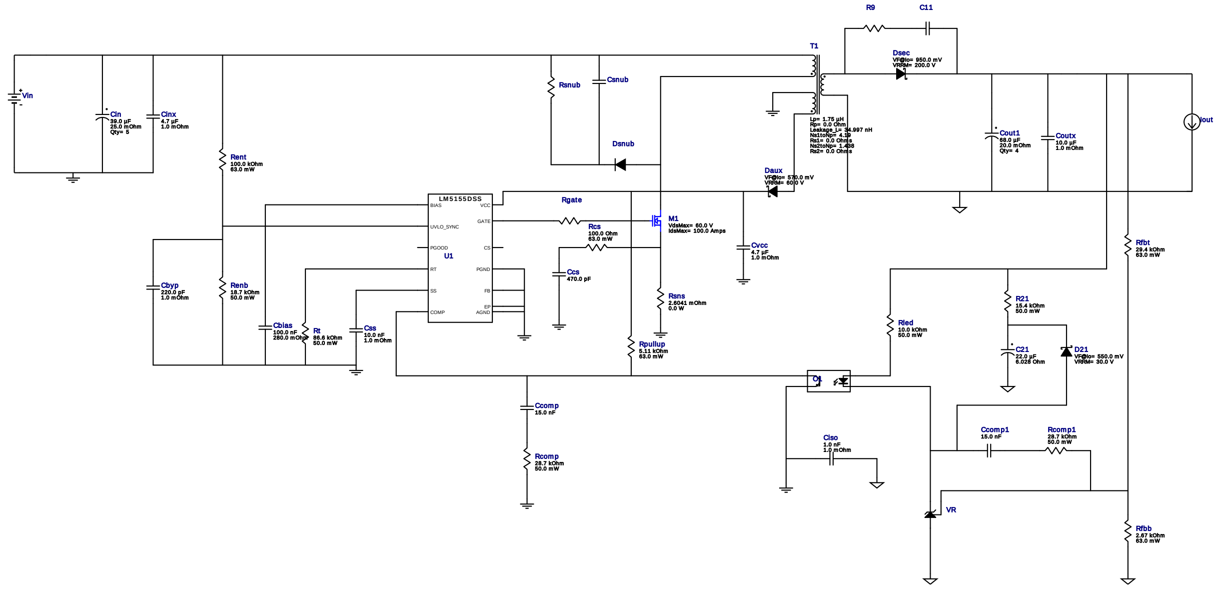
| | | |
|---|---|---|
| **TEXAS INSTRUMENTS** | VinMin = 11.0V<br>VinMax = 14.0V<br>Vout = 30.0V<br>Iout = 3.0A | Device = LM5155DSSR<br>Topology = Flyback<br>Created = 2025-05-23 08:52:54.884<br>BOM Cost = NA<br>BOM Count = 40<br>Total Pd = 9.58W |

# WEBENCH ® Design Report

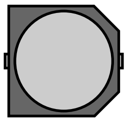
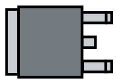
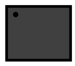
Design : 3 LM5155DSSR
LM5155DSSR 14V-22V to 30.00V @ 3A



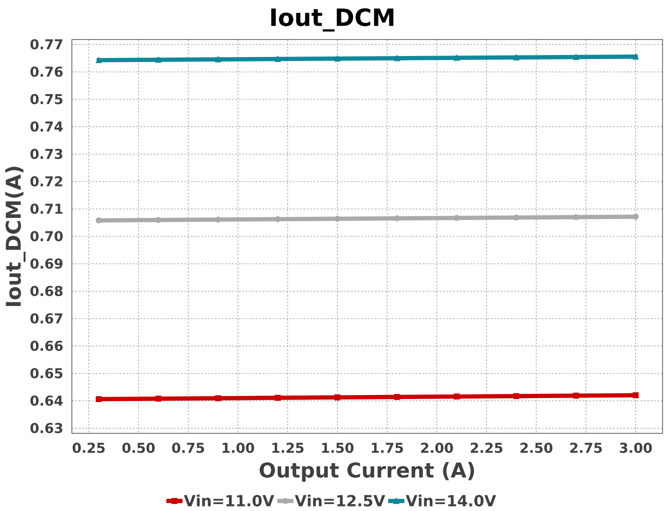
1. Notes: 1. Transformer windings: Np is the primary winding, Ns1 is the secondary winding and Ns2 is the winding for the auxiliary supply. 2. The primary side snubber (Rsnub,Csnub,Dsnub) and secondary side snubber(R9,C11),drive resistor (Rgate) are added as place holders. Kindly refer http://www.ti.com.cn/cn/lit/an/snva744/snva744.pdf for selecting diode for RCD snubber on switch node. Please refer http://www.ti.com/lit/an/slva255/slva255.pdf for design of snubber over the output diode. Hence the overall efficiency displayed is an approximate measure

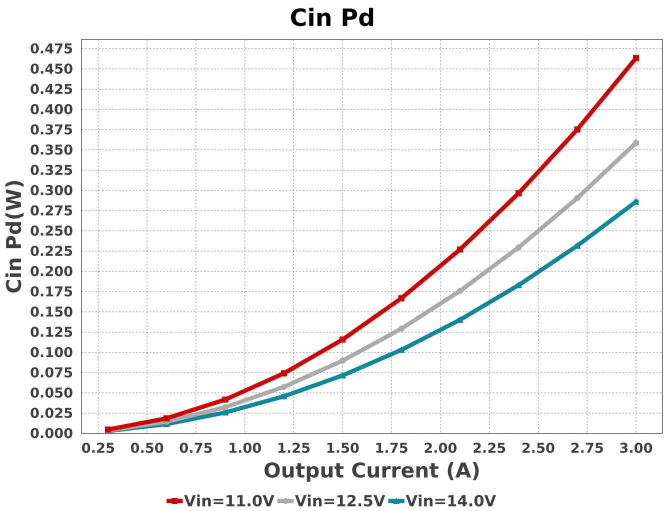
## Electrical BOM

| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| C21 | Chemi-Con | ELXZ500ELL220MEB5D<br>Series= LXZ | Cap= 22.0 uF<br>ESR= 6.0278 Ohm<br>VDC= 50.0 V<br>IRMS= 155.0 mA | 1 | $0.11 | Chemi-Con_500x1150 49 $mm^2$ |
| Cbias | AVX | 08053C104KAT2A<br>Series= X7R | Cap= 100.0 nF<br>ESR= 280.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 $mm^2$ |
| Cbyp | MuRata | GRM033R71C221KA01D<br>Series= X7R | Cap= 220.0 pF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0201 2 $mm^2$ |
| Ccomp | TDK | C2012C0G1H153J085AA<br>Series= C0G/NP0 | Cap= 15.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.06 | 0805 7 $mm^2$ |
| Ccomp1 | TDK | C2012C0G1H153J085AA<br>Series= C0G/NP0 | Cap= 15.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.06 | 0805 7 $mm^2$ |
| Ccs | Samsung Electro-Mechanics | CL21C471JBANNNC<br>Series= C0G/NP0 | Cap= 470.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 $mm^2$ |
| Cin | Panasonic | 50SVPF39M<br>Series= SVPF | Cap= 39.0 uF<br>ESR= 25.0 mOhm<br>VDC= 50.0 V<br>IRMS= 3.8 A | 5 | $1.15 | CAPSMT_62_E12 106 $mm^2$ |

