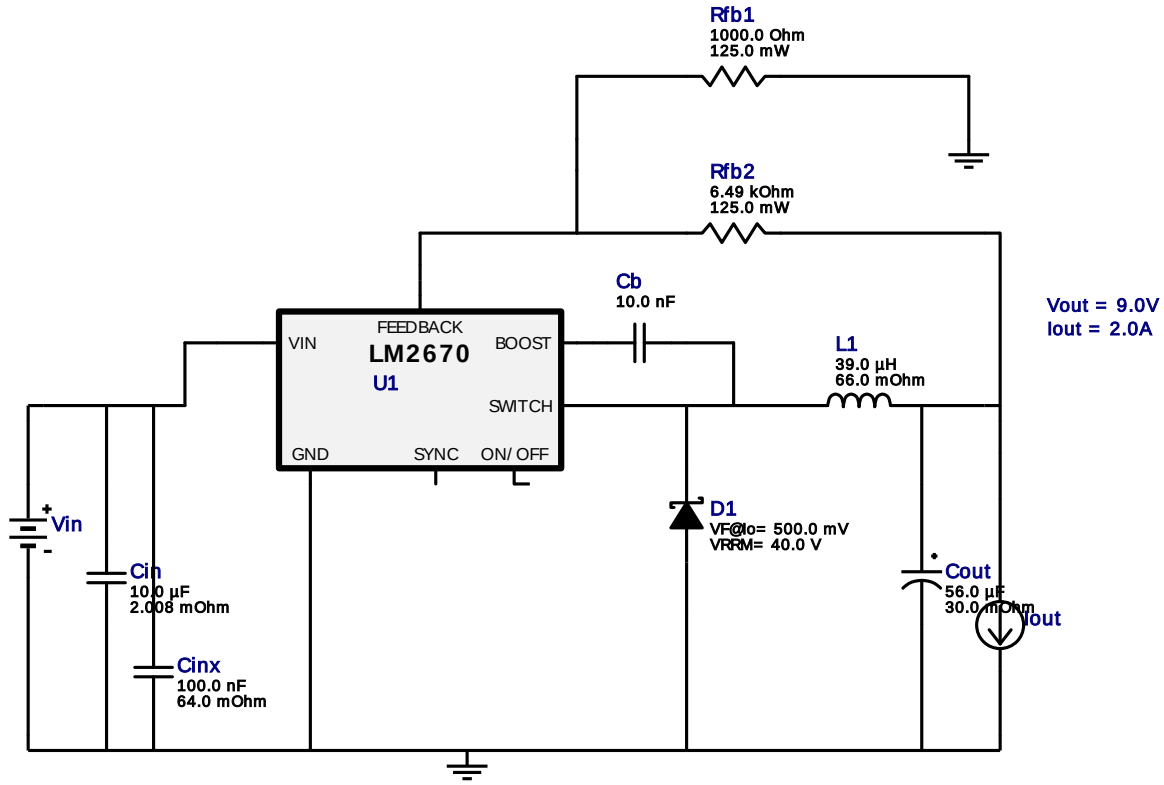
# WEBENCH® Design Report

VinMin = 14.0V
VinMax = 25.0V
Vout = 9.0V
Iout = 2.0A

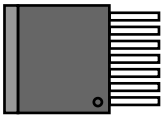
Device = LM2670SX-ADJ/NOPB
Topology = Buck
Created = 7/15/16 6:35:04 PM
BOM Cost = $2.99
BOM Count = 9
Total Pd = 1.32W

