DEMO CIRCUIT 957
QUICK START GUIDE

LTC3785
3.3V, 3.0A Synchronous Buck-Boost Controller

DESCRIPTION

Demonstration circuit 957 is a wide input range, 3.3V, 3.0A Synchronous Buck-Boost Converter featuring the LTC3785.

This circuit was designed to demonstrate the high levels of performance, efficiency, and small solution size attainable using this part in a buck-boost power supply. It operates at 500kHz and produces a regulated 3.3V, 3.0A output from an input voltage range of 2.7 to 10V. It is suitable for portable applications, and has a footprint area that is 0.36 square inches.

Synchronous rectification helps to attain efficiency up to 96%, depending on line and load. The LTC3785 provides current limit and shutdown disconnect. It offers Burst Mode operation for high efficiency at light loads.

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

PERFORMANCE SUMMARY **Specifications are at TA = 25°C**

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range		2.7		10	V
V_{OUT}	Output Voltage			3.3		V
I_{OUT}	Output Current Range	V_{IN} = 2.7 –10V	0		3.0	A
F_{SW}	Switching (Clock) Frequency			500		kHz
$V_{OUT\ P-P}$	Output Ripple	V_{IN} = 4.2V, I_{OUT} = 3.0A (20MHz BW)		20		mV_{P-P}
I_{REG}	Output Regulation	Line and Load (2.7-10V, 0-3.0A)		±0.36		%
P_{OUT}/P_{IN}	Efficiency (see Figure 2)	V_{IN} =4.2V, I_{OUT} = 3.0A		92.5		%

OPERATING PRINCIPLES

The LTC3785 Synchronous Buck-Boost Controller is employed to produce a 3.3V output from an input ranging from 2.7V to 10V.

The converter utilizes a proprietary 4-switch topology to provide an output that is within the input voltage range. It seamlessly transitions from buck, to buck-boost, to boost modes of operation to maintain the output as the input voltage goes from maximum to minimum values.

QUICK START PROCEDURE

Demonstration circuit 957 is easy to set up to evaluate the performance of the LTC3785. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring the output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip and ground ring directly across the last output capacitor (C15) as shown in Figure 1.

1. Set an input power supply that is capable of 2.7V to 10V to 4.2V. Turn off the supply.

2. With power off, connect the supply to the input terminals +Vin and –Vin.

a. Input voltages lower than 2.7V can keep the converter from turning on due to the undervoltage lockout feature of the LTC3785.

b. If efficiency measurements are desired, an ammeter capable of measuring 5Adc or a resistor shunt can be put in series with the input supply in order to measure the DC957's input current.

c. A voltmeter with a capability of measuring at least 10V can be placed across the input terminals in order to get an accurate input voltage measurement.

3. Turn on the power at the input.

NOTE. Make sure that the input voltage never exceeds 10V.

4. Check for the proper output voltage of 3.3V. Turn off the power at the input.

5. Once the proper output voltages are established, connect a variable load capable of sinking 3.0A at 3.3V to the output terminals +Vout and –Vout. Set the current for 0A.

a. If efficiency measurements are desired, an ammeter or a resistor shunt that is capable of handling 3.0Adc can be put in series with the output load in order to measure the DC957's output current.

b. A voltmeter with a capability of measuring at least 3.3V can be placed across the output terminals in order to get an accurate output voltage measurement.

6. Turn on the power at the input.

NOTE. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

7. Once the proper output voltage is again established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other desired parameters.

