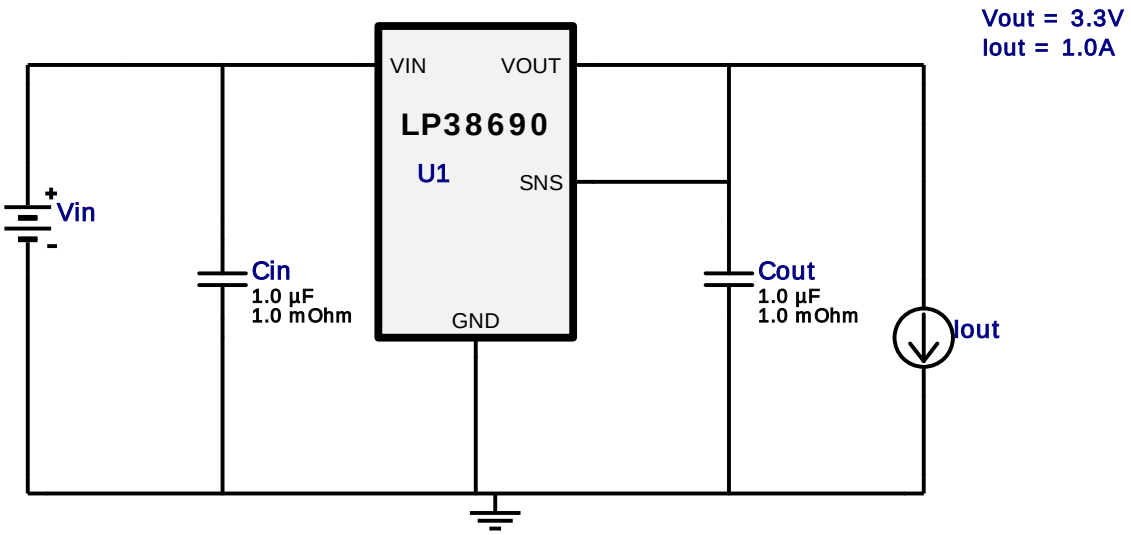
WEBENCH® Design Report

VinMin = 4.8V
VinMax = 5.2V
Vout = 3.3V
Iout = 1.0A

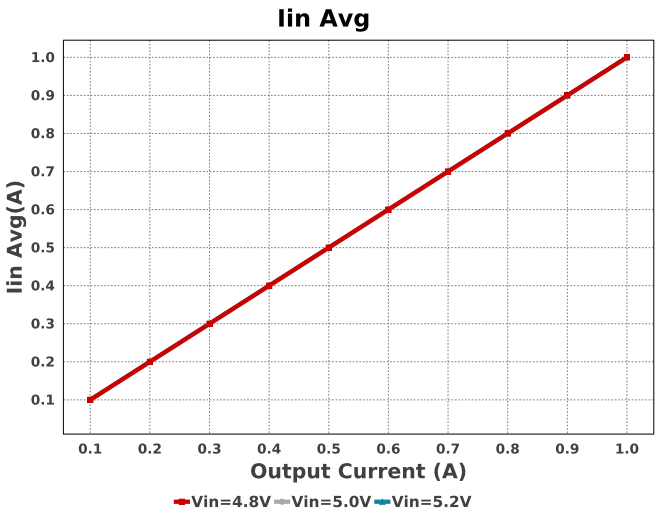
Device = LP38690SD-3.3/NOPB
Topology = LDO
Created = 2024-05-05 23:05:20.335
BOM Cost = $0.72
BOM Count = 3
Total Pd = 1.9W

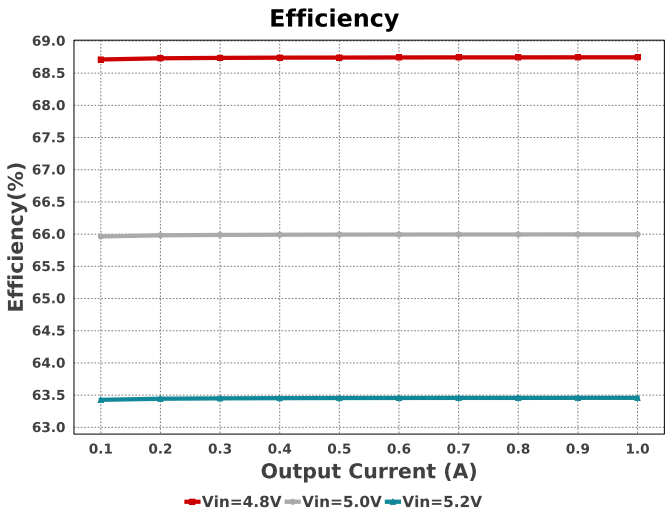
Design : 8 LP38690SD-3.3/NOPB
LP38690SD-3.3/NOPB 4.8V-5.2V to 3.30V @ 1A



