



1.0 Design Specifications

Inputs	Outputs #1
VinMin=6	Vout1=20
VinMax=20	Iout1=5

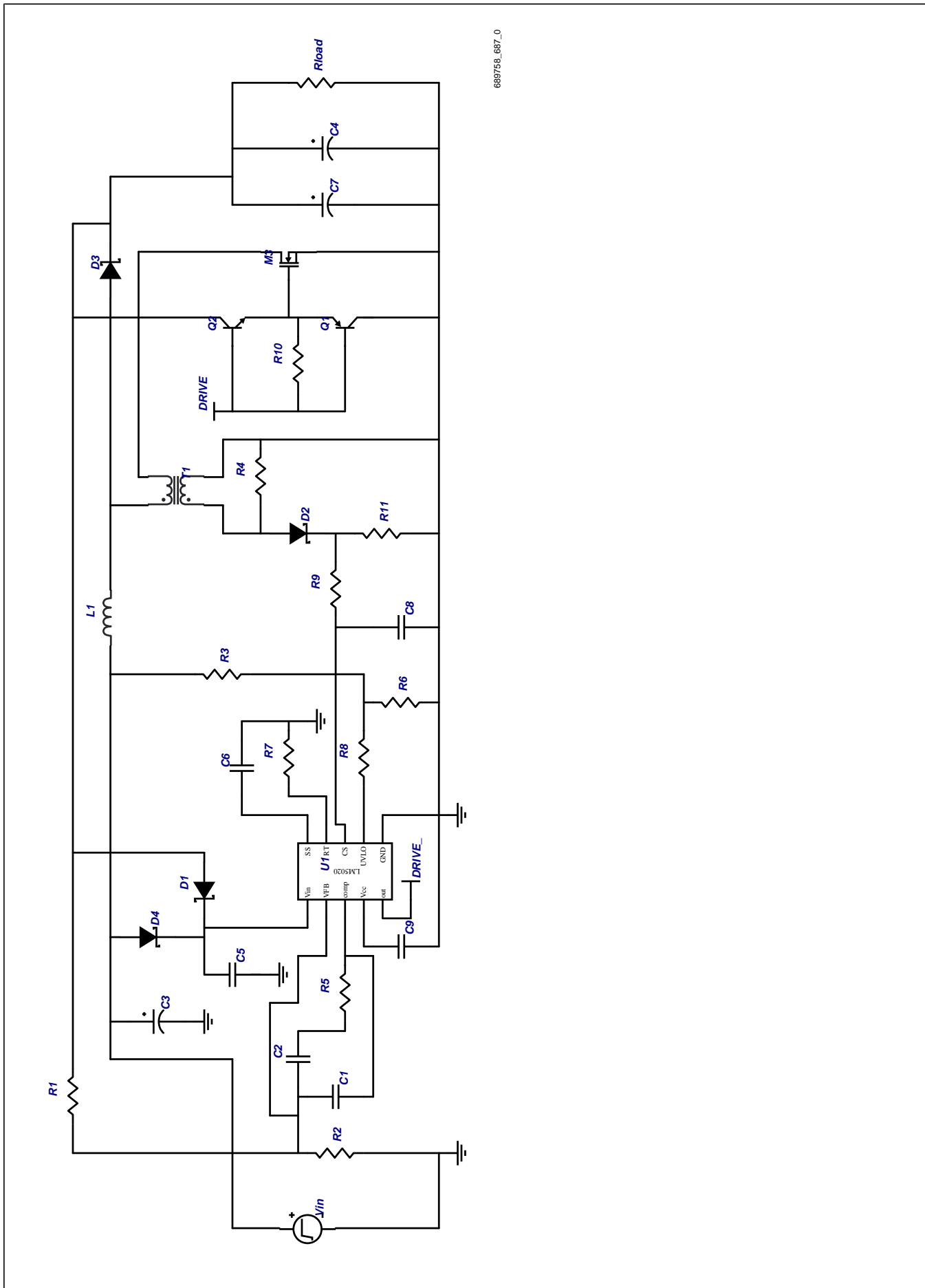
2.0 Design Description

The LM5020 is employed here to design a Boost power supply where the input voltage rail is stepped up to create the output voltage rail. The LM5020 is a versatile pwm controller requiring an external FET switch which can be sized to fit the output specification. Here the output FET is driven especially hard through the driver circuit, Q1 & Q2, in order to optimize efficiency and turn-on/off transitions. Please note that this power supply can maintain steady state operation at 6V input but that it is necessary for the input voltage at startup to be above 13V. The input voltage, V_{in} , during the on-time of the switch charges the L1 inductor through the FET to ground. During the off-time of the FET switch the inductor reverses polarity to forward bias the diode D3 to charge the output capacitors to the required output voltage and provide current to the load. The current sense circuit, involving transformer T1,

