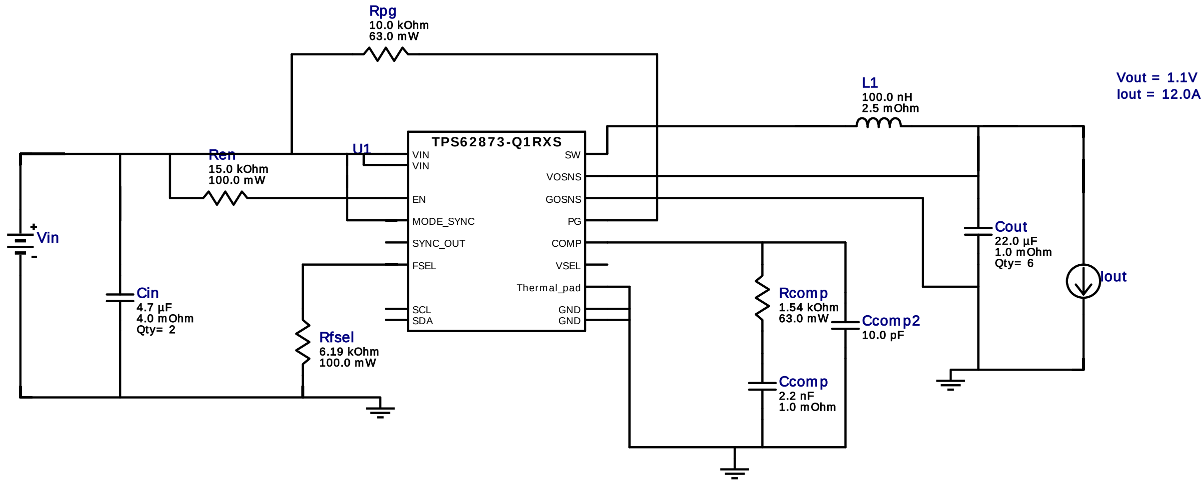
VinMin = 2.7V	Device = TPS62873QWRXSRQ1
VinMax = 6.0V	Topology = Buck
Vout = 1.1V	Created = 2024-02-13 06:37:08.009
Iout = 12.0A	BOM Cost = NA
	BOM Count = 16
	Total Pd = 1.84W

WEBENCH ® Design Report

Design : 107 TPS62873QWRXSRQ1
TPS62873QWRXSRQ1 2.7V-6V to 1.10V @ 15



Design Alerts

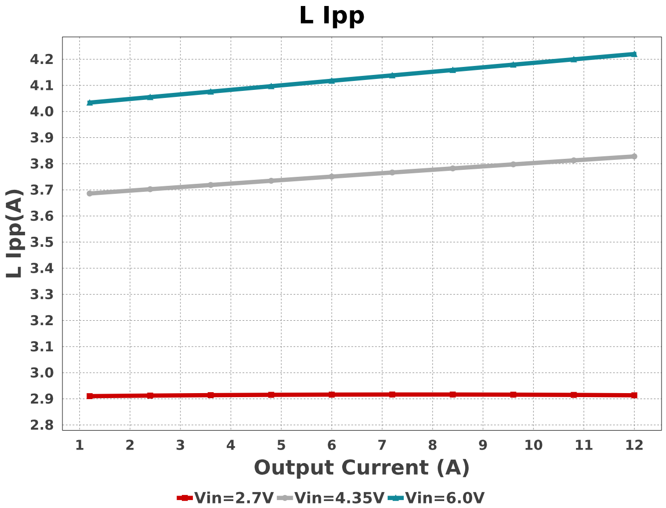
Component Selection Information

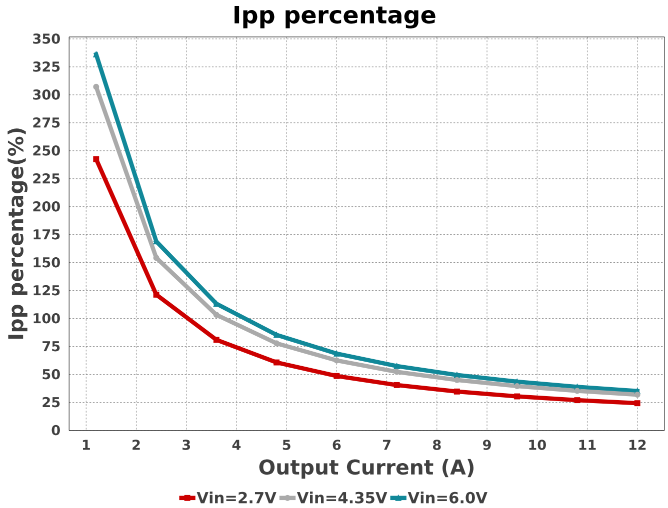
The TPS62873-Q1 is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.

