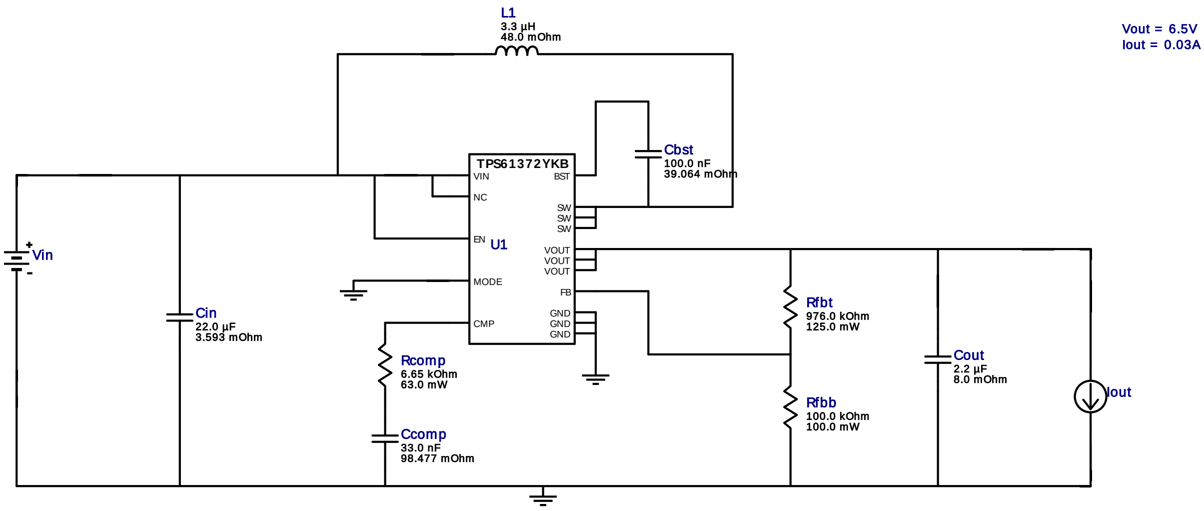
TEXAS INSTRUMENTS

WEBENCH ® Design Report

VinMin = 3.3V
VinMax = 3.7V
Vout = 6.5V
Iout = 0.03A

Device = TPS61372YKBR
Topology = Boost
Created = 2020-11-01 21:02:41.649
BOM Cost = $3.36
BOM Count = 9
Total Pd = 0.02W

