DESIGN SOLUTION # 44

High Efficiency SP7650 2.5V Buck Converter with Wide 5-16V Input Range

Designed by: Tim Sullivan

Part Number: SP7650

Electrical Requirements:

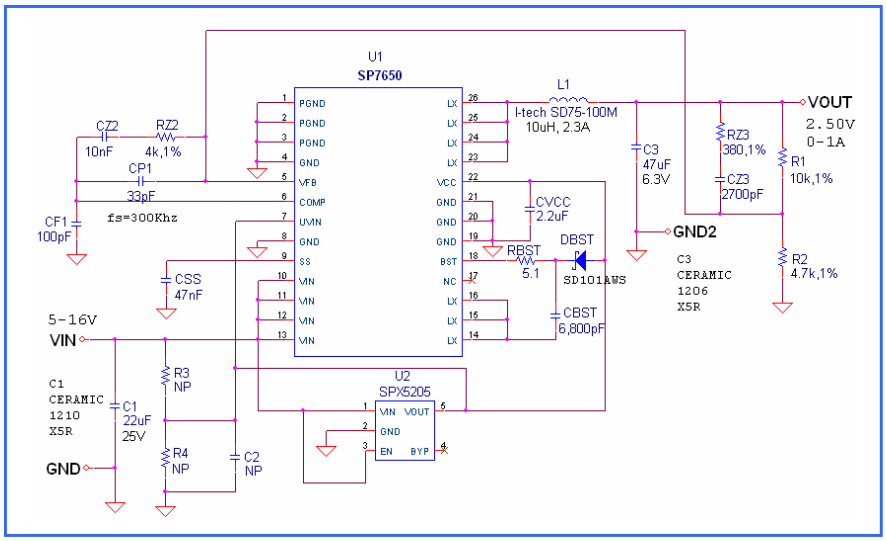
Input Voltage:	5-16V
Output Voltage:	2.5 Volts
Output Current:	requirement for this supply is 1Amp

Circuit Description:

This circuit has been designed to provide 2.5 volts from a 5volt nominal supply, and will convert inputs up to 16volts. It uses the PowerBlox™ solution SP7650 and 18 parts (not including PCB and I/O pins) and uses approximately 2 square inches of board space. It is possible to maintain this small area usage due to the incorporation of the high- and low-side FETs and the PWM controller into one package.

The solution uses an Inter-Technical 7x7x5mm low profile inductor which is a good balance of size and performance for this solution. An inexpensive Sipex SPX5205 LDO was used to provide the 5V Vcc for the part. Ceramic capacitors were used on the converter input and output and a Type III feedback configuration was implemented to provide excellent transient response. For further information on implementing Type III loop configuration, see this application note on the Sipex website: http://www.sipex.com/files/ApplicationNotes/Type%20III%20Loop%20Compensation%20Oct12-06.pdf

This report includes an application schematic complete with component values, a complete Bill of Materials, and figures illustrating the electrical performance of the design.



