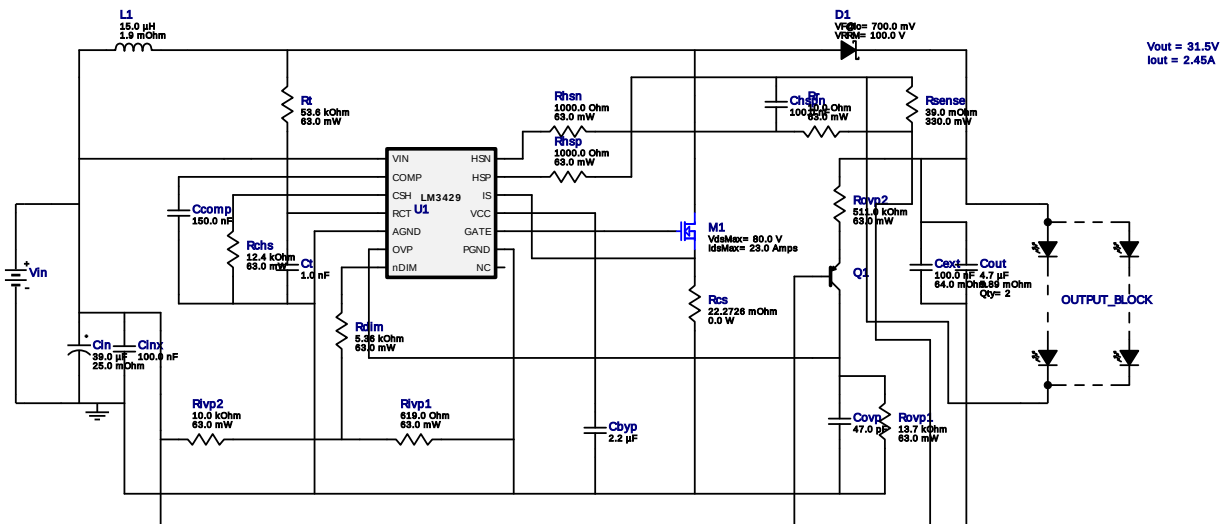


## WEBENCH® Design Report

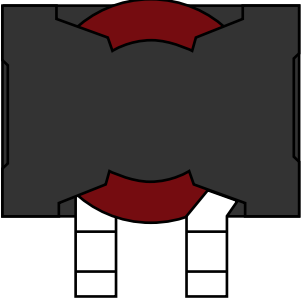
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LM3429MH/NOPB 24.0V-32.0V to 31.50V @ 2.553753440860215A



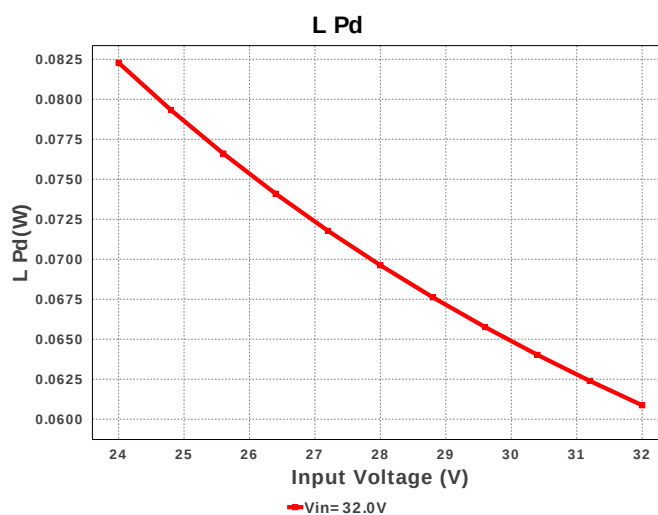
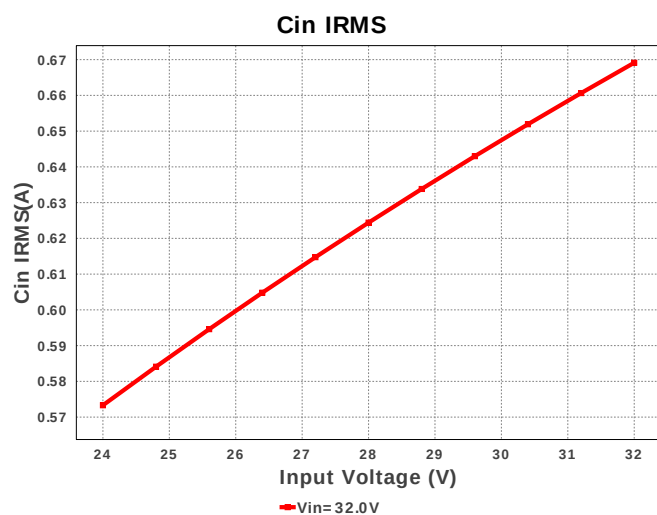
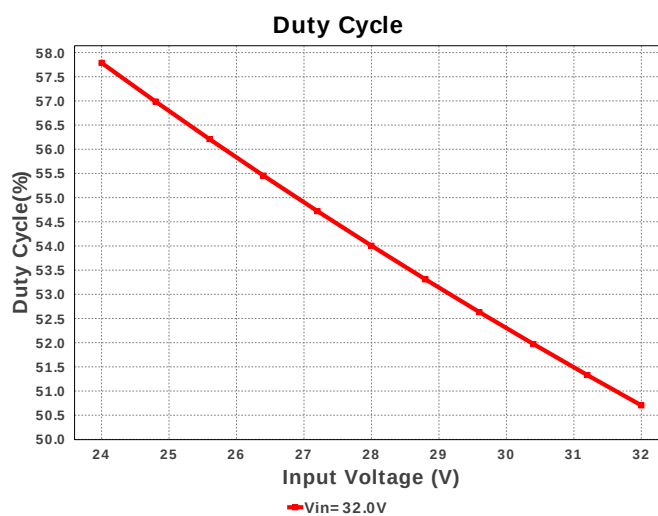
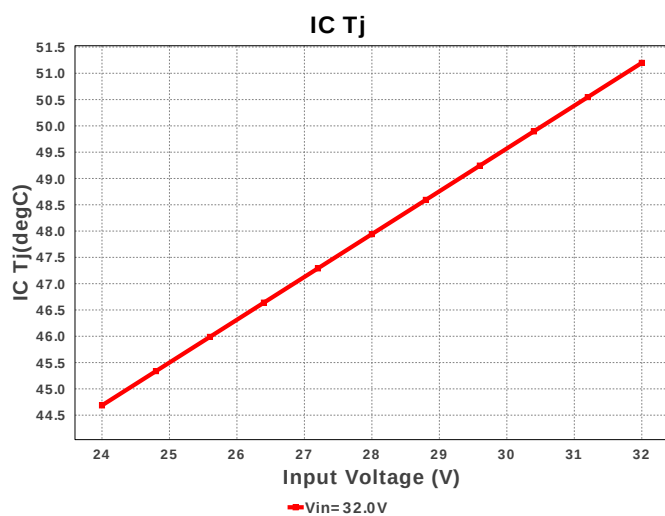
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

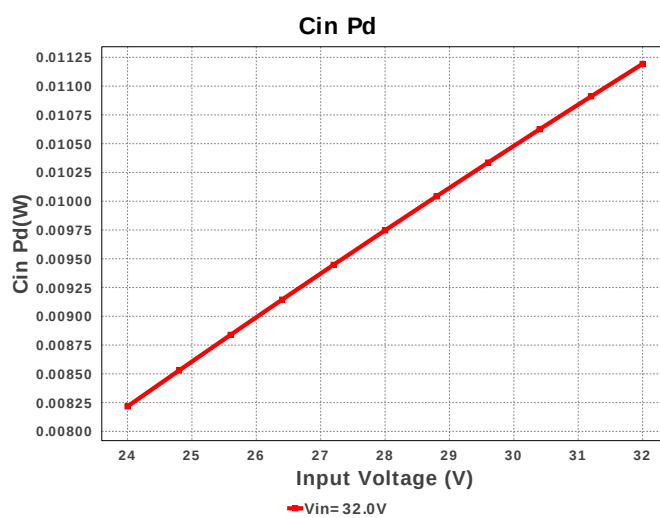
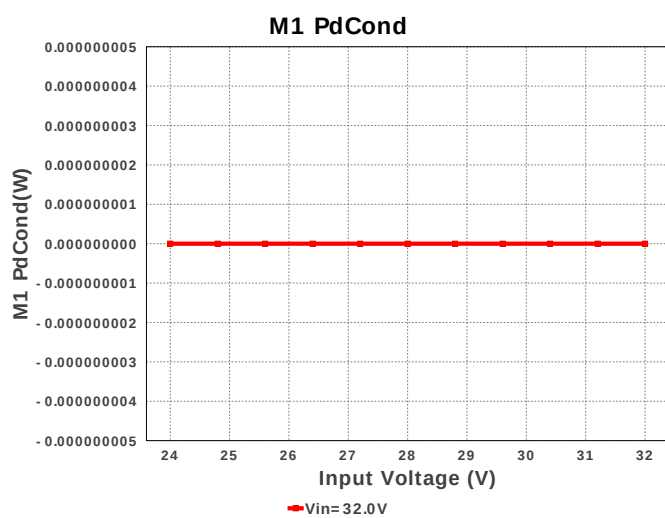
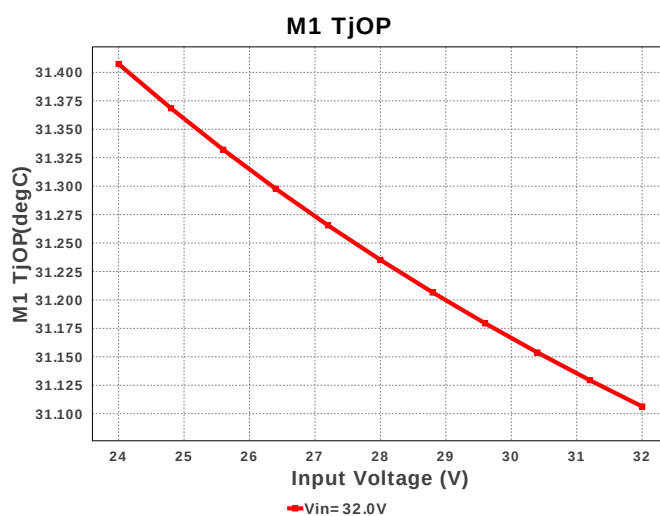
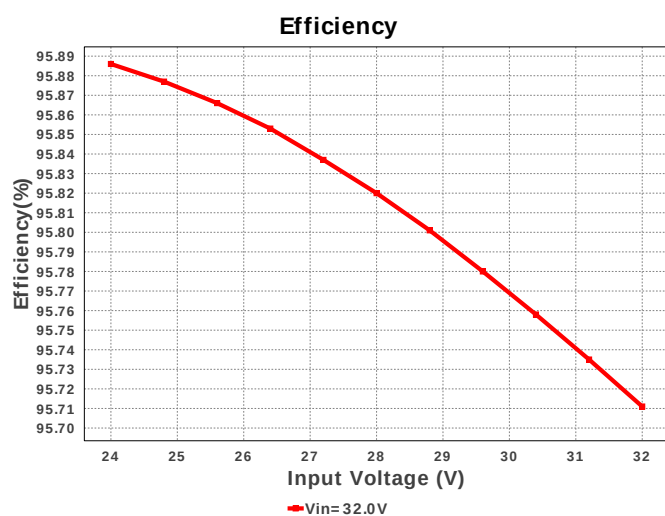
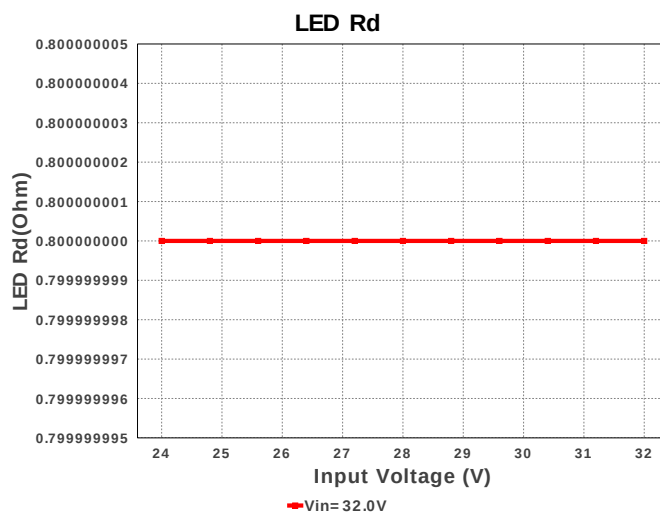
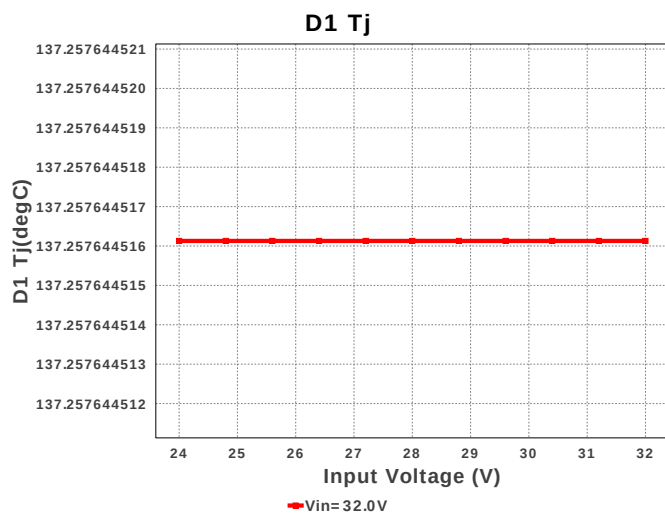
## Electrical BOM

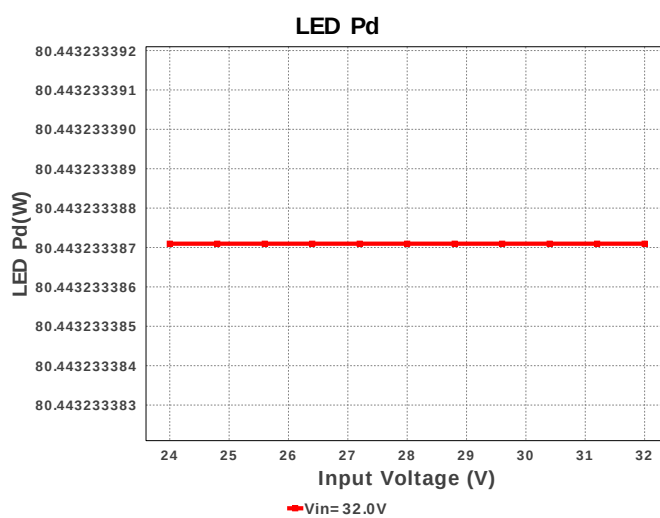
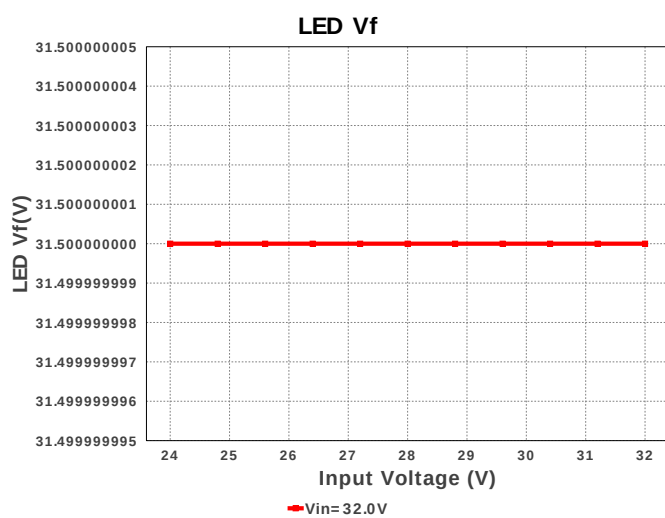
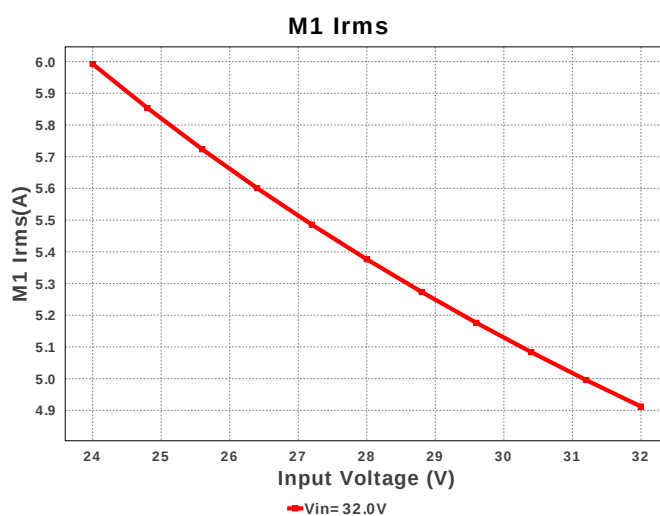
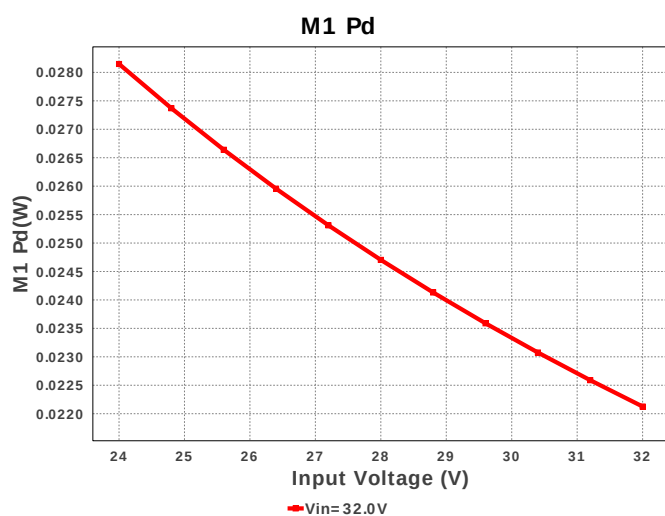
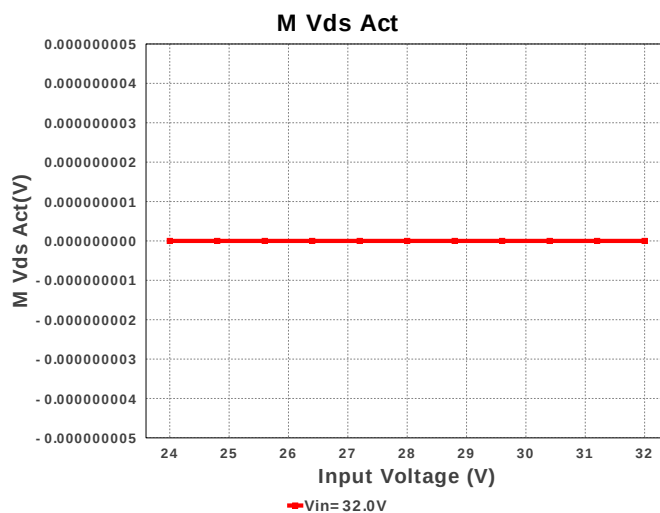
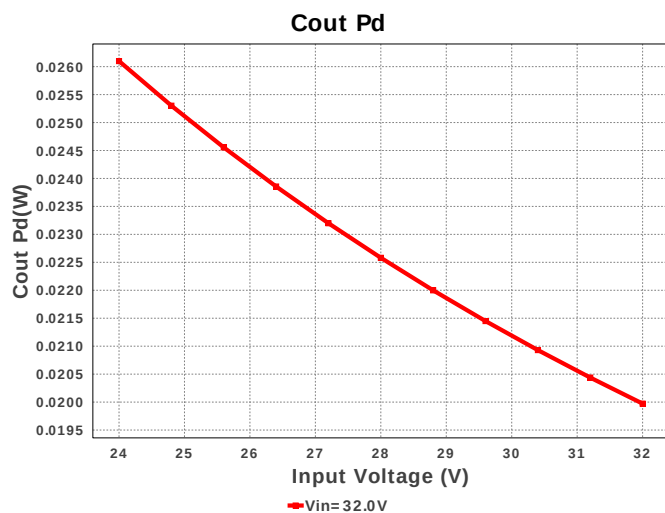
| #  | Name  | Manufacturer | Part Number                         | Properties                                                      | Qty | Price  | Footprint                         |
|----|-------|--------------|-------------------------------------|-----------------------------------------------------------------|-----|--------|-----------------------------------|
| 1. | Cbyp  | Taiyo Yuden  | EMK212B7225KG-T<br>Series= X7R      | Cap= 2.2 uF<br>VDC= 16.0 V<br>IRMS= 0.0 A                       | 1   | \$0.03 | 0805 7 mm <sup>2</sup>            |
| 2. | Ccomp | MuRata       | GRM155R60J154KE01D<br>Series= X5R   | Cap= 150.0 nF<br>VDC= 6.3 V<br>IRMS= 0.0 A                      | 1   | \$0.01 | 0402 3 mm <sup>2</sup>            |