Electrical BOM

Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
Cin	Taiyo Yuden	LMK212B7105KG-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
Cout	Taiyo Yuden	LMK212B7105KG-T Series= X7R	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
U1	Texas Instruments	LP38690SD-3.3/NOPB	Switcher	1	$0.68	SDE06A 16 mm²





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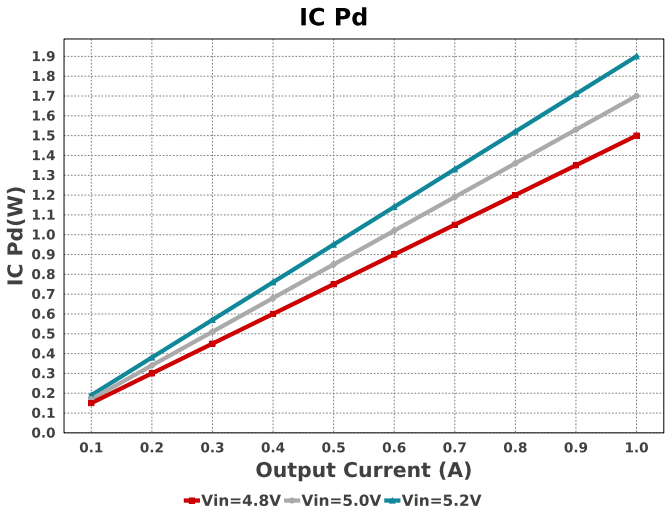

