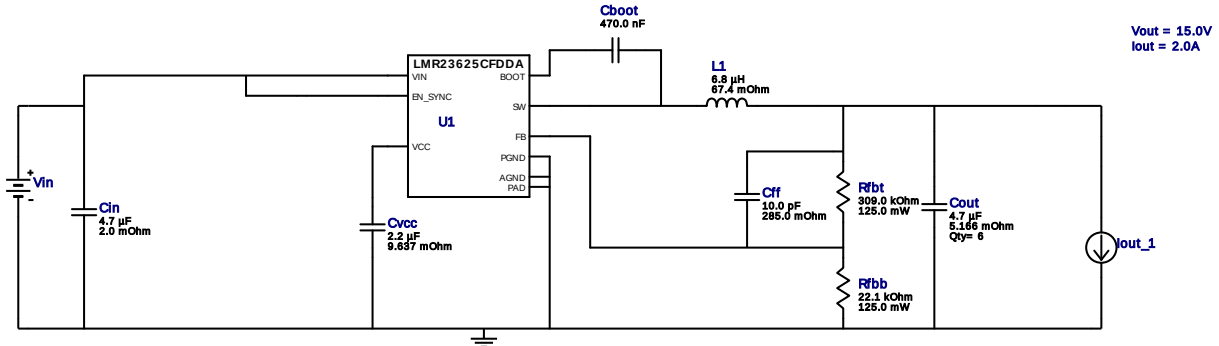


## WEBENCH® Design Report

Design : 4352199/34 LMR23625CFDDAR  
LMR23625CFDDAR 22.0V-30.0V to 15.00V @ 2.0A

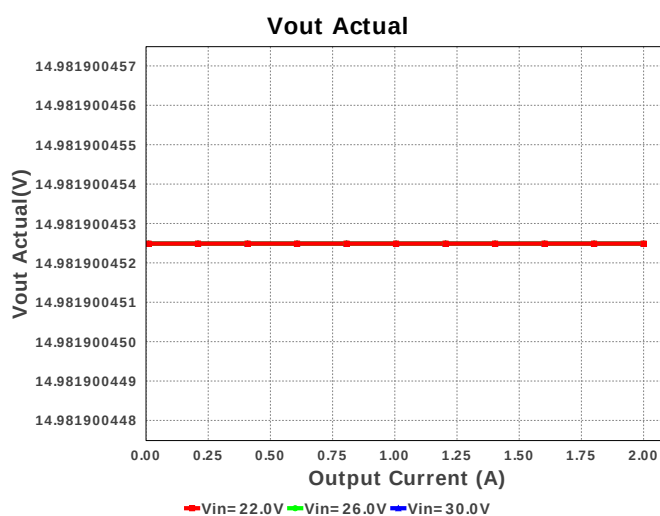
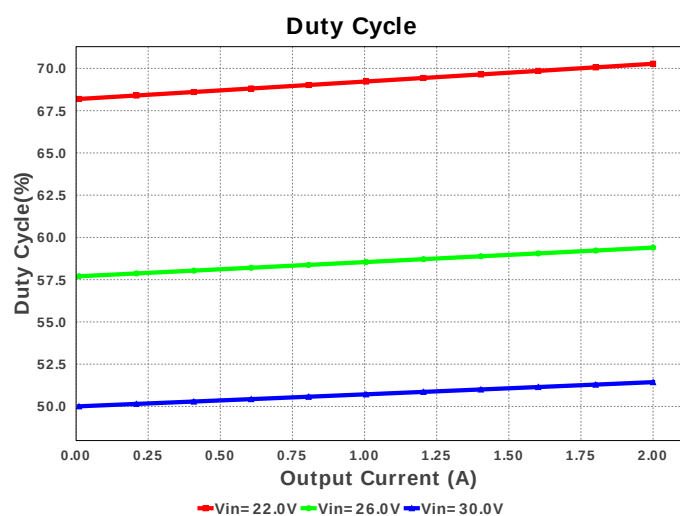
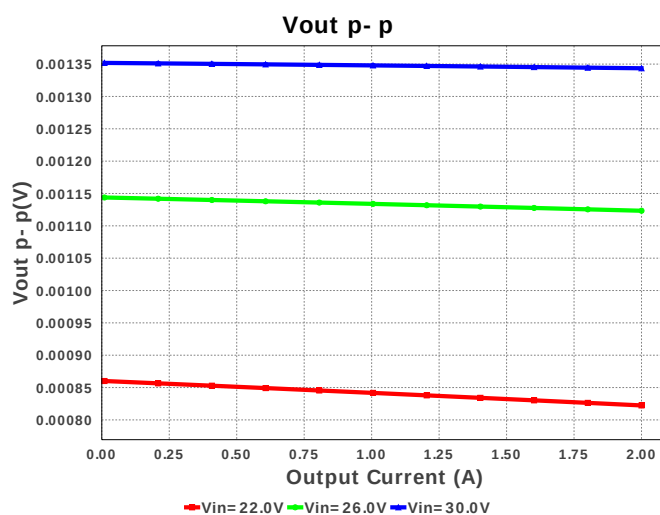
