Si786 Demonstration Board

FEATURES

- 5- and 3.3-V Step-Down Synchronous Converters
- Less than 500-μA Quiescent Current
- 25-μA Shutdown Current
- 5.5- to 30-V Input Operating Range

The Si786 Dual-Output Power-Supply Controller for Notebook Computers is a system level integration of two step-down controllers, micropower 5- and 3.3-V linear regulators, and two comparators. The controllers perform high efficiency conversion of the battery pack energy (typically 12 V) or the output of an ac-to-dc wall converter (typically 18- to 24-V_{DC}) to 5- and 3.3-V system supply voltages. The micropower linear regulator can be used to keep power management and back-up circuitry alive during the shutdown of the step-down converters. The comparators can be biased at any voltage, simplifying battery monitoring or providing sufficient voltage to enhance the gate of a low on-resistance n-channel FET used in switching power to different zones in the system.

On the Demo Board, the Si786 is configured as a complete system, ready for operation. It takes 5.5- to 30-V in, and produces regulated 5 V at any current from no load to 3 A, and 3.3 V out at any current from no load to 3 A. Included in this document are the Bill of Materials, Demo Board Schematic, and PCB layout

The demonstration board layout is available in Gerber file format. Please contact your Vishay Siliconix sales representative or distributor for a copy.

ORDERING INFORMATION: PART NUMBER Si786DBDB

POWER-UP CHECK LIST

1. Start by setting the control switches located in the bottom right corner of the Demo Board. Set the top switch to the left, setting the switching frequency to 200 kHz (to the right is 300 kHz). Set the second switch down to the right, turning the 5-V converter on (to the left is off). Set the third switch down to the right, turning the 3.3-V converter on (to the left is off). Set the bottom switch to the right, allowing the PWM to operate (to the left is shutdown).
2. Attach an electronic load set in resistive mode to the 3.3-V output pins. Set the current to 100 mA. Alternatively, you can use a resistor of value 33 Ω, 1 W.
3. Attach an electronic load set in resistive mode to the 5-V output pins. Set the current to 100 mA. Alternatively, you can use a resistor of value 50 Ω, 1 W.
4. Attach a 10-V supply and ground to the pins on the top side of the board. It is best to use a separate wire from the supply's ground to each of the Demo Board's ground pins, because of the high currents at low input voltages.
5. Take an oscilloscope probe, and place the ground on the 5-V GND pin, and the probe on the 5-V pin. Set the vertical scale for this channel at ac coupled at 50 mV/div. Take a second probe, and place the ground on the 5-V GND pin, and the probe on pin 17 (LX_5) of the Si786. Set this channel at dc coupled 2 V/div. Set the time base at 200 μsec/div.
6. Leave the probes in place. Change the scale on the second probe (the one attached to pin 17) to 10 V/div, and the time base to 500 nsec/div. Set the 5-V output current on the electronic load to 1 A. Set the input power supply to 16 V. Alternatively, *first turn off the input power supply*, and replace the 50-W resistor with a 5-Ω, 10-W resistor, and then turn the input power supply back on, setting it to 16 V.
7. This step should be performed only if an electronic load is being used. Set the input voltage to 15 V. Remove the second probe (the one attached to pin 17 of the Si786), or turn off the channel displaying it. Place a current probe around the wire leading from the 5-V output to the electronic load, and set the oscilloscope and amplifier so that it will display approximately 2 A/div. Set the oscilloscope time base back to 200 μsec/div. Set the 3.3-V electronic load to have a constant 1-A load. Now set up the 5-V electronic load so that it cycles between 100 mA and 3 A at approximately 1 kHz (1 msec period).
8. This step should be performed only if an electronic load is being used. Set the 5-V electronic load back to a constant 1-A current. Remove the voltage probe from the 5-V output. Move the ground of the probe onto the GND pin of the 3.3-V output, and the probe onto the 3.3-V output pin. Remove the current probe from the 5-V output wire, and place it around the wire leading from the 3.3-V output to the electronic load. Now set up the 3.3-V electronic load so that it cycles between 100 mA and 3 A at approximately 1 kHz (1 msec period).

