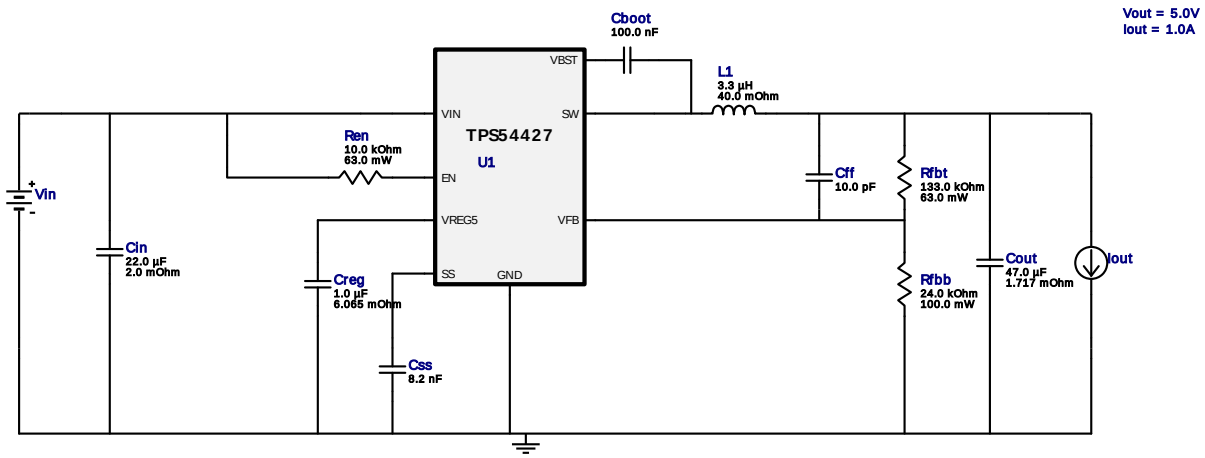
# WEBENCH® Design Report

VinMin = 12.0V
VinMax = 14.0V
Vout = 5.0V
Iout = 1.0A

Device = TPS54427DDAR
Topology = Buck
Created = 7/17/16 11:32:34 PM
BOM Cost = $1.46
BOM Count = 11
Total Pd = 0.31W

