

FEATURES

Low cost**Meet's Specification for AVNET Mini Module Plus for Xilinx 7 series Kintex FPGA****Hard wired turn on sequence****High Efficiency (>93% at full load)****12 V input +/-10%****Eight regulated outputs (4 dual output ADP1850 devices)****3.3 V @ 8 A output, 2% tolerance (<5% required)****2.5 V @ 8 A output, 2% tolerance (<5% required)****2.0 V @ 2 A output, 2% tolerance (<3% required)****1.8 V @ 6 A output, 2% tolerance (<5% required)****1.5 V/1.35 V @ 4 A jumper selectable output, 2% (<5% required)****1.2 V @ 4 A output, 2% tolerance (<2.5% required)****1.0 V @ 6 A output, 2% tolerance (<3% required)****Second 1.0 V @ 6 A output, 2% tolerance (<3% required)**

DESCRIPTION

The Analog Devices Power Module provides a proven robust design for powering Xilinx 7 series devices. Designed to meet the tolerance and sequencing guidelines set forth by Xilinx, the Analog Devices Power Module provides a highly optimized controller based design utilizing the ADP1850 dual output synchronous buck controller. This design uses four dual channel ADP1850 controllers to achieve 8 independent outputs. It utilizes an innovative clocking scheme deriving the clock signal from the switchnodes of the first rails to power up. This reduces channel interaction and beat frequencies that would be present without synchronization and eliminates a costly external clock source. It meets recommended start up sequencing for Xilinx 7 series devices: Vccint -> Vccaux -> Vccaux_io -> Vcco

Table 1. Measured results

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------------------------------|--------------|--------------------|
| Total Loss (Iout =max all rails) | 6.0 | W |
| Power delived | 84 | W |
| Vout ripple | 10 | mVppk on each rail |

Rev. 2

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Table 2. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 1.35-1.5V | Volts |
| Iout | 4 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 3. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 1.8 V | Volts |
| Iout | 6 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 4. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 2 V | Volts |
| Iout | 2 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 5. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 3.3 V | Volts |
| Iout | 8 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 6. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 1 V | Volts |
| Iout | 6 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 7. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 1 V | Volts |
| Iout | 6 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 8. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 1.2 V | Volts |
| Iout | 4 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 9. Basic Specifications

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-------------|--------------|--------------|
| Vout | 2.5 V | Volts |
| Iout | 8 | Amps |
| Tamb | 55 | degC |
| Vinmin | 10.8 | Volts |
| Vinmax | 13.2 | Volts |

Table 10. Dissipation Estimates

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|-----------------------|--------------|--------------|
| <i>ADP1850(total)</i> | 0.711 | W |
| Highside FETs | 2.06 | W |
| Lowside FETs | 1.78 | W |
| Inductors | 1.37 | W |
| Total | 6.0 | W |

Table 11. Temperature Estimates

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|---------------------|--------------|--------------|
| <i>Ambient Temp</i> | 55 | degC |
| <i>ADP1850</i> | 65 | degC |
| Highside FET | 71 | degC |
| Lowside FET | 71 | degC |
| Inductors | 65 | degC |

Table 12. Operational Estimates

| <i>Spec</i> | <i>Value</i> | <i>Units</i> |
|------------------|--------------|--------------|
| Iin (simulation) | 0.22 | A |
| Irms L1 | 0.346 | A |
| Ipk L1 | 0.8 | A |
| Irms Fet | 0.33 | A |
| Pk Voltage FET | 75 | V |

