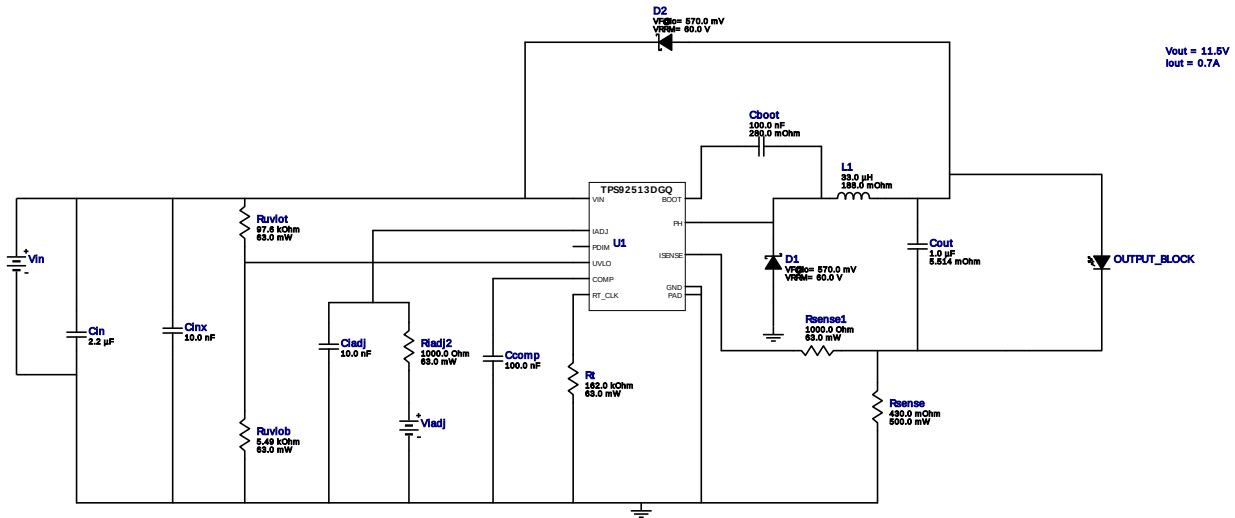


## WEBENCH® Design Report

Design : 4758170/4 TPS92513DGQR  
TPS92513DGQR 24.0V-32.0V to 11.50V @ 0.7A

VinMin = 24.0V  
VinMax = 32.0V  
Vout = 11.5V  
Iout = 0.7A

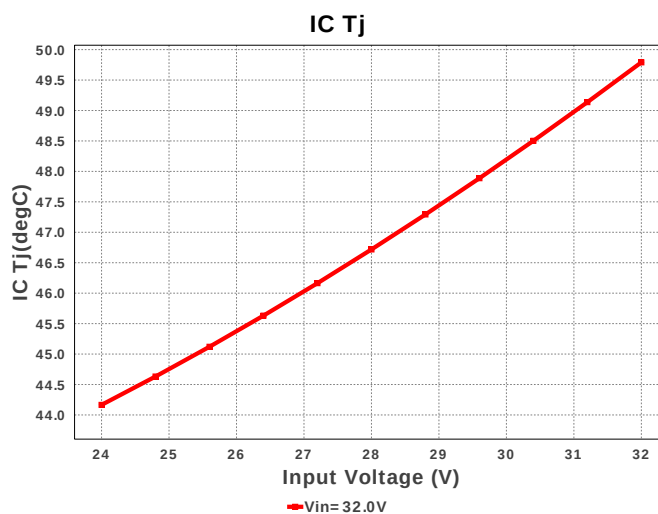
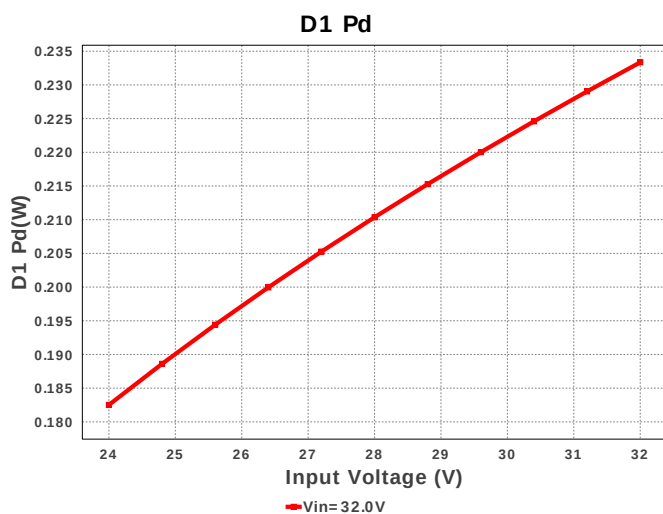
Device = TPS92513DGQR  
Topology = Buck  
Created = 8/2/16 7:34:06 AM  
BOM Cost = \$5.98  
BOM Count = 17  
Total Pd = 0.86W

