



Si9143 High-Performance Processor Controller Demo Board

FEATURES

- Voltage Mode Control
- Synchronous Buck Converter
- Short Circuit Current Limiting
- Over-Voltage Protection
- Output Current to 15 A
- Power Good Signal
- +5 V or +12 V Input
- Switching Frequency = 200 kHz
- Output Voltage Adjustable 1.8 V to 3.5 V

DESCRIPTION

The Si9143 is a voltage-mode, synchronous buck controller designed for point-of-use dc-to-dc conversion in high-performance servers and desktop computers. High efficiency at full load is accomplished by driving high- and low-side n-channel MOSFETS. The input voltage range has been designed for 4.75 V to 13.2 V to allow use of either 5 V or 12 V. This demo board is capable of handling 15 A of continuous output current. And the output voltage can be set easily to the desired value (from 1.8 V to 3.5 V in 0.1 V increments) by adjusting the five voltage identification pins on the connector. Table 1 shows the logic settings for various output voltages.

The Si9143 is designed to provide automatic true current sharing between parallel power supplies. To use this function, all the Si9143s have to be synchronized by tying their SYNC pins and all the PWM pins together. These two pins are left open on the demo board.

The Bill-of-Materials (Table 2) and Demo Board Schematic are attached to this document. Refer to Table 1 for different voltage settings.

ORDERING INFORMATION

Part Number Si9143DB

TEST SETUP AND OPERATION

1. The Si9143 Demo Board requires an input power source and a load. The input power source may be either +5 V or +12 V. If +5 V is used as an input, be sure it is capable of sourcing at least 15 A; if +12 V is used as an input, be sure it is capable of sourcing at least 8 A. An electronic load is recommended for the load; be sure that it is capable of sinking 60W, and that it will operate with an input voltage as low as 1.5 V. Also required for the demonstration described here are an oscilloscope, two DVMs, and two ammeters.
2. There is a 40-pin connector socket available on board, which is mechanically compatible with Intel's VRM Header 8, revision 3.0. If no connector will be used, input/output power can be connected at separate pins on the demo board. Connections between the load and demo board and the electronic load should be made with heavy gauge wire (AWG #14 or larger) and should be as short as possible. For a specific output voltage set point, certain voltage identification pins (VIDx) need to be grounded.
3. Attach the first DVM to the input of the Si9143 demo board. The attachments should be made as close as possible to the board, NOT at the power supply. Attach the second DVM to the output of the demo board. Again, the attachments should be made as close as possible to the board, NOT at the electronic load. In particular, do not rely on the built-in meters of the power supply and the electronic load for voltage measurements, because of the voltage dropped along the connection wires. Set input voltage and load current to zero before powering up.
4. Put an oscilloscope ground to the output ground. Then connect Ch1 probe to pin 21 (DH), Ch2 probe to pin 17 (DL), and Ch3 probe to pin 20 (Lx) of Si9143. Set the scope scale to 5 V/div. for all channels. At 6-V input voltage and 2.8-V/1-A output, the resulting waveform will appear approximately as shown in Figure 1.
5. Basic Operation: After powering up the power source, slowly increase the voltage until the DVM at the input reads 5 V. Adjust the load current within the operating range and observe the regulation of output voltage. Voltage/current data at the input and output can be recorded to calculate the efficiency of the demo board.

**TABLE 1. VOLTAGE IDENTIFICATION CODE**

Processor Pins: 0 = Connected to ground; 1 = Open or pull-up to V_{in}					V_{out}
VID4	VID3	VID2	VID1	VID0	(VDC)
0	1	1	1	1	*
0	1	1	1	0	*
0	1	1	0	1	*
0	1	1	0	0	*
0	1	0	1	1	*
0	1	0	1	0	*
0	1	0	0	1	*
0	1	0	0	0	*
0	0	1	1	1	*
0	0	1	1	0	*
0	0	1	0	1	1.80
0	0	1	0	0	1.85
0	0	0	1	1	1.90
0	0	0	1	0	1.95
0	0	0	0	1	2.00
0	0	0	0	0	2.05
1	1	1	1	1	No CPU
1	1	1	1	0	2.1
1	1	1	0	1	2.2
1	1	1	0	0	2.3
1	1	0	1	1	2.4
1	1	0	1	0	2.5
1	1	0	0	1	2.6
1	1	0	0	0	2.7
1	0	1	1	1	2.8
1	0	1	1	0	2.9
1	0	1	0	1	3.0
1	0	1	0	0	3.1
1	0	0	1	1	3.2
1	0	0	1	0	3.3
1	0	0	0	1	3.4
1	0	0	0	0	3.5