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REVISION HISTORY

11/18/2011—Revision 0: Initial Version r0 board

1/27/2012—Revision 1: Update Schematic and BOM for r1 board

SCHEMATIC

Figure 1. Schematic page1 1v2@4A, 2v5@8A

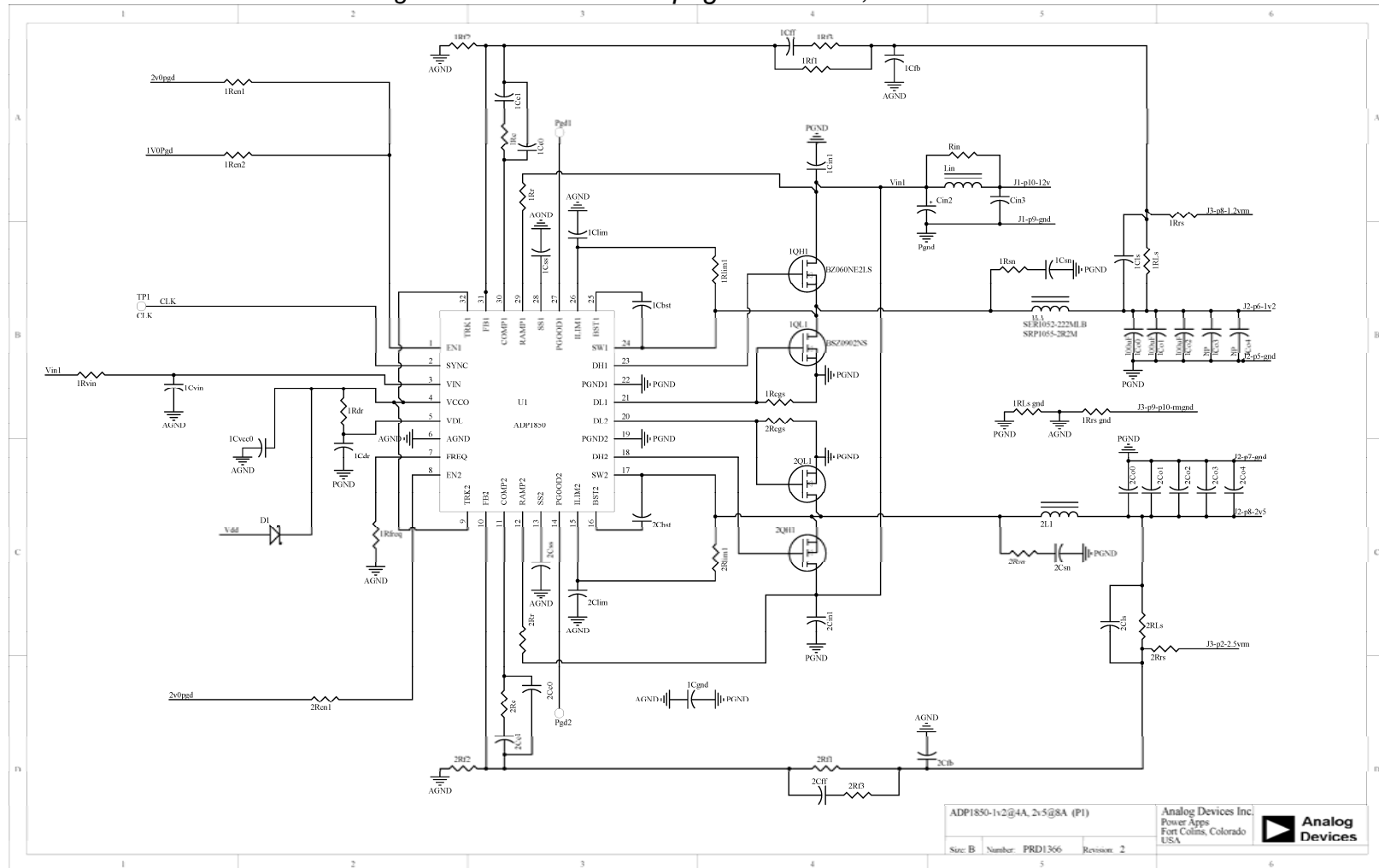


Figure 2. Schematic page2 1v8@6A, 1v5@4A

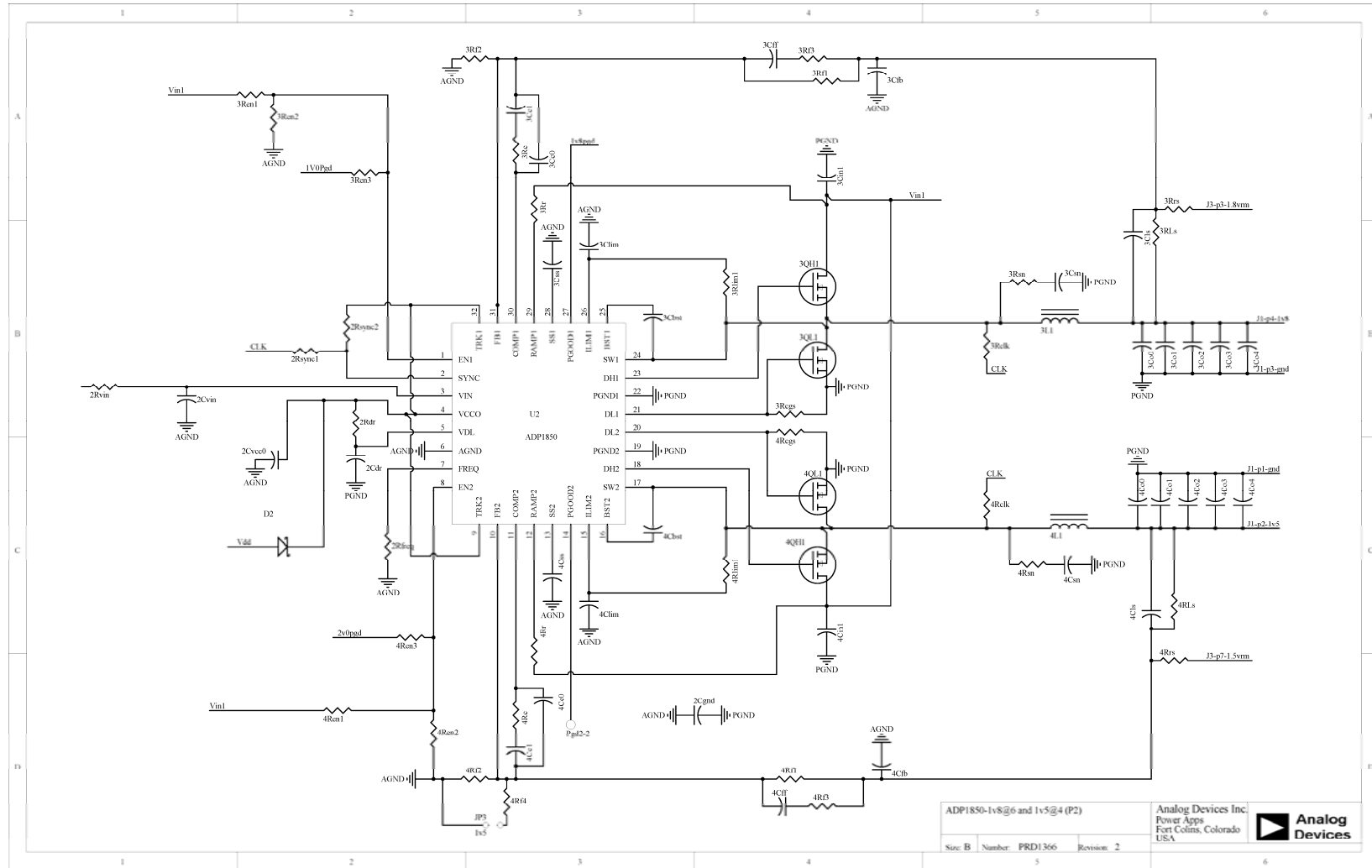


Figure 3. Schematic page3 1v0@6A, 1v0@6A

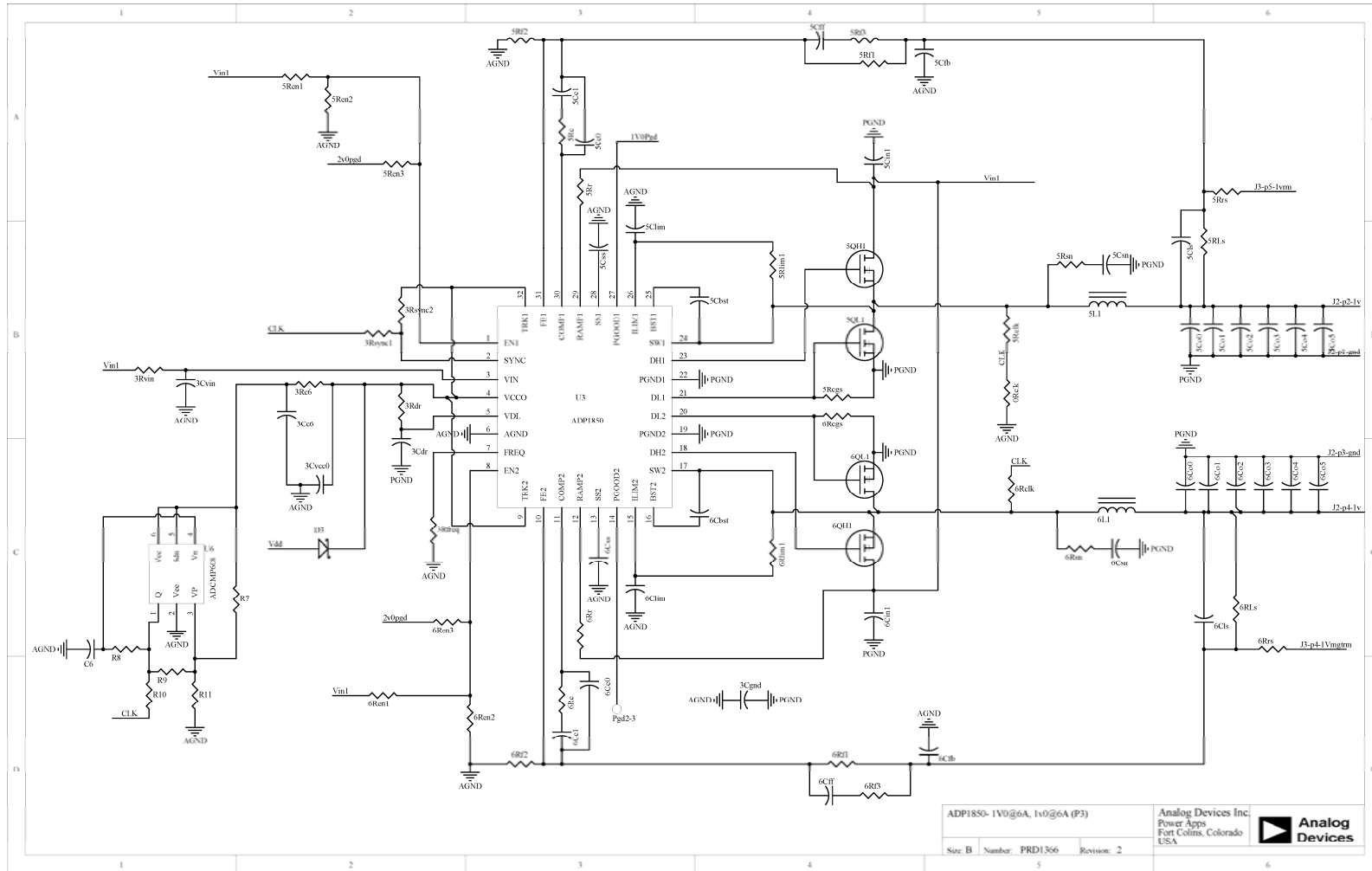
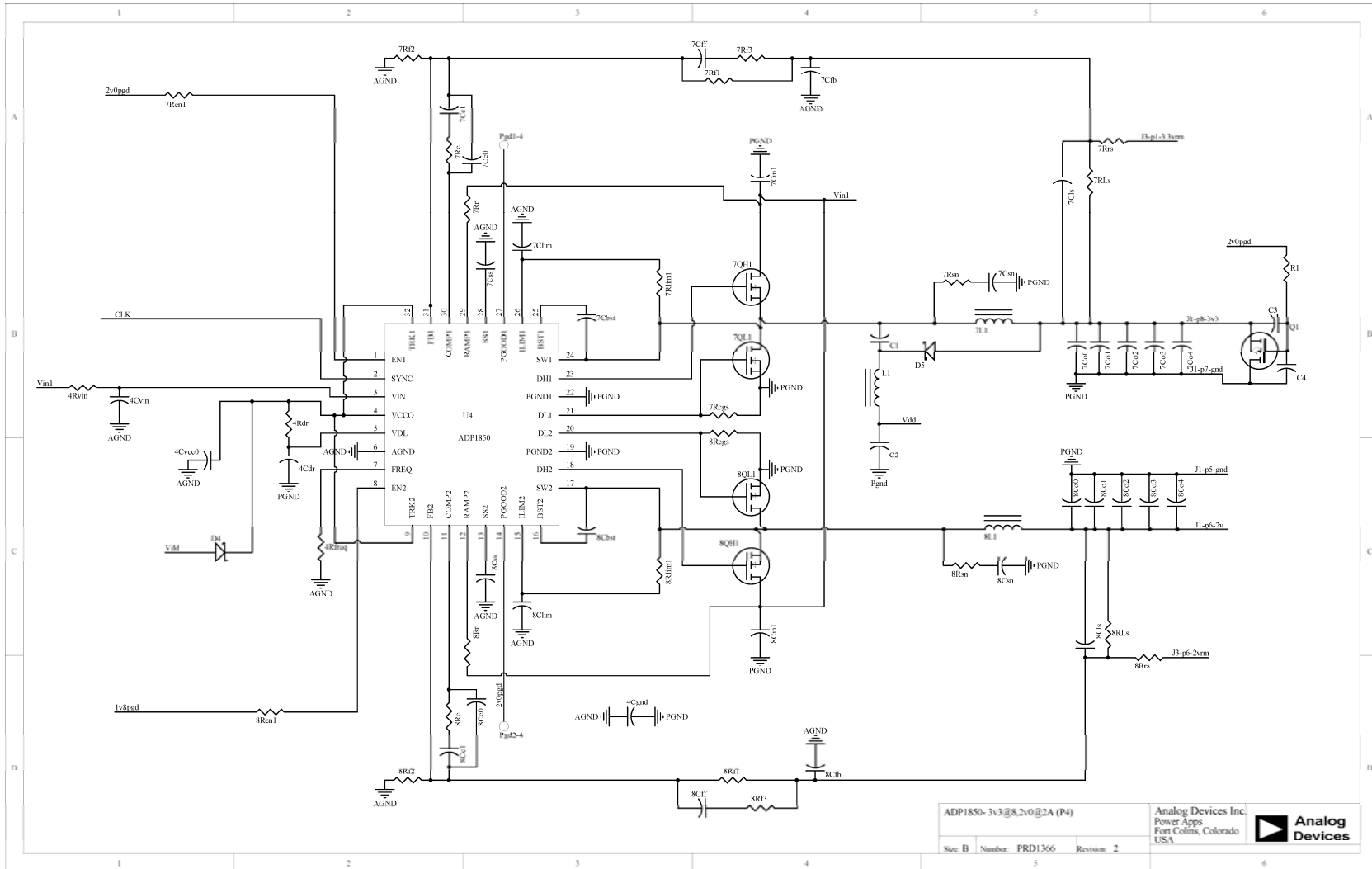