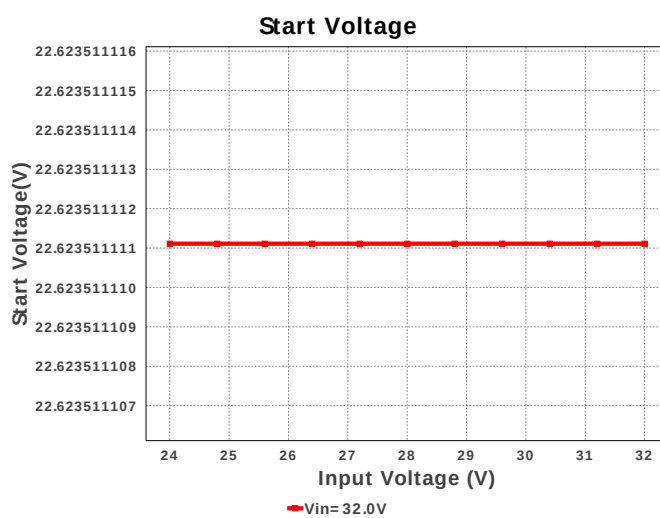
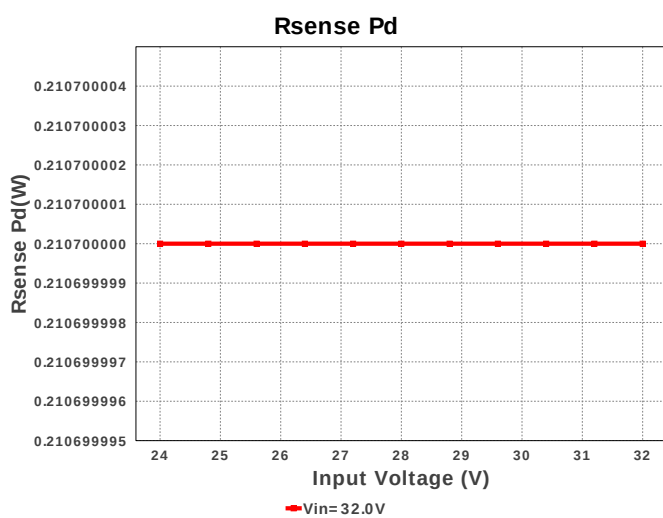
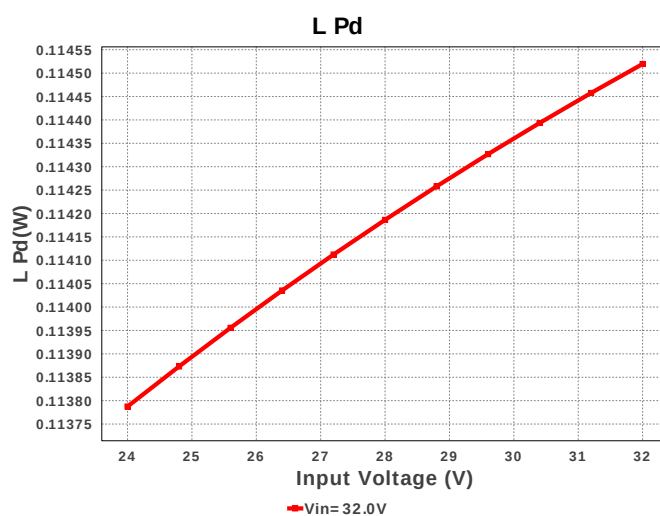
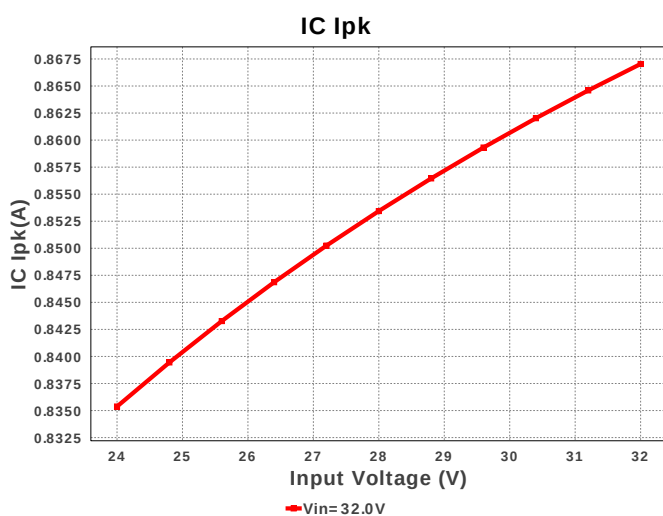
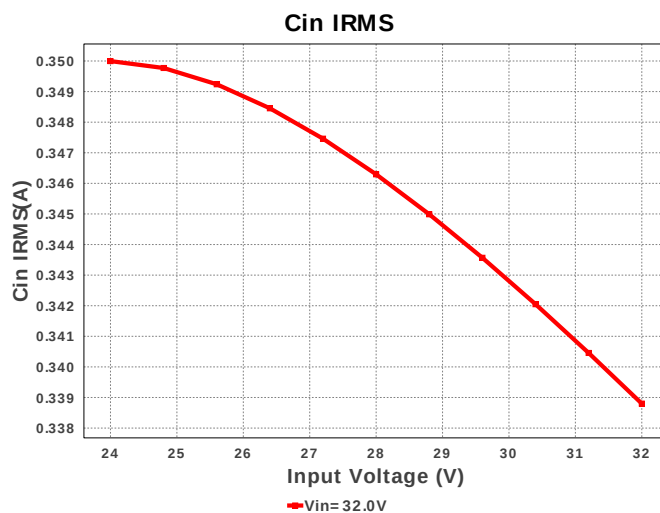
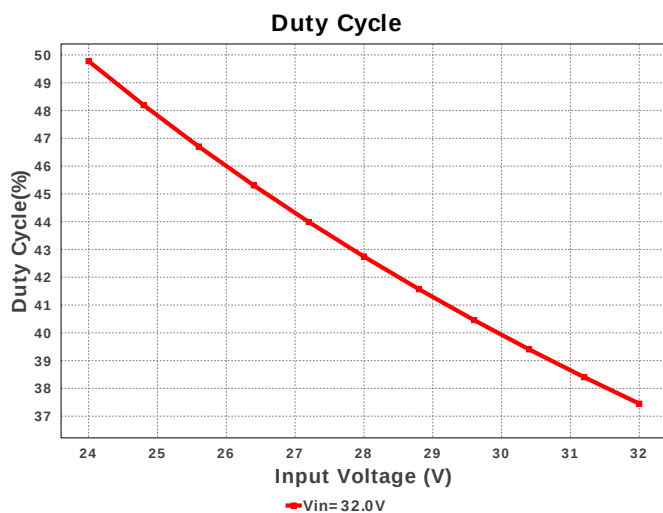


