

DESCRIPTION

Demonstration circuits 1237A-A and 1237A-B are dual 800/400mA high efficiency synchronous boost converters. With a light load, the boost converters can startup with an input voltage as low as 700mV and once started, the input can go as low as 500mV while maintaining a regulated output voltage.

Separate input terminals are provided for each converter, and a jumper for paralleling the two inputs.

Terminals and jumpers for separately shutting down or sequencing each regulators output and individual Power-Good outputs are included. Jumpers are also provided for selecting a total of six output voltages, selecting BURST or PWM operation and switching frequency. The 16-pin 3X3 mm QFN thermally enhanced package combined with the high switching frequency provides a very tiny multi output solution.

The LTC3537 also features output disconnect and the input voltage can be greater or less than the output voltage.

This demonstration circuit allows the user to quickly evaluate the LTC3527 performance. Jumpers make selecting different output voltages simple while terminals on the board allow easy hookup to input supplies and output loads.

Demonstration circuit 1237A-B (LTC3527-1) has an active pull-down to quickly discharge the output capacitor when manually shutdown.

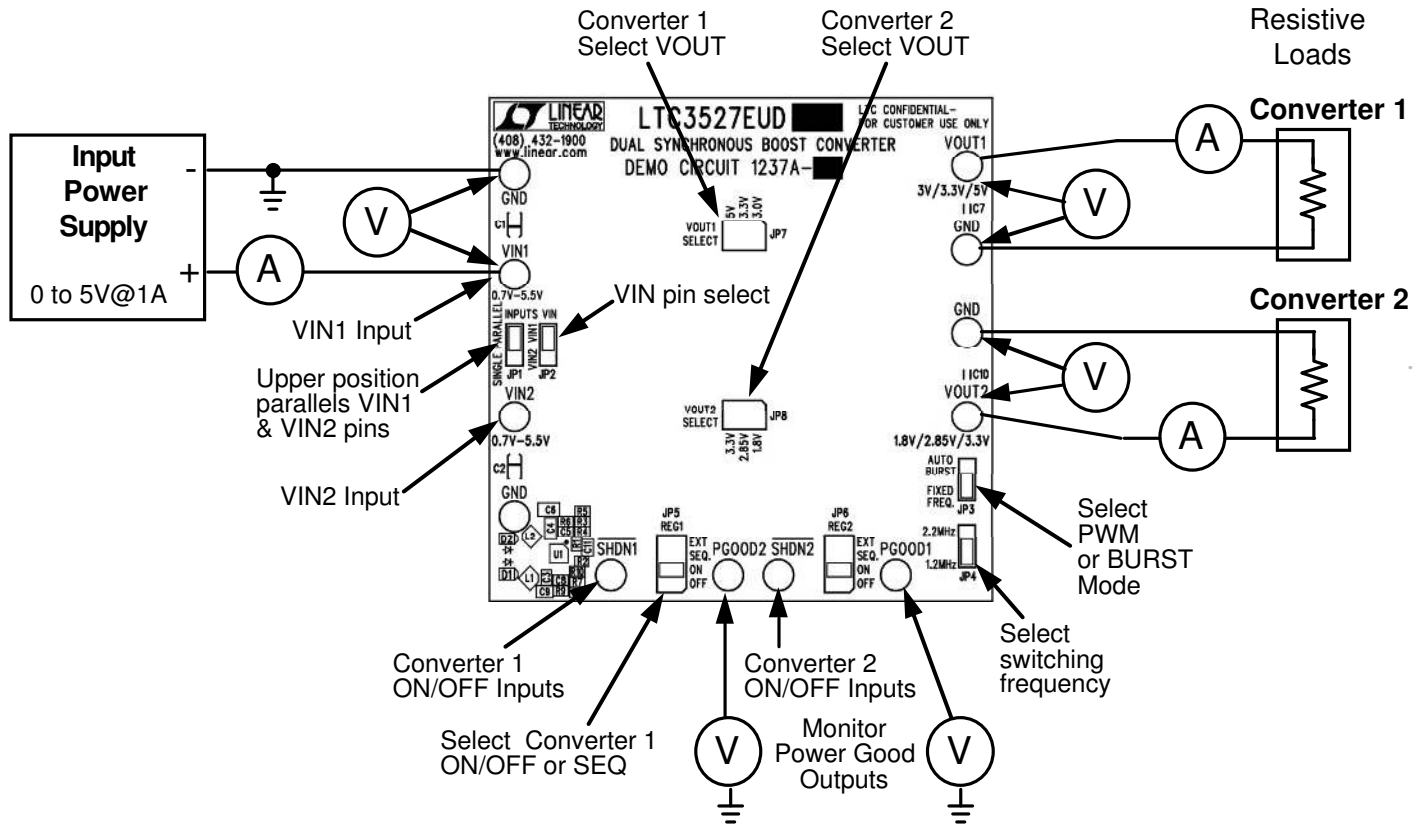
Design files for this circuit board are available. Call the LTC factory.