Design : 45 TPS61372YKBR
TPS61372YKBR 3.3V-3.7V to 6.50V @ 0.03A



Design Alerts

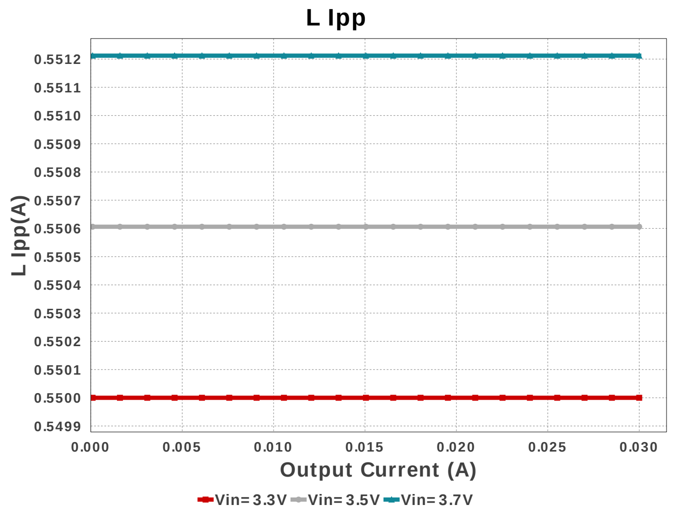
Component Selection Information

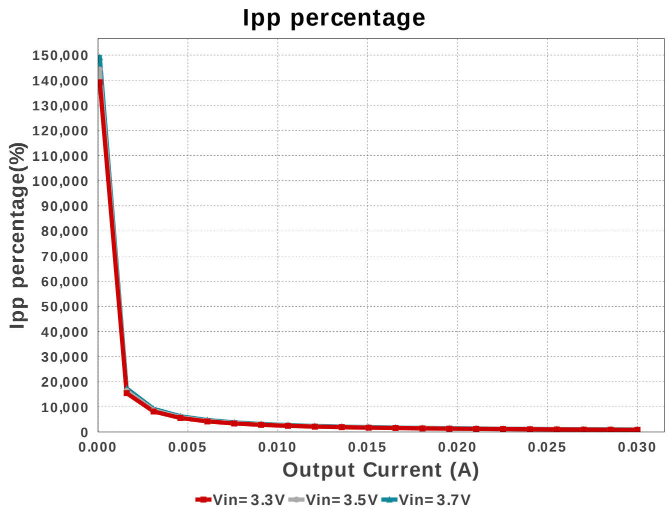
The WEBENCH model for TPS61372 does not support operation in PFM mode. Hence, the bode plot chart & loop related operating values have been disabled. Also, since the bode electrical simulation results may not be accurate in PFM mode, we would recommend verifying stability by running Load & Input Transient electrical simulation.

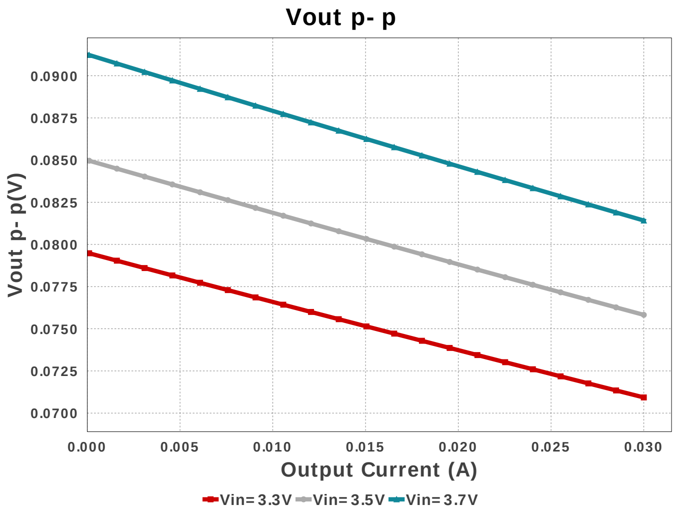
Electrical BOM

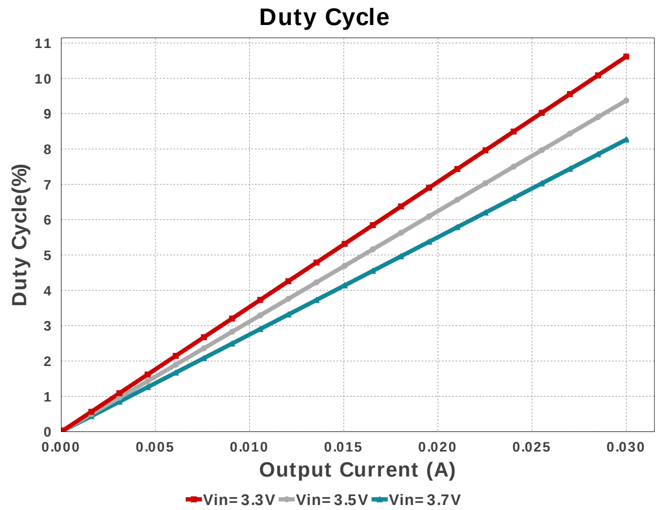
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cbst	TDK	CGA2B3X7R1H104K050BB Series= X7R	Cap= 100.0 nF ESR= 39.064 mOhm VDC= 50.0 V IRMS= 814.67 mA	1	$0.02	0402 3 mm^2
Ccomp	TDK	CGA2B3X7R1H333K050BB Series= X7R	Cap= 33.0 nF ESR= 98.477 mOhm VDC= 50.0 V IRMS= 530.78 mA	1	$0.01	0402 3 mm^2
Cin	MuRata	GRM31CR71A226KE15L Series= X7R	Cap= 22.0 uF ESR= 3.593 mOhm VDC= 10.0 V IRMS= 3.5332 A	1	$0.37	1206_190 11 mm^2
Cout	Kemet	C0805C225K4RACTU Series= X7R	Cap= 2.2 uF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 15.55 A	1	$0.10	0805 7 mm^2
L1	Wurth Elektronik	78438356033	L= 3.3 µH 48.0 mOhm	1	$1.18	WE-MAIA_4020 26 mm^2
Rcomp	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rfbb	Yageo	RT0603BRD07100KL Series= ?	Res= 100.0 kOhm Power= 100.0 mW Tolerance= 0.1%	1	$0.04	0603 5 mm^2
Rfbt	Yageo	RT0805BRD07976KL Series= ?	Res= 976.0 kOhm Power= 125.0 mW Tolerance= 0.1%	1	$0.05	0805 7 mm^2

