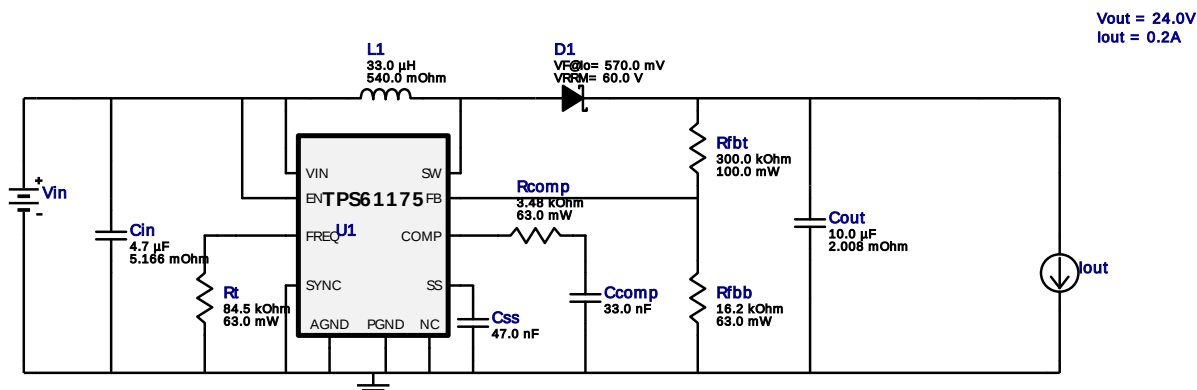


## WEBENCH® Design Report

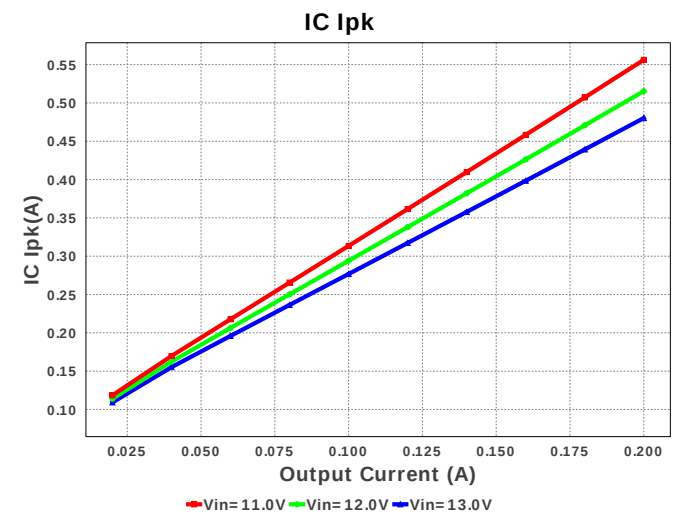
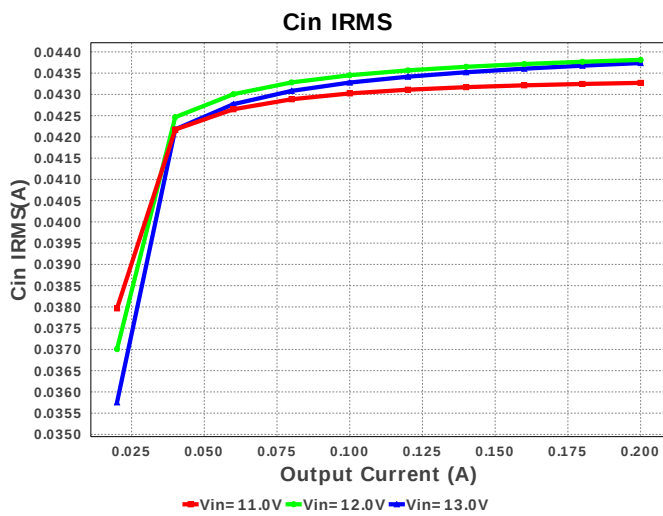
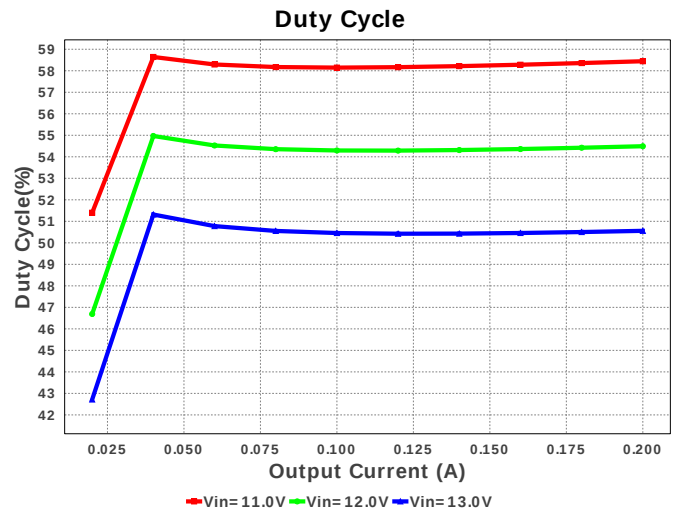
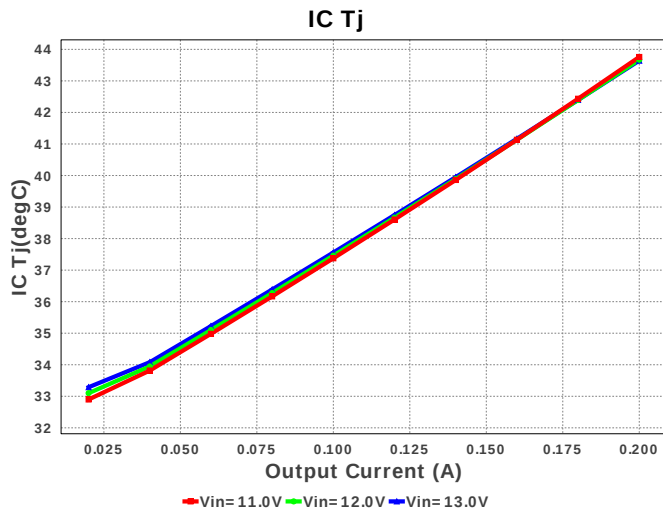
Design : 4742013/35 TPS61175PWPR  
TPS61175PWPR 11.0V-13.0V to 24.00V @ 0.2A

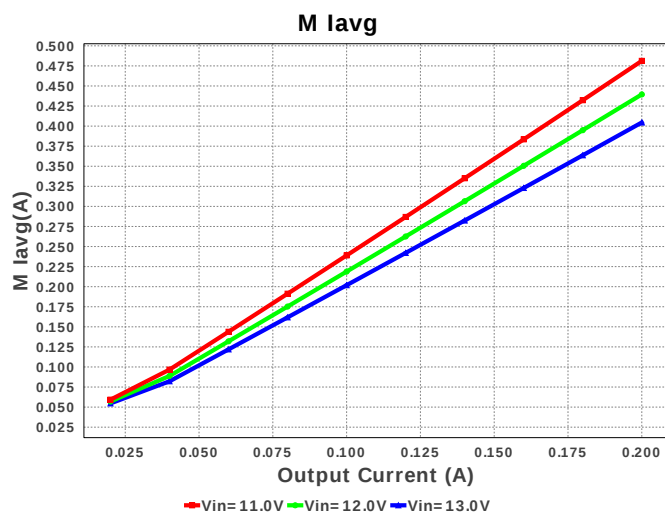
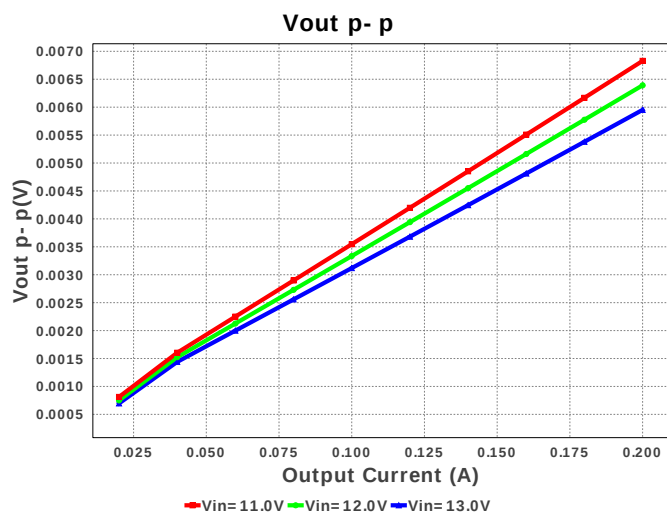
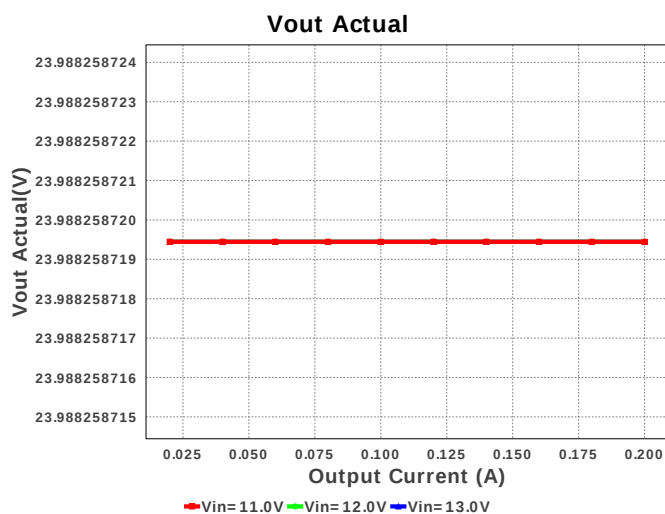
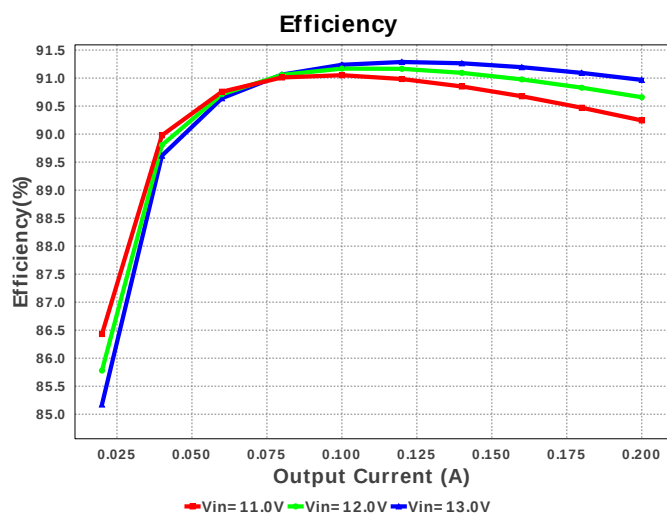
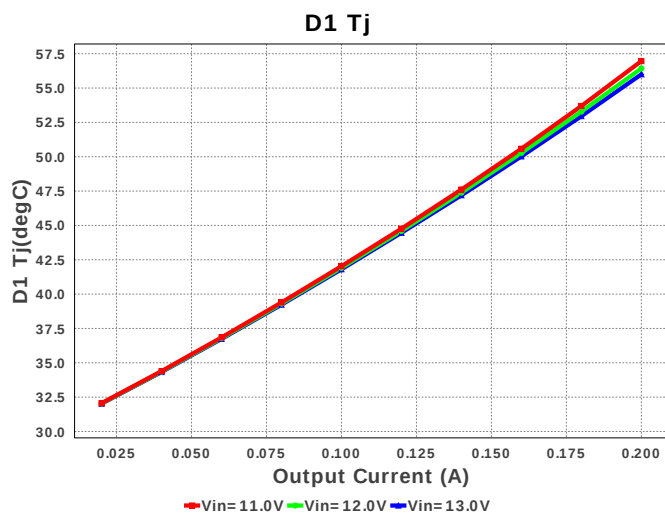
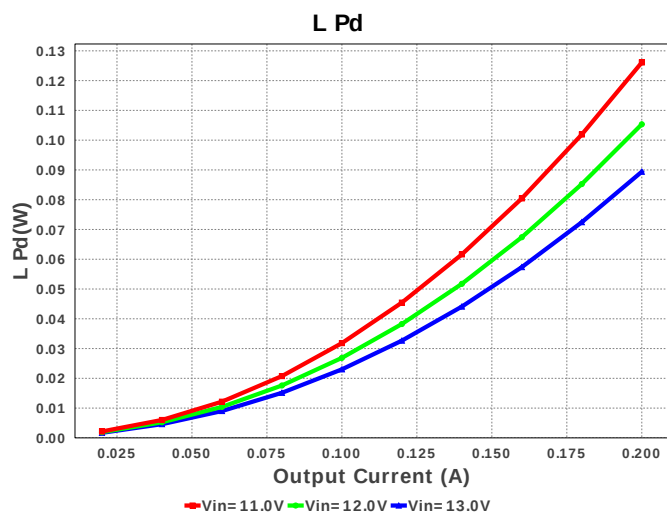


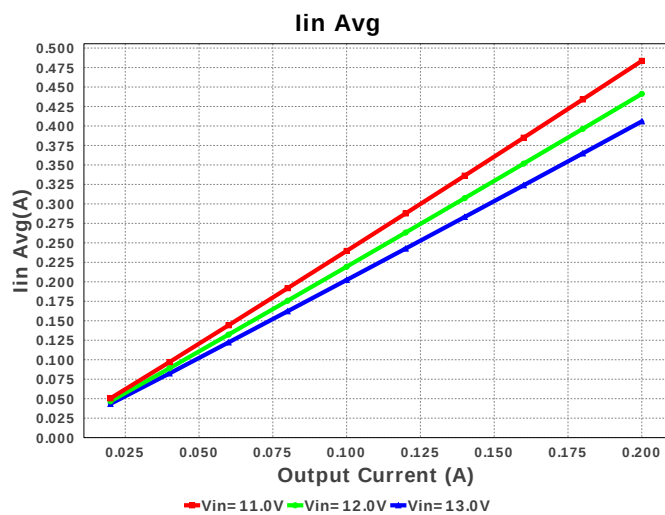
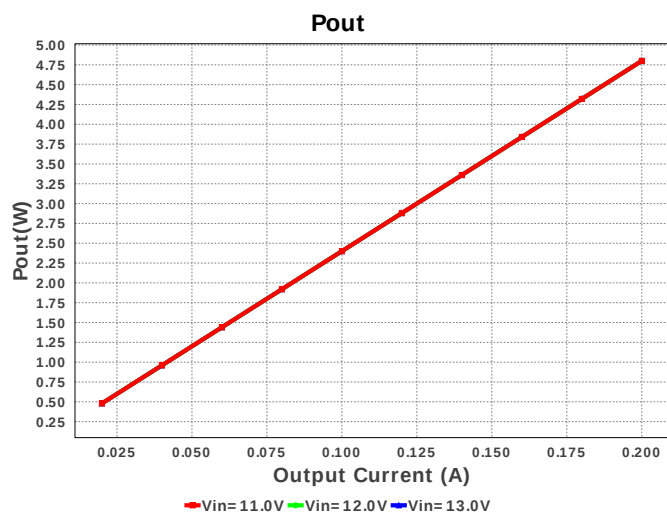
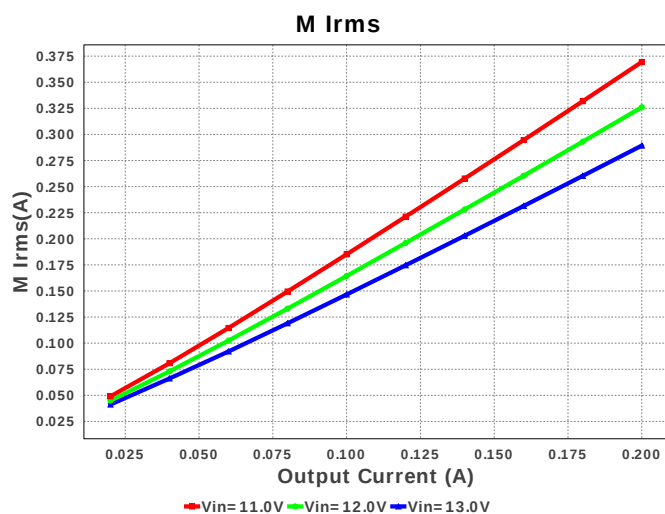
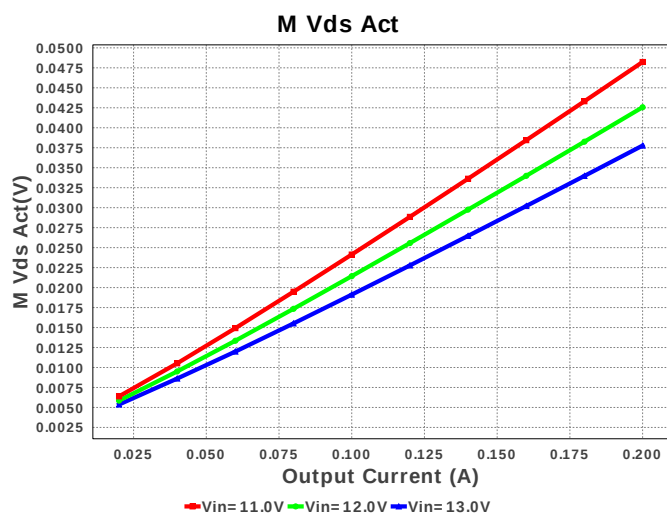
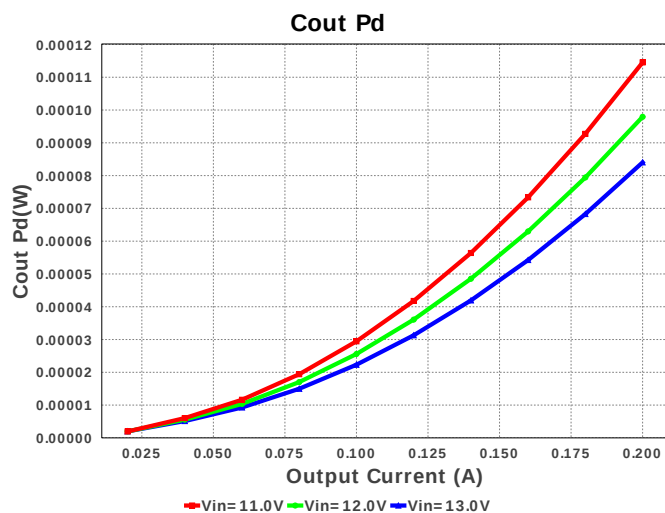
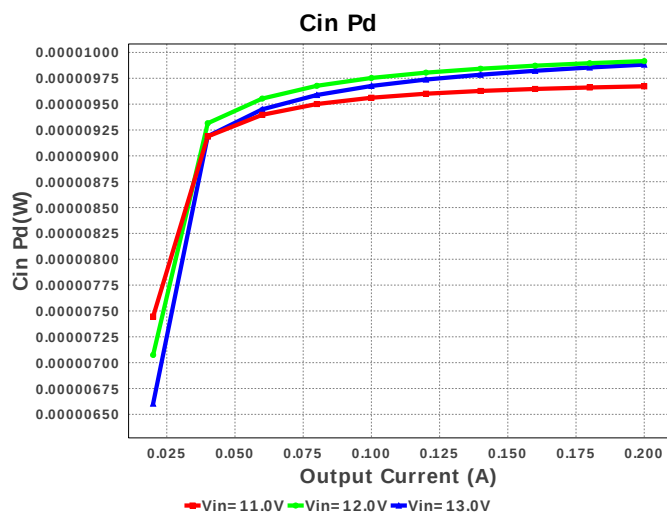
## Electrical BOM

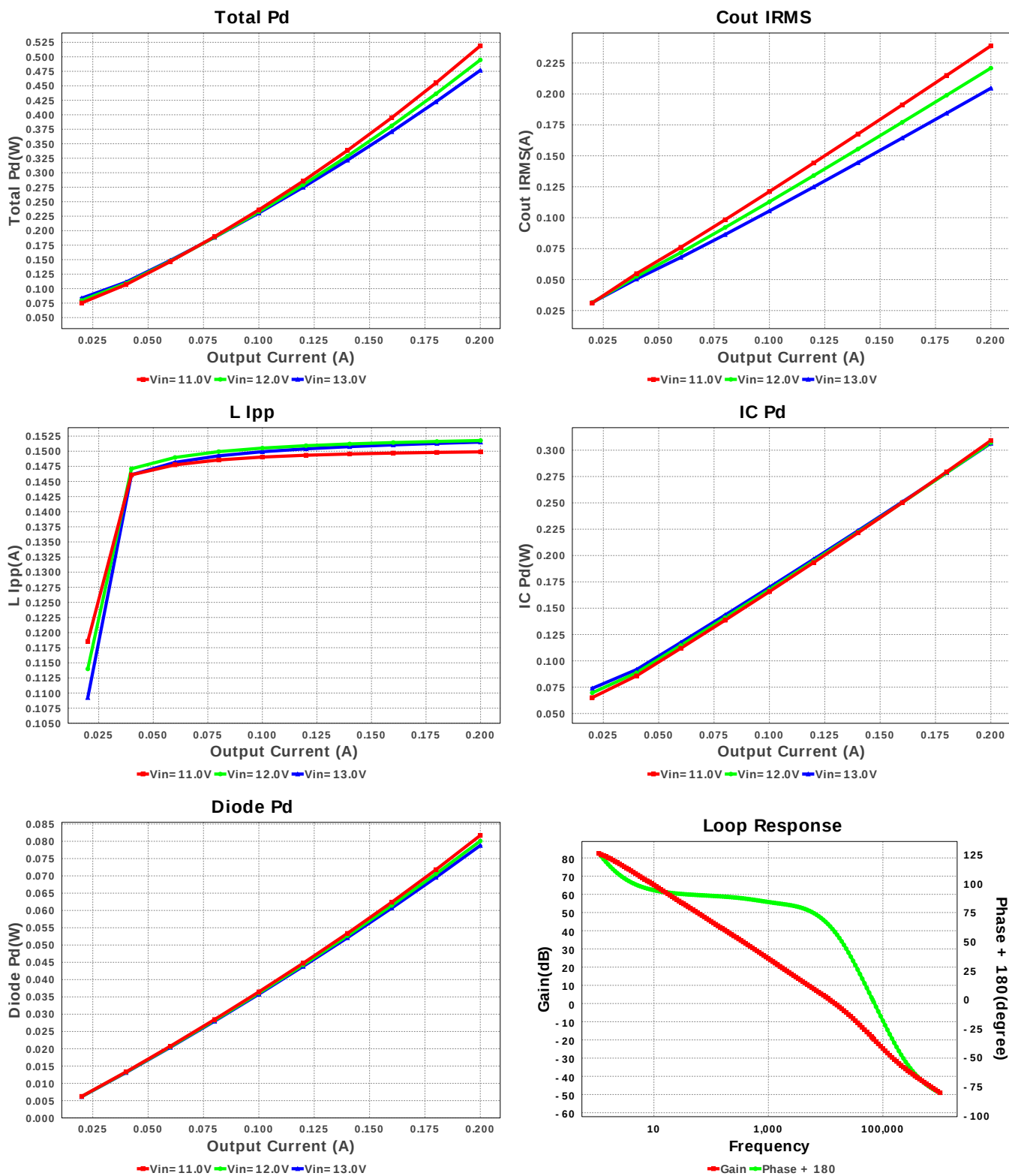
| #   | Name  | Manufacturer      | Part Number                          | Properties                                                       | Qty | Price  | Footprint                   |