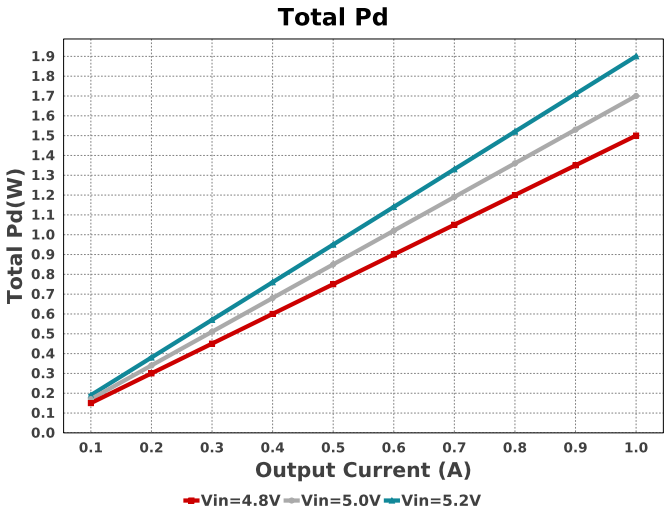

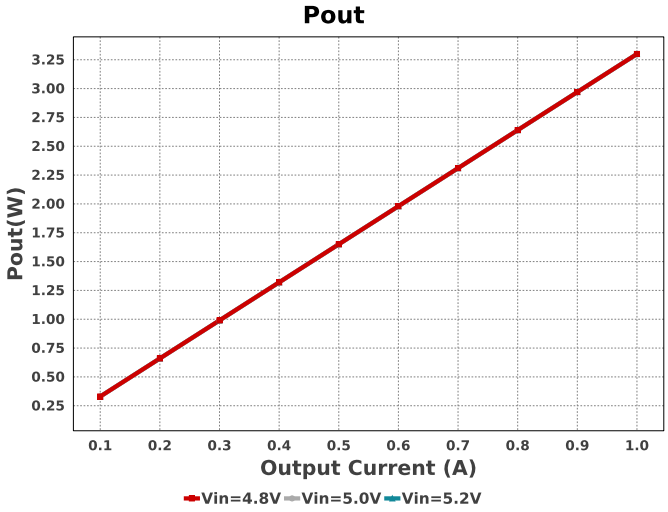

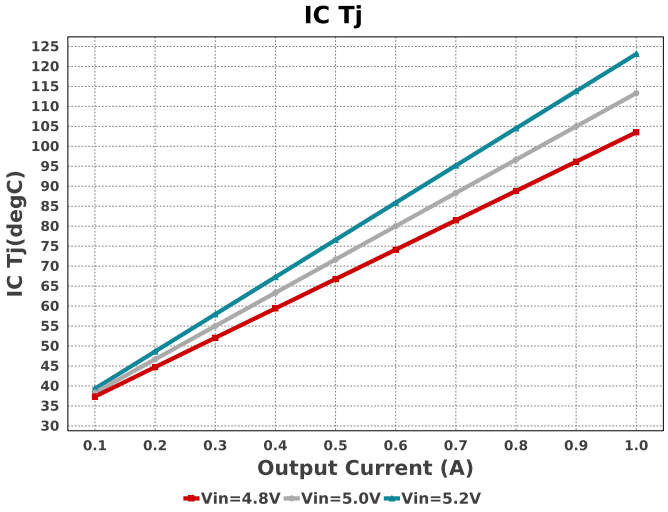

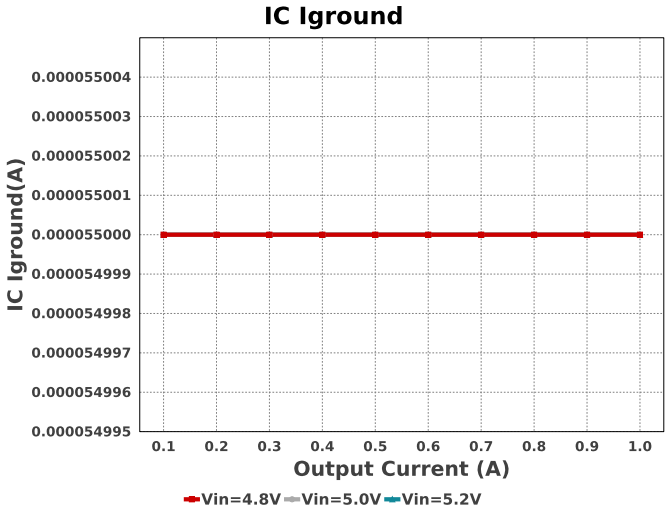

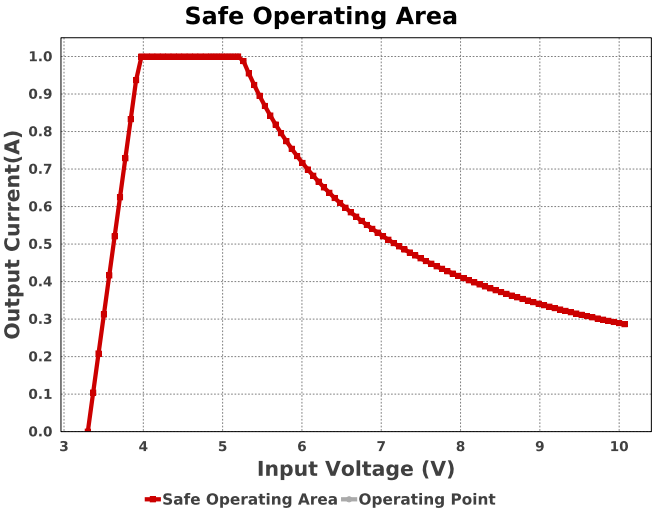

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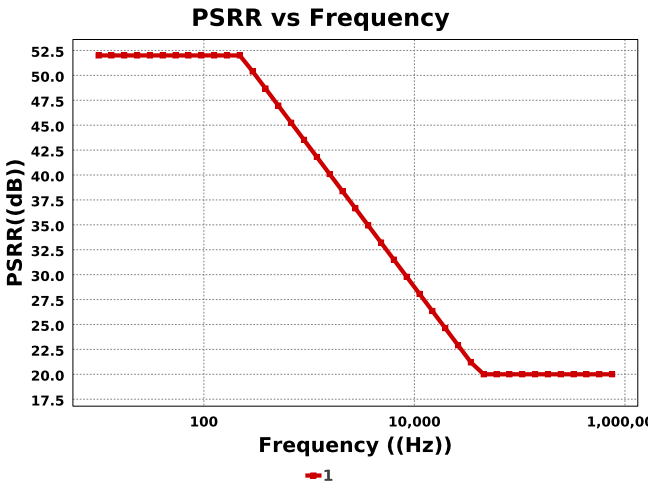

