

WEBENCH® Power Architect

Project Report

Project : 4372849/44 : LM26420X PMU project
 Created : 2016-11-10 03:14:01.666

Project Summary

- | | |
|-----------------------------------|-----------------------|
| 1. Total System Efficiency | 86.009 % |
| 2. Total System BOM Count | 19.0 |
| 3. Total System Footprint | 158.0 mm ² |
| 4. Total System BOM Cost | \$2.49 |
| 5. Total System Power Dissipation | 374.1 mW |

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

| Supply | Sequencer Flag | Load | Load Name |
|----------|----------------|--------|-----------|
| PMU1_Ch1 | 0 | LOAD_1 | |
| PMU1_Ch2 | 0 | LOAD_2 | |
| PMU1 | NA | | |

Power Supplies

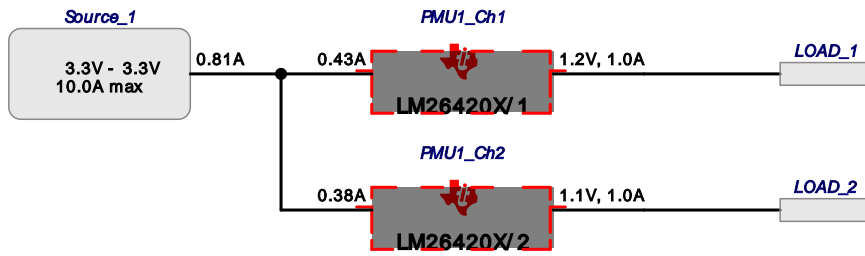
| # | Name | NSID | Description | Vout | Iout | Efficiency | Foot-print | Cost | Design | Page |
|----|----------|------------|--|-------|-------|------------|------------|--------|--------|------|
| 1. | PMU1_Ch1 | LM26420X/1 | Buck : Dual High-Frequency Step Down DC-DC regulator | 1.2 V | 1.0 A | 84.6% | 86 | \$2.06 | 437 | 8 |
| 2. | PMU1_Ch2 | LM26420X/2 | Buck : Dual High-Frequency Step Down DC-DC regulator | 1.1 V | 1.0 A | 87.6% | 91 | \$2.14 | 438 | 13 |
| 3. | PMU1 | LM26420X | PMU : NA | V | NaN A | 86% | 158 | \$2.49 | 436 | 4 |

Power Loads

| # | Name | VLoad | ILoad | Description |
|----|--------|-------|-------|----------------|
| 1. | LOAD_1 | 1.2 V | 1.0 A | VoutRipple=10% |
| 2. | LOAD_2 | 1.1 V | 1.0 A | VoutRipple=10% |

Project Diagram

WEBENCH® Power Architect Project ID : 44 LM26420X PMU project Power Architect 2016-11-10 03:14:01.666



Electrical Procurement BOM

| Manufacturer | Part Number | Description | Quantity | Budgetary Price | Footprint (mm ²) |
|-------------------|--------------------|-------------|----------|-----------------|---------------------------------|
| Vishay-Dale | CRCW040210K0FKED | 0402 | 4 | \$0.01 | 12 |
| Vishay-Dale | CRCW040210K2FKED | 0402 | 4 | \$0.01 | 12 |
| Vishay-Dale | CRCW04023K83FKED | 0402 | 2 | \$0.01 | 6 |
| Vishay-Dale | CRCW040249K9FKED | 0402 | 4 | \$0.01 | 12 |
| Vishay-Dale | CRCW04025R11FKED | 0402 | 1 | \$0.01 | 3 |
| MuRata | GRM155R61A474KE15D | 0402 | 1 | \$0.01 | 3 |
| MuRata | GRM219R61A106KE44D | 0805 | 4 | \$0.03 | 27 |
| MuRata | GRM21BC80G226ME39L | 0805 | 8 | \$0.04 | 27 |
| Texas Instruments | LM26420XSQ/NOPB | RUM0016A | 3 | \$1.73 | 75 |
| Yageo America | RC0603FR-075K1L | 0603 | 2 | \$0.01 | 9 |
| Bourns | SDR0403-3R3ML | SDR0403 | 2 | \$0.18 | 55 |
| Bourns | SRR4028-3R3Y | SRR4028 | 2 | \$0.26 | 67 |
| Total | | | 37 | \$6.69 | 308.64 |

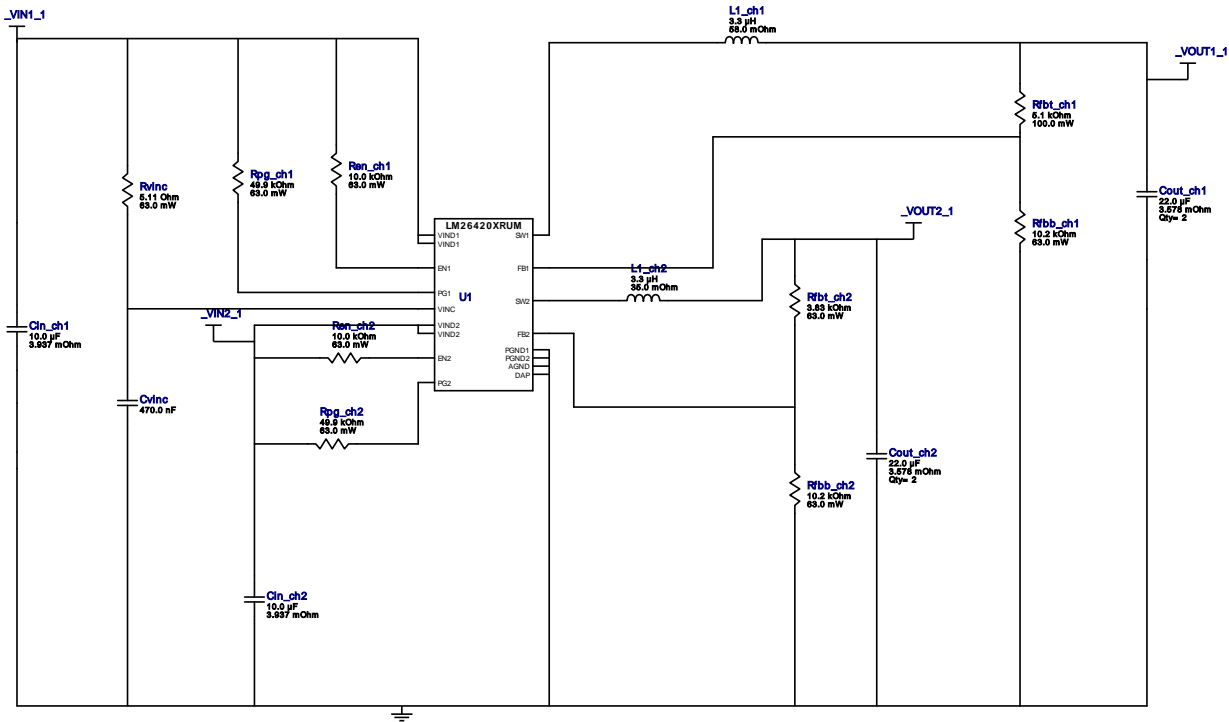


Vout = 1.2V
Iout = 1.0A

Device = LM26420XSQ/NOPB
Topology = PMU
Created = 11/10/16 3:14:00 AM
BOM Cost = \$2.49
BOM Count = 19
Total Pd = 0.37W

