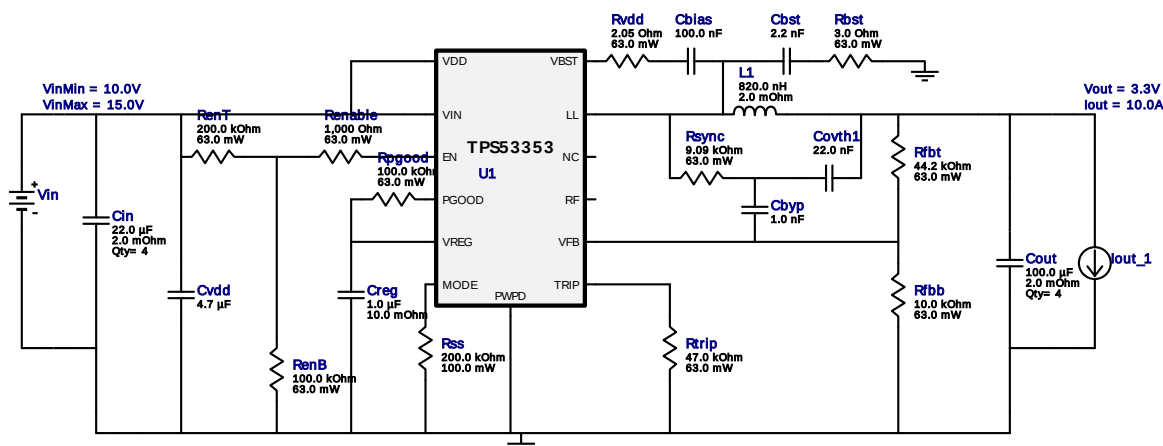


## WEBENCH® Design Report

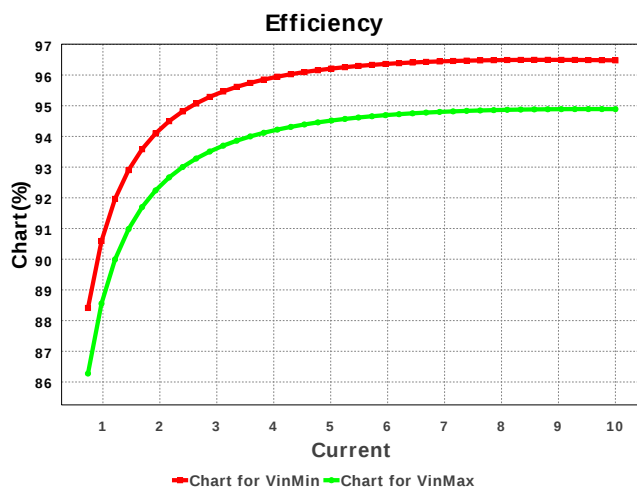
Design : 1209005/186 TPS53353DQPR  
TPS53353DQPR 10.0V-15.0V to 3.3V @ 10.0A



