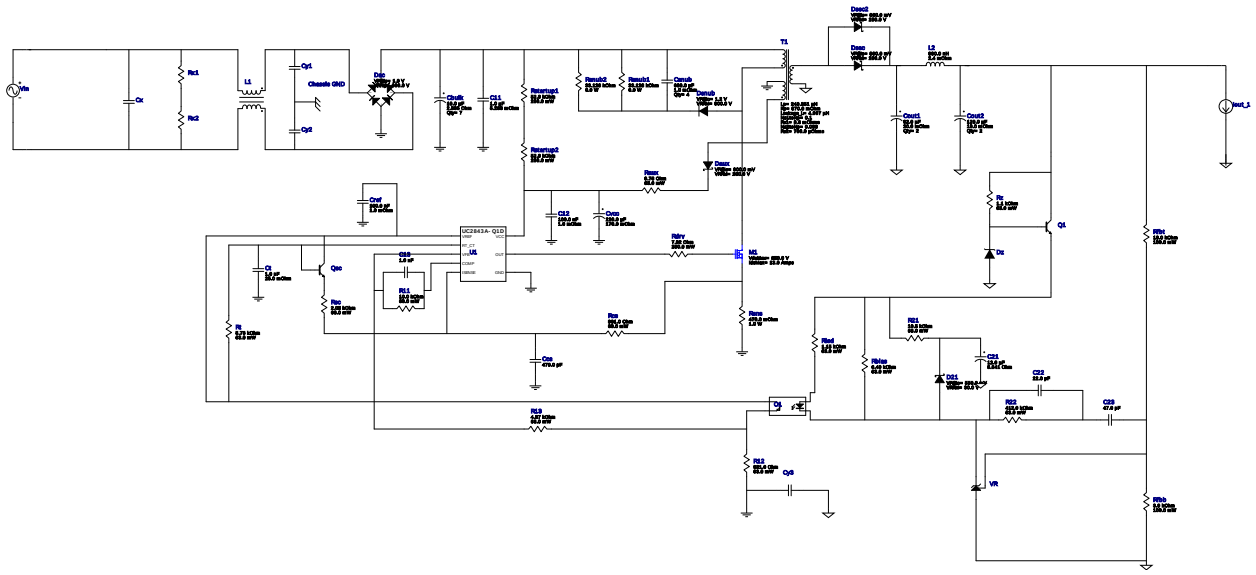
VinMin = 165.0V
VinMax = 265.0V
Vout = 14.0V
Iout = 5.0A

Device = UC2843AQD8RQ1
Topology = Flyback
Created = 2017-11-16 19:15:04.092
BOM Cost = $0.00
BOM Count = 60
Total Pd = 6.37W

# WEBENCH® Design Report

Design : 3992736/14 UC2843AQD8RQ1
UC2843AQD8RQ1 165.0V-265.0V to 14.00V @ 5.0A



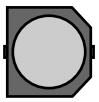
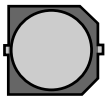
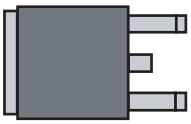
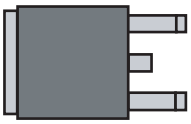
1. The EMI filter selected here contains the estimated values. The real numbers will depend on the attenuation needed at a particular frequency.

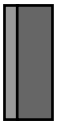
## My Comments

No comments

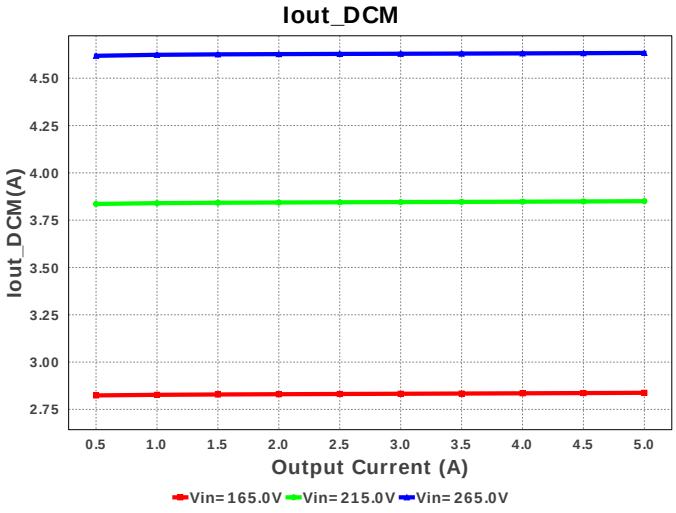
## Electrical BOM

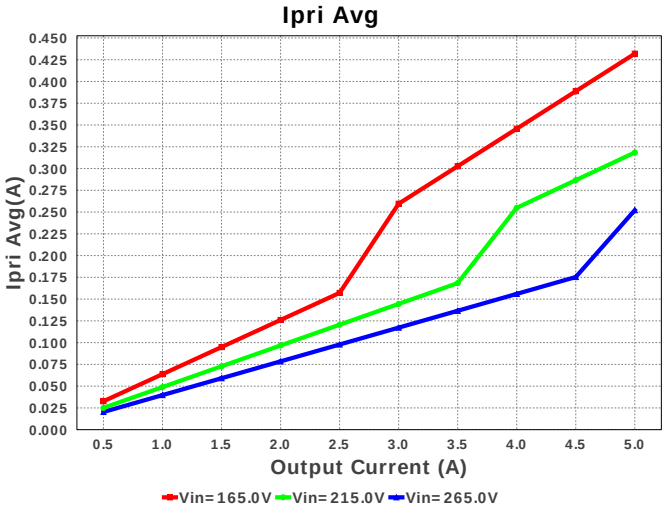
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | C11 | TDK | C5750X6S2W105K<br>Series= X6S | Cap= 1.0 uF<br>ESR= 5.263 mOhm<br>VDC= 400.0 V<br>IRMS= 0.0 A | 1 | $1.45 | 2220 54 mm$^2$ |
| 2. | C12 | MuRata | GRM155R61C104KA88D<br>Series= X5R | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm$^2$ |
| 3. | C13 | AVX | 04025A101JAT2A<br>Series= C0G/NP0 | Cap= 1.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm$^2$ |
| 4. | C21 | Chemi-Con | ELXZ630ELL120MEB5D<br>Series= LXZ | Cap= 12.0 uF<br>ESR= 8.8407 Ohm<br>VDC= 63.0 V<br>IRMS= 145.0 mA | 1 | $0.07 | Chemi-Con_500x1150 49 mm$^2$ |
| 5. | C22 | Kemet | C0805C220K3GACTU<br>Series= C0G/NP0 | Cap= 22.0 pF<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm$^2$ |
| 6. | C23 | Samsung Electro-Mechanics | CL02C470JO2ANNC<br>Series= C0G/NP0 | Cap= 47.0 pF<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 01005 2 mm$^2$ |
| 7. | Cbulk | Panasonic | EEUED2G100<br>Series= ED | Cap= 10.0 uF<br>ESR= 2.8648 Ohm<br>VDC= 400.0 V<br>IRMS= 300.0 mA | 7 | $0.22 | CAPPR5-10X20 144 mm$^2$ |