WEBENCH® Design Report












Design : 4372849/436 LM26420XSQ/NOPB
Design 436 - LM26420XSQ/NOPB

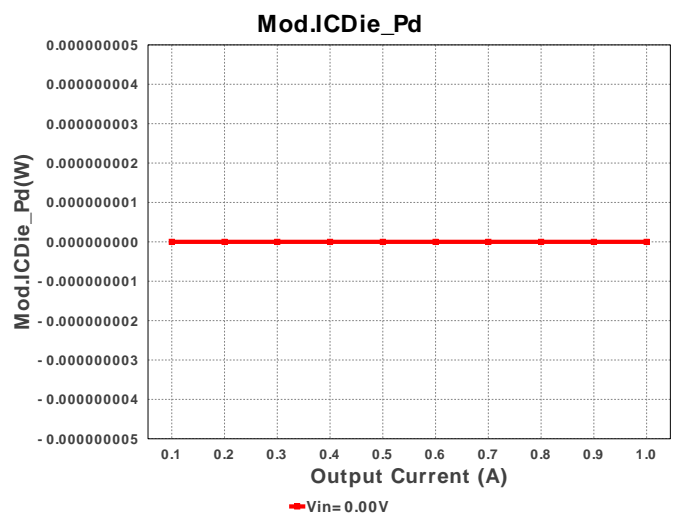
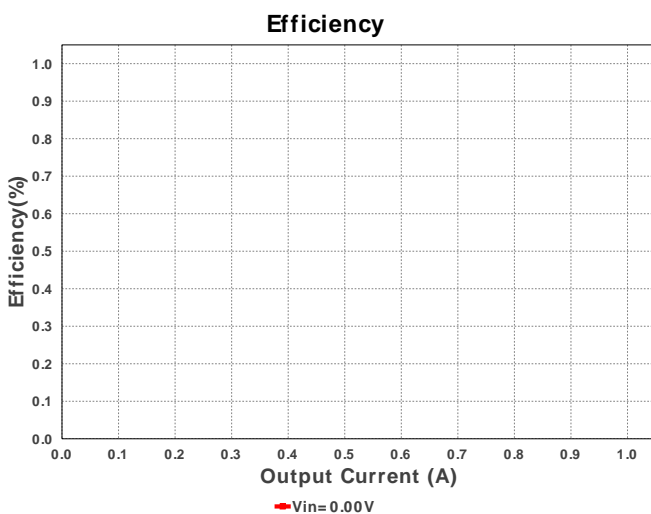


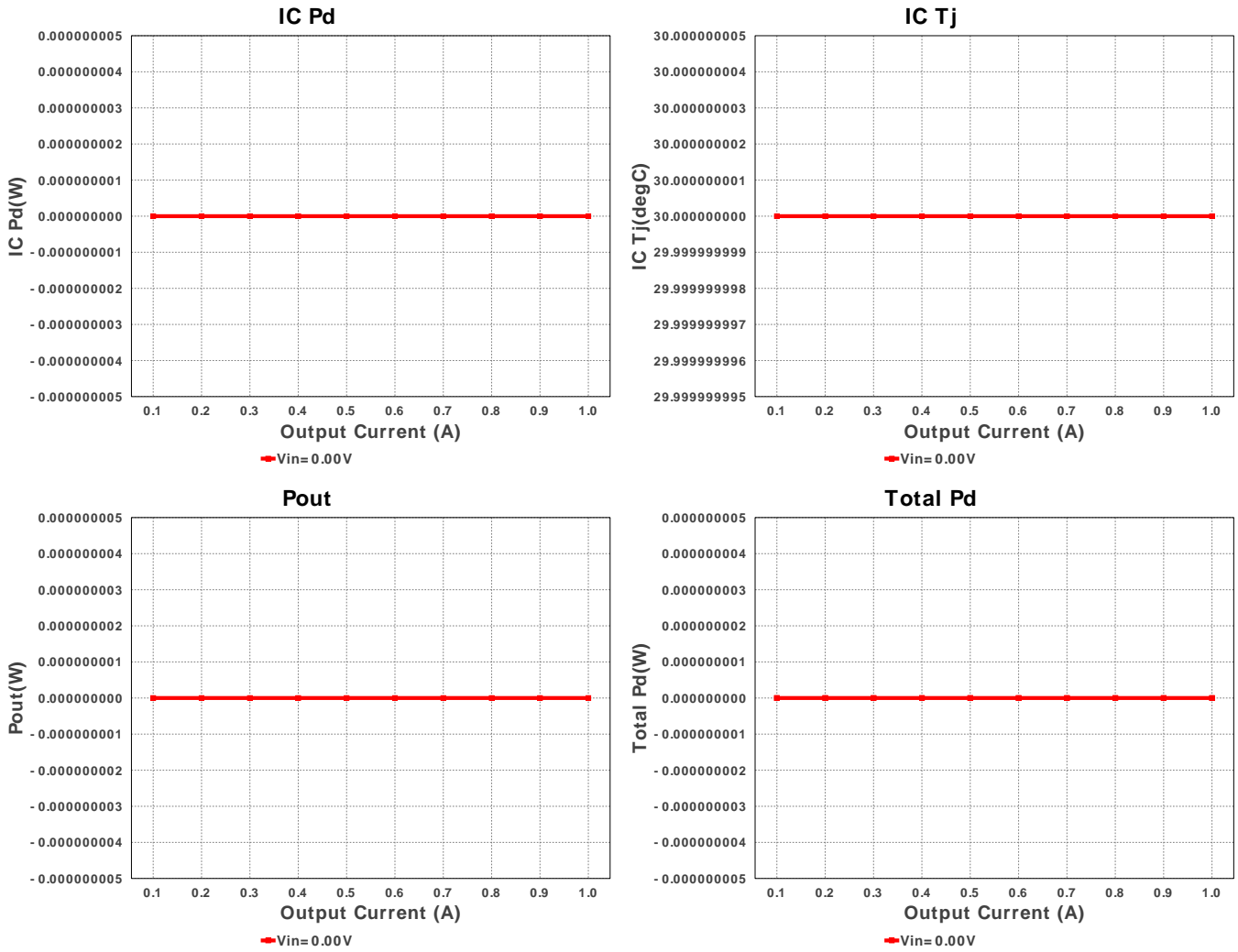
1. This schematic shows all the components for this Power Management Unit. The block diagram on the left shows how the channels are connected. Use the drop down PMU Options selector below the optimization dial on the summary page to get the details for each channel. Or click on the block diagram on the left to select a specific channel.

Electrical BOM

| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|----|----------|--------------|-----------------------------------|--|-----|--------|----------------------------|
| 1. | Cin_ch1 | MuRata | GRM219G61A106KE44D Series= X5R | Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A | 1 | \$0.03 | 0805 7 mm ² |
| 2. | Cin_ch2 | MuRata | GRM219G61A106KE44D Series= X5R | Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A | 1 | \$0.03 | 0805 7 mm ² |
| 3. | Cout_ch1 | MuRata | GRM21BC80G226ME39L Series= X6S | Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A | 2 | \$0.04 | 0805 7 mm ² |
| 4. | Cout_ch2 | MuRata | GRM21BC80G226ME39L Series= X6S | Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A | 2 | \$0.04 | 0805 7 mm ² |
| 5. | Cvinc | MuRata | GRM155R61A474KE15D Series= X5R | Cap= 470.0 nF VDC= 10.0 V IRMS= 0.0 A | 1 | \$0.01 | 0402 3 mm ² |
| 6. | L1_ch1 | Bourns | SDR0403-3R3ML | L= 3.3 μH DCR= 58.0 mOhm | 1 | \$0.18 | SDR0403 28 mm ² |

| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|-----|----------|-------------------|--------------------------------------|---|-----|--------|--|
| 7. | L1_ch2 | Bourns | SRR4028-3R3Y | L= 3.3 μ H DCR= 35.0 mOhm | 1 | \$0.26 |  SRR4028 34 mm² |
| 8. | Ren_ch1 | Vishay-Dale | CRCW040210K0FKED Series= CRCW..e3 | Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 9. | Ren_ch2 | Vishay-Dale | CRCW040210K0FKED Series= CRCW..e3 | Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 10. | Rfbb_ch1 | Vishay-Dale | CRCW040210K2FKED Series= CRCW..e3 | Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 11. | Rfbb_ch2 | Vishay-Dale | CRCW040210K2FKED Series= CRCW..e3 | Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 12. | Rfbt_ch1 | Yageo America | RC0603FR-075K1L Series= ? | Res= 5.1 kOhm Power= 100.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0603 5 mm² |
| 13. | Rfbt_ch2 | Vishay-Dale | CRCW04023K83FKED Series= CRCW..e3 | Res= 3.83 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 14. | Rpg_ch1 | Vishay-Dale | CRCW040249K9FKED Series= CRCW..e3 | Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 15. | Rpg_ch2 | Vishay-Dale | CRCW040249K9FKED Series= CRCW..e3 | Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 16. | Rvinc | Vishay-Dale | CRCW04025R11FKED Series= CRCW..e3 | Res= 5.11 Ohm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 |  0402 3 mm² |
| 17. | U1 | Texas Instruments | LM26420XSQ/NOPB | Switcher | 1 | \$1.73 |  RUM0016A 25 mm² |





