

# WEBENCH® Power Architect

## Project Report

Project : 3496425/3 : PA\_Project\_0 (modified from 0)  
 Created : 2016-07-19 01:08:03.627  
 Optimize project optFactor=3

### Project Summary

|                                   |           |
|-----------------------------------|-----------|
| 1. Total System Efficiency        | 86.38 %   |
| 2. Total System BOM Count         | 12.0      |
| 3. Total System Footprint         | 175.0 mm2 |
| 4. Total System BOM Cost          | \$1.23    |
| 5. Total System Power Dissipation | 260.2 mW  |

--> Launch WEBENCH Power Architect.

## Sequencer Flag Table

| Supply   | Sequencer Flag | Load   | Load Name |
|----------|----------------|--------|-----------|
| SUPPLY_1 | 0              | LOAD_1 | LOAD #1   |

## Power Supplies

| #  | Name     | NSID      | Description                                                                      | Vout  | Iout  | Efficiency | Foot-print | Cost   | Design | Page |
|----|----------|-----------|----------------------------------------------------------------------------------|-------|-------|------------|------------|--------|--------|------|
| 1. | SUPPLY_1 | TPS54335A | Switcher : 28V, 3A, Low Iq, Synchronous, monolithic buck converter with Eco-mode | 3.3 V | 0.5 A | 86.4%      | 175        | \$1.23 | 29     | 4    |

## Power Loads

| #  | Name    | VLoad | ILoad | Description   |
|----|---------|-------|-------|---------------|
| 1. | LOAD #1 | 3.3 V | 0.5 A | VoutRipple=5% |

## Project Diagram

WEBENCH® Power Architect Project ID : 3 PA\_Project\_0 (modified from 0) Power Architect 2016-07-19 01:08:03.627



## Electrical Procurement BOM

| Manufacturer      | Part Number        | Description   | Quantity | Budgetary Price | Footprint<br>(mm <sup>2</sup> ) |
|-------------------|--------------------|---------------|----------|-----------------|---------------------------------|
| Kemet             | C0805C104K5RACTU   | 0805          | 2        | \$0.01          | 14                              |
| Yageo America     | CC0805KRX7R9BB222  | 0805          | 1        | \$0.01          | 7                               |
| Vishay-Dale       | CRCW0402100KFKED   | 0402          | 1        | \$0.01          | 3                               |
| Vishay-Dale       | CRCW040232K4FKED   | 0402          | 1        | \$0.01          | 3                               |
| Vishay-Dale       | CRCW0402825RFKED   | 0402          | 1        | \$0.01          | 3                               |
| Vishay-Dale       | CRCW040295K3FKED   | 0402          | 1        | \$0.01          | 3                               |
| MuRata            | GRM155C80J124KE01D | 0402          | 1        | \$0.02          | 3                               |
| MuRata            | GRM31CC80J476KE18L | 1206_190      | 1        | \$0.10          | 11                              |
| MuRata            | GRM31CR61E106KA12L | 1206_190      | 1        | \$0.05          | 11                              |
| NIC Components    | NPI54C390KTRF      | IND_NPI54C    | 1        | \$0.09          | 61                              |
| Texas Instruments | TPS54335ADDAR      | R-PDSO-<br>G8 | 1        | \$0.90          | 57                              |
| Total             |                    |               | 12       | \$1.23          | 175.24                          |

