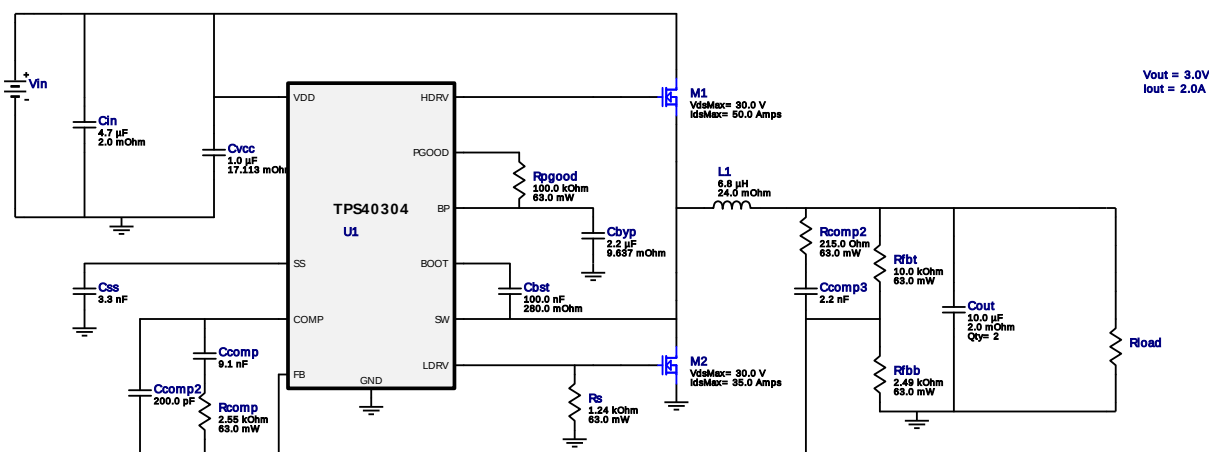
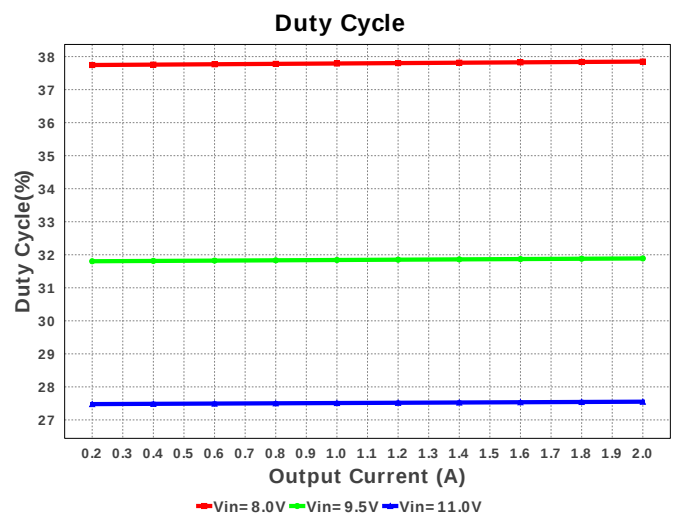
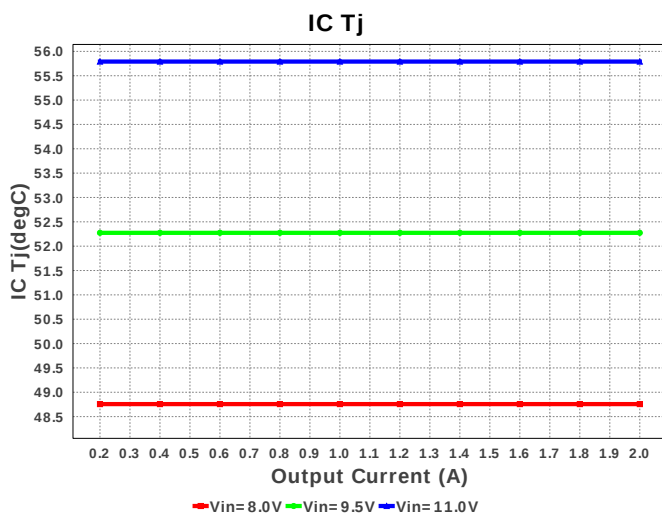


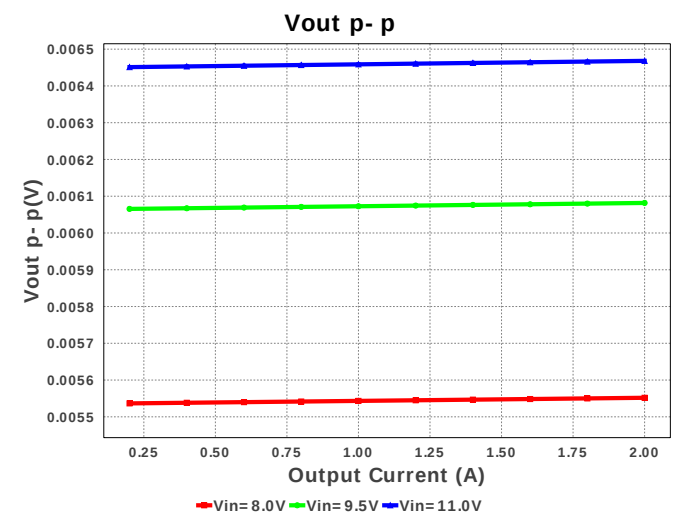
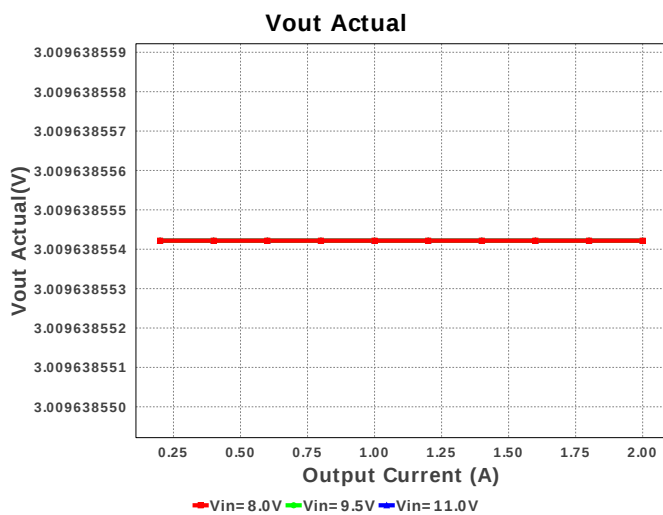
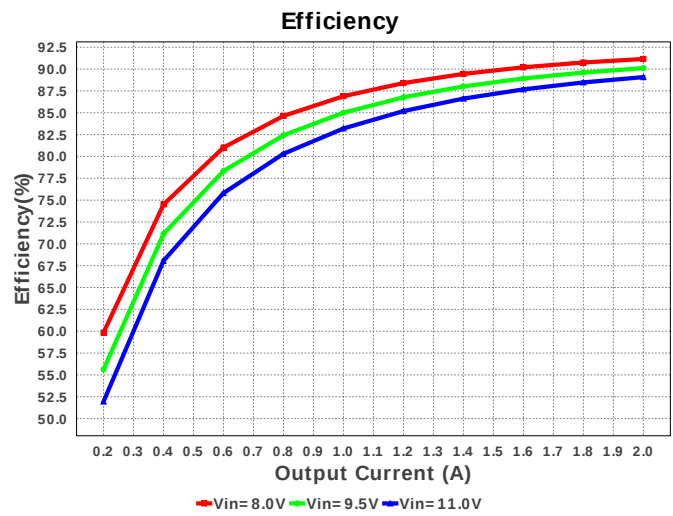
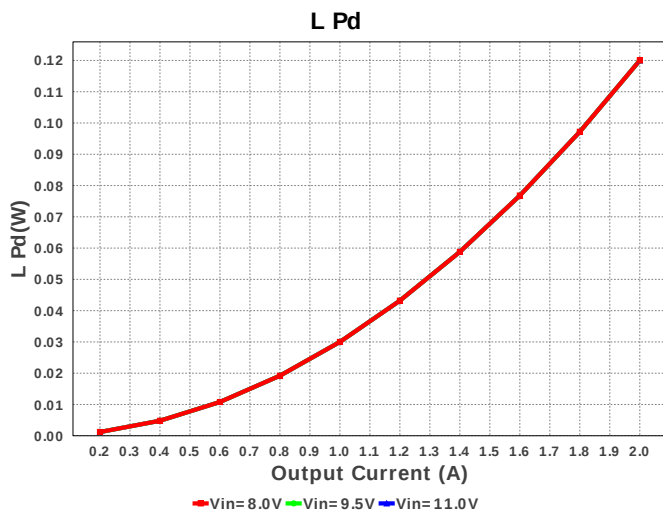
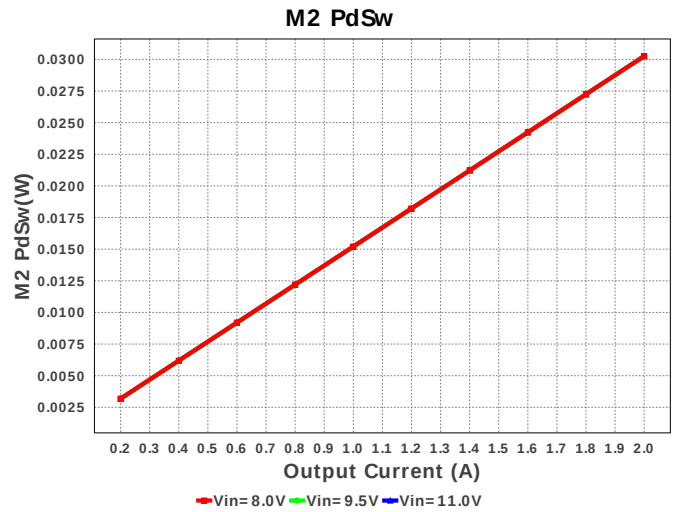
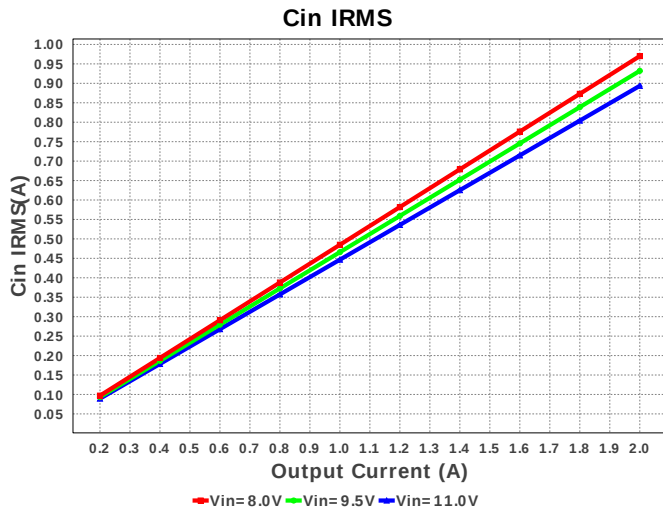


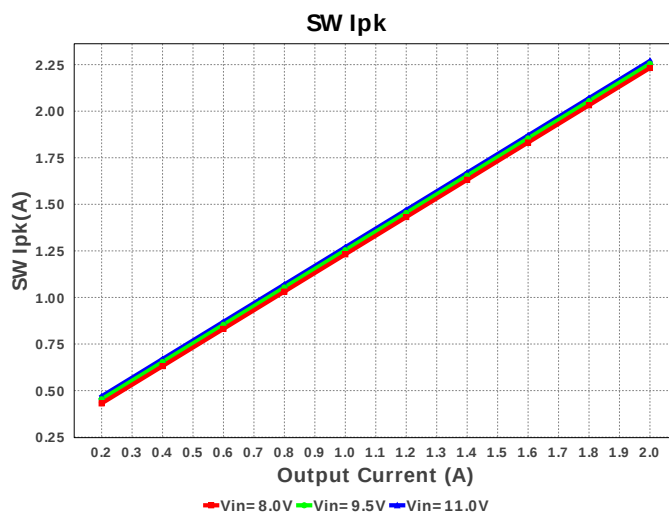
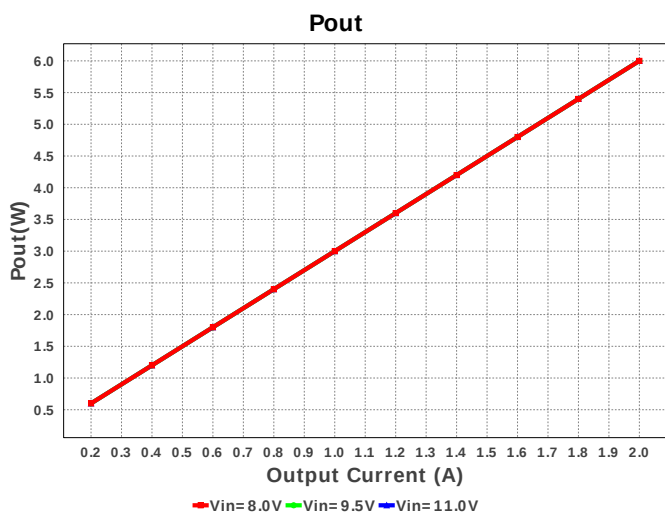
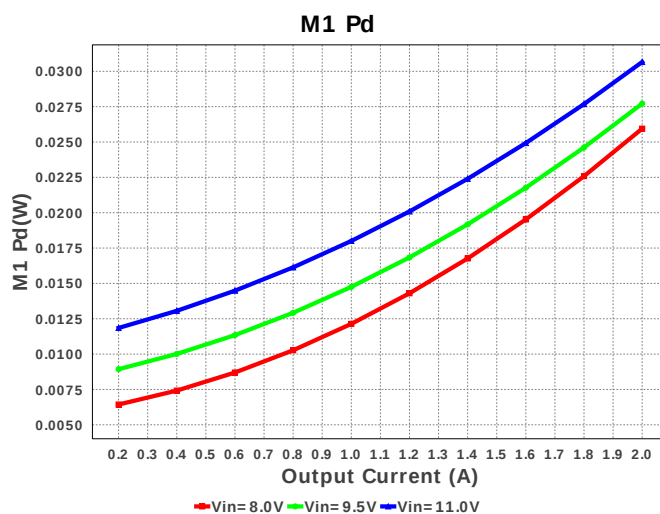
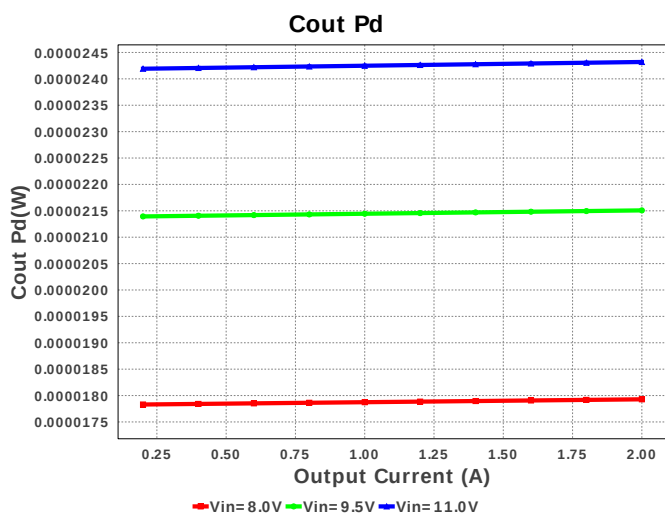
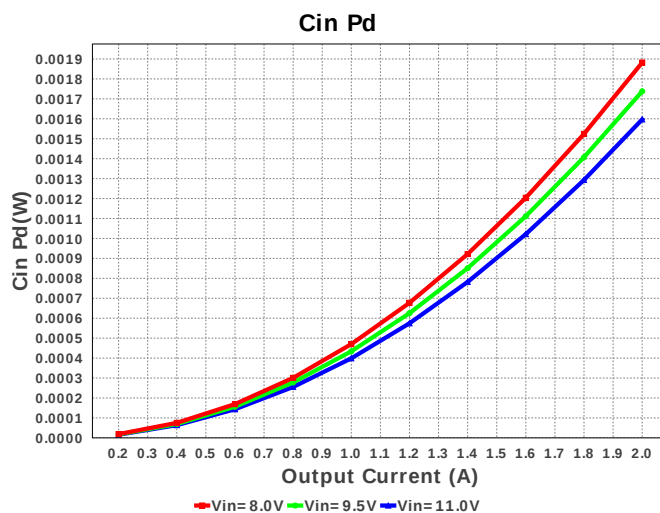
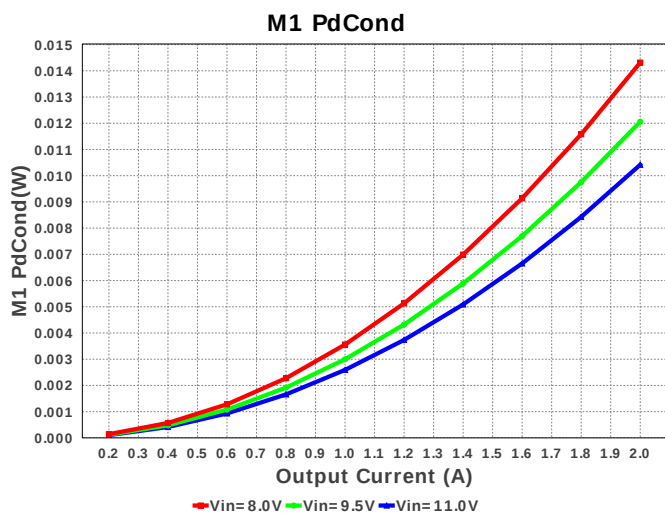
Device = TPS40304DRCR  
Topology = Buck  
Created = 9/23/16 1:15:38 AM  
BOM Cost = \$1.86  
BOM Count = 20  
Total Pd = 0.74W

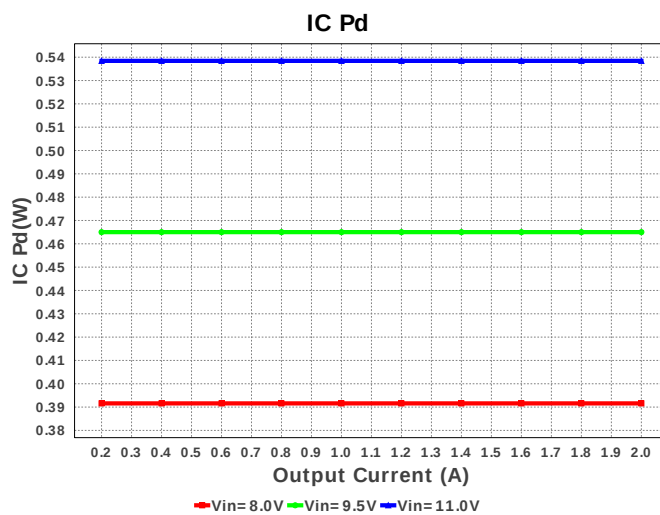
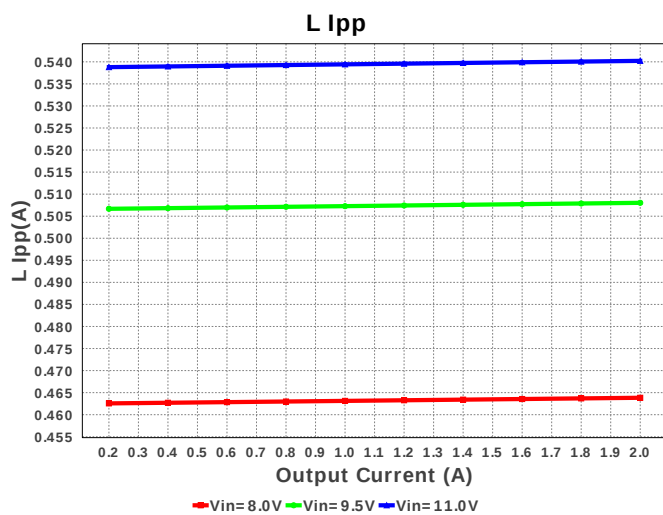
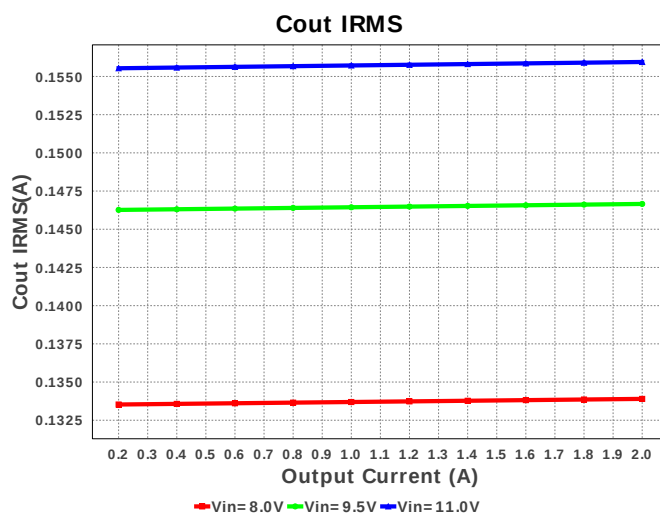
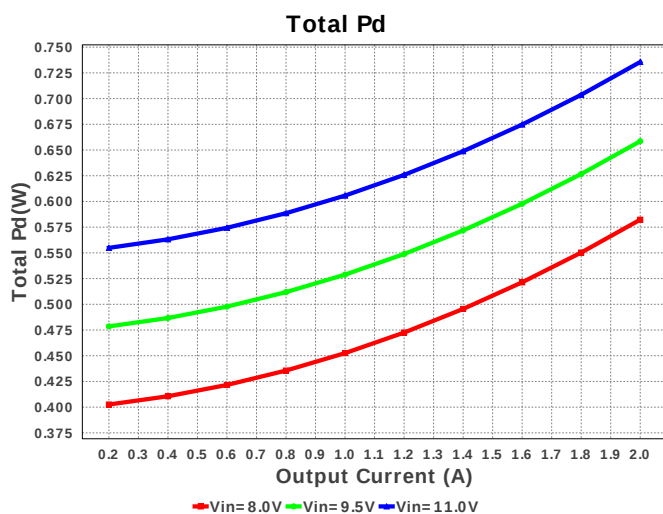
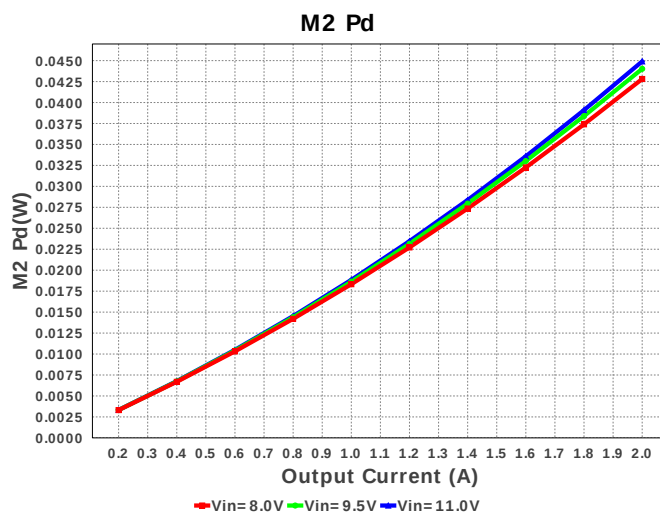
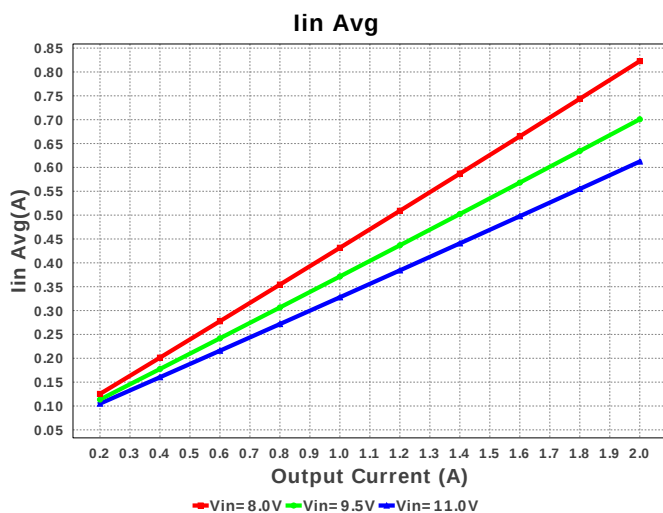


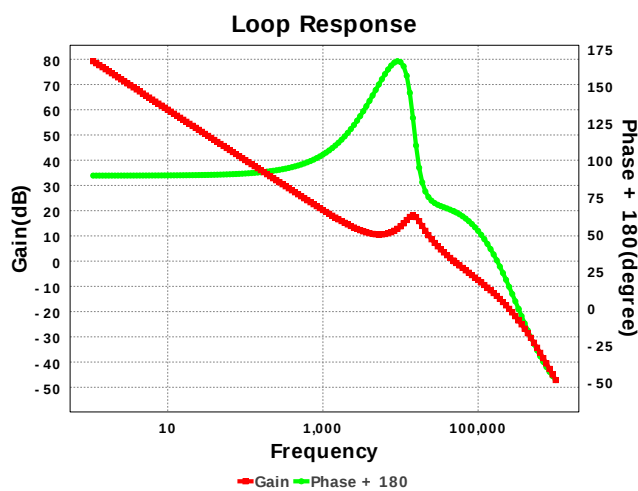
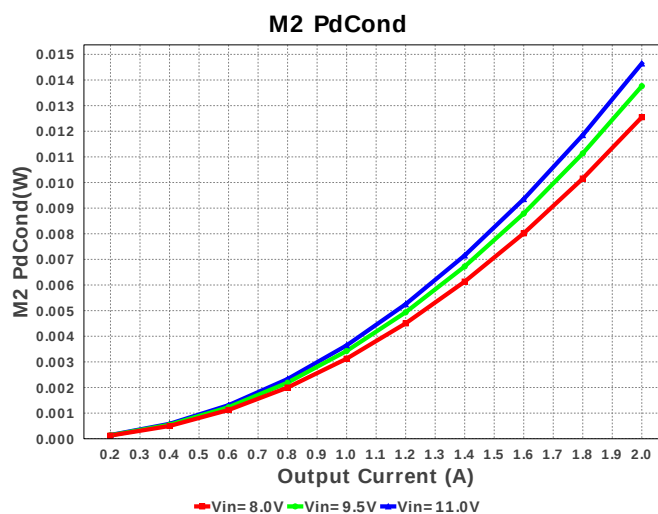
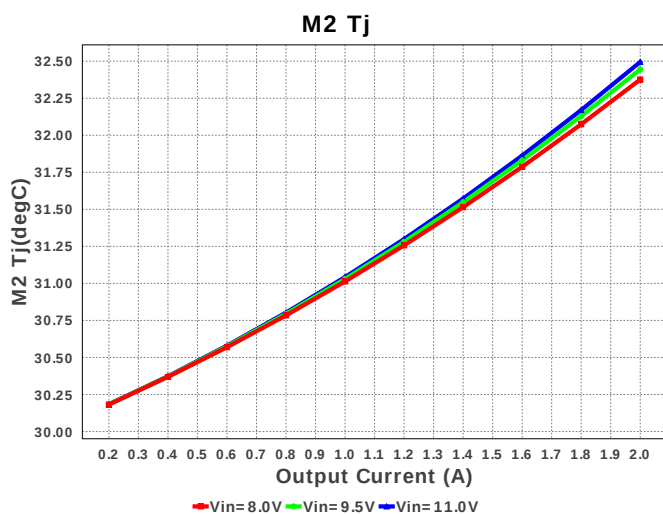
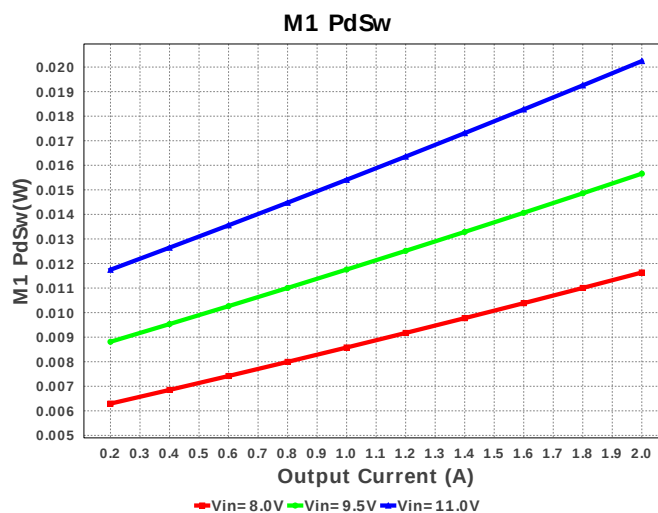