Operating Values

#	Name	Value	Category	Description
1.	IC Iground	55.0 µA	IC	IC ground current
2.	IC Pd	1.9 W	IC	IC power dissipation
3.	IC Tj	123.114 degC	IC	IC junction temperature
4.	IC Tolerance	165.0 mV	IC	IC Feedback Tolerance
5.	ICThetaJA	49.0 degC/W	IC	IC junction-to-ambient thermal resistance
6.	Iin Avg	1.0 A	IC	Average input current
7.	IOUT_OP	1.0 A	Op Point	Iout operating point
8.	Input Ripple Frequency	100.0 kHz	Op Point	Input Source Ripple Frequency for PSRR Calculation
9.	PSRR est.	-20.0 dB	Op Point	Power Supply Rejection Ratio estimated
10.	VIN_OP	5.2 V	Op Point	Vin operating point
11.	Total Pd	1.9 W	Power	Total Power Dissipation
12.	BOM Count	3	System Information	Total Design BOM count
13.	Efficiency	63.458 %	System Information	Steady state efficiency
14.	FootPrint	30.0 mm^2	System Information	Total Foot Print Area of BOM components
15.	Pout	3.3 W	System Information	Total output power
16.	Total BOM	$0.72	System Information	Total BOM Cost
17.	Vin p-p	52.0 mV	System Information	Input Source ripple voltage
18.	Vout	3.3 V	System Information	Operational Output Voltage
19.	Vout Tolerance	5.0 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
20.	Vout p-p	5.2 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

Name	Value	Description
Iout	1.0	Maximum Output Current
VinMax	5.2	Maximum input voltage
VinMin	4.8	Minimum input voltage
Vout	3.3	Output Voltage
base_pn	LP38690	Base Product Number
source	DC	Input Source Type
Ta	30.0	Ambient temperature

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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

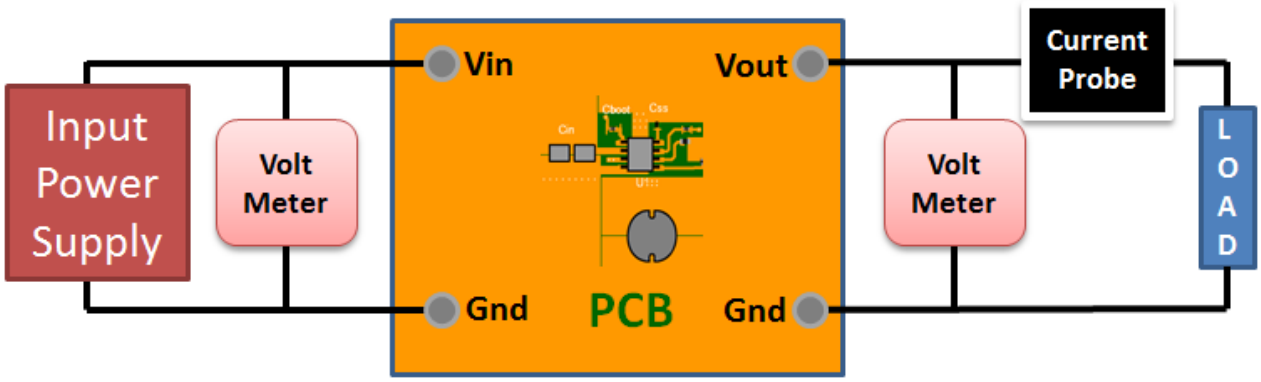
If board assembly is done in house it is best to tack down one terminal of a component on the board then solder the other terminal. For surface mount parts with large tabs, such as the DPAK, the tab on the back of the package should be pre-tinned with solder, then tacked into place by one of the pins. 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 4.8V 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.

