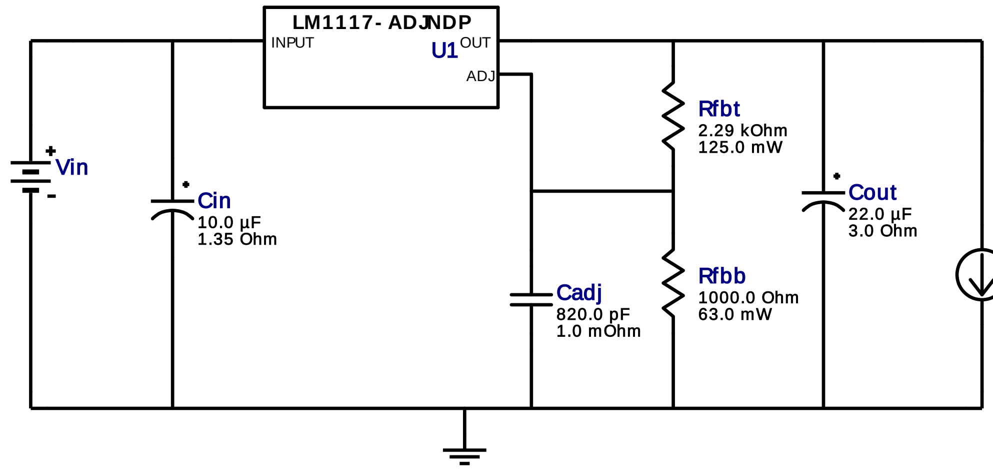
TEXAS INSTRUMENTS

WEBENCH ® Design Report

VinMin = 3.3V
VinMax = 3.3V
Vout = 1.8V
Iout = 0.5A

Device = LM1117DTX-ADJ/NOPB
Topology = LDO
Created = 2020-09-01 21:39:38.642
BOM Cost = NA
BOM Count = 6
Total Pd = 0.8W

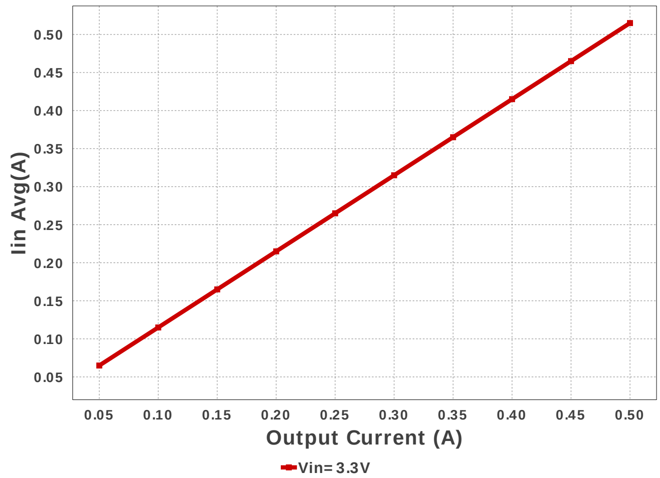
Design : 9842 LM1117DTX-ADJ/NOPB
LM1117DTX-ADJ/NOPB 3.3V-3.3V to 1.80V @ 0.5A