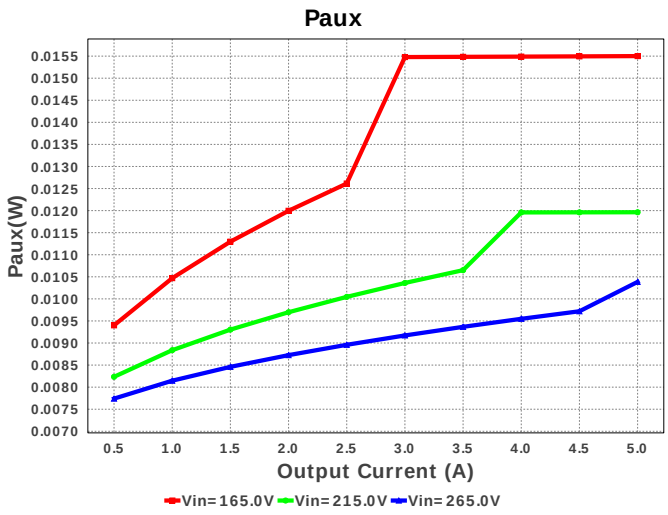
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 8. | Ccs | MuRata | GCM1555C1H471JA16D<br>Series= C0G/NP0 | Cap= 470.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 9. | Cout1 | Panasonic | 35SVPF82M<br>Series= SVPF | Cap= 82.0 uF<br>ESR= 20.0 mOhm<br>VDC= 35.0 V<br>IRMS= 4.0 A | 2 | $0.64 |  <br>CAPSMT_62_E12 106 mm$^2$ |
| 10. | Cout2 | Panasonic | 35SEPF120M<br>Series= SEPF | Cap= 120.0 uF<br>ESR= 18.0 mOhm<br>VDC= 35.0 V<br>IRMS= 4.4 A | 2 | $0.70 |  <br>SEPF_F13 144 mm$^2$ |
| 11. | Cref | MuRata | GRM155R61C104KA88D<br>Series= X5R | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 12. | Csnub | MuRata | GRM31A7U2J681JW31D<br>Series= U2J | Cap= 680.0 pF<br>ESR= 1.0 mOhm<br>VDC= 630.0 V<br>IRMS= 0.0 A | 4 | $0.08 |  <br>1206 11 mm$^2$ |
| 13. | Ct | Kemet | C0805C102J5GACTU<br>Series= C0G/NP0 | Cap= 1.0 nF<br>ESR= 25.0 mOhm<br>VDC= 50.0 V<br>IRMS= 1.71 A | 1 | $0.02 | <br>0805 7 mm$^2$ |
| 14. | Cvcc | Nichicon | UUD1E221MNL1GS<br>Series= uD | Cap= 220.0 uF<br>ESR= 170.0 mOhm<br>VDC= 25.0 V<br>IRMS= 450.0 mA | 1 | $0.17 |  <br>SM_RADIAL_8MM 113 mm$^2$ |
| 15. | D21 | Panasonic | DB2S31600L | VF@Io= 550.0 mV<br>VRRM= 30.0 V | 1 | $0.04 | <br>SOD-523 5 mm$^2$ |
| 16. | Dac | Diodes Inc. | HD06-T | VF@Io= 1.0 V<br>VRRM= 600.0 V | 1 | $0.15 |  <br>MiniDIP 62 mm$^2$ |
| 17. | Daux | SMC Diode Solutions | SK220ATR | VF@Io= 900.0 mV<br>VRRM= 200.0 V | 1 | $0.04 |  <br>SMA 37 mm$^2$ |
| 18. | Dsec | ON Semiconductor | MBRB40250TG | VF@Io= 860.0 mV<br>VRRM= 250.0 V | 1 | $0.99 |  <br>DDPAK 210 mm$^2$ |
| 19. | Dsec2 | ON Semiconductor | MBRB40250TG | VF@Io= 860.0 mV<br>VRRM= 250.0 V | 1 | $0.99 |  <br>DDPAK 210 mm$^2$ |
| 20. | Dsnub | Microsemi | UFS180JE3/TR13 | VF@Io= 1.2 V<br>VRRM= 800.0 V | 1 | $0.71 |  <br>DO-214BA 42 mm$^2$ |
| 21. | Dz | Diodes Inc. | MMSZ5241B-7-F | Zener | 1 | $0.04 | <br>SOD-123 13 mm$^2$ |
| 22. | L2 | Bourns | SRP1040-R68M | L= 680.0 nH<br>DCR= 2.4 mOhm | 1 | $0.61 |  <br>SRP1040 172 mm$^2$ |

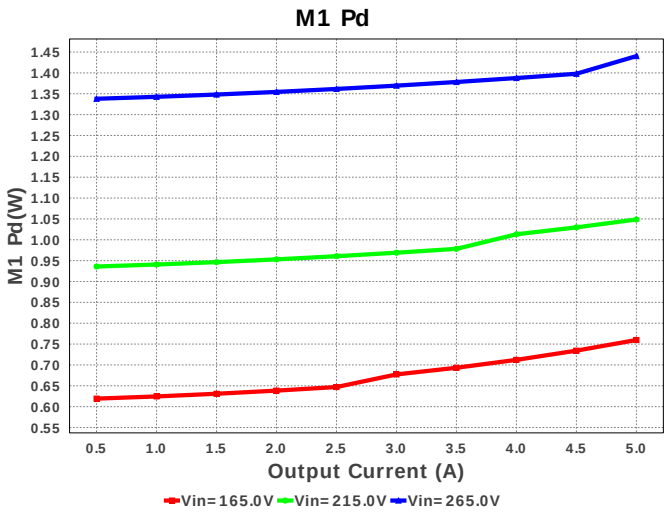
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 23. | M1 | Infineon Technologies | IPP65R190C7 | VdsMax= 650.0 V<br>IdsMax= 13.0 Amps | 1 | $1.45 |  <br>TO-220AB 79 mm$^2$ |
| 24. | O1 | Fairchild Semiconductor | FOD817A | Optocoupler | 1 | $0.11 |  <br>DIP-4 71 mm$^2$ |
| 25. | Q1 | ON Semiconductor | BC846BLT1G | Bipolar Transistor | 1 | $0.02 |  <br>SOT-23 14 mm$^2$ |
| 26. | Qsc | STMicroelectronics | 2N2222A | Bipolar Transistor | 1 | $1.02 |  <br>TO-18 57 mm$^2$ |
| 27. | R11 | Vishay-Dale | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 28. | R12 | Vishay-Dale | CRCW0402931RFKED<br>Series= CRCW..e3 | Res= 931.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 29. | R13 | Vishay-Dale | CRCW04024K87FKED<br>Series= CRCW..e3 | Res= 4.87 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 30. | R21 | Vishay-Dale | CRCW040210K5FKED<br>Series= CRCW..e3 | Res= 10.5 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 31. | R22 | Vishay-Dale | CRCW0402412KFKED<br>Series= CRCW..e3 | Res= 412.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 32. | Raux | Vishay-Dale | CRCW04029R76FKED<br>Series= CRCW..e3 | Res= 9.76 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 33. | Rbias | Vishay-Dale | CRCW04026K49FKED<br>Series= CRCW..e3 | Res= 6.49 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 34. | Rcs | Vishay-Dale | CRCW0402931RFKED<br>Series= CRCW..e3 | Res= 931.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 35. | Rdrv | Vishay-Dale | CRCW12067R32FKEA<br>Series= CRCW..e3 | Res= 7.32 Ohm<br>Power= 250.0 mW<br>Tolerance= 1.0% | 1 | $0.01 |  <br>1206 11 mm$^2$ |
| 36. | Rfbb | Yageo America | RC0603FR-073K9L<br>Series= ? | Res= 3.9 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0603 5 mm$^2$ |
| 37. | Rfbt | Yageo America | RC0603FR-0718KL<br>Series= ? | Res= 18.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0603 5 mm$^2$ |
| 38. | Rled | Vishay-Dale | CRCW04021K15FKED<br>Series= CRCW..e3 | Res= 1.15 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 39. | Rsc | Vishay-Dale | CRCW04022K05FKED<br>Series= CRCW..e3 | Res= 2.05 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 40. | Rsns | Stackpole Electronics Inc | RSF1FTR470<br>Series= ? | Res= 470.0 mOhm<br>Power= 1.0 W<br>Tolerance= 1.0% | 1 | $0.05 |  <br>RSF1 150 mm$^2$ |
| 41. | Rsnub1 | CUSTOM | CUSTOM<br>Series= ? | Res= 33.128 kOhm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 mm$^2$ |

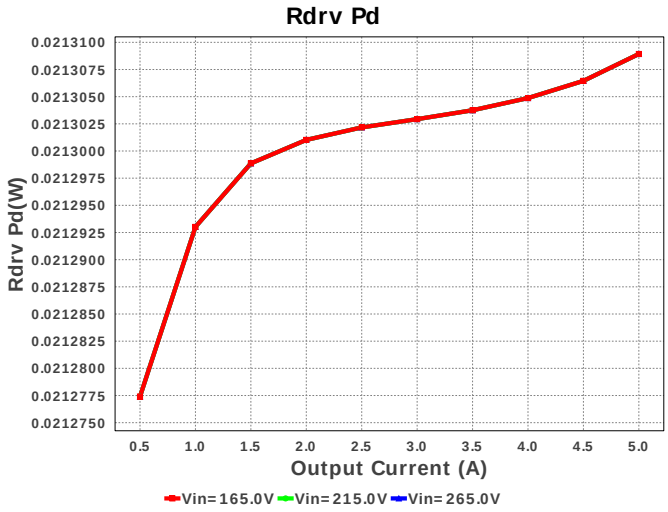
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 42. | Rsnub2 | CUSTOM | CUSTOM<br>Series= ? | Res= 33.128 kOhm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 mm² |
| 43. | Rstartup1 | Panasonic | ERJ-8ENF5232V<br>Series= ERJ-8E | Res= 52.3 kOhm<br>Power= 250.0 mW<br>Tolerance= 1.0% | 1 | $0.01 |  <br>1206 11 mm² |
| 44. | Rstartup2 | Panasonic | ERJ-8ENF5232V<br>Series= ERJ-8E | Res= 52.3 kOhm<br>Power= 250.0 mW<br>Tolerance= 1.0% | 1 | $0.01 |  <br>1206 11 mm² |
| 45. | Rt | Vishay-Dale | CRCW04025K76FKED<br>Series= CRCW..e3 | Res= 5.76 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm² |
| 46. | Rz | Vishay-Dale | CRCW04021K10FKED<br>Series= CRCW..e3 | Res= 1.1 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm² |
| 47. | T1 | CUSTOM | CUSTOM | Lp= 249.851 µH<br>Rp= 870.0 mOhm<br>Leakage_L= 4.997 µH<br>Ns1toNp= 0.1<br>Rs1= 8.6 mOhms<br>Ns2toNp= 0.083<br>Rs2= 700.0 µOhms | 1 | NA | CUSTOM 0 mm² |
| 48. | U1 | Texas Instruments | UC2843AQD8RQ1 | Switcher | 1 | $0.48 |  <br>D0008A 57 mm² |
| 49. | VR | Texas Instruments | TL431AIDBZR | Voltage References | 1 | $0.08 |  <br>DBZ0003A 14 mm² |

