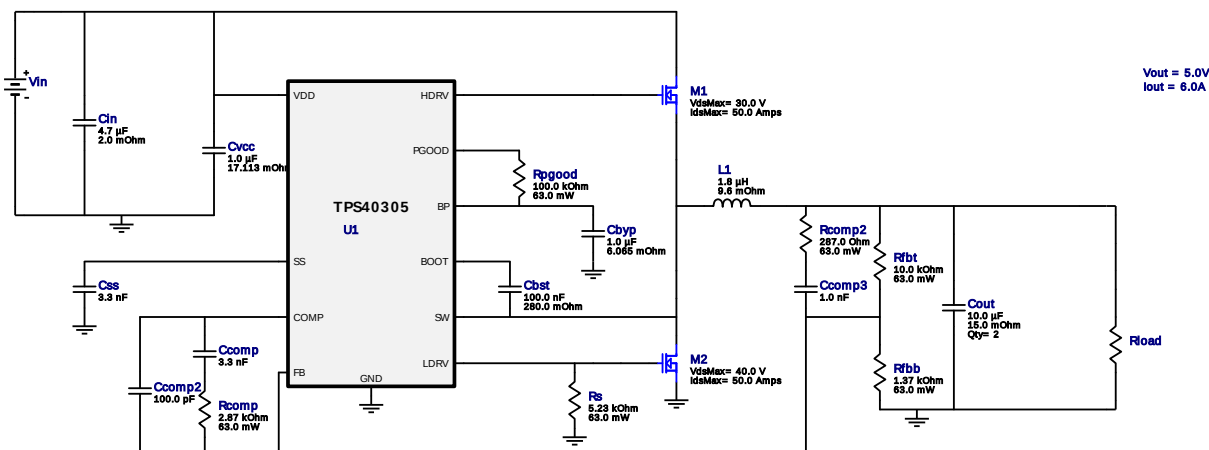


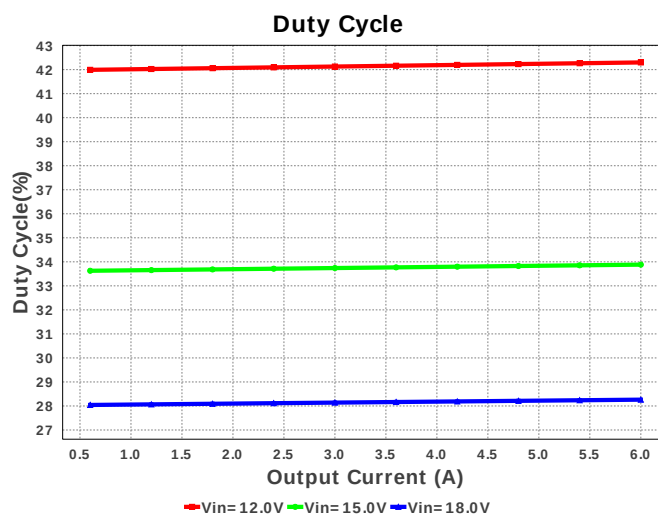
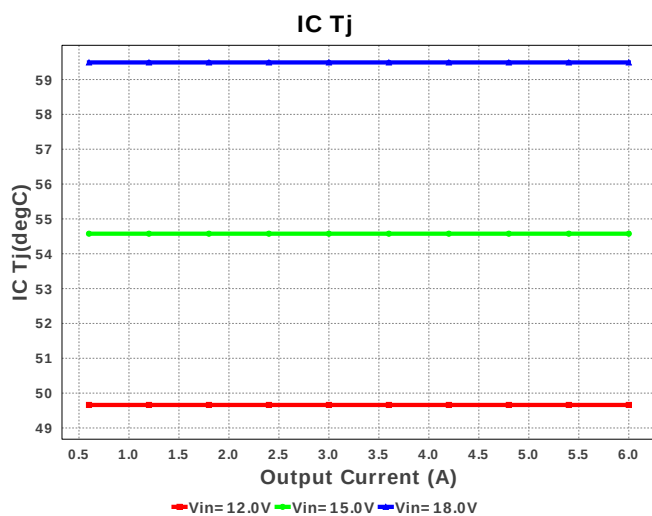


