DEMO CIRCUIT 1580A
QUICK START GUIDE

LTC3856EUH
HIGH EFFICIENCY POLYPHASE BUCK CONVERTER

DESCRIPTION

Demonstration circuit 1580A is a high efficiency, polyphase, synchronous buck converter with 4.5V to 14V input range. It can supply 50A maximum load current at 1.5V output. The demo board uses the LTC®3856EUH controller. The LTC3856 is a feature-rich single-output dual-phase synchronous buck controller with on-chip drivers, remote output voltage sensing. This board is setup with sense resistor configuration with optional inductor DCR sensing circuit. Temperature compensation function can guarantee accurate current limit over a wide temperature range with DCR sensing. Stage shedding function allows the controller to decrease the phase number to be one at the light load condition in order to save switching related loss. Adaptive voltage positioning (AVP) can help improve the transient response. The LTC3856 is suitable for input from 4.5V to 38V and output up to 5V. The LTC3856 can provide high efficiency, high power density and versatile power solutions for telecom and datacom systems, industrial and medical instruments, DC power distribution systems and computer systems. The controller is available in 32-pin 5mm × 5mm QFN and 38-pin SSOP packages.

The RUN pin (JP1) provides enable feature. To shut down the converter, one simple way is to force the RUN pin below 1.2V (JP1: OFF). Use JP3 jumper to select burst mode, stage shedding mode or forced continuous mode operation. The phase of CLKOUT is set by JP2. Switching frequency is pre-set at about 400KHz, and it can be easily modified from 250KHz to 770KHz. Please see LTC3856 data sheet for detailed information.

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

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Input Voltage Range		4.5V to 14V
Output Voltage, V_{OUT}	V_{IN} = 4.5-14V, I_{OUT} = 0A to 50A	1.5V ±2%
Maximum Output Current, I_{OUT}	V_{IN} = 4.5-14V, V_{OUT} = 1.5V	50A
Typical Efficiency	V_{IN} = 12V, V_{OUT} = 1.5V, I_{OUT} = 50A	87.7%
Typical Switching Frequency		400kHz

QUICK START PROCEDURE

Demonstration circuit 1580A is easy to set up to evaluate the performance of the LTC3856EUH. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to Vin (4.5V-14V) and GND (input return).
2. Connect the 1.5V output load between Vout and GND (Initial load: no load).
3. Connect the DVMs to the input and outputs.
4. Turn on the input power supply and check for the proper output voltages. Vout should be 1.5V+/-2%.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. See Figure 2 for the proper scope probe technique. Short, stiff leads need to be soldered to the (+) and (-) terminals of an output capacitor. The probe's ground ring needs to touch the (-) lead and the probe tip needs to touch the (+) lead.