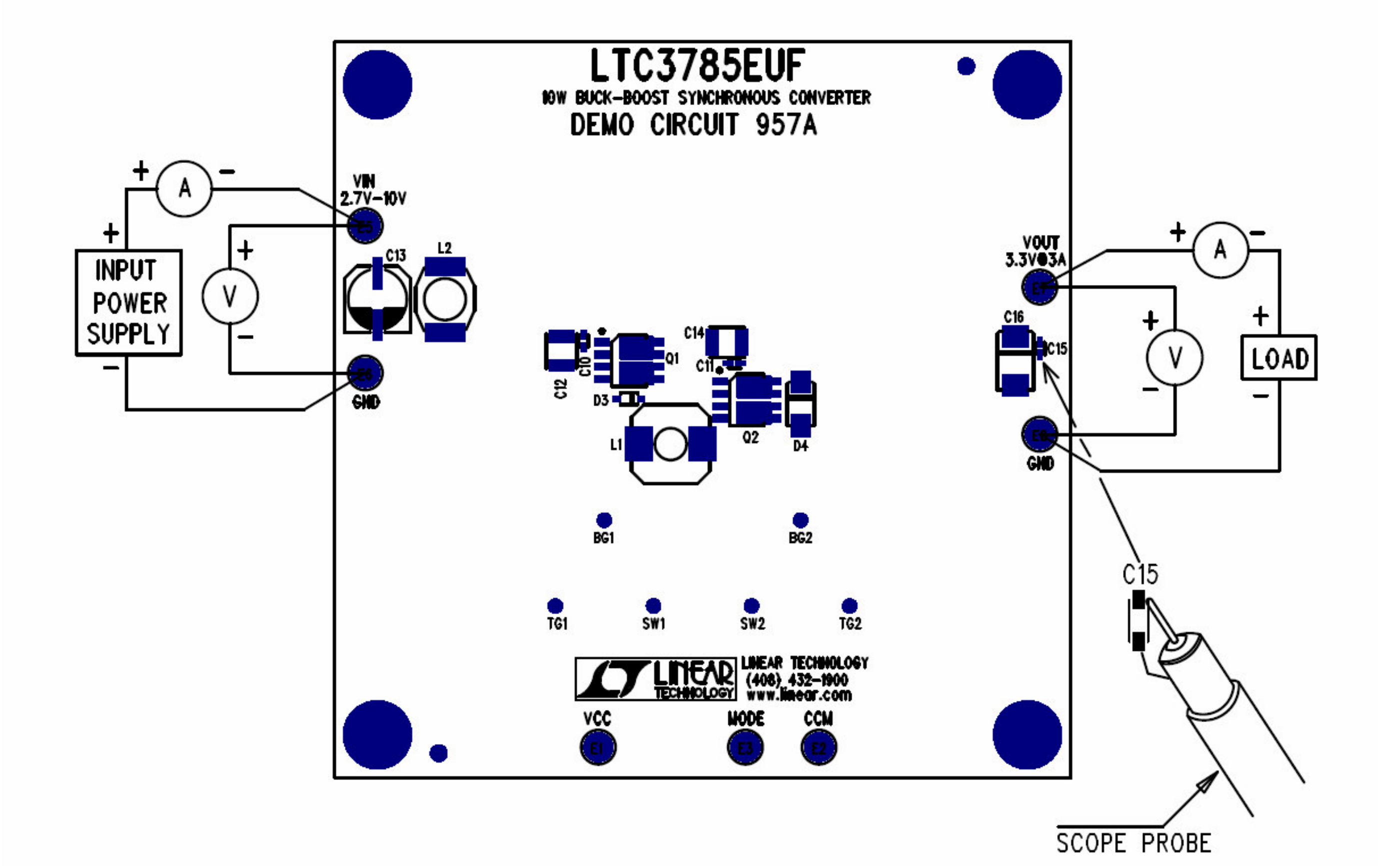

Figure 1. Proper Measurement Equipment Setup