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Table 1. Typical Specifications (25°C)

	Conditions	Limits
Input Voltage Range V_{IN}		0.7V to 5.5V
Converter 1, 3V V_{OUT}	$V_{IN} = 1.2V, I_{OUT} = 100mA$	$3V \pm 3\%$
Converter 1, 3.3V V_{OUT}	$V_{IN} = 1.2V, I_{OUT} = 100mA$	$3.3V \pm 3\%$
Converter 1, 5V V_{OUT}	$V_{IN} = 1.2V, I_{OUT} = 100mA$	$5.0V \pm 3\%$
Output Ripple Voltage (burst mode)	$V_{IN} = 1.5V, V_{OUT} = 3.3V, I_{OUT} = 15mA$	40mV p-p
Output Ripple Voltage (fixed frequency, 1.2MHz)	$V_{IN} = 1.5V, V_{OUT} = 3.3V, I_{OUT} = 200mA$	10mV p-p
Boost Efficiency (1.2MHz)	$V_{IN} = 1.8V, V_{OUT} = 3.3V, I_{OUT} = 100mA$	88%
Converter 2, 1.8V V_{OUT}	$V_{IN} = 1.2V, I_{OUT} = 50mA$	$1.8V \pm 3\%$
Converter 2, 2.85V V_{OUT}	$V_{IN} = 1.2, I_{OUT} = 50mA$	$2.85V \pm 3\%$
Converter 2, 3.3V V_{OUT}	$V_{IN} = 1.2V, I_{OUT} = 50mA$	$3.3V \pm 3\%$

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 1237 DUAL SYNCHRONOUS BOOST CONVERTER



Board Number	LTC Part Number	Part Marking
1237A-A	LTC3527EUD	LDDK
1237A-B	LTC3527EUD-1	LCXP

Figure 1. Demonstration Circuit Test Setup

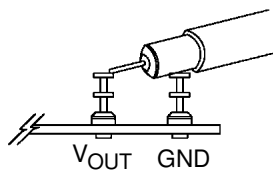


Figure 2. Scope Probe Placement for Measuring Output Ripple Voltage

QUICK START PROCEDURE

The LTC3527/3527-1 circuits can be evaluated using the setup shown in Figure 1. Simply placing jumpers in various locations and measuring voltages can verify most of the features. It is recommended that the LTC3527 data sheet be nearby for a more complete explanation of the various features and specifications.

Using jumpers JP7 and JP8, select the desired output voltages (with no jumpers installed, the output voltage is set for the highest voltage). Enable each regulator by placing jumpers JP5 and JP6 in the ON position; place JP1 in the “PARALLEL” position and jumper JP2 to the “VIN1” position. When using separate input supply voltages, place JP1 in the “SINGLE” position and set jumper JP2 to the higher of the two input voltages. Using JP3, select the desired mode (FIXED FREQUENCY or AUTO BURST) and with JP4, select the desired switching frequency (1.2MHz or 2.2MHz).

Connect voltmeters and ammeters as shown in the Figure 1 test setup. Connect a power supply to the VIN1 and GND terminals and suitable load resistors on the two VOUT and GND terminals. Avoid excessive wire lengths between the input power supply and the demonstration board. Wire lengths greater than 18 inches may require additional capacitance near the input terminals.

With a light load (1k resistor) at each output, begin increasing the input power supply voltage. At approximately 700mV, the output will rise to the selected regulated voltage. When the output voltage exceeds the input voltage by at least 240mV, the converter powers itself from the output instead of the input. This feature allows the input voltage to drop as low as 500mV (at light loads) and still maintain a regulated output voltage. A data sheet curve shows the minimum resistive load vs. Vin that will allow the boost converter to start.