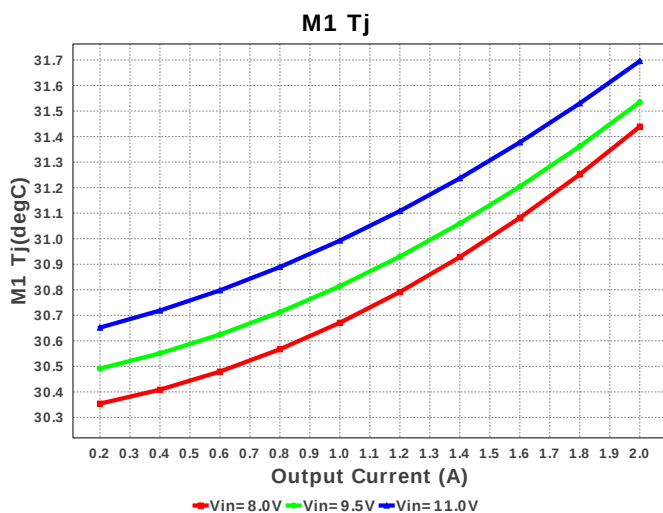
| #   | Name   | Manufacturer      | Part Number                          | Properties                                           | Qty | Price  | Footprint                                                                                                             |
|-----|--------|-------------------|--------------------------------------|------------------------------------------------------|-----|--------|-----------------------------------------------------------------------------------------------------------------------|
| 10. | L1     | TDK               | VLP8040T-6R8M                        | L= 6.8 $\mu$ H<br>DCR= 24.0 mOhm                     | 1   | \$0.22 | <br>VLP8040 113 mm <sup>2</sup>    |
| 11. | M1     | Texas Instruments | CSD17308Q3                           | VdsMax= 30.0 V<br>IdsMax= 50.0 Amps                  | 1   | \$0.28 | <br>DQG0008A 18 mm <sup>2</sup>    |
| 12. | M2     | Texas Instruments | CSD17577Q3A                          | VdsMax= 30.0 V<br>IdsMax= 35.0 Amps                  | 1   | \$0.24 | <br>DNH0008A 18 mm <sup>2</sup>    |
