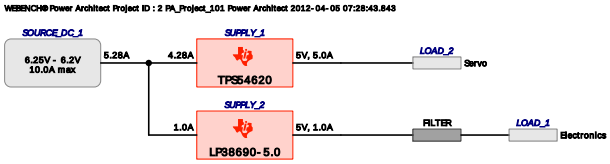
WEBENCH® Power Architect



Project Report

Project : 682565/2 : PA_Project_101
Created : 2012-04-05 07:28:43.843
Optimize project optFactor=1

Project Summary

1.	Total System Efficiency	90.7 %
2.	Total System BOM Count	20.0
3.	Total System Footprint	337.0 mm2
4.	Total System BOM Cost	$4.54
5.	Total System Power Dissipation	3.076 W

--> Launch WEBENCH Power Architect.

Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	TPS54620	: 6A Synchronous Step Down SWIFT Converter	5 V	5.0 A	93.5%	205	$3.45	9	6
2.	SUPPLY_2	LP38690-5.0	: Very low quiescent current	5 V	1.0 A	78.8%	132	$1.09	10	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	Servo	5 V	5 A	VoutRipple=10%
2.	Electronics	5 V	1 A	Filter required

Project Diagram

Electrical Procurement BOM

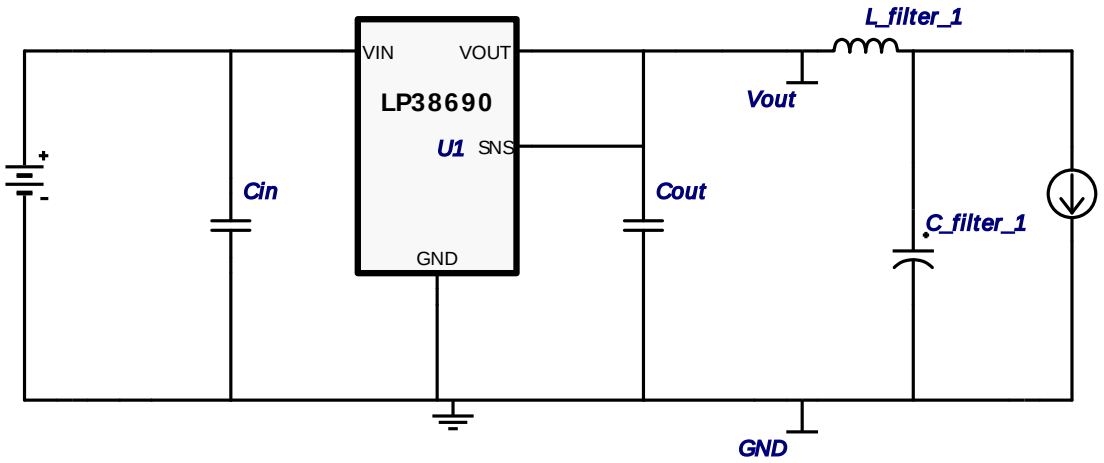
Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
Coilcraft	0603AF-121KRB	0603AF	1	$0.43	12
TDK	C1005X5R0J105M	0402	1	$0.01	8
TDK	C1608X5R1A105K	0603	1	$0.01	10
TDK	C1608Y5V1E104Z	0603	1	$0.01	10
TDK	C3225X5R1A226M	1210	2	$0.16	47
Vishay-Dale	CRCW0402105KFKED	0402	1	$0.01	8
Vishay-Dale	CRCW040210K0FKED	0402	1	$0.01	8
Vishay-Dale	CRCW040228K7FKED	0402	1	$0.01	8
Vishay-Dale	CRCW040237K4FKED	0402	1	$0.01	8
Vishay-Dale	CRCW040249K9FKED	0402	1	$0.01	8
Vishay-Dale	CRCW040252K3FKED	0402	1	$0.01	8
Vishay-Dale	CRCW04025K49FKED	0402	1	$0.01	8
Nippon Chemi-Con	EMVY160ADA470MF55G	CAPSMT_62_F55	1	$0.09	77
MuRata	GRM155R71C123KA01D	0402	1	$0.01	8
MuRata	GRM155R71H182KA01D	0402	1	$0.01	8
Texas Instruments	LP38690SD-5.0	SDE06A	1	$0.55	25
Taiyo Yuden	TMK212BJ475KG-T	0805	1	$0.05	13
Texas Instruments	TPS54620RHLR	S-PVQFN-N14	1	$2.50	32
Coilcraft	XAL4020-601MEB	XAL4020	1	$0.48	36
Total			**20**	**$4.54**	**337**

