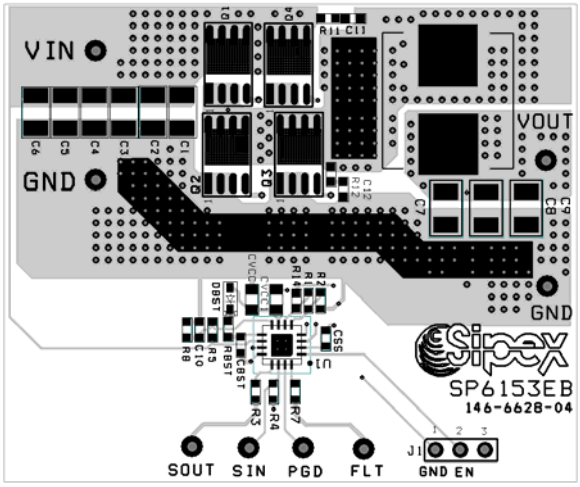
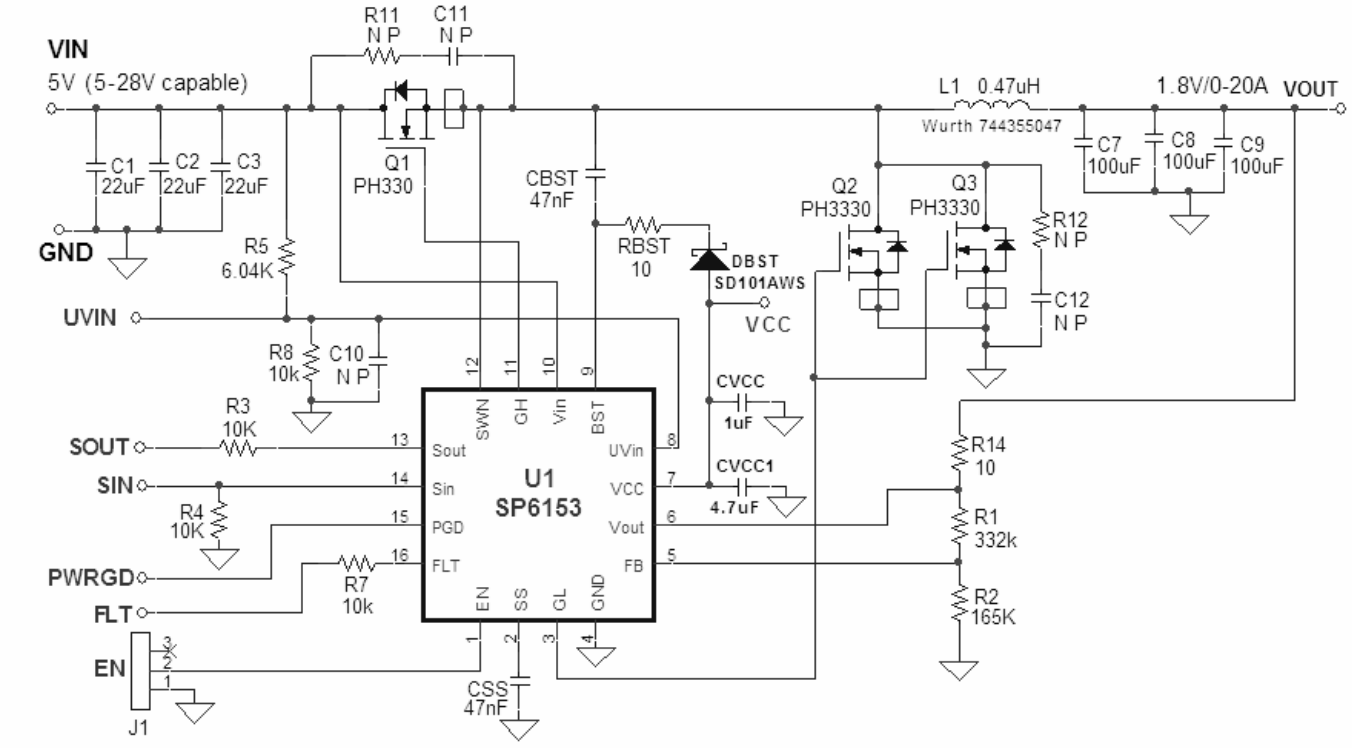
SP6153
Evaluation Board Manual