| 13. | Rcomp  | Vishay-Dale       | CRCW04022K55FKED<br>Series= CRCW..e3 | Res= 2.55 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 14. | Rcomp2 | Vishay-Dale       | CRCW0402215RFKED<br>Series= CRCW..e3 | Res= 215.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 15. | Rfbb   | Vishay-Dale       | CRCW04022K49FKED<br>Series= CRCW..e3 | Res= 2.49 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 16. | Rfbt   | Vishay-Dale       | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 17. | Rpgood | Vishay-Dale       | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 18. | Rs     | Vishay-Dale       | CRCW04021K24FKED<br>Series= CRCW..e3 | Res= 1.24 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>         |
| 19. | U1     | Texas Instruments | TPS40304DRCR                         | Switcher                                             | 1   | \$0.85 | <br>S-PVSON-N10 17 mm <sup>2</sup> |











## Operating Values

| #   | Name         | Value                 | Category | Description                             |
|-----|--------------|-----------------------|----------|-----------------------------------------|
| 1.  | Cin IRMS     | 893.543 mA            | Current  | Input capacitor RMS ripple current      |
| 2.  | Cout IRMS    | 155.947 mA            | Current  | Output capacitor RMS ripple current     |
| 3.  | Iin Avg      | 612.33 mA             | Current  | Average input current                   |
| 4.  | L Ipp        | 540.22 mA             | Current  | Peak-to-peak inductor ripple current    |
| 5.  | SW Ipk       | 2.27 A                | Current  | Peak switch current                     |
| 6.  | BOM Count    | 20                    | General  | Total Design BOM count                  |
| 7.  | FootPrint    | 244.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components |
| 8.  | Frequency    | 600.0 kHz             | General  | Switching frequency                     |
| 9.  | IC Tolerance | 10.0 mV               | General  | IC Feedback Tolerance                   |
| 10. | Mode         | CCM                   | General  | Conduction Mode                         |
| 11. | Pout         | 6.0 W                 | General  | Total output power                      |