| 3. | Cext  | Kemet        | C0805C104K5RACTU<br>Series= X7R     | Cap= 100.0 nF<br>ESR= 64.0 mOhm<br>VDC= 50.0 V<br>IRMS= 1.64 A  | 1   | \$0.01 | 0805 7 mm <sup>2</sup>            |
| 4. | Chspn | 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>            |
| 5. | Cin   | Panasonic    | 50SVPF39M<br>Series= ?              | Cap= 39.0 uF<br>ESR= 25.0 mOhm<br>VDC= 50.0 V<br>IRMS= 3.8 A    | 1   | \$0.72 | CAPSMT_62_E12 106 mm <sup>2</sup> |
| 6. | Cinx  | MuRata       | GRM188R72A104KA35D<br>Series= X7R   | Cap= 100.0 nF<br>VDC= 100.0 V<br>IRMS= 0.0 A                    | 1   | \$0.03 | 0603 5 mm <sup>2</sup>            |
| 7. | Cout  | TDK          | C3225X7S2A475M200AB<br>Series= X7S  | Cap= 4.7 uF<br>ESR= 5.89 mOhm<br>VDC= 100.0 V<br>IRMS= 6.7739 A | 2   | \$0.42 | 1210 15 mm <sup>2</sup>           |
| 8. | Covp  | Kemet        | C0805C470K5GACTU<br>Series= C0G/NP0 | Cap= 47.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                      | 1   | \$0.01 | 0805 7 mm <sup>2</sup>            |

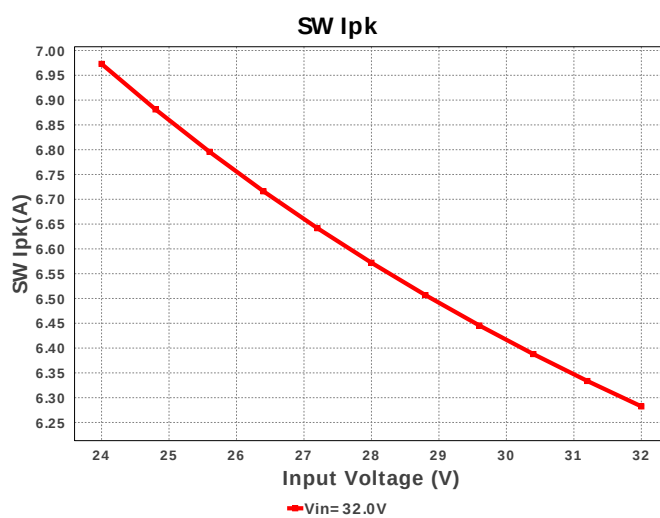
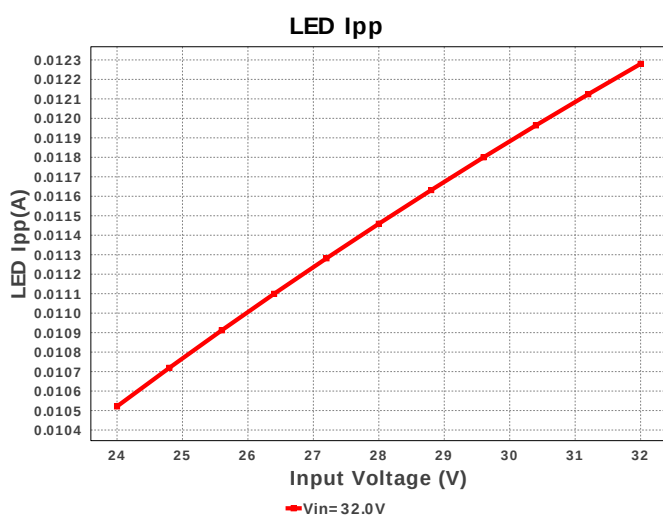
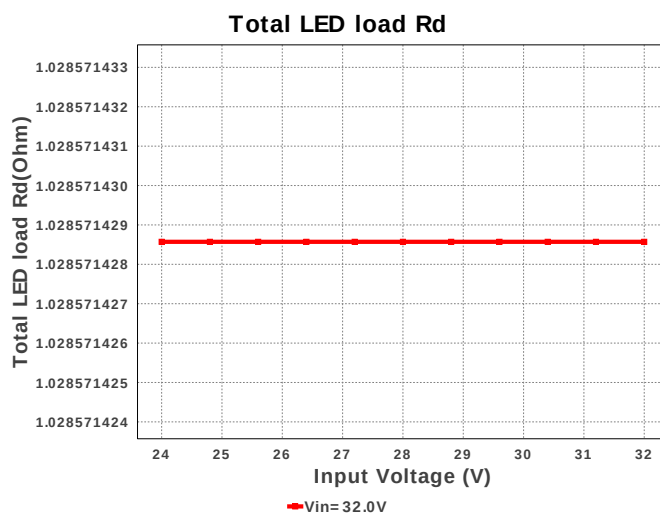
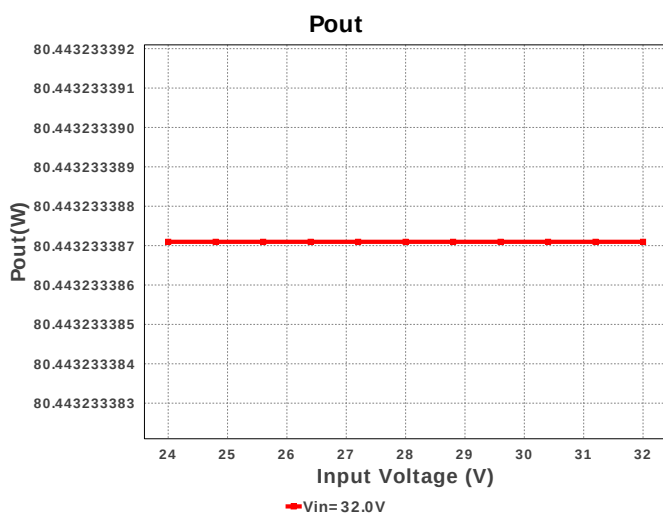
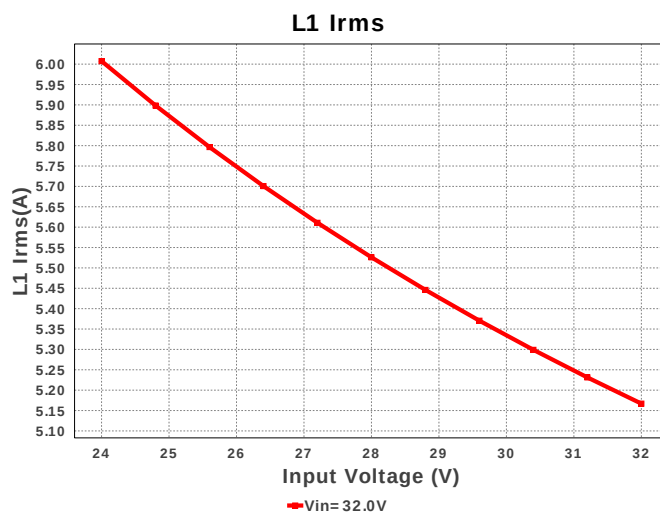
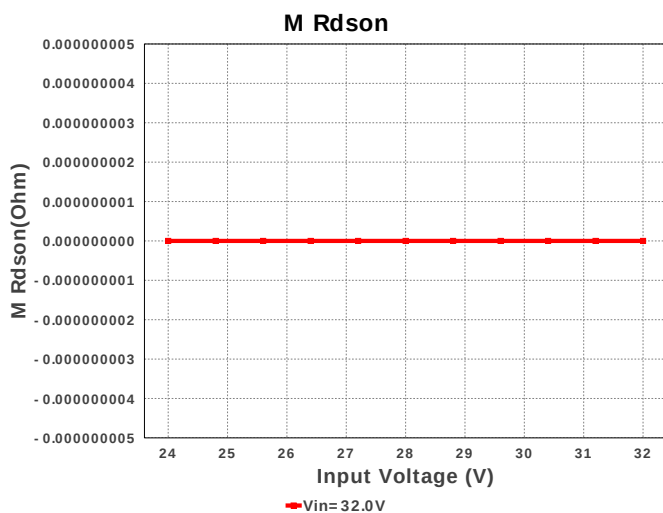
| #   | Name   | Manufacturer              | Part Number                          | Properties                                           | Qty | Price  | Footprint                                                                                                         |
|-----|--------|---------------------------|--------------------------------------|------------------------------------------------------|-----|--------|-------------------------------------------------------------------------------------------------------------------|
