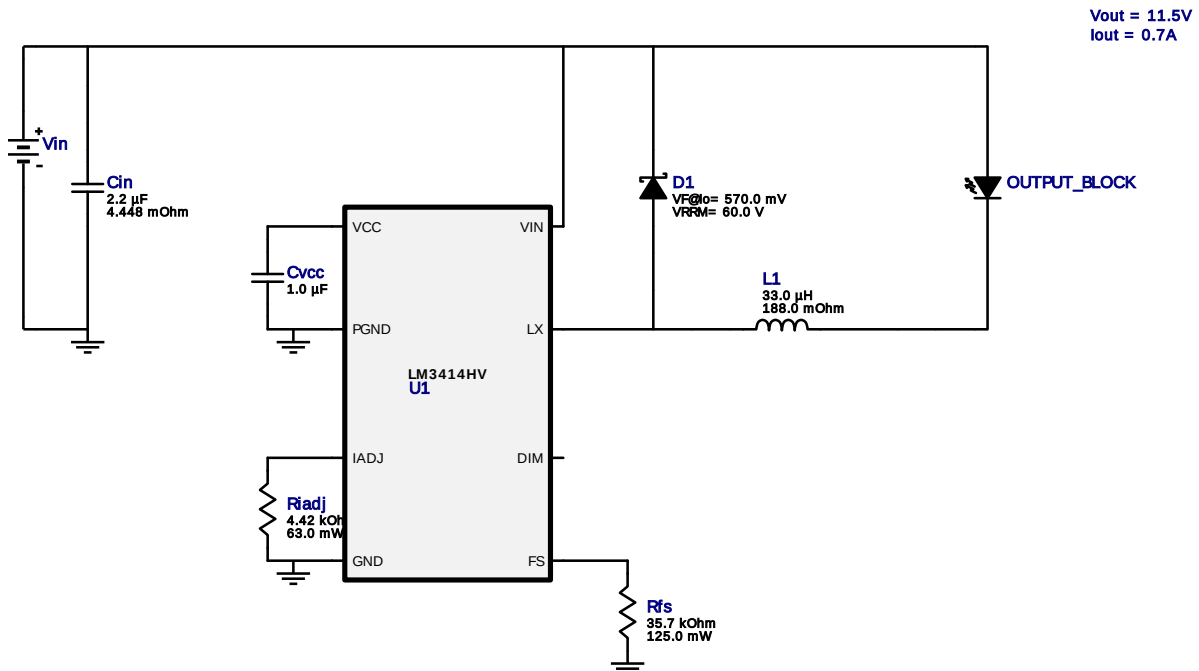


## WEBENCH® Design Report

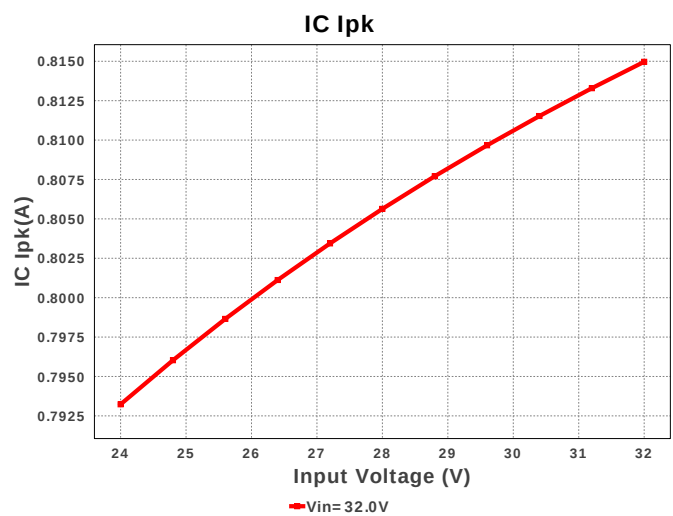
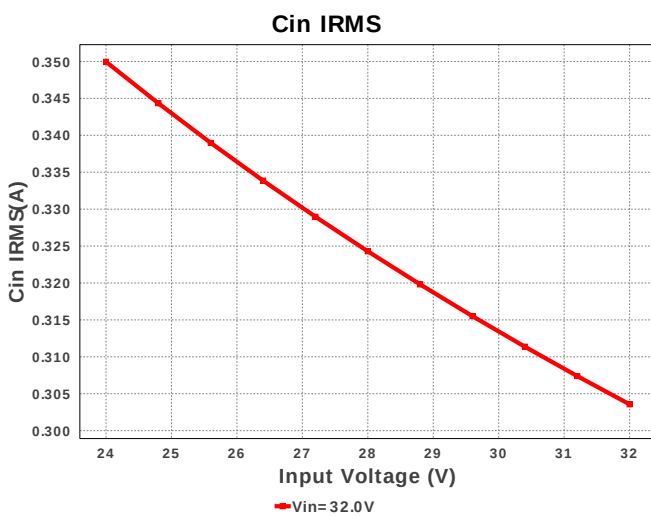
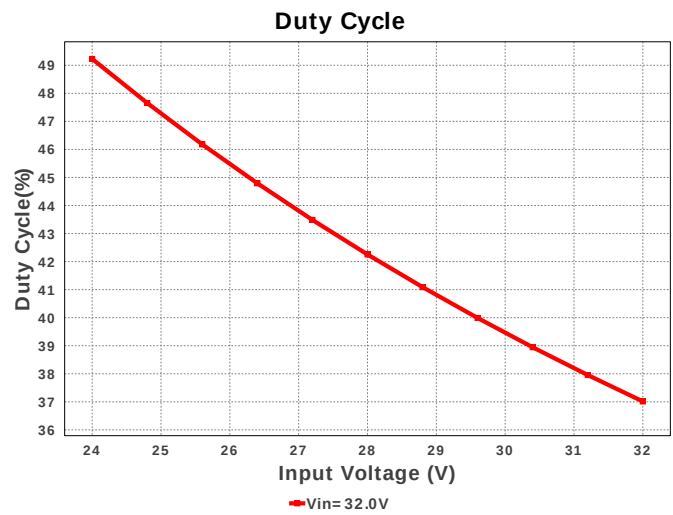
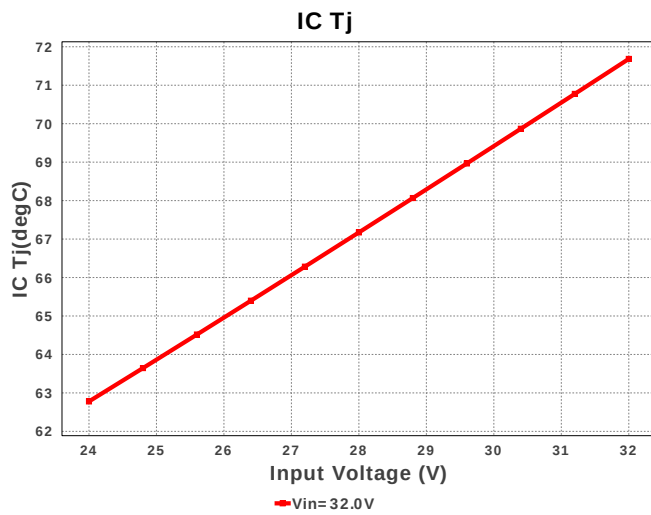
Design : 4807438/4 LM3414HVMR/NOPB  
LM3414HVMR/NOPB 24.0V-32.0V to 11.50V @ 0.7A

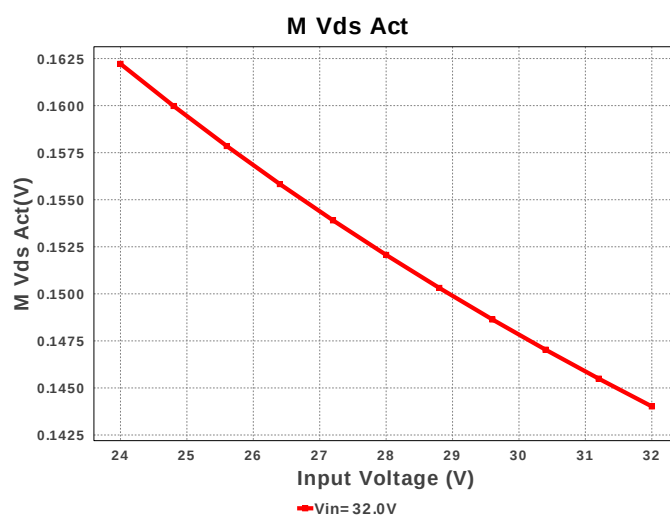
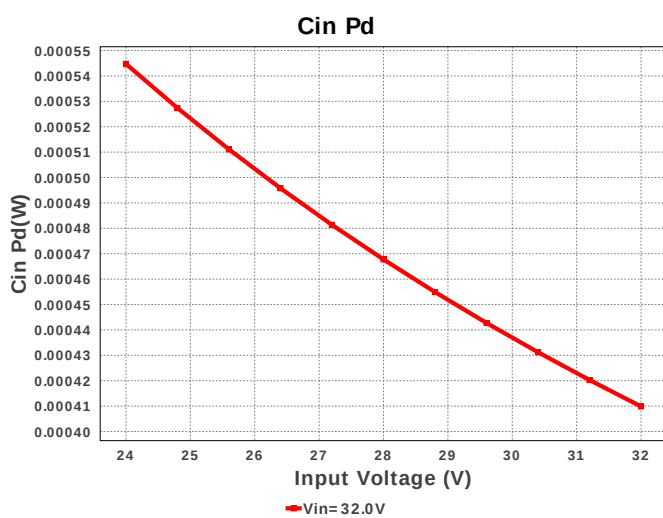
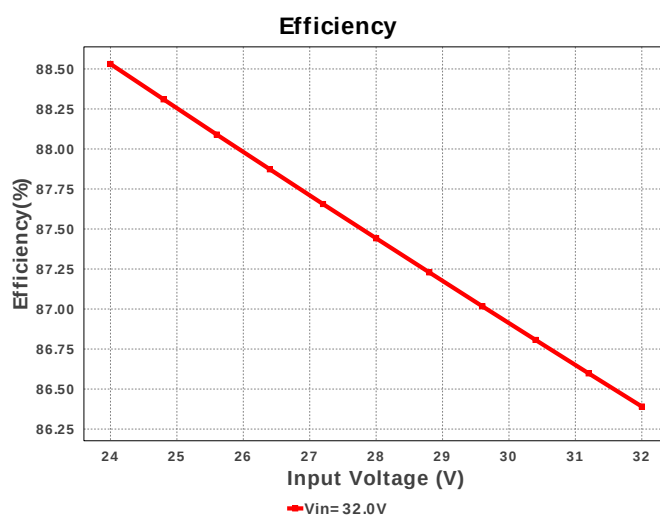
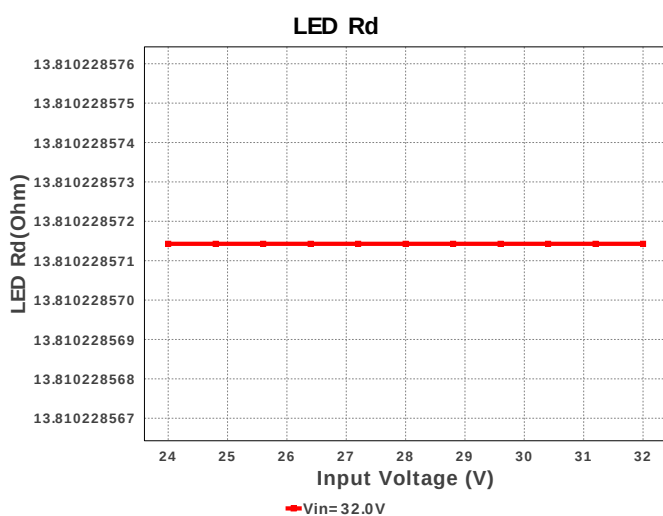
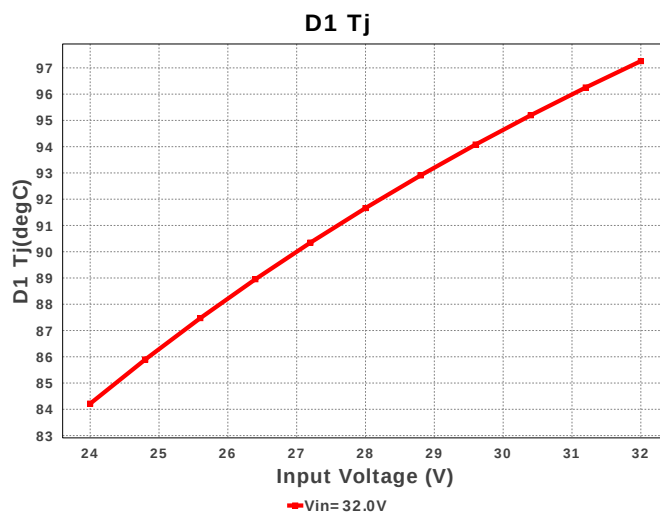
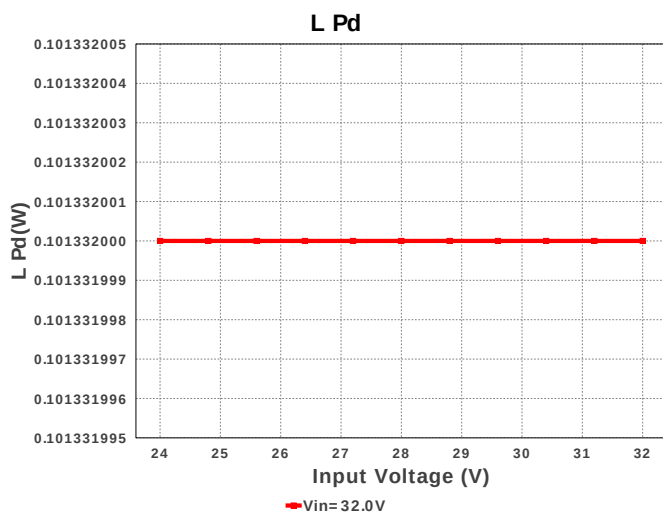


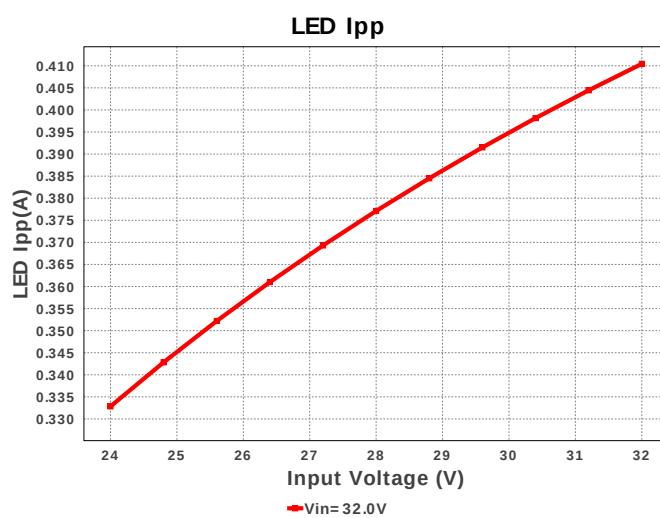
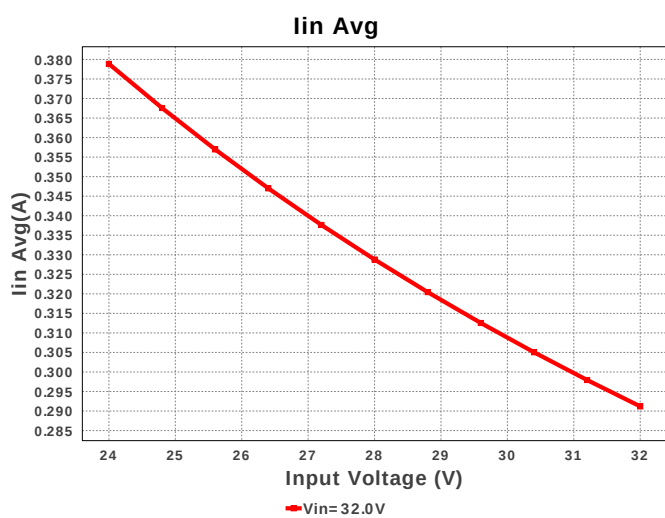
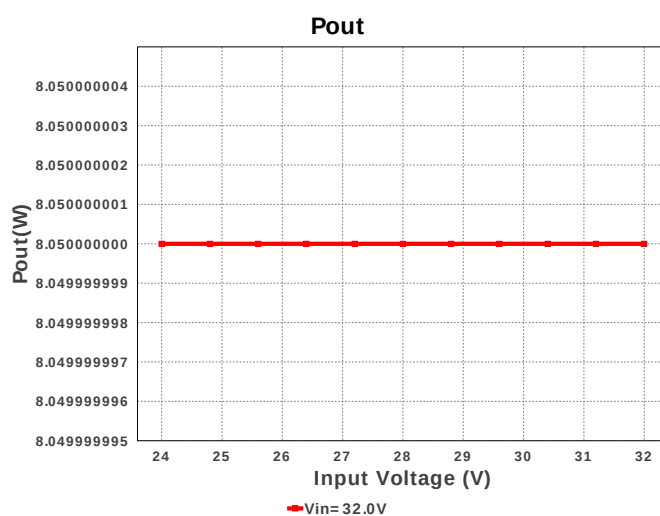
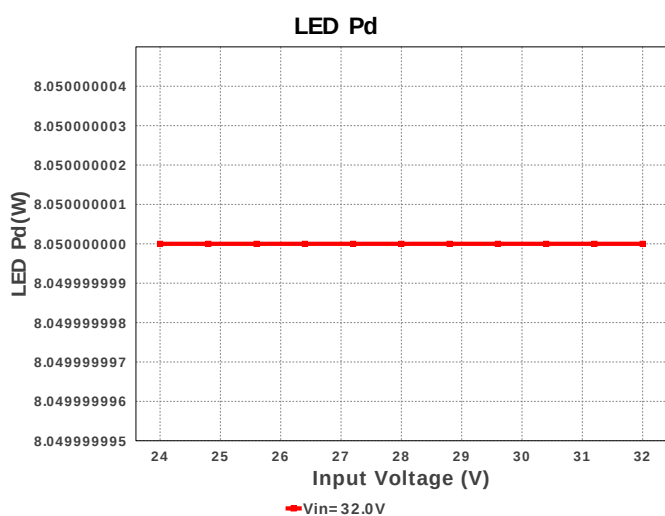
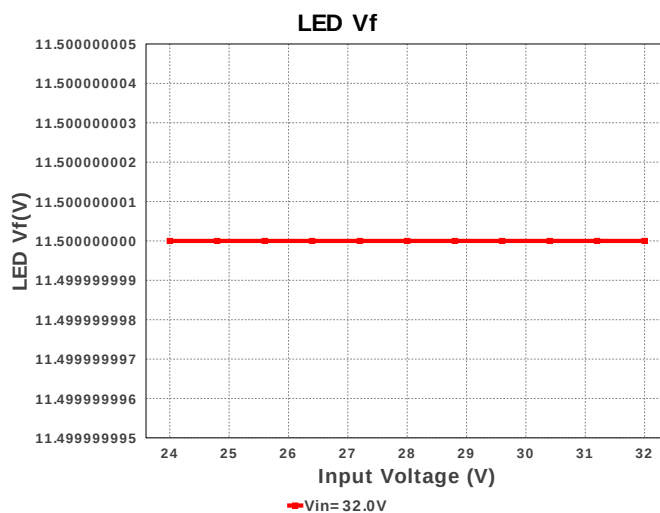
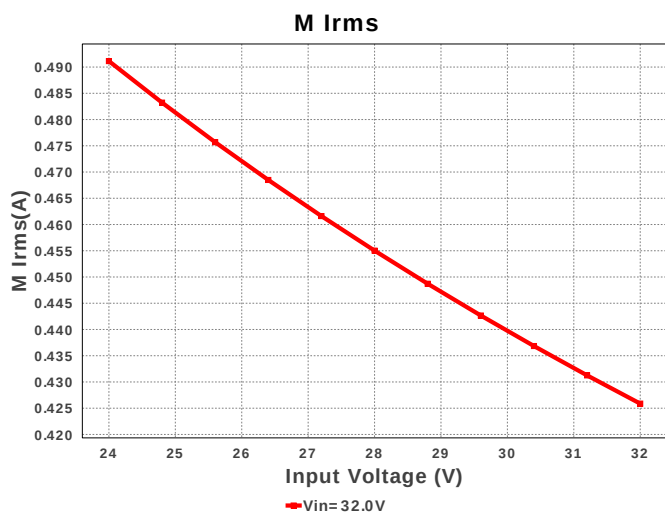
## Electrical BOM

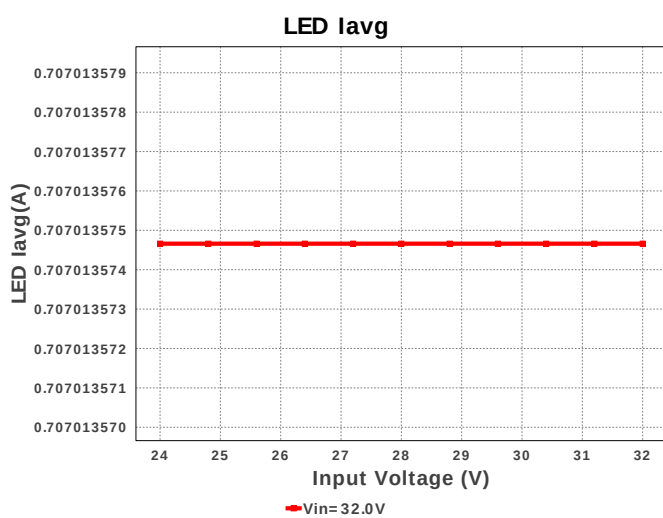
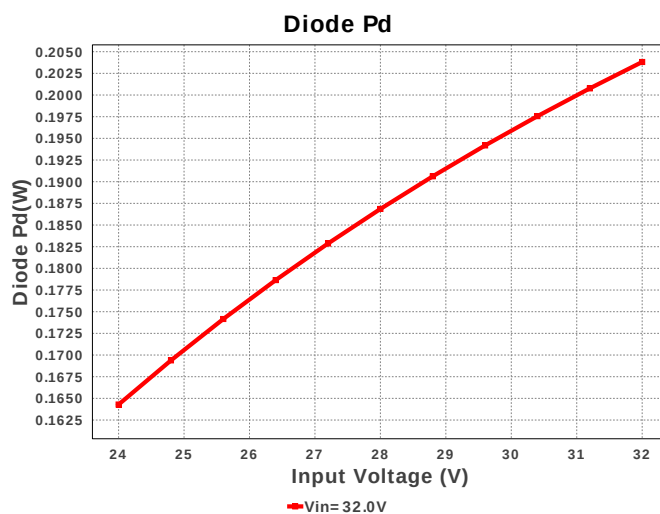
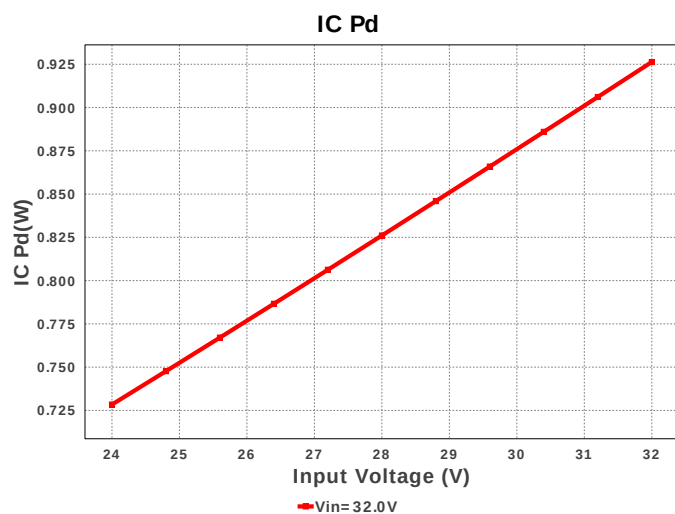
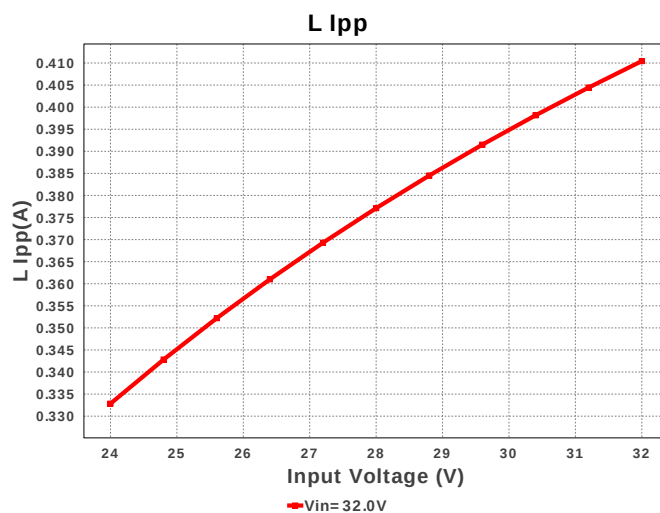
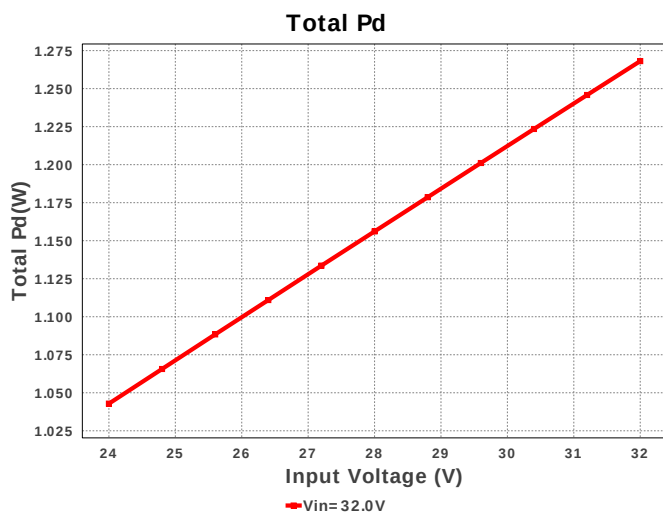