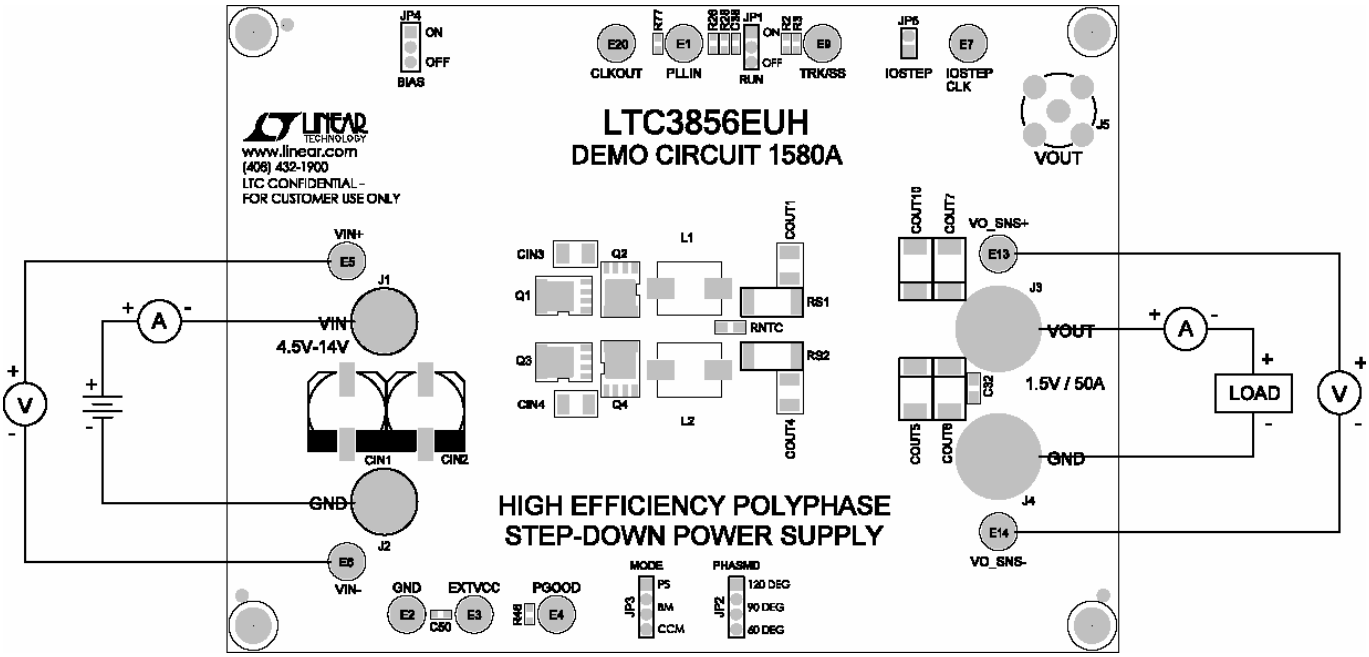


Figure 1. Proper Measurement Equipment Setup

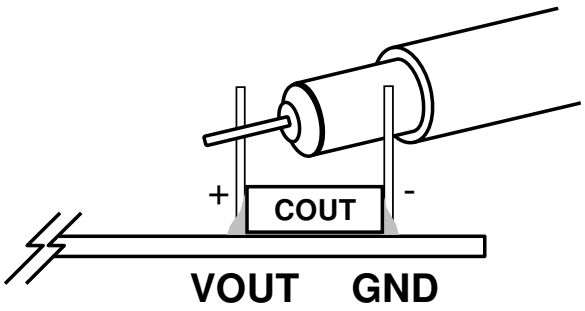


Figure 2. Measuring Output Voltage Ripple