|-----|-------|-------------------|--------------------------------------|------------------------------------------------------------------|-----|--------|-----------------------------|
| 1.  | Ccomp | MuRata            | GRM033R60J333KE01D<br>Series= X5R    | Cap= 33.0 nF<br>VDC= 6.3 V<br>IRMS= 0.0 A                        | 1   | \$0.01 | 0201 2 mm <sup>2</sup>      |
| 2.  | Cin   | MuRata            | GRM21BC81E475KA12L<br>Series= X6S    | Cap= 4.7 uF<br>ESR= 5.166 mOhm<br>VDC= 25.0 V<br>IRMS= 2.03531 A | 1   | \$0.02 | 0805 7 mm <sup>2</sup>      |
| 3.  | Cout  | MuRata            | GRM32ER7YA106KA12L<br>Series= X7R    | Cap= 10.0 uF<br>ESR= 2.008 mOhm<br>VDC= 35.0 V<br>IRMS= 4.6772 A | 1   | \$0.22 | 1210_280 15 mm <sup>2</sup> |
| 4.  | Css   | Taiyo Yuden       | TMK212B7473KD-T<br>Series= X7R       | Cap= 47.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 | 0805 7 mm <sup>2</sup>      |
| 5.  | D1    | NXP Semiconductor | PMEG6010CEH,115                      | Vf@Io= 570.0 mV<br>VRRM= 60.0 V                                  | 1   | \$0.04 | SOD-123F 12 mm <sup>2</sup> |
| 6.  | L1    | Würth Elektronik  | 744773133                            | L= 33.0 uH<br>DCR= 540.0 mOhm                                    | 1   | \$1.20 | WE-PD2-S 28 mm <sup>2</sup> |