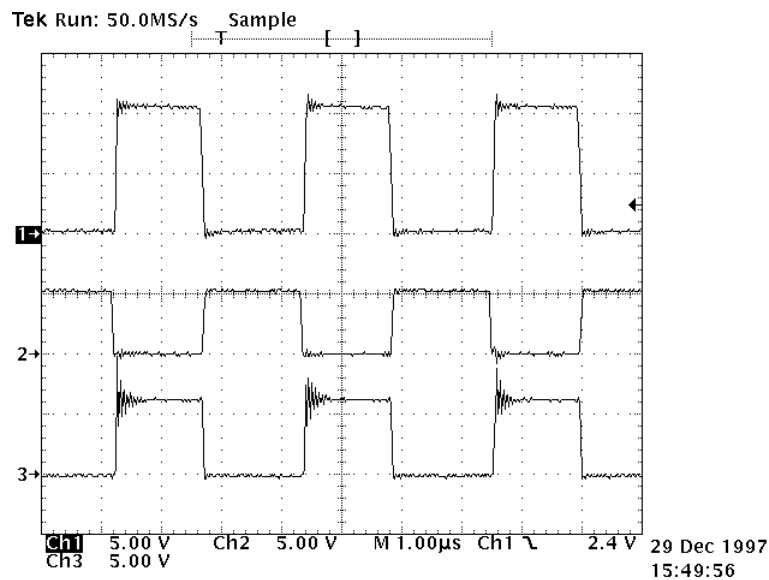


FIGURE 1. Si9143DB Sample Waveform

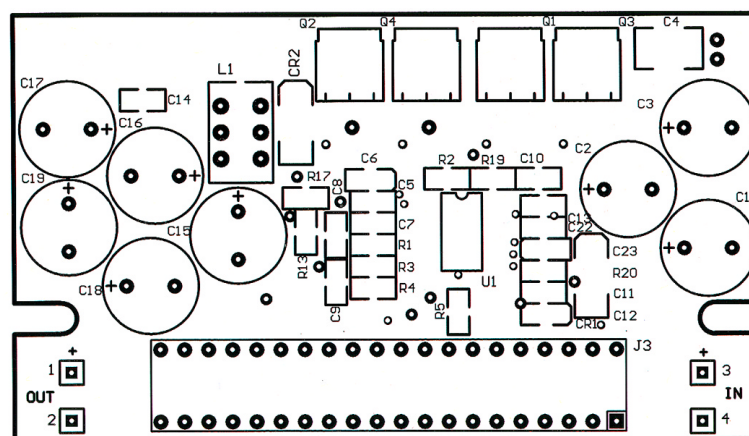


FIGURE 2. Si9143DB Top Layer Silk Screen

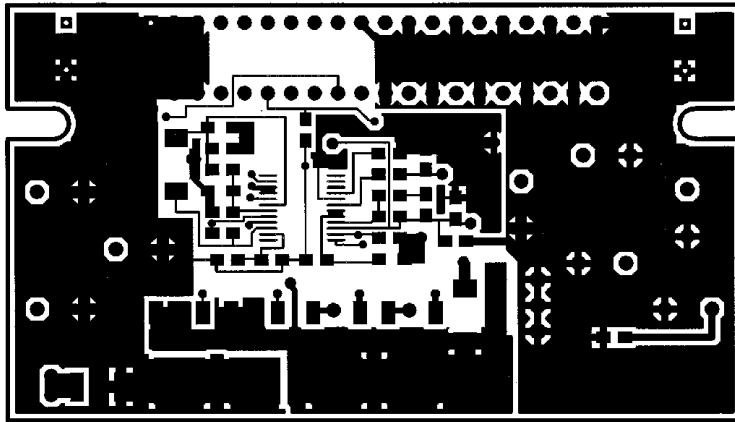


FIGURE 3. Si9143 DB Top Layer

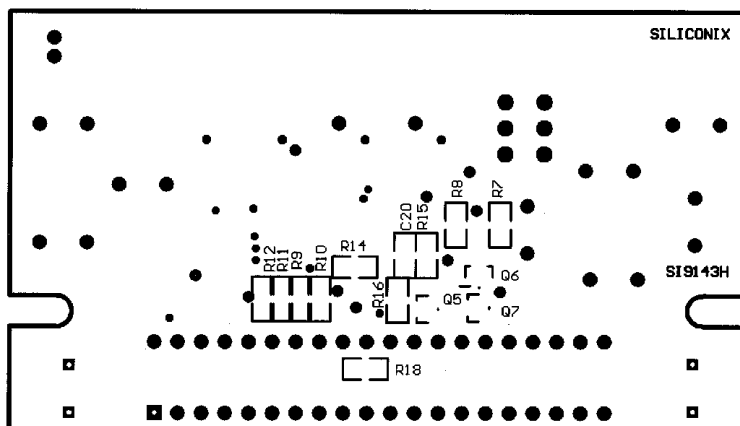


FIGURE 4. Si9143 DB Bottom Layer Silk Screen

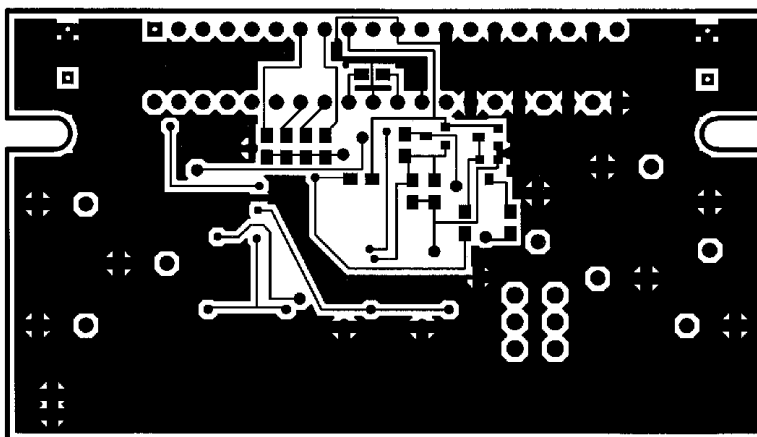


FIGURE 5. Si9143 DB Bottom Layer

TABLE 2. SI9143DB BILL-OF-MATERIALS

Pin	Used	Reference Designators	Part Type	Description	Pattern	Part Number	Manufacturer
1	3	C1, C2, C3, C15, C16	1000 μ F	Capacitor, 1000 μ F/10 V	Radial-Lead	EKE00DD410C00	Vishay Roederstein
2	1	C4	10 μ F	Ceramic	1210	GRM42-2X5R106K16	Murata
3	5	C5, C9, C11, C14, C22	0.1 μ F	Capacitor	805	VJ0805104KXXAT	Vishay Vitramon
4	3	C6, C12, C23	4.7 μ F	Capacitor	1206	GRM42-2X5R475K16	Murata
5	1	C7	27 pF	Capacitor	805	VJ0805270KXXAT	Vishay Vitramon
6	1	C8	470 pF	Capacitor	805	VJ0805471KXXAT	Vishay Vitramon
7	1	C10	1000 pF	Capacitor	805	VJ0805102KXXAT	Vishay Vitramon
8	1	C13	0.47 μ F	Capacitor	805	VJ0805474KXXAT	Vishay Vitramon
9	5	C17, C18, C19	2200 μ F	Capacitor, 2200 μ F/10 V	Radial-Lead	EKE00FI422C00	Vishay Roederstein
10	4	C20	0.01 μ F	Capacitor	805		Vishay Vitramon