| #  | Name  | Manufacturer      | Part Number                           | Properties                                                      | Qty | Price  | Footprint                                                                                                            |
|----|-------|-------------------|---------------------------------------|-----------------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------------------|
| 1. | Cin   | MuRata            | GRM31CR71H225KA88L<br>Series= X7R     | Cap= 2.2 uF<br>ESR= 4.448 mOhm<br>VDC= 50.0 V<br>IRMS= 2.2252 A | 1   | \$0.05 | <br>1206_190 11 mm <sup>2</sup> |
| 2. | Cvcc  | AVX               | 08055C105KAT2A<br>Series= X7R         | Cap= 1.0 uF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.45 | <br>0805 7 mm <sup>2</sup>      |
| 3. | D1    | NXP Semiconductor | PMEG6010CEH,115                       | VF@Io= 570.0 mV<br>VRRM= 60.0 V                                 | 1   | \$0.04 | <br>SOD-123F 12 mm <sup>2</sup> |
| 4. | D_LED | Cree              | XHP50A-00-0000-0D0BJ40CB              | LED                                                             | 1   | \$5.18 | <br>xlampxhp 0 mm <sup>2</sup>  |
| 5. | L1    | Bourns            | SRN6045-330M                          | L= 33.0 uH<br>DCR= 188.0 mOhm                                   | 1   | \$0.16 | <br>SRN6045 64 mm <sup>2</sup>  |
| 6. | Rfs   | Panasonic         | ERJ-6ENF3572V<br>Series= ERJ-6E       | Res= 35.7 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%            | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>      |
| 7. | Riadj | Vishay-Dale       | CRCW04024K42FKED<br>Series= CRCW...e3 | Res= 4.42 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 | LM3414HVMR/NOPB | Switcher   | 1   | \$0.96 | <br>MRA08A 56 mm <sup>2</sup> |









## Operating Values

| #   | Name         | Value                 | Category | Description                             |
|-----|--------------|-----------------------|----------|-----------------------------------------|
| 1.  | Cin IRMS     | 303.562 mA            | Current  | Input capacitor RMS ripple current      |
