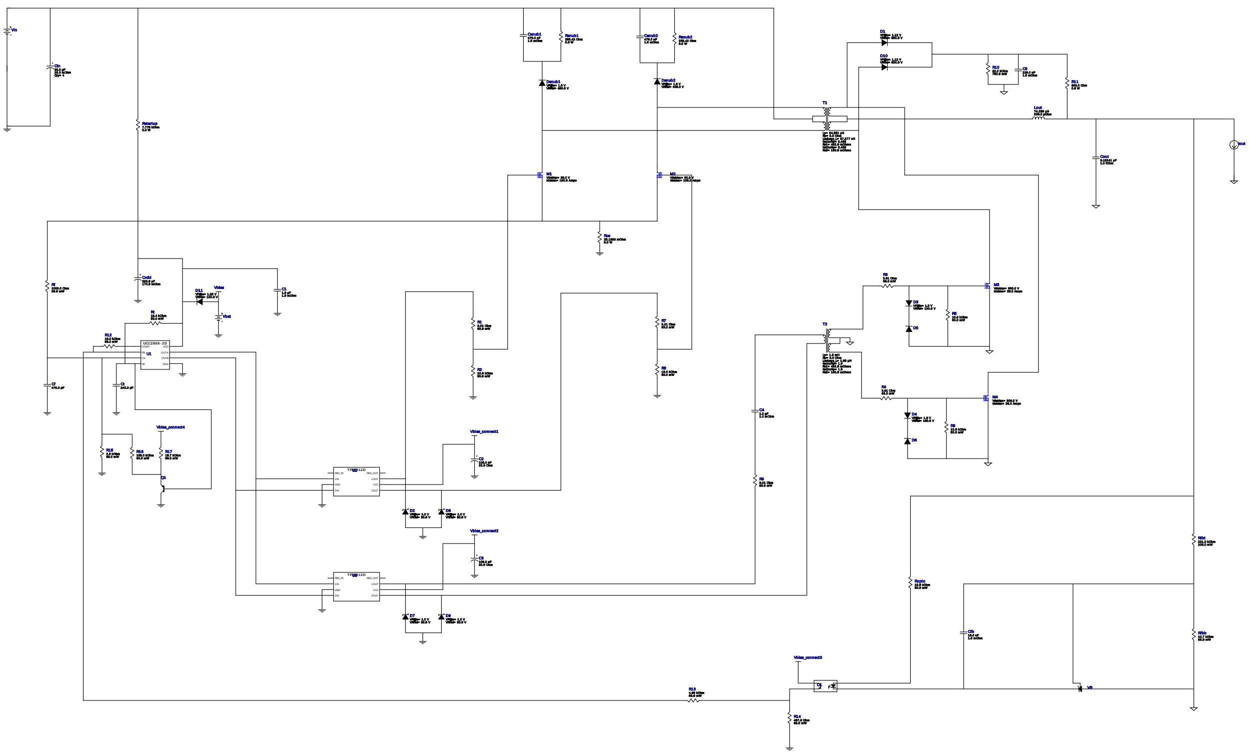
TEXAS INSTRUMENTS

# WEBENCH ® Design Report

VinMin = 11.0V
VinMax = 13.0V
Vout = 54.0V
Iout = 2.5A

Device = UCC2808D-2
Topology = Push Pull
Created = 2020-03-10 09:27:49.759
BOM Cost = NA
BOM Count = 68
Total Pd = 11.63W

Design : 170 UCC2808D-2
UCC2808D-2 11V-13V to 54.00V @ 2.5A



## Electrical BOM

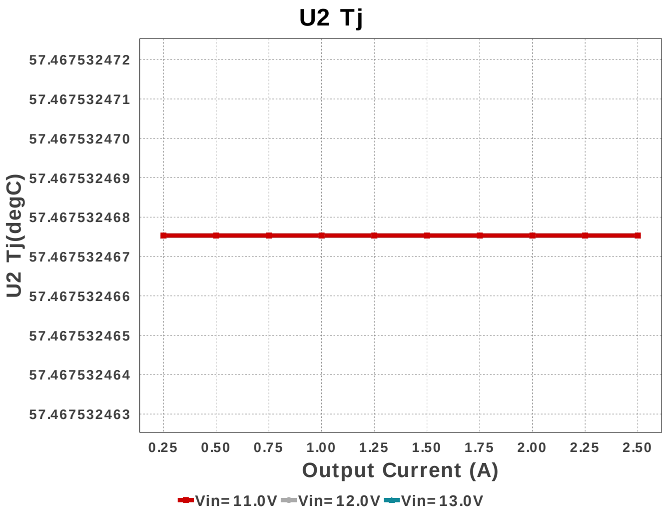
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| C1 | Taiyo Yuden | GMK212B7105KG-T<br>Series= X7R | Cap= 1.0 uF<br>ESR= 1.0 mOhm<br>VDC= 35.0 V<br>IRMS= 0.0 A | 1 | $0.03 | 0805 7 mm² |
| C2 | Vishay-Sprague | 293D104X9035A2TE3<br>Series= 293D | Cap= 100.0 nF<br>ESR= 20.0 Ohm<br>VDC= 35.0 V<br>IRMS= 60.0 mA | 1 | $0.09 | 3216-18 11 mm² |
| C3 | Vishay-Sprague | 293D104X9035A2TE3<br>Series= 293D | Cap= 100.0 nF<br>ESR= 20.0 Ohm<br>VDC= 35.0 V<br>IRMS= 60.0 mA | 1 | $0.09 | 3216-18 11 mm² |
| C4 | Taiyo Yuden | TMK212B7105KG-T<br>Series= X7R | Cap= 1.0 uF<br>ESR= 1.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.02 | 0805 7 mm² |

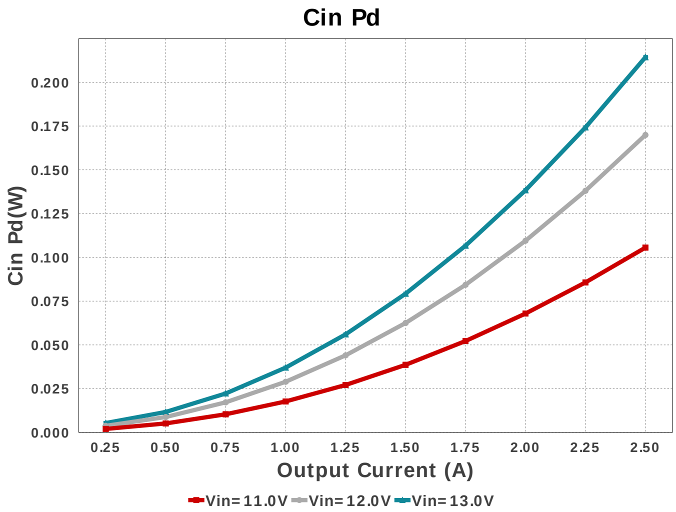
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| C5 | MuRata | GRM55DR72J224KW01L<br>Series= X7R | Cap= 220.0 nF<br>ESR= 1.0 mOhm<br>VDC= 630.0 V<br>IRMS= 0.0 A | 1 | $0.52 | 2220 54 $mm^2$ |
| Cf | AVX | 04025A471JAT2A<br>Series= C0G/NP0 | Cap= 470.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 $mm^2$ |
| Cfb | MuRata | GRM033R70J103KA01D<br>Series= X7R | Cap= 10.0 nF<br>ESR= 1.0 mOhm<br>VDC= 6.3 V<br>IRMS= 0.0 A | 1 | $0.01 | 0201 2 $mm^2$ |
| 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 | 4 | $0.74 | CAPSMT_62_E12 106 $mm^2$ |
| Cout | CUSTOM | CUSTOM<br>Series= ? | Cap= 3.15141 uF<br>ESR= 1.0 fOhm<br>VDC= 135.0 V<br>IRMS= 393.648 mA | 1 | NA | CUSTOM 0 $mm^2$ |
| Csnub1 | MuRata | GRM21BR72A474KA73L<br>Series= X7R | Cap= 470.0 nF<br>ESR= 1.0 mOhm<br>VDC= 100.0 V<br>IRMS= 0.0 A | 1 | $0.16 | 0805 7 $mm^2$ |
| Csnub2 | MuRata | GRM21BR72A474KA73L<br>Series= X7R | Cap= 470.0 nF<br>ESR= 1.0 mOhm<br>VDC= 100.0 V<br>IRMS= 0.0 A | 1 | $0.16 | 0805 7 $mm^2$ |
| Ct | Samsung Electro-Mechanics | CL10C241JB8NNNC<br>Series= C0G/NP0 | Cap= 240.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0603 5 $mm^2$ |
| Cvdd | 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 | SM_RADIAL_8MM 113 $mm^2$ |
| D1 | Bourns | CD214C-F3600 | VF@Io= 1.12 V<br>VRRM= 600.0 V | 1 | $0.23 | SMC 83 $mm^2$ |
| D10 | Bourns | CD214C-F3600 | VF@Io= 1.12 V<br>VRRM= 600.0 V | 1 | $0.23 | SMC 83 $mm^2$ |
| D11 | Diodes Inc. | 1N4148W-7-F | VF@Io= 1.25 V<br>VRRM= 100.0 V | 1 | $0.03 | SOD-123 13 $mm^2$ |
| D2 | SMC Diode Solutions | BAT54WSTR | VF@Io= 1.0 V<br>VRRM= 30.0 V | 1 | $0.02 | SOD-323 9 $mm^2$ |
| D3 | ON Semiconductor | MMSD4148T1G | VF@Io= 1.0 V<br>VRRM= 100.0 V | 1 | $0.02 | SOD-123 13 $mm^2$ |
| D4 | ON Semiconductor | MMSD4148T1G | VF@Io= 1.0 V<br>VRRM= 100.0 V | 1 | $0.02 | SOD-123 13 $mm^2$ |
| D5 | Diodes Inc. | MMSZ5242B-7-F | Zener | 1 | $0.04 | SOD-123 13 $mm^2$ |
| D6 | Diodes Inc. | MMSZ5242B-7-F | Zener | 1 | $0.04 | SOD-123 13 $mm^2$ |
| D7 | SMC Diode Solutions | BAT54WSTR | VF@Io= 1.0 V<br>VRRM= 30.0 V | 1 | $0.02 | SOD-323 9 $mm^2$ |
| D8 | SMC Diode Solutions | BAT54WSTR | VF@Io= 1.0 V<br>VRRM= 30.0 V | 1 | $0.02 | SOD-323 9 $mm^2$ |