| 7.  | Rcomp | Vishay-Dale       | CRCW04023K48FKED<br>Series= CRCW..e3 | Res= 3.48 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | 0402 3 mm <sup>2</sup>      |
| 8.  | Rfbb  | Vishay-Dale       | CRCW040216K2FKED<br>Series= CRCW..e3 | Res= 16.2 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | 0402 3 mm <sup>2</sup>      |
| 9.  | Rfbbt | Yageo America     | RC0603FR-07300KL<br>Series= ?        | Res= 300.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0%            | 1   | \$0.01 | 0603 5 mm <sup>2</sup>      |
| 10. | Rt    | Vishay-Dale       | CRCW040284K5FKED<br>Series= CRCW..e3 | Res= 84.5 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | 0402 3 mm <sup>2</sup>      |

| #      | Name | Manufacturer      | Part Number  | Properties | Qty | Price  | Footprint                                                                                                            |
|--------|------|-------------------|--------------|------------|-----|--------|----------------------------------------------------------------------------------------------------------------------|
| 11. U1 |      | Texas Instruments | TPS61175PWPR | Switcher   | 1   | \$1.40 | <br>R-PDSO-G14 61 mm <sup>2</sup> |









## Operating Values

| #   | Name         | Value                 | Category | Description                             |
|-----|--------------|-----------------------|----------|-----------------------------------------|
| 1.  | Cin IRMS     | 43.271 mA             | Current  | Input capacitor RMS ripple current      |
| 2.  | Cout IRMS    | 238.814 mA            | Current  | Output capacitor RMS ripple current     |
| 3.  | IC Ipk       | 556.217 mA            | Current  | Peak switch current in IC               |
| 4.  | Iin Avg      | 483.54 mA             | Current  | Average input current                   |
| 5.  | L Ipp        | 149.89 mA             | Current  | Peak-to-peak inductor ripple current    |
| 6.  | M Iavg       | 481.27 mA             | Current  | MOSFET Average current                  |
| 7.  | M1 Irms      | 369.406 mA            | Current  | Q Iavg                                  |
| 8.  | BOM Count    | 11                    | General  | Total Design BOM count                  |