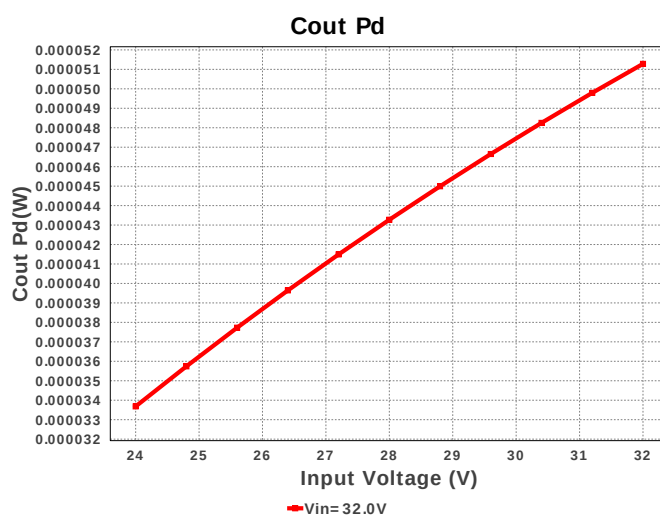
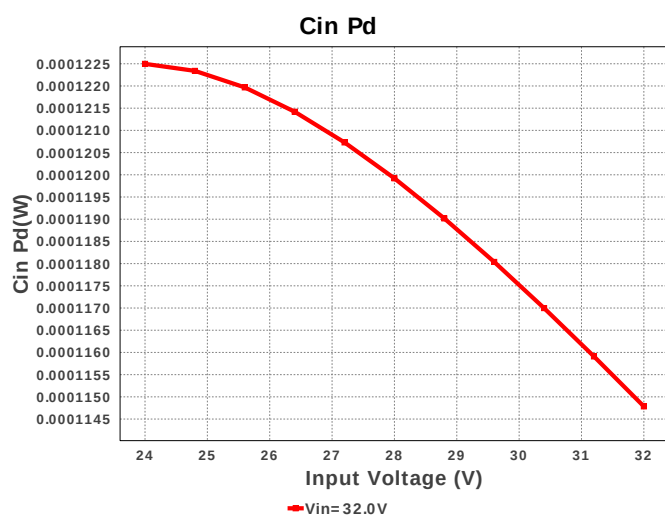
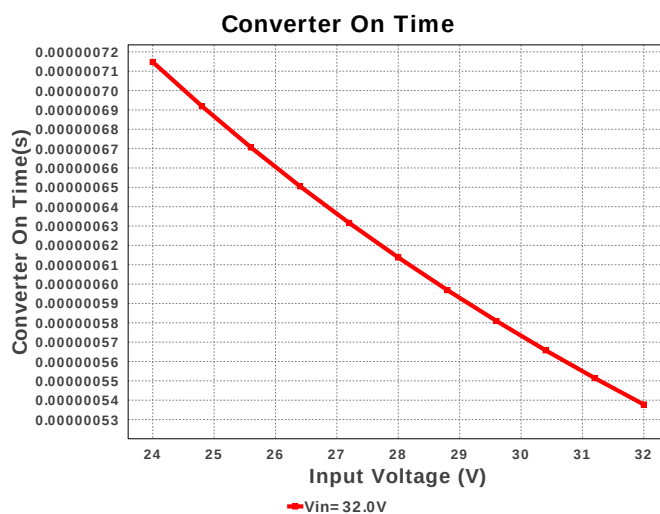