WEBENCH® Design Report

VinMin = 6.25V
VinMax = 6.25V
Vout = 5.0V
Iout = 1.0A

Device = LP38690SD-5.0
Topology = LDO
Created = 4/5/12 7:28:43 AM
BOM Cost = $1.09
Total Pd = 1.35 W
Footprint = 132.0 mm2
BOM Count = 5

Design : 682565/10 LP38690SD-5.0
LP38690SD-5.0 6.25V-6.25V to 5.0V @ 1.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
1.	C_filter_1	Nippon Chemi-Con	EMVY160ADA470MF55G Series= MVY	1	$0.09	Cap= 47.0 µF ESR= 1.0 Ohm VDC= 16.0 V IRMS= 140.0 mA	CAPSMT_62_F55 77mm2
2.	Cin	TDK	C1608X5R1A105K Series= X5R	1	$0.01	Cap= 1.0 µF ESR= 5.7 mOhm VDC= 10.0 V IRMS= 0.0 A	0603 10mm2
3.	Cout	TDK	C1005X5R0J105M Series= X5R	1	$0.01	Cap= 1.0 µF ESR= 7.9 mOhm VDC= 6.3 V IRMS= 0.0 A	0402 8mm2
4.	L_filter_1	Coilcraft	0603AF-121KRB	1	$0.43	L= 120.0 nH DCR= 94.999 mOhm	0603AF 12mm2
5.	U1	Texas Instruments	LP38690SD-5.0	1	$0.55	Switcher	SDE06A 25mm2

Operating Values

#	Name	Value	Category	Description
1.	IC Iground	55.0 µ A	Current	IC ground current
2.	Iin Avg	1.0 A	Current	Average input current
3.	filter_1 attenuation Factor	500.0 m	Filter	Attenuation factor
4.	filter_1 target Vpp	0.0 V	Filter	Target voltage ripple through filter filter_1
5.	BOM Count	5.0	General	Total Design BOM count
6.	FootPrint	132.0 mm2	General	Total Foot Print Area of BOM components
7.	IC Tolerance	250.0 m V	General	IC Feedback Tolerance
8.	Pout	5.0 W	General	Total output power
9.	Total BOM	$1.09	General	Total BOM Cost
10.	Vin p-p	62.5 m V	Op_Point	Input Source ripple voltage
11.	filter_1 cut-off freq	67.016 k Hz	Op_Point	Filter cut off frequency filter_1
12.	filter_1 voltage drop	94.999 m V	Op_Point	Voltage drop through filter filter_1
13.	Efficiency	78.798 %	Op_point	Steady state efficiency
14.	IC Tj	91.267 degC	Op_point	IC junction temperature
15.	ICThetaJA	49.0 degC/W	Op_point	IC junction-to-ambient thermal resistance

#	Name	Value	Category	Description
16.	IOUT_OP	1.0 A	Op_point	Iout operating point
17.	Input Ripple Frequency	100.0 k Hz	Op_point	Input Source Ripple Frequency for PSRR Calculation
18.	PSRR est.	-11.901 dB	Op_point	Power Supply Rejection Ratio estimated
19.	VIN_OP	6.25 V	Op_point	Vin operating point
20.	Vout p-p	15.879 m V	Op_point	Peak-to-peak output ripple voltage
21.	IC Pd	1.25 W	Power	IC power dissipation
22.	Total Pd	1.345 W	Power	Total Power Dissipation
23.	filter_1_Pd	94.999 m W	Power	Filter Power Loss filter_1
24.	Input Load Capacitance	1.0 µ F	Unknown	Input load capacitance seen by upstream circuit