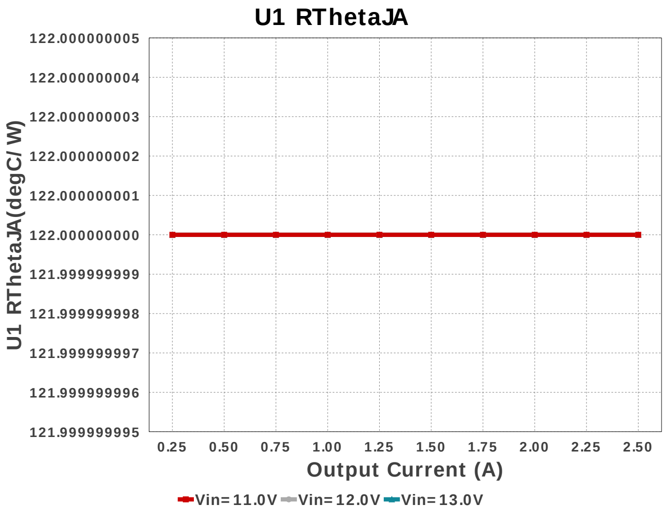
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| D9 | SMC Diode Solutions | BAT54WSTR | VF@Io= 1.0 V<br>VRRM= 30.0 V | 1 | $0.02 | SOD-323 9 $mm^2$ |
| Dsnub1 | SMC Diode Solutions | UF4004TA | VF@Io= 1.0 V<br>VRRM= 400.0 V | 1 | $0.22 | DO-41 43 $mm^2$ |
| Dsnub2 | SMC Diode Solutions | UF4004TA | VF@Io= 1.0 V<br>VRRM= 400.0 V | 1 | $0.22 | DO-41 43 $mm^2$ |
| Lout | CUSTOM | CUSTOM | L= 74.259 µH<br>500.0 µOhm | 1 | NA | CUSTOM 0 $mm^2$ |
| M1 | Texas Instruments | CSD19502Q5B | VdsMax= 80.0 V<br>IdsMax= 100.0 Amps | 1 | $0.85 | DQK0006C 9 $mm^2$ |
| M2 | Texas Instruments | CSD19502Q5B | VdsMax= 80.0 V<br>IdsMax= 100.0 Amps | 1 | $0.85 | DQK0006C 9 $mm^2$ |
| M3 | Panasonic | FDB28N30TM | VdsMax= 300.0 V<br>IdsMax= 28.0 Amps | 1 | $0.97 | DDPAK 210 $mm^2$ |
| M4 | Panasonic | FDB28N30TM | VdsMax= 300.0 V<br>IdsMax= 28.0 Amps | 1 | $0.97 | DDPAK 210 $mm^2$ |
| O1 | Fairchild Semiconductor | FOD817A | Optocoupler | 1 | $0.11 | DIP-4 71 $mm^2$ |
| Q1 | Fairchild Semiconductor | MMBT4403 | Bipolar Transistor | 1 | $0.05 | SOT-23 14 $mm^2$ |
| R1 | Vishay-Dale | CRCW04023R01FKED<br>Series= CRCW..e3 | Res= 3.01 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R10 | Vishay-Dale | CRCW201062K0FKEF<br>Series= ? | Res= 62.0 kOhm<br>Power= 750.0 mW<br>Tolerance= 1.0% | 1 | $0.03 | 2010 32 $mm^2$ |
| R11 | CUSTOM | CUSTOM<br>Series= ? | Res= 800.0 Ohm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| R12 | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R13 | Vishay-Dale | CRCW04024K99FKED<br>Series= CRCW..e3 | Res= 4.99 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R14 | Vishay-Dale | CRCW0402487RFKED<br>Series= CRCW..e3 | Res= 487.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R15 | Vishay-Dale | CRCW04022K80FKED<br>Series= CRCW..e3 | Res= 2.8 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R16 | Yageo | RC0201FR-07105KL<br>Series= ? | Res= 105.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R17 | Yageo | RC0201FR-0718K7L<br>Series= ? | Res= 18.7 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R2 | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |

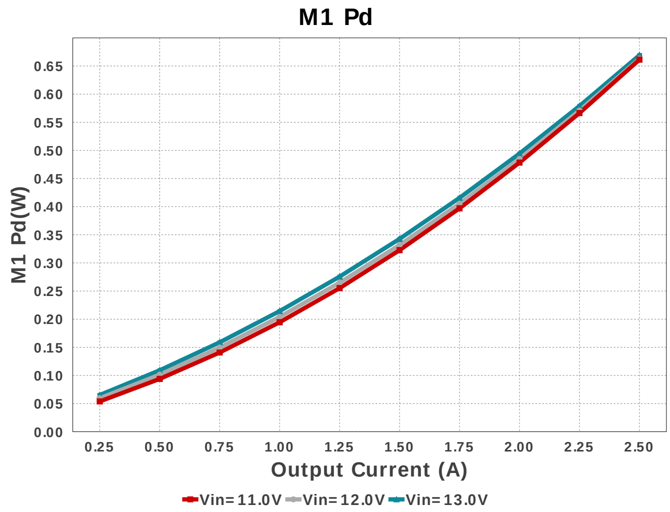
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| R3 | Vishay-Dale | CRCW04023R01FKED<br>Series= CRCW..e3 | Res= 3.01 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R4 | Vishay-Dale | CRCW04023R01FKED<br>Series= CRCW..e3 | Res= 3.01 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R5 | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R6 | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R7 | Vishay-Dale | CRCW04023R01FKED<br>Series= CRCW..e3 | Res= 3.01 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| R8 | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| R9 | Vishay-Dale | CRCW04023R01FKED<br>Series= CRCW..e3 | Res= 3.01 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rcs | CUSTOM | CUSTOM<br>Series= ? | Res= 25.1833 mOhm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| Rf | Vishay-Dale | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1000.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rfbb | Vishay-Dale | CRCW040210K7FKED<br>Series= CRCW..e3 | Res= 10.7 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 $mm^2$ |
| Rfbt | Vishay-Dale | CRCW0603221KFKEA<br>Series= CRCW..e3 | Res= 221.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0603 5 $mm^2$ |
| Ropto | Yageo | RC0201FR-0710KL<br>Series= ? | Res= 10.0 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| Rsnub1 | CUSTOM | CUSTOM<br>Series= ? | Res= 255.42 Ohm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| Rsnub2 | CUSTOM | CUSTOM<br>Series= ? | Res= 255.42 Ohm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| Rstartup | CUSTOM | CUSTOM<br>Series= ? | Res= 7.776 kOhm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1 | NA | CUSTOM 0 $mm^2$ |
| Rt | Yageo | RC0201FR-0715K4L<br>Series= ? | Res= 15.4 kOhm<br>Power= 50.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0201 2 $mm^2$ |
| T1 | CUSTOM | CUSTOM | Lp= 64.851 µH<br>Rp= 0.0 Ohm<br>Leakage_L= 97.277 nH<br>Ns1toNp= 5.455<br>Rs1= 432.0 mOhms<br>Ns2toNp= 5.455<br>Rs2= 100.0 mOhms | 1 | NA | CUSTOM 0 $mm^2$ |
| T2 | CUSTOM | CUSTOM | Lp= 1.3 mH<br>Rp= 0.0 Ohm<br>Leakage_L= 1.95 µH<br>Ns1toNp= 1.0<br>Rs1= 432.0 mOhms<br>Ns2toNp= 1.0<br>Rs2= 100.0 mOhms | 1 | NA | CUSTOM 0 $mm^2$ |

