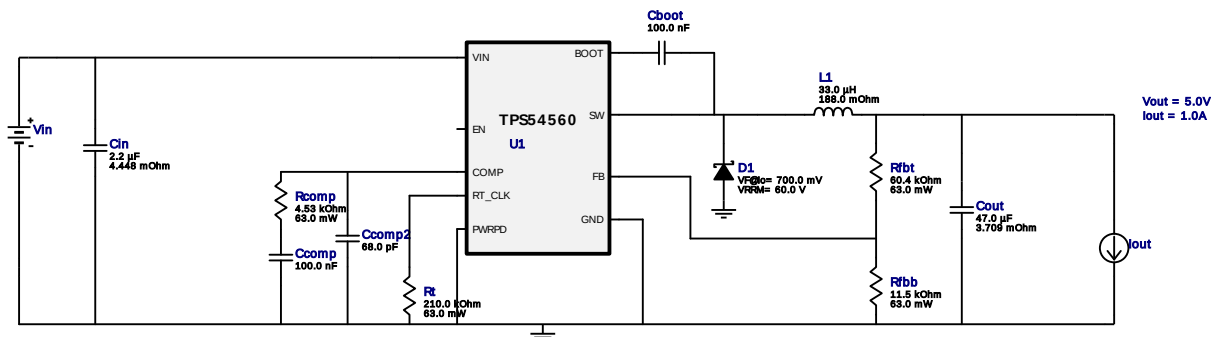


## WEBENCH® Design Report

Design : 4742013/103 TPS54560DDAR  
TPS54560DDAR 30.0V-37.0V to 5.00V @ 1.0A



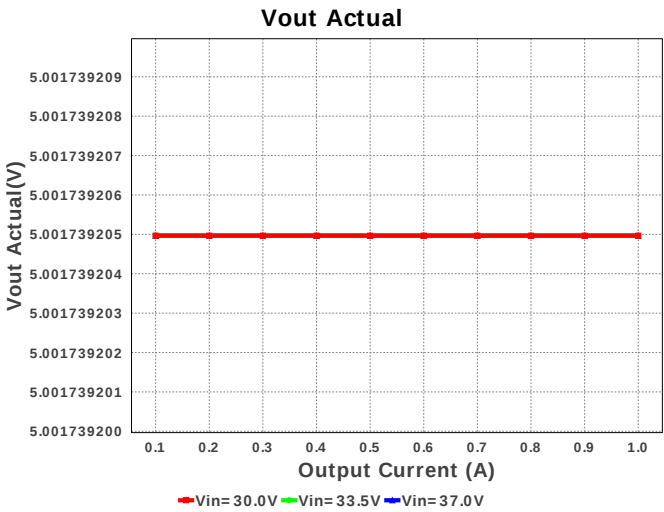
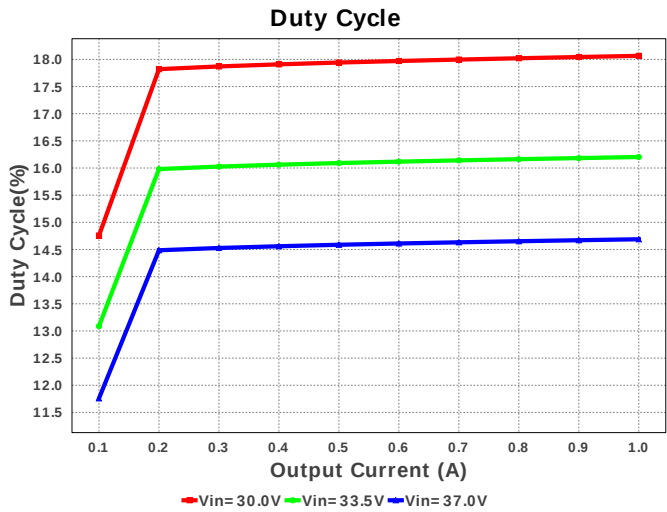
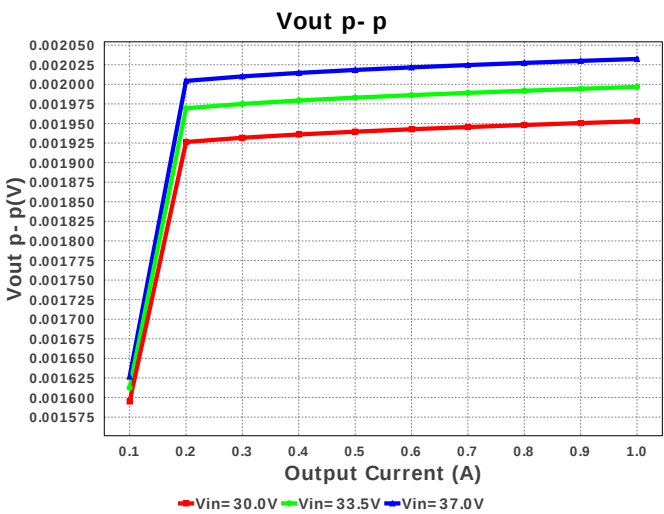
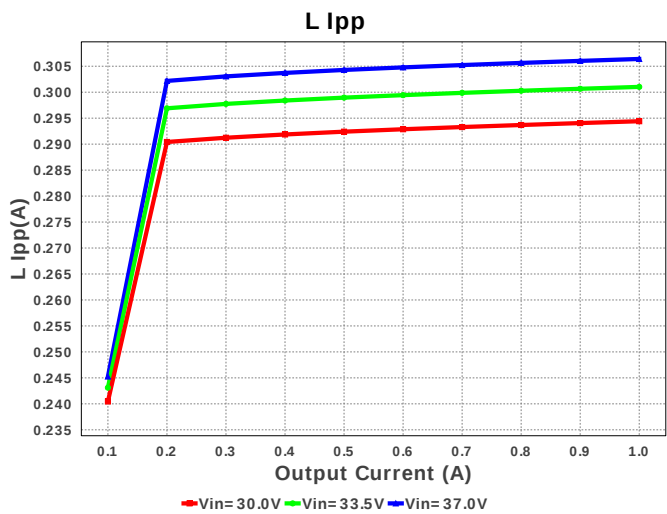
## Electrical BOM

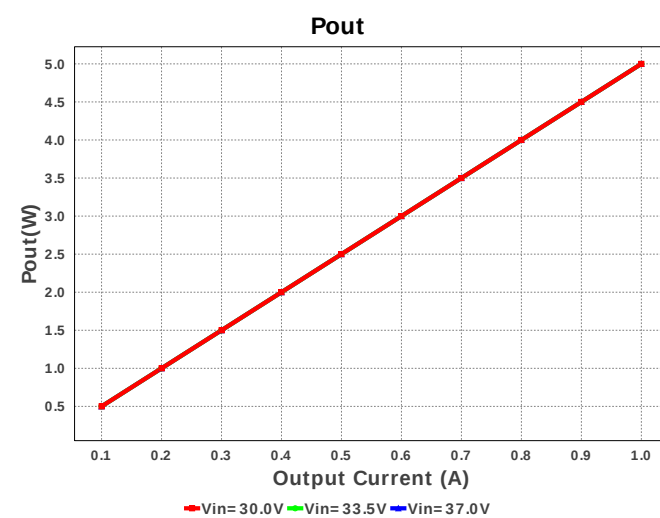
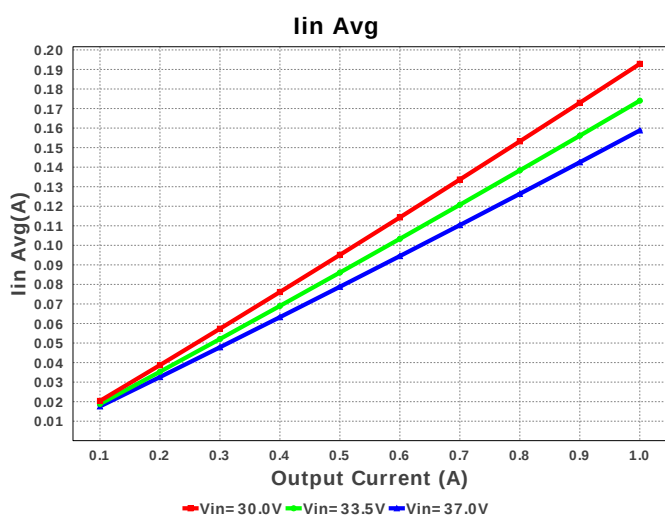
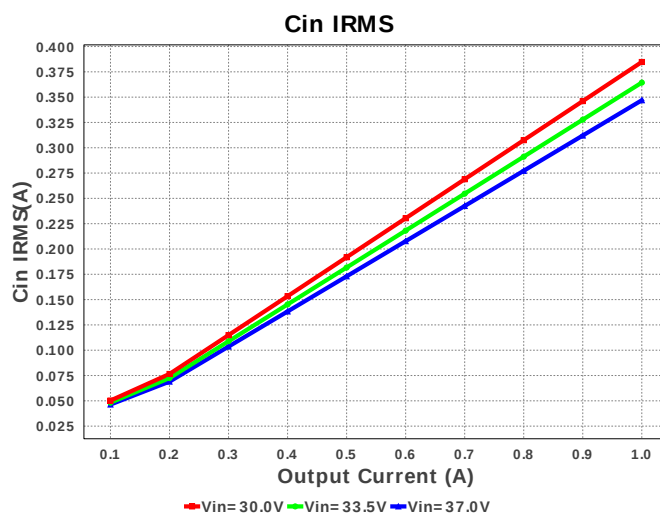
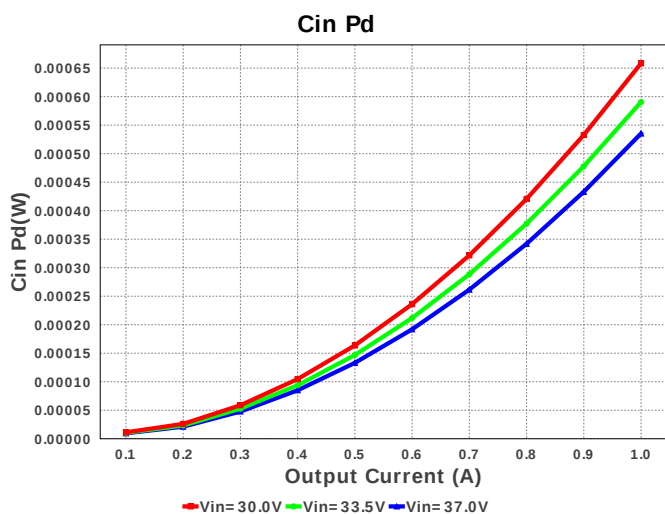
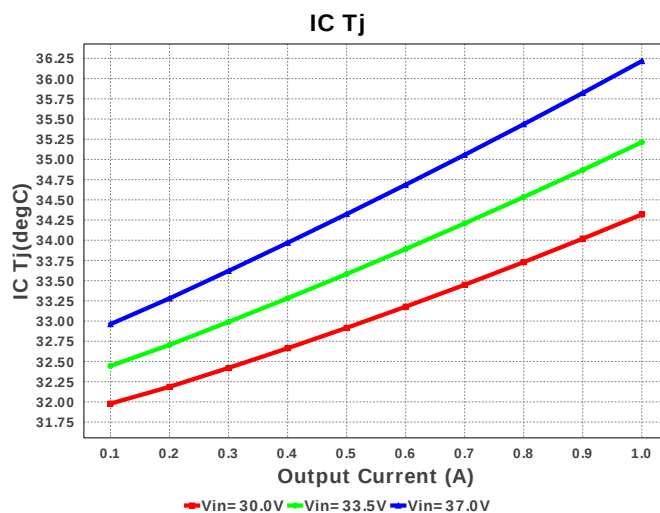
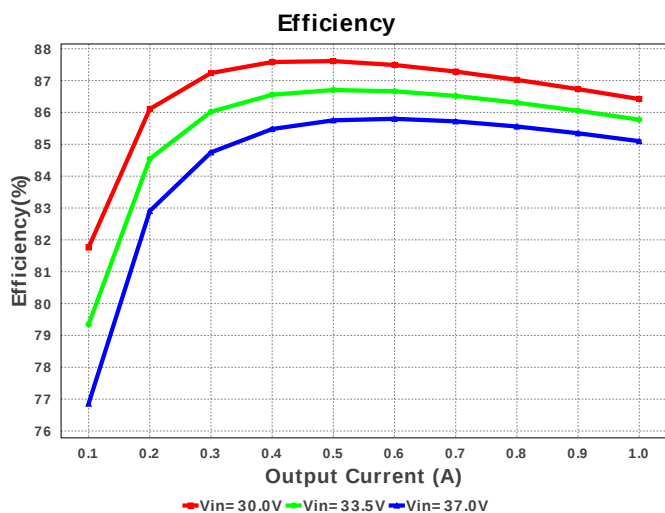
| #   | Name   | Manufacturer | Part Number                          | Properties                                                       | Qty | Price  | Footprint                                                                                                         |
|-----|--------|--------------|--------------------------------------|------------------------------------------------------------------|-----|--------|-------------------------------------------------------------------------------------------------------------------|
| 1.  | Cboot  | MuRata       | GRM155R61A104KA01D<br>Series= X5R    | Cap= 100.0 nF<br>VDC= 10.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 |  0402 3 mm <sup>2</sup>        |
