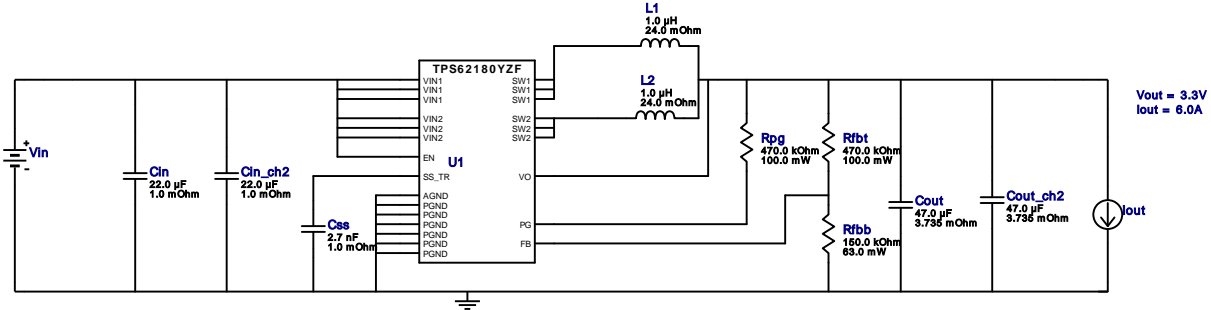


VinMin = 10.0V
VinMax = 15.0V
Vout = 3.3V
Iout = 6.0A

Device = TPS62180YZFR
Topology = Buck
Created = 2023-07-11 02:40:49.695
BOM Cost = \$3.35
BOM Count = 11
Total Pd = 2.33W

