DEMO CIRCUIT 1510A
Demo Manual

LTC3858EUH
POLYPHASE HIGH VOUT SYNC. BUCK CONVERTER

DESCRIPTION

Demonstration circuit 1510A is a high output voltage, high efficiency synchronous poly-phase buck converter featuring the LTC3858EUH. The demo circuit is available in two versions. The input voltage of both versions is 16V to 26V. DC1510A-A is configured using 2 piece of LTC3858EUH with 4 phase interleaving operation which provides 12V/50A output, while the DC1510A-B is configured with 1 piece of LTC3858EUH with 2 phase interleaving operation which provides 12V/25A output.

The board has a Mode selection jumper that allows the converter to run in Forced CCM Mode, Pulse Skip Mode or Burst Mode operation. Synchronization to an external clock (frequency range 150kHz to 500kHz) is also possible on this board.

The demo circuit senses inductor current with sensing resistor but also has an optional DCR sense circuit that allows using the inductor's DCR as the current sensing element to save cost, footprint and improve efficiency.

The LTC3858EUH datasheet gives a complete description of these parts, operation and application information and must be read in conjunction with this quick start guide for Demonstration circuit 1510A.

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

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

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Supply Range		16		26	V
Output Voltage Range	V_{IN} = 24V, V_{OUT} = 12 V	11.82	12	12.18	V
Nominal Switching Frequency			250		kHz
Full Load Efficiency (See Figure 3 for efficiency curves)	V_{IN} = 24V, V_{OUT} = 12V, I_{LOAD} = 50A (-A) / 25A (-B)		97.3		%

QUICK START PROCEDURE

Demonstration circuit 1510A is easy to set up to evaluate the performance of the LTC3858EUH. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE. When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the Vin or Vout and GND terminals. See Figure 2 for proper scope probe technique.

1. Place jumpers in the following positions:

   JP1 MODE CCM

   JP2 RUN ON

   JP3 RUN ON

2. With power off, connect the input power supply to VIN and GND. Connect the load to the output. The load current should be smaller than 50A for DC1510A-A and smaller than 25A for DC1510A-B.

3. Turn on the power at the input.

   NOTE. Make sure that the input voltage does not exceed 36V.

4. Check for the proper output voltage. VOUT = 11.82V to 12.18V

5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

6. Different operating modes can be evaluated by changing the position of JP1 **MODE** jumper and are discussed in the next section.

