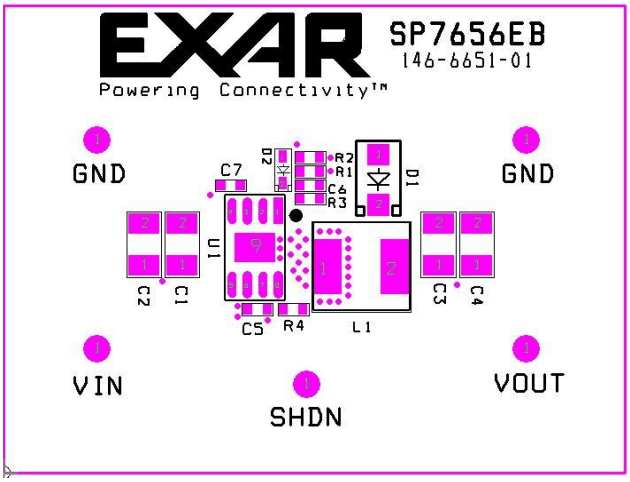
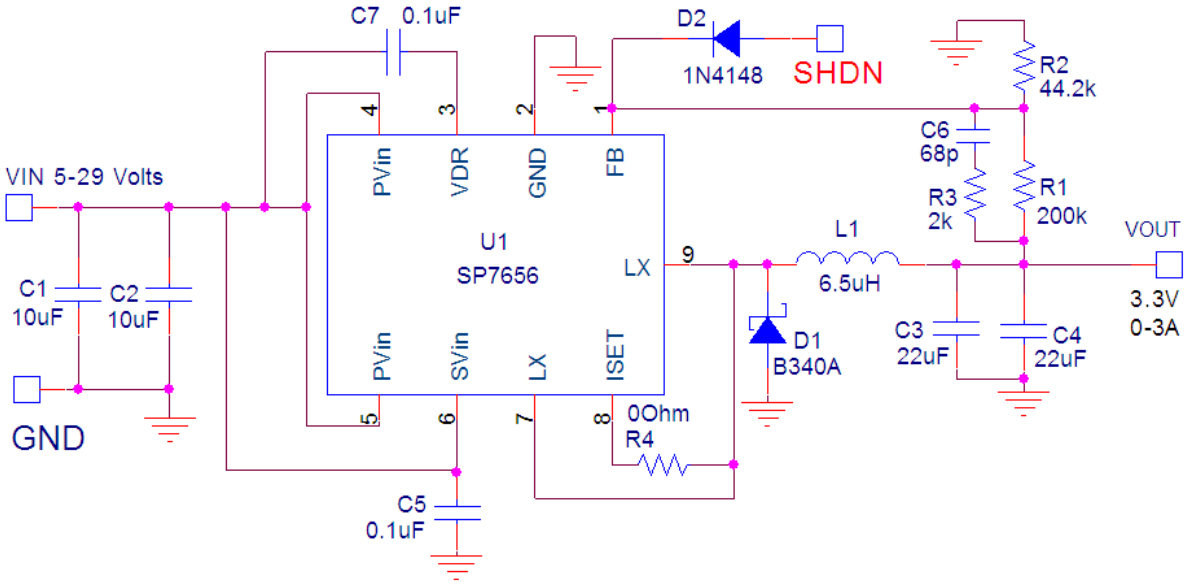
SP7656
Evaluation Board Manual

- Wide Input Voltage Range 5V – 29V
- 3 Amps Continuous 4 Amps Peak Output Current
- Internal Compensation
- Input Feedforward Control
- 600kHz Constant Frequency Operation
- Low 0.6V Reference Voltage
- High output setpoint accuracy of 1%
- Internal Soft Start
- Small SO8-EP Thermally Enhanced Package
- Adjustable Overcurrent Protection
- Lead Free, RoHS Compliant Package



SP7656EB SCHEMATIC



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USING THE EVALUATION BOARD

1) Powering Up the SP7656EB Circuit

Connect the Vin supply to the “VIN” and “GND” posts of SP7656 Evaluation Board with short leads. Connect a Load between the VOUT and GND posts, again using short leads to minimize parasitic inductance and voltage drop.

