



Design Solution 4

SP6133 Converts 12V input to 1.3V output at 30A

Date: December 30, 2005

Designed by: Shahin Maloyan (smaloyan@sipex.com)

Part Number: SP6133

Application Description: Powering GPU on a graphics card

Electrical Requirements:

Input Voltage	10V - 14V
Output Voltage	1.3V
Output Current	30A

Circuit Description:

This circuit has been designed to provide 1.3V output at 30A for powering a high current GPU (graphics processor) on a graphics card. High output current and low cost dictated the choice of the controller and external components. In order to reduce cost single phase synchronous buck regulator topology was chosen. The SP6133 is a high performance buck regulator controller that provides all necessary functions required by a buck regulator: overcurrent protection, power good output, adjustable UVLO and Enable input. Constant switching frequency (300kHz) optimizes switching loss and

This report includes application schematic, complete Bill of materials and figures 1-3 illustrating electrical and thermal performance of the design.

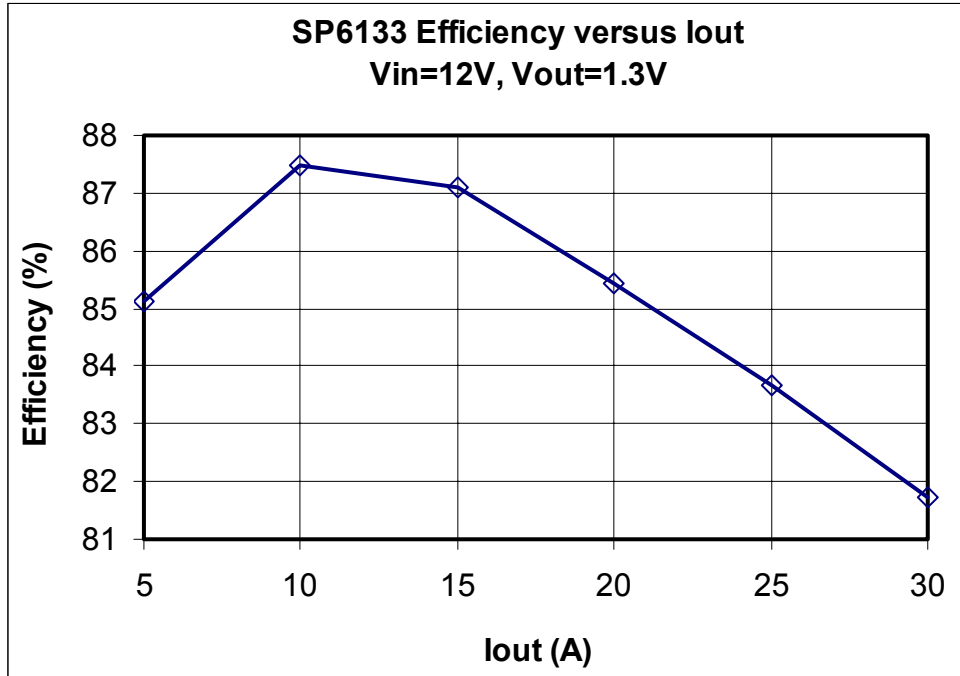


Figure 1. Efficiency Graph at 25C

Component	Temperature @ Iout=25A	Temperature @ Iout=30A
SP6133	69	81
M1T	77	95
M2T	75	95
M1B	76	99
M2B	77	101
L	78	99