Operating Values

| # | Name | Value | Category | Description |
|-----|---------------|-----------------------|----------|--|
| 1. | BOM Count | 19 | General | Total Design BOM count |
| 2. | FootPrint | 158.0 mm ² | General | Total PMU footprint area of BOM components |
| 3. | Pout | 2.3 W | General | Total PMU output power |
| 4. | Total BOM | \$2.49 | General | Total BOM Cost |
| 5. | Efficiency | 86.009 % | Op_point | PMU steady state efficiency |
| 6. | IC Tj | 40.231 degC | Op_point | PMU IC junction temperature |
| 7. | ICThetaJA | 40.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 8. | Cout_ch1 Pd | 1.573 μW | Power | Output capacitor power dissipation |
| 9. | Cout_ch2 Pd | 1.484 μW | Power | Output capacitor power dissipation |
| 10. | IC Pd | 255.78 mW | Power | IC Pd |
| 11. | L1_ch1 Pd | 72.575 mW | Power | Inductor power dissipation |
| 12. | L1_ch2 Pd | 43.793 mW | Power | Inductor power dissipation |
| 13. | Mod. ICDie_Pd | 255.78 mW | Power | IC Pd |
| 14. | Total Pd | 374.142 mW | Power | PMU total power dissipation |
| 15. | Total Pd | 374.142 mW | Power | PMU total power dissipation |

Design Inputs

| # | Name | Value | Description |
|-----|---------|----------|------------------------------------|
| 1. | Iout | 1.0 | Maximum Output Current |
| 2. | Iout1 | 1.0 | Output Current #1 |
| 3. | Iout2 | 1.0 | Output Current #2 |
| 4. | Vin1Max | 3.3 | Maximum Input Voltage #1 |
| 5. | Vin1Min | 3.3 | Minimum Input Voltage #1 |
| 6. | Vin2Max | 3.3 | Maximum Input Voltage #2 |
| 7. | Vin2Min | 3.3 | Minimum Input Voltage #2 |
| 8. | Vout | 1.2 | Output Voltage |
| 9. | Vout1 | 1.2 | Output Voltage #1 |
| 10. | Vout2 | 1.1 | Output Voltage #2 |
| 11. | base_pn | LM26420X | Texas Instruments Base Part Number |
| 12. | source | DC | Input Source Type |

| # | Name | Value | Description |
|-----|------|-------|---------------------|
| 13. | ta | 30.0 | Ambient temperature |

Design Assistance

1. LM26420X Product Folder : <http://www.ti.com/product/lm26420> : contains the data sheet and other resources.

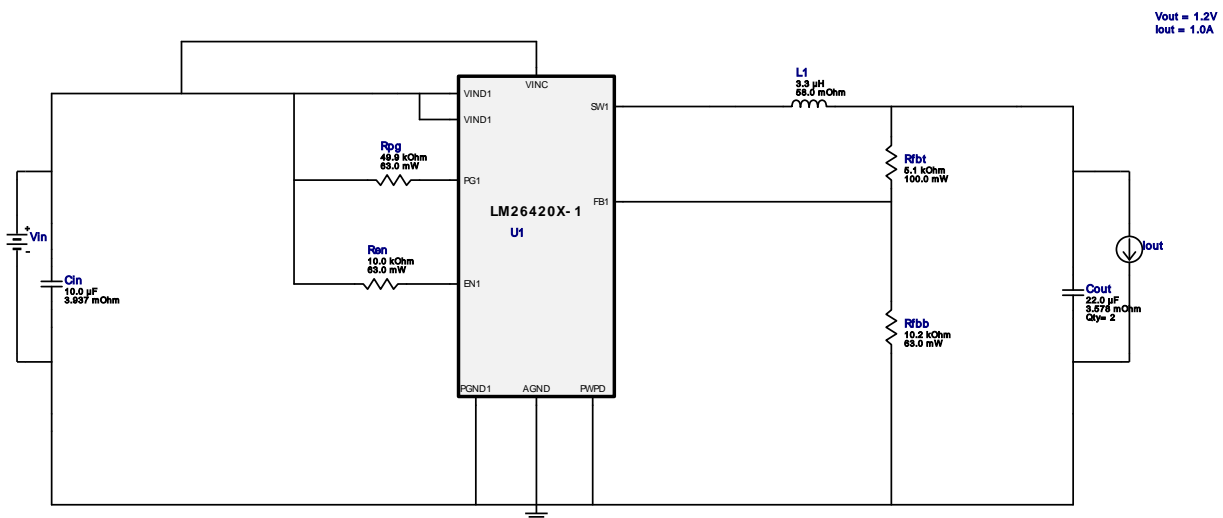


Vout = 1.2V
Iout = 1.0A

Device = LM26420XSQ/NOPB
Topology = Buck
Created = 11/10/16 3:14:01 AM
BOM Cost = \$NaN
BOM Count = NaN
Total Pd = 0.22W

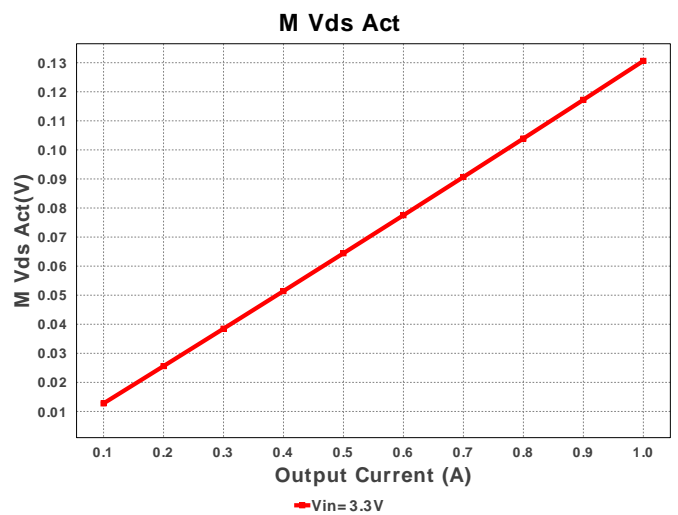
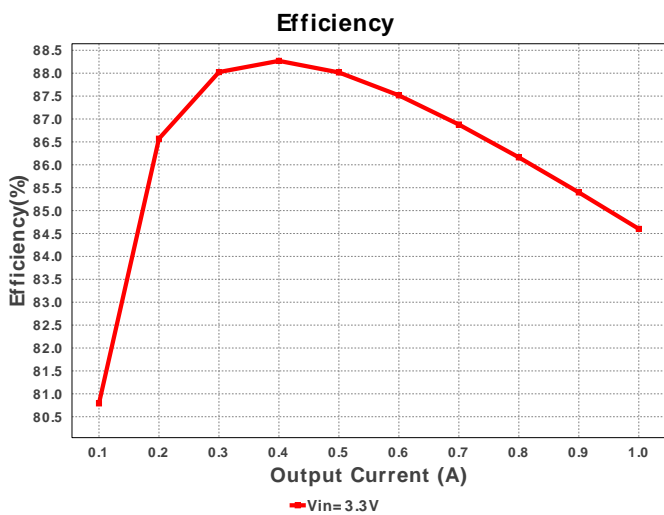
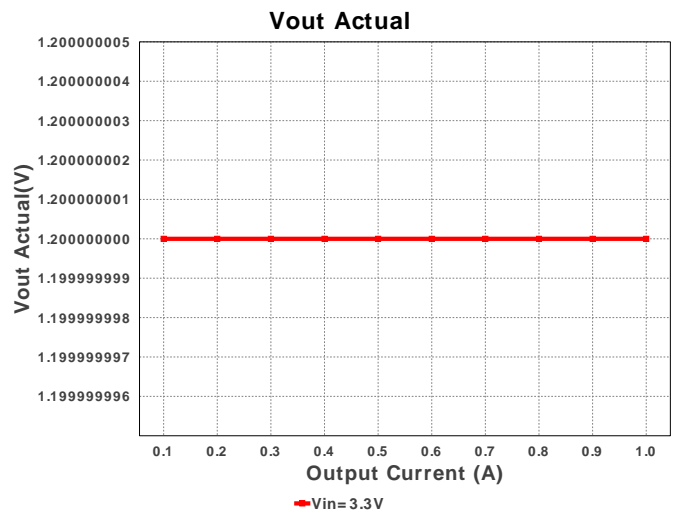
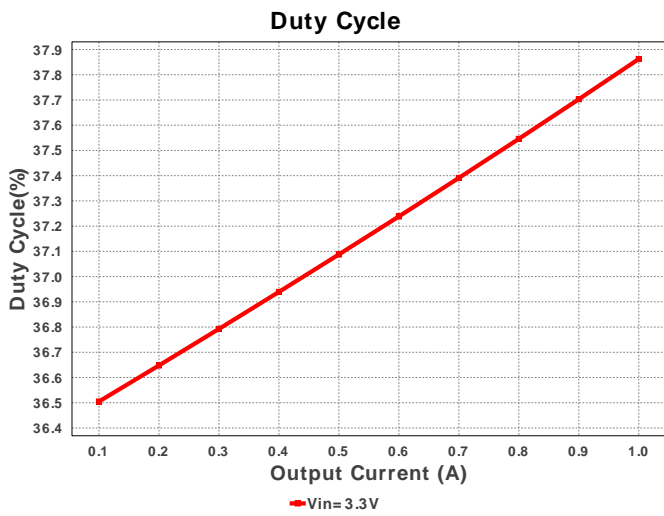
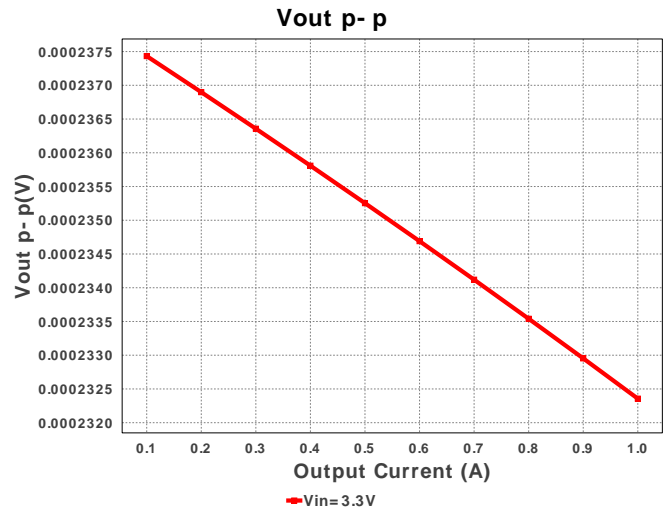
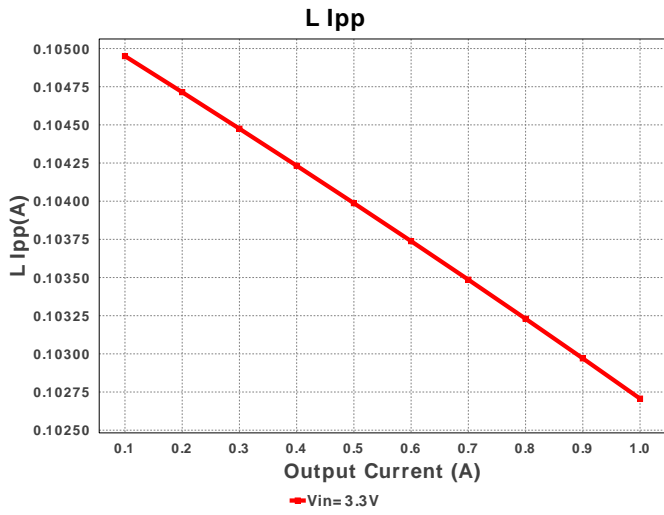
WEBENCH® Design Report