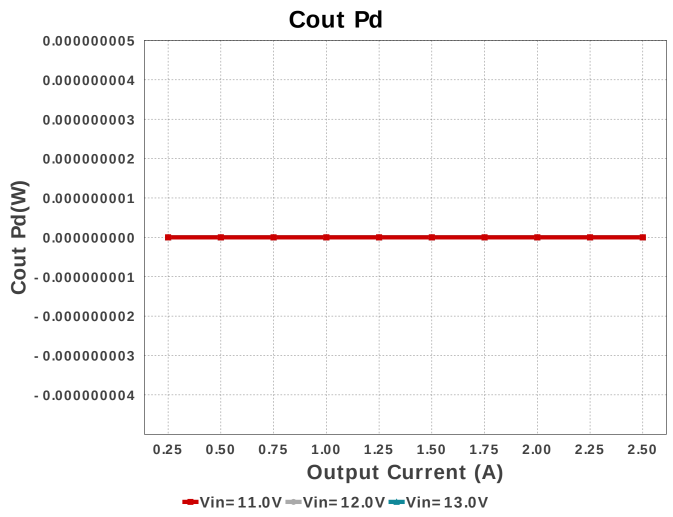
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| U1 | Texas Instruments | UCC2808D-2 | Switcher | 1 | $1.56 | 0 $mm^2$ |
| U2 | unknown | | unknown | | NA | |
| U3 | unknown | | unknown | | NA | |
| VR | Texas Instruments | TL431IDBVR | Voltage References | 1 | $0.07 | R-PDSO-G3 16 $mm^2$ |