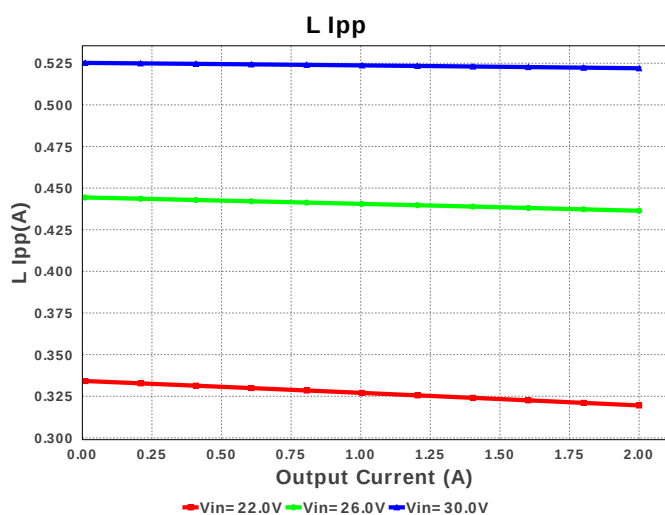


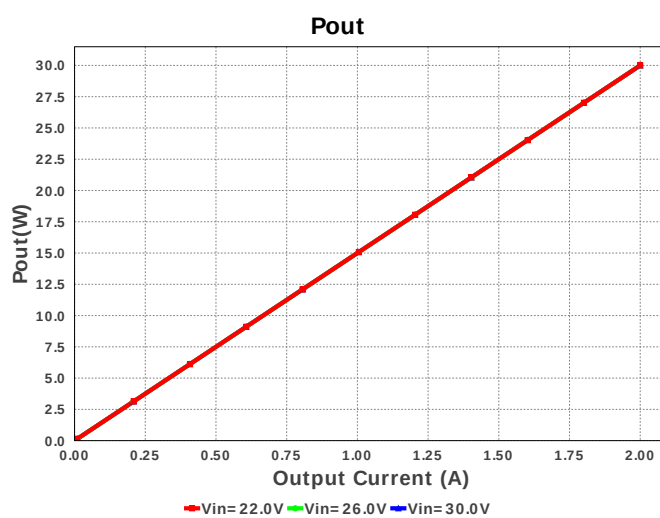
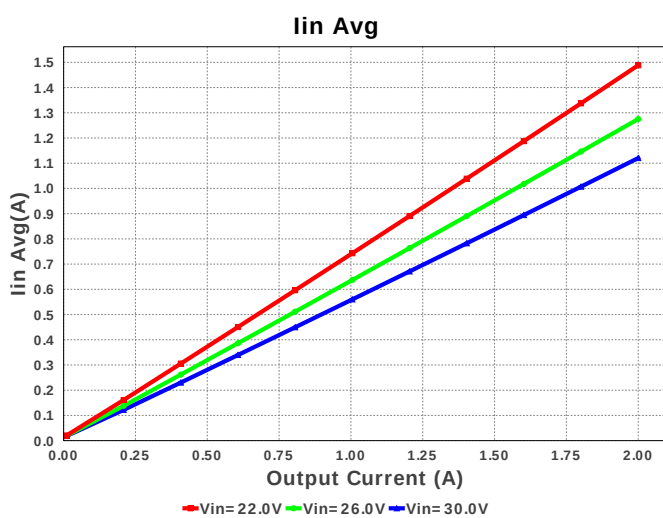
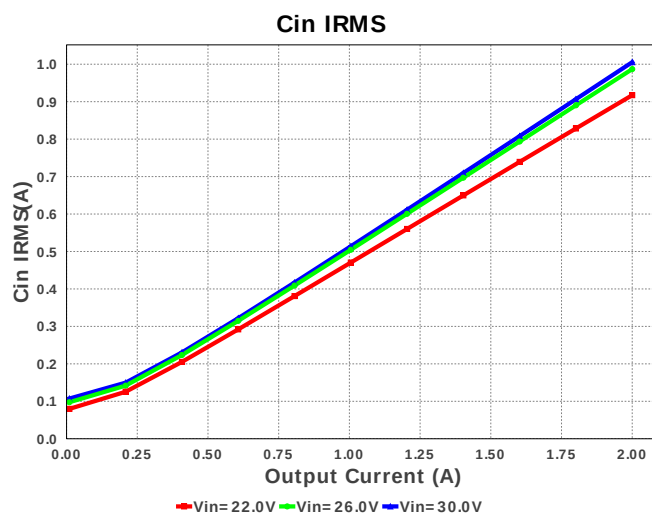
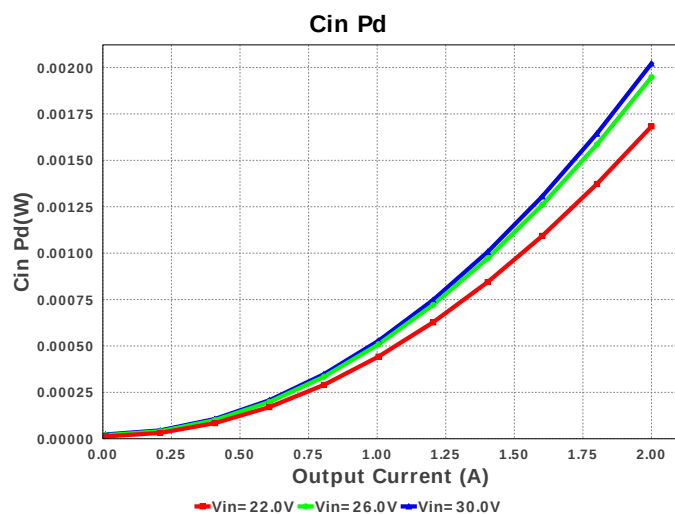
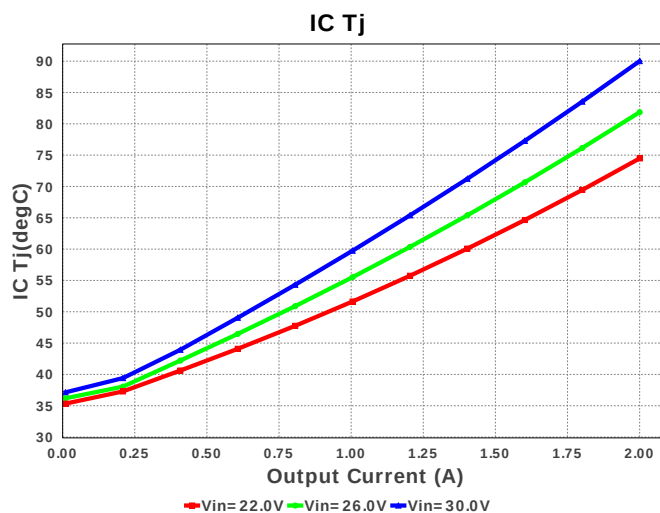
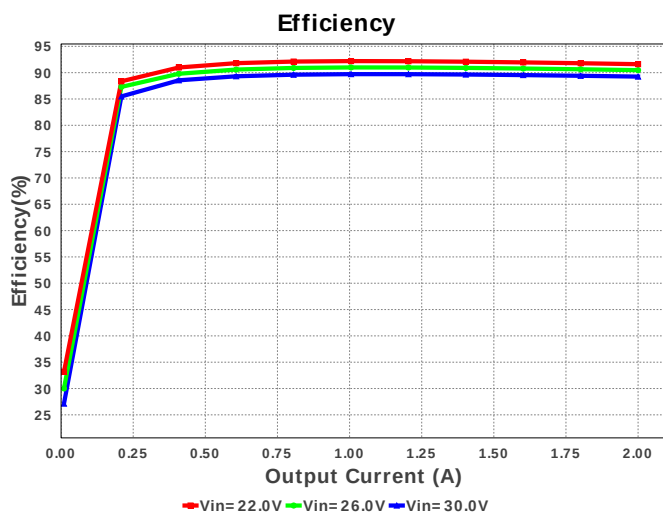
1. The input capacitor included in the BOM only contains a small filter capacitor that should be placed near the IC. Depending on where the power supply is laid out in the system additional bulk capacitance may need to be added to filter the line ripple.