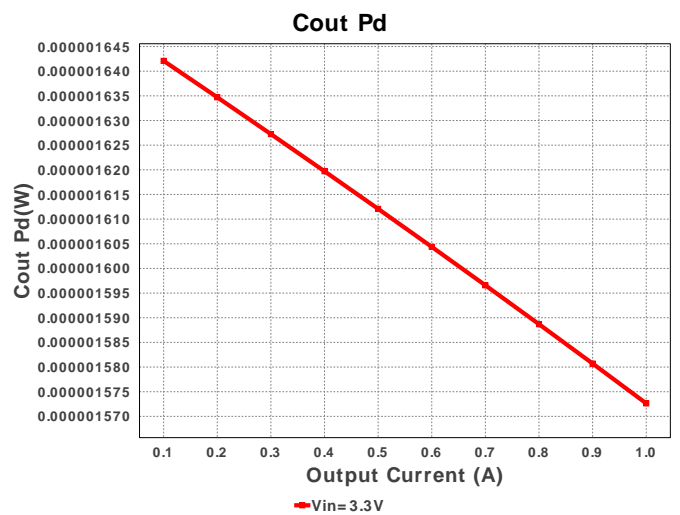
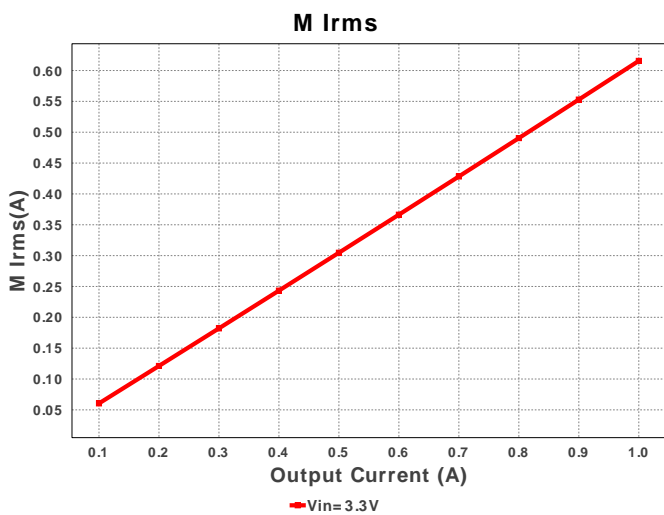
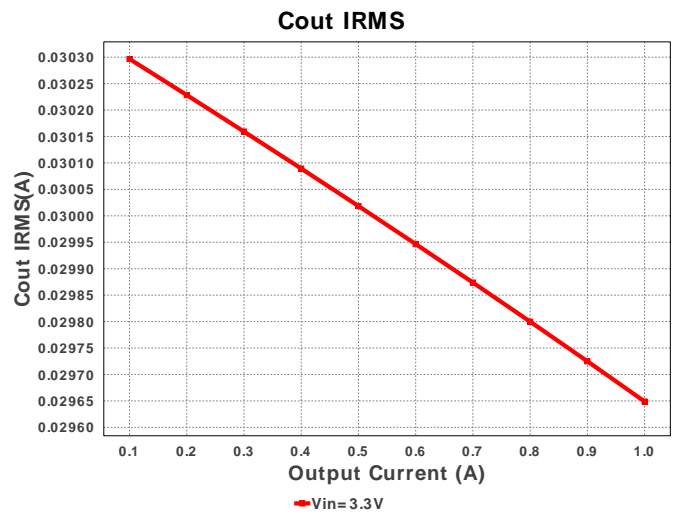
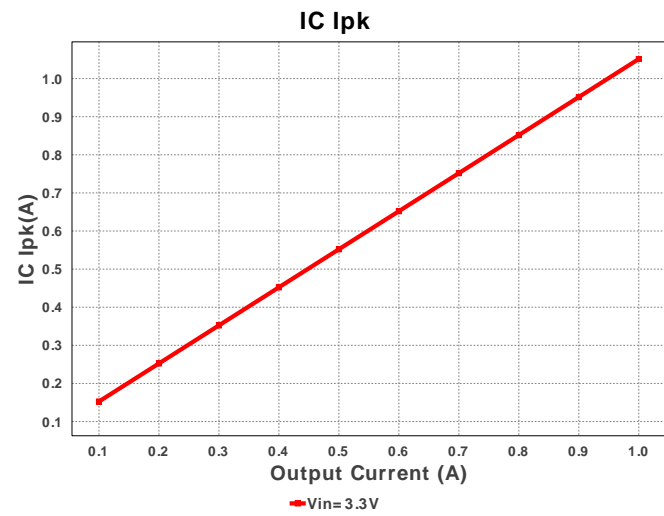
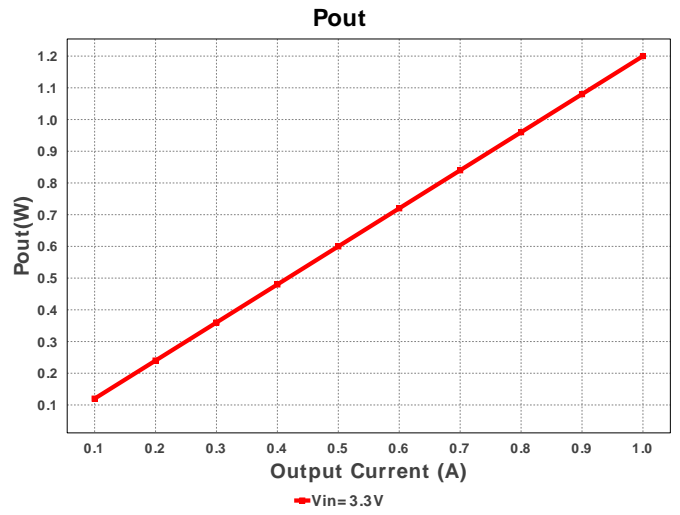
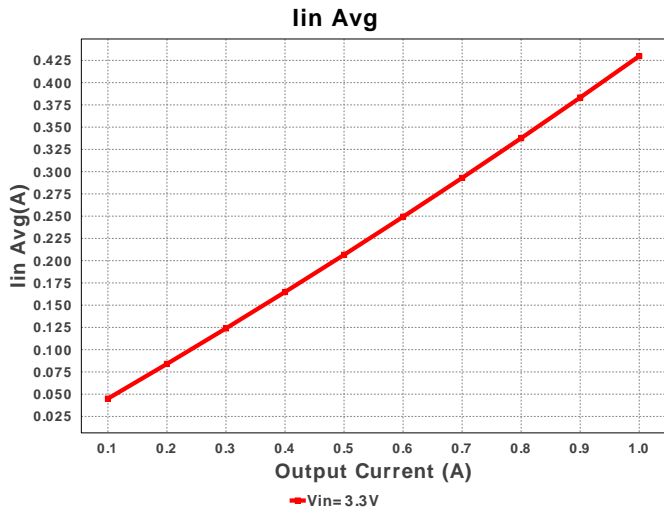
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LM26420XSQ/NOPB 3.3V-3.3V to 1.20V @ 1.0A