- 5V nominal Input step down Synchronous Buck Converter - up to 20A output current
- Built in feedback compensation with feed forward
- 300KHz fixed switching frequency
- Highly Integrated Design, Minimal External Components
- High Efficiency: 93%
- Over current circuit protection with auto restart using FET RDS_{ON} sensing
- Power Good Output
- UVLO detects both V_{CC} and V_{IN}
- Programmable soft start
- Fast transient response



SP6153EB SCHEMATIC



USING THE EVALUATION BOARD

1) Powering Up the SP61533EB Circuit

Connect the SP6153 Evaluation Board with an external +5V power supply. Connect with short leads and large diameter wire directly to the “VIN” and “GND” posts. Connect a Load between the VOUT and GND posts, again using short leads with large diameter wire to minimize inductance and voltage drops. The supply is capable of 28Vin but the components have been selected and optimized for a 5Vin nominal supply.

2) Measuring Output Load Characteristics

It’s best to GND reference scope and digital meters using the Star GND post in the center of the board. VOUT ripple can best be seen touching probe tip to the pad for C9 and scope GND collar touching Star GND post – avoid a GND lead on the scope which will increase noise pickup.

3) Using the Evaluation Board with Different Output Voltages

While the SP6153 Evaluation Board has been tested and delivered with the output set to 1.8V, by simply changing one resistor, R2, the SP6153 can be set to other output voltages. The relationship in the Equation 1 is based on a voltage divider from the output to the feedback pin VFB, which is set to an internal reference voltage of 0.60V. Standard 1% metal film resistors of surface mount size 0603 are recommended.

$$R2 = \frac{R1}{(\frac{Vout}{0.6V} - 1)} \qquad \text{Eq1}$$

R1 resistance must remain 332kΩ for overall system loop stability.

Note that since the SP6153 Evaluation Board design was optimized for 5V down conversion to 1.8V, changes of output voltage and/or input voltage will alter performance from the data given in the Power Supply Data section.

POWER SUPPLY DATA

The SP6153ER is designed with a very accurate 1.0% reference over line, load and temperature. Figure 1 & 2 data show a typical SP6153 evaluation board efficiency and regulation plots, with efficiencies up to 93% and output currents up to 20A. The output voltage ripple of less than 50mV at full load and the LX node are shown in figure 3. Figures 4 and 5 illustrate a 10A to 20A and 1A to 20A Load Step. Short circuit and current limit are shown in Figures 6 and 7. Typical startup characteristics into a full load and no load are shown in figure 8 and 9. All data was taken at 5Vin and 1.8Vout

While data on individual power supply boards may vary, the capability of the SP6153ER of achieving a high accuracy over a range of load conditions shown here is quite impressive and desirable for accurate power supply design.