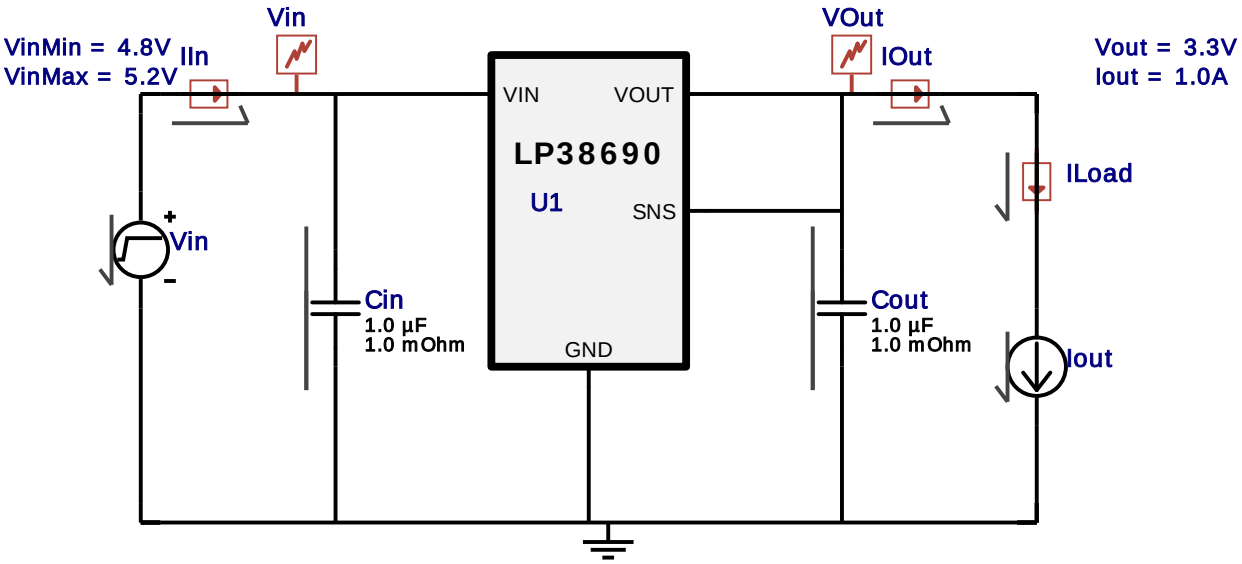


WEBENCH® Electrical Simulation Report

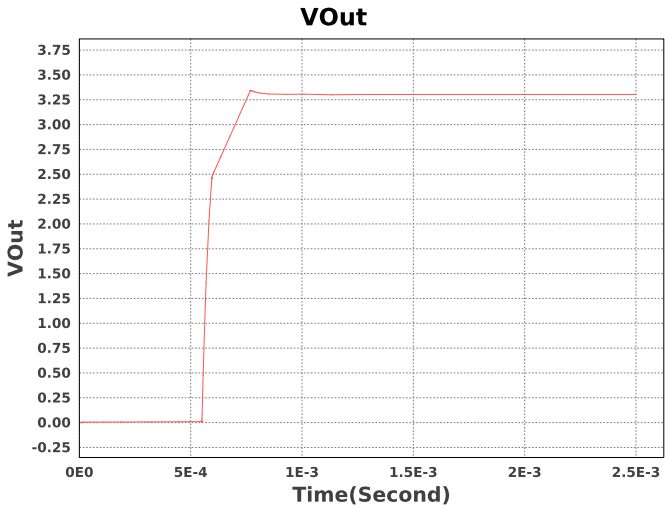
Design Id = 8

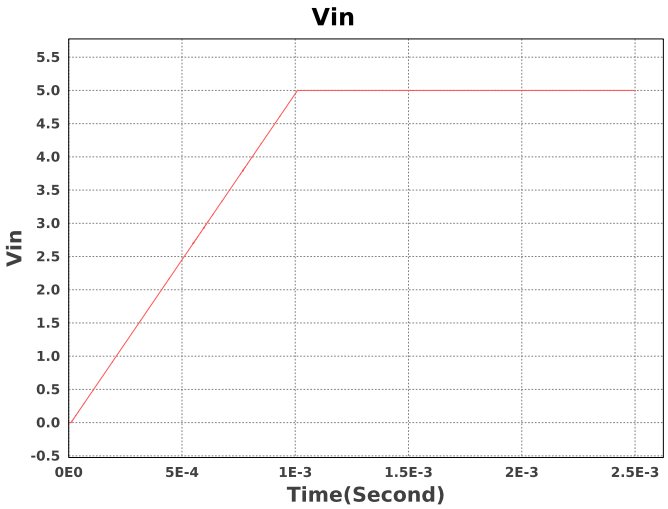
sim_id = 1

Simulation Type = Startup



Simulation Parameters





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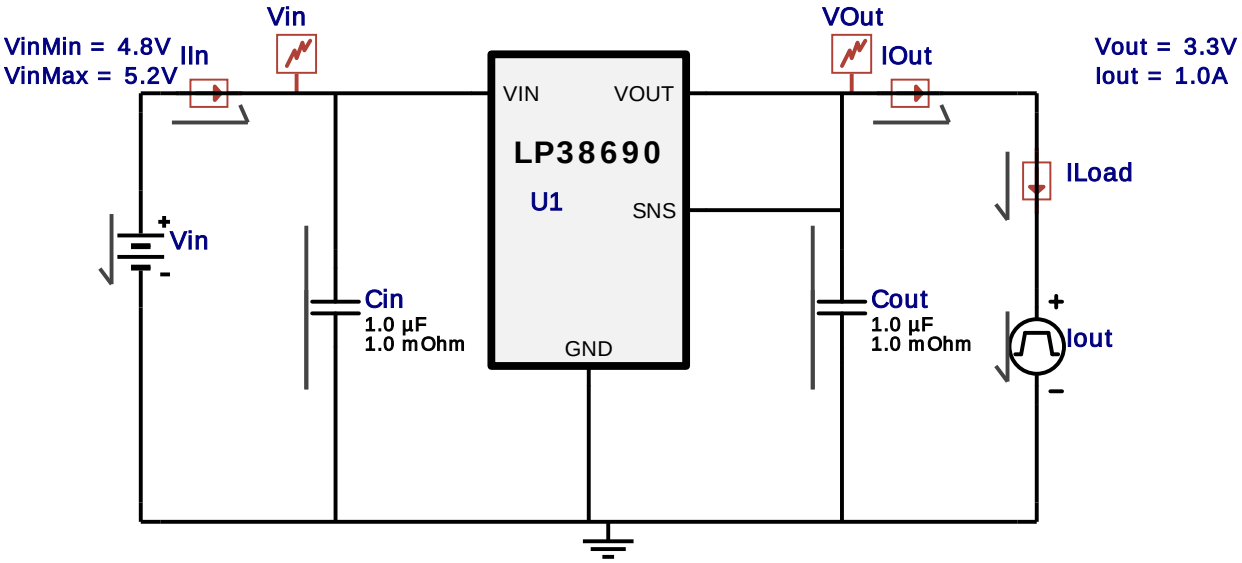
Design Id = 8

