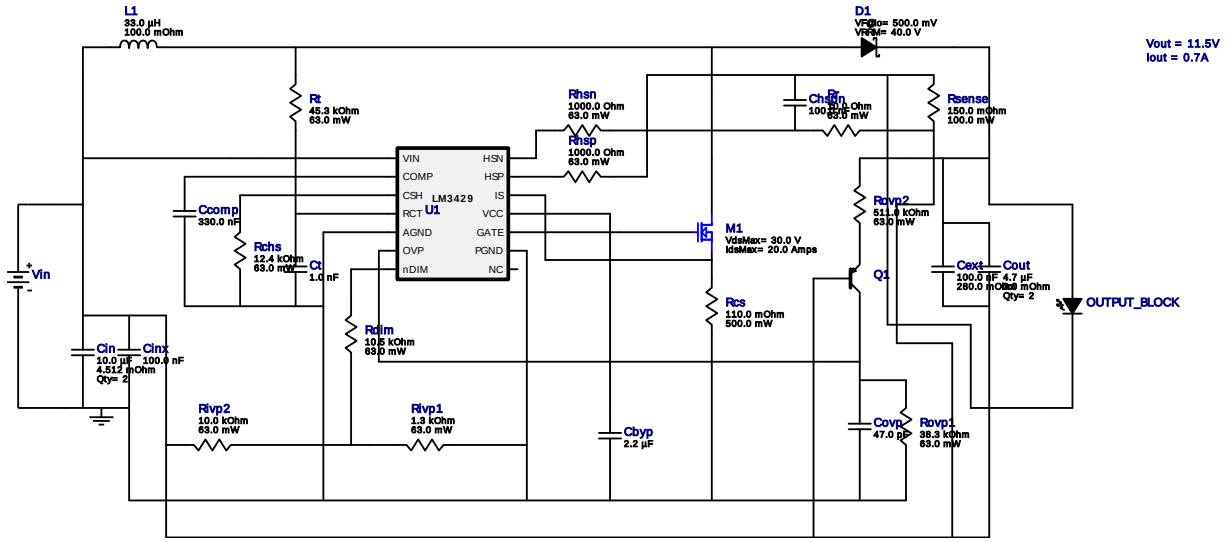
# WEBENCH® Design Report

VinMin = 12.0V
VinMax = 12.0V
Vout = 11.5V
Iout = 0.7A

Device = LM3429MH/NOPB
Topology = Buck_Boost
Created = 8/14/16 5:25:18 AM
BOM Cost = $7.32
BOM Count = 29
Total Pd = 1.43W

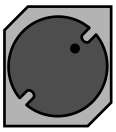
Design : 4009018/108 LM3429MH/NOPB
LM3429MH/NOPB 12.0V-12.0V to 18.86V @ 0.6639684946236559A



