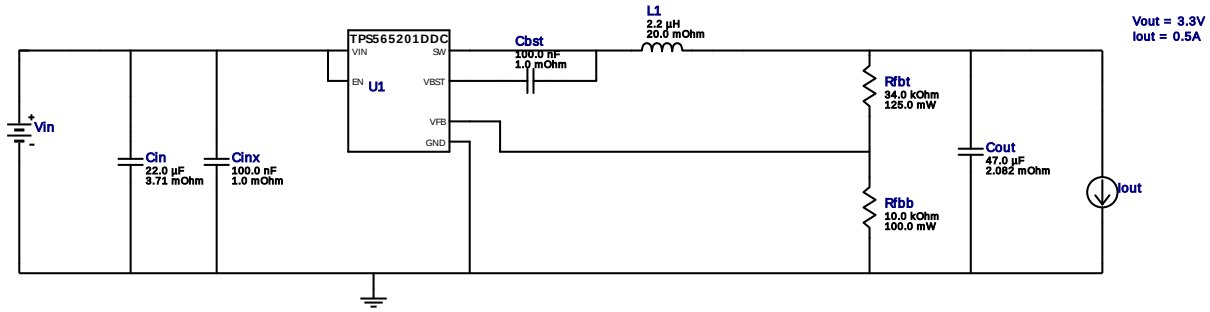
# WEBENCH® Design Report

VinMin = 5.0V
VinMax = 5.0V
Vout = 3.3V
Iout = 0.5A

Device = TPS565201DDCR
Topology = Buck
Created = 2018-04-20 08:00:30.044
BOM Cost = $1.89
BOM Count = 8
Total Pd = 0.06W