| 9.  | FootPrint    | 144.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components |
| 10. | Frequency    | 1.148 MHz             | General  | Switching frequency                     |
| 11. | IC Tolerance | 20.0 mV               | General  | IC Feedback Tolerance                   |

| #   | Name           | Value       | Category | Description                                                                                |
|-----|----------------|-------------|----------|--------------------------------------------------------------------------------------------|
| 12. | M Vds Act      | 48.231 mV   | General  | Voltage drop across the MosFET                                                             |
| 13. | Pout           | 4.8 W       | General  | Total output power                                                                         |
| 14. | Total BOM      | \$2.94      | General  | Total BOM Cost                                                                             |
| 15. | D1 Tj          | 56.962 degC | Op_Point | D1 junction temperature                                                                    |
| 16. | Low Freq Gain  | 82.547 dB   | Op_Point | Gain at 10Hz                                                                               |
| 17. | Vout Actual    | 23.988 V    | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 18. | Vout OP        | 24.0 V      | Op_Point | Operational Output Voltage                                                                 |
| 19. | Cross Freq     | 9.877 kHz   | Op_point | Bode plot crossover frequency                                                              |
| 20. | Duty Cycle     | 58.443 %    | Op_point | Duty cycle                                                                                 |
| 21. | Efficiency     | 90.244 %    | Op_point | Steady state efficiency                                                                    |
| 22. | Gain Marg      | -19.596 dB  | Op_point | Bode Plot Gain Margin                                                                      |
| 23. | IC Tj          | 43.759 degC | Op_point | IC junction temperature                                                                    |