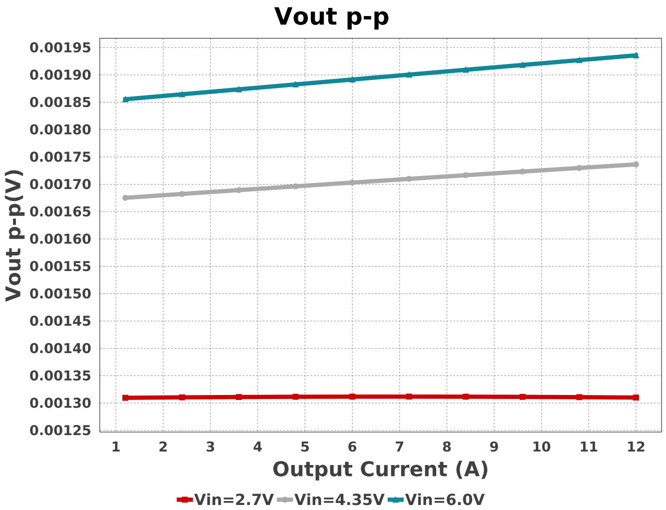
Electrical BOM

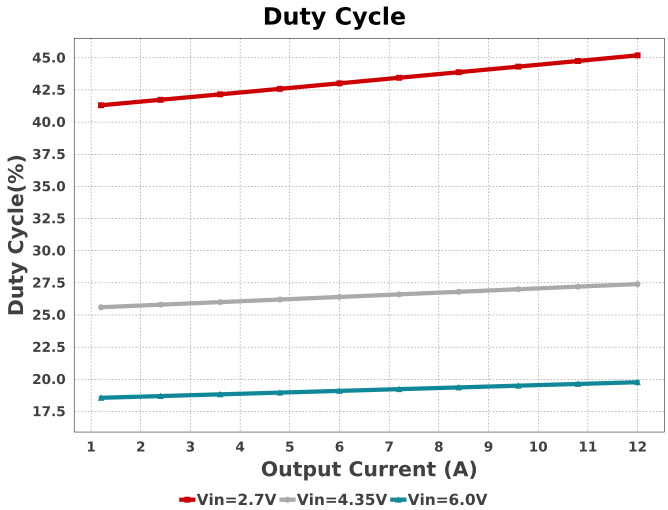
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Ccomp	MuRata	GRM155R71E222KA01D Series= X7R	Cap= 2.2 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
Ccomp2	Kemet	C0805C100M4GACTU Series= C0G/NP0	Cap= 10.0 pF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
Cin	Kemet	C0805C475K8PACTU Series= X5R	Cap= 4.7 uF ESR= 4.0 mOhm VDC= 10.0 V IRMS= 9.89 A	2	$0.05	0805 7 mm²
Cout	MuRata	GRM21BD70J226ME44L Series= X7T	Cap= 22.0 uF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 6.0 A	6	$0.10	0805 7 mm²
L1	Coilcraft	XEL4020-101MEC	L= 100.0 nH 2.5 mOhm	1	NA	MLC7532 0 mm²
Rcomp	Vishay-Dale	CRCW04021K54FKED Series= CRCW..e3	Res= 1.54 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
Ren	Yageo	RC0603FR-0715KL Series= ?	Res= 15.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²