2) Measuring Output Load Characteristics

It’s best to GND reference scope and digital meters using a single GND post in the output of the board. VOUT ripple can best be seen touching probe tip to the pad for C4 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 SP7656 Evaluation Board has been tested and delivered with the output set to 3.3V, by simply changing one resistor, R2, the SP7656 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.

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

R1 resistance must remain 200kΩ for overall system loop stability.

Note that since the SP7656 Evaluation Board design was optimized for 12V down conversion to 3.3V, 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 SP7656ER is designed with an accurate 2.0% reference over line, load and temperature. Figure 1 & 2 data show a typical SP7656 evaluation board efficiency and regulation plots, with efficiencies up to 87% and output currents up to 4A. The output voltage ripple of less than 6.6mV at full load and the LX node are shown in Figure 3. Figures 4 and 5 illustrate a 0.3A to 3A and 1.5A to 3A Load Step. Hiccup due to overcurrent is shown in Figure 6. Typical startup characteristics into a full load and no load are shown in Figure 7 and 8. All waveforms were taken under 12V to 3.3V conversion.

While data on individual power supply boards may vary, the capability of the SP7656ER of achieving a high accuracy over a range of load conditions shown here is quite impressive and desirable for accurate power supply design.

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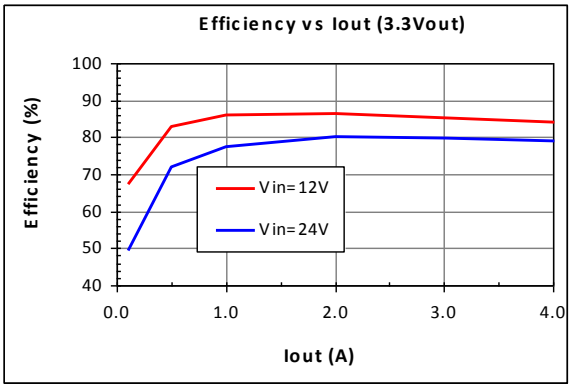