Figure 4. Schematic page4 3v3@8A, 2v0@2A



BILL OF MATERIALS

Table 13. Bill of Materials

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|-------------|-----------|-----------------|------------------|----------|-----|----------------------------|-------------|
| U1 | ADI | ADP1850ACPZ | Controller | LFCSP32 | 1 | 26.0 | 1.0 |
| 1L1 | Coilcraft | SER1052-222MLB | 2.2uH,6mΩ | 12 x 11 | 1 | 117.0 | 5.2 |
| | Bourns | SRP1055-2R2M | 2.2uH,5.8mΩ | 11.3x9.4 | | | |
| 1QH1 | Infineon | BSZ060NE2LS | 8.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 1QL1 | Infineon | BSZ0902NS | 3.5mΩ, 30V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 1Co0...1Co2 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 3 | 24.0 | 2.0 |
| 1Co3...1Co4 | | No Pop | | 1210 | 0 | 0.0 | 0.0 |
| 1Cin1 | Murata | GRM31CR61E106K | 10uF, 25V, X5R | 1206 | 1 | 5.1 | 1.6 |
| 1Rr | Vishay | 1% Metal Film | 150KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Rcgs | Vishay | 1% Metal Film | 22.1KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Rlim1 | Vishay | 1% Metal Film | 619Ω | 0402 | 1 | 0.5 | 0.5 |
| 1Rc | Vishay | 1% Metal Film | 40.2KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Rrs | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| 1RLs | Vishay | 1% Metal Film | 100Ω | 0402 | 1 | 0.5 | 0.5 |
| 1Rf3 | Vishay | 1% Metal Film | 750Ω | 0402 | 1 | 0.5 | 0.5 |
| 1Rf1 | Vishay | 0.1% Metal Film | 35.7KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Rf2 | Vishay | 0.1% Metal Film | 35.7KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Ren1 | Vishay | 1% Metal Film | 10.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Ren2 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 1Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 1Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 1Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 1Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| D1 | | No Pop | | SOD323 | 1 | 3.8 | 1.1 |
| 1Clim | Murata | 10% NPO or COG | 22pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 1Css | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 1Cc1 | Murata | 10% NPO or COG | 470pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 1Cc0 | Murata | 10% NPO or COG | 4.7pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 1Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 1Cff | Murata | 10% NPO or COG | 560pF | 0402 | 1 | 0.5 | 0.5 |
| 2L1 | Coilcraft | SER1052-222MLB | 2.2uH,6mΩ | 12 x 11 | 1 | 117.0 | 5.2 |
| | Bourns | SRP1055-2R2M | 2.2uH,5.8mΩ | 11.3x9.4 | | | |
| 2QH1 | Infineon | BSZ060NE2LS | 8.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 2QL1 | Infineon | BSZ018NE2LS | 2.4mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 2Co0...2Co2 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 3 | 24.0 | 2.0 |
| 2Co3...2Co4 | | No Pop | | 1210 | 0 | 0.0 | 0.0 |
| 2Cin1 | Murata | GRM32ER61C226K | 22uF, 16V, X5R | 1210 | 1 | 8.0 | 2.0 |
| 2Rr | Vishay | 1% Metal Film | 120KΩ | 0805 | 1 | 3.1 | 0.5 |
| 2Rcgs | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 2Rlim1 | Vishay | 1% Metal Film | 806Ω | 0402 | 1 | 0.5 | 0.5 |
| 2Rc | Vishay | 1% Metal Film | 133KΩ | 0402 | 1 | 0.5 | 0.5 |
| 2Rrs | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| 2RLs | Vishay | 1% Metal Film | 100Ω | 0402 | 1 | 0.5 | 0.5 |
| 2Rf3 | Vishay | 1% Metal Film | 1.91kΩ | 0402 | 1 | 0.5 | 0.5 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|-------------|-----------|------------------|------------------|----------|-----|-------------------------|----------|
| 2Rf1 | Vishay | 1% Metal Film | 93.1KΩ | 0402 | 1 | 0.5 | 0.5 |
| 2Rf2 | Vishay | 1% Metal Film | 29.4KΩ | 0402 | 1 | 0.5 | 0.5 |
| 2Ren1 | Vishay | 1% Metal Film | 10.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 2Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 2Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 2Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 2Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 2Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 2Ccss | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 2Cc1 | Murata | 10% NPO or COG | 150pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 2Cc0 | Murata | 10% NPO or COG | 3.3pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 2Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 2Cff | Murata | 10% NPO or COG | 220pF | 0402 | 1 | 0.5 | 0.5 |
| 1Cvin | Murata | X5R or X7R | 1uF, 25v | 0603 | 1 | 3.1 | 0.5 |
| 1Cvcc0 | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 1Cgnd | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 1Rdr | Vishay | 1% Metal Film | 10Ω | 0805 | 1 | 3.1 | 0.5 |
| 1Cdr | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 1Rfreq | Vishay | 1% Metal Film | 165KΩ | 0402 | 1 | 0.5 | 0.5 |
| 1Rvin | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| 1Rrsgnd | Vishay | Zero Ohm Jumper | 0Ω | 0402 | 1 | 0.5 | 0.5 |
| 1RLsgnd | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| Cin2 | Nichicon | PCV1D271MCL1GS | 270uF, 20V, Poly | 10mm | 1 | 100.0 | 10.0 |
| Lin | Cooper | FP1007R1-R30-R | 300nH, 0.29mΩ | 8 x 10 | 1 | 83.2 | 7.0 |
| Cin3 | Taiyo | EMK212 BJ106KG-T | 10uF, 16V, X5R | 0805 | 1 | 2.5 | 1.3 |
| Rin | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| U2 | ADI | ADP1850ACPZ | Controller | LFCSP32 | 1 | 26.0 | 1.0 |
| 3L1 | Coilcraft | SER1052-222MLB | 2.2uH, 6mΩ | 12 x 11 | 1 | 117.0 | 5.2 |
| | Bourns | SRP1055-2R2M | 2.2uH, 5.8mΩ | 11.3x9.4 | | | |
| 3QH1 | Infineon | BSZ060NE2LS | 8.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 3QL1 | Infineon | BSZ0902NS | 3.5mΩ, 30V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 3Co0...3Co2 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 3 | 24.0 | 2.0 |
| 3Co3...3Co4 | | No Pop | | 1210 | 0 | 0.0 | 0.0 |
| 3Cin1 | Murata | GRM32DR71C106K | 10uF, 16V, X7R | 1210 | 1 | 8.0 | 2.0 |
| 3Rr | Vishay | 1% Metal Film | 100KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rcgs | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Rlim1 | Vishay | 1% Metal Film | 866Ω | 0402 | 1 | 0.5 | 0.5 |
| 3Rc | Vishay | 1% Metal Film | 191KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rrs | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| 3RLs | Vishay | 1% Metal Film | 100Ω | 0402 | 1 | 0.5 | 0.5 |
| 3Rf3 | Vishay | 1% Metal Film | 1.82KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rf1 | Vishay | 1% Metal Film | 46.4KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rf2 | Vishay | 1% Metal Film | 23.2KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Ren1 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Ren2 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Ren3 | Vishay | 1% Metal Film | 10.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rclk | | No Pop | | 0402 | 0 | 0.0 | 0.0 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|-------------------|---------------------|--------------------------------|--------------------------|---------------------|-----|-------------------------|----------|
| 3Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 3Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| D2 | | No Pop | | SOD323 | 1 | 3.8 | 1.1 |
| 3Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 3Ccss | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 3Cc1 | Murata | 10% NPO or COG | 270pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 3Cc0 | Murata | 10% NPO or COG | 3.3pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 3Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 3Cff | Murata | 10% NPO or COG | 150pF | 0402 | 1 | 0.5 | 0.5 |
| 4L1 | Coilcraft Bourns | SER1052-222MLB SRP1055-2R2M | 2.2uH,6mΩ 2.2uH,5.8mΩ | 12 x 11 11.3x9.4 | 1 | 117.0 | 5.2 |
| 4QH1 | Infineon | BSZ060NE2LS | 8.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 4QL1 | Infineon | BSZ036NE2LS | 5.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 4Co0..4Co1 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 2 | 16.0 | 2.0 |
| 4Co2..4Co4 | | No Pop | | 1210 | 0 | 0.0 | 2.0 |
| 4Cin1 | Murata | GRM31CR71C106K | 10uF, 16V, X7R | 1206 | 1 | 5.1 | 1.6 |
| 4Rr | Vishay | 1% Metal Film | 66.5KΩ | 0805 | 1 | 3.1 | 0.5 |
| 4Rcgs | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Rlim1 | Vishay | 1% Metal Film | 909Ω | 0402 | 1 | 0.5 | 0.5 |
| 4Rc | Vishay | 1% Metal Film | 110KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Rrs | Vishay | 5% Metal Film | 1.0Ω | 0402 | 1 | 0.5 | 0.5 |
| 4RLs | Vishay | 1% Metal Film | 100Ω | 0402 | 1 | 0.5 | 0.5 |
| 4Rf3 | Vishay | 1% Metal Film | 806Ω | 0402 | 1 | 0.5 | 0.5 |
| 4Rf1 | Vishay | 1% Metal Film | 35.7KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Rf2 | Vishay | 1% Metal Film | 28.7KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Rf4 | Vishay | 1% Metal Film | 140KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Ren1 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Ren2 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Ren3 | Vishay | 1% Metal Film | 10.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Rclk | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 4Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 4Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 4Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 4Ccss | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 4Cc1 | Murata | 10% NPO or COG | 180pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 4Cc0 | Murata | 10% NPO or COG | 3.9pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 4Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 4Cff | Murata | 10% NPO or COG | 270pF | 0402 | 1 | 0.5 | 0.5 |
| 2Cvin | Murata | X5R or X7R | 1uF, 25v | 0603 | 1 | 3.1 | 0.5 |
| 2Cvcc0 | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 2Cgnd | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 2Rdr | Vishay | 1% Metal Film | 10Ω | 0805 | 1 | 3.1 | 0.5 |
| 2Cdr | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|--------------------|-----------|-----------------|---------------------|----------|-----|-------------------------|----------|
| 2Rfreq | Vishay | 1% Metal Film | 165K Ω | 0402 | 1 | 0.5 | 0.5 |
| 2Rvin | Vishay | 1% Metal Film | 1 Ω | 0402 | 1 | 0.5 | 0.5 |
| 2Rsync1 | Vishay | 1% Metal Film | 10.0K Ω | 0402 | 1 | 0.5 | 0.5 |
| 2Rsync2 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| U3 | ADI | ADP1850ACPZ | Controller | LFCSP32 | 1 | 26.0 | 1.0 |
| 5L1 | Coilcraft | SER1052-132MLB | 1.3uH,4m Ω | 12 x 11 | 1 | 117.0 | 5.2 |
| | Bourns | SRP1055-1R4M | 1.4uH,3.2m Ω | 11.3x9.4 | | | |
| 5QH1 | Infineon | BSZ060NE2LS | 8.1m Ω , 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 5QL1 | Infineon | BSZ0902NS | 3.5m Ω , 30V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 5Co0...5Co5 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 6 | 48.0 | 2.0 |
| 5Cin1 | Murata | GRM32DR71C106K | 10uF, 16V, X7R | 1210 | 1 | 8.0 | 2.0 |
| 5Rr | Vishay | 1% Metal Film | 100K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rcgs | Vishay | 1% Metal Film | 22.1K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rlim1 | Vishay | 1% Metal Film | 866 Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rc | Vishay | 1% Metal Film | 42.2K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rrs | Vishay | 5% Metal Film | 1.0 Ω | 0402 | 1 | 0.5 | 0.5 |
| 5RLs | Vishay | 1% Metal Film | 100 Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rf3 | Vishay | 1% Metal Film | 511 Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rf1 | Vishay | 0.1% Metal Film | 16.2K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rf2 | Vishay | 0.1% Metal Film | 24.3K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Ren1 | Vishay | 1% Metal Film | 154K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Ren2 | Vishay | 1% Metal Film | 10.0K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Ren3 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 5Rclk | Vishay | 1% Metal Film | 2.0K Ω | 0402 | 1 | 0.5 | 0.5 |
| 0Rclk | Vishay | 1% Metal Film | 5.11K Ω | 0402 | 1 | 0.5 | 0.5 |
| 5Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 5Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 5Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 5Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| D3 | | No Pop | | SOD323 | 1 | 3.8 | 1.1 |
| 5Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 5Css | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 5Cc1 | Murata | 10% NPO or COG | 680pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 5Cc0 | Murata | 10% NPO or COG | 10pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 5Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 5Cff | Murata | 10% NPO or COG | 1.0nF | 0402 | 1 | 0.5 | 0.5 |
| 6L1 | Coilcraft | SER1052-132MLB | 1.3uH,4m Ω | 12 x 11 | 1 | 117.0 | 5.2 |
| | Bourns | SRP1055-1R4M | 1.4uH,3.2m Ω | 11.3x9.4 | | | |
| 6QH1 | Infineon | BSZ060NE2LS | 8.1m Ω , 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 6QL1 | Infineon | BSZ0902NS | 3.5m Ω , 30V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 6Co0...6Co5 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 6 | 48.0 | 2.0 |
| 6Cin1 | Murata | GRM32DR71C106K | 10uF, 16V, X7R | 1210 | 1 | 8.0 | 2.0 |
| 6Rr | Vishay | 1% Metal Film | 100K Ω | 0805 | 1 | 3.1 | 0.5 |
| 6Rcgs | Vishay | 1% Metal Film | 22.1K Ω | 0402 | 1 | 0.5 | 0.5 |
| 6Rlim1 | Vishay | 1% Metal Film | 866 Ω | 0402 | 1 | 0.5 | 0.5 |
| 6Rc | Vishay | 1% Metal Film | 42.2K Ω | 0402 | 1 | 0.5 | 0.5 |
| 6Rrs | Vishay | 5% Metal Film | 1.0 Ω | 0402 | 1 | 0.5 | 0.5 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|-------------|---------------------|---------------------------------|------------------------------|----------------------|-----|-------------------------|----------|
| 6RLs | Vishay | 1% Metal Film | 100Ω | 0402 | 1 | 0.5 | 0.5 |
| 6Rf3 | Vishay | 1% Metal Film | 511Ω | 0402 | 1 | 0.5 | 0.5 |
| 6Rf1 | Vishay | 0.1% Metal Film | 16.2KΩ | 0402 | 1 | 0.5 | 0.5 |
| 6Rf2 | Vishay | 0.1% Metal Film | 24.3KΩ | 0402 | 1 | 0.5 | 0.5 |
| 6Ren1 | Vishay | 1% Metal Film | 154KΩ | 0402 | 1 | 0.5 | 0.5 |
| 6Ren2 | Vishay | 1% Metal Film | 10.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 6Ren3 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 6Relk | Vishay | 1% Metal Film | 2.0KΩ | 0402 | 1 | 0.5 | 0.5 |
| 6Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 6Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 6Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 6Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 6Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 6Css | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 6Cc1 | Murata | 10% NPO or COG | 680pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 6Cc0 | Murata | 10% NPO or COG | 10pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 6Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 6Cff | Murata | 10% NPO or COG | 1.0nF | 0402 | 1 | 0.5 | 0.5 |
| 3Cvin | Murata | X5R or X7R | 1uF, 25v | 0603 | 1 | 3.1 | 0.5 |
| 3Cvcc0 | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 3Cgnd | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 3Rdr | Vishay | 1% Metal Film | 10Ω | 0805 | 1 | 3.1 | 0.5 |
| 3Cdr | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 3Rfreq | Vishay | 1% Metal Film | 165KΩ | 0402 | 1 | 0.5 | 0.5 |
| 3Rvin | Vishay | 1% Metal Film | 1Ω | 0402 | 1 | 0.5 | 0.5 |
| 3Rsync1 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Rsync2 | Vishay | 1% Metal Film | 1Ω | 0402 | 1 | 0.5 | 0.5 |
| 3Rc6 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 3Cc6 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| R7 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| R8 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| R9 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| R10 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| R11 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| C6 | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| U6 | | No Pop | | SC-70 | 0 | 0.0 | 0.0 |
| U4 | ADI | ADP1850ACPZ | Controller | LFCSP32 | 1 | 26.0 | 1.0 |
| 7L1 | Coilcraft Cooper | SER1360-272KLB HCF1305-3R0-R | 2.7uH, 2.4mΩ 3.0uH, 4.9mΩ | 13 x 13 12.5x12.5 | 1 | 168.0 | 5.8 |
| 7QH1 | Infineon | BSZ060NE2LS | 8.1mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 7QL1 | Infineon | BSZ018NE2LS | 2.4mΩ, 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 7Co0...7Co2 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 3 | 24.0 | 2.0 |
| 7Co3...7Co4 | | No Pop | | 1210 | 0 | 0.0 | 0.0 |
| 7Cin1 | Murata | GRM32DR71C106K | 10uF, 16V, X7R | 1210 | 1 | 8.0 | 2.0 |
| 7Rr | Vishay | 1% Metal Film | 200KΩ | 0402 | 1 | 0.5 | 0.5 |
| 7Rcgs | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 7Rlim1 | Vishay | 1% Metal Film | 787Ω | 0402 | 1 | 0.5 | 0.5 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|-------------------|---------------------|--------------------------------|--|----------------------|-----|-------------------------|----------|
| 7Rc | Vishay | 1% Metal Film | 102K Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Rrs | Vishay | 5% Metal Film | 1.0 Ω | 0402 | 1 | 0.5 | 0.5 |
| 7RLs | Vishay | 1% Metal Film | 100 Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Rf3 | Vishay | 1% Metal Film | 3.01K Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Rf1 | Vishay | 1% Metal Film | 115K Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Rf2 | Vishay | 1% Metal Film | 25.5K Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Ren1 | Vishay | 1% Metal Film | 100K Ω | 0402 | 1 | 0.5 | 0.5 |
| 7Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 7Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 7Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 7Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| D4 | | No Pop | | SOD323 | 1 | 3.8 | 1.1 |
| 7Clim | Murata | 10% NPO or COG | 18pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 7Ccss | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 7Cc1 | Murata | 10% NPO or COG | 270pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 7Cc0 | Murata | 10% NPO or COG | 8.2pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 7Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 7Cff | Murata | 10% NPO or COG | 120pF | 0402 | 1 | 0.5 | 0.5 |
| 8L1 | Coilcraft Cooper | MSS1048-472NLB DR1050-4R7-R | 4.7uH, 12.3m Ω 4.7uH, 11.9m Ω | 11 x 11 10.3x10.5 | 1 | 109.0 | 5.1 |
| 8QH1 | Infineon | BSZ060NE2LS | 8.1m Ω , 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 8QL1 | Infineon | BSZ060NE2LS | 8.1m Ω , 25V | PP8-3x3 | 1 | 11.6 | 1.1 |
| 8Co0 | Murata | GRM32ER60J107M | 100uF, 6.3V, X5R | 1210 | 1 | 8.0 | 2.0 |
| 8Co1..8Co4 | | No Pop | | 1210 | 0 | 0.0 | 2.0 |
| 8Cin1 | Murata | GRM31CR71C475K | 4.7uF, 16V, X7R | 1206 | 1 | 5.1 | 1.6 |
| 8Rr | Vishay | 1% Metal Film | 100K Ω | 0805 | 1 | 3.1 | 0.5 |
| 8Rcgs | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 8Rlim1 | Vishay | 1% Metal Film | 750 Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rc | Vishay | 1% Metal Film | 43.2K Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rrs | Vishay | 5% Metal Film | 1.0 Ω | 0402 | 1 | 0.5 | 0.5 |
| 8RLs | Vishay | 1% Metal Film | 100 Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rf3 | Vishay | 1% Metal Film | 909 Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rf1 | Vishay | 0.1% Metal Film | 38.3K Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rf2 | Vishay | 0.1% Metal Film | 16.5K Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Ren1 | Vishay | 1% Metal Film | 100K Ω | 0402 | 1 | 0.5 | 0.5 |
| 8Rsn | | No Pop | | 0805 | 0 | 0.0 | 0.0 |
| 8Csn | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 8Cls | | No Pop | | 0402 | 0 | 0.0 | 0.0 |
| 8Cbst | Murata | X5R or X7R | 100nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 8Clim | Murata | 10% NPO or COG | 22pF, >20v | 0402 | 1 | 0.5 | 0.5 |
| 8Ccss | Murata | 10% NPO or COG | 56nF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 8Cc1 | Murata | 10% NPO or COG | 390pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 8Cc0 | Murata | 10% NPO or COG | 18pF, >6v | 0402 | 1 | 0.5 | 0.5 |
| 8Cfb | Murata | X5R or X7R | 100nF>6v | 0402 | 1 | 0.5 | 0.5 |
| 8Cff | Murata | 10% NPO or COG | 470pF | 0402 | 1 | 0.5 | 0.5 |
| 4Cvin | Murata | X5R or X7R | 1uF, 25v | 0603 | 1 | 3.1 | 0.5 |
| 4Cvcc0 | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |