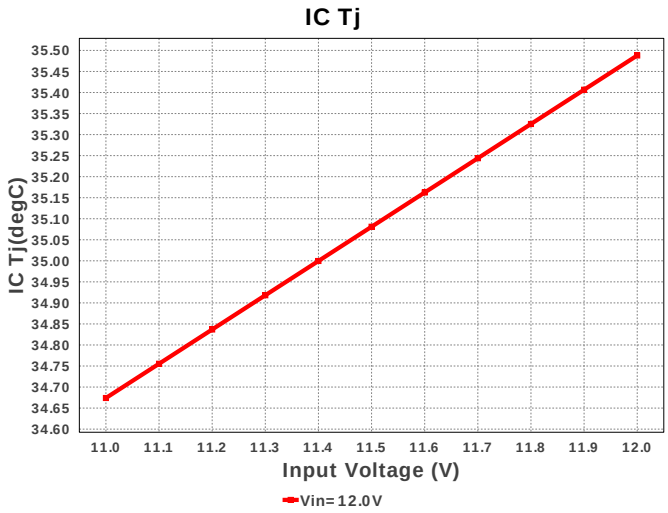

1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

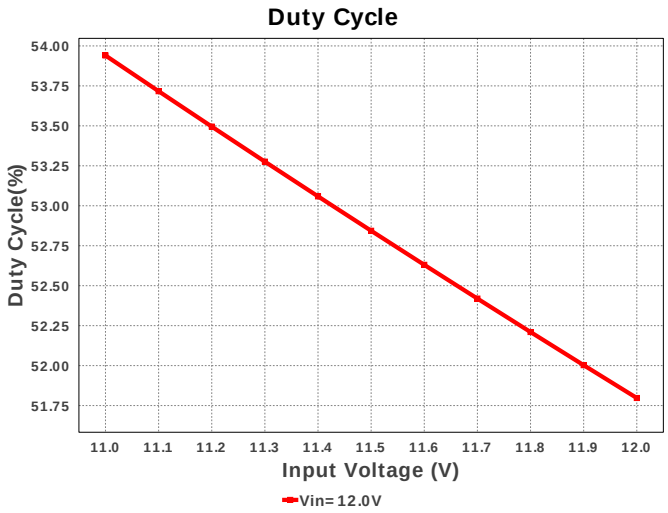
## Electrical BOM

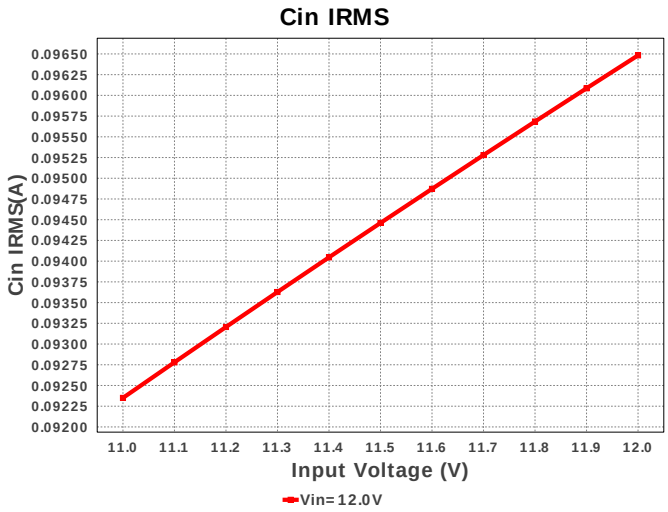
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 1. | Cbyp | Taiyo Yuden | EMK212B7225KG-T<br>Series= X7R | Cap= 2.2 uF<br>VDC= 16.0 V<br>IRMS= 0.0 A | 1 | $0.03 | 0805 7 mm$^2$ |
| 2. | Ccomp | MuRata | GRM155R60J334KE01D<br>Series= X5R | Cap= 330.0 nF<br>VDC= 6.3 V<br>IRMS= 0.0 A | 1 | $0.01 | 0402 3 mm$^2$ |
| 3. | Cext | 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 | $0.01 | 0805 7 mm$^2$ |
| 4. | Chspn | MuRata | GRM21BR71E104KA01L<br>Series= X7R | Cap= 100.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm$^2$ |
| 5. | Cin | MuRata | GRM31CR61E106KA12L<br>Series= X5R | Cap= 10.0 uF<br>ESR= 4.512 mOhm<br>VDC= 25.0 V<br>IRMS= 2.447 A | 2 | $0.05 | 1206_190 11 mm$^2$ |
| 6. | Cinx | Kemet | C0603C104K3RACTU<br>Series= X7R | Cap= 100.0 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0603 5 mm$^2$ |
| 7. | Cout | MuRata | GRM31CR71H475KA12L<br>Series= X7R | Cap= 4.7 uF<br>ESR= 3.0 mOhm<br>VDC= 50.0 V<br>IRMS= 4.98 A | 2 | $0.07 | 1206 11 mm$^2$ |
| 8. | Covp | Kemet | C0805C470K5GACTU<br>Series= C0G/NP0 | Cap= 47.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A | 1 | $0.01 | 0805 7 mm$^2$ |
| 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 | $0.01 | 0805 7 mm$^2$ |

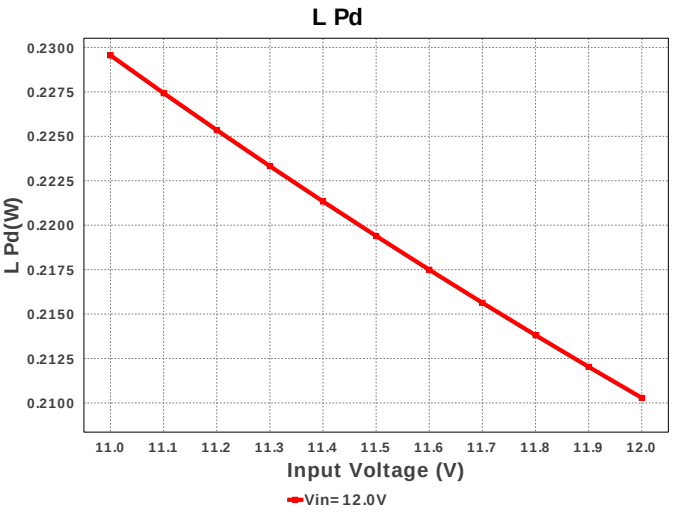
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 10. | D1 | Diodes Inc. | B340A-13-F | VF@Io= 500.0 mV<br>VRRM= 40.0 V | 1 | $0.11 |  <br>SMA 37 mm$^2$ |
| 11. | D_LED | Cree | XHP50A-00-0000-0D00J40CB | LED | 1 | $5.02 |  <br>xlampxhp 0 mm$^2$ |
| 12. | L1 | Bourns | SDR1105-330KL | L= 33.0 µH<br>DCR= 100.0 mOhm | 1 | $0.29 |  <br>SDR1105 157 mm$^2$ |
| 13. | M1 | Texas Instruments | CSD17579Q3A | VdsMax= 30.0 V<br>IdsMax= 20.0 Amps | 1 | $0.19 |  <br>TRANS_NexFET_Q3A 18 mm$^2$ |
| 14. | Q1 | Diodes Inc. | MMBT3906-7-F | Bipolar Transistor | 1 | $0.02 |  <br>SOT-23 14 mm$^2$ |
| 15. | Rchs | Vishay-Dale | CRCW040212K4FKED<br>Series= CRCW..e3 | Res= 12.4 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 16. | Rcs | Rohm | MCR25JZHFLR110<br>Series= MCR25 | Res= 110.0 mOhm<br>Power= 500.0 mW<br>Tolerance= 1.0% | 1 | $0.03 | <br>1210 15 mm$^2$ |
| 17. | Rdim | Vishay-Dale | CRCW040210K5FKED<br>Series= CRCW..e3 | Res= 10.5 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 18. | Rhsn | Vishay-Dale | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1000.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 19. | Rhsp | Vishay-Dale | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1000.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 20. | Rivp1 | Vishay-Dale | CRCW04021K30FKED<br>Series= CRCW..e3 | Res= 1.3 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 21. | Rivp2 | Vishay-Dale | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 22. | Rovp1 | Vishay-Dale | CRCW040238K3FKED<br>Series= CRCW..e3 | Res= 38.3 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 23. | Rovp2 | Vishay-Dale | CRCW0402511KFKED<br>Series= CRCW..e3 | Res= 511.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 24. | Rr | Vishay-Dale | CRCW040210R0FKED<br>Series= CRCW..e3 | Res= 10.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |
| 25. | Rsense | Panasonic | ERJ-3RSFR15V<br>Series= ERJ-3R | Res= 150.0 mOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1 | $0.03 | <br>0603 5 mm$^2$ |
| 26. | Rt | Vishay-Dale | CRCW040245K3FKED<br>Series= CRCW..e3 | Res= 45.3 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1 | $0.01 | <br>0402 3 mm$^2$ |