2. If there is no VinTyp specified, WEBENCH will use the VinMax value. To change the VinTyp value, click on the "Change Design Inputs" button under the Optimization Tuning knob. In some applications, while the design requires the input voltage to be a wide range, for a majority of the time, it is operating at a much lower voltage than the maximum input voltage. Sizing the inductor based on the maximum input voltage may yield an inductance much larger than typically needed, causing a larger footprint for the overall design. At the same time, components such as the input capacitor must be rated based on the maximum input voltage. WEBENCH now supports the use of this additional input voltage specification.

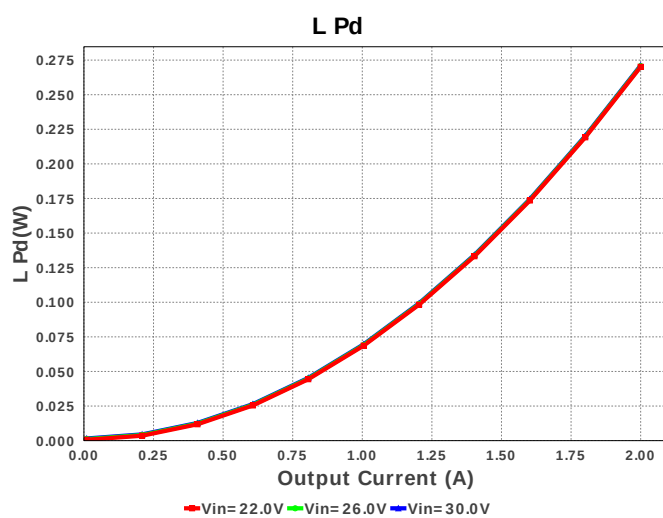
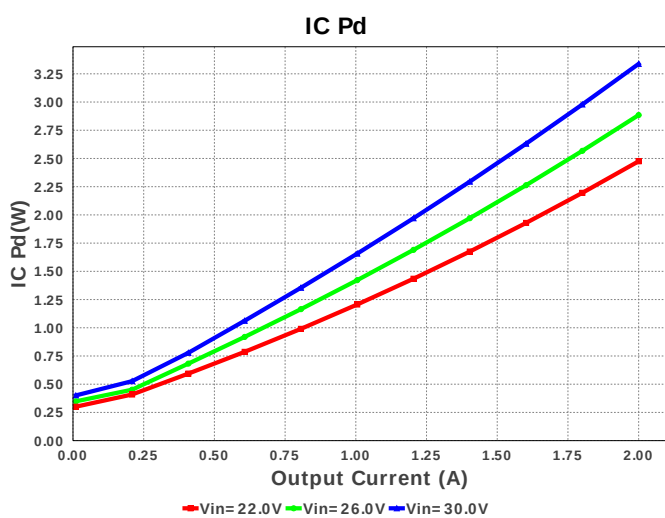
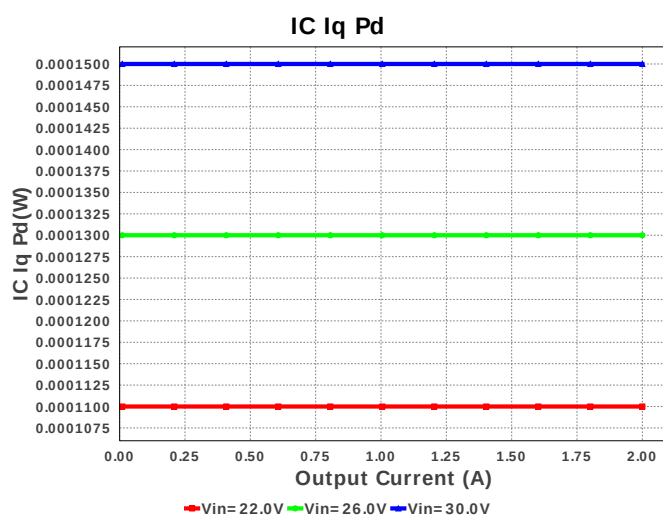
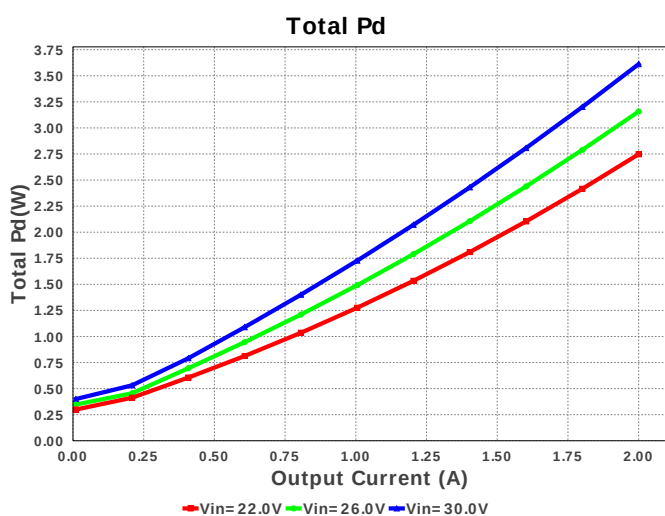
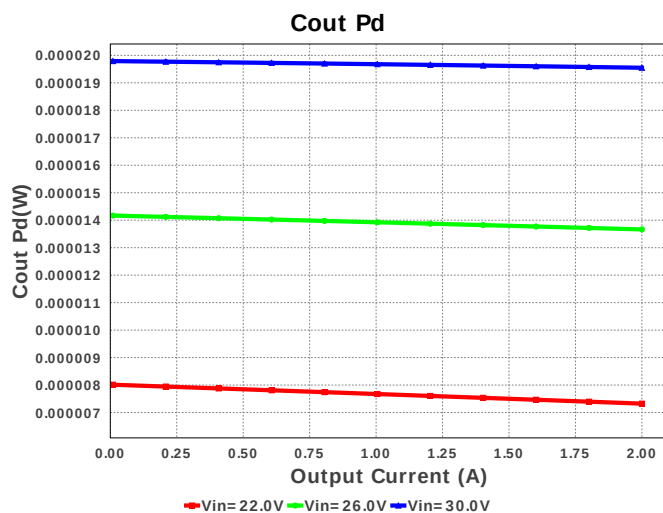
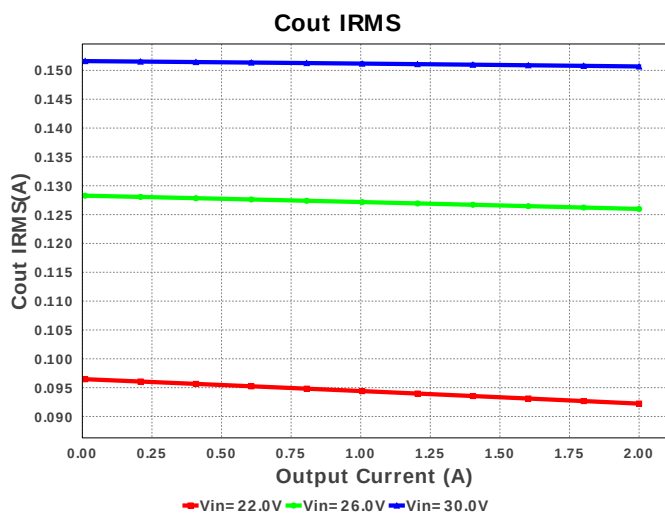
## Electrical BOM

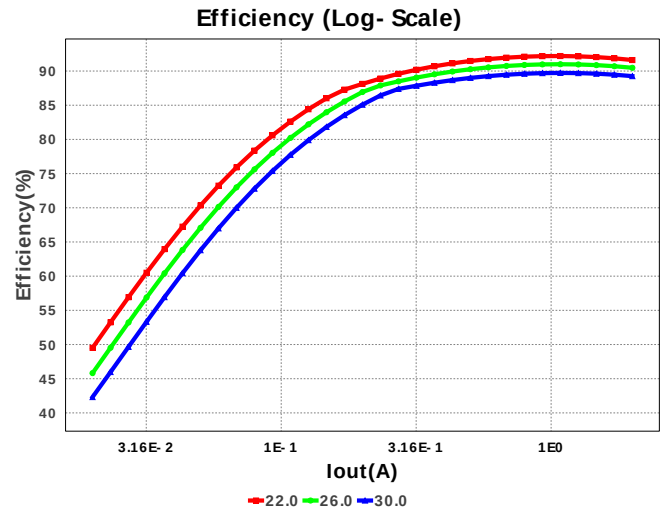
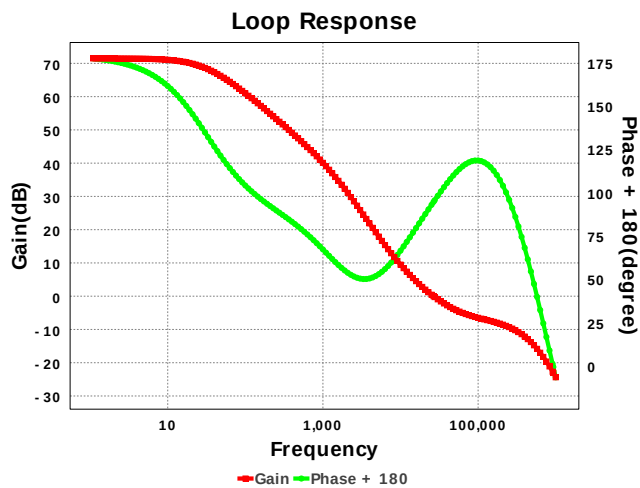
| #  | Name  | Manufacturer | Part Number                         | Properties                                                       | Qty | Price  | Footprint                  |
|----|-------|--------------|-------------------------------------|------------------------------------------------------------------|-----|--------|----------------------------|
| 1. | Cboot | MuRata       | GRM21BR71H474KA88L<br>Series= X7R   | Cap= 470.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                      | 1   | \$0.05 | 0805 7 mm <sup>2</sup>     |
| 2. | Cff   | Kemet        | C0805C100J5GACTU<br>Series= C0G/NP0 | Cap= 10.0 pF<br>ESR= 285.0 mOhm<br>VDC= 50.0 V<br>IRMS= 221.0 mA | 1   | \$0.01 | 0805 7 mm <sup>2</sup>     |
| 3. | Cin   | MuRata       | GRM32ER71H475KA88L<br>Series= X7R   | Cap= 4.7 uF<br>ESR= 2.0 mOhm<br>VDC= 50.0 V<br>IRMS= 5.35 A      | 1   | \$0.19 | 1210 15 mm <sup>2</sup>    |
| 4. | Cout  | MuRata       | GRM21BC81E475KA12L<br>Series= X6S   | Cap= 4.7 uF<br>ESR= 5.166 mOhm<br>VDC= 25.0 V<br>IRMS= 2.03531 A | 6   | \$0.02 | 0805 7 mm <sup>2</sup>     |