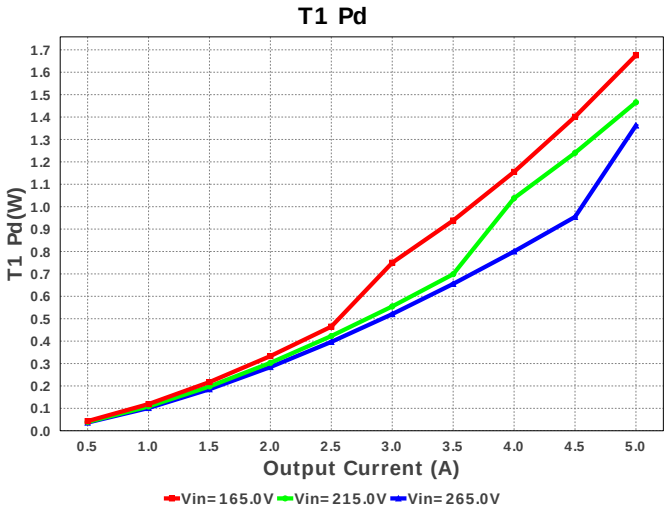


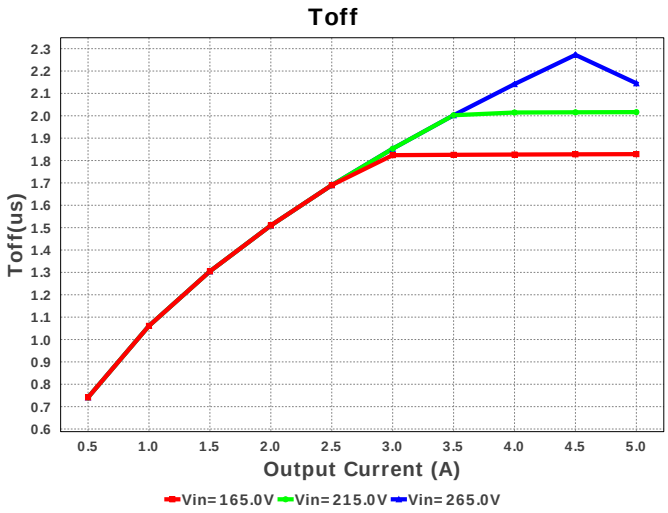



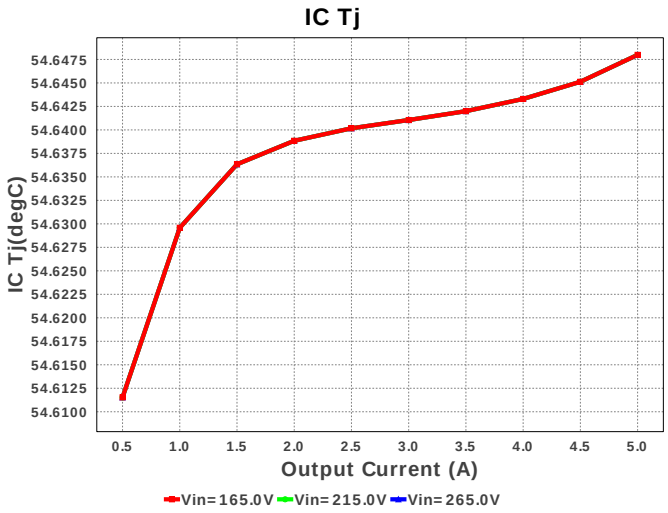


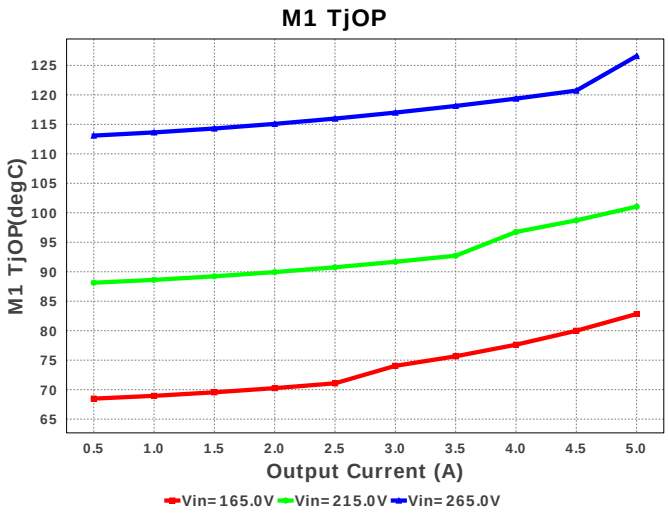



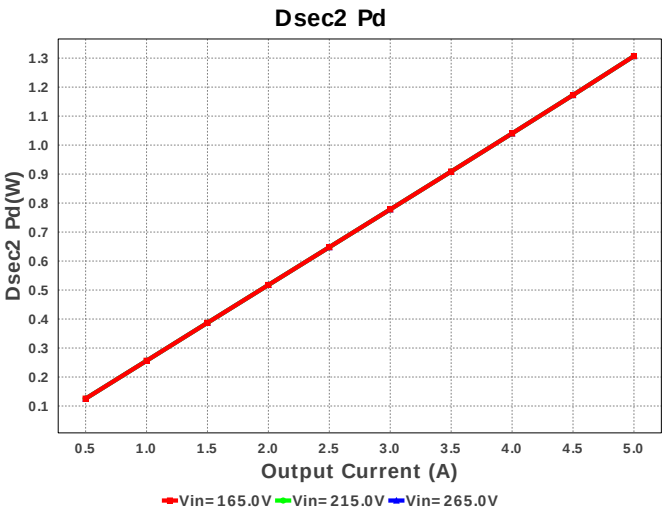



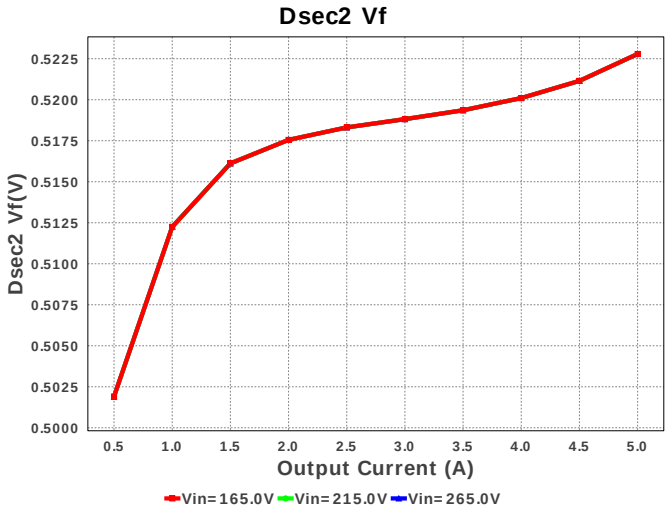



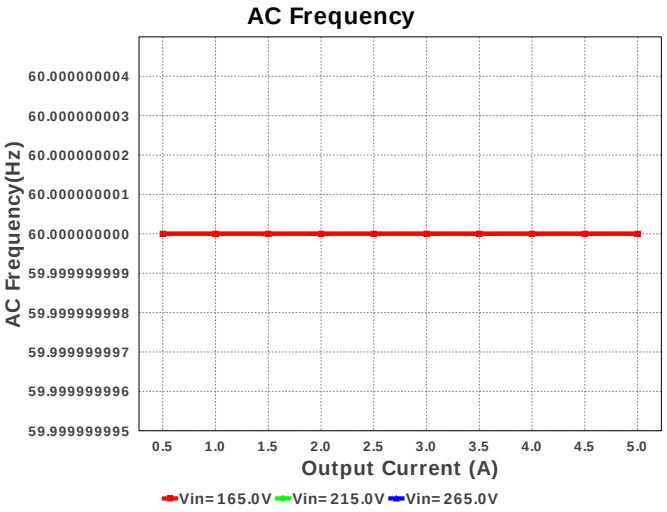



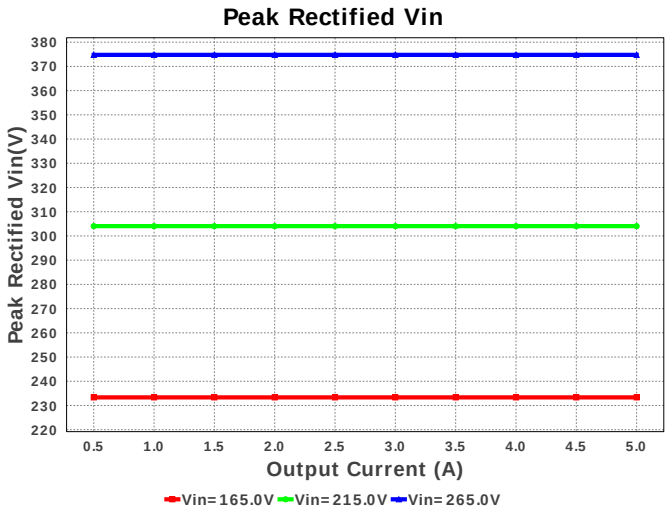



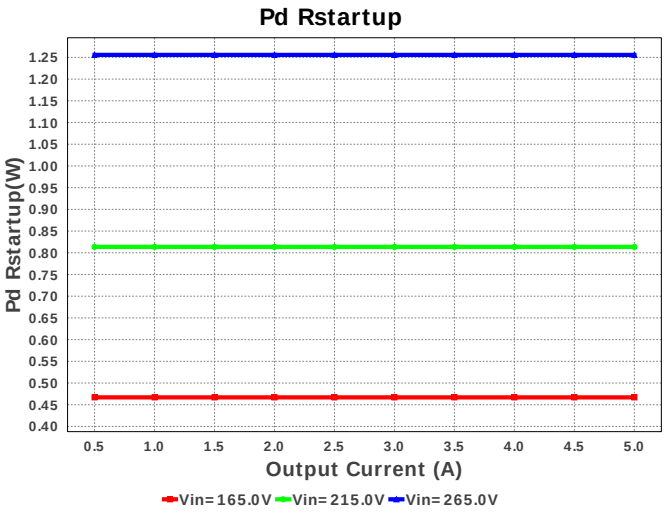


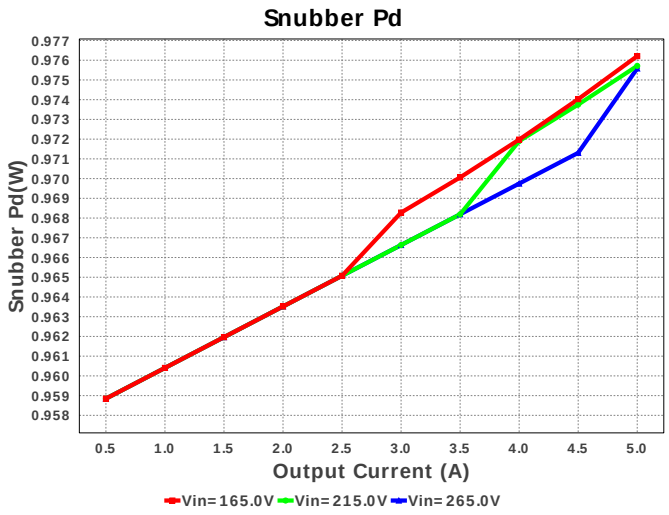



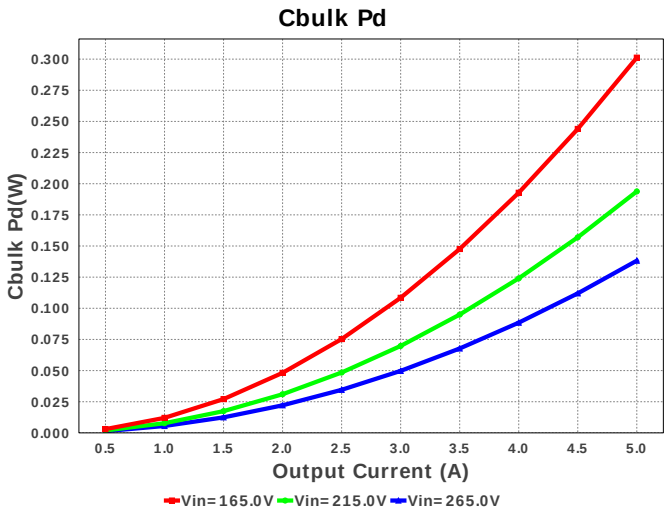



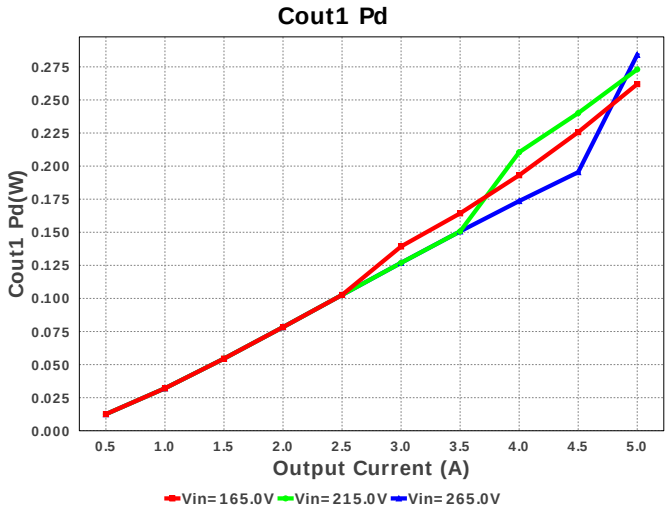



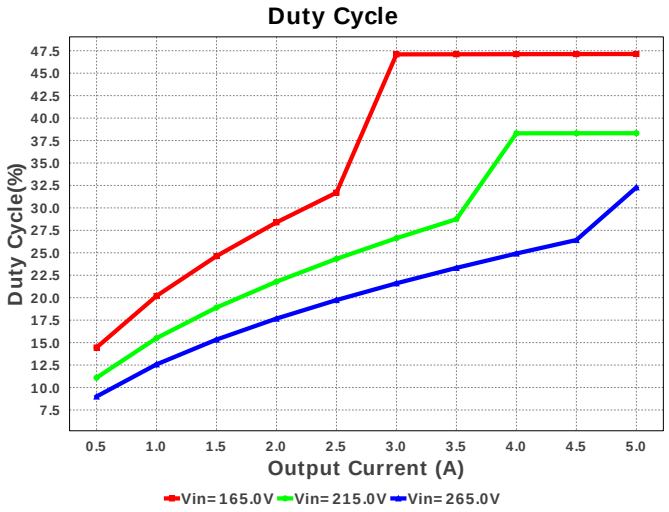



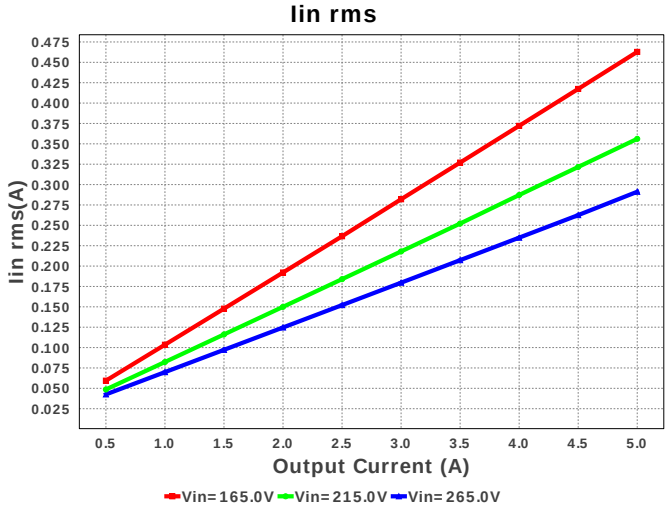



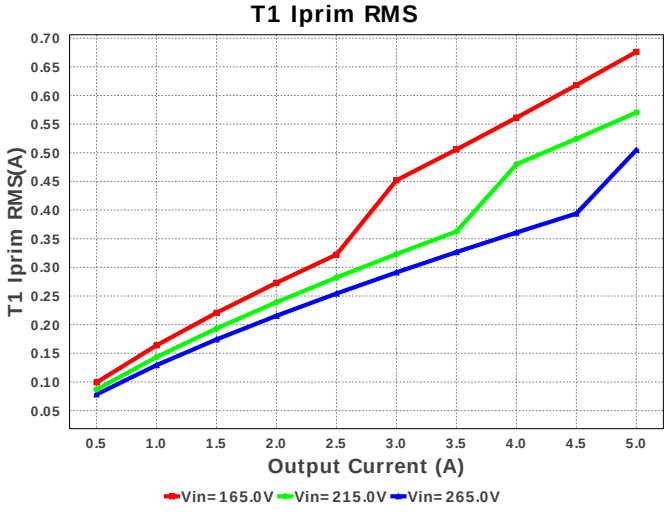


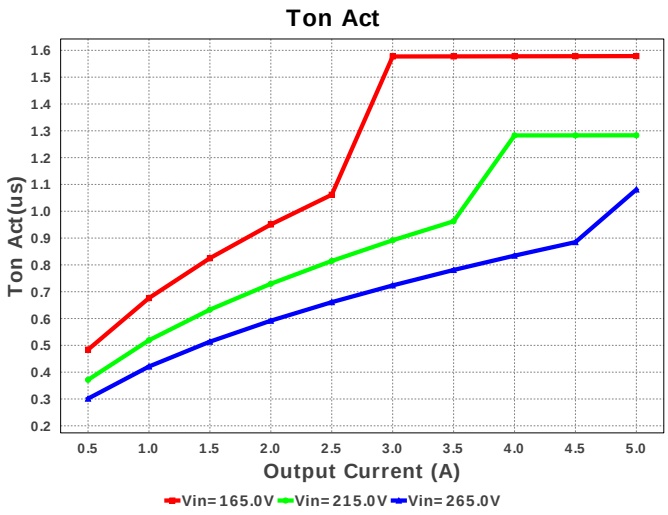



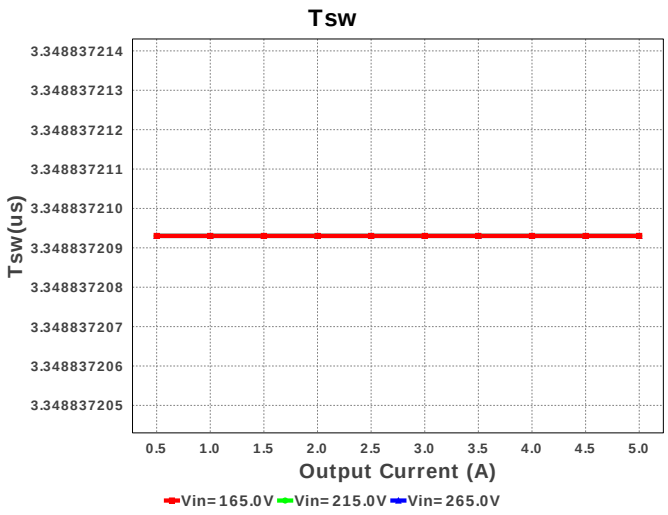



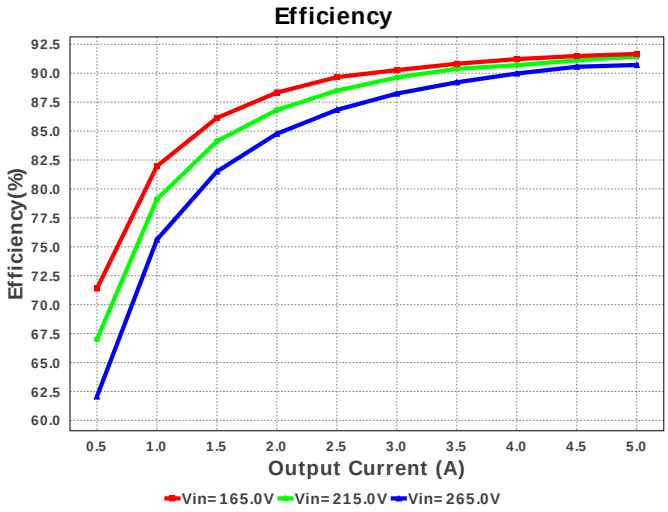



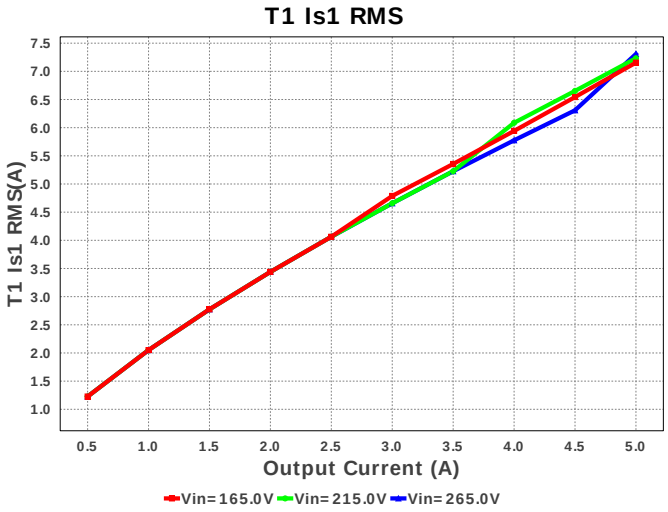



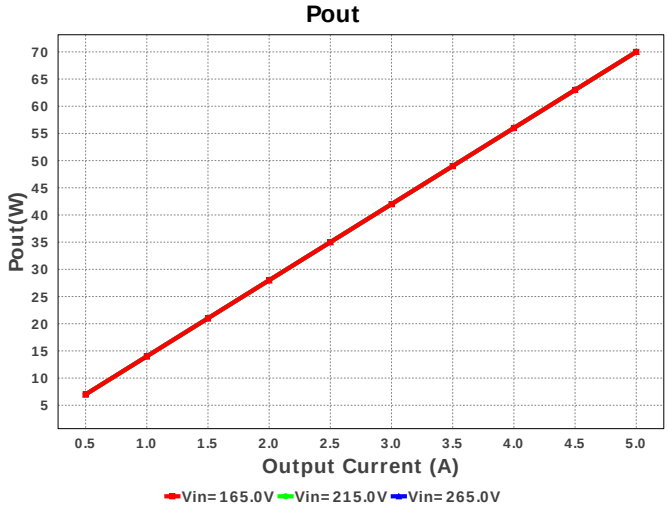



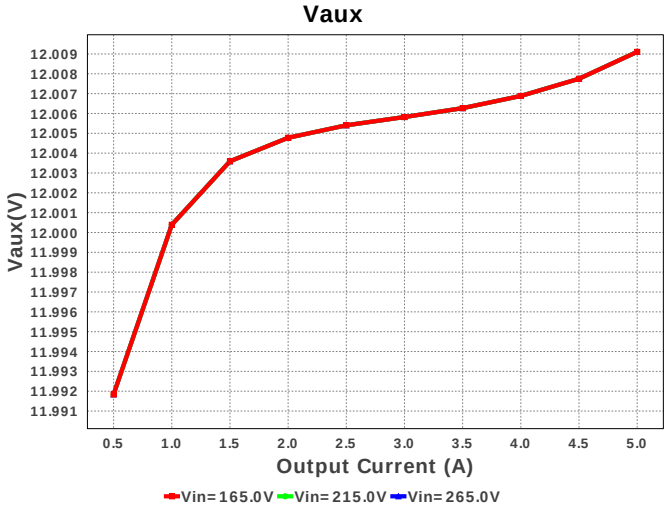


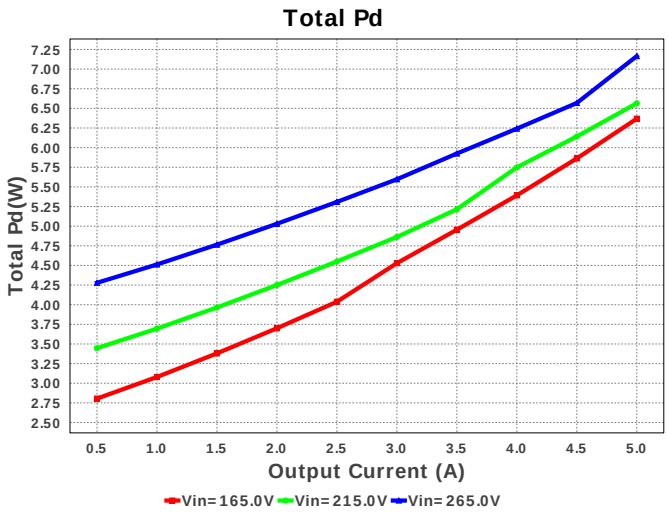



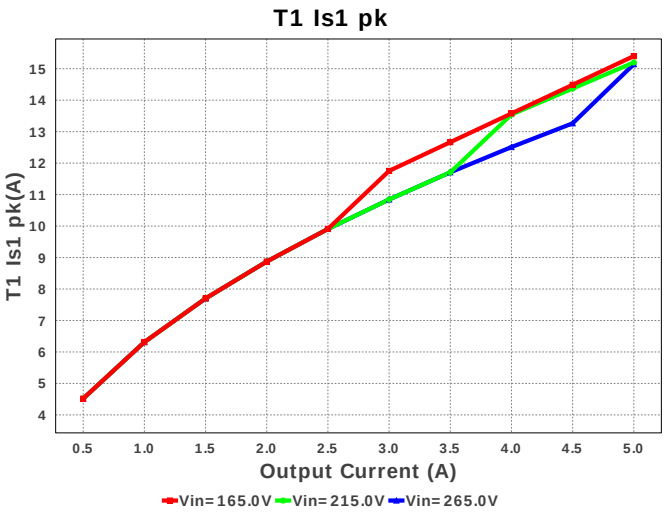



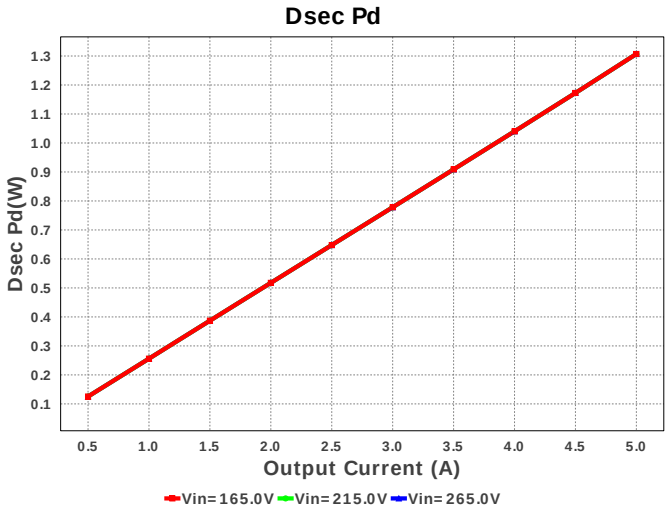



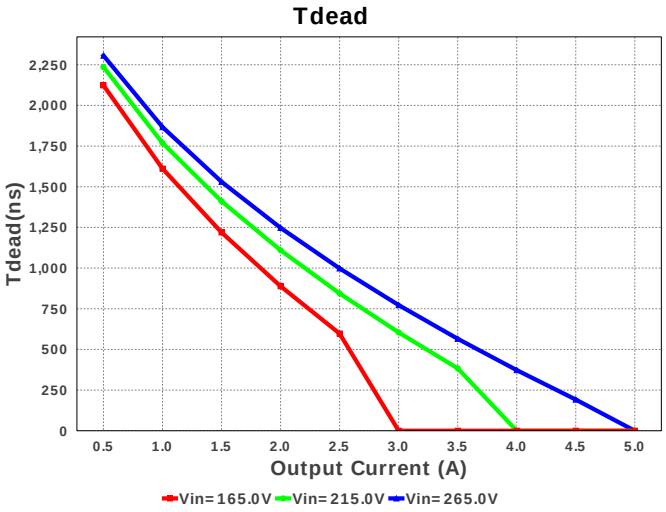



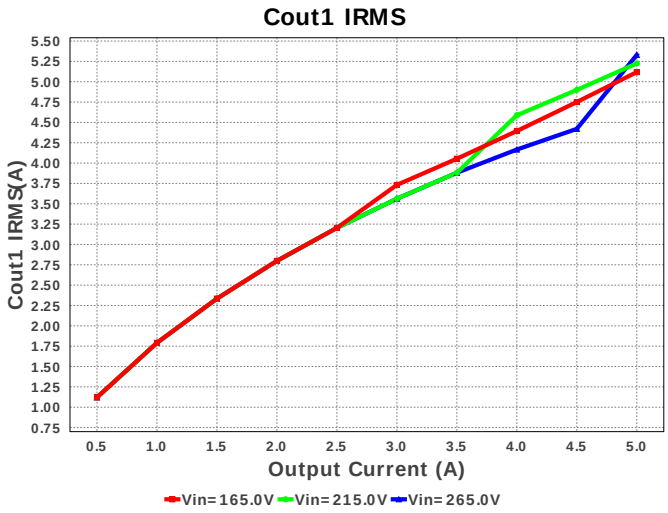



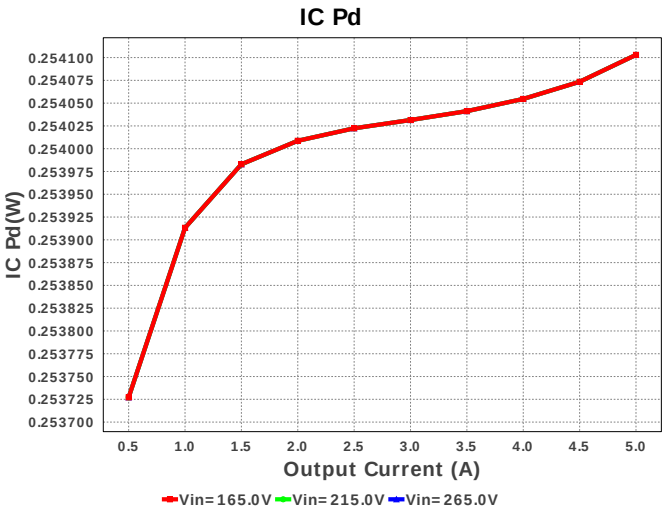