provides for the current mode operation of the control loop as well as a cycle to cycle current limit function. T1 is used instead of the more typical current sense resistor because of the high pulsed currents occurring at low input voltages. The output voltage is set through the voltage divider R1 & R2 and the loop transient response is governed by the resistor capacitor circuit across the feedback pin, VFB, and the compensation pin, COMP, of the controller IC. Output capacitors, C4 & C7, are selected to limit ripple and noise voltages while the input capacitance, C3, limits the noise ripple effects found on the input rail. The softstart ramp time is set via C6; the switch frequency is set by R7. After startup the voltage to power the LM5020 is taken from the output voltage through D1.

Notes: The FET M1 in the schematic is shown as Q3 in the board layout.

3.0 Schematic



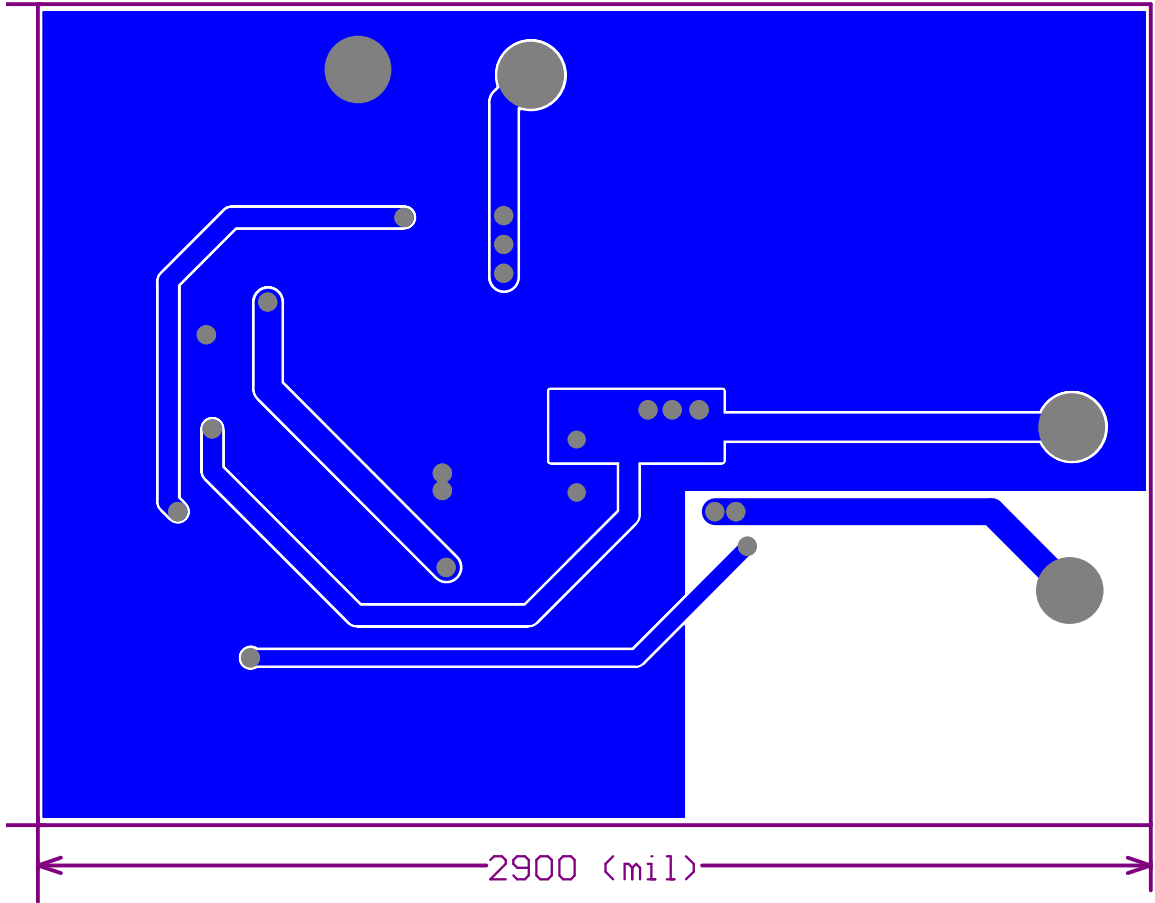
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FIGURE 1. Example Schematic Showing Connection for all Components.