| 5. | Cvcc  | MuRata       | GRM188R60J225KE19D<br>Series= X5R   | Cap= 2.2 uF<br>ESR= 9.637 mOhm<br>VDC= 6.3 V<br>IRMS= 1.32271 A  | 1   | \$0.02 | 0603 5 mm <sup>2</sup>     |
| 6. | L1    | Coilcraft    | XAL4030-682MEB                      | L= 6.8 uH<br>DCR= 67.4 mOhm                                      | 1   | \$0.72 | XAL4030 25 mm <sup>2</sup> |
| 7. | Rfbb  | Panasonic    | ERJ-6ENF2212V<br>Series= ERJ-6E     | Res= 22.1 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 | 0805 7 mm <sup>2</sup>     |
| 8. | Rfht  | Panasonic    | ERJ-6ENF3093V<br>Series= ERJ-6E     | Res= 309.0 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%            | 1   | \$0.01 | 0805 7 mm <sup>2</sup>     |

| #  | Name | Manufacturer      | Part Number    | Properties | Qty | Price  | Footprint                                                                                                            |
|----|------|-------------------|----------------|------------|-----|--------|----------------------------------------------------------------------------------------------------------------------|
| 9. | U1   | Texas Instruments | LMR23625CFDDAR | Switcher   | 1   | \$1.35 | <br>DDA0008E_N 57 mm <sup>2</sup> |









## Operating Values

| #   | Name                | Value                 | Category | Description                                                                                |
|-----|---------------------|-----------------------|----------|--------------------------------------------------------------------------------------------|
| 1.  | Cin IRMS            | 1.005 A               | Current  | Input capacitor RMS ripple current                                                         |
| 2.  | Cout IRMS           | 150.682 mA            | Current  | Output capacitor RMS ripple current                                                        |
| 3.  | Iin Avg             | 1.12 A                | Current  | Average input current                                                                      |
| 4.  | L Ipp               | 521.98 mA             | Current  | Peak-to-peak inductor ripple current                                                       |