Design : 5286684/42 TPS565201DDCR
TPS565201DDCR 5.0V-5.0V to 3.30V @ 0.5A

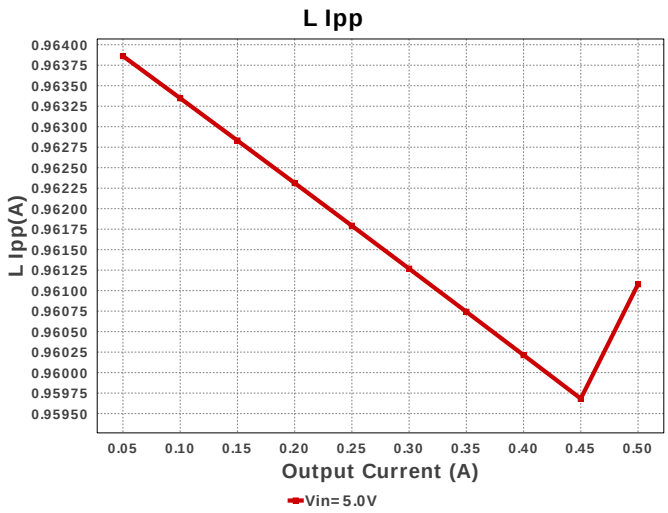


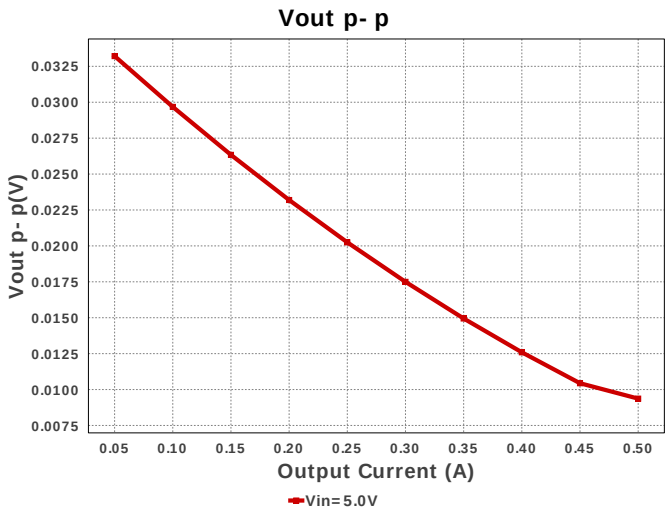

## My Comments

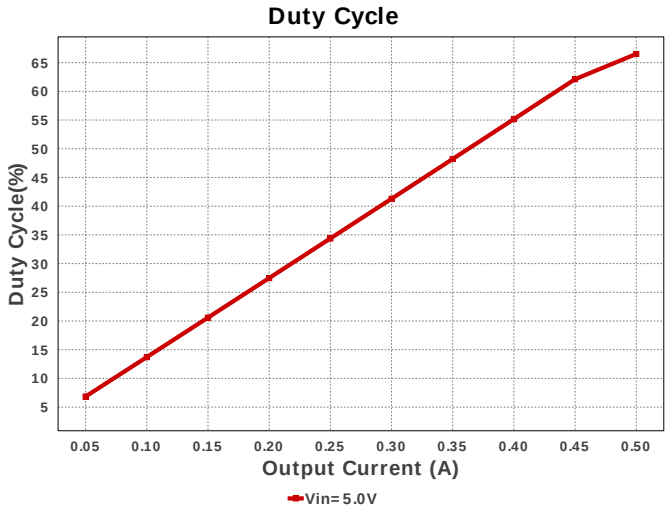
No comments

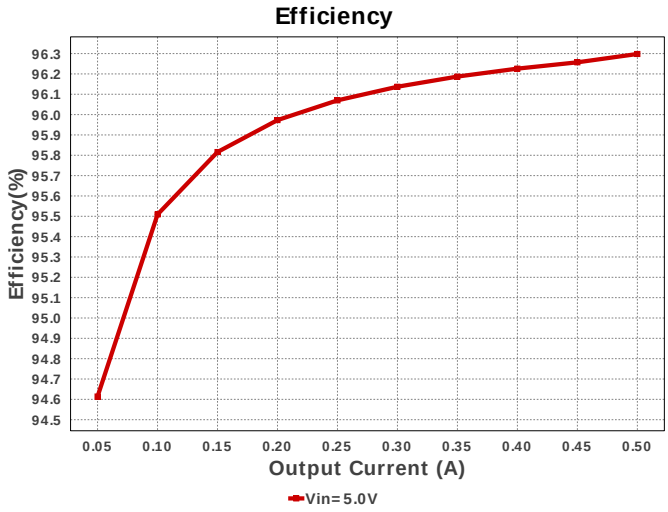
## Electrical BOM

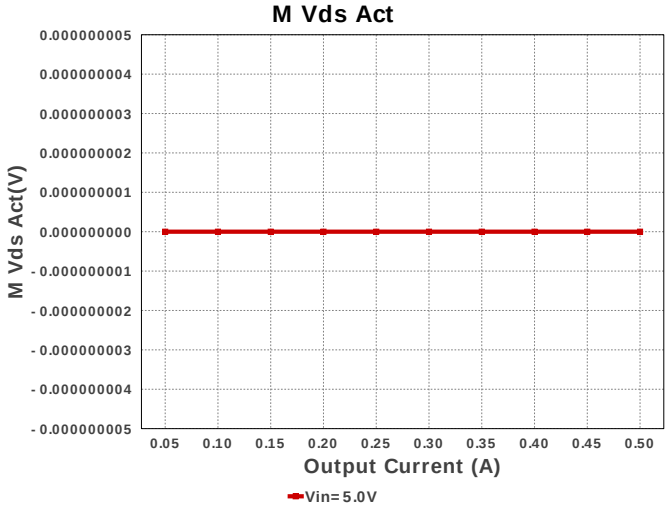
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | Cbst | Kemet | C0603C104Z3VACTU<br>Series= Y5V | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0603 5 mm² |
| 2. | Cin | TDK | C1608X5R1A226M080AC<br>Series= X5R | Cap= 22.0 uF<br>ESR= 3.71 mOhm<br>VDC= 10.0 V<br>IRMS= 2.69936 A | 1 | $0.16 | 0603 5 mm² |
| 3. | Cinx | MuRata | GRM155R60J104KA01D<br>Series= X5R | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 6.3 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm² |
| 4. | Cout | TDK | C3216X5R1E476M160AC<br>Series= X5R | Cap= 47.0 uF<br>ESR= 2.082 mOhm<br>VDC= 25.0 V<br>IRMS= 5.0279 A | 1 | $0.50 | 1206 11 mm² |
| 5. | L1 | TDK | CLF6045T-2R2N | L= 2.2 µH<br>DCR= 20.0 mOhm | 1 | $0.39 | CLF6045 68 mm² |
| 6. | Rfbb | Yageo America | RC0603FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0603 5 mm² |
| 7. | Rfbt | Vishay-Dale | CRCW080534K0FKEA<br>Series= CRCW..e3 | Res= 34.0 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0805 7 mm² |
| 8. | U1 | Texas Instruments | TPS565201DDCR | Switcher | 1 | $0.80 | DDC0006A_N 10 mm² |