| 2.  | IC Ipk       | 900.234 mA            | Current  | Peak switch current in IC               |
| 3.  | Iin Avg      | 291.23 mA             | Current  | Average input current                   |
| 4.  | L Ipp        | 410.47 mA             | Current  | Peak-to-peak inductor ripple current    |
| 5.  | LED Iavg     | 707.014 mA            | Current  | LED Average Current                     |
| 6.  | LED Ipp      | 410.473 mA            | Current  | LED Ripple Current                      |
| 7.  | M1 Irms      | 425.894 mA            | Current  | Q Iavg                                  |
| 8.  | BOM Count    | 8                     | General  | Total Design BOM count                  |
| 9.  | FootPrint    | 159.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components |
| 10. | Frequency    | 560.224 kHz           | General  | Switching frequency                     |
| 11. | IC Tolerance | 25.0 mV               | General  | IC Feedback Tolerance                   |

| #   | Name           | Value       | Category | Description                                                                                |
|-----|----------------|-------------|----------|--------------------------------------------------------------------------------------------|
| 12. | M Vds Act      | 147.041 mV  | General  | Voltage drop across the MosFET                                                             |
| 13. | Mode           | CCM         | General  | Conduction Mode                                                                            |
| 14. | Pout           | 8.05 W      | General  | Total output power                                                                         |
| 15. | Total BOM      | \$1.68      | General  | Total BOM Cost                                                                             |
| 16. | D1 Tj          | 97.254 degC | Op_Point | D1 junction temperature                                                                    |
| 17. | Vout OP        | 11.5 V      | Op_Point | Operational Output Voltage                                                                 |