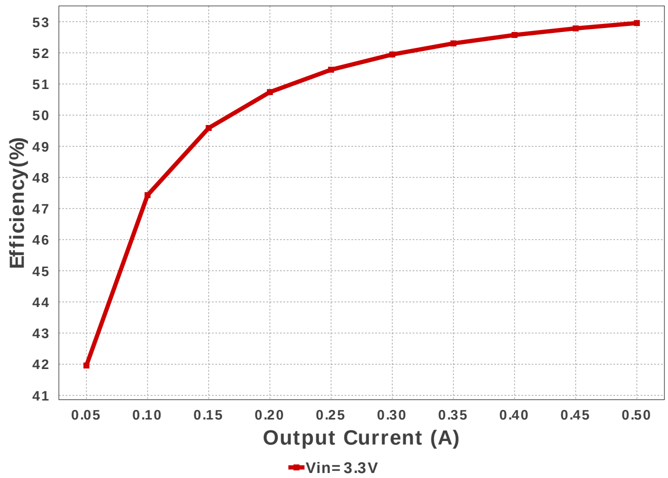
Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cadj	MuRata	GRM033R71E821KA01D Series= X7R	Cap= 820.0 pF ESR= 1.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
Cin	Panasonic	EEE-FK1C100R Series= FK	Cap= 10.0 uF ESR= 1.35 Ohm VDC= 16.0 V IRMS= 90.0 mA	1	$0.08	SM_RADIAL_B 47 mm^2
Cout	Panasonic	EEE-FC0J220R Series= FC	Cap= 22.0 uF ESR= 3.0 Ohm VDC= 6.3 V IRMS= 50.0 mA	1	$0.07	SM_RADIAL_B 47 mm^2
Rfbb	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
Rfbt	Yageo	RT0805BRD072K29L Series= RT0805	Res= 2.29 kOhm Power= 125.0 mW Tolerance= 0.1%	1	NA	0805 7 mm^2
U1	Texas Instruments	LM1117DTX-ADJ/NOPB	Switcher	1	$0.44	NDP0003B 102 mm^2