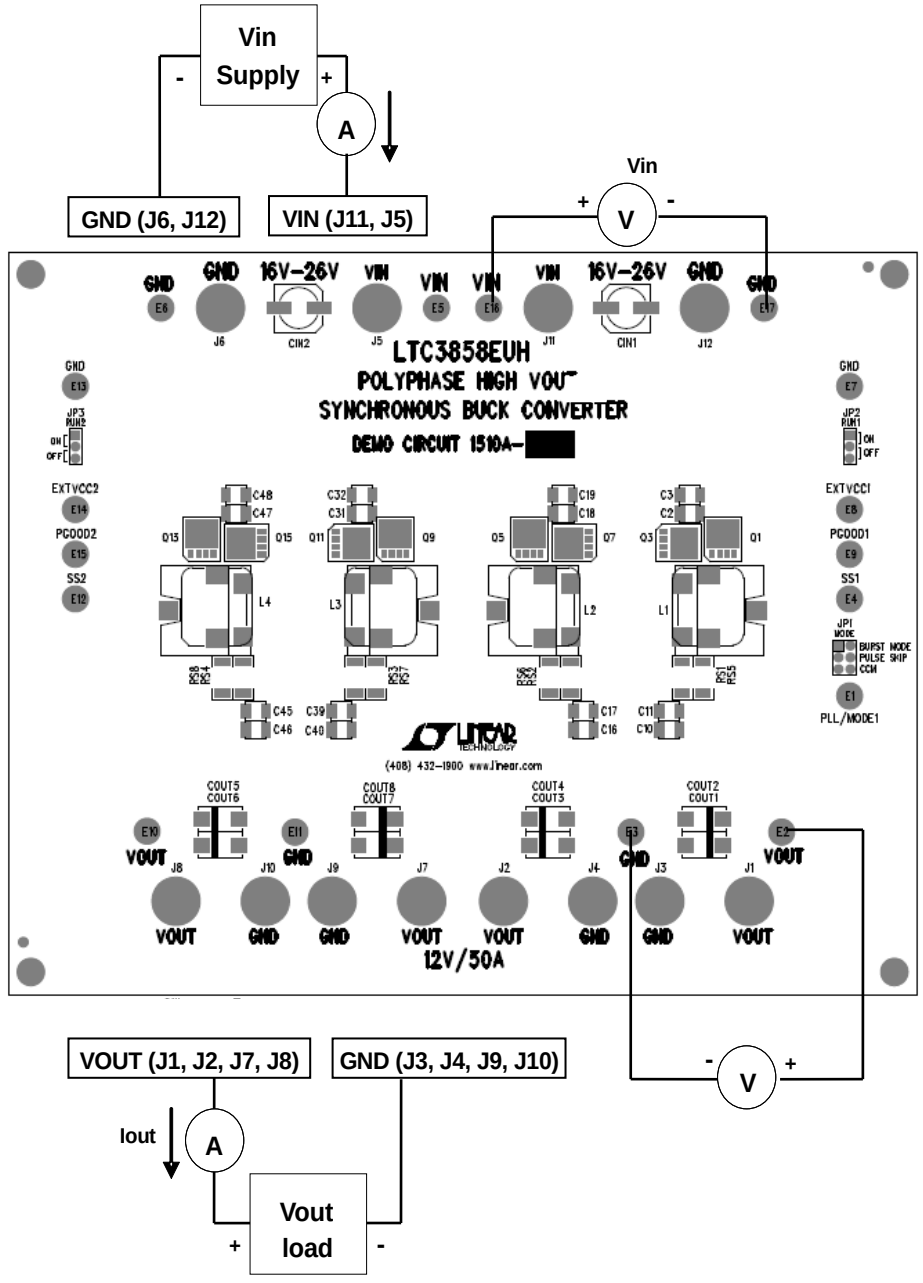


Figure 1. Proper Measurement Equipment Setup

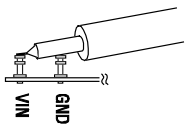


Figure 2. Measuring Input or Output Ripple

FREQUENCY SYNCHRONIZATION AND MODE SELECTION

Demonstration circuit 1510A's Mode selector allows the converter to run in Forced CCM Mode, Pulse Skip Mode or Burst Mode operation by changing position of **JP1 MODE** jumper. For synchronizing to an external clock source, **JP1 MODE** jumper needs to be removed. Apply the external clock (frequency range 150kHz to 500kHz) from the **PLL/MODE1** turret to **GND**. Refer to Table 2 and to the data sheet for more details.

Note: Please don't use Burst Mode in 4 phase interleaving operation

Table 2. Mode Selection and Synchronizing Operation Options

CONFIGURATION	PLL/MODE1 JUMPER
Forced CCM Mode Operation	"CCM"
Pulse Skip Mode Operation	"PULSE SKIP"
Burst Mode Operation	"BURST MODE"
Synchronize to Ext. clock (Ext. clock apply to MODE/PLLIN turret)	Remove Jumper

OPTIONAL INDUCTOR DCR CURRENT SENSING

Demonstration circuit 1510A provides an optional circuit for Inductor DCR Current Sensing. Inductor DCR Current Sensing uses the DCR of the inductor to sense the inductor current instead of discrete sense resistors. The advantages of DCR sensing are lower cost, reduced board space and higher efficiency, but the disadvantage is a less accurate current limit. If DCR sensing is used, be sure to select an inductor current with a sufficiently high saturation current or use an iron powder type. Refer to the datasheet for more details.