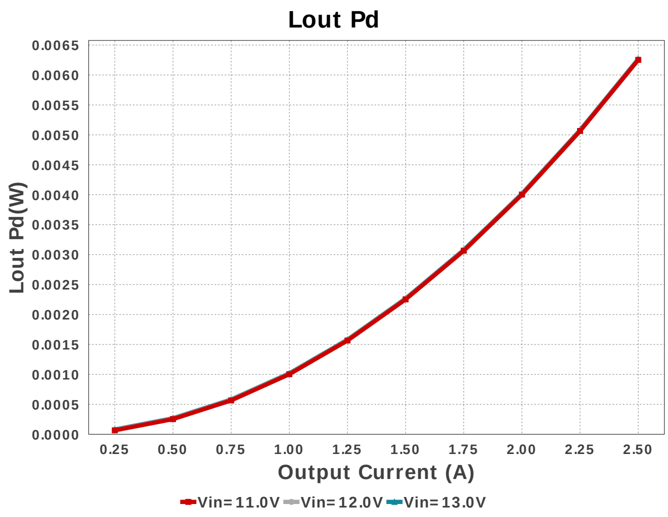


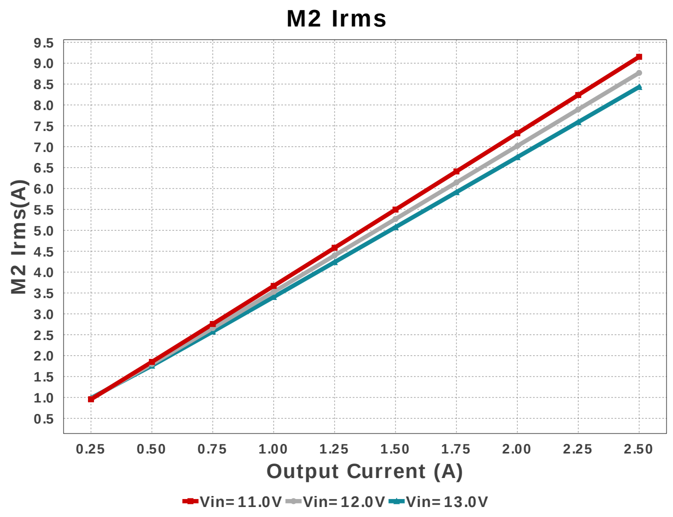



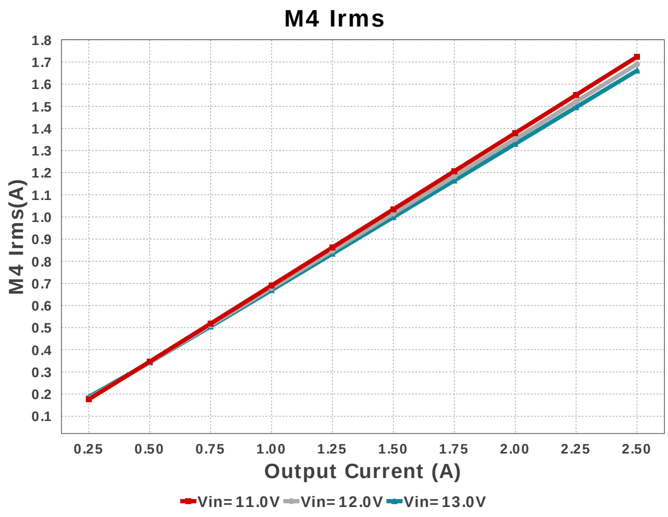



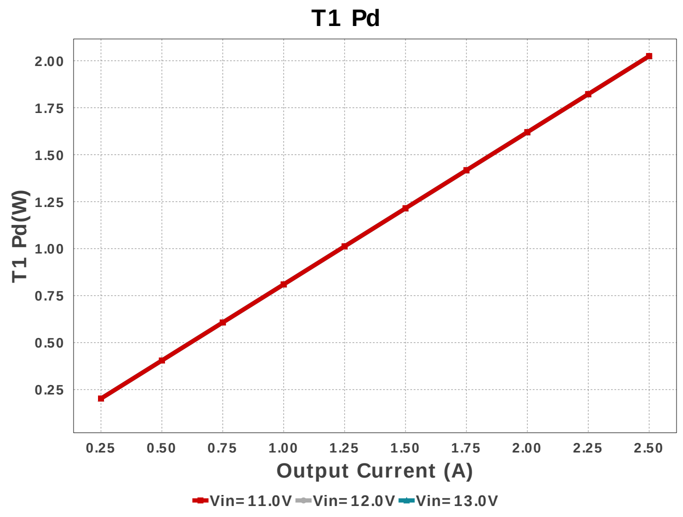



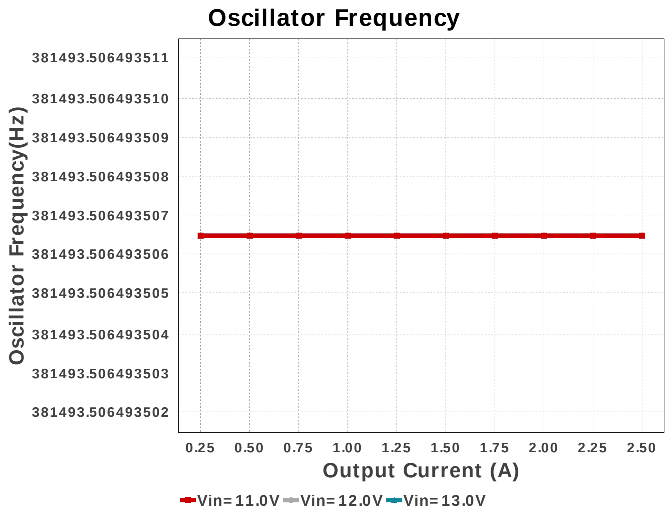

Cout Pd
Cout Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

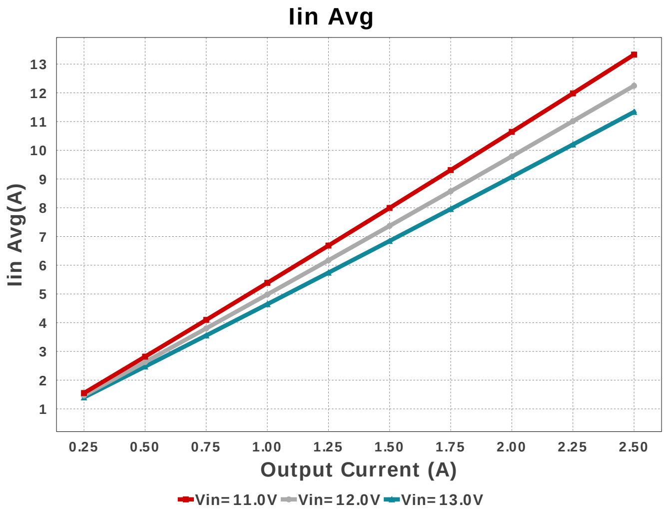

Lout Pd
Lout Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

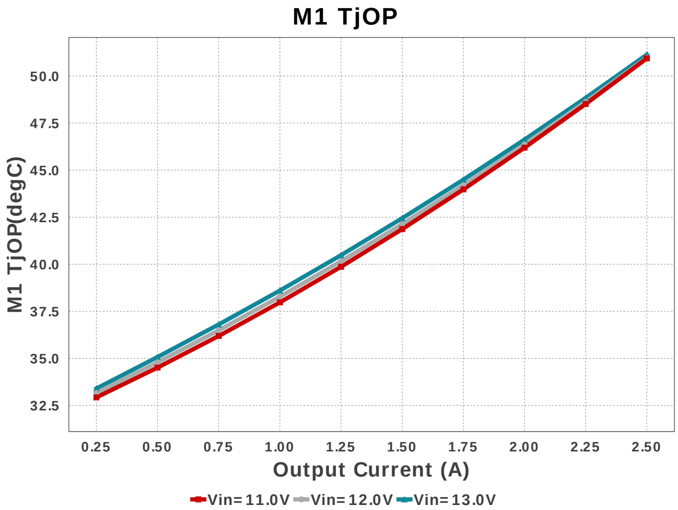

M2 Irms
M2 Irms(A)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

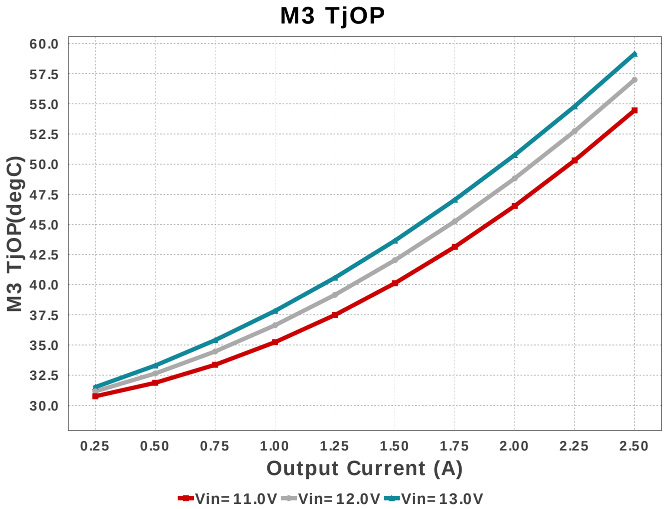

M4 Irms
M4 Irms(A)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

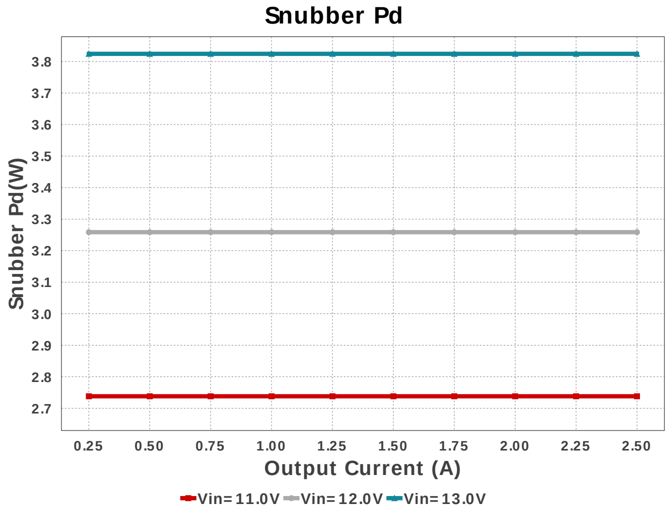

T1 Pd
T1 Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

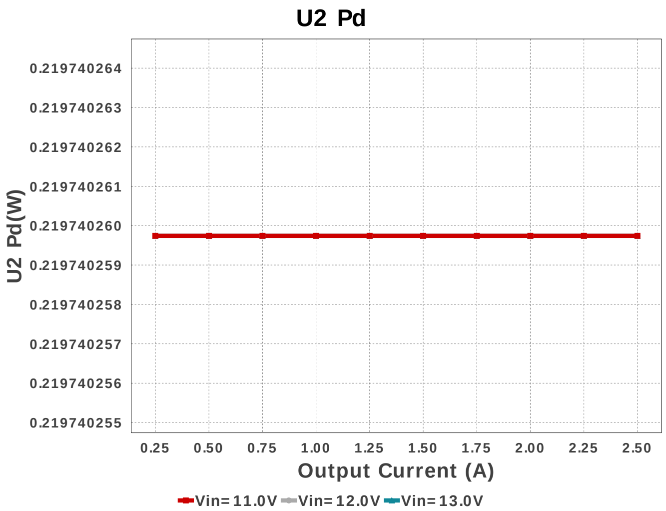

Oscillator Frequency
Oscillator Frequency(Hz)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

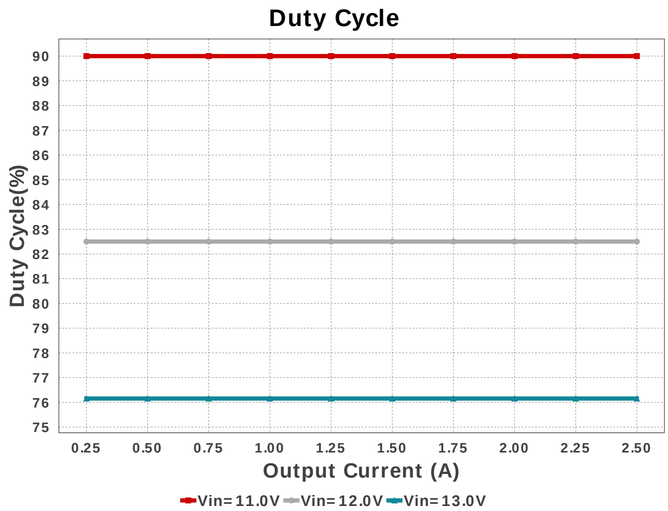

Iin Avg
Iin Avg(A)
13 12 11 10 9 8 7 6 5 4 3 2 1
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

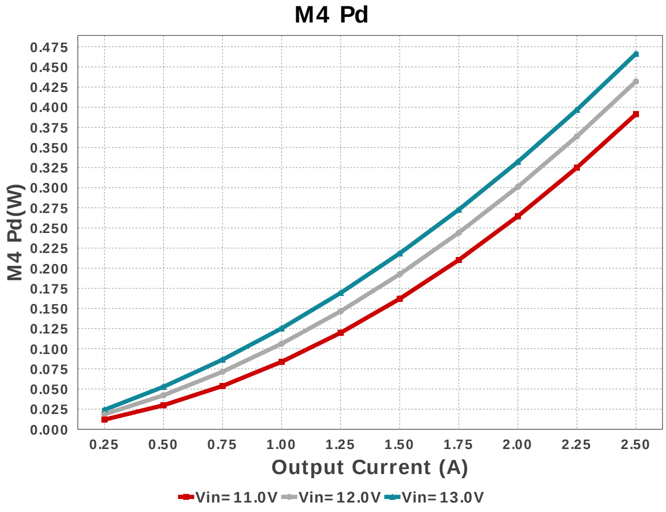

M1 TjOP
M1 TjOP(degC)
50.0 47.5 45.0 42.5 40.0 37.5 35.0 32.5
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

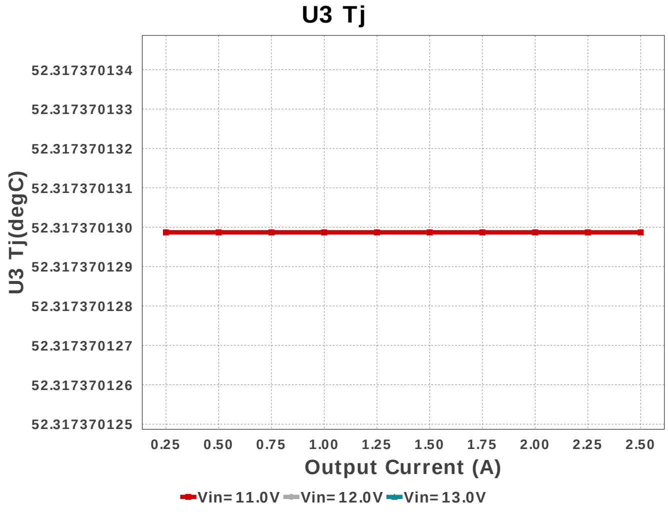

M3 TjOP
M3 TjOP(degC)
60.0 57.5 55.0 52.5 50.0 47.5 45.0 42.5 40.0 37.5 35.0 32.5 30.0
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

