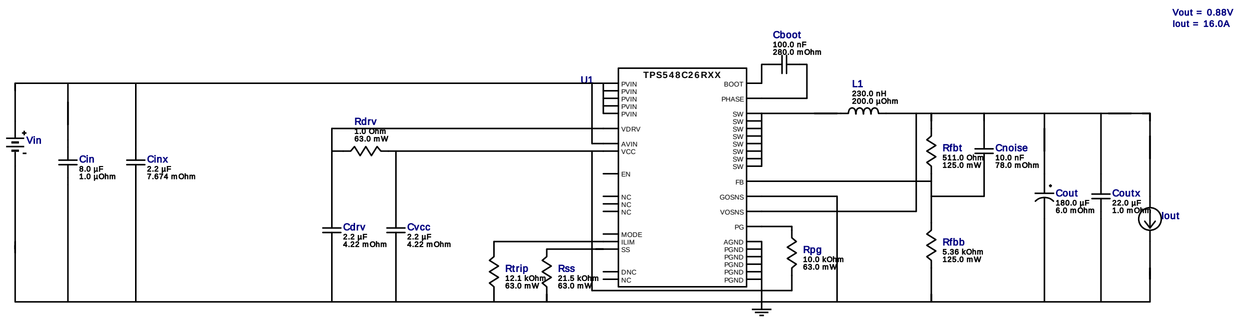
VinMin = 12.0V
VinMax = 12.0V
Vout = 0.88V
Iout = 16.0A

Device = TPS548C26RXXR
Topology = Buck
Created = 2023-12-20 19:36:52.703
BOM Cost = NA
BOM Count = 16
Total Pd = 2.03W

WEBENCH ® Design Report

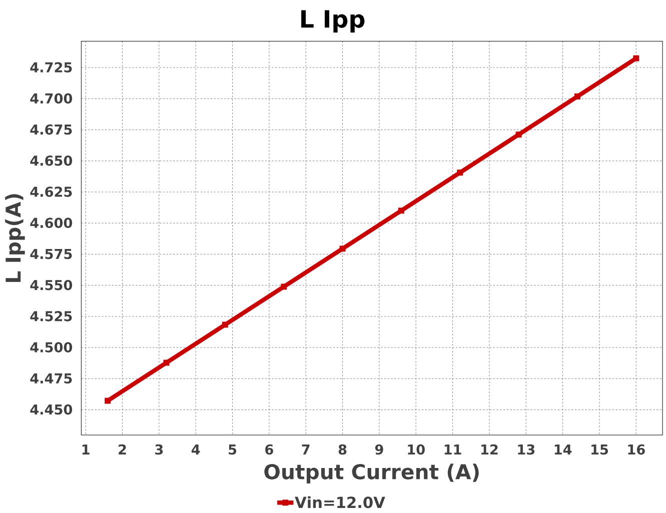
Design : 105 TPS548C26RXXR
TPS548C26RXXR 12V-12V to .88V @ 16A