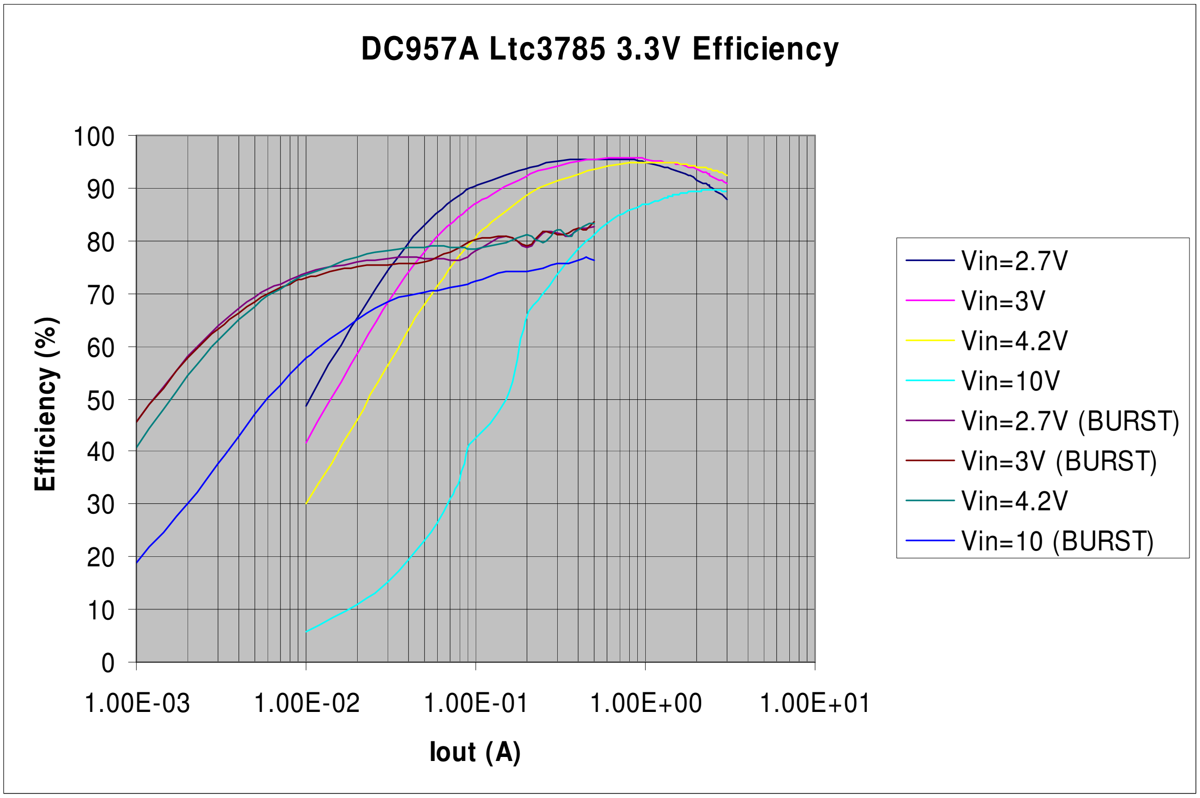

Figure 2. Efficiency – Note 90%+ efficiency over a wide current range.

