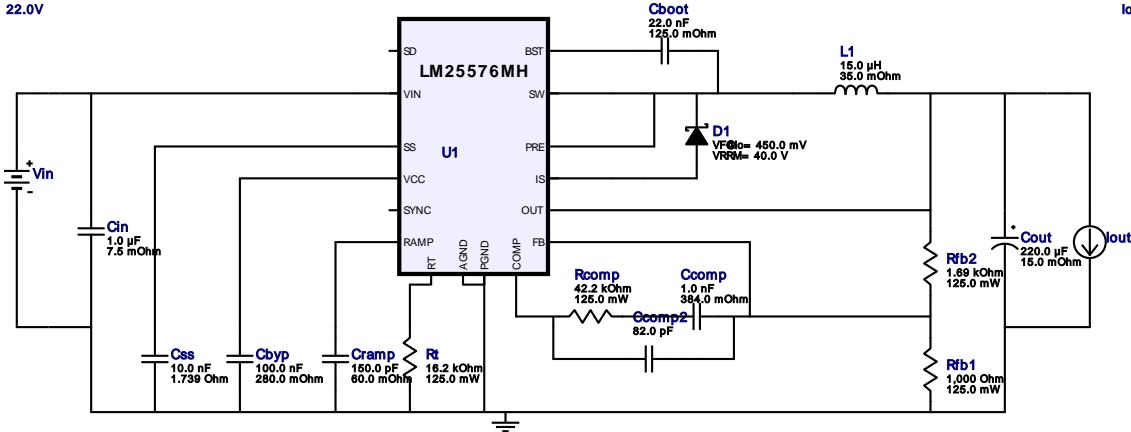


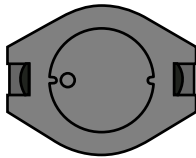





**WEBENCH<sup>®</sup> Design Report**

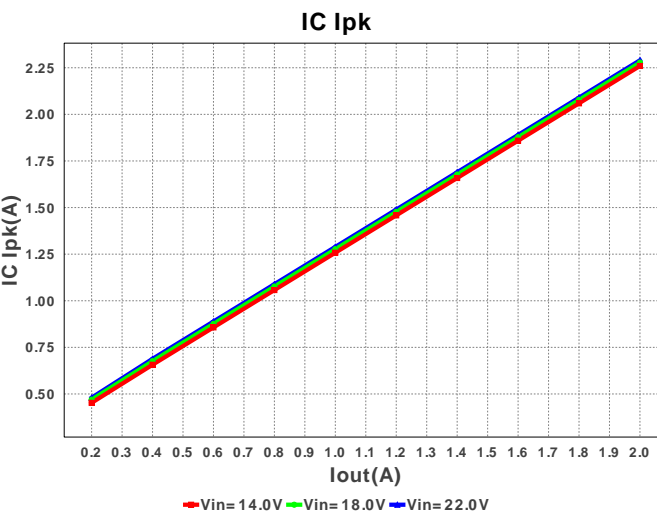