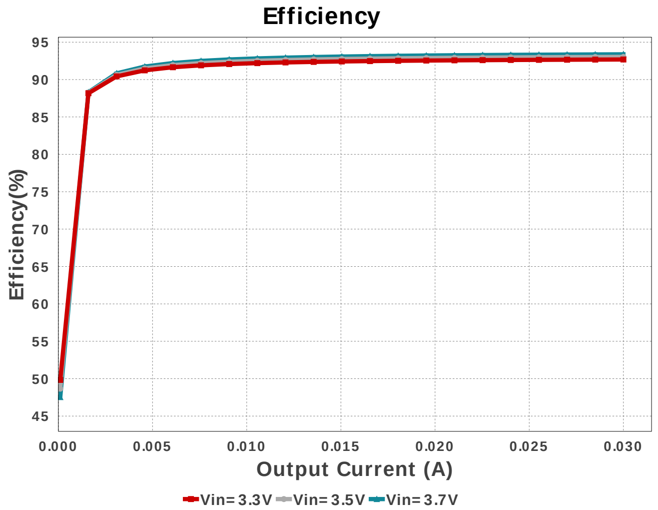
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
U1	Texas Instruments	TPS61372YKBR	Switcher	1	$1.58	YKB0016AEAG 6 mm²

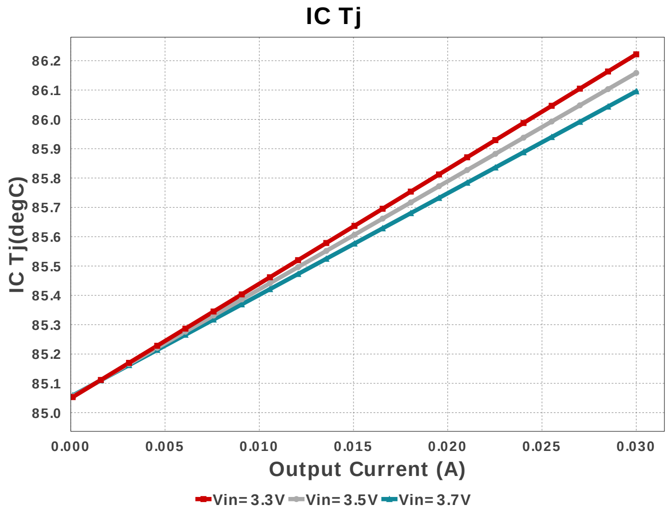