WEBENCH® Design Report

Design : 1 TPS62180YZFR
TPS62180YZFR 4V-15V to 3.30V @ 6A



Design Alerts

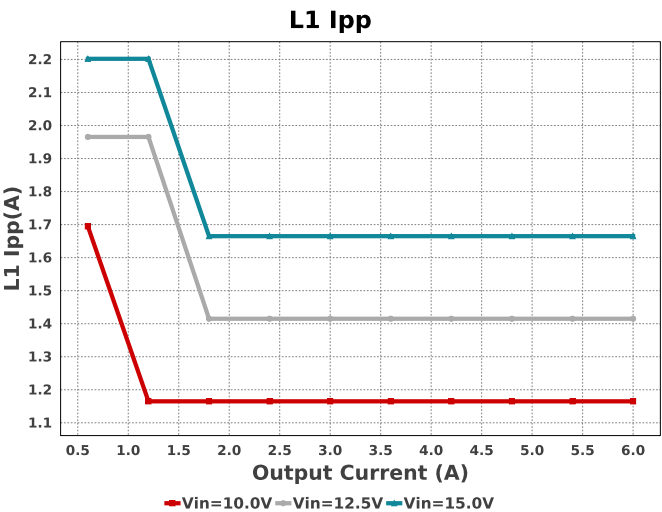
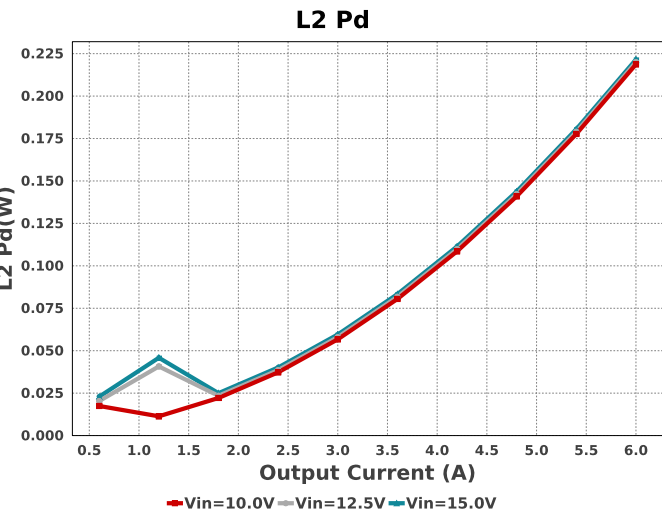
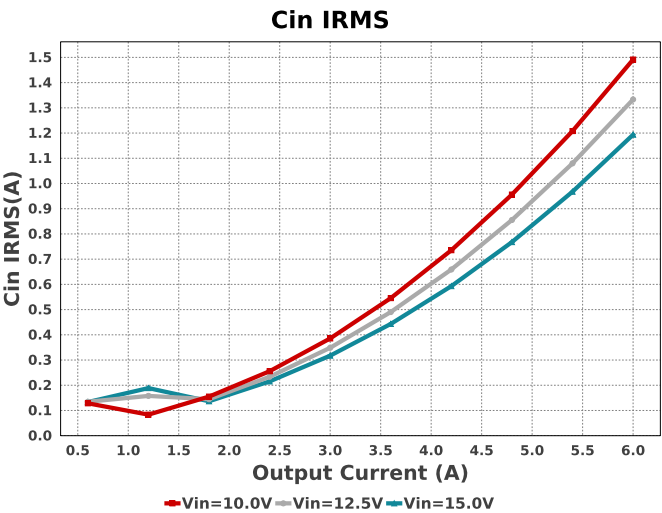
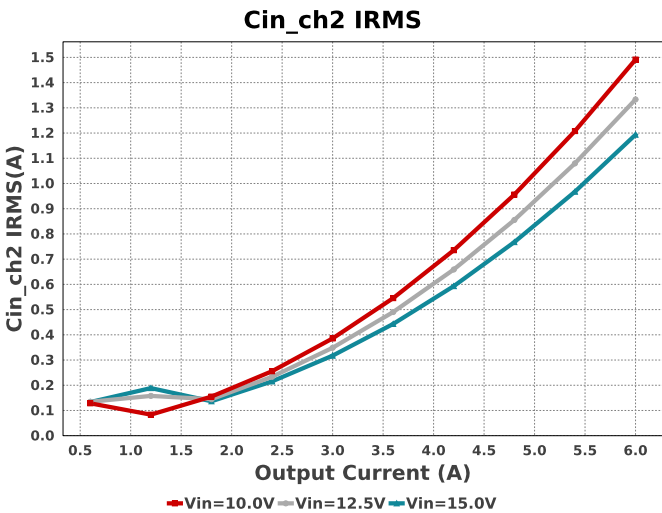
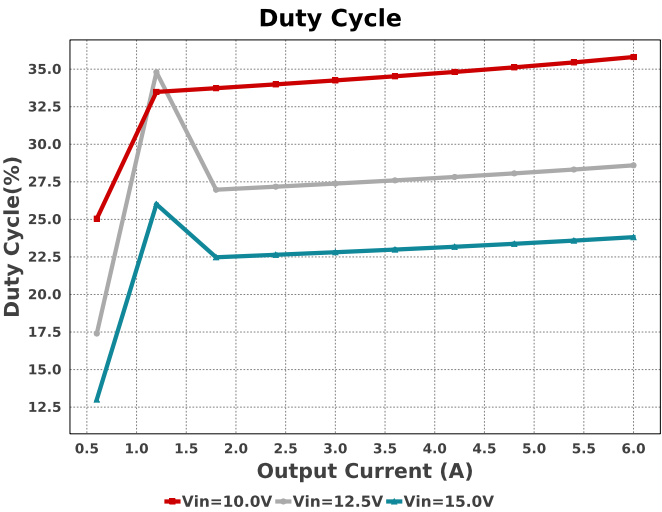
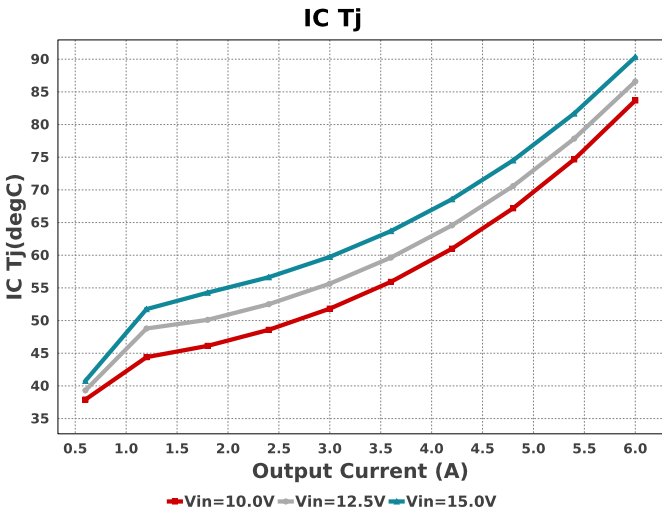
Component Selection Information

