full Load**

Test condition: The input voltage was set at 24V, and all four outputs were set at full load.
Ch2 – 5VN (-5V) (AC coupled)

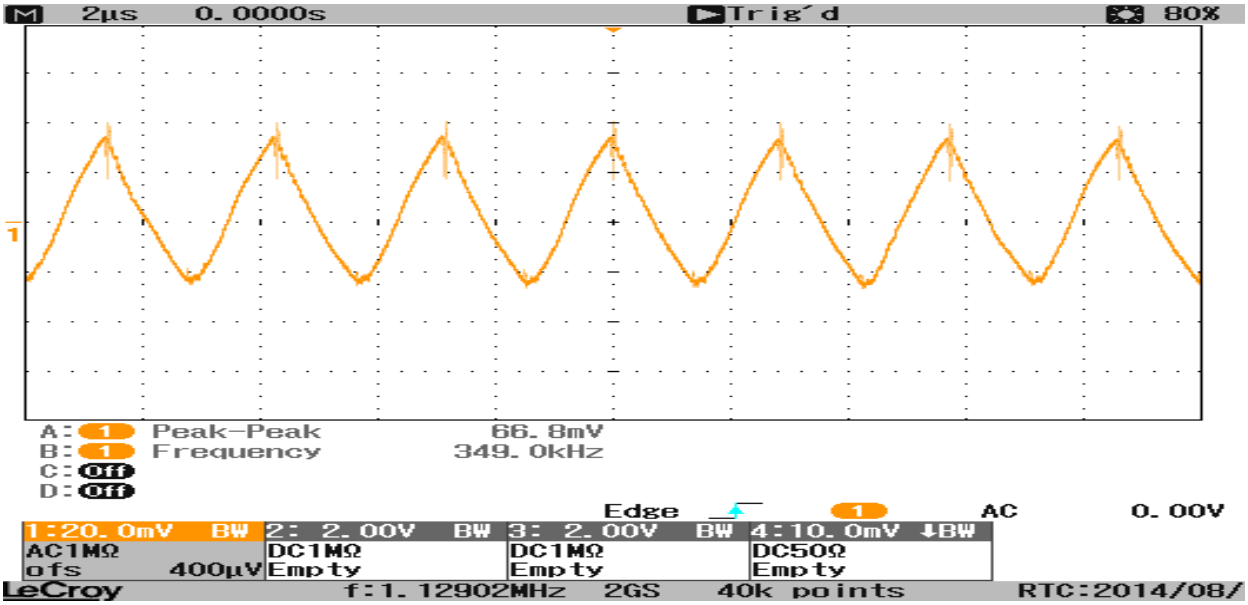


**Figure 19. -5V AC Output Ripple at Full Load**

Test condition: The input voltage was set at 24V, and all four outputs were set at full load.
Ch2 – 15VN (-15V) (AC coupled)