| 5.  | BOM Count           | 14                    | General  | Total Design BOM count                                                                     |
| 6.  | FootPrint           | 169.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                                                    |
| 7.  | Frequency           | 2.1 MHz               | General  | Switching frequency                                                                        |
| 8.  | Pout                | 30.0 W                | General  | Total output power                                                                         |
| 9.  | Total BOM           | \$2.48                | General  | Total BOM Cost                                                                             |
| 10. | ICThetaJA Effective | 18.0 degC/W           | Op_Point | Effective IC Junction-to-Ambient Thermal Resistance                                        |
| 11. | Low Freq Gain       | 71.481 dB             | Op_Point | Gain at 10Hz                                                                               |
| 12. | Vout Actual         | 14.982 V              | Op_Point | Vout Actual calculated based on selected voltage divider resistors                         |
| 13. | Vout OP             | 15.0 V                | Op_Point | Operational Output Voltage                                                                 |
| 14. | Cross Freq          | 26.631 kHz            | Op_point | Bode plot crossover frequency                                                              |
| 15. | Duty Cycle          | 51.437 %              | Op_point | Duty cycle                                                                                 |
| 16. | Efficiency          | 89.254 %              | Op_point | Steady state efficiency                                                                    |
| 17. | Gain Marg           | -23.087 dB            | Op_point | Bode Plot Gain Margin                                                                      |
| 18. | IC Tj               | 90.009 degC           | Op_point | IC junction temperature                                                                    |
