Solution for Design 1

SP6133 Converts 12V input to 1.5V output at 20A

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

Part Number: SP6133

Application Description: Powering microprocessor on a computer motherboard

Electrical Requirements:

Input Voltage	10V - 14V
Output Voltage	1.5V
Output Current	20A
Power Good Output	Required

Circuit Description:

This circuit has been designed to provide 1.5V output at 20A for powering a microprocessor. High output current and the requirement to provide Power Good output dictated the choice of the controller: SP6133. The circuit is configured as a standard buck regulator with two bottom MOSFETs and one top MOSFET selected in order to optimize efficiency.

Report includes application schematic, complete Bill of materials and figures 1-5 illustrating electrical and thermal performance of the design.

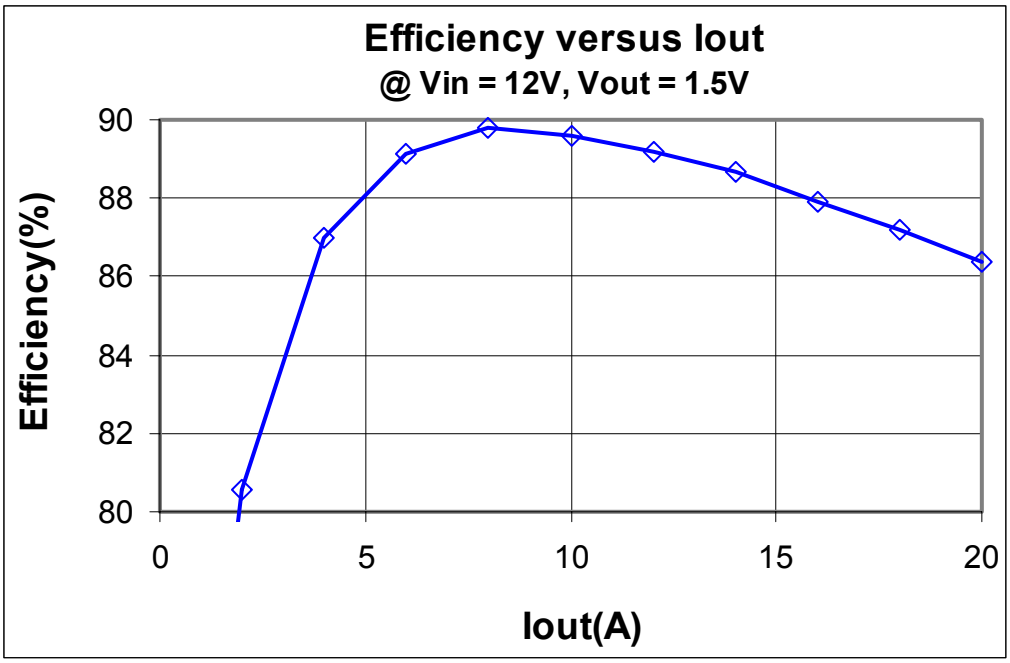


Figure 1- Efficiency at 25 C

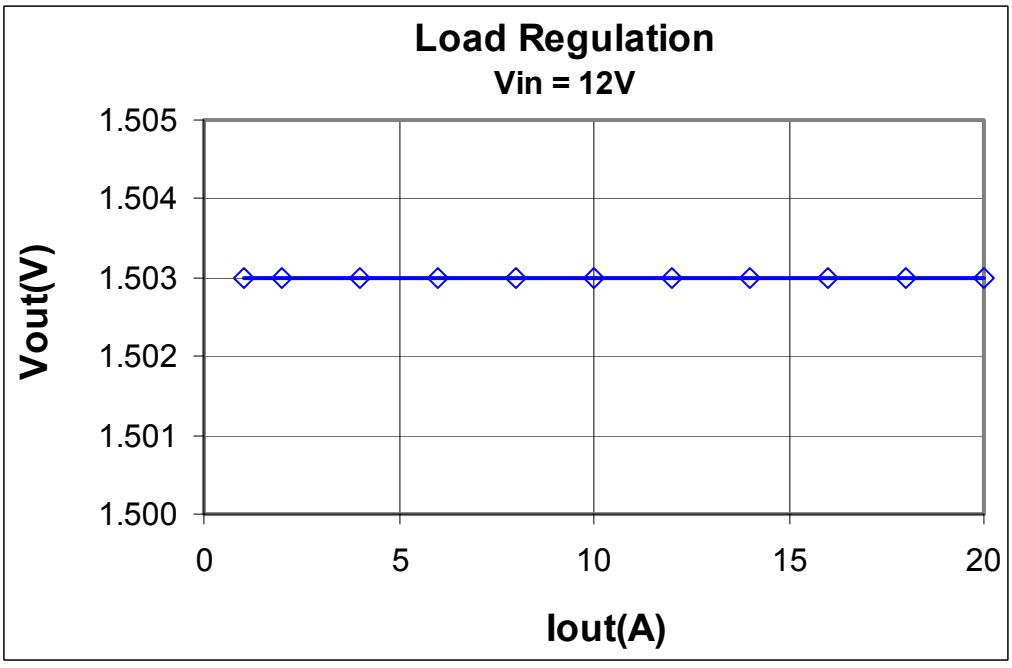


Figure 2- Load regulation, Vin=12V

Component	Operating temperature C
SP6133	57
M1T	66
M1B	64
M2B	64
L	65
C5	52
C6	51
C7	50