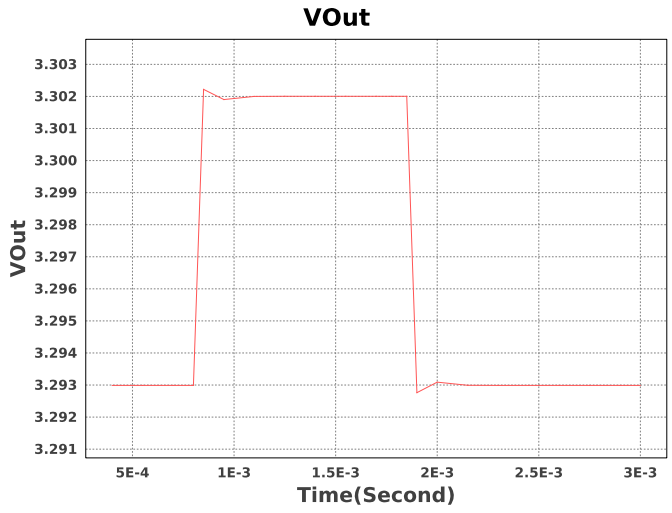
sim_id = 2

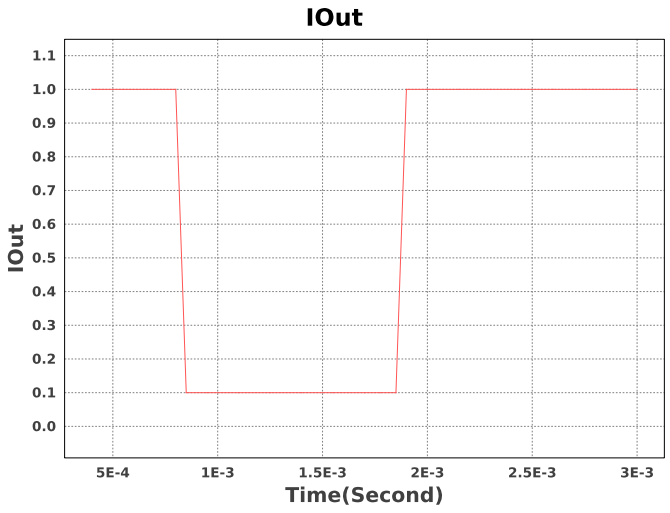
Simulation Type = Load Transient



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Iout	signal_type	Signal Type	PULSE
		I1	Initial Current	1.0 A
		I2	Step Current	0.1 A
		Td	Initial Delay Time	800u sec
		Tr	Rise Time	50u sec
		Tf	Fall Time	50u sec
		Pw	Pulse Width	1m sec