PCB LAYOUT

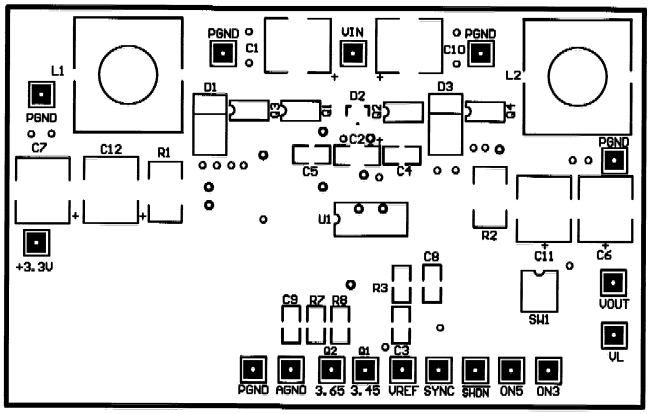


Figure 1. Top Silkscreen

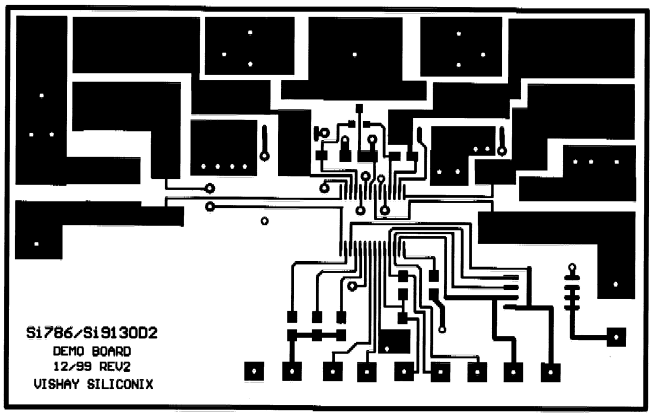


Figure 2. Top Layer

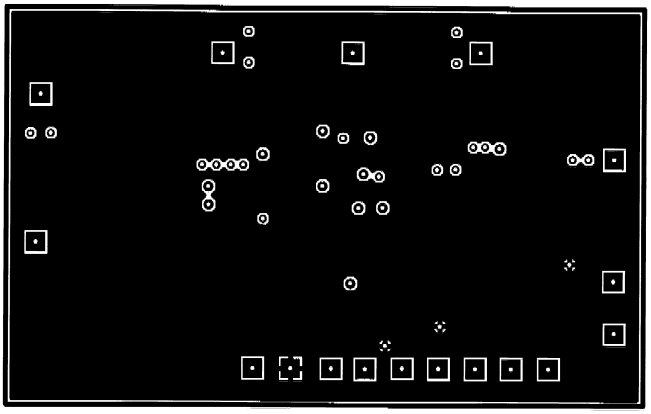


Figure 3. Mid-Layer 1 (AGND)

PCB LAYOUT

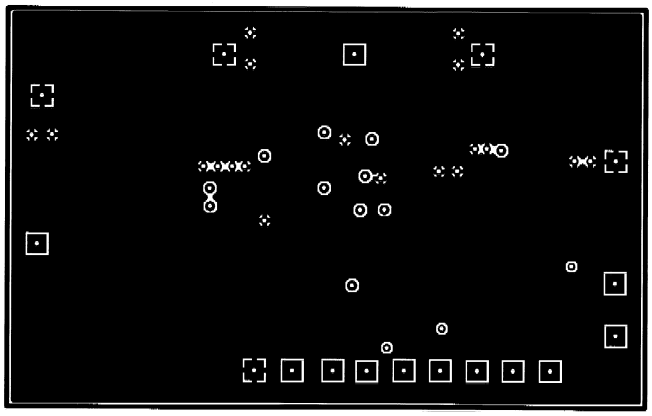


Figure 4. Mid-Layer 2 (PGND)