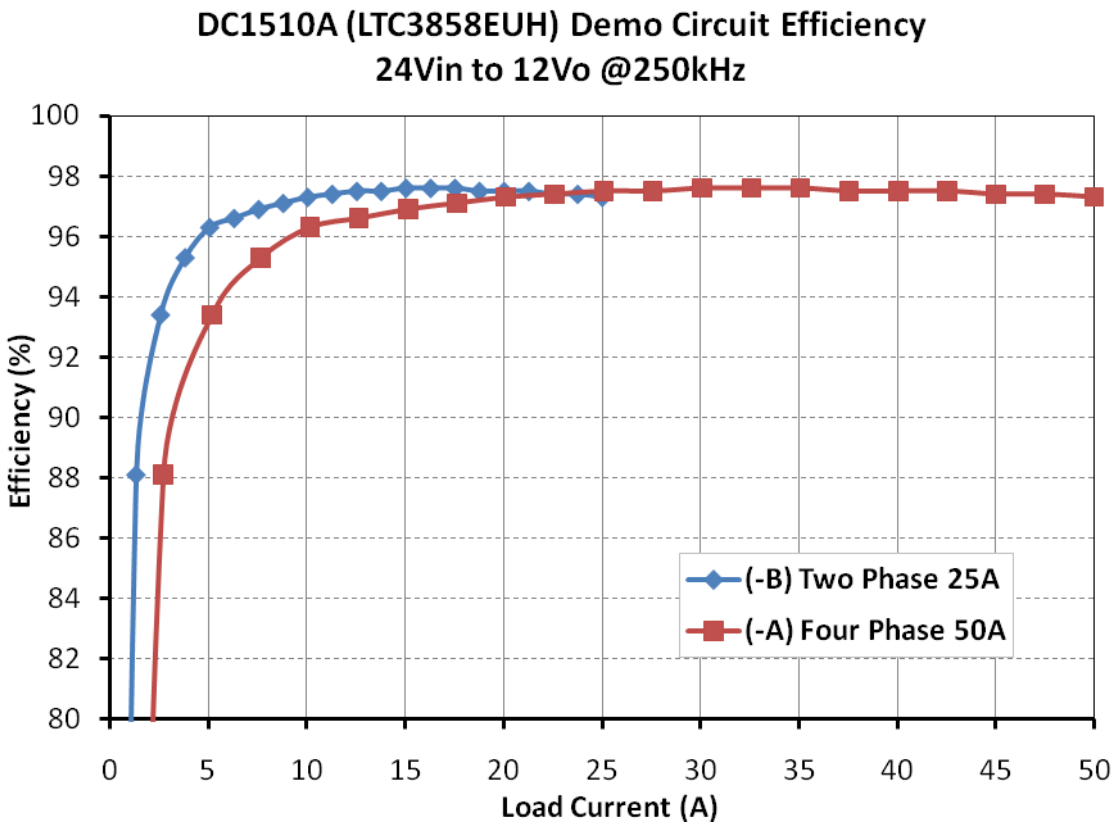
