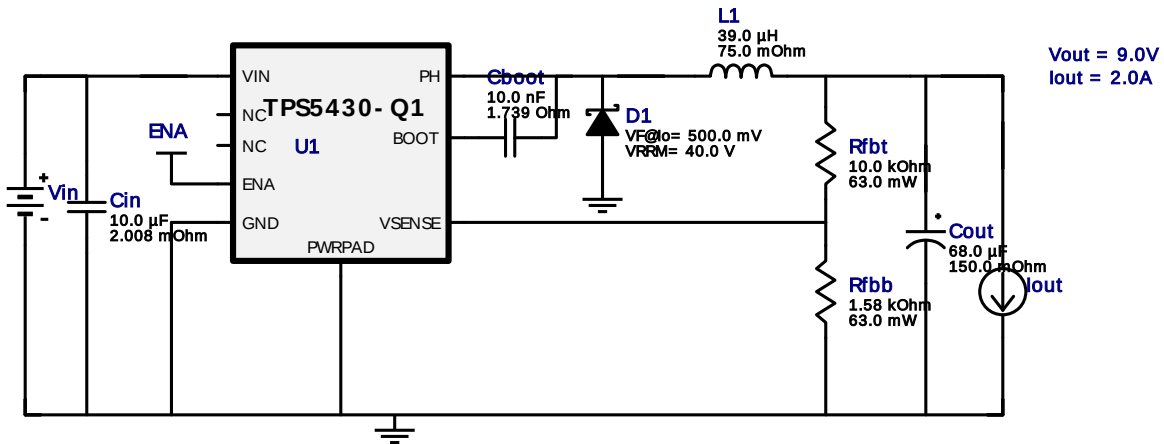


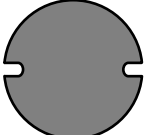
## WEBENCH® Design Report

Design : 4742013/19 TPS5430QDDARQ1  
TPS5430QDDARQ1 14.0V-25.0V to 9.00V @ 2.0A



1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application. View WEBENCH(R) Disclaimer.