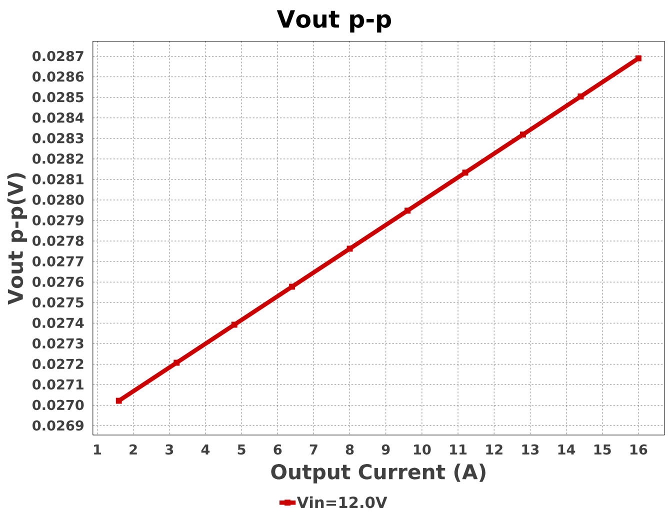


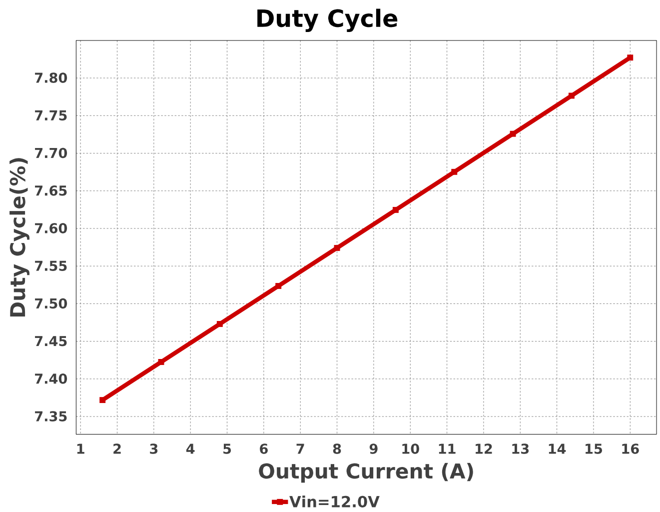
Electrical BOM

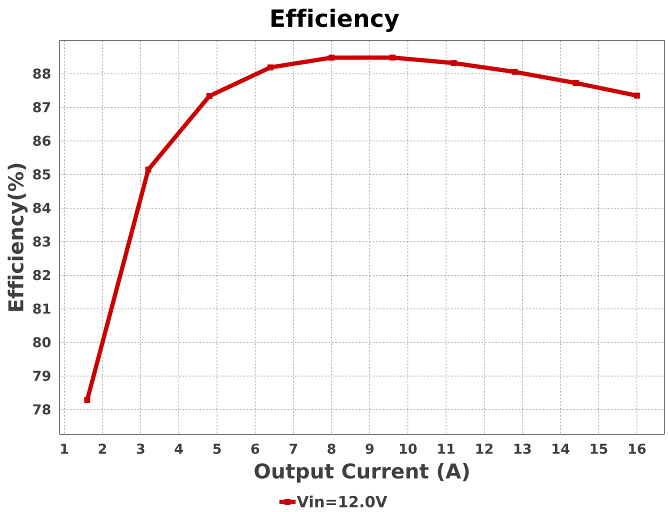
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cboot	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
Cdrv	MuRata	GRM21BR71A225KA01L Series= X7R	Cap= 2.2 uF ESR= 4.22 mOhm VDC= 10.0 V IRMS= 2.08454 A	1	$0.03	0805 7 mm²
Cin	CUSTOM	CUSTOM Series= ?	Cap= 8.0 uF ESR= 1.0 uOhm VDC= 25.0 V IRMS= 4.6222 A	1	NA	CUSTOM 0 mm²
Cinx	TDK	C1608X5R1V225K080AC Series= X5R	Cap= 2.2 uF ESR= 7.674 mOhm VDC= 35.0 V IRMS= 1.87823 A	1	$0.04	0603 5 mm²
Cnoise	AVX	08055C103KAT2A Series= X7R	Cap= 10.0 nF ESR= 78.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
Cout	Panasonic	EEFSS0E181R Series= SS	Cap= 180.0 uF ESR= 6.0 mOhm VDC= 2.5 V IRMS= 7.5 A	1	$0.86	7343-15 59 mm²
Coutx	MuRata	GRM188R60J226MEA0D Series= X5R	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 6.0 A	1	$0.04	0603 5 mm²
Cvcc	MuRata	GRM21BR71A225KA01L Series= X7R	Cap= 2.2 uF ESR= 4.22 mOhm VDC= 10.0 V IRMS= 2.08454 A	1	$0.03	0805 7 mm²
L1	Coilcraft	SLC1175-231MEB	L= 230.0 nH 200.0 µOhm	1	$0.48	SLC1175 125 mm²