### Electrical BOM

| #   | Name   | Manufacturer | Part Number                         | Properties                                                  | Qty | Price  | Footprint      |
|-----|--------|--------------|-------------------------------------|-------------------------------------------------------------|-----|--------|----------------|
| 1.  | Cbias  | Kemet        | C0603C104K5RACTU<br>Series= X7R     | Cap= 100.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                 | 1   | \$0.01 | 0603 10mm2     |
| 2.  | Cbst   | Kemet        | C0603C222K5RAC<br>Series= X7R       | Cap= 2.2 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                   | 1   | \$0.03 | 0603 10mm2     |
| 3.  | Cbyp   | Kemet        | C0603C102J5GAC<br>Series= C0G/NP0   | Cap= 1.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                   | 1   | \$0.04 | 0603 10mm2     |
| 4.  | Cin    | TDK          | C3225X5R1C226M<br>Series= X5R       | Cap= 22.0 µF<br>ESR= 2.0 mOhm<br>VDC= 16.0 V<br>IRMS= 3.5 A | 4   | \$0.20 | 1210 23mm2     |
| 5.  | Cout   | TDK          | C3225X5R0J107M<br>Series= X5R       | Cap= 100.0 µF<br>ESR= 2.0 mOhm<br>VDC= 6.3 V<br>IRMS= 3.5 A | 4   | \$0.38 | 1210 23mm2     |
| 6.  | Covth1 | Kemet        | C0603C223K5RACTU<br>Series= X7R     | Cap= 22.0 nF<br>VDC= 50.0 V<br>IRMS= 0.0 A                  | 1   | \$0.01 | 0603 10mm2     |
| 7.  | Creg   | TDK          | C3216X7R1H105K<br>Series= X7R       | Cap= 1.0 µF<br>ESR= 10.0 mOhm<br>VDC= 50.0 V<br>IRMS= 3.2 A | 1   | \$0.04 | 1206 19mm2     |
| 8.  | Cvd    | MuRata       | GRM21BC81E475KA12L<br>Series= 379   | Cap= 4.7 µF<br>VDC= 25.0 V<br>IRMS= 0.0 A                   | 1   | \$0.04 | 0805 13mm2     |
| 9.  | L1     | Coiltronics  | HCP1305-R82-R                       | L= 820.0 nH<br>DCR= 2.0 mOhm                                | 1   | \$0.94 | HCP1305 235mm2 |
| 10. | Rbst   | Vishay-Dale  | CRCW04023R00JNED<br>Series= CRCW.e3 | Res= 3.0 Ohm<br>Power= 63.0 mW<br>Tolerance= 5.0%           | 1   | \$0.07 | 0402 8mm2      |

| #   | Name    | Manufacturer      | Part Number                          | Properties                                            | Qty | Price  | Footprint                                                                                              |
|-----|---------|-------------------|--------------------------------------|-------------------------------------------------------|-----|--------|--------------------------------------------------------------------------------------------------------|
| 11. | RenB    | Vishay-Dale       | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 8mm2          |
| 12. | RenT    | Vishay-Dale       | CRCW0402200KFKED<br>Series= CRCW..e3 | Res= 200.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 8mm2          |
| 13. | Renable | Vishay-Dale       | CRCW04021K00FKED<br>Series= CRCW..e3 | Res= 1,000 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 8mm2          |
| 14. | Rfbb    | Vishay-Dale       | CRCW040210K0FKED<br>Series= CRCW..e3 | Res= 10.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 8mm2          |
| 15. | Rfbt    | Vishay-Dale       | CRCW040244K2FKED<br>Series= CRCW..e3 | Res= 44.2 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 8mm2          |
| 16. | Rpgood  | Vishay-Dale       | CRCW0402100KFKED<br>Series= CRCW..e3 | Res= 100.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%  | 1   | \$0.01 |  0402 8mm2          |
| 17. | Rss     | Vishay-Dale       | CRCW0603200KFKEA<br>Series= CRCW..e3 | Res= 200.0 kOhm<br>Power= 100.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0603 10mm2         |
| 18. | Rsync   | Vishay-Dale       | CRCW04029K09FKED<br>Series= CRCW..e3 | Res= 9.09 kOhm<br>Power= 63.0 mW<br>Tolerance= 1.0%   | 1   | \$0.01 |  0402 8mm2          |
| 19. | Rtrip   | Vishay-Dale       | CRCW040247K0JNED<br>Series= CRCW..e3 | Res= 47.0 kOhm<br>Power= 63.0 mW<br>Tolerance= 5.0%   | 1   | \$0.07 |  0402 8mm2          |
| 20. | Rvdd    | Vishay-Dale       | CRCW04022R05FKED<br>Series= CRCW..e3 | Res= 2.05 Ohm<br>Power= 63.0 mW<br>Tolerance= 1.0%    | 1   | \$0.01 |  0402 8mm2         |
| 21. | U1      | Texas Instruments | TPS53353DQPR                         | Switcher                                              | 1   | \$3.95 |  R-PSON-N22 58mm2 |