Increase the input voltage to approximately 1.5V or more and increase each load current. The maximum load current depends on the input and output voltage settings. A data sheet curve shows the maximum output current for different input and output voltages.

Using voltmeters, verify each converter output voltage for each of the output voltage options. Output ripple voltage and startup waveforms can be observed using an oscilloscope. In Burst mode with light load current, the output ripple voltage is higher than in non-burst mode. Observe proper scope probe placement shown in Figure 2. Typical Electrical Specifications are shown in table 1.

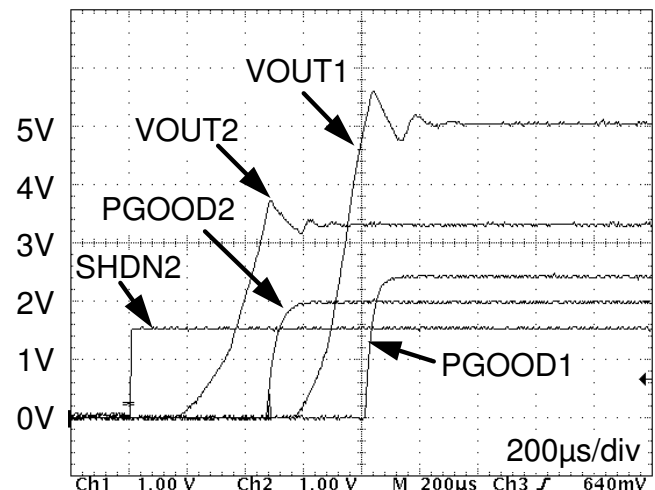


Figure 3. Voltages at start-up with VOUT1 sequenced to VOUT2

Moving jumpers JP5 or JP6 to the OFF position can individually shut down either regulator. Shutting down the Boost Converter drops the converter’s output voltage to near 0V. The LTC3527-1 has an active pull-down to quickly discharge the output capacitor when manually shutdown.

Jumpers JP5 and JP6 also can also be set for regulator output voltage sequencing. Depending on the jumper setting, one of the regulators will remain shut down until the other regulator has reached regulation.

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DUAL SYNCHRONOUS BOOST CONVERTER

The PWRGOOD open drain output terminals are high when the output voltage is in regulation and pull low if the output voltage is approximately 10% low, for any reason. Figure 3 shows various waveforms with VOUT1 sequenced to VOUT2. VOUT1 is only allowed to be ON when VOUT 2 is in regulation. This is done by connecting the PGOOD2 to SHDN1.

When V_{in} is near V_{OUT} and in the range of approximately 300mV to 100mV below V_{out} , the converters are approaching the switch minimum ON time resulting in an increased output voltage ripple similar to BURST mode operation. This ripple can be reduced by increasing the output capacitance.

The input voltage can exceed the output voltage and still maintain regulation, although the maximum output current is less and efficiency is lower.

With JP3 in the Auto Burst position, the converters will operate in a low quiescent current burst mode, provided both converters are under light load. Increasing the load current of either converter will force both converters into fixed frequency (PWM) mode.

Applications with an input of 1.6V or less boosting to a voltage between 3V and 5V out, requiring BURST mode operation, must use the 1.1MHz

Switching frequency. Using the higher frequency will result in higher light load quiescent current. See data sheet curves “Burst Mode Threshold Current vs V_{IN} ” for additional information.