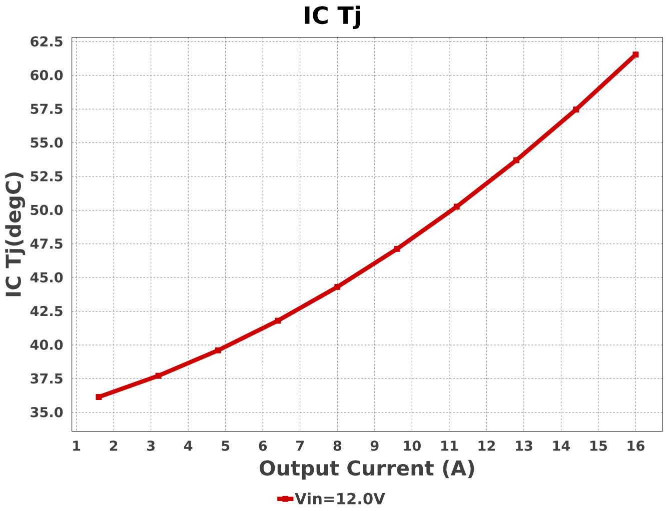
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rdrv	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rfbb	Yageo	RT0805BRD075K36L Series= ?	Res= 5.36 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.04	0805 7 mm^2
Rfbt	Susumu Co Ltd	RG2012P-5110-B-T5 Series= RG2012	Res= 511.0 Ohm Power= 125.0 mW Tolerance= 0.1%	1	$0.06	0805 7 mm^2
Rpg	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rss	Vishay-Dale	CRCW040221K5FKED Series= CRCW..e3	Res= 21.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rtrip	Yageo	AC0402FR-0712K1L Series= ?	Res= 12.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
U1	Texas Instruments	TPS548C26RXXR	Switcher	1	$2.00	RXX0037A 121 mm^2