Figure3- Component operating temperature, Vin=12V, Vout=1.5V, Iout=20A, Ta=25C

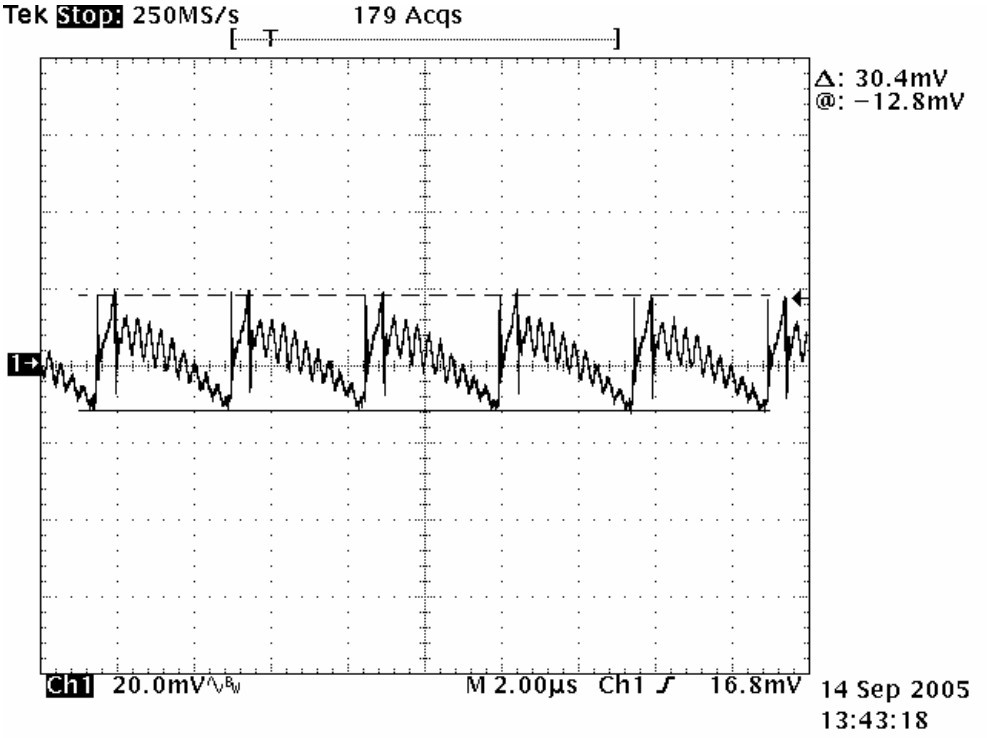