| 9.  | Ct     | 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>        |
| 10. | D1     | Vishay-Semiconductor      | V12P10-M3/86A                        | VF@Io= 700.0 mV<br>VRRM= 100.0 V                     | 1   | \$0.43 |  TO-277A 56 mm <sup>2</sup>    |
| 11. | D_LED  | CUSTOM                    | CUSTOM                               | LED                                                  | 63  | NA     | CUSTOM 0 mm <sup>2</sup>                                                                                          |
| 12. | L1     | Coilcraft                 | SER2915H-153KL                       | L= 15.0 µH<br>DCR= 1.9 mOhm                          | 1   | \$1.95 |  SER2915H 652 mm <sup>2</sup>  |
| 13. | M1     | Infineon Technologies     | BSC340N08NS3 G                       | VdsMax= 80.0 V<br>IdsMax= 23.0 Amps                  | 1   | \$0.19 |  PG-TDSON-8 55 mm <sup>2</sup> |
| 14. | Q1     | Diodes Inc.               | MMBT3906-7-F                         | Bipolar Transistor                                   | 1   | \$0.02 |  SOT-23 14 mm <sup>2</sup>     |
| 15. | Rchs   | Vishay-Dale               | CRCW040212K4FKED<br>Series= CRCW..e3 | Res= 12.4 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 16. | Rcs    | CUSTOM                    | CUSTOM<br>Series= ?                  | Res= 22.2726 mOhm<br>Power= 0.0 W<br>Tolerance= 0.0% | 1   | NA     | CUSTOM 0 mm <sup>2</sup>                                                                                          |
| 17. | Rdim   | Vishay-Dale               | CRCW04025K36FKED<br>Series= CRCW..e3 | Res= 5.36 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 18. | Rhsn   | 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>      |