Design Inputs

#	Name	Value	Description
1.	Iout	1.0 A	Maximum Output Current
2.	Iout1	1.0 Amps	Output Current #1
3.	VinMax	6.25 V	Maximum input voltage
4.	VinMin	6.25 V	Minimum input voltage
5.	Vout	5.0 V	Output Voltage
6.	Vout1	5.0 Volt	Output Voltage #1
7.	base_pn	LP38690	National Based Product Number
8.	Ta	30.0 degC	Ambient temperature

Design Assistance

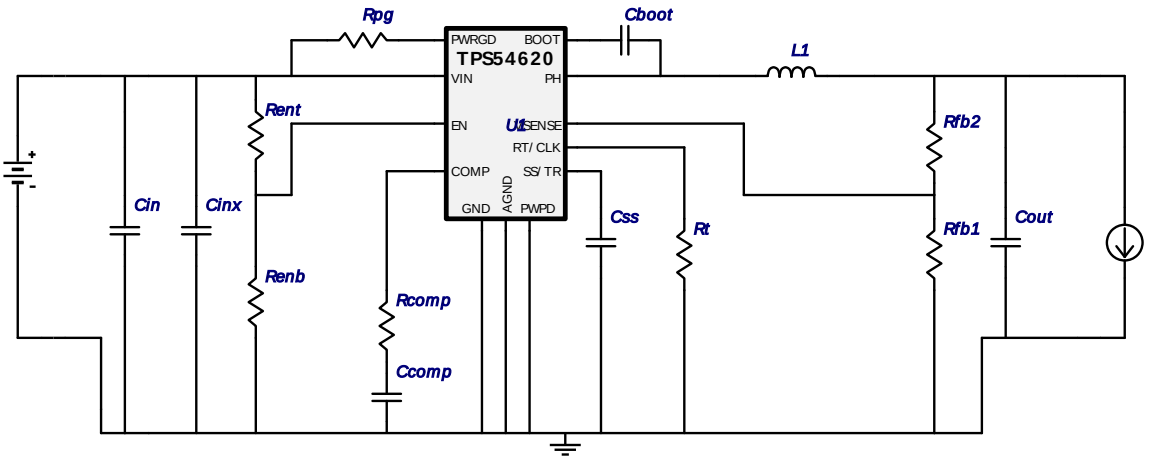
1. **LP38690** Product Folder : http://www.national.com/pf/LP/LP38690.html : contains the data sheet and other resources.

WEBENCH® Design Report

VinMin = 6.25V
VinMax = 6.25V
Vout = 5.0V
Iout = 5.0A

Device = TPS54620RHLR
Topology = Buck
Created = 4/5/12 7:28:51 AM
BOM Cost = $3.45
Total Pd = 1.73 W
Footprint = 205.0 mm2
BOM Count = 15