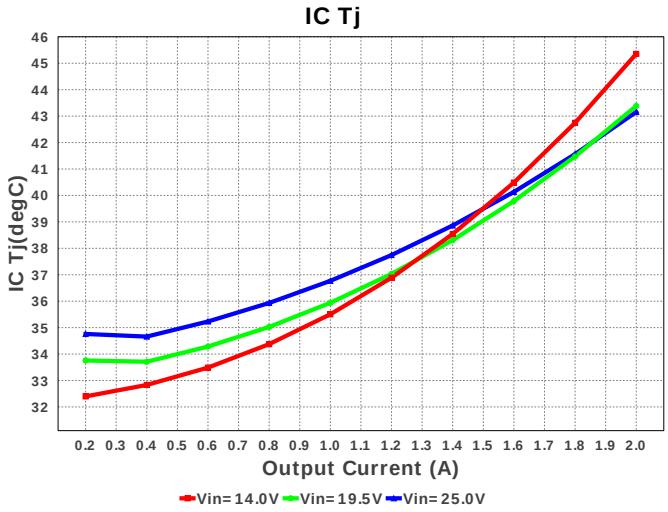
Design : 4742013/12 LM2670SX-ADJ/NOPB
LM2670SX-ADJ/NOPB 14.0V-25.0V to 9.00V @ 2.0A