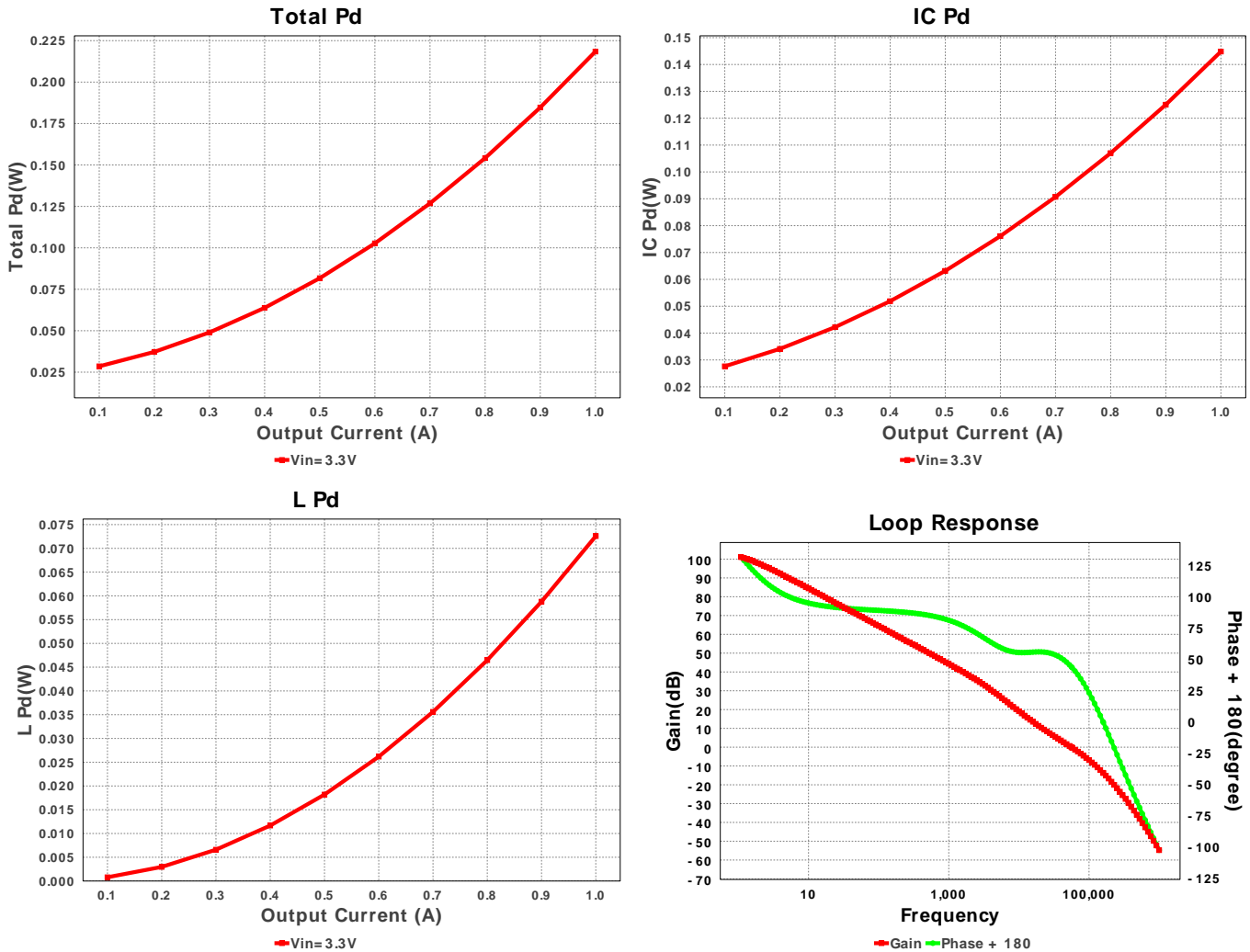


Electrical BOM

| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|----|------|-------------------|--------------------------------------|--|-----|--------|-----------------------------|
| 1. | Cin | MuRata | GRM219R61A106KE44D Series= X5R | Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A | 1 | \$0.03 | 0805 7 mm ² |
| 2. | Cout | MuRata | GRM21BC80G226ME39L Series= X6S | Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A | 2 | \$0.04 | 0805 7 mm ² |
| 3. | L1 | Bourns | SDR0403-3R3ML | L= 3.3 uH DCR= 58.0 mOhm | 1 | \$0.18 | SDR0403 28 mm ² |
| 4. | Ren | Vishay-Dale | CRCW040210K0FKED Series= CRCW..e3 | Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 5. | Rfbb | Vishay-Dale | CRCW040210K2FKED Series= CRCW..e3 | Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 6. | Rfbt | Yageo America | RC0603FR-075K1L Series= ? | Res= 5.1 kOhm Power= 100.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0603 5 mm ² |
| 7. | Rpg | Vishay-Dale | CRCW040249K9FKED Series= CRCW..e3 | Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 8. | U1 | Texas Instruments | LM26420XSQ/NOPB | Switcher | 0 | \$1.73 | RUM0016A 25 mm ² |







Operating Values

| # | Name | Value | Category | Description |
|-----|----------------|-----------------|----------|--|
| 1. | Cout IRMS | 29.649 mA | Current | Output capacitor RMS ripple current |
| 2. | IC Ipk | 1.051 A | Current | Peak switch current in IC |
| 3. | Iin Avg | 429.82 mA | Current | Average input current |
| 4. | L Ipp | 102.71 mA | Current | Peak-to-peak inductor ripple current |
| 5. | M Irms | 615.643 mA | Current | MOSFET RMS current |
| 6. | Frequency | 2.2 MHz | General | Switching frequency |
| 7. | IC Tolerance | 20.0 mV | General | IC Feedback Tolerance |
| 8. | M Vds Act | 130.63 mV | General | Voltage drop across the MosFET |
| 9. | Mode | CCM | General | Conduction Mode |
| 10. | Pout | 1.2 W | General | Total output power |
| 11. | Low Freq Gain | 101.034 dB | Op_Point | Gain at 10Hz |
| 12. | Vout Actual | 1.2 V | Op_Point | Vout Actual calculated based on selected voltage divider resistors |
| 13. | Vout OP | 1.2 V | Op_Point | Operational Output Voltage |
| 14. | Cross Freq | 55.983 kHz | Op_point | Bode plot crossover frequency |
| 15. | Duty Cycle | 37.862 % | Op_point | Duty cycle |
| 16. | Efficiency | 84.601 % | Op_point | PMU channel steady state efficiency |
| 17. | Gain Marg | -13.776 dB | Op_point | Bode Plot Gain Margin |
| 18. | IOUT_OP | 1.0 A | Op_point | Iout operating point |
| 19. | Phase Marg | 44.581 deg | Op_point | Bode Plot Phase Margin |
| 20. | VIN_OP | 3.3 V | Op_point | Vin operating point |
| 21. | Vout p-p | 232.357 μ V | Op_point | Peak-to-peak output ripple voltage |
| 22. | Cout Pd | 1.573 μ W | Power | Output capacitor power dissipation |
| 23. | IC Pd | 144.819 mW | Power | IC power dissipation |
| 24. | L Pd | 72.575 mW | Power | Inductor power dissipation |
| 25. | Total Pd | 218.42 mW | Power | PMU channel power dissipation |
| 26. | Vout Tolerance | 3.19 % | | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