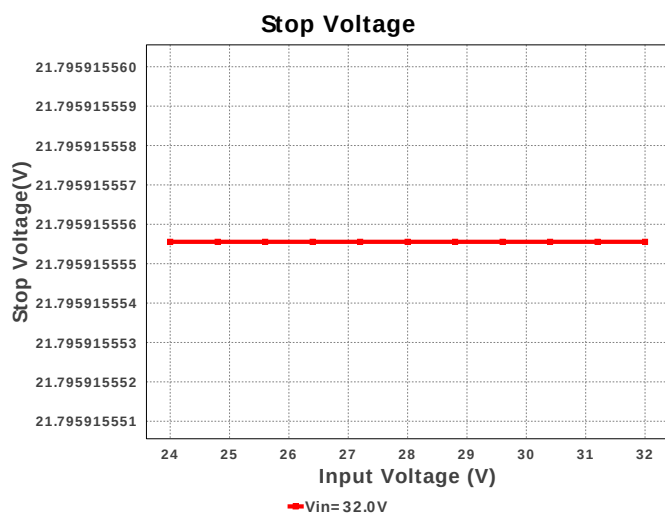
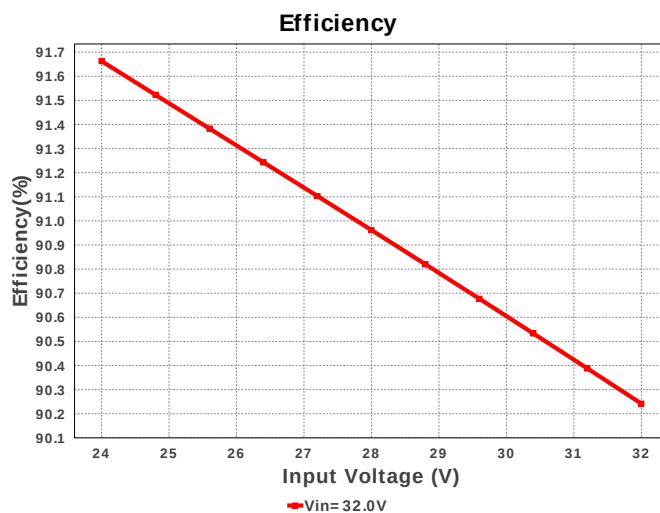
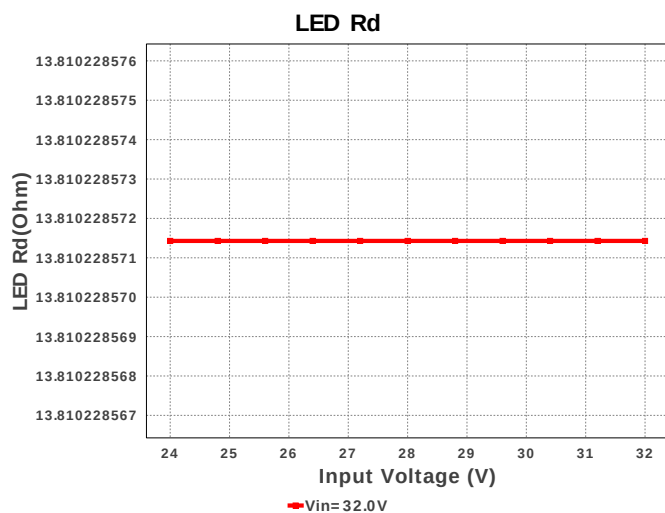
### Electrical BOM