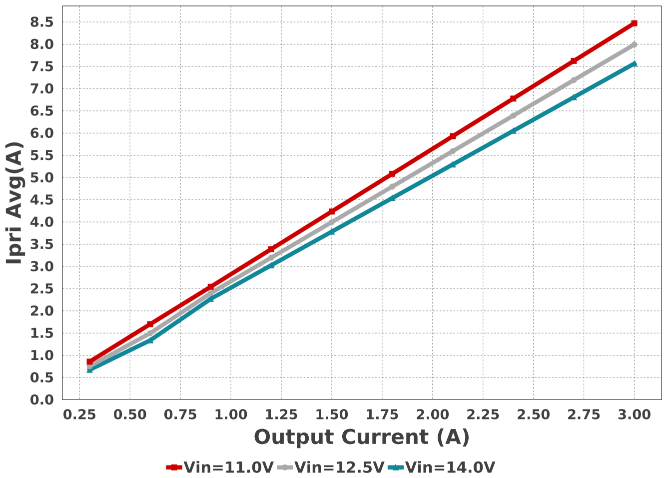
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| Cinx | CUSTOM | CUSTOM<br>Series= ? | Cap= 4.7 uF<br>ESR= 1.0 mOhm<br>VDC= 18.2 V<br>IRMS= 17.5325 A | 1 | NA | CUSTOM 0 $mm^2$ |
| Ciso | Johanson Technology | 202R18W102KV4E<br>Series= X7R | Cap= 1.0 nF<br>ESR= 1.0 mOhm<br>VDC= 2.0 kV<br>IRMS= 0.0 A | 1 | $0.06 | <br>1206_190 11 $mm^2$ |
| Cout1 | Panasonic | 50SVPF68M<br>Series= SVPF | Cap= 68.0 uF<br>ESR= 20.0 mOhm<br>VDC= 50.0 V<br>IRMS= 4.3 A | 4 | $1.57 | <br>CAPSMT_62_F12 151 $mm^2$ |
| Coutx | MuRata | GRM32ER71J106MA12L<br>Series= X7R | Cap= 10.0 uF<br>ESR= 1.0 mOhm<br>VDC= 63.0 V<br>IRMS= 0.0 A | 1 | $0.30 | 1210_270 15 $mm^2$ |
| Css | MuRata | GRM033R71A103KA01D<br>Series= X7R | Cap= 10.0 nF<br>ESR= 1.0 mOhm<br>VDC= 10.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0201 2 $mm^2$ |
| Cvcc | Taiyo Yuden | TMK212BJ475KG-T<br>Series= X5R | Cap= 4.7 uF<br>ESR= 1.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.06 | 0805 7 $mm^2$ |
| D21 | Panasonic | DB2S31600L | VF@Io= 550.0 mV<br>VRRM= 30.0 V | 1 | $0.03 | SOD-523 5 $mm^2$ |
| Daux | Nexperia | PMEG6010CEH,115 | VF@Io= 570.0 mV<br>VRRM= 60.0 V | 1 | $0.04 | SOD-123F 12 $mm^2$ |
| Dsec | SMC Diode Solutions | SBRD10200TR | VF@Io= 950.0 mV<br>VRRM= 200.0 V | 1 | $0.18 | <br>DPAK 102 $mm^2$ |
| M1 | Texas Instruments | CSD18532Q5B | VdsMax= 60.0 V<br>IdsMax= 100.0 Amps | 1 | $0.73 | <br>TRANS_NexFET_Q5B 58 $mm^2$ |
| O1 | Vishay-Semiconductor | TCMT1107 | Optocoupler | 1 | $0.19 | <br>SOP-4 44 $mm^2$ |
| R21 | Yageo | RC0201FR-0715K4L<br>Series= ? | Res= 15.4 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rcomp | Yageo | RC0201FR-0728K7L<br>Series= ? | Res= 28.7 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rcomp1 | Yageo | RC0201FR-0728K7L<br>Series= ? | Res= 28.7 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rcs | Vishay-Dale | CRCW0402100RFKED<br>Series= CRCW..e3 | Res= 100.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Renb | Yageo | RC0201FR-0718K7L<br>Series= ? | Res= 18.7 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rent | Vishay-Dale | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rfbb | Vishay-Dale | CRCW04022K67FKED<br>Series= CRCW..e3 | Res= 2.67 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |

| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| Rfbt | Vishay-Dale | CRCW040229K4FKED Series= CRCW..e3 | Res= 29.4 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rled | Yageo | RC0201FR-0710KL Series= ? | Res= 10.0 kOhm Power= 50.0 mW Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rpullup | Vishay-Dale | CRCW04025K11FKED Series= CRCW..e3 | Res= 5.11 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rsns | CUSTOM | CUSTOM Series= ? | Res= 2.6041 mOhm Power= 0.0 W Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| Rt | Yageo | RC0201FR-0786K6L Series= ? | Res= 86.6 kOhm Power= 50.0 mW Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| T1 | CUSTOM | CUSTOM | Lp= 1.75 µH Rp= 0.0 Ohm Leakage_L= 34.997 nH Ns1toNp= 4.19 Rs1= 0.0 Ohms Ns2toNp= 1.438 Rs2= 0.0 Ohms | 1 | NA | CUSTOM 0 $mm^2$ |
| U1 | Texas Instruments | LM5155DSSR | Switcher | 1 | $0.69 | DSS0012B 12 $mm^2$ |
| VR | Texas Instruments | TL431IDBVR | Voltage References | 1 | $0.05 | R-PDSO-G3 16 $mm^2$ |

