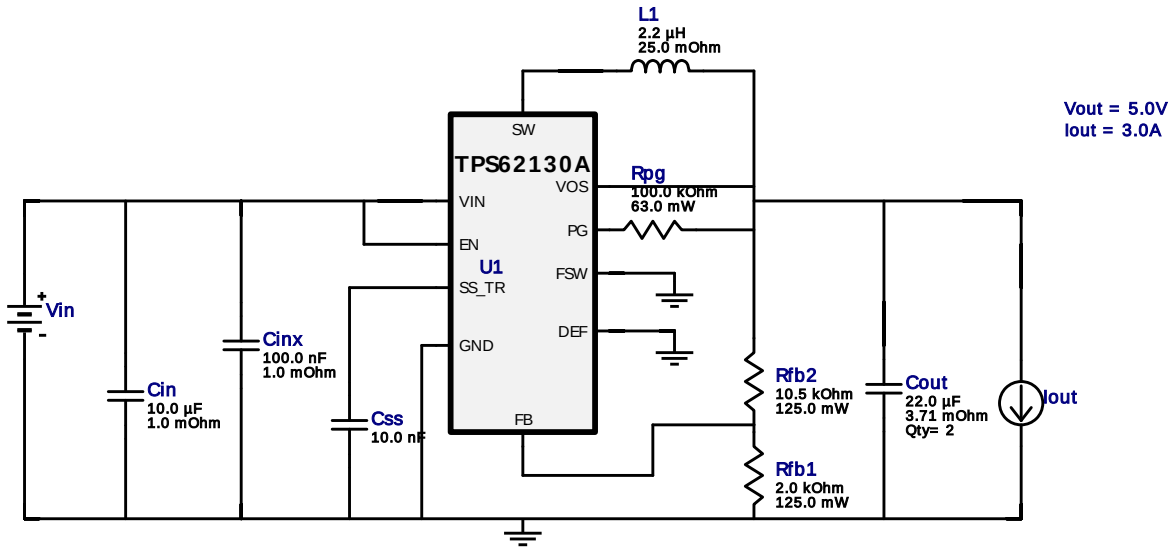
WEBENCH® Design Report

VinMin = 10.8V
VinMax = 13.2V
Vout = 5.0V
Iout = 3.0A

Device = TPS62130ARGTR
Topology = Buck
Created = 2018-12-27 11:23:30.294
BOM Cost = $2.52
BOM Count = 10
Total Pd = 1.78W

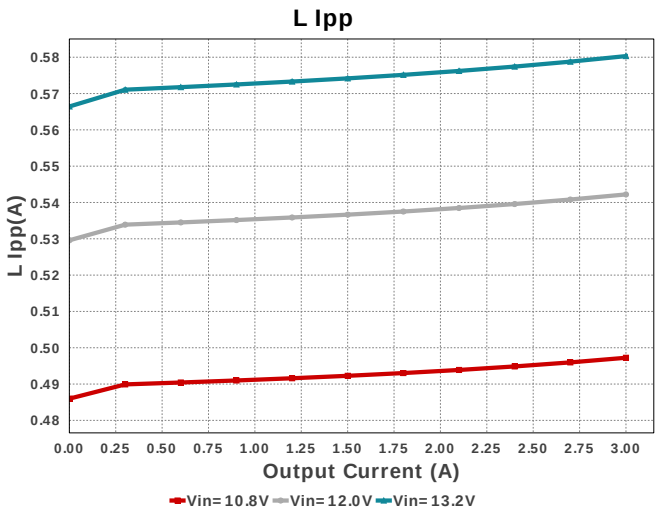
Design : 2 TPS62130ARGTR
TPS62130ARGTR 10.8V-13.2V to 5.00V @ 3A