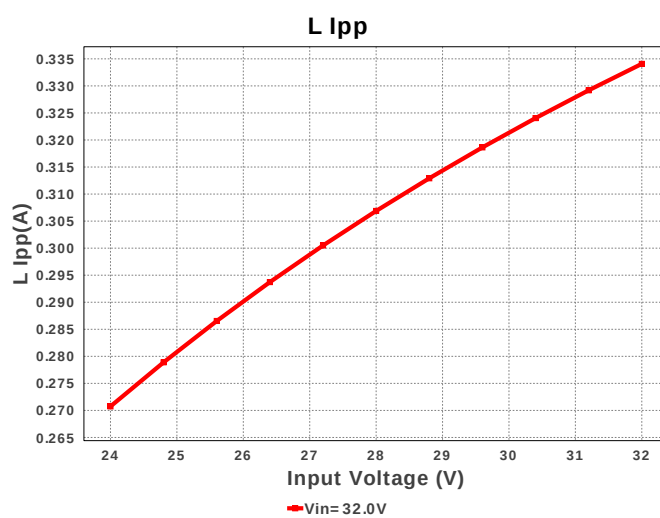
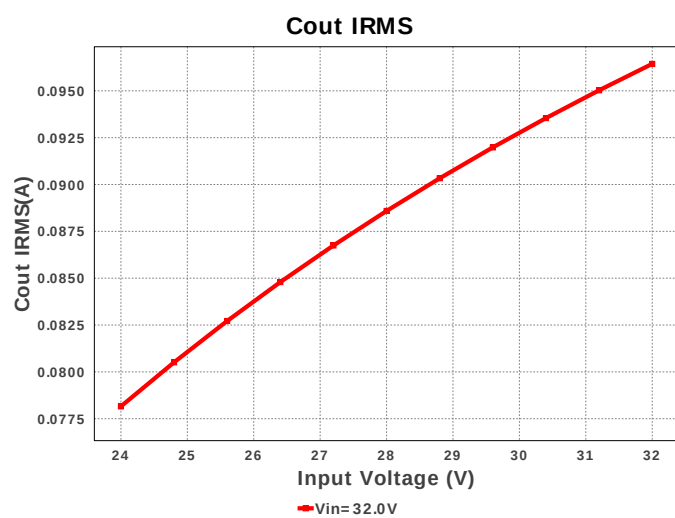
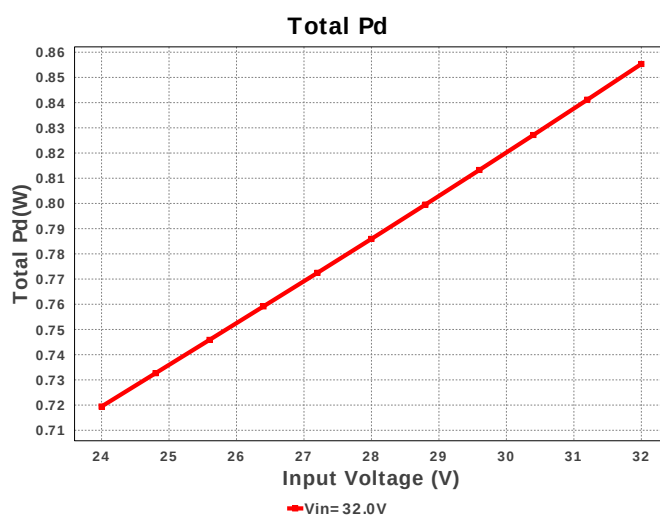
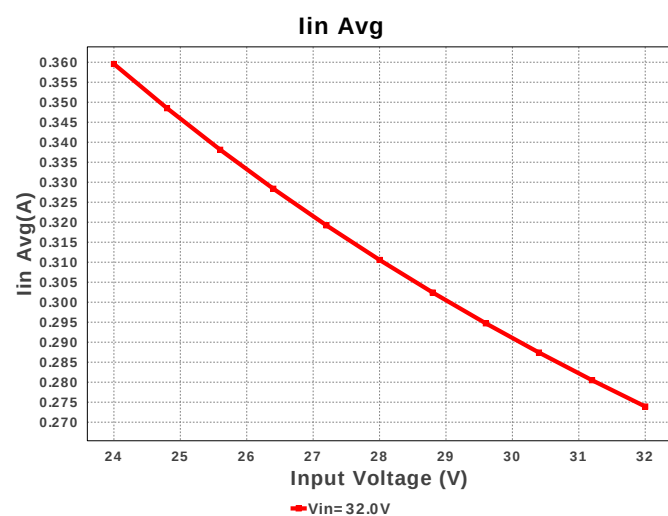
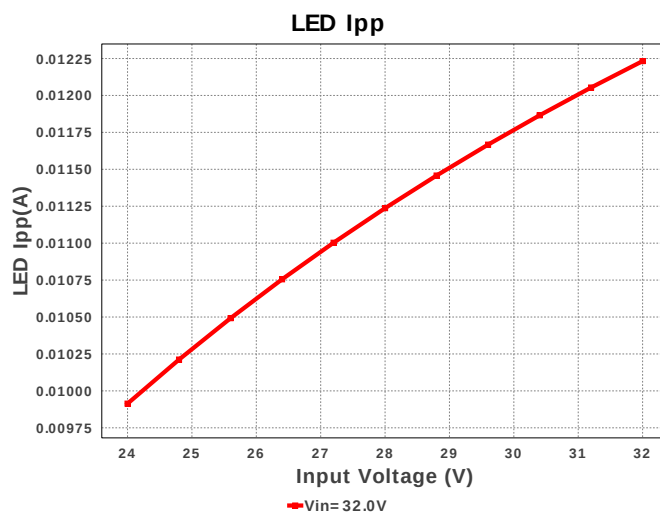
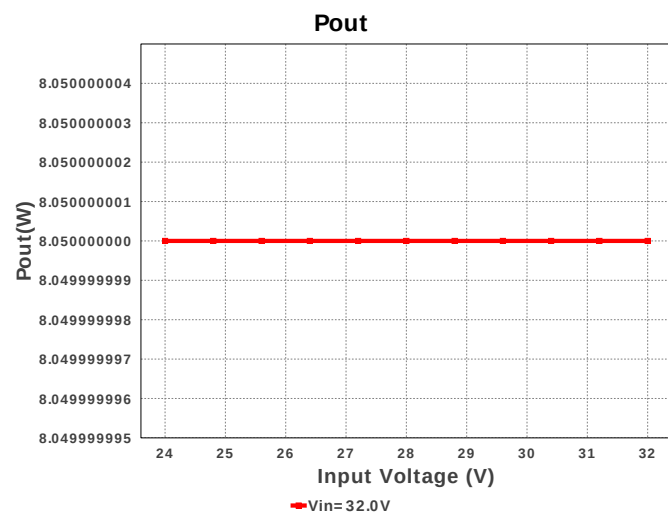
| #   | Name  | Manufacturer      | Part Number                       | Properties                                                       | Qty | Price  | Footprint                   |
|-----|-------|-------------------|-----------------------------------|------------------------------------------------------------------|-----|--------|-----------------------------|
| 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 | 0805 7 mm <sup>2</sup>      |
| 2.  | Ccomp | MuRata            | GRM21BR71E104KA01L<br>Series= X7R | Cap= 100.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 | 0805 7 mm <sup>2</sup>      |
| 3.  | Ciadj | MuRata            | GRM216R71H103KA01D<br>Series= X7R | Cap= 10.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 | 0805 7 mm <sup>2</sup>      |
| 4.  | Cin   | Taiyo Yuden       | HMK325B7225KN-T<br>Series= X7R    | Cap= 2.2 uF<br>VDC= 100.0 V<br>IRMS= 0.0 A                       | 1   | \$0.13 | 1210 15 mm <sup>2</sup>     |