| Des | MFG | Part Number | Component Specs | Pkg | Qty | Area (mm ²) | Hgt (mm) |
|---------------|--------|---------------|-----------------|--------|-----|----------------------------|-------------|
| 4Cgnd | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 4Rdr | Vishay | 1% Metal Film | 10Ω | 0805 | 1 | 3.1 | 0.5 |
| 4Cdr | Murata | X5R or X7R | 1uF, 6.3v | 0603 | 1 | 3.1 | 0.5 |
| 4Rfreq | Vishay | 1% Metal Film | 165KΩ | 0402 | 1 | 0.5 | 0.5 |
| 4Rvin | Vishay | 1% Metal Film | 1Ω | 0402 | 1 | 0.5 | 0.5 |
| C1 | | No Pop | | 0603 | 1 | 3.1 | 0.5 |
| C2 | | No Pop | | 0603 | 1 | 3.1 | 0.5 |
| L1 | | No Pop | | 3 x 3 | 1 | 9.0 | 5.1 |
| D5 | | No Pop | | SOD323 | 1 | 3.8 | 1.1 |
| Q1 | | No Pop | | SC70-6 | 1 | 4.6 | 0.8 |
| R1 | | No Pop | | 0402 | 1 | 0.5 | 0.5 |
| C3 | | No Pop | | 0402 | 1 | 0.5 | 0.5 |
| C4 | | No Pop | | 0402 | 1 | 0.5 | 0.5 |