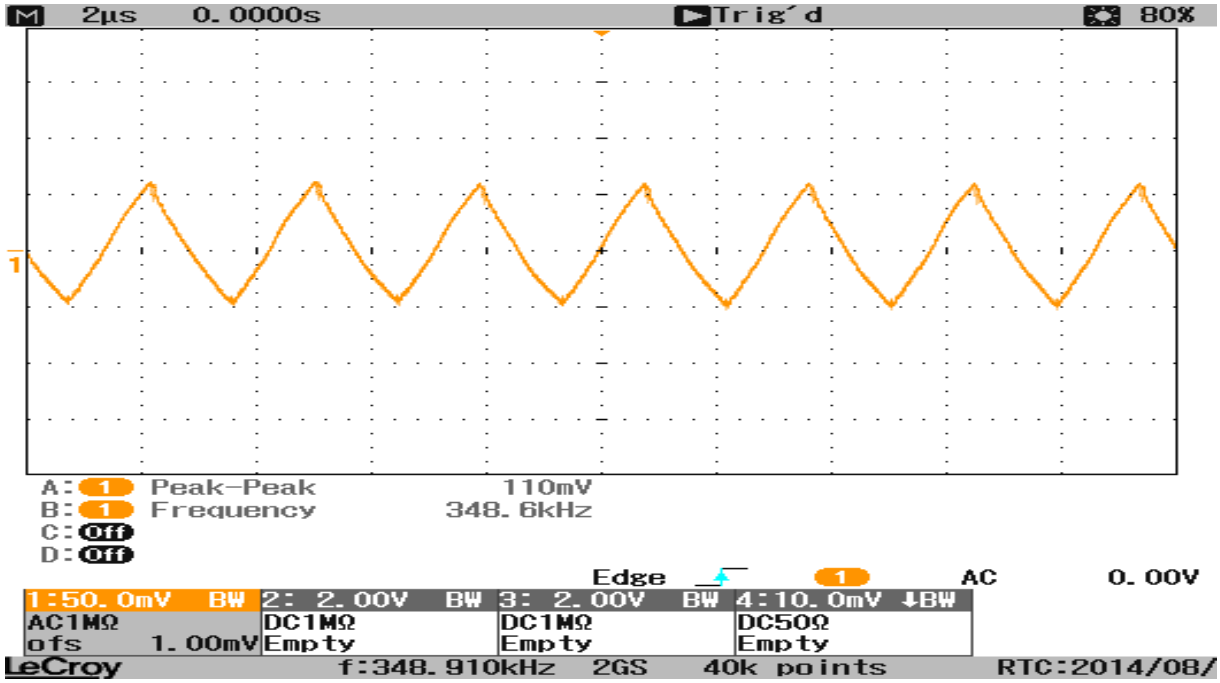


**Figure 20. -15V AC Output Ripple at Full Load**

Test condition: The input voltage was set at 24V, and all four outputs were set at full load.
Ch2 – 15VP (+15V) (AC coupled)