Figure 4- Steady state output ripple is 30mV at Iout=20A

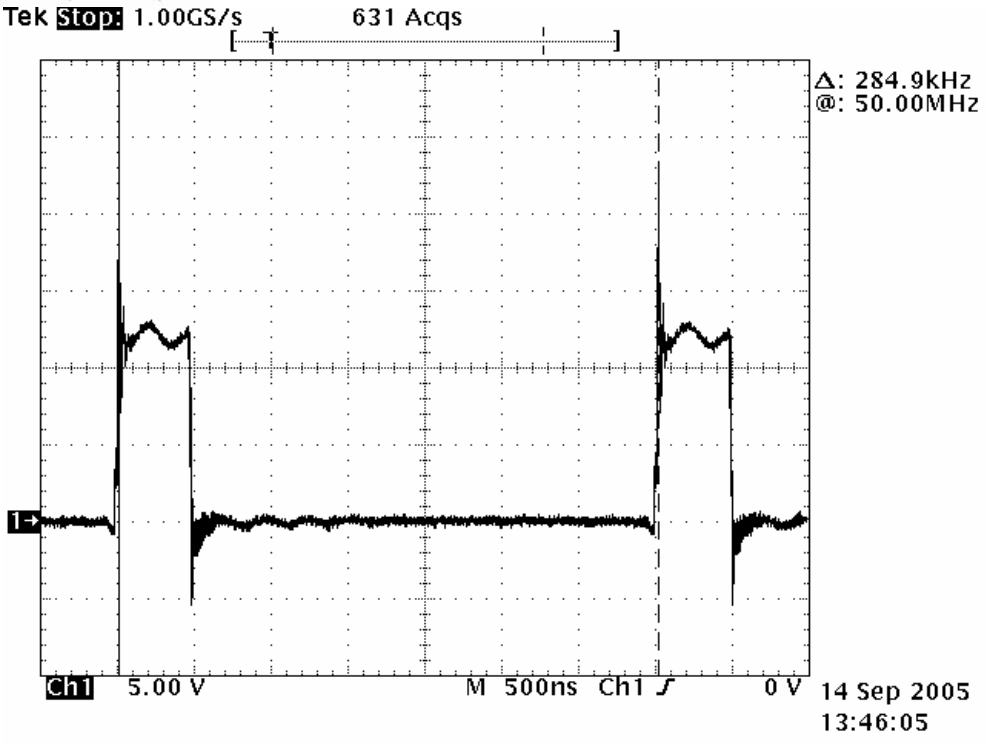