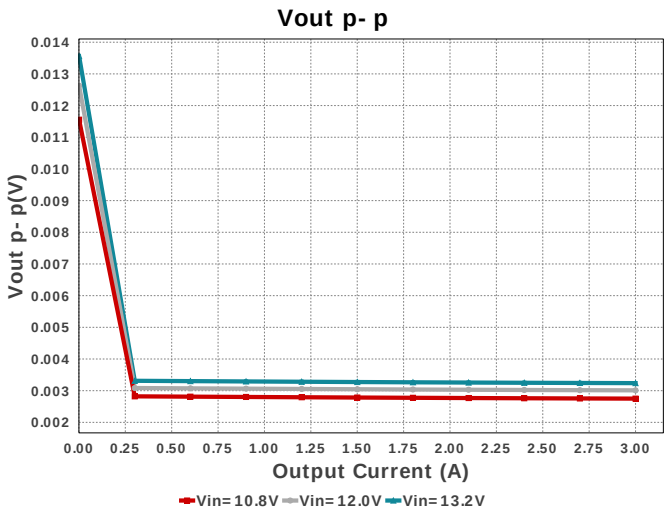


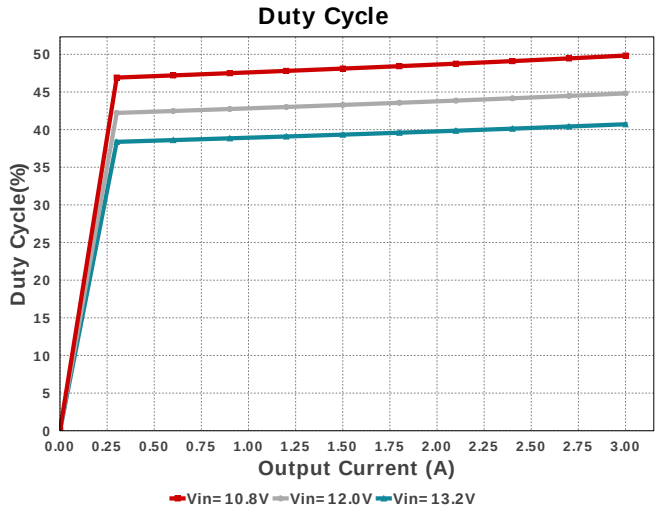
Electrical BOM

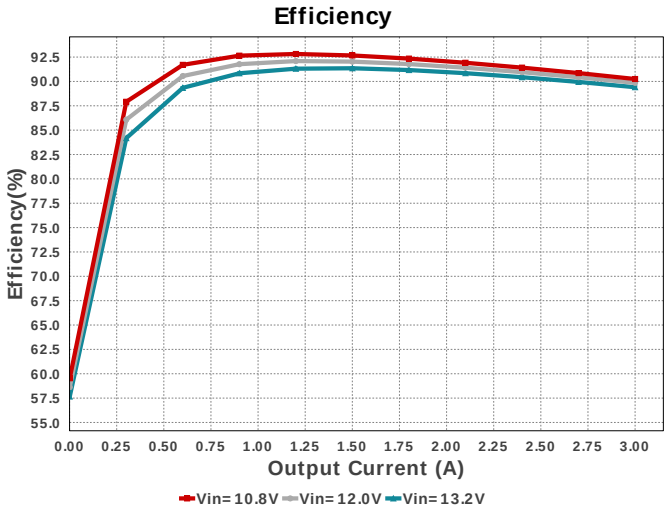
Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	MuRata	GRM31CR71E106KA12L Series= X7R	Cap= 10.0 uF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 6.0 A	1	$0.29	1206_180 11 mm²
Cinx	Kemet	C0603C104M3VACTU Series= Y5V	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.02	0603 5 mm²
Cout	TDK	C1608X5R1A226M080AC Series= X5R	Cap= 22.0 uF ESR= 3.71 mOhm VDC= 10.0 V IRMS= 2.69936 A	2	$0.13	0603 5 mm²
Css	Kemet	C0805C103J3GACTU Series= C0G/NP0	Cap= 10.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.10	0805 7 mm²
L1	Vishay-Dale	IHLP2020CZER2R2M11	L= 2.2 µH DCR= 25.0 mOhm	1	$0.99	IHLP-2020CZ 54 mm²
Rfb1	Panasonic	ERJ-6ENF2001V Series= ERJ-6E	Res= 2.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
Rfb2	Panasonic	ERJ-6ENF1052V Series= ERJ-6E	Res= 10.5 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
Rpg	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
U1	Texas Instruments	TPS62130ARGTR	Switcher	1	$0.83	S-PVQFN-N16 17 mm²