LAYOUT

Figure 5. Top Layer Layout

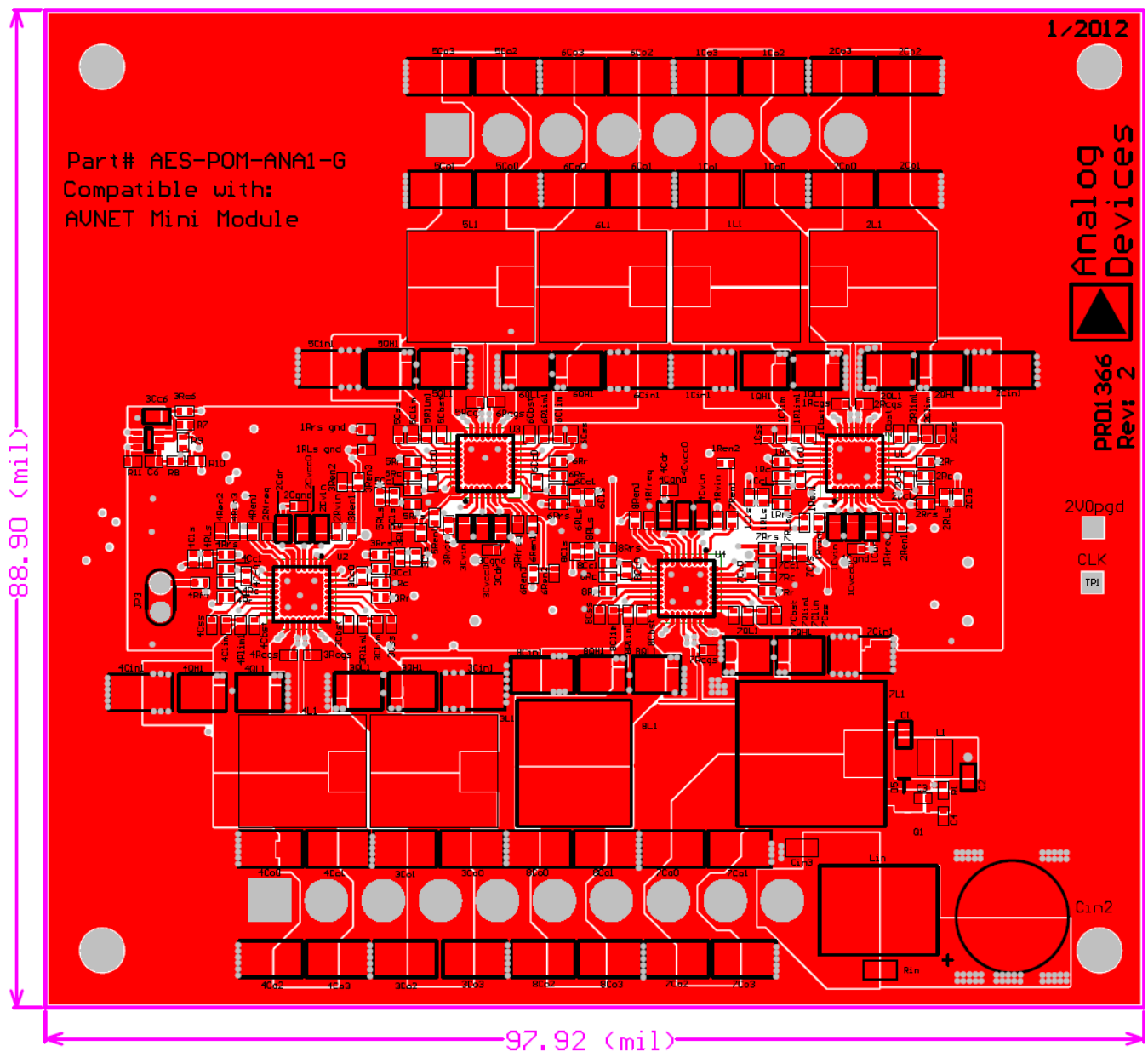
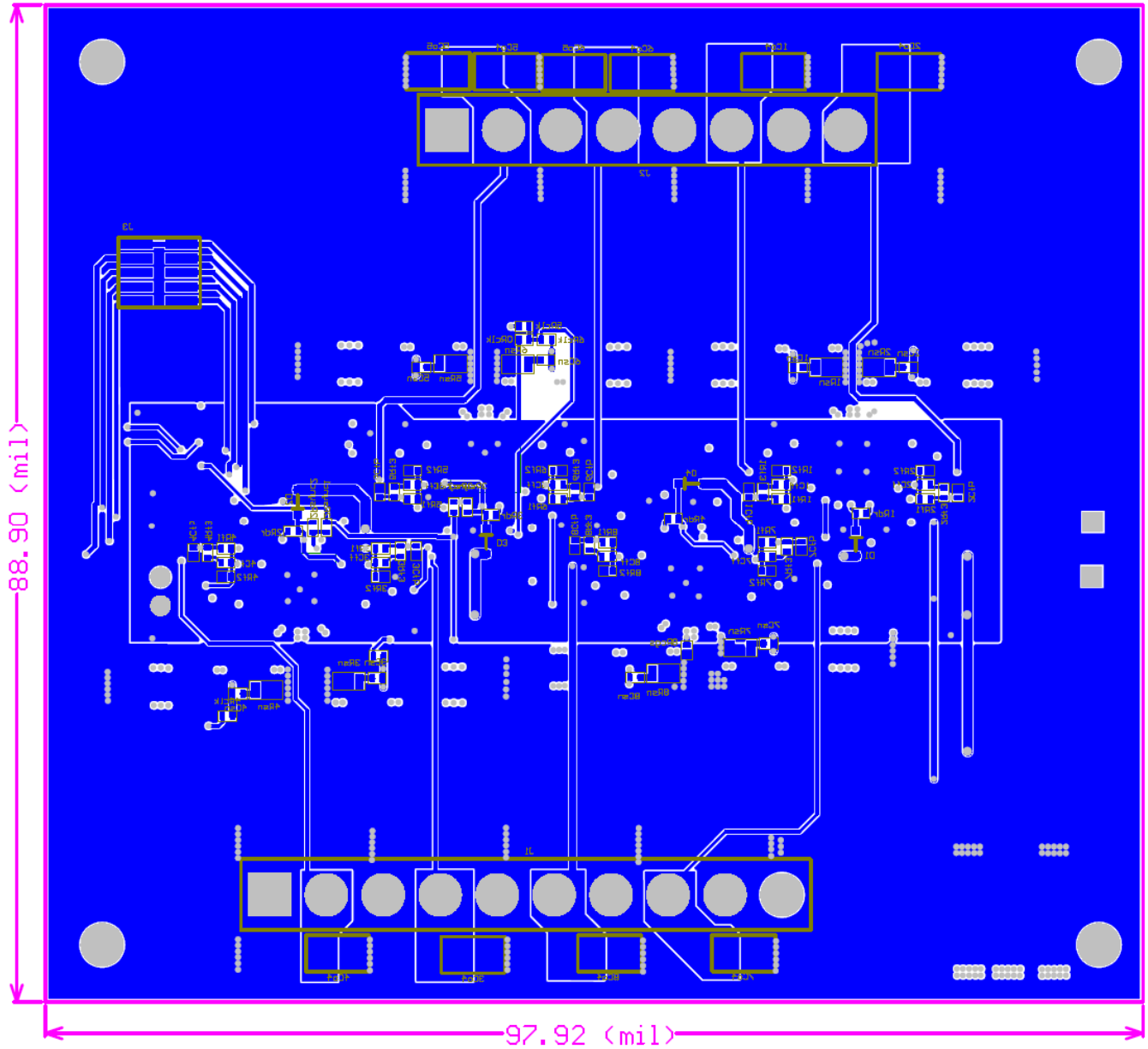


