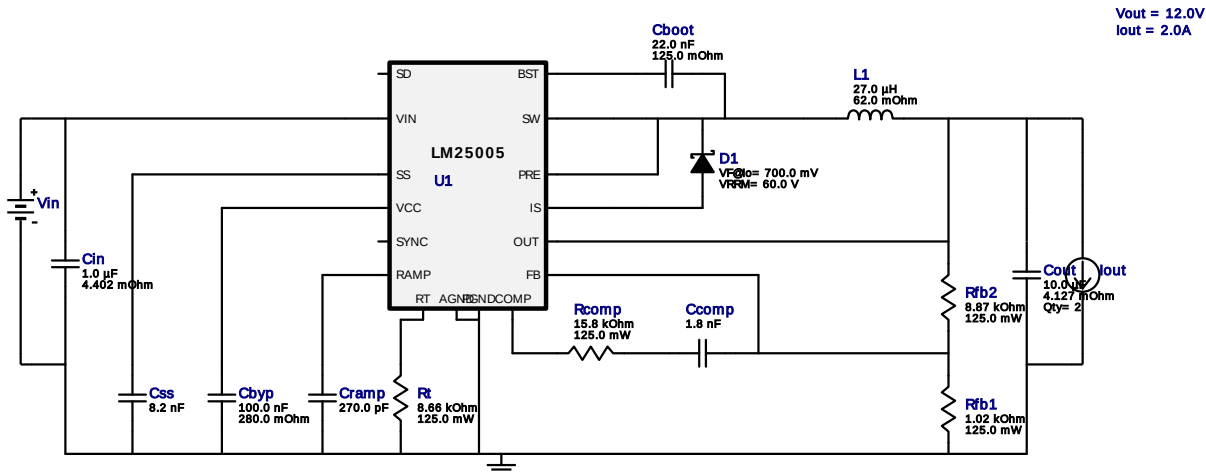


## WEBENCH® Design Report

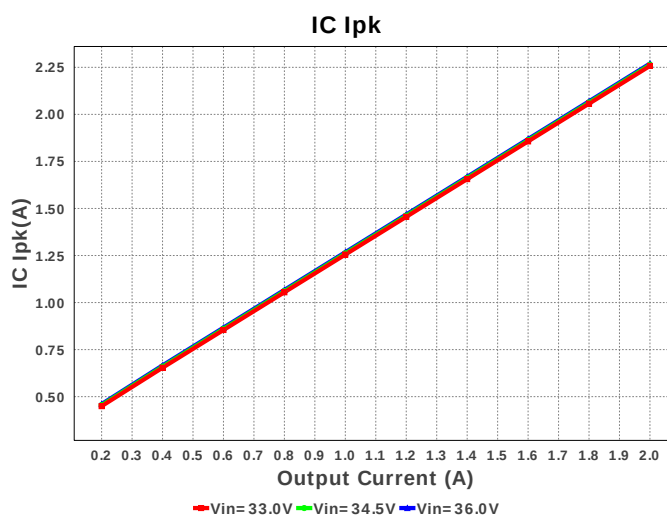
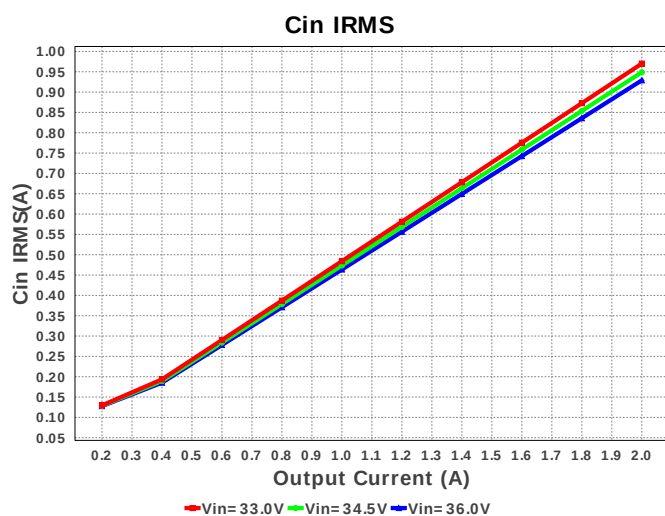
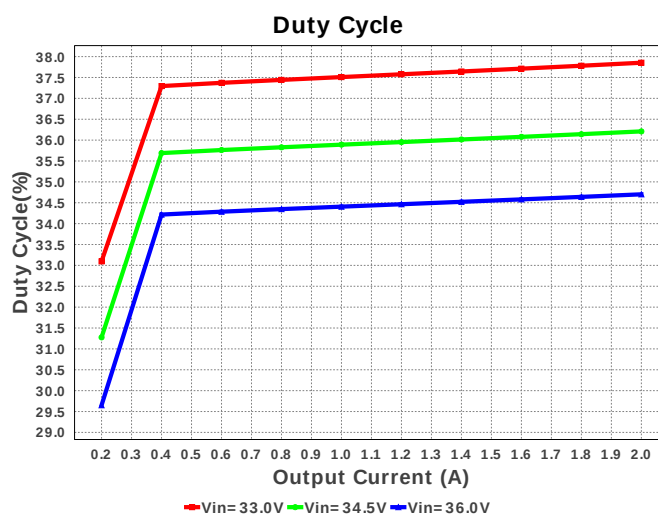
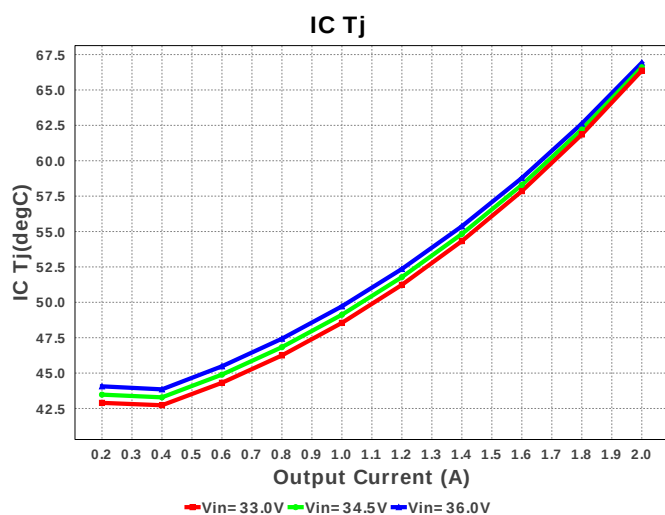
Design : 4742119/2 LM25005MHX/NOPB  
LM25005MHX/NOPB 33.0V-36.0V to 12.00V @ 2.0A

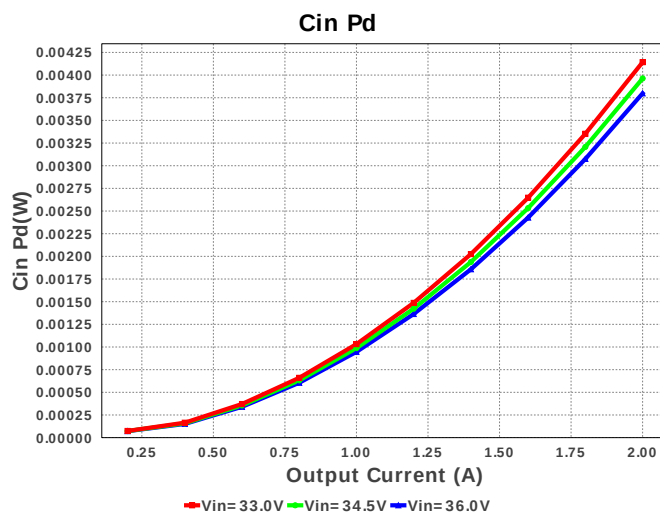
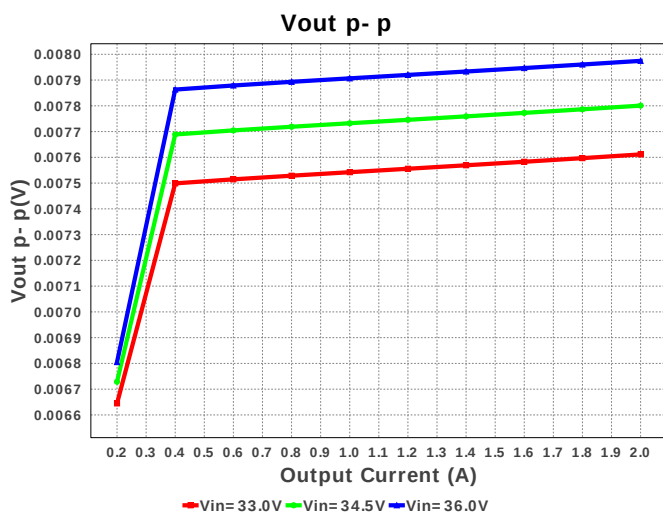
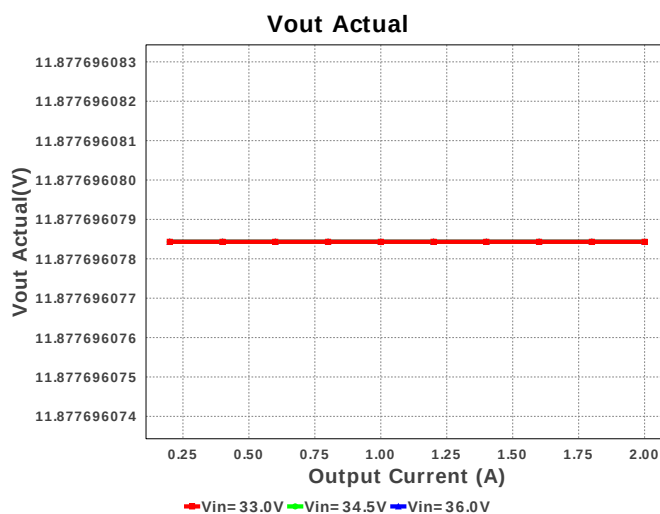
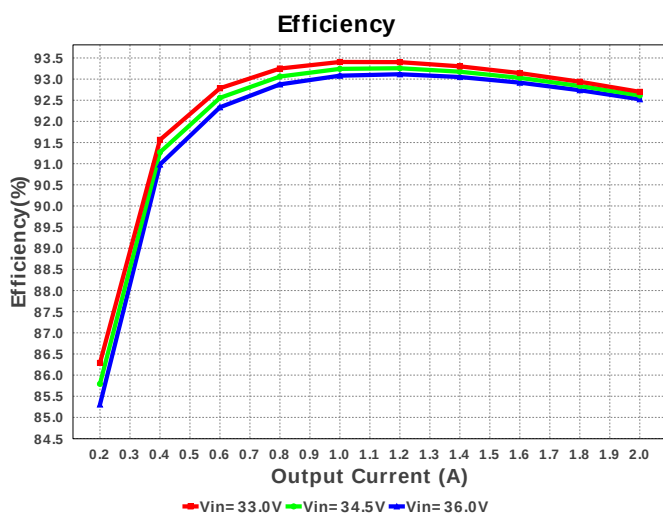
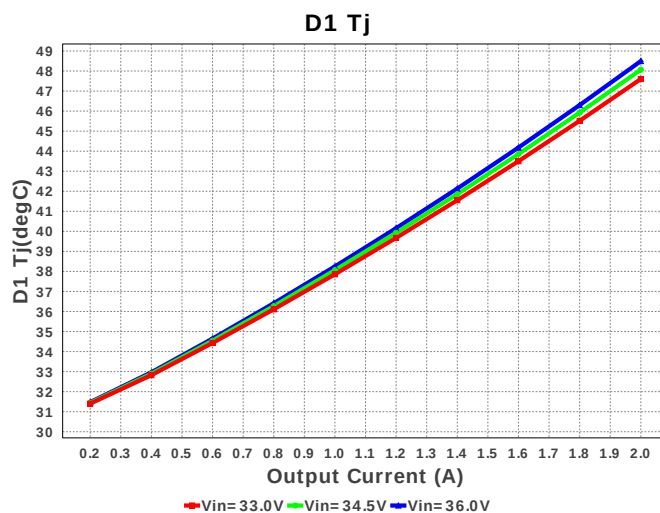
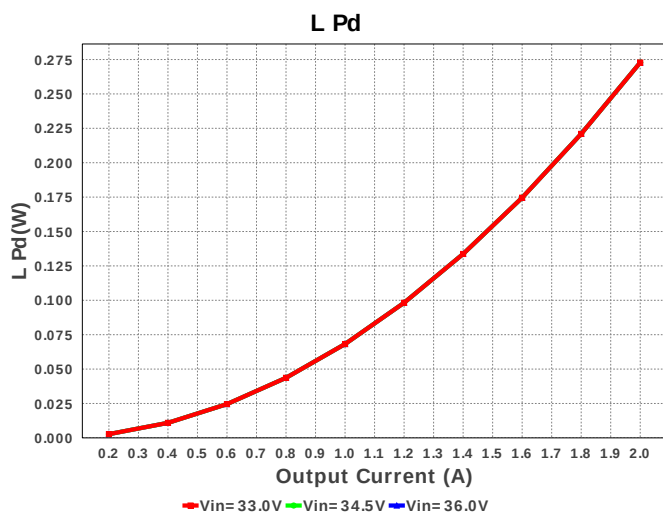


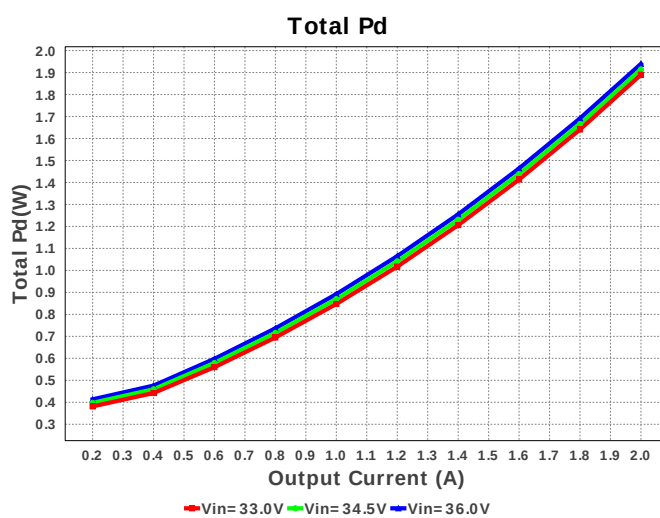
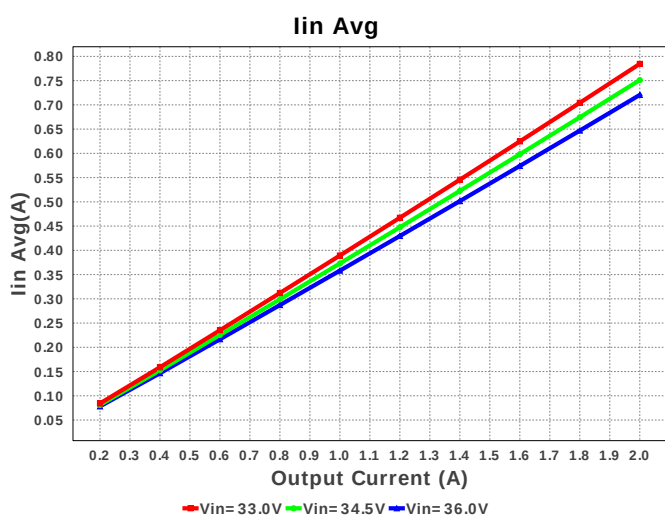
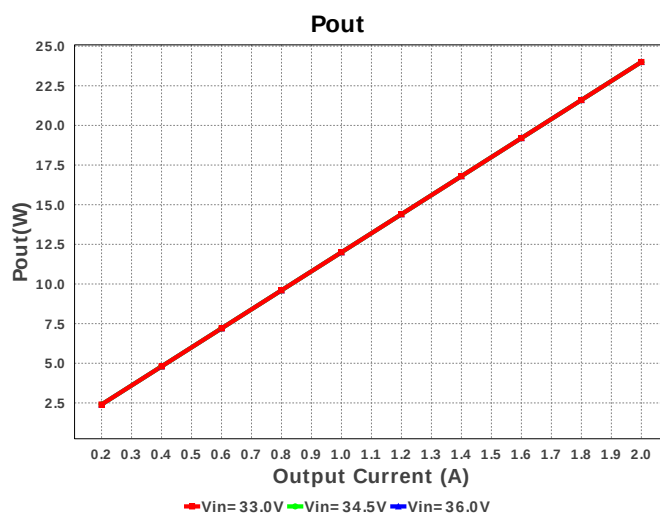
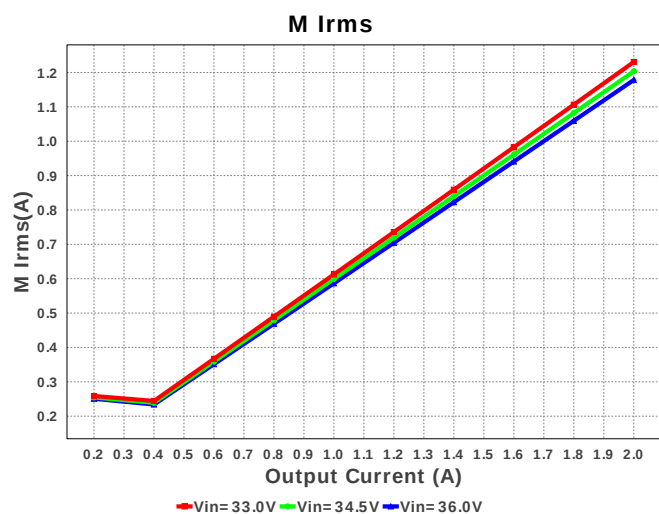
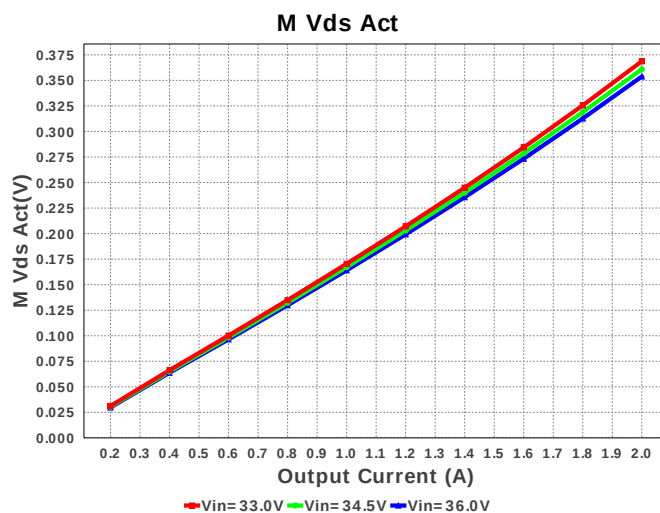
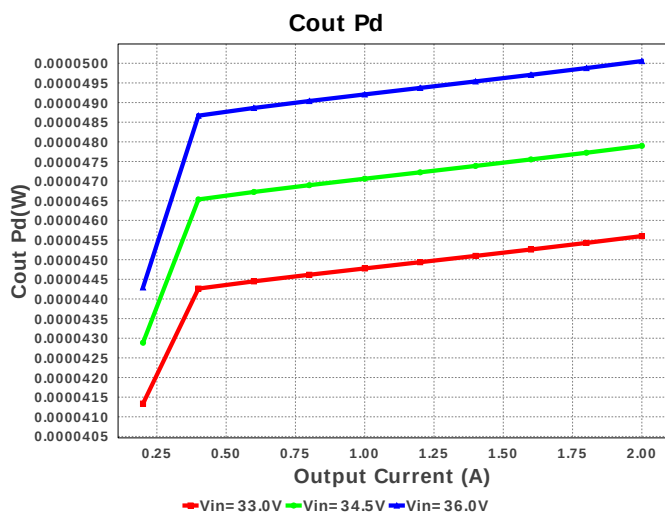
## Electrical BOM

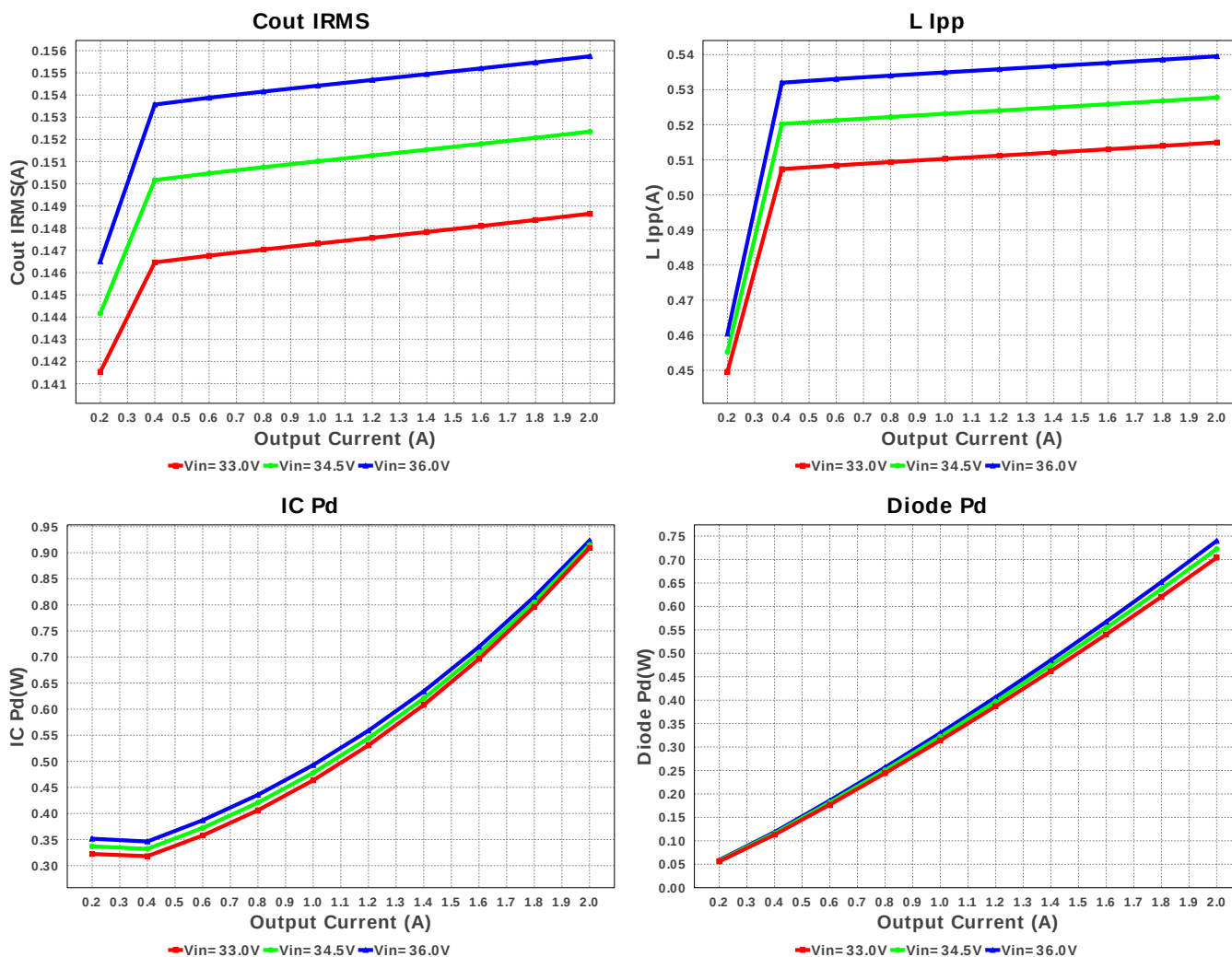
| #  | Name  | Manufacturer  | Part Number                       | Properties                                                        | Qty | Price  | Footprint                   |