| #   | Name           | Value       | Category | Description                                                                                |
|-----|----------------|-------------|----------|--------------------------------------------------------------------------------------------|
| 12. | Total BOM      | \$1.86      | General  | Total BOM Cost                                                                             |
| 13. | Low Freq Gain  | 79.292 dB   | Op_Point | Gain at 10Hz                                                                               |
| 14. | Vout Actual    | 3.01 V      | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 15. | Cross Freq     | 43.561 kHz  | Op_point | Bode plot crossover frequency                                                              |
| 16. | Duty Cycle     | 27.551 %    | Op_point | Duty cycle                                                                                 |
| 17. | Efficiency     | 89.079 %    | Op_point | Steady state efficiency                                                                    |
| 18. | Gain Marg      | -24.723 dB  | Op_point | Bode Plot Gain Margin                                                                      |
| 19. | IC Tj          | 55.791 degC | Op_point | IC junction temperature                                                                    |
| 20. | IOUT_OP        | 2.0 A       | Op_point | Iout operating point                                                                       |
| 21. | M1 Tj          | 31.696 degC | Op_point | M1 MOSFET junction temperature                                                             |
| 22. | M2 Tj          | 32.495 degC | Op_point | M2 MOSFET junction temperature                                                             |
| 23. | Phase Marg     | 65.514 deg  | Op_point | Bode Plot Phase Margin                                                                     |
| 24. | VIN_OP         | 11.0 V      | Op_point | Vin operating point                                                                        |
| 25. | Vout p-p       | 5.644 mV    | Op_point | Peak-to-peak output ripple voltage                                                         |
| 26. | Cin Pd         | 1.597 mW    | Power    | Input capacitor power dissipation                                                          |