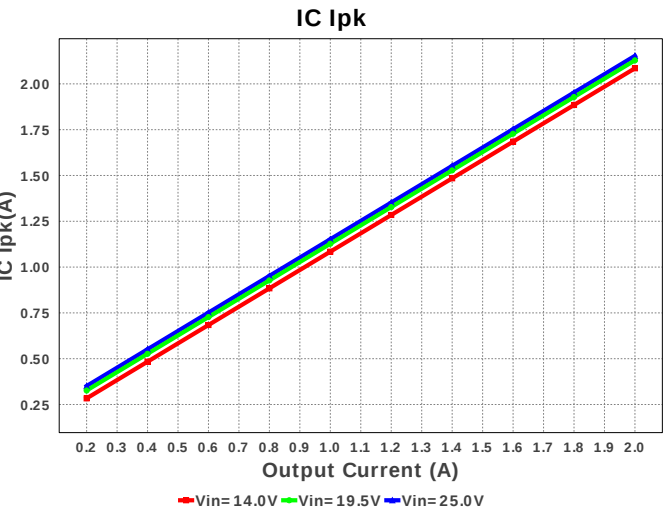
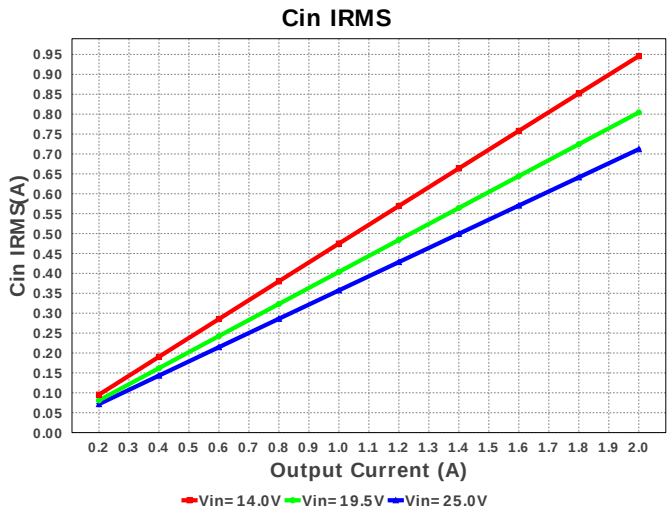
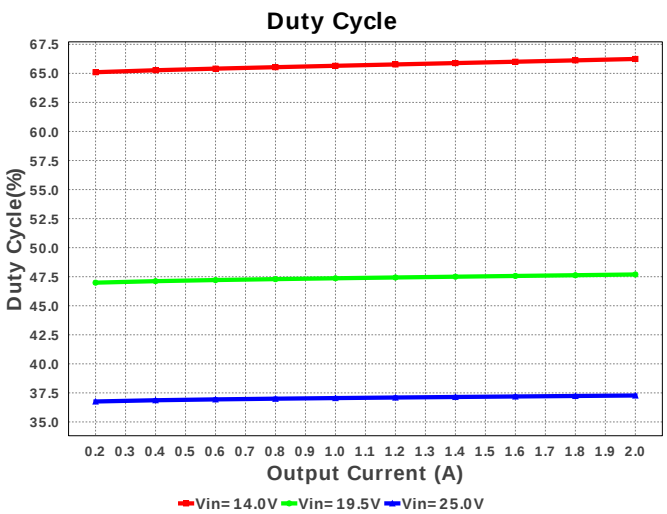
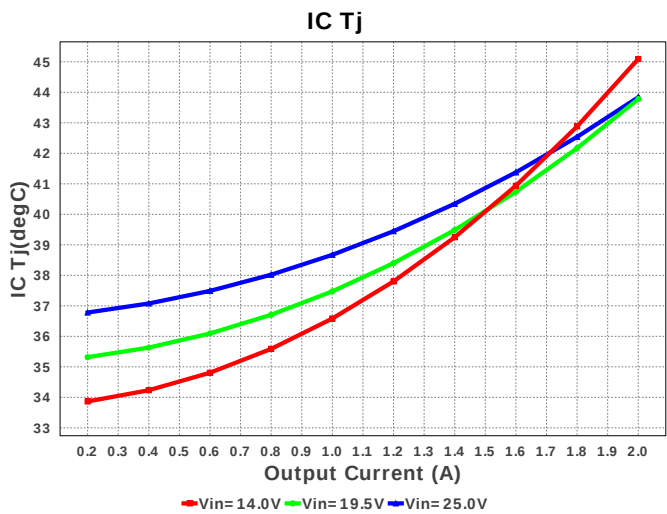
### Electrical BOM

| #  | Name  | Manufacturer | Part Number                          | Properties                                                       | Qty | Price  | Footprint                                                                                                            |
|----|-------|--------------|--------------------------------------|------------------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------------------|
| 1. | Cboot | Kemet        | C0805C103K5RACTU<br>Series= X7R      | Cap= 10.0 nF<br>ESR= 1.739 Ohm<br>VDC= 50.0 V<br>IRMS= 411.0 mA  | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>      |
| 2. | Cin   | MuRata       | GRM32ER7YA106KA12L<br>Series= X7R    | Cap= 10.0 uF<br>ESR= 2.008 mOhm<br>VDC= 35.0 V<br>IRMS= 4.6772 A | 1   | \$0.22 | <br>1210_280 15 mm <sup>2</sup> |
| 3. | Cout  | Kemet        | T495D686K020ATE150<br>Series= T495   | Cap= 68.0 uF<br>ESR= 150.0 mOhm<br>VDC= 20.0 V<br>IRMS= 900.0 mA | 1   | \$0.50 | <br>7343-31 59 mm <sup>2</sup>  |
| 4. | D1    | Diodes Inc.  | B240A-13-F                           | VF@Io= 500.0 mV<br>VRRM= 40.0 V                                  | 1   | \$0.09 | <br>SMA 37 mm <sup>2</sup>      |
| 5. | L1    | Bourns       | SDR1307-390KL                        | L= 39.0 uH<br>DCR= 75.0 mOhm                                     | 1   | \$0.35 | <br>SDR1307 227 mm <sup>2</sup> |
| 6. | Rfbb  | Vishay-Dale  | CRCW04021K58FKED<br>Series= CRCW..e3 | Res= 1.58 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>      |
| 7. | Rfbb  | 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>      |