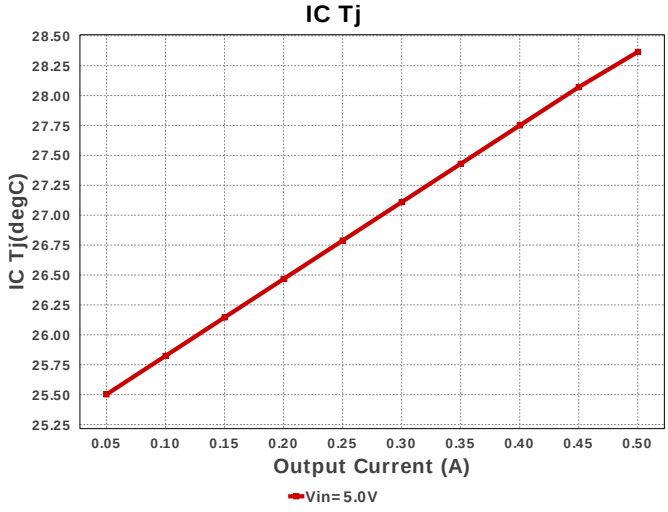


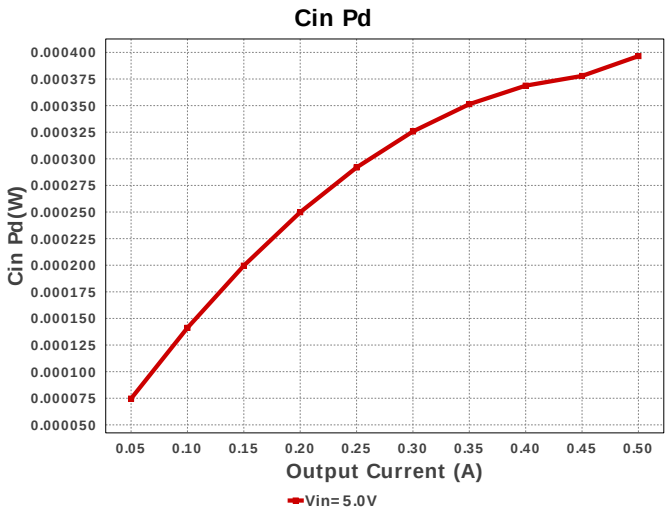



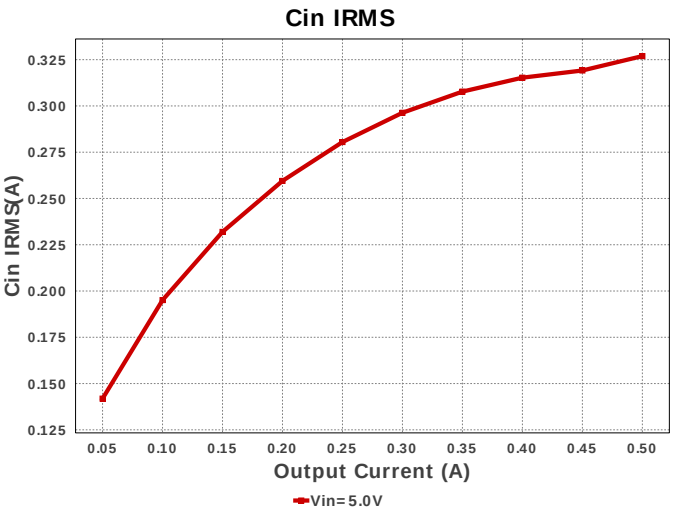



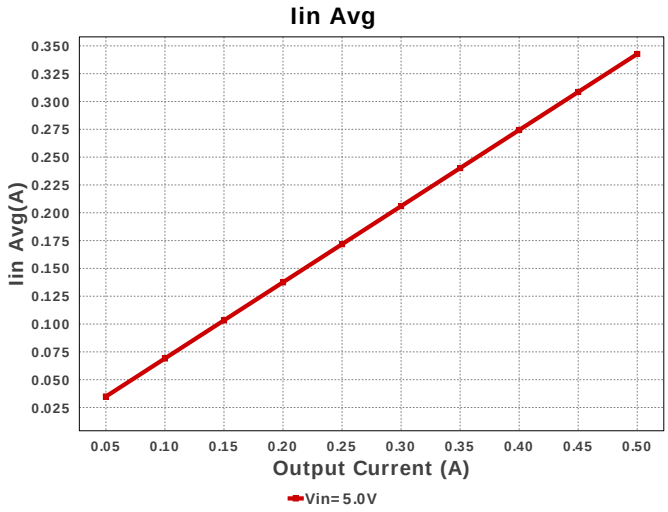



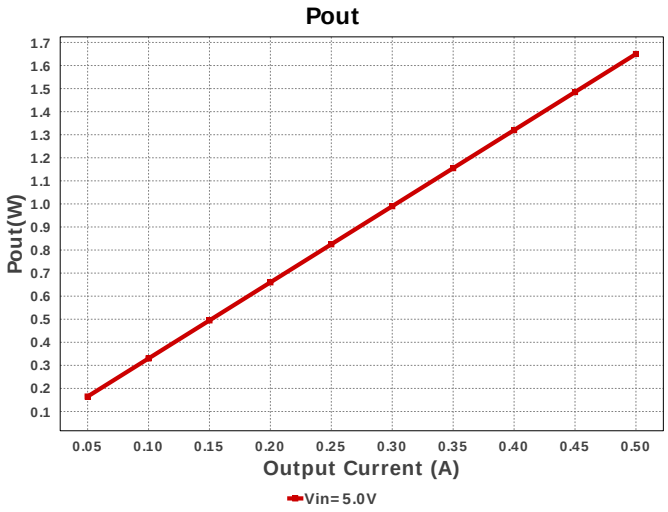



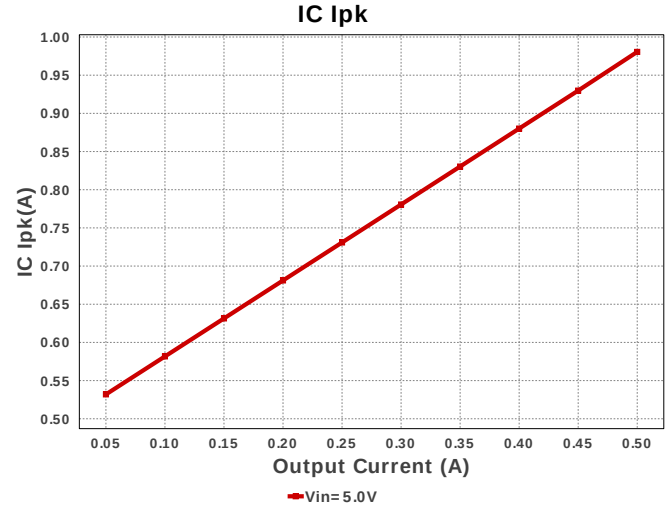



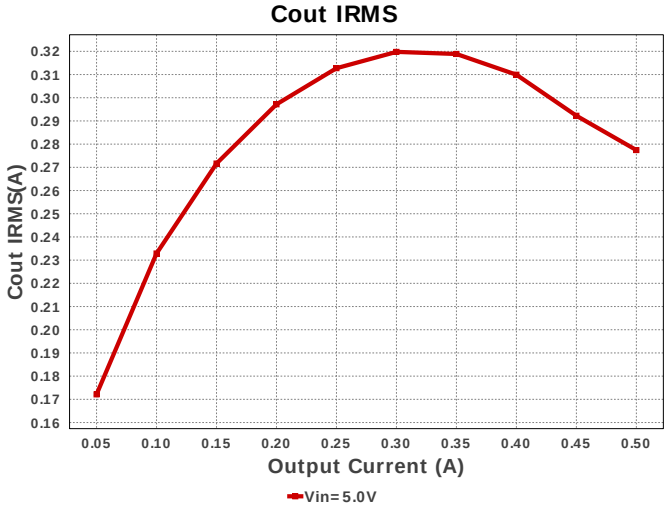


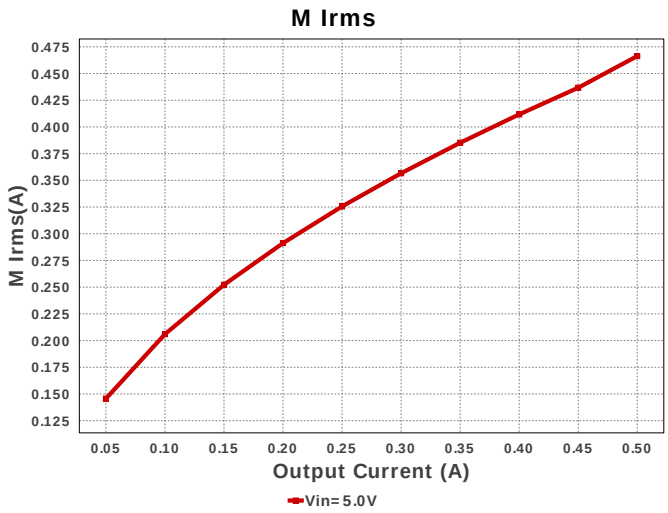



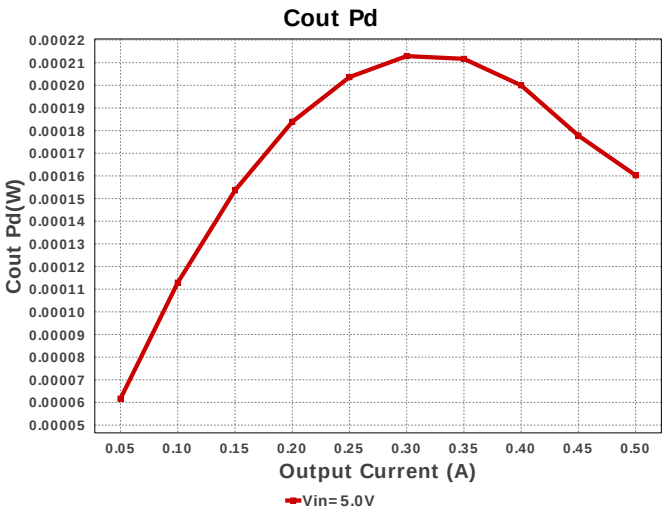



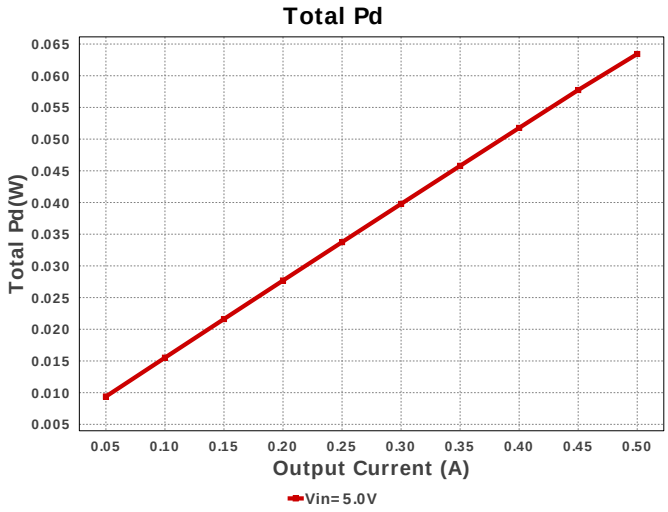



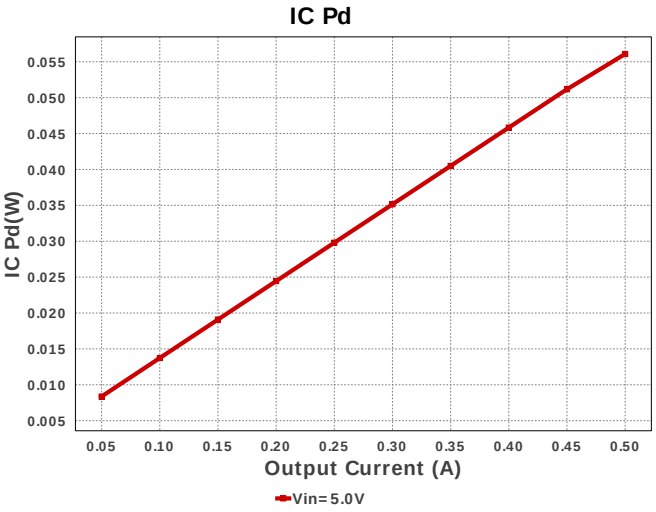



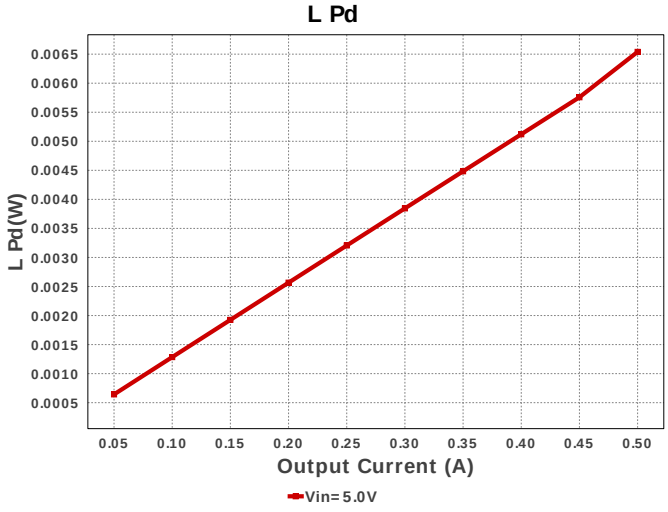






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 326.925 mA | Current | Input capacitor RMS ripple current |
| 2. | Cout IRMS | 277.439 mA | Current | Output capacitor RMS ripple current |
| 3. | IC Ipk | 980.539 mA | Current | Peak switch current in IC |