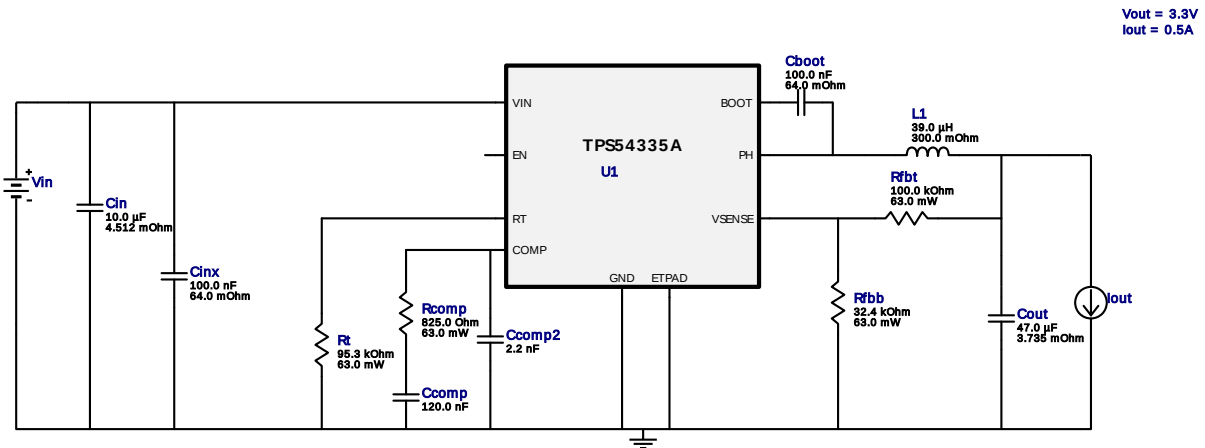


Vout = 3.3V  
Iout = 0.5A

Device = TPS54335ADDAR  
Topology = Buck  
Created = 7/19/16 1:08:03 AM  
BOM Cost = \$1.23  
BOM Count = 12  
Total Pd = 0.26W

# WEBENCH<sup>®</sup> Design Report

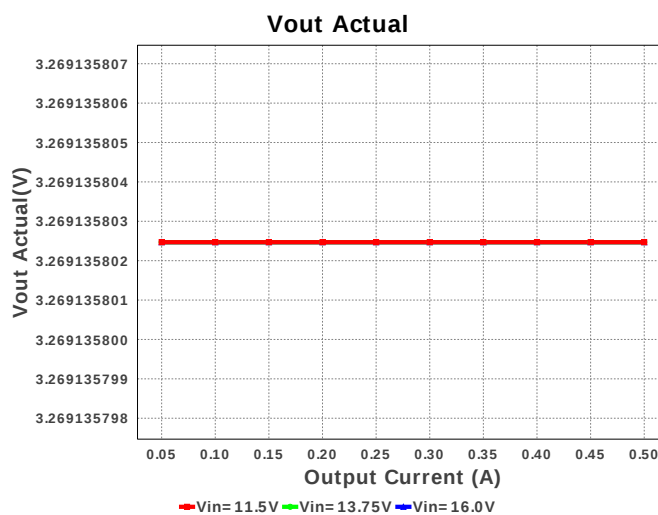
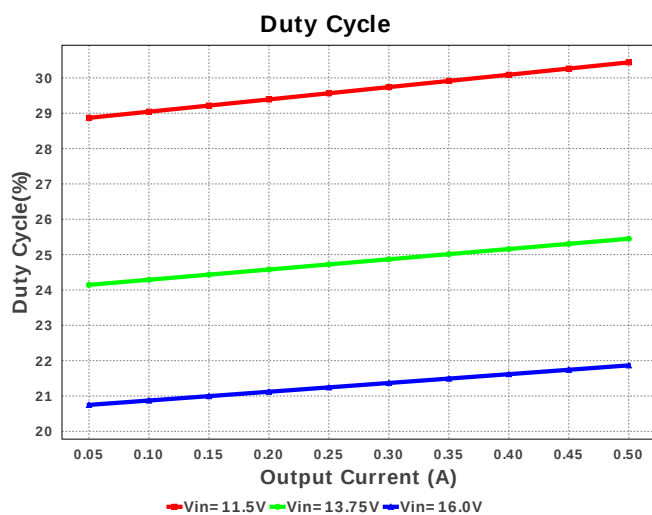
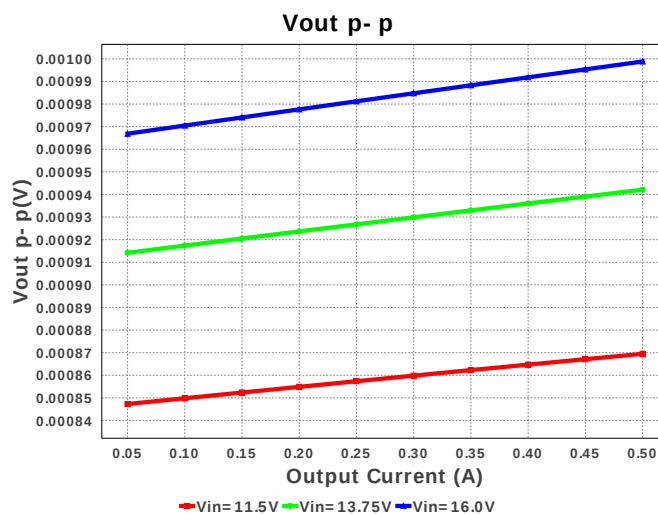
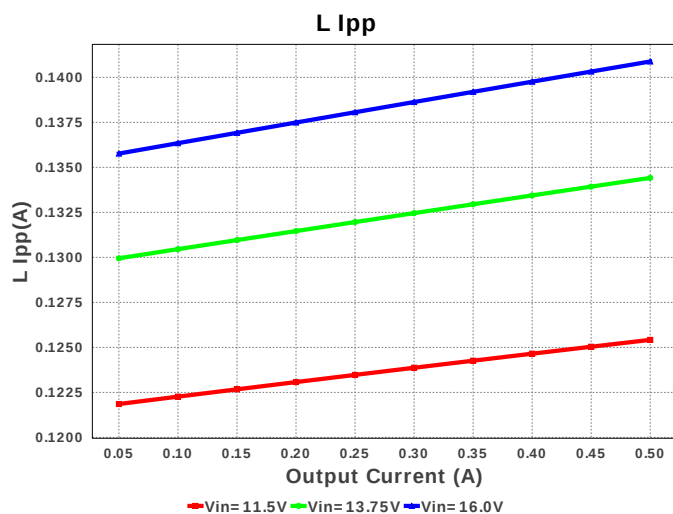
Design : 3496425/29 TPS54335ADDAR  
TPS54335ADDAR 11.5V-16.0V to 3.30V @ 0.5A