| 18. | Duty Cycle     | 37.017 %    | Op_point | Duty cycle                                                                                 |
| 19. | Efficiency     | 86.379 %    | Op_point | Steady state efficiency                                                                    |
| 20. | IC Tj          | 80.091 degC | Op_point | IC junction temperature                                                                    |
| 21. | ICThetaJA      | 54.0 degC/W | Op_point | IC junction-to-ambient thermal resistance                                                  |
| 22. | IOUT_OP        | 700.0 mA    | Op_point | Iout operating point                                                                       |
| 23. | LED Rd         | 13.81 Ohm   | Op_point | LED DynamicResistance                                                                      |
| 24. | LED Vf         | 11.5 V      | Op_point | Total LED Forward Calculated Voltage                                                       |
| 25. | VIN_OP         | 32.0 V      | Op_point | Vin operating point                                                                        |
| 26. | Cin Pd         | 409.883 μW  | Power    | Input capacitor power dissipation                                                          |
| 27. | Diode Pd       | 203.801 mW  | Power    | Diode power dissipation                                                                    |
| 28. | IC Pd          | 927.61 mW   | Power    | IC power dissipation                                                                       |
| 29. | L Pd           | 101.332 mW  | Power    | Inductor power dissipation                                                                 |
| 30. | LED Pd         | 8.05 W      | Power    | LED Power Dissipation                                                                      |
| 31. | Total Pd       | 1.269 W     | Power    | Total Power Dissipation                                                                    |
| 32. | Vout Tolerance | 217.39 m%   |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## 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       | LM3414HV                | Base Product Number       |
| 7.  | LED_Architect | N                       | LED Architect Project     |
| 8.  | ledparallel   | 1.0                     | Number of LED in parallel |
| 9.  | ledpartnumber | XHP50A-00-0000-0D0B1400 | 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. The LM3414 uses a floating buck configuration to supply a constant output current of 350mA to a series of LEDs. This device features: an integrated power N-MOSFET switch, allowing for a simple compact power solution, adjustable switching frequency, via an external resistor, and PWM dimming ability to control the LED brightness. An integrated power N-MOSFET switch allows for a simple compact solution. The switching frequency can be adjusted, via an external resistor. PWM dimming allows the LED brightness to be controlled.

2. **LM3414HV** Product Folder : <http://www.ti.com/product/LM3414HV> : 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](#).