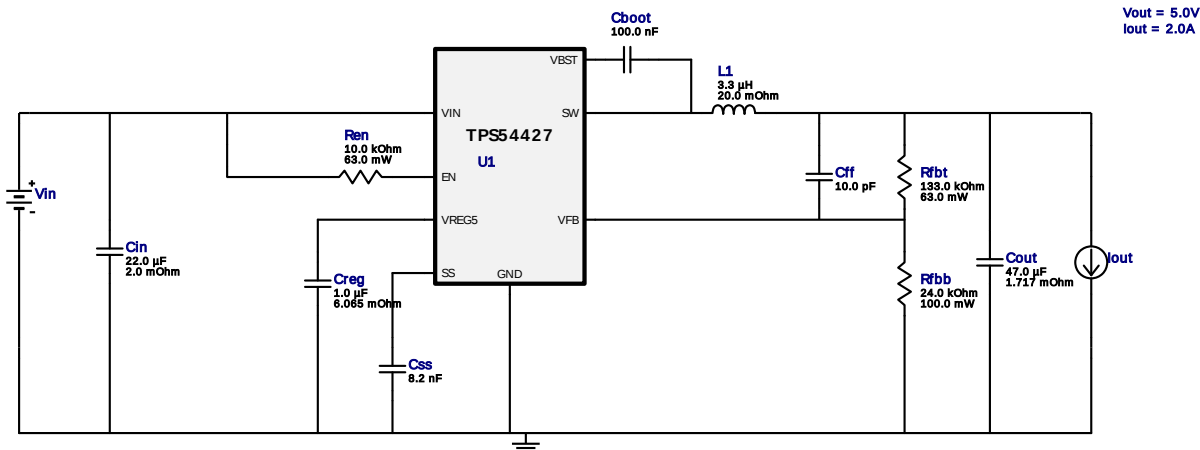


## WEBENCH® Design Report

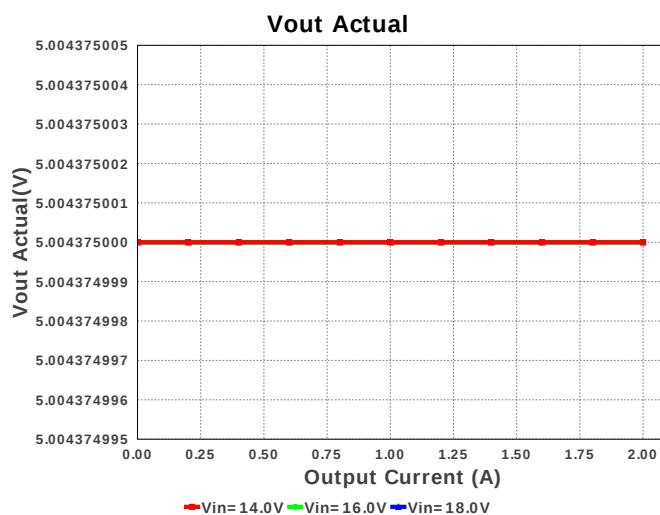
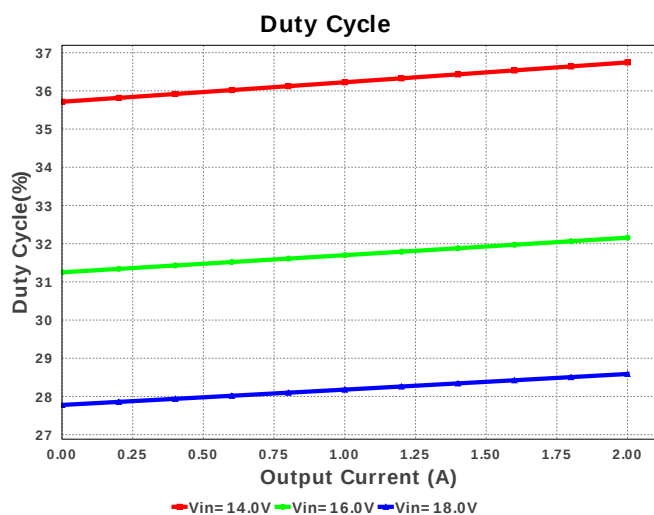
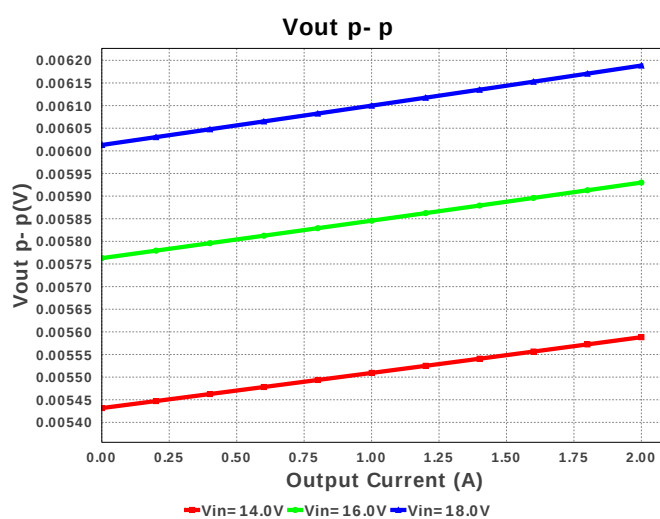
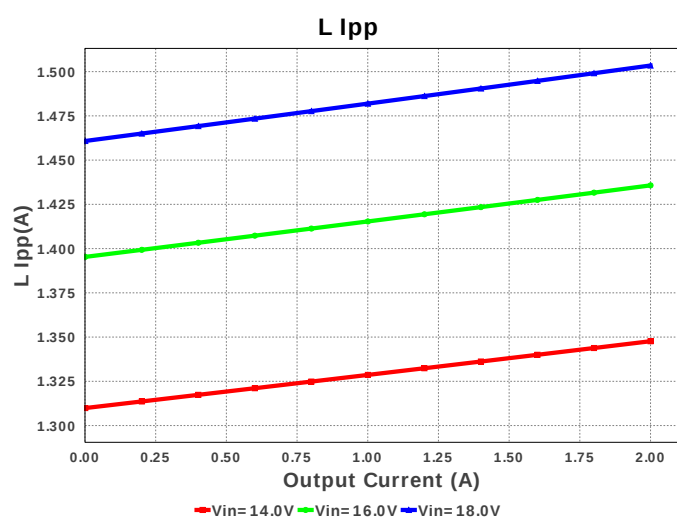
Design : 4058737/178 TPS54427DDAR  
TPS54427DDAR 14.0V-18.0V to 5.00V @ 2.0A

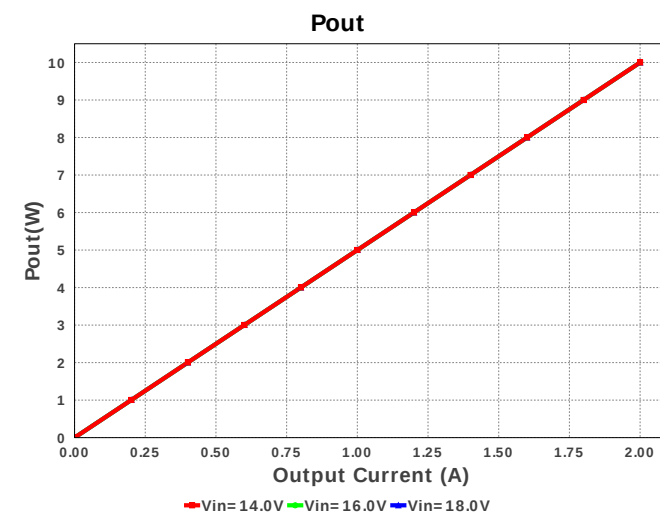
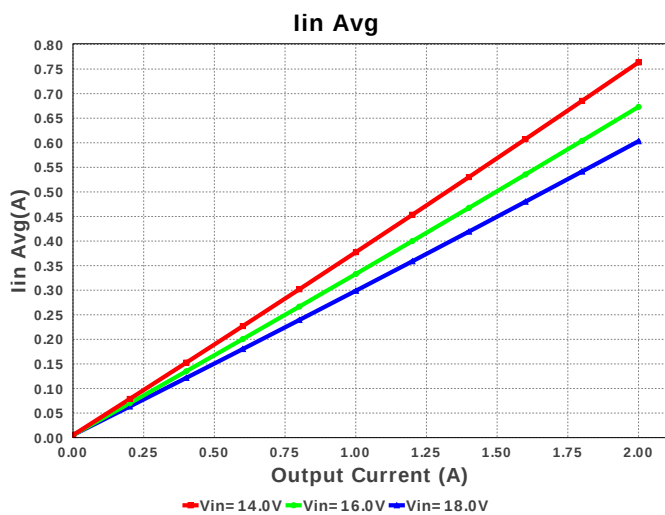
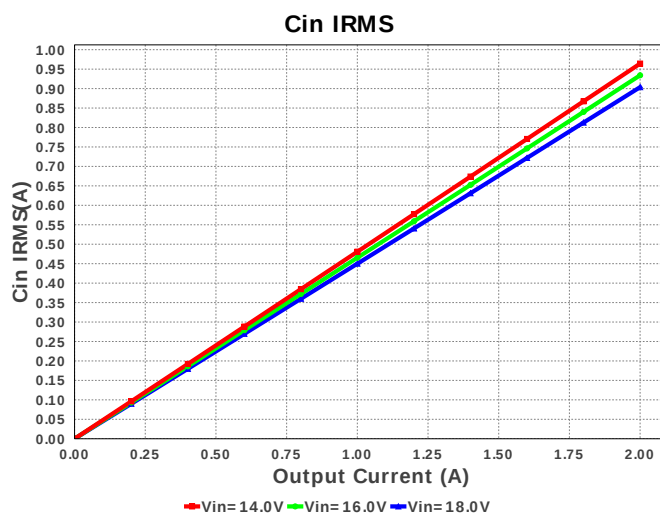
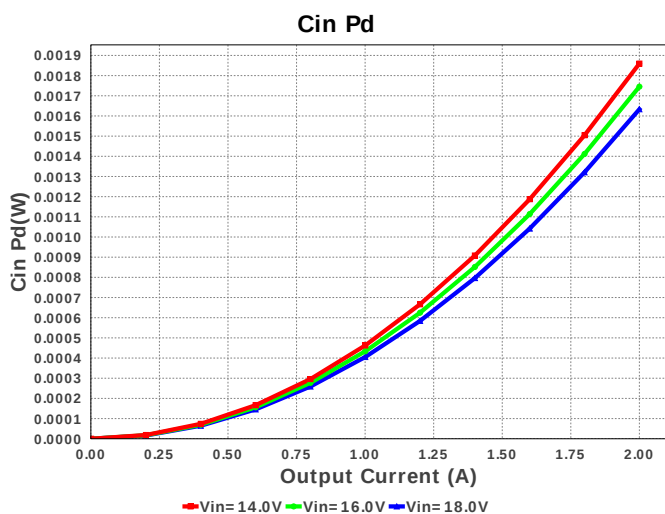
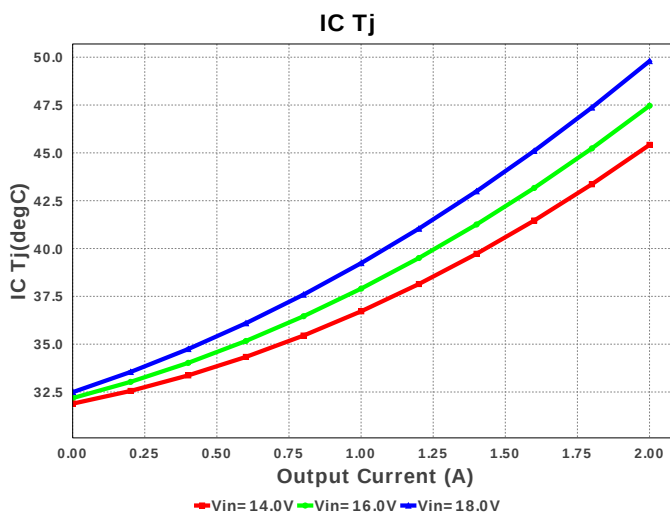
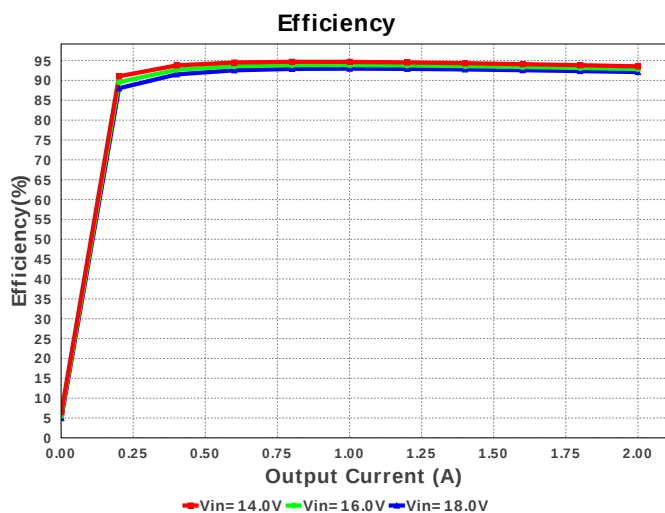


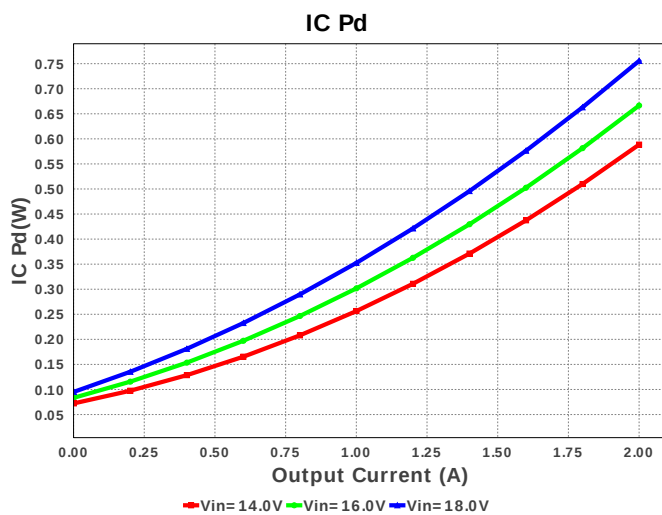
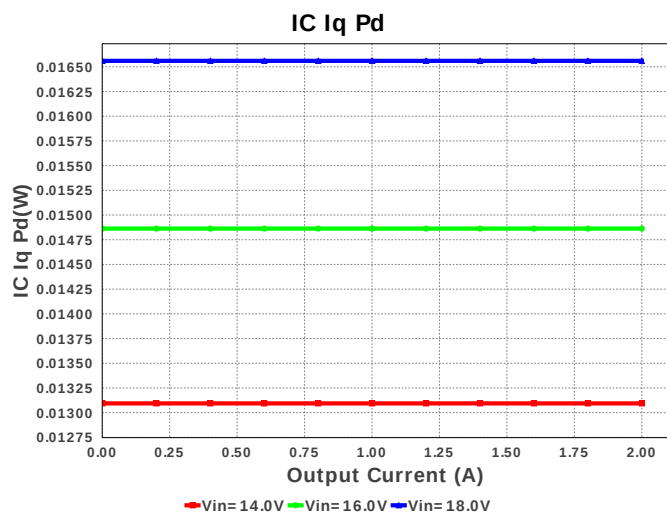
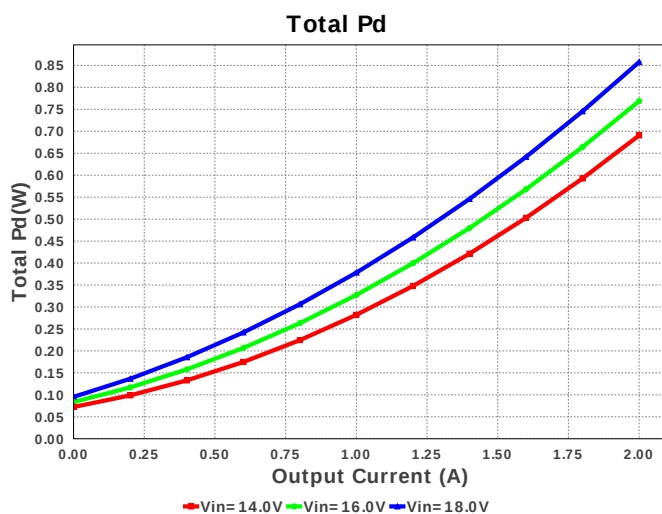
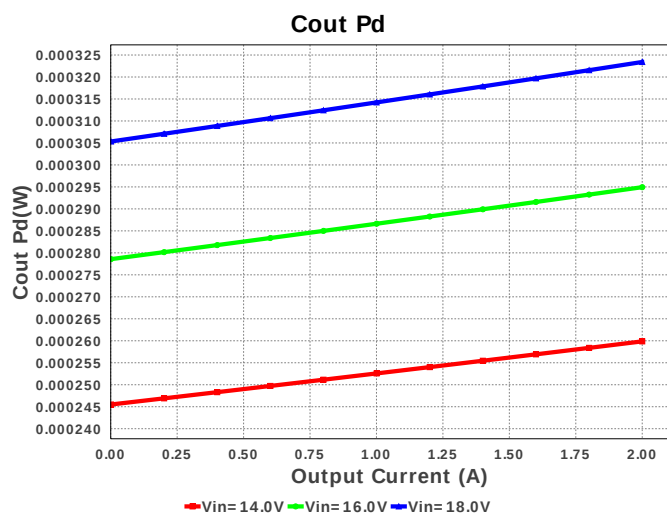
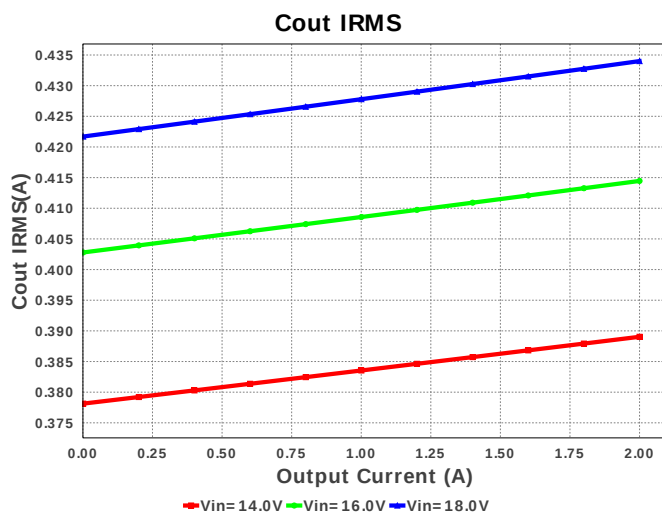
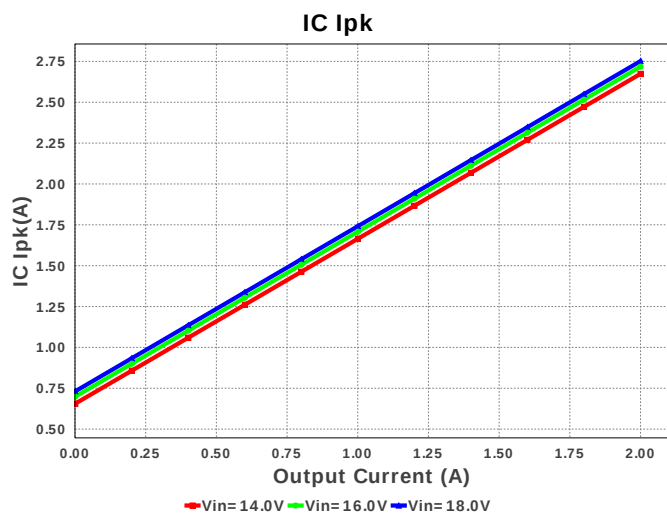
## Electrical BOM

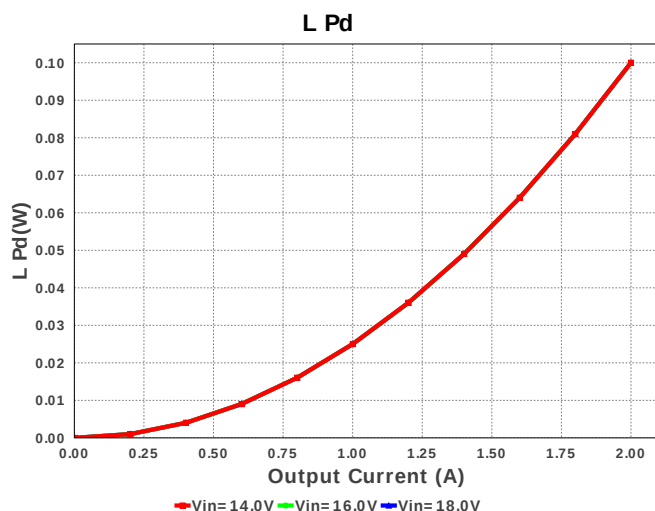
| #   | Name  | Manufacturer  | Part Number                          | Properties                                                       | Qty | Price  | Footprint                                                                                                        |