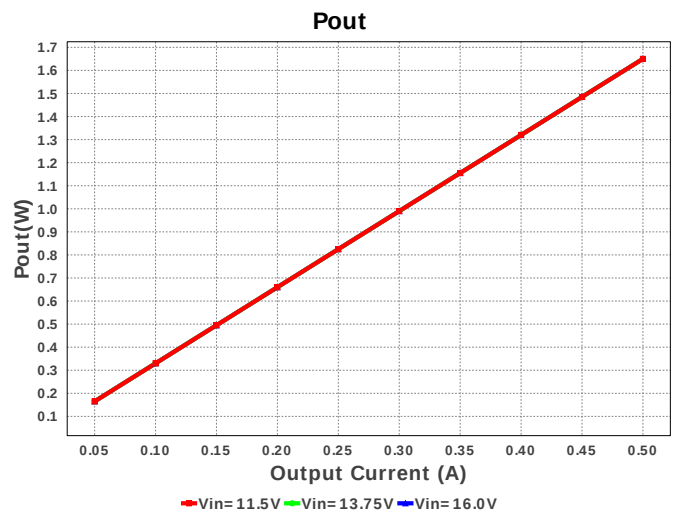
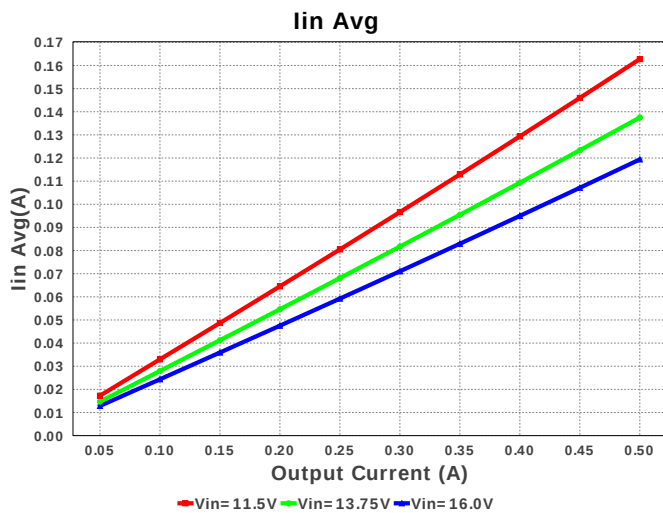
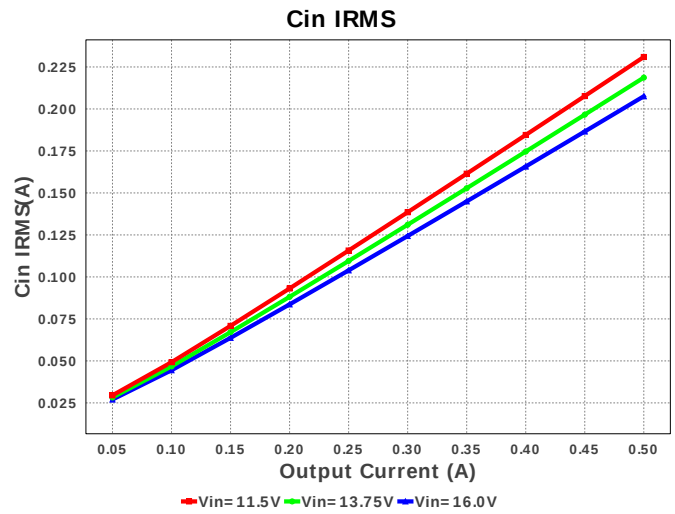