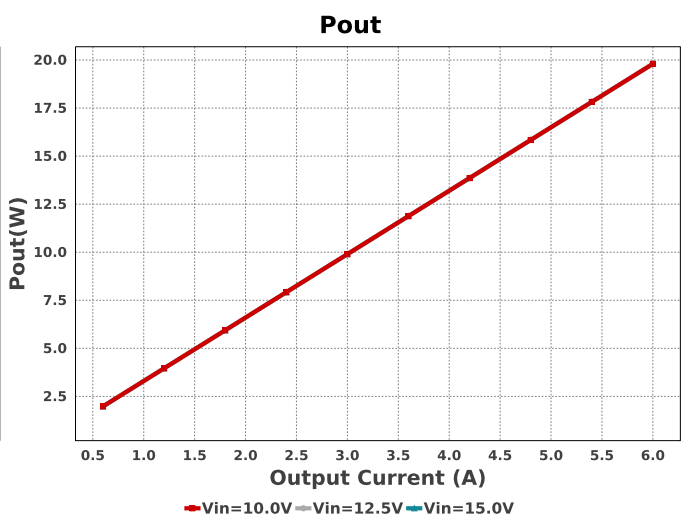
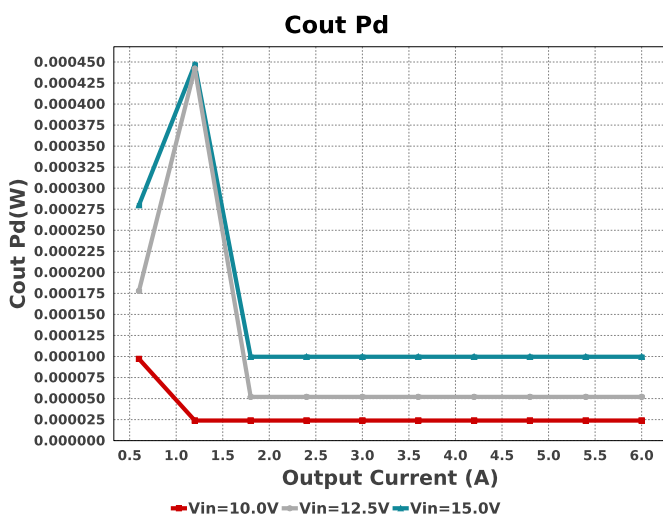
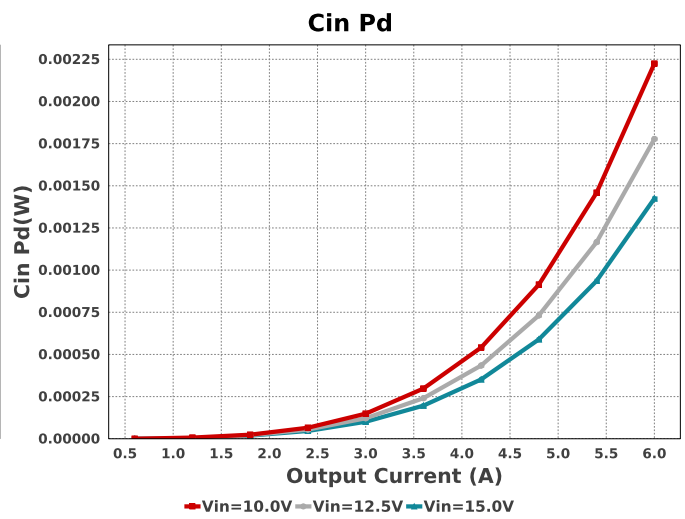
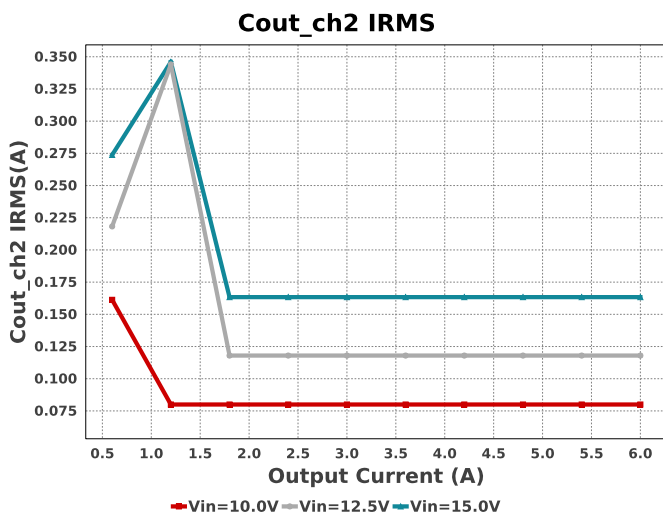
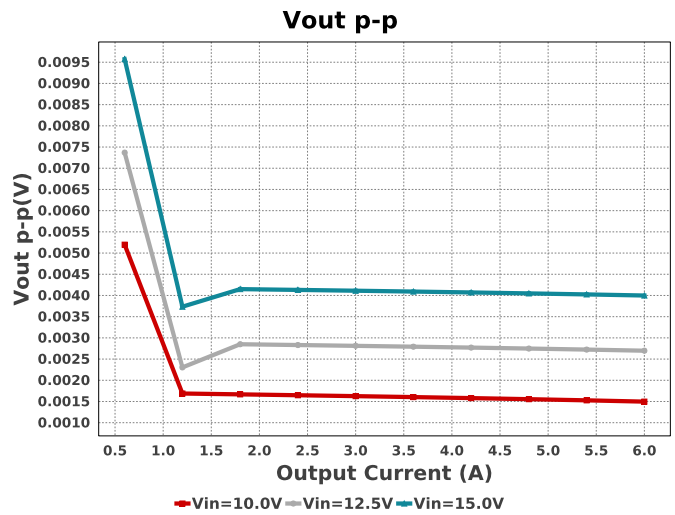
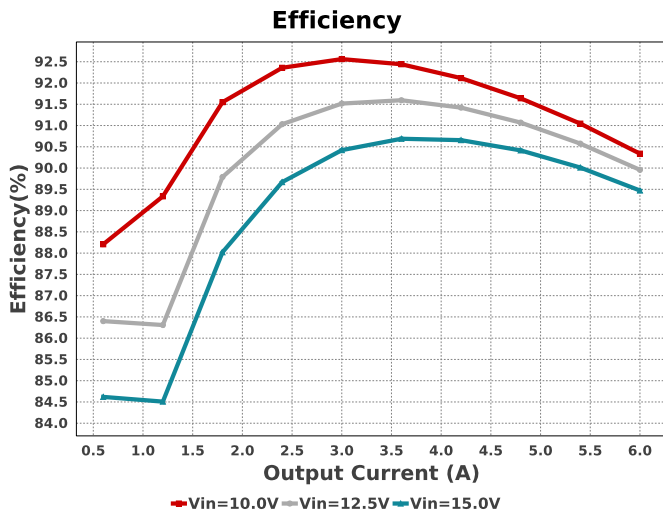
The TPS62180 is a dual-phase converter which allows a very small solution size for a 6A converter. This WEBENCH(R) model only supports two-inductor designs where the component pair (L1, L2), pair (Cin, Cin_ch2) and pair (Cout, Cout_ch2) are kept the same.