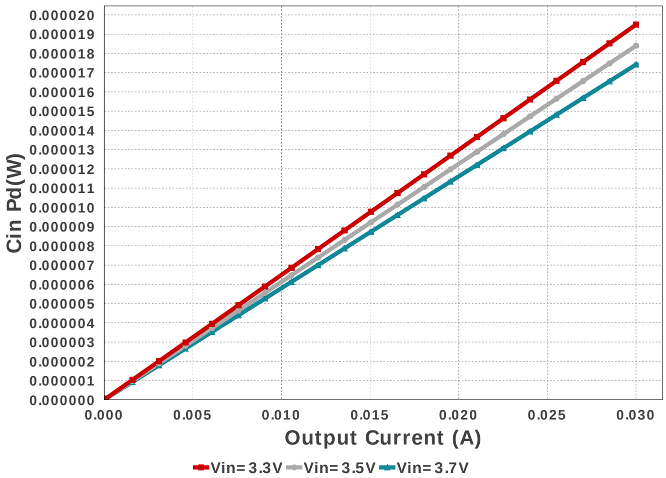




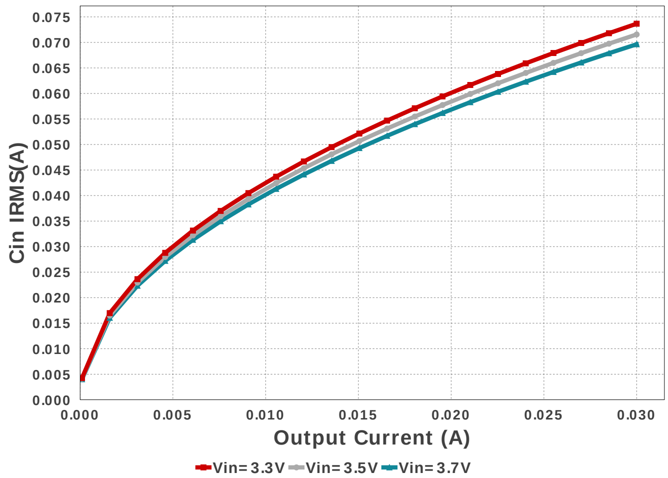




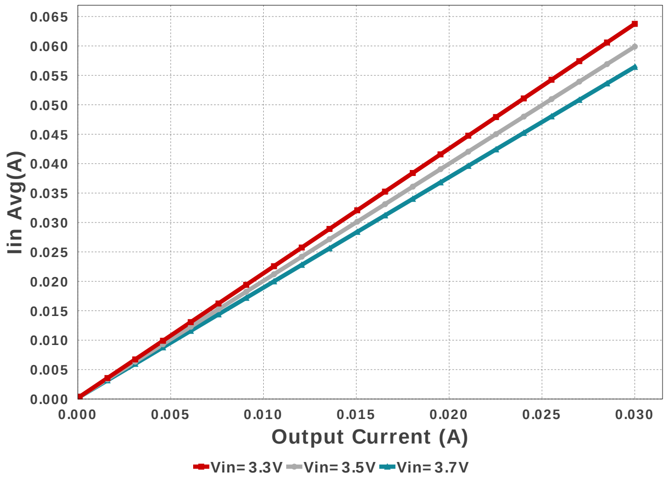
Cin Pd



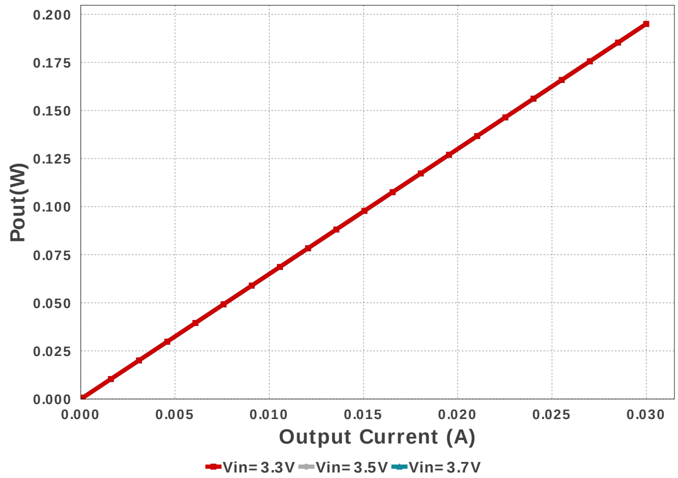
Cin IRMS



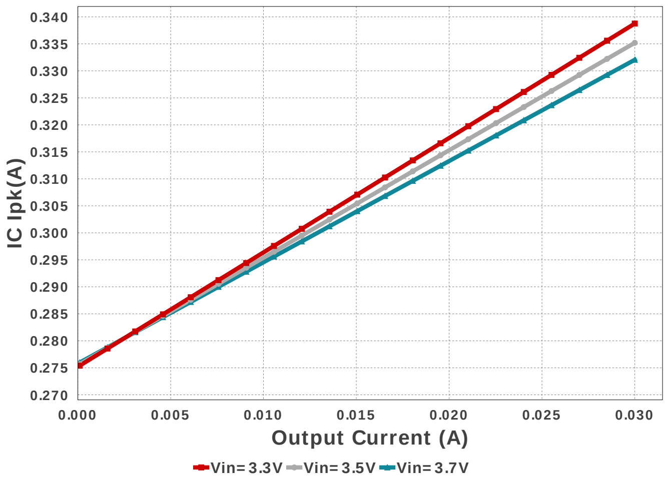
