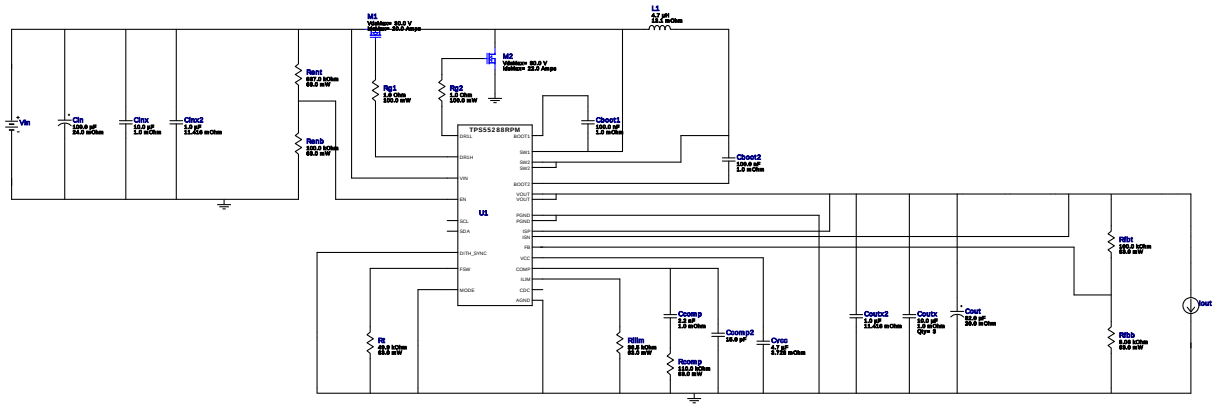
VinMin = 12.0V
VinMax = 20.0V
Vout = 15.0V
Iout = 5.0A

Device = TPS55288RPMR
Topology = Buck_Boost
Created = 2022-09-01 02:14:40.007
BOM Cost = $6.80
BOM Count = 26
Total Pd = 2.13W

# WEBENCH® Design Report

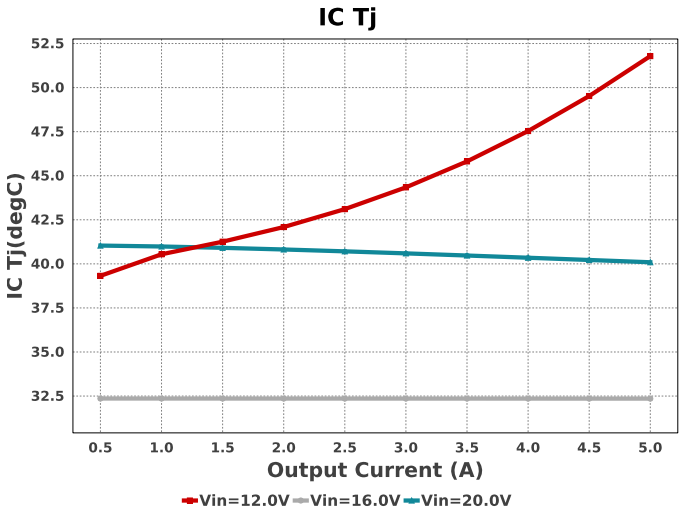
Design : 8223 TPS55288RPMR
TPS55288RPMR 20V-36V to 20.00V @ 5A

