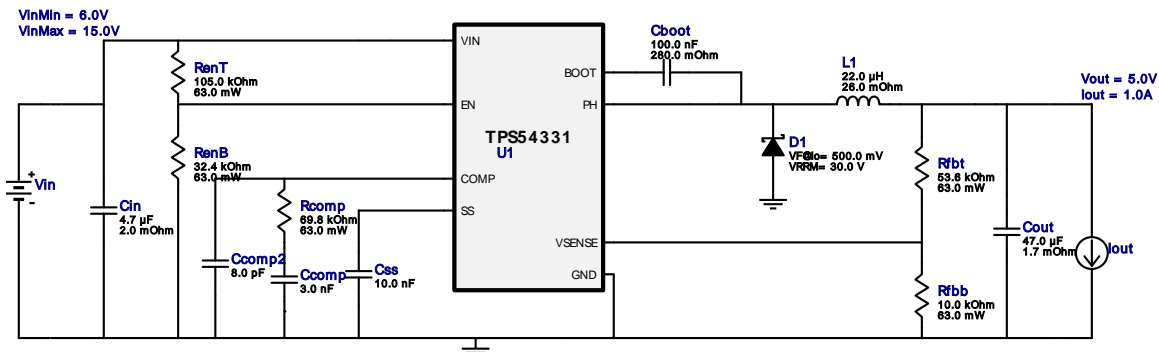




## WEBENCH® Design Report

Design : 3519092/16 TPS54331DR  
TPS54331DR 6.0V-15.0V to 5.0V @ 1.0A



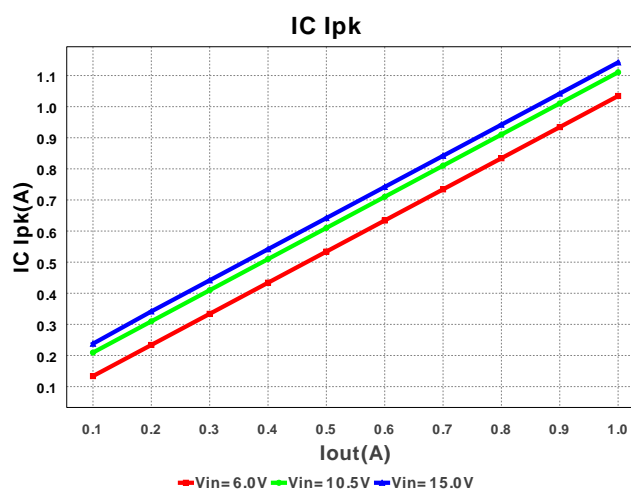
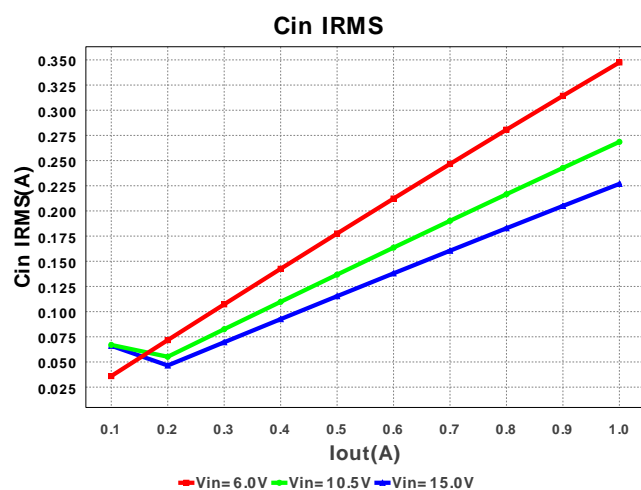
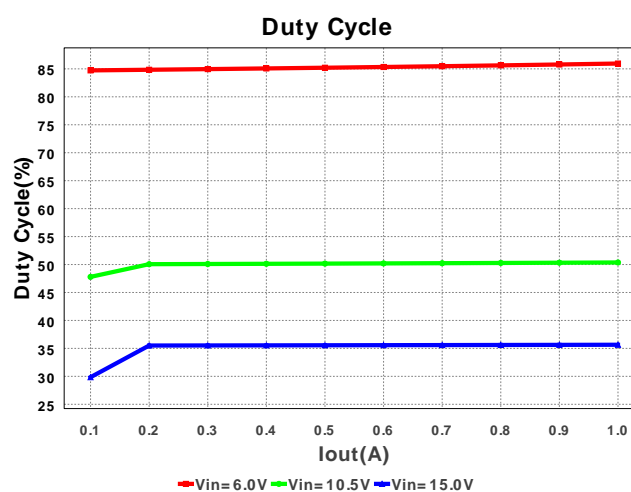
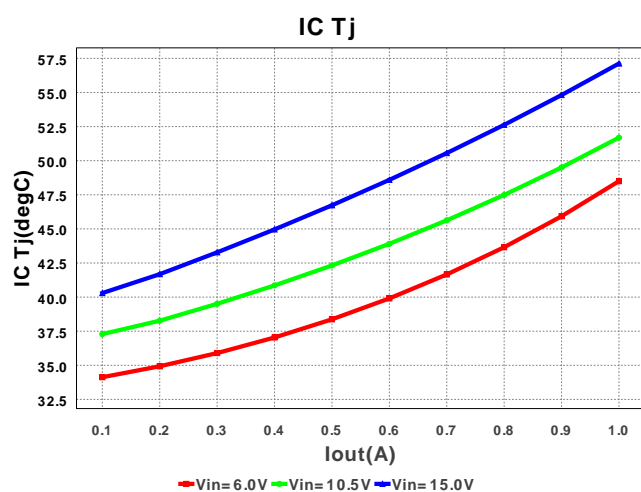
### Electrical BOM