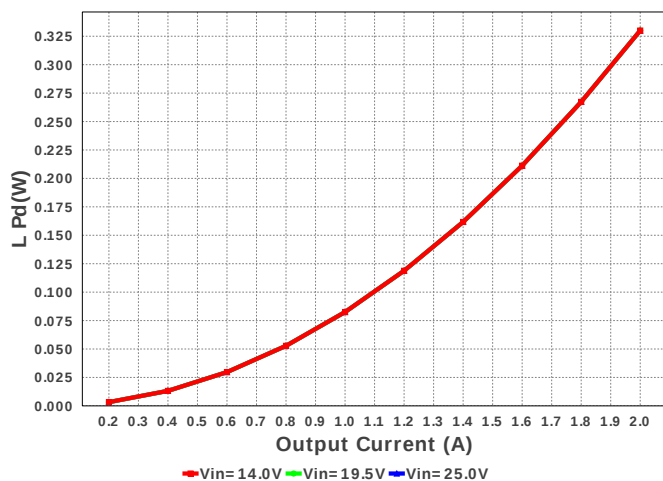
| #  | Name | Manufacturer      | Part Number    | Properties | Qty | Price  | Footprint |
|----|------|-------------------|----------------|------------|-----|--------|-----------|
| 8. | U1   | Texas Instruments | TPS5430QDDARQ1 | Switcher   | 1   | \$2.20 |           |