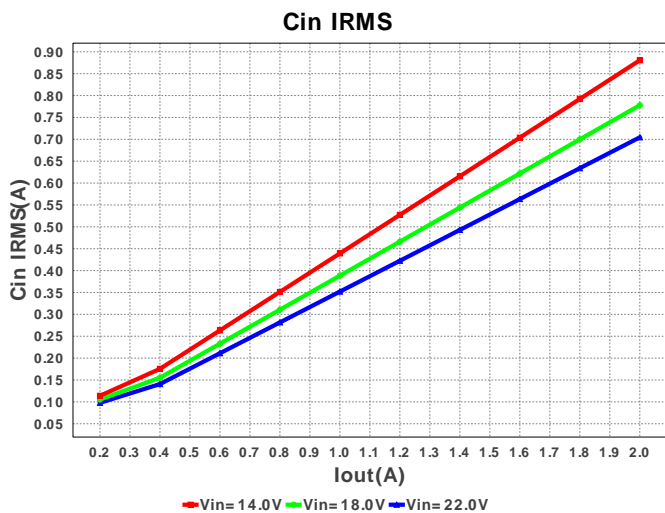
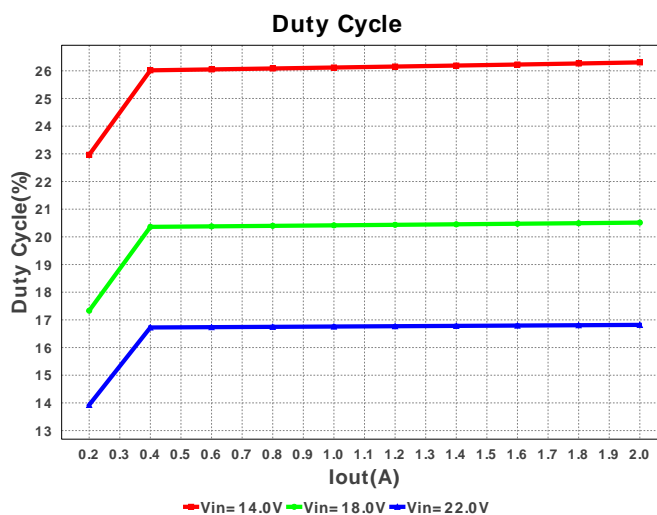
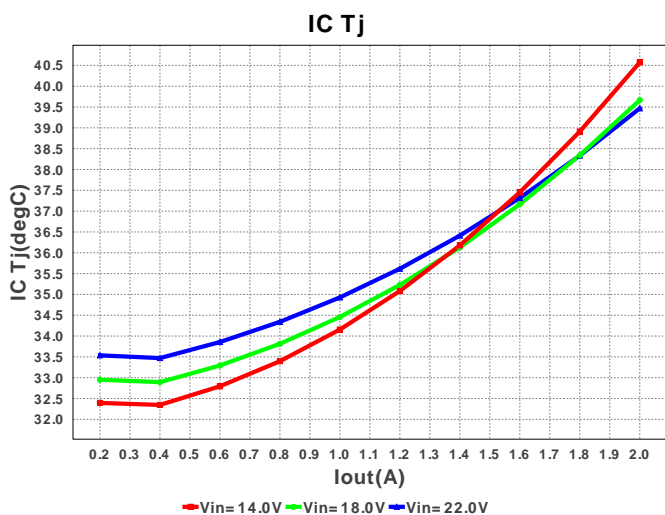
 Design : 3806764/330 LM25576MH/NOPB  
 LM25576MHX/NOPB 14.0V-22.0V to 3.3V @ 2.0A