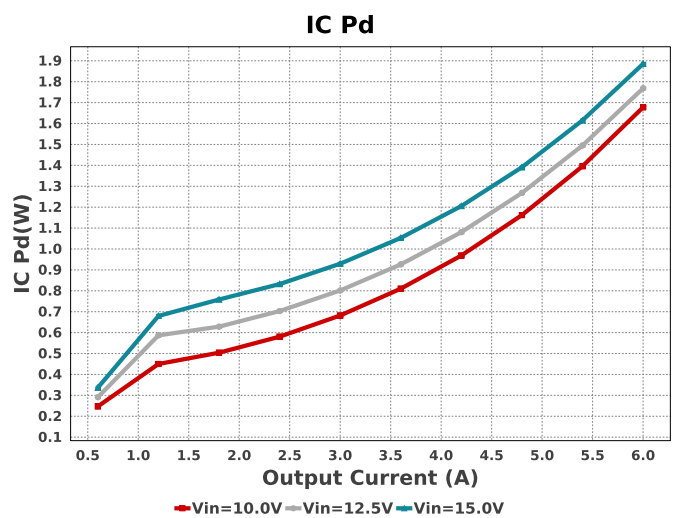
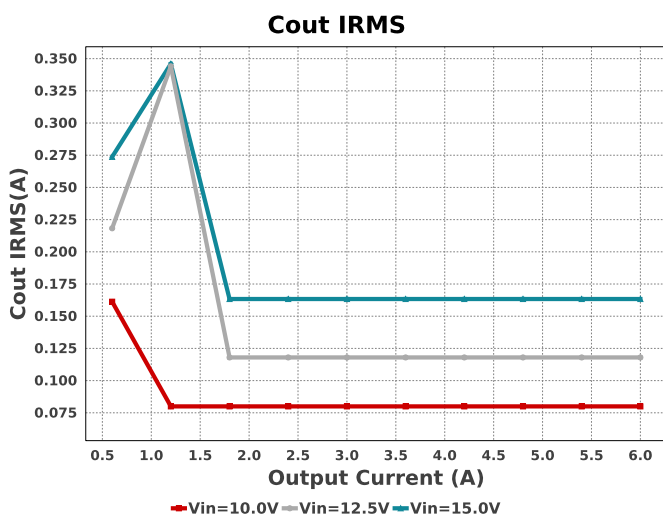
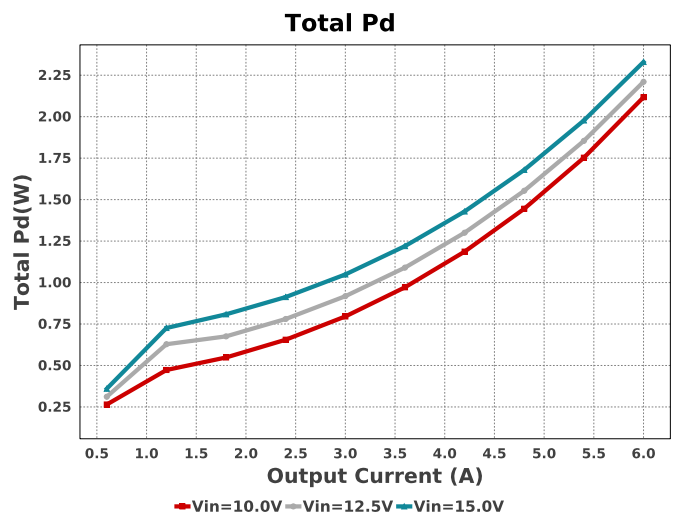
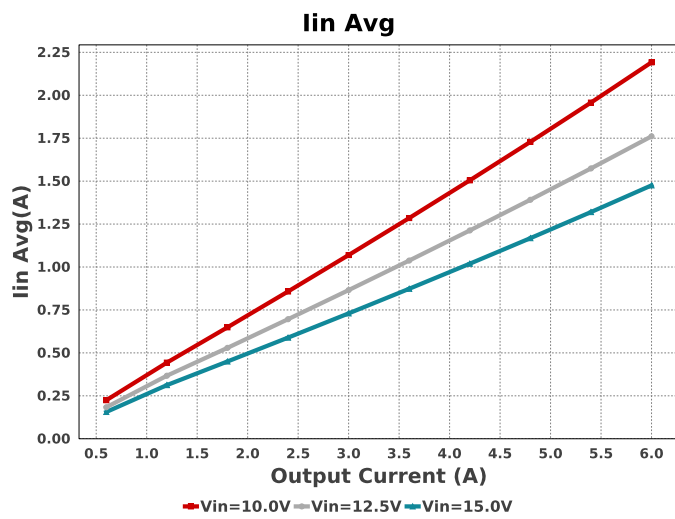
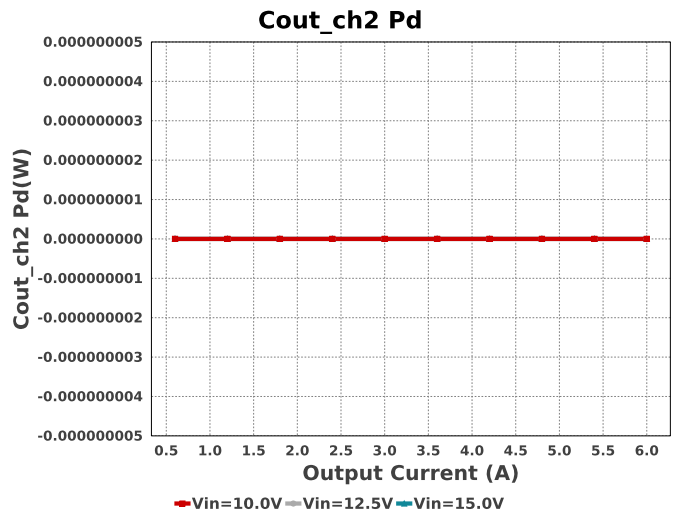
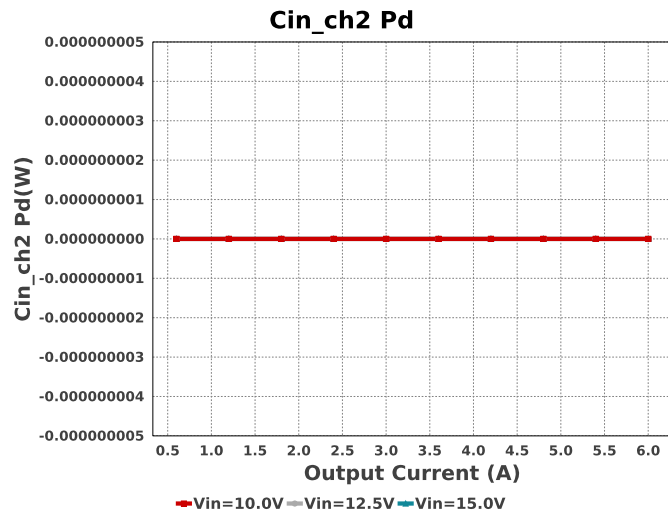
Electrical BOM