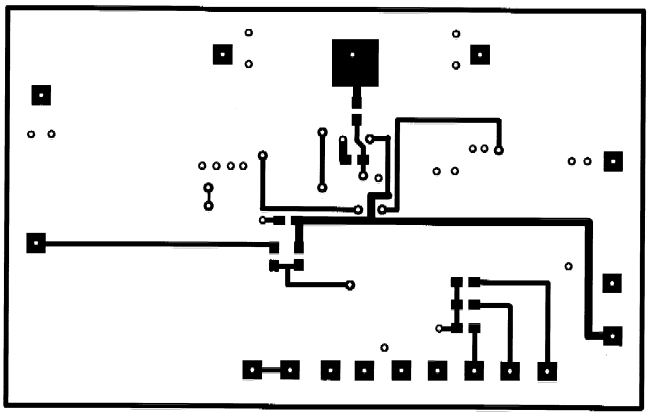


Figure 5. Bottom Layer

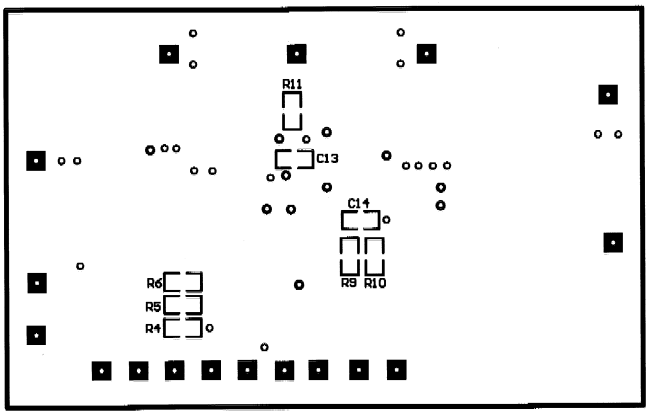
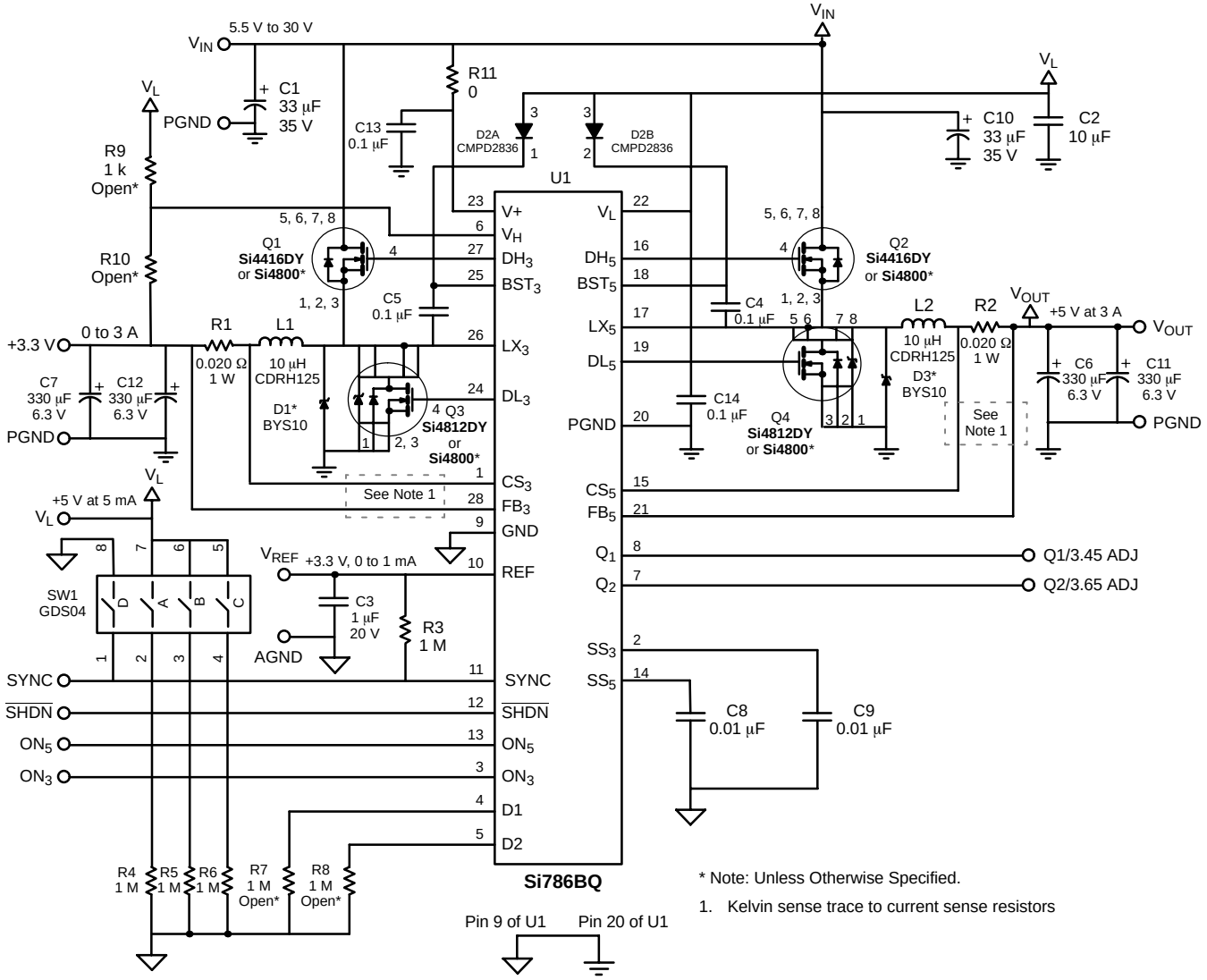