Figure 6. Bottom Layer Layout



MEASUREMENTS

Figure 7. Measured Efficiency over Load

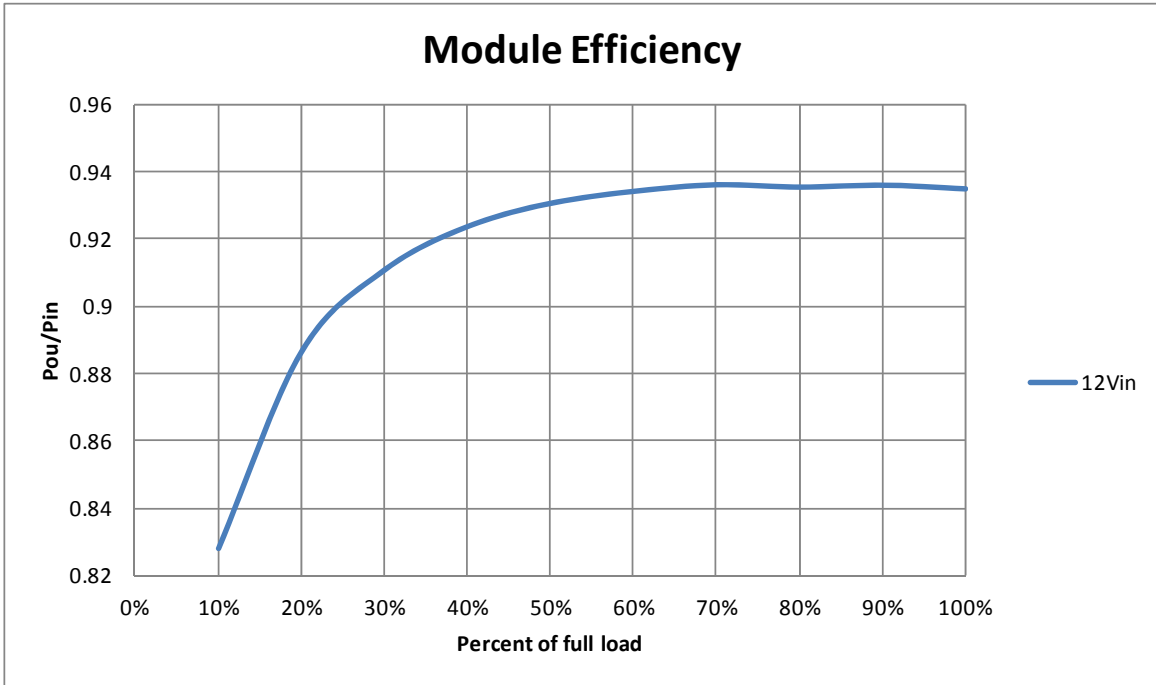


Figure 8. Load Regulation

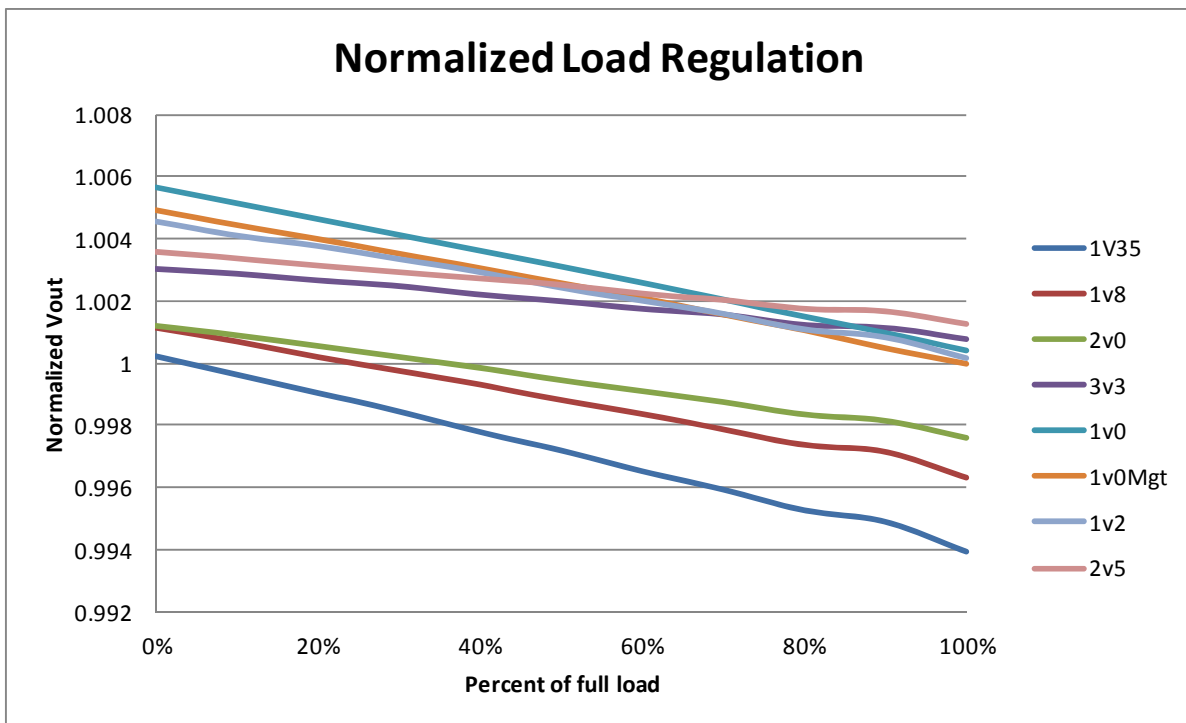
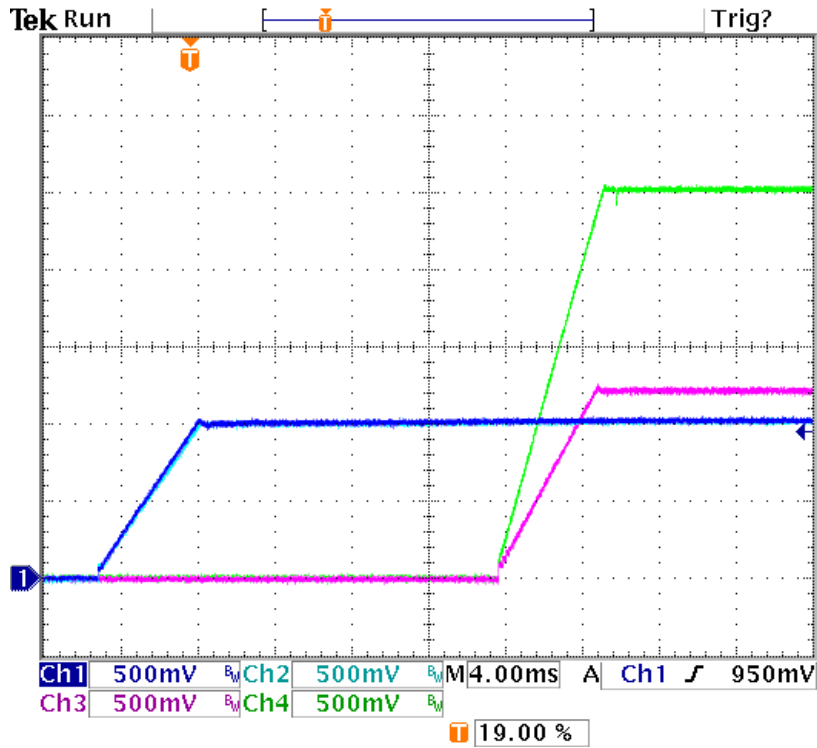
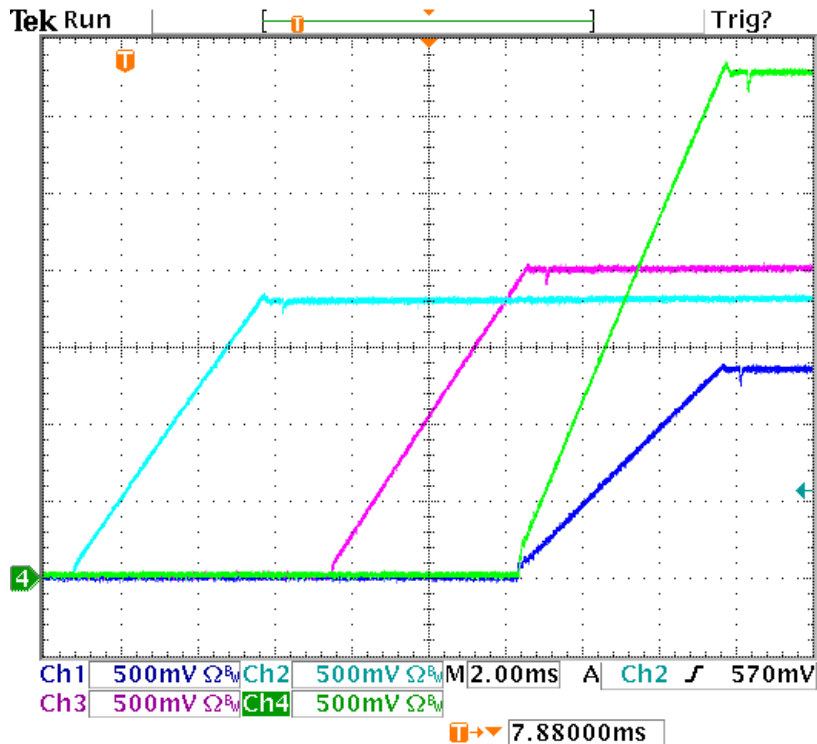


Figure 9. Turn on 50Ohm load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5



15 Nov 2011
10:57:43

Figure 10. Turn on 50Ohm load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



15 Nov 2011
10:10:36

Figure 11. Turn off 50Ohm load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5

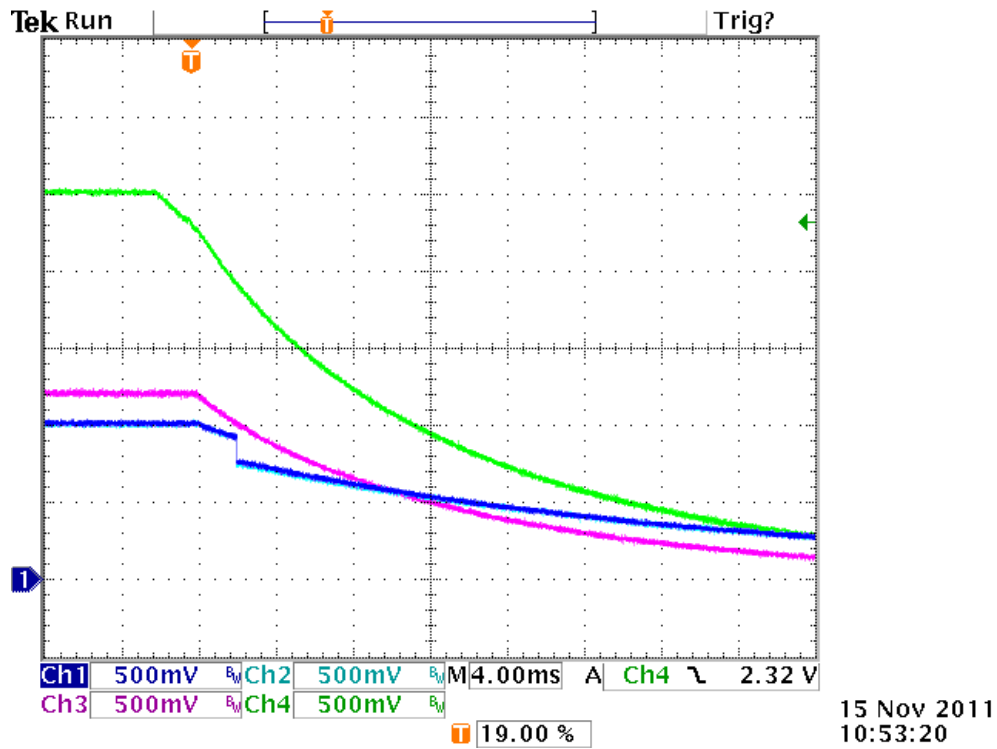


Figure 12. Turn off 50Ohm load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3