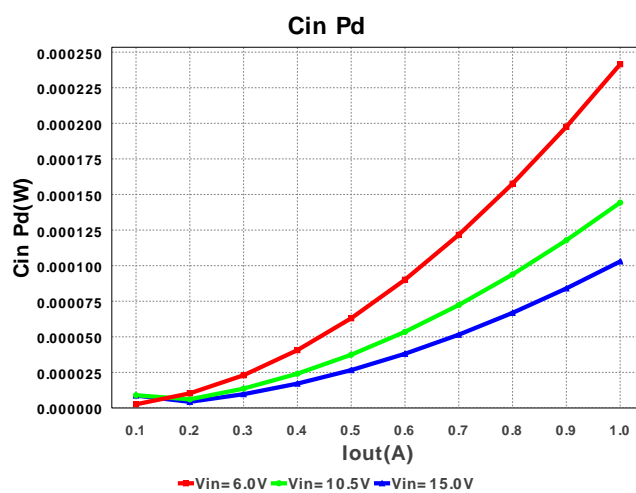
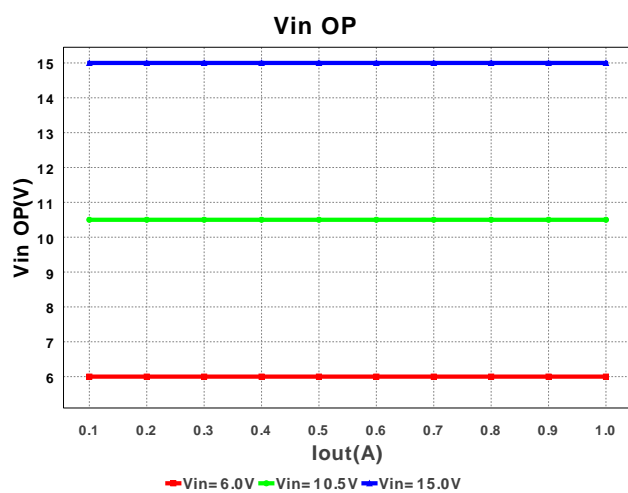
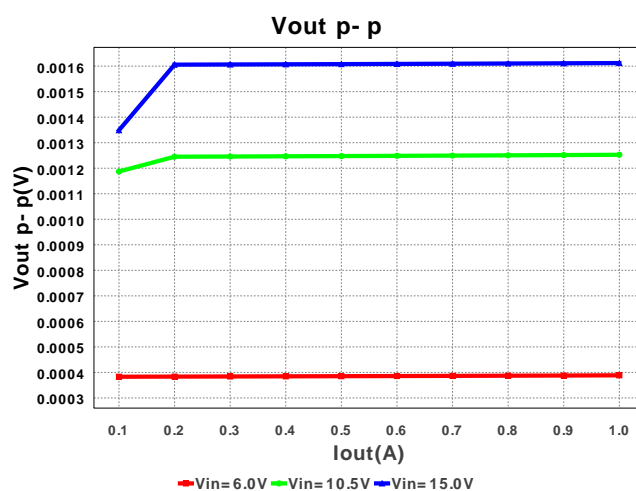
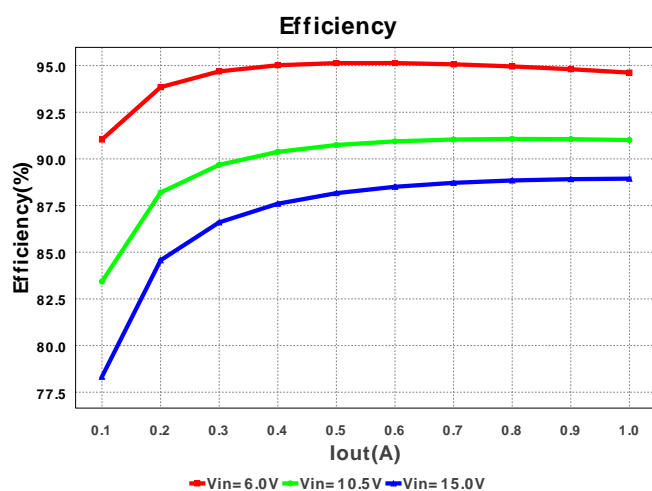
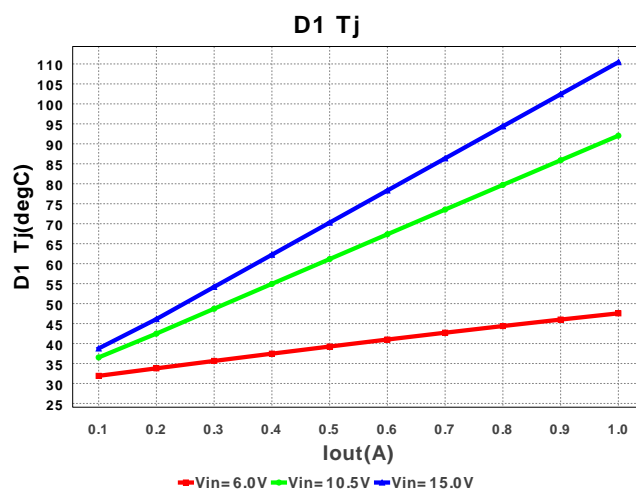
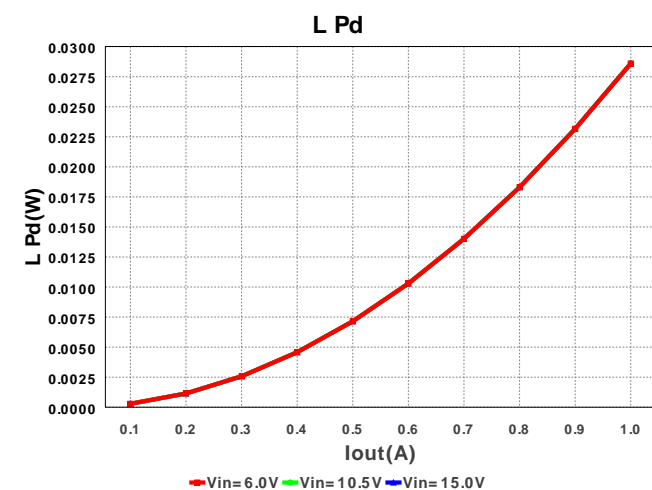
| #   | Name   | Manufacturer  | Part Number                           | Properties   | Qty | Price  | Footprint   |
|-----|--------|---------------|---------------------------------------|--|-----|--------|---|
| 1.  | Cboot  | AVX           | 08053C104KAT2A<br>Series= X7R         | Cap= 100.0 nF<br>ESR= 280.0 mOhm<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1   | \$0.01 | <br>0805 13mm2       |
| 2.  | Ccomp  | MuRata        | GRM1885C1H302JA01D<br>Series= C0G/NP0 | Cap= 3.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                      | 1   | \$0.02 | <br>0603 10mm2     |
| 3.  | Ccomp2 | Yageo America | CC0805DRNP09BN8R0<br>Series= C0G/NP0  | Cap= 8.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 | <br>0805 13mm2     |
| 4.  | 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   | \$0.06 | <br>0805 13mm2     |