Design : 4743458/19 TPS54427DDAR
TPS54427DDAR 12.0V-14.0V to 5.00V @ 1.0A

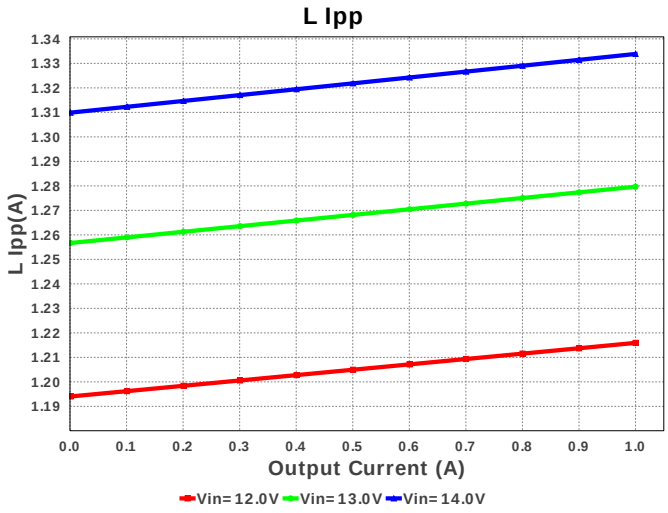


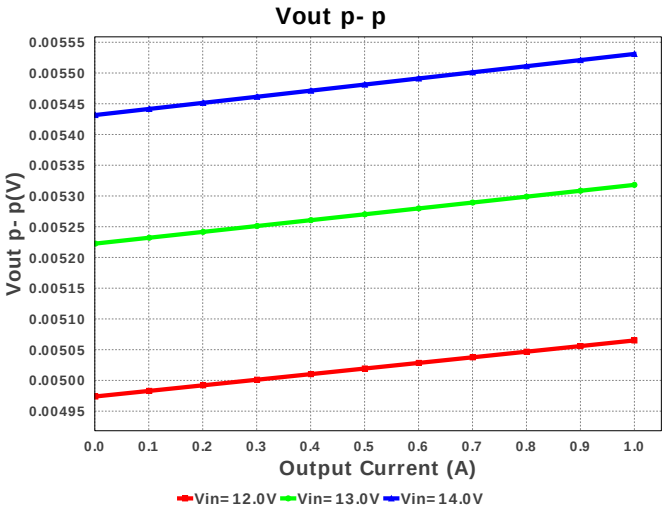

## Electrical BOM

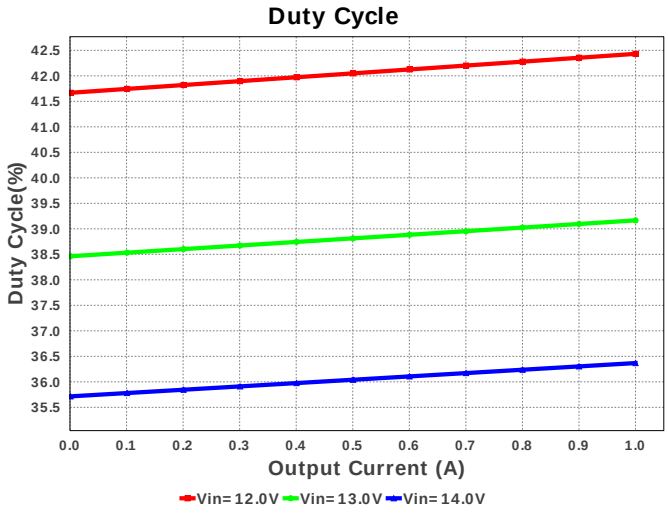
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | Cboot | MuRata | GRM155R61A104KA01D<br>Series= X5R | Cap= 100.0 nF<br>VDC= 10.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm² |
| 2. | Cff | Kemet | C0805C100M4GACTU<br>Series= C0G/NP0 | Cap= 10.0 pF<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm² |
| 3. | Cin | MuRata | GRM32ER61E226KE15L<br>Series= X5R | Cap= 22.0 uF<br>ESR= 2.0 mOhm<br>VDC= 25.0 V<br>IRMS= 3.67 A | 1 | $0.16 | 1210 15 mm² |
| 4. | Cout | TDK | C3216JB1A476M<br>Series= JB | Cap= 47.0 uF<br>ESR= 1.717 mOhm<br>VDC= 10.0 V<br>IRMS= 0.0 A | 1 | $0.34 | 1206 11 mm² |
| 5. | Creg | MuRata | GRM188R61A105KA61D<br>Series= X5R | Cap= 1.0 uF<br>ESR= 6.065 mOhm<br>VDC= 10.0 V<br>IRMS= 1.30675 A | 1 | $0.01 | 0603 5 mm² |
| 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 mm² |
| 7. | L1 | NIC Components | NPI54C3R3MTRF | L= 3.3 µH<br>DCR= 40.0 mOhm | 1 | $0.09 | IND_NPI54C 61 mm² |
| 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 mm² |
| 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 mm² |
| 10. | Rfbt | 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 mm² |

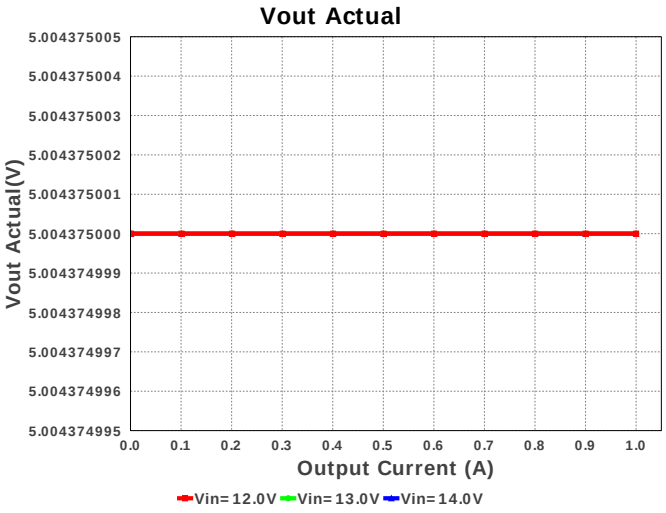
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 11. | U1 | Texas Instruments | TPS54427DDAR | Switcher | 1 | $0.80 | |