| 19. | Rhsp   | 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>      |
| 20. | Rivp1  | Vishay-Dale               | CRCW0402619RFKED<br>Series= CRCW..e3 | Res= 619.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 21. | Rivp2  | Vishay-Dale               | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 22. | Rovp1  | Vishay-Dale               | CRCW040213K7FKED<br>Series= CRCW..e3 | Res= 13.7 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 23. | Rovp2  | Vishay-Dale               | CRCW0402511KFKED<br>Series= CRCW..e3 | Res= 511.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 24. | Rr     | Vishay-Dale               | CRCW040210R0FKED<br>Series= CRCW..e3 | Res= 10.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 3 mm <sup>2</sup>      |
| 25. | Rsense | Panasonic                 | ERJ-L14KF39MU<br>Series= ERJ-L14     | Res= 39.0 mOhm<br>Power= 330.0 mW<br>Tolerance= 1.0% | 1   | \$0.11 |  1210 15 mm <sup>2</sup>     |

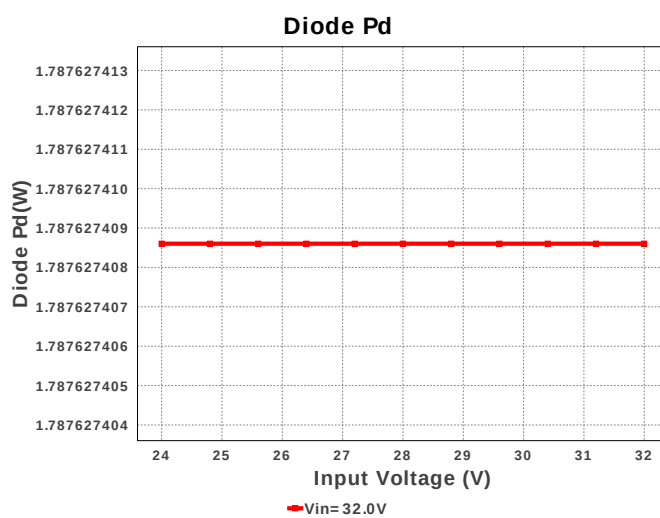
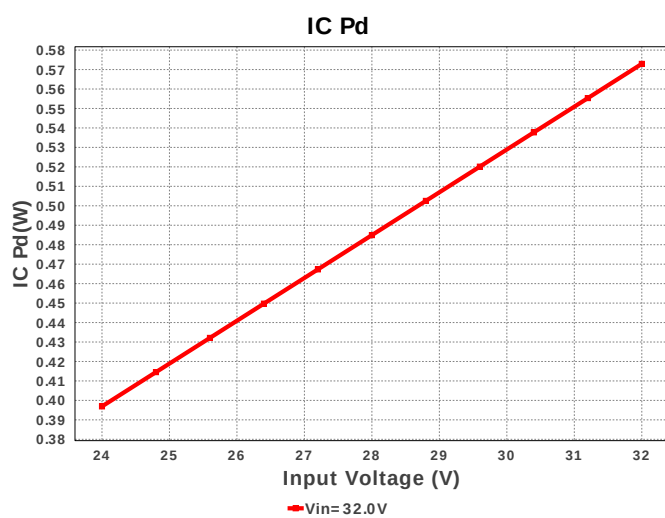
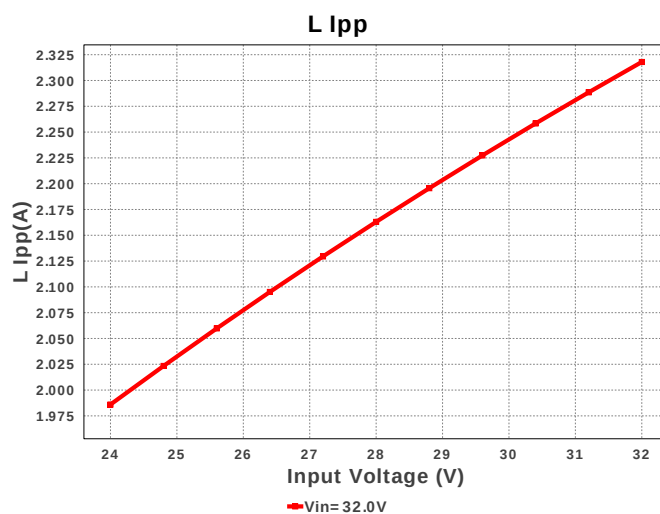
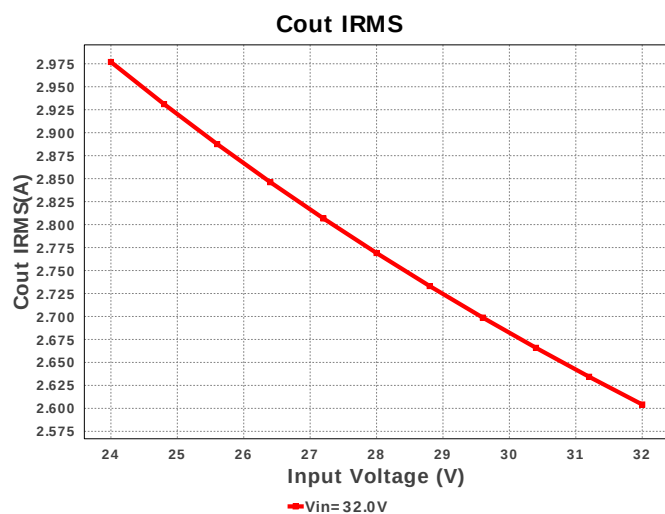
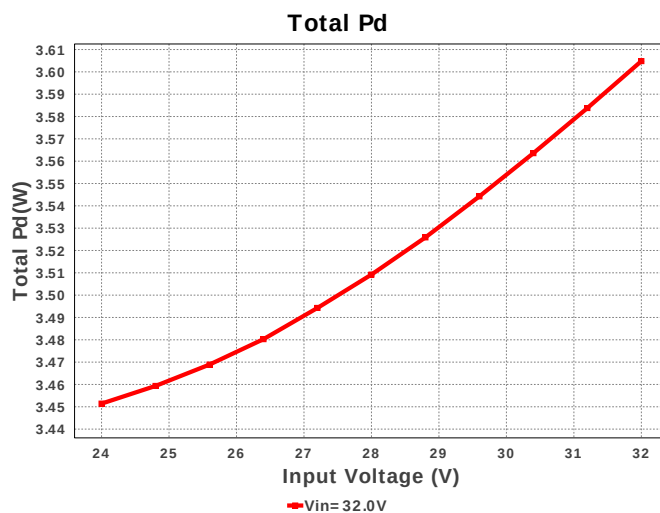
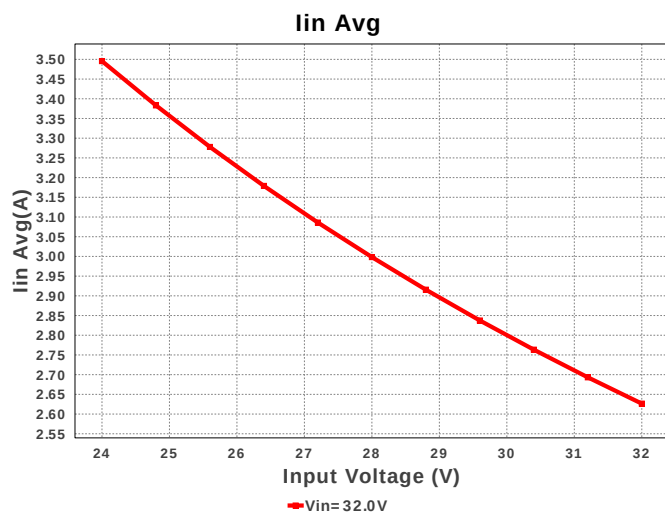
| #   | Name | Manufacturer      | Part Number                          | Properties                                          | Qty | Price  | Footprint                                                                                         |
|-----|------|-------------------|--------------------------------------|-----------------------------------------------------|-----|--------|---------------------------------------------------------------------------------------------------|