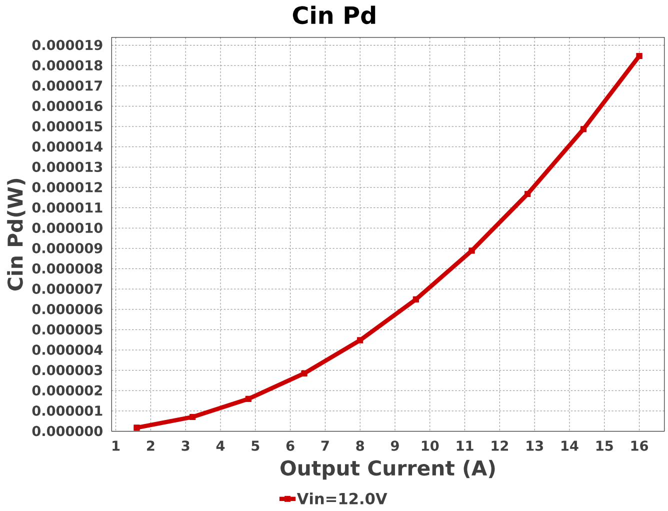


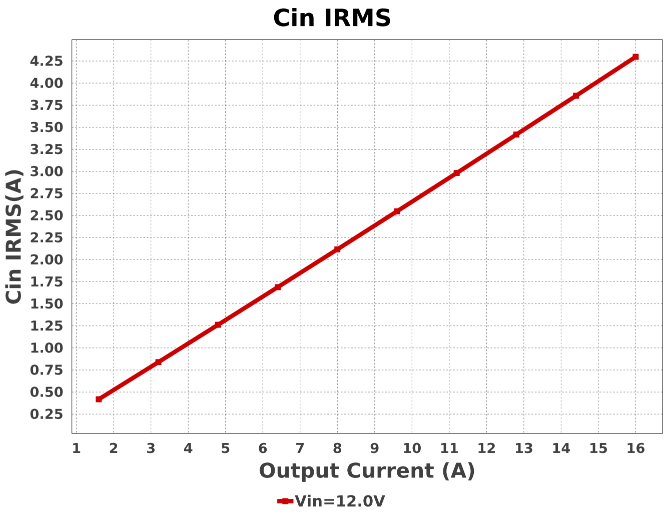


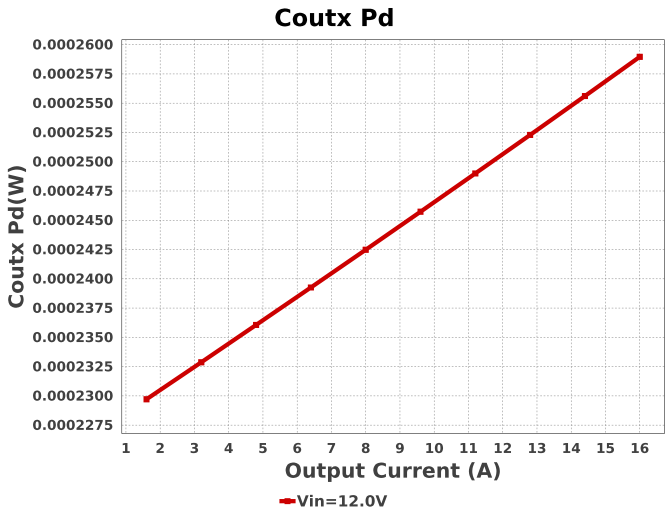


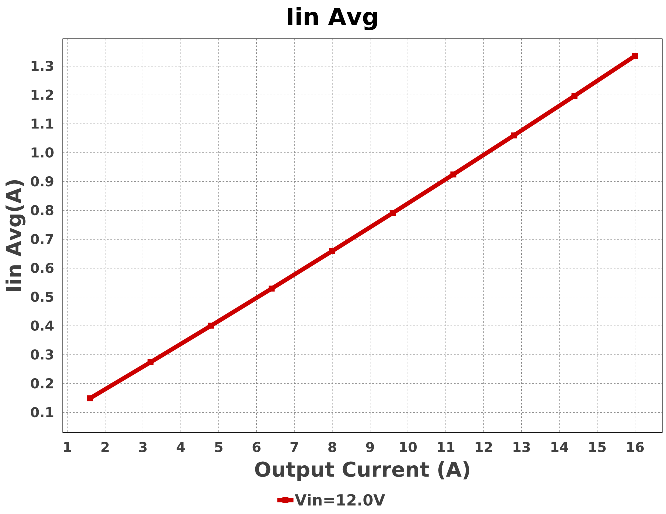


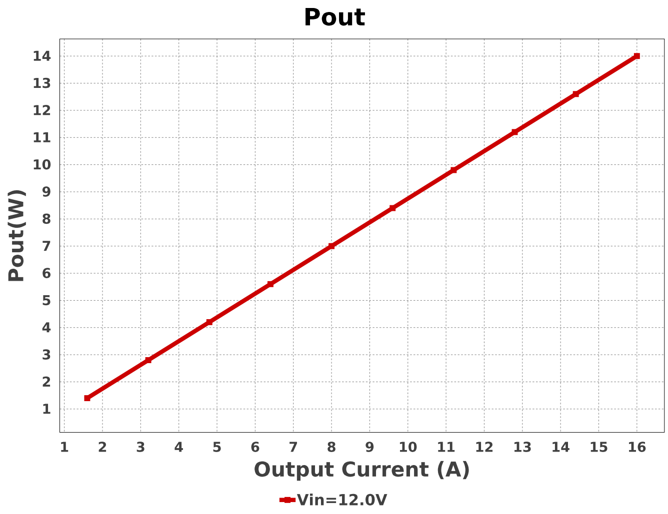

IC Tj
IC Tj(degC)
Output Current (A)
Vin=12.0V

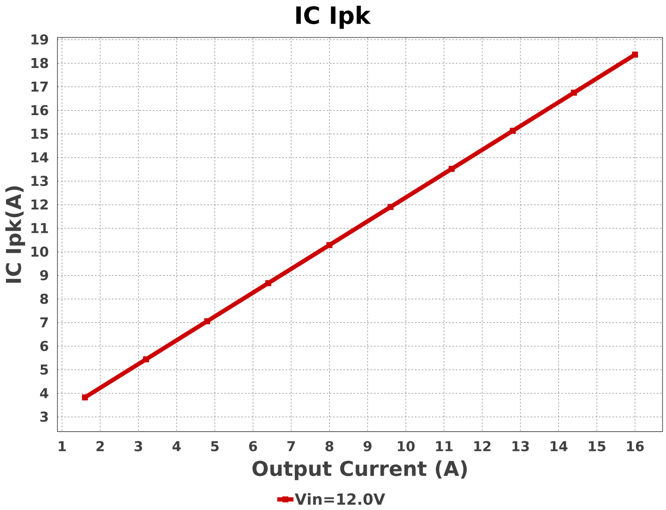

Cin Pd
Cin Pd(W)
Output Current (A)
Vin=12.0V

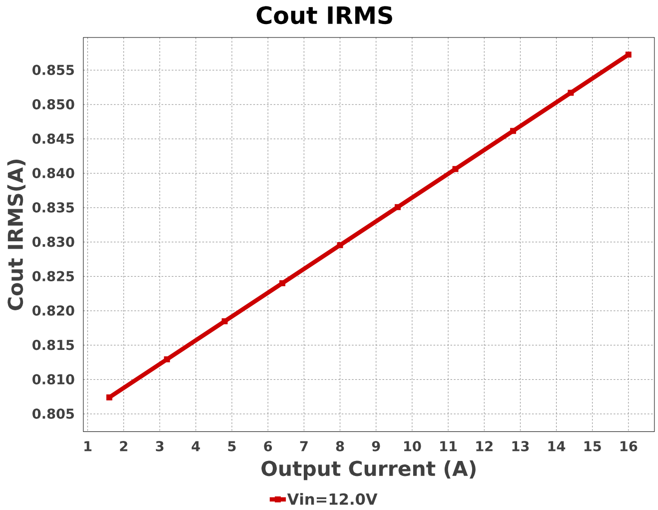

Cin IRMS
Cin IRMS(A)
Output Current (A)
Vin=12.0V

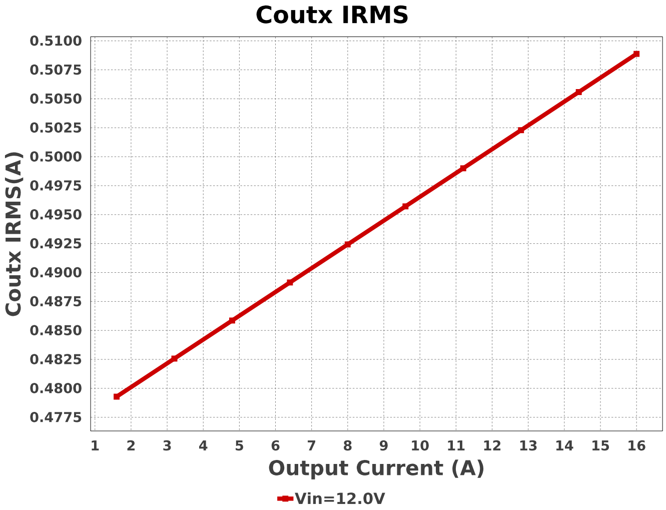

Coutx Pd
Coutx Pd(W)
Output Current (A)
Vin=12.0V

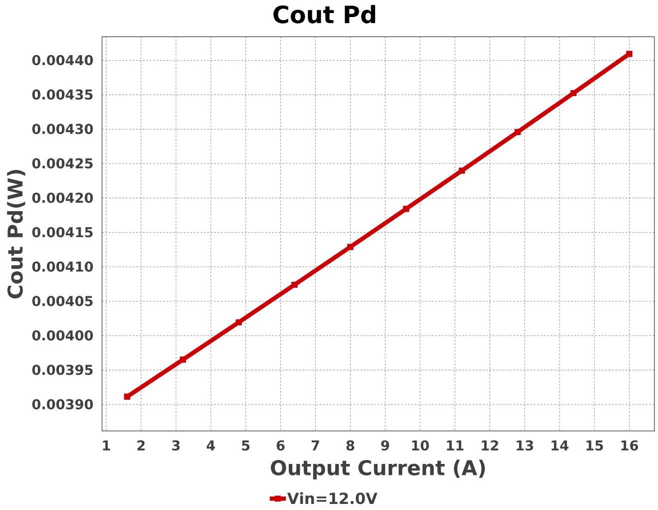

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=12.0V

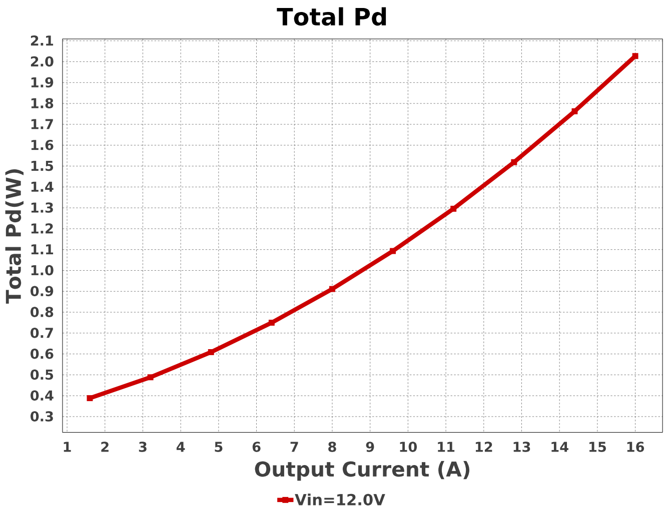

Pout
Pout(W)
Output Current (A)
Vin=12.0V

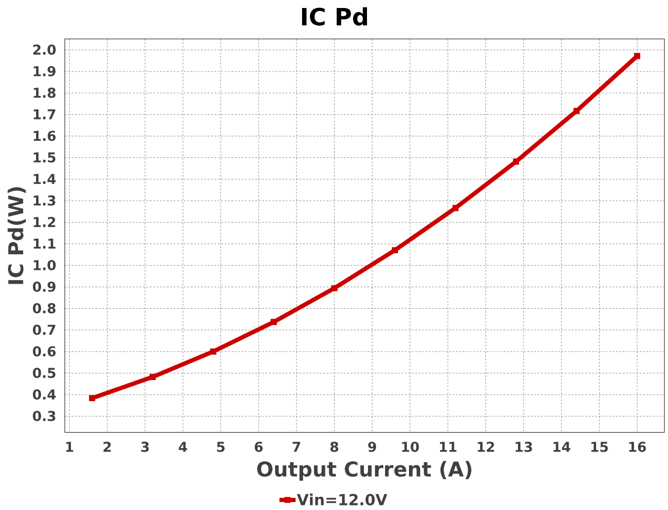

IC Ipk
IC Ipk(A)
Output Current (A)
Vin=12.0V

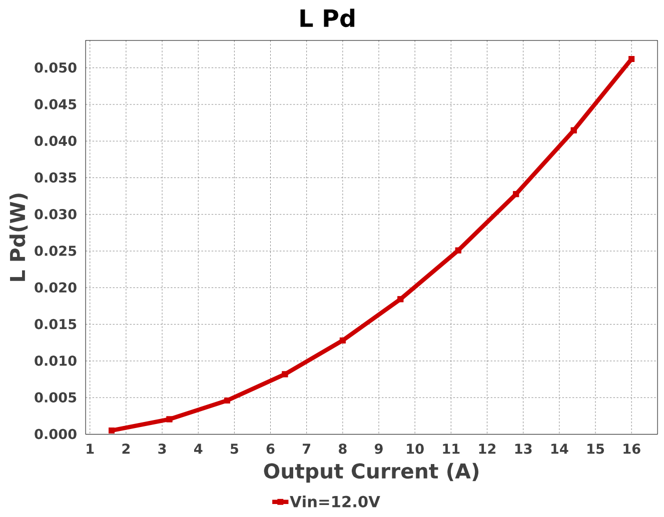

Cout IRMS
Cout IRMS(A)
Output Current (A)
Vin=12.0V


Coutx IRMS
Coutx IRMS(A)
Output Current (A)
Vin=12.0V


Cout Pd
Cout Pd(W)
Output Current (A)
Vin=12.0V


Total Pd
Total Pd(W)