## Operating Values

| #  | Name      | Value     | Category | Description                                  |
|----|-----------|-----------|----------|----------------------------------------------|
| 1. | Cin IRMS  | 1.21 A    | Current  | Input capacitor RMS ripple current           |
| 2. | Cout IRMS | 570.0 mA  | Current  | Output capacitor RMS ripple current          |
| 3. | IC Irms   | 10.3 A    | Current  | Calculated current across IC                 |
| 4. | L Ipp Max | 7.932 A   | Current  | Inductor Peak to Peak Current calculated Max |
| 5. | L Ipp Min | 6.803 A   | Current  | Inductor Peak to Peak Current calculated Min |
| 6. | L1 Irms   | 10.3 A    | Current  | Inductor ripple current                      |
| 7. | BOM Count | 27        | General  | Total Design BOM count                       |
| 8. | FootPrint | 637.0 mm2 | General  | Total Foot Print Area of BOM components      |

| #   | Name         | Value     | Category | Description                                |
|-----|--------------|-----------|----------|--------------------------------------------|
| 9.  | Frequency    | 500.0 kHz | General  | Switching frequency                        |
| 10. | IC Tolerance | 600.0 mV  | General  | IC Feedback Tolerance                      |
| 11. | Pout         | 33.0 W    | General  | Total output power                         |
| 12. | Total BOM    | \$7.62    | General  | Total BOM Cost                             |
| 13. | Cin Vdrop    | 15.1 V    | Op_Point | Calculated voltage across input cap        |
| 14. | Cout Vdrop   | 3.32 V    | Op_Point | Calculated voltage across output capacitor |
| 15. | IC Vdrop     | 15.1 V    | Op_Point | Calculated voltage across IC               |
| 16. | Vout OP      | 3.3 V     | Op_Point | Operational Output Voltage                 |
| 17. | Duty Cycle   | 22.3 %    | Op_point | Duty cycle                                 |
| 18. | Efficiency   | 94.456 %  | Op_point | Steady state efficiency                    |
| 19. | IC Tj        | 54.0 degC | Op_point | IC junction temperature                    |
| 20. | IOUT_OP      | 10.0 A    | Op_point | Iout operating point                       |
| 21. | VIN_OP       | 15.0 V    | Op_point | Vin operating point                        |
| 22. | Vout p-p     | 9.1 mV    | Op_point | Peak-to-peak output ripple voltage         |
| 23. | Cin Pd       | 12.0 mW   | Power    | Input capacitor power dissipation          |
| 24. | Cout Pd      | 3.0 mW    | Power    | Output capacitor power dissipation         |
| 25. | IC Pd        | 1.5 W     | Power    | IC power dissipation                       |
| 26. | M1 Rdson Max | 5.0 mOhm  | Power    | High side FET Rdson max                    |
| 27. | M1 Rdson Min | 5.0 mOhm  | Power    | High side FET Rdson min                    |
| 28. | M2 Rdson Max | 2.0 mOhm  | Power    | Low side FET Rdson Max                     |
| 29. | M2 Rdson Min | 2.0 mOhm  | Power    | Low side FET Rdson Min                     |
| 30. | Total Pd     | 1.5 W     | Power    | Total Power Dissipation                    |

## Design Inputs

| #  | Name    | Value     | Description            |
|----|---------|-----------|------------------------|
| 1. | Iout    | 10.0 A    | Maximum Output Current |
| 2. | Iout1   | 10.0 Amps | Output Current #1      |
| 3. | VinMax  | 15.0 V    | Maximum input voltage  |
| 4. | VinMin  | 10.0 V    | Minimum input voltage  |
| 5. | Vout    | 3.3 V     | Output Voltage         |
| 6. | Vout1   | 3.3 Volt  | Output Voltage #1      |
| 7. | base_pn | TPS53353  | Base Product Number    |
| 8. | source  | DC        | Input Source Type      |
| 9. | Ta      | 30.0 degC | Ambient temperature    |

## Design Assistance

1. **TPS53353** Product Folder : <http://www.ti.com/product/TPS53353> : contains the data sheet and other resources.

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