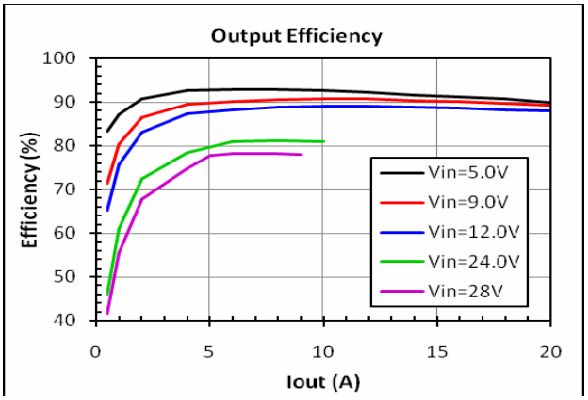


Figure 1. Efficiency vs Load

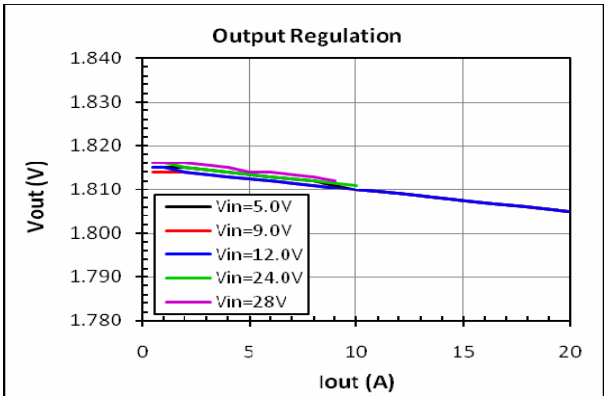


Figure 2. Output Voltage vs Load

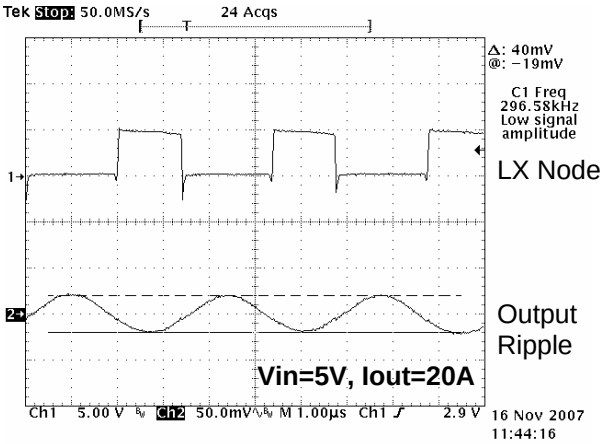


Figure 3. LX node & output ripple voltage

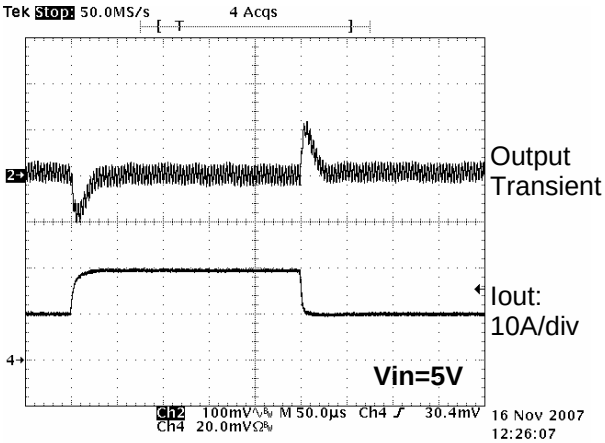


Figure 4. Load Step Response: 10->20A

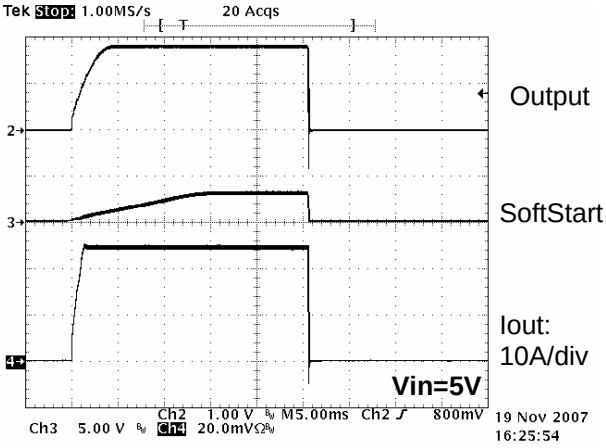


Figure 5. Current limit set point 25A

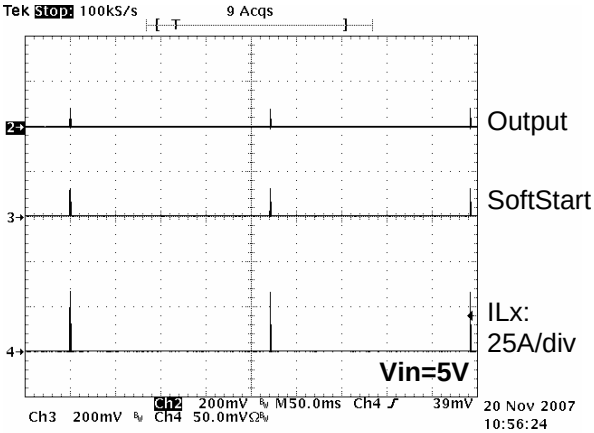


Figure 6. Output Under Short Circuit

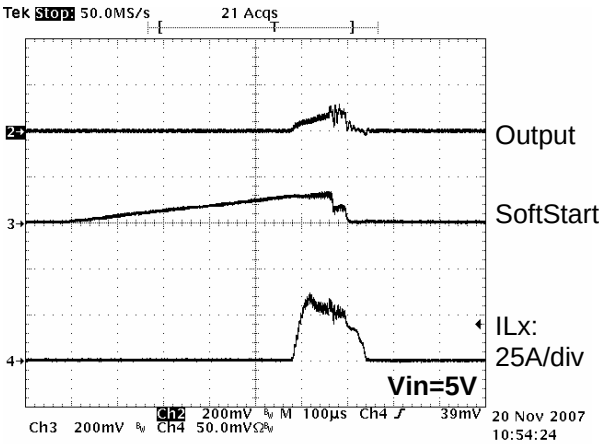


Figure 7. Output Under Short Circuit

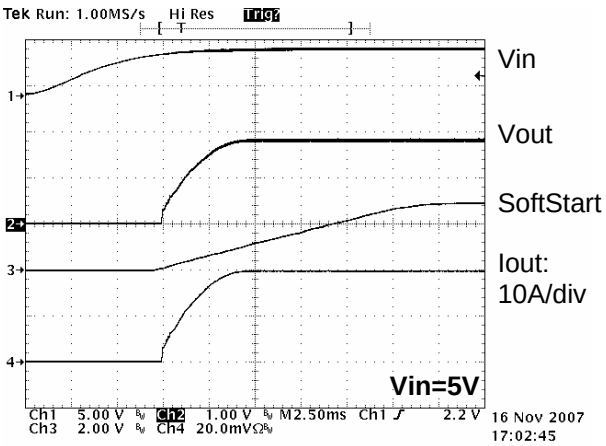


Figure 8. Startup into Full Load 20A

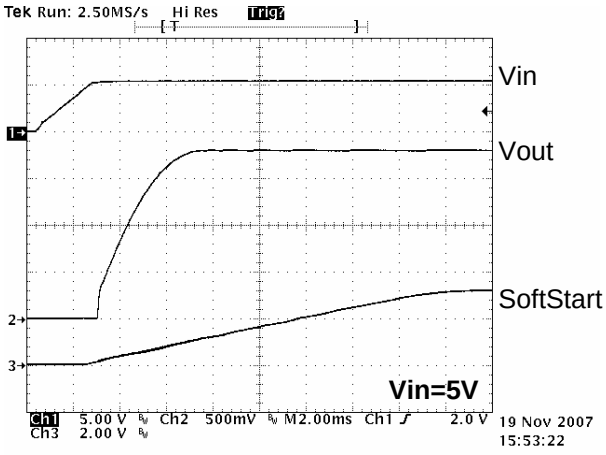


Figure 9. Startup into No Load

PC Layout Drawings

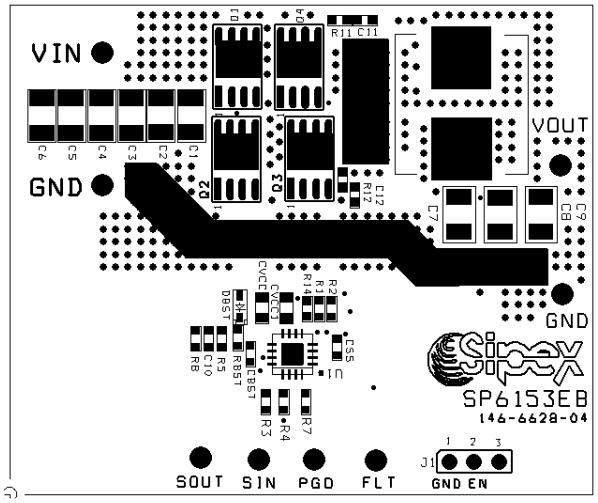


Figure 10. SP6153EB Top Side Component Placement

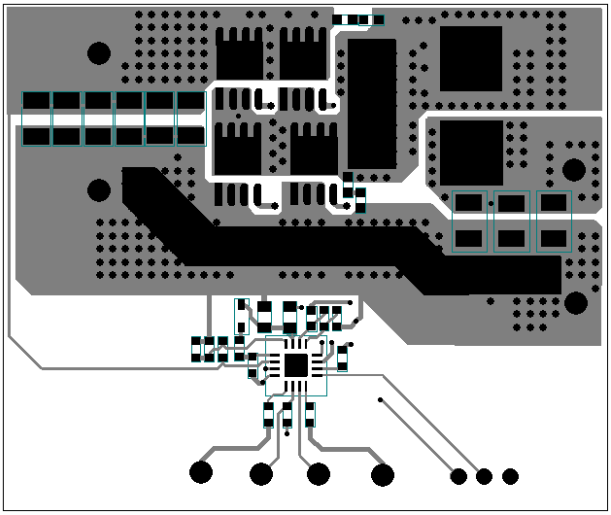


Figure 11. SP6153EB PC Layout Top Side