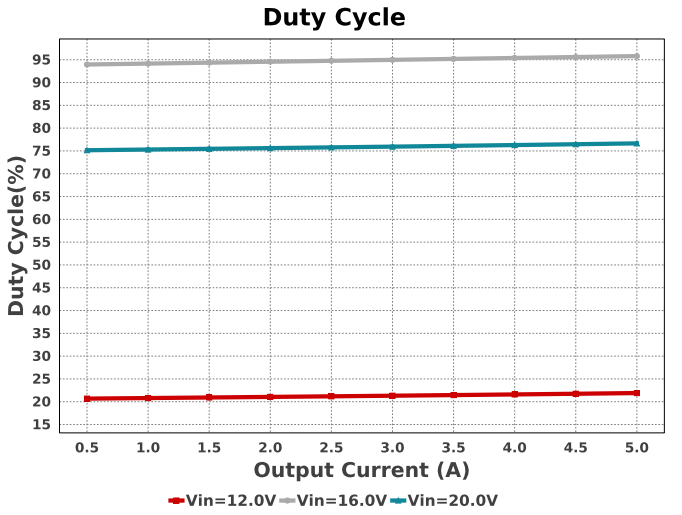


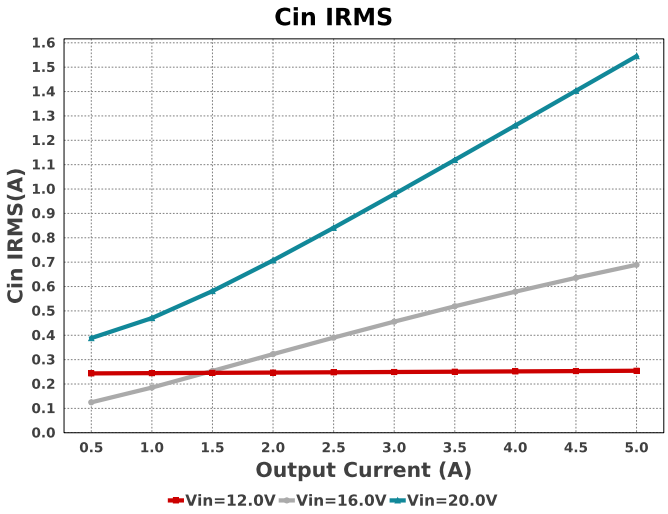
## Electrical BOM

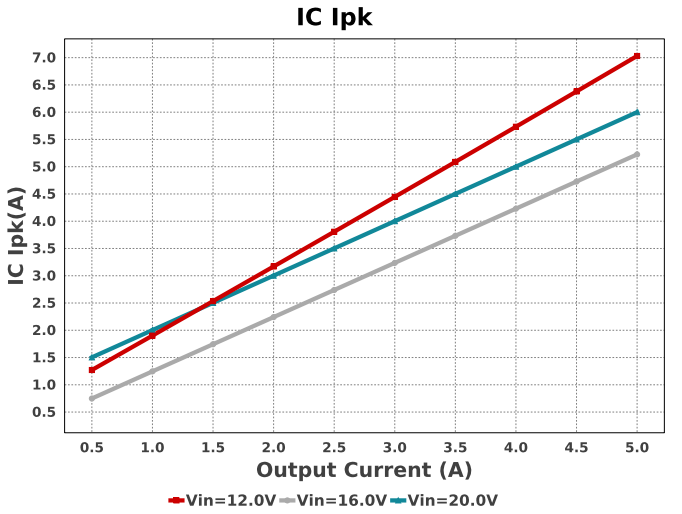
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| Cboot1 | Taiyo Yuden | EMK107B7104KA-T<br>Series= X7R | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0603 5 mm² |
| Cboot2 | Taiyo Yuden | EMK107B7104KA-T<br>Series= X7R | Cap= 100.0 nF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0603 5 mm² |
| Ccomp | MuRata | GRM155R71C222KA01D<br>Series= X7R | Cap= 2.2 nF<br>ESR= 1.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm² |
| Ccomp2 | Kemet | C0402C150J4GACTU<br>Series= C0G/NP0 | Cap= 15.0 pF<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm² |
| Cin | Panasonic | 25SVPF100M<br>Series= SVPF | Cap= 100.0 uF<br>ESR= 24.0 mOhm<br>VDC= 25.0 V<br>IRMS= 3.2 A | 1 | $0.66 | CAPSMT_62_E7 106 mm² |
| Cinx | TDK | C3225X7R1H106M250AC<br>Series= X7R | Cap= 10.0 uF<br>ESR= 1.0 mOhm<br>VDC= 50.0 V<br>IRMS= 5.0 A | 1 | $0.27 | 1210 15 mm² |
| Cinx2 | TDK | C1005X5R1V105K050BC<br>Series= X5R | Cap= 1.0 uF<br>ESR= 11.416 mOhm<br>VDC= 35.0 V<br>IRMS= 1.483 A | 1 | $0.03 | 0402 3 mm² |
| Cout | Panasonic | 35SVPF82M<br>Series= SVPF | Cap= 82.0 uF<br>ESR= 20.0 mOhm<br>VDC= 35.0 V<br>IRMS= 4.0 A | 1 | $1.17 | CAPSMT_62_E12 106 mm² |
| Coutx | TDK | C3225X7R1H106M250AC<br>Series= X7R | Cap= 10.0 uF<br>ESR= 1.0 mOhm<br>VDC= 50.0 V<br>IRMS= 5.0 A | 3 | $0.27 | 1210 15 mm² |