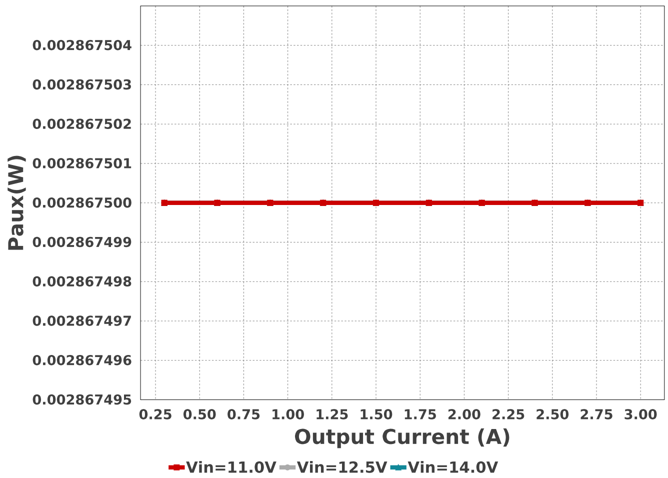


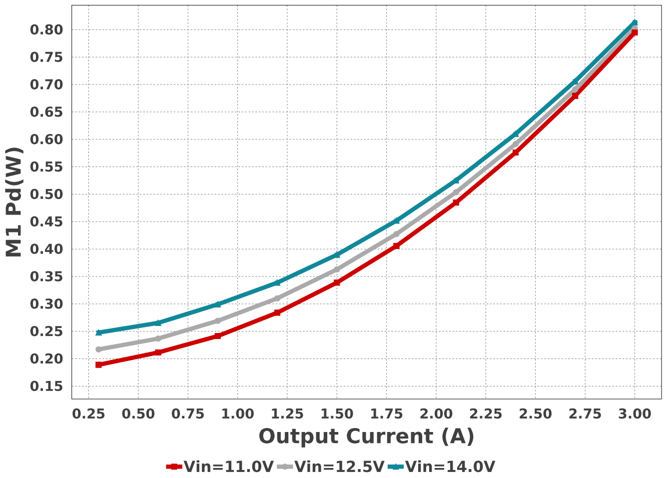
### Ipri Avg



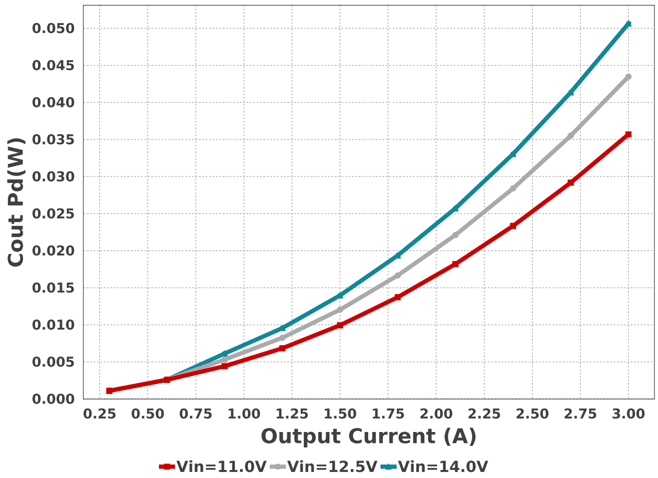

### Paux



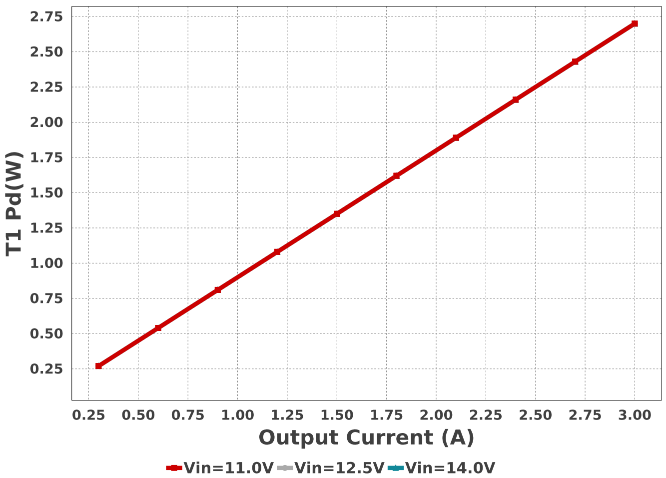

### M1 Pd



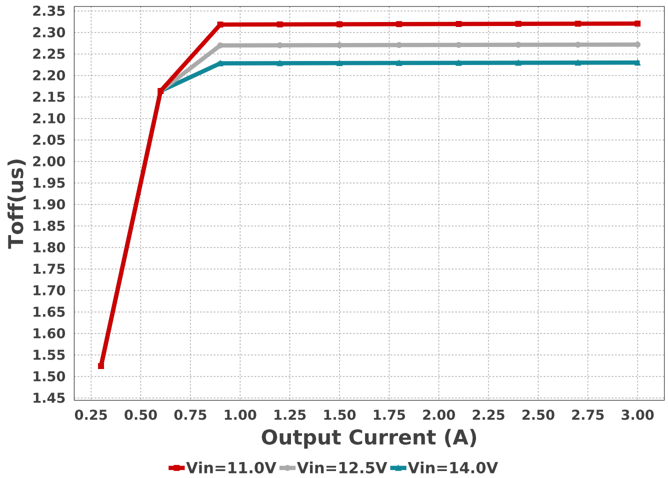

### Cout Pd

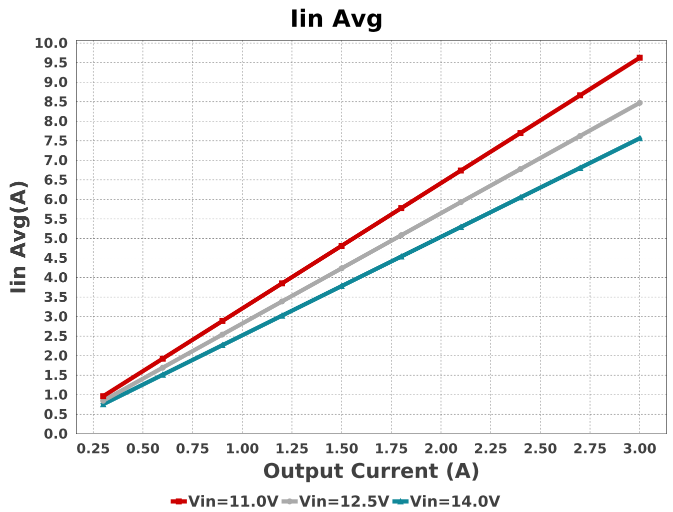


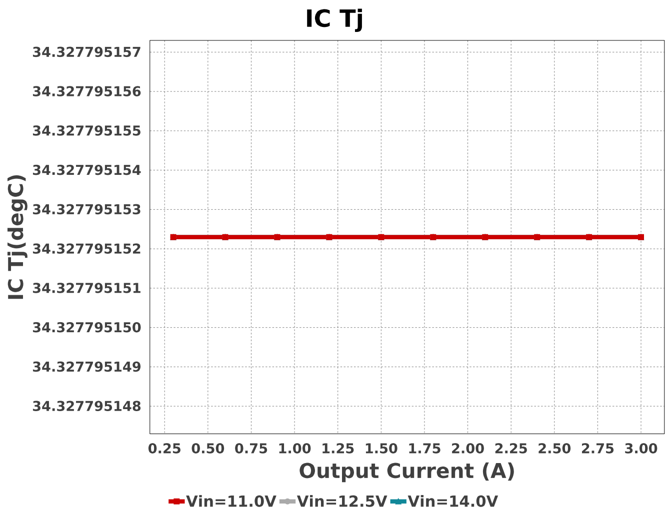

### T1 Pd

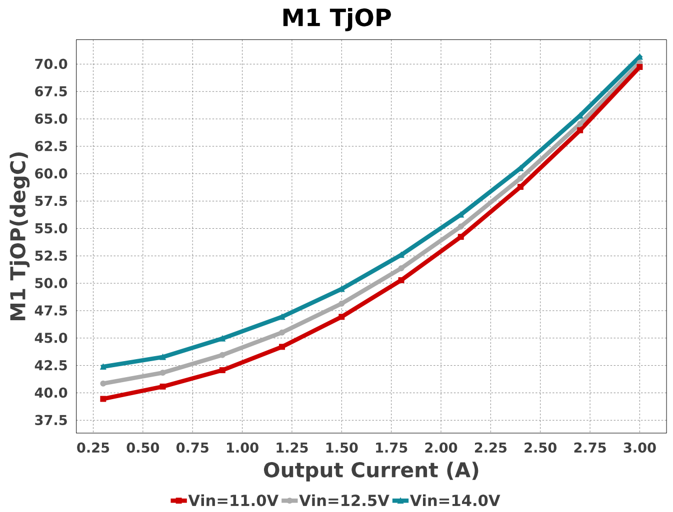


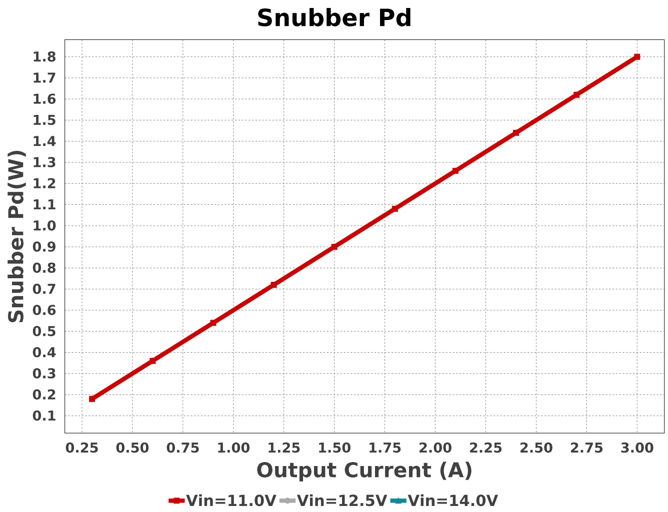

### Toff

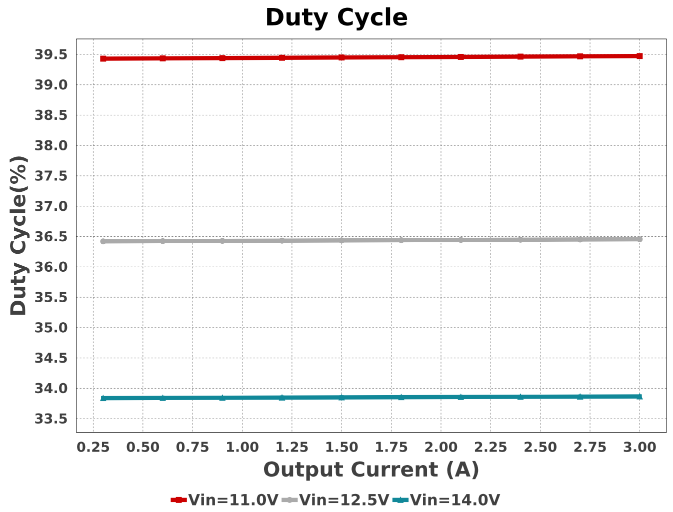


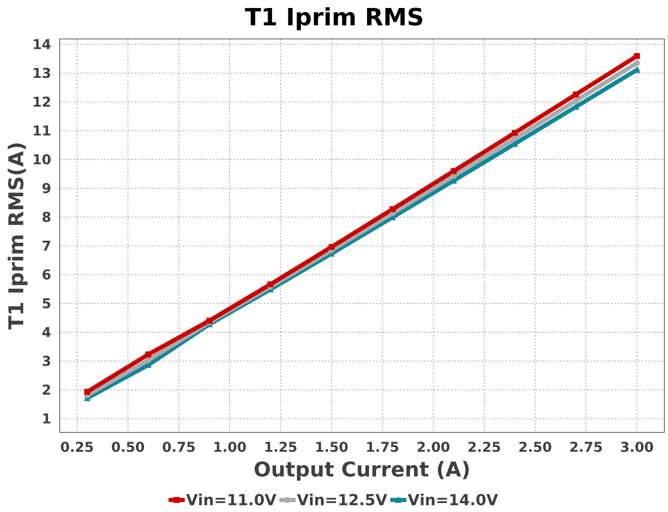

Iin Avg
Iin Avg(A)
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

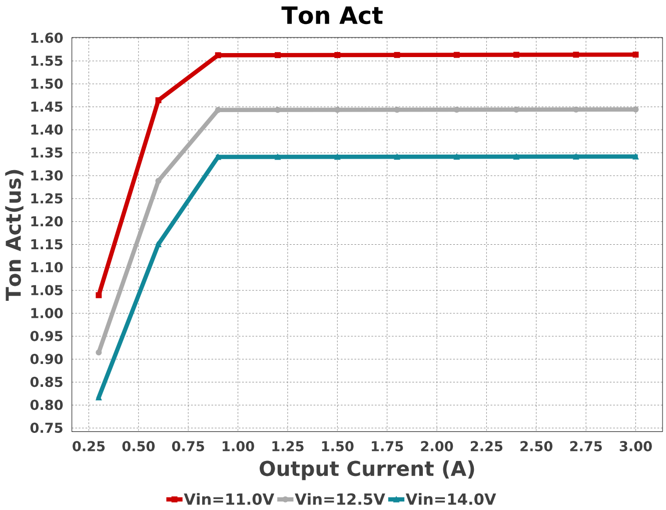

IC Tj
IC Tj(degC)
34.327795157 34.327795156 34.327795155 34.327795154 34.327795153 34.327795152 34.327795151 34.327795150 34.327795149 34.327795148