| 26. | Rt   | Vishay-Dale       | CRCW040253K6FKED<br>Series= CRCW..e3 | Res= 53.6 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0402 3 mm²    |
| 27. | U1   | Texas Instruments | LM3429MH/NOPB                        | Switcher                                            | 1   | \$1.20 |  MXA14A 59 mm² |

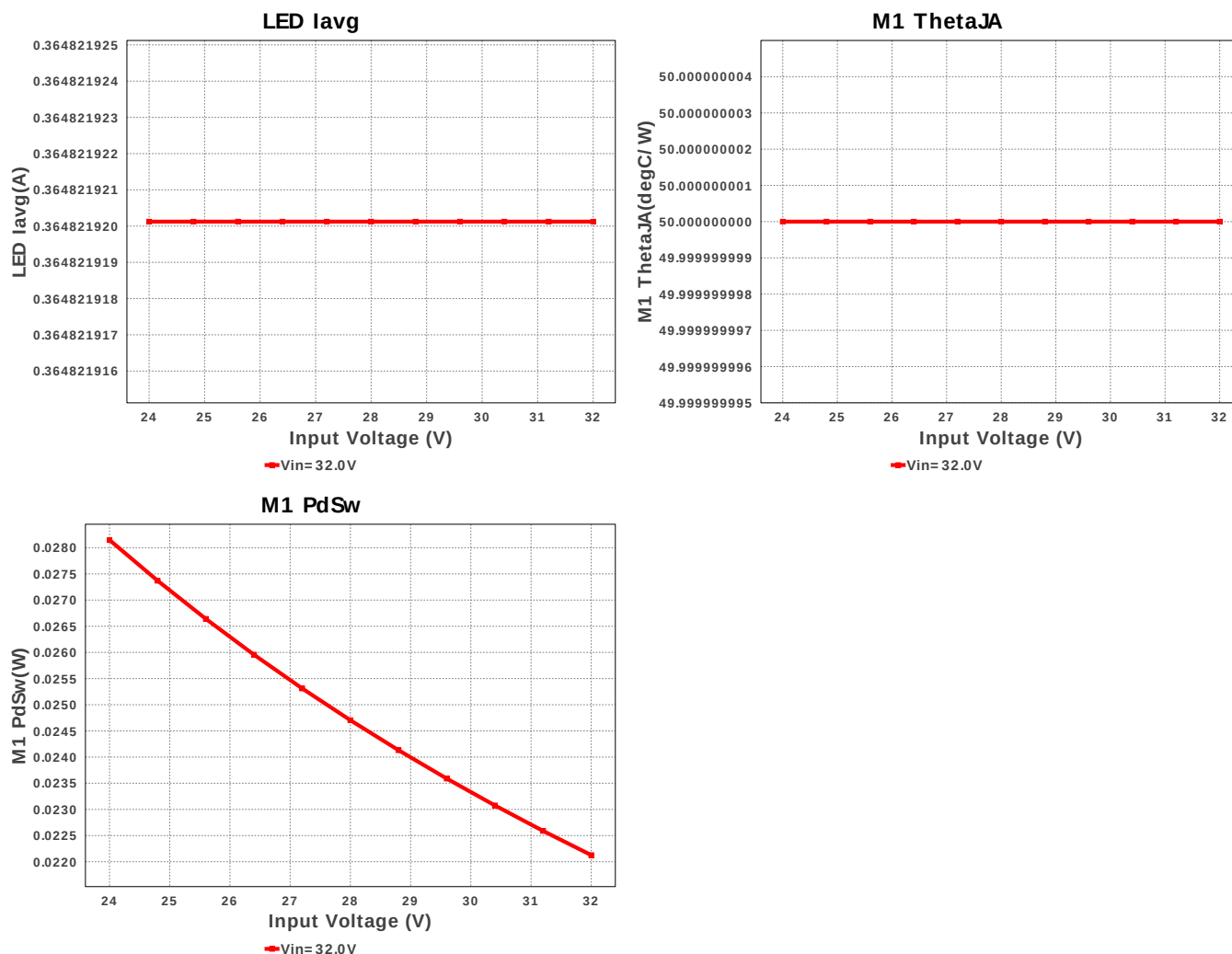












## Operating Values

| #   | Name         | Value                   | Category | Description                                   |
|-----|--------------|-------------------------|----------|-----------------------------------------------|
| 1.  | Cin IRMS     | 573.313 mA              | Current  | Input capacitor RMS ripple current            |
| 2.  | Cout IRMS    | 2.976 A                 | Current  | Output capacitor RMS ripple current           |
| 3.  | Iin Avg      | 3.507 A                 | Current  | Average input current                         |
| 4.  | L Ipp        | 1.986 A                 | Current  | Peak-to-peak inductor ripple current          |
| 5.  | L1 Irms      | 6.007 A                 | Current  | Inductor ripple current                       |
| 6.  | LED Iavg     | 364.822 mA              | Current  | LED Average Current                           |
| 7.  | LED Ipp      | 10.521 mA               | Current  | LED Ripple Current                            |
| 8.  | M1 Irms      | 5.98 A                  | Current  | M1 MOSFET Irms                                |
| 9.  | SW Ipk       | 6.973 A                 | Current  | Peak switch current                           |