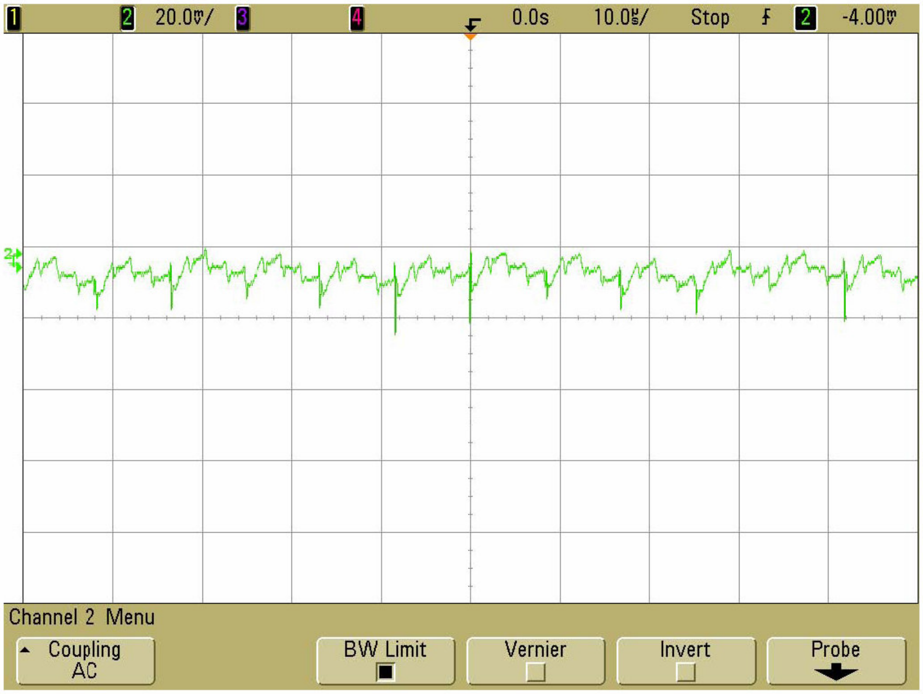

Figure 3. Output Ripple at 4.2Vin and 3.0Aout (20MHz) - 10uS and 20mV / div

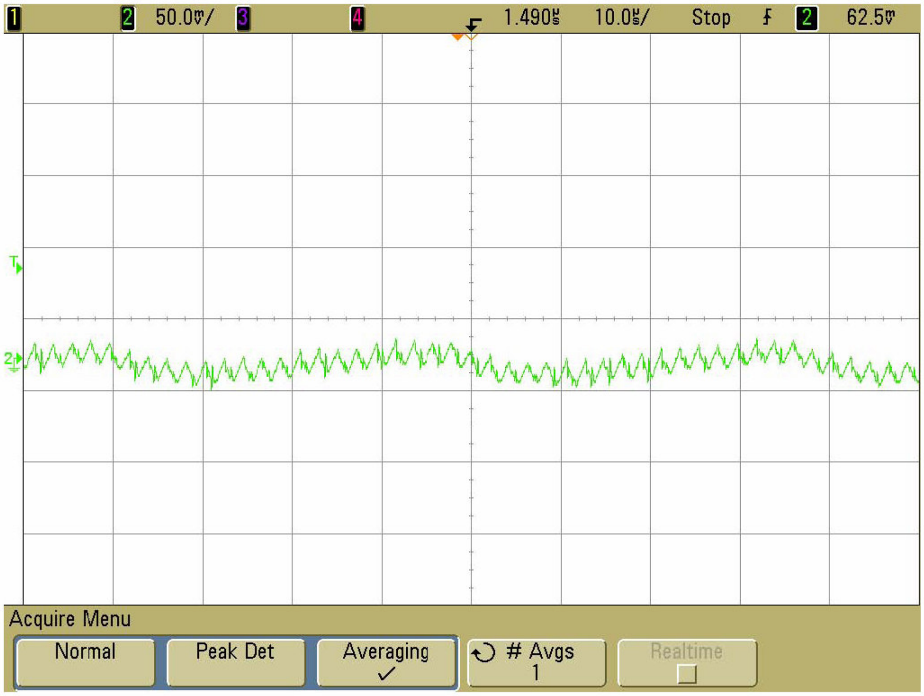

Figure 4. Output Ripple at 2.7Vin and 3.0Aout (20MHz) - 10uS and 50mV / div

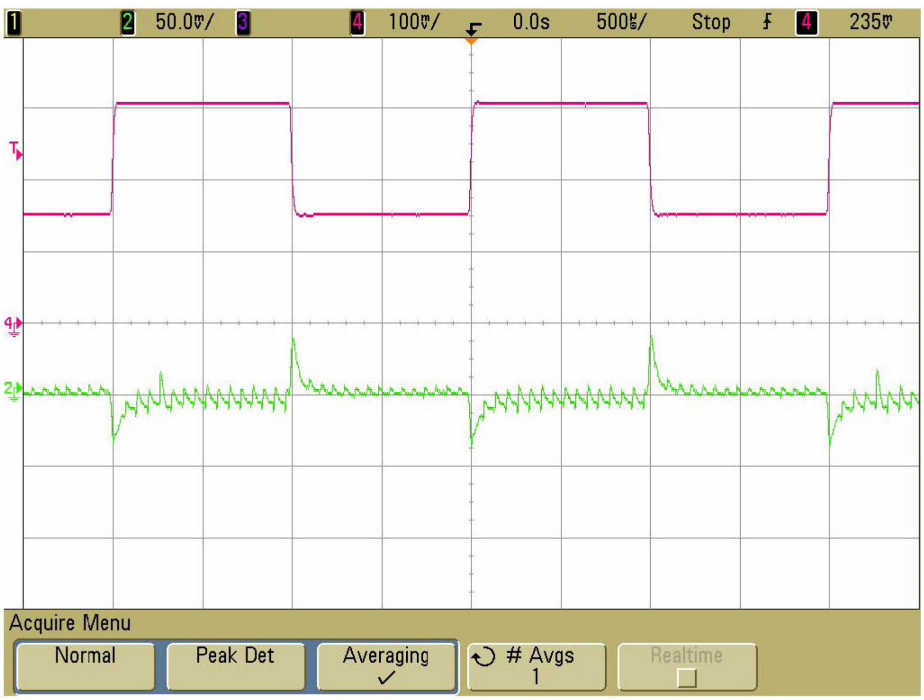

Figure 5. Transient Response Waveform at 4.2Vin and 1.5 - 3.0Aout – 500uS and 50mV / div