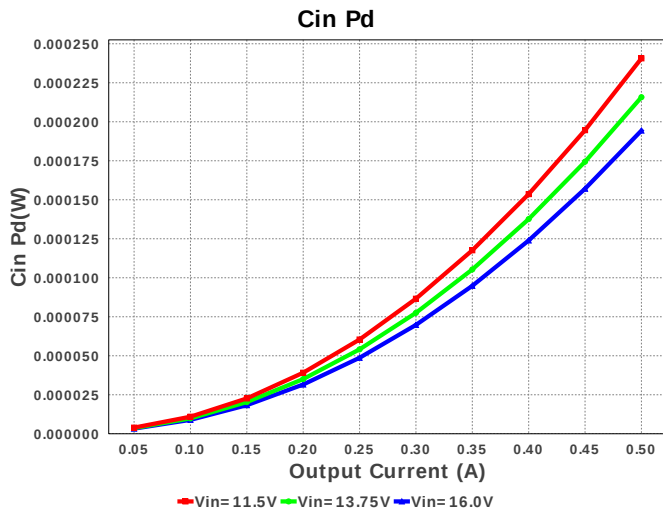
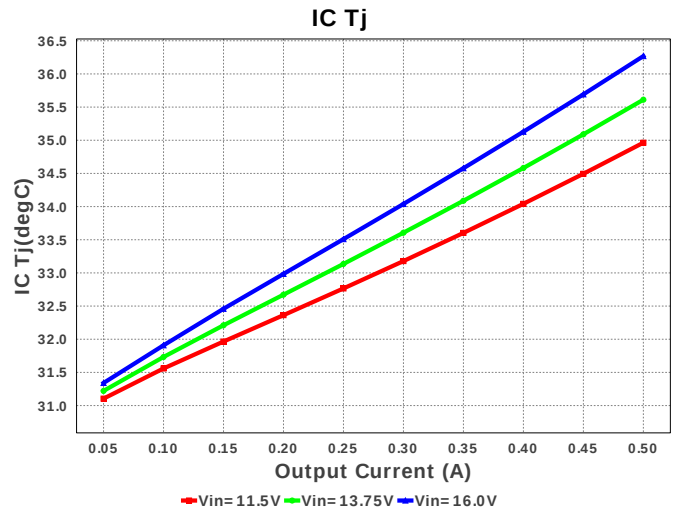
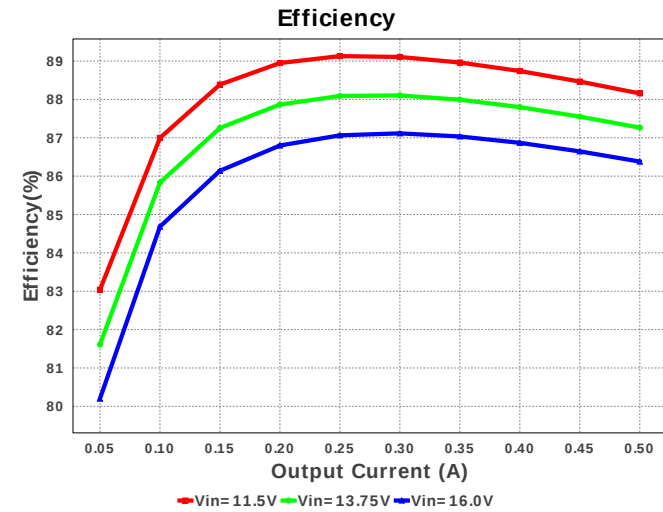