| 10. | BOM Count    | 90                      | General  | Total Design BOM count                        |
| 11. | FootPrint    | 1.062 k mm <sup>2</sup> | General  | Total Foot Print Area of BOM components       |
| 12. | Frequency    | 461.754 kHz             | General  | Switching frequency                           |
| 13. | IC Tolerance | 25.0 mV                 | General  | IC Feedback Tolerance                         |
| 14. | M Rdson      | 0.0 Ohm                 | General  | Drain-Source On-resistance                    |
| 15. | M Vds Act    | 0.0 V                   | General  | M Vds                                         |
| 16. | M1 ThetaJA   | 50.0 degC/W             | General  | MOSFET junction-to-ambient thermal resistance |
| 17. | Mode         | CCM                     | General  | Conduction Mode                               |
| 18. | Pout         | 80.443 W                | General  | Total output power                            |
| 19. | Total BOM    | \$0.0                   | General  | Total BOM Cost                                |
| 20. | D1 Tj        | 137.258 degC            | Op_Point | D1 junction temperature                       |
| 21. | Vout OP      | 31.5 V                  | Op_Point | Operational Output Voltage                    |
| 22. | Duty Cycle   | 57.867 %                | Op_point | Duty cycle                                    |
| 23. | Efficiency   | 95.567 %                | Op_point | Steady state efficiency                       |
| 24. | IC Tj        | 47.8 degC               | Op_point | IC junction temperature                       |
| 25. | ICThetaJA    | 37.0 degC/W             | Op_point | IC junction-to-ambient thermal resistance     |