| 4. | Iin Avg | 342.69 mA | Current | Average input current |
| 5. | L Ipp | 961.08 mA | Current | Peak-to-peak inductor ripple current |
| 6. | M1 Irms | 466.321 mA | Current | Q Iavg |
| 7. | BOM Count | 8 | General | Total Design BOM count |
| 8. | FootPrint | 113.0 $mm^2$ | General | Total Foot Print Area of BOM components |
| 9. | Frequency | 526.407 kHz | General | Switching frequency |
| 10. | IC Tolerance | 10.0 mV | General | IC Feedback Tolerance |
| 11. | M Vds Act | 0.0 V | General | Voltage drop across the MosFET |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 12. | Mode | CCM | General | Conduction Mode |
| 13. | Pout | 1.65 W | General | Total output power |
| 14. | Total BOM | $1.89 | General | Total BOM Cost |
| 15. | Duty Cycle | 66.506 % | Op Point | Duty cycle |
| 16. | Efficiency | 96.298 % | Op Point | Steady state efficiency |
| 17. | IC Tj | 28.365 degC | Op Point | IC junction temperature |
| 18. | ICThetaJA | 60.0 degC/W | Op Point | IC junction-to-ambient thermal resistance |
| 19. | IOUT_OP | 500.0 mA | Op Point | Iout operating point |
| 20. | VIN_OP | 5.0 V | Op Point | Vin operating point |
| 21. | Vout Actual | 3.366 V | Op Point | Vout Actual calculated based on selected voltage divider resistors |
| 22. | Vout OP | 3.3 V | Op Point | Operational Output Voltage |
| 23. | Vout Tolerance | 2.889 % | Op Point | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |
| 24. | Vout p-p | 9.368 mV | Op Point | Peak-to-peak output ripple voltage |
| 25. | Cin Pd | 396.525 µW | Power | Input capacitor power dissipation |
| 26. | Cout Pd | 160.257 µW | Power | Output capacitor power dissipation |
| 27. | IC Pd | 56.089 mW | Power | IC power dissipation |
| 28. | L Pd | 6.539 mW | Power | Inductor power dissipation |
| 29. | Total Pd | 63.432 mW | Power | Total Power Dissipation |

## Design Inputs

| # | Name | Value | Description |
|---|---|---|---|
| 1. | Iout | 500.0 m | Maximum Output Current |
| 2. | VinMax | 5.0 | Maximum input voltage |
| 3. | VinMin | 5.0 | Minimum input voltage |
| 4. | Vout | 3.3 | Output Voltage |
| 5. | base_pn | TPS565201 | Base Product Number |
| 6. | source | DC | Input Source Type |
| 7. | Ta | 25.0 | Ambient temperature |

## Design Assistance

1. **TPS565201** Product Folder : http://www.ti.com/product/TPS565201 : contains the data sheet and other resources.