| 5.  | Cinx  | MuRata            | GRM188R72A103KA01D<br>Series= X7R | Cap= 10.0 nF<br>VDC= 100.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 | 0603 5 mm <sup>2</sup>      |
| 6.  | Cout  | MuRata            | GRM21BR71E105KA99L<br>Series= X7R | Cap= 1.0 uF<br>ESR= 5.514 mOhm<br>VDC= 25.0 V<br>IRMS= 1.47583 A | 1   | \$0.02 | 0805 7 mm <sup>2</sup>      |
| 7.  | D1    | NXP Semiconductor | PMEG6010CEH,115                   | VF@Io= 570.0 mV<br>VRRM= 60.0 V                                  | 1   | \$0.04 | SOD-123F 12 mm <sup>2</sup> |
| 8.  | D2    | NXP Semiconductor | PMEG6010CEH,115                   | VF@Io= 570.0 mV<br>VRRM= 60.0 V                                  | 1   | \$0.04 | SOD-123F 12 mm <sup>2</sup> |
| 9.  | D_LED | Cree              | XHP50A-00-0000-0D00J40CB          | LED                                                              | 1   | \$5.02 | xlampxhp 0 mm <sup>2</sup>  |
| 10. | L1    | Bourns            | SRN6045-330M                      | L= 33.0 uH<br>DCR= 188.0 mOhm                                    | 1   | \$0.16 | SRN6045 64 mm <sup>2</sup>  |