| 19. | IOUT_OP             | 2.0 A                 | Op_point | Iout operating point                                                                       |
| 20. | Phase Marg          | 95.219 deg            | Op_point | Bode Plot Phase Margin                                                                     |
| 21. | VIN_OP              | 30.0 V                | Op_point | Vin operating point                                                                        |
| 22. | Vout p-p            | 1.344 mV              | Op_point | Peak-to-peak output ripple voltage                                                         |
| 23. | Cin Pd              | 2.022 mW              | Power    | Input capacitor power dissipation                                                          |
| 24. | Cout Pd             | 19.549 μW             | Power    | Output capacitor power dissipation                                                         |
| 25. | IC Iq Pd            | 150.0 μW              | Power    | IC Iq Pd                                                                                   |
| 26. | IC Pd               | 3.338 W               | Power    | IC power dissipation                                                                       |
| 27. | L Pd                | 271.13 mW             | Power    | Inductor power dissipation                                                                 |
| 28. | Total Pd            | 3.612 W               | Power    | Total Power Dissipation                                                                    |
| 29. | Vout Tolerance      | 3.923 %               |          | 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  | 30.0       | Maximum input voltage  |
| 3. | VinMin  | 22.0       | Minimum input voltage  |
| 4. | Vout    | 15.0       | Output Voltage         |
| 5. | base_pn | LMR23625CF | Base Product Number    |
| 6. | source  | DC         | Input Source Type      |
| 7. | Ta      | 30.0       | Ambient temperature    |

## Design Assistance

1. **LMR23625CF** Product Folder : <http://www.ti.com/product/LMR23625> : 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](#).