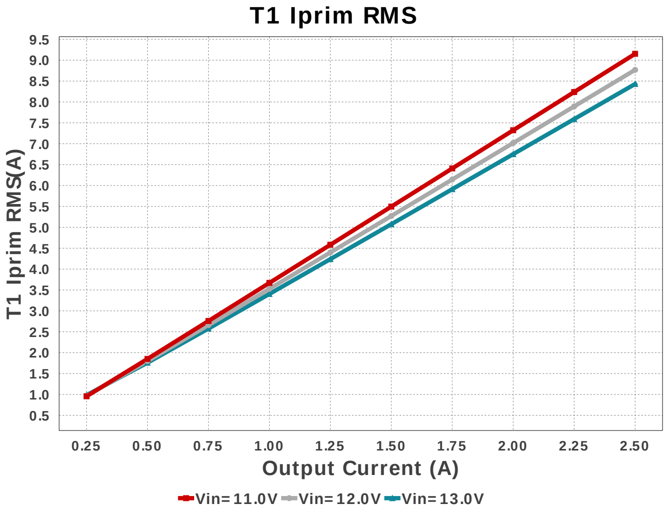

Snubber Pd
Snubber Pd(W)
3.8 3.7 3.6 3.5 3.4 3.3 3.2 3.1 3.0 2.9 2.8 2.7
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

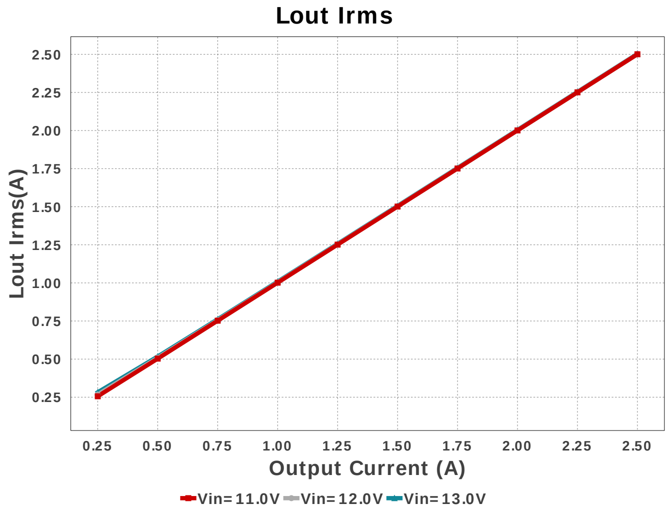

U2 Pd
U2 Pd(W)
0.219740264 0.219740263 0.219740262 0.219740261 0.219740260 0.219740259 0.219740258 0.219740257 0.219740256 0.219740255
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

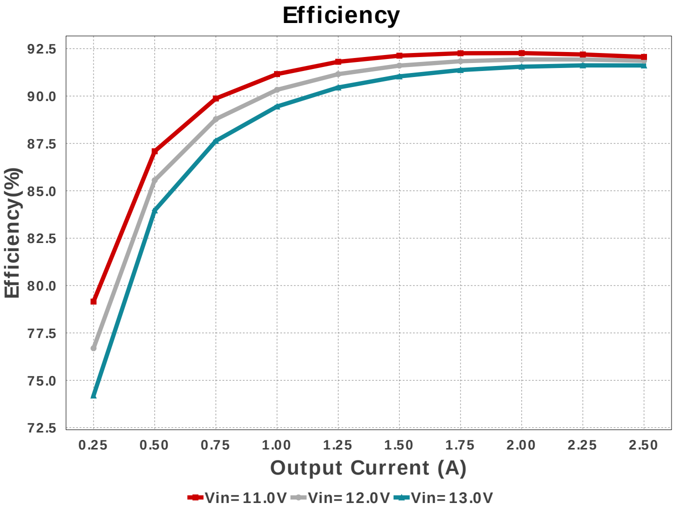

Duty Cycle
Duty Cycle(%)
90 89 88 87 86 85 84 83 82 81 80 79 78 77 76 75
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin= 11.0V Vin= 12.0V Vin= 13.0V

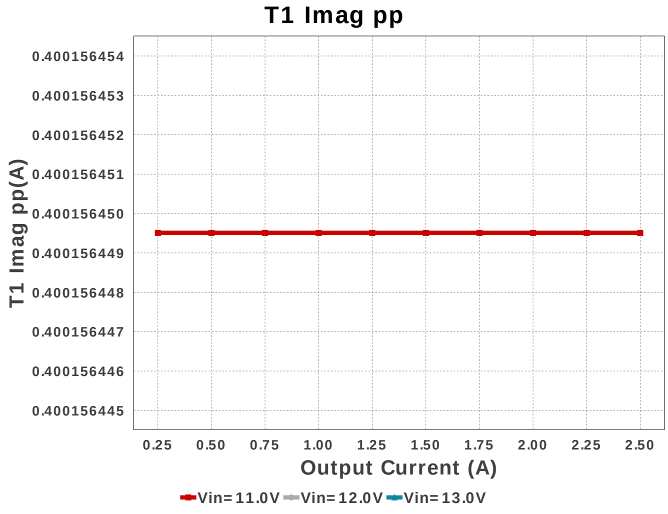

M4 Pd
M4 Pd(W)
0.475
0.450
0.425
0.400
0.375
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

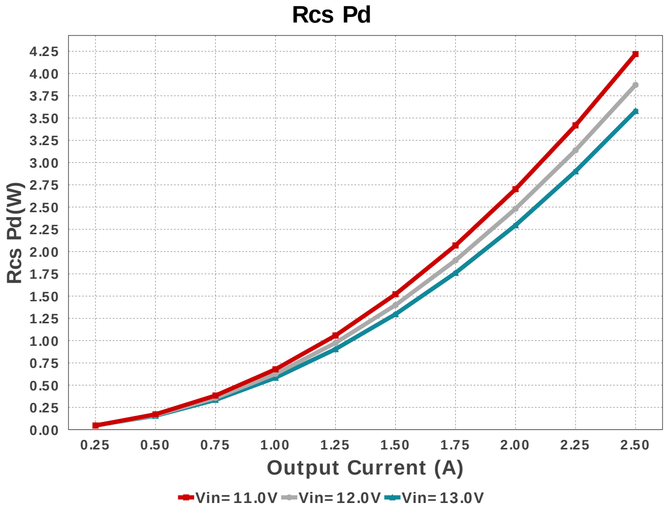

U3 Tj
U3 Tj(degC)
52.317370134
52.317370133
52.317370132
52.317370131
52.317370130
52.317370129
52.317370128
52.317370127
52.317370126
52.317370125
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

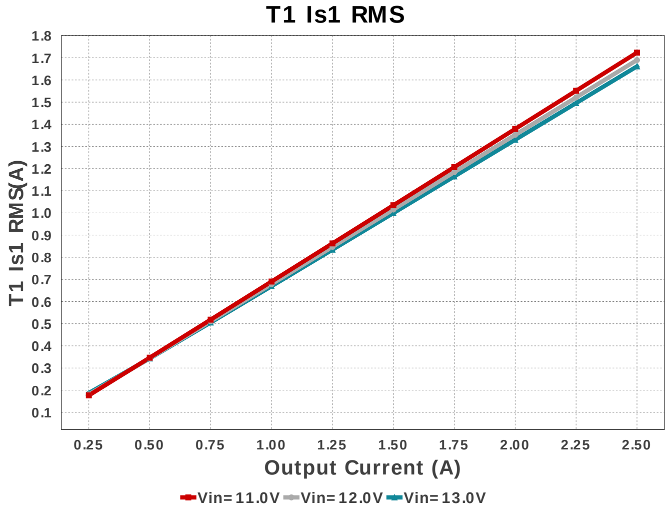

T1 Iprim RMS
T1 Iprim RMS(A)
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