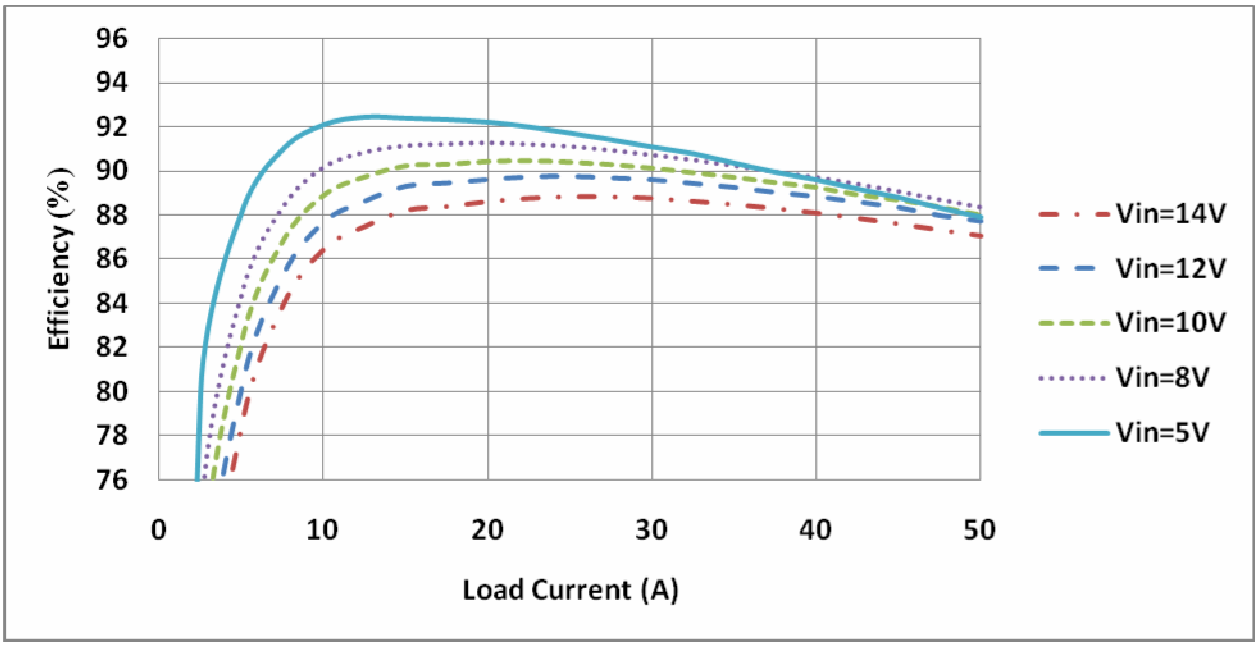
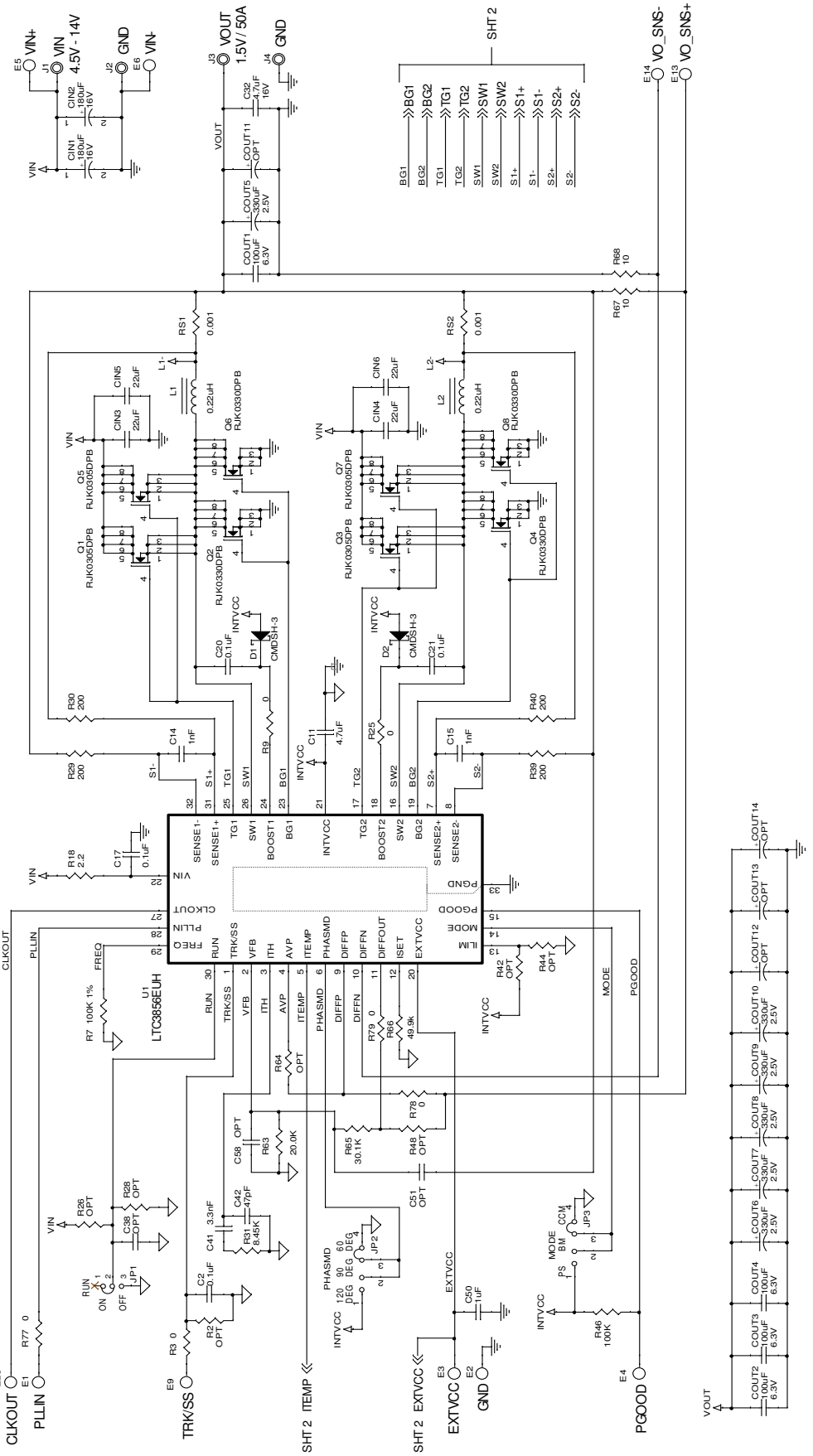
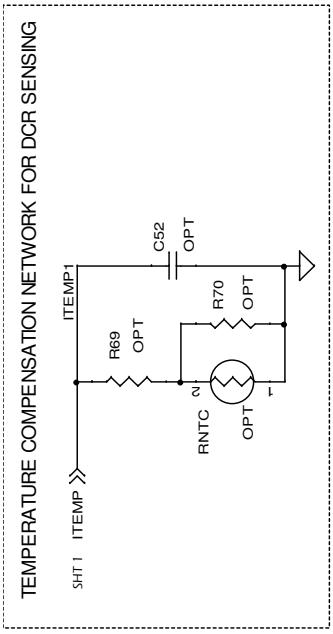
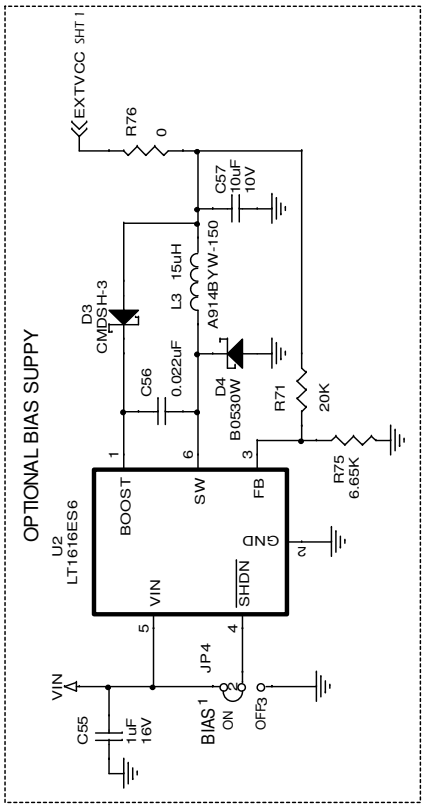
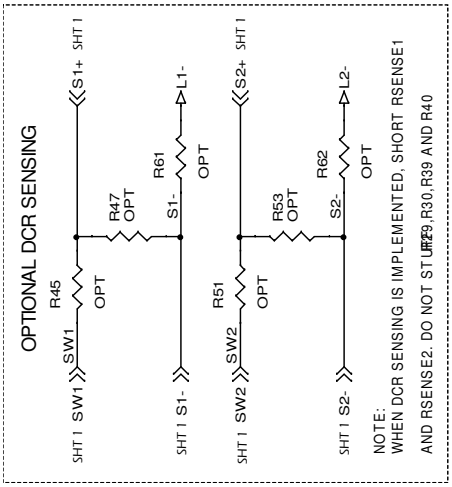