Performance Measurements

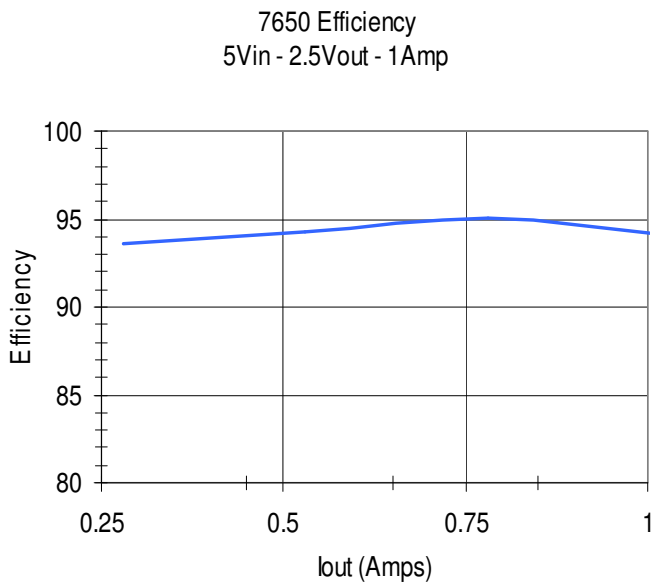


Figure 1 – Efficiency vs Load

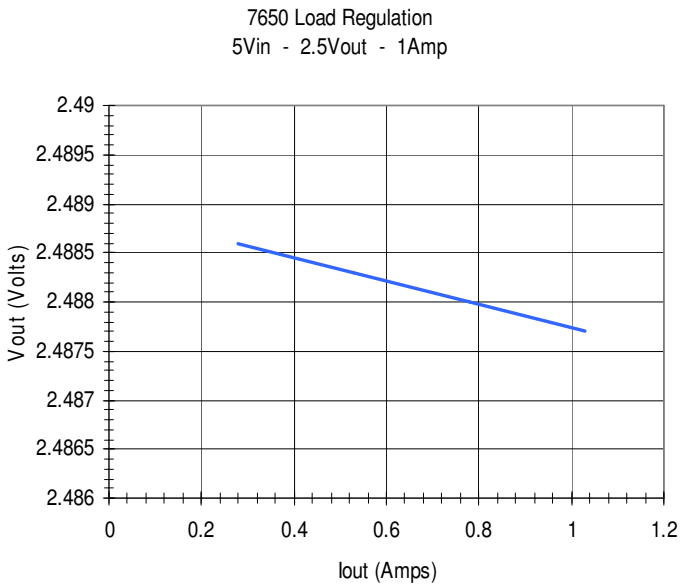


Figure 2 – Load Regulation

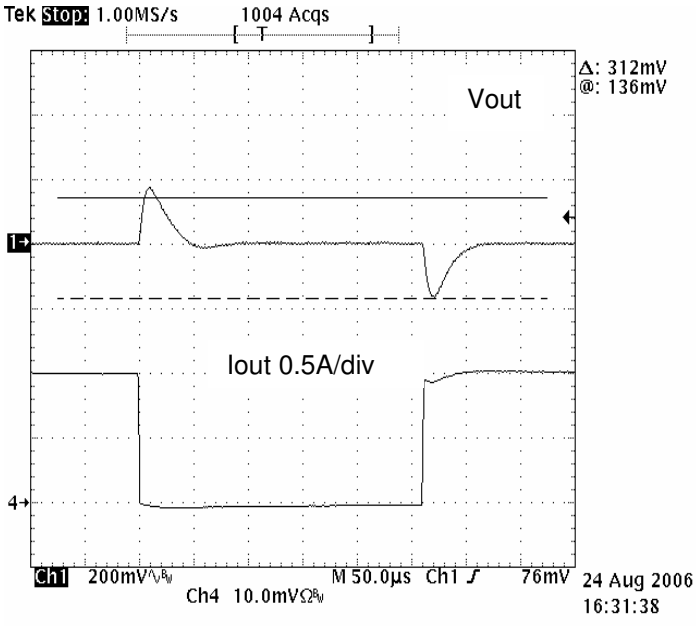


Figure 2 – Load Step Response 0->1 Amp