|-----|-------|---------------|--------------------------------------|------------------------------------------------------------------|-----|--------|------------------------------------------------------------------------------------------------------------------|
| 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.  | Cff   | Kemet         | C0805C100M4GACTU<br>Series= C0G/NP0  | Cap= 10.0 pF<br>VDC= 16.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 |  0805 7 mm <sup>2</sup>     |
| 3.  | Cin   | MuRata        | GRM32ER61E226KE15L<br>Series= X5R    | Cap= 22.0 µF<br>ESR= 2.0 mOhm<br>VDC= 25.0 V<br>IRMS= 3.67 A     | 1   | \$0.16 |  1210 15 mm <sup>2</sup>    |
| 4.  | Cout  | TDK           | C3216JB1A476M<br>Series= JB          | Cap= 47.0 µF<br>ESR= 1.717 mOhm<br>VDC= 10.0 V<br>IRMS= 0.0 A    | 1   | \$0.34 |  1206 11 mm <sup>2</sup>    |
| 5.  | Creg  | MuRata        | GRM188R61A105KA61D<br>Series= X5R    | Cap= 1.0 µF<br>ESR= 6.065 mOhm<br>VDC= 10.0 V<br>IRMS= 1.30675 A | 1   | \$0.01 |  0603 5 mm <sup>2</sup>     |