| 5.  | Cout   | TDK           | C4532X5R1A476M<br>Series= X5R         | Cap= 47.0 uF<br>ESR= 1.7 mOhm<br>VDC= 10.0 V<br>IRMS= 3.8 A    | 1   | \$0.63 | <br>1812 39mm2     |
| 6.  | Css    | MuRata        | GRM155R61A103KA01D<br>Series= X5R     | Cap= 10.0 nF<br>VDC= 10.0 V<br>IRMS= 0.0 A                     | 1   | \$0.01 | <br>0402 8mm2      |
| 7.  | D1     | Diodes Inc.   | B130-13-F                             | VF@Io= 500.0 mV<br>VRRM= 30.0 V                                | 1   | \$0.06 | <br>SMA 37mm2      |
| 8.  | L1     | Coilcraft     | MSS1210-223MEB                        | L= 22.0 uH<br>DCR= 26.0 mOhm                                   | 1   | \$0.81 | <br>MSS1210 204mm2 |
| 9.  | Rcomp  | Vishay-Dale   | CRCW040269K8FKED<br>Series= CRCW..e3  | Res= 69.8 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%            | 1   | \$0.01 | <br>0402 8mm2      |
| 10. | RenB   | Vishay-Dale   | CRCW040232K4FKED<br>Series= CRCW..e3  | Res= 32.4 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%            | 1   | \$0.01 | <br>0402 8mm2      |
| 11. | RenT   | Vishay-Dale   | CRCW0402105KFKED<br>Series= CRCW..e3  | Res= 105.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%           | 1   | \$0.01 | <br>0402 8mm2      |