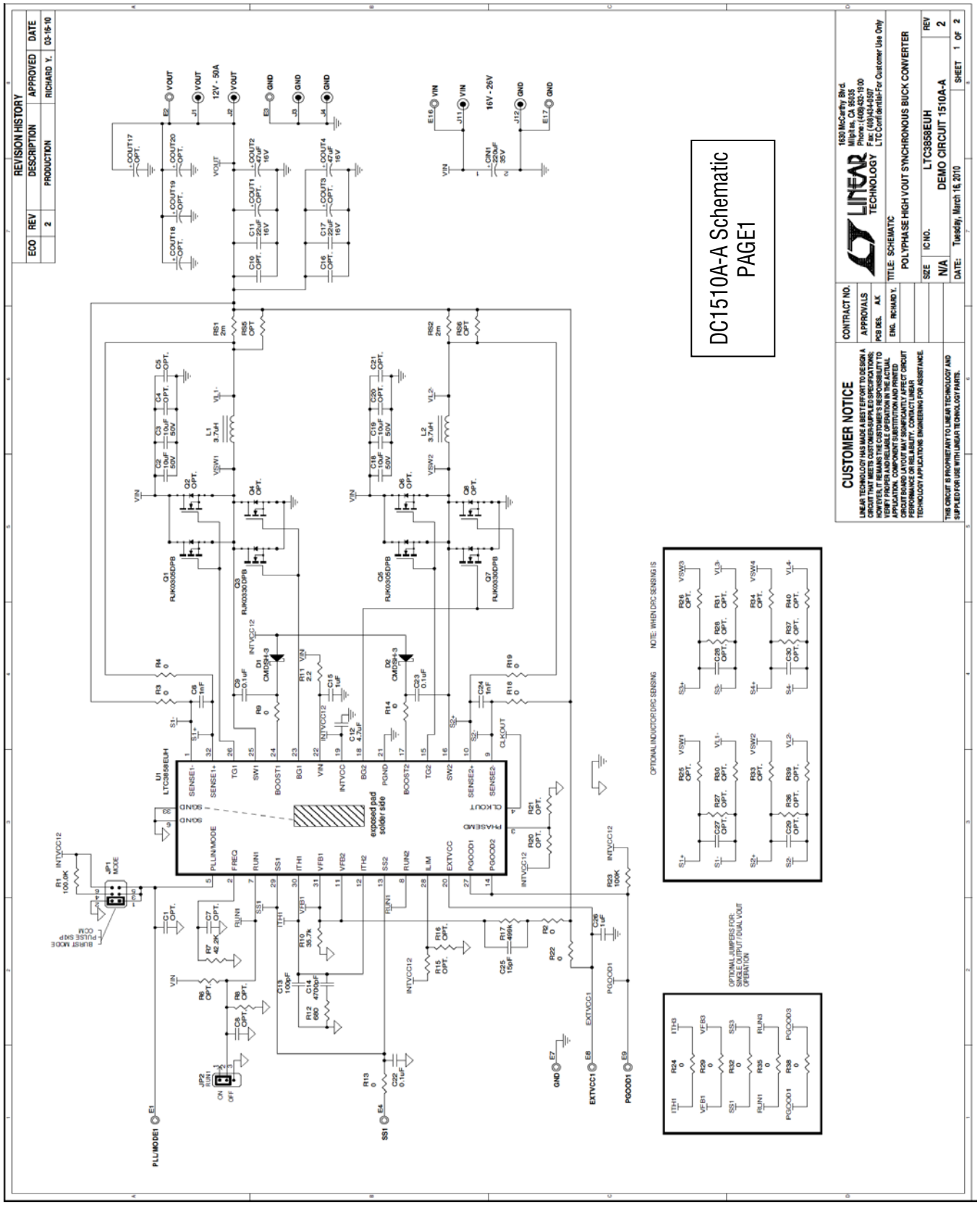