Design Inputs

| # | Name | Value | Description |
|----|---------|------------|------------------------------------|
| 1. | Iout | 1.0 | Maximum Output Current |
| 2. | VinMax | 3.3 | Maximum input voltage |
| 3. | VinMin | 3.3 | Minimum input voltage |
| 4. | Vout | 1.2 | Output Voltage |
| 5. | base_pn | LM26420X/1 | Texas Instruments Base Part Number |
| 6. | source | DC | Input Source Type |
| 7. | ta | 30.0 | Ambient temperature |

Design Assistance

1. LM26420X/1 Product Folder : <http://www.ti.com/product/LM26420X> : contains the data sheet and other resources.

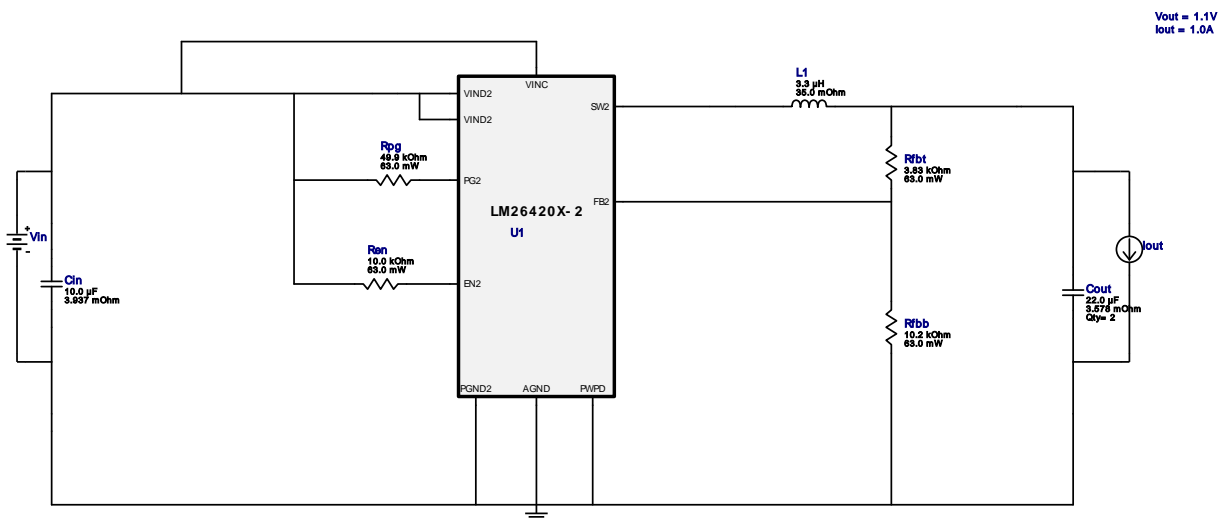


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Iout = 1.0A



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Topology = Buck
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BOM Count = NaN
Total Pd = 0.16W