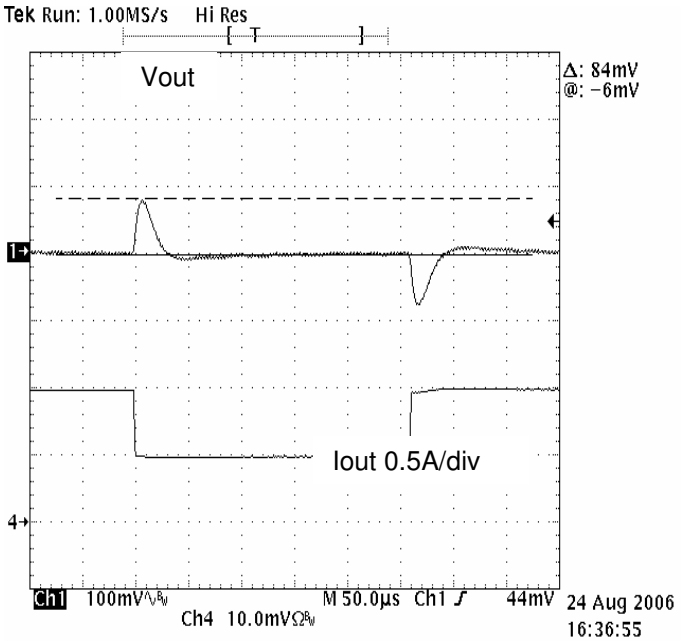


Figure 3 – Load Step Response 0.5->1 Amp

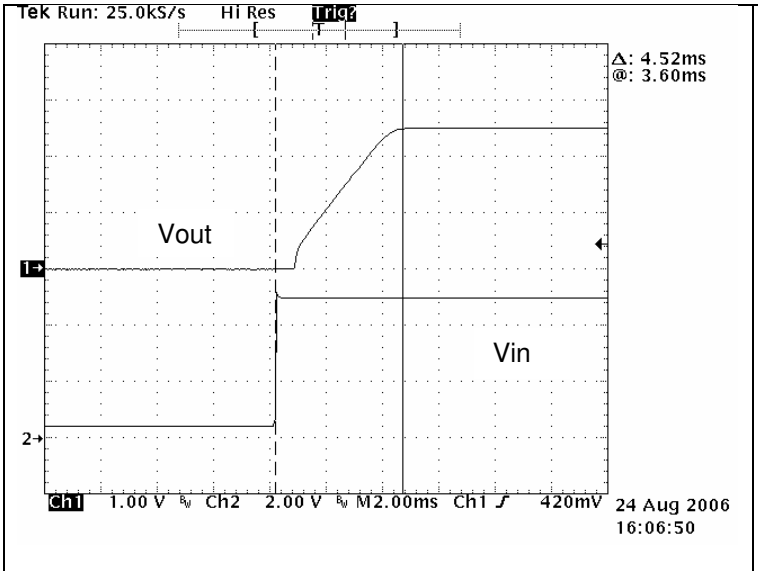


Figure 4 – Start-Up Response: in to 1 Amp

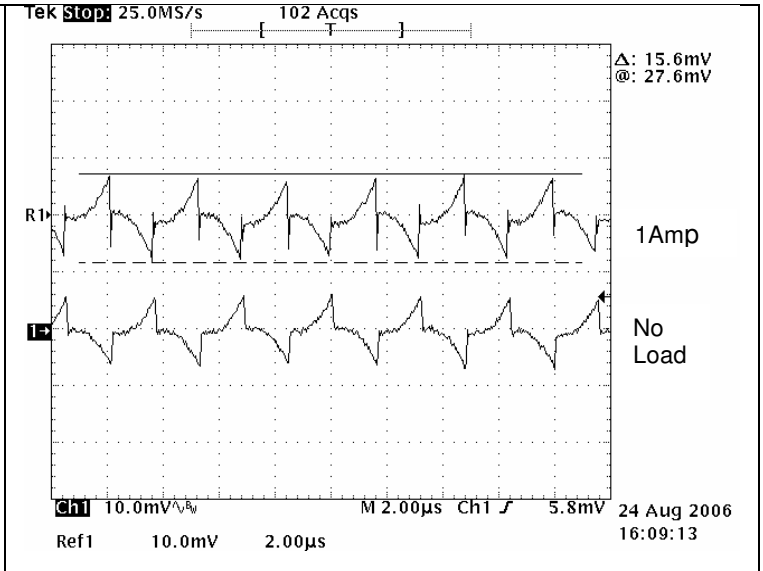
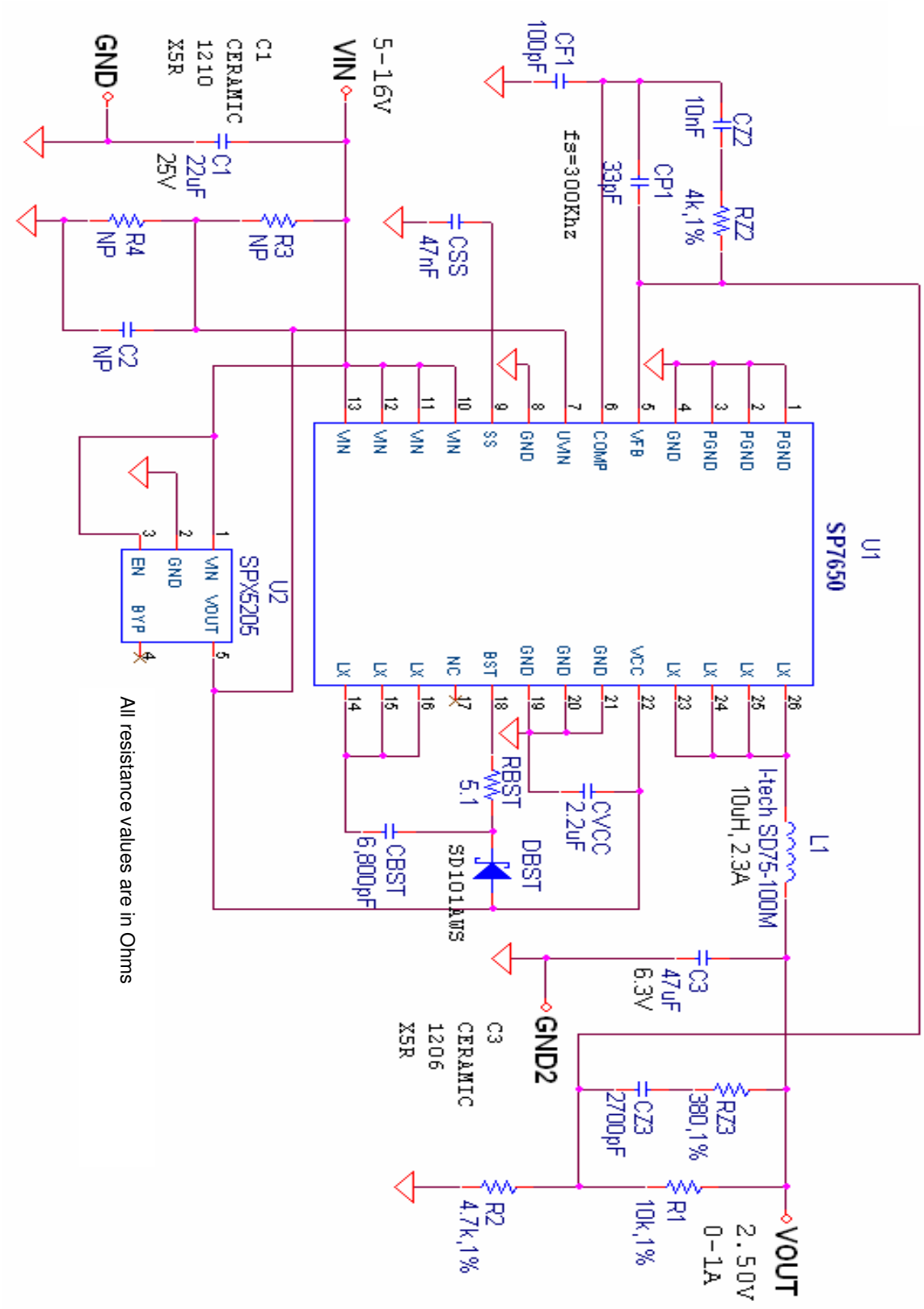