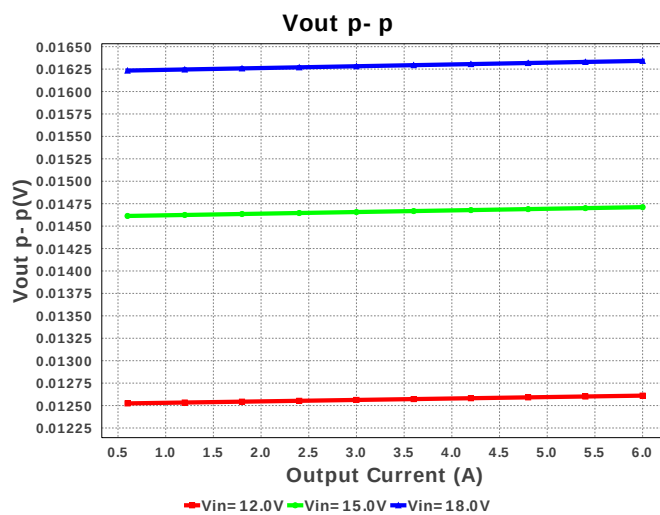
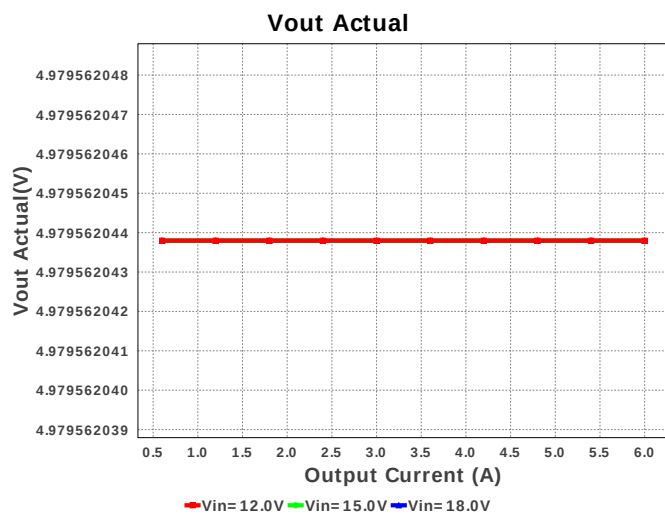
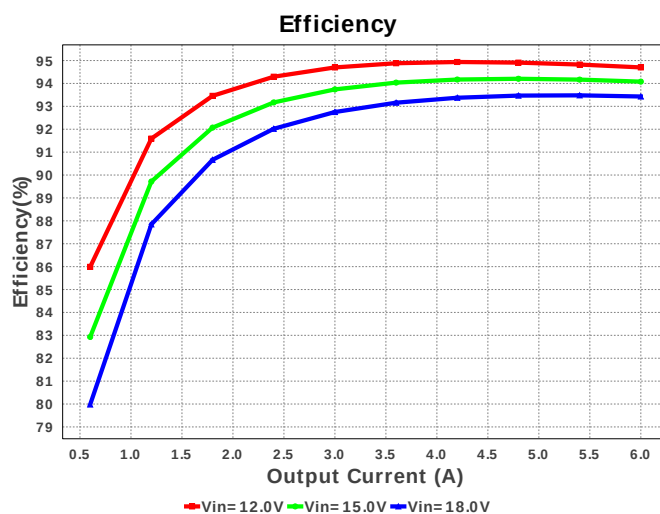
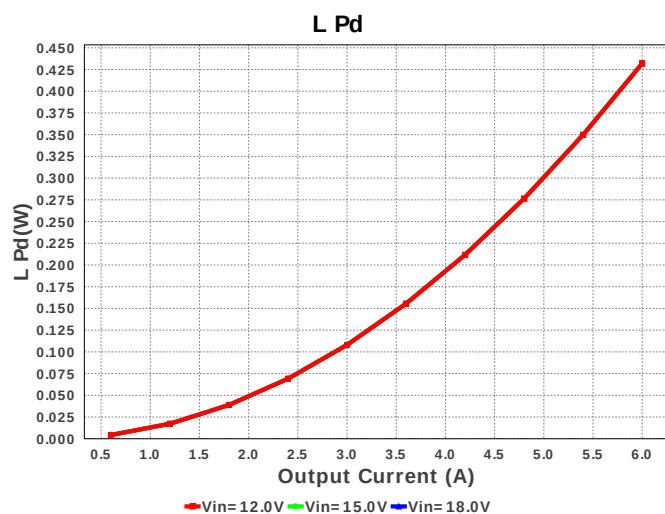
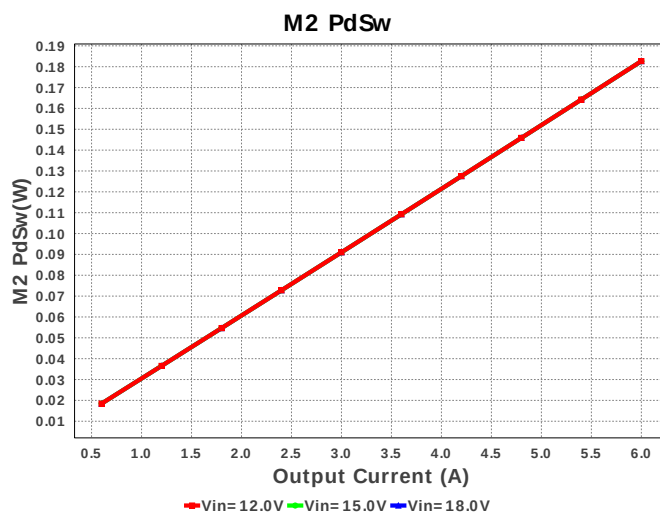
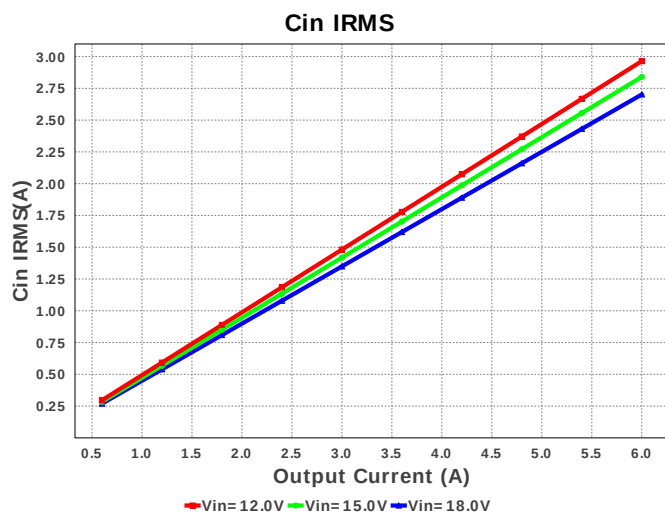
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Topology = Buck  
Created = 9/20/16 5:53:26 PM  
BOM Cost = \$2.36  
BOM Count = 20  
Total Pd = 2.11W