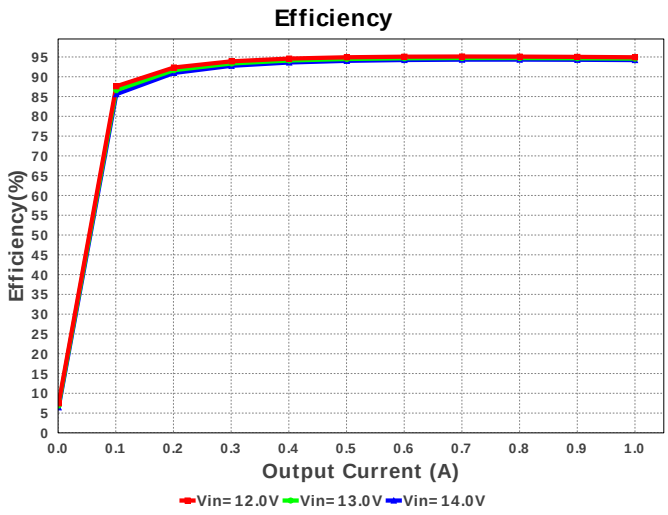
R-PDSO-G8 57 mm$^2$

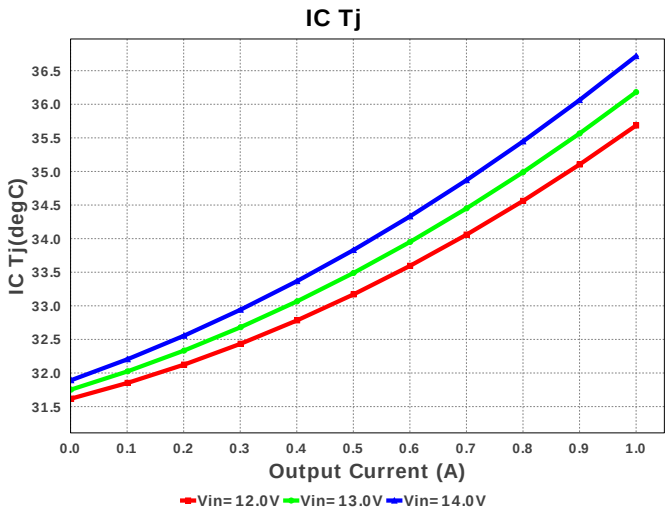


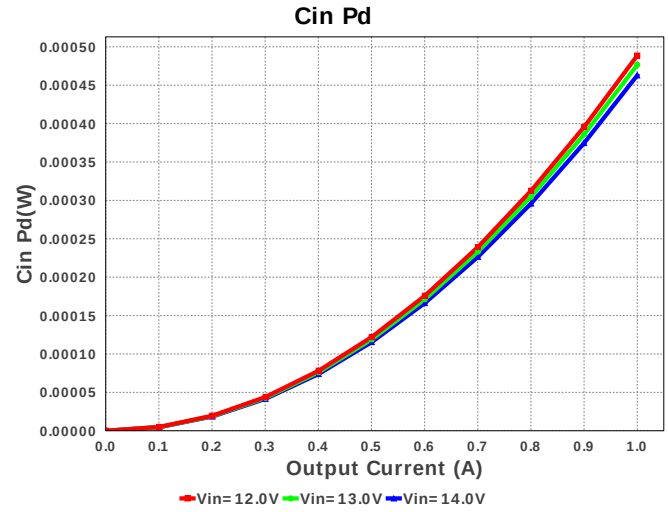



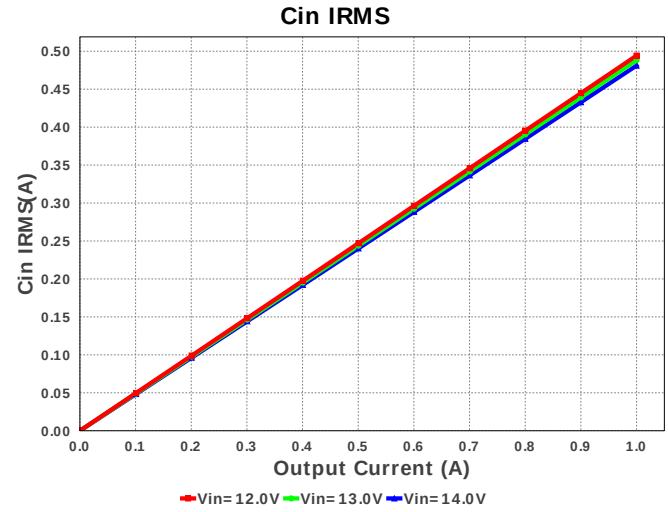



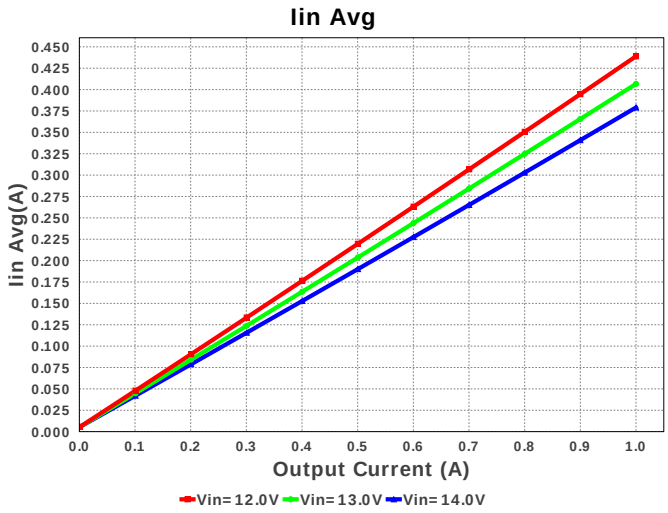



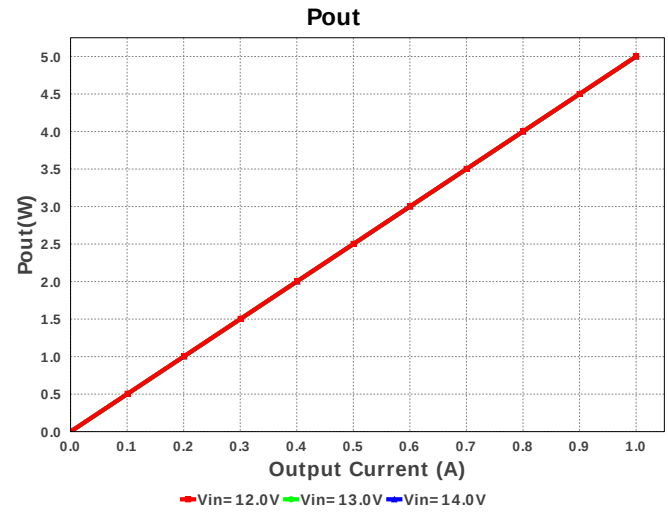


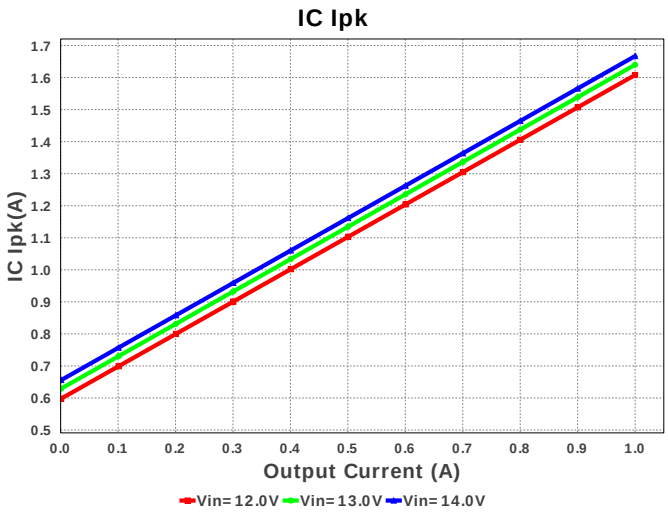



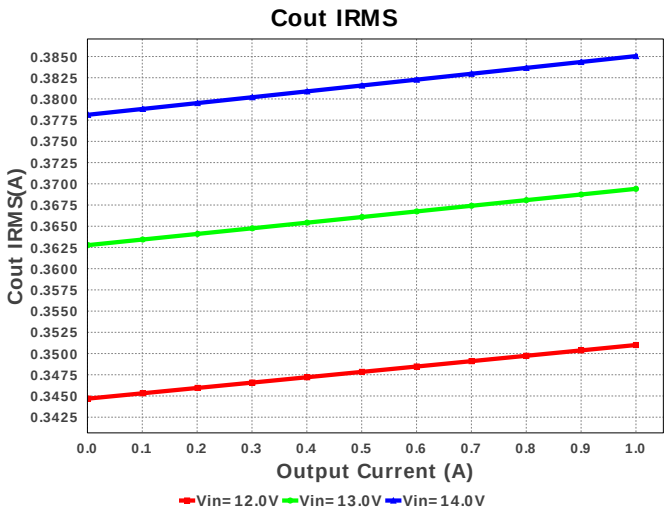



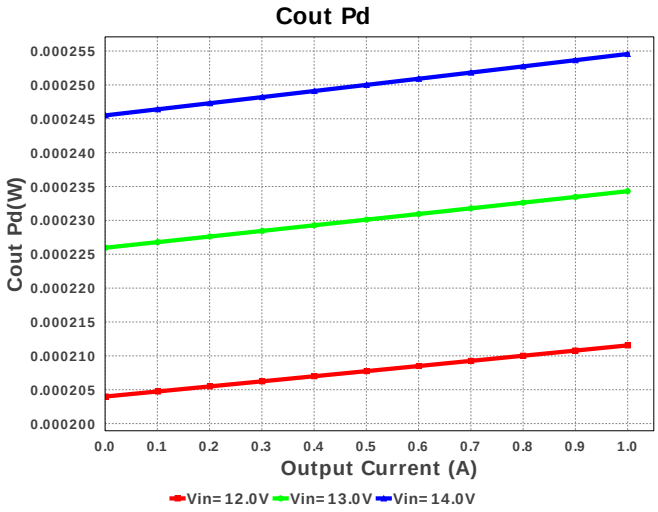



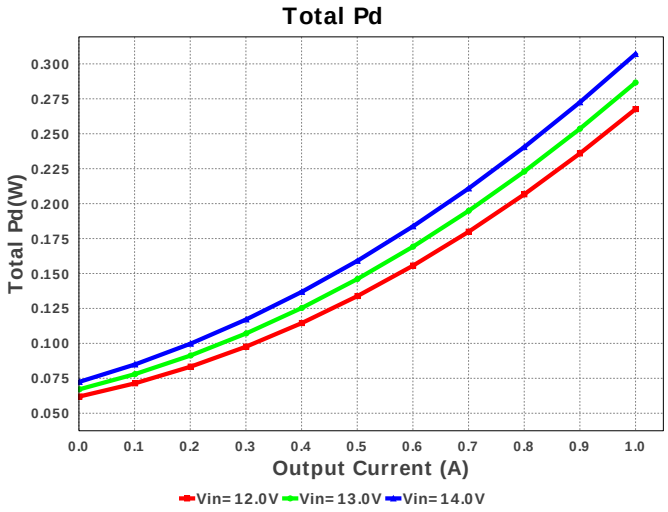



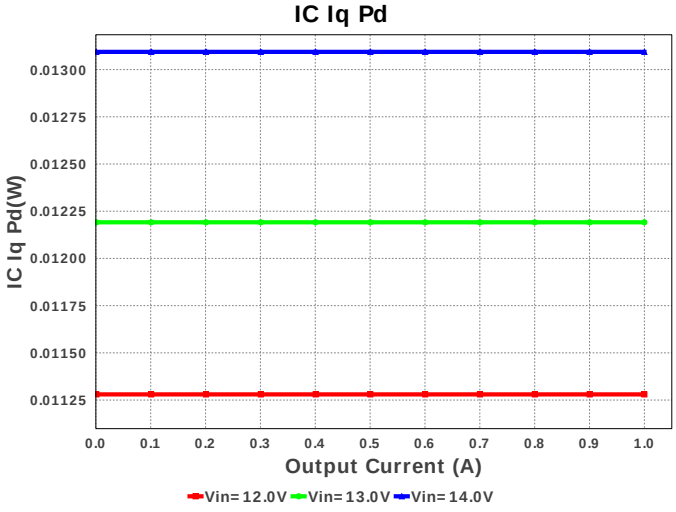



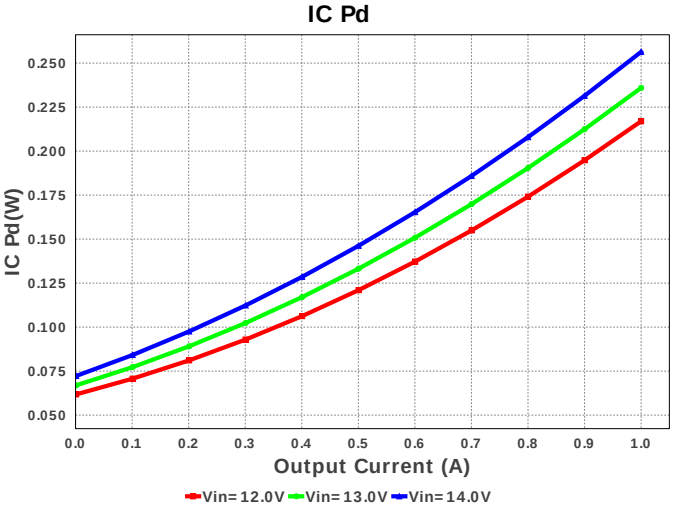


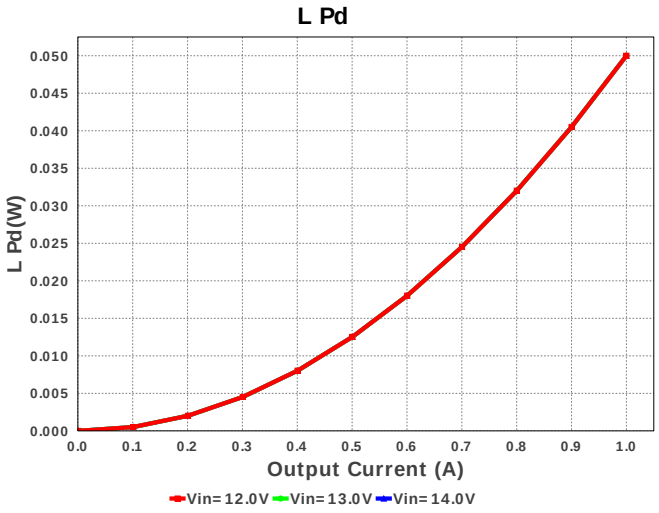