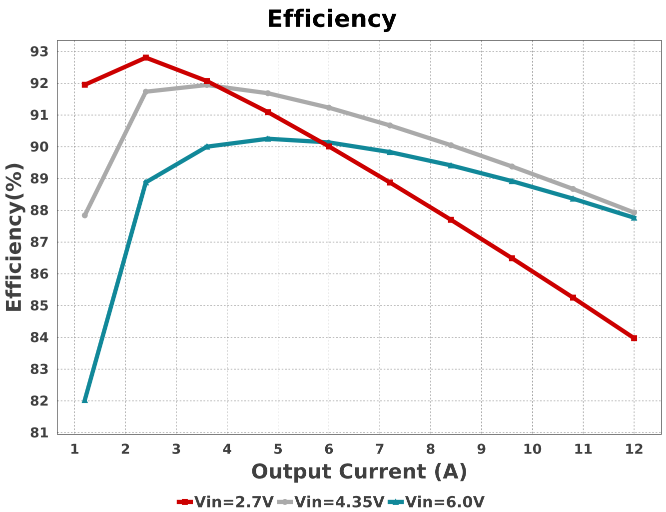
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Rfsel	Vishay-Dale	CRCW06036K19FKEA Series= CRCW..e3	Res= 6.19 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm^2
Rpg	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
U1	Texas Instruments	TPS62873QWRXSRQ1	Switcher	1	$1.85	RXS0016A-MFG 23 mm^2