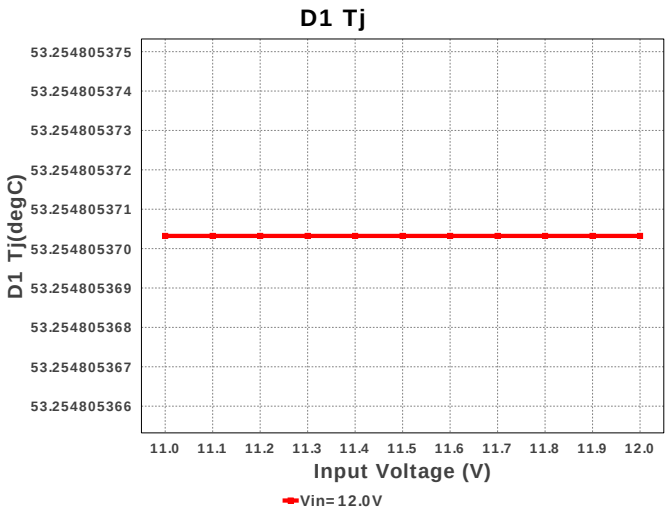
| # | Name | Manufacturer | Part Number | Properties | Qty | Price | Footprint |
|---|---|---|---|---|---|---|---|
| 27. | U1 | Texas Instruments | LM3429MH/NOPB | Switcher | 1 | $1.20 | MXA14A 59 mm² |