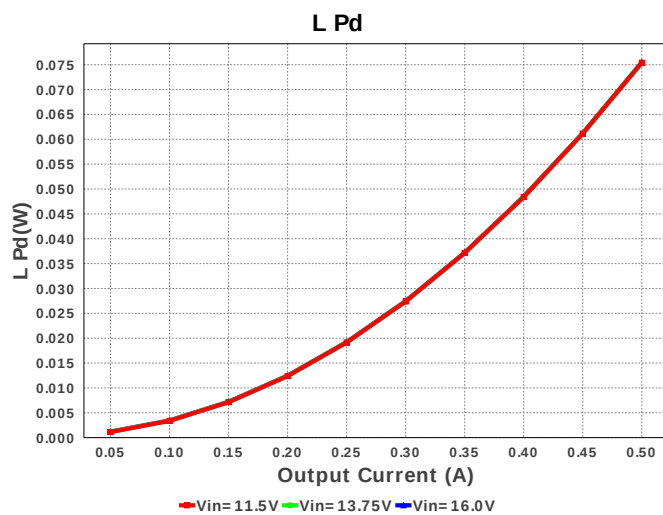
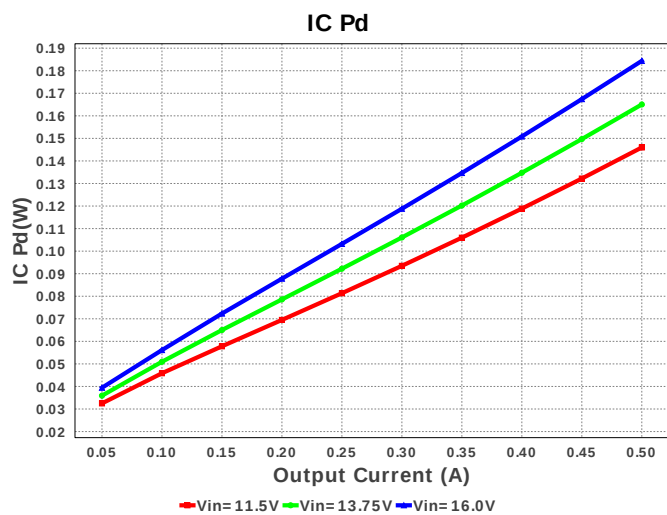
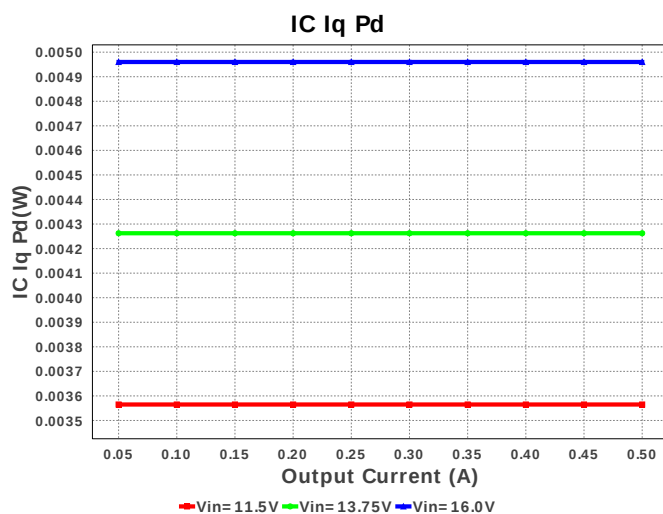