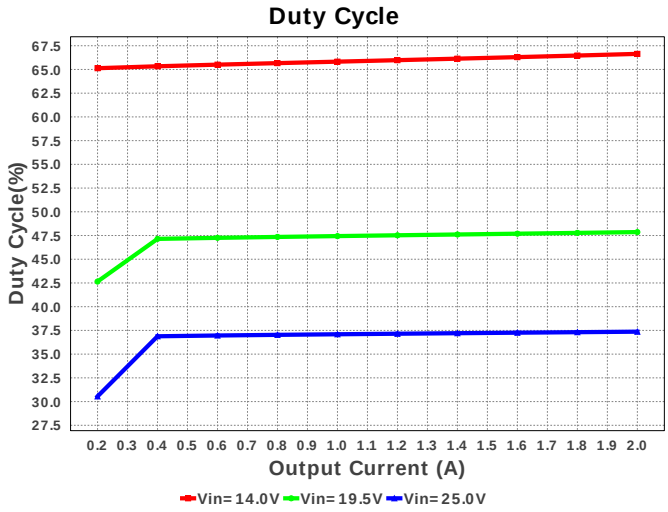


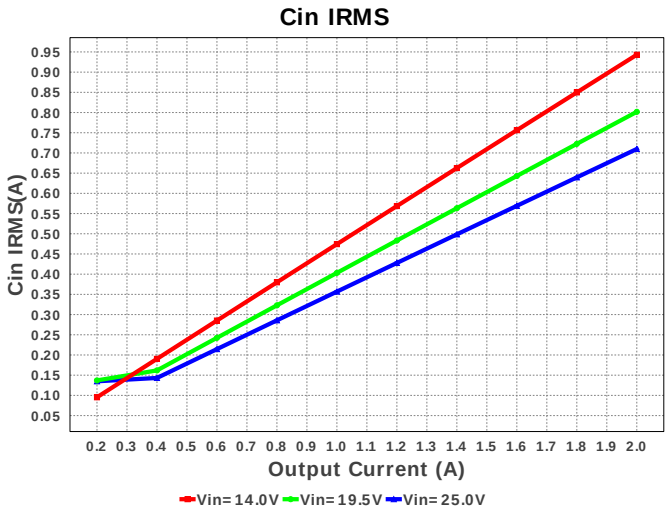

## Electrical BOM

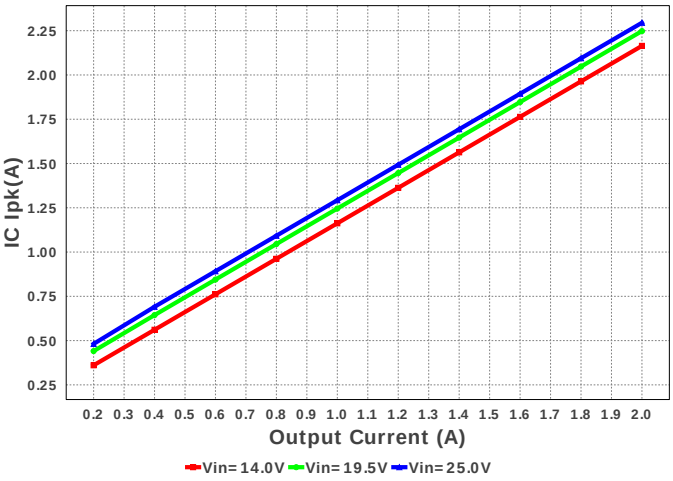
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | Cb | MuRata | GRM216R71H103KA01D<br>Series= X7R | Cap= 10.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm² |
| 2. | Cin | MuRata | GRM32ER7YA106KA12L<br>Series= X7R | Cap= 10.0 uF<br>ESR= 2.008 mOhm<br>VDC= 35.0 V<br>IRMS= 4.6772 A | 1 | $0.22 | 1210_280 15 mm² |
| 3. | Cinx | Kemet | C0805C104K5RACTU<br>Series= X7R | Cap= 100.0 nF<br>ESR= 64.0 mOhm<br>VDC= 50.0 V<br>IRMS= 1.64 A | 1 | $0.01 | 0805 7 mm² |
| 4. | Cout | Panasonic | 20SVPF56MX<br>Series= ? | Cap= 56.0 uF<br>ESR= 30.0 mOhm<br>VDC= 20.0 V<br>IRMS= 2.8 A | 1 | $0.35 | CAPSMT_62_E61 53 mm² |
| 5. | D1 | Diodes Inc. | B240A-13-F | VF@Io= 500.0 mV<br>VRRM= 40.0 V | 1 | $0.09 | SMA 37 mm² |
| 6. | L1 | Bourns | SRR1210-390M | L= 39.0 µH<br>DCR= 66.0 mOhm | 1 | $0.44 | SRR1210 196 mm² |

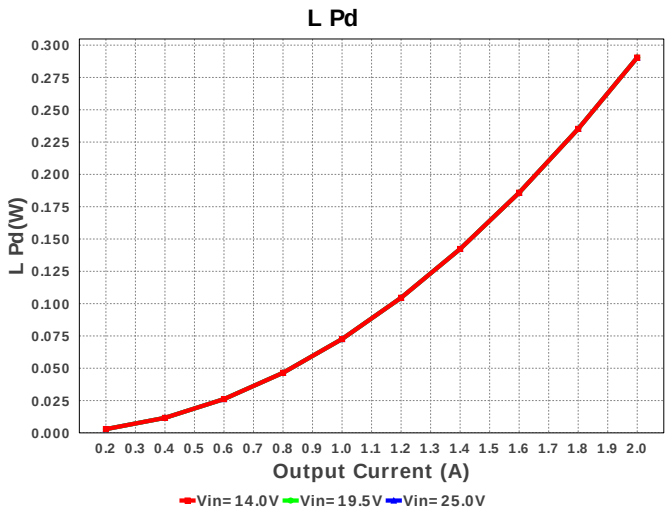
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 7. | Rfb1 | Panasonic | ERJ-6ENF1001V<br>Series= ERJ-6E | Res= 1000.0 Ohm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0805 7 mm$^2$ |
| 8. | Rfb2 | Panasonic | ERJ-6ENF6491V<br>Series= ERJ-6E | Res= 6.49 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0805 7 mm$^2$ |
| 9. | U1 | Texas Instruments | LM2670SX-ADJ/NOPB | Switcher | 1 | $1.85 |  <br>TS7B 199 mm$^2$ |

