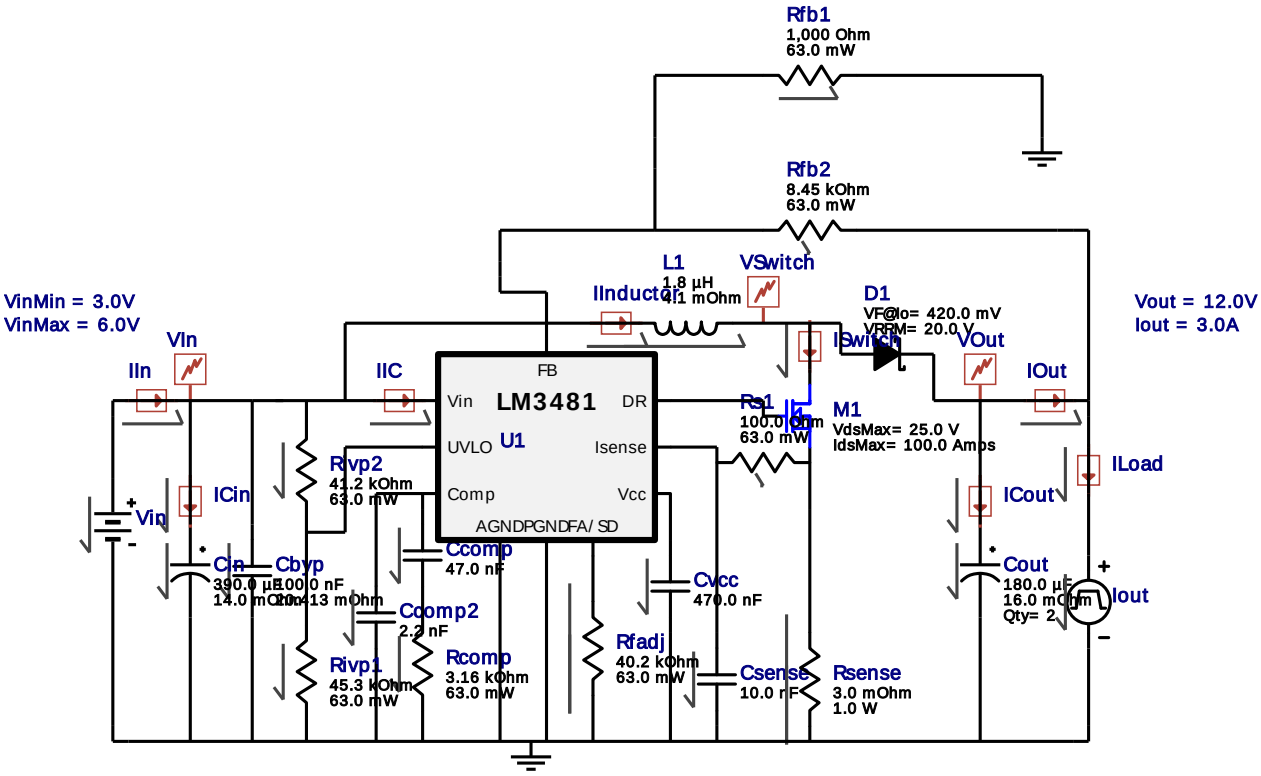
# WEBENCH® Electrical Simulation Report

VinMin = 3.0V
VinMax = 6.0V
Vout = 12.0V
Iout = 3.0A

Device = LM3481MM/NOPB
Topology = Boost
Created = 3/15/15 10:03:59 PM
User ID = 3789096
Design Id = 1
eSim Id = 3
Simulation Type = Load Transient