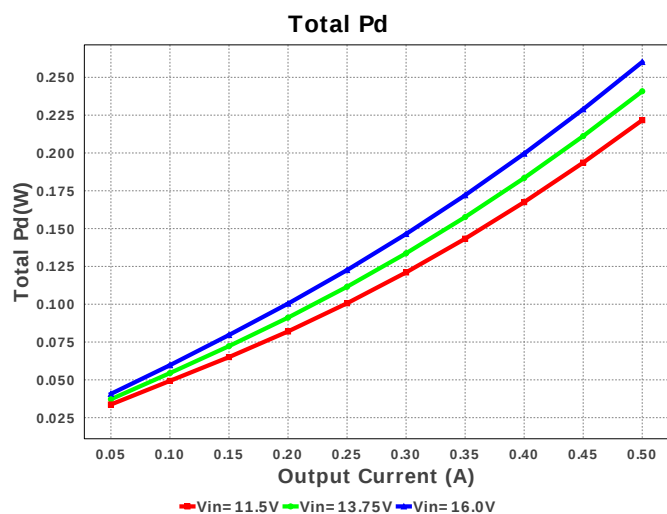
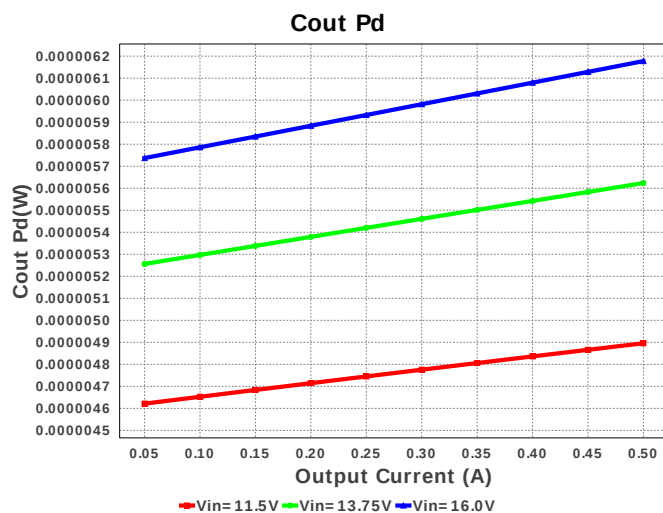
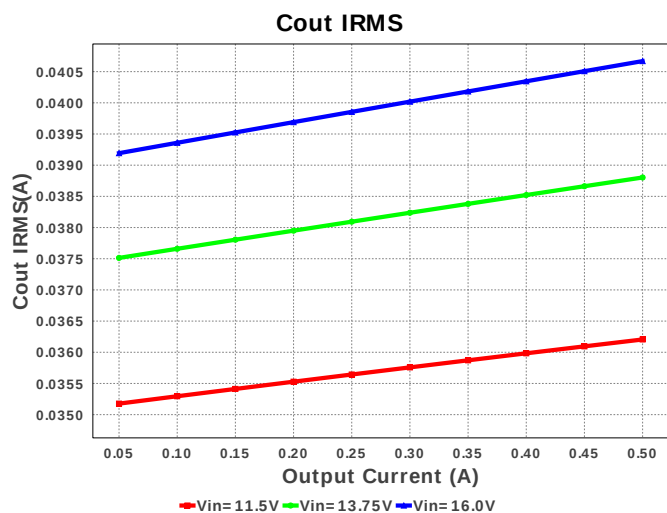
## Electrical BOM