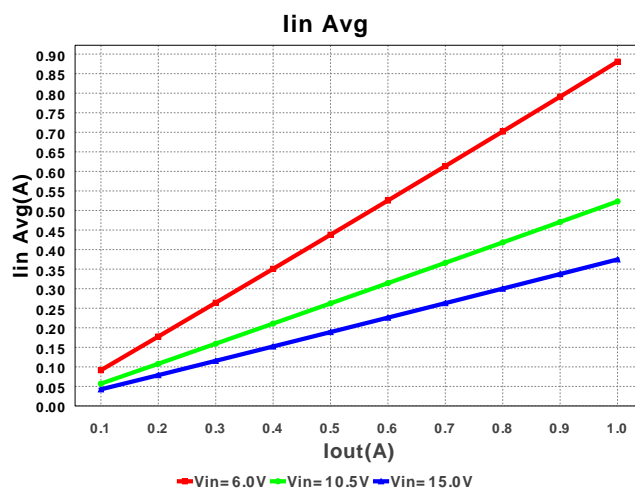
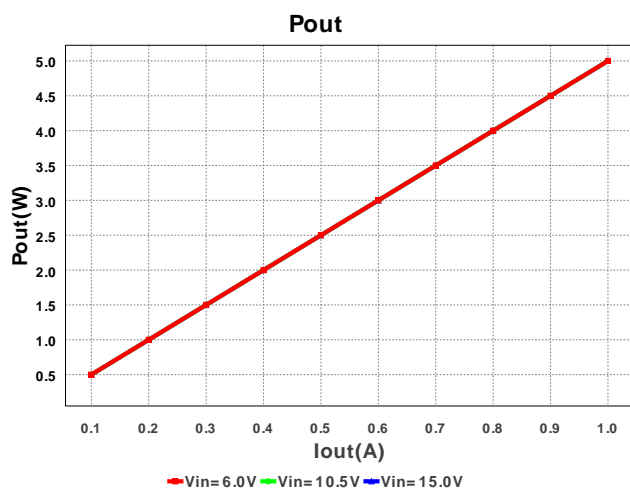
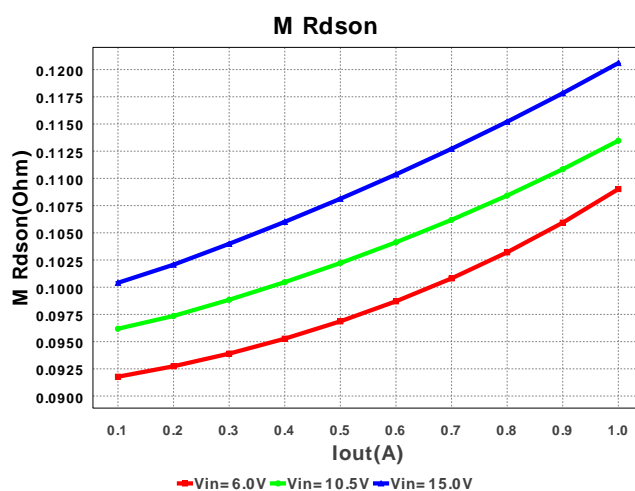
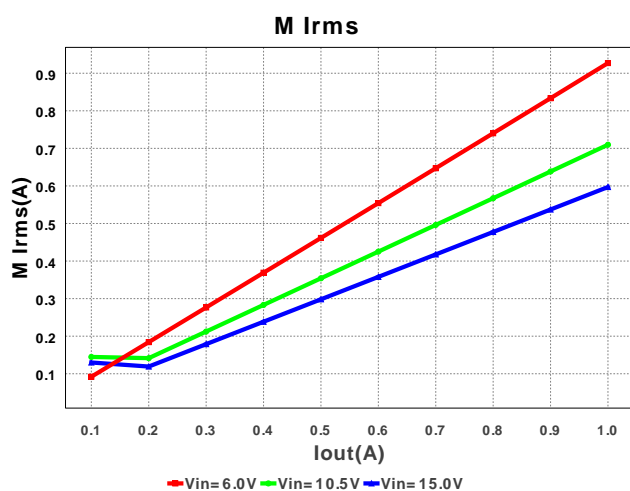
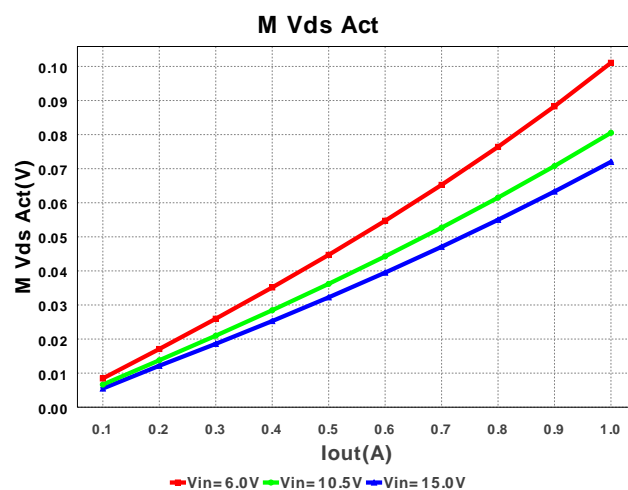
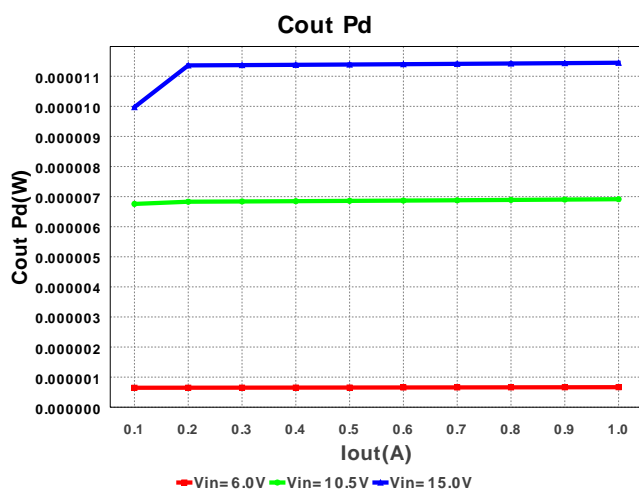
| #   | Name | Manufacturer      | Part Number                          | Properties  | Qty | Price  | Footprint   |
|-----|------|-------------------|--------------------------------------|---|-----|--------|---|
| 12. | Rfbb | Vishay-Dale       | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0402 8mm2 |
| 13. | Rfbt | Vishay-Dale       | CRCW040253K6FKED<br>Series= CRCW..e3 | Res= 53.6 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0402 8mm2 |
| 14. | U1   | Texas Instruments | TPS54331DR                           | Switcher  | 1   | \$0.75 |   |