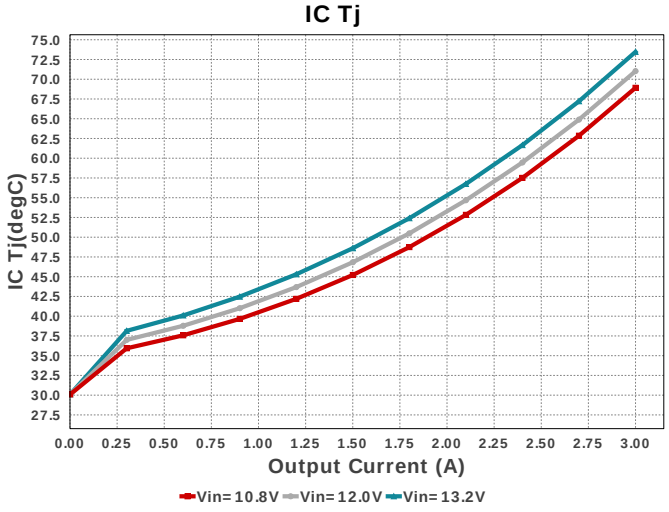
Copyright © 2018, Texas Instruments Incorporated

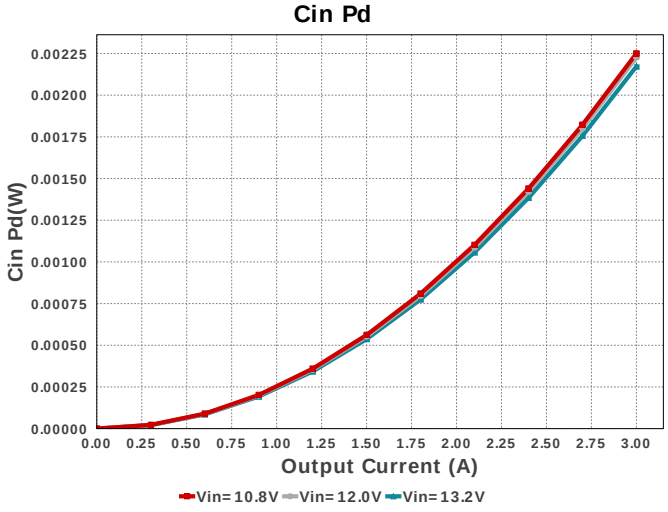




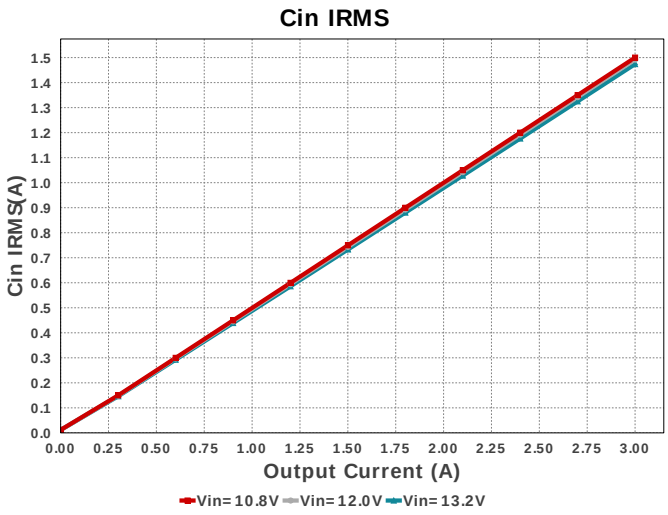