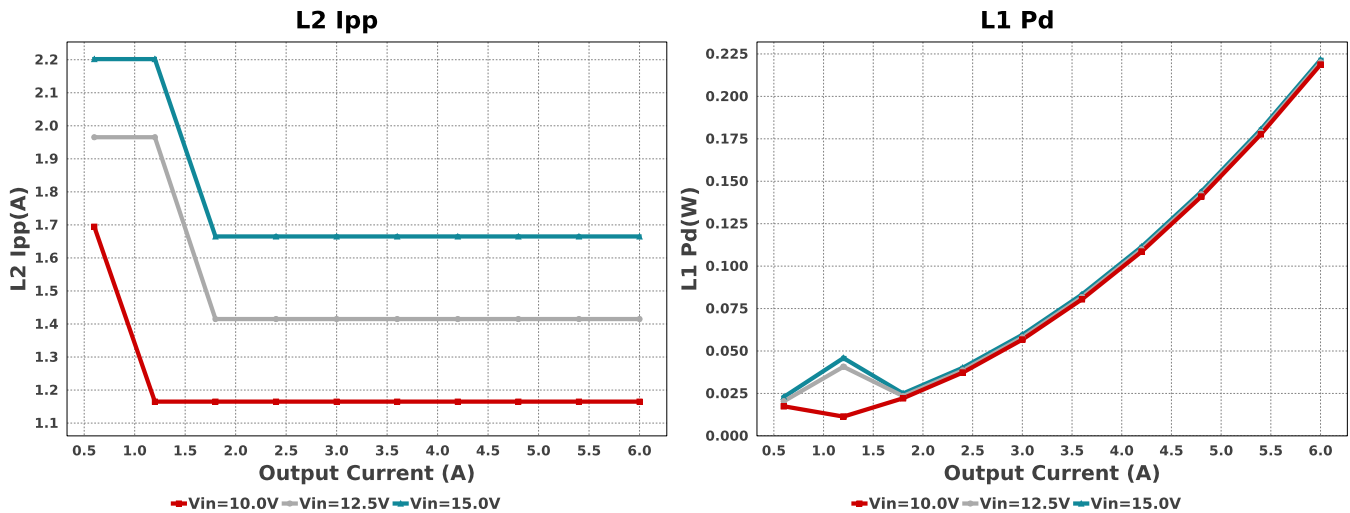
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	Taiyo Yuden	TMK325B7226KMHP Series= X7R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.31	1210_270 15 mm ²
Cin_ch2	Taiyo Yuden	TMK325B7226KMHP Series= X7R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.31	1210_270 15 mm ²
Cout	MuRata	GRM31CR60J476KE19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.13	1206_190 11 mm ²
Cout_ch2	MuRata	GRM31CR60J476KE19L Series= X5R	Cap= 47.0 uF ESR= 3.735 mOhm VDC= 6.3 V IRMS= 4.091 A	1	\$0.13	1206_190 11 mm ²
Css	MuRata	GRM188R71E272KA01D Series= X7R	Cap= 2.7 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0603 5 mm ²
L1	Vishay-Dale	IHLP1212BZER1R0M11	L= 1.0 uH 24.0 mOhm	1	\$0.63	IHLP-1212BZ 19 mm ²
L2	Vishay-Dale	IHLP1212BZER1R0M11	L= 1.0 uH 24.0 mOhm	1	\$0.63	IHLP-1212BZ 19 mm ²
Rfbb	Vishay-Dale	CRCW0402150KFKED Series= CRCW..e3	Res= 150.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
Rfbt	Yageo	RC0603FR-07470KL Series= ?	Res= 470.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
Rpg	Yageo	RC0603FR-07470KL Series= ?	Res= 470.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
U1	Texas Instruments	TPS62180YZFR	Switcher	1	\$1.17	<div></div> <div>YZF0024AMAM 13 mm²</div>