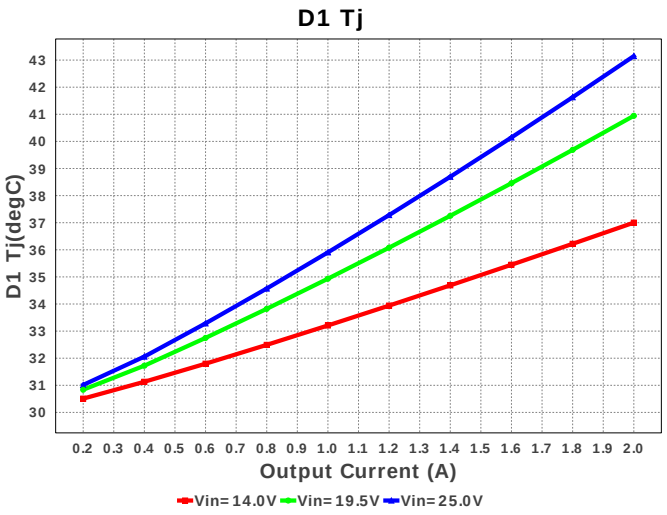


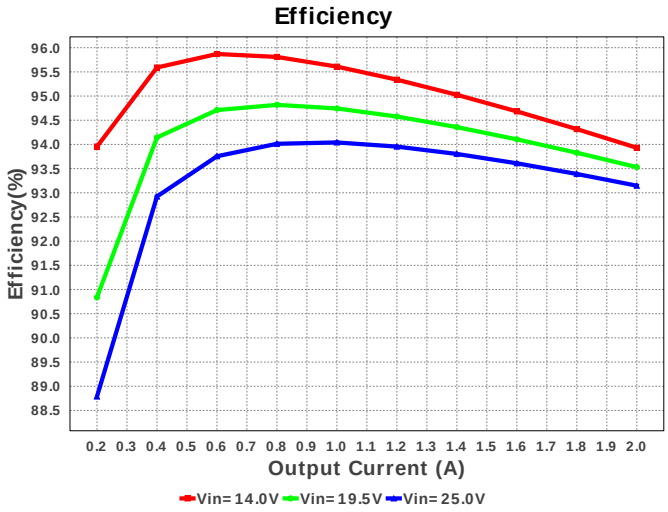



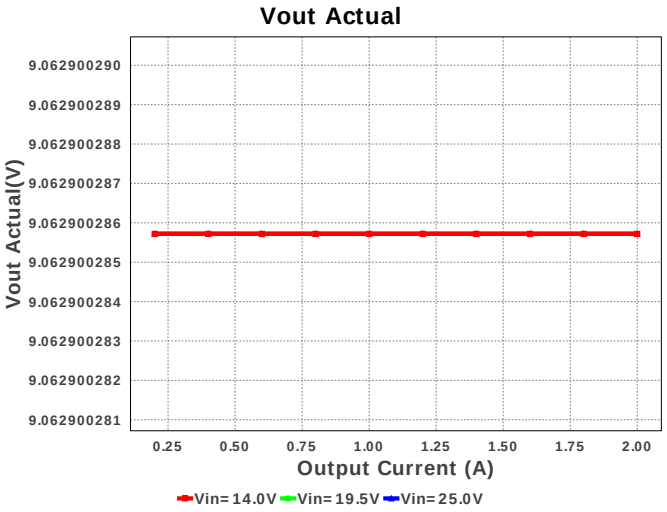



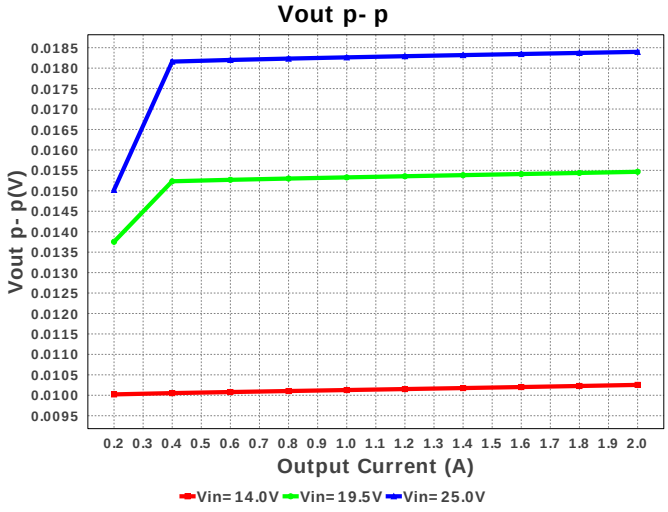



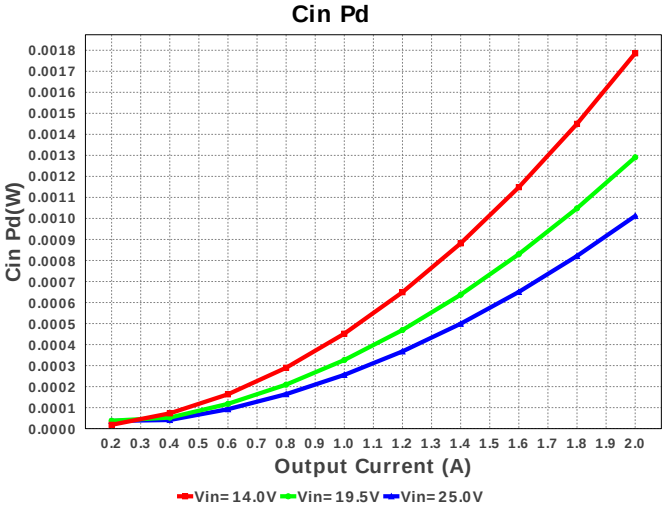


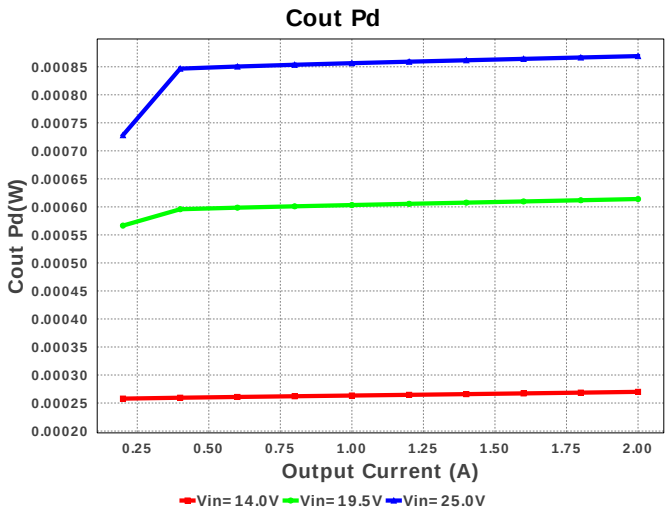



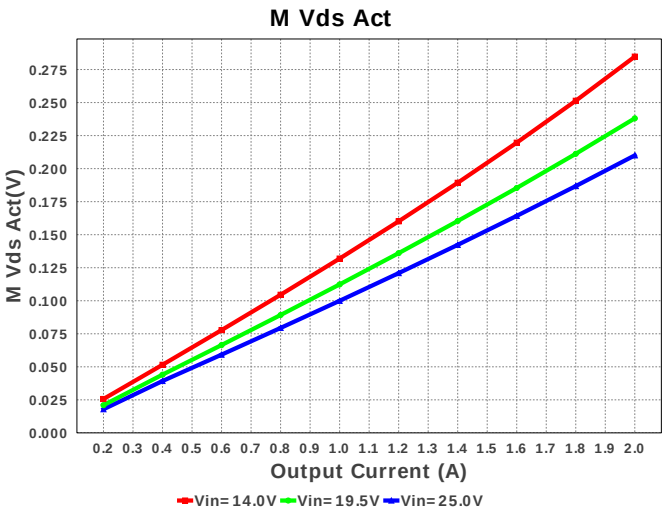



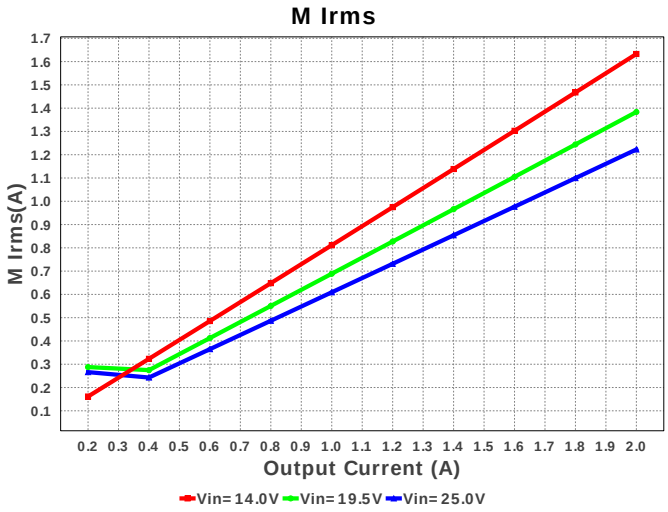



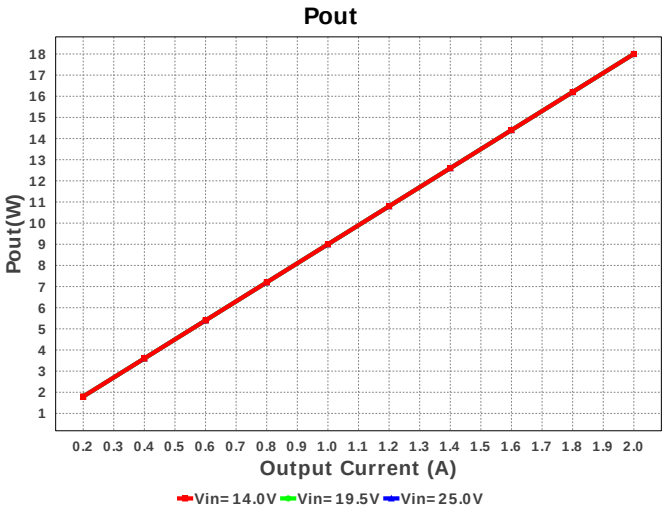



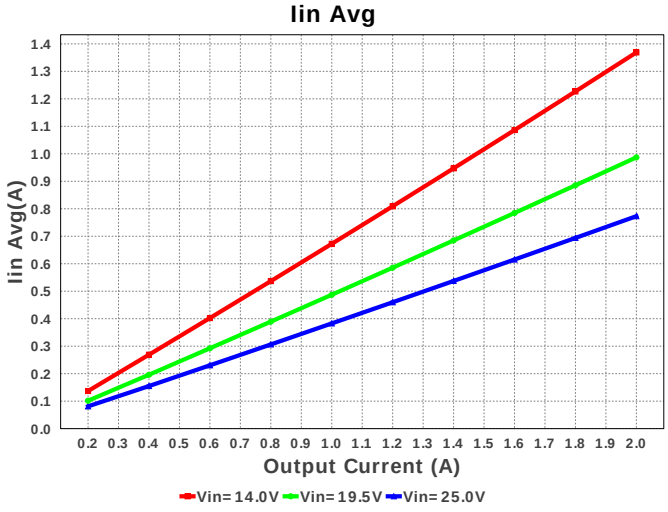



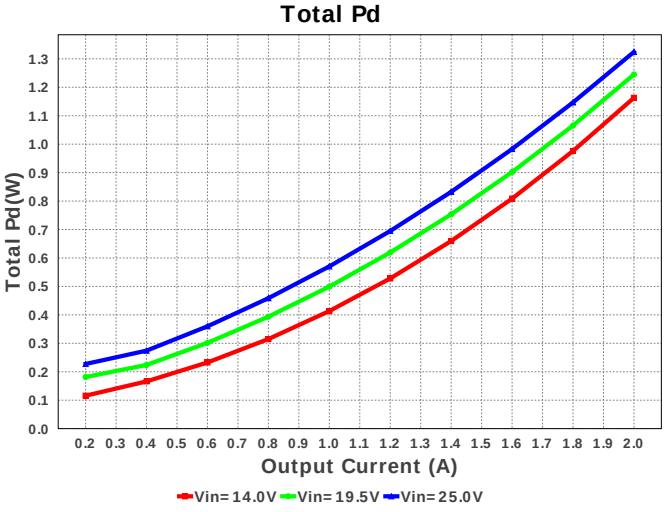


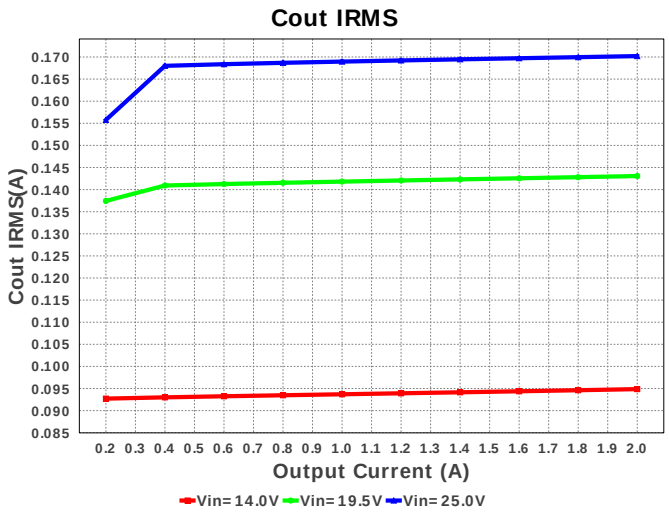



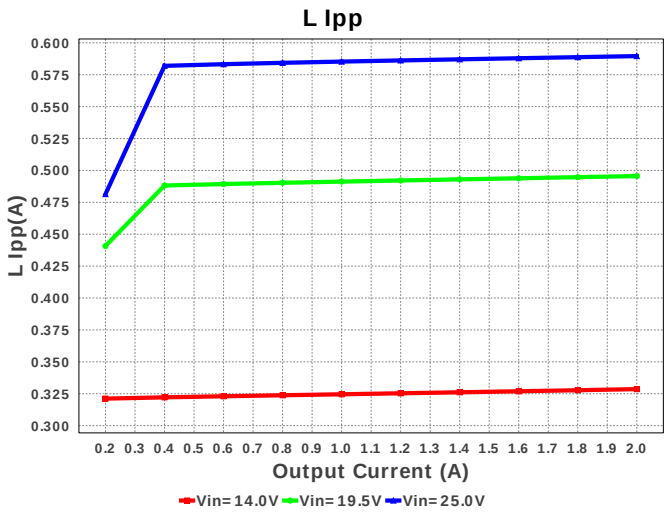



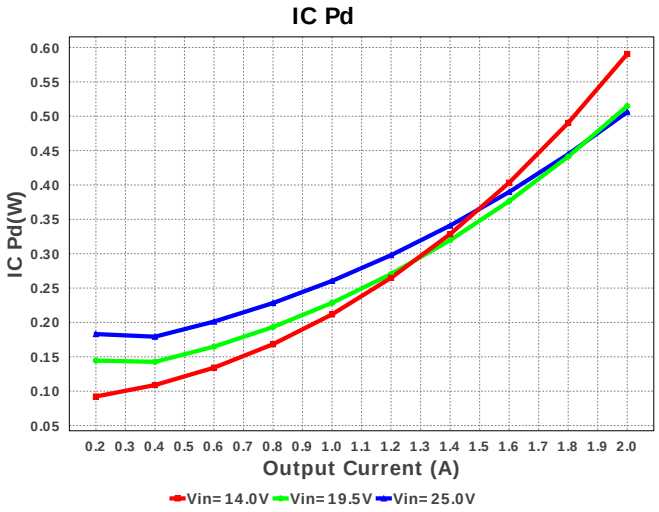



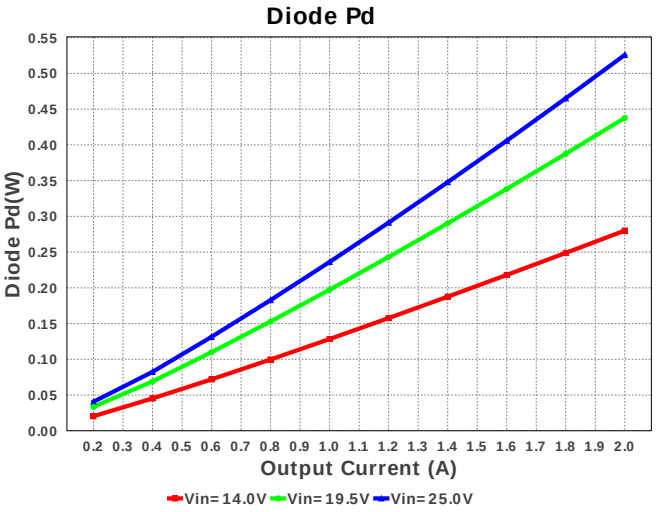