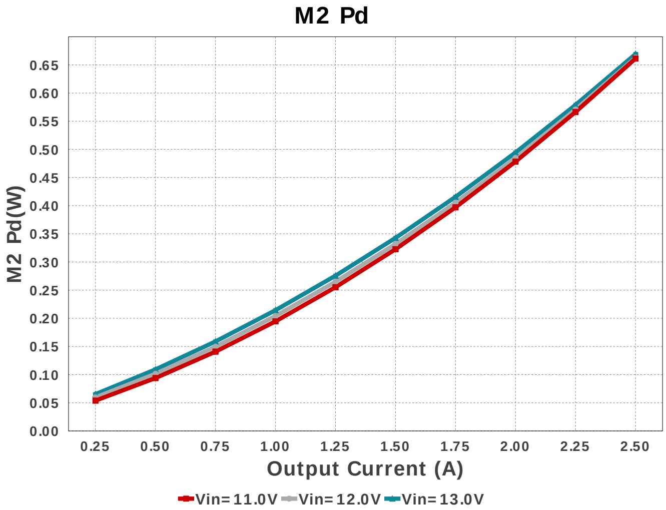

Lout Irms
Lout Irms(A)
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

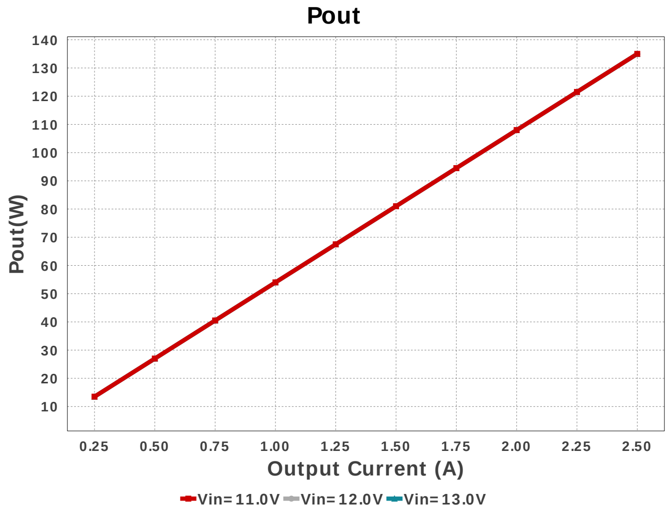

Efficiency
Efficiency(%)
92.5
90.0
87.5
85.0
82.5
80.0
77.5
75.0
72.5
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

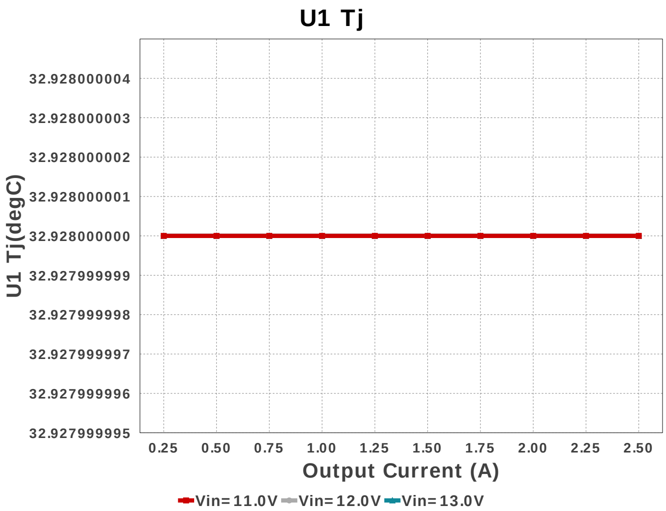

T1 Imag pp
T1 Imag pp(A)
0.400156454
0.400156453
0.400156452
0.400156451
0.400156450
0.400156449
0.400156448
0.400156447
0.400156446
0.400156445
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
Output Current (A)
Vin=11.0V
Vin=12.0V
Vin=13.0V