Design : 682565/9 TPS54620RHLR
TPS54620RHLR 6.25V-6.25V to 5.0V @ 5.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
1.	Cboot	TDK	C1608Y5V1E104Z Series= Y5V	1	$0.01	Cap= 100.0 nF ESR= 33.3 mOhm VDC= 25.0 V IRMS= 0.0 A	0603 10mm2
2.	Ccomp	MuRata	GRM155R71H182KA01D Series= X7R	1	$0.01	Cap= 1.8 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	0402 8mm2
3.	Cin	TDK	C3225X5R1A226M Series= X5R	1	$0.16	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 10.0 V IRMS= 3.2 A	1210 23mm2
4.	Cinx	Taiyo Yuden	TMK212BJ475KG-T Series= X5R	1	$0.05	Cap= 4.7 µF ESR= 0.0 Ohm VDC= 25.0 V IRMS= 0.0 A	0805 13mm2
5.	Cout	TDK	C3225X5R1A226M Series= X5R	1	$0.16	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 10.0 V IRMS= 3.2 A	1210 23mm2
6.	Css	MuRata	GRM155R71H103KA88D Series= X7R	1	$0.01	Cap= 10.0 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	0402 8mm2
7.	L1	Coilcraft	XAL4020-601MEB	1	$0.48	L= 600.0 nH DCR= 10.0 mOhm	XAL4020 36mm2
8.	Rcomp	Vishay-Dale	CRCW04025K49FKED Series= CRCW..e3	1	$0.01	Res= 5.49 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
9.	Renb	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	1	$0.01	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
10.	Rent	Vishay-Dale	CRCW0402105KFKED Series= CRCW..e3	1	$0.01	Res= 105.0 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
11.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	1	$0.01	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
12.	Rfb2	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	1	$0.01	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
13.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	1	$0.01	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
14.	Rt	Vishay-Dale	CRCW040228K7FKED Series= CRCW..e3	1	$0.01	Res= 28.7 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
15.	U1	Texas Instruments	TPS54620RHLR	1	$2.50	Switcher	S-PVQFN-N14 32mm2

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.865 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	313.101 m A	Current	Output capacitor RMS ripple current
3.	IC Ipk	5.542 A	Current	Peak switch current in IC
4.	Iin Avg	4.277 A	Current	Average input current
5.	L Ipp	1.085 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	4.563 A	Current	Q Iavg
7.	BOM Count	15.0	General	Total Design BOM count
8.	FootPrint	205.0 mm2	General	Total Foot Print Area of BOM components
9.	Frequency	1.6 M Hz	General	Switching frequency
10.	IC Tolerance	10.0 m V	General	IC Feedback Tolerance
11.	M Vds Act	164.338 m V	General	
12.	Mode	CCM	General	Conduction Mode
13.	Pout	25.0 W	General	Total output power
14.	Total BOM	$3.45	General	Total BOM Cost
15.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
16.	Cross Freq	136.208 k Hz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	83.298 %	Op_point	Duty cycle
18.	Efficiency	93.525 %	Op_point	Steady state efficiency
19.	IC Tj	75.154 degC	Op_point	IC junction temperature
20.	ICThetaJA	32.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	5.0 A	Op_point	Iout operating point
22.	Phase Marg	53.16 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	6.25 V	Op_point	Vin operating point
24.	Vout p-p	6.021 m V	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	6.956 m W	Power	Input capacitor power dissipation
26.	Cout Pd	196.064 µ W	Power	Output capacitor power dissipation
27.	IC Iq Pd	3.75 m W	Power	IC Iq Pd
28.	IC Pd	1.411 W	Power	IC power dissipation
29.	L Pd	312.5 m W	Power	Inductor power dissipation
30.	M1 PdCond	749.941 m W	Power	M1 MOSFET conduction losses
31.	M1 PdSw	156.25 m W	Power	M1 MOSFET switching losses
32.	M2 PdCond	121.126 m W	Power	M2 MOSFET conduction losses
33.	Total Pd	1.731 W	Power	Total Power Dissipation
34.	Input Load Capacitance	26.7 µ F	Unknown	Input load capacitance seen by upstream circuit
35.	M2 Pbody	280.0 m W	Unknown	Power dissipation through lower FET

Design Inputs

#	Name	Value	Description
1.	Iout	5.0 A	Maximum Output Current
2.	Iout1	5.0 Amps	Output Current #1
3.	SoftStart	3.0 ms	Soft Start Time (ms)
4.	VinMax	6.25 V	Maximum input voltage
5.	VinMin	6.25 V	Minimum input voltage
6.	Vout	5.0 V	Output Voltage
7.	Vout1	5.0 Volt	Output Voltage #1
8.	base_pn	TPS54620	National Based Product Number
9.	Ta	30.0 degC	Ambient temperature
10.	UserFsw	1.6 MHz	Customer Selected Frequency

Design Assistance

1. **TPS54620** Product Folder : http://www.national.com/pfhttp://www.ti.com/product/tps54620 : contains the data sheet and other resources.