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 709.806 mA | Current | Input capacitor RMS ripple current |
| 2. | Cout IRMS | 170.202 mA | Current | Output capacitor RMS ripple current |
| 3. | IC Ipk | 2.295 A | Current | Peak switch current in IC |
| 4. | Iin Avg | 772.97 mA | Current | Average input current |
| 5. | L Ipp | 589.6 mA | Current | Peak-to-peak inductor ripple current |
| 6. | M1 Irms | 1.223 A | Current | Q Iavg |
| 7. | BOM Count | 9 | General | Total Design BOM count |
| 8. | FootPrint | 527.0 $mm^2$ | General | Total Foot Print Area of BOM components |
| 9. | Frequency | 260.0 kHz | General | Switching frequency |
| 10. | IC Tolerance | 24.0 mV | General | IC Feedback Tolerance |
| 11. | M Vds Act | 210.022 mV | General | Voltage drop across the MosFET |
| 12. | Pout | 18.0 W | General | Total output power |
| 13. | Total BOM | $2.99 | General | Total BOM Cost |
| 14. | D1 Tj | 43.147 degC | Op_Point | D1 junction temperature |
| 15. | Vout Actual | 9.063 V | Op_Point | Vout Actual calculated based on selected voltage divider resistors |
| 16. | Vout OP | 9.0 V | Op_Point | Operational Output Voltage |
| 17. | Cross Freq | 22.197 kHz | Op_point | Bode plot crossover frequency |
| 18. | Duty Cycle | 37.366 % | Op_point | Duty cycle |
| 19. | Efficiency | 93.147 % | Op_point | Steady state efficiency |