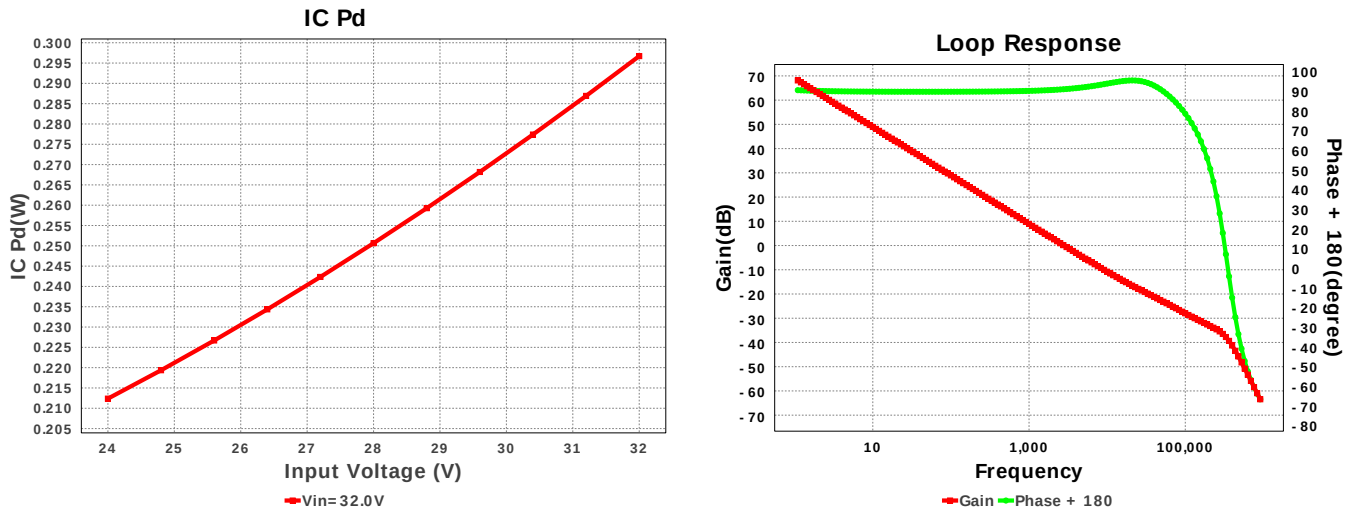
| #   | Name    | Manufacturer      | Part Number                          | Properties                                            | Qty | Price  | Footprint                                                                                                            |
|-----|---------|-------------------|--------------------------------------|-------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------------------|
| 11. | Riadj2  | Vishay-Dale       | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1000.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>           |
| 12. | Rsense  | Rohm              | MCR25JZHFLR430<br>Series= MCR25      | Res= 430.0 mOhm<br>Power= 500.0 mW<br>Tolerance= 1.0% | 1   | \$0.03 |  1210 15 mm <sup>2</sup>          |
| 13. | Rsense1 | Vishay-Dale       | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1000.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>           |
| 14. | Rt      | Vishay-Dale       | CRCW0402162KFKED<br>Series= CRCW..e3 | Res= 162.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>           |
| 15. | Ruvlob  | Vishay-Dale       | CRCW04025K49FKED<br>Series= CRCW..e3 | Res= 5.49 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 3 mm <sup>2</sup>           |
| 16. | Ruvlot  | Vishay-Dale       | CRCW040297K6FKED<br>Series= CRCW..e3 | Res= 97.6 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 3 mm <sup>2</sup>           |
| 17. | U1      | Texas Instruments | TPS92513DGQR                         | Switcher                                              | 1   | \$0.45 |  DGQ0010D_NV_N 24 mm <sup>2</sup> |