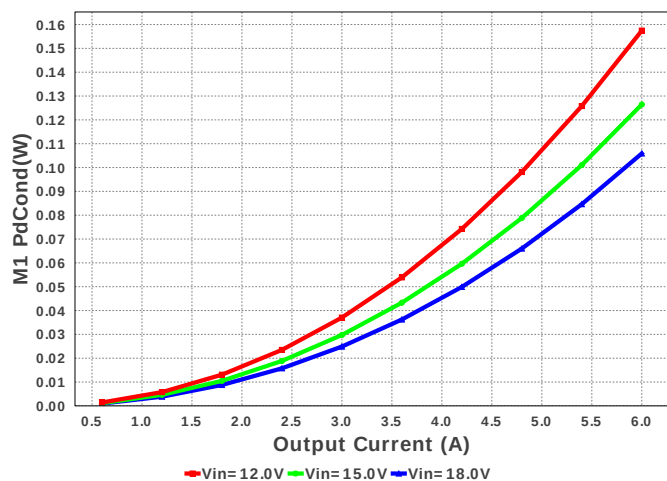
| #  | Name   | Manufacturer              | Part Number                          | Properties                                                        | Qty | Price  | Footprint                                                                                                    |
|----|--------|---------------------------|--------------------------------------|-------------------------------------------------------------------|-----|--------|--------------------------------------------------------------------------------------------------------------|
| 1. | Cbst   | 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 <sup>2</sup> |
| 2. | Cbyp   | MuRata                    | GRM188R61A105KA61D<br>Series= X5R    | Cap= 1.0 uF<br>ESR= 6.065 mOhm<br>VDC= 10.0 V<br>IRMS= 1.30675 A  | 1   | \$0.01 |  0603 5 mm <sup>2</sup> |
| 3. | Ccomp  | MuRata                    | GRM216R71E332KA01D<br>Series= X7R    | Cap= 3.3 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A                         | 1   | \$0.01 |  0805 7 mm <sup>2</sup> |
| 4. | Ccomp2 | Yageo America             | CC0805JRNPO9BN101<br>Series= C0G/NP0 | Cap= 100.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 |  0805 7 mm <sup>2</sup> |
| 5. | Ccomp3 | Samsung Electro-Mechanics | CL21C102JBCNFNC<br>Series= C0G/NP0   | Cap= 1.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                         | 1   | \$0.01 |  0805 7 mm <sup>2</sup> |
| 6. | Cin    | MuRata                    | GRM21BR61E475MA12L<br>Series= X5R    | Cap= 4.7 uF<br>ESR= 2.0 mOhm<br>VDC= 25.0 V<br>IRMS= 7.29 A       | 1   | \$0.02 |  0805 7 mm <sup>2</sup> |
| 7. | Cout   | Yageo America             | CC0603MRX5R5BB106<br>Series= X5R     | Cap= 10.0 uF<br>ESR= 15.0 mOhm<br>VDC= 6.3 V<br>IRMS= 0.0 A       | 2   | \$0.03 |  0603 5 mm <sup>2</sup> |
| 8. | Css    | MuRata                    | GRM033R61A332KA01D<br>Series= X5R    | Cap= 3.3 nF<br>VDC= 10.0 V<br>IRMS= 0.0 A                         | 1   | \$0.01 |  0201 2 mm <sup>2</sup> |
| 9. | Cvcc   | MuRata                    | GRM188R61E105KA12D<br>Series= X5R    | Cap= 1.0 uF<br>ESR= 17.113 mOhm<br>VDC= 25.0 V<br>IRMS= 979.39 mA | 1   | \$0.01 |  0603 5 mm <sup>2</sup> |