Figure 2. Component Temperature at 30A

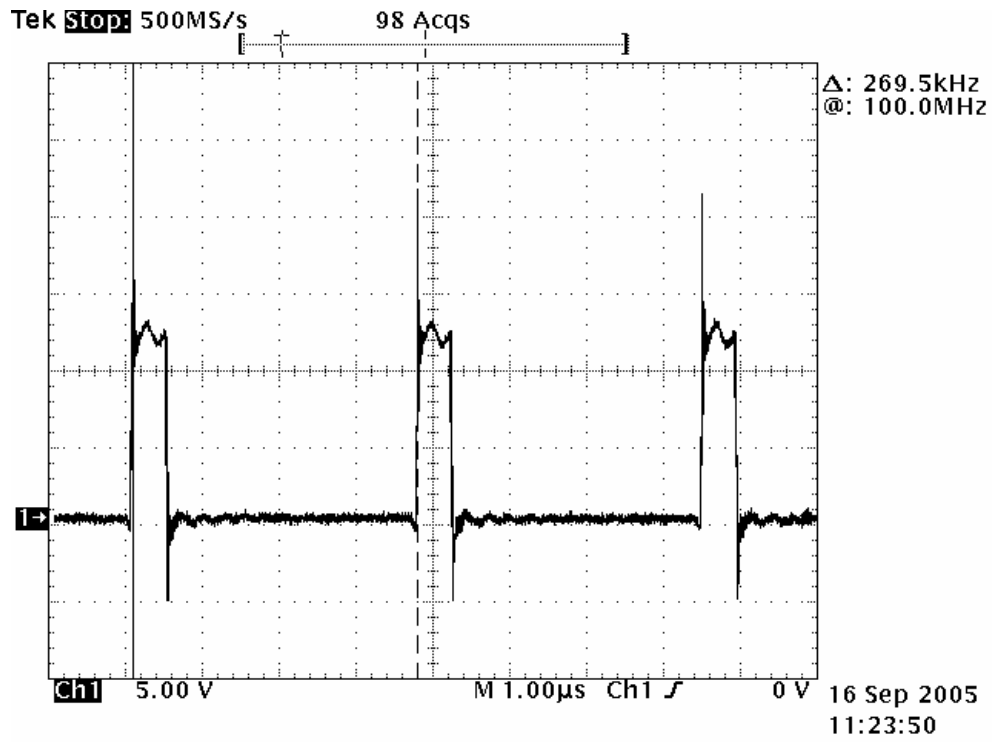


Figure 3. Switching Node

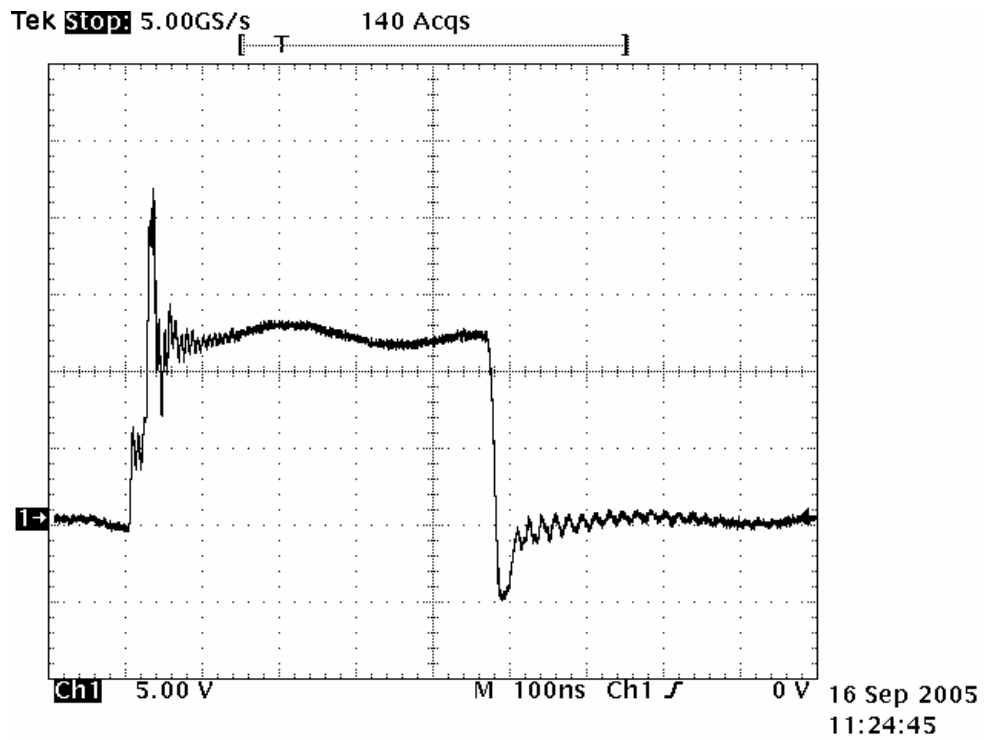