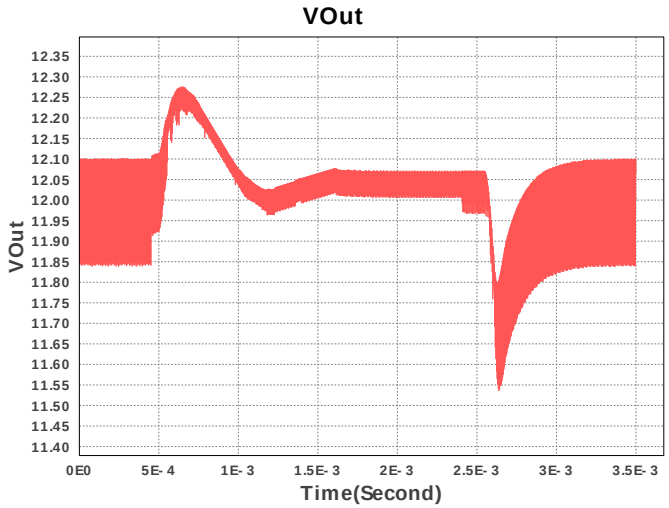

## Electrical BOM

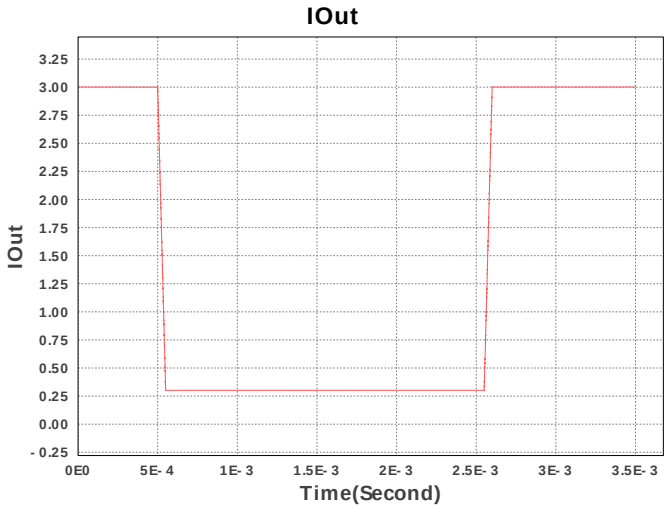
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | Cbyp | TDK | C1005X5R0J104K<br>Series= X5R | Cap= 100.0 nF<br>ESR= 20.413 mOhm<br>VDC= 6.3 V<br>IRMS= 0.0 A | 1 | $0.01 | 1005 3 mm² |
| 2. | Ccomp | Taiyo Yuden | TMK212B7473KD-T<br>Series= X7R | Cap= 47.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm² |
| 3. | Ccomp2 | Yageo America | CC0805KRX7R9BB222<br>Series= X7R | Cap= 2.2 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm² |
| 4. | Cin | Panasonic | 20SVPF390M<br>Series= 1273 | Cap= 390.0 µF<br>ESR= 14.0 mOhm<br>VDC= 20.0 V<br>IRMS= 4.95 A | 1 | $0.63 | CAPSMT_62_E12 106 mm² |
| 5. | Cout | Panasonic | 25SVPF180M<br>Series= 1273 | Cap= 180.0 µF<br>ESR= 16.0 mOhm<br>VDC= 25.0 V<br>IRMS= 4.65 A | 2 | $0.61 | CAPSMT_62_E12 106 mm² |
| 6. | Csense | MuRata | GRM216R71H103KA01D<br>Series= X7R | Cap= 10.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm² |
| 7. | Cvcc | MuRata | GRM155C80G474KE01D<br>Series= 379 | Cap= 470.0 nF<br>VDC= 4.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm² |

| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 8. | D1 | Vishay-Semiconductor | SL42-E3/57T | VF@Io= 420.0 mV<br>VRRM= 20.0 V | 1 | $0.32 |  <br>SMC 83 mm$^2$ |
| 9. | L1 | Coilcraft | XAL7070-182MEB | L= 1.8 µH<br>DCR= 4.1 mOhm | 1 | $1.05 |  <br>XAL7070 87 mm$^2$ |
| 10. | M1 | Texas Instruments | CSD16325Q5 | VdsMax= 25.0 V<br>IdsMax= 100.0 Amps | 1 | $0.84 |  <br>TRANS_NexFET_Q5 55 mm$^2$ |
| 11. | Rcomp | Vishay-Dale | CRCW04023K16FKED<br>Series= CRCW..e3 | Res= 3.16 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 12. | Rfadj | Vishay-Dale | CRCW040240K2FKED<br>Series= CRCW..e3 | Res= 40.2 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 13. | Rfb1 | Vishay-Dale | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1,000 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 14. | Rfb2 | Vishay-Dale | CRCW04028K45FKED<br>Series= CRCW..e3 | Res= 8.45 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 15. | Rivp1 | Vishay-Dale | CRCW040245K3FKED<br>Series= CRCW..e3 | Res= 45.3 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 16. | Rivp2 | Vishay-Dale | CRCW040241K2FKED<br>Series= CRCW..e3 | Res= 41.2 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 17. | Rs1 | Vishay-Dale | CRCW0402100RFKED<br>Series= CRCW..e3 | Res= 100.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 18. | Rsense | Stackpole Electronics Inc | CSNL1206FT3L00<br>Series= 478 | Res= 3.0 mOhm<br>Power= 1.0 W<br>Tolerance= 1.0% | 1 | $0.19 |  <br>1206 11 mm$^2$ |
| 19. | U1 | Texas Instruments | LM3481MM/NOPB | Switcher | 1 | $0.80 |  <br>MUB10A 24 mm$^2$ |