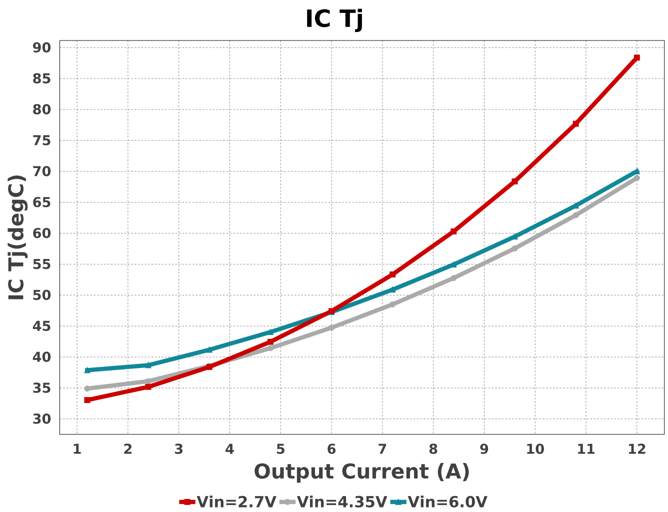


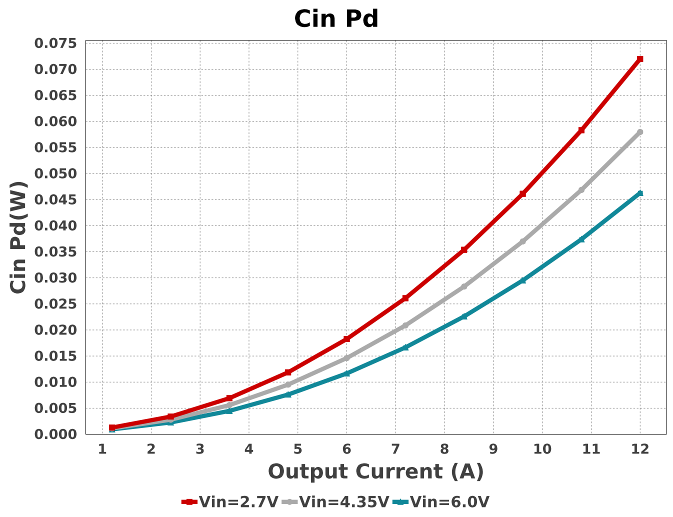


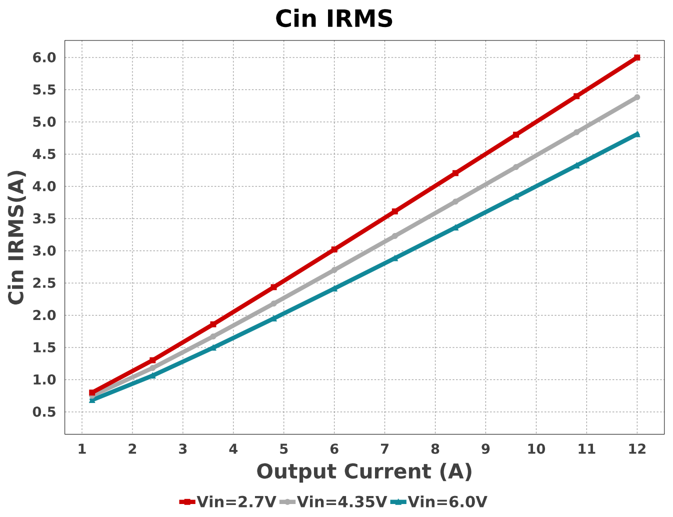


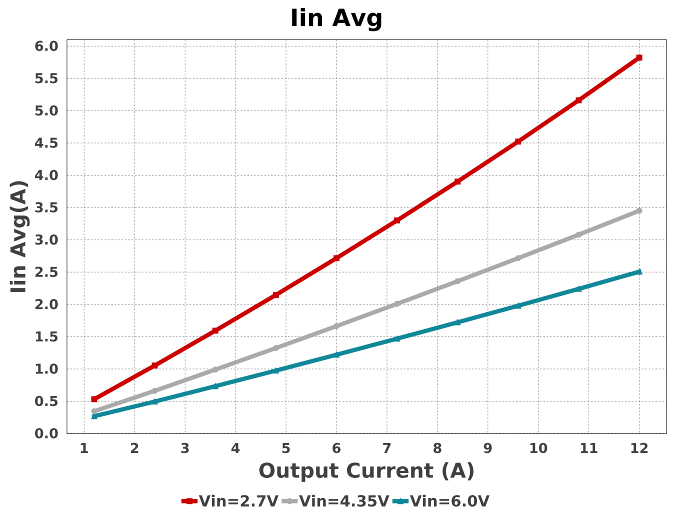


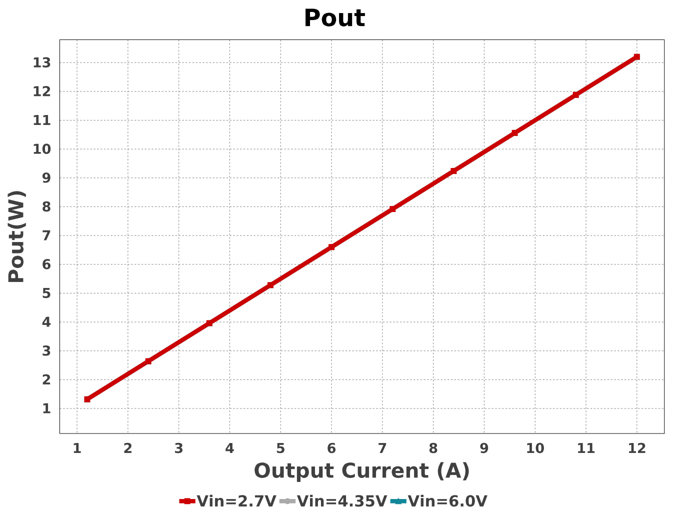


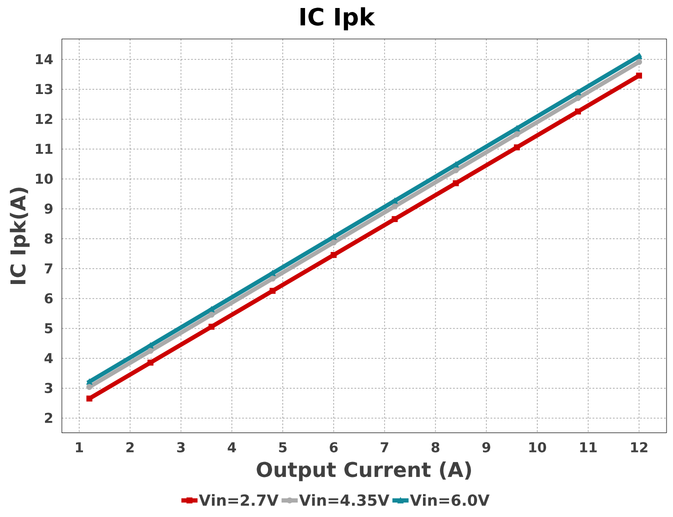


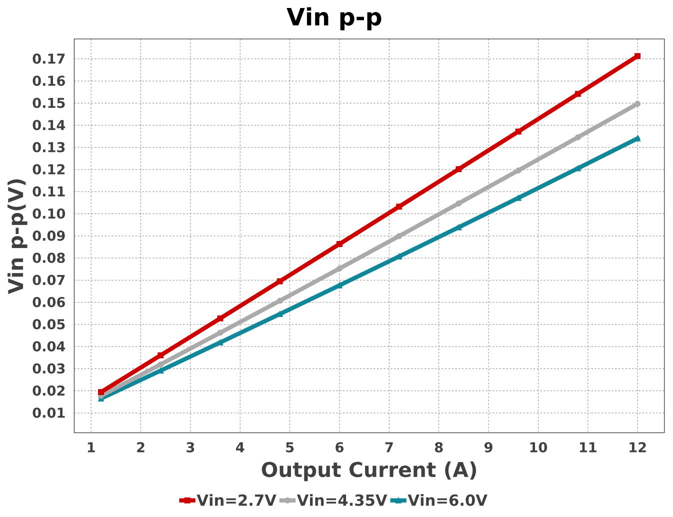

Cin Pd
Cin Pd(W)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

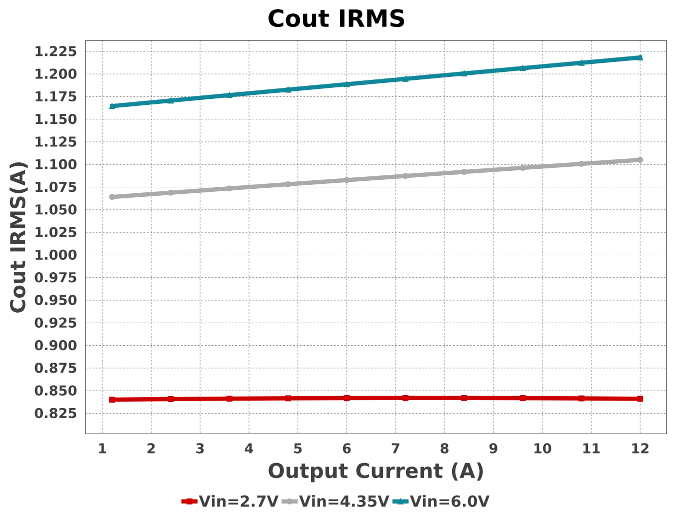

Cin IRMS
Cin IRMS(A)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

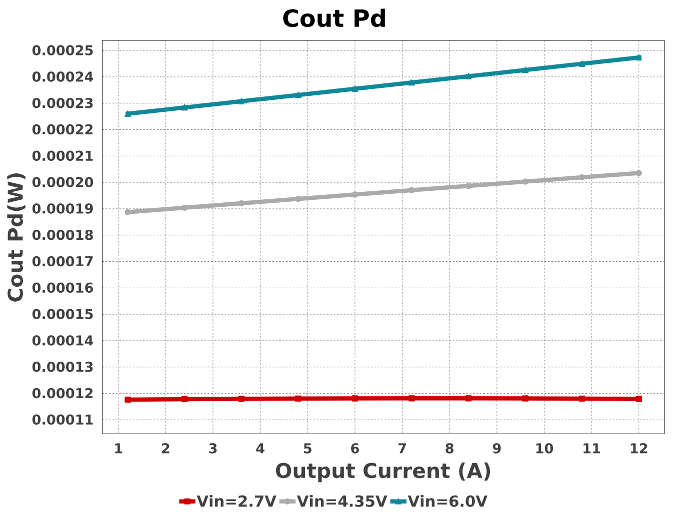

Iin Avg