| #   | Name   | Manufacturer      | Part Number                          | Properties                                           | Qty | Price  | Footprint                                                                                                                  |
|-----|--------|-------------------|--------------------------------------|------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------------------------|
| 10. | L1     | Coilcraft         | XAL6030-182MEB                       | L= 1.8 $\mu$ H<br>DCR= 9.6 mOhm                      | 1   | \$0.65 | <br>XAL6030 72 mm <sup>2</sup>          |
| 11. | M1     | Texas Instruments | CSD17308Q3                           | VdsMax= 30.0 V<br>IdsMax= 50.0 Amps                  | 1   | \$0.28 | <br>DQG0008A 18 mm <sup>2</sup>         |
| 12. | M2     | Texas Instruments | CSD18504Q5A                          | VdsMax= 40.0 V<br>IdsMax= 50.0 Amps                  | 1   | \$0.37 | <br>TRANS_NexFET_Q5A 55 mm <sup>2</sup> |
| 13. | Rcomp  | Vishay-Dale       | CRCW04022K87FKED<br>Series= CRCW..e3 | Res= 2.87 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 14. | Rcomp2 | Vishay-Dale       | CRCW0402287RFKED<br>Series= CRCW..e3 | Res= 287.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 15. | Rfbb   | Vishay-Dale       | CRCW04021K37FKED<br>Series= CRCW..e3 | Res= 1.37 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 16. | Rfbt   | Vishay-Dale       | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 17. | Rpgood | Vishay-Dale       | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 18. | Rs     | Vishay-Dale       | CRCW04025K23FKED<br>Series= CRCW..e3 | Res= 5.23 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 19. | U1     | Texas Instruments | TPS40305DRCR                         | Switcher                                             | 1   | \$0.85 | <br>S-PVSON-N10 17 mm <sup>2</sup>    |