| 26. | IOUT_OP      | 2.554 A                 | Op_point | Iout operating point                          |
| 27. | LED Rd       | 800.0 mOhm              | Op_point | LED DynamicResistance                         |
| 28. | LED Vf       | 31.5 V                  | Op_point | Total LED Forward Calculated Voltage          |
| 29. | M1 TJOP      | 36.846 degC             | Op_point | M1 MOSFET junction temperature                |
| 30. | VIN_OP       | 24.0 V                  | Op_point | Vin operating point                           |
| 31. | Cin Pd       | 8.217 mW                | Power    | Input capacitor power dissipation             |



| #   | Name              | Value      | Category | Description                                                                                |
|-----|-------------------|------------|----------|--------------------------------------------------------------------------------------------|
| 32. | Cout Pd           | 26.085 mW  | Power    | Output capacitor power dissipation                                                         |
| 33. | Diode Pd          | 1.788 W    | Power    | Diode power dissipation                                                                    |
| 34. | IC Pd             | 481.09 mW  | Power    | IC power dissipation                                                                       |
| 35. | L Pd              | 82.284 mW  | Power    | Inductor power dissipation                                                                 |
| 36. | LED Pd            | 80.443 W   | Power    | LED Power Dissipation                                                                      |
| 37. | M1 Pd             | 136.921 mW | Power    | M1 MOSFET total power dissipation                                                          |