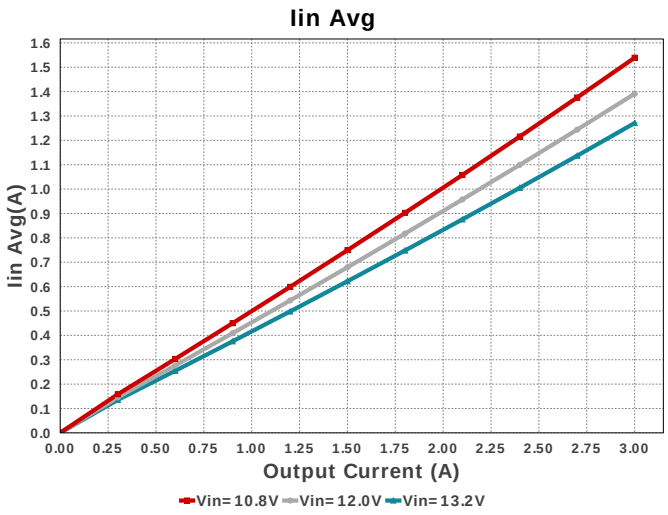


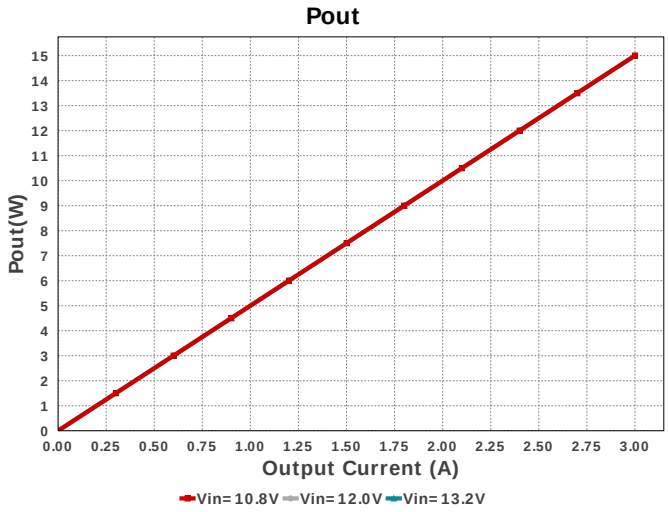


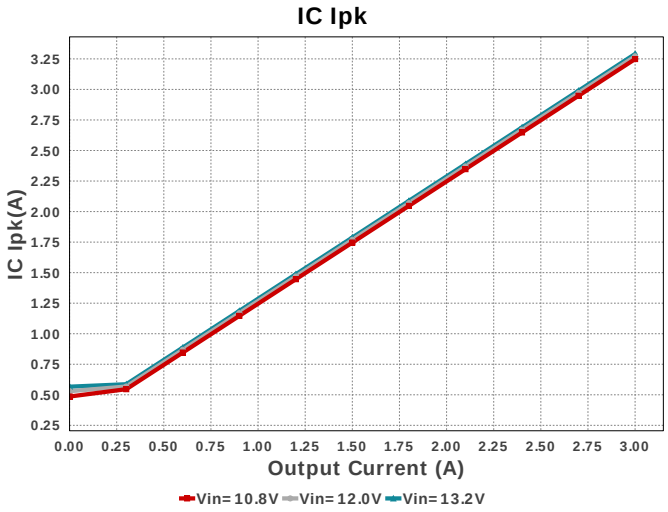


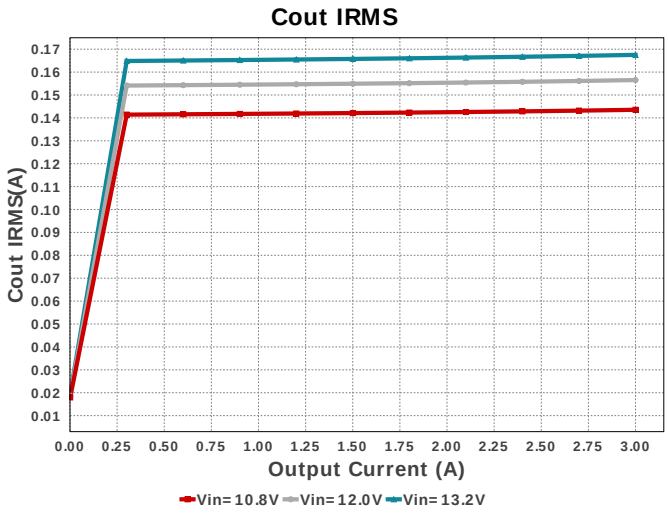
Copyright © 2018, Texas Instruments Incorporated