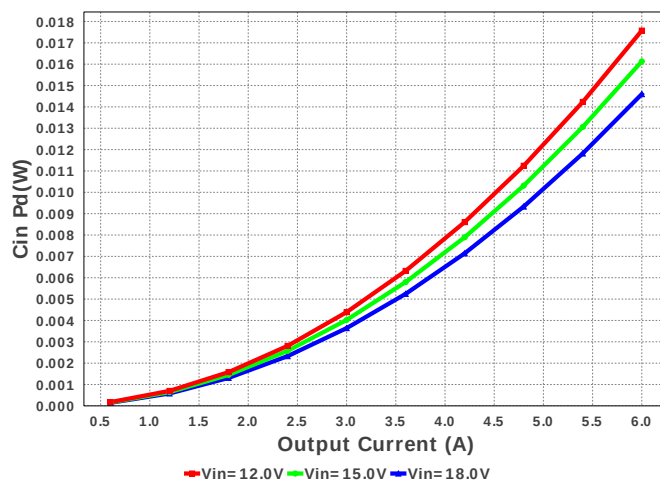




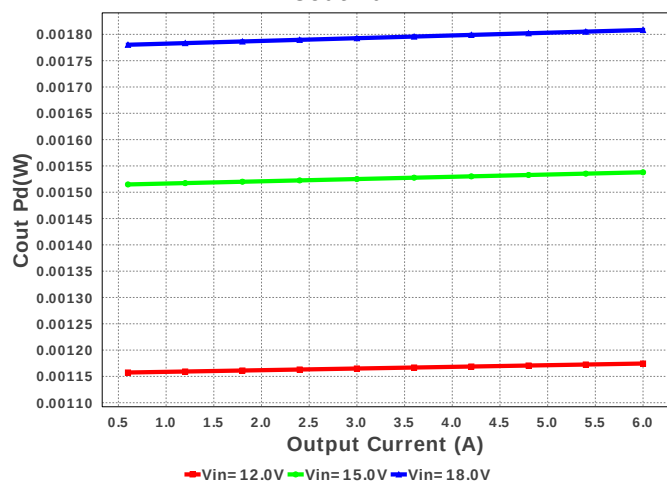
M1 PdCond



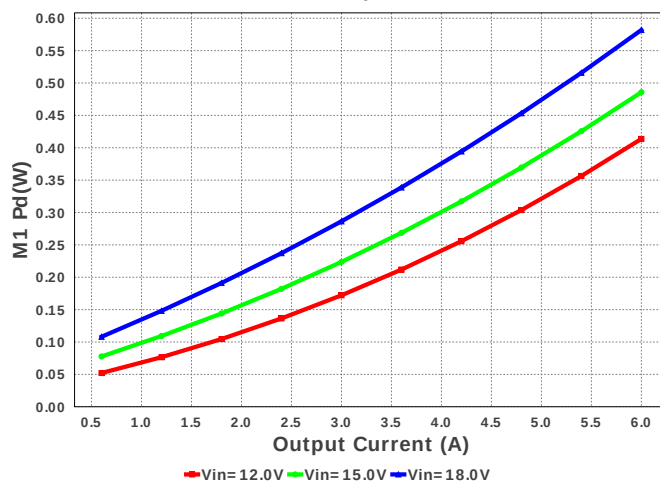
Cin Pd



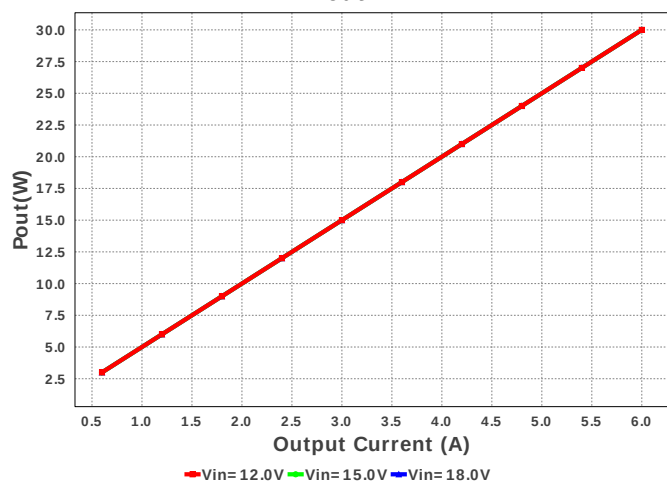
Cout Pd



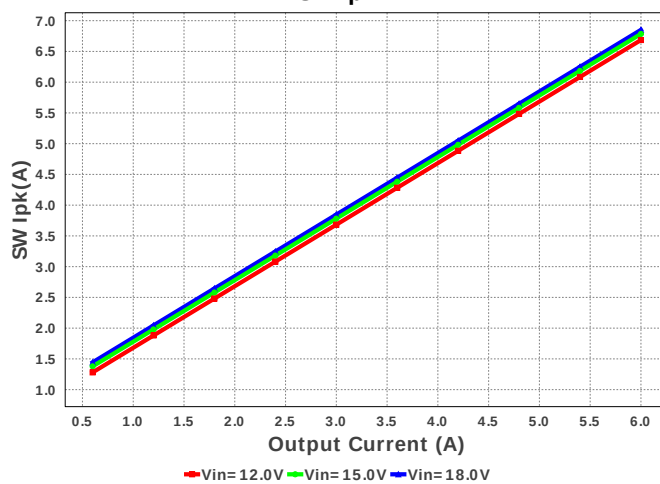
M1 Pd