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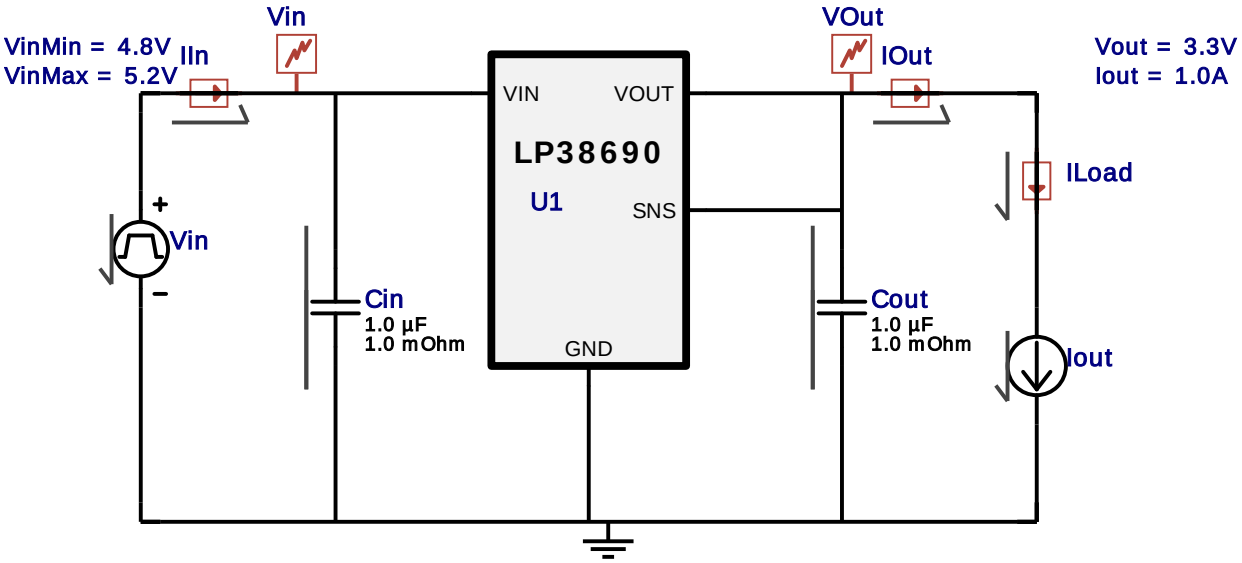
Design Id = 8