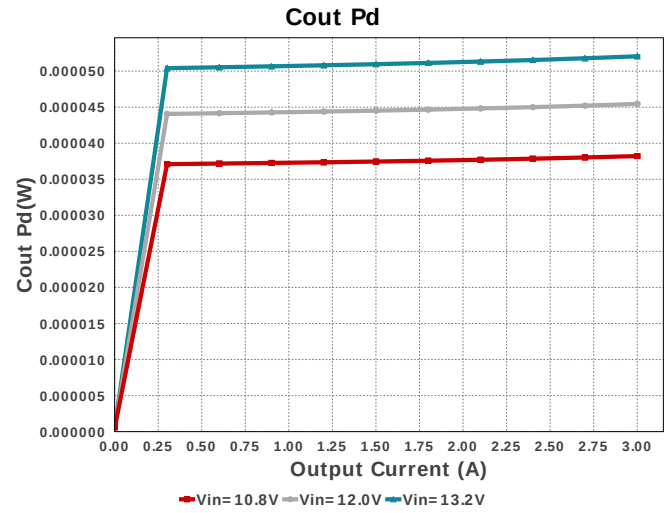




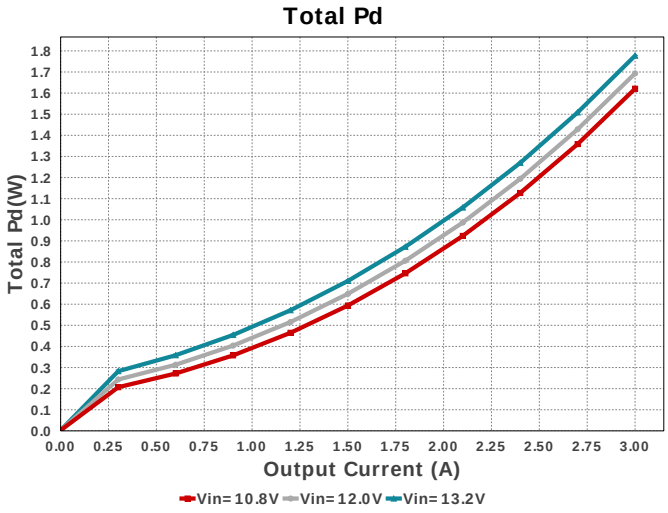


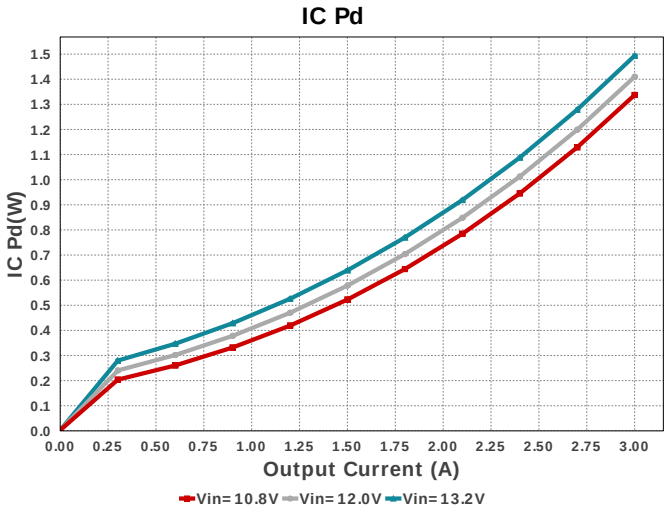


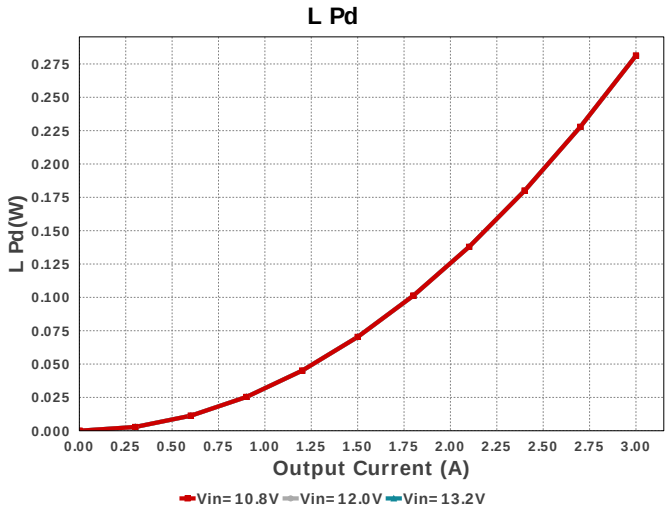


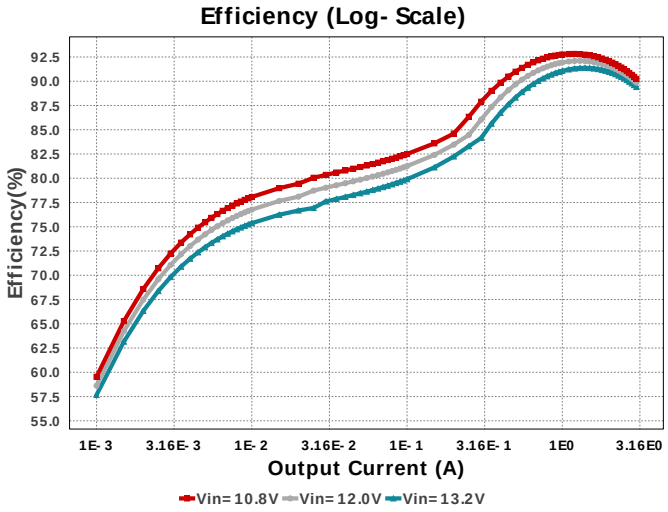


Copyright © 2018, Texas Instruments Incorporated









Operating Values

#	Name	Value	Category	Description
1.	BOM Count	10		Total Design BOM count
2.	Total BOM	$2.52		Total BOM Cost
3.	Cin IRMS	1.474 A	Capacitor	Input capacitor RMS ripple current
4.	Cin Pd	2.172 mW	Capacitor	Input capacitor power dissipation
5.	Cout IRMS	167.521 mA	Capacitor	Output capacitor RMS ripple current
6.	Cout Pd	52.057 µW	Capacitor	Output capacitor power dissipation
7.	IC Ipk	3.29 A	IC	Peak switch current in IC
8.	IC Pd	1.494 W	IC	IC power dissipation
9.	IC Tj	73.466 degC	IC	IC junction temperature
10.	ICThetaJA	29.1 degC/W	IC	IC junction-to-ambient thermal resistance
11.	Iin Avg	1.271 A	IC	Average input current
12.	L Ipp	580.309 mA	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	281.25 mW	Inductor	Inductor power dissipation
14.	Cin Pd	2.172 mW	Power	Input capacitor power dissipation
15.	Cout Pd	52.057 µW	Power	Output capacitor power dissipation
16.	IC Pd	1.494 W	Power	IC power dissipation
17.	L Pd	281.25 mW	Power	Inductor power dissipation
18.	Total Pd	1.777 W	Power	Total Power Dissipation
19.	Duty Cycle	40.712 %	System Information	Duty cycle
20.	Efficiency	89.407 %	System Information	Steady state efficiency
21.	FootPrint	119.0 mm^2	System Information	Total Foot Print Area of BOM components
22.	Frequency	2.615 MHz	System Information	Switching frequency
23.	Iout	3.0 A	System Information	Iout operating point
24.	Mode	CCM	System Information	Conduction Mode
25.	Pout	15.0 W	System Information	Total output power