| 38. | M1 PdCond         | 0.0 W      | Power    | M1 MOSFET conduction losses                                                                |
| 39. | M1 PdSw           | 136.921 mW | Power    | M1 MOSFET switching losses                                                                 |
| 40. | Total Pd          | 3.731 W    | Power    | Total Power Dissipation                                                                    |
| 41. | Total LED load Rd | 1.029 Ohm  |          | Total LED Load DynamicResistance                                                           |
| 42. | Vout Tolerance    | 79.365 m%  |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #   | Name          | Value      | Description               |
|-----|---------------|------------|---------------------------|
| 1.  | Iout          | 2.45       | Maximum Output Current    |
| 2.  | VinMax        | 32.0       | Maximum input voltage     |
| 3.  | VinMin        | 24.0       | Minimum input voltage     |
| 4.  | Vout          | 31.5       | Output Voltage            |
| 5.  | application   | LED_DRIVER | LED Application           |
| 6.  | base_pn       | LM3429     | Base Product Number       |
| 7.  | LED_Architect | N          | LED Architect Project     |
| 8.  | ledparallel   | 7.0        | Number of LED in parallel |
| 9.  | ledpartnumber | Custom     | LED Part number           |
| 10. | ledseries     | 9.0        | 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. **LM3429** Product Folder : <http://www.ti.com/product/LM3429> : contains the data sheet and other resources.

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