11	1	CR1	D1FS4	Schottky, 40 V 1.1 A	Case 1F, SMT	DIFS4	Shindengen
12	1	CR2	DE4SC4M	Schottky, 40 V 5 A	DPAK, SMT	DE4SC4M	Shindengen
13	1	L1	1.5 μ H	Inductor, 1.5 μ H	Radial-Lead		Custom
14	4	Q1, Q2, Q3, Q4	N-Ch MOSFET	N-Channel MOSFET	U2	SUD50N03-10	Vishay Siliconix
15	2	R1, R12	200 k	Resistor, 200 k Ω	805	CRCW08052003FRT1	Vishay Dale
16	1	R2	1	Resistor, 1 Ω	805	CRCW080551R0FRT1	Vishay Dale
17	1	R3	510	Resistor, 510 Ω	805	CRCW08055100FRT1	Vishay Dale
18	1	R4	30 k	Resistor, 30 k Ω	805	CRCW08053002FRT1	Vishay Dale
19	1	R5	1 K	Resistor, 1 k Ω	805	CRCW08051001FRT1	Vishay Dale
20	1	R7	33.2 k	Resistor, 33.2 k Ω	805	CRCW08053322FRT1	Vishay Dale
21	5	R8, R14, R15, R16, R18	10 k	Resistor, 10 k Ω	805	CRCW08051002FRT1	Vishay Dale
22	1	R9	24.9 k	Resistor, 24.9 k Ω	805	CRCW08052492FRT1	Vishay Dale
23	1	R10	49.9 k	Resistor, 49.9 k Ω	805	CRCW08054992FRT1	Vishay Dale
24	1	R11	100 k	Resistor, 100 k Ω	805	CRCW08051003FRT1	Vishay Dale
25	1	R13	28.7 k	Resistor, 28.7 k Ω	805	CRCW08052872FRT1	Vishay Dale
26	1	R17	16.9 k	Resistor, 16.9 k Ω	805	CRCW08051692FRT1	Vishay Dale
27	1	R19	5 K	Resistor, 5 k Ω	805	CRCW08055001FRT1	Vishay Dale
28	1	R20	49.9	Resistor, 49.9 Ω	805	CRCW080549R9FRT1	Vishay Dale
29	1	U1	PIC	Current Sharing Controller	U1	Si9143	Vishay Siliconix