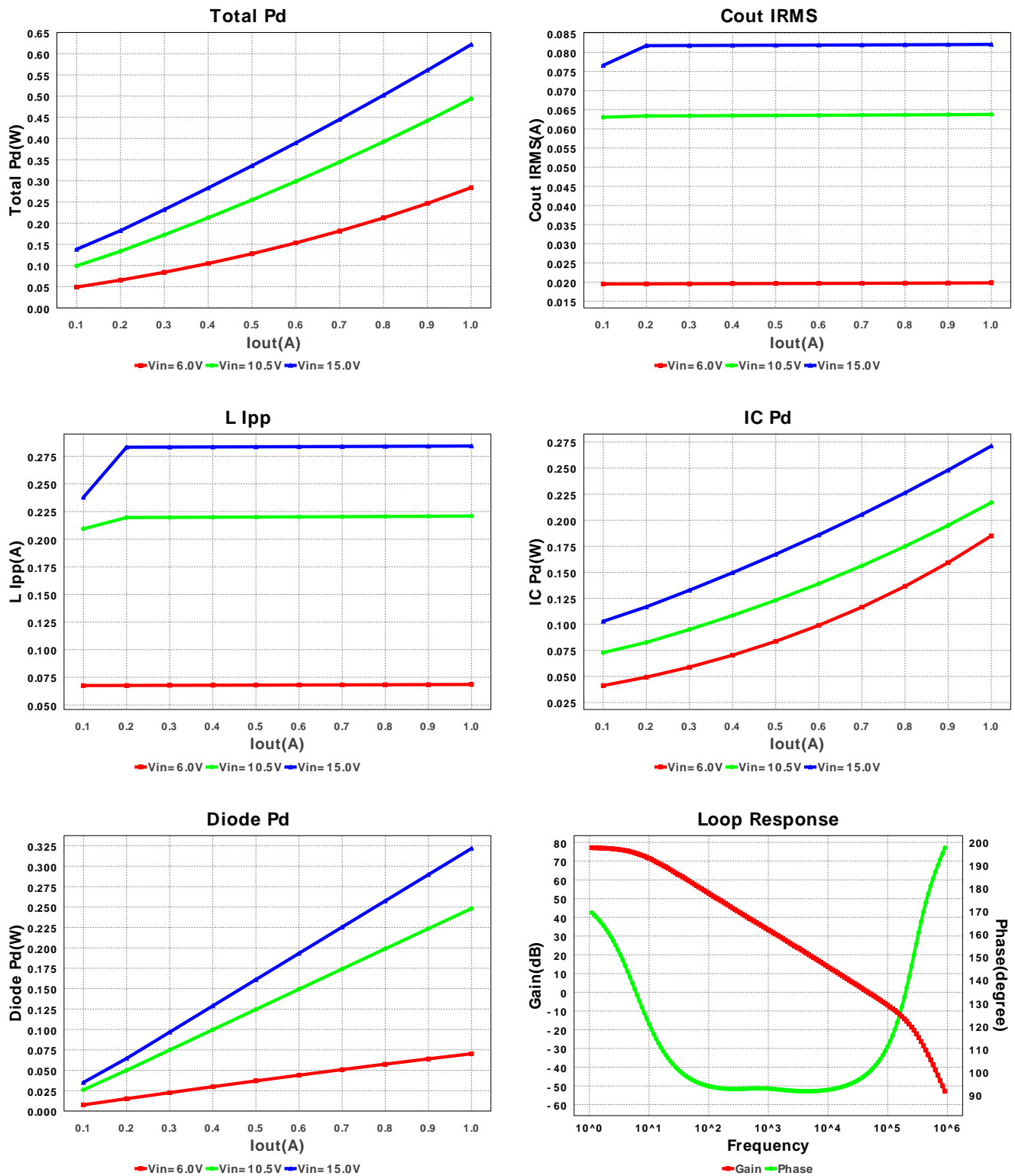


R-PDSO-G8 57mm2









## Operating Values

| #   | Name         | Value      | Category | Description                             |
|-----|--------------|------------|----------|---|
| 1.  | Cin IRMS     | 226.862 mA | Current  | Input capacitor RMS ripple current      |
| 2.  | Cout IRMS    | 82.066 mA  | Current  | Output capacitor RMS ripple current     |
| 3.  | IC Ipk       | 1.0 A      | Current  | Peak switch current in IC               |
| 4.  | Iin Avg      | 374.78 mA  | Current  | Average input current                   |
| 5.  | L Ipp        | 284.286 mA | Current  | Peak-to-peak inductor ripple current    |
| 6.  | M1 Irms      | 597.072 mA | Current  | Q lavg                                  |
| 7.  | BOM Count    | 14         | General  | Total Design BOM count                  |
| 8.  | FootPrint    | 432.0 mm2  | General  | Total Foot Print Area of BOM components |
| 9.  | Frequency    | 570.0 kHz  | General  | Switching frequency                     |
| 10. | IC Tolerance | 0.0 V      | General  | IC Feedback Tolerance                   |
| 11. | M Vds Act    | 72.006 mV  | General  | Voltage drop across the MosFET          |

| #   | Name       | Value        | Category | Description                               |
|-----|------------|--------------|----------|---|
| 12. | Mode       | CCM          | General  | Conduction Mode                           |
| 13. | Pout       | 5.0 W        | General  | Total output power                        |
| 14. | Total BOM  | \$2.41       | General  | Total BOM Cost                            |
| 15. | D1 Tj      | 110.438 degC | Op_Point | D1 junction temperature                   |
| 16. | Vout OP    | 5.0 V        | Op_Point | Operational Output Voltage                |
| 17. | Cross Freq | 47.526 kHz   | Op_point | Bode plot crossover frequency             |
| 18. | Duty Cycle | 35.649 %     | Op_point | Duty cycle                                |