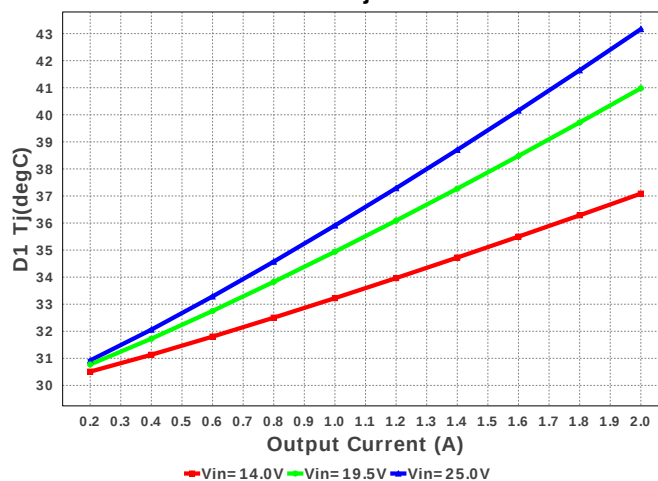
R-PDSO-G8 57 mm<sup>2</sup>



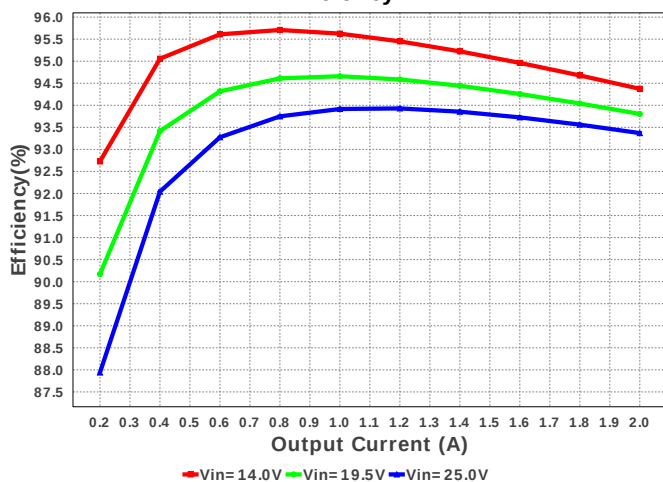
L Pd



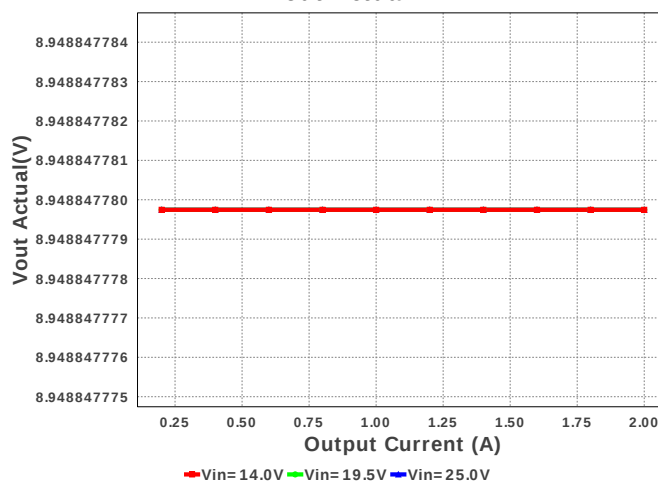
D1 Tj