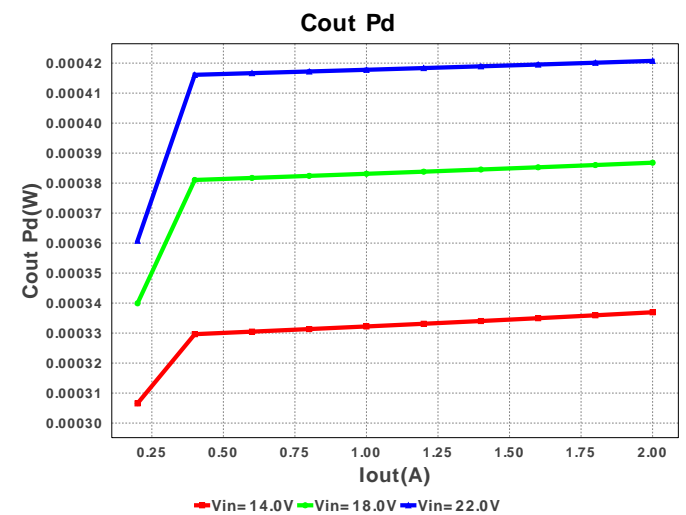
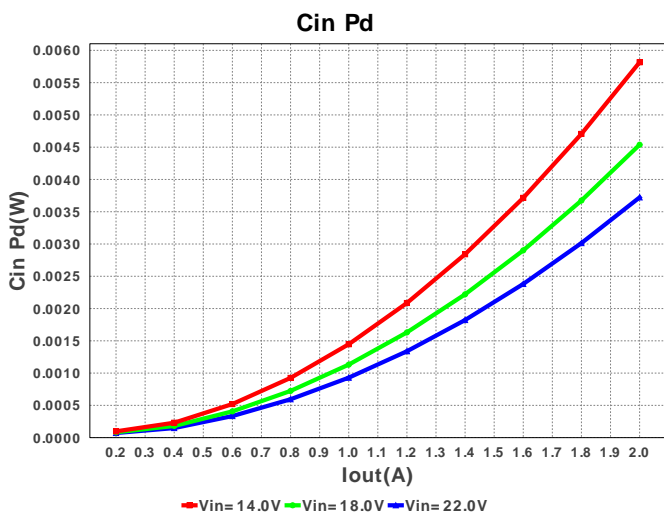
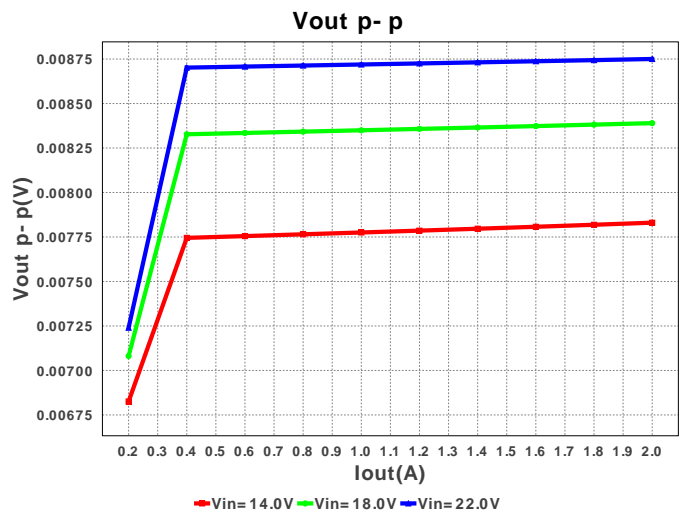