| 27. | Cout Pd        | 24.32 µW    | Power    | Output capacitor power dissipation                                                         |
| 28. | IC Pd          | 538.428 mW  | Power    | IC power dissipation                                                                       |
| 29. | L Pd           | 120.0 mW    | Power    | Inductor power dissipation                                                                 |
| 30. | M1 Pd          | 30.665 mW   | Power    | M1 MOSFET total power dissipation                                                          |
| 31. | M1 PdCond      | 10.422 mW   | Power    | M1 MOSFET conduction losses                                                                |
| 32. | M1 PdSw        | 20.243 mW   | Power    | M1 MOSFET switching losses                                                                 |
| 33. | M2 Pd          | 44.912 mW   | Power    | M2 MOSFET total power dissipation                                                          |
| 34. | M2 PdCond      | 14.652 mW   | Power    | M2 MOSFET conduction losses                                                                |
| 35. | M2 PdSw        | 30.259 mW   | Power    | M2 MOSFET switching losses                                                                 |
| 36. | Total Pd       | 735.598 mW  | Power    | Total Power Dissipation                                                                    |
| 37. | Vout Tolerance | 3.311 %     |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value    | Description            |
|----|---------|----------|------------------------|
| 1. | Iout    | 2.0      | Maximum Output Current |
| 2. | VinMax  | 11.0     | Maximum input voltage  |
| 3. | VinMin  | 8.0      | Minimum input voltage  |
| 4. | Vout    | 3.0      | Output Voltage         |
| 5. | base_pn | TPS40304 | Base Product Number    |
| 6. | source  | DC       | Input Source Type      |
| 7. | Ta      | 30.0     | Ambient temperature    |

## Design Assistance

1. **TPS40304** Product Folder : <http://www.ti.com/product/TPS40304> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

**You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.**

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).