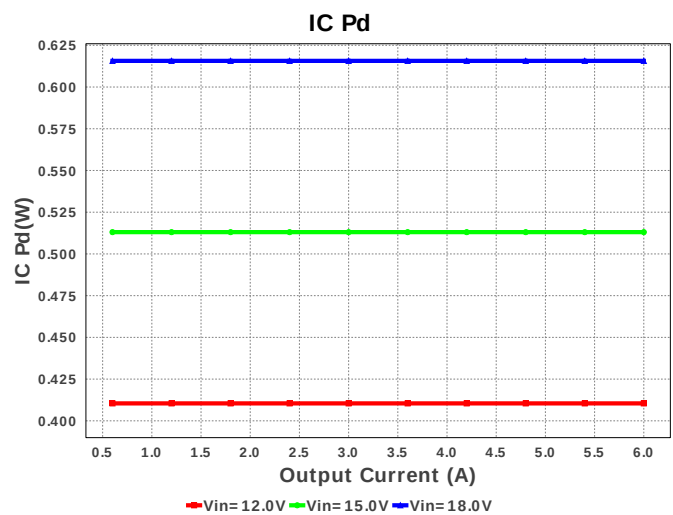
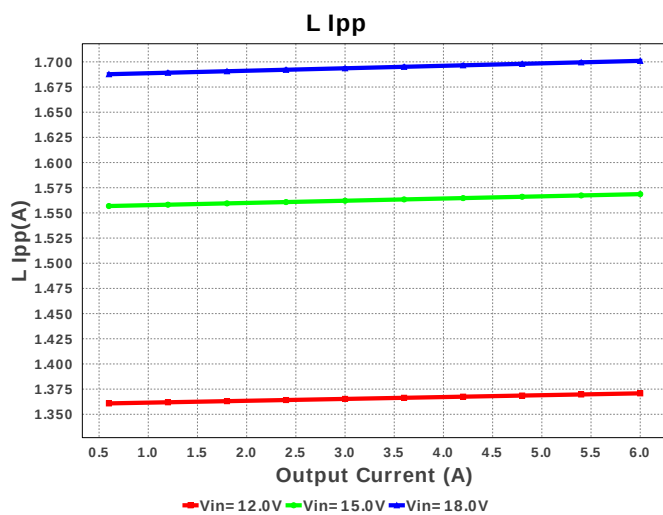
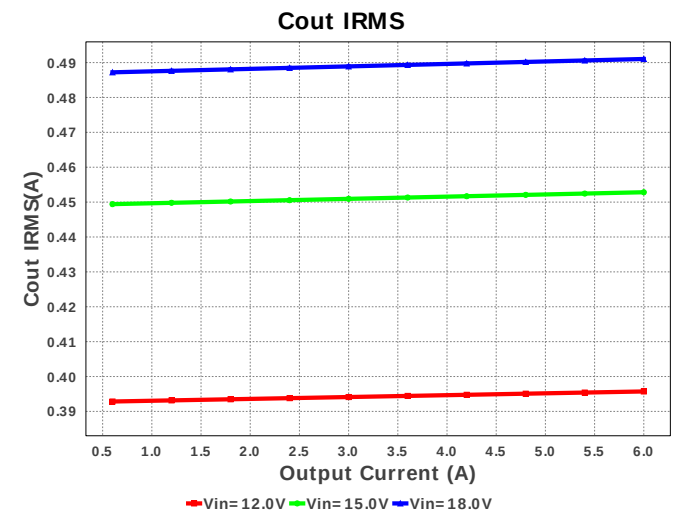
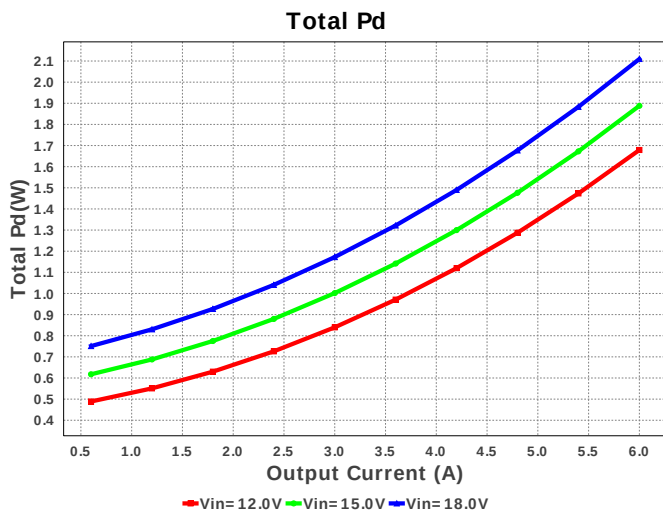
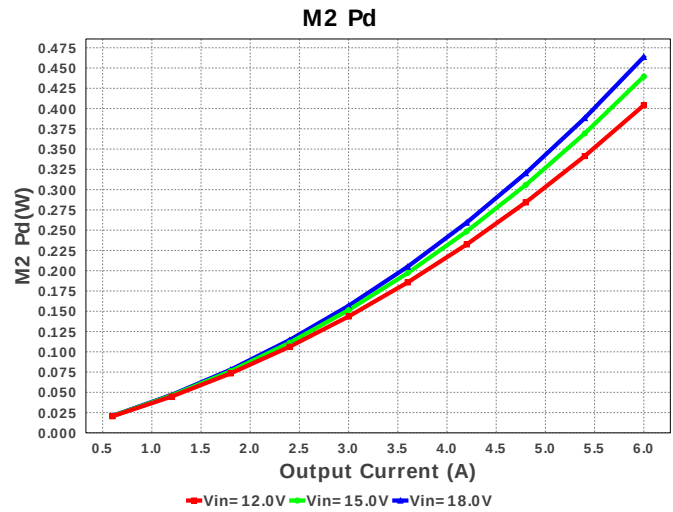
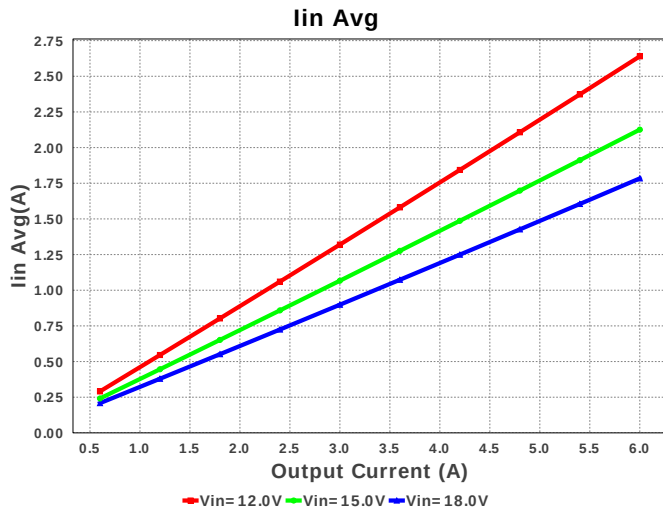