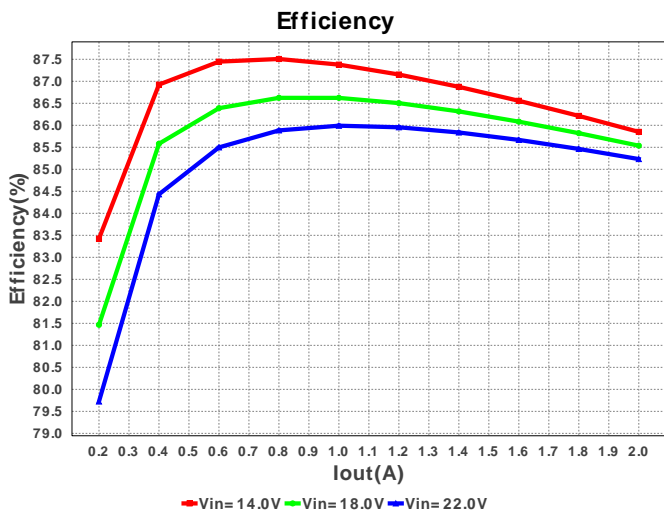
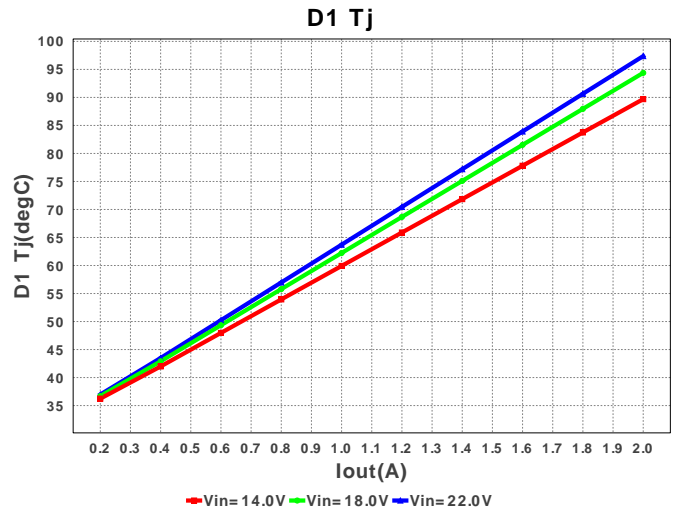
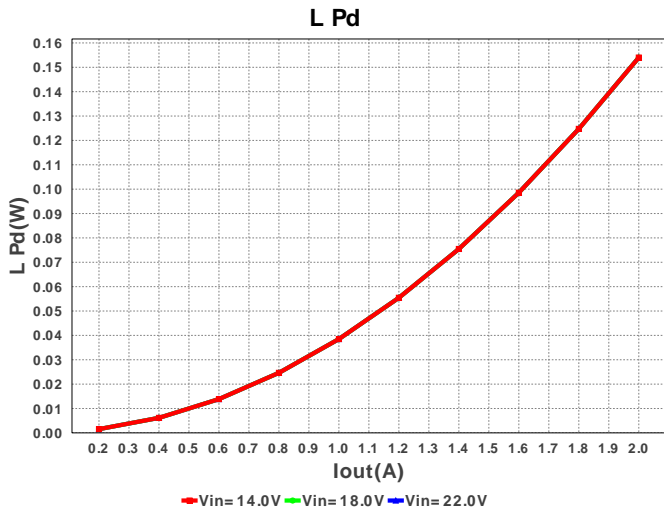
 VinMin = 14.0V  
 VinMax = 22.0V