Copyright © 2018, Texas Instruments Incorporated

#	Name	Value	Category	Description
26.	Vin	13.2 V	System Information	Vin operating point
27.	Vout	5.0 V	System Information	Operational Output Voltage
28.	Vout Actual	5.0 V	System Information	Vout Actual calculated based on selected voltage divider resistors
29.	Vout Tolerance	3.528 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
30.	Vout p-p	3.238 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	3.0	Maximum Output Current
VinMax	13.2	Maximum input voltage
VinMin	10.8	Minimum input voltage
Vout	5.0	Output Voltage
base_pn	TPS62130A	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

Copyright © 2018, Texas Instruments Incorporated

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

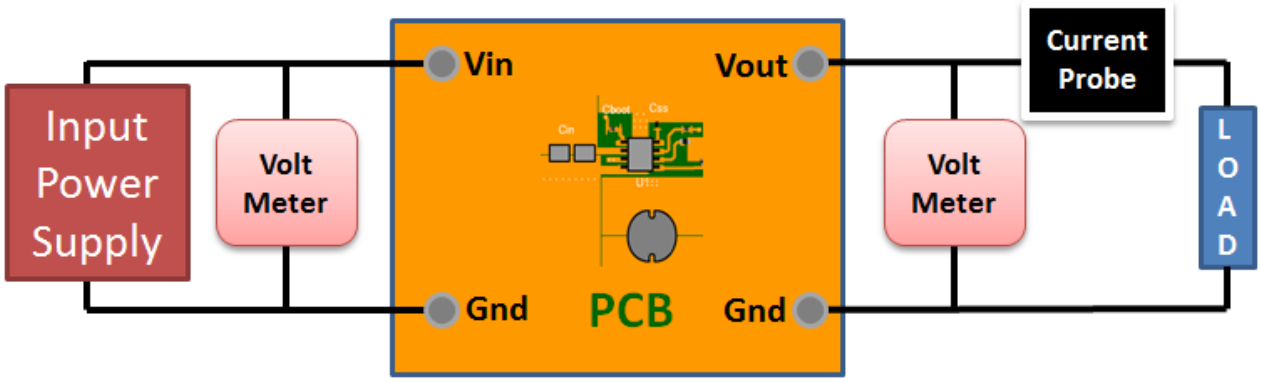
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 10.8V 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. Feature Highlights: DCS-Control(TM) Architecture with upto 3A output current, 3V to 17V Input Voltage Range, Adjustable output voltage from 0.9V to 6VSelectable operating frequency, Optional Softstart Capacitor for slow startup, Tracking,Pin selectable output voltage (nominal, +5%) Seamless Power Save Mode for Light Load Efficiency, Power Good Output, 100% Duty Cycle mode, Short Circuit Protection, PG=Low when device is in shutdown through EN, UVLO or Thermal Shutdown

2. Master key : 33CDBA79CB766D3F[v1]

3. **TPS62130A** Product Folder : http://www.ti.com/product/TPS62130A : contains the data sheet and other resources.

Copyright © 2018, Texas Instruments Incorporated

Important Notice and Disclaimer

TI provides technical and reliability data (including datasheets), design resources (including reference designs), application or other design advice, web tools, safety information, and other resources AS IS and with all faults, and disclaims all warranties. These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

Providing these resources does not expand or otherwise alter TI's applicable Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with TI products.