## Simulation Parameters

| # | Name | Parameter Name | Description | Values |
|---|---|---|---|---|
| 1. | Cin | IC | Initial Condition across the capacitor | 4.5 V |
| 2. | Cout | IC | Initial Condition Across Capacitor | 12.0 V |
| 3. | Iout | signal_type | Signal Type | PULSE |
| | | I1 | Initial Current | 3.0 A |
| | | I2 | Peak Current | 0.3 A |
| | | Td | Initial Delay Time | 0.5m Sec |
| | | Tr | Rise Time | 50u Sec |
| | | Tf | Fall Time | 50u Sec |
| | | Pw | Pulse Width | 2m Sec |




## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 764.578 mA | Current | Input capacitor RMS ripple current |
| 2. | Cout IRMS | 5.528 A | Current | Output capacitor RMS ripple current |
| 3. | Iin Avg | 13.18 A | Current | Average input current |
| 4. | L Ipp | 2.649 A | Current | Peak-to-peak inductor ripple current |
| 5. | L1 Irms | 13.165 A | Current | Inductor ripple current |
| 6. | M1 Irms | 15.597 A | Current | M1 MOSFET Irms |
| 7. | SW Ipk | 14.467 A | Current | Peak switch current |
| 8. | BOM Count | 20 | General | Total Design BOM count |
| 9. | FootPrint | 626.0 $mm^2$ | General | Total Foot Print Area of BOM components |
| 10. | Frequency | 479.249 kHz | General | Switching frequency |
| 11. | IC Tolerance | 19.0 mV | General | IC Feedback Tolerance |
| 12. | M Vds Act | 39.877 mV | General | M Vds |
| 13. | M1 Rdson | 2.557 mOhm | General | Drain-Source On-resistance |
| 14. | M1 ThetaJA | 50.0 degC/W | General | MOSFET junction-to-ambient thermal resistance |
| 15. | Mode | CCM | General | Conduction Mode |
| 16. | Pout | 36.0 W | General | Total output power |
| 17. | Total BOM | $5.17 | General | Total BOM Cost |
| 18. | D1 Tj | 93.0 degC | Op_Point | D1 junction temperature |
| 19. | Vout OP | 12.0 V | Op_Point | Operational Output Voltage |
| 20. | Cross Freq | 2.566 kHz | Op_point | Bode plot crossover frequency |
| 21. | Duty Cycle | 77.174 % | Op_point | Duty cycle |
| 22. | Efficiency | 91.045 % | Op_point | Steady state efficiency |
| 23. | Gain Marg | -17.043 dB | Op_point | Bode Plot Gain Margin |
| 24. | IC Tj | 38.628 degC | Op_point | IC junction temperature |
| 25. | ICThetaJA | 200.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 26. | IOUT_OP | 3.0 A | Op_point | Iout operating point |
| 27. | M1 TjOP | 65.861 degC | Op_point | M1 MOSFET junction temperature |
| 28. | Phase Marg | 56.206 deg | Op_point | Bode Plot Phase Margin |
| 29. | VIN_OP | 3.0 V | Op_point | Vin operating point |
| 30. | Vout p-p | 115.737 mV | Op_point | Peak-to-peak output ripple voltage |
| 31. | Cin Pd | 8.184 mW | Power | Input capacitor power dissipation |
| 32. | Cout Pd | 244.497 mW | Power | Output capacitor power dissipation |
| 33. | Diode Pd | 1.26 W | Power | Diode power dissipation |
| 34. | IC Pd | 43.14 mW | Power | IC power dissipation |
| 35. | L Pd | 852.735 mW | Power | Inductor power dissipation |
| 36. | M1 Pd | 717.225 mW | Power | M1 MOSFET total power dissipation |
| 37. | M1 PdCond | 621.951 mW | Power | M1 MOSFET conduction losses |
| 38. | M1 PdSw | 95.274 mW | Power | M1 MOSFET switching losses |
| 39. | Rfb Pd | 15.238 mW | Power | Rfb Power Dissipation |
| 40. | Total Pd | 3.541 W | Power | Total Power Dissipation |
| 41. | Low Freq Gain | 51.113 dB | Unknown | Gain at 10Hz |

## Design Inputs

| # | Name | Value | Description |
|---|---|---|---|
| 1. | Iout | 3.0 A | Maximum Output Current |
| 2. | Iout1 | 3.0 Amps | Output Current #1 |
| 3. | VinMax | 6.0 V | Maximum input voltage |
| 4. | VinMin | 3.0 V | Minimum input voltage |
| 5. | Vout | 12.0 V | Output Voltage |
| 6. | Vout1 | 12.0 Volt | Output Voltage #1 |
| 7. | base_pn | LM3481 | Base Product Number |

| # | Name | Value | Description |
|---|---|---|---|
| 8. | source | DC | Input Source Type |
| 9. | Ta | 30.0 degC | Ambient temperature |

## Design Assistance

1. **LM3481** Product Folder : http://www.ti.com/product/lm3481 : contains the data sheet and other resources.