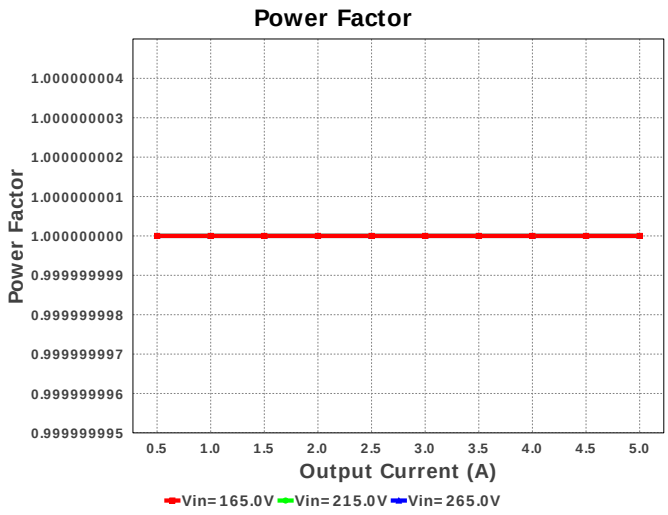



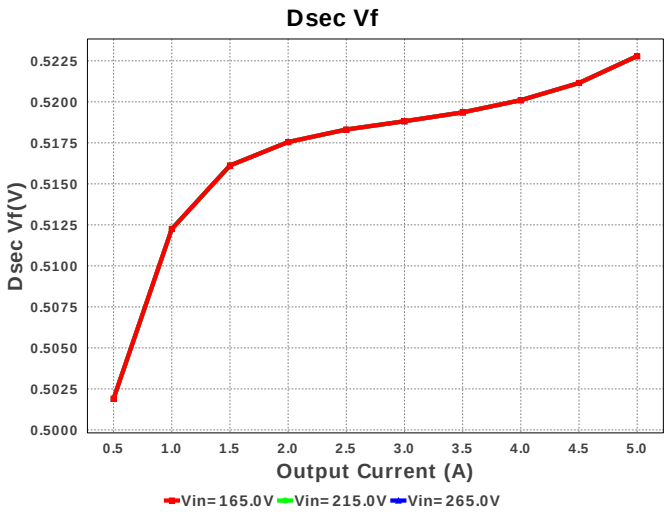



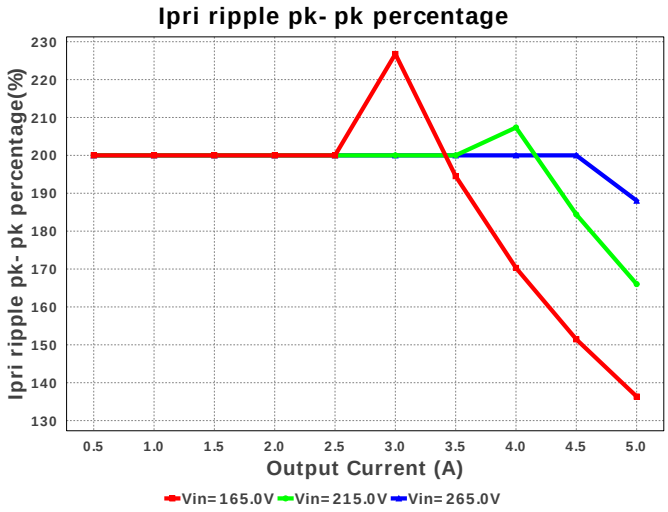



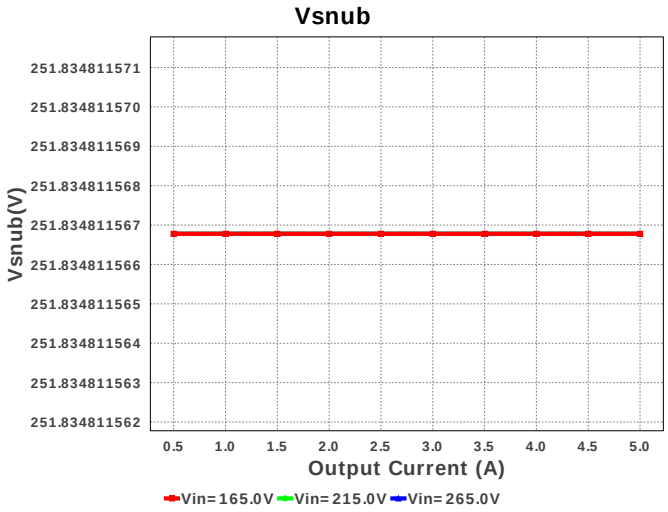



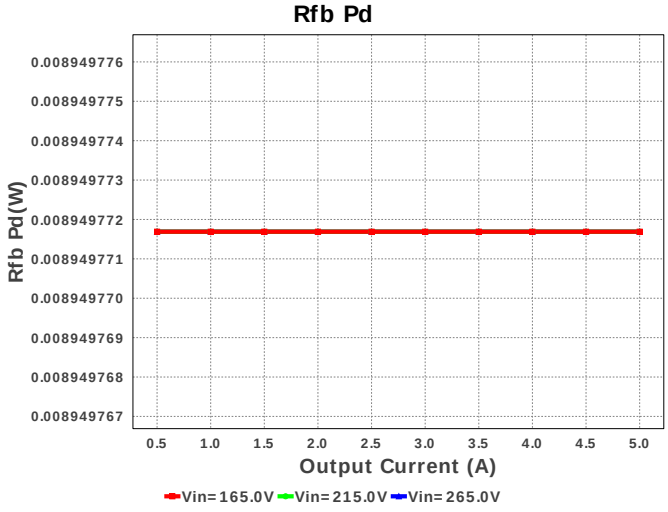



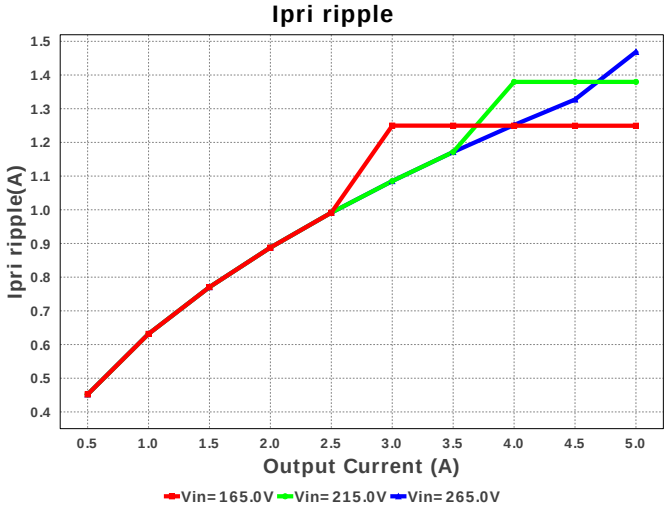


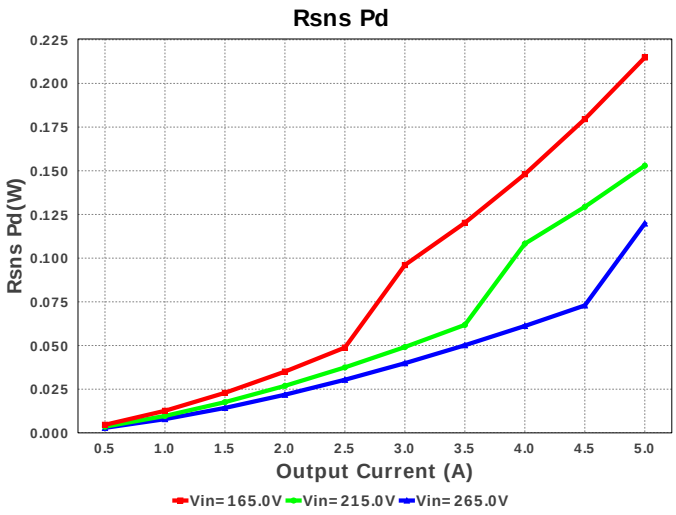



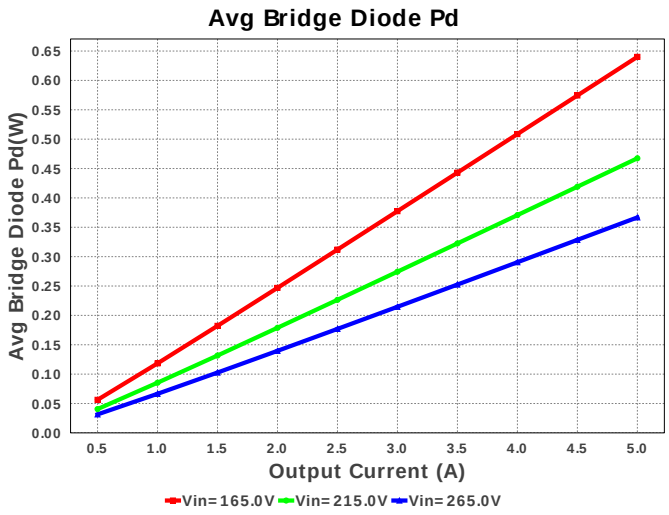



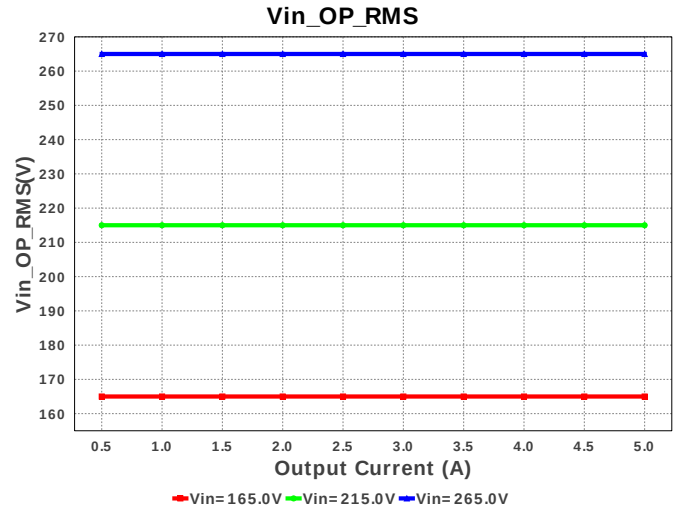



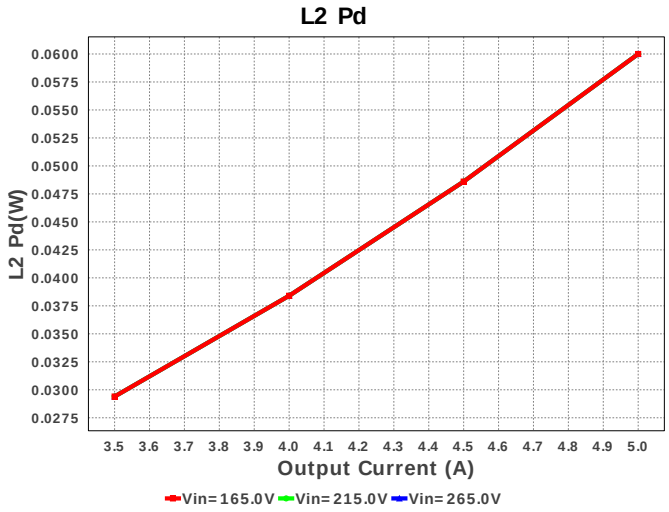



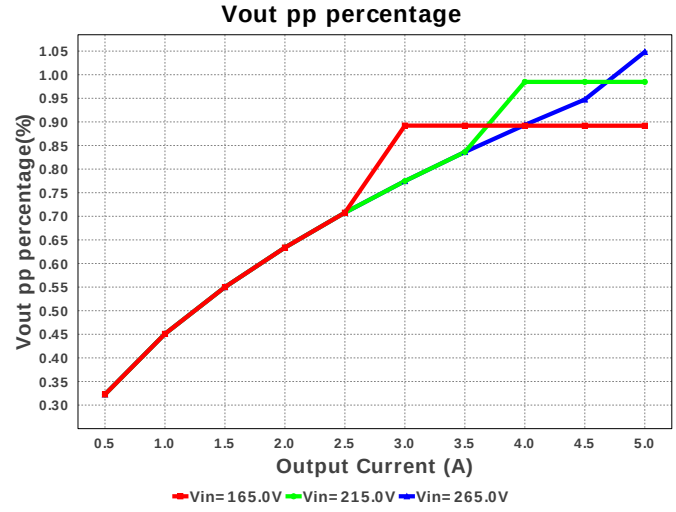



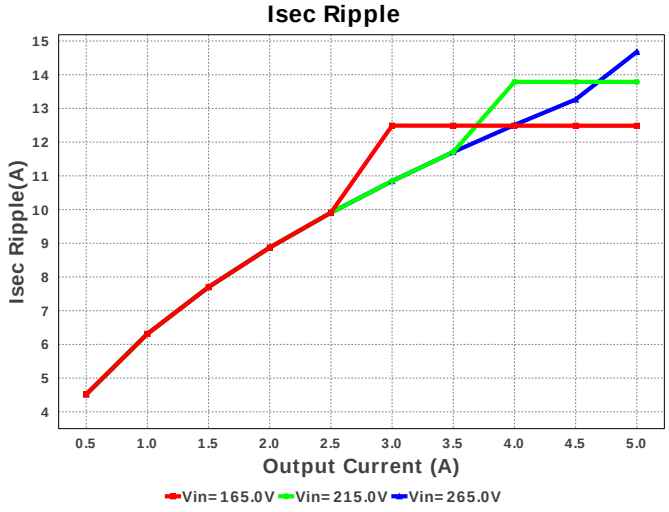


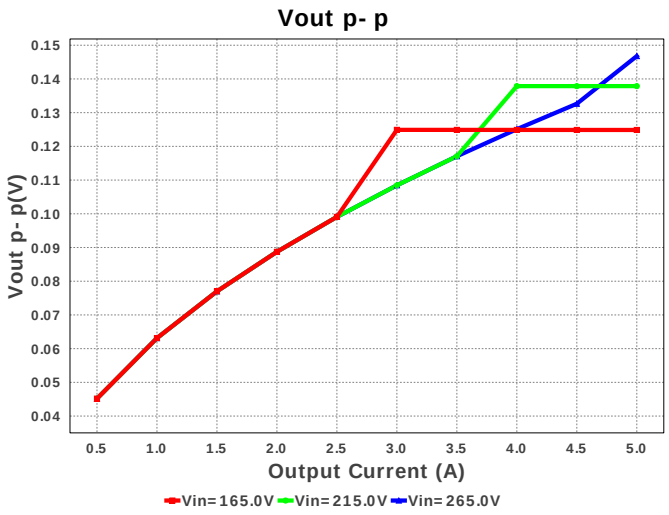



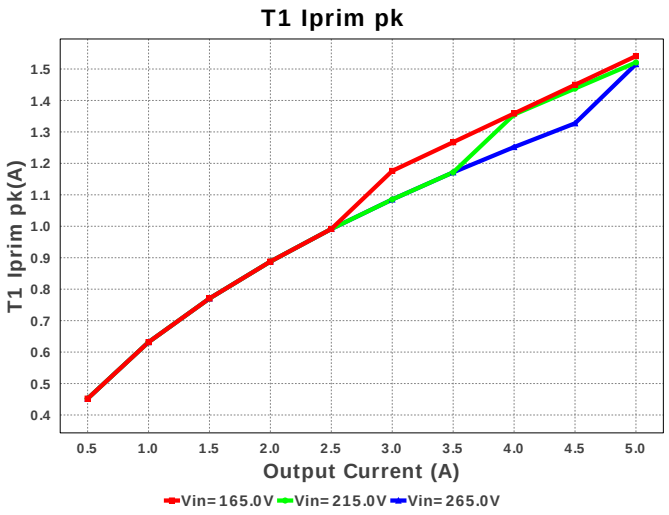






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cout1 IRMS | 5.118 A | Current | Output capacitor1 RMS ripple current |
| 2. | Iin rms | 462.84 mA | Current | RMS Input Current |
| 3. | Iout_DCM | 2.838 A | Current | Approximate Current below which DCM mode of operation will begin |
| 4. | Ipri Avg | 431.923 mA | Current | Average Current in Primary Winding over the complete Switching Period |
| 5. | Ipri ripple | 1.249 A | Current | Ripple Current in the Primary Winding |