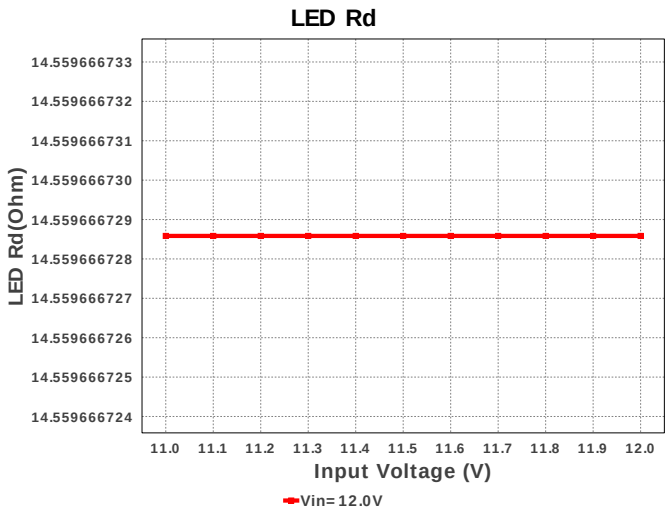


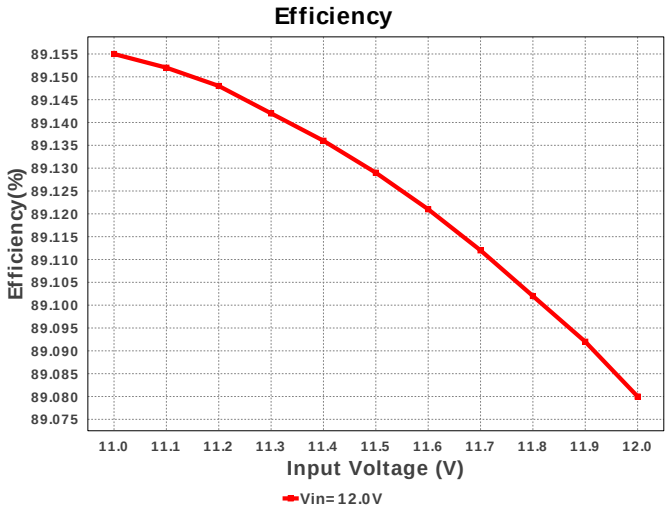



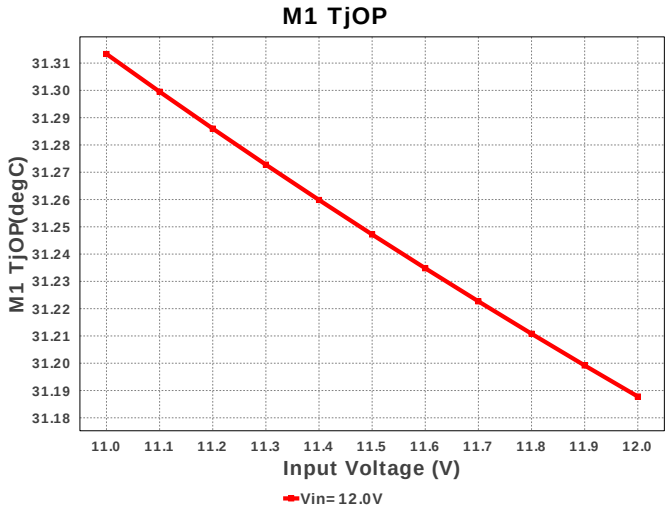



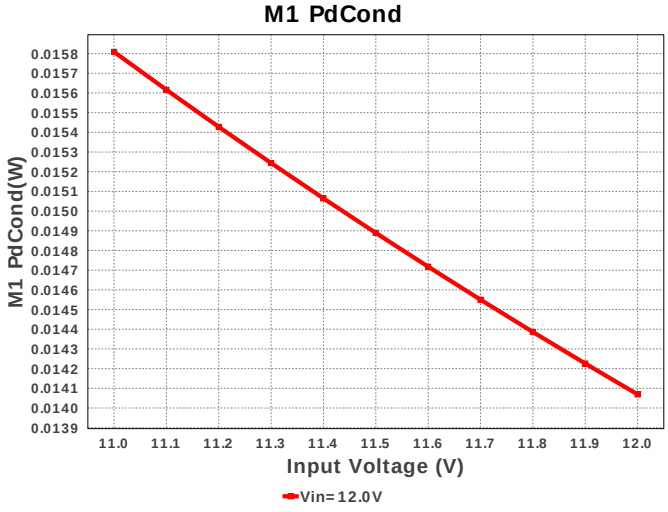



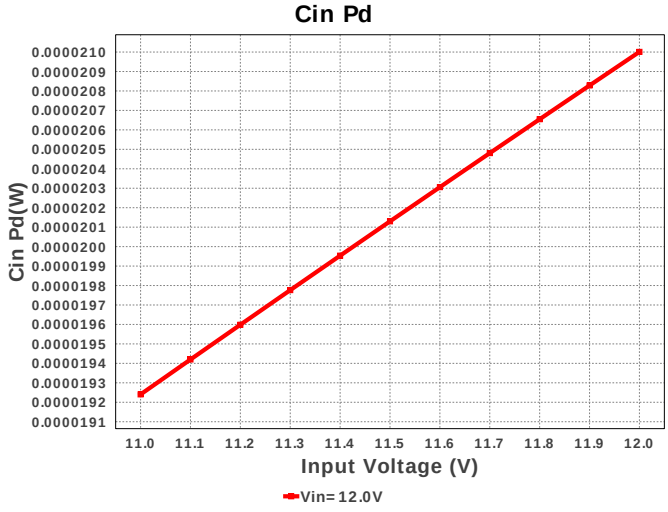


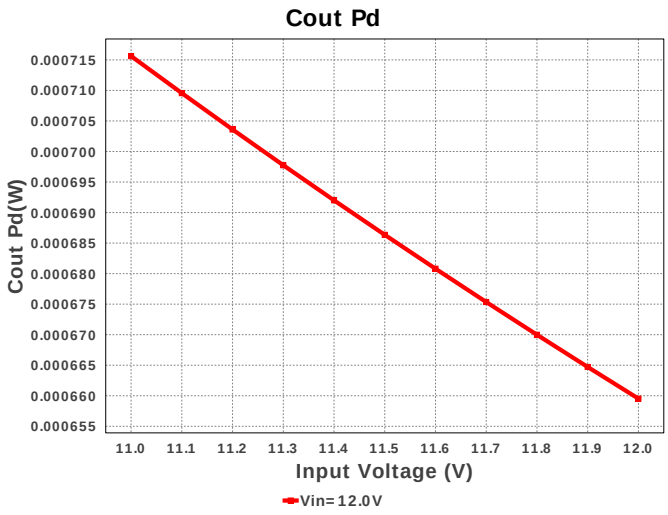



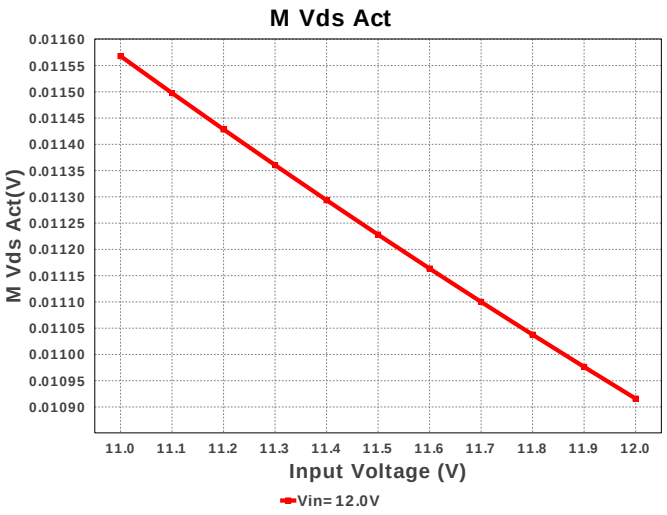



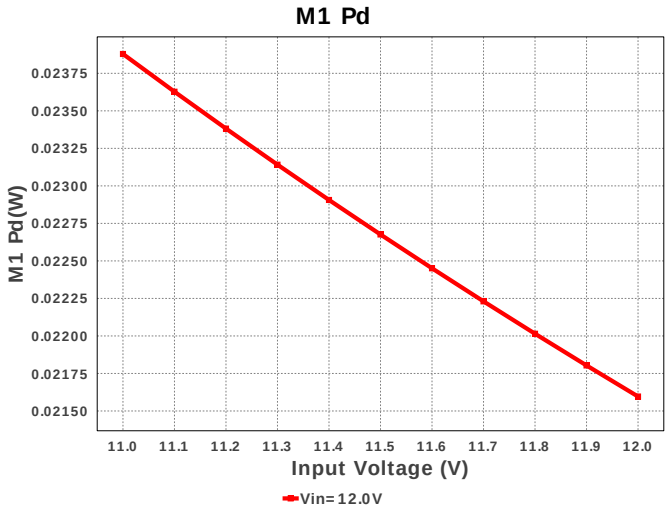



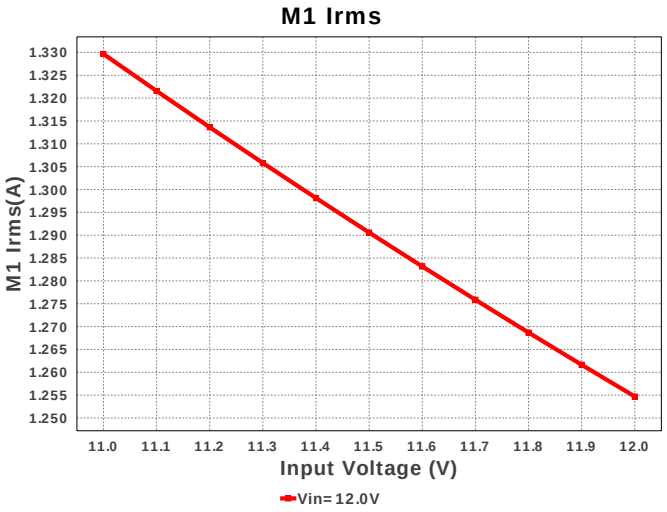



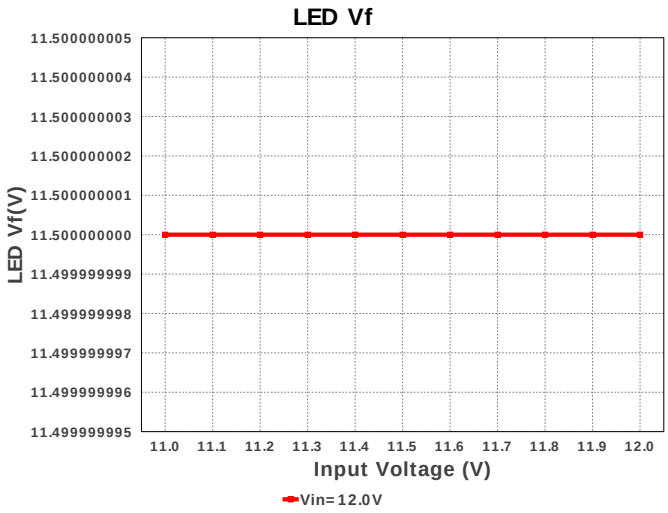



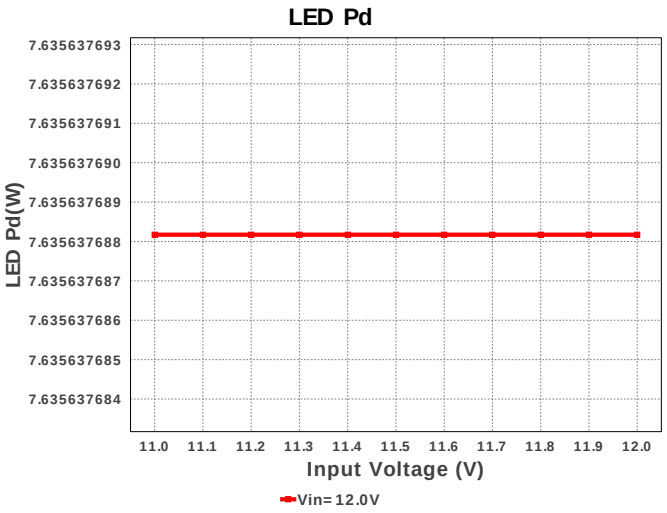


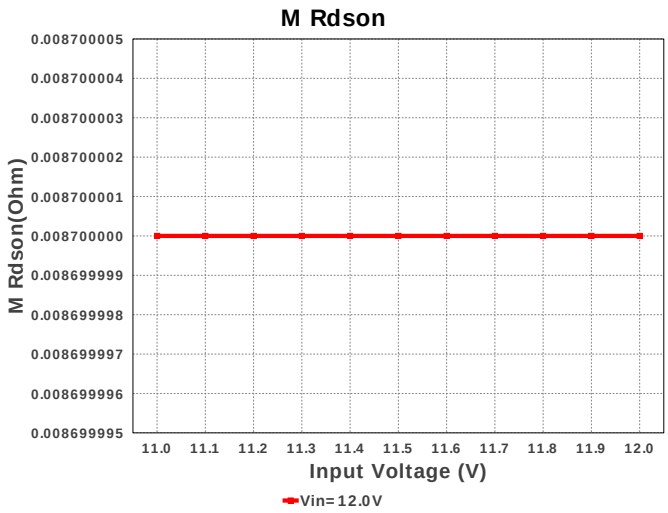



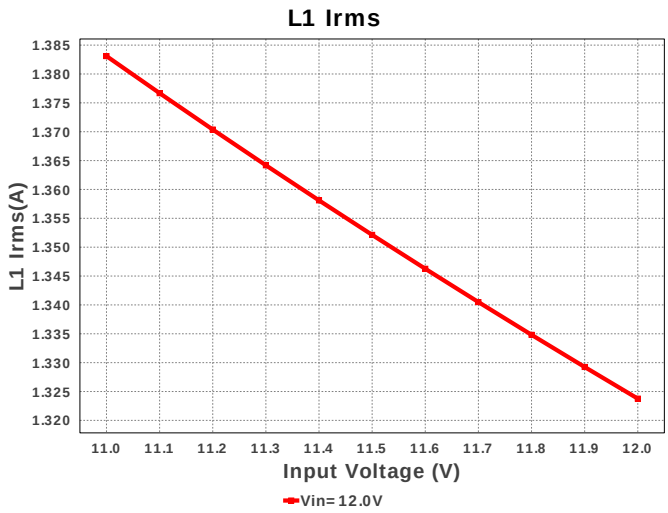



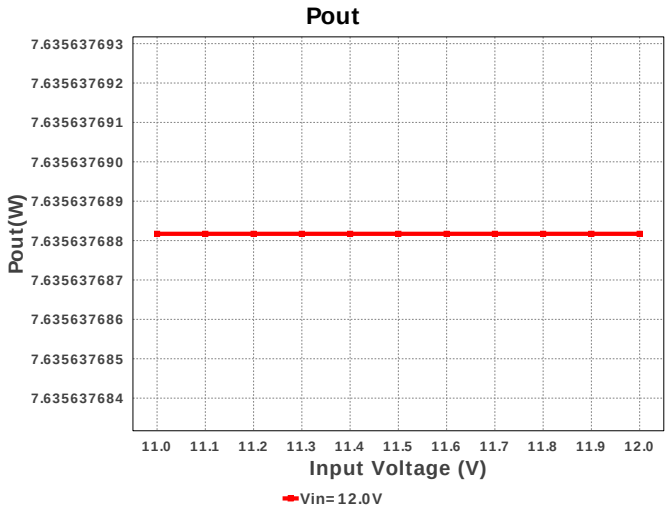



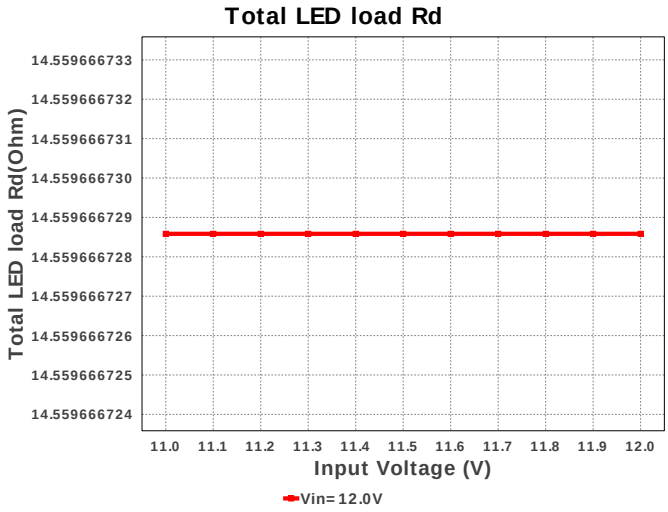



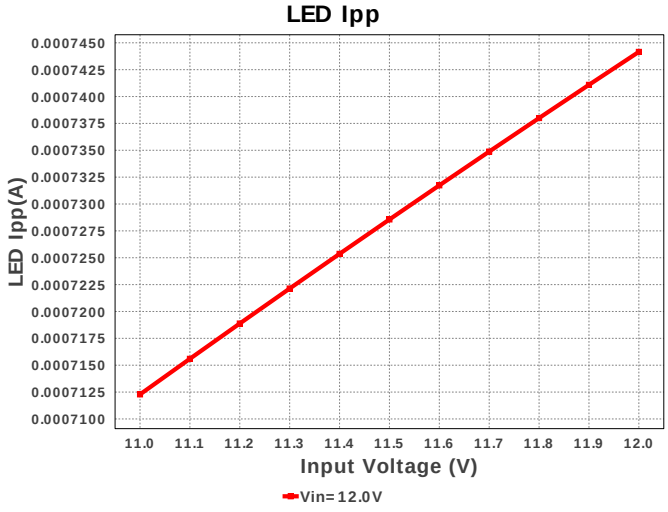



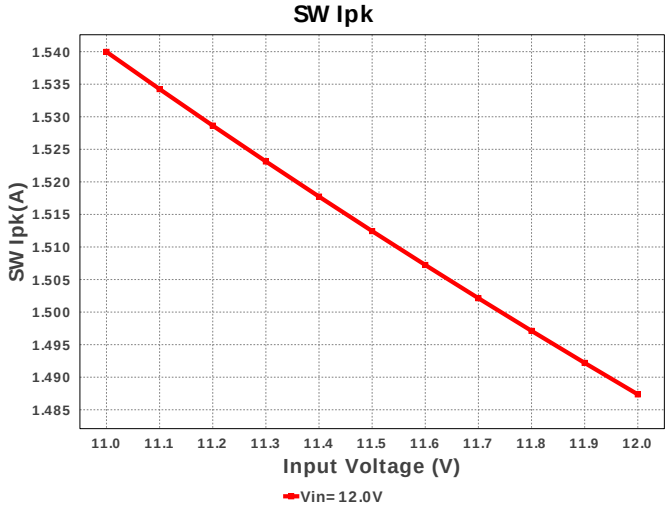


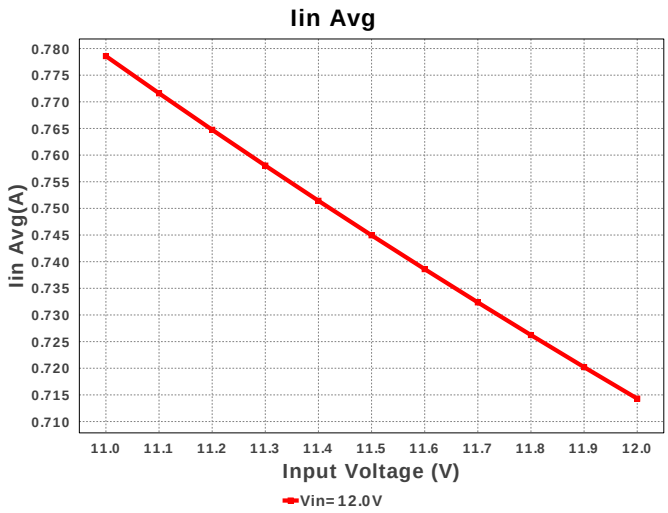



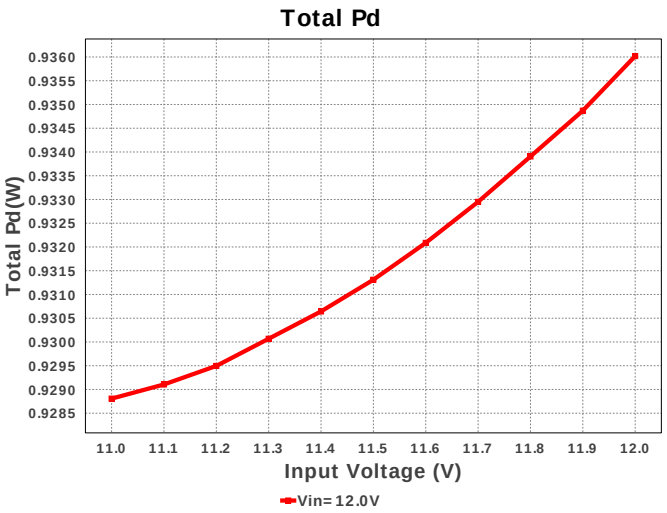



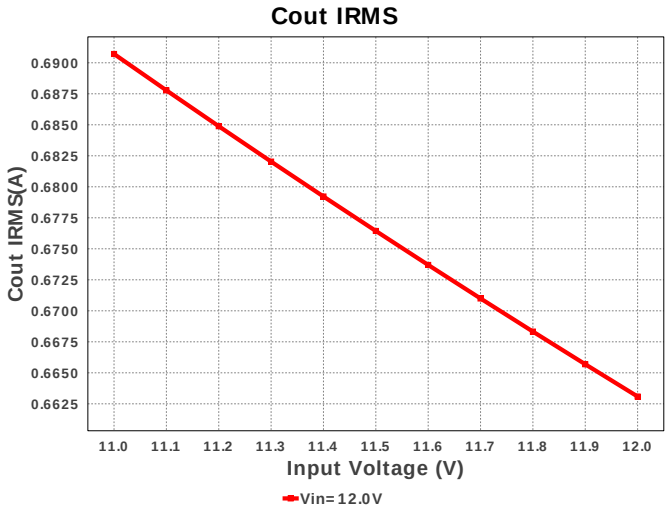