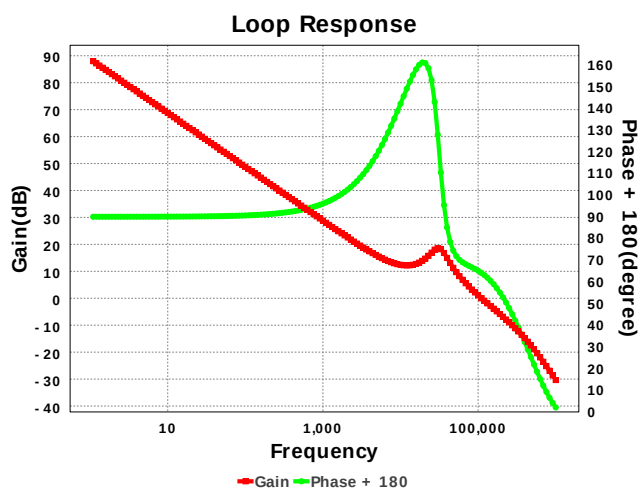
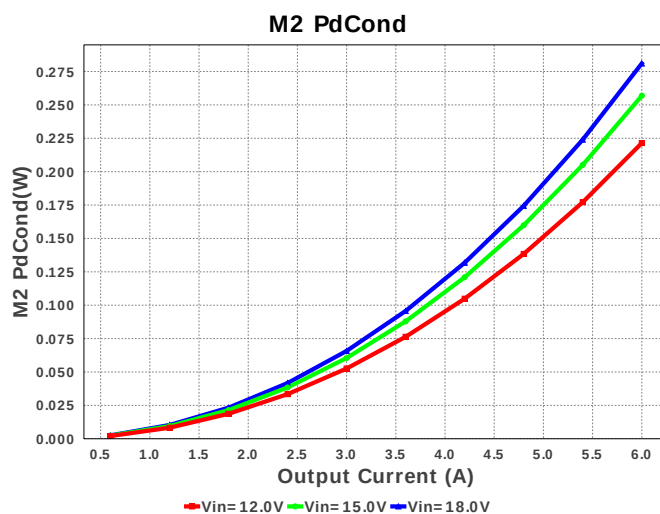
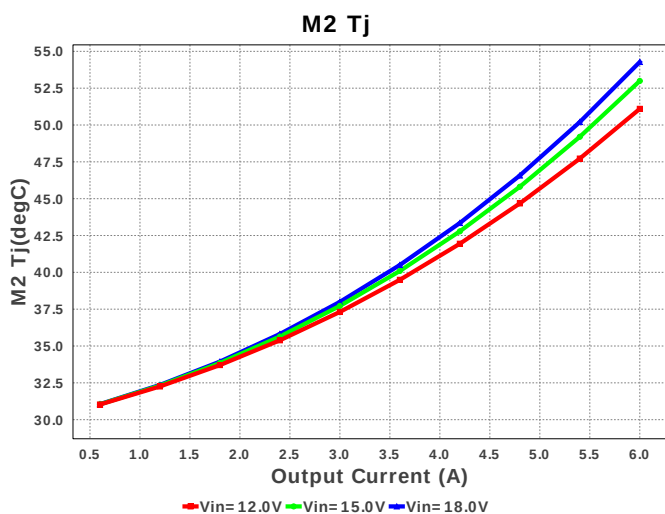
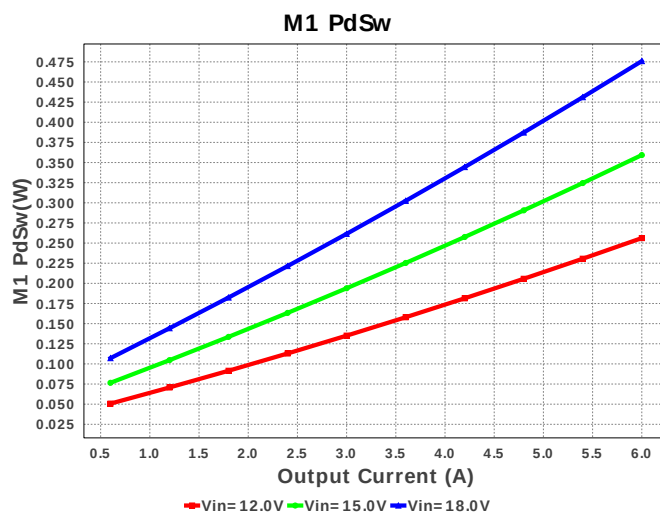
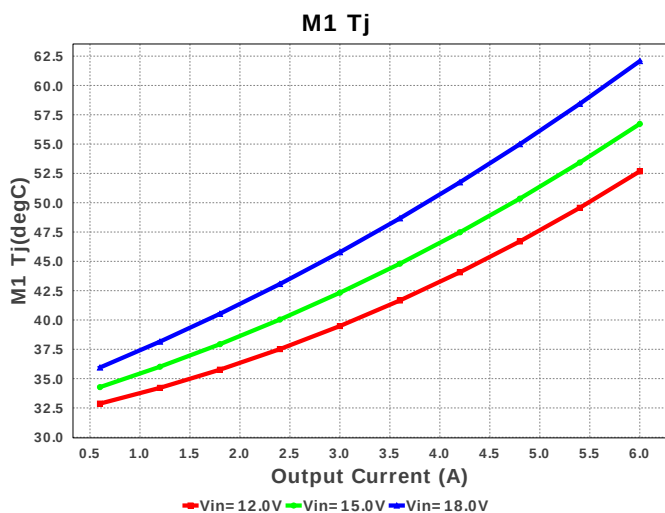
Pout