|----|-------|---------------|-----------------------------------|-------------------------------------------------------------------|-----|--------|-----------------------------|
| 1. | Cboot | Kemet         | C0805C223K5RACTU<br>Series= X7R   | Cap= 22.0 nF<br>ESR= 125.0 mOhm<br>VDC= 50.0 V<br>IRMS= 645.0 mA  | 1   | \$0.01 | 0805 7 mm <sup>2</sup>      |
| 2. | Cbyp  | 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>      |
| 3. | Ccomp | MuRata        | GRM033R71C182KA88D<br>Series= X7R | Cap= 1.8 nF<br>VDC= 16.0 V<br>IRMS= 0.0 A                         | 1   | \$0.01 | 0201 2 mm <sup>2</sup>      |
| 4. | Cin   | MuRata        | GRM21BR71H105KA12L<br>Series= X7R | Cap= 1.0 uF<br>ESR= 4.402 mOhm<br>VDC= 50.0 V<br>IRMS= 1.677 A    | 1   | \$0.05 | 0805 7 mm <sup>2</sup>      |
| 5. | Cout  | MuRata        | GRM21BR61C106KE15L<br>Series= X5R | Cap= 10.0 uF<br>ESR= 4.127 mOhm<br>VDC= 16.0 V<br>IRMS= 2.46634 A | 2   | \$0.03 | 0805 7 mm <sup>2</sup>      |
| 6. | Cramp | Yageo America | CC0805KRX7R9BB271<br>Series= X7R  | Cap= 270.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 | 0805 7 mm <sup>2</sup>      |