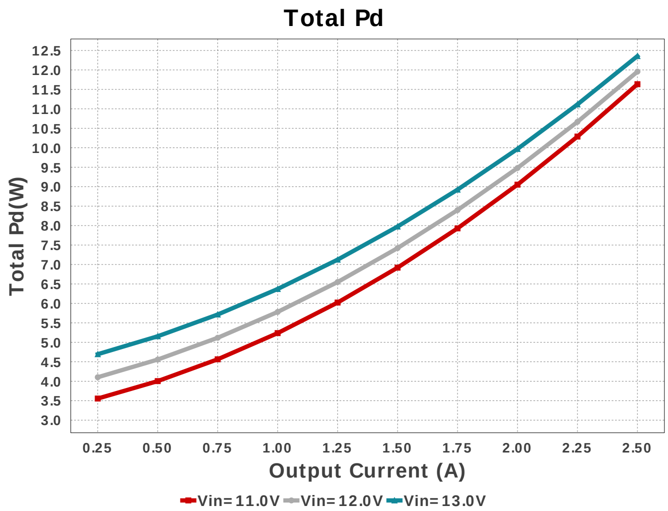

Rcs Pd
Rcs Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

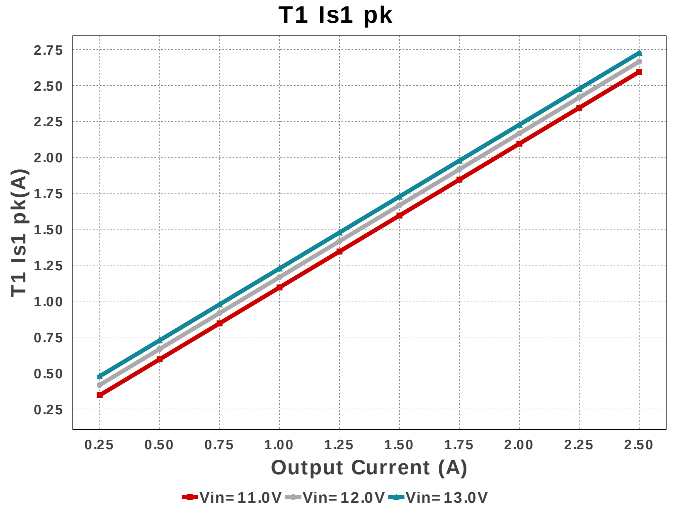

T1 Is1 RMS
T1 Is1 RMS(A)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

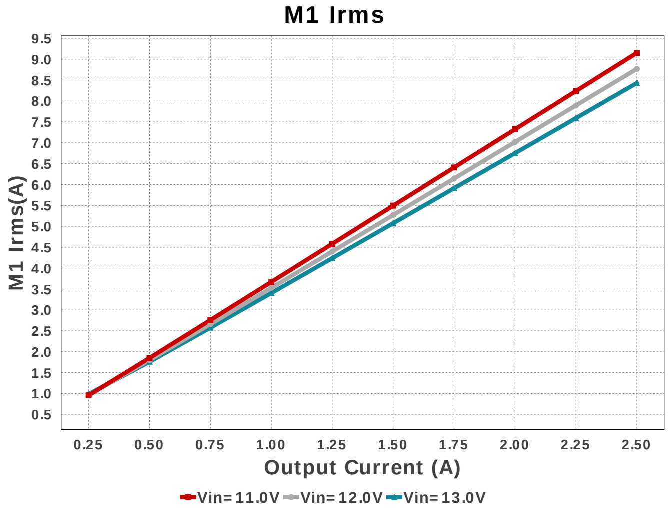

M2 Pd
M2 Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

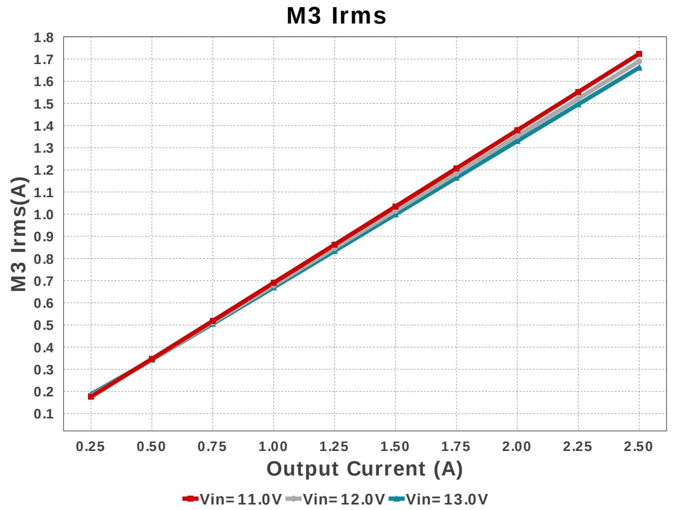

Pout
Pout(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

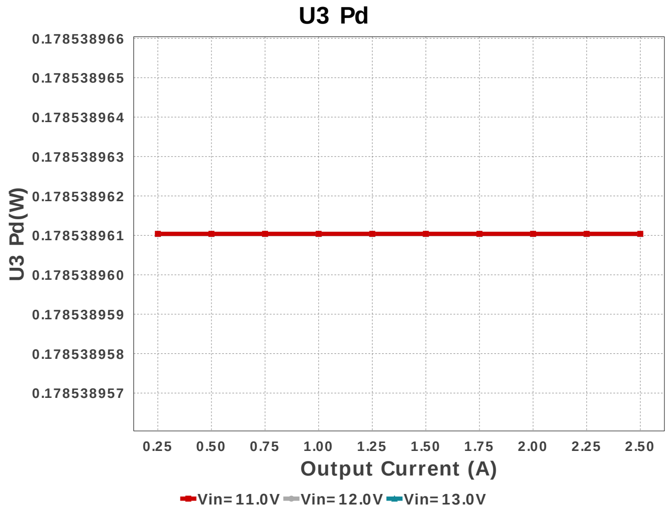

U1 Tj
U1 Tj(degC)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

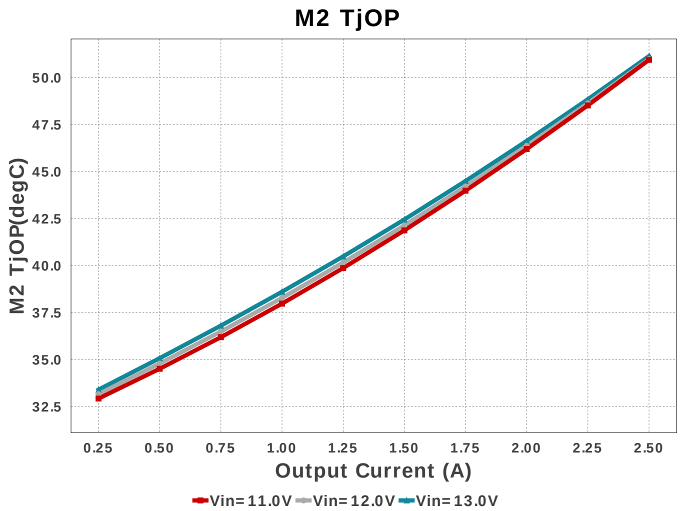

Total Pd
Total Pd(W)
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

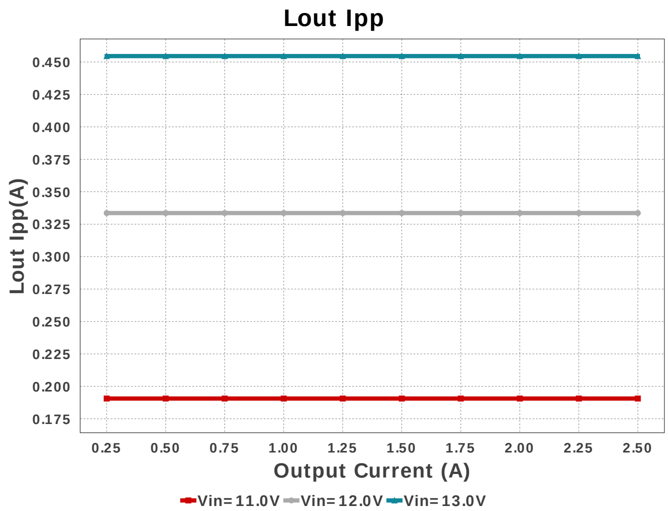

T1 Is1 pk
T1 Is1 pk(A)
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V


M1 Irms
M1 Irms(A)
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
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

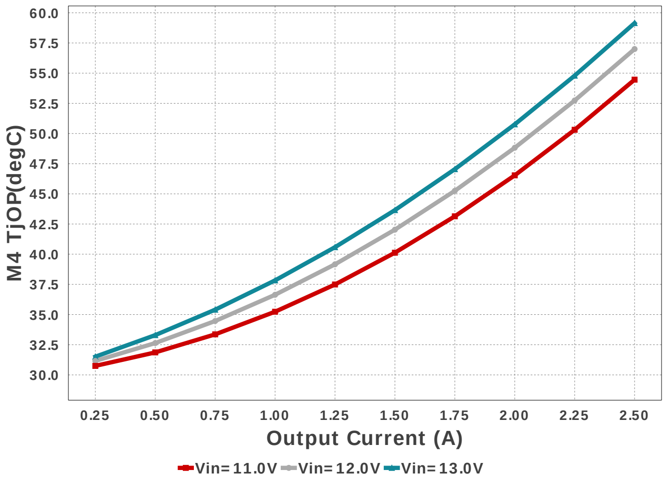

M3 Irms
M3 Irms(A)
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V


U3 Pd
U3 Pd(W)
0.178538966
0.178538965
0.178538964
0.178538963
0.178538962
0.178538961
0.178538960
0.178538959
0.178538958
0.178538957
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

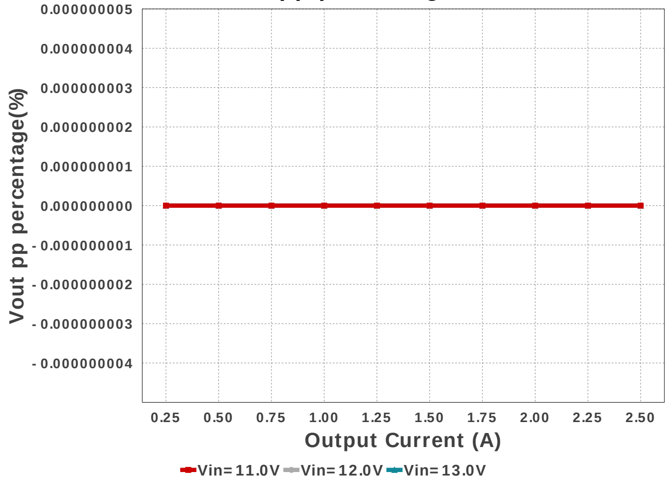

M2 TjOP
M2 TjOP(degC)
50.0
47.5
45.0
42.5
40.0
37.5
35.0
32.5
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V


Lout Ipp
Lout Ipp(A)
0.450
0.425
0.400
0.375
0.350
0.325
0.300
0.275
0.250
0.225
0.200
0.175
0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50
Output Current (A)
Vin=11.0V Vin=12.0V Vin=13.0V