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

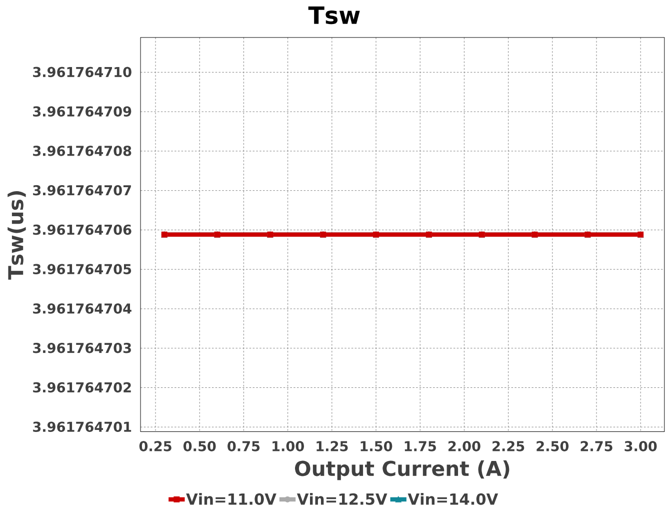

M1 TjOP
M1 TjOP(degC)
70.0 67.5 65.0 62.5 60.0 57.5 55.0 52.5 50.0 47.5 45.0 42.5 40.0 37.5
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

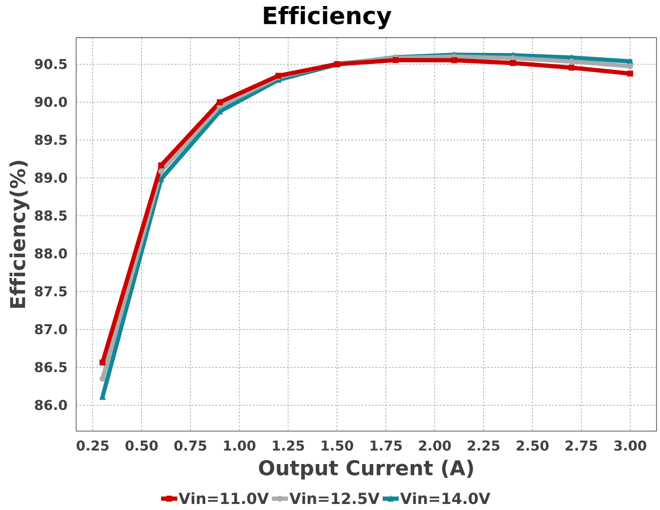

Snubber Pd
Snubber Pd(W)
1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

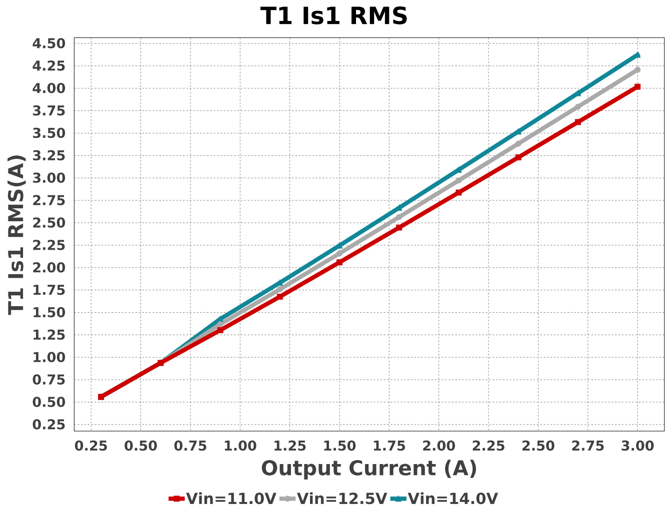

Duty Cycle
Duty Cycle(%)
39.5 39.0 38.5 38.0 37.5 37.0 36.5 36.0 35.5 35.0 34.5 34.0 33.5
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

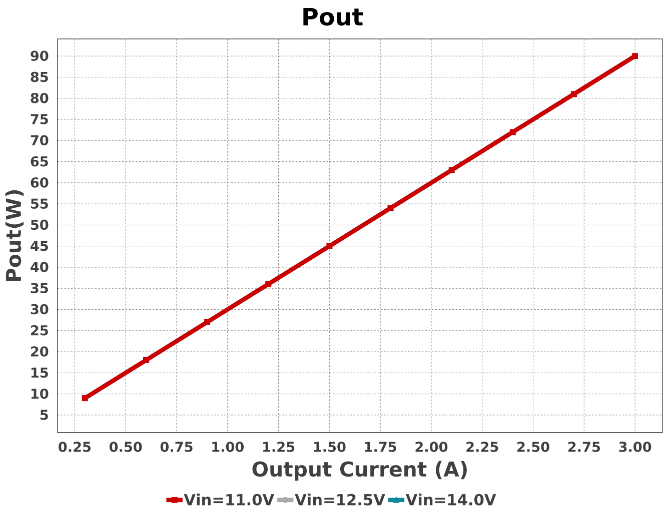

T1 Iprim RMS
T1 Iprim RMS(A)
14 13 12 11 10 9 8 7 6 5 4 3 2 1
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