| 2.  | Ccomp  | MuRata       | GRM21BR71E104KA01L<br>Series= X7R    | Cap= 100.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 |  0805 7 mm <sup>2</sup>      |
| 3.  | Ccomp2 | Kemet        | C0805C680K5GACTU<br>Series= C0G/NP0  | Cap= 68.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 |  0805 7 mm <sup>2</sup>      |
| 4.  | Cin    | MuRata       | GRM31CR71H225KA88L<br>Series= X7R    | Cap= 2.2 uF<br>ESR= 4.448 mOhm<br>VDC= 50.0 V<br>IRMS= 2.2252 A  | 1   | \$0.05 |  1206_190 11 mm <sup>2</sup> |
| 5.  | Cout   | MuRata       | GRM31CR61A476KE15L<br>Series= X5R    | Cap= 47.0 uF<br>ESR= 3.709 mOhm<br>VDC= 10.0 V<br>IRMS= 4.2862 A | 1   | \$0.15 |  1206_190 11 mm <sup>2</sup> |
| 6.  | D1     | Diodes Inc.  | B260A-13-F                           | VF@Io= 700.0 mV<br>VRRM= 60.0 V                                  | 1   | \$0.09 |  SMA 37 mm <sup>2</sup>      |
| 7.  | L1     | Bourns       | SRN6045-330M                         | L= 33.0 uH<br>DCR= 188.0 mOhm                                    | 1   | \$0.16 |  SRN6045 64 mm <sup>2</sup>  |