| 20. | IC Tj | 43.158 degC | Op_point | IC junction temperature |
| 21. | ICThetaJA | 26.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 22. | IOUT_OP | 2.0 A | Op_point | Iout operating point |
| 23. | Phase Marg | 52.244 deg | Op_point | Bode Plot Phase Margin |
| 24. | VIN_OP | 25.0 V | Op_point | Vin operating point |
| 25. | Vout p-p | 18.398 mV | Op_point | Peak-to-peak output ripple voltage |
| 26. | Cin Pd | 1.012 mW | Power | Input capacitor power dissipation |
| 27. | Cout Pd | 869.06 µW | Power | Output capacitor power dissipation |
| 28. | Diode Pd | 525.887 mW | Power | Diode power dissipation |
| 29. | IC Pd | 506.094 mW | Power | IC power dissipation |
| 30. | L Pd | 290.4 mW | Power | Inductor power dissipation |
| 31. | Total Pd | 1.324 W | Power | Total Power Dissipation |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 32. | Vout Tolerance | 3.769 % | | 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 | 25.0 | Maximum input voltage |
| 3. | VinMin | 14.0 | Minimum input voltage |
| 4. | Vout | 9.0 | Output Voltage |
| 5. | base_pn | LM2670 | Base Product Number |
| 6. | source | DC | Input Source Type |
| 7. | Ta | 30.0 | Ambient temperature |

## Design Assistance

1. **LM2670** Product Folder : http://www.ti.com/product/LM2670 : contains the data sheet and other resources.