Iin Avg(A)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

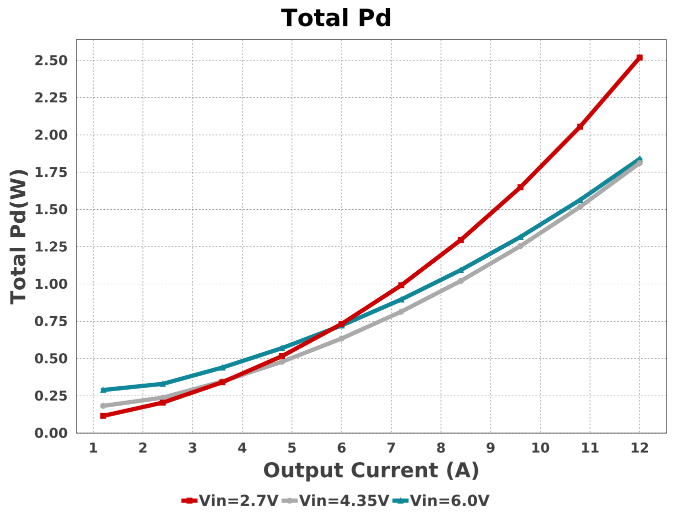

Pout
Pout(W)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

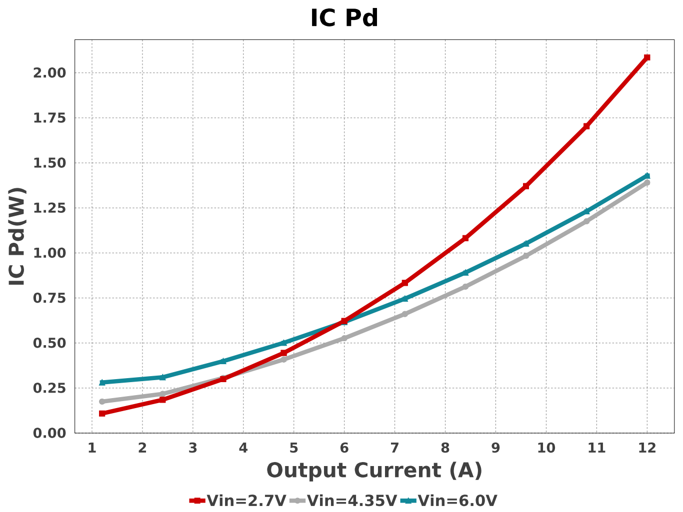

IC Ipk
IC Ipk(A)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

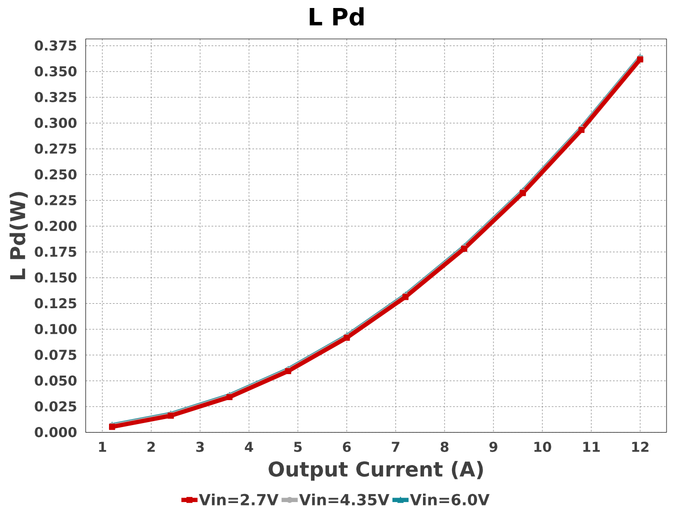

Vin p-p
Vin p-p(V)
Output Current (A)
Vin=2.7V Vin=4.35V Vin=6.0V

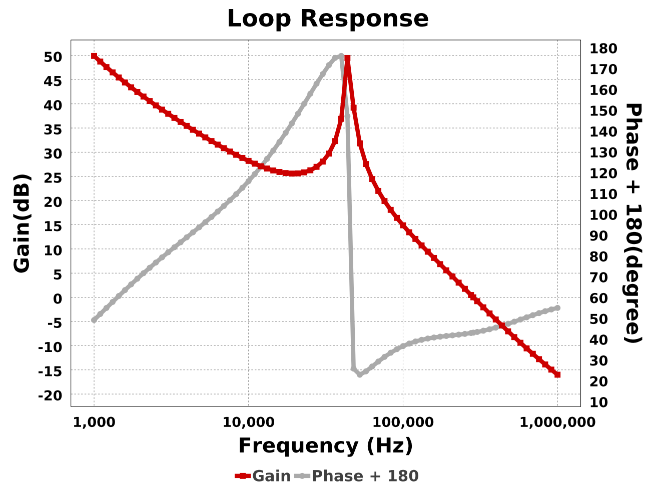












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	16		Total Design BOM count
2.	Total BOM	NA		Total BOM Cost
3.	Cin IRMS	4.81 A	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	46.273 mW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	1.218 A	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	247.34 µW	Capacitor	Output capacitor power dissipation
7.	IC Ipk	14.11 A	IC	Peak switch current in IC
8.	IC Pd	1.429 W	IC	IC power dissipation
9.	IC Tj	70.021 degC	IC	IC junction temperature
10.	ICThetaJA Effective	28.0 degC/W	IC	Effective IC Junction-to-Ambient Thermal Resistance
11.	Iin Avg	2.507 A	IC	Average input current