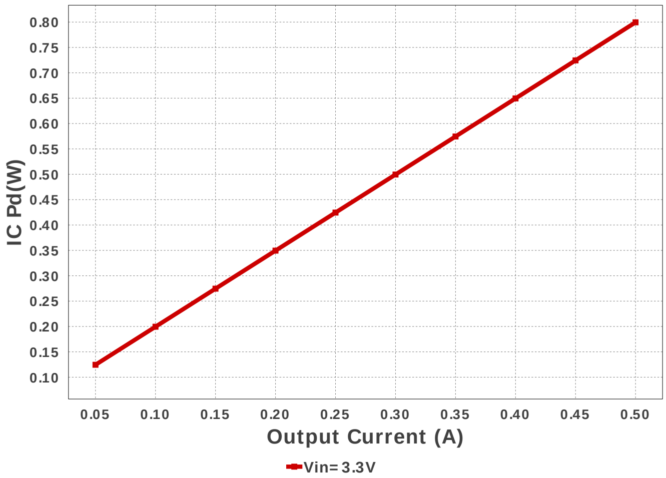
Iin Avg



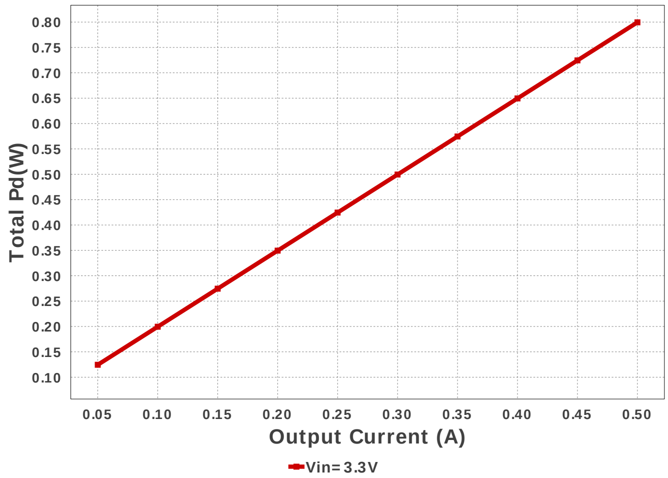
Efficiency



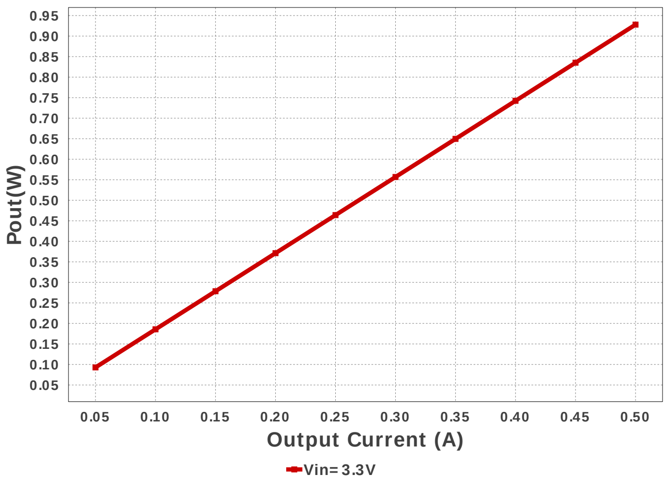
IC Pd



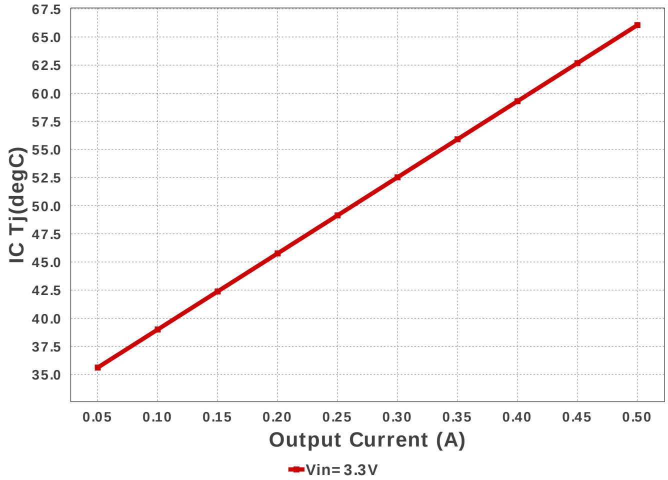
Total Pd

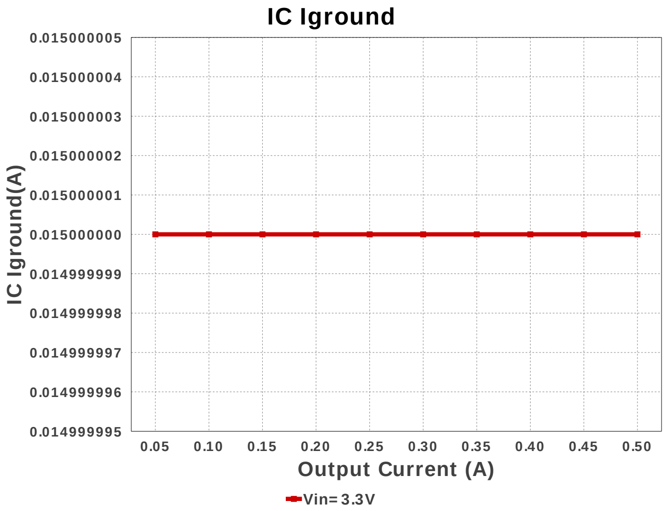


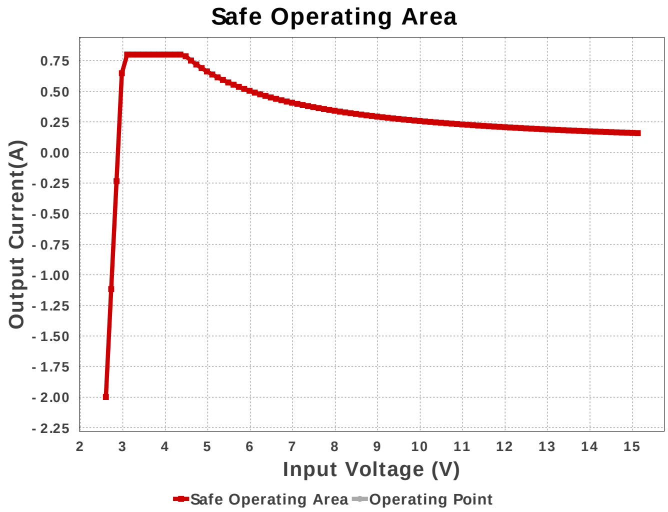
Pout

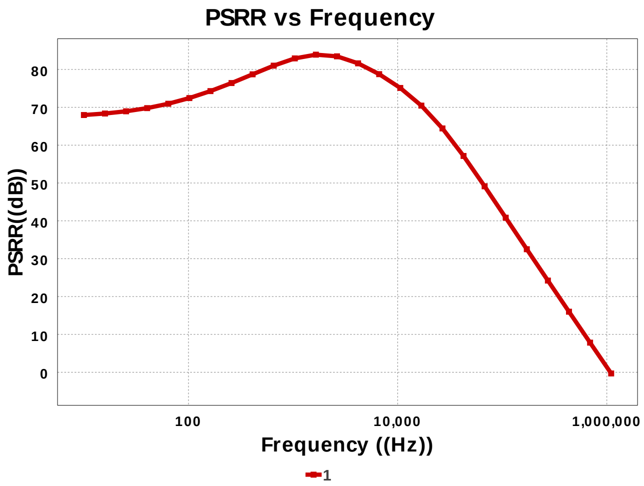


IC Tj









Operating Values

#	Name	Value	Category	Description
1.	Output Noise RMS	54.0 µV	General	Noise RMS
2.	IC Iground	15.0 mA	IC	IC ground current
3.	IC Pd	799.5 mW	IC	IC power dissipation
4.	IC Tj	66.057 degC	IC	IC junction temperature
5.	IC Tolerance	12.5 mV	IC	IC Feedback Tolerance
6.	ICThetaJA	45.1 degC/W	IC	IC junction-to-ambient thermal resistance
7.	Iin Avg	515.0 mA	IC	Average input current
8.	IOUT_OP	500.0 mA	Op Point	Iout operating point
9.	Input Ripple Frequency	100.0 kHz	Op Point	Input Source Ripple Frequency for PSRR Calculation
10.	PSRR est.	-42.202 dB	Op Point	Power Supply Rejection Ratio estimated
11.	VIN_OP	3.3 V	Op Point	Vin operating point
12.	Total Pd	799.5 mW	Power	Total Power Dissipation
13.	BOM Count	6	System Information	Total Design BOM count