| 7. | Css   | MuRata        | GRM155R71E822KA01D<br>Series= X7R | Cap= 8.2 nF<br>VDC= 25.0 V<br>IRMS= 0.0 A                         | 1   | \$0.01 | 0402 3 mm <sup>2</sup>      |
| 8. | D1    | Diodes Inc.   | B260A-13-F                        | VF@Io= 700.0 mV<br>VRRM= 60.0 V                                   | 1   | \$0.09 | SMA 37 mm <sup>2</sup>      |
| 9. | L1    | Bourns        | SRR1208-270ML                     | L= 27.0 uH<br>DCR= 62.0 mOhm                                      | 1   | \$0.37 | SRR1208 216 mm <sup>2</sup> |

| #   | Name  | Manufacturer      | Part Number                     | Properties                                           | Qty | Price  | Footprint                                                                                                     |
|-----|-------|-------------------|---------------------------------|------------------------------------------------------|-----|--------|---------------------------------------------------------------------------------------------------------------|
| 10. | Rcomp | Panasonic         | ERJ-6ENF1582V<br>Series= ERJ-6E | Res= 15.8 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 11. | Rfb1  | Panasonic         | ERJ-6ENF1021V<br>Series= ERJ-6E | Res= 1.02 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 12. | Rfb2  | Panasonic         | ERJ-6ENF8871V<br>Series= ERJ-6E | Res= 8.87 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 13. | Rt    | Panasonic         | ERJ-6ENF8661V<br>Series= ERJ-6E | Res= 8.66 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 14. | U1    | Texas Instruments | LM25005MHX/NOPB                 | Switcher                                             | 1   | \$1.40 |  MXA20A 71 mm <sup>2</sup> |









## Operating Values

| #   | Name           | Value                 | Category | Description                                                                                |
|-----|----------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS       | 928.912 mA            | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS      | 155.749 mA            | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | IC Ipk         | 2.268 A               | Current  | Peak switch current in IC                                                                  |