Output Current (A)
Vin=12.0V


IC Pd
IC Pd(W)
Output Current (A)
Vin=12.0V



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	16		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cin IRMS	4.298 A	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	18.469 µW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	857.259 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	4.409 mW	Capacitor	Output capacitor power dissipation
7.	Coutx IRMS	508.877 mA	Capacitor	Output capacitor_x RMS ripple current
8.	Coutx Pd	258.96 µW	Capacitor	Output capacitor_x power loss
9.	IC Ipk	18.366 A	IC	Peak switch current in IC
10.	IC Pd	1.972 W	IC	IC power dissipation
11.	IC Tj	61.543 degC	IC	IC junction temperature
12.	ICThetaJA	16.0 degC/W	IC	IC junction-to-ambient thermal resistance
13.	Iin Avg	1.336 A	IC	Average input current
14.	L Ipp	4.732 A	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	51.2 mW	Inductor	Inductor power dissipation
16.	Cin Pd	18.469 µW	Power	Input capacitor power dissipation
17.	Cout Pd	4.409 mW	Power	Output capacitor power dissipation
18.	Coutx Pd	258.96 µW	Power	Output capacitor_x power loss
19.	IC Pd	1.972 W	Power	IC power dissipation
20.	L Pd	51.2 mW	Power	Inductor power dissipation
21.	Total Pd	2.027 W	Power	Total Power Dissipation
22.	Duty Cycle	7.827 %	System Information	Duty cycle
23.	Efficiency	87.352 %	System Information	Steady state efficiency
24.	FootPrint	467.0 mm^2	System Information	Total Foot Print Area of BOM components
25.	Frequency	800.0 kHz	System Information	Switching frequency
26.	Iout	16.0 A	System Information	Iout operating point
27.	Mode	FCCM	System Information	Conduction Mode
28.	Pout	14.0 W	System Information	Total output power
29.	Vin	12.0 V	System Information	Vin operating point
30.	Vout	875.0 mV	System Information	Operational Output Voltage
31.	Vout Actual	876.3 mV	System Information	Vout Actual calculated based on selected voltage divider resistors
32.	Vout Tolerance	1.018 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
33.	Vout p-p	28.69 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	16.0	Maximum Output Current