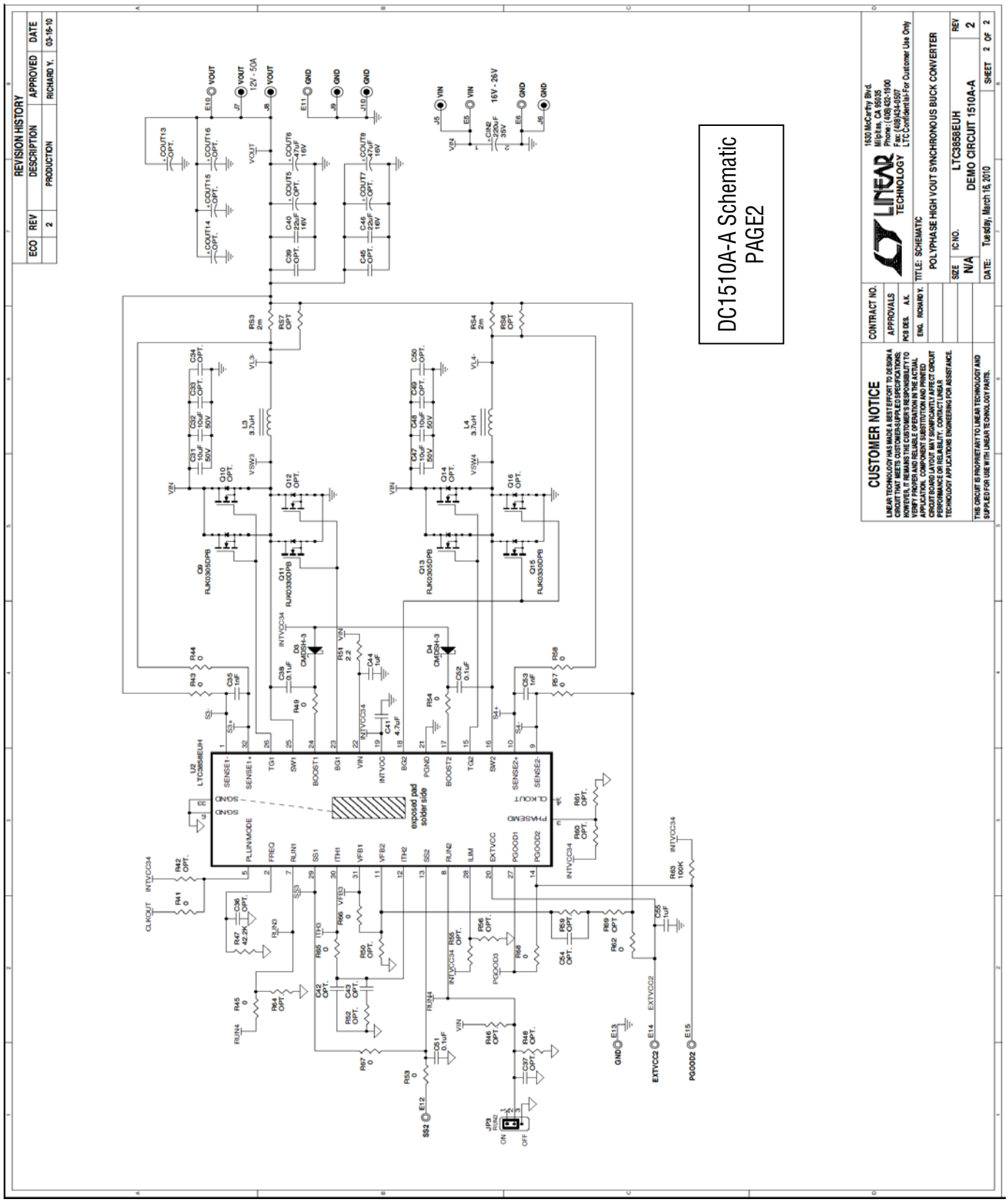