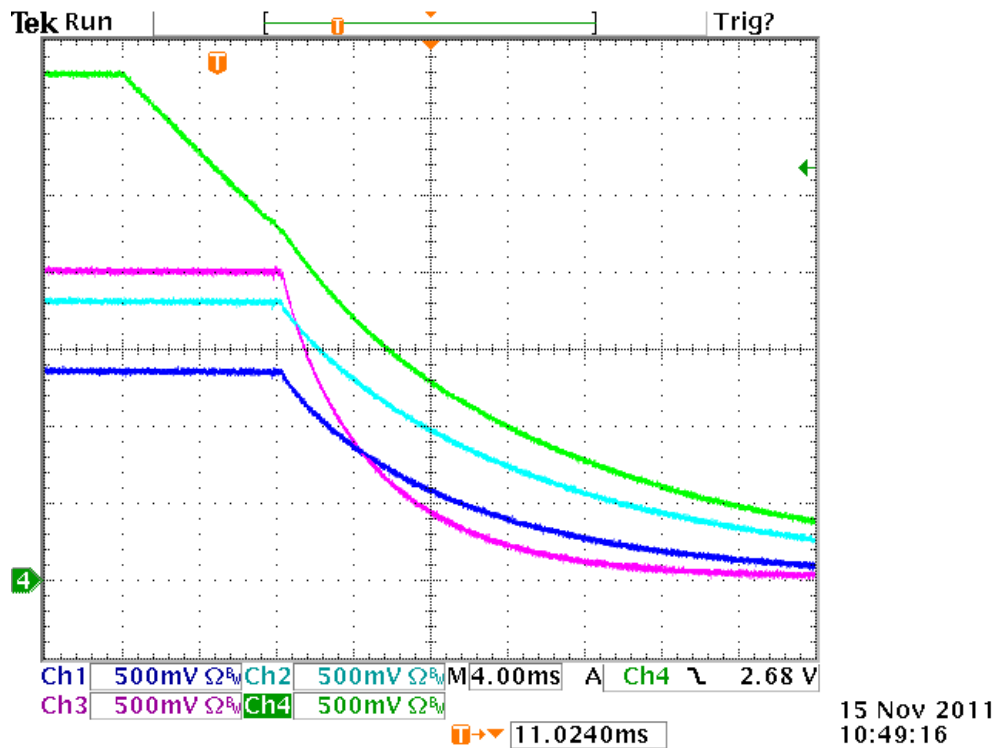
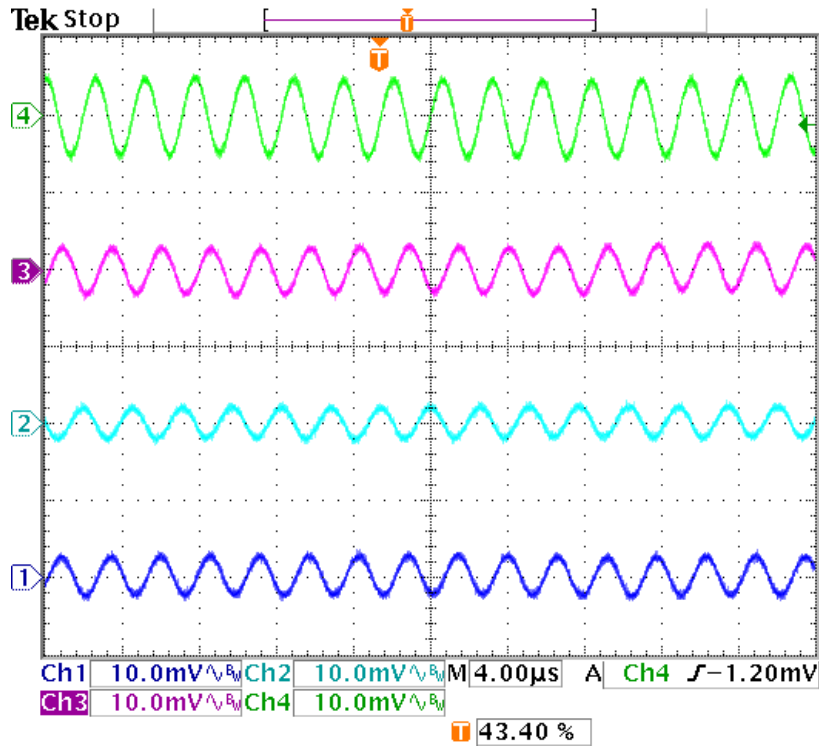
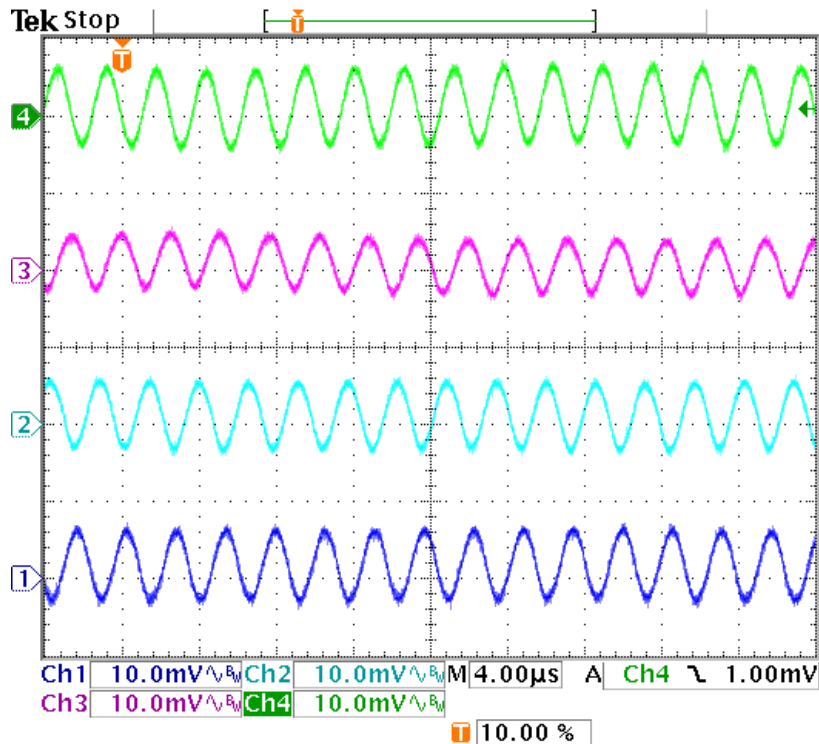


Figure 13. Ripple No load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5



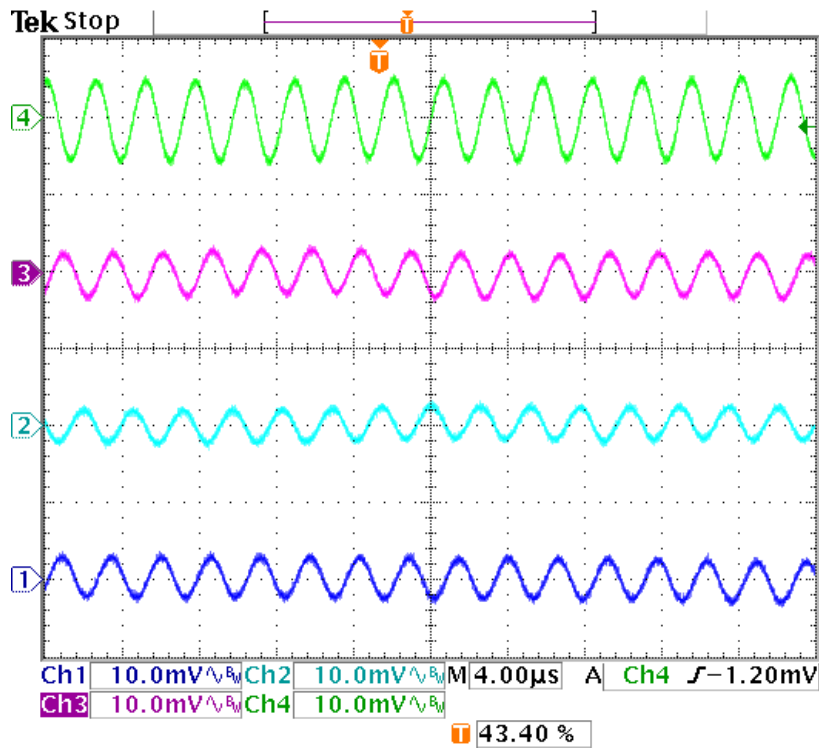
15 Nov 2011
11:34:45

Figure 14. Ripple No load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



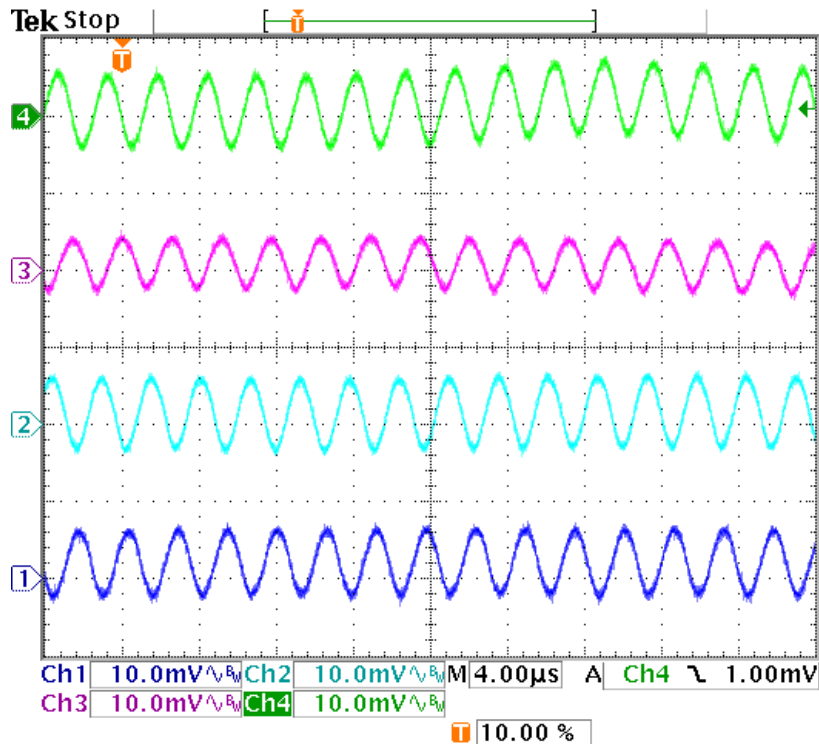
15 Nov 2011
11:28:35

Figure 15. Ripple half load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5