SW Ipk







## Operating Values

| #   | Name         | Value                 | Category | Description                             |
|-----|--------------|-----------------------|----------|-----------------------------------------|
| 1.  | Cin IRMS     | 2.702 A               | Current  | Input capacitor RMS ripple current      |
| 2.  | Cout IRMS    | 491.031 mA            | Current  | Output capacitor RMS ripple current     |
| 3.  | Iin Avg      | 1.784 A               | Current  | Average input current                   |
| 4.  | L Ipp        | 1.701 A               | Current  | Peak-to-peak inductor ripple current    |
| 5.  | SW Ipk       | 6.85 A                | Current  | Peak switch current                     |
| 6.  | BOM Count    | 20                    | General  | Total Design BOM count                  |
| 7.  | FootPrint    | 235.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components |
| 8.  | Frequency    | 1.2 MHz               | General  | Switching frequency                     |
| 9.  | IC Tolerance | 10.0 mV               | General  | IC Feedback Tolerance                   |
| 10. | Mode         | CCM                   | General  | Conduction Mode                         |
| 11. | Pout         | 30.0 W                | General  | Total output power                      |

| #   | Name           | Value       | Category | Description                                                                                |
|-----|----------------|-------------|----------|--------------------------------------------------------------------------------------------|
| 12. | Total BOM      | \$2.36      | General  | Total BOM Cost                                                                             |
| 13. | Low Freq Gain  | 88.07 dB    | Op_Point | Gain at 10Hz                                                                               |
| 14. | Vout Actual    | 4.98 V      | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 15. | Cross Freq     | 110.512 kHz | Op_point | Bode plot crossover frequency                                                              |
| 16. | Duty Cycle     | 28.262 %    | Op_point | Duty cycle                                                                                 |
| 17. | Efficiency     | 93.417 %    | Op_point | Steady state efficiency                                                                    |
| 18. | Gain Marg      | -31.922 dB  | Op_point | Bode Plot Gain Margin                                                                      |
| 19. | IC Tj          | 59.491 degC | Op_point | IC junction temperature                                                                    |
| 20. | IOUT_OP        | 6.0 A       | Op_point | Iout operating point                                                                       |
| 21. | M1 Tj          | 62.076 degC | Op_point | M1 MOSFET junction temperature                                                             |
| 22. | M2 Tj          | 54.278 degC | Op_point | M2 MOSFET junction temperature                                                             |
| 23. | Phase Marg     | 63.639 deg  | Op_point | Bode Plot Phase Margin                                                                     |
| 24. | VIN_OP         | 18.0 V      | Op_point | Vin operating point                                                                        |
| 25. | Vout p-p       | 16.342 mV   | Op_point | Peak-to-peak output ripple voltage                                                         |
| 26. | Cin Pd         | 14.598 mW   | Power    | Input capacitor power dissipation                                                          |
| 27. | Cout Pd        | 1.808 mW    | Power    | Output capacitor power dissipation                                                         |
| 28. | IC Pd          | 615.672 mW  | Power    | IC power dissipation                                                                       |
| 29. | L Pd           | 432.0 mW    | Power    | Inductor power dissipation                                                                 |
| 30. | M1 Pd          | 582.521 mW  | Power    | M1 MOSFET total power dissipation                                                          |
| 31. | M1 PdCond      | 106.583 mW  | Power    | M1 MOSFET conduction losses                                                                |
| 32. | M1 PdSw        | 475.938 mW  | Power    | M1 MOSFET switching losses                                                                 |
| 33. | M2 Pd          | 467.38 mW   | Power    | M2 MOSFET total power dissipation                                                          |
| 34. | M2 PdCond      | 284.71 mW   | Power    | M2 MOSFET conduction losses                                                                |
| 35. | M2 PdSw        | 182.671 mW  | Power    | M2 MOSFET switching losses                                                                 |
| 36. | Total Pd       | 2.114 W     | Power    | Total Power Dissipation                                                                    |
| 37. | Vout Tolerance | 3.473 %     |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value    | Description            |
|----|---------|----------|------------------------|
| 1. | Iout    | 6.0      | Maximum Output Current |
| 2. | VinMax  | 18.0     | Maximum input voltage  |
| 3. | VinMin  | 12.0     | Minimum input voltage  |
| 4. | Vout    | 5.0      | Output Voltage         |
| 5. | base_pn | TPS40305 | Base Product Number    |
| 6. | source  | DC       | Input Source Type      |
| 7. | Ta      | 30.0     | Ambient temperature    |

## Design Assistance

1. **TPS40305** Product Folder : <http://www.ti.com/product/TPS40305> : contains the data sheet and other resources.

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