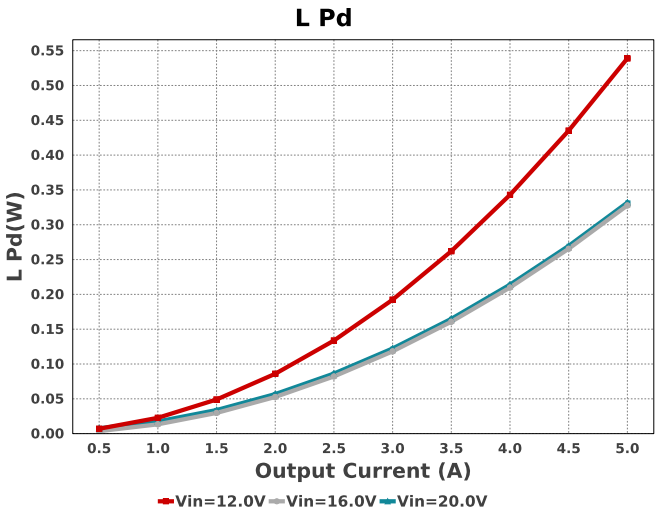
| Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|
| Coutx2 | TDK | C1005X5R1V105K050BC<br>Series= X5R | Cap= 1.0 uF<br>ESR= 11.416 mOhm<br>VDC= 35.0 V<br>IRMS= 1.483 A | 1 | $0.03 | 0402 3 mm² |
| Cvcc | TDK | C1608X6S1C475K080AC<br>Series= X6S | Cap= 4.7 uF<br>ESR= 3.728 mOhm<br>VDC= 16.0 V<br>IRMS= 2.69359 A | 1 | $0.08 | 0603 5 mm² |
| L1 | Coilcraft | XAL6060-472MEB | L= 4.7 µH<br>13.1 mOhm | 1 | $0.82 | XAL6060 72 mm² |
| M1 | Texas Instruments | CSD17578Q3A | VdsMax= 30.0 V<br>IdsMax= 20.0 Amps | 1 | $0.17 | DNH0008A 18 mm² |
| M2 | Texas Instruments | CSD17571Q2 | VdsMax= 30.0 V<br>IdsMax= 22.0 Amps | 1 | $0.11 | DQK0006C 9 mm² |
| Rcomp | Vishay-Dale | CRCW0402110KFKED<br>Series= CRCW..e3 | Res= 110.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 mm² |
| Renb | 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 mm² |
| Rent | Vishay-Dale | CRCW0402887KFKED<br>Series= CRCW..e3 | Res= 887.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 mm² |
| Rfbb | Vishay-Dale | CRCW04028K06FKED<br>Series= CRCW..e3 | Res= 8.06 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 mm² |
| Rfbt | 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 mm² |
| Rg1 | Vishay-Dale | CRCW06031R00FKEA<br>Series= CRCW..e3 | Res= 1.0 Ohm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0603 5 mm² |
| Rg2 | Vishay-Dale | CRCW06031R00FKEA<br>Series= CRCW..e3 | Res= 1.0 Ohm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0603 5 mm² |
| Rilim | Yageo | AC0402FR-0736K5L<br>Series= ? | Res= 36.5 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 mm² |
| Rt | Vishay-Dale | CRCW040249K9FKED<br>Series= CRCW..e3 | Res= 49.9 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | 0402 3 mm² |
| U1 | Texas Instruments | TPS55288RPMR | Switcher | 1 | $2.52 | RPM0026A 22 mm² |