Figure 1. Efficiency vs. Load

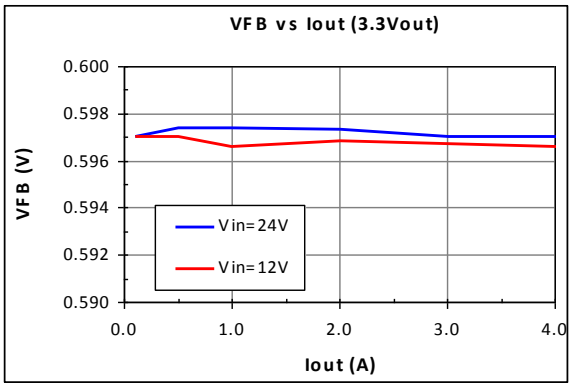

Figure 2. VFB vs. Load

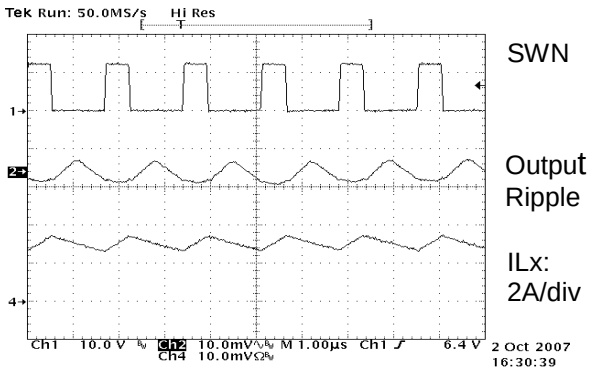

Figure 3. SWN & Output Ripple Voltage

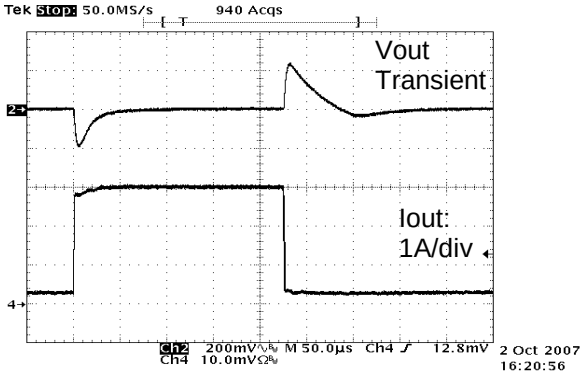

Figure 4. Load Step Response: 0.3A->3A

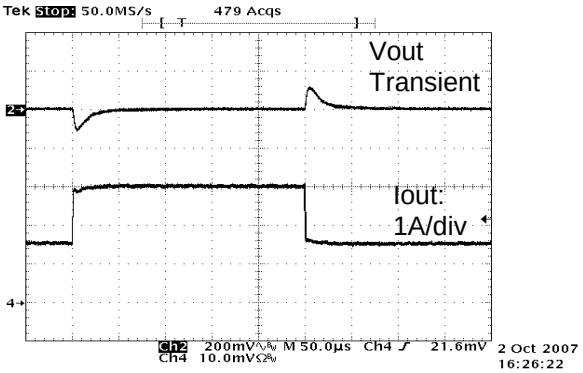

Figure 5. Load Step Response 1.5->3A

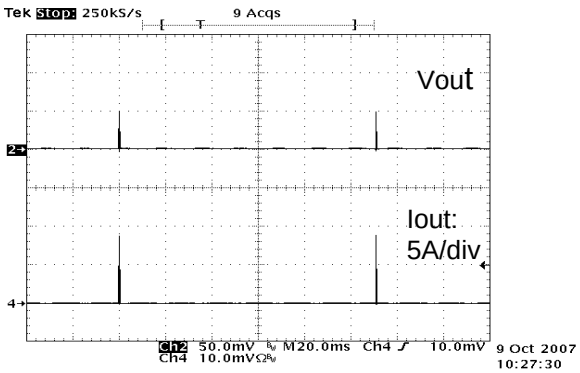

Figure 6. Hiccup due to overcurrent

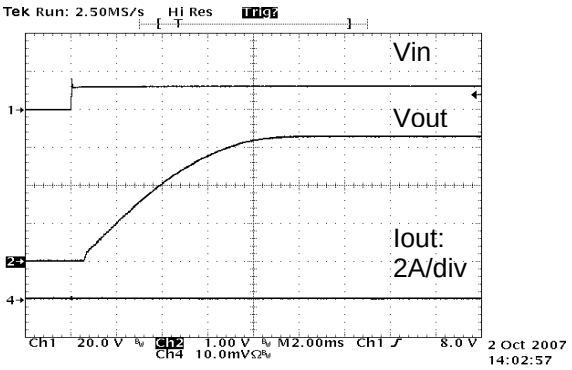

Figure 7. Startup No Load

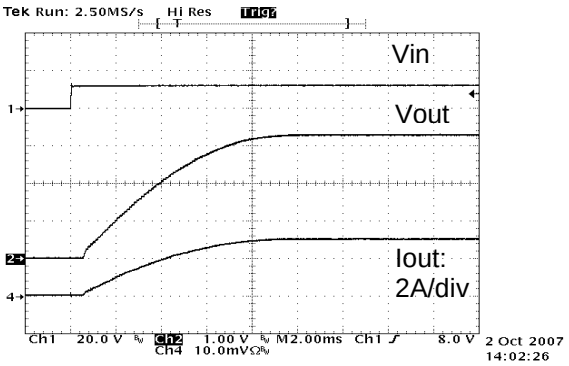

Figure 8. Startup into 3A

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PC Layout Drawings

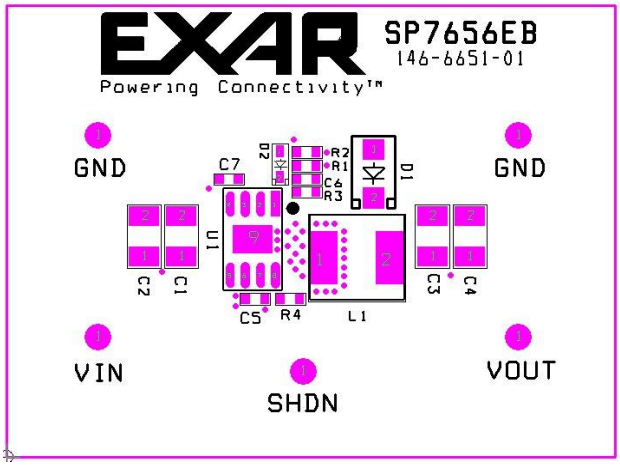

Figure 10. SP7656EB Top Side Component Placement

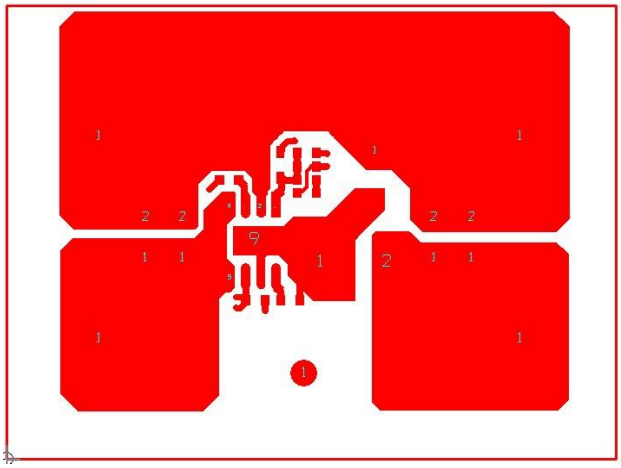

Figure 11. SP7656EB Layout Top Side

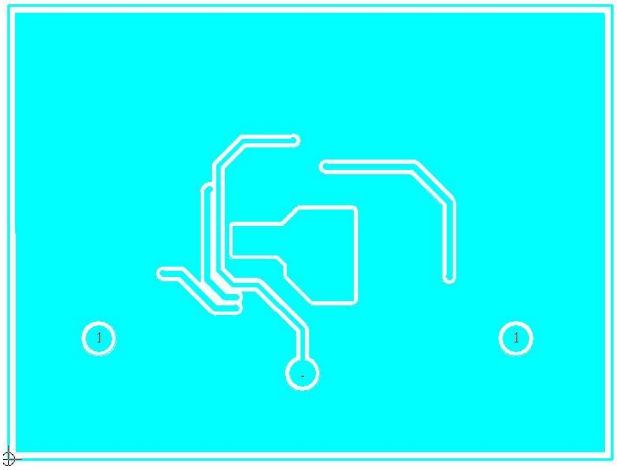

Figure 12. SP7656EB Layout Bottom Side

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Table 1: SP7656EB Suggested Components and Vendor List

Line No.	Ref. Des.	Qty.	Manuf.	Manuf. Part Number	Layout Size	Component	Vendor Phone Number
1	PCB	1	Exar	146-6651-01	1.175"x1.934"	SP7656EB	408-934-7500