| 24. | ICThetaJA      | 44.5 degC/W | Op_point | IC junction-to-ambient thermal resistance                                                  |
| 25. | IOUT_OP        | 200.0 mA    | Op_point | Iout operating point                                                                       |
| 26. | Phase Marg     | 62.283 deg  | Op_point | Bode Plot Phase Margin                                                                     |
| 27. | VIN_OP         | 11.0 V      | Op_point | Vin operating point                                                                        |
| 28. | Vout p-p       | 5.39 mV     | Op_point | Peak-to-peak output ripple voltage                                                         |
| 29. | Cin Pd         | 9.673 μW    | Power    | Input capacitor power dissipation                                                          |
| 30. | Cout Pd        | 114.52 μW   | Power    | Output capacitor power dissipation                                                         |
| 31. | Diode Pd       | 81.702 mW   | Power    | Diode power dissipation                                                                    |
| 32. | IC Pd          | 309.18 mW   | Power    | IC power dissipation                                                                       |
| 33. | L Pd           | 126.086 mW  | Power    | Inductor power dissipation                                                                 |
| 34. | Total Pd       | 518.916 mW  | Power    | Total Power Dissipation                                                                    |
| 35. | Vout Tolerance | 3.575 %     |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value    | Description            |
|----|---------|----------|------------------------|
| 1. | Iout    | 200.0 m  | Maximum Output Current |
| 2. | VinMax  | 13.0     | Maximum input voltage  |
| 3. | VinMin  | 11.0     | Minimum input voltage  |
| 4. | Vout    | 24.0     | Output Voltage         |
| 5. | base_pn | TPS61175 | Base Product Number    |
| 6. | source  | DC       | Input Source Type      |
| 7. | Ta      | 30.0     | Ambient temperature    |

## Design Assistance

1. **TPS61175 Product Folder** : <http://www.ti.com/product/TPS61175> : 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](#).