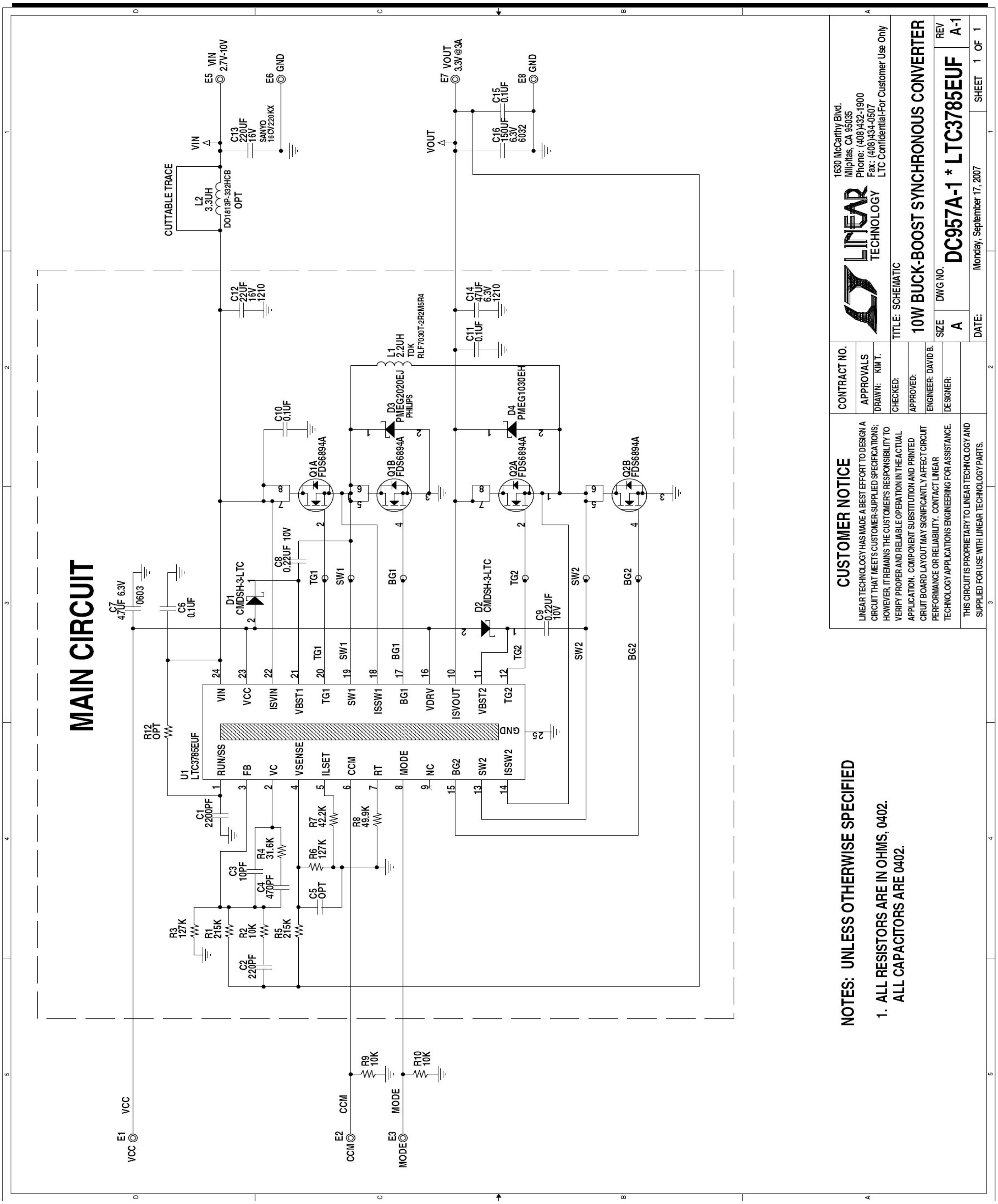

Figure 6. Complete Board Schematic

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