| 4.  | Iin Avg        | 720.54 mA             | Current  | Average input current                                                                      |
| 5.  | L Ipp          | 539.53 mA             | Current  | Peak-to-peak inductor ripple current                                                       |
| 6.  | M1 Irms        | 1.178 A               | Current  | Q lavg                                                                                     |
| 7.  | BOM Count      | 15                    | General  | Total Design BOM count                                                                     |
| 8.  | FootPrint      | 397.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 9.  | Frequency      | 571.723 kHz           | General  | Switching frequency                                                                        |
| 10. | IC Tolerance   | 18.0 mV               | General  | IC Feedback Tolerance                                                                      |
| 11. | M Vds Act      | 353.813 mV            | General  | Voltage drop across the MosFET                                                             |
| 12. | Pout           | 24.0 W                | General  | Total output power                                                                         |
| 13. | Total BOM      | \$2.06                | General  | Total BOM Cost                                                                             |
| 14. | D1 Tj          | 48.495 degC           | Op_Point | D1 junction temperature                                                                    |
| 15. | Vout Actual    | 11.878 V              | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 16. | Vout OP        | 12.0 V                | Op_Point | Operational Output Voltage                                                                 |
| 17. | Duty Cycle     | 34.702 %              | Op_point | Duty cycle                                                                                 |
| 18. | Efficiency     | 92.523 %              | Op_point | Steady state efficiency                                                                    |
| 19. | IC Tj          | 66.924 degC           | Op_point | IC junction temperature                                                                    |