| 6. | Ipri ripple pk-pk percentage | 136.357 % | Current | Primary Current pk-pk ripple percentage(of Ipri avg during ton only) |
| 7. | Isec Ripple | 12.486 A | Current | Ripple Current in the Secondary Winding |
| 8. | T1 Iprim RMS | 676.091 mA | Current | Transformer Primary RMS Current |
| 9. | T1 Iprim pk | 1.541 A | Current | Transformer Primary Peak Current |
| 10. | T1 Is1 RMS | 7.155 A | Current | Transformer Secondary1 RMS Current |
| 11. | T1 Is1 pk | 15.4 A | Current | Transformer Secondary1 Peak Current |
| 12. | AC Frequency | 50.0 Hz | General | Input AC frequency |
| 13. | BOM Count | 60 | General | Total Design BOM count |
| 14. | Daux trr | 0.0 ns | General | Auxiliary Diode Reverse Recovery Time |
| 15. | Dsec Vf | 522.788 mV | General | Effective Forward Voltage Drop at the Operating Current |
| 16. | Dsec trr | 0.0 ns | General | Output Diode Reverse Recovery Time |
| 17. | Dsec2 Vf | 522.788 mV | General | Effective Forward Voltage Drop at the Operating Current |
| 18. | Dsnub trr | 60.0 ns | General | Snubber Diode Reverse Recovery Time |
| 19. | FootPrint | 3.082 k $mm^2$ | General | Total Foot Print Area of BOM components |
| 20. | Frequency | 298.611 kHz | General | Switching frequency |