Figure 12. SP6153EB PC Layout 2nd & 3rd Layers

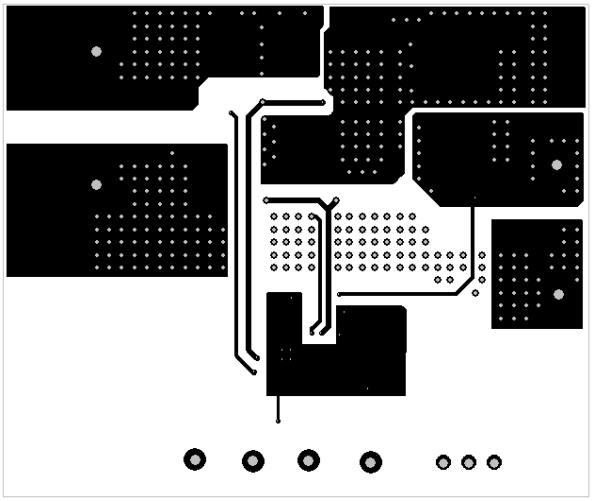


Figure 13. SP6153EB PC Layout Bottom Side

Table 1: SP6153EB Suggested Components and Vendor List

Line No.	Ref. Des.	Qty.	Manufacturer	Manuf. Part Number	Layout Size	Component	Vendor
1	PCB	1	Exar	146-6628-04		SP6153EB	Exar.com
2	U1	1	Exar	SP6153EU	4X4mm QFN-16	Synchronous Buck Regulator	Exar.com
3	DBST	1	Vishay Semi	SD101AWS	SOD-323	15mA-30V Schottky Diode	Vishay.com
4	L1	1	Wurth	744355047	5050	0.47uH Coil, 1.6mOhm	We-online.com
5	C1, C2, C3	3	muRata	GRM32ER61E226K	1210	22uF Ceramic X5R 25V	MURATA.com
6	C7, C8, C9	3	TDK muRata	C3225X5R0J107M GRM32ER60J107M	1210	100uF Ceramic X5R 6.3V	TDK.com MURATA.com
7	CBST, CSS	2	TDK muRata	C1608X7R1H473K GRM188R71H473K	0603	47nF Ceramic X7R 50V	TDK.com MURATA.com
8	C10, C11, C12	3	**Not Populated**				
9	CVCC	1	muRata	GRM188R61A105K	0603	1uF Ceramic X5R 10V	MURATA.com