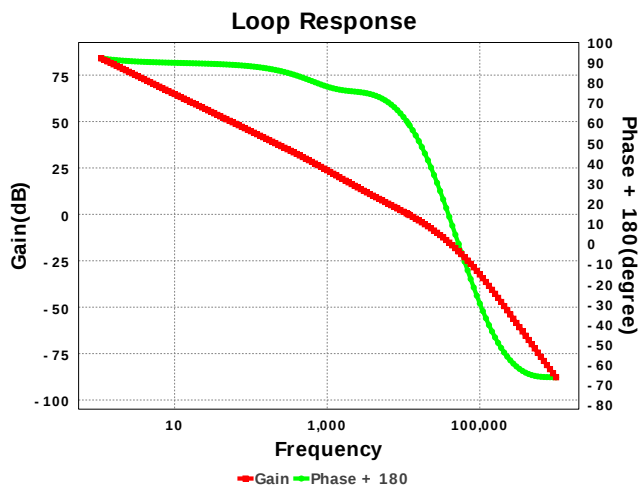
| #   | Name   | Manufacturer   | Part Number                          | Properties                                                      | Qty | Price  | Footprint                                                                                                              |
|-----|--------|----------------|--------------------------------------|-----------------------------------------------------------------|-----|--------|------------------------------------------------------------------------------------------------------------------------|
| 1.  | Cboot  | 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 | <br>0805 7 mm <sup>2</sup>        |
| 2.  | Ccomp  | MuRata         | GRM155C80J124KE01D<br>Series= X6S    | Cap= 120.0 nF<br>VDC= 6.3 V<br>IRMS= 0.0 A                      | 1   | \$0.02 | <br>0402 3 mm <sup>2</sup>        |
| 3.  | Ccomp2 | Yageo America  | CC0805KRX7R9BB222<br>Series= X7R     | Cap= 2.2 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>        |
| 4.  | 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 | 1   | \$0.05 | <br>1206_190 11 mm <sup>2</sup>   |
| 5.  | Cinx   | 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 | <br>0805 7 mm <sup>2</sup>        |
| 6.  | Cout   | MuRata         | GRM31CC80J476KE18L<br>Series= X6S    | Cap= 47.0 uF<br>ESR= 3.735 mOhm<br>VDC= 6.3 V<br>IRMS= 4.0522 A | 1   | \$0.10 | <br>1206_190 11 mm <sup>2</sup>   |
| 7.  | L1     | NIC Components | NPI54C390KTRF                        | L= 39.0 uH<br>DCR= 300.0 mOhm                                   | 1   | \$0.09 | <br>IND_NPI54C 61 mm <sup>2</sup> |
| 8.  | Rcomp  | Vishay-Dale    | CRCW0402825RFKED<br>Series= CRCW..e3 | Res= 825.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>        |
| 9.  | Rfbb   | 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 3 mm <sup>2</sup>        |
| 10. | Rfbt   | Vishay-Dale    | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 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              |
|-----|------|-------------------|--------------------------------------|-----------------------------------------------------|-----|--------|------------------------|
| 11. | Rt   | Vishay-Dale       | CRCW040295K3FKED<br>Series= CRCW..e3 | Res= 95.3 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | 0402 3 mm <sup>2</sup> |
| 12. | U1   | Texas Instruments | TPS54335ADDAR                        | Switcher                                            | 1   | \$0.90 |                        |