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 481.058 mA | Current | Input capacitor RMS ripple current |
| 2. | Cout IRMS | 385.048 mA | Current | Output capacitor RMS ripple current |
| 3. | IC Ipk | 1.667 A | Current | Peak switch current in IC |
| 4. | Iin Avg | 379.08 mA | Current | Average input current |
| 5. | L Ipp | 1.334 A | Current | Peak-to-peak inductor ripple current |
| 6. | BOM Count | 11 | General | Total Design BOM count |
| 7. | FootPrint | 171.0 $mm^2$ | General | Total Foot Print Area of BOM components |
| 8. | Frequency | 743.605 kHz | General | Switching frequency |
| 9. | Pout | 5.0 W | General | Total output power |
| 10. | Total BOM | $1.46 | 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 | 36.368 % | Op_point | Duty cycle |
| 15. | Efficiency | 94.214 % | Op_point | Steady state efficiency |
| 16. | IC Tj | 36.717 degC | Op_point | IC junction temperature |
| 17. | IOUT_OP | 1.0 A | Op_point | Iout operating point |
| 18. | VIN_OP | 14.0 V | Op_point | Vin operating point |
| 19. | Vout p-p | 5.531 mV | Op_point | Peak-to-peak output ripple voltage |
| 20. | Cin Pd | 462.834 µW | Power | Input capacitor power dissipation |
| 21. | Cout Pd | 254.565 µW | Power | Output capacitor power dissipation |
| 22. | IC Iq Pd | 13.094 mW | Power | IC Iq Pd |
| 23. | IC Pd | 256.377 mW | Power | IC power dissipation |
| 24. | L Pd | 50.0 mW | Power | Inductor power dissipation |
| 25. | Total Pd | 307.07 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 | 1.0 | Maximum Output Current |
| 2. | VinMax | 14.0 | Maximum input voltage |
| 3. | VinMin | 12.0 | Minimum input voltage |
| 4. | Vout | 5.0 | Output Voltage |
| 5. | base_pn | TPS54427 | Base Product 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 : contains the data sheet and other resources.