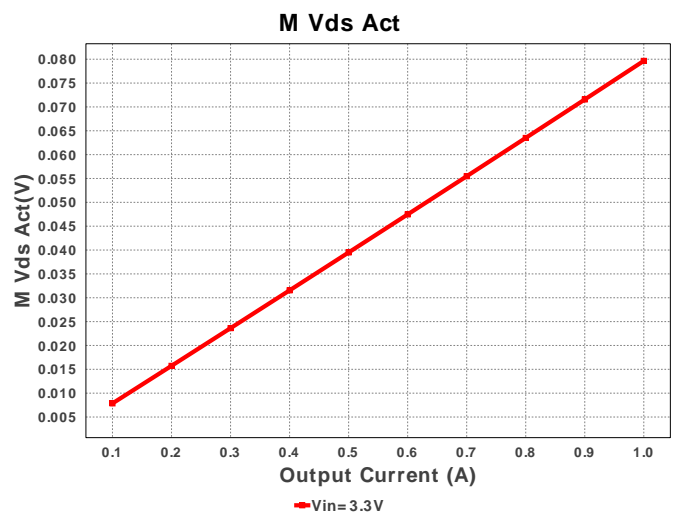
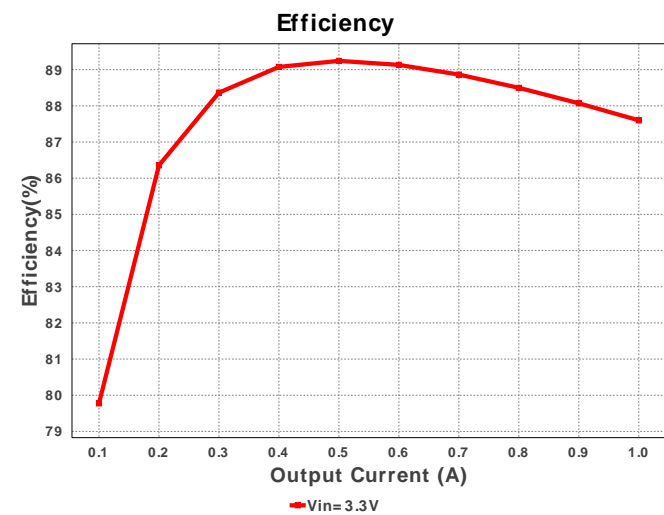
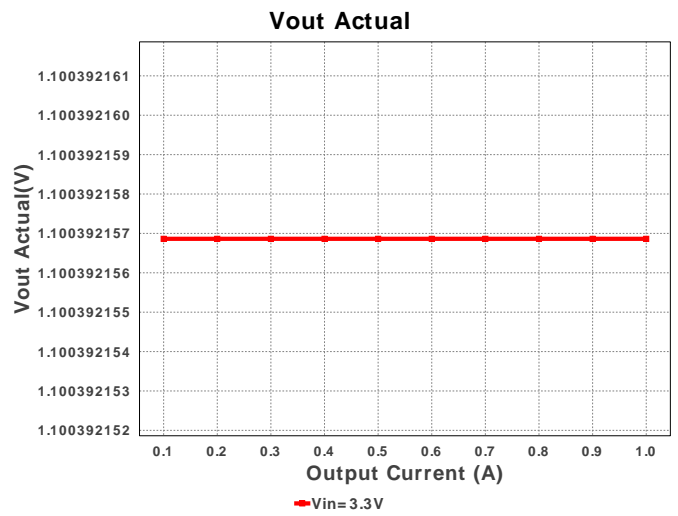
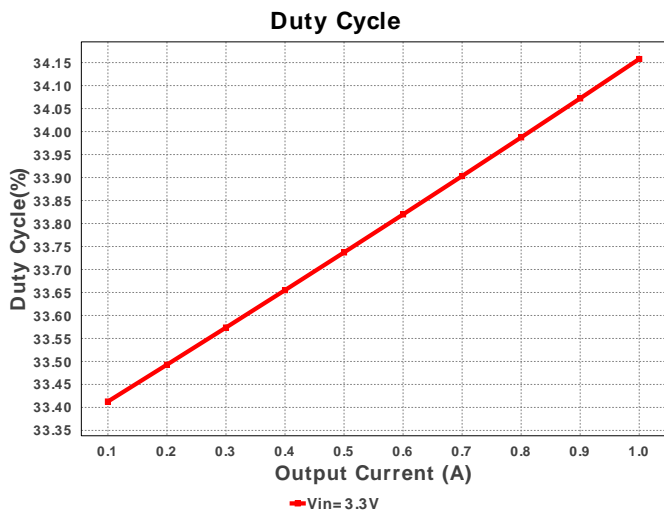
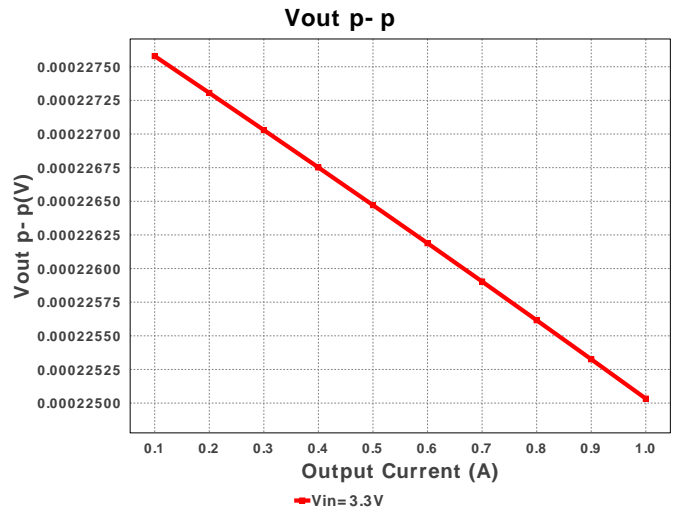
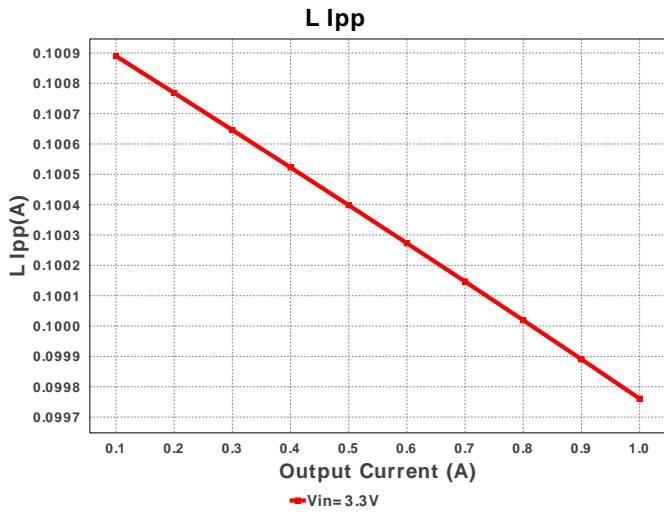
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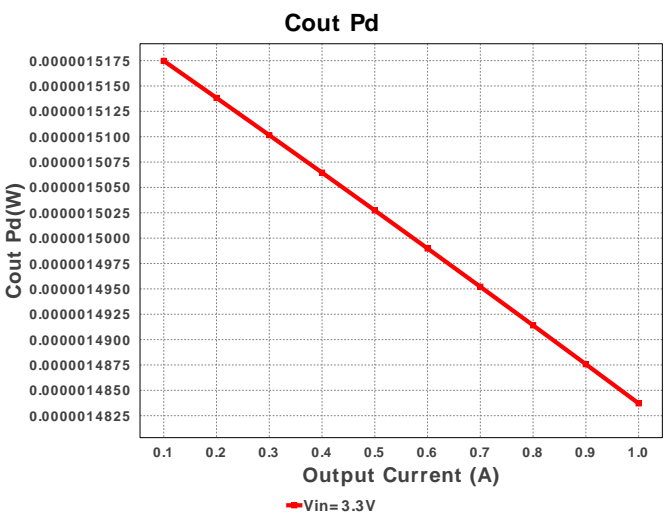
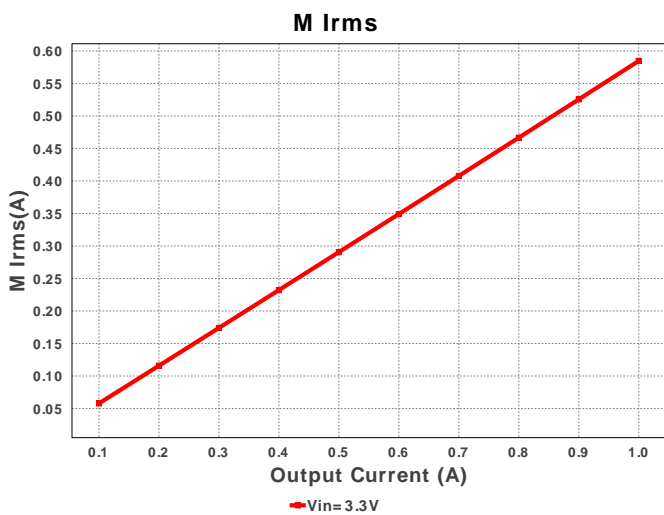
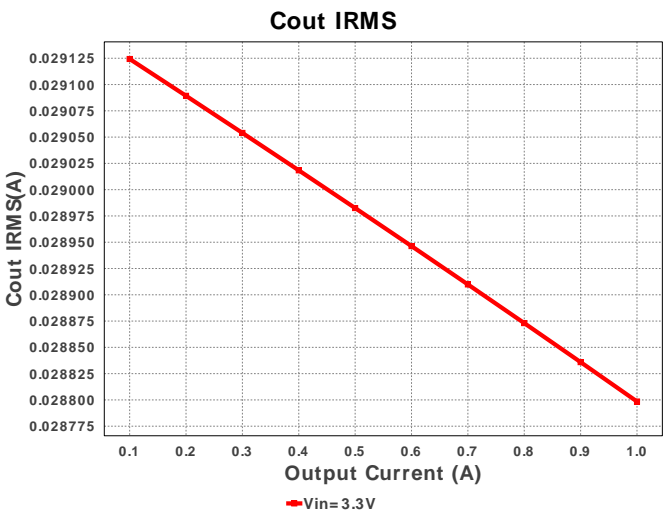
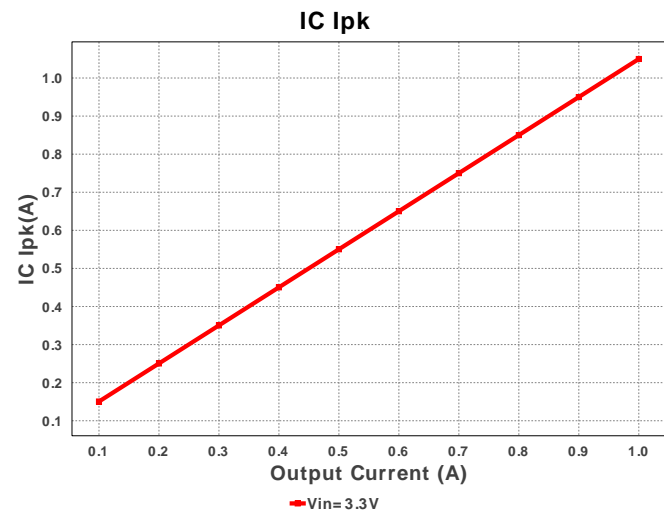
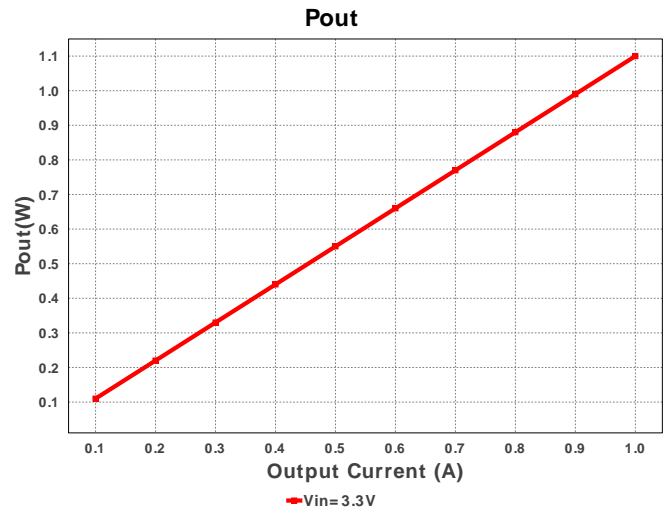
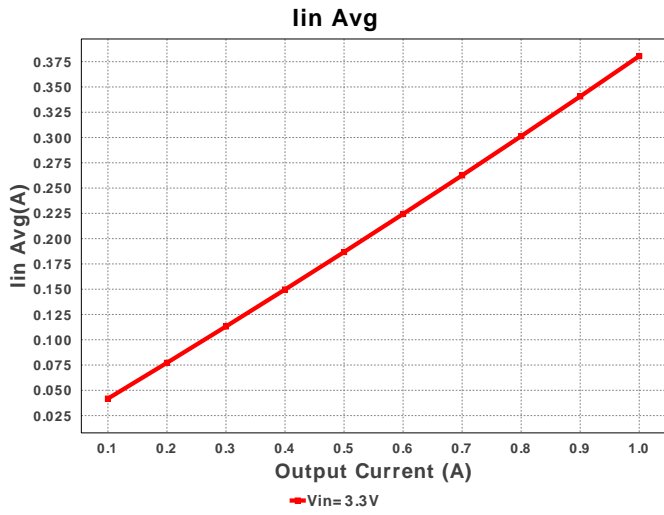
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LM26420XSQ/NOPB 3.3V-3.3V to 1.10V @ 1.0A