Figure 3. Efficiency Curve for Demonstration Circuit 1510A


DC1510A-A Schematic
PAGE1


DC1510A-A Schematic
PAGE2
REVISION HISTORY
ECO REV DESCRIPTION APPROVED DATE
2 PRODUCTION RICHARD Y. 03-16-10
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.
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CONTRACT NO.
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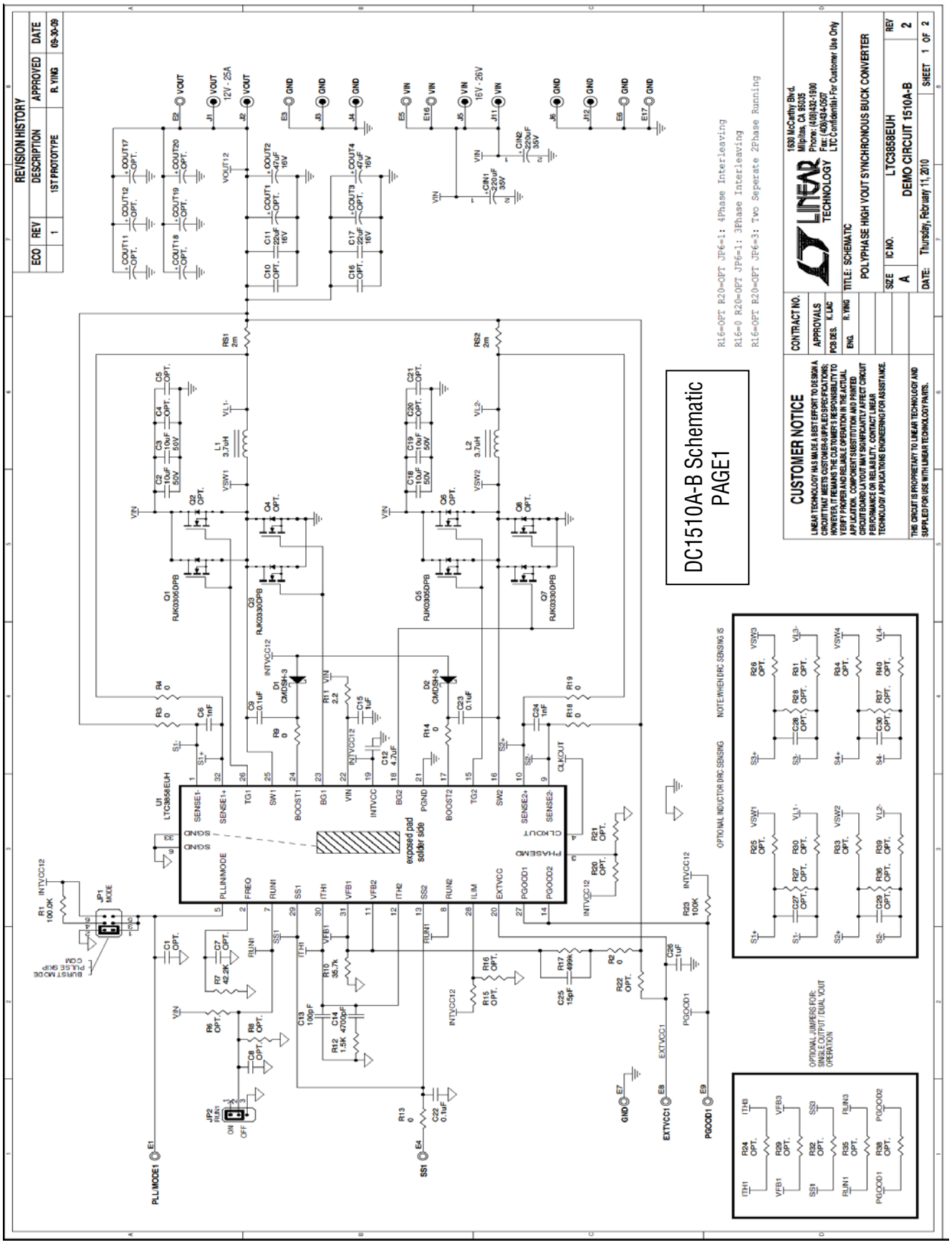
LTC Confidential-For Customer Use Only
TITLE: SCHEMATIC
POLYPHASE HIGH VOUT SYNCHRONOUS BUCK CONVERTER
SIZE IC NO. LTC3858EUH REV
N/A DEMO CIRCUIT 1510A-A 2
DATE: Tuesday, March 16, 2010
SHEET 2 OF 2