| 8.  | Rcomp  | Vishay-Dale  | CRCW04024K53FKED<br>Series= CRCW..e3 | Res= 4.53 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 9.  | Rfbb   | Vishay-Dale  | CRCW040211K5FKED<br>Series= CRCW..e3 | Res= 11.5 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 10. | Rfbt   | Vishay-Dale  | CRCW040260K4FKED<br>Series= CRCW..e3 | Res= 60.4 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 11. | Rt     | Vishay-Dale  | CRCW0402210KFKED<br>Series= CRCW..e3 | Res= 210.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |

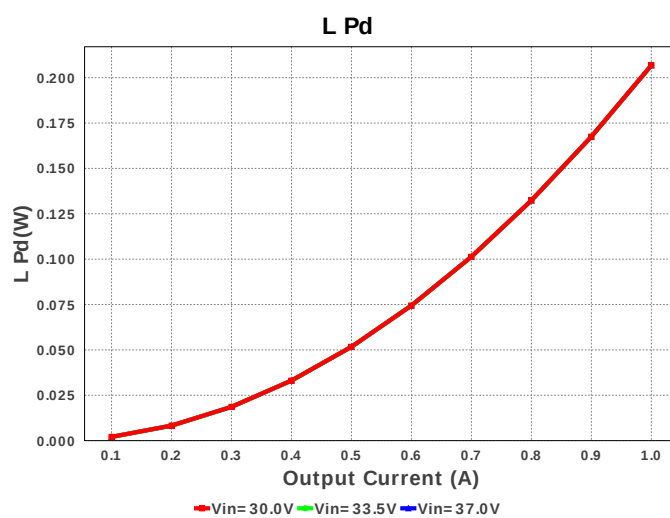
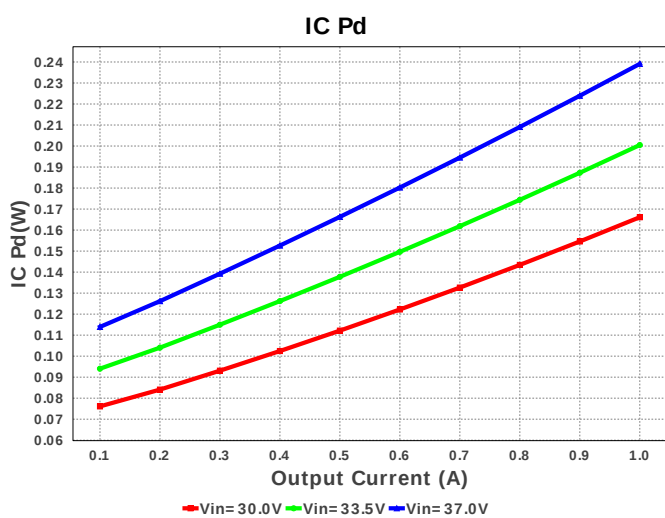
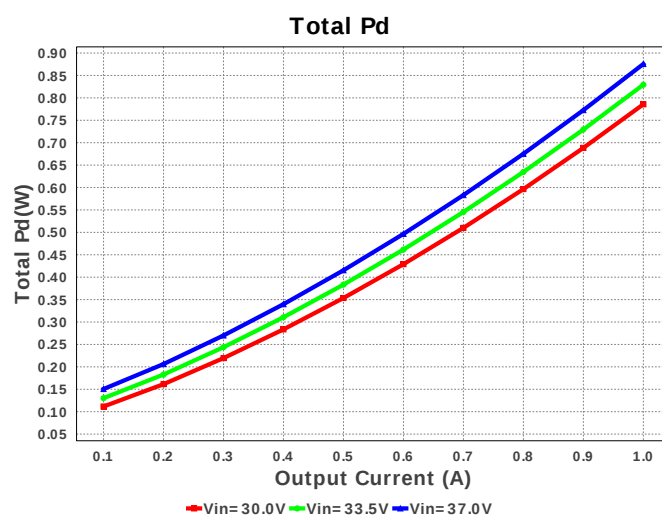
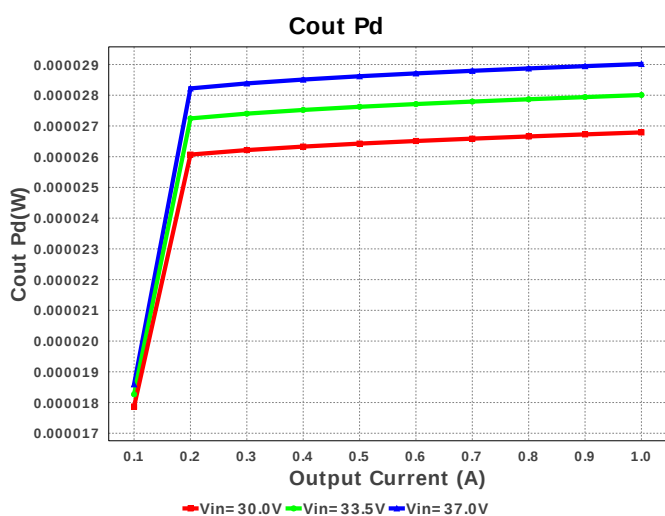
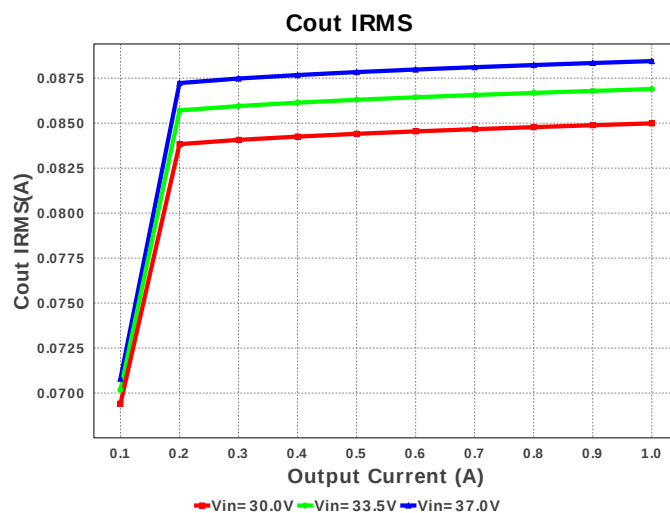
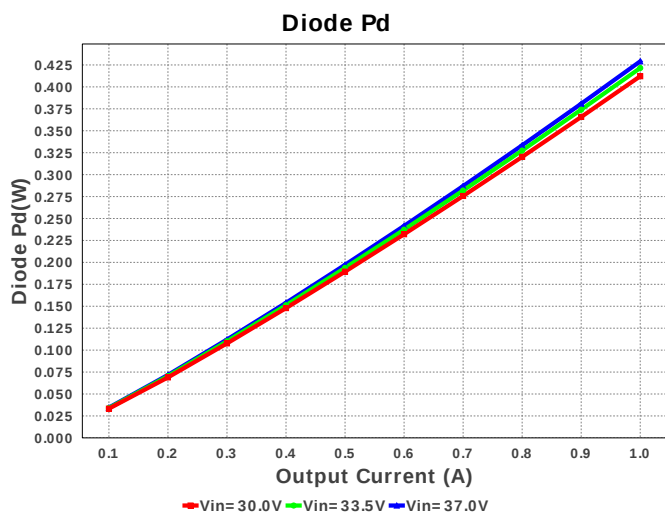
| #   | Name | Manufacturer      | Part Number  | Properties | Qty | Price  | Footprint |
|-----|------|-------------------|--------------|------------|-----|--------|-----------|
| 12. | U1   | Texas Instruments | TPS54560DDAR | Switcher   | 1   | \$2.30 |           |

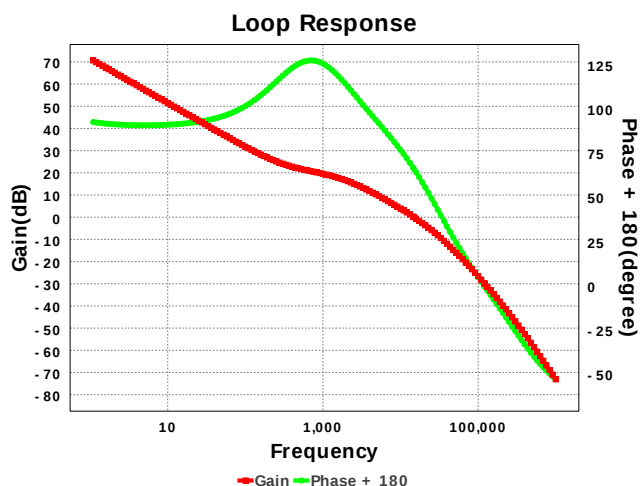


R-PDSO-G8 57 mm<sup>2</sup>









## Operating Values

| #   | Name                | Value                 | Category | Description                                                                                |