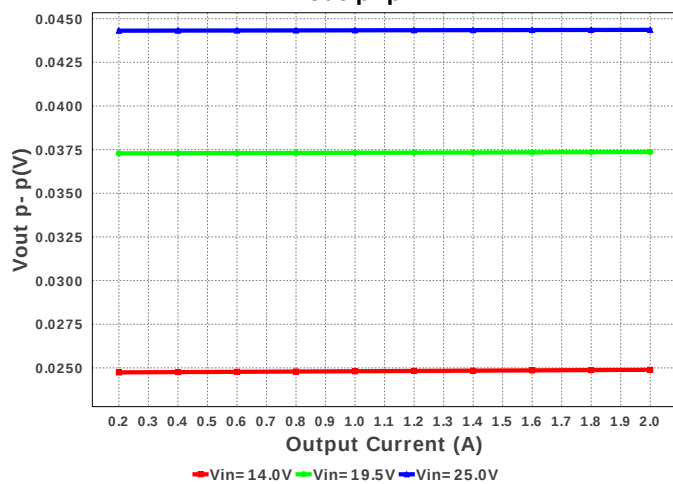
Efficiency



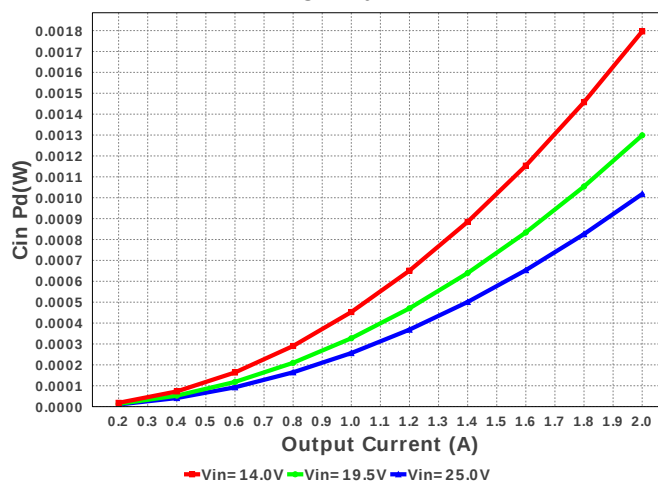
Vout Actual

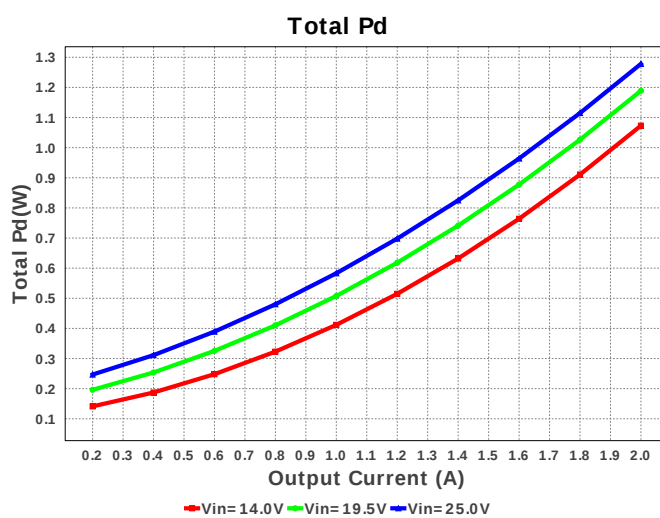
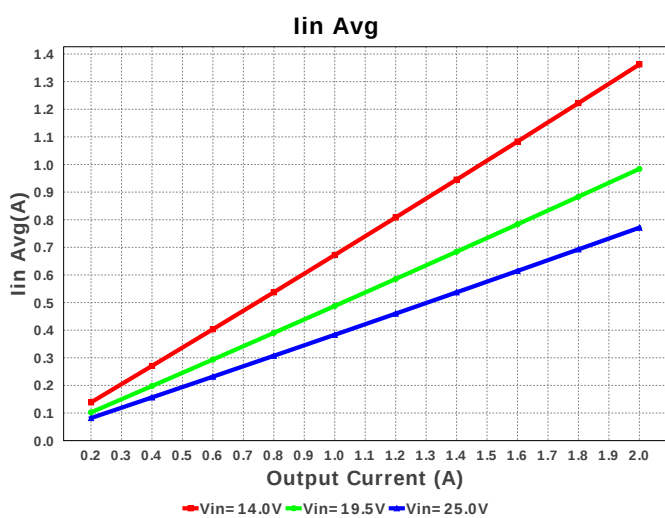