10	CVCC1	1	muRata	GRM188R60J475K	0603	4.7uF Ceramic X5R 6.3V	MURATA.com
11	Q1, Q2, Q3	3	NXP Semiconductors	PH3330L	SOT-669 LFPAK	N MOS FET 30V 3.3mOhm	NXP.com
12	R1	1	Vishay	CRCW060332KF	0603	332K Ohm Thick Film Res 1%	Vishay.com
13	R2	1	Vishay	CRCW0603165KF	0603	165K Ohm Thick Film Res 1%	Vishay.com
14	R3, R4 R7, R8	4	Vishay	CRCW060310KF	0603	10K Ohm Thick Film Res 1%	Vishay.com
15	R5	1	Vishay	CRCW06036K04F	0603	6.04K Ohm Thick Film Res 1%	Vishay.com
16	R11, R12	2	**Not Populated**				
17	RBST, R14	2	Vishay	CRCW060310R00F	0603	10 Ohm Thick Film Res	Vishay.com
18	J1	1	Wurth Ecletronic	61303611121	6x2.54 mm	3 pin Header	We-online.com
19	VIN,VOUT,GND SOUT, SIN, PGT, FLT	8	Mill-Max Mfg. Corp	0300-1-15-01-47-01-10-0	.042" Dia	Female Test Point Post	800-344-4539

ORDERING INFORMATION

Model	Temperature Range	Package Type
SP6153EB	-40°C to +85°C	SP6153 Evaluation Board
SP6153ER	-40°C to +85°C	4X4mm16-pin DFN