R-PDSO-G8 57 mm<sup>2</sup>







## Operating Values

| #   | Name                | Value                 | Category | Description                                                                                |
|-----|---------------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS            | 207.545 mA            | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS           | 40.669 mA             | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | Iin Avg             | 119.38 mA             | Current  | Average input current                                                                      |
| 4.  | L Ipp               | 140.88 mA             | Current  | Peak-to-peak inductor ripple current                                                       |
| 5.  | BOM Count           | 12                    | General  | Total Design BOM count                                                                     |
| 6.  | FootPrint           | 175.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 7.  | Frequency           | 496.814 kHz           | General  | Switching frequency                                                                        |
| 8.  | IC Tolerance        | 12.0 mV               | General  | IC Feedback Tolerance                                                                      |
| 9.  | Pout                | 1.65 W                | General  | Total output power                                                                         |
| 10. | Total BOM           | \$1.23                | General  | Total BOM Cost                                                                             |
| 11. | ICThetaJA Effective | 34.0 degC/W           | Op_Point | Effective IC Junction-to-Ambient Thermal Resistance                                        |
| 12. | Low Freq Gain       | 83.987 dB             | Op_Point | Gain at 10Hz                                                                               |
| 13. | Vout Actual         | 3.269 V               | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 14. | Vout OP             | 3.3 V                 | Op_Point | Operational Output Voltage                                                                 |
| 15. | Cross Freq          | 11.549 kHz            | Op_point | Bode plot crossover frequency                                                              |
| 16. | Duty Cycle          | 21.867 %              | Op_point | Duty cycle                                                                                 |
| 17. | Efficiency          | 86.38 %               | Op_point | Steady state efficiency                                                                    |
| 18. | Gain Marg           | -19.9 dB              | Op_point | Bode Plot Gain Margin                                                                      |
| 19. | IC Tj               | 36.269 degC           | Op_point | IC junction temperature                                                                    |
| 20. | IOUT_OP             | 500.0 mA              | Op_point | Iout operating point                                                                       |
| 21. | Phase Marg          | 59.973 deg            | Op_point | Bode Plot Phase Margin                                                                     |
| 22. | VIN_OP              | 16.0 V                | Op_point | Vin operating point                                                                        |
| 23. | Vout p-p            | 998.824 $\mu$ V       | Op_point | Peak-to-peak output ripple voltage                                                         |
| 24. | Cin Pd              | 194.353 $\mu$ W       | Power    | Input capacitor power dissipation                                                          |
| 25. | Cout Pd             | 6.178 $\mu$ W         | Power    | Output capacitor power dissipation                                                         |
| 26. | IC Iq Pd            | 4.96 mW               | Power    | IC Iq Pd                                                                                   |
| 27. | IC Pd               | 184.376 mW            | Power    | IC power dissipation                                                                       |
| 28. | L Pd                | 75.496 mW             | Power    | Inductor power dissipation                                                                 |
| 29. | Total Pd            | 260.153 mW            | Power    | Total Power Dissipation                                                                    |
| 30. | Vout Tolerance      | 3.049 %               |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value     | Description                        |
|----|---------|-----------|------------------------------------|
| 1. | Iout    | 500.0 m   | Maximum Output Current             |
| 2. | VinMax  | 16.0      | Maximum input voltage              |
| 3. | VinMin  | 11.5      | Minimum input voltage              |
| 4. | Vout    | 3.3       | Output Voltage                     |
| 5. | base_pn | TPS54335A | Texas Instruments Base Part Number |
| 6. | source  | DC        | Input Source Type                  |
| 7. | ta      | 30.0      | Ambient temperature                |

## Design Assistance

1. TPS54335A Product Folder : <http://www.ti.com/product/TPS54335A> : contains the data sheet and other resources.

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