4.0 Bill Of Materials

Part	Manufacturer	Part#	Attributes
C1	Vitramon	VJ0805A101KXXAT	100p F
C2	Vitramon	VJ0805Y472KXXAT	4.7n F
C3	TDK	C4532X7R1E106M	10u F
C4	TDK	C4532X7R1E106M	10u F
C5	Vitramon	VJ0805Y104KXXAT	0.1u F
C6	Vitramon	VJ0805Y103KXXAT	10n F
C7	Sanyo	35MV330WX	330u F, 0.044 Ohms
C8	Vitramon	VJ0805A471KXXAT	470p F
C9	Vitramon	VJ0805Y154KXXAT	150n F
D1	ONSEMI	MMSD4148	1 V
D2	ONSEMI	MMSD4148	1 V
D3	Diodes Inc	B560C	0.7 V
D4	ONSEMI	MMSD4148	1 V
L1	Vishay	ILHP-5050FD-222	2.2u H, 0.014 Ohms
M3	IR	IRLR7843	
Q1	ONSEMI	MMBT2907	
Q2	ONSEMI	MMBT2222A	
R1	Dale	CRCW08051503FRT6	150k Ohms
R10	Dale	CRCW08054R22FRT6	4.22 Ohms
R11	Dale	CRCW08052R49FRT6	2.49 Ohms
R2	Dale	CRCW08051002FRT6	10k Ohms
R3	Dale	CRCW08051002FRT6	10k Ohms
R4	Dale	CRCW08051002FRT6	10k Ohms
R5	Dale	CRCW08051002FRT6	10k Ohms
R6	Dale	CRCW08054751FRT6	4.75k Ohms
R7	Dale	CRCW08051742FRT6	17.4k Ohms
R8	Dale	CRCW08052001FRT6	2k Ohms
R9	Dale	CRCW08053010FRT6	301 Ohms
T1	PULSE	P8208	
U1	National Semiconductor	LM5020	