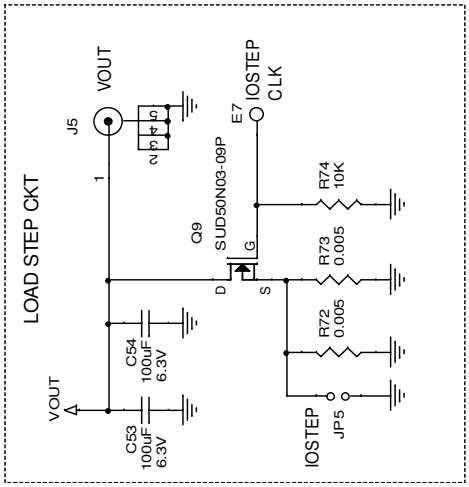
Figure 3. Efficiency vs load current


VIN+
VIN
4.5V - 14V
GND
VIN-
VOUT
1.5V / 50A
GND
SHT 2
VO_SNS-
VO_SNS+
U1
LTC3856EUH
CLKOUT
PLLIN
TRK/SS
ITEMP
EXTVCC
GND
PGOOD
VOUT


TEMPERATURE COMPENSATION NETWORK FOR DCR SENSING
SHT1 ITEMP
ITEMP1
R69 OPT
C52 OPT
R70 OPT
RNTC
OPT


OPTIONAL BIAS SUPPY
EXTVCC SHT1
R76 0
C57 10uF 10V
D3 CMDSH-3
L3 15uH A914BYW-150
C56 0.022uF
D4 B0530W
R71 20K
R75 6.65K
U2 LT1616ES6
BOOST
SW
FB
GND
VIN
SHDN
VIN
C55 1uF 16V
JP4
BIAS 1
ON
OFF3


OPTIONAL DCR SENSING
SHT1 SW1
SW1
R45 OPT
R47 OPT
S1+ SHT1
L1-
R61 OPT
S1-
SHT1 S1-
SHT1 SW2
SW2
R51 OPT
R53 OPT
S2+ SHT1
L2-
R62 OPT
S2-
SHT1 S2-
NOTE:
WHEN DCR SENSING IS IMPLEMENTED, SHORT RSENSE1
AND RSENSE2. DO NOT STUFF R29,R30,R39 AND R40


LOAD STEP CKT
VOUT
J5
VOUT
C53 100uF 6.3V
C54 100uF 6.3V
Q9 SUD50N03-09P
D
G
S
E7
IOSTEP CLK
R74 10K
R73 0.005
R72 0.005
IOSTEP
JP5