#	Name	Value	Category	Description
12.	Ipp percentage	35.167 %	Inductor	Inductor ripple current percentage (with respect to average inductor current)
13.	L Ipp	4.22 A	Inductor	Peak-to-peak inductor ripple current
14.	L Pd	363.71 mW	Inductor	Inductor power dissipation
15.	Cin Pd	46.273 mW	Power	Input capacitor power dissipation
16.	Cout Pd	247.34 µW	Power	Output capacitor power dissipation
17.	IC Pd	1.429 W	Power	IC power dissipation
18.	L Pd	363.71 mW	Power	Inductor power dissipation
19.	Total Pd	1.84 W	Power	Total Power Dissipation
20.	Cross Freq	285.273 kHz	System Information	Bode plot crossover frequency
21.	Duty Cycle	19.773 %	System Information	Duty cycle
22.	Efficiency	87.768 %	System Information	Steady state efficiency
23.	FootPrint	187.0 mm^2	System Information	Total Foot Print Area of BOM components
24.	Frequency	2.25 MHz	System Information	Switching frequency
25.	Gain Marg	-36.631 dB	System Information	Bode Plot Gain Margin
26.	Iout	12.0 A	System Information	Iout operating point
27.	Low Freq Gain	49.903 dB	System Information	Gain at 1Hz
28.	Mode	CCM	System Information	Conduction Mode
29.	Phase Marg	43.519 deg	System Information	Bode Plot Phase Margin
30.	Pout	13.2 W	System Information	Total output power
31.	Vin	6.0 V	System Information	Vin operating point
32.	Vin p-p	134.06 mV	System Information	Peak-to-peak input voltage
33.	Vout	1.1 V	System Information	Operational Output Voltage
34.	Vout Tolerance	1.0 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
35.	Vout p-p	1.936 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	12.0	Maximum Output Current
VinMax	6.0	Maximum input voltage
VinMin	2.7	Minimum input voltage
Vout	1.1	Output Voltage
base_pn	TPS62873-Q1	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

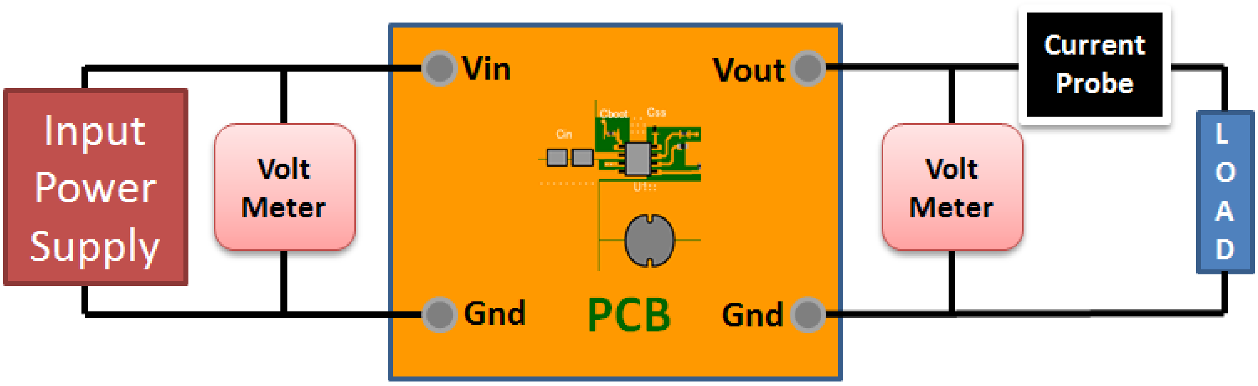
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 2.7V 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.