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.194 A	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	1.425 mW	Capacitor	Input capacitor power dissipation
3.	Cin_ch2 IRMS	1.194 A	Capacitor	Input Capacitor Cin2 RMS Ripple Current
4.	Cin_ch2 Pd	1.425 mW	Capacitor	Average Power Dissipation in the Input Capacitor Cin2
5.	Cout IRMS	163.355 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	99.668 μ W	Capacitor	Output capacitor power dissipation
7.	Cout_ch2 IRMS	163.355 mA	Capacitor	Output capacitor2 RMS ripple current
8.	Cout_ch2 Pd	99.668 μ W	Capacitor	Output capacitor2 power dissipation
9.	IC Ipk	3.832 A	IC	Max rated switch current in IC
10.	IC Iq Pd	1.5 μ W	IC	IC Iq Pd
11.	IC Pd	1.885 W	IC	IC power dissipation
12.	IC Tj	90.33 degC	IC	IC junction temperature
13.	IC Tolerance	8.0 mV	IC	IC Feedback Tolerance
14.	ICThetaJA	32.0 degC/W	IC	IC junction-to-ambient thermal resistance
15.	Iin Avg	1.475 A	IC	Average input current
16.	L1 Ipp	1.665 A	Inductor	Peak-to-peak inductor ripple current
17.	L1 Pd	221.54 mW	Inductor	Inductor power dissipation
18.	L2 Ipp	1.665 A	Inductor	Peak-to-peak inductor ripple current
19.	L2 Pd	221.54 mW	Inductor	Inductor power dissipation
20.	Cin Pd	1.425 mW	Power	Input capacitor power dissipation
21.	Cin_ch2 Pd	1.425 mW	Power	Average Power Dissipation in the Input Capacitor Cin2
22.	Cout Pd	99.668 μ W	Power	Output capacitor power dissipation
23.	Cout_ch2 Pd	99.668 μ W	Power	Output capacitor2 power dissipation
24.	IC Pd	1.885 W	Power	IC power dissipation
25.	L1 Pd	221.54 mW	Power	Inductor power dissipation
26.	L2 Pd	221.54 mW	Power	Inductor power dissipation
27.	Total Pd	2.332 W	Power	Total Power Dissipation
28.	BOM Count	11	System	Total Design BOM count
29.	Duty Cycle	23.815 %	System	Duty cycle
30.	Efficiency	89.465 %	System	Steady state efficiency
31.	FootPrint	120.0 mm ²	System	Total Foot Print Area of BOM components
32.	Frequency	1.546 MHz	System	Switching frequency
33.	Iout	6.0 A	System	Iout operating point
34.	Mode	CCM	System	Conduction Mode
35.	Pout	19.8 W	System	Total output power
36.	Total BOM	\$3.35	System	Total BOM Cost
37.	Vin	15.0 V	System	Vin operating point
38.	Vout	3.3 V	System	Operational Output Voltage
39.	Vout Actual	3.307 V	System	Vout Actual calculated based on selected voltage divider resistors