Iin Avg



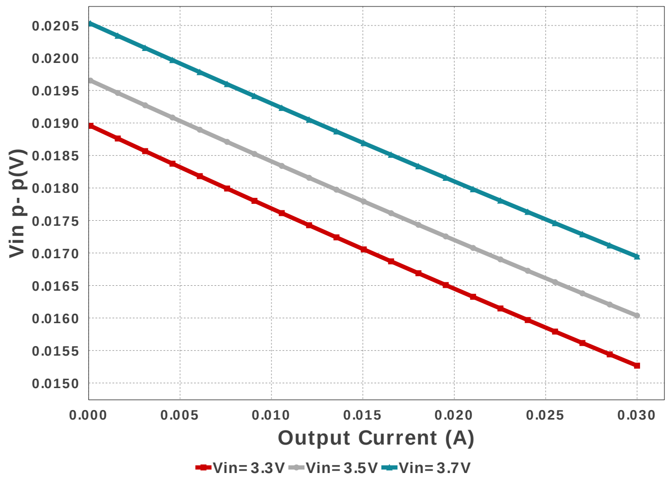
Pout



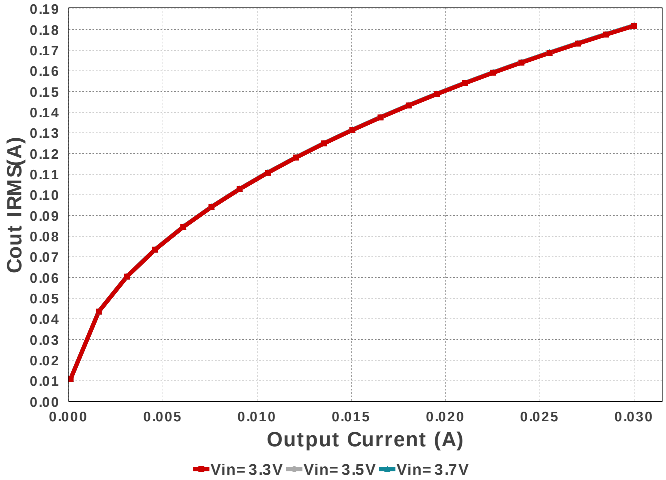
IC Ipk



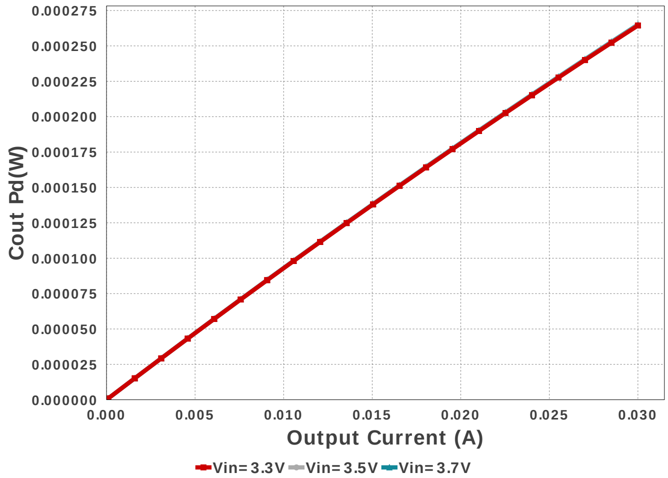
Vin p- p



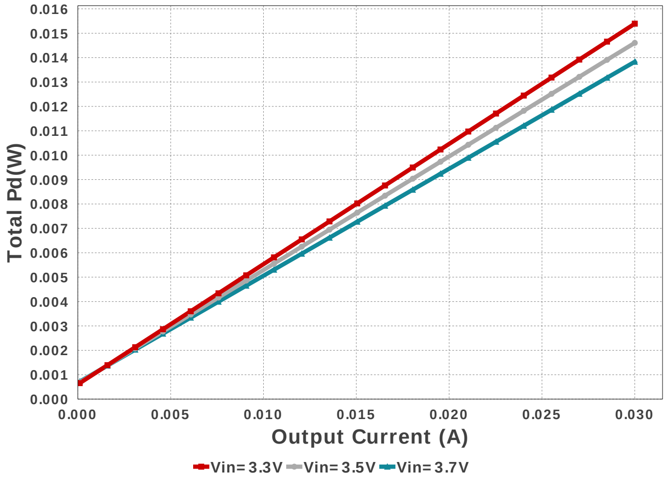