|-----|---------------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS            | 347.34 mA             | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS           | 88.724 mA             | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | Iin Avg             | 159.26 mA             | Current  | Average input current                                                                      |
| 4.  | L Ipp               | 307.35 mA             | Current  | Peak-to-peak inductor ripple current                                                       |
| 5.  | BOM Count           | 12                    | General  | Total Design BOM count                                                                     |
| 6.  | FootPrint           | 209.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 7.  | Frequency           | 464.858 kHz           | General  | Switching frequency                                                                        |
| 8.  | Pout                | 5.0 W                 | General  | Total output power                                                                         |
| 9.  | Total BOM           | \$2.82                | General  | Total BOM Cost                                                                             |
| 10. | ICThetaJA Effective | 26.0 degC/W           | Op_Point | Effective IC Junction-to-Ambient Thermal Resistance                                        |
| 11. | Low Freq Gain       | 70.654 dB             | Op_Point | Gain at 10Hz                                                                               |
| 12. | Vout Actual         | 5.002 V               | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 13. | Vout OP             | 5.0 V                 | Op_Point | Operational Output Voltage                                                                 |
| 14. | Cross Freq          | 14.911 kHz            | Op_point | Bode plot crossover frequency                                                              |
| 15. | Duty Cycle          | 14.734 %              | Op_point | Duty cycle                                                                                 |
| 16. | Efficiency          | 84.854 %              | Op_point | Steady state efficiency                                                                    |
| 17. | Gain Marg           | -29.998 dB            | Op_point | Bode Plot Gain Margin                                                                      |