#	Name	Value	Category	Description
40.	Vout Tolerance	2.547 %	System Information	Vout Tolerance based on IC Tolerance (full load) and voltage divider resistors if applicable
41.	Vout p-p	5.268 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	6.0	Maximum Output Current
VinMax	15.0	Maximum input voltage
VinMin	10.0	Minimum input voltage
Vout	3.3	Output Voltage
base_pn	TPS62180	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

WEBENCH® Assembly

Component Testing

Some published data on components in datasheets such as Capacitor ESR and Inductor DC resistance is based on conservative values that will guarantee that the components always exceed the specification. For design purposes it is usually better to work with typical values. Since this data is not always available it is a good practice to measure the Capacitance and ESR values of C_{in} and C_{out} , and the inductance and DC resistance of $L1$ before assembly of the board. Any large discrepancies in values should be electrically simulated in WEBENCH to check for instabilities and thermally simulated in WebTHERM to make sure critical temperatures are not exceeded.

Soldering Component to Board

If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab down to the board place the iron down on the board while resting against the tab, heating both surfaces simultaneously. Apply light pressure to the top of the plastic case until the solder flows around the part and the part is flush with the PCB. If the solder is not flowing around the board you may need a higher wattage iron (generally 25W to 30W is enough).

Initial Startup of Circuit

It is best to initially power up the board by setting the input supply voltage to the lowest operating input voltage 10.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to V_{in} and GND. Connect a digital volt meter and a load if needed to set the minimum load of the design from V_{out} and GND. Turn on the input supply and slowly turn up the current limit on the input supply. If the voltage starts to rise on the input supply continue increasing the input supply current limit while watching the output voltage. If the current increases on the input supply, but the voltage remains near zero, then there may be a short or a component misplaced on the board. Power down the board and visually inspect for solder bridges and recheck the diode and capacitor polarities. Once the power supply circuit is operational then more extensive testing may include full load testing, transient load and line tests to compare with simulation results.

Load Testing

The setup is the same as the initial startup, except that an additional digital voltmeter is connected between V_{in} and GND, a load is connected between V_{out} and GND and a current meter is connected in series between V_{out} and the load. The load must be able to handle at least rated output power + 50% (7.5 watts for this design). Ideally the load is supplied in the form of a variable load test unit. It can also be done in the form of suitably large power resistors. When using an oscilloscope to measure waveforms on the prototype board, the ground leads of the oscilloscope probes should be as short as possible and the area of the loop formed by the ground lead should be kept to a minimum. This will help reduce ground lead inductance and eliminate EMI noise that is not actually present in the circuit.



Design Assistance

1. Master key : 8D06C45BDA54575D0ABDC1D23455A5FE[v1]
2. **TPS62180** Product Folder : <http://www.ti.com/product/TPS62180> : contains the data sheet and other resources.

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