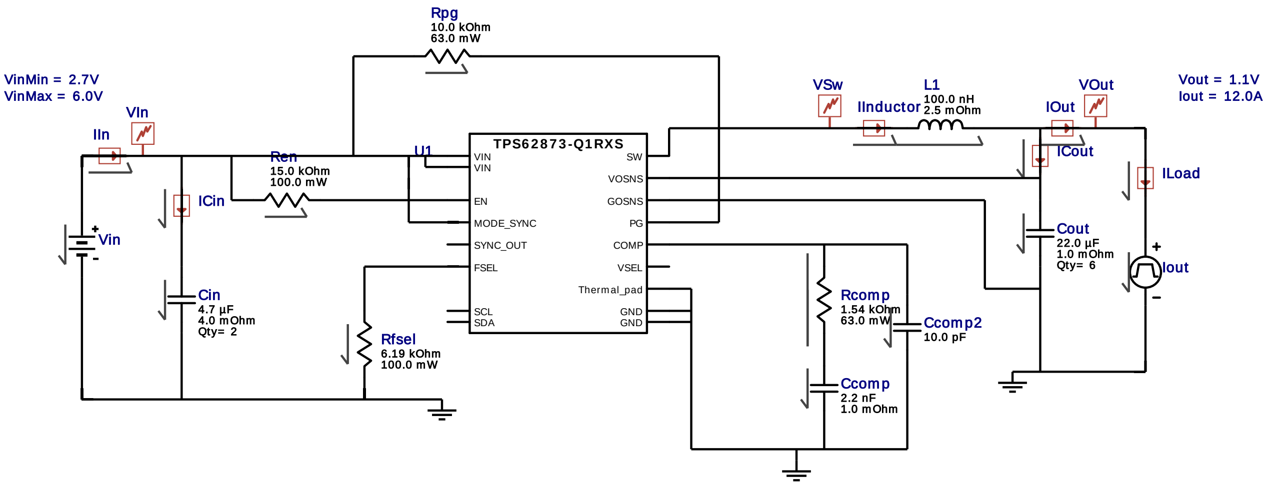


WEBENCH® Electrical Simulation Report

Design Id = 107

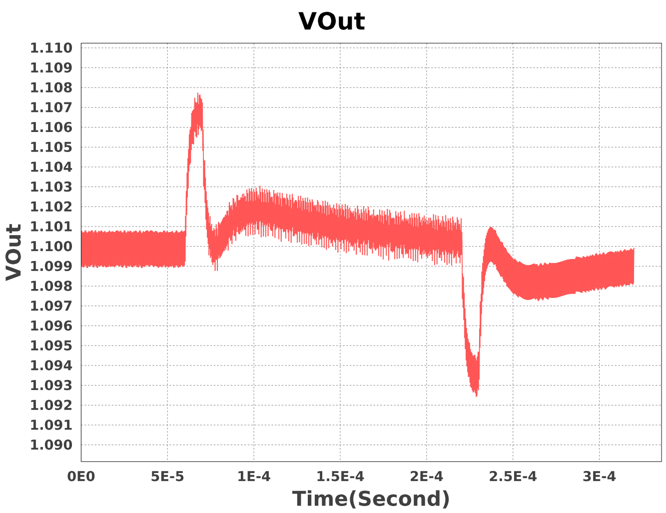
sim_id = 5

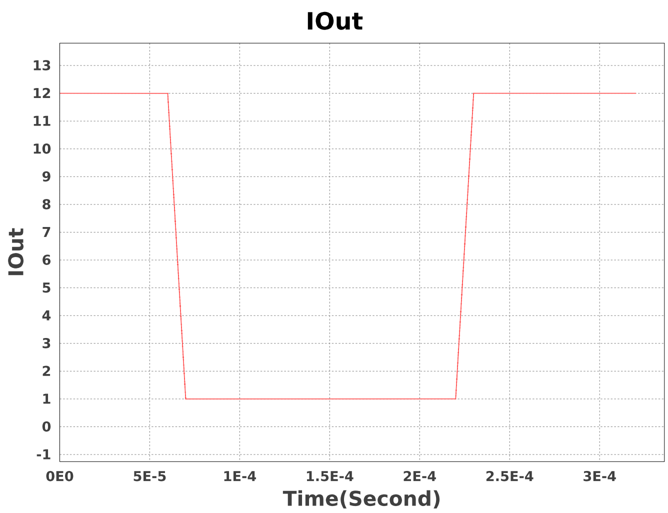
Simulation Type = Load Transient



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	ILoad	I	Load Current	ILoad1 A
2.	Iout	signal_type	Signal Type	PULSE
		I1	Minimum Load Current	12.0 A
		I2	Minimum Load Current	1.0 A
		Td	Initial Time Delay	6.0E-5 s
		Tf	Fall Time	1.0E-5 s
		Tr	Rise Time	1.0E-5 s
		Pw	Pulse Width	1.5E-4 s





Design Assistance

1. Master key : 6840987D3C5906C5[v1]

2. **TPS62873-Q1** Product Folder : http://www.ti.com/product/TPS62873%2DQ1 : contains the data sheet and other resources.

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