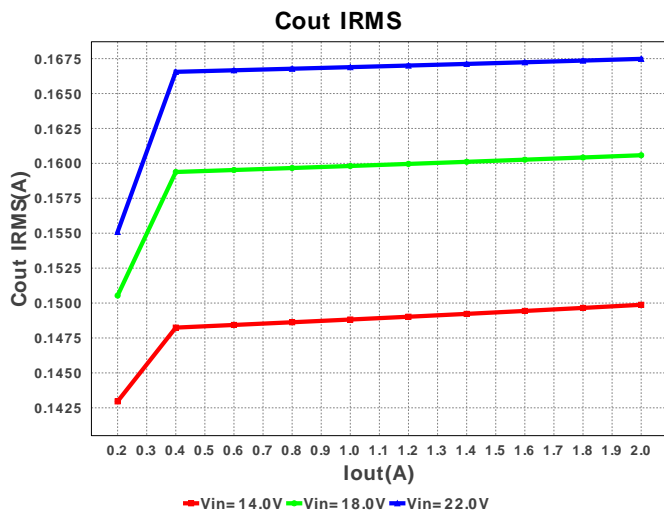
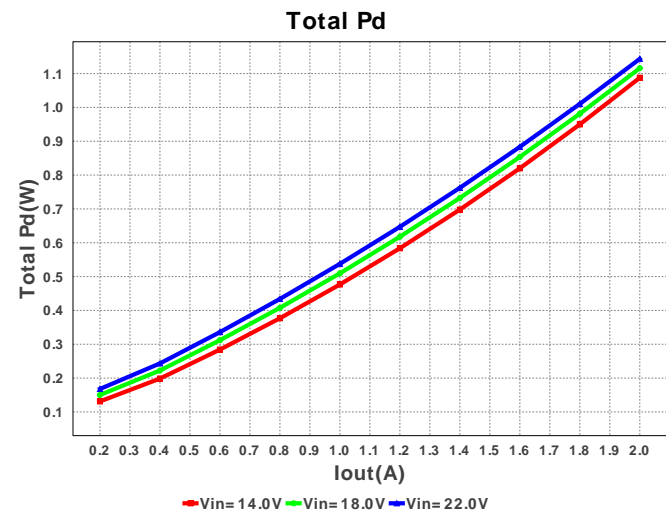
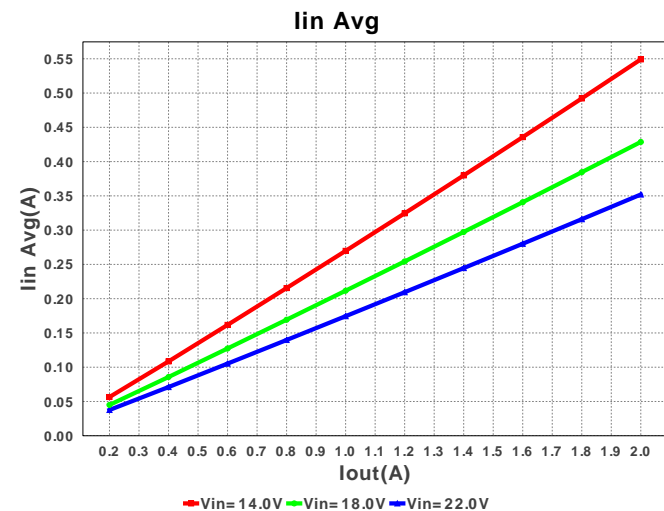