| 18. | IC Tj               | 36.218 degC           | Op_point | IC junction temperature                                                                    |
| 19. | IOUT_OP             | 1.0 A                 | Op_point | Iout operating point                                                                       |
| 20. | Phase Marg          | 66.53 deg             | Op_point | Bode Plot Phase Margin                                                                     |
| 21. | VIN_OP              | 37.0 V                | Op_point | Vin operating point                                                                        |
| 22. | Vout p-p            | 2.039 mV              | Op_point | Peak-to-peak output ripple voltage                                                         |
| 23. | Cin Pd              | 536.63 μW             | Power    | Input capacitor power dissipation                                                          |
| 24. | Cout Pd             | 29.197 μW             | Power    | Output capacitor power dissipation                                                         |
| 25. | Diode Pd            | 445.951 mW            | Power    | Diode power dissipation                                                                    |
| 26. | IC Pd               | 239.15 mW             | Power    | IC power dissipation                                                                       |
| 27. | L Pd                | 206.8 mW              | Power    | Inductor power dissipation                                                                 |
| 28. | Total Pd            | 892.496 mW            | Power    | Total Power Dissipation                                                                    |
| 29. | Vout Tolerance      | 2.714 %               |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value    | Description            |
|----|---------|----------|------------------------|
| 1. | Iout    | 1.0      | Maximum Output Current |
| 2. | VinMax  | 37.0     | Maximum input voltage  |
| 3. | VinMin  | 30.0     | Minimum input voltage  |
| 4. | Vout    | 5.0      | Output Voltage         |
| 5. | base_pn | TPS54560 | Base Product Number    |
| 6. | source  | DC       | Input Source Type      |
| 7. | Ta      | 30.0     | Ambient temperature    |

## Design Assistance

1. **TPS54560** Product Folder : <http://www.ti.com/product/TPS54560> : contains the data sheet and other resources.

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