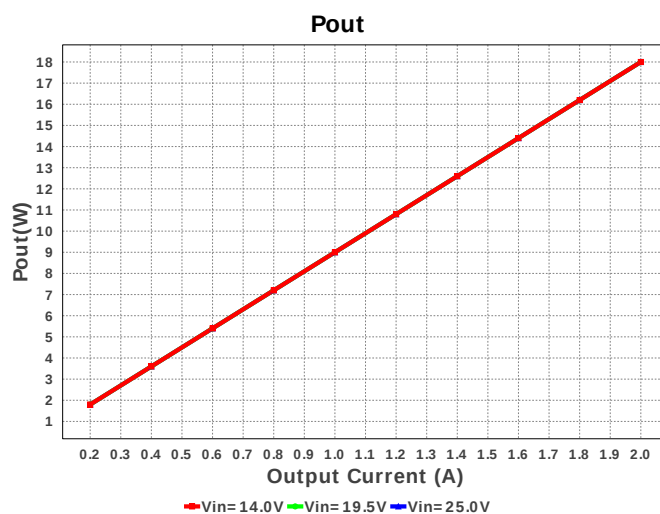
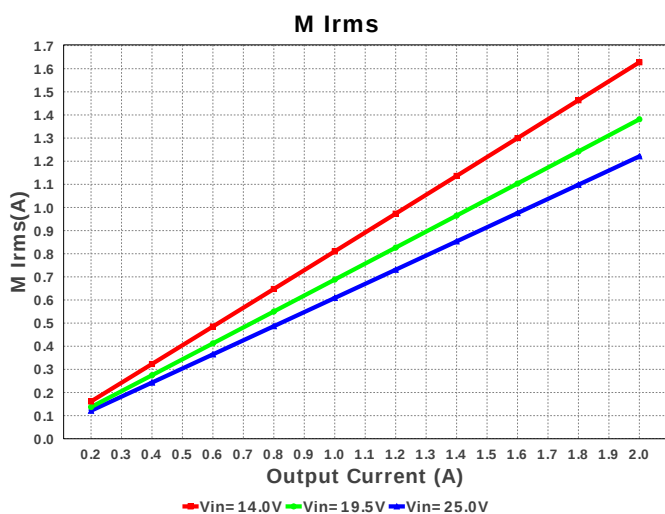
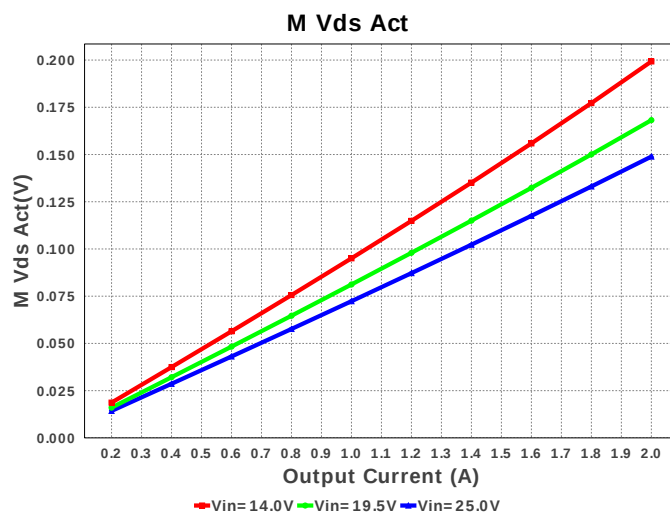
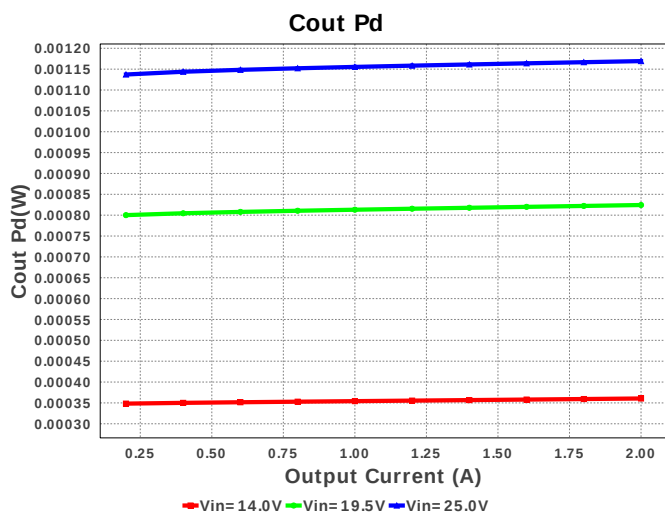