Figure 5 – Output Ripple, Iout = 0 to 1Amp

Circuit Schematic



Converter Bill of Materials

		SP7650 Vin=5V Vout=2.5V @1Amp Evaluation Board Rev. 00 List of Materials					12/11/2006
Line No.	Ref. Des.	Qty.	Manuf.	Manuf. Part Number	Layout Size	Component	Vendor Phone Number
1	PCB	1	Sipex	7655EB	1.75"X2.75"	SP7655EB	978-667-7800
2	U1	1	Sipex	SP7650EU	DFN-26	2-FETs Buck Ctrl	978-667-7800
3	U2	1	Sipex	SPX5205M5-5.0	SOT-23-5	150mA LDO Voltage Reg	978-667-7800
4	DBST	1	Vishay Semi	SD101AWS	SOD-323	15mA Schottky Diode	402-563-6866
6	L1	1	InterTechnical	SD75-100M	6.8X6.8mm	10uH, 70mOhm, 2.34A	914-347-2474
7	C3	1	TDK	C3225X5R0J476M	1206	47uF Ceramic X5R 6.3V	978-779-3111
8	C1	1	TDK	C3225X7R1E226M	1210	22uF Ceramic X7R 25V	978-779-3111
9	CVCC	1	TDK	C1608X5R1A225K	0603	2.2uF Ceramic X5R 10V	978-779-3111
10	CBST	1	TDK	C1608X5R1A682K	0603	6800pF Ceramic X5R 10V	978-779-3111
11	C2	0	NP	NP	0603	Do Not Place	-
12	CSS	1	TDK	C1608X7R1H473K	0603	47,000pF Ceramic X7R 50V	978-779-3111
13	CP1	1	TDK	C1608COG1H330J	0603	33pF Ceramic COG 50V	978-779-3111
14	CZ2	1	TDK	C1608COG1H103J	0603	10nF Ceramic COG 50V	978-779-3111
15	CF1	1	TDK	C1608COG1H101J	0603	100pF Ceramic COG 50V	978-779-3111
16	CZ3	1	TDK	C1608COG1H272J	0603	2700pF Ceramic COG 50V	978-779-3111
17	RZ2	1	Panasonic	ERJ-3EKF40000V	0603	4K Ohm Thick Film Res 1%	800-344-4539
18	R2	1	Panasonic	ERJ-3EKF4701V	0603	4.7K Ohm Thick Film Res 1%	800-344-4539
19	RZ3	1	Panasonic	ERJ-3EKF3800V	0603	380 Ohm Thick Film Res 1%	800-344-4539
20	R1	1	Panasonic	ERJ-3EKF1002V	0603	10K Ohm Thick Film Res 1%	800-344-4539
21	R3	0	NP	NP	0603	Do Not Place	-
22	R4	0	NP	NP	0603	Do Not Place	-
23	RBST	1	Panasonic	ERJ-3EKF05R1V	0603	5.1 Ohm Thick Film Res 1%	800-344-4539
25	VIN, VOUT, GND, GND2	4	Vector Electronic	K24C/M	.042 Dia	Input/Output Terminal Posts	800-344-4539

For further assistance:

Email:	Sipexsupport@sipex.com
WWW Support page:	http://www.sipex.com/content.aspx?p=support
Live Technical Chat:	http://www.geolink-group.com/sipex/
Sipex Application Notes:	http://www.sipex.com/applicationNotes.aspx
Type III loop Compensation Application Note:	http://www.sipex.com/files/ApplicationNotes/Type%20III%20Loop%20Compensation%20Oct12-06.pdf
Type III loop Compensation Calculator:	http://www.sipex.com/files/ApplicationNotes/TypeIIICalculator.xls

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