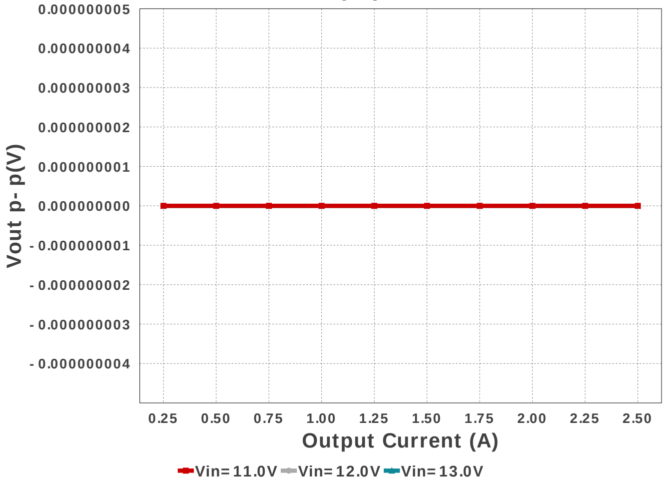
M4 TjOP



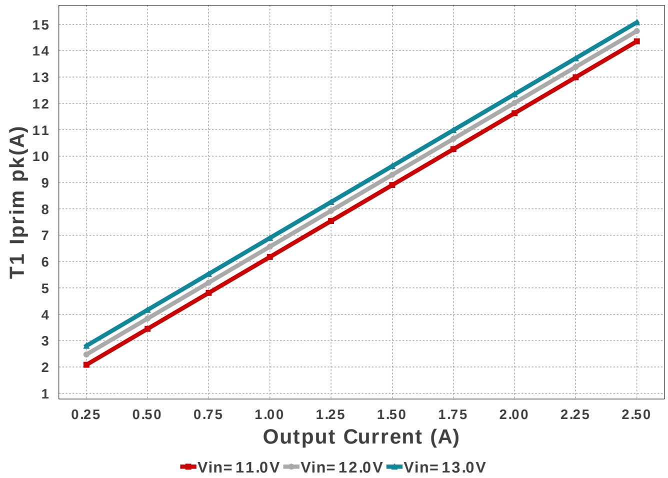

Vout pp percentage



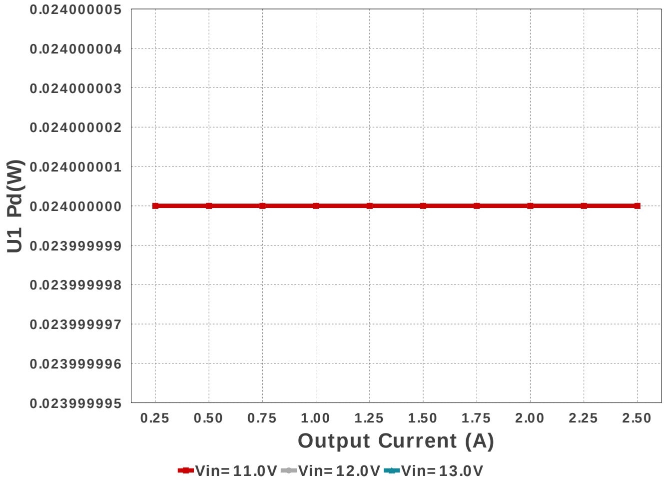

Vout p- p



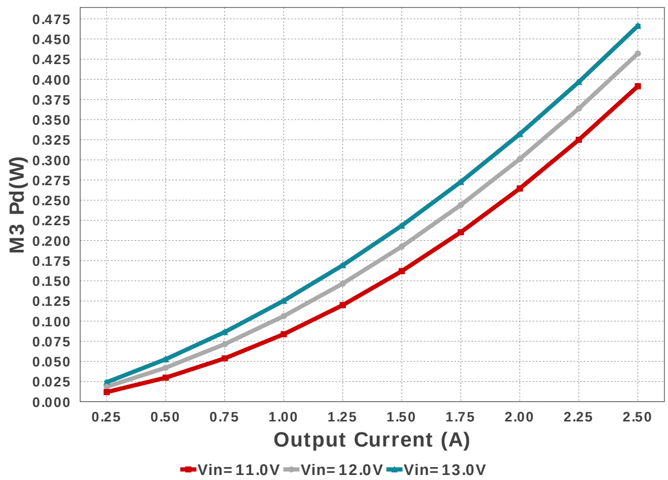

T1 Iprim pk




U1 Pd




M3 Pd




## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin Pd | 105.56 mW | Capacitor | Input capacitor power dissipation |
| 2. | Cout Pd | 0.012 fW | Capacitor | Output capacitor power dissipation |
| 3. | Lout Irms | 2.501 A | Current | Lout ripple current |
| 4. | Iin Avg | 13.33 A | IC | Average input current |
| 5. | U1 RThetaJA | 122.0 degC/W | IC | U1 IC junction-to-ambient thermal resistance |
| 6. | Lout Ipp | 190.616 mA | Inductor | Peak-to-peak output inductor ripple current |
| 7. | M1 Irms | 9.152 A | Mosfet | M1 MOSFET Irms |
| 8. | M1 Pd | 661.32 mW | Mosfet | M1 MOSFET total power dissipation |
| 9. | M1 TjOP | 63.066 degC | Mosfet | M1 MOSFET junction temperature |
| 10. | M2 Irms | 9.152 A | Mosfet | M2 MOSFET Irms |
| 11. | M2 Pd | 661.32 mW | Mosfet | M2 MOSFET total power dissipation |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 12. | M2 TjOP | 63.066 degC | Mosfet | M2 MOSFET junction temperature |
| 13. | M3 Irms | 1.723 A | Mosfet | M3 MOSFET Irms |
| 14. | M3 Pd | 391.4 mW | Mosfet | M3 MOSFET total power dissipation |
| 15. | M3 TjOp | 54.462 degC | Mosfet | M3 MOSFET junction temperature |
| 16. | M4 Irms | 1.723 A | Mosfet | M4 MOSFET Irms |
| 17. | M4 Pd | 391.4 mW | Mosfet | M4 MOSFET total power dissipation |
| 18. | M4 TjOp | 54.462 degC | Mosfet | M4 MOSFET junction temperature |
| 19. | Oscillator Frequency | 381.494 kHz | Op Point | Oscillator Frequency |
| 20. | Cin Pd | 105.56 mW | Power | Input capacitor power dissipation |
| 21. | Cout Pd | 0.012 fW | Power | Output capacitor power dissipation |
| 22. | Lout Pd | 6.253 mW | Power | Lout power dissipation |
| 23. | M1 Pd | 661.32 mW | Power | M1 MOSFET total power dissipation |
| 24. | M2 Pd | 661.32 mW | Power | M2 MOSFET total power dissipation |
| 25. | M3 Pd | 391.4 mW | Power | M3 MOSFET total power dissipation |
| 26. | M4 Pd | 391.4 mW | Power | M4 MOSFET total power dissipation |
| 27. | Rcs Pd | 4.218 W | Power | Power Dissipation in Current Sense Resistors |
| 28. | Snubber Pd | 2.738 W | Power | Snubber Power Dissipation |
| 29. | T1 Pd | 2.025 W | Power | Estimated Losses in Transformer |
| 30. | Total Pd | 11.634 W | Power | Total Power Dissipation |
| 31. | U1 Pd | 24.0 mW | Power | U1 Power Dissipation |
| 32. | U2 Pd | 219.74 mW | Power | U2 Power Dissipation |
| 33. | U3 Pd | 178.539 mW | Power | U3 Power Dissipation |
| 34. | Rcs Pd | 4.218 W | Resistor | Power Dissipation in Current Sense Resistors |
| 35. | BOM Count | 68 | System Information | Total Design BOM count |
| 36. | Duty Cycle | 90.0 % | System Information | Duty cycle |
| 37. | Efficiency | 92.066 % | System Information | Steady state efficiency |
| 38. | FootPrint | 1.733 k $mm^2$ | System Information | Total Foot Print Area of BOM components |
| 39. | Iout | 2.5 A | System Information | Iout operating point |
| 40. | Mode | CCM | System Information | Conduction Mode |
| 41. | Pout | 135.0 W | System Information | Total output power |
| 42. | Total BOM | NA | System Information | Total BOM Cost |
| 43. | U1 Tj | 32.928 degC | System Information | U1 junction temperature |
| 44. | U2 Tj | 57.468 degC | System Information | U2 junction temperature |
| 45. | U3 Tj | 52.317 degC | System Information | U3 junction temperature |
| 46. | Vin | 11.0 V | System Information | Vin operating point |
| 47. | Vout Actual | 54.0 V | System Information | Operational Output Voltage |
| 48. | Vout Tolerance | 1.927 % | System Information | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |
| 49. | Vout p-p | 0.191 fV | System Information | Peak-to-peak output ripple voltage |
| 50. | Vout pp percentage | 0.353 f% | System Information | Output Voltage ripple percentage |
| 51. | T1 Imag pp | 400.156 mA | Transformer | Transformer peak to peak magnetising current |
| 52. | T1 Iprim RMS | 9.152 A | Transformer | Transformer Primary RMS Current |
| 53. | T1 Iprim pk | 14.356 A | Transformer | Transformer Primary Peak Current |
| 54. | T1 Is1 RMS | 1.723 A | Transformer | Transformer Secondary1 RMS Current |
| 55. | T1 Is1 pk | 2.595 A | Transformer | Transformer Secondary1 Peak Current |
| 56. | T1 Pd | 2.025 W | Transformer | Estimated Losses in Transformer |

## Design Inputs

| Name | Value | Description |
|---|---|---|
| Iout | 2.5 | Maximum Output Current |
| VinMax | 13.0 | Maximum input voltage |
| VinMin | 11.0 | Minimum input voltage |
| Vout | 54.0 | Output Voltage |
| base_pn | UCC2808-2 | 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

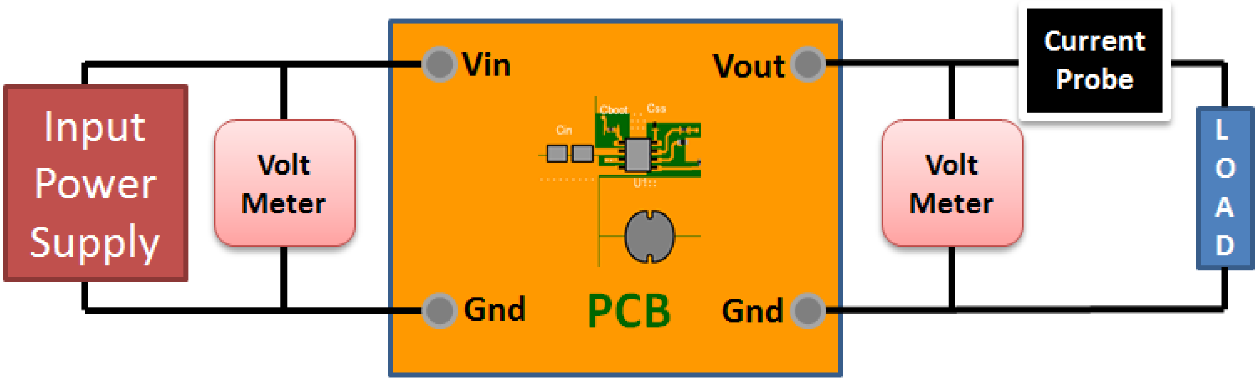
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 : EACE00008E56DC2F[v1]

2. **UCC2808-2** Product Folder : http://www.ti.com/product/UCC2808%2D1 : contains the data sheet and other resources.