Figure 4. Switching Node close up

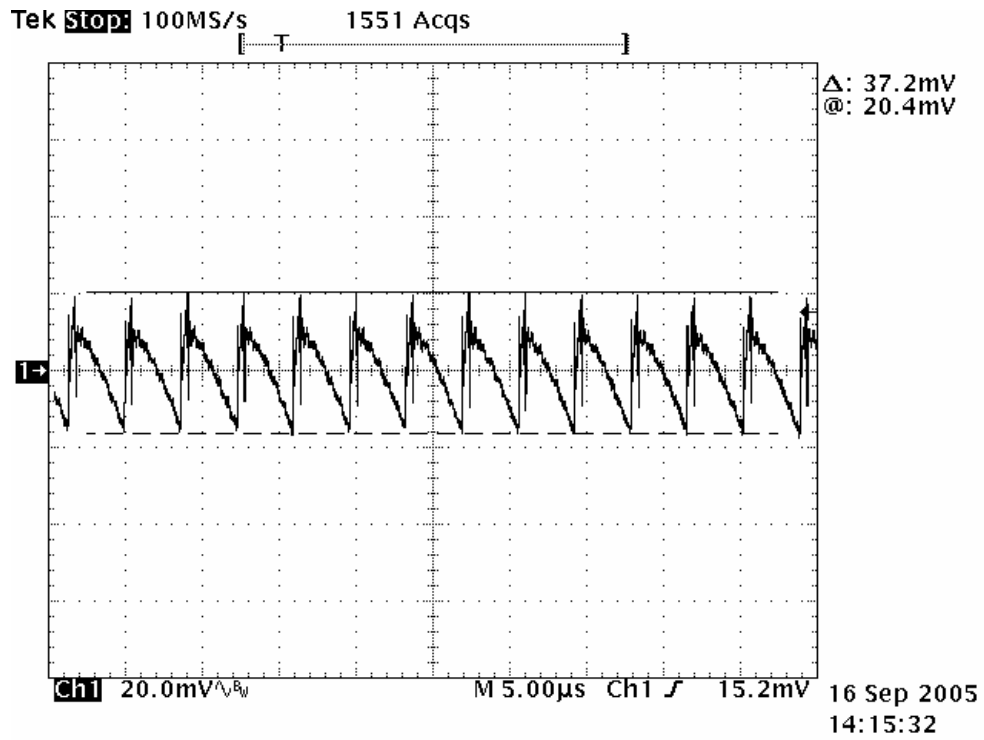
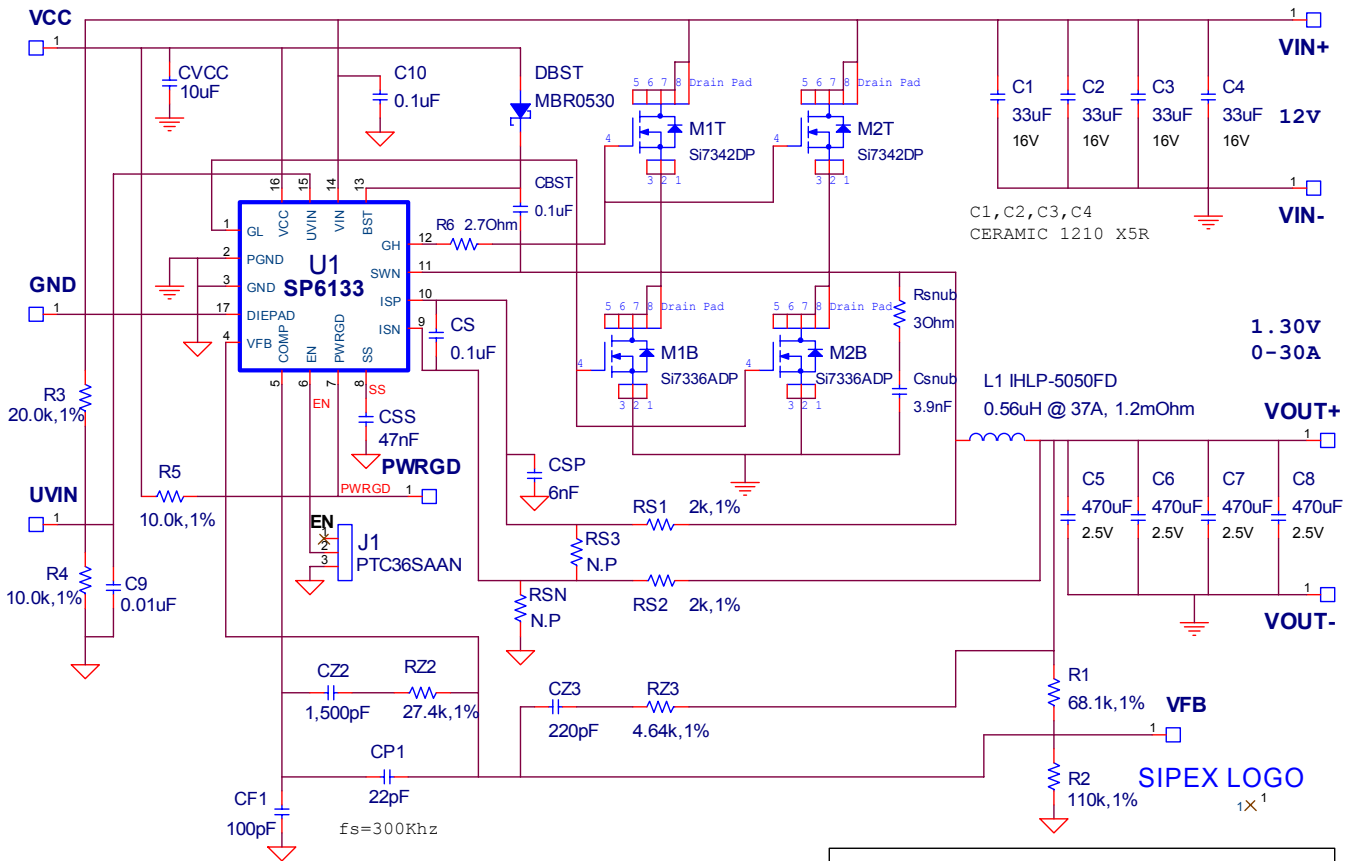