| 21. | Mode | CCM | General | Conduction Mode |
| 22. | Pout | 70.0 W | General | Total output power |
| 23. | Power Factor | 1.0 | General | Assumed Power Factor for the Application |
| 24. | Tdead | 0.0 ns | General | Approximate Dead Time of the Regulator |
| 25. | Toff | 1.829 us | General | Approximate Converter Off Time |
| 26. | Ton Act | 1.579 us | General | Approximate Converter On Time |
| 27. | Total BOM | $0.0 | General | Total BOM Cost |
| 28. | Tsw | 3.349 us | General | Switching Time Period |
| 29. | Vaux | 12.009 V | General | Auxiliary Voltage |
| 30. | Vsnub | 251.835 V | General | Voltage Across the Snubber |
| 31. | Vout Actual | 14.01 V | Op_Point | Vout Actual calculated based on selected voltage divider resistors |
| 32. | Vout OP | 14.0 V | Op_Point | Operational Output Voltage |
| 33. | Duty Cycle | 47.137 % | Op_point | Duty cycle |
| 34. | Efficiency | 91.661 % | Op_point | Steady state efficiency |
| 35. | IC Tj | 54.648 degC | Op_point | IC junction temperature |
| 36. | ICThetaJA | 97.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 37. | IOUT_OP | 5.0 A | Op_point | Iout operating point |