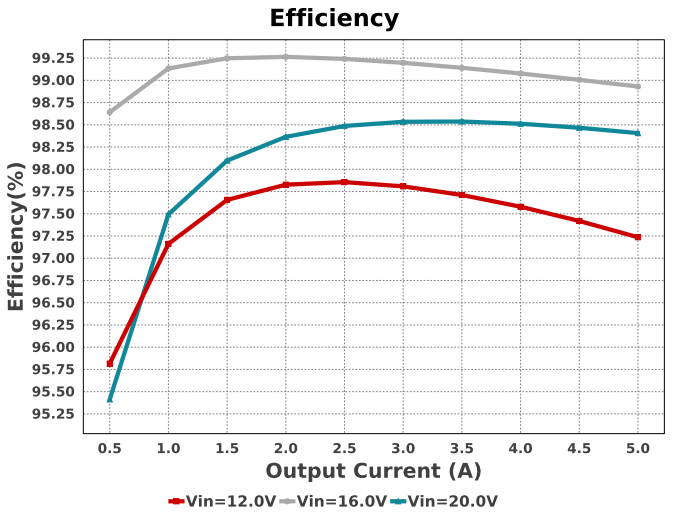


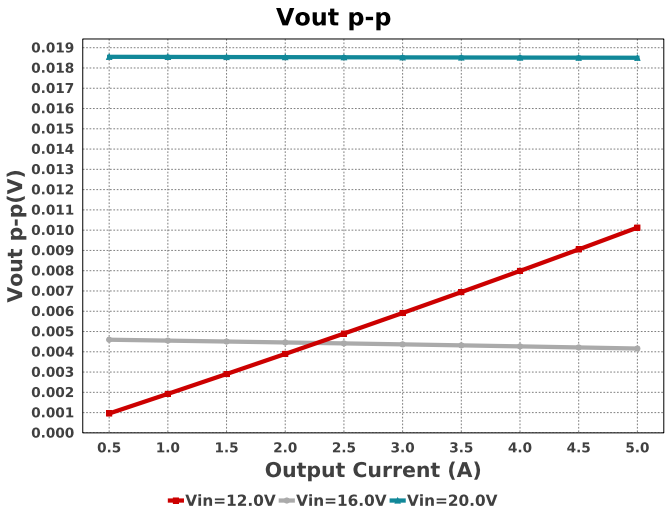



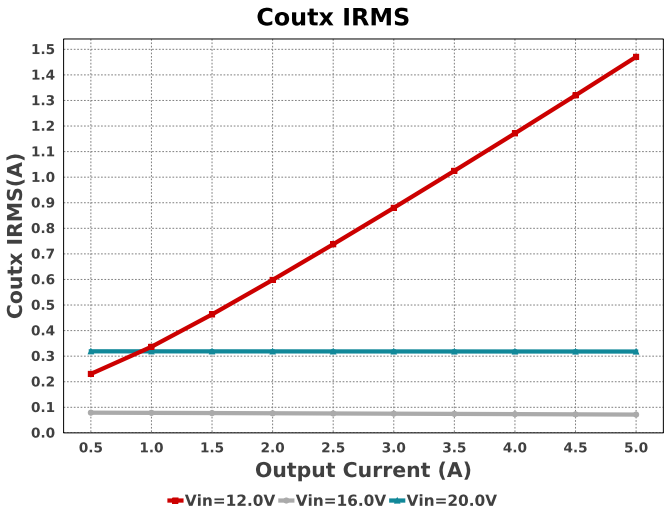



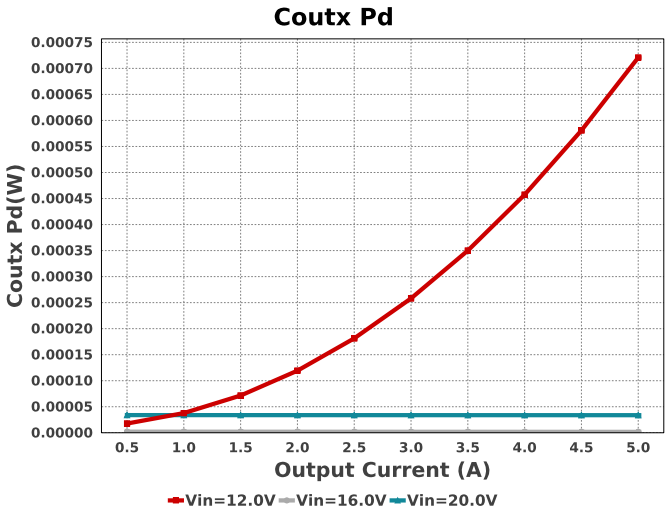



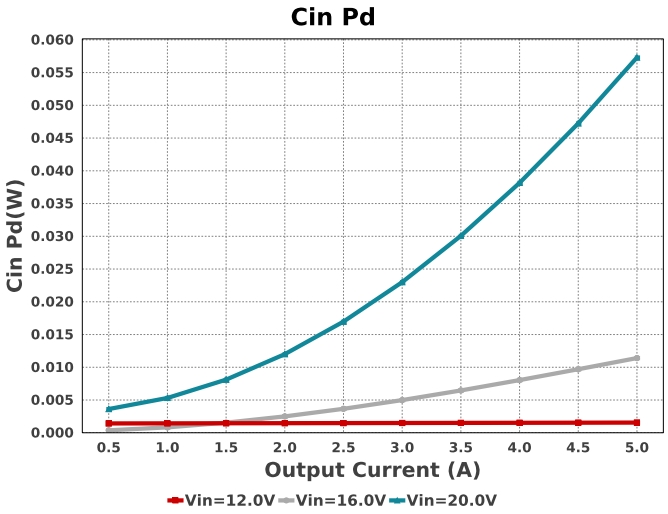



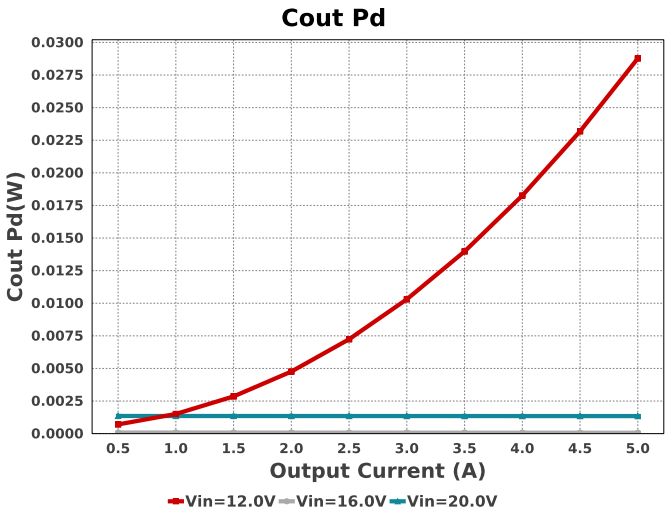



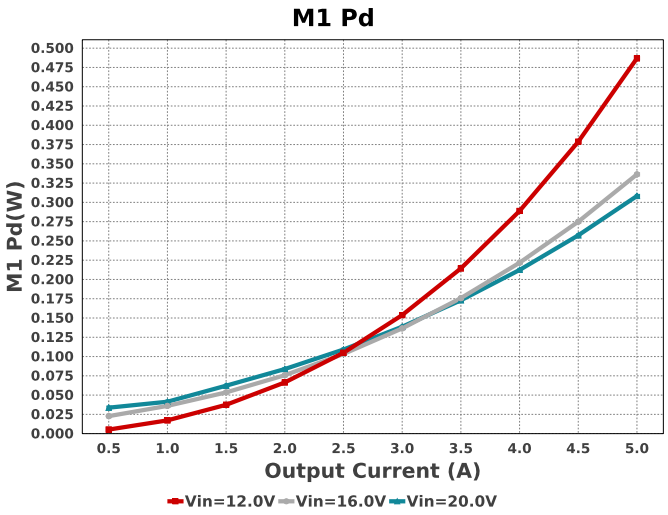


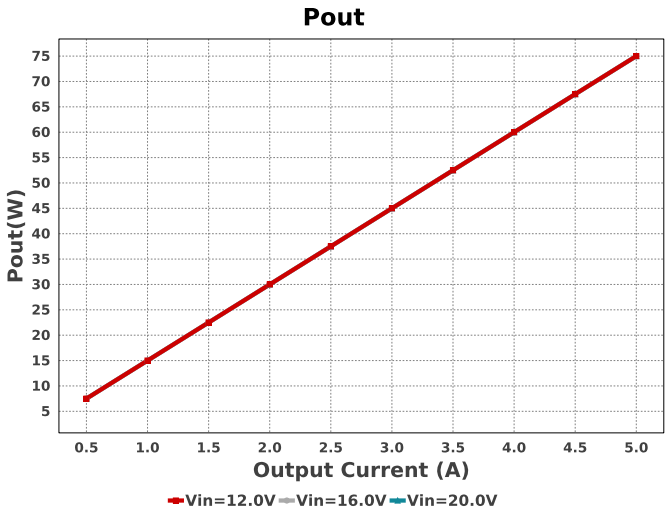



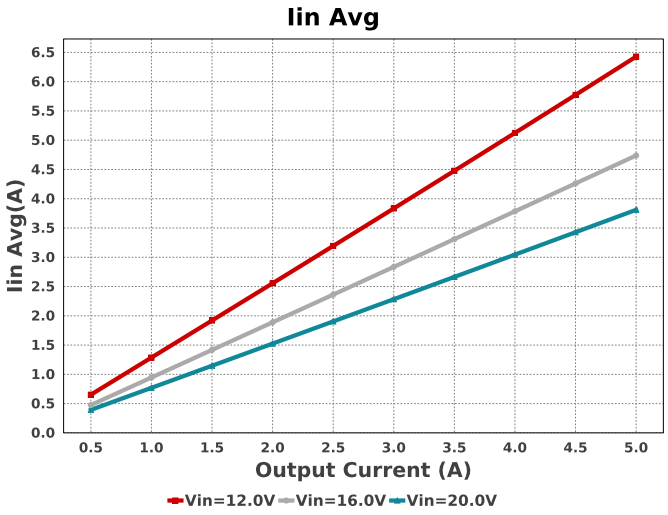



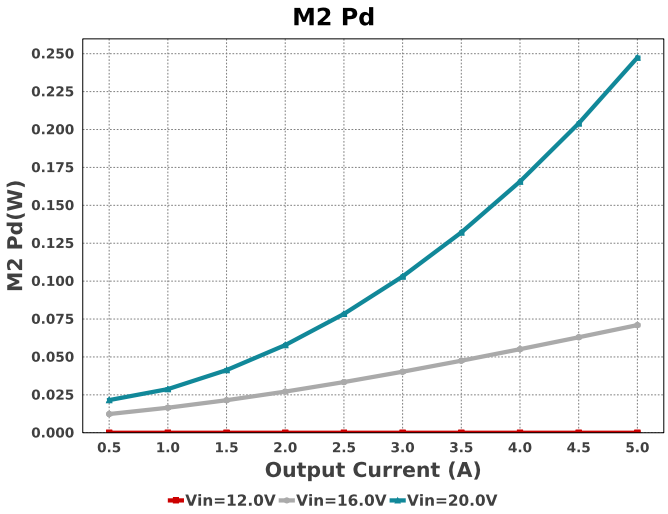



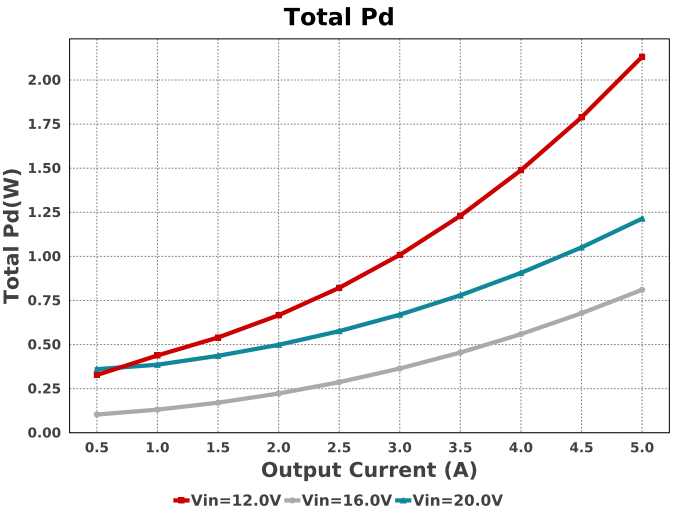



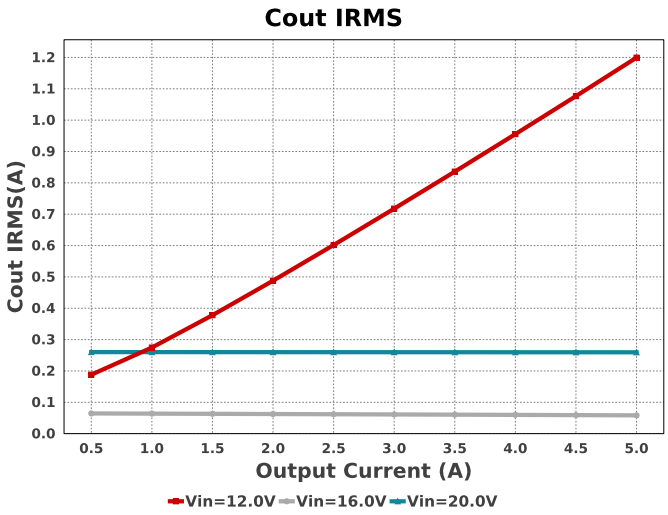



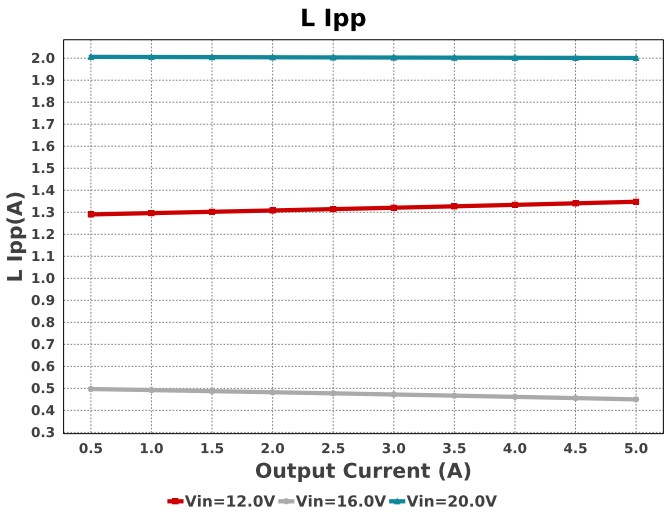


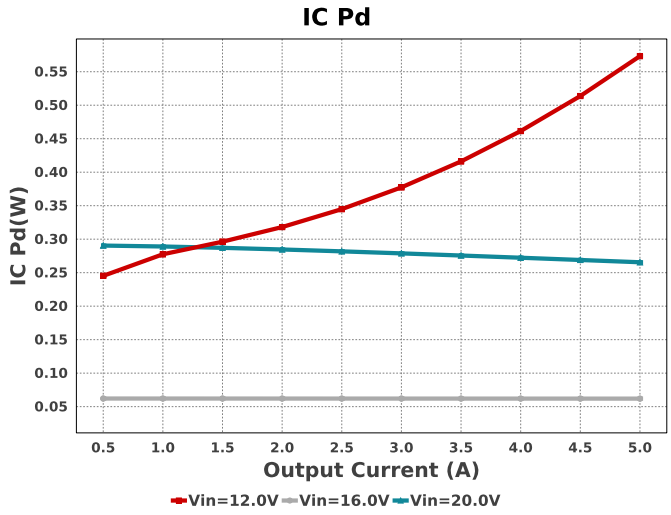



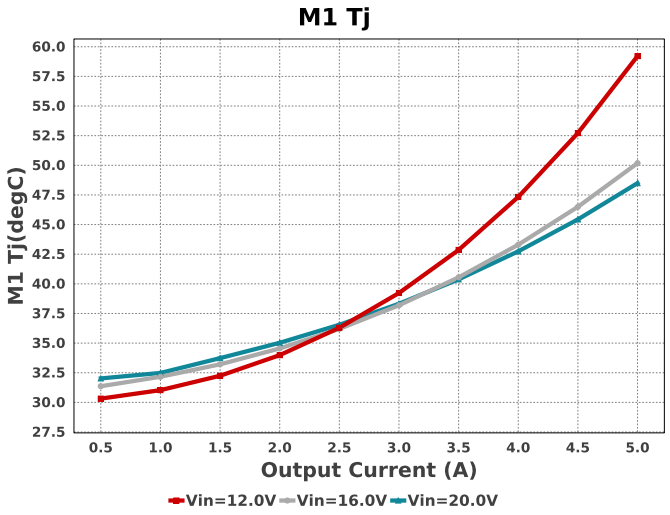



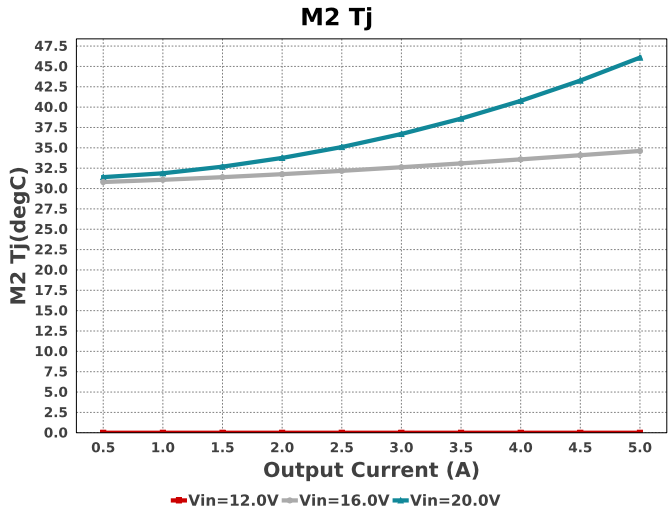



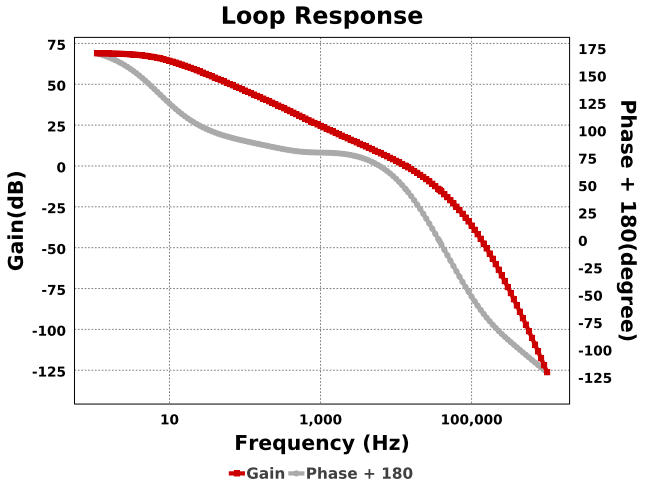



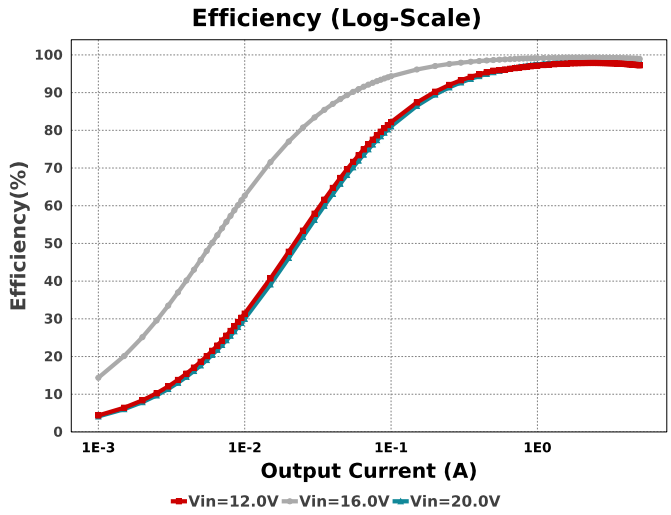






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 254.428 mA | Capacitor | Input capacitor RMS ripple current |