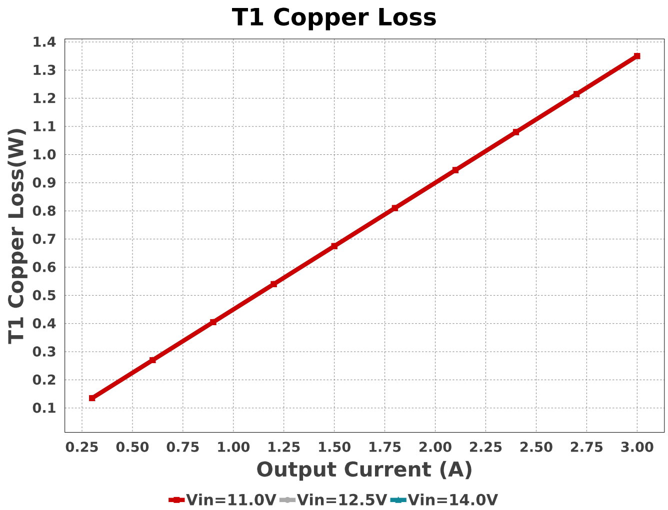

Ton Act
Ton Act(us)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

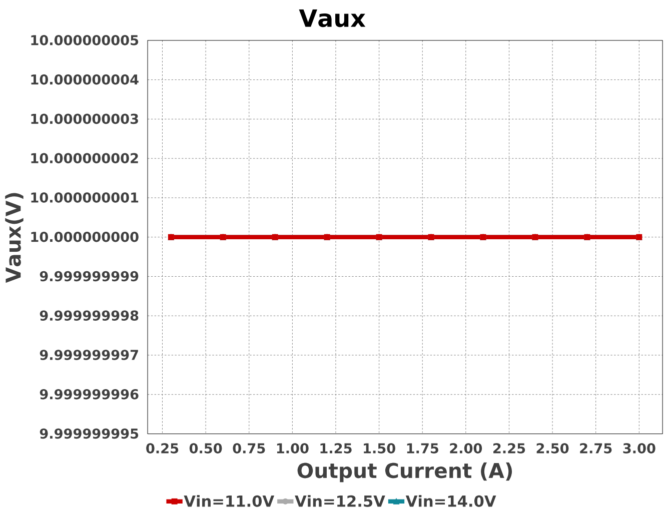

Tsw
Tsw(us)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

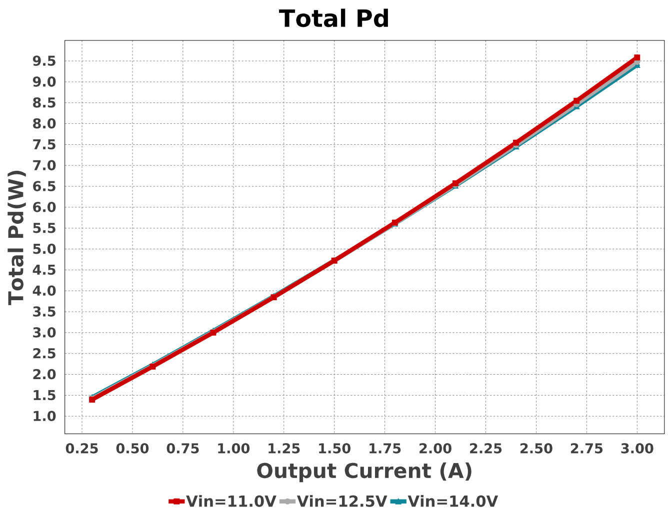

Efficiency
Efficiency(%)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

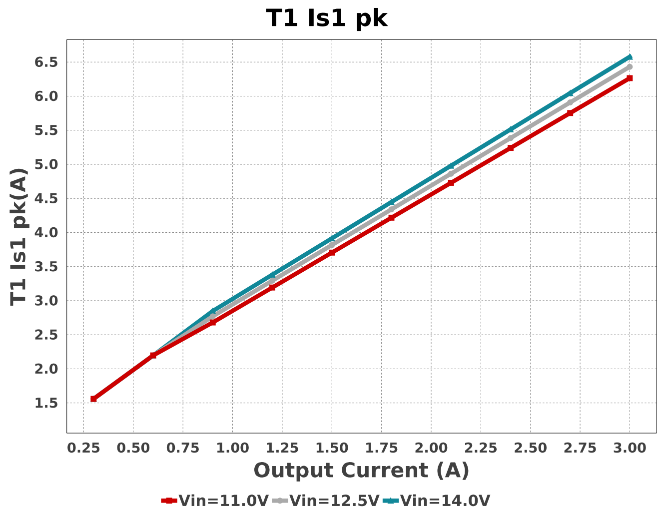

T1 Is1 RMS
T1 Is1 RMS(A)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

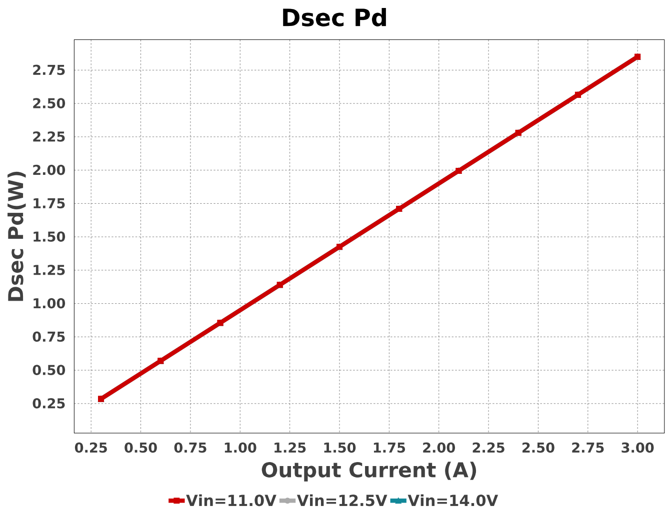

Pout
Pout(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

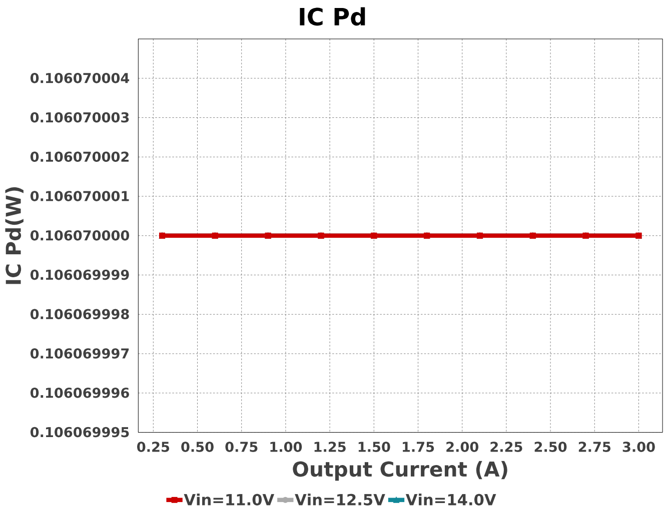

T1 Copper Loss
T1 Copper Loss(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

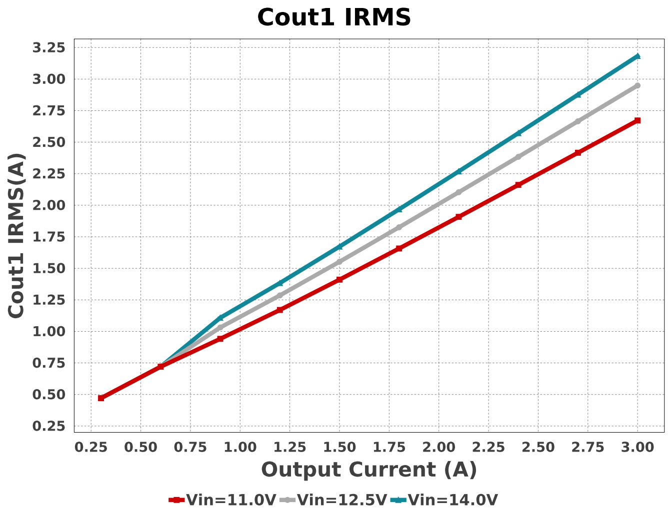

Vaux
Vaux(V)
10.000000005
10.000000004
10.000000003
10.000000002
10.000000001
10.000000000
9.999999999
9.999999998
9.999999997
9.999999996
9.999999995
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