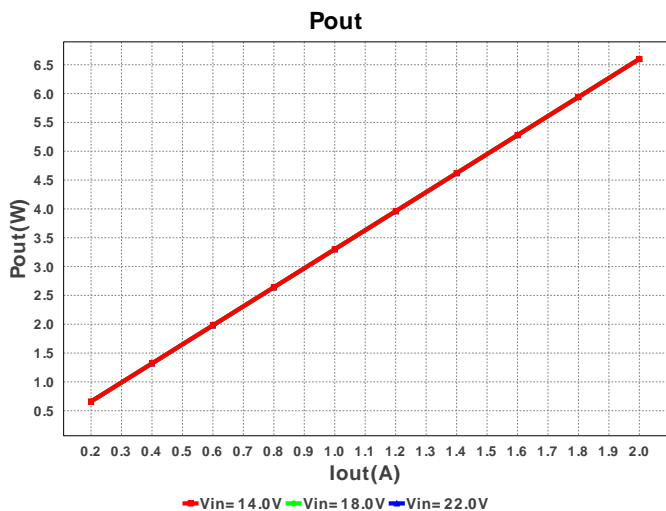
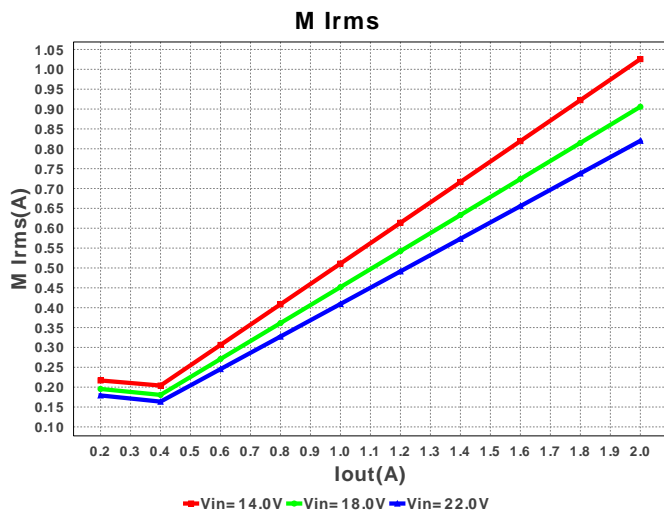
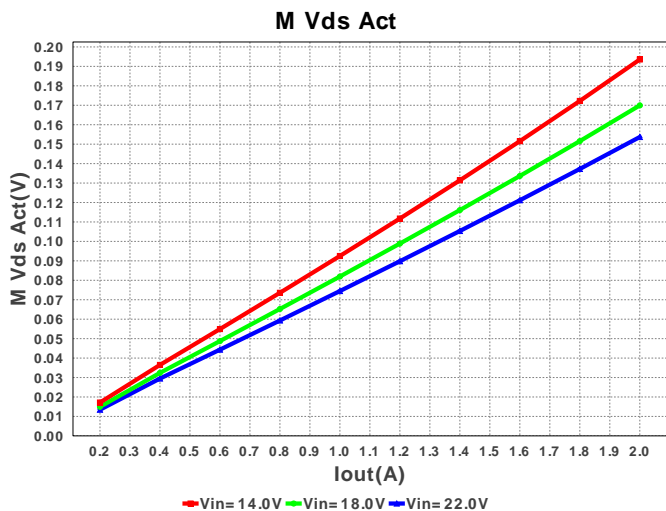
 Vout = 3.3V  
 Iout = 2.0A