| 2. | Cin Pd | 1.554 mW | Capacitor | Input capacitor power dissipation |
| 3. | Cout IRMS | 1.199 A | Capacitor | Output capacitor RMS ripple current |
| 4. | Cout Pd | 28.771 mW | Capacitor | Output capacitor power dissipation |
| 5. | Coutx IRMS | 1.471 A | Capacitor | Output capacitor_x RMS ripple current |
| 6. | Coutx Pd | 720.79 µW | Capacitor | Output capacitor_x power loss |
| 7. | IC Ipk | 7.031 A | IC | Peak switch current in IC |
| 8. | IC Pd | 573.32 mW | IC | IC power dissipation |
| 9. | IC Tj | 51.786 degC | IC | IC junction temperature |
| 10. | IC Tolerance | 12.0 mV | IC | IC Feedback Tolerance |
| 11. | ICThetaJA | 38.0 degC/W | IC | IC junction-to-ambient thermal resistance |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 12. | Iin Avg | 6.428 A | IC | Average input current |
| 13. | L Ipp | 1.348 A | Inductor | Peak-to-peak inductor ripple current |
| 14. | L Pd | 538.9 mW | Inductor | Inductor power dissipation |
| 15. | M1 Pd | 486.86 mW | Mosfet | M1 MOSFET total power dissipation |
| 16. | M1 Tj | 59.211 degC | Mosfet | M1 MOSFET junction temperature |
| 17. | M2 Pd | 0.0 W | Mosfet | M2 MOSFET total power dissipation |
| 18. | M2 Tj | 0.0 degC | Mosfet | M2 MOSFET junction temperature |
| 19. | Cin Pd | 1.554 mW | Power | Input capacitor power dissipation |
| 20. | Cout Pd | 28.771 mW | Power | Output capacitor power dissipation |
| 21. | Coutx Pd | 720.79 µW | Power | Output capacitor_x power loss |
| 22. | IC Pd | 573.32 mW | Power | IC power dissipation |
| 23. | L Pd | 538.9 mW | Power | Inductor power dissipation |
| 24. | M1 Pd | 486.86 mW | Power | M1 MOSFET total power dissipation |
| 25. | M2 Pd | 0.0 W | Power | M2 MOSFET total power dissipation |
| 26. | Total Pd | 2.132 W | Power | Total Power Dissipation |
| 27. | BOM Count | 26 | System Information | Total Design BOM count |
| 28. | Cross Freq | 11.35 kHz | System Information | Bode plot crossover frequency |