Cout IRMS



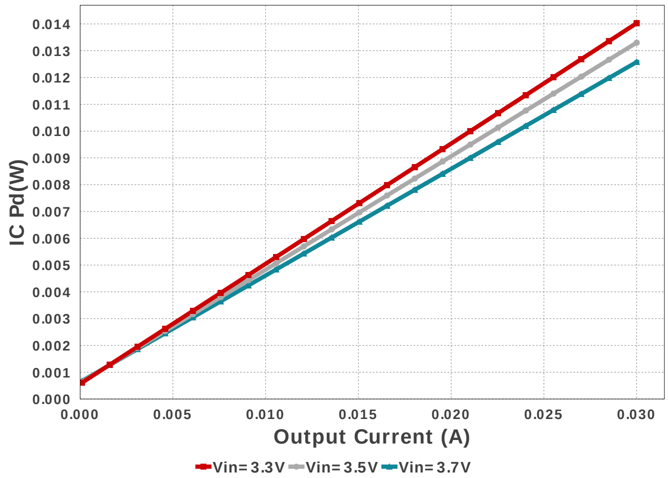
Cout Pd



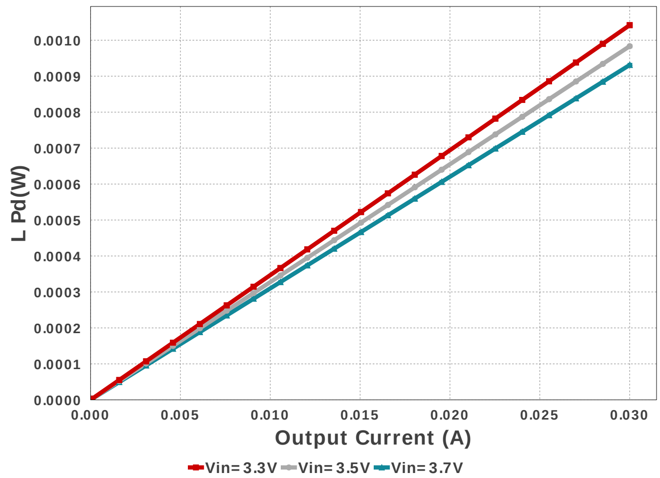
Total Pd



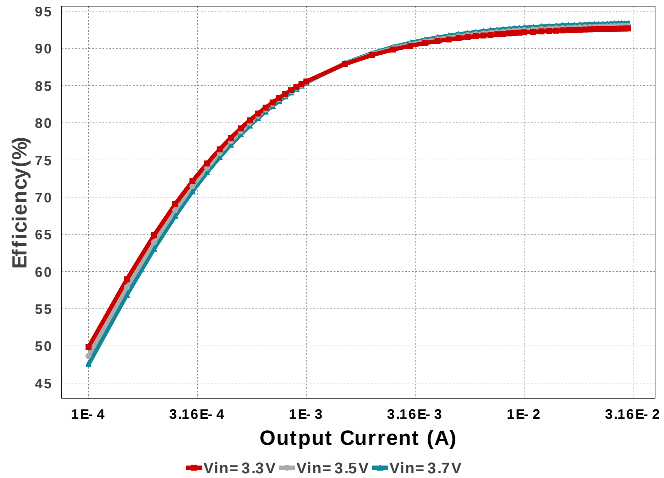
IC Pd



L Pd



Efficiency (Log- Scale)