**Electrical BOM**

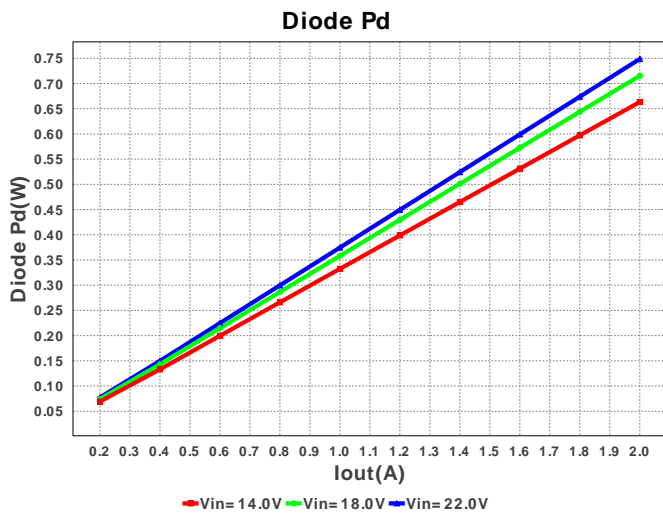
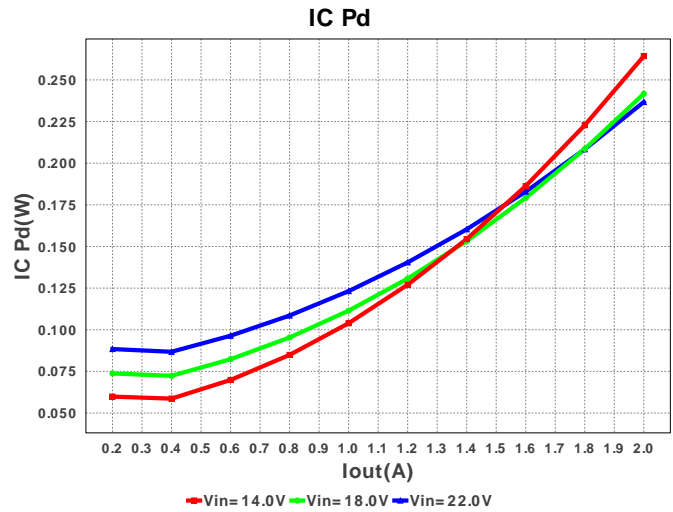
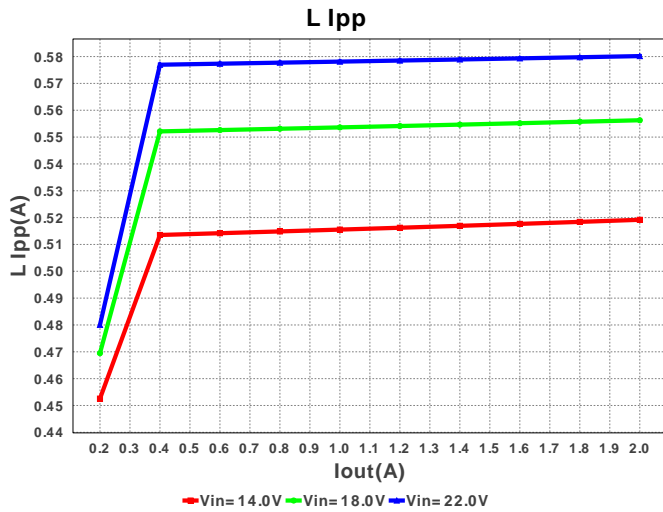
| #  | Name   | Manufacturer  | Part Number                          | Properties   | Qty | Price  | Footprint           |
|----|--------|---------------|--------------------------------------|--|-----|--------|---------------------|
| 1. | Cboot  | Kemet         | C0805C223K5RACTU<br>Series= X7R      | Cap= 22.0 nF<br>ESR= 125.0 mOhm<br>VDC= 50.0 V<br>IRMS= 645.0 mA | 1   | \$0.01 | 0805 7mm2           |
| 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 7mm2           |
| 3. | Ccomp  | Kemet         | C0805C102K5RACTU<br>Series= X7R      | Cap= 1.0 nF<br>ESR= 384.0 mOhm<br>VDC= 50.0 V<br>IRMS= 214.0 mA  | 1   | \$0.01 | 0805 7mm2           |
| 4. | Ccomp2 | Yageo America | CC0805JRNP09BN820<br>Series= C0G/NP0 | Cap= 82.0 pF<br>VDC= 50.0 V<br>IRMS= 0.0 A                       | 1   | \$0.01 | 0805 7mm2           |
| 5. | Cin    | TDK           | C3216X7R2A105M160AA<br>Series= X7R   | Cap= 1.0 µF<br>ESR= 7.5 mOhm<br>VDC= 100.0 V<br>IRMS= 5.923 A    | 1   | \$0.11 | 1206 11mm2          |
| 6. | Cout   | Panasonic     | 6SVPE220MW<br>Series= 259            | Cap= 220.0 µF<br>ESR= 15.0 mOhm<br>VDC= 6.3 V<br>IRMS= 3.15 A    | 1   | \$0.14 | CAPSMT_62_E61 53mm2 |
| 7. | Cramp  | Kemet         | C0805C151J5GACTU<br>Series= C0G/NP0  | Cap= 150.0 pF<br>ESR= 60.0 mOhm<br>VDC= 50.0 V<br>IRMS= 676.0 mA | 1   | \$0.01 | 0805 7mm2           |
| 8. | Css    | Kemet         | C0805C103K5RACTU<br>Series= X7R      | Cap= 10.0 nF<br>ESR= 1.739 Ohm<br>VDC= 50.0 V<br>IRMS= 411.0 mA  | 1   | \$0.01 | 0805 7mm2           |
| 9. | D1     | Diodes Inc.   | B340LB-13-F                          | VF@Io= 450.0 mV<br>VRRM= 40.0 V                                  | 1   | \$0.14 | SMB 44mm2           |