VinMax	12.0	Maximum input voltage
VinMin	12.0	Minimum input voltage

Name	Value	Description
Vout	875.0 m	Output Voltage
base_pn	TPS548C26	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 Cin and Cout, 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

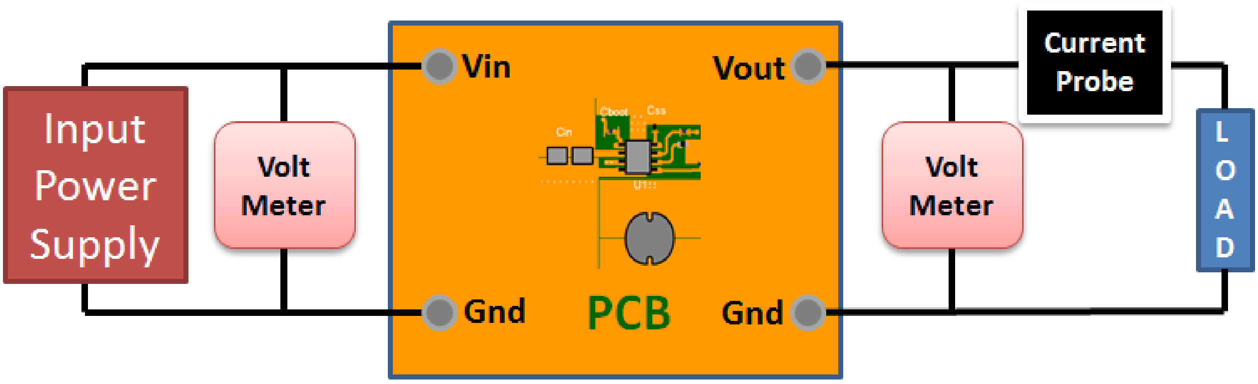
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. To solder the tab town 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 12.0V and set the input supply's current limit to zero. With the input supply off connect up the input supply to Vin and GND. Connect a digital volt meter and a load if needed to set the minimum Iout of the design from Vout 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 Vin and GND, a load is connected between Vout and GND and a current meter is connected in series between Vout 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 : 663A81E598F70D67[v1]

2. **TPS548C26** Product Folder : http://www.ti.com/product/TPS548C26 : contains the data sheet and other resources.