5.0 Layout



PADC_NSC0293_lo_1

FIGURE 2. Board's Bottom View

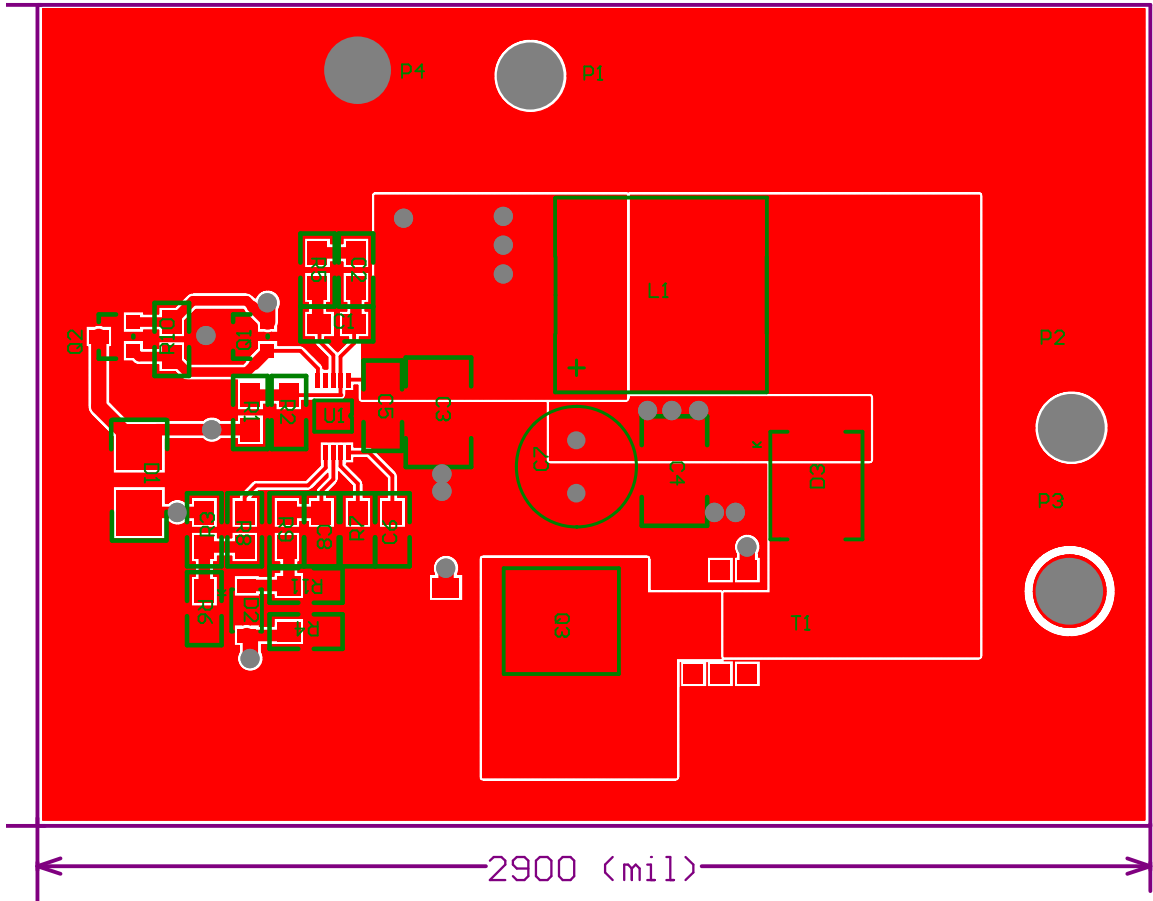


FIGURE 3. Board's Top View

PADC_NSC0293_lo_2

6.0 Waveforms

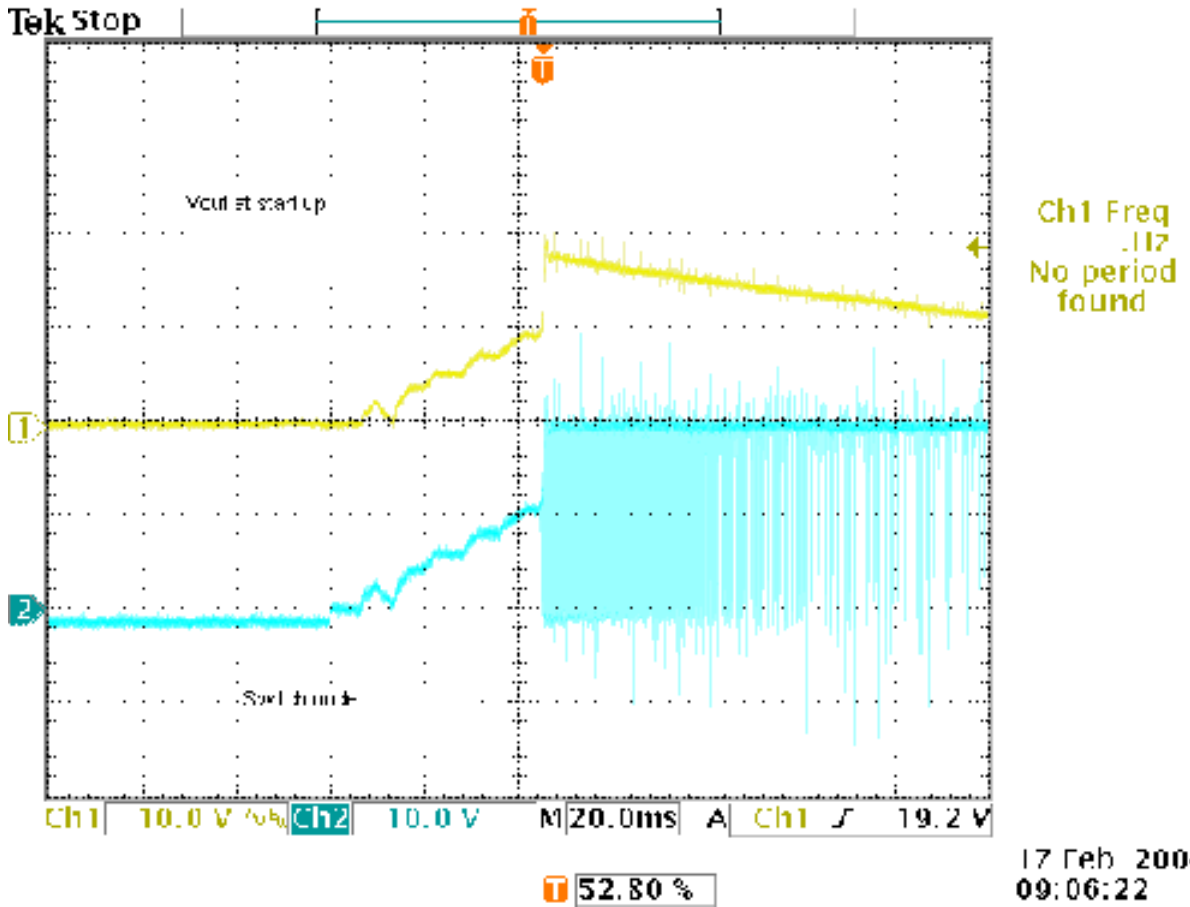


FIGURE 4. NSC0293-Start up



PADC_NSC0293_wf_4

FIGURE 5. NSC0293-Swich node

Notes

Notes

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