| 6.  | Css   | MuRata        | GRM033R61A822KA01D<br>Series= X5R    | Cap= 8.2 nF<br>VDC= 10.0 V<br>IRMS= 0.0 A                        | 1   | \$0.01 |  0201 2 mm <sup>2</sup>     |
| 7.  | L1    | Bourns        | SDR0805-3R3ML                        | L= 3.3 µH<br>DCR= 20.0 mOhm                                      | 1   | \$0.22 |  SDR0805 96 mm <sup>2</sup> |
| 8.  | Ren   | Vishay-Dale   | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 |  0402 3 mm <sup>2</sup>     |
| 9.  | Rfbb  | Yageo America | RC0603FR-0724KL<br>Series= ?         | Res= 24.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 |  0603 5 mm <sup>2</sup>     |
| 10. | Rfht  | Vishay-Dale   | CRCW0402133KFKED<br>Series= CRCW..e3 | Res= 133.0 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 |
|-----|------|-------------------|--------------|------------|-----|--------|-----------|
| 11. | U1   | Texas Instruments | TPS54427DDAR | Switcher   | 1   | \$0.80 |           |

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







## Operating Values

| #   | Name                | Value                 | Category | Description                                                                                |
|-----|---------------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS            | 903.674 mA            | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS           | 434.006 mA            | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | IC Ipk              | 2.752 A               | Current  | Peak switch current in IC                                                                  |
| 4.  | Iin Avg             | 603.2 mA              | Current  | Average input current                                                                      |
| 5.  | L Ipp               | 1.503 A               | Current  | Peak-to-peak inductor ripple current                                                       |
| 6.  | BOM Count           | 11                    | General  | Total Design BOM count                                                                     |
| 7.  | FootPrint           | 206.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 8.  | Frequency           | 749.102 kHz           | General  | Switching frequency                                                                        |