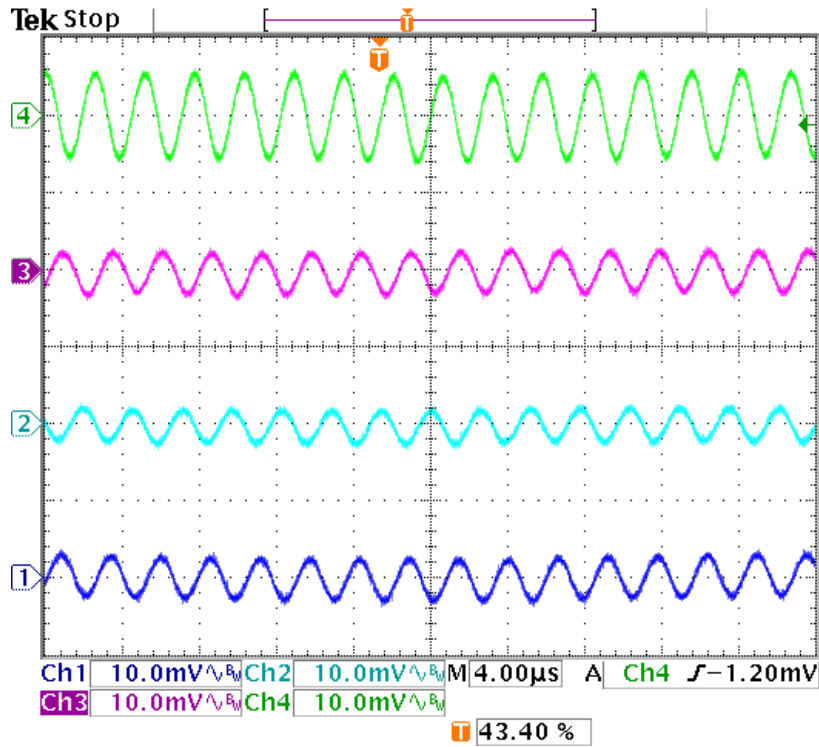
15 Nov 2011
11:37:06

Figure 16. Ripple half load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



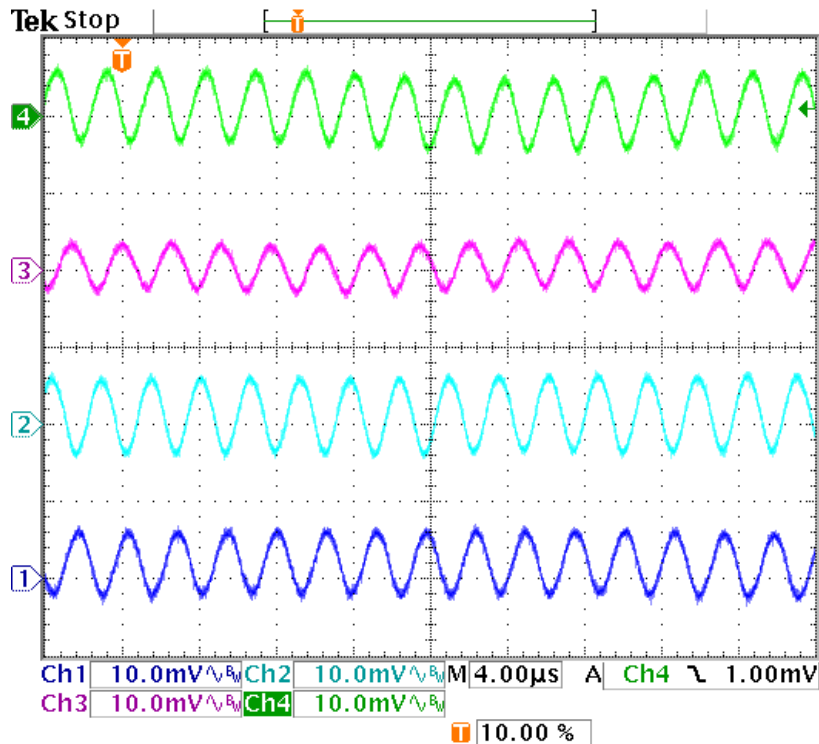
15 Nov 2011
11:30:52

Figure 17. Ripple full load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5



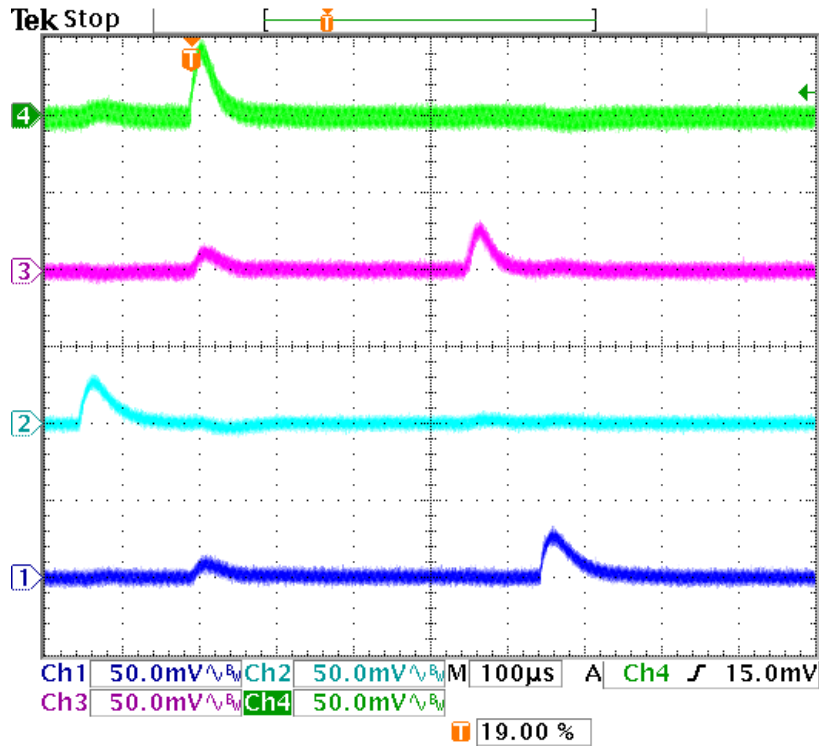
15 Nov 2011
11:38:34

Figure 18. Ripple full load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



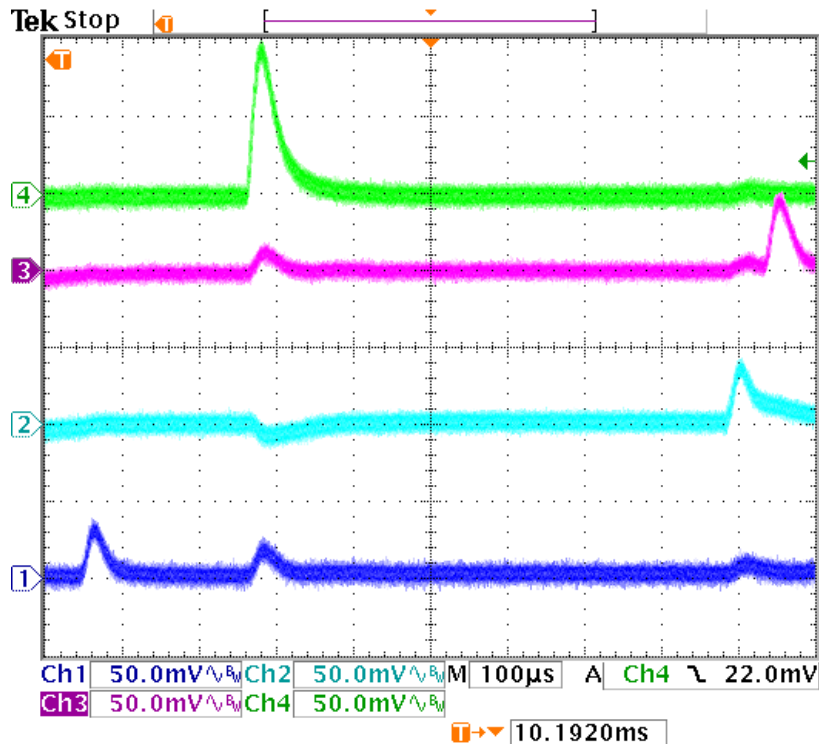
15 Nov 2011
11:32:21

Figure 19. Load release 100% to 50% load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5



15 Nov 2011
11:26:00

Figure 20. Load release 100% to 50% load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



15 Nov 2011
11:19:47

Figure 21. Load step 50% to 100% load: Ch1=1V0, Ch2=1V0Mgt, Ch3=1V2, Ch4=2V5

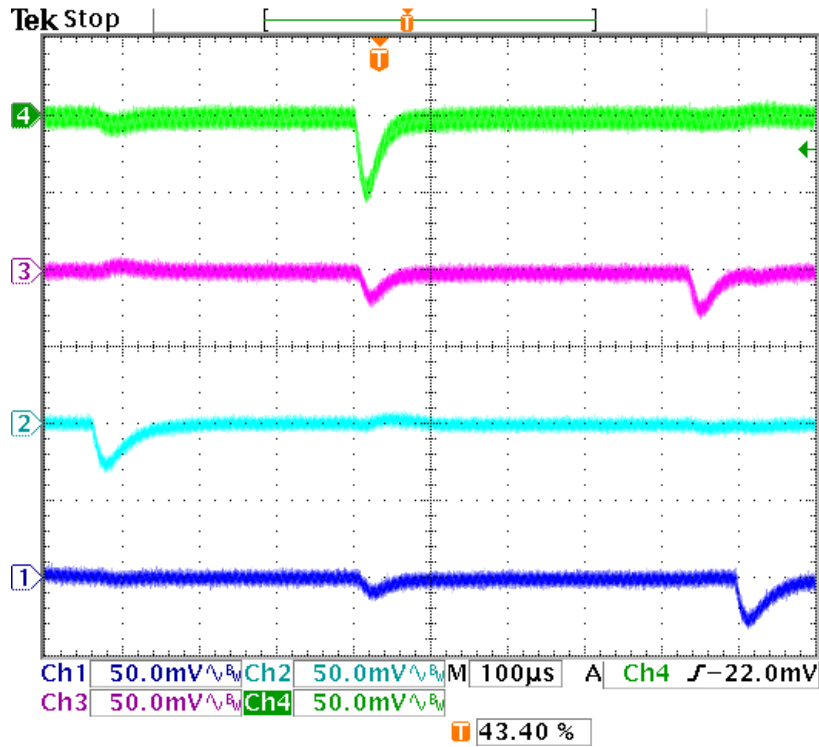
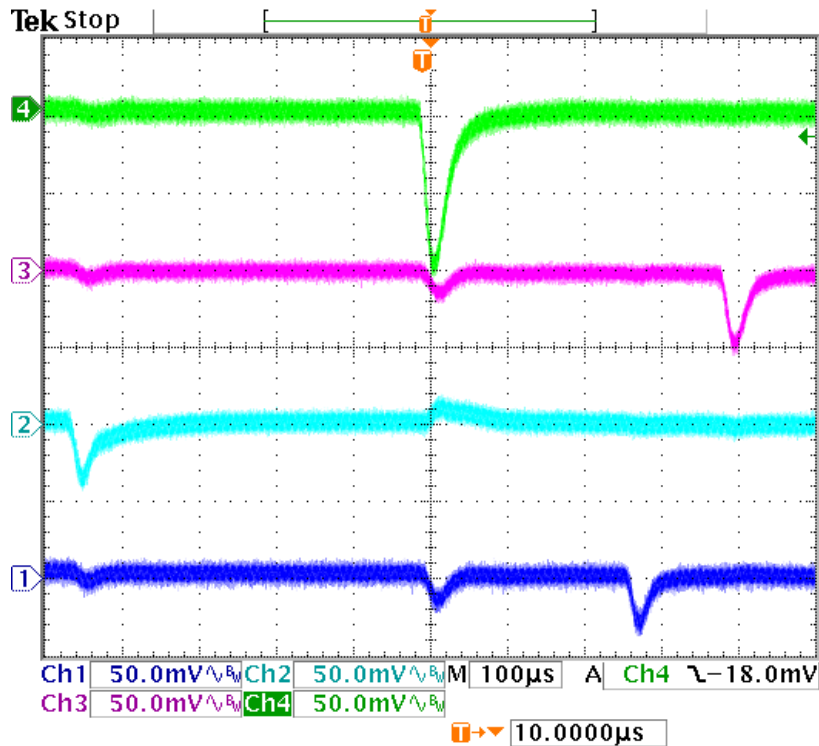


Figure 22. Load step 50% to 100% load: Ch1=1V5, Ch2=1V8, Ch3=2V0, Ch4=3V3



NOTES

The sequencing is designed to meet Xilinx requirements for Kintex 7.

ADI module part number: AES-POM-ANA1-G