| 38. | M1 TjOP | 82.833 degC | Op_point | M1 MOSFET junction temperature |
| 39. | Peak Rectified Vin | 233.343 V | Op_point | Peak voltage seen at rectified input |
| 40. | Vin_OP_RMS | 165.0 V | Op_point | AC Input RMS Voltage |
| 41. | Vout p-p | 124.864 mV | Op_point | Peak-to-peak output ripple voltage |
| 42. | Avg Bridge Diode Pd | 640.115 mW | Power | Average Power Dissipation in the Bridge Diode over the AC Line Period |
| 43. | Cbulk Pd | 301.189 mW | Power | Bulk capacitor power dissipation |
| 44. | Cout1 Pd | 261.949 mW | Power | Output capacitor1 power dissipation |
| 45. | Dsec Pd | 1.307 W | Power | Secondary Diode Power Dissipation |
| 46. | Dsec2 Pd | 1.307 W | Power | Secondary Diode Power Dissipation |
| 47. | IC Pd | 254.103 mW | Power | IC power dissipation |
| 48. | L2 Pd | 60.0 mW | Power | Average Power Dissipation in the Inductor Over the AC Line Period |
| 49. | M1 Pd | 759.825 mW | Power | M1 MOSFET total power dissipation |
| 50. | Paux | 15.501 mW | Power | Power Dissipation in Raux and Daux |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 51. | Pd Rstartup | 466.922 mW | Power | Power Dissipation in Rstartup1 and Rstartup2 |