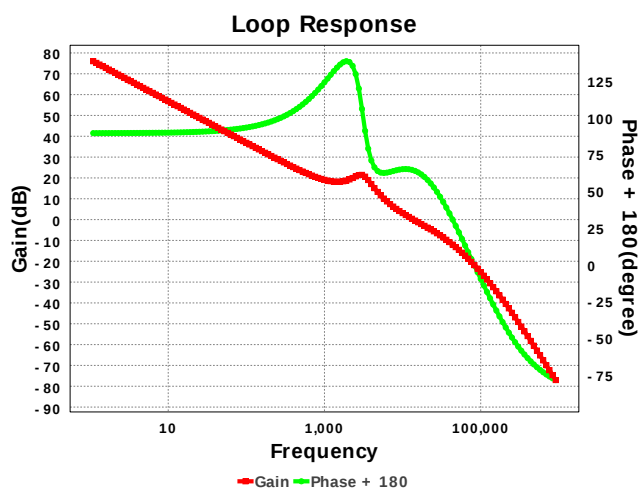
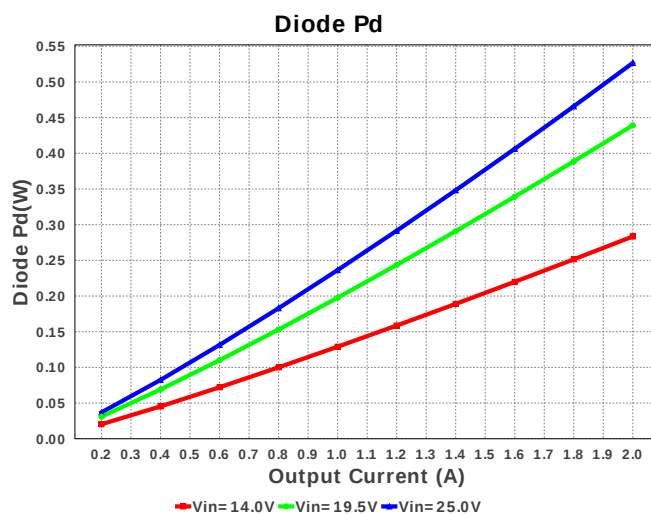
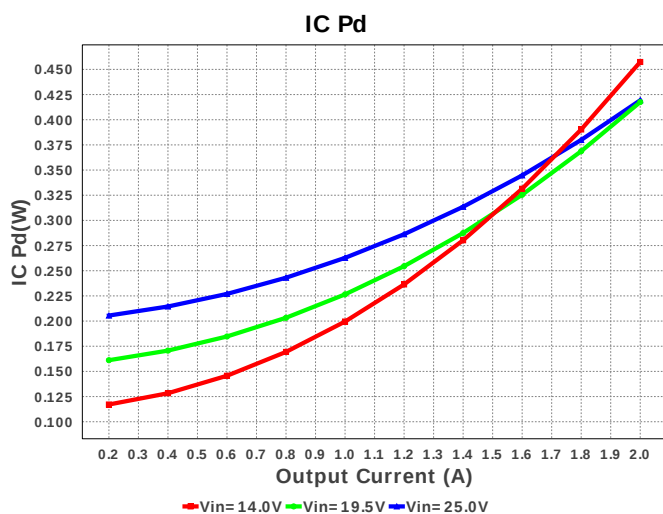
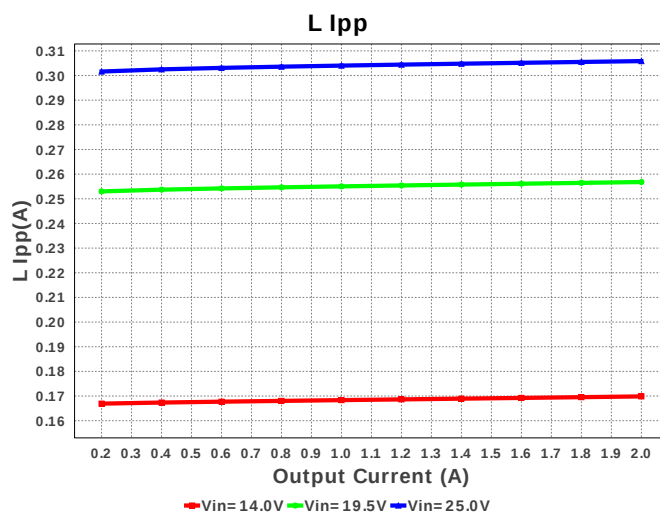
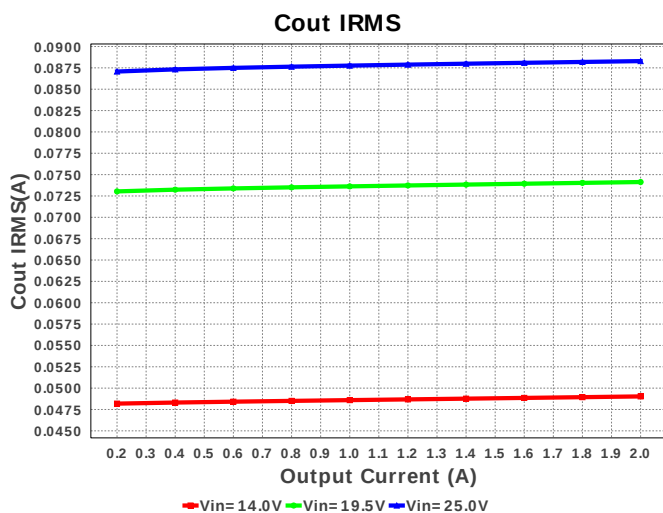
Vout p-p