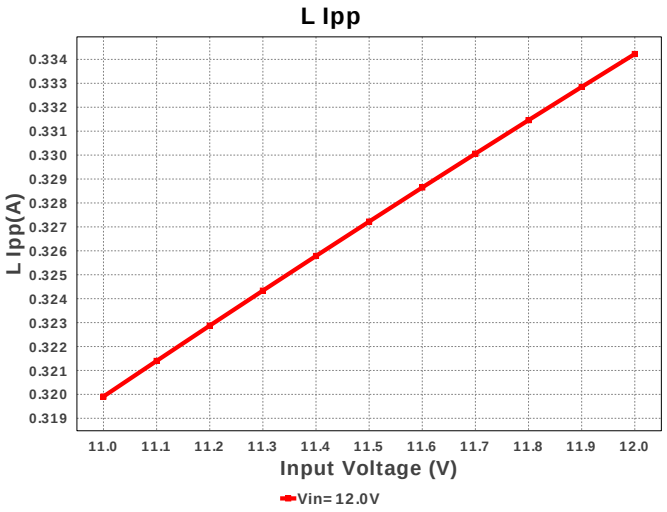



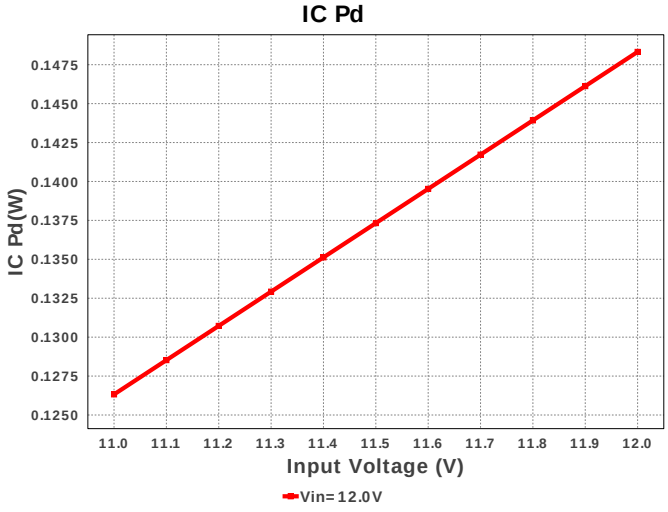



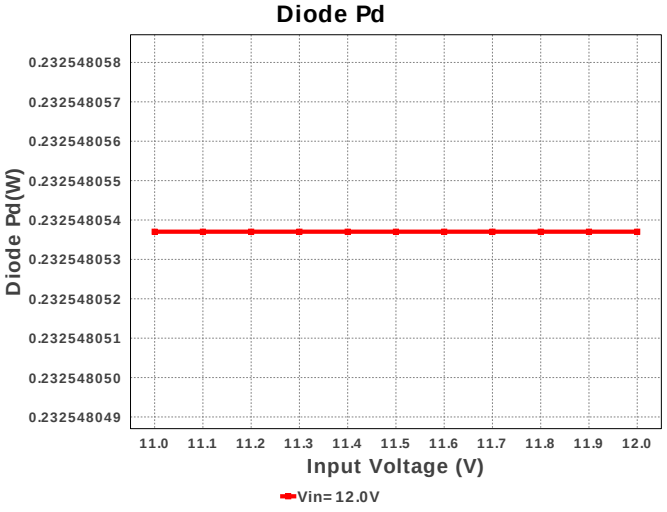


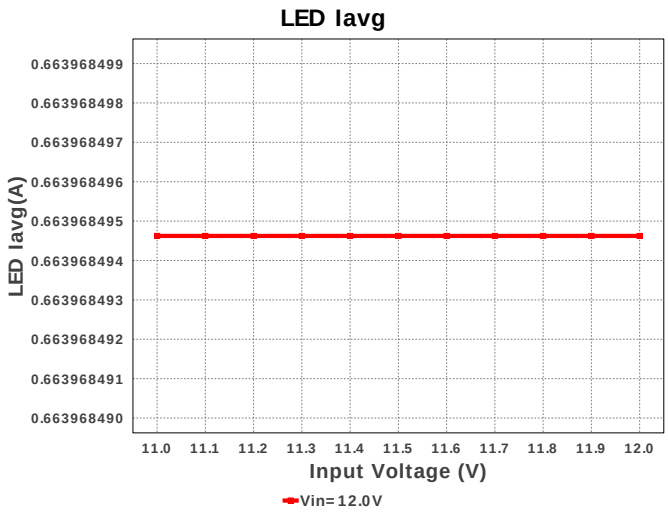



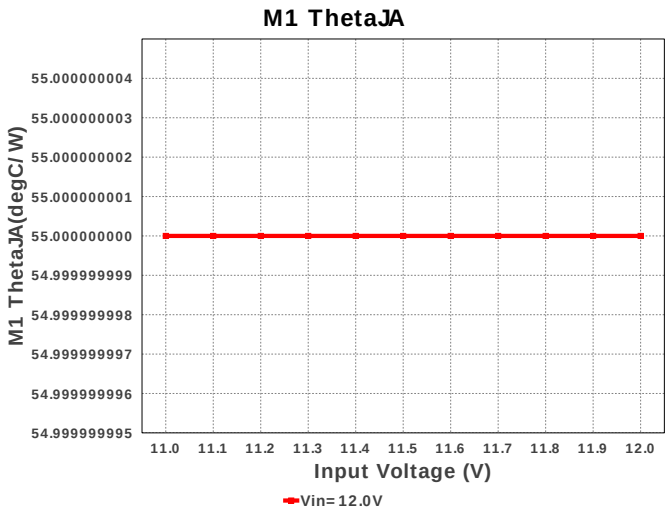



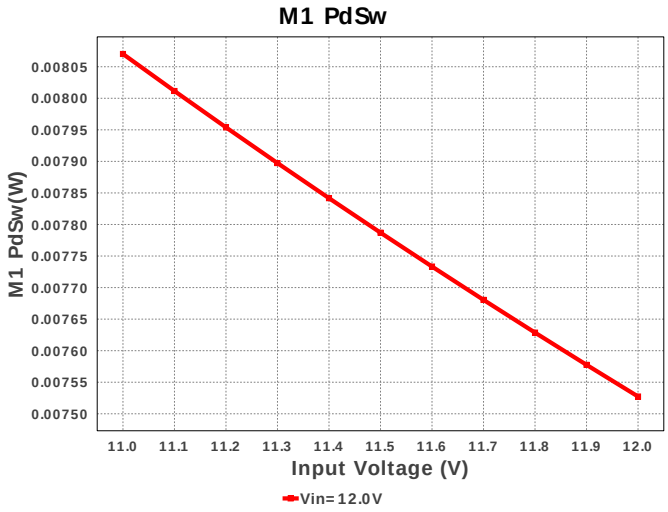






## Operating Values

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 1. | Cin IRMS | 119.405 mA | Current | Input capacitor RMS ripple current |
| 2. | Cout IRMS | 834.8 mA | Current | Output capacitor RMS ripple current |
| 3. | Iin Avg | 1.163 A | Current | Average input current |
| 4. | L Ipp | 413.63 mA | Current | Peak-to-peak inductor ripple current |
| 5. | L1 Irms | 1.733 A | Current | Inductor ripple current |
| 6. | LED Iavg | 663.968 mA | Current | LED Average Current |
| 7. | LED Ipp | 920.953 µA | Current | LED Ripple Current |
| 8. | M1 Irms | 1.775 A | Current | M1 MOSFET Irms |