| 52. | Rdrv Pd | 21.309 mW | Power | Power Dissipation in Gate Drive Resistor |
| 53. | Rfb Pd | 8.95 mW | Power | Rfb Power Dissipation |
| 54. | Rsns Pd | 214.837 mW | Power | Current Limit Sense Resistor Power Dissipation |
| 55. | Snubber Pd | 976.209 mW | Power | Snubber Power Dissipation |
| 56. | T1 Pd | 1.676 W | Power | Estimated Losses in Transformer |
| 57. | Total Pd | 6.368 W | Power | Total Power Dissipation |
| 58. | Vout Tolerance | 1.986 % | | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |
| 59. | Vout pp percentage | 891.884 m% | | Output Voltage ripple percentage |

## Design Inputs

| # | Name | Value | Description |
|---|---|---|---|
| 1. | Iout | 5.0 | Maximum Output Current |
| 2. | VinMax | 265.0 | Maximum input voltage |
| 3. | VinMin | 165.0 | Minimum input voltage |
| 4. | Vout | 14.0 | Output Voltage |
| 5. | acFrequency | 50.0 | Light Output in Lumen |
| 6. | base_pn | UC2843A-Q1 | Texas Instruments Base Part Number |
| 7. | source | AC | Input Source Type |
| 8. | ta | 30.0 | Ambient temperature |

## Design Assistance

1. UC2843A-Q1 Product Folder : http://www.ti.com/product/UC2843A%2DQ1 : contains the data sheet and other resources.