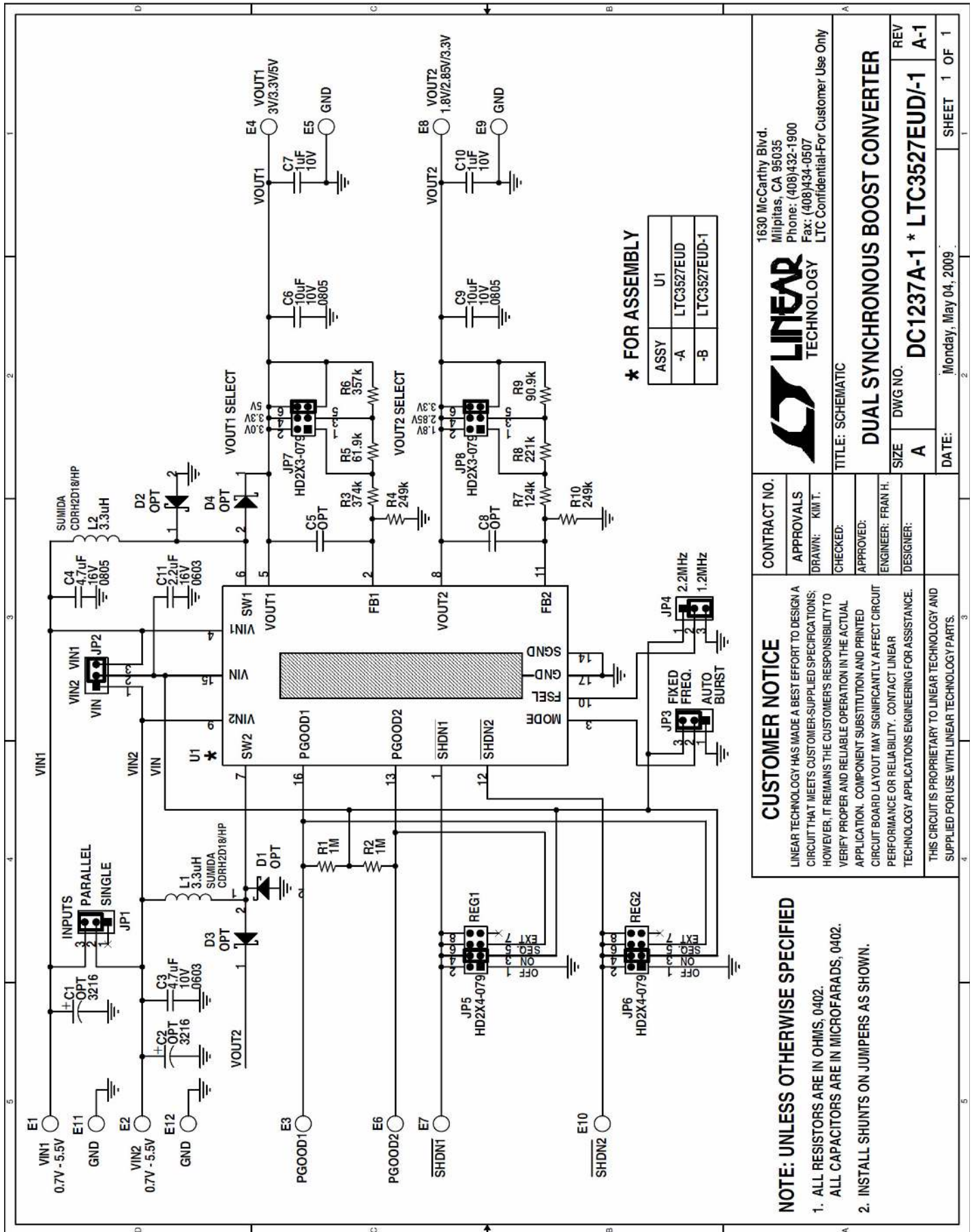
When evaluating the circuit at low input voltages, it is important to monitor the input voltage directly at the input terminals of the circuit board. At very low input voltages, voltage drops in the power supply wire and Ammeter will result in the input voltage at the input terminals dropping below the minimum voltage required for operation.

Additional pc board pads are provided for an optional input bypass capacitor (C1). It maybe necessary when using long wires between the power supply and circuit board, or for adding a tantalum capacitor to minimize input voltage transients that may occur when the input is hot-switched. Also, pads on the board are provided for adding small Schottky diodes, which can increase efficiency slightly under some conditions. But adding these diodes defeat the output disconnect and short circuit protection features.

See LTC3527 Data Sheet for additional information

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DUAL SYNCHRONOUS BOOST CONVERTER



*** FOR ASSEMBLY**

ASSY	U1
-A	LTC3527EUD
-B	LTC3527EUD-1

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DUAL SYNCHRONOUS BOOST CONVERTER

SIZE: A DWG NO.: DC1237A-1 * LTC3527EUD/-1 REV: A-1

DATE: Monday, May 04, 2009 SHEET 1 OF 1

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

CONTRACT NO. _____
 APPROVALS _____
 DRAWN: KIM T.
 CHECKED: _____
 APPROVED: _____
 ENGINEER: FRAN H.
 DESIGNER: _____

- NOTE: UNLESS OTHERWISE SPECIFIED**
1. ALL RESISTORS ARE IN OHMS, 0402.
 2. INSTALL SHUNTS ON JUMPERS AS SHOWN.