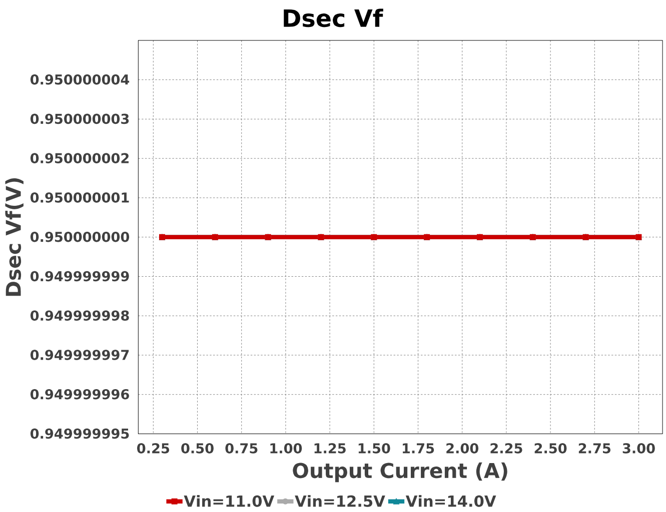

Total Pd
Total Pd(W)
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

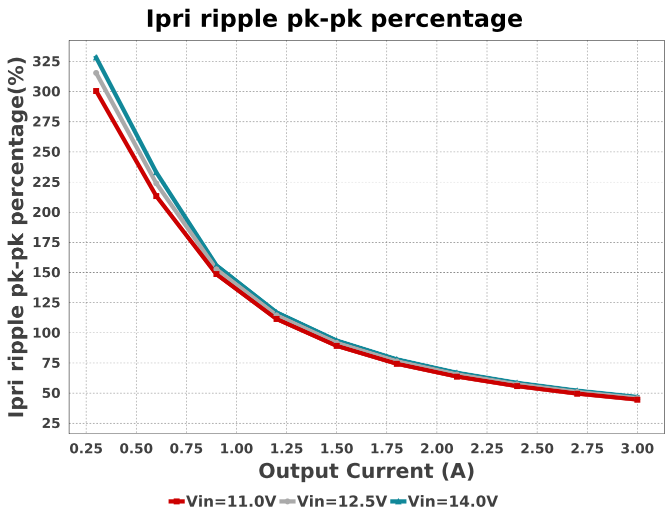

T1 Is1 pk
T1 Is1 pk(A)
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

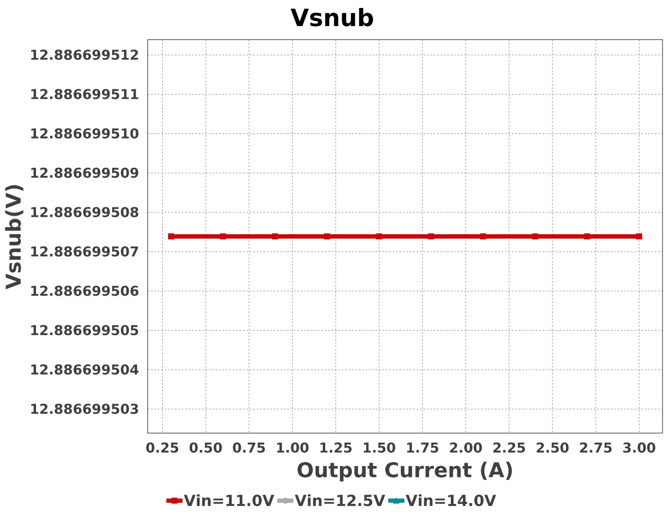

Dsec Pd
Dsec Pd(W)
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

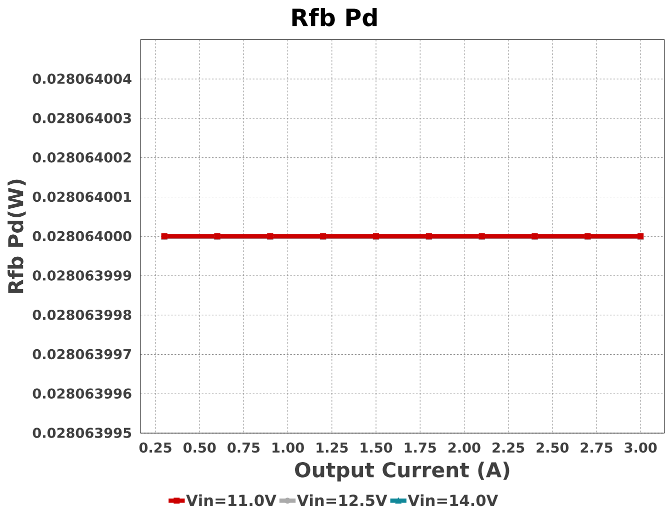

IC Pd
IC Pd(W)
0.106070004
0.106070003
0.106070002
0.106070001
0.106070000
0.106069999
0.106069998
0.106069997
0.106069996
0.106069995
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

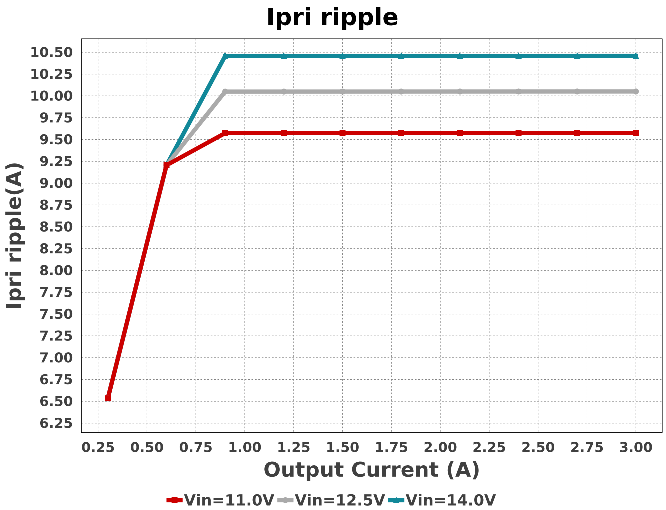

Cout1 IRMS
Cout1 IRMS(A)
3.25
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

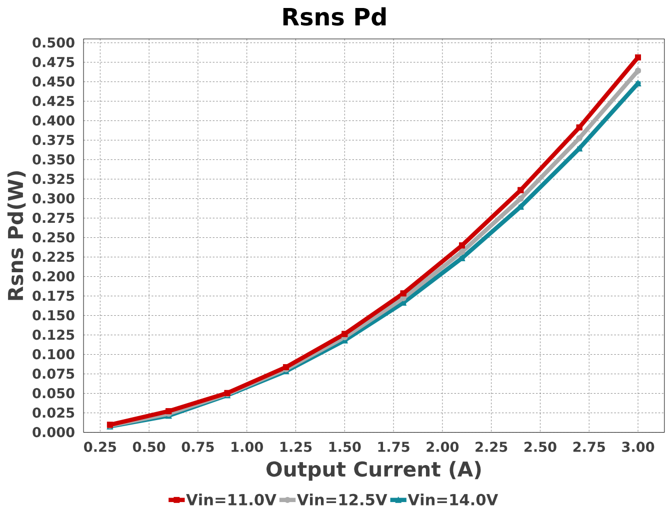

Dsec Vf
Dsec Vf(V)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

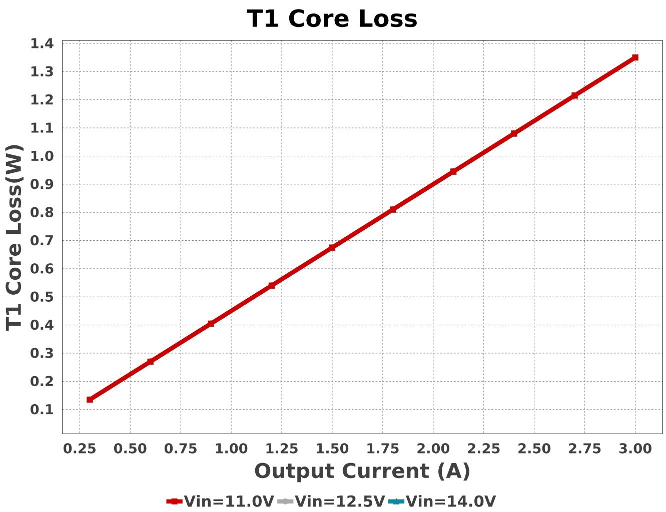

Ipri ripple pk-pk percentage
Ipri ripple pk-pk percentage(%)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