Figure 5- Switching node, f=285KHz

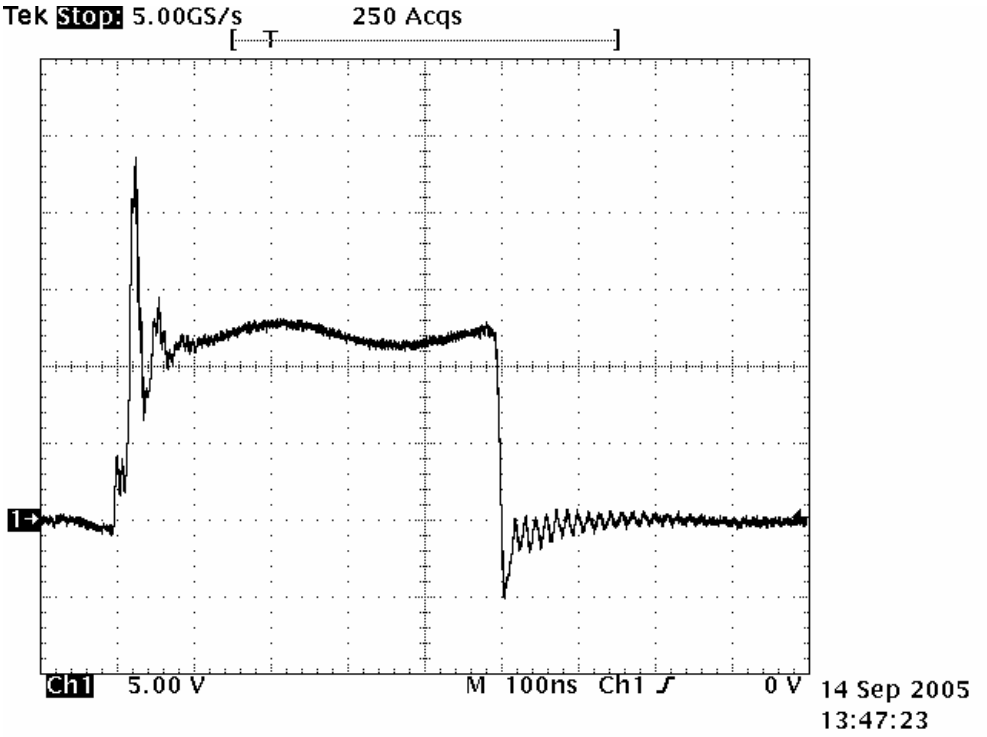
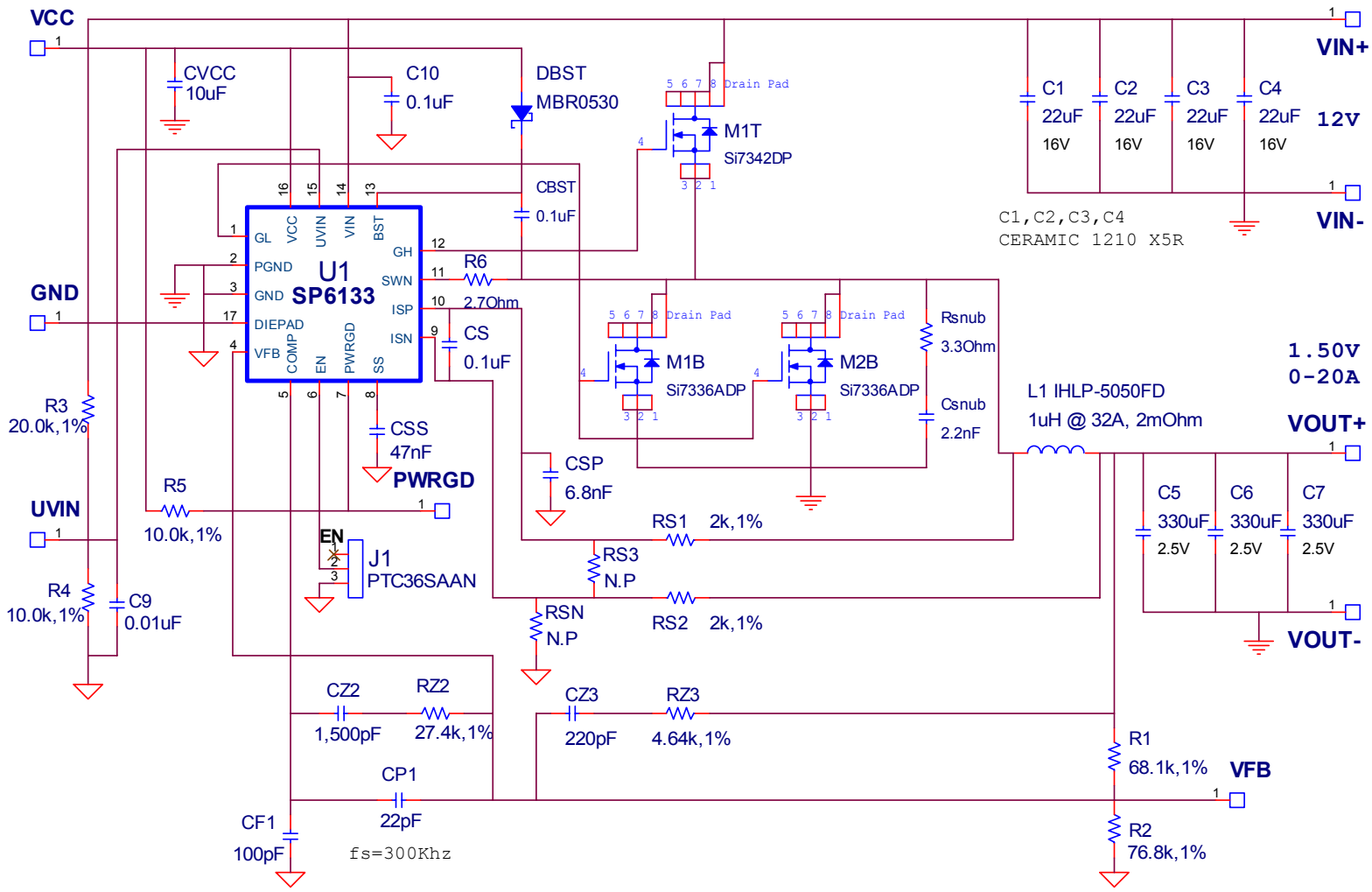