| 9.  | Pout                | 10.0 W                | General  | Total output power                                                                         |
| 10. | Total BOM           | \$1.59                | General  | Total BOM Cost                                                                             |
| 11. | ICThetaJA Effective | 26.2 degC/W           | Op_Point | Effective IC Junction-to-Ambient Thermal Resistance                                        |
| 12. | Vout Actual         | 5.004 V               | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 13. | Vout OP             | 5.0 V                 | Op_Point | Operational Output Voltage                                                                 |
| 14. | Duty Cycle          | 28.589 %              | Op_point | Duty cycle                                                                                 |
| 15. | Efficiency          | 92.102 %              | Op_point | Steady state efficiency                                                                    |
| 16. | IC Tj               | 49.796 degC           | Op_point | IC junction temperature                                                                    |
| 17. | IOUT_OP             | 2.0 A                 | Op_point | Iout operating point                                                                       |
| 18. | VIN_OP              | 18.0 V                | Op_point | Vin operating point                                                                        |
| 19. | Vout p-p            | 6.188 mV              | Op_point | Peak-to-peak output ripple voltage                                                         |
| 20. | Cin Pd              | 1.633 mW              | Power    | Input capacitor power dissipation                                                          |
| 21. | Cout Pd             | 323.416 $\mu$ W       | Power    | Output capacitor power dissipation                                                         |
| 22. | IC Iq Pd            | 16.56 mW              | Power    | IC Iq Pd                                                                                   |
| 23. | IC Pd               | 755.586 mW            | Power    | IC power dissipation                                                                       |
| 24. | L Pd                | 100.0 mW              | Power    | Inductor power dissipation                                                                 |
| 25. | Total Pd            | 857.533 mW            | Power    | Total Power Dissipation                                                                    |
| 26. | Vout Tolerance      | 3.573 %               |          | 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  | 18.0     | Maximum input voltage              |
| 3. | VinMin  | 14.0     | Minimum input voltage              |
| 4. | Vout    | 5.0      | Output Voltage                     |
| 5. | base_pn | TPS54427 | Texas Instruments Base Part Number |
| 6. | source  | DC       | Input Source Type                  |
| 7. | ta      | 30.0     | Ambient temperature                |

## Design Assistance

1. [TPS54427 Product Folder](http://www.ti.com/product/TPS54427) : <http://www.ti.com/product/TPS54427> : contains the data sheet and other resources.

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