| 29. | Duty Cycle | 21.9 % | System Information | Duty cycle |
| 30. | Efficiency | 97.236 % | System Information | Steady state efficiency |
| 31. | FootPrint | 449.0 $mm^2$ | System Information | Total Foot Print Area of BOM components |
| 32. | Frequency | 397.614 kHz | System Information | Switching frequency |
| 33. | Gain Marg | -9.615 dB | System Information | Bode Plot Gain Margin |
| 34. | Iout | 5.0 A | System Information | Iout operating point |
| 35. | Low Freq Gain | 60.983 dB | System Information | Gain at 1Hz |
| 36. | Mode | CCM | System Information | Conduction Mode |
| 37. | Phase Marg | 45.705 deg | System Information | Bode Plot Phase Margin |
| 38. | Pout | 75.0 W | System Information | Total output power |
| 39. | Total BOM | $6.8 | System Information | Total BOM Cost |
| 40. | Vin | 12.0 V | System Information | Vin operating point |
| 41. | Vout | 15.0 V | System Information | Operational Output Voltage |
| 42. | Vout Actual | 3.781 V | System Information | Vout Actual calculated based on selected voltage divider resistors |
| 43. | Vout Tolerance | 6.204 % | System Information | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |
| 44. | Vout p-p | 10.126 mV | System Information | Peak-to-peak output ripple voltage |
| 45. | Vref | 2c6 | System Information | Register VREF |

## Design Inputs

| Name | Value | Description |
|---|---|---|
| Iout | 5.0 | Maximum Output Current |
| VinMax | 20.0 | Maximum input voltage |
| VinMin | 12.0 | Minimum input voltage |
| Vout | 15.0 | Output Voltage |
| base_pn | TPS55288 | Base Product Number |
| source | DC | Input Source Type |
| Ta | 30.0 | Ambient temperature |

# WEBENCH® Assembly

## Design Assistance

1. Master key : AE3011FD2EE8F4EB[v1]
2. **TPS55288** Product Folder : http://www.ti.com/product/TPS55288 : contains the data sheet and other resources.