14.	Efficiency	52.957 %	System Information	Steady state efficiency
15.	FootPrint	209.0 mm²	System Information	Total Foot Print Area of BOM components
16.	Pout	927.926 mW	System Information	Total output power
17.	Total BOM	NA	System Information	Total BOM Cost
18.	Vin p-p	33.0 mV	System Information	Input Source ripple voltage
19.	Vout	1.856 V	System Information	Operational Output Voltage
20.	Vout Actual	1.856 V	System Information	Vout Actual calculated based on selected voltage divider resistors
21.	Vout p-p	256.097 µV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	500.0 m	Maximum Output Current
VinMax	3.3	Maximum input voltage
VinMin	3.3	Minimum input voltage
Vout	1.8	Output Voltage
base_pn	LM1117-ADJ	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

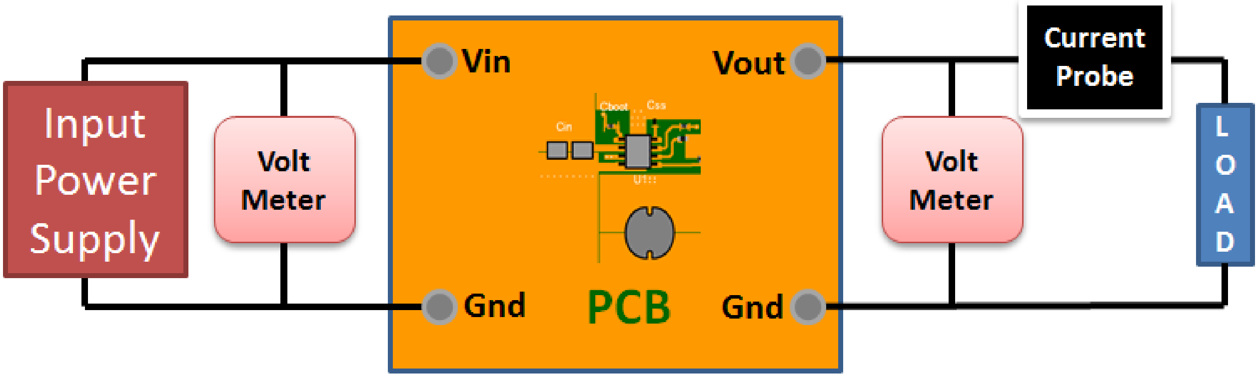
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins.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

2. Master key : 9323268074580801[v1]

3. **LM1117-ADJ** Product Folder : http://www.ti.com/product/lm1117 : contains the data sheet and other resources.

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