Figure 6- Close-up of switching node



Notes:

1) All resistors & capacitors size
0603 unless other wise specified

2) MT1, MB1, MB2 Bottom-Side Drain Contact

SP6133 20A Evaluation Board List of Materials						
Line No.	Ref. Des.	Qty.	Manuf.	Manuf. Part Number	Layout Size	Component
1	PCB	1	Sipex	146-6604-00	2.1"x2.5"	SP6133EB
2	U1	1	Sipex	SP6133EU	QFN-16	Synchronous Buck Controller
3	MT	1	Vishay Semi	Si7342DP	Power SO-8	NFET 30V, 9.75mOhm
4	MB	2	Vishay Semi	Si7336ADP	Power SO-8	NFET 30V, 4mOhm
5	DBST	1	Vishay Semi	MBR0530	SOD-123	30V, 0.5A Schottky Diode
6	L1	1	Vishay	IHLP-5050FD	12.6X12.6mm	1uH Coil 32A 2mOhm
7	C5, C6, C7	5	SANYO	2R5TPE330MC	4.3x7.3mm	330uF POSCAP 2.5V
8	C1, C2, C3, C4	4	TDK	C3225X5R1C226M	1210	22uF Ceramic X5R 16V
9	CVCC	1	TDK	C2012X5R0J106M	0805	10uF Ceramic X5R 6.3V
10	CBST, CS, C10	3	TDK	C1608X7R1H104K	0603	0.1uF Ceramic X7R 50V
12	C9	1	TDK	C1608X7R1H103K	0603	0.01uF Ceramic X7R 50V
13	CSS	1	TDK	C1608X7R1H473K	0603	47,000pF Ceramic X7R 50V
	Csnub	1	TDK	C1608COG1H222J	0603	2200pF Ceramic COG 50V
14	CP1	1	TDK	C1608COG1H220J	0603	22pF Ceramic COG 50V
15	CSP	1	TDK	C1608COG1H682J	0603	6800pF Ceramic COG 50V
16	CZ2	1	TDK	C1608COG1H152J	0603	1,500pF Ceramic COG 50V
17	CF1	1	TDK	C1608COG1H101J	0603	100pF Ceramic COG 50V
18	CZ3	1	TDK	C1608COG1H221J	0603	220pF Ceramic COG 50V
19	RZ2	1	Panasonic	ERJ-3EKF2742V	0603	27.4K Ohm Thick Film Res 1%
21	RZ3	1	Panasonic	ERJ-3EKF4641V	0603	4.64K Ohm Thick Film Res 1%
22	R1	1	Panasonic	ERJ-3EKF6812V	0603	68.1K Ohm Thick Film Res 1%
20	R2	1	Panasonic	ERJ-3EKF7682V	0603	76.8K Ohm Thick Film Res 1%
23	R3	1	Panasonic	ERJ-3EKF2002V	0603	20.0K Ohm Thick Film Res 1%
24	R4, R5	2	Panasonic	ERJ-3EKF1002V	0603	10.0K Ohm Thick Film Res 1%
	R6	1	Panasonic		0603	2.7Ohm Thick Film Res 1%
	Rsnub	1	Panasonic		0603	3.3Ohm Thick Film Res 1%
25	RS1, RS2	2	Panasonic	ERJ-3EKF2001V	0603	2.00K Ohm Thick Film Res 1%
26	RS3 (not populated)					
27	J1	1	Sullins	PTC36SAAN	.32x.12	36-Pin (3x12) Header
28	(J1)	1	Sullins	STC02SYAN	.2x.1	Shunt
29	VIN, VCC, VFB, PWRGD, UVIN, GND	6	Vector Electronic	K24C/M	.042 Dia	Test Point Post
30	VOUT+, VOUT-	2				Female plug