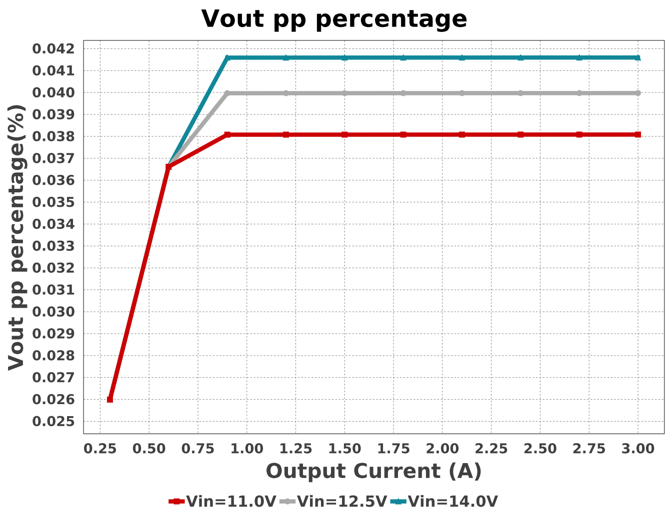

Vsnub
Vsnub(V)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

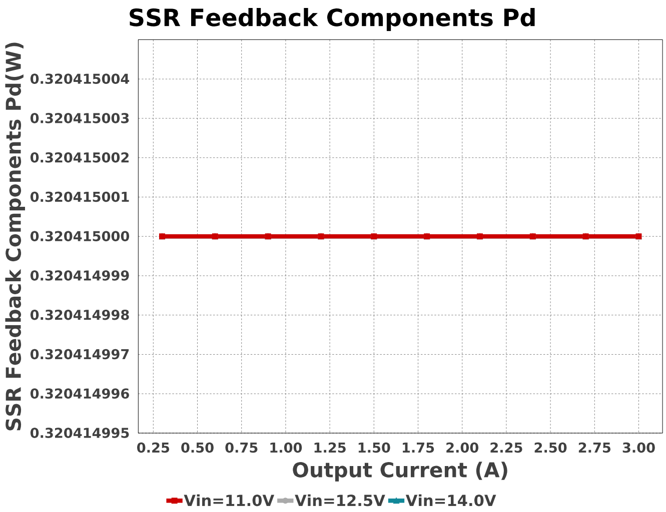

Rfb Pd
Rfb Pd(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

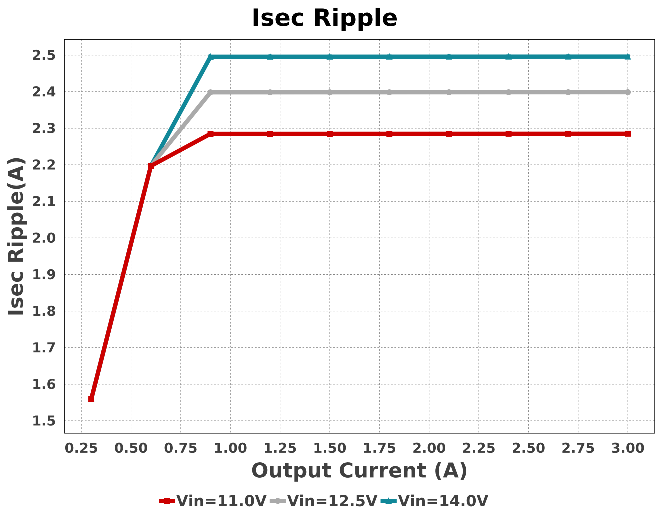

Ipri ripple
Ipri ripple(A)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

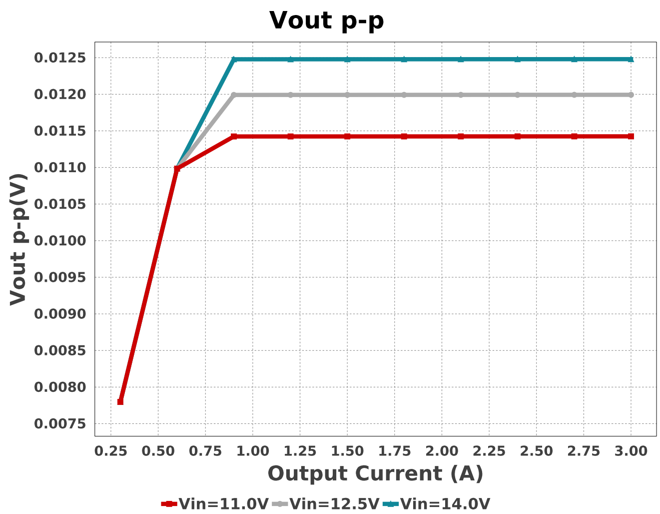

Rsns Pd
Rsns Pd(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

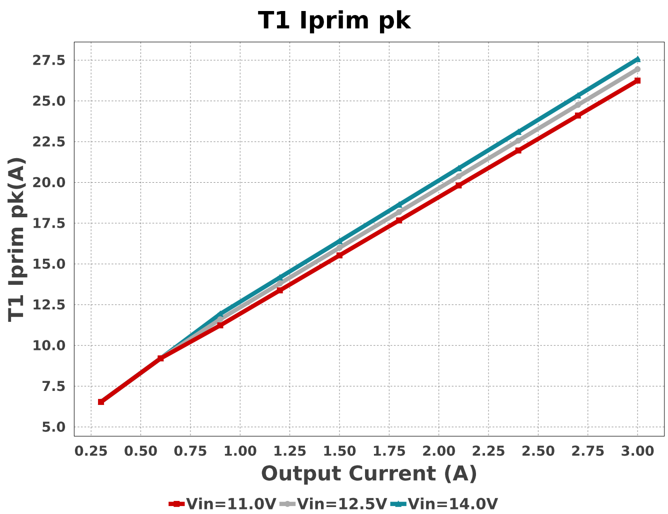

T1 Core Loss
T1 Core Loss(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V

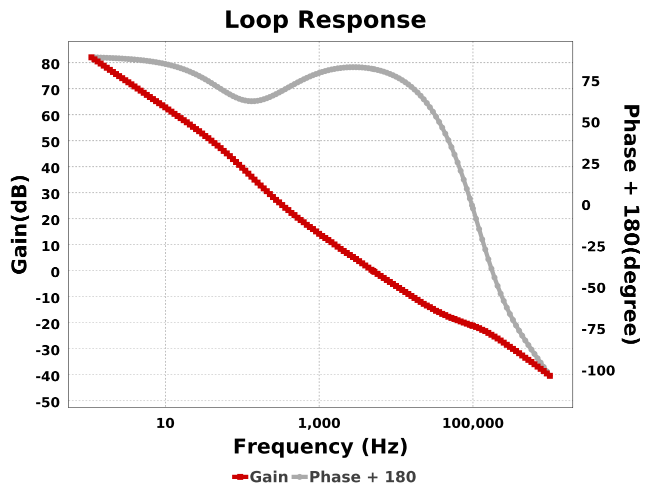

Vout pp percentage
Vout pp percentage(%)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V


SSR Feedback Components Pd
SSR Feedback Components Pd(W)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V