| #   | Name  | Manufacturer      | Part Number                  | Properties   | Qty | Price  | Footprint   |
|-----|-------|-------------------|------------------------------|--|-----|--------|---|
| 10. | L1    | Bourns            | SDR1806-150ML                | L= 15.0 $\mu$ H<br>DCR= 35.0 mOhm                    | 1   | \$0.47 | <br>SDR1806 325mm2 |
| 11. | Rcomp | Panasonic         | ERJ-6ENF4222V<br>Series= 225 | Res= 42.2 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0805 7mm2      |
| 12. | Rfb1  | Panasonic         | ERJ-6ENF1001V<br>Series= 225 | Res= 1,000 Ohm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0805 7mm2      |
| 13. | Rfb2  | Panasonic         | ERJ-6ENF1691V<br>Series= 225 | Res= 1.69 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0805 7mm2      |
| 14. | Rt    | Panasonic         | ERJ-6ENF1622V<br>Series= 225 | Res= 16.2 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 | <br>0805 7mm2      |
| 15. | U1    | Texas Instruments | LM25576MHX/NOPB              | Switcher   | 1   | \$2.00 | <br>MXA20A 71mm2   |









## Operating Values

| #   | Name         | Value       | Category | Description                               |
|-----|--------------|-------------|----------|---|
| 1.  | Cin IRMS     | 704.478 mA  | Current  | Input capacitor RMS ripple current        |
| 2.  | Cout IRMS    | 167.482 mA  | Current  | Output capacitor RMS ripple current       |
| 3.  | IC Ipk       | 2.289 A     | Current  | Peak switch current in IC                 |
| 4.  | Iin Avg      | 351.98 mA   | Current  | Average input current                     |
| 5.  | L Ipp        | 580.173 mA  | Current  | Peak-to-peak inductor ripple current      |
| 6.  | M1 Irms      | 820.217 mA  | Current  | Q lavg                                    |
| 7.  | BOM Count    | 15          | General  | Total Design BOM count                    |
| 8.  | FootPrint    | 572.0 mm2   | General  | Total Foot Print Area of BOM components   |
| 9.  | Frequency    | 361.402 kHz | General  | Switching frequency                       |
| 10. | IC Tolerance | 18.0 mV     | General  | IC Feedback Tolerance                     |
| 11. | M Vds Act    | 153.678 mV  | General  | Voltage drop across the MosFET            |
| 12. | Pout         | 6.6 W       | General  | Total output power                        |
| 13. | Total BOM    | \$2.96      | General  | Total BOM Cost                            |
| 14. | D1 Tj        | 97.377 degC | Op_Point | D1 junction temperature                   |
| 15. | Vout OP      | 3.3 V       | Op_Point | Operational Output Voltage                |
| 16. | Duty Cycle   | 16.819 %    | Op_point | Duty cycle                                |
| 17. | Efficiency   | 85.233 %    | Op_point | Steady state efficiency                   |
| 18. | IC Tj        | 39.469 degC | Op_point | IC junction temperature                   |
| 19. | ICThetaJA    | 40.0 degC/W | Op_point | IC junction-to-ambient thermal resistance |
| 20. | IOUT_OP      | 2.0 A       | Op_point | Iout operating point                      |
| 21. | VIN_OP       | 22.0 V      | Op_point | Vin operating point                       |
| 22. | Vout p-p     | 8.75 mV     | Op_point | Peak-to-peak output ripple voltage        |
| 23. | Cin Pd       | 3.722 mW    | Power    | Input capacitor power dissipation         |
| 24. | Cout Pd      | 420.751 μW  | Power    | Output capacitor power dissipation        |
| 25. | Diode Pd     | 748.63 mW   | Power    | Diode power dissipation                   |
| 26. | IC Pd        | 236.717 mW  | Power    | IC power dissipation                      |
| 27. | L Pd         | 154.0 mW    | Power    | Inductor power dissipation                |
| 28. | Total Pd     | 1.143 W     | Power    | Total Power Dissipation                   |

## Design Inputs

| #   | Name      | Value       | Description                 |
|-----|-----------|-------------|-----------------------------|
| 1.  | Iout      | 2.0 A       | Maximum Output Current      |
| 2.  | Iout1     | 2.0 Amps    | Output Current #1           |
| 3.  | SoftStart | 1.0 ms      | Soft Start Time (ms)        |
| 4.  | VinMax    | 22.0 V      | Maximum input voltage       |
| 5.  | VinMin    | 14.0 V      | Minimum input voltage       |
| 6.  | Vout      | 3.3 V       | Output Voltage              |
| 7.  | Vout1     | 3.3 Volt    | Output Voltage #1           |
| 8.  | base_pn   | LM25576     | Base Product Number         |
| 9.  | source    | DC          | Input Source Type           |
| 10. | Ta        | 30.0 degC   | Ambient temperature         |
| 11. | UserFsw   | 571.723 kHz | Customer Selected Frequency |

## Design Assistance

1. **LM25576** Product Folder : <http://www.ti.com/product/lm25576> : contains the data sheet and other resources.

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