## Operating Values

| #   | Name              | Value                 | Category | Description                                |
|-----|-------------------|-----------------------|----------|--------------------------------------------|
| 1.  | Cin IRMS          | 338.8 mA              | Current  | Input capacitor RMS ripple current         |
| 2.  | Cout IRMS         | 95.946 mA             | Current  | Output capacitor RMS ripple current        |
| 3.  | IC Ipk            | 866.184 mA            | Current  | Peak switch current in IC                  |
| 4.  | Iin Avg           | 273.92 mA             | Current  | Average input current                      |
| 5.  | L Ipp             | 332.37 mA             | Current  | Peak-to-peak inductor ripple current       |
| 6.  | LED Ipp           | 12.17 mA              | Current  | LED Ripple Current                         |
| 7.  | BOM Count         | 17                    | General  | Total Design BOM count                     |
| 8.  | FootPrint         | 187.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components    |
| 9.  | Frequency         | 696.429 kHz           | General  | Switching frequency                        |
| 10. | IC Tolerance      | 0.0 V                 | General  | IC Feedback Tolerance                      |
| 11. | Pout              | 8.05 W                | General  | Total output power                         |
| 12. | Total BOM         | \$5.98                | General  | Total BOM Cost                             |
| 13. | Vout OP           | 11.5 V                | Op_Point | Operational Output Voltage                 |
| 14. | Cross Freq        | 2.799 kHz             | Op_point | Bode plot crossover frequency              |
| 15. | Duty Cycle        | 37.452 %              | Op_point | Duty cycle                                 |
| 16. | Efficiency        | 90.242 %              | Op_point | Steady state efficiency                    |
| 17. | IC Tj             | 49.791 degC           | Op_point | IC junction temperature                    |
| 18. | ICThetaJA         | 66.7 degC/W           | Op_point | IC junction-to-ambient thermal resistance  |
| 19. | IOUT_OP           | 700.0 mA              | Op_point | Iout operating point                       |
| 20. | LED Rd            | 13.81 Ohm             | Op_point | LED DynamicResistance                      |
| 21. | Phase Marg        | 90.432 deg            | Op_point | Bode Plot Phase Margin                     |
| 22. | VIN_OP            | 32.0 V                | Op_point | Vin operating point                        |
| 23. | Cin Pd            | 114.785 μW            | Power    | Input capacitor power dissipation          |
| 24. | Cout Pd           | 50.76 μW              | Power    | Output capacitor power dissipation         |
| 25. | D1 Pd             | 233.347 mW            | Power    | Output Diode Power Dissipation             |
| 26. | IC Pd             | 296.712 mW            | Power    | IC power dissipation                       |
| 27. | L Pd              | 114.498 mW            | Power    | Inductor power dissipation                 |
| 28. | Rsense Pd         | 210.7 mW              | Power    | LED Current Rsns Power Dissipation         |
| 29. | Total Pd          | 855.332 mW            | Power    | Total Power Dissipation                    |
| 30. | Start Voltage     | 22.624 V              | UVLO     | Start Voltage with External UVLO Resistors |
| 31. | Stop Voltage      | 21.796 V              | UVLO     | Stop Voltage with External UVLO Resistors  |
| 32. | Converter On Time | 535.032 ns            |          | Approximate Converter On Time              |

## Design Inputs

| #   | Name          | Value                   | Description               |
|-----|---------------|-------------------------|---------------------------|
| 1.  | Iout          | 700.0 m                 | Maximum Output Current    |
| 2.  | VinMax        | 32.0                    | Maximum input voltage     |
| 3.  | VinMin        | 24.0                    | Minimum input voltage     |
| 4.  | Vout          | 11.5                    | Output Voltage            |
| 5.  | application   | LED_DRIVER              | LED Application           |
| 6.  | base_pn       | TPS92513                | Base Product Number       |
| 7.  | LED_Architect | N                       | LED Architect Project     |
| 8.  | ledparallel   | 1.0                     | Number of LED in parallel |
| 9.  | ledpartnumber | XHP50A-00-0000-0D00140C | LED Part number           |
| 10. | ledseries     | 1.0                     | Number of LED in series   |
| 11. | line_fsw      | 60.0                    | AC Line Frequency         |
| 12. | source        | DC                      | Input Source Type         |
| 13. | Ta            | 30.0                    | Ambient temperature       |

## Design Assistance

1. **TPS92513** Product Folder : <http://www.ti.com/product/TPS92513> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

**You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.**

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).