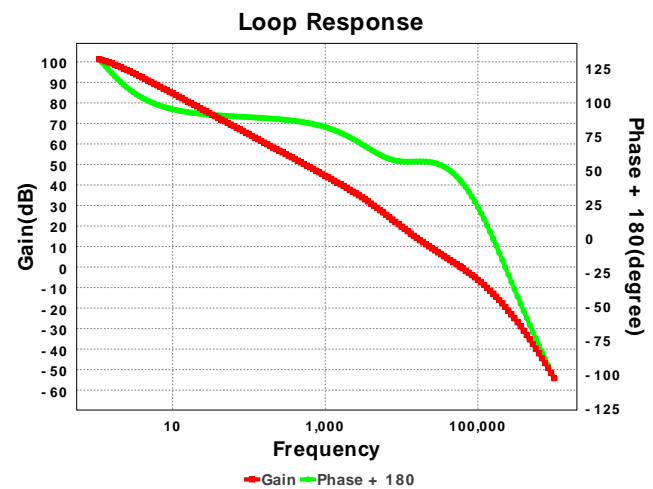
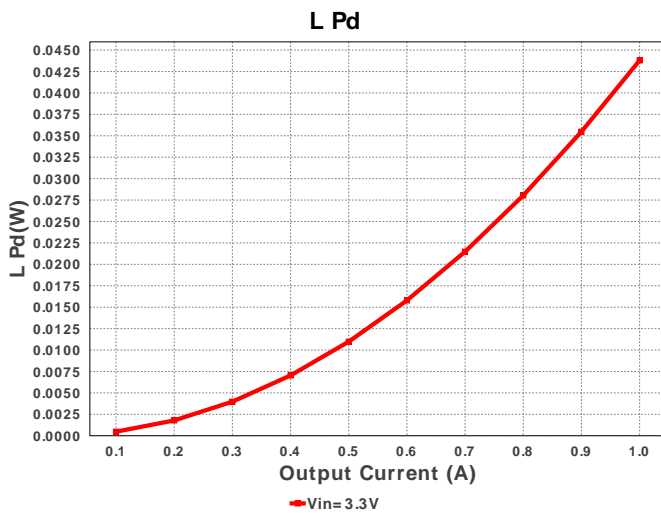
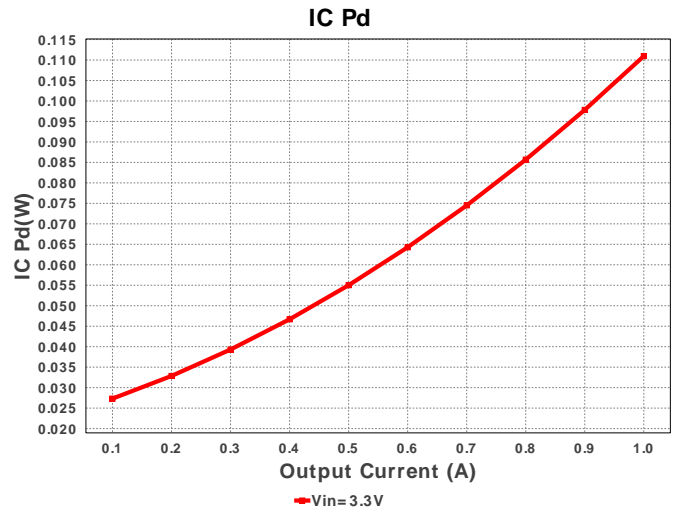
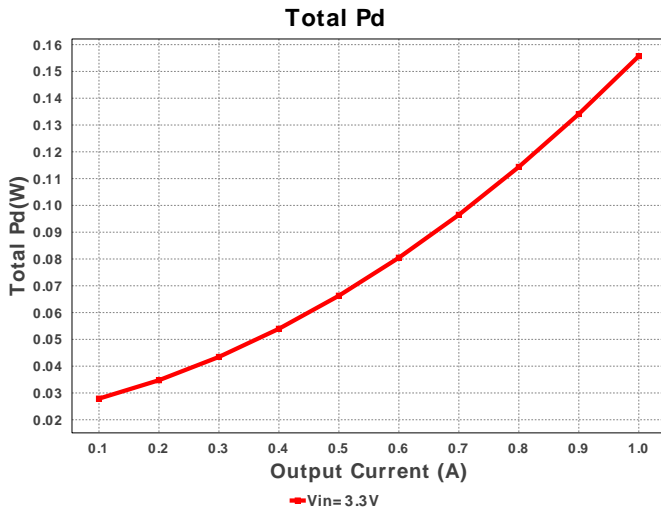


Electrical BOM

| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|----|------|-------------------|--------------------------------------|--|-----|--------|--|
| 1. | Cin | MuRata | GRM219R61A106KE44D Series= X5R | Cap= 10.0 uF ESR= 3.937 mOhm VDC= 10.0 V IRMS= 2.7713 A | 1 | \$0.03 | 0805 7 mm ² |
| 2. | Cout | MuRata | GRM21BC80G226ME39L Series= X6S | Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A | 2 | \$0.04 | 0805 7 mm ² |
| 3. | L1 | Bourns | SRR4028-3R3Y | L= 3.3 uH DCR= 35.0 mOhm | 1 | \$0.26 |  SRR4028 34 mm ² |
| 4. | Ren | Vishay-Dale | CRCW040210K0FKED Series= CRCW..e3 | Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 5. | Rfbb | Vishay-Dale | CRCW040210K2FKED Series= CRCW..e3 | Res= 10.2 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 6. | Rfht | Vishay-Dale | CRCW04023K83FKED Series= CRCW..e3 | Res= 3.83 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 7. | Rpg | Vishay-Dale | CRCW040249K9FKED Series= CRCW..e3 | Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0% | 1 | \$0.01 | 0402 3 mm ² |
| 8. | U1 | Texas Instruments | LM26420XSQ/NOPB | Switcher | 0 | \$1.73 |  RUM0016A 25 mm ² |







Operating Values

| # | Name | Value | Category | Description |
|-----|----------------|------------|----------|--|
| 1. | Cout IRMS | 28.798 mA | Current | Output capacitor RMS ripple current |
| 2. | IC Ipk | 1.05 A | Current | Peak switch current in IC |
| 3. | Iin Avg | 380.52 mA | Current | Average input current |
| 4. | L Ipp | 99.761 mA | Current | Peak-to-peak inductor ripple current |
| 5. | M Irms | 584.735 mA | Current | MOSFET RMS current |
| 6. | Frequency | 2.2 MHz | General | Switching frequency |
| 7. | IC Tolerance | 20.0 mV | General | IC Feedback Tolerance |
| 8. | M Vds Act | 79.654 mV | General | Voltage drop across the MosFET |
| 9. | Mode | CCM | General | Conduction Mode |
| 10. | Pout | 1.1 W | General | Total output power |
| 11. | Low Freq Gain | 101.241 dB | Op_Point | Gain at 10Hz |
| 12. | Vout Actual | 1.1 V | Op_Point | Vout Actual calculated based on selected voltage divider resistors |
| 13. | Vout OP | 1.1 V | Op_Point | Operational Output Voltage |
| 14. | Cross Freq | 59.512 kHz | Op_point | Bode plot crossover frequency |
| 15. | Duty Cycle | 34.158 % | Op_point | Duty cycle |
| 16. | Efficiency | 87.599 % | Op_point | PMU channel steady state efficiency |
| 17. | Gain Marg | -13.089 dB | Op_point | Bode Plot Gain Margin |
| 18. | IOUT_OP | 1.0 A | Op_point | Iout operating point |
| 19. | Phase Marg | 42.926 deg | Op_point | Bode Plot Phase Margin |
| 20. | VIN_OP | 3.3 V | Op_point | Vin operating point |
| 21. | Vout p-p | 225.033 μV | Op_point | Peak-to-peak output ripple voltage |
| 22. | Cout Pd | 1.484 μW | Power | Output capacitor power dissipation |
| 23. | IC Pd | 110.961 mW | Power | IC power dissipation |
| 24. | L Pd | 43.793 mW | Power | Inductor power dissipation |
| 25. | Total Pd | 155.721 mW | Power | PMU channel power dissipation |
| 26. | Vout Tolerance | 3.065 % | | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

Design Inputs

| # | Name | Value | Description |
|----|---------|------------|------------------------------------|
| 1. | Iout | 1.0 | Maximum Output Current |
| 2. | VinMax | 3.3 | Maximum input voltage |
| 3. | VinMin | 3.3 | Minimum input voltage |
| 4. | Vout | 1.1 | Output Voltage |
| 5. | base_pn | LM26420X/2 | Texas Instruments Base Part Number |
| 6. | source | DC | Input Source Type |
| 7. | ta | 30.0 | Ambient temperature |

Design Assistance

1. LM26420X/2 Product Folder : <http://www.ti.com/product/LM26420X> : contains the data sheet and other resources.

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