DC1510A-B Schematic
PAGE1
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1 1ST PROTOTYPE R. YING 09-30-09
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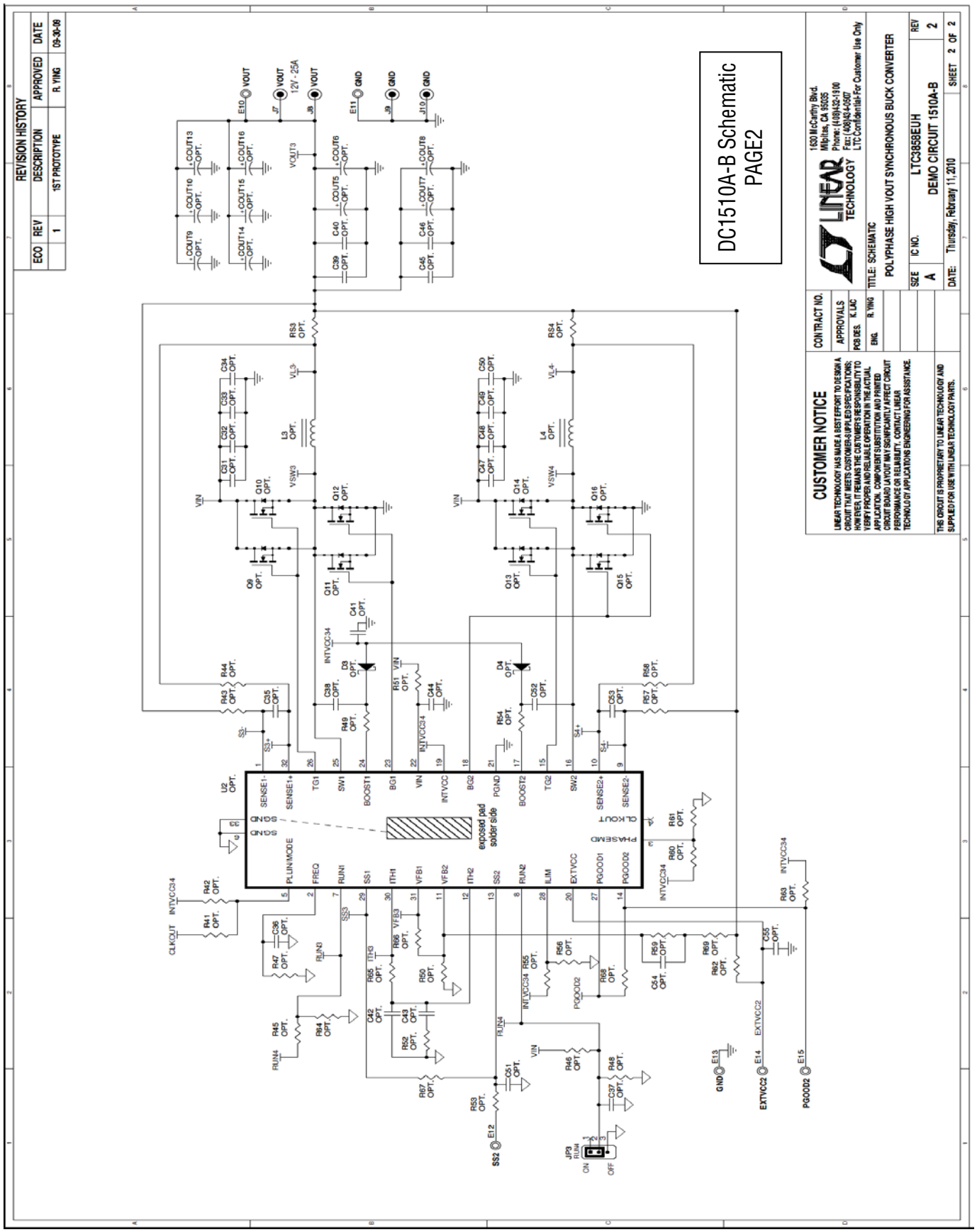
POLYPHASE HIGH VOUT SYNCHRONOUS BUCK CONVERTER
SIZE A
IC NO. LTC3858EUH
DEMO CIRCUIT 1510A-B
REV 2
DATE: Thursday, February 11, 2010
SHEET 1 OF 2
R16=OPT R20=OPT JP6=1: 4Phase Interleaving
R16=0 R20=OPT JP6=1: 3Phase Interleaving
R16=OPT R20=OPT JP6=3: Two Seperate 2Phase Running
U1 LTC3858EUH
Q1 RJK0306DPB
Q3 RJK0330DPB
Q5 RJK0305DPB
Q7 RJK0330DPB
D1 CMDSH-3
D2 CMDSH-3
L1 3.7uH
L2 3.7uH
RS1 2m
RS2 2m
VOUT 12V - 25A
VIN 16V - 26V
OPTIONAL INDUCTOR DRC SENSING
NOTE:WHEN DRC SENSING IS
OPTIONAL JUMPERS FOR: SINGLE OUTPUT / DUAL VOUT OPERATION
exposed pad solder side
PLLMODE1
SS1
EXTVCC1
PGOOD1
GND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SIZE A
IC NO. LTC3858EUH
DEMO CIRCUIT 1510A-B
REV 2
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SHEET 2 OF 2
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.
U2 OPT.
SENSE1-
SENSE1+
TG1
SW1
BOOST1
BG1
VIN
INTVCC
BG2
PGND
BOOST2
TG2
SW2
SENSE2+
SENSE2-
PLLIN/MODE
FREQ
RUN1
SS1
ITH1
VFB1
VFB2
ITH2
SS2
RUN2
ILIM
EXTVCC
PGOOD1
PGOOD2
exposed pad
solder side
VOUT
GND
VIN
INTVCC34
EXTVCC2
PGOOD2
RUN4
SS2
JP3 RUN4
ON
OFF