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	9		Total Design BOM count
2.	Total BOM	$3.364		Total BOM Cost
3.	Cin IRMS	73.663 mA	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	19.496 µW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	181.797 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	264.4 µW	Capacitor	Output capacitor power dissipation
7.	IC Ipk	338.755 mA	IC	Peak switch current in IC
8.	IC Pd	14.028 mW	IC	IC power dissipation
9.	IC Tj	86.222 degC	IC	IC junction temperature
10.	IC Tolerance	8.0 mV	IC	IC Feedback Tolerance
11.	ICThetaJA	87.1 degC/W	IC	IC junction-to-ambient thermal resistance

#	Name	Value	Category	Description
12.	Iin Avg	63.755 mA	IC	Average input current
13.	Ipp percentage	862.671 %	Inductor	Inductor ripple current percentage (with respect to average inductor current)
14.	L Ipp	550.0 mA	Inductor	Peak-to-peak inductor ripple current
15.	L Pd	1.042 mW	Inductor	Inductor power dissipation
16.	Cin Pd	19.496 µW	Power	Input capacitor power dissipation
17.	Cout Pd	264.4 µW	Power	Output capacitor power dissipation
18.	IC Pd	14.028 mW	Power	IC power dissipation
19.	L Pd	1.042 mW	Power	Inductor power dissipation
20.	Total Pd	15.392 mW	Power	Total Power Dissipation
21.	Duty Cycle	10.616 %	System Information	Duty cycle
22.	Efficiency	92.684 %	System Information	Steady state efficiency
23.	FootPrint	70.0 mm^2	System Information	Total Foot Print Area of BOM components
24.	Frequency	192.718 kHz	System Information	Switching frequency
25.	Iout	30.0 mA	System Information	Iout operating point
26.	Mode	PFM	System Information	Conduction Mode
27.	Pout	195.0 mW	System Information	Total output power
28.	Vin	3.3 V	System Information	Vin operating point
29.	Vin p-p	15.267 mV	System Information	Peak-to-peak input voltage
30.	Vout	6.5 V	System Information	Operational Output Voltage
31.	Vout Actual	6.456 V	System Information	Vout Actual calculated based on selected voltage divider resistors
32.	Vout Tolerance	1.517 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
33.	Vout p-p	70.929 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	30.0 m	Maximum Output Current
VinMax	3.7	Maximum input voltage
VinMin	3.3	Minimum input voltage
Vout	6.5	Output Voltage
base_pn	TPS61372	Base Product Number
source	DC	Input Source Type
Ta	85.0	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

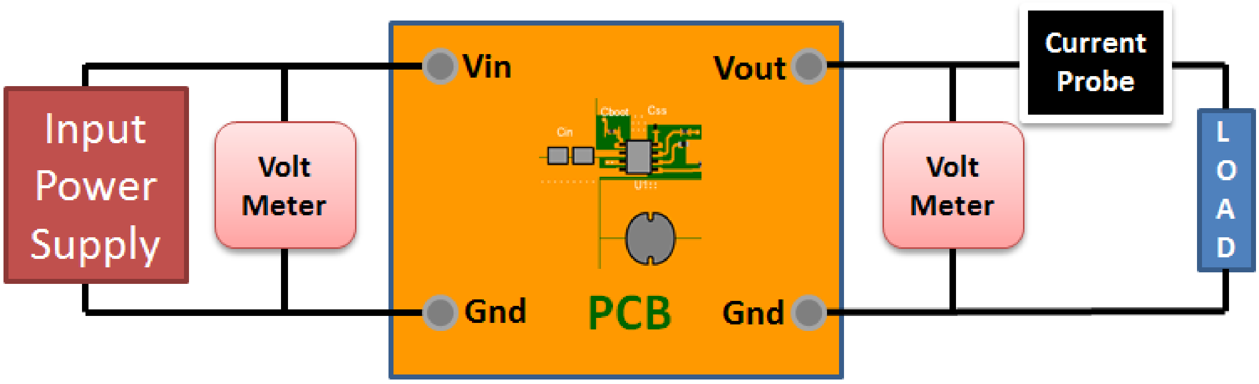
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 3.3V 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 : 202DDE02F07E0483[v1]

2. **TPS61372** Product Folder : http://www.ti.com/product/TPS61372 : contains the data sheet and other resources.

Important Notice and Disclaimer