| 19. | Efficiency | 88.941 %     | Op_point | Steady state efficiency                   |
| 20. | IC Tj      | 57.122 degC  | Op_point | IC junction temperature                   |
| 21. | ICThetaJA  | 100.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 22. | IOUT_OP    | 1.0 A        | Op_point | Iout operating point                      |
| 23. | Phase Marg | 99.96 deg    | Op_point | Bode Plot Phase Margin                    |
| 24. | VIN_OP     | 15.0 V       | Op_point | Vin operating point                       |
| 25. | Vout p-p   | 1.612 mV     | Op_point | Peak-to-peak output ripple voltage        |
| 26. | Cin Pd     | 102.933 µW   | Power    | Input capacitor power dissipation         |
| 27. | Cout Pd    | 11.449 µW    | Power    | Output capacitor power dissipation        |
| 28. | Diode Pd   | 321.753 mW   | Power    | Diode power dissipation                   |
| 29. | IC Pd      | 271.218 mW   | Power    | IC power dissipation                      |
| 30. | L Pd       | 28.6 mW      | Power    | Inductor power dissipation                |
| 31. | Total Pd   | 621.704 mW   | Power    | Total Power Dissipation                   |

## Design Inputs

| #  | Name    | Value     | Description            |
|----|---------|-----------|------------------------|
| 1. | Iout    | 1.0 A     | Maximum Output Current |
| 2. | Iout1   | 1.0 Amps  | Output Current #1      |
| 3. | VinMax  | 15.0 V    | Maximum input voltage  |
| 4. | VinMin  | 6.0 V     | Minimum input voltage  |
| 5. | Vout    | 5.0 V     | Output Voltage         |
| 6. | Vout1   | 5.0 Volt  | Output Voltage #1      |
| 7. | base_pn | TPS54331  | Base Product Number    |
| 8. | source  | DC        | Input Source Type      |
| 9. | Ta      | 30.0 degC | Ambient temperature    |

## Design Assistance

1. **TPS54331** Product Folder : <http://www.ti.com/product/tps54331> : contains the data sheet and other resources.

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