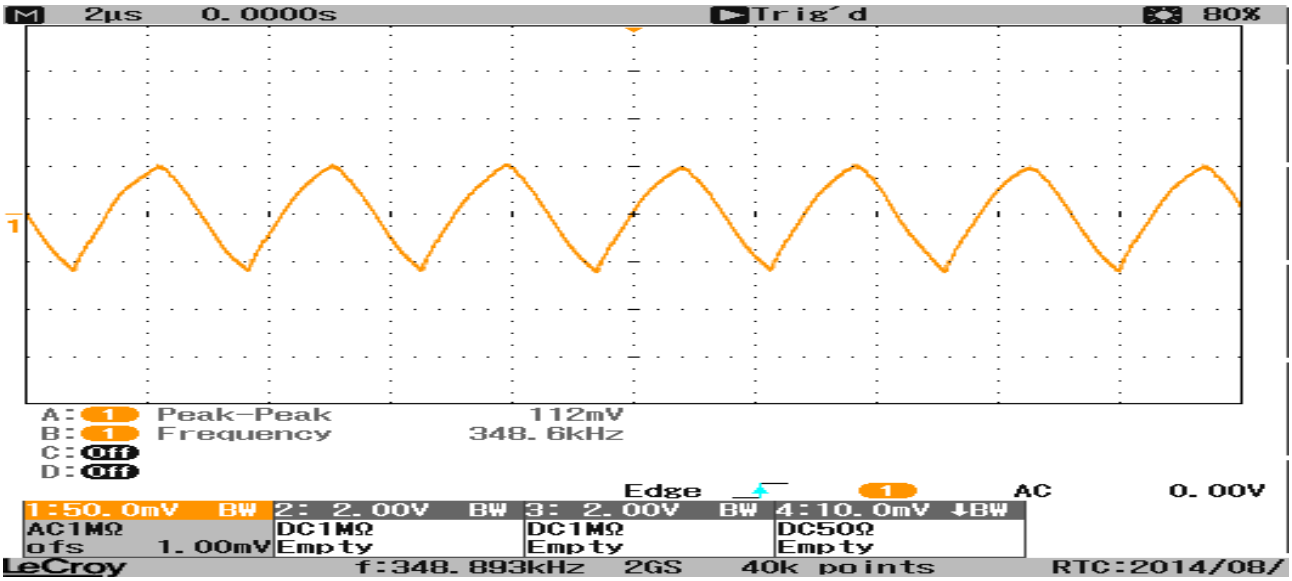


**Figure 21. +15V AC Output Ripple at Full Load**

# Appendix – Test Data

Vin=20V

| Vin | Iin | 15VP | Io15vp | 5VP | Io5vp | 15VN | Io15vn | 5VN | Io5vn | Efficiency |
|---|---|---|---|---|---|---|---|---|---|---|
| 20.02 | 19.70 | 15.21 | 0.11 | 4.98 | 0.02 | -15.22 | 0.10 | -4.99 | 0.04 | 0.89% |
| 20.05 | 30.14 | 15.11 | 4.98 | 4.94 | 5.07 | -15.12 | 5.07 | -4.95 | 5.05 | 33.43% |
| 20.07 | 41.04 | 15.03 | 9.94 | 4.91 | 10.63 | -15.04 | 10.22 | -4.92 | 10.05 | 49.13% |
| 20.03 | 62.84 | 14.86 | 20.01 | 4.85 | 19.73 | -14.88 | 20.03 | -4.86 | 20.07 | 62.66% |
| 20.05 | 85.67 | 14.68 | 29.75 | 4.80 | 30.35 | -14.70 | 29.99 | -4.80 | 30.00 | 67.96% |
| 19.92 | 109.67 | 14.48 | 40.05 | 4.73 | 40.43 | -14.50 | 40.08 | -4.74 | 40.04 | 70.59% |
| 20.05 | 131.87 | 14.31 | 50.05 | 4.67 | 49.65 | -14.33 | 49.94 | -4.68 | 50.05 | 71.77% |

Vin=24V

| Vin | Iin | 15VP | Io15vp | 5VP | Io5vp | 15VN | Io15vn | 5VN | Io5vn | Efficiency |
|---|---|---|---|---|---|---|---|---|---|---|
| 24.04 | 17.76 | 15.37 | 0.11 | 5.04 | 0.02 | -15.38 | 0.11 | -5.04 | 0.04 | 0.86% |
| 24.01 | 26.60 | 15.28 | 5.01 | 5.00 | 5.05 | -15.29 | 5.07 | -5.00 | 5.05 | 32.05% |
| 23.98 | 35.77 | 15.22 | 9.98 | 4.97 | 10.70 | -15.23 | 10.22 | -4.98 | 10.53 | 48.17% |
| 23.94 | 54.15 | 15.11 | 20.11 | 4.94 | 19.85 | -15.12 | 20.03 | -4.94 | 20.07 | 62.02% |
| 23.96 | 73.18 | 15.00 | 29.98 | 4.90 | 30.17 | -15.02 | 29.99 | -4.91 | 30.00 | 68.16% |
| 23.99 | 93.30 | 14.89 | 40.52 | 4.86 | 40.80 | -14.91 | 40.08 | -4.87 | 40.04 | 71.23% |
| 24.02 | 112.30 | 14.76 | 50.69 | 4.82 | 49.73 | -14.78 | 49.78 | -4.83 | 50.09 | 72.90% |

Vin=32V

| Vin | Iin | 15VP | Io15vp | 5VP | Io5vp | 15VN | Io15vn | 5VN | Io5vn | Efficiency |
|---|---|---|---|---|---|---|---|---|---|---|
| 32.04 | 15.48 | 15.63 | 0.11 | 5.12 | 0.02 | -15.64 | 0.11 | -5.13 | 0.04 | 0.77% |
| 32.05 | 21.97 | 15.49 | 5.02 | 5.07 | 5.03 | -15.50 | 5.08 | -5.08 | 5.04 | 29.49% |
| 32.01 | 28.96 | 15.43 | 10.19 | 5.05 | 10.69 | -15.44 | 10.22 | -5.05 | 10.04 | 45.28% |
| 32.00 | 42.76 | 15.35 | 20.19 | 5.02 | 19.29 | -15.37 | 20.04 | -5.02 | 20.08 | 59.60% |
| 31.97 | 57.25 | 15.28 | 30.09 | 4.99 | 29.87 | -15.30 | 29.99 | -5.00 | 30.02 | 66.53% |
| 31.98 | 72.65 | 15.22 | 40.72 | 4.97 | 40.51 | -15.24 | 40.09 | -4.98 | 40.07 | 70.22% |
| 32.08 | 87.62 | 15.16 | 51.02 | 4.95 | 49.59 | -15.18 | 49.98 | -4.96 | 50.11 | 72.10% |

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265