| 9. | SW Ipk | 1.936 A | Current | Peak switch current |
| 10. | BOM Count | 29 | General | Total Design BOM count |
| 11. | FootPrint | 420.0 $mm^2$ | General | Total Foot Print Area of BOM components |
| 12. | Frequency | 546.358 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 | 12.524 W | General | Total output power |
| 19. | Total BOM | $7.32 | General | Total BOM Cost |
| 20. | D1 Tj | 55.402 degC | Op_Point | D1 junction temperature |
| 21. | Vout OP | 18.863 V | Op_Point | Operational Output Voltage |
| 22. | Duty Cycle | 63.627 % | Op_point | Duty cycle |
| 23. | Efficiency | 89.73 % | Op_point | Steady state efficiency |
| 24. | IC Tj | 38.663 degC | Op_point | IC junction temperature |
| 25. | ICThetaJA | 37.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 26. | IOUT_OP | 663.97 mA | Op_point | Iout operating point |
| 27. | LED Rd | 14.56 Ohm | Op_point | LED DynamicResistance |
| 28. | LED Vf | 18.863 V | Op_point | Total LED Forward Calculated Voltage |
| 29. | M1 TjOP | 32.521 degC | Op_point | M1 MOSFET junction temperature |
| 30. | VIN_OP | 12.0 V | Op_point | Vin operating point |
| 31. | Cin Pd | 32.165 µW | Power | Input capacitor power dissipation |

| # | Name | Value | Category | Description |
|---|---|---|---|---|
| 32. | Cout Pd | 1.045 mW | Power | Output capacitor power dissipation |
| 33. | Diode Pd | 254.023 mW | Power | Diode power dissipation |
| 34. | IC Pd | 234.146 mW | Power | IC power dissipation |
| 35. | L Pd | 360.368 mW | Power | Inductor power dissipation |
| 36. | LED Pd | 12.524 W | Power | LED Power Dissipation |
| 37. | M1 Pd | 50.411 mW | Power | M1 MOSFET total power dissipation |
| 38. | M1 PdCond | 0.0 W | Power | M1 MOSFET conduction losses |
| 39. | M1 PdSw | 50.411 mW | Power | M1 MOSFET switching losses |
| 40. | Total Pd | 1.433 W | Power | Total Power Dissipation |
| 41. | Total LED load Rd | 14.56 Ohm | | Total LED Load DynamicResistance |
| 42. | Vout Tolerance | 132.54 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 | 12.0 | Maximum input voltage |
| 3. | VinMin | 12.0 | Minimum input voltage |
| 4. | Vout | 11.5 | Output Voltage |
| 5. | application | LED_DRIVER | LED Application |
| 6. | base_pn | LM3429 | Texas Instruments Base Part Number |
| 7. | isLEDArchitect | N | LED Architect Project |
| 8. | ledparallel | 1.0 | Number of LED in parallel |
| 9. | ledpartnumber | XHP50A-00-0000-0D00UHCB | 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. LM3429 Product Folder : http://www.ti.com/product/LM3429 : contains the data sheet and other resources.