2	U1	1	Exar	SP7656	SO-8 EP	Non-Sync. LED Driver	408-934-7500
4	D1	1	On Semi	MBRA340T3	SMA	Schotkky, 40V, 3A	602-244-6600
5	L1	1	WURTH	744314650	7.0X6.9mm	POWER-CHOKE WE-HC	201-785-8800
6	D2	1	MCC	1N4148WX	SOD323	Fast Switching Diode 500mW	818-701-4933
7	C1.C2	2	Taiyo Yuden	UMK325BJ106MM-T	1210	10uF Ceramic, 50V, X7S, 1210	800-388-2496
8	C3.C4	2	MURATA	GRM21BR60J226M	1210	22uF Ceramic X5R 6.3V	770-436-1300
9	C5,C7	2	MURATA	GRM188R71H104K	0603	0.1uF Ceramic, X7R, 50V	770-436-1300
10	C6	1	MURATA	GRM1885C1H680J	0603	68pF Ceramic, COG, 50V	770-436-1300
11	R1	1	VISHAY/DALE	CRCW060320KFK	0603	200K Ohm 1%, 1/10W,0603	402-563-6866
12	R2	1	VISHAY/DALE	CRCW060344K2FK	0603	44.2k Ohm 1%, 1/10W, 0603	402-563-6866
13	R3	1	VISHAY/DALE	CRCW06032K00FK	0603	2.00K Ohm 1%, 1/10W, 0603	402-563-6866
14	R4	1	VISHAY/DALE	CRCW06030000Z	0603	0.0 Ohm 1/10W, 5%, 0603	402-563-6866
15	VIN, VOUT,GND, GND, SHDN	5	Vector Electronic	K24C/M	.042 Dia	Test Point Post	800-344-4539

ORDERING INFORMATION

Model	Temperature Range	Package Type
SP7656EB	-40°C to +125°C	SP7656 Evaluation Board
SP7656EN2-L	-40°C to +125°C	SO8-EP

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