Figure 6. Bottom Silkscreen

APPLICATION CIRCUIT



* Note: Unless Otherwise Specified.

1. Kelvin sense trace to current sense resistors

BILL-OF-MATERIALS: Si786, DEMO BOARD 2							
Item	**Qty**	**Designator**	**Part Type**	**Description**	**Footprint**	**Vendor Part#**	**Manufacturer**
1	2	R1, R2	0.02 Ω	Resistor, 1 W, 1%	WSL-2512	WSL-2512	Vishay Dale
2	6	R3, R4, R5, R6	1 MΩ	Resistor, $^1/_8$, 1%	WSL-2512	CRCW08051004FRT1	Vishay Dale
3	3	R7, R8, R9	Open	Resistor, $^1/_8$, 1%	0805	N.U.	
4	1	R10	Open	Resistor, $^1/_8$, 1%	0805	N.U.	
5	1	R11	0	Resistor, $^1/_8$, 1%	0805	CRCW08050000FRT1	Vishay Dale
6	2	C1, C10	33 µF	CAP, TAN, 35 V	595D_R	595D336X0035R2T	Vishay Sprague
7	1	C2	10 µF	CAP, CER, 6.3 V	1206	GRM42-6, X5R, 106K, 6.3	Murata
8	1	C3	1 µF	CAP, CER, Z5U, 50 V, 10%	0805	VJ0805Y106KXAAT	Vishay Vitramon
9	4	C4, C5, C13, C14	0.1 µF	CAP, CER, X7R, 50 V, 10%	0805	VJ0805Y104KXAAT	Vishay Vitramon
10	4	C6, C7, C11, C12	330 µF	CAP, TAN, 6.3 V	595D_D	595D337X06R3D2T	Vishay Sprague
11	2	C8, C9	0.01 µF	CAP, CER, X7R, 50 V, 10%	0805	VJ0805Y103KXAAT	Vishay Vitramon
12	2	D1*, D3*	BYS10-35	Schottky Diode, 35 V	BYS10	BYS10-35	Vishay Telefunken
13	1	D2	CMPD2836	Diode, Dual 1N4148	SOT-23	CMPD2836	Central Semiconductor
14	2	L1, L2	10 µH	10 µH Inductor, 20%	CDRH125	CDRH125-100	Sumida
15	2	Q1*, Q2*	Si4416DY	N-MOSFET	SO-8	Si4416DY	Vishay Siliconix
16	2	Q3*, Q4*	Si4812DY	N-MOSFET	SO-8	Si4812DY	Vishay Siliconix
17	1	U1	Si786/9130DB	Power IC	SSOP-28	Si9137	Vishay Siliconix
18	1	SW1	GDS04	4-POS SMT Switch	SW-SO8	GDS04	Augat
19	17	Power, GND and TP	Header	1-Pin Header	TP1	Header	Multi-Source

*Note: Use Si4800 for Q1 to Q4 with D1 and D3; or use Si4416DY for Q1 and Q2, Si4812DY for Q3 and Q4 without D1 and D3.