Figure 5. Steady state ripple is 37mV at $I_{out}=30A$



Notes:

- 1) All resistors & capacitors size 0603 unless other wise specified
- 2) MT1, MT2, MB1, MB2 Bottom-Side Drain Contact

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SP6133 30A Evaluation Board List of Materials

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SM

Line No.	Ref. Des.	Qty.	Manuf.	Manuf. Part Number	Layout Size	Component	Vendor Phone Number
1	PCB	1	Sipex	146-6604-00	2.1"x2.5"	SP6133EB	978-667-7800
2	U1	1	Sipex	SP6133EU	QFN-16	Synchronous Buck Controller	978-667-7800
3	MT	2	Vishay Semi	Si7342DP	Power SO-8	NFET 30V, 9.75mOhm	402-563-6866
4	MB	2	Vishay Semi	Si7336ADP	Power SO-8	NFET 30V, 4mOhm	402-563-6866
5	DBST	1	Vishay Semi	MBR0530	SOD-123	30V, 0.5A Schottky Diode	800-344-4539
6	L1	1	Vishay	IHLP-5050FD	12.6X12.6mm	0.56uH Coil 37A 1.4mOhm	800-344-4539
7	C5, C6, C7, C8	5	SANYO	2R5TPE470MC	4.3x7.3mm	470uF POSCAP 2.5V	978-779-3111
8	C1, C2, C3, C4	4	TDK	C3225X5R1C336M	1210	33uF Ceramic X5R 16V	978-779-3111
9	CVCC	1	TDK	C2012X5R0J106M	0805	10uF Ceramic X5R 6.3V	978-779-3111
10	CBST, CS, C10	3	TDK	C1608X7R1H104K	0603	0.1uF Ceramic X7R 50V	978-779-3111
12	C9	1	TDK	C1608X7R1H103K	0603	0.01uF Ceramic X7R 50V	978-779-3111
13	CSS	1	TDK	C1608X7R1H473K	0603	47,000pF Ceramic X7R 50V	978-779-3111
	Csnub	1	TDK	C1608COG1H222J	0603	3900pF Ceramic COG 50V	978-779-3112
14	CP1	1	TDK	C1608COG1H220J	0603	22pF Ceramic COG 50V	978-779-3111
15	CSP	1	TDK	C1608COG1H682J	0603	6800pF Ceramic COG 50V	978-779-3111
16	CZ2	1	TDK	C1608COG1H152J	0603	1,500pF Ceramic COG 50V	978-779-3111
17	CF1	1	TDK	C1608COG1H101J	0603	100pF Ceramic COG 50V	978-779-3111
18	CZ3	1	TDK	C1608COG1H221J	0603	220pF Ceramic COG 50V	978-779-3111
19	RZ2	1	Panasonic	ERJ-3EKF2742V	0603	27.4K Ohm Thick Film Res 1%	800-344-4539
21	RZ3	1	Panasonic	ERJ-3EKF4641V	0603	4.64K Ohm Thick Film Res 1%	800-344-4539
22	R1	1	Panasonic	ERJ-3EKF6812V	0603	68.1K Ohm Thick Film Res 1%	800-344-4539
20	R2	1	Panasonic	ERJ-3EKF7682V	0603	110K Ohm Thick Film Res 1%	800-344-4539
23	R3	1	Panasonic	ERJ-3EKF2002V	0603	20.0K Ohm Thick Film Res 1%	800-344-4539
24	R4, R5	2	Panasonic	ERJ-3EKF1002V	0603	10.0K Ohm Thick Film Res 1%	800-344-4539
	R6	1	Panasonic		0603	2.7 Ohm Thick Film Res	
	Rsnub	1	Panasonic		0603	3 Ohm Thick Film Res	
25	RS1, RS2	2	Panasonic	ERJ-3EKF2001V	0603	2.00K Ohm Thick Film Res 1%	800-344-4539
26	RS3 (not populated)						
27	J1	1	Sullins	PTC36SAAN	.32x.12	36-Pin (3x12) Header	800-344-4539
28	(J1)	1	Sullins	STC02SYAN	.2x.1	Shunt	800-344-4539
29	VIN, VCC, VFB, PWRGD, UVIN, GND	6	Vector Electronic	K24C/M	.042 Dia	Test Point Post	800-344-4539
30	VOUT+, VOUT-	2				Female plug	