Cin Pd







## Operating Values

| #   | Name         | Value                 | Category | Description                             |
|-----|--------------|-----------------------|----------|-----------------------------------------|
| 1.  | Cin IRMS     | 711.926 mA            | Current  | Input capacitor RMS ripple current      |
| 2.  | Cout IRMS    | 88.291 mA             | Current  | Output capacitor RMS ripple current     |
| 3.  | IC Ipk       | 2.153 A               | Current  | Peak switch current in IC               |
| 4.  | Iin Avg      | 771.13 mA             | Current  | Average input current                   |
| 5.  | L Ipp        | 305.85 mA             | Current  | Peak-to-peak inductor ripple current    |
| 6.  | M1 Irms      | 1.221 A               | Current  | Q lavg                                  |
| 7.  | BOM Count    | 8                     | General  | Total Design BOM count                  |
| 8.  | FootPrint    | 407.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components |
| 9.  | Frequency    | 500.0 kHz             | General  | Switching frequency                     |
| 10. | IC Tolerance | 18.315 mV             | General  | IC Feedback Tolerance                   |
| 11. | M Vds Act    | 148.905 mV            | General  | Voltage drop across the MosFET          |

| #   | Name           | Value       | Category | Description                                                                                |
|-----|----------------|-------------|----------|--------------------------------------------------------------------------------------------|
| 12. | Pout           | 18.0 W      | General  | Total output power                                                                         |
| 13. | Total BOM      | \$3.39      | General  | Total BOM Cost                                                                             |
| 14. | D1 Tj          | 43.166 degC | Op_Point | D1 junction temperature                                                                    |
| 15. | Vout Actual    | 8.949 V     | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 16. | Vout OP        | 9.0 V       | Op_Point | Operational Output Voltage                                                                 |
| 17. | Cross Freq     | 13.785 kHz  | Op_point | Bode plot crossover frequency                                                              |
| 18. | Duty Cycle     | 37.275 %    | Op_point | Duty cycle                                                                                 |
| 19. | Efficiency     | 93.37 %     | Op_point | Steady state efficiency                                                                    |
| 20. | IC Tj          | 43.838 degC | Op_point | IC junction temperature                                                                    |
| 21. | ICThetaJA      | 33.0 degC/W | Op_point | IC junction-to-ambient thermal resistance                                                  |
| 22. | IOUT_OP        | 2.0 A       | Op_point | Iout operating point                                                                       |
| 23. | Phase Marg     | 64.767 deg  | Op_point | Bode Plot Phase Margin                                                                     |
| 24. | VIN_OP         | 25.0 V      | Op_point | Vin operating point                                                                        |
| 25. | Vout p-p       | 45.891 mV   | Op_point | Peak-to-peak output ripple voltage                                                         |
| 26. | Cin Pd         | 1.018 mW    | Power    | Input capacitor power dissipation                                                          |
| 27. | Cout Pd        | 1.169 mW    | Power    | Output capacitor power dissipation                                                         |
| 28. | Diode Pd       | 526.645 mW  | Power    | Diode power dissipation                                                                    |
| 29. | IC Pd          | 419.323 mW  | Power    | IC power dissipation                                                                       |
| 30. | L Pd           | 330.0 mW    | Power    | Inductor power dissipation                                                                 |
| 31. | Total Pd       | 1.278 W     | Power    | Total Power Dissipation                                                                    |
| 32. | Vout Tolerance | 3.271 %     |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value      | Description            |
|----|---------|------------|------------------------|
| 1. | Iout    | 2.0        | Maximum Output Current |
| 2. | VinMax  | 25.0       | Maximum input voltage  |
| 3. | VinMin  | 14.0       | Minimum input voltage  |
| 4. | Vout    | 9.0        | Output Voltage         |
| 5. | base_pn | TPS5430-Q1 | Base Product Number    |
| 6. | source  | DC         | Input Source Type      |
| 7. | Ta      | 30.0       | Ambient temperature    |

## Design Assistance

1. Feature Highlights: Automotive Qualified 3A, 500kHz Fixed Switching Frequency, Internal Compensation
2. The TPS5430-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application
3. **TPS5430-Q1** Product Folder : <http://www.ti.com/product/TPS5430%2DQ1> : contains the data sheet and other resources.

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