Isec Ripple
Isec Ripple(A)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V


Vout p-p
Vout p-p(V)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V


T1 Iprim pk
T1 Iprim pk(A)
Output Current (A)
Vin=11.0V Vin=12.5V Vin=14.0V




## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin Pd | 463.27 mW | Capacitor | Input capacitor power dissipation |
| 2. | Cout Pd | 35.693 mW | Capacitor | Output capacitor1 power dissipation |
| 3. | Cout1 IRMS | 2.672 A | Capacitor | Output capacitor1 RMS ripple current |
| 4. | Dsec Pd | 2.85 W | Diode | Secondary Diode Power Dissipation |
| 5. | Dsec Vf | 950.0 mV | Diode | Effective Forward Voltage Drop at the Operating Current |
| 6. | IC Pd | 106.07 mW | IC | IC power dissipation |
| 7. | IC Tj | 34.328 degC | IC | IC junction temperature |
| 8. | ICThetaJA Effective | 40.8 degC/W | IC | Effective IC Junction-to-Ambient Thermal Resistance |
| 9. | Iin Avg | 9.626 A | IC | Average input current |
| 10. | M1 Pd | 794.81 mW | Mosfet | M1 MOSFET total power dissipation |
| 11. | M1 TjOP | 69.741 degC | Mosfet | M1 MOSFET junction temperature |
| 12. | Cin Pd | 463.27 mW | Power | Input capacitor power dissipation |
| 13. | Cout Pd | 35.693 mW | Power | Output capacitor1 power dissipation |
| 14. | Dsec Pd | 2.85 W | Power | Secondary Diode Power Dissipation |
| 15. | IC Pd | 106.07 mW | Power | IC power dissipation |
| 16. | M1 Pd | 794.81 mW | Power | M1 MOSFET total power dissipation |
| 17. | Paux | 2.867 mW | Power | Power Dissipation in Raux and Daux |
| 18. | Rfb Pd | 28.064 mW | Power | Rfb Power Dissipation |
| 19. | Rsns Pd | 481.26 mW | Power | Current Limit Sense Resistor Power Dissipation |
| 20. | SSR Feedback Components Pd | 320.415 mW | Power | SSR control Mode Feedback Components Power Dissipation. |
| 21. | Snubber Pd | 1.8 W | Power | Approximate Snubber Power Dissipation (Assumed 2% of Output Power) |
| 22. | T1 Copper Loss | 1.35 W | Power | Transformer Copper Loss Power Dissipation |
| 23. | T1 Core Loss | 1.35 W | Power | Transformer Core Loss Power Dissipation |
| 24. | T1 Pd | 2.7 W | Power | Estimated Losses in Transformer |
| 25. | Total Pd | 9.582 W | Power | Total Power Dissipation |
| 26. | Rfb Pd | 28.064 mW | Resistor | Rfb Power Dissipation |
| 27. | Rsns Pd | 481.26 mW | Resistor | Current Limit Sense Resistor Power Dissipation |
| 28. | BOM Count | 40 | System Information | Total Design BOM count |
| 29. | Cross Freq | 3.673 kHz | System Information | Bode plot crossover frequency |
| 30. | Duty Cycle | 39.473 % | System Information | Duty cycle |
| 31. | Efficiency | 90.377 % | System Information | Steady state efficiency |
| 32. | FootPrint | 1.568 k $mm^2$ | System Information | Total Foot Print Area of BOM components |
| 33. | Frequency | 252.413 kHz | System Information | Switching frequency |
| 34. | Gain Marg | -21.594 dB | System Information | Bode Plot Gain Margin |
| 35. | Iout | 3.0 A | System Information | Iout operating point |
| 36. | Iout_DCM | 642.052 mA | System Information | Approximate Current below which DCM mode of operation will begin |
| 37. | Low Freq Gain | 79.022 dB | System Information | Gain at 1Hz |
| 38. | Mode | CCM | System Information | Conduction Mode |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 39. | Phase Marg | 81.94 deg | System Information | Bode Plot Phase Margin |
| 40. | Pout | 90.0 W | System Information | Total output power |
| 41. | Toff | 2.321 us | System Information | Approximate Converter Off Time |
| 42. | Ton Act | 1.564 us | System Information | Approximate Converter On Time |
| 43. | Total BOM | NA | System Information | Total BOM Cost |
| 44. | Tsw | 3.962 us | System Information | Switching Time Period |
| 45. | Vin | 11.0 V | System Information | Vin operating point |
| 46. | Vout | 30.0 V | System Information | Operational Output Voltage |
| 47. | Vout Actual | 29.968 V | System Information | Vout Actual calculated based on selected voltage divider resistors |
| 48. | Vout Tolerance | 2.913 % | System Information | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |
| 49. | Vout p-p | 11.425 mV | System Information | Peak-to-peak output ripple voltage |
| 50. | Vout pp percentage | 38.084 m% | System Information | Output Voltage ripple percentage |
| 51. | Vsnub | 12.887 V | System Information | Voltage Across the Snubber |
| 52. | Ipri Avg | 8.471 A | Transformer | Average Current in Primary Winding over the complete Switching Period |
| 53. | Ipri ripple | 9.575 A | Transformer | Ripple Current in the Primary Winding |
| 54. | Ipri ripple pk-pk percentage | 44.617 % | Transformer | Primary Current pk-pk ripple percentage(of Ipri avg during ton only) |
| 55. | Isec Ripple | 2.285 A | Transformer | Ripple Current in the Secondary Winding |
| 56. | Paux | 2.867 mW | Transformer | Power Dissipation in Raux and Daux |
| 57. | T1 Copper Loss | 1.35 W | Transformer | Transformer Copper Loss Power Dissipation |
| 58. | T1 Core Loss | 1.35 W | Transformer | Transformer Core Loss Power Dissipation |
| 59. | T1 Iprim RMS | 13.594 A | Transformer | Transformer Primary RMS Current |
| 60. | T1 Iprim pk | 26.248 A | Transformer | Transformer Primary Peak Current |
| 61. | T1 Is1 RMS | 4.017 A | Transformer | Transformer Secondary1 RMS Current |
| 62. | T1 Is1 pk | 6.264 A | Transformer | Transformer Secondary1 Peak Current |
| 63. | T1 Pd | 2.7 W | Transformer | Estimated Losses in Transformer |
| 64. | Vaux | 10.0 V | Transformer | Auxiliary Voltage |

## Design Inputs

| Name | Value | Description |
|---|---|---|
| Iout | 3.0 | Maximum Output Current |
| VinMax | 14.0 | Maximum input voltage |
| VinMin | 11.0 | Minimum input voltage |
| Vout | 30.0 | Output Voltage |
| base_pn | LM5155 | Base Product Number |
| source | DC | Input Source Type |
| Ta | 30.0 | Ambient temperature |

# WEBENCH® Assembly

## Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of Cin and Cout, and the inductance and DC resistance of L1 before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

## Soldering Component to Board

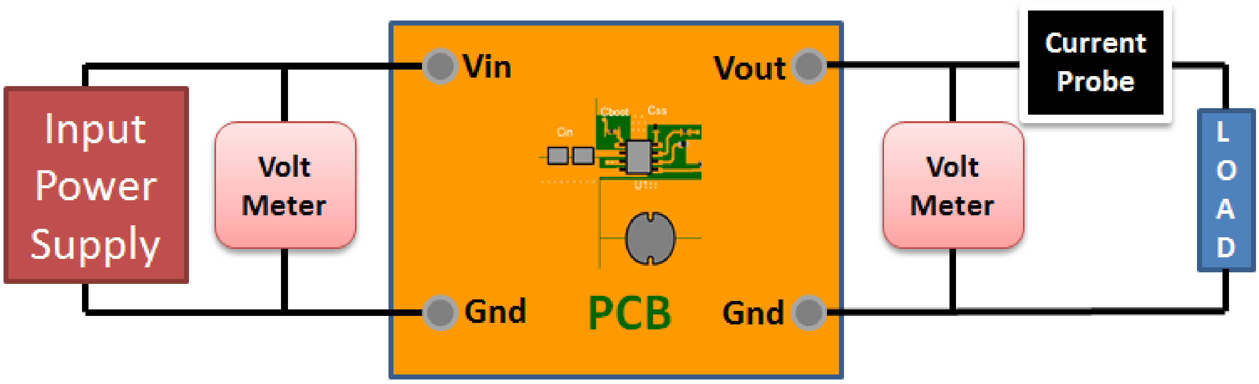
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

## Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 11.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

## Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout and the load. The load must be able to handle at least rated output power + 50% ( 7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.




## Design Assistance

1. Master key : 29B226842215AB3573FA3854FE6B08E3[v1]

2. **LM5155** Product Folder : http://www.ti.com/product/LM5155 : contains the data sheet and other resources.

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