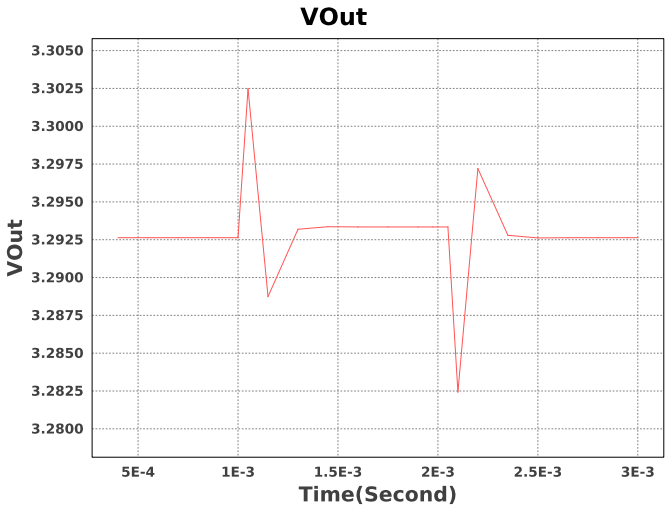
sim_id = 3

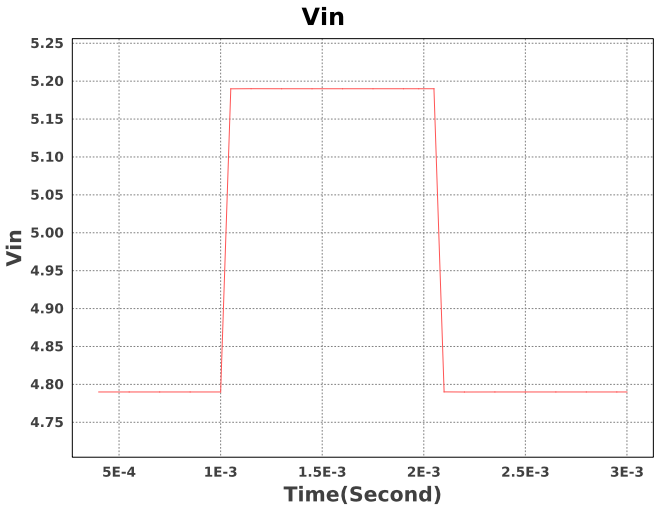
Simulation Type = Input Transient



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Iout	I	Load Current	1.0 A





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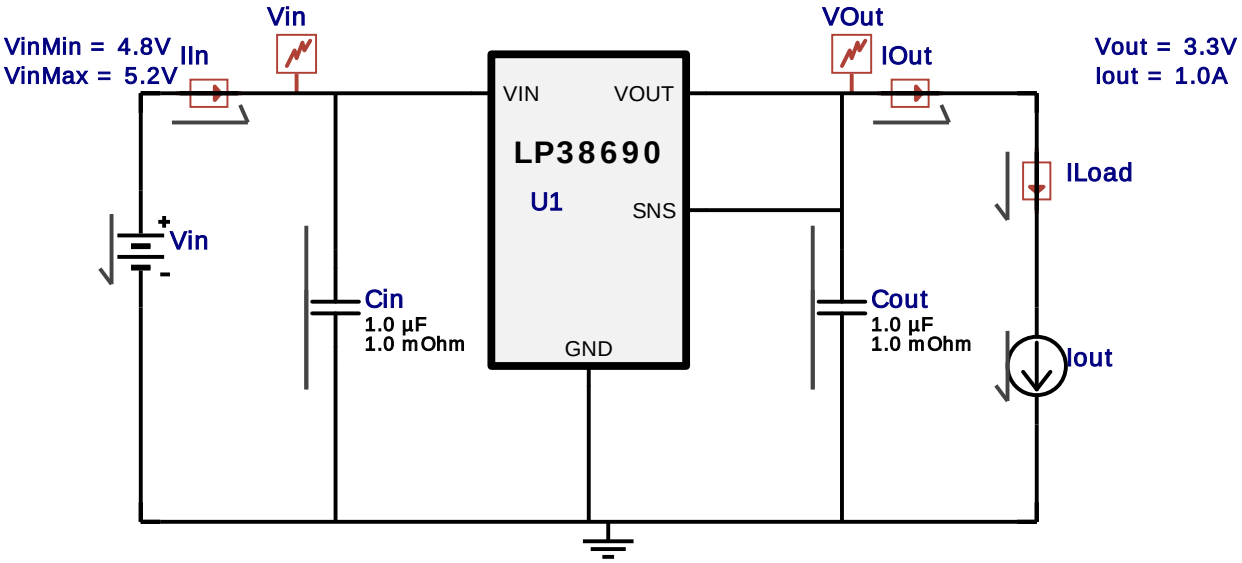
Design Id = 8

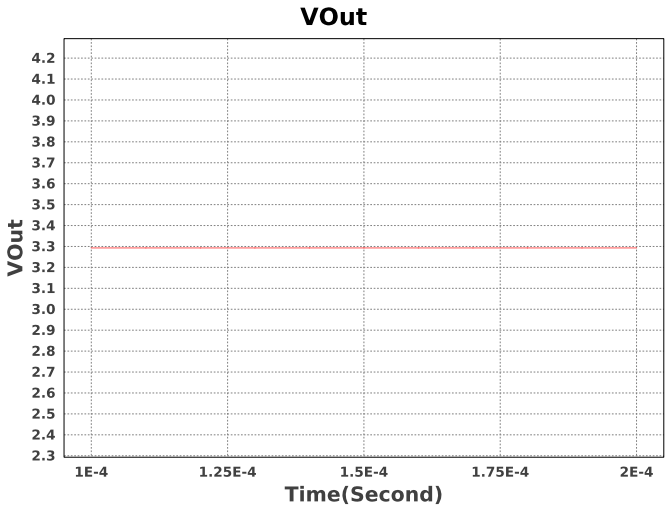
sim_id = 4

Simulation Type = Steady State



Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Iout	I	Load current	1.0 A



Design Assistance

1. Master key : 923DA64241894DCE52F037691413034A[v1]
2. **LP38690** Product Folder : http://www.ti.com/product/lp38690 : contains the data sheet and other resources.

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