| 20. | ICThetaJA      | 40.0 degC/W           | Op_point | IC junction-to-ambient thermal resistance                                                  |
| 21. | IOUT_OP        | 2.0 A                 | Op_point | Iout operating point                                                                       |
| 22. | VIN_OP         | 36.0 V                | Op_point | Vin operating point                                                                        |
| 23. | Vout p-p       | 7.974 mV              | Op_point | Peak-to-peak output ripple voltage                                                         |
| 24. | Cin Pd         | 3.798 mW              | Power    | Input capacitor power dissipation                                                          |
| 25. | Cout Pd        | 50.056 $\mu$ W        | Power    | Output capacitor power dissipation                                                         |
| 26. | Diode Pd       | 739.805 mW            | Power    | Diode power dissipation                                                                    |
| 27. | IC Pd          | 923.092 mW            | Power    | IC power dissipation                                                                       |
| 28. | L Pd           | 272.8 mW              | Power    | Inductor power dissipation                                                                 |
| 29. | Total Pd       | 1.939 W               | Power    | Total Power Dissipation                                                                    |
| 30. | Vout Tolerance | 3.308 %               |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value   | Description            |
|----|---------|---------|------------------------|
| 1. | Iout    | 2.0     | Maximum Output Current |
| 2. | VinMax  | 36.0    | Maximum input voltage  |
| 3. | VinMin  | 33.0    | Minimum input voltage  |
| 4. | Vout    | 12.0    | Output Voltage         |
| 5. | base_pn | LM25005 | Base Product Number    |
| 6. | source  | DC      | Input Source Type      |
| 7. | Ta      | 30.0    | Ambient temperature    |

## Design Assistance

1